CHARTER TOWNSHIP OF ORION
PLANNING COMMISSION REGULAR MEETING AGENDA
WEDNESDAY, AUGUST 3, 2022 - 7:00 PM
ORION TOWNSHIP MUNICIPAL COMPLEX BOARD ROOM
2323 JOSLYN ROAD
LAKE ORION, MI 48360

Public Hearing at 7:05 p.m. for PC-22-28, GM Orion BET 2, Special Land Use Request to expand an automotive manufacturing facility located at 4555 Giddings Road (parcels 09-34-200-006 and 09-34-400-011)

Joint Public Hearing with the Township Board of Trustees (immediately following PC-22-28 Public Hearing): PC-22-29, Baldwin Village Planned Unit Development (PUD) Concept and Eligibility Plan, located at 4410 & 4408 S. Baldwin Rd. (parcel 09-32-301-001), an unaddressed parcel 09-32-301-014 located at the NW corner of Morgan and S. Baldwin Roads, an unaddressed parcel 09-32-151-020 located north of 4408 S. Baldwin, and 4292 S. Baldwin (parcel 09-32-151-021). The applicant, RED Equities, LLC, is proposing to rezone the properties from Single Family Residential-1 (R-1), Suburban Farms (SF) and Brown Road Innovation Zone (BIZ) to Planned Unit Development (PUD) to construct a mixed-use development containing both residential and commercial components on approximately 67 acres.

In the spirit of compliance with the Americans with Disabilities Act, individuals with a disability should feel free to contact Penny S. Shults, Clerk, at (248) 391-0304, ext. 4001, at least seventy-two hours in advance of the meeting to request accommodations.

CHARTER TOWNSHIP OF ORION PLANNING COMMISSION
* * * * * A G E N D A * * * * *
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1. OPEN MEETING

2. ROLL CALL

3. MINUTES

A. 7-20-22, Planning Commission Regular Meeting Minutes
B. 7-20-22, Planning Commission Public Hearing Minutes for PC-21-07, 5-Year Master Plan Update

4. AGENDA REVIEW AND APPROVAL

5. BRIEF PUBLIC COMMENT – NON-AGENDA ITEMS ONLY

6. CONSENT AGENDA

7. NEW BUSINESS

A. PC-22-28, GM Orion BET 2, Special Land Use, Wetland & Site Plan located at 4555 Giddings Road (parcels 09-34-200-006 and 09-34-400-011)
B. PC-22-29, Baldwin Village PlannedUnit Development (PUD) Concept and Eligibility Plan, located at 4410 & 4408 S. Baldwin Rd. (parcel 09-32-301-001), an unaddressed parcel 09-32-301-014 located at the NW corner of Morgan and S. Baldwin Roads, an unaddressed parcel 09-32-151-020 located north of 4408 S. Baldwin, and 4292 S. Baldwin (parcel 09-32-151-021).

8. UNFINISHED BUSINESS

9. PUBLIC COMMENTS

10. COMMUNICATIONS

A. Additional Correspondences Received Regarding Master Plan

11. PLANNERS REPORT/EDUCATION

12. COMMITTEE REPORTS

13. FUTURE PUBLIC HEARINGS

A. 08-17-22 at 7:05 p.m., PC-22-31, 1112-1128 Lapeer Road Rezone, the request is to rezone 1112, 1116, 1120, 1124, 1128, & 1132 S. Lapeer Road (parcel #09-14-201-005) from Restricted Business (RB) to General Business (GB).

14. CHAIRMAN'S COMMENTS

15. COMMISSIONERS' COMMENTS

16. ADJOURNMENT

In the spirit of compliance with the Americans with Disabilities Act, individuals with a disability should feel free to contact the Township at least seventy-two hours in advance of the meeting when requesting accommodations.

CHARTER TOWNSHIP OF ORION PLANNING COMMISSION
******** MINUTES ********
REGULAR MEETING, WEDNESDAY, JULY 20, 2022

The Charter Township of Orion Planning Commission held a regular meeting on Wednesday, July 20, 2022, at 7:00 p.m. at the Orion Township Municipality Complex Board Room, 2323 Joslyn Road, Lake Orion, Michigan 48360.

PLANNING COMMISSION MEMBERS PRESENT:

Scott Reynolds, Chairman
Don Gross, Vice Chairman
Derek Brackon, Commissioner
Joe St. Henry, Secretary
Don Walker, PC Rep to ZBA
Kim Urbanowski, BOT Rep to PC

PLANNING COMMISSION MEMBERS ABSENT:

Jessica Gingell, Commissioner

1. OPEN MEETING

Chairman Reynolds opened the meeting at 7:00 p.m.

2. ROLL CALL

As noted above.

CONSULTANTS PRESENT:

Rod Arroyo (Township Planner) of Giffels Webster
Matt Wojciechowski (Township Planner) of Giffels Webster
Eric Pietsch (Township Planner) of Giffels Webster
Mark Landis (Township Engineer) of Orchard, Hiltz, and McCliment, Inc.
Tammy Girling, Township Planning & Zoning Director

OTHERS PRESENT:

Jonathan Forrest
Matthew Koneda
Pat Ebner
Tina Hein
Ray Malikis
Marilyn Hester
Tom William
Joseph Salome
Laura Schueller
Heather Smiley
Carol Ebner
Sandy Walker
Delore Malikis
Dan Hester
Katheryn Kennedy
Sandra Vanderlaan

3. MINUTES

A. 7-6-22, Planning Commission Regular Meeting Minutes
B. 7-6-22, Planning Commission Public Hearing Minutes PPC-2022-18, 3850 Joslyn Rd. Special Land Use for a Gas Station with a Drive-Thru.

Moved by Vice-Chairman Gross, seconded by Commissioner Walker to **approve** both sets of minutes as presented. **Motion carried**

4. AGENDA REVIEW AND APPROVAL

Moved by Vice-Chairman Gross, seconded by Trustee Urbanowski, to **approve** the agenda as presented. **Motion carried**

5. BRIEF PUBLIC COMMENT – NON-AGENDA ITEMS ONLY

None.

6. CONSENT AGENDA

None.

Chairman Reynolds recessed the regular meeting and opened the Public Hearing at 7:05 p.m. for case PC-2021-07, 5-Year Master Plan Update.

Chairman Reynolds closed the PPC-21-07 Public Hearing at 8:10 p.m. and reconvened the regular Planning Commission meeting at 8:10 p.m.

7. NEW BUSINESS

A. PC-22-26, Rigel Terrace Westland & Site Plan, located at 2410 S. Lapeer Rd. (parcel 09-23-301-005) & unaddressed parcels 09-23-301-012 & 09-23-301-013 (which are located between 2410 and 2600 S. Lapeer Rd.).

Chairman Reynolds said that the petitioner was there to give a presentation and overview of their site plan and wetland application. He asked them to step up to the podium and state their name and address for the record.

Trustee Urbanowski said that she is currently the Interim Director at the Chamber of Commerce and Moceri is a member. She asked them to make a determination if she should be recused? Chairman Reynolds replied that at this point and time he didn't believe that was a conflict of interest.

Mr. Dominic J. Moceri the Administrative Manager for Rigel Terrace LLC. He introduced his team Mr. Steve Pangori with AEW Engineers, their partners Manny Kianicky with SR Jacobson, Nico Schultz with Soave Organization or Trident Orion LLC, and Mr. David Stollman who helped arrange and put together these partners of experienced developers in the region and they go back four generations with David Stollman's family in the business. They also have Dominic Tringali who is their lead architect, and he will speak after Mr. Pangori and his brother Mario Moceri who makes sure he doesn't say too much.

Mr. Moceri thanked the Chairman, the Planning Commission, planning staff, the Township Engineer Landis, Township Planners Rod Arroyo, Matt Wojciechowski, and Joe for their diligent review.

Mr. Moceri stated that as Dr. Carl Sagan would say Rigel is the brightest star in the Orion constellation. That is where they got the term, Rigel Terrace, it is the brightest star in the constellation of Orion. Orion was a great hunter, so they chose the street Hunter Blvd. within this.

Mr. Moceri said they were pleased to present them with a modest plan that incorporates 25% less density than what is provided in the ordinance, and Mr. Pangori can elaborate on that later. They have 25% less than what is provided in the ordinance and at the same time, it provides a transition between the intense commercial of the Home Depot directly to the south and a transition to the multi-housing choices that the Pulte development directly north has with the duplexes, the fourplexes, and the single-family. He believed this provides a nice transition. The property is currently zoned, they are not seeking a PUD. They are seeking to get approval so that every segment of the ordinance is not exceeded. There are some writeups and recommendations from the Engineering Consultant with OHM, and with the Planning Consultant Giffels Webster, and they concur with the things that they oversaw and can address those in detail. The building length was exceeded because they were trying to make certain that the Fire Department, they are volunteering to fire suppress these buildings, and so the FDC meters were and the attachments were on the sides of those buildings now they are going to put them in the center, so now they are back into compliance. There are some decks that they had encroached

into the side yard setback, which oddly enough is the north and south side of the proposal, and they could insert those decks and recess those in to cure that oversight on their part and appreciate their patience. They do have a plan that they could submit through administrative review subject to the Planning Commission's consent that they can fulfill these, with the administrative consultants and the Planning Department to review those. They do have an alternate plan that Mr. Pangori can review with them this evening. There is only 17% of building coverage which is far below the max building coverage that is under their ordinance and the graphic he felt clearly identifies that. He thanked them again for their consideration and time. He will be available for questions but thought that the technical questions will be between Mr. Pangori and also Mr. Tringali.

Mr. Pangori said that as Mr. Moceri has indicated they are looking for site plan approval and a wetland permit to develop this 16-acre parcel with 101 townhome units consisting of four-to-eight-unit buildings. The property is currently zoned RM-2, they comply with that zoning, that zoning district allows 8 units per acre, which would allow them 128 units on this 16-acre parcel, and they are proposing 101 units.

Mr. Pangori stated he wanted to spend a few minutes going through some of the comments from the Engineering and Planning Consultants and provide them with their responses to those comments. He started with the wetland review from OHM. There was one comment in there that the plans be revised to relocate the proposed detention basin outlet from wetland A and the associated 25-ft. buffer. He wanted to indicate that they are in the process of reevaluating that outlet from the detention basin and will comply with that requirement. Moving on to OHM's site plan review, he was reading from page four of their document under the conclusions, and he will address that item by item. The first item is a franchise utility easement that should be shown to ensure that there are no conflicts with public utilities. Otherwise, provide a note indicating that the franchise utility easement will not be located within or overlap water main and sanitary sewer easements. He stated that they concur with that. They will do both, they will add the utility easement to the plans to ensure that there is no conflict with the sanitary and water easements.

Mr. Pangori said that the second item is to eliminate conflicts with proposed light poles and utilities. They will add the light pole's locations to the site plan to indicate that there are no conflicts there.

Mr. Pangori stated that item three is to revise the plans to show the locations of proposed infiltration to meet the required Channel Protection Control Volume. They did have a geotechnical investigation done on the property by SME and the infiltration rates are less than .24 which means that the soil is not good for infiltration so they won't be able to infiltrate but they will comply with the other requirements of the detention ordinance. Number four was revising the plans to include pavement sections per the Township Engineering Standards for the roadway, internal sidewalk, and safety path. They will add those cross sections to the plans. The fifth item was revising the plans to include sidewalk crossings of Celeste Circle and indicate the location of ADA ramps. They will comply with that too. The sixth item was to relocate the marketing sign from the existing sanitary sewer easement, which they will do. The final item was that the engineering plan, designed in accordance with Zoning Ordinance #78, Stormwater Management and Soil Erosion & Sedimentation Control Ordinance #139 and the Township's Engineering Standards shall be submitted to the Township for review and approval prior to construction. A detailed cost estimate for the improvements shall be submitted with the plans signed and sealed by the design engineer, which they will comply with, assuming that they will be getting approval this evening.

Mr. Pangori said he wanted to go through the Planner's comments on the site plan, and there are nine of those. The first one was the applicant should consider a common visitor space lot(s). When someone has more than two vehicles visiting, they can't use another driveway without blocking access to another garage. They concur with that; they are providing a two-car garage in each of the units plus there are two parking spaces available in the driveway itself. They are also proposing that they permit on the exterior side of the circle road. Based on the number of spaces between the driveways of the buildings they believe that they can provide ten on-street parking spaces to comply with that and felt that there were enough visitor spaces for this development.

Mr. Pangori stated that the second item was the applicant shall confirm underground utilities and yes, they confirmed that all utilities will be installed underground. The third item was a performance guarantee is required, and they acknowledge that.

Mr. Pangori said the fourth item is regarding the four eight-unit buildings that exceeded the 200-ft. length. Mr. Moceri explained this, on the ends of the eight-unit buildings there was a roughly 5x8-ft. utility or meter room where the Fire Department connection and the meter boxes would be held. It was an oversight on their part. That is what permitted the buildings or allow the buildings to be greater than the 200-ft. In those eight-unit buildings they will only be removing that utility closet and putting it inside of the garage, and the FDC boxes will be between the garages on the outside of the garage to resolve that issue.

Mr. Pangori stated that for the fifth item the applicant shall add site coverage to the site plan. Mr. Moceri indicated that they do have a site coverage of 17.8% which 25% is permitted by the ordinance. They have a revised site plan where they have made these changes but that note was added to the plans.

Mr. Pangori said item number six buildings 3, 4, 9 & 10 appear to have porches or balconies projecting 6'6" into the side setback. That is the northerly and southerly boundaries of the property, the buildings that back up to that side of the parcel. Mr. Moceri had indicated that there are a couple of things there that they did, the original site plans show offsetting garages as they go across the unit. Which was something that they voluntarily did to try to break up the front elevation of the garages. That is really what caused that projection into the side yard. On the revised plan on only those units that back up to those side yards they have eliminated that jog in the front garages and reduced the porch depth to 6-ft. beyond the furthest dimension of the rear of those buildings, and all the porches will comply with the ordinance on the side yards.

Mr. Pangori stated in comment number seven, that building 11 appears to have a porch/balcony project 6'6" into the front setback. Building 11 is the building that backs up to Lapeer Rd. which would be the first building on the left as they are pulling into the development. Their interpretation of the ordinance is that porches and balconies are permitted in the front yard to extend no further than 10-ft. from the building. They believe that that complies, so they kept the jog in the garages on that particular building. If they were misinterpreted that they can easily eliminate the jog and pull those porches back out of the 100-ft. front yard setback.

Mr. Pangori said the final two items dealt with the trees. Number eight was that the applicant shall provide the final open space tree requirement calculation based on the tree survey submitted. There was a response letter that they included from the landscape architect Jim Allen that indicates that 157 trees are required to meet the general landscaping requirements, and this requirement is met by preserving 425 trees. The ninth item was a tree removal was required per section 27.12. Applicant should provide replacement tree details based on the d.b.h. requirements. This information was on sheet L-9, there was a summary part of the table that indicated that 595 non-landmark replacement trees are required on a one-to-one basis.

The landmark d.b.h. removed is 703 inches which result in 234 three-inch deciduous trees or eight-ft. evergreen tree replacements.

Mr. Pangori stated that they were confident that their responses to all the current concerns presented and will address the items in the review letter.

Mr. Dominic Tringali stated he has worked on the project with Mr. Moceri and several other ones as well. He said they did read the ordinance and architecturally they did look at it very closely to try to give some deviation and relief. They basically have four, five, six, & eightplexes that he has put together. Rather than typically having straight in the front on the elevation, they have some relief going back and forth. On the floor plans, they will see they have pulled some back and some forward. They actually added a few side entries as well too, so that way they don't have all the garages looking in front, they have some variety in there, some breakup in there, and then having it all tie together with the simplicity of what they created there is what they put together. The units are two-story units they are about 1,800-sq. ft. very popular something the market really needs, and they think they are going to fill a really good hole with this particular product that they put in there and the residents that they designed in there. Supposedly there is going to be about a two million housing shortage coming up and they can fill some of that gap and they thought it would be a good transition.

Mr. Tringali showed them the elevations. He stated that each unit is different, so they have some variety and not too much consistency. They have covered porches on some of the sides of the units too. Architecturally they are really pleased with what they are creating there. Also, some of the details of the canopies they are putting on the front and garage doors to cover those up. He showed them the fourplex and how some of the garage's projects in front, the other two were set back, they did that consistently throughout the project. He showed them the ones with the side entries, and how the decks in the rear are partially backed in as well too that they can meet the ordinance and the covered porches on the side.

Planner Wojciechowski said they hit a lot of the information, so he did a very brief summary. 101 townhouse units within 17 buildings ranging from four to eight units per building, and each unit would have three bedrooms. There are two parking spaces within the garage and two spaces in the driveway for four per unit which does meet the overall count, and they heard how the applicant intends to address the visitor parking. Really the item that he wanted to draw their attention to, was the one waiver that they are requesting with this site plan which is typically the RM-2 district requires covered receptacles, and dumpster enclosures, and they are proposing to have individual trash cans that are stored within the garages so that is requested in lieu of the dumpster area. That does require a Planning Commission waiver from sections 7.03 I. Otherwise, the applicant kind of addressed all of the nine comments that they had in their letter.

Chairman Reynolds said he was sure that one of the items that they will want to circle back to is item #7 in their review for front projects as it relates to those decks, but they can circle back when they open it up to the Planning Commission.

Engineer Landis said he will start out with their wetland review as the applicant indicated they are seeking a wetland permit for some minor impacts with the development.

Engineer Landis stated that his letter of July 13, 2022, was their first review of their application that was submitted jointly by AEW and Barr Engineering. The application included the EGLE and Army Core of Engineers joint permit application, as well as plans. Based on their site visit on July 12th they were able to confirm the delineation that is included in their report. There are two on-site wetlands, rather small in size, as well as one off-site wetland. The off-site wetland is wetland "A" and it basically eclipses or is barely adjacent to the southwest corner of the

development. As they know the Township has a 25-ft. wetland buffer that would be offset, so that offset, the buffer would actually encroach into their development even though the wetland does not. That wetland is just under one acre in size, and it is offsite in nature.

Engineer Landis stated that wetlands B & C are onsite in the northeast portion of the development. Wetland B is .33-acres in size and wetland C is .006-acres, so it is very small. They did some desktop review in addition to the onsite review and interestingly enough when they go through the historical imagery, it is available online, these wetlands do not appear to be present prior to 1963. So, it is quite possible that these were manmade depressions, part of surrounding developments or improvements to M24 it is hard to say, and they don't appear to be natural forming.

Engineer Landis said in their opinion wetland A is regulated by EGLE as well as the Township as it is contiguous with lower Trout Lake. Wetlands B & C in their opinion not regulated by EGLE but would be regulated by the Township because they provide some means of stormwater control.

Engineer Landis stated that as far as control impacts, as the applicant indicated, the only impact they had to wetland A, which was the offsite wetland where the buffer encroaches, they were proposing to extend storm sewer slightly offsite with an easement to outlet their detention pond. That would obviously impact the wetland and the buffer, and hearing from the applicant tonight it sounds like they are willing to pull that storm sewer back and avoid those impacts. He added that impacts to wetland B they are proposing to fill all .33 acres of wetland B as well as the .006 acres of wetlands C. Those are required to basically construct the ring road and buildings 1 & 17.

Engineer Landis said that while the proposed project does impact the onsite wetlands it appears that the wetlands are only providing stormwater management, they are not of high quality in regard to habitat or vegetation based on their review and that of their consultant. Since the applicant is proposing to construct a replacement stormwater management system consistent with the Township regulations it was their opinion that the function of those wetlands will be in effect mitigated. It was their opinion that the wetland submittal is in compliance with the Township's ordinances and standards. They would just ask that any approval would be contingent upon their commitment to revise the plans to avoid the impacts to wetlands A and the associated 25-ft. buffer.

Chairman Reynolds said they did have reviews completed by the Fire Marshal, Public Services, Water Resource Commissioner review, and MDOT. There was also a traffic impact study completed, and a site walk completed by their site walk committee.

Engineer Landis said he did have a separate engineering site review. He stated that the applicant did a nice job of hitting all of the concluding comments so he would just give them some additional information.

Engineer Landis said there was an existing 16-inch water main on the west side of M24. The applicant is proposing to loop the water main through two connections so they will loop the water main through the site. There is an existing 8-inch sanitary sewer also available on M24. Neither system has any capacity issues relative to serving this development. The applicant did provide preliminary detention calculations as well as a forebay and detention pond on the site. They did ask that they also include the channel protection volume control. He added that it sounds like they have done some infiltration testing and it is showing that those infiltration rates are below the level that is acceptable to promote infiltration. If that is the fact, they will still ask

them to provide some low-impact development features to the maximum extent practicable. That will be something they can pick up at engineering.

Engineer Landis said paving and grading everything appeared to be acceptable payment slopes appear to be between 1-6% and 1-4% for parking areas. They are going to provide the pavement sections as they discussed.

Engineer Landis stated that as far as traffic is concerned, they did look at whether or not this site would warrant a traffic impact study, based on the number of units., and the review of ITE this site was well below the threshold that is in the Township ordinance to warrant a traffic study. Nonetheless, the applicant did provide a limited traffic-impact assessment. They did look at it they had a couple of minor comments nothing that would warrant any revisions or changes.

Engineer Landis said that the applicant already went through their concluding comments, and it sounds like they are willing to make plan revisions.

Commissioner Brackon asked regarding the MDOT document he wasn't able to tell whether or not there was a definitive answer to whether there is going to be a full-depth right-hand turn lane off of M24 onto this? He had to believe, and he has heard it before, and it was also a concern of his that the traffic affecting Lapeer Rd. with additional 101 units is going to be somewhat impactful. He thought that the right-hand turn lane could help alleviate that. He couldn't tell whether or not that was in the plans or not. Mr. Trigali replied yes, what they were proposing was to utilize the wide shoulder that is there as the deceleration lane, that is what MDOT was requiring. Their comment was if in fact that it is not full depth asphalt, they would have to take that portion of the shoulder out and reconstruct its full depth. They are in the process of FOIAing that information from MDOT to determine whether that shoulder is full width or not. They believe that it is because the road was recently reconstructed but they haven't found that answer yet. If they find that it is not, then it would just have to be removed and replaced.

Commissioner Brackon asked Engineer Landis if a full-depth right-hand turn lane would be impactful or help the traffic flow? Engineer Landis said that there are certain warrants that MDOT will look at relative to their development and if those warrants are met then they will be required to by MDOT but that would be under their jurisdiction.

Commissioner Brackon read it as it was almost that MDOT was leaving it up to the petitioner as to whether they wanted to do the full depth right-hand turn lane or just use the shoulder. Mr. Trigali said that there might be some confusion as they are talking about the depth and the thickness of the asphalt in the shoulder. They approved the geometrics that they show on the plan all they were questioning was whether or not their shoulder full depth asphalt or not that was something they are going to research through a FOIA.

Commissioner Brackon stated that the issue wasn't then whether to put a right turn lane in. Mr. Trigali replied that is correct.

Mr. Moceri said that MDOT when M24 was reconstructed they put in an entire continuous deceleration/acceleration lane, but they stripped it off where they can't drive on that. That is to be restriped so there is going to be a deceleration section on that shoulder for deceleration to move into Rigel into Hunter Blvd. Then when they exit, the extra wide shoulder that they have already created will be restriped to be that acceleration lane to be that right-hand movement that they are seeking.

Secretary St. Henry said it was similar to the Speedway at M24 that is kind of the setup they have there when they turn right it is the far-right shoulder, then they have turned into an acceleration lane.

Chairman Reynolds said it was nice to see a development come in with not just maxing out all of the units that are allowed with the density but rather doing something that is tastefully designed and laid out in the community. That is obviously a fight that they have on a regular basis, so, to be walking into that as a presentation was nice to see. He was glad to see that the same thing goes with the overall lot coverages under their requirements. He thought that there was a nice quality architecture that was proposed here. They have responded to the site and its zoning and then also tried to provide some relief in the façades so that it doesn't look like one big housing block type of development. He appreciated the applicant coming forth and willing to address the number of comments that did come up from the reviews from their consultants. It seems like the one concern he had regarding wetland A would be addressed with the applicant revising their plans per their discussion here this evening. Those other wetlands being smaller in nature and assumed to be somewhat manmade those to him seem to be remediated with the other improvements occurring to the site. In regard to the potential waiver that would be granted here this evening, he didn't see a need for a trash enclosure, he lived in a development very similar to this where every homeowner/occupant is going to handle their own trash versus it being like an apartment complex style where they are hauling their trash out to the common dumpster. In many ways this is a small single-family home size, so not see that being a major issue.

Chairman Reynolds said one minor comment that he had he would like to see them in the rereview take a look at some of the additional signage that is proposed for advertising for the development to make sure that either it adheres to their ordinance or is revised as temporary or something that fits that ordinance section. Planning & Zoning Director Girling said that signage is done entirely administratively by staff, so they do need it removed from the site plan. The Planning Commission is not assigned to review signage. Chairman Reynolds said that as clarification for that to be removed or reviewed at a later date.

Vice-Chairman Gross thought it fit in well between an existing condominium project to the north and the retail development with Home Depot to the south. He liked the way that the units back up to the units to the north so that it is a comparable type of development back-to-back. The same with Home Depot where the units are backyard to the Home Depot. He agreed that wetlands B & C are minor, wetland C is like 200-sq. ft. that is the size of a parking space, and wetland B is only 14,000-sq. ft. so again it is really insignificant in terms of the bigger picture. As the Engineer indicated that the purpose of those will be resolved with other infrastructure. He agreed that the trash enclosure is not necessary if there is going to be internal disposal of the trash. He agreed with Chairman Reynolds that it is nice to see a development that comes in not looking for excessive development higher-density in fact it is below the density of what the ordinance would permit. Overall, he is pleased with the plan.

Trustee Urbanowski said that is what she was going to say as well. It is refreshing not to be pushed to the edge of what is allowable. She liked the way the building is pushed forward, and it has a lot of depth and a nice look to it, with side garages. Overall, it is going to be a beautiful development. They have talked about traffic and things like that before but there is a light right there at Scripps that should be helpful for any kind of traffic coming in and out of there. She thought that it was clever, the use of the names, and thought it was nice because they were just talking about connecting to the history and making part of this Township. Cover trash enclosure was not a big deal to her either because everyone will have their own account with our GFL.

Vice-Chairman Gross said that the Planner indicated the setback along the units on Lapeer Rd. He thought they said they considered the front yard he would consider those the rear yard as opposed to the front yard therefore it would be compliant with the setback requirement for a rear yard.

Chairman Reynolds said he thought that was specific to item number seven in the Planner's review.

Planner Wojciechowski said he thought he heard the applicant indicate that those are going to be at grade porches. So, the ordinance does permit patios and porches that are not covered that are no higher than 3-ft. above grade to extend up to 10-ft. into that setback. As long as the floorplans for building 11 show that those are patios projecting into that then it is compliant with the ordinance. Chairman Reynolds asked the applicant to clarify that. Mr. Moceri replied that they concur, and they want to be a variance-free proposition here and not a PUD. Again, they are not looking to get the last pound of flesh out of this he thought that their returns will come long term with their occupancy terms, and retention. This is a great Township, and they want to just hopefully accomplish their goals and objectives. They believe that Rigel Terrace does that.

Moved by Vice-Chairman Gross, seconded by Commissioner Walker, that the Planning Commission approves the wetland permit for PC-22-26, Rigel Terrace Wetland, located at 2410 S. Lapeer Rd. (parcel 09-23-301-005) & unaddressed parcels 09-23-301-012 & 09-23-301-013 for plans date stamped received June 29, 2022. This approval is based on the findings of fact: that per the Engineer's review and report of July 13, 2022, the action is not likely and will not pollute, impair, or destroy a Wetland; there are no feasible prudent alternatives to the proposed action, and this reflects an improvement for the vehicular circulation on the site; the approval is consistent with the public interest, in light of the stated purposed of the ordinances. The condition of the approval of the Wetland permit is there is compliance with the Wetland Day protection.

Discussion on the motion:

> Chairman Reynolds asked if there was any concern with the condition on the motion just to adhere to the issue or the conflict with A? Engineer Landis replied no as long as their condition is to have the applicant adhere to their comment number one, he was fine with it. Chairman Reynolds asked if the motion maker would like to further clarify otherwise, they can leave the motion as is. Vice-Chairman Gross said to leave the motion as is.

Roll call vote was as follows: Urbanowski, yes; Brackon, yes; St. Henry, yes; Walker, yes; Gross, yes; Reynolds, yes. **Motion carried 6-0 (Gingell absent).**

Moved by Vice-Chairman Gross, seconded by Trustee Urbanowski, that the Planning Commission grants the waiver for the requirement for a covered trash receptacle because the applicant demonstrates that the operation of the development will be for internal trash to be retained by the individual units.

Roll call vote was as follows: Gross, yes; Urbanowski, yes; Brackon, yes; St. Henry, yes; Walker, yes; Reynolds, yes. **Motion carried 6-0 (Gingell absent).**

Moved by Vice-Chairman Gross, seconded by Trustee Urbanowski, that the Planning Commission grants approval for PC-22-26, Rigel Terrace Site Plan the site plan is to be revised in accordance with the comments made by the applicant this evening to reflect the reviews of the Planner and the Engineers letters of July 14, 2022, and July 13, 2022, respectively for the

subject property at 2410 S. Lapeer Rd. (parcel 09-23-301-005) & unaddressed parcel 09-23-301-012 & 09-23-301-013.

Discussion on the motion:

> Planning & Zoning Director Girling asked if they could add in the condition of removing any signage?

Vice-Chairman Gross amended his motion, Trustee Urbanowski re-supported that the sign that is shown in the submission be deleted and to be reviewed by the Planners at a later date independent of the Planning Commission.

Discussion on the motion:

> Ms. Katheryn Kennedy 690 Rochester said she was very concerned that they are doing waivers of wetlands. Also, Greenshield and Scripps she thought were natural beauty lands. That section of the property is pretty much the only thing left for the wildlife; the Bald Mountain area is pretty much wiped out around the park where development has encroached. She feels anytime they fill a wetland they create a flood zone. There are multiple problems that they create themselves, and she felt this was a real issue. She doesn't agree with adding so much transient housing to their community. These are big apartment projects, and townhome projects, nobody is talking about real houses that families want to live in. She actually has a real concern about Commissioner St. Henry making the statement that there is no conflict of interest he actually works for the individual that presented the World Economic Forum Resolution for Oakland County and he is a long-term employee of Oakland County Economic Development who's pushing the World Economic Forum into their communities. The County actually created an obtainable Housing Trust on February 24th, they also put Economic Development in charge of their airports. They have a no-fee no-lease to the US Border Patrol for their airport where they don't have to pay any rental. The taxpayers have to pay whatever the expenses are over some notable user fees and at the same time, they moved their records to facilities. In this entire process, they are digitizing everything, they have digitized their real estate, they digitized them. She actually got a QR code from Oakland County for an opinions survey and then she got a QR code from the State of Michigan for an opinion survey. A QR code is designed for tracking and data capture, it was designed by a foreign corporation Denso Wave in 1994 for manufacturing inventory control. Why is our government using these types of things on them and why are they using their tax funds to bring a lot of other people from other regions of the world to our community that they can support? That is not reasonable, and they are saying that they want 11,500 obtainable housing units, they are looking at only apartments, the cost-benefit analysis with apartment and property taxes the property tax owners are the ones paying the costs, they are bearing the cost of it. She is really concerned about their schools, infrastructure, traffic is horrid already, this is not a positive thing. There was a global Detroit Forum that was for landlords to teach them how to rent to the refugees which is HUD money.

Roll call vote was as follows: Walker, yes; Gross, yes; Urbanowski, yes; Brackon, yes; St. Henry, yes; Reynolds, yes. **Motion carried 6-0 (Gingell absent).**

Mr. Moceri said he couldn't let things like that be un-responded to, this is not meant to be a debate but to say that his children who live in Townhomes are transient, and his granddaughter resides with his son in a Township. His nephew, his Godson, Dominic Tringali their Architect lives in a Townhome. These are attached single-family residents, they may be for lease, or they

may be for sale. He couldn't let those set idle. They are not transient born and raised right down the block in the community, part of the community, and he won't let those comments just float out there.

B. PC-22-27, Willow Creek Apartments Wetland & Site Plan, located at 3120 S. Lapeer Rd., (parcel 09-26-151-019).

Chairman Reynolds asked the applicant to state their name and address for the record.

Mr. Joseph Salome 251 Diversion St. Rochester, MI, and Jason Fleis with Umlor Group 49287 West Rd., Wixom, MI presented.

Mr. Salome stated that what they have proposed was 104 units on 18 acres at the current Willow Creek driving range area. With an adjacent open space, they are proposing to use a 12% land coverage as they are allowed to go up to 25%. What they have designed is all the units are two bedrooms and they all have their own private attached garage. They are trying to serve a different part of the market and use some of the challenges that this site has relative to the ITC corridor to the south and incorporate that into their open space. They are aware of the comments about the square footage for the proposed patios and if they could make that work within the ordinance, they would propose to meet that minimum requirement. The photometric plan was something that can be supplied. They would not propose to have any balconies or patios extend out beyond what is the current requirement of what he believed 3-ft.

Mr. Salome said that he thought that the landscaping in conjunction with the existing trees that are going to remain is going to provide an excellent screening to the west and to the north.

Mr. Jason Fleis thanked the Planning Commission for the opportunity to present today. He also thanked the Township staff for a very productive pre-application meeting and a thorough review. He said the Fire Department wanted them to put on record that the buildings will be suppressed so two entrances will not be required. Commissioner St. Henry had concerns with traffic and the capacity of existing utilities. The Director of Public Services provided a letter saying they have ample capacity for sanitary and water main along Lapeer Rd. The Oakland County Water Resources Commission they will comply with the permitting requirements required there. OHM Engineering review they will comply with their comments as well, as well as the OHM wetland review, they agreed with the findings there.

Mr. Fleis said regarding the site plan review for the photometric plan that was required they are just proposing a couple of streetlights at the entrance, the rest of the lighting will be on the buildings but will provide what is required to meet the requirements they are not asking for any variances. They will provide underground utilities throughout the site. The patios will meet the minimum square footage as required. The calculation for the open space, 500-sq. ft. per unit is required which is 52,000-sq. ft. and to the south of the units they have provided the 5-ft. walking path, they have over 3 acres just in that area, not including the wetlands. Additional information on the dimensions will be provided. The tree removal permit required, again, they have chosen a site that was already cleared of trees, they provided a tree study, but will provide the additional calculations as required but had minimum impact on the existing trees on the site.

Planner Wojciechowski read through his review date stamped July 15, 2022.

Engineer Landis read through his review date stamped July 14, 2022.

Chairman Reynolds said that there was a review by the Fire Marshal and did not recommend approval based on the following comments, that there was one access road if the units were to

be un-suppressed or if one access road was with suppressed buildings to comply with the 2015 International Fire Code (IFC), along with Fire Department Connections located on the street side of the building or facing approved by the fire apparatus access roads, fully visible and recognizable for the street. So those are either not provided to date or need to be revised to show all of the (FDC) connections. The turning radius in the emergency apparatus road needs to be provided per the Orion Township Fire Department turning performance analysis template.

Chairman Reynolds said that there were reviews for Public Services without additional comments, along with MDOT and there was a Site Walk report completed for the project.

Vice-Chairman Gross asked if the frontage along Lapeer Rd. was something that was part of their site? Are you purchasing that? Mr. Salome replied that it is part of the purchase agreement currently and pending the outcome of this meeting this evening they may enter into further negotiation with the seller to possibly keep the miniature golf portion of the site itself. It was something that was going to be subject to these proceedings. It is their intention to connect the walking path to the south in order to connect to the existing sidewalk.

Vice-Chairman Gross asked if there were any restrictions regarding the use of the easement property on the south that is encumbered with the overhead wires, and the underground utilities? Mr. Salome replied that they are not proposing to do anything outside of what the easement requirements are. The walking path and they are going to have a dog park area, yoga areas are all in compliance with the easement.

Vice-Chairman Gross asked if there were any restrictions placed on it by the utility companies? Mr. Salome replied not unless they want to go vertical. Vice-Chairman Gross said it seemed like it was an area where they could really take advantage of the open space. They started with the walking path, and he could see an area where there are exercise stations along the path to kind of be an attraction to their tenants possibly a dog run, a putting green. Mr. Salome said if they could move their turn the existing driving range straight down. The issue is hitting golf balls toward the buildings. They do have plans to put a dog park there as well as some recreational things like the yoga area, and that may evolve a bit into some other amenities that they are hoping to make attractive to the residents. Vice-Chairman Gross said that as the Planner indicated it is kind of off-site to be used by the residents but if it is organized such as it would be an attraction to actually use that area. Mr. Salome agreed and was excited to be able to use it. It was nice that it was open and had very little tree impact on the whole site. Vice-Chairman Gross said he would hate to see it just as a field. Mr. Salome said it wouldn't be good in terms of the optics of it for the development and didn't think it would be a good addition from a marketing perspective, they are going to make it nice. Vice-Chairman Gross said they are showing two trash enclosure areas, they are both at the west end of the site. Mr. Salome said he didn't want to complicate anyone's life right now, but it was interesting that the last applicant made the request to allow to go to individual trash bins, he would hate to say this, but they would probably make the same request. They are doing another development right now they are doing that the same way and that is the preferred way to go. He thinks that if they could avoid the dumpster, it is better. Again, he didn't want to complicate the process.

Vice Chairman Gross asked if these units had attached garages? Mr. Salome replied that they all have attached garages. Vice-Chairman Gross said that will make it easier for the tenants to maintain their own garbage.

Chairman Reynolds asked if they are seeking a trash enclosure waiver and wouldn't install the enclosures if the waiver was granted to provide individual trash? Would they still enclose a trash enclosure? Mr. Salome yes, he is requesting it. Chairman Reynolds said on the plan right now on the west end there are two trash enclosures. He asked if they would remove those from

the plan or keep those on the plan if the waiver was provided? Mr. Salome replied if the waiver was provided and at the pleasure of the Planning Commission, he would propose that they remove the two proposed enclosures and allow for individual trash containers that would be housed in each individual unit's garage.

Commissioner Brackon questioned the MDOT if that was addressed in the proposed access to parcel B? Mr. Salome replied that they will address the MDOT comments when and if the frontage is developed per their comments. If and when that is developed, they will address it, that is what they are requiring. Commissioner Brackon said they wrote, to avoid having further mitigate for future development traffic of parcel B they should consider preparing the TIS for the worst-case scenario and address it at one time, this time. He asked if he was saying that he is not going to do that. Mr. Fleis replied that they are going to comply with MDOT and their requirements. He was working with Julie Kroll who did the initial traffic impact assessment that was submitted. They are going to provide some additional information to MDOT, they will work with them to meet the requirements. They wanted the worst case. Where the truck turn around is coming off of Lapeer Rd., and they had the right turn lane, it is not as clean as other sites where they can see a clear right turn lane, but they have the exaggerated shoulder and then they have the larger turnaround, so where do they put a secondary entrance. So, what they are concerned with is having a secondary access right there going to that second site. What they are going to do is provide the additional information for the worst case, working for what the future development is of that area, what additional traffic is because they are probably going to come out on the boulevard entrance and then out to Lapeer Rd., so there is only one entrance for that future development.

Commissioner Brackon asked if they going to provide a site development plan that includes proposed access to parcel B or not? Mr. Fleis replied yes, what they need to do is work through the process with MDOT. When they get the traffic counts and distances. What they didn't do is get into the design of the future development. What they want to do is incorporate into their plan if there is a need to provide an entrance to that future development off of the boulevard, they will provide that. If they can't get a secondary entrance on Lapeer Rd. They will comply with MDOT and what they need. Mr. Salome said if MDOT is not going to allow another entrance they will incorporate the entrance to that site off of their boulevard entrance. If they will allow a separate entrance, then they will design for that.

Commissioner Brackon thought that their concern was if parcel B is sold are they still going to allow that second entrance off of their boulevard. Mr. Salome replied yes it will be a requirement.

Commissioner Walker asked Planner Wojciechowski what he was saying about the trees, what was the recommendation on the trees? Planner Wojciechowski replied that when they took a look at the site the western property line requires 90 trees to be provided. The applicant is adding 40 trees, so they are essentially deficient in terms of the ordinance by 50 but the ordinance does allow for the Planning Commission to accept existing vegetation in lieu of meeting the requirement for those 50 trees. If they feel that it effectively screens the property from the west.

Commissioner Walker asked if the question of whether or not they are going to leave the putt-putt course is that part of the vegetation issue or not? Mr. Salome replied no it is not. There is existing vegetation and mature trees along the north boundary line some on their property and along the west. They feel those are of higher quality than what they could replace but that would be at the pleasure of the Planning Commission if they are required to put the additional 50 trees they will. They are feeling that they are meeting the requirement and thought that there was a mechanism in the ordinance for them to do it that way.

Commissioner Walker asked Engineer Landis that he seems to indicate that although there are two wetland areas, they are insignificant? Engineer Landis replied it is insignificant in the way of the impacts. They are basically replacing an existing driveway culvert and just making it longer to accommodate the wider driveway that is going to come in. Commissioner Walker questioned that he was not suggesting any sort of remediation or anything like that. Engineer Landis replied that he didn't think it was warranted.

Commissioner Brackon asked Commissioner Walker if he would want them to put those additional trees in somewhere? Commissioner Walker replied that he wasn't sure, the fact that there would be 50 less trees after they are done. He asked if that was correct? Mr. Fleis replied that he didn't prepare the landscape plan but from his review and what he was familiar with on the plan it is more about preserving the existing trees there it is not eliminating trees and then not replacing them it is maintaining the trees along the west and north property line, and then along the creek as well to the east. It is keeping those trees in place.

Chairman Reynolds showed the Board the tree survey. There is a number of trees around the property. All the trees with red "X's" on them are those being removed. So, they can see the ones that will be remaining which are primarily to the west and the south not therefore on the north. He did agree that there are some abilities to provide a little wiggle room here based on the existing trees. He did think that 50 is a lot especially when they consider this northern property line is not landscaped with existing trees per kind of this motive. He thought to him in his perspective here especially just with how they have influenced the tree ordinance he thought there was a compromise that they would be looking to seek, at least in his perspective. He asked the applicant to clarify if he was wrong. Obviously, there is a lot of them likely to be removed because of the detention basin. They could see on the overview some of the trees that are being maintained, clusters to the south, and most of the clusters to the north are not. He thought that is where maybe there is some compromise or discussion here is to incorporate some additional thoughts.

Chairman Reynolds said overall the intent of the project he thought was there, he was in support of that. He appreciates the general density that is here. He was a little reluctant just in general some of the comments that came up to just conditional approve this tonight. He has a lot of trust in their consultants but that sometimes is an issue. He thought that all of these things are capable to be addressed. He would just want to make sure that if they put that kind of faith in their consultants that they have the time to review it and if there is a concern that there isn't a reluctancy to have it come back to the Planning Commission if his fellow Planning Commissioners were intending or seeking a potential approval tonight. One of the comments is always to kind of stick up for their fire and safety. There are some bigger comments with the Fire Marshal none that he didn't think were workable here, but they need to make sure that these things are buttoned up. Comments previous to the last project, and are kind of minor in nature, they don't have a photometric, they are missing a couple of components. He wasn't trying to steer anyone in any certain way but just to be aware that there are some bigger revisions here to work through that he thought could all be implemented but should be done in a proper motion.

Trustee Urbanowski asked regarding the Fire Department, if they are suppressed, they only need one? Chairman Reynolds said that is what his understanding is, it is effectively when they have a multi-unit development here if there is only one access the units would be suppressed.

Mr. Salome said that they are suppressing the buildings voluntarily. They will meet the Fire Marshal's requirement there. They will also of course meet the radius requirements, as well, through the engineering process. He had no problem with Fire Marshal's comments at all.

Mr. Salome stated that as far as the photometric goes there will only be lighting on the buildings and at the entrance there will not be any other lighting at all. The photometric is going to be very simple.

Chairman Reynolds said that is where some of his concerns arising both at the turning template and the photometric are all things that they typically see at this phase. It is not something they see in final engineering when they see it further developed. That is where his feeling on this project, he was in support of the intent here he felt there needed to be a little more information.

Vice-Chairman Gross said he would like to get some partial approvals on the wetlands, and the trash enclosures. He thought that they can resolve those issues this evening. Then give some direction relative to the site plan and hopefully it can come back to them relatively quickly because he didn't think they were that extensive but would provide them with some comfort zone in terms of the final project.

Trustee Urbanowski said they were talking about trees, and the little area to the south for recreation, maybe a nice little park area there with some landscaping in that area might be a nice addition. Engineer Landis didn't think that ITC would allow the planting of trees. Chairman Reynolds said although they have a large area, they are somewhat restricted in use. His opinion is seeing some of the trees being removed and seeing where there might be some areas, whether it is creating another feature or not, he would like to see some of those items addressed or the applicant come with a proposal to say here is our actual calculations that they have come up with and they are asking for a slight deviation per the ordinance.

Trustee Urbanowski said she was in support of the idea of this development as well. She does believe that they need housing like this.

Secretary St. Henry said he hoped that they could address the tree issue. He was very familiar with that site. If they are clearing out a fair number of trees off the northern boundary, he would like to see the trees replaced somewhere on the site, if possible, they are talking 50, it is not a huge number given the size of this development.

Moved by Vice-Chairman Gross, seconded by Commissioner Walker, relative to the wetland permit under Ordinance number 107, that the Planning Commission approves the wetland permit for PC-22-27, Willow Creek Apartments Wetland, located at 3120 S. Lapeer Rd. (parcel 09-26-151-091) for the plans date stamped received June 29, 2022. This approval is based on the following findings of facts: per the Engineer's report of July 14, 2022, the action is not likely and will not pollute, impair, or destroy a Wetland; there are no feasible or prudent alternatives to the proposed action since this is an expansion of the entrance drive into the site; the approval is consistent with the public interest in light of the stated purposed of the ordinances of the Township.

Roll call vote was as follows: St. Henry, yes; Walker, yes; Urbanowski, yes; Brackon, yes; Gross, yes; Reynolds, yes. **Motion carried 6-0 (Gingell absent).**

Moved by Vice-Chairman Gross, seconded by Trustee Urbanowski, that the Planning Commission grants a waiver from the requirement enclosed trash receptacle because the applicant has demonstrated that they will provide internal trash provisions for the individual tenants to retain their trash and therefore the trash enclosures indicated on the site plan can be removed.

Roll call vote was as follows: Urbanowski, yes; Gross, yes; Walker, yes; Brackon, yes; St, Henry, yes; Reynolds, yes. **Motion carried 6-0 (Gingell absent).**
Moved by Vice-Chairman Gross, seconded by Commissioner Walker, that the Planning Commission postpones site plan approval for PC-22-27, Willow Creek Apartments Site Plan, located at 3120 S. Lapeer Rd. (parcel 09-26-151-019) to allow the applicant to revise the plans to indicate some improved trees along the north portion of the site adjacent to the residential property to the north, and to include in the landscape plan some proposals for the development of the south park area.

Discussion on the motion:

Mr. Salome stated that he would like to formally request that he remove the request to eliminate the 50 trees. He thought that if that was something that is creating a little bit of tension here, he could say he agreed it wasn't that many trees. He thought looking at the site plan they could probably find places to put them in. He formally retracted that request and to meet the ordinance exactly with the additional 50 trees.

Mr. Salome said it seemed to him that the only thing that they are deficient in is the park area. As he has stated they plan to put in the dog park, the yoga area, and the sidewalk. At that moment in his mind, the thing that they are stuck on is the photometric plan and he would like to work that through with the consultants and come up with an acceptable photometric plan per the ordinance and what the standard practices would be.

Chairman Reynolds said he wanted to turn it over to the Planning Commissioners. There was a motion made to postpone the case to address the open items of their consultants and their Fire Marshal and to consider adding trees to the north property line and to further developing the south area. Since the motion is on the table the applicant has stated a request to retract the 50 trees variation from the tree ordinance.

Commissioner Brackon thought that postponement was the proper way to go at this point and time. He would like to see the new site plan with all of these issues addressed before approving or not approving.

Chairman Reynolds said even with the retraction of trees as presented by the applicant he would still support the postponement. He thought that yes, it is photometric but there are some other items here, additional grading, some of those items are things they have resolved at this point. He knew that they could be perceived as minor in nature but as they are sitting here as a Commission, he was slightly reluctant in that regard.

Commissioner Walker said more so than the photometric, he was concerned about the Fire Marshall's input. He thought that was a big deal.

Mr. Fleis said they will provide the FDC connections that he has requested. The buildings will be suppressed. He was more looking for the truck turning template, but the radius exceeds what the minimum requirements are, it is just showing the template on the site plan and that is something they can comply with. They have fuller width roadways as well providing further additional turning areas for the truck. He felt that the Fire Marshal's comments are easily addressed.

Mr. Salome stated that the Fire Marshal's comments are already addressed. The radius is absolutely addressed. The issue with the buildings being suppressed is addressed there are no Fire Marshal concerns here whatsoever. He did respectively request that that be taken into consideration. He wasn't clear where there were any grading

concerns here? If there is something more than photometric he wasn't clear on exactly what it is. This is not a PUD this is an approved use of the site pending the purchase, he has a lot riding on trying to get this through. If these are major issues, he would 100% support them tabling it but if they were minor issues, he would respectfully request that they consider allowing them to work those through administratively.

Planning & Zoning Director Girling said obviously it is at the Planning Commission's discretion but in order to get approval even if it is administratively approved it still has to meet the ordinance. If there is nothing subjective like not putting in 50 trees, then the consultants are going to look to make sure they meet the ordinance and if they don't, they will have to come back. If there was nothing subjective, she just wanted to add that in there.

Chairman Reynolds said if there was an opportunity as the applicant has requested and put forth for them tonight if they retract the 50 trees and is provided with administrative review and approval that is what is generally being discussed in a big picture if there is a comfort level otherwise the postponement is the current motion on the table.

Secretary St. Henry said the administrative review would be for the photometric plan? Chairman Reynolds replied all of the above. Planning & Zoning Director Girling replied that it would go to the Planner, Engineer, and the Fire Department.

Chairman Reynolds said that the open comments that exist here tonight would be subject to the review of their professional consultants and if they couldn't come to a conclusion then it would default to come back to them.

Commissioner Brackon said he was still in favor of the postponement if the preference is to move forward with a vote, he thinks there is a risk of denials or no votes on the approval versus a greater chance with the postponement of seeing it and being satisfied with the site plan being approved at that time in his opinion.

Chairman Reynolds said that without having an actual motion on the table here, he would foresee that motion to be approved if all of the conditions brought forth are met to the liking of our professional consultants, and if not, it would come back to the Planning Commission. It wouldn't be a straight-up yes or no but more or less a conditional approval. That is not uncommon it just comes down to where they get into these projects with a long list.

Engineer Landis stated that he was very comfortable with reviewing revisions related to the comments. It is relatively minor in nature, and it can be resolved for what it is worth.

Planner Wojciechowski said regarding the lighting and the photometric plan there are only two standards to review it is that the lighting is shielded downward, and it doesn't exceed .3 along the west property line. He would echo Engineer Landis's comments their review is very minor in nature.

Chairman Reynolds asked if the motion maker was comfortable with retracting their statement with the intent to recommend approval with conditioned upon addressing all of those comments are re-review.

Vice-Chairman Gross rescinds the motion to postpone at this point.

Moved by Chairman Reynolds, seconded by Commissioner Walker, that the Planning Commission grants site plan approval for PC-22-27 Willow Creek Apartments Site Plan, located at 3120 S. Lapeer Rd (parcel 09-26-151-019) for plans date received June 29, 2022, based on the following findings of facts: this approval is based on the following conditions, the successful rezone of the property to RM-1, that all of the comments in the Planners review letter is to be addressed, all the comments within the Township Engineer comments to be addressed, and all the comments within the Fire Marshal's review to be addressed. This motion also includes the applicant's retraction as presented here tonight to therefore plant the 50 trees that were previously proposed as deficient, and he would request that the applicant still consider additional plantings on that south side of the parcel as originally presented in the original postponement motion, part of the landscape plan that intent would still stand true. This motion includes the plans being resubmitted to our professional consultants, and our Fire Marshal, agreeable to their liking for site plan approval and meeting all of those ordinance requirements, if those requirements are not met it would come back to the Planning Commission.

Roll call vote was as follows: Walker, yes; Brackon, no; St. Henry, yes; Gross, yes; Urbanowski, yes; Reynolds, yes. **Motion carried 6-0 (Gingell absent).**

8. UNFINISHED BUSINESS

A. PC-2021-07, 5-Year Master Plan Update

Planner Arroyo said there was a memo in the packet that described the changes from the previous draft. As they know they were primarily just correcting factual information that is all outlined in that memo.

Planner Arroyo stated that Lapeer Rd. is not proposed to be an interstate highway it is a state-divided trunkline and there is no text that talks about it being an interstate highway.

Planner Arroyo said one other minor item that he wanted to point out that came to their attention. One minor correction that they would like them to consider if they make a motion tonight is that the northwest corner of Baldwin and Morgan is currently shown as this light purple that is institutional and really, they believe it should have this mixed-use, industrial commercial mixed-use which is consistent with the underlying BIZ zoning that is already there for the frontage piece of that. They would suggest that that be incorporated as a map amendment that they would include. He knew this wasn't a parcel-specific plan but thought it was a nice clarification, and at the same time the density plan doesn't show a density on the density plan because of that institutional overlay, so this would then bring in the density that is the mixed-use and village center density on that if it were to be developed as residential at some point, but it is a mixed-use development so it doesn't have to be residential. If they choose to make a motion tonight incorporating that minor correction, he thought that would be helpful.

Chairman Reynolds thanked everyone for their efforts in this. He thought that they had a very comprehensive review and very thorough review of this Master Plan. He was in support of a couple of changes here and would look forward to submitting the resolution to adopt.

Vice-Chairman Gross asked if they could do the changes by consensus like they did at the last meeting as opposed to by resolution just do it by consensus. Planner Arroyo thought what they could say if they are choosing to move forward and approve the resolution it would be conditioned upon that one change at the northwest corner of Morgan and Baldwin being incorporated into those two maps as presented tonight.

Planning & Zoning Director Girling said she wanted to pass one that was a question on location. Again, if this is irrelevant and it is not a concern, but it was kind of intertwined with all of the

citizen letters, it was an internal question that she received that page 113 seemed to be a strange location not really related to the adjacent pages and perhaps it should be moved to the amenity section. She didn't know if they had any thoughts or if they could look really quick at page 113. If they say that is where they intentionally put it, and that it should be there. She thought it was more directed at the Planner. She added that Leisure Recreation, they are talking about the concept of redevelopment, and it just seemed like it was in a very strange place, and Leisure Recreation seemed to be more appropriate in the amenity section. She said she would bring it up, she has brought it up, if they like where it is at, then they like where it is at.

Planner Wojciechowski said that was the section that initially had a little bit more language about the tourism aspect, so it was under the economic development umbrella, and throughout the process, they softened that language a little bit and it landed at the Leisure Recreation language to sort of still mention it but not necessarily promote it as the primary economic development driver. He would say it is still in the correct spot.

Moved by Vice-Chairman Gross, seconded by Chairman Reynolds, that they amend the Future Land Use Plan as presented to reflect a change to the NW corner of Baldwin and Morgan Road from institutional to mixed-use, on the Master Plan Map and on the Density Map that it reflects a mixed-use density.

Roll call vote was as follows: St. Henry, yes; Urbanowski, yes; Brackon, yes; Walker, yes; Gross, yes; Reynolds, yes. **Motion carried 6-0 (Gingell absent).**

Moved by Vice-Chairman Gross, seconded by Trustee Urbanowski, whereas, the Orion Township Planning Commission may prepare and adopt a Master Plan for the physical development of the Township as empowered by the Michigan Planning Enabling Act of 2008 being PA33 of 2008, and whereas, the Orion Township has contracted with a professional planning consultant to assist the Planning Commission with the technical assessments necessary to make the Master Plan for the Township that includes a Future Land Use Plan, Complete Street Plan, Housing and Density Plan, Economic Development Plan, and Environmental Resources, and more, and whereas, the Master Plan is a guide to assist the community and evaluating future developments in the community, whereas, the Master Plan does not make decisions but is used as a resource based on historical trends and future projections based upon current available data and information and whereas, Orion Township provided multiple opportunities for public input as part of the process including, but not limited to, two in-person open house workshops, one online open house, online resident survey, and multiple Planning Commission study sessions open to the public. Whereas, the Planning Commission has held a public hearing on its proposed Master Plan on July 20, 2022. Therefore, be it resolved that the Orion Township Planning Commission hereby adopts the Master Plan for the Township, along with the text, maps, charts, graphs, and other descriptive material contained in the Plan dated with the latest revisions of July 7, 2022. Be it further resolved that this Master Plan be submitted to the Township Board as the adopted plan by the Planning Commission.

Roll call vote was as follows: Urbanowski, yes; Gross, yes; St. Henry, yes; Walker, yes; Brackon, yes; Reynolds, yes. **Motion carried 6-0 (Gingell absent).**

9. PUBLIC COMMENTS
None.

10. COMMUNICATIONS
None.

11. PLANNERS REPORTS

A. Article on Agrihoods and Agritourism

Planner Arroyo said he just wanted to make an announcement that this is going to be Matt Wojciechowski's last meeting. Matt has decided to take a job in West Palm Beach, FL working for a consulting firm. They are very fortunate to have Planner Eric Pietsch he has been involved in doing plan reviews and in the Master Plan, so he is very familiar. He is going to be stepping up and taking a bigger role. Chairman Reynolds said thank you very much for all of his efforts towards Orion Township and our projects.

Planner Pietsch said they do have a report on agrihoods and agri-development which he thought was appropriate given the concerns that they heard here tonight from some of the community members who want to preserve the rural nature of the community. With agrihoods is a mechanism that can be looked at as a sustainability practice within communities. He thought it was kind of an appropriate bridge to those types of concerns that they heard tonight.

12. COMMITTEE REPORTS

None.

13. PUBLIC HEARINGS

A. 08-03-22 at 7:05 p.m., PC-22-28, GM Orion BET 2, Special Land Use Request Public Hearing to expand an automotive manufacturing facility located at 4555 Giddings Road (parcels 09-34-200-006 and 09-34-400-011)

B. 08-03-22 Joint Public Hearing with the Board of Trustees on PC-22-29 (immediately following the PC-22-28 public hearing at 7:05 p.m.). Baldwin Village Planned Unit Development (PUD) Concept and Eligibility Plan, located at 4410- & 4408 S. Baldwin Rd. (parcel 09-32-301-001), and unaddressed parcel 09-32-301-014 located at the NW corner of Morgan and S. Baldwin Roads, an unaddressed parcel 09-32-151-020 located north of 4408 S. Baldwin, and 4292 S. Baldwin (parcel 09-32-151-021).

14. CHAIRMAN'S COMMENTS

None.

15. COMMISSIONERS' COMMENTS

Trustee Urbanowski welcomed Planner Pietsch back. She wished Matt Wojciechowski good luck and congratulations they will miss him. She thanked Planner Arroyo for steering this ship through some good waters and some rocky ones too.

Secretary St. Henry wished Planner Wojciechowski good luck. He did want to address a comment that was made regarding a conflict of interest, him being on this Planning Commission. He does work for Oakland County in Economic Development, he has been there for five years, but it has not been a long-term position. He is in charge of marketing communications supporting the workforce development division for the County. Prior to that, he worked for Lake Orion Community Schools and a number of private enterprises in the automotive finance tech businesses. Prior to that, he was the editor of their community newspaper reporting on many things going on in the Township.

Commissioner Walker said good luck to Planner Wojciechowski. He apologized for forgetting that Commissioner St. Henry was on the Planning Commission when they did the last Master Plan. He wanted to echo what was said about this Planning Commission, since he has been on

this Commission this is the best one. He appreciated all that the consultants and all you folks do.

Chairman Reynolds agreed and appreciated everyone's efforts. It was refreshing and rewarding and as much as it is dreadful to come here be here till 10:15 p.m. sometimes it is nice that there is some good thought here.

Secretary St. Henry said over the course of 7-8 years they have had very competent people on this Planning Commission but the Commission that has been established now over the last year or two has much more robust dialog.

16. ADJOURNMENT

Moved by Chairman Reynolds, seconded by Vice-Chairman Gross, to adjourn the meeting at 10:15 p.m. **Motion carried.**

Respectfully submitted,

Debra Walton
PC/ZBA Recording Secretary
Charter Township of Orion

_____
Planning Commission Approval Date

CHARTER TOWNSHIP OF ORION PLANNING COMMISSION MINUTES
PP-2021-07, 5-YEAR MASTER PLAN UPDATE
PUBLIC HEARING – WEDNESDAY, JULY 20, 2022

The Charter Township of Orion Planning Commission held a Public Hearing on Wednesday, July 20, 2022, at 7:05 p.m. at the Orion Township Municipal Complex Board Room 2323 Joslyn Road, Lake Orion, MI 48360.

PLANNING COMMISSION MEMBERS PRESENT:

Scott Reynolds, Chairman
Don Gross, Vice Chairman
Kim Urbanowski, BOT Rep to PC
Derek Brackon, Commissioner
Joe St. Henry, Secretary
Don Walker, PC Rep to ZBA

PLANNING COMMISSION MEMBERS ABSENT:

Jessica Gingell, Commissioner

CONSULTANTS PRESENT:

Rod Arroyo, (Township Planner) of Giffels Webster
Matt Wojciechowski (Township Planner) of Giffels Webster
Eric Pietsch (Township Planner) of Giffels Webster
Mark Landis (Township Engineer) of Orchard, Hiltz, and McCliment, Inc.
Tammy Girling, Township Planning & Zoning Director

OTHERS PRESENT:

Jonathan Forrest
Matthew Koneda
Pat Ebner
Tina Hein
Ray Malikis
Marilyn Hester
Tom William
Joseph Salome
Laura Schueller
Heather Smiley
Carol Ebner
Sandy Walker
Delore Malikis
Dan Hester
Katheryn Kennedy
Sandra Vanderlaan

PC-2021-07, 5-Year Master Plan Update

Chairman Reynolds asked Planner Arroyo to give an overview of the Master Plan.

Planner Arroyo said that Matt Wojciechowski and Eric Pietsch were with him all from Giffels Webster. He was pleased to be working with the Planning Commission on their update to the Master Plan. He had a few slides he wanted to go through to provide an overview of the process.

Planner Arroyo said he thought it might be helpful to talk about what is a Master Plan. Number one it is a long-range vision for the future. It enables the Planning Commission to look beyond what they typically do at a typical meeting which is looking at site plans and looking at current conditions, and rather look to the future. This plan is prepared in conformance with the Michigan Planning Enabling Act which sets forth the procedures and standards. The Master Plan itself provides a guide for the future. He thought it was important to point out that a Master Plan is not a zoning ordinance it does not impact the zoning of their property directly, it does not change any ordinance, it is a policy document. The State Statute says that the Planning Commission is the body that prepares that document, and the Planning Commission approves that document. Any change to a law, in this particular case they are talking about land use law, would be the zoning ordinance, that would require a different process, first coming to Planning Commission, then having a public hearing, and then ultimately the final action would be the Township Board would have to amend the zoning map and the zoning ordinance. That is not what this is about tonight, this is about the Master Plan. It provides a framework for looking at long-range decisions. It provides a way of looking at how various areas of the community have different characteristics and different abilities to potentially have different land uses. That is part of the study that goes on as part of this process and it also encourages partnership, looking at opportunities for the community is often engaged with other entities and for example recreation. They have state recreation areas here, they have

county parks, they have local parks and recreation. All of those coordinates provide an opportunity to serve the residents of the community.

Planner Arroyo said the plan itself starts off by describing the purpose it has an executive summary. It also gives a brief history of the community, the regional setting, and how this community is in relationship to the surrounding area. It discusses existing land use which is how land is being used today, and it talks about demographics, so they have a profile, and it has been updated to include 2020 census information. It also has some forecasted information in terms of changes and demographics. It looks at the local economy statistical data regarding the local economy, they have community facilities, a description of the various facilities that are provided such as police stations, and fire stations, all of those things are documented in the report. Then it talks about the environment and natural features.

Planner Arroyo stated that the next stage really starts to get into the plan, looking towards the future. One of the most important things about doing a plan is public input. He will talk about all of the steps that were taken to get public input throughout this process. Goals and Objectives are the statements that the Planning Commission develops that help establishes the framework for the Master Plan. Then the various chapters, the key elements of the plan including housing and density, economic development, complete streets which is essentially the transportation element, and then the future land use, and the future land use plan now. Then finally there is a guide towards implementation, once they have a plan in place, they want to be able to implement it. In this case, they have what is called a zoning plan which is something that is required by State Statute and that just describes how the Master Plan aligns with the zoning ordinance and how changes might occur in the future as the plan is implemented. It also includes action strategies, which are specific things that can be done by the Planning Commission and by others to implement the plan.

Planning Arroyo said starting off at the beginning they have a brief history, there are some photographs and some stories behind the history of the Township just to provide a setting for the discussion that is included in the plan. Existing conditions talked about demographics and economics, and they are summarized hopefully in a way that makes it easy to read. They used to do Master Plans they had a lot of text, and it wasn't always that exciting to go through them. Now they have some infographics and some other charts, and it just makes it a little easier to understand the information.

Planner Arroyo stated that natural features there quite a bit of mapping that was done as part of this to document where, for example, flood hazards areas are, where wetlands are, where woodlands and all those other important natural features that are included in the community.

Planner Arroyo said public input and community engagement. He did want to spend some time addressing this because there has been a considered effort to involve the public in this process. For one thing, the Township website has been a resource from the very beginning, there has been information on the Township website about the plan. One of the first things that they did when they started this plan was there was an online survey that was prepared, and they had a very good response they had over 600 responses from residents in this community to the survey. That is more than they typically see, so congratulations to the community for really reaching out and responding to the Master Plan survey.

Planner Arroyo said they also conducted two Open Houses, which is also somewhat unusual. Usually, with a Master Plan, they might have one Open House, in this case, they had two. The very first one was in June 2021, and because of the COVID pandemic, they actually did that when they had an in-person version and an online version. If they wanted to come in person, they could, and if they wanted to participate online, they could. They had about 45 people come in person to the Orion Center where they held that and then they had approximately 30 people participate online with the Open House.

Planner Arroyo said they also had a series of Planning Commission study sessions. He showed them the dates that those occurred, as well as when the Master Plan was on the agenda for the regular meeting. There was a total of 13 workshops starting in February of 2021, where the Planning Commission met here

11 of those were 6 p.m. work sessions, and the other two were the Open Houses. During those work sessions which were open to the public and they had the public attend, in some cases, they went through the process of studying the Township, looking at the information, and going through the Future Land Use Map. Rather painstakingly looking section by section at how the community is developing, how it has developed, and what the future was. Once again 22 meetings it has been on the agenda for the Planning Commission as they have gone through this process.

Planner Arroyo stated in addition they had some special focus groups in meetings, they had what is called a staff leadership advanced meeting where the Township staff came together and provided input, that was back in February of 2021. They had a student art contest where students in the area were allowed to submit some art related to the plan, some of that is included in the Master Plan. Then they had another Open House in this building in May 2022, where they had approximately 25 people attend, and another opportunity for people to see the draft plan and discuss that. Today is the Public Hearing on the document.

Planner Arroyo said one of the things they tried to do with this Master Plan versus the previous one is to try to make it easier to digest, and easier to understand. In the previous Master Plan from 2015, if they wanted to read about the goals and objectives, they had to go through about 27 pages. They found as they were reviewing it, particularly when they were looking at developer projects, trying to get the information from the plan was a little difficult when the goals and objectives are spread out over 27 pages. They thought about how they might do that a little differently, so they compressed things and kind of revisited how it is approached. They have a vision statement, and goals on one page, they consolidated approximately 30 goals into five key topic areas. Then they put the objectives on three pages and then they moved the action strategies to the end of the plan along with the zoning plan to provide a good outline that makes sense and is hopefully easier to follow.

Planner Arroyo showed them the vision statement that was grafted as part of this and thought it was helpful for the Planning Commission and set the stage for the planning work that was done.

Planner Arroyo said he wanted to show them the chapters. They have a housing plan where they focused on housing. This does include a residential density plan, so that is a separate map that shows density ranges for various locations within the community. He added that these ranges are there for a reason, this is a long-range plan, and they need to look at areas in more detail when it comes time for consideration of a change in zoning for example. They may not be guaranteed the highest density in the range they may end up at the lowest density in the range, or even somewhere in the middle. That will be a decision that will be made once a zoning application is made to the Township, the Planning Commission holds a public hearing they then study it and then make a recommendation to the Township Board, and then the Township Board makes the ultimate decision. This sets a range of potential densities depending upon the location within the community.

Planner Arroyo said they also have an economic development plan. One of the things that the Township is striving to do is to become certified by the Michigan Economic Development Corporations, Redevelopment Ready Communities Program, part of that is to have an economic development plan. An Economic Development Plan is included and part of what they did with this process was they actually did a market analysis and looked at the real potential for various housing, retail, office, and industrial growth over the next ten years, and that is documented in the plan. They also included, because it is a requirement of the Redevelopment Ready Communities Program, they looked at three different potential development sites, the information is documented there, and they talked about some development potential on those sites.

Planner Arroyo said that the Complete Streets Plan, which is also a requirement of the State Statute, that they look at their transportation, that they look at both motorized and non-motorized transportation. They have a separate plan that has the safety path plan, as it has been traditionally known, that is the complete

streets plan. Then the thoroughfare plan or the master right-of-way plan tends to deal more with motorized vehicles and how they travel through the community.

Planner Arroyo said that the Future Land Use Map is a policy guide that directs certain locations within the community where certain land uses make the most sense and there is a link. When you look at this it does reference back to the residential density plan because if they are trying to understand what the residential areas mean in terms of density go look at the residential density plan.

Planner Arroyo said they also see circles on the Future Land Use Map there are four of them, one is within Lake Orion, so it is technically outside of the boundary, but it is a hub obviously of activity. Then they have three others and those are what they call 15-minute neighborhoods. The concept of a 15-minute neighborhood is that as the community grows the Township would like to be in a position where they would like to get to these certain core areas that offer basic goods and services, like a grocery store, or a place to go out to eat, or a small market, it would be nice if they had the opportunity to take another form of transportation besides their car. The concept behind this is these 15-minutes are defined by how long it would take them on a bicycle to get from the edge to the core of the 15-minute neighborhood. It is ruffly a three-mile radius traveling at about 12 MPH, which is a typical speed for being on a bicycle. What that looks like is when they spread it out over the Township, they can see that these four areas, the four concentric circles, which they are not really because this is showing real travel time today, do overlap. They almost have 100% of the community covered where they could ride a bike to one of these four locations. Right now, some of them already offer those basic goods and services, in fact, three of them do, and one may have more of that in the future. It provides an opportunity to potentially either walk, ride a bike, or take a car in order to visit all of these so, opening the opportunity for different forms of transportation. Gas prices are up they may want to look at something different, maybe that is the time they ride your bike to go out to eat or to go pick up something at the store, you need a gallon of milk they can throw it on the back of their bike and go back. It is nice to have those options as world conditions change and impact how the cost of living within the community might change.

Planner Arroyo said he did mention action strategies, they do have the zoning plan and then all of those action strategies, are broken out into different types of actions. Some of those actions may involve amending the zoning map, others may involve taking an advocacy position, trying to promote for example the protection of certain natural features, and sometimes the Township reaches out to other organizations. Whether they be nonprofit or other governmental entities and try to work together to try to preserve some the natural features or work together to try to preserve a trail or some other features such as that. Some of them are related to capital improvements, those are large expenditures that the Township or other governmental agencies may have to incur, and some of them fall into what they call, the “other category”.

Planner Arroyo stated that some previous actions that have happened, as required by State law the Township Board authorize the distribution of the draft plan to reviewing agencies and adjacent communities, so all adjacent communities got a copy. The various reviewing agencies like the County, SEMCOG, the Road Commission, MDOT, and other entities like that all were getting copies in accordance with the typical process. There was a 63-day review period, during that period the Master Plan was also available on the Townships website. And as required Oakland County did review this, the Townships are required to send their plans for review, that is a State law requirement. The Oakland County Coordinating Zoning Committee found that this draft is not inconsistent with any city, village, or township plan, that received notice of the draft plan. Then they also received other comments that were included in their packet.

Planner Arroyo said the next step in this process is to conduct the public hearing and then ultimately when the Planning Commission is ready, they would then adopt the Master Plan.

Chairman Reynolds said he would like to open it up to citizens who are present for public comment. If they would like to make a comment, they can step up to the podium please keep your one trip to three minutes so they can give everyone the opportunity to speak. If and when they step up to the podium,

please state their name and address for the record, and clearly speak into the microphone so they can have them on record.

Ms. Katheryn Kennedy 690 Rochester said she did submit emails to them before coming here. She would actually request that they reject this plan in its entirety, it is supposed to be a long-term plan. In the very beginning, it says that it was intended for 10-20 years but they just did one in 2015, and this one was started in 2020, however, it was only started with Giffels Webster, Planning Commission, and three citizens throughout the planning period. When the hearing for the Open House she attended on May 18th, they already had it all put together. There really wasn't the type of citizen input that there should be. They also had a Coordinating Zoning Committee, that he mentioned, yes it was held on July 7th and the packet they received that evening at 7 p.m. was different than before, it was now a revision seven. The packet that was sent to the County was a revision six. She did attach a file with some of the notes. She had some real serious concerns about a lot of things beyond the point that it wasn't done by the citizens. It seems to be geared towards the objectives of Oakland County to urbanize this area. They have continued to have a Regional Transportation Board even though they vote against it. She would point their attention to the thoroughfare Master Plan, they expect to have these roads in this way in the next five years and maybe that is what the five million that is probably being borrowed for the State. Lapeer they are expecting as an interstate, now, she knows Lapeer she didn't know where they could put an interstate and all of those businesses would be wiped out, what are they thinking. They also have listed Baldwin Rd. as a major thoroughfare 150-ft. right-of-way. Again, where do they put it, they just did all of the roads, they just did all of those roundabouts, and they have a business up against them. The two signs across from Friendship Park are for sale signs, and in this plan, it shows high-density housing. They have created new higher density than they have ever had for residential housing. The Michigan Zoning Enabling Act that he mentioned, she actually mentioned too because the Legislative Committee on July 12th tried to pass a resolution to go forward at Oakland County, they tabled it for now, but they are trying to take control of all of their real estate from a State level. She did attend a conference where they explained what they are doing even though MICHA they have a website they can type in, but she didn't have a chance to compile it but would be glad to meet with them separately. She asked them to please reject any of these changes. A lot of these roads are wider than what they have available unless they wipe out the lakes.

Mr. Jonathan Forrest 1701 Oneida Trail asked what is a small town? Why is it such a perverse notion to what to keep one the way it is? Though may contemporaries think small towns of America are backward, uncultured, and uncivilized, the truth is the opposite. Small towns have an identity that makes them unique. The people in small town communities know each other, care for each other, and love each other. Orion Township is no exception, nor should it be, they mustn't allow outside sources to dictate Orion Township and its citizens. They are not Pontiac, they are not Rochester, they are not Royal Oak, Flint, or Detroit, they are Orion. People come to live here because it is less busy than the big cities. If they adopt this Master Plan, they will become like every other community that developed into a world hub devoid of identity. They implore them to keep Orion Township how it should be a place where living is a vacation.

Ms. Heather Smiley stated she has been an Orion Township resident for the last 21 years. She is a Detroit native so coming out here she knew the first couple of months were a little difficult to sleep because of the frogs and the natural elements. Every day she gets upset seeing the new zoning changes, seeing the destruction of their woods before there is even a purchase of a property. They have areas that are already cleared of trees that are able to be developed but yet there are builders that want to come in and take what little habitat and natural development areas that they have available. It really upsets her because she sees a vision of a dollar is stronger than the vision of their community. She didn't know if people are familiar with Rochester and Rochester Hills, but Rochester pretty much used their last part of the parcel for development because they just grew too big too quickly. She knew that living off of Clarkston Rd. that there are some parcels around her that they want to put in multiple homes that they don't have the infrastructure for, and she is scared to know how it is going to affect their well and septic, and things of that nature. She moved out here to make a better life for her family to enjoy the natural element that they call the Village of Orion Township, and it really makes her sad to see it being destroyed. She hoped that the love of the community is stronger than the love of the mighty dollar on this

Commission. She wasn't saying that they don't have room to grow because obviously, they can't stop growth, but she thought that they needed to be mindful of the citizens and the residents that live here, why they live here, and why they moved here, and why they continue to love their community. It is not because of the duplexes and the high 15-minute density places, it is because you can drive for 15-minutes and see nature, see a hawk, turkey, and deer, that is why they live in Orion Township. If she wanted to see concrete, she would just go back to Detroit quite frankly. She thought the Planning Commission did a great job, honestly, she really appreciates all the ways they try to incorporate saving nature. She knew they had a tough job, but there are just some things that they have to stand firm in.

Ms. Marilyn Hester 1207 Hemingway stated that in this Master Plan she didn't see anything about what they are going to do about their first responders as far as fire, police protection, and EMS. She was concerned about all of the development going on. They are going to need more support.

Ms. Carol Ebner 768 Sherry Dr. said she agreed with all of these other comments. They moved out here because it was rural, not urban not a city. She could see in doing some of these improvements, but she is also concerned about the traffic. She lives off of Clarkston Rd. and they are talking about putting in multi-family dwellings. The traffic is already terrible on that road, and everybody cuts down their road. They have complained to the Township, and to other people about the amount of traffic and the speed on their road. The road is in terrible condition because of all of the traffic. The other multi-family developments around here have all kinds of crime. There are all kinds of problems off of Kimberly Rd. in those apartments, her niece lived a ½ mile from the Sheriff's Department, there were shootings and stabbings in those apartments, and she just heard there was a murder there last week. She was very concerned about the crime and everything else going on around here with all of this building and concrete.

M. Tom Williams 1160, 1180, 1998, 1212 Hemingway said on their street at one point Silverman wanted to develop the whole thing and he ended up buying the property from Silverman from keeping them from developing their street. How many more people does it take, like him, to invest in the community to stop some of this development? The traffic is horrible down their road anyway, and they have a dirt road, people fly down through there, and he didn't see anything in the Master Plan that addresses any of that.

Mr. Matt Koneda 474 Green Hill Lane said he was born in Detroit his family was kind enough to move to Novi to get away from Detroit in the mid- '70s. His wife and he were able to get married and they moved to Troy in the hope they could find a quiet neighborhood, it lasted for about two years, and then the sprawl happened. They were grateful to find and be able to afford a home here because it reminded them of Novi and Northville where they spent their youth. There were parks, it was green, and there was a community. What he was afraid of here with all of the proposals of low-income high-density mass transit is none of those things equal safety, they never have in any community, any city, any urban area. Why do they think that they are going to be different? Like one of the other speakers said there is no facilitation or increase in police and fire that they can see that was readily apparent. They would have to increase the fire and police significantly to provide the level of safety that they have learned to love and appreciate here. Again, their job is not easy, they are citizens just like us, and they probably don't get paid much at all if anything to do this job. He truly appreciated them working on this his job he also has to do 5-year and 10-year plans it is part of what they do. He would just like it to be something that really means something. They are a place where living is a vacation. He feels that if they continue to go down the road of suburban sprawl that will not be the case.

Ms. Tina Hein 630 N. Blocki said that from everything that she has listened to, and she had spoken last time when she was at the meeting to definitely, please reject this plan. She stated last time they need to have a balance, not too much overgrowth. She did want to bring it up because they are talking about the development and bringing in more housing, people, stores, and restaurants. Have they thought about a level one trauma hospital here? Have they thought about that? If they are going to bring more and more people here, they really need to think about that. She did hear that they plan on cutting safety, someone else mentioned that a couple of other people, cutting the safety budget, the policing, fire, and EMS, is really not a good idea. As far as the hospital if something happens lots of car accidents here, Lapeer Rd.

is a nightmare, especially heading north on Lapeer to get to Oxford. It took her almost 30 minutes one time to get to an appointment for 3 miles. That is really something that they need to think about. The nearest hospital they have to go to is Lapeer, Troy, or Pontiac.

Ms. Sandra Rahman 9308 Oakmont Dr. said she was here to piggyback on everything everybody is saying. Number one she would be precautious of their development here. They have a lot of people on their board that are builders, and developers and they have relatives in Rochester, Auburn Hills. In the little circle, they are building our Board Members have been doing this for years. She worries about their conflict of interest developing around here, the kickbacks, and the marijuana situation in the County here. For one they have had so many accidents now on Lapeer Rd., deadly accidents, and they don't have a rush hour hospital to go to piggybacking to that. Everyone is in a hurry to develop but nobody is paying attention to what is going on right now. She would precaution them to worry about what is going on in their community right now rather than worrying about rushing through this thing that they can think through a little longer. And to consider what is really going on with the developers, the board members, and the circle of friends running this community.

Mr. Noah Stevens 3507 Pasadena stated that he was the last house on the left the dead-end Cottages of Gregory Meadows are being built right next to him. It didn't appear that based on that development and this Master Plan that they are taking into consideration the current homeowners. Kind of like everybody that is stating stuff here today. Infrastructure is a huge thing, traffic, fire, EMS, and police, but he was also a younger guy he has a family they don't have children in schools yet, but they will soon. All of this extra development concerns him about what is going to happen with all the extra students in the schools, and if his children will be able to get the same level of education that Orion Township residents receive today. He would appreciate that if they took into consideration all of the infrastructure not just hospitals, and traffic, but also the schools as well.

Ms. Sandy Walker 2565 Mueller Rd. said she believed that the property that she and her husband own for over 20 years is the only property on Judah Lake that has a creek coming off of Judah Lake running through their property and going into the nature center that she saw on the document. She was a little concerned about all that she was hearing here. She used to be the last house on the left just like that gentleman just said she used to be that house until they built that big giant neighborhood and plowed all the woods down. Now the traffic just flows down here street. Over the bridge, they had to build over the creek. She works for the largest telephone company in the world, she was sure they knew who that was. There are over 30,000 people in here division, if she only got 600 surveys back from sending out something to those 30,000 people she would be concerned, if that survey was only 600 people came back or only 45 people attended a meeting of her 30,000 people that she works with. Another time 25 people showed up they have 23 people here tonight, and she just heard about this. She was sorry she didn't know about this sooner she saw they had a 63-day review period. She guesses she didn't read the Lake Orion Review or wherever else she was supposed, to know when this was going on. She would like to keep their little town rural. Baldwin is a disaster she has to go up it every day it is just a massive piece of cement that just has cars whipping all day long. She said she was going to gracefully ask them to reject this plan.

Ms. Chris Broquet, 110 S. Newman Rd. said she wasn't prepared to speak so bear with her. She noticed on the Master Plan they believe there are only 17 acres of rural property in Orion Township. 1990's her family moved to Rochester and there was a lady on Crooks or Livernois she forgot it had a barn, farm, a pony, and a pottery studio. She used to put a sign out, advertising that she sold pottery. As the place developed, they told her she couldn't have the sign anymore. She told them this is my livelihood and farm and so what she did was she changed her last name she hyphenated to Pottery so she could have Pottery on the mailbox. Then Rochester City said they don't allow ponies and farms anymore, so they were pushed out and they were there forever. What she was thinking was that there are many more people in Orion Township that farm, not all people commercially sell things they may make milk, honey, or vegetables for their family but either way if the Planning Committee only thinks there are 17 acres of farmland are they going to say the same thing to them because they don't feel that they exist at all. That

is what she is worried about in the Master Plan. She believed that there should be a plan saying, hey well this area can't be for big commerce, or that area can't be for big commerce. Let's be sensible and not grow willy-nilly she understood that but when the plan initially doesn't actually reflect what is in Orion Township that is what she worries about. As far as low-income housing a lot of people think that more people should be allowed to live in the area, she agreed, but a lot of times they cut corners on that housing, and the buildings don't last. Ask people that live in moderately priced apartments in Lake Orion, they are having a problem finding custodians and janitors to work to keep it nice, this is moderately priced, not a luxury, not low income, just people earning a living. She wondered how this is all going to stay nice if people can't find custodians now. Speaking about the hospitals they just lost another urgent care that closed up because there is no staff. Those are just a couple of things to keep in mind that they might not have thought about.

Chairman Reynolds asked Secretary St. Henry to do a tally of the citizen letters they received.

Secretary St. Henry stated that they have received a number of comments from citizens, and he was going to read their names. All of them are opposed to the Master Plan. The names of the folks that wrote to them are Kathryn Kennedy, Stanley and Carolyn Stevens, Andrea Pupkiewicz, Aubrey Zufelt, Jan Kruszewski, Tina Hein, Karen Koneda, Joyce, Linda Greer, Bob Steinheiser, Adrian Ratza, Kevin Breslin, and Timothy Munsell.

Secretary St. Henry added that they also received comments from Donni Steele, Gary Roberts, Water Resources Commissioner, and the Oakland County Road Commission submitted comments.

Trustee Urbanowski said a couple of people said something about public safety concerns. She had the same concern, and she did sit down with their Fire Chef and their Lieutenant and expressed her concern. She has gotten no information that they would be any kind of trouble with their plan. They are confident that the staff they have now and the capability that they have is going to continue to be sufficient for their community. Someone mentioned talking of cutting their safety budget, she is a Township Trustee, and she can tell them right now she has never heard that not at all. In terms of hospitals, they have to have a certificate of need for that that has nothing to do with anything that they do here, that is a difficult thing to get for one thing. Then for infrastructure, she is also the representative of the Public Works department, so she frequently talks to the people in Water in Sewer Department. They have one of the newest systems in the County and they have no issues in terms of water and sewer infrastructure issues and they always look at that when they look at these plans.

Commissioner Walker said as opposed to what Trustee Urbanowski just said his comments are going to be more to the heart of the matter. He is a 34-year resident of this Township. He would love to be living in the Township that he moved into, he truly would, it is not going to happen, it is dreadful. You are all correct about the traffic, the number of people, the number of subdivisions, the number of buildings, every one of you is right, but that is called progress. He wasn't saying it was a good thing, but it is what it is. None of you will be able to turn the clock back, he can't, this Commission can't. While they are talking about the clock, he thought he was the only one here last time when the last Master Plan was submitted. He was still appalled at you and your neighbors, they are telling them they didn't know about this, it was the same thing 5-years ago. The populous said they didn't know, they put it in the Orion Review, they put it on ONTV they put it wherever they could put it, but they can't make them listen to it, they can't make them think about it. Now when the time is nye now you are all upset. He didn't blame them for being upset if he could be he would be upset also but he can't be, so he isn't upset. It is true it is how it is and even now adding the 23 of you, how many people have they heard from, very few of the 38,000 people that live in this Township. Shame on all of you. They should have been here quicker and more. He wasn't sure if it would have made a big difference, but it might of.

Secretary St. Henry stated that he appreciated everyone coming out here and the comments from people during the Open Houses and during the other opportunities to provide input for this report. His wife and their two families have lived here for over 90 years. His wife's family moved here in 1972 and he moved

here in 1982 with his family from out of state but was actually born in Detroit. If any of them had followed this Planning Commission over the last couple of years especially they would notice that they have the very same concerns that they do in regard to traffic, utilities, density, general overall growth and population, the importance of preserving the natural character of their community. If they go back through the couple hundred cases that they have reviewed over this time they would see that many times they have shot down developments for all of those concerns. Unfortunately, in some cases, one of the gentlemen that came up and mentioned Gregory Meadows for example. They rejected Gregory Meadows, the Township Board rejected Gregory Meadows, unfortunately, the developer decided to take this to the courts. Every time this has gone before the courts since he has been on the Planning Commission since 2013, he was involved in that Master Plan, courts rule in favor of private property owners every time. They come back to them, and they say they are not going to like how they are going to rule against this it is time to make a compromise with the builder, for example, so they do that. Often times they are able to negotiate different amenities, and different plans that address some of their initial needs. If they don't do that the builder goes back to their original plan and the courts approve it. That is a challenge they face, and they get frustrated every week when they are looking at different plans.

Secretary St. Henry said he will say this about this Planning Commission, and he has seen people come and go over the last 7 or 8 years except for Commissioner Walker. This group is probably the most conservative group that he has ever been involved with in terms of trying to preserve the natural/historical character of their community Orion Township and development in progress. It is true that in the past they had builders on this Planning Commission, they have had Civil Engineers, they had developers, and he sat back, and they were very competent and very personable, and they knew their jobs, but he wondered if there was a conflict of interest. He could tell them that they don't have current professionals on this Board that is involved in any of that with the exception of their chairperson who is an architect, and it is very good to have him on this Board because he understands plans probably better than any of them. And Mr. Wortman is retired, and he has been in the planning industry. He appreciates the fact that they don't have what he would consider in the past ulterior motives, and that is not even right, because the people that were on this Board before did a great job. From an optics perspective, he could understand where people would have concerns. This group pays more attention to the needs of their community, and the historical makeup of their community than any group that he has ever been a part of. There are people asking if this is going to be the next Rochester or Troy. When his family moved here in 1982 his aunt was a realtor in Ortonville and his father looked around for a home his friends told him he should move to Troy or Novi, and his dad said he couldn't afford that. He talked to his aunt who was a realtor in Ortonville, and she said that, in the early '80s, you want to look at Lake Orion, Clarkston, Oxford, that is where the growth is going to happen next, and she was dead right. When he moved here there were about 20,000 people in the Township now, they are up to 38,000 or 40,000 people in the Township it is not a small town anymore. The signs of growing beyond a small rural community ended in the late '80s when the building boom started to take off. Quite frankly if you didn't see this coming you were living under a rock. That being said they have to recognize they have over 100 tier one and tier two auto suppliers supplying not just the Detroit three automakers but the entire world automotive industry here. They are a major economic development hub for the state of Michigan and North America especially as it relates to the automotive industry, and robotics industries, growing quickly in aerospace and defense. If they want those industries to flourish, and he thought they did, and a lot of them work at those they have to address some of the housing issues in their community. The bottom line is there are not enough places for people to live in northern Oakland County. They work in northern Oakland County, but some people travel far distances to come to work. The younger professionals and the younger families don't necessarily live in $400,000 - $500,000 houses or they can't afford them just yet, someday they will. That is why, over the last couple of years have taken a close look at a lot of the housing developments, and Planner Arroyo has spoken about this many times with that middle-level housing, and it is something they lack in this community. His parent moved back from up north and they could not find a place to live in Lake Orion as retirees. His older daughter is just starting a family, and he has a grandson now, they wanted to move to Lake Orion, but they couldn't find a place to live, so they are ready to buy their first home. This is the issue they are wrestling with. Yes, they know that apartments, townhomes, and other middle market housing developments are new to a large extent they have to find the right place for them in their

community. They have shot down a couple over the last 6-7 months because they recognize their value of them, and the demand they just thought they were in the wrong place. They told the builders to go back to the drawing board here are some other options to consider, and they hope they will consider them, it doesn't mean they will approve them next time, but they are always open to ideas for responsible development. That is what this group is most interested in is responsible development. Balancing the need for what they call progress with trying to be responsible for the needs and desires of their current residents. It is a balancing act, and it is not easy, but they have to think about when they are not here anymore in future generations and balancing progress with the natural habitat of their beautiful community and what their residents want now, and it is not always easy. He thought personally this Master Plan was put together with a heck of a lot of thought by many people much more so than the Master Plan he was involved with before and part of that was because they had a new Planner come in with some new ideas. Every page of that Master Plan was reviewed by all of them, all of the maps, they did make changes where it made sense to reflect the current situation in Orion Township, is it perfect, probably not, but he didn't know any document like this that is perfect. He thought it was a good guide to move them forward as they continue to look at development that comes before them, developments that they can be aware of by attending their meetings as Commissioner Walker mentioned, it is a guide for them. Please take that into consideration as they think about the work that they have done.

Vice-Chairman Gross said that Orion Township consists of 36 square miles of real estate. They don't own the real estate, they don't own the property, the Township doesn't own the property, they own some of it and they have done a good job of developing that into open space, parklands, and the like. The purpose of the Planning Commission under the State Statute as the Planning Consultant has indicated is to prepare a Master Plan and review it every 5-years to update it to see if there are changes that are needed to be made or if there are things that need to be considered in a new updated Master Plan. Their purpose as a Planning Commission is to review that previous Master Plan and update it to current conditions, to review and control development on private property in a manner that is consistent in reflecting land use laws, and individual property rights. As Secretary St. Henry indicated the Master Plan does provide them with a guide for the Planning Commission to review projects that come before them to see if they are consistent with the plan and in accordance with the Zoning Ordinance which is the regulation portion of their responsibility. To make sure it is consistent with the ordinances that they adopt relative to the development of the property. This is an ongoing process they will be reviewing the plan again in another 5-years to see how it needs to be revised, reconsidered, changed, added to, or deleted from. It is not something that is adopted today and in place for the next 15-20 years, it is a plan that they review on a regular basis on a 5-year interim.

Chairman Reynolds said that he appreciated all the public involvement that they have had through this entire process. A couple of comments were made just with that involvement, and he commended themselves as a Commission to get the involvement that they did have in this public involvement process with the Master Plan. Many townships and municipalities don't go out of their way they just meet the minimum requirement and that is all they do to essentially gather input. He has been part of the Master Plan and discussions in the Village of Lake Orion, he sat on that Commission also. They pride themselves on getting 20-30 responses. Yes, it is a different scale of a community but in the bigger picture, they really did go out of their way many of those times during COVID. They ran meetings in hybrid formats to make sure that people had the opportunity if they were not comfortable in person to come, show up and provide comments. They went out of their way to run five screens to make sure people had the opportunity to chat, email, and live format, to make sure this was involved in a very open book process. He was proud of the Master Plan that they have put together and they have gone page by page, and he knew personally he has spent hundreds of his own hours looking at this, to the comment, no he really didn't get paid to do any of those additional hours. He encouraged everyone to stay involved no matter where this Master Plan may come. They typically see a huge outcry at the very end. They didn't have more than two or three people in the room to start this process. As a Chair of a Planning Commission it is disappointing, but they publicly advertised, and they did encourage involvement. That wasn't because they wanted it to be that way. He encouraged everyone to stay involved and to stay involved with what projects are going on in our community, our website is constantly being updated. The Planning Department goes out of its way to

make sure that all that information is available to the public at all times no matter what project is at any stage even ones that are in the works and potentially coming back. The Planning staff will readily bring that forth to them and make them stay aware of those things that they would like to be. He would like those people who would like to stay vocal about where our community is going not to stop showing up to their meetings. Just because they are done with the Master Plan to Secretary St. Henry's point they see hundreds of cases a year and better yet that doesn't necessarily come to this Commission for a final ruling or a review that is shot down long before they ever even appear in front of them. From a community involvement standpoint, yes, he would encourage all of them to stay involved and apply to be appointed to one of these commissions, these are not elected positions. They see this all the time; they get to this big hot topic someone stirs up the community to come with an outcry and then everyone disappears once whatever that item is off the agenda or election season upon us, they see a room full of people and then everyone disappears. He appreciates public comment. Please stay involved he appreciates their involvement and coming here tonight.

Commissioner Brackon stated that they can't stop progress and the story he thinks about is having lived in Orion Township for 22 years now he had the opportunity to be on Lake Orion many times and bring people that don't live in Lake Orion onto the lake and give them tours and tell them about the history of why they are called the Dragons. Specifically, about the history of Park Island and how it was an amusement park, and that story just fascinates him. Every time he sees those pictures it just makes him think of how wonderful a time that was. He can't imagine the pressure or the public outcry that occurred when Park Island was being taken down and turned into a residential community. They are not trying to take down their Park Island they are trying to move forward. They have all of their interests in mind and if they attend any of their meetings and see what they have turned down. He didn't know the percentage but from what he has seen from his being on a little over a year on this Commission, more than 50% of the plans get turned down, at least initially. They are on their side; they appreciate everything that they are saying and truly this Master Plan is an outline to preserve Orion Township the best they can but also understand that progress has to be made.

Chairman Reynolds closed the public hearing at 8:10 p.m.

Respectfully submitted,

Debra Walton
PC/ZBA Recording Secretary
Charter Township of Orion

_____
Planning Commission Approval Date

Charter Township of Orion

2323 Joslyn Rd., Lake Orion MI 48360
www.oriontownship.org

Planning & Zoning Department
Phone: (248) 391-0304, ext. 5000

TO: The Charter Township of Orion Planning Commission

FROM: Tammy Girling, Planning & Zoning Director

DATE: July 27, 2022

RE: PC-22-28, GM Orion BET 2, Special Land Use, Wetland & Site Plan

As requested, I am providing suggested motions for the abovementioned project. Please feel free to modify the language. The verbiage below could substantially change based upon the Planning Commissions' findings of facts for the project. Any additional findings of facts should be added to the motion below.

Special Land Use (Ord. No. 78, Section 30.02)

Motion 1: I move that the Planning Commission **approve/deny** PC-22-28, GM Orion BET 2 Special Land Use Request to expand an automotive manufacturing facility located at 4555 Giddings Road (parcel 09-34-200-006 and 09-34-400-011) for plans date stamped received July 6, 2022. This approval/denial is based on the following finding of facts:

a. Compatibility with Adjacent Uses (Insert any findings of facts),
b. Compatibility with Master Plan (Insert findings of facts),
c. Adequate Public Services (Insert findings of facts),
d. Impact on Traffic (Insert findings of facts),
e. Detrimental Effects (Insert findings of facts),
f. Enhancement of Surrounding Environment (Insert findings of facts),
g. Isolation of Existing Land Use (Insert findings of facts).

If Approved:
This approval is subject to the following conditions (insert any additional conditions such as hours of operation, times of year, etc.)

Wetland Permit (Ordinance No. 107)

Motion 2: I move that the Planning Commission **approves/denies** the wetland permit for PC-22-28, GM Orion BET 2 located at 4555 Giddings Road (parcel 09-34-200-006 and 09-34-400-011) for plans date stamped received July 6, 2022. This **approval/denial** is based on the following findings of facts:

a. The action or use **is not/is** likely to or **will not/will** pollute, impair, or destroy a Wetland (insert findings of facts).
b. There **are no/are** feasible or prudent alternatives to the proposed action (insert findings of facts)
c. The **approval is/is not** consistent with public interest, in light of the stated purposes of the ordinances (insert findings of facts).

If approved the approval is based on the following conditions:
Motion maker to insert any conditions.

Wetland Setback Waiver (Ord. No. 78, Section 27.17)

Motion 3: I move that the Planning Commission **approve/deny** wetland setback waivers for PC-22-28, GM Orion BET 2 located at 4555 Giddings Road (parcel 09-34-200-006 and 09-34-400-011) for plans date stamped received July 6, 2022, based on the applicant **demonstrating/not demonstrating** the appropriateness of a lower setback and compliance with **one or more** of the following criteria: (motion maker insert findings of facts)

a. Demonstrated habitat preservation
b. Demonstrated water quality preservation
c. Demonstrated storm water quality retention
d. Existence of a legal lot of record

Off-street Parking Calculation Waiver (Ord. No. 78, Section 19.03 C)

Motion 4: I move that the Planning Commission **approve/deny** a parking calculation waiver for PC-22-28, GM Orion BET 2 located at 4555 Giddings Road (parcel 09-34-200-006 and 09-34-400-011) for plans date stamped received July 6, 2022, based on the following: (motion maker insert findings of facts)

e. The applicant **did/did not** provide evidence that indicates that another standard would be more reasonable, because of the level of current or future employment and/or the level of current or future customer traffic (insert how they did or didn't demonstrate).
f. (motion maker to insert any additional findings of facts)

Internal Parking Lot Landscaping Waiver (Ord. No. 78, Section 19.03, D 7)

Motion 5: I move that the Planning Commission **approve/deny** an internal parking lot landscaping waiver for PC-22-28, GM Orion BET 2 located at 4555 Giddings Road (parcel 09-34-200-006 and 09-34-400-011) for plans date stamped received July 6, 2022, based on the following: (motion maker insert findings of facts)

a. The applicant **did/did not** provide evidence that such landscaping would not provide significant stormwater detention benefits (insert how they did or didn't demonstrate)
b. (motion maker to insert any additional findings of facts)

Loading/Unloading Requirements Waiver (Ord. No. 78, Section 19.03, J)

Motion 6: I move that the Planning Commission **approve/deny** a waiver from the loading/unloading requirement of Section 27.04 for PC-22-28, GM Orion BET 2 located at 4555 Giddings Road (parcel 09-34-200-006 and 09-34-400-011) for plans date stamped received July 6, 2022 because the applicant **did/did not** demonstrate that the requirements do not reflect industry requirements and needs (motion make to insert findings of facts).

Safety Path Construction Waiver (Ord. No 78, Section 19.03, M)

Motion 7: I move that the Planning Commission **approve/deny** a waiver from the requirement to construct safety paths for PC-22-28, GM Orion BET 2 located at 4555 Giddings Road (parcel 09-34-200-006 and 09-34-400-011) for plans date stamped received July 6, 2022 because the applicant **did/did not** provide evidence that indicates that another standard would be more reasonable (motion make to insert findings of facts).

Site Plan (Ord. No. 78, Section 30.01)

Motion 8: I move that the Planning Commission grants site plan **approval** for PC-22-28, GM Orion BET 2 Site Plan located at 4555 Giddings Road (parcel 09-34-200-006 and 09-34-400-011) for plans date stamped received July 6, 2022 based on the following findings of facts (motion make to insert findings of facts).

This **approval** is based on the following conditions:

- The applicant will amend the plans to address any unresolved issues from the township's engineer, planner, and fire department reviews and resubmit for re-review by the consultants to their satisfaction with no required return to the Planning Commission unless the applicant is unable to meet one of the consultants issues.
- (Motion maker to list any additional conditions).

Or

I move that the Planning Commission **denies** site plan approval for PC-22-28, GM Orion BET 2 Site Plan located at 4555 Giddings Road (parcel 09-34-200-006 and 09-34-400-011) for plans date stamped received July 6, 2022. This **denial** is based on the following reasons (insert findings of facts).

Or

I move that the Planning Commission **postpones** site plan approval for PC-22-28, GM Orion BET 2 Site Plan located at 4555 Giddings Road (parcel 09-34-200-006 and 09-34-400-011) for plans date stamped received July 6, 2022 for the following reasons (motion maker to indicate outstanding items to be addressed from the Planner's, Fire Marshall's, or Engineer's review letter(s)).

July 27, 2022

Scott Reynolds
Planning Commission Chairperson
CHARTER TOWNSHIP OF ORION
2323 Joslyn Road
Lake Orion, MI 48360

RE: GM Orion Assembly BET Expansion - Wetland – PC-2022-28
Wetland Review

Received: July 6, 2022 by Orion Township

Dear Mr. Reynolds:

We have completed the first review for the GM Orion Assembly Wetland submittal. Wetlands on this site are shown on plans prepared by Wade Trim. The EGLE/USACE Joint Permit Application was utilized for the township wetland permit application and was included in the submittal. The wetland inspection, delineation report, and permit application were completed by GHD Services, Inc. The application was reviewed with respect to the Township's Wetlands Protection Ordinance, No. 107.

EXISTING SITE CONDITIONS:

The proposed site is located east of Giddings Rd, south of Silver Bell Rd , and north of Brown Rd. within Section 34 of the Charter Township of Orion. After conducting a site visit on July 14, 2022, we were able to generally confirm the location of the wetlands as depicted on the plans and in the wetland report.

Please note that wetlands are described with a W ahead of the wetland identifying letter and the water bodies are described with a WB ahead of the water body identifying letter. For example, Wetland A is represented by W-A and Water Body A is represented by WB-A.

Following is a composite list of wetlands and water bodies from the delineation report:
W-A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y
WB A, B, C, D, E, F, G, H, I, J

The following wetlands were added after the original delineation report:
W-AA, AB

PLEASE NOTE: Figure 1 – Delineated Wetland and Waterbody Features (GM Wetland Map) combines W-A, B, C, D, E, and F with WB-A, B, C, D, E, and F respectively. For clarity, and most up-to-date information, this letter will refer to the GM Wetland Map included below for wetland identification purposes.

Regulated Under Ordinance 107, Section 3.A:

Wetlands regulated by this section include W-A, B, C, D, E, and F. Section 3.A identifies these wetlands as being regulated for the purpose that they are hydraulically contiguous with a river, lake, or stream. National Wetlands Inventory (NWI) and Michigan Resource Inventory System (MIRIS) maps appear to only recognize a small portion of Wetland A as wetland area. NWI Describes it as a Palustrine, Emergent, Persistent and Seasonally Flooded (PEMIC). Altogether, these wetlands total 5.6 acres. According to the USDA National Resource Conservation Service (NRCS) map, these wetlands are generally comprised of soils Oshtemo-Boyer Loamy Sands (13B and 13C), and Granby Loamy Sand (39). Per EGLE response to the wetland delineation report, these wetlands are also regulated by EGLE. The EGLE Regulated Wetland Map has been included below for reference.

Regulated Under Ordinance 107, Section 3.B:

Wetlands regulated by this section include only W-N. Section 3.B identifies this wetland as being regulated because the wetland is over two (2) acres in size. Neither NWI nor MIRIS recognize this area as an existing wetland. The NRCS maps identify this wetland's soils as Oshtemo-Boyer Loamy Sands (13B) and Riddles Sandy Loam (44C). W-N is 2.7 acres in size. This wetland was determined to not be regulated by EGLE.

Regulated Under Ordinance 107, Section 5.B.5:

Wetlands regulated by this section include W-G, H, I, J, K, M, O, P, Q, R, U, V, W, X, Y, and AA. Section 5.B.5 identifies these wetlands as being regulated for the purpose that the wetlands provide flood and storm control by hydrologic absorption and storage capacity. Of these wetlands, NWI maps only have record of W-Q, X, and W. W-X and W are represented as part of a much larger wetland adjacent Carpenter Lake. NWI maps identify these three (3) wetlands as Palustrine, Scrub-Shrub, Broad-Leaved Deciduous, and Seasonally Flooded (PSS1C). MIRIS maps identify the same three (3) wetlands with the addition of W-Y. NRCS maps indicate soil types in these wetlands comprised primarily of Marlette Sandy Loam (10B), Capac Sandy Loam (11B), Brookston and Colwood Loams (12), Oshtemo Boyer Loamy Sands (13B, 13C, and 13E), Houghton and Adrian Mucks (27), and riddles Sandy Loam (44C). These wetlands combine for a total area of 4.99 acres. Wetlands W-H, I, J, M, R, U, V, W, X, and Y are all regulated by EGLE per the EGLE Regulated Wetland Map.

Regulated Under Ordinance 107, Sections 5.B.3 & 5.B.5:

Wetlands regulated under this section include W-L, S, T, and AB. Section 5.B.3 identifies these wetlands as being regulated because they support plants or animals of an identified local importance. While neither the NWI nor MIRIS mapping systems have record of these wetlands, and the NRCS map identifies soil types to be Oshtemo-Boyer Loamy Sands (13B) which is consistent with other on-site wetlands, these wetlands were identified to be of higher quality. During the site visit, it was determined that W-L, S, and T contained species of Sphagnum moss which is typically found in bogs. These may be historical remnants of bogs that persist to this day. The bog ecosystem can be significant for a variety of species. Just south of W-S and T is W-AB, which is classified as a vernal pool. Vernal pools are seasonal depressional wetlands that provide a unique habitat for a variety of plants and animals that are able to survive in seasonally flooded areas. Altogether, these wetlands are 1.08 acres total in size. While these wetlands are not regulated by EGLE, these are considered higher-quality wetlands in the site.

Non-Regulated Wetlands

WB- F, G, H, I, and J (totaling 12.16 acres) are not considered regulated wetlands due to the fact that they are basins that were designed and constructed specifically for stormwater runoff management purposes. They are of standard quality and do not appear to be ecologically significant in nature.


LEGEND
Security Lobby
Check-in Location
GM ORION ASSEMBLY PLANT
LAKE ORION, MICHIGAN
DELINEATED WETLAND
AND WATERBODY FEATURES
FIGURE 1

OHM
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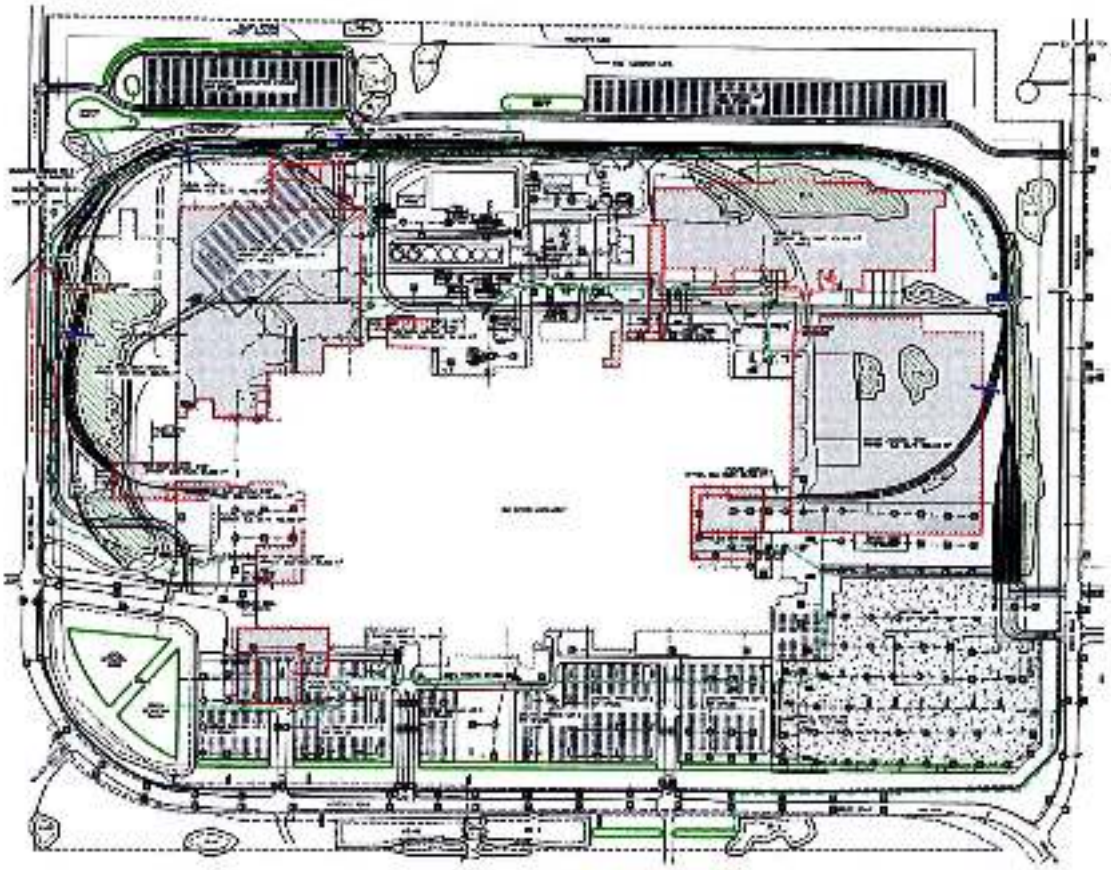
Figure 2.
EGLE Wetland Identification Overview
GM
Orion Township
WP - HPG-HESW-13EXX

WP Assessment Area
EGLE Regulated Wetland
EGLE Unregulated Wetland

EGLE



Snip from Existing Wetland Plan (Sheet G-000)

OHM
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Wetland A: Looking Northeast

Wetland F: Looking East

Wetland D: Western End

Wetland T: Looking North

Wetland H: I to H Culverts

Wetland M: Culvert to Storm Network

Wetland L: Moss

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IMPACT OF THE PROPOSED PROJECT ON THE WETLANDS:

EGLE Regulated Impacts:

The applicant included a Wetland Exhibit plan set which accurately displays the proposed impacts of the final buildout of the GM Orion Assembly building including potential future expansions of the proposed building additions. A total of 5.56 EGLE regulated wetland acres are proposed for impacts based on the proposed improvements. Based on the EGLE/USACE Joint Permit Application (JPA), this includes 1.76 acres of impact from general filling operations, and 3.80 acres of impacts due to structure placement. See the table taken from the Wetland Exhibit plan set below:

Regulated Wetlands

Location	Area (ft^2)	Impacted Areas (ft^2)	Impacted Areas (Acres)	Volume (Cyd)
W-B	35,323	690	0.02	72.22
W-I	6,945	6,945	0.16	437.28
W-H	1,672	1,672	0.04	104.22
W-E	9,168	-	-	-
W-D	12,662	-	-	-
W-F	19,347	19,347	0.44	3582.78
W-A	135,467	135,467	3.11	21007.63
W-B	9,086	9,086	0.21	874.94
W-C	53,552	53,552	1.23	2479.25
WB-G	423,454	-	-	-
W-U	8,136	-	-	-
W-V	11,140	-	-	-
WB-H	51,200	-	-	-
W-X	7,677	-	-	-
WB-F	2,553	-	-	-
W-W	5,533	-	-	-
WB-I	48,839	-	-	-
W-Y	26,056	-	-	-
W-M	5,748	5,748	0.13	1277.3
W-J	9,832	9,832	0.23	3277.33
Total	864,077	242,340	5.56	86112.95

In addition to the impacts shown in the table above, the applicant is proposing partial filling of a stream (as recognized by EGLE) for approximately 463 lineal feet, which totals 309 cubic yards of fill.

Township Regulated Impacts:

Excluding the wetland areas listed above, it appears that wetlands W-G, K, L, N, O, and AA will be completely filled by the proposed improvements, totaling an additional 3.48 acres of wetland impacts. Additionally, wetlands W-P, and W-T appear to be partially affected by the proposed improvements. Those wetlands combine for 1.96 acres. Wetlands W-Q, S, U, and AB do not appear to be impacted by the proposed improvements. A table summarizing the wetland impacts was included on the Existing Wetland Plan (sheet G-006, shown above) in the site plan

submittal, however the table appears to exclude Wetland W-S and W-T and should be updated. The table indicates a total of 4.19 acres of impacts to unregulated wetlands.

Proposed Mitigation:

The applicant is proposing mitigation in multiple forms.

1. Purchasing credits into a wetland bank at a ratio of 1.5:1 for emergent wetlands and a ratio of 2:1 for forested wetlands. For the 5.57 acres of proposed impacts to the EGLE regulated wetlands, the applicant is proposing to purchase 8.61 acres worth of wetland credits.
2. Replacing the impacted stream on site. For the fill of 463 linear feet of existing stream on-site, the applicant is proposing to relocate the stream and provide 500 linear feet of new stream on site.
3. The proposed CPVC BMPs that are included in the storm management system will provide new areas for infiltration and may lead to new habitat growth in areas not proposed for future development. These BMPs will also provide stormwater management that is currently done naturally by some of the existing wetlands.

Per the Ordinance, the wetland application shall not be approved unless the following exist:

1. The action or use is not likely to or will not pollute, impair, or destroy a wetland. *In our opinion, the proposed impacts to the wetlands are offset by the applicant's efforts to mitigate the impacts. The majority of the high-quality wetlands are being preserved and the EGLE regulated wetlands are being banked at a rate over 1.5:1 overall.*
2. There are no feasible or prudent alternatives to the proposed action. *In our opinion, the proposed land use is consistent with the zoning of the property and the proposed impacts are consistent with typical developments to provide the required road access, utility networks, and storm water management.*
3. The approval is consistent with public interest, in light of the stated purposes of this Ordinance. *Based on the above findings, it is our opinion the requirements of the Wetlands Protection Ordinance are being met. The applicant is providing the required storm water management facilities and impacting the least amount of wetland area possible given the location of the improvements.*

CONCLUSION:

In our opinion, the wetlands submittal for the GM Orion Assembly BET Expansion project is in substantial compliance with the Township's Wetlands Protection Ordinance.

Please note the Soil Erosion and Sediment Control (SESC) measures will be reviewed during the engineering review phase to ensure that the wetlands are protected from adjacent construction practices. Further measures such as multiple rows of silt fence, outlet filters, and vegetative buffers may be required as part of that review.

Please feel free to contact us with any questions at (248) 751-3108 or joseph.lehman@ohm-advisors.com

Sincerely,
OHM Advisors

Joe Lehman, P.E.
Engineer

Mark A. Landis, P.E.
Project Manager

cc: Chris Barnett, Township Supervisor
David Goodloe, Building Official
Jeff Stout, Director of Public Services
Tammy Girling, Director of Planning and Zoning
Lynn Harrison, Planning and Zoning Coordinator
Reuben Jones, General Motors, LLC
Erich Smith, Wade Trim, Inc.
Chris Carnell, Walbridge

File: P:\0161_0123\SITE_OrionTwp\2022\0122\2204 GM Expansion\MUNI\Permits\Wetland\2022.07.26 GM - Wetland Review.docx

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RECEIVED

JUL 28 2022

Orion Township
Planning & Zoning

July 28, 2022

Scott Reynolds, Planning Commission Chairperson
CHARTER TOWNSHIP OF ORION
2323 Joslyn Road
Lake Orion, MI 48360

RE: GM Orion Assembly BET Expansion, PC-2022-28
Site Plan Review #1

Received: July 6, 2022, by Orion Township

Dear Mr. Reynolds:

We have completed our review of the GM Orion Assembly BET Expansion plan set. The plans were prepared by Wade Trim and were reviewed with respect to the Township's Zoning Ordinance, No. 78, Stormwater Management and Soil Erosion & Sedimentation Control Ordinance, No. 139, and the Township's Engineering Standards.

EXISTING SITE CONDITIONS:

The site is located along the east side of Giddings Rd., south of W Silverbell Rd., and north of Brown Rd. within Section 34 of the Charter Township of Orion. The site is zoned Industrial Complex (IC) and is bound by parcels to the east zoned Mobile Home Park (MHP) and Industrial Park (IP), parcels to the north zoned Industrial Park (IP) and Limited Industrial (LI), parcels to the west zoned Suburban Estates (SE) and Industrial Park (IP), and to the south by the Township border with the City of Auburn Hills.

The existing site contains the GM Orion Assembly complex which is comprised of a nearly 3.7M square foot assembly building, including several smaller buildings along with infrastructure designed to support the manufacturing process. The smaller buildings on site include an air compressor cooling tower, a chemical storage tank pad, coal handling buildings, a cogen building, standard cooling towers, grit separators, a hazardous waste storage pad, a powerhouse/wastewater treatment building, a pump house, a salt storage building, a sludge building, a steel storage canopy, a switch house, and a tank farm. Along with the buildings, there are train tracks, large scale parking lots, several drive aisles and approaches on the surrounding roads, and large-scale storm conveyance and storage systems that handle the drainage from the site and some of the bordering areas. The existing site contains multiple independent easements. The majority of which are storm drainage easements. There is also a sanitary sewer easement located at the north end of the site, just east of Gate 1. Additionally, there is a large solar power license easement located east of the assembly building that is proposed to be removed.

The applicant is proposing nearly double the size and modify the plant to assemble battery vehicle trucks (BET). Construction will be completed in 3-phases. Phase 1 includes demolition of existing roads and underground utilities in the eastern portion of the site to facilitate construction of an approximately 888,500 sq.ft. new body module shop, and an approximately 634,600 sq.ft. paint shop. Both the body module shop and paint shop will be connected to the existing Orion Assembly building. A new ring-road is proposed in the location of the existing

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train tracks that loop around the north and east side of the building. A temporary 800 space parking lot located in the northeast corner of the site is proposed for construction operations. Along with the temporary parking lot is a new approach off Silver Bell Rd.

The proposed work for Phase 2 includes two (2) storage building extensions to the Orion Assembly building totaling 312,600 sq.ft., an approximately 860,500 sq.ft. battery assembly shop, three (3) new body module shops totaling 154,650 sq.ft. on the north side of the Orion Assembly building, final utility connections to the Phase 1 buildings, surface grading, new storm inlet construction, road and truck dock surfacing, and restoration. Additionally, Phase 2 includes a new access road and approach off Brown Rd. along with a 1,000-space parking lot located south of the temporary parking lot, and a second additional approach further west located south of the western end of the existing train tracks.

Phase 3 includes demolition of existing roads and underground utilities on the west side of the Orion Assembly building, final construction of building pads, storm sewer and underground detention facilities, final utility connections to new buildings, surface grading, inlet construction, road and truck dock surfacing, and existing parking lot rehabilitation and resurfacing.

All 3 phases include fire and domestic water, sanitary sewer, storm sewer, and natural gas demolition and installation as needed. Sheet G-004 appears to indicate a proposed 8-foot safety path along the entire site frontage along Brown Rd, Giddings Rd, and Silver Bell Rd. It is our understanding that the applicant has requested that the safety path be constructed by others with future proposed offsite improvements, which is why it is not included in any of the three (3) construction phases.

WATER MAIN AND SANITARY SEWER:

There is existing 24-inch water main located south of the site on Brown Rd. and west of the site on Giddings Rd. The existing water main on-site features two 16-inch connections to the Township water main network. One connection point is located on the south side of the site off Brown Rd, near the southeast corner. The second connection point is located on the west side of the site off Giddings Rd, approximately midway north/south. Both connections points include meter pits as the internal system is privately owned, operated, and maintained by GM. Internally, the water main is comprised of loops around the GM Orion Assembly building. The applicant is proposing to cut and cap several of the internal loops and extend temporary service through the Orion Assembly building to facilitate construction. Water main is shown extending along the proposed ring road with services connecting to the proposed paint shop southeast of the existing Orion Assembly building. Modifications to the alignment of the 16-inch main that extends from the south on Brown Rd. are also proposed to facilitate construction of the new buildings. Per recent communications, it is our understanding that the applicant intends to replace and upgrade all site fire hydrants to the current Township hydrant model. Please ensure any necessary impacts based on these upgrades is reflected in the plans at Engineering.

Per discussion with the applicant, the anticipated peak hour demand for water from the Township will be ~0.75 mgd. Significant improvements have been made over the years resulting in an increase in water efficiency at this site since its original development. The proposed improvements will result in a slight increase the usage of Township systems based on current usage. These figures are significantly less than the assembly plant used when it began operations in the 1980's. Per Township records, water use has been declining since the 2000's, for example, in 2006 the plant used just over 1 mgd of water. Per review of the Township's hydraulic model the Township's water main system has sufficient capacity to serve the proposed improvements.

There is existing 12-inch sanitary sewer located west of the site along Giddings Rd. and Silver Bell Rd. that extends north up Giddings to Waldon Rd as a 24-inch main. The existing site features an onsite industrial wastewater pretreatment plant within the Orion Assembly building. A series of sanitary sewer extensions collect the sewage and

process water from the existing buildings located east of the Orion Assembly building. The extensions all connect to a single 18-inch sanitary sewer lead that enters the industrial wastewater pretreatment plant. From the treatment plant, the sanitary sewer extends north and connects to the Township's 24 inch sanitary sewer located north of the site at Silver Bell Rd. and Giddings Rd. Per discussion with the applicant, the anticipated peak hour flow for the sewer is 0.48 mgd or 0.75 cfs. Due to the increase in water efficiencies in the plant, there has been a resulting reduction in the sanitary sewer discharge over the years. While the anticipated flow the proposed improvement is slightly higher than the existing flow, previous models have allocated nearly 4cfs without any signs of downstream impacts. Based on this information, there is sufficient capacity in the Township sanitary sewer system to handle the increased flow from the proposed improvements.

Because the existing systems are owned and operated by GM, and the proposed improvements only include extensions of the existing water main and sanitary system internal to the site, no easements (proposed or existing) are shown or required.

STORMWATER MANAGEMENT:

The existing site currently drains from the perimeter inward. The runoff from paved areas is collected almost exclusively via catch basins and conveyed via storm sewer to the two (2) detention basins located in the northwest corner of the site. Runoff from green space is captured in wetlands or catch basins located at low-points and conveyed via culverts or connected directly to the storm network that leads into the detention system. Some of the wetlands are low points without drainage courses available and appear to infiltrate overtime. The majority of the wetlands are hydraulicly connected to the existing storm network and drain into the existing detention basins. All water collected by the storm network is released from detention in the northwest corner of the site into a 36-inch storm sewer that extends southward to the ultimate outlet location on the west side of Giddings Rd. into an existing wetland system that is connected to Carpenter Lake. The storm sewer networks along Brown Rd. and Giddings Rd. area are also included in the detention system drainage area and outlet at the same location.

Per review of historical records, it appears the existing detention basins in the northwest corner of the site were designed to detain two (2) consecutive50-year storm events. The applicant is proposing to increase this requirement and provide detention for the 100-year storm event for the existing and proposed improvements. In addition, new impervious areas will include Channel Protection/infiltration per recently adopted OCWRC standards.

The applicant is proposing to remove some of the existing storm sewer which is located within the vicinity of the proposed building additions and reroute the conveyance around the complex along the proposed ring road. Additionally, the applicant is proposing two (2) new detention basins on the east side of the site. These basins outlet into the storm network and discharge into the existing basins. The applicant did not include full detention calculations within the Site Plan submittal, however preliminary detention calculations were provided under separate cover. The detention calculations appear to be provided per new Orion Township and OCWRC Standards which is acceptable. The C-value calculation is included and is in the Land Use Summary table format, however the summary table needs to include the area of open water (including basins at 100-year elevation) at a C-factor of 1.0.

Channel Protection is included in the plans. Volume calculations for the BMPs of choice and details regarding their connection to the proposed storm system will be required at Engineering. The detention currently operates via sluice gate at a restricted rate of 12 cfs, however the sluice gate is not opened until the basins on the west side of Giddings Rd. are near empty. The applicant has included two volume required calculations. The first calculation assumes the sluice gate were open during the rain event (standard for most detention systems), and the second assumes the sluice gate is closed (how the site functions currently). For both scenarios, the current detention basin appears to have adequate storage to handle the runoff for this site. There appears to be a discrepancy between the

separate storm calculations and sheet C-005 which states that if the 12 cfs outflow is not occurring during rain events, that an additional 192,000 cf is required. This is not consistent with the separate calculations which show a 325,513 cf excess storage under the same condition. Per discussions with the applicant, the calculations are correct and the notes on the plans will be updated in Engineering.

Also included in the proposed improvements is the rerouting of the runoff from Brown Rd. that is currently captured and conveyed through the site's on-site detention system. The runoff from the Brown Rd. area is proposed to be detained in the off-site detention systems on the west side of Giddings Rd. Additional details will be required at engineering to ensure the existing/proposed ponds have adequate capacity to accept the runoff from Brown Rd.

Some conveyance profiles were included in the site plan. It appears that some of the existing on-site storm sewer exceeds the maximum allowable slopes for storm sewer of its size, however, given the unique nature of the terraced slopes at the southeast corner of the site and the existing condition of the storm sewer, no changes to these pipes will be considered required unless the area is already being altered for new improvements. The remainder of the storm sewer profiles along with conveyance calculations will be required at Engineering.

GRADING:

Existing grades were provided via one foot contours. The existing site generally drains from the outside inward, with the majority of the inner area being relatively flat. The largest slopes on site are located in the southeast corner where there is terraced green space which drops from Brown Rd. to the existing train tracks on site. The upper side of the slopes reach a high-point elevation of approximately 1145 located in the southeast corner of the site on the eastern border. The low points on site are located within the existing detention basins, in the northwest corner of the site, at an elevation of approximately 1010. The majority of the site which consists of the buildings and parking areas is between elevations of 1030 and 1040. The terraced slopes appear to vary but are generally around 1:3.

Proposed grades are shown via primarily one-foot contours with some spot grades at site features such as low points, high-points, curb lines, and building elevations. The applicant appears to be proposing maximum site slopes of 1:3. Given the existing site conditions and the massive grade change throughout the site, 1:3 slopes will be accepted where proposed. The applicant should attempt to reduce slopes to 1:4 in areas with few grading constraints. The existing drainage pattern appears to be preserved with the ultimate outlet being at the main detention area in the northwest corner of the site. Limits of disturbance were included on the individual grading sheets, and contours are generally shown meeting with the existing contours and appear accurate. No retaining walls appear to be proposed as a part of Phase 1 construction.

Preliminary pavement grades were provided primarily in one-foot contours which appear to be acceptable. Pavement slopes should remain between 1% and 6% for drive areas, and between 1% and 4% for parking areas. Several proposed pavement-sections were included on sheet C-523, including sections for Heavy Duty Concrete, Medium Duty Concrete, Construction Access Road Asphalt, Building Pad Aggregate, and several joint and intersection details. The proposed medium duty and heavy duty concrete sections are slightly less than the township recommended section for IP zoning. However, the majority of the provided cross-sections meet the Orion Township Standards for their proposed use. Pavement sections should be included for the on-site sidewalk in future submittals.

TRAFFIC & CIRCULATION:

The applicant is adding two (2) new approaches on Brown Rd. and one (1) on Silver Bell Rd. Internal site circulation appears to provide sufficient space for the Orion Township Fire Apparatus to navigate throughout the site. Proposed parking spaces appear to be nine (9) by nineteen (19) feet with 22 foot wide drive aisles, which is acceptable per

Township Standards. Options for pedestrian crossings on the ring road between the parking lot and the Orion Assembly complex are still being finalized.

A draft Traffic Impact Study (TIS) was included in the Site Plan submittal. The draft TIS was limited in scope and focused on intersections adjacent to the site and proposed drive entrances. It is our understanding the final study will be broadened in scope to include additional intersections further away from the site including several I-75 interchanges as directed by the Road Commission for Oakland County (RCOC) and Michigan Department of Transportation (MDOT). Based on this information, we offer the following initial comments:

The TIS is based on the full build to be completed by 2024 and the plant operating with 3,916 employees between three shifts. Additionally, 683 trucks are anticipated to access the plant during each shift. Currently the plant operates with only one shift with 1,246 employees. The largest shift for the proposed expansion is anticipated to be the first shift with 1,477 employees which is an increase of 231 employees compared to existing.

The trip generation has been projected using a fitted curve equation. While the Orion Township zoning ordinance requires the use of a value of one standard deviation above the average value of the data set, section 27.14.D.5.c states "Alternately, a published or unpublished trip generation study for a comparable development may be utilized, if performed by a Professional Engineer and subject to review and approval by the Township Engineer." Per follow-up discussions with the applicant, recent traffic data has been collected from the existing GM Orion and the existing GM Delta sites and has been provided as a basis for the trip generation. Typically, values are used from the Institute of Transportation Engineers (ITE) tables for trip generation. However, due to the lack of data for a manufacturing site of this size, the use of local data is more appropriate and is more likely to reflect expected conditions.

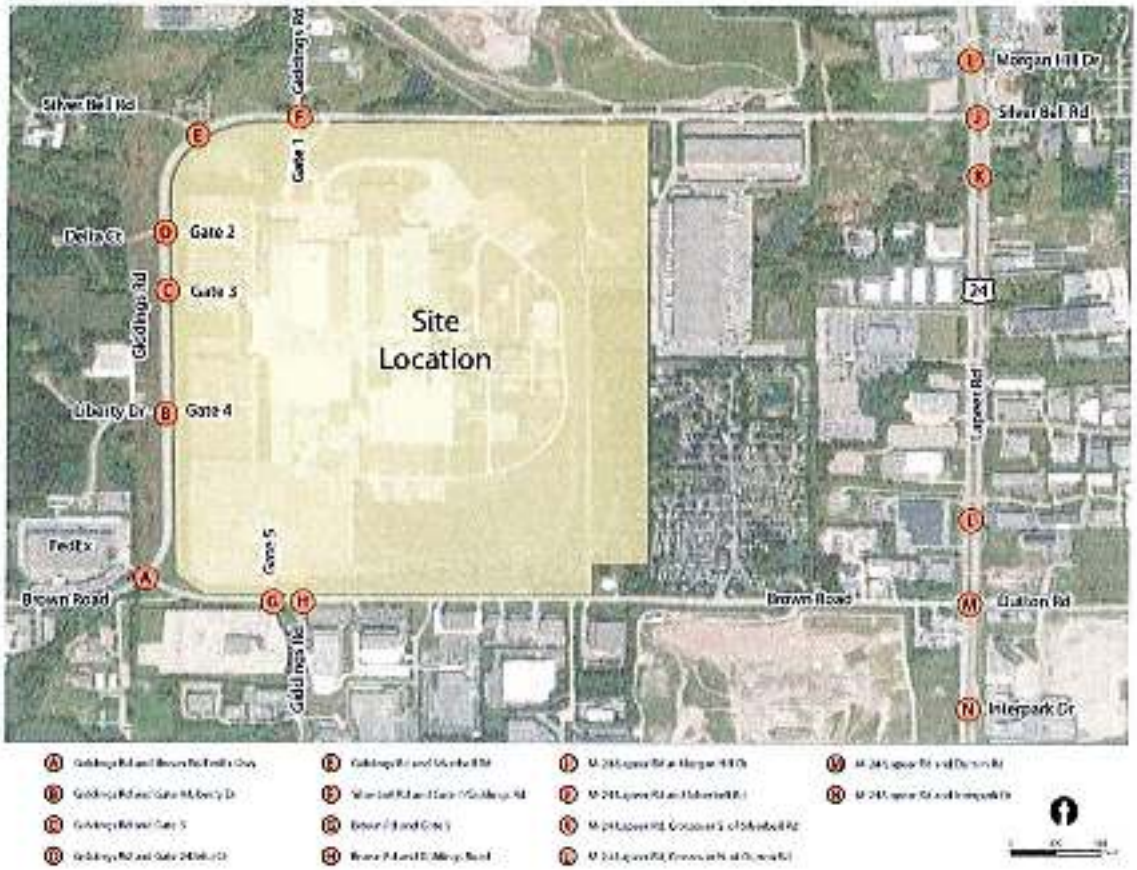
The study discusses the additional trips to account for the increase in the first shift employees from 1,246 to 1,477. Initially we had concern that the study did not appear to address the impacts of possible overlapping movements occurring during shift change, where an entirely different set of vehicles could be moving in the opposite direction. Our concern being that the movement of these two groups of employees would be on the roadway during the same hour long period. Per follow-up discussion with the applicant, it is our understanding there is an overlap of 30 minutes with shifts. Therefore, one shift does not exit until the next shift has arrived completely. Therefore, the peak hours of each shift will not occur at the same time. The below exhibit provided by the applicant shows the expected peak periods of each shift:

As noted in each case, the majority of the incoming shifts have already arrived before the majority of the outgoing shifts have exited.

Below is a map of the study area from the TIS noting gate and intersection locations. In addition, following is a summary of the proposed mitigation:

- Place the intersection of Silver Bell Rd & Giddings Rd/Gate 1 under traffic signal control
- Provide a right-turn taper at the following locations:
    - NB Giddings Rd approach to Gate 2
    - WB Brown Rd approach to Gate 7
- Construct a right-turn only lane with a minimum of 100' of storage length at the following location:
    - NB Giddings Rd approach to Gate 3
- Construct a left-turn only lane with a minimum of 150' of storage length at the following locations:
    - EB Brown Rd approach to Gate 7
    - WB Silver Bell Rd approach to Gate 8
- Provide signal timing adjustments at the following signalized intersections:
    - Giddings Rd & FedEx Driveway/Brown Rd
    - Giddings Rd & Liberty Dr/Gate 4
    - M-24 & the crossover north of Silver Bell Rd
    - M-24 & Silver Bell Rd
    - M-24 & the crossover south of Silver Bell Rd
    - M-24 & the crossover north of Brown/Dutton Rd
    - M-24 & Brown/Dutton Rd
    - M-24 & the crossover south of Brown/Dutton Rd

Figure 1-1. Study Area.



GM Orion Assembly Plant Traffic Impact Study (Phase 1) 12

In summary, we currently have no objections to the draft TIS or it's recommendations. Further review and approval by Orion Township, RCOC and MDOT will be required once the final report is prepared.

LANDSCAPING/SOIL EROSION AND SEDIMENTATION AND CONTROL:

A Landscaping Plan was not provided. Consideration should be given to avoid tree plantings directly over utilities. We defer further comment to the Township Planner.

Soil Erosion and Sedimentation Control (SESC) measures were included on the grading sheets. The applicant has identified several temporary measures including silt fence at the end of large slopes, around wetlands, and at outlets, erosion control blankets on slopes steeper than 1:6, check dams along swales, and seed and stabilization in graded areas. The applicant needs to include inlet protection on future SESC sheets at engineering. SESC measures will be reviewed in greater detail at engineering, however, they are acceptable for the Site Plan submittal.

NATURAL FEATURES:

Wetlands:

Several wetlands were identified on the existing site. A wetland delineation report, detailing all on-site wetlands and any necessary mitigation was provided by the applicant. Please refer to the wetland review letter which will be provided under separate cover for more information.

Woodlands:

It is our understanding that sites in the IC zoning district are not subject to Ordinance Section 21.12. We defer further comment to the Township Planner.

CONCLUSION:

In our opinion, the site plan as submitted is in substantial compliance with the Township's ordinances and engineering standards. We ask that any approval include the following:

1. Consolidate the Site Plan set to include the separately submitted survey and drainage calculations/exhibits and exclude the partial plan sheets as the composite plans adequately convey the proposed improvements.
2. The engineering plan, designed in accordance with Zoning Ordinance No. 78, Stormwater Management and Soil Erosion & Sedimentation Control Ordinance No. 139, and the Township's Engineering Standards shall be submitted to the Township for review and approval prior to construction. A detailed cost estimate for the improvements shall be submitted with the plans signed and sealed by the design engineer.

The applicant should note the Township may require performance bonds, fees, and/or escrows for a preconstruction meeting and necessary inspections. Please feel free to contact us with any questions at (248) 751-3100 or mark.landis@ohm-advisors.com.

Sincerely,
OHM Advisors

Joe Lehman, P.E.
Project Engineer

Mark Landis, P.E.
Project Manager

cc: Chris Barnett, Township Supervisor
David Goodloe, Building Official
Jeff Stout, Director of Public Services
Tammy Girling, Director of Planning and Zoning
Lynn Harrison, Planning and Zoning Coordinator
Jeff Williams, Township Fire Marshal
Bill Basjkow, Water and Sewer Superintendent
Reuben Jones, General Motors, LLC
Erich Smith, Wade Trim, Inc.
Chris Carnell, Wellbridge
File

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giffels webster

July 20, 2022

Orion Township Planning Commission
2525 Joslyn Road
Lake Orion, MI, 48360

Site Plan and Special Land Use: Review no. 1
GM Orion

Case Number:	PC-2022-28	**Applicant:**	Ruben M. Jones
Address:	4555 Giddings	**Plan Date:**	07/01/2022
Parcel ID:	09-34-200-008 & 09-34-400-011	**Zoning:**	Industrial Complex (IC)
Area:	455.91 AC	**Reviewer:**	Rod Arroyo

Dear Planning Commission Members:

We have reviewed the above application and site plan, landscape plan, and tree survey and a summary of our findings is below. Items in **bold** require specific action by the Planning Commission. Items in *italics* can be addressed administratively.

Project Summary

The applicant is proposing to construct approximately 3.3 million square feet (sf) of additional floor space in order to accommodate a new production method and product (Electric trucks). In addition, much of the infrastructure onsite will be upgraded or expanded including parking, interior roadways, docks and utilities. The project includes:

- New north truck entrance and 9,600 linear feet (lf) of new three-lane perimeter road
- New 874,800 sf body shop addition on northeast corner of facility
- Future 603,000 sf body shop expansion on north side of new body shop addition
- New 634,600 sf paint shop in separate building on southeast corner of facility
- New parking areas with pedestrian and vehicle crossings over existing railroad tracks
- Upgraded utility services
- New stormwater detention basins, bioswales, and conveyances
- Temporary contractor parking, offices, staging and laydown areas

SUMMARY OF REVIEW

Revisions & Additional Information

1. **A landscape plan shall be submitted to the Planning Commission for approval; Applicant shall indicate changes to existing landscaping on the landscape plan.**
2. **A photometric plan is required**
3. **Applicant shall confirm internal trash containment and pick up**
4. **Applicant should add zoning compliance table to site plan and confirm the maximum height of all structures does not exceed 120'.**
5. **Applicant shall provide sheet C-A04 & -A05 with parking lot dimensions**

Planning Commission Waivers

1. **Site is deficient 3,381 parking spaces**
2. **PC waiver requested from internal parking lot landscaping requirement**
3. **Applicant is requesting a reduction to the loading zone requirement**
4. **Applicant is requesting that safety paths within public road rights-of-way that are shown on the plans be constructed by others as part of road improvement project.**

Zoning Ordinance Compliance Tables

3. **IC District Standards.**

Industrial Complex (Article XIX)					
Section	**Standard**			**Proposed**	**Comment**
19.01	A manufacturing or assembly plant of at least 2,000,000 sq.-ft. A series of interconnected manufacturing and/or assembly plants on one site and under one ownership and having at least 2,000,000 square feet of total floor space			3,260,000 sq. ft expansion of assembly facility	Special Land Use approval required
19.03	A.	Site Plan approval required		Site Plan & Special Land use applications have been submitted	
	B.	Minimum parcel size of 400 acres		455 Acres	Compliant
	C.	Off Street Parking			
		1.	a. One (1) parking space per 1000 square feet of gross floor area or one (1) space per employee whichever is greater for uses within the IC zoning district. (6,981,200 / 1,000 = 6,982 spaces required)	3,651 total permanent spaces proposed	**Site is deficient 3,380 spaces.**
			b. Fifty (50) visitor parking spaces shall also be provided for parcels larger than twenty-five (25) acres. 7,031 total spaces required.		
		2.	The Planning Commission may, at their discretion, modify the numerical requirements for off-street parking, based on evidence provided by the applicant that indicates that another standard would be more reasonable,	**Applicant provided documentation regarding why they believe 2,922 spaces are sufficient. A PC waiver requested**	
		3.	Driveways and parking areas may be curbed and shall consist of hard surfaced concrete, blacktop, crushed concrete or gravel, as approved by the Planning Commission	Curbed concrete drives and parking lots	Compliant
		4.	All off-street parking shall conform to the standards set forth in Section 27.04.1,.2,.3.a&b	See pg. 7	
		5.	No parking area or driveway shall be closer than thirty (30) feet to the adjacent property lines when the parcel abuts residentially zoned or used property. However, when the parcel abuts commercial/office or industrially zoned property, no parking area or driveway shall be closer than ten (10) feet to the adjacent property lines.	New parking is 200' + from property line	Compliant
19.03	D.	1.	**A landscape plan shall be submitted to the Planning Commission for approval**		
		2.	A landscaped screen, at least fifty (50) feet in width, shall be provided along the entire perimeter of an IC District use, except where ingress and egress drives are located. Internal road are permitted to be located within the landscape buffer screen.	Existing screening to remain	**Applicant shall add information to landscape plan**

		3.	Such screening shall consist of earth berms or evergreen landscaping subject to approval of the Planning Commission.	TBD	
		4.	All landscaping and screening shall be maintained in an attractive, litter-free, safe, and healthy condition. Maintenance of all landscaping shall be of sufficient frequency to prevent overgrowth and deterioration from the original condition.	-	
		5.	The landscaped greenbelt required along with the perimeter of the parcel may be reduced in width or waived by the Planning Commission when the parcel abuts commercial/office or industrially zoned property and when existing off-street parking, drives and/or structures are located within the setback area. The Planning Commission may, at their discretion, modify or waive certain landscaping requirements if provided evidence that the proposed landscape plans meet the intent of the landscaping provisions as described in the considerations outlined in Section 27.05.	TBD	**Applicant shall indicate changes to existing landscaping on the landscape plan**
		6.	Properties in the IC district are not required to obtain a tree removal permit and not subject to the requirements of Sec.27.12.		
		7.	Parking areas should contain landscape areas to provide for rain gardens and stormwater runoff detention. The Planning Commission may, at their discretion, waiver the requirements for landscape islands based on evidence provided by the applicant that such landscaping would not provide significant stormwater detentions benefits.	Exterior stormwater detention pond [3].	**PC waiver requested from internal landscaping requirement**
	E.	Signage reviewed under separate permit			
	F.	1.	A lighting plan shall be submitted with all site plans as set forth in Section 27.11 of this Ordinance. All other Zoning Ordinance regulations shall apply unless otherwise noted in this Ordinance.	None provided	**Applicant shall submit**
		2.	Exterior site lighting shall be fully shielded and directed downward to prevent off-site glare.	-	-
		3.	Site illumination on properties adjacent to residential properties shall not exceed 0.3 foot-candle along property lines, or 1.0 foot-candle along non-residential property lines. Parking lot lighting shall be governed by Section 27.11.	-	-
19.03	G.	Any use developed or proposed within the district shall have direct access to more than one existing or proposed major thoroughfare having a minimum right-of-way of at 120'.		Brown, Giddings and Silverbell meet this standard	
	H.	If possible, all utilities servicing the business structure shall be buried underground.		Engineering to confirm this standard	
	I.	1.	Covered trash receptacles, surrounded on three (3) sides by masonry brick-type walls one (1) foot higher than the receptacle shall be provided in the rear yard.	None Shown	**Applicant shall confirm internal trash containment**

		2.	The fourth side of the enclosed trash receptacle area shall be equipped with an opaque lockable gate that is the same height as the masonry brick wall.		
		3.	The Planning Commission may, at their discretion, waive the requirements for a covered trash receptacle as described herein, if, after considering the nature of the operation being proposed, the Commission determines that the amount of trash generated can be adequately disposed of without use of an outside trash receptacle. (amended 01.30.86)		
	J.	1.	Loading and unloading areas shall be located in the rear or side yard of a non-residential structure.	15 loading docks located in the Brown Rd. side yard	Compliant
		2.	Loading and unloading areas shall not be located where they will interfere with parking or obstruct ingress or egress.		
		3.	All loading and unloading areas shall be in conformance with the requirements set forth in Section 27.04.	Reduced loading area	**See. Pg. 7 of review letter**
		4.	The Planning Commission may, at their discretion, modify or waiver certain loading requirements if provided evidence that the loading requirements in section 27.04 do not reflect industry requirements and needs		
	K.	Performance Guarantee required			
	L.	1.	Smoke	Applicant shall confirm compliance with these	
		2.	Open Fires		
		3.	Noxious Gases		
		4.	Air Contaminants		
		5.	Glare and Heat		
		6.	Noise		
		7.	Vibration		
		8.	Radio Transmission		
		9.	Storage of Flammable Materials		
		10.	Radioactive Materials		
		11.	Water Pollution		
19.03	M.	Construction of safety paths for pedestrian use and use by non-motorized vehicles shall be required in conjunction with the development of all parcels in this zoning district. The safety paths shall conform to the specifications outlined in Section 27.06 and Ordinance No. 97. The PC may waive or modify this standard if the applicant demonstrates another standards would be more reasonable		Pathway shown along N, S & W property lines	Compliant; engineering to confirm design standards. **Applicant requested waiver that safety path to be constructed by others with future road improvement.**
	N.	Does not apply		-	-
	O.	Wetland Setbacks		Engineering is reviewing Wetland permits	

	Standard	Requirement	Proposed	Comment
19.04	Front Yard Setback	100'	100' +	Compliant; applicant should add
	Rear Yard Setback	100'	N/A	
	Side Yard Setback	100'	300' +	

	Min. Parcel Area	400 AC	455 acres	zoning compliance table to site plan
	Max. Parcel Area	500 AC		
	Max Height (all structures)	120'	90'	Applicant shall confirm. No stacks are shown on elevations
	Min clear space	50'	50'	Fire dept. to confirm

4. **General Provisions**. The standards in the table below are a summary of the applicable Zoning Ordinance standards in Article XXVI; please refer to the individual sections referenced herein for the full Zoning Ordinance text

(Article XXXIV)					
Section	**Standard**			**Proposed**	**Comment**
27.04	A.	Off Street Parking			
		General Requirements			
	2.	a.	Off-street parking for other than residential uses shall be either on the same lot, or within three hundred (300) feet of the building or use it is intended to serve, if said spaces and uses are located in the same zoning district or zoned Parking District measured from the nearest point of the building or use and the nearest point of the off-street parking lot	All spaces are located on the same lot as the site improvements	Compliant
	3	a.	Plans for the layout of off-street parking facilities shall be in accord with the requirements set forth in the Off-Street Parking Chart		
		b.	Maneuvering lanes shall have adequate width to permit safe one-way traffic movement, with the exception of the 90 patterns, which shall provide for safe two-way traffic movement. Each entrance and exit to and from a parking lot shall be at least twenty-five (25) feet from the nearest point of any property zoned for residential use	Not provided	*Applicant shall provide sheet C-A04 & -A05 with parking lot dimensions*
	B.	Off Street Loading			
	3.	c.	i. For buildings containing twenty thousand (20,000) to forty thousand (40,000) square feet of gross floor area, two (2) loading berths shall be provided, plus one (1) additional loading berth for each additional forty thousand (40,000) square feet of gross floor area or fraction thereof. 17	176 loading docks would be required; 15 are proposed	**Applicant is requesting PC waiver per 19.03.J.4.**
27.05	4.		Parking Lot Landscaping Adjacent to Roads Excluding Single Family Residential Uses. A greenbelt separation area is required between the right-of-way property line and the nearest portion of any off-street parking area, for parcels fronting roads but excluding single family residential uses. Said area shall be a minimum of 20' in width and minimally landscaped as follows and as illustrated in the following figure:	The PC may wish to consider if this applies to the new 1020 space lot north of Brown Rd.	**Landscaping plan should address this standard**

		a	One [1] tree for each thirty (30) lineal feet, or fraction thereof, of required greenbelt separation area (including driveways). Such trees shall be located between the abutting right-of-way and the off-street parking area or vehicular use area (~350' of frontage = 12 trees)	None Shown	
	E.	Non-residential Lighting Standards			
27.11		a.	Lighting for uses adjacent to non-residential properties shall be designed and maintained such that illumination levels do not exceed 1.0 foot-candle along property lines. The light intensity provided at ground level shall be a minimum of 0.3 foot-candle anywhere in the area to be illuminated	**Applicant shall provide on photometric plan demonstrating compliance with these standards (or describe waivers requested from required standards)**	
			Parking lot illumination shall average 0.9 foot candles		
		b.	Metal halide, incandescent, fluorescent, or mercury vapor fixtures shall be used in an effort to maintain a unified lighting standard throughout the Township and prevent light pollution. Sodium vapor fixtures may be used, but only w/color corrected / shielded lenses		
	1.	d	The maximum height of pole fixtures shall be twenty (20) feet, or the height of the building, whichever is less, measured from the ground level to the center line of the light source. Fixtures should provide an overlapping pattern of light at a height of seven (7) feet above ground level. The Planning Commission may permit a maximum height of thirty (30) feet in an industrial district where fixtures are no closer than two hundred (200) feet to any residential district.		
27.11		e	Except where used for security or safety purposes, as approved in advance by the Planning Commission, all outdoor lighting fixtures, existing or hereafter installed and maintained upon private property within commercial, industrial and office zoning, shall be turned off or reduced in intensity between 11:00 p.m. and sunrise, except when used for commercial and industrial uses, such as in sales, assembly, and repair areas, where such use continues after 11:00 p.m., but only for so long as such use continues		
	2.	a	Building-mounted lighting shall be fully shielded and directed downward to prevent off-site glare. The intensity of light shall not exceed 20 foot-candles unless lights are recessed within an overhead roof or canopy. Light shall not exceed 0.3 foot-candle along new and existing residential property lines and 1.0 foot-candle along non-residential property lines.		

30.02 – Special Land Use Procedures and Standards

8. Planning Commission Determination. The Planning Commission shall make the final determination on the application for special land use approval. Such determination shall be based on the requirements and standards of this Ordinance. In making the final determination, the Planning Commission shall consider the reports and recommendations from the Enforcement Officer, Water and Sewer Department, Township Planner, Township Engineer, Township Fire Chief, the Road Commission for Oakland County, the Oakland County Health Department, the Oakland County Drain Commission, appropriate utility companies, and the Michigan Department of Transportation, where applicable.

13. Standards for Granting Special Land Use Approval. The Planning Commission shall approve special land uses upon determination that the proposed use will comply with all applicable requirements of the Ordinance, applicable standards for specific uses, and the following general standards.

a. Compatibility with Adjacent Uses. The proposed special land use shall be designed, constructed, operated and maintained so as to be compatible with uses of adjacent land. The site design of the proposed special land use shall minimize the impact of site activity on surrounding properties. In determining whether this requirement has been met, consideration shall be given to:

1) The location and screening of vehicular circulation and parking areas in relation to surrounding development.
2) The location and screening of outdoor storage, outdoor activity or work areas, and mechanical equipment, in relation to surrounding development.
3) The hours of operation of the proposed use. Approval of a special land use may be conditioned upon operation within specified hours considered appropriate to ensure minimal impact on surrounding uses.
4) The bulk, placement, and materials of construction of the proposed use in relation to surrounding uses.

b. Compatibility with Master Plan. The proposed special land use shall be compatible with and in accordance with the general principles and objectives of the Orion Township Master Plan and shall promote the intent and purpose of this Ordinance.

c. Public Services. The proposed special land use shall be located so as to be adequately served by essential public facilities and services, such as highways, streets, police and fire protection, drainage systems, water and sewage facilities, and schools.

d. Impact of Traffic. The location of the proposed special land use within the zoning district shall minimize the impact of the traffic generated by the proposed use on surrounding uses. In determining whether this requirement has been met, consideration shall be given to:

1) Proximity and access to major thoroughfares.
2) Estimated traffic generated by the proposed use.
3) Proximity and relation to intersections.
4) Adequacy of sight distances.
5) Location of and access to off-street parking.
6) Required vehicular turning movements.
7) Provision for pedestrian traffic.

e. Detrimental Effects. The proposed special land use shall not involve any activities, processes, materials, equipment, or conditions of operation, and shall not be so located or designed, as to be detrimental to

public health, safety, and welfare. In determining whether this requirement has been met, consideration shall be given to the production of traffic, noise, vibration, smoke, fumes, odors, dust, glare, and light.

f. Enhancement of Surrounding Environment. The proposed special land use shall provide the maximum feasible enhancement of the surrounding environment and shall not unreasonably interfere with or discourage the appropriate development and use of adjacent land and buildings or unreasonably affect their value. In determining whether this requirement has been met, consideration shall be given to:

1) The provision of landscaping and other site amenities. Provision of additional landscaping over and above the requirements of this Ordinance may be required as a condition of approval of a special land use.

2) The bulk, placement, and materials of construction of proposed structures in relation to surrounding uses.

f. Enhancement of Surrounding Environment. The proposed special land use shall provide the maximum feasible enhancement of the surrounding environment, and shall not unreasonably interfere with or discourage the appropriate development and use of adjacent land and buildings or unreasonably affect their value. In determining whether this requirement has been met, consideration shall be given to:

1) The provision of landscaping and other site amenities. Provision of additional landscaping over and above the requirements of this Ordinance may be required as a condition of approval of a special land use.

2) The bulk, placement, and materials of construction of proposed structures in relation to surrounding uses

g. Isolation of Existing Land Use. The location of the proposed special land use shall not result in a small residential area being substantially surrounded by non-residential development, and further, the location of the proposed special land use shall not result in a small non-residential area being substantially surrounded by incompatible uses.

We recommend the planning commission review the standards above and include a statement regarding their findings in the motion.

Staff will be available to discuss this review at the next Planning Commission meeting

Respectfully,
Giffels Webster

Rodney L. Arroyo, AICP
Partner

Matt Wojciechowski, AICP
Senior Planner

Charter Township of Orion

3365 Gregory Rd., Lake Orion MI 48359
www.orionfire.org

Fire Department
Phone: (248) 391-0304, ext. 2000
Fax: (248) 309-6003

RECEIVED
JUL 27 2022
Orion Township
Planning & Zoning

To: Planning Commission/Planning & Zoning Director
From: Jeff Williams, Fire Marshal
Re: PC-2022-28, General Motors SLU, Wetland, and Site Plan
Date: 7/27/2022

The Orion Township Fire Department has completed its review of Application PC-2022-28 for the limited purpose of compliance with Charter Township of Orion Ordinance's, Michigan Building Code, and all applicable Fire Codes.

Based upon the application and documentation provided, the Fire Department has the following recommendation:

X Approved – The plan is considered approved at this time by the fire department. All items listed below shall be addressed on the engineering submittal for fire department review.

Requirements:

1. Fire apparatus access roads shall be designed and maintained to support the imposed loads of fire apparatus and shall be surfaced to provide all-weather driving capabilities during all construction phases.

2. Fire apparatus access roads shall have an unobstructed width of not less than 20 feet exclusive of shoulders and an unobstructed vertical clearance of 13 feet of 6 inches during all construction phases.

3. Fire apparatus access road width where fire hydrants are present shall be not less than 26 feet in width

4. Fire apparatus access roads shall not exceed 10 percent grade at all times.

5. Where the vertical distance between the grad plane and the highest roof surface exceeds 30 feet, an approved aerial access road measuring 26 feet shall be provided on site. This measurement shall be exclusive of shoulders and shall be located within the immediate vicinity of the building. The location of the road shall be not less than 15 feet and no grater then 30 feet from the building.

6. All portions of the building's exterior walls shall be within 150 feet of the fire access road. Access roads may be extended to 200 feet for buildings equipped with an approved automatic sprinkler system installed in the structure. When fire apparatus access roads cannot be installed because of locations on property, topography, waterways, nonnegotiable grades or other similar conditions, and an approved alternative means of fire protection may be approved.

7. Dead end fire apparatus access roads more than 150 feet length shall be provided with an approved area for turning around fire apparatus.

8. The turning radius for the emergency apparatus road shall be in accordance with the Orion Township Fire Department turning performance analysis template. Overlays of the template shall be shown on the final revised site plan submittal.

9. A plan / schedule for fire access during construction shall be provided.
   - This schedule shall include all proposed fire suppression system shut down / out of service dates and times.
   - General Motors and or on-site contractors shall coordinate all scheduled fire suppression system shutdowns with the Orion Township Fire Prevention Division.

10. Details for No Parking Fire Lane signage including road striping (cross hatching) area shall be indicated on the plan.

11. Fire department access roads 20 to 26 feet wide shall be posted with NO PARKING FIRE LANE signage on both sides of the fire apparatus access road. Fire department access roads greater than 26 feet shall only require posting on one side of the roadway.

12. Security gates across fire apparatus access roads shall be approved by the fire code official. Where security gates are installed, they shall have an approved means of emergency operation. The security gates and emergency operation shall be always maintained operational. This information shall be included on the engineering submittal.

13. Traffic calming devices shall be prohibited except when approved by the fire code official.

Site Water and Fire Protection:

14. The most remote exterior portion of a non-sprinklered building shall be within 400 feet of a fire hydrant and no more than 600 feet for a sprinkled building measured by an approved route around the exterior of the facility or building. General spacing between fire hydrants shall not exceed 500 feet on main drive isles.
   - Additional fire hydrants shall be located in all proposed parking areas and Hautaway Yard.

15. Buildings equipped with a standpipe system installed in accordance with section 905 of IFC shall have a fire hydrant within 100 feet of the fire department connection.

16. All existing and proposed water mains and fire hydrant locations and sizes shall be indicated on the engineering plans.
   - All existing fire hydrants remaining on site shall be updated to meet Townships standards
   - Hydraulic flow information shall be provided for all fire hydrants located on site
   - The fire department is requesting a narrative regarding how the private fire suppression system operates and explains its components and design features
   - All private fire service mains shall be installed to meet the requirements of NFPA 24
   - All fire protection systems shall be maintained to meet the requirements of NFPA 25

17. Fire Department Connections (FDC) for sprinkler or standpipes shall be located with respect to hydrants, landscaping, and fire department access roads. Fire Department Connections shall be so located that the fire apparatus and hose connection to supply the system will not obstruct access to the building for other fire apparatus. The location of the fire department connection location shall be approved by the fire code official.

Charter Township of Orion

2850 Gregory Rd., Lake Orion MI 48359
www.orionmichigan.org

Fire Department
Phone: (248) 391-0304, ext. 2000
Fax: (248) 209-6009

18. Fire Department Connection shall be located on the street side of the building or facing approved fire apparatus access roads, fully visible and recognizable for the street, fire apparatus access road or nearest point of the fire department vehicle access or otherwise approved by the fire code official.

19. A 3-foot clear space around fire hydrants and fire department connections shall be maintained at all times.

20. Where fire hydrants are subject to impact by a motor vehicle, guard post or other approved means shall be provided.

Emergency Responder Radio Coverage:

21. The facility shall have approved radio coverage for emergency responders within the building based on the existing coverage levels of the public safety communication system utilized by the jurisdiction, measured at the exterior of the building.

Utility Locations:

22. Utility locations shall be depicted on the engineering plans

This approval is limited to the application and materials reviewed which at this time do not raise a specific concern with regard to location and/or impact on health and safety. However, the approval is conditioned upon the applicant providing sufficient additional information at time of building permit application that includes data or documents, confirming full compliance with all applicable building codes, fire codes and Township Ordinances.

If there are any questions, the Fire Department may be reached at 248-391-0304 ext. 2004.
Sincerely,

Jeffrey Williams

Jeff Williams, Fire Marshal
Orion Township Fire Department

Charter Township of Orion

2323 Joslyn • Lake Orion, Michigan 48360 • (248) 391-0304

To: Tammy Girling
Planning & Zoning Director

From: Jeffery T. Stout
Director, Department of Public Services

Date: July 28, 2022

Re: PC-2022-28, General Motors SLU, Wetland, and Site Plan

Dear Tammy,

The Department of Public Services has reviewed the above-mentioned project. We have ample water and sanitary sewer capacity to meet the needs of this expansion.

If you have any questions, please contact me.

Respectfully Submitted,

Jeffery T. Stout
Director
Department of Public Services

WRC
WATER RESOURCES COMMISSIONER
Jim Nash

RECEIVED
JUL 18 2022
Orion Township
Planning & Zoning

July 15, 2022

Lynn Harrison
Orion Township
Planning & Zoning
2323 Joslyn Road
Lake Orion, MI 48360

Reference: **GM Orion BET Expansion-Phase I – CAMS #202200589**
Part of the SE, SW, NE & NW ¼ of Section 34, Orion Township

Dear Ms. Harrison,

This office has received one set of plans for the GM Orion BET Expansion-Phase I Project to be developed in the Southeast, Southwest, Northeast & Northwest ¼ of Section 34, Orion Township.

Our stormwater system review indicates that the proposed project has no direct involvement with any legally established County Drain under the jurisdiction of this office. Therefore, a storm drainage permit will not be required from this office.

The water system is operated and maintained by Orion Township and plans must be submitted to Orion Township for review.

The sanitary sewer is within the Clinton-Oakland Sewage Disposal System. Any proposed sewers of 8" or larger may require a permit through this office.

Please note that all applicable permits and approvals from federal, state or local authorities, public utilities and private property owners must be obtained.

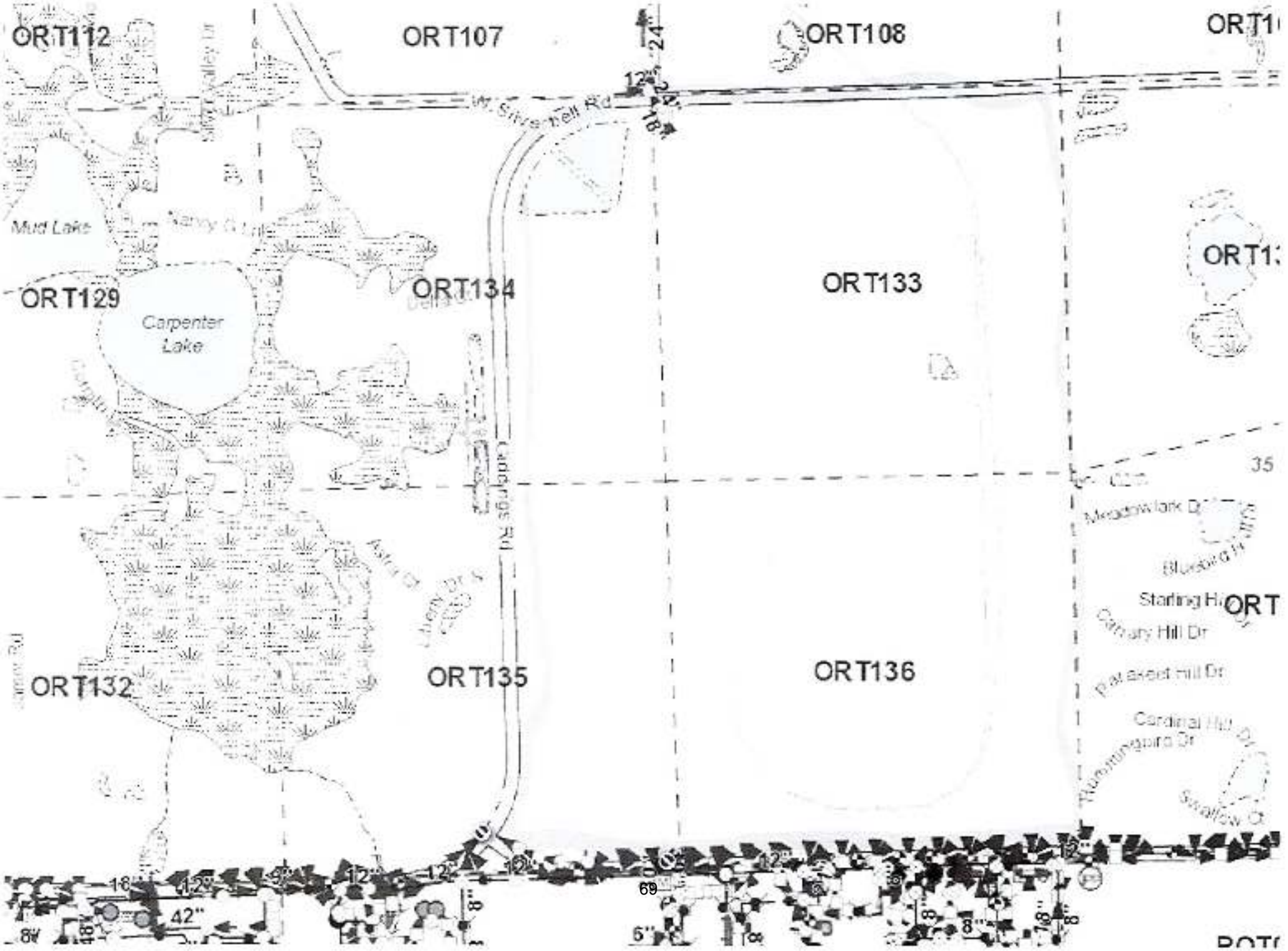
Any related earth disruption must conform to applicable requirements of Part 91, Soil Erosion and Sedimentation Control of the Natural Resource and Environmental Protection Act, Act 451 of the Public Acts of 1994. An application should be made to Orion Township for the required soil erosion permit.

If there are any questions regarding this matter, please contact Dan Bulkus at 248-897-2744.

Sincerely,

Brian Bennett, P.E.
Civil Engineer III

One Public Works Drive • Building 95 West • Waterford, MI 48328-1907
Phone: 248.858.0958 • Fax: 248.858.1066 • www.oakgov.com/drain


ORT112
ORT107
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W Silverbell Rd
Mud Lake
Carpenter Lake
ORT129
ORT134
ORT133
Cardigan Rd
35
Meadowlark Dr
Starling Hill Dr
Calvary Hill Dr
Parakeet Hill Dr
Cardinal Hill Dr
Thunderbird Dr
Swallow Ct
ORT132
ORT135
ORT136
42"

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PARTIAL A01 UTILITY PLAN	C-A01-U
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PARTIAL A02 DEMOLITION UTILITY PLAN	C-A02-DU
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PARTIAL B01 DEMOLITION UTILITY PLAN	C-B01-DU
PARTIAL B01 SITE PLAN	C-B01-S
PARTIAL B01 GRADING PLAN	C-B01-G
PARTIAL B01 UTILITY PLAN	C-B01-U
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PARTIAL B03 GRADING PLAN	C-B03-G
PARTIAL B03 UTILITY PLAN	C-B03-U
PARTIAL B04 DEMOLITION SITE PLAN	C-B04-DS
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PARTIAL B04 GRADING PLAN	C-B04-G
PARTIAL B04 UTILITY PLAN	C-B04-U
PARTIAL B05 DEMOLITION SITE PLAN	C-B05-DS
PARTIAL B05 DEMOLITION UTILITY PLAN	C-B05-DU
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PARTIAL B05 GRADING PLAN	C-B05-G
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PARTIAL C01 GRADING PLAN	C-C01-G
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PARTIAL C05 DEMOLITION SITE PLAN	C-C05-DS
PARTIAL C05 DEMOLITION UTILITY PLAN	C-C05-DU
PARTIAL C05 SITE PLAN	C-C05-S
PARTIAL C05 GRADING PLAN	C-C05-G
PARTIAL C05 UTILITY PLAN	C-C05-U
PARTIAL C06 DEMOLITION SITE PLAN	C-C06-DS
PARTIAL C06 DEMOLITION UTILITY PLAN	C-C06-DU
PARTIAL C06 SITE PLAN	C-C06-S
PARTIAL C06 GRADING PLAN	C-C06-G
PARTIAL C06 UTILITY PLAN	C-C06-U
PARTIAL D01 DEMOLITION SITE PLAN	C-D01-DS
PARTIAL D01 DEMOLITION UTILITY PLAN	C-D01-DU
PARTIAL D01 SITE PLAN	C-D01-S
PARTIAL D01 GRADING PLAN	C-D01-G
PARTIAL D01 UTILITY PLAN	C-D01-U
PARTIAL D02 DEMOLITION SITE PLAN	C-D02-DS
PARTIAL D02 DEMOLITION UTILITY PLAN	C-D02-DU
PARTIAL D02 SITE PLAN	C-D02-S
PARTIAL D02 GRADING PLAN	C-D02-G
PARTIAL D02 UTILITY PLAN	C-D02-U
PARTIAL D01 DEMOLITION SITE PLAN	C-D01-DS
PARTIAL D01 DEMOLITION UTILITY PLAN	C-D01-DU
PARTIAL D01 SITE PLAN	C-D01-S
PARTIAL D01 GRADING PLAN	C-D01-G
PARTIAL D01 UTILITY PLAN	C-D01-U
PARTIAL D03 DEMOLITION SITE PLAN	C-D03-DS
PARTIAL D03 DEMOLITION UTILITY PLAN	C-D03-DU
PARTIAL D02 SITE PLAN	C-D02-S
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LAKE ORION, MICHIGAN
GM ORION ASSEMBLY BET EXPANSION
50% PHASE I SITE PLAN
JULY 1, 2022

LOCATION MAP

KEY MAP
NOT TO SCALE

SCOPE OF WORK

[illegible]

EXISTING UTILITIES

[illegible]

811
Know what's below.
Call before you dig.

PRELIMINARY
NOT FOR CONSTRUCTION

REVISIONS

SITE KEY MAP

WADE TRIM

Sustainable Workplaces
"Creating places you want to be"
General Motors Company

Structure ID: 180067
Level:
BET EXPANSION

COVER SHEET

D. GRIFFIN	20047
AS NOTED	G-001
07.01.2022	

CABLE TV (EXISTING / PROPOSED)
- CABLE TV POLE
- CABLE TV PEDESTAL
- OVERHEAD CABLE TELEVISION
- UNDERGROUND CABLE TELEVISION

ELECTRICAL
- CIRCUIT BREAKER PANEL
- HANDHOLE
- MANHOLE
- OUTLET
- PEDESTAL
- TRANSFORMER BOX
- METER
- POWER POLE
- TRANSFORMER TOWER
- OVERHEAD ELECTRIC
- UNDERGROUND ELECTRIC

GAS
- VENT
- BLOW OFF
- FILLER PIPE
- MANHOLE
- METER
- STOP BOX
- SHUTOFF VALVE
- GAS

LINE WORK
- BOUNDARY LINE
- BUILDING
- BUILDING SETBACK
- CHAIN LINK FENCE
- GRAVEL
- GUARDRAIL
- LANDSCAPE
- ORNAMENTAL FENCE
- PROPERTY LINE
- RAILROAD TRACK CENTERLINE
- RIGHT OF WAY
- SECTION LINE
- GHOST LINE
- SILT FENCE
- TOP OF BANK
- UTILITY/DRAINAGE EASEMENT
- WALL
- WETLAND
- WOOD FENCE
- PAINTED CROSSWALK
- PROJECT LIMITS LINE (THIS PROJECT)
- PROJECT LIMITS LINE (OTHER PROJECTS)

MONUMENTS
- BENCH MARK
- MONUMENT
- TRAVERSE POINT

OVERHEAD UTILITIES
- DEADMAN ANCHOR
- LIGHT POLE
- GUY WIRE ANCHOR
- GUY POLE
- OVERHEAD CABLE TV & TELEPHONE
- OVERHEAD ELECTRIC & CABLE TV
- OVERHEAD ELECTRIC, CABLE TV AND TELEPHONE

SANITARY SEWER
- CLEAN OUT
- PUMP STATION MANHOLE
- SANITARY MANHOLE
- COMBINED SEWER MANHOLE
- SEPTIC TANK
- SEWER VENT
- FORCEMAIN
- SANITARY SEWER
- COMBINED SEWER (6"-21")
- COMBINED SEWER (24"+)

SITE (DEMO) (EXISTING / PROPOSED)
- ABANDON ITEM
- ADJUST ITEM
- RECONSTRUCT ITEM
- RELOCATE ITEM
- REMOVE ITEM
- ABANDON UTILITY
- TO BE REMOVED

SITE (GRADING)
- FLOW ARROW
- SIDE SLOPE
- SLOPE LABEL
- SPOT GRADE
- TOP OF CURB (T), TOP OF GUTTER (G)
- TOP OF CURB (T), TOP OF PAVEMENT (P)
- HIGH POINT
- MAJOR CONTOUR LINES
- MINOR CONTOUR LINES

SITE (JOINTING)
- LONGITUDINAL BREAKING CONSTRUCTION JOINT
- TRANSVERSE DOWELED CONTRACTION JOINT
- LONGITUDINAL LANE TIE JOINT
- TRAVERSE EXPANSION JOINT
- DOWELED EXPANSION JOINT
- TRAVERSE JOINT
- THICKENED EDGE
- SAWCUT (WEAKEND PLANE JOINT)

SITE (MISC)
- ACCESSIBLE SYMBOL
- PARKING COUNT
- LAMP POLE
- LIGHT POLE (SINGLE LAMP)
- LIGHT POLE (DOUBLE LAMP 180°)
- LIGHT POLE (DOUBLE LAMP 90°)
- LIGHT POLE (THREE LAMP)
- LIGHT POLE (FOUR LAMP)
- BOLLARD
- BOLLARD LIGHT
- TEST PIT PILE
- TEST HOLE

STORM/DRAINAGE
- CATCH BASIN (ROUND GRATE)
- CATCH BASIN (SQUARE GRATE)
- CISTERN
- BOX CULVERT
- CULVERT END SECTION
- CULVERT HEADWALL
- DOWN SPOUT
- ROUND INLET
- SQUARE INLET
- STORM MANHOLE
- STORM SEWER STUB
- SWALE CENTERLINE
- FLOOD PLAIN
- STORM SEWER (6"-21")
- STORM SEWER (24"+)

TELEPHONE & OTHER UTILITIES
- TELEPHONE POLE
- TELEPHONE MANHOLE
- TELEPHONE PEDESTAL
- COMMUNICATIONS MANHOLE
- FIRE CALL
- POLICE CALL
- PHONE BOOTH
- UTILITY MANHOLE
- OVERHEAD TELEPHONE
- UNDERGROUND TELEPHONE
- FIBER OPTIC

TOPOGRAPHIC FEATURES
- FILL PORT
- FLAG POLE
- GAS PUMP
- GAS TANK (UNDERGROUND)
- MONITORING WELL
- POST (ROUND)
- POST (SQUARE)
- ROCK
- SIGN POST
- SPRINKLER HEAD
- SPRINKLER JUNCTION BOX
- TRAFFIC SIGNAL
- UNDERGROUND MARKER
- UNDERGROUND MARKER BALL

VEGETATION (EXISTING / PROPOSED)
- CONIFEROUS BUSH
- CONIFEROUS TREE
- DECIDUOUS BUSH
- DECIDUOUS TREE
- MULTI-STEM CONIFEROUS TREE
- MULTI-STEM DECIDUOUS TREE
- STUMP
- BRUSH LINE
- EDGE OF WOODS
- HEDGE
- TREE ROW

FOR PROPOSED VEGETATION SEE LANDSCAPE PLAN

WATER
- BACKFLOW PREVENTER
- COUPLER VALVE
- FAUCET
- FIRE DEPARTMENT CONNECTION
- FIRE HYDRANT
- GATE VALVE & BOX
- POST INDICATOR VALVE
- METER
- METER PIT
- SHUT OFF VALVE
- DOMESTIC WATER
- LOW PRESSURE FIRE WATER
- FIRE WATER

WATER (MISCELLANEOUS)
- CONDENSATE WATER GATE VALVE
- GEOTHERMAL BORE
- CONDENSATE WATER
- GEOTHERMAL RETURN
- GEOTHERMAL SUPPLY
- HYDRONIC CHILLED SUPPLY/RETURN
- HYDRONIC HOT SUPPLY/RETURN

UTILITY STRUCTURE IDENTIFICATIONS

STORM
- GRID#-CB-01 STORM CATCH BASIN
- GRID#-CO-01 STORM CLEANOUT
- GRID#-MH-01 STORM MANHOLE
- GRID#-OCS-01 OUTLET CONTROL STRUCTURE
- GRID# ES-01 STORM END SECTION

SANITARY SEWER
- GRID# SS-01 SANITARY MANHOLE
- GRID# SS-CO-01 SANITARY CLEANOUT

DOMESTIC WATER
- GRID# DWV-01 DOMESTIC GROUND VALVE
- GRID# DPV-01 DOMESTIC PIV GATE VALVE
- GRID# DH-01 DOMESTIC FIRE HYDRANT
- GRID# DM-01 DOMESTIC MONITOR FIRE HYDRANT (TYPE I)

FIRE WATER
- GRID#-FWV-01 FIRE WATER VALVE
- GRID#-FWH-01 FIRE WATER HYDRANT

ELECTRICAL
- GRID#-EHH-01 ELECTRICAL HANDHOLE
- GRID#-EMH-01 ELECTRICAL MANHOLE
- GRID# SLP-01 SINGLE LIGHT POLE
- GRID# DLP-01 DOUBLE LIGHT POLE

COMMUNICATIONS
- GRID# FHH FIBER HANDHOLE
- GRID#-FMH FIBER MANHOLE

STANDARD ABBREVIATIONS

ABAN	ABANDON	HWR	HOT WATER RETURN
APPD	APPROVED	HYD	HYDRANT
APPROX	APPROXIMATE	INT	INTERSECTION
HMA	HOT MIX ASPHALT	INV	INVERT
B-B	BACK TO BACK	IW	IRRIGATION WATER
BDRY	BOUNDARY	LF	LINEAL FEET
BF	BARRIER FREE	LP	LOW POINT
BIT	BITUMINOUS	LPFW	LOW PRESSURE FIRE WATER
BM	BENCHMARK	MATCH	MATCH EXISTING ELEVATION
BOC	BACK OF CURB	MAX	MAXIMUM
BOW	BOTTOM OF WALL	MIN	MINIMUM
C&G	CURB AND GUTTER	N	NORTHING
CB	CATCH BASIN	NA	[illegible]
CL	CENTERLINE	NIC	NOT IN CONTRACT
CMP	CORRUGATED METAL PIPE	NTS	NOT TO SCALE
CO	CLEAN OUT	OH	OVERHEAD
CONC	CONCRETE	P	PHASE
CPP	CORRUGATED POLYETHYLENE PIPE	PI	POINT OF INTERSECTION
CS	COMBINED SEWER	PIV	POST INDICATOR VALVE
CWS	CHILLED WATER SUPPLY	PL	PROPERTY LINE
CWR	CHILLED WATER RETURN	PRV	PRESSURE REDUCING VALVE
DW	DOMESTIC WATER	PSI	POUNDS PER SQUARE INCH
DA	DRAINAGE AREA	PVI	POINT OF VERTICAL INTERSECTION
DEMO	DEMOLITION	Q	RATE OF FLOW
DI	DUCTILE IRON	R	RADIUS
DLP	DOUBLE LIGHT POLE	SCWP	STEAM CONDENSATE WATER PIPE
DS	DOWNSPOUT	REF	REFERENCE
DW	DOMESTIC WATER	ROW	RIGHT OF WAY
DWG	DRAWING	RCP	REINFORCED CONCRETE PIPE
E	EXISTING	RR	RAILROAD
E-E	EDGE TO EDGE	SAN	SANITARY SEWER
EL	ELEVATION	SLDPP	SMOOTH LINED POLYETHYLENE
EOP	EDGE OF PAVEMENT		PLASTIC PIPE
EASE	EASEMENT	SLP	SINGLE LIGHT POLE
EXC	EXCAVATE	ST	STORM SEWER
FDC	FIRE DEPARTMENT CONNECTION	SW	SIDEWALK
FFE	FINISHED FLOOR ELEVATION	T/C	TOP OF CURB
FG	FINISHED GRADE	TOB	TOP OF BANK
F-F	FACE TO FACE	TOC	TOP OF CONCRETE
FW	FIRE WATER	TOS	TOP OF SLOPE
GB	GRADE BREAK	TOF	TOP OF FLANGE
GDR	GUARD RAIL	T/G	TOP OF GRAVEL
GPM	GALLONS PER MINUTE	TOW	TOP OF WALL
GUT	GUTTER	T/P	TOP OF PAVEMENT
GV	GATE VALVE	TW	TOP OF WALK
HDPE	HIGH DENSITY POLYETHYLENE	U/G	UNDERGROUND
HP	HIGH POINT	UTIL	UTILITY
HWS	HOT WATER SUPPLY	VC	VERTICAL CURVE

PATTERNS (DEMO)
- AGGREGATE REMOVAL
- COLD MILLING
- CONCRETE REMOVAL
- CONSTRUCTION ENTRANCE
- FULL-DEPTH PAVEMENT IN PLACE/ PAVEMENT REMOVAL
- LANDSCAPING REMOVAL

PATTERNS
- CONCRETE
- GRAVEL
- GREENSPACE
- PAVEMENT – HEAVY DUTY
- PAVEMENT – LOTS AND DRIVES
- PAVEMENT – MEDIUM DUTY
- RIPRAP
- TURF
- DRY GREEN SEED MIX
- DRY MESIC PRAIRIE SEED MIX

REVISIONS

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CERTIFIER

WADE TRIM

Sustainable Workplaces
"Creating places you want to be"
General Motors Company

EXPANSION

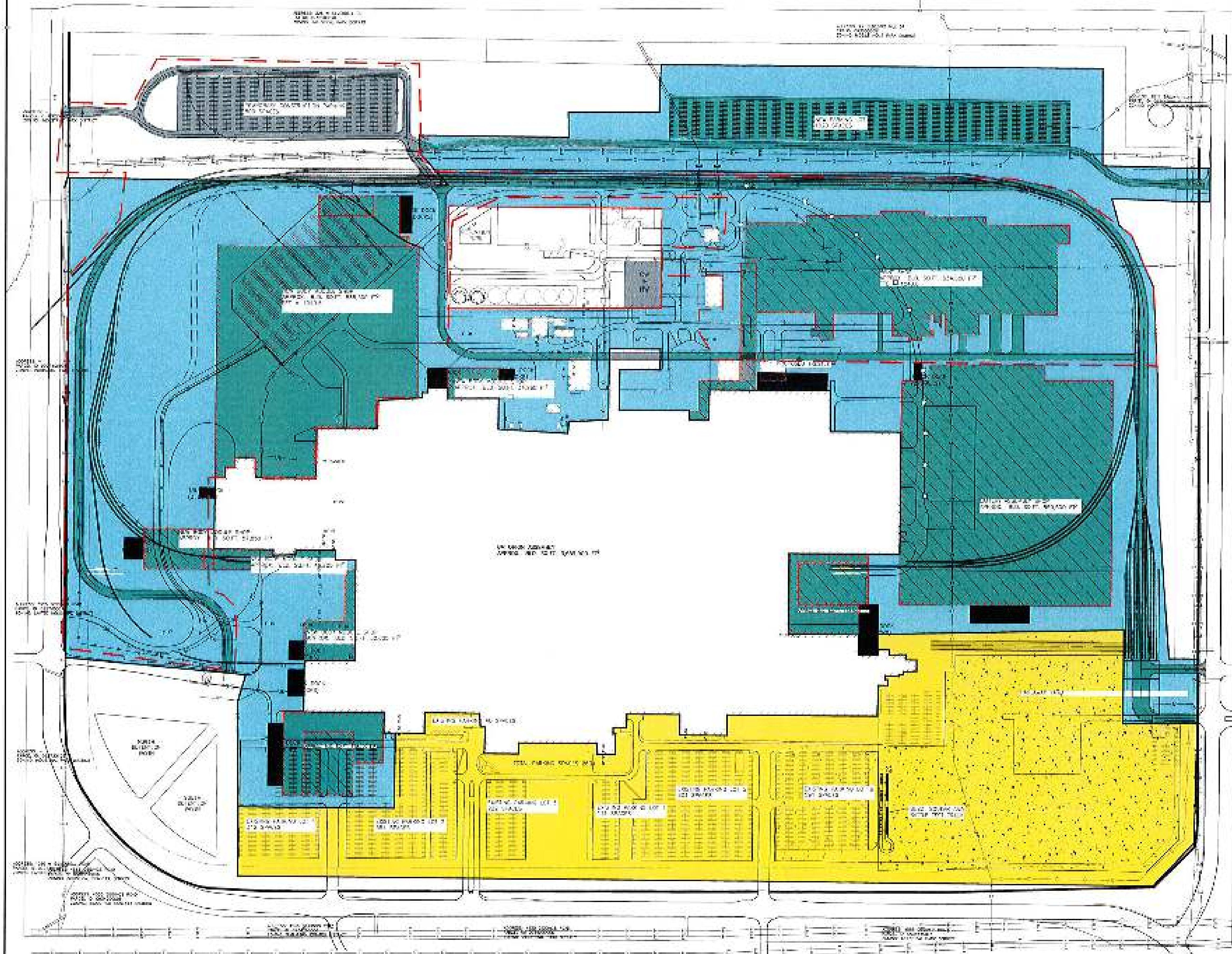
LEGEND

M. GRIFFIN

R. YANCHO

AS NOTED

G-002



PHASE 1 – (118) ACRES

PHASE 2 – (202) ACRES

PHASE 3 – (72) ACRES

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WADE TRIM

Sustainable Workplaces

General Motors Company

BET EXPANSION

CONSTRUCTION SEQUENCING PLAN

AS NOTED

G-003

Project Summary (Purpose and Use)

State, regional, and local governments and other community stakeholders have all expressed a desire to have Michigan be a leader for electric vehicle (EV) and EV component development and manufacturing. This commitment is reflected in two recent press releases; Whitmer News article dated December 12, 2021 titled "Governor Whitmer Signs Legislation Enabling Michigan to Attract Billions in Investment" and on January 1, 2022, titled "Historic 7 billion Investment by GM to Create Thousands of Manufacturing Jobs" (see attached). This commitment further demonstrates, through new legislation and financial incentives, to support EV and EV component development and manufacturing. In January 2022, GM announced it is investing $4 billion to convert the existing Orion Assembly into an electric truck production facility. This investment is expected to create more than 2,350 new jobs at Orion and retain approximately 1,000 current jobs when the plant is fully operational. Electric truck production will begin at Orion in 2024. The Orion investment will drive significant facility and capacity expansion at the site, including expanded Body and General Assembly and a new Paint Shop and Battery Pack Assembly areas. Approximately 3.3 million square feet (sf) of additional floor space will be constructed. In addition, much of the infrastructure onsite will be upgraded or expanded including parking, interior roadways, docks and utilities. The Project is an essential part of GM's commitment to create 1 million units if of EV capacity in North America by 2025 and eliminate tailpipe emissions from all GM-manufactured light duty vehicles by 2035.

Except for a small portion on the far east side of the Orion facility, the entre property was developed, recontoured or otherwise disturbed in the early 1980s as the Plant was constructed. Uneven settling of the final grades from that activity are responsible for the creation of numerous small, primarily low-quality wetlands on the site today. Small, lineal wetlands have also developed in portions of several constructed swales and open stormwater conveyances from the same period.

The purpose of the project is to aggressively pursue GM's vison and commitments to transition to EVs by upgrading and expanding the existing GM Orion Assembly Operations to produce high volume, full size, battery electric trucks. Integral to the project purpose is that existing production facilities will be re-purposed and new production facilities will be constructed. The proximity of existing production facilities to new production facilities is an essential need identified by GM to achieve the project purpose. Also critical to the project purpose is that construction work commence by August 31, 2022. The Project elements include:

- New north truck entrance and 9,600 linear feet (lf) of new three-lane perimeter road on north, east and south side of facility.
- New 874,800 sf body shop addition on northeast corner of facility.
- Future 603,000 sf body shop expansion on north side of new body shop addition.
- New 634,600 sf paint shop in separate building on southeast corner of facility.

- New parking areas with pedestrian and vehicle crossings over existing railroad tracks.
- Upgraded utility services.
- New stormwater detention basins, bioswales, and conveyances.
- Temporary contractor parking, offices, staging and laydown areas.

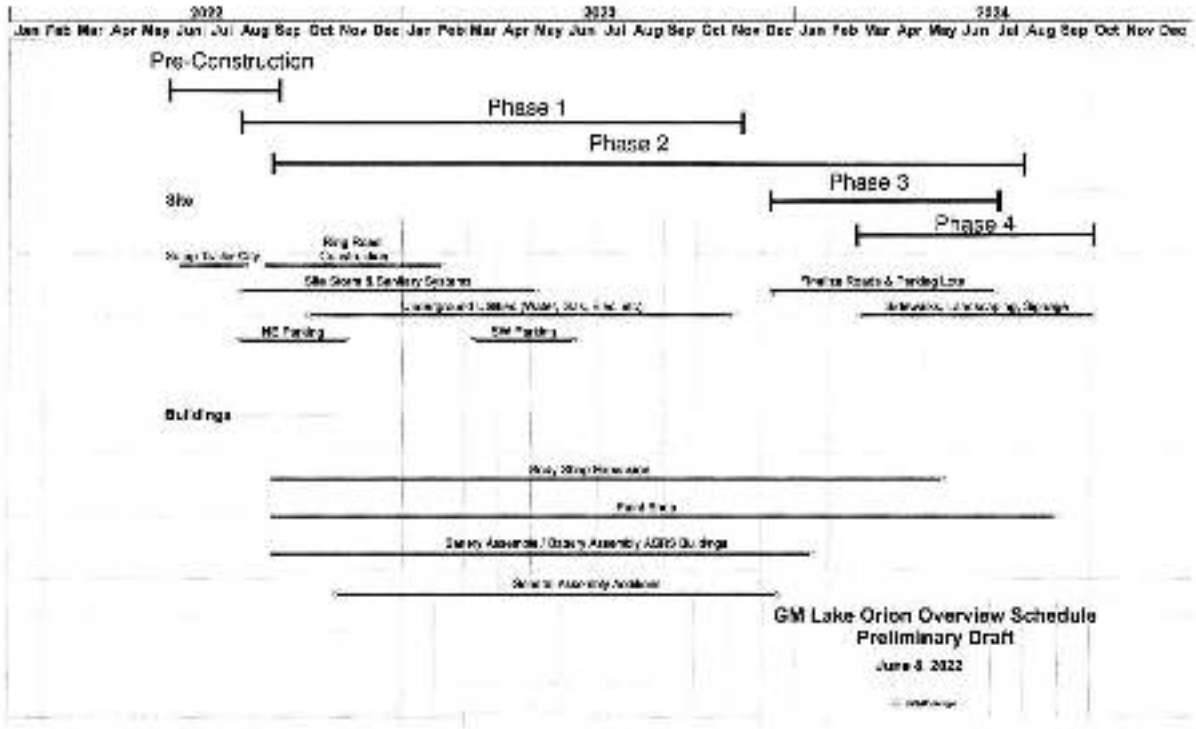
Project Construction Sequence, Methods and Equipment

The Project will utilize a design-build process, with design and engineering being finalized while building construction is ongoing. The design-build process may result in changes to the initial construction plans as the building process is completed. The construction scope, schedule and phasing anticipate as many of these potential changes as possible and, by necessity, the design is refined well into the construction phase.

The Project will be implemented in five phases starting with Pre-Construction activities, which are currently underway and commencing with Phase 4 in the third quarter of 2024. Phase I of construction is scheduled to start September 1, 2022, with construction of the new paint shop. The Project phases and schedule are summarized below and shown in the Project Schedule Table.

- Initial "Pre-Construction" activities will focus on site access for construction trades, installation of soil erosion control features and delineation of work areas separating construction operations from ongoing plant operations.
- Phase 1 of construction activities will include: Site balancing, temporary roadways, installation of new storm water conveyance systems (inclusive of retention ponds and piping), underground Fire Protection systems, electrical utilities, temporary parking lots and permanent roadways.
- Phase 2 of construction activities will have a primary focus on construction of the new buildings and existing building expansions: Paint Shop, Battery Assembly, Body Shop and General Assembly.
- Phase 3 construction activities will include the balance of roadways, parking lot improvements, building approaches and misc. support buildings.
- Phase 4 construction activities include: sidewalks and landscaping / soil stabilization, activities.

PROJECT SCHEDULE TABLE



Project Alternatives:

GM considered a range of offsite and onsite alternatives to avoid or minimize impacts to wetlands and streams. The alternatives considered include:

- Alternative #1-No Build
- Alternative #2: Offsite-New Construction on Undeveloped Land
- Alternative #3: Offsite/Onsite-New Construction on Undeveloped Land/Orion Expansion
- Alternative #4: Onsite-Orion Expansion

Alternative #1

Alternative #1 is the no-build option that would retain the existing Orion Assembly "as is" with no plans to modify, expand or update the facility. Alternative #1 does not achieve the stated project purpose that requires upgrades and expansion of the existing GM Orion facility to produce high volume battery electric trucks. In addition, Alternative #1 does not allow GM to make significant progress towards its commitment to create 1 million units if of EV capacity in North America by 2025 and eliminate tailpipe emissions from all GM-manufactured light duty vehicles by 2035. Therefore, Alternative #1 is neither feasible nor prudent and was not selected.

Alternative #2

Alternative #2 would include constructing the Project on an undeveloped greenfield. GM has several assembly projects that are in various stages of planning and design and, thus, has a good understanding of the differences in cost between retrofitting an existing facility vs constructing a new facility. Retrofitting an existing assembly facility for high volume electric vehicle production requires approximately two-thirds the capital required to build an equivalent greenfield assembly plant. In addition, retrofitting and expanding an existing assembly operation can be done much faster than an all-new build on undeveloped property. GM estimates that transition to battery electric trucks on an existing facility can be completed more than twelve months sooner than what would be required to construct the Project on an undeveloped greenfield.

The existing Orion Assembly footprint, including buildings, roads, parking, stormwater and rail, totals approximately 300 acres and with the proposed expansion will total approximately 450 acres. Assuming a similar project footprint, Alternative #2 would result in minimum of 450 acres of greenfield converted to industrial land use, compared to approximately 150 acres of conversion for the Project. The direct and indirect environmental impacts of converting an additional 300-acres of undeveloped greenfield to industrial land use would have the potential for significantly higher impacts to wetlands, stormwater quality/quantity and wildlife habitat.

Additional social and economic factors that were considered by GM include existing workforce availability, commitments to labor, proximity to established supply base, support of the local and regional tax base, transportation and logistics, utilities, and other factors that when combined, impact availability of manufacturing inputs, result in changes and demands to transportation infrastructure and pose stresses to existing local resources.

Considering the economic, scheduling, environmental, and social factors reviewed by GM, Alternative #2 was found to not be feasible or prudent, did not achieve the stated project purpose, and was therefore, rejected from further consideration.

Alternative #3

Alternative #3 combines expansion of the existing facility with new construction on adjacent property. Assuming that there are willing sellers of these properties, the property to the north is the Waste Management Eagle Valley Landfill; the property to the east is a fully developed mix of light industrial and residential; the property to the south is fully developed light industrial and the properties to the west are either developed or have been platted into a mixture of commercial and residential lots. A large wetland complex that includes Carpenter and Mud Lakes lies just to the west, further limiting alternatives to expand to nearby offsite locations. A final constraint to expanding the facility to adjacent properties is the existing roads on the north, west and south boundary and include Giddings, Silver Bell and Brown Roads. Dividing production across four-lane roads by either truck or overhead conveyance is not practical from a manufacturing production standpoint as it would result in long term process inefficiencies, as well as increased operations and maintenance cost and increased environmental impacts associated with greater resource and energy use. In addition to these constraints, expansion to adjacent land would be significantly more expensive and would not be possible to do within the stated timeline that is needed to achieve the project purpose.

Considering the lack of available undeveloped land on all boundaries of the Orion Assembly, existing transportation infrastructure, and large areas of wetland to the north and west, GM determined that Alternative #3 is neither feasible or prudent and would not achieve the stated project purpose. Alternative #3 was therefore rejected from further consideration.

Alternative #4

Alternative #4 focuses on maximizing the efficient use of existing infrastructure, retrofitting existing manufacturing buildings, and constructing new building additions to support efficient, high volume, battery electric truck production. The underutilized Orion Assembly is the only assembly operation available in southeast Michigan with a low volume product that can withstand the concurrent impact of interruptions and temporary shutdowns that this renovation and expansion will bring while still meeting product demand. The economic impact resulting from such interruptions would be many times higher at the higher volume assembly facilities making Orion Assembly the only prudent option available. Orion Assembly is also strategically located near the New Lansing battery cell manufacturing operations and the all-electric assembly plant, Factory Zero. The proximity of these three operations facilitates shared resources, reduces logistics related energy usage and makes other alternatives cost-prohibitive and imprudent.

As noted in discussion for Alternative #2 and #3, retrofitting and expansion of an existing facility will reduce resource use and environmental impacts, save more than $1 billion in capital costs and will enable GM to pursue a much more aggressive construction and production schedules than would be possible on a new site. GM also notes that quantity and types of wetlands and other natural resources is not known for Alternatives #2 and #3; however, EGLE Wetland Inventory Maps clearly show large areas of wetland to the north and west and other undeveloped greenfield sites are likely to contain wetland and other natural resources that could be impacted.

Based on this review, GM concludes that Alternative #4 is the only feasible and prudent alternative that achieves the stated project purpose.

Onsite Alternatives Review and Sequencing

The Department of Environment, Great Lakes, and Energy's (EGLE) Water Resources Division (WRD) conducted a Level 3 Wetland Identification Program (WIP) review of the Project (submission number HPG-HESW-13EXX) on May 9, 2022. The WIP Report identified 9.9 acres of wetlands regulated under Part 303 of the Natural Resources and Environmental Protection Act (NREPA) and two stream segments totally approximately 800-feet. The following reviews key project elements that may affect wetlands and streams. This section provides a brief description, identifies affected wetlands and reviews alternatives and construction options to avoid and minimize wetland and stream impacts.

General Considerations for Onsite Alternatives and Sequencing

During the initial stages of site development planning, the project team reviewed the key project elements to identify opportunities to avoid or minimize impacts to regulated wetlands. As will be noted

In the project-specific sequencing discussion that follows, building addition alternatives are extremely limited. The project team, therefore, focused on project elements that might offer greater flexibility to avoid or minimize wetland impacts including employee parking, equipment/material laydown and storage areas and stormwater ponding.

The project team originally considered the area west of Giddings Road for employee and temporary contractor parking. Following site visits and review of the Preliminary Wetland Delineation, the project team agreed to locate those temporary uses and permanent new parking areas to upland portions of the property east of Giddings Road. Moving parking to the east side of Giddings Road resulted in avoidance of approximately 1.4 acres of wetland impact.

The site development plan initially included a stormwater detention basin on wetland W-D and stream WB-C. After much discussion on options to minimize impacts, the Civil Design Team was able to relocate the stormwater detention basin to the east of wetland W-D and stream WB-C. This revision to the stormwater plan avoided impacts to 0.3 acres of wetland and 314 linear feet of stream channel WB-C.

Impacts to regulated wetlands include the new building footprints, roadways utilities and the necessary fill/grading to support those site improvements. Building additions need to be located where they are in order to sequence their inputs into the defined manufacturing process flow. A detailed explanation of each major building addition along with a discussion of the factors that limit options of locating these structures is included below. As discussed above, several temporary and permanent features where initially planned to impact regulated wetlands but have now been relocated into upland areas to avoid such impacts and preserve acres of wetlands on the property.

The northeast, east and south sides of the existing Plant is bordered by existing rail lines. The northside is bounded by Silverbell and Gidding Road is located on the westside of the property. The size and scope of the expansion necessary to create a high-volume BET assembly operation requires the existing interior ring road on the north, east and south sides of the Plant be replaced with a new road located close as possible to the existing RR and the public streets. All the available space between the existing plant and new ring road will be unavoidably used or impacted during construction.

North Access and Perimeter Road (Ring Road)

The new ring road will be constructed along the north, east, and south sides of the Project. The north segment of the ring road will include removal of an existing east-west rail spur; the east and south segments of the ring road will extend along the edge of the existing main rail track. The three-lane ring road will extend approximately 9600 linear feet (1.8 miles) and provide truck and logistical access to meet the expanded manufacturing facility. The only feasible and prudent alternative to meet the project purpose will result in wetland impacts due to site improvements required to raise the existing road grade adjacent to building expansions for truck dock access, barrier free walkways around buildings, as well as emergency vehicle access lanes.

<u>Affected Wetlands</u>

W-B, W-C, W-F, W-H, W-I

<u>Alternatives Considered</u>

The ring road needs to be inside the secured area of the site beyond the truck entry. The ring road, as planned, is pushed to the outer limit of buildable space and is sized to the minimum to support required truck volumes, queuing and safety requirements. There are no alternative configurations for the perimeter road that allow for the Body Shop expansion necessary to meet the stated project purpose.

Avoidance and Minimization

Nearly all available land between the existing assembly operations and main railroad is required for expansion of the manufacturing operations. The manufacturing specific building configurations, the required building setbacks, and the need for a three-lane road surface that can accommodate truck traffic exclude options for avoiding, or minimizing impacts to wetlands W-B, W-C, W-F, W-H and WI.

NE Contractor Entrance, Parking and Access Road

A separate contractor entrance, access road and parking area with approximately 800 spaces is required to allow for access for construction equipment, materials, and the workforce. The pedestrian and vehicle crossing of both wetland W-R and the rails is necessary to get construction workers, equipment, and materials into the east and south portions of the existing manufacturing area where the building additions will be constructed.

Affected Wetlands

W-R

Alternatives Considered

Wetland W-R is a stormwater conveyance adjacent to and east of the existing rail lines. The proposed wetland crossing is located at an existing ground level rail crossing, near the proposed construction entrance and contractor parking lot. Property on the west side of Giddings Rd was considered for contractor parking but that location would require impacts to more than 1 acre of wetlands and is not feasible due to the distance from the Body, Paint and Battery Assembly construction sites.

The existing ring road on the north, east and south sides of the Plant must be relocated to make room for approximately 3.3 M SF of building additions. This relocation recuires the construction entrance, access road, and wetland crossings in the proposed location to align with an existing rail crossing and the proposed road on the west side of the tracks that provides access to the construction areas. Moving the entrance north of W-R is not feasible because of the need to cross the rails south of the proposed Body addition near W-H which will provice access to Paint, Battery Assembly and Body construction areas.

Avoidance and Minimization

Both the pedestrian and vehicle crossings have been sized to the minimum dimensions necessary to safely handle the expected traffic levels and provide a safe separation between vehicles and pedestrians.

All available land has been considered for the expanded manufacturing operations on this site. The building additions must be located adjacent to and tie into the existing corresponding process areas

(Body, Paint, Assembly). The ring road, which must extend around the perimeter of the facility expansion. A construction entrance crossing the rails from the east is required to move equipment, materials, and contractors to the construction areas on the east and south sides. There are no feasible and prudent alternatives to avoid or minimize wetlands that also meet the project purpose due to the necessary layout of the buildings and the need for construction access.

New and Future Body Shop Additions

A new Body Shop expansion of approximately 874,800 square feet and future Body Shop expansion of 603,000 square feet is proposed on the northeast corner of the Project. The new and future Body Shop additions will provide space to meet the additional underbody process needs for the full-size battery electric truck. The new and future Body Shop additions will require reconstruction of storm sewer and other utilities and require relocation of the perimeter road to the new ring road.

Affected Wetlands

W-A, W-C, W-B, W-H, WI

Alternatives Considered

This plan is designed around the required, logical, automotive assembly plant workflow of Body, to Paint, and then to General Assembly, with a feed into General Assembly from Battery Assembly. A multistory Body Shop was considered but was found to be impractical due to the size of the components, weights of process and product, further increases in conveyance, and impact on operational and product cost. While other alternatives have been considered they all (inclusive of the future Body expansion) essentially require the same footprint. Several actions have been taken to minimize the Body footprint fit onto the plan as shown, including:

- Addition of three Automated Storage and Retrieval Systems (ASRS), essentially tall (+/-100') automated warehouses for line side materials that significantly reduce building footprint.
- Relocation of some mechanical plant equipment elsewhere on the site and into underused portions of other building areas.
- Added overhead conveyance and product buffer areas.

Avoidance and Minimization

All available land has been considered for the expanded manufacturing operations on this site. The building additions must be located adjacent to and tie into the existing corresponding process areas (Body, Paint, Assembly). The ring road, which must extend around the perimeter of the facility expansion, further constrains the location and configuration of the Body Shop. There are no feasible and prudent alternatives to avoid or minimize wetlands that also meet the project purpose due to the necessary layout of the buildings and manufacturing process flow.

Paint Shop

The proposed new Paint Shop will be a separate building of approximately 634,600 square foot footprint located in the SE corner of the site. The shape of a Paint Shop is dictated by long linear ovens and the size of product being produced at the plant. A Paint Shop needs be located on the site connected to or within a reasonable conveyance distance from the transition between the Body and Assembly functions. Placement of the proposed Paint Shop takes into consideration the required offsets from the primary electrical service (100' minimum), railroads, ring roads (for truck logistics and fire apparatus access) as well as to limit the distance for rerouted utilities (water, natural gas and storm sewer).

Affected Wetlands

W-J, W-M

Alternatives Considered

The Paint Shop must be onsite adjacent to the Body and Assembly functions. GM has considered alternate footprints for this facility with all requiring significant changes to the paint line processes, increasing the footprint of the building and extending primary utilities to the facility, reducing efficiency of the operations and increasing construction/operations and product cost. Also, a change in footprint to limit impacts to the wetlands not only moves the Paint Shop significantly further from the Body/Assembly transition but also encroaches into the location needed for Battery Assembly. This alternative would permanently reduce the efficiency of operations and increase building, truck logistics, operations, and product costs. In addition, this would result in an increase in environmental impacts associated with energy usage, emissions and raw material use due to increased logistical and transportation activities.

Avoidance and Minimization

All available land has been considered for the expanded manufacturing operations on this site. The building additions must be located adjacent to and tie into the existing corresponding process areas (Body, Paint, Assembly). The ring road, which must extend around the perimeter of the facility expansion, further constrains the location of the paint shop. There are no feasible and prudent alternatives that meet the project purpose due to the necessary layout of the buildings, the location of the new ring road, and the manufacturing process flow.

WADE TRIM

Wade Trim Associates, Inc.
25251 Northline Road • Taylor, MI 48180
734.947.9700 • www.wadetrim.com

RECEIVED
JUL 06 2022
Orion Township
Planning & Zoning

July 5, 2022

Orion Township
2323 Joslyn Road
Lake Orion, MI 48360

Attention: Ms. Tammy Girling
Director Planning and Zoning

Re: GM Orion Assembly BET Expansion
Waivers for Site Plan Approval

Dear Ms. Girling:

Wade Trim is requesting the following waivers for the referenced project. These waivers have been discussed in our progress meetings:

1. Off Street Parking per 19.03.C.1.a requires 1 parking space per 1000 square feet of gross floor area.

   - Total proposed square feet = 6,981,200 square feet
   - Required spaces = 6,981 + 50 minimum visitors = 7,031

   Please find attached a memo with future employee projections. The level of automation in the manufacturing process reduces number of employees.

2. Safety Paths per 19.03.M.

   - The Site Master Plan depicts the location of a future safety path in road right-of-way. General Motors requests that the safety path be constructed by others with future proposed offsite road improvements. The future path is shown in the site plans on page G-004.

Please let us know if you require any additional information.

Very truly yours,

Wade Trim Associates, Inc.

Erich V. Smith, PE
Vice President

EVS:jlb
WAB 2003.01B
20220701_WAB03B-LTR.DOCX
Enclosure

TECHNICAL MEMORANDUM

TO: Gary Jensen, RA, LEED AP/Ghafari

FROM: Bridget Bienkowski, PE, PTOE/Wade Trim
Reviewed by Lori Pawlik, PE, PTOE/Wade Trim

DATE: June 3, 2022

RE: General Motors Lake Orion Assembly Plant
Parking Space Needs for Proposed Expansion

1.0 BACKGROUND

Site expansion is proposed for the General Motors Lake Orion Assembly Plant including additional buildings and parking areas, with the preliminary concept site plan being designed to accommodate expansion of the assembly plant to increase an additional 2,670 employees. As part of planning for infrastructure for the site, the parking space needs have been evaluated to determine the number required to accommodate the additional employees. It is estimated that there will be 3,916 employees on site at full build out, working in three separate shifts.

2.0 PARKING SPACE OCCUPANCIES

2.1 Total Parking Spaces

The principal source for empirical information on parking demand for various land uses is the Institute of Transportation Engineers (ITE) publication ***Parking Generation***. The publication is update periodically and currently includes parking data for 121 different land uses.

As opposed to minimum parking requirements specified in zoning ordinances, the ITE parking data provide an indication of the actual usage of parking spaces for various land uses. It is important to have an accurate estimate of actual parking demand for a number of reasons including accounting for shift workers, reducing the land consumed for parking, and improving water quality and reducing the heat generated by excessive pavement.

The *ITE Parking Generational Manual, 5th Edition* was used to estimate site parking space needs based on the number of employees per building location as shown in Table 2-1. The same land use (Land Use: 130 Industrial Park) that was used to generate the estimated number of trips based on employees was also used for the parking generation.

Table 2-1 Generated parking space and ADA space summary

Building Location	Body	Paint	General Assembly (GA)	GSC	Other	Rechargeable Energy Story System (RESS)	Total
No. of Parking Spaces per Building	296	291	1,218	420	237	460	2,922
No. of Spaces Redistributed to the 2 Parking Lots	-	1,031	1,891	-	-	-	2,922
Minimum No. of ADA Parking Spaces	-	20	28	-	-	-	48

As only two permanent parking areas are planned on site to be shared by multiple buildings, the parking generated for the 6 buildings need to be condensed into the 2 parking lots. Therefore, the GSC parking spaces were distributed to the General Assembly (GA) area (1/3 of spaces) and the Paint Shop area (2/3 of spaces). All of the "other" spaces were distributed near the GA building. As shown in Attachment A, 1,031 spaces are recommended near the Paint Shop, and 1,891 spaces are recommended near the General Assembly building, for a total of 2,922 spaces across the two site parking lots.

2.2 ADA Parking Spaces

With any change or improvement made to parking areas, accessible parking spaces must be provided as required by the U.S. Department of Justice Americans with Disabilities Act (ADA) standards for Accessible Design. As shown in Table 2-1, the number of ADA spaces for each parking lot were determined per ADA guidelines which require that a minimum number of ADA spaces be included based on the total number of spaces. These numbers are a portion of the employee space count required. In other words, of the 2,922 spaces recommended, it is required that a minimum of 48 spaces be designed for ADA parking.

Some of the considerations that must be taken in the planning of ADA spaces per the design guidelines include:

- Locating spaces near the shortest accessible route of travel to an accessible facility entrance. With buildings this large, it's important to provide ADA spaces near multiple entry points (if feasible) so users do not have to travel long distances once inside the building.
- Providing an accessible route from the accessible parking to the accessible entrance.
- Locating spaces at the most level ground close to the accessible entrance.

Making sure an accessible route is free of curbs or stairs, is at least 3- feet wide, and have firm, stable, and slip resistant surfaces.

2.3 Parking Space – Employees Per Shift Comparison

A separate trip generation analysis is being conducted as part of a traffic impact study for the site, which shows that between the morning shift and afternoon shift, there may be an overlap of 2,200 vehicle trips at the site at once. The 2,922 spaces will accommodate these vehicles, as well as an additional 500 spaces as requested by the owner, with 222 extra to distribute across the two parking areas. These numbers represent the general number of spaces recommended per the parking generation standards, and do not include special spaces that may be desired by the owner for other uses such as rideshare or drop off spaces, loading and unloading spaces, truck docks, management parking, motorcycle spaces, etc. Those needs should be considered on a case by case basis as the site design progresses.

3.0 CONCLUSION

Based on an assessment for the ITE parking occupancy data, a total of 2,922 parking spaces are recommended for the GM Lake Orion site to accommodate the parking needs of the employees and visitors, and a minimum of 48 ADA spaces are required.

Attachment A.
Parking Space Map

Parking Space Map

APPROXIMATE TOTAL BUILDING AREA
EXISTING BUILDING: 1,121,000 +/- SF
PROPOSED ADDITION: 2,000,000 SF
FUTURE ADDITION/SPACE PROTECT: 795,000 SF

LEGEND
No. of Parking Spaces

NOTE
ALL DISTANCES AND BUILDING AREA MEASUREMENTS ARE APPROXIMATE. SUBJECT TO FIELD VERIFICATION.

PRELIMINARY
NOT FOR CONSTRUCTION

811
Know what's below.
Call before you dig.

WADE TRIM

Sustainable Workplaces
"Creating places you want to be"
General Motors Company

Site ID: TBD
Structure ID: TBD
Level: LEVEL

NONE | TBD
TBD | TBD
1" = 200' | X X.X
03.11.2022

Charter Township of Orion
Planning & Zoning Department
2323 Joslyn Rd., Lake Orion MI 48360
P: (248) 391-0304 ext. 5000

RECEIVED
JUL 06 2022
Orion Township
Planning & Zoning

Case # PC-22-28
Meeting Date 8/31/2022

Charter Township of Orion Planning Commission

Site Plan Approval Application

30.1 , A. Intent: The site plan review procedures and standards are intended to provide an opportunity for consultation and cooperation between the applicant and the Planning Commission so as to achieve maximum utilization of land with minimum adverse effects on adjoining property. Furthermore, it is the intent of these procedures and standards to allow for review of site plans by the Planning Commission, to provide a consistent and uniform method of review, and to ensure full compliance with the standards contained within Zoning Ordinance 78, and other applicable local ordinances and State and Federal laws.

Project Name: GM Orion BET 2

Name of Development if applicable: General Motors, LLC

Applicant

Name: Reuben M. Jones, Orion Assembly Plant Director
Address: 4555 Giddings Road City: Orion State: MI Zip: 48359
Phone: Cell: 586-690-0068 Fax:
Email: reuben.m.jones@gm.com

***Property Owner(s)**

Name: Reuen M. Jones, Orion Assembly Plant Director
Address: 4555 Giddings Road City: Orion State: MI Zip: 48359
Phone: Cell: 586-690-0068 Fax:
Email: reuben.m.jones@gm.com

* If the name on the deed does not match the name of the property owner on this application, documentation showing the individual is the same as the company name must be provided.

Plan Preparer Firm/Person

Name: Wade Trim, Inc., (Erich Smith)
Address: 25251 Northline Road City: Taylor State: MI Zip: 48180
Phone: 834-947-9700 Cell: 989-751-5370 Fax:
Email: esmith@wadetrim.com

Project Contact Person

Name: Walbridge (Chris Carnell)
Address: 777 Woodward Ave ste 300 City: Detroit State: MI Zip: 48226
Phone: 313-963-8000 Cell: 313-215-8235 Fax:
Email: ccarnell@walbridge.com

Property Description

Sidwell Number(s): 09-34-200-006, 09-34-400-011

Location or Address of Property: 4555 Giddings Road

Side of Street: East Nearest Intersection: Brown/Giddings and Silver Bell/Giddings

Acreage: 455.91 Current Use of Property: Automotive manufacturing

Is the complete legal description printed on the site plan? ☐ Yes ■ No (If no please attach to theapplication)

Project Information

N - Industrial Park, Limited Industrial S. - Not in Township
E - Industrial Park, Mobile Home Park W. - Industrial Park, Suburban Estates

Subject Property Zoning: IC - Industrial Complex Adjacent Zoning: N. S. E. W.

List any known variances needed (subject to change based on Township consultant's review) None

Give a detailed description of the proposed development, including the number and size of the buildings or units being proposed The proposed use will be the same as the current use. the expansion will approximately double the sft of under roof area for automotive manufacturing. This includes the modification of the existing plant roads support the flow of new assembly area for electric vehicles (EV) including body assembly, paint and battery assembly areas.

Submittal to Outside Agencies

Pursuant to Zoning Ordinance 78, Section 30.01 C. a copy of this application and two copies of the site plan must be submitted to the each of the following agencies. Please provide the Township with a copy of each transmittal as proof of delivery.

AT&T 54 Mill St. Pontiac, MI 48342	Consumers Power Company 530 W. Willow St. Lansing, MI 48906
DTE Energy Co. ATTENTION: NW Planning & Design 1970 Orchard Lake Rd. Sylvan Lake, MI 48320	Oakland County Health Department Building 34 East 1200 N. Telegraph Rd. Pontiac, MI 48341
Michigan Department of Transportation (if applicable) 800 Vanguard Dr. Pontiac, MI 48341	Road Commission of Oakland County (if applicable) ssintkowski@rcoc.org (electronic submittal only)
Oakland County Water Resources To Be Submitted by the Township	

I/We, the undersigned, do hereby submit this application for Site Plan Approval, pursuant to the provisions of the Charter Township of Orion Zoning Ordinance; No. 78, Section 30.01, and applicable ordinance requirements. In support of this request the above facts are provided. I hereby certify that the information provided is accurate and the application that has been provided is complete.

Signature of Applicant:
(must be original ink signature) _____ Date: 6/29/22

Print Name: Reuben M. Jones

I, the property owner, hereby give permission to the applicant listed above to act as my agent in submitting applications, correspondence and to represent me at all meetings. I also grant permission to the Planning Commission members to visit the property, without prior notification, as is deemed necessary.

Signature of Owner (If the deed of ownership does not show an individual, ie is a corporation, partnership, etc., documentation must be provided showing the individual signing this application has signing rights for the entity):

(must be original ink signature) _____ Date: 6/29/22

Print Name: Reuben M. Jones

Charter Township of Orion
Planning & Zoning Department
2323 Joslyn Rd., Lake Orion MI 48360
P: (248) 391-0304 ext. 5002

Project Name GM Orion BET 2

PC# _____ Parcel#(s) 09-34-200-006, 09-34-400-011

Please select an option below:

☑ **Permission to Post on Web Site**

By signing below as applicant and on behalf of my consultants, we agree to allow the plans for the above-named project, in which approval is being sought by the Planning Commission and/or Township Board, to be posted on the Township website.

Signature of Applicant

6/29/22
Date

Reuben M. Jones
Printed Name of Applicant

☐ **Do not want plans posted on Web Site**

RECEIVED
JUL 06 2022
Orion Township Planning & Zoning
RECEIVED
2022

Charter Township of Orion
Planning & Zoning Department
2323 Joslyn Rd., Lake Orion MI 48360
P: (248) 391-0304 ext. 5000

Case # PC-22-28
Meeting Date: 8/3/2022

Charter Township of Orion Planning Commission
Special Land Use Approval Application

30.02, A. Intent: Special land use procedures and standards are instituted to provide consistent and uniform guidelines for the Planning Commission to follow in arriving at any special land use decision over which it has jurisdiction. Special land uses are uses that may be permitted in a district, but only if certain specified conditions are met, and only after review and approval by the Planning Commission. The review procedures which are conditions for approval are intended to provide protection for adjacent uses and ensure full compliance with the standards contained within Zoning Ordinance 78 and other applicable local ordinances and State and Federal laws.

Project Name: GM Orion BET 2

Name of Development/Business if applicable: General Motors, LLC

Applicant

Name: Reuben M. Jones, Orion Assembly Plant Director
Address: 4555 Giddings Road City: Orion State: MI Zip: 48359
Phone: Cell: 586-690-0068 Fax:
Email: Reuben.m.jones@gm.com

***Property Owner(s)**

Name: Reuben M. Jones, Orion Assembly Plant Director
Address: 4555 Giddings Road City: Orion State: MI Zip: 48359
Phone: Cell: 586-690-0068 Fax:
Email: Reuben.m.jones@gm.com

* If the name on the deed does not match the name of the property owner on this application, documentation showing the individual is the same as the company name must be provided.

Plan Preparer Firm/Person

Name: Wade Trim, Inc. (Erich Smith)
Address: 25251 Northline Road City: Taylor State: MI Zip: 48180
Phone: 734-947-9700 Cell: 989-751-5370 Fax:
Email: esmith@wadetrim.com

Project Contact Person

Name: Walbridge (Chris Carnell)
Address: 777 Woodward Ave ste 300 City: Detroit State: MI Zip: 48226
Phone: 313-963-8000 Cell: 313-215-8235 Fax:
Email: ccarnell@walbridge.com

Property Description

Sidwell Number(s): 09-34-200-005, 09-34-400-011

Location or Address of Property: 4555 Giddings Road

Side of Street: East Nearest Intersection: Brown/Giddings and Silver Bell/Giddings

Acreage: 465.91 Current Use of Property: Automotive manufacturing

Project Information

Is the complete legal description printed on the site plan? ☐ Yes ■ No (if no please attach to the application)

W - Industrial Park, Suburban Estates
N - Industrial Park, Limited Industrial
E - Industrial Park, Mobile Home Park
S - Not in Township

Subject Property Zoning: IC - Industrial Complex Adjacent Zoning: N. S. E. W.

Give a detailed description of the proposed use:

The proposed use will be the same as the current use, the expansion will approximately double the sft of under roof area for automotive manufacturing. This includes the modification of the existing plant use to support the flow of new assembly lines for electric vehicles (EV) including body assembly, paint and battery assemblies.

Submittal to Outside Agencies

Pursuant to Zoning Ordinance 78, Section 30.02(B), a copy of this application must be submitted to the each of thefollowing agencies: Please provide the Township with a copy of each transmittal and proof of delivery.

AT&T 54 Mill St. Pontiac, MI 48342	Consumers Power Company 530 W. Willow Rd. Lansing, MI 48906
DTE Energy Co. ATTENTION: NW Planning & Design 1970 Orchard Lake Rd. Sylvan Lake, MI 48320	Oakland County Health Department Building 34 East 1200 N. Telegraph Rd. Pontiac, MI 48341
Oakland County Water Resources Commission (To be submitted by the Township)	Road Commission of Oakland County (if applicable) ssinkowski@rcoc.org (Electronic submittal only)
Michigan Department of Transportation (if applicable) 800 Vanguard Dr. Pontiac, MI 48341	

Compatibility of Adjacent Uses

The proposed special land use shall be designed, constructed, operated, and maintained so as to be compatible with uses of adjacent land. The site design of the proposed special land use shall minimize the impact of site activity on surrounding properties. In determining whether this requirement has been met, please describe the consideration given to the following:

Location and screening of vehicular circulation and parking areas in relation to surrounding development

Minimum setbacks of 100' are proposed to be met around the existing site except for the north end of the property.

At this location, an internal service road will be constructed within 35' of the property line to maximize manufacturing operations.

Existing green buffers will remain in place on the west and east sides of the property. Additional 100' screening shall be provided along the south side of the property.

SE corner of the property adjacent to the area zoned mobile home park.

Location and screening of outdoor storage, outdoor activity or work areas and mechanical equipment, in relation to surrounding development

Outdoor activities include several truck docks for receiving of materials and off-site shipping of finished vehicles.

The hours of operation of the proposed use

Proposed to have 3 shifts, 24 hours operation (7 days / week).

The bulk, placement, and materials of construction of the proposed use in relation to surrounding uses

Phase 1 construction access will be off Silver Bell Road in the NE corner of the site, adjacent to other industrial park uses. Construction access in later phases will include the existing plant truck gate entrances (Gate 1 off Silver Bell and Gate 6 off Brown Road). 100' minimum setbacks for areas of disturbance (except for the North border which will be 35').

Compatibility with Master Plan

Describe how the proposed special land use is compatible with and in accordance with the general principles and objectives of the Orion Township Master Plan and how it promotes the intent and purpose of Zoning Ordinance 78.

The plant expansion will take advantage of an existing manufacturing facility to aggressively pursue GM's vision and commitment to transition of EVs. When in full production, the GM Orion Assembly operations will produce high volume, full size, battery electric trucks (BET). Creating more than 2300 new jobs and retaining 1000 current jobs. This is consistent with the intent of the industrial complex zoning for this area of the township.

Public Services

Describe how the proposed special land use is located so as to be adequately served by essential public facilities and services, such as highways, streets, police and fire protection, drainage systems, water and sewage facilities, and schools.

The existing facility has utility services already in place, with upgrades planned for electric service. Water, wastewater, and natural gas loads for the proposed expansion are being reviewed. The road access to highways is adequate to support the expansion. Existing road infrastructure is planned to be rehabilitated due to the existing conditions, but no road widening, except for turn lanes and potential modifications to traffic signals.

The site is currently upgrading the onsite fire water tanks and the fire protection system will be expanded to serve the new manufacturing space.

No additional storm water discharge points are planned for the site. Improvements are proposed to the storm water system for storage and treat the additional developed areas.

Impact on Traffic

The location of the proposed special land use within the zoning district shall minimize the impact of the traffic generated by the proposed use on surrounding uses. Describe the consideration given to the following:

Proximity and access to major thoroughfares: The site is accessed by 2 interchanges from I-75

1. Joslyn Road at I-75 via Giddings to Brown Road to Joslyn Road (<2 miles)
2. M-24/Lapeer Road at I-75 via Brown Road or Silverbell Road to M-24/Lapeer Road (2-3 miles)

Estimated traffic generated by the proposed use:

Proximity and relation to intersections:

Adequacy of sight distances: No issues.

Location of and access to off-street parking: The existing parking off Giddings Road will continue to be maintained through Gates 2, 3, and 4. Three Gate 7 off Brown Road and Gate 9 off Silverbell Road will be constructed to provide access to a 800 space temporary construction parking lot in the NE corner of the site and a permanent 1000 space parking lot in the SE corner of the site. Note the SE parking lot will be used for construction parking during the peak of construction in 2023.

Required vehicular turning movements: Turning movements for internal roadways were analyzed using a WB-67 for truck dock access. Appendix F of the Orion Township Engineering Standards for the fire department ladder truck turning template was also used to confirm access on all internal roads adjacent to the buildings can accommodate the ladder truck.

Provision for pedestrian traffic: An 8' wide safety pathway is shown on the site master plan along the road right-of-ways of Brown, Giddings, and Silverbell Road per Zoning Ordinance 78 27.06.5.

The pathway will be constructed as part of the off-site road improvements.

Detrimental Effects

The proposed special land use shall not involve any activities, processes, materials, equipment or conditions of operation, and shall not be so located or designed, as to be detrimental to public health, safety, and welfare. Describe the consideration given to the production of traffic, noise, vibration, smoke, fumes, odors, dust, glare, and light.

Increased volume of traffic does not exceed what the original developed area anticipated (4000 employees worked here previously). All new processes and rehabilitation of the existing facility will reduce the overall environmental impacts of noise, vibration, smoke, fumes, order, dust, glare and light.

Enhancement of Surrounding Environment

The proposed special land use shall provide the maximum feasible enhancement of the surrounding environment and shall not unreasonably interfere with or discourage the appropriate development and use of adjacent land and buildings or unreasonably affect their value. Describe how consideration was given to:

Landscaping & other amenities: Landscape buffers, the use of storm water bioswales to treat parking lot run off and infiltration basins to take advantage of the soil conditions are being incorporated into the design. No new current storm water outfalls are proposed.

The bulk placement and materials of construction of proposed structures in relation to surrounding uses:

Isolation of Existing Land Use

Explain how the location of the proposed special land use does not result in a small residential area being substantially surrounded by non-residential development, and further, the location of the proposed special land use does not result in a small non-residential area being substantially surrounded by incompatible uses: Land Use to remain the same, not applicable.

Required Signage

Pursuant to Zoning Ordinance 78, Section 30.02(D) a sign indicating the requested special land use shall be installed on the parcel(s) no less than 15 days prior to the scheduled public hearing. Please check one:

☐ I will install the sign(s) as required (see below for specifications).

☒ I would like to lease signage from the Township (including installation).
(please complete attached Sign Request Form).

I/We, the undersigned, do hereby submit this application for Special Land Use, pursuant to the provisions of the Charter Township of Orion Zoning Ordinance No. 78, Section 30.02 and applicable ordinance requirements. In support of this request the above facts are provided. I hereby certify that the information provided is accurate and the application that has been provided is complete.

Signature of Applicant:
(must be original ink signature) _____ Date: 6/29/22

Print Name: Reuben M. Jones

I, the property owner, hereby give permission to the applicant listed above to act as my agent in submitting applications, correspondence and to represent me at all meetings. I also grant permission to the Planning Commission members to visit the property, without prior notification, as is deemed necessary.

Signature of Owner*:
(must be original ink signature) _____ Date: 6/29/22

Print Name: Reuben M. Jones

*If the deed of ownership does not show an individual, ie a corporation, partnership, etc,, documentation must be provided showing the individual signing this application has signing rights for the entity.

As per Ordinance 78, Section 30.02(D), Special Land Procedures and Standards, a sign shall be installed 15 days prior to the requiredpublic hearing. Please see the Ordinance for additional specifications.

The sign shall have the following wording:

SPECIAL LAND USE PROPOSED	- (min 8" high letters)
For more information call:	- (min 3" high letters)
Charter Township of Orion	- (min 4" high letters)
Planning and Zoning Department	- (min 4" high letters)
248-391-0304 ext. 5002	- (min 4" high letters)

*Please note, the Township does offer the ability to rent the required signage (see attached form). Please contact the Planning and Zoning Department with any questions.

Charter Township of Orion
Planning & Zoning Department
2323 Joslyn Rd., Lake Orion MI 48360
P: (248) 391-0304 ext. 5002

Project Name GM Orion BET 2

PC#_____ Parcel#(s)_____

Please select an option below:

☑ **Permission to Post on Web Site**

By signing below as applicant and on behalf of my consultants, we agree to allow the plans for the above-named project, in which approval is being sought by the Planning Commission and/or Township Board, to be posted on the Township website.

Signature of Applicant — Date: 6/29/22

Printed Name of Applicant: Reuben M. Jones

☐ **Do not want posted on Web Site**

Digital EGLE/USACE Joint Permit Application (JPA) for Inland Lakes and Streams, Great Lakes, Wetlands, Floodplains, Dams, Environmental Areas, High Risk Erosion Areas and Critical Dune Areas

version 1.30

(Submission #: HPJ-A9WK-QFGQ0, version 1)

Details

Submission ID	HPJ-A9WK-QFGQ0
Submission Reason	New
Status	In Process

Fees

Fee	$2,000.00
Payments/Adjustments	($2,000.00)
Balance Due	$0.00 (Paid)

Form Input

Instructions

To download a copy or print these instructions. Please click this link (recommended).

Contact Information

Applicant Information (Usually the property owner)

First Name Reuben
Last Name *Jones*

Organization Name
General Motors-Orion Assembly

Phone Type	Number	Extension
Business	2483775100	

Email
reuben.jones@gm.com

Address
4555 GIDDINGS RD
LAKE ORION, MI 48359

Is the Property Owner different from the Applicant?
No

Has the applicant hired an agent or cooperating agency (agency or firm assisting applicant) to complete the application process?
No

Are there additional property owners or other contacts you would like to add to the application?
Yes

Additional Contact Information (1 of 2)

Contact Role(s)
Consultant

Contact Information

Prefix
Mr.

First Name Anthony
Last Name *DeMars*

Title
Senior Natural Resource Specialist

Organization Name
GHD Services, Inc.

Phone Type	Number	Extension
Business	6125246868	

Email
tony.demars@ghd.com

Address
900 LONG LAKE RD
STE 200
SAINT PAUL, MN 55112

Additional Contact Information (2 of 2)

Contact Role(s)
Consultant

Contact Information

Prefix
NONE PROVIDED

First Name	Last Name
John	*Maher*

Title
NONE PROVIDED

Organization Name
GM

Phone Type	Number	Extension
Mobile	17658606543	

Email
john.maher@gm.com

Address
31266 ALFRED SLOAN RD
GM GLOBAL TECH CENTER - SERV ENG
WARREN, MI 48092

Project Location

DEQ Site Reference Number (Pre-Populated)
7208294043768178907

Project Location
42.71728619475128,-83.26199054716018

4555 GIDDINGS RD, LAKE ORION, MI

Project Location Address
4555 GIDDINGS RD
GENERAL MOTORS-ORION ASSEMBLY
LAKE ORION, MI 48359

County
Oakland

Is there a Property Tax ID Number(s) for the project area?
Yes
Please enter the Tax ID Number(s) for the project location
09-34-400-011, 09-34-200-006, 09-34-200-006, 09-34-400-011

Is there Subdivision/Plat and Lot Number(s)?
No

Is this project within Indian Lands?
No

Local Unit of Government (LUG)
Orion Township

Directions to Project Site
Heading northbound on I-75N, take Exit 83 on to Joslyn Road. Turn right onto Joslyn Road and travel .3 miles to Brown Road. Travel .8 miles on Brown Road to Giddings Road. Project Site is located at 4555 Giddings Road and is located northeast of the intersection of Brown Road and Giddings Road.

Background Information

Has the Michigan Department of Environment, Great Lakes, and Energy (EGLE) and/or United States Army Corps of Engineers (USACE) conducted a pre-application meeting/inspection for this project?
Yes

Provide the date of the pre-application meeting/inspection
3/29/2022

Pre-application File Number:
HPG-6JSJ-D69R8

EGLE and/or USACE staff person involved in the pre-application meeting/inspection:
Robert Primeau

Has the project scope or design changed since the pre-application meeting/inspection?
No

Has the EGLE completed a Wetland Identification Program (WIP) assessment for this site?
Yes

Please enter the WIP assessment number:
HPG-HESW-13EXX

Upload copy of WIP letter
EGLE WRD Wetland Identification Report – 63-GM-Orion Twp.pdf - 06/17/2022 11:43 AM
Comment
NONE PROVIDED

Environmental Area Number (If known):
NONE PROVIDED

Has the United States Army Corps of Engineers (USACE) completed either an approved or preliminary jurisdictional determination for this site?
No

Were any regulated activities previously completed on this site under an EGLE and/or USACE permit?
No

Have any activities commenced on this project?
No

Is this an after-the-fact application?
No

Are you aware of any unresolved violations of environmental law or litigation involving the property?
No

Is there a conservation easement or other easement, deed restriction, lease, or other encumbrance upon the property?
Yes

Easement Holder Contact Information

First Name John **Last Name** *Maher*

Organization Name
General Motors-Orion Assembly

Phone Type	Number	Extension
Business	7658808543	

Email
john.maher@gm.com

Address
4555 GIDDINGS RD
LAKE ORION, MI 48359
United States

Describe the type of easement or encumbrance
The property has multiple easements which are summarized in the attached Orion ASSY Easement-Sidetrack Agreement summary table. The following documents are attached.
Easement 12200000-Electrical Substation
Easement 12201000-Sewer Line
Easement 12259000-Drainage
Easement 13670000-Water Line
Easement 14393000-Water Supply
Easement 15684000-Sanitary Sewer
Easement 17210000-Vehicular and Pedestrian Access
Easement 19921000-Drainage Easement
Agreement H17210A-Railroad ROW/Sidetrack

Attach a copy of a description of the easement or encumbrance
13670000 - Easement Agreement.pdf - 06/17/2022 12:24 PM
17210000 - Sketches.pdf - 06/17/2022 12:24 PM
19921000 - Easement Agreement.pdf - 06/17/2022 12:24 PM
12259000 - Easement Agreement.pdf - 06/17/2022 12:24 PM
14393000 - Easement Agreement.pdf - 06/17/2022 12:24 PM
13670000 - Sketch and Legal Description.pdf - 06/17/2022 12:24 PM
H17210A - Sidetrack Agreement.pdf - 06/17/2022 12:24 PM
14393000 - Drawing - ncorrect # license for 1987 water system improvements .pdf - 06/17/2022 12:24 PM
12200000 - Easement Agreement.pdf - 06/17/2022 12:24 PM
15684000 - Easement Agreement.pdf - 06/17/2022 12:24 PM
12201000 - Easement Agreement.pdf - 06/17/2022 12:24 PM
17210000 - Easement Agreement.pdf - 06/17/2022 12:24 PM
Orion ASSY - Easement-Sidetrack Agreements 11Jun.pdf - 06/17/2022 12:29 PM
Comment
NONE PROVIDED

Are there any other federal, interstate, state, or local agency authorizations associated with this project?
Yes

List all other federal, interstate, state, or local agency authorizations.

Agency	Type of Approval	Number	Date Applied	Approved/Denied/Undetermined
EPA	Waste : EPA ID	MID000718544	06/08/1982	Approved
MI EGLE AQD	Air : Title V Permit (US Only)	MI-ROP-B7227-2020	09/22/2020	Approved
Great Lakes Water Authority	Water : Pretreatment Permit	157-93957-IU	09/02/2020	Approved

Agency	Type of Approval	Number	Date Applied	Approved/Denied/Undetermined
Michigan DEQ	Water : NPDES Permit (US Only)	MIS110921	03/01/2021	Approved
EGLE	Waste : Infectious / Medical Waste Permit	MW0044288	07/19/2021	Approved

Comments
NONE PROVIDED

Permit Application Category and Public Notice Information

Indicate the type of permit being applied for.
Individual Permit for all other projects

This type of permit application requires that you include contact information for the adjacent landowners to this project. If you are only entering in a small number of bordering parcel owners contact information, please select "Enter list of recipients". If there is a rather large number of affected property owners such as a project that significantly affects lake levels, please upload a spreadsheet of the property owners. Please include names and mailing addresses.
Upload a list.

Uploads/Attachments
Lake Orion Adjoining Properties - Parcel Data.pdf - 06/17/2022 12:54 PM
Comment
NONE PROVIDED

Project Description

Project Use: (select all that apply - Private, Commercial, Public/Government/Tribal, Receiving Federal/State Transportation Funds, Non-profit, or Other)
Commercial

Project Type (select all that apply):
Development-Commercial/Industrial

Project Summary (Purpose and Use): Provide a summary of all proposed activities including the intended use and reason for the proposed project.
See ATT-A, ATT-B, ATT-C, ATT-D

Project Construction Sequence, Methods, and Equipment: Describe how the proposed project timing, methods, and equipment will minimize disturbance from the project construction, including but not limited to soil erosion and sedimentation control measures.
See ATT-A, ATT-B, ATT-C, ATT-D

Project Alternatives: Describe all options considered as alternatives to the proposed project, and describe how impacts to state and federal regulated waters will be avoided and minimized. This may include other locations, materials, etc.
See ATT-A, ATT-B, ATT-C, ATT-D

Project Compensation: Describe how the proposed impacts to state and federal regulated waters will be compensated, OR explain why compensatory mitigation should not be required for the proposed impacts. Include amount, location, and method of compensation (i.e., bank, on-site, preservation, etc.)
The Project will utilize future release of emergent wetland credits from the Oakland-Snell Mitigation Bank will provide all of the necessary credits to satisfy the Project needs related to emergent wetland impacts (7.73 credits). Further, the Krummrey Wetland Mitigation Bank can provide the necessary forested wetland credits to satisfy the Project needs related to forested wetland impacts (0.88 credits). It is proposed that the purchase of these credits be made to satisfy the Project's wetland mitigation requirements.

The project will include 500 linear feet of new intermittent stream channel to mitigate impacts for the loss of 463 linear feet of intermittent stream.

Upload any additional information as needed to provide information applicable to your project regarding project purpose sequence, methods, alternatives, or compensation.
ATT-A_Orion Purpose Need Alternatives Analysis_06212022_rev4.pdf - 06/21/2022 04:49 PM
ATT-D_20220610-Stormwater-TECHNICAL Memorandum.pdf - 06/21/2022 04:49 PM
ATT-B_Governor Whitmer Signs Legislation Enab...pdf - 06/21/2022 04:49 PM
ATT-C_Gov. Whitmer Secures Historic $7 Billio...pdf - 06/21/2022 04:49 PM
Comment
NONE PROVIDED

Resource and Activity Type

SELECT THE ACTIVITIES from the list below that are proposed in your project (check ALL that apply). If you don't see your project type listed, select "Other Project Type". These activities listed require additional information to be gathered later in the application.
Stream, River or Drain Construction Relocation and Enclosure Activities

The Proposed Project will involve the following resources (check ALL that apply).
Wetland
Stream or River
Proposed Stream Mitigation

Major Project Fee Calculation Questions

Is filling of 10,000 cubic yards or more proposed (cumulatively) within wetlands, streams, lakes, or Great Lakes?
Yes

Is dredging of 10,000 cubic yards (cumulatively) or more proposed within streams, lakes, or Great Lakes? (wetlands not included)
No

Is new dredging or adjacent upland excavation in suspected contamination areas proposed by this application?
No

Is a subdivision, condominium, or new golf course proposed?
No

Wetland Project Information and Impacts

Has a professional wetland delineation been completed for this site?
Yes

Attach a copy of wetland delineation report with data form.
12573881-RPT-GM Orion Assembly-Wetland Delineation Report.pdf - 06/17/2022 01:17 PM
Comment
NONE PROVIDED

Total acres of wetland affected by this project.

Category	Affected area (acres)
Permanent	5.57
Temporary	0
	Sum: 5.57

Is filling or draining of 1 acre or more (cumulatively) of wetland proposed?
Yes

Select all wetland types that will be affected by this project:
Emergent
Forested
Scrub-shrub

If your project includes placing fill in wetland then select the proposed activities from the following list. If your activity is not shown, then select "None of the Above" and move to the next question. Only enter an impacted area in one of the impact tables (do not duplicate impact entries).:
Road - New

Complete this table for projects involving Fill. Enter each activity/ location that corresponds with each activity selected in the previous question and enter the dimensions. Activities may be entered in one line of the table if they occupy the same impact footprint and cannot be broken out separately (Example: Activity - Driveway and Riprap slope). Multiple activities in different locations should be listed on different lines of the table.

Activity	Length (feet)	Width (feet)	Depth (feet)	Area (square feet)	Volume (cubic feet)	Volume (cubic yards)	Corrected value for complex impact AREAS (square feet)
W-R.4	85	9.176	2.5	779.96	1949.9	72	780
W-F.1	386.94	50	5	19347	96735	3583	19347
W-B.1	60.72	50	2.6	3036	7893.6	292	3036
W-C.1	929.64	50	1.25	46482	58102.5	2152	46482
W-I.1	138.9	50	1.7	6945	11806.5	437	6945
				Sum: 76589.96	Sum: 176487.5	Sum: 6536	Sum: 76590

Source of Fill Material:
On-site (show on plan)

Type of Fill.
Sand

Is riprap proposed?
No

Select from the following list for Excavation/Dredge Activities (If your proposed project is primarily a structure enter the impact as a structure. Only enter an impacted area in one of the impact tables in one impact section):
None of the above

If your project includes STRUCTURES IN WETLAND then select all of the proposed activities in the following list. If your activity is not shown, then select "None of the Above" and move to the next question. Only enter an impacted area in one of the impact tables (do not duplicate impact entries).:
Building - non-residential new, Commercial/Industrial/Public
Culvert
Building - accessory Structure

Projects involving Structures:

Activity	Length (feet)	Width (feet)	Depth (feet)	Area (Sq. feet)	Volume (cubic feet)	Volume (cubic yards)	Corrected value for complex impact AREAS (square feet)
W-H.2	352	4.7025	1.7	1655.28	2813.9759999999997	104	1655.28
W-A.3	840	161.2757	14.75	135471.588	1998205.923	74008	135471.6
W-B.3	874	6.922	2.6	6049.6279999999995	15729.5528	583	6050
W-C.3	340	20.794	1.25	7069.96	8837.45	327	7070
W-M.5	298	19.288	6	5747.6240000000005	34486.944	1277	5748
W-J.5	220	44.69	9	9831.8	88486.2	3277	9832
				Sum: 165826.28	Sum: 2148560.0458	Sum: 79576	Sum: 165826.88

If your project includes Other Activities in WETLAND not listed in this section, then select from the proposed activities in the following list. If your activity in Wetland has not been listed in this Wetland Section, then select "Other" and enter a description of your activity. Only enter an impacted area in one of the Impact tables (do not duplicate impact entries). If you selected a Fill, Excavation/Dredging, or Structure activity above in this section, but do not have an activity listed as Other, then select None of the Above for this question.
None of the above

Is Wetland Mitigation being proposed as part of this proposed project?
Yes

Mitigation Project Details for Wetlands

Impact Location (include identifier on site plan)	Impact Type:	Impact Amount (acres)	Replacement Ratio (include any reduction)	Mitigation Type	Mitigation Amount (acres)	Kind of Mitigation
W-A.3	Emergent	3.11	1.5:1	Emergent	4.67	Bank
W-B.1	Emergent	0.07	1.5:1	Emergent	0.11	Bank
W-B.3	Emergent	0.14	1.5:1	Emergent	0.21	Bank
W-C.1	Emergent	1.07	1.5:1	Emergent	1.61	Bank
W-C.3	Emergent	0.16	1.5:1	Emergent	0.24	Bank
W-F.1	Forested	0.44	2.0:1	Forested	0.88	Bank
W-H.1	Emergent	0.01	1.5:1	Emergent	0.02	Bank
W-H.2	Emergent	0.03	1.5:1	Emergent	0.05	Bank
W-I.1	Emergent	0.16	1.5:1	Emergent	0.24	Bank
W-J.5	Emergent	0.23	1.5105	Emergent	0.35	Bank

Impact Location (include identifier on site plan)	Impact Type:	Impact Amount (acres)	Replacement Ratio (include any reduction)	Mitigation Type	Mitigation Amount (acres)	Kind of Mitigation
W-M.5	Emergent	0.13	1.5:1	Emergent	0.20	Bank
W-R.4	Emergent	0.02	1.5:1	Emergent	0.03	Bank
		Sum: 5.57			Sum: 8.61	

Wetland mitigation plan or associated documents
12573881-LTR-GM Orion Mitigation Plan-062122.pdf - 06/21/2022 02:38 PM
Comment
NONE PROVIDED

Stream Project Information (1 of 1)

Please provide a name for the stream, river, channel:
Unnamed

Stream Water elevation reference* (show elevation on plans with description):
NAVD 88

Ordinary High Water Mark (OHWM) elevation (feet):
1025

Date of observation (M/D/Y)
4/27/2022

What length (feet) does the project activity(ies) extend waterward of the OHWM?
12

What length (feet) does the project activity(ies) extend landward of the OHWM?
100

Is the drainage area upstream of the proposed project area greater than 2 sq. miles?
No

What is the the width (feet) of the stream where the water begins to overflow its banks. This is called the Bankfull width.
12

Will a turbidity curtain be used during the proposed project?
No

Inland Lakes, Great Lakes and Stream Impacts (1 of 1)

The following impact description applies to: (select only one at a time, duplicate this entire section if there are impacts to multiple waterbody types):
Stream

Linear feet of stream affected by your project

Category	Affected linear feet (ft)
Permanent	463
Temporary	0
	Sum: 463

Select from the following list all Fill Activities (select all that apply to this waterbody impacted):
Road - New

Complete this table for projects involving Fill below the Ordinary High Water Mark. Enter each activity/ location that corresponds with each activity selected in the previous question and enter the dimensions. Activities may be entered in one line of the table if they occupy the same impact footprint and cannot be broken out separately (Example: Activity - Driveway and Riprap slope). Multiple activities in different locations should be listed on different lines of the table.

Activity	Length (feet)	Width (feet)	Depth (feet)	Area (square feet)	Volume (cubic feet)	Volume (cubic yards	Corrected Value for complex Impact Area (square feet)
General Fill	463	12	1.5	5556	8334	309	NONE PROVIDED
				Sum: 5556	Sum: 8334	Sum: 309	Sum: NaN

Type of Fill
Sand

Source of Fill
On-site (show on plans)

Is riprap proposed?
No

Activities Involving Dredging or Excavation: Select from the following list for Excavation/Dredge Activities (select all that apply to this waterbody impacted):
No Dredging/Excavation Proposed

If your project includes STRUCTURES then select all of the proposed activities in the following list. If your activity is not shown, then select "None of the Above" and move to the next question. Only enter an impacted area in one of the Impact tables (do not duplicate impact entries).:
None of the above

If your project includes Other Activities not listed in this section, then select from the proposed activities in the following list. If your activity has not been listed in this Section, then select "Other" and enter a description of your activity. Only enter an impacted area in one of the Impact tables (do not duplicate impact entries). If you selected a Fill, Excavation/Dredging, or Structure activity above in this section, but do not have an activity listed as Other, then select None of the Above for this question.
None of the above

Does the proposed project include mitigation?
stream mitigation

Streams Impacts

Impact Location (include identifier on site plan)	Impact Type (Enclosure, Relocation, Dredging, Armoring, or Other)	Impact Amount (linear feet)
See WB-D	Other: Channel will be filled in with existing flows routed to GM storm sewer system	463
		Sum: 463

Streams Mitigation

Mitigation Location (Label)	Mitigation Type (Replacement, Restoration, Preservation, or Other)	Mitigation Amount (linear feet)
See WB-D-Mitigation	Replacement	500
		Sum: 500

Stream Mitigation Uploads
EX5-GM ORION STREAM MITIGATION EXHIBIT.pdf - 06/21/2022 05:05 PM
Comment
NONE PROVIDED

Stream, River or Drain Construction Relocation and Enclosure Activities

STREAM INFORMATION

Is this a county drain?
No

Does the proposed project include an:
Relocation

Are stream relocations of 500 feet or more in length (cumulatively) proposed?
No

Dimensions of existing stream/drain channel

Length (feet)	Width (top of bank to top of bank) (feet)	Depth (feet)	Channel bottom width (feet)
463	12	1	1.5

Will existing channel be abandoned?
Yes

Length of channel to be abandoned (feet):
463

Will old/existing channel be backfilled to top of bank grade?
Yes

Existing channel average water depth in a normal year (feet)
.25

Dimensions of new or relocated stream channel:

Length (feet)	Width (feet)	Depth (feet)
500	4	.25

Is a two-stage or similar design proposed?
No

Volume of dredge/excavation (cubic yards)
5800

How will slopes and bottom be stabilized?
Slopes will be stabilizec with erosion control blankets and seeded to a native bio-swale/short prairie seed mix and cover crop.

Proposed side slopes (vertical / horizontal):
1:4

For activities on legally established county drains, provide original design and proposed dimensions and elevations.
NONE PROVIDED
Comment
NONE PROVIDED

Upload of Proposed Site Plans

Required on all Site Plan uploads. Please identify that all of the following items are included on your plans that you upload with this application.

Site Plan Features	Existing and Proposed Plan Set
Scale, Compass North, and Property Lines	Yes
Fill and Excavation areas with associated amounts in cubic yards	Yes
Any rivers, lakes, or ponds and associated Ordinary High Water Mark (OHWM)	Yes
Exterior dimensions of Structures, Fill and Excavation areas associated with the proposed project	Yes
Dimensions to other Structures and Lot Lines associated with the project	Yes
Topographic Contour Lines from licensed surveyor or engineer when applicable	Yes

Upload Site Plans and Cross Section Drawings for your Proposed Project

EX9-GM ORION WETLAND EXHIBIT - QUADRANT 4.pdf - 06/21/2022 05:23 PM
EX4-GM ORION PROPOSED STORM EXHIBIT.pdf - 06/21/2022 05:23 PM
EX3-GM ORION CONSTRUCTION ROAD CROSSING EXHIBIT.pdf - 06/21/2022 05:23 PM
EX12-GM SURF CROSS SECTION EXHIBIT - 2.pdf - 06/21/2022 05:23 PM
EX10-GM ORION WETLAND EXHIBIT.pdf - 06/21/2022 05:23 PM
EX5-GM ORION STREAM MITIGATION EXHIBIT.pdf - 06/21/2022 05:23 PM
EX8-GM ORION WETLAND EXHIBIT - QUADRANT 3.pdf - 06/21/2022 05:23 PM
EX7-GM ORION WETLAND EXHIBIT - QUADRANT 2.pdf - 06/21/2022 05:23 PM
EX11-GM SURF CROSS SECTION EXHIBIT - 1.pdf - 06/21/2022 05:23 PM
EX6-GM ORION WETLAND EXHIBIT - QUADRANT 1.pdf - 06/21/2022 05:23 PM
EX13-GM SURF CROSS SECTION EXHIBIT - 3.pdf - 06/21/2022 05:23 PM
EX1-EXISTING CONDITION WETLAND EXHIBIT - CONTOURS.pdf - 06/21/2022 05:23 PM
EX17-NE PARKING ACCESS ROAD CROSSING EXHIBIT.pdf - 06/21/2022 05:23 PM
EX15-GM SURF CROSS SECTION EXHIBIT - 5.pdf - 06/21/2022 05:23 PM
EX-14-GM SURF CROSS SECT ON EXHIBIT - 4.pdf - 06/21/2022 05:23 PM
EX16-GM SURF CROSS SECTION EXHIBIT - PLAN.pdf - 06/21/2022 05:23 PM
EX2-EXISTING CONDITION WETLAND EXHIBIT.pdf - 06/21/2022 05:23 PM
EX18-WETLAND IMPACT SECTION REFERENCE.pdf - 06/21/2022 05:23 PM

Comment
NONE PROVIDED

Additional Required and Supplementary Documents

NONE PROVIDED

Comment
NONE PROVIDED

Fees

Major Project Fee
+$2000.00

Total Fee Amount:
$2000.00

Is the applicant or landowner a State of Michigan Agency?
No

Attachments

Date	Attachment Name	Context	User
6/21/2022 5:23 PM	EX1-EXISTING CONDITION WETLAND EXHIBIT - CONTOURS.pdf	Attachment	Anthony DeMars
6/21/2022 5:23 PM	EX17-NE PARKING ACCESS ROAD CROSSING EXHIBIT.pdf	Attachment	Anthony DeMars
6/21/2022 5:23 PM	EX15-GM SURF CROSS SECTION EXHIBIT - 5.pdf	Attachment	Anthony DeMars
6/21/2022 5:23 PM	EX-14-GM SURF CROSS SECTION EXHIBIT - 4.pdf	Attachment	Anthony DeMars
6/21/2022 5:23 PM	EX16-GM SURF CROSS SECTION EXHIBIT - PLAN.pdf	Attachment	Anthony DeMars
6/21/2022 5:23 PM	EX2-EXISTING CONDITION WETLAND EXHIBIT.pdf	Attachment	Anthony DeMars
6/21/2022 5:23 PM	EX18-WETLAND IMPACT SECTION REFERENCE.pdf	Attachment	Anthony DeMars
6/21/2022 5:23 PM	EX9-GM ORION WETLAND EXHIBIT - QUADRANT 4.pdf	Attachment	Anthony DeMars
6/21/2022 5:23 PM	EX4-GM ORION PROPOSED STORM EXHIBIT.pdf	Attachment	Anthony DeMars
6/21/2022 5:23 PM	EX3-GM ORION CONSTRUCTION ROAD CROSSING EXHIBIT.pdf	Attachment	Anthony DeMars
6/21/2022 5:23 PM	EX12-GM SURF CROSS SECTION EXHIBIT - 2.pdf	Attachment	Anthony DeMars
6/21/2022 5:23 PM	EX10-GM ORION WETLAND EXHIBIT.pdf	Attachment	Anthony DeMars
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6/21/2022 5:23 PM	EX7-GM ORION WETLAND EXHIBIT - QUADRANT 2.pdf	Attachment	Anthony DeMars
6/21/2022 5:23 PM	EX11-GM SURF CROSS SECTION EXHIBIT - 1.pdf	Attachment	Anthony DeMars
6/21/2022 5:23 PM	EX6-GM ORION WETLAND EXHIBIT - QUADRANT 1.pdf	Attachment	Anthony DeMars
6/21/2022 5:23 PM	EX13-GM SURF CROSS SECTION EXHIBIT - 3.pdf	Attachment	Anthony DeMars
6/21/2022 5:05 PM	EX5-GM ORION STREAM MITIGATION EXHIBIT.pdf	Attachment	Anthony DeMars
6/21/2022 4:49 PM	ATT-A_Orion Purpose Need Alternatives Analysis_06212022_rev4.pdf	Attachment	Anthony DeMars
6/21/2022 4:49 PM	ATT-D_20220610-Stormwater-TECHNICAL Memorandum.pdf	Attachment	Anthony DeMars
6/21/2022 4:49 PM	ATT-B_Governor Whitmer Signs Legislation Enab...pdf	Attachment	Anthony DeMars
6/21/2022 4:49 PM	ATT-C_Gov. Whitmer Secures Historic $7 Billio...pdf	Attachment	Anthony DeMars
6/21/2022 2:38 PM	12573681-LTR-GM Orion Mitigation Plan-062122.pdf	Attachment	Anthony DeMars

Date	Attachment Name	Context	User
6/17/2022 1:17 PM	12573881-RPT-GM Orion Assembly-Wetland Delineation Report.pdf	Attachment	Anthony DeMars
6/17/2022 12:54 PM	Lake Orion Adjoining Properties - Parcel Data.pdf	Attachment	Anthony DeMars
6/17/2022 12:29 PM	Orion ASSY - Easement-Sidetrack Agreements 11Jun.pdf	Attachment	Anthony DeMars
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6/17/2022 12:24 PM	14393000 - Easement Agreement.pdf	Attachment	Anthony DeMars
6/17/2022 12:24 PM	13670000 - Sketch and Legal Description.pdf	Attachment	Anthony DeMars
6/17/2022 12:24 PM	H17210A - Sidetrack Agreement.pdf	Attachment	Anthony DeMars
6/17/2022 12:24 PM	14393000 - Drawing - incorrect # license for 1987 water system improvemnts .pdf	Attachment	Anthony DeMars
6/17/2022 12:24 PM	12200000 - Easement Agreement.pdf	Attachment	Anthony DeMars
6/17/2022 12:24 PM	15684000 - Easement Agreement.pdf	Attachment	Anthony DeMars
6/17/2022 12:24 PM	12201000 - Easement Agreement.pdf	Attachment	Anthony DeMars
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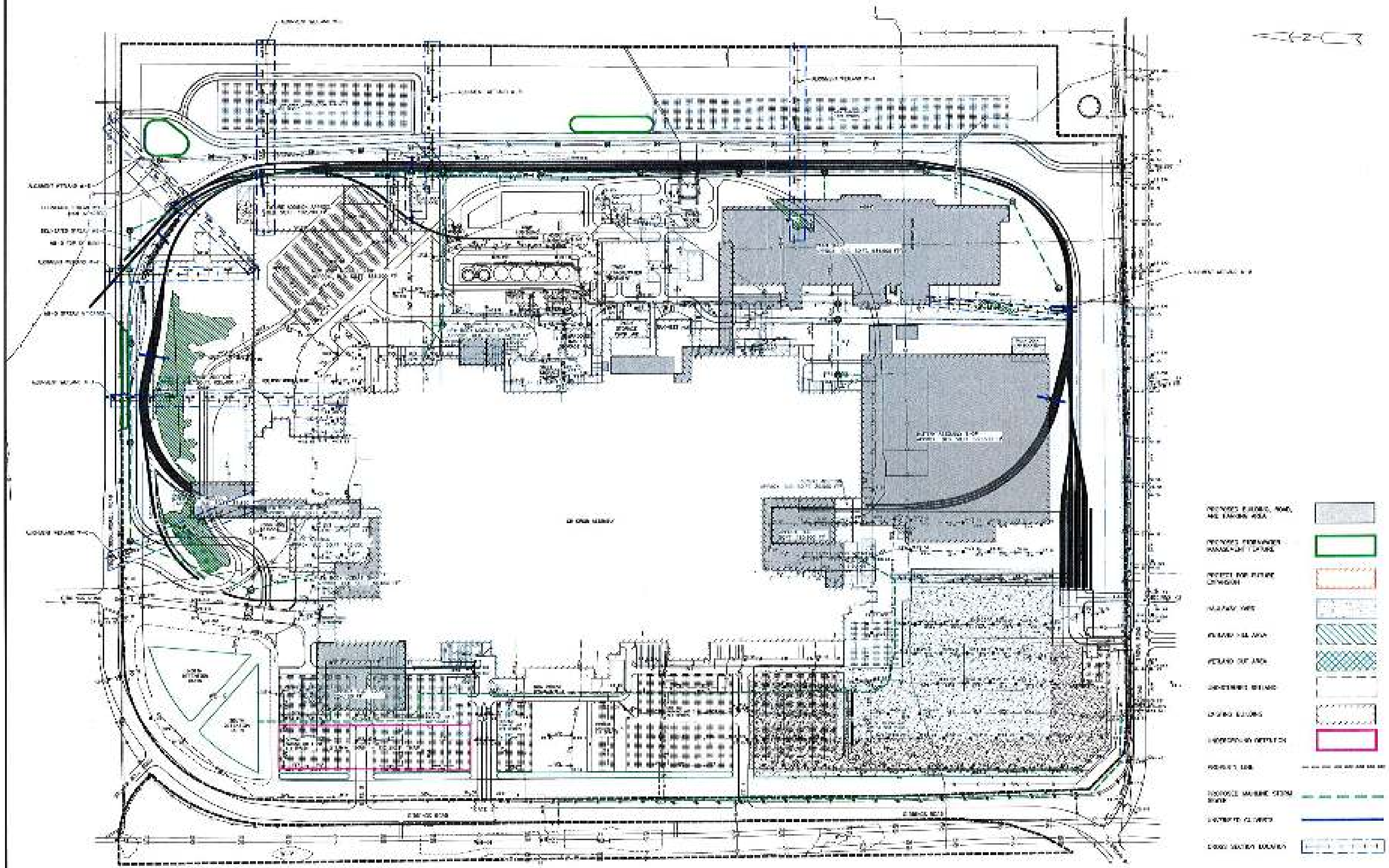
6/17/2022 12:24 PM	13670000 - Easement Agreement.pdf	Attachment	Anthony DeMars
6/17/2022 11:43 AM	EGLE WRD Wetland Identification Report – 63-GM-Orion Twp.pdf	Attachment	Anthony DeMars

Status History

	User	Processing Status
6/9/2022 3:35:10 PM	Anthony DeMars	Draft
6/21/2022 11:26:59 PM	Reuben Jones	Submitting
6/21/2022 11:27:14 PM	Reuben Jones	Submitted
6/21/2022 11:27:22 PM	Reuben Jones	In Process

Please use the Link in the Description to View the GM Site Plan.



811
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Orion Township
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PRELIMINARY
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WADE TRIM

Sustainable Workplaces
General Motors Company

GM ORION ASSEMBLY

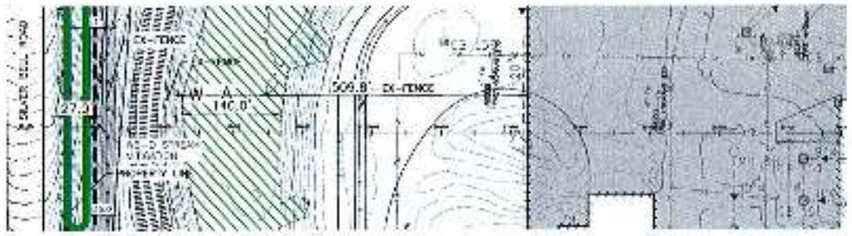
Structure ID: TBD
Level: LEVEL

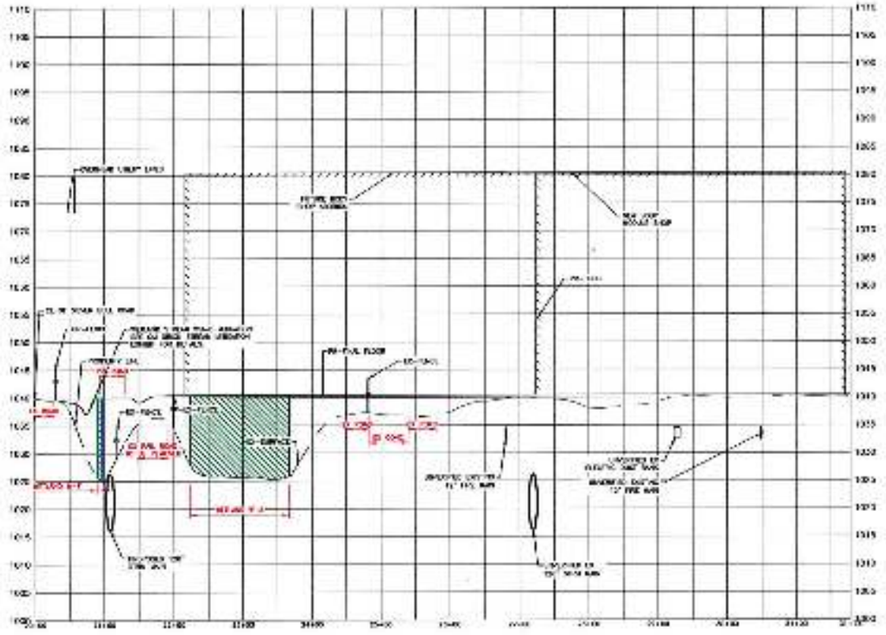
WAS2023-017
TBD
TBD
TBD

TBD
TBD
TBD
1:200
05.20.2022

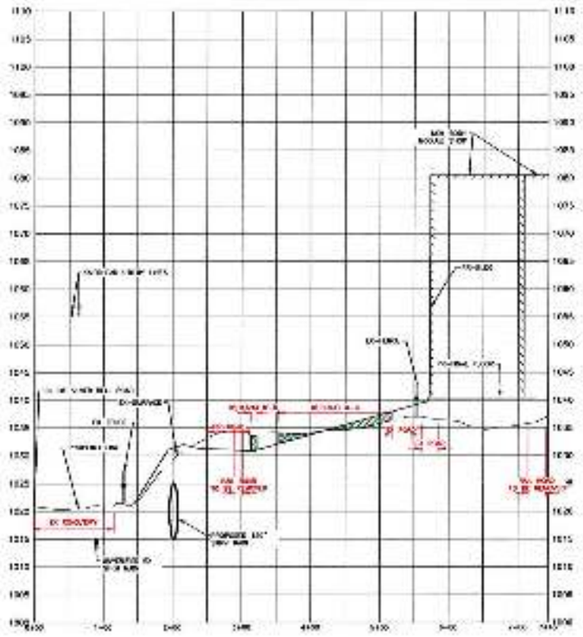
XX.X

113





PROFILE ALONG A-A



PROFILE ALONG B-B

STAND FILL

STAND OFF

PRELIMINARY
NOT FOR CONSTRUCTION

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SLOPE ASSEMBLY

Structure ID: T2D

WA20003-01

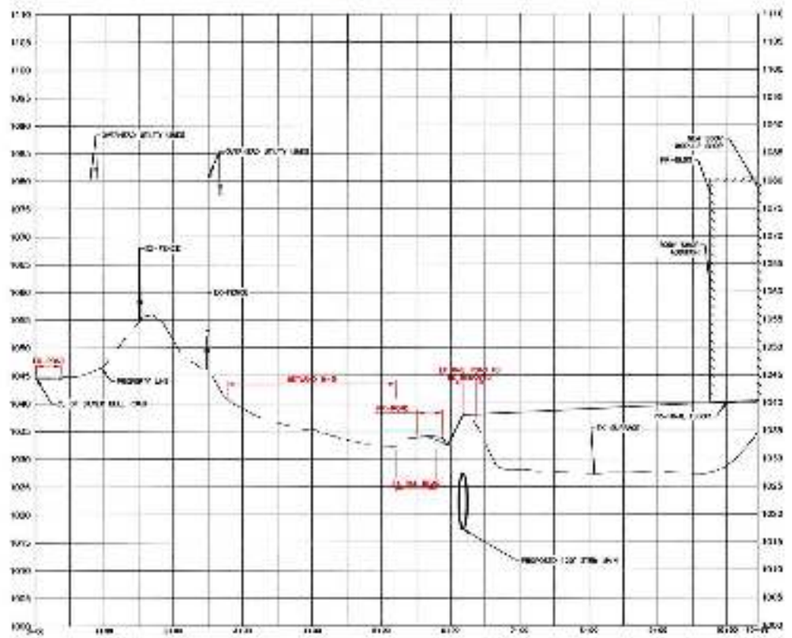
T2D

T2D

T2D

06.30.2022

XX.X



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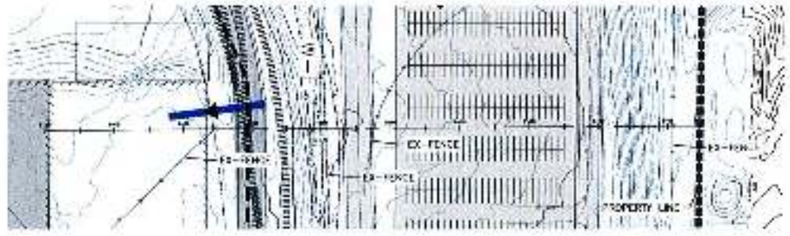

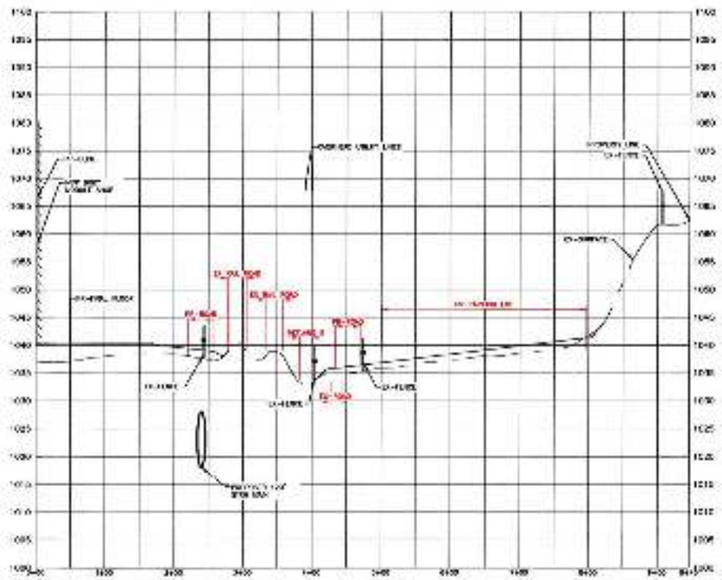

PROFILE ALONG N-S

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REVISIONS

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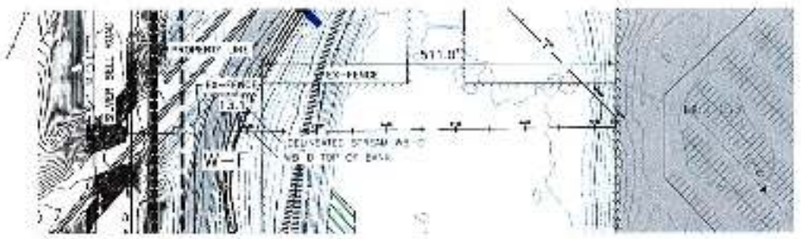
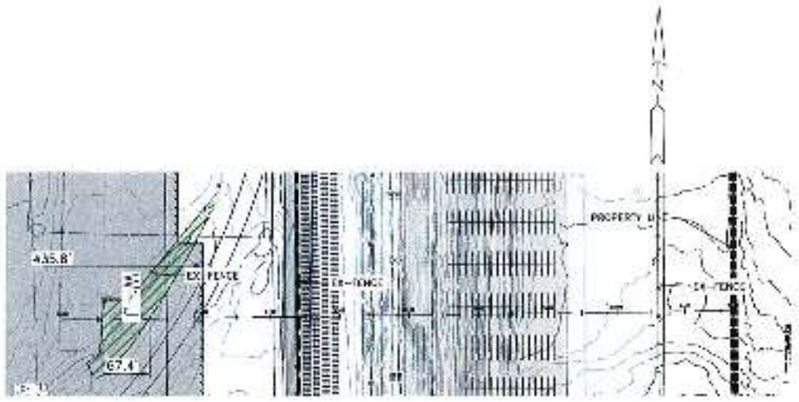
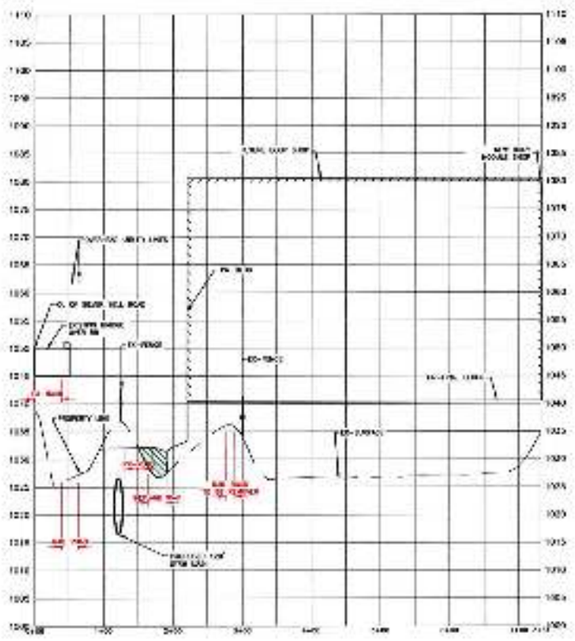
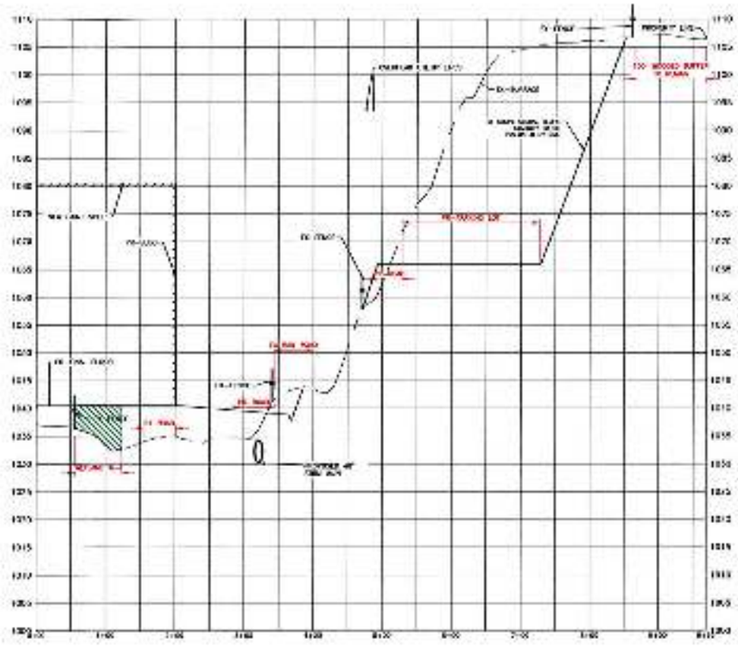
CIVIL DETAIL ASSEMBLY
CROSS SECTION - E
Structure ID: TBD
Level LEVEL

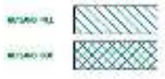
XX.X











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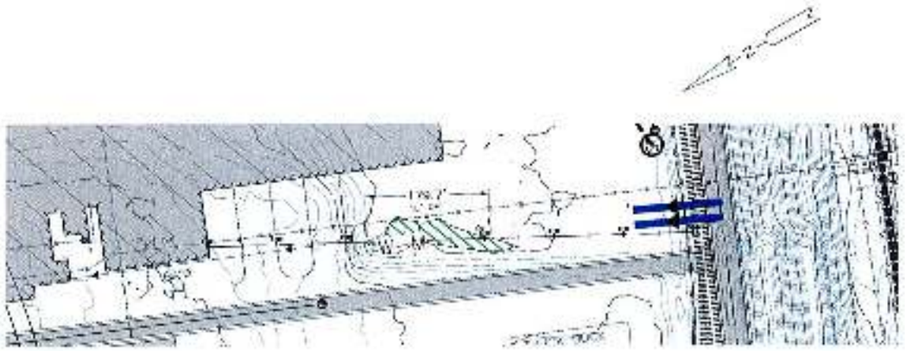
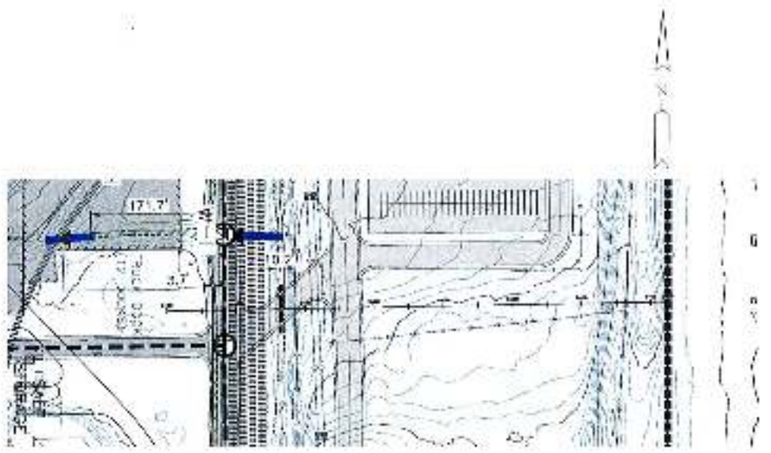
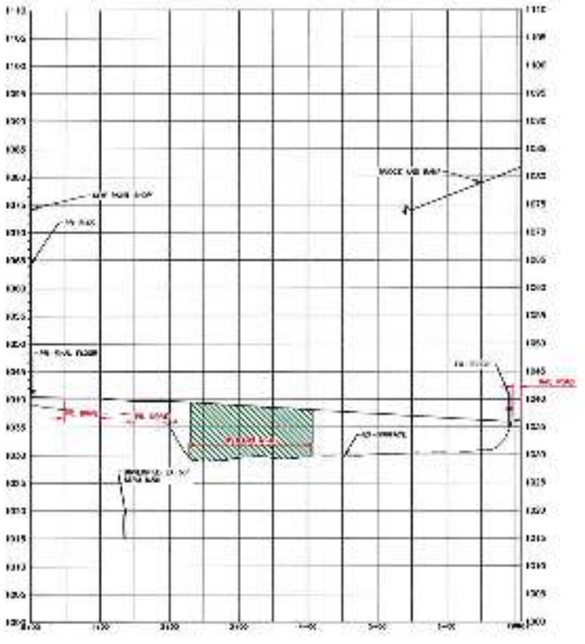
DW_DESIGN_ASSEMBLY
CROSS SECTION - 3

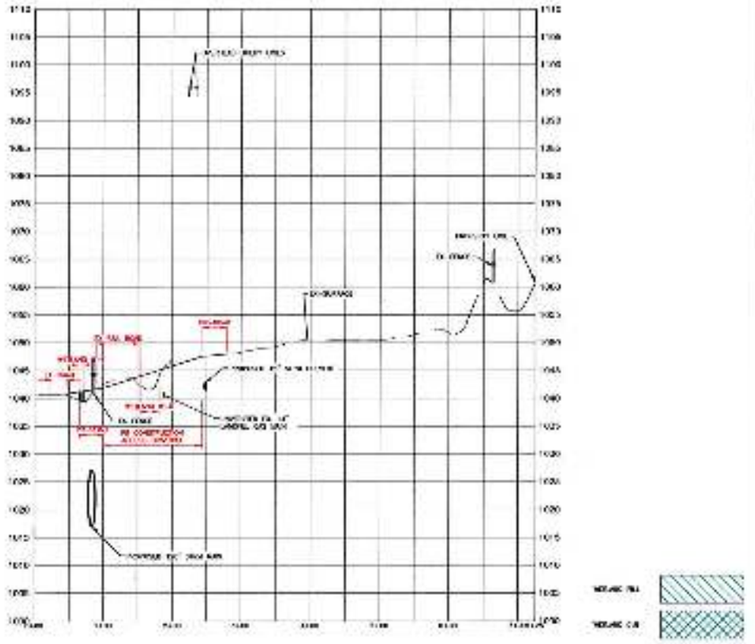
Structure ID: TBD
Level: LEVEL

TBD	TBD
TBD	XX.X
1:50	
09.30.2022	









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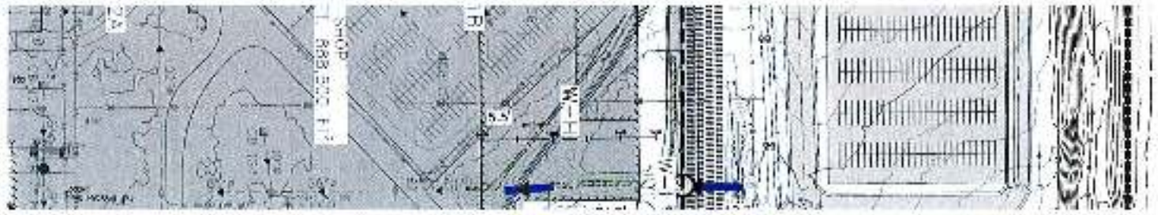
General Motors Company

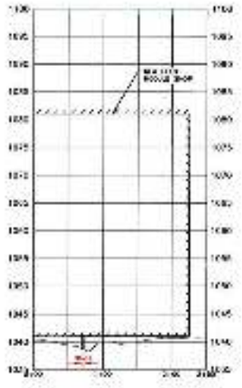
CROSS SECTION - 4

Sheetname ID: TBD
Level: LEVEL

XX.X

117





PRELIMINARY
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General Motors Company

GM ORION ASSEMBLY

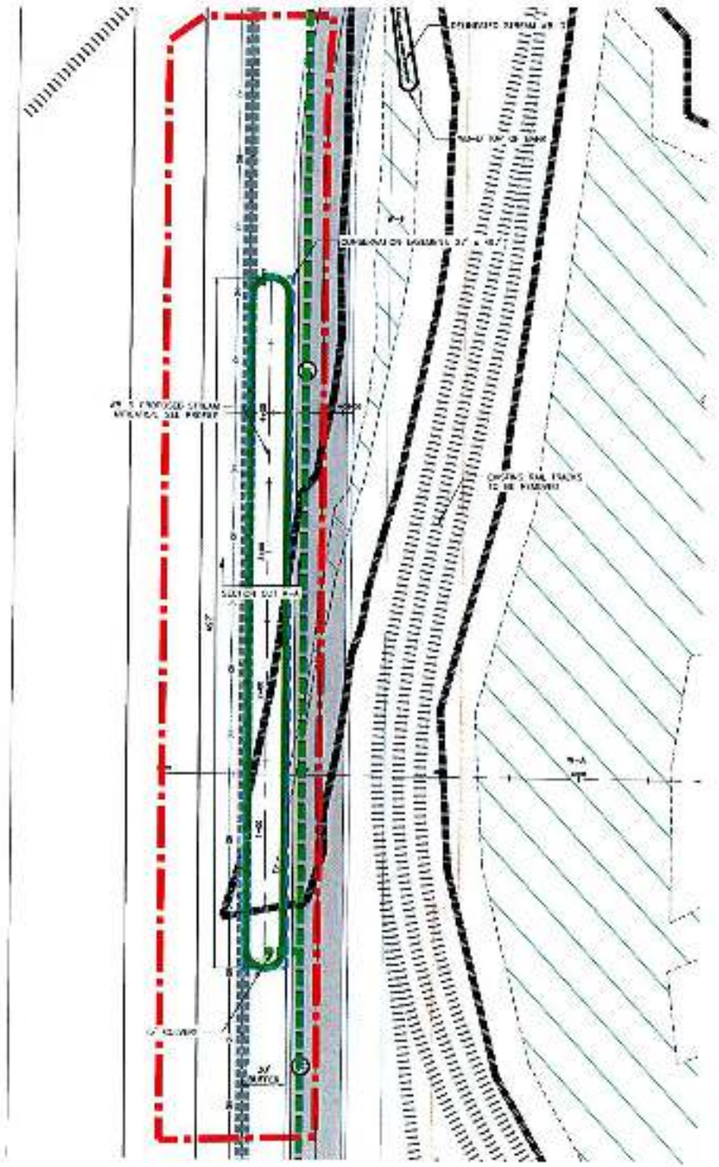
Structure ID: TBD

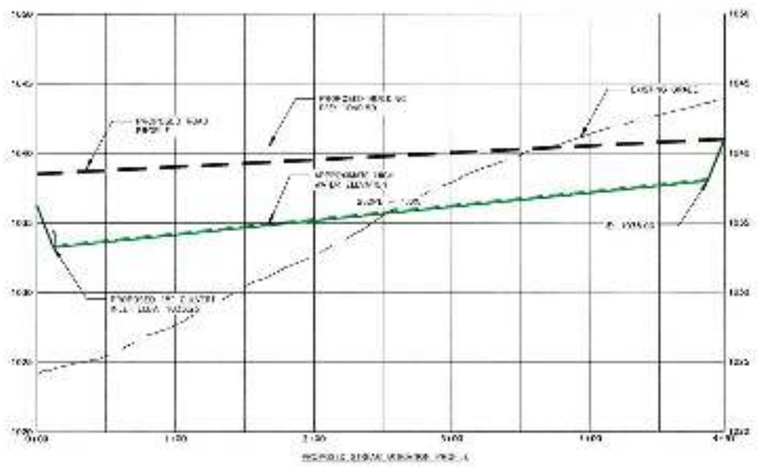
TBD | TBD

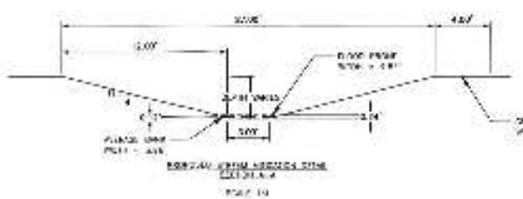
1:40

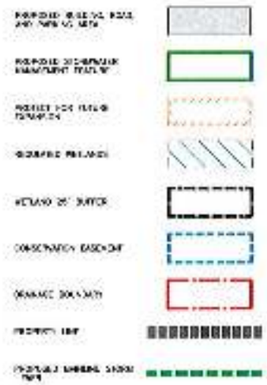
06.30.2022

XX.X









WADE TRIM

Sustainable Workplaces
"Creating places you want to be"
General Motors Company

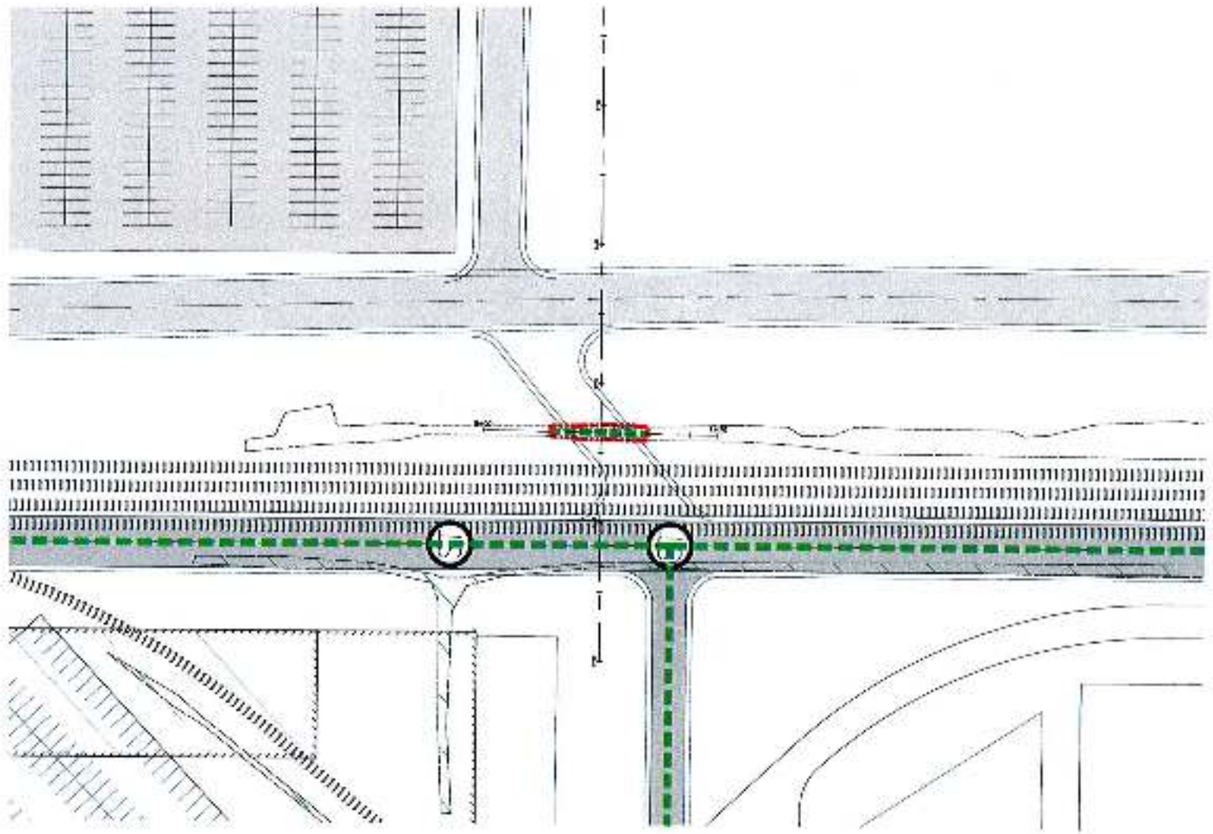
GM ORION ASSEMBLY

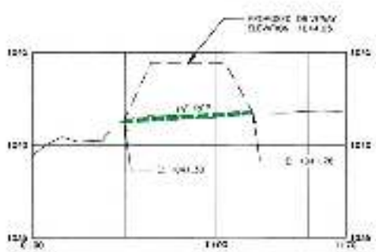
Site ID: TBD
PD-0 STREAM MITIGATION
DRAWING

Structure ID: TDC
Level: LEVEL

PROJECT NO.	SHEET NO.
M#22003.07	
TDC	
TDC	
TBD	

ACAD	JOB NO.
TBD	TBD
DRAWN BY	
TBD	
SCALE	
1:40	
DATE	
05.16.2022	X-X.X



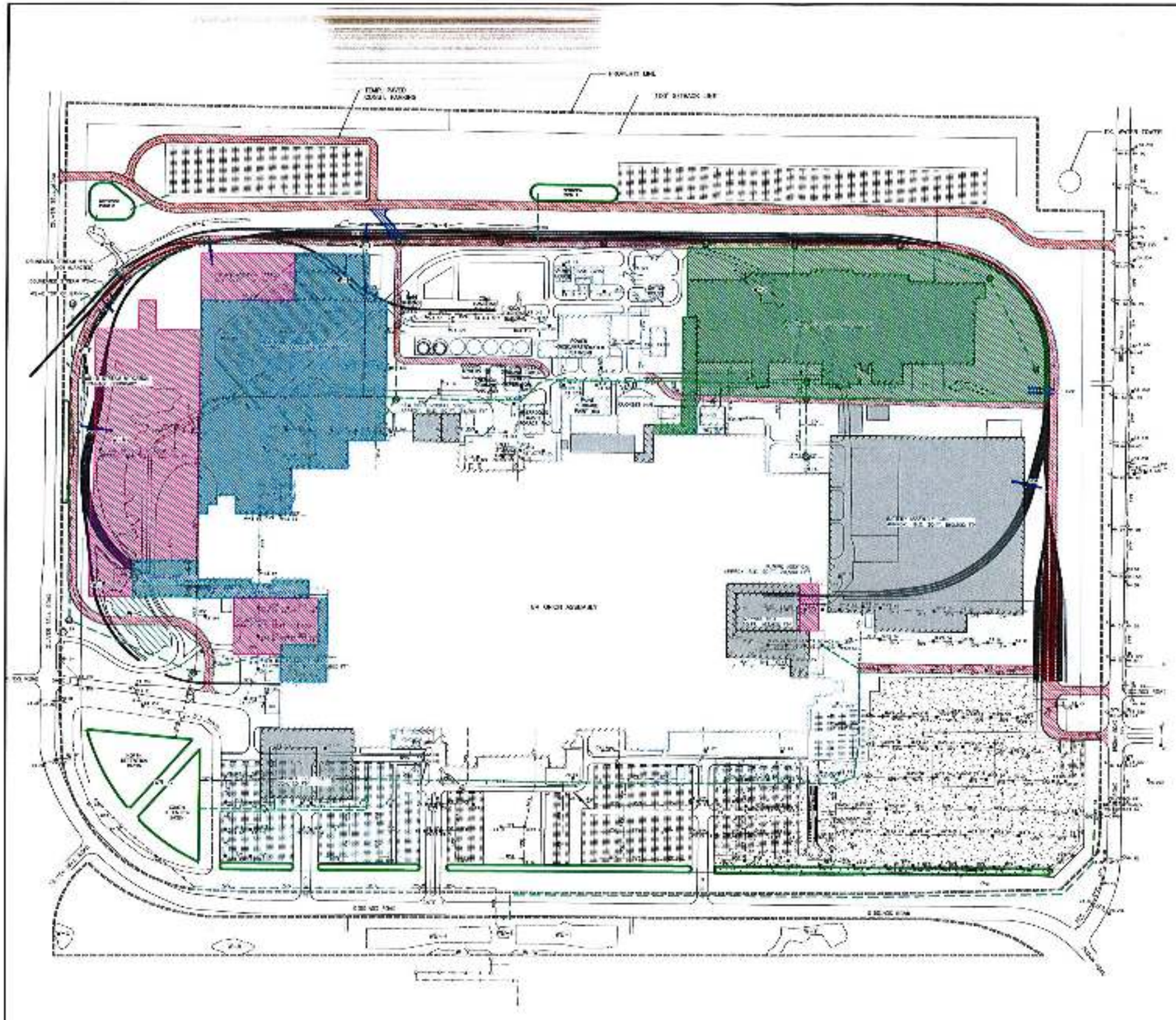


WADE TRIM

Sustainable Workplaces

General Motors Company

XX.X



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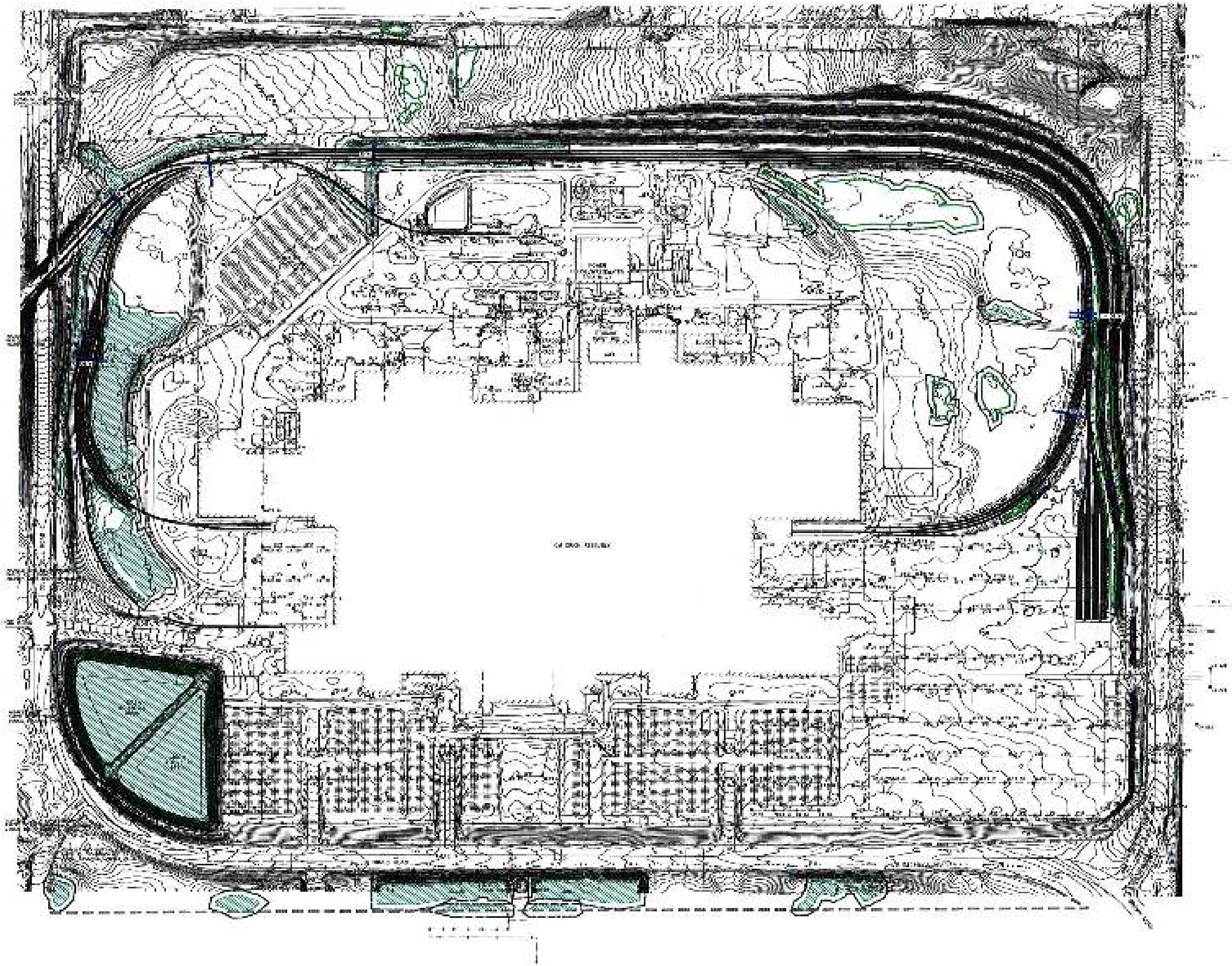
General Motors Company

SU_ORION_ASSEMBLY

XX.X



LEGEND

REGULATED WETLANDS

NON-REGULATED WETLANDS

EXISTING BUILDING

EXISTING STORM SEWER

PROPERTY LINE

Sustainable Workplaces

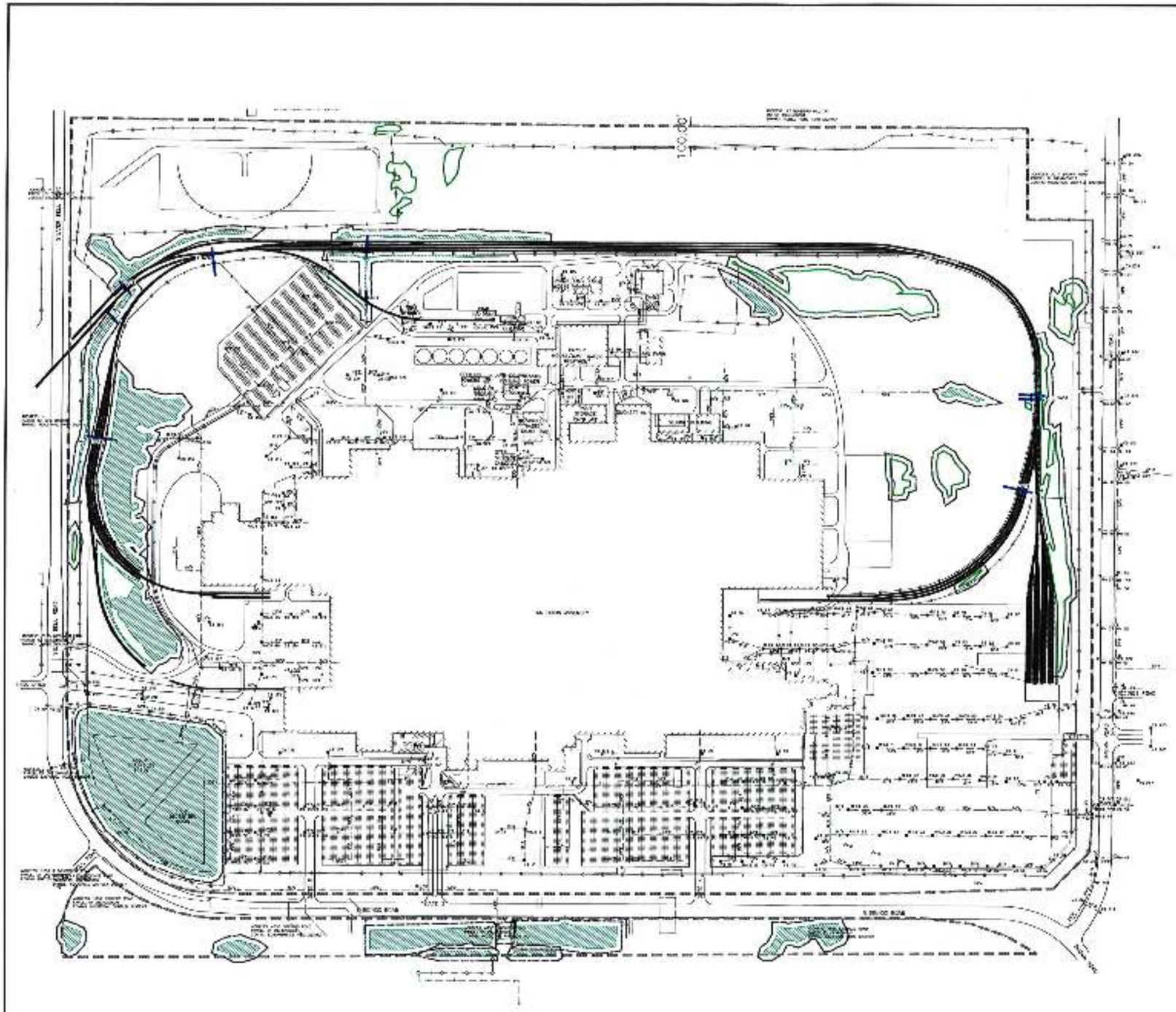
General Motors Company

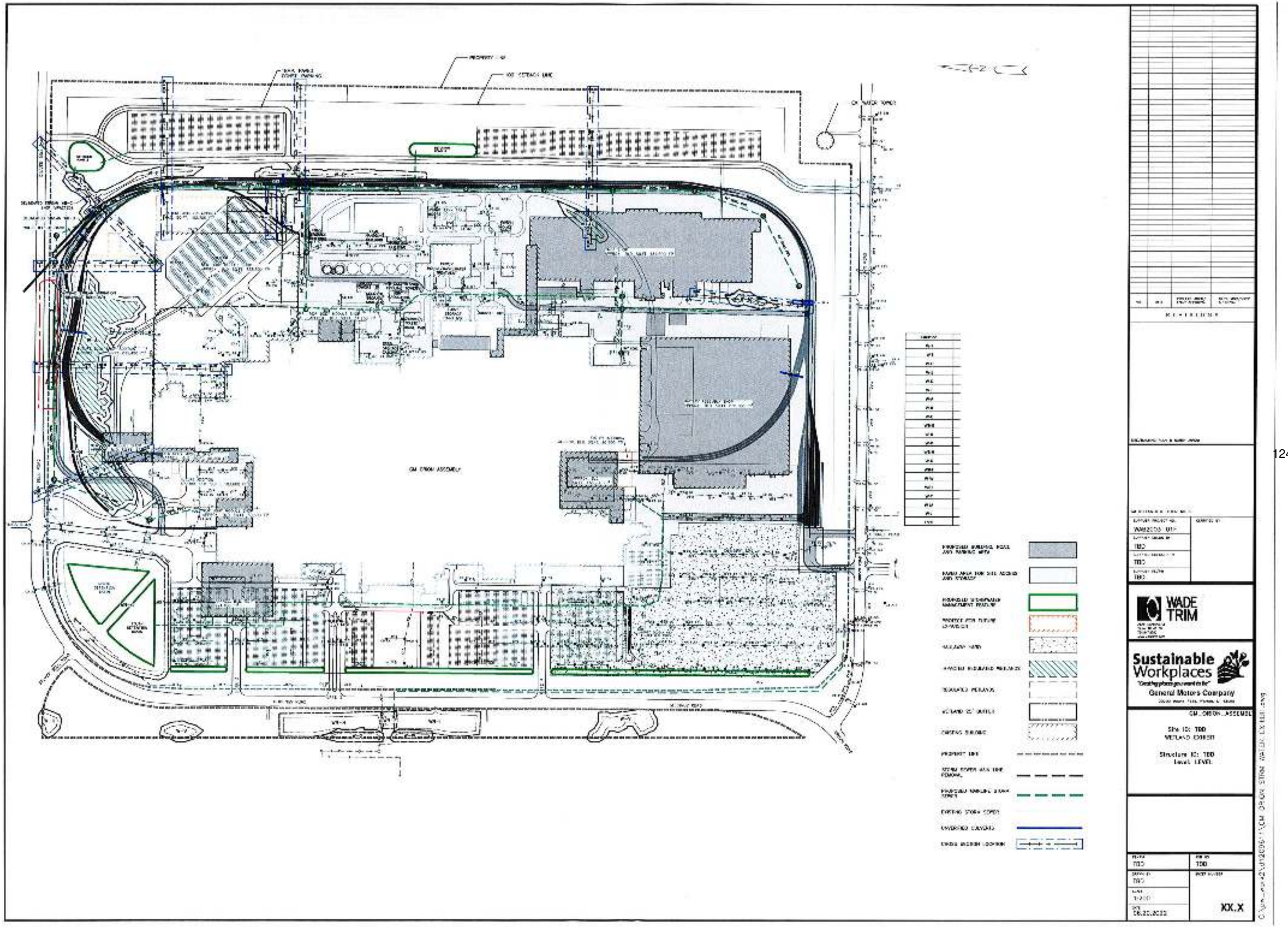
Site ID: TBD

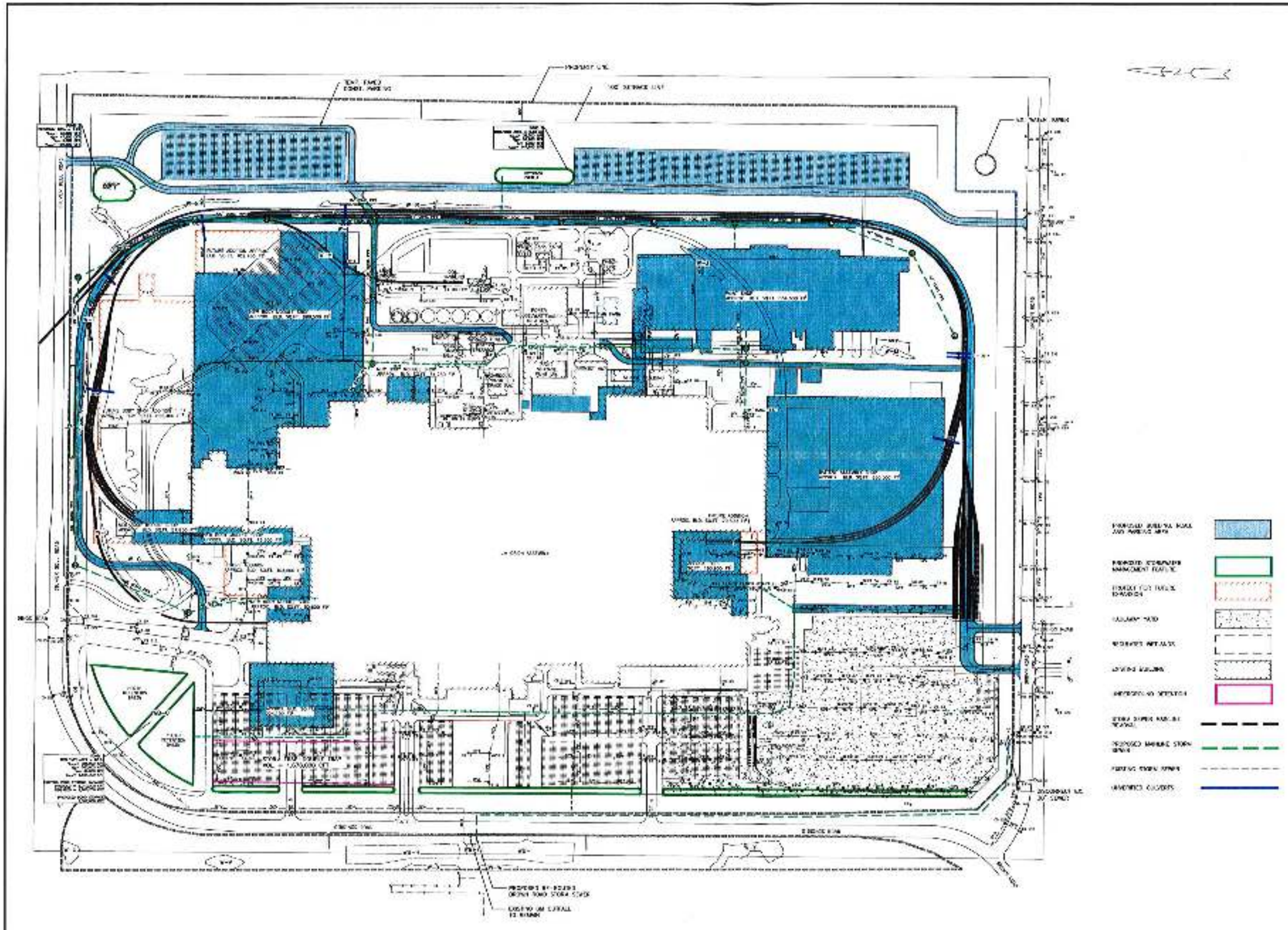
Structure ID: TBD

Level: LEVEL

TBD	TBD
TBD	
1:200	
10/20/2022	X X.X




WADE TRIM
Sustainable Workplaces
General Motors Company
GM_ORION_ASSEMBLY
Site ID: TBD
METLAND EXPERT
Structure ID: TBD
Level: LEVEL
XX.X

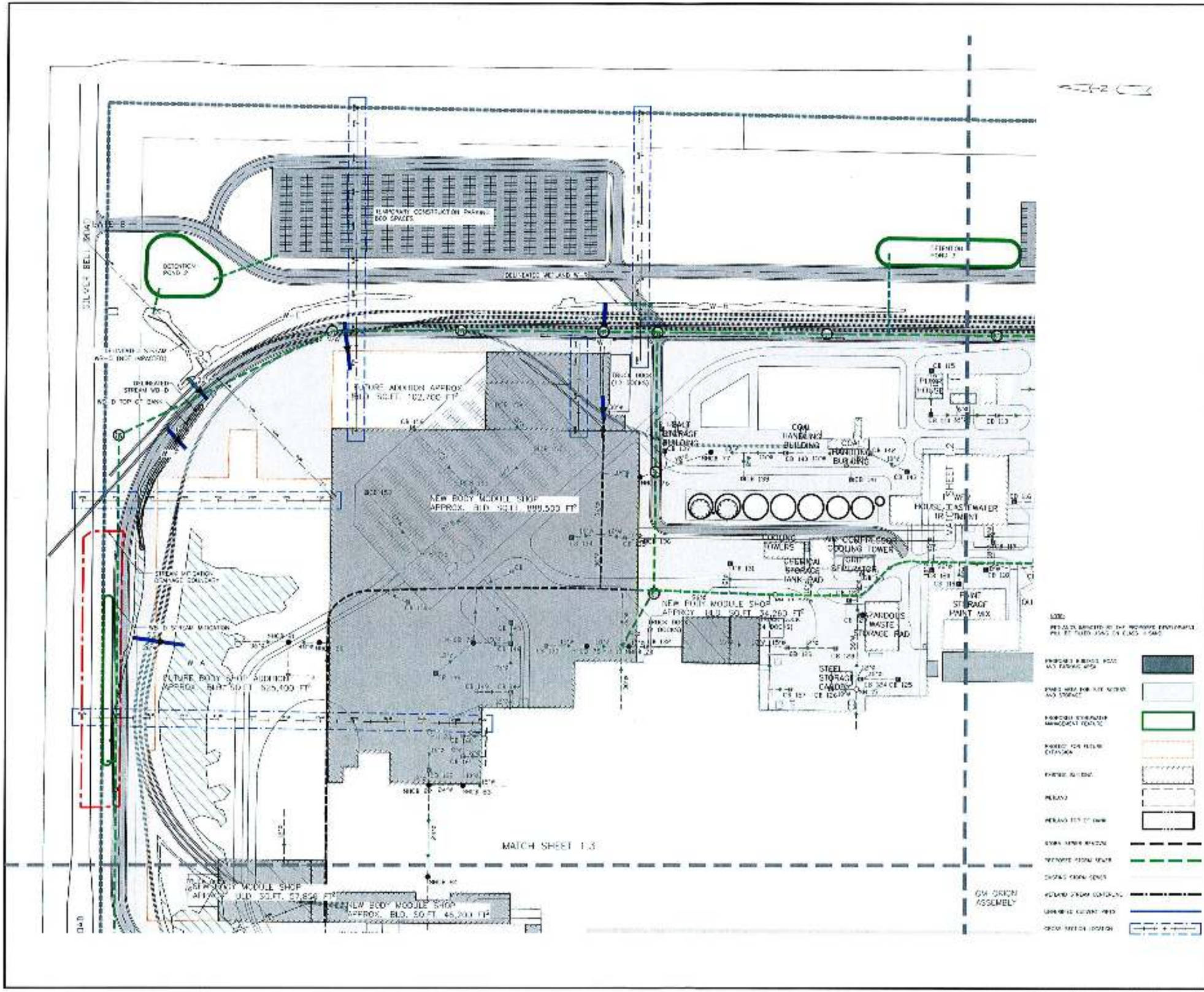


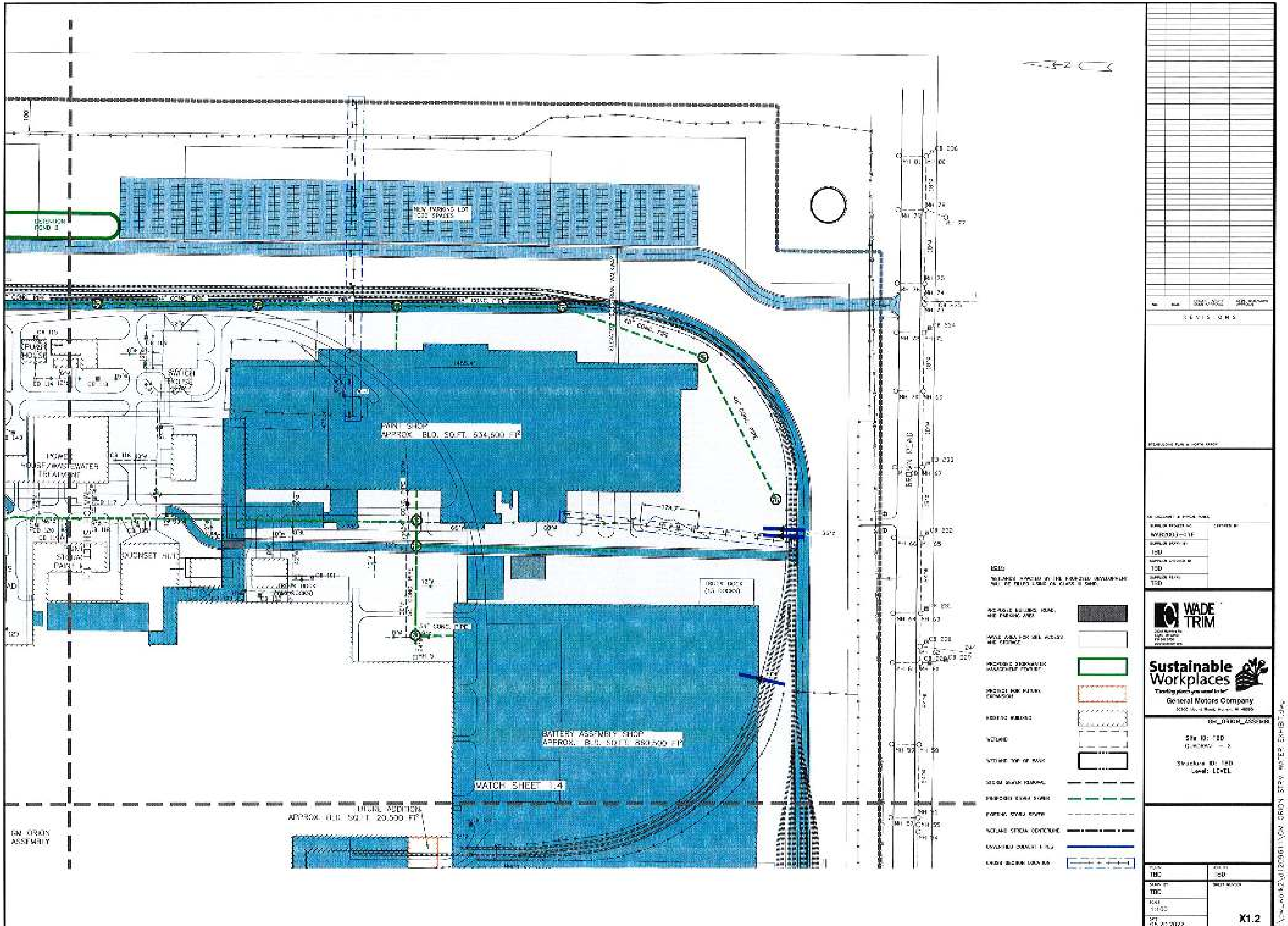
WADE TRIM

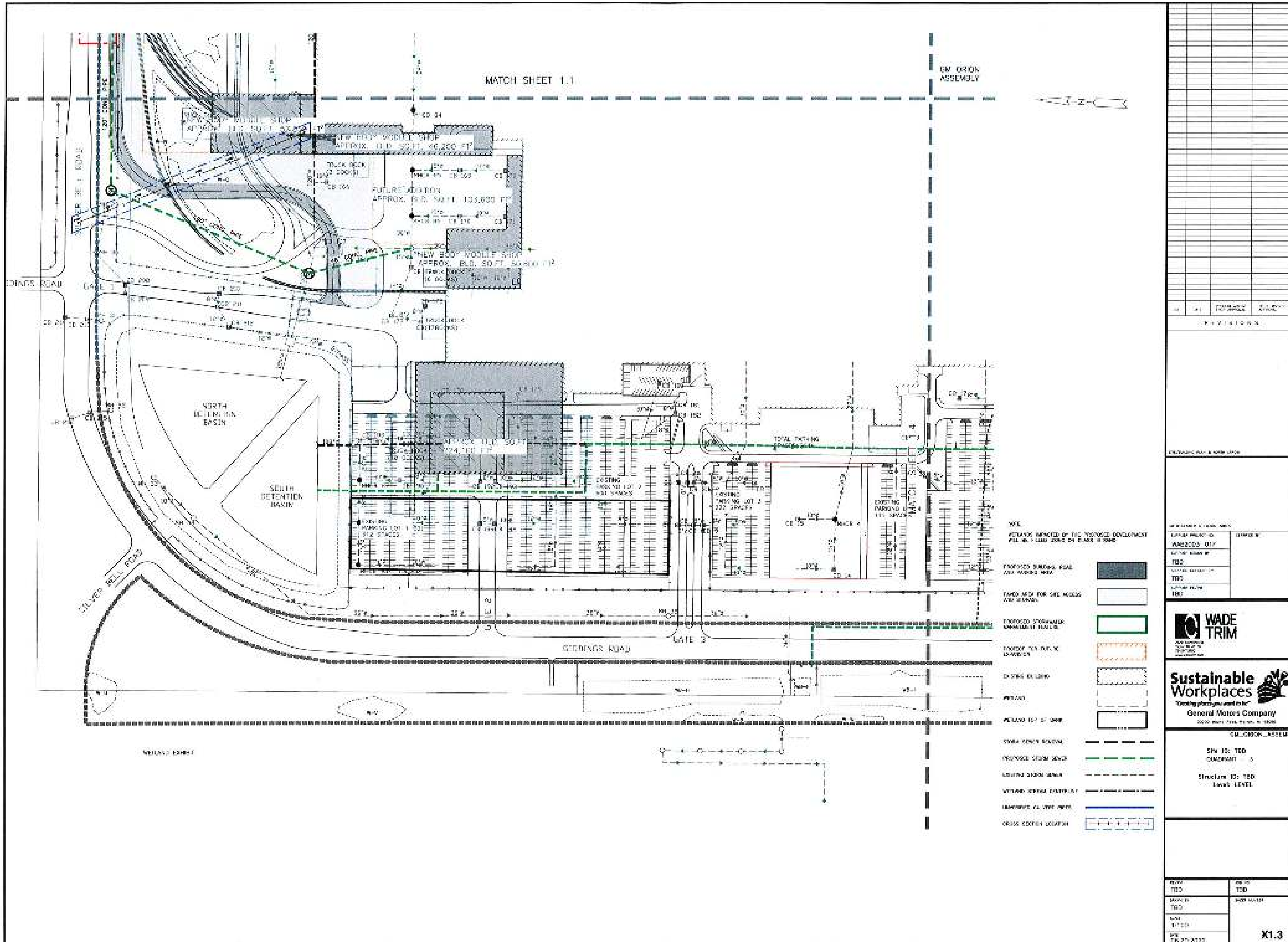
Sustainable Workplaces

General Motors Company

XX.X


SILVER BELL ROAD
DETENTION POND 2
DELINEATED WETLAND NO. 3
DELINEATED STREAM NO. D
TEMPORARY CONSTRUCTION PARKING 800 SPACES
FUTURE ADDITION APPROX BLD SQ FT 102,700 FT²
NEW BODY MODULE SHOP APPROX. BLD SQ FT 999,500 FT²
NEW PAINT MODULE SHOP APPROX BLD SQ FT 34,260 FT²
FUTURE BODY SHOP ADDITION APPROX BLD SQ FT 525,400 FT²
NEW BODY MODULE SHOP APPROX. BLD SQ FT 45,200 FT²
SALT STORAGE BUILDING
COAL HANDLING BUILDING
COAL STORAGE BUILDING
COOLING TOWERS
AIR COMPRESSOR COOLING TOWER
CHEMICAL STORAGE TANK PAD
HAZARDOUS WASTE STORAGE PAD
PAINT STORAGE PAINT MIX
HOUSE WASTEWATER TREATMENT
STEEL STORAGE CANOPY
STREAM MITIGATION DRAINAGE CORRIDOR
MATCH SHEET 1.3
GM ORION ASSEMBLY
WADE TRIM
Sustainable Workplaces
General Motors Company
Site ID: 103
Structure ID: 100
Level: LEVEL
X1.1


NEW PARKING LOT
DETENTION POND 3
PUMP HOUSE
SWITCH HOUSE
PAINT SHOP
APPROX. BLD. SQ.FT. 634,500 FT²
POWER HOUSE/WASTEWATER TREATMENT
QUONSET HUT
BATTERY ASSEMBLY SHOP
APPROX. BLD. SQ.FT. 880,500 FT²
MATCH SHEET 1.4
APPROX. BLD. SQ.FT. 20,500 FT²
GM ORION ASSEMBLY
BROWN ROAD
WADE TRIM
Sustainable Workplaces
General Motors Company
Site ID: TBD
Structure ID: TBD
Level: LEVEL
TBD
1:100
05.20.2022
X1.2
127


MATCH SHEET 1.1
GM ORION ASSEMBLY
NEW BODY MODULE SHOP
APPROX. BLD. SQ.FT. 46,200 FT²
FUTURE ADDITION
APPROX. BLD. SQ.FT. 135,600 FT²
NEW BODY MODULE SHOP
APPROX. BLD. SQ.FT. 50,800 FT²
GIDDINGS ROAD
GATE 1
NORTH DETENTION BASIN
SOUTH DETENTION BASIN
SILVER BELL ROAD
GIDDINGS ROAD
GATE 2
MATCH SHEET
WETLAND EXHIBIT
WADE TRIM
Sustainable Workplaces
General Motors Company
X1.3

128

FUTURE ADDITION
APPROX. BLD. SQ.FT. 20,500 FT²

MATCH SHEET 1.1

APPROX. B.A.
SQ.FT. 183,000 FT²

GM DIXON ASSEMBLY

EXISTING PARKING LOT 1
601 SPACES

EXISTING PARKING LOT 1

DIBBINS ROAD

BROWN ROAD

MATCH SHEET 1.4

SITE:
AREAS IDENTIFIED BY THE PROPOSED DEVELOPMENT ARE TO BE FILLED (SEE CIVIL PLANS)

PROPOSED BUILDING, ROAD AND PARKING AREA

EXISTING AREA FOR SITE WORKS AND SWALES

PROPOSED STORMWATER MANAGEMENT FEATURE

PROPOSED BUILDING EXPANSION

EXISTING BUILDING

WETLAND

WETLAND EDGE OF BANK

EXISTING STORM SEWERS

PROPOSED STORM SEWER

EXISTING STORM SEWER

WETLAND STORM CONTOURS

UNDERGROUND GAS LINES

OVERHEAD HYDRO LINES

REVISIONS

WA9503-01F

TBD

TBD

TBD

WADE TRIM

Sustainable Workplaces

General Motors Company

GM_DIXON_ASSEMBLY

Site ID: TBD
Component = 5

Structure ID: TBD
Level: LEVEL

TBD

TBD

TBD

TBD

X1.3

GRETCHEN WHITMER
GOVERNOR

STATE OF MICHIGAN
DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY
LANSING

EGLE

LIESL EICHLER CLARK
DIRECTOR

May 24, 2022

VIA EMAIL AND U.S. MAIL

John Maher, General Motors-Orion Assembly
4555 Giddings Road
Lake Orion, Michigan 48359

Dear John Maher:

SUBJECT: Wetland Identification Report
Wetland Identification Site Name: 63-GM-Orion Township
MiWaters Submission Number: HPG-HESW-13EXX

The Department of Environment, Great Lakes, and Energy's (EGLE) Water Resources Division (WRD) conducted a Level 3 Wetland Identification Program (WIP) review of an assessment area consisting of approximately 200 acres on property [Tax ID numbers: 09-34-200-006; 09-34-400-011] located in Town 04N, Range 10E, Section 34; Orion Township (Figure 1) during May 9, 2022. The review was conducted in accordance with Part 303, Wetlands Protection, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA); and Rule 4(1), Wetland Identification and Assessment (R 281.924), of the Administrative Rules for Part 303. This is a report of our findings in response to your WIP application.

Staff from the WRD reviewed pertinent information such as historical aerial imagery, topographic mapping data, soils survey data, and surface hydrology data. The on-site investigation was conducted with your wetland consultant present and included a review of plants, hydrology, and soils. Staff confirm, in part, the wetland boundary lines delineated by your consultant. Several relatively small wetland areas near the southern and eastern edges of the WIP site were overlooked and omitted by the consultant. Evidence showed that the areas exhibit wetland hydrology during a typical growing season.

The site maps (Figures 2, 3A, 3B) of the WIP assessment area were created by combining information from your consultant and the WRD. The new maps identify areas containing regulated wetland, unregulated wetland, and non-wetland (upland).

Eighteen wetlands (i.e., A, B, C, D, E, F, I, J, M, R, V, W, X, Y, FF, HH, II, H), within the assessment area are regulated by the WRD because of wetland size and/or contiguity to a pond, lake, or stream. For the areas [approx. 9 9 acres total on site] identified as regulated wetland on the site maps (Figures 2, 3A, 3B), please be advised that any of the following activities require a permit under Part 303:

a) Deposit or permit the placing of fill material in a regulated wetland.
b) Dredge, remove, or permit the removal of soil or minerals from regulated wetland.
c) Construct, operate, or maintain any use or development in a regulated wetland.

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Michigan.gov/EGLE • 800-662-9278

d) Drain surface water from a regulated wetland.

The unregulated wetlands are not regulated by the WRD because they are not contiguous to the Great Lakes, an inland lake or pond, or a river or stream, and are less than 5 acres in size. For those areas identified as unregulated wetland or non-wetland (upland) on the site maps (Figures 2, 3A, 3B), the WRD lacks jurisdiction under Part 303 for activities occurring there.

This Wetland Identification Report is limited to findings pursuant to Part 303 and does not constitute a determination of jurisdiction under other programs administered by EGLE. Any land use activities undertaken within the assessment area may be subject to regulation pursuant to the NREPA under the following programs:

Part 91, Soil Erosion and Sedimentation Control
Part 301, Inland Lakes and Streams

Please be aware that this Wetland Identification Report does not constitute a determination of the jurisdiction under local ordinances or federal law. The United States Army Corps of Engineers (USACE) retains regulatory authority over certain wetlands pursuant to Section 404 of the federal Clean Water Act (CWA), and specifically those wetlands associated with traditionally navigable waters of the state. Navigable waters are generally the Great Lakes, their connecting waters, and river systems and lakes connected to these waters. In other areas of the state, the WRD is responsible for identification of wetland boundaries for purposes of compliance with the CWA under an agreement with the United States Environmental Protection Agency. Your assessment area is unlikely to be within those areas also regulated by the USACE. Additional information may be obtained by contacting the USACE at 313-226-2218.

You may request the WRD reassess the wetland boundaries and regulatory status of wetlands within any portion of the assessment area, should you disagree with the findings, within 60 days of the date of this report. A written request to reassess the Wetland Identification assessment area must be accompanied by supporting evidence with regard to wetland vegetation, soils, or hydrology that are different from, or in addition to, the information relied upon by WRD staff in preparing this report. The request should be submitted to:

Wetland Identification Program
Department of Environment, Great Lakes, and Energy
Water Resources Division
P.O. Box 30458
Lansing, Michigan 48909-7958

Please use the MiWaters submission number assigned to this project site if submitting a permit application or otherwise corresponding with our office.

The findings contained in this report do not convey, provide, or otherwise imply approval of any governing act, ordinance, or regulation, nor does it waive the obligation to acquire any

applicable federal, state, county, or local approvals. This Wetland Identification Report is not a permit for any activity that requires a permit from EGLE.

The findings contained in this report are binding on EGLE until May 24, 2025, a period of three years from the date of this Wetland Identification Report unless a reassessment has been conducted. Please contact me at GyekisK@Michigan.gov; 517-243-5002; or EGLE, P.O. Box 30458, Lansing, Michigan 48909-7958, if you have any questions regarding this report.

Sincerely,

Keto Gyekis
Wetland Identification Program Coordinator
Water Resources Division

Enclosures
cc: Oakland County Soil Erosion Enforcement Agent (CEA)
Oakland County Health Department
Orion Township Clerk
Anthony DeMars, GHD Services, Inc.
Andy Hartz, EGLE
Robert Primeau, EGLE

Figure 1.
EGLE Wetland Identification Location
Orion Township
WIP - HPG-HESW-13EXX

Figure 2.
EGLE Wetland Identification Overview
GM
Orion Township
WP - HPG-HESW-13EXX

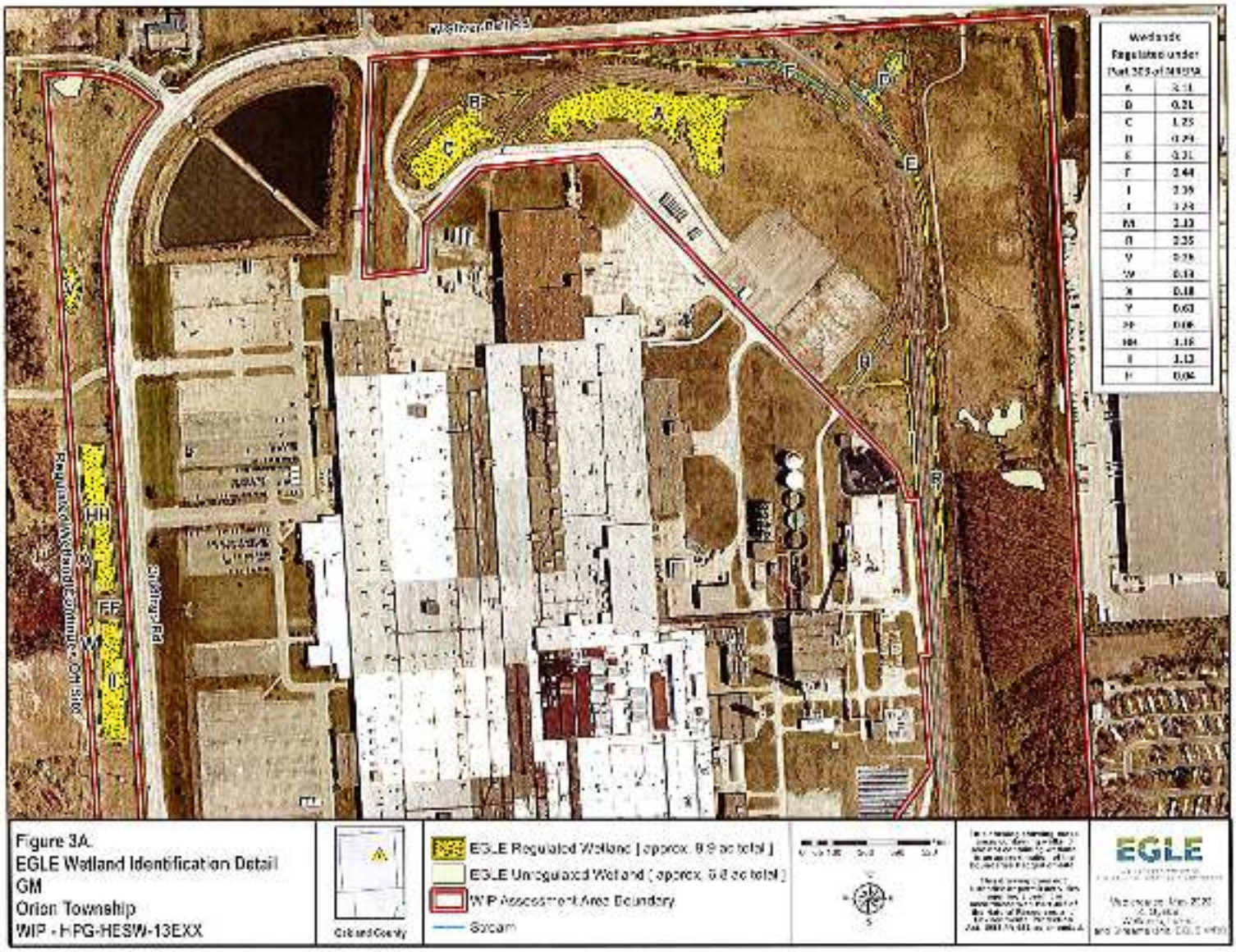

Figure 3A.
EGLE Wetland Identification Detail
GM
Orion Township
WIP - HPG-HESW-13EXX


Wetlands
Regulated under
Part 303 of NREPA
A 3.31
B 0.21
C 1.75
D 0.29
E 0.21
F 0.45
I 0.16
J 0.22
M 0.13
R 0.95
V 0.26
W 0.13
X 0.18
Y 0.61
FF 0.06
H-1 1.10
I 1.12
M 0.04
Brown Rd
Figure 3B.
EGLE Wetland Identification Detail
GM
Orion Township
WIP - HPG-HESW-13EXX
EGLE Regulated Wetland [approx. 6.9 ac total]
EGLE Unregulated Wetland [approx. 6.8 ac total]
WIP Assessment Area Boundary
EGLE

Wetland Delineation Report

GM Orion Assembly

General Motors, LLC

May 5, 2022

→ The Power of Commitment

Contents

Table index

Appendices

1. Introduction

GHD Services, Inc. (GHD) was retained by General Motors LLC (GM) to conduct an on-site delineation of wetlands and waters for the GM Orion Assembly Plant (Project) located at 4555 Giddings Road, Orion Township, Oakland County, Michigan. GM proposes major expansion of the Orion Assembly plant within the existing property boundaries of the Orion facility. The location of the proposed expansion has not yet been finalized but is anticipated to impact much of the undeveloped portions of the Orion facility. This report describes the Project site conditions, the wetland and waterbody delineation approach and methodology, and summarizes the results of the on-site wetland and waterbody delineation.

2. Contact Information

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3. Site Description

3.1 Project Location

The Project is in Sections 34 and 35, Township 4 North, Range 10E, Orion Township, Oakland County, Michigan. The project totals approximately 458 acres with most of the Project bounded on the north by West Silver Bell Road; the west by Giddings Road, and the south by Brown Road. The Project also includes two parcels along the west side of Giddings Road. The latitude/longitude centroid of the Project is 42.7156/-83.2598. The location of the project is shown on Appendix, A Figure 1.

3.2 Land Use & Plant Communities

As shown on Appendix A, Figure 2, the west 1/3 and central portions of the Project are industrial development associated with the assembly plant. The developed portions of the Project include buildings, offices, parking, maintained turf and stormwater retention basins. The undeveloped northeast, southeast and east central portion of the Project is a mixture of abandoned rail, disturbed grassland, forest, woodland, and wetland. Wetland features are associated with ditches and drainage swales that border the abandoned rail. The northeast corner of the Project includes a former recreational use area with two baseball diamonds, an abandoned building, and a fitness trail that extends along the east boundary through the wooded area. The narrow strip of land located west of Giddings Road is a mixture of grassland, wetland, and forest edge. This area is bisected by an overhead electric transmission line and is crossed by several access roads that serve lots for manufacturing businesses to the west. Three stormwater basins are located near the center of this narrow strip.

Plant communities on the undeveloped potions of the Project include disturbed grassland dominated by introduced grasses and early successional forb species. Wetland communities present include wet meadow, shallow emergent marsh, shrub swamp and forested wetland. An 20-acre area of forest and woodland is located along the east boundary and comprises the only portion of the Project area that is undisturbed. The northern half of the forest is mature oak-hickory forest, while the southern half of the forest is a mixture of disturbed early successional forest and woodland.

3.3 Topography

Topographic features and aerial imagery are shown on Appendix A, Figure 2. Elevations on the project area range from approximately 1,128 feet above mean sea level (amsl) on the southeast corner of the Project (near the water tower) to approximately 1000 feet amsl on the west boundary of the Project. Significant modifications have been made to topography from cut and fill activities associated with the railroad and assembly plant development. The steepest slopes are located along the south and east side of the Project where a series of terraces extend upslope from the edge of the abandoned railroad tracks. Slopes in these areas exceed 30%. Topography elsewhere on the Project is gently sloping with occasional short, steep slopes along roads and ditches.

3.4 Soils

The NRCS soil map units are shown on Appendix A, Figure 3 and summarized in Table 3 with respect to drainage class and hydric rating. Soils on the Project have undergone significant alteration from cut and fill associated with development of the Orion Assembly. In addition to the Orion Assembly, alterations to soils include construction of roads, rail and terracing of hillslopes. Most of the Project is mapped as Oshtemo-Boyer loamy sand and Udipsamments and if surveyed today would be mapped as Urban Land. Secondary soil map units include Oshtemo-Boyer loamy sand, Marlette sandy loam, Riddles sandy loam, and Sebewa loam. The primary areas of hydric soils (see Appendix A, Figure 3) are along the west boundary of the Project, consisting of Houghton and Adrian mucks, on the north-central part of the Project, consisting of Granby loamy sand; and on the southeast corner of the Project, consisting of Colwood loam.

Table 1 Summary of NRCS Soils and Hydric Rating

Soil Map Unit Name	Drainage Class	Hydric Rating
Brookston and Colwood loams	Very poorly drained	96
Capac sandy loam, 0 to 4 percent slopes	Somewhat poorly drained	4
Gilford sandy loam, till plain, 0 to 2 percent slopes	Poorly drained	95
Granby loamy sand	Very poorly drained	94
Houghton and Adrian mucks	Very poorly drained	100
Kibbie fine sandy loam, 0 to 4 percent slopes	Somewhat poorly drained	6
Lenawee silty clay loam, 0 to 1 percent slopes	Poorly drained	93
Marlette sandy loam, 1 to 6 percent slopes	Well drained	2
Oakville fine sand, 0 to 6 percent slopes	Moderately well drained	2
Oshtemo-Boyer loamy sands, 0 to 6 percent slopes	Well drained	5
Oshtemo-Boyer loamy sands, 12 to 40 percent slopes	Well drained	0
Oshtemo-Boyer loamy sands, 6 to 12 percent slopes	Well drained	4
Riddles sandy loam, 1 to 6 percent slopes	Well drained	5
Riddles sandy loam, 6 to 12 percent slopes	Well drained	2
Sebewa loam, disintegration moraine, 0 to 2 percent slopes	Poorly drained	94

Soil Map Unit Name	Drainage Class	Hydric Rating
Spinks loamy sand, 0 to 6 percent slopes	Well drained	9
Udipsamments, undulating	Excessively drained	0
Wasepi sandy loam, 0 to 3 percent slopes	Somewhat poorly drained	4

3.5 Hydrography

The National Hydrography Dataset (NHD) and National Wetland Inventory (NWI) data are shown on Appendix A, Figure 4. Additionally, Part 303 Wetlands data from the Department of Environment, Great Lakes, and Energy (EGLE) are shown on Appendix A, Figure 5.

The NHD shows one unnamed stream flowing from the west boundary of the Project to Carpenter Lake. A second unnamed stream is located approximately 700 feet west of the southwest boundary of the Project and flows north to Carpenter Lake. A third unnamed stream is located approximately 1,300 feet east of the northeast corner of the Project and flows north to an unnamed pond. The NHD shows two waterbody features on the Northwest corner of the Project, which corresponds to a two-cell stormwater retention basin.

The NWI identifies four waterbodies on the Project, which includes the stormwater basin on the northwest corner, two stormwater basins west of Giddings Road, and the small coal pile process treatment basin on the east side of the Project. The NWI identifies five wetlands on the Project, which includes one palustrine emergent marsh (PEM) near the north boundary, one forested/shrub wetland (PSS) on the southeast corner, and two PEM wetlands and one PSS wetland on the west side of Giddings Road.

The Project is located within three Hydrologic Unit Code (HUC) watersheds; the Sashabaw Creek Watershed (HUC-040900030102), which drains all but the northeast corner; the Paint Creek Watershed (HUC-040900030110), which drains the northeast corner; and the Galloway Creek-Clinton River Watershed (HUC-040900030111), which forms a watershed divide with the two other watersheds near the east boundary of the Project. These watersheds are in the St. Clair-Detroit watershed of Lake Huron. The boundaries of the three watersheds are shown on Appendix A, Figure 4. It should be noted that portions of the Paint Creek Watershed on the Northeast corner of the Project drain southwest towards the Orion Facility via several stormwater conveyance channels. This runoff discharges into several inlet pipes and then is routed to the stormwater basins on the northwest corner of the Project.

4. Survey Methodology

4.1 Desktop Review and Preliminary Wetland and Waterbody Survey Report

GHD completed a desktop review of spatial data and databases to identify the potential location of wetlands and waterbodies on the Project. The desktop review included review of NWI, NRCS Soil Survey, NHD, LiDAR contour elevation data and aerial imagery. The boundaries of potential wetland and waterbody features identified by the desktop review were delineated onto a base map, which was used to guide the on-site delineation.

The desktop review identified forty-five potential wetland or waterbody features, which corresponded to concave-shaped topographic features, drainageways, ditches, ponded or saturated areas, and areas identified as containing hydric soils or wetlands on the EGLE Map Viewer. Each potential wetland or waterbody feature was then verified as confirmed wetland, potential wetland, or non-wetland during in early March 2022. The Preliminary Wetland and Waterbody Survey Report (GHD, 2022) (Preliminary Report) identified twenty-four confirmed wetlands, eight potential wetlands, and eighteen non-wetland areas. A significant number of these features included constructed stormwater basins and conveyance channels.

4.2 Field Survey

GHD recognized potential waters of the United States, including wetlands, as those defined in 33CFR 328.3. As applicable to this effort, 33 CFR 328.3(b) defines wetlands as "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions." Hydrophytic vegetation ratings assigned by the National Wetland Plant List (NWPL) indicator ratings for the Midwest Region were used and include obligate (OBL), facultative wetland (FACW) and facultative (FAC), facultative upland (FACU) and upland (UPL).

GHD followed the methodology for delineating wetlands outlined in the *Corps of Engineers Wetlands Delineation Manual* (1987) and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Midwest Region* (Version 2.0) (2010). The delineation of streams, ditches and other waterbodies was recorded at the Ordinary High-Water Mark (OHWM). Per 33 CFR 328.3(e), the OHWM is defined as "(the) line on the shore established by the fluctuations of water and indicated by physical characteristics such as clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding area."

GHD completed a preliminary wetland and waterbody survey (preliminary survey) on March 1st and 2nd, 2022. The purpose of the preliminary survey was to verify the presence or absence of wetlands and waterbodies identified during the desktop review. The preliminary survey was conducted outside the normal growing season under frozen soil conditions. These data were used to guide the on-site delineation performed April 25th through April 28th. This delineation was performed during the normal growing season under normal conditions.

Wetland and waterbody boundaries were delineated using a Trimble Global Positioning System (GPS) capable of sub-meter accuracy (Appendix A, Figure 6) and photographs were taken in each cardinal direction for every wetland and upland sample point and upstream and downstream for each waterbody (Appendix B). Soil pits were excavated to identify hydric or non-hydric soil characteristics and wetland determination data sheets were completed for each wetland and its corresponding upland location (Appendix C).

5. Results

GHD collected 57 sample points (wetlands and uplands) and delineated the boundaries of 25 wetlands and 10 waterbodies. Appendix A, Figure 6 provides the location of the sample points, wetlands, and waterbodies delineated during the field survey. Photographs of representative sample points documenting key wetland and waterbody features and adjacent upland areas is provided in Appendix B. GHD collected photos at each sample point and waterbody feature and can provide additional photo documentation upon request. Wetland Determination Data Sheets for each of the 57 sample points is provided in Appendix C.

5.1 Wetlands

Table 2 summarizes the 25 wetlands delineated on-site. This table includes feature identification (Feature ID), feature type, Cowardin code, and size (acres).

Table 2 Summary of Wetlands Delineated On-Site

ID	Feature Type	Cowardin	Acres
W-A	Wetland	PEM	3.11
W-B	Stormwater Conveyance	PEM	0.21
W-C	Wetland	PEM	1.25

ID	Feature Type	Cowardin	Acres
W-N	Wetland	PEM	2.7
W-O	Stormwater Conveyance	PEM	0.04
W-P	Wetland	PFO/PEM	1.87

ID	Feature Type	Cowardin	Acres
W-D	Stormwater Conveyance	PEM	0.29
W-E	Stormwater Conveyance	PEM	0.21
W-F	Stormwater Conveyance	PFO/PSS	0.55
W-G	Stormwater Conveyance	PEM	0.05
W-H	Stormwater Conveyance	PEM	0.05
W-I	Stormwater Conveyance	PEM	0.16
W-J	Stormwater Conveyance	PEM	0.23
W-K	Wetland	PEM	0.25
W-L	Wetland	PEM	0.41
W-M	Wetland	PEM	0.13

ID	Feature Type	Cowardin	Acres
W-Q	Wetland	PFO	0.46
W-R	Stormwater Conveyance	PEM	0.35
W-S	Wetland	PEM	0.33
W-T	Wetland	PEM	0.09
W-U	Wetland	PEM	0.19
W-V	Wetland	PEM	0.26
W-W	Wetland	PEM	0.13
W-X	Wetland	PEM	0.18
W-Y	Wetland	PEM	0.61

Following the Cowardin classifications, twenty-one (21) of the wetlands delineated were observed as Palustrine Emergent (PEM), one (1) as Palustrine Scrub-Shrub (PSS), one (1) as Palustrine Forested (PFO), one (1) is a combination of PSS and PFO, and one (1) is a combination of PFO and PEM.

Wetland A (W-A) was the largest wetland delineated on-site (3.11-acres). Wetland N (W-N) is 2.7-acres. Wetland P (W-P) is 1.87-acres, and Wetland C (W-C) is 1.23-acres in size. Twelve (12) wetlands are less than 0.25-acres, seven (7) wetlands are less than 0.50-acres, and two (2) wetlands are less than 1-acre in size.

Ten (10) of the wetlands were identified as stormwater conveyances. These wetlands are associated with constructed ditches that are located parallel to railroad tracks or roads. Except for Wetland B (W-B) and Wetland D (W-D) these ditches possess the three mandatory criteria for a wetland (hydrophytic vegetation, hydric soils, and hydrology), but do not possess any characteristics of a water course (e.g., they lack an Ordinary High Water Mark [OHWM], standing or flowing water, or scouring within the bottom of the ditch contour). The remaining wetlands are not associated with a ditch (i.e., stormwater conveyance), but occur naturally in low-lying areas across the landscape.

Wetland F (W-F [Appendix A, Figure 6B]) is wetland complex consisting of portions dominated by forest vegetation (PFO) and portions dominated by shrub vegetation (PSS). In these respective areas, cottonwood (*Populus deltoides*) and hawthorn (*Crataegus crus-galli*) were the dominant forest vegetation and sandbar willow (*Salix interior*) was the dominant shrub vegetation. Throughout the wetland, reed canary grass (*Phalaris arundinacea*) dominated the herbaceous layer. The soils exhibited hydric characteristics in the form of a depleted matrix and hydrology was observed by the presence of surface water, high water table, water marks, drift deposits, and water-stained leaves. These and additional data are provided on the Wetland Determination Data Sheets for Sample Points 12 and 14 (Appendix C). W-F was observed as stormwater conveyance associated with a ditch located between West Silverbell Road and railroad tracks.

Wetland P (W-P [Appendix A, Figure 6C and Figure 6D]) is a wetland complex consisting of portions dominated by forest vegetation (PFO) and portions dominated by emergent (PEM) vegetation. In these respective areas, box elder (*Acer negundo*) was the dominant forest vegetation (PFO) and reed canary grass and common reed (*Phragmites australis*) were the dominant herbaceous vegetation. The soils exhibited hydric characteristics in the form of a depleted matrix and hydrology was observed by the presence of high water table and saturation. These and additional data are provided on the Wetland Determination Data Sheets for Sample Point 33 (Appendix C). W-P was observed as a stormwater conveyance associated with a ditch located parallel to railroad tracks on the southern-most portion of the site.

Wetland Q (W-Q [Appendix A, Figure 6D]) is located southeast of W-P and is a forested wetland (PFO) dominated by cottonwood, with green ash (*Fraxinus pennsylvanica*) observed in a non-dominant percent-cover. The soils exhibited hydric characteristics in the form of a depleted matrix and hydrology was observed by the presence high water table, saturation, and algal mat or crust. W-Q is located on a constructed terrace located at the southern-most portion of the site. These and additional data are provided on the Wetland Determination Data Sheets for Sample Points 36 and 38 (Appendix C).

The PEM wetlands observed as stormwater conveyances shared similar vegetative, hydrologic, and soil characteristics. Common reed, reed canary grass lake sedge (*Carex lacustris*), Canada bluegrass (*Poa compressa*), cattail hybrid (*Typha x glauca*), and path rush (*Juncus tenuis*) are common wetland species observed in these wetlands. Soils typically exhibited hydric characteristics in the form of a depleted matrix and/or depleted below a dark surface. Hydrology was typically exhibited by the presence of surface water, high water table, and/or saturation.

The other PEM wetlands shared similar vegetative, hydrologic, and soil characteristics among each other, but exhibited a more diverse plant composition than observed in the PEM wetlands associated with stormwater conveyances. Kentucky bluegrass (*Poa pratensis*), Canada bluegrass, reed canary grass, common reed, perennial rye grass (*Lolium perenne*), meadow foxtail (*Alopecurus pratensis*), tussock sedge (*Carex stricta*), and fowl bluegrass (*Poa palustris*). Soils typically exhibited hydric characteristics in the form of a depleted matrix. Hydrology was typically exhibited by the presence of surface water, high water table, saturation, water-stained leaves, inundation visible on aerial imagery, and/or geomorphic position.

5.2 Waterbodies

Table 3 summarizes the waterbodies delineated on-site. The table includes a description of each feature, data pertaining to individual characteristics, size (linear feet/acres), description, and relevant notes.

Table 3 Summary of Waterbodies Delineated On-Site

ID	Top of Bank (Width)	Top of Bank (Depth)	Water Depth	Size	Description	Notes
WB-A	2 ft.	6 in.	3 in.	45 ft.	Discontinuous Stream Channel	Located within Wetland A (W-A)
WB-B	1 ft.	7 in.	3 in.	56 ft.	Discontinuous Stream Channel	Located within constructed ditch
WB-C	10 in.	1 ft.	3 in.	314 ft.	Discontinuous Stream Channel	Located within constructed ditch
WB-D	12 ft.	1 ft.	3 in.	463 ft.	Discontinuous Stream Channel	Located within constructed ditch
WB-E	12 ft.	1.5 ft.	3 in.	120 ft.	Discontinuous Stream Channel	Located within constructed ditch
WB-F	-	-	-	0.06 ac.	Stormwater Basin	Located beneath electrical tower
WB-G	-	-	-	9.72 ac.	Stormwater Basin	Constructed
WB-H	-	-	-	1.18 ac.	Stormwater Basin	Constructed
WB-I	-	-	-	1.12 ac.	Stormwater Basin	Constructed
WB-J	-	-	-	0.08 ac.	Stormwater Basin	Constructed

Five (5) discontinuous stream channels were delineated (WB-A, WB-B, WB-C, WB-D, WB-E). Each of these discontinuous stream channels were observed as ephemeral water features with no surficial connectivity to any watercourse, tributary, or stream. WB-A is located entirely within the delineated boundaries of Wetland A (W-A). Each of the remaining discontinuous stream channels (WB-B, WB-C, WB-D, and WB-E) have channels located within constructed ditches that run parallel to railroad tracks and are also located within delineated wetland boundaries.

WB-F is a stormwater basin associated with a depressional area located immediately beneath an electric utility line tower that collects seasonal rainfall or snowmelt. WB-F has no outlet to adjacent wetlands and no other surficial connectivity to a watercourse, tributary, or stream. WB-G is a large, constructed stormwater basin located directly east

of Giddings Road and south of West Silverbell Road in the northwest corner of the Orion Assembly site. WB-H and WB-I are constructed stormwater basins located directly west of Giddings Road. These stormwater basins are surrounded by a chain-link fence. WB-J is also a constructed stormwater basin located on the eastern-most boundary of the site, south of West Silverbell Road.

6. Review of Potential Wetland Areas

GHD reviewed several potential wetland areas identified in the Preliminary Report that were found to not support wetland. The following briefly describes key areas that were reviewed and found to not support wetland.

Athletic Field on Northeast Corner

The former athletic field area on the northeast corner of the Project (referenced as P24B in the Preliminary Report), was inspected and found to not meet the three-parameter wetland criteria. This area is located on the outfields of two former baseball diamonds. The infields, benches and fences separating the two ballfields are still present. As documented at sample point #45, the vegetation in this area is dominated by perennial ryegrass (*Lolium perenne*), Kentucky bluegrass, (*Poa pratensis*) and orchard grass (*Dactylis glomerata*) and does not meet the criteria for hydrophytic vegetation. The soils consist of a 4-inch loamy 10YR 4/2 layer over 10YR 6/1 fill and meet the hydric soil criteria for depleted matrix. Compacted fill or concrete was found at approximately 10 inches below the surface. These soil conditions were confirmed from multiple test pits across the area. The soils were saturated in the layer immediately above the concrete or compacted gravel and met the criteria for hydrology. Although the former athletic field met wetland criteria for soils and hydrology, it did not meet the criteria for hydrophytic vegetation.

Turf Areas on Northwest Corner of Project

The Preliminary Report identified a number of small depressions (P13-P16) on the northwest corner of the Project. Our inspection of these features indicated that they all occur on maintained turf grass areas usually around maintained stormwater inlets. The size of these areas are very small (.03-.07 acres) and they are isolated from each other. Within these areas there may be very small areas around the stormwater inlets that contain hydrophytic vegetation, otherwise they are maintained upland turf.

7. Conclusions

GHD delineated the boundaries of 25 wetlands and 10 waterbodies on-site. Of the 35 total features, 20 are associated with a previously constructed stormwater conveyance or stormwater basin. Ten (10) wetlands and five (5) discontinuous stream channels are identified as stormwater conveyances associated with constructed ditches along roadside and/or railroad tracks, and five (5) waterbodies are constructed stormwater basins. The remaining features are also reflective of prolonged disturbance and human activities occurring on-site since the construction of the Orion Assembly facility. Twenty-one (21) of the 25 wetlands delineated on-site are less than 1-acre in size and three (3) of the five (5) discontinuous stream channels are 120-feet or less linear feet.

8. References Cited

- Environmental Laboratory. 1987. Corps of Engineers Wetlands Delineation Manual. Technical Report Y-87-1, U.S. Army Engineer Waterways Experiment Stations, Vicksburg, MS.

- GHD Services, Inc. 2022. Preliminary Wetland and Waterbody Survey Report, GM Orion Assembly, General Motors, LLC. March 22, 2022.
- Michigan Department of Environment, Great Lakes, and Energy (EGLE). Wetlands Map Viewer. Available at the following link: https://www.mcgi.state.mi.us/wetlands/mcgiMap.html. Accessed May 1, 2022.
- Natural Resources Conservation Service. Soil Survey Staff. United States Department of Agriculture. Web Soil Survey. Available online at the following link: https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm. Accessed May 1, 2022.
- U.S. Army Corps of Engineers. 2020. NWPL-National Wetland Plant List. Available at the following link: https://wetland-plants.sec.usace.army.mil/nwpl_static/v34/home/home.html. Accessed on May 1, 2022.
- U.S. Army Corps of Engineers. 2010. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Midwest Region (Version 2.0), U.S. Army Corps of Engineers. ERDC/EL TR-10-16. Vicksburg, MS: U.S. Army Engineer Research and Development Center.
- USGS. 2022. National Hydrography Dataset. Technical Report. United States Geological Survey. Available online at the following link: https://www.usgs.gov/national-hydrography. Accessed on May 1, 2022.

Appendices

Appendix A

Figures

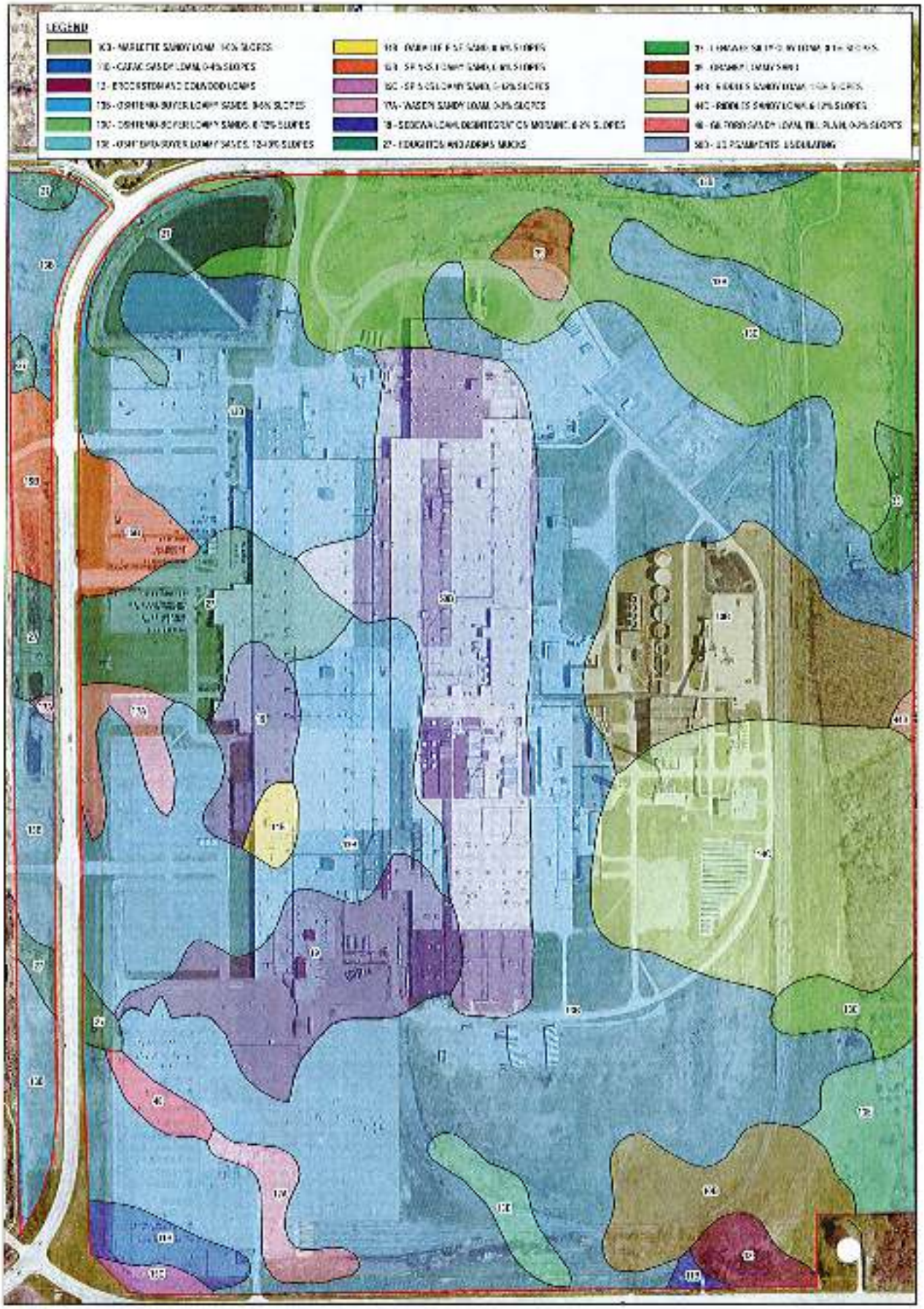
PROJECT LOCATION

FIGURE 1

GHD

AERIAL IMAGERY AND TOPOGRAPHY

FIGURE 2



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GHD

WASTEWATER TREATMENT PLANT
DIRECTORY DIAGRAM

NRCS SOILS

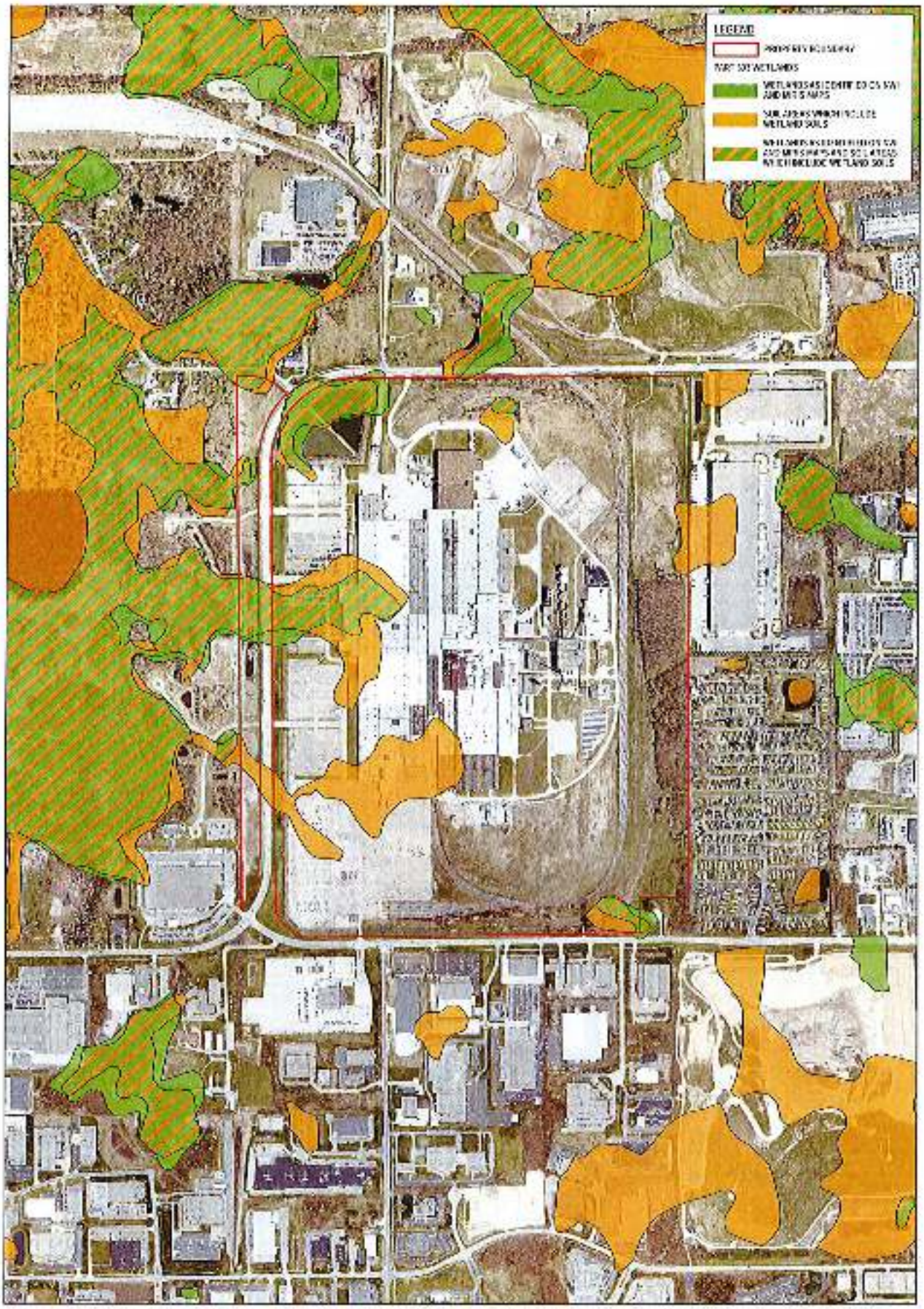
FIGURE 3

GHD

ONTARIO ASSEMBLY LAND

NATIONAL WETLANDS INVENTORY AND MED HYDROGRAPHY

FIGURE 4



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GHD

PART 303 WETLANDS

FIGURE 5

GHD

DELINEATED WETLAND AND WATERBODY FEATURES OVERALL SITE

FIGURE 6

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GHD

DELINEATED WETLAND AND WATERBODY FEATURES NORTHWEST QUADRANT DETAIL

FIGURE 6A

GHD

DELINEATED WETLAND AND WATERBODY FEATURES NORTHEAST QUADRANT DETAIL

FIGURE 6B

GM DRAINAGE DISTRICT PLANT
LANDSCAPE DESIGN

DELINEATED WETLAND AND WATERBODY FEATURES SOUTHWEST QUADRANT DETAIL

FIGURE 6C


LEGEND
WETLAND SAMPLE POINT
WETLAND
DELINEATED WETLAND
AND WATERBODY FEATURES
SOUTHEAST COLORADO TRIBAL
FIGURE 6D

Appendix B

Photos

Site Photographs

Photo 1 *Representative view of emergent wetland (PEM) sample point showing surface water inundation.*

Photo 2 *Representative view of upland sample point adjacent to herbaceous wetland.*

Photo 3 *Representative view of discontinuous stream channel adjacent to railroad tracks.*

Photo 4 *Representative view of emergent wetland (PEM) sample point located in stormwater conveyance.*

Photo 5 Representative view of forested wetland (PFO) sample point.

Photo 6 Representative view of forested upland sample point.

Photo 7 *Representative view of scrub-shrub (PSS) wetland sample point.*

Photo 8 *Representative view of constructed stormwater basin located west of Giddings Road.*

Appendix C

Wetland Determination Data Sheets

U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Midwest Region
See ERDC/EL TR-10-16; the proponent agency is CECW-CO-R

OMB Control #: 0710-0024, Exp:11/30/2024
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: GM-Orion | City/County: | Sampling Date: 4/25/2022
Applicant/Owner: General Motors, LLC | State: MI | Sampling Point: SP1
Investigator(s): Jann/Dal/Ars | Section, Township, Range: Sec 34 and 35, Twp 4N, R 10E
Landform (hillside, terrace, etc.): Flat/ Depression | Local relief (concave, convex, none): None
Slope (%): <1% | Lat: 42.721385 | Long: -83.257802 | Datum: NAD 83
Soil Map Unit Name: Oshtemo-Boyer loamy sands, 6 to 12 percent slopes | NWI classification: Upland
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:
Wetland A - constructed/ graded land between rail and facility

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
Sapling/Shrub Stratum (Plot size: 15)			
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
Herb Stratum (Plot size: 5)			
1. *Poa pratensis*	40	Yes	FAC
2. *Phalaris arundinacea*	30	Yes	FACW
3. *Poa compressa*	10	No	FACU
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	80 =Total Cover		
Woody Vine Stratum (Plot size: 30)			
1.			
2.			
	=Total Cover		

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)
Total Number of Dominant Species Across All Strata: 2 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of		Multiply by:	
OBL species	0	x 1 =	0
FACW species	30	x 2 =	60
FAC species	40	x 3 =	120
FACU species	10	x 4 =	40
UPL species	0	x 5 =	0
Column Totals	80 (A)		220 (B)

Prevalence Index = B/A = 2.75

Hydrophytic Vegetation Indicators:
___ 1 - Rapid Test for Hydrophytic Vegetation
X 2 - Dominance Test is >50%
X 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)
[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: SP1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-3	10YR 5/1	100					Loamy/Clayey	Silty Loam w/ Sand
3-6	10YR 5/1	90	10YR 5/3	10	C	M	Loamy/Clayey	Distinct redox concentrations
6-10	10YR 5/1	70	10YR 5/3	30	C	M	Loamy/Clayey	Distinct redox concentrations
10-16	10YR 5/1	50	10YR 4/4	50	C	M	Loamy/Clayey	Distinct redox concentrations

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ? Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ? Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Hardpan/compated fil

Depth (inches): 8

Hydric Soil Present? Yes X No ___

Remarks:
hardpan @ 8" (restrictive layer) graded, then compacted

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes X	No ___	Depth (inches):	2
Water Table Present?	Yes X	No ___	Depth (inches):	0
Saturation Present? (includes capillary fringe)	Yes X	No ___	Depth (inches):	0

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

U.S. Army Corps of Engineers **WETLAND DETERMINATION DATA SHEET – Midwest Region** See ERDC/EL TR-10-16; the proponent agency is CECW-CO-R	*OMB Control #: 0710-0024, Exp:11/30/2024* *Requirement Control Symbol EXEMPT:* *(Authority: AR 335-15, paragraph 5-2a)*

Project/Site: GM-Orion City/County: Sampling Date: 4/25/2022

Applicant/Owner: General Motors, LLC State: MI Sampling Point: SP3

Investigator(s): Jann/DeMars Section, Township, Range: Sec 34 and 35, Twp 4N, R 10E

Landform (hillside, terrace, etc.): Flat Local relief (concave, convex, none): None

Slope (%): <1 Lat: 42.721352 Long: -83.257523 Datum: NAD 83

Soil Map Unit Name: Oshtemo-Boyer loamy sands, 0 to 6 percent slopes NWI classification: Upland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No X	**Is the Sampled Area within a Wetland?** Yes ____ No X
Hydric Soil Present?	Yes ____	No X	
Wetland Hydrology Present?	Yes ____	No X	

Remarks:
WA

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
Sapling/Shrub Stratum (Plot size: 15)			
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
Herb Stratum (Plot size: 5)			
1. *Lotus corniculatus*	40	Yes	FACU
2. *Poa compressa*	30	Yes	FACU
3. *Lolium perenne*	25	Yes	FACU
4. *Phalaris arundinacea*	20	No	FACW
5.			
6.			
7.			
8.			
9.			
10.			
	115 =Total Cover		
Woody Vine Stratum (Plot size: 30)			
1.			
2.			
	=Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.0% (A/B)

Prevalence Index worksheet:

Total % Cover of		Multiply by:	
OBL species	0	x 1 =	0
FACW species	20	x 2 =	40
FAC species	0	x 3 =	0
FACU species	95	x 4 =	380
UPL species	0	x 5 =	0
Column Totals:	115 (A)		420 (B)
Prevalence Index = B/A =			3.65

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: SP3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-16	10YR 4/3						Loamy/Clayey	Fill

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ____ No X

Remarks:
Fill material

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ____ No X Depth (inches): _____

Water Table Present? Yes ____ No X Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ____ No X Depth (inches): _____

Wetland Hydrology Present? Yes ____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

U.S. Army Corps of Engineers **WETLAND DETERMINATION DATA SHEET – Midwest Region** See ERDC/EL TR-10-16; the proponent agency is CECW-CO-R	*OMB Control #: 0710-0024, Exp:11/30/2024* *Requirement Control Symbol EXEMPT:* *(Authority: AR 335-15, paragraph 5-2a)*

Project/Site: GM-Orion City/County: Sampling Date: 4/25/2022

Applicant/Owner: General Motors, LLC State: MI Sampling Point: SP3WA

Investigator(s): JannilDaMars Section, Township, Range: Sec 34 and 35, Twp 4N, R 10E

Landform (hillside, terrace, etc.): Hillslope Local relief (concave, convex, none): Concave

Slope (%): 1% Lat: 42.721672 Long: -83.259132 Datum: NAD 83

Soil Map Unit Name: Granby loamy sand NWI classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:
Sloping basin ringed with monitoring wells. Looks constructed but unclear for what. Center of site drainage under RR U 19 via valve to north.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
Sapling/Shrub Stratum (Plot size: 15)			
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
Herb Stratum (Plot size: 5)			
1. *Phragmites australis*	60	Yes	FACW
2. *Phalaris arundinacea*	30	Yes	FACW
3. *Poa palustris*	10	No	FACW
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	100 =Total Cover		
Woody Vine Stratum (Plot size: 30)			
1.			
2.			
	=Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	100	x 2 =	200
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	100 (A)		200 (B)
Prevalence Index = B/A =			2.00

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is <3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: SP3WA

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-5	10YR 5/1	100					Loamy/Clayey	Silty sand
5-10	10YR 5/1	95	10YR 5/6	5	C	M	Loamy/Clayey	Prominent redox concentrations

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ? Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply):

- X Surface Water (A1)
- X High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- X Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes X	No ___	Depth (inches): 2
Water Table Present?	Yes X	No ___	Depth (inches): 0
Saturation Present? (includes capillary fringe)	Yes X	No ___	Depth (inches): 0

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Midwest Region
See ERDC/EL TR-10-16; the proponent agency is CECW-CO-R

OMB Control #: 0710-0024, Exp:11/30/2024
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: GM-Orion | City/County: | Sampling Date: 4/25/2022
Applicant/Owner: General Motors, LLC | State: MI | Sampling Point: SP4
Investigator(s): Jarod DeMars | Section, Township, Range: Sec 34 and 35, Twp 4N, R 10E
Landform (hillside, terrace, etc.): Ditch/ Swale | Local relief (concave, convex, none): Concave
Slope (%): <1% | Lat: 42.721424 | Long: -83.262328 | Datum: NAD 83
Soil Map Unit Name: Oshtemo-Boyer loamy sands, 6 to 12 percent slopes | NWI classification: PEM
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____
Hydric Soil Present?	Yes X	No ____
Wetland Hydrology Present?	Yes X	No ____

Is the Sampled Area within a Wetland? Yes X No ____

Remarks:
Sample point is in flat fill area with perimiter ditch. Wetland WD

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15)			
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
Herb Stratum (Plot size: 5)			
1. *Phalaris arundinacea*	70	Yes	FACW
2. *Poa palustris*	20	Yes	FACW
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	90 = Total Cover		
Woody Vine Stratum (Plot size: 30)			
1.			
2.			
	=Total Cover		

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)
Total Number of Dominant Species Across All Strata: 2 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	90	x 2 =	180
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	90 (A)		180 (B)

Prevalence Index = B/A = 2.00

Hydrophytic Vegetation Indicators:
___ 1 - Rapid Test for Hydrophytic Vegetation
X 2 - Dominance Test is >50%
X 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)
[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: SP4

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-6	10YR 5/1	100					Loamy/Clayey	Fill
6-12	10YR 6/2	100					Loamy/Clayey	Fill

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Compacted fill/ clay

Depth (inches): 6

Hydric Soil Present? Yes X No ___

Remarks:

Sample point has fill over compacted stony mineral

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No ___ Depth (inches): 3

Water Table Present? Yes X No ___ Depth (inches): 11

Saturation Present? (includes capillary fringe) Yes X No ___ Depth (inches): 0

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Midwest Region
See ERDC/EL TR-10-16; the proponent agency is CECW-CO-R

OMB Control #: 0710-0024, Exp:11/30/2024
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: GM-Orion | City/County: | Sampling Date: 4/26/2022
Applicant/Owner: General Motors, LLC | State: MI | Sampling Point: SP5
Investigator(s): Jarni/DeMars | Section, Township, Range: Sec 34 and 35 Twp 4N, R 10E
Landform (hillside, terrace, etc.): None | Local relief (concave, convex, none): Convex
Slope (%): 1% | Lat: 42.721391 | Long: -83.292289 | Datum: NAD 83
Soil Map Unit Name: Oshtemo-Boyer loamy sands, 6 to 12 percent slopes | NWI classification: Upland
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No X	**Is the Sampled Area within a Wetland?** Yes ____ No X
Hydric Soil Present?	Yes ____	No X	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:
Sample point on spoil/clay fill on ditch slope

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Juniperus virginiana*	10	Yes	FACU
2. *Elaeagnus angustifolia*	5	Yes	FACU
3.			
4.			
5.			
	15	=Total Cover	
Sapling/Shrub Stratum (Plot size: 15)			
1. *Elaeagnus umbellata*	20	Yes	UPL
2.			
3.			
4.			
5.			
	20	=Total Cover	
Herb Stratum (Plot size: 5)			
1. *Poa compressa*	40	Yes	FACU
2. *Dactylis glomerata*	30	Yes	FACU
3. *Phalaris arundinacea*	20	Yes	FACW
4. *Daucus carota*	5	No	UPL
5.			
6.			
7.			
8.			
9.			
10.			
	95	=Total Cover	
Woody Vine Stratum (Plot size: 30)			
1.			
2.			
		=Total Cover	

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)
Total Number of Dominant Species Across All Strata: 6 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 16.7% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	20	x 2 =	40
FAC species	0	x 3 =	0
FACU species	85	x 4 =	340
UPL species	25	x 5 =	125
Column Totals:	130 (A)		505 (B)

Prevalence Index = B/A = 3.88

Hydrophytic Vegetation Indicators:
___ 1 - Rapid Test for Hydrophytic Vegetation
___ 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)
[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: SP5

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 4/1	100					Loamy/Clayey	Fill, clayey with rock
6-12	10YR 6/3						Loamy/Clayey	Fill, clayey with rock

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: cemented fill

Depth (inches): 6

Hydric Soil Present? Yes ___ No X

Remarks:

Soils are fill. Cemented layer starts at 6"

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches): ___
Water Table Present?	Yes X	No ___	Depth (inches): 6
Saturation Present? (includes capillary fringe)	Yes X	No ___	Depth (inches): 0

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

U.S. Army Corps of Engineers **WETLAND DETERMINATION DATA SHEET – Midwest Region** See ERDC/EL TR-10-16; the proponent agency is CECW-CO-R	*OMB Control #: 0710-0024, Exp:11/30/2024* *Requirement Control Symbol EXEMPT:* *(Authority: AR 335-15, paragraph 5-2a)*

Project/Site: GM-Orion City/County: Sampling Date: 4/25/2022

Applicant/Owner: General Motors, LLC State: MI Sampling Point: SP6

Investigator(s): Jann/DeMars Section, Township, Range: Sec 34 and 35, Twp 4N, R 10E

Landform (hillside, terrace, etc.): Flat Local relief (concave, convex, none): None

Slope (%): <1% Lat: 42.721314 Long: -83.282116 Datum: NAD 83

Soil Map Unit Name: Oshtemo-Boyer loamy sands, 6 to 12 percent slopes NWI classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
Sapling/Shrub Stratum (Plot size: 15)			
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
Herb Stratum (Plot size: 5)			
1. *Poa palustris*	50	Yes	FACW
2. *Phalaris arundinacea*	30	Yes	FACW
3. *Poa compressa*	20	Yes	FACU
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	100 =Total Cover		
Woody Vine Stratum (Plot size: 30)			
1.			
2.			
	=Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 66.7% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	80	x 2 =	160
FAC species	0	x 3 =	0
FACU species	20	x 4 =	80
UPL species	0	x 5 =	0
Column Totals:	100 (A)		240 (B)
Prevalence Index = B/A =			2.40

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: SP8

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 5/1	100					Loamy/Clayey	Hi-Sit Clay Rock
6-10	10YR 6/2	100					Loamy/Clayey	Compacted Fill

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Compacted Fill

Depth (inches): 6

Hydric Soil Present? Yes X No ___

Remarks:
Soils are fill with stony compacted layer aprox 6" below surface

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches): ___
Water Table Present?	Yes X	No ___	Depth (inches): 1
Saturation Present? (includes capillary fringe)	Yes X	No ___	Depth (inches): 6

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Midwest Region
See ERDC/EL TR-10-16; the proponent agency is CECW-CO-R

OMB Control #: 0710-0024, Exp:11/30/2024
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: GM-Orion City/County: Sampling Date: 4/26/2022
Applicant/Owner: General Motors, LLC State: MI Sampling Point: SP7
Investigator(s): Jann/DeMars Section, Township, Range: Sec 34 and 35 Twp 4N, R 10E
Landform (hillside, terrace, etc.): Drainage Way Local relief (concave, convex, none): Concave
Slope (%): 2% Lat: 42.721851 Long: -83.255225 Datum: NAD 83
Soil Map Unit Name: Oshtemo-Boyer loamy sands, 6 to 12 percent slopes NWI classification: PEM
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes X No ____
Hydric Soil Present? Yes X No ____
Wetland Hydrology Present? Yes X No ____

Is the Sampled Area within a Wetland? Yes X No ____

Remarks:
Wetland 3 - Recently excavated ditch/ swale with stream feature draining from east.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
Sapling/Shrub Stratum (Plot size: 15)			
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
Herb Stratum (Plot size: 5)			
1. *Phalaris arundinacea*	40	Yes	FACW
2. *Phragmites australis*	20	Yes	FACW
3. *Typha X glauca*	10	No	OBL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	70 =Total Cover		
Woody Vine Stratum (Plot size: 30)			
1.			
2.			
	=Total Cover		

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)
Total Number of Dominant Species Across All Strata: 2 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	10	x 1 =	10
FACW species	60	x 2 =	120
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	70 (A)		130 (B)

Prevalence Index = B/A = 1.86

Hydrophytic Vegetation Indicators:
___ 1 - Rapid Test for Hydrophytic Vegetation
X 2 - Dominance Test is >50%
X 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)
[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: SP7

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 5/1	100					Loamy/Clayey	Silty Sand (Mucky layer on surface)
4-7	10YR 4/1	100					Loamy/Clayey	Silty gravel
7-12	10YR 4/1	100					Loamy/Clayey	Silty Clay

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No ___

Remarks:
SP adjacent to stream channel

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required):

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches): ___
Water Table Present?	Yes ___	No X	Depth (inches): ___
Saturation Present? (includes capillary fringe)	Yes X	No ___	Depth (inches): 0

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

U.S. Army Corps of Engineers **WETLAND DETERMINATION DATA SHEET – Midwest Region** See ERDC/EL TR-10-16; the proponent agency is CECW-CO-R	*OMB Control #: 0710-0024, Exp:11/30/2024* *Requirement Control Symbol EXEMPT:* *(Authority: AR 335-15, paragraph 5-2a)*

Project/Site: GM-Orion City/County: Sampling Date: 4/28/2022

Applicant/Owner: General Motors, LLC State: MI Sampling Point: SP8

Investigator(s): Jann/Del/ars Section, Township, Range: Sec 34 and 35, Two 4N, R 10E

Landform (hillside, terrace, etc.): Hillslope Local relief (concave, convex, none): Convex

Slope (%): 5 Lat: 42.721903 Long: -83.255233 Datum: NAD 83

Soil Map Unit Name: Oshtemo-Boyer loamy sands, 6 to 12 percent slopes NWI classification: Upland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation X, Soil X, or Hydrology ____ significantly disturbed? Are 'Normal Circumstances' present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No X	**Is the Sampled Area within a Wetland?** Yes ____ No X
Hydric Soil Present?	Yes ____	No X	
Wetland Hydrology Present?	Yes ____	No X	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Juniperus virginiana*	5	Yes	FACU
2.			
3.			
4.			
5.			
	5	=Total Cover	
Sapling/Shrub Stratum (Plot size: 15)			
1.			
2.			
3.			
4.			
5.			
		=Total Cover	
Herb Stratum (Plot size: 5)			
1. *Poa pratensis*	40	Yes	FAC
2. *Lotus corniculatus*	30	Yes	FACU
3. *Centaurea stoebe*	20	No	UPL
4. *Phalaris arundinacea*	15	No	FACW
5. *Vicia sativa*	10	No	FACU
6. *Phragmites australis*	5	No	FACW
7.			
8.			
9.			
10.			
	120	=Total Cover	
Woody Vine Stratum (Plot size: 30)			
1.			
2.			
		=Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 33.3% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	20	x 2 =	40
FAC species	40	x 3 =	120
FACU species	45	x 4 =	180
UPL species	20	x 5 =	100
Column Totals:	125 (A)		440 (B)

Prevalence Index = B/A = 3.52

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: SP8

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-13	10YR 3/3	100					Loamy/Clayey	Fill

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ____ No X

Remarks:

Soils are recently graded fill

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D8)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ____ No X Depth (inches): ____

Water Table Present? Yes ____ No X Depth (inches): ____

Saturation Present? (includes capillary fringe) Yes ____ No X Depth (inches): ____

Wetland Hydrology Present? Yes ____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

U.S. Army Corps of Engineers **WETLAND DETERMINATION DATA SHEET – Midwest Region** See ERDC/EL TR-10-16; the proponent agency is CECW-CO-R	*OMB Control #: 0710-0024, Exp:11/30/2024* *Requirement Control Symbol EXEMPT:* *(Authority: AR 335-15, paragraph 5-2a)*

Project/Site: GM-Orion City/County: Sampling Date: 4/28/2022

Applicant/Owner: General Motors, LLC State: MI Sampling Point: SP9

Investigator(s): Jarmi/DeMars Section, Township, Range: Sec 34 and 35, Two 4N, R 10E

Landform (hillside, terrace, etc.): Drainage Swale Local relief (concave, convex, none): Concave

Slope (%): 1% Lat: 42.721219 Long: -83.254875 Datum: NAD 83

Soil Map Unit Name: Osheimo Boyer loamy sands, 6 to 12 percent slopes NWI classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are 'Normal Circumstances' present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____
Hydric Soil Present?	Yes X	No ____
Wetland Hydrology Present?	Yes X	No ____

Is the Sampled Area within a Wetland? Yes X No ____

Remarks:
Wetland WE- Drainage Swale

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: 5)			
1. *Phalaris arundinacea*	60	Yes	FACW
2. *Poa pratensis*	20	Yes	FAC
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	80 = Total Cover		
Woody Vine Stratum (Plot size: 30)			
1.			
2.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	60	x 2 =	120
FAC species	20	x 3 =	60
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	80 (A)		180 (B)
Prevalence Index = B/A =			2.25

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: SP8

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-8	10YR 5/1	100					Loamy/Clayey	
8-12	10YR 5/1	100					Loamy/Clayey	Compacted Stony Fill

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron Manganese Masses (F12)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Compacted Fill

Depth (inches): 8

Hydric Soil Present? Yes X No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- X Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- X Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- X Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes X	No ___	Depth (inches):	1
Water Table Present?	Yes X	No ___	Depth (inches):	3
Saturation Present? (includes capillary fringe)	Yes X	No ___	Depth (inches):	0

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

U.S. Army Corps of Engineers **WETLAND DETERMINATION DATA SHEET – Midwest Region** See ERDC/EL TR-10-16; the proponent agency is CECW-CO-R	*OMB Control #: 0710-0024, Exp:11/30/2024* *Requirement Control Symbol EXEMPT:* *(Authority: AR 335-15, paragraph 5-2a)*

Project/Site: GM-Orion City/County: Sampling Date: 4/26/2022

Applicant/Owner: General Motors, LLC State: MI Sampling Point: SP10

Investigator(s): Jamil/DeMars Section, Township, Range: Sec 34 and 35, Twp 4N, R 10E

Landform (hillside, terrace, etc.): Hillslope Local relief (concave, convex, none): Convex

Slope (%): 2% Lat: 42.721231 Long: -83.254823 Datum: NAD 83

Soil Map Unit Name: Oshtemo-Boyer loamy sands, 6 to 12 percent slopes NWI classification: Upland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No X	**Is the Sampled Area within a Wetland?**	Yes ____ No X
Hydric Soil Present?	Yes ____	No X		
Wetland Hydrology Present?	Yes ____	No X		

Remarks:

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 30)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15)			
1. *Elaeagnus umbellata*	10	Yes	UPL
2.			
3.			
4.			
5.			
	10 = Total Cover		
Herb Stratum (Plot size: 5)			
1. *Lotus corniculatus*	70	Yes	FACU
2. *Phalaris arundinacea*	20	No	FACW
3. *Poa pratensis*	10	No	FAC
4. *Vicia sativa*	5	No	FACU
5.			
6.			
7.			
8.			
9.			
10.			
	105 = Total Cover		
Woody Vine Stratum (Plot size: 30)			
1.			
2.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	20	x 2 =	40
FAC species	10	x 3 =	30
FACU species	75	x 4 =	300
UPL species	10	x 5 =	50
Column Totals:	115 (A)		420 (B)
Prevalence Index = B/A =			3.65

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: SP10

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-8	10YR 4/2	100					Loamy/Clayey	Loam Fill
8-14	10YR 5/3	100					Loamy/Clayey	Sandy Loam Fill

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Compacted Fill

Depth (inches): 8

Hydric Soil Present? Yes ____ No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): ____
Water Table Present?	Yes ____	No X	Depth (inches): ____
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches): ____

Wetland Hydrology Present? Yes ____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Midwest Region
See ERDC/EL TR-10-16; the proponent agency is CECW-CO-R

OMB Control #: 0710-0024, Exp:11/30/2024
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: GM-Orion City/County: Sampling Date: 4/25/2022
Applicant/Owner: General Motors, LLC State: Sampling Point: SP11
Investigator(s): Jarrin Dell'Aria Section, Township, Range: Sec 34 and 35, Twp 4N, R 10E
Landform (hillside, terrace, etc.): Drainage Swale Local relief (concave, convex, none): Convex
Slope (%): <1% Lat: 42.721397 Long: -83.254997 Datum: NAD 83
Soil Map Unit Name: Oshtemo-Bayer loamy sands, 6 to 12 percent slopes NWI classification: PSS
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
Sapling/Shrub Stratum (Plot size: 15)			
1. *Salix interior*	70	Yes	FACW
2.			
3.			
4.			
5.			
	70	=Total Cover	
Herb Stratum (Plot size: 5)			
1. *Phalaris arundinacea*	10	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	10	=Total Cover	
Woody Vine Stratum (Plot size: 30)			
1.			
2.			
	=Total Cover		

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)
Total Number of Dominant Species Across All Strata: 2 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	80	x 2 =	160
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	80 (A)		160 (B)
Prevalence Index = B/A =			2.00

Hydrophytic Vegetation Indicators:
___ 1 - Rapid Test for Hydrophytic Vegetation
X 2 - Dominance Test is >50%
X 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)
[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: SP11

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-8	10YR 5/1	100					Loamy/Clayey	Silt Loam Fill
8-12	10YR 6/3	100					Loamy/Clayey	Silty Gravel Fil

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Compacted Fill

Depth (inches): 0

Hydric Soil Present? Yes X No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- X Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- X Water Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (D10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches): ___
Water Table Present?	Yes X	No ___	Depth (inches): 0
Saturation Present? (includes capillary fringe)	Yes X	No ___	Depth (inches): 0

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

U.S. Army Corps of Engineers **WETLAND DETERMINATION DATA SHEET – Midwest Region** See ERDC/EL TR-10-16; the proponent agency is CECW-CO-R	*OMB Control #: 0710-0024, Exp:11/30/2024* *Requirement Control Symbol EXEMPT:* *(Authority: AR 335-15, paragraph 5-2a)*

Project/Site: GM-Orion | City/County: Orion/Oakland | Sampling Date: 4/26/2022

Applicant/Owner: General Motors, LLC | State: MI | Sampling Point: SP12

Investigator(s): Jamri/DeMars | Section, Township, Range: Sec 34 and 35, Two 4N, R 10E

Landform (hillside, terrace, etc.): Drainage Way | Local relief (concave, convex, none): Concave

Slope (%): <1% | Lat.: 42.722151 | Long: -83.256711 | Datum: NAD 83

Soil Map Unit Name: Oshtemo-Boyer loamy sands, 6 to 12 percent slopes | NWI classification: PSS

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 30)			
1. *Populus deltoides*	20	Yes	FAC
2.			
3.			
4.			
5.			
	20	=Total Cover	
Sapling/Shrub Stratum (Plot size: 15)			
1. *Salix interior*	60	Yes	FACW
2.			
3.			
4.			
5.			
	60	=Total Cover	
Herb Stratum (Plot size: 5)			
1. *Phalaris arundinacea*	50	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	50	=Total Cover	
Woody Vine Stratum (Plot size: 30)			
1.			
2.			
		=Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of		Multiply by:	
OBL species	0	x 1 =	0
FACW species	110	x 2 =	220
FAC species	20	x 3 =	60
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	130 (A)		280 (B)

Prevalence Index = B/A = 2.15

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: SP12

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-8	10YR 5/1	100					Loamy/Clayey	Silt Loam
8-14	10YR 5/2	100					Loamy/Clayey	Silt Loam

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ___

Depth (inches): ___

Hydric Soil Present? Yes X No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- X High Water Table (A2)
- ___ Saturation (A3)
- X Water Marks (B1)
- ___ Sediment Deposits (B2)
- X Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- X Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes X	No ___	Depth (inches):	1
Water Table Present?	Yes X	No ___	Depth (inches):	0
Saturation Present? (includes capillary fringe)	Yes X	No ___	Depth (inches):	0

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

U.S. Army Corps of Engineers **WETLAND DETERMINATION DATA SHEET – Midwest Region** See ERDC/EL TR-10-16; the proponent agency is CECW-CO-R	*OMB Control #: 0710-0024, Exp:11/30/2024* *Requirement Control Symbol EXEMPT:* *(Authority: AR 335-15, paragraph 5-2a)*

Project/Site: GM-Orion City/County: Orion/Oakland Sampling Date: 4/26/2022

Applicant/Owner: General Motors, LLC State: MI Sampling Point: SP 13

Investigator(s): Jarmi/DeMars Section, Township, Range: Sec 34 and 35, Twp 4N, R 10E

Landform (hillside, terrace, etc.): Hillslope Local relief (concave, convex, none): None

Slope (%): 5% Lat: 42.722099 Long: -83.259724 Datum: NAD 83

Soil Map Unit Name: Oshtemo-Boyer loamy sands, 6 to 12 percent slopes NWI classification: Lp

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ____ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** Yes ____ No X
Hydric Soil Present?	Yes ____	No X	
Wetland Hydrology Present?	Yes ____	No X	

Remarks:
Hillslope on constructed waterway

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
Sapling/Shrub Stratum (Plot size: 15)			
1. *Populus deltoides*	20	Yes	FAC
2. *Salix interior*	10	Yes	FACW
3. *Crataegus crus-galli*	5	No	FAC
4.			
5.			
	35 =Total Cover		
Herb Stratum (Plot size: 5)			
1. *Lotus corniculatus*	90	Yes	FACU
2. *Vicia sativa*	5	No	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	95 =Total Cover		
Woody Vine Stratum (Plot size: 30)			
1.			
2.			
	=Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 66.7% (A/B)

Prevalence Index worksheet:

Total % Cover of		Multiply by:	
OBL species	0	x 1 =	0
FACW species	10	x 2 =	20
FAC species	25	x 3 =	75
FACU species	95	x 4 =	380
UPL species	0	x 5 =	0
Column Totals:	130 (A)		475 (B)

Prevalence Index = B/A = 3.65

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: SP 13

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-12	10YR 3/3	100					Loamy/Clayey	Fill

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ____ No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ____ No X Depth (inches): _____

Water Table Present? Yes ____ No X Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ____ No X Depth (inches): _____

Wetland Hydrology Present? Yes ____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

U.S. Army Corps of Engineers **WETLAND DETERMINATION DATA SHEET – Midwest Region** See ERDC/EL TR-10-16; the proponent agency is CECW-CO-R	*OMB Control #: 0710-0024, Exp:11/30/2024* *Requirement Control Symbol EXEMPT:* *(Authority: AR 335-15, paragraph 5-2a)*

Project/Site: GM-Orion | City/County: Orion/Oakland | Sampling Date: 4/26/2022

Applicant/Owner: General Motors, LLC | State: MI | Sampling Point: SP14

Investigator(s): Jarrit/DeMars | Section, Township, Range: Sec 34 and 35, Twp 4N, R 10E

Landform (hillside, terrace, etc.): Drainage Way | Local relief (concave, convex, none): Concave

Slope (%): <1% | Lat: 42.721698 | Long: -83.250335 | Datum: NAD 83

Soil Map Unit Name: Oshtemo-Boyer loamy sands, 6 to 12 percent slopes | NWI classification: PEMA/ PFO

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Populus deltoides*	30	Yes	FAC
2. *Crataegus crus-galli*	5	No	FAC
3.			
4.			
5.			
	35	=Total Cover	
Sapling/Shrub Stratum (Plot size: 15)			
1.			
2.			
3.			
4.			
5.			
		=Total Cover	
Herb Stratum (Plot size: 5)			
1. *Phalaris arundinacea*	60	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	60	=Total Cover	
Woody Vine Stratum (Plot size: 30)			
1.			
2.			
		=Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	80	x 2 =	160
FAC species	35	x 3 =	105
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	115 (A)		265 (B)

Prevalence Index = B/A = 2.30

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: SP14

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-12	10YR 5/1	100					Loamy/Clayey	Silt Loam Fill

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ___

Depth (inches): ___

Hydric Soil Present? Yes X No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply):

- ___ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- X Sediment Deposits (B2)
- X Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- X Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required):

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches): ___
Water Table Present?	Yes X	No ___	Depth (inches): 3
Saturation Present? (includes capillary fringe)	Yes X	No ___	Depth (inches): 0

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

U.S. Army Corps of Engineers **WETLAND DETERMINATION DATA SHEET – Midwest Region** See ERDC/EL TR-10-16; the proponent agency is CECW-CO-R	*OMB Control #: 0710-0024, Exp:11/30/2024* *Requirement Control Symbol EXEMPT:* *(Authority: AR 335-15, paragraph 5-2a)*

Project/Site: GM-Orion | City/County: Orion/Oakland | Sampling Date: 4/26/2022

Applicant/Owner: General Motors, LLC | State: MI | Sampling Point: SP16

Investigator(s): Jenni/DeMarz | Section, Township, Range: Sec 34 and 35, Twp 4N, R 10E

Landform (hillside, terrace, etc.): Drainage Way/ Ditch | Local relief (concave, convex, none): Concave

Slope (%): <1% | Lat.: 42.72233 | Long: -83.230447 | Datum: NAD 83

Soil Map Unit Name: Oshtemo-Boyer loamy sands, 6 to 12 percent slopes | NWI classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:
SP is at bottom of ditch

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
Sapling/Shrub Stratum (Plot size: 15)			
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
Herb Stratum (Plot size: 5)			
1. Phalaris arundinacea	90	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	90 =Total Cover		
Woody Vine Stratum (Plot size: 30)			
1.			
2.			
	=Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	90	x 2 =	180
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	90 (A)		180 (B)

Prevalence Index = B/A = 2.00

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: SP15

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 5/1	100					Loamy/Clayey	Silt Loam Fill
4-12	10YR 6/1	100					Loamy/Clayey	Silt Loam Fill

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ___

Depth (inches): ___

Hydric Soil Present? Yes X No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes X	No ___	Depth (inches):	1
Water Table Present?	Yes X	No ___	Depth (inches):	0
Saturation Present? (includes capillary fringe)	Yes X	No ___	Depth (inches):	0

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

U.S. Army Corps of Engineers **WETLAND DETERMINATION DATA SHEET – Midwest Region** See ERDC/EL TR-10-16; the proponent agency is CECW-CO-R	*OMB Control #: 0710-0024, Exp:11/30/2024* *Requirement Control Symbol EXEMPT:* *(Authority: AR 335-15, paragraph 5-2a)*

Project/Site: GM-Orion City/County: Orion/Oakland Sampling Date: 4/26/2022

Applicant/Owner: General Motors, LLC State: MI Sampling Point: 16

Investigator(s): Janni/Dell'Ario Section, Township, Range: Sec 34 and 35, Two 4N, R 10E

Landform (hillside, terrace, etc.): Hill Slope Local relief (concave, convex, none): Concave

Slope (%): 5% Lat: 42.722305 Long: -83.263446 Datum: NAD 83

Soil Map Unit Name: Oshtemo-Boyer loamy sands, 6 to 12 percent slopes NWI classification: Upland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No X	**Is the Sampled Area within a Wetland?** Yes ____ No X
Hydric Soil Present?	Yes ____	No X	
Wetland Hydrology Present?	Yes ____	No X	

Remarks:
Need to check

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: 5)			
1. *Poa compressa*	60	Yes	FACU
2. *Solidago gigantea*	30	Yes	FACW
3. *Phalaris arundinacea*	5	No	FACW
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	115 = Total Cover		
Woody Vine Stratum (Plot size: 30)			
1.			
2.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50.0% (A/B)

Prevalence Index worksheet:

Total % Cover of		Multiply by	
OBL species	0	x 1 =	0
FACW species	35	x 2 =	70
FAC species	0	x 3 =	0
FACU species	80	x 4 =	320
UPL species	0	x 5 =	0
Column Totals:	115 (A)		390 (B)
Prevalence Index = B/A =			3.39

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No N

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: 15

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-8	10YR 4/2	100					Loamy/Clayey	
8-14	10YR 5/2	98	10YR 6/3	2	C	M	Loamy/Clayey	Faint redox concentrations

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ____ No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): ____
Water Table Present?	Yes ____	No X	Depth (inches): ____
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches): ____

Wetland Hydrology Present? Yes ____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Midwest Region
See ERDC/EL TR-10-16; the proponent agency is CECW-CO-R

OMB Control #: 0710-0024, Exp:11/30/2024
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2e)

Project/Site: GM-Orion | City/County: Orion/Oakland | Sampling Date: 4/26/2022
Applicant/Owner: General Motors, LLC | State: MI | Sampling Point: SP17
Investigator(s): Jenni/DeMars | Section, Township, Range: Sec 34 and 35, Twp 4N, R 10E
Landform (hillside, terrace, etc.): Drainage way | Local relief (concave, convex, none): Concave
Slope (%): 2% | Lat: 42.722305 | Long: -83.250448 | Datum: NAD 83
Soil Map Unit Name: Oshtemo-Boyer loamy sands, 6 to 12 percent slopes | NWI classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 30)			
1.			
2.			
3.			
4.			
5.			
	____	=Total Cover	
Sapling/Shrub Stratum (Plot size: 15)			
1.			
2.			
3.			
4.			
5.			
	____	=Total Cover	
Herb Stratum (Plot size: 5)			
1. *Poa palustris*	30	Yes	FACW
2. *Juncus tenuis*	30	Yes	FAC
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	60	= Total Cover	
Woody Vine Stratum (Plot size: 30)			
1.			
2.			
	____	=Total Cover	

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)
Total Number of Dominant Species Across All Strata: 2 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of		Multiply by	
OBL species	0	x 1 =	0
FACW species	30	x 2 =	60
FAC species	30	x 3 =	90
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	60 (A)		150 (B)
Prevalence Index = B/A =			2.50

Hydrophytic Vegetation Indicators:
___ 1 - Rapid Test for Hydrophytic Vegetation
X 2 - Dominance Test is >50%
X 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)
[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks: (Include photo numbers here or on a separate sheet.)
Sphagnum moss cover is approx 40%

SOIL

Sampling Point: SP17

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-5	10YR 4/1	100					Loamy/Clayey	Silt Loam
5-13	10YR 6/1	100					Loamy/Clayey	Silt Loam

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply):

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes X	No ___	Depth (inches):	1
Water Table Present?	Yes X	No ___	Depth (inches):	0
Saturation Present? (includes capillary fringe)	Yes X	No ___	Depth (inches):	0

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Midwest Region
See ERDC/EL TR-10-16; the proponent agency is CECW-CO-R

OMB Control #: 0710-0024, Exp:11/30/2024
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: GM-Orion City/County: Orion/Oakland Sampling Date: 4/20/2022
Applicant/Owner: General Motors, LLC State: MI Sampling Point: SP18
Investigator(s): Jann/DeMars Section, Township, Range: Sec 34 and 35, Twp 4N, R 10E
Landform (hillside, terrace, etc.): Hillslope Local relief (concave, convex, none): Convex
Slope (%): 3% Lat: 42.71879 Long: -83.255691 Datum: NAD 83
Soil Map Unit Name: Oshtemo-Boyer loamy sands, 0 to 6 percent slopes NWI classification: UP
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____ or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No X	**Is the Sampled Area within a Wetland?** Yes ____ No X
Hydric Soil Present?	Yes ____	No X	
Wetland Hydrology Present?	Yes ____	No X	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
Sapling/Shrub Stratum (Plot size: 15)			
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
Herb Stratum (Plot size: 5)			
1. *Bromus inermis*	90	Yes	FACU
2. *Poa compressa*	10	No	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	100 =Total Cover		
Woody Vine Stratum (Plot size: 30)			
1.			
2.			
	=Total Cover		

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)
Total Number of Dominant Species Across All Strata: 1 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 0.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	0	x 1 = 0
FACW species	0	x 2 = 0
FAC species	0	x 3 = 0
FACU species	100	x 4 = 400
UPL species	0	x 5 = 0
Column Totals:	100 (A)	400 (B)

Prevalence Index = B/A = 4.00

Hydrophytic Vegetation Indicators:
___ 1 - Rapid Test for Hydrophytic Vegetation
___ 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)
[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: SP18

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-8	10YR 4/2	100					Loamy/Clayey	Fill
8-16	10YR 5/3	95	7.5YR 5/8	5	C	M	Loamy/Clayey	Prominent redox concentrations

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ____ No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ____ No X Depth (inches): _____

Water Table Present? Yes ____ No X Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ____ No X Depth (inches): _____

Wetland Hydrology Present? Yes ____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Midwest Region
See ERDC/EL TR-10-16; the proponent agency is CECW-CO-R

OMB Control #: 0710-0024, Exp:11/30/2024
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: GM-Orion | City/County: Orion/Oakland | Sampling Date: 4/28/2022
Applicant/Owner: General Motors, LLC | State: MI | Sampling Point: SP19
Investigator(s): Jarrid/DeMars | Section, Township, Range: Sec. 34 and 35, Twp 4N, R 10E
Landform (hillside, terrace, etc.): Swale/ Ditch | Local relief (concave, convex, none): Concave
Slope (%): 1% | Lat: 42.718538 | Long: -83.25537 | Datum: NAD 83
Soil Map Unit Name: Oshtemo-Boyer loamy sands, 0 to 6 percent slopes | NWI classification: PEM
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
Sapling/Shrub Stratum (Plot size: 15)			
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
Herb Stratum (Plot size: 5)			
1. *Phalaris arundinacea*	80	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	80 =Total Cover		
Woody Vine Stratum (Plot size: 30)			
1.			
2.			
	=Total Cover		

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)
Total Number of Dominant Species Across All Strata: 1 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of		Multiply by	
OBL species	0	x 1 =	0
FACW species	80	x 2 =	160
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	80 (A)		160 (B)

Prevalence Index = B/A = 2.00

Hydrophytic Vegetation Indicators:
___ 1 - Rapid Test for Hydrophytic Vegetation
X 2 - Dominance Test is >50%
X 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)
[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: SP19

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-7	10YR 5/1	100					Loamy/Clayey	
7-14	10YR 6/1	100					Loamy/Clayey	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ___

Depth (inches): ___

Hydric Soil Present? Yes X No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches): ___
Water Table Present?	Yes X	No 1	Depth (inches): ___
Saturation Present? (includes capillary fringe)	Yes X	No 0	Depth (inches): ___

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Midwest Region
See ERDC/EL TR-10-16; the proponent agency is CECW-CO-R

OMB Control #: 0710-0024, Exp:11/30/2024
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: GM-Orion | City/County: Orion/Oakland | Sampling Date: 4/26/2022
Applicant/Owner: General Motors, LLC | State: MI | Sampling Point: SP20
Investigator(s): Jann/DeMars | Section, Township, Range: Sec. 34 and 35, Twp 4N, R 10E
Landform (hillside, terrace, etc.): Hillslope | Local relief (concave, convex, none): Convex
Slope (%): 10% | Lat: 42.718550 | Long: -83.255382 | Datum: NAD 83
Soil Map Unit Name: Oshtemo-Boyer loamy sands, 0 to 6 percent slopes | NWI classification: UP

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No X	**Is the Sampled Area within a Wetland?** Yes ____ No X
Hydric Soil Present?	Yes ____	No X	
Wetland Hydrology Present?	Yes ____	No X	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15)			
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
Herb Stratum (Plot size: 5)			
1. *Centaurea stoebe*	70	Yes	UPL
2. *Bromus inermis*	20	Yes	FACU
3. *Vicia sativa*	10	No	FACU
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: 30)			
1.			
2.			
	=Total Cover		

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)
Total Number of Dominant Species Across All Strata: 2 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 0.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	0	x 3 =	0
FACU species	30	x 4 =	120
UPL species	70	x 5 =	350
Column Totals:	100 (A)		470 (B)
Prevalence Index = B/A =			4.70

Hydrophytic Vegetation Indicators:
___ 1 - Rapid Test for Hydrophytic Vegetation
___ 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)
[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: SP20

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-8	10YR 4/2	100					Loamy/Clayey	
8-13	10YR 5/3	100					Loamy/Clayey	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ____ No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ____ No X Depth (inches): ____

Water Table Present? Yes ____ No X Depth (inches): ____

Saturation Present? Yes ____ No X Depth (inches): ____

(includes capillary fringe)

Wetland Hydrology Present? Yes ____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

U.S. Army Corps of Engineers **WETLAND DETERMINATION DATA SHEET – Midwest Region** See ERDC/EL TR-10-16; the proponent agency is CECW-CO-R	*OMB Control #: 0710-0024, Exp:11/30/2024* *Requirement Control Symbol EXEMPT:* *(Authority: AR 335-15, paragraph 5-2a)*

Project/Site: GM-Orion | City/County: Orion/Oakland | Sampling Date: 4/26/2022

Applicant/Owner: General Motors, LLC | State: MI | Sampling Point: SP21

Investigator(s): Jann/DeMars | Section, Township, Range: Sec. 34 and 35, Twp 4N, R 10E

Landform (hillside, terrace, etc.): Drainage Swale | Local relief (concave, convex, none): Concave

Slope (%): 2% | Lat: 42.713147 | Long: -83.255483 | Datum: NAD 83

Soil Map Unit Name: Riddles sandy loam, 6 to 12 percent slopes | NWI classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
Sapling/Shrub Stratum (Plot size: 15)			
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
Herb Stratum (Plot size: 5)			
1. *Phragmites australis*	90	Yes	FACW
2. *Carex lacustris*	15	No	OBL
3. *Poa compressa*	10	No	FACU
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	115 =Total Cover		
Woody Vine Stratum (Plot size: 30)			
1.			
2.			
	=Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of		Multiply by	
OBL species	15	x 1 =	15
FACW species	90	x 2 =	180
FAC species	0	x 3 =	0
FACU species	10	x 4 =	40
UPL species	0	x 5 =	0
Column Totals:	115 (A)		235 (B)

Prevalence Index = B/A = 2.04

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: SP21

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-9	10YR 4/1	100					Loamy/Clayey	
9-18	10YR 5/1	85	10YR 7/2	5	C	M	Loamy/Clayey	Faint redox concentrations

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- X Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ___

Depth (inches): ___

Hydric Soil Present? Yes X No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches): ___
Water Table Present?	Yes X	No ___	Depth (inches): 4
Saturation Present? (includes capillary fringe)	Yes X	No ___	Depth (inches): 0

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

U.S. Army Corps of Engineers **WETLAND DETERMINATION DATA SHEET – Midwest Region** See ERDC/EL TR-10-16; the proponent agency is CECW-CO-R	*OMB Control #: 0710-0024, Exp:11/30/2024* *Requirement Control Symbol EXEMPT:* *(Authority: AR 335-15, paragraph 5-2a)*

Project/Site: GM-Orion City/County: Orion/Oakland Sampling Date: 4/29/2022

Applicant/Owner: General Motors, LLC State: MI Sampling Point: SP22

Investigator(s): Jann/DeMers Section, Township, Range: Sec. 34 and 35, Twp 4N, R 10E

Landform (hillside, terrace, etc.): Hillslope Local relief (concave, convex, none): None

Slope (%): 3% Lat: 42.713105 Long: -83.255414 Datum: NAD 83

Soil Map Unit Name: Riddles sandy loam, 6 to 12 percent slopes NWI classification: Upland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No X	**Is the Sampled Area within a Wetland?** Yes ____ No X
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes ____	No X	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: 5)			
1. *Poa pratensis*	50	Yes	FAC
2. *Poa compressa*	30	Yes	FACU
3. *Dactylis glomerata*	20	Yes	FACU
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: 30)			
1.			
2.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 33.3% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	50	x 3 =	150
FACU species	50	x 4 =	200
UPL species	0	x 5 =	0
Column Totals:	100 (A)		350 (B)
Prevalence Index = B/A =			3.50

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: SF22

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-9	10YR 4/2	100					Loamy/Clayey	
9-14	10YR 8/1	90	10YR 5/4	10	C	M	Loamy/Clayey	Distinct redox concentrations

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Hardpan/ Compacted Fill

Depth (inches): 10

Hydric Soil Present? Yes X No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply):

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___

Water Table Present? Yes ___ No X Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ___

Wetland Hydrology Present? Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Midwest Region
See ERDC/EL TR-10-16; the proponent agency is CECW-CO-R

OMB Control #: 0710-0024, Exp:11/30/2024
Requirement Control Symbol EXEMPT;
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: GM-Orion | City/County: Orion/Oakland | Sampling Date: 2/27/2022
Applicant/Owner: General Motors, LLC | State: MI | Sampling Point: SP23
Investigator(s): Jenn/DeMars | Section, Township, Range: Sec. 34 and 35, Twp 4N, R 10E
Landform (hillside, terrace, etc.): Hillslope Seep | Local relief (concave, convex, none): None
Slope (%): 2% | Lat: 42.71113 | Long: -83.268421 | Datum: NAD 83
Soil Map Unit Name: Cohoctah-Boyer loamy sands, 0 to 6 percent slopes | NWI classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____ or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____ or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:

VEGETATION – Use scientific names of plants

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: 5)			
1. *Phragmites australis*	100	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: 30)			
1.			
2.			
	= Total Cover		

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)
Total Number of Dominant Species Across All Strata: 1 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of		Multiply by:	
OBL species	0	x 1 =	0
FACW species	100	x 2 =	200
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	100 (A)		200 (B)

Prevalence Index = B/A = 2.00

Hydrophytic Vegetation Indicators:
___ 1 - Rapid Test for Hydrophytic Vegetation
X 2 - Dominance Test is >50%
X 3 - Prevalence Index is <3.0
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)
[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: SP23

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-3	10YR 4/1	100					Loamy/Clayey	
3-14	10YR 5/1	100					Loamy/Clayey	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches): ___
Water Table Present?	Yes X	No ___	Depth (inches): 9
Saturation Present? (includes capillary fringe)	Yes X	No ___	Depth (inches): 0

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Midwest Region
See ERDC/EL TR-10-16; the proponent agency is CECW-CO-R

OMB Control #: 0710-0024, Exp:11/30/2024
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: GM-Orion | City/County: Orion/Oakland | Sampling Date: 4/27/2022
Applicant/Owner: General Motors, LLC | State: MI | Sampling Point: SP24
Investigator(s): Jenn/DeMars | Section, Township, Range: Sec. 34 and 35, Twp 4N, R 10E
Landform (hillside, terrace, etc.): Hillslope | Local relief (concave, convex, none): Convex
Slope (%): 2% | Lat: 42.711095 | Long: -83.258321 | Datum: NAD 83
Soil Map Unit Name: Oshtemo-Boyer loamy sands, 0 to 6 percent slopes | NWI classification: Upland
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No X	Is the Sampled Area within a Wetland? Yes ____ No X
Hydric Soil Present?	Yes ____	No X	
Wetland Hydrology Present?	Yes ____	No X	

Remarks:

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 30)			
1.			
2.			
3.			
4.			
5.			
	____	=Total Cover	
Sapling/Shrub Stratum (Plot size: 15)			
1.			
2.			
3.			
4.			
5.			
	____	=Total Cover	
Herb Stratum (Plot size: 5)			
1. *Lolium perenne*	30	Yes	FACU
2. *Poa compressa*	60	Yes	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	90	=Total Cover	
Woody Vine Stratum (Plot size: 30)			
1.			
2.			
	____	=Total Cover	

Remarks: (Include photo numbers here or on a separate sheet.)

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)
Total Number of Dominant Species Across All Strata: 2 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 0.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	0	x 3 =	0
FACU species	90	x 4 =	360
UPL species	0	x 5 =	0
Column Totals	90 (A)		360 (B)
Prevalence Index = B/A =			4.00

Hydrophytic Vegetation Indicators:
___ 1 - Rapid Test for Hydrophytic Vegetation
___ 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)
[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No X

SOIL

Sampling Point: SP24

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-13	10YR 4/2	100					Loamy/Clayey	Fill

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ____ No X

Remarks:
Soils are Fill

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ____ No X Depth (inches): _____

Water Table Present? Yes ____ No X Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ____ No X Depth (inches): _____

Wetland Hydrology Present? Yes ____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Midwest Region
See ERDC/EL TR-10-16; the proponent agency is CECW-CO-R

OMB Control #: 0710-0024, Exp:11/30/2024
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: GM-Orion | City/County: Orion/Oakland | Sampling Date: 2/27/2022
Applicant/Owner: General Motors, LLC | State: MI | Sampling Point: SP25
Investigator(s): Jenni/DeMars | Section, Township, Range: Sec. 34 and 35, Twp 4N, R 10E
Landform (hillside, terrace, etc.): Flat | Local relief (concave, convex, none): None
Slope (%): | Lat: 42.710555 | Long: -83.258428 | Datum: NAD 83
Soil Map Unit Name: Oshtemo-Boyer loamy sands, 0 to 6 percent slopes | NWI classification: PEM
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)
Are Vegetation , Soil , or Hydrology significantly disturbed? Are "Normal Circumstances" present? Yes X No
Are Vegetation , Soil , or Hydrology naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No
Hydric Soil Present?	Yes X	No
Wetland Hydrology Present?	Yes X	No

Is the Sampled Area within a Wetland? Yes X No

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
Sapling/Shrub Stratum (Plot size: 15)			
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
Herb Stratum (Plot size: 5)			
1. *Alopecurus pratensis*	40	Yes	FACW
2. *Poa palustris*	30	Yes	FACW
3. *Juncus tenuis*	10	No	FAC
4. *Carex stricta*	5	No	OBL
5.			
6.			
7.			
8.			
9.			
10.			
	85	=Total Cover	
Woody Vine Stratum (Plot size: 30)			
1.			
2.			
	=Total Cover		

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)
Total Number of Dominant Species Across All Strata: 2 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	5	x 1 =	5
FACW species	70	x 2 =	140
FAC species	10	x 3 =	30
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	85 (A)		175 (B)

Prevalence Index = B/A = 2.06

Hydrophytic Vegetation Indicators:
1 - Rapid Test for Hydrophytic Vegetation
X 2 - Dominance Test is >50%
X 3 - Prevalence Index is ≤3.0[1]
4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: SP25

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-5	10YR 4/1	100					Loamy/Clayey	
5-18	10YR 5/1	100					Loamy/Clayey	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Hardpan

Depth (inches): 8

Hydric Soil Present? Yes X No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches): ___
Water Table Present?	Yes X	No ___	Depth (inches): 3
Saturation Present? (includes capillary fringe)	Yes X	No ___	Depth (inches): 0

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

U.S. Army Corps of Engineers **WETLAND DETERMINATION DATA SHEET – Midwest Region** See ERDC/EL TR-10-16; the proponent agency is CECW-CO-R	*OMB Control #: 0710-0024, Exp:11/30/2024* *Requirement Control Symbol EXEMPT:* *(Authority: AR 335-15, paragraph 5-2a)*

Project/Site: GM-Orion | City/County: Orion/Oakland | Sampling Date: 2/27/2022

Applicant/Owner: General Motors, LLC | State: MI | Sampling Point: SP 23

Investigator(s): Jenni/Dell'Aria | Section, Township, Range: Sec. 34 and 35, Twp 4N, R 10E

Landform (hillside, terrace, etc.): Hillslope | Local relief (concave, convex, none): None

Slope (%): 1% | Lat: 42.710337 | Long: -83.259265 | Datum: NAD 83

Soil Map Unit Name: Oshtemo-Boyer loamy sands, 0 to 6 percent slopes | NWI classification: Upland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No X	**Is the Sampled Area within a Wetland?** Yes ____ No N
Hydric Soil Present?	Yes ____	No N	
Wetland Hydrology Present?	Yes ____	No N	

Remarks:

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 30)			
1.			
2.			
3.			
4.			
5.			
	____ =Total Cover		
Sapling/Shrub Stratum (Plot size: 15)			
1.			
2.			
3.			
4.			
5.			
	____ =Total Cover		
Herb Stratum (Plot size: 5)			
1. *Lotus corniculatus*	40	Yes	FACU
2. *Lotus corniculatus*	30	Yes	FACU
3. *Centaurea stoebe*	20	Yes	UPL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	90 =Total Cover		
Woody Vine Stratum (Plot size: 30)			
1.			
2.			
	____ =Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	0	x 3 =	0
FACU species	70	x 4 =	280
UPL species	20	x 5 =	100
Column Totals:	90 (A)		380 (B)

Prevalence Index = B/A = 4.22

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: SP 26

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 4/2	100					Loamy/Clayey	
4-14	10YR 5/4	90	10YR 4/1	10	C	M	Loamy/Clayey	Faint redox concentrations, fill

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ____ No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D8)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ____ No X Depth (inches): _____

Water Table Present? Yes ____ No X Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ____ No X Depth (inches): _____

Wetland Hydrology Present? Yes ____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Midwest Region
See ERDC/EL TR-10-16; the proponent agency is CECW-CO-R

OMB Control #: 0710-0024, Exp:11/30/2024
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: GM-Orion | City/County: Orion/Oakland | Sampling Date: 2/27/2022
Applicant/Owner: General Motors, LLC | State: MI | Sampling Point: SP27
Investigator(s): Jenni DeMars | Section, Township, Range: Sec. 34 and 35, Twp 4N, R 10E
Landform (hillside, terrace, etc.): Drainage Way | Local relief (concave, convex, none): None
Slope (%): 0 | Lat: 42.710523 | Long: -83.257021 | Datum: NAD 83
Soil Map Unit Name: Oshtemo-Boyer loamy sands, 0 to 6 percent slopes | NWI classification: PEM
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are 'Normal Circumstances' present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 30)			
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
Sapling/Shrub Stratum (Plot size: 15)			
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
Herb Stratum (Plot size: 5)			
1. *Poa compressa*	40	Yes	FACU
2. *Poa pratensis*	30	Yes	FAC
3. *Alopecurus pratensis*	20	Yes	FACW
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	90 =Total Cover		
Woody Vine Stratum (Plot size: 30)			
1.			
2.			
	=Total Cover		

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)
Total Number of Dominant Species Across All Strata: 3 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 66.7% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	20	x 2 =	40
FAC species	30	x 3 =	90
FACU species	40	x 4 =	160
UPL species	0	x 5 =	0
Column Totals:	90 (A)		290 (B)
Prevalence Index = B/A =			3.22

Hydrophytic Vegetation Indicators:
___ 1 - Rapid Test for Hydrophytic Vegetation
X 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain):
[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: SP27

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 4/1	100					Loamy/Clayey	Loam
4-14	10YR 5/1	100					Loamy/Clayey	Clay

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ___

Depth (inches): ___

Hydric Soil Present? Yes X No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches): ___
Water Table Present?	Yes X	No ___	Depth (inches): 4
Saturation Present? (includes capillary fringe)	Yes X	No ___	Depth (inches): 0

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

U.S. Army Corps of Engineers **WETLAND DETERMINATION DATA SHEET – Midwest Region** See ERDC/EL TR-10-16; the proponent agency is CECW-CO-R	*OMB Control #: 0710-0024, Exp:11/30/2024* *Requirement Control Symbol EXEMPT:* *(Authority: AR 335-15, paragraph 5-2a)*

Project/Site: GM-Orion | City/County: Orion/Oakland | Sampling Date: 4/26/2022

Applicant/Owner: General Motors, LLC | State: MI | Sampling Point: SP28

Investigator(s): Jandl/DeMare | Section, Township, Range: Sec. 34 and 35, Twp 4N, R 10E

Landform (hillside, terrace, etc.): Flat | Local relief (concave, convex, none): None

Slope (%): 0 | Lat: 42.710588 | Long: -83.296848 | Datum: NAD 83

Soil Map Unit Name: Oshtemo-Boyer loamy sands, 0 to 6 percent slopes | NWI classification: Up

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No X
Hydric Soil Present?	Yes ____	No X
Wetland Hydrology Present?	Yes ____	No X
Is the Sampled Area within a Wetland?	Yes ____	No X

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
Sapling/Shrub Stratum (Plot size: 15)			
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
Herb Stratum (Plot size: 5)			
1. *Lotus corniculatus*	90	Yes	FACU
2. *Bromus inermis*	5	No	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	95 =Total Cover		
Woody Vine Stratum (Plot size: 30)			
1.			
2.			
	=Total Cover		

Remarks: (Include photo numbers here or on a separate sheet.)

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	0	x 3 =	0
FACU species	95	x 4 =	380
UPL species	0	x 5 =	0
Column Totals:	95 (A)		380 (B)
Prevalence Index = B/A =			4.00

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No X

SOIL

Sampling Point: SF28

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-8	10YR 4/2	100					Loamy/Clayey	Fill
8-19	10YR 6/3	100					Loamy/Clayey	Course sand fill

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ____ No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): ____
Water Table Present?	Yes ____	No X	Depth (inches): ____
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches): ____

Wetland Hydrology Present? Yes ____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Midwest Region
See ERDC/EL TR-10-16; the proponent agency is CECW-CO-R

OMB Control #: 0710-0024, Exp:11/30/2024
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: GM-Orion | City/County: Orion/Oakland | Sampling Date: 4/26/2022
Applicant/Owner: General Motors, LLC | State: MI | Sampling Point: SP29
Investigator(s): Jenni/DeMars | Section, Township, Range: Sec. 34 and 35, Twp 4N, R 10E
Landform (hillside, terrace, etc.): Flat | Local relief (concave, convex, none): None
Slope (%): ____ | Lat: 42.711251 | Long: -83.25547 | Datum: NAD 83
Soil Map Unit Name: | NWI classification: PEM
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____
Hydric Soil Present?	Yes X	No ____
Wetland Hydrology Present?	Yes X	No ____

Is the Sampled Area within a Wetland? Yes X No ____

Remarks:
Sphagnum moss present

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: 5)			
1. *Alopecurus pratensis*	40	Yes	FACW
2. *Poa palustris*	30	Yes	FACW
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	70 = Total Cover		
Woody Vine Stratum (Plot size: 30)			
1.			
2.			
	= Total Cover		

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)
Total Number of Dominant Species Across All Strata: 2 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	70	x 2 =	140
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	70 (A)		140 (B)
Prevalence Index = B/A =			2.00

Hydrophytic Vegetation Indicators:
___ 1 - Rapid Test for Hydrophytic Vegetation
X 2 - Dominance Test is >50%
X 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)
[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks: (Include photo numbers here or on a separate sheet.)
Approximately 20% cover of sphagnum moss

SOIL

Sampling Point: SP29

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-8	10YR 4/1	100					Loamy/Clayey	Silt Loam
8-18	10YR 5/1	75	10YR 4/2	5	C	M	Loamy/Clayey	Faint redox concentrations

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ___

Depth (inches): ___

Hydric Soil Present? Yes X No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- X High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes X	No ___	Depth (inches): 1
Water Table Present?	Yes X	No ___	Depth (inches): 0
Saturation Present? (includes capillary fringe)	Yes X	No ___	Depth (inches): 0

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

U.S. Army Corps of Engineers **WETLAND DETERMINATION DATA SHEET – Midwest Region** See ERDC/EL TR-10-16; the proponent agency is CECW-CO-R	*OMB Control #: 0710-0024, Exp:11/30/2024* *Requirement Control Symbol EXEMPT:* *(Authority: AR 335-15, paragraph 5-2a)*

Project/Site: GM-Orion City/County: Orion/Oakland Sampling Date: 4/29/2022

Applicant/Owner: General Motors, LLC State: MI Sampling Point: SP30

Investigator(s): Jarret/DeMars Section, Township, Range: Sec. 34 and 35, Twp 4N, R 10E

Landform (hillside, terrace, etc.): Flat Local relief (concave, convex, none): None

Slope (%): 0 Lat: 42.711285 Long: -83.25533 Datum: NAD 83

Soil Map Unit Name: Oshtemo-Hoyer loamy sands, 0 to 6 percent slopes NWI classification: Upland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No X	**Is the Sampled Area within a Wetland?** Yes ____ No X
Hydric Soil Present?	Yes ____	No X	
Wetland Hydrology Present?	Yes ____	No X	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
Sapling/Shrub Stratum (Plot size: 15)			
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
Herb Stratum (Plot size: 5)			
1. *Lotus corniculatus*	100	Yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	100 =Total Cover		
Woody Vine Stratum (Plot size: 30)			
1.			
2.			
	=Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	0	x 3 =	0
FACU species	100	x 4 =	400
UPL species	0	x 5 =	0
Column Totals:	100 (A)		400 (B)

Prevalence Index = B/A = 4.00

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: SP30

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-12	10YR 4/2	100					Loamy/Clayey	Fill
12-14	10YR 6/3	100					Loamy/Clayey	Sand Fill

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ____ No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): ____
Water Table Present?	Yes ____	No X	Depth (inches): ____
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches): ____

Wetland Hydrology Present? Yes ____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

U.S. Army Corps of Engineers **WETLAND DETERMINATION DATA SHEET – Midwest Region** See ERDC/EL TR-10-16; the proponent agency is CECW-CO-R	*OMB Control #: 0710-0024, Exp:11/30/2024* *Requirement Control Symbol EXEMPT:* *(Authority: AR 335-15, paragraph 5-2a)*

Project/Site: GM-Orion | City/County: Orion/Oakland | Sampling Date: 4/28/2022

Applicant/Owner: General Motors, LLC | State: MI | Sampling Point: SP31

Investigator(s): Jarni/DeMars | Section, Township, Range: Sec. 34 and 35, Twp 4N, R 10E

Landform (hillside, terrace, etc.): Ditch | Local relief (concave, convex, none): Concave

Slope (%): <1% | Lat: 42.710092 | Long: -83.260375 | Datum: NAD 83

Soil Map Unit Name: Oshtemo-Boyer loamy sands, 0 to 6 percent slopes | NWI classification: PFO

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Populus deltoides*	30	Yes	FAC
2. *Salix nigra*	10	Yes	OBL
3.			
4.			
5.			
	40	=Total Cover	
Sapling/Shrub Stratum (Plot size: 15)			
1. *Cornus racemosa*	5	Yes	FAC
2.			
3.			
4.			
5.			
	5	=Total Cover	
Herb Stratum (Plot size: 5)			
1. *Phragmites australis*	80	Yes	FACW
2. *Phalaris arundinacea*	20	Yes	FACW
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	80	=Total Cover	
Woody Vine Stratum (Plot size: 30)			
1.			
2.			
		=Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 5 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	10	x 1 =	10
FACW species	80	x 2 =	160
FAC species	35	x 3 =	105
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals	125 (A)		275 (B)

Prevalence Index = B/A = 2.20

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: SP31

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-7	10YR 4/1	100					Loamy/Clayey	Fill
7-14	10YR 5/1	100					Loamy/Clayey	Fill

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Compacted Fill

Depth (inches): ___

Hydric Soil Present? Yes X No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches): ___
Water Table Present?	Yes X	No ___	Depth (inches): 1
Saturation Present? (includes capillary fringe)	Yes X	No ___	Depth (inches): 0

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Midwest Region
See ERDC/EL TR-10-16; the proponent agency is CECW-CO-R

OMB Control #: 0710-0024, Exp:11/30/2024
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: GM-Orion | City/County: Orion/Oakland | Sampling Date: 4/27/2022
Applicant/Owner: General Motors, LLC | State: MI | Sampling Point: SP32
Investigator(s): Jenni/DeMars | Section, Township, Range: Sec. 34 and 35, Twp 4N, R 10E
Landform (hillside, terrace, etc.): Hillslope | Local relief (concave, convex, none): Convex
Slope (%): 10% | Lat: 42.710056 | Long: -83.260408 | Datum: NAD 83
Soil Map Unit Name: Oshtemo-Boyer loamy sands, 0 to 6 percent slopes | NWI classification: Upland
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No X	**Is the Sampled Area within a Wetland?** Yes ____ No X
Hydric Soil Present?	Yes ____	No X	
Wetland Hydrology Present?	Yes ____	No X	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
Sapling/Shrub Stratum (Plot size: 15)			
1. *Juniperus virginiana*	10	Yes	FACU
2.			
3.			
4.			
5.			
	10 =Total Cover		
Herb Stratum (Plot size: 5)			
1. *Dactylis glomerata*	40	Yes	FACU
2. *Poa compressa*	20	Yes	FACU
3. *Centaurea stoebe*	10	No	UPL
4. *Phragmites australis*	5	No	FACW
5.			
6.			
7.			
8.			
9.			
10.			
	75 =Total Cover		
Woody Vine Stratum (Plot size: 30)			
1.			
2.			
	=Total Cover		

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)
Total Number of Dominant Species Across All Strata: 3 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	5	x 2 =	10
FAC species	0	x 3 =	0
FACU species	70	x 4 =	280
UPL species	10	x 5 =	50
Column Totals:	85 (A)		340 (B)
Prevalence Index = B/A =			4.00

Hydrophytic Vegetation Indicators:
___ 1 - Rapid Test for Hydrophytic Vegetation
___ 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)
[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: SP32

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-10	10YR 4/2	100					Loamy/Clayey	
10-14	10YR 4/3	100					Loamy/Clayey	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ____ No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ____ No X Depth (inches) _____

Water Table Present? Yes ____ No X Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ____ No X Depth (inches): _____

Wetland Hydrology Present? Yes ____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available.

Remarks:

U.S. Army Corps of Engineers **WETLAND DETERMINATION DATA SHEET – Midwest Region** See ERDC/EL TR-10-16; the proponent agency is CECW-CO-R	*OMB Control #: 0710-0024, Exp:11/30/2024* *Requirement Control Symbol EXEMPT:* *(Authority: AR 335-15, paragraph 5-2a)*

Project/Site: GM-Orion City/County: Orion/Oakland Sampling Date: 4/27/2022

Applicant/Owner: General Motors, LLC State: MI Sampling Point: SP33

Investigator(s): JannilJoh/Ars Section, Township, Range: Sec. 34 and 35, Twp 4N, R 10E

Landform (hillside, terrace, etc.): Hillslope/ Terrace Local relief (concave, convex, none): None

Slope (%): 20% Lat: 42.709163 Long: -83.257688 Datum: NAD 83

Soil Map Unit Name: Oshtemo-Boyer loamy sands, 0 to 6 percent slopes NWI classification: Upland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:
Sample point on midslope of terrace

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: 5)			
1. *Phalaris arundinacea*	80	Yes	FACW
2. *Phragmites australis*	40	Yes	FACW
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	120 = Total Cover		
Woody Vine Stratum (Plot size: 30)			
1.			
2.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	120	x 2 =	240
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	120 (A)		240 (B)
Prevalence Index = B/A =			2.00

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: SP33

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-9	10YR 4/2	100					Loamy/Clayey	
9-18	10YR 6/2	60	10YR 6/4	20	C	M	Loamy/Clayey	Distinct redox concentrations

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ___

Depth (inches): ___

Hydric Soil Present? Yes X No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D8)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches): ___
Water Table Present?	Yes X	No ___	Depth (inches): 12
Saturation Present? (includes capillary fringe)	Yes X	No ___	Depth (inches): 9

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

U.S. Army Corps of Engineers **WETLAND DETERMINATION DATA SHEET – Midwest Region** See ERDC/EL TR-10-16; the proponent agency is CECW-CO-R	*OMB Control #: 0710-0024, Exp:11/30/2024* *Requirement Control Symbol EXEMPT:* *(Authority: AR 335-15, paragraph 5-2a)*

Project/Site: GM-Orion City/County: Orion/Oakland Sampling Date: 4/27/2022

Applicant/Owner: General Motors, LLC State: MI Sampling Point: SP34

Investigator(s): Jamie DeMars Section, Township, Range: Sec 34 and 35, Two 4N, R 10E

Landform (hillside, terrace, etc.): Terrace - top slope Local relief (concave, convex, none): Concave

Slope (%): 10 Lat: 42.708098 Long: -83.257398 Datum: NAD 83

Soil Map Unit Name: Ceresmo-Boyer loamy sands, 0 to 6 percent slopes NWI classification: Upland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No X	**Is the Sampled Area within a Wetland?** Yes ____ No X
Hydric Soil Present?	Yes ____	No X	
Wetland Hydrology Present?	Yes ____	No X	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Acer negundo*	10	Yes	FAC
2.			
3.			
4.			
5.			
	10 = Total Cover		
Sapling/Shrub Stratum (Plot size: 15)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: 5)			
1. *Lolos cornculatus*	80	Yes	FACU
2. *Dactylis glomerata*	20	Yes	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: 30)			
1.			
2.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 33.3% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	10	x 3 =	30
FACU species	100	x 4 =	400
UPL species	0	x 5 =	0
Column Totals:	110 (A)		430 (B)

Prevalence Index = B/A = 3.91

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: SP34

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-7	10YR 4/2	100					Loamy/Clayey	
7-14	10YR 6/3	100					Loamy/Clayey	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ____ No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ____ No X Depth (inches): _____

Water Table Present? Yes ____ No X Depth (inches): _____

Saturation Present? Yes ____ No X Depth (inches): _____

(includes capillary fringe)

Wetland Hydrology Present? Yes ____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Midwest Region
See ERDC/EL TR-10-16; the proponent agency is CECW-CO-R

OMB Control #: 0710-0024, Exp:11/30/2024
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: GM-Orion | City/County: Orion/Oakland | Sampling Date: 4/27/2022
Applicant/Owner: General Motors, LLC | State: MI | Sampling Point: SP35
Investigator(s): JannitDeMars | Section, Township, Range: Sec 34 and 35, Two 4N, R 10E
Landform (hillside, terrace, etc.): Back slope of terrace | Local relief (concave, convex, none): Concave
Slope (%): 3% | Lat: 42.709054 | Long: -83.258899 | Datum: NAD 83
Soil Map Unit Name: Marlette sandy loam, 1 to 6 percent slopes | NWI classification: Upland
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** Yes ____ No X
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes ____	No X	

Remarks:
Backslope of terrace

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
Sapling/Shrub Stratum (Plot size: 15)			
1. *Frangula alnus*	5	Yes	FACW
2.			
3.			
4.			
5.			
	5 =Total Cover		
Herb Stratum (Plot size 5)			
1. *Phragmites australis*	80	Yes	FACW
2. *Lotus corniculatus*	30	Yes	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	110 =Total Cover		
Woody Vine Stratum (Plot size: 30)			
1.			
2.			
	=Total Cover		

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)
Total Number of Dominant Species Across All Strata: 3 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 66.7% (A/B)

Prevalence Index worksheet:

Total % Cover of		Multiply by:	
OBL species	0	x 1 =	0
FACW species	85	x 2 =	170
FAC species	0	x 3 =	0
FACU species	30	x 4 =	120
UPL species	0	x 5 =	0
Column Totals:	115 (A)		290 (B)

Prevalence Index = B/A = 2.52

Hydrophytic Vegetation Indicators:
___ 1 - Rapid Test for Hydrophytic Vegetation
X 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: SP35

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 3/1						Loamy/Clayey	
6-14	10YR 5/1	97	10YR 5/4	3	C	M	Loamy/Clayey	Distinct redox concentrations

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- X Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ___

Depth (inches): ___

Hydric Soil Present? Yes X No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___

Water Table Present? Yes ___ No X Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ___

Wetland Hydrology Present? Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

U.S. Army Corps of Engineers **WETLAND DETERMINATION DATA SHEET – Midwest Region** See ERDC/EL TR-10-16; the proponent agency is CECW-CO-R	*OMB Control #: 0710-0024, Exp:11/30/2024* *Requirement Control Symbol EXEMPT;* *(Authority: AR 335-15, paragraph 5-2a)*

Project/Site: GM-Orion | City/County: Orion/Oakland | Sampling Date: 4/27/2022

Applicant/Owner: General Motors, LLC | State: MI | Sampling Point: SP36

Investigator(s): Jenni DeMars | Section, Township, Range: Sec 34 and 35, Twp 4N, R 10E

Landform (hillside, terrace, etc.): Hillslope | Local relief (concave, convex, none): Concave

Slope (%): 3% | Lat: 42.708852 | Long: -83.256306 | Datum: NAD 83

Soil Map Unit Name: Brookston and Colwood loams | NWI classification: PEO

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____ or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Populus deltoides*	60	Yes	FAC
2. *Fraxinus pennsylvanica*	10	No	FACW
3.			
4.			
5.			
	70	=Total Cover	
Sapling/Shrub Stratum (Plot size: 15)			
1. *Cornus racemosa*	30	Yes	FAC
2.			
3.			
4.			
5.			
	30	=Total Cover	
Herb Stratum (Plot size: 5)			
1. *Phalaris arundinacea*	60	Yes	FACW
2. *Phragmites australis*	20	Yes	FACW
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	80	=Total Cover	
Woody Vine Stratum (Plot size: 30)			
1.			
2.			
		=Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	60	x 2 =	180
FAC species	90	x 3 =	270
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	180 (A)		450 (B)
Prevalence Index = B/A =			2.50

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: SP36

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type	Loc[2]	Texture	Remarks
0-7	10YR 4/1	100					Loamy/Clayey	Silty Loam
7-14	10YR 5/1	95	10YR 5/3	5	C	M	Loamy/Clayey	Distinct redox concentrations

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- X Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___

Water Table Present? Yes X No ___ Depth (inches): 4

Saturation Present? (includes capillary fringe) Yes X No ___ Depth (inches): 0

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Midwest Region
See ERDC/EL TR-10-16; the proponent agency is CECW-CO-R

OMB Control #: 0710-0024, Exp:11/30/2024
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: GM-Orion City/County: Orion/Oakland Sampling Date: 4/27/2022
Applicant/Owner: General Motors, LLC State: MI Sampling Point: SP37
Investigator(s): Jarod DeMars Section, Township, Range: Sec 34 and 35, Two 4N, R 10E
Landform (hillside, terrace, etc.): Hills ope Local relief (concave, convex, none): Convex
Slope (%): 2% Lat: 42.708886 Long: -83.25537° Datum: NAD 83
Soil Map Unit Name: Brookston and Colwood loams NWI classification: Upland
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____ or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____ or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** Yes ____ No X
Hydric Soil Present?	Yes ____	No X	
Wetland Hydrology Present?	Yes ____	No X	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15)			
1. Cornus racemosa	20	Yes	FAC
2.			
3.			
4.			
5.			
	20	= Total Cover	
Herb Stratum (Plot size: 5)			
1. Phalaris arundinacea	90	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	90	= Total Cover	
Woody Vine Stratum (Plot size: 30)			
1. Vitis riparia	10	Yes	FACW
2.			
	10	= Total Cover	

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)
Total Number of Dominant Species Across All Strata: 3 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	100	x 2 =	200
FAC species	20	x 3 =	60
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	120 (A)		260 (B)

Prevalence Index = B/A = 2.17

Hydrophytic Vegetation Indicators:
___ 1 - Rapid Test for Hydrophytic Vegetation
X 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)
[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: SP37

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-6	10YR 4/1	100					Loamy/Clayey	
6-14	10YR 5/4	100					Loamy/Clayey	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ____ No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ____ No X Depth (inches): _____

Water Table Present? Yes ____ No X Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ____ No X Depth (inches): _____

Wetland Hydrology Present? Yes ____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

U.S. Army Corps of Engineers **WETLAND DETERMINATION DATA SHEET – Midwest Region** See ERDC/EL TR-10-16; the proponent agency is CECW-CO-R	*OMB Control #: 0710-0024, Exp:11/30/2024* *Requirement Control Symbol EXEMPT:* *(Authority: AR 335-15, paragraph 5-2a)*

Project/Site: GM-Orion City/County: Orion/Oakland Sampling Date: 4/28/2022

Applicant/Owner: General Motors, LLC State: MI Sampling Point: SP39

Investigator(s): Jarrid DeMers Section, Township, Range: Sec 34 and 35, Two 4N, R 10E

Landform (hillside, terrace, etc.): Hillslope Local relief (concave, convex, none): None

Slope (%): 2% Lat: 42.708943 Long: -83.255486 Datum: NAD 83

Soil Map Unit Name: Brookston and Colwood loams NWI classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No	**Is the Sampled Area within a Wetland?** Yes X No
Hydric Soil Present?	Yes X No	
Wetland Hydrology Present?	Yes X No	

Remarks

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: 5)			
1. *Phragmites australis*	90	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	90 = Total Cover		
Woody Vine Stratum (Plot size: 30)			
1.			
2.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	90	x 2 =	180
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	90 (A)		180 (B)

Prevalence Index = B/A = 2.00

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: SP38

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-8	10YR 3/1	100					Loamy/Clayey	
8-10	10YR 4/1	90	10YR 5/4	10	C	M	Loamy/Clayey	Distinct redox concentrations
10-14	10YR 5/2	70	10YR 5/4	30	C	M	Loamy/Clayey	Distinct redox concentrations

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- X Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ___

Depth (inches): ___

Hydric Soil Present? Yes X No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply):

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required):

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- X Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___

Water Table Present? Yes ___ No X Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ___

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Midwest Region
See ERDC/EL TR-10-16; the proponent agency is CECW-CO-R

OMB Control #: 0710-0024, Exp:11/30/2024
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: GM-Orion | City/County: Orion/Oakland | Sampling Date: 4/26/2022
Applicant/Owner: General Motors, LLC | State: MI | Sampling Point: SP39
Investigator(s): Jarrit/Dat/Mars | Section, Township, Range: Sec 34 and 35, Two 4N, R 10E
Landform (hillside, terrace, etc.): Backslope of terrace | Local relief (concave, convex, none): Convex
Slope (%): 2% | Lat: 42.716017 | Long: -83.254224 | Datum: NAD 83
Soil Map Unit Name: Marette sandy loam, 1 to 6 percent slopes | NWI classification: Upland
Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No ____ (If no, explain in Remarks.)
Are Vegetation ____ Soil ____ , or Hydrology ____ significantly disturbed? Are 'Normal Circumstances' present? Yes ____ No X
Are Vegetation ____ , Soil ____ , or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** Yes ____ No X
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes ____	No X	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15)			
1. *Salix interior*	10	Yes	FACW
2.			
3.			
4.			
5.			
	10 = Total Cover		
Herb Stratum (Plot size: 5)			
1. *Phalaris arundinacea*	40	Yes	FACW
2. *Lotus corniculatus*	20	Yes	FACU
3. *Poa compressa*	10	No	FACU
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	70 = Total Cover		
Woody Vine Stratum (Plot size: 30)			
1.			
2.			
	= Total Cover		

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)
Total Number of Dominant Species Across All Strata: 3 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 66.7% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	50	x 2 =	100
FAC species	0	x 3 =	0
FACU species	30	x 4 =	120
UPL species	0	x 5 =	0
Column Totals:	80 (A)		220 (B)
Prevalence Index = B/A =			2.75

Hydrophytic Vegetation Indicators:
___ 1 - Rapid Test for Hydrophytic Vegetation
X 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)
[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: SP09

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-2	10YR 4/1	100					Loamy/Clayey	
2-10	10YR 5/1	100					Loamy/Clayey	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Compacted/ Clay/ Rock

Depth (inches): 10

Hydric Soil Present? Yes X No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply):

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required):

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___

Water Table Present? Yes ___ No X Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ___

Wetland Hydrology Present? Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Midwest Region
See ERDC/EL TR-10-16; the proponent agency is CECW-CO-R

OMB Control #: 0710-0024, Exp:11/30/2024
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: GM-Orion | City/County: Orion/Oakland | Sampling Date: 4/26/2022
Applicant/Owner: General Motors, LLC | State: MI | Sampling Point: SP40
Investigator(s): Jenni/DeMars | Section, Township, Range: Sec 34 and 35 Two 4N, R 10E
Landform (hillside, terrace, etc.): Ditch | Local relief (concave, convex, none): Concave
Slope (%): 1% | Lat: 42.717769 | Long: -83.254523 | Datum: NAD 83
Soil Map Unit Name: Marlette sandy loam, 1 to 6 percent slopes | NWI classification: PEM
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Populus deltoides*	5	Yes	FAC
2.			
3.			
4.			
5.			
	5	=Total Cover	
Sapling/Shrub Stratum (Plot size: 15)			
1. *Salix interior*	5	Yes	FACW
2.			
3.			
4.			
5.			
	5	=Total Cover	
Herb Stratum (Plot size: 5)			
1. *Phalaris arundinacea*	70	Yes	FACW
2. *Phragmites australis*	30	Yes	FACW
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	100	=Total Cover	
Woody Vine Stratum (Plot size: 30)			
1.			
2.			
		=Total Cover	

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)
Total Number of Dominant Species Across All Strata: 4 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	105	x 2 =	210
FAC species	5	x 3 =	15
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals	110 (A)		225 (B)
Prevalence Index = B/A =			2.05

Hydrophytic Vegetation Indicators:
___ 1 - Rapid Test for Hydrophytic Vegetation
X 2 - Dominance Test is >50%
X 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)
[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: SP40

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-2	10YR 4/1	100					Loamy/Clayey	Silt Loam Fill
2-12	10YR 6/1	100					Loamy/Clayey	Silt Loam Fill

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- X Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes X	No ___	Depth (inches):	1
Water Table Present?	Yes X	No ___	Depth (inches):	0
Saturation Present? (includes capillary fringe)	Yes X	No ___	Depth (inches):	0

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

U.S. Army Corps of Engineers **WETLAND DETERMINATION DATA SHEET – Midwest Region** See ERDC/EL TR-10-16; the proponent agency is CECW-CO-R	*OMB Control #: 0710-0024, Exp:11/30/2024* *Requirement Control Symbol EXEMPT:* *(Authority: AR 335-15, paragraph 5-2e)*

Project/Site: GM-Orion City/County: Orion/Oakland Sampling Date: 4/28/2022

Applicant/Owner: General Motors, LLC State: MI Sampling Point: SP41

Investigator(s): Jarni/DeMars Section, Township, Range: Sec 34 and 35, Two 4N, R 10E

Landform (hillside, terrace, etc.): Inslope of railroad ditch Local relief (concave, convex, none): None

Slope (%): 10 Lat: 42.717769 Long: -83.204551 Datum: NAD 83

Soil Map Unit Name: Marlette sandy loam, 1 to 8 percent slopes NWI classification: Upland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No X	Is the Sampled Area within a Wetland? Yes ____ No X
Hydric Soil Present?	Yes ____	No X	
Wetland Hydrology Present?	Yes ____	No X	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
Sapling/Shrub Stratum (Plot size: 15)			
1. *Cornus alba*	10	Yes	FACW
2.			
3.			
4.			
5.			
	10 =Total Cover		
Herb Stratum (Plot size: 5)			
1. *Poa compressa*	70	Yes	FACU
2. *Centaurea stoebe*	20	Yes	UPL
3. *Phalaris arundinacea*	10	No	FACW
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	100 =Total Cover		
Woody Vine Stratum (Plot size: 30)			
1.			
2.			
	=Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 33.3% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	20	x 2 =	40
FAC species	0	x 3 =	0
FACU species	70	x 4 =	280
UPL species	20	x 5 =	100
Column Totals:	110 (A)		420 (B)
Prevalence Index = B/A =			3.82

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: SP41

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-12	10YR 4/3	100					Loamy/Clayey	Silt Loam Fill

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ____ No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ____ No X Depth (inches): _____

Water Table Present? Yes ____ No X Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ____ No X Depth (inches): _____

Wetland Hydrology Present? Yes ____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

U.S. Army Corps of Engineers **WETLAND DETERMINATION DATA SHEET – Midwest Region** See ERDC/EL TR-10-16, the proponent agency is CECW-CO-R	*OMB Control #: 0710-0024, Exp:11/30/2024* *Requirement Control Symbol EXEMPT:* *(Authority: AR 335-15, paragraph 5-2a)*

Project/Site: GM-Orion City/County: Orion/Oakland Sampling Date: 4/29/2022

Applicant/Owner: General Motors, LLC State: MI Sampling Point: SP42

Investigator(s): Jenni DeMars Section, Township, Range: Sec 34 and 35, Two 4N, R 10E

Landform (hillside, terrace, etc.): Depression Local relief (concave, convex, none): Concave

Slope (%): 1% Lat: 42.718052 Long: -83.253379 Datum: NAD 83

Soil Map Unit Name: Ostrerno-Boyer loamy sands, 0 to 6 percent slopes NWI classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
Sapling/Shrub Stratum (Plot size: 15)			
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
Herb Stratum (Plot size: 5)			
1. *Alopecurus pratensis*	50	Yes	FACW
2. *Poa pratensis*	30	Yes	FAC
3. *Lolium perenne*	10	No	FACU
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	90 =Total Cover		
Woody Vine Stratum (Plot size: 30)			
1.			
2.			
	=Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of		Multiply by:	
OBL species	0	x 1 =	0
FACW species	50	x 2 =	100
FAC species	30	x 3 =	90
FACU species	10	x 4 =	40
UPL species	0	x 5 =	0
Column Totals:	90 (A)		230 (B)
Prevalence Index = B/A =			2.56

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: SP42

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-10	10YR 5/1	100					Loamy/Clayey	Silt Loam

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Compacted Clay/ Rock

Depth (inches): 10

Hydric Soil Present? Yes X No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- X Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes X	No ___	Depth (inches): 1
Water Table Present?	Yes X	No ___	Depth (inches): 0
Saturation Present? (includes capillary fringe)	Yes X	No ___	Depth (inches): 0

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

U.S. Army Corps of Engineers **WETLAND DETERMINATION DATA SHEET – Midwest Region** See ERDC/EL TR-10-16. The proponent agency is CECW-CO-R	*OMB Control #: 0710-0024, Exp:11/30/2024* *Requirement Control Symbol EXEMPT:* *(Authority: AR 335-15, paragraph 5-2a)*

Project/Site: GM-Orion City/County: Orion/Oakland Sampling Date: 4/28/2022

Applicant/Owner: General Motors, LLC State: MI Sampling Point: SP43

Investigator(s): Jarrod DeMars Section, Township, Range: Sec 34 and 35, Two 4N, R 10E

Landform (hillside, terrace, etc.): Hillslope Local relief (concave, convex, none): None

Slope (%): 1% Lat: 42.718058 Long: -83.253763 Datum: NAD 83

Soil Map Unit Name: Oshtemo-Boyer loamy sands, 0 to 6 percent slopes NWI classification: Upland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No X	**Is the Sampled Area within a Wetland?** Yes ____ No X
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes ____	No X	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Juniperus virginiana*	10	Yes	FACU
2.			
3.			
4.			
5.			
	10 = Total Cover		
Sapling/Shrub Stratum (Plot size: 15)			
1. *Elaeagnus umbellata*	20	Yes	UPL
2. *Crataegus succ-gall*	5	Yes	FAC
3.			
4.			
5.			
	25 = Total Cover		
Herb Stratum (Plot size: 5)			
1. *Lolium perenne*	40	Yes	FACU
2. *Lotus corniculatus*	35	Yes	FACU
3. *Alopecurus pratensis*	20	No	FACW
4. *Poa pratensis*	10	No	FAC
5.			
6.			
7.			
8.			
9.			
10.			
	105 = Total Cover		
Woody Vine Stratum (Plot size: 30)			
1.			
2.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 20.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	20	x 2 =	40
FAC species	15	x 3 =	45
FACU species	85	x 4 =	340
UPL species	20	x 5 =	100
Column Totals:	140 (A)		525 (B)
Prevalence Index = B/A =			3.75

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: SP43

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-8	10YR 4/1	100					Loamy/Clayey	Silt Loam
8-14	10YR 4/1	70	10YR 5/4	30	C	M	Loamy/Clayey	Distinct redox concentrations

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___

Water Table Present? Yes ___ No X Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ___

Wetland Hydrology Present? Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

U.S. Army Corps of Engineers **WETLAND DETERMINATION DATA SHEET – Midwest Region** See ERDC/EL TR-10-16; the proponent agency is CECW-CO-R	*OMB Control #: 0710-0024, Exp:11/30/2024* *Requirement Control Symbol EXEMPT:* *(Authority: AR 335-15, paragraph 5-2a)*

Project/Site: GM Orion | City/County: Orion/Oakland | Sampling Date: 4/28/2022

Applicant/Owner: General Motors, LLC | State: MI | Sampling Point: SP44

Investigator(s): Jenn/DelVare | Section, Township, Range: Sec 34 and 35, Two 4N, R 10E

Landform (hillside, terrace, etc.): Depression | Local relief (concave, convex, none): Concave

Slope (%): 1% | Lat: 42.7[illegible]6058 | Long: -83.253971 | Datum: NAD 83

Soil Map Unit Name: Oshtemo-Boyer loamy sands, 0 to 6 percent slopes | NWI classification: PEMA

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____ Soil ____ , or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____ Soil ____ , or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____
Hydric Soil Present?	Yes X	No ____
Wetland Hydrology Present?	Yes X	No ____
Is the Sampled Area within a Wetland?	Yes X	No ____

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	____ =Total Cover		
Sapling/Shrub Stratum (Plot size: 15)			
1.			
2.			
3.			
4.			
5.			
	____ =Total Cover		
Herb Stratum (Plot size: 5)			
1. *Alopecurus pratensis*	40	Yes	FACW
2. *Poa pratensis*	30	Yes	FAC
3. *Poa compressa*	15	No	FACU
4. *Lotus corniculatus*	5	No	FACU
5.			
6.			
7.			
8.			
9.			
10.			
	90 =Total Cover		
Woody Vine Stratum (Plot size: 30)			
1.			
2.			
	____ =Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	40	x 2 =	80
FAC species	30	x 3 =	90
FACU species	20	x 4 =	80
UPL species	0	x 5 =	0
Column Totals:	90 (A)		250 (B)
Prevalence Index = B/A =			2.78

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: SP44

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-7	10YR 5/1	100					Loamy/Clayey	
7-14	10YR 5/1	80	10YR 5/4	40	C	M	Loamy/Clayey	Distinct redox concentrations

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No ____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- X Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): ____
Water Table Present?	Yes X	No ____	Depth (inches): 2
Saturation Present? (includes capillary fringe)	Yes X	No ____	Depth (inches): 0

Wetland Hydrology Present? Yes X No ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Midwest Region
See ERDC/EL TR-10-16; the proponent agency is CECW-CO-R

OMB Control #: 0710-0024, Exp:11/30/2024
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: GM-Orion City/County: Orion/Oakland Sampling Date: 4/26/2022
Applicant/Owner: General Motors, LLC State: MI Sampling Point: SP45
Investigator(s): Jann/DeMars Section, Township, Range: Sec 34 and 35, Twp 4N, R 10E
Landform (hillside, terrace, etc.): Abandoned baseball fields Local relief (concave, convex, none): None
Slope (%): 0 Lat: 42.720856 Long: -83.253342 Datum: NAD 83
Soil Map Unit Name: Oshtemo-Boyer loamy sands, 6 to 12 percent slopes NWI classification: Up
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No X	**Is the Sampled Area within a Wetland?** Yes ____ No X
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
Sapling/Shrub Stratum (Plot size: 15)			
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
Herb Stratum (Plot size: 5)			
1. *Lolium perenne*	50	Yes	FACU
2. *Poa pratensis*	30	Yes	FAC
3. *Dactylis glomerata*	20	Yes	FACU
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	100 =Total Cover		
Woody Vine Stratum (Plot size: 30)			
1.			
2.			
	=Total Cover		

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)
Total Number of Dominant Species Across All Strata: 3 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 33.3% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	30	x 3 =	90
FACU species	70	x 4 =	280
UPL species	0	x 5 =	0
Column Totals:	100 (A)		370 (B)
Prevalence Index = B/A =			3.70

Hydrophytic Vegetation Indicators:
___ 1 - Rapid Test for Hydrophytic Vegetation
___ 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)
[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: SP45

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-4	10YR 4/2						Loamy/Clayey	
4-10	10YR 6/1	70	10YR 3/4	30	C	M	Loamy/Clayey	Distinct redox concentrations

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- X Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rock?

Depth (inches): 10

Hydric Soil Present? Yes X No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches): ___
Water Table Present?	Yes ___	No X	Depth (inches): ___
Saturation Present? (includes capillary fringe)	Yes X	No ___	Depth (inches): 10

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Bottom of soil pit stops at hard surface that appears to be concrete or other paved suface. This impervious surface prevents drainage

U.S. Army Corps of Engineers **WETLAND DETERMINATION DATA SHEET – Midwest Region** See ERDC/EL TR-10-16, the proponent agency is CECW-CO-R	*OMB Control #: 0710-0024, Exp:11/30/2024* *Requirement Control Symbol EXEMPT:* *(Authority: AR 335-15, paragraph 5-2a)*

Project/Site: GM-Orion City/County: Orion/Oakland Sampling Date: 4/28/2022

Applicant/Owner: General Motors, LLC State: MI Sampling Point: SP46

Investigator(s): Jann/DeMars Section, Township, Range: Sec 34 and 35, Two 4N, R 10E

Landform (hillside, terrace, etc.): Depression Local relief (concave, convex, none): Concave

Slope (%): 5% Lat: 42.722148 Long: -83.267588 Datum: NAD 83

Soil Map Unit Name: Houghton and Adrian mucks NWI classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____
Hydric Soil Present?	Yes X	No ____
Wetland Hydrology Present?	Yes X	No ____

Is the Sampled Area within a Wetland? Yes X No ____

Remarks

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: 5)			
1. *Phalaris arundinacea*	100	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: 30)			
1.			
2.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	100	x 2 =	200
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	100 (A)		200 (B)
Prevalence Index = B/A =			2.00

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: SP46

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-24	10YR 2/1	100					Mucky Peat	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- [X] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5)
- [ ] 2 cm Muck (A10)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] 5 cm Mucky Peat or Peat (S3)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] Stripped Matrix (S6)
- [ ] Dark Surface (S7)
- [ ] Loamy Mucky Mineral (F1)
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- [ ] Coast Prairie Redox (A16)
- [ ] Iron-Manganese Masses (F12)
- [ ] Red Parent Material (F21)
- [ ] Very Shallow Dark Surface (F22)
- [ ] Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type:

Depth (inches):

Hydric Soil Present? Yes X No

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- [ ] Surface Water (A1)
- [X] High Water Table (A2)
- [X] Saturation (A3)
- [ ] Water Marks (B1)
- [ ] Sediment Deposits (B2)
- [ ] Drift Deposits (B3)
- [ ] Algal Mat or Crust (B4)
- [ ] Iron Deposits (B5)
- [ ] Inundation Visible on Aerial Imagery (B7)
- [ ] Sparsely Vegetated Concave Surface (B8)
- [ ] Water Stained Leaves (B9)
- [ ] Aquatic Fauna (B13)
- [ ] True Aquatic Plants (B14)
- [ ] Hydrogen Sulfide Odor (C1)
- [ ] Oxidized Rhizospheres on Living Roots (C3)
- [ ] Presence of Reduced Iron (C4)
- [ ] Recent Iron Reduction in Tilled Soils (C6)
- [ ] Thin Muck Surface (C7)
- [ ] Gauge or Well Data (D9)
- [ ] Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- [ ] Surface Soil Cracks (B6)
- [ ] Drainage Patterns (B10)
- [ ] Dry-Season Water Table (C2)
- [ ] Crayfish Burrows (C8)
- [ ] Saturation Visible on Aerial Imagery (C9)
- [ ] Stunted or Stressed Plants (D1)
- [X] Geomorphic Position (D2)
- [X] FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes No X Depth (inches):

Water Table Present? Yes X No Depth (inches): 10

Saturation Present? (includes capillary fringe) Yes X No Depth (inches): 2

Wetland Hydrology Present? Yes X No

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

U.S. Army Corps of Engineers **WETLAND DETERMINATION DATA SHEET – Midwest Region** See ERDC/EL TR-10-16; the proponent agency is CECW-CO-R	*OMB Control #: 0710-0024, Exp:11/30/2024* *Requirement Control Symbol EXEMPT:* *(Authority: AR 335-15, paragraph 5-2a)*

Project/Site: GM-Orion City/County: Orion/Oakland Sampling Date: 4/26/2022

Applicant/Owner: General Motors, LLC State: MI Sampling Point: SP47

Investigator(s): Jamil/DeMars Section, Township, Range: Sec 34 and 35, Twp 4N, R 10E

Landform (hillside, terrace, etc.): Hillslope Local relief (concave, convex, none): None

Slope (%): 5 Lat: 42.722026 Long: -83.267808 Datum: NAD 83

Soil Map Unit Name: Houghton and Adrian mucks NWI classification: Up

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** Yes ____ No X
Hydric Soil Present?	Yes ____	No X	
Wetland Hydrology Present?	Yes ____	No X	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
Sapling/Shrub Stratum (Plot size: 15)			
1. *Rhamnus cathartica*	5	Yes	FAC
2.			
3.			
4.			
5.			
	5 =Total Cover		
Herb Stratum (Plot size: 5)			
1. *Verbascum thapsus*	20	Yes	UPL
2. *Alliaria petiolata*	15	Yes	FAC
3. *Barbarea vulgaris*	10	Yes	FAC
4. *Phalaris arundinacea*	5	No	FACW
5.			
6.			
7.			
8.			
9.			
10.			
	50 =Total Cover		
Woody Vine Stratum (Plot size: 30)			
1.			
2.			
	=Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 75.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	3	x 1 =	0
FACW species	5	x 2 =	10
FAC species	30	x 3 =	90
FACU species	0	x 4 =	0
UPL species	20	x 5 =	100
Column Totals	55 (A)		200 (B)

Prevalence Index = B/A = 3.64

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: SP47

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 3/1	100					Loamy/Clayey	
4-9	10YR 6/3	95	10YR 3/6	5	C	M	Loamy/Clayey	Distinct redox concentrations

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ____ No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ____ No X Depth (inches): ____

Water Table Present? Yes ____ No X Depth (inches): ____

Saturation Present? (includes capillary fringe) Yes ____ No X Depth (inches): ____

Wetland Hydrology Present? Yes ____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

U.S. Army Corps of Engineers **WETLAND DETERMINATION DATA SHEET – Midwest Region** See ERDC/EL TR-10-16; the proponent agency is CECW-CO-R	*OMB Control #: 0710-0024, Exp:11/30/2024* *Requirement Control Symbol EXEMPT:* *(Authority: AR 335-15, paragraph 5-2a)*

Project/Site: GM-Orion City/County: Orion/Oakland Sampling Date: 4/26/2022

Applicant/Owner: General Motors, LLC State: MI Sampling Point: SP48

Investigator(s): Jeani/DotMars Section, Township, Range: Sec 34 and 35, Two 4N, R 10E

Landform (hillside, terrace, etc.): Hillslope Local relief (concave, convex, none): Concave

Slope (%): 5% Lat: 42.718575 Long: -83.267926 Datum: NAD 83

Soil Map Unit Name: Sainks loamy sand, 0 to 6 percent slopes NWI classification: Upland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation x , Soil x , or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ____ No X

Are Vegetation ____ , Soil ____ , or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** Yes ____ No X
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes ____	No X	

Remarks:
The site appears to be dredge spoil placed on upland area with wetland vegetation that has seeded in over fill material

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	____ =Total Cover		
Sapling/Shrub Stratum (Plot size: 15)			
1. Spirea alba	10	Yes	FACW
2.			
3.			
4.			
5.			
	10 =Total Cover		
Herb Stratum (Plot size: 5)			
1. Phalaris arundinacea	60	Yes	FACW
2. Carex lacustris	30	Yes	OBL
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	90 =Total Cover		
Woody Vine Stratum (Plot size: 30)			
1.			
2.			
	____ =Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	30	x 1 =	30
FACW species	70	x 2 =	140
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals	100 (A)		170 (B)

Prevalence Index = B/A = 1.70

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: SP48

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-9	10YR 4/1	100					Loamy/Clayey	
9-16	10YR 4/1	95	10YR 3/4	5			Loamy/Clayey	Sandy loam

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___

Water Table Present? Yes ___ No X Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ___

Wetland Hydrology Present? Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Midwest Region
See ERDC/EL TR-10-16; the proponent agency is CECW-CO-R

OMB Control #: 0710-0024, Exp:11/30/2024
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: GM-Orion | City/County: Orion/Oakland | Sampling Date: 4/28/2022
Applicant/Owner: General Motors, LLC | State: MI | Sampling Point: SP49
Investigator(s): Jann/DeMars | Section, Township, Range: Sec 34 and 35, Twp 4N, R 10E
Landform (hillside, terrace, etc.): Hillslope | Local relief (concave, convex, none): None
Slope (%): 5% | Lat: 42.719761 | Long: -83.267672 | Datum: NAD 83
Soil Map Unit Name: Houghton and Adrian mucks | NWI classification: PEM
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes X No ____
Hydric Soil Present? Yes X No ____
Wetland Hydrology Present? Yes X No ____

Is the Sampled Area within a Wetland? Yes X No ____

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
Sapling/Shrub Stratum (Plot size: 15)			
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
Herb Stratum (Plot size: 5)			
1. *Phalaris arundinacea*	100	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	100 =Total Cover		
Woody Vine Stratum (Plot size: 30)			
1.			
2.			
	=Total Cover		

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)
Total Number of Dominant Species Across All Strata: 1 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	100	x 2 =	200
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	100 (A)		200 (B)

Prevalence Index = B/A = 2.00

Hydrophytic Vegetation Indicators:
___ 1 - Rapid Test for Hydrophytic Vegetation
X 2 - Dominance Test is >50%
X 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: SP49

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-10	10YR 2/1	100					Loamy/Clayey	
10-18	10YR 3/1	100					Loamy/Clayey	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- X Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ___

Depth (inches): ___

Hydric Soil Present? Yes X No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___

Water Table Present? Yes ___ No X Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ___

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

U.S. Army Corps of Engineers **WETLAND DETERMINATION DATA SHEET – Midwest Region** See ERDC/EL TR-10-16; the proponent agency is CECW-CO-R	*OMB Control #: 0710-0024, Exp:11/30/2024* *Requirement Control Symbol EXEMPT:* *(Authority: AR 335-15, paragraph 5-2a)*

Project/Site: GM-Orion | City/County: Orion/Oakland | Sampling Date: 4/28/2022

Applicant/Owner: General Motors, LLC | State: MI | Sampling Point: SP50

Investigator(s): Jarmi/DeMars | Section, Township, Range: Sec 34 and 35, Twp 4N, R 10E

Landform (hillside, terrace, etc.): Depression | Local relief (concave, convex, none): Concave

Slope (%): 3% | Lat: 42.719856 | Long: -83.237643 | Datum: NAD 83

Soil Map Unit Name: Houghton and Adrian mucks | NWI classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:

VEGETATION – Use scientific names of plants

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: 5)			
1. *Phragmites australis*	60	Yes	FACW
2. *Phalaris arundinacea*	20	Yes	FACW
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	80 = Total Cover		
Woody Vine Stratum (Plot size: 30)			
1.			
2.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of		Multiply by:	
OBL species	0	x 1 =	0
FACW species	80	x 2 =	160
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	80 (A)		160 (B)

Prevalence Index = B/A = 2.00

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: SP10

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-18	10YR 2/1						Mucky Peat	Sapric Peat

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- X Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ___

Depth (inches): ___

Hydric Soil Present? Yes X No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes X	No ___	Depth (inches): 1
Water Table Present?	Yes X	No ___	Depth (inches): 0
Saturation Present? (includes capillary fringe)	Yes X	No ___	Depth (inches): 0

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

U.S. Army Corps of Engineers **WETLAND DETERMINATION DATA SHEET – Midwest Region** See ERDC/EL TR-10-16; the proponent agency is CECW-CO-R	*OMB Control #: 0710-0024, Exp:11/30/2024* *Requirement Control Symbol EXEMPT:* *(Authority: AR 335-15, paragraph 5-2a)*

Project/Site: GM-Orion | City/County: Orion/Oakland | Sampling Date: 4/28/2022

Applicant/Owner: General Motors, LLC | State: MI | Sampling Point: SP51

Investigator(s): Jenni/DeMars | Section, Township, Range: Sec 34 and 35, Two 4N, R 10E

Landform (hillside, terrace, etc.): Depression/ Drainage Swale | Local relief (concave, convex, none): Concave

Slope (%): 2% | Lat: 42.716144 | Long: -83.297648 | Datum: NAD 83

Soil Map Unit Name: Houghton and Adrian mucks | NWI classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
Sapling/Shrub Stratum (Plot size: 15)			
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
Herb Stratum (Plot size: 5)			
1. *Phragmites australis*	60	Yes	FACW
2. *Phalaris arundinacea*	30	Yes	FACW
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	90 =Total Cover		
Woody Vine Stratum (Plot size: 30)			
1.			
2.			
	=Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	90	x 2 =	180
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	90 (A)		180 (B)
Prevalence Index = B/A =			2.00

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: SP51

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-10	10YR 2/1	100					Loamy/Clayey	Fill
10-18	10YR 5/1	95	10YR 4/4	5	C	M	Loamy/Clayey	Distinct Redox Reasons, Sandy Loam / Il

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- X Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No ___

Remarks:
10-18" is mix of 10YR 5/1 and 10Yr 6/1, all with redox concentrations

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- X Drainage Patterns (B10)
- ___ Dry Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ___ Depth (inches): ___

Water Table Present? Yes ___ No ___ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No ___ Depth (inches): ___

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
SP is located in outlet of adjacent stormwater basins

U.S. Army Corps of Engineers **WETLAND DETERMINATION DATA SHEET – Midwest Region** See ERDC/EL TR-10-16; the proponent agency is CECW-CO-R	*OMB Control #: 0710-0024, Exp:11/30/2024* *Requirement Control Symbol EXEMPT:* *(Authority: AR 335-15, paragraph 5-2a)*

Project/Site: GM-Orion City/County: NAD 83 Sampling Date: 4/28/2022

Applicant/Owner: General Motors, LLC State: MI Sampling Point: SP52

Investigator(s): Jarmi/DeMars Section, Township, Range: Sec 24 and 35, Twp 4N, R 10E

Landform (hillside, terrace, etc.): Hillslope Local relief (concave, convex, none): None

Slope (%): 5% Lat: 42.716216 Long: -83.267837 Datum: NAD 83

Soil Map Unit Name: Houghton and Adrian mucks NWI classification: Up

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____ Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No X	**Is the Sampled Area within a Wetland?** Yes ____ No X
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes ____	No X	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	____	=Total Cover	
Sapling/Shrub Stratum (Plot size: 15)			
1. *Elaeagnus umbellata*	5	Yes	UPL
2.			
3.			
4.			
5.			
	5	=Total Cover	
Herb Stratum (Plot size: 5)			
1. *Poa compressa*	60	Yes	FACU
2. *Verbascum thapsus*	30	Yes	UPL
3. *Phragmites australis*	10	No	FACW
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	100	=Total Cover	
Woody Vine Stratum (Plot size: 30)			
1.			
2.			
	____	=Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.0% (A/B)

Prevalence Index worksheet:

Total % Cover of		Multiply by	
OBL species	0	x 1 =	0
FACW species	10	x 2 =	20
FAC species	0	x 3 =	0
FACU species	80	x 4 =	240
UPL species	35	x 5 =	175
Column Totals:	105 (A)		435 (B)
Prevalence Index = B/A =			4.14

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: SP52

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-7	10YR 3/1	100					Loamy/Clayey	Fill
7-13	10YR 3/1	85	10YR 5/4	5	C	M	Loamy/Clayey	Distinct redox concentrations
13-18	10YR 3/1	90	10YR 5/4	10	C	M	Loamy/Clayey	Distinct redox concentrations, sand fill

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- X Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply):

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required):

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___

Water Table Present? Yes ___ No X Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ___

Wetland Hydrology Present? Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Midwest Region
See ERDC/EL TR-10-16; the proponent agency is CECW-CO-R

OMB Control #: 0710-0024, Exp:11/30/2024
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: GM-Orion | City/County: Orion/Oakland | Sampling Date: 3/1-3/2/2022
Applicant/Owner: General Motors, LLC | State: MI | Sampling Point: SPS3
Investigator(s): Jann/DeMars | Section, Township, Range: Sec 34 and 35, Two 4N, R 10E
Landform (hillside, terrace, etc.): Depression/ Drainage | Local relief (concave, convex, none): Convex
Slope (%): 1% | Lat: 42.716494 | Long: -83.26764 | Datum: NAD 83
Soil Map Unit Name: Houghton and Adrian mucks | NWI classification: PEM
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes X No ____
Hydric Soil Present? Yes X No ____
Wetland Hydrology Present? Yes X No ____

Is the Sampled Area within a Wetland? Yes X No ____

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: 5)			
1. *Phragmites australis*	80	Yes	FACW
2. *Phalaris arundinacea*	20	Yes	FACW
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: 30)			
1.			
2.			
	= Total Cover		

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)
Total Number of Dominant Species Across All Strata: 2 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	100	x 2 =	200
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	100 (A)		200 (B)

Prevalence Index = B/A = 2.00

Hydrophytic Vegetation Indicators:
___ 1 - Rapid Test for Hydrophytic Vegetation
X 2 - Dominance Test is >50%
X 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)
[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: SP53

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 4/1						Loamy/Clayey	Fill
4-14	10Yr 5/1	97	10YR 5/4	3	C	M	Loamy/Clayey	Distinct redox concentrations, sandy loam fill

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ? Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches) ___

Water Table Present? Yes ___ No X Depth (inches) ___

Saturation Present? (includes capillary fringe) Yes X No ___ Depth (inches) 4

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

U.S. Army Corps of Engineers **WETLAND DETERMINATION DATA SHEET – Midwest Region** See ERDC/EL TR-10-16; the proponent agency is CECW-CO-R	*OMB Control #: 0710-0024, Exp:11/30/2024* *Requirement Control Symbol EXEMPT:* *(Authority: AR 335-15, paragraph 5-2a)*

Project/Site: GM-Orion | City/County: Orion/Oakland | Sampling Date: 4/28/2022

Applicant/Owner: General Motors, LLC | State: MI | Sampling Point: SP54

Investigator(s): Jarni/DeMars | Section, Township, Range: Sec 34 and 35, Two 4N, R 10E

Landform (hillside, terrace, etc.): Drainage Swale | Local relief (concave, convex, none): Concave

Slope (%): - | Lat: 42.712607 | Long: -83.297377 | Datum: PEM

Soil Map Unit Name: Houghton and Adrian mucks | NWI classification: NAD 83

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
Sapling/Shrub Stratum (Plot size: 15)			
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
Herb Stratum (Plot size: 5)			
1. *Phragmites australis*	80	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	80 =Total Cover		
Woody Vine Stratum (Plot size: 30)			
1.			
2.			
	=Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species 0	x 1 = 0
FACW species 80	x 2 = 160
FAC species 0	x 3 = 0
FACU species 0	x 4 = 0
UPL species 0	x 5 = 0
Column Totals: 80 (A)	160 (B)

Prevalence Index = B/A = 2.00

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: SP54

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type	Redox Features Loc[2]	Texture	Remarks
0-6	10YR 4/1	100					Loamy/Clayey	
6-14	10YR 5/1	85	10YR 4/4	5	C	M	Loamy/Clayey	Distinct redox concentrations

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No ____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- X Water Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): ____
Water Table Present?	Yes X	No ____	Depth (inches): 10
Saturation Present? (includes capillary fringe)	Yes X	No ____	Depth (inches): 0

Wetland Hydrology Present? Yes X No ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Midwest Region
See ERDC/EL TR-10-16; the proponent agency is CECW-CO-R

OMB Control #: 0710-0024, Exp:11/30/2024
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: GM-Orion City/County: Orion/Oakland Sampling Date: 4/28/2022
Applicant/Owner: General Motors, LLC State: MI Sampling Point: SP56
Investigator(s): Jann/UpMars Section, Township, Range: Sec 34 and 35, Twp 4N, R 10E
Landform (hillside, terrace, etc.): Top of Berm / Topfill Local relief (concave, convex, none): Convex
Slope (%): 3% Lat: 42.712889 Long: -83.237447 Datum: NAD 83
Soil Map Unit Name: Houghton and Adrian mucks NWI classification: Up
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No X	Is the Sampled Area within a Wetland? Yes ____ No X
Hydric Soil Present?	Yes ____	No X	
Wetland Hydrology Present?	Yes ____	No X	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
Sapling/Shrub Stratum (Plot size: 15)			
1. *Crataegus crus-galli*	5	Yes	FAC
2.			
3.			
4.			
5.			
	5 =Total Cover		
Herb Stratum (Plot size: 5)			
1. *Poa compressa*	80	Yes	FACU
2. *Phragmites australis*	5	No	FACW
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	85 =Total Cover		
Woody Vine Stratum (Plot size: 30)			
1.			
2.			
	=Total Cover		

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)
Total Number of Dominant Species Across All Strata: 2 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 50.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	5	x 2 =	10
FAC species	5	x 3 =	15
FACU species	80	x 4 =	320
UPL species	0	x 5 =	0
Column Totals	90 (A)		345 (B)
Prevalence Index = B/A =			3.83

Hydrophytic Vegetation Indicators:
___ 1 - Rapid Test for Hydrophytic Vegetation
___ 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)
[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: SP05

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-14	10YR 4/2	100					Loamy/Clayey	Fill

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ____ No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ____ No X Depth (inches): _____

Water Table Present? Yes ____ No X Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ____ No X Depth (inches): _____

Wetland Hydrology Present? Yes ____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

U.S. Army Corps of Engineers **WETLAND DETERMINATION DATA SHEET – Midwest Region** See ERDC/EL TR-10-16; the proponent agency is CECW-CO-R	*OMB Control #: 0710-0024, Exp:11/30/2024* *Requirement Control Symbol EXEMPT:* *(Authority: AR 335-15, paragraph 5-2a)*

Project/Site: GM-Orion | City/County: Orion/Oakland | Sampling Date: 4/28/2022

Applicant/Owner: General Motors, LLC | State: MI | Sampling Point: SP56

Investigator(s): Jenn/DeMars | Section, Township, Range: Sec 34 and 35, Twp 4N, R 10E

Landform (hillside, terrace, etc.): Depression | Local relief (concave, convex, none): Concave

Slope (%): 1% | Lat: 42.713063 | Long: -83.267504 | Datum: NAD 83

Soil Map Unit Name: Houghton and Adrian mucks | NWI classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:
Wetland edge mostly defined by fill edge

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: 5)			
1. *Phalaris arundinacea*	30	Yes	FACW
2. *Oenothea sensibilis*	20	Yes	FACW
3. *Symplocarpus foetidus*	10	No	OBL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	60 = Total Cover		
Woody Vine Stratum (Plot size: 30)			
1.			
2.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of		Multiply by:	
OBL species	10	x 1 =	10
FACW species	50	x 2 =	100
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	60 (A)		110 (B)

Prevalence Index = B/A = 1.83

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: SP56

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-16	10YR 2/1						Muck	Muck

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- X Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- X 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ___

Depth (inches): ___

Hydric Soil Present? Yes X No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches): ___
Water Table Present?	Yes X	No ___	Depth (inches): 4
Saturation Present? (includes capillary fringe)	Yes X	No ___	Depth (inches): 0

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Midwest Region
See ERDC/EL TR-10-16; the proponent agency is CECW-CO-R

OMB Control #: 0710-0024, Exp:11/30/2024
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: GM-Orion | City/County: Orion/Oakland | Sampling Date: 4/28/2022
Applicant/Owner: General Motors, LLC | State: MI | Sampling Point: SP57
Investigator(s): Jarod DeMars | Section, Township, Range: Sec 34 and 35, Two 4N, R 10E
Landform (hillside, terrace, etc.): Hillslope | Local relief (concave, convex, none): None
Slope (%): - | Lat: 42.713081 | Long: -83.267458 | Datum: NAD 83
Soil Map Unit Name: Houghton and Adrian mucks | NWI classification: Upland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** Yes ____ No X
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes ____	No X	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15)			
1. *Salix interior*	15	Yes	FACW
2. *Lonicera tatarica*	10	Yes	FACU
3.			
4.			
5.			
	25 = Total Cover		
Herb Stratum (Plot size: 5)			
1. *Phalaris arundinacea*	50	Yes	FACW
2. *Verbascum thapsus*	10	No	UPL
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	60 = Total Cover		
Woody Vine Stratum (Plot size: 30)			
1.			
2.			
	= Total Cover		

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)
Total Number of Dominant Species Across All Strata: 3 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 66.7% (A/B)

Prevalence Index worksheet:

Total % Cover of		Multiply by	
OBL species	0	x 1 =	0
FACW species	65	x 2 =	130
FAC species	0	x 3 =	0
FACU species	10	x 4 =	40
UPL species	10	x 5 =	50
Column Totals:	85 (A)		220 (B)
Prevalence Index = B/A =			2.59

Hydrophytic Vegetation Indicators:
___ 1 - Rapid Test for Hydrophytic Vegetation
X 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)
[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: SP57

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
3-14	10YR 4/2	98	10YR 5/4	2	C	M	Loamy/Clayey	Distinct Redox Concentrations, +II

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No ____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- X FAC-Neutral Test (D5)

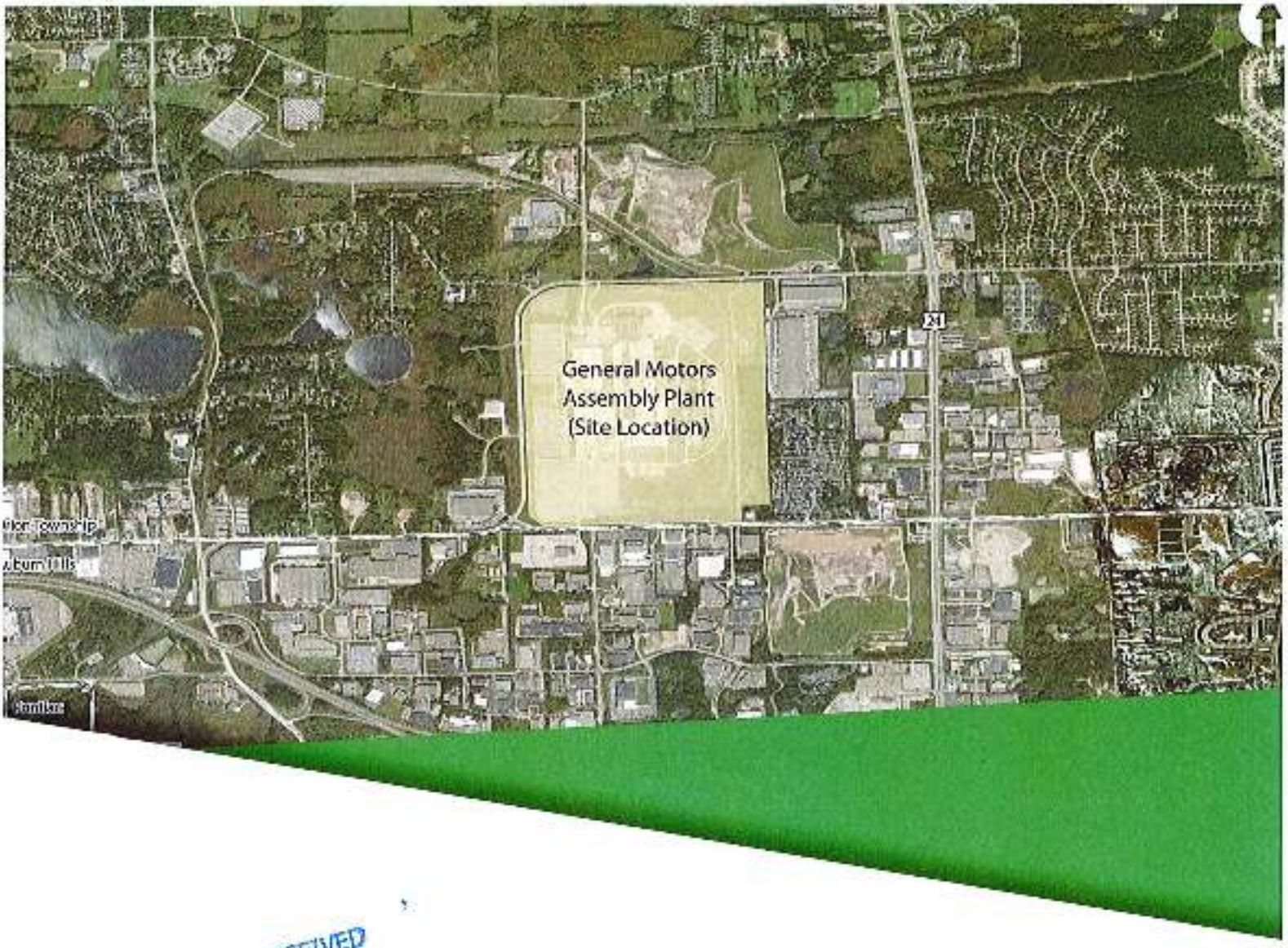
Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): ____
Water Table Present?	Yes ____	No X	Depth (inches): ____
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches): ____

Wetland Hydrology Present? Yes ____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:



DRAFT REPORT

GENERAL MOTORS ORION ASSEMBLY PLANT EXPANSION TRAFFIC IMPACT STUDY (PHASE 1)

Orion Township, Michigan

July 6, 2022

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FIGURES

TABLES

APPENDICES

Acronyms	
AASHTO	American Association of State Highway and Transportation Officials
ADT	Average Daily Traffic
ECRC	Eaton County Road Commission
FHWA	Federal Highway Administration
HCM	Highway Capacity Manual
ITE	Institute of Transportation Engineers
GM	General Motors
LOS	Level of Service
MDOT	Michigan Department of Transportation
MPH	Miles Per Hour
MMUTCD	Michigan Manual on Uniform Traffic Control Devices
NCHRP	National Cooperative Highway Research Program
NEMA	National Electric Manufacturers Association
PHF	Peak Hour Factor
RCOC	Road Commission for Oakland County
TCAT	Traffic Crash Analysis Tool
TDMS	Transportation Data Management System
TIA	Transportation Improvement Association

EXECUTIVE SUMMARY

Introduction & Background

The General Motors (GM) Orion Assembly Plant industrial site is proposed for expansion which includes construction west of M-24, east of Giddings Road, south of Silver Bell Road and north of Brown Road in Orion Township, Michigan. The industrial site is proposed as an expansion of the existing GM Orion Assembly plant. The site land use is designated as industrial and is adjacent to other industrial properties. The plant expansion which includes new body assembly, battery assembly and paint shop is expected to be constructed by 2024, and at full build-out is expected to have 3,916 employees between three shifts. Access is planned to be served by five employee driveways (one on Silver Bell Road, three on Giddings Road, and one on Brown Road) and two commercial vehicle traffic driveways (one on Silver Bell Road and one on Brown Road).

The objective of this study was to determine and evaluate the impact that the proposed plant expansion would have on future motor vehicle traffic operations and safety on the nearby roadway network. Traffic capacity and safety concerns were identified as a result of the impact analysis and mitigation strategies were recommended to alleviate these issues. Additionally, 683 trucks per shift are anticipated to access the proposed plant.

The traffic impact analyses for this site is being conducted in two phases – Phase 1 includes intersections adjacent to the site to determine immediate impacts, and Phase 2 includes additional intersections further away from the site including several I-75 interchanges as directed by the Road Commission for Oakland County (RCOC) and the Michigan Department of Transportation (MDOT). This report analyzes and presents the Phase 1 traffic impacts that the proposed development will have on the following intersections in the project area:

- M-24 & the crossover north of Silver Bell Rd (Existing)
- M-24 & Silver Bell Rd (Existing)
- M-24 & the crossover south of Silver Bell Rd (Existing)
- M-24 & the crossover north of Brown/Dutton Rd (Existing)
- M-24 & Brown/Dutton Rd (Existing)
- M-24 & the crossover south of Brown/Dutton Rd (Existing)
- Brown Rd & Giddings Rd (Existing)
- Brown Rd & Roush Driveway (Existing)
- Giddings Rd & FedEx Driveway/Brown Rd (Existing)
- Giddings Rd & Liberty Dr/Gate 4 (Existing)
- Giddings Rd & Gate 3 (Lansing Road) (Existing)
- Giddings Rd & Delta Ct/Gate 2 (Existing)
- Giddings Rd & Silver Bell Rd (Existing)
- Silver Bell Rd & Giddings Rd/Gate 1 (Existing)
- GM Orion Expansion Gate 7 & Brown Rd (Proposed)

- GM Orion Expansion Gate 8 & Silver Bell Rd (Proposed)

The study area intersections were analyzed for the AM and PM peak times for the following conditions:

- Existing (2022) Conditions
- Build (2024) Proposed Conditions
- Future (2024) Mitigated Conditions

Existing Conditions

A safety analysis was performed at each of the study intersections and did not find a discernible crash pattern at most of the intersections, except a potential issue with angle collisions at the unsignalized intersections of Silver Bell Rd and Giddings Rd/Gate 1. The EB/WB approaches at this intersection have relatively large approach widths with numerous lanes. With the addition of the site traffic to the network, a traffic signal is warranted and recommended at this intersection.

Peak hour traffic counts at the nearby study intersections were collected in April 2022 and were used in the study as the basis for the analysis of existing conditions. The Synchro traffic capacity analyses determined that all study intersection approaches operate at an acceptable LOS D or better, except for the following intersection approaches:

- Giddings Rd & Delta Ct/Gate 2
    - Westbound approach operated at LOS F with 127.1 seconds of average vehicle delay (PM Peak).
- M-24 & Brown Rd/Dutton Rd
    - Westbound approach operates at LOS E with 77.6 seconds of average vehicle delay (AM Peak) and LOS E with 57.0 seconds of average vehicle delay (PM Peak).
    - Eastbound approach operates at LOS F with 87.7 seconds of average vehicle delay (PM Peak).
- M-24 & Crossover south of Brown Rd/Dutton Rd
    - Eastbound approach operates at a LOS F with 137.9 second of average vehicle delay (AM Peak) and LOS E with 55.2 seconds of average vehicle delay (PM Peak).
- M-24 & Crossover north of Brown Rd/Dutton Rd
    - Westbound approach operates at a LOS E with 64.0 seconds of average vehicle delay (AM Peak).
- M-24 & Silver Bell Rd
    - Westbound approach operates at LOS E with 58.7 seconds of average vehicle delay (AM Peak).

- Eastbound approach operates at LOS E with 66.9 seconds of average vehicle delay (PM Peak).

- M-24 & Crossover south of Silver Bell Rd
  - Eastbound approach operates at LOS E with 58.1 seconds of average vehicle delay (AM Peak) and LOS E with 57.7 seconds of average vehicle delay (PM Peak).
- M-24 & Crossover north of Silver Bell Rd
  - Westbound approach operates at LOS E with 61.7 seconds of average vehicle delay (AM Peak) and LOS E with 58.7 seconds of average vehicle delay (PM Peak).

Trip Generation

The trips generated by the proposed GM Orion Expansion industrial site were determined in accordance with the Institute of Transportation Engineers (ITE) standard practices and distributed and assigned to the study intersections and five site access driveways based on existing traffic patterns and nearby primary traffic generators based on existing population density. An industrial park with 3,916 total employees can be expected to generate up to 1,196 inbound trips on a typical weekday AM peak and 962 outbound trips on a typical weekday PM peak. Additionally, 80 trucks are expected to enter and 80 trucks are expected to exit the site during each of the AM and PM peak times.

Currently the plant operates with only **one shift with 1,246 employees**, and the proposed expansion will operate with **three shifts with 3,916 employees and 1,477 employees** during the largest shift, for an additional 231 employees during that shift compared to the other two shifts. Although the number of employees is significantly increasing, the implementation of two additional shifts will greatly help to minimize the impacts to traffic. This is demonstrated as **only 273 and 82 trips are added to the roadway network during AM Peak hour and PM Peak hour respectively.**

Signal and Turn Lane Warrants

Peak hour turn lane and signal warrant analyses were performed in accordance with MDOT and MMUTCD guidelines at the seven site accesses. A traffic signal is warranted and is recommended for installation at Gate 1. It was determined that the following turn lanes were warranted:

- NB Right Turn Lane at Gate 3 (100')
- NB Right Turn taper at Gate 2
- WB Right Turn taper at Gate 7
- EB Left Turn Lane at Gate 7 (150')
- WB Left Turn Lane at Gate 8 (150')

Proposed Conditions

Each of the existing study area intersections and proposed site access intersections were evaluated with the future build traffic volumes to determine the future intersection operations with the

proposed GM Orion Expansion development project. The existing geometrics and signal timing was used and no adjustments were made. Highway capacity analyses were conducted for the existing geometric conditions and traffic control, and projected build traffic volumes.

The capacity analysis for the proposed build conditions indicated that all study area intersections and movements are expected to continue to operate at an acceptable level of service during the weekday AM and PM peak times, with the exception of those listed below. All of the locations already experienced a LOS E or F in the existing condition except for the one shown in red. All approaches at the three site access points are expected to operate at LOS D or better.

- M-24 & Brown Rd/Dutton Rd
    - Westbound approach operates at LOS F with 91.0 seconds of average vehicle delay (AM Peak) and LOS E with 58.5 seconds of average vehicle delay (PM Peak).
    - Eastbound approach operates at LOS E with 58.3 seconds of average vehicle delay (AM Peak) and LOS F with 108.6 seconds of average vehicle delay (PM Peak).
- M-24 & Crossover south of Brown Rd/Dutton Rd
    - Eastbound approach operates at a LOS E with 58.3 second of average vehicle delay (AM Peak) and LOS E with 56.0 seconds of average vehicle delay (PM Peak).
- M-24 & Crossover north of Brown Rd/Dutton Rd
    - Westbound approach operates at a LOS E with 69.0 seconds of average vehicle delay (AM Peak).
- M-24 & Silver Bell Rd
    - Westbound approach operates at LOS E with 58.2 seconds of average vehicle delay (AM Peak).
    - Eastbound approach operates at LOS E with 70.3 seconds of average vehicle delay (PM Peak).
- M-24 & Crossover south of Silver Bell Rd
    - Eastbound approach operates at LOS E with 58.5 seconds of average vehicle delay (AM Peak) and LOS E with 57.3 seconds of average vehicle delay (PM Peak).
- M-24 & Crossover north of Silver Bell Rd
    - Westbound approach operates at LOS E with 62.4 seconds of average vehicle delay (AM Peak) and LOS E with 58.8 seconds of average vehicle delay (PM Peak).

Mitigated Conditions

To mitigate vehicle delay at the intersections / approaches with LOS E or worse, the recommended turn lanes/signals were added and signal timing adjustments were investigated, which consisted of changes to cycle lengths and phase split times. It was found that these signal timing adjustments would improve approach and intersection operations to LOS D or better at all signalized intersections except for the following intersections.

- M-24 & Brown Rd/Dutton Rd

    - Westbound approach operates at LOS E with 57.1 seconds of average vehicle delay (AM Peak)
- M-24 & the crossover south of Brown/Dutton Rd
    - Eastbound approach operates at LOS E with 58.3 seconds of average vehicle delay (AM Peak)
- M-24 & the crossover south of Silver Bell Rd
    - Eastbound crossover approach operates at LOS E with 52.1 seconds of average vehicle delay (PM Peak)
- M-24 & the crossover north of Silver Bell Rd
    - Westbound crossover approach operates at LOS E with 63.7 seconds of average vehicle delay (AM Peak).

Recommendations

A summary of all recommendations as a result of the traffic safety and operations analyses conducted in this report are as follows:

- Place the intersection of Silver Bell Rd & Giddings Rd/Gate 1 under traffic signal control with a 100 second cycle length during the AM Peak and 80 second cycle length during the PM Peak
- Provide a right-turn taper at the following locations:
    - NB Giddings Rd approach to Gate 2
    - WB Brown Rd approach to Gate 7
- Construct a right-turn only lane with a minimum of 100' of storage length at the following location:
    - NB Giddings Rd approach to Gate 3
- Construct a left-turn only lane with a minimum of 150' of storage length at the following locations:
    - EB Brown Rd approach to Gate 7
    - WB Silver Bell Rd approach to Gate 8
- Provide signal timing adjustments at the following signalized intersections:
    - Giddings Rd & FedEx Driveway/Brown Rd
    - Giddings Rd & Liberty Dr/Gate 4
    - M-24 & the crossover north of Silver Bell Rd
    - M-24 & Silver Bell Rd
    - M-24 & the crossover south of Silver Bell Rd
    - M-24 & the crossover north of Brown/Dutton Rd
    - M-24 & Brown/Dutton Rd
    - M-24 & the crossover south of Brown/Dutton Rd

1.0 INTRODUCTION

1.1 Background Information

The General Motors (GM) Orion Assembly Plant Expansion industrial site is proposed for expansion west of M-24, east of Giddings Road, south of Silver Bell Road and north of Brown Road in Orion Township, Michigan. The industrial site is proposed as an expansion of the existing GM Orion Assembly plant. The site land use is designated as industrial and is adjacent to other industrial properties. The expanded plant is expected to be constructed by 2024, and at full build-out is expected to have 3,916 employees between three shifts. Access is planned to be served by five employee driveways (one on Silver Bell Road, three on Giddings Road, and one on Brown Road) and two commercial vehicle traffic driveways (one on Silver Bell Road and one on Brown Road). An aerial view of the proposed site footprint in relation to the surrounding area is provided in **Figure 1-1**.

1.2 Objective and Scope

The objective of this study is to determine and evaluate future motor vehicle traffic conditions of the GM Orion Expansion industrial site and the roadway networks surrounding the campus site. The traffic evaluations described in this report are based on existing traffic volumes and operations and anticipated future traffic at full buildout of the site in 2024. The scope of the study included the following items.

- Collection of background information, transportation data, traffic volumes and crash data
- Traffic capacity and operational analyses of the site and surrounding area
- Preparation of a preliminary mitigation evaluation

Figure 1-1. Study Area.

2.0 METHODOLOGY

The study involved the collection and review of geometric, traffic control, and traffic volume data for roadways and intersections potentially impacted by the proposed industrial site. This data served as input for the highway capacity analyses that were conducted to estimate the traffic impacts of the proposed development. The information collected and the evaluation procedures used to conduct the analyses are described in this section.

2.1 Traffic Impact Study Area

Based on a review of the road network adjacent to the proposed site and conversations with the Road Commission for Oakland County (RCOC) and Michigan Department of Transportation (MDOT), the impact area for this study was identified. The traffic impact analyses for this site is being conducted in two phases – Phase 1 includes intersections adjacent to the site to determine immediate impacts, and Phase 2 includes additional intersections further away from the site including several I-75 interchanges as directed by the Road Commission for Oakland County (RCOC) and the Michigan Department of Transportation (MDOT). This report analyzes and presents the Phase 1, and it was established that the initial analysis study area would include the following intersections:

- M-24 & the crossover north of Silver Bell Rd (Existing)
- M-24 & Silver Bell Rd (Existing)
- M-24 & the crossover south of Silver Bell Rd (Existing)
- M-24 & the crossover north of Brown/Dutton Rd (Existing)
- M-24 & Brown/Dutton Rd (Existing)
- M-24 & the crossover south of Brown/Dutton Rd (Existing)
- Brown Rd & Giddings Rd (Existing)
- Brown Rd & Roush Driveway (Existing)
- Giddings Rd & FedEx Driveway/Brown Rd (Existing)
- Giddings Rd & Liberty Dr/Gate 4 (Existing)
- Giddings Rd & Gate 3 (Lansing Road) (Existing)
- Giddings Rd & Delta Ct/Gate 2 (Existing)
- Giddings Rd & Silver Bell Rd (Existing)
- Silver Bell Rd & Giddings Rd/Gate 1 (Existing)
- GM Orion Expansion Gate 7 & Brown Rd (Proposed)
- GM Orion Expansion Gate 8 & Silver Bell Rd (Proposed)

The additional intersection of Silver Bell Road & the Driveway just east of Gate 1 was also requested to include in the study. However, upon further analysis, this driveway is gated off without any turning movements into/out of the drive. The study area will be examined as fully constructed with new drives to the expansion installed.

Due to the expansive geographic area and large number of intersections that were required by MDOT and the RCOC to be included in this study, the traffic impact study is being developed in two Phases. This Phase 1 study was developed as an initial step in assisting GM in the design of the internal roadway network and to determine adjacent roadway improvements that are needed to accommodate site traffic. The Phase 2 study is currently underway and will complete the traffic analysis by including the Phase 1 intersections as well as the Phase 2 intersections listed below. The Phase 2 report will be reviewed by agencies and additional coordination may take place based on infrastructure recommendations for mitigating any impacts imposed by site traffic.

2.2 Data Collection

Data collection included collection of directional vehicle turning movements and approach truck counts for morning and afternoon peak periods. Directional turning movement counts were conducted at the study intersections listed in Section 2.1. Historical traffic count information for study roadways obtained on MDOT's Transportation Data Management System (TDMS) were used to determine the pertinent time periods for weekday morning and afternoon traffic data collection to coincide with the shift change periods at the existing GM Orion Assembly plant.

The directional turning movement counts were conducted by Quality Counts for the hours of 5:30 a.m. to 8:30 a.m. and 3:00 p.m. to 6:00 p.m. on Tuesday, April 26, 2022, while local schools were in session, and the existing GM Assembly plant was in operation. Passenger vehicles, heavy vehicles, pedestrians, and bicycles were counted, and all possible vehicle turning movements at these intersection approaches were recorded in 15-minute intervals. Upon review of the data, additional time frames were requested for the three GM Assembly employee driveways (Gates 2, 3, and 4). The additional time frames of 5:00-5:30 a.m. and 2:30 -3:00 p.m. for the same day were added to the existing turning movement data. All existing turning movement data that were collected are summarized in **Appendix A**, and the traffic volume data used in the study are shown for motor vehicles in **Figure 2-1**.

Traffic signal timing permits needed for the analysis were obtained from RCOC for all signalized study intersections. The signal timing permits are included in **Appendix B**.

2.2.1 COVID-19 Traffic Volume Comparisons

Due to the COVID-19 pandemic continuing to impact travel, the April 2022 vehicle traffic volumes were compared to pre-covid vehicle traffic volumes. The MDOT Transportation Data Management System (TDMS) was used to extract data prior to 2020. The two nearest MDOT TDMS stations to the proposed site had data from September 2019 and August 2019.

The AM and PM peak hour 2-way traffic volumes were compared for each year, with the results shown in **Figure 2-2**. As shown, some 2022 peak volumes were found to be lower at one location and higher at another than the pre-covid volumes. The change in volumes differed by time of day,

these differences may be explained by seasonal factors, permanent changes to work-from-home schedules at major employers in the area, local road construction, etc. Given that the data is inconclusive, no adjustments were made to the turning movement traffic volumes collected in April 2022 and utilized in this study. It is important to note that the differences in the PM counts, which had the largest volumes, were less than 5%. These small differences would have a negligible effect on the study results.

Figure 2-1. Existing Peak Hour Vehicle Volumes.

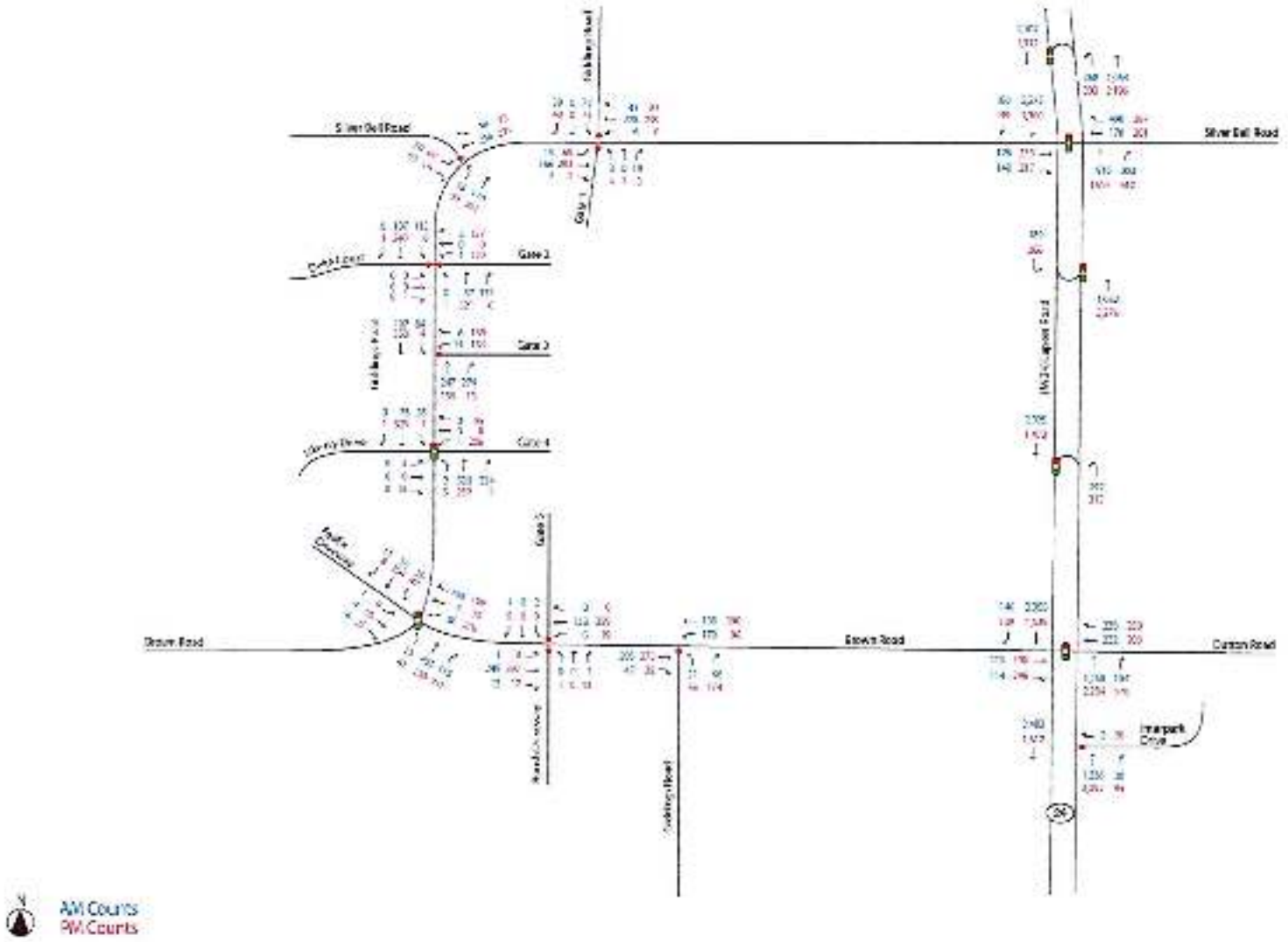
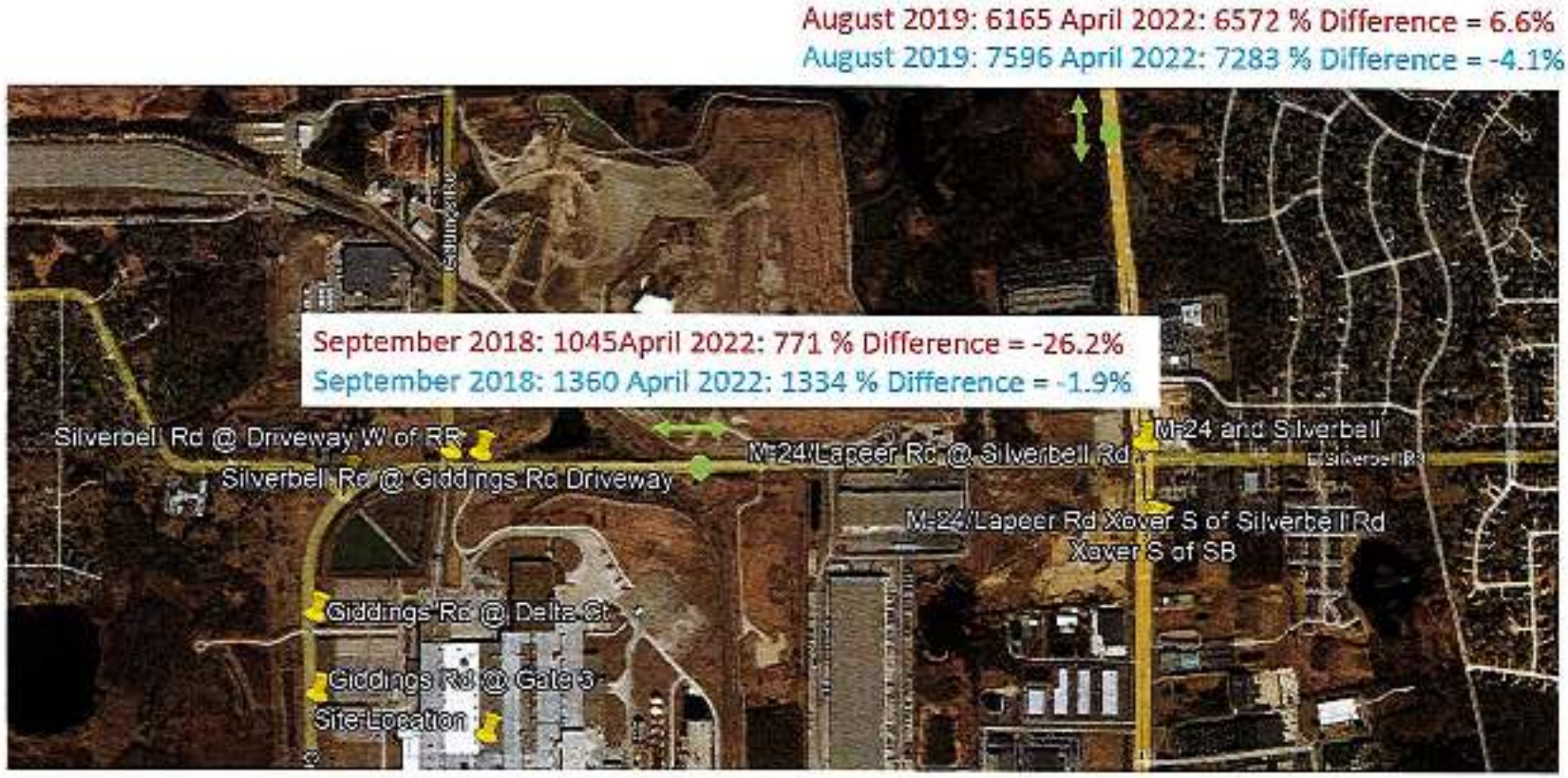


Figure 2-2. Pre-Covid vs. 2022 AM and PM Traffic Volume Comparisons.



2.3 Operational Analysis Procedures

The traffic impact analysis includes methodology for trip generation, distribution, and traffic assignment based on the Institute of Transportation Engineers (ITE) standard practices. Applicable technical standards such as the *Institute of Traffic Engineer's Trip Generation, MDOT Geometric Design Guidance September 2017, 11th Edition*, the *2000, 2010, and 6th Edition Highway Capacity Manual, Transportation Research Board Special Report 209*, the *2011 American Association of State Highway and Transportation Officials (AASHTO) Policy on Geometric Design of Highways and Streets*, and the *2011 Michigan Manual on Uniform Traffic Control Devices (MMUTCD)* were also used.

2.3.1 Highway Capacity Analysis

Highway capacity analyses were conducted to determine the existing level of service of the study area intersections and the level of service expected on the roadway network surrounding the proposed GM Orion Expansion industrial site. Synchro 11.1, build 1, revision 6 (11.1.1.6) was used to conduct the analyses.

Synchro 11 is a software package used for modeling and optimizing traffic signal timing at intersections. The program utilizes the methods of the *2000 Highway Capacity Manual (HCM), 2010 Highway Capacity Manual*, and *6th Edition Highway Capacity Manual* to calculate capacity. The capacity worksheets for existing year conditions are provided in **Appendix C**.

Capacity analyses were conducted to measure the performance of the intersections in terms of level of service. Level of service (LOS) ranges from LOS A, which represents the best traffic conditions, to LOS F, which is the worst condition. Operations at LOS A through E are generally considered acceptable for side-street movements at unsignalized intersections. Quantitative measures of level of service are given in the following paragraphs.

The level of service measurement for stop-controlled intersections is average control delay, which is also quantified in terms of seconds of delay per vehicle. Control delay includes the initial deceleration delay, queue move-up time, stopped delay, and acceleration delay. The level of service criteria for signalized and unsignalized intersections, taken from the *HCM 2000*, is shown in **Table 2-1**. HCM 2000 was used since the later versions of the manual do not support the older signalized intersections with non-NEMA phasing.

Table 2-1. Level of Service Criteria for Intersections.			
Level of Service	Description	Signalized Intersections Average Control Delay, Seconds per vehicle	Unsignalized Intersections Average Control Delay, Seconds per vehicle
A	Little or no delay.	<10.0	<10.0
B	Short traffic delays.	Between 10 and 20	Between 10 and 15
C	Average traffic delays.	Between 20 and 35	Between 15 and 25
D	Long traffic delays.	Between 35 and 55	Between 25 and 35
E	Very long traffic delays.	Between 55 and 80	Between 35 and 50
F	Demand exceeds capacity.	>80	>50

Source: Transportation Research Board, Highway Capacity Manual 2000.

3.0 TRAFFIC ANALYSIS

The traffic impact feasibility study included a review of the study area, an estimation of the amount of peak-period traffic generated by the proposed development, distribution of the site traffic onto the local streets, assignment of traffic volumes to the study area intersections, and capacity analyses to determine the impact of the proposed development on the level of service and operations on the surrounding roadway network serving the proposed GM Orion Expansion industrial site.

3.1 Existing Conditions

3.1.1 Current GM Orion Site Employees

Currently, the GM Orion Assembly Plant has one shift from 6:00 am to 2:30 pm with a total of 1,246 employees. During the current AM Peak, 923 employees (74% of the total employees for the shift) arrive during the current AM Peak and 880 employees (71% of the total employees for the shift) depart during the current PM Peak.

The existing transportation study network is shown in **Figure 1-1**, and a summary of the network is described below.

3.1.2 Roadway System

M-24 (Lapeer Rd) is a Principal Arterial running north-south with primarily two lanes in each direction and paved shoulders. At the study location, M-24 is a boulevard that prohibits direct left turns, but provides crossovers for left turn vehicles to travel in the opposite direction. The posted speed limit is 55 MPH. The surrounding land use is primarily commercial with some industrial uses.

Silver Bell Rd is a minor arterial running east-west that varies from a four lane cross section (two lanes in each direction) to a five lane cross-section (two lanes in each direction with a two way center left turn lane). The speed limit is 50 MPH. The surrouncing land use is primarily commercial/industrial development.

Brown Rd is a minor arterial roadway running east-west that varies from a four lane cross section (two lanes in each direction) to a five lane cross-section (two lanes in each direction with a two way center left turn lane). The speed limit is 50 MPH. The surrounding land use is primarily commercial/industrial development.

Giddings Rd is a minor arterial roadway running north south that has a five lane cross-section (two lanes in each direction with a two way center left turn lane). The speed limit is 50 MPH. The surrounding land use is primarily commercial/industrial development.

3.1.3 Intersection Geometry and Traffic Control – Existing Conditions

M-24 & the crossover north of Silver Bell Rd is a signalized crossover with two approaches. The crossover for westbound M-24 traffic consists of two left-turn lanes. Southbound M-24 consists of

three through lanes. No pedestrian, bicyclist, or transit facilities are present at the intersection. The traffic signal runs free throughout the duration of the day and night. The signal does not have a night flash schedule.

M-24 & Silver Bell Rd is a signalized intersection with four approaches. Eastbound Silver Bell Rd consists of one through lane, one shared through/right-turn lane and a right-turn only lane. Westbound Silver Bell Rd consists of two through lanes, and two right-turn only lanes. Northbound M-24 and southbound M-24 consist of three through lanes and a right turn only lane. There are sidewalks present at the intersection. The traffic signal runs free throughout the duration of the day and night. The signal does not have a night flash schedule.

M-24 & the crossover south of Silver Bell Rd is a signalized crossover with two approaches. The crossover for eastbound M-24 traffic consists of two left-turn lanes. Northbound M-24 consists of three through lanes. No pedestrian, bicyclist, or transit facilities are present at the intersection. The traffic signal runs free throughout the duration of the day and night. The signal does not have a night flash schedule.

M-24 & the crossover north of Brown Rd/Dutton Rd is a signalized crossover with two approaches. The crossover for westbound M-24 traffic consists of two left-turn lanes. Southbound M-24 consists of two through lanes. No pedestrian, bicyclist, or transit facilities are present at the intersection. The traffic signal runs free throughout the duration of the day and night. The signal does not have a night flash schedule.

M-24 & Brown Rd/Dutton Rd is a signalized intersection with four approaches. Eastbound Brown Rd consists of one through lane, one shared through/right-turn lane and a right-turn only lane. Westbound Dutton Rd consists of two through lanes, and two right-turn only lanes. Northbound M-24 consist of three through lanes and a right-turn only lane. Southbound M-24 consists of two through lanes and a right-turn only lane. There are sidewalks present at the intersection. The traffic signal runs free throughout the duration of the day and night. The signal does not have a night flash schedule.

M-24 & the crossover south of Brown Rd/Dutton Rd is a signalized crossover with two approaches. The crossover for eastbound M-24 traffic consists of one left-turn lane. Northbound M-24 consists of two through lanes. No pedestrian, bicyclist, or transit facilities are present at the intersection. The traffic signal runs free throughout the duration of the day and night. The signal does not have a night flash schedule.

Brown Rd & Giddings Rd is a minor-street stop-controlled intersection with three approaches and stop-control present on the Giddings Rd approach. The Eastbound and Westbound Brown Road approaches have two lanes in each direction and a two way center left turn lane. Northbound

Giddings Road has one shared left/through/right lane. There is a sidewalk that crosses Giddings Road, but ends just west of the roadway.

Brown Rd & Roush Driveway is a minor-street stop-controlled intersection with four approaches and stop-control present on the Roush Driveway/Gate 5 approaches. The Eastbound and Westbound Brown Road approaches have two lanes in each direction and a two-way center left turn lane. Northbound Giddings Road and Southbound Gate 5 approaches have one shared left/through/right lane. No pedestrian, bicyclist, or transit facilities are present at the intersection.

Giddings Rd & FedEx Driveway/Brown Rd is a signalized intersection with four approaches. Northbound Brown Road consists of two through lanes, a right-turn lane and a left-turn only lane. Southbound Giddings Road consists of a through lane, a shared through/right turn lane, and a left turn only lane. Westbound Brown Road consists of a left turn lane, a shared left/through lane, and a right turn only lane. The eastbound approach is a gated entrance to a FedEx facility. No pedestrian, bicyclist, or transit facilities are present at the intersection. The traffic signal runs free throughout the duration of the day and night. The signal does not have a night flash schedule.

Giddings Rd & Liberty Dr/Gate 4 is a signalized intersection with four approaches. Northbound Giddings Road consists of a right turn only lane, two through lanes and a left-turn only lane. Southbound Giddings Road consists of two through lanes, a left turn only lane, and a right turn taper. Westbound Gate 4 is a gated entrance to the GM facility. Eastbound Liberty Drive is not signalized. No pedestrian, bicyclist, or transit facilities are present at the intersection. The traffic signal runs free throughout the duration of the day and night. The signal does not have a night flash schedule.

Giddings Rd & Gate 3 is a minor-street stop-controlled intersection with three approaches and stop-control present on the Gate 3 approach. Northbound Giddings Road consist of one through lane and a shared right turn/through lane. Southbound Giddings Road has two through lanes and a center two-way left turn lane. Gate 3 is a gated entrance to the GM facility. No pedestrian, bicyclist, or transit facilities are present at the intersection.

Giddings Rd & Delta Ct/Gate 2 is a minor-street stop-controlled intersection with four approaches and stop-control present on the Delta Ct/Gate 2 approaches. Northbound Giddings Road consist of one through lane and a shared right turn/through lane. Southbound Giddings Road has two through lanes and a center two-way left turn lane. Delta Ct has one shared left/through right lane. Gate 2 is a gated entrance to the GM Facility. No pedestrian, bicyclist, or transit facilities are present at the intersection.

Giddings Rd & W Silver Bell Rd is a minor-street stop-controlled intersection with three approaches and stop-control present on the Silver Bell Road approach. Northeast-bound Giddings Rd consists of two through lanes and a center two way left turn lane. Southwest-bound Silver Bell Rd consists of a

through lane and a shared through/right turn lane. Southbound Silver Bell Rd consists of a left turn only lane and a right turn only lane. There is a sidewalk that crosses the southbound approach.

Silver Bell Rd & Giddings Rd/Gate 1 is a minor-street stop-controlled intersection with four approaches and stop-control present on the Giddings Road/Gate 1 approaches. Eastbound and westbound Silver Bell Rd has one through lane, one shared through/right turn only lane, and a two way center left turn lane. Southbound Giddings Road has a shared left/through lane and a right turn only lane. The northbound approach of Gate 1 is a gated entrance to the GM Facility. There is sidewalk present in the northwest corner of the intersection.

3.2 Crash Analysis

To examine the crash history of the study intersections, police crash data were obtained from Transportation Improvement Association's (TIA) Traffic Crash Analysis Tool (TCAT) website files for the three-year period of January 1, 2017, through December 31, 2019. Due to shutdowns related to the COVID-19 pandemic, crash data from 2020 and 2021 were excluded from the analysis. The crash data within a 150-foot radius of each intersection was reviewed to determine if any crash patterns were present. The intersections surrounding the site location were evaluated. Further details are provided in the following intersection analyses.

3.2.1 Silver Bell Road & Giddings Road/Gate 1

The results from the analysis at the intersection of Silver Bell Road and the Giddings Road driveway are shown in Table 3-1. During the three-year study period, there were 18 crashes, averaging 6.0 crashes per year. None of the reported crashes involved a pedestrian or bicyclist. Majority of the crashes involved SB vehicles on Giddings Rd. Four crashes resulted in injury (2 Type A and 2 Type B). Most crashes were reported to have occurred on a weekday, during daylight hours, clear weather, and dry pavement conditions.

Table 3-1 Crash characteristics at Silver Bell Road and Giddings Road.

Crash Type	Number of Crashes	Number of Crashes per Year
Angle	9	3.0
Rear End	4	1.3
Rear End – Right Turn	1	0.3
Sideswipe – Same Direction	2	0.7
Single Motor Vehicle	1	0.3
Backing	1	0.3
Total	18	6.0

Source: Traffic Improvement Association TCAT

3.2.2 Silver Bell Road & Giddings Road

The results from the analysis at the intersection of Silver Bell Road and Giddings Road are shown in Table 3-2. During the three-year study period, there were 6 crashes, averaging 2.0 crashes per year. None of the reported crashes involved a pedestrian or bicyclist. Three crashes resulted in injury (1 Type A, 2 Type C). Most crashes were reported to have occurred on a weekday, during daylight hours, clear weather, and dry pavement conditions.

Table 3-2 Crash characteristics at Silver Bell Road and Giddings Road.

Crash Type	Number of Crashes	Number of Crashes per Year
Rear End	2	0.7
Sideswipe – Same Direction	2	0.7
Sideswipe – Opposite Direction	1	0.3
Backing	1	0.3
Total	6	2.0

Source: Traffic Improvement Association TCAT

3.2.3 Giddings Road & Delta Court

The results from the analysis at the intersection of Giddings Road and Delta Court are shown in Table 3-3. During the three year study period, there was one crash, averaging 0.3 crashes per year. It resulted in a Type A Incapacitating Injury. This crash was reported to have occurred on a weekday, during daylight hours, clear weather, and dry pavement conditions.

Table 3-3 Crash characteristics at Giddings Road and Delta Court.

Crash Type	Number of Crashes	Number of Crashes per Year
Rear End – Right Turn	1	0.3
Total	1	0.3

Source: Traffic Improvement Association TCAT

3.2.4 Giddings Road & Gate 3 Entrance

There were no crashes reported within 250 feet of the intersection of Giddings Road and the Gate 3 entrance driveway during the three-year stucy period.

3.2.5 Giddings Road & Liberty Drive

The results from the analysis at the intersection of Giddings Road and Liberty Drive are shown in Table 3-4. During the three-year study period, there were three crashes, averaging one crash per year. None of the reported crashes involved a pedestrian or bicyclist but one crash resulted in a Type

3 Non-Incapacitating Injury. Most crashes were reported to have occurred on a weekday, during daylight hours, clear weather, and dry pavement conditions.

Table 3-4 Crash characteristics at Giddings Road and Liberty Drive.

Crash Type	Number of Crashes	Number of Crashes per Year
Angle	2	0.6
Single Motor Vehicle	1	0.3
Total	3	1.0

Source: Traffic Improvement Association TCAT

3.2.6 Giddings Road & FedEx Driveway/Brown Road

The results from the analysis at the intersection of Giddings Road and the FedEx driveway/Brown Road are shown in Table 3-5. During the three-year study period, there were four crashes, averaging 1.3 crashes per year. None of the reported crashes involved a pedestrian or bicyclist. There were no reported injury crashes. Most crashes were reported to have occurred on a weekday, during daylight hours, clear weather, and dry pavement conditions.

Table 3-5 Crash characteristics at Giddings Road and FedEx driveway/Brown Road.

Crash Type	Number of Crashes	Number of Crashes per Year
Rear End	1	0.3
Angle	1	0.3
Sideswipe – Same Direction	1	0.3
Sideswipe – Opposite Direction	1	0.3
Total	4	1.3

Source: Traffic Improvement Association TCAT

3.2.7 Brown Road & Roush Driveway

The results from the analysis at the intersection of Brown Road and the Roush driveway are shown in Table 3-6. During the three-year study period, there were three crashes, averaging one crash per year. None of the reported crashes involved a pedestrian or bicyclist. Two crashes resulted in injury (1 Type A, 1 Type C). Most crashes were reported to have occurred on a weekday, during daylight hours, clear weather, and dry pavement conditions.

Table 3-6 Crash characteristics at Brown Road and Roush driveway.

Crash Type	Number of Crashes	Number of Crashes per Year
Rear End	1	0.3

Crash Type	Number of Crashes	Number of Crashes per Year
Head On	1	0.3
Other	1	0.3
Total	3	1.0

Source: Traffic Improvement Association TCAT

3.2.8 Brown Road & Giddings Road

The results from the analysis at the intersection of Brown Road and Giddings Road are shown in Table 3-7. During the three-year study period, there were 9 crashes, averaging three crashes per year. None of the reported crashes involved a pedestrian or bicyclist. There were no reported injury crashes. Most crashes were reported to have occurred on a weekday, during daylight hours, clear weather, and dry pavement conditions.

Table 3-7 Crash characteristics at Brown Road and Giddings Road.

Crash Type	Number of Crashes	Number of Crashes per Year
Rear End	6	2.0
Angle	2	0.6
Backing	1	0.3
Total	9	3.0

Source: Traffic Improvement Association TCAT

3.2.9 Crash Analysis Results

The results from the crash analysis do not indicate a major crash problem in the study area. The three employee driveways (Gate 2, Gate 3, Gate 4) had minimal to no crashes reported within the study period, indicating no existing crash problems at these locations. The higher amount of angle and injury crashes at Gate 1 indicate a potential issue at this location and will be reviewed further in the signal warrant analysis.

3.3 Existing Conditions Operational Analysis

The analysis of existing operations was initiated with the preparation of existing condition models using Synchro 11 and the existing roadway geometry and traffic control information. The existing conditions models utilize the traffic volumes collected in April 2022 as depicted in **Figure 2-1**. The capacity analysis included an examination of the weekday AM and PM peak times.

The results of the capacity analyses for existing conditions are summarized in **Table 3-8**, which provides the LOS and delay values at each intersection for each approach throughout the study area. The capacity analyses for existing conditions revealed that all study area intersections and

movements operate at an acceptable level of service during the weekday AM and PM peak times at an acceptable LOS D or better, except for those listed below. A depiction of the approach LOS by peak time is provided in **Figure 3-1**.

- Giddings Rd & Delta Ct/Gate 2
    - Westbound approach operated at LOS F with 127.1 seconds of average vehicle delay (PM Peak)
- M-24 & Brown Rd/Dutton Rd
    - Westbound approach operates at LOS E with 77.6 seconds of average vehicle delay (AM Peak) and LOS E with 57.0 seconds of average vehicle delay (PM Peak).
    - Eastbound approach operates at LOS F with 87.7 seconds of average vehicle delay (PM Peak).
- M-24 & Crossover south of Brown Rd/Dutton Rd
    - Eastbound approach operates at a LOS F with 137.9 second of average vehicle delay (AM Peak) and LOS E with 55.2 seconds of average vehicle delay (PM Peak).
- M-24 & Crossover north of Brown Rd/Dutton Rd
    - Westbound approach operates at a LOS E with 64.0 seconds of average vehicle delay (AM Peak).
- M-24 & Silver Bell Rd
    - Westbound approach operates at LOS E with 58.7 seconds of average vehicle delay (AM Peak).
    - Eastbound approach operates at LOS E with 66.9 seconds of average vehicle delay (PM Peak).
- M-24 & Crossover south of Silver Bell Rd
    - Eastbound approach operates at LOS E with 58.1 seconds of average vehicle delay (AM Peak) and LOS E with 57.7 seconds of average vehicle delay (PM Peak).
- M-24 & Crossover north of Silver Bell Rd
    - Westbound approach operates at LOS E with 61.7 seconds of average vehicle delay (AM Peak) and LOS E with 58.7 seconds of average vehicle delay (PM Peak).

3.3.1 SimTraffic Model Calibration and Validation

After completing the Synchro analysis for existing conditions, the SimTraffic models were calibrated and validated to ensure that they reflected actual field operations. This is an essential step in Synchro modeling and was conducted prior to the analysis and simulation of any future conditions.

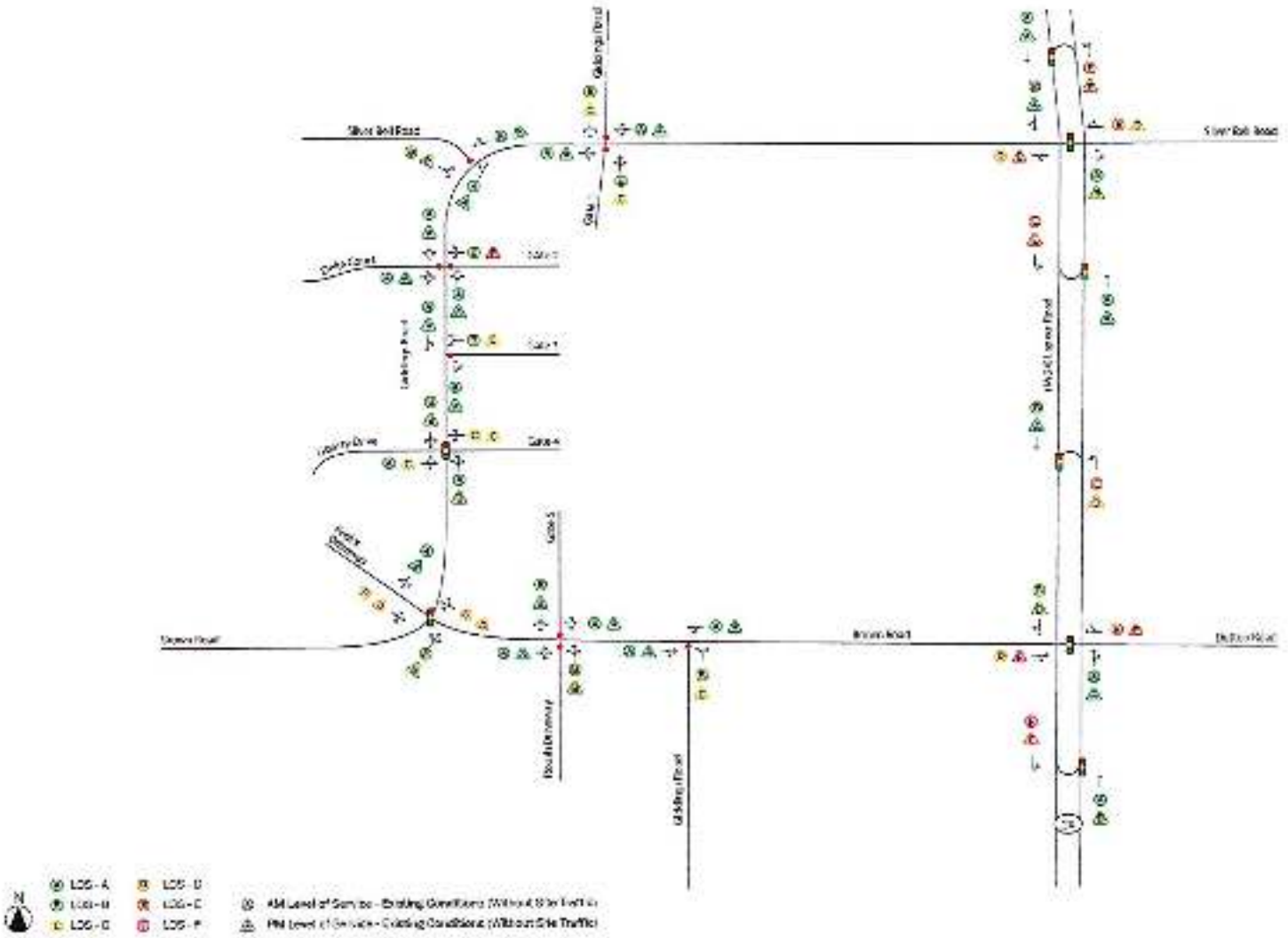
The SimTraffic results for existing conditions were calibrated and validated for weekday morning and weekday afternoon peak shift hour conditions. The process involved comparing the actual traffic volumes collected at each intersection with the SimTraffic Volume Exited report. The models were considered validated when the field counts and model results were within the greater of ±10 percent

or ±20 vehicles. No adjustments to model parameters were required to achieve validation of the models. The SimTraffic validation reports are included in **Appendix D.**

Table 3-8. Existing Conditions (Without Site Traffic) – Synchro Analyses Results.

Intersection	Measure	AM Peak					PM Peak				
		EB	WB	NB	SB	Total	EB	WB	NB	SB	Total
Silver Bell Rd & Gate 1/Giddings Rd Driveway (Two-way Stop)	LOS	A	A	B	B	A	A	A	C	C	A
	Delay (sec)	0.8	0.2	10.9	12.6	3.0	0.9	0.0	16.8	15.3	2.3
Silver Bell Rd & Giddings Rd (Two-way Stop)	LOS	A	A	-	B	A	A	A	-	B	A
	Delay (sec)	0.8	0.0	-	10.5	2.9	0.7	0.0	-	12.6	1.5
Giddings Rd & Delta Ct/Gate 2 (Two-way Stop)	LOS	A	B	A	A	A	A	F	A	A	C
	Delay (sec)	0.0	11.0	0.0	3.5	1.8	9.1	127.1	0.0	0.0	36.6
Giddings Rd & Gate 3 (Two-way Stop)	LOS	-	B	A	A	A	-	C	A	A	A
	Delay (sec)	-	13.3	0.0	4.2	1.4	-	17.2	0.0	0.1	5.2
Giddings Rd & Liberty Dr/Gate 4 (Signal)	LOS	A	C	A	B	A	C	C	B	B	B
	Delay (sec)	0.0	21.8	8.3	11.6	8.8	22.0	31.8	11.9	14.9	19.2
Giddings Rd & FedEx Driveway/Brown Rd (Signal)	LOS	D	D	B	A	B	D	D	B	A	B
	Delay (sec)	51.2	43.9	11.2	4.8	16.6	38.6	41.8	12.9	8.6	17.1
Brown Rd & Giddings Rd (Two-way Stop)	LOS	A	A	B	-	A	A	A	C	-	A
	Delay (sec)	0.0	4.0	11.8	-	3.7	0.0	2.2	15.8	-	4.4
Brown Rd & Roush Dr (Two-way Stop)	LOS	A	A	B	B	A	A	A	B	A	A
	Delay (sec)	0.0	0.2	10.8	11.6	0.3	0.0	0.4	10.1	0.0	0.4
M-24 & Brown Rd/Dutton Rd (Signal)	LOS	D	E	A	B	C	F	E	A	B	C
	Delay (sec)	54.8	77.6	3.1	13.7	21.1	87.7	57.0	5.4	10.2	31.4
M-24 & Xover S of Brown Dutton (Signal)	LOS	F	-	A	-	B	E	-	B	-	B
	Delay (sec)	137.9	-	3.1	-	10.4	55.2		11.4	-	14.8
M-24 & Xover N of Brown Dutton (Signal)	LOS	-	E	-	B	B	-	D	-	A	B
	Delay (sec)	-	64.0	-	11.0	17.3	-	52.3	-	5.1	10.9
M-24 & Xover S of Silver Bell Rd (Signal)	LOS	E	-	A	-	B	E	-	A	-	B
	Delay (sec)	58.1	-	1.4	-	13.2	57.7	-	3.9	-	11.5
M-24 & Silver Bell Rd (Signal)	LOS	D	F	A	B	C	E	D	B	A	C
	Delay (sec)	52.2	58.7	7.2	11.1	25.2	66.9	53.6	11.9	8.8	26.5
M-24 &Xover N of Silver Bell Rd (Signal)	LOS	-	E	-	A	B	-	E	-	A	A
	Delay (sec)	-	61.7	-	5.7	14.3	-	58.7	-	2.2	9.9

Figure 3-1. Existing Conditions (Without Site Traffic) – Intersection Approach Level of Service.



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3.4 Proposed Development Conditions

The traffic study with traffic from the proposed expanded plant development began with the development of turning movement volumes for the weekday AM and PM peak shift times. These future traffic volumes were derived from developing the trip generation, distribution, and assignment for the proposed development and adding them to the existing traffic volumes.

3.4.1 Site Access

The GM Orion Expansion campus will occur on site at the existing GM Orion Assembly plant. There is a new parking area that is being added to the southeast section of the site. There is one new employee driveway proposed on Silver Bell Rd and one new employee driveway proposed on Brown Rd that will lead to this new parking area. The three existing employee driveways on Giddings Road are to remain access points to the site and the existing parking area. Gate 1 and Gate 5 driveways will become truck-only accesses. A preliminary site layout is depicted in **Figure 3-2.**

3.4.2 Background Traffic Growth

To determine a background traffic growth rate, the SEMCOG 2045 Regional Development Forecast was used. Shown in **Figure 3-3**, there is zero to negligible growth forecasted for the four indicators in Orion Township from 2022 (traffic data collection year) to 2024 (anticipated build-out date). Therefore, the Proposed traffic conditions analysis did not utilize a background traffic growth rate.

Figure 3-2. Preliminary Site Plan Layout – GM Orion Expansion.

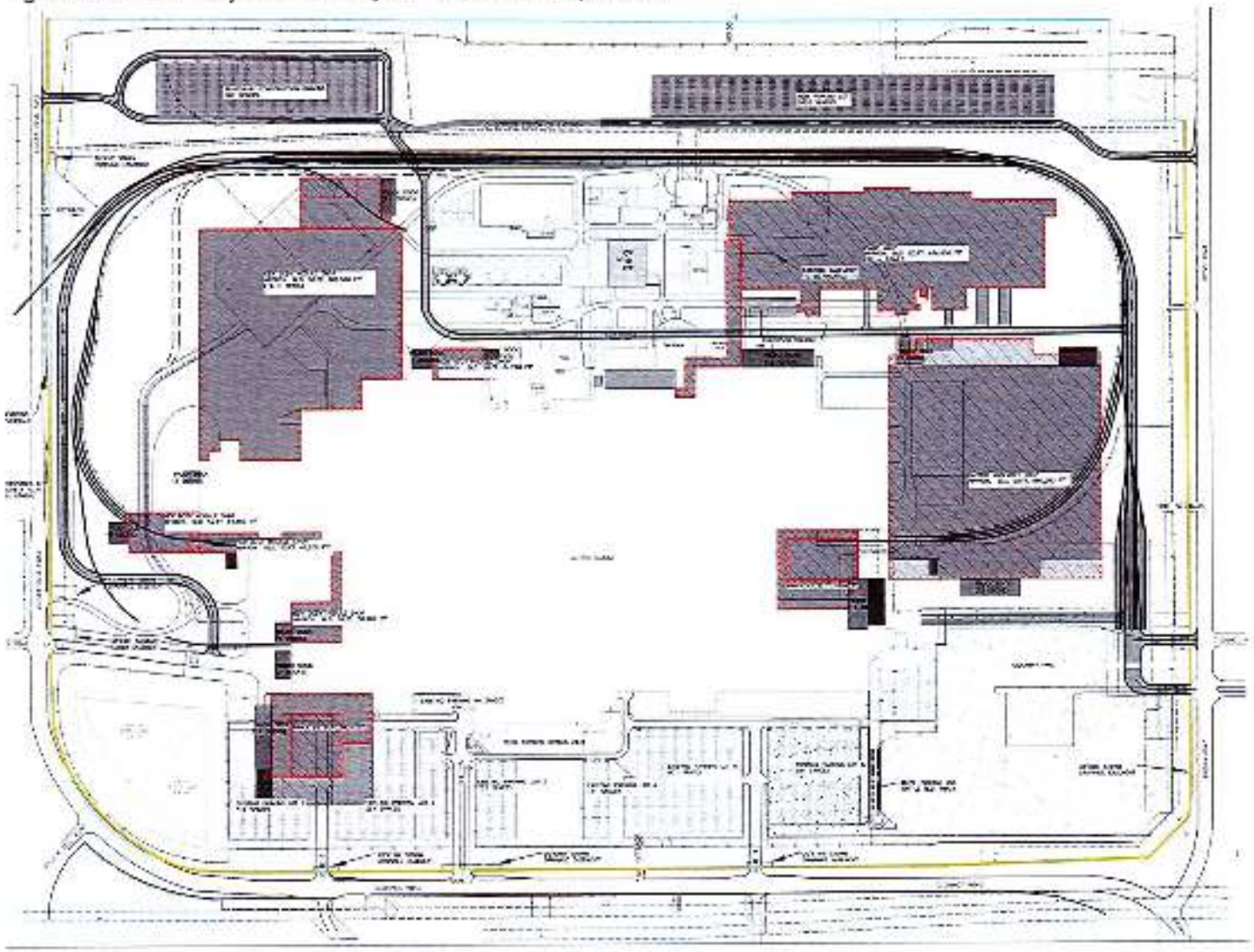

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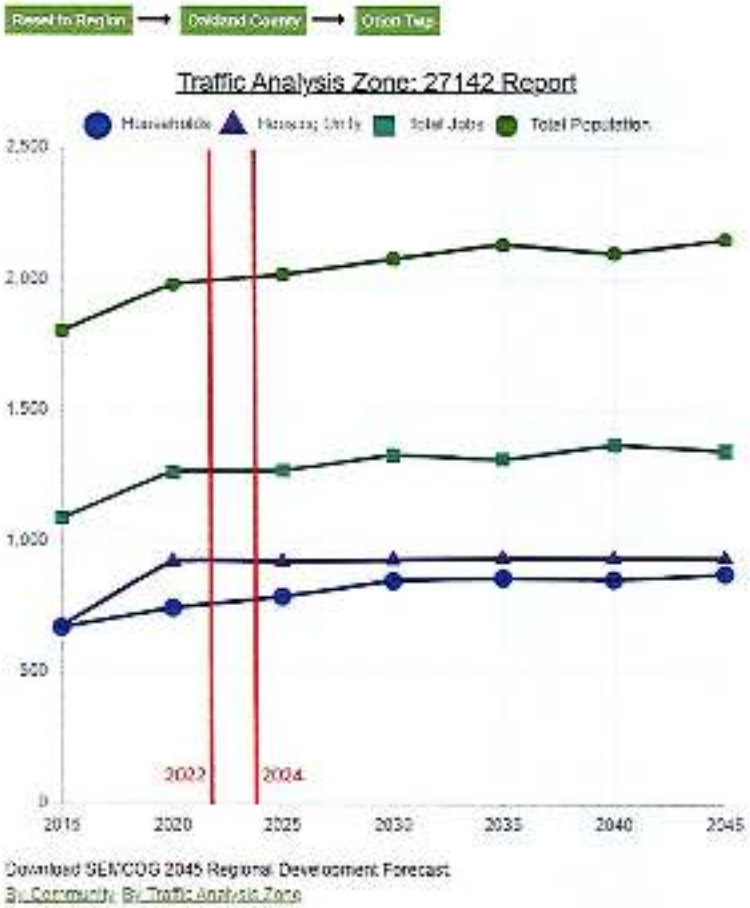
Figure 3-3. Orion Township Regional Development Forecast.



3.4.3 Trip Generation

Based on discussions with the project team, the proposed GM Orion Expansion at full build-out is expected to have three shifts with a maximum total of 3,916 employees between all three shifts. 1,220 hourly employees are anticipated during each shift, with an additional 257 administrative / office employees during Shift #1, for a total of 1,477 employees during Shift #1 (The maximum amount of employees in any shift). Additionally, 683 trucks per shift are anticipated to access the proposed plant.

New trips to be generated by the GM Orion Expansion were estimated based on information and procedures contained in the Institute of Transportation Engineer's (ITE) report Trip Generation, Eleventh Edition (Web Application Version 6.0 – May 2022). Given that the proposed development is zoned for industrial and is planned to have a variety of industrial facilities on site, including administrative buildings, the land use Industrial Park was used to generate trips for this purpose (ITE Land Use Code (LUC) 130).

Other land uses were investigated for applicability for this particular site within the Industrial Land Use Group (LUCs 100-199), including LUC 140 – Manufacturing which is the most similar land use type to LUC 130 – Industrial Park. However, it was determined that the trip generation estimates using LUC 130 – Industrial Site would provide the most appropriate analysis by predicting the number of trips most closely represented by the expected employee demand per shift. **Table 3-9** provides the AM and PM peak shift time trip generation summary for motor vehicles for LUC 130.

Table 3-9. Trip Generation – Motor Vehicles.

Land Use	Weekday AM Peak Shift of Generator			Weekday PM Peak Shift of Generator		
	Total	In	Out	Total	In	Out
130 - Industrial Park	1,375+160	1,196+80	179+80	1,218+160	256+80	962+80

XX = Trucks

Source: Institute of Transportation Engineers, Trip Generation, 11th Edition

As seen in **Table 3-2**, an industrial park with 3,916 total employees can be expected to generate up to 1,196 inbound trips on a typical weekday AM peak while Shift #1 is entering and prior to Shift #3 leaving, and 962 outbound trips on a typical weekday PM peak when Shift #1 is leaving and after Shift #2 has arrived. Additionally, 80 trucks are expected to enter and 80 trucks are expected to exit the site during each of the AM and PM peak times. These AM and PM trip values represent the peak traffic demand loads on the study network and are utilized in the ensuing trip distribution and assignment as well as the subsequent traffic capacity analyses.

As shown in **Table 3-10**, there are already existing GM employees on the network that are accounted for in the existing counts. In order to prevent double counting employees, the difference between the proposed and existing was calculated. For the AM peak period, there will be 273 additional trips and for the PM peak period, there will be 82 additional trips added to the network.

Table 3-10. Employee Count comparison.

Scenario	Existing	Proposed	Difference
Max employees in a shift	1,246	1,477	+231
AM Entering Trips	923	1,196	+273
PM Departing Trips	880	962	+82

3.4.4 Directional Trip Distribution and Traffic Assignment

The anticipated traffic volumes were distributed to the surrounding transportation network based on a combination of travel demand forecasts, existing traffic patterns, and nearby primary traffic generators. To further refine the trip distribution, zip code data was collected for employees at the existing GM Orion Assembly plant. The zip code data was aggregated and percentages were determined as depicted in **Figure 3-4**, and the estimated trip distribution percentages are depicted in **Figure 3-5**.

The estimated number of weekday AM and PM peak trips were distributed to the surrounding roadway network using the determined percentages, as shown in **Figures 3-6** and **3-7** for generated traffic. Projected site generated trips were added to the existing traffic volumes as depicted in **Figure 2-1** to yield the proposed build conditions. **Figure 3-8** illustrates the weekday AM and PM peak traffic volumes for the proposed build conditions.

It is important to note that currently the plant operates with only **one shift with 1,246 employees**, and the proposed expansion will operate with **three shifts with 3,916 employees and 1,477 employees** during the largest shift, for an additional 231 employees during that shift. Although the number of employees is significantly increasing, the implementation of two additional shifts will greatly help to minimize the impacts to traffic. This is demonstrated as **only 273 and 82 trips are added to the roadway network during AM Peak hour and PM Peak hour respectively.**

Figure 3-4. Population Map for Existing GM Orion Assembly Plant Employees by Zip Code.

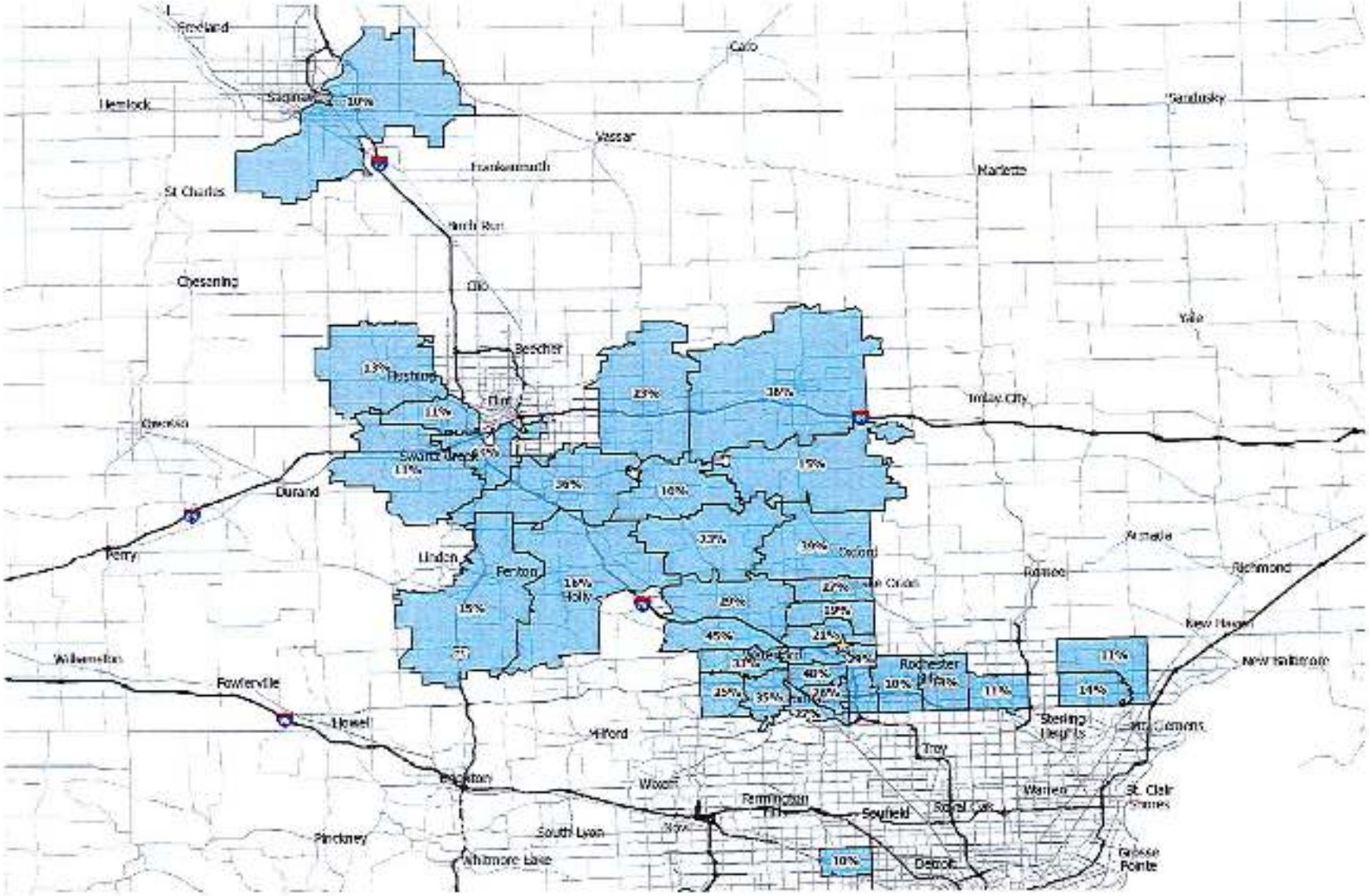


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Figure 3-5. Directional Distribution for Site Generated Trips.

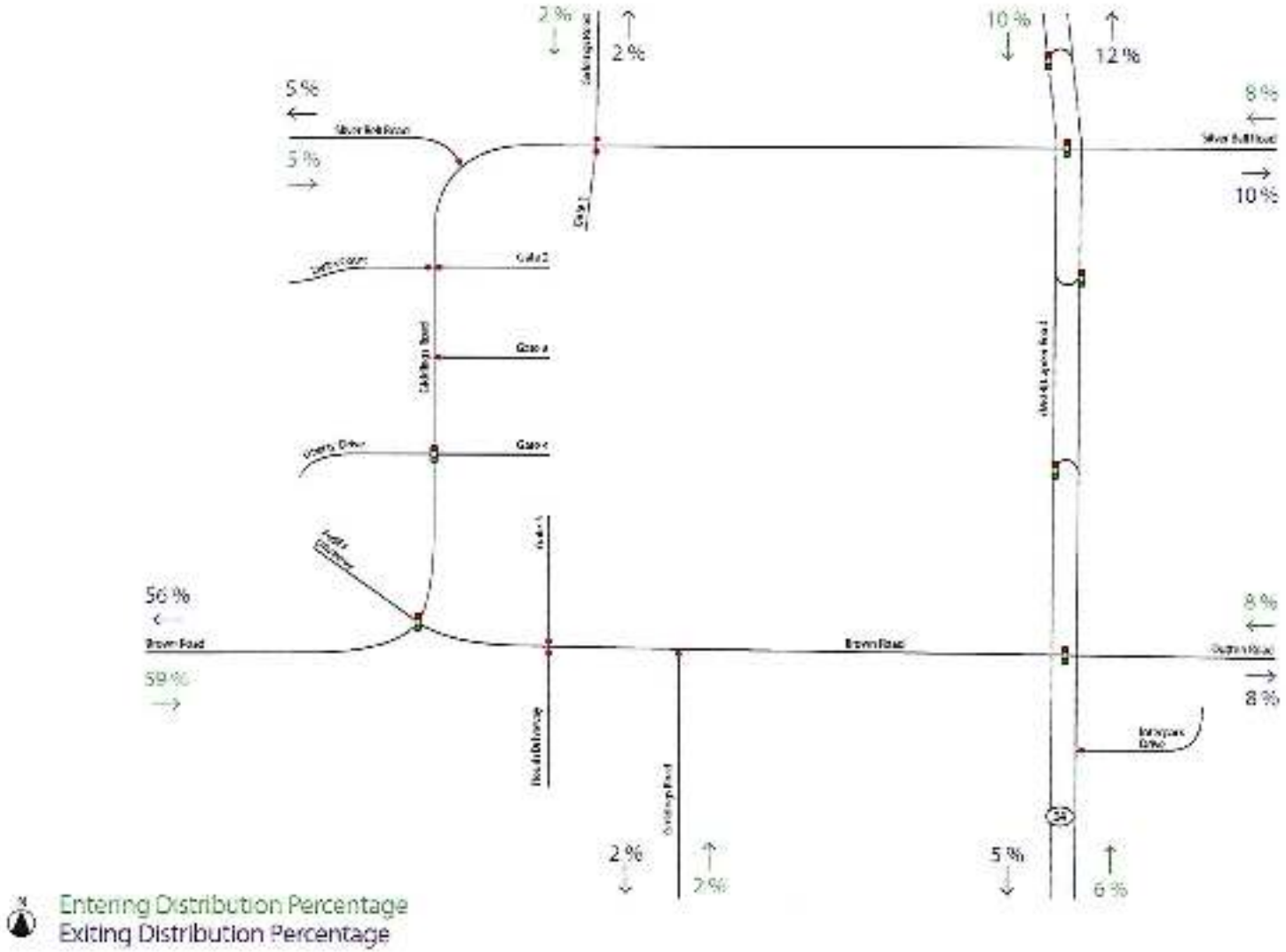


Figure 3-6. AM Peak Site Generated Traffic Volumes.

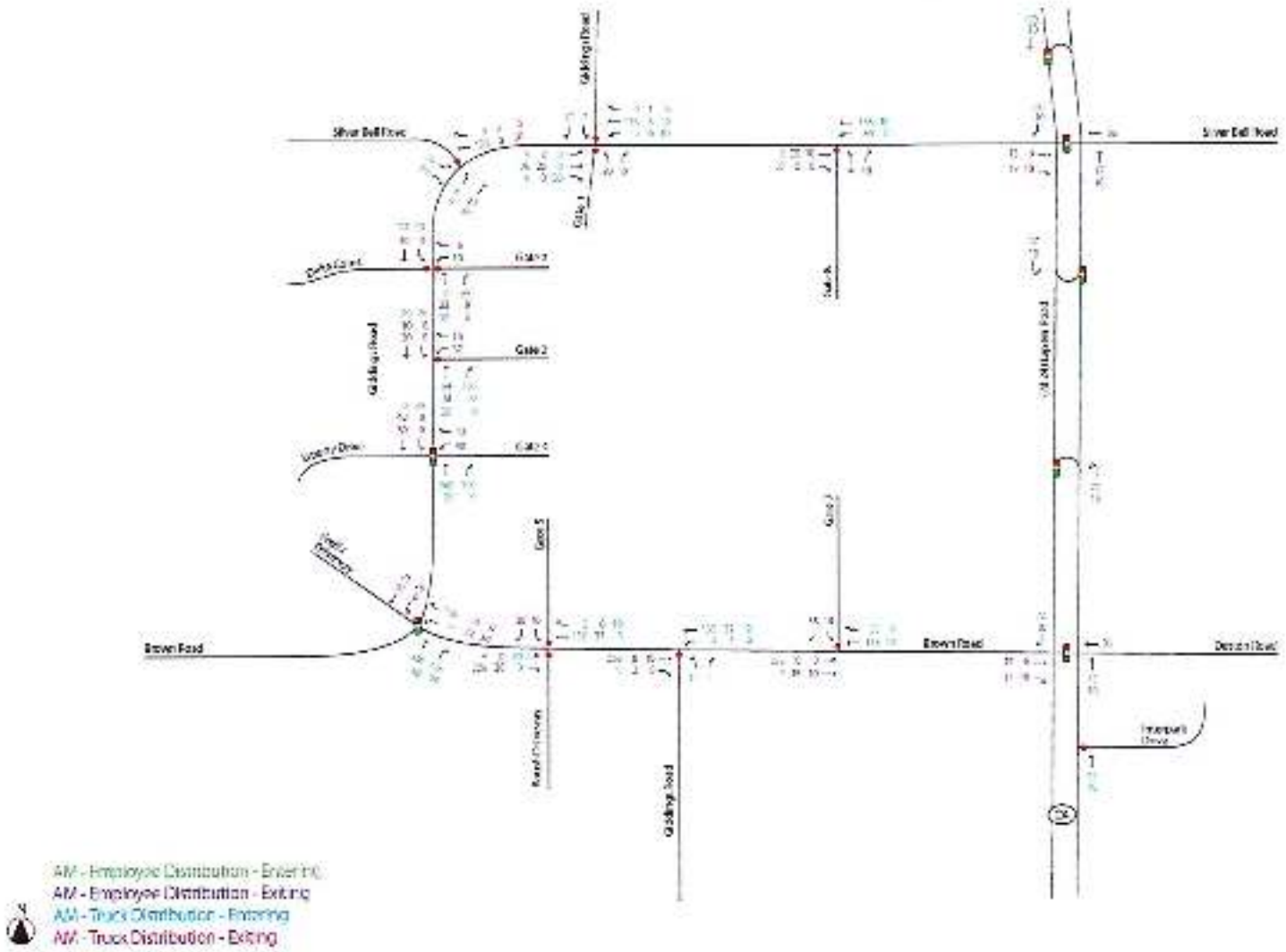


Figure 3-7. PM Peak Site Generated Traffic Volumes.

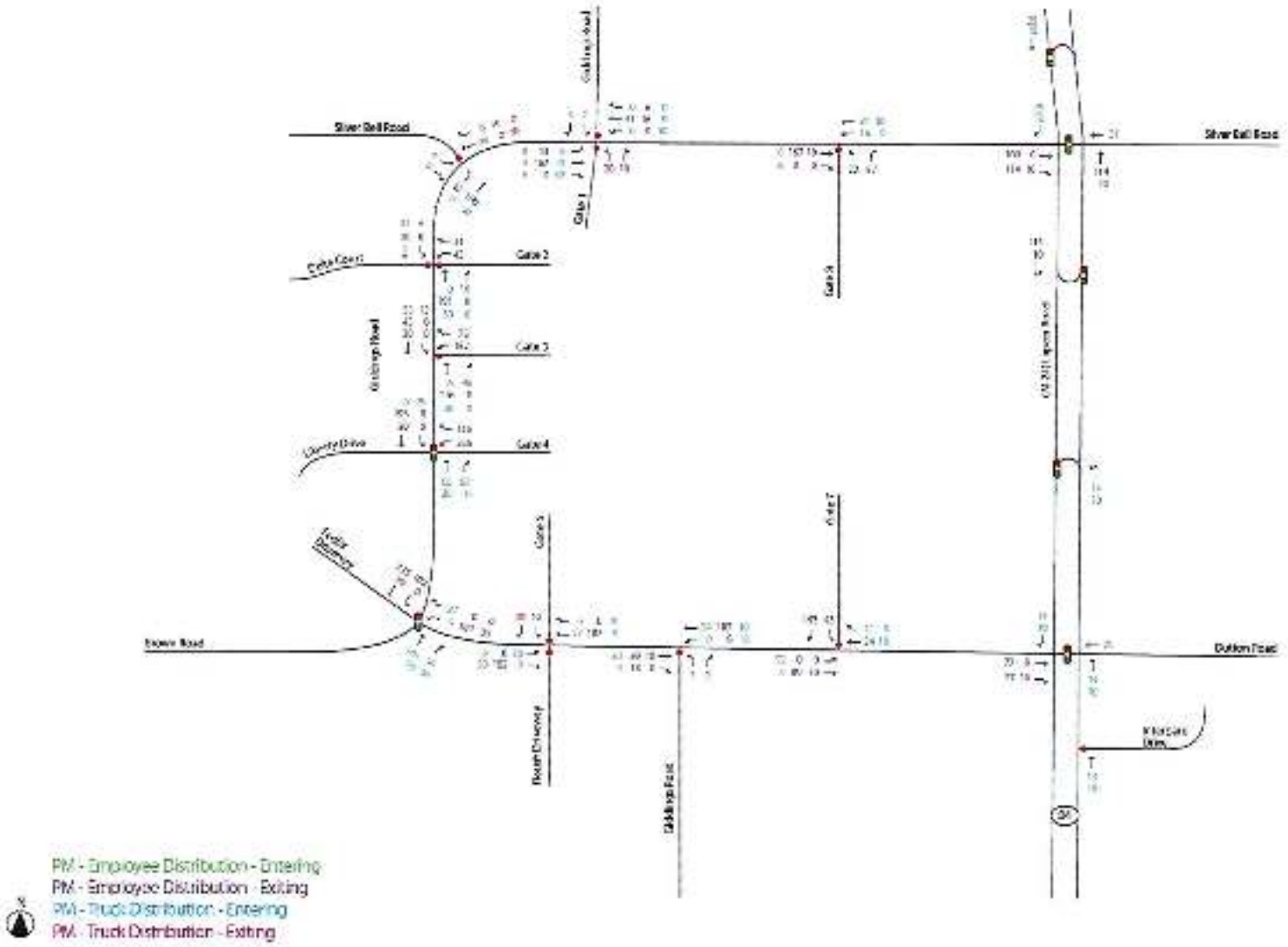
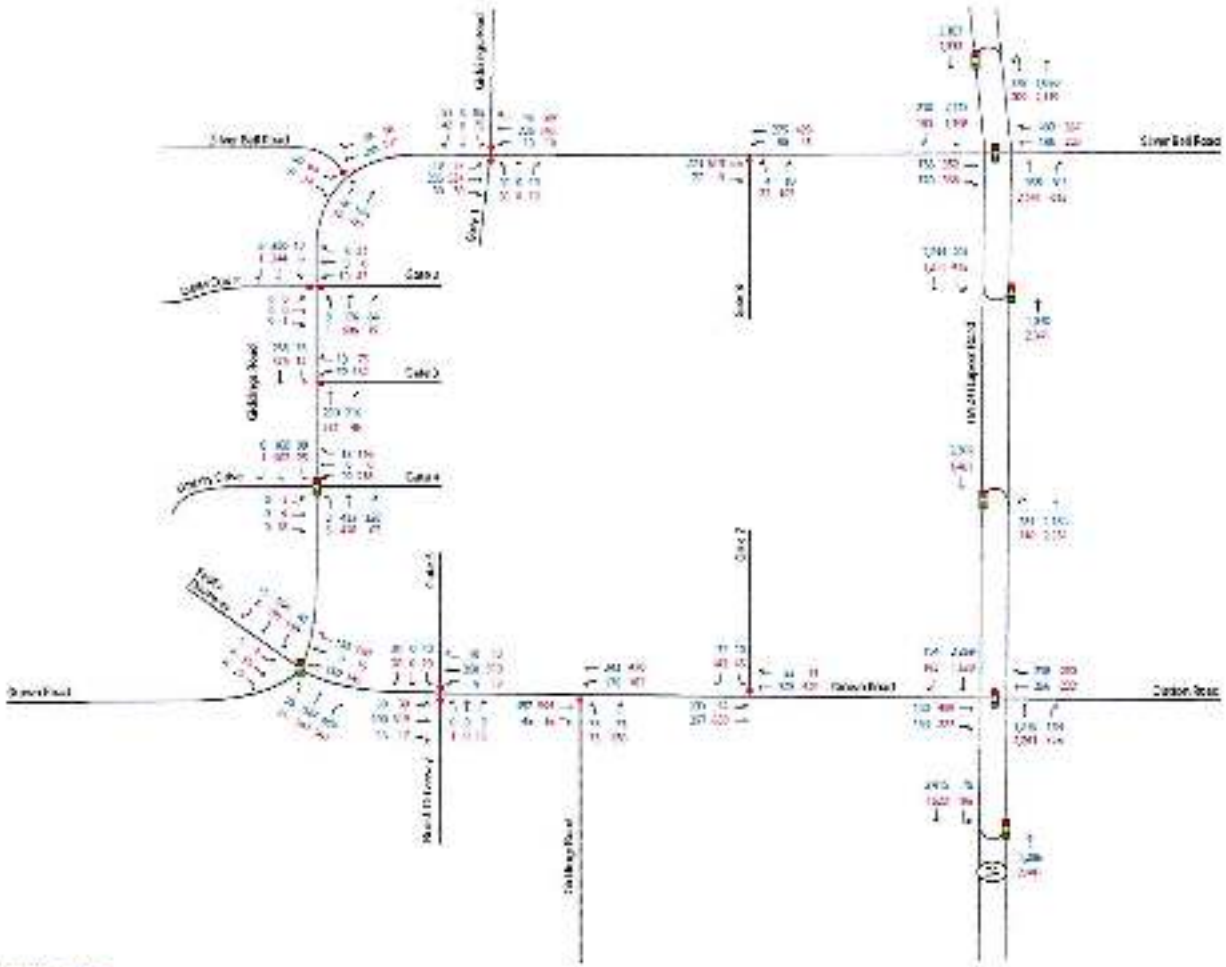


Figure 3-8. AM / PM Peak Site Generated Traffic Volumes – Future Build-out Traffic Volumes.



3.4.5 Peak Hour Turn Lane and Signal Warrant Analysis – Proposed Accesses

Michigan Department of Transportation (MDOT) turn lane warrants were examined with the additional site generated traffic to determine if right turn or left-turn lanes would be needed at any of the site driveways that do not currently have them. Signal warrant analysis was also performed at the proposed employee access drive and the proposed truck driveways to determine if a traffic signal may be warranted.

Peak Hour Turn Lane Analysis

As shown in **Table 3-11**, based on the volume warrants, one new right turn lane at Gate 3 and two right turn tapers (Gate 2 and Gate 7) are warranted. Left turn lanes are warranted at Gates 7 and 8. The turn lane warrant worksheets are attached in **Appendix E**.

Table 3-11. Turn Lane and Signal Warrant Analysis.

Site Driveway	Warrant		
	Right Turn Lane	Left Turn Lane	Signal
Gate 1	Not warranted	Existing	Warranted
Gate 2	NB Taper warranted	Existing	Not Warranted
Gate 3	NB warranted (100')	Existing	Not Warranted
Gate 4	Existing	Existing	Existing
Gate 5	Not warranted	Existing	Not Warranted
Gate 7	WB taper warranted	EB Warranted (150')	Not Warranted
Gate 8	Not warranted	WB Warranted (150')	Not Warranted

Signal Warrant Analysis

As shown in **Table 3-11**, a new signal is warranted at Gate 1. The warrants for traffic signal installation are described in Part 4, Chapter 4C, Section 4C.01 through 4C.10 of the 2009 Edition of the FHWA *Manual on Uniform Traffic Control Devices (MUTCD) with Revision Numbers 1 and 2*, pages 436 through 448. The *MUTCD* states that traffic control signals should not be considered unless one or more of eight warrants are met. The satisfaction / dissatisfaction of a traffic signal warrant(s) will not in itself require the installation or removal of a traffic control signal.

For this analysis, since 24-hour counts were not collected, data was taken from MDOT's Transportation Data Management System to fill in any gaps in the volume data. The results of the Signal Warrant Analysis is shown in **Appendix F**. The intersection of Silver Bell Rd and Giddings Rd/Gate 1 is warranted for a signal based on Warrant 1, the Eight-Hour Vehicular Volume warrant. Additionally, in the one year period of September 1, 2018 to August 31, 2019, there were 6 angle crashes that could potentially be corrected by signalization. Since this will be used as a truck access point, it is warranted based on the Eight-Hour Vehicular Volume warrant, and the potential safety

issue, it is recommended to add a signal at the intersection of Silver Bell Rd and Giddings Rd/Gate 1.

As shown in **Figure 3-9**, the PM Peak vehicular volumes meet the criteria for installation of a traffic signal based on the peak hour warrant, and thus a traffic signal is recommended at the employee access drive at Davis Highway. As shown in **Figure 3-10**, the vehicular volumes during neither of the peak times meet the criteria for installation of a traffic signal based on the peak hour warrant, and thus a traffic signal **is not** recommended at the site truck exit to Davis Highway.

3.4.6 Proposed Development Operational Analysis

Each of the existing study area intersections and proposed site access intersections were evaluated with the future build traffic volumes to determine the future intersection operations with the proposed GM Orion Expansion development project. The existing geometrics and signal timing were used and no adjustments were made. Highway capacity analyses were conducted for the existing geometric conditions and traffic control, and projected build traffic volumes, and are summarized in **Table 3-12. Figure 3-9** depicts the approach LOS by peak time.

The capacity analysis for the proposed build conditions indicated that all study area intersections and movements are expected to continue to operate at an acceptable level of service during the weekday AM and PM peak times, with the exception of those listed below. All of the locations already experienced a LOS E or F in the existing condition except for the one shown in red. All approaches at the five employee site access points and two truck driveways are expected to operate at LOS D or better. The full synchro reports for the Proposed Condition can be found in **Appendix G.**

- M-24 & Brown Rd/Dutton Rd
    - Westbound approach operates at LOS F with 91.0 seconds of average vehicle delay (AM Peak) and LOS E with 58.5 seconds of average vehicle delay (PM Peak).
    - Eastbound approach operates at LOS F with 58.3 seconds of average vehicle delay (AM Peak) and LOS F with 108.6 seconds of average vehicle delay (PM Peak).
- M-24 & Crossover south of Brown Rd/Dutton Rd
    - Eastbound approach operates at a LOS E with 58.3 second of average vehicle delay (AM Peak) and LOS E with 56.0 seconds of average vehicle delay (PM Peak).
- M-24 & Crossover north of Brown Rd/Dutton Rd
    - Westbound approach operates at a LOS E with 69.0 seconds of average vehicle delay (AM Peak).
- M-24 & Silver Bell Rd
    - Westbound approach operates at LOS E with 58.2 seconds of average vehicle delay (AM Peak).
    - Eastbound approach operates at LOS E with 70.3 seconds of average vehicle delay (PM Peak).
- M-24 & Crossover south of Silver Bell Rd
    - Eastbound approach operates at LOS E with 58.5 seconds of average vehicle delay (AM Peak) and LOS E with 57.3 seconds of average vehicle delay (PM Peak).
- M-24 & Crossover north of Silver Bell Rd
    - Westbound approach operates at LOS E with 62.4 seconds of average vehicle delay (AM Peak) and LOS E with 58.8 seconds of average vehicle delay (PM Peak).

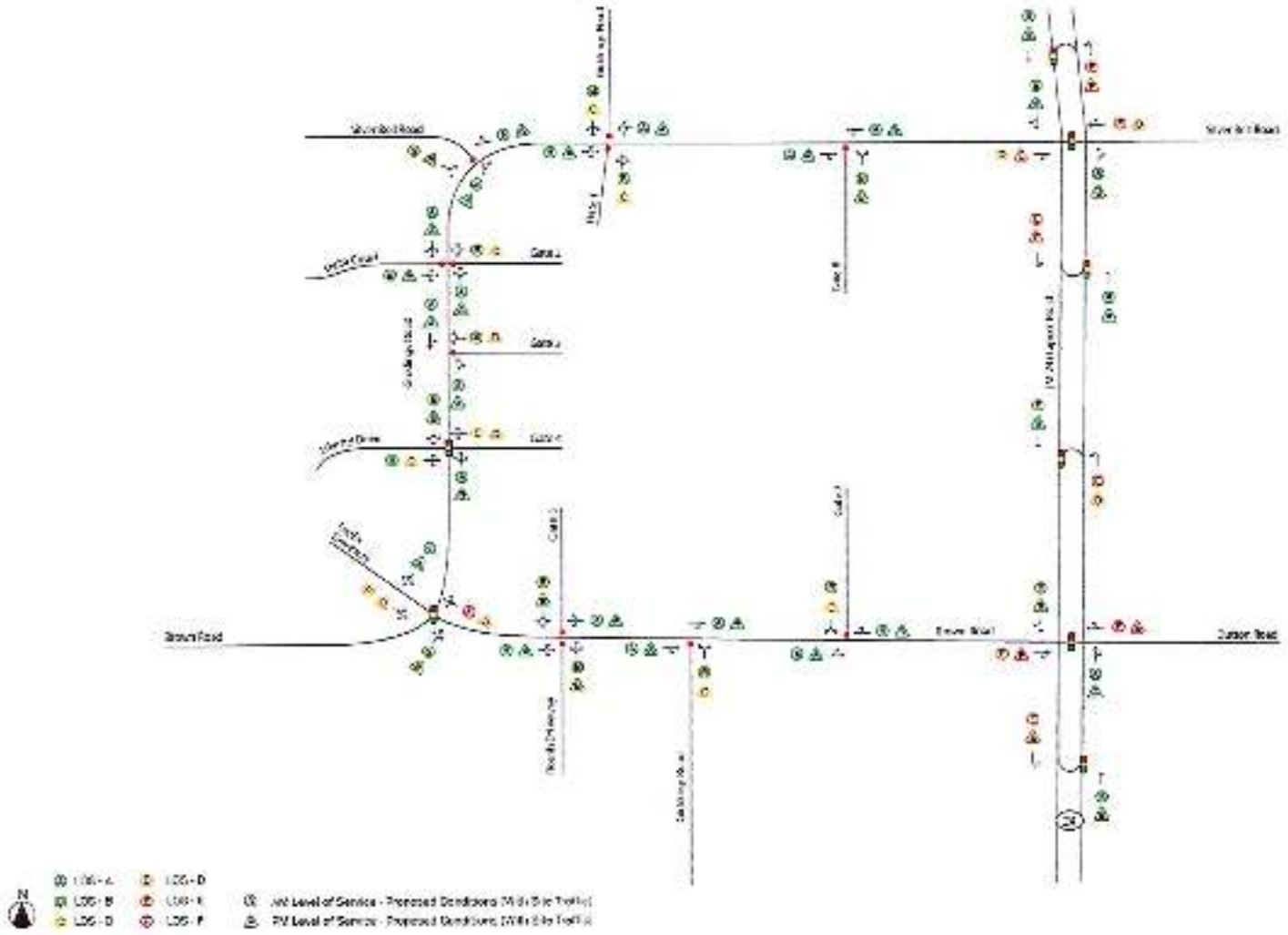
Mitigation measures were investigated to improve the LOS at these approaches / intersections to an acceptable LOS D or better. The analysis of these measures is described in the next section.

Table 3-12. Proposed Conditions (With Site Traffic) – Synchro Analyses Results.

Intersection	Measure	AM Peak					PM Peak				
		EB	WB	NB	SB	Total	EB	WB	NB	SB	Total
Silver Bell Rd & Gate 1/Giddings Rd Driveway (Two-way Stop)	LOS	A	A	B	B	A	A	A	C	C	A
	Delay (sec)	0.6	0.3	13.1	12.7	3.7	1.1	0.2	20.6	16.4	3.3
Silver Bell Rd & Giddings Rd (One-way Stop)	LOS	A	A	-	B	A	A	A	-	B	A
	Delay (sec)	0.8	0.0	-	11.0	3.0	0.7	0.0	-	12.6	1.6
Giddings Rd & Delta Ct/Gate 2 (Two-way Stop)	LOS	B	B	A	A	A	A	C	A	A	A
	Delay (sec)	0.0	10.9	0.0	0.5	0.6	9.4	24.1	0.0	0.2	1.8
Giddings Rd & Gate 3 (One-way Stop)	LOS	-	B	A	A	A	-	D	A	A	A
	Delay (sec)	-	12.9	0.0	2.3	1.4	-	30.4	0.0	0.3	6.5
Giddings Rd & Liberty Dr/Gate 4 (Signal)	LOS	A	C	A	B	A	C	D	B	B	C
	Delay (sec)	0.0	23.3	6.5	13.5	9.4	22.0	36.0	12.5	14.1	20.0
Giddings Rd & FedEx Driveway/Brown Rd (Signal)	LOS	D	F	B	A	C	D	D	B	A	C
	Delay (sec)	51.2	82.2	11.1	3.5	23.2	38.6	49.0	13.7	8.7	21.2
Brown Rd & Giddings Rd (One-way Stop)	LOS	A	A	B	-	A	A	A	C	-	A
	Delay (sec)	0.0	3.9	13.1	-	2.9	0.0	1.6	18.3	-	4.1
Brown Rd & Roush Dr/Gate 5 (Two-way Stop)	LOS	A	A	B	B	A	A	A	B	B	A
	Delay (sec)	0.6	0.2	10.1	12.4	1.0	0.5	0.3	10.4	12.0	0.9
Brown Rd & Gate 7 (One-way Stop)	LOS	A	A	-	B	A	A	A	-	C	A
	Delay (sec)	4.6	0.0	-	14.7	3.1	0.9	0.0	-	15.4	2.5
M-24 & Brown Rd/Dutton Rd (Signal)	LOS	E	F	A	B	C	F	E	A	B	D
	Delay (sec)	56.0	91.0	3.8	13.9	24.5	108.6	58.5	5.5	11.2	38.9
M-24 & Xover S of Brown Dutton (Signal)	LOS	F	-	A	-	A	F	-	B	-	B
	Delay (sec)	58.3	-	2.7	-	6.4	56.0	-	12.2	-	15.6
M-24 & Xover N of Brown Dutton (Signal)	LOS	-	E	-	B	B	-	D	-	A	B
	Delay (sec)	-	69.0	-	11.9	19.6	-	51.8	-	4.2	11.5
M-24 & Xover S of Silver Bell Rd (Signal)	LOS	E	-	A	-	B	E	-	A	-	B
	Delay (sec)	58.5	-	1.3	-	10.4	57.3	-	4.4	-	12.4
M-24 & Silver Bell Rd (Signal)	LOS	D	E	A	B	C	E	D	B	A	C
	Delay (sec)	52.2	58.2	7.5	11.4	25.2	70.3	52.9	12.3	9.0	27.9

Intersection	Measure	AM Peak					PM Peak				
		EB	WB	NB	SB	Total	EB	WB	NB	SB	Total
M-24 &Xover N of Silver Bell Rd (Signal)	LOS	-	F	-	A	B	-	E	-	A	A
	Delay (sec)	-	62.4	-	5.9	14.6	-	58.8	-	2.3	10.0
Silver Bell Rd & Gate 8 (One-way Stop)	LOS	A	A	B	-	A	A	A	B	-	A
	Delay (sec)	0.0	2.0	11.0	-	1.3	0.0	0.4	13.6	-	1.5

Figure 3-9. Proposed Conditions (With Site Traffic) – Intersection Approach Level of Service.



3.4.7 Proposed Development Operational Analysis – With Mitigation

To improve operations during both the AM and PM peak times at the study intersections, the following mitigation strategies were investigated:

- Place the intersection of Silver Bell Rd & Giddings Rd/Gate 1 under traffic signal control with a 100 second cycle length during the AM Peak and 80 second cycle length during the PM Peak
- Provide a right-turn taper at the following locations:
    - NB Giddings Rd approach to Gate 2
    - WB Brown Rd approach to Gate 7
- Construct a right-turn only lane with a minimum of 100' of storage length at the following location:
    - NB Giddings Rd approach to Gate 3
- Construct a left-turn only lane with a minimum of 150' of storage length at the following locations:
    - EB Brown Rd approach to Gate 7
    - WB Silver Bell Rd approach to Gate 8
- Signal timing adjustments at the following signalized intersections:
    - Giddings Rd & FedEx Driveway/Brown Rd
    - Giddings Rd & Liberty Dr/Gate 4
    - M-24 & the crossover north of Silver Bell Rd
    - M-24 & Silver Bell Rd
    - M-24 & the crossover south of Silver Bell Rd
    - M-24 & the crossover north of Brown/Dutton Rd
    - M-24 & Brown/Dutton Rd
    - M-24 & the crossover south of Brown/Dutton Rd

The signal timing adjustments consisted primarily of changes to phasing splits and offsets. The cycle length at the intersection of M-24 at Silver Bell Rd was changed from 140 seconds to 130 seconds during both Peak times to coordinate with the adjacent crossovers and study intersections.

Highway capacity analyses were conducted for the mitigated conditions and projected build traffic volumes, and are summarized in **Table 3-13**. **Figure 3-10** depicts the approach LOS by peak time. The capacity analysis for the mitigated build conditions indicated that all study area intersections and movements are expected to operate at an acceptable level of service D or better during the weekday AM and PM peak times, except for the following:

- M-24 & Brown Rd/Dutton Rd
    - Westbound approach operates at LOS E with 57.1 seconds of average vehicle delay (AM Peak)

- M-24 & the crossover south of Brown/Dutton Rd
    - Eastbound approach operates at LOS E with 58.3 seconds of average vehicle delay (AM Peak)
- M-24 & the crossover south of Silver Bell Rd
    - Eastbound crossover approach operates at LOS E with 62.1 seconds of average vehicle delay (PM Peak)
- M-24 & the crossover north of Silver Bell Rd
    - Westbound crossover approach operates at LOS E with 63.7 seconds of average vehicle delay (AM Peak).

The suggested improvements are shown in **Figure 3-11.** The full synchro reports for the Mitigated Conditions can be found in **Appendix H.**

To further improve mitigated conditions at the study intersections noted above, the study recommends additional consideration of the following:

- Provide dual right-turn only lanes on the WB Dutton Rd approach to M-24 to improve approach and overall intersection traffic operations, particularly during the AM Peak time
- Implement half-cycle lengths at signalized crossovers

As previously mentioned, the plant operates with only one shift with 1,246 employees, and the proposed expansion will operate with three shifts with 3,916 employees and 1,477 employees during the largest shift, for an additional 231 employees during that shift. Although the number of employees is significantly increasing, the implementation of two additional shifts will greatly help to minimize the impacts to traffic.

Table 3-13. Mitigated Conditions (With Site Traffic) – Synchro Analyses Results.

Intersection	Measure	AM Peak					PM Peak				
		EB	WB	NB	SB	Total	EB	WB	NB	SB	Total
Silver Bell Rd & Gate 1/Giddings Rd Driveway (Signal)	LOS	A	A	D	D	B	A	A	D	C	A
	Delay (sec)	4.3	5.7	39.5	37.4	13.7	3.1	4.6	39.0	33.4	8.5
Silver Bell Rd & Giddings Rd (One-way Stop)	LOS	A	A	-	B	A	A	A	-	B	A
	Delay (sec)	0.8	0.0	-	11.0	3.0	0.7	0.0	-	12.6	1.6
Giddings Rd & Delta Ct/Gate 2 (Two-way Stop)	LOS	A	B	A	A	A	A	C	A	A	A
	Delay (sec)	0.0	10.5	0.0	0.5	0.6	9.4	23.5	0.0	0.2	1.7
Giddings Rd & Gate 3 (Two-way Stop)	LOS	-	B	A	A	A	-	D	A	A	A
	Delay (sec)	-	11.9	0.0	2.3	1.4	-	27.9	0.0	0.3	5.9
Giddings Rd & Liberty Dr/Gate 4 (Signal)	LOS	A	D	B	A	B	B	C	A	B	B
	Delay (sec)	0.0	35.2	12.5	6.0	12.2	14.6	22.5	7.3	15.5	15.1
Giddings Rd & FedEx Driveway/Brown Rd (Signal)	LOS	D	D	B	A	B	D	C	B	B	B
	Delay (sec)	51.2	41.2	12.8	6.1	17.4	38.3	30.7	15.4	10.4	17.8
Brown Rd & Giddings Rd (One way Stop)	LOS	A	A	B	-	A	A	A	C	-	A
	Delay (sec)	0.0	3.9	13.1	-	2.9	0.0	1.6	18.3	-	4.1
Brown Rd & Roush Dr/Gate 5 (Two-way Stop)	LOS	A	A	B	B	A	A	A	D	C	A
	Delay (sec)	0.6	0.2	10.1	12.4	1.0	0.7	0.3	10.5	16.6	1.2
Brown Rd & Gate 7 (One-way Stop)	LOS	A	A	-	B	A	A	A	-	C	A
	Delay (sec)	4.2	0.0	-	14.2	2.8	0.7	0.0	-	15.3	2.4
M-24 & Brown Rd/Dutton Rd (Signal)	LOS	D	E	A	C	C	D	D	A	B	C
	Delay (sec)	50.4	57.1	5.3	26.1	26.2	53.0	46.0	9.6	16.7	26.0
M-24 & Xover S of Brown Dutton (Signal)	LOS	E	-	A	-	A	D	-	B	-	B
	Delay (sec)	58.3	-	2.7	-	6.4	53.9	-	12.1	-	15.4
M-24 & Xover N of Brown Dutton (Signal)	LOS	-	D	-	B	B	-	D	-	A	B
	Delay (sec)	-	54.9	-	11.4	17.3	-	54.7	-	6.3	13.8
M-24 & Xover S of Silver Bell Rd (Signal)	LOS	D	-	A	-	A	E	-	A	-	B
	Delay (sec)	51.2	-	1.5	-	9.4	62.1	-	3.9	-	12.8
	LOS	D	D	11.7	B	C	D	D	B	B	C

Intersection	Measure	AM Peak					PM Peak				
		EB	WB	NB	SB	Total	EB	WB	NB	SB	Total
M-24 & Silver Bell Rd (Signal)	Delay (sec)	46.7	52.2	B	11.3	25.2	51.0	43.3	10.4	15.4	25.5
M-24 &Xover N of Silver Bell Rd (Signal)	LOS	-	E	-	A	B	-	D	-	A	A
	Delay (sec)	-	63.7	-	6.7	15.5	-	54.3	-	2.4	9.4
Silver Bell Rd & Gate 8 (One-way Stop)	LOS	A	A	B	-	A	A	A	B	-	A
	Delay (sec)	0.0	1.9	11.0	-	1.2	0.0	0.3	13.6	-	1.5

Figure 3-10. Mitigated Conditions (With Site Traffic) – Intersection Approach Level of Service.

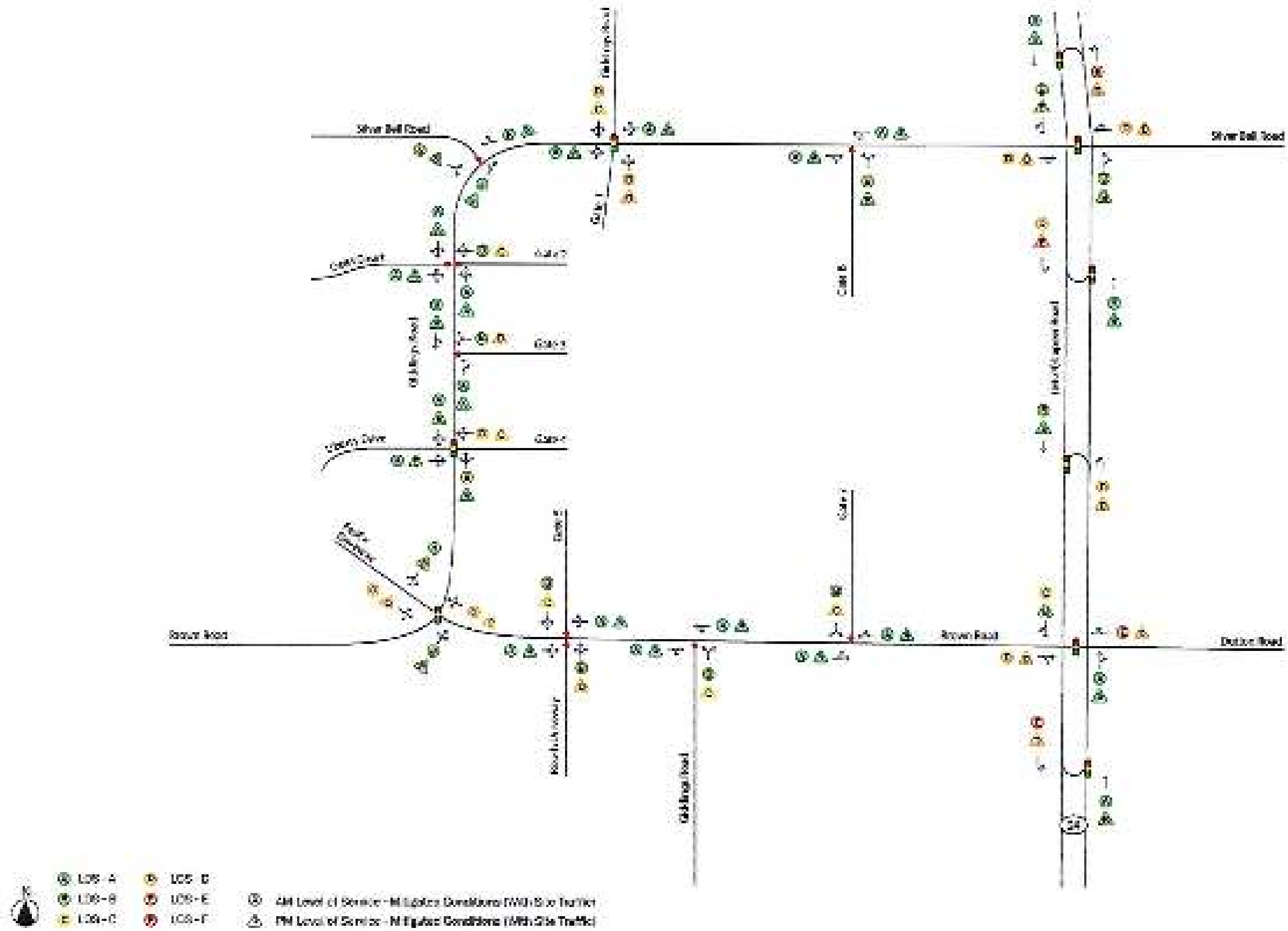
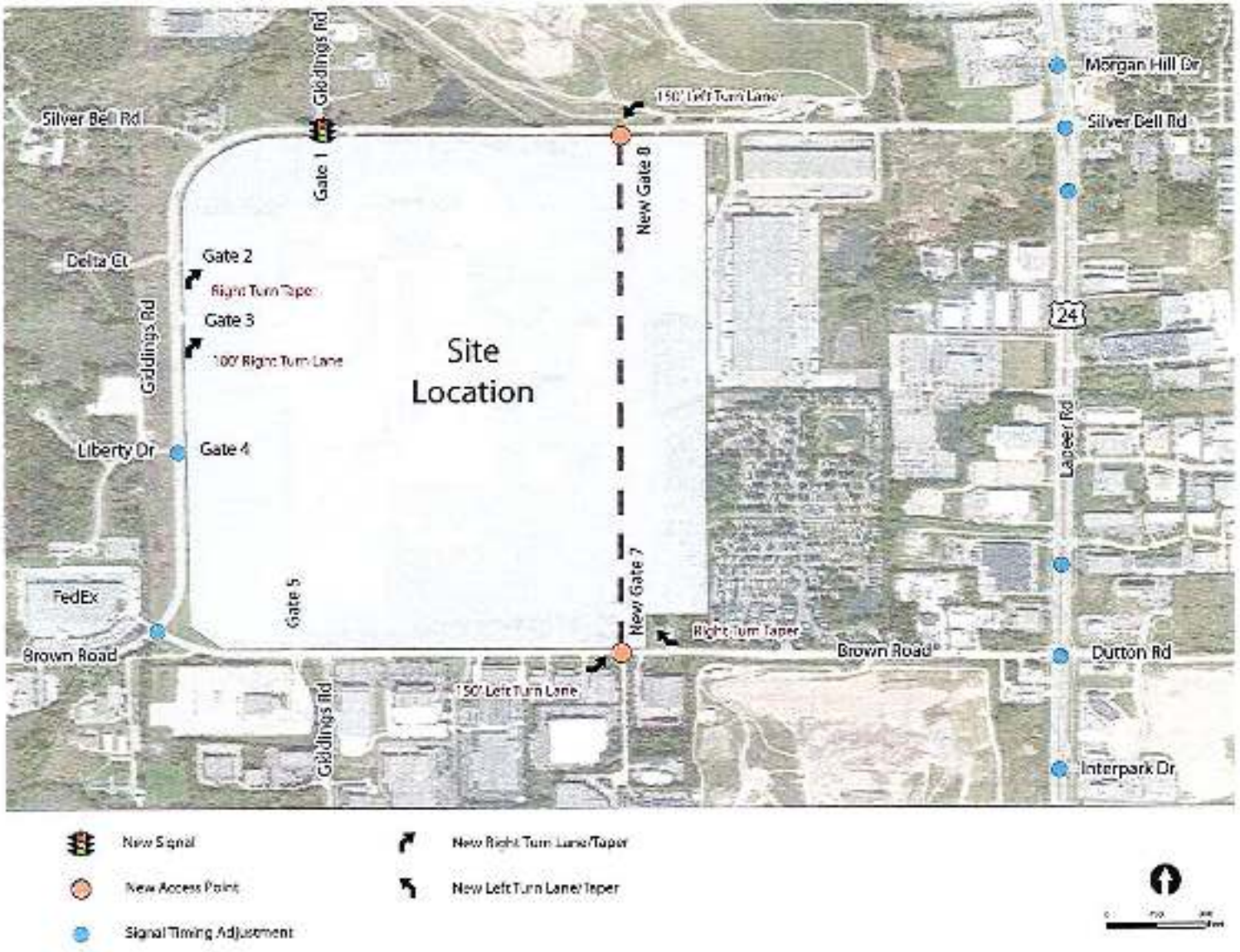


Figure 3-11. Site Layout Recommended Improvements.



3.5 Further Analysis

Due to the expansive geographic area and large number of intersections that were required by MDOT and the RCOC to be included in this study, the traffic impact study is being developed in two Phases. This report includes Phase 1 of this study and the summary of the roadways immediately adjacent to the Project Site and the recommendations for those roadways. Phase 2 analysis is currently underway, building upon the analysis done in Phase 1 and includes additional intersections to further study the impact of the GM expansion. The Phase 2 report will be reviewed by agencies and additional coordination may take place based on infrastructure recommendations for mitigating any impacts imposed by site traffic. The following intersections will be included in Phase 2 of the study:

- Brown Rd & Joslyn Rd
- Joslyn Rd to Brown Rd Connector
- Brown Rd to Joslyn Rd Connector
- I-75 @ Baldwin Rd
    - NB I-75 exit to NB Baldwin Rd (ramp A)
    - NB I-75 exit to SB Baldwin Rd (ramp H)
    - NB/SB Baldwin Rd entrance to NB I-75 (ramp D)
    - SB I-75 exit to NB/SB Baldwin Rd (ramp C)
    - NB Baldwin Rd entrance to SB I-75 (ramp B)
    - SB Baldwin Rd entrance to SB I-75 (ramp G)
- I-75 @ Joslyn Rd
    - NB I-75 exit to NB/SB Joslyn Rd (ramp A)
    - NB Joslyn Rd entrance to NB I-75 (ramp E)
    - SB Joslyn Rn entrance to NB I-75 (ramp D)
    - SB I-75 exit to NB Joslyn Rd (ramp F)
    - SB I-75 exit to SB Joslyn Rd (ramp C)
    - NB/SB Joslyn Rd entrance to SB I-75 (ramp B)
- I-75 @ M-24/Lapeer Rd
    - NB/SB I-75 exit to NB M-24/Lapeer Rd (ramp F)
    - NB/SB I-75 exit to SB M-24/Lapeer Rd (ramp C)
    - NB M-24/Lapeer Rd entrance to NB/SB I-75 (ramp B)
    - SB M-24/Lapeer Rd entrance to NB/SB I-75 (ramp D)

4.0 CONCLUSION & RECOMMENDATIONS

A GM Orion Assembly Plant industrial site expansion is proposed in Orion Township, Michigan. The proposed expanded plant is proposed to be fully built-out by 2024 and is expected to have 3,196 employees between three shifts.

Access is planned to be served via five employee driveways and two driveways for commercial vehicle traffic. The objective of this study was to determine and evaluate the impact that the

proposed industrial site would have on future motor vehicle traffic operations and safety on the nearby surrounding roadway network. Traffic capacity and safety concerns were identified as a result of the analysis and mitigation strategies were recommended to alleviate these issues. Additionally, 683 trucks per shift are anticipated to access the proposed plant.

A safety analysis was performed at each of the study intersections and did not find a discernible crash pattern at most of the intersections, except a potential issue with angle collisions at the unsignalized intersections of Silver Bell Road & Gidding Rd/Gate 1. With the new site traffic, a signal is warranted at this location and is recommended to reduce the likelihood for an angle collision.

Peak hour traffic counts at the nearby stucy intersections were collected in April 2022 and were used in the study as the basis for the analysis of existing conditions. The Synchro traffic capacity analyses determined that all study intersection approaches operate at an acceptable LOS D or better, except for the following:

- Giddings Rd & Delta Ct/Gate 2
    - Westbound approach operated at LOS F with 127.1 seconds of average vehicle delay (PM Peak)
- M-24 & Brown Rd/Dutton Rd
    - Westbound approach operates at LOS E with 77.6 seconds of average vehicle delay (AM Peak) and LOS E with 57.0 seconds of average vehicle delay (PM Peak).
    - Eastbound approach operates at LOS F with 87.7 seconds of average vehicle delay (PM Peak).
- M-24 & Crossover south of Brown Rd/Dutton Rd
    - Eastbound approach operates at a LOS F with 137.9 second of average vehicle delay (AM Peak) and LOS E with 65.2 seconds of average vehicle delay (PM Peak).
- M-24 & Crossover north of Brown Rd/Dutton Rd
    - Westbound approach operates at a LOS E with 64.0 seconds of average vehicle delay (AM Peak).
- M-24 & Silver Bell Rd
    - Westbound approach operates at LOS F with 58.7 seconds of average vehicle delay (AM Peak).
    - Eastbound approach operates at LOS E with 66.9 seconds of average vehicle delay (PM Peak).
- M-24 & Crossover south of Silver Bell Rd
    - Eastbound approach operates at LOS E with 58.1 seconds of average vehicle delay (AM Peak) and LOS E with 57.7 seconds of average vehicle delay (PM Peak).
- M-24 & Crossover north of Silver Bell Rd
    - Westbound approach operates at LOS E with 61.7 seconds of average vehicle delay (AM Peak) and LOS F with 58.7 seconds of average vehicle delay (PM Peak).

The trips generated by the proposed GM Orion Expansion industrial site were determined in accordance with the Institute of Transportation Engineers (ITE) standard practices and distributed and assigned to the study intersections and five site access driveways based on existing traffic patterns and nearby primary traffic generators based on existing population density. An industrial park with 3,196 total employees can be expected to generate up to 1,196 inbound trips on a typical weekday AM peak and 962 outbound trips on a typical weekday PM peak. Additionally, 80 trucks are expected to enter and 80 trucks are expected to exit the site during each of the AM and PM peak times.

Currently the plant operates with only **one shift with 1,246 employees**, and the proposed expansion will operate with **three shifts with 3,916 employees and 1,477 employees** during the largest shift, for an additional 231 employees during that shift. Although the number of employees is significantly increasing, the implementation of two additional shifts will greatly help to minimize the impacts to traffic. This is demonstrated as **only 273 and 82 trips are added to the roadway network during AM Peak hour and PM Peak hour respectively.**

Peak hour turn lane and signal warrant analyses were performed in accordance with MDOT and MMUTCD guidelines at the seven site accesses. A traffic signal is warranted and recommended for installation at Gate 1. It was determined that the following turn lanes were warranted:

- NB Right Turn Lane at Gate 3 (100')
- NB Right Turn taper at Gate 2
- WB Right Turn taper at Gate 7
- EB Left Turn Lane at Gate 7 (150')
- WB Left Turn Lane at Gate 8 (150')

Traffic capacity analyses were conducted for the proposed conditions using Synchro traffic microsimulation software to pinpoint specific areas of vehicle delay and queuing at the study intersections. The following approaches / intersections are expected to operate at LOS E or worse without mitigation (all of these operated at LOS E or worse during existing conditions except the one shown in red):

- M-24 & Brown Rd/Dutton Rd
    - Westbound approach operates at LOS F with 91.0 seconds of average vehicle delay (AM Peak) and LOS E with 58.5 seconds of average vehicle delay (PM Peak).
    - Eastbound approach operates at LOS F with 58.3 seconds of average vehicle delay (AM Peak) and LOS F with 108.6 seconds of average vehicle delay (PM Peak).
- M-24 & Crossover south of Brown Rd/Dutton Rd
    - Eastbound approach operates at a LOS E with 58.3 second of average vehicle delay (AM Peak) and LOS E with 56.0 seconds of average vehicle delay (PM Peak).

- M-24 & Crossover north of Brown Rd/Dutton Rd
    - Westbound approach operates at a LOS E with 69.0 seconds of average vehicle delay (AM Peak).
- M-24 & Silver Bell Rd
    - Westbound approach operates at LOS F with 58.2 seconds of average vehicle delay (AM Peak).
    - Eastbound approach operates at LOS F with 70.3 seconds of average vehicle delay (PM Peak).
- M-24 & Crossover south of Silver Bell Rd
    - Eastbound approach operates at LOS E with 58.5 seconds of average vehicle delay (AM Peak) and LOS E with 57.3 seconds of average vehicle delay (PM Peak).
- M-24 & Crossover north of Silver Bell Rd
    - Westbound approach operates at LOS E with 62.4 seconds of average vehicle delay (AM Peak) and LOS E with 58.8 seconds of average vehicle delay (PM Peak).

To mitigate vehicle delay at the intersections / approaches with LOS E or worse, the recommended turn lanes were added, and signal timing adjustments were investigated, which consisted of changes to cycle lengths and phase split times. It was found that these signal timing adjustments would improve approach and intersection operations to LOS D or better at all signalized intersections except for the following intersections.

- M-24 & Brown Rd/Dutton Rd
    - Westbound approach operates at LOS E with 57.1 seconds of average vehicle delay (AM Peak)
- M-24 & the crossover south of Brown/Dutton Rd
    - Eastbound approach operates at LOS E with 58.3 seconds of average vehicle delay (AM Peak)
- M-24 & the crossover south of Silver Bell Rd
    - Eastbound crossover approach operates at LOS E with 62.1 seconds of average vehicle delay (PM Peak)
- M-24 & the crossover north of Silver Bell Rd
    - Westbound crossover approach operates at LOS E with 63.7 seconds of average vehicle delay (AM Peak).

A summary of all recommendations as a result of the traffic safety and operations analyses conducted in this report are as follows:

- Place the intersection of Silver Bell Rd & Giddings Rd/Gate 1 under traffic signal control with a 100 second cycle length during the AM Peak and 80 second cycle length during the PM Peak

- Provide a right-turn taper at the following locations:
    - NB Giddings Rd approach to Gate 2
    - WB Brown Rd approach to Gate 7
- Construct a right-turn only lane with a minimum of 100' of storage length at the following locations:
    - NB Giddings Rd approach to Gate 3
- Construct a left-turn only lane with a minimum of 150' of storage length at the following locations:
    - EB Brown Rd approach to Gate 7
    - WB Silver Bell Rd approach to Gate 8
- Provide signal timing adjustments at the following signalized intersections:
    - Giddings Rd & FedEx Driveway/Brown Rd
    - Giddings Rd & Liberty Dr/Gate 4
    - M-24 & the crossover north of Silver Bell Rd
    - M-24 & Silver Bell Rd
    - M-24 & the crossover south of Silver Bell Rd
    - M-24 & the crossover north of Brown/Dutton Rd
    - M-24 & Brown/Dutton Rd
    - M-24 & the crossover south of Brown/Dutton Rd

Appendix A.
Existing Traffic Count Data

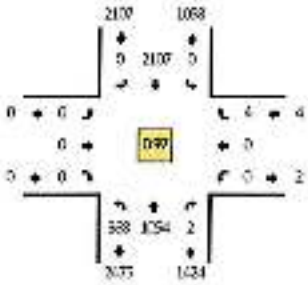
Type of peak hour being reported: Intersection Peak

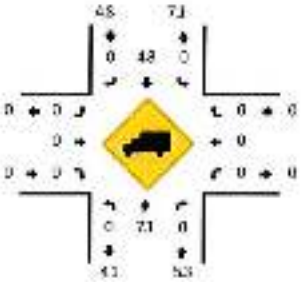
Method for determining peak hour: Total Entering Volume

LOCATION: M-24/Lapeer Rd -- Morgan Hill Dr
CITY/STATE: Oak and, MI

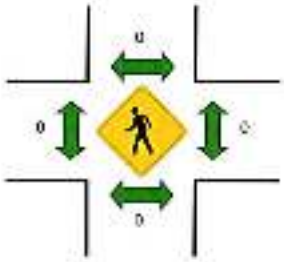
QC JOB #: 15737001
DATE: Wed, Apr 27 2022

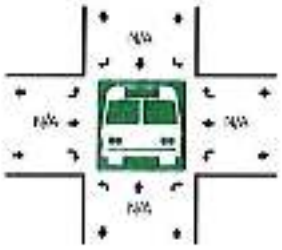
Peak-Hour: 7:30 AM -- 8:30 AM
Peak 15-Min: 8:15 AM -- 8:30 AM

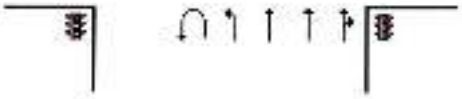


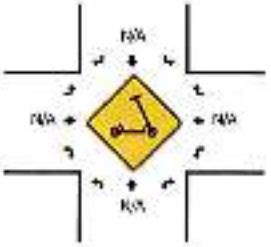


Quality Counts
DATA THAT DRIVES COMMUNITIES









15-Min Count Period Beginning At	M-24/Lapeer Rd (Northbound)				M-24/Lapeer Rd (Southbound)				Morgan Hill Dr (Eastbound)				Morgan Hill Dr (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
5:30 AM	0	36	0	45	0	387	0	0	0	0	0	0	0	0	0	0	468	
5:45 AM	0	47	0	42	0	422	0	0	0	0	0	0	0	0	0	0	511	
6:00 AM	0	73	0	41	0	347	0	0	0	0	0	0	0	0	1	0	462	
6:15 AM	0	83	0	49	0	486	0	0	0	0	0	0	0	0	0	0	617	2058
6:30 AM	0	113	0	68	0	479	0	0	0	0	0	0	0	0	0	0	660	2250
6:45 AM	0	189	0	79	0	493	0	0	0	0	0	0	0	0	2	0	763	2502
7:00 AM	0	177	0	81	0	534	0	0	0	0	0	0	0	0	1	0	793	2833
7:15 AM	0	200	0	108	0	520	0	0	0	0	0	0	0	0	4	0	832	3048
7:30 AM	0	220	1	103	0	539	0	0	0	0	0	0	0	0	0	0	863	3251
7:45 AM	0	289	1	74	0	519	0	0	0	0	0	0	0	0	2	0	884	3372
8:00 AM	0	281	0	105	0	494	0	0	0	0	0	0	0	0	0	0	880	3459
8:15 AM	0	265	0	86	0	555	0	0	0	0	0	0	0	0	2	0	908	3535

Peak 15 Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	1060	0	344	0	2220	0	0	0	0	0	0	0	0	8	0	3632
Heavy Trucks	0	92	0		0	108	0		0	0	0		0	0	0		200
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 5/12/2022 2:47 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

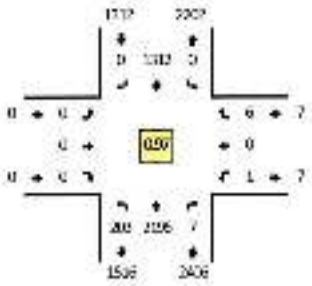
Type of peak hour being reported: Intersection Peak

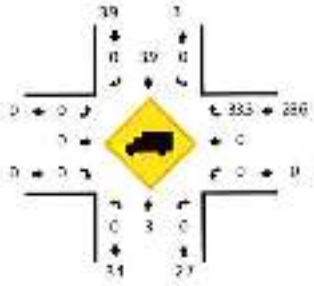
Method for determining peak hour: Total Entering Volume

LOCATION: M-24/Lapeer Rd -- Morgan Hill Dr
CITY/STATE: Oakland, MI

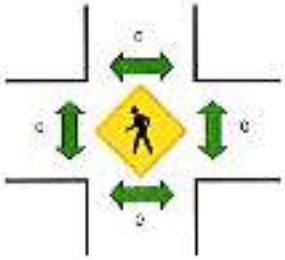
QC JOB #: 15737003
DATE: Tue, Apr 26 2022

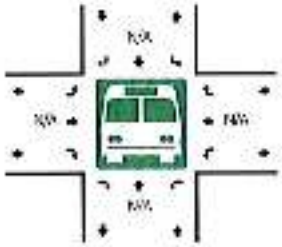
Peak-Hour: 4:15 PM -- 5:15 PM
Peak 15-Min: 4:15 PM -- 4:30 PM

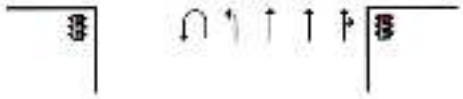


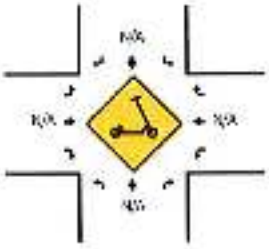


Quality Counts
DATA THAT DRIVES COMMUNITIES









15-Min Count Period Beginning At	M-24/Lapeer Rd (Northbound)				M-24/Lapeer Rd (Southbound)				Morgan Hill Dr (Eastbound)				Morgan Hill Dr (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
3:00 PM	0	431	1	47	0	362	0	0	0	0	0	0	0	0	0	0	841	
3:15 PM	0	521	0	54	0	329	0	0	0	0	0	0	0	0	1	0	905	
3:30 PM	0	575	0	62	0	312	0	0	0	0	0	0	0	0	1	0	950	
3:45 PM	0	534	0	48	0	303	0	0	0	0	0	0	0	0	1	0	886	3582
4:00 PM	0	506	0	56	0	320	0	0	0	0	0	0	0	0	1	0	883	3624
4:15 PM	0	577	2	43	0	337	0	0	0	0	0	0	1	0	2	0	962	3691
4:30 PM	0	560	2	51	0	319	0	0	0	0	0	0	0	0	1	0	933	3664
4:45 PM	0	531	2	55	0	348	0	0	0	0	0	0	0	0	2	0	938	3711
5:00 PM	0	528	1	54	0	313	0	0	0	0	0	0	0	0	1	0	897	3725
5:15 PM	0	553	0	46	0	320	0	0	0	0	0	0	0	0	0	0	919	3676
5:30 PM	0	564	1	41	0	321	0	0	0	0	0	0	0	0	1	0	928	3671
5:45 PM	0	531	0	37	0	290	0	0	0	0	0	0	0	0	1	0	859	3597

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	2308	8	172	0	1348	0	0	0	0	0	0	4	0	8	0	3848
Heavy Trucks	0	56	0		0	52	0		0	0	0		0	0	0		108
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 5/12/2022 2:47 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

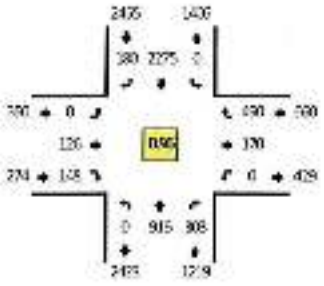
Type of peak hour being reported: Intersection Peak

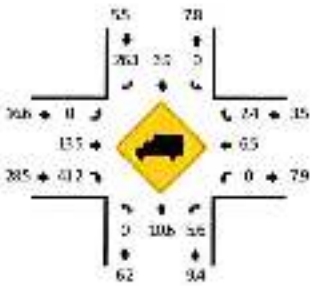
Method for determining peak hour: Total Entering Volume

LOCATION: M-24/Lapeer Rd -- Silverbell Rd
CITY/STATE: Oakland, MI

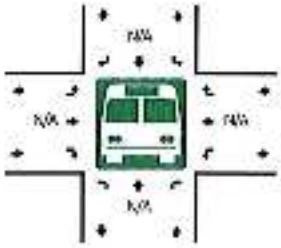
QC JOB #: 15737004
DATE: Wed, Apr 27 2022

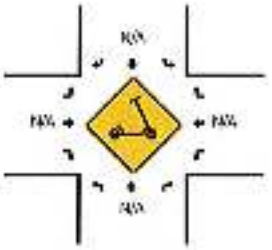
Peak-Hour: 7:30 AM -- 8:30 AM
Peak 15-Min: 8:15 AM -- 8:30 AM





Quality Counts
DATA THAT DRIVES COMMUNITIES





15-Min Count Period Beginning At	M-24/Lapeer Rd (Northbound)				M-24/Lapeer Rd (Southbound)				Silverbell Rd (Eastbound)				Silverbell Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
5:30 AM	0	54	8	0	0	369	71	0	0	0	10	0	0	22	27	0	570	
5:45 AM	0	62	10	0	0	386	68	0	0	6	14	0	0	23	27	0	596	
6:00 AM	0	76	12	0	0	372	26	0	0	6	15	0	0	8	39	0	554	
6:15 AM	0	82	21	0	0	472	31	0	0	6	21	0	0	15	51	0	699	2418
6:30 AM	0	132	26	0	0	539	29	0	0	22	16	0	0	14	50	0	828	2686
6:45 AM	0	180	34	0	0	505	41	0	0	15	42	0	0	32	88	0	937	3028
7:00 AM	0	164	47	0	0	585	22	0	0	18	33	0	0	24	113	0	1006	3480
7:15 AM	0	190	59	0	0	597	31	0	0	26	47	0	0	38	108	0	1096	3977
7:30 AM	0	208	61	0	0	595	38	0	0	29	33	0	0	26	109	0	1099	4138
7:45 AM	0	246	75	0	0	524	50	0	0	39	38	0	0	45	120	0	1135	4336
8:00 AM	0	233	68	0	0	558	52	0	0	24	37	0	0	56	149	0	1177	4507
8:15 AM	0	231	99	0	0	598	46	0	0	34	40	0	0	49	112	0	1197	4609

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	924	396	0	0	2392	160	0	0	136	160	0	0	172	448	0	4788
Heavy Trucks	0	124	16		0	96	56		0	20	72		0	16	12		412
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 5/12/2022 2:47 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-7212

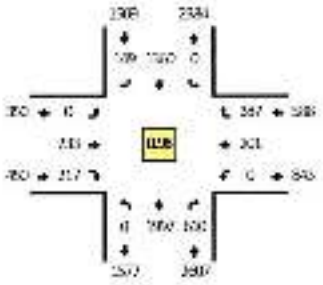
Type of peak hour being reported: Intersection Peak

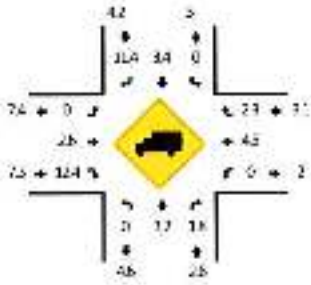
Method for determining peak hour: Total Entering Volume

LOCATION: M-24/Lapeer Rd -- Silverbell Rd
CITY/STATE: Oakland, MI

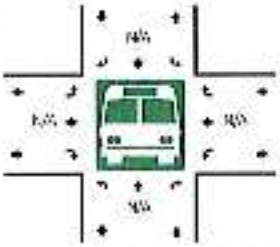
QC JOB #: 15737006
DATE: Tue, Apr 26 2022

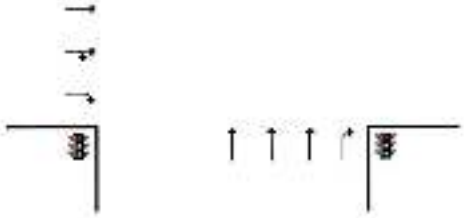
Peak Hour: 4:30 PM -- 5:30 PM
Peak 15 Min: 4:30 PM -- 4:45 PM

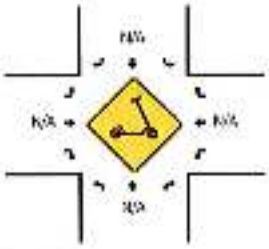




Quality Counts
DATA THAT DRIVES COMMUNITIES







15-Min Count Period Beginning At	M-24/Lapeer Rd (Northbound)				M-24/Lapeer Rd (Southbound)				Silverbell Rd (Eastbound)				Silverbell Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
3:00 PM	0	388	124	0	0	356	41	0	0	49	70	0	0	58	80	0	1146	
3:15 PM	0	473	138	0	0	349	39	0	0	47	52	0	0	51	106	0	1255	
3:30 PM	0	526	136	0	0	322	46	0	0	46	56	0	0	41	101	0	1286	
3:45 PM	0	482	133	0	0	308	40	0	0	44	44	0	0	44	94	0	1189	4876
4:00 PM	0	479	139	0	0	337	37	0	0	39	48	0	0	49	105	0	1229	4959
4:15 PM	0	535	152	0	0	347	31	0	0	45	44	0	0	54	92	0	1300	5004
4:30 PM	0	523	132	0	0	334	30	0	0	57	81	0	0	49	105	0	1310	5037
4:45 PM	0	471	149	0	0	350	38	0	0	48	44	0	0	44	102	0	1255	5103
5:00 PM	0	506	147	0	0	338	34	0	0	66	50	0	0	52	81	0	1273	5147
5:15 PM	0	496	182	0	0	329	41	0	0	63	42	0	0	56	99	0	1307	5154
5:30 PM	0	502	154	0	0	330	27	0	0	52	46	0	0	50	102	0	1263	5088
5:45 PM	0	480	130	0	0	306	22	0	0	58	33	0	0	44	86	0	1159	5001

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	2100	528	0	0	1336	144	0	0	228	324	0	0	196	420	0	5276
Heavy Trucks	0	68	16		0	64	20		0	8	40		0	12	12		240
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 5/12/2022 2:47 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

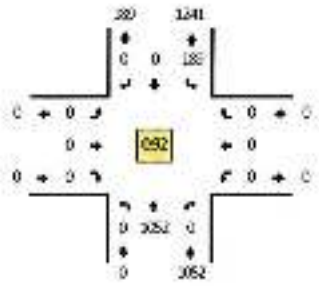
Type of peak hour being reported: Intersection Peak

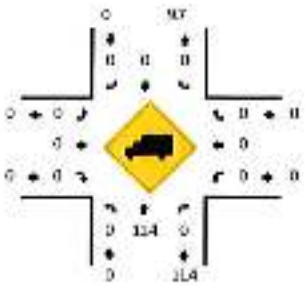
Method for determining peak hour: Total Entering Volume

LOCATION: M-24/Lapeer Rd -- Xover S of Silverbell Rd
CITY/STATE: Oakland, MI

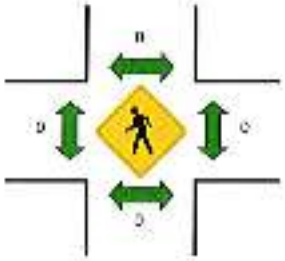
QC JOB #: 15737007
DATE: Wed, Apr 27 2022

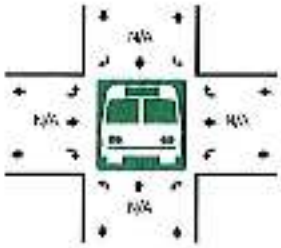
Peak-Hour: 7:30 AM -- 8:30 AM
Peak 15-Min: 8:15 AM -- 8:30 AM

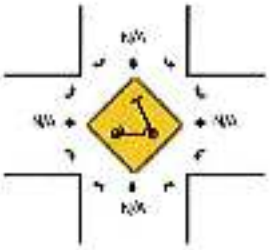




Quality Counts
DATA THAT DRIVES COMMUNITIES







15-Min Count Period Beginning At	M-24/Lapeer Rd (Northbound)				M-24/Lapeer Rd (Southbound)				Xover S of Silverbell Rd (Eastbound)				Xover S of Silverbell Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
5:30 AM	0	54	0	0	0	0	0	8	0	0	0	0	0	0	0	0	62	
5:45 AM	0	62	0	0	0	0	0	10	0	0	0	0	0	0	0	0	72	
6:00 AM	0	80	0	0	0	0	0	8	0	0	0	0	0	0	0	0	88	
6:15 AM	0	90	0	0	0	0	0	15	0	0	0	0	0	0	0	0	105	327
6:30 AM	0	136	0	0	0	0	0	20	0	0	0	0	0	0	0	0	156	421
6:45 AM	0	193	0	0	0	0	0	21	0	0	0	0	0	0	0	0	214	563
7:00 AM	0	190	0	0	0	0	0	20	0	0	0	0	0	0	0	0	210	685
7:15 AM	0	211	0	0	0	0	0	41	0	0	0	0	0	0	0	0	252	832
7:30 AM	0	242	0	0	0	0	0	30	0	0	0	0	0	0	0	0	272	948
7:45 AM	0	294	0	0	0	0	0	38	0	0	0	0	0	0	0	0	332	1066
8:00 AM	0	251	0	0	0	0	0	47	0	0	0	0	0	0	0	0	298	1154
8:15 AM	0	265	0	0	0	0	0	74	0	0	0	0	0	0	0	0	339	1241

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	1060	0	0	0	0	0	296	0	0	0	0	0	0	0	0	1356
Heavy Trucks	0	148	0		0	0	0		0	0	0		0	0	0		148
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 5/12/2022 2:47 PM

SOURCE: Quality Counts, LLC [http://www.qualitycounts.net] 1-877-580-2212

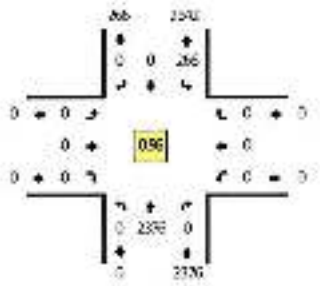
Type of peak hour being reported: Intersection Peak

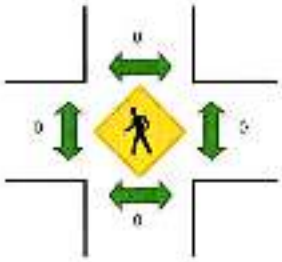
Method for determining peak hour: Total Entering Volume

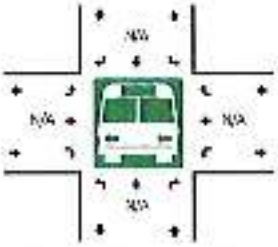
LOCATION: M-24/Lapeer Rd -- Xover S of Silverbell Rd
CITY/STATE: Oakland, MI

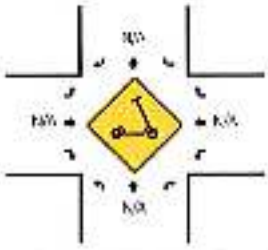
QC JOB #: 15737009
DATE: Tue, Apr 26 2022

Peak-Hour: 4:15 PM – 5:15 PM
Peak 15-Min: 4:15 PM – 4:30 PM









15 Min Count Period Beginning At	M-24/Lapeer Rd (Northbound)				M-24/Lapeer Rd (Southbound)				Xover S of Silverbell Rd (Eastbound)				Xover S of Silverbell Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
3:00 PM	0	434	0	0	0	0	0	81	0	0	0	0	0	0	0	0	515	
3:15 PM	0	536	0	0	0	0	0	83	0	0	0	0	0	0	0	0	619	
3:30 PM	0	609	0	0	0	0	0	83	0	0	0	0	0	0	0	0	692	
3:45 PM	0	553	0	0	0	0	0	76	0	0	0	0	0	0	0	0	629	2455
4:00 PM	0	549	0	0	0	0	0	73	0	0	0	0	0	0	0	0	622	2562
4:15 PM	0	618	0	0	0	0	0	69	0	0	0	0	0	0	0	0	687	2630
4:30 PM	0	595	0	0	0	0	0	69	0	0	0	0	0	0	0	0	664	2602
4:45 PM	0	556	0	0	0	0	0	71	0	0	0	0	0	0	0	0	627	2600
5:00 PM	0	607	0	0	0	0	0	57	0	0	0	0	0	0	0	0	664	2642
5:15 PM	0	610	0	0	0	0	0	71	0	0	0	0	0	0	0	0	681	2036
5:30 PM	0	584	0	0	0	0	0	76	0	0	0	0	0	0	0	0	660	2632
5:45 PM	0	594	0	0	0	0	0	69	0	0	0	0	0	0	0	0	672	2677

Peak 15 Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	2472	0	0	0	0	0	276	0	0	0	0	0	0	0	0	2748
Heavy Trucks	0	68	0		0	0	0		0	0	0		0	0	0		68
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 5/12/2022 2:47 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

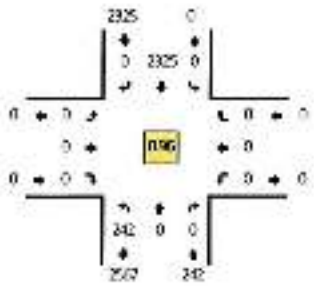
Type of peak hour being reported: Intersection Peak

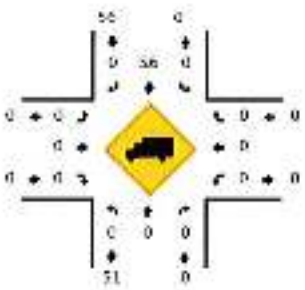
Method for determining peak hour: Total Entering Volume

LOCATION: M-24/Lapeer Rd -- Xover S of Premier Dr
CITY/STATE: Oakland, MI

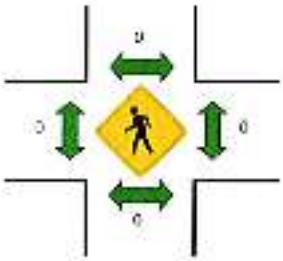
QC JOB #: 15737010
DATE: Wed, Apr 27 2022

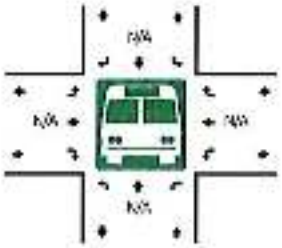
Peak-Hour: 7:00 AM -- 8:00 AM
Peak 15-Min: 7:30 AM -- 7:45 AM

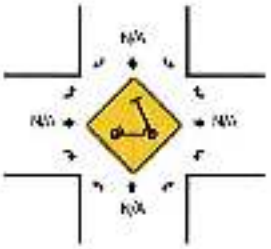




Quality Counts
DATA THAT DRIVES COMMUNITIES







15-Min Count Period Beginning At	M-24/Lapeer Rd (Northbound)				M-24/Lapeer Rd (Southbound)				Xover S of Premier Dr (Eastbound)				Xover S of Premier Dr (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
5:30 AM	0	0	0	67	0	355	0	0	0	0	0	0	0	0	0	0	422	
5:45 AM	0	0	0	59	0	382	0	0	0	0	0	0	0	0	0	0	441	
6:00 AM	0	0	0	49	0	377	0	0	0	0	0	0	0	0	0	0	426	
6:15 AM	0	0	0	35	0	487	0	0	0	0	0	0	0	0	0	0	522	1811
6:30 AM	0	0	0	51	0	482	0	0	0	0	0	0	0	0	0	0	533	1922
6:45 AM	0	0	0	26	0	501	0	0	0	0	0	0	0	0	0	0	527	2008
7:00 AM	0	0	0	44	0	588	0	0	0	0	0	0	0	0	0	0	632	2214
7:15 AM	0	0	0	57	0	591	0	0	0	0	0	0	0	0	0	0	648	2340
7:30 AM	0	0	0	61	0	608	0	0	0	0	0	0	0	0	0	0	669	2476
7:45 AM	0	0	0	80	0	538	0	0	0	0	0	0	0	0	0	0	618	2567
8:00 AM	0	0	0	59	0	529	0	0	0	0	0	0	0	0	0	0	588	2523
8:15 AM	0	0	0	48	0	559	0	0	0	0	0	0	0	0	0	0	607	2483

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	0	244	0	2432	0	0	0	0	0	0	0	0	0	0	2676
Heavy Trucks	0	0	0		0	140	0		0	0	0		0	0	0		140
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 5/17/2023 2:47 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

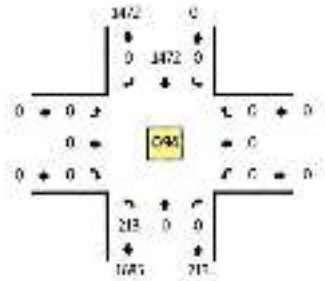
Type of peak hour being reported: Intersection Peak

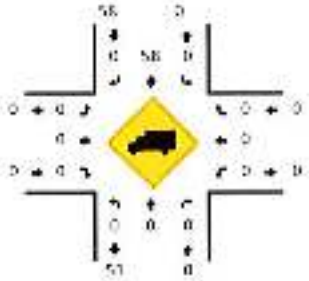
Method for determining peak hour: Total Entering Volume

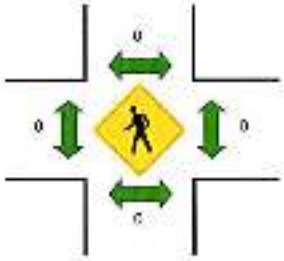
LOCATION: M-24/Lapeer Rd -- Xover S of Premier Dr
CITY/STATE: Oakland, MI

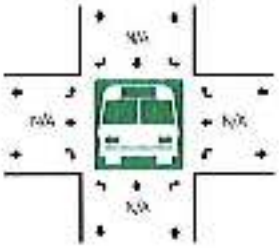
QC JOB #: 15737012
DATE: Tue, Apr 26 2022

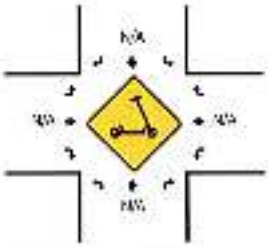
Peak-Hour: 4:15 PM – 5:15 PM
Peak 15-Min: 4:30 PM – 4:45 PM











15 Min Count Period Beginning At	M-24/Lapeer Rd (Northbound)				M-24/Lapeer Rd (Southbound)				Xover S of Premier Dr (Eastbound)				Xover S of Premier Dr (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
3:00 PM	0	0	0	57	0	367	0	0	0	0	0	0	0	0	0	0	424	
3:15 PM	0	0	0	57	0	348	0	0	0	0	0	0	0	0	0	0	405	
3:30 PM	0	0	0	73	0	361	0	0	0	0	0	0	0	0	0	0	434	
3:45 PM	0	0	0	60	0	330	0	0	0	0	0	0	0	0	0	0	390	1653
4:00 PM	0	0	0	54	0	357	0	0	0	0	0	0	0	0	0	0	409	1638
4:15 PM	0	0	0	45	0	343	0	0	0	0	0	0	0	0	0	0	388	1621
4:30 PM	0	0	0	50	0	400	0	0	0	0	0	0	0	0	0	0	450	1637
4:45 PM	0	0	0	63	0	357	0	0	0	0	0	0	0	0	0	0	420	1667
5:00 PM	0	0	0	55	0	372	0	0	0	0	0	0	0	0	0	0	427	1685
5:15 PM	0	0	0	67	0	315	0	0	0	0	0	0	0	0	0	0	382	1679
5:30 PM	0	0	0	60	0	342	0	0	0	0	0	0	0	0	0	0	402	1681
5:45 PM	0	0	0	43	0	285	0	0	0	0	0	0	0	0	0	0	328	1540

Peak 15 Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	0	200	0	1600	0	0	0	0	0	0	0	0	0	0	1800
Heavy Trucks	0	0	0		0	100	0		0	0	0		0	0	0		100
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 5/12/2022 2:47 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

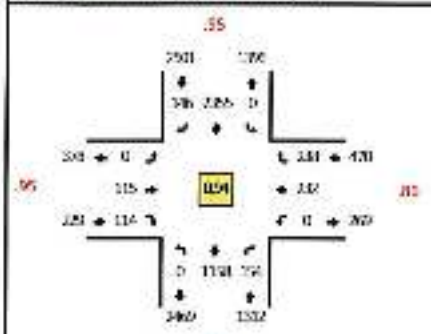
Type of peak hour being reported: Intersection Peak

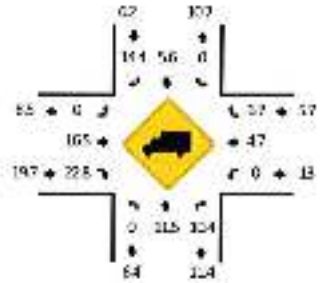
Method for determining peak hour: Total Entering Volume

LOCATION: M-24/Lapeer Rd -- Dutton Rd
CITY/STATE: Auburn Hills, MI

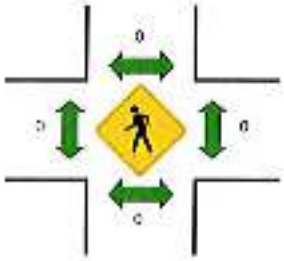
QC JOB #: 15737013
DATE: Wed, Apr 27 2022

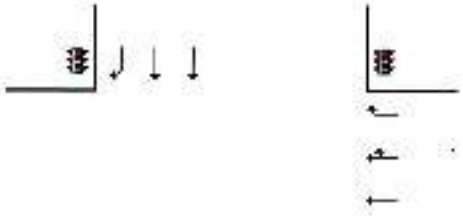
Peak-Hour: 7:15 AM -- 8:15 AM
Peak 15-Min: 7:45 AM -- 8:00 AM

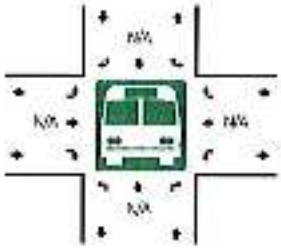


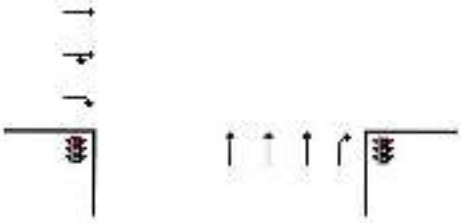


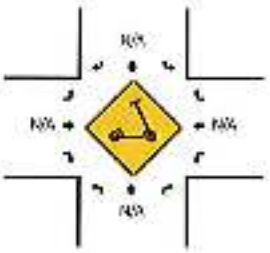
Quality Counts
DATA THAT DRIVES COMMUNITIES











15 Min Count Period Beginning At	M-24/Lapeer Rd (Northbound)				M-24/Lapeer Rd (Southbound)				Dutton Rd (Eastbound)				Dutton Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
5:30 AM	0	135	7	0	0	350	60	0	0	4	11	0	1	46	14	0	628	
5:45 AM	0	150	22	0	0	368	70	0	0	4	11	0	0	32	14	0	671	
6:00 AM	0	134	19	0	0	381	29	0	0	6	17	0	0	22	18	0	629	
6:15 AM	0	151	21	0	0	479	21	0	0	14	14	0	0	19	15	0	733	2660
6:30 AM	0	202	26	0	0	514	33	0	0	13	19	0	0	34	24	0	866	2891
6:45 AM	0	285	32	0	0	499	22	0	0	7	23	0	0	44	31	0	943	3168
7:00 AM	0	253	28	0	0	589	36	0	0	14	24	0	0	50	36	0	1025	3559
7:15 AM	0	270	34	0	0	635	25	0	0	19	29	0	0	56	67	0	1135	3962
7:30 AM	0	263	40	0	0	626	36	0	0	27	35	0	0	44	58	0	1129	4232
7:45 AM	0	350	52	0	0	556	48	0	0	35	24	0	0	80	56	0	1201	4490
8:00 AM	0	275	29	0	0	538	37	0	0	34	26	0	0	52	57	0	1047	4512
8:15 AM	0	332	44	0	0	578	32	0	0	23	15	0	0	59	41	0	1127	4534

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	1400	208	0	0	2224	192	0	0	140	96	0	0	320	224	0	4804
Heavy Trucks	0	172	32		0	132	36		0	20	28		0	20	12		452
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 5/12/2022 2:47 PM

SOURCE: Quality Counts, LLC [http://www.qualitycounts.net] 1-877-580-2212

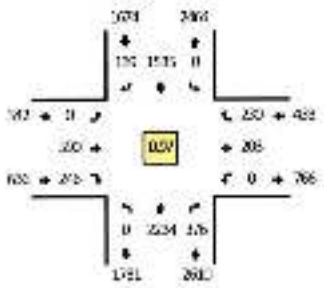
Type of peak hour being reported: Intersection Peak

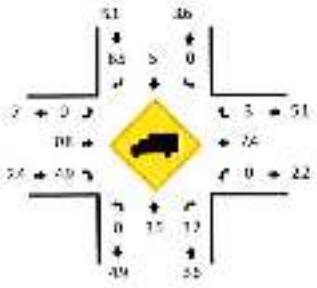
Method for determining peak hour: Total Entering Volume

LOCATION: M-24/Lapeer Rd -- Dutton Rd
CITY/STATE: Auburn Hills, MI

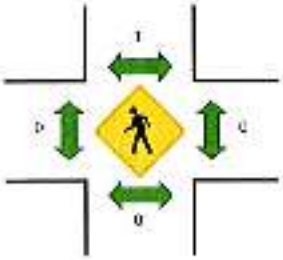
QC JOB #: 15737015
DATE: Tue, Apr 26 2022

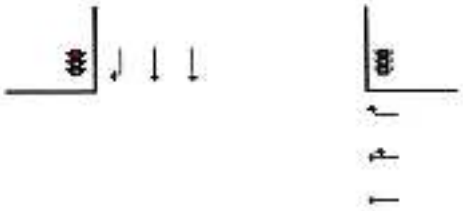
Peak-Hour: 4:15 PM -- 5:15 PM
Peak 15-Min: 4:30 PM -- 4:45 PM

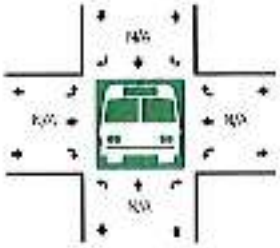


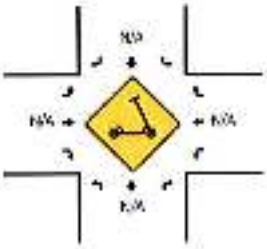


Quality Counts
DATA THAT DRIVES COMMUNITIES









15-Min Count Period Beginning At	M-24/Lapeer Rd (Northbound)				M-24/Lapeer Rd (Southbound)				Dutton Rd (Eastbound)				Dutton Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
3:00 PM	0	435	71	0	0	390	37	0	0	87	63	0	0	60	55	0	1218	
3:15 PM	0	515	67	0	0	371	35	0	0	81	47	0	0	53	56	0	1225	
3:30 PM	0	505	67	0	0	409	36	0	0	57	68	0	0	50	67	0	1319	
3:45 PM	0	530	75	0	0	338	33	0	0	70	51	0	0	37	62	0	1217	4979
4:00 PM	0	500	57	0	0	376	33	0	0	69	65	0	0	53	60	0	1233	4994
4:15 PM	0	601	93	0	0	346	34	0	0	94	52	0	0	48	52	0	1320	5089
4:30 PM	0	557	85	0	0	402	41	0	0	108	93	0	0	51	52	0	1378	5148
4:45 PM	0	544	106	0	0	387	34	0	0	86	47	0	0	54	57	0	1313	5244
5:00 PM	0	552	92	0	0	391	30	0	0	104	54	0	0	50	69	0	1342	5353
5:15 PM	0	579	99	0	0	348	38	0	0	92	40	0	0	55	62	0	1303	5336
5:30 PM	0	579	89	0	0	367	33	0	0	85	45	0	0	41	58	0	1297	5265
5:45 PM	0	556	51	0	0	318	29	0	0	62	43	0	0	28	41	0	1119	5061

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	2148	340	0	0	1644	164	0	0	432	372	0	0	264	208	0	5512
Heavy Trucks	0	96	8		0	92	8		0	12	12		0	12	8		248
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 5/12/2022 2:47 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-7212

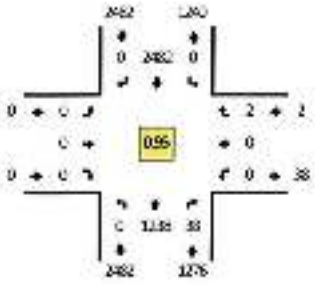
Type of peak hour being reported: Intersection Peak

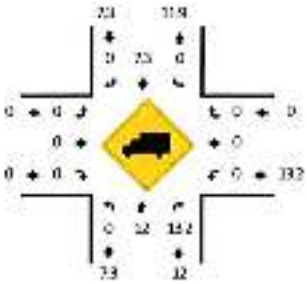
Method for determining peak hour: Total Entering Volume

LOCATION: M-24/Lapeer Rd -- Interpark Dr
CITY/STATE: Auburn Hills, MI

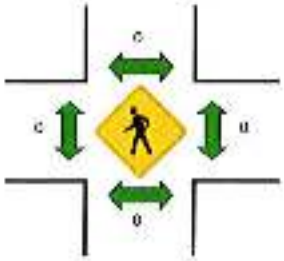
QC JOB #: 15737016
DATE: Wed, Apr 27 2022

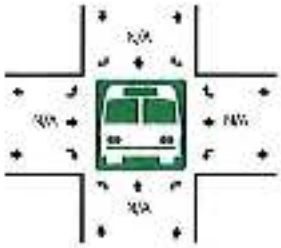
Peak-Hour: 7:00 AM -- 8:00 AM
Peak 15-Min: 7:45 AM -- 8:00 AM

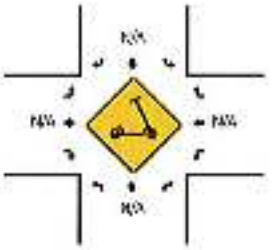




Quality Counts
DATA THAT DRIVES COMMUNITIES







15-Min Count Period Beginning At	M-24/Lapeer Rd (Northbound)				M-24/Lapeer Rd (Southbound)				Interpark Dr (Eastbound)				Interpark Dr (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
5:30 AM	0	138	4	0	0	339	0	0	0	0	0	0	0	0	0	0	481	
5:45 AM	0	167	4	0	0	373	0	0	0	0	0	0	0	0	0	0	544	
6:00 AM	0	141	1	0	0	389	0	0	0	0	0	0	0	0	0	0	531	
6:15 AM	0	166	2	0	0	473	0	0	0	0	0	0	0	0	0	0	641	2197
6:30 AM	0	216	4	0	0	517	0	0	0	0	0	0	0	0	1	0	738	2454
6:45 AM	0	309	8	0	0	518	0	0	0	0	0	0	0	0	0	0	835	2745
7:00 AM	0	263	6	0	0	607	0	0	0	0	0	0	0	0	1	0	877	3091
7:15 AM	0	289	5	0	0	632	0	0	0	0	0	0	0	0	0	0	926	3376
7:30 AM	0	298	12	0	0	661	0	0	0	0	0	0	0	0	0	0	971	3609
7:45 AM	0	388	18	0	0	582	0	0	0	0	0	0	0	0	1	0	988	3760
8:00 AM	0	283	10	0	0	556	0	0	0	0	0	0	0	0	1	0	852	3705
8:15 AM	0	354	12	0	0	575	0	0	0	0	0	0	0	0	1	0	942	3761

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	1552	60	0	0	2328	0	0	0	0	0	0	0	0	0	0	3944
Heavy Trucks & Buses	0	192	4		0	176	0		0	0	0		0	0	0		372
Pedestrians		0				0				0				0			0
Bicycles on Roadway	0	0	0		0	0	0		0	0	0		0	0	0		0

Comments:

Report generated on 5/12/2022 2:47 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

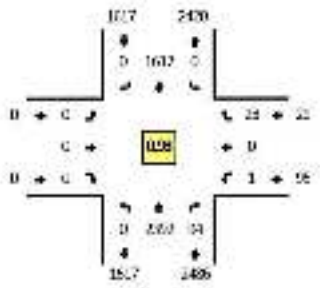
Type of peak hour being reported: Intersection Peak

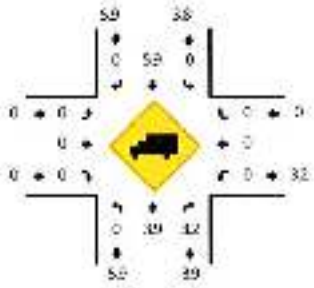
Method for determining peak hour: Total Entering Volume

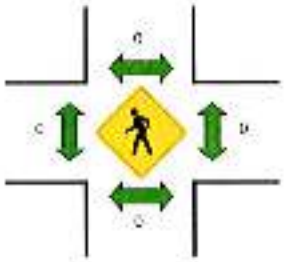
LOCATION: M-24/Lapeer Rd -- Interpark Dr
CITY/STATE: Auburn Hills, MI

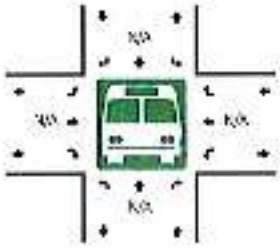
QC JOB #: 15737018
DATE: Tue, Apr 26 2022

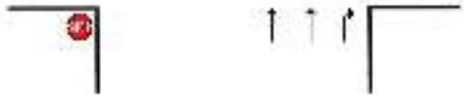
Peak Hour: 4:15 PM -- 5:15 PM
Peak 15-Min: 4:30 PM -- 4:45 PM

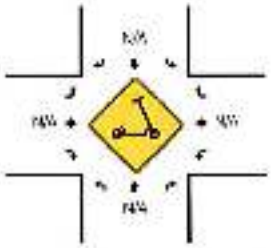












15-Min Count Period Beginning At	M-24/Lapeer Rd (Northbound)				M-24/Lapeer Rd (Southbound)				Interpark Dr (Eastbound)				Interpark Dr (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
3:00 PM	0	482	21	0	0	401	0	0	0	0	0	0	0	0	5	0	909	
3:15 PM	0	583	26	0	0	382	0	0	0	0	0	0	0	0	11	0	952	
3:30 PM	0	574	22	0	0	434	0	0	0	0	0	0	0	0	8	0	1038	
3:45 PM	0	565	20	0	0	374	0	0	0	0	0	0	0	0	3	0	962	3861
4:00 PM	0	532	21	0	0	418	0	0	0	0	0	0	0	0	2	0	973	3935
4:15 PM	0	642	22	0	0	356	0	0	0	0	0	0	0	0	10	0	1030	4003
4:30 PM	0	592	23	0	0	403	0	0	0	0	0	0	0	0	5	0	1023	4028
4:45 PM	0	599	24	0	0	398	0	0	0	0	0	0	0	0	6	0	1027	4083
5:00 PM	0	589	25	0	0	400	0	0	0	0	0	0	0	0	7	1	1022	4132
5:15 PM	0	622	32	0	0	357	0	0	0	0	0	0	0	0	9	0	1020	4122
5:30 PM	0	611	21	0	0	368	0	0	0	0	0	0	0	0	9	0	1009	4078
5:45 PM	0	576	16	0	0	313	0	0	0	0	0	0	0	0	4	0	909	3960

Peak 15-Min Hourrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	2248	92	0	0	1852	0	0	0	0	0	0	0	0	29	0	4212
Heavy Trucks	0	104	4		0	120	0		0	0	0		0	0	0		228
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 5/12/2022 2:47 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

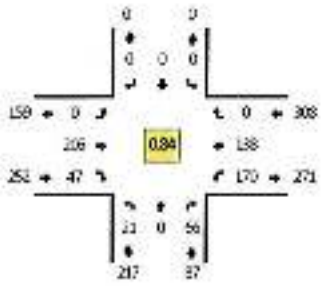
Type of peak hour being reported: Intersection Peak

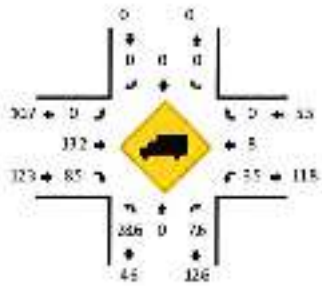
Method for determining peak hour: Total Entering Volume

LOCATION: Giddings Rd -- Brown Rd
CITY/STATE: Auburn Hills, MI

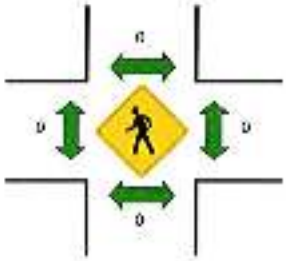
QC JOB #: 15737019
DATE: Wed, Apr 27 2022

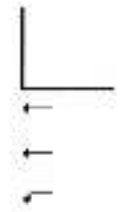
Peak-Hour: 7:15 AM -- 8:15 AM
Peak 15-Min: 7:45 AM -- 8:00 AM

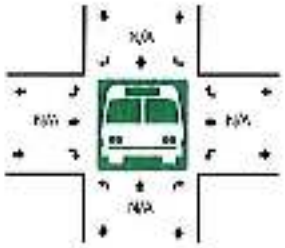


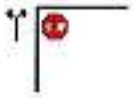


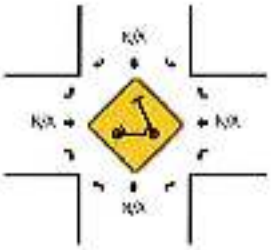
Quality Counts
DATA THAT DRIVES COMMUNITIES











15-Min Count Period Beginning At	Giddings Rd (Northbound)				Giddings Rd (Southbound)				Brown Rd (Eastbound)				Brown Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
5:30 AM	15	0	21	0	0	0	0	0	0	34	7	0	14	55	0	0	150	
5:45 AM	20	0	27	0	0	0	0	0	0	44	4	0	25	51	0	0	171	
6:00 AM	5	0	9	0	0	0	0	0	0	27	6	0	25	15	0	0	87	
6:15 AM	0	0	9	0	0	0	0	0	0	26	4	0	14	18	0	0	71	479
6:30 AM	3	0	8	0	0	0	0	0	0	30	9	0	30	26	0	0	106	485
6:45 AM	5	0	10	0	0	0	0	0	0	43	10	0	29	22	0	0	119	383
7:00 AM	1	0	15	0	0	0	0	0	0	45	4	0	45	32	0	0	142	438
7:15 AM	3	0	18	0	0	0	0	0	0	49	13	0	51	25	0	0	159	526
7:30 AM	5	0	13	0	0	0	0	0	0	61	6	0	29	35	0	0	139	559
7:45 AM	5	0	14	0	0	0	0	0	0	69	15	0	52	48	0	0	193	633
8:00 AM	8	0	21	0	0	0	0	0	0	46	13	0	38	30	0	0	156	607
8:15 AM	1	0	11	0	0	0	0	0	0	43	8	0	46	33	0	0	142	630

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	20	0	56	0	0	0	0	0	0	236	60	0	208	192	0	0	772
Heavy Trucks & Buses	8	0	8		0	0	0		0	36	12		4	16	0		84
Pedestrians		0				0				0				0			0
Bicycles on Roadway	0	0	0		0	0	0		0	0	0		0	0	0		0

Comments:

Report generated on 5/12/2022 2:47 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

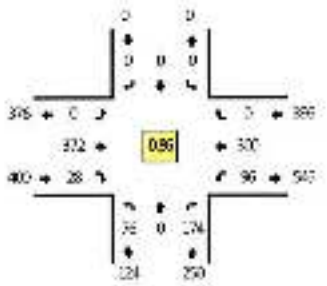
Type of peak hour being reported: Intersection Peak

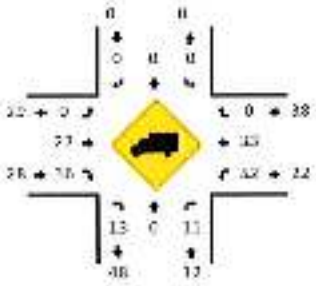
Method for determining peak hour: Total Entering Volume

LOCATION: Giddings Rd -- Brown Rd
CITY/STATE: Auburn Hills, MI

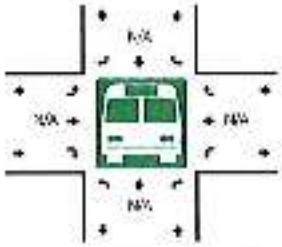
QC JOB #: 15737021
DATE: Tue, Apr 26 2022

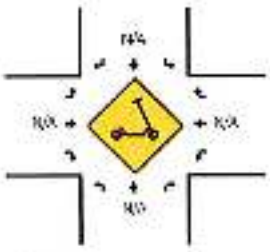
Peak-Hour: 4:15 PM -- 5:15 PM
Peak 15-Min: 4:30 PM -- 4:45 PM





Quality Counts
DATA THAT DRIVES COMMUNITIES





15-Min Count Period Beginning At	Giddings Rd (Northbound)				Giddings Rd (Southbound)				Brown Rd (Eastbound)				Brown Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
3:00 PM	17	0	39	0	0	0	0	0	0	95	8	0	28	74	0	0	256	
3:15 PM	13	0	38	0	0	0	0	0	0	76	5	0	18	79	0	1	213	
3:30 PM	10	0	38	0	0	0	0	0	0	92	4	0	26	77	0	0	247	
3:45 PM	11	0	21	0	0	0	0	0	0	70	5	0	16	54	0	0	177	901
4:00 PM	18	0	42	0	0	0	0	0	0	102	12	0	16	75	0	0	265	908
4:15 PM	19	0	36	0	0	0	0	0	0	91	10	0	14	67	0	0	237	920
4:30 PM	21	0	52	0	0	0	0	0	0	97	9	0	39	90	0	0	308	983
4:45 PM	21	0	30	0	0	0	0	0	0	88	6	0	19	67	0	0	231	1037
5:00 PM	15	0	56	0	0	0	0	0	0	96	7	0	24	76	0	0	274	1046
5:15 PM	13	0	40	0	0	0	0	0	0	78	5	0	14	76	0	0	226	1037
5:30 PM	16	0	40	0	0	0	0	0	0	80	5	0	13	60	0	0	214	947
5:45 PM	9	0	27	0	0	0	0	0	0	78	3	0	5	42	0	0	164	880

Peak 15 Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	84	0	208	0	0	0	0	0	0	388	20	0	156	360	0	0	1216
Heavy Trucks	0	0	4		0	0	0		0	20	0		0	24	0		48
Buses																	
Pedestrians		0				0				0				0			0
Bicycles Scooters	0	0	0		0	0	0		0	0	0		0	0	0		0

Comments:

Report generated on 5/12/2022 2:47 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

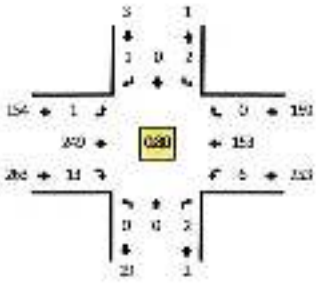
Type of peak hour being reported: Intersection Peak

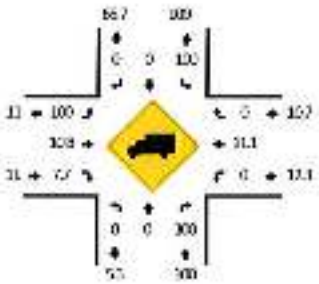
Method for determining peak hour: Total Entering Volume

LOCATION: Roush Dwy -- Brown Rd
CITY/STATE: Auburn Hills, MI

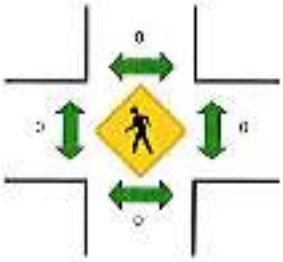
QC JOB #: 15737022
DATE: Wed, Apr 27 2022

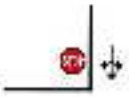
Peak Hour: 7:15 AM -- 8:15 AM
Peak 15-Min: 7:45 AM -- 8:00 AM

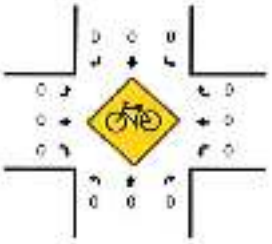


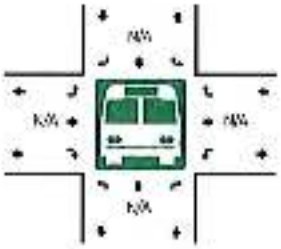


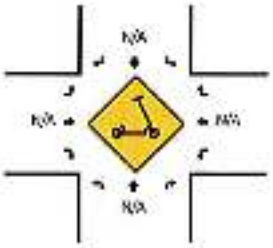
Quality Counts
DATA THAT DRIVES COMMUNITIES











15 Min Count Period Beginning At	Roush Dwy (Northbound)				Roush Dwy (Southbound)				Brown Rd (Eastbound)				Brown Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
5:30 AM	9	0	9	0	1	0	0	0	0	51	0	0	3	60	1	0	124	
5:45 AM	12	0	1	0	1	0	0	0	0	46	0	0	1	69	1	0	131	
6:00 AM	5	0	0	0	0	0	0	0	0	33	0	0	2	18	0	0	58	
6:15 AM	1	0	2	0	0	0	0	0	4	28	0	0	1	17	0	0	53	366
6:30 AM	1	0	3	0	0	0	1	0	0	36	0	0	2	26	1	0	70	312
6:45 AM	0	0	0	0	0	0	0	0	0	53	1	0	0	27	0	0	81	262
7:00 AM	0	0	1	0	0	0	0	0	0	48	0	0	2	31	0	0	82	286
7:15 AM	0	0	2	0	0	0	0	0	0	60	1	0	1	27	0	0	91	324
7:30 AM	0	0	0	0	0	0	0	0	0	57	4	0	0	40	0	0	101	355
7:45 AM	0	0	0	0	2	0	0	0	0	72	7	0	2	51	0	0	134	408
8:00 AM	0	0	0	0	0	0	1	0	1	60	1	0	3	35	0	0	101	427
8:15 AM	0	0	0	0	0	0	0	0	1	50	1	0	2	32	0	0	86	422

Peak 15 Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	0	0	8	0	0	0	0	288	28	0	8	204	0	0	536
Heavy Trucks	0	0	0		8	0	0		0	40	0		0	24	0		72
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 5/12/2022 2:47 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

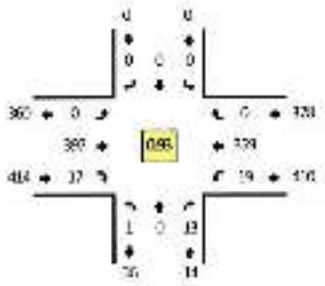
Type of peak hour being reported: Intersection Peak

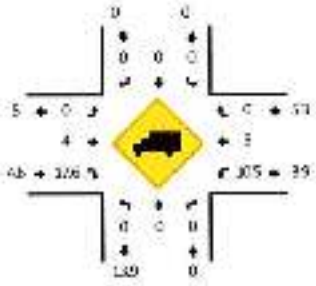
Method for determining peak hour: Total Entering Volume

LOCATION: Roush Dwy -- Brown Rd
CITY/STATE: Auburn Hills, MI

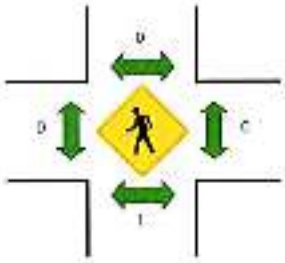
QC JOB #: 15737024
DATE: Tue, Apr 26 2022

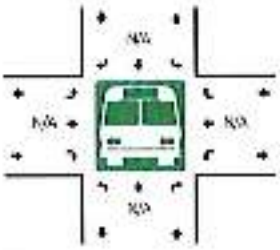
Peak Hour: 4:00 PM - 5:00 PM
Peak 15 Min: 4:30 PM - 4:45 PM

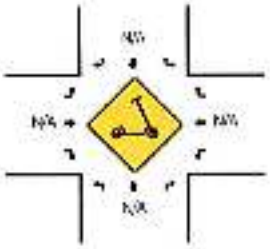




Quality Counts
DATA THAT DRIVES COMMUNITIES







15-Min Count Period Beginning At	Roush Dwy (Northbound)				Roush Dwy (Southbound)				Brown Rd (Eastbound)				Brown Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
3:00 PM	0	0	1	0	2	0	1	0	0	101	0	0	1	90	0	0	195	
3:15 PM	0	0	1	0	0	0	0	0	1	79	1	0	1	86	1	0	172	
3:30 PM	1	0	3	0	0	0	0	0	0	93	1	0	0	88	0	0	186	
3:45 PM	1	0	4	0	1	0	3	0	0	71	4	0	3	62	0	0	149	703
4:00 PM	0	0	4	0	0	0	0	0	0	106	2	0	7	86	0	0	205	715
4:15 PM	0	0	4	0	0	0	0	0	0	97	8	0	9	76	0	0	194	737
4:30 PM	0	0	1	0	0	0	0	0	0	100	3	0	3	112	0	0	216	767
4:45 PM	1	0	4	0	0	0	0	0	0	91	4	0	3	85	0	0	188	806
5:00 PM	12	0	8	0	1	0	0	0	0	94	2	0	0	90	0	0	207	805
5:15 PM	10	0	7	0	0	0	0	0	0	76	2	0	0	92	0	0	189	800
5:30 PM	7	0	5	0	0	0	0	0	0	83	1	0	1	72	0	0	169	753
5:45 PM	4	0	2	0	0	0	0	0	0	78	0	0	0	51	0	0	135	700

Peak 15 Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	4	0	0	0	0	0	0	400	12	0	0	448	0	0	864
Heavy Trucks	0	0	0		0	0	0		0	20	0		0	24	0		44
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 5/12/2022 2:47 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

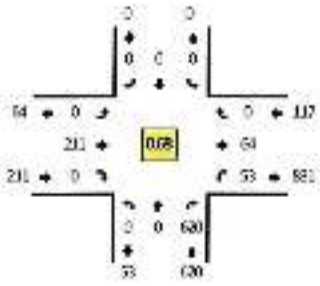
Type of peak hour being reported: Intersection Peak

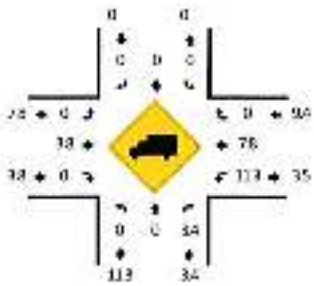
Method for determining peak hour: Total Entering Volume

LOCATION: Joslyn Rd Connector -- Brown Rd
CITY/STATE: Auburn Hills, MI

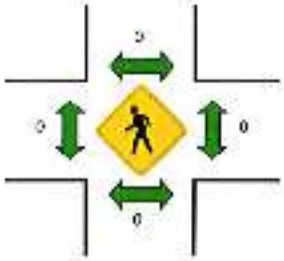
QC JOB #: 15737025
DATE: Thu, Apr 28 2022

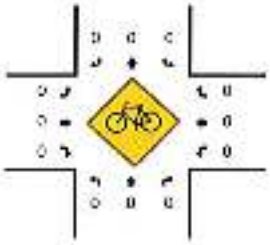
Peak-Hour: 5:30 AM -- 6:30 AM
Peak 15-Min: 5:30 AM -- 5:45 AM

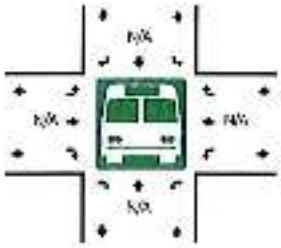


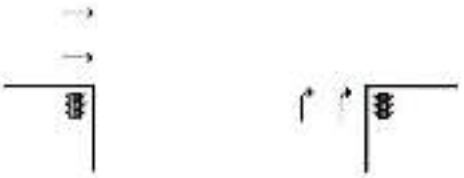


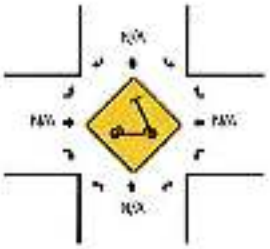
Quality Counts
DATA THAT DRIVES COMMUNITIES











15-Min Count Period Beginning At	Joslyn Rd Connector (Northbound)				Joslyn Rd Connector (Southbound)				Brown Rd (Eastbound)				Brown Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
5:30 AM	0	0	241	0	0	0	0	0	0	85	0	0	8	12	0	0	346	
5:45 AM	0	0	245	0	0	0	0	0	0	75	0	0	11	13	0	0	344	
6:00 AM	0	0	80	0	0	0	0	0	0	26	0	0	23	19	0	0	148	
6:15 AM	0	0	54	0	0	0	0	0	0	25	0	0	11	20	0	0	110	948
6:30 AM	0	0	64	0	0	0	0	0	0	35	0	0	17	10	0	0	126	737
6:45 AM	0	0	101	0	0	0	0	0	0	49	0	0	14	29	0	0	193	586
7:00 AM	0	0	90	0	0	0	0	0	0	79	0	0	23	35	0	0	227	665
7:15 AM	0	0	63	0	0	0	0	0	0	55	0	0	19	37	0	0	174	720
7:30 AM	0	0	88	0	0	0	0	0	0	60	0	0	19	41	0	0	208	814
7:45 AM	0	0	122	0	0	0	0	0	0	94	0	0	23	37	0	0	276	887
8:00 AM	0	0	79	0	0	0	0	0	0	54	0	0	44	42	0	0	219	888
8:15 AM	0	0	61	0	0	0	0	0	0	62	0	0	31	45	0	0	199	912

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	964	0	0	0	0	0	0	340	0	0	32	48	0	0	1384
Heavy Trucks & Buses	0	0	16		0	0	0		0	0	0		4	0	0		20
Pedestrians		0				0				0				0			0
Bicycles & Scooters	0	0	0		0	0	0		0	0	0		0	0	0		0

Comments:

Report generated on 5/12/2022 2:47 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

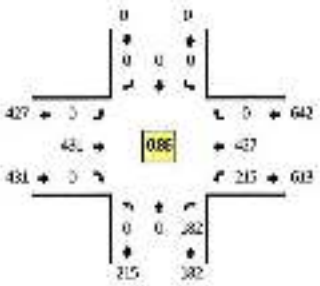
Type of peak hour being reported: Intersection Peak

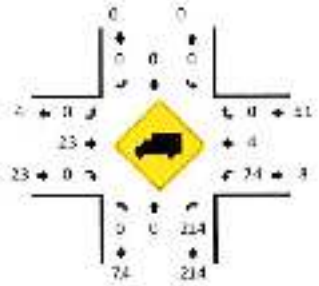
Method for determining peak hour: Total Entering Volume

LOCATION: Joslyn Rd Connector -- Brown Rd
CITY/STATE: Auburn Hills, MI

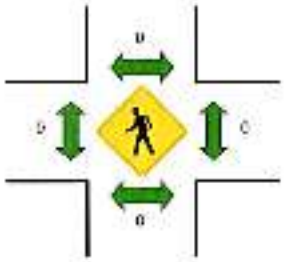
QC JOB #: 15737027
DATE: Wed, Apr 27 2022

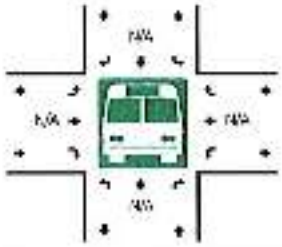
Peak-Hour: 3:45 PM -- 4:45 PM
Peak 15-Min: 4:30 PM -- 4:45 PM

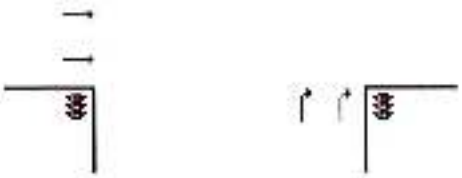


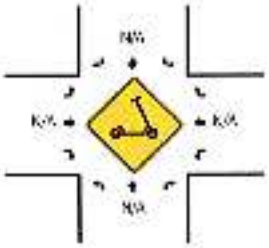


Quality Counts
DATA THAT DRIVES COMMUNITIES









15-Min Count Period Beginning At	Joslyn Rd Connector (Northbound)				Joslyn Rd Connector (Southbound)				Brown Rd (Eastbound)				Brown Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
3:00 PM	0	0	36	0	0	0	0	0	0	116	0	0	74	113	0	0	339	
3:15 PM	0	0	40	0	0	0	0	0	0	103	0	0	55	104	0	0	302	
3:30 PM	0	0	46	0	0	0	0	0	0	97	0	0	51	110	0	0	304	
3:45 PM	0	0	41	0	0	0	0	0	0	110	0	0	39	103	0	0	293	1252
4:00 PM	0	0	46	0	0	0	0	0	0	108	0	0	54	97	0	0	305	1198
4:15 PM	0	0	46	0	0	0	0	0	0	94	0	0	46	105	0	0	291	1187
4:30 PM	0	0	49	0	0	0	0	0	0	119	0	0	76	122	0	0	366	1255
4:45 PM	0	0	41	0	0	0	0	0	0	77	0	0	62	92	0	0	272	1234
5:00 PM	0	0	40	0	0	0	0	0	0	93	0	0	44	131	0	0	308	1217
5:15 PM	0	0	41	0	0	0	0	0	0	89	0	0	49	119	0	0	298	1224
5:30 PM	0	0	34	0	0	0	0	0	0	106	0	0	43	96	0	0	279	1187
5:45 PM	0	0	46	0	0	0	0	0	0	109	0	0	28	103	0	0	286	1171

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	196	0	0	0	0	0	0	476	0	0	304	488	0	0	1464
Heavy Trucks	0	0	52		0	0	0		0	8	0		16	20	0		96
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 5/12/2022 2:47 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

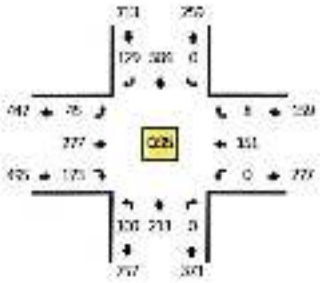
Type of peak hour being reported: Intersection Peak

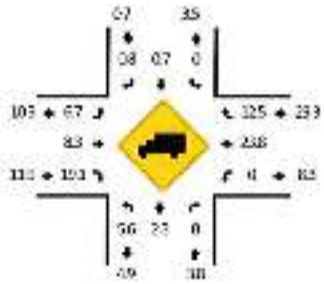
Method for determining peak hour: Total Entering Volume

LOCATION: Joslyn Rd -- Brown Rd
CITY/STATE: Oakland, MI

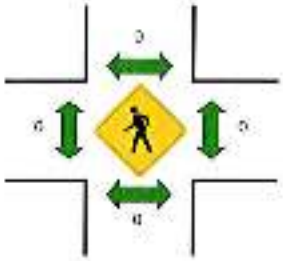
QC JOB #: 15737028
DATE: Thu, Apr 28 2022

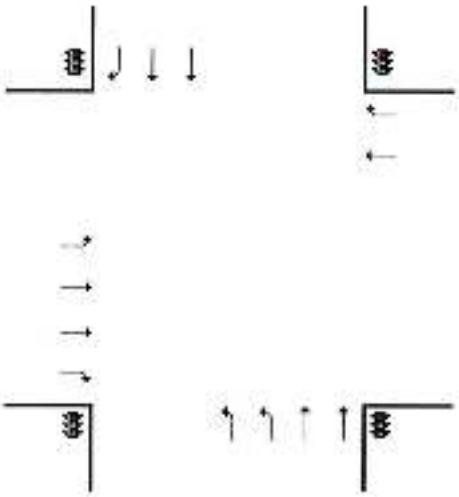
Peak Hour: 7:15 AM -- 8:15 AM
Peak 15-Min: 7:45 AM -- 8:00 AM

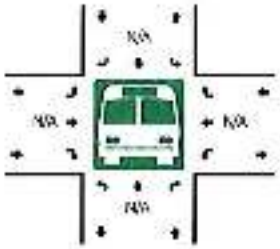


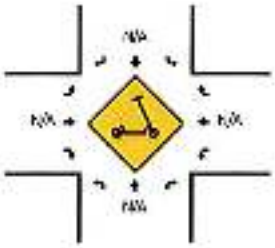


Quality Counts
DATA THAT DRIVES COMMUNITIES









15-Min Count Period Beginning At	Joslyn Rd (Northbound)				Joslyn Rd (Southbound)				Brown Rd (Eastbound)				Brown Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
5:30 AM	11	9	0	0	0	38	8	0	1	87	7	0	0	13	0	0	174	
5:45 AM	16	17	0	0	0	32	12	0	3	74	6	0	0	12	1	0	195	
6:00 AM	10	16	0	0	0	64	8	0	1	25	21	0	0	17	0	0	163	
6:15 AM	14	33	0	0	0	76	7	0	0	25	19	0	0	17	4	0	195	725
6:30 AM	7	24	0	0	0	86	14	0	4	35	20	0	0	18	0	0	210	757
6:45 AM	22	48	0	0	0	100	16	0	4	49	33	0	0	25	0	0	296	864
7:00 AM	27	30	0	0	0	109	21	0	7	79	29	1	0	34	3	0	340	1037
7:15 AM	35	46	0	0	0	156	22	0	10	57	44	2	0	37	2	0	411	1263
7:30 AM	32	36	0	0	0	102	39	0	4	69	50	0	0	35	3	0	450	1497
7:45 AM	43	55	0	0	0	120	34	0	13	96	49	3	0	39	3	0	459	1660
8:00 AM	50	76	0	0	0	122	34	0	11	55	30	2	0	40	0	0	420	1740
8:15 AM	29	38	0	0	0	91	34	0	6	62	57	2	0	38	7	0	364	1693

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	172	220	0	0	0	456	136	0	52	384	196	12	0	150	12	0	1830
Heavy Trucks	16	4	0		0	8	0		4	40	36		0	40	0		148
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 5/12/2022 2:47 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-7212

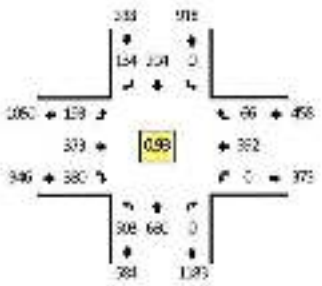
Type of peak hour being reported: Intersection Peak

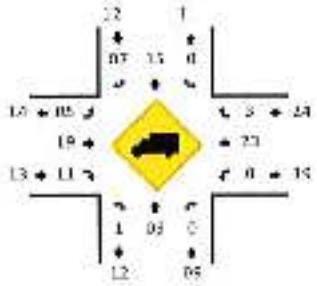
Method for determining peak hour: Total Entering Volume

LOCATION: Joslyn Rd -- Brown Rd
CITY/STATE: Oakland, MI

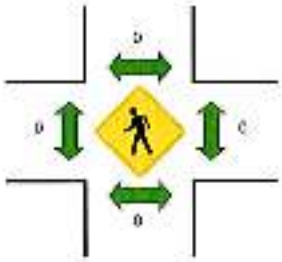
QC JOB #: 15737030
DATE: Wed, Apr 27 2022

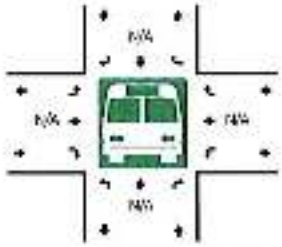
Peak-Hour: 4:30 PM -- 5:30 PM
Peak 15-Min: 5:15 PM -- 5:30 PM

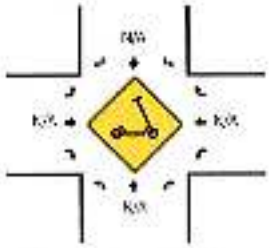


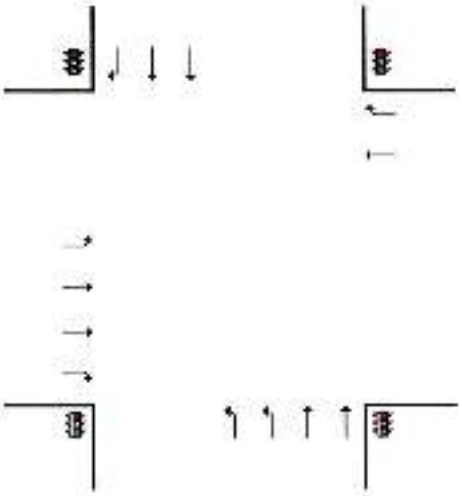


Quality Counts
DATA THAT DRIVES COMMUNITIES









15-Min Count Period Beginning At	Joslyn Rd (Northbound)				Joslyn Rd (Southbound)				Brown Rd (Eastbound)				Brown Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
3:00 PM	124	107	0	0	0	63	44	0	86	314	101	7	0	95	11	0	767	
3:15 PM	102	135	0	0	0	71	32	0	47	101	94	1	0	135	6	0	696	
3:30 PM	119	132	0	0	0	54	33	0	56	99	96	7	0	98	12	0	703	
3:45 PM	135	140	0	0	0	64	33	0	47	109	89	6	0	86	13	0	719	2825
4:00 PM	101	124	0	0	0	76	46	0	46	105	95	7	0	73	13	0	690	2808
4:15 PM	131	135	0	0	0	69	25	0	28	98	105	5	0	103	12	0	706	2818
4:30 PM	120	168	0	0	0	52	33	0	39	115	86	4	0	111	20	0	748	2863
4:45 PM	124	137	0	0	0	49	24	0	50	75	91	4	0	71	11	0	636	2780
5:00 PM	116	165	0	0	0	53	34	0	38	93	110	8	0	110	19	0	754	2844
5:15 PM	143	210	0	0	0	50	43	0	45	90	93	5	0	92	16	0	787	2925
5:30 PM	107	144	0	0	0	45	46	0	42	108	103	5	0	97	8	0	705	2882
5:45 PM	115	116	0	0	0	55	30	0	32	108	96	6	0	91	10	0	660	2506

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	572	840	0	0	0	200	172	0	180	360	372	20	0	368	64	0	3148
Heavy Trucks	4	4	0		0	4	0		0	4	8		0	8	4		36
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 5/12/2022 2:47 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

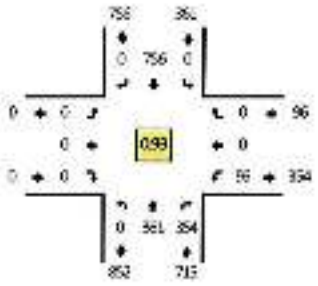
Type of peak hour being reported: Intersection Peak

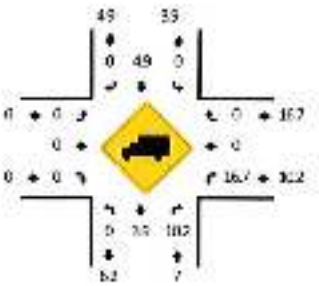
Method for determining peak hour: Total Entering Volume

LOCATION: Joslyn Rd -- Brown Rd Connector
CITY/STATE: Auburn Hills, MI

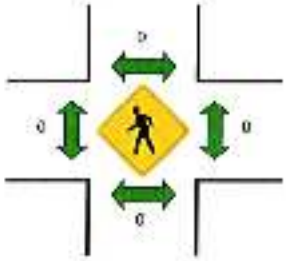
QC JOB #: 15737031
DATE: Thu, Apr 28 2022

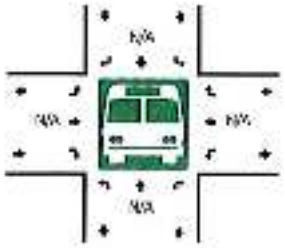
Peak-Hour: 7:15 AM -- 8:15 AM
Peak 15-Min: 7:45 AM -- 8:00 AM

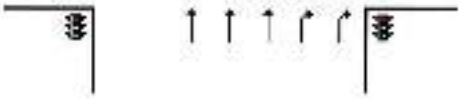


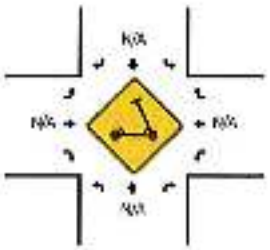


Quality Counts
DATA THAT DRIVES COMMUNITIES









15-Min Count Period Beginning At	Joslyn Rd (Northbound)				Joslyn Rd (Southbound)				Brown Rd Connector (Eastbound)				Brown Rd Connector (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
5:30 AM	0	71	244	0	0	46	0	0	0	0	0	0	8	0	0	0	369	
5:45 AM	0	81	245	0	0	60	0	0	0	0	0	0	11	0	0	0	347	
6:00 AM	0	29	78	0	0	83	0	0	0	0	0	0	23	0	0	0	213	
6:15 AM	0	40	58	0	0	100	0	0	0	0	0	0	11	0	0	0	209	1099
6:30 AM	0	30	64	0	0	112	0	0	0	0	0	0	17	0	0	0	223	992
6:45 AM	0	70	101	0	0	136	0	0	0	0	0	0	14	0	0	0	321	966
7:00 AM	0	57	86	0	0	141	0	0	0	0	0	0	21	0	0	0	305	1058
7:15 AM	0	74	65	0	0	204	0	0	0	0	0	0	19	0	0	0	362	1211
7:30 AM	0	68	87	0	0	227	0	0	0	0	0	0	21	0	0	0	403	1391
7:45 AM	0	96	126	0	0	175	0	0	0	0	0	0	23	0	0	0	420	1490
8:00 AM	0	123	76	0	0	150	0	0	0	0	0	0	33	0	0	0	382	1567
8:15 AM	0	81	54	0	0	151	0	0	0	0	0	0	41	0	0	0	327	1542

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	384	504	0	0	700	0	0	0	0	0	0	92	0	0	0	1680
Heavy Trucks & Buses	0	20	48		0	44	0		0	0	0		24	0	0		136
Pedestrians		0				0				0				0			0
Bicycles & Scooters	0	0	0		0	0	0		0	0	0		0	0	0		0

Comments:

Report generated on 5/12/2022 2:47 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-7212

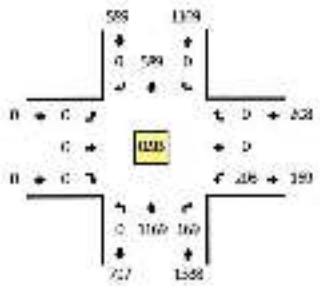
Type of peak hour being reported: Intersection Peak

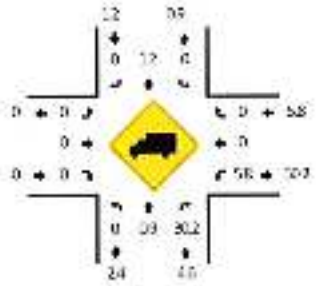
Method for determining peak hour: Total Entering Volume

LOCATION: Joslyn Rd -- Brown Rd Connector
CITY/STATE: Auburn Hills, MI

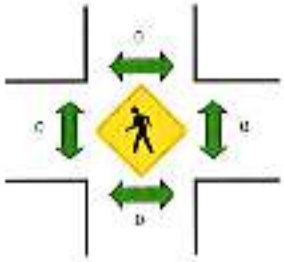
QC JOB #: 15737033
DATE: Wed, Apr 27 2022

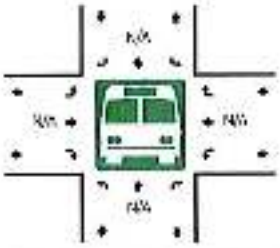
Peak-Hour: 4:30 PM -- 5:30 PM
Peak 15-Min: 4:30 PM -- 4:45 PM

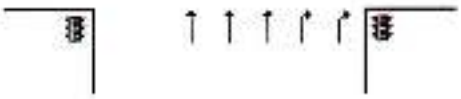


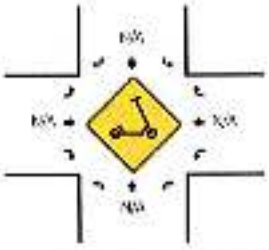


Quality Counts
DATA THAT DRIVES COMMUNITIES









15-Min Count Period Beginning At	Joslyn Rd (Northbound)				Joslyn Rd (Southbound)				Brown Rd Connector (Eastbound)				Brown Rd Connector (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
3:00 PM	0	222	36	0	0	165	0	0	0	0	0	0	54	0	0	0	487	
3:15 PM	0	244	40	0	0	165	0	0	0	0	0	0	60	0	0	0	509	
3:30 PM	0	253	41	0	0	145	0	0	0	0	0	0	51	0	0	0	490	
3:45 PM	0	264	42	0	0	161	0	0	0	0	0	0	43	0	0	0	510	1996
4:00 PM	0	239	46	0	0	164	0	0	0	0	0	0	48	0	0	0	497	2006
4:15 PM	0	266	46	0	0	171	0	0	0	0	0	0	44	0	0	0	527	2024
4:30 PM	0	300	48	0	0	141	0	0	0	0	0	0	82	0	0	0	572	2106
4:45 PM	0	236	39	0	0	140	0	0	0	0	0	0	42	0	0	0	457	2053
5:00 PM	0	302	42	0	0	165	0	0	0	0	0	0	44	0	0	0	553	2109
5:15 PM	0	331	39	0	0	143	0	0	0	0	0	0	40	0	0	0	553	2135
5:30 PM	0	257	37	0	0	147	0	0	0	0	0	0	45	0	0	0	486	2049
5:45 PM	0	227	50	0	0	152	0	0	0	0	0	0	32	0	0	0	456	2048

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	1200	196	0	0	564	0	0	0	0	0	0	328	0	0	0	2288
Heavy Trucks	0	16	52		0	4	0		0	0	0		24	0	0		96
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 5/12/2022 2:47 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

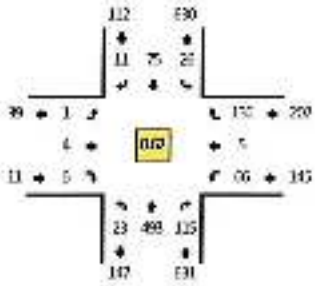
Type of peak hour being reported: Intersection Peak

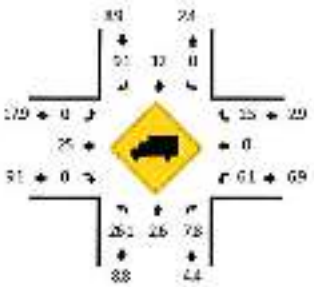
Method for determining peak hour: Total Entering Volume

LOCATION: Giddings Rd -- FedEx Dwy/Brown Rd
CITY/STATE: Oakland, MI

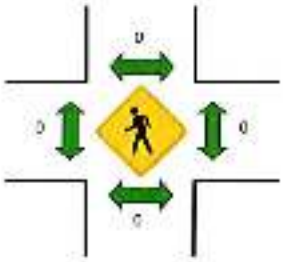
QC JOB #: 15737034
DATE: Wed, Apr 27 2022

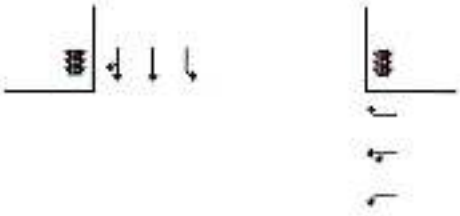
Peak-Hour: 5:30 AM -- 6:30 AM
Peak 15-Min: 5:45 AM -- 6:00 AM

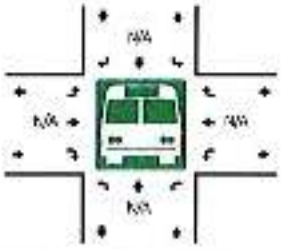


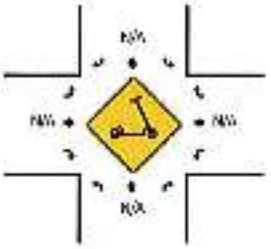


Quality Counts
DATA THAT DRIVES COMMUNITIES









15-Min Count Period Beginning At	Giddings Rd (Northbound)				Giddings Rd (Southbound)				FedEx Dwy/Brown Rd (Eastbound)				FedEx Dwy/Brown Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
5:30 AM	4	210	27	0	5	16	1	0	0	1	4	0	11	1	65	0	346	
5:45 AM	8	223	38	0	10	27	2	0	0	0	0	0	25	3	59	0	390	
6:00 AM	6	37	23	0	5	14	4	0	0	3	1	0	17	0	7	0	118	
6:15 AM	8	23	20	0	4	18	4	0	1	0	1	0	13	1	5	0	107	961
6:30 AM	8	29	26	0	10	26	1	0	0	1	1	0	21	1	6	0	130	745
6:45 AM	8	33	45	0	11	29	3	0	0	0	2	0	16	2	8	0	157	512
7:00 AM	14	23	32	0	14	38	6	0	1	0	1	0	27	2	3	0	161	555
7:15 AM	22	38	44	0	16	34	2	0	0	1	1	0	19	3	5	0	185	633
7:30 AM	20	39	44	0	18	47	5	0	0	0	3	0	24	5	10	0	215	718
7:45 AM	25	54	62	0	18	46	9	0	0	0	4	0	31	4	13	0	276	837
8:00 AM	15	51	41	0	19	51	6	0	0	3	1	0	26	1	8	0	226	902
8:15 AM	15	28	39	0	9	56	1	0	1	3	4	0	27	1	5	0	193	910

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	20	892	144	0	40	108	8	0	0	0	0	0	100	12	236	0	1560
Heavy Trucks	4	16	0		0	8	4		0	0	0		8	0	0		40
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 5/12/2022 3:47 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

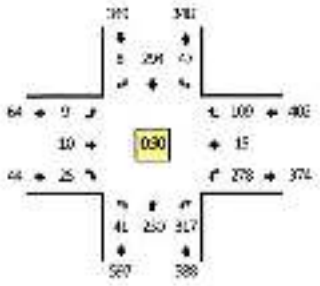
Type of peak hour being reported: Intersection Peak

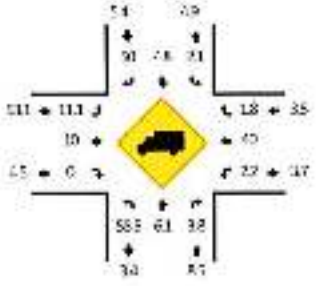
Method for determining peak hour: Total Entering Volume

LOCATION: Giddings Rd -- FedEx Dwy/Brown Rd
CITY/STATE: Oakland, MI

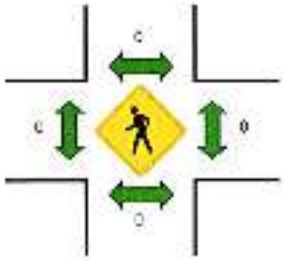
QC JOB #: 15737036
DATE: Tue, Apr 26 2022

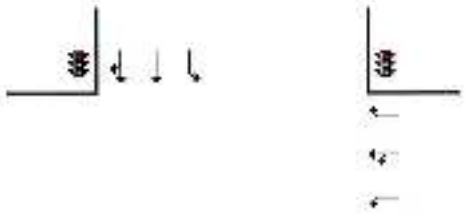
Peak-Hour: 4:30 PM -- 5:30 PM
Peak 15-Min: 4:30 PM -- 4:45 PM

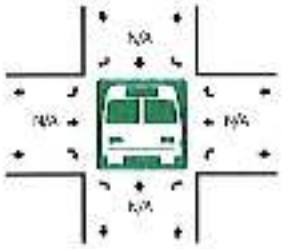


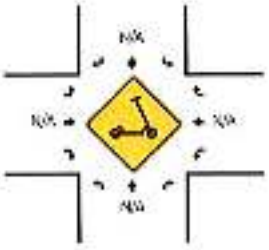


Quality Counts
DATA THAT DRIVES COMMUNITIES









15-Min Count Period Beginning At	Giddings Rd (Northbound)				Giddings Rd (Southbound)				FedEx Dwy/Brown Rd (Eastbound)				FedEx Dwy/Brown Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
3:00 PM	9	54	81	0	17	55	6	0	1	3	6	0	67	1	24	0	324	
3:15 PM	12	45	59	0	18	60	1	0	2	7	8	0	57	5	21	0	295	
3:30 PM	12	59	79	0	11	79	4	0	1	4	9	0	69	5	15	0	347	
3:45 PM	14	57	62	0	15	47	5	0	0	3	10	0	45	3	20	0	288	1254
4:00 PM	10	46	88	0	14	54	4	0	1	9	4	0	62	0	15	0	316	1246
4:15 PM	15	49	76	0	18	63	2	0	1	12	9	0	56	3	17	0	321	1272
4:30 PM	11	63	77	0	22	85	2	0	1	2	8	0	87	6	21	0	386	1311
4:45 PM	8	55	88	0	8	61	1	0	1	3	8	0	55	2	10	0	319	1342
5:00 PM	8	56	79	0	10	73	1	0	4	4	3	0	66	1	32	0	337	1363
5:15 PM	14	56	73	0	7	74	4	0	3	1	6	0	60	6	37	0	341	1393
5:30 PM	4	57	76	0	4	41	1	0	5	2	7	0	58	1	15	0	281	1278
5:45 PM	4	42	71	0	6	48	1	0	1	4	5	0	40	2	15	0	239	1198

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	44	252	308	0	88	344	8	0	4	8	32	0	348	24	84	0	1544
Heavy Trucks	28	16	16		4	12	4		0	0	0		16	8	0		104
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments

Report generated on 5/12/2022 2:47 PM

SOURCE: Quality Counts, LLC [http://www.qualitycounts.net] 1-877-580-2212

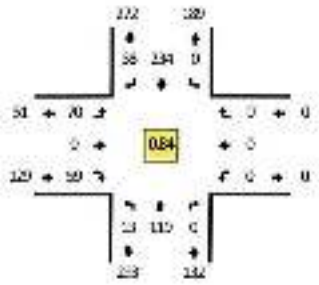
Type of peak hour being reported: Intersection Peak

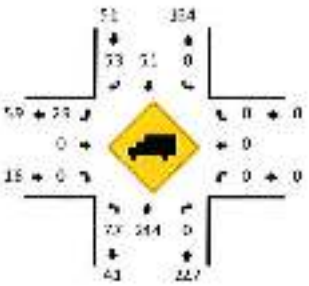
Method for determining peak hour: Total Entering Volume

LOCATION: Giddings Rd -- Silverbell Rd
CITY/STATE: Oakland, MI

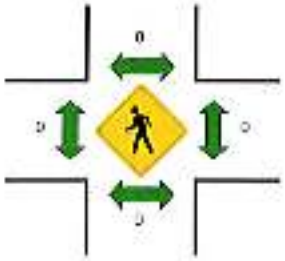
QC JOB #: 15737046
DATE: Wed, Apr 27 2022

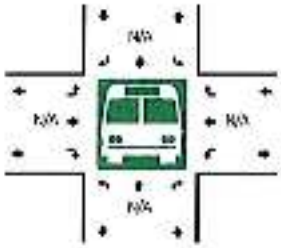
Peak-Hour: 7:30 AM -- 8:30 AM
Peak 15-Min: 7:45 AM -- 8:00 AM

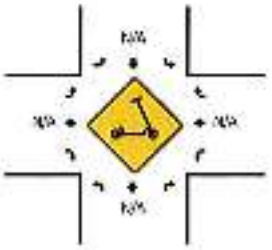




Quality Counts
DATA THAT DRIVES COMMUNITIES







15-Min Count Period Beginning At	Giddings Rd (Northbound)				Giddings Rd (Southbound)				Silverbell Rd (Eastbound)				Silverbell Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
5:30 AM	1	26	0	0	0	79	2	0	3	0	27	0	0	0	0	0	138	
5:45 AM	0	22	0	1	0	73	2	0	8	0	35	0	0	0	0	0	142	
6:00 AM	2	21	0	0	0	24	1	0	4	0	9	0	0	0	0	0	61	
6:15 AM	1	22	0	0	0	28	2	0	11	0	4	0	0	0	0	0	68	409
6:30 AM	0	24	0	0	0	31	0	0	15	0	5	0	0	0	0	0	75	346
6:45 AM	1	23	0	0	0	35	8	0	11	0	5	0	0	0	0	0	88	302
7:00 AM	0	14	0	0	0	46	4	0	6	0	13	0	0	0	0	0	83	314
7:15 AM	4	35	0	0	0	47	7	0	9	0	9	0	0	0	0	0	111	357
7:30 AM	4	21	0	0	0	50	5	0	13	0	23	0	0	0	0	0	116	398
7:45 AM	3	36	0	0	0	73	4	0	27	0	16	0	0	0	0	0	159	469
8:00 AM	3	37	0	0	0	54	20	0	17	0	11	0	0	0	0	0	142	528
8:15 AM	3	25	0	0	0	57	9	0	13	0	9	0	0	0	0	0	116	533

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	12	144	0	0	0	292	16	0	108	0	54	0	0	0	0	0	626
Heavy Trucks	0	40	0		0	12	0		4	0	0		0	0	0		56
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 5/12/2022 2:47 PM

SOURCE: Quality Counts, LLC [http://www.qualitycounts.net] 1 877 580 2212

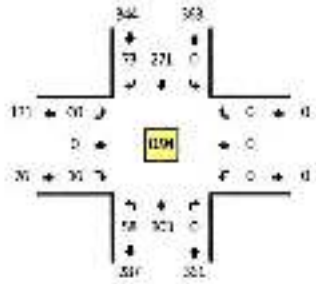
Type of peak hour being reported: Intersection Peak

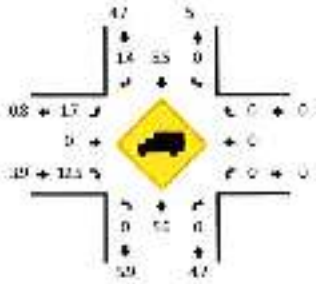
Method for determining peak hour: Total Entering Volume

LOCATION: Giddings Rd -- Silverbell Rd
CITY/STATE: Oakland, MI

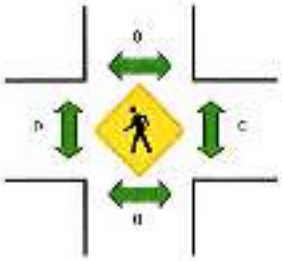
QC JOB #: 15737048
DATE: Tue, Apr 26 2022

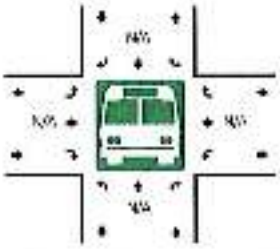
Peak Hour: 4:30 PM -- 5:30 PM
Peak 15 Min: 5:00 PM -- 5:15 PM

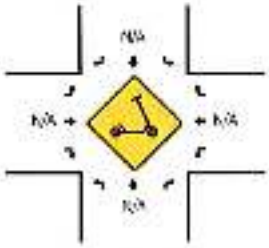




Quality Counts
DATA THAT DRIVES COMMUNITIES







15-Min Count Period Beginning At	Giddings Rd (Northbound)				Giddings Rd (Southbound)				Silverbell Rd (Eastbound)				Silverbell Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
3:00 PM	16	72	0	0	0	49	22	0	16	0	5	0	0	0	0	0	180	
3:15 PM	18	73	0	0	0	53	14	0	21	0	4	0	0	0	0	0	183	
3:30 PM	12	70	0	0	0	68	11	0	14	0	6	0	0	0	0	0	181	
3:45 PM	9	65	0	0	0	43	18	0	15	0	8	0	0	0	0	0	158	702
4:00 PM	15	55	0	0	0	54	11	0	7	0	5	0	0	0	0	0	147	669
4:15 PM	11	64	0	0	0	52	17	0	11	0	3	0	0	0	0	0	158	644
4:30 PM	18	77	0	0	0	71	17	0	16	0	2	0	0	0	0	0	201	684
4:45 PM	15	61	0	0	0	62	21	0	10	0	4	0	0	0	0	0	173	679
5:00 PM	19	79	0	0	0	67	20	0	21	0	5	0	0	0	0	0	208	740
5:15 PM	9	86	0	0	0	71	15	0	13	0	5	0	0	0	0	0	199	781
5:30 PM	9	76	0	0	0	46	15	0	13	0	4	0	0	0	0	0	163	743
5:45 PM	11	46	0	0	0	42	14	0	16	0	5	0	0	0	0	0	134	704

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	64	316	0	0	0	268	80	0	84	0	20	0	0	0	0	0	832
Heavy Trucks	0	16	0		0	28	0		0	0	0		0	0	0		44
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 5/12/2022 2:47 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

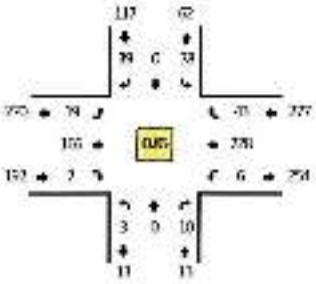
Type of peak hour being reported: Intersection Peak

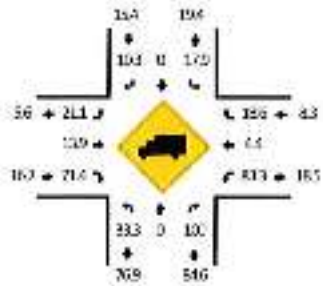
Method for determining peak hour: Total Entering Volume

LOCATION: Giddings Rd/Dwy -- Silverbell Rd
CITY/STATE: Oakland, MI

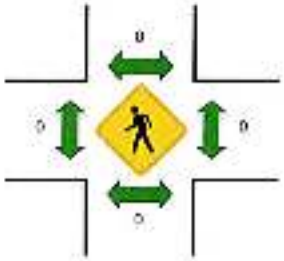
QC JOB #: 15737049
DATE: Wed, Apr 27 2022

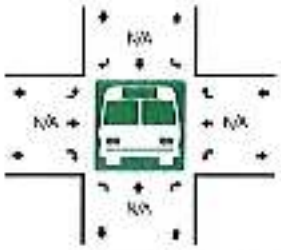
Peak-Hour: 7:30 AM -- 8:30 AM
Peak 15-Min: 7:45 AM -- 8:00 AM





Quality Counts
DATA THAT DRIVES COMMUNITIES





15-Min Count Period Beginning At	Giddings Rd/Dwy (Northbound)				Giddings Rd/Dwy (Southbound)				Silverbell Rd (Eastbound)				Silverbell Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
5:30 AM	0	0	0	0	4	1	17	0	17	11	2	0	3	66	2	0	123	
5:45 AM	1	0	0	0	9	0	14	0	17	11	1	0	3	60	10	0	126	
6:00 AM	1	0	1	0	8	0	2	0	9	16	4	0	2	25	2	0	68	
6:15 AM	2	0	0	0	9	0	5	0	7	20	5	0	0	33	7	0	78	395
6:30 AM	1	0	1	0	14	0	5	0	4	36	1	0	0	24	4	0	90	362
6:45 AM	1	0	3	0	23	0	7	0	5	25	3	0	1	39	9	0	116	392
7:00 AM	2	0	0	0	17	0	14	0	3	17	2	0	1	33	6	0	95	379
7:15 AM	2	0	2	0	32	0	8	0	3	35	3	0	0	47	5	0	135	434
7:30 AM	0	0	1	0	24	0	12	0	2	33	0	0	2	42	2	0	118	462
7:45 AM	0	0	4	0	20	0	11	0	7	54	2	0	1	67	11	0	177	528
8:00 AM	1	0	1	0	14	0	8	0	7	45	4	0	1	63	12	0	156	584
8:15 AM	2	0	4	0	20	0	8	0	3	34	1	0	2	56	18	0	148	599

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	16	0	80	0	44	0	28	216	8	0	4	256	44	0	708
Heavy Trucks	0	0	16		20	0	0		8	28	8		4	12	0		96
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 5/12/2022 2:47 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

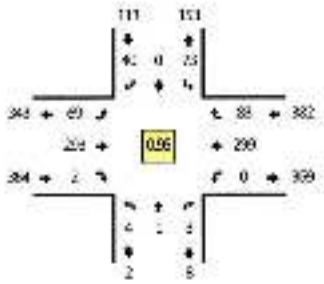
Type of peak hour being reported: Intersection Peak

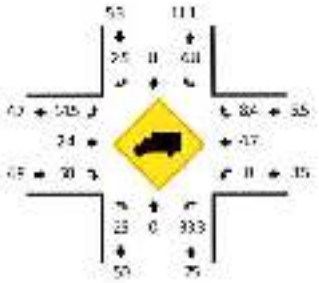
Method for determining peak hour: Total Entering Volume

LOCATION: Giddings Rd/Dwy -- Silverbell Rd
CITY/STATE: Oakland, MI

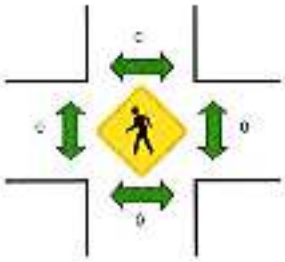
QC JOB #: 15737051
DATE: Tue, Apr 26 2022

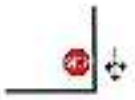
Peak-Hour: 4:30 PM -- 5:30 PM
Peak 15-Min: 5:15 PM -- 5:30 PM

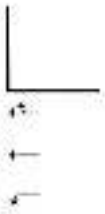


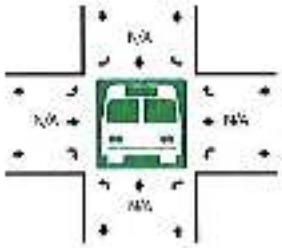


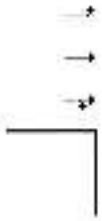
Quality Counts
DATA THAT DRIVES COMMUNITIES

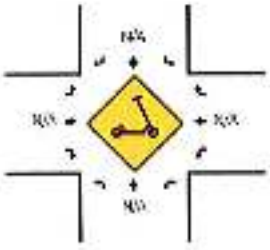












15-Min Count Period Beginning At	Giddings Rd/Dwy (Northbound)				Giddings Rd/Dwy (Southbound)				Silverbell Rd (Eastbound)				Silverbell Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
3:00 PM	0	0	0	1	8	0	9	0	12	74	0	1	0	61	18	1	185	
3:15 PM	1	0	0	0	11	0	5	0	17	77	0	0	0	62	22	0	196	
3:30 PM	1	0	1	1	12	0	8	0	16	68	1	0	0	75	15	0	198	
3:45 PM	0	0	0	0	7	0	6	0	14	68	0	0	0	54	21	0	170	747
4:00 PM	1	0	0	0	13	0	11	0	6	57	0	0	0	51	29	0	168	730
4:15 PM	0	0	0	0	14	0	8	0	15	60	0	0	0	63	17	0	177	711
4:30 PM	2	0	2	0	17	0	9	0	8	80	1	0	0	76	26	0	222	737
4:45 PM	1	1	0	0	25	0	11	0	13	61	0	0	0	71	14	0	197	764
5:00 PM	1	0	0	0	17	0	9	0	19	77	0	0	0	76	21	0	220	816
5:15 PM	0	0	1	0	14	0	11	0	29	75	0	0	0	76	22	0	228	867
5:30 PM	1	0	0	0	16	0	6	0	16	73	0	0	0	55	21	0	190	835
5:45 PM	0	0	0	0	24	0	9	0	12	51	0	0	0	48	16	0	158	796

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	4	0	56	0	44	0	116	300	0	0	0	304	88	0	912
Heavy Trucks, Buses	0	0	0		0	0	0		16	8	0		0	8	4		36
Pedestrians		0				0				0				0			0
Bicycles, Scooters	0	0	0		0	0	0		0	0	0		0	0	0		0

Comments:

Report generated on 5/12/2022 2:47 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1 877 580 2212

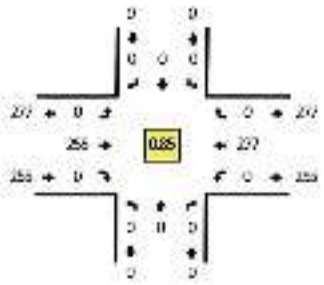
Type of peak hour being reported: Intersection Peak

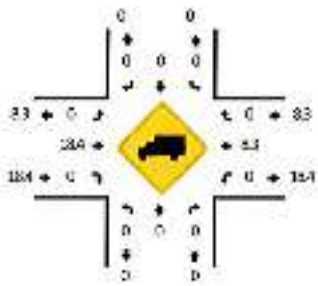
Method for determining peak hour: Total Entering Volume

LOCATION: Driveway W of RR -- Silverbell Rd
CITY/STATE: Oakland, MI

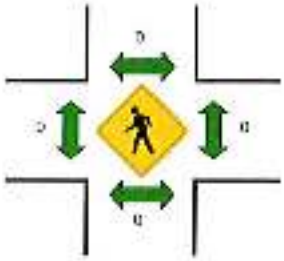
QC JOB #: 15737052
DATE: Wed, Apr 27 2022

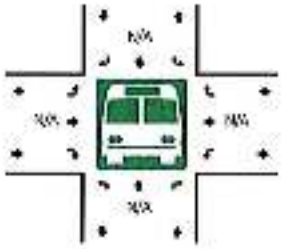
Peak Hour: 7:30 AM -- 8:30 AM
Peak 15-Min: 7:45 AM -- 8:00 AM

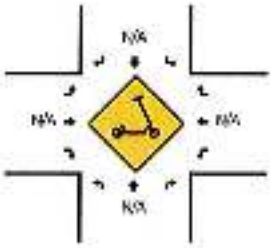




Quality Counts
DATA THAT DRIVES COMMUNITIES







15-Min Count Period Beginning At	Driveway W of RR (Northbound)				Driveway W of RR (Southbound)				Silverbell Rd (Eastbound)				Silverbell Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
5:30 AM	0	0	0	0	0	0	0	0	0	15	0	0	0	71	0	0	86	
5:45 AM	0	0	0	0	0	0	0	0	0	20	0	0	0	73	0	0	93	
6:00 AM	0	0	0	0	0	0	0	0	0	25	0	0	0	27	0	0	52	
6:15 AM	0	0	0	0	0	0	0	0	0	29	0	0	0	30	0	0	59	290
6:30 AM	0	0	0	0	0	0	0	0	0	51	0	0	0	28	0	0	79	283
6:45 AM	0	0	0	0	0	0	0	0	0	51	0	0	0	49	0	0	100	290
7:00 AM	0	0	0	0	0	0	0	0	0	34	0	0	0	40	0	0	74	312
7:15 AM	0	0	0	0	0	0	0	0	0	66	0	0	0	48	0	0	116	369
7:30 AM	0	0	0	0	0	0	0	0	0	59	0	0	0	46	0	0	105	395
7:45 AM	0	0	0	0	0	0	0	0	0	78	0	0	0	79	0	0	157	452
8:00 AM	0	0	0	0	0	0	0	0	0	60	0	0	0	76	0	0	136	514
8:15 AM	0	0	0	0	0	0	0	0	0	58	0	0	0	76	0	0	134	532

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	0	0	0	0	0	0	0	312	0	0	0	316	0	0	628
Heavy Trucks	0	0	0		0	0	0		0	64	0		0	16	0		80
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 5/12/2022 2:47 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

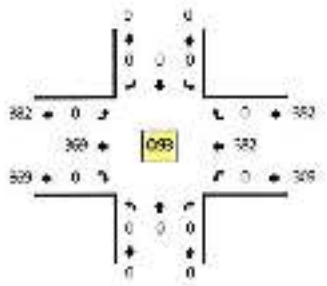
Type of peak hour being reported: Intersection Peak

Method for determining peak hour: Total Entering Volume

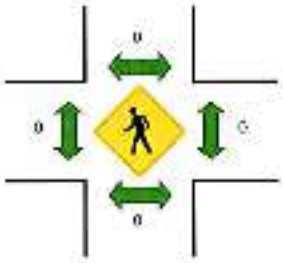
LOCATION: Driveway W of RR -- Silverbell Rd
CITY/STATE: Oakland, MI

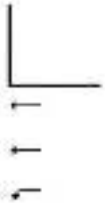
QC JOB #: 15737054
DATE: Tue, Apr 26 2022

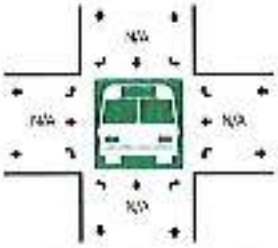
Peak-Hour: 4:30 PM -- 5:30 PM
Peak 15-Min: 4:30 PM -- 4:45 PM

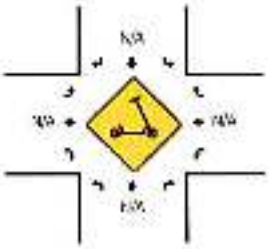


Quality Counts
DATA THAT DRIVES COMMUNITIES









15-Min Count Period Beginning At	Driveway W of RR (Northbound)				Driveway W of RR (Southbound)				Silverbell Rd (Eastbound)				Silverbell Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
3:00 PM	0	0	0	0	0	0	0	0	0	88	0	0	0	80	0	0	168	
3:15 PM	0	0	0	0	0	0	0	0	0	88	0	0	0	85	0	0	173	
3:30 PM	0	0	0	0	0	0	0	0	0	91	0	0	0	98	0	0	189	
3:45 PM	0	0	0	0	0	0	0	0	0	75	0	0	0	75	0	0	150	680
4:00 PM	0	0	0	0	0	0	0	0	0	70	0	0	0	80	0	0	150	642
4:15 PM	0	0	0	0	0	0	0	0	0	74	0	0	0	80	0	0	154	623
4:30 PM	0	0	0	0	0	0	0	0	0	99	0	0	0	102	0	0	201	655
4:45 PM	0	0	0	0	0	0	0	0	0	85	0	0	0	85	0	0	170	675
5:00 PM	0	0	0	0	0	0	0	0	0	95	0	0	0	97	0	0	192	717
5:15 PM	0	0	0	0	0	0	0	0	0	80	0	0	0	99	0	0	188	751
5:30 PM	0	0	0	0	0	0	0	0	0	91	0	0	0	76	0	0	167	717
5:45 PM	0	0	0	0	0	0	0	0	0	75	0	0	0	62	0	0	137	684

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	0	0	0	0	0	0	0	396	0	0	0	408	0	0	804
Heavy Trucks	0	0	0		0	0	0		0	20	0		0	24	0		44
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 5/12/2022 2:47 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-7217

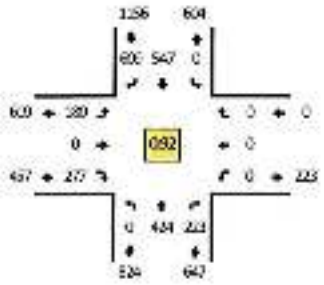
Type of peak hour being reported: Intersection Peak

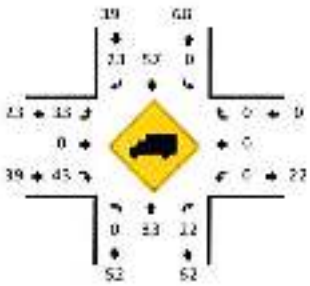
Method for determining peak hour: Total Entering Volume

LOCATION: Baldwin Rd -- I-75 EB Ramps
CITY/STATE: Auburn Hills, MI

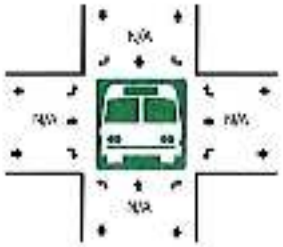
QC JOB #: 15737055
DATE: Thu, Apr 28 2022

Peak-Hour: 7:15 AM -- 8:15 AM
Peak 15-Min: 7:30 AM -- 7:45 AM





Quality Counts
DATA THAT DRIVES COMMUNITIES



15-Min Count Period Beginning At	Baldwin Rd (Northbound)				Baldwin Rd (Southbound)				I-75 EB Ramps (Eastbound)				I-75 EB Ramps (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
5:30 AM	0	68	23	0	0	36	71	0	25	0	54	0	0	0	0	0	257	
5:45 AM	0	72	33	0	0	55	58	0	30	0	60	0	0	0	0	0	318	
6:00 AM	0	36	34	0	0	58	66	0	26	0	31	0	0	0	0	0	273	
6:15 AM	0	43	41	0	0	66	66	0	32	0	47	0	0	0	0	0	330	1268
6:30 AM	0	72	34	0	0	96	114	0	36	0	57	0	0	0	0	0	409	1330
6:45 AM	0	90	50	0	0	91	106	0	49	0	61	0	0	0	0	0	453	1465
7:00 AM	0	92	62	0	0	95	125	0	31	0	44	0	0	0	0	0	449	1641
7:15 AM	0	80	63	0	0	131	160	0	39	0	44	0	0	0	0	0	517	1828
7:30 AM	0	121	82	0	0	140	181	0	37	0	72	0	0	0	0	0	633	2032
7:45 AM	0	121	49	0	0	141	139	0	58	0	99	0	0	0	0	0	606	2185
8:00 AM	0	102	49	0	0	135	129	0	46	0	63	0	0	0	0	0	524	2260
8:15 AM	0	96	55	0	0	133	140	0	45	0	45	0	0	0	0	0	514	2257

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	484	248	0	0	560	724	0	148	0	288	0	0	0	0	0	2452
Heavy Trucks	0	36	0		0	24	28		4	0	4		0	0	0		96
Buses																	
Pedestrians		4				0				0				4			8
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 5/12/2022 2:47 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

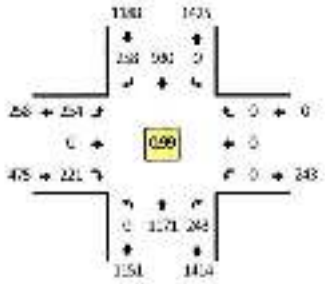
Type of peak hour being reported: Intersection Peak

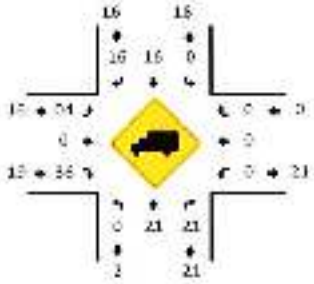
Method for determining peak hour: Total Entering Volume

LOCATION: Baldwin Rd -- I-75 EB Ramps
CITY/STATE: Auburn Hills, MI

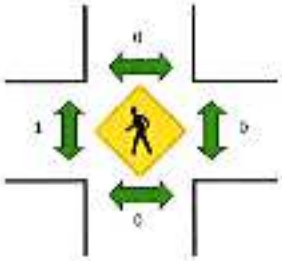
QC JOB #: 15737057
DATE: Wed, Apr 27 2022

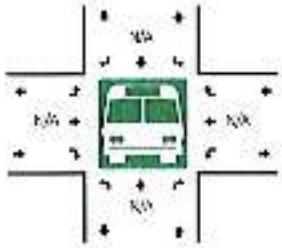
Peak-Hour: 4:45 PM – 5:45 PM
Peak 15-Min: 5:00 PM – 5:15 PM

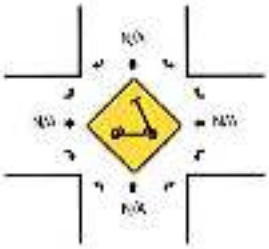




Quality Counts
DATA THAT DRIVES COMMUNITIES







15-Min Count Period Beginning At	Baldwin Rd (Northbound)				Baldwin Rd (Southbound)				I-75 EB Ramps (Eastbound)				I-75 EB Ramps (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
3:00 PM	0	229	53	0	0	221	59	0	73	0	62	0	0	0	0	0	670	
3:15 PM	0	230	64	0	0	239	63	0	53	0	57	0	0	0	0	0	726	
3:30 PM	0	279	55	0	0	241	50	0	69	0	52	0	0	0	0	0	742	
3:45 PM	0	266	61	0	0	232	46	0	61	0	64	0	0	0	0	0	729	2867
4:00 PM	0	232	53	0	0	198	49	0	64	0	49	0	0	0	0	0	645	2841
4:15 PM	0	288	66	0	0	247	52	0	46	0	62	0	0	0	0	0	761	2880
4:30 PM	0	269	51	0	0	224	63	0	66	0	49	0	0	0	0	0	722	2860
4:45 PM	0	306	55	0	0	221	67	0	60	0	50	0	0	0	0	0	759	2890
5:00 PM	0	303	67	0	0	243	52	0	59	0	56	0	0	0	0	0	780	3025
5:15 PM	0	290	55	0	0	230	76	0	58	0	62	0	0	0	0	0	777	3038
5:30 PM	0	266	66	0	0	236	63	0	77	0	53	0	0	0	0	0	761	3077
5:45 PM	0	242	51	0	0	236	65	0	68	0	47	0	0	0	0	0	709	3027

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	1212	268	0	0	972	208	0	236	0	224	0	0	0	0	0	3120
Heavy Trucks	0	36	8		0	16	0		0	0	8		0	0	0		68
Buses																	
Pedestrians		0				0				4				0			4
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 5/12/2022 2:47 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

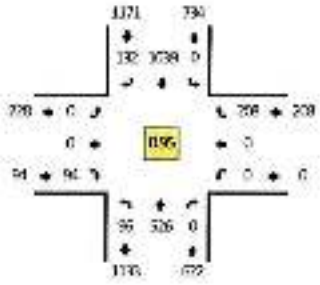
Type of peak hour data reported: Intersection Peak

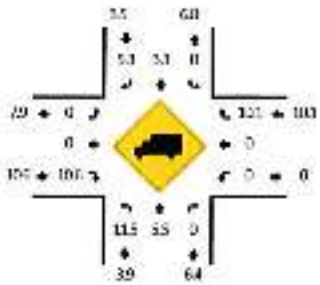
Method for determining peak hour: Total Entering Volume

LOCATION: Baldwin Rd -- I-75 WB Ramps
CITY/STATE: Auburn Hills, MI

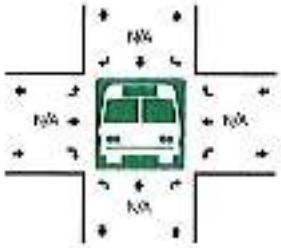
QC JOB #: 15737058
DATE: Thu, Apr 28 2022

Peak-Hour: 7:30 AM -- 8:30 AM
Peak 15-Min: 7:45 AM -- 8:00 AM





Quality Counts
DATA THAT DRIVES COMMUNITIES



15-Min Count Period Beginning At	Baldwin Rd (Northbound)				Baldwin Rd (Southbound)				I-75 WB Ramps (Eastbound)				I-75 WB Ramps (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
5:30 AM	6	96	0	0	0	102	8	0	0	0	6	0	0	0	7	0	225	
5:45 AM	11	93	0	0	0	110	7	0	0	0	10	0	0	0	13	0	244	
6:00 AM	12	52	0	0	0	136	16	0	0	0	7	0	0	0	6	0	229	
6:15 AM	14	61	0	0	0	151	11	0	0	0	16	0	0	0	12	0	265	963
6:30 AM	17	65	0	0	0	192	12	0	0	0	16	0	0	0	27	0	350	1088
6:45 AM	20	104	0	0	0	188	15	0	0	0	11	0	0	0	22	0	381	1225
7:00 AM	29	89	0	0	0	204	26	0	0	0	15	0	0	0	21	0	384	1380
7:15 AM	18	109	0	0	0	273	18	0	0	0	12	0	0	0	35	0	471	1586
7:30 AM	25	133	0	0	0	286	22	0	0	0	22	0	0	0	51	0	549	1788
7:45 AM	18	157	0	0	0	299	31	0	0	0	22	0	0	0	66	0	593	1967
8:00 AM	32	120	0	0	0	232	43	0	0	0	28	0	0	0	38	0	493	2006
8:15 AM	21	116	0	0	0	252	36	0	0	0	22	0	0	0	53	0	500	2096

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	72	628	0	0	0	1036	124	0	0	0	88	0	0	0	264	0	2212
Heavy Trucks	4	52	0		0	40	8		0	0	4		0	0	28		136
Buses																	
Pedestrians		0				0				0				4			4
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 5/12/2022 3:47 PM

SOURCE: Quality Counts, LLC [http://www.qualitycounts.net] 1-877-580-2212

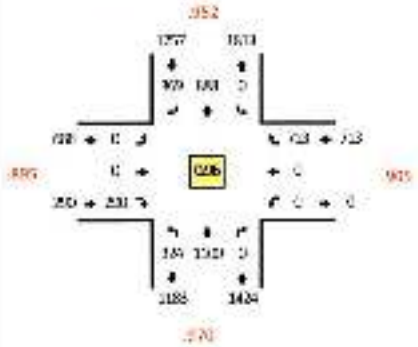
Type of peak hour being reported: Intersection Peak

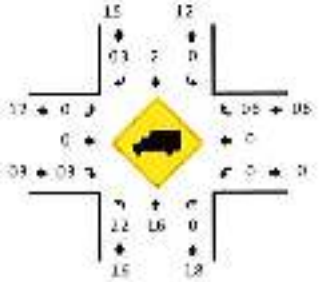
Method for determining peak hour: Total Entering Volume

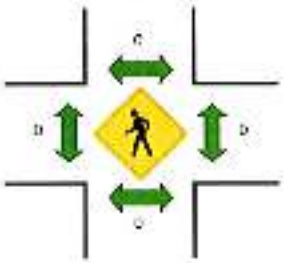
LOCATION: Baldwin Rd -- I-75 WB Ramps
CITY/STATE: Auburn Hills, MI

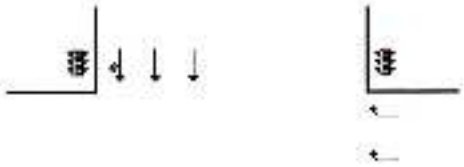
QC JOB #: 15737060
DATE: Wed, Apr 27 2022

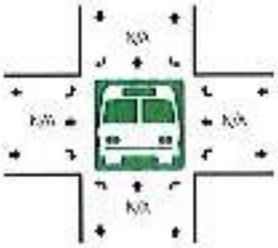
Peak-Hour: 4:45 PM -- 5:45 PM
Peak 15-Min: 5:15 PM -- 5:30 PM

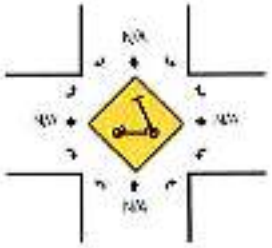












15-Min Count Period Beginning At	Baldwin Rd (Northbound)				Baldwin Rd (Southbound)				I-75 WB Ramps (Eastbound)				I-75 WB Ramps (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
3:00 PM	73	229	0	1	0	225	80	0	0	0	68	0	0	0	131	0	787	
3:15 PM	60	244	0	0	0	234	100	0	0	0	71	0	0	0	148	0	857	
3:30 PM	92	247	0	0	0	214	82	0	0	0	75	0	0	0	149	0	859	
3:45 PM	61	254	0	0	0	205	112	0	0	0	72	0	0	0	144	0	848	3351
4:00 PM	66	251	0	1	0	187	85	0	0	0	53	0	0	0	143	0	787	3341
4:15 PM	73	265	0	0	0	228	85	0	0	0	75	0	0	0	144	0	870	3354
4:30 PM	87	253	0	0	0	210	99	0	0	0	69	0	0	0	131	0	849	3344
4:45 PM	84	283	0	0	0	221	93	0	0	0	72	0	0	0	153	0	906	3392
5:00 PM	103	261	0	0	0	206	94	0	0	0	81	0	0	0	189	0	936	3561
5:15 PM	68	288	0	2	0	231	99	0	0	0	74	0	0	0	197	0	959	3650
5:30 PM	64	268	0	3	0	228	83	0	0	0	63	0	0	0	174	0	883	3084
5:45 PM	51	256	0	1	0	240	78	0	0	0	65	0	0	0	139	0	830	3508

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	272	1152	0	8	0	924	396	0	0	0	296	0	0	0	788	0	3836
Heavy Trucks	8	16	0		0	32	0		0	0	0		0	0	0		56
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 5/12/2022 2:47 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

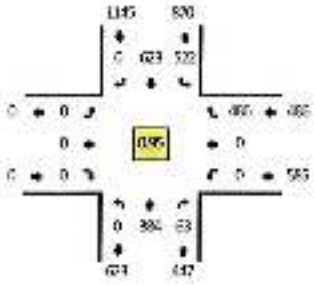
Type of peak hour data reported: Intersection Peak

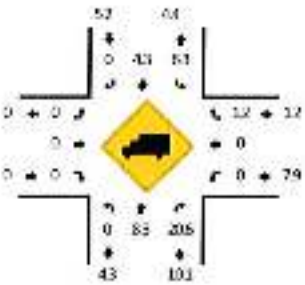
Method for determining peak hour: Total Entering Volume

LOCATION: Joslyn Rd -- I-75 EB Ramps
CITY/STATE: Auburn Hills, MI

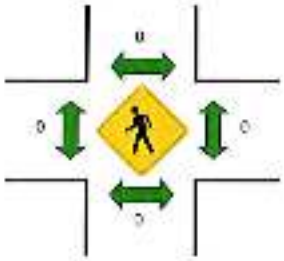
QC JOB #: 15737061
DATE: Thu, Apr 28 2022

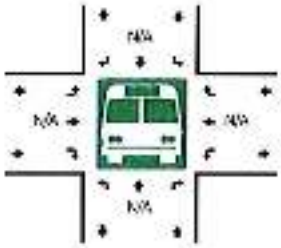
Peak-Hour: 7:15 AM -- 8:15 AM
Peak 15-Min: 7:30 AM -- 7:45 AM

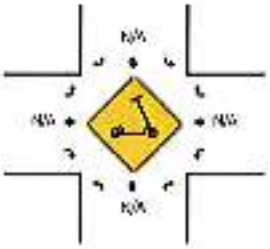




Quality Counts
DATA THAT DRIVES COMMUNITIES







15-Min Count Period Beginning At	Joslyn Rd (Northbound)				Joslyn Rd (Southbound)				I-75 EB Ramps (Eastbound)				I-75 EB Ramps (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
5:30 AM	0	70	6	0	27	100	0	1	0	0	0	0	0	0	169	0	372	
5:45 AM	0	108	5	0	36	130	0	0	0	0	0	0	0	0	157	0	436	
6:00 AM	0	42	22	0	70	103	0	0	0	0	0	0	0	0	48	0	285	
6:15 AM	0	60	13	0	84	83	0	0	0	0	0	0	0	0	60	0	300	1393
6:30 AM	0	51	8	0	93	126	0	1	0	0	0	0	0	0	79	0	358	1379
6:45 AM	0	83	13	0	86	133	0	0	0	0	0	0	0	0	105	0	420	1363
7:00 AM	0	58	15	0	97	153	0	0	0	0	0	0	0	0	92	0	415	1493
7:15 AM	0	81	11	0	142	209	0	0	0	0	0	0	0	0	98	0	541	1734
7:30 AM	0	104	19	0	153	159	0	0	0	0	0	0	0	0	111	0	546	1922
7:45 AM	0	102	18	0	117	147	0	0	0	0	0	0	0	0	150	0	535	2037
8:00 AM	0	97	14	0	110	108	0	0	0	0	0	0	0	0	127	0	456	2078
8:15 AM	0	68	14	0	109	112	0	0	0	0	0	0	0	0	81	0	383	1920

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	410	76	0	612	636	0	0	0	0	0	0	0	0	444	0	2184
Heavy Trucks & Buses	0	40	16		52	24	0		0	0	0		0	0	4		136
Pedestrians			0				0				0				0		0
Bicycles & Scooters	0	0	0		0	0	0		0	0	0		0	0	0		0

Comments:

Report generated on 5/12/2022 2:48 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

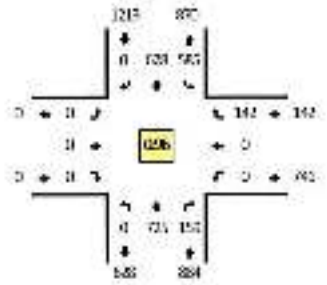
Type of peak hour being reported: Intersection Peak

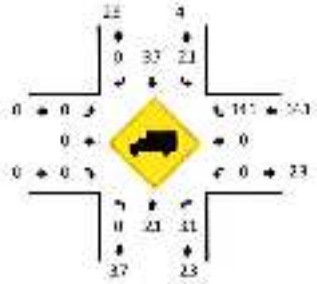
Method for determining peak hour: Total Entering Volume

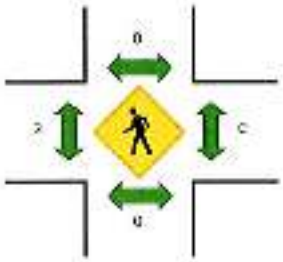
LOCATION: Joslyn Rd -- I-75 EB Ramps
CITY/STATE: Auburn Hills, MI

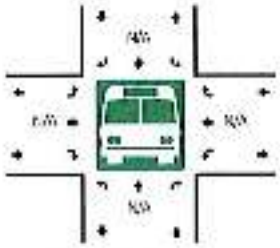
QC JOB #: 15737063
DATE: Wed, Apr 27 2022

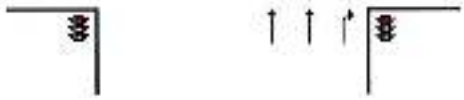
Peak Hour: 3:45 PM -- 4:45 PM
Peak 15-Min: 4:30 PM -- 4:45 PM

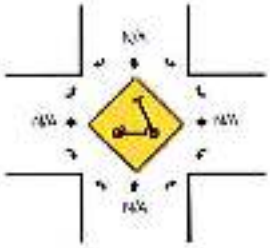












15-Min Count Period Beginning At	Joslyn Rd (Northbound)				Joslyn Rd (Southbound)				I-75 EB Ramps (Eastbound)				I-75 EB Ramps (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
3:00 PM	0	164	38	0	142	182	0	2	0	0	0	0	0	0	27	0	555	
3:15 PM	0	158	23	0	127	138	0	3	0	0	0	0	0	0	39	0	488	
3:30 PM	0	100	32	0	139	141	0	0	0	0	0	0	0	0	41	0	513	
3:45 PM	0	183	25	0	124	164	0	1	0	0	0	0	0	0	38	0	536	2092
4:00 PM	0	190	37	0	150	162	0	1	0	0	0	0	0	0	35	0	585	2102
4:15 PM	0	197	39	0	124	138	0	0	0	0	0	0	0	0	37	0	555	2169
4:30 PM	0	185	58	0	184	184	0	1	0	0	0	0	0	0	31	0	583	2239
4:45 PM	0	156	45	0	125	139	0	2	0	0	0	0	0	0	23	0	488	2191
5:00 PM	0	101	43	0	185	143	0	0	0	0	0	0	0	0	33	0	505	2231
5:15 PM	0	178	16	0	148	135	0	2	0	0	0	0	0	0	36	0	515	2176
5:30 PM	0	150	32	0	152	141	0	0	0	0	0	0	0	0	38	0	513	2106
5:45 PM	0	161	22	0	138	129	0	2	0	0	0	0	0	0	33	0	485	2073

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	620	232	0	730	616	0	4	0	0	0	0	0	0	124	0	2332
Heavy Trucks	0	12	8		8	16	0		0	0	0		0	0	28		72
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 5/13/2022 2:48 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-7212

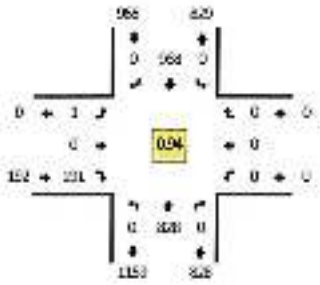
Type of peak hour being reported: Intersection Peak

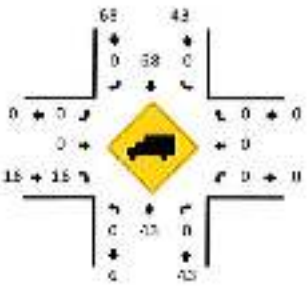
Method for determining peak hour: Total Entering Volume

LOCATION: Joslyn Rd -- I-75 WB Off Ramp
CITY/STATE: Auburn Hills, MI

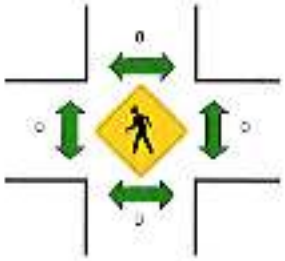
QC JOB #: 15737064
DATE: Thu, Apr 28 2022

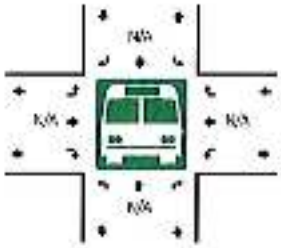
Peak Hour: 7:15 AM -- 8:15 AM
Peak 15 Min: 7:30 AM -- 7:45 AM

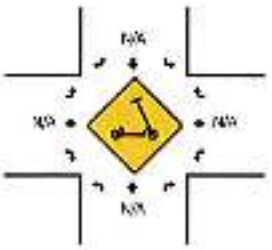




Quality Counts
DATA THAT DRIVES COMMUNITIES







15-Min Count Period Beginning At	Joslyn Rd (Northbound)				Joslyn Rd (Southbound)				I-75 WB Off Ramp (Eastbound)				I-75 WB Off Ramp (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
5:30 AM	0	241	0	0	0	73	0	0	0	0	58	0	0	0	0	0	372	
5:45 AM	0	263	0	0	0	102	0	0	0	0	67	0	0	0	0	0	432	
6:00 AM	0	88	0	0	0	152	0	0	0	0	26	0	0	0	0	0	266	
6:15 AM	0	119	0	0	0	136	0	0	0	0	31	0	0	0	0	0	286	1352
6:30 AM	0	126	0	0	0	184	0	0	0	0	35	0	0	0	0	0	345	1325
6:45 AM	0	179	0	0	0	168	0	0	0	0	43	0	0	0	0	0	390	1283
7:00 AM	0	150	0	0	0	188	0	0	0	0	56	0	0	0	0	0	394	1411
7:15 AM	0	173	0	0	0	264	0	0	0	0	86	0	0	0	0	0	523	1652
7:30 AM	0	209	0	0	0	271	0	0	0	0	48	0	0	0	0	0	528	1835
7:45 AM	0	243	0	0	0	239	0	0	1	0	35	0	0	0	0	0	518	1963
8:00 AM	0	203	0	0	0	194	0	0	0	0	22	0	0	0	0	0	419	1988
8:15 AM	0	154	0	0	0	204	0	0	1	0	32	0	0	0	0	0	391	1856

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	836	0	0	0	1084	0	0	0	0	192	0	0	0	0	0	2112
Heavy Trucks	0	48	0		0	92	0		0	0	4		0	0	0		144
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 5/12/2022 2:48 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

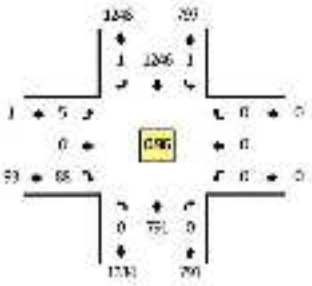
Type of peak hour being reported: Intersection Peak

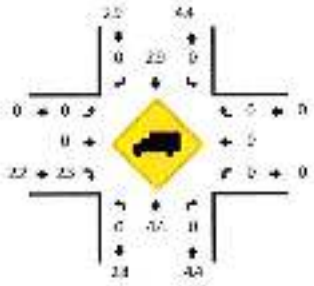
Method for determining peak hour: Total Entering Volume

LOCATION: Joslyn Rd -- I-75 WB Off Ramp
CITY/STATE: Auburn Hills, MI

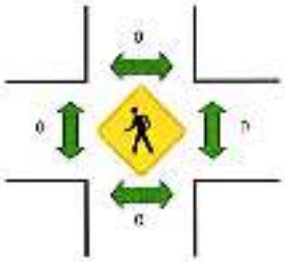
QC JOB #: 15737066
DATE: Wed, Apr 27 2022

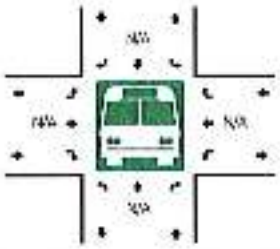
Peak Hour: 3:45 PM - 4:45 PM
Peak 15-Min: 4:30 PM - 4:45 PM

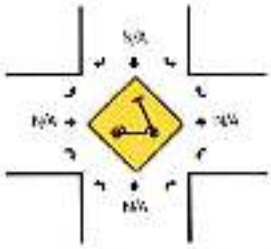




Quality Counts
DATA THAT DRIVES COMMUNITIES







15-Min Count Period Beginning At	Joslyn Rd (Northbound)				Joslyn Rd (Southbound)				I-75 WB Off Ramp (Eastbound)				I-75 WB Off Ramp (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
3:00 PM	0	184	0	0	0	319	0	0	0	0	25	0	0	0	0	0	526	
3:15 PM	0	157	0	0	0	256	0	0	0	0	19	0	0	0	0	0	432	
3:30 PM	0	186	0	0	0	286	0	0	1	0	21	0	0	0	0	0	497	
3:45 PM	0	192	0	0	0	281	0	0	1	0	24	0	0	0	0	0	498	1993
4:00 PM	0	202	0	0	0	305	0	0	2	0	27	0	0	0	0	0	536	2003
4:15 PM	0	199	0	0	0	323	0	0	2	0	19	0	0	0	0	0	543	2074
4:30 PM	0	196	0	0	0	337	1	1	0	0	18	0	0	0	0	0	555	2132
4:45 PM	0	142	0	0	0	283	0	0	0	0	19	0	0	0	0	0	444	2078
5:00 PM	0	214	0	0	0	305	0	0	0	0	17	0	0	0	0	0	536	2078
5:15 PM	0	176	0	0	0	279	0	0	1	0	20	0	0	0	0	0	472	2007
5:30 PM	0	168	0	0	0	290	0	0	0	0	12	0	0	0	0	0	490	1942
5:45 PM	0	143	0	0	0	270	0	0	0	0	22	0	0	0	0	0	435	1933

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	702	0	0	0	1348	4	4	0	0	72	0	0	0	0	0	2220
Heavy Trucks	0	40	0		0	20	0		0	0	4		0	0	0		64
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 5/12/2022 2:48 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

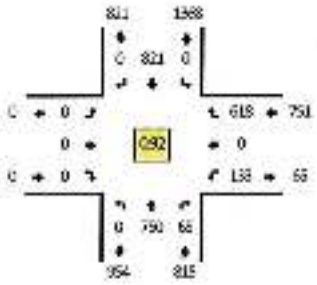
Type of peak hour being reported: Intersection Peak

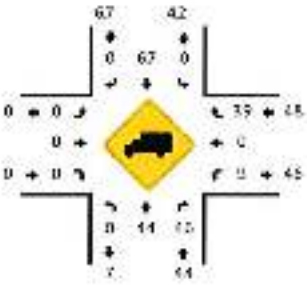
Method for determining peak hour: Total Entering Volume

LOCATION: Joslyn Rd -- I-75 WB Ramps
CITY/STATE: Auburn Hills, MI

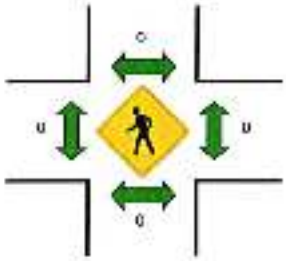
QC JOB #: 15737067
DATE: Thu, Apr 28 2022

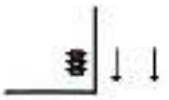
Peak-Hour: 7:15 AM -- 8:15 AM
Peak 15-Min: 7:45 AM -- 8:00 AM

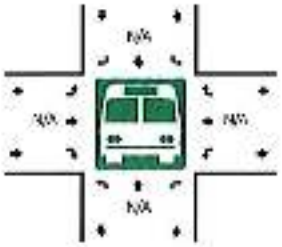


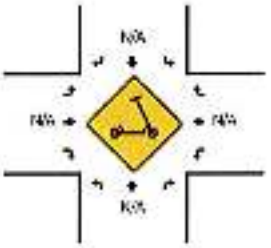


Quality Counts
DATA THAT DRIVES COMMUNITIES









15-Min Count Period Beginning At	Joslyn Rd (Northbound)				Joslyn Rd (Southbound)				I-75 WB Ramps (Eastbound)				I-75 WB Ramps (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
5:30 AM	0	232	3	0	0	53	0	0	0	0	0	0	75	0	150	0	463	
5:45 AM	0	257	6	0	0	63	0	0	0	0	0	0	29	0	144	0	499	
6:00 AM	0	78	9	0	0	120	0	0	0	0	0	0	34	0	84	0	325	
6:15 AM	0	101	16	0	0	122	0	0	0	0	0	0	16	0	68	0	323	1630
6:30 AM	0	114	11	0	0	160	0	0	0	0	0	0	22	0	72	0	379	1526
6:45 AM	0	171	9	0	0	139	0	0	0	0	0	0	31	0	129	0	479	1506
7:00 AM	0	146	4	0	0	168	0	0	0	0	0	0	23	0	125	0	466	1647
7:15 AM	0	160	12	0	0	225	0	0	0	0	0	0	35	0	128	0	560	1884
7:30 AM	0	181	26	0	0	234	0	0	0	0	0	0	40	0	132	0	613	2118
7:45 AM	0	225	20	0	0	199	0	0	0	0	0	0	32	0	175	0	651	2290
8:00 AM	0	184	7	0	0	163	0	0	0	0	0	0	26	0	183	0	563	2387
8:15 AM	0	155	8	0	0	181	0	0	0	0	0	0	28	0	143	0	515	2342

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	900	80	0	0	796	0	0	0	0	0	0	128	0	700	0	2604
Heavy Trucks Buses	0	36	8		0	60	0		0	0	0		0	0	36		132
Pedestrians		0				0				0				0			0
Bicycles Scooters	0	0	0		0	0	0		0	0	0		0	0	0		0

Comments:

Report generated on 5/12/2022 2:48 PM

SOURCE: Quality Counts, LLC [http://www.qualitycounts.net] 1-877-580-2212

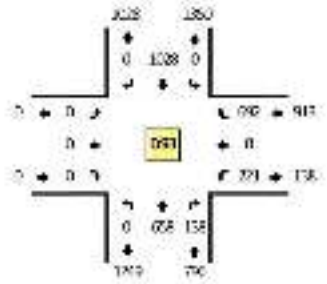
Type of peak hour being reported: Intersection Peak

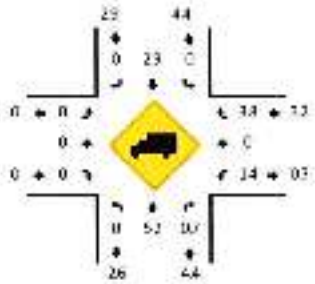
Method for determining peak hour: Total Entering Volume

LOCATION: Joslyn Rd -- I-75 WB Ramps
CITY/STATE: Auburn Hills, MI

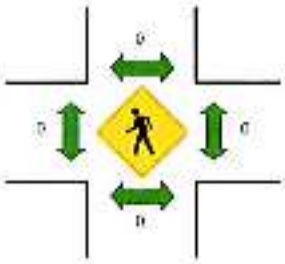
QC JOB #: 15737069
DATE: Wed, Apr 27 2022

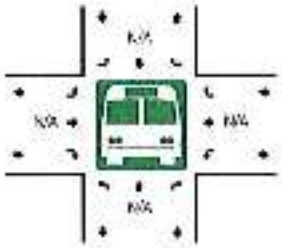
Peak-Hour: 3:45 PM -- 4:45 PM
Peak 15-Min: 4:30 PM -- 4:45 PM

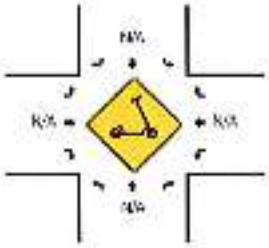




Quality Counts
DATA THAT DRIVES COMMUNITIES







15-Min Count Period Beginning At	Joslyn Rd (Northbound)				Joslyn Rd (Southbound)				I-75 WB Ramps (Eastbound)				I-75 WB Ramps (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
3:00 PM	0	132	48	0	0	255	0	0	0	0	0	0	56	0	147	0	638	
3:15 PM	0	155	47	0	0	216	0	0	0	0	0	0	59	0	159	0	616	
3:30 PM	0	133	52	0	0	223	0	0	0	0	0	0	66	0	188	0	662	
3:45 PM	0	162	35	0	0	225	0	0	0	0	0	0	52	0	167	0	641	2557
4:00 PM	0	161	38	0	0	241	0	0	0	0	0	0	60	0	159	0	659	2578
4:15 PM	0	169	32	0	0	266	0	0	0	0	0	0	60	0	174	0	701	2663
4:30 PM	0	166	33	0	0	296	0	0	0	0	0	0	49	0	192	0	736	2737
4:45 PM	0	110	31	0	0	219	0	0	0	0	0	0	55	0	187	0	592	2678
5:00 PM	0	174	46	0	0	255	0	0	0	0	0	0	45	0	191	0	711	2730
5:15 PM	0	159	24	0	0	223	0	0	0	0	0	0	54	0	248	0	708	2729
5:30 PM	0	165	23	0	0	256	0	0	0	0	0	0	49	0	166	0	659	2832
5:45 PM	0	132	11	0	0	225	0	0	0	0	0	0	51	0	164	0	583	2833

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	664	132	0	0	1184	0	0	0	0	0	0	196	0	768	0	2944
Heavy Trucks	0	44	4		0	16	0		0	0	0		4	0	32		100
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 5/12/2022 2:48 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

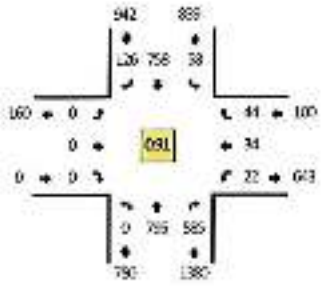
Type of peak hour being reported: Intersection Peak

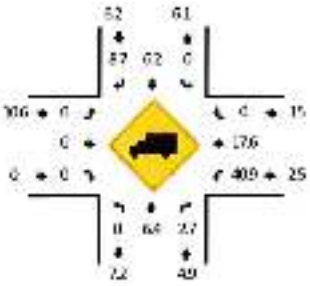
Method for determining peak hour: Total Entering Volume

LOCATION: Joslyn Rd -- Harmon Rd/I-75 WB On Ramp
CITY/STATE: Auburn Hills, MI

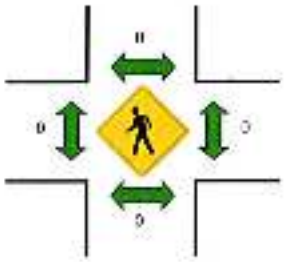
QC JOB #: 15737070
DATE: Thu, Apr 28 2022

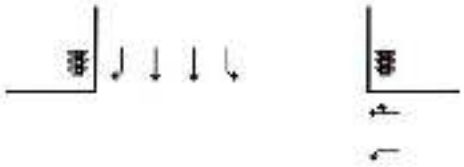
Peak-Hour: 7:30 AM -- 8:30 AM
Peak 15-Min: 7:45 AM -- 8:00 AM

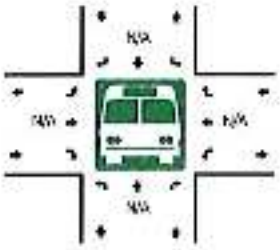


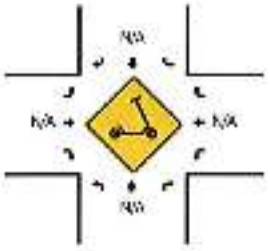


Quality Counts
DATA THAT DRIVES COMMUNITIES









15-Min Count Period Beginning At	Joslyn Rd (Northbound)				Joslyn Rd (Southbound)				Harmon Rd/I-75 WB On Ramp (Eastbound)				Harmon Rd/I-75 WB On Ramp (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
5:30 AM	0	275	107	0	4	48	1	0	0	0	0	0	4	2	1	0	442	
5:45 AM	0	266	137	0	6	61	7	0	0	0	0	0	6	3	5	0	491	
6:00 AM	0	105	60	0	10	99	8	0	0	0	0	0	23	5	0	0	314	
6:15 AM	0	108	63	0	5	109	8	0	0	0	0	0	13	5	2	0	313	1560
6:30 AM	0	107	76	0	6	132	12	1	0	0	0	0	30	15	5	0	384	1502
6:45 AM	0	384	112	0	15	132	16	0	0	0	0	0	8	6	7	0	476	1489
7:00 AM	0	363	105	0	5	159	18	0	0	0	0	0	7	9	7	0	473	1648
7:15 AM	0	153	138	0	5	217	17	0	0	0	0	0	7	8	4	0	541	1876
7:30 AM	0	196	118	0	12	224	33	0	0	0	0	0	9	13	6	0	605	2097
7:45 AM	0	214	184	0	19	197	24	0	0	0	0	0	9	9	11	0	667	2286
8:00 AM	0	205	163	0	13	166	26	0	0	0	0	0	4	6	16	0	599	2412
8:15 AM	0	180	120	0	14	171	43	0	0	0	0	0	6	6	11	0	551	2422

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	856	736	0	76	788	96	0	0	0	0	0	36	36	44	0	2668
Heavy Trucks	0	40	20		0	52	20		0	0	0		8	4	0		144
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 5/12/2022 2:48 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

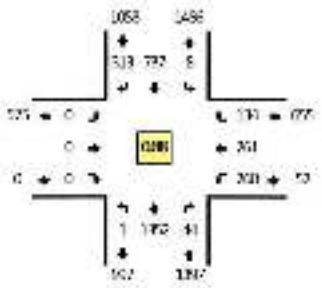
Type of peak hour being reported: Intersection Peak

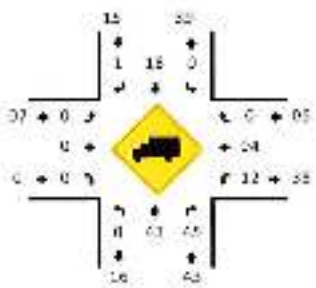
Method for determining peak hour: Total Entering Volume

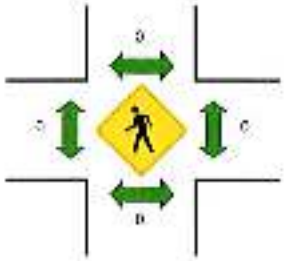
LOCATION: Joslyn Rd -- Harmon Rd/I-75 WB On Ramp
CITY/STATE: Auburn Hills, MI

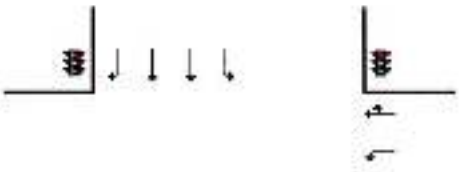
QC JOB #: 15737072
DATE: Wed, Apr 27 2022

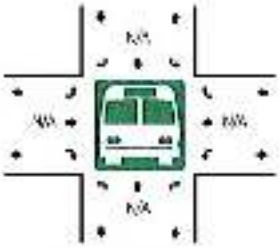
Peak-Hour: 4:30 PM -- 5:30 PM
Peak 15-Min: 4:30 PM -- 4:45 PM

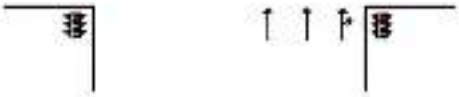


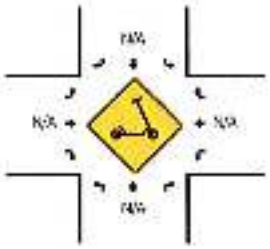












15-Min Count Period Beginning At	Joslyn Rd (Northbound)				Joslyn Rd (Southbound)				Harmon Rd/I-75 WB On Ramp (Eastbound)				Harmon Rd/I-75 WB On Ramp (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
3:00 PM	0	248	26	0	6	202	93	0	0	0	0	0	54	83	30	0	742	
3:15 PM	0	307	17	0	6	188	80	0	0	0	0	0	77	99	18	0	687	
3:30 PM	0	307	18	0	5	153	90	0	0	0	0	0	60	67	35	0	744	
3:45 PM	0	309	18	0	2	185	62	0	0	0	0	0	40	55	17	0	668	2836
4:00 PM	0	310	5	0	6	182	78	0	0	0	0	0	58	89	30	0	758	2852
4:15 PM	0	330	13	0	1	207	70	0	0	0	0	0	58	57	18	0	754	2924
4:30 PM	0	341	12	0	0	210	95	0	0	0	0	0	87	89	46	0	880	3060
4:45 PM	1	269	11	0	5	108	68	0	0	0	0	0	54	53	24	0	655	3045
5:00 PM	0	354	12	0	1	196	79	0	0	0	0	0	59	65	35	0	801	3088
5:15 PM	0	388	9	0	2	163	71	0	0	0	0	0	60	54	29	0	776	3110
5:30 PM	0	318	13	0	6	191	52	0	0	0	0	0	46	49	31	0	706	2936
5:45 PM	0	280	11	0	2	183	51	0	0	0	0	0	42	35	20	0	624	2907

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	1364	48	0	0	840	380	0	0	0	0	0	348	356	184	0	3520
Heavy Trucks	0	76	4		0	16	8		0	0	0		0	4	0		108
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 5/12/2022 2:48 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Wade Trim

25251 Northline Road
Taylor, MI 48184

GM Orion
Giddings Rd & Delta Ct
4/26/2022
taken from Quality Counts video

File Name : Giddings-Delta_20220426_PM
Site Code : 15737045
Start Date : 4/26/2022
Page No : 1

Groups Printed- Unshifted - Heavy Trucks

	Giddings Rd From North					Delta Ct From East					Giddings Rd From South					Delta Ct From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
02:30 PM	0	63	0	0	63	94	0	66	0	160	0	251	1	0	252	0	0	0	0	0	475
02:45 PM	1	64	0	0	65	45	0	55	0	100	0	109	0	0	109	0	0	0	0	0	274
Total	1	127	0	0	128	139	0	121	0	260	0	360	1	0	361	0	0	0	0	0	749
03:00 PM	0	52	0	0	52	9	0	4	0	13	0	79	0	0	79	0	0	0	0	0	144
03:15 PM	0	61	0	0	61	9	0	4	0	13	0	82	0	0	82	1	0	0	0	1	157
03:30 PM	0	75	1	0	76	1	0	1	0	2	0	81	0	0	81	0	0	0	0	0	159
03:45 PM	0	52	0	0	52	3	0	3	0	6	0	72	0	0	72	0	0	0	0	0	130
Total	0	240	1	0	241	22	0	12	0	34	0	314	0	0	314	1	0	0	0	1	590
04:00 PM	0	54	0	0	54	1	0	1	0	2	0	69	0	0	69	0	0	0	0	0	125
Grand Total	1	421	1	0	423	162	0	134	0	296	0	743	1	0	744	1	0	0	0	1	1464
Apprch %	0.2	99.5	0.2	0		54.7	0	45.3	0		0	99.9	0.1	0		100	0	0	0		
Total %	0.1	28.8	0.1	0	28.9	11.1	0	9.2	0	20.2	0	50.8	0.1	0	50.8	0.1	0	0	0	0.1	
Unshifted	0	414	1	0	415	162	0	134	0	296	0	736	1	0	737	1	0	0	0	1	1449
% Unshifted	0	98.3	100	0	98.1	100	0	100	0	100	0	99.1	100	0	99.1	100	0	0	0	100	99
Heavy Trucks	1	7	0	0	8	0	0	0	0	0	0	7	0	0	7	0	0	0	0	0	15
% Heavy Trucks	100	1.7	0	0	1.9	0	0	0	0	0	0	0.9	0	0	0.9	0	0	0	0	0	1

Wade Trim
25251 Northline Road
Taylor, MI 48184

File Name : Giddings-Delta_20220426_PM
Site Code : 15737045
Start Date : 4/26/2022
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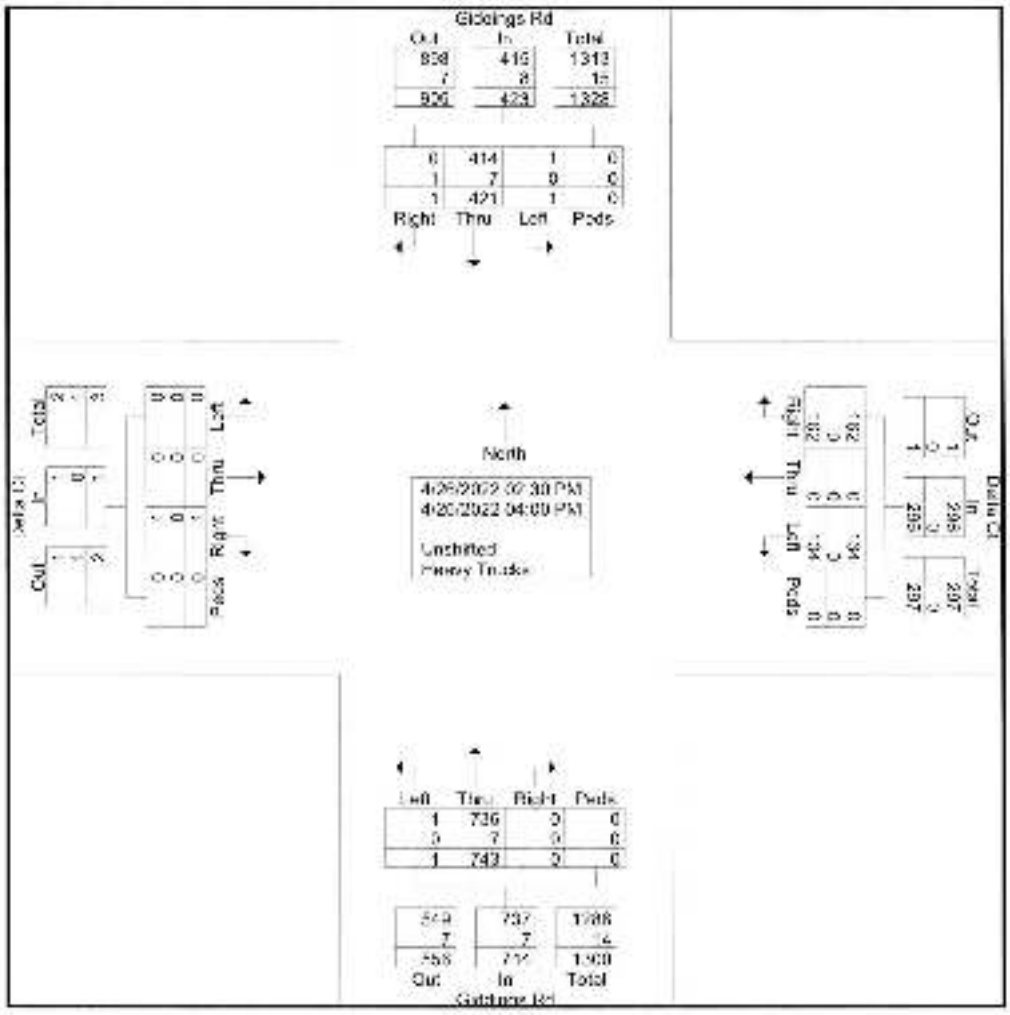

Wade Trim
25251 Northline Road
Taylor, MI 48184

File Name : Giddings-Delta_20220426_PM
Site Code : 15737045
Start Date : 4/26/2022
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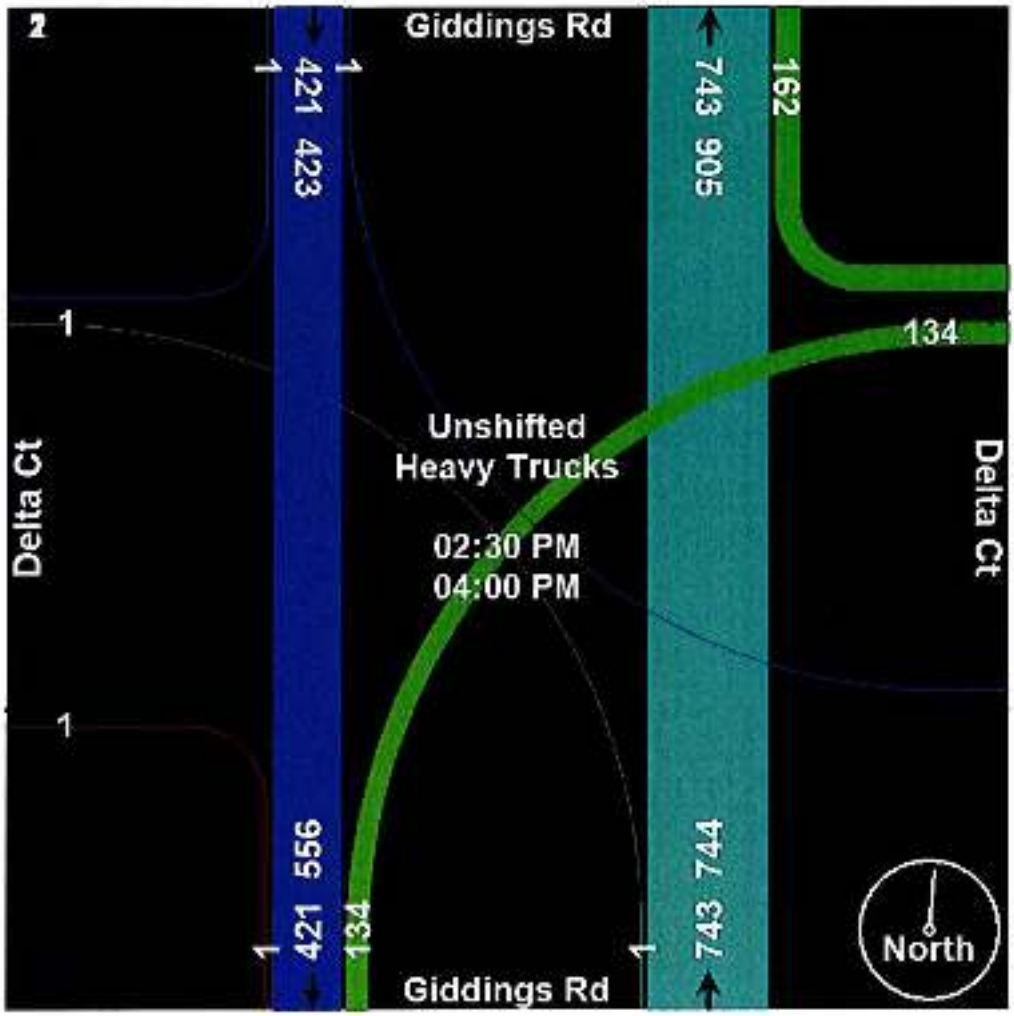
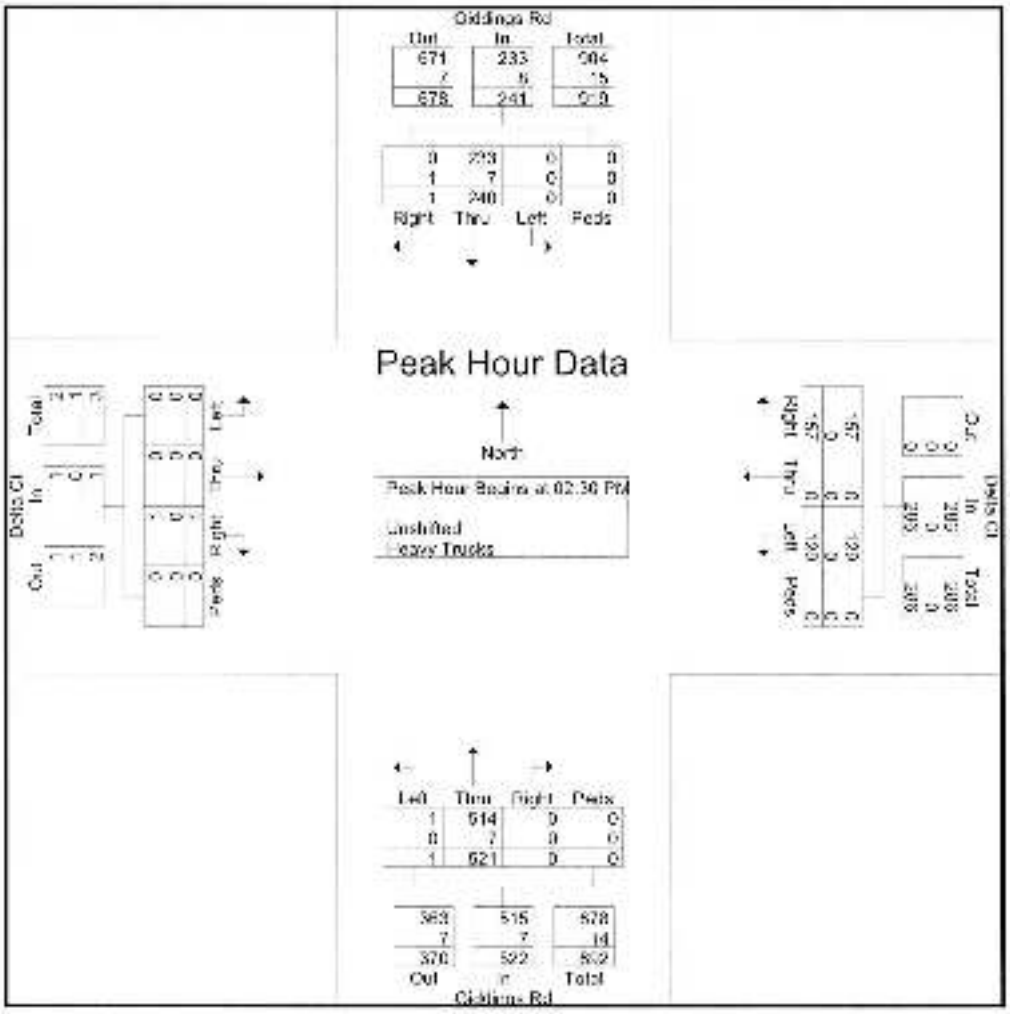


Wade Trim
25251 Northline Road
Taylor, MI 48184

File Name : Giddings-Delta_20220426_PM
Site Code : 15737045
Start Date : 4/26/2022
Page No : 4

	Giddings Rd From North					Delta Ct From East					Giddings Rd From South					Delta Ct From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 03:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 02:30 PM																					
02:30 PM	0	63	0	0	63	94	0	66	0	160	0	251	1	0	252	0	0	0	0	0	475
02:45 PM	1	64	0	0	65	45	0	55	0	100	0	109	0	0	109	0	0	0	0	0	274
03:00 PM	0	52	0	0	52	9	0	4	0	13	0	79	0	0	79	0	0	0	0	0	144
03:15 PM	0	61	0	0	61	9	0	4	0	13	0	82	0	0	82	1	0	0	0	1	157
Total Volume	1	240	0	0	241	157	0	129	0	286	0	521	1	0	522	1	0	0	0	1	1050
% App. Total	0.4	99.6	0	0		54.9	0	45.1	0		0	99.8	0.2	0		100	0	0	0		
PHF	.250	.938	.000	.000	.927	.418	.000	.489	.000	.447	.000	.519	.250	.000	.518	.250	.000	.000	.000	.250	.553
Unshifted	0	233	0	0	233	157	0	129	0	286	0	514	1	0	515	1	0	0	0	1	1035
% Unshifted	0	97.1	0	0	96.7	100	0	100	0	100	0	98.7	100	0	98.7	100	0	0	0	100	98.6
Heavy Trucks	1	7	0	0	8	0	0	0	0	0	0	7	0	0	7	0	0	0	0	0	15
% Heavy Trucks	100	2.9	0	0	3.3	0	0	0	0	0	0	1.3	0	0	1.3	0	0	0	0	0	1.4



Wade Trim
25251 Northline Road
Taylor, MI 48184

File Name : Giddings-Delta_20220426_PM
Site Code : 15737045
Start Date : 4/26/2022
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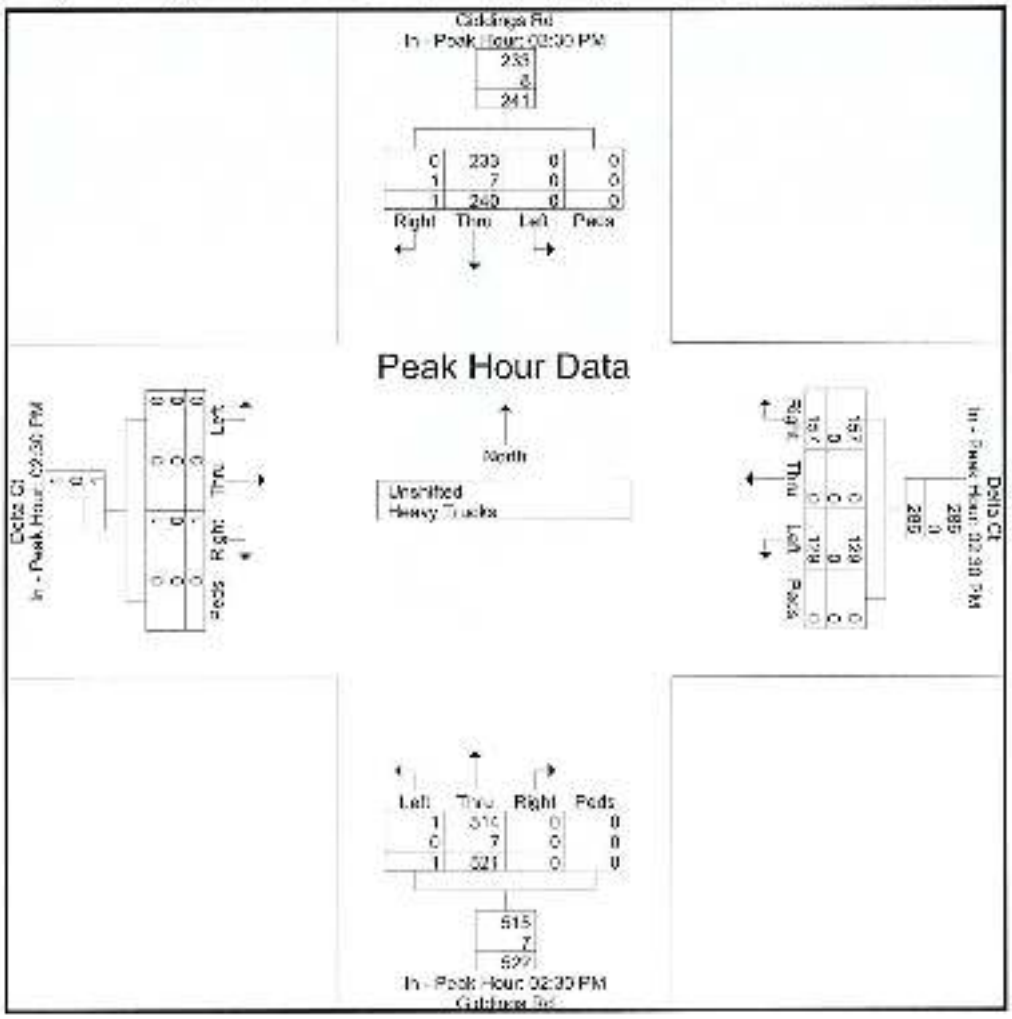
	Giddings Rd From North					Delta Ct From East					Giddings Rd From South					Delta Ct From West				
Start Time	Right	Thru	Left	Peds	[illegible]	Right	Thru	Left	Peds	[illegible]	Right	Thru	Left	Peds	[illegible]	Right	Thru	Left	Peds	[illegible]
Peak Hour Analysis From 02:30 PM to 03:15 PM - Peak 1 of 1																				
Peak Hour for Each Approach Begins at:																				
[illegible]																				
+0 mins.	0	63	0	0	63	94	0	66	0	160	0	251	1	0	252	0	0	0	0	0
+15 mins.	1	64	0	0	65	45	0	55	0	100	0	109	0	0	109	0	0	0	0	0
+30 mins.	0	52	0	0	52	9	0	4	0	13	0	79	0	0	79	0	0	0	0	0
+45 mins.	0	61	0	0	61	9	0	4	0	13	0	82	0	0	82	1	0	0	0	1
Total Volume	1	240	0	0	241	157	0	129	0	286	0	521	1	0	522	1	0	0	0	1
% App. Total	0.4	99.6	0	0		54.9	0	45.1	0		0	99.8	0.2	0		100	0	0	0	
PHF	.250	.938	.000	.000	.927	.418	.000	.489	.000	.447	.000	.519	.250	.000	.518	.250	.000	.000	.000	.250
Unshifted	0	233	0	0	233	157	0	129	0	286	0	514	1	0	515	1	0	0	0	1
% Unshifted	0	97.1	0	0	96.7	100	0	100	0	100	0	98.7	100	0	98.7	100	0	0	0	100
Heavy Trucks	1	7	0	0	8	0	0	0	0	0	0	7	0	0	7	0	0	0	0	0
% Heavy Trucks	100	2.9	0	0	3.3	0	0	0	0	0	0	1.3	0	0	1.3	0	0	0	0	0



Wade Trim
25251 Northline Road
Taylor, MI 48184

File Name : Giddings-Delta_20220426_PM
Site Code : 15737045
Start Date : 4/26/2022
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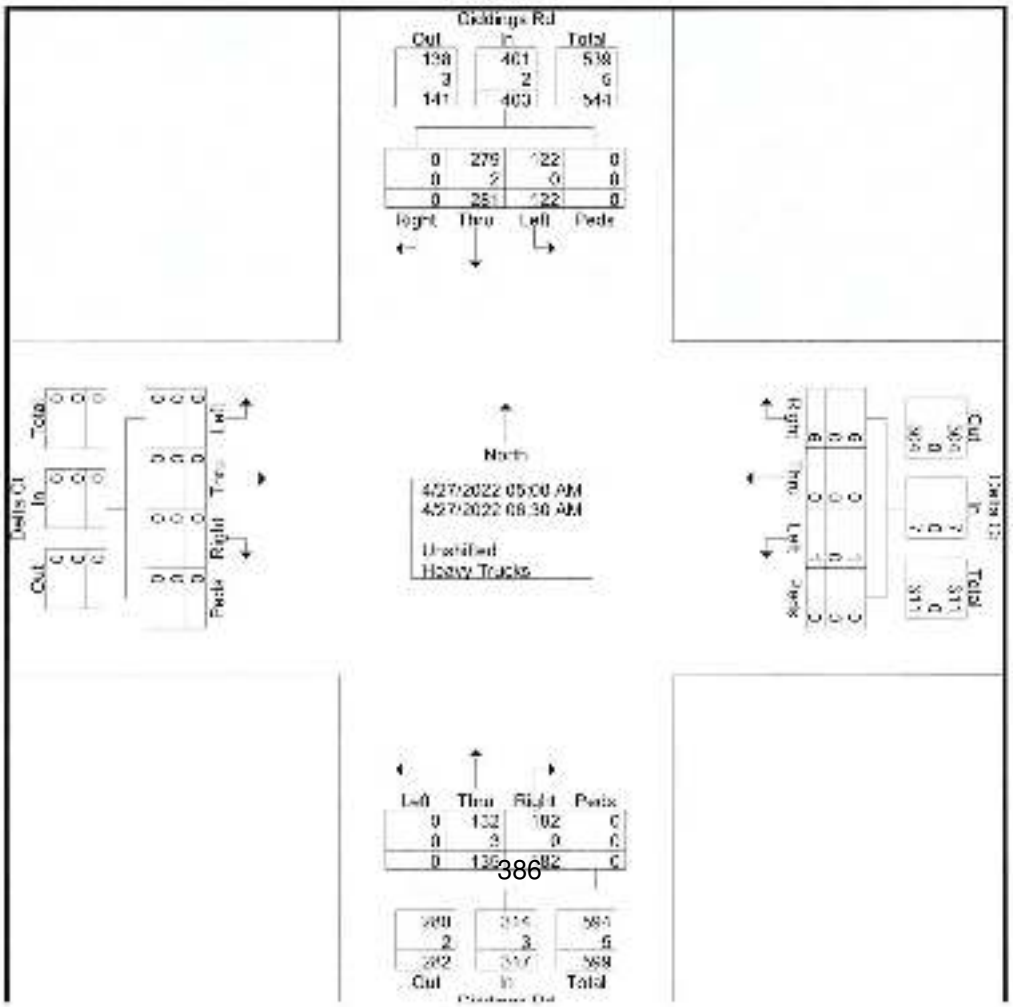
Wade Trim
25251 Northline Road
Taylor, MI 48184

GM Orion
Giddings Rd & Delta Ct
4/27/2022
taken from Quality Counts video

File Name : Giddings-Delta_20220427_AM
Site Code : 15737043
Start Date : 4/27/2022
Page No : 1

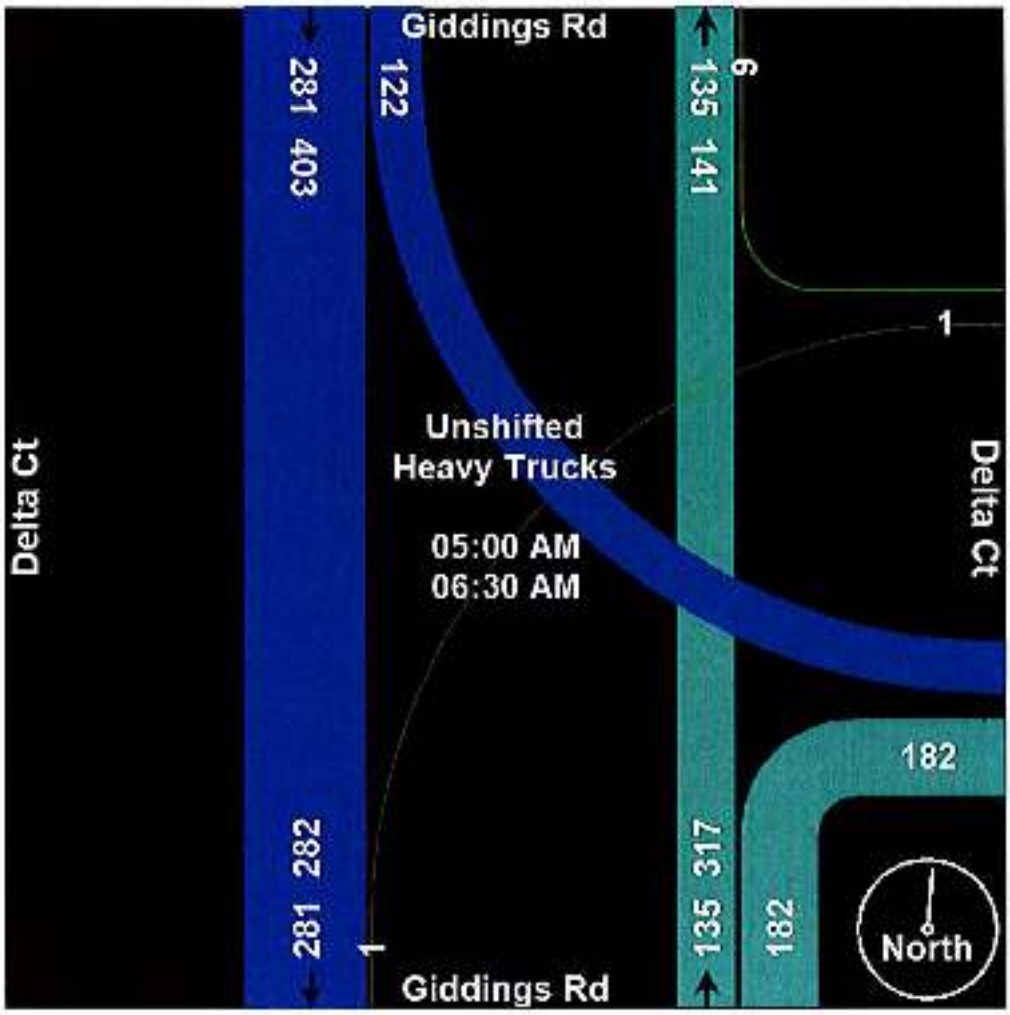
Groups Printed- Unshifted - Heavy Trucks

	Giddings Rd From North					Delta Ct From East					Giddings Rd From South					Delta Ct From West					
Start Time	Right	Thru	Left	Peds	Ap. Total	Right	Thru	Left	Peds	Ap. Total	Right	Thru	Left	Peds	Ap. Total	Right	Thru	Left	Peds	Ap. Total	Int. Total
05:00 AM	0	25	14	0	37	0	0	0	0	0	10	7	0	0	17	0	0	0	0	0	54
05:15 AM	0	32	19	0	51	1	0	0	0	1	28	12	0	0	40	0	0	0	0	0	92
05:30 AM	0	63	40	0	103	1	0	0	0	1	58	27	0	0	85	0	0	0	0	0	189
05:45 AM	0	69	42	0	111	1	0	1	0	2	79	21	0	0	100	0	0	0	0	0	213
Total	0	187	115	0	302	3	0	1	0	4	175	67	0	0	242	0	0	0	0	0	548
06:00 AM	0	26	4	0	30	1	0	0	0	1	5	23	0	0	28	0	0	0	0	0	59
06:15 AM	0	32	3	0	35	2	0	0	0	2	0	21	0	0	21	0	0	0	0	0	58
06:30 AM	0	36	0	0	36	0	0	0	0	0	2	24	0	0	26	0	0	0	0	0	62
Grand Total	0	281	122	0	403	6	0	1	0	7	182	135	0	0	317	0	0	0	0	0	727
Approach %	0	69.7	30.3	0		85.7	0	14.3	0		57.4	42.6	0	0		0	0	0	0		
Total %	0	38.7	16.8	0	55.4	0.8	0	0.1	0	1	25	18.6	0	0	43.6	0	0	0	0	0	
Unshifted	0	279	122	0	401	6	0	1	0	7	182	132	0	0	314	0	0	0	0	0	722
% Unshifted	0	99.3	100	0	99.5	100	0	100	0	100	100	97.8	0	0	99.1	0	0	0	0	0	99.3
Heavy Trucks	0	2	0	0	2	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	5
% Heavy Trucks	0	0.7	0	0	0.5	0	0	0	0	0	0	2.2	0	0	0.9	0	0	0	0	0	0.7



Wade Trim
25251 Northline Road
Taylor, MI 48184

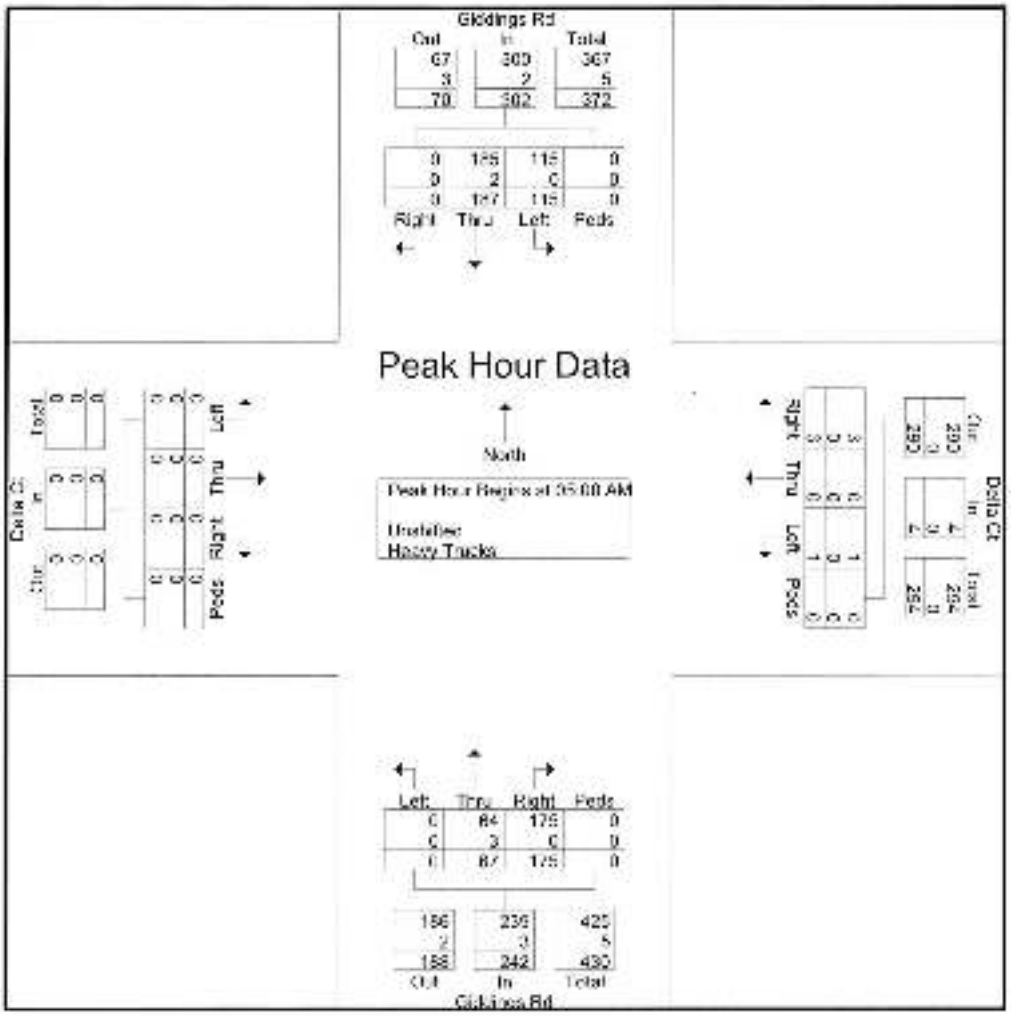
File Name : Giddings-Delta_20220427_AM
Site Code : 15737043
Start Date : 4/27/2022
Page No : 2



Wade Trim
25251 Northline Road
Taylor, MI 48180

File Name : Giddings-Delta_20220427_AM
Site Code : 15737043
Start Date : 4/27/2022
Page No : 3

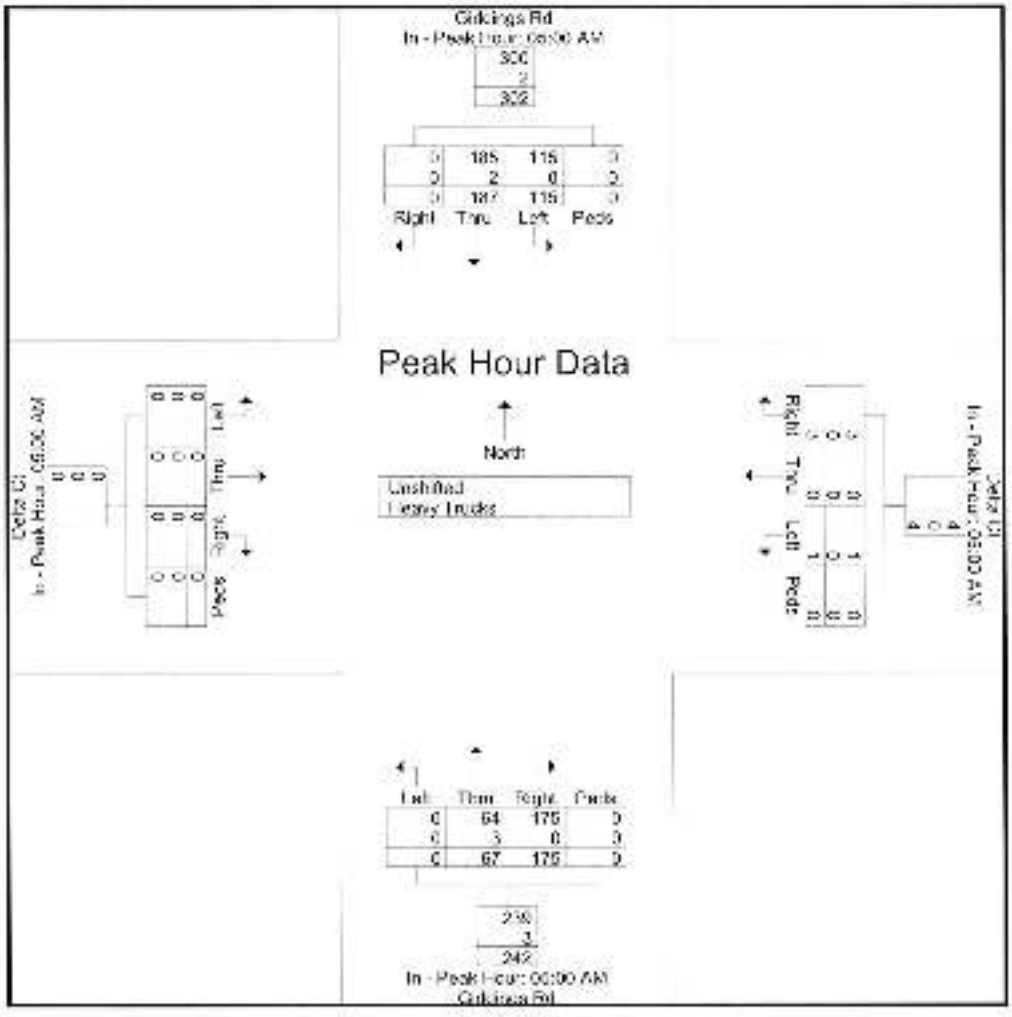
Start Time	Giddings Rd From North Right	Thru	Left	Peds	App. Total	Delta Ct From East Right	Thru	Left	Peds	App. Total	Giddings Rd From South Right	Thru	Left	Peds	App. Total	Delta Ct From West Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 05:00 AM to 05:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 AM																					
05:00 AM	0	23	14	0	37	0	0	0	0	0	10	7	0	0	17	0	0	0	0	0	54
05:15 AM	0	32	19	0	51	1	0	0	0	1	28	12	0	0	40	0	0	0	0	0	92
05:30 AM	0	63	40	0	103	1	0	0	0	1	58	27	0	0	85	0	0	0	0	0	189
05:45 AM	0	69	42	0	111	1	0	1	0	2	79	21	0	0	100	0	0	0	0	0	213
Total Volume	0	187	115	0	302	3	0	1	0	4	175	67	0	0	242	0	0	0	0	0	548
% App. Total	0	61.9	38.1	0		75	0	25	0		72.3	27.7	0	0		0	0	0	0		
PHF	.000	.678	.686	.000	.680	.750	.000	.250	.000	.500	.554	.620	.000	.000	.605	.000	.000	.000	.000	.000	.643
Unshifted	0	185	115	0	300	3	0	1	0	4	175	64	0	0	239	0	0	0	0	0	543
% Unshifted	0	98.9	100	0	99.3	100	0	100	0	100	100	95.5	0	0	98.8	0	0	0	0	0	99.1
Heavy Trucks	0	2	0	0	2	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	5
% Heavy Trucks	0	1.1	0	0	0.7	0	0	0	0	0	0	4.5	0	0	1.2	0	0	0	0	0	0.9



Wade Trim
25251 Northline Road
Taylor, MI 48184

File Name : Giddings-Delta_20220427_AM
Site Code : 15737043
Start Date : 4/27/2022
Page No : 4

	Giddings Rd From North					Delta Ct From East					Giddings Rd From South					Delta Ct From West					
Start Time	Right	Thru	Left	Peds	App. Tot.	Right	Thru	Left	Peds	App. Tot.	Right	Thru	Left	Peds	App. Tot.	Right	Thru	Left	Peds	App. Tot.	Int. Tot.
Peak Hour Analysis From 05:00 AM to 05:45 AM - Peak 1 of 1																					
Peak Hour for Each Approach Begins at:																					
	05:30 AM					05:00 AM					05:00 AM					05:00 AM					
+0 mins.	0	23	14	0	37	0	0	0	0	0	10	7	0	0	17	0	0	0	0	0	0
+15 mins.	0	32	19	0	51	1	0	0	0	1	28	12	0	0	40	0	0	0	0	0	0
+30 mins.	0	63	40	0	103	1	0	0	0	1	58	27	0	0	85	0	0	0	0	0	0
+45 mins.	0	69	42	0	111	1	0	1	0	2	79	21	0	0	100	0	0	0	0	0	0
Total Volume	0	187	115	0	302	3	0	1	0	4	175	67	0	0	242	0	0	0	0	0	0
% App. Total	0	61.9	38.1	0		75	0	25	0		72.3	27.7	0	0		0	0	0	0		
PHF	.000	.678	.685	.000	.680	.750	.000	.250	.000	.500	.554	.628	.000	.000	.605	.000	.000	.000	.000	.000	
Unshifted	0	186	115	0	300	3	0	1	0	4	175	64	0	0	239	0	0	0	0	0	0
% Unshifted	0	98.9	100	0	99.3	100	0	100	0	100	100	95.5	0	0	98.8	0	0	0	0	0	0
Heavy Trucks	0	2	0	0	2	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	0
% Heavy Trucks	0	1.1	0	0	0.7	0	0	0	0	0	0	4.5	0	0	1.2	0	0	0	0	0	0



Wade Trim
25251 Northline Road
Taylor, MI 48184

File Name : Giddings-Delta_20220427_AM
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Wade Trim
25251 Northline Road
Taylor, MI 48184

GM Orion
Giddings Rd & Gate 3
4/26/2022
taken from Quality Counts video

File Name : Giddings-Gate3_20220426_PM
Site Code : 15737042
Start Date : 4/26/2022
Page No : 1

Groups Printed- Unshifted - Heavy Trucks

	Giddings Rd From North					Gate 3 From East					Giddings Rd From South					Gate 3 From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	Int. Total	Int. Total
02:30 PM	0	118	0	0	118	92	0	84	0	176	4	139	0	0	143	0	0	0	0	0	437
02:45 PM	0	114	2	0	116	30	0	44	0	74	3	77	0	0	80	0	0	0	0	0	270
Total	0	232	2	0	234	122	0	128	0	250	7	216	0	0	223	0	0	0	0	0	707
03:00 PM	0	57	1	0	58	7	0	17	0	24	6	71	0	0	77	0	0	0	0	0	159
03:15 PM	0	64	1	0	65	10	0	9	0	19	0	71	0	0	71	0	0	0	0	0	155
03:30 PM	0	75	1	0	76	7	0	6	0	13	0	74	0	0	74	0	0	0	0	0	163
03:45 PM	0	55	0	0	55	3	0	6	0	9	1	69	0	0	70	0	0	0	0	0	134
Total	0	251	3	0	254	27	0	38	0	65	7	285	0	0	292	0	0	0	0	0	611
04:00 PM	0	55	0	0	55	1	0	10	0	11	0	68	0	0	68	0	0	0	0	0	134
Grand Total	0	538	5	0	543	150	0	176	0	326	14	569	0	0	583	0	0	0	0	0	1452
Apprch %	0	99.1	0.9	0		46	0	54	0		2.4	97.6	0	0		0	0	0	0		
Total %	0	37.1	0.3	0	37.4	10.3	0	12.1	0	22.5	1	39.2	0	0	40.2	0	0	0	0	0	
Unshifted	0	531	5	0	536	150	0	176	0	326	14	562	0	0	576	0	0	0	0	0	1138
% Unshifted	0	98.7	100	0	98.7	100	0	100	0	100	100	98.8	0	0	98.8	0	0	0	0	0	99
Heavy Trucks	0	7	0	0	7	0	0	0	0	0	0	7	0	0	7	0	0	0	0	0	14
% Heavy Trucks	0	1.3	0	0	1.3	0	0	0	0	0	0	1.2	0	0	1.2	0	0	0	0	0	1

Wade Trim
25251 Northline Road
Taylor, MI 48184

File Name : Giddings-Gate3_20220426_PM
Site Code : 15737042
Start Date : 4/26/2022
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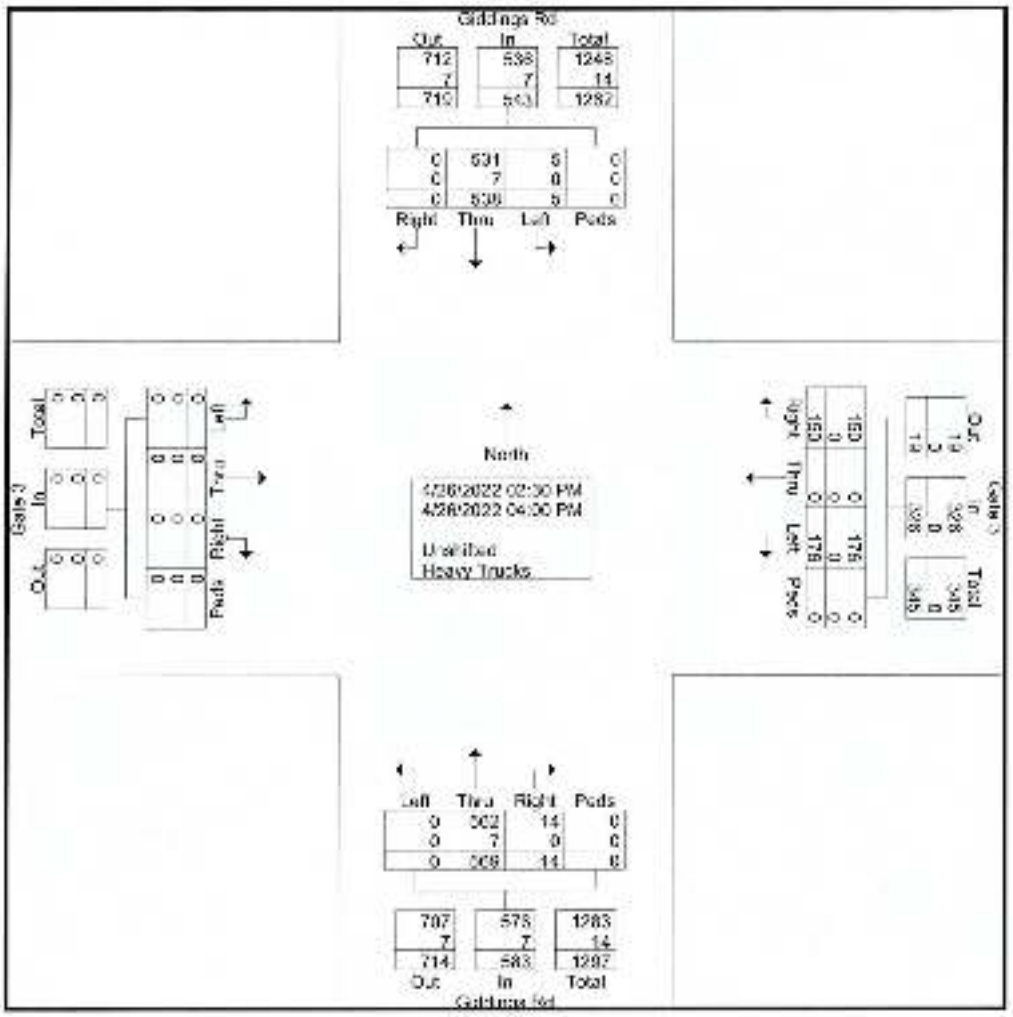

Wade Trim
25251 Northline Road
Taylor, MI 48184

File Name : Giddings-Gate3_20220426_PM
Site Code : 15737042
Start Date : 4/26/2022
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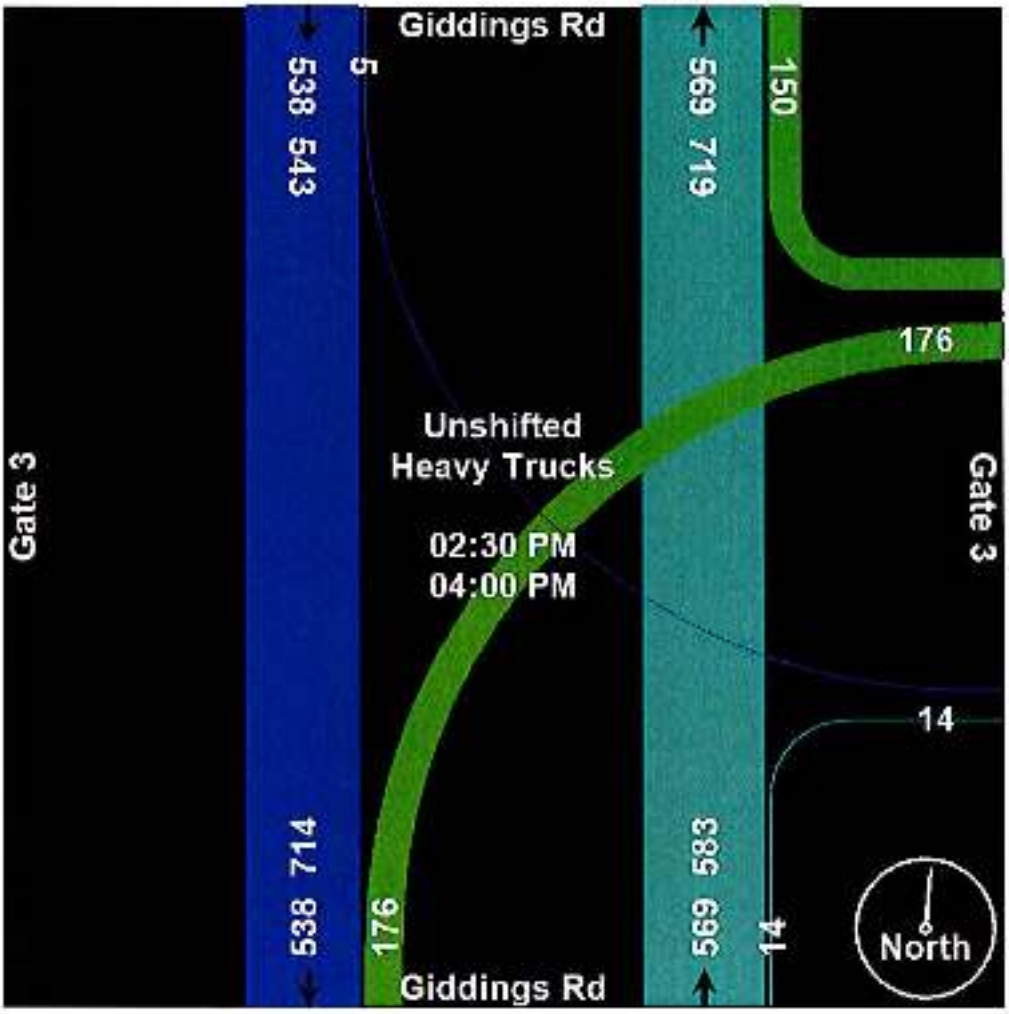

Wade Trim
25251 Northline Road
Taylor, MI 48184

File Name : Giddings-Gate3_20220426_PM
Site Code : 15737042
Start Date : 4/26/2022
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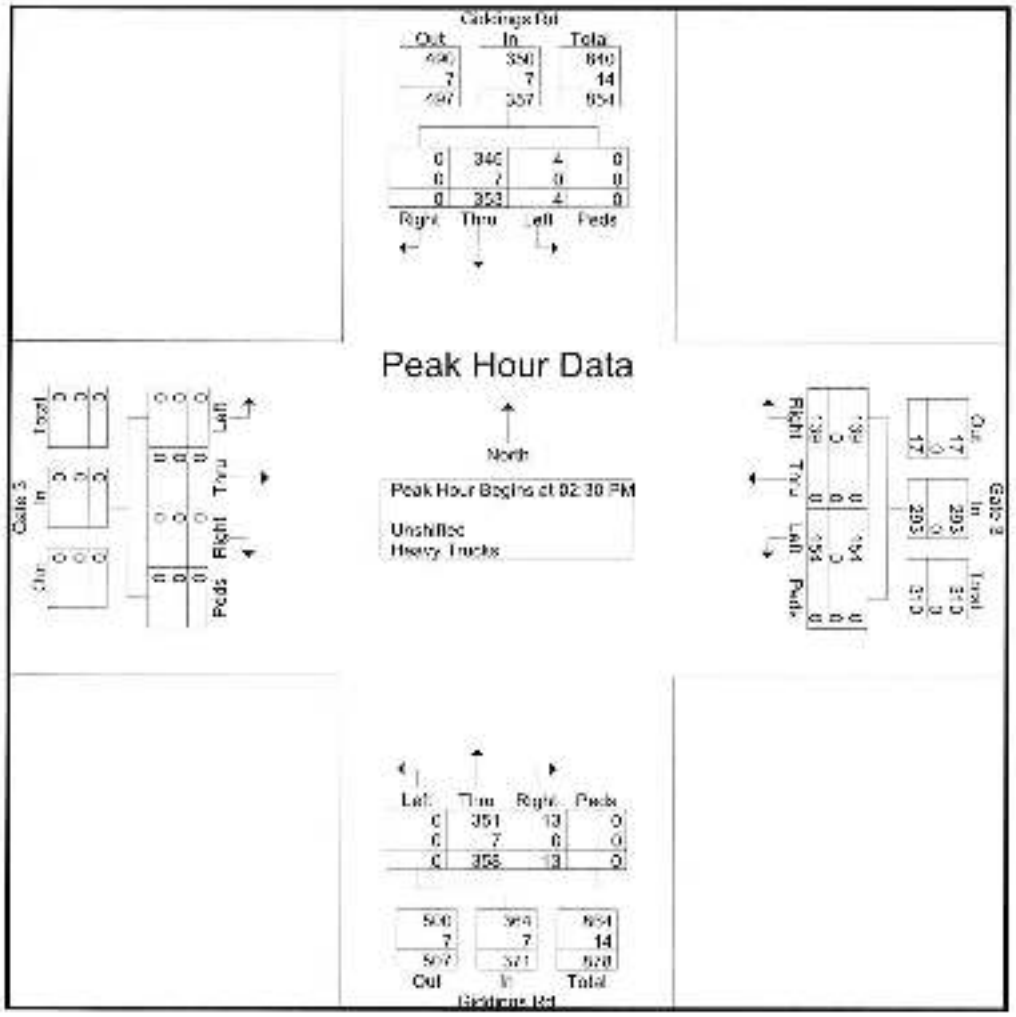
	Giddings Rd From North					Gate 3 From East					Giddings Rd From South					Gate 3 From West					
Start Time	Right	Thru	Left	Peds	App. Tot.	Right	Thru	Left	Peds	App. Tot.	Right	Thru	Left	Peds	App. Tot.	Right	Thru	Left	Peds	App. Tot.	Int. Total
Peak Hour Analysis From 02:30 PM to 03:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 02:30 PM																					
02:30 PM	0	116	0	0	116	92	0	84	0	176	4	139	0	0	143	0	0	0	0	0	437
02:45 PM	0	114	2	0	116	30	0	44	0	74	3	77	0	0	80	0	0	0	0	0	270
03:00 PM	0	57	1	0	58	7	0	17	0	24	6	71	0	0	77	0	0	0	0	0	159
03:15 PM	0	64	1	0	65	10	0	9	0	19	0	71	0	0	71	0	0	0	0	0	155
Total Volume	0	353	4	0	357	139	0	154	0	293	13	358	0	0	371	0	0	0	0	0	1021
% App. Total	0	98.9	1.1	0		47.4	0	52.6	0		3.5	96.5	0	0		0	0	0	0		
PHF	.000	.749	.000	.000	.756	.378	.000	.458	.000	.416	.542	.844	.000	.000	.849	.000	.000	.000	.000	.000	.584
Unshifted	0	346	4	0	350	139	0	154	0	293	13	351	0	0	364	0	0	0	0	0	1007
% Unshifted	0	98.0	100	0	98.0	100	0	100	0	100	100	98.0	0	0	98.1	0	0	0	0	0	98.6
Heavy Trucks	0	7	0	0	7	0	0	0	0	0	0	7	0	0	7	0	0	0	0	0	14
% Heavy Trucks	0	2.0	0	0	2.0	0	0	0	0	0	0	2.0	0	0	1.9	0	0	0	0	0	1.4



Wade Trim
25251 Northline Road
Taylor, MI 48184

File Name : Giddings-Gate3_20220426_PM
Site Code : 15737042
Start Date : 4/26/2022
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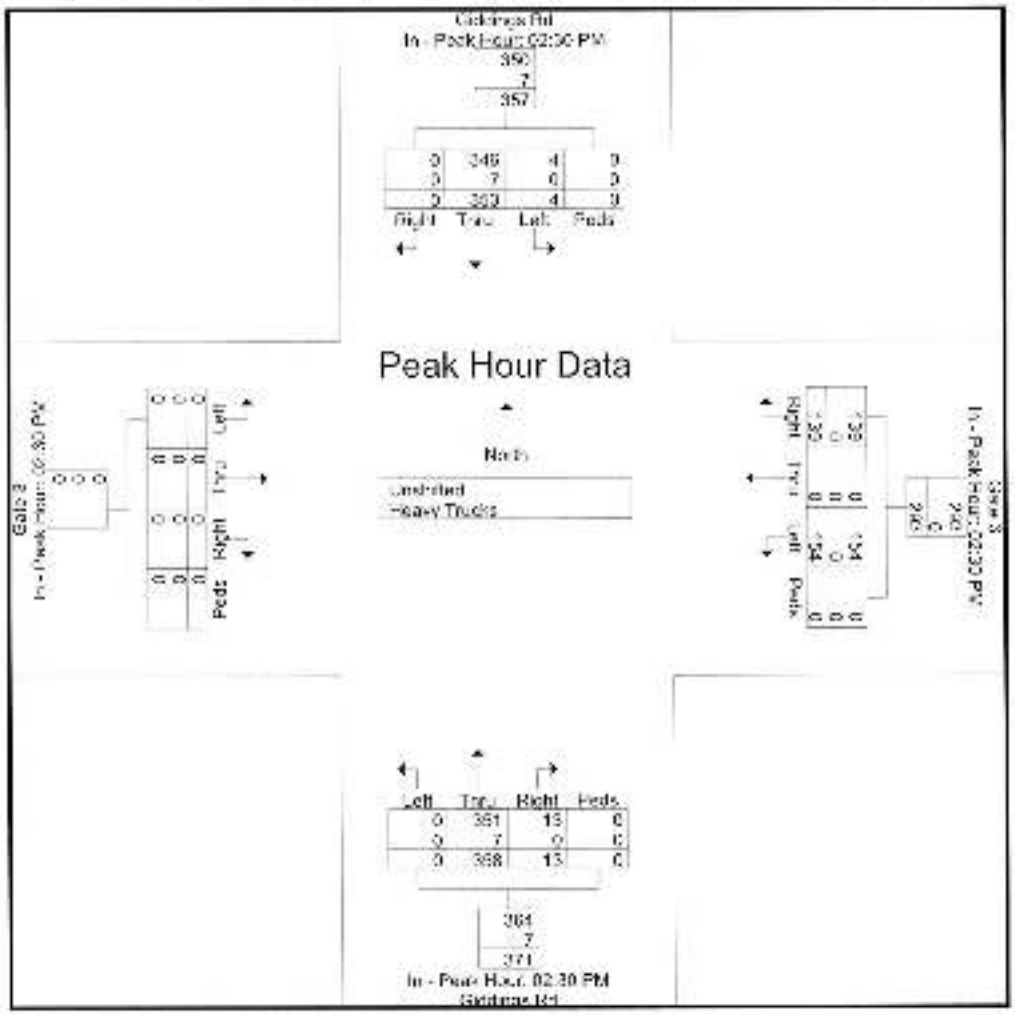
	Giddings Rd From North					Gate 3 From East					Giddings Rd From South					Gate 3 From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 03:45 PM - Peak 1 of 1																					
Peak Hour for Each Approach Begins at:																					
						02:30 PM					02:30 PM										
+0 mins.	0	118	0	0	118	92	0	84	0	176	4	139	0	0	143	0	0	0	0	0	
+15 mins.	0	114	2	0	116	30	0	44	0	74	3	77	0	0	80	0	0	0	0	0	
+30 mins.	0	57	1	0	58	7	0	17	0	24	6	71	0	0	77	0	0	0	0	0	
+45 mins.	0	64	1	0	65	10	0	9	0	19	0	71	0	0	71	0	0	0	0	0	
Total Volume	0	353	4	0	357	139	0	154	0	293	13	358	0	0	371	0	0	0	0	0	
% App. Total	0	98.9	1.1	0		47.4	0	52.6	0		3.5	96.5	0	0		0	0	0	0		
PHF	.000	.746	.500	.000	.756	.378	.000	.438	.000	.416	.542	.644	.000	.000	.649	.000	.000	.000	.000	.000	
Unshifted	0	346	4	0	350	139	0	154	0	293	13	351	0	0	364	0	0	0	0	0	
% Unshifted	0	98	100	0	98	100	0	100	0	100	100	98	0	0	98.1	0	0	0	0	0	
Heavy Trucks	0	7	0	0	7	0	0	0	0	0	0	7	0	0	7	0	0	0	0	0	
% Heavy Trucks	0	2	0	0	2	0	0	0	0	0	0	2	0	0	1.9	0	0	0	0	0	



Wade Trim
25251 Northline Road
Taylor, MI 48184

File Name : Giddings-Gate3_20220426_PM
Site Code : 15737042
Start Date : 4/26/2022
Page No : 6

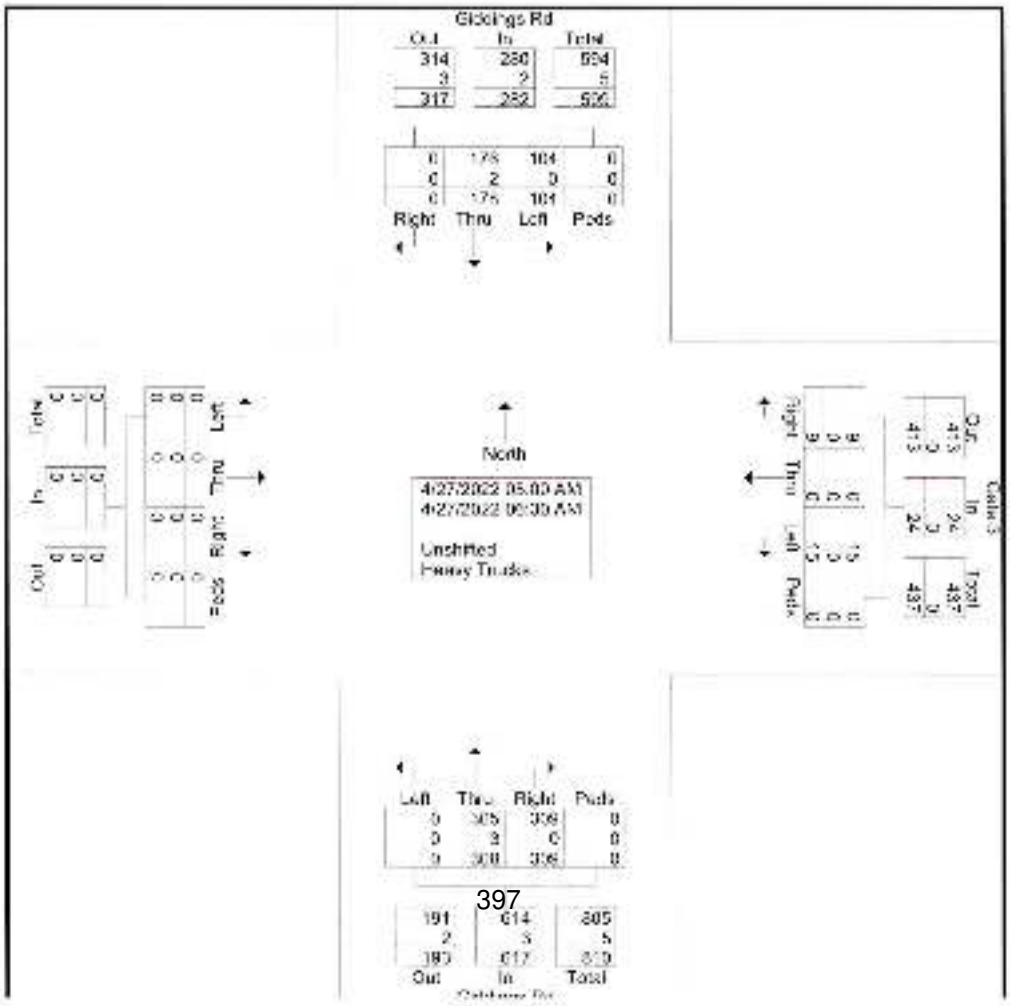
Wade Trim
25251 Northline Road
Taylor, MI 48184

GM Orion
Giddings Rd & Gate 3
4/27/2022
taken from Quality Counts video

File Name : Giddings-Gate3_20220427_AM
Site Code : 15737040
Start Date : 4/27/2022
Page No : 1

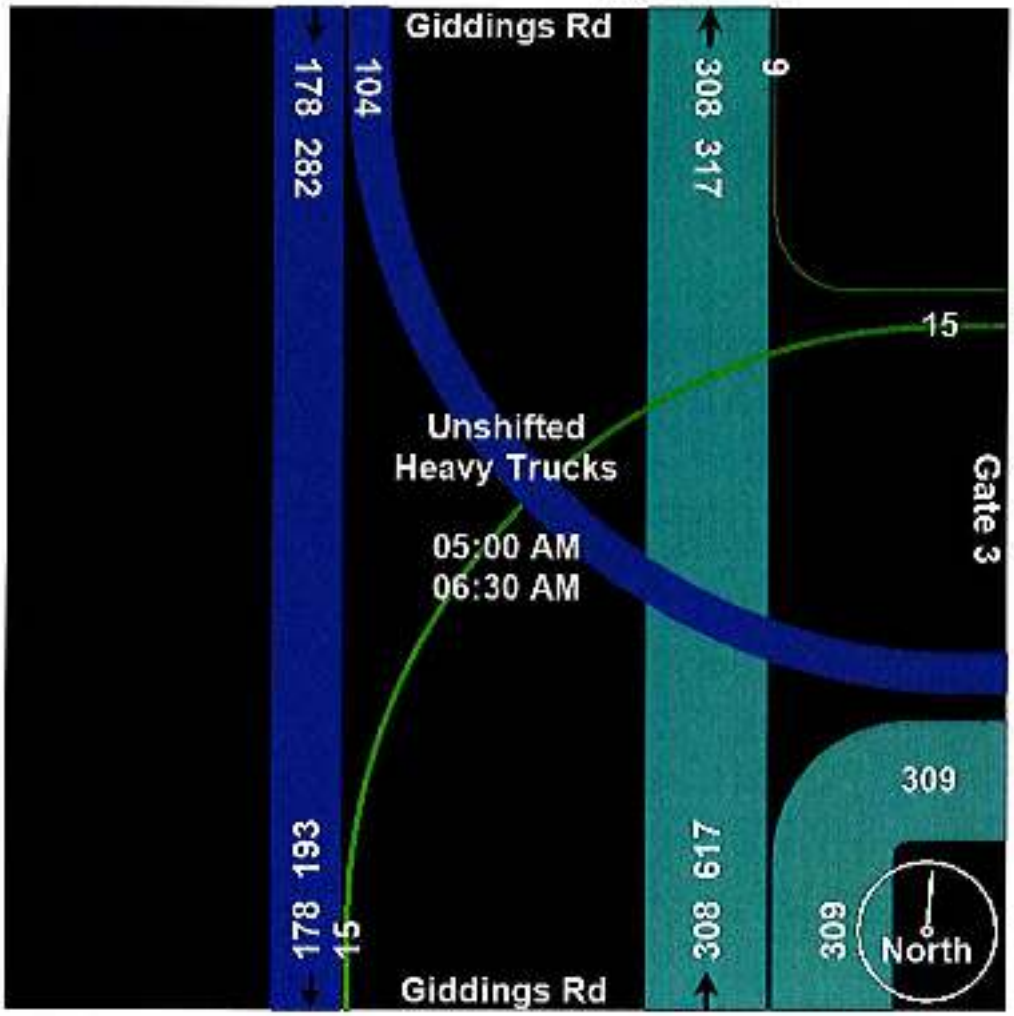
Groups Printed- Unshifted - Heavy Trucks

	Giddings Rd From North					Gate 3 From East					Giddings Rd From South					From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
05:00 AM	0	11	12	0	23	0	0	0	0	0	22	16	0	0	38	0	0	0	0	0	61
05:15 AM	0	12	20	0	32	2	0	1	0	3	56	37	0	0	93	0	0	0	0	0	128
05:30 AM	0	32	31	0	63	1	0	4	0	5	108	88	0	0	196	0	0	0	0	0	264
05:45 AM	0	40	30	0	70	0	0	6	0	6	93	96	0	0	189	0	0	0	0	0	265
Total	0	95	93	0	188	3	0	11	0	14	279	237	0	0	516	0	0	0	0	0	718
06:00 AM	0	23	3	0	26	3	0	3	0	6	17	26	0	0	43	0	0	0	0	0	75
06:15 AM	0	28	3	0	31	3	0	0	0	3	7	19	0	0	26	0	0	0	0	0	60
06:30 AM	0	32	5	0	37	0	0	1	0	1	6	26	0	0	32	0	0	0	0	0	70
Grand Total	0	175	101	0	282	9	0	15	0	24	309	308	0	0	617	0	0	0	0	0	923
Aparch %	0	93.1	36.9	0		37.5	0	62.5	0		50.1	49.9	0	0		0	0	0	0		
Total %	0	18.5	11.5	0	30.6	1	0	1.6	0	2.6	33.5	33.4	0	0	66.8	0	0	0	0	0	
Unshifted	0	175	101	0	280	9	0	15	0	24	309	305	0	0	614	0	0	0	0	0	918
% Unshifted	0	98.9	100	0	99.3	100	0	100	0	100	100	99	0	0	99.5	0	0	0	0	0	99.5
Heavy Trucks	0	2	0	0	2	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	5
% Heavy Trucks	0	1.1	0	0	0.7	0	0	0	0	0	0	1	0	0	0.5	0	0	0	0	0	0.5



Wade Trim
25251 Northline Road
Taylor, MI 48184

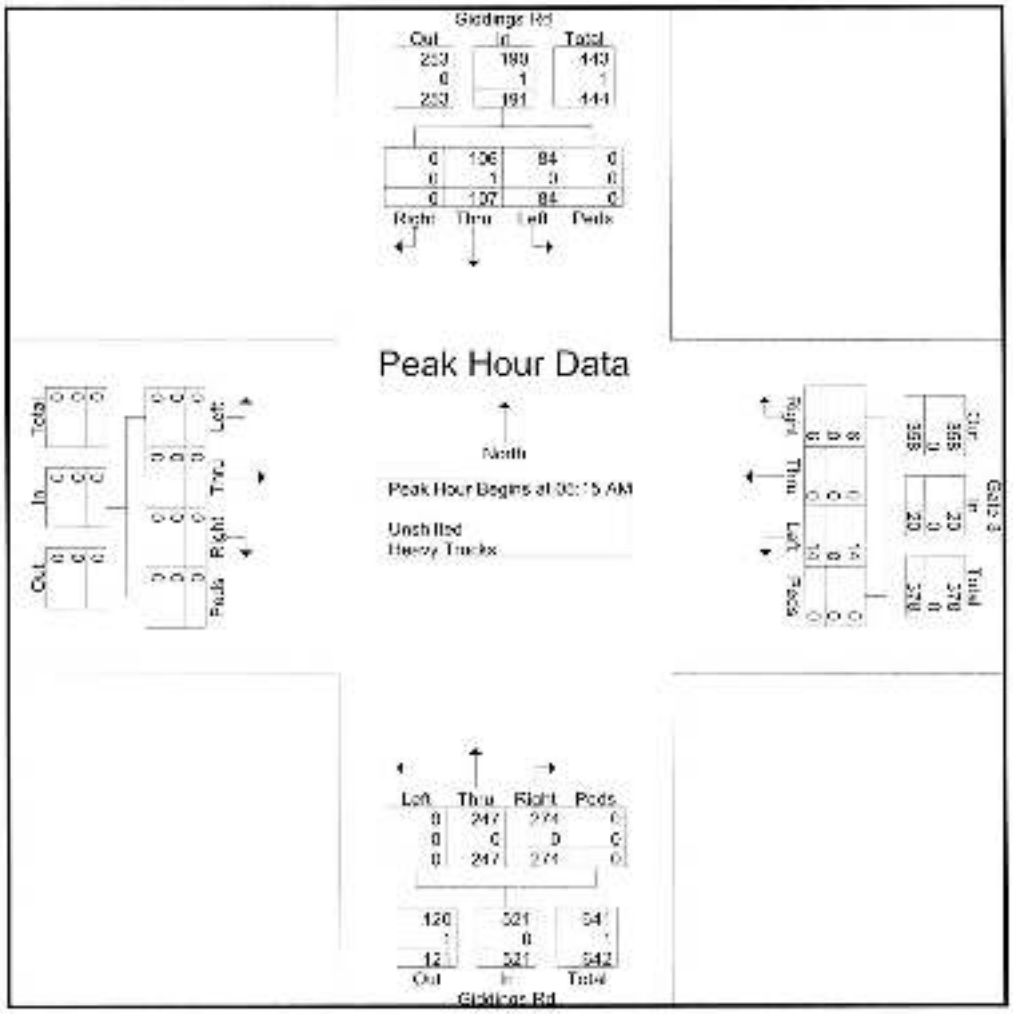
File Name : Giddings-Gate3_20220427_AM
Site Code : 15737040
Start Date : 4/27/2022
Page No : 2



Wade Trim
25251 Northline Road
Taylor, MI 48184

File Name : Giddings-Gate3_20220427_AM
Site Code : 15737040
Start Date : 4/27/2022
Page No : 3

	Giddings Rd From North					Gate 3 From East					Giddings Rd From South					From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 05:00 AM to 06:30 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:15 AM																					
05:15 AM	0	12	20	0	32	2	0	1	0	3	56	37	0	0	93	0	0	0	0	0	128
05:30 AM	0	32	31	0	63	1	0	4	0	5	108	88	0	0	196	0	0	0	0	0	264
05:45 AM	0	40	33	0	70	3	0	6	0	6	93	96	0	0	189	0	0	0	0	0	265
06:00 AM	0	23	3	0	26	3	0	3	0	6	17	26	0	0	43	0	0	0	0	0	75
Total Volume	0	107	84	0	191	9	0	14	0	20	274	247	0	0	521	0	0	0	0	0	732
% App. Total	0	56	44	0		30	0	70	0		52.6	47.4	0	0		0	0	0	0		
PHF	.000	.669	.677	.000	.682	.500	.000	.583	.000	.833	.634	.643	.000	.000	.665	.000	.000	.000	.000	.000	.691
Unshifted	0	106	84	0	190	8	0	14	0	20	274	247	0	0	521	0	0	0	0	0	731
% Unshifted	0	99.1	100	0	99.5	100	0	100	0	100	100	100	0	0	100	0	0	0	0	0	99.9
Heavy Trucks	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
% Heavy Trucks	0	0.9	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1



Wade Trim
25251 Northline Road
Taylor, MI 48184

File Name : Giddings-Gate3_20220427_AM
Site Code : 15737040
Start Date : 4/27/2022
Page No : 4

Wade Trim
25251 Northline Road
Taylor, MI 48184

GM Orion
Giddings Rd & Liberty Dr
4/26/2022
taken from Quality Counts video

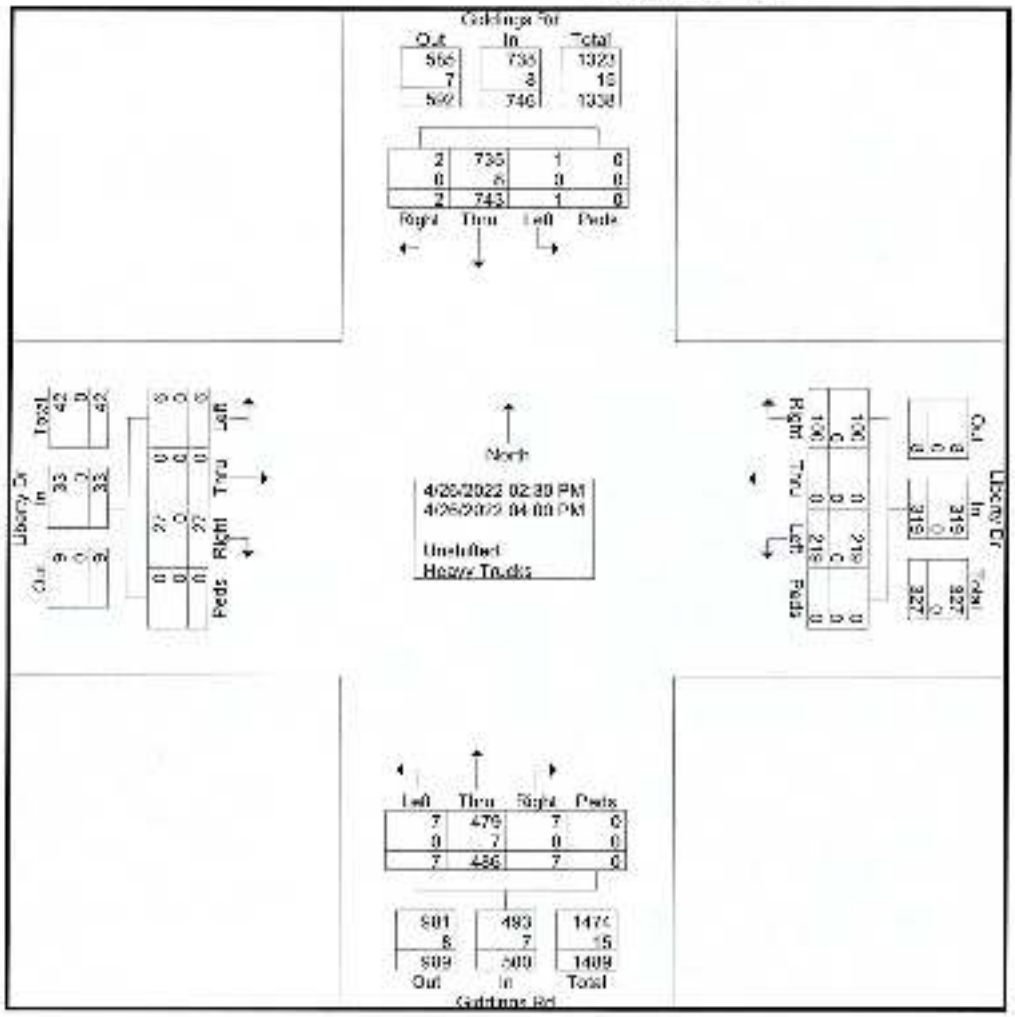
File Name : Giddings-Liberty_20220426_PM
Site Code : 15737039
Start Date : 4/26/2022
Page No : 1

Groups Printed- Unshifted - Heavy Trucks

	Giddings Rd From North					Liberty Dr From East					Giddings Rd From South					Liberty Dr From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
02:30 PM	0	215	0	0	215	91	0	148	0	239	1	62	0	0	63	3	0	0	0	3	520
02:45 PM	0	171	0	0	171	3	0	43	0	46	0	75	2	0	77	2	0	1	0	3	297
Total	0	386	0	0	386	94	0	191	0	285	1	137	2	0	140	5	0	1	0	6	817
03:00 PM	0	72	1	0	73	1	0	8	0	9	1	76	2	0	79	13	0	0	0	13	174
03:15 PM	1	71	0	0	72	0	0	7	0	7	1	69	1	0	71	0	0	2	0	2	152
03:30 PM	0	88	0	0	88	0	0	7	0	7	0	74	1	0	75	1	0	0	0	1	171
03:45 PM	0	62	0	0	62	2	0	3	0	5	4	68	1	0	73	1	0	0	0	1	141
Total	1	293	1	0	295	3	0	25	0	28	6	287	5	0	298	15	0	2	0	17	638
04:00 PM	1	64	0	0	65	3	0	3	0	6	0	82	0	0	82	7	0	3	0	10	163
Grand Total	2	743	1	0	746	100	0	219	0	319	7	486	7	0	500	27	0	6	0	33	1598
Approach %	0.3	99.6	0.1	0		31.3	0	68.7	0		1.4	97.2	1.4	0		81.8	0	18.2	0		
Total %	0.1	46.5	0.1	0	46.7	6.3	0	13.7	0	20	0.4	30.4	0.4	0	31.3	1.7	0	0.4	0	2.1	
Unshifted	2	735	1	0	738	100	0	219	0	319	7	479	7	0	493	27	0	6	0	33	1583
% Unshifted	100	98.9	100	0	98.9	100	0	100	0	100	100	98.6	100	0	98.6	100	0	100	0	100	99.1
Heavy Trucks	0	8	0	0	8	0	0	0	0	0	0	7	0	0	7	0	0	0	0	0	15
% Heavy Trucks	0	1.1	0	0	1.1	0	0	0	0	0	0	1.4	0	0	1.4	0	0	0	0	0	0.9

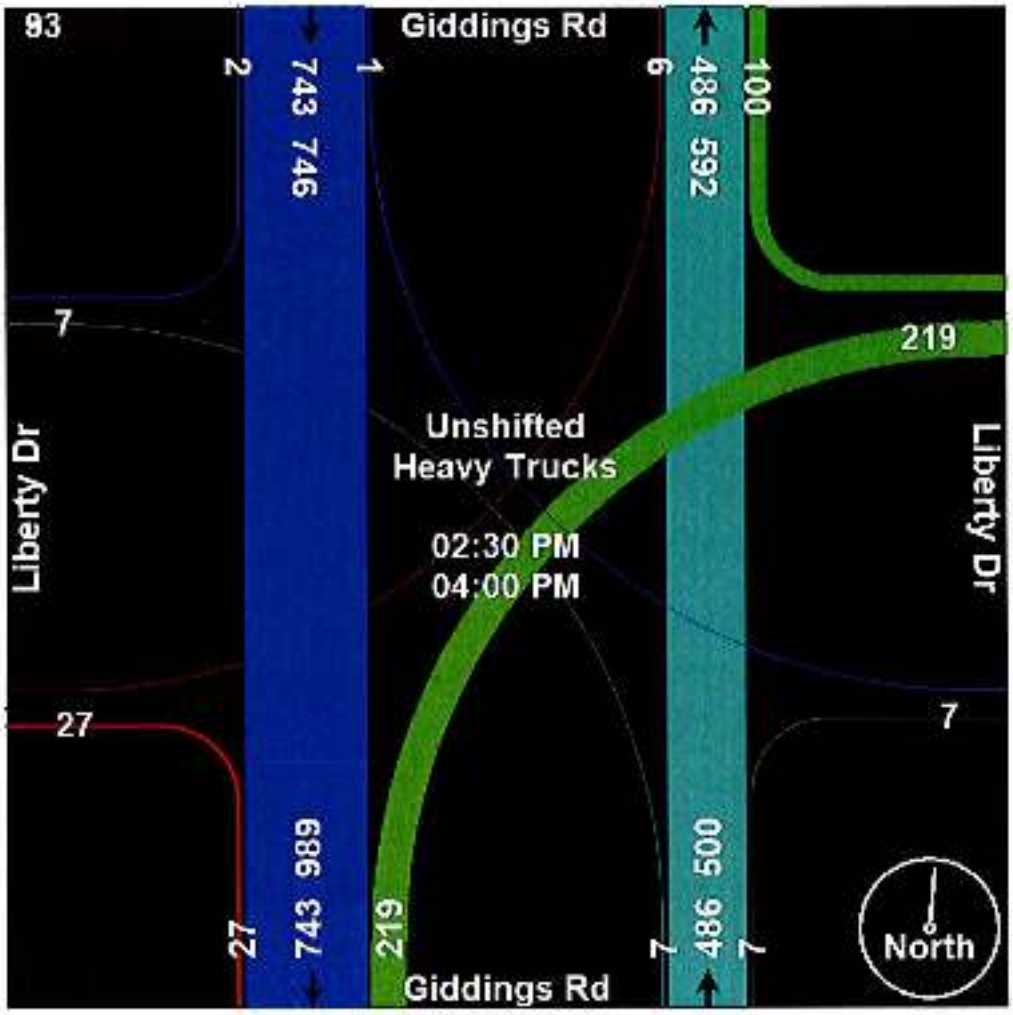
Wade Trim
25251 Northline Road
Taylor, MI 48184

File Name : Giddings-Liberty_20220426_PM
Site Code : 15737039
Start Date : 4/26/2022
Page No : 2



Wade Trim
25251 Northline Road
Taylor, MI 48184

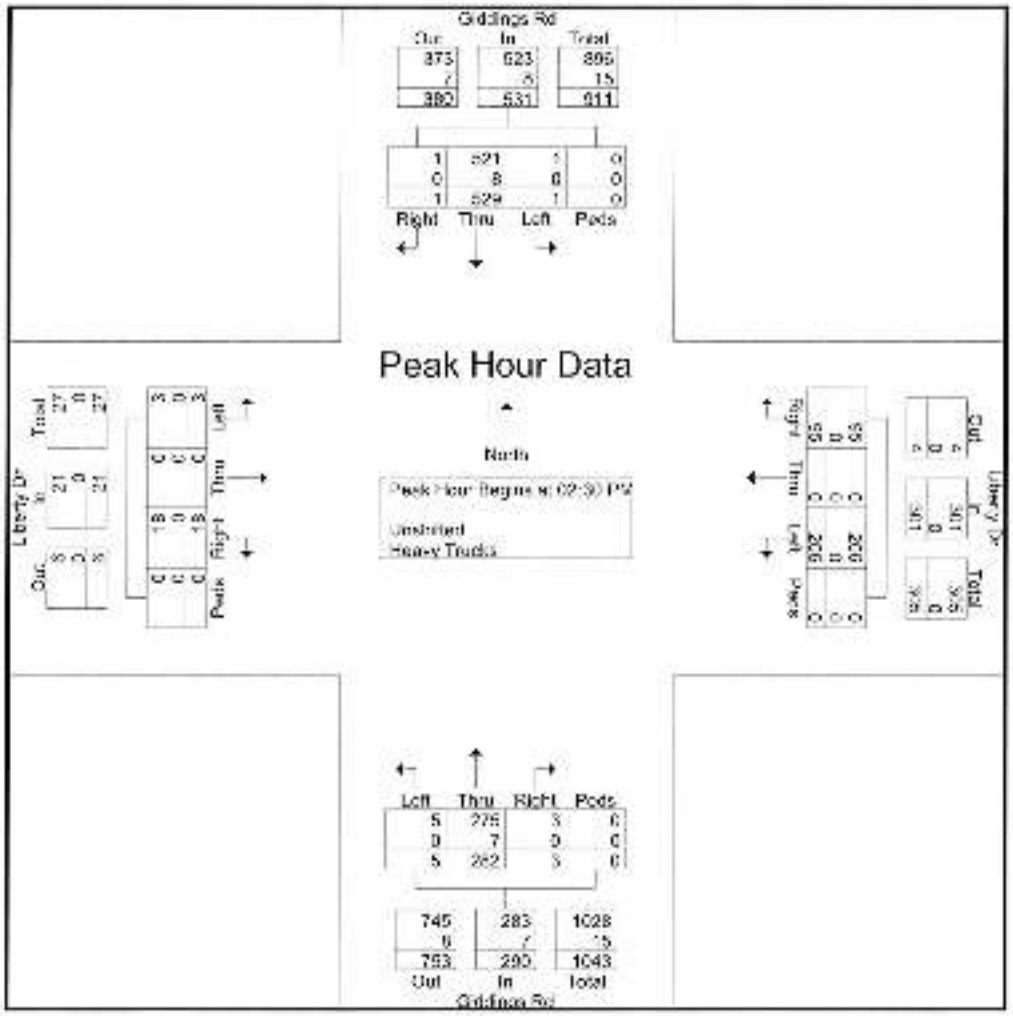
File Name : Giddings-Liberty_20220426_PM
Site Code : 15737039
Start Date : 4/26/2022
Page No : 3



Wade Trim
25251 Northline Road
Taylor, MI 48184

File Name : Giddings-Liberty_20220426_PM
Site Code : 15737039
Start Date : 4/26/2022
Page No : 4

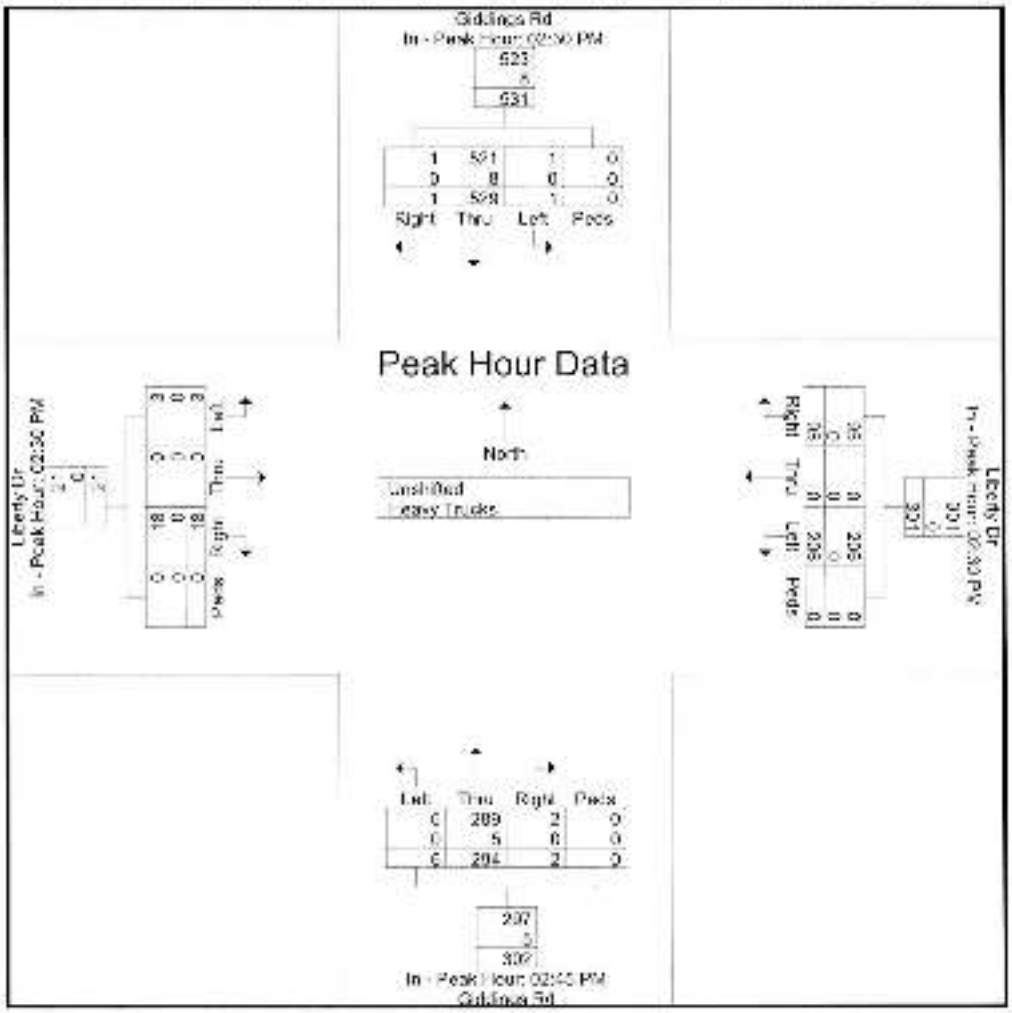
	Giddings Rd From North					Liberty Dr From East					Giddings Rd From South					Liberty Dr From West					
Start Time	Right	Thru	Left	Peds	App. Tot.	Right	Thru	Left	Peds	App. Tot.	Right	Thru	Left	Peds	App. Tot.	Right	Thru	Left	Peds	App. Tot.	Int. Total
Peak Hour Analysis From 02:30 PM to 03:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 02:30 PM																					
02:30 PM	0	215	0	0	215	91	0	148	0	239	1	82	0	0	83	3	0	0	0	3	520
02:45 PM	0	171	0	0	171	3	0	43	0	46	0	75	2	0	77	2	0	1	0	3	297
03:00 PM	0	72	1	0	73	1	0	8	0	9	1	78	2	0	79	13	0	0	0	13	174
03:15 PM	1	71	0	0	72	0	0	7	0	7	1	69	1	0	71	0	0	2	0	2	152
Total Volume	1	529	1	0	531	95	0	206	0	301	3	292	5	0	290	18	0	3	0	21	1143
% App. Total	0.2	99.6	0.2	0		31.6	0	68.4	0		1	97.2	1.7	0		85.7	0	14.3	0		
PHF	.250	.615	.250	.000	.617	.261	.000	.348	.000	.315	.750	.928	.625	.000	.918	.346	.000	.375	.000	.404	.550
Unshifted	1	521	1	0	523	95	0	206	0	301	3	275	5	0	283	18	0	3	0	21	1126
% Unshifted	100	98.5	100	0	98.5	100	0	100	0	100	100	97.5	100	0	97.6	100	0	100	0	100	98.7
Heavy Trucks	0	8	0	0	8	0	0	0	0	0	0	7	0	0	7	0	0	0	0	0	15
% Heavy Trucks	0	1.5	0	0	1.5	0	0	0	0	0	0	2.5	0	0	2.4	0	0	0	0	0	1.3



Wade Trim
25251 Northline Road
Taylor, MI 48184

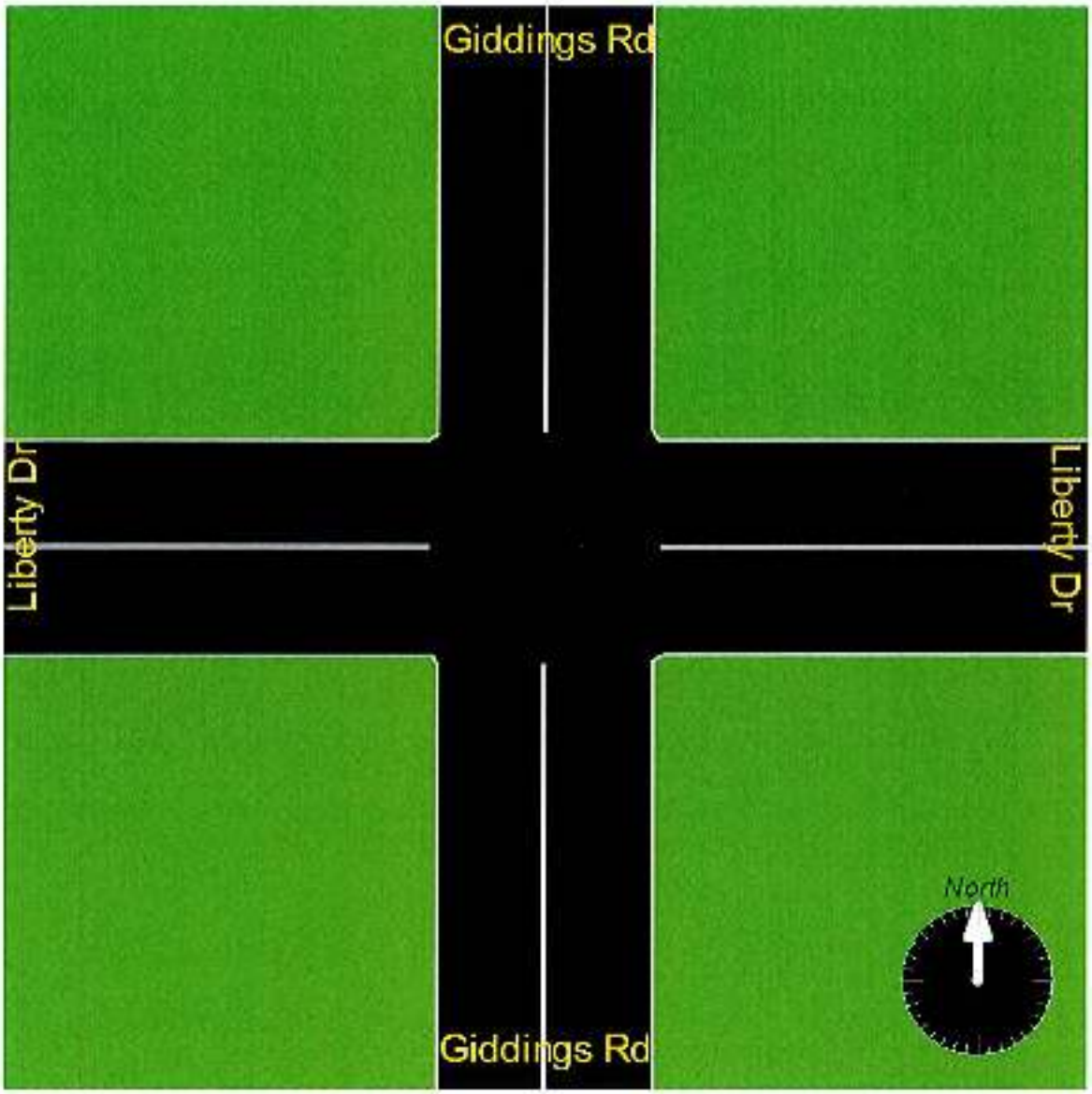
File Name : Giddings-Liberty_20220426_PM
Site Code : 15737039
Start Date : 4/26/2022
Page No : 5

	Giddings Rd From North					Liberty Dr From East					Giddings Rd From South					Liberty Dr From West				
Start Time	Right	Thru	Left	Peds	App. Tot	Right	Thru	Left	Peds	App. Tot	Right	Thru	Left	Peds	App. Tot	Right	Thru	Left	Peds	App. Tot
Peak Hour Analysis From 02:30 PM to 03:45 PM - Peak 1 of 1																				
Peak Hour for Each Approach Begins at:																				
+0 mins	0	215	0	0	215	91	0	148	0	239	0	75	2	0	77	3	0	0	0	3
+15 mins	0	171	0	0	171	3	0	43	0	46	1	76	2	0	79	2	0	1	0	3
+30 mins	0	72	1	0	73	1	0	8	0	9	1	69	1	0	71	13	0	0	0	13
+45 mins	1	71	0	0	72	0	0	7	0	7	0	74	1	0	75	0	0	2	0	2
Total Volume	1	529	1	0	531	95	0	206	0	301	2	294	6	0	302	18	0	3	0	21
% App. Total	0.2	99.6	0.2	0		31.8	0	68.4	0		0.7	97.4	2	0		85.7	0	14.3	0	
PHF	.250	.615	.250	.000	.617	.261	.000	.348	.000	.315	.500	.957	.750	.000	.956	.346	.000	.375	.000	.404
Unshifted	1	521	1	0	523	95	0	206	0	301	2	289	6	0	297	18	0	3	0	21
% Unshifted	100	98.5	100	0	98.5	100	0	100	0	100	100	98.3	100	0	98.3	100	0	100	0	100
Heavy Trucks	0	8	0	0	8	0	0	0	0	0	0	5	0	0	5	0	0	0	0	0
% Heavy Trucks	0	1.5	0	0	1.5	0	0	0	0	0	0	1.7	0	0	1.7	0	0	0	0	0



Wade Trim
25251 Northline Road
Taylor, MI 48184

File Name : Giddings-Liberty_20220426_PM
Site Code : 15737039
Start Date : 4/26/2022
Page No : 6



Wade Trim

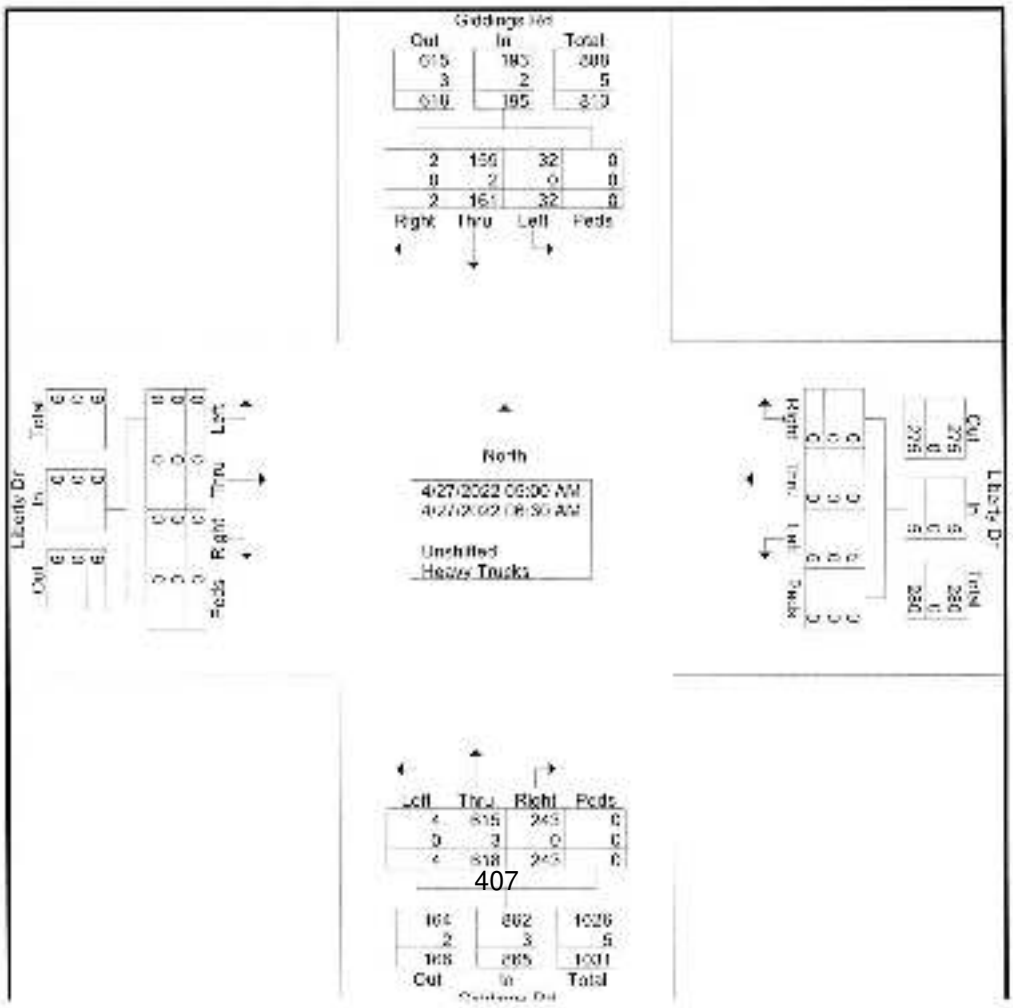
25251 Northline Road
Taylor, MI 48184

GM Orion
Giddings Rd & Liberty Dr
4/27/22
taken from Quality Counts video

File Name : Giddings-Liberty_20220427_AM
Site Code : 15737037
Start Date : 4/27/2022
Page No : 1

Groups Printed- Unshifted - Heavy Trucks

	Giddings Rd From North					Liberty Dr From East					Giddings Rd From South					Liberty Dr From West					
Start Time	Right	Thru	Left	Peds	[illegible]	Right	Thru	Left	Peds	[illegible]	Right	Thru	Left	Peds	[illegible]	Right	Thru	Left	Peds	[illegible]	[illegible]
05:00 AM	0	4	6	0	10	0	0	0	0	0	25	38	0	0	63	0	0	0	0	0	73
05:15 AM	0	12	3	0	15	0	0	1	0	1	44	94	0	0	138	0	0	0	0	0	154
05:30 AM	0	24	10	0	34	0	0	0	0	0	80	195	0	0	275	0	0	0	0	0	309
05:45 AM	0	38	9	0	47	0	0	0	0	0	85	193	2	0	280	0	0	0	0	0	327
Total	0	78	28	0	106	0	0	1	0	1	234	520	2	0	756	0	0	0	0	0	863
06:00 AM	2	24	1	0	27	0	0	0	0	0	2	41	1	0	44	0	0	0	0	0	71
06:15 AM	0	26	1	0	27	0	0	0	0	0	4	25	0	0	29	0	0	0	0	0	56
06:30 AM	0	33	2	0	35	0	0	4	0	4	3	32	1	0	36	0	0	0	0	0	75
Grand Total	2	161	32	0	195	0	0	5	0	5	243	618	4	0	865	0	0	0	0	0	1065
Apprch %	1	82.6	16.4	0		0	0	100	0		28.1	71.4	0.5	0		0	0	0	0		
Total %	0.2	15.1	3	0	18.3	0	0	0.5	0	0.5	22.8	58	0.4	0	81.2	0	0	0	0	0	
Unshifted	2	159	32	0	193	0	0	5	0	5	243	615	4	0	862	0	0	0	0	0	1060
% Unshifted	100	98.8	100	0	99	0	0	100	0	100	100	99.5	100	0	99.7	0	0	0	0	0	99.5
Heavy Trucks	0	2	0	0	2	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	5
% Heavy Trucks	0	1.2	0	0	1	0	0	0	0	0	0	0.5	0	0	0.3	0	0	0	0	0	0.5



Wade Trim
25251 Northline Road
Taylor, MI 48184

File Name : Giddings-Liberty_20220427_AM
Site Code : 15737037
Start Date : 4/27/2022
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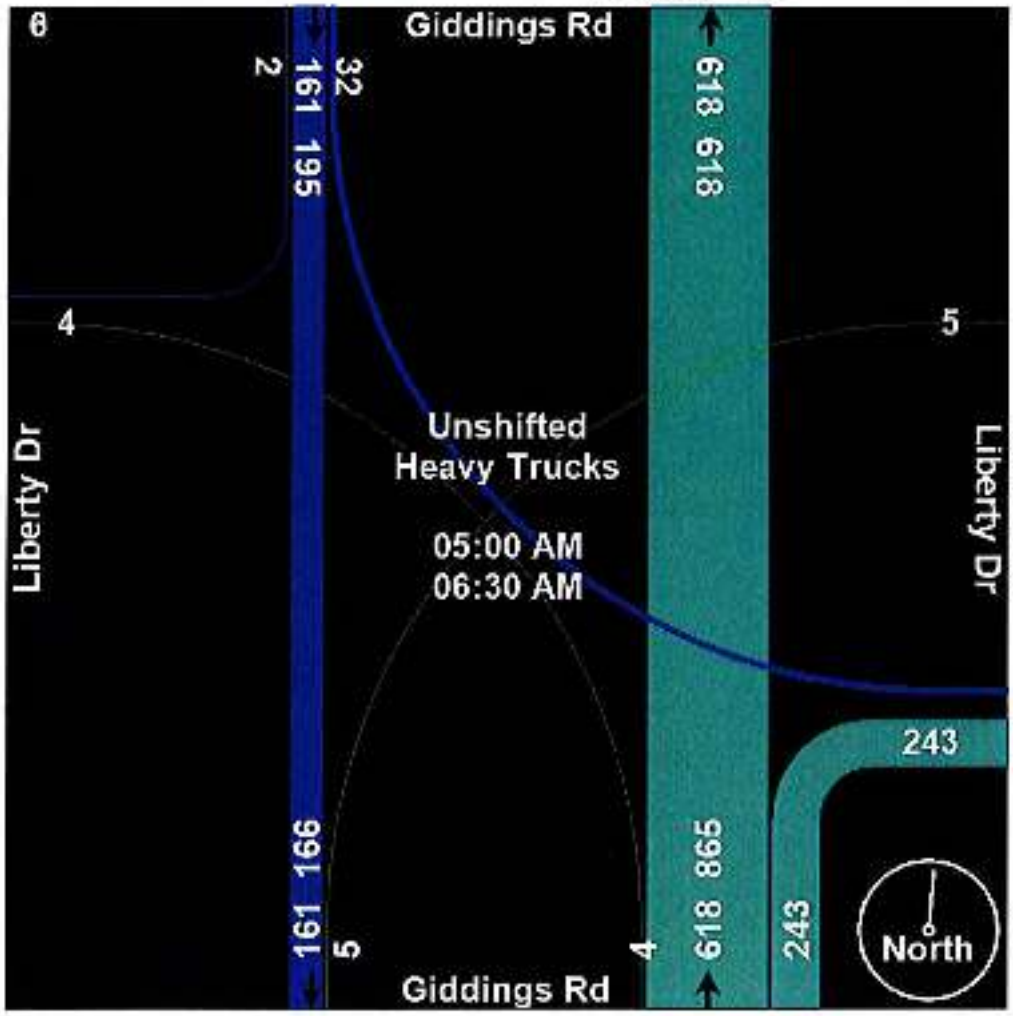
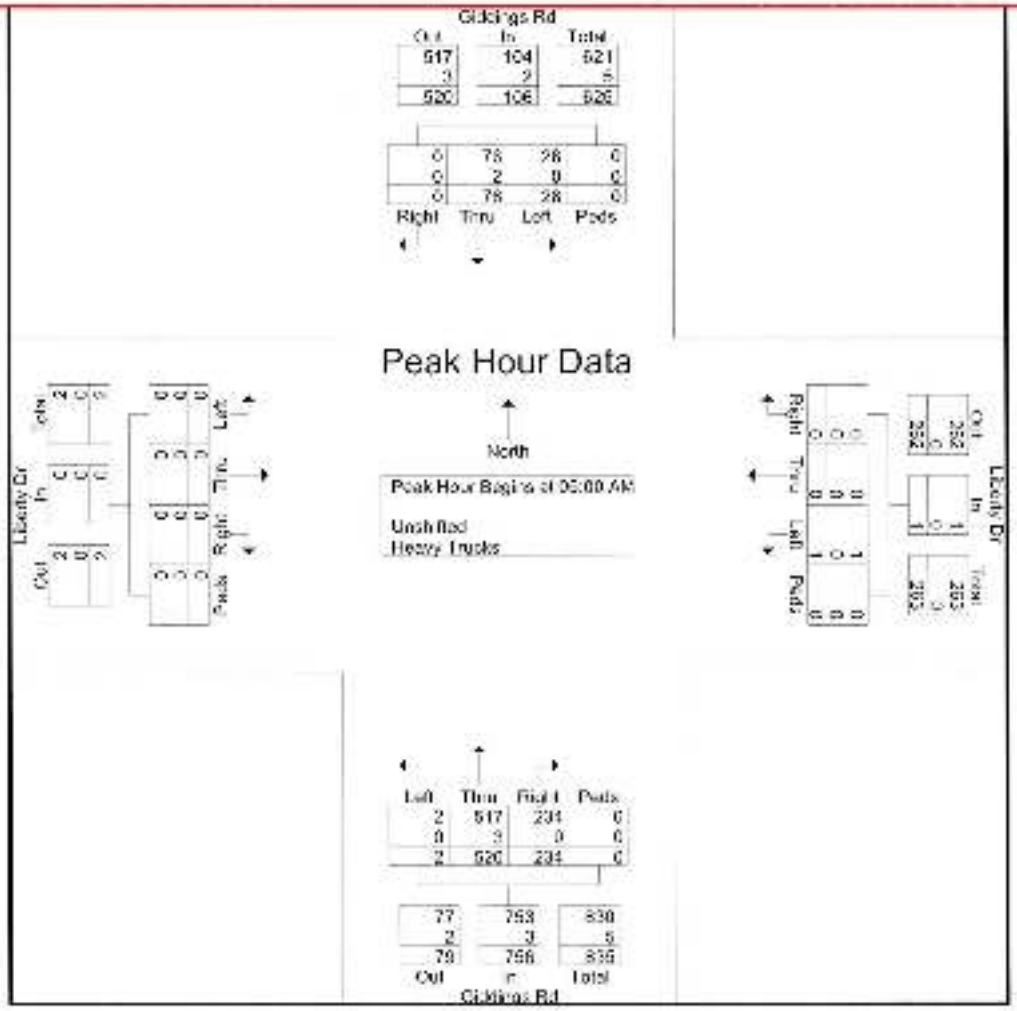


Wade Trim
25251 Northline Road
Taylor, MI 48184

File Name : Giddings-Liberty_20220427_AM
Site Code : 15737037
Start Date : 4/27/2022
Page No : 3

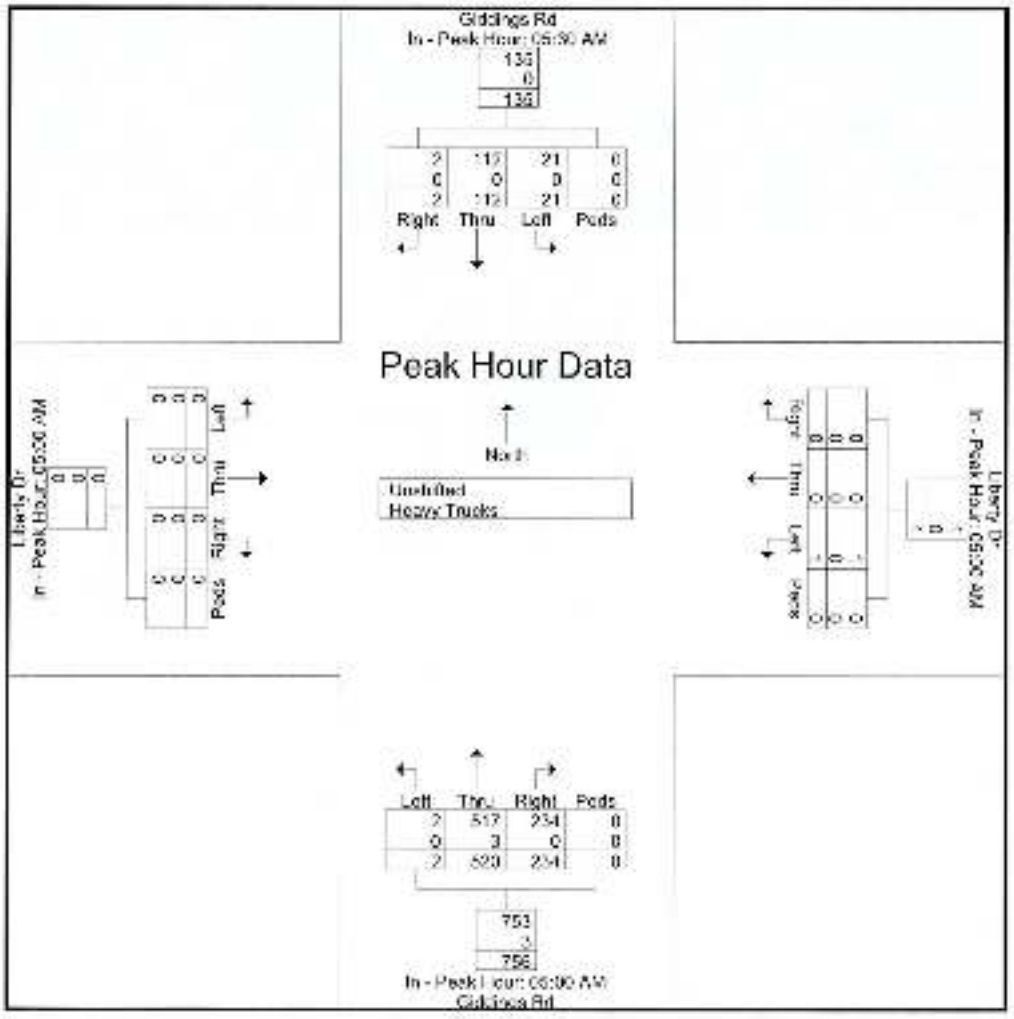
	Giddings Rd From North					Liberty Dr From East					Giddings Rd From South					Liberty Dr From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 05:00 AM to 06:15 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 AM																					
05:00 AM	0	4	6	0	10	0	0	0	0	0	25	36	0	0	63	0	0	0	0	0	73
05:15 AM	0	12	3	0	15	0	0	1	0	1	44	94	0	0	138	0	0	0	0	0	154
05:30 AM	0	24	10	0	34	0	0	0	0	0	80	195	0	0	275	0	0	0	0	0	309
05:45 AM	0	38	9	0	47	0	0	0	0	0	85	193	2	0	280	0	0	0	0	0	327
Total Volume	0	78	28	0	106	0	0	1	0	1	234	520	2	0	756	0	0	0	0	0	863
% App. Total	0	73.6	26.4	0		0	0	100	0		31	68.8	0.3	0		0	0	0	0		
PHF	.000	.513	.700	.000	.554	.000	.000	.250	.000	.250	.688	.667	.250	.000	.675	.000	.000	.000	.000	.000	.660
Unshifted	0	78	28	0	106	0	0	1	0	1	234	517	2	0	753	0	0	0	0	0	860
% Unshifted	0	97.4	100	0	98.1	0	0	100	0	100	100	99.4	100	0	99.6	0	0	0	0	0	99.4
Heavy Trucks	0	2	0	0	2	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	5
% Heavy Trucks	0	2.6	0	0	1.9	0	0	0	0	0	0	0.6	0	0	0.4	0	0	0	0	0	0.6



Wade Trim
25251 Northline Road
Taylor, MI 48184

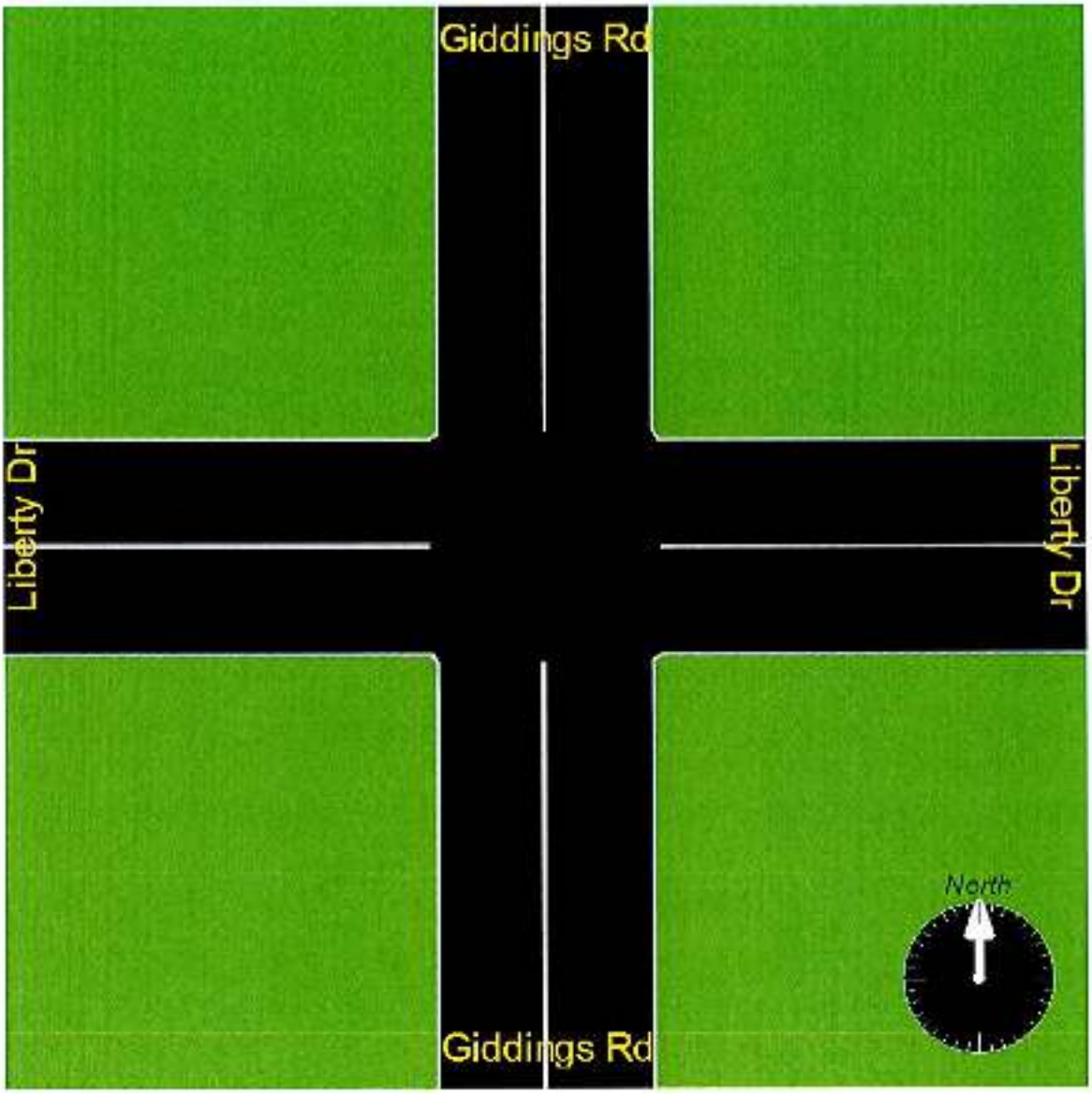
File Name : Giddings-Liberty_20220427_AM
Site Code : 15737037
Start Date : 4/27/2022
Page No : 4

Start Time	Giddings Rd From North					Liberty Dr From East					Giddings Rd From South					Liberty Dr From West					
	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 05:00 AM to 06:15 AM - Peak 1 of 1																					
Peak Hour for Each Approach Begins at:																					
+0 mins.	0	24	10	0	34	0	0	0	0	0	25	38	0	0	63	0	0	0	0	0	
+15 mins.	0	38	9	0	47	0	0	1	0	1	44	94	0	0	138	0	0	0	0	0	
+30 mins.	2	24	1	0	27	0	0	0	0	0	80	195	0	0	275	0	0	0	0	0	
+45 mins.	0	26	1	0	27	0	0	0	0	0	85	193	2	0	280	0	0	0	0	0	
Total Volume	2	112	21	0	135	0	0	1	0	1	234	520	2	0	756	0	0	0	0	0	
% App. Total	1.5	83	15.6	0		0	0	100	0		31	68.8	0.3	0		0	0	0	0		
PHF	.250	.737	.525	.000	.718	.000	.000	.250	.000	.250	.888	.667	.250	.000	.675	.000	.000	.000	.000	.000	
Unshifted	2	112	21	0	135	0	0	1	0	1	234	517	2	0	753	0	0	0	0	0	
% Unshifted	100	100	100	0	100	0	0	100	0	100	100	99.4	100	0	99.6	0	0	0	0	0	
Heavy Trucks	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	
% Heavy Trucks	0	0	0	0	0	0	0	0	0	0	0	0.6	0	0	0.4	0	0	0	0	0	



Wade Trim
25251 Northline Road
Taylor, MI 48184

File Name : Giddings-Liberty_20220427_AM
Site Code : 15737037
Start Date : 4/27/2022
Page No : 5



Appendix B.
Signal Timing Permits

OAKLAND COUNTY ROAD COMMISSION
TRAFFIC - SAFETY DEPARTMENT
SIGNAL WORK ORDER

LOCATION: BROWN & GIDDINGS DATE: 9-3-08

CITY/TOWNSHIP: AUBURN HILLS / ORION BY: TERRY CREECH

COUNTY#: 88 STATE#: ——— CHARGES: 78 000880

PLEASE PERFORM THE FOLLOWING:

____ ELECTRICAL DEVICE: ____ INSTALL ____ MODERNIZE ____ MAINTENANCE

____ UNDERGROUND

____ EDISON OK: ____ YES ____ NO JOB#: SEP 12

____ COORDINATE W/DISTRICT 7:

	DIAL...	1	1	1	1		2	2	2	2		3	3	3	3		4	4	4	4
	SPLIT	1	2	3	4		1	2	3	4		1	2	3	4		1	2	3	4
____	CHANGE TIMING																			
____	CHANGE OFFSET																			
____	CHANGE CYCLE LENGTH																			
____	ADD DIAL/SPLIT																			

X CHANGE BREAKOUT OR EPROM: Change Personality (REV 2)
(PLANS & SCHEDULES)

____ CHANGE HOURS OF OPERATION:

OLD:

NEW:

____ REPROGRAM TBC

____ INSTALL INTERCONNECT: ____ TBC ____ MINITROL ____ TONE

____ MBT OK: ____ YES ____ NO

____ NO CHANGE - RECORD CORRECTION

X OTHER: REQUIRES A CHECKSUM CHANGE.

APPROVED BY: DJ DATE: 9/4/08

DATE INSTALLED: 9-10-2008

INSTALLED BY: D+2 KE, C M

```
INTERSECTION :- 66   BROWN & GIDDINGS
DESCRIPTION PROMS :- X000880 / E4005
CONTROLLER TYPE :- STANDARD PERSONALITY CONTROLLER
SOFTWARE :- MOD 52 SCATS
INPUTS :-

    1. WB BROWN THRU/L L PRES (LK)          NOTE : ALL DETECTORS ARE
    2. WB BROWN THRU/L T PRES (LK)                 LOOPS.
    3. WB BROWN RT PRES (NL)
    4. SB GIDDINGS LT L PRES (LK)
    5. SB GIDDINGS LT L ADV PRES (LK)
    6. SB GIDDINGS L PRES (LK)
    7. SB GIDDINGS R PRES (LK)
    8. FEDEX L PRES (LK)
    9. FEDEX R PRES (LK)
   10. EB BROWN L PRES (LK)
   11. EB BROWN T1 PRES (LK)
   12. EB BROWN T2 PRES (LK)
   13. EB BROWN R PRES (LK)

APPROACHES :-
   A APPR 1 : SB GIDDINGS L,R              A APPR 2 : EB BROWN L,T1,T2,R
   B APPR 1 : WB BROWN THRU/L L,T,WB RT
   C APPR 1 : FEDEX L,R
   D APPR 1 : SB GIDDINGS LT L,L ADV

FLEXIDATA :-
SEQUENCE  A,B,C,D          A,B,C,D
AUTO RSL
R- REL    A                A
R+ REL    B                B
Q- REL    C                C
Q+ REL    D                D
LOOKAHEAD D                D

SPECIAL FEATURES :-

   The personality revision number is currently 2 (-B).
```

Checksums:

Times 22/042

Pers E9/351

Total C8/313

```
P44-12 CABINET
LOAD SWITCH 1 - SB CIDDINGS LT                  CL      FLR
                NB BROWN RT (G,A)                       BR
LOAD SWITCH 2 - EB BROWN                        A       FLR
LOAD SWITCH 4 - NB BROWN THRU & LT                      B & BL      FLR
              EB BROWN RT (G,A)                 AR      -
LOAD SWITCH 6 - SB CIDDINGS                             C       FLR
LOAD SWITCH 8 - FEDEX DRIVE THRU & LT           D & DL          FLR

JUMPERS
189-190,191-192,193-194,195-196,197-198,199-200,217-218,219-220,221-222,
239-240,241-242,243-244,261-262,263-264,265-266,298-302,321-322,323-324,
325-326,327-328,329-PB1,343-PB1,347-348,349-350,351-PB1,365-PB1,369-370,
371-372,373-PB1,387-PB1,391-392,393-394,395-PB1

SIGNAL MONITOR:  1-6,2-6.
All switches OFF EXCEPT: Dual Select A&B; G&Y Enable; SSM 1,2,4,6,8.
Minimum Flash = 4 + 2 - 1.

**********************************
* CONTROLLER INFORMATION SHEET *
*      FOR SITE NO.    88        *
*          Terry Creech          *
*    DATE :- 03-SEP-2008         *
**********************************
```

FLEXILINK PLAN DATA

Intersection # 88 State # _____ Date: 09/03/08 Prepared By: Terry Creech

Intersection: Brown & Giddings City: Auburn Hills / Orion

Flash: None Approved By: Rachel Jones

		PL0	PL1	PL2	PL3	PL4	PL5	PL6	PL7	PL8
0	CL		80	100	100					
1	A		0	0	0					
2	B		24	60	24					
3	C		41	73	41					
4	D		52	84	72					
5	E									
6	F									
7	G									
8	R-									
9	R+									
10	Of (Y-)		0	0	0					
11	Y-	C								
12	Z-									
13	Z+									
14	Q-		41	73						
15	Q+		69	89						
16	XH									
17	XL									

NOTE: STAGES WITH ONE SECOND PHASE TIMES ARE SKIPPED
BLANK ENTRIES ARE DEFAULT VALUES = 0 FOR ENTRIES #0 - #7, #16 - #17
254 FOR ENTRIES #8 - #15 'C' ENTRY MEANS CONTINOUS = 255

							Timers		
Phase	Direction	Min	Max	ECO	Amber	All Red	Gap	Hdwy	Waste
A	EB Brown & SB Giddings	10.0	40.0		4.7	1.8	3.0	1.2	10.0
B	WB Brown	7.0	20.0		4.7	1.6	3.0	1.2	10.0
C	Fedex Dr	5.0	20.0		3.5	2.5	3.0	1.2	10.0
D	SB Giddings Thru & LT	5.0	20.0		4.7	1.8	3.0	1.2	10.0
E									
F									
G									

	Day	Hours	Plan#
SC1	14	0:00	1
SC2	8	5:30	2
SC3	8	6:40	1
SC4	8	7:30	3
SC5	8	8:15	1
SC6	8	18:00	2
SC7			
SC8			
SC9			
SC10			

Pedestrian Crossing Times

Direction	Walk	CL 1	CL 2

Normal Operating Mode

Isolated	Flexilink	Masterlink	Master Isolated	Flexi Isolated
		X		

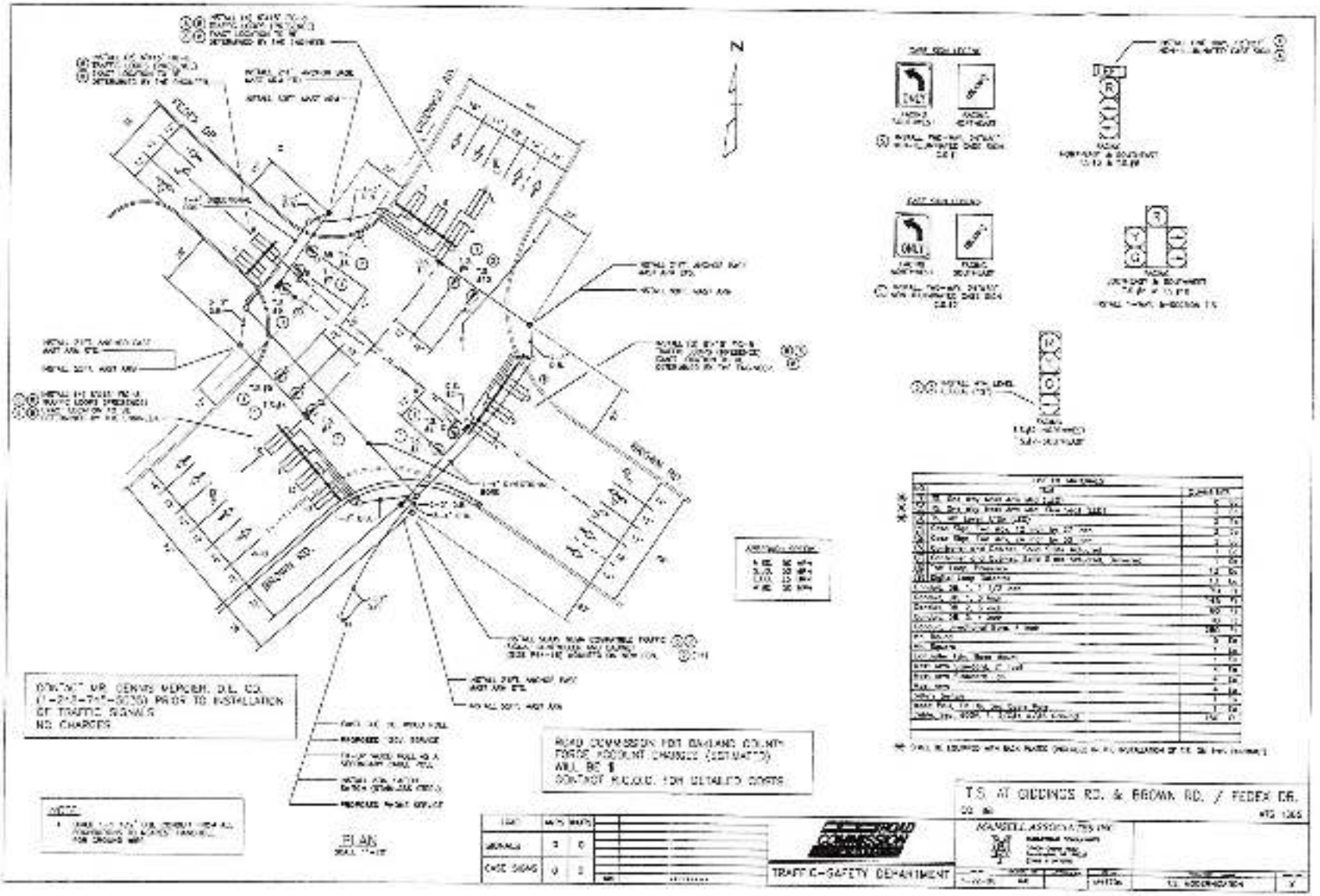
DAY OF WEEK CODE NUMBER

0	Daily Schedule	4	WED	8	MON-FRI	12	MON,FRI,SAT
1	SUN	5	THUR	9	MON-SAT	13	SAT,SUN
2	MON	6	FRI	10	TUE,WED,THU	14	EVERY DAY
3	TUE	7	SAT	11	MON,FRI	15	NEVER

D Connector Form for Mod 50 w/Loops

Intersection Name: [illegible]
County No: 825
Date: 11-27-06

Detector Number on Print	Detector Description	D-Conn Term #	D-Conn Description	Phase
1	[illegible] LT	1	Det 9	4
2	[illegible]	2	Det 10	4
3	[illegible] RT	3	Det 11	4
4	[illegible]	4	Det 12	1
5	[illegible]	5	Det 13	1
6	[illegible]	6	Det 14	6
7	[illegible]	7	Det 15	6
8	[illegible]	8	Det 16	8
9	[illegible]	9	Det 17	8
10	[illegible]	10	Det 18	2
11	[illegible]	11	Det 19	2
12	[illegible]	12	Det 20	2
13	[illegible]	13	Det 21	2
		14	Det 22	
		15	Det 23	
		16	Det 24	
		Backpanel		
		Backpanel		
		Backpanel		
		Backpanel		
		Backpanel		
		Backpanel		
		Backpanel		
		Backpanel		


CONTACT MR. DENNIS MERCIER, D.E. CO.
(1-248-745-9030) PRIOR TO INSTALLATION
OF TRAFFIC SIGNALS
NO CHARGES
ROAD COMMISSION FOR OAKLAND COUNTY
FORCE ACCOUNT CHARGES (ESTIMATE)
WILL BE $
CONTACT R.C.O.C. FOR DETAILED COSTS
T.S. AT GIDDINGS RD. & BROWN RD. / FEDEX DR.
TRAFFIC-SAFETY DEPARTMENT
PLAN

OAKLAND COUNTY ROAD COMMISSION
TRAFFIC - SAFETY DEPARTMENT
SIGNAL WORK ORDER

LOCATION: GIDDINGS & GM ORION PLANT (GATE 4) DATE: 3-1-22

CITY/TOWNSHIP: ORION BY: RACHEL JONES

COUNTY#: 700 STATE#: — CHARGES: 007000

PLEASE PERFORM THE FOLLOWING:

Road Commission For Oakland County

____ ELECTRICAL DEVICE: ___ INSTALL ___ MODERNIZE ___ MAINTENANCE

____ UNDERGROUND:

____ EDISON OK: ____ YES ___ NO JOB#:

MAR 16 2022

____ COORDINATE W/DISTRICT 7:

Traffic Operations

	DIAL..	1	1	1	1		2	2	2	2		3	3	3	3		4	4	4	4
	SPLIT.	1	2	3	4		1	2	3	4		1	2	3	4		1	2	3	4
____	CHANGE TIMING.....																			
____	CHANGE OFFSET.....																			
____	CHANGE CYCLE LENGTH.....																			
____	ADD DIAL/SPLIT.....																			

____ CHANGE BREAKOUT OR EPROM:

X CHANGE HOURS OF OPERATION:

OLD: MON: 3PM - 5:30PM; TUE-FRI: 1:30AM - 3AM, 3PM - 5:30PM; SAT: 1:30AM - 3A

NEW: MON: 1:30PM - 5:30PM; TUE-FRI: 1:30AM - 3AM, 1:30PM - 5:30PM; SAT: 1:30AM - 3AM

X REPROGRAM TBC 3. TRAFFIC EVENTS

____ INSTALL INTERCONNECT: ___ TBC ___ MINITROL ___ TONE

____ MBT OK: ____ YES ___ NO

____ NO CHANGE - RECORD CORRECTION

X OTHER: PLEASE INSTALL ON OR BEFORE 1:30PM MONDAY 3/14/22.

(Rev 33)

APPROVED BY: DATE: 3/1/22

DATE INSTALLED: 3/12/22

INSTALLED BY: D-8

PROGRAM LOG FOR EAGLE SIGNAL CONTROLLER - MOD 32 EPAC

INTERSECTION: GIDDINGS & G.M. ORION PLANT (GATE 4)

CITY/VILLAGE/TOWNSHIP: ORION

COUNTY#: 7100 MDOT#: _____ REV#: 33 DETROIT EDISON#: _____

DRAWN BY: Rachel Jones APPROVED BY: _____ DATE DRAWN: 3/1/22

INSTALLED BY: _____ DATE INSTLD: / /

HOURS OF OPERATION: MON 1:30PM-5:30PM; TUE-FRI: 1:30AM-3AM, 3PM-5:30PM; SAT: 1:30AM-

HOURS OF FLASHING: MON 5:30PM-1:30PM; TUE-FRI: 3AM-1:30PM; 5:30PM-1:30AM; SAT: 3AM-1:30AM; SUN: 24

2. UTILITIES - 1. ACCESS

CODE.....: 1642 CODE: Four digits (0000 - 9999)

2. UTILITIES - 6. LOAD DEFAULT

C - CHANGE CURRENT SOFTWARE OPTION

SELECT SOFTWARE OPTION 1 1- FIO (TS1 ONLY); 2- TS2 (TS2 ONLY)

4. UNIT DATA - 5. RING STRUCTURE

**** NOTE: INSERT ALL RING #'S FIRST, THEN NXT & CONCUR ****

CHANNEL:	RING	PHNXT	CONCURRENT PHASES																CHANNEL	
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	VEH	PED
PHASE 1:			1																	
PHASE 2:	1	4		1															2	
PHASE 3:					1															
PHASE 4:	1	2				1													4	
PHASE 5:							1													
PHASE 6:								1												
PHASE 7:									1											
PHASE 8:										1										
PHASE 9:											1									
PHASE 10:												1								
PHASE 11:													1							
PHASE 12:														1						
PHASE 13:															1					
PHASE 14:																1				
PHASE 15:																	1			
PHASE 16:																		1		

CODES:

RING Ring Number for Phase (1-4)

PHNXT Phase Next in Ring (1-16)

CONCUR PH Phases To Be Concurrent (0=NO, 1=YES)

For vehicle channel & ped channel, enter "1" under channel# shown.

3. PHASE DATA - 1. BASIC TIMINGS

Phase	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	RANGE
Minimum Green		10		10													00-99
Passage																	0.0-9.9
Maximum #1		45		45													000-999
Maximum #2																	000-999
Yellow Clearance		4.0		3.5													3.0-9.9
Red Clearance		1.5		2.5													0.0-9.9

PROGRAM LOG FOR EAGLE SIGNAL CONTROLLER - MOD 52 EPAC

3. PHASE DATA - 3. PEDESTRIAN TIMINGS

Phase	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	RANGE (SEC)
Walk																	00-99
Pedest Clearance																	00-99
Flashing Walk																	
Extend Ped Clear																	(0-no, 1-Y+R, 2-Y)
Act Rest-in Walk																	

3. PHASE DATA - 4. INITIALIZE & NON ACTUATED RESPONSE

Phase	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Initial		4		1												
NA Response																

CODES:	0	1	2	3	4
Initial	none	inactive	red	yellow	green
NA Response	none	to 1	to 2	both	-----

3. PHASE DATA - 5. VEHICLE & PEDESTRIAN RECALLS

Phase	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Vehicle Recall		3		3												
Pedestrian Recall																

CODES:	0	1	2	3	4
Vehicle	none	1 call	min	max	soft
Pedestrian	none	1 call	ped	bot N. A.	-----

3. PHASE DATA - 6. NONLOCK & MISC CONTROLS

Phase	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Nonlock Memory																
Dual Entry																
Last Car Passage																
Conditional Service																

CODES: 0 = NO 1 = YES

3. PHASE DATA - 7. SPECIAL SEQUENCE

Phase	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Omit																
-Yel																
Ocal																

3. PHASE DATA - 8. SPECIAL DETECTOR - 0. SPC 1-8 (TS1 ONLY)

Detector # on Print	1	2	3	4	5	6	7	8
Assigned Phase								

CODES: 0 1 2 3 4

Operation Mode: Norm Veh Norm Ped 1 call St Bar A St Bar B

A. CONTROLS

	RANGE (SEC)
Extend Time	00-99
Delay Time	00-999

3. PHASE DATA - 8. SPECIAL DETECTOR - 1. VEH 1-8 OR 2.VEH 9-16 (TS2 ONLY)

Detector # on Print	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Assigned Phase																

CODES: 0 1 2 3 4

Operation Mode: Norm Veh Norm Ped 1 call St Bar A St Bar B

A. CONTROLS

	RANGE (SEC)
Extend Time	00-99
Delay Time	00-999

3. PHASE DATA - 0. MISC PED+VEH OPT

Phase	1	2	3	4	5	6	7	8
WOFF/10								
MODE								

Walk Offset MODE: 0 = Advance Walk 1 = Delay Walk

GDLY/10								
YDLY/10								

GDLY = Amt of time Advance Warning remains ON after the beginning of Green

YDLY = Amt of time the Advance Warning turns ON before the end of Green

4. UNIT DATA - 1. STARTUP & MISCELLANEOUS

Start up time : 0 (00-99) State : 0 (0 = fl, 1 = red)

Auto ped clear : 0 Red revert : 7.0 (2.0 - 9.9)

Stop time reset : 0 (0 = No, 1 = Yes)

4. UNIT DATA - 2. REMOTE FLASH

Phase	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
FLASH																
ALT																
ENTER																
EXIT																

(0=No; 1=R, 2=Y)

(0=On/Off; 1=Off/On

Test A = Remote Flash: 0 (0 = no & 1 = yes)

6. TIME BASE - 0. SPC FUNCTION MAPPING

FUNCTION NAME

AS 8-15 = OLI - P FL G PHS

AS 8-15 = OLI - P FL R PHS

SPC FUNC

1	2	3	4	5	6	7	8

NOTE: Go up after entering to get this screen.

4. UNIT DATA - 6. ALT SEQ. 08-15

EPAC ALT SEQ (PHASE PAIR TO REVERSE)

SEQ	.PP1.	.PP2.	.PP3.	.PP4.	.PP5.	.PP6.
08						
09						
10						
11						

SEQ	.PP1.	.PP2.	.PP3.	.PP4.	.PP5.	.PP6.
12						
13						
14						
15						

4. UNIT DATA - 3. OVERLAP STANDARD

Phase	1	2	3	4	5	6	7	8	CH#
OVL A Phses									
+GRN Phses									
OVL B Phses									
+GRN Phses									
OVL C Phses									
+GRN Phses									
OVL D Phses									
+GRN Phses									

Phase	1	2	3	4	5	6	7	8	CH#
Overlap I									
Overlap J									
Overlap K									
Overlap L									
Overlap M									
Overlap N									
Overlap O									
Overlap P									

* For FYA operation, '+GRN' entry is the thru phase opposing the FYA phase

4. UNIT DATA - 4. OVERLAP SPECIAL

Overlap	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
Trail green																
Trail yellow																
Trail red																
-Green / -yellow (-G/Y)																
TG Preempt																

* Overlap green omitted by # - phase green; Overlap yellow omitted by # - phase yellow

* For FYA operation, '-G/Y' entry defines the phase that is the green arrow

4. UNIT DATA - 7. PORT 1 / ITS DATA (TS2 ONLY)

ADDRESS	DESCRIPTION	PRES	M40
0	T&F BIU #1 TS2		
1	T&F BIU #2 TS2		
2	T&F BIU #3 TS2		
3	T&F BIU #4 TS2		
4	T&F BIU #5 RESERVED		
5	T&F BIU #6 RESERVED		
6	T&F BIU #7 MFG USE		
7	T&F BIU #8 MFG USE		
8	DET BIU #1 TS2		
9	DET BIU #2 TS2		
10	DET BIU #3 TS2		
11	DET BIU #4 TS2		
12	DET BIU #5 RESERVED		
13	DET BIU #6 RESERVED		
14	DET BIU #7 MFG USE		
15	DET BIU #8 MFG USE		
16	MALFUNCTION UNIT		
17	DIAGNOSTIC (MSG 30)		
18	CONTROLLER UNIT		

CODES: 0=NO / 1=YES

4. UNIT DATA - 8. I/O MISCELLANEOUS

Ring#	1	2	3	4
Input Response	1			
Output Select	1			

I/O Modes	INPUT	OUTPUT
"ABC" Connector		
"D" Connector		

Controller with Detection (TS1 ONLY):
EPAC300/M52 enter "1" under D Conn Input
2070 enter "0" under D Conn Input

5. COORDINATION DATA - 1. COORD SETUP

		0	1	2	3	4	5
OPER:	1	FRE	AUT	MAN	--------	--------	--------
MODE:	0	PRM	YLD	PYL	POM	SOM	FAC
MAX :	0	INH	MX1	MX2	--------	--------	--------
CORR:	2	DWL	MDW	SWY	SW4	--------	--------
OFST:		BEG	END	OF GREEN			
FRCE:		PLN CYC LE TIME					

MX DWELL: _____ YIELD PERIOD: _____

5. COORDINATION DATA - 3. DIAL/SPLIT DATA

Mode: 0 = actuated
1 = coord phase
2 = minimum recall
3 = maximum recall
4 = pedestrain recall
5 = maximum + pedestrain recall
6 = phase omit
7 = dual coord phase

Sequence: 00 - 15 (Unit data has definition)
Ring Lag: Ring offset from local cycle zero when not barrier locked to Ring #1.
Time: 00 - 99 seconds.

5. COORDINATION DATA - 3. DIAL/SPLIT DATA

LEVEL 2

DIAL 1 / SPLIT 1 CYCLE LENGTH: 80 SEC

PHASE	1	2	3	4	5	6	7	8
TIME		40		40				
MODE		1		3				

DIAL 1 / SPLIT 2 CYCLE LENGTH: 100

PHASE	1	2	3	4	5	6	7	8
TIME		60		40				
MODE		1		3				

DIAL 1 / SPLIT 3 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 1 / SPLIT 4 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

LEVEL 1

OFFSET	1	2	3
TIME	0		
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME	0		
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			

DIAL 2 / SPLIT 1 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 2 / SPLIT 2 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 2 / SPLIT 3 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 2 / SPLIT 4 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			

5. COORDINATION DATA - 3. DIAL/SPLIT DATA

LEVEL 2

DIAL 3 / SPLIT 1 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 3 / SPLIT 2 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 3 / SPLIT 3 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 3 / SPLIT 4 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 4 / SPLIT 1 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 4 / SPLIT 2 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 4 / SPLIT 3 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 4 / SPLIT 4 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

LEVEL 1

OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			

OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			

6. TIME BASE DATA - 2. SET TIME / DATE

-- DATE -- MM/DD/YY	-- TIME -- HH:MM:SS	MON & WEEK:	BEG -- DST -- MM	SW	END -- MM	SW
/ /	: :		3	2	11	1

CYCLE ZERO: 14 : 00 (HH:MM - EVENT)

STZ DIFF: -18000 (GPS OFFSET)

2. UTILITIES - 8. CONFIGURE PORTS - 8. GPS CONFIGURATION

GPS: 1 (0-NO, 1-YES) PORT: 4

6. TIME BASE DATA - 3. TRAFFIC EVENTS

PRO DAY	TIME HH : MM	COORD PATRN D / S / O	MAX 2 PHASE #S	OMIT PHASE #S
* * *	* * * * *		* * * * * * * *	* * * * * * * *
01	00 : 00	5 / 5 / 1		
02	00 : 00	5 / 5 / 1		
02	13 : 30	1 / 2 / 11		
02	17 : 30	5 / 5 / 1		
03	00 : 00	5 / 5 / 1		
03	01 : 30	1 / 2 / 11		
03	09 : 00	5 / 5 / 1		
03	13 : 30	1 / 2 / 11		
03	17 : 30	5 / 5 / 1		
07	00 : 00	5 / 5 / 1		
07	01 : 30	1 / 2 / 11		
07	03 : 00	5 / 5 / 1		
	:	/ /		
	:	/ /		
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REFERENCE DATA
PRO DAY = 01 - 99
(Program day)

HH:MM = 24 Hour clock

PATTERN: (D/S/O)
FLASH =5/5/
FREE =0/0/4

MAX2 & OMITS:
Call free, set pattern to 0/0/0.

D = DIAL #
S = SPLIT #
0 = OFFSET #

6. TIME BASE DATA - 4. AUXILIARY EVENTS

PRO DAY	TIME HH : MM		AUX A1	A2	A3		DET VALUE D1	D2	D3		DIM DIM
	:										
	:										
	:										
	:										
	:										
	:										
	:										
	:										
	:										
	:										
	:										
	:										
	:										

REFERENCE DATA:
PRO DAY = 00 - 99
(Program day)

HH:MM = 24 Hour clock

AUX = Output states
DET VALUE:
1 = Det diag value
2 = Enables report
3 = Repeat multiplier

DIM = Dimming state

ALL: 0 = off, 1 = on

6. TIME BASE DATA - 5. TIME OF YEAR EVENTS

DATE MM / DD / YY		SPECIAL DAY	WEEK
/ /			
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DATE MM / DD / YY		SPECIAL DAY	WEEK
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REFERENCE DATA
Special day = Any program day 00 - 99.

Special week:
Week 0 = Pro Day 01-07
Week 1 = Pro Day 11-17
Week 2 = Pro Day 21-27

6. TIME BASE DATA - 6. EQUATE/TRANSFER

CODE: 0 (0 = equate, 1 = transfer)

FROM

03 = 04	05	06				
=						
=						
=						
=						
=						
=						

DAY EQUATE: Care must be taken to insure days are not equated to undefined days or days that are equated to other days. The result will be a day without events to run.

7. PREEMPT DATA - 1. ALL PREEMPTS

RING TIMES	1	2	3	4		
MIN GREEN/WALK						
OVERRIDE	FL	1/2	2/3	3/4	4/5	5/6
STATUS						
CODES	0 = NO, 1 = YES					

7. PREEMPT DATA - PREEMPT 1

1. MISC DATA: (0 = no, 1 = yes)

TEST..: ___ N-LOCK.: ___ LINK PR#..: ___
DELAY: ___ EXTEND: ___ DURATION: ___
MXCALL: ___ LOCK OUT: ___

RING	1	2	3	4	5	6	7	8
EXIT								
CALLS								

2. INTERVAL TIMES:

SEL PED CLR : ___ TRK YEL CHG : __.__
SEL YEL CHG : __.__ TRK RED CLR : __.__
SEL RED CLR : __.__ DWELL GREEN: ___
TRACK GREEN: ___ RET PED CLR : ___
TRK PED CLR : ___ RET YEL CHG : __.__
RET YEL CLR : __.__

3. VEHICLE STATUS:

PHASE	1	2	3	4	5	6	7	8
TRK GRN								
DWELL								

(0=red, 1=grn, 2=flr, 3=fly, 4=dark)

CYCLE								

(0=no, 1=act, 2=min recall, 3=max recall)

4. PEDESTRIAN STATUS:

PHASE	1	2	3	4	5	6	7	8
TRK GRN								
DWELL								

(0=dont wlk, 1=wlk, 2=flwlk, 3=dark)

CYCLE								

(0 = no, 1 = act, 2 = recall)

5. OVERLAP STATUS:

OVERLAP	A	B	C	D
TRK GRN				
DWELL				

(0=red, 1=grn, 2=flr, 3=fly, 4=dark)

CYCLE								

(0 = no, 1 = act)

6. LOW PRIORITY: (0=no, 1=yes)

TEST..: ___ N-LOCK.: ___ SKIP.....: ___
DELAY: ___ EXTEND: ___ DURATION: ___
DWELL: ___ MXCALL.: ___ LOCK OUT: ___

RING	1	2	3	4	5	6	7	8
DWELL								
CALLS								

SIGNAL PHASING

PHASE#	ROAD	PHASE	LOAD SW	FLASH
1				
2	GIDDINGS	A & B	2	FLA
3				
4	GATE 4	C	4	FLR
5				
6				
7				
8				
OLA				
OLB				
OLC				
OLD				
1PED				
2PED				
3PED				
4PED				
5PED				
6PED				
7PED				
8PED				

Controller Information Sheet
For Mod 52 EPAC
Pole Mount "M" Cabinet

Intersection:	Giddings & G.M. Orion Plant (Gate 4)
County No:	700
State No:	-
Prepared By:	Dawn Bierlein
Date:	12-02-17

Phasing:

Load Switch 2:	Giddings	A & B	FLA
Load Switch 4:	Gate 4	C	FLR

Jumpers:

121-213, 151-152, 153-154, 155-156, 173-174, 175-176, 177-178, 233-PB1, 237-PB1, 241-PB1, 255-256, 257-258, 259-260, 261-262, 263-PB1.

Conflict Monitor: None.

All switches OFF EXCEPT: Dual Select A&B; G&Y Enable; SSM 2,4.
Minimum Flash = 4 + 2 + 1

OAKLAND COUNTY ROAD COMMISSION
TRAFFIC - SAFETY DEPARTMENT
SIGNAL WORK ORDER

LOCATION: M-24 & Silverbell DATE: 8-17-16

CITY/TOWNSHIP: Orion BY: T. Creech

COUNTY#: 11218 STATE#: 63112-01-013 CHARGES: WO 170260

PLEASE PERFORM THE FOLLOWING:

____ ELECTRICAL DEVICE: ___ INSTALL ____ MODERNIZE ____ MAINTENANCE

____ UNDERGROUND: _____

____ EDISON OK: ____ YES ____ NO JOB#: _____

____ COORDINATE W/DISTRICT 7: _____

DIAL..	1	1	1	1		2	2	2	2		3	3	3	3		4	4	4	4
SPLIT.	1	2	3	4		1	2	3	4		1	2	3	4		1	2	3	4
____ CHANGE TIMING.....																			
____ CHANGE OFFSET.....																			
____ CHANGE CYCLE LENGTH.....																			
____ ADD DIAL/SPLIT.....																			

____ CHANGE BREAKOUT OR EPROM: _____

____ CHANGE HOURS OF OPERATION:

OLD: _____ FEB 16 2017

NEW: _____

____ REPROGRAM TBC

____ INSTALL INTERCONNECT: ____ TBC ____ MINITROL ____ TONE

____ MBT OK: ____ YES ____ NO

____ NO CHANGE - RECORD CORRECTION

x OTHER: Build P44-16 TSZ cabinet for contractor w/ MOD 60 SCATS controller, loop rack, and ATT wireless Digi (existing Digi will be used at new cabinet)

APPROVED BY: _____ DATE: 9/2/16

DATE INSTALLED: 2016

INSTALLED BY: TOC

```
INTERSECTION :- 11218   M-24 & SILVERBELL
DESCRIPTION PROMS :- X11218 / F2806
CONTROLLER TYPE :- STANDARD PERSONALITY CONTROLLER
SOFTWARE TYPE :- MOD 60 SCATS S30 TS2

INPUTS :-
 1. NB SILVERBELL L (LK)                    NOTE :- ALL DETECTORS ARE LOOPS.
 2. NB SILVERBELL C (LK)
 3. EB SILVERBELL R (LK)
 4. NB M-24 L (LK)
 5. NB M-24 CL (LK)
 6. NB M-24 CR (LK)
 7. NB M-24 R (LK)
 8. WB SILVERBELL L (LK)
 9. WB SILVERBELL CL (LK)
10. WB SILVERBELL CR (LK)
11. WB SILVERBELL R (LK)
12. SB M-24 L (LK)
13. SB M-24 CL (LK)
14. SB M-24 CR (LK)
15. SB M-24 R (LK)

PED 2: NB M-24 PED EAST P.B.
PED 4: WB SILVERBELL PED NORTH P.B.
PED 6: SB M-24 PED WEST P.B.
PED 8: EB SILVERBELL PED SOUTH P.B.

APPROACHES :-
A APP 1 : NB SILVERBELL L,CL,CR,R          A APP 2 : SB SILVERBELL L,CL,CR,R
B APP 1 : EB SILVERBELL L,C,R              B APP 2 : WB SILVERBELL L,CL,CR,R

FLEXIDATA :-                               PEDESTRIANS :-
SEQUENCE  A,B          A,B                    1. -
AUTO REL                                      2. NB M-24 PED EAST (P+)
R- REL    A            A                      3. -
R+ REL    B            B                      4. WB SILVERBELL PED NORTH (P+)
Q- REL                                        5. -
Q+ REL                                        6. SB M-24 PED WEST (P-)
                                              7. -
                                              8. EB SILVERBELL PED SOUTH (P-)

SPECIAL FEATURES :-
   Personality revision is 1 (=A).

   A STAGE HAS A PERMANENT DEMAND.
   DEMAND FOR B STAGE IN FLEXI AND ISOLATED, SET ZNEG TO DISABLE.
   Night Flash code: Set Y+ to activate the night flash in Flexilink.
   Pedestrians have automatic introduction using SCATS Y-.

   SB ADAMS NEAR has early cut-off operation in B stage.
   NB ADAMS NEAR has early cut-off operation in B stage.
```

BACKPANEL :- SIZE P44-16 TS2 CABINET

LOAD SWITCH 2: NB M-24	A	FLA
LOAD SWITCH 3: EB SILVERBELL FAR	DF	FLR
LOAD SWITCH 4: WB SILVERBELL NEAR	DN	FLR
LOAD SWITCH 6: SB M-24	C	FLA
LOAD SWITCH 7: WB SILVERBELL FAR	BF	FLR
LOAD SWITCH 8: EB SILVERBELL NEAR	DN	FLR
LOAD SWITCH 9: NB M-24 PED EAST	WA	
LOAD SWITCH 10: WB SILVERBELL PED NORTH	WB	
LOAD SWITCH 11: SB M-24 PED WEST	WC	
LOAD SWITCH 12: EB SILVERBELL PED SOUTH	WD	

MMU :- (MENU : SET/VIEW CONFIG)

Field Check Enable

Channel 2: G, Y, R
Channel 3: G, Y, R
Channel 4: G, Y, R
Channel 6: G, Y, R
Channel 7: G, Y, R
Channel 8: G, Y, R

Dual Indication Enable:

R+G: Channel 2,3,4,6,7,8,9,10,11,12
R+Y: Channel 2,3,4,6,7,8
G+Y: Channel 2,3,4,6,7,8

Red Fail Enable:

Enable: Channel 2,3,4,6,7,8

Y & R Clearance Disable:

Channel 2,3,4,6,7,8 Enabled

Unit Options:

All OFF except:
Recurrent pulse
Program Memory Card

Program Card:

Compatible Channels: 2-6,2-9,2-11,3-4,3-7,
3-8,3-10,3-12,4-7,4-8,4-10,4-12,6-9,6-11,
7-8,7-10,7-12,8-10,8-12,9-11,10-12.

Min Flash Time: 4+2+1
Min Yellow Change Disable: 9,10,11,12
Voltage Monitor Latch: None

Note :- Add Jumper 16 MMU Flash - 116 Monitor ST Out

```
**********************************
* CONTROLLER INFORMATION SHEET *
*        FOR SITE NO. 11218    *
*           T. CREECH          *
*          17-AUG-2016         *
**********************************
```

CHECKSUMS
TIMES: 2B / 0S0
PERS: F6 / 366
TOTAL: DE / 336

FLEXILINK PLAN DATA

Intersection # 11218 State # 63112-01-013 Date: 08/17/16 Prepared By: T. Creech

Intersection: M-24 & Silverbell City: Orion

Hours of Operation: 7 Days: 24 Hours Approved By: R. Jones

Hours of Flashing: None

		PL0	PL1	PL2	PL3	PL4	PL5	PL6	PL7	PL8
0	CL	0	130	140	140					
1	A		0	0	0					
2	B		94	99	104					
3	C									
4	D									
5	E									
6	F									
7	G									
8	R-									
9	R+									
10	OI (Y-)		45	8	89					
11	Y+	C								
12	Z-									
13	Z+									
14	Q-									
15	Q+									
16	XH									
17	XL									

NOTE: Stages with 1 second of phase time are skipped. Blank entries are default values equal to 0.
Except for an AWA controller, entries #8 to #15 (=254) and 'C' entry means continuous (=255).

							Timers		
Phase	Direction	Min	Max	ECO	Amber	All Red	Gap	Hdwy	Waste
A	M-24	10.0	110.0		5.0	1.7	3.0	1.2	10.0
B	Silverbell	7.0	40.0	2.0	4.7	1.6	3.0	1.2	10.0
C									
D									
E									
F									
G									

	Day	Hours	Plan#
SC1	8	5:00	2
SC2	8	9:00	1
SC3	8	14:00	3
SC4	8	19:00	1
SC5	14	0:00	1
SC6			
SC7			
SC8			
SC9			
SC10			

Pedestrian Crossing Times

Direction	Walk	CL 1	CL 2
NB M-24 Ped East (Ped 2)	7.0	24.0	3.7
WB Silverbell Ped North (Ped 4)	7.0	12.0	5.3
SB M-24 Ped West (Ped 6)	7.0	24.0	3.7
EB Silverbell Ped South (Ped 8)	7.0	12.0	5.3

Normal Operating Mode

Isolated	Flexilink	Masterlink	Master Isolated	Fleet Isolated
		X		

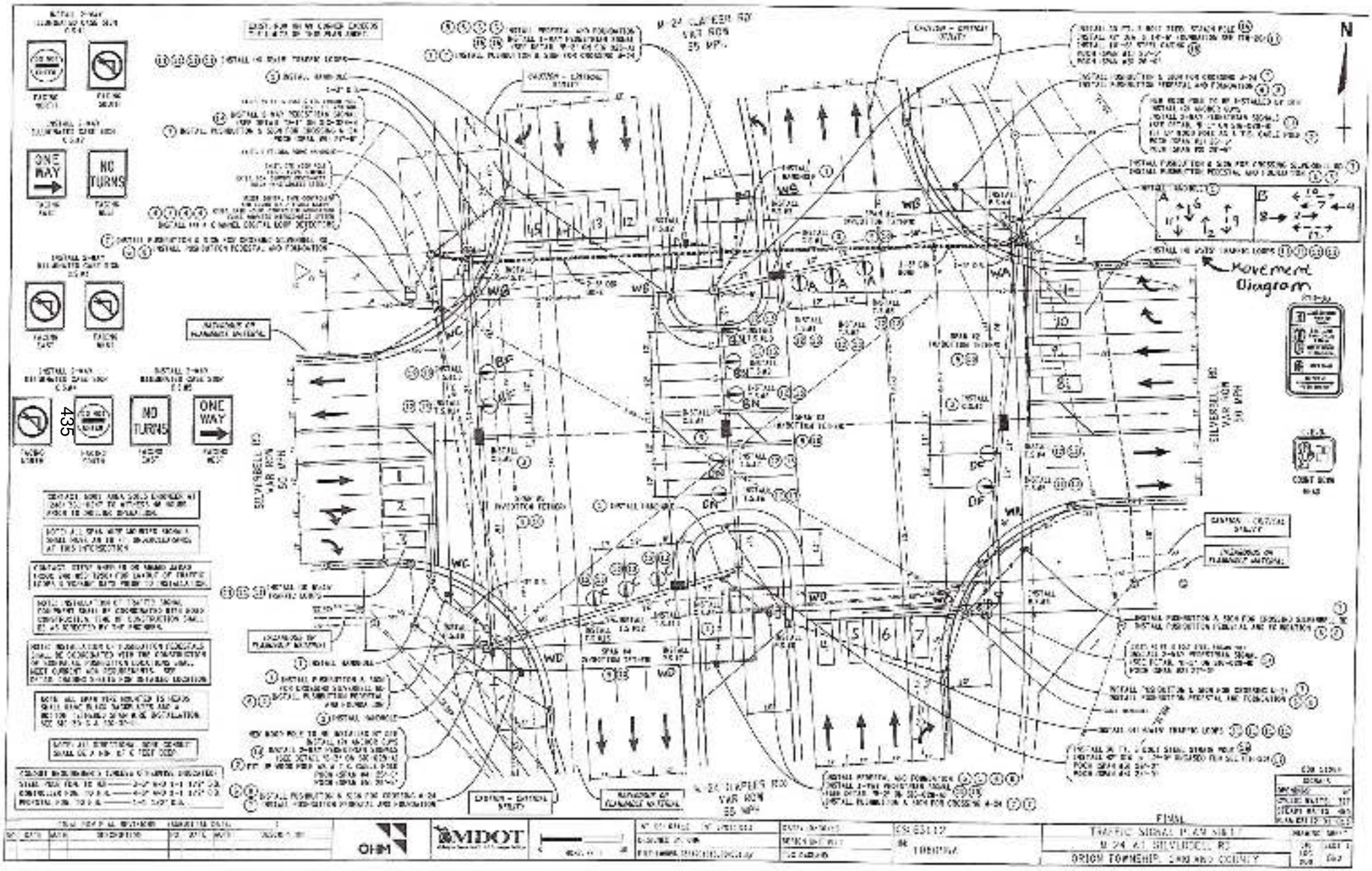
DAY OF WEEK CODE NUMBER

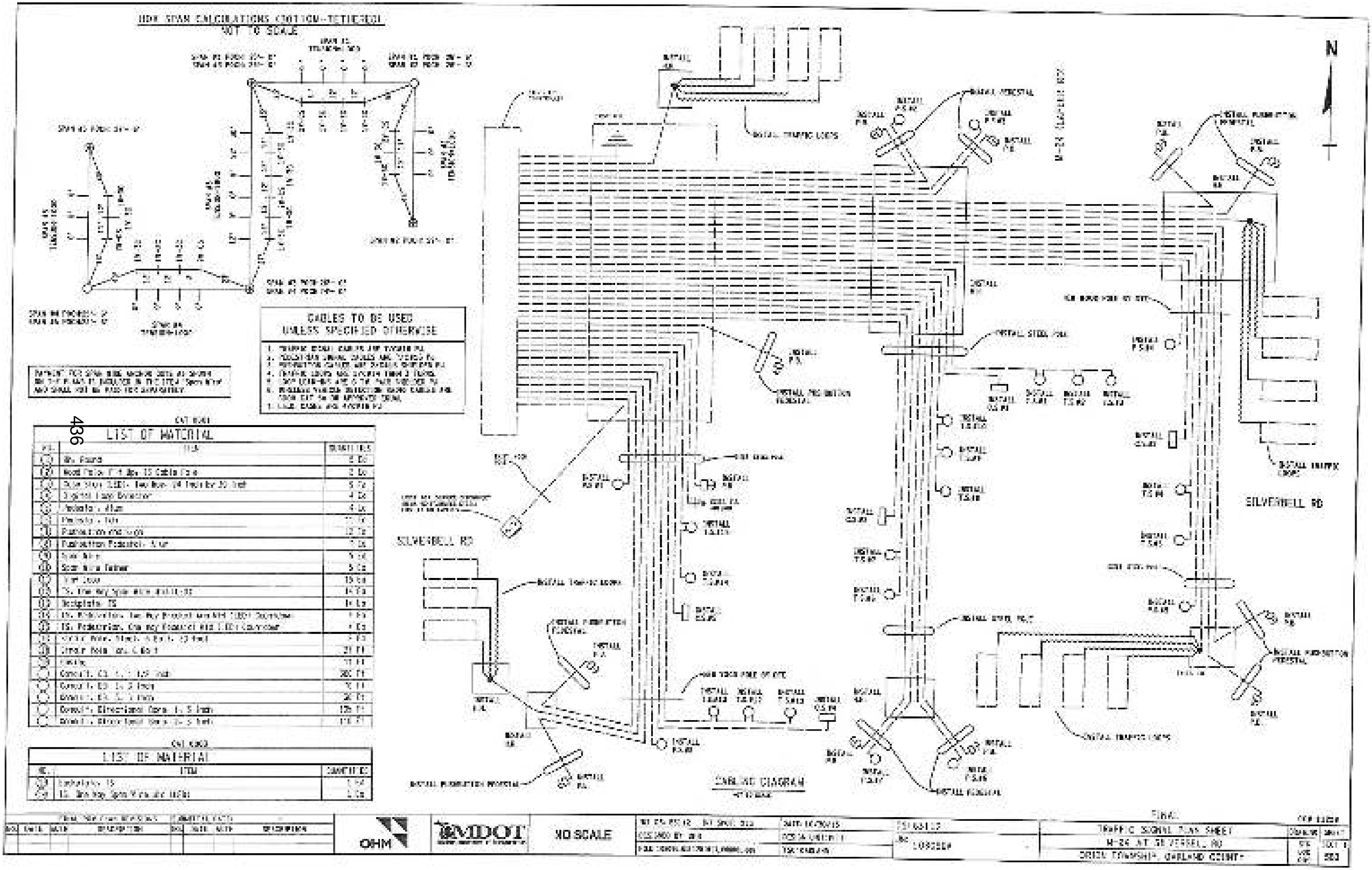
0	[illegible]	4	WED	8	MON-FRI	12	MON,FRI SAT
1	SUN	5	THUR	9	MON-SAT	13	SAT,SUN
2	MON	6	FRI	10	[illegible]	14	EVERY DAY
3	TUE	7	SAT	11	MON,FRI	15	NEVER

TS2 LOOP DETECTORS BIU #1

CO#11218 - M-24 & Silverbell

Detector # on print	Description	Phase	Output
1	EB SILVERBELL L	8	1
2	EB SILVERBELL C	8	2
3	EB SILVERBELL R	8	3
4	NB M-24 L	2	4
5	NB M-24 CL	2	5
6	NB M-24 CR	2	6
7	NB M-24 R	2	7
8	WB SILVERBELL L	4	8
9	WB SILVERBELL CL	4	9
10	WB SILVERBELL CR	4	10
11	WB SILVERBELL R	4	11
12	SB M-24 L	6	12
13	SB M-24 CL	6	13
14	SB M-24 CR	6	14
15	SB M-24 R	6	15


ONE WAY
NO TURNS
NO TURNS
ONE WAY
Movement Diagram
SILVERBELL RD
VAR ROW
35 MPH
FINAL
OHM
MDOT


NOT TO SCALE
CABLES TO BE USED
UNLESS SPECIFIED OTHERWISE
LIST OF MATERIAL
LIST OF MATERIAL
N
SILVERBELL RD
SILVERBELL RD
INSTALL TRAFFIC LOOPS
INSTALL STEEL POLE
CABLING DIAGRAM
NO SCALE
OHM
MDOT
FINAL
TRAFFIC SIGNAL PLAN SHEET
M-24 AT SILVERBELL RD
ORION TOWNSHIP, OAKLAND COUNTY

OAKLAND COUNTY ROAD COMMISSION
TRAFFIC - SAFETY DEPARTMENT
SIGNAL WORK ORDER

LOCATION: M-24 & Brown / Butler DATE: 1-23-18

CITY/TOWNSHIP: Orion BY: J. Creech

COUNTY#: 11220 STATE#: 63112-01-025 CHARGES: 78 11220 0

PLEASE PERFORM THE FOLLOWING:

____ ELECTRICAL DEVICE: ____ INSTALL ____ MODERNIZE ____ MAINTENANCE

____ UNDERGROUND: _____

____ EDISON OK: ____ YES ____ NO JOB#: _____ MAR 1 2018

____ COORDINATE W/DISTRICT 7: _____

	DIAL..	1	1	1	1		2	2	2	2		3	3	3	3		4	4	4	4
	SPLIT.	1	2	3	4		1	2	3	4		1	2	3	4		1	2	3	4
____	CHANGE TIMING.....																			
____	CHANGE OFFSET.....																			
____	CHANGE CYCLE LENGTH.....																			
____	ADD DIAL/SPLIT.....																			

X CHANGE BREAKOUT OR EPROM: REV 2

____ CHANGE HOURS OF OPERATION: (Flexi changes, MAX time)

OLD: _____

NEW: _____

____ REPROGRAM TBC

____ INSTALL INTERCONNECT: ____ TBC ____ MINITROL ____ TONE

____ MBT OK: ____ YES ____ NO

____ NO CHANGE - RECORD CORRECTION

X OTHER: Requires a check-sum change

Monitor - Unit Options : LED Guard ON

APPROVED BY: _____ DATE: 2/18/18

DATE INSTALLED: 2/27/18

INSTALLED BY: Harbor Maintenance

INTERSECTION :- 11220 M-24 & BROWN / DUTTON
DESCRIPTION PROMS :- X11220 / F280G
CONTROLLER TYPE :- STANDARD PERSONALITY CONTROLLER
SOFTWARE TYPE :- MOD 60 SCATS 530 T82

INPUTS :-
1. EB BROWN L (LK)
2. EB BRPWM C (LK)
3. EB BROWN R (LK)
4. NB M-24 L (LK)
5. NB M-24 CL (LK)
6. NB M-24 CR (LK)
7. NB M-24 R (LK)
8. WB DUTTON L (LK)
9. WB DUTTON C (LK)
10. WB DUTTON R (LK)
11. SB M-24 L (LK)
12. SB M-24 C (LK)
13. SB M-24 R (LK)

NOTE :- ALL DETECTORS ARE LOOPS.

PED 2: NB M-24 PED EAST P.B.
PED 4: WB DUTTON PED NORTH P.B.
PED 6: SB M-24 PED WEST P.B.
PED 8: EB BROWN PED SOUTH P.B.

APPROACHES :-
A APP 1 : NB M-24 L,CL,CR,R
B APP 1 : EB BROWN L,C,R

A APP 2 : SB M-24 L,C,R
B APP 2 : WB DUTTON L,C,R

FLEXIDATA :-

SEQUENCE	A,B	A,B
AUTO REL		
R- REL	A	A
R+ REL	B	B
Q- REL		
Q+ REL		

PEDESTRIANS :-
1. -
2. NB M-24 PED EAST (P+)
3. -
4. WB DUTTON PED NORTH (P+)
5. -
6. SB M-24 PED WEST (P-)
7. -
8. EB BROWN PED SOUTH (P-)

SPECIAL FEATURES :-
Personality revision is 2 (=B).

A STAGE HAS A PERMANENT DEMAND.
DEMAND FOR B STAGE IN FLEXI AND ISOLATED, SET ZNE3 TO DISABLE.
Night Flash code: Set Y+ to activate the night flash in Flexilink.
Pedestrians have automatic introduction using SCATS Y-.

EB BROWN NEAR has early cut-off operation in B stage.
WB DUTTON NEAR has early cut-off operation in B stage.

BACKPANEL :- SIZE P44-16 TS2 CABINET

LOAD SWITCH 2: NB M-24	A	FLA
LOAD SWITCH 3: EB BROWN FAR	DF	FLR
LOAD SWITCH 4: WB DUTTON NEAR	BN	FLR
LOAD SWITCH 6: SB M-24	C	FLA
LOAD SWITCH 7: WB DUTTON FAR	BF	FLR
LOAD SWITCH 8: EB BROWN NEAR	DN	FLR
LOAD SWITCH 9: NB M-24 PED EAST	WA	
LOAD SWITCH 10: NB DUTTON PED NORTH	WB	
LOAD SWITCH 11: SB M-24 PED WEST	WC	
LOAD SWITCH 12: EB BROWN PED SOUTH	WD	

MMU :- (MENU : SET/VIEW CONFIG)

Field Check Enable

Channel 2: G, Y, R
Channel 3: G, Y, R
Channel 4: G, Y, R
Channel 6: G, Y, R
Channel 7: G, Y, R
Channel 8: G, Y, R

Dual Indication Enable:

R+G: Channel 2,3,4,6,7,8,9,10,11,12
R+Y: Channel 2,3,4,6,7,8
G+Y: Channel 2,3,4,6,7,8

Red Fail Enable:

Enable: Channel 2,3,4,6,7,8

Y & R Clearance Disable:

Channel 2,3,4,6,7,8 Enabled

Unit Options:

All OFF except:
Recurrent pulse
Program Memory Card
LED Guard

Program Card:

Compatible Channels: 2-6,2-9,2-11,3-4,3-7,
3-8,3-10,3-12,4-7,4-8,4-10,4-12,6-9,6-11,
7-8,7-10,7-12,8-10,8-12,9-11,10-12.

Min Flash Time: 4+2+1
Min Yellow Change Disable: 9,10,11,12
Voltage Monitor Latch: None

Note :- Add Jumper 16 MMU Flash - 116 Monitor ST Out

```
**********************************
* CONTROLLER INFORMATION SHEET *
*        FOR SITE NO. 11220    *
*           T. CREECH          *
*           23-JAN-2018        *
**********************************
```

CHECKSUMS
TIMES: 42 / 102
PERS: 01 / 001
TOTAL: 43 / 103

FLEXILINK PLAN DATA

Intersection # 11220 **State #** 63112-01-025 **Date:** 01/23/18 **Prepared By:** T. Creech

Intersection: M-24 & Brown / Dutton **City:** Orion

Hours of Operation: 7 Days: 24 Hours **Approved By:** R. Jones

Hours of Flashing: None

		PL0	PL1	PL2	PL3	PL4	PL5	PL6	PL7	PL8
0	CL	0	130	130	130					
1	A		0	0	0					
2	B		107	107	102					
3	C									
4	D									
5	E									
6	F									
7	G									
8	R-									
9	R+									
10	Of (Y-)		110	110	110					
11	Y+	C								
12	Z-									
13	Z+									
14	Q-									
15	Q+									
16	XH									
17	XL									

NOTE: Stages with 1 second of phase time are skipped. Blank entries are default values equal to 0. Except for an AWA controller, entries #8 to #15 (=254) and 'C' entry means continuous (=255).

							Timers		
Phase	Direction	Min	Max	ECO	Amber	All Red	Gap	Hdwy	Waste
A	M-24	10.0	110.0		5.0	1.8	3.0	1.2	10.0
B	Brown / Dutton	7.0	35.0	2.0	4.7	1.6	3.0	1.2	10.0
C									
D									
E									
F									
G									

	Day	Hours	Plan#
SC1	8	5:00	2
SC2	8	9:00	1
SC3	8	14:00	3
SC4	8	19:00	1
SC5	14	0:00	1
SC6			
SC7			
SC8			
SC9			
SC10			

Pedestrian Crossing Times

Direction	Walk	CL 1	CL 2
NB M-24 Ped East (Ped 2)	7.0	22.0	3.8
WB Dutton Ped North (Ped 4)	7.0	12.0	5.3
SB M-24 Ped West (Ped 6)	7.0	22.0	3.8
EB Brown Ped South (Ped 8)	7.0	12.0	5.3

Normal Operating Mode

Isolated	Flexilink	Masterlink	Master Isolated	Flex Isolated
		X		

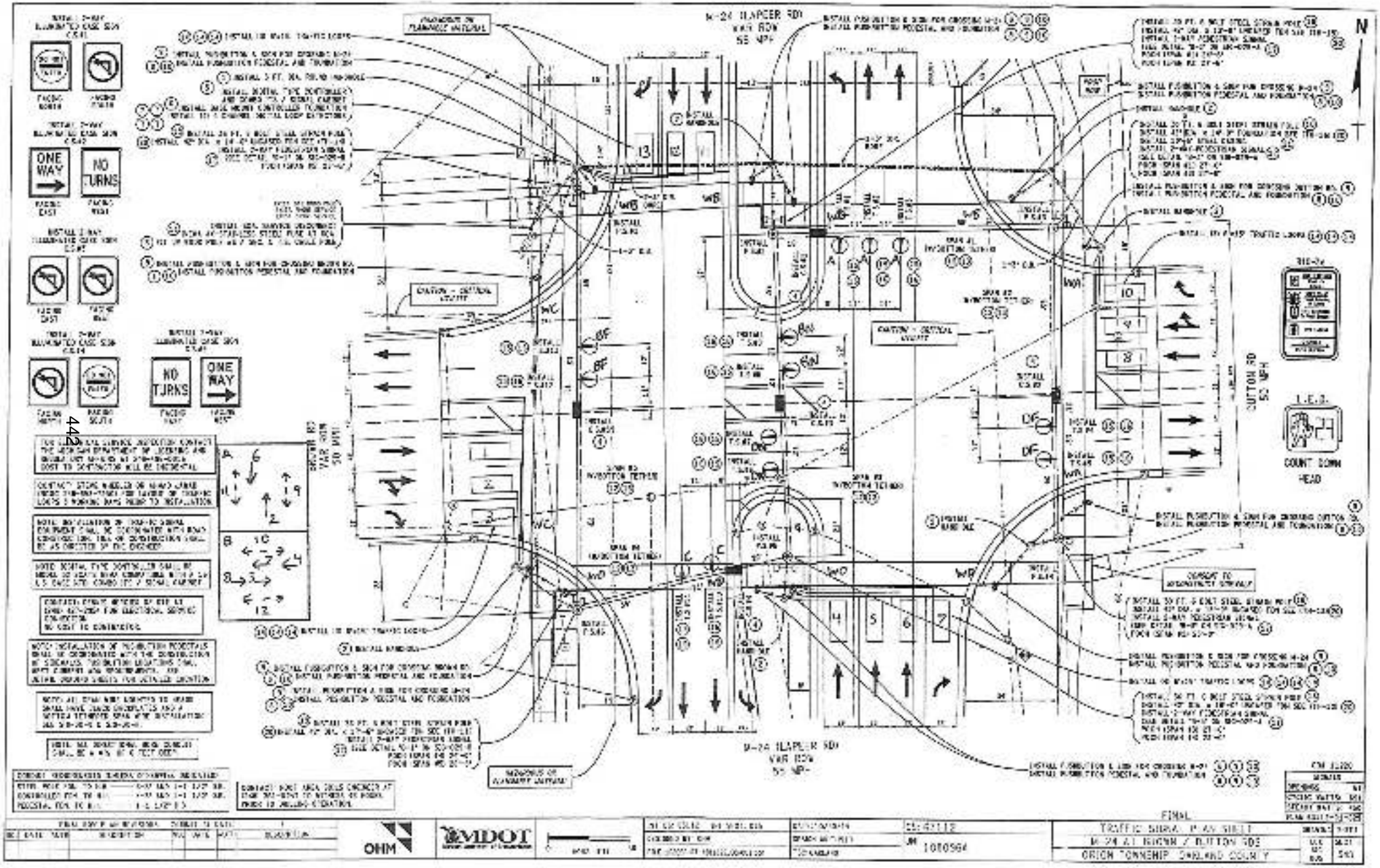
DAY OF WEEK CODE NUMBER

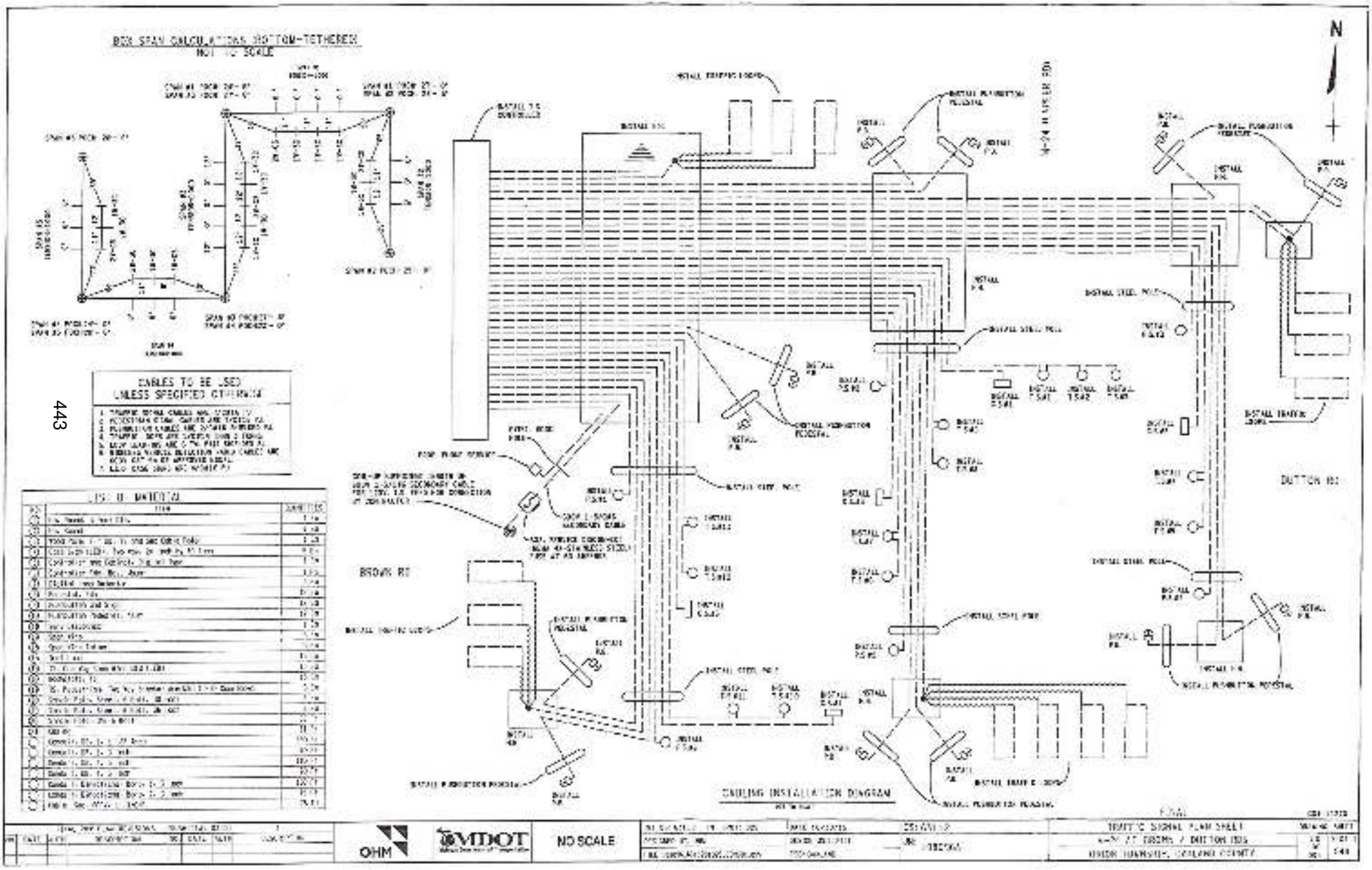
0	[illegible]	4	WED	8	MON-FRI	12	MON,FRI,SAT
1	SUN	5	THUR	9	MON-SAT	13	SAT,SUN
2	MON	6	FRI	10	TUE,WED,THU	14	EVERY DAY
3	TUE	7	SAT	11	MON,FRI	15	NEVER

TS2 LOOP DETECTORS BIU #1

CO#11220 - M-24 & Brown/Dutton

Detector # on print	Description	Phase	Output
1	EB BROWN L	8	1
2	EB BROWN C	8	2
3	EB BROWN R	8	3
4	NB M-24 L	2	4
5	NB M-24 CL	2	5
6	NB M-24 CR	2	6
7	NB M-24 R	2	7
8	WB DUTTON L	4	8
9	WB DUTTON C	4	9
10	WB DUTTON R	4	10
11	SB M-24 L	6	11
12	SB M-24 C	6	12
13	SB M-24 R	6	13


M-24 (LAPEER RD)
VAR ROW
55 MPH
CUTLER RD
VAR ROW
55 MPH
ONE WAY
NO TURNS
NO TURNS
ONE WAY
COUNT DOWN HEAD
N
442


BOX SPAN CALCULATIONS (BOTTOM-TETHERED)
NOT TO SCALE
CABLES TO BE USED
UNLESS SPECIFIED OTHERWISE
BROWN RD
DUTTON RD
N
CABLING INSTALLATION DIAGRAM
NO SCALE
OHM
MDOT
TRAFFIC SIGNAL PLAN SHEET

OAKLAND COUNTY ROAD COMMISSION
TRAFFIC - SAFETY DEPARTMENT
SIGNAL WORK ORDER

LOCATION: M-24 & X/O N/O Brown DATE: 1-23-18

CITY/TOWNSHIP: Orion BY: T. Creech

COUNTY#: 11259 STATE#: 63112-01-125 CHARGES: 78 11259 0

PLEASE PERFORM THE FOLLOWING:

____ ELECTRICAL DEVICE: ____ INSTALL ____ MODERNIZE ____ MAINTENANCE

____ UNDERGROUND: _____

____ EDISON OK: ____ YES ____ NO JOB#: _____ MAR 1 2018

____ COORDINATE W/DISTRICT 7: _____

DIAL..	1	1	1	1		2	2	2	2		3	3	3	3		4	4	4	4
SPLIT.	1	2	3	4		1	2	3	4		1	2	3	4		1	2	3	4
____ CHANGE TIMING.....																			
____ CHANGE OFFSET.....																			
____ CHANGE CYCLE LENGTH.....																			
____ ADD DIAL/SPLIT.....																			

X CHANGE BREAKOUT OR EPROM: REV 2

____ CHANGE HOURS OF OPERATION: (flexi changes, MAX time)

OLD: _____

NEW: _____

____ REPROGRAM TBC

____ INSTALL INTERCONNECT: ____ TBC ____ MINITROL ____ TONE

____ MBT OK: ____ YES ____ NO

____ NO CHANGE - RECORD CORRECTION

X OTHER: Requires a checksum change

Monitor - Unit options: LED Good ON

APPROVED BY: _____ DATE: 2/18/18

DATE INSTALLED: 2/27/18

INSTALLED BY: Kevin Wojtkowiak

```
INTERSECTION :- 11259  M-24 & X/O N/O BROWN
DESCRIPTION PROMS :- X11259 / F2002
CONTROLLER TYPE :- STANDARD PERSONALITY CONTROLLER
SOFTWARE TYPE :- MOD 52 SCATS 330 TS2

INPUTS :-
 1. X/O N/O BROWN L (NL)          NOTE:  ALL DETECTORS ARE
 2. X/O N/O BROWN R (NL)                 SENSYS PUCKS.
 3. SB M-24 L (LK)
 4. SB M-24 C (LK)
 5. SB M-24 R (LK)

APPROACHES :-
A APP 1 : SB M-24 L,C,R
B APP 1 : X/O N/O BROWN L,R

FLEXIDATA :-                      PEDESTRIANS :-
SEQUENCE  A,B          A,B
AUTO REL
R- REL    A            A
R+ REL    B            B
G- REL
G+ REL

SPECIAL FEATURES :-
   Personality revision is 2 (=B).
   A STAGE HAS A PERMANENT DEMAND.
   DEMAND FOR B STAGE IN FLEXI AND ISOLATED, SET ZNEG TO DISABLE.

BACKPANEL :- SIZE M TS2 CABINET
            LOAD SWITCH  2: SB M-24                  A          PLA
            LOAD SWITCH  4: X/O N/O BROWN            B          PLB

MMU :- (MENU : SET/VIEW CONFIG)
           Field Check Enable            Channel 2:  G, Y, R
                                         Channel 4:  G, Y, R

           Dual Indication Enable:       R+G:  Channel 2, 4
                                         R+Y:  Channel 2, 4
                                         G+Y:  Channel 2, 4

           Red Fail Enable:              Enable: Channel 2, 4

           Y & R Clearance Disable:      Channel 2, 4 Enabled

           Unit Options:                 All OFF except:
                                         Recurrent pulse
                                         Program Memory Card
                                         LRD Guard

           Program Card:                 Compatible Channels: None
                                         Min Flash Time: 4+2+1
                                         Min Yellow Change Disable: None
                                         Voltage Monitor Latch: None

     NOTE :- Add Jumper 16 MMU Flash - 116 Monitor ST Out.
  **********************************     Checksums:
  * CONTROLLER INFORMATION SHEET *      Times EF / 357
  *      FOR SITE NO. 11259       *     Pers  15 / 025
  *           T. CRESCH           *     Total FA / 372
  *         23-JAN-2018           *
  **********************************
```

FLEXILINK PLAN DATA

Intersection # 11259 **State #** 63112-01-125 **Date:** 01/23/18 **Prepared By:** T. Creech

Intersection: M-24 & X/O N/O Brown **City:** Orion

Hours of Operation: 7 Days: 24 Hours **Approved By:** R. Jones

Hours of Flashing: None

		PL0	PL1	PL2	PL3	PL4	PL5	PL6	PL7	PL8
0	CL		130	130	130					
1	A		0	0	0					
2	B		105	110	98					
3	C									
4	D									
5	E									
6	F									
7	G									
8	R-									
9	R+									
10	O/ (Y-)		100	100	100					
11	Y+	C								
12	Z-									
13	Z+									
14	Q-									
15	Q+									
16	XH									
17	XL									

NOTE: Stages with 1 second of phase time are skipped. Blank entries are default values equal to 0. Except for an AWA controller, entries #8 to #15 (=254) and 'C' entry means continuous (=255).

							Timers		
Phase	Direction	Min	Max	ECO	Amber	All Red	Gap	Hdwy	Waste
A	M-24	10.0	110.0		5.0	1.1	3.0	1.2	10.0
B	X/O N/O Brown	7.0	35.0		3.0	1.8	3.0	1.2	10.0
C									
D									
E									
F									
G									

	Day	Hours	Plan#
SC1	8	5:00	2
SC2	8	9:00	1
SC3	8	14:00	3
SC4	8	19:00	1
SC5	14	0:00	1
SC6			
SC7			
SC8			
SC9			
SC10			

Pedestrian Crossing Times

Direction	Walk	CL 1	CL 2

Normal Operating Mode

Isolated	Flexilink	Masterlink	Master Isolated	Flexi Isolated
		X		

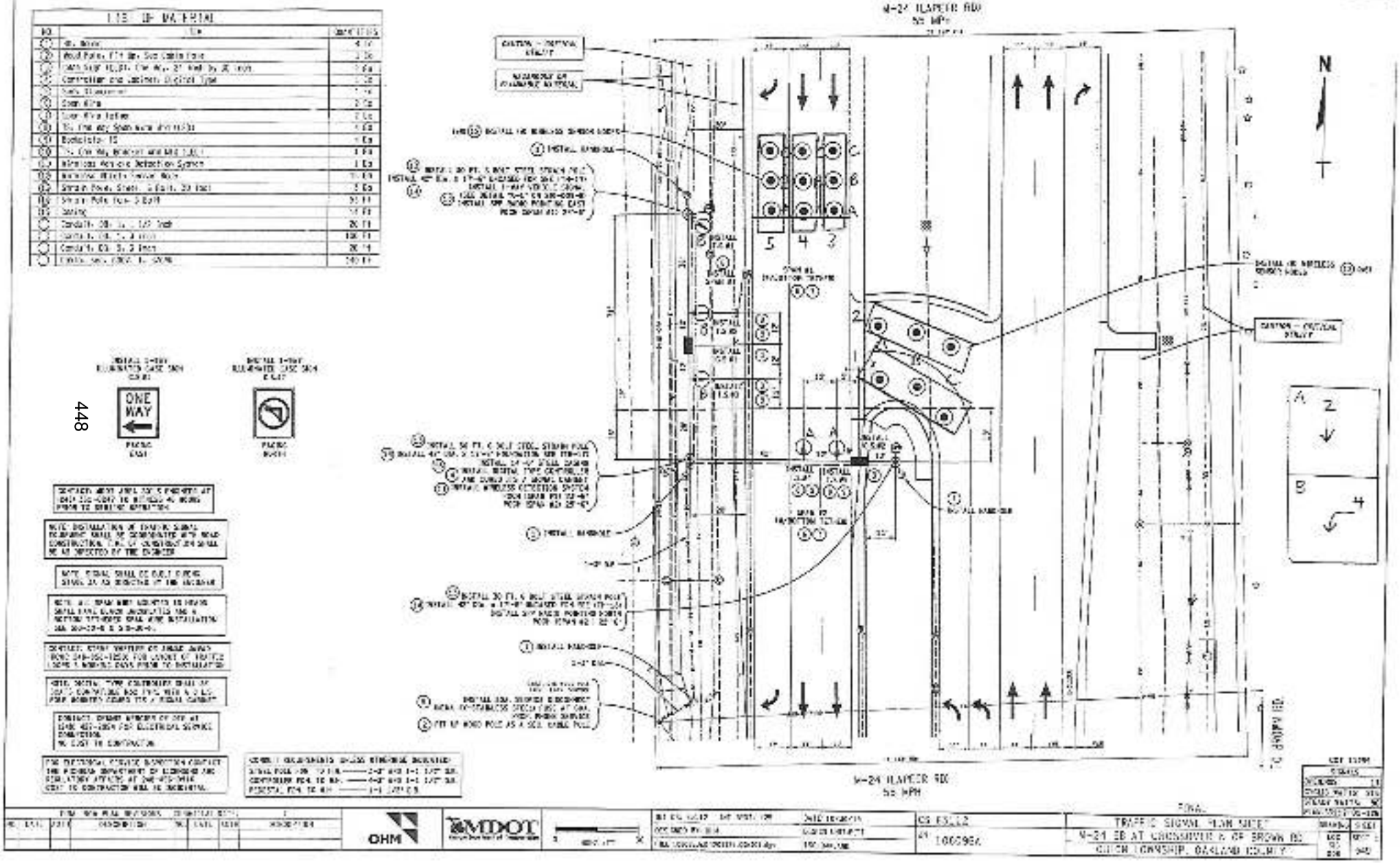
DAY OF WEEK CODE NUMBER

0	[illegible]	4	WED	8	MON-FRI	12	MON,FR,SAT
1	SUN	5	THUR	9	MON-SAT	13	SAT,SUN
2	MON	6	FRI	10	TUE,WED,THU	14	EVERY DAY
3	TUE	7	SAT	11	MON,FRI	15	NEVER

TS2 SENSYS DETECTORS BIU #1

CO#11259

Detector # on print	Description	Phase	Output
1	X/O N/O Brown L	4	1
2	X/O N/O Brown R	4	2
3	SB M-24 L	2	3
4	SB M-24 C	2	4
5	SB M-24 R	2	5


LIST OF MATERIAL
M-21 (LAPEER RD)
55 MPH
M-24 (LAPEER RD)
55 MPH
N
ONE WAY
448

OAKLAND COUNTY ROAD COMMISSION
TRAFFIC - SAFETY DEPARTMENT
SIGNAL WORK ORDER

LOCATION: M-24 & x/o S/O Brown DATE: 1-23-18

CITY/TOWNSHIP: Auburn Hills BY: T. Creech

COUNTY #: 11260 STATE #: 63112-01-225 CHARGES: Z8 11260 O

PLEASE PERFORM THE FOLLOWING

___ ELECTRICAL DEVICE: ___ INSTALL ___ MODERNIZE ___ MAINTENANCE

___ UNDERGROUND: ______

___ EDISON OK: ___ YES ___ NO JOB #: ______

___ COORDINATE W/DISTRICT ?: ______

	1	1	1	1		2	2	2	2		3	3	3	3		4	4	4	4
DIAL.	1	1	1	1		2	2	2	2		3	3	3	3		4	4	4	4
SPLIT.	1	2	3	4		1	2	3	4		1	2	3	4		1	2	3	4
___ CHANGE TIMING																			
___ CHANGE OFFSET																			
___ CHANGE CYCLE LENGTH																			
___ ADD DIAL/SPLIT																			

X CHANGE BREAKOUT OR EPROM: REV 2

___ CHANGE HOURS OF OPERATION: (Yel... change, Max time)

OLD: ______

NEW: ______

___ REPROGRAM TBC

___ INSTALL INTERCONNECT: ___ TBC ___ CONTROL ___ TONE

___ MST OK: ___ YES ___ NO

___ NO CHANGE - RECORD CORRECTION

X OTHER: Requires a checksum change
Monitor - Unit options: LED Guard ON

APPROVED BY: [signature] DATE: 3/18/18

DATE INSTALLED: ______

INSTALLED BY: ______

INTERSECTION :- 11260 M-24 & X/O S/O BROWN
DESCRIPTION PROMS :- X11260 / X2002
CONTROLLER TYPE :- STANDARD PERSONALITY CONTROLLER
SOFTWARE TYPE :- MOD 52 SCATS 810 <u>T82</u>

INPUTS :-
1. X/O S/O BROWN L (NL)
2. X/O S/O BROWN R (NL)
3. KE M-24 L (LK)
4. NE M-24 C (LK)
5. NE M-24 R (LK)

NOTE: ALL DETECTORS ARE SENSYS PUCKS.

APPROACHES :-
A APP 1 : NE M-24 L,C,R
B APP 1 : X/O S/O BROWN L,R

FLEXIDATA :-			PEDESTRIANS :-
SEQUENCE	A,B	A,B	
AUTO XSL			
R- XSL	A	A	
R+ XSL	B	B	
Q- XSL			
Q+ XSL			

SPECIAL FEATURES :-
Personality revision is 2 (a8).
A STAGE HAS A PERMANENT DEMAND.
DEMAND FOR B STAGE IN FLEXI AND ISOLATED, SET XNSS TO DISABLE.

BACKPANEL :- SIGN X T82 CABINET

LOAD SWITCH	2: KE M-24	A	PLA
LOAD SWITCH	4: X/O S/O BROWN	B	PLB

MMU :- (MENU : SET/VIEW CONFIG)

Field Check Enable	Channel 2: G, Y, R Channel 4: G, Y, R
Dual Indication Enable:	R+G: Channel 2, 4 R+Y: Channel 2, 4 G+Y: Channel 2, 4
Red Fail Enable:	Enable: Channel 2, 4
Y & R Clearance Disable:	Channel 2, 4 Enabled
Unit Options:	All OFF except: Recurrent pulse Program Memory Card LED Guard
Program Card:	Compatible Channels: None Min Flash Time: 6+2+1 Min Yellow Change Disable: None Voltage Monitor Latch: None

NOTE :- Add Jumper 16 MMU Flash - 110 Monitor ST Out

****
* CONTROLLER INFORMATION SHEET *
* FOR SITE NO. 11260 *
* T. DREDGE *
* 23-JAN-2014 *
****

Checksums.
Times 51 / 351
Ports 1B / 035
Total 9A / 212

FLEXILINK PLAN DATA

Intersection #: 1220 State A: ES112-01-22S Date: 01/23/15 Prepared By: T. Crozier

Intersection: M-24 & W/O S/O Brown City: Auburn Hills

Hours of Operation: 7 Days, 24 Hours Approved By: R. [illegible]

Hours of Flashing: None

		PL0	PL1	PL2	PL3	PL4	PL5	PL6	PL7	PL8
0	CL		150	150	150					
1	A		0	0	0					
2	B		106	106	101					
3	C									
4	D									
5	E									
6	F									
7	G									
8	R-									
9	R+									
10	CI (Y-)		90	90	89					
11	Y+	C								
12	Z-									
13	Z+									
14	O-									
15	O+									
16	X1									
17	X2									

NOTE: Shifts with 1 second of phase time are skipped. Blank entries are default values equal to 0.
Codes for an AWA controller, entries #8 to #15 (=254) and 'C' entry means continuous (=255).

Phase	Direction	Min	Max	PCO	Amber	All Red	Timers Gap	Hdwy	Waste
A	M-24	10.0	110.0		3.0	1.0	3.0	1.2	10.0
B	W/O S/O Brown	7.0	35.0		3.0	1.0	3.0	1.2	10.0
C									
D									
E									
F									
G									

	Day	Hours	Plan#
SC1	8	5:00	2
SC2	8	9:00	1
SC3	8	14:00	3
SC4	8	19:00	1
SC5	14	0:00	1
SC6			
SC7			
SC8			
SC9			
SC10			

Pedestrian Crossing Times

Direction	Walk	CL 1	CL 2

Normal Operating Mode

Isolated	Flexilink	Masterlink	[illegible]	Flex Isolated
		X		

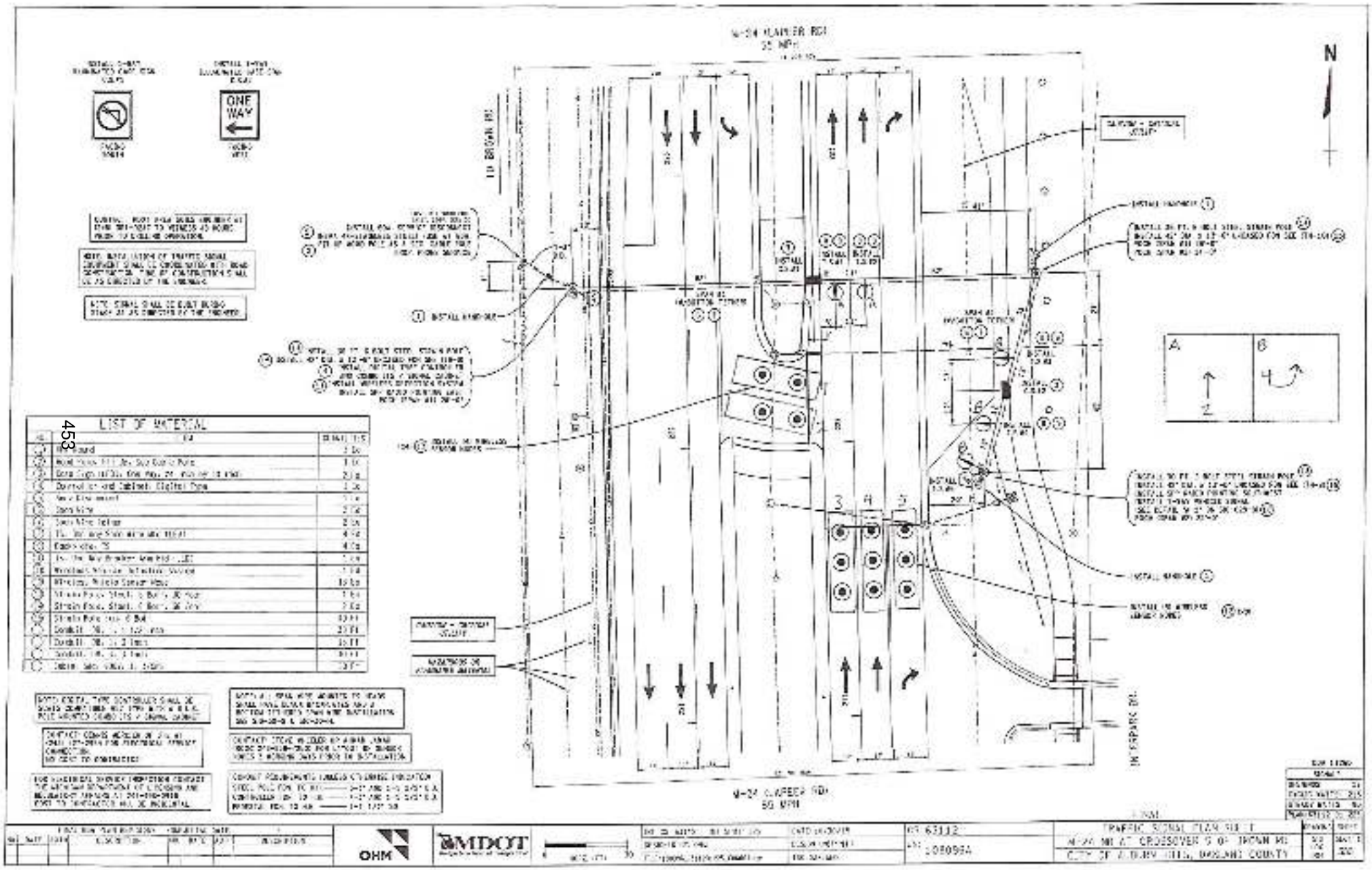
DAY OF WEEK CODE NUMBER

0	[illegible]	4	ALL	8	MON-FRI	12	[illegible]
1	SUN	5	THUR	9	MON-SAT	13	SAT,SUN
2	MON	6	FRI	10	[illegible]	14	EVERY DAY
3	TUE	7	SAT	11	WORK FR	15	NEVER

TS2 SENSYS DETECTORS BIU #1

CO#11260

Detector # or zone	Description	Phase	Output
1	X/O S/O Brown L	4	1
2	X/O S/O Brown R	4	2
3	NB M-24 L	2	3
4	NB M-24 C	2	4
5	NB M-24 R	2	5


N
ONE WAY
LIST OF MATERIAL
453

OAKLAND COUNTY ROAD COMMISSION
TRAFFIC - SAFETY DEPARTMENT
SIGNAL WORK ORDER

LOCATION: M-24 & x/o S/o Silverbell DATE: 1-24-18

CITY/TOWNSHIP: Orion BY: T. Creech

COUNTY#: 11303 STATE#: 63112-01-313 CHARGES: 78 11303 0

PLEASE PERFORM THE FOLLOWING:

____ ELECTRICAL DEVICE: ____ INSTALL ____ MODERNIZE ____ MAINTENANCE

____ UNDERGROUND: _____

____ EDISON OK: ____ YES ____ NO JOB#: MAR 1 2018

____ COORDINATE W/DISTRICT 7: _____

DIAL..	1	1	1	1		2	2	2	2		3	3	3	3		4	4	4	4
SPLIT.	1	2	3	4		1	2	3	4		1	2	3	4		1	2	3	4
____ CHANGE TIMING.....																			
____ CHANGE OFFSET.....																			
____ CHANGE CYCLE LENGTH.....																			
____ ADD DIAL/SPLIT.....																			

X CHANGE BREAKOUT OR EPROM: REV Z
(flex changes, MAX time)

____ CHANGE HOURS OF OPERATION:

OLD: _____

NEW: _____

____ REPROGRAM TBC

____ INSTALL INTERCONNECT: ____ TBC ____ MINITROL ____ TONE

____ MBT OK: ____ YES ____ NO

____ NO CHANGE - RECORD CORRECTION

X OTHER: Requires a checksum change
Monitor - Unit Options : LED Guard ON

APPROVED BY: _____ DATE: 2/18/18

DATE INSTALLED: 2/27/18

INSTALLED BY: Howell Signal

INTERSECTION :- 11303 M-24 & X/O S/O SILVERBELL
DESCRIPTION PROMS :- X11303 / F2002
CONTROLLER TYPE :- STANDARD PERSONALITY CONTROLLER
SOFTWARE TYPE :- MOD 52 SCATS 930 **TS2**

INPUTS :-
1. X/O S/O SILVERBELL L (NL)
2. X/O S/O SILVERBELL R (NL)
3. NB M-24 L (LK)
4. NB M-24 C (LK)
5. NB M-24 R (LK)

NOTE: ALL DETECTORS ARE SENSYS PUCKS.

APPROACHES :-
A APP 2 : NB M-24 L,C,R
B APP 1 : X/O S/O SILVERBELL L,R

FLEXIDATA :-		PEDESTRIANS :-
SEQUENCE	A,B	A,B
AUTO REL		
R- REL	A	A
R+ REL	B	B
Q- REL		
Q+ REL		

SPECIAL FEATURES :-
Personality revision is 2 (=B).
A STAGE HAS A PERMANENT DEMAND.
DEMAND FOR B STAGE IN FLEXI AND ISOLATED, SET ZNEG TO DISABLE.

BACKPANEL :- SIZE M **TS2** CABINET

LOAD SWITCH	2: NB M-24	A	PLA
LOAD SWITCH	4: X/O S/O SILVERBELL	B	PLR

MMU :- (MENU : SET/VIEW CONFIG)

Field Check Enable	Channel 2: G, Y, R Channel 4: G, Y, R
Dual Indication Enable:	R+G: Channel 2, 4 R+Y: Channel 2, 4 G-Y: Channel 2, 4
Red Fail Enable:	Enable: Channel 2, 4
Y & R Clearance Disable:	Channel 2, 4 Enabled
Unit Options:	All OFF except: Recurrent pulse Program Memory Card LED Guard
Program Card:	Compatible Channels: None Min Flash Time: 4+2+1 Min Yellow Change Disable: None Voltage Monitor Latch: None

NOTE :- Add Jumper 16 MMU Flash - 116 Monitor ST Out

```
**********************************
* CONTROLLER INFORMATION SHEET   *
*      FOR SITE NO. 11303        *
*           T. CREECH            *
*          24 JAN 2018           *
**********************************
```

Checksums:
Times E8 / 350
Pers AB / 253
Total 43 / 203

FLEXILINK PLAN DATA

Intersection # 11303 **State #** 63112-01-313 **Date:** 01/24/18 **Prepared By:** T. Creech

Intersection: M-24 & X/O S/O Silverbell **City:** Orion Twp.

Hours of Operation: 7 Days: 24 Hours **Approved By:** R. Jones

Hours of Flashing: None

		PL0	PL1	PL2	PL3	PL4	PL5	PL6	PL7	PL8
0	CL		130	130	130					
1	A		0	0	0					
2	B		90	107	93					
3	C									
4	D									
5	E									
6	F									
7	G									
8	R-									
9	R+									
10	Of (Y-)		41	41	41					
11	Y+	C								
12	Z-									
13	Z+									
14	Q-									
15	Q+									
16	XH									
17	XL									

NOTE: Stages with 1 second of phase time are skipped. Blank entries are default values equal to 0. Except for an AWA controller, entries #8 to #15 (=254) and 'C' entry means continuous (=255).

Phase	Direction	Min	Max	ECO	Amber	All Red	Timers		
							Gap	Hdwy	Waste
A	M-24	10.0	110.0		5.0	1.2	3.0	1.2	10.0
B	X/O S/O Silverbell	7.0	15.0		3.0	1.8	3.0	1.2	10.0
C									
D									
E									
F									
G									

	Day	Hours	Plan#
SC1	8	5:00	2
SC2	8	9:00	1
SC3	8	14:00	3
SC4	8	19:00	1
SC5	14	0:00	1
SC6			
SC7			
SC8			
SC9			
SC10			

Pedestrian Crossing Times

Direction	Walk	CL 1	CL 2

Normal Operating Mode

Isolated	Flexilink	Masterlink	Master Isolated	Flexi Isolated
		X		

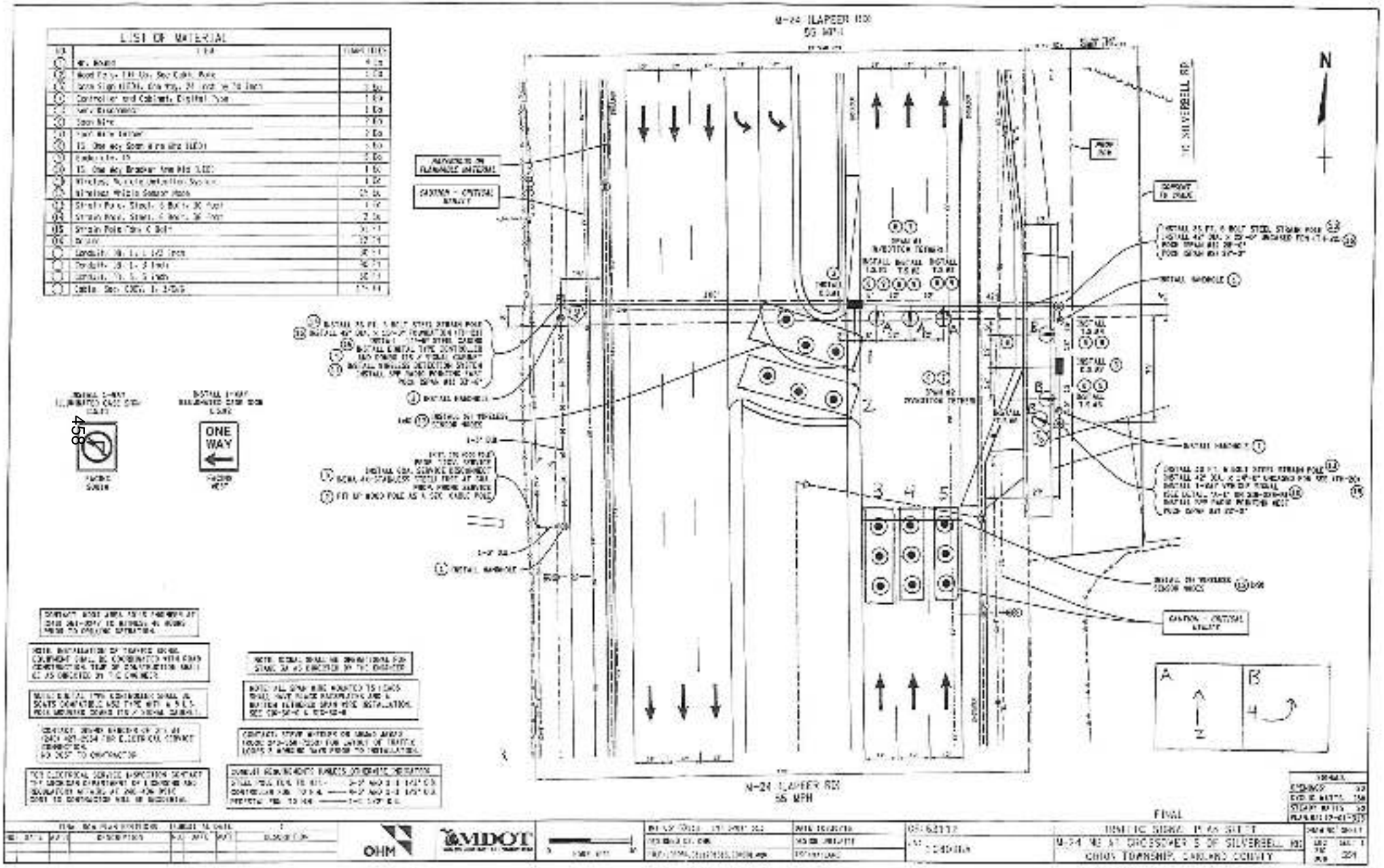
DAY OF WEEK CODE NUMBER

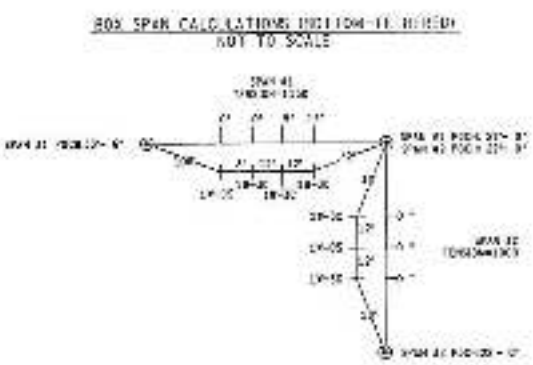
0	Not Needed	4	WED	8	MON-FRI	12	MON,FRI,SAT
1	SUN	5	THUR	9	MON-SAT	13	SAT,SUN
2	MON	6	FRI	10	TUE,WED,THU	14	EVERY DAY
3	TUE	7	SAT	11	MON,FRI	15	NEVER

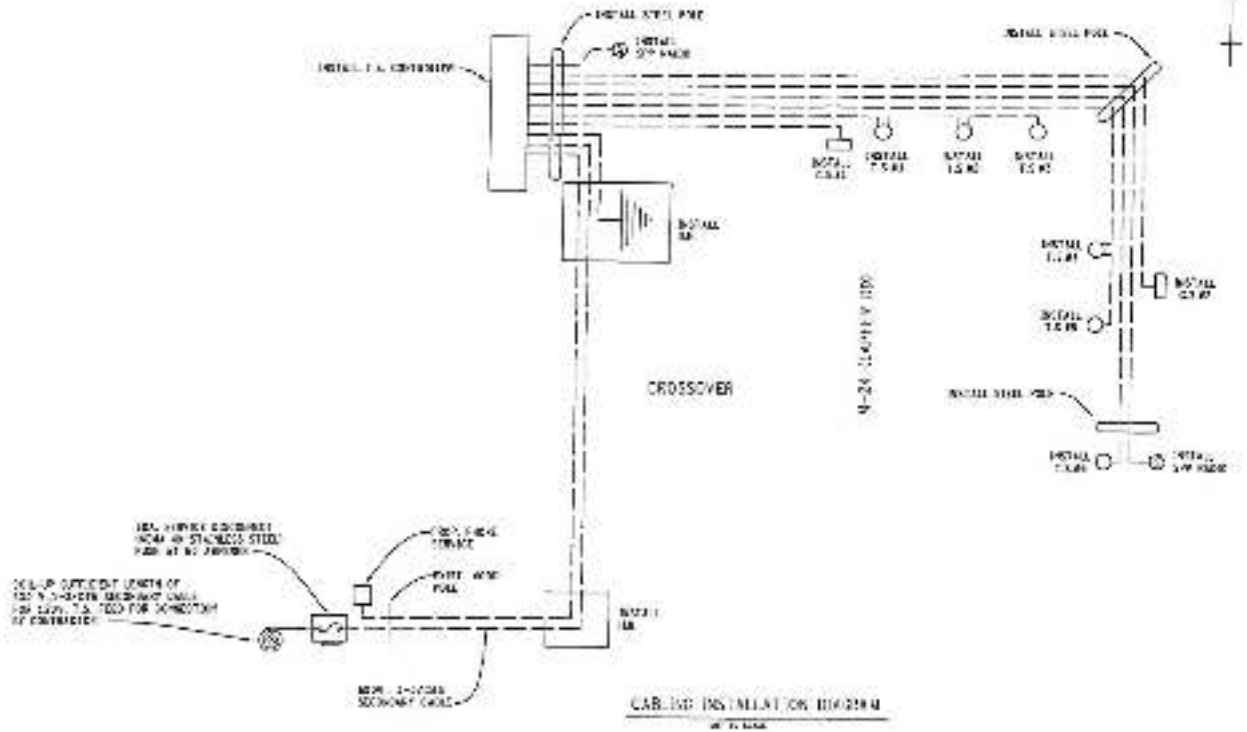
TS2 SENSYS DETECTORS BIU #1

CO#11303

Detector # on print	Description	Phase	Output
1	X/O S/O Silverbell L	4	1
2	X/O S/O Silverbell R	4	2
3	NB M-24 L	2	3
4	NB M-24 C	2	4
5	NB M-24 R	2	5


M-24 (LAPEER RD)
55 MPH
N
S. SILVERBELL RD.
LIST OF MATERIAL
ITEM
QUANTITY
ONE WAY
458
M-24 (LAPEER RD)
55 MPH
FINAL





CABLES TO BE USED
UNLESS SPECIFIED OTHERWISE

OHM

MDOT

NO SCALE

459

OAKLAND COUNTY ROAD COMMISSION
TRAFFIC - SAFETY DEPARTMENT
SIGNAL WORK ORDER

LOCATION: M-24 & x/o N/O Silverbell DATE: 1-24-18

CITY/TOWNSHIP: Orion BY: T. Creech

COUNTY#: 11304 STATE#: 63112-01-113 CHARGES: 78 11304 0

PLEASE PERFORM THE FOLLOWING:

____ ELECTRICAL DEVICE: ____ INSTALL ____ MODERNIZE ____ MAINTENANCE

____ UNDERGROUND: _____

____ EDISON OK: ____ YES ____ NO JOB#: MAR 1 2018

____ COORDINATE W/DISTRICT 7: _____

	DIAL..	1	1	1	1		2	2	2	2		3	3	3	3		4	4	4	4
	SPLIT.	1	2	3	4		1	2	3	4		1	2	3	4		1	2	3	4
____	CHANGE TIMING.....																			
____	CHANGE OFFSET.....																			
____	CHANGE CYCLE LENGTH.....																			
____	ADD DIAL/SPLIT.....																			

X CHANGE BREAKOUT OR EPROM: REV Z (flexi charges)

____ CHANGE HOURS OF OPERATION:

OLD: _____

NEW: _____

____ REPROGRAM TBC

____ INSTALL INTERCONNECT: ____ TBC ____ MINITROL ____ TONE

____ MBT OK: ____ YES ____ NO

____ NO CHANGE - RECORD CORRECTION

X OTHER: Requires a checksum change

Monitor - Unit Options: LED Guard ON

APPROVED BY: _____ DATE: 2/18/18

DATE INSTALLED: 2/27/18

INSTALLED BY: Jason Wojtkowiak

INTERSECTION :- 11304 M-24 & X/O N/O SILVERBELL
DESCRIPTION PROMS :- X11304 / F2002
CONTROLLER TYPE :- STANDARD PERSONALITY CONTROLLER
SOFTWARE TYPE :- MOD S2 SCATS S30 TS2

INPUTS :-
1. X/O N/O SILVERBELL L (NL)
2. X/O N/O SILVERBELL R (NL)
3. SB M-24 L (LK)
4. SB M-24 C (LK)
5. SB M-24 R (LK)

NOTE: ALL DETECTORS ARE SENSYS PUCKS.

APPROACHES :-
A APP 1 : SB M-24 L,C,R
B APP 1 : X/O N/O SILVERBELL L,R

FLEXIDATA :-		PEDESTRIANS :-
SEQUENCE	A,B	A,B
AUTO REL		
R- REL	A	A
R+ REL	B	B
Q- REL		
Q+ REL		

SPECIAL FEATURES :-
Personality revision is 2 (=B).
A STAGE HAS A PERMANENT DEMAND.
DEMAND FOR B STAGE IN FLEXI AND ISOLATED, SET ZNEG TO DISABLE.

BACKPANEL :- SIZE M TS2 CABINET

LOAD SWITCH	2: SB M-24	A	FLA
LOAD SWITCH	4: X/O N/O SILVERBELL	B	FLR

MMU :- (MENU : SET/VIEW CONFIG)

Field Check Enable	Channel 2: G, Y, R Channel 4: G, Y, R
Dual Indication Enable:	R+G: Channel 2, 4 R+Y: Channel 2, 4 G+Y: Channel 2, 4
Red Fail Enable:	Enable: Channel 2, 4
Y & R Clearance Disable:	Channel 2, 4 Enabled
Unit Options:	All OFF except: Recurrent pulse Program Memory Card LED Guard
Program Card:	Compatible Channels: None Min Flash Time: 4+2+1 Min Yellow Change Disable: None Voltage Monitor Latch: None

NOTE :- Add Jumper 16 MMU Flash - 116 Monitor ST Out

```
**********************************
* CONTROLLER INFORMATION SHEET   *
*      FOR SITE NO. 11304        *
*          T. CREECH             *
*         24-JAN-2018            *
**********************************
```

Checksums:
Times 1E / 036
Pcrs B5 / 265
Total AB / 253

FLEXILINK PLAN DATA

Intersection # 11304 State # 83112-01-113 Date: 01/24/18 Prepared By: T Creech

Intersection: M-24 & X/O N/O Silverbell City: Orion Twp.

Hours of Operation: 7 Days: 24 Hours Approved By: R. Jones

Hours of Flashing: None

		PL0	PL1	PL2	PL3	PL4	PL5	PL6	PL7	PL8
0	CL		130	130	130					
1	A		0	0	0					
2	B		90	107	93					
3	C									
4	D									
5	E									
6	F									
7	G									
8	R-									
9	R+									
10	Of (Y-)		41	41	41					
11	Y+	C								
12	Z-									
13	Z+									
14	Q-									
15	Q+									
16	XH									
17	XL									

NOTE: Stages with 1 second of phase time are skipped. Blank entries are default values equal to 0. Except for an AWA controller, entries #8 to #15 (=254) and 'C' entry means continuous (=255).

							Timers		
Phase	Direction	Min	Max	ECO	Amber	All Red	Gap	Hdwy	Waste
A	M-24	10.0	110.0		5.0	1.1	3.0	1.2	10.0
B	X/O N/O Silverbell	7.0	40.0		3.0	1.8	3.0	1.2	10.0
C									
D									
E									
F									
G									

	Day	Hours	Plan#
SC1	8	5:00	2
SC2	8	9:00	1
SC3	8	14:00	3
SC4	8	19:00	1
SC5	14	0:00	1
SC6			
SC7			
SC8			
SC9			
SC10			

Pedestrian Crossing Times

Direction	Walk	CL 1	CL 2

Normal Operating Mode

Isolated	Flexilink	Masterlink	Master Isolated	Flexi Isolated
		X		

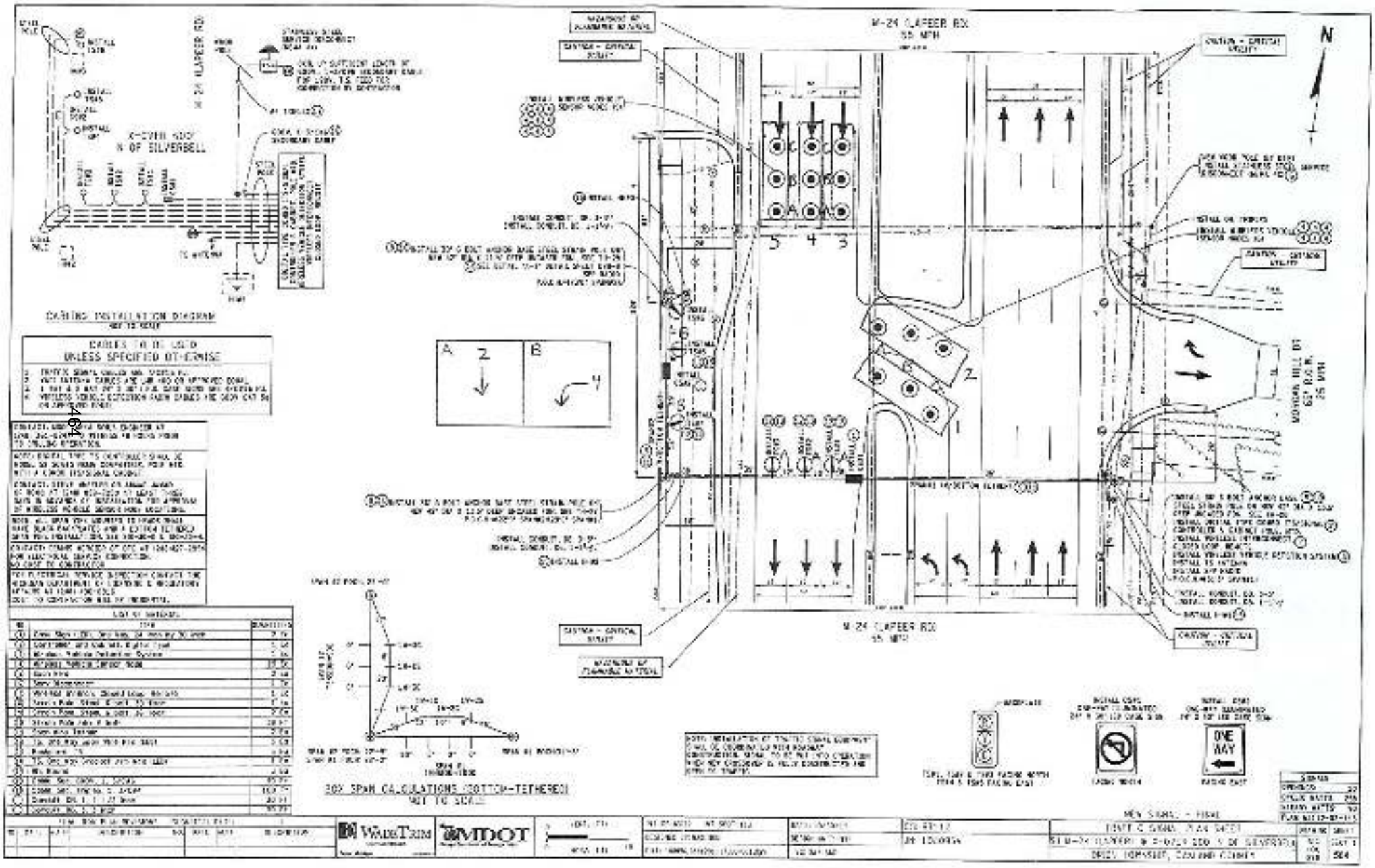
DAY OF WEEK CODE NUMBER

0	Invalid Selection	4	WED	8	MON-FRI	12	MON,FRI,SAT
1	SUN	5	THUR	9	MON-SAT	13	SAT,SUN
2	MON	6	FRI	10	TUE,WED,THU	14	EVERY DAY
3	TUE	7	SAT	11	MON,FRI	15	NEVER

TS2 SENSYS DETECTORS BIU #1

CO#11304

Detector # on print	Description	Phase	Output
1	X/O N/O Silverbell L	4	1
2	X/O N/O Silverbell R	4	2
3	SB M-24 L	2	3
4	SB M-24 C	2	4
5	SB M-24 R	2	5


M-24 CLAPEER RD
55 MPH
N
CABLING INSTALLATION DIAGRAM
CABLES TO BE USED
UNLESS SPECIFIED OTHERWISE
M-24 CLAPEER RD
55 MPH
BOX SPAN CALCULATIONS (COTTON-TETHERED)
NOT TO SCALE
ONE WAY
WadeTrim
MDOT

Appendix C.
Existing Conditions - Synchro Reports

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh)	0	0	0	1	0	0	2	572	234	28	111	0
Future Volume (vph)	0	0	0	1	0	0	2	572	234	28	111	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)				6.0			6.2	6.2	6.2	6.2	6.2	
Lane Util. Factor				1.00			1.00	0.95	1.00	1.00	0.95	
Frt				1.00			1.00	1.00	0.85	1.00	1.00	
Flt Protected				0.95			0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)				1900			1900	3762	1700	1900	3689	
Flt Permitted				0.76			0.64	1.00	1.00	0.28	1.00	
Satd. Flow (perm)				1514			1270	3762	1700	560	3689	
Peak-hour factor, PHF	0.60	0.60	0.60	0.60	0.60	0.60	0.68	0.68	0.68	0.60	0.60	0.60
Adj. Flow (vph)	0	0	0	2	0	0	3	841	344	47	185	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	140	0	0	0
Lane Group Flow (vph)	0	0	0	2	0	0	3	841	204	47	185	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	3%	0%
Turn Type				Perm			Perm	NA	Perm	Perm	NA	
Protected Phases		4			4			2			2	
Permitted Phases	4			4			2		2	2		
Actuated Green, G (s)				34.0			53.8	53.8	53.8	53.8	53.8	
Effective Green, g (s)				34.0			53.8	53.8	53.8	53.8	53.8	
Actuated g/C Ratio				0.34			0.54	0.54	0.54	0.54	0.54	
Clearance Time (s)				6.0			6.2	6.2	6.2	6.2	6.2	
Lane Grp Cap (vph)				514			683	2023	914	301	1984	
v/s Ratio Prot								c0.22			0.05	
v/s Ratio Perm				c0.00			0.00		0.12	0.08		
v/c Ratio				0.00			0.00	0.42	0.22	0.16	0.09	
Uniform Delay, d1				21.8			13.7	13.7	12.1	11.7	11.2	
Progression Factor				1.00			0.82	0.68	0.29	1.00	1.00	
Incremental Delay, d2				0.0			0.0	0.6	0.5	1.1	0.1	
Delay (s)				21.8			8.7	10.0	4.1	12.8	11.3	
Level of Service				C			A	A	A	B	B	
Approach Delay (s)		0.0			21.8			8.3			11.6	
Approach LOS		A			C			A			B	

Intersection Summary

HCM 2000 Control Delay	8.8	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.26		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.2
Intersection Capacity Utilization	40.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	126	148	0	170	0	0	0	0	0	2275	180
Future Volume (vph)	0	126	148	0	170	0	0	0	0	0	2275	180
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	12	12	12	12	12	12	11	11	11	11	11	11
Total Lost time (s)		6.3	6.3		6.3						6.7	6.7
Lane Util. Factor		0.91	0.91		0.95						0.91	1.00
Frt		0.95	0.85		1.00						1.00	0.85
Flt Protected		1.00	1.00		1.00						1.00	1.00
Satd. Flow (prot)		2815	1097		3551						5075	1304
Flt Permitted		1.00	1.00		1.00						1.00	1.00
Satd. Flow (perm)		2815	1097		3551						5075	1304
Peak-hour factor, PHF	0.89	0.89	0.89	0.81	0.81	0.81	0.90	0.90	0.90	0.95	0.95	0.95
Adj. Flow (vph)	0	142	166	0	210	0	0	0	0	0	2395	189
RTOR Reduction (vph)	0	6	24	0	0	0	0	0	0	0	0	41
Lane Group Flow (vph)	0	206	72	0	210	0	0	0	0	0	2395	148
Heavy Vehicles (%)	0%	14%	41%	0%	7%	2%	0%	0%	0%	0%	4%	26%
Turn Type		NA	Perm		NA						NA	Perm
Protected Phases		4			8						6	
Permitted Phases			4									6
Actuated Green, G (s)		24.4	24.4		26.4						100.6	100.6
Effective Green, g (s)		24.4	24.4		26.4						100.6	100.6
Actuated g/C Ratio		0.17	0.17		0.19						0.72	0.72
Clearance Time (s)		6.3	6.3		6.3						6.7	6.7
Vehicle Extension (s)		3.0	3.0		3.0						3.0	3.0
Lane Grp Cap (vph)		490	191		669						3646	937
v/s Ratio Prot		c0.07			0.06						c0.47	
v/s Ratio Perm			0.07									0.11
v/c Ratio		0.42	0.38		0.31						0.66	0.16
Uniform Delay, d1		51.5	51.1		49.0						10.5	6.3
Progression Factor		1.00	1.00		0.00						1.00	1.00
Incremental Delay, d2		0.6	1.3		0.3						0.9	0.4
Delay (s)		52.1	52.3		0.3						11.4	6.6
Level of Service		D	D		A						B	A
Approach Delay (s)		52.2			0.3			0.0			11.1	
Approach LOS		D			A			A			B	

Intersection Summary

HCM 2000 Control Delay	14.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	60.1%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	1	4	6	66	5	136	23	671	233	26	75	11
Future Volume (vph)	1	4	6	66	5	136	23	671	233	26	75	11
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)	6.0	6.0		6.3	6.3	6.5	6.5	6.5	6.3	6.5	6.5	
Lane Util. Factor	1.00	1.00		0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.95	
Frt	1.00	0.91		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00		0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1900	1653		1687	1717	1567	1508	3689	1574	1900	3340	
Flt Permitted	0.95	1.00		0.95	0.96	1.00	0.68	1.00	1.00	0.18	1.00	
Satd. Flow (perm)	1900	1653		1687	1717	1567	1074	3689	1574	357	3340	
Peak-hour factor, PHF	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.72	0.72	0.72
Adj. Flow (vph)	2	7	10	110	8	227	38	1118	388	36	104	15
RTOR Reduction (vph)	0	10	0	0	0	130	0	0	132	0	4	0
Lane Group Flow (vph)	2	7	0	58	60	97	38	1118	256	36	115	0
Heavy Vehicles (%)	0%	25%	0%	7%	0%	2%	28%	3%	8%	0%	12%	9%
Turn Type	Split	NA		Split	NA	pm+ov	Perm	NA	pm+ov	pm+pt	NA	
Protected Phases	8	8		4	4	1		2	4	1	6	
Permitted Phases						4	2		2	6		
Actuated Green, G (s)	2.0	2.0		6.7	6.7	13.4	59.3	59.3	66.0	72.5	72.5	
Effective Green, g (s)	2.0	2.0		6.7	6.7	13.4	59.3	59.3	66.0	72.5	72.5	
Actuated g/C Ratio	0.02	0.02		0.07	0.07	0.13	0.59	0.59	0.66	0.72	0.72	
Clearance Time (s)	6.0	6.0		6.3	6.3	6.5	6.5	6.5	6.3	6.5	6.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	36	33		113	115	223	636	2197	1038	362	2421	
v/s Ratio Prot	0.00	c0.00		0.03	c0.03	c0.03		c0.30	0.02	0.01	0.03	
v/s Ratio Perm						0.03	0.04		0.13	0.07		
v/c Ratio	0.05	0.22		0.51	0.52	0.44	0.06	0.51	0.25	0.10	0.05	
Uniform Delay, d1	48.1	48.2		45.1	45.1	38.8	8.6	11.9	6.9	6.0	3.9	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.33	0.95	
Incremental Delay, d2	0.6	3.3		3.9	4.2	1.4	0.2	0.8	0.1	0.1	0.0	
Delay (s)	48.6	51.5		49.0	49.3	41.2	8.8	12.7	7.0	8.0	3.8	
Level of Service	D	D		D	D	D	A	B	A	A	A	
Approach Delay (s)		51.2			43.9			11.2			4.8	
Approach LOS		D			D			B			A	

Intersection Summary

HCM 2000 Control Delay	16.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	25.3
Intersection Capacity Utilization	45.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	115	114	0	232	0	0	0	0	0	2355	146
Future Volume (vph)	0	115	114	0	232	0	0	0	0	0	2355	146
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	12	12	13	12	12	12	11	11	11	11	11	11
Total Lost time (s)		6.3	6.3		6.3						6.8	6.8
Lane Util. Factor		0.91	0.91		0.95						0.95	1.00
Frt		0.96	0.85		1.00						1.00	0.85
Flt Protected		1.00	1.00		1.00						1.00	1.00
Satd. Flow (prot)		3040	1300		3619						3465	1442
Flt Permitted		1.00	1.00		1.00						1.00	1.00
Satd. Flow (perm)		3040	1300		3619						3465	1442
Peak-hour factor, PHF	0.92	0.92	0.92	0.86	0.86	0.86	0.82	0.82	0.82	0.94	0.94	0.94
Adj. Flow (vph)	0	125	124	0	270	0	0	0	0	0	2505	155
RTOR Reduction (vph)	0	12	29	0	0	0	0	0	0	0	0	15
Lane Group Flow (vph)	0	160	43	0	270	0	0	0	0	0	2505	140
Heavy Vehicles (%)	0%	17%	23%	0%	5%	0%	6%	6%	6%	0%	6%	14%
Turn Type		NA	Perm		NA						NA	Perm
Protected Phases		4			8						6	
Permitted Phases			4									6
Actuated Green, G (s)		14.7	14.7		16.7						100.2	100.2
Effective Green, g (s)		14.7	14.7		16.7						100.2	100.2
Actuated g/C Ratio		0.11	0.11		0.13						0.77	0.77
Clearance Time (s)		6.3	6.3		6.3						6.8	6.8
Vehicle Extension (s)		3.0	3.0		3.0						3.0	3.0
Lane Grp Cap (vph)		343	147		464						2670	1111
v/s Ratio Prot		0.05			c0.07						c0.72	
v/s Ratio Perm			0.04									0.10
v/c Ratio		0.47	0.33		0.58						0.94	0.13
Uniform Delay, d1		54.0	53.1		53.4						12.3	3.8
Progression Factor		1.00	1.00		0.09						0.79	0.50
Incremental Delay, d2		1.3	1.3		0.6						4.6	0.1
Delay (s)		55.3	54.4		5.4						14.4	2.0
Level of Service		D	D		A						B	A
Approach Delay (s)		54.8			5.4			0.0			13.7	
Approach LOS		D			A			A			B	

Intersection Summary

HCM 2000 Control Delay	16.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	15.1
Intersection Capacity Utilization	90.3%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	368	0	0	0	0	2087
Future Volume (vph)	368	0	0	0	0	2087
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Lane Width	12	12	11	11	11	11
Total Lost time (s)	4.8					6.1
Lane Util. Factor	0.97					0.91
Frt	1.00					1.00
Flt Protected	0.95					1.00
Satd. Flow (prot)	3686					5027
Flt Permitted	0.95					1.00
Satd. Flow (perm)	3686					5027
Peak-hour factor, PHF	0.93	0.93	0.86	0.96	0.95	0.95
Adj. Flow (vph)	396	0	0	0	0	2197
RTOR Reduction (vph)	39	0	0	0	0	0
Lane Group Flow (vph)	357	0	0	0	0	2197
Heavy Vehicles (%)	0%	0%	6%	6%	0%	5%
Turn Type	Perm					NA
Protected Phases						6
Permitted Phases	8					
Actuated Green, G (s)	16.6					102.5
Effective Green, g (s)	16.6					102.5
Actuated g/C Ratio	0.13					0.79
Clearance Time (s)	4.8					6.1
Vehicle Extension (s)	3.0					3.0
Lane Grp Cap (vph)	470					3963
v/s Ratio Prot						c0.44
v/s Ratio Perm	c0.10					
v/c Ratio	0.76					0.55
Uniform Delay, d1	54.8					5.2
Progression Factor	1.00					1.00
Incremental Delay, d2	6.9					0.6
Delay (s)	61.7					5.7
Level of Service	E					A
Approach Delay (s)	61.7		0.0			5.7
Approach LOS	E		A			A

Intersection Summary

HCM 2000 Control Delay	14.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	10.9
Intersection Capacity Utilization	65.8%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	242	0	0	0	0	2259
Future Volume (vph)	242	0	0	0	0	2259
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Lane Width	12	12	11	11	11	11
Total Lost time (s)	4.8					6.1
Lane Util. Factor	0.97					0.95
Frt	1.00					1.00
Flt Protected	0.95					1.00
Satd. Flow (prot)	3686					3465
Flt Permitted	0.95					1.00
Satd. Flow (perm)	3686					3465
Peak-hour factor, PHF	0.76	0.76	0.92	0.92	0.95	0.95
Adj. Flow (vph)	318	0	0	0	0	2378
RTOR Reduction (vph)	33	0	0	0	0	0
Lane Group Flow (vph)	285	0	0	0	0	2378
Heavy Vehicles (%)	0%	0%	6%	6%	0%	6%
Turn Type	Perm					NA
Protected Phases						6
Permitted Phases	6					
Actuated Green, G (s)	14.0					105.1
Effective Green, g (s)	14.0					105.1
Actuated g/C Ratio	0.11					0.81
Clearance Time (s)	4.8					6.1
Vehicle Extension (s)	3.0					3.0
Lane Grp Cap (vph)	396					2801
v/s Ratio Prot						c0.69
v/s Ratio Perm	c0.08					
v/c Ratio	0.72					0.85
Uniform Delay, d1	56.1					7.6
Progression Factor	1.05					1.00
Incremental Delay, d2	5.6					3.4
Delay (s)	64.3					11.0
Level of Service	E					B
Approach Delay (s)	64.3		0.0			11.0
Approach LOS	E		A			B

Intersection Summary

HCM 2000 Control Delay	17.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	10.9
Intersection Capacity Utilization	98.0%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	72	0	0	1240	0	0
Future Volume (vph)	72	0	0	1240	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Lane Width	16	12	11	11	11	11
Total Lost time (s)	4.8			6.1		
Lane Util. Factor	0.97			0.95		
Frt	1.00			1.00		
Flt Protected	0.95			1.00		
Satd. Flow (prot)	3941			3280		
Flt Permitted	0.95			1.00		
Satd. Flow (perm)	3941			3280		
Peak-hour factor, PHF	0.81	0.81	0.95	0.90	0.92	0.92
Adj. Flow (vph)	89	0	0	1550	0	0
RTOR Reduction (vph)	84	0	0	0	0	0
Lane Group Flow (vph)	5	0	0	1550	0	0
Heavy Vehicles (%)	6%	6%	0%	12%	6%	6%
Turn Type	Perm			NA		
Protected Phases				2		
Permitted Phases	4					
Actuated Green, G (s)	7.0			112.1		
Effective Green, g (s)	7.0			112.1		
Actuated g/C Ratio	0.05			0.86		
Clearance Time (s)	4.8			6.1		
Vehicle Extension (s)	3.0			3.0		
Lane Grp Cap (vph)	212			2828		
v/s Ratio Prot				c0.47		
v/s Ratio Perm	c0.00					
v/c Ratio	0.02			0.55		
Uniform Delay, d1	58.3			2.3		
Progression Factor	2.37			1.00		
Incremental Delay, d2	0.0			0.8		
Delay (s)	137.9			3.1		
Level of Service	F			A		
Approach Delay (s)	137.9			3.1	0.0	
Approach LOS	F			A	A	

Intersection Summary

HCM 2000 Control Delay	10.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	10.9
Intersection Capacity Utilization	103.9%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	189	0	0	1030	0	0
Future Volume (vph)	189	0	0	1030	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Lane Width	12	12	11	11	11	11
Total Lost time (s)	4.8			6.2		
Lane Util. Factor	0.97			0.91		
Frt	1.00			1.00		
Flt Protected	0.95			1.00		
Satd. Flow (prot)	3686			4755		
Flt Permitted	0.95			1.00		
Satd. Flow (perm)	3686			4755		
Peak-hour factor, PHF	0.63	0.92	0.92	0.90	0.95	0.95
Adj. Flow (vph)	300	0	0	1144	0	0
RTOR Reduction (vph)	282	0	0	0	0	0
Lane Group Flow (vph)	18	0	0	1144	0	0
Heavy Vehicles (%)	0%	0%	0%	11%	6%	6%
Turn Type	Perm			NA		
Protected Phases				2		
Permitted Phases	4					
Actuated Green, G (s)	7.6			111.4		
Effective Green, g (s)	7.6			111.4		
Actuated g/C Ratio	0.06			0.86		
Clearance Time (s)	4.8			6.2		
Vehicle Extension (s)	3.0			3.0		
Lane Grp Cap (vph)	215			4074		
v/s Ratio Prot				c0.24		
v/s Ratio Perm	c0.00					
v/c Ratio	0.08			0.28		
Uniform Delay, d1	57.9			1.8		
Progression Factor	1.00			0.75		
Incremental Delay, d2	0.2			0.2		
Delay (s)	58.1			1.5		
Level of Service	E			A		
Approach Delay (s)	58.1			1.5	0.0	
Approach LOS	E			A	A	

Intersection Summary

HCM 2000 Control Delay	13.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.27		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	68.4%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑			↑↑	↱↱		↑↑↑	↱			
Traffic Volume (vph)	0	126	0	0	170	490	0	916	303	0	0	0
Future Volume (vph)	0	126	0	0	170	490	0	916	303	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	12	12	12	12	12	12	11	11	11	11	11	11
Total Lost time (s)		6.3			6.3	6.3		6.7	6.7			
Lane Util. Factor		0.95			0.95	0.88		0.91	1.00			
Frt		1.00			1.00	0.85		1.00	0.85			
Flt Protected		1.00			1.00	1.00		1.00	1.00			
Satd. Flow (prot)		3333			3551	2933		4755	1550			
Flt Permitted		1.00			1.00	1.00		1.00	1.00			
Satd. Flow (perm)		3333			3551	2933		4755	1550			
Peak-hour factor, PHF	0.89	0.89	0.89	0.81	0.81	0.91	0.92	0.92	0.92	0.95	0.95	0.95
Adj. Flow (vph)	0	142	0	0	210	605	0	996	329	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	217	0	0	93	0	0	0
Lane Group Flow (vph)	0	142	0	0	210	388	0	996	236	0	0	0
Heavy Vehicles (%)	0%	14%	41%	0%	7%	2%	0%	11%	6%	0%	0%	0%
Turn Type		NA			NA	Perm		NA	Perm			
Protected Phases		8			4			2				
Permitted Phases						4			2			
Actuated Green, G (s)		26.4			24.4	24.4		100.6	100.6			
Effective Green, g (s)		26.4			24.4	24.4		100.6	100.6			
Actuated g/C Ratio		0.19			0.17	0.17		0.72	0.72			
Clearance Time (s)		6.3			6.3	6.3		6.7	6.7			
Vehicle Extension (s)		3.0			3.0	3.0		3.0	3.0			
Lane Grp Cap (vph)		628			618	511		3418	1113			
v/s Ratio Prot		0.04			0.06			c0.21				
v/s Ratio Perm						c0.13			0.15			
v/c Ratio		0.23			0.34	0.76		0.29	0.21			
Uniform Delay, d1		48.1			50.7	55.0		7.0	6.5			
Progression Factor		0.03			1.00	1.00		1.00	1.00			
Incremental Delay, d2		0.2			0.3	6.4		0.2	0.4			
Delay (s)		1.7			51.1	61.4		7.2	7.0			
Level of Service		A			D	E		A	A			
Approach Delay (s)		1.7			58.7			7.2			0.0	
Approach LOS		A			E			A			A	

Intersection Summary

HCM 2000 Control Delay	25.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.38		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	60.1%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	115	0	0	232	238	0	1158	154	0	0	0
Future Volume (vph)	0	115	0	0	232	238	0	1158	154	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	12	12	12	12	12	13	11	11	11	11	11	11
Total Lost time (s)		6.3			6.3	6.3		6.8	6.8			
Lane Util. Factor		0.95			0.91	0.91		0.91	1.00			
Frt		1.00			0.96	0.85		1.00	0.85			
Flt Protected		1.00			1.00	1.00		1.00	1.00			
Satd. Flow (prot)		3248			3330	1494		4712	1494			
Flt Permitted		1.00			1.00	1.00		1.00	1.00			
Satd. Flow (perm)		3248			3330	1494		4712	1494			
Peak-hour factor, PHF	0.92	0.92	0.92	0.86	0.86	0.86	0.82	0.82	0.82	0.92	0.92	0.92
Adj. Flow (vph)	0	125	0	0	270	277	0	1412	188	0	0	0
RTOR Reduction (vph)	0	0	0	0	30	85	0	0	43	0	0	0
Lane Group Flow (vph)	0	125	0	0	348	84	0	1412	145	0	0	0
Heavy Vehicles (%)	0%	17%	0%	0%	5%	7%	0%	12%	10%	6%	6%	6%
Turn Type		NA			NA	Perm		NA	Perm			
Protected Phases		8			4			2				
Permitted Phases						4			2			
Actuated Green, G (s)		16.7			14.7	14.7		100.2	100.2			
Effective Green, g (s)		16.7			14.7	14.7		100.2	100.2			
Actuated g/C Ratio		0.13			0.11	0.11		0.77	0.77			
Clearance Time (s)		6.3			6.3	6.3		6.8	6.8			
Vehicle Extension (s)		3.0			3.0	3.0		3.0	3.0			
Lane Grp Cap (vph)		417			373	168		3631	1151			
v/s Ratio Prot		0.04			c0.11			c0.30				
v/s Ratio Perm						0.06			0.10			
v/c Ratio		0.30			0.93	0.50		0.39	0.13			
Uniform Delay, d1		51.4			57.2	54.2		4.9	3.8			
Progression Factor		0.07			1.00	1.00		0.55	1.10			
Incremental Delay, d2		0.4			29.9	2.3		0.3	0.2			
Delay (s)		4.1			87.0	56.5		3.0	4.4			
Level of Service		A			F	E		A	A			
Approach Delay (s)		4.1			77.6			3.1			0.0	
Approach LOS		A			E			A			A	

Intersection Summary			
HCM 2000 Control Delay	21.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.46		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	15.1
Intersection Capacity Utilization	80.3%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	19	163	7	6	260	43	3	0	10	78	0	39
Future Volume (Veh/h)	19	163	7	6	260	43	3	0	10	78	0	39
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.76	0.76	0.76	0.88	0.88	0.88	0.60	0.60	0.60	0.81	0.81	0.81
Hourly flow rate (vph)	25	214	9	7	295	49	5	0	17	96	0	48
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		TWLTL			None							
Median storage veh)		2										
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	344			223			478	626	112	508	606	172
vC1, stage 1 conf vol							268	268		334	334	
vC2, stage 2 conf vol							210	358		174	273	
vCu, unblocked vol	344			223			478	626	112	508	606	172
tC, single (s)	4.5			5.8			8.2	6.5	8.9	7.9	6.5	7.1
tC, 2 stage (s)							7.2	5.5		6.9	5.5	
tF (s)	2.4			3.0			3.8	4.0	4.3	3.7	4.0	3.4
p0 queue free %	98			99			99	100	97	83	100	94
cM capacity (veh/h)	1086			912			525	538	679	550	555	817

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	SB 1
Volume Total	25	143	80	7	197	147	22	144
Volume Left	25	0	0	7	0	0	5	96
Volume Right	0	0	9	0	0	49	17	48
cSH	1086	1700	1700	912	1700	1700	636	618
Volume to Capacity	0.02	0.08	0.05	0.01	0.12	0.09	0.03	0.23
Queue Length 95th (ft)	2	0	0	1	0	0	3	22
Control Delay (s)	8.4	0.0	0.0	9.0	0.0	0.0	10.9	12.6
Lane LOS	A			A			B	B
Approach Delay (s)	0.8			0.2			10.9	12.6
Approach LOS							B	B

Intersection Summary			
Average Delay	3.0		
Intersection Capacity Utilization	34.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	13	119	264	38	70	59
Future Volume (Veh/h)	13	119	264	38	70	59
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.83	0.83	0.88	0.88	0.75	0.75
Hourly flow rate (vph)	16	143	300	43	93	79
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		TWLTL	TWLTL			
Median storage veh)		2	2			
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	343				425	172
vC1, stage 1 conf vol					322	
vC2, stage 2 conf vol					104	
vCu, unblocked vol	343				425	172
tC, single (s)	4.3				6.9	6.9
tC, 2 stage (s)					5.9	
tF (s)	2.3				3.5	3.3
p0 queue free %	99				86	91
cM capacity (veh/h)	1171				669	849

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	SB 1	SB 2
Volume Total	16	72	72	200	143	93	79
Volume Left	16	0	0	0	0	93	0
Volume Right	0	0	0	0	43	0	79
cSH	1171	1700	1700	1700	1700	669	849
Volume to Capacity	0.01	0.04	0.04	0.12	0.08	0.14	0.09
Queue Length 95th (ft)	1	0	0	0	0	12	8
Control Delay (s)	8.1	0.0	0.0	0.0	0.0	11.3	9.7
Lane LOS	A					B	A
Approach Delay (s)	0.8			0.0		10.5	
Approach LOS						B	

Intersection Summary			
Average Delay	2.9		
Intersection Capacity Utilization	20.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	1	0	3	0	129	175	115	208	0
Future Volume (Veh/h)	0	0	0	1	0	3	0	129	175	115	208	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.60	0.60	0.60	0.60	0.60	0.60	0.61	0.61	0.61	0.68	0.68	0.68
Hourly flow rate (vph)	0	0	0	2	0	5	0	211	287	169	306	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								TWLTL			TWLTL	
Median storage veh)								2			2	
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	754	1142	153	846	998	249	306			498		
vC1, stage 1 conf vol	644	644		354	354							
vC2, stage 2 conf vol	110	498		491	644							
vCu, unblocked vol	754	1142	153	846	998	249	306			498		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)	6.5	5.5		6.5	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	100	100	99	100			84		
cM capacity (veh/h)	352	308	872	405	365	757	1286			1076		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	0	7	0	141	357	271	204
Volume Left	0	2	0	0	0	169	0
Volume Right	0	5	0	0	287	0	0
cSH	1700	606	1700	1700	1700	1076	1700
Volume to Capacity	0.00	0.01	0.00	0.08	0.21	0.16	0.12
Queue Length 95th (ft)	0	1	0	0	0	14	0
Control Delay (s)	0.0	11.0	0.0	0.0	0.0	6.2	0.0
Lane LOS	A	B				A	
Approach Delay (s)	0.0	11.0	0.0			3.5	
Approach LOS	A	B					

Intersection Summary				
Average Delay	1.8			
Intersection Capacity Utilization	30.7%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	14	6	238	274	84	125
Future Volume (Veh/h)	14	6	238	274	84	125
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.83	0.83	0.67	0.67	0.68	0.68
Hourly flow rate (vph)	17	7	445	409	124	184
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			TWLTL			TWLTL
Median storage veh)			2			2
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	990	427			954	
vC1, stage 1 conf vol	650					
vC2, stage 2 conf vol	340					
vCu, unblocked vol	990	427			954	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.3			2.2	
p0 queue free %	96	99			84	
cM capacity (veh/h)	411	582			794	

Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	17	7	297	557	124	92	92
Volume Left	17	0	0	0	124	0	0
Volume Right	0	7	0	409	0	0	0
cSH	411	582	1700	1700	794	1700	1700
Volume to Capacity	0.04	0.01	0.17	0.33	0.16	0.05	0.05
Queue Length 95th (ft)	3	1	0	0	14	0	0
Control Delay (s)	14.1	11.3	0.0	0.0	10.4	0.0	0.0
Lane LOS	B	B			B		
Approach Delay (s)	13.3		0.0		4.2		
Approach LOS	B						

Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	33.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1	249	13	6	206	0	0	0	2	2	0	1
Future Volume (Veh/h)	1	249	13	6	206	0	0	0	2	2	0	1
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.83	0.83	0.83	0.75	0.75	0.75	0.60	0.60	0.60	0.60	0.60	0.60
Hourly flow rate (vph)	1	300	16	8	275	0	0	0	3	3	0	2
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		TWLTL			TWLTL							
Median storage veh)		2			2							
Upstream signal (ft)		1038										
pX, platoon unblocked												
vC, conflicting volume	275			316			466	601	158	446	609	138
vC1, stage 1 conf vol							310	310		291	291	
vC2, stage 2 conf vol							156	291		155	318	
vCu, unblocked vol	275			316			466	601	158	446	609	138
tC, single (s)	6.1			4.1			7.5	6.5	6.9	6.5	6.5	6.9
tC, 2 stage (s)							6.5	5.5		6.5	5.5	
tF (s)	3.2			2.2			3.5	4.0	4.3	4.5	4.0	3.3
p0 queue free %	100			99			100	100	100	99	100	100
cM capacity (veh/h)	796			1256			530	568	622	439	582	892

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	SB 1
Volume Total	1	200	116	8	183	92	3	5
Volume Left	1	0	0	8	0	0	0	3
Volume Right	0	0	16	0	0	0	3	2
cSH	796	1700	1700	1256	1700	1700	622	551
Volume to Capacity	0.00	0.12	0.07	0.01	0.11	0.05	0.00	0.01
Queue Length 95th (ft)	0	0	0	0	0	0	0	1
Control Delay (s)	9.5	0.0	0.0	7.9	0.0	0.0	10.8	11.6
Lane LOS	A			A			B	B
Approach Delay (s)	0.0			0.2			10.8	11.6
Approach LOS							B	B

Intersection Summary				
Average Delay	0.3			
Intersection Capacity Utilization	16.9%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	206	47	170	191	21	66
Future Volume (Veh/h)	206	47	170	191	21	66
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.85	0.85	0.77	0.77	0.75	0.75
Hourly flow rate (vph)	242	55	221	248	28	88
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL			None		
Median storage veh)	2					
Upstream signal (ft)	1256					
pX, platoon unblocked						
vC, conflicting volume			297		836	148
vC1, stage 1 conf vol					270	
vC2, stage 2 conf vol					566	
vCu, unblocked vol			297		836	148
tC, single (s)			4.2		7.3	7.1
tC, 2 stage (s)					6.3	
tF (s)			2.2		3.8	3.4
p0 queue free %			82		92	90
cM capacity (veh/h)			1247		361	853

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1
Volume Total	161	136	221	124	124	116
Volume Left	0	0	221	0	0	28
Volume Right	0	55	0	0	0	88
cSH	1700	1700	1247	1700	1700	641
Volume to Capacity	0.09	0.08	0.18	0.07	0.07	0.18
Queue Length 95th (ft)	0	0	16	0	0	16
Control Delay (s)	0.0	0.0	8.5	0.0	0.0	11.8
Lane LOS			A			B
Approach Delay (s)	0.0		4.0			11.8
Approach LOS						B

Intersection Summary			
Average Delay	3.7		
Intersection Capacity Utilization	30.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	3	0	18	206	0	95	5	298	3	1	563	1
Future Volume (vph)	3	0	18	206	0	95	5	298	3	1	563	1
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.0		6.0	6.0		6.2	6.2	6.2	6.2	6.2	
Lane Util. Factor		1.00		1.00	1.00		1.00	0.95	1.00	1.00	0.95	
Frt		0.88		1.00	0.85		1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.99		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1756		1900	1700		1900	3689	1700	1900	3724	
Flt Permitted		0.97		0.73	1.00		0.25	1.00	1.00	0.56	1.00	
Satd. Flow (perm)		1711		1469	1700		504	3689	1700	1111	3724	
Peak-hour factor, PHF	0.60	0.60	0.60	0.60	0.60	0.60	0.92	0.92	0.92	0.62	0.62	0.62
Adj. Flow (vph)	5	0	30	343	0	158	5	324	3	2	908	2
RTOR Reduction (vph)	0	23	0	0	104	0	0	0	1	0	0	0
Lane Group Flow (vph)	0	12	0	343	54	0	5	324	2	2	910	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	3%	0%	0%	2%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		4			4			2			2	
Permitted Phases	4			4			2		2	2		
Actuated Green, G (s)		34.0		34.0	34.0		53.8	53.8	53.8	53.8	53.8	
Effective Green, g (s)		34.0		34.0	34.0		53.8	53.8	53.8	53.8	53.8	
Actuated g/C Ratio		0.34		0.34	0.34		0.54	0.54	0.54	0.54	0.54	
Clearance Time (s)		6.0		6.0	6.0		6.2	6.2	6.2	6.2	6.2	
Lane Grp Cap (vph)		581		499	578		271	1984	914	597	2003	
v/s Ratio Prot					0.03			0.09			c0.24	
v/s Ratio Perm		0.01		c0.23			0.01		0.00	0.00		
v/c Ratio		0.02		0.69	0.09		0.02	0.16	0.00	0.00	0.45	
Uniform Delay, d1		21.9		28.4	22.5		10.8	11.7	10.7	10.7	14.1	
Progression Factor		1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		0.1		7.5	0.3		0.1	0.2	0.0	0.0	0.7	
Delay (s)		22.0		36.0	22.8		10.9	11.9	10.7	10.7	14.8	
Level of Service		C		D	C		B	B	B	B	B	
Approach Delay (s)		22.0			31.8			11.9			14.8	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM 2000 Control Delay	19.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.2
Intersection Capacity Utilization	42.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	356	329	0	201	0	0	0	0	0	1560	149
Future Volume (vph)	0	356	329	0	201	0	0	0	0	0	1560	149
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	12	12	12	12	12	12	11	11	11	11	11	11
Total Lost time (s)		6.3	6.3		6.3						6.7	6.7
Lane Util. Factor		0.91	0.91		0.95						0.91	1.00
Frt		0.96	0.85		1.00						1.00	0.85
Flt Protected		1.00	1.00		1.00						1.00	1.00
Satd. Flow (prot)		3329	1381		3619						5124	1490
Flt Permitted		1.00	1.00		1.00						1.00	1.00
Satd. Flow (perm)		3329	1381		3619						5124	1490
Peak-hour factor, PHF	0.82	0.82	0.82	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	434	401	0	212	0	0	0	0	0	1432	157
RTOR Reduction (vph)	0	22	57	0	0	0	0	0	0	0	0	47
Lane Group Flow (vph)	0	556	200	0	212	0	0	0	0	0	1432	110
Heavy Vehicles (%)	0%	3%	12%	0%	5%	0%	0%	0%	0%	0%	3%	11%
Turn Type		NA	Perm		NA						NA	Perm
Protected Phases		4			8						6	
Permitted Phases			4									6
Actuated Green, G (s)		26.8	26.8		28.8						98.2	98.2
Effective Green, g (s)		26.8	26.8		28.8						98.2	98.2
Actuated g/C Ratio		0.19	0.19		0.21						0.70	0.70
Clearance Time (s)		6.3	6.3		6.3						6.7	6.7
Vehicle Extension (s)		3.0	3.0		3.0						3.0	3.0
Lane Grp Cap (vph)		637	264		744						3594	1038
v/s Ratio Prot		c0.17			0.06						c0.28	
v/s Ratio Perm			0.15									0.07
v/c Ratio		0.87	0.76		0.28						0.40	0.11
Uniform Delay, d1		54.9	53.5		46.9						5.7	5.7
Progression Factor		1.00	1.00		0.00						1.00	1.00
Incremental Delay, d2		12.6	11.9		0.2						0.3	0.2
Delay (s)		67.6	65.4		0.2						6.0	5.9
Level of Service		E	E		A						A	A
Approach Delay (s)		66.9			0.2			0.0			5.8	
Approach LOS		E			A			A			A	

Intersection Summary

HCM 2000 Control Delay	26.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	64.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	9	10	25	278	15	67	41	230	317	156	623	5
Future Volume (vph)	9	10	25	278	15	67	41	230	317	156	623	5
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)	6.0	6.0		6.3	6.3	6.5	6.5	6.5	6.3	6.5	6.5	
Lane Util. Factor	1.00	1.00		0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.95	
Frt	1.00	0.89		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected	0.95	1.00		0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1712	1737		1770	1717	1667	1195	3585	1635	1863	3593	
Flt Permitted	0.95	1.00		0.95	0.96	1.00	0.35	1.00	1.00	0.50	1.00	
Satd. Flow (perm)	1712	1737		1770	1717	1667	440	3585	1635	981	3593	
Peak-hour factor, PHF	0.92	0.92	0.92	0.88	0.88	0.88	0.95	0.95	0.95	0.79	0.79	0.79
Adj. Flow (vph)	10	11	27	316	17	76	43	242	334	197	789	10
RTOR Reduction (vph)	0	26	0	0	0	57	0	0	157	0	1	0
Lane Group Flow (vph)	10	12	0	167	166	19	43	242	177	197	798	0
Heavy Vehicles (%)	11%	10%	0%	2%	40%	2%	59%	6%	4%	2%	5%	50%
Turn Type	Split	NA		Split	NA	pm+ov	Perm	NA	pm+ov	pm+pt	NA	
Protected Phases	8	8		4	4	1		2	4	1	6	
Permitted Phases						4	2		2	6		
Actuated Green, G (s)	3.0	3.0		10.3	10.3	19.6	32.1	32.1	42.4	47.9	47.9	
Effective Green, g (s)	3.0	3.0		10.3	10.3	19.6	32.1	32.1	42.4	47.9	47.9	
Actuated g/C Ratio	0.04	0.04		0.13	0.13	0.25	0.40	0.40	0.53	0.60	0.60	
Clearance Time (s)	6.0	6.0		6.3	6.3	6.5	6.5	6.5	6.3	6.5	6.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	64	65		227	221	408	176	1438	866	689	2151	
v/s Ratio Prot	0.01	c0.01		0.09	c0.10	0.01		0.07	0.03	0.03	c0.22	
v/s Ratio Perm						0.01	0.10		0.06	0.14		
v/c Ratio	0.16	0.18		0.74	0.75	0.05	0.24	0.17	0.20	0.29	0.37	
Uniform Delay, d1	37.3	37.3		33.5	33.6	23.1	15.9	15.4	9.9	7.5	8.3	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	1.1	1.4		11.7	13.4	0.0	3.3	0.3	0.1	0.2	0.5	
Delay (s)	38.4	38.7		45.2	47.0	23.1	19.2	15.6	10.0	7.7	8.8	
Level of Service	D	D		D	D	C	B	B	B	A	A	
Approach Delay (s)		38.6			41.8			12.9			8.6	
Approach LOS		D			D			B			A	

Intersection Summary

HCM 2000 Control Delay	17.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	25.3
Intersection Capacity Utilization	55.4%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	390	248	0	203	0	0	0	0	0	1535	139
Future Volume (vph)	0	390	248	0	203	0	0	0	0	0	1535	139
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	12	13	13	12	12	12	11	11	11	11	11	11
Total Lost time (s)		6.3	6.3		6.3						6.8	6.8
Lane Util. Factor		0.91	0.91		0.95						0.95	1.00
Frt		0.98	0.85		1.00						1.00	0.85
Flt Protected		1.00	1.00		1.00						1.00	1.00
Satd. Flow (prot)		3638	1522		3551						3498	1536
Flt Permitted		1.00	1.00		1.00						1.00	1.00
Satd. Flow (perm)		3638	1522		3551						3498	1536
Peak-hour factor, PHF	0.80	0.80	0.80	0.91	0.91	0.91	1.00	0.92	0.92	0.93	0.93	0.93
Adj. Flow (vph)	0	488	308	0	223	0	0	0	0	0	1651	149
RTOR Reduction (vph)	0	8	45	0	0	0	0	0	0	0	0	40
Lane Group Flow (vph)	0	548	195	0	223	0	0	0	0	0	1651	109
Heavy Vehicles (%)	0%	1%	5%	0%	7%	0%	6%	6%	6%	0%	5%	7%
Turn Type		NA	Perm		NA						NA	Perm
Protected Phases		4			8						6	
Permitted Phases			4									6
Actuated Green, G (s)		19.7	19.7		21.7						95.2	95.2
Effective Green, g (s)		19.7	19.7		21.7						95.2	95.2
Actuated g/C Ratio		0.15	0.15		0.17						0.73	0.73
Clearance Time (s)		6.3	6.3		6.3						6.8	6.8
Vehicle Extension (s)		3.0	3.0		3.0						3.0	3.0
Lane Grp Cap (vph)		551	230		592						2561	1124
v/s Ratio Prot		c0.15			0.06						c0.47	
v/s Ratio Perm			0.13									0.07
v/c Ratio		1.00	0.85		0.38						0.64	0.10
Uniform Delay, d1		55.1	53.7		48.1						5.8	5.0
Progression Factor		1.00	1.00		0.03						1.09	1.02
Incremental Delay, d2		36.9	24.0		0.3						1.0	0.1
Delay (s)		92.0	77.7		1.8						10.6	5.2
Level of Service		F	E		A						B	A
Approach Delay (s)		87.7			1.8			0.0			10.2	
Approach LOS		F			A			A			B	

Intersection Summary

HCM 2000 Control Delay	31.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	15.1
Intersection Capacity Utilization	65.6%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	203	0	0	0	0	1306
Future Volume (vph)	203	0	0	0	0	1306
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Lane Width	12	12	11	11	11	11
Total Lost time (s)	4.8					6.1
Lane Util. Factor	0.97					0.91
Frt	1.00					1.00
Flt Protected	0.95					1.00
Satd. Flow (prot)	3686					5075
Flt Permitted	0.95					1.00
Satd. Flow (perm)	3686					5075
Peak-hour factor, PHF	0.95	0.95	0.86	0.86	0.95	0.95
Adj. Flow (vph)	214	0	0	0	0	1375
RTOR Reduction (vph)	127	0	0	0	0	0
Lane Group Flow (vph)	87	0	0	0	0	1375
Heavy Vehicles (%)	0%	0%	6%	6%	0%	4%
Turn Type	Perm					NA
Protected Phases						6
Permitted Phases	8					
Actuated Green, G (s)	8.8					110.3
Effective Green, g (s)	8.8					110.3
Actuated g/C Ratio	0.07					0.85
Clearance Time (s)	4.8					6.1
Vehicle Extension (s)	3.0					3.0
Lane Grp Cap (vph)	249					4305
v/s Ratio Prot						c0.27
v/s Ratio Perm	c0.02					
v/c Ratio	0.35					0.32
Uniform Delay, d1	57.9					2.0
Progression Factor	1.00					1.00
Incremental Delay, d2	0.9					0.2
Delay (s)	58.7					2.2
Level of Service	E					A
Approach Delay (s)	58.7		0.0			2.2
Approach LOS	E		A			A

Intersection Summary

HCM 2000 Control Delay	9.9	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.32		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	10.9
Intersection Capacity Utilization	74.5%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	213	0	3	0	3	1461
Future Volume (vph)	213	0	3	0	3	1461
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Lane Width	12	12	11	11	11	11
Total Lost time (s)	4.8					6.1
Lane Util. Factor	0.97					0.95
Frt	1.00					1.00
Flt Protected	0.95					1.00
Satd. Flow (prot)	3586					3465
Flt Permitted	0.95					1.00
Satd. Flow (perm)	3586					3465
Peak-hour factor, PHF	0.85	0.95	0.92	0.92	0.95	0.82
Adj. Flow (vph)	251	0	0	0	0	1782
RTOR Reduction (vph)	65	0	0	0	0	0
Lane Group Flow (vph)	186	0	0	0	0	1782
Heavy Vehicles (%)	0%	0%	6%	6%	0%	6%
Turn Type	Perm					NA
Protected Phases						6
Permitted Phases	8					
Actuated Green, G (s)	11.8					107.3
Effective Green, g (s)	11.8					107.3
Actuated g/C Ratio	0.09					0.83
Clearance Time (s)	4.8					6.1
Vehicle Extension (s)	3.0					3.0
Lane Grp Cap (vph)	334					2859
v/s Ratio Prot						c0.51
v/s Ratio Perm	c0.05					
v/c Ratio	0.56					0.62
Uniform Delay, d1	58.6					4.1
Progression Factor	0.90					1.00
Incremental Delay, d2	1.6					1.0
Delay (s)	52.5					5.1
Level of Service	D					A
Approach Delay (s)	52.5		0.0			5.1
Approach LOS	D		A			A

Intersection Summary

HCM 2000 Control Delay	11.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	10.9
Intersection Capacity Utilization	105.9%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	190	0	0	2420	0	0
Future Volume (vph)	190	0	0	2420	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Lane Width	16	12	11	11	11	11
Total Lost time (s)	4.8			6.1		
Lane Util. Factor	0.97			0.95		
Frt	1.00			1.00		
Flt Protected	0.95			1.00		
Satd. Flow (prot)	4177			3532		
Flt Permitted	0.95			1.00		
Satd. Flow (perm)	4177			3532		
Peak-hour factor, PHF	0.88	0.88	0.95	0.94	0.92	0.92
Adj. Flow (vph)	216	0	0	2574	0	0
RTOR Reduction (vph)	15	0	0	0	0	0
Lane Group Flow (vph)	201	0	0	2574	0	0
Heavy Vehicles (%)	0%	6%	0%	4%	6%	6%
Turn Type	Perm			NA		
Protected Phases				2		
Permitted Phases	4					
Actuated Green, G (s)	11.6			107.5		
Effective Green, g (s)	11.6			107.5		
Actuated g/C Ratio	0.09			0.83		
Clearance Time (s)	4.8			6.1		
Vehicle Extension (s)	3.0			3.0		
Lane Grp Cap (vph)	372			2920		
v/s Ratio Prot				c0.73		
v/s Ratio Perm	c0.05					
v/c Ratio	0.54			0.88		
Uniform Delay, d1	56.7			7.2		
Progression Factor	0.95			1.00		
Incremental Delay, d2	1.2			4.2		
Delay (s)	55.3			11.4		
Level of Service	E			B		
Approach Delay (s)	55.3			11.4	0.0	
Approach LOS	E			B	A	

Intersection Summary

HCM 2000 Control Delay	14.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	10.9
Intersection Capacity Utilization	113.7%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	378	0	0	2341	0	0
Future Volume (vph)	378	0	0	2341	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Lane Width	12	12	11	11	11	11
Total Lost time (s)	4.8			6.2		
Lane Util. Factor	0.97			0.91		
Frt	1.00			1.00		
Flt Protected	0.95			1.00		
Satd. Flow (prot)	3686			5124		
Flt Permitted	0.95			1.00		
Satd. Flow (perm)	3686			5124		
Peak-hour factor, PHF	0.94	0.92	0.92	0.95	0.95	0.95
Adj. Flow (vph)	402	0	0	2464	0	0
RTOR Reduction (vph)	11	0	0	0	0	0
Lane Group Flow (vph)	391	0	0	2464	0	0
Heavy Vehicles (%)	0%	0%	0%	3%	6%	6%
Turn Type	Perm			NA		
Protected Phases				2		
Permitted Phases	4					
Actuated Green, G (s)	19.1			93.9		
Effective Green, g (s)	19.1			93.9		
Actuated g/C Ratio	0.15			0.77		
Clearance Time (s)	4.8			6.2		
Vehicle Extension (s)	3.0			3.0		
Lane Grp Cap (vph)	541			3937		
v/s Ratio Prot				c0.48		
v/s Ratio Perm	c0.11					
v/c Ratio	0.72			0.63		
Uniform Delay, d1	52.9			6.7		
Progression Factor	1.00			0.51		
Incremental Delay, d2	4.7			0.7		
Delay (s)	57.7			4.1		
Level of Service	E			A		
Approach Delay (s)	57.7			4.1	0.0	
Approach LOS	E			A	A	

Intersection Summary

HCM 2000 Control Delay	11.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	76.3%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑			↑↑	↱↑		↑↑↑	↱			
Traffic Volume (vph)	0	356	0	0	201	387	0	2109	610	0	0	0
Future Volume (vph)	0	356	0	0	201	387	0	2109	610	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	12	12	12	12	12	12	11	11	11	11	11	11
Total Lost time (s)		6.3			8.3	8.3		6.7	6.7			
Lane Util. Factor		0.95			0.95	0.88		0.91	1.00			
Frt		1.00			1.00	0.85		1.00	0.85			
Flt Protected		1.00			1.00	1.00		1.00	1.00			
Satd. Flow (prot)		3689			3619	2933		5124	1611			
Flt Permitted		1.00			1.00	1.00		1.00	1.00			
Satd. Flow (perm)		3689			3619	2933		5124	1611			
Peak-hour factor, PHF	0.82	0.82	0.82	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	434	0	0	212	407	0	2220	642	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	23	0	0	21	0	0	0
Lane Group Flow (vph)	0	434	0	0	212	384	0	2220	621	0	0	0
Heavy Vehicles (%)	0%	3%	0%	0%	5%	2%	0%	3%	2%	0%	0%	0%
Turn Type		NA			NA	Perm		NA	Perm			
Protected Phases		6			4			2				
Permitted Phases						4			2			
Actuated Green, G (s)		28.8			26.8	26.8		98.2	98.2			
Effective Green, g (s)		28.8			26.8	26.8		98.2	98.2			
Actuated g/C Ratio		0.21			0.19	0.19		0.70	0.70			
Clearance Time (s)		6.3			8.3	8.3		6.7	6.7			
Vehicle Extension (s)		3.0			3.0	3.0		3.0	3.0			
Lane Grp Cap (vph)		758			692	561		3594	1130			
v/s Ratio Prot		0.12			0.06			c0.43				
v/s Ratio Perm						c0.13			0.39			
v/c Ratio		0.57			0.31	0.68		0.62	0.55			
Uniform Delay, d1		50.1			48.6	52.7		11.0	10.2			
Progression Factor		0.04			1.00	1.00		1.00	1.00			
Incremental Delay, d2		0.5			0.3	3.4		0.8	1.9			
Delay (s)		2.6			48.9	56.1		11.8	12.1			
Level of Service		A			D	E		B	B			
Approach Delay (s)		2.6			53.6			11.9			0.0	
Approach LOS		A			D			B			A	

Intersection Summary			
HCM 2000 Control Delay	17.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	64.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	390	0	0	203	230	0	2254	376	0	0	0
Future Volume (vph)	0	390	0	0	203	230	0	2254	376	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	12	12	12	12	12	13	11	11	11	11	11	11
Total Lost time (s)		6.3			6.3	6.3		6.8	6.8			
Lane Util. Factor		0.95			0.91	0.91		0.91	1.00			
Frt		1.00			0.95	0.85		1.00	0.85			
Flt Protected		1.00			1.00	1.00		1.00	1.00			
Satd. Flow (prot)		3762			3256	1552		5075	1580			
Flt Permitted		1.00			1.00	1.00		1.00	1.00			
Satd. Flow (perm)		3762			3256	1552		5075	1580			
Peak-hour factor, PHF	0.80	0.80	0.80	0.81	0.81	0.81	0.94	0.94	0.94	0.95	0.93	0.93
Adj. Flow (vph)	0	488	0	0	251	284	0	2377	400	0	0	0
RTOR Reduction (vph)	0	0	0	0	11	27	0	0	12	0	0	0
Lane Group Flow (vph)	0	488	0	0	359	138	0	2377	388	0	0	0
Heavy Vehicles (%)	0%	1%	0%	0%	8%	3%	0%	4%	4%	0%	6%	6%
Turn Type		NA			NA	Perm		NA	Perm			
Protected Phases		8			4			2				
Permitted Phases						4			2			
Actuated Green, G (s)		21.7			19.7	19.7		95.2	95.2			
Effective Green, g (s)		21.7			19.7	19.7		95.2	95.2			
Actuated g/C Ratio		0.17			0.15	0.15		0.73	0.73			
Clearance Time (s)		6.3			6.3	6.3		6.8	6.8			
Vehicle Extension (s)		3.0			3.0	3.0		3.0	3.0			
Lane Grp Cap (vph)		627			493	235		3716	1157			
v/s Ratio Prot		c0.13			0.11			c0.47				
v/s Ratio Perm						0.09			0.25			
v/c Ratio		0.78			0.73	0.59		0.64	0.34			
Uniform Delay, d1		51.8			52.6	51.4		8.8	6.2			
Progression Factor		0.04			1.00	1.00		0.61	0.50			
Incremental Delay, d2		1.5			5.3	3.7		0.4	0.4			
Delay (s)		3.7			57.9	55.1		5.8	3.5			
Level of Service		A			E	E		A	A			
Approach Delay (s)		3.7			57.0			5.4			0.0	
Approach LOS		A			E			A			A	

Intersection Summary

HCM 2000 Control Delay	12.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	15.1
Intersection Capacity Utilization	65.6%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	69	609	2	0	299	83	4	1	3	73	0	40
Future Volume (Veh/h)	69	609	2	0	299	83	4	1	3	73	0	40
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.88	0.88	0.88	0.94	0.94	0.94	0.60	0.60	0.60	0.79	0.79	0.79
Hourly flow rate (vph)	78	692	2	0	318	88	7	2	5	92	0	51
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		TWLTL			None							
Median storage veh)		2										
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	406			694			1059	1255	347	870	1212	203
vC1, stage 1 conf vol							849	849		362	362	
vC2, stage 2 conf vol							210	406		508	850	
vCu, unblocked vol	406			694			1059	1255	347	870	1212	203
tC, single (s)	4.4			4.1			8.0	6.5	7.6	7.6	6.5	7.0
tC, 2 stage (s)							7.0	5.5		6.6	5.5	
tF (s)	2.4			2.2			3.8	4.0	3.6	3.6	4.0	3.3
p0 queue free %	93			100			97	99	99	77	100	94
cM capacity (veh/h)	1062			911			244	315	587	405	325	801

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	SB 1
Volume Total	78	461	233	0	212	194	14	143
Volume Left	78	0	0	0	0	0	7	92
Volume Right	0	0	2	0	0	88	5	51
cSH	1062	1700	1700	1700	1700	1700	319	492
Volume to Capacity	0.07	0.27	0.14	0.00	0.12	0.11	0.04	0.29
Queue Length 95th (ft)	6	0	0	0	0	0	3	30
Control Delay (s)	8.7	0.0	0.0	0.0	0.0	0.0	16.8	15.3
Lane LOS	A						C	C
Approach Delay (s)	0.9			0.0			16.8	15.3
Approach LOS							C	C

Intersection Summary				
Average Delay	2.3			
Intersection Capacity Utilization	39.0%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	58	620	270	73	60	16
Future Volume (Veh/h)	58	620	270	73	60	16
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.73	0.73
Hourly flow rate (vph)	61	653	284	77	82	22
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		TWLTL	TWLTL			
Median storage veh)		2	2			
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	361				771	160
vC1, stage 1 conf vol					322	
vC2, stage 2 conf vol					448	
vCu, unblocked vol	361				771	160
tC, single (s)	4.1				6.8	7.2
tC, 2 stage (s)					5.8	
tF (s)	2.2				3.5	3.4
p0 queue free %	95				84	97
cM capacity (veh/h)	1209				512	798

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	SB 1	SB 2
Volume Total	61	326	326	189	172	82	22
Volume Left	61	0	0	0	0	82	0
Volume Right	0	0	0	0	77	0	22
cSH	1209	1700	1700	1700	1730	512	798
Volume to Capacity	0.05	0.19	0.19	0.11	0.10	0.16	0.03
Queue Length 95th (ft)	4	0	0	0	0	14	2
Control Delay (s)	8.1	0.0	0.0	0.0	0.0	13.4	9.6
Lane LOS	A					B	A
Approach Delay (s)	0.7			0.0		12.6	
Approach LOS						B	

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	26.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	1	129	0	157	1	521	0	0	285	1
Future Volume (Veh/h)	0	0	1	129	0	157	1	521	0	0	285	1
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.93	0.93	0.93
Hourly flow rate (vph)	0	0	2	215	0	262	2	868	0	0	306	1
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								TWLTL			TWLTL	
Median storage veh)								2			2	
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1006	1178	154	1027	1179	434	307			868		
vC1, stage 1 conf vol	306	306		872	872							
vC2, stage 2 conf vol	700	872		155	307							
vCu, unblocked vol	1006	1178	154	1027	1179	434	307			868		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			6.1		
tC, 2 stage (s)	6.5	5.5		6.5	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			3.2		
p0 queue free %	100	100	100	29	100	54	100			100		
cM capacity (veh/h)	210	345	871	304	345	576	1265			371		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	2	477	2	579	289	0	204	103
Volume Left	0	215	2	0	0	0	0	0
Volume Right	2	262	0	0	0	0	0	1
cSH	871	411	1265	1700	1700	1700	1700	1700
Volume to Capacity	0.00	1.16	0.00	0.34	0.17	0.00	0.12	0.06
Queue Length 95th (ft)	0	454	0	0	0	0	0	0
Control Delay (s)	9.1	127.1	7.8	0.0	0.0	0.0	0.0	0.0
Lane LOS	A	F	A					
Approach Delay (s)	9.1	127.1	0.0			0.0		
Approach LOS	A	F						

Intersection Summary			
Average Delay	36.6		
Intersection Capacity Utilization	43.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	154	139	383	13	4	411
Future Volume (Veh/h)	154	139	383	13	4	411
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.60	0.60	0.65	0.65	0.76	0.76
Hourly flow rate (vph)	257	232	589	20	5	541
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			TWLTL			TWLTL
Median storage veh)			2			2
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	880	304			609	
vC1, stage 1 conf vol	309					
vC2, stage 2 conf vol	280					
vCu, unblocked vol	880	304			609	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.3			2.2	
p0 queue free %	46	67			99	
cM capacity (veh/h)	473	697			979	

Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	257	232	393	216	5	270	270
Volume Left	257	0	0	0	5	0	0
Volume Right	0	232	0	20	0	0	0
cSH	473	697	1700	1700	979	1700	1700
Volume to Capacity	0.54	0.33	0.23	0.13	0.01	0.16	0.16
Queue Length 95th (ft)	80	36	0	0	0	0	0
Control Delay (s)	21.3	12.7	0.0	0.0	8.7	0.0	0.0
Lane LOS	C	B			A		
Approach Delay (s)	17.2		0.0		0.1		
Approach LOS	C						

Intersection Summary			
Average Delay	5.2		
Intersection Capacity Utilization	25.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	466	17	19	359	0	1	0	13	0	0	0
Future Volume (Veh/h)	0	466	17	19	359	0	1	0	13	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.93	0.93	0.93	0.84	0.84	0.84	0.70	0.70	0.70	0.92	0.92	0.92
Hourly flow rate (vph)	0	501	18	23	427	0	1	0	18	0	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		TWLTL			TWLTL							
Median storage veh)		2			2							
Upstream signal (ft)		1038										
pX, platoon unblocked												
vC, conflicting volume	427			519			770	983	260	742	892	214
vC1, stage 1 conf vol							510	510		473	473	
vC2, stage 2 conf vol							260	473		270	519	
vCu, unblocked vol	427			519			770	983	260	742	892	214
tC, single (s)	4.1			4.3			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)							6.5	5.5		6.5	5.5	
tF (s)	2.2			2.3			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			98			100	100	97	100	100	100
cM capacity (veh/h)	1143			993			471	434	745	476	423	798

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	SB 1
Volume Total	0	334	185	23	285	142	20	0
Volume Left	0	0	0	23	0	0	1	0
Volume Right	0	0	18	0	0	0	19	0
cSH	1700	1700	1700	993	1700	1700	724	1700
Volume to Capacity	0.00	0.20	0.11	0.02	0.17	0.08	0.03	0.00
Queue Length 95th (ft)	0	0	0	2	0	0	2	0
Control Delay (s)	0.0	0.0	0.0	8.8	0.0	0.0	10.1	0.0
Lane LOS				A			B	A
Approach Delay (s)	0.0			0.4			10.1	0.0
Approach LOS							B	A

Intersection Summary

Average Delay	0.4		
Intersection Capacity Utilization	25.0%	CU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	451	28	36	302	76	174
Future Volume (Veh/h)	451	28	36	302	76	174
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.77	0.77	0.86	0.86
Hourly flow rate (vph)	475	29	125	392	88	202
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL			None		
Median storage veh)	2					
Upstream signal (ft)	1256					
pX, platoon unblocked						
vC, conflicting volume			534		936	252
vC1, stage 1 conf vol					490	
vC2, stage 2 conf vol					446	
vCu, unblocked vol			534		936	252
tC, single (s)			4.2		6.8	6.9
tC, 2 stage (s)					5.8	
tF (s)			2.2		3.5	3.3
p0 queue free %			88		80	73
cM capacity (veh/h)			1036		441	751

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1
Volume Total	317	187	125	196	196	290
Volume Left	0	0	125	0	0	88
Volume Right	0	29	0	0	0	202
cSH	1700	1700	1036	1700	1700	619
Volume to Capacity	0.19	0.11	0.12	0.12	0.12	0.47
Queue Length 95th (ft)	0	0	10	0	0	62
Control Delay (s)	0.0	0.0	9.0	0.0	0.0	15.8
Lane LOS			A			C
Approach Delay (s)	0.0		2.2			15.8
Approach LOS						C

Intersection Summary			
Average Delay	4.4		
Intersection Capacity Utilization	41.9%	ICU Level of Service	A
Analysis Period (min)	15		

Appendix D.
Existing Conditions - Validation Logs

1011: Giddings Rd & Liberty Dr/Gate 4 Performance by movement

Movement	WBL	NBL	NBT	NBR	SBL	SBT	All
Vehicles Entered	1	2	821	235	29	113	1003
Vehicles Exited	1	2	823	233	29	114	1002
Hourly Exit Rate	1	2	823	233	29	114	1002
Input Volume	1	2	821	234	28	120	1006
% of Volume	80	89	100	100	103	95	100

1013: M-24 (Lapeer) SB/M-24 (Lapeer) SB & Silver Bell Rd Performance by movement

Movement	EBT	EBR	WBT	SBT	SBR	All
Vehicles Entered	169	140	162	2294	186	2951
Vehicles Exited	167	139	162	2314	186	2968
Hourly Exit Rate	167	139	162	2314	186	2968
Input Volume	165	148	173	2308	180	2971
% of Volume	101	94	95	100	103	100

1017: Brown Rd/Giddings Rd & FedEx Drive/Brown Road Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Vehicles Entered	1	3	8	59	20	134	20	675	223	26	81	10
Vehicles Exited	1	3	8	58	20	132	19	674	222	26	81	10
Hourly Exit Rate	1	3	8	58	20	132	19	674	222	26	81	10
Input Volume	1	4	6	66	26	136	23	671	233	26	84	11
% of Volume	80	75	128	89	75	97	83	100	95	99	96	89

1017: Brown Rd/Giddings Rd & FedEx Drive/Brown Road Performance by movement

Movement	All
Vehicles Entered	1260
Vehicles Exited	1254
Hourly Exit Rate	1254
Input Volume	1289
% of Volume	97

1025: M-24 (Lapeer) SB & Brown Road/Dutton Road (Push Button) Performance by movement

Movement	EBT	EBR	WBT	SBT	SBR	All
Vehicles Entered	127	105	215	2385	143	2975
Vehicles Exited	123	104	214	2397	143	2981
Hourly Exit Rate	123	104	214	2397	143	2981
Input Volume	131	114	232	2381	146	3004
% of Volume	94	91	92	101	98	99

1113: M-24 (Lapeer) SB /SB M-24 (Lapeer Rd) & X-over N of Silver Bell Performance by movement

Movement	WBL	SBT	All
Vehicles Entered	378	2074	2450
Vehicles Exited	378	2072	2450
Hourly Exit Rate	378	2072	2450
Input Volume	368	2087	2455
% of Volume	103	99	100

1125: M-24 (Lapeer) SB & NB to SB X-over (N of Brown) Performance by movement

Movement	WBL	SBT	All
Vehicles Entered	247	2279	2526
Vehicles Exited	243	2282	2525
Hourly Exit Rate	243	2282	2525
Input Volume	242	2291	2524
% of Volume	100	100	100

1128: M-24 (Lapeer) SB & X-over N of Harmon Performance by movement

Movement	WBL	SBT	All
Vehicles Entered	508	2470	2978
Vehicles Exited	504	2479	2983
Hourly Exit Rate	504	2479	2983
Input Volume	508	2480	2988
% of Volume	99	100	100

1225: M-24 (Lapeer) NB & SB to NB X-over (S of Brown) Performance by movement

Movement	EBL	NBT	All
Vehicles Entered	73	1351	1424
Vehicles Exited	73	1352	1425
Hourly Exit Rate	73	1352	1425
Input Volume	72	1338	1410
% of Volume	102	101	101

1313: M-24 (Lapeer) NB & X-over south of Silver Bell Performance by movement

Movement	EBL	NBT	All
Vehicles Entered	192	1031	1223
Vehicles Exited	191	1029	1220
Hourly Exit Rate	191	1029	1220
Input Volume	189	1030	1219
% of Volume	101	100	100

1913: M-24 (Lapeer) NB & Silver Bell Rd Performance by movement

Movement	EBT	WBT	WBR	NBT	NBR	All
Vehicles Entered	124	166	491	957	292	2030
Vehicles Exited	124	162	488	963	292	2029
Hourly Exit Rate	124	162	488	963	292	2029
Input Volume	126	170	490	946	303	2036
% of Volume	98	95	100	102	96	100

1925: M-24 (Lapeer) NB & Dutton Road (Push Button)/Dutton Road (Push Buttons) Performance by movement

Movement	EBT	WBT	WBR	NBT	NBR	All
Vehicles Entered	109	231	242	1179	154	1915
Vehicles Exited	109	215	240	1189	155	1908
Hourly Exit Rate	109	215	240	1189	155	1908
Input Volume	115	232	238	1168	154	1907
% of Volume	95	93	101	102	100	100

9028: M-24 (Lapeer) SB & Harmon Rd Performance by movement

Movement	EBR	SBT	SBR	All
Vehicles Entered	39	2560	425	3024
Vehicles Exited	39	2563	424	3026
Hourly Exit Rate	39	2563	424	3026
Input Volume	38	2586	405	3030
% of Volume	102	99	105	100

9030: Gated entrance/Giddings Rd & Silver Bell Rd Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBR	SBL	SBR	All
Vehicles Entered	18	170	8	5	251	43	2	9	77	40	653
Vehicles Exited	18	170	8	5	252	43	2	9	77	40	654
Hourly Exit Rate	18	170	8	5	252	43	2	9	77	40	654
Input Volume	19	166	7	6	253	43	3	10	78	39	654
% of Volume	95	102	119	80	100	100	73	88	99	103	100

9040: Giddings Rd & Silver Bell Rd Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Vehicles Entered	13	137	250	38	74	59	581
Vehicles Exited	13	137	259	38	74	59	580
Hourly Exit Rate	13	137	259	38	74	59	580
Input Volume	13	142	265	38	70	59	587
% of Volume	100	96	98	101	106	100	99

9050: Giddings Rd & Delta Ct Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Vehicles Entered	1	2	143	179	114	228	667
Vehicles Exited	1	2	143	179	113	228	666
Hourly Exit Rate	1	2	143	179	113	228	666
Input Volume	1	3	144	175	115	235	673
% of Volume	80	73	99	102	98	97	99

9060: Giddings Rd & Gate 3 Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Vehicles Entered	11	6	304	270	84	120	795
Vehicles Exited	12	6	304	270	84	120	796
Hourly Exit Rate	12	6	304	270	84	120	796
Input Volume	14	6	304	274	84	126	808
% of Volume	86	96	100	99	100	95	99

9070: Rousch Dr & Brown Road Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	NBR	SBL	SBR	All
Vehicles Entered	0	261	14	6	196	2	2	1	482
Vehicles Exited	0	263	14	6	196	2	2	1	484
Hourly Exit Rate	0	263	14	6	196	2	2	1	484
Input Volume	1	278	13	6	209	2	2	1	512
% of Volume	0	95	108	104	94	89	89	89	94

9080: Giddings Rd & Brown Road Performance by movement

Movement	EBT	EBR	WBL	WBT	NBL	NBR	All
Vehicles Entered	197	44	164	193	19	68	685
Vehicles Exited	197	44	163	192	19	68	683
Hourly Exit Rate	197	44	163	192	19	68	683
Input Volume	209	47	170	201	21	68	714
% of Volume	94	94	96	95	89	103	96

9126: M-24 (Lapeer) NB & NB to SB X-over (N of Brown) Performance by movement

Movement	NBL	NBT	All
Vehicles Entered	248	1266	1514
Vehicles Exited	247	1264	1511
Hourly Exit Rate	247	1264	1511
Input Volume	242	1251	1493
% of Volume	102	101	101

9128: M-24 (Lapeer) SB & SB to NB X-over (S of Brown) Performance by movement

Movement	SBL	SBT	All
Vehicles Entered	73	2423	2496
Vehicles Exited	73	2412	2485
Hourly Exit Rate	73	2412	2485
Input Volume	72	2417	2489
% of Volume	102	100	100

9132: M-24 (Lapeer) NB & X-over N of Harmon Performance by movement

Movement	NBL	NBT	All
Vehicles Entered	509	1230	1739
Vehicles Exited	509	1230	1738
Hourly Exit Rate	509	1230	1738
Input Volume	509	1224	1732
% of Volume	100	100	100

9136: M-24 (Lapeer) SB & Auburn Hills N. Dr. (Isiah Thomas) Flash 24hrs/Auburn Hills N. Dr. (Isiah Thomas) Flashes 24hr

Movement	EBR	WBT	SBT	SBR	All
Vehicles Entered	15	74	2596	9	2694
Vehicles Exited	16	76	2593	9	2694
Hourly Exit Rate	16	76	2593	9	2694
Input Volume	17	74	2618	9	2718
% of Volume	93	103	99	100	99

9138: M-24 (Lapeer) NB & Auburn Hills N. Dr. (Isiah Thomas) Flashes 24hr Performance by movement

Movement	NBL	NBT	All
Vehicles Entered	74	1842	1916
Vehicles Exited	74	1842	1916
Hourly Exit Rate	74	1842	1916
Input Volume	74	1832	1906
% of Volume	100	101	101

9140: M-24 (Lapeer) SB & Auburn Hills Arena (Championship Dr.) Flash 24hrs/Auburn Hills Arena (Championship Dr.) Per

Movement	SBT	All
Vehicles Entered	2612	2612
Vehicles Exited	2612	2612
Hourly Exit Rate	2612	2612
Input Volume	2635	2635
% of Volume	99	99

9142: M-24 (Lapeer) NB & Auburn Hills Arena (Championship Dr.)/Driveway Performance by movement

Movement	NBT	All
Vehicles Entered	1805	1805
Vehicles Exited	1809	1809
Hourly Exit Rate	1809	1809
Input Volume	1801	1801
% of Volume	100	100

9500: Dummy B & Silver Bell Rd Performance by movement

Movement	EBT	WBT	WBR	NBR	All
Vehicles Entered	262	317	43	25	647
Vehicles Exited	262	321	43	25	651
Hourly Exit Rate	262	321	43	25	651
Input Volume	262	322	41	23	647
% of Volume	100	100	106	110	101

9520: M-24 (Lapeer) SB & Dummy F Performance by movement

Movement	EBR	SBT	All
Vehicles Entered	21	2523	2544
Vehicles Exited	21	2522	2543
Hourly Exit Rate	21	2522	2543
Input Volume	25	2526	2551
% of Volume	85	100	100

9521: M-24 (Lapeer) SB & X-over south of Silver Bell Performance by movement

Movement	SBL	SBT	All
Vehicles Entered	193	2554	2747
Vehicles Exited	192	2549	2741
Hourly Exit Rate	192	2549	2741
Input Volume	189	2561	2750
% of Volume	102	100	100

9522: M-24 (Lapeer) NB & Dummy F Performance by movement

Movement	NBT	NBR	All
Vehicles Entered	1075	124	1199
Vehicles Exited	1073	123	1196
Hourly Exit Rate	1073	123	1196
Input Volume	1078	124	1202
% of Volume	100	99	100

9524: M-24 (Lapeer) SB & Dummy G Performance by movement

Movement	EBR	SBT	All
Vehicles Entered	94	2388	2472
Vehicles Exited	94	2385	2469
Hourly Exit Rate	94	2385	2469
Input Volume	93	2397	2490
% of Volume	101	99	100

9526: M-24 (Lapeer) NB & Dummy G Performance by movement

Movement	WBR	NBT	All
Vehicles Entered	22	1228	1250
Vehicles Exited	22	1228	1250
Hourly Exit Rate	22	1228	1250
Input Volume	21	1222	1243
% of Volume	106	100	101

9528: Dummy H & M-24 (Lapeer) SB Performance by movement

Movement	SBT	All
Vehicles Entered	2608	2608
Vehicles Exited	2605	2605
Hourly Exit Rate	2605	2605
Input Volume	2629	2629
% of Volume	99	99

9580: Dummy A & Brown Road Performance by movement

Movement	EBT	EBR	WBT	WBR	All
Vehicles Entered	224	45	346	17	632
Vehicles Exited	223	45	355	17	640
Hourly Exit Rate	223	45	355	17	640
Input Volume	237	43	371	17	668
% of Volume	94	105	96	99	96

9817: M-24 (Lapeer) NB & X-over N of Silver Bell Performance by movement

Movement	NBL	NBT	All
Vehicles Entered	376	1089	1465
Vehicles Exited	376	1087	1463
Hourly Exit Rate	376	1087	1463
Input Volume	368	1087	1455
% of Volume	102	100	101

Total Network Performance

Vehicles Entered	8009
Vehicles Exited	8018
Hourly Exit Rate	8018
Input Volume	73047
% of Volume	11

1011: Giddings Rd & Liberty Dr Performance by movement

Movement	EBL	EBR	WBL	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
Vehicles Entered	2	15	205	107	4	254	5	2	582	1	1217
Vehicles Exited	2	15	205	106	4	254	5	1	583	1	1216
Hourly Exit Rate	2	15	205	106	4	254	5	1	583	1	1216
Input Volume	3	18	206	95	5	305	3	1	593	1	1230
% of Volume	73	83	100	112	80	96	167	80	98	80	99

1013: M-24 (Lapeer) SB/M-24 (Lapeer) SB & Silver Bell Rd Performance by movement

Movement	EBT	EBR	WBT	SBT	SBR	All
Vehicles Entered	375	324	190	1352	156	2397
Vehicles Exited	376	324	190	1343	156	2389
Hourly Exit Rate	376	324	190	1343	156	2389
Input Volume	379	329	201	1363	149	2422
% of Volume	99	98	95	99	105	99

1017: Brown Rd/Giddings Rd & FedEx Drive/Brown Road Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Vehicles Entered	8	12	26	276	25	65	40	223	312	147	692	9
Vehicles Exited	8	12	26	275	25	65	40	223	311	148	695	9
Hourly Exit Rate	8	12	26	275	25	65	40	223	311	148	695	9
Input Volume	9	10	25	276	23	67	41	230	317	156	702	8
% of Volume	96	127	105	99	109	97	98	97	98	95	99	116

1017: Brown Rd/Giddings Rd & FedEx Drive/Brown Road Performance by movement

Movement	All
Vehicles Entered	1835
Vehicles Exited	1838
Hourly Exit Rate	1838
Input Volume	1863
% of Volume	99

1025: M-24 (Lapeer) SB & Brown Road/Dutton Road (Push Button) Performance by movement

Movement	EBT	EBR	WBT	SBT	SBR	All
Vehicles Entered	403	243	210	1575	137	2568
Vehicles Exited	372	229	209	1583	137	2530
Hourly Exit Rate	372	229	209	1583	137	2530
Input Volume	406	246	210	1593	139	2595
% of Volume	92	93	99	99	98	97

1113: M-24 (Lapeer) SB /SB M-24 (Lapeer Rd) & X-over N of Silver Bell Performance by movement

Movement	WBL	SBT	All
Vehicles Entered	193	1311	1504
Vehicles Exited	192	1311	1503
Hourly Exit Rate	192	1311	1503
Input Volume	203	1306	1509
% of Volume	95	100	100

1125: M-24 (Lapeer) SB & NB to SB X-over (N of Brown) Performance by movement

Movement	WBL	SBT	All
Vehicles Entered	212	1505	1717
Vehicles Exited	212	1504	1716
Hourly Exit Rate	212	1504	1716
Input Volume	213	1517	1730
% of Volume	100	99	99

1128: M-24 (Lapeer) SB & X-over N of Harmon Performance by movement

Movement	WBL	SBT	All
Vehicles Entered	53	1448	1501
Vehicles Exited	53	1446	1499
Hourly Exit Rate	53	1446	1499
Input Volume	61	1468	1528
% of Volume	87	99	98

1225: M-24 (Lapeer) NB & SB to NB X-over (S of Brown) Performance by movement

Movement	EBL	NBT	All
Vehicles Entered	185	2459	2644
Vehicles Exited	183	2465	2648
Hourly Exit Rate	183	2465	2648
Input Volume	190	2469	2658
% of Volume	96	100	100

1313: M-24 (Lapeer) NB & X-over south of Silver Bell Performance by movement

Movement	EBL	NBT	All
Vehicles Entered	373	2484	2857
Vehicles Exited	373	2479	2852
Hourly Exit Rate	373	2479	2852
Input Volume	378	2524	2902
% of Volume	99	98	98

1913: M-24 (Lapeer) NB & Silver Bell Rd Performance by movement

Movement	EBT	WBT	WBR	NBT	NBR	All
Vehicles Entered	354	187	383	2083	599	3606
Vehicles Exited	354	190	386	2085	598	3593
Hourly Exit Rate	354	190	386	2085	598	3593
Input Volume	356	201	387	2114	610	3668
% of Volume	99	95	100	98	98	98

1925: M-24 (Lapeer) NB & Dutton Road (Push Button)/Dutton Road (Push Buttons) Performance by movement

Movement	EBT	WBT	WBR	NBT	NBR	All
Vehicles Entered	358	204	218	2238	366	3384
Vehicles Exited	359	201	212	2252	365	3389
Hourly Exit Rate	359	201	212	2252	365	3389
Input Volume	390	203	230	2241	376	3441
% of Volume	92	99	92	100	97	98

9028: M-24 (Lapeer) SB & Harmon Rd Performance by movement

Movement	EBR	SBT	SBR	All
Vehicles Entered	428	1465	36	1927
Vehicles Exited	429	1462	36	1927
Hourly Exit Rate	429	1462	36	1927
Input Volume	427	1494	36	1957
% of Volume	100	98	101	98

9030: Gated entrance/Giddings Rd & Silver Bell Rd Performance by movement

Movement	EBL	EBT	EBR	WBT	WBR	NBL	NBT	NBR	SBL	SBR	All
Vehicles Entered	71	613	3	297	83	2	1	4	67	39	1180
Vehicles Exited	71	614	3	298	83	2	1	4	68	39	1183
Hourly Exit Rate	71	614	3	298	83	2	1	4	68	39	1183
Input Volume	69	624	2	304	83	4	1	3	73	40	1202
% of Volume	103	98	150	98	100	50	83	145	93	98	98

9040: Giddings Rd & Silver Bell Rd Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Vehicles Entered	58	720	286	72	59	19	1194
Vehicles Exited	57	724	287	72	59	18	1197
Hourly Exit Rate	57	724	287	72	59	18	1197
Input Volume	58	732	274	73	60	16	1212
% of Volume	98	99	99	98	99	112	99

9050: Giddings Rd & Delta Ct Performance by movement

Movement	EBR	WBL	WBR	NBL	NBT	SBT	SBR	All
Vehicles Entered	1	123	153	1	523	289	1	1091
Vehicles Exited	1	125	153	1	523	290	1	1094
Hourly Exit Rate	1	125	153	1	523	290	1	1094
Input Volume	1	129	157	1	534	295	1	1118
% of Volume	80	97	97	80	98	98	100	98

9060: Giddings Rd & Gate 3 Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Vehicles Entered	154	132	410	14	3	405	1118
Vehicles Exited	154	132	411	14	3	405	1119
Hourly Exit Rate	154	132	411	14	3	405	1119
Input Volume	154	139	413	13	4	416	1140
% of Volume	100	95	100	106	71	97	98

9070: Rausch Dr & Brown Road Performance by movement

Movement	EBT	EBR	WBL	WBT	NBL	NBR	All
Vehicles Entered	462	16	19	368	1	14	878
Vehicles Exited	464	16	20	366	1	14	881
Hourly Exit Rate	464	16	20	366	1	14	881
Input Volume	473	17	19	369	1	13	892
% of Volume	98	93	104	99	100	108	99

9080: Giddings Rd & Brown Road Performance by movement

Movement	EBT	EBR	WBL	WBT	NBL	NBR	All
Vehicles Entered	450	30	98	305	75	171	1130
Vehicles Exited	449	30	98	306	76	171	1130
Hourly Exit Rate	449	30	98	306	76	171	1130
Input Volume	456	28	96	309	76	174	1141
% of Volume	98	106	102	99	100	98	99

9126: M-24 (Lapeer) NB & NB to SB X-over (N of Brown) Performance by movement

Movement	NBL	NBT	All
Vehicles Entered	212	2322	2534
Vehicles Exited	212	2315	2527
Hourly Exit Rate	212	2315	2527
Input Volume	213	2336	2549
% of Volume	100	99	99

9128: M-24 (Lapeer) SB & SB to NB X-over (S of Brown) Performance by movement

Movement	SBL	SBT	All
Vehicles Entered	185	1590	1775
Vehicles Exited	185	1586	1771
Hourly Exit Rate	185	1586	1771
Input Volume	190	1612	1801
% of Volume	97	98	98

9132: M-24 (Lapeer) NB & X-over N of Harmon Performance by movement

Movement	NBL	NBT	All
Vehicles Entered	53	2767	2820
Vehicles Exited	53	2754	2807
Hourly Exit Rate	53	2754	2807
Input Volume	61	2749	2810
% of Volume	87	100	100

9136: M-24 (Lapeer) SB & Auburn Hills N. Dr. (siah Thomas) Flash 24hrs/Auburn Hills N. Dr. (Isiah Thomas) Flashes 24hr

Movement	EBR	WBT	SBT	SBR	All
Vehicles Entered	76	54	1953	2	2087
Vehicles Exited	77	54	1952	2	2085
Hourly Exit Rate	77	54	1952	2	2085
Input Volume	74	52	1984	1	2112
% of Volume	104	104	98	200	99

9138: M-24 (Lapeer) NB & Auburn Hills N. Dr. (Isiah Thomas) Flashes 24hr Performance by movement

Movement	NBL	NBT	All
Vehicles Entered	54	2986	3040
Vehicles Exited	54	2981	3035
Hourly Exit Rate	54	2981	3035
Input Volume	52	2969	3021
% of Volume	104	100	100

9140: M-24 (Lapeer) SB & Auburn Hills Arena (Championship Dr.) Flash 24hrs/Auburn Hills Arena (Championship Dr.) Per

Movement	SBT	SBR	All
Vehicles Entered	1892	75	1967
Vehicles Exited	1893	75	1968
Hourly Exit Rate	1893	75	1968
Input Volume	1920	74	1994
% of Volume	99	102	99

9142: M-24 (Lapeer) NB & Auburn Hills Arena (Championship Dr.)/Driveway Performance by movement

Movement	NBT	All
Vehicles Entered	2870	2870
Vehicles Exited	2868	2868
Hourly Exit Rate	2868	2868
Input Volume	2854	2854
% of Volume	100	100

9500: Dummy B & Silver Bell Rd Performance by movement

Movement	EBT	WBT	SBR	All
Vehicles Entered	684	357	32	1073
Vehicles Exited	685	355	32	1072
Hourly Exit Rate	685	355	32	1072
Input Volume	697	359	32	1098
% of Volume	98	99	100	98

9520: M-24 (Lapeer) SB & Dummy F Performance by movement

Movement	EBR	SBT	All
Vehicles Entered	151	1316	1467
Vehicles Exited	151	1320	1471
Hourly Exit Rate	151	1320	1471
Input Volume	150	1338	1488
% of Volume	100	99	99

9521: M-24 (Lapeer) SB & X-over south of Silver Bell Performance by movement

Movement	SBL	SBT	All
Vehicles Entered	371	1317	1688
Vehicles Exited	373	1313	1686
Hourly Exit Rate	373	1313	1686
Input Volume	378	1340	1718
% of Volume	99	98	98

9522: M-24 (Lapeer) NB & Dummy F Performance by movement

Movement	WBR	NBT	All
Vehicles Entered	83	2294	2377
Vehicles Exited	83	2286	2369
Hourly Exit Rate	83	2286	2369
Input Volume	90	2320	2410
% of Volume	92	99	98

9524: M-24 (Lapeer) SB & Dummy G Performance by movement

Movement	SBT	SBR	All
Vehicles Entered	1479	121	1600
Vehicles Exited	1475	120	1595
Hourly Exit Rate	1475	120	1595
Input Volume	1501	123	1624
% of Volume	98	98	98

9526: M-24 (Lapeer) NB & Dummy G Performance by movement

Movement	NBT	NBR	All
Vehicles Entered	2429	323	2752
Vehicles Exited	2427	322	2749
Hourly Exit Rate	2427	322	2749
Input Volume	2426	321	2749
% of Volume	100	100	100

9528: Dummy H & M-24 (Lapeer) SB Performance by movement

Movement	SBT	All
Vehicles Entered	1892	1892
Vehicles Exited	1868	1868
Hourly Exit Rate	1868	1868
Input Volume	1919	1919
% of Volume	98	98

9580: Dummy A & Brown Road Performance by movement

Movement	EBT	WBT	NBR	SBR	All
Vehicles Entered	646	355	12	52	1065
Vehicles Exited	646	362	12	52	1072
Hourly Exit Rate	646	362	12	52	1072
Input Volume	662	360	11	56	1089
% of Volume	98	101	107	93	98

9817: M-24 (Lapeer) NB & X-over N of Silver Bell Performance by movement

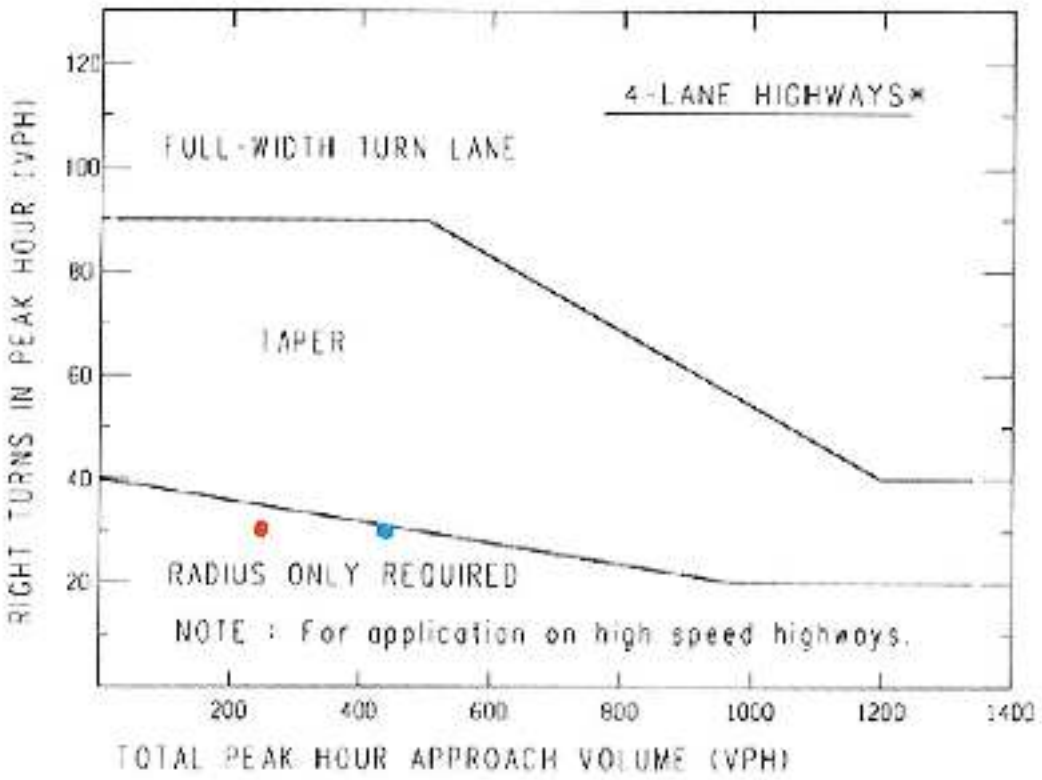
Movement	NBL	NBT	All
Vehicles Entered	193	2255	2448
Vehicles Exited	193	2247	2440
Hourly Exit Rate	193	2247	2440
Input Volume	203	2296	2498
% of Volume	95	98	98

Total Network Performance

Vehicles Entered	9292
Vehicles Exited	9225
Hourly Exit Rate	9225
Input Volume	81476
% of Volume	11

Appendix E.
Turn Lane Warrants

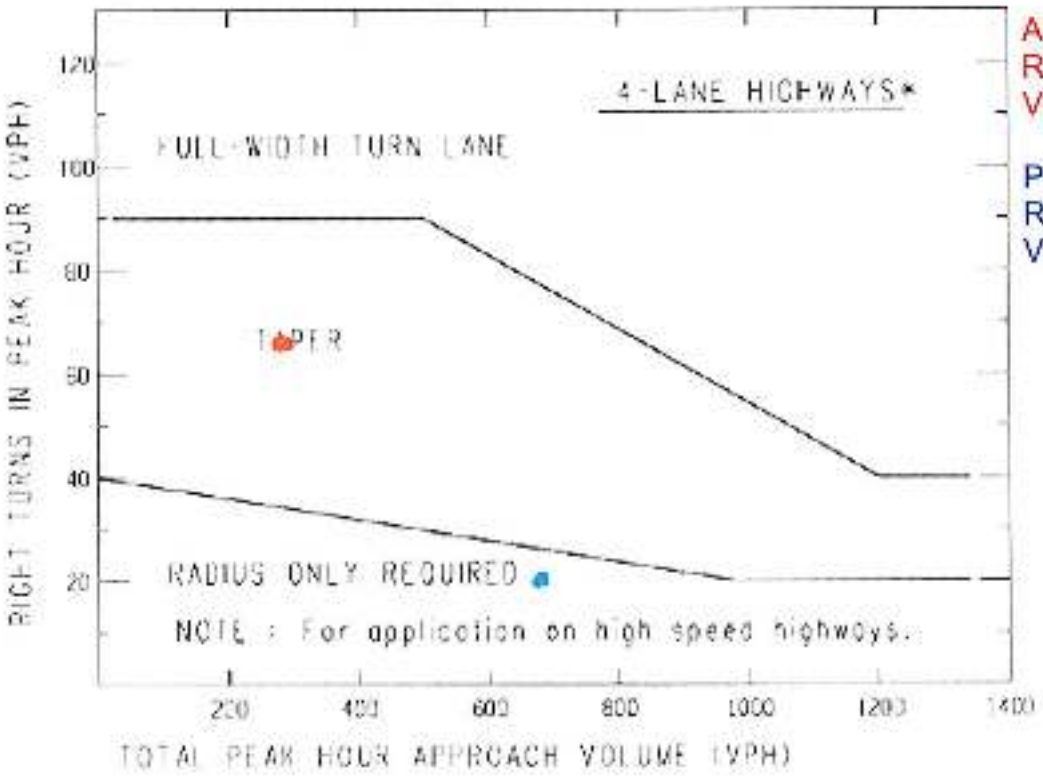
Gate 1



AM Proposed
RT= 30
VPH= 235

PM Proposed
RT=30
VPH=414

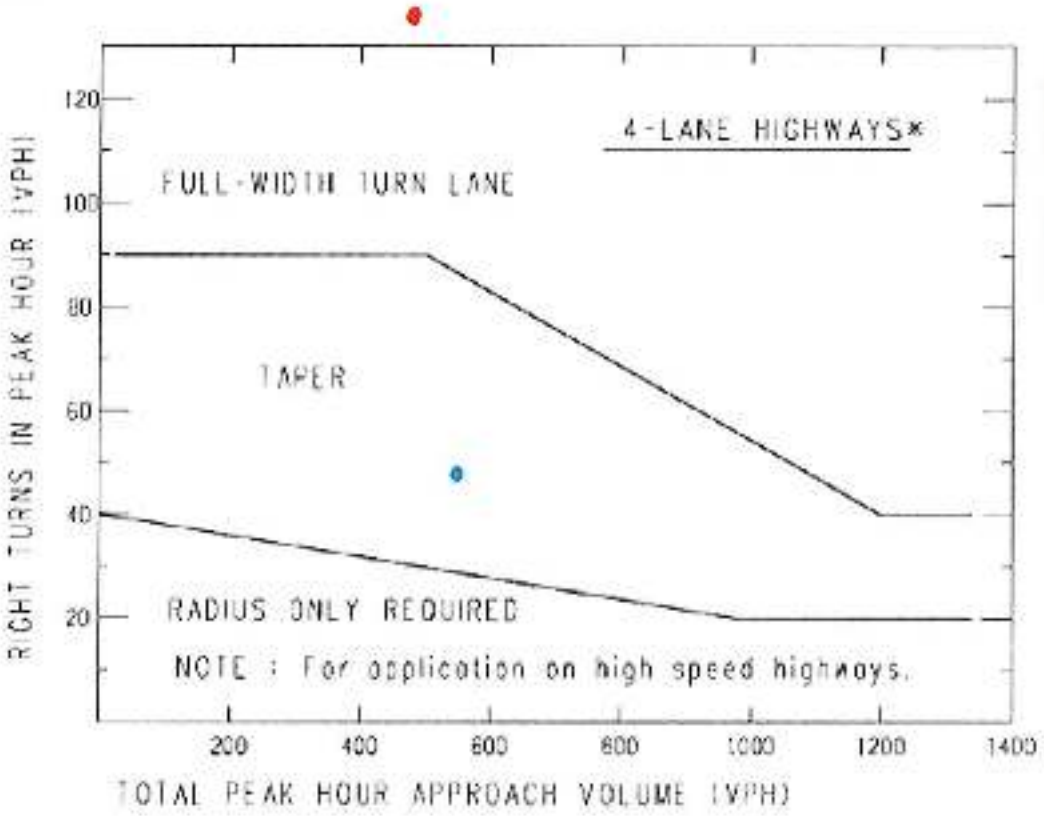
Gate 2



AM Proposed
RT= 64
VPH=240

PM Proposed
RT=19
VPH=625

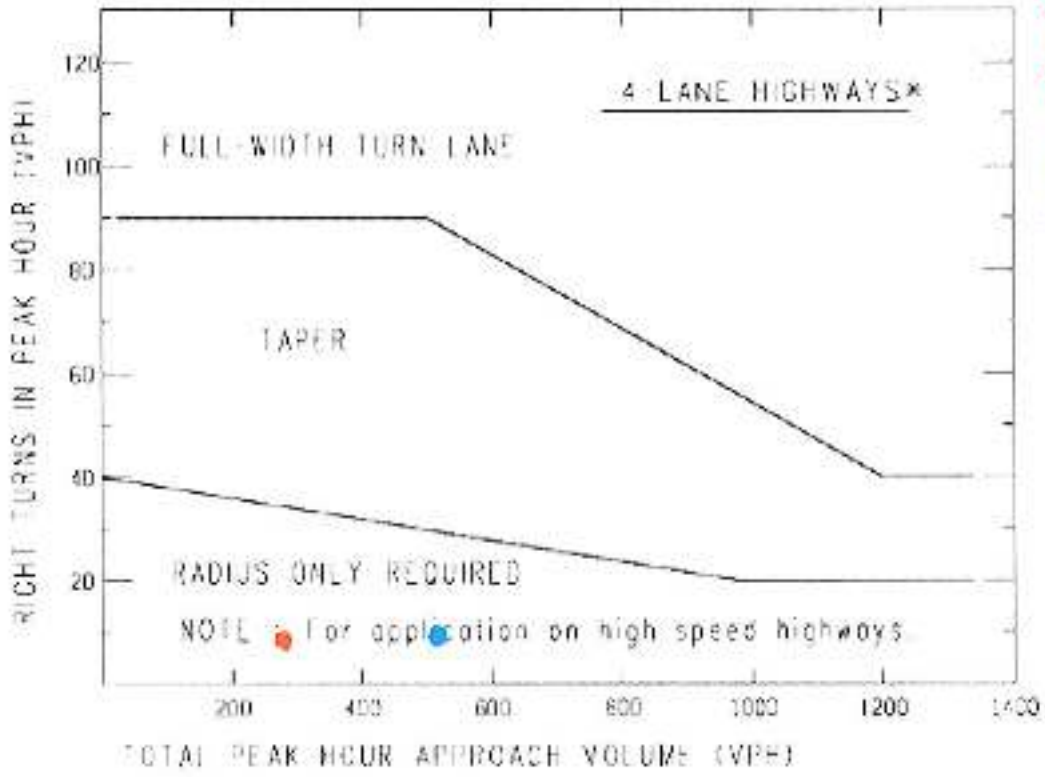
Gate 3



AM Proposed
RT= 216
VPH= 446

PM Proposed
RT=46
VPH=597

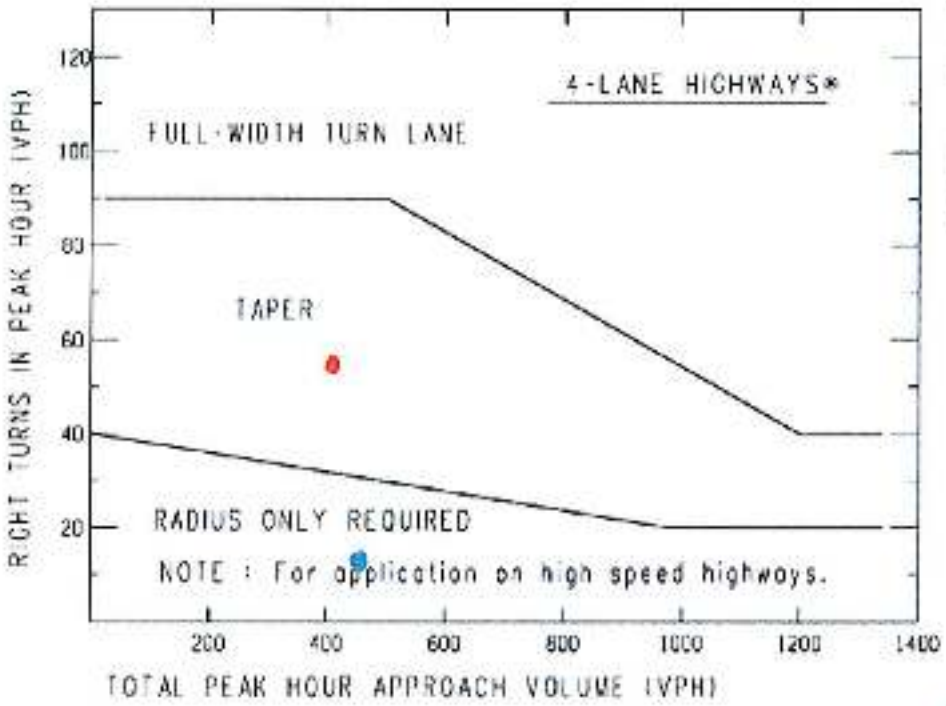
Gate 5



AM Proposed
RT= 10
VPH=270

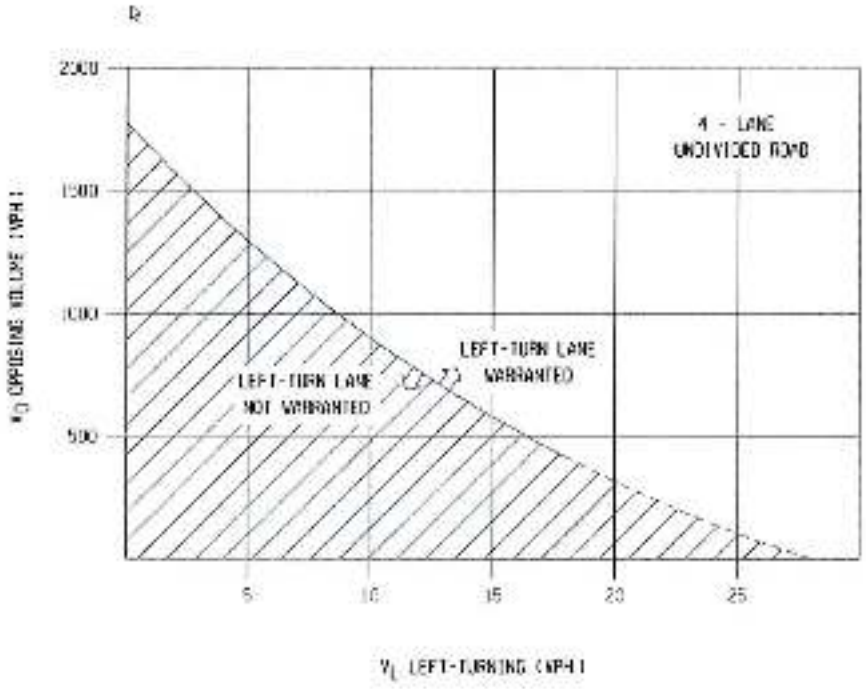
PM Proposed
RT=10
VPH=579

Gate 7



AM Proposed
RT= 55
VPH= 433

PM Proposed
RT=11
VPH=440



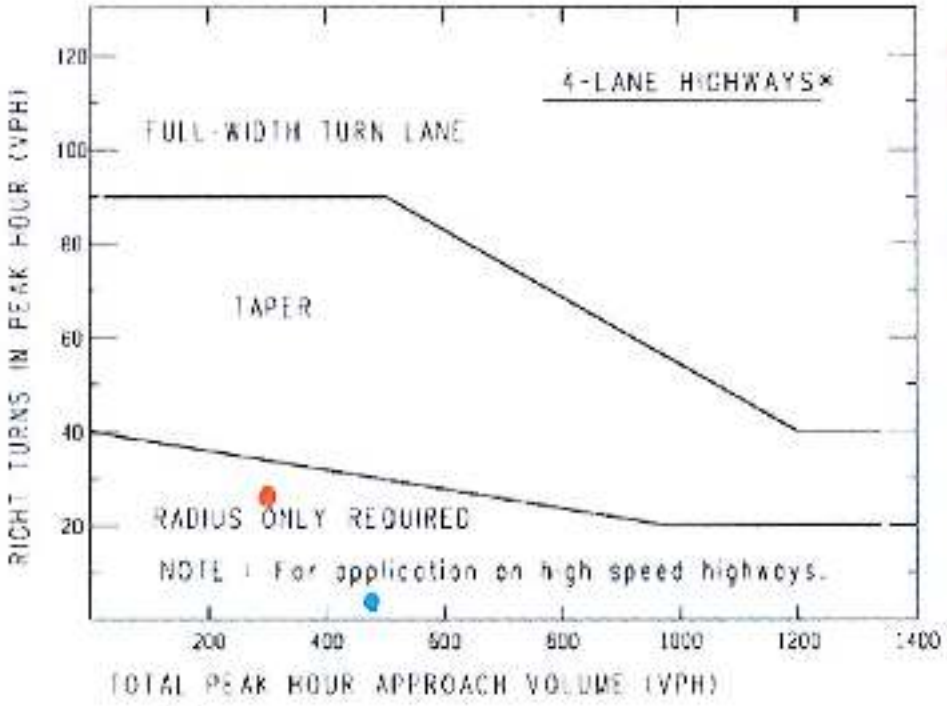
AM Proposed
VL= 233
VO= 433
VA= 530

(Off chart)

PM Proposed
VL=52
VO=440
VA=682

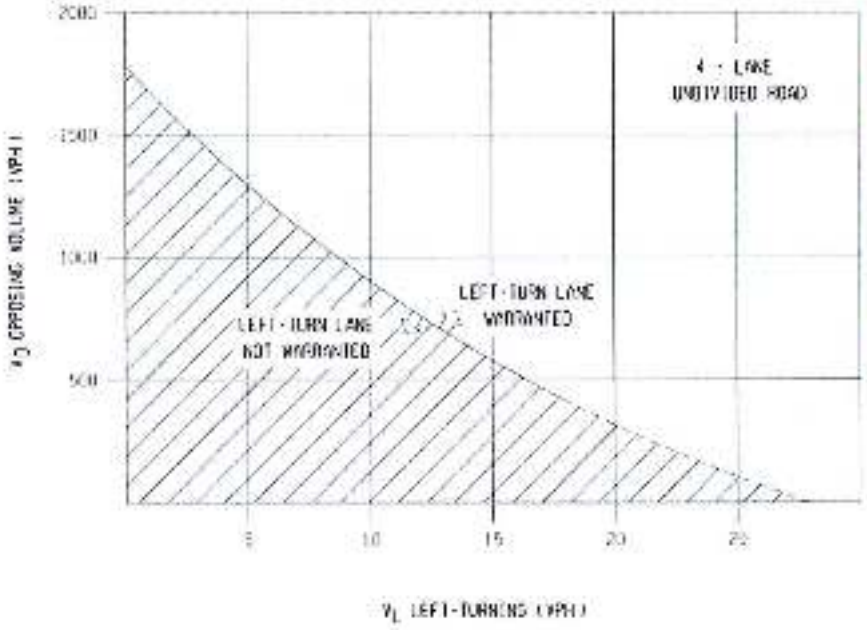
(Off chart)

Gate 8



AM Proposed
RT= 27
VPH= 330

PM Proposed
RT=6
VPH=469



AM Proposed
VL= 80
VO= 330
VA= 355
(Off chart)

PM Proposed
VL=15
VO=469
VA=435
(Off chart)

Appendix F.
Signal Warrants

Summary of Warrants

Spot Number:	9030		
Major Street:	Silver Bell Rd	Minor Street:	Gate 1
Intersection:	Silver Bell Rd at Gate 1		
City/Twp:	Orion		
Date Performed:	6/22/2022	Performed By:	BNB
Date Volumes Collected:	4/27/2022		

Warrant	Condition	Is Warrant Met
Data Validation Error		NO
WARRANT 1: Eight-Hour Vehicular Volume		YES
	Condition A	NO
	Condition B	YES
	Condition A&B	NO
WARRANT 2: Four-Hour Vehicular Volume	(70%)	NO
WARRANT 3: Peak-Hour Vehicular Volume	(70%)	NO
	Condition A	NO
	Condition B	NO
WARRANT 4: Pedestrian Volume	(70%)	NO
	Four Hour	N/A
	Peak Hour	N/A
(Threshold)	HAWK	NO
(Threshold)	RRFB	NO
WARRANT 5: School Crossing		NO
WARRANT 6: Coordinated Signal System		NO
WARRANT 7: Crash Experience		NO
	Condition A	NO
	Condition B	NO
WARRANT 8: Roadway Network		NO
WARRANT 9: Intersection Near a Grade Crossing		#N/A

Issue to Be Addressed by Signalization:

Traffic Impact Study

Summary of Warrants

Spot Number:	9050		
Major Street:	Giddings Rd	Minor Street:	Gate 2
Intersection:	Giddings Rd at Gate 2		
City/Twp:	Orion		
Date Performed:	6/22/2022	Performed By:	BNB
Date Volumes Collected:	5/1/2022		

Warrant	Condition	Is Warrant Met
Data Validation Error		NO
WARRANT 1: Eight-Hour Vehicular Volume		NO
	Condition A	NO
	Condition B	NO
	Condition A&B	NO
WARRANT 2: Four-Hour Vehicular Volume	(70%)	NO
WARRANT 3: Peak-Hour Vehicular Volume	(70%)	#N/A
	Condition A	#N/A
	Condition B	NO
WARRANT 4: Pedestrian Volume	(70%)	NO
	Four Hour	N/A
	Peak Hour	N/A
(Threshold)	HAWK	NO
(Threshold)	RRFB	NO
WARRANT 5: School Crossing		NO
WARRANT 6: Coordinated Signal System		0
WARRANT 7: Crash Experience		NO
	Condition A	NO
	Condition B	NO
WARRANT 8: Roadway Network		0
WARRANT 9: Intersection Near a Grade Crossing		#N/A

Issue to Be Addressed by Signalization:

Traffic Impact Study

Summary of Warrants

Spot Number:	9060		
Major Street:	Giddings Rd	Minor Street	Gate 3
Intersection:	Giddings Rd & Gate 3		
City/Twp.:	Orion		
Date Performed:	6/22/2022	Performed By	BNB
Date Volumes Collected:	5/1/2022		

Warrant	Condition	Is Warrant Met
Data Validation Error		NO
WARRANT 1: Eight-Hour Vehicular Volume		NO
	Condition A	NO
	Condition B	NO
	Condition A&B	NO
WARRANT 2: Four-Hour Vehicular Volume	(70%)	NO
WARRANT 3: Peak-Hour Vehicular Volume	(70%)	NO
	Condition A	NO
	Condition B	NO
WARRANT 4: Pedestrian Volume	(70%)	NO
	Four Hour	N/A
	Peak Hour	N/A
(Threshold)	HAWK	NO
(Threshold)	RRFB	NO
WARRANT 5: School Crossing		NO
WARRANT 6: Coordinated Signal System		0
WARRANT 7: Crash Experience		NO
	Condition A	NO
	Condition B	NO
WARRANT 8: Roadway Network		0
WARRANT 9: Intersection Near a Grade Crossing		#N/A

Issue to Be Addressed by Signalization:

Traffic Impact Study

Summary of Warrants

Spot Number:	9070		
Major Street:	Giddings Rd	Minor Street:	Gate 4
Intersection:	Giddings Rd at Gate 4		
City/Twp:	Orion		
Date Performed:	6/22/2022	Performed By:	BNB
Date Volumes Collected:	5/1/2022		

Warrant	Condition	Is Warrant Met
Data Validation Error		NO
WARRANT 1: Eight-Hour Vehicular Volume		NO
	Condition A	NO
	Condition B	NO
	Condition A&B	NO
WARRANT 2: Four-Hour Vehicular Volume	(70%)	NO
WARRANT 3: Peak-Hour Vehicular Volume	(70%)	YES
	Condition A	NO
	Condition B	YES
WARRANT 4: Pedestrian Volume	(70%)	NO
	Four Hour	N/A
	Peak Hour	N/A
(Threshold)	HAWK	NO
(Threshold)	RRFB	NO
WARRANT 5: School Crossing		NO
WARRANT 6: Coordinated Signal System		0
WARRANT 7: Crash Experience		NO
	Condition A	NO
	Condition B	NO
WARRANT 8: Roadway Network		0
WARRANT 9: Intersection Near a Grade Crossing		#N/A

Issue to Be Addressed by Signalization:

Traffic Impact Study

Summary of Warrants

Spot Number:	9070		
Major Street:	Giddings Rd	Minor Street:	Gate 5
Intersection:	Giddings Rd at Gate 5		
City/Twp:	Orion		
Date Performed:	8/22/2022	Performed By:	BNB
Date Volumes Collected:	5/1/2022		

Warrant	Condition	Is Warrant Met
Data Validation Error		NO
WARRANT 1: Eight-Hour Vehicular Volume		NO
	Condition A	NO
	Condition B	NO
	Condition A&B	NO
WARRANT 2: Four-Hour Vehicular Volume	(70%)	NO
WARRANT 3: Peak-Hour Vehicular Volume	(70%)	NO
	Condition A	NO
	Condition B	NO
WARRANT 4: Pedestrian Volume	(70%)	NO
	Four Hour	N/A
	Peak Hour	N/A
(Threshold)	HAWK	NO
(Threshold)	RRFB	NO
WARRANT 5: School Crossing		NO
WARRANT 6: Coordinated Signal System		NO
WARRANT 7: Crash Experience		NO
	Condition A	NO
	Condition B	NO
WARRANT 8: Roadway Network		NO
WARRANT 9: Intersection Near a Grade Crossing		#N/A

Issue to Be Addressed by Signalization:

Traffic Impact Study

Summary of Warrants

Spot Number:	9070		
Major Street:	Gidd ngs Rd	Minor Street:	Gate 7
Intersection:	Giddings Rd at Gate 7		
City/Twp:	Orion		
Date Performed:	6/22/2022	Performed By:	BNB
Date Volumes Collected:	5/1/2022		

Warrant	Condition	Is Warrant Met
Data Validation Error		NO
WARRANT 1: Eight-Hour Vehicular Volume		NO
	Condition A	NO
	Condition B	NO
	Condition A&B	NO
WARRANT 2: Four-Hour Vehicular Volume	(70%)	NO
WARRANT 3: Peak-Hour Vehicular Volume	(70%)	NO
	Condition A	NO
	Condition B	NO
WARRANT 4: Pedestrian Volume	(70%)	NO
	Four Hour	N/A
	Peak Hour	N/A
(Threshold)	HAWK	NO
(Threshold)	RRFB	NO
WARRANT 5: School Crossing		NO
WARRANT 6: Coordinated Signal System		0
WARRANT 7: Crash Experience		NO
	Condition A	NO
	Condition B	NO
WARRANT 8: Roadway Network		0
WARRANT 9: Intersection Near a Grade Crossing		#N/A

Issue to Be Addressed by Signalization:

Traffic Impact Study

Summary of Warrants

Spot Number	9070		
Major Street:	Silver Bell rd	Minor Street:	Gate 8
Intersection:	Silver Bell rd at Gate 8		
City/Twp:	Orion		
Date Performed:	6/22/2022	Performed By:	BNB
Date Volumes Collected:	5/1/2022		

Warrant		Condition	Is Warrant Met
Data Validation Error			NO
WARRANT 1: Eight-Hour Vehicular Volume			NO
		Condition A	NO
		Condition B	NO
		Condition A&B	NO
WARRANT 2: Four-Hour Vehicular Volume		(70%)	NO
WARRANT 3: Peak-Hour Vehicular Volume		(70%)	NO
		Condition A	NO
		Condition B	NO
WARRANT 4: Pedestrian Volume		(70%)	NO
		Four Hour	N/A
		Peak Hour	N/A
	(Threshold)	HAWK	NO
	(Threshold)	RRFB	NO
WARRANT 5: School Crossing			NO
WARRANT 6: Coordinated Signal System			0
WARRANT 7: Crash Experience			NO
		Condition A	NO
		Condition B	NO
WARRANT 8: Roadway Network			0
WARRANT 9: Intersection Near a Grade Crossing			#N/A

Issue to Be Addressed by Signalization:
Traffic Impact Study

Appendix G.
Proposed Conditions - Synchro Reports

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	49	0	13	2	433	350	99	166	0
Future Volume (vph)	0	0	0	49	0	13	2	433	350	99	166	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)				6.0	6.0		6.2	6.2	6.2	6.2	6.2	
Lane Util. Factor				1.00	1.00		1.00	0.95	1.00	1.00	0.95	
Frt				1.00	0.85		1.00	1.00	0.85	1.00	1.00	
Flt Protected				0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)				1900	1700		1900	3762	1700	1900	3669	
Flt Permitted				0.76	1.00		0.58	1.00	1.00	0.39	1.00	
Satd. Flow (perm)				1514	1700		1160	3762	1700	753	3669	
Peak-hour factor, PHF	0.60	0.60	0.60	0.60	0.60	0.60	0.68	0.68	0.68	0.60	0.60	0.60
Adj. Flow (vph)	0	0	0	82	0	22	3	637	515	165	280	0
RTOR Reduction (vph)	0	0	0	0	15	0	0	0	238	0	0	0
Lane Group Flow (vph)	0	0	0	82	7	0	3	637	277	165	280	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	3%	0%
Turn Type				Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		4			4			2			2	
Permitted Phases	4			4			2		2	2		
Actuated Green, G (s)				34.0	34.0		53.8	53.8	53.8	53.8	53.8	
Effective Green, g (s)				34.0	34.0		53.8	53.8	53.8	53.8	53.8	
Actuated g/C Ratio				0.34	0.34		0.54	0.54	0.54	0.54	0.54	
Clearance Time (s)				6.0	6.0		6.2	6.2	6.2	6.2	6.2	
Lane Grp Cap (vph)				514	578		624	2023	914	405	1984	
v/s Ratio Prot					0.00			0.17			0.08	
v/s Ratio Perm				c0.05			0.00		0.16	c0.22		
v/c Ratio				0.16	0.01		0.00	0.31	0.30	0.41	0.14	
Uniform Delay, d1				23.0	21.9		10.7	12.6	12.8	13.7	11.5	
Progression Factor				1.00	1.00		0.79	0.72	0.16	1.00	1.00	
Incremental Delay, d2				0.7	0.0		0.0	0.4	0.8	3.0	0.1	
Delay (s)				23.7	21.9		8.5	9.6	2.8	16.7	11.7	
Level of Service				C	C		A	A	A	B	B	
Approach Delay (s)		0.0			23.3			6.5			13.5	
Approach LOS		A			C			A			B	

Intersection Summary

HCM 2000 Control Delay	9.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.31		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.2
Intersection Capacity Utilization	43.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	136	170	0	186	0	0	0	0	0	2275	210
Future Volume (vph)	0	136	170	0	186	0	0	0	0	0	2275	210
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	12	12	12	12	12	12	11	11	11	11	11	11
Total Lost time (s)		6.3	6.3		6.3						6.7	6.7
Lane Util. Factor		0.91	0.91		0.95						0.91	1.00
Frt		0.95	0.85		1.00						1.00	0.85
Flt Protected		1.00	1.00		1.00						1.00	1.00
Satd. Flow (prot)		2789	1097		3551						5075	1304
Flt Permitted		1.00	1.00		1.00						1.00	1.00
Satd. Flow (perm)		2789	1097		3551						5075	1304
Peak-hour factor, PHF	0.89	0.89	0.89	0.81	0.81	0.81	0.90	0.90	0.90	0.95	0.95	0.95
Adj. Flow (vph)	0	153	191	0	230	0	0	0	0	0	2395	221
RTOR Reduction (vph)	0	6	24	0	0	0	0	0	0	0	0	49
Lane Group Flow (vph)	0	231	53	0	230	0	0	0	0	0	2395	172
Heavy Vehicles (%)	0%	14%	41%	0%	7%	0%	0%	0%	0%	0%	4%	26%
Turn Type		NA	Perm		NA						NA	Perm
Protected Phases		4			8						6	
Permitted Phases			4									6
Actuated Green, G (s)		25.1	25.1		27.1						99.9	99.9
Effective Green, g (s)		25.1	25.1		27.1						99.9	99.9
Actuated g/C Ratio		0.18	0.18		0.19						0.71	0.71
Clearance Time (s)		6.3	6.3		6.3						6.7	6.7
Vehicle Extension (s)		3.0	3.0		3.0						3.0	3.0
Lane Grp Cap (vph)		500	196		687						3621	930
v/s Ratio Prot		c0.08			0.06						c0.47	
v/s Ratio Perm			0.05									0.13
v/c Ratio		0.46	0.42		0.33						0.66	0.18
Uniform Delay, d1		51.4	51.0		48.7						10.9	6.6
Progression Factor		1.00	1.00		0.00						1.00	1.00
Incremental Delay, d2		0.7	1.5		0.3						1.0	0.4
Delay (s)		52.1	52.5		0.3						11.8	7.1
Level of Service		D	D		A						B	A
Approach Delay (s)		52.2			0.3			0.0			11.4	
Approach LOS		D			A			A			B	

Intersection Summary

HCM 2000 Control Delay	15.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	63.9%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	1	4	6	130	5	155	23	629	489	40	166	11
Future Volume (vph)	1	4	6	130	5	155	23	629	489	40	166	11
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)	6.0	6.0		6.3	6.3	6.5	6.5	6.5	6.3	6.5	6.5	
Lane Util. Factor	1.00	1.00		0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.95	
Fr	1.00	0.91		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1900	1653		1687	1705	1667	1508	3389	1574	1900	3367	
Flt Permitted	0.95	1.00		0.95	0.96	1.00	0.60	1.00	1.00	0.20	1.00	
Satd. Flow (perm)	1900	1653		1687	1705	1667	951	3389	1574	395	3367	
Peak-hour factor, PHF	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.72	0.72	0.72
Adj. Flow (vph)	2	7	10	217	8	258	38	1048	815	56	231	15
RTOR Reduction (vph)	0	10	0	0	0	140	0	0	280	0	4	0
Lane Group Flow (vph)	2	7	0	113	112	118	38	1048	535	56	242	0
Heavy Vehicles (%)	0%	25%	0%	7%	0%	2%	26%	3%	8%	0%	12%	9%
Turn Type	Split	NA		Split	NA	pm+ov	Perm	NA	pm+ov	pm+pt	NA	
Protected Phases	8	8		4	4	1		2	4	1	6	
Permitted Phases						4	2		2	6		
Actuated Green, G (s)	2.0	2.0		6.7	6.7	13.7	59.0	59.0	65.7	72.5	72.5	
Effective Green, g (s)	2.0	2.0		6.7	6.7	13.7	59.0	59.0	65.7	72.5	72.5	
Actuated g/C Ratio	0.02	0.02		0.07	0.07	0.14	0.59	0.59	0.66	0.72	0.72	
Clearance Time (s)	6.0	6.0		6.3	6.3	6.5	6.5	6.5	6.3	6.5	6.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	38	33		113	114	228	561	2176	1034	391	2441	
v/s Ratio Prot	0.00	c0.00		c0.07	0.07	c0.04		0.28	c0.33	0.01	0.07	
v/s Ratio Perm						0.03	0.04		0.31	0.09		
v/c Ratio	0.05	0.22		1.00	0.98	0.52	0.07	0.48	0.52	0.14	0.10	
Uniform Delay, d1	48.1	48.2		46.6	46.6	43.1	8.8	11.7	8.9	5.7	4.1	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	0.94	0.72	
Incremental Delay, d2	0.6	3.3		84.7	76.3	2.0	0.2	0.8	0.4	0.2	0.1	
Delay (s)	48.6	51.5		131.3	124.9	42.1	9.0	12.5	9.4	5.6	3.0	
Level of Service	D	D		F	F	D	A	B	A	A	A	
Approach Delay (s)		51.2			82.2			11.1			3.5	
Approach LOS		D			F			B			A	

Intersection Summary

HCM 2000 Control Delay	23.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	25.3
Intersection Capacity Utilization	52.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	130	134	0	256	0	0	0	0	0	2359	194
Future Volume (vph)	0	130	134	0	256	0	0	0	0	0	2359	194
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	12	13	13	12	12	12	11	11	11	11	11	11
Total Lost time (s)		6.3	6.3		6.3						6.8	6.8
Lane Util. Factor		0.91	0.91		0.95						0.95	1.00
Frt		0.96	0.85		1.00						1.00	0.85
Flt Protected		1.00	1.00		1.00						1.00	1.00
Satd. Flow (prot)		3031	1300		3619						3465	1442
Flt Permitted		1.00	1.00		1.00						1.00	1.00
Satd. Flow (perm)		3031	1300		3619						3465	1442
Peak-hour factor, PHF	0.92	0.92	0.92	0.86	0.86	0.86	0.82	0.82	0.82	0.94	0.94	0.94
Adj. Flow (vph)	0	141	146	0	298	0	0	0	0	0	2510	206
RTOR Reduction (vph)	0	12	28	0	0	0	0	0	0	0	0	11
Lane Group Flow (vph)	0	186	61	0	298	0	0	0	0	0	2510	195
Heavy Vehicles (%)	0%	17%	23%	0%	5%	0%	6%	6%	6%	0%	6%	14%
Turn Type		NA	Perm		NA						NA	Perm
Protected Phases		4			8						6	
Permitted Phases			4									6
Actuated Green, G (s)		14.7	14.7		16.7						100.2	100.2
Effective Green, g (s)		14.7	14.7		16.7						100.2	100.2
Actuated g/C Ratio		0.11	0.11		0.13						0.77	0.77
Clearance Time (s)		6.3	6.3		6.3						6.8	6.8
Vehicle Extension (s)		3.0	3.0		3.0						3.0	3.0
Lane Grp Cap (vph)		342	147		464						2670	1111
v/s Ratio Prot		0.06			c0.08						c0.72	
v/s Ratio Perm			0.05									0.14
v/c Ratio		0.55	0.41		0.64						0.94	0.18
Uniform Delay, d1		54.5	53.6		53.8						12.4	3.9
Progression Factor		1.00	1.00		0.07						0.84	0.60
Incremental Delay, d2		1.8	1.9		0.3						4.5	0.2
Delay (s)		56.3	55.5		3.8						14.9	2.6
Level of Service		E	E		A						B	A
Approach Delay (s)		56.0			3.8			0.0			13.9	
Approach LOS		E			A			A			B	

Intersection Summary

HCM 2000 Control Delay	16.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	15.1
Intersection Capacity Utilization	80.4%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	379	0	3	0	0	2107
Future Volume (vph)	379	0	3	0	0	2107
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Lane Width	12	12	11	11	11	11
Total Lost time (s)	4.8					6.1
Lane Util. Factor	0.97					0.91
Fr	1.00					1.00
Fll Protected	0.95					1.00
Satd. Flow (prot)	3686					5027
Fll Permitted	0.95					1.00
Satd. Flow (perm)	3686					5027
Peak-hour factor, PHF	0.93	0.93	0.86	0.68	0.95	0.95
Adj. Flow (vph)	408	0	0	0	0	2216
RTOR Reduction (vph)	38	0	0	0	0	0
Lane Group Flow (vph)	368	0	0	0	0	2216
Heavy Vehicles (%)	0%	0%	6%	6%	0%	3%
Turn Type	Perm					NA
Protected Phases						6
Permitted Phases	8					
Actuated Green, G (s)	16.8					102.3
Effective Green, g (s)	16.8					102.3
Actuated g/C Ratio	0.13					0.79
Clearance Time (s)	4.8					6.1
Vehicle Extension (s)	3.0					3.0
Lane Grp Cap (vph)	476					3955
v/s Ratio Prot						c0.44
v/s Ratio Perm	c0.10					
v/c Ratio	0.77					0.56
Uniform Delay, d1	54.8					5.3
Progression Factor	1.00					1.00
Incremental Delay, d2	7.6					0.6
Delay (s)	62.4					5.9
Level of Service	E					A
Approach Delay (s)	62.4		0.0			5.9
Approach LOS	E		A			A

Intersection Summary

HCM 2000 Control Delay	14.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	10.9
Intersection Capacity Utilization	66.4%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	284	0	0	0	0	2269
Future Volume (vph)	284	0	0	0	0	2269
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Lane Width	12	12	11	11	11	11
Total Lost time (s)	4.8					6.1
Lane Util. Factor	0.97					0.95
Frt	1.00					1.00
Flt Protected	0.95					1.00
Satd. Flow (prot)	3686					3465
Flt Permitted	0.95					1.00
Satd. Flow (perm)	3686					3465
Peak-hour factor, PHF	0.76	0.76	0.92	0.92	0.95	0.95
Adj. Flow (vph)	374	0	0	0	0	2388
RTOR Reduction (vph)	32	0	0	0	0	0
Lane Group Flow (vph)	342	0	0	0	0	2388
Heavy Vehicles (%)	3%	0%	6%	6%	0%	6%
Turn Type	Perm					NA
Protected Phases						6
Permitted Phases	8					
Actuated Green, G (s)	14.8					104.3
Effective Green, g (s)	14.8					104.3
Actuated g/C Ratio	0.11					0.80
Clearance Time (s)	4.8					6.1
Vehicle Extension (s)	3.0					3.0
Lane Grp Cap (vph)	419					2779
v/s Ratio Prot						c0.69
v/s Ratio Perm	c0.09					
v/c Ratio	0.82					0.86
Uniform Delay, d1	56.3					8.2
Progression Factor	1.03					1.00
Incremental Delay, d2	11.0					3.7
Delay (s)	69.3					11.9
Level of Service	E					B
Approach Delay (s)	69.3		0.0			11.9
Approach LOS	E		A			B

Intersection Summary

HCM 2000 Control Delay	19.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	10.9
Intersection Capacity Utilization	98.6%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	78	0	0	1286	0	0
Future Volume (vph)	78	0	0	1286	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Lane Width	16	12	11	11	11	11
Total Lost time (s)	4.8			6.1		
Lane Util. Factor	0.97			0.95		
Frt	1.00			1.00		
Flt Protected	0.95			1.00		
Satd. Flow (prot)	3941			3260		
Flt Permitted	0.95			1.00		
Satd. Flow (perm)	3941			3260		
Peak-hour factor, PHF	0.81	0.81	0.95	0.95	0.92	0.92
Adj. Flow (vph)	96	0	0	1354	0	0
RTOR Reduction (vph)	91	0	0	0	0	0
Lane Group Flow (vph)	5	0	0	1354	0	0
Heavy Vehicles (%)	6%	6%	0%	12%	6%	6%
Turn Type	Perm			NA		
Protected Phases				2		
Permitted Phases	4					
Actuated Green, G (s)	7.0			112.1		
Effective Green, g (s)	7.0			112.1		
Actuated g/C Ratio	0.05			0.86		
Clearance Time (s)	4.8			6.1		
Vehicle Extension (s)	3.0			3.0		
Lane Grp Cap (vph)	212			2828		
v/s Ratio Prot				c0.41		
v/s Ratio Perm	c0.00					
v/c Ratio	0.02			0.48		
Uniform Delay, d1	58.3			2.1		
Progression Factor	1.00			1.00		
Incremental Delay, d2	0.0			0.6		
Delay (s)	58.3			2.7		
Level of Service	E			A		
Approach Delay (s)	58.3			2.7	0.0	
Approach LOS	E			A	A	

Intersection Summary

HCM 2000 Control Delay	6.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	10.9
Intersection Capacity Utilization	105.6%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	201	0	0	1040	0	0
Future Volume (vph)	201	0	0	1040	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Lane Width	12	12	11	11	11	11
Total Lost time (s)	4.8			6.2		
Lane Util. Factor	0.97			0.91		
Frt	1.00			1.00		
Flt Protected	0.95			1.00		
Satd. Flow (prot)	3686			4755		
Flt Permitted	0.95			1.00		
Satd. Flow (perm)	3686			4755		
Peak-hour factor, PHF	0.92	0.92	0.90	0.90	0.95	0.95
Adj. Flow (vph)	218	0	0	1156	0	0
RTOR Reduction (vph)	206	0	0	0	0	0
Lane Group Flow (vph)	12	0	0	1156	0	0
Heavy Vehicles (%)	0%	0%	0%	11%	6%	6%
Turn Type	Perm			NA		
Protected Phases				2		
Permitted Phases	4					
Actuated Green, G (s)	7.0			112.0		
Effective Green, g (s)	7.0			112.0		
Actuated g/C Ratio	0.05			0.88		
Clearance Time (s)	4.8			6.2		
Vehicle Extension (s)	3.0			3.0		
Lane Grp Cap (vph)	198			4096		
v/s Ratio Prot				c0.24		
v/s Ratio Perm	c0.00					
v/c Ratio	0.06			0.28		
Uniform Delay, d1	58.4			1.6		
Progression Factor	1.00			0.76		
Incremental Delay, d2	0.1			0.2		
Delay (s)	58.5			1.4		
Level of Service	E			A		
Approach Delay (s)	58.5			1.4	0.0	
Approach LOS	F			A	A	

Intersection Summary

HCM 2000 Control Delay	10.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.27		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	69.8%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑			↑↑	↱↱		↑↑↑	↱			
Traffic Volume (vph)	0	136	0	0	186	490	0	938	303	0	0	0
Future Volume (vph)	0	136	0	0	186	490	0	938	303	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	12	12	12	12	12	12	11	11	11	11	11	11
Total Lost time (s)		6.3			8.3	8.3		6.7	6.7			
Lane Util. Factor		0.95			0.95	0.88		0.91	1.00			
Frt		1.00			1.00	0.85		1.00	0.85			
Flt Protected		1.00			1.00	1.00		1.00	1.00			
Satd. Flow (prot)		3333			3551	2933		4755	1550			
Flt Permitted		1.00			1.00	1.00		1.00	1.00			
Satd. Flow (perm)		3333			3551	2933		4755	1550			
Peak-hour factor, PHF	0.89	0.89	0.89	0.81	0.81	0.81	0.92	0.92	0.92	0.95	0.95	0.95
Adj. Flow (vph)	0	153	0	0	230	605	0	1020	329	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	205	0	0	94	0	0	0
Lane Group Flow (vph)	0	153	0	0	230	400	0	1020	235	0	0	0
Heavy Vehicles (%)	0%	14%	0%	0%	7%	2%	0%	11%	6%	0%	0%	0%
Turn Type		NA			NA	Perm		NA	Perm			
Protected Phases		8			4			2				
Permitted Phases						4			2			
Actuated Green, G (s)		27.1			25.1	25.1		99.9	99.9			
Effective Green, g (s)		27.1			25.1	25.1		99.9	99.9			
Actuated g/C Ratio		0.19			0.18	0.18		0.71	0.71			
Clearance Time (s)		6.3			8.3	8.3		6.7	6.7			
Vehicle Extension (s)		3.0			3.0	3.0		3.0	3.0			
Lane Grp Cap (vph)		645			636	525		3333	1106			
v/s Ratio Prot		0.05			0.06			c0.21				
v/s Ratio Perm						c0.14			0.15			
v/c Ratio		0.24			0.36	0.76		0.30	0.21			
Uniform Delay, d1		47.7			50.4	54.6		7.3	6.8			
Progression Factor		0.03			1.00	1.00		1.00	1.30			
Incremental Delay, d2		0.2			0.4	6.4		3.2	0.4			
Delay (s)		1.6			50.8	61.1		7.5	7.2			
Level of Service		A			D	E		A	A			
Approach Delay (s)		1.6			58.2			7.5			0.0	
Approach LOS		A			E			A			A	

Intersection Summary			
HCM 2000 Control Delay	25.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.38		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	60.9%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑			↑↑	↱		↑↑↑	↱			
Traffic Volume (vph)	0	130	0	0	256	238	0	1210	154	0	0	0
Future Volume (vph)	0	130	0	0	256	238	0	1210	154	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	12	12	12	12	12	13	11	11	11	11	11	11
Total Lost time (s)		6.3			6.3	6.3		6.8	6.8			
Lane Util. Factor		0.95			0.91	0.91		0.91	1.00			
Frt		1.00			0.96	0.85		1.00	0.85			
Flt Protected		1.00			1.00	1.00		1.00	1.00			
Satd. Flow (prot)		3248			3320	1494		4712	1494			
Flt Permitted		1.00			1.00	1.00		1.00	1.00			
Satd. Flow (perm)		3248			3320	1494		4712	1494			
Peak-hour factor, PHF	0.92	0.92	0.92	0.86	0.86	0.86	0.82	0.80	0.80	0.92	0.92	0.92
Adj. Flow (vph)	0	141	0	0	298	277	0	1512	192	0	0	0
RTOR Reduction (vph)	0	0	0	0	23	71	0	0	44	0	0	0
Lane Group Flow (vph)	0	141	0	0	375	106	0	1513	149	0	0	0
Heavy Vehicles (%)	0%	17%	0%	0%	5%	7%	0%	12%	10%	6%	6%	6%
Turn Type		NA			NA	Perm		NA	Perm			
Protected Phases		8			4			2				
Permitted Phases						4			2			
Actuated Green, G (s)		16.7			14.7	14.7		100.2	100.2			
Effective Green, g (s)		16.7			14.7	14.7		100.2	100.2			
Actuated g/C Ratio		0.13			0.11	0.11		0.77	0.77			
Clearance Time (s)		6.3			6.3	6.3		6.8	6.8			
Vehicle Extension (s)		3.0			3.0	3.0		3.0	3.0			
Lane Grp Cap (vph)		417			375	168		3631	1151			
v/s Ratio Prot		0.04			c0.11			c0.32				
v/s Ratio Perm						0.07			0.10			
v/c Ratio		0.34			1.00	0.63		0.42	0.13			
Uniform Delay, d1		51.6			57.6	55.1		5.0	3.8			
Progression Factor		0.06			1.00	1.00		0.66	1.22			
Incremental Delay, d2		0.4			46.1	7.5		0.3	0.2			
Delay (s)		3.6			103.7	62.6		3.7	4.8			
Level of Service		A			F	E		A	A			
Approach Delay (s)		3.6			91.0			3.8			0.0	
Approach LOS		A			F			A			A	

Intersection Summary

HCM 2000 Control Delay	24.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	15.1
Intersection Capacity Utilization	80.4%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	19	205	30	10	226	43	30	0	10	85	0	51
Future Volume (Veh/h)	19	205	30	10	226	43	30	0	10	85	0	51
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.76	0.76	0.76	0.86	0.88	0.88	0.60	0.60	0.60	0.81	0.81	0.81
Hourly flow rate (vph)	25	270	39	11	257	49	50	0	17	105	0	63
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		TWLTL			None							
Median storage veh)		2										
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	306			309			553	668	154	506	662	153
vC1, stage 1 conf vol							340	340		304	304	
vC2, stage 2 conf vol							214	328		202	359	
vCu, unblocked vol	306			309			553	668	154	506	662	153
tC, single (s)	4.5			5.8			8.2	6.5	6.9	7.9	6.5	7.1
tC, 2 stage (s)							7.2	5.5		6.9	5.5	
tF (s)	2.4			3.0			3.8	4.0	4.0	3.7	4.0	3.4
p0 queue free %	96			99			90	100	97	81	100	93
cM capacity (veh/h)	1125			823			490	525	823	554	530	841

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	SB 1
Volume Total	25	180	129	11	171	135	67	168
Volume Left	25	0	0	11	0	0	50	105
Volume Right	0	0	39	0	0	49	17	63
cSH	1125	1700	1700	823	1700	1700	510	636
Volume to Capacity	0.02	0.11	0.08	0.01	0.10	0.08	0.13	0.26
Queue Length 95th (ft)	2	0	0	1	0	0	11	26
Control Delay (s)	8.3	0.0	0.0	9.4	0.0	0.0	13.1	12.7
Lane LOS	A			A			B	B
Approach Delay (s)	0.6			0.3			13.1	12.7
Approach LOS							B	B

Intersection Summary				
Average Delay	3.7			
Intersection Capacity Utilization	28.6%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	18	164	268	39	90	51
Future Volume (Veh/h)	18	164	268	39	90	51
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.83	0.83	0.88	0.88	0.75	0.75
Hourly flow rate (vph)	22	198	305	44	120	68
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		TWLTL	TWLTL			
Median storage veh)		2	2			
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	349				470	174
vC1, stage 1 conf vol					327	
vC2, stage 2 conf vol					143	
vCu, unblocked vol	349				470	174
tC, single (s)	4.3				6.9	6.9
tC, 2 stage (s)					5.9	
tF (s)	2.3				3.5	3.3
p0 queue free %	98				82	92
cM capacity (veh/h)	1164				652	845

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	SB 1	SB 2
Volume Total	22	99	99	203	146	120	68
Volume Left	22	0	0	0	0	120	0
Volume Right	0	0	0	0	44	0	68
cSH	1164	1700	1700	1700	1700	652	845
Volume to Capacity	0.02	0.06	0.06	0.12	0.09	0.18	0.08
Queue Length 95th (ft)	1	0	0	0	0	17	7
Control Delay (s)	8.2	0.0	0.0	0.0	0.0	11.8	9.6
Lane LOS	A					B	A
Approach Delay (s)	0.8			0.0		11.0	
Approach LOS						B	

Intersection Summary			
Average Delay	3.0		
Intersection Capacity Utilization	25.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	10	0	6	0	176	64	19	300	0
Future Volume (Veh/h)	0	0	0	10	0	6	0	176	64	19	300	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.60	0.60	0.60	0.60	0.60	0.60	0.61	0.61	0.61	0.68	0.68	0.68
Hourly flow rate (vph)	0	0	0	17	0	10	0	289	105	28	441	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								TWLTL			TWLTL	
Median storage veh)								2			2	
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	652	891	220	618	838	197	441			394		
vC1, stage 1 conf vol	497	497		342	342							
vC2, stage 2 conf vol	154	394		276	497							
vCu, unblocked vol	652	891	220	618	838	197	441			394		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)	6.5	5.5		6.5	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	97	100	99	100			98		
cM capacity (veh/h)	489	452	790	558	471	817	1130			1176		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	0	27	0	193	231	28	220	220
Volume Left	0	17	0	0	0	28	0	0
Volume Right	0	10	0	0	105	0	0	0
cSH	1700	632	1700	1700	1700	1176	1700	1700
Volume to Capacity	0.00	0.04	0.00	0.11	0.12	0.02	0.13	0.13
Queue Length 95th (ft)	0	3	0	0	0	2	0	0
Control Delay (s)	0.0	10.9	0.0	0.0	0.0	8.1	0.0	0.0
Lane LOS	A	B				A		
Approach Delay (s)	0.0	10.9	0.0			0.5		
Approach LOS	A	B						

Intersection Summary				
Average Delay	0.6			
Intersection Capacity Utilization	24.5%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	32	10	230	216	75	235
Future Volume (Veh/h)	32	10	230	216	75	235
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.83	0.83	0.67	0.67	0.68	0.68
Hourly flow rate (vph)	39	12	343	322	110	346
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			TWLTL			TWLTL
Median storage veh)			2			2
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	897	332			665	
vC1, stage 1 conf vol	504					
vC2, stage 2 conf vol	393					
vCu, unblocked vol	897	332			665	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.3			2.2	
p0 queue free %	91	98			88	
cM capacity (veh/h)	458	669			934	

Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	39	12	229	436	110	173	173
Volume Left	39	0	0	0	110	0	0
Volume Right	0	12	0	322	0	0	0
cSH	458	669	1700	1700	934	1700	1700
Volume to Capacity	0.09	0.02	0.13	0.26	0.12	0.10	0.10
Queue Length 95th (ft)	7	1	0	0	10	0	0
Control Delay (s)	13.6	10.5	0.0	0.0	9.4	0.0	0.0
Lane LOS	B	B			A		
Approach Delay (s)	12.9		0.0		2.3		
Approach LOS	B						

Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	29.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	30	490	13	6	283	10	0	0	2	10	0	30
Future Volume (Veh/h)	30	490	13	6	283	10	0	0	2	10	0	30
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	33	533	14	7	283	11	0	0	2	11	0	33
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		TWLTL			TWLTL							
Median storage veh)		2			2							
Upstream signal (ft)		1038										
pX, platoon unblocked												
vC, conflicting volume	294			547			794	914	274	637	916	147
vC1, stage 1 conf vol							606	606		302	302	
vC2, stage 2 conf vol							188	308		334	613	
vCu, unblocked vol	294			547			794	914	274	637	916	147
tC, single (s)	6.1			4.2			7.6	6.6	7.0	6.5	6.5	6.9
tC, 2 stage (s)							6.6	5.6		6.5	7.5	
tF (s)	3.2			2.3			3.6	4.1	3.4	4.5	5.0	4.3
p0 queue free %	96			99			100	100	100	97	100	95
cM capacity (veh/h)	777			991			336	411	712	353	257	635

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	SB 1
Volume Total	33	355	192	7	139	105	2	44
Volume Left	33	0	0	7	0	0	0	11
Volume Right	0	0	14	0	0	11	2	33
cSH	777	1700	1700	991	1700	1700	712	529
Volume to Capacity	0.04	0.21	0.11	0.01	0.11	0.06	0.00	0.08
Queue Length 95th (ft)	3	0	0	1	0	0	0	7
Control Delay (s)	9.8	0.0	0.0	8.7	0.0	0.0	10.1	12.4
Lane LOS	A			A			B	B
Approach Delay (s)	0.6			0.2			10.1	12.4
Approach LOS							B	B

Intersection Summary				
Average Delay	1.0			
Intersection Capacity Utilization	35.5%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	457	45	170	243	33	73
Future Volume (Veh/h)	457	45	170	243	33	73
Sign Control	Free			Free	Stop	
Grade	3%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	497	49	185	264	36	79
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL			None		
Median storage veh)	2					
Upstream signal (ft)	1256					
pX, platoon unblocked						
vC, conflicting volume			546		1024	273
vC1, stage 1 conf vol					522	
vC2, stage 2 conf vol					502	
vCu, unblocked vol			546		1024	273
tC, single (s)			4.2		6.9	7.0
tC, 2 stage (s)					5.9	
tF (s)			2.3		3.6	3.4
p0 queue free %			81		91	89
cM capacity (veh/h)			992		381	713

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1
Volume Total	331	215	185	132	132	115
Volume Left	0	0	185	0	0	36
Volume Right	0	49	0	0	0	79
cSH	1700	1700	992	1700	1700	560
Volume to Capacity	0.19	0.13	0.19	0.08	0.08	0.21
Queue Length 95th (ft)	0	0	17	0	0	19
Control Delay (s)	0.0	0.0	9.5	0.0	0.0	13.1
Lane LOS			A			B
Approach Delay (s)	0.0		3.9			13.1
Approach LOS						B

Intersection Summary			
Average Delay	2.9		
Intersection Capacity Utilization	39.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	233	297	379	55	10	35
Future Volume (Veh/h)	233	297	379	55	10	35
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	253	323	411	60	11	38
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						4
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	471				1138	236
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	471				1138	236
tC, single (s)	4.2				6.9	7.0
tC, 2 stage (s)						
tF (s)	2.3				3.6	3.4
p0 queue free %	76				93	95
cM capacity (veh/h)	1059				150	754

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	361	215	274	197	49
Volume Left	253	0	0	0	11
Volume Right	0	0	0	60	38
cSH	1059	1700	1700	1700	670
Volume to Capacity	0.24	0.13	0.16	0.12	0.07
Queue Length 95th (ft)	23	0	0	0	6
Control Delay (s)	7.4	0.0	0.0	0.0	14.7
Lane LOS	A				B
Approach Delay (s)	4.6		0.0		14.7
Approach LOS					B

Intersection Summary			
Average Delay	3.1		
Intersection Capacity Utilization	39.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	273	27	80	275	4	10
Future Volume (Veh/h)	273	27	80	275	4	10
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.83	0.83	0.83	0.83	0.92	0.92
Hourly flow rate (vph)	329	33	96	331	4	11
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						4
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			362		703	181
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			362		703	181
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			92		99	99
cM capacity (veh/h)			1208		346	837

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	219	143	206	221	15
Volume Left	0	0	96	0	4
Volume Right	0	33	0	0	11
cSH	1700	1700	1208	1700	1141
Volume to Capacity	0.13	0.08	0.08	0.13	0.01
Queue Length 95th (ft)	0	0	6	0	1
Control Delay (s)	0.0	0.0	4.2	0.0	11.0
Lane LOS			A		B
Approach Delay (s)	0.0		2.0		11.0
Approach LOS					B

Intersection Summary			
Average Delay	1.3		
Intersection Capacity Utilization	30.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	3	0	19	238	0	116	5	478	83	25	502	1
Future Volume (vph)	3	0	19	238	0	116	5	478	83	25	502	1
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.0		6.0	6.0		6.2	6.2	6.2	6.2	6.2	
Lane Util. Factor		1.00		1.00	1.00		1.00	0.95	1.00	1.00	0.95	
Fr		0.88		1.00	0.85		1.00	1.00	0.85	1.00	1.00	
Fl Protected		0.99		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1756		1900	1700		1900	3669	1700	1900	3724	
Fl Permitted		0.96		0.73	1.00		0.29	1.00	1.00	0.44	1.00	
Satd. Flow (perm)		1706		1469	1700		585	3669	1700	884	3724	
Peak-hour factor, PHF	0.60	0.60	0.60	0.60	0.60	0.60	0.92	0.92	0.92	0.62	0.62	0.62
Adj. Flow (vph)	5	0	32	397	0	193	5	520	68	40	810	2
RTOR Reduction (vph)	0	23	0	0	127	0	0	0	31	0	0	0
Lane Group Flow (vph)	0	12	0	397	66	0	5	520	37	40	812	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	3%	0%	0%	2%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		4			4			2			2	
Permitted Phases	4			4			2		2	2		
Actuated Green, G (s)		34.0		34.0	34.0		53.8	53.8	53.8	53.8	53.8	
Effective Green, g (s)		34.0		34.0	34.0		53.8	53.8	53.8	53.8	53.8	
Actuated g/C Ratio		0.34		0.34	0.34		0.54	0.54	0.54	0.54	0.54	
Clearance Time (s)		6.0		6.0	6.0		6.2	6.2	6.2	6.2	6.2	
Lane Grp Cap (vph)		580		499	578		314	1984	914	475	2033	
v/s Ratio Prot					0.04			0.14			c0.22	
v/s Ratio Perm		0.01		c0.27			0.01		0.02	0.05		
v/c Ratio		0.02		0.80	0.11		0.02	0.26	0.04	0.08	0.41	
Uniform Delay, d1		21.9		29.9	22.7		10.8	12.4	10.9	11.2	13.6	
Progression Factor		1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		0.1		12.4	0.4		0.1	0.3	0.1	0.3	0.6	
Delay (s)		22.0		42.2	23.1		10.9	12.7	11.0	11.5	14.3	
Level of Service		C		D	C		B	B	B	B	B	
Approach Delay (s)		22.0			36.0			12.5			14.1	
Approach LOS		C			D			B			B	

Intersection Summary

HCM 2000 Control Delay	20.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.2
Intersection Capacity Utilization	49.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	352	368	0	220	0	0	0	0	0	1358	193
Future Volume (vph)	0	352	368	0	220	0	0	0	0	0	1358	193
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	12	12	12	12	12	12	11	11	11	11	11	11
Total Lost time (s)		6.3	6.3		6.3						6.7	6.7
Lane Util. Factor		0.91	0.91		0.95						0.91	1.00
Frt		0.96	0.85		1.00						1.00	0.85
Flt Protected		1.00	1.00		1.00						1.00	1.00
Satd. Flow (prot)		3292	1381		3619						5124	1480
Flt Permitted		1.00	1.00		1.00						1.00	1.00
Satd. Flow (perm)		3292	1381		3619						5124	1480
Peak-hour factor, PHF	0.82	0.82	0.82	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	429	449	0	232	0	0	0	0	0	1429	193
RTOR Reduction (vph)	0	30	56	0	0	0	0	0	0	0	0	58
Lane Group Flow (vph)	0	579	213	0	232	0	0	0	0	0	1429	135
Heavy Vehicles (%)	0%	3%	12%	0%	5%	0%	0%	0%	0%	0%	3%	11%
Turn Type		NA	Perm		NA						NA	Perm
Protected Phases		4			8						6	
Permitted Phases			4									6
Actuated Green, G (s)		27.3	27.3		29.3						97.7	97.7
Effective Green, g (s)		27.3	27.3		29.3						97.7	97.7
Actuated g/C Ratio		0.20	0.20		0.21						0.70	0.70
Clearance Time (s)		6.3	6.3		6.3						6.7	6.7
Vehicle Extension (s)		3.0	3.0		3.0						3.0	3.0
Lane Grp Cap (vph)		641	269		757						3575	1032
v/s Ratio Prot		c0.18			0.06						c0.28	
v/s Ratio Perm			0.15									0.09
v/c Ratio		0.90	0.79		0.31						0.40	0.13
Uniform Delay, d1		55.1	53.6		46.8						8.9	7.0
Progression Factor		1.00	1.00		0.00						1.00	1.00
Incremental Delay, d2		16.1	14.6		0.2						0.3	0.3
Delay (s)		71.2	68.2		0.2						9.2	7.3
Level of Service		E	E		A						A	A
Approach Delay (s)		70.3			0.2			0.0			9.0	
Approach LOS		E			A			A			A	

Intersection Summary

HCM 2000 Control Delay	27.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	64.7%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	9	10	25	345	15	190	41	347	397	159	591	8
Future Volume (vph)	9	10	25	345	15	190	41	347	397	159	591	8
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)	6.0	6.0		6.3	6.3	6.5	6.5	6.5	6.3	6.5	6.5	
Lane Util. Factor	1.00	1.00		0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.95	
Frt	1.00	0.89		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected	0.95	1.00		0.95	0.98	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1712	1737		1770	1728	1667	1195	3585	1635	1863	3592	
Flt Permitted	0.95	1.00		0.95	0.98	1.00	0.38	1.00	1.00	0.44	1.00	
Satd. Flow (perm)	1712	1737		1770	1728	1667	458	3585	1635	869	3592	
Peak-hour factor, PHF	0.92	0.92	0.92	0.88	0.88	0.88	0.95	0.95	0.95	0.79	0.79	0.79
Adj. Flow (vph)	10	11	27	392	17	216	43	365	418	201	748	10
RTOR Reduction (vph)	0	26	0	0	0	162	0	0	197	0	1	0
Lane Group Flow (vph)	10	12	0	204	205	54	43	365	221	201	757	0
Heavy Vehicles (%)	11%	10%	0%	2%	40%	2%	53%	6%	4%	2%	5%	50%
Turn Type	Split	NA		Split	NA	pm+ov	Perm	NA	pm+ov	pm+pt	NA	
Protected Phases	8	8		4	4	1		2	4	1	6	
Permitted Phases						4	2		2	6		
Actuated Green, G (s)	3.0	3.0		10.7	10.7	23.1	31.6	31.6	42.3	47.5	47.5	
Effective Green, g (s)	3.0	3.0		10.7	10.7	23.1	31.6	31.6	42.3	47.5	47.5	
Actuated g/C Ratio	0.04	0.04		0.13	0.13	0.25	0.40	0.40	0.53	0.59	0.59	
Clearance Time (s)	6.0	6.0		6.3	6.3	6.5	6.5	6.5	6.3	6.5	6.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	64	65		236	231	418	190	1416	864	632	2132	
v/s Ratio Prot	0.01	c0.01		0.12	c0.12	0.02		0.10	0.03	0.04	c0.21	
v/s Ratio Perm						0.02	0.09		0.10	0.15		
v/c Ratio	0.16	0.18		0.86	0.89	0.13	0.24	0.26	0.26	0.32	0.35	
Uniform Delay, d1	37.3	37.3		33.9	34.1	23.2	16.2	16.3	10.3	7.7	8.4	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	1.1	1.4		26.4	30.9	0.1	3.1	0.4	0.2	0.3	0.5	
Delay (s)	38.4	38.7		60.3	64.9	23.3	19.3	16.7	10.4	8.0	8.8	
Level of Service	D	D		E	E	C	B	B	B	A	A	
Approach Delay (s)		38.8			49.0			13.7			8.7	
Approach LOS		D			D			B			A	

Intersection Summary

HCM 2000 Control Delay	21.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	25.3
Intersection Capacity Utilization	56.3%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	409	277	0	222	0	0	0	0	0	1539	162
Future Volume (vph)	0	409	277	0	222	0	0	0	0	0	1539	162
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	12	13	13	12	12	12	11	11	11	11	11	11
Total Lost time (s)		6.3	6.3		6.3						6.8	6.8
Lane Util. Factor		0.91	0.91		0.95						0.95	1.00
Frt		0.98	0.85		1.00						1.00	0.85
Flt Protected		1.00	1.00		1.00						1.00	1.00
Satd. Flow (prot)		3622	1522		3551						3498	1536
Flt Permitted		1.00	1.00		1.00						1.00	1.00
Satd. Flow (perm)		3622	1522		3551						3498	1536
Peak-hour factor, PHF	0.80	0.80	0.80	0.91	0.91	0.91	0.92	0.92	0.92	0.93	0.93	0.93
Adj. Flow (vph)	0	511	346	0	244	0	0	0	0	0	1655	174
RTOR Reduction (vph)	0	10	45	0	0	0	0	0	0	0	0	43
Lane Group Flow (vph)	0	588	214	0	244	0	0	0	0	0	1655	131
Heavy Vehicles (%)	0%	1%	5%	0%	7%	0%	8%	6%	6%	0%	5%	7%
Turn Type		NA	Perm		NA						NA	Perm
Protected Phases		4			8						6	
Permitted Phases			4									6
Actuated Green, G (s)		19.7	19.7		21.7						95.2	95.2
Effective Green, g (s)		19.7	19.7		21.7						95.2	95.2
Actuated g/C Ratio		0.15	0.15		0.17						0.73	0.73
Clearance Time (s)		6.3	6.3		6.3						6.8	6.8
Vehicle Extension (s)		3.0	3.0		3.0						3.0	3.0
Lane Grp Cap (vph)		548	230		592						2561	1124
v/s Ratio Prot		c0.16			0.07						c0.47	
v/s Ratio Perm			0.14									0.09
v/c Ratio		1.07	0.93		0.41						0.65	0.12
Uniform Delay, d1		55.1	54.5		48.4						8.8	5.1
Progression Factor		1.00	1.00		0.03						1.18	1.37
Incremental Delay, d2		59.4	40.5		0.3						1.1	0.2
Delay (s)		114.5	95.0		1.7						11.6	7.2
Level of Service		F	F		A						B	A
Approach Delay (s)		106.6			1.7			0.0			11.2	
Approach LOS		F			A			A			B	

Intersection Summary

HCM 2000 Control Delay	38.9	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	15.1
Intersection Capacity Utilization	68.5%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	239	0	0	0	0	1332
Future Volume (vph)	239	0	0	0	0	1332
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Lane Width	12	12	11	11	11	11
Total Lost time (s)	4.8					6.1
Lane Util. Factor	0.97					0.91
Frt	1.00					1.00
Flt Protected	0.95					1.00
Satd. Flow (prot)	3686					5075
Flt Permitted	0.95					1.00
Satd. Flow (perm)	3686					5075
Peak-hour factor, PHF	0.95	0.95	0.88	0.86	0.95	0.95
Adj. Flow (vph)	223	0	0	0	0	1402
RTOR Reduction (vph)	123	0	0	0	0	0
Lane Group Flow (vph)	100	0	0	0	0	1402
Heavy Vehicles (%)	0%	0%	6%	6%	0%	4%
Turn Type	Perm					NA
Protected Phases						6
Permitted Phases	8					
Actuated Green, G (s)	9.1					110.0
Effective Green, g (s)	9.1					110.0
Actuated g/C Ratio	0.07					0.85
Clearance Time (s)	4.8					6.1
Vehicle Extension (s)	3.0					3.0
Lane Grp Cap (vph)	258					4294
v/s Ratio Prot						c0.28
v/s Ratio Perm	c0.03					
v/c Ratio	0.39					0.33
Uniform Delay, d1	57.8					2.1
Progression Factor	1.00					1.00
Incremental Delay, d2	1.0					0.2
Delay (s)	58.8					2.3
Level of Service	E					A
Approach Delay (s)	58.8		0.0			2.3
Approach LOS	E		A			A

Intersection Summary

HCM 2000 Control Delay	10.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.33		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	10.9
Intersection Capacity Utilization	75.4%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	240	0	0	0	0	1461
Future Volume (vph)	240	0	0	0	0	1461
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Lane Width	12	12	11	11	11	11
Total Lost time (s)	4.8					5.1
Lane Util. Factor	0.97					0.95
Frt	1.00					1.00
Flt Protected	0.95					1.00
Satd. Flow (prot)	3696					3485
Flt Permitted	0.95					1.00
Satd. Flow (perm)	3696					3485
Peak-hour factor, PHF	0.85	0.85	0.92	0.92	0.95	0.95
Adj. Flow (vph)	282	0	0	0	0	1538
RTOR Reduction (vph)	105	0	0	0	0	0
Lane Group Flow (vph)	177	0	0	0	0	1538
Heavy Vehicles (%)	0%	0%	6%	6%	0%	6%
Turn Type	Perm					NA
Protected Phases						6
Permitted Phases	8					
Actuated Green, G (s)	11.4					107.7
Effective Green, g (s)	11.4					107.7
Actuated g/C Ratio	0.09					0.83
Clearance Time (s)	4.8					5.1
Vehicle Extension (s)	3.0					3.0
Lane Grp Cap (vph)	323					2870
v/s Ratio Prot						c0.44
v/s Ratio Perm	c0.05					
v/c Ratio	0.55					0.54
Uniform Delay, d1	56.8					3.4
Progression Factor	0.89					1.00
Incremental Delay, d2	1.5					0.7
Delay (s)	52.1					4.2
Level of Service	D					A
Approach Delay (s)	52.1		0.0			4.2
Approach LOS	D		A			A

Intersection Summary

HCM 2000 Control Delay	11.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	10.9
Intersection Capacity Utilization	105.9%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	196	0	0	2441	0	0
Future Volume (vph)	196	0	0	2441	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Lane Width	16	12	11	11	11	11
Total Lost time (s)	4.8			6.1		
Lane Util. Factor	0.97			0.95		
Frt	1.00			1.00		
Flt Protected	0.95			1.00		
Satd. Flow (prot)	4177			5552		
Flt Permitted	0.95			1.00		
Satd. Flow (perm)	4177			5552		
Peak-hour factor, PHF	0.88	0.88	0.94	0.94	0.92	0.92
Adj. Flow (vph)	223	0	0	2597	0	0
RTOR Reduction (vph)	15	0	0	0	0	0
Lane Group Flow (vph)	208	0	0	2597	0	0
Heavy Vehicles (%)	6%	6%	6%	4%	6%	6%
Turn Type	Perm			NA		
Protected Phases				2		
Permitted Phases	4					
Actuated Green, G (s)	11.8			107.3		
Effective Green, g (s)	11.8			107.3		
Actuated g/C Ratio	0.09			0.83		
Clearance Time (s)	4.8			6.1		
Vehicle Extension (s)	3.0			3.0		
Lane Grp Cap (vph)	379			2915		
v/s Ratio Prot				c0.74		
v/s Ratio Perm	c0.05					
v/c Ratio	0.55			0.89		
Uniform Delay, d1	56.6			7.5		
Progression Factor	0.97			1.00		
Incremental Delay, d2	1.3			4.6		
Delay (s)	56.0			12.1		
Level of Service	E			B		
Approach Delay (s)	56.0			12.1	0.0	
Approach LOS	E			B	A	

Intersection Summary

HCM 2000 Control Delay	15.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	10.9
Intersection Capacity Utilization	115.1%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	415	0	0	2341	0	0
Future Volume (vph)	415	0	0	2341	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Lane Width	12	12	11	11	11	11
Total Lost time (s)	4.8			6.2		
Lane Util. Factor	0.97			0.91		
Frt	1.00			1.00		
Flt Protected	0.95			1.00		
Satd. Flow (prot)	3686			5124		
Flt Permitted	0.95			1.00		
Satd. Flow (perm)	3686			5124		
Peak-hour factor, PHF	0.94	0.94	0.92	0.95	0.95	0.95
Adj. Flow (vph)	441	0	0	2464	0	0
RTOR Reduction (vph)	11	0	0	0	0	0
Lane Group Flow (vph)	430	0	0	2464	0	0
Heavy Vehicles (%)	0%	0%	0%	3%	6%	6%
Turn Type	Perm			NA		
Protected Phases				2		
Permitted Phases	4					
Actuated Green, G (s)	20.5			96.5		
Effective Green, g (s)	20.5			96.5		
Actuated g/C Ratio	0.16			0.76		
Clearance Time (s)	4.8			6.2		
Vehicle Extension (s)	3.0			3.0		
Lane Grp Cap (vph)	581			3882		
v/s Ratio Prot				c0.48		
v/s Ratio Perm	c0.12					
v/c Ratio	0.74			0.63		
Uniform Delay, d1	52.2			7.4		
Progression Factor	1.00			0.52		
Incremental Delay, d2	5.0			0.7		
Delay (s)	57.3			4.5		
Level of Service	E			A		
Approach Delay (s)	57.3			4.5	0.0	
Approach LOS	E			A	A	

Intersection Summary

HCM 2000 Control Delay	12.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	77.3%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑			↑↑	↱↱		↑↑↑	↱			
Traffic Volume (vph)	0	352	0	0	220	387	0	2141	615	0	0	0
Future Volume (vph)	0	352	0	0	220	387	0	2141	615	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	12	12	12	12	12	12	11	11	11	11	11	11
Total Lost time (s)		6.3			6.3	6.3		6.7	6.7			
Lane Util. Factor		0.95			0.95	0.86		0.91	1.00			
Frt		1.00			1.00	0.85		1.00	0.85			
Flt Protected		1.00			1.00	1.00		1.00	1.00			
Satd. Flow (prot)		3689			3619	2933		5124	1611			
Flt Permitted		1.00			1.00	1.00		1.00	1.00			
Satd. Flow (perm)		3689			3619	2933		5124	1611			
Peak-hour factor, PHF	0.82	0.82	0.82	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	429	0	0	232	407	0	2254	647	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	23	0	0	22	0	0	0
Lane Group Flow (vph)	0	429	0	0	232	384	0	2254	625	0	0	0
Heavy Vehicles (%)	0%	3%	0%	0%	5%	2%	0%	5%	2%	0%	0%	0%
Turn Type		NA			NA	Perm		NA	Perm			
Protected Phases		8			4			2				
Permitted Phases						4			2			
Actuated Green, G (s)		29.3			27.3	27.3		97.7	97.7			
Effective Green, g (s)		29.3			27.3	27.3		97.7	97.7			
Actuated g/C Ratio		0.21			0.20	0.20		0.70	0.70			
Clearance Time (s)		6.3			6.3	6.3		6.7	6.7			
Vehicle Extension (s)		3.0			3.0	3.0		3.0	3.0			
Lane Grp Cap (vph)		772			705	571		3575	1124			
v/s Ratio Prot		0.12			0.06			c0.44				
v/s Ratio Perm						c0.13			0.39			
v/c Ratio		0.56			0.33	0.67		0.63	0.56			
Uniform Delay, d1		49.5			48.5	52.2		11.4	10.4			
Progression Factor		0.06			1.00	1.00		1.00	1.00			
Incremental Delay, d2		0.4			0.3	3.1		0.9	2.0			
Delay (s)		3.1			48.7	55.3		12.3	12.4			
Level of Service		A			D	E		B	B			
Approach Delay (s)		3.1			52.9			12.3			0.0	
Approach LOS		A			D			B			A	

Intersection Summary

HCM 2000 Control Delay	17.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	84.7%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑			↑↑↑	↱		↑↑↑	↱			
Traffic Volume (vph)	0	409	0	0	222	230	0	2261	376	0	0	0
Future Volume (vph)	0	409	0	0	222	230	0	2261	376	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	12	12	12	12	12	13	11	11	11	11	11	11
Total Lost time (s)		6.3			6.3	6.3		6.8	6.8			
Lane Util. Factor		0.95			0.91	0.91		0.91	1.00			
Frt		1.00			0.96	0.85		1.00	0.85			
Flt Protected		1.00			1.00	1.00		1.00	1.00			
Satd. Flow (prot)		3762			3268	1552		5075	1580			
Flt Permitted		1.00			1.00	1.00		1.00	1.00			
Satd. Flow (perm)		3762			3268	1552		5075	1580			
Peak-hour factor, PHF	0.80	0.80	0.80	0.81	0.81	0.81	0.94	0.94	0.94	0.93	0.93	0.93
Adj. Flow (vph)	0	511	0	0	274	284	0	2405	400	0	0	0
RTOR Reduction (vph)	0	0	0	0	10	27	0	0	12	0	0	0
Lane Group Flow (vph)	0	511	0	0	375	146	0	2405	388	0	0	0
Heavy Vehicles (%)	0%	1%	0%	0%	8%	3%	0%	4%	4%	0%	6%	6%
Turn Type		NA			NA	Perm		NA	Perm			
Protected Phases		8			4			2				
Permitted Phases						4			2			
Actuated Green, G (s)		21.7			19.7	19.7		95.2	95.2			
Effective Green, g (s)		21.7			19.7	19.7		95.2	95.2			
Actuated g/C Ratio		0.17			0.15	0.15		0.73	0.73			
Clearance Time (s)		6.3			6.3	6.3		6.8	6.8			
Vehicle Extension (s)		3.0			3.0	3.0		3.0	3.0			
Lane Grp Cap (vph)		627			495	235		3716	1157			
v/s Ratio Prot		c0.14			0.11			c0.47				
v/s Ratio Perm						0.09			0.25			
v/c Ratio		0.81			0.76	0.62		0.65	0.34			
Uniform Delay, d1		52.2			52.9	51.7		9.9	6.2			
Progression Factor		0.04			1.00	1.00		0.60	0.49			
Incremental Delay, d2		0.8			6.5	5.0		0.5	0.4			
Delay (s)		3.0			59.4	56.7		5.8	3.4			
Level of Service		A			E	E		A	A			
Approach Delay (s)		3.0			58.5			5.5			0.0	
Approach LOS		A			E			A			A	

Intersection Summary

HCM 2000 Control Delay	12.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	15.1
Intersection Capacity Utilization	66.5%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	77	534	30	10	343	88	30	0	10	75	0	42
Future Volume (Veh/h)	77	534	30	10	343	88	30	0	10	75	0	42
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.88	0.88	0.88	0.94	0.94	0.94	0.60	0.60	0.60	0.79	0.79	0.79
Hourly flow rate (vph)	88	607	34	11	365	95	50	0	17	95	0	53
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		TWLTL			None							
Median storage veh)		2										
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	460			641			1058	1282	320	931	1252	230
vC1, stage 1 conf vol							800	800		434	434	
vC2, stage 2 conf vol							258	482		496	817	
vCu, unblocked vol	460			641			1058	1282	320	931	1252	230
tC, single (s)	4.4			4.1			8.0	6.5	7.6	7.6	6.5	7.0
tC, 2 stage (s)							7.0	5.5		6.6	5.5	
tF (s)	2.4			2.2			3.8	4.0	3.6	3.6	4.0	3.3
p0 queue free %	91			99			80	100	97	75	100	93
cM capacity (veh/h)	1011			953			254	311	592	377	316	769

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	SB 1
Volume Total	88	405	236	11	243	217	67	148
Volume Left	88	0	0	11	0	0	50	95
Volume Right	0	0	34	0	0	95	17	53
cSH	1011	1700	1700	953	1700	1700	297	462
Volume to Capacity	0.09	0.24	0.14	0.01	0.14	0.13	0.23	0.32
Queue Length 95th (ft)	7	0	0	1	0	0	21	34
Control Delay (s)	8.9	0.0	0.0	8.8	0.0	0.0	20.6	16.4
Lane LOS	A			A			C	C
Approach Delay (s)	1.1			0.2			20.6	16.4
Approach LOS							C	C

Intersection Summary			
Average Delay	3.3		
Intersection Capacity Utilization	35.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	50	577	327	88	64	24
Future Volume (Veh/h)	50	577	327	88	64	24
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.73	0.73
Hourly flow rate (vph)	53	607	344	93	88	33
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		TWLTL	TWLTL			
Median storage veh)		2	2			
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	437				800	218
vC1, stage 1 conf vol					330	
vC2, stage 2 conf vol					410	
vCu, unblocked vol	437				800	218
tC, single (s)	4.1				6.8	7.2
tC, 2 stage (s)					5.8	
tF (s)	2.2				3.5	3.4
p0 queue free %	95				83	96
cM capacity (veh/h)	1134				509	753

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	SB 1	SB 2
Volume Total	53	304	304	229	208	88	33
Volume Left	53	0	0	0	0	88	0
Volume Right	0	0	0	0	93	0	33
cSH	1134	1700	1700	1700	1700	509	753
Volume to Capacity	0.05	0.18	0.18	0.13	0.12	0.17	0.04
Queue Length 95th (ft)	4	0	0	0	0	15	3
Control Delay (s)	8.3	0.0	0.0	0.0	0.0	13.5	10.0
Lane LOS	A					B	B
Approach Delay (s)	0.7			0.0		12.6	
Approach LOS						B	

Intersection Summary			
Average Delay	1.6		
Intersection Capacity Utilization	28.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	1	43	0	21	1	606	19	6	344	1
Future Volume (Veh/h)	0	0	1	43	0	21	1	606	19	6	344	1
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.93	0.93	0.93
Hourly flow rate (vph)	0	0	2	72	0	35	2	1010	32	6	370	1
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								TWLTL			TWLTL	
Median storage veh)								2			2	
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	926	1428	186	1229	1413	521	371			1042		
vC1, stage 1 conf vol	382	382		1030	1030							
vC2, stage 2 conf vol	544	1046		199	383							
vCu, unblocked vol	926	1428	186	1229	1413	521	371			1042		
tC, single (s)	7.6	6.6	7.0	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)	6.6	5.6		6.5	5.5							
tF (s)	3.6	4.1	3.4	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	70	100	93	100			99		
cM capacity (veh/h)	387	269	813	244	290	505	1193			675		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	2	107	2	673	369	6	247	124
Volume Left	0	72	2	0	0	6	0	0
Volume Right	2	35	0	0	32	0	0	1
cSH	813	294	1199	1700	1700	675	1700	1700
Volume to Capacity	0.00	0.36	0.00	0.40	0.22	0.01	0.15	0.07
Queue Length 95th (ft)	0	40	0	0	0	1	0	0
Control Delay (s)	9.4	24.1	8.0	0.0	0.0	10.4	0.0	0.0
Lane LOS	A	C	A			B		
Approach Delay (s)	9.4	24.1	0.0			0.2		
Approach LOS	A	C						

Intersection Summary			
Average Delay	1.9		
Intersection Capacity Utilization	33.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	152	75	551	46	12	376
Future Volume (Veh/h)	152	75	551	46	12	376
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.60	0.60	0.65	0.65	0.76	0.76
Hourly flow rate (vph)	253	125	848	71	16	495
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			TWLTL			TWLTL
Median storage veh)			2			2
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1163	460			919	
vC1, stage 1 conf vol	884					
vC2, stage 2 conf vol	280					
vCu, unblocked vol	1163	460			919	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.3			2.2	
p0 queue free %	27	77			98	
cM capacity (veh/h)	347	554			751	

Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	253	125	565	354	16	248	248
Volume Left	253	0	0	0	16	0	0
Volume Right	0	125	0	71	0	0	0
cSH	347	554	1700	1700	751	1700	1700
Volume to Capacity	0.73	0.23	0.33	0.21	0.02	0.15	0.15
Queue Length 95th (ft)	138	22	0	0	2	0	0
Control Delay (s)	38.9	13.4	0.0	0.0	9.9	0.0	0.0
Lane LOS	E	B			A		
Approach Delay (s)	30.4		0.0		0.3		
Approach LOS	D						

Intersection Summary			
Average Delay	6.5		
Intersection Capacity Utilization	30.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	30	519	17	19	513	10	1	0	13	10	0	30
Future Volume (Veh/h)	30	519	17	19	513	10	1	0	13	10	0	30
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.93	0.93	0.93	0.84	0.84	0.84	0.70	0.70	0.70	0.92	0.92	0.92
Hourly flow rate (vph)	32	558	18	23	611	12	1	0	19	11	0	33
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		TWLTL			TWLTL							
Median storage veh)		2			2							
Upstream signal (ft)		1038										
pX, platoon unblocked												
vC, conflicting volume	630			576			1019	1307	288	1032	1310	315
vC1, stage 1 conf vol							631	631		670	670	
vC2, stage 2 conf vol							388	676		362	640	
vCu, unblocked vol	630			576			1019	1307	288	1032	1310	315
tC, single (s)	4.1			4.3			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)							6.5	5.5		6.5	5.5	
tF (s)	2.2			2.3			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	97			98			100	100	97	97	100	95
cM capacity (veh/h)	962			934			362	332	715	359	336	687

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	SB 1
Volume Total	32	372	204	23	412	218	20	44
Volume Left	32	0	0	23	0	0	1	11
Volume Right	0	0	18	0	0	12	19	33
cSH	962	1700	1700	934	1700	1700	582	559
Volume to Capacity	0.03	0.22	0.12	0.02	0.24	0.13	0.03	0.08
Queue Length 95th (ft)	3	0	0	2	0	0	2	6
Control Delay (s)	8.9	0.0	0.0	9.0	0.0	0.0	10.4	12.0
Lane LOS	A			A			B	B
Approach Delay (s)	0.5			0.3			10.4	12.0
Approach LOS							B	B

Intersection Summary				
Average Delay	0.9			
Intersection Capacity Utilization	32.6%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	508	36	102	470	78	176
Future Volume (Veh/h)	508	36	102	470	78	176
Sign Control	Free			Free	Stop	
Grade	3%			0%	0%	
Peak Hour Factor	0.95	0.95	0.77	0.77	0.86	0.86
Hourly flow rate (vph)	533	38	132	610	91	205
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL			None		
Median storage veh)	2					
Upstream signal (ft)	1256					
pX, platoon unblocked						
vC, conflicting volume			571		1121	286
vC1, stage 1 conf vol					552	
vC2, stage 2 conf vol					569	
vCu, unblocked vol			571		1121	286
tC, single (s)			4.2		6.8	6.9
tC, 2 stage (s)					5.8	
tF (s)			2.2		3.5	3.3
p0 queue free %			86		76	71
cM capacity (veh/h)			977		378	714

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1
Volume Total	355	216	132	305	305	296
Volume Left	0	0	132	0	0	91
Volume Right	0	38	0	0	0	205
cSH	1700	1700	977	1700	1700	562
Volume to Capacity	0.21	0.13	0.14	0.18	0.18	0.53
Queue Length 95th (ft)	0	0	12	0	0	77
Control Delay (s)	0.0	0.0	9.3	0.0	0.0	18.3
Lane LOS			A			C
Approach Delay (s)	0.0		1.6			18.3
Approach LOS						C

Intersection Summary			
Average Delay	4.1		
Intersection Capacity Utilization	44.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	52	630	429	11	45	143
Future Volume (Veh/h)	52	630	429	11	45	143
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.93	0.90	0.77	0.77	0.92	0.92
Hourly flow rate (vph)	56	700	557	14	49	155
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						4
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	571				1030	286
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	571				1033	286
tC, single (s)	4.2				6.9	7.0
tC, 2 stage (s)						
tF (s)	2.3				3.6	3.4
p0 queue free %	94				77	78
cM capacity (veh/h)	971				209	699

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	291	467	371	200	204
Volume Left	56	0	0	0	49
Volume Right	0	0	0	14	155
cSH	971	1700	1700	1700	871
Volume to Capacity	0.06	0.27	0.22	0.12	0.23
Queue Length 95th (ft)	5	0	0	0	23
Control Delay (s)	2.3	0.0	0.0	0.0	15.4
Lane LOS	A				C
Approach Delay (s)	0.9		0.0		15.4
Approach LOS					C

Intersection Summary			
Average Delay	2.5		
Intersection Capacity Utilization	42.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	613	6	15	420	22	107
Future Volume (Veh/h)	613	6	15	420	22	107
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.84	0.84	0.94	0.94	0.92	0.92
Hourly flow rate (vph)	730	7	16	447	24	116
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						4
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			737		969	368
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			737		969	368
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		90	82
cM capacity (veh/h)			878		243	634

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	487	250	165	298	140
Volume Left	0	0	16	0	24
Volume Right	0	7	0	0	116
cSH	1700	1700	878	1700	765
Volume to Capacity	0.29	0.15	0.02	0.18	0.18
Queue Length 95th (ft)	0	0	1	0	17
Control Delay (s)	0.0	0.0	1.1	0.0	13.6
Lane LOS			A		B
Approach Delay (s)	0.0		0.4		13.6
Approach LOS					B

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	31.4%	ICU Level of Service	A
Analysis Period (min)	15		

Appendix H.
Mitigated Conditions - Synchro Reports

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	49	0	13	2	433	350	99	168	0
Future Volume (vph)	0	0	0	49	0	13	2	433	350	99	168	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)				6.0	6.0		6.2	6.2	6.2	6.2	6.2	
Lane Util. Factor				1.00	1.00		1.00	0.95	1.00	1.00	0.95	
Frt				1.00	0.85		1.00	1.00	0.85	1.00	1.00	
Flt Protected				0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)				1900	1700		1900	3762	1700	1900	3689	
Flt Permitted				0.76	1.00		0.58	1.00	1.00	0.40	1.00	
Satd. Flow (perm)				1514	1700		1160	3762	1700	806	3689	
Peak-hour factor, PHF	0.60	0.60	0.60	0.60	0.60	0.60	0.68	0.68	0.68	0.60	0.60	0.60
Adj. Flow (vph)	0	0	0	82	0	22	3	637	515	165	280	0
RTOR Reduction (vph)	0	0	0	0	18	0	0	0	166	0	0	0
Lane Group Flow (vph)	0	0	0	82	4	0	3	637	349	165	280	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	3%	0%
Turn Type				Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		4			4			2			2	
Permitted Phases	4			4			2		2	2		
Actuated Green, G (s)				20.0	20.0		67.8	67.8	67.8	67.8	67.8	
Effective Green, g (s)				20.0	20.0		67.8	67.8	67.8	67.8	67.8	
Actuated g/C Ratio				0.20	0.20		0.68	0.68	0.68	0.68	0.68	
Clearance Time (s)				6.0	6.0		6.2	6.2	6.2	6.2	6.2	
Lane Grp Cap (vph)				302	340		786	2550	1152	546	2501	
v/s Ratio Prot					0.00			0.17			0.08	
v/s Ratio Perm				c0.05			0.00		c0.21	0.20		
v/c Ratio				0.27	0.01		0.00	0.25	0.30	0.30	0.11	
Uniform Delay, d1				33.8	32.1		5.2	6.2	6.5	6.5	5.6	
Progression Factor				1.00	1.00		1.43	1.10	2.84	0.93	0.92	
Incremental Delay, d2				2.2	0.1		0.0	0.2	0.8	1.4	0.1	
Delay (s)				36.0	32.2		7.4	7.1	19.2	7.3	5.3	
Level of Service				D	C		A	A	B	A	A	
Approach Delay (s)		0.0			35.2			12.5			6.0	
Approach LOS		A			D			B			A	

Intersection Summary

HCM 2000 Control Delay	12.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.30		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.2
Intersection Capacity Utilization	43.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	136	170	0	186	0	0	0	0	0	2275	210
Future Volume (vph)	0	136	170	0	186	0	0	0	0	0	2275	210
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	12	12	12	12	12	12	11	11	11	11	11	11
Total Lost time (s)		6.3	6.3		6.3						6.7	6.7
Lane Util. Factor		0.91	0.91		0.95						0.91	1.00
Frt		0.85	0.85		1.00						1.00	0.85
Flt Protected		1.00	1.00		1.00						1.00	1.00
Satd. Flow (prot)		2789	1097		3551						5075	1304
Flt Permitted		1.00	1.00		1.00						1.00	1.00
Satd. Flow (perm)		2789	1097		3551						5075	1304
Peak-hour factor, PHF	0.89	0.89	0.89	0.81	0.81	0.81	0.90	0.90	0.90	0.95	0.95	0.95
Adj. Flow (vph)	0	153	191	0	230	0	0	0	0	0	2395	221
RTOR Reduction (vph)	0	4	25	0	0	0	0	0	0	0	0	52
Lane Group Flow (vph)	0	233	92	0	230	0	0	0	0	0	2395	169
Heavy Vehicles (%)	0%	14%	41%	0%	7%	0%	0%	0%	0%	0%	4%	26%
Turn Type		NA	Perm		NA						NA	Perm
Protected Phases		4			8						6	
Permitted Phases			4									6
Actuated Green, G (s)		25.2	25.2		27.2						89.8	89.8
Effective Green, g (s)		25.2	25.2		27.2						89.8	89.8
Actuated g/C Ratio		0.19	0.19		0.21						0.69	0.69
Clearance Time (s)		6.3	6.3		6.3						6.7	6.7
Vehicle Extension (s)		3.0	3.0		3.0						3.0	3.0
Lane Grp Cap (vph)		540	212		742						3505	900
v/s Ratio Prot		c0.08			0.06						c0.47	
v/s Ratio Perm			0.07									0.13
v/c Ratio		0.43	0.39		0.31						0.68	0.19
Uniform Delay, d1		46.1	45.7		43.5						11.8	7.1
Progression Factor		1.00	1.00		0.00						0.86	1.89
Incremental Delay, d2		0.6	1.2		0.2						0.9	0.4
Delay (s)		46.7	46.8		0.3						11.1	13.9
Level of Service		D	D		A						B	B
Approach Delay (s)		46.7			0.3			0.0			11.3	
Approach LOS		D			A			A			B	

Intersection Summary

HCM 2000 Control Delay	14.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	60.9%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	1	4	6	130	5	155	23	623	489	40	166	11
Future Volume (vph)	1	4	6	130	5	155	23	623	489	40	166	11
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)	6.0	6.0		6.3	6.3	6.5	6.5	6.5	6.3	6.5	6.5	
Lane Util. Factor	1.00	1.00		0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.95	
Frt	1.00	0.91		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1900	1653		1687	1705	1667	1508	3689	1574	1900	3367	
Flt Permitted	0.95	1.00		0.95	0.96	1.00	0.60	1.00	1.00	0.18	1.00	
Satd. Flow (perm)	1900	1653		1687	1705	1667	951	3689	1574	365	3367	
Peak-hour factor, PHF	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.72	0.72	0.72
Adj. Flow (vph)	2	7	10	217	8	258	38	1048	815	56	231	15
RTOR Reduction (vph)	0	10	0	0	0	122	0	0	278	0	4	0
Lane Group Flow (vph)	2	7	0	113	112	136	38	1048	539	56	242	0
Heavy Vehicles (%)	0%	25%	0%	7%	0%	2%	26%	3%	8%	0%	12%	9%
Turn Type	Split	NA		Split	NA	pm+ov	Perm	NA	pm+ov	pm+pt	NA	
Protected Phases	8	8		4	4	1		2	4	1	6	
Permitted Phases						4	2		2	6		
Actuated Green, G (s)	2.0	2.0		11.7	11.7	18.4	54.3	54.3	66.0	67.5	67.5	
Effective Green, g (s)	2.0	2.0		11.7	11.7	18.4	54.3	54.3	66.0	67.5	67.5	
Actuated g/C Ratio	0.02	0.02		0.12	0.12	0.18	0.54	0.54	0.66	0.68	0.68	
Clearance Time (s)	6.0	6.0		6.3	6.3	6.5	6.5	6.5	6.3	6.5	6.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	38	33		197	199	306	516	2003	1038	349	2272	
v/s Ratio Prot	0.00	c0.00		c0.07	0.07	c0.03		c0.28	0.06	0.01	0.07	
v/s Ratio Perm						0.05	0.04		0.28	0.10		
v/c Ratio	0.05	0.22		0.57	0.56	0.45	0.07	0.52	0.52	0.16	0.11	
Uniform Delay, d1	48.1	48.2		41.8	41.7	36.3	10.9	14.6	8.8	7.7	5.7	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.04	0.38	
Incremental Delay, d2	0.6	3.3		4.0	3.6	1.0	0.3	1.0	0.4	0.2	0.1	
Delay (s)	48.6	51.5		45.8	45.3	37.3	11.2	15.6	9.2	8.3	5.7	
Level of Service	D	D		D	D	D	B	B	A	A	A	
Approach Delay (s)		51.2			41.2			12.8			6.1	
Approach LOS		D			D			B			A	

Intersection Summary

HCM 2000 Control Delay	17.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	25.3
Intersection Capacity Utilization	52.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	130	134	0	256	0	0	0	0	0	2359	194
Future Volume (vph)	0	130	134	0	256	0	0	0	0	0	2359	194
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	12	13	13	12	12	12	11	11	11	11	11	11
Total Lost time (s)		6.3	6.3		6.3						6.8	6.8
Lane Util. Factor		0.91	0.91		0.95						0.95	1.00
Frt		0.96	0.85		1.00						1.00	0.85
Flt Protected		1.00	1.00		1.00						1.00	1.00
Satd. Flow (prot)		3031	1300		3619						3465	1442
Flt Permitted		1.00	1.00		1.00						1.00	1.00
Satd. Flow (perm)		3031	1300		3619						3465	1442
Peak-hour factor, PHF	0.92	0.92	0.92	0.86	0.86	0.86	0.82	0.82	0.92	0.94	0.94	0.94
Adj. Flow (vph)	0	141	146	0	298	0	0	0	0	0	2510	206
RTOR Reduction (vph)	0	7	27	0	0	0	0	0	0	0	0	37
Lane Group Flow (vph)	0	191	62	0	298	0	0	0	0	0	2510	169
Heavy Vehicles (%)	0%	17%	23%	0%	5%	0%	6%	6%	6%	0%	6%	14%
Turn Type		NA	Perm		NA						NA	Perm
Protected Phases		4			8						6	
Permitted Phases			4									6
Actuated Green, G (s)		19.7	19.7		21.7						95.2	95.2
Effective Green, g (s)		19.7	19.7		21.7						95.2	95.2
Actuated g/C Ratio		0.15	0.15		0.17						0.73	0.73
Clearance Time (s)		6.3	6.3		6.3						6.8	6.8
Vehicle Extension (s)		3.0	3.0		3.0						3.0	3.0
Lane Grp Cap (vph)		459	197		604						2537	1055
v/s Ratio Prot		0.06			c0.08						c0.72	
v/s Ratio Perm			0.05									0.12
v/c Ratio		0.42	0.31		0.49						0.99	0.16
Uniform Delay, d1		49.9	49.1		49.2						16.9	5.3
Progression Factor		1.00	1.00		0.07						1.00	0.81
Incremental Delay, d2		0.5	0.9		0.5						10.9	0.2
Delay (s)		50.5	50.0		3.7						27.9	4.5
Level of Service		D	D		A						C	A
Approach Delay (s)		50.4			3.7			0.0			26.1	
Approach LOS		D			A			A			C	

Intersection Summary

HCM 2000 Control Delay	26.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	13.1
Intersection Capacity Utilization	80.4%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	378	0	0	0	0	2107
Future Volume (vph)	378	0	0	0	0	2107
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Lane Width	12	12	11	11	11	11
Total Lost time (s)	4.8					6.1
Lane Util. Factor	0.97					0.91
Frt	1.00					1.00
Flt Protected	0.95					1.00
Satd. Flow (prot)	3686					5027
Flt Permitted	0.95					1.00
Satd. Flow (perm)	3686					5027
Peak-hour factor, PHF	0.93	0.93	0.86	0.86	0.95	0.95
Adj. Flow (vph)	406	0	0	0	0	2215
RTOR Reduction (vph)	21	0	0	0	0	0
Lane Group Flow (vph)	385	0	0	0	0	2219
Heavy Vehicles (%)	0%	0%	6%	6%	0%	5%
Turn Type	Perm					NA
Protected Phases						6
Permitted Phases	8					
Actuated Green, G (s)	18.8					100.3
Effective Green, g (s)	18.8					100.3
Actuated g/C Ratio	0.14					0.77
Clearance Time (s)	4.8					6.1
Vehicle Extension (s)	3.0					3.0
Lane Grp Cap (vph)	533					3878
v/s Ratio Prot						c0.44
v/s Ratio Perm	c0.10					
v/c Ratio	0.72					0.57
Uniform Delay, d1	53.1					6.1
Progression Factor	1.12					1.00
Incremental Delay, d2	4.4					0.6
Delay (s)	63.7					6.7
Level of Service	E					A
Approach Delay (s)	63.7		0.0			6.7
Approach LOS	E		A			A

Intersection Summary

HCM 2000 Control Delay	15.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	10.9
Intersection Capacity Utilization	66.4%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	284	0	0	0	0	2269
Future Volume (vph)	284	0	0	0	0	2269
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Lane Width	12	12	11	11	11	11
Total Lost time (s)	4.8					6.1
Lane Util. Factor	0.97					0.95
Frt	1.00					1.00
Flt Protected	0.95					1.00
Satd. Flow (prot)	3686					3465
Flt Permitted	0.95					1.00
Satd. Flow (perm)	3686					3465
Peak-hour factor, PHF	0.76	0.76	0.92	0.92	0.95	0.95
Adj. Flow (vph)	374	0	0	0	0	2388
RTOR Reduction (vph)	12	0	0	0	0	0
Lane Group Flow (vph)	362	0	0	0	0	2388
Heavy Vehicles (%)	0%	0%	6%	6%	0%	6%
Turn Type	Perm					NA
Protected Phases						6
Permitted Phases	8					
Actuated Green, G (s)	18.1					101.0
Effective Green, g (s)	18.1					101.0
Actuated g/C Ratio	0.14					0.78
Clearance Time (s)	4.8					6.1
Vehicle Extension (s)	3.0					3.0
Lane Grp Cap (vph)	513					2692
v/s Ratio Prot						c0.69
v/s Ratio Perm	c0.10					
v/c Ratio	0.71					0.89
Uniform Delay, d1	53.4					10.4
Progression Factor	0.96					0.67
Incremental Delay, d2	4.2					4.4
Delay (s)	55.3					11.4
Level of Service	E					B
Approach Delay (s)	55.3		0.0			11.4
Approach LOS	E		A			B

Intersection Summary

HCM 2000 Control Delay	17.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	10.9
Intersection Capacity Utilization	98.6%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	78	0	0	1286	0	0
Future Volume (vph)	78	0	0	1286	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Lane Width	16	12	11	11	11	11
Total Lost time (s)	4.8			6.1		
Lane Util. Factor	0.97			0.95		
Frt	1.00			1.00		
Flt Protected	0.95			1.00		
Satd. Flow (prot)	3941			3280		
Flt Permitted	0.95			1.00		
Satd. Flow (perm)	3941			3280		
Peak-hour factor, PHF	0.81	0.81	0.95	0.95	0.92	0.92
Adj. Flow (vph)	96	0	0	1354	0	0
RTOR Reduction (vph)	91	0	0	0	0	0
Lane Group Flow (vph)	5	0	0	1354	0	0
Heavy Vehicles (%)	6%	6%	0%	12%	6%	6%
Turn Type	Perm			NA		
Protected Phases				2		
Permitted Phases	4					
Actuated Green, G (s)	7.0			112.1		
Effective Green, g (s)	7.0			112.1		
Actuated g/C Ratio	0.05			0.86		
Clearance Time (s)	4.8			6.1		
Vehicle Extension (s)	3.0			3.0		
Lane Grp Cap (vph)	212			2828		
v/s Ratio Prot				c0.41		
v/s Ratio Perm	c0.00					
v/c Ratio	0.02			0.48		
Uniform Delay, d1	58.3			2.1		
Progression Factor	1.00			1.00		
Incremental Delay, d2	0.0			0.6		
Delay (s)	58.3			2.7		
Level of Service	E			A		
Approach Delay (s)	58.3			2.7	0.0	
Approach LOS	E			A	A	

Intersection Summary

HCM 2000 Control Delay	6.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.46		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	10.9
Intersection Capacity Utilization	105.6%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	201	0	0	1040	0	0
Future Volume (vph)	201	0	0	1040	0	0
Ideal Flow (vphp)	2000	2000	2000	2000	2000	2000
Lane Width	12	12	11	11	11	11
Total Lost time (s)	4.8			6.2		
Lane Util. Factor	0.97			0.91		
Fr	1.00			1.00		
Fll Protected	0.95			1.00		
Sald. Flow (prot)	3688			4755		
Fll Permitted	0.95			1.00		
Sald. Flow (perm)	3688			4755		
Peak-hour factor, PHF	0.92	0.92	0.92	0.90	0.95	0.95
Adj. Flow (vph)	218	0	0	1156	0	0
RTOR Reduction (vph)	190	0	0	0	0	0
Lane Group Flow (vph)	28	0	0	1156	0	0
Heavy Vehicles (%)	0%	0%	0%	11%	6%	6%
Turn Type	Perm			NA		
Protected Phases				2		
Permitted Phases	4					
Actuated Green, G (s)	7.6			111.4		
Effective Green, g (s)	7.6			111.4		
Actuated g/C Ratio	0.06			0.86		
Clearance Time (s)	4.8			6.2		
Vehicle Extension (s)	3.0			3.0		
Lane Grp Cap (vph)	215			4074		
v/s Ratio Prot				c0.24		
v/s Ratio Perm	c0.01					
v/c Ratio	0.13			0.28		
Uniform Delay, d1	58.1			1.8		
Progression Factor	0.88			0.81		
Incremental Delay, d2	0.3			0.2		
Delay (s)	51.2			1.6		
Level of Service	D			A		
Approach Delay (s)	51.2			1.6	0.0	
Approach LOS	D			A	A	

Intersection Summary

HCM 2000 Control Delay	9.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.27		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	68.8%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑			↑↑	↱↱		↑↑↑	↱			
Traffic Volume (vph)	0	136	0	0	186	490	0	938	303	0	0	0
Future Volume (vph)	0	136	0	0	186	490	0	938	303	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	12	12	12	12	12	12	11	11	11	11	11	11
Total Lost time (s)		6.3			6.3	6.3		6.7	6.7			
Lane Util. Factor		0.95			0.95	0.86		0.91	1.00			
Frt		1.00			1.00	0.85		1.00	0.85			
Flt Protected		1.00			1.00	1.00		1.00	1.00			
Satd. Flow (prot)		3333			3551	2933		4755	1550			
Flt Permitted		1.00			1.00	1.00		1.00	1.00			
Satd. Flow (perm)		3333			3551	2933		4755	1550			
Peak-hour factor, PHF	0.89	0.89	0.89	0.81	0.81	0.81	0.92	0.92	0.92	0.95	0.95	0.95
Adj. Flow (vph)	0	153	0	0	230	605	0	1020	329	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	182	0	0	102	0	0	0
Lane Group Flow (vph)	0	153	0	0	230	423	0	1020	227	0	0	0
Heavy Vehicles (%)	0%	14%	0%	0%	7%	2%	0%	11%	6%	0%	0%	0%
Turn Type		NA			NA	Perm		NA	Perm			
Protected Phases		6			4			2				
Permitted Phases						4			2			
Actuated Green, G (s)		27.2			25.2	25.2		89.8	89.8			
Effective Green, g (s)		27.2			25.2	25.2		89.8	89.8			
Actuated g/C Ratio		0.21			0.19	0.19		0.69	0.69			
Clearance Time (s)		6.3			6.3	6.3		6.7	6.7			
Vehicle Extension (s)		3.0			3.0	3.0		3.0	3.0			
Lane Grp Cap (vph)		697			688	538		3294	1070			
v/s Ratio Prot		0.05			0.06			c0.21				
v/s Ratio Perm						c0.14			0.15			
v/c Ratio		0.22			0.33	0.79		0.31	0.21			
Uniform Delay, d1		42.6			45.2	49.4		7.9	7.3			
Progression Factor		0.02			1.00	1.00		1.22	2.58			
Incremental Delay, d2		0.2			0.3	5.4		0.2	0.4			
Delay (s)		1.0			45.5	54.8		9.9	19.2			
Level of Service		A			D	D		A	B			
Approach Delay (s)		1.0			52.2			12.2			0.0	
Approach LOS		A			D			B			A	

Intersection Summary			
HCM 2000 Control Delay	25.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	60.9%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑			↑↑↑	↱		↑↑↑	↱			
Traffic Volume (vph)	0	130	0	0	256	239	0	1210	154	0	0	0
Future Volume (vph)	0	130	0	0	256	239	0	1210	154	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	12	12	12	12	12	13	11	11	11	11	11	11
Total Lost time (s)		6.3			6.3	6.3		6.5	6.8			
Lane Util. Factor		0.95			0.91	0.91		0.91	1.00			
Frt		1.00			0.96	0.85		1.00	0.85			
Flt Protected		1.00			1.00	1.00		1.00	1.00			
Satd. Flow (prot)		3248			3320	1494		4712	1494			
Flt Permitted		1.00			1.00	1.00		1.00	1.00			
Satd. Flow (perm)		3248			3320	1494		4712	1494			
Peak-hour factor, PHF	0.92	0.92	0.92	0.86	0.86	0.86	0.82	0.80	0.80	0.92	0.92	0.92
Adj. Flow (vph)	0	141	0	0	298	277	0	1512	192	0	0	0
RTOR Reduction (vph)	0	0	0	0	24	53	0	0	52	0	0	0
Lane Group Flow (vph)	0	141	0	0	374	124	0	1513	141	0	0	0
Heavy Vehicles (%)	0%	17%	0%	0%	5%	7%	0%	12%	10%	6%	6%	6%
Turn Type		NA			NA	Perm		NA	Perm			
Protected Phases		8			4			2				
Permitted Phases						4			2			
Actuated Green, G (s)		21.7			19.7	19.7		95.2	95.2			
Effective Green, g (s)		21.7			19.7	19.7		95.2	95.2			
Actuated g/C Ratio		0.17			0.15	0.15		0.73	0.73			
Clearance Time (s)		6.3			6.3	6.3		6.8	6.8			
Vehicle Extension (s)		3.0			3.0	3.0		3.0	3.0			
Lane Grp Cap (vph)		542			503	226		3450	1094			
v/s Ratio Prot		0.04			c0.11			c0.32				
v/s Ratio Perm						0.08			0.09			
v/c Ratio		0.26			0.74	0.55		0.44	0.13			
Uniform Delay, d1		47.2			52.7	51.0		6.9	5.1			
Progression Factor		0.04			1.00	1.00		0.77	0.43			
Incremental Delay, d2		0.2			5.9	2.7		0.4	0.2			
Delay (s)		2.1			58.6	53.7		5.7	2.4			
Level of Service		A			E	D		A	A			
Approach Delay (s)		2.1			57.1			5.3			0.0	
Approach LOS		A			E			A			A	

Intersection Summary

HCM 2000 Control Delay	17.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	15.1
Intersection Capacity Utilization	80.4%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	19	205	30	10	226	43	30	0	10	85	0	51
Future Volume (vph)	19	205	30	10	226	43	30	0	10	85	0	51
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)	6.0	6.0		6.0	6.0			6.0	6.0		6.0	6.0
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00		1.00	1.00
Frt	1.00	0.98		1.00	0.99			1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00			0.95	1.00		0.95	1.00
Satd. Flow (prot)	1570	2986		950	3496			950	850		1610	1545
Flt Permitted	0.57	1.00		0.58	1.00			0.69	1.00		0.72	1.00
Satd. Flow (perm)	935	2986		564	3496			699	850		1228	1545
Peak-hour factor, PHF	0.76	0.76	0.76	0.89	0.88	0.88	0.60	0.60	0.60	0.81	0.81	0.81
Adj. Flow (vph)	25	270	39	11	257	49	50	0	17	105	0	63
RTOR Reduction (vph)	0	11	0	0	16	0	0	0	14	0	0	50
Lane Group Flow (vph)	25	298	0	11	290	0	0	50	3	0	105	13
Heavy Vehicles (%)	21%	14%	100%	100%	4%	17%	100%	0%	100%	18%	0%	10%
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)	68.0	68.0		68.0	68.0			20.0	20.0		20.0	20.0
Effective Green, g (s)	68.0	68.0		68.0	68.0			20.0	20.0		20.0	20.0
Actuated g/C Ratio	0.68	0.68		0.68	0.68			0.20	0.20		0.20	0.20
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0	6.0		6.0	6.0
Lane Grp Cap (vph)	635	2030		383	2377			137	170		245	309
v/s Ratio Prot		c0.10			0.08							
v/s Ratio Perm	0.03			0.02				0.07	0.00		c0.09	0.01
v/c Ratio	0.04	0.15		0.03	0.12			0.36	0.02		0.43	0.04
Uniform Delay, d1	5.3	5.7		5.2	5.6			34.5	32.1		35.0	32.3
Progression Factor	0.67	0.74		1.00	1.00			1.00	1.00		1.00	1.00
Incremental Delay, d2	0.1	0.2		0.1	0.1			7.4	0.2		5.4	0.2
Delay (s)	3.6	4.4		5.4	5.7			41.9	32.3		40.4	32.5
Level of Service	A	A		A	A			D	C		D	C
Approach Delay (s)		4.3			5.7			39.5			37.4	
Approach LOS		A			A			D			D	

Intersection Summary

HCM 2000 Control Delay	13.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.21		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	36.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	NBL	NBT	SBT	SBR	SEL	SER
Lane Configurations						
Traffic Volume (veh/h)	18	164	268	39	90	51
Future Volume (Veh/h)	18	164	268	39	90	51
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.83	0.83	0.88	0.88	0.75	0.75
Hourly flow rate (vph)	22	198	305	44	120	68
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		TWLTL	TWLTL			
Median storage veh)		2	2			
Upstream signal (ft)			829			
pX, platoon unblocked						
vC, conflicting volume	349				470	174
vC1, stage 1 conf vol					327	
vC2, stage 2 conf vol					143	
vCu, unblocked vol	349				470	174
tC, single (s)	4.3				6.9	6.9
tC, 2 stage (s)					5.9	
tF (s)	2.3				3.5	3.3
p0 queue free %	98				82	92
cM capacity (veh/h)	1164				652	845

Direction, Lane #	NB 1	NB 2	NB 3	SB 1	SB 2	SE 1	SE 2
Volume Total	22	99	99	203	146	120	68
Volume Left	22	0	0	0	0	120	0
Volume Right	0	0	0	0	44	0	68
cSH	1164	1700	1700	1700	1700	652	845
Volume to Capacity	0.02	0.06	0.06	0.12	0.09	0.18	0.08
Queue Length 95th (ft)	1	0	0	0	0	17	7
Control Delay (s)	8.2	0.0	0.0	0.0	0.0	11.8	9.6
Lane LOS	A					B	A
Approach Delay (s)	0.8			0.0		11.0	
Approach LOS						B	

Intersection Summary			
Average Delay	3.0		
Intersection Capacity Utilization	25.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	10	0	6	0	175	64	19	300	0
Future Volume (Veh/h)	0	0	0	10	0	6	0	175	64	19	300	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.60	0.60	0.60	0.60	0.60	0.60	0.61	0.61	0.61	0.69	0.68	0.68
Hourly flow rate (vph)	0	0	0	17	0	10	0	289	105	28	441	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)						2						
Median type								TWLTL			TWLTL	
Median storage veh)								2			2	
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	642	891	220	586	786	144	441			394		
vC1, stage 1 conf vol	497	497		289	289							
vC2, stage 2 conf vol	144	394		276	497							
vCu, unblocked vol	642	891	220	586	786	144	441			394		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)	6.5	5.5		6.5	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	97	100	99	100			98		
cM capacity (veh/h)	490	452	790	586	483	883	1130			1176		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2	SB 3
Volume Total	0	27	0	144	144	105	28	220	220
Volume Left	0	17	0	0	0	0	28	0	0
Volume Right	0	10	0	0	0	105	0	0	0
cSH	1700	930	1700	1700	1700	1700	1176	1700	1700
Volume to Capacity	0.00	0.03	0.00	0.09	0.09	0.06	0.02	0.13	0.13
Queue Length 95th (ft)	0	2	0	0	0	0	2	0	0
Control Delay (s)	0.0	10.5	0.0	0.0	0.0	0.0	8.1	0.0	0.0
Lane LOS	A	B					A		
Approach Delay (s)	0.0	10.5	0.0				0.5		
Approach LOS	A	B							

Intersection Summary

Average Delay	0.6		
Intersection Capacity Utilization	24.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	32	10	230	216	75	235
Future Volume (Veh/h)	32	10	230	216	75	235
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.83	0.83	0.67	0.67	0.68	0.68
Hourly flow rate (vph)	39	12	343	322	110	346
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			TWLTL			TWLTL
Median storage veh)			2			2
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	736	172			665	
vC1, stage 1 conf vol	343					
vC2, stage 2 conf vol	393					
vCu, unblocked vol	736	172			665	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.3			2.2	
p0 queue free %	92	99			88	
cM capacity (veh/h)	509	849			934	

Direction, Lane #	WB 1	WB 2	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	39	12	172	172	322	110	173	173
Volume Left	39	0	0	0	0	110	0	0
Volume Right	0	12	0	0	322	0	0	0
cSH	509	849	1700	1700	1700	934	1700	1700
Volume to Capacity	0.08	0.01	0.10	0.10	0.19	0.12	0.10	0.10
Queue Length 95th (ft)	6	1	0	0	0	10	0	0
Control Delay (s)	12.7	9.3	0.0	0.0	0.0	9.4	0.0	0.0
Lane LOS	B	A				A		
Approach Delay (s)	11.9		0.0			2.3		
Approach LOS	B							

Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	23.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	30	490	13	6	260	10	0	0	2	10	0	30
Future Volume (Veh/h)	30	490	13	6	260	10	0	0	2	10	0	30
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	33	533	14	7	283	11	0	0	2	11	0	33
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		TWLTL			TWLTL							
Median storage veh)		2			2							
Upstream signal (ft)		1038										
pX, platoon unblocked												
vC, conflicting volume	294			547			794	914	274	637	916	147
vC1, stage 1 conf vol							606	606		302	302	
vC2, stage 2 conf vol							188	308		334	613	
vCu, unblocked vol	294			547			794	914	274	637	916	147
tC, single (s)	6.1			4.2			7.6	6.6	7.0	6.5	6.5	6.9
tC, 2 stage (s)							6.6	5.6		6.5	7.5	
tF (s)	3.2			2.3			3.6	4.1	3.4	4.5	5.0	4.3
p0 queue free %	96			99			100	100	100	97	100	95
cM capacity (veh/h)	777			991			396	411	712	353	257	635

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	SB 1
Volume Total	33	355	192	7	189	105	2	44
Volume Left	33	0	0	7	0	0	0	11
Volume Right	0	0	14	0	0	11	2	33
cSH	777	1700	1700	991	1700	1700	712	529
Volume to Capacity	0.04	0.21	0.11	0.01	0.11	0.06	0.00	0.08
Queue Length 95th (ft)	3	0	0	1	0	0	0	7
Control Delay (s)	9.8	0.0	0.0	8.7	0.0	0.0	10.1	12.4
Lane LOS	A			A			B	B
Approach Delay (s)	0.6			0.2			10.1	12.4
Approach LOS							B	B

Intersection Summary

Average Delay	1.0		
Intersection Capacity Utilization	35.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	457	45	170	243	33	73
Future Volume (Veh/h)	457	45	170	243	33	73
Sign Control	Free			Free	Stop	
Grade	0%			3%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	497	49	185	264	36	79
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL			None		
Median storage veh)	2					
Upstream signal (ft)	1256					
pX, platoon unblocked						
vC, conflicting volume			546		1024	273
vC1, stage 1 conf vol					522	
vC2, stage 2 conf vol					502	
vCu, unblocked vol			546		1024	273
tC, single (s)			4.2		6.9	7.0
tC, 2 stage (s)					5.9	
tF (s)			2.3		3.6	3.4
p0 queue free %			81		91	89
cM capacity (veh/h)			992		381	713

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1
Volume Total	331	215	185	132	132	115
Volume Left	0	0	185	0	0	36
Volume Right	0	49	0	0	0	79
cSH	1700	1700	992	1700	1700	560
Volume to Capacity	0.19	0.13	0.19	0.08	0.08	0.21
Queue Length 95th (ft)	0	0	17	0	0	19
Control Delay (s)	0.0	0.0	9.5	0.0	0.0	13.1
Lane LOS			A			B
Approach Delay (s)	0.0		3.9			13.1
Approach LOS						B

Intersection Summary				
Average Delay	2.9			
Intersection Capacity Utilization	33.3%	ICU Level of Service		A
Analysis Period (min)	15			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	233	297	378	55	10	35
Future Volume (Veh/h)	233	297	378	55	10	35
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	253	323	411	60	11	38
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						4
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	471				1078	206
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	471				1078	206
tC, single (s)	4.2				6.9	7.0
tC, 2 stage (s)						
tF (s)	2.3				3.6	3.4
p0 queue free %	76				93	95
cM capacity (veh/h)	1059				157	783

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	SB 1
Volume Total	253	162	162	206	206	60	49
Volume Left	253	0	0	0	0	0	11
Volume Right	0	0	0	0	0	60	38
cSH	1059	1700	1700	1700	1700	1700	701
Volume to Capacity	0.24	0.10	0.10	0.12	0.12	0.04	0.07
Queue Length 95th (ft)	23	0	0	0	0	0	6
Control Delay (s)	9.5	0.0	0.0	0.0	0.0	0.0	14.2
Lane LOS	A						B
Approach Delay (s)	4.2			0.0			14.2
Approach LOS							B

Intersection Summary			
Average Delay	2.8		
Intersection Capacity Utilization	35.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↴		↰	↑↑	↰	↱
Traffic Volume (veh/h)	273	27	80	275	4	10
Future Volume (Veh/h)	273	27	80	275	4	10
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.83	0.83	0.83	0.83	0.92	0.92
Hourly flow rate (vph)	329	33	96	331	4	11
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						4
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			362		703	181
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			362		703	181
tC, single (s)			4.1		6.9	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			92		99	99
cM capacity (veh/h)			1208		346	837

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1
Volume Total	219	143	96	166	166	15
Volume Left	0	0	96	0	0	4
Volume Right	0	33	0	0	0	11
cSH	1700	1700	1208	1700	1700	1141
Volume to Capacity	0.13	0.08	0.08	0.10	0.10	0.01
Queue Length 95th (ft)	0	0	6	0	0	1
Control Delay (s)	0.0	0.0	8.2	0.0	0.0	11.0
Lane LOS			A			B
Approach Delay (s)	0.0		1.9			11.0
Approach LOS						B

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	25.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	3	0	18	236	0	116	5	478	63	25	502	1
Future Volume (vph)	3	0	18	236	0	116	5	478	63	25	502	1
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.0		6.0	6.0		6.2	6.2	6.2	6.2	6.2	
Lane Util. Factor		1.00		1.00	1.00		1.00	0.95	1.00	1.00	0.95	
Frt		0.85		1.00	0.85		1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.99		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1756		1900	1700		1900	3689	1700	1900	3724	
Flt Permitted		0.97		0.73	1.00		0.27	1.00	1.00	0.43	1.00	
Satd. Flow (perm)		1709		1469	1700		537	3689	1700	868	3724	
Peak-hour factor, PHF	0.60	0.60	0.60	0.60	0.60	0.60	0.92	0.92	0.92	0.62	0.62	0.62
Growth Factor (vph)	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%
Adj. Flow (vph)	5	0	30	401	0	195	5	525	69	41	818	2
RTOR Reduction (vph)	0	21	0	0	117	0	0	0	38	0	0	0
Lane Group Flow (vph)	0	14	0	401	78	0	5	525	31	41	820	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	3%	0%	0%	2%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		4			4			2			2	
Permitted Phases	4			4			2		2	2		
Actuated Green, G (s)		32.0		32.0	32.0		35.8	35.8	35.8	35.8	35.8	
Effective Green, g (s)		32.0		32.0	32.0		35.8	35.8	35.8	35.8	35.8	
Actuated g/C Ratio		0.40		0.40	0.40		0.45	0.45	0.45	0.45	0.45	
Clearance Time (s)		6.0		6.0	6.0		6.2	6.2	6.2	6.2	6.2	
Lane Grp Cap (vph)		683		587	680		240	1650	760	388	1666	
v/s Ratio Prot					0.05			0.14			c0.22	
v/s Ratio Perm		0.01		c0.27			0.01		0.02	0.05		
v/c Ratio		0.02		0.68	0.11		0.02	0.32	0.04	0.11	0.49	
Uniform Delay, d1		14.5		19.8	15.1		12.3	14.2	12.4	12.8	15.7	
Progression Factor		1.00		1.00	1.00		0.39	0.53	0.14	0.94	0.94	
Incremental Delay, d2		0.1		6.3	0.3		0.2	0.5	0.1	0.5	1.0	
Delay (s)		14.6		26.1	15.4		5.0	6.0	1.8	12.6	15.7	
Level of Service		B		C	B		A	A	A	B	B	
Approach Delay (s)		14.6			22.6			7.3			15.6	
Approach LOS		B			C			A			B	

Intersection Summary

HCM 2000 Control Delay	15.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	12.2
Intersection Capacity Utilization	49.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	352	366	0	220	0	0	0	0	0	1358	183
Future Volume (vph)	0	352	366	0	220	0	0	0	0	0	1358	183
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	12	12	12	12	12	12	11	11	11	11	11	11
Total Lost time (s)		6.3	6.3		6.3						6.7	6.7
Lane Util. Factor		0.91	0.91		0.95						0.91	1.00
Frt		0.96	0.85		1.00						1.00	0.85
Flt Protected		1.00	1.00		1.00						1.00	1.00
Satd. Flow (prot)		3293	1381		3313						5124	1480
Flt Permitted		1.00	1.00		1.00						1.00	1.00
Satd. Flow (perm)		3293	1381		3313						5124	1480
Peak-hour factor, PHF	0.82	0.82	0.82	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor (vph)	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%
Adj. Flow (vph)	0	434	453	0	234	0	0	0	0	0	1444	195
RTOR Reduction (vph)	0	33	33	0	0	0	0	0	0	0	0	69
Lane Group Flow (vph)	0	582	239	0	234	0	0	0	0	0	1444	126
Heavy Vehicles (%)	0%	3%	12%	0%	5%	0%	0%	0%	0%	0%	3%	11%
Turn Type		NA	Perm		NA						NA	Perm
Protected Phases		4			8						6	
Permitted Phases			4									6
Actuated Green, G (s)		30.8	30.8		32.8						84.2	84.2
Effective Green, g (s)		30.8	30.8		32.8						84.2	84.2
Actuated g/C Ratio		0.24	0.24		0.25						0.65	0.65
Clearance Time (s)		6.3	6.3		6.3						6.7	6.7
Vehicle Extension (s)		3.0	3.0		3.0						3.0	3.0
Lane Grp Cap (vph)		780	327		913						3318	958
v/s Ratio Prot		c0.18			0.06						c0.28	
v/s Ratio Perm			0.17									0.09
v/c Ratio		0.75	0.73		0.26						0.44	0.13
Uniform Delay, d1		46.0	45.8		38.9						11.2	8.8
Progression Factor		1.00	1.00		0.30						1.09	4.32
Incremental Delay, d2		3.9	8.2		0.1						0.4	0.3
Delay (s)		49.9	54.0		0.2						12.6	38.3
Level of Service		D	D		A						B	D
Approach Delay (s)		51.1			0.2			0.0			15.7	
Approach LOS		D			A			A			B	

Intersection Summary

HCM 2000 Control Delay	25.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	130.3	Sum of lost time (s)	13.0
Intersection Capacity Utilization	65.2%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	9	10	25	345	15	190	41	347	397	159	591	8
Future Volume (vph)	9	10	25	345	15	190	41	347	397	159	591	8
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost Time (s)	6.0	6.0		6.3	6.3	6.5	6.5	6.5	6.3	6.5	6.5	
Lane Util. Factor	1.00	1.00		0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.95	
Frt	1.00	0.86		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected	0.95	1.00		0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1712	1737		1770	1728	1667	1195	3585	1635	1863	3592	
Flt Permitted	0.95	1.00		0.95	0.96	1.00	0.36	1.00	1.00	0.43	1.00	
Satd. Flow (perm)	1712	1737		1770	1728	1667	454	3585	1635	843	3592	
Peak-hour factor, PHF	0.92	0.92	0.92	0.88	0.69	0.88	0.95	0.95	0.95	0.79	0.79	0.79
Growth Factor (vph)	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%
Adj. Flow (vph)	10	11	27	396	17	218	44	369	422	203	756	10
RTOR Reduction (vph)	0	26	0	0	0	152	0	0	203	0	1	0
Lane Group Flow (vph)	10	12	0	208	207	66	44	369	219	203	765	0
Heavy Vehicles (%)	11%	10%	0%	2%	40%	2%	59%	6%	4%	2%	5%	50%
Turn Type	Split	NA		Split	NA	pm+ov	Perm	NA	om+ov	pm+pt	NA	
Protected Phases	8	8		4	4	1		2	4	1	6	
Permitted Phases						4	2		2	6		
Actuated Green, G (s)	3.2	3.2		14.1	14.1	24.1	27.4	27.4	41.5	43.9	43.9	
Effective Green, g (s)	3.2	3.2		14.1	14.1	24.1	27.4	27.4	41.5	43.9	43.9	
Actuated g/C Ratio	0.04	0.04		0.18	0.18	0.30	0.34	0.34	0.52	0.55	0.55	
Clearance Time (s)	6.0	6.0		6.3	6.3	6.5	6.5	6.5	6.3	6.5	6.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	68	69		311	304	502	155	1227	848	393	1971	
v/s Ratio Prot	0.01	c0.01		0.12	c0.12	0.02		0.10	0.05	0.04	c0.21	
v/s Ratio Perm						0.02	0.10		0.09	0.15		
v/c Ratio	0.15	0.18		0.68	0.68	0.13	0.28	0.30	0.26	0.34	0.39	
Uniform Delay, d1	37.1	37.1		30.7	30.8	20.3	19.2	19.3	10.7	9.5	10.3	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.98	
Incremental Delay, d2	1.0	1.2		5.2	6.2	0.1	4.5	0.6	0.2	0.3	0.5	
Delay (s)	38.1	38.3		36.0	37.0	20.5	23.7	19.9	10.9	9.5	10.7	
Level of Service	D	D		D	D	C	C	B	B	A	B	
Approach Delay (s)		38.3			30.9			15.5			10.4	
Approach LOS		D			C			B			B	

Intersection Summary

HCM 2000 Control Delay	17.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	25.3
Intersection Capacity Utilization	56.6%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	409	277	0	222	0	0	0	0	0	1539	162
Future Volume (vph)	0	409	277	0	222	0	0	0	0	0	1539	162
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	12	13	13	12	12	12	11	11	11	11	11	11
Total Lost time (s)		6.3	6.3		6.3						6.8	6.8
Lane Util. Factor		0.91	0.91		0.95						0.95	1.00
Frt		0.88	0.85		1.00						1.00	0.85
Flt Protected		1.00	1.00		1.00						1.00	1.00
Satd. Flow (prot)		3622	1522		3551						3498	1536
Flt Permitted		1.00	1.00		1.00						1.00	1.00
Satd. Flow (perm)		3622	1522		3551						3498	1536
Peak-hour factor, PHF	0.80	0.80	0.80	0.91	0.91	0.91	0.92	0.92	0.92	0.93	0.93	0.93
Growth Factor (vph)	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%
Adj. Flow (vph)	0	516	350	0	246	0	0	0	0	0	1671	176
RTOR Reduction (vph)	0	10	25	0	0	0	0	0	0	0	0	56
Lane Group Flow (vph)	0	594	237	0	246	0	0	0	0	0	1671	120
Heavy Vehicles (%)	0%	1%	5%	0%	7%	0%	6%	6%	6%	0%	5%	7%
Turn Type		NA	Perm		NA						NA	Perm
Protected Phases		4			8						6	
Permitted Phases			4									6
Actuated Green, G (s)		27.9	27.9		29.9						87.0	87.0
Effective Green, g (s)		27.9	27.9		29.9						87.0	87.0
Actuated g/C Ratio		0.21	0.21		0.23						0.67	0.67
Clearance Time (s)		6.3	6.3		6.3						6.8	6.8
Vehicle Extension (s)		3.0	3.0		3.0						3.0	3.0
Lane Grp Cap (vph)		777	326		816						2340	1027
v/s Ratio Prot		c0.16			0.07						c0.48	
v/s Ratio Perm			0.16									0.08
v/c Ratio		0.76	0.73		0.30						0.71	0.12
Uniform Delay, d1		48.0	47.5		41.4						13.6	7.7
Progression Factor		1.00	1.00		0.01						1.20	0.80
Incremental Delay, d2		4.5	7.8		0.2						1.7	0.2
Delay (s)		52.5	55.3		0.6						18.0	6.3
Level of Service		D	E		A						B	A
Approach Delay (s)		53.3			0.8			0.0			16.9	
Approach LOS		D			A			A			B	

Intersection Summary

HCM 2000 Control Delay	26.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	15.1
Intersection Capacity Utilization	67.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	209	0	0	0	0	1332
Future Volume (vph)	209	0	0	0	0	1332
Ideal Flow (vahpl)	2000	2000	2000	2000	2000	2000
Lane Width	12	12	11	11	11	11
Total Lost time (s)	4.8					6.1
Lane Util. Factor	0.97					0.91
Frt	1.00					1.00
Flt Protected	0.95					1.00
Satd. Flow (prot)	3686					5075
Flt Permitted	0.95					1.00
Satd. Flow (perm)	3686					5075
Peak-hour factor, PHF	0.95	0.95	0.86	0.86	0.95	0.95
Growth Factor (vph)	101%	101%	101%	101%	101%	101%
Adj. Flow (vph)	222	0	0	0	0	1416
RTOR Reduction (vph)	112	0	0	0	0	0
Lane Group Flow (vph)	110	0	0	0	0	1416
Heavy Vehicles (%)	0%	0%	5%	6%	0%	4%
Turn Type	Perm					NA
Protected Phases						6
Permitted Phases	8					
Actuated Green, G (s)	9.4					109.7
Effective Green, g (s)	9.4					109.7
Actuated g/C Ratio	0.07					0.84
Clearance Time (s)	4.8					6.1
Vehicle Extension (s)	3.0					3.0
Lane Grp Cap (vph)	266					4282
v/s Ratio Prot						c0.28
v/s Ratio Perm	c0.03					
v/c Ratio	0.41					0.33
Uniform Delay, d1	57.7					2.2
Progression Factor	0.91					1.00
Incremental Delay, d2	0.8					0.2
Delay (s)	53.5					2.4
Level of Service	D					A
Approach Delay (s)	53.5		0.0			2.4
Approach LOS	D		A			A

Intersection Summary			
HCM 2000 Control Delay	9.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	10.9
Intersection Capacity Utilization	76.1%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	240	0	0	0	0	1481
Future Volume (vph)	240	0	0	0	0	1481
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Lane Width	12	12	11	11	11	11
Total Lost time (s)	4.8					6.1
Lane Util. Factor	0.97					0.95
Frt	1.00					1.00
Flt Protected	0.95					1.00
Satd. Flow (prot)	3686					3465
Flt Permitted	0.95					1.00
Satd. Flow (perm)	3686					3465
Peak-hour factor, PHF	0.85	0.85	0.92	0.92	0.95	0.95
Growth Factor (vph)	101%	101%	101%	101%	101%	101%
Adj. Flow (vph)	285	0	0	0	0	1553
RTOR Reduction (vph)	42	0	0	0	0	0
Lane Group Flow (vph)	243	0	0	0	0	1553
Heavy Vehicles (%)	0%	0%	6%	6%	0%	6%
Turn Type	Perm					NA
Protected Phases						6
Permitted Phases	8					
Actuated Green, G (s)	13.9					105.2
Effective Green, g (s)	13.9					105.2
Actuated g/C Ratio	0.11					0.81
Clearance Time (s)	4.9					6.1
Vehicle Extension (s)	3.0					3.0
Lane Grp Cap (vph)	394					2803
v/s Ratio Prot						c0.45
v/s Ratio Perm	c0.07					
v/c Ratio	0.62					0.55
Uniform Delay, d1	55.5					4.3
Progression Factor	0.94					1.33
Incremental Delay, d2	2.2					0.7
Delay (s)	54.6					6.4
Level of Service	D					A
Approach Delay (s)	54.6		0.0			6.4
Approach LOS	D		A			A

Intersection Summary

HCM 2000 Control Delay	13.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	10.9
Intersection Capacity Utilization	106.9%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	196	0	0	2441	0	0
Future Volume (vph)	196	0	0	2441	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Lane Width	16	12	11	11	11	11
Total Lost time (s)	4.8			6.1		
Lane Util. Factor	0.97			0.95		
Frt	1.00			1.00		
Flt Protected	0.95			1.00		
Satd. Flow (prot)	4177			3532		
Flt Permitted	0.95			1.00		
Satd. Flow (perm)	4177			3532		
Peak-hour factor, PHF	0.88	0.88	0.94	0.94	0.92	0.92
Growth Factor (vph)	101%	101%	101%	101%	101%	101%
Adj. Flow (vph)	225	0	0	2623	0	0
RTOR Reduction (vph)	13	0	0	0	0	0
Lane Group Flow (vph)	212	0	0	2623	0	0
Heavy Vehicles (%)	0%	6%	0%	4%	6%	6%
Turn Type	Perm			NA		
Protected Phases				2		
Permitted Phases	2					
Actuated Green, G (s)	11.9			107.2		
Effective Green, g (s)	11.9			107.2		
Actuated g/C Ratio	0.09			0.82		
Clearance Time (s)	4.8			6.1		
Vehicle Extension (s)	3.0			3.0		
Lane Grp Cap (vph)	382			2912		
v/s Ratio Prot				c0.74		
v/s Ratio Perm	c0.05					
v/c Ratio	0.56			0.90		
Uniform Delay, d1	56.5			7.8		
Progression Factor	0.84			1.00		
Incremental Delay, d2	1.3			5.0		
Delay (s)	54.1			12.8		
Level of Service	D			B		
Approach Delay (s)	54.1			12.8	0.0	
Approach LOS	D			B	A	

Intersection Summary

HCM 2000 Control Delay	16.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	10.9
Intersection Capacity Utilization	116.1%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	415	0	0	2341	0	0
Future Volume (vph)	415	0	0	2341	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Lane Width	12	12	11	11	11	11
Total Lost time (s)	4.8			6.2		
Lane Util. Factor	0.97			0.91		
Frt	1.00			1.00		
Flt Protected	0.95			1.00		
Satd. Flow (prot)	3686			5124		
Flt Permitted	0.95			1.00		
Satd. Flow (perm)	3686			5124		
Peak-hour factor, PHF	0.94	0.94	0.92	0.95	0.95	0.95
Growth Factor (vpr)	101%	101%	101%	101%	101%	101%
Adj. Flow (vph)	446	0	0	2489	0	0
RTOR Reduction (vph)	8	0	0	0	0	0
Lane Group Flow (vph)	438	0	0	2489	0	0
Heavy Vehicles (%)	0%	0%	0%	3%	6%	6%
Turn Type	Perm			NA		
Protected Phases				2		
Permitted Phases	4					
Actuated Green, G (s)	20.8			98.2		
Effective Green, g (s)	20.8			98.2		
Actuated g/C Ratio	0.16			0.76		
Clearance Time (s)	4.8			6.2		
Vehicle Extension (s)	3.0			3.0		
Lane Grp Cap (vph)	589			3870		
v/s Ratio Prot				c0.49		
v/s Ratio Perm	c0.12					
v/c Ratio	0.74			0.64		
Uniform Delay, d1	52.1			7.6		
Progression Factor	1.11			0.46		
Incremental Delay, d2	4.5			0.7		
Delay (s)	62.3			4.2		
Level of Service	E			A		
Approach Delay (s)	62.3			4.2	0.0	
Approach LOS	E			A	A	

Intersection Summary

HCM 2000 Control Delay	13.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	78.1%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑			↑↑	↱↑		↑↑↑	↱			
Traffic Volume (vph)	0	352	0	0	220	387	0	2141	615	0	0	0
Future Volume (vph)	0	352	0	0	220	387	0	2141	615	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	12	12	12	12	12	12	11	11	11	11	11	11
Total Lost time (s)		6.3			6.3	6.3		6.7	6.7			
Lane Util. Factor		0.95			0.95	0.88		0.91	1.00			
Frt		1.00			1.00	0.85		1.00	0.85			
Flt Protected		1.00			1.00	1.00		1.00	1.00			
Satd. Flow (prot)		3689			3619	2933		5124	1611			
Flt Permitted		1.00			1.00	1.00		1.00	1.00			
Satd. Flow (perm)		3689			3619	2933		5124	1611			
Peak-hour factor, PHF	0.82	0.82	0.82	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor (vph)	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%
Ad. Flow (vph)	0	434	0	0	234	411	0	2276	654	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	24	0	0	57	0	0	0
Lane Group Flow (vph)	0	434	0	0	234	387	0	2276	597	0	0	0
Heavy Vehicles (%)	0%	3%	0%	0%	5%	2%	0%	3%	2%	0%	0%	0%
Turn Type		NA			NA	Perm		NA	Perm			
Protected Phases		8			4			2				
Permitted Phases						4			2			
Actuated Green, G (s)		32.8			30.8	30.8		84.2	84.2			
Effective Green, g (s)		32.8			30.8	30.8		84.2	84.2			
Actuated g/C Ratio		0.25			0.24	0.24		0.65	0.65			
Clearance Time (s)		6.3			6.3	6.3		6.7	6.7			
Vehicle Extension (s)		3.0			3.0	3.0		3.0	3.0			
Lane Grp Cap (vph)		930			857	694		3318	1043			
v/s Ratio Prot		0.12			0.06			c0.44				
v/s Ratio Perm						c0.13			0.37			
v/c Ratio		0.47			0.27	0.56		0.69	0.57			
Uniform Delay, d1		41.2			40.5	43.6		14.5	12.8			
Progression Factor		0.06			1.00	1.00		0.89	0.59			
Incremental Delay, d2		0.3			0.2	1.0		0.9	1.8			
Delay (s)		2.9			40.6	44.6		11.0	9.4			
Level of Service		A			D	D		B	A			
Approach Delay (s)		2.9			43.2			10.6			0.0	
Approach LOS		A			D			B			A	

Intersection Summary			
HCM 2000 Control Delay	15.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	65.2%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑			↑↑	↱		↑↑↑	↱			
Traffic Volume (vph)	0	409	0	0	222	230	0	2261	378	0	0	0
Future Volume (vph)	0	409	0	0	222	230	0	2261	378	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	12	12	12	12	12	13	11	11	11	11	11	11
Total Lost time (s)		6.3			6.3	6.3		6.8	6.8			
Lane Util. Factor		0.95			0.91	0.91		0.91	1.00			
Frt		1.00			0.96	0.85		1.00	0.85			
Flt Protected		1.00			1.00	1.00		1.00	1.00			
Satd. Flow (prot)		3762			3268	1552		5075	1580			
Flt Permitted		1.00			1.00	1.00		1.00	1.00			
Satd. Flow (perm)		3762			3268	1552		5075	1580			
Peak-hour factor, PHF	0.80	0.80	0.80	0.81	0.81	0.81	0.94	0.94	0.94	0.93	0.93	0.93
Growth Factor (vph)	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%
Adj. Flow (vph)	0	516	0	0	277	287	0	2429	404	0	0	0
RTOR Reduction (vph)	0	0	0	0	5	25	0	0	25	0	0	0
Lane Group Flow (vph)	0	516	0	0	384	150	0	2429	379	0	0	0
Heavy Vehicles (%)	0%	1%	0%	0%	8%	3%	0%	4%	4%	0%	6%	6%
Turn Type		NA			NA	Perm		NA	Perm			
Protected Phases		8			4			2				
Permitted Phases						4			2			
Actuated Green, G (s)		29.9			27.9	27.9		87.0	87.0			
Effective Green, g (s)		29.9			27.9	27.9		87.0	87.0			
Actuated g/C Ratio		0.23			0.21	0.21		0.67	0.67			
Clearance Time (s)		6.3			6.3	6.3		6.8	6.8			
Vehicle Extension (s)		3.0			3.0	3.0		3.0	3.0			
Lane Grp Cap (vph)		865			701	353		3396	1057			
v/s Ratio Prot		c0.14			0.12			c0.48				
v/s Ratio Perm						0.10			0.24			
v/c Ratio		0.60			0.55	0.45		0.72	0.36			
Uniform Delay, d1		44.7			45.4	44.4		13.6	9.4			
Progression Factor		0.02			1.00	1.00		0.71	0.59			
Incremental Delay, d2		0.8			0.9	1.0		0.7	0.5			
Delay (s)		1.6			46.3	45.3		10.3	6.0			
Level of Service		A			D	D		B	A			
Approach Delay (s)		1.6			46.0			9.7			0.0	
Approach LOS		A			D			A			A	

Intersection Summary			
HCM 2000 Control Delay	13.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	15.1
Intersection Capacity Utilization	67.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	77	534	30	10	343	89	30	0	10	75	0	42
Future Volume (vph)	77	534	30	10	343	89	30	0	10	75	0	42
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)	6.0	6.0		6.0	6.0			6.0	6.0		6.0	6.0
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00		1.00	1.00
Frt	1.00	0.99		1.00	0.97			1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00			0.95	1.00		0.95	1.00
Satd. Flow (prot)	1652	3518		950	3486			950	850		1776	1650
Flt Permitted	0.46	1.00		0.41	1.00			0.69	1.00		0.72	1.00
Satd. Flow (perm)	843	3518		406	3486			685	850		1353	1650
Peak-hour factor, PHF	0.88	0.88	0.88	0.94	0.94	0.94	0.60	0.60	0.60	0.79	0.79	0.79
Growth Factor (vph)	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%
Adj. Flow (vph)	88	613	34	11	369	96	50	0	17	96	0	54
RTOR Reduction (vph)	0	5	0	0	29	0	0	0	14	0	0	45
Lane Group Flow (vph)	88	642	0	11	436	0	0	51	3	0	96	9
Heavy Vehicles (%)	15%	2%	100%	100%	5%	8%	100%	0%	100%	7%	0%	3%
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)	55.0	55.0		55.0	55.0			13.0	13.0		13.0	13.0
Effective Green, g (s)	55.0	55.0		55.0	55.0			13.0	13.0		13.0	13.0
Actuated g/C Ratio	0.69	0.69		0.69	0.69			0.16	0.16		0.16	0.16
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0	6.0		6.0	6.0
Lane Grp Cap (vph)	579	2418		279	2396			112	138		219	268
v/s Ratio Prot		c0.18			0.13							
v/s Ratio Perm	0.10			0.03				c0.07	0.00		0.07	0.01
v/c Ratio	0.15	0.27		0.04	0.18			0.46	0.02		0.44	0.03
Uniform Delay, d1	4.4	4.8		4.0	4.5			30.3	28.1		30.2	28.2
Progression Factor	0.83	0.59		1.00	1.00			1.00	1.00		1.00	1.00
Incremental Delay, d2	0.6	0.3		0.3	0.2			12.8	0.3		6.3	0.2
Delay (s)	3.3	3.1		4.3	4.6			43.1	28.4		36.5	28.4
Level of Service	A	A		A	A			D	C		D	C
Approach Delay (s)		3.1			4.6			39.4			33.6	
Approach LOS		A			A			D			C	

Intersection Summary

HCM 2000 Control Delay	8.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.30		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	49.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	NBL	NBT	SBT	SBR	SEL	SER
Lane Configurations						
Traffic Volume (veh/h)	50	577	327	88	64	24
Future Volume (Veh/h)	50	577	327	88	64	24
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.73	0.73
Hourly flow rate (vph)	53	813	348	94	89	33
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		TWLTL	TWLTL			
Median storage veh)		2	2			
Upstream signal (ft)			829			
pX, platoon unblocked						
vC, conflicting volume	442				808	221
vC1, stage 1 conf vol					395	
vC2, stage 2 conf vol					412	
vCu, unblocked vol	442				808	221
tC, single (s)	4.1				6.8	7.2
tC, 2 stage (s)					5.8	
tF (s)	2.2				3.5	3.4
p0 queue free %	95				82	96
cM capacity (veh/h)	1129				506	750

Direction, Lane #	NB 1	NB 2	NB 3	SB 1	SB 2	SE 1	SE 2
Volume Total	53	306	306	232	210	89	33
Volume Left	53	0	0	0	0	89	0
Volume Right	0	0	0	0	84	0	33
cSH	1129	1700	1700	1700	1700	506	750
Volume to Capacity	0.05	0.18	0.18	0.14	0.12	0.18	0.04
Queue Length 95th (ft)	4	0	0	0	0	16	3
Control Delay (s)	8.3	0.0	0.0	0.0	0.0	13.6	10.0
Lane LOS	A					B	B
Approach Delay (s)	0.7			0.0		12.6	
Approach LOS						B	

Intersection Summary			
Average Delay	1.6		
Intersection Capacity Utilization	25.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	1	43	0	21	1	606	19	6	344	1
Future Volume (Veh/h)	0	0	1	43	0	21	1	606	19	6	344	1
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.93	0.93	0.93
Hourly flow rate (vph)	0	0	2	72	0	35	2	1020	32	7	374	1
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								TWLTL			TWLTL	
Median storage veh)								2			2	
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	938	1444	188	1227	1413	510	375			1052		
vC1, stage 1 conf vol	388	358		1024	1024							
vC2, stage 2 conf vol	549	1056		203	389							
vCu, unblocked vol	938	1444	188	1227	1413	510	375			1052		
tC, single (s)	7.6	6.6	7.0	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)	6.6	5.6		6.5	5.5							
tF (s)	3.6	4.1	3.4	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	71	100	93	100			99		
cM capacity (veh/h)	383	263	810	248	291	514	1195			669		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2	SB 3
Volume Total	2	107	2	510	510	32	7	249	126
Volume Left	0	72	2	0	0	0	7	0	0
Volume Right	2	35	0	0	0	32	0	0	1
cSH	810	296	1195	1700	1700	1730	669	1700	1700
Volume to Capacity	0.00	0.36	0.00	0.30	0.30	0.02	0.01	0.15	0.07
Queue Length 95th (ft)	0	40	0	0	0	0	1	0	0
Control Delay (s)	9.5	23.9	8.0	0.0	0.0	0.0	10.4	0.0	0.0
Lane LOS	A	C	A				B		
Approach Delay (s)	9.5	23.9	0.0				0.2		
Approach LOS	A	C							

Intersection Summary			
Average Delay	1.7		
Intersection Capacity Utilization	32.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	152	75	551	46	12	376
Future Volume (Veh/h)	152	75	551	46	12	376
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.60	0.60	0.65	0.65	0.76	0.76
Hourly flow rate (vph)	256	126	958	71	16	500
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			TWLTL			TWLTL
Median storage veh)			2			2
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1138	428			927	
vC1, stage 1 conf vol	856					
vC2, stage 2 conf vol	282					
vCu, unblocked vol	1138	428			927	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.3			2.2	
p0 queue free %	28	78			98	
cM capacity (veh/h)	357	581			746	

Direction, Lane #	WB 1	WB 2	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	256	126	428	428	71	16	250	250
Volume Left	256	0	0	0	0	16	0	0
Volume Right	0	126	0	0	71	0	0	0
cSH	357	581	1700	1700	1700	746	1700	1700
Volume to Capacity	0.72	0.22	0.25	0.25	0.04	0.02	0.15	0.15
Queue Length 95th (ft)	133	20	0	0	0	2	0	0
Control Delay (s)	36.8	12.9	0.0	0.0	0.0	9.9	0.0	0.0
Lane LOS	E	B				A		
Approach Delay (s)	28.9		0.0			0.3		
Approach LOS	D							

Intersection Summary			
Average Delay	6.1		
Intersection Capacity Utilization	25.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	30	519	17	19	519	10	1	0	13	10	0	30
Future Volume (Veh/h)	30	519	17	19	519	10	1	0	13	10	0	30
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.93	0.93	0.93	0.84	0.84	0.84	0.70	0.70	0.70	0.92	0.92	0.92
Hourly flow rate (vph)	33	564	18	23	624	12	1	0	19	11	0	33
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		TWLTL			TWLTL							
Median storage veh)		2			2							
Upstream signal (ft)		1035										
pX, platoon unblocked												
vC, conflicting volume	636			582			1030	1321	291	1043	1324	318
vC1, stage 1 conf vol							639	639		676	676	
vC2, stage 2 conf vol							391	682		367	648	
vCu, unblocked vol	636			582			1030	1321	291	1043	1324	318
tC, single (s)	6.1			4.3			7.5	6.5	6.9	6.5	6.5	6.9
tC, 2 stage (s)							6.5	5.5		6.5	5.5	
tF (s)	3.2			2.3			3.5	4.0	3.3	4.5	4.0	4.3
p0 queue free %	93			98			100	100	97	95	100	93
cM capacity (veh/h)	501			929			346	323	712	205	326	458

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	SB 1
Volume Total	33	376	206	23	416	220	20	44
Volume Left	33	0	0	23	0	0	1	11
Volume Right	0	0	18	0	0	12	19	33
cSH	501	1700	1700	929	1700	1700	676	350
Volume to Capacity	0.07	0.22	0.12	0.02	0.24	0.13	0.03	0.13
Queue Length 95th (ft)	5	0	0	2	0	0	2	11
Control Delay (s)	12.7	0.0	0.0	9.0	0.0	0.0	10.5	16.8
Lane LOS	B			A			B	C
Approach Delay (s)	0.7			0.3			10.5	16.8
Approach LOS							B	C

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	32.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	505	36	102	470	78	176
Future Volume (Veh/h)	505	36	102	470	78	176
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.77	0.77	0.86	0.86
Hourly flow rate (vph)	539	38	134	616	92	207
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL			None		
Median storage veh)	2					
Upstream signal (ft)	1256					
pX, platoon unblocked						
vC, conflicting volume			576		1133	286
vC1, stage 1 conf vol					557	
vC2, stage 2 conf vol					576	
vCu, unblocked vol			576		1133	286
tC, single (s)			4.2		6.8	6.9
tC, 2 stage (s)					5.8	
tF (s)			2.2		3.5	3.3
p0 queue free %			86		75	71
cM capacity (veh/h)			973		375	712

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1
Volume Total	359	217	134	308	308	299
Volume Left	0	0	134	0	0	92
Volume Right	0	38	0	0	0	207
cSH	1700	1700	973	1700	1700	556
Volume to Capacity	0.21	0.13	0.14	0.18	0.18	0.54
Queue Length 95th (ft)	0	0	12	0	0	79
Control Delay (s)	0.0	0.0	9.3	0.0	0.0	18.7
Lane LOS			A			C
Approach Delay (s)	0.0		1.7			18.7
Approach LOS						C

Intersection Summary			
Average Delay	4.2		
Intersection Capacity Utilization	44.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	52	630	429	11	45	143
Future Volume (Veh/h)	52	630	429	11	45	143
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.90	0.90	0.77	0.77	0.92	0.92
Hourly flow rate (vph)	58	707	563	14	49	157
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						4
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	577				1032	282
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	577				1032	282
tC, single (s)	4.2				6.9	7.0
tC, 2 stage (s)						
tF (s)	2.3				3.6	3.4
p0 queue free %	94				76	78
cM capacity (veh/h)	965				208	704

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	SB 1
Volume Total	58	354	354	282	282	14	206
Volume Left	58	0	0	0	0	0	49
Volume Right	0	0	0	0	0	14	157
cSH	965	1700	1700	1700	1700	1700	876
Volume to Capacity	0.06	0.21	0.21	0.17	0.17	0.01	0.24
Queue Length 95th (ft)	5	0	0	0	0	0	23
Control Delay (s)	9.0	0.0	0.0	0.0	0.0	0.0	15.4
Lane LOS	A						C
Approach Delay (s)	0.7			0.0			15.4
Approach LOS							C

Intersection Summary			
Average Delay	2.4		
Intersection Capacity Utilization	29.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	613	6	15	420	22	107
Future Volume (Veh/h)	613	6	15	420	22	107
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.84	0.84	0.94	0.94	0.92	0.92
Hourly flow rate (vph)	737	7	16	451	24	117
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						4
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			744		998	372
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			744		998	372
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		90	81
cM capacity (veh/h)			873		239	631

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1
Volume Total	491	253	16	226	226	141
Volume Left	0	0	16	0	0	24
Volume Right	0	7	0	0	0	117
cSH	1700	1700	873	1700	1700	761
Volume to Capacity	0.29	0.15	0.02	0.13	0.13	0.19
Queue Length 95th (ft)	0	0	1	0	0	17
Control Delay (s)	0.0	0.0	9.2	0.0	0.0	13.6
Lane LOS			A			B
Approach Delay (s)	0.0		0.3			13.6
Approach LOS						B

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	29.5%	ICU Level of Service	A
Analysis Period (min)	15		

Tammy Girling

From: Smith, Erich <ESMITH@WadeTrim.com>
Sent: Wednesday, July 6, 2022 11:47 AM
To: Tammy Girling
Cc: Piper, Adam; Philpot, Tyler; Gary Jensen; Joe Roman
Subject: FW: 20220706 GM Orion Traffic Impact Analysis Report

Tammy- just wanted to make you aware we have a draft traffic study we shared for the site plan submittal. Note this focuses on the improvements for the roads/drive entrances adjacent to the GM Orion Assembly site. The final study will continue thru September to include additional coordination with the Road Commission for Oakland County and MDOT.

Thanks, Erich

WADE TRIM

Erich Smith, PE Vice President
734.947.9700 office
989.751.5370 cell

From: Piper, Adam <apiper@wadetrim.com>
Sent: Wednesday, July 06, 2022 10:41 AM
To: Smith, Erich <ESMITH@WadeTrim.com>
Subject: 20220706 GM Orion Traffic Impact Analysis Report

From: Piper, Adam
To: cbarnett@oriontownship.org; tgirling@oriontownship.org
Cc: Piper, Adam; Smith, Erich; tphilpot@wadetrim.com
Expires: 8/6/22, 11:59:59 PM EDT

Wade Trim Secure File Transfer - New File Available

Files:
1. Draft GM Orion Expansion - Traffic Impact Analysis 7-6-2022 Report and Appendix.pdf

View delivery

Governor Whitmer Signs Legislation Enabling Michigan to Attract Billions in Investment, Create Tens of Thousands of Good-Paying Jobs

December 20, 2021

FOR IMMEDIATE RELEASE??

December 20, 2021??

Contact:?Press@michigan.gov???

???

Governor Whitmer Signs Legislation Enabling Michigan to Attract Billions in Investment, Create Tens of Thousands of Good-Paying Jobs

Bipartisan bills will support small businesses and invest in a $1 billion economic development fund, build on Michigan's ongoing economic momentum

?.

DETROIT, Mich.?- Governor Gretchen Whitmer today signed the bipartisan Strategic Outreach and Attraction Reserve (SOAR) package to support small businesses and fully fund a historic economic development toolkit to make Michigan a national leader in business attraction.

The governor signed House Bill 4603 to create a $1 billion economic development fund to ensure the state can compete for billions of dollars in investment and attract tens of thousands of jobs to bolster our economy. The governor signed Senate Bill 771 to create a $500 million fund to make our economy more adaptable to the rapid pace of technological change, supporting small businesses, and creating or retaining good-paying jobs. Additionally, the governor

signed Senate Bill 769 to create a financing mechanism for both programs and Senate

Bill 85 to provide full funding to start delivering for Michiganders right away. SB 85 will also provide direct assistance to small businesses affected by the COVID-19 pandemic. This transformative economic development package will build on Michigan's growing economic momentum.

"Today, I signed a package of bills that will put Michiganders first and continue building on our economic momentum," said?**Governor Gretchen Whitmer**. "Thanks to the effective collaboration between legislative leadership, my administration, and community and business leaders, I signed bills that will back small businesses and empower Michigan to grow and attract billions in investment and create tens of thousands of good-paying jobs. Because both parties in the legislature came together, our state will be able win huge, transformational projects and compete effectively for every dollar and every job for decades to come. The critical economic development fund we have set up will pay massive dividends as we continue staying focused on growing our economy, creating good-paying jobs, and lowering costs for families. We also delivered resources directly to new and existing small businesses today, building on work we have been doing since March 2020 to ensure they can thrive. Our work over the last few months proves that when we come to the table in good faith and put Michiganders first, we are capable of extraordinary progress. I will continue working with anyone to deliver meaningful change on the kitchen-table priorities that make a difference in people's lives."?

At the bill signing, Governor Whitmer was joined by House Speaker Jason Wentworth and Senate Majority Leader Mike Shirkey, who were instrumental in the passage of these bills.

"Michigan is a great place to live, work, and raise a family. But our business climate is still holding us back from what we can be. Small businesses are struggling to fully reopen, large employers are picking other states for long-term investments, and far too many local workers are still on the sidelines. We need to step in and provide a shot in the arm that will lead to new opportunities for everyone. That is exactly what these bills do," said **House Speaker Jason Wentworth**. "With this plan, we are giving small businesses a way to create new jobs in every corner of the state. We are helping large employers keep more opportunities here at home where they belong. And we are providing certainty, stability and opportunity to people worried about making ends meet when

they sit down to pay their monthly bills. Those are the kind of results hard-working families need to see from their state government."

"With the actions we are affirming today, we are not just demonstrating Michigan is 'in the game,' we are establishing our seat at the table, side by side with investors who recognize the value of Michigan and its unique assets," said **Senate Majority Leader Mike Shirkey**. "Purposeful budgeted actions will now replace the uncertainty of mortgaged futures. This first significant step must be accompanied by a disciplined commitment to improving and leading in every category, and, most importantly, friendly to moms and dads and families."

"Make no mistake: this is an important beginning," said **Quentin L. Messer, Jr., CEO of the Michigan Economic Development Corporation**. "We appreciate the incredible diligence, hard work and collaborative approach to position Michigan for large-scale investments that accelerate growth in high-paying jobs, retain large customers for our small businesses and remain at the center of technological change for decades to come."

"This bipartisan legislation sets a new and transparent foundation for economic development that helps boost our state's competitiveness and is open to job providers of all sizes and industries," said **Jim Holcomb, incoming president & CEO of the Michigan Chamber of Commerce**. "It's also a shining example of the smart public policy that can be achieved when both parties and the Governor and Legislature work together."

"Michigan must out-compete other states to attract and retain manufacturing investment. I'm pleased to say that this package puts Michigan in the game for transformational investments as the auto industry and the component supply chain quickly evolves from the internal combustion engine to electric and autonomous vehicles," said **John Walsh, President and CEO of MMA**. "We commend Legislature and the Whitmer Administration for working together and coordinating closely with the manufacturing industry to allow us to engage in the interstate battle for current and future jobs and investments.

"We hope the hard work done here by Governor Whitmer, the legislature and all the business groups involved can provide businesses some respite from their continued struggles," said **MLBA Executive Director Scott Ellis**. "The goal was to provide some assistance to the businesses that faced the greatest financial hardships and I believe this funding successfully achieves that objective."

"Economic Development Leaders for Michigan formed in 2020 to encourage bold action for Michigan's economic development policy. Today, we are pleased with the passage and signing of the SOAR funds and the crucial first step the legislature and Governor Whitmer have taken to stimulate investment in our great state," said **Rob Cleveland, CEO of Cornerstone Alliance, Member of Economic Development Leaders for Michigan**. "We look forward to continued efforts with statewide and local partners to ensure a long-term, comprehensive economic development strategy to attract both talent and job-creators to Michigan, grow our economy, and generate prosperity in every corner of this dynamic, diverse state."

"Big bipartisan wins for Michigan are increasingly rare, especially ones that have a transformative impact on our economy. Michigan created and owned the automotive industry since its inception, but leadership today does not ensure leadership into the future - especially in light of other states gunning for our assets," said **Sandy Baruah, President and CEO of the Detroit Regional Chamber**. "The Chamber and MICHauto, along with partners across the state, are proud to have worked with the Legislature and Governor's office to pass the biggest bipartisan deal in Michigan since the 2019 bill signing at the Mackinac Policy Conference, which will allow our state to compete and win the jobs of the future."

Michigan's Economic Momentum

Michigan added 145,000 jobs in 2021, including 67,000 in the last three months, rounding out seven straight months of job growth and bolstering economic momentum. Today's legislation will empower Michigan to create tens of thousands more jobs.

The Michigan Economic Development Corporation (MEDC) has several transformational projects in its pipeline that would invest billions of dollars into Michigan, create tens of thousands of good-paying jobs for Michiganders, and continue the state's strong economic growth. These programs will support business retention and attraction efforts across regions through improved site readiness efforts and create a new "home court" advantage for automotive, electric vehicle, and advanced manufacturing growth in the state.

Small Business Support

Through COVID-19, the Whitmer-Gilchrist administration set up 23 economic relief programs delivering over $240 million to small businesses in all 83 Michigan counties. These grants supported over 25,000 companies, retained over 200,000 jobs with nearly 75% of the support going to restaurants, bars, retailers, and other service industry small businesses.

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Governor Press Release 12 - December 2021

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Gov. Whitmer Secures Historic $7 Billion Investment by GM to Create Thousands of Manufacturing Jobs, Making Michigan a Home for Company's Electric Vehicle Future

January 25, 2022

FOR IMMEDIATE RELEASE

January 25, 2022

Contact: press@michigan.gov

Gov. Whitmer Secures Historic $7 Billion Investment by GM to Create Thousands of Manufacturing Jobs, Making Michigan a Home for Company's Electric Vehicle Future

- ***$7 billion investment will create 4,000 and retain 1,000 jobs and is a significant portion of GM's overall planned investment in electric and autonomous vehicles through 2025***
- ***Includes converting GM Orion Township assembly plant to build full-size EV pickups; building Ultium's 3rd US battery cell plant in Lansing***
- ***First transformational project secured with bipartisan SOAR legislation signed into law last month***

LANSING, Mich. - Governor Gretchen Whitmer today joined General Motors CEO Mary Barra, union officials, elected officials, and local and state leaders to announce a historic investment that will secure the automotive manufacturer's commitment to creating an all-electric future, and 5,000 new and retained manufacturing jobs, in Michigan. The $7 billion investment includes a $4 billion investment to convert GM's Orion Township assembly plant for the production of full-size EV pickups and up to $2.5 billion to build Ultium's third U.S. battery cell plant in Lansing, growing the state's global leadership in electric vehicle and advanced battery production.

"GM's $7 billion investment in Michigan-the largest in their history-will create and retain 5,000 good-paying jobs and enable us to build on our legacy as the place that put the world on wheels," said **Governor Gretchen Whitmer**. "When it comes to investing in Michigan, GM and I have the same philosophy: 'Everybody In.' Michigan's future is bright, and I will continue working with anyone to make transformational investments in our economy, create good-paying jobs, and empower working families."

The Michigan Strategic Fund approved support earlier today for GM's transformational projects in Orion Township and the Lansing area, creating 4,000 new jobs and generating $6.5 billion in total capital investment. In addition to these EV-related investments in Michigan, GM also announced today it is investing more than $510 million in its two Lansing-area vehicle assembly plants to upgrade their production capabilities for near term products. Today's announcement cements the auto manufacturer's commitment to creating an all-electric future from within Michigan and grows the state's momentum as a leader in electric vehicle and advanced automotive manufacturing.

"Today we are taking the next step in our continuous work to establish GM's EV leadership by making investments in our vertically integrated battery production in the U.S., and our North American EV production capacity," said **Mary Barra, GM Chair and CEO**. "These important investments would not have been possible without the strong support from the Governor, Michigan Legislature, Orion Township, the City of Lansing, Delta Township as well as our collaboration with the UAW and LG Energy Solution. These investments also create opportunities in Michigan for us to bring our employees along on our transition to an all-electric future."

General Motors plans to expand at its **Orion Township** facility to convert part of the site to support the production of EV trucks. The company will construct several additions to the facility, renovate certain areas and make site improvements over the next three to five years, along with adding machinery, equipment, and special tooling. The project is expected to generate a total capital investment of $4 billion and create 2,300 jobs. The project will also retain 1,000 jobs.

Through its joint venture with LG Energy Solution, GM also plans to construct its third U.S. Ultium high-volume battery cell manufacturing facility in the **city of Lansing** and **Delta Township**. The facility will include a clean room environment, machinery and equipment that will allow for the high-volume output necessary to produce cells at this capacity. The project is expected to generate a total capital investment of $2.5 billion and create 1,700 jobs.

GM's decision to expand in Michigan will have a?far-reaching?impact on the entire state,

with the influx of jobs resulting in spinoff investments and local redevelopment opportunities. Over 20 years, more than $28.8 billion in new personal income is expected to be generated by the direct, indirect, and induced jobs this opportunity will create, much of which will be spent at local small businesses throughout the community and the state. In addition, the project has an employment multiplier of 3.8, which means that an additional 2.8 jobs in Michigan's economy are anticipated to be created for every new direct job, due to the extensive supply chain that exists in Michigan.

To support today's transformational investments, the Michigan Strategic Fund approved:

- A Critical Industry Program grant in the amount of $600 million for the creation of up to 4,000 jobs related to the Orion Township and Ultium projects;
- An 18-year Renewable Energy Renaissance Zone which will require a minimum investment of $1.5 billion with the potential for up to $2.5 billion, estimated to be worth $158 million;
- A Strategic Site Readiness Program grant in the amount of $66.1 million awarded to the Lansing Economic Area Partnership (LEAP) for public infrastructure and utility upgrades.

The Michigan Economic Development Corporation also authorized a State Education Tax abatement to be used in conjunction with the locally approved Orion Township abatement in support of the GM expansion.

The Orion assembly plant and Ultium battery cell plant projects are the first to be approved utilizing the new Critical Industry Program and Strategic Site Readiness Program signed into law by Gov. Whitmer in December. These programs were created to ensure Michigan could effectively compete for billions of dollars in investment and attract tens of thousands of jobs to bolster the state's economy.

"This project will create new opportunities for businesses of all sizes across the state to ensure that Michigan retains its strong supplier network and provide a platform for further investment throughout Michigan.?GM's decision underscores the strength of the workforce within our state's automotive sector and the bipartisan, Team Michigan commitment to winning the future of mobility and EV manufacturing here in Michigan," said MEDC CEO and Michigan Strategic Fund President and Chair Quentin Messer Jr. "We appreciate GM's continued vote of confidence in Michigan and their partnership on this historic economic win for our friends and neighbors, and are encouraged by the economic opportunity impact it will have across our state for decades to come."?

In addition to MSF support, Orion Township approved PA 198 real property tax abatements for the Orion assembly plant expansions.

"We are thrilled to partner with and support the continued growth and innovation of

General Motors at the Orion Assembly Plant here in Orion Township. The new

investment is a clear indication that GM trusts the hard-working people of Southeast Michigan as they continue their transition from automaker to platform innovator," said **Orion Township Supervisor Chris Barnett.** "Not only are we excited about the thousands of jobs that will be created and the state-of-the-art electric vehicles rolling off the line, but the ripple effect this investment will have on our local economy will make a substantial positive impact for our residents and small businesses for decades to come."?

The city of Lansing has unanimously approved a Renewable Energy Renaissance Zone and PA 198 agreement. Lansing and Delta Township also both passed unanimously an extended 425 revenue sharing agreement for the plant for 25 years. The Lansing Board of Water and Light's Board of Commissioners also unanimously passed a special electric rate for Ultium. Additionally, in order to construct the new assembly plant, Delta Township and the Lansing Board of Water and Light will extensively and rapidly expand infrastructure capacity in support of the site.

"LEAP has been proud to lead regional efforts around this pivotal historic moment for Michigan and the Lansing region. We collectively thank Ultium and its investing partners for choosing the Lansing region and Michigan over other location options, and acknowledge the?crucial personal leadership of Governor Gretchen Whitmer and MEDC CEO Quentin Messer, our state legislature and the outstanding leadership of Lansing Mayor Schor, Delta Township Supervisor Ken Fletcher and BWL CEO Dick Peffley,"?said **Bob Trezise, president and CEO of the Lansing Economic Area Partnership.** "This project represents a secure future for our region and state in making electric powered vehicles, batteries and systems, along with potential semiconductor/chip-making and other high technology-related companies and suppliers that will follow the core EV and battery investments to build the future of mobility."?

As Michigan works to secure its leadership in automotive and EV manufacturing, GM's expansions will continue to ensure long-term economic opportunity for the manufacturing workforce in the region, while solidifying and strengthening jobs and economic growth across the supply chain throughout the state.

UAW President Ray Curry and **UAW Vice President and Director of the UAW General Motors Department Terry Dittes** said in a joint statement:

"In a fast-evolving industry that advances toward technologies like electric vehicles, UAW members in Michigan knew they could face challenges or benefit from opportunities as the auto industry evolves. Today, through the work of Governor Gretchen Whitmer and her administration, General Motors, and the hardworking

women and men of the UAW, Michiganders seized the opportunities of the future.

Today's announcement positions Michigan to remain at the center of the auto industry's evolution and positions UAW members and their families to benefit for decades to come."

About Michigan Economic Development Corporation (MEDC)

The Michigan Economic Development Corporation is the state's marketing arm and lead advocate for business development, job awareness and community development with the focus on growing Michigan's economy.?For more information on the MEDC and our initiatives, visit?www.MichiganBusiness.org.?For Pure Michigan® tourism information, your trip begins at?www.michigan.org. Join the conversation on:?Facebook,? Instagram,?LinkedIn, and?Twitter.

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Governor

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Gov. Whitmer Secures Historic $7 Billion Investment by GM to Create Thousands of Manufacturing Jobs, Making Michigan a Home for Company's Electric Vehicle Future

TECHNICAL MEMORANDUM

TO: Orion Township Engineer

FROM: Erich Smith, PE/Wade Trim
Brian Han/Wade Trim

DATE: July 5, 2022

RE: GM Orion Assembly Stormwater Management

Project Number WAB2003.01F
File/path

General Motors (GM) Orion Assembly site is covered under the State of Michigan Department of Environment, Great Lakes, and Energy (EGLE), National Pollutant Discharge Elimination System (NPDES) general permit no. MIS1100000 (refer to NPDES Permit). Effective from April 1, 2021, to April 1, 2026. The Certificate of Coverage (COC) authorizes General Motors, LLC to discharge an unspecified amount of stormwater to Carpenter Lake. The GM Orion Assembly facility is undergoing a major expansion to support electric vehicle (EV) production. Building expansions include 3.26 million square feet of additional body module shop, battery assembly shop, and a separate paint shop that will be connected to the main facility via overhead enclosed conveyor system. Additional employee parking areas and internal roadways to facilitate new truck docks will be constructed.

1.1 Existing Storm Water System

The existing stormwater conveyance system collects all runoff from the site, as well as the runoff from Brown Road and the adjacent businesses. This runoff discharges to two existing stormwater detention basins (north and south) located on the northwest corner of the site. Stormwater runoff is conveyed via two primary trunk sewers that generally serve the east and west portions of the site. The west half of the site (approximately 123 acres) discharges to the south detention basin. The east half of the site (approximately 294 acres) discharges to the north detention basin. Refer to Existing Condition Stormwater Exhibit.

Information provided by the Township shows that the existing north and south basins were designed to hold two consecutive 50-year rains (refer to Stormwater Attachment I). This document also indicates that the site drains into 2 basins on the west side of Giddings Road and discharges at a

rate not to exceed 12 cubic feet per second (cfs). Record drawings and field investigation have determined that the GM detention basins do not discharge into the ponds on the west side of Giddings, but exit through a series of culverts to the Brown Drain as shown in Stormwater Attachment I. In addition, this document notes that a total 9,000,000 cft of capacity is available in the existing detention basins (1985 plans noted 8,378,675 cft). However, this appears to exclude the permanent pool that the ponds operate with today. Therefore, we calculate a maximum available storage volume of 4,885,857 cubic feet (cft). This storage volume assumes that the pond operates with a water surface elevation between a range of 1010 – 1023 feet.

In 2018, the outlet to the existing north and south detention basins was upgraded with new gates and controls. These gates were installed to control the pond discharge rates, 12 cfs allowable per County records, and water levels as well as to provide the flexibility to maintain a permanent pool. The gates can be fully closed to contain all stormwater runoff from the site, allowing for complete containment of contaminated stormwater under an emergency condition.

As a result, the basins are designed for volume capture of storm events up to and including a 100-year, 24 hour storm, without the allowable 12 cfs of baseline discharge. Required detention for these existing conditions was calculated using Technical Release 55 (TR-55) Methodology and Oakland County Method for comparison.

TR-55 (SCS) Methodology (refer to Calculations)
Area = 416.58 acres
Curve Number = 73.6 (Total area separated into east and west subbasins)
Average Time of Concentration (T_c) = 15 min
100-Year 24-hour Storm = 5.43 inches
Required Detention Volume (refer to Calculations)
4,187,350 cft

Oakland County Methodology
Rational Method
Area = 416.58
Runoff Coefficient =0.5232
Average Time of Concentration (T_c) = 15 min
$\text{Intensity}_{100\text{-Year}} = \frac{83.3}{(T_c+9.17)^{0.83}} = 6.31$ in/hr
Required Detention Volume
18,985 * 0.6077 * 416.58 = 4,805,701 cft

It should be noted that a portion of the eastern side of the site is diverted to a separate industrial containment sewer system which discharges to the onsite wastewater treatment plant. These treated areas, totaling 3.27 acres, include the tank farm and adjacent loading area, fire water and

wastewater tanks, which have a containment dike, coal pad, containment pond, and salt shed slab. In addition, portions of the entrance drives located on the western part of the site, are not captured in the existing stormwater conveyance system. These areas sheet flow towards the catch basins along Giddings Road and then discharges to the two existing basins located West of Giddings Road. The western area totals 14.89 acres, along with the east 3.27 acres are excluded from runoff calculations.

1.2 Proposed Stormwater Improvements

Proposed modifications to the stormwater system include removing the existing sewer within the new building footprints, relocating portions of the main trunk sewer on the east and west sides of the plant, and installing new stormwater management systems. These modifications address the specific requirements of Orion Township and the Oakland County Water Resources Commissioner Stormwater Engineering Design Standards dated November 22, 2021. An exhibit of the GM Orion Proposed Drainage Area is attached showing the sub-drainage boundaries, runoff coefficients, proposed stormwater detention and water quality features (refer to GM Orion Proposed Drainage Area).

The proposed system has been analyzed from an overall site perspective to provide planning-level estimates of stormwater management facilities required to meet the applicable design standards. For this effort, we have assumed the following design criteria:

1. The stormwater detention volume for the entire watershed draining to the existing ponds must be adequate to fully capture the runoff volume from a 100-year event. For this site, the 100 year storm rainfall depth is 5.43 inches.
2. Within the development areas where additional impervious area is proposed, an additional channel protection storage volume is required to retain runoff from the 1.3-inch event. The proposed additional impervious area is 86.01 acres of existing greenspace being developed to the proposed condition. Per Oakland County, the proposed channel protection control volume (CPCV) for the 86.01 acres is calculated to be 385,587 cft (see calculation below):

   Area = 86.01 acres (based on proposed Impervious)
   Runoff Coefficient = 0.95
   Average Time of Concentration (T_c) = 15 min
   $\text{Intensity}_{100\text{-Year}} = \frac{63.3}{(T_c+9.17)^{0.81}} = 6.31$ in/hr

   CPVC = 4719 * 86.01 * 0.95 = 385,587 cft
   The CPVC volume was removed from the required storage volume for both methods.

3. Due to the size of the site, stormwater runoff calculations used for modeling purposes are performed using the Soil Conservation Service (SCS) runoff curve number approach. The US Department of Agriculture (USDA) WinTR-55 model framework is being used for the calculations.
4. Runoff curve numbers (CN) were calculated as weighted values based on the hydrologic soil group and land cover type within each subarea
5. All design runoff volumes are based on 24-hour rainfall depths (inches) from the National Oceanic and Atmospheric Administration (NOAA) Atlas-14
6. For volumetric sizing of new stormwater management facilities associated with proposed impervious areas, calculations provided by the Oakland County Water Resources Commission have been used.
7. As site development moves forward, the conveyance capacity of the collection system will be evaluated assuming the following criteria:
    - Flow must be contained within the crown of the pipe without surcharge for the 10-year storm
    - During the 25-year storm, the hydraulic grade line can rise to within 1-foot of the ground surface.
    - Any surface flooding that occurs during the 100-year storm must not impact buildings and structures on the site.

8. In-system storage capacity of 412,700 cft was calculated and subtracted from the required detention pond storage volume using a HGL of 1023 in the large diameter storm pipe (7' to 10') entering the detention basins from the west and east line.

Using the above design criteria, the following results were developed for proposed conditions.

TR-55 (SCS) Methodology (refer to Calculations)
Area = 416.58 acres
Average Curve Number = 84 (Total area separated into 46 subbasins)
Average Time of Concentration (T_c) = 15 min
100-Year 24-hour Storm = 5.43 inches
Flow was dynamically routed and accounts for in system storage
Total Runoff Volume = 5,545,390 cft

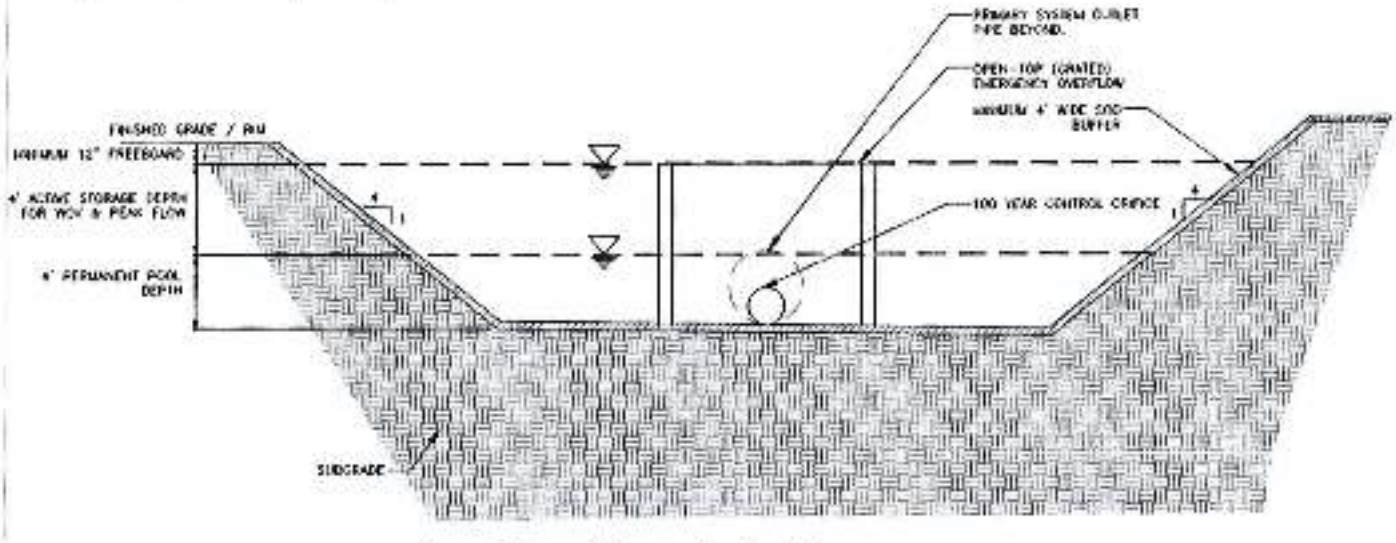
Oakland County Methodology (refer to Calculations)
Area = 416.58 acres (based on proposed Impervious)
Runoff Coefficient = 0.6776
Average Time of Concentration (T_c) = 15 min
$\text{Intensity}_{100\,\text{Year}} = \frac{82.3}{(T_c+9.17)^{0.81}} = 6.31$ in/hr
Total Runoff Volume = 5,358,631 cft

The allowable discharge volume was then calculated for both the TR-55 and Oakland County's Rational methodologies. A summary of the site's required volumes, with the allowable 12 cfs discharge rate is summarized below:

Parameters	TR-55 Method	Oakland County Rational Method
Runoff Volume (cft)	5,645,390	5,358,631
In-System Storage (cft)	(412,700)	(412,700)
CPVC Volume (cft)	(385,587)	(385,587)
Allowable Discharge Volume (cft)	(480,147)	(235,446)
Pond Storage Volume Provided (cft)	4,885,857	4,885,857
Excess Storage/ (Additional) Storage Required (cft)	(618,901)	(560,958)

While these calculations show that there is additional room for excess runoff, the calculations assume that 86.01 acres is the extent of the additional impervious, post development, area. The internal roadway within the east side of the site, may contain additional impervious areas which are not yet accounted. The Oakland County method uses a "C" Coefficient of 0.6776 and the Tr-55 method uses a comparable CN of 84 (Johnson and Meadows 1980).

This proposed stormwater management system also includes two new detention ponds. Ponds 2 and 3 are proposed on east side of the site, as shown on the GM Orion Proposed Storm Exhibit. The ponds are not included in the detention pond storage volume calculated above because the ponds outfall into the exisitng detention ponds. The CPVC, CPRC, forebay, and detention volumes for the ponds were sized to manage stormwater from the adjacent parking lot areas. These stormwater management facilities will be open systems and will meet the requirements of the County's Best Management Practices (BMPs).



Open System Stormwater Facility

The outfall for the site will not be modified as part of the site development.

Offsite Improvements

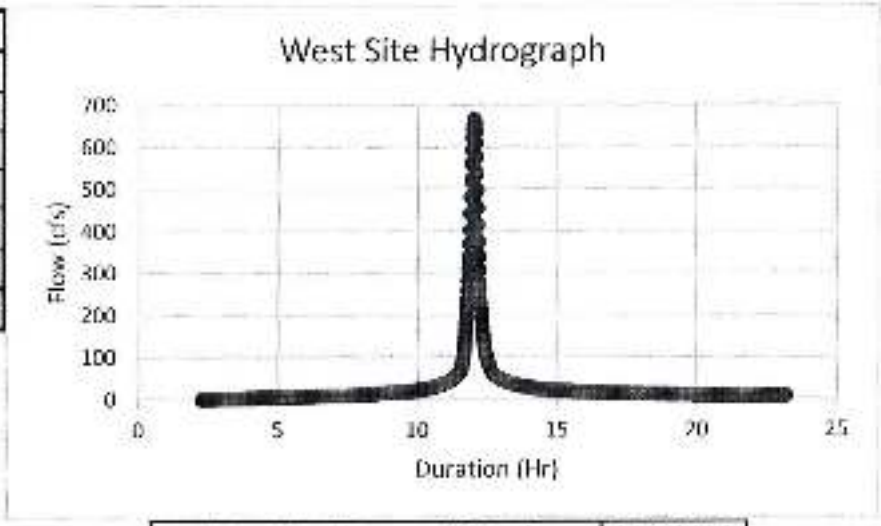
Currently, the Brown Road's storm sewer system drains across the west parking lot of the GM Orion Assembly Site. The proposed plan is to disconnect the existing 30-inch storm sewer near the intersection of Brown and Giddings Roads and redirect this drain via a new storm sewer along the east side of Giddings Road, crossing to the west side of the road, and conveying into an open ditch to the existing detention basins (refer to GM Orion Proposed Storm Exhibit). Note that Giddings Road stormwater already discharges to these basins. Calculations are included showing the basins were previously designed to hold the stormwater runoff for a 100-year event from roadways.

Attachments and Exhibits

Existing Condition Stormwater Exhibit
Stormwater Attachment I (from Orion Twp)
GM Orion Proposed Drainage Area Exhibit
NPDES Permit
Calculations

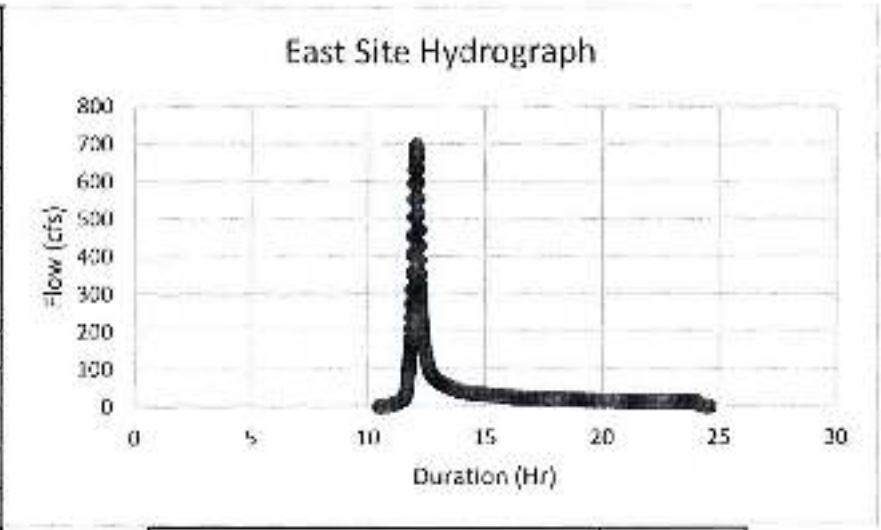
Existing Conditions TR-55 Method

West Site Soils Area	Total (Ac)
Grass	
HSG A	6.51
HSG B	
HSG C	
HSG D	7.88
Impervious	108.67
	123.06



∫West Site Hydrograph (x) dx =	2,114,126

East Site Soils Area	Total (Ac)
Grass	
HSG A	126.53
HSG B	18.82
HSG C	23.51
HSG D	11.32
Gravel	
HSG A	3.54
HSG B	3.03
HSG C	
HSG D	
Wooded	
HSG A	4.66
HSG B	8.96
HSG C	4.63
HSG D	
Impervious	88.5
	293.5

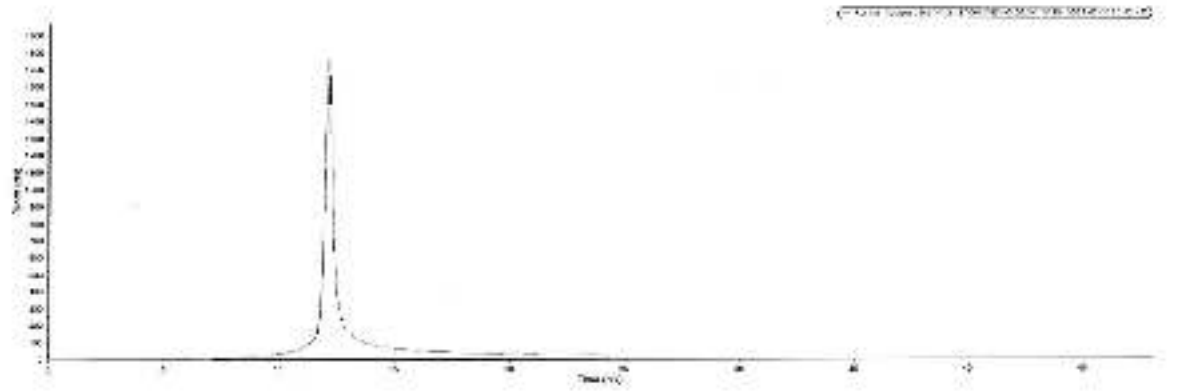


∫East Site Hydrograph (x) dx =	2,073,224

Weighted CN	73.6
Total East and West Area (Ac)	416.56
Excluded Area (Ac)	18.16
Total Area (Ac)	434.72

Note:
The existing conditions of the site was modeled using WinTR-55. A hydrograph was developed and intergrated giving a runoff volume of 4,187,350 cft.

Proposed Conditions TR-55



Weighted CN	84		
Tributary Area (Ac)	416.56		
12 cfs Underflow Volume (cft)		480,147	
Total Required 100-yr Detention (0 cfs)			5,545,390 cft
Total Required 100-yr Detention (12 cfs)			5,065,243 cft

Note:
The proposed conditions were modeled in Autodesk Storm and Sanitary Analysis 2020.

Existing Conditions Oakland County Method	
Time of Conentration (T_c)	15
Intensity	6.312348

Runoff Classification	Total (Ac)	C Values	C x A
Green Space			
HSG A	141.24	0.15	21.19
HSG B	30.81	0.2	6.16
HSG C	28.14	0.25	7.04
HSG D	19.2	0.3	5.76
Impervious	197.17	0.95	187.31
Excluded Area	18.16		
Total	434.72		227.45

Coeffcient Runoff
0.5232

Total Required 100-yr Detention	18,985*416.58*0.5232 =	4,137,834

Proposed Conditions Oakland County Method	
Time of Conentration (T_c)	15
Intensity	6.31

Runoff Classification	Total (Ac)	C Values	C x A
Green Space			
HSG A	74.53	0.15	11.18
HSG B	20.49	0.2	4.10
HSG C	25.03	0.25	6.26
HSG D	13.35	0.3	4.01
Impervious	283.18	0.95	269.02
Excluded Area	18.16		
Total	434.74		294.56

Coeffcient Runoff
0.6776

100-yr Peak Outflow (Q_{100})	12 cfs	
100-yr Peak Inflow (Q_{100IN})	0.6776*6.31*416.58 =	1781.7
Storage Curve Factor (R)	0.206-(0.15*LN(12/1781.70)) =	0.9561

Total Required 100-yr Detention (0 cfs)	18,985*416.58*0.6776 =	5,358,631
Total Required 100-yr Detention (12 cfs)	5,358,631*.9561 =	5,123,185
Total CPVC Vol Required	4719*86.01*0.95 =	385,587
Total CPRC Required	6897*86.01*0.95 =	563,550
Total Forebay Vol Required	545*86.01*0.95 =	44,532

Detention Pond Sizing Summary

No Underflow

Parameters	TR-55	County Rational
Runoff Volume	5,545,390	5,358,631
Pond Storage Volume	4,885,857	4,885,857
In-System Storage	412,700	412,700
CPVC Volume	385,587	385,587
Required Storage	-138,754	-325,513

12 cfs Underflow

Parameters	TR-55	County Rational
Runoff Volume	5,545,390	5,358,631
Pond Storage Volume	4,885,857	4,885,857
In-System Storage	412,700	412,700
CPVC Volume	385,587	385,587
Underflow Volume	480,147	235,446
Required Storage	-618,901	-560,958

Offsite Improvements

Brown and Giddings Road Pond Sizing

Tributary Area (Ac)	36.35		
Impervious Area (Ac)	14.26		
Pervious Area (Ac)	22.09		
Coeffcient Runoff	0.5551		
Total Required 100-yr Detention		18,985*36.35*0.5551 =	383,077

PERMIT NO. MIS110000

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY

AUTHORIZATION TO DISCHARGE UNDER THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

STORM WATER DISCHARGES NOT ASSOCIATED WITH SPECIAL-USE AREAS FOR CYCLE-YEAR 1 WATERSHEDS

In compliance with the provisions of the federal Clean Water Act (federal Water Pollution Control Act, 33 U.S.C., Section 1251 et seq., as amended); Part 31, Water Resources Protection, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA); Part 41, Sewerage Systems, of the NREPA; and Michigan Executive Order 2019-06, storm water associated with industrial activity as defined under Title 40 of the Code of Federal Regulations, Sections 122.26(b)(14)(i-ix), or as deemed necessary under Section 402(p)(2)€ of the Clean Water Act, and other storm water that is adequately regulated by this permit, is authorized to be discharged from facilities specified in individual Certificates of Coverage (COCs) in accordance with effluent limitations, monitoring requirements and other conditions set forth in this general National Pollutant Discharge Elimination System (NPDES) permit (permit).

The applicability of this permit shall be limited to facilities that discharge storm water to surface waters of the state located within a Cycle-Year 1 Watershed and have not been determined by the Michigan Department of Environment, Great Lakes, and Energy (Department) to need an individual NPDES permit. Discharges which may cause or contribute to a violation of a water quality standard are not authorized by this permit.

In order to constitute a valid authorization to discharge, this permit must be complemented by a COC issued by the Department. The permittee shall post a copy of the COC in a publicly accessible location, in plain sight, at the location granted discharge authorization under this permit by the COC.

Unless specified otherwise, all contact with the Department required by this permit shall be to the position indicated on the COC.

This permit takes effect on April 1, 2021. The provisions of this permit are severable. After notice and opportunity for a hearing, this permit may be modified, suspended, or revoked in whole or in part during its term in accordance with applicable laws and rules.

This permit shall expire at midnight on **April 1, 2026.**

Issued: October 27, 2020.

Original signed by Christine Alexander
Christine Alexander, Manager
Permits Section
Water Resources Division

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PERMIT FEE REQUIREMENTS

In accordance with Section 324.3118 of the NREPA, the permittee shall make payment of an annual storm water fee to the Department for each January 1 the permit is in effect regardless of occurrence of discharge. The permittee shall submit the fee in response to the Department's annual notice. Payment may be made electronically via the Department's MiWaters system. The MiWaters website is located at https://miwaters.deq.state.mi.us. Payment shall be submitted or postmarked by March 15 for notices mailed by February 1. Payment shall be submitted or postmarked no later than 45 days after receiving the notice for notices mailed after February 1.

CONTESTED CASE INFORMATION

Any person who is aggrieved by this permit may file a sworn petition with the Michigan Administrative Hearing System within the Michigan Department of Licensing and Regulatory Affairs, c/o the Michigan Department of Environment, Great Lakes, and Energy setting forth the conditions of the permit which are being challenged and specifying the grounds for the challenge. The Department of Licensing and Regulatory Affairs may reject any petition filed more than 60 days after issuance as being untimely.

PART I

Section A. Final Effluent Limitations and Monitoring Requirements

1. Final Effluent Limitations and Monitoring Requirements

During the period beginning on the effective cate of this permit and the individual COC and lasting until the expiration of this permit or termination of the individual COC, the permittee is authorized to discharge storm water associated with industrial activity as defined under 40 CFR 122.26(b)(14)(i-ix) to surface waters of the state. Such discharge shall be limited and monitored by the permittee as specified below.

a. Narrative Standard
In accordance with R 323.1050 of the Part 4 Rules promulgated pursuant to Part 31 of the NREPA, the receiving waters shall not have any of the following physical properties as a result of this discharge in unnatural quantities that are, or may become, injurious to any designated use: turbidity, color, oil films, floating solids, foams, settleable solids, suspended solids, or deposits.

b. Unusual Discharge Characteristics
Storm water discharges shall be monitored as required by this permit to ensure there is no unusual characteristics (i.e., unnatural turbidity, color, oil film, floating solids, foams, settleable solids, suspended solids, or deposits) that would cause a violation of the narrative standard or other water quality standards.

c. Industrial Storm Water Certified Operator
Storm water treatment and/or control measures associated with this discharge shall be under direct supervision of an industrial storm water operator certified by the Department, as required by Section 3110 of the NREPA.

d. Implementation of Storm Water Pollution Prevention Plan
The permittee shall implement an acceptable Storm Water Pollution Prevention Plan (SWPPP) as required by this permit.

PART I

Section B. Storm Water Pollution Prevention Plan

1. Storm Water Pollution Prevention Plan

The SWPPP is a written plan which identifies sources of significant materials associated with industrial activity and includes procedures intended to reduce the exposure of significant materials to storm water. An acceptable SWPPP shall include the facility name, address, COC number, and meet the conditions specified in Part I.B.2. through Part I.B.8. of this permit. The SWPPP template and other guidance materials are available on the Industrial Storm Water Program webpage at: www.michigan.gov/industrialstormwater.

2. Source Identification

To identify potential sources of significant materials that have reasonable potential to pollute storm water and subsequently be discharged to surface waters of the state, the SWPPP shall, at a minimum, include the following:

a. A site map
The site map shall identify and label the following:

1) buildings and other permanent structures;

2) all areas of industrial activity, industrial equipment, and/or industrial material storage;

3) storage, disposal, and/or recycling areas for significant materials;

4) the location of all storm water discharge points and monitoring points (numbered or otherwise uniquely labeled for reference);

5) the location of all storm water inlets (e.g. catch basins, roof drains, etc.) contributing to each storm water discharge point (numbered or otherwise labeled for reference);

6) the location of non-storm water NPDES-permitted discharges;

7) the location of all storm water conveyances (e.g. pipe, ditch, channel, etc.) and outlines of the drainage areas contributing to each storm water discharge point;

8) all structural controls (e.g. secondary containment, inlet filters, etc.) and/or or storm water treatment equipment/devices;

9) area(s) of vegetation (with appropriate labelling such as lawn, old field, marsh, wooded, etc.);

10) area(s) that have the potential for soil erosion and sediment discharges (e.g. gravel lots, access roads, material stockpiles, outfalls, etc.);

11) impervious surfaces (e.g., roofs, asphalt, concrete, etc.);

12) name and location of receiving water(s); and

13) contaminated areas of the site regulated under Part 201 (Environmental Remediation) of the NREPA.

b. A list of all significant materials associated with industrial activity
The list shall include significant materials that have a reasonable potential to pollute storm water and identify the activity or area in which the significant materials are handled or stored. For each activity or area identified, the inlet(s) and discharge point(s) impacted in the event of a spill or release shall be included on the list. The following industrial activities and/or areas shall be evaluated for the potential to expose significant materials to storm water, if applicable:

PART I

Section B. Storm Water Pollution Prevention Plan

1) loading, unloading, and other industrial material handling activities;

2) outdoor industrial material storage areas, including secondary containment structures;

3) outdoor manufacturing or processing activities;

4) dust or particulate generating processes/activities;

5) discharges associated with vents, stacks, and air emission controls;

6) industrial waste or recyclable material storage or disposal areas;

7) activities associated with the maintenance and cleaning of vehicles, machines, and equipment;

8) area(s) that have the potential for soil erosion and sediment discharges (e.g., gravel lots, access roads, material stockpiles, outfalls, etc.);

9) areas of contamination regulated under Part 201 (Environmental Remediation) of the NREPA;

10) areas of significant material residues;

11) areas where animals (wild or domestic) congregate and deposit wastes; and

12) other areas where storm water may come into contact with significant materials.

c. A listing of significant spills, leaks, or releases (see Part II.A. of this permit)
The list shall include the date, volume, location of the significant spill/leak/release, and the clean up actions. The list shall include significant spills, leaks, or releases that occurred over the three (3) years prior to the effective date of a COC authorizing discharge under this permit. Significant spills, leaks or releases shall be controlled in accordance with the SWPPP and are cause for the SWPPP to be updated as specified in Part I.B.6. of this permit. The permittee shall notify the Department of significant spills, leaks, or releases as specified in Part II.C.6 and/or Part II.C.7. of this permit. Written reports regarding significant spills, leaks, or releases shall be retained with the SWPPP records in accordance with Part I.C.1. of this permit.

d. A summary of storm water discharge sampling data
If data has been collected, the SWPPP shall include a list of the pollutants detected, sources identified, and the control measures implemented to reduce the discharge of the detected pollutants. Storm water discharge sampling data shall be retained in accordance with Part I.C.1. of this permit.

e. A description of the illicit connection investigation
The permittee shall implement an illicit connection investigation and elimination program. The SWPPP shall include a written description of the actions taken to identify, investigate, and eliminate illicit connections to Municipal Separate Storm Sewer System (MS4) or surface waters of the state. Any discharge from an illicit connection to an MS4 or surface waters of the state is a violation of this permit.

f. A description of the dust suppression material used onsite
The SWPPP shall include a description of the dust suppression material used onsite, the areas where the material is used, and the actions implemented to prevent an unauthorized discharge of the material. If the permittee does not use dust suppression material onsite, the SWPPP shall indicate this.

PART I

Section B. Storm Water Pollution Prevention Plan

3. Total Maximum Daily Loads (TMDLs)

The permittee is required to implement nonstructural and/or structural controls to reduce the discharge of the pollutant(s) associated with any TMDL(s) identified on the COC. The SWPPP shall include a list of all TMDL(s) identified on the COC, as well as references to control measures already listed in the SWPPP intended to reduce the discharge of the TMDL pollutant(s). The implementation of an acceptable SWPPP shall meet the control measure expectations of all TMLD(s) identified on the COC; however, the Department may require additional control measures if it is determined that the storm water discharge is negatively impacting the applicable TMDL(s). If no TMDLs are identified on the COC, this condition does not apply.

4. Nonstructural Controls

To manage and address sources of significant materials that have reasonable potential to pollute storm water and subsequently be discharged to surface waters of the state, the SWPPP shall, at a minimum, include the following nonstructural controls:

a. Prevertative Maintenance
Prevertive maintenance procedures shall list the storm water management and control devices, treatment systems, industrial equipment, etc. that will be routinely serviced and maintained to prevent significant material exposure to storm water. The written procedures shall include a maintenance schedule for each item listed.

b. Good Housekeeping Inspections
Good housekeeping procedures shall list the areas that will be routinely inspected and cleaned to prevent significant material exposure to storm water. The areas associated with the items listed in the preventative maintenance procedures shall also be included. The written procedures shall include an inspection and cleaning schedule for each area listed. A written report documenting the implementation of the inspection and cleaning schedule shall be retained in accordance with Part I.C.1. of this permit.

c. Comprehensive Site Inspections
Comprehensive site inspection procedures shall include all items listed below in Part I.B.4.c.3) that will be inspected by an Industrial Storm Water Certified Operator to ensure compliance with this permit. At a minimum, one inspection shall be performed during normal facility operating hours within each of the following quarters unless the Department has approved an alternate schedule in accordance with Part I.C.10.: January – March, April – June, July – September, and October – December. A written report documenting the comprehensive site inspection shall be retained in accordance with Part I.C.1. of this permit and shall include the following information:

1) Date of the inspection.

2) The Industrial Storm Water Certified Operator's name(s) and certification number(s).

3) All observations regarding significant material exposure and any necessary corrective actions related to the inspection of the following:

a) Areas identified in Part I.B.2.a. and Part I.B.2.b. of this permit.

b) Areas listed in Part I.B.2.c. of this permit where significant spills, leaks, or releases have occurred in the past three years.

c) All storm water inlets, conveyances (not including subsurface piping), and discharge points.

d) All structural controls and/or storm water treatment equipment/devices.

PART I

Section B. Storm Water Pollution Prevention Plan

4) A review of the good housekeeping reports, and any other paperwork associated with the SWPPP.

5) A written statement, based on the results of the comprehensive site inspection, certifying compliance with the terms of this permit and with the permittee's SWPPP.

d. Visual Assessments

At a minimum, one (1) storm water sample shall be collected for visual assessment during normal facility operating hours at each discharge point within each of the following quarters unless the Department has approved an alternate schedule in accordance with Part I.C.10. of this permit: January – March, April – June, July – September, and October – December. Visual assessment guidance is available on the Industrial Storm Water Program webpage at www.michigan.gov/industrialstormwater.

The following are the requirements of the visual assessments and shall be included in the written procedures:

1) The storm water sample(s) shall be collected during normal hours of operation by an Industrial Storm Water Certified Operator, Qualified Personnel as defined in Part II.A. of this permit, or automatic sampling device.

2) The storm water sample(s) shall be collected:

a) with clean equipment and containers, and

b) within the first 30 minutes of the start of a discharge resulting from a qualifying storm event as defined in Part II.A. of this permit. If it is not possible to collect the sample within the first 30 minutes of discharge, the sample shall be collected as soon thereafter as practicable. In the case of snowmelt, samples shall be collected during a period with measurable discharge from the site.

3) The visual assessment of the storm water sample(s) shall be performed and documented by an Industrial Storm Water Certified Operator. Documentation shall be retained in accordance with Part I.C.1. of this permit and shall include the following information:

a) Sample location(s).

b) Storm water sample collection date(s), time(s), and if applicable, an explanation as to why sample(s) were not collected within the first 30 minutes of discharge.

c) Visual assessment date and time.

d) Name and certification number of the Industrial Storm Water Certified Operator.

e) Storm event information, including the length of event expressed in hours, approximate size of event expressed in inches of precipitation, duration of time since previous event that caused a discharge, date and time the discharge began, and nature of event (i.e., rainfall or snowmelt).

f) Name(s) of personnel who obtained the storm water sample(s) or document that an automatic sampling device was used.

PART I

Section B. Storm Water Pollution Prevention Plan

g) Any notable observations of the discharge while the storm water samples were collected. This requirement is waived if an automatic sampling device was used to collect the storm water samples.

h) Sample(s) shall be observed in a colorless glass or plastic container for the following characteristics: color, oil sheen, turbidity, floating solids, suspended solids, settleable solids, foam, and any other unusual characteristics.

i) Unaltered, full-color photograph of the storm water sample(s) against a white background.

j) A description of corrective actions taken if any unusual characteristics are identified during the visual assessment.

4) When a visual assessment cannot be completed for any reason (e.g., adverse weather conditions, no discharge, qualifying event occurred outside the normal facility operating hours, etc.) during any quarter, written documentation explaining the reason for not completing the visual assessment shall be included with the SWPPP records. Adverse weather conditions are those that are dangerous or create inaccessibility for personnel, such as local flooding, high winds, electrical storms, or situations that otherwise make sampling impractical such as drought or extended frozen conditions.

5) If the facility has two (2) or more storm water discharge points that are believed to discharge substantially identical storm water effluents, the facility may conduct visual assessments of the discharge at one (1) of the storm water discharge points and report that the results also apply to the other substantially identical storm water discharge point(s). The determination of substantially identical storm water discharge points is to be based on the significant material evaluation conducted as set forth under Part I.B.2.b. of this permit and shall be clearly documented in the SWPPP. Visual assessments shall be conducted on a rotating basis of each substantially identical storm water discharge point throughout the period of coverage under this permit.

e. Material Handling and Spill Prevention / Response Procedures

Significant material handling and storage procedures shall be developed to minimize the potential for leaks, spills and other releases that may be exposed to storm water. For each potential spill or release area, the procedures shall identify the significant material handling and storage requirements, spill response actions, and locations of spill kits. The SWPPP shall include language describing what a reportable spill or release is, and the appropriate reporting requirements in accordance with Part II.C.6. and Part II.C.7. of this permit.

For Polluting Materials (see Part II.A. of this permit), the SWPPP may reference any of the following plans:

- Pollution Incident Prevention Plan (PIPP) prepared in accordance with the Part 5 Rules (R 324.2001 through R 324.2009 of the Michigan Administrative Code)
- Hazardous Waste Contingency Plan prepared in accordance with 40 CFR 264 and 265 Subpart D, as required by Part 111 of the NREPA
- Spill Prevention Control and Countermeasure (SPCC) plan prepared in accordance with 40 CFR 112

PART I

Section B. Storm Water Pollution Prevention Plan

f. Annual Employee Training Program
The SWPPP shall include a written description of the employee training program that will be implemented on an annual basis to inform appropriate personnel of the components of the SWPPP and requirements of this permit. Records of the annual employee training program shall be retained in accordance with Part I.C.1. of this permit.

5. Structural Controls

Structural controls shall be used to reduce significant material exposure and/or the concentration of significant materials in the discharge to ensure compliance with Part I.A.1.a. and Part I.A.1.b. of this permit. The SWPPP shall provide a list of all structural controls utilized onsite and the significant material(s) intended to be managed by the structural controls. The location of the structural controls shall be identified on the site map. Where applicable, structural controls shall, at a minimum, be utilized to achieve the following:

a. prevent unauthorized discharges from industrial waste and recyclable material containers,

b. prevent the discharge of sediment and other particulates that can be mobilized by storm water, and

c. minimize channel/streambank erosion and scour in the immediate vicinity of outfalls.

6. Keeping SWPPPs Current

a. The permittee and/or an Industrial Storm Water Certified Operator shall review the SWPPP annually after it is developed and maintain a written report of the review. Based on the review, the permittee or an Industrial Storm Water Certified Operator shall amend the SWPPP as needed to ensure continued compliance with the terms and conditions of this permit. A SWPPP Annual Review Report form is available on the Industrial Storm Water Program webpage at www.michigan.gov/industrialstormwater. The written report of the SWPPP Annual Review shall be retained in accordance with Part I.C.1. of this permit

b. The SWPPP developed under the conditions of a previous permit shall be amended as necessary to ensure compliance with this permit.

c. The SWPPP shall be updated or amended whenever changes at the facility have the potential to increase the exposure of significant materials to storm water, significant spills/leaks/releases occur at the facility, or when the SWPPP is determined by the permittee or the Department to be ineffective in achieving the general objectives of controlling pollutants in storm water discharges associated with industrial activity. SWPPP updates necessitated by increased activity or significant spills at the facility shall include a description of how the permittee intends to control any new sources of significant materials or respond to and prevent spills in accordance with the requirements of this permit.

d. The Department may notify the permittee at any time that the SWPPP does not meet minimum requirements of this permit. Such notification shall identify why the SWPPP does not meet minimum requirements of this permit. The permittee shall make the required changes to the SWPPP within 30 days after such notification from the Department and shall submit to the Department a written certification that the requested changes have been made.

e. Amendments to the SWPPP shall be signed and retained on-site with the SWPPP pursuant to Part I.B.8. of this permit.

PART I

Section B. Storm Water Pollution Prevention Plan

7. Contact Information and Industrial Storm Water Certified Operator Update

a. The SWPPP shall include contact information (i.e. name, mailing address, phone number, and email address) for the Facility Contact, Industrial Storm Water Certified Operator(s), environmental consultant, and/or any other appropriate individuals who manage the storm water program at the facility. The SWPPP shall be updated, as necessary, to ensure the contact information is current.

b. If the primary Industrial Storm Water Certified Operator is replaced, the permittee shall provide the name and certification number of the new Industrial Storm Water Certified Operator to the Department by updating the facility's MiWaters site. If a facility has multiple Industrial Storm Water Certified Operators, the names and certification numbers of all shall be included in the SWPPP.

8. Signature and SWPPP Certification

a. The SWPPP shall be reviewed and signed by an Industrial Storm Water Certified Operator and by either the permittee or an authorized representative in accordance with 40 CFR 122.22. The SWPPP and associated records shall be retained on-site at the facility that generates the storm water discharge.

b. The permittee shall make the SWPPP and items required by Part I.C.1. of this permit available upon request to the Department. The Department makes the non-confidential business portions of the SWPPP available to the public.

PART I

Section C. Special Conditions

1. Record Keeping

The permittee shall maintain records of all SWPPP-related activities. All such records shall be retained for three (3) years. The following records are required by this permit:

a. good housekeeping inspection reports

b. comprehensive site inspection reports

c. visual assessment reports

d. employee training records

e. SWPPP annual review reports

f. significant spill, leak, or release reports, and

g. storm water discharge sampling data.

2. Non-Storm Water Discharges

Storm water is defined in Part II.A. to encompass non-storm water discharges included under the conditions of this permit. Any discharge of wastewater other than storm water as defined under the conditions of this permit shall be in compliance with an NPDES permit issued for the discharge. The non-storm water discharges included under the conditions of this permit are authorized under this permit, provided pollution prevention controls for the non-storm water component are identified in the permittee's SWPPP. The non-storm water discharges included under the conditions of this permit are as follows:

a. discharges from fire hydrant flushing

b. potable water sources, including water line flushing

c. water from fire system testing and fire-fighting training without burned materials or chemical fire suppressants

d. irrigation drainage

e. lawn watering

f. routine building wash-down that does not use detergents or other compounds

g. pavement wash waters where contamination by toxic or hazardous materials has not occurred (unless all contamination by toxic or hazardous materials has been removed) and where detergents are not used

h. uncontaminated condensate from air conditioners, coolers, and other compressors, and from the outside storage of refrigerated gases or liquids

i. springs

j. uncontaminated groundwater

k. foundation or footing drains where flows are not contaminated with process materials such as solvents, and

PART I

Section C. Special Conditions

l. discharges from fire-fighting activities. Discharges from fire-fighting activities are exempted from the requirement to be identified in the SWPPP.

3. Request for Approval to Use Water Treatment Additives

Prior to use of any water treatment additive, the permittee shall obtain written approval from the Department. Requests for such approval shall be submitted via the Department's MiWaters system. The MiWaters website is located at https://miwaters.deq.state.mi.us. Instructions for submitting such a request may be obtained at http://www.michigan.gov/deglenpdes (near the bottom of that page, click on one or both of the links located under the Water Treatment Additives banner). Additional monitoring and reporting may be required as a condition for the approval to use the water treatment additive.

A request for approval to use water treatment additives shall include all of the following usage and discharge information for each water treatment additive proposed to be used:

a. The Safety Data Sheet (SDS);

b. Ingredient information, including the name of each ingredient, CAS number for each ingredient, and fractional content by weight for each ingredient;

c. The proposed water treatment additive discharge concentration with supporting calculations;

d. The discharge frequency (i.e., number of hours per day and number of days per year);

e. The outfall(s) and monitoring point(s) from which the water treatment additive is to be discharged;

f. The type of removal treatment, if any, that the water treatment additive receives prior to discharge;

g. The water treatment additive's function (i.e., microbiocide, flocculant, etc.);

h. The SDS shall include a 48-hour LC50 or EC50 for a North American freshwater planktonic crustacean (either *Ceriodaphnia sp.*, *Daphnia sp.*, or *Simocephalus sp.*). The results shall be based on the whole water treatment additive, shall not be results based on a similar product, and shall not be estimated; and

i. The SDS shall include the results of a toxicity test for one (1) other North American freshwater aquatic species (other than a planktonic crustacean) that meets a minimum requirement of R 323.1057(2) of the Water Quality Standards. The results shall be based on the whole water treatment additive, shall not be results based on a similar product, and shall not be estimated. Examples of tests that would meet this requirement include a 96-hour LC50 for rainbow trout, bluegill, or fathead minnow.

4. Tracer Dye Discharges

This permit does not authorize the discharge of tracer dyes without approval from the Department. Requests to discharge tracer dyes shall be submitted to the Department in accordance with Rule 1097 (R 323.1097 of the Michigan Administrative Code).

PART I

Section C. Special Conditions

5. Facility Contact

The "Facility Contact" was specified in the application. The permittee may replace the facility contact at any time. Within ten (10) days of taking such action, the permittee shall notify the Department in writing and update the Facility Contact in MiWaters, including the name, physical address, email address, and telephone number of the new facility contact. The MiWaters website is located at https://miwaters.deq.state.mi.us (log in, select the site from the left-side menu, click on Details, click on Contacts from the top menu, click Add Contact, fill out the required fields, and select "Facility Contact" from the list of roles).

a. The facility contact shall be (or a duly authorized representative of this person):
- for a corporation, a principal executive officer of at least the level of vice president, or a designated representative, if the representative is responsible for the overall operation of the facility from which the discharge described in the permit application or other NPDES form originates,
- for a partnership, a general partner,
- for a sole proprietorship, the proprietor, or
- for a municipal, state, or other public facility, either a principal executive officer, the mayor, village president, city or village manager, or other duly authorized employee.

b. A person is a duly authorized representative only if:
- the authorization is made in writing to the Department by a person described in paragraph a. of this section; and
- the authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity such as the position of plant manager, operator of a well or a well field, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the facility (a duly authorized representative may thus be either a named individual or any individual occupying a named position).

Nothing in this section obviates the permittee from properly submitting reports and forms as required by law.

6. Portable Industrial Facilities

a. Storm water discharges from satellite locations of a portable industrial facility may be authorized by obtaining a COC issued under this permit. To obtain a COC, an NOI or other Department-approved application shall be submitted to the Department for a primary mailing address of the owner or operator of the portable facility. Following receipt of a COC, if the portable facility is to be moved to a satellite location, the permittee shall notify the Department of the relocation, via MiWaters, at least ten (10) days prior to start-up at the satellite location. The notification shall include the location (township, range, section, and quarter-quarter section) of the current and proposed sites for the portable facility, the receiving water for the discharge, and the anticipated date of the move. Failure to notify the Department concerning the satellite location is a permit violation.

b. The permittee shall submit an NOI or other Department-approved application for each portable facility that could be moved to a satellite location. A SWPPP shall be in place for each facility at the time of start-up and shall be modified for each new location as necessary.

PART I

Section C. Special Conditions

7. Expiration and Reissuance

On or before October 1, 2025, a permittee seeking continued authorization to discharge under this permit beyond the permit's expiration date shall submit to the Department a written request containing such information, forms, and fees as required by the Department. Without an adequate request, a permittee's authorization to discharge will expire on **April 1, 2026**. With an adequate request, a permittee shall continue to be subject to the terms and conditions of the expired permit until the Department takes action on the request, unless this permit is terminated or revoked.

If this permit is terminated or revoked, all authorizations to discharge under the permit shall expire on the date of termination or revocation.

If this permit is substantively modified, the Department will notify the permittee of any required action. If a specific response is required by the Department and the permittee fails to submit an adequate response, the permittee's authorization to discharge will terminate on the effective date of the modified permit. If a specific response is required by the Department and the permittee submits an adequate response, the permittee shall be subject to the terms and conditions of the modified permit beginning on the effective date of the modified permit unless the Department notifies the permittee otherwise.

8. Termination of General Permit Coverage

A permittee may submit a request to the Department to terminate the COC for a facility when:

a. all storm water discharges authorized under this permit are eliminated, or

b. industrial activity has ceased, and no significant materials are exposed to storm water.

9. Requirement to Obtain Individual Permit

The Department may require any person who is authorized to discharge by a COC and this permit to apply for and obtain an Individual NPDES permit if any of the following circumstances apply:

a. the discharge is a significant contributor to pollution as determined by the Department on a case-by-case basis

b. the discharger is not complying, or has not complied, with the conditions of this permit

c. a change has occurred in the availability of demonstrated technology or practices for the control or abatement of waste applicable to the point source discharge

d. effluent standards and limitations are promulgated for point source discharges subject to this permit, or

e. the Department determines that the criteria under which the permit was issued no longer apply.

Any person may request the Department to take action pursuant to the provisions of Rule 2191 (R 323.2191 of the Michigan Administrative Code).

PART I

Section C. Special Conditions

10. Alternate Schedule Request for Comprehensive Site Inspections and/or Visual Assessment

The permittee may request Department approval of an alternate schedule for comprehensive site inspections and/or visual assessments. Such a request may be made if the permittee meets the following criteria: the permittee is in full compliance with this permit, the permittee has an acceptable SWPPP, the permittee has installed and/or implemented adequate structural controls at the facility, the permittee has all required inspection reports available at the facility, and the permittee has an Industrial Storm Water Certified Operator at the facility. The Department may revoke the approval of an alternate schedule at any time upon notification to the permittee if these criteria are not being met.

PART II

Part II may include terms and /or conditions not applicable to discharges covered under this permit.

Section A. Definitions

Acute toxic unit (TU_A) means $100/LC_{50}$ where the LC_{50} is determined from a whole effluent toxicity (WET) test which produces a result that is statistically or graphically estimatec to be lethal to 50% of the test organisms.

Annual monitoring frequency refers to a calendar year beginning on January 1 and ending on December 31. When required by this permit, an analytical result, reading, value or observation shall be reported for that period if a discharge occurs during that period.

Authorized public agency means a state, local, or county agency that is designated pursuant to the provisions of Section 9110 of Part 91, Soil and Sedimentation Control, of the NREPA, to implement soil erosion and sedimentation control requirements with regard to construction activities undertaken by that agency.

Best management practices (BMPs) means structural devices or nonstructural practices that are designed to prevent pollutants from entering into storm water, to direct the flow of storm water, or to treat polluted storm water.

Bioaccumulative chemical of concern (BCC) means a chemical which, upon entering the surface waters, by itself or as its toxic transformation product, accumulates in aquatic organisms by a human health bioaccumulation factor of more than 1000 after considering metabolism and other physiochemical properties that might enhance or inhibit bioaccumulation. The human health bioaccumulation factor shall be derived according to R 323.1057(5). Chemicals with half-lives of less than 8 weeks in the water column, sediment, and biota are not BCCs. The minimum bioaccumulation concentration factor (BAF) information needed to define an organic chemical as a BCC is either a field-measured BAF or a BAF derived using the biota-sediment accumulation factor (BSAF) methocology. The minimum BAF information needed to define an inorganic chemical as a BCC, including an organometal, is either a field-measured BAF or a laboratory-measured bioconcentration factor (BCF). The BCCs to which these rules apply are identified in Table 5 of R 323.1057 of the Water Quality Standards.

Biosolids are the solid, semisolid, or liquid residues generated during the treatment of sanitary sewage or domestic sewage in a treatment works. This includes, but is not limited to, scum or solids removed in primary, secondary, or advanced wastewater treatment processes and a derivative of the removed scum or solids.

Bulk biosolids means biosolids that are not sold or given away in a bag or other container for application to a lawn or home garden.

Certificate of Coverage (COC) is a document, issued by the Department, which authorizes a discharge under a general permit.

Chronic toxic unit (TU_C) means $100/MATC$ or $100/IC_{25}$, where the maximum acceptable toxicant concentration (MATC) and IC_{25} are expressed as a percent effluent in the test medium.

Class B biosolids refers to material that has met the Class B pathogen reduction requirements or equivalent treatment by a Process to Significantly Reduce Pathogens (PSRP) in accordance with the Part 24 Rules, Land Application of Biosolids, promulgated under Part 31 of the NREPA. Processes include aerobic digestion, composting, anaerobic digestion, lime stabilization and air drying.

Combined sewer system is a sewer system in which storm water runoff is combined with sanitary wastes.

Continuous monitoring refers to sampling/readings that occur at regular and consistent intervals throughout a 24-hour period and at a frequency sufficient to capture data that are representative of the discharge. The maximum acceptable interval between samples/readings shall be one (1) hour.

PART II

Section A. Definitions

Daily concentration
FOR PARAMETERS OTHER THAN pH, DISSOLVED OXYGEN, TEMPERATURE, AND CONDUCTIVITY – Daily concentration is the sum of the concentrations of the individual samples of a parameter taken within a calendar day divided by the number of samples taken within that calendar day. The daily concentration will be used to determine compliance with any maximum and minimum daily concentration limitations. For guidance and examples showing how to perform calculations using results below quantification levels, see the document entitled "Reporting Results Below Quantification," available at https://www.michigan.gov/documents/deq/wrd-npdes-results-quantification_620791_7.pdf.

FOR pH, DISSOLVED OXYGEN, TEMPERATURE, AND CONDUCTIVITY – The daily concentration used to determine compliance with maximum daily pH, temperature, and conductivity limitations is the highest pH, temperature, and conductivity readings obtained within a calendar day. The daily concentration used to determine compliance with minimum daily pH and dissolved oxygen limitations is the lowest pH and dissolved oxygen readings obtained within a calendar day.

Daily loading is the total discharge by weight of a parameter discharged during any calendar day. This value is calculated by multiplying the daily concentration by the total daily flow and by the appropriate conversion factor. The daily loading will be used to determine compliance with any maximum daily loading limitations. When required by the permit, report the maximum calculated daily loading for the month in the "MAXIMUM" column under "QUANTITY OR LOADING" on the DMRs.

Daily monitoring frequency refers to a 24-hour day. When required by this permit, an analytical result, reading, value or observation shall be reported for that period if a discharge occurs during that period.

Department means the Michigan Department of Environment, Great Lakes, and Energy.

Detection level means the lowest concentration or amount of the target analyte that can be determined to be different from zero by a single measurement at a stated level of probability.

Discharge means the addition of any waste, waste effluent, wastewater, pollutant, or any combination thereof to any surface water of the state.

EC_{50} means a statistically or graphically estimated concentration that is expected to cause 1 or more specified effects in 50% of a group of organisms under specified conditions.

Fecal coliform bacteria monthly
FOR WWSLs THAT COLLECT AND STORE WASTEWATER AND ARE AUTHORIZED TO DISCHARGE ONLY IN THE SPRING AND/OR FALL ON AN INTERMITTENT BASIS – Fecal coliform bacteria monthly is the geometric mean of all daily concentrations determined during a discharge event. Days on which no daily concentration is determined shall not be used to determine the calculated monthly value. The calculated monthly value will be used to determine compliance with the maximum monthly fecal coliform bacteria limitations. When required by the permit, report the calculated monthly value in the "AVERAGE" column under "QUALITY OR CONCENTRATION" on the DMR. If the period in which the discharge event occurred was partially in each of two months, the calculated monthly value shall be reported on the DMR of the month in which the last day of discharge occurred.

FOR ALL OTHER DISCHARGES – Fecal coliform bacteria monthly is the geometric mean of all daily concentrations determined during a reporting month. Days on which no daily concentration is determined shall not be used to determine the calculated monthly value. The calculated monthly value will be used to determine compliance with the maximum monthly fecal coliform bacteria limitations. When required by the permit, report the calculated monthly value in the "AVERAGE" column under "QUALITY OR CONCENTRATION" on the DMR.

PART II

Section A. Definitions

Fecal coliform bacteria 7-day
FOR WWSLs THAT COLLECT AND STORE WASTEWATER AND ARE AUTHORIZED TO DISCHARGE ONLY IN THE SPRING AND/OR FALL ON AN INTERMITTENT BASIS – Fecal coliform bacteria 7-day is the geometric mean of the daily concentrations determined during any 7 consecutive days of discharge during a discharge event. If the number of daily concentrations determined during the discharge event is less than 7 days, the number of actual daily concentrations determined shall be used for the calculation. Days on which no daily concentration is determined shall not be used to determine the value. The calculated 7-day value will be used to determine compliance with the maximum 7-day fecal coliform bacteria limitations. When required by the permit, report the maximum calculated 7-day geometric mean value for the month in the "MAXIMUM" column under "QUALITY OR CONCENTRATION" on the DMRs. If the 7-day period was partially in each of two months, the value shall be reported on the DMR of the month in which the last day of discharge occurred.

FOR ALL OTHER DISCHARGES – Fecal coliform bacteria 7-day is the geometric mean of the daily concentrations determined during any 7 consecutive days in a reporting month. If the number of daily concentrations determined is less than 7, the actual number of daily concentrations determined shall be used for the calculation. Days on which no daily concentration is determined shall not be used to determine the value. The calculated 7-day value will be used to determine compliance with the maximum 7-day fecal coliform bacteria limitations. When required by the permit, report the maximum calculated 7-day geometric mean for the month in the "MAXIMUM" column under "QUALITY OR CONCENTRATION" on the DMRs. The first calculation shall be made on day 7 of the reporting month, and the last calculation shall be made on the last day of the reporting month.

Flow-proportioned composite sample – See definition of **24-hour composite sample.**

General permit means an NPDES permit issued authorizing a category of similar discharges.

Geometric mean is the average of the logarithmic values of a base 10 data set, converted back to a base 10 number.

Grab sample is a single sample taken at neither a set time nor flow.

IC_{25} means the toxicant concentration that would cause a 25% reduction in a nonquantal biological measurement for the test population.

Illicit connection means a physical connection to a municipal separate storm sewer system that primarily conveys non-storm water discharges other than uncontaminated groundwater into the storm sewer; or a physical connection not authorized or permitted by the local authority, where a local authority requires authorization or a permit for physical connections.

Illicit discharge means any discharge to, or seepage into, a municipal separate storm sewer system that is not composed entirely of storm water or uncontaminated groundwater. Illicit discharges include non-storm water discharges through pipes or other physical connections; dumping of motor vehicle fluids, household hazardous wastes, domestic animal wastes, or litter; collection and intentional dumping of grass clippings or leaf litter; or unauthorized discharges of sewage, industrial waste, restaurant wastes, or any other non-storm water waste directly into a separate storm sewer.

Individual permit means a site-specific NPDES permit.

Industrial material means material handling equipment; industrial machinery; raw materials; industrial production and processes; and intermediate products, by-products, final products, and waste products.

Inlet means a catch basin, roof drain, conduit, drain tile, retention pond riser pipe, sump pump, or other point where storm water or wastewater enters into a closed conveyance system prior to discharge off site or into waters of the state.

PART II

Section A. Definitions

Interference is a discharge which, alone or in conjunction with a discharge or discharges from other sources, both: 1) inhibits or disrupts a POTW, its treatment processes or operations, or its sludge processes, use or disposal; and 2) therefore, is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation) or, of the prevention of sewage sludge use or disposal in compliance with the following statutory provisions and regulations or permits issued thereunder (or more stringent state or local regulations): Section 405 of the Clean Water Act, the Solid Waste Disposal Act (SWDA) (including Title II, more commonly referred to as the Resource Conservation and Recovery Act (RCRA), and including state regulations contained in any state sludge management plan prepared pursuant to Subtitle D of the SWDA), the Clean Air Act, the Toxic Substances Control Act, and the Marine Protection, Research and Sanctuaries Act. [This definition does not apply to sample matrix interference].

Land application means spraying or spreading biosolids or a biosolics derivative onto the land surface, injecting below the land surface, or incorporating into the soil so that the biosolids or biosolids derivative can either condition the soil or fertilize crops or vegetation grown in the soil.

LC_{50} means a statistically or graphically estimated concentration that is expected to be lethal to 50% of a group of organisms under specified conditions.

Maximum acceptable toxicant concentration (MATC) means the concentration obtained by calculating the geometric mean of the lower and upper chronic limits from a chronic test. A lower chronic limit is the highest tested concentration that did not cause the occurrence of a specific adverse effect. An upper chronic limit is the lowest tested concentration which did cause the occurrence of a specific adverse effect and above which all tested concentrations caused such an occurrence.

Maximum extent practicable means implementation of best management practices by a public body to comply with an approved storm water management program as required by a national permit for a municipal separate storm sewer system, in a manner that is environmentally beneficial, technically feasible, and within the public body's legal authority.

MBTU/hr means million British Thermal Units per hour.

MGD means million gallons per day.

Monthly concentration is the sum of the daily concentrations determined during a reporting period divided by the number of daily concentrations determined. The calculated monthly concentration will be used to determine compliance with any maximum monthly concentration limitations. Days with no discharge shall not be used to determine the value. When required by the permit, report the calculated monthly concentration in the 'AVERAGE' column under "QUALITY OR CONCENTRATION" on the DMR.

For minimum percent removal requirements, the monthly influent concentration and the monthly effluent concentration shall be determined. The calculated monthly percent removal, which is equal to 100 times the quantity [1 minus the quantity (monthly effluent concentration divided by the monthly influent concentration)], shall be reported in the "MINIMUM" column under "QUALITY OR CONCENTRATION" on the DMRs.

Monthly loading is the sum of the daily loadings of a parameter divided by the number of daily loadings determined during a reporting period. The calculated monthly loading will be used to determine compliance with any maximum monthly loading limitations. Days with no discharge shall not be used to determine the value. When required by the permit, report the calculated monthly loading in the "AVERAGE" column under "QUANTITY OR LOADING" on the DMR.

Monthly monitoring frequency refers to a calendar month. When required by this permit, an analytical result, reading, value or observation shall be reported for that period if a discharge occurs during that period.

Municipal separate storm sewer means a conveyance or system of conveyances designed or used for collecting or conveying storm water which is not a combined sewer and which is not part of a POTW as defined in the Code of Federal Regulations at 40 CFR 122.2.

PART II

Section A. Definitions

Municipal separate storm sewer system (MS4) means all separate storm sewers that are owned or operated by the United States, a state, city, village, township, county, district, association, or other public body created by or pursuant to state law, having jurisdiction over disposal of sewage, industrial wastes, storm water, or other wastes, including special districts under state law, such as a sewer district, flood control district, or drainage district, or similar entity, or a designated or approved management agency under Section 208 of the Clean Water Act that discharges to the waters of the state. This term includes systems similar to separate storm sewer systems in municipalities, such as systems at military bases, large hospital or prison complexes, and highways and other thoroughfares. The term does not include separate storm sewers in very discrete areas, such as individual buildings.

National Pretreatment Standards are the regulations promulgated by or to be promulgated by the Federal Environmental Protection Agency pursuant to Section 307(b) and (c) of the Clean Water Act. The standards establish nationwide limits for specific industrial categories for discharge to a POTW.

No observed adverse effect level (NOAEL) means the highest tested dose or concentration of a substance which results in no observed adverse effect in exposed test organisms where higher doses or concentrations result in an adverse effect.

Noncontact cooling water is water used for cooling which does not come into direct contact with any raw material, intermediate product, by-product, waste product or finished product.

Nondomestic user is any discharger to a POTW that discharges wastes other than or in addition to water-carried wastes from toilet, kitchen, laundry, bathing or other facilities used for household purposes.

Nonstructural controls are practices or procedures implemented by employees at a facility to manage storm water or to prevent contamination of storm water.

NPDES means National Pollutant Discharge Elimination System.

Outfall is the location at which a point source discharge first enters a surface water of the state.

Part 91 agency means an agency that is designated by a county board of commissioners pursuant to the provisions of Section 9105 of Part 91 of the NREPA; an agency that is designated by a city, village, or township in accordance with the provisions of Section 9106 of Part 91 of the NREPA; or the Department for soil erosion and sedimentation control activities under Part 615, Supervisor of Wells; Part 631, Reclamation of Mining Lands; or Part 632, Nonferrous Metallic Mineral Mining, of the NREPA, pursuant to the provisions of Section 9115 of Part 91 of the NREPA.

Part 91 permit means a soil erosion and sedimentation control permit issued by a Part 91 agency pursuant to the provisions of Part 91 of the NREPA.

Partially treated sewage is any sewage, sewage and storm water, or sewage and wastewater, from domestic or industrial sources that is treated to a level less than that required by the permittee's NPDES permit, or that is not treated to national secondary treatment standards for wastewater, including discharges to surface waters from retention treatment facilities.

Point of discharge is the location of a point source discharge where storm water is discharged directly into a separate storm sewer system.

Point source discharge means a discharge from any discernible, confined, discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, or rolling stock. Changing the surface of land or establishing grading patterns on land will result in a point source discharge where the storm water from the site is ultimately discharged to waters of the state.

Polluting material means any material, in solid or liquid form, identified as a polluting material under the Part 5 Rules, Spillage of Oil and Polluting Materials, promulgated under Part 31 of the NREPA (R 324.2001 through R 324.2009 of the Michigan Administrative Code).

PART II

Section A. Definitions

Portable Industrial Facility means a facility that is engaged in regulated industrial activity (e.g. concrete batch plants, asphalt plants, aggregate crushing plants, etc.) however it does not have a permanent fixed location and is designed to be moved and operated at various locations.

POTW is a publicly owned treatment work.

Predevelopment is the last land use prior to the planned new development or redevelopment.

Pretreatment is reducing the amount of pollutants, eliminating pollutants, or altering the nature of pollutant properties to a less harmful state prior to discharge into a public sewer. The reduction or alteration can be by physical, chemical, or biological processes, process changes, or by other means. Dilution is not considered pretreatment unless expressly authorized by an applicable National Pretreatment Standard for a particular industrial category.

Public (as used in the MS4 individual permit) means all persons who potentially could affect the authorized storm water discharges, including, but not limited to, residents, visitors to the area, public employees, businesses, industries, and construction contractors and developers.

Public body means the United States; the state of Michigan; a city, village, township, county, school district, public college or university, or single-purpose governmental agency; or any other body which is created by federal or state statute or law.

Qualified Personnel means an individual who meets qualifications acceptable to the Department and who is authorized by an Industrial Storm Water Certified Operator to collect the storm water sample.

Qualifying storm event means a storm event causing greater than 0.1 inch of rainfall and occurring at least 72 hours after the previous measurable storm event that also caused greater than 0.1 inch of rainfall. Upon request, the Department may approve an alternate definition meeting the condition of a qualifying storm event.

Quantification level means the measurement of the concentration of a contaminant obtained by using a specified laboratory procedure calculated at a specified concentration above the detection level. It is considered the lowest concentration at which a particular contaminant can be quantitatively measured using a specified laboratory procedure for monitoring of the contaminant.

Quarterly monitoring frequency refers to a three month period, defined as January through March, April through June, July through September, and October through December. When required by this permit, an analytical result, reading, value or observation shall be reported for that period if a discharge occurs during that period.

Regional Administrator is the Region 5 Administrator, U.S. EPA, located at R-19J, 77 W. Jackson Blvd., Chicago, Illinois 60604.

Regulated area means the permittee's urbanized area, where urbanized area is defined as a place and its adjacent densely-populated territory that together have a minimum population of 50,000 people as defined by the United States Bureau of the Census and as determined by the latest available decennial census.

Secondary containment structure means a unit, other than the primary container, in which significant materials are packaged or held, which is required by state or federal law to prevent the escape of significant materials by gravity into sewers, drains, or otherwise directly or indirectly into any sewer system or to the surface waters or groundwaters of the state.

Separate storm sewer system means a system of drainage, including, but not limited to, roads, catch basins, curbs, gutters, parking lots, ditches, conduits, pumping devices, or man-made channels, which is not a combined sewer where storm water mixes with sanitary wastes, and is not part of a POTW.

PART II

Section A. Definitions

Significant industrial user is a nondomestic user that: 1) is subject to Categorical Pretreatment Standards under 40 CFR 403.6 and 40 CFR Chapter I, Subchapter N; or 2) discharges an average of 25,000 gallons per day or more of process wastewater to a POTW (excluding sanitary, noncontact cooling and boiler blowdown wastewater); contributes a process waste stream which makes up five (5) percent or more of the average dry weather hydraulic or organic capacity of the POTW treatment plant; or is designated as such by the permittee as defined in 40 CFR 403.12(a) on the basis that the industrial user has a reasonable potential for adversely affecting the POTW's treatment plant operation or violating any pretreatment standard or requirement (in accordance with 40 CFR 403.8(f)(6)).

Significant materials means any material which could degrade or impair water quality, including but not limited to: raw materials; fuels; solvents, detergents, and plastic pellets; finished materials such as metallic products; hazardous substances designated under Section 101(14) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (see 40 CFR 372.65); any chemical the facility is required to report pursuant to Section 313 of Emergency Planning and Community Right-to-Know Act (EPCRA); polluting materials as identified under the Part 5 Rules (R 324.2001 through R 324.2009 of the Michigan Administrative Code); Hazardous Wastes as defined in Part 111, Hazardous Waste Management, of the NREPA; fertilizers; pesticides; and waste products such as ashes, slag, and sludge that have the potential to be released with storm water discharges.

Significant spills and significant leaks means any release of a polluting material reportable under the Part 5 Rules (R 324.2001 through R 324.2009 of the Michigan Administrative Code).

Significant release means any release of a significant material from the facility to surface waters of the state or to a separate storm sewer system in excess of the effluent limitations set forth under this permit.

Special-use area means storm water discharges for which the Department has determined that additional monitoring is needed from: secondary containment structures required by state or federal law; lands on Michigan's List of Sites of Environmental Contamination pursuant to Part 201, Environmental Remediation, of the NREPA; and/or areas with other activities that may contribute pollutants to the storm water.

Stoichiometric means the quantity of a reagent calculated to be necessary and sufficient for a given chemical reaction.

Storm water means storm water runoff, snow melt runoff, surface runoff and drainage, and non-storm water included under the conditions of this permit.

Storm water discharge point is the location where the point source discharge of storm water is directed to surface waters of the state or to a separate storm sewer. It includes the location of all point source discharges where storm water exits the facility, including *outfalls* which discharge directly to surface waters of the state, and *points of discharge* which discharge directly into separate storm sewer systems.

Structural controls are physical features or structures used at a facility to manage or treat storm water.

SWPPP means the Storm Water Pollution Prevention Plan prepared in accordance with this permit.

Tier I value means a value for aquatic life, human health or wildlife calculated under R 323.1057 of the Water Quality Standards using a tier I toxicity database.

Tier II value means a value for aquatic life, human health or wildlife calculated under R 323.1057 of the Water Quality Standards using a tier II toxicity database.

Total maximum daily loads (TMDLs) are required by the Clean Water Act for waterbodies that do not meet water quality standards. TMDLs represent the maximum daily load of a pollutant that a waterbody can assimilate and meet water quality standards, and an allocation of that load among point sources, nonpoint sources, and a margin of safety.

PART II

Section A. Definitions

Toxicity reduction evaluation (TRE) means a site-specific study conducted in a stepwise process designed to identify the causative agents of effluent toxicity, isolate the sources of toxicity, evaluate the effectiveness of toxicity control options, and then confirm the reduction in effluent toxicity.

Water Quality Standards means the Part 4 Water Quality Standards promulgated pursuant to Part 31 of the NREPA, being R 323.1041 through R 323.1117 of the Michigan Administrative Code.

Weekly monitoring frequency refers to a calendar week which begins on Sunday and ends on Saturday. When required by this permit, an analytical result, reading, value or observation shall be reported for that period if a discharge occurs during that period.

WWSL is a wastewater stabilization lagoon.

WWSL discharge event is a discrete occurrence during which effluent is discharged to the surface water up to 10 days of a consecutive 14-day period.

3-portion composite sample is a sample consisting of three equal-volume grab samples collected at equal intervals over an 8-hour period.

7-day concentration
FOR WWSLs THAT COLLECT AND STORE WASTEWATER AND ARE AUTHORIZED TO DISCHARGE ONLY IN THE SPRING AND/OR FALL ON AN INTERMITTENT BASIS – The 7-day concentration is the sum of the daily concentrations determined during any 7 consecutive days of discharge during a WWSL discharge event divided by the number of daily concentrations determined. If the number of daily concentrations determined during the WWSL discharge event is less than 7 days, the number of actual daily concentrations determined shall be used for the calculation. The calculated 7-day concentration will be used to determine compliance with any maximum 7-day concentration limitations. When required by the permit, report the maximum calculated 7-day concentration for the WWSL discharge event in the "MAXIMUM" column under "QUALITY OR CONCENTRATION" on the DMR. If the WWSL discharge event was partially in each of two months, the value shall be reported on the DMR of the month in which the last day of discharge occurred.

FOR ALL OTHER DISCHARGES – The 7-day concentration is the sum of the daily concentrations determined during any 7 consecutive days in a reporting month divided by the number of daily concentrations determined. If the number of daily concentrations determined is less than 7, the actual number of daily concentrations determined shall be used for the calculation. The calculated 7-day concentration will be used to determine compliance with any maximum 7-day concentration limitations in the reporting month. When required by the permit, report the maximum calculated 7-day concentration for the month in the "MAXIMUM" column under "QUALITY OR CONCENTRATION" on the DMR. The first 7-day calculation shall be made on day 7 of the reporting month, and the last calculation shall be made on the last day of the reporting month.

PART II

Section A. Definitions

7-day loading
FOR WWSLs THAT COLLECT AND STORE WASTEWATER AND ARE AUTHORIZED TO DISCHARGE ONLY IN THE SPRING AND/OR FALL ON AN INTERMITTENT BASIS – The 7-day loading is the sum of the daily loadings determined during any 7 consecutive days of discharge during a WWSL discharge event divided by the number of daily loadings determined. If the number of daily loadings determined during the WWSL discharge event is less than 7 days, the number of actual daily loadings determined shall be used for the calculation. The calculated 7-day loading will be used to determine compliance with any maximum 7-day loading limitations. When required by the permit, report the maximum calculated 7-day loading for the WWSL discharge event in the "MAXIMUM" column under "QUANTITY OR LOADING" on the DMR. If the WWSL discharge event was partially in each of two months, the value shall be reported on the DMR of the month in which the last day of discharge occurred.

FOR ALL OTHER DISCHARGES – The 7-day loading is the sum of the daily loadings determined during any 7 consecutive days in a reporting month divided by the number of daily loadings determined. If the number of daily loadings determined is less than 7, the actual number of daily loadings determined shall be used for the calculation. The calculated 7-day loading will be used to determine compliance with any maximum 7-day loading limitations in the reporting month. When required by the permit, report the maximum calculated 7-day loading for the month in the "MAXIMUM" column under "QUANTITY OR LOADING" on the DMR. The first 7-day calculation shall be made on day 7 of the reporting month, and the last calculation shall be made on the last day of the reporting month.

24-hour composite sample is a flow-proportioned composite sample consisting of hourly or more frequent portions that are taken over a 24-hour period. A time-proportioned composite sample may be used upon approval of the Department if the permittee demonstrates it is representative of the discharge.

PART II

Section B. Monitoring Procedures

1. Representative Samples

Samples and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge.

2. Test Procedures

Test procedures for the analysis of pollutants shall conform to regulations promulgated pursuant to Section 304(h) of the Federal Act (40 CFR Part 136 – Guidelines Establishing Test Procedures for the Analysis of Pollutants), unless specified otherwise in this permit. **Test procedures used shall be sufficiently sensitive to determine compliance with applicable effluent limitations.** For lists of approved test methods, see the following website: https://www.epa.gov/cwa-methods. Requests to use test procedures not promulgated under 40 CFR Part 136 for pollutant monitoring required by this permit shall be made in accordance with the Alternate Test Procedures regulations specified in 40 CFR 136.4. These requests shall be submitted to the Manager of the Permits Section, Water Resources Division, Michigan Department of Environment, Great Lakes, and Energy, P.O. Box 30458, Lansing, Michigan, 48909-7958. The permittee may use such procedures upon approval.

The permittee shall periodically calibrate and perform maintenance procedures on all analytical instrumentation at intervals to ensure accuracy of measurements. The calibration and maintenance shall be performed as part of the permittee's laboratory Quality Control/Quality Assurance program.

3. Instrumentation

The permittee shall periodically calibrate and perform maintenance procedures on all monitoring instrumentation at intervals to ensure accuracy of measurements.

4. Recording Results

For each measurement or sample taken pursuant to the requirements of this permit, the permittee shall record the following information: 1) the exact place, date, and time of measurement or sampling; 2) the person(s) who performed the measurement or sample collection; 3) the dates the analyses were performed; 4) the person(s) who performed the analyses; 5) the analytical techniques or methods used; 6) the date of and person responsible for equipment calibration; and 7) the results of all required analyses.

5. Records Retention

All records and information resulting from the monitoring activities required by this permit including all records of analyses performed and calibration and maintenance of instrumentation and recordings from continuous monitoring instrumentation shall be retained for a minimum of three (3) years, or longer if requested by the Regional Administrator or the Department.

PART II

Section C. Reporting Requirements

1. Start-up Notification

If the permittee will not discharge during the first 60 days following the effective date of this permit, the permittee shall notify the Department within 14 days following the effective date of this permit, and then 60 days prior to the commencement of the discharge.

2. Submittal Requirements for Self-Monitoring Data

Part 31 of the NREPA (specifically Section 324.3110(7)); and R 323.2155(2) of Part 21, Wastewater Discharge Permits, promulgated under Part 31 of the NREPA, allow the Department to specify the forms to be utilized for reporting the required self-monitoring data. Unless instructed on the effluent limitations page to conduct "Retained Self-Monitoring," the permittee shall submit self-monitoring data via the Department's MiWaters system.

The permittee shall utilize the information provided on the MiWaters website, located at https://miwaters.deq.state.mi.us, to access and submit the electronic forms. Both monthly summary and daily data shall be submitted to the Department no later than the 20th day of the month following each month of the authorized discharge period(s). The permittee may be allowed to submit the electronic forms after this date if the Department has granted an extension to the submittal date.

3. Retained Self-Monitoring Requirements

If instructed on the effluent limits page (or otherwise authorized by the Department in accordance with the provisions of this permit) to conduct retained self-monitoring, the permittee shall maintain a year-to-date log of retained self-monitoring results and, upon request, provide such log for inspection to the staff of the Department. Retained self-monitoring results are public information and shall be promptly provided to the public upon request.

The permittee shall certify, in writing, to the Department, on or before January 10th (April 1st for animal feeding operation facilities) of each year, that: 1) all retained self-monitoring requirements have been complied with and a year-to-date log has been maintained; and 2) the application on which this permit is based still accurately describes the discharge. With this annual certification, the permittee shall submit a summary of the previous year's monitoring data. The summary shall include maximum values for samples to be reported as daily maximums and/or monthly maximums and minimum values for any daily minimum samples.

Retained self-monitoring may be denied to a permittee by notification in writing from the Department. In such cases, the permittee shall submit self-monitoring data in accordance with Part II.C.2., above. Such a denial may be rescinded by the Department upon written notification to the permittee. Reissuance or modification of this permit or reissuance or modification of an individual permittee's authorization to discharge shall not affect previous approval or denial for retained self-monitoring unless the Department provides notification in writing to the permittee.

4. Additional Monitoring by Permittee

If the permittee monitors any pollutant at the location(s) designated herein more frequently than required by this permit, using approved analytical methods as specified above, the results of such monitoring shall be included in the calculation and reporting of the values required in the Discharge Monitoring Report. Such increased frequency shall also be indicated.

Monitoring required pursuant to Part 41 of the NREPA or Rule 35 of the Mobile Home Park Commission Act (Act 96 of the Public Acts of 1987) for assurance of proper facility operation shall be submitted as required by the Department.

PART II

Section C. Reporting Requirements

5. Compliance Dates Notification

Within 14 days of every compliance date specified in this permit, the permittee shall submit a *written* notification to the Department indicating whether or not the particular requirement was accomplished. If the requirement was not accomplished, the notification shall include an explanation of the failure to accomplish the requirement, actions taken or planned by the permittee to correct the situation, and an estimate of when the requirement will be accomplished. If a written report is required to be submitted by a specified date and the permittee accomplishes this, a separate written notification is not required.

6. Noncompliance Notification

Compliance with all applicable requirements set forth in the Clean Water Act, Parts 31 and 41 of the NREPA, and related regulations and rules is required. All instances of noncompliance shall be reported as follows:

a. 24-Hour Reporting
Any noncompliance which may endanger health or the environment (including maximum and/or minimum daily concentration discharge limitation exceedances) shall be reported, verbally, within 24 hours from the time the permittee becomes aware of the noncompliance. A written submission shall also be provided within five (5) days.

b. Other Reporting
The permittee shall report, in writing, all other instances of noncompliance not described in a. above at the time monitoring reports are submitted; or, in the case of retained self-monitoring, within five (5) days from the time the permittee becomes aware of the noncompliance.

Written reporting shall include: 1) a description of the discharge and cause of noncompliance; and 2) the period of noncompliance, including exact dates and times, or, if not yet corrected, the anticipated time the noncompliance is expected to continue, and the steps taken to reduce, eliminate and prevent recurrence of the noncomplying discharge.

7. Spill Notification

The permittee shall immediately report any release of any polluting material which occurs to the surface waters or groundwaters of the state, unless the permittee has determined that the release is not in excess of the threshold reporting quantities specified in the Part 5 Rules (R 324.2001 through R 324.2009 of the Michigan Administrative Code), by calling the Department at the number indicated on the second page of this permit (or, if this is a general permit, on the COC); or, if the notice is provided after regular working hours, call the Department's 24-hour Pollution Emergency Alerting System telephone number, 1-800-292-4706 (calls from **out-of-state** call 1-517-373-7660).

Within ten (10) days of the release, the permittee shall submit to the Department a full written explanation as to the cause of the release, the discovery of the release, response (clean-up and/or recovery) measures taken, and preventive measures taken or a schedule for completion of measures to be taken to prevent reoccurrence of similar releases.

PART II

Section C. Reporting Requirements

8. Upset Noncompliance Notification

If a process "upset" (defined as an exceptional incident in which there is unintentional and temporary noncompliance with technology based permit effluent limitations because of factors beyond the reasonable control of the permittee) has occurred, the permittee who wishes to establish the affirmative defense of upset, shall notify the Department by telephone within 24 hours of becoming aware of such conditions; and within five (5) days, provide in writing, the following information:

a. that an upset occurred and that the permittee can identify the specific cause(s) of the upset;

b. that the permitted wastewater treatment facility was, at the time, being properly operated and maintained (note that an upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation); and

c. that the permittee has specified and taken action on all responsible steps to minimize or correct any adverse impact in the environment resulting from noncompliance with this permit.

No determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review.

In any enforcement proceedings, the permittee, seeking to establish the occurrence of an upset, has the burden of proof.

9. Bypass Prohibition and Notification

a. Bypass Prohibition
Bypass is prohibited, and the Department may take an enforcement action, unless:

1) bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;

2) there were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate backup equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass; and

3) the permittee submitted notices as required under 9.b. or 9.c. below.

b. Notice of Anticipated Bypass
If the permittee knows in advance of the need for a bypass, it shall submit prior notice to the Department, if possible at least ten (10) days before the date of the bypass, and provide information about the anticipated bypass as required by the Department. The Department may approve an anticipated bypass, after considering its adverse effects, if it will meet the three (3) conditions listed in 9.a. above.

c. Notice of Unanticipated Bypass
The permittee shall submit notice to the Department of an unanticipated bypass by calling the Department at the number indicated on the second page of this permit (if the notice is provided after regular working hours, use the following number: 1-800-282-4706) as soon as possible, but no later than 24 hours from the time the permittee becomes aware of the circumstances.

PART II

Section C. Reporting Requirements

d. Written Report of Bypass
A written submission shall be provided within five (5) working days of commencing any bypass to the Department, and at additional times as directed by the Department. The written submission shall contain a description of the bypass and its cause; the period of bypass, including exact dates and times, and if the bypass has not been corrected, the anticipated time it is expected to continue; steps taken or planned to reduce, eliminate, and prevent reoccurrence of the bypass; and other information as required by the Department.

e. Bypass Not Exceeding Limitations
The permittee may allow any bypass to occur which does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance to ensure efficient operation. These bypasses are not subject to the provisions of 9.a., 9.b., 9.c., and 9.d., above. This provision does not relieve the permittee of any notification responsibilities under Part II.C.11. of this permit.

f. Definitions

1) Bypass means the intentional diversion of waste streams from any portion of a treatment facility.

2) Severe property damage means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

10. Bioaccumulative Chemicals of Concern (BCC)

Consistent with the requirements of R 323.1098 and R 323.1215 of the Michigan Administrative Code, the permittee is prohibited from undertaking any action that would result in a lowering of water quality from an increased loading of a BCC unless an increased use request and antidegradation demonstration have been submitted and approved by the Department.

11. Notification of Changes in Discharge

The permittee shall notify the Department, in writing, as soon as possible but no later than 10 days of knowing, or having reason to believe, that any activity or change has occurred or will occur which would result in the discharge of: 1) detectable levels of chemicals on the current Michigan Critical Materials Register, priority pollutants or hazardous substances set forth in 40 CFR 122.21, Appendix D, or the Pollutants of Initial Focus in the Great Lakes Water Quality Initiative specified in 40 CFR 132.6, Table 6, which were not acknowledged in the application or listed in the application at less than detectable levels; 2) detectable levels of any other chemical not listed in the application or listed at less than detection, for which the application specifically requested information; or 3) any chemical at levels greater than five times the average level reported in the complete application (see the first page of this permit, for the date(s) the complete application was submitted). Any other monitoring results obtained as a requirement of this permit shall be reported in accordance with the compliance schedules.

PART II

Section C. Reporting Requirements

12. Changes in Facility Operations

Any anticipated action or activity, including but not limited to facility expansion, production increases, or process modification, which will result in new or increased loadings of pollutants to the receiving waters must be reported to the Department by a) submission of an increased use request (application) and all information required under R 323.1098 (Antidegradation) of the Water Quality Standards or b) by notice if the following conditions are met: 1) the action or activity will not result in a change in the types of wastewater discharged or result in a greater quantity of wastewater than currently authorized by this permit; 2) the action or activity will not result in violations of the effluent limitations specified in this permit; 3) the action or activity is not prohibited by the requirements of Part II.C.10.; and 4) the action or activity will not require notification pursuant to Part II.C.11. Following such notice, the permit or, if applicable, the facility's COC may be modified according to applicable laws and rules to specify and limit any pollutant not previously limited.

13. Transfer of Ownership or Control

In the event of any change in control or ownership of facilities from which the authorized discharge emanates, the permittee shall submit to the Department 30 days prior to the actual transfer of ownership or control a written agreement between the current permittee and the new permittee containing: 1) the legal name and address of the new owner; 2) a specific date for the effective transfer of permit responsibility, coverage and liability; and 3) a certification of the continuity of or any changes in operations, wastewater discharge, or wastewater treatment.

If the new permittee is proposing changes in operations, wastewater discharge, or wastewater treatment, the Department may propose modification of this permit in accordance with applicable laws and rules.

14. Operations and Maintenance Manual

For wastewater treatment facilities that serve the public (and are thus subject to Part 41 of the NREPA), Section 4104 of Part 41 and associated Rule 2957 of the Michigan Administrative Code allow the Department to require an Operations and Maintenance (O&M) Manual from the facility. An up-to-date copy of the O&M Manual shall be kept at the facility and shall be provided to the Department upon request. The Department may review the O&M Manual in whole or in part at its discretion and require modifications to it if portions are determined to be inadequate.

At a minimum, the O&M Manual shall include the following information: permit standards; descriptions and operation information for all equipment; staffing information; laboratory requirements; record keeping requirements; a maintenance plan for equipment; an emergency operating plan; safety program information; and copies of all pertinent forms, as-built plans, and manufacturer's manuals.

Certification of the existence and accuracy of the O&M Manual shall be submitted to the Department at least sixty days prior to start-up of a new wastewater treatment facility. Recertification shall be submitted sixty days prior to start-up of any substantial improvements or modifications made to an existing wastewater treatment facility.

PART II

Section C. Reporting Requirements

15. Signatory Requirements

All applications, reports, or information submitted to the Department in accordance with the conditions of this permit and that require a signature shall be signed and certified as described in the Clean Water Act and the NREPA.

The Clean Water Act provides that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or noncompliance, shall, upon conviction, be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than 6 months per violation, or by both.

The NREPA (Section 3115(2)) provides that a person who at the time of the violation knew or should have known that he or she discharged a substance contrary to this part, or contrary to a permit, COC, or order issued or rule promulgated under this part, or who intentionally makes a false statement, representation, or certification in an application for or form pertaining to a permit or COC or in a notice or report required by the terms and conditions of an issued permit or COC, or who intentionally renders inaccurate a monitoring device or record required to be maintained by the Department, is guilty of a felony and shall be fined not less than $2,500.00 or more than $25,000.00 for each violation. The court may impose an additional fine of not more than $25,000.00 for each day during which the unlawful discharge occurred. If the conviction is for a violation committed after a first conviction of the person under this subsection, the court shall impose a fine of not less than $25,000.00 per day and not more than $50,000.00 per day of violation. Upon conviction, in addition to a fine, the court in its discretion may sentence the defendant to imprisonment for not more than 2 years or impose probation upon a person for a violation of this part. With the exception of the issuance of criminal complaints, issuance of warrants, and the holding of an arraignment, the circuit court for the county in which the violation occurred has exclusive jurisdiction. However, the person shall not be subject to the penalties of this subsection if the discharge of the effluent is in conformance with and obedient to a rule, order, permit, or COC of the Department. In addition to a fine, the attorney general may file a civil suit in a court of competent jurisdiction to recover the full value of the injuries done to the natural resources of the state and the costs of surveillance and enforcement by the state resulting from the violation.

16. Electronic Reporting

Upon notice by the Department that electronic reporting tools are available for specific reports or notifications, the permittee shall submit electronically all such reports or notifications as required by this permit, on forms provided by the Department.

PART II

Section D. Management Responsibilities

1. Duty to Comply

All discharges authorized herein shall be consistent with the terms and conditions of this permit. The discharge of any pollutant identified in this permit, more frequently than, or at a level in excess of, that authorized, shall constitute a violation of this permit.

It is the duty of the permittee to comply with all the terms and conditions of this permit. Any noncompliance with the Effluent Limitations, Special Conditions, or terms of this permit constitutes a violation of the NREPA and/or the Clean Water Act and constitutes grounds for enforcement action; for permit or Certificate of Coverage (COC) termination, revocation and reissuance, or modification; or denial of an application for permit or COC renewal.

It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

2. Operator Certification

The permittee shall have the waste treatment facilities under direct supervision of an operator certified at the appropriate level for the facility certification by the Department, as required by Sections 3110 and 4104 of the NREPA. Permittees authorized to discharge storm water shall have the storm water treatment and/or control measures under direct supervision of a storm water operator certified by the Department, as required by Section 3110 of the NREPA.

3. Facilities Operation

The permittee shall, at all times, properly operate and maintain all treatment or control facilities or systems installed or used by the permittee to achieve compliance with the terms and conditions of this permit. Proper operation and maintenance includes adequate laboratory controls and appropriate quality assurance procedures.

4. Power Failures

In order to maintain compliance with the effluent limitations of this permit and prevent unauthorized discharges, the permittee shall either:

a. provide an alternative power source sufficient to operate facilities utilized by the permittee to maintain compliance with the effluent limitations and conditions of this permit; or

b. upon the reduction, loss, or failure of one or more of the primary sources of power to facilities utilized by the permittee to maintain compliance with the effluent limitations and conditions of this permit, the permittee shall halt, reduce or otherwise control production and/or all discharge in order to maintain compliance with the effluent limitations and conditions of this permit.

5. Adverse Impact

The permittee shall take all reasonable steps to minimize or prevent any adverse impact to the surface waters or groundwaters of the state resulting from noncompliance with any effluent limitation specified in this permit including, but not limited to, such accelerated or additional monitoring as necessary to determine the nature and impact of the discharge in noncompliance.

PART II

Section D. Management Responsibilities

6. Containment Facilities

The permittee shall provide facilities for containment of any accidental losses of polluting materials in accordance with the requirements of the Part 5 Rules (R 324.2001 through R 324.2009 of the Michigan Administrative Code). For a POTW, these facilities shall be approved under Part 41 of the NREPA.

7. Waste Treatment Residues

Residuals (i.e. solids, sludges, biosolids, filter backwash, scrubber water, ash, grit, or other pollutants or wastes) removed from or resulting from treatment or control of wastewaters, including those that are generated during treatment or left over after treatment or control has ceased, shall be disposed of in an environmentally compatible manner and according to applicable laws and rules. These laws may include, but are not limited to, the NREPA, Part 31 for protection of water resources, Part 55 for air pollution control, Part 111 for hazardous waste management, Part 115 for solid waste management, Part 121 for liquid industrial wastes, Part 301 for protection of inland lakes and streams, and Part 303 for wetlands protection. Such disposal shall not result in any unlawful pollution of the air, surface waters or groundwaters of the state.

8. Right of Entry

The permittee shall allow the Department, any agent appointed by the Department, or the Regional Administrator, upon the presentation of credentials and, for animal feeding operation facilities, following appropriate biosecurity protocols:

a. to enter upon the permittee's premises where an effluent source is located or any place in which records are required to be kept under the terms and conditions of this permit; and

b. at reasonable times to have access to and copy any records required to be kept under the terms and conditions of this permit; to inspect process facilities, treatment works, monitoring methods and equipment regulated or required under this permit; and to sample any discharge of pollutants.

9. Availability of Reports

Except for data determined to be confidential under Section 308 of the Clean Water Act and Rule 2128 (R 323.2128 of the Michigan Administrative Code), all reports prepared in accordance with the terms of this permit, shall be available for public inspection at the offices of the Department and the Regional Administrator. As required by the Clean Water Act, effluent data shall not be considered confidential. Knowingly making any false statement on any such report may result in the imposition of criminal penalties as provided for in Section 309 of the Clean Water Act and Sections 3112, 3115, 4106 and 4110 of the NREPA.

10. Duty to Provide Information

The permittee shall furnish to the Department, within a reasonable time, any information which the Department may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit or the facility's COC, or to determine compliance with this permit. The permittee shall also furnish to the Department, upon request, copies of records required to be kept by this permit.

Where the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report to the Department, it shall promptly submit such facts or information.

PART II

Section E. Activities Not Authorized by This Permit

1. Discharge to the Groundwaters

This permit does not authorize any discharge to the groundwaters. Such discharge may be authorized by a groundwater discharge permit issued pursuant to the NREPA.

2. POTW Construction

This permit does not authorize or approve the construction or modification of any physical structures or facilities at a POTW. Approval for the construction or modification of any physical structures or facilities at a POTW shall be by permit issued under Part 41 of the NREPA.

3. Civil and Criminal Liability

Except as provided in permit conditions on "Bypass" (Part II.C.9. pursuant to 40 CFR 122.41(m)), nothing in this permit shall be construed to relieve the permittee from civil or criminal penalties for noncompliance, whether or not such noncompliance is due to factors beyond the permittee's control, such as accidents, equipment breakdowns, or labor disputes.

4. Oil and Hazardous Substance Liability

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee may be subject under Section 311 of the Clean Water Act except as are exempted by federal regulations.

5. State Laws

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable state law or regulation under authority preserved by Section 510 of the Clean Water Act.

6. Property Rights

The issuance of this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize violation of any federal, state or local laws or regulations, nor does it obviate the necessity of obtaining such permits, including any other Department of Environment, Great Lakes, and Energy permits, or approvals from other units of government as may be required by law.

HYDRAULIC SOILS GROUP

A		141.24 AC
B		30.83 AC
C		26.14 AC
D		19.20 AC

TOTAL PERVIOUS AREA= 219.4 AC

WATER

GRAVEL AREA:

TREE AREA:

WEST SITE IMPERVIOUS AREA: 100.51 AC

EAST SITE IMPERVIOUS AREA: 96.66 AC

TOTAL IMPERVIOUS AREA= 197.17 AC

EXCLUDED AREA EAST: 3.27 AC

EXCLUDED AREA WEST: 14.89 AC

TOTAL EXCLUDED AREA = 18.16 AC

DIVIDING DRAINAGE LINE: - - - - - - - -

WEST SITE PERVIOUS AREA: 14.39 AC

EAST SITE PERVIOUS AREA: 205.02 AC

REQUIRED EXISTING STORAGE: 4,147,360 CFT

PROVIDED DETENTION VOLUME FROM 1985 PLANS: 8,378,675 CFT

PROVIDED DETENTION VOLUME FROM SURFACE: 5,681,560 CFT

RECEIVED
JUL 08 2022
Orion Township
Planning & Zoning

REVISIONS

SITE KEY MAP

WADE TRIM

Sustainable Workplaces
"Creating places you want to be"
General Motors Company

XX.X

CATCHMENT	SUBCATCH	RUNOFF RATE
1	A	27.2
	B	62.04
2	A	73.00
	B	47.86
	C	46.71
	D	26.34
	E	45.16
3		28.40
4		73.00
5	A	72.94
	B	64.06
	C	30.53
6	A	33.26
	B	58.77
	C	36.52
7	A	204.71
	B	32.66
	C	32.5
	D	102.24
8	-	96.40
9	A	27.19
	B	29.00
	C	26.06
	D	27.50
	E	27.26
10	A	1.46
	B	30.49
11	A	42.06
	C	90.98
	D	26.34
12	A	69.04
	C	25.44
	H	92.35
13	-	25.98
14	A	57.46
	D	30.67
15	-	66.17
16	A	37.28
	B	92.68
	C	25.60
	D	8.83
17	-	112.81
18	-	54.00
19	-	108.9
20	-	6.95
21	-	14.04
22	-	14.34
23	-	97.5
24	-	127.93

REVISIONS

SITE KEY MAP

WADE TRIM

Sustainable Workplaces
"Creating places you want to be"
General Motors Company

GM UNION ASSEMBLY
4555 GIDDINGS RD
ORION TWP, MI 48359
Site ID: 1905

Structure ID: 05187
Level

BET EXPANSION

PROPOSED DRAINAGE EXHIBIT

DRAWN: M. GRIFFIN	JOB NO: 90247
CHECKED: R. YANCHO	SHEET NUMBER
SCALE: AS NOTED	
DATE: 07.01.2022	

ATTACHMENT I

Stormwater runoff from the proposed GM plant site will be directed to two retention basins sized to hold two consecutive 50-year rains. The proposed total basin capacity is 9,000,000 cubic feet, based on 100% runoff from 200 acres of hard surface (roof, parking lots, roads) and 35% runoff from 240 acres (unpaved areas). The basins will be equipped with skimmers to renove floating oil. The retention pond water will be monitored for pH and conductivity prior to discharge. The basins will be clay-lined to prevent bottom leakage and thereby ensure that the rate of discharge from the basins can be controlled.

An additional retention basin will be located by Oakland County in the Detroit Edison Power easement along the western edge of the site to collect stormwater runoff from Giddings Road and portions of other roads in the immediate area. Discharge from the GM retention basins will be staged through the Oakland County retention basin. Water from the county retention basin will be discharged to the wetlands using overflow weir boxes to provide sheetflow drainage. The county retention basin will be designed to limit the maximum rate of discharge to 12 CFS and thereby prevent any increase in the water level of Carpenter Lake. The timing and rate of discharge from the GM retention basins will be controlled, so that road runoff collected in the county basin will be discharged first. Water collected in the GM basins will then be released to the county basin, at a rate not to exceed 12 CFS.

Fluor Engineering & Construction
Detroit, Michigan

Project Low Pond System — Assembly Plant — Orion
Sheet No. LP-1 of ___
Job No. 5240
By LA Date 6-13-80

APPENDIX J

1. Total Drainage Area = 54.41 acres
   a) 13.18 acres paved C = 100%
   b) 41.23 acres unpaved C = 35%
   c) Ceqniv = (13.18 × 1 + 41.23 × .35) ÷ 54.41 = 0.51

2. Typical cross section thru pond looking south:

STORAGE POND SIZED FOR 100 YR - 24 HR STORM

36"ϕ CMP. M.H. W/ ORIFICE HOLES SIZED TO LIMIT Q TO MAX. 3 CFS @ PEAK STORAGE VOLUME

Low-Pond discharge pipe

MANHOLES & DISTRIBUTION PIPE FROM SITE RET'N POND

FLOODED OUTLET PIPES FROM SITE DISTRIBUTION MANHOLES. NUMBER AND SIZE TO RESTRICT FLOW TO Q = 12 TO 15 CFS

COMMON DISTRIBUTION WEIR BOX FOR SITE RET'N POND DISCHARGE AND LOW POND DISCHARGE. Q = 12 TO 18 CFS

Fleet Engineering & Construction
Detroit, Michigan

Project
Location

Sheet No. LP-2 of
Job No. 5240
By LA Date 6-13-91

APPENDIX J

3. Size pond for 100yr - 24 hr storm

$I = \frac{290}{T+31}$ $I_{24} = \frac{290}{24\times60+31} = .197$

Total Rain Fall = $24 \times I_{24} = 4.73$ inches

Storage Volume = $\frac{4.73}{12} \times 54.41 \text{ acres} \times 43560 \times 0.51$

$V_S = 476,449 = \underline{480,000 \text{ CF}}$

4. Try 3 ponds w/ culvert cross-connections @ Edison Towers located in central wetlands

Low water = 1000 High Water = 1006 H = 6'

T/Berms = 1008

Volume Calculation:

South Pond: $275\times65\times6 + 2(275+65)\frac{6\times18}{2}$

$= 143,970$ C.F.

Center Pond: $= 410\times66\times6 + 2(410+66)\frac{6\times18}{2}$

$= 213,768$ C.F.

North Pond: $= 306\times73\times6 + 2(306+73)\frac{6\times18}{2}$

$= 174,960$ C.F.

TOTAL VOLUME = $\underline{532,700 \text{ C.F.}}$

Project Low Pond System — Assembly Plant — Orion — Sheet No. LP-3 of ___ — Job No. 52 AO — By LA — Date 6-13-80

Plant Engineering & Construction — Detroit, Michigan

APPENDIX J

5. Calculate orifice size (Total) and Qmax for 96 hour discharge

Refer to Erosion & Sediment Control Design Manual by Oakland County Drain Commission

$Q = CA\sqrt{2GH}$ $C = 0.625$ A = Total area of orifices

A_m = Mean Area = $\frac{V}{H_w} = \frac{480000\ C.F.}{6} = 80,000$

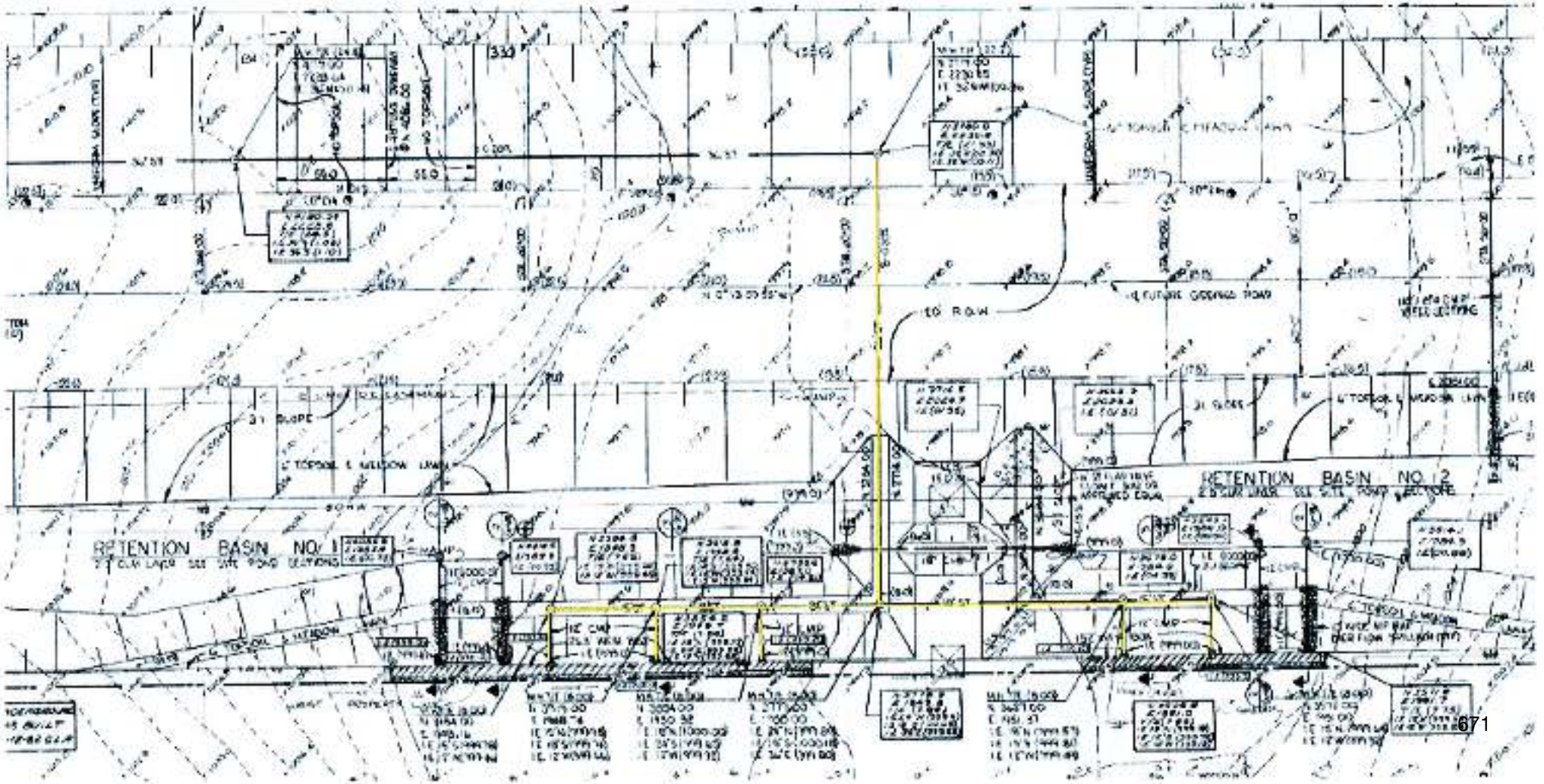
$A = \frac{.3988\ A_m \sqrt{H_w}}{T}$

$A = \frac{.3988 \times 80,000\sqrt{6}}{96 \times 60 \times 60 \text{ sec}} = 0.227$ S.F.

$Q_{max} = CA\sqrt{2GH}$

$= 0.625 \times .227\sqrt{64.4 \times 6}$

$Q_{max} = 2.79$ CFS



As-Built of Existing Discharge Piping for GM Detention Basins

RECORD DESCRIPTION

Parcel 1:

Part of Section 34 and also a part of the Northwest 1/4 of Section 35, Town 4 North, Range 10 East, Orion Township, Oakland County, Michigan, and described as:
Beginning at the Northeast corner of Section 34;
thence North 89°58'06" East, 27.10 feet along the North line of Section 35;
thence South 00°39'24" West, 2636.66 feet;
thence North 89°10'33" West, 1.00 feet to the East 1/4 corner of Section 34;
thence South 00°05'42" West, 2646.09 feet to the Southeast corner of Section 34;
thence South 89°37'48" West, 2724.09 feet along the South line of Section 34 to the South 1/4 corner of Section 34;
thence South 89°49'54" West, 1340.83 feet along the South line of Section 34;
thence North 00°24'56" West, 5285.11 feet to a point in the North line of Section 34;
thence South 89°53'37" East, 1341.12 feet along the North line of Section 34 to the North 1/4 corner of Section 34;
thence North 89°58'06" East, 2770.95 feet along the North line of Section 34 to the Northeast corner of Section 34 and the Point of Beginning;

EXCEPTING therefrom the following described property:
Part of the Northeast 1/4 of Section 34, Town 4 North, Range 10 East, Orion Township, Oakland County, Michigan described as:
Beginning at the North 1/4 corner of Section 34;
thence North 89°58'06" East, 1475.00 feet along the North line of Section 34;
thence South 00°32'06" West, 889.51 feet;
thence South 89°58'06" West, 1461.18 feet to a point on the North and South 1/4 line of Section 34; thence North 00°24'47" West, 889.89 feet along the North and South 1/4 line of Section 34 to the Point of Beginning and North 1/4 corner of Section 34.

EXCEPTING therefrom the following described property:
That part of the Southeast 1/4 of Section 34, Township 4 North, Range 10 East, Orion Township, Oakland County, Michigan, described as:
Commencing at the Southeast corner of said Section 34;
thence North 00°05'42" East 80.00 feet to the Point of Beginning;
thence South 89°37'48" West 450.0 feet;
thence North 00°05'42" East 325.0 feet;
thence North 89°37'48" East 450.0 feet;
thence South 00°05'42" West 325.0 feet to the Point of Beginning.

Parcel B:
Part of the Northeast 1/4 of Section 34, Town 4 North, Range 10 East, Orion Township, Oakland County, Michigan described as:
Beginning at the North 1/4 corner of Section 34;
thence North 89°58'06" East, 1475.00 feet along the North line of Section 34;
thence South 00°32'06" West, 889.51 feet;
thence South 89°58'06" West, 1461.18 feet to a point on the North and South 1/4 line of Section 34; thence North 00°24'47" West, 889.89 feet along the North and South 1/4 line of Section 34 to the Point of Beginning and North 1/4 corner of Section 34.

EXCEPT
that part deeded to Oakland County for road purposes as recorded in Liber 8050, Page 280 described as:
Part of Section 34 and also part of the Northwest 1/4 of Section 35, Town 4 North, Range 10 East, Orion Township, Oakland County, Michigan described as beginning at the Northeast corner of Section 34;
thence North 89°58'06" East, 27.10 feet along the North line of Section 35;
thence South 00°39'24" West, 60.01 feet;
thence South 89°58'06" West, 2826.22 feet;
thence South 87°08'28" West, 240.93 feet to the beginning of a non-tangent curve concave to the Southeast having a radius of 758.51 feet and a long chord which bears South 44°52'34" West, 898.35 feet;
thence Southwesterly 952.21 feet along said curve;
thence South 02°38'42" West, 240.93 feet;
thence South 00°17'56" East, 3073.40 feet;
thence South 01°47'51" East, 322.47 feet;
thence South 46°10'06" East, 251.43 feet to the beginning of a non-tangent curve concave to the Northeast having a radius of 740.00 feet and a long chord which bears South 84°41'40" East, 141.14 feet;
thence Easterly 141.35 feet along said curve;
thence North 89°49'54" East, 705.48 feet;
thence North 89°37'48" East, 2724.82 feet;
thence South 00°05'42" West, 80.00 feet to the Southeast corner of Section 34;
thence South 89°37'48" West, 2724.09 feet along the South line of Section 34 to the South 1/4 corner of Section 34;
thence South 89°49'54" West, 1340.83 feet along the South line of Section 34;
thence North 00°24'56" West, 352.04 feet;
thence North 25°18'30" East, 176.37 feet;
thence North 18°37'38" East, 179.55 feet;
thence North 08°28'41" East, 240.44 feet;
thence North 00°12'58" West, 3577.94 feet;
thence North 06°06'10" East, 92.85 feet to the beginning of a non-tangent curve concave to the Southeast having a radius of 873.51 feet and a long chord which bears North 20°49'03" East, 545.62 feet;
thence Northeasterly 553.06 feet along said curve;
thence North 41°11'03" West, 21.29 feet to the beginning of a curve concave to the Southwest having a radius of 438.22 feet and a long chord which bears North 62°15'48" West, 360.74 feet;
thence Northwesterly 371.79 feet along said curve;
thence North 89°53'37" West, 109.71 feet;
thence North 00°24'56" West, 60.00 feet to a point on the North line of Section 34;
thence South 89°53'37" East, 1341.12 feet along the North line of Section 34 to the North 1/4 corner of Section 34;
thence North 89°58'06" East, 2770.94 feet along the North line of Section 34 to the Northeast corner of Section 34 and the Point of Beginning.

EXCEPTIONS

8. Right of Way granted to Board of County Road Commissioners of the County of Oakland over the land as set forth in Liber 7330, Page 516.
- Waldon Brown Rd. ROW. Not shown.
- Item located as shown hereon.

9. Easement for ingress and egress granted to IRN Corp., a Michigan corporation and the terms conditions contained therein recorded in Liber 15840, Page 519.
- Item located as shown hereon.

10. Easement granted to Board of County Road Commissioners of the County of Oakland for the road drainage system over subject property as contained in Liber 5154, Page 347.
- Eight easements located as shown hereon.

11. Easement granted to the County of Oakland for sewer line as recorded in Liber 6067, Page 104.
- Item located as shown hereon.

12. Easement granted to Charter Township of Orion for water supply as recorded in Liber 10211, Page 762 and in Liber 10211, Page 767.
- Item located as shown hereon.

14. Memorandum of Solar Power Site License agreement dated October 28, 2011 and recorded June 21, 2017 in Liber 50785, Page 733.
- Item located as shown hereon.

SURVEYOR'S NOTES

This survey is based on Information of Title Report issued by Title Source, INC., Order No. [illegible], Effective Date August 1, 2017 at 8:00 a.m.

The bearing of [illegible] along the North line of Section 34 as contained in record description was used as the basis of bearings.

PARCEL AREA

[illegible]

LOCATION MAP

SURVEYOR'S CERTIFICATION

CERTIFICATION
I hereby certify that I have surveyed and mapped the land above platted and described on August [illegible], 2017 [illegible]

Derek Koeski, P.S. #[illegible]
Professional Surveyor

RECEIVED
JUL 06 2022
Orion Township
Planning & Zoning

BOUNDARY SURVEY

MICHIGAN SURVEYING, INC.
37637 Five Mile Rd., Suite 364, Livonia, MI 48154
tel. (734) 542-9088, fax (734) 799-5737
www.MichiganSurveying.com

JOB No.: 17-1522 Sheet: 1 OF 2

672

GENERAL MOTORS LLC
4555 GODDINGS RD.
ORION TWP., MI 48359

PARCEL 1

EXCEPTION 1
& PARCEL II

EXCEPTION 2

EXCEPTION 3

PID: 09-34-200-006

PID: 09-34-400-011

GODDINGS RD. (VARIABLE WIDTH) PUBLIC

DELTA CT. - PUBLIC

LIBERTY DRIVE
SOUTH - PUBLIC

BROWN RD. (66' WD.) N 1/2 PUBLIC

LEGEND

BOUNDARY SURVEY

MICHIGAN SURVEYING, INC.
30637 Five Mile Rd., Suite 364, Livonia, MI 48154
ph. (734) 542-9098, fax (734) 798-6737
www.MichiganSurveying.com

Charter Township of Orion
Planning & Zoning Department
2323 Joslyn Rd., Lake Orion MI 48360
P: (248) 391-0304 ext. 5000; Fax (248) 391-1454

TO: The Charter Township of Orion Planning Commission

FROM: Tammy Girling, Planning & Zoning Director

DATE: July 28, 2022

RE: PC-22-29 Baldwin Village PUD Concept and Eligibility Plan

As requested, I am providing a suggested motion for the matter mentioned above. Please feel free to modify the language. The verbiage below could change based upon the Planning Commissions' findings of facts. Any additional findings of facts should be added to the motion below. Please note that it was suggested to me that on matters that involve rezonings, PUD's, Special Land Uses, or variances, that I provide language indicating that the matter can be **approved, denied or postponed**.

Planned Unit Development (Ordinance #78, Section 30.03)

Motion 1: I move that the Planning Commission forwards a recommendation to the Township Board to **approve/deny** PC-22-29 Baldwin Village PUD Concept and Eligibility Plan, located at located at 4410 & 4408 S. Baldwin Rd. (parcel 09-32-301-001), an unaddressed parcel 09-32-301-014 located at the NW corner of Morgan and S. Baldwin Roads, an unaddressed parcel 09-32-151-020 located north of 4408 S. Baldwin, and 4292 S. Baldwin (parcel 09-32-151-021) for plans date stamped received July 7, 2022. This recommendation to **approve/deny** is based on the following findings of facts:

That the applicant **has/has not** met the following eligibility criteria of Section 30.03(B) of the Township Zoning Ordinance and **has/has not** met the intent of a PUD as stated in 30.03A of the Township Zoning Ordinance:

A. Recognizable Benefit
* How will a PUD approval result in a recognizable and substantial benefit to the ultimate users of the project and the community (insert findings of fact)
* How would such benefit otherwise be unfeasible or unlikely to be achieved (Insert findings of facts),

B Density Impact
* Will the proposed type and density of use result in a material increase in the use of public services, facilities and utilities, in relation to what would be permitted if the property were developed without using the PUD (Insert findings of facts),
* Will the proposed PUD place an unreasonable burden upon the subject and/or surrounding land and/or property owners and occupants/or the natural features (Insert findings of facts),

C. Township Master Plan
* Will the proposed development be consistent with the intent and spirit of the Master Plan and community (Insert finding of facts),

D. Economic Impact
* Will the proposed PUD result in an unreasonable negative economic

impact upon surrounding properties in relation to the economic impact that would occur from a more traditional development (Insert finding of facts),

E. Guaranteed Open Space
* Does the proposed PUD contain at least as much usable open space as would be required in the Ordinance for the most dominant use in the development (Insert findings of facts),

F. Unified Control
* Is the proposed PUD under single ownership or control such that there is a single person or entity having responsibility for completing the project with this Ordinance (insert findings of facts)

If Recommendation to Approve:
This recommendation is subject to the following conditions:

A. (Motion maker to list any unresolved issues related to the Township Planner's review letter).
B. (Motion maker to list any unresolved issues related to the Township Engineer's review letter).
C. (Motion maker to list any additional conditions).

Or

I move that the Planning Commission **postpone** action on PC-22-29 Baldwin Village PUD Concept and Eligibility Plan, located at located at 4410 & 4408 S. Baldwin Rd. (parcel 09-32-301-001), an unaddressed parcel 09-32-301-014 located at the NW corner of Morgan and S. Baldwin Roads, an unaddressed parcel 09-32-151-020 located north of 4408 S. Baldwin, and 4292 S. Baldwin (parcel 09-32-151-021) for plans date stamped received July 7, 2022 for the following reasons (insert findings of facts).

July 27, 2022

RECEIVED
JUL 27 2022
Orion Township
Planning & Zoning

Scott Reynolds, Planning Commission Chairperson
CHARTER TOWNSHIP OF ORION
2323 Joslyn Road
Lake Orion, MI 48360

RE: Baldwin Village PUD, PC-22-29
Concept PUD Review #1, rev1

Received: July 26, 2022, by Orion Township

Dear Mr. Reynolds:

We have completed our review of the Baldwin Village Concept PUD plan set. The plans, dated July 6, 2022, and July 20, 2022, were prepared by Stonefield Engineering & Design (commercial) and AEW, Inc. (residential) and were reviewed with respect to the Township's Zoning Ordinance, No. 78, Stormwater Management and Soil Erosion & Sedimentation Control Ordinance, No. 139, and the Township's Engineering Standards.

EXISTING SITE CONDITIONS:

The site is located on the west side of Baldwin Rd. opposite Judah Rd, within the western ½ of Section 32 of the Charter Township of Orion. The site has three different zonings. The majority of the site is zoned Suburban Farms (SF), with the exception of a small portion in the north which is zoned Single-Family Residential (R-1), and a parcel that is located at the intersection of Morgan and Baldwin zoned Brown Rd. Innovation Zone (BIZ). The site is located at the southern end of the Gingellville Village Center Overlay District. The site is bound by parcels to the north zoned Multiple-Family Residential (RM-1) and Single Family Residential (R-2), to the west by parcels zoned Planned Unit Development (PUD) and Single Family Residential (R-1), to the south zoned General Business (GB), and to the east zoned Restricted Business (RB), Office and Professional (OP), and Brown Rd. Innovation Zone (BIZ).

The site is 63.30 acres in total. The existing site is undeveloped and appears to be heavily wooded with the exception of a large water body and some dirt access trails. The applicant is proposing a mixed-use for the site, attributing 47.67 net acres (~75.3% of total site) toward residential use and 11.87 net acres (~18.8% of total site) toward commercial use. The commercial portion of the proposed site contains two (2) multi-tenant buildings (7,520 square-feet each), a car wash (4,905 square-feet), a restaurant with drive-thru (4,978 square-feet), and a grocery store (44,254 square-feet). The residential portion of the site is broken up into three (3) sections that all meet at a roundabout intersection in the middle of the site. The north exit on the roundabout leads to the Uptown Village, which is comprised eleven (11) Multi-Family buildings totaling 304 units. These three-story buildings range from 19 to 38 units per building. The western exit on the roundabout leads to the North Village, which contains fourteen (14) townhouses totaling 77 units. These two-story buildings range from between three (3) and eight (8) units per building. The southern exit on the roundabout leads to the South Village which contains twelve (12) townhouses, and seven (7) single-family attached buildings, totaling 82 units. These buildings range between two (2) and eight (8) units in size each.

Along with the proposed residential and commercial development, the applicant is proposing several features for public benefit, including a small pocket park and pond with fountains in the northeast corner of the site. On the west side of the site, there is a proposed Nature Preserve, trail system, and pathway connection to the Cottages at Gregory Meadows. The Nature Preserve area appears to be the existing protected wetland

OHM Advisors
1827 NORTH SQUIRREL ROAD
AUBURN HILLS, MICHIGAN 48326
T 248.751.3100
F 248.364.3001
OHM-Advisors.com

DENSITY PLAN:
A Parallel Plan was included in the revised plan set using the Gingellville Village Overlay District and the Brown Road Industrial Zone (BIZ) District. The plan includes 28 multifamily buildings, 24 units each or a total of 672 residential units in addition to 115,000 sf of commercial. The proposed driveways off Baldwin Road appear to be the same as shown on the Concept PUD. The drives and road network loops through the site and provides a cul-de-sac at the end of the only dead-end street. The larger main wetland on-site is shown with the required 25-foot buffer and does not appear to be impacted. The two smaller wetlands are proposed to be filled similar to the Concept PUD. Adequate room has been set aside for storm water management assuming the southern commercial building will have underground storage. We defer further comment on the Density Plan requirements to the Township Planning Consultant.

WATER MAIN & SANITARY SEWER:
There is existing 16-inch water main located along the west side of Baldwin Rd. For the commercial portion of the proposed site, the applicant is proposing a small looped connection with long dead-ends extending from it to serve as hydrant coverage. Dead-end hydrant lengths and sizing shall meet Township Standards. For the residential portion, the water main appears to have three connection points. One at the boulevard entrance directly into the Uptown Village, one connection to the commercial water main, and another connection to the Cottages at Gregory Meadows water main via the easement located west of the site in the northwest corner. The water main connection locations shall be shown in entirety at Final PUD including a possible connection at Gingell Drive. The connection between the commercial and residential water main shall be included in both the commercial and residential plan sets. Several looped connections are provided for the Uptown, North, and South Villages and the layout appears to be generally acceptable. Gate valves appear to be provided at some tees. Gate valve and hydrant spacing will be reviewed in greater detail at Final PUD. The applicant shall ensure that gate valve and hydrant spacing meets the requirements of the Township Engineering Standards, such that in the event of a break in the main, no more than two (2) hydrants or thirty (30) units are out of service at any one time. FDC's, service leads, and utility length/material type appear to have been left out of the plans for the Concept PUD submittal and should be provided. The Township water main system appears to have sufficient capacity to serve the proposed development.

If a single water service is proposed for each of the residential buildings, meter rooms with knox boxes accessible by the Township shall be provided. The meter room requirements and knox box access needs to be coordinated with the Township DPW.

There is existing 15-inch gravity sewer along the east side of Baldwin Rd. north of the Brown Rd. Innovation Zone and 8-inch forcemain located in the median south of that location. The applicant is proposing to connect the commercial parcels to the manhole located between the forcemain and the gravity sewer, as well as a location north on the gravity sewer. The plans identify an existing stub located within the boundary of the Baldwin Rd. pavement. The Township sanitary sewer system appears to have sufficient capacity to serve the proposed development.

Grease interceptors appear to be proposed on the sanitary leads leaving the grocery store and the restaurants. Commercial buildings require monitoring manholes per OCWRC requirements. The grease interceptor and main sanitary lead need to connect and pass through the monitoring manhole for each building prior to tying back into the main sanitary line.

Details regarding the connection locations for the sanitary sewer for the grocery store and residential portion of the site are required prior to Engineering.

No water main and sanitary sewer easements were shown on the plans. Sanitary sewer on site requires a 20-foot sanitary sewer easement and water main requires a 12-foot wate main easement. Easements must be included in the Final PUD plan set.

Preliminary water main and sanitary sewer basis of design calculations shall be provided at Final PUD.

Franchise utility easements shall be included in the Final PUD plans. The franchise utility easement shall not overlap proposed water main and sanitary sewer easements except at perpendicular crossings and other infeasible locations.

STORMWATER MANAGEMENT:

The existing topography of the proposed commercial site appears to have several local low and high points. One-foot contours were provided for the existing grade. The applicant appears to be proposing a split storm water management system. An underground detention system with an outlet leading to an existing storm catch basin within Morgan Rd. appears to be proposed for the southern-most drive-thru restaurant. The applicant will need RCOC approval to outlet into this location and shall verify that downstream capacity is sufficient to handle the flow from the development. Additionally, the proposed storm management system needs to conform to the new stormwater standards within the Township Engineering Standards. Channel protection and water quality must be provided in addition to detention. No detention calculations have been provided for the commercial portion of the site, but a C-value calculation appears to have been estimated. The C-value calculation does not appear to follow the guidelines in the Township Engineering Standards and should be recalculated using C-factors based on the underlying soil types. The remainder of the proposed storm management system for the commercial portion of the site (8.6 acres) appears to drain north and connect to the residential portion of the site which has a regional detention basin. The connection draining north is not shown and needs to be indicated on the utility plan for the commercial submittal. Preliminary detention calculations must be provided for the southern portion of the commercial site at Final PUD.

The Topographic Survey for the residential portion of the site includes existing spot grades but should provide one or two-foot contours as part of the Final PUD submittal. In general, it appears that the existing site drains toward the wetlands located central to the residential parcels, to the northeast where there is an existing 24-inch storm outlet, or infiltrates at local low points within the site. A C-value calculation does not appear to have been provided for the residential portion of the site. The calculation shall be shown to ensure that appropriate C-factors based on the Township Standards were used to obtain that C-value. Preliminary detention calculations were provided per Township Standards; however channel protection does not appear to be proposed. The applicant shall provide channel protection per Township Standards unless underlaying soils indicate that infiltration is not suitable for this site. If the soils are not suitable for infiltration, additional Low Impact Design measures will need to be provided. The ultimate outlet for the residential portion of the site is the existing 24-inch storm outlet on the east side of the site. RCOC approval will be required for this outlet, and the applicant must verify that sufficient downstream capacity is available. The freeboard elevation for the detention basin must be shown and identified at Engineering.

Stormwater management will need to be updated as part of the Final PUD submittal to meet Township Standards. The applicant shall provide channel protection for the entire site or provide evidence that the site is unsuitable for infiltration. C value calculations shall be provided and C factors based on hydrologic soil group shall be used to calculate site C values. This calculation shall be provided as a part of the detention calculations. Refer to the Land Use Summary table in the OCWRC Stormwater Standards for providing the C-value calculation.

Additionally, a pre-development and post-development drainage area map should be provided for both the commercial and residential portions of the site as part of the Final PUD submittal. It is unclear if the drainage pattern is being maintained based on the information provided. Consideration should be given during

development of the Final PUD to ensure that the existing wetland is provided the same amount of stormwater runoff that it currently receives to maintain existing vegetation and habitat.

TRAFFIC & CIRCULATION:

Proposed access to the development includes two (2) boulevard entrances, one (1) two-way entrance, one (1) ingress only, and one (1) egress only approaches, all located on the west side of Baldwin Rd. One of the boulevard entrances is located on the Baldwin-Judah roundabout. The eastern most boulevard has 22 foot lane widths. The roundabout boulevard has 16-foot lane-widths. The ingress and egress-only lanes have 20-foot lane-widths. The remaining approach is thirty-six (36) feet wide and appears to facilitate two (2) right-turn exit lanes. Provided lane and drive-aisle widths appear acceptable per Township Ordinance and Engineering Standards. All work within the Baldwin Rd. right-of-way will require permit approval from the RCOC.

The minimum drive aisle width throughout the commercial portion of the site appears to be twenty-two (22) feet wide. Main drive aisles appear to range between twenty-six (26) and thirty (30) feet in width. The drive aisles appear to be sufficient for the Orion township Fire Truck. The applicant shall overlay a turning template at Final PUD for the Orion Township Fire Apparatus. The residential portion of the site appears to have a minimum drive aisle of twenty four (24) feet wide with main aisles at twenty seven (27) foot width. This is acceptable per Township Ordinance and Engineering Standards. There are also several dead end portions of the parking lot located in the residential portion of the site. The applicant shall coordinate with the Orion Township Fire Marshal to ensure fire access is provided sufficiently based on Fire Department requirements.

Internal sidewalk appears to be provided throughout the site with several connection points to the existing safety pathway along Baldwin Rd by the grocery store and near the Uptown Village. An additional connection should be provided near the restaurant. In general, crossings should not be provided in locations without receiving ramps on both sides of the crossings. Please ensure that ramps/crossings do not lead directly to driveways, curbed areas, or areas without receiving ramps. Crossings should be provided for the units located in the center of the circle in the South Village.

The applicant is proposing a 10-foot wide pathway connection to the Cottages at Gregory Meadows in the northwest corner of the site via easement provided for cross-access. The main intent for the cross-access was for road and utility connection to this parcel. Consideration should be given to make a road connection to the Cottages at Gregory Meadows. It appears the grade at the road within the Cottages is roughly 1076 and the road grade within Baldwin Village is roughly 1055 resulting in a difference of ~21 feet over ~330 feet giving a road grade of ~6%. This slope is at the upper end of the recommended 1%-6% for drives but within acceptable limits.

The ingress only drive approach located directly across from the north to south crossover on Baldwin Rd. should be removed. With the high demand drive thru restaurant, there is a serious concern that there is inadequate stacking space in the northbound cross over lane in Baldwin which would result in traffic backing up on Baldwin Road. Northbound customers would instead use the roundabout at Baldwin and Judah Rd to enter the site.

Parking spaces appear to be proposed at nine (9) feet by nineteen (19) feet which is acceptable per Township Standards. The sidewalk adjacent parking spaces needs to be seven (7) feet wide to account for vehicle overhand. The sidewalk west of the grocery store appears to only be about five (5) feet wide. Please increase the width in this area.

The pathway running along Baldwin Road should be located to provide separation between the pathway and travel lanes. Near the proposed grocery store, a proposed driveway taper runs adjacent to the pathway. The pathway in this area should be pulled away from the pavement.

Provide sign location and type on the Final PUD plans. This will include stop signs, pedestrian signs, speed Limits signs, do not enter wrong way signs, etc.

The concept plan includes two multi-tenant buildings along Baldwin Road. Adjacent to the southern building is a one-way drive aisle running alongside the south face of the building. It is not apparent from the concept plan what the intended use of this drive aisle is. There does not appear to be space in this area to accommodate stacking for another drive-thru.

Refuse vehicle turning movements should be checked to verify that all commercial dumpsters are proposed in serviceable locations.

The internal roadway network appears to include a circular intersection near the center of the development. Clarification on the operational intent of this intersection should be provided. If this intersection is intended to operate as a roundabout it should be designed with the appropriate geometric features and design best practices. If is in not intended to operate as a roundabout the design should be modified to clarify the intended right-of-way control. In either case the geometry of the intersection and the location of the pedestrian crosswalks should be modified.

A Traffic Impact Study (TIS) was recently submitted, but not in time to be included in this review. It is our opinion that the traffic study can be reviewed as part of Final PUD since the site is located along the recently widened Baldwin Road

PAVING & GRADING:

Existing grades were provided via 1-foot contours on the commercial portion of the site and only via spot grades on the Topographic Survey for the Residential Portion. 5-foot contours appear to be underlain in other residential sheets, however 1-foot contours should be provided on the Topographic Survey and underlain throughout the site so that grading can be assessed in greater detail. The high-point on site appears to be in the northwest quadrant of the residential portion at an elevation of roughly 1,090. The wetland area appears to be at an elevation of 1,038, but the lowest point on site is located near the center of the residential area at an elevation of roughly 1,000. The existing drainage pattern is not consistent throughout the site. Some areas appear to drain to the wetlands while other areas drain off-site or even infiltrate at local low points. Geotechnical investigation should be focused at these local low points to determine whether or not infiltration is feasible for the site.

Proposed grades were provided via 1-foot contours and spot grades on the commercial site. The applicant appears to be proposing maximum slopes of 1:3 to meet existing grades at the site border. 1:4 shall be the maximum slope for the portion of the site that is not between the proposed development and the Cottages at Gregory Meadows site. 1:3 slopes should not be used adjacent Morgan Rd. and Baldwin Rd. The proposed grades for the residential portion of the site were provided via finish floor grades, rim grades, and some centerline/top-of-curb grades throughout the road. Insufficient grades were provided for the green space and the proposed retaining wall. Additional grading information shall be provided at Final PUD. The applicant shall ensure that the site matches existing grades at the border and that top and bottom-of-wall grades are provided for the retaining walls.

NATURAL FEATURES:

WOODLANDS

The site is heavily wooded, with the highest density of existing trees in the northern half of the site near the wetland. A tree survey was not provided along with the survey and will be required at Final PUD. Landmark trees must be identified, and trees proposed for removal must be identified on the tree survey.

WETLANDS

The National Wetlands Inventory (NWI) shows record of a single wetland on site (approximately 2.71+ acres). The wetland appears to contain standing water and was recognized on the Concept Plan. Additionally, a smaller wetland was identified on the concept plans located at the site low-point. A wetland delineation report and wetland permit for minor fills was submitted just prior to issuance of our letter. Per cursory review, it appears there are

three (3) wetlands on site. Proposed impacts include filling ~0.07 acres of the larger ~2.71 acre wetland, filling all of the smaller two wetlands which are ~0.02 acres and 0.003 acres. Impacts to the wetland buffer will need to be identified and quantified on the Final PUD grading plans. The wetland delineation and wetland permit application will be reviewed under separate cover.

LANDSCAPING:

Landscaping plantings and trees were shown on the overall Master Site Plan. The applicant shall ensure that tree locations will not impact utilities, retaining walls, or any other site features. The utilities should be underlain on the Landscape Plan so that any possible impacts can be assessed.

CONCLUSION:

In our opinion, the Concept PUD is in substantial compliance with the Township's ordinances and engineering standards. We ask that any approval include the following.

1. Consideration should be given to make a road connection to the Cottages at Gregory Meadows.
2. A Traffic Impact Study (TIS) was recently submitted but not in time to be included in this review. It is our opinion that this can be reviewed as part of Final PUD since the site is located along the recently widened Baldwin Road.
3. The Final PUD plans will likely need to include infiltration to meet CPVC as required by engineering standards. This may require additional space that could result in a reduction in density.
4. The ingress only drive approach located directly across from the north to south crossover on Baldwin Rd. should be removed or adjusted to not impact traffic on Baldwin Road. This will be reviewed as part of the Traffic Study.

Please feel free to contact us with any questions at (248) 751-3108 or joseph.lehman@ohm-advisors.com.

Sincerely,
OHM Advisors

Joe Lehman, PE
Project Engineer

Mark A. Landis, PE
Project Manager

cc: Chris Barnett, Township Supervisor
David Goodine, Building Official
Jeff Stout, Director of Public Services
Tammy Girling, Director of Planning and Zoning
Lynn Harrison, Planning and Zoning Coordinator
Jeff Williams, Township Fire Marshal
Bill Basigkow, Water and Sewer Superintendent
Rod Arroyo, Township Planning Consultant
Gilbert "Buzz" Silverman, RED Equities
Charles Oliva, Stonefield Engineering & Design
Stephen Pangori, AEW, Inc.
File

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Charter Township of Orion

3365 Gregory Rd., Lake Orion MI 48359
www.oriontownship.org

Fire Department
Phone: (248) 391-0304, ext. 2000
Fax: (248) 909-6909

To: Planning Commission/Planning & Zoning Director
From: Jeff Williams, Fire Marshal
Re: PC-2022-29 Baldwin Village PUD Concept
Date: 7/22/2022

The Orion Township Fire Department has completed its review of Application PC-2022-29 for the limited purpose of compliance with Charter Township of Orion Ordinance's, Michigan Building Code, and all applicable Fire Codes.

Based upon the application and documentation provided, the Fire Department has the following comments at this time regarding the concept plan.

Comments:

- The revised plan shall explain which buildings will be equipped with a fire suppression system.
- Fire Hydrant Coverage is lacking in the commercial, residential, and main drive isles areas that lead into the site.
- A dead-end access drive exceeding the reequipments of International Fire Code was noted on the submittal.

In past discussions with the applicant, it is the fire departments understanding that these minor concerns will be addressed in the Final PUD plan and is not necessary for concept.

If there are any questions, the Fire Department may be reached at 248-391-0304 ext. 2004.

Sincerely,

Jeffrey Williams

Jeff Williams, Fire Marshal
Orion Township Fire Department

giffels webster

July 28, 2022

Orion Township Planning Commission
2525 Joslyn Road
Lake Orion, MI, 48360

Site Plan Review no. 1
Baldwin Village PUD Concept

Case Number:	PC-2022-29	**Plan Date:**	7/7/2022
Address:	West side of Baldwin Road, north of Morgan Road	**Zoning:**	SF -Suburban Farms Residential, R-1 -Single-family Residential, (Gingellville Overlay District), BIZ -Brown Road Innovation Zone (outside overlay district)
Parcel ID:	09-32-301-001 & -014; 09-32-151-020 & -021		
Area:	63.3 acres		
Applicant:	RED Equities, LLC	**Reviewer:**	Eric Pietsch Rod Arroyo, AICP

Dear Planning Commission Members:

We have reviewed the above application and PUD Concept Plan, and a summary of our findings is below. Items in **bold** require specific action by the Planning Commission. Items in *italics* can be adcressed administratively.

PROJECT SUMMARY

The proposed Planned Unit Development (PUD) is located on the west side of Baldwin Road, north of Morgan Road. The 63.3-acre site consists of four parcels (together as one zoning lot) encompassing three underlying zoning districts, Suburban Farms (SF), Single-family residential (R1), and Brown Road Innovation Zone (BIZ). Access to the commercial and residential development is provided along the entire east boundary via Baldwin Road, as well as a westward extension of Judah Road from the roundabout at Baldwin. An existing wetland near the central-west property line will serve as a protected natural feature, incorporating open space and pedestrian pathways into the development. Commercial uses are proposed along Baldwin Road, south of Judah. The remaining site will consist of 465 attached residential units.

SUMMARY OF REVIEW

1. **Intent.** The concept plan proposes a density of 9.76 dwelling units/acre, which is significantly less than the 20 dwelling units/acre permitted in the Gingellville Overlay District.
2. **Land Use.** The proposed neighborhood grocery store is an appropriate use as explained in the Gingellville Overlay District; however, size restrictions limit the facility to approximately 13,000 square feet. Single-family uses are to be the dominate residential component, per the PUD ordinance. The new Master Plan updates this vision to be more inclusive of attached dwelling units, including duplex, quadplex, and other missing middle housing units. The proposed residential uses are primarily attached multi-family units.
3. **Design.** The proposed retail facilities require a design that emphasizes tenant spaces and breaks within the building facades. The retail buildings facing Baldwin Road, including the neighborhood grocery store shall demonstrate compliance of the Gingellville Design Plan.
4. **Off-street Parking.** The restaurant proposes an excessive amount of parking spaces above the minimum required. The applicant should justify the reason for additional parking spaces. Less parking spaces may relieve the need for parking setback waiver requests.
5. **Loading & Unloading.** Dimensioned loading spaces shall be confirmed on the plans for all uses.
6. **Preservation of natural features.** The central-west portion of the site contains wetland / natural features and is proposed to be preserved. A tree survey for the entire site has not yet occurred and is noted to occur at site plan review and Final PUD. The applicant should address any existing trees that are intended to be preserved and those intended for removal.
7. **Landscaping.** A landscape plan is required for a full review and to demonstrate street & parking lot landscaping standards comply.
8. **Lighting.** A lighting plan is required at final plan approval for a full review of overall lighting standards.
9. **Building Height.** Height of the proposed buildings in the BIZ and Gingellville Districts must be determined prior to final plan approval.
10. **Improvements in traffic patterns.** The applicant should address how the project was designed to minimize the impact of traffic generated by the proposed development on surrounding uses, as outlined in 30.03.C.7. *We defer to the Township Engineer for further comment.*
11. **Pedestrian access.** Pedestrian connections from all safety paths to the restaurant and retail commercial uses should be included. Pedestrian connections within the development are proposed, including connections from residential to non-residential components of the development. There is

also a proposed pedestrian path linking to the Cottages at Gregory Meadows where a stub connection for both vehicular and pedestrian linkages was envisioned.

12. **Density plan submittal.** The applicant's proposed density is approximately 9.76 dwelling units per acre which is lower than the Gingellville Overlay District permits. The applicant has provided a parallel plan for comparison (see page 11 for comments).
13. **Building materials.** Conceptual building illustrations have been provided, but detailed building material documentation has not yet been submitted. The preference of the Gingellville Overlay District is predominantly brick and stone.
14. **PUD Eligibility.** Planning Commission should review the PUD Eligibility Requirements at the end of this letter and in the ordinance as part of this process.

Waivers

1. A waiver to allow the grocery store, while similar in uses permitted in RB, it exceeds the general limit of 13,000 sq. ft. as mentioned in the Gingellville Overlay District and 20,000 sf in RB. (Grocery store sq. ft.: 44,234)
2. A waiver to allow attached single-family residential as proposed. The Overlay District states that any mixed use project over 40 acres in size is required to be at least 60% single-family detached residential use. As noted above, the new Master Plan has updated the vision for this area to incorporate more attached units.
3. A waiver to allow attached housing to extend more than 1,000 feet east or west of the future right-of-way of Baldwin Rd, per the Overlay District.
4. A waiver to allow the commercial buildings to have flat roofs (pitched roofs are a requirement of the Gingellville Overlay District.
5. A waiver to allow the grocery store to consist of a large expanse of blank exterior wall along the Baldwin Rd. side of the building. The overlay district requires the inclusion of windows and varying architectural treatments. Windows, awnings, and arcades must total at least 60% of a facade length abutting a public street when the bldg. length exceeds 100 ft. Also, commercial buildings shall not exceed 250 feet of frontage, which the grocery store exceeds (271.67 ft, although 49 ft is recessed)
6. A waiver to allow the grocery store to be as close as 12.2 feet from Baldwin Rd. right of way line (15 ft. required).
7. A waiver to allow the attached single-family residences to not contain the minimum 8 ft. in width by 6 ft. in depth front porch.
8. A waiver to allow the residential density to exceed 9 dwelling units per acre if not all front facing garages are recessed from the front living area by at least 5 ft., or if any apartment building exceeds 160 ft. in length (some exceed 210 ft).

BIZ District

9. A waiver to allow the restaurant a 32 ft. setback in lieu of the 100 ft. min. setback of the drive-thru canopies and speaker boxes from the lot line of a single-family or multi-family zoned and/or used parcel.

10. A waiver to allow the restaurant a 12.5 ft. setback in lieu of the 50 ft. min. setback for associated parking lots, maneuvering lanes, and drive-thru lanes from the lot line of a single-family or multi-family zoned and/or used parcel.
11. A waiver to allow a 35.7 ft. front yard in lieu of the 40 ft. front yard required for the restaurant along Baldwin Rd.
12. A waiver request to allow the restaurant a 12.5 ft. setback in lieu of the 30 ft. min. parking/driveway setback to adjacent property lines abutting residentially zoned or used property.
13. A waiver request to allow the restaurant:
    a. 32.3 ft. parking (order station) setback in lieu of the required 100 ft. adjacent to residential.
    b. 12.5 ft. parking setback in lieu of the required 50 ft. adjacent to residential.
    c. 12.5 ft. parking setback in lieu of the required 30 ft. drive-thru parking setback.
14. A waiver request to allow the carwash a ~16.25 ft. setback to the north in lieu of the required 20 ft. req. (if the Applicant is not combining parcels).
15. A waiver request to allow commercial surface parking spaces to be located in the front yard(s) along Baldwin Rd. per the BIZ standards.
16. A waiver to allow parking and drives closer than 20 ft to any property line in BIZ district (if the Applicant is not combining parcels). For example, parking is 16.25 ft from east car wash property line. 20 ft greenbelt not provided.
17. A waiver request to allow lighting fixtures within the interior portion of the BIZ district to be other than bronze color, shoebox style LED on a square pole, should that not be consistent with the lighting fixtures along Baldwin Rd. leading into the Gingellville Overlay District. PC should discuss and determine if this should be addressed later when a detailed lighting plan is reviewed.

Outside BIZ District

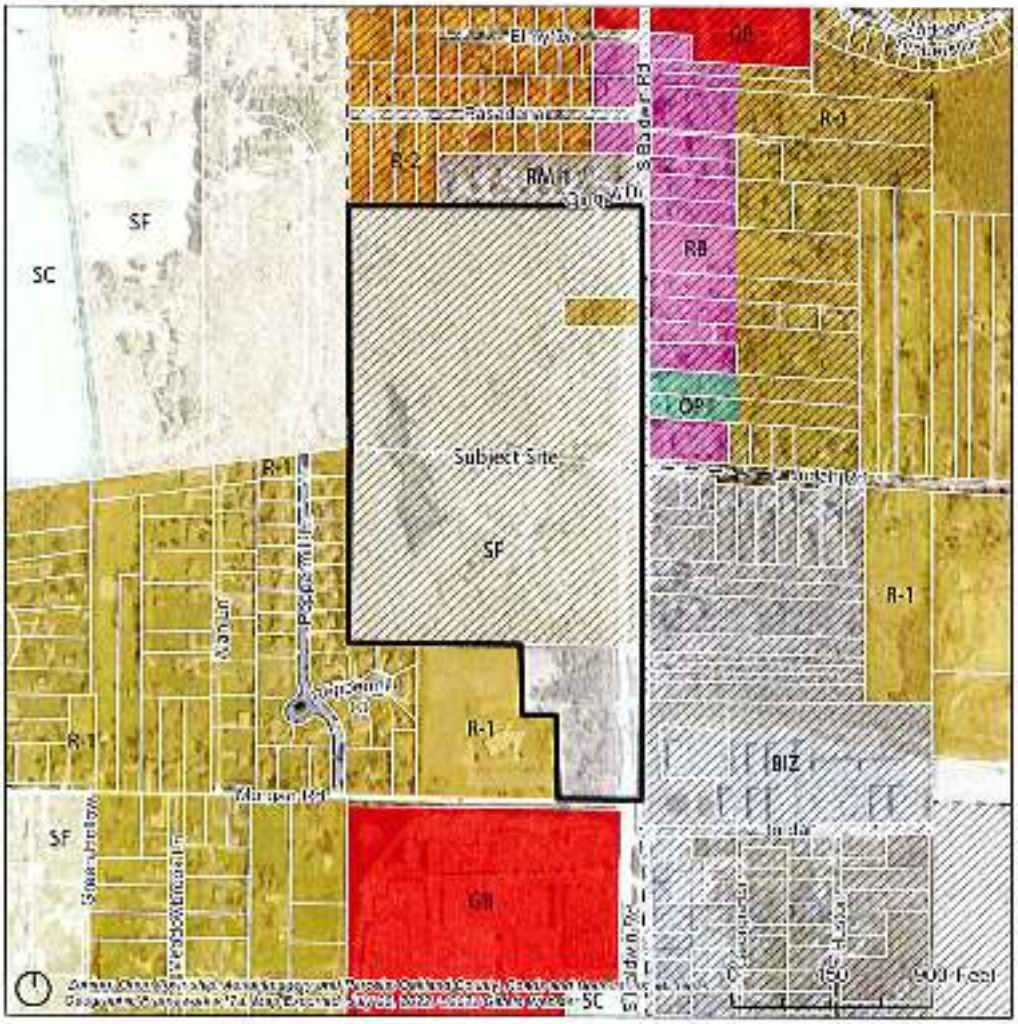
18. A waiver request to allow the greenbelt along the west side of Baldwin Rd. to be less than 20 ft. in width due to an irregular right-of-way line.
19. A waiver to allow trellis and other amenities in required yards in excess of standards (Section 27.03).
20. A waiver request to allow internal roadway widths less than 60 ft.
21. A waiver to allow auto washes and drive-through uses, which are considered ancillary uses in the BIZ district. In the case of the proposal, there is not a larger-scale development over 10 acres in the BIZ district, rather it is in another zoning district.
22. A waiver to allow the 75 ft. min. setback in the multiple family section from property zoned single-family to be modified to west (50 ft.) and north (61 ft.). This requires a finding that it does not impact adjacent properties and that there is a recognizable benefit in doing so.
23. A waiver to allow 100 ft. front yard setback min. in the multiple family area to be modified to 66 ft. min. provided.

Existing Conditions

1. **Zoning.** The site is zoned Suburban Farms Residential (SF), Brown Road Innovation Zone (BIZ) and a small parcel zoned R-1 Single-family Residential.

2. **Adjacent Zoning and Land Uses.**

Direction	Zoning	Use
North	R-2 – Single-family RM-1 – Single-family	Single-family
South	GB – General Business	Commercial-Retail
East	BIZ RB – Restricted business OP – Office and professional	Single-family Vacant Commercial-Restaurant, retail, office
West	PUD – Planned Unit Development R-1 – Single-family residential	Single-family, institutional (church) Vacant



Zoning Ordinance Compliance Tables

3. **Underlying District Standards.** As stated in the Gingellville Overlay, the Schedule of Regulations for the underlying zoning district shall be applied for density, height, setback, lot size, lot width, lot coverage, floor area, etc. When a proposed use otherwise permitted in the overlay is not listed as a permitted use in the underlying district, the Planning Commission shall use the standards in the district which most closely corresponds to the permitted use(s), and these may be modified by the Planning Commission if necessary to meet the spirit and intent of the overlay district. The underlying district for the majority of the Gingellville Overlay portion of this development is Suburban Farms, with a small section of R-1. For the commercial portion, the Applicant has provided a comparison with the Restricted Business Schedule.

LAND USE AND ZONING		
PID: 09-32-301-014		
GINGELLVILLE OVERLAY DISTRICT & RESTRICTED BUSINESS ZONE (RB)		
PROPOSED USE GROCERY STORE	PERMITTED USE	
ZONING REQUIREMENT	REQUIRED (RB)	PROPOSED
MINIMUM LOT AREA	9,000 SF (0.21 AC)	204,915 SF (4.70 AC)
MINIMUM LOT WIDTH	N/A	529.1 FT
MAXIMUM TENANT FLOOR AREA	13,000 SF	44,234 SF (W)
MAXIMUM STRUCTURE LOT COVERAGE	30% (61,475 SF)	21.6% (44,234 SF)
MAXIMUM BUILDING HEIGHT	25 FT	< 25 FT
MINIMUM FRONT YARD SETBACK	20 FT	42.7 FT
MINIMUM SIDE YARD SETBACK	15 FT	12.2 FT (W)
MINIMUM REAR YARD SETBACK	20 FT	154.8 FT
MINIMUM RESIDENTIAL GREENBELT	30 FT	30.0 FT
MINIMUM FRONT / REAR GREENBELT	20 FT	20.0 FT
MINIMUM SIDE YARD GREENBELT	15 FT	26.3 FT
MINIMUM CLEAR SPACE AROUND STRUCTURES	15 FT	PROVIDED
MINIMUM OPEN SPACE	10% (12,525 SF)	21.2% (39,905 SF)

(W) WAIVER

Note that RB has a maximum building size of 20,000 sf and Gingellville Overlay has a 13,000 sf max., both of which are exceeded by the grocery store.

Multiple-family uses are not permitted in the SF and R-1 districts. Below is the Schedule that applies to the RM-1 and RM-2 District for comparison purposes.

A. Several units in North Village and South Village do not meet the end to end minimum of 30 feet and the end-to-rear / end-to-front min. of 50 feet. However, the PUD section (30.03) sets forth alternative separation and setback standards for multi-family developments, allowing 20- foot separation for end-to-end, a 25-foot front setback, 35-foot side setback, and a 35-foot rear setback.

B. The 75 ft. min. setback from property zoned single-family is not met to the west (50 ft.) and north (61 ft.). 100 ft. front yard setback min. not met (66 ft. provided). The PUD sec. allows for the potential reduction of the perimeter setback to no less than 35 ft., but this requires review and specific action by the PC and Township Board, with a determination that the variation does not negatively impact adjacent properties and provides a recognizable benefit.

Section 7.04 – RM-1 and RM-2 Area and Bulk Requirements *(amended 04.19.93, 01.19.04, 11.01.10)*

A. Minimum Lot or Parcel Area. Multiple-family dwellings shall not be erected on a lot or parcel of land which has an area of fewer than five (5) acres, excluding existing road right-of-way.

B. Building Bulk and Height. The maximum building height shall be thirty-five (35) feet and two and one-half (2 1/2) stories. The maximum dimension of a building measured in any straight line shall be two hundred (200) feet.

C. Maximum Number of Dwelling Units Per Acre.

1. The number of dwelling units (du) per acre in the RM Districts shall not exceed the following:

   RM-1: 6 du/acre
   RM-2: 8 du/acre

D. Minimum Floor Area/Unit.

One bedroom	-	500 square feet
Two bedrooms	-	700 square feet
Three bedrooms	-	900 square feet
Four bedrooms*	-	1,000 square feet

* An additional one hundred fifty (150) square feet of floor area shall be provided for each bedroom over and above four (4) bedrooms.

Maximum site coverage - 25%.

E. Building Setbacks.

1. Buildings shall have the following minimum setbacks from the perimeter of the parcel:

   a. Front yards - 100 feet
   b. All other yards, including side and rear yards - 50 feet

2. Side and rear setbacks shall be a minimum of seventy-five (75) feet along those property lines which abut a single-family district, or one-family detached units or lots of an approved residential PUD plan, and which are not separated from such units, lots, or one-family district by a major thoroughfare or collector street, or where the abutting single-family dwelling unit district is not already developed for a permitted use other than single-family residential.

3. If more than one building shall be constructed on the same site, the minimum distance between buildings shall be:

   a. When front to rear, front to front, and/or rear to rear - 70 feet
   b. End to end - 30 feet
   c. End to front and/or end to rear - 50 feet

4. **Gingellville Overlay District Standards.**

Gingellville Overlay District Standards (Article XXXIII)			
Section	**Requirement**		**Comment**
33.01 Principal Permitted Uses		All uses within the Gingellville Village Center Overlay District shall be restricted to those listed as either permitted principal uses and/or special uses in the underlying zoning district.	See Item F. below.
	A.	Commercial uses shall be limited to low intensity retail, office or professional uses similar to the Restricted Business zoning district (RB).	**The PC should determine if a 44,234 sq.ft. grocery store is an appropriate use & size and is consistent with the Village character at this location. Waiver required.**
	B.	Intensive commercial (big box) uses shall be restricted. Max. floor area for commercial use shall be limited and shall be consistent with the Village character (generally not greater than 13,000 sq. ft. per tenant).	
	F.	The Schedule of Regulations for the underlying zoning district shall be applied for density, height, setback, lot size/width/coverage, floor area, etc. When a proposed use otherwise permitted in the overlay is not listed as a permitted use in the underlying district, the PC shall use the standards in the district which most closely corresponds to the permitted use(s), and these may be modified by the PC if necessary to meet the spirit and intent of the overlay district.	**Attached single-family residential and grocery stores are not a permitted use in the underlying SF or R-1 zoning districts. PUD Waiver but are permitted in the Overlay district.**
	I.	Single family residences are favored as the predominate land use in the mixed-use developments and may be interspersed with a mixture of multi-family/attached housing or local business uses.	*Of the 465 dwelling units proposed, 14 are attached single-family units (duplexes by definition). 3% of all residential units. No units are detached.*
33.02 Design Standards	General Standards.		
	A.	1. Land uses should transition from commercial, or multiple family, to lower density residential uses including single-family detached units to the east and west of Baldwin Rd., with appropriate buffers and screening on the perimeter.	*The western most dwelling units consist of attached single family units (duplexes by definition) and attached townhouses, setback no less than 50' to the adj. residential units.*
		5. Pedestrian amenities such as streetscape, street furniture, benches, lighting, pavers, and extensive landscaping shall be required and shall meet the standards as listed in the Gingellville Village Design Plan and Guidelines or approved equivalent as determined by the Building Department.	*The applicant states the intent is to meet or exceed minimum pedestrian design standards.*
		6. All projects shall demonstrate quality architecture and landscaping consistent with the Gingellville Village Design Plan and Guidelines.	*A landscape plan is required at final to further demonstrate these design standards, as well as street & parking lot landscaping standards.*
	Open Space and Community Design Feature.		
	B.	1. Residential Uses. An active or passive recreation/open space plan shall be submitted to PC for consideration. The plan shall demonstrate that at least 15% of the gross land area is maintained for recreation/open space amenities which	*Areas (acreages) on the site plan, designated as the 26% open space, should be identified at final.*

		accurately reflect the intended demographics of the development.	
		3. Each non-residential establishment shall contribute to the establishment or enhancement of community and public spaces by providing at least 2 of the following: patio/seating area, pedestrian plaza with benches, window shopping walkway, outdoor playground area, outdoor sculpture, kiosk area, water feature, clock tower, or other such deliberately shaped area and/or a focal feature or amenity that, in the sole discretion of the Twp., is determined to adequately enhance such community and public spaces.	*Five (5) non-residential establishments are proposed. 2 items required for each, amounts to a minimum of ten (10) items that enhance community and public spaces. Applicant notes they will meet or exceed the requirement.*
		4. Money in Lieu of Construction. In lieu of establishment of public space amenities, such as pedestrian plazas, window shopping walkways, outdoor play area, outdoor sculpture, kiosks, water features, clock tower, etc., the Twp. Planning Commission and/or Twp. Board may accept a sum of money equivalent to the actual cost of construction for the public space amenities. Money in lieu of construction shall only be allowed for sites where there are practical difficulties, spatial limitations or other factors which prevent on-site construction of public amenities. The amount shall be placed in escrow or other named accounts as established by the Twp. Board for ongoing or future construction of public space amenities within the Gingellville Village Center Overlay District.	*In addition to the above enhancements, the applicant states they will contribute to the twp. safety path and parks funds.* **The applicant should indicate if money in lieu of construction is intended due to practical difficulties preventing the construction of necessary public amenity improvements in and around the development.**
		5. Compliance with Gingellville Village Design Plan & Guidelines. Money in lieu of construction for public space amenities shall be directed to projects in accordance with the Gingellville Village Design Plan and Guidelines. Funds shall be designated for projects approved by the PC and Twp. Board which implement components of the Concept Plan for the Village of Gingellville (see Map 3 at end of Article) or other public space amenities within the Gingellville Village Center Overlay District.	**Are the pathways and open spaces available to the public at all times?**
Site Access, Parking, and Loading.			
		Site access, parking, and loading shall be controlled in the interest of public safety.	*Site access is proposed via access drives along the west side of Baldwin Rd. as well as the west extension of Judah Rd. to the site's interior.* *Cross-access connections are provided within the development.* *The plans appear to meet these standards. See Engineer's review)*
	C.	1. Provisions for circulation between developments on adjacent parcels shall be required through joint drives and cross-access connections.	
		2. Driveway placement must be such that loading and unloading activities will not hinder vehicle ingress or egress. All loading areas for non-residential uses shall be located within rear yard or side yard areas, and/or screened.	
		3. Access management standards shall be in accordance with Sec. 27.14.	
Pedestrian Pathways and Sidewalks.			
	D.	Pedestrian Pathways and Sidewalks. Vehicular access and circulation shall be planned to ensure safe pedestrian	*Plans promote the 15-minute neighborhood. Extensive pedestrian and*

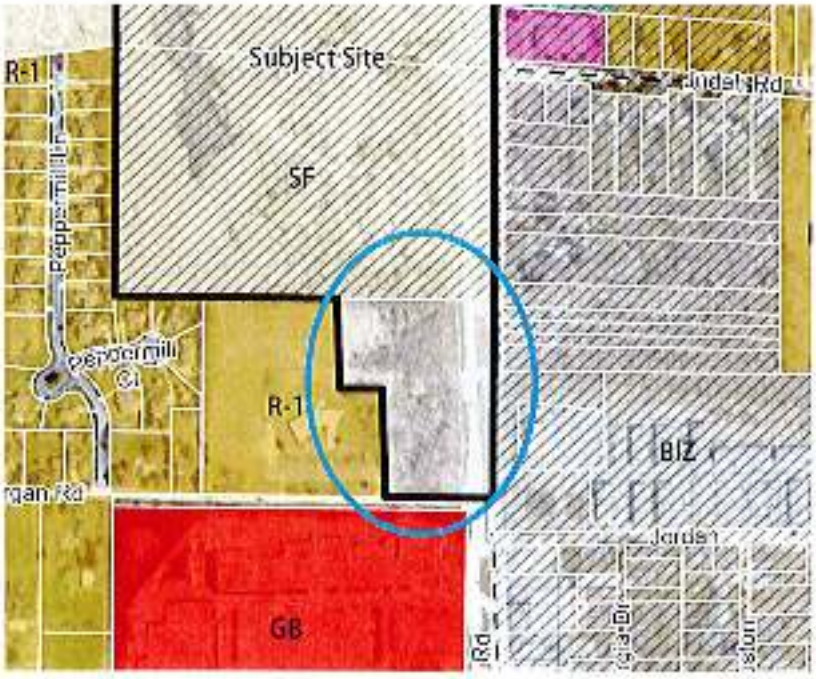
		movement within the development. Pedestrian systems shall provide safe, all-weather, efficient, and aesthetically pleasing means of on-site movement and shall be an integral part of the overall site design concept. Pedestrian pathway connections to parking areas, buildings, other amenities and between on-site and perimeter pedestrian systems and safety paths shall be planned and installed wherever feasible.	*vehicular connections are provided internally.* *Plans should ensure a pedestrian connection from Baldwin Rd. to the restaurant & two multi-tenant retail buildings.* *One pedestrian pathway is provided to an adjacent Cottages at Gregory Meadows development at the NW corner. Note: a vehicular and pedestrian connection was envisioned.*
	Signage.		
	E.	Signage will be reviewed at final PUD submittal.	
	Lighting.		
	F.	All lighting shall conform to the requirements of Sec. 27.11, in order to maintain vehicle and pedestrian safety, site security, and accentuate architectural details.	*The applicant states they will meet or exceed the overlay design plan standards. To be confirmed at final.* *See general provisions table for additional review.*
		1. All street and parking lot lighting shall be installed in accordance with the Gingellville Village Design Plan and Guidelines or approved equivalents.	
		2. Pedestrian lighting shall be provided for pedestrian walkways, building entries, and other areas where illumination is needed to permit safe pedestrian travel.	
	Landscaping/Greenbelts/Buffers/Screening Elements.		
	G.	1. Parking Lot Screening Along Baldwin Rd. The screening of parking lots along Baldwin Rd. shall conform with the Gingellville Village Design Plan and Guidelines and the pillar and fence details provided herein. The plantings to occur along the screening fence will also be in accordance with the Gingellville Village Design Plan and Guidelines (consisting of perennials and compact shrubs along the fence).	*A landscape plan is required to further demonstrate these design standards, as well as street & parking lot landscaping standards. To be reviewed at final*
	Architecture.		
	H.	1. An individual building shall not exceed 5,000 sq. ft. per tenant. Existing buildings or new buildings within the GB District shall be excluded from this requirement.	**The proposed grocery store bldg. is 44,234 sq. ft. The underlying zone is Suburban Farms Residential however, the Gingellville OD suggests retail uses are appropriate. PUD waiver required for size.**
		a. All buildings shall have a roof pitch of no less than 4 ft. of rise (vertical) over 12 ft. of run (horizontal).	**Conceptual renderings indicate the proposed commercial bldgs. have flat roofs.**

			PUD waiver required.
		b. The exterior of the bldg. shall appear to have an abundance of individual uses through the inclusion of windows and varying architectural treatments, while the interior may consist of one individual use. Large expanses of blank walls are to be avoided.	**Conceptual renderings of the grocery store facility do not demonstrate compliance of this standard. PUD Waiver required.**
		c. Architectural interest shall be provided through use of repetitious patterns of color, texture, & material modules, at least one of which shall repeat horizontally. Each module should repeat at intervals of no more than 50 ft.	*This standard appears to be met for the commercial buildings. To be confirmed at final.*
		d. Bldg. facades greater than 100 ft. in length shall incorporate recesses, projections, and or windows along at least 20% of the length of the facade. Varying roof lines, projections/recesses etc. are encouraged to enhance "Village" characteristics. Windows, awnings, and arcades must total at least 60% of a facade length abutting a public street.	**Conceptual renderings of the grocery store facility do not demonstrate compliance of this standard. PUD Waiver required.**
		e. Primary building entrances shall be clearly defined and recessed or framed by a sheltering element such as an awning, arcade, or portico in order to provide shelter from the summer sun and winter weather.	*This standard appears to be met for the commercial buildings.*
	Building Materials.		
	I.	1. Materials shall blend with those existing on adjacent properties.	**These standards should be addressed for all residential and commercial buildings.**
		2. One dominant material shall be selected, with a preference toward masonry and stone.	
	Residential Appearance, Building Height, and Density.		
	J.	1. Lots having sufficient width shall require side entrance garages.	*Lots are not provided. Some units have front, some have side and others rear facing garages.*
		2. Front facing garages shall extend no more than 6 ft. past the front living area.	*These dimensional standards shall be shown on a final site plan.*
		3. Front porches are required for all single-family residences. Porches shall be a minimum size of 8 ft. in width and 6 ft. in depth.	The seven (7) duplex buildings (14 units) do not appear to include front porches. By definition these are duplex units. PC to determine if this applies.
		4. At least 50% of the front elevation of a dwelling, excluding garage door, shall be masonry material such as brick, stone, or cementitious siding. Cultured stone shall be acceptable.	*Final plans shall demonstrate compliance of this standard.*
		5. Residential density shall not exceed 9 dwelling units per acre for the portion of the development that is designated for residential use. This maximum density may be increased to 20 dwelling units per acre and the max. height / number of stories may be increases to 3 stories / 45 ft. if all the following conditions are met:	*Residential density of this development is proposed to be 9.76 dwelling units per acre.*
		a) Minimum residential open space shall be 20%. There shall be a square, green or similar open space park or plaza that includes benches, shade trees, walking paths (sidewalks and/or	*This standard is met.*

		trails), and similar amenities within or at the edge of the residential area.	
		b) Front facing garages shall be recessed from the front living area by at least 5 ft.	*These dimensional standards shall be shown on a detailed site plan.* **This standard does not appear to be met & would require a PUD Waiver for the density to exceed 9 du/ac.**
		c) If multiple-family units are proposed, they shall be of a townhouse, bungalow court, small multiplex (triplex or quadplex), or duplex variety. When these bldg. types are proposed, the PC may permit reduced setbacks, consistent with Sec. 33.03, based upon consideration of the bldg. type, development concept, and adjacent land uses. Apartments are also permitted as part of the density bonus and additional building height bonus, provided they shall have no bldg. dimension, measured in a straight line, that exceeds 160 ft.	*This dimensional standard shall be shown on a detailed site plan if the residential density is to remain above 9 du/ac. Some residential buildings exceed 220 ft.*
		d) No bldg. exceeding 35 ft. in height shall be located closer than 100 ft. from an adjacent single-family residential district.	*Proposed bldg. heights shall be identified along the north, west, and south property lines, where there are adjacent residential uses or zoning district.*
	Fences.		
	K.	1. The finished side of all fences shall face the common property line boundary or the public right-of-way.	*Applicant states standards will be met or exceeded. Plans shall demonstrate compliance with dimensioned, detailed exhibits.*
		2. Only the following fence materials shall be allowed: wood (or vinyl closely resembling wood) wrought iron (or aluminum closely resembling wrought iron) stone or brick. All other fence materials, including chain link and vinyl-clad chain link are prohibited unless placed in side or rear yards or screened from public view by landscaping or other means.	
	Building Roofs.		
	L.	1. In instances where roof vents, roof mounted mechanical equipment, pipes, etc., can be viewed from ground level, they shall be grouped together, painted to match roof color to reduce their appearance, and screened from view.	*The applicant states plans will meet or exceed standard. Plans, elevations, and renderings shall demonstrate comoliance.*
		2. There shall be variations in roof lines to reduce the massive scale of the structure and add visual interest. Single roof planes covering more than 3,000 sq ft. must be broken up by dormers, cross-ridges, minor roofs, chimneys, or similar features.	**All proposed commercial buildings exceed 3,000 sq. ft. This standard shall be met. Final plans & renderings shall show compliance. Per Sec. H above, the grocery store requires a PUD Waiver.**

	Screening of Exterior Electrical Equipment and Transformers.		
	M.	1. Transformers that may be visible from any primary visual exposure area shall be screened with either plantings or a durable noncombustible enclosure which are unified and harmonious with the overall architectural theme.	*The applicant states plans will meet or exceed the standard. Final plans and renderings shall demonstrate compliance. Adequate screening shall be identified where applicable.*
		2. Exterior-mounted electrical equipment shall be mounted on the interior of a building wherever possible or shall be located where it is substantially screened form public view. Such equipment shall never be located on the street side or primary exposure side of any building.	
33.03 Modification of Standards	A.	The PC shall have the authority to waive or modify the standards of Sec. 33.01 or 33.02 upon consideration of the following:	*Any of the standards listed in this table may be waived or modified by the PC after finding any of the standards apply.*
		1. The standards of this section would prevent reasonable use of the site.	
		2. Existing site design including architecture, parking, driveways, etc. are placed in a manner which makes application of standards impractical.	
		3. Limited lot area and the arrangement of existing features provide inadequate space to accommodate design requirements.	
		4. Other design constraints and considerations as defined by the PC.	
		5. The requirements of Sects. 33.01 and 33.02 may be modified by way of a PUD approved in accordance with Section 30.03.	

5. **Brown Road Innovation Zone (BIZ) Standards.**
The southeast portion of the development lies within the BIZ District and is circled in the image below. The proposed uses within this area include restaurant, auto wash, and retail.



a. **BIZ District Standards.** Retail uses consisting of less than 50,000 square feet are considered Type B ancillary uses in the BIZ District. The table below indicates compliance or required waivers with respect to the applicable standards for this site and proposed use within the BIZ District.

b. **BIZ District Waivers.** The Planning Commission is permitted to waive or modify the standards of Section 34.03 (required conditions) based upon the economic impact, quality of architectural design, and overall compatibility with the district.

Brown Road Innovation Zone (Article XXXIV)			
Section	**Requirement**		**Comment**
34.01 Uses Permitted	B.	Ancillary/Stand-alone uses allowed in conjunction with larger-scale projects involving planned developments of over 10 acres in size.	*Proposed PUD is 63.3 acres. Primary uses include residential and retail.*
	C.	Ancillary commercial only permitted after primary permitted, to be in a development agreement.	A development agreement is req. upon PC approval.
	D.	Special Land Uses. Outdoor patio use of the restaurant and drive-thru ancillary uses of the restaurant and car wash in the BIZ District.	**Requested as part of PUD approval.**
34.02 Ancillary Uses Requiring Special Land Use Approval Drive Thru Uses	A.	1) 100 ft. min. setback of all drive-thru canopies and speaker boxes from lot line of a single-family or multi-family zoned and/or used parcel.	**Restaurant: 32.3 ft. (west PL) -waiver requested.**
		2) 50 ft. min. setback for associated parking lots, maneuvering lanes, & drive-thru lanes from the lot line of single-family or multi-family zoned and/or used parcels.	**Restaurant: 12.5 ft. (west PL) -waiver requested.** Note: proposed restaurant use currently does not operate on Sundays. Adjacent place of worship peak day is Sundays.
		3) Any noise associated with a drive-thru use shall not exceed 60 decibels when measured at the property line.	*Plans shall comply.*
34.03 Required Conditions	Drive-Thru Restaurant With Outdoor Patio (Use Group B).		
	B.	Minimum Lot Area 20,000 square feet	*105,668 sq. ft.*
		Minimum Lot Width 90 ft.	*357 ft. Baldwin Rd. 221 ft. Morgan Rd.*
		Minimum Front Yard 40 ft.	**35.7 ft. Baldwin (canopy) PUD Waiver required.** *57.2 ft. Morgan*
		Minimum Side Yard 20 ft.	*262 ft. (north)*
		Minimum Rear Yard 30 ft. (50 ft. abutting res)	*111.7 ft. (west res.)*
		Maximum Building Height -No limit	TBD (per plans)
	Drive-Thru Car Wash (Use Group B).		
	B.	Minimum Lot Area 20,000 sq. ft.	*82,208 sq. ft.*
		Minimum Lot Width 90 ft.	*198.9 ft.*
		Minimum Front Yard 40 ft.	*150.5 ft.*
		Minimum Side Yard 20 ft.	*74.7 ft. (south) 83 ft. (north)*
		Minimum Rear Yard 30 ft. (50 ft. abutting res)	*118.3 ft.*
		Maximum Building Height -No limit	TBD (per plans)
	Off-Street Parking.		
	E.	1) 1 space per 100 sq. ft. GFA (restaurant)	*50 sp. req., 91 sp. prov.*

		1) 1 space per 200 sq. ft. GFA (car wash)	*25 sp. req., 28 sp. prov.*
		2) The PC may, at their discretion, modify the numerical requirements for off-street parking based on evidence provided by the applicant that indicates that another standard would be more reasonable, because of the level of current or future employment, and/or the level of current or future customer traffic.	*Restaurant: Excess of 41 spaces.* *Car wash: Excess of 3 spaces.*
		3a) 30 ft. min. parking/driveway setback to adjacent property lines abutting residentially zoned or used property.	**Restaurant: 12.5 ft. (waiver requested)** *Car wash: 30 ft. – complies*
		3b) 20 ft. min. parking area/driveway setback when abutting commercial/office or industrially zoned property.	*Restaurant: N/A* *Car wash: N/A*
		4) Driveways and parking areas shall be curbed and consist of hard surfaced concrete, blacktop, or equivalent, as approved by the Planning Commission.	*Site plans for the restaurant & car wash show compliance of this standard*
		5) All off street parking shall conform to the standards set forth in Section 27.04 of this Ordinance.	*See General Provisions review below*
		6) The required setback for parking may be reduced in width or waived by the Planning Commission, subject to landscaping or screening requirements.	**Parking setback waivers requested for restaurant:** **1) Drive-thru order station: 100 ft. to res. required. 32.3 ft. provided.** **2) Drive-thru parking: 50 ft. to res. required. 12.5 ft. provided.** **3) Min. parking drive-thru setback: 30 ft. required. 12.5 ft. provided.** **Parking setback waiver requested for the car wash:** **1) Min. property line parking setback: 20 ft. req. ~16.25 ft. provided (north) unless lots are combined. Only 5 feet of setback from shared drive.** **A landscape plan showing all screening is required at final.**
	General Design Standards.		
	F.	1) Development Patterns. Proposed development shall reflect characteristics & design features that are consistent with the Township Master Plan. The intent of the district is to create a coordinated development pattern which provides a smooth transition between uses & properties. Transition may be created through coordination of bldg. styles & setbacks, landscape buffers, and cross access between properties.	*The restaurant and car wash are part of a larger planned development and are the only two uses proposed within the BIZ District.* **Waiver required. General intent seems to be met.**

		2) A mix of industrial, commercial, and other uses is allowed as long as appropriately buffered and sited.	*See landscape and buffering review under General Provisions below.*
		3) Access Management, Parking, and Loading. Overall street and/or driveway design and layout shall be an integral component of site design providing for both internal access to service the development of properties and cross access between individual properties (Figure 34.1). Developments shall meet the access management standards set forth in Section 27.14 while parking and loading shall meet the standards set forth in Article 27.04.	*Vehicular access from Baldwin Rd. enters at the car wash while access to Baldwin Road exists at the restaurant. Cross access exists between the two uses as well as the remainder of the PUD development to the north.*
		4) Off-street parking shall be located predominantly within the side or rear yard areas, unless waived by the PC. The PC may allow parking in the front yard, subject to traffic safety, visibility, convenience, landscape buffering, or other site factors. If parking is allowed within the front yard as provided above, and the parking area is proposed within 200 ft. of a public road right-of-way, only a one way or two-way maneuvering lane with two rows of parking stalls may be provided in the front yard. The remainder of parking shall be located in the side or rear yard unless waived by the PC. All parking must meet the setback standards of Section 34.03.D and the greenbelt requirements as shown in Figure 34.4 or 34.6.	**Restaurant: Majority of parking spaces proposed in the side yard, north of bldg. 6 spaces (above the required amt.) in the Baldwin Rd. front yard requires a waiver from the PC.** **Car wash: 24 of the 28 spaces are vacuum/drying bays, 6 of which are located in the Baldwin Rd. front yard, requires a waiver from the PC.**
34.03 Required Conditions cont.		5) Pedestrian Pathways and Sidewalks. Emphasis shall be placed on providing a pedestrian circulation system which promotes safety and connects mixed use areas. Vehicular access and circulation shall be planned to ensure safe pedestrian movement by means of safety paths within the development.	**The restaurant and car wash are both automobile-centric uses with focus on adequate vehicular circulation. Internal pathways are shown on the site plan and the PC may consider pedestrian connections to adjacent safety paths.**
		6) General Site Design/Architectural Guidelines. It is the intent of the District to provide an environment of high quality and complementary building architecture and site design. Special emphasis shall be placed upon methods that tend to reduce the visual impact of large buildings, to encourage tasteful, imaginative design for individual buildings, and to create a complex of buildings compatible with the Brown Road corridor. Large-format retail centers shall comply with Section 27.16.	*The proposed buildings should complement the BIZ District as well as the Gingellville Overlay District to the north. Additional review at final.*
		7) Specific Site Design/Architectural Guidelines for properties fronting Brown Road.	
		In an effort to provide a transition and continuity from Brown Rd. to the Gingellville area to the north, the following architectural guidelines shall be incorporated into the design of principal and ancillary structures along Brown Rd.	**The development does <u>not</u> have frontage along Brown Rd.; however, the two sites are directly south of the Gingellville Overlay District.**
		a) Architectural interest shall be provided through the use of repetitious patterns of color, texture and material	

		modules, at least one of which shall repeat horizontally. Each module should repeat at intervals of no more than 50 ft. Plain 8" x 16" concrete masonry units shall be avoided. Clay brick, stone and/or textured, split face or patterned masonry units shall be used	The PC may consider any of these criteria for the proposed restaurant and car wash, which will be located in a transition area between the BIZ and Gingellville Overlay District. Final elevation drawings have not yet been submitted. 20' applies. Not found along north of car wash adjacent to Gingellville Overlay District and deficient in other locations. PUD Waiver required.
		b) Bldg. facades greater than 100 ft. in length shall incorporate recesses, projections, and/or windows along at least 20% of the length of the façade. Varying roof lines, projections/recesses etc. are encouraged. Windows, awnings, and arcades must total at least 60% of a façade length abutting a public street.	
		c) Standardized, pre-engineered metal sided industrial buildings shall be prohibited unless approved by the PC.	
		d) Primary bldg. entrances should be clearly defined and recessed or framed by a sheltering element such as an awning, arcade, or portico in order to provide shelter from the summer sun & winter weather. Multiple-family residential bldgs. may have covered projecting or recessed porches, covered stoops, or lightwells (for brownstone type construction).	
		e) Greenbelts for Use Group A, B, and C shall be 20' in width. The greenbelt for Use Group D shall be 30' in width.	
		B) Landscaping/Greenbelts/Buffers/Screening Elements. All landscape features of the site shall conform to the requirements set forth in Section 27.05 as well as the regulations listed in Section 34.03 T.	*See review of General Provisions section below.*
	Signage.		
	G.	Signage will be reviewed at final PUD submittal.	
	Lighting Regulations.		
	H	1) A lighting plan shall be submitted with all site plans as set forth in Section 27.11 of this Ordinance. All other Zoning Ordinance regulations shall apply unless otherwise noted in this Ordinance.	*A lighting plan that demonstrates compliance of all lighting requirements shall be provided at final.*
		2) Exterior site lighting shall be fully shielded and directed downward to prevent off-site glare.	
		3) Site illumination on properties adjacent to residential properties shall not exceed 0.3 ft-candle along property lines, or 1.0 ft candle along non-residential property lines. Parking lot lighting shall be governed by Sec. 27.11.	
		4) Ornamental lighting shall be provided within the greenbelt adjacent to Brown Road...	*Standard not applicable.*
		5) Lighting fixtures within the interior portion of the BIZ district and not within the greenbelt of Brown, Joslyn, or Jordan Roads shall be bronze color, shoebox style LED on a square pole.	*Confirm compliance.* The PC should determine applicability given location next to Gingellville.
	Knee Wall.		
	I.	Where required, a 30" high knee wall as illustrated in Figures 34.2 and 34.3 shall be installed. The knee wall shall adhere to the following standards.	The PC may consider knee wall criteria along Baldwin Rd. for the proposed Special Land Use and Planned Unit Development. The restaurant and car wash are
		1) Decorative knee wall shall be located within the greenbelt, parallel to the R.O.W. and adjacent to the entry planting.	

		2) Columns shall be located at each end of the fence with a brick base and limestone cap.	**located in a transition area between the BIZ and Gingellville Overlay Districts.**
		3) Columns shall have an overall height of 36 inches with a wall height of 2 feet 6 inches.	
		4) Maintenance and repair of the knee wall shall be the responsibility of the property owner.	**See also Item "T" (Landscaping) below.**
34.03 Required Conditions cont.	Public Road Access.		
	I.	Any use developed or proposed within this district shall have direct access to a dedicated public or private road. Access management requirements for driveways, curb cuts, and traffic shall comply with Section 27.14.	*See review of the General Provisions section below.*
	Utilities.		
	K.	Utilities. All utilities servicing the buildings or structures shall be buried underground.	*Plans shall comply.*
	Accessory Outdoor Storage.		
	L.	*No outdoor storage is proposed with this development.*	
	Covered Trash / Recycling or Compactor Areas.		
	L.	1) Covered trash receptacles, recycling receptacles, or compactors shall be surrounded on 3 sides by masonry brick-type walls 1 ft. higher than the receptacle shall be provided in the rear yard of the bldg. or principal use structure.	*Trash enclosures are shown on the site plan for the restaurant & car wash. Dimensions & details of these items shall demonstrate compliance of these standards.* **The restaurant parcel consists of 2 trash enclosures near adj. residential-zoned property which is an encroachment of the parking setback standard being sought as a waiver from the PC.**
		2) The 4th side of the trash receptacle, recycling receptacle, or compactor enclosure shall be equipped with an opaque lockable gate that is the same height as the brick-type wall.	
		3) The PC may, at their discretion, waive the requirements for a covered trash receptacle or compactor as described herein, if, after considering the nature of the operation being proposed, the Commission determines that the amount of trash generated can be adequately disposed of without use of an outside trash receptacle or compactor.	
	Loading and Unloading.		
	M.	1) Loading and unloading areas shall be located in the rear or side yard of a non-residential district.	*The plans shall demonstrate compliance of these standards.*
		2) Loading and unloading areas shall not be located where they will interfere w/ parking or obstruct ingress & egress.	
		3) All loading and unloading areas shall be in conformance with the reqmnts. set forth in Sec. 27.04.	*See review of the General Provisions section below.*
	Performance Bond Requirement.		
	N.	The PC shall req. a performance bond to be deposited with the Twp. Clerk in accordance with the provisions set forth in Sec. 30.09, to ensure that necessary & req. improvements proposed on the site plan will be completed.	*The applicant shall comply.*
	Building Type.		
	O.	All principal uses shall be contained within a free-standing building.	*This standard is met.*
	Safety Paths.		
	P.	Construction of safety paths for pedestrian use and use by non-motorized vehicles shall be required in conjunction	*See review of the General Provisions section below.*

		with the development of all parcels in this zoning district. The safety paths shall conform to the specifications outlined in Sec. 27.06 and Ord. 97.	
	Tree Preservation Regulations		
	Q.	The tree permit requirements apply to developments in this District, according to the terms of Section 27.12.	*The applicant shall comply.*
	Wetland Setbacks.		
	R.	The wetland setback requirements apply to all developments in this District, according to the terms of Sec. 27.17.	*See review of the General Provisions section below.*
	Noise.		
	S.	Regulations regarding the abatement and control of excessive noise are found within the Charter Twp. of Orion Noise Ord. No. 135.	*The applicant shall comply.*
	Landscaping		
		A full landscape plan review will take place at final.	
34.04 Modification of Standards		The Planning Commission shall have the authority to waive or modify the standards of Section 34.03 based upon the economic impact, quality of architectural design, and overall compatibility with the District.	

6. **General Provisions.** The standards in the table below are a summary of the applicable Zoning Ordinance standards in Article XXV; please refer to the individual sections referenced herein for the full Zoning Ordinance text.

General Provisions (Article 27)			
Condition	**Requirement**		**Comment**
27.03 Yard & Bulk Requirements	Projections Into Required Yards		
	C.	1) In all yards: Awnings and canopies; steps 4 ft. or less above grade which are necessary for access to a permitted bldg. or for access to a zoning lot from a street or alley; chimneys projecting 24 in. or less into the yard; approved free-standing signs; arbors and trellises; flagpoles; window unit air conditioners projecting not more than 18 in. into the req. yard; and fences or walls, subject to applicable height restrictions.	*6 trellis structures proposed along the Baldwin Rd. ROW line.* *5 trellis structures pr. along the Judah Rd. extension.* *5 trellis structures pr. in front yards of the North Village.* *2 trellis structures pr. in South Village setback area.* *Multiple fence & column segments along Baldwin & Judah Rd. extension.* *Pr. retaining wall along north & east side of grocery store. Provide cut*

			*sheet of fences/walls. **PUD Waiver required.***
		2) In front yards. Open, paved terraces not over 3 ft. above the avg. grade of the adjoining ground and not projecting farther than 10 ft. beyond the bldg., but not including roofed-over terraces or porches; 1-story bay windows and other architectural features projecting 3 ft. or less into the yards; and overhanging eaves and gutters projecting 3 ft. or less into the yard.	*Paved terrace/patio extension btw. 2 multi-tenant commercial bldgs. along Baldwin Rd. front yard. Plans should dimension the width to not exceed 10 ft. max. Res. & comm. bldg. features shall comply with these standards. Show at final.*
		3a) In rear yards. Balconies; fallout shelters; breezeways; open porches; one story bay windows, & other architectural features projecting 3 ft. or less into the yard; & overhanging eaves or gutters projecting 3 ft. or less into the yard.	*Residential units shall dimension balcony protrusions from the structure(s) at final*
		3b) In rear yards. Decks may be permitted to project into a required rear yard when the following conditions are met...	*Decks are not proposed with this development.*
		4) In side yards. 1-story bay windows and other architectural features projecting into the required yard by not more than 2 in. for each 1 ft. width of side yard; and overhanging eaves and gutters projecting 18 in. or less into the yard.	*Residential & commercial structures shall comply.*
	Location of Required Open Space.		
	E.	All yards and other open spaces allocated to a building or group of buildings shall be located on the same zoning lot as such building or group of buildings.	*This standard is met.*
	Variances to Yard Regulations.		
	F.	The ZBA or PUD process may modify yard regulations by granting a variance for individual cases where literal enforcement of the provisions of the Ordinance would not be reasonably possible or would result in unnecessary hardship. Examples where such variances from yard regulations would be appropriate include:	**Due to an irregular configuration of the Baldwin Rd. right-of-way, the proposed grocery store is 12.2 ft. from the property line. The encroachment into the required yard necessitates a PUD Waiver from 15 ft RB District side yard min.**
		1) A planned development in a multiple-family district;	
		2) Cases where the applicability of the regulations on lots existing and of record at the time this Ordinance became effective cannot be determined.	
		3) Lots that are peculiar in shape, topography, or site configuration.	
	Corner Clearance.		
	G.	No fence, wall, structure, or planting shall be erected, established, or maintained on any corner lot which will obstruct the view of drivers in vehicles approaching the intersection. Fences, walls, structures, or plantings located in the triangular area described below shall not be permitted to exceed a height of 30 in. above the lowest point of the intersecting road. The unobstructed triangular area referred to above may consist of either:	*These standards appear to comply.*

		1) The area formed at the corner intersection of 2 public ROW lines, the 2 sides of the triangular area being 30 ft. in length measured along abutting public rights-of-way lines, and the 3rd side being a line connecting these 2 sides, or	
		2) The area formed at the corner intersection of a public right-of-way and a driveway, 2 sides of a triangular area being 10 ft. in length measured along the ROW & driveway lines and the 3rd side being a line connecting these 2 sides.	
27.04 Parking and Loading	Off-Street Parking		
	A.	1) Scope of Requirements.	
		1) For all bldgs. & structures erected & all uses of land established after the effective date of this Ord., off-street parking shall be provided as required by the regulations of the districts in which such bldgs. or uses are located.	*The provided off-street parking shall comply with the parking standards required by the ord.*
		2) If the intensity of use of any bldg., structure, or premises is increased through the addition of dwelling units, GFA, seating capacity, or other units of measurement specified herein for req. parking, additional off-street parking shall be provided for such increase in intensity of use.	*The site consists of no existing bldgs. proposing additions.*
		3) Whenever the existing use of a bldg. or structure is changed to a new use, parking facilities shall be provided as req. by this Ord. for the new use, regardless of any variance which might have been in effect prior to the change of use.	*Site consists of no existing bldgs. proposing additions.*
		c) Additional Off-Street Parking. Nothing in this Ord. shall be deemed to prevent voluntary establishment of off-street parking facilities to serve any existing use of land or bldgs., provided that all regulations herein governing the location, design, and operation of such facilities are adhered to.	*The off-street parking spaces in excess of the ord. requirements must comply with all parking design standards.*
		f) Electric Vehicle Charging Stations.	**Due to the foreseeable increase in electric vehicle demand, the PC may consider a percentage of EV parking spaces as a condition of PUD and site plan approval.**
		1) Permitted Locations. When accessory to a principal permitted use, electric vehicle charging stations are permitted in all zoning districts.	
		2) Parking.	
		2a) Electric vehicle charging stations located within parking lots or garages may be included in the calculation of minimum required off-street parking spaces.	
		2b) Public electric vehicle charging stations are reserved for parking and charging electric vehicles only. Electric vehicles may be parked in any space designated for public parking subject to the restrictions that would apply to any other vehicle that would park in that space.	
		2c) Electric vehicle charging stations shall be sized the same as a standard parking space as required in the Off-Street Parking Chart herein.	
		2. General Requirements	
		a) Location. Off-street parking for other than residential uses shall be either on the same lot, or within 300 ft. of the bldg. or use it is intended to serve, if said spaces and uses are located in the same zoning district or zoned Parking District measured from the nearest point of the building or use and the nearest point of the off-street parking lot.	*This standard appears to comply.*

		Unless otherwise specified in the regulations for each district, a minimum setback of 20 ft. shall be maintained between any off-street parking area and adjacent property lines. Enclosed bldgs. & carports containing off-street parking shall be subject to applicable yard requirements for the district in which they are located.	**Parking setback encroachments are explained above & require a PUD Waiver.**
		b) Residential Parking. Off-street parking spaces in single-family res. districts shall consist of a parking strip, driveway, garage, or combination thereof and shall be located on the premises they are intended to serve.	*This standard is not applicable.*
		d) Access. Except on lots accommodating single-family dwellings, each off-street parking space shall open directly onto an aisle or driveway of sufficient width and design as to provide safe and efficient means of vehicular access. All off-street parking facilities shall be designed with appropriate means of vehicular access to a street or alley in a manner which will least interfere with traffic movement. Backing directly onto a street shall be prohibited. Ingress and egress to an off-street parking area lying in the area zoned for other than res. use shall not be across land zoned for res. use.	*This standard appears to be met.*
		e) Collective Use of Off-Street Parking. Off-street parking space for separate bldgs. or uses may be provided collectively. If parking facilities for separate bldgs. or uses are provided collectively, the total number of spaces so provided shall not be less than the number which would be required if the spaces were provided separately. The ZBA may reduce the total number of spaces provided collectively by up to 25% if such reduction is specifically approved as part of the required site plan approval process. Such approval shall be granted only on a showing that the parking demands of the 2 uses do not overlap.	*This standard is met.*
		h) Parking Space for Physically Handicap	*Details and dimensions of all handicap parking to meet these standards shall be shown on a detailed final site plan.*
		1) Number. Each parking lot that services a bldg. entrance, except single or two-family residential or temporary structures, shall have a number of level parking spaces as set forth in the following table, and identified by above grade signs as reserved for physically handicapped persons.	
		2) Size. Accessible Parking Spaces for cars shall be a minimum of 11 ft. wide (8' wide parking space plus a 5' wide marked access aisle). Van-Accessible Parking Spaces shall be a minimum of 16 ft. wide (8' wide parking space plus an 8' wide marked access aisle).	
		3) Location. Parking spaces for the physically handicapped shall be located as close as possible to elevators, ramps, walkways, and entrances. Parking spaces shall be located so that the physically handicapped persons are not compelled to wheel or walk behind parking cars to reach entrances, ramps, walkways, or elevators.	
		4) Curbs. Where a curb exists btw. a parking lot surface and a sidewalk surface, an inclined curb approach or a curb cut with a gradient of not more than 1 ft. in 12 ft. and a width of not less than 4 ft. shall be provided for wheelchair access.	

		5) (See, also, State of Michigan Barrier-Free Rules.) The State rules, if they are more restrictive, shall apply in place of the Charter Twp. of Orion Ordinance provisions.	
		6) Number of Required Off-Street Spaces. Off-street parking spaces shall be provided in the quantities req. by the regulations for the districts in which the bldgs. or uses are located. For the purposes of computing the number of parking spaces required, the definition of "Structure Area" as set forth in Article II shall govern. When determination of the number of off-street parking spaces required by this Ord. results in a fractional requirement, any fraction of less than 1/2 may be disregarded, while a fraction of 1/2 or more shall be counted as 1 parking space. Parking spaces req. on an employee basis shall be based on the max. number of employees on duty or residing, or both, on the premises at any one time.	
		3. Layout and Construction	**Detailed final site plans shall include all dimensional components of the proposed parking facilities.**
		a) Dimensions. Plans for the layout of off-street parking facilities shall be in accord with the requirements set forth in the Off-Street Parking Chart contained herein.	
		b) Maneuvering Lanes. Maneuvering lanes shall have adequate width to permit safe one-way traffic movement, with the exception of the 90 pattern, which shall provide for safe 2-way traffic movement. Each entrance and exit to and from a parking lot shall be at least 25 ft. from the nearest point of any property zoned for res. use.	**Parking setback encroachments are explained above & require a PUD Waiver.**
		c) Surfacing and Drainage. Unless otherwise specified in the regulations for each district, all off-street parking areas, access lanes, and driveways required under this section shall be surfaced with concrete, asphalt, or an equivalent hard, dustless surface as approved by the PC. Off-street parking areas, except those serving single or 2 family residences and railroad freight yards, shall also be curbed. Off-street parking areas, access lanes, and driveways shall be graded and drained so as to not drain onto adjacent property or toward buildings. The grading, surfacing, and drainage plans shall be in conformance with the specifications of the Twp. Surfacing of all parking areas, access lanes, and driveways must be completed within 1 year of the date the permit is issued.	*These standards appear to comply. Grading & drainage review is completed by the township engineer.*
		d) Lighting. Any lighting used to illuminate off-street parking areas shall be directed on the parking area only and away from nearby res. properties & public streets. In no case shall lighting exceed 3 foot-candles measured at the lot line.	**A lighting plan that meets all applicable standards shall be provided.**
		e) Screening and Landscaping. Except for those serving single and 2-family dwellings, all off street parking areas shall be screened from view from any adjoining residential property. Such screening shall consist of earth berms, permanent walls, or evergreen landscaping, subject to approval of the PC and in accordance with the provisions set forth in Section 27.05. In cases where a wall extends to any alley which serves	**A landscape plan is required at final to demonstrate compliance of all detailed landscaping standards.**

		as a means of ingress and egress to a parking area, the wall may be ended within 10 ft. from the nearest edge of the alley so as to provide a wider access route to the parking area.	
		f) Wheel Stops. Except for those serving single and two-family dwellings, all parking lots shall be provided with wheel stops or bumper guards so located that no part of parked vehicles will extend beyond the property line or into required landscaped areas.	*The applicant shall comply with these standards.*
		h) Signs. Accessory signs shall be permitted in parking areas in accordance with the provisions set forth in the Orion Twp. Sign Ordinance No. 153.	
	Off Street Loading and Unloading		
	B.	1) Scope and Application.	**Details of loading & unloading areas shall be represented on the detailed final site plan(s) for each facility.**
		a) For all bldgs. & structures erected & all uses of land established after the effective date of this Ord., off-street loading and unloading space shall be provided as required by the provisions set forth in this sec. and by the regulations of the districts in which such bldgs. or uses are located.	
		2) General Requirements.	**Details of loading & unloading areas shall be represented on the detailed final site plan(s) for each facility.** *The proposed grocery store appears to comply with loading standards but should also be included on a detailed site plan.*
		a) Location. Permitted and req. loading berths shall be located as provided in the regulations for each zoning district. Except as provided under Central Loading below, all req. loading berths shall be located on the same zoning lot as the use served. No permitted or req. loading berth shall be located within 30 ft. of the nearest intersection of any 2 streets. Loading and unloading facilities shall not be so located as to interfere with ingress or egress or off-street parking.	
		b) Size. Unless otherwise specified, any required off-street loading berth shall be at least 10 ft. in width by at least 50 ft. in length, exclusive of aisle and maneuvering space, and shall have a vertical clearance of at least 14 ft.	
		c) Access. Each required off-street loading berth shall be designed with appropriate means of vehicular access to a street or alley in a manner which will least interfere with traffic movement. A determination that this standard has been met shall be made by the PC during site plan review.	
		d) Surfacing. All off-street loading berths and loading dock approaches shall be surfaced with a permanent, durable surface, such as concrete, asphalt, or an equivalent material as approved by the PC. The grading, drainage, and surfacing plans for the loading area shall be in conformance with the specifications of the Twp. Engineer.	
		3. Specific Requirements	**Details of loading & unloading areas shall be represented on the detailed site plan(s) for residential areas.**
		a) Residence Districts. Off street loading facilities accessory to uses allowed in districts zoned for residential use shall be provided in accordance with the following minimum requirements:	
		a1) For the uses listed hereunder, 1 loading berth shall be provided for bldgs. containing 10,000 to 100,000 sq. ft. of GFA, plus 1 additional loading berth for each additional 100,000 sq. ft. of GFA or fraction thereof:	

		"All other non-residential uses in a residentially zoned dist.".	
		b) Business Districts (OP, RB, GB SP-1, SP-2, REC-1, REC-2)	*Standards not applicable.*
	Restriction of Open Parking and/or Storage in All Districts Except Where Permitted; Regulation in Single-Family Residential Districts.		
	C.	1) These regulations are intended to control the open parking and storage of trailers, boats, and similar recreational vehicles so as to maintain the orderly appearance of the Township's single-family neighborhoods.	*Standards are not applicable to non-single-family development.*

27.06 Streets, Roads, and Other Means of Access	Acceleration/Deceleration/Passing Lanes.		
	C.	1) Driveways providing ingress and egress to all 2-lane, paved major thoroughfares or collector streets shall be provided with paved acceleration and deceleration lanes and passing lanes.	*These standards are subject to review & approval by the township engineer.*
		2) Driveways providing ingress and egress to roads of 4 or more lanes in width shall be provided with paved tapers for traffic entering the site.	
		3) Driveways providing ingress and egress to any gravel major thoroughfare or collector street shall be provided with tapers for traffic entering the site.	
		4) Required lanes or tapers shall be indicated schematically on the site plan and shall be constructed in accordance with the current standards for such facilities as established by the RCOC.	
		5) Where it can be shown that such lanes or tapers already exist, the requirement may be waived or modified by the PC when site plan review is required by said body or by the Board of Appeals in all other instances.	
	Internal Roadways.		
	D.	1) Width. Unless otherwise specified in Ordinance No. 60, Land Division and Private Roads, an internal or on-site roadway shall be at least 18 ft. in width.	*This standard is met.*
		a) For any zoning district other than single-family residential that has 3 or more structures proposed to front on an internal road, the right-of-way shall be 60 ft., with an improved surface of 30 ft.	**The internal roadway widths, shown on the plans, do not meet these standards. See engineering review A PUD Waiver is req.**
		b) For any zoning district other than single-family residential that has a single structure served by a driveway, the right-of-way shall be a minimum of 30 ft. with an improved surface of 18 ft.	
		2) Surfacing and Drainage. Unless otherwise specified, all internal or on-site roadways shall be surfaced with concrete, asphalt or an equivalent hard, dustless surface as approved by the PC. Roadways shall be graded & drained so as to not drain onto adjacent property or toward bldgs. The grading, surface, & drainage plans shall be in conformance with the specifications of the Twp. & approved by the Twp. Engineer.	*This standard appears to be met.*
	Service Roads.		
	E.	If the PC determines that proposed or anticipated development will result in an excessive number of entrance or exit drives onto a major thoroughfare, thereby creating potentially hazardous traffic conditions and diminishing the carrying capacity of the thoroughfare, the Commission may require construction of service roads on abutting parcels to allow traffic	

		circulation from 1 parcel to another without re-entering the public thoroughfare. Such service roads shall conform to the following standards:	
	E.	1) Location and Dimensions. The front edge of the service road shall be located no closer than the future right of way line of the thoroughfare & shall be at least 24 ft. in width.	**May require PUD waiver. See engineer review.**
		2) Easement. Use of the service road shall be secured through an easement permitting the use of the service road for traffic circulation from 1 parcel to another. Said easement shall be in written form acceptable to the Commission and adopted by the Twp. Board prior to issuance of a building permit. No permanent structures other than the service road shall be permitted within the easement. Said easement shall be recorded with the Oakland County Register of Deeds.	*The applicant shall provide all required, recorded documentation pertaining to the cross access easement(s).*
		3) Surfacing and Drainage. Service roads shall be surfaced with concrete, asphalt or an equivalent hard, dustless surface as approved by the PC. Roadways shall be graded and drained so as not to drain toward bldgs. The grading, surfacing, & drainage plans shall be in conformance with the specifications of the Twp. & approved by the Twp. Engineer.	*This standard appears to be met.*
		4) Maintenance. Each property owner shall be responsible for maint. of the easement & service road so that it remains usable as a means of circulating from 1 parcel to another.	
	Safety Pathways.		
	F.	1) Location and Width. Required pathways shall be eight feet in width and shall be located in the road right-of-way, with a setback of 1 ft. from the property line. The PC may modify this requirement in consideration for the location of utilities, existing landscaping, or other site improvements.	*These standards appear to be met; however, the plans (site & landscape) should show all required pathway connections.*
		2) Design Standards. Required pathways shall be constructed of asphalt or concrete in accordance with adopted engineering standards for the Township.	
		3) Alignment with Adjacent Pathways. Required pathways shall be aligned horizontally and vertically with existing pathways or sidewalks on adjacent properties. The PC may waive this requirement if existing adjacent pathways or sidewalks are not constructed in conformance with the standards set forth herein.	
		4) Signage. The PC may require installation of signage for the purposes of safety where it is necessary to separate vehicular traffic from ped. and bicycle traffic, or where it is necessary to alert vehicular traffic of the presence of the pathways.	
		5) Maintenance. The owner of the property which fronts on the required pathway shall be responsible for maintenance of the pathway, including patching cracked or deteriorated pavement and removal of glass and other debris.	
		6) Permits. It shall be the responsibility of the owner or developer to secure any required permits from the RCOC or MDOT to allow pathway construction in the road ROW.	

27.11 Lighting Regulations	Lighting Plan Submittal Requirements.		
	D.	1) Location of all free-standing, building-mounted and canopy light fixtures on the site plan and/or building elevations.	**A comprehensive lighting plan shall be submitted for review of all lighting standards of this section (final site plan item)**
		2) Photometric grid overlaid on the proposed site plan, indicating the overall light intensity throughout the site (in foot-candles). (The PC is authorized to waive the requirement of a photometric grid when it is determined that such information is not necessary for site plan review.)	
		3) Specifications and details for the type of fixture being proposed, including the total foot-candle output, type of lamp, and method of shielding.	
		4) Use of the fixture proposed.	
		5) Any other information deemed necessary to determine the appropriateness of lighting by the Building Department and/or PC.	
	Non-Residential Lighting Standards		
	E.	1) Free-standing Pole Lighting. Exterior lighting shall be fully shielded and directed downward to prevent off site glare. The intensity of light at the base of a light fixture shall not exceed 20 foot-candles unless lights are recessed within an overhead roof or canopy structure.	**The lighting plan, once provided, should address all applicable standards of this section. The applicant shall identify & explain any lighting design element that is proposed to satisfy the design guidelines of the Gingellville Overlay Design Plan.**
		a) Parking Lot Lighting. Parking lot illumination shall average the following minimum over the entire area, measured 5 ft. above the surface:	
		Small (5-10 spaces) — Avg. 0.4 foot-candle	
		Medium (11-99 spaces) — Avg. 0.6 foot-candle	
		Large (100+ spaces) — Avg. 0.9 foot-candle	
		b) Metal halide, incandescent, fluorescent, or mercury vapor fixtures shall be used in an effort to maintain a unified lighting standard throughout the Township and prevent light pollution. Sodium vapor fixtures may be used, but only with color corrected and shielded lenses.	
		c) The PC may approve decorative or historic light fixtures as an alternative to shielded fixtures, when it can be proven that there will be no off-site glare and that the proposed fixtures will be more consistent with the character of the site.	
		d) The max. height of pole fixtures shall be 20 ft., or the height of the building, whichever is less, measured from the ground level to the centerline of the light source. Fixtures should provide an overlapping pattern of light at a height of 7 ft. above ground level. The PC may permit a maximum height of 30 ft. in an industrial district where fixtures are no closer than 200 ft. to any residential district.	
		e) Except where used for security or safety purposes, as approved in advance by the PC, all outdoor lighting fixtures, existing or hereafter installed and maintained upon private property within commercial, industrial and office zoning districts, shall be turned off or reduced in lighting intensity between 11:00 p.m. and sunrise, except when used for commercial and industrial uses, such as in sales, assembly,	

		and repair areas, where such use continues after 11:00 p.m., but only for so long as such use continues.	
		f) No exposed luminous tube lighting shall be used.	
		2) Building-Mounted Lighting.	
		a) Building-mounted lighting shall be fully shielded and directed downward to prevent off-site glare. The intensity of light shall not exceed 20 foot-candles unless lights are recessed within an overhead roof or canopy structure. Light shall not exceed 0.3 foot-candle along new and existing residential property lines and 1.0 foot-candle along non-residential property lines.	
		b) Metal halide, incandescent, fluorescent, or mercury vapor fixtures shall be used in an effort to maintain a unified lighting standard throughout the Township and prevent light pollution. Sodium vapor fixtures may be used, but only with color corrected and shielded lenses.	
		c) The PC may approve decorative or historic light fixtures as an alternative to shielded fixtures, when it can be proven that there will be no off-site glare and that the proposed fixtures will be more consistent with the character of the site.	
		d) Luminous tube and exposed bulb fluorescent lighting is prohibited as an architectural detail on all buildings, e.g., along the roof line and eaves, around windows, etc. The PC may approve internally illuminated architectural bands or external lighting directed on buildings, where it can be shown that the treatment will serve a legitimate function and will not adversely impact neighboring properties.	
		3) Canopy Lighting.	
		a) All internally lit translucent or fabric awnings shall be prohibited within any zoning district, unless the Building Official or his or her designee determines that the following conditions are met:	
		i) Fluorescent tubes are not visible from the right-of-way.	
		ii. Light levels comply with other ordinance provisions and are not offensive to the adjoining neighbors.	
		iii. Any proposed signage on the translucent or fabric awning shall comply with Orion Twp. Sign Ordinance No. 153 requirements.	
Residential Lighting Standards			
	F.	1) Site Lighting. All outdoor lighting in residential use districts shall be shielded or directed in a manner which reduces glare and shall be so arranged as to reflect objectionable lighting from all adjacent residential districts or adjacent residences.	**The lighting plan, once provided, shall comply with these standards.**
		2) Parking Lots. For non-residential uses, allowed in residential zoning districts such as churches, and municipal facilities, etc., all parking lots shall be subject to Sec. 27.11 (E).	
Prohibited Lighting Types			
	G.	1) The use of search lights or any similar high-intensity light for outdoor advertisement or entertainment.	*The plans shall comply with these standards.*
		2) Flashing, moving, or intermittent-type lighting.	

		3) Building or roof mounted lighting intended to attract attention to the building and/or use and not strictly designed for security purposes or architectural accent.	
		4. Exterior exposed luminous tube lighting except neon lighting used for signage.	
	Exemptions.		
		The following are exempt from the lighting requirements of this Section, except that the Building Dept. may take steps to eliminate the impact of the following exempted items when deemed necessary to protect the health, safety, and welfare of the public.	*These standards do not apply to the proposed PUD.*
	H.	1. Sports fields. 2. Swimming pools. 3. Holiday decorations. 4. Shielded pedestrian walkway lighting. 5. Street lights or lights within a public or private road right-of-way.	
	Application of Standards for Major Thoroughfares		
27.14 Access Management	C.	2) A traffic impact study shall be required for a rezoning, site plan, subdivision plat, or development plan, under any of the following situations:	**The applicant shall provide a copy of the Traffic Impact Analysis (see engineering review).**
		a) For any proposed rezoning, whether consistent or not with the current Master Land Use Plan, when the proposed uses could generate at least 100 trips during the peak hour or over 750 trips in an avg. day. The traffic impact study shall evaluate the changes between the potential uses that are the most intense trip generators under the current zoning and the zoning being requested.	
		b) For any proposed site plan or development, when the proposed uses could generate at least 100 trips during the peak hour or over 750 trips in an average day.	
		c) For other proposed development projects, as may be requested by the PC. Examples may include projects requiring Special Land Use permits or PUDs.	

7. Applicant provided a parallel plan which compares the site with existing zoning. The BIZ zoning shows a hotel and retail building. The remainder of the site has retail and a series of 24-unit multi-family buildings. The 24-unit buildings would as shown would not be permitted by the underlying zoning or by the Gingellville Overlay District as written. The plan does not show at least 60% single family detached residential units.

8. **PUD Criteria**

Planning Commission should carefully review the PUD Criteria in Section 30.03. The following are some highlighted areas:

In general, the Planning Commission may recommend variations from PUD guidelines when an applicant has demonstrated the doing so will result in a corresponding benefit to the community.

RECOGNIZABLE BENEFIT.

See applicant submittal packet for additional information.

a. Preservation of natural features. A tree survey for the entire site has not yet occurred. Some wetland and natural areas are being preserved.
b. Preservation of historic buildings. N/A
c. Improvements in traffic patterns. The PUD Intent section states that enhanced traffic circulation should be provided, and a less sprawling form of development should be encouraged. Generally, multiple access points and intersections provide enhanced circulation through dispersing traffic through multiple travel routes in areas, where reduced access points and intersections, and the use of cul-de-sacs can concentrate traffic on one or two roadways limiting circulation options. Access is limited to specific locations. Defer to Township engineer for comment.
d. Improvements in the aesthetic qualities. There are a wide variety of site amenities shown on the plan and described elsewhere in this review.
e. Improvements in public safety or welfare. Defer to Township engineer regarding traffic safety and public facilities. See letters from other departments for additional input
f. High-quality architectural design. Applicant has provided concept drawings that appear to show high quality design. Note, however, that several PUD waivers are required.
g. Provision of transitional areas. See applicant response. Note that some transition areas require granting of waivers.

Density impact.
The applicant has submitted a parallel subdivision plan. We note that it appears that the plan is not feasible under the existing zoning. One key issue is the number of multiple family units proposed. See 6. above.

Note: The ultimate density shall be recommended by the Planning Commission and determined by the Township Board and shall be based upon the underlying zoning or a density as designated by the Master Plan. The density is less than the maximum in the Master Plan, however, it appears that waivers are necessary to achieve some of the design proposals.

Township Master Plan.
The Future Land Use map in the new Master Plan is generally consistent with the proposal. It also has been updated to be more accepting of some types of multiple family development in the Gingellville Overlay. The following is an excerpt from the Master Plan:

> Gingellville: Permitted uses within the area outlined are listed in the Gingellville Village Center Overlay District –Section 33.01 Principal Uses Permitted. Following are the list of uses currently permitted/restricted in this overlay district.
> - Low intensity retail, office, or professional uses.
> - "Big Box" or intensive commercial uses shall be restricted.
> - Mixed use developments including residential and commercial uses are encouraged as part of a PUD.

- Deep parcels shall be reserved for residential uses but may have frontage retail or flex space that could be townhouse, retail or other similar uses. Single-family residences are favored as the predominant land use at the edges of the district. In mixed use projects, it is expected that detached and attached units would be interspersed with local business uses along the frontage of the property. Missing middle housing types are also encouraged in this area.

Economic impact.
This section states that the Planning Commission should determine that in relation to the existing zoning, the proposed development shall not result in a material negative economic impact upon surrounding properties.

Guaranteed open space. Section 30.03 B.5. states that 15% of the site shall be guaranteed open space including usable active and passive upland spaces and trails. Park like amenities may be provided and open space shall be equally available to all residents of the development with maintenance and ownership documentation shall be submitted. The plan reflects compliance with the percentages.

Unified control.
This is a coordinated and interconnected development under the control of several partnering developers as outlined in the packet.

OTHER KEY PUD ISSUES.

Compatibility with adjacent uses.
Consideration shall be given to:

a. The bulk, placement, and materials of construction of proposed structures.
b. The location and screening of vehicular circulation and parking areas in relation to surrounding development.
c. The location and screening of outdoor storage, outdoor activity or work areas, and mechanical equipment in relation to surrounding development.
d. The hours of operation of the proposed uses.
e. The provision of landscaping and other site amenities.

Transition areas.
The applicant is proposing open space and tree preservation as a transition area abutting single family residential districts to the west and north of the site. Planning Commission should review these transitions with the applicant. The Zoning Ordinance requires that if the grade change adjacent to a single-family residential area is to be varied by more than three feet, the site plan shall include cross sections illustrating existing and proposed grades in relation to existing and proposed building heights.

Architectural and site element design.
Residential facades should not be dominated by garages. Where attached garages are proposed, at least 50% of the garages should be side-entry or recessed, where the front of the garage is at least five feet behind the front line of the living portion of the principal dwelling. The intent of encouraging recessed or side entry garages is to enhance the aesthetic appearance of the development and minimize the visual impact resulting from the close clustering of units allowed under these regulations. Some additional detail will be needed to review. This should be discussed with the Applicant.

Staff will be available to discuss this review at the next Planning Commission meeting.

Respectfully,
Giffels Webster

Rodney L. Arroyo, AICP
Partner

Eric Pietsch
Senior Planner

Charter Township of Orion

2323 Joslyn • Lake Orion, Michigan 48360 • (248) 391-0304

To: Tammy Girling
Planning & Zoning Director

From: Jeffery T. Stout
Director, Department of Public Services

Date: July 21, 2022

Re: PC-2022-29, Baldwin Village PUD Concept

Dear Tammy,

The Department of Public Services has reviewed the above-mentioned project. We have ample capacity to meet the needs of this expansion.

If you have any questions, please contact me.

Respectfully Submitted,

Jeffery T. Stout
Director
Department of Public Services

WRC
WATER RESOURCES COMMISSIONER
Jim Nash

July 15, 2022

RECEIVED
JUL 18 2022
Orion Township
Planning & Zoning

Lynn Harrison
Orion Township
Planning & Zoning
2323 Joslyn Road
Lake Orion, MI 48360

Reference: **Baldwin Village PUD – CAMS #202200590**
Part of the SW & NW ¼ of Section 32, Orion Township

Dear Ms. Harrison,

This office has received one set of plans for the Baldwin Village PUD Project to be developed in the Southwest & Northwest ¼ of Section 32, Orion Township.

Our stormwater system review indicates that the proposed project has no direct involvement with any legally established County Drain under the jurisdiction of this office. Therefore, a storm drainage permit will not be required from this office.

The water system is operated and maintained by Orion Township and plans must be submitted to Orion Township for review.

The sanitary sewer is within the Clinton-Oakland Sewage Disposal System. Any proposed sewers of 8" or larger may require a permit through this office.

Please note that all applicable permits and approvals from federal, state or local authorities, public utilities and private property owners must be obtained.

Any related earth disruption must conform to applicable requirements of Part 91, Soil Erosion and Sedimentation Control of the Natural Resource and Environmental Protection Act, Act 451 of the Public Acts of 1994. An application should be made to Orion Township for the required soil erosion permit.

If there are any questions regarding this matter, please contact Dan Butkus at 248-897-2744.

Sincerely,

Brian Bennett, P.E.
Civil Engineer III

RECEIVED

JUL 22 2022

Orion Township
Planning & Zoning

PC -22-29 Baldwin Village Planned Unit Development

A site walk was conducted on July 22, 2022 for the subject property located on the west side of Baldwin Road between Morgan and Gregory Streets.

The parcel is large and is well forested with large trees and a heavy border of trees on Baldwin Road.

Baldwin was recently widened with the southern portion having a boulevard and round-about adjacent to it and the northern portion having a 5 lane road adjacent to it.

The property is vacant and there is one excepted parcel at the northern end of the property but it is surrounded by the proposed development. The Shalom Baptist Church is on adjacent property and abuts the property on Morgan Road and the immediate corner of Baldwin and Morgan was acquired from the church.

There is a well established single family subdivision on Peppermill Lane and Peppermill Court abutting to the west of the property and single family homes to the north on Gingell Drive and Pasadena Drive. The homes on Gingell Dr. are single loaded with the homes on north side of the street. The property on the south side of Gingell Drive is part of the subject request. The homes on Pasadena Drive are deep lots which back onto the subject property. To the northwest of the subject property is a new development under construction - The Cottages at Gregory - which is single family detached condominium development by Pulte. Further to the south is a shopping center with Kohls as the primary anchor and other brand name retail establishments before the I-75 Baldwin interchange. There is a traffic signal at the entrance to the shopping center and there are no other traffic signals on Baldwin until Clarkston Road - relying on the round abouts to regulate traffic flow.

The preliminary plan indicates a major entrance at the Judah Road round about and other entrances at other uses on the site. A pedestrian path exists on Baldwin Road.

The site is heavily wooded and with careful site design to take advantage of the existing mature trees on the border of the property it would assist in providing substantial buffering to the adjacent single family homes.

Respectfully submitted

Donald Gross, Planning Commissioner

_____

Donald Gross, Planning Commissioner
Charter Township of Orion
2525 Joslyn Rd., Lake Orion MI 48360
dgross@oriontownship.org
http://www.oriontownship.org

RECEIVED

JUL 07 2022

Orion Township
Planning & Zoning

Charter Township of Orion
Planning & Zoning Department
2323 Joslyn Rd., Lake Orion MI 48360
P: (248) 391-0304 ext. 5000

Case # PC-22-29

Meeting Date: _

Charter Township of Orion Planning Commission
Planned Unit Development (PUD) Application

Project Name: BALDWIN VILLAGE

Applicant

Name: RED Equities, LLC / Gilbert "Buzz" Silverman

Address: 121 West Long Lake - Suite 190 City: Bloomfield Hills State: MI Zip: 48304

Phone: 248-540-6400 Cell: _____ Fax: _____

Email: buzz@silverman.com

***Property Owner(s)**

Name: David Carr - 3400 Morgan Road, Orion Twp, MI 48359 248-391-0443
Edwin Adler - 20 West Washington Clarkston, MI 48346 248-625-0443

Address: _____ City: _____ State: _____ Zip: _____

Phone: _____ Cell: _____ Fax: _____

Email: _____

* If the name on the deed does not match the name of the property owner on this application, documentation showing the individual is the same as the company name must be provided.

Plan Preparer Firm/Person

Name: J Eppink Partners, Inc - 9336 Sashabaw Road, Clarkston, MI 48348 248-922-0789
Anderson, Eckstein, & Westrick, INc - 51301 Schoenherr Rd, Shelby Twp, MI 586-726-1234

Address: _____ City: _____ State: _____ Zip: _____
Stonefield Engineering & Design - 607 Shelby St, Suite 200, Detroit, MI 48226

Phone: _____ Cell: _____ Fax: _____

Email: _____

Project Contact Person

Name: Gilbert "Buzz" Silverman

Address: 131 West Long Lake, Suite 190 City: Bloomfield Hills State: MI Zip: 48304

Phone: 248-540-6400 Cell: 248-310-3400 Fax: _____

Email: buzz@silverman.com

Property Description

Sidwell Number(s): 09-32-301-001, 09-32-301-014, 09-32-151-020, 09-32-151-021

Location or Address of Property: West side of Baldwin, North of Morgan, west of Judah Road

Side of Street: Morgan Nearest Intersection: Baldwin & Judah

Acreage: 63.3 Current Use of Property: Vacant

Frontage (in feet): 2,388 aprox Depth (in feet): 1,253 aprox

Subject Property Zoning: SR / BIZ Adjacent Zoning: N. SF / MF S. BIZ / SF E. RB / O&P W. SF / PUD

Is the complete legal description printed on the site plan? [X] Yes [ ] No (if no please attach to the application)

Intent/Eligibility/Design Standards

Comprehensive Statement of Intent: Give a detailed description of the proposed development (refer to Ord. 78, Section 30.03(A)). Please indicate the number and size of the buildings or units be proposed (attach a separate sheet).

Narrative Description of Project: Provide info of the market concept of the project, and explaining the manner in which the criteria set forth for eligibility (Ord. 78, Section 30.03(B)) and design (Ord. 78, Section 30.03(C)-(E)) have been met (attach a separate sheet detailing each criteria).

Per Ord. 78, 30.03(C)(6), all Zoning Ordinance requirements for the underlying zoning district shall remain in full force unless waived or modified by the Planning Commission and Township Board. Below is a list of requirements, please list the current zoning requirement and what is being proposed. Please also detail how the specific design criteria listed is being met.

See Deviation Chart and Site Plan Attached

	Per Zoning Ordinance	Proposed
Lot size and width		
Lot coverage		
Min floor area		
Front, side, and rear setbacks		
Height		
Parking and loading		
Fencing		
Landscaping		
Setback for side entry garage		
Other		

Does the project have adequate:

Perimeter setback and berming? YES

Thoroughfare design? YES

Drainage design? YES

Utility design? YES

Underground utilities? YES

Pedestrian circulation system from vehicular thoroughfares and ways? YES

Achievement of an integrated development with respect to signage, lighting, landscaping, and building materials? YES

Noise reduction and visual screening mechanisms (particularly where nonresidential uses adjoin off-site residentially zonedproperty)? YES

Outside Agencies

Per Ord. 78, Section 30.01(C), a copy of this application and two (2) copies of the site plan must be submitted to each of thefollowing agencies. Please provide the Township with a copy of each transmittal as proof of delivery.

AT&T
54 Mill St.
Pontiac, MI 48342

Consumers Power Company
530 W. Willow St.
Lansing, MI 48906

DTE Energy Co.
ATTENTION: NW Planning & Design
1970 Orchard Lake Rd.
Sylvan Lake, MI 48320

Michigan Department of Transportation (if applicable)
800 Vanguard Dr.
Pontiac, MI 48341

Oakland County Water Resources Commission
(To be submitted by the Township)

Oakland County Health Department
Building 34 East
1200 N. Telegraph Rd.
Pontiac, MI 48341

Road Commission of Oakland County (if applicable)
ssmtkowski@rcoc.org
(Electronic submittal only)

Required Signage

Per Ord. 78, Section 30.04(H), a sign indicating the requested rezone shall be installed on the parcels(s) no less than 15 days prior to the scheduled public Hearing. Please check one:

☐ I will install the sign(s) as required (see below for specifications).

☒ I would like to lease signage from the Township (including installation).
(please complete attached Sign Request Form).

The sign shall have the following wording (see Ord. 78, Section 30.04(H) for additional requirements):

ZONING CHANGE PROPOSED	- (min 8" high letters)
For more information call:	- (min 3" high letters)
Charter Township of Orion	- (min 4" high letters)
Planning and Zoning Department	- (min 4" high letters)
248-391-0304 ext. 5002	- (min 4" high letters)

*Please note, the Township does offer the ability to rent the required signage (see attached form). Please contact the Planning and Zoning Department with any questions.

I/We, the undersigned, do hereby submit this application for Rezoning, pursuant to the provisions of the Charter Township of Orion Zoning Ordinance No. 78, Sections 30.03 and 30.01 and any other applicable ordinance requirements. In support of this request, the above facts are provided. I hereby certify that the information provided is accurate and the application that has beenprovided is complete.

Signature of Applicant: SEE ATTACHED Date: _____
(must be original ink signature)

Print Name: _____

I, the property owner, hereby give permission to the applicant listed above to act as my agent in submitting applications, correspondence and to represent me at all meetings. I also grant permission to the Planning Commission members to visit the property, without prior notification, as is deemed necessary.

Signature of Owner*: SEE ATTACHED Date: _____
(must be original ink signature)

Print Name: _____

*If the deed of ownership does not show an individual, ie a corporation, partnership, etc., documentation must be provided showing theindividual signing this application has signing rights for the entity.

Baldwin Village:

Applicant: Baldwin Village

I/We, the undersigned, do hereby submit this application for Rezoning, pursuant to the provisions of the Charter Township of Orion Zoning Ordinance No. 78, Sections 30.03 and 30.01 and any other applicable ordinance requirements. In support of this request, the above facts are provided. I hereby certify that the information provided is accurate and the application that has beenprovided is complete.

Signature of Applicant:
(must be original ink signature) Red Equities By _____ Date: 7/5/22

Print Name: Red Equities By Gilbert "Buzz" Silverman

Baldwin Village:

Applicant:

I/We, the undersigned, do hereby submit this application for Rezoning, pursuant to the provisions of the Charter Township of Orion Zoning Ordinance No. 78, Sections 30.03 and 30.01 and any other applicable ordinance requirements. In support of this request, the above facts are provided. I hereby certify that the information provided is accurate and the application that has beenprovided is complete.

Signature of Applicant:
(must be original ink signature) _____ Date: 7/5/22

Print Name: Gabriel Schuchman

Baldwin Village:

Applicant:

I/We, the undersigned, do hereby submit this application for Rezoning, pursuant to the provisions of the Charter Township of Orion Zoning Ordinance No. 78, Sections 30.03 and 30.01 and any other applicable ordinance requirements. In support of this request, the above facts are provided. I hereby certify that the information provided is accurate and the application that has beenprovided is complete.

Signature of Applicant:
(must be original ink signature) _____ Date: 7.5.22

Print Name: Dominic Moceri

Charter Township of Orion
Planning & Zoning Department
2323 Joslyn Rd., Lake Orion MI 48360
P: (248) 391-0304 ext. 5002

Project Name BALDWIN VILLAGE

PC# _____ Parcel#(s) _____

Please select an option below:

☑ **Permission to Post on Web Site**

By signing below as applicant and on behalf of my consultants, we agree to allow the plans for the above-named project, in which approval is being sought by the Planning Commission and/or Township Board, to be posted on the Township website.

BY RED EQUITIES _____ 7/15/22
Signature of Applicant — Date

RED EQUITIES By Gilbert "Buzz" Silverman MGR.
Printed Name of Applicant

☐ **Do not want Posted on Web Site**

Baldwin Village:

Property Owner Two:

I, the property owner, hereby give permission to the applicant listed above to act as my agent in submitting applications, correspondence and to represent me at all meetings. I also grant permission to the Planning Commission members to visit the property, without prior notification, as is deemed necessary.

Signature of Owner*:
(must be original ink signature) David M. Carr Date: 6/29/22

Print Name: DAVID M. CARR

*If the deed of ownership does not show an individual, ie a corporation, partnership, etc,, documentation must be provided showing theindividual signing this application has signing rights for the entity.

Baldwin Village:

Property Owner One:

I, the property owner, hereby give permission to the applicant listed above to act as my agent in submitting applications, correspondence and to represent me at all meetings. I also grant permission to the Planning Commission members to visit the property, without prior notification, as is deemed necessary.

Signature of Owner*: Edward F Adler Date: 7-5-2022
(must be original ink signature)

Print Name: Edward F Adler

*If the deed of ownership does not show an individual, ie a corporation, partnership, etc., documentation must be provided showing theindividual signing this application has signing rights for the entity.

J EPPINK
PARTNERS INC
Traditional Town Planning
Landscape Architecture

5336 Sashabaw Road
Clarkston, MI 48346
248 922 0789 - t
248 922 0415 - f

July 26, 2022

Ms. Tammy Girling
Orion Township Planning Department
2323 Joslyn Road
Lake Orion, Michigan 48360

RE: Baldwin Village
Parallel Plan

Dear Ms. Girling:

Attached please find a Parallel Site Plan to be included as a supplement to the July 6, 2022, Baldwin Village Conceptual PUD submission.

The Parallel plan has been completed in compliance with the existing Zoning Districts: the Brown Road Industrial Zone (BIZ) district, and the Gingellville Village Center Overlay district, in which the site is located. The Parallel Plan has incorporated the land use and dimensional standards found in the Orion Township Zoning Ordinance and provides a residential desnity of 20 units per acre based on Section 33.02(J)(5)(a-d) of the Gingellville Overlay Ordinance.

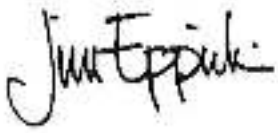
Contrasting to the Parallel Plan, the preferred Baldwin Village site plan proposes a residential density of 9.76 units per acre within the residential sections of the development. **Section 33.03(E)(1) of the Township's PUD Ordinance allows a density credit for Exemplary Projects. Baldwin Village is an exemplary project, in our opinion, and qualifies for the desnity bonus by providing the following elements:**

c) 20% Open Space has been provided (10.65 acres). This is in addition to the preservation of 2.6 acres of wooded wetlands and the creation of a 2.65-acre pond with fountains
c) Baldwin Village provides a comprehensive stormwater management plan that enhances surface and ground water quality while protecting natural systems of the site
d) The plan preserves a 2.6-acre high quality wooded wetland on site as well as wooded buffers at the perimeter of the site

e) The applicant has offered financial contributions to the Township Safety Path fund as well as to benefit the construction of the Camp Agawam accessible kayak launch
f) Additional exemplary design and development elements within the Baldwin Village development as noted in the Conceptual PUD Submission documents and architectural renderings

Thank you for incorporating the Parallel Plan into the Conceptual PUD package for use as a tool in the review and evaluation of Baldwin Village. We are happy to provide any additional information or description that may be helpful or required.

Sincerely,



Baldwin Village

Orion Township Michigan

July 6, 2022

Conceptual Planned Unit Development

Orion Township Planning Commission

Location:
Northwest corner of
Baldwin Road and Morgan Road
Orion Township, Michigan

Commercial Developer:

ALRIG USA

Applicant / Developer:

SILVERMAN
A RED EQUITIES DEVELOPMENT

121 West Long Lake - suite 190
Bloomfield Hills, Michigan 48304
248-540-6400

Residential Developer:

MOCERI
Michigan's Legendary Dream Builder

S.R. JACOBSON
DEVELOPMENT CORPORATION

Submission Document Index:

Architect:

DAG
DETROIT ARCHITECTURAL GROUP

Architect:

Dominick Tringali
ARCHITECTURAL COLLECTION

Urban Design & Landscape Architect:

J EPPINK PARTNERS, INC.
Urban Design Studio
Landscape Architecture
Traditional Town Planning

Commercial Civil Engineer:

STONEFIELD
engineering & design

Residential Civil Engineer:

ANDERSON, ECKSTEIN & WESTRICK, INC.
CIVIL ENGINEERS SURVEYORS ARCHITECTS

STATE OF MICHIGAN
JAMES T. EPPINK
LANDSCAPE ARCHITECT
No. 1309
REGISTERED LANDSCAPE ARCHITECT

Project Data:

PARCEL SIZE :

63.30 Gross Acres
58.70 Net Acres
00.84 RCOC Parcel Net
59.54 Total Net Acres

47.67 Net Residential Acres
11.87 Net Commercial Acres

Open Space : 20%
Preservation of Wetland
Establishment of perimeter buffer

Residential Density :
465 Proposed Residences
9.76 Residences / acre

Residential Roads (private):
Road Easement 60'
Road Width 27' (back of curb)

Perimeter Setbacks:
50' min North, South, West (residential)
50' min Baldwin Rd frontage (residential)
38' min Baldwin Rd. frontage (commercial)

Zoning :

Current: **SF** within the Gingellville Village Center Overlay Dist.
BIZ within the Brown Rd Innovation District

Proposed: **Gingellville Village Center Overlay District** implementing a **PUD** (Planned Unit Development) & Village Center District Standards

Gingellville Village Center Overlay District
General Design & Development Criteria implemented within Baldwin Village:

- Promote mixed-use development that advances a 'village' concept
- Predominately residential
- Transition from Commercial to multi-family to single family
- Provide appropriate buffers at perimeter
- Promote pedestrian connections & linkages
- Pedestrian amenities, streetscape, & walkways
- Quality Architecture & Landscape Architecture
- Open Space & Community Spaces
- Gingellville approved master signage plan

Residential Components:

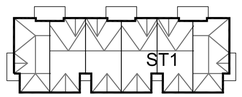
North Village Townhomes
79 Townhomes (2-story)
16' Front setback (from easement)
30' Rear setback (minimum)
20' Building to building min distance

South Village Townhomes
68 Townhomes (2-story)
14 Attached Single Family (2-story)
15' Front setback (from easement)
30' Rear setback (minimum)
20' Building to building min distance

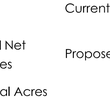
Uptown Village
304 Residential Units (3-story)
15' Front setback (from easement)
60' Building to building min distance

Plaza at Baldwin Village (commercial)
70,000 sf Commercial square footage (net)
35' Front setback (from Baldwin ROW)
100' Rear setback (min from western PL)
50' Building to building min distance
9' x 19' Parking space (min size)

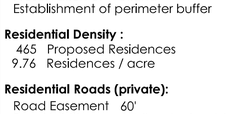
Building Legend:



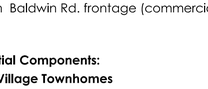
The Towns at South Village
68 Townhouse residences
4, 5, 6, 7, & 8 residences per building
2 - Story / Front & Side Garage
2 interior garage spaces / unit



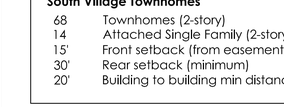
The Towns at South Village
14 Attached Single Family
2 residences per building
2 - Story / Front Garage
2 interior garage spaces / unit



The Towns at North Village
27 Townhouse residences
4, 7, & 8 residences per building
2 - Story / Front Garage
2 interior garage spaces / unit



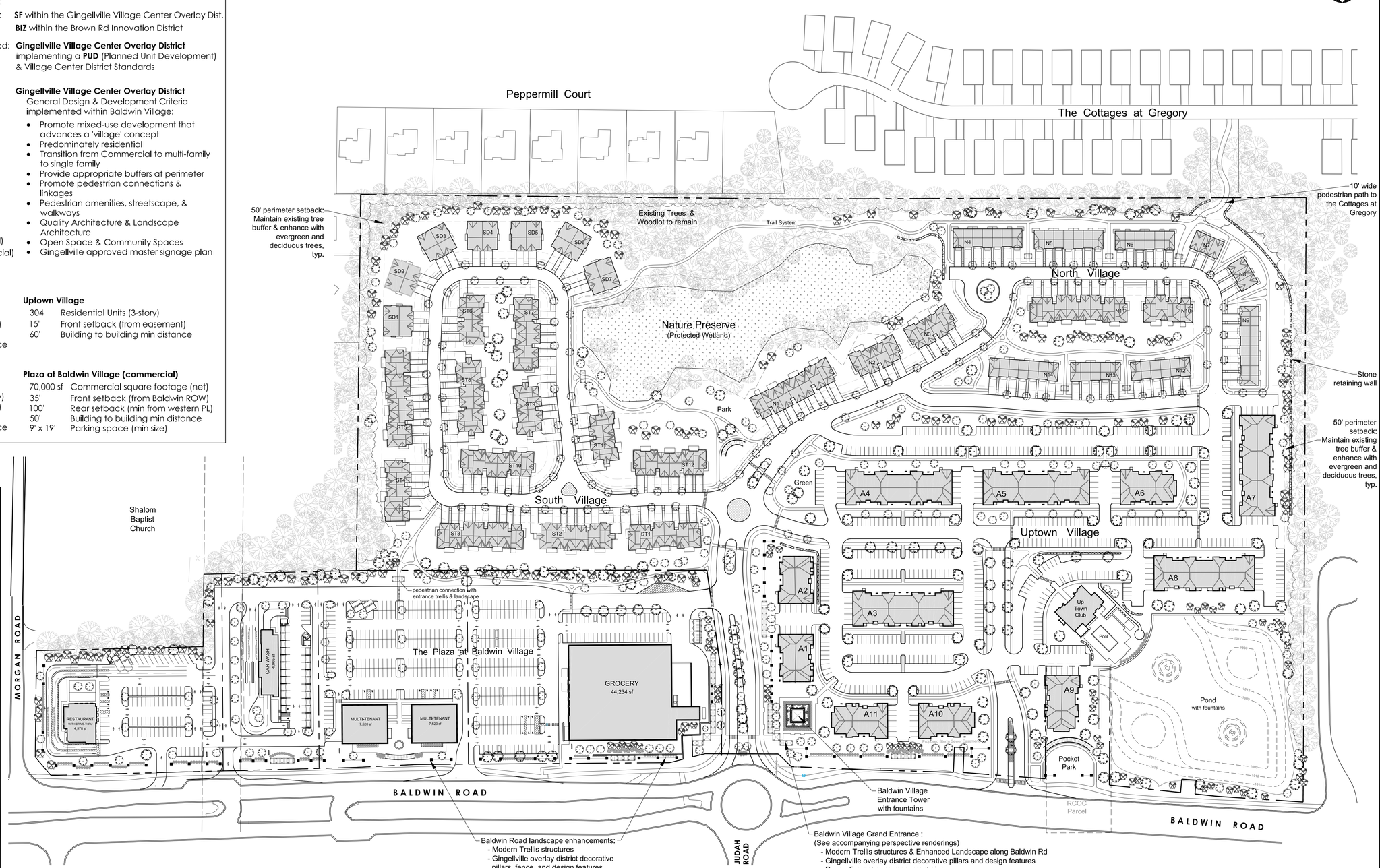
The Towns at North Village
52 Townhouse residences
3, 4, 5, 6, & 8 residences per building
2 - Story / Rear Garage
2 interior garage spaces / unit



Uptown Village
304 Multi-Family residences
19 or 38 residences per building
3 - Story
12 interior garage spaces / building

Baldwin Village - Master Site Plan:

SCALE: 1" = 100'



Gingellville Village Center Overlay District & Brown Road Innovation Zone (BIZ)

Baldwin Village is located within the Gingellville Village Center Overlay District and the Brown Road Innovation Zone (BIZ). The Orion Township Master Plan calls for this area to be developed to create a 'village-like" atmosphere with various uses that are interconnected, pedestrian friendly, and blend community-oriented business with residential uses. It further defines the 'fifteen minute' neighborhood and directs that the Gingellville Village Overlay District and Brown Road Innovation Zone standards outlined in the Township's Zoning Ordinance be used in the design and development of this area. Baldwin Village creates a mixed-use, interconnected, 15-minute neighborhood that will provide 20% open space, landscaped parks, buffers, and natural preservation areas, along with three residential villages and a community targeted commercial village, all with harmonious, high-caliper architecture, site design amenities, and an iconic gateway experience and landscape at the gateway to Orion Township.

See artistic perspective images of Baldwin Village grand entrance, common areas, and proposed architecture included in accompanying package

Overlay District Parallel Plan & Design Standards:

The Gingellville Village Center Overlay District and the Brown Road Innovation Zone provide standards that supersede underlying zoning. The Baldwin Village development plan meets or exceeds the standards and objectives of the Overlay districts. The proposed density of Baldwin Village is less than half of the density permitted within the Gingellville Overlay District, and therefore a parallel plan is not provided within this submission package. The chart on this page provides standards used and comparisons to the Overlay Districts and Ordinance standards including permitted vs. proposed density.

Orion Township Zoning Ordinance : Section 33.03

Baldwin Village meets the intent and objectives of the Gingellville and BIZ Overlay districts' land uses, design, and dimensional standards. Section 33.03 of the Gingellville Overlay District further grants the Planning Commission the authority to waive or modify the standards in order to achieve the complexity of a master planned, mixed use community such as Baldwin Village.

Deviation Table:

Item:	Ordinance Objective:	Baldwin Village - Proposed:
Retail: Max Floor Area	13,000 sf	44,234 sf
Res Distance from Baldwin	1,000'	1,125'
Open Space	15% / 10%	20% overall
Architecture	5,000 sf / use	44,234 sf / grocery
Gingellville permitted Density	20 DU / acre	9.76 residences proposed
	20 x 47.67 = 953 permitted	9.76 x 47.67 = 465 proposed
Residential Type	Attached Single Family Attached Multi Family Detached Single Family	Attached Single Family Attached Multi Family
Commercial Uses Permitted within BIZ District	Restaurant (w/ drive thru) Retail Restaurant Car Wash	Restaurant (w/ drive thru) Retail Restaurant Car Wash

See proposed dimensional standards on Commercial and residential site plan included in this submission package

Baldwin Village Features:

1. Three Residential Villages
2. One Commercial Village
3. Interconnected sidewalks, trails, and circulation system
4. Preservation / protection of wetland and environmental system
5. Twenty percent Open Space
6. Preservation / enhancement of perimeter woods and landscape buffer
7. Decorative pond with fountains at Baldwin Road
8. Iconic Baldwin Village tower with fountain and robust landscape
9. Modern trellis features with enhanced landscape along entire Baldwin Rd frontage

STATE OF MICHIGAN
REGISTERED LANDSCAPE ARCHITECT
JAMES T. EPPINK
LANDSCAPE ARCHITECT
No. 1309

J EPPINK PARTNERS, INC.
Urban Design Studio

Landscape Architecture
Traditional Town Planning

9336 Sashabaw Road
Clarkston, Michigan 48348
248.922.0789

Project:
Baldwin Village
Orion Township, Mi.

Applicant / Developer:
RED Equities, LLC
121 W. Long Lake, Suite 200
Bloomfield Hills, MI 48304

Development Team:

Residential:
Moceri Companies

Residential:
S.R. Jacobson
Development Company

Commercial:
ALRIG USA

Sheet:
Master Site Plan

Issues / Revisions
Conceptual PUD Submittal 07-06-22

Drawn by:

Checked By
JTE

Date
July 6, 2022

Scale
As Shown

Not for Construction

Sheet
MP-1

SITE DEVELOPMENT PLAN

FOR

BALDWIN VILLAGE

PROPOSED COMMERCIAL DEVELOPMENT - THE PLAZA

PARCEL ID: 09-32-301-001 & 09-32-301-014
SWC OF BALDWIN ROAD & JUDAH ROAD
CHARTER TOWNSHIP OF ORION
OAKLAND COUNTY, MICHIGAN 48359

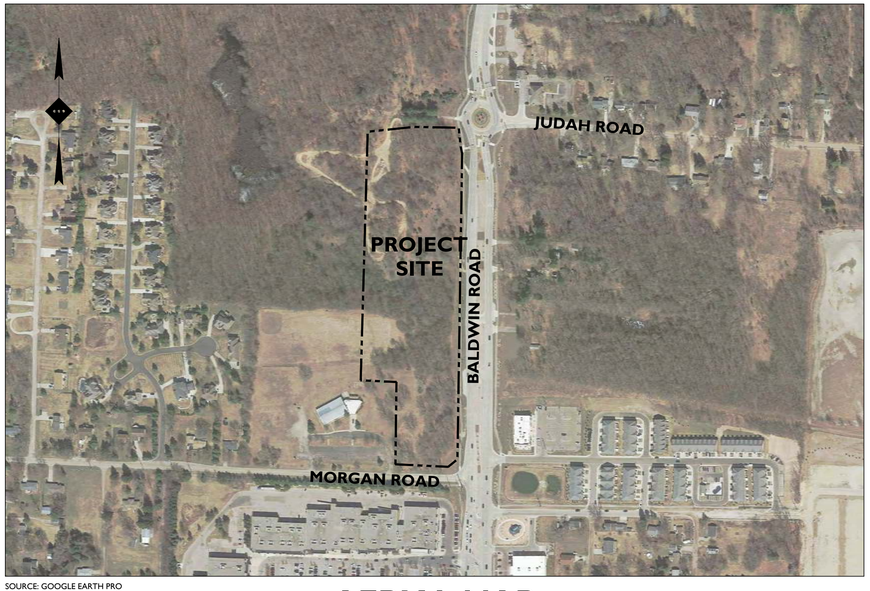
APPLICANT

ORION TOWNSHIP RETAIL MANAGEMENT LLC
30200 TELEGRAPH ROAD, SUITE 205
BINGHAM FARMS, MICHIGAN 48025
248-646-9999

SOURCE: USGS TOPO MAP

LOCATION / KEY MAP

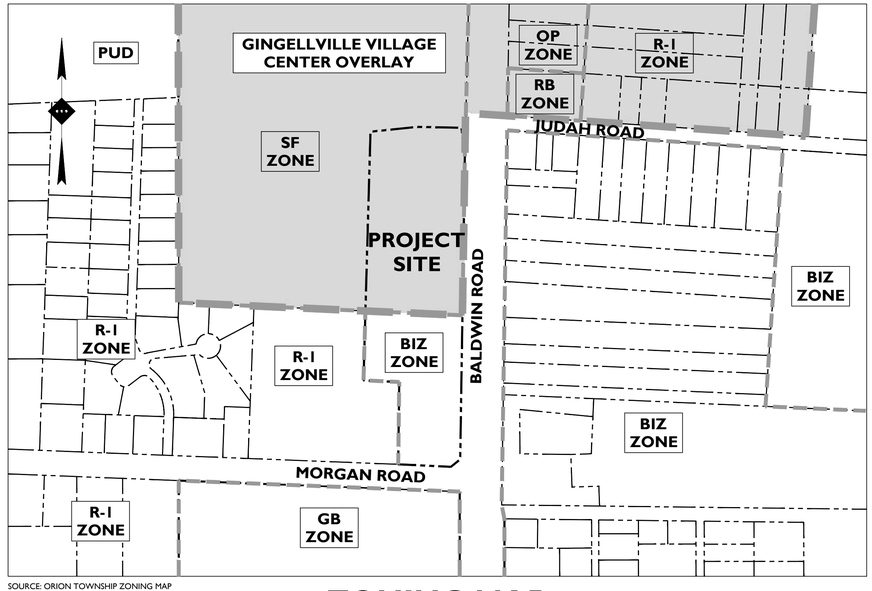
SCALE: 1" = 2,000'±



SOURCE: GOOGLE EARTH PRO

AERIAL MAP

SCALE: 1" = 300'±



SOURCE: ORION TOWNSHIP ZONING MAP

ZONING MAP

SCALE: 1" = 300'±

PLANS PREPARED BY:

STONEFIELD engineering & design

Detroit, MI · New York, NY · Boston, MA
Princeton, NJ · Tampa, FL · Rutherford, NJ
www.stonefieldeng.com

607 Shelby Suite 200, Detroit, MI 48226
Phone 248.247.1115

811 Know what's **below** **Call** before you dig.

PLAN REFERENCE MATERIALS:

1. THIS PLAN SET REFERENCES THE FOLLOWING DOCUMENTS INCLUDING, BUT NOT LIMITED TO:
   - TOPOGRAPHIC ALTA/NSPS LAND TITLE SURVEY PREPARED BY PEA GROUP DATED 03/11/2022
   - ALTA SURVEY PREPARED BY AEW DATED JUNE 2022
   - GEOTECHNICAL REPORT PREPARED BY McDOWELL & ASSOCIATES DATED 01/10/2022
   - AERIAL MAP OBTAINED FROM GOOGLE EARTH
   - LOCATION MAP USGS ONLINE MAPS
2. ALL REFERENCE MATERIAL LISTED ABOVE SHALL BE CONSIDERED A PART OF THIS PLAN SET AND ALL INFORMATION CONTAINED WITHIN THESE MATERIALS SHALL BE UTILIZED IN CONJUNCTION WITH THIS PLAN SET. THE CONTRACTOR IS RESPONSIBLE TO OBTAIN A COPY OF EACH REFERENCE AND REVIEW IT THOROUGHLY PRIOR TO THE START OF CONSTRUCTION.

SHEET INDEX

ADDITIONAL SHEETS

DRAWING TITLE	SHEET #
TOPOGRAPHIC SURVEY (PEA)	1 OF 1
ALTA SURVEY (AEW)	1 OF 1

ISSUE	DATE	BY	DESCRIPTION
1	06/29/2022	MPH	FOR CONCEPTUAL PLAN PUD REVIEW

NOT APPROVED FOR CONSTRUCTION

STONEFIELD engineering & design
Detroit, MI · New York, NY · Princeton, NJ
Tampa, FL · Boston, MA · Rutherford, NJ
www.stonefieldeng.com
607 Shelby Suite 200, Detroit, MI 48226
Phone 248.247.1115

SITE DEVELOPMENT PLANS

BALDWIN VILLAGE
PROPOSED COMMERCIAL DEVELOPMENT - THE PLAZA

PID: 09-32-301-001 & 09-32-301-014
SWC OF BALDWIN ROAD & JUDAH ROAD
CHARTER TOWNSHIP OF ORION
OAKLAND COUNTY, MICHIGAN 48359

STATE OF OHIO — CHARLES D. CUNO — 70005 — REGISTERED PROFESSIONAL ENGINEER — NATIONAL
J. REID COOKSEY, P.E.
LICENSED PROFESSIONAL ENGINEER

STONEFIELD engineering & design

SCALE: AS SHOWN | PROJECT ID: DET-210395

TITLE: COVER SHEET

DRAWING: C-1

V:\DET\2021\DET-210395-ALBG-W-SOUTH-BALDWIN-ROAD-&-JUDAH-ROAD,-ORION-TOWNSHIP,-MI\CAD\PLOTS\DP-01_COVER.DWG

GENERAL NOTES

1. THE CONTRACTOR SHALL VERIFY AND FAMILIARIZE THEMSELVES WITH THE EXISTING SITE CONDITIONS AND THE PROPOSED SCOPE OF WORK (INCLUDING DIMENSIONS, LAYOUT, ETC.) PRIOR TO INITIATING THE IMPROVEMENTS IDENTIFIED WITHIN THESE DOCUMENTS. SHOULD ANY DISCREPANCY BE FOUND BETWEEN THE EXISTING SITE CONDITIONS AND THE PROPOSED WORK THE CONTRACTOR SHALL NOTIFY STONEFIELD ENGINEERING & DESIGN, LLC. PRIOR TO THE START OF CONSTRUCTION.
2. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS AND ENSURE THAT ALL REQUIRED APPROVALS HAVE BEEN OBTAINED PRIOR TO THE START OF CONSTRUCTION. COPIES OF ALL REQUIRED PERMITS AND APPROVALS SHALL BE KEPT ON SITE AT ALL TIMES DURING CONSTRUCTION.
3. ALL CONTRACTORS WILL, TO THE FULLEST EXTENT PERMITTED BY LAW, INDEMNIFY AND HOLD HARMLESS STONEFIELD ENGINEERING & DESIGN, LLC. AND IT'S SUB-CONSULTANTS FROM AND AGAINST ANY DAMAGES AND LIABILITIES INCLUDING ATTORNEY'S FEES ARISING OUT OF CLAIMS BY EMPLOYEES OF THE CONTRACTOR IN ADDITION TO CLAIMS CONNECTED TO THE PROJECT AS A RESULT OF NOT CARRYING THE PROPER INSURANCE FOR WORKERS COMPENSATION, LIABILITY INSURANCE, AND LIMITS OF COMMERCIAL GENERAL LIABILITY INSURANCE.
4. THE CONTRACTOR SHALL NOT DEVIATE FROM THE PROPOSED IMPROVEMENTS IDENTIFIED WITHIN THIS PLAN SET UNLESS APPROVAL IS PROVIDED IN WRITING BY STONEFIELD ENGINEERING & DESIGN, LLC.
5. THE CONTRACTOR IS RESPONSIBLE TO DETERMINE THE MEANS AND METHODS OF CONSTRUCTION.
6. THE CONTRACTOR SHALL NOT PERFORM ANY WORK OR CAUSE DISTURBANCE ON A PRIVATE PROPERTY NOT CONTROLLED BY THE PERSON OR ENTITY WHO HAS AUTHORIZED THE WORK WITHOUT PRIOR WRITTEN CONSENT FROM THE OWNER OF THE PRIVATE PROPERTY.
7. THE CONTRACTOR IS RESPONSIBLE TO RESTORE ANY DAMAGED OR UNDERMINED STRUCTURE OR SITE FEATURE THAT IS IDENTIFIED TO REMAIN ON THE PLAN SET. ALL REPAIRS SHALL USE NEW MATERIALS TO RESTORE THE FEATURE TO ITS EXISTING CONDITION AT THE CONTRACTORS EXPENSE.
8. CONTRACTOR IS RESPONSIBLE TO PROVIDE THE APPROPRIATE SHOP DRAWINGS, PRODUCT DATA, AND OTHER REQUIRED SUBMITTALS FOR REVIEW. STONEFIELD ENGINEERING & DESIGN, LLC. WILL REVIEW THE SUBMITTALS IN ACCORDANCE WITH THE DESIGN INTENT AS REFLECTED WITHIN THE PLAN SET.
9. THE CONTRACTOR IS RESPONSIBLE FOR TRAFFIC CONTROL IN ACCORDANCE WITH MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES, LATEST EDITION.
10. THE CONTRACTOR IS REQUIRED TO PERFORM ALL WORK IN THE PUBLIC RIGHT-OF-WAY IN ACCORDANCE WITH THE APPROPRIATE GOVERNING AUTHORITY AND SHALL BE RESPONSIBLE FOR THE PROCUREMENT OF STREET OPENING PERMITS.
11. THE CONTRACTOR IS REQUIRED TO RETAIN AN OSHA CERTIFIED SAFETY INSPECTOR TO BE PRESENT ON SITE AT ALL TIMES DURING CONSTRUCTION & DEMOLITION ACTIVITIES.
12. SHOULD AN EMPLOYEE OF STONEFIELD ENGINEERING & DESIGN, LLC. BE PRESENT ON SITE AT ANY TIME DURING CONSTRUCTION, IT DOES NOT RELIEVE THE CONTRACTOR OF ANY OF THE RESPONSIBILITIES AND REQUIREMENTS LISTED IN THE NOTES WITHIN THIS PLAN SET.

PUD REQUIREMENTS

PID: 09-32-301-014		
PLANNED UNIT DEVELOPMENT REQUIREMENTS		
ZONING REQUIREMENT	**REQUIRED**	**PROPOSED**
LOT AREA	10 AC	11.87 AC (517,037 SF)
GUARANTEED OPEN SPACE	10% (51,704 SF)	25.8% (133,491 SF)
ACCESS DRIVE SEPARATION FROM EXISTING STREET / INTERSECTION	200 FT	PROVIDED
PERIMETER SETBACK / BERMING ADJACENT TO RESIDENTIAL ZONING	100 FT	12.5 FT (SOUTHERN LOT) (W)

(W) WAIVER

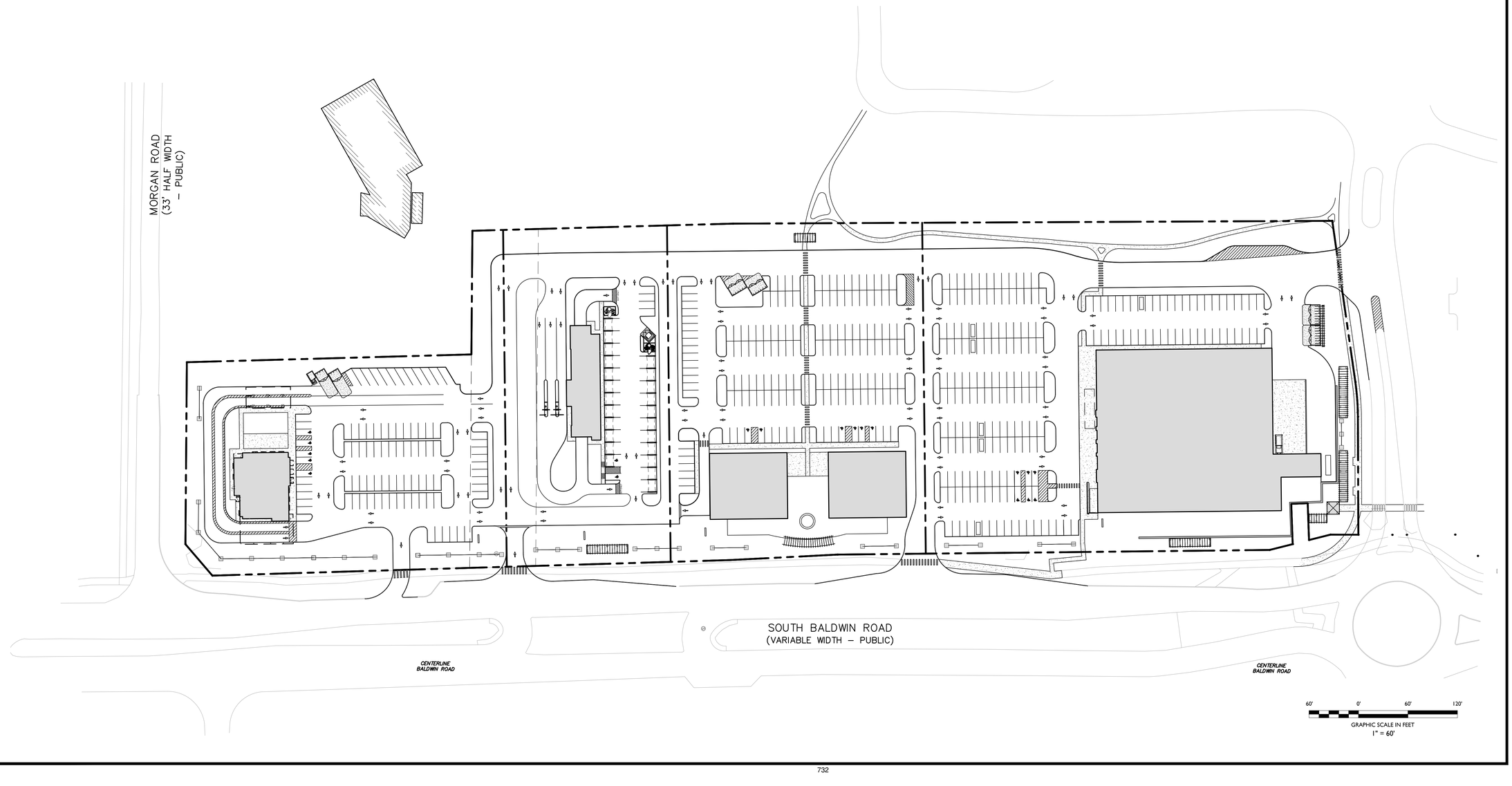
OFF-STREET PARKING REQUIREMENTS *

CODE SECTION	REQUIRED	PROPOSED
§ 34.03.E	RESTAURANT = 50 SPACES AUTO WASH = 25 SPACES RESTAURANT = 150 SPACES GROCERY STORE = 221 SPACES **TOTAL = 50 + 25 + 150 + 221 = 446 SPACES**	**477 SPACES**

* PARKING REQUIREMENTS BASED ON BROWN ROAD INNOVATION ZONE REQUIREMENTS

SYMBOL / **DESCRIPTION**

- PROPERTY LINE
- SETBACK LINE
- PROPOSED BUILDING
- PROPOSED CONCRETE



ISSUE	DATE	BY	DESCRIPTION
1	06/29/2022	MPH	FOR CONCEPTUAL PLAN PUD REVIEW

NOT APPROVED FOR CONSTRUCTION

STONEFIELD engineering & design
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Tampa, FL · Boston, MA · Rutherford, NJ
www.stonefieldeng.com
607 Shelby Suite 200, Detroit, MI 48226
Phone 248.247.1115

SITE DEVELOPMENT PLANS

BALDWIN VILLAGE

PROPOSED COMMERCIAL DEVELOPMENT - THE PLAZA

PID: 09-32-301-001 & 09-32-301-014
SW/C OF BALDWIN ROAD & JUDAH ROAD
CHARTER TOWNSHIP OF ORION
OAKLAND COUNTY, MICHIGAN 48359

STATE OF OHIO
CHARLES D. OLNO
REGISTERED PROFESSIONAL ENGINEER
J. REID COOKSEY, P.E.
LICENSED PROFESSIONAL ENGINEER

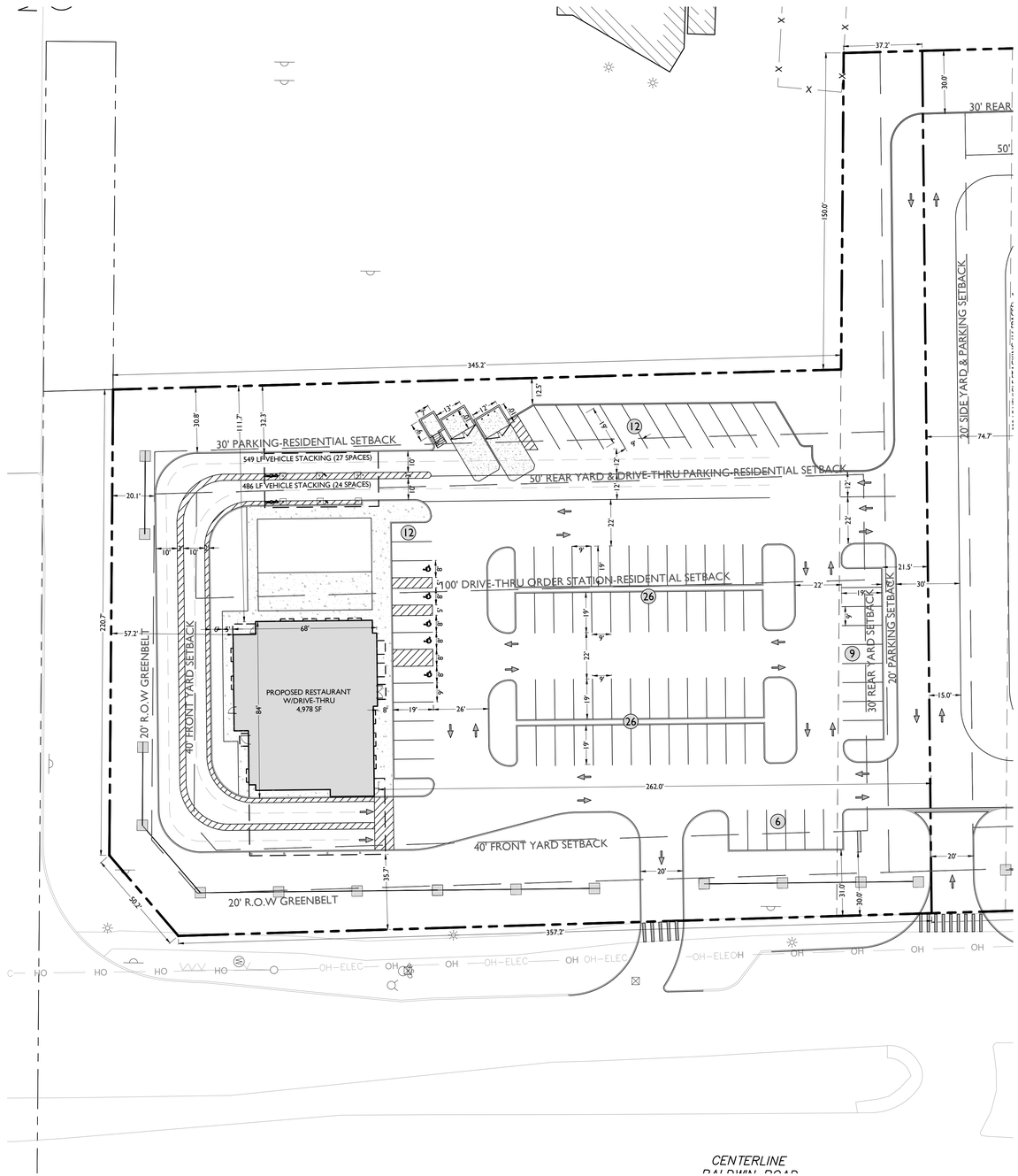
STONEFIELD engineering & design

SCALE: 1" = 60' | PROJECT ID: DET-210395

TITLE: SITE PLAN

DRAWING: C-2

V:\DET\2021\DET-210395-ALAG\41-SOUTH BALDWIN ROAD & JUDAH ROAD, ORION TOWNSHIP, MI\CAD\PLOT\DEN-SI\2104-56-SITE.DWG



LAND USE AND ZONING		
PID: 09-32-301-014		
BROWN ROAD INNOVATION ZONE		
PROPOSED USE		
RESTAURANT (WITH DRIVE-THRU)	ANCILLARY - SPECIAL LAND USE	
OUTDOOR PATIO	ANCILLARY - PERMITTED USE	
OUTDOOR CAFE	ANCILLARY - SPECIAL LAND USE	
ZONING REQUIREMENT	**REQUIRED**	**PROPOSED**
MINIMUM OVERALL AREA	10 AC[1]	±11.87 AC
MINIMUM LOT AREA	20,000 SF	105,668 SF (2.43 AC)
MINIMUM LOT WIDTH	90 FT	221.00 FT
MAXIMUM SITE COVERAGE	40%	4.7% (4,978 SF)
MAXIMUM BUILDING HEIGHT	TBD	TBD
MINIMUM FRONT YARD SETBACK	40 FT	35.7 FT (W)
MINIMUM SIDE YARD SETBACK	20 FT	N/A
MINIMUM REAR YARD SETBACK	30 FT	262.0 FT
MINIMUM REAR YARD (RESIDENTIAL)	50 FT	111.7 FT
MINIMUM DRIVE-THRU ORDER STATION-RESIDENTIAL SETBACK	100 FT	32.3 FT (W)
MINIMUM DRIVE-THRU PARKING-RESIDENTIAL SETBACK	50 FT	12.5 FT (W)
MINIMUM PROPERTY LINE PARKING SETBACK[2]	20 FT	20.1 FT
MINIMUM PROPERTY LINE PARKING SETBACK (RESIDENTIAL)[2]	30 FT	12.5 FT (W)
MINIMUM R.O.W. GREENBELT	20 FT	20.1 FT
MINIMUM OPEN SPACE	10% (10,567 SF)	36.9% (39,058 SF)

(W) WAIVER

(1) § 34.01.C. - ANCILLARY COMMERCIAL USES OR STAND-ALONE COMMERCIAL USES MAY BE PERMITTED WITHIN USE GROUP TYPES A, B AND C IF DEVELOPED IN CONJUNCTION WITH LARGER-SCALE PLANNED DEVELOPMENT PROJECTS HAVING MULTIPLE TENANTS WITH A TOTAL LAND AREA OF AT LEAST TEN (10) ACRES.

(2) § 34.03.E.3. - THE REQUIRED SETBACK FOR PARKING MAY BE REDUCED IN WIDTH OR WAIVED BY THE PLANNING COMMISSION, SUBJECT TO LANDSCAPING OR SCREENING REQUIREMENTS.

OFF-STREET PARKING REQUIREMENTS		
CODE SECTION	**REQUIRED**	**PROPOSED**
§ 34.03.E	RESTAURANT 1 SPACE PER 100 SF GFA (4,978 SF)/(1/100 SF) = 50 SPACES	**91 SPACES**
§ 27.04.A.3	90° PARKING: 9 FT X 19 FT W/ 22 FT AISLE	9 FT X 19 FT W/ 22 FT AISLES
	60° PARKING: 9 FT X 19 FT W/ 15 FT AISLE	9 FT X 19 FT
§ 27.04.B.2	OFF STREET LOADING: 1 SPACE, 10 FT X 50 FT	TO OCCUR OFF HOURS
§ 27.05.6	INTERIOR LOT LANDSCAPING: 20 SF OF LANDSCAPING PER SPACE	PROVIDED

SIGNAGE REQUIREMENTS		
CODE SECTION	**REQUIRED**	**PROPOSED**
SIGN ORDINANCE § 153-20 (*)	**NUMBER OF SIGNS:** ONE PER ZONING LOT, ONE PER MULTI-TENANT SIGN, OR ONE SHOPPING CENTER SIGN	**1 SIGN**
	SIGN AREA: OVERALL HEIGHT 6 FT TO 8 FT 40 SF PER SIDE (MAX. 80 SF TOTAL)	**80 SF**
	SETBACK: 30 FT FROM RIGHT-OF-WAY	**30.0 FT**

(*) THE SIGN AREA MAY BE INCREASED BY ONE (1) SQUARE FOOT PER SIDE FOR EACH TWO (2) FEET BY WHICH THE SIGN IS SET BACK BEYOND THE MINIMUM REQUIRED SETBACK, PROVIDED THAT THE RESULTING SIGN AREA IS NOT MORE THAN THREE (3) TIMES THE SIGN AREA PERMITTED IN THE DISTRICT AND IS NOT GREATER THAN ONE HUNDRED AND FIFTY (150) SQUARE FEET.

ADDITIONAL GROUND SIGNS MAY BE PERMITTED FOR EACH ZONING LOT IF THE FOLLOWING CONDITIONS APPLY:
A. TWO (2) GROUND SIGNS MAY BE PERMITTED ON A CORNER LOT THAT HAS AT LEAST TWO HUNDRED (200) FEET OF FRONTAGE ON EACH OF TWO (2) THOROUGHFARES OR COLLECTOR STREETS, PROVIDED THAT ONLY ONE (1) SIGN IS ORIENTED TOWARD EACH THOROUGHFARE OR STREET

THE FOLLOWING ADDITIONAL GROUND SIGNS MAY BE PERMITTED:
A. DRIVE-IN OR DRIVE-THROUGH RESTAURANTS MAY BE PERMITTED TWO GROUND SIGNS IN ADDITION TO THE GROUND SIGNS PERMITTED, PROVIDED THAT THE SIGNS ARE LOCATED WITHIN TWENTY (20) FEET FROM THE FIRST DRIVE-THROUGH WINDOW

SYMBOL	DESCRIPTION
	PROPERTY LINE
	SETBACK LINE
	PROPOSED CURB
	PROPOSED BUILDING
	PROPOSED CONCRETE
	PROPOSED BUILDING DOORS

GENERAL NOTES

1. THE CONTRACTOR SHALL VERIFY AND FAMILIARIZE THEMSELVES WITH THE EXISTING SITE CONDITIONS AND THE PROPOSED SCOPE OF WORK (INCLUDING DIMENSIONS, LAYOUT, ETC.) PRIOR TO INITIATING THE IMPROVEMENTS IDENTIFIED WITHIN THESE DOCUMENTS. SHOULD ANY DISCREPANCY BE FOUND BETWEEN THE EXISTING SITE CONDITIONS AND THE PROPOSED WORK THE CONTRACTOR SHALL NOTIFY STONEFIELD ENGINEERING & DESIGN, LLC. PRIOR TO THE START OF CONSTRUCTION.
2. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS AND ENSURE THAT ALL REQUIRED APPROVALS HAVE BEEN OBTAINED PRIOR TO THE START OF CONSTRUCTION. COPIES OF ALL REQUIRED PERMITS AND APPROVALS SHALL BE KEPT ON SITE AT ALL TIMES DURING CONSTRUCTION.
3. ALL CONTRACTORS WILL, TO THE FULLEST EXTENT PERMITTED BY LAW, INDEMNIFY AND HOLD HARMLESS STONEFIELD ENGINEERING & DESIGN, LLC. AND IT'S SUB-CONSULTANTS FROM AND AGAINST ANY DAMAGES AND LIABILITIES INCLUDING ATTORNEY'S FEES ARISING OUT OF CLAIMS BY EMPLOYEES OF THE CONTRACTOR IN ADDITION TO CLAIMS CONNECTED TO THE PROJECT AS A RESULT OF NOT CARRYING THE PROPER INSURANCE FOR WORKERS COMPENSATION, LIABILITY INSURANCE, AND LIMITS OF COMMERCIAL GENERAL LIABILITY INSURANCE.
4. THE CONTRACTOR SHALL NOT DEVIATE FROM THE PROPOSED IMPROVEMENTS IDENTIFIED WITHIN THIS PLAN SET UNLESS APPROVAL IS PROVIDED IN WRITING BY STONEFIELD ENGINEERING & DESIGN, LLC.
5. THE CONTRACTOR IS RESPONSIBLE TO DETERMINE THE MEANS AND METHODS OF CONSTRUCTION.
6. THE CONTRACTOR SHALL NOT PERFORM ANY WORK OR CAUSE DISTURBANCE ON A PRIVATE PROPERTY NOT CONTROLLED BY THE PERSON OR ENTITY WHO HAS AUTHORIZED THE WORK WITHOUT PRIOR WRITTEN CONSENT FROM THE OWNER OF THE PRIVATE PROPERTY.
7. THE CONTRACTOR IS RESPONSIBLE TO RESTORE ANY DAMAGED OR UNDERMINED STRUCTURE OR SITE FEATURE THAT IS IDENTIFIED TO REMAIN ON THE PLAN SET. ALL REPAIRS SHALL USE NEW MATERIALS TO RESTORE THE FEATURE TO ITS EXISTING CONDITION AT THE CONTRACTORS EXPENSE.
8. CONTRACTOR IS RESPONSIBLE TO PROVIDE THE APPROPRIATE SHOP DRAWINGS, PRODUCT DATA, AND OTHER REQUIRED SUBMITTALS FOR REVIEW. STONEFIELD ENGINEERING & DESIGN, LLC. WILL REVIEW THE SUBMITTALS IN ACCORDANCE WITH THE DESIGN INTENT AS REFLECTED WITHIN THE PLAN SET.
9. THE CONTRACTOR IS RESPONSIBLE FOR TRAFFIC CONTROL IN ACCORDANCE WITH MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES, LATEST EDITION.
10. THE CONTRACTOR IS REQUIRED TO PERFORM ALL WORK IN THE PUBLIC RIGHT-OF-WAY IN ACCORDANCE WITH THE APPROPRIATE GOVERNING AUTHORITY AND SHALL BE RESPONSIBLE FOR THE PROCUREMENT OF STREET OPENING PERMITS.
11. THE CONTRACTOR IS REQUIRED TO RETAIN AN OSHA CERTIFIED SAFETY INSPECTOR TO BE PRESENT ON SITE AT ALL TIMES DURING CONSTRUCTION & DEMOLITION ACTIVITIES.
12. SHOULD AN EMPLOYEE OF STONEFIELD ENGINEERING & DESIGN, LLC. BE PRESENT ON SITE AT ANY TIME DURING CONSTRUCTION, IT DOES NOT RELIEVE THE CONTRACTOR OF ANY OF THE RESPONSIBILITIES AND REQUIREMENTS LISTED IN THE NOTES WITHIN THIS PLAN SET.

30' 0' 30' 60'
GRAPHIC SCALE IN FEET
1" = 30'

ISSUE	DATE	BY	DESCRIPTION
1	06/29/2022	MPH	FOR CONCEPTUAL PLAN PUD REVIEW

NOT APPROVED FOR CONSTRUCTION

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SITE DEVELOPMENT PLANS

BALDWIN VILLAGE

PROPOSED COMMERCIAL DEVELOPMENT - THE PLAZA

PID: 09-32-301-001 & 09-32-301-014
SWC OF BALDWIN ROAD & JUDAH ROAD
CHARTER TOWNSHIP OF ORION
OAKLAND COUNTY, MICHIGAN 48359

STATE OF OHIO
CHARLES D. OLIVO
68853
REGISTERED PROFESSIONAL ENGINEER
J. REID COOKSEY, P.E.
LICENSED PROFESSIONAL ENGINEER

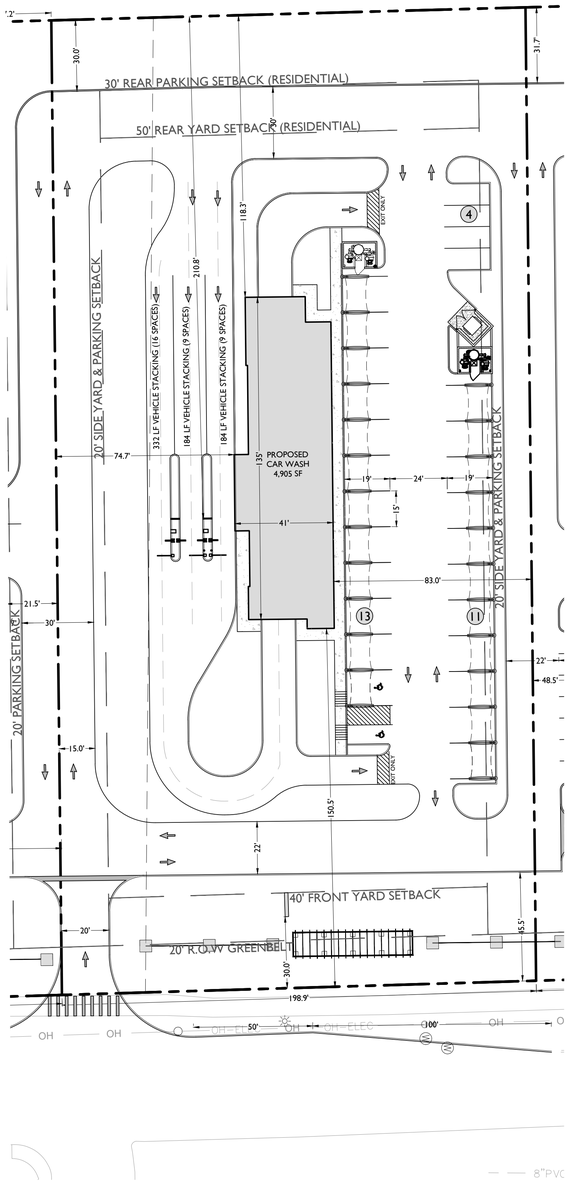
STONEFIELD engineering & design

SCALE: 1" = 30' | PROJECT ID: DET-210395

TITLE:
SITE PLAN
(RESTAURANT W/ DRIVE-THRU)

DRAWING:
C-3

V:\DET\2021\DET-210395-AutoCAD\SITE\BALDWIN ROAD & JUDAH ROAD, ORION TOWNSHIP, MI\CAD\PLOTS\DP-SITE-03.04.06.08.SITE.DWG



LAND USE AND ZONING

PID: 09-32-301-014

BROWN ROAD INNOVATION ZONE

PROPOSED USE		
AUTO WASH	ANCILLARY - SPECIAL LAND USE	
ZONING REQUIREMENT	**REQUIRED**	**PROPOSED**
MINIMUM OVERALL AREA	10 AC(1)	±11.87 AC
MINIMUM LOT AREA	20,000 SF	81,208 SF (1.86 AC)
MINIMUM LOT WIDTH	90 FT	198.9 FT
MAXIMUM SITE COVERAGE	40%	6.0% (4,905 SF)
MAXIMUM BUILDING HEIGHT	TBD	TBD
MINIMUM FRONT YARD SETBACK	40 FT	150.5 FT
MINIMUM SIDE YARD SETBACK	20 FT	74.7 FT
MINIMUM REAR YARD SETBACK	30 FT	118.3 FT
MINIMUM REAR YARD (RESIDENTIAL)	50 FT	118.3 FT
MINIMUM PROPERTY LINE PARKING SETBACK(2)	20 FT	0.0 FT (W)
MINIMUM PROPERTY LINE PARKING SETBACK (RESIDENTIAL)(2)	30 FT	30.0 FT
MINIMUM R.O.W. GREENBELT	20 FT	45.5 FT
MINIMUM OPEN SPACE	10% (8,121 SF)	34.3% (27,918 SF)

(W) WAIVER

(1) § 34.01.C. - ANCILLARY COMMERCIAL USES OR STAND-ALONE COMMERCIAL USES MAY BE PERMITTED WITHIN USE GROUP TYPES A, B AND C IF DEVELOPED IN CONJUNCTION WITH LARGER-SCALE PLANNED DEVELOPMENT PROJECTS HAVING MULTIPLE TENANTS WITH A TOTAL LAND AREA OF AT LEAST TEN (10) ACRES.

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OFF-STREET PARKING REQUIREMENTS

CODE SECTION	REQUIRED	PROPOSED
§ 14.03	AUTO WASH: 1 SPACE PER 200 SF GFA (4,905 SF)/(1/200 SF) = 25 SPACES	**28 SPACES**
§ 27.04.A.3	90° PARKING: 9 FT X 19 FT W/ 22 FT AISLE	12 FT X 19 FT W/ 22 FT AISLES
§ 27.04.B.2	OFF STREET LOADING: 1 SPACE, 10 FT X 50 FT	TO OCCUR OFF-HOURS
§ 27.05.6	INTERIOR LOT LANDSCAPING: 20 SF OF LANDSCAPING PER SPACE	PROVIDED

SIGNAGE REQUIREMENTS

CODE SECTION	REQUIRED	PROPOSED
SIGN ORDINANCE § 153-20 (*)	**NUMBER OF SIGNS:** ONE PER ZONING LOT, ONE PER MULTI-TENANT SIGN, OR ONE SHOPPING CENTER SIGN	**1 SIGN**
	SIGN AREA: OVERALL HEIGHT 6 FT TO 8 FT 40 SF PER SIDE (MAX. 80 SF TOTAL)	**80 SF**
	SETBACK: 30 FT FROM RIGHT-OF-WAY	**30.0 FT**

(*) THE SIGN AREA MAY BE INCREASED BY ONE (1) SQUARE FOOT PER SIDE FOR EACH TWO (2) FEET BY WHICH THE SIGN IS SET BACK BEYOND THE MINIMUM REQUIRED SETBACK, PROVIDED THAT THE RESULTING SIGN AREA IS NOT MORE THAN THREE (3) TIMES THE SIGN AREA PERMITTED IN THE DISTRICT AND IS NOT GREATER THAN ONE HUNDRED AND FIFTY (150) SQUARE FEET.

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SYMBOL	DESCRIPTION
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	SETBACK LINE
	PROPOSED CURB
	PROPOSED BUILDING
	PROPOSED CONCRETE
	PROPOSED BUILDING DOORS

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30' 0' 30' 60'

GRAPHIC SCALE IN FEET

1" = 30'

ISSUE	DATE	BY	DESCRIPTION
1	06/29/2022	MPH	FOR CONCEPTUAL PLAN PUD REVIEW

NOT APPROVED FOR CONSTRUCTION

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SITE DEVELOPMENT PLANS

BALDWIN VILLAGE

PROPOSED COMMERCIAL DEVELOPMENT - THE PLAZA

PID: 09-32-301-001 & 09-32-301-014
SWC OF BALDWIN ROAD & JUDAH ROAD
CHARTER TOWNSHIP OF ORION
OAKLAND COUNTY, MICHIGAN 48359

STATE OF OHIO
CHARLES D. OLIVO
PROFESSIONAL ENGINEER

J. REID COOKSEY, P.E.
LICENSED PROFESSIONAL ENGINEER

STONEFIELD engineering & design

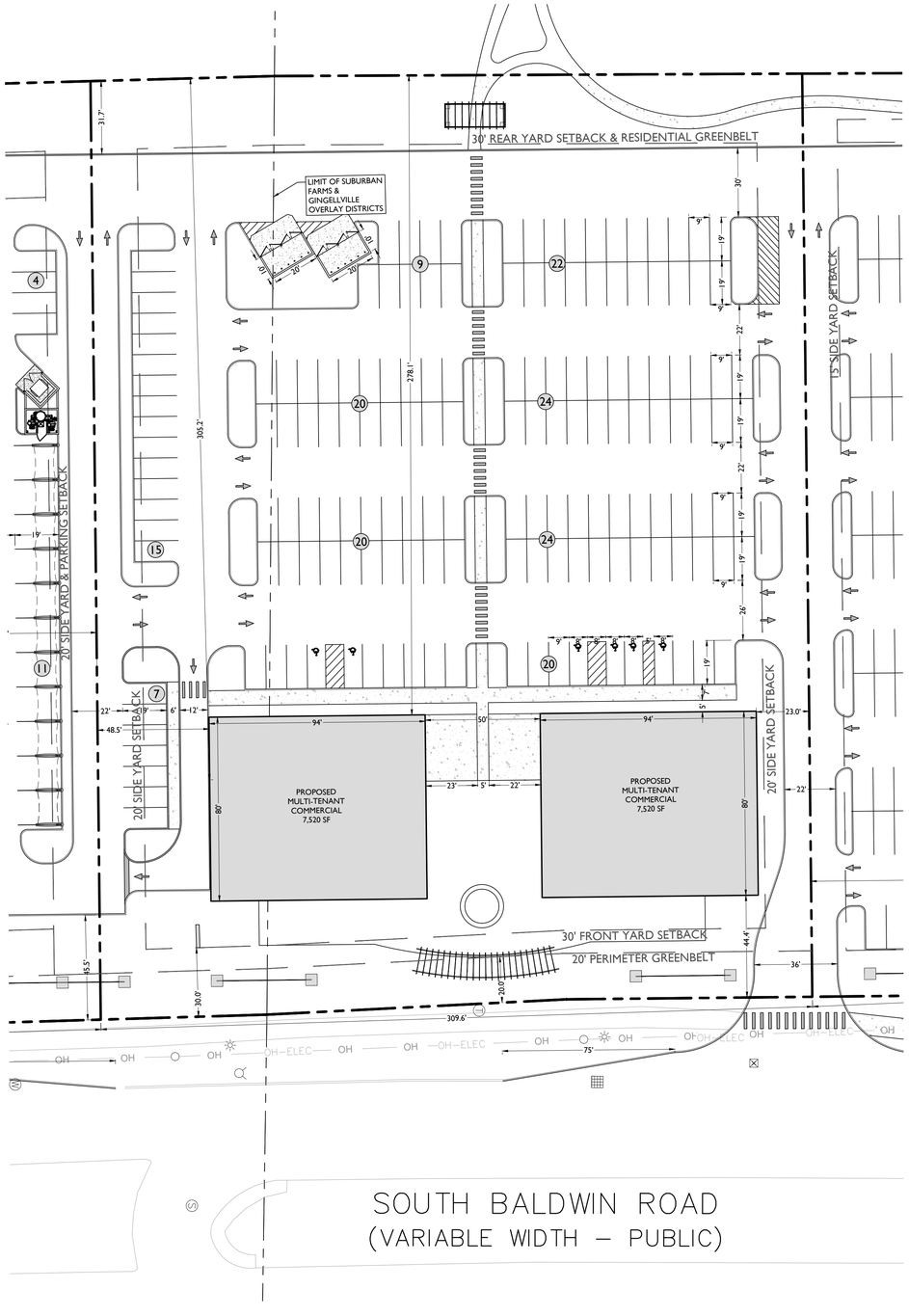
SCALE: 1" = 30' | PROJECT ID: DET-210395

TITLE: SITE PLAN (CARWASH)

DRAWING: C-4

V:\DET\2021\DET-210395-ALBG-M\SOUTH BALDWIN ROAD & JUDAH ROAD, ORION TOWNSHIP, MI\CAD\PDF\SDP-R2.03.04.05.06.SITE.DWG

PARCEL WITHIN BROWN ROAD INNOVATION ZONE & SUBURBAN FARMS / GINGELLVILLE OVERLAY DISTRICTS.



LAND USE AND ZONING

PID: 09-32-301-014

GINGELLVILLE OVERLAY DISTRICT & GENERAL BUSINESS ZONE (GB)

PROPOSED USE(1)

RESTAURANT (NO DRIVE-THRU)	PERMITTED USE
RESTAURANT (W/ DRIVE-THRU)	SPECIAL LAND USE
OUTDOOR PATIO	PERMITTED USE
OUTDOOR CAFE	SPECIAL LAND USE
GROCERY STORE	PERMITTED USE
MEDICAL OFFICE	PERMITTED USE
RETAIL STORE	PERMITTED USE

ZONING REQUIREMENT	REQUIRED (GB)	PROPOSED
MINIMUM LOT AREA	12,000 SF (0.28 AC)	125,245 SF (2.86 AC)
MINIMUM LOT WIDTH	165 FT	309.6 FT
MAXIMUM TENANT FLOOR AREA	13,000 SF	PROVIDED
MAXIMUM STRUCTURE LOT COVERAGE	30% (37,574 SF)	12.0% (15,040 SF)
MAXIMUM BUILDING HEIGHT	25 FT	< 25 FT
MINIMUM FRONT YARD SETBACK	30 FT	44.4 FT
MINIMUM SIDE YARD SETBACK	20 FT	23.0 FT
MINIMUM REAR YARD SETBACK	30 FT	278.1 FT
DRIVE-THRU SPEAKER SETBACK FROM RESIDENTIAL ZONE	100 FT	305.2 FT
DRIVE-THRU PARKING SETBACK	50 FT	31.7 FT (W)
PERIMETER GREENBELT	20 FT	20.0 FT
RESIDENTIAL PERIMETER GREENBELT	30 FT	31.7 FT
MINIMUM CLEAR SPACE AROUND STRUCTURES	20 FT	PROVIDED
MINIMUM OPEN SPACE	10% (12,525 SF)	21.2% (26,611 SF)

(W) WAIVER

(1) PARKING HAS BEEN BASED ON ALL RESTAURANT USE FOR CONSERVATIVE BREAKDOWN.

OFF-STREET PARKING REQUIREMENTS

CODE SECTION	REQUIRED	PROPOSED
§ 14.03	**RESTAURANT:**(1) 1 SPACE PER 100 SF GFA (15,040 SF)(1/100 SF) = 150 SPACES	**161 SPACES**
§ 27.04.A.3	90° PARKING: 9 FT X 19 FT W/ 22 FT AISLE	9 FT X 19 FT W/ 22-30 FT AISLES
§ 27.04.B.2	OFF STREET LOADING: 1 SPACE, 10 FT X 50 FT	PROVIDED
§ 27.05.6	INTERIOR LOT LANDSCAPING: 20 SF OF LANDSCAPING PER SPACE	PROVIDED

(1) PARKING HAS BEEN BASED ON ALL RESTAURANT USE FOR CONSERVATIVE BREAKDOWN.

SIGNAGE REQUIREMENTS

CODE SECTION	REQUIRED	PROPOSED
SIGN ORDINANCE § 153-20 (*)	**NUMBER OF SIGNS:** ONE PER ZONING LOT, ONE PER MULTI-TENANT SIGN, OR ONE SHOPPING CENTER SIGN	**1 SIGN**
	SIGN AREA: OVERALL HEIGHT 6 FT TO 8 FT 40 SF PER SIDE (MAX. 80 SF TOTAL)	**80 SF**
	SETBACK: 30 FT FROM RIGHT-OF-WAY	**30.0 FT**

(*) THE SIGN AREA MAY BE INCREASED BY ONE (1) SQUARE FOOT PER SIDE FOR EACH TWO (2) FEET BY WHICH THE SIGN IS SET BACK BEYOND THE MINIMUM REQUIRED SETBACK, PROVIDED THAT THE RESULTING SIGN AREA IS NOT MORE THAN THREE (3) TIMES THE SIGN AREA PERMITTED IN THE DISTRICT AND IS NOT GREATER THAN ONE HUNDRED AND FIFTY (150) SQUARE FEET.

ADDITIONAL GROUND SIGNS MAY BE PERMITTED FOR EACH ZONING LOT IF THE FOLLOWING CONDITIONS APPLY:
A. TWO (2) GROUND SIGNS MAY BE PERMITTED ON A CORNER LOT THAT HAS AT LEAST TWO HUNDRED (200) FEET OF FRONTAGE ON EACH OF TWO (2) THOROUGHFARES OR COLLECTOR STREETS, PROVIDED THAT ONLY ONE (1) SIGN IS ORIENTED TOWARD EACH THOROUGHFARE OR STREET

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SYMBOL	DESCRIPTION
	PROPERTY LINE
	SETBACK LINE
	PROPOSED CURB
	PROPOSED FLUSH CURB
	PROPOSED SIGNS / BOLLARDS
	PROPOSED BUILDING
	PROPOSED CONCRETE
	PROPOSED BUILDING DOORS

GENERAL NOTES

1. THE CONTRACTOR SHALL VERIFY AND FAMILIARIZE THEMSELVES WITH THE EXISTING SITE CONDITIONS AND THE PROPOSED SCOPE OF WORK (INCLUDING DIMENSIONS, LAYOUT, ETC.) PRIOR TO INITIATING THE IMPROVEMENTS IDENTIFIED WITHIN THESE DOCUMENTS. SHOULD ANY DISCREPANCY BE FOUND BETWEEN THE EXISTING SITE CONDITIONS AND THE PROPOSED WORK THE CONTRACTOR SHALL NOTIFY STONEFIELD ENGINEERING & DESIGN, LLC. PRIOR TO THE START OF CONSTRUCTION.
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3. ALL CONTRACTORS WILL, TO THE FULLEST EXTENT PERMITTED BY LAW, INDEMNIFY AND HOLD HARMLESS STONEFIELD ENGINEERING & DESIGN, LLC. AND ITS SUB-CONSULTANTS FROM AND AGAINST ANY DAMAGES AND LIABILITIES INCLUDING ATTORNEY'S FEES ARISING OUT OF CLAIMS BY EMPLOYEES OF THE CONTRACTOR IN ADDITION TO CLAIMS CONNECTED TO THE PROJECT AS A RESULT OF NOT CARRYING THE PROPER INSURANCE FOR WORKERS COMPENSATION, LIABILITY INSURANCE, AND LIMITS OF COMMERCIAL GENERAL LIABILITY INSURANCE.
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5. THE CONTRACTOR IS RESPONSIBLE TO DETERMINE THE MEANS AND METHODS OF CONSTRUCTION.
6. THE CONTRACTOR SHALL NOT PERFORM ANY WORK OR CAUSE DISTURBANCE ON A PRIVATE PROPERTY NOT CONTROLLED BY THE PERSON OR ENTITY WHO HAS AUTHORIZED THE WORK WITHOUT PRIOR WRITTEN CONSENT FROM THE OWNER OF THE PRIVATE PROPERTY.
7. THE CONTRACTOR IS RESPONSIBLE TO RESTORE ANY DAMAGED OR UNDERMINED STRUCTURE OR SITE FEATURE THAT IS IDENTIFIED TO REMAIN ON THE PLAN SET. ALL REPAIRS SHALL USE NEW MATERIALS TO RESTORE THE FEATURE TO ITS EXISTING CONDITION AT THE CONTRACTORS EXPENSE.
8. CONTRACTOR IS RESPONSIBLE TO PROVIDE THE APPROPRIATE SHOP DRAWINGS, PRODUCT DATA, AND OTHER REQUIRED SUBMITTALS FOR REVIEW. STONEFIELD ENGINEERING & DESIGN, LLC. WILL REVIEW THE SUBMITTALS IN ACCORDANCE WITH THE DESIGN INTENT AS REFLECTED WITHIN THE PLAN SET.
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10. THE CONTRACTOR IS REQUIRED TO PERFORM ALL WORK IN THE PUBLIC RIGHT-OF-WAY IN ACCORDANCE WITH THE APPROPRIATE GOVERNING AUTHORITY AND SHALL BE RESPONSIBLE FOR THE PROCUREMENT OF STREET OPENING PERMITS.
11. THE CONTRACTOR IS REQUIRED TO RETAIN AN OSHA CERTIFIED SAFETY INSPECTOR TO BE PRESENT ON SITE AT ALL TIMES DURING CONSTRUCTION & DEMOLITION ACTIVITIES.
12. SHOULD AN EMPLOYEE OF STONEFIELD ENGINEERING & DESIGN, LLC. BE PRESENT ON SITE AT ANY TIME DURING CONSTRUCTION, IT DOES NOT RELIEVE THE CONTRACTOR OF ANY OF THE RESPONSIBILITIES AND REQUIREMENTS LISTED IN THE NOTES WITHIN THIS PLAN SET.

30' 0' 30' 60'

GRAPHIC SCALE IN FEET
1" = 30'

ISSUE	DATE	BY	DESCRIPTION
1	06/29/2022	MPH	FOR CONCEPTUAL PLAN PUD REVIEW

NOT APPROVED FOR CONSTRUCTION

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Phone 248.247.1115

SITE DEVELOPMENT PLANS

BALDWIN VILLAGE

PROPOSED COMMERCIAL DEVELOPMENT - THE PLAZA

PID: 09-32-301-001 & 09-32-301-014
SW/C OF BALDWIN ROAD & JUDAH ROAD
CHARTER TOWNSHIP OF ORION
OAKLAND COUNTY, MICHIGAN 48359

STATE OF OHIO
CHARLES D. CUNNINGHAM
J. REID COOKSEY, P.E.
REGISTERED PROFESSIONAL ENGINEER
LICENSED AS A PROFESSIONAL ENGINEER

STONEFIELD engineering & design

SCALE: 1" = 30' | PROJECT ID: DET-210395

TITLE:

SITE PLAN (COMMERCIAL BUILDINGS)

DRAWING:

C-5

V:\DET\2021\DET-210395-ALMG-M1\SOUTH BALDWIN ROAD & JUDAH ROAD, ORION TOWNSHIP, MI\CAD\PLOT\DET-SITE.DWG

LAND USE AND ZONING

PID: 09-32-301-014		
GINGELLVILLE OVERLAY DISTRICT & RESTRICTED BUSINESS ZONE (RB)		
PROPOSED USE GROCERY STORE	PERMITTED USE	
ZONING REQUIREMENT	**REQUIRED (RB)**	**PROPOSED**
MINIMUM LOT AREA	9,000 SF (0.21 AC)	204,915 SF (4.70 AC)
MINIMUM LOT WIDTH	N/A	529.1 FT
MAXIMUM TENANT FLOOR AREA	13,000 SF	44,234 SF (W)
MAXIMUM STRUCTURE LOT COVERAGE	30% (61,475 SF)	21.6% (44,234 SF)
MAXIMUM BUILDING HEIGHT	25 FT	< 25 FT
MINIMUM FRONT YARD SETBACK	20 FT	42.7 FT
MINIMUM SIDE YARD SETBACK	15 FT	12.2 FT (W)
MINIMUM REAR YARD SETBACK	20 FT	154.0 FT
MINIMUM RESIDENTIAL GREENBELT	30 FT	30.0 FT
MINIMUM FRONT / REAR GREENBELT	20 FT	20.0 FT
MINIMUM SIDE YARD GREENBELT	15 FT	26.3 FT
MINIMUM CLEAR SPACE AROUND STRUCTURES	15 FT	PROVIDED
MINIMUM OPEN SPACE	10% (12,525 SF)	21.2% (39,905 SF)

(W) WAIVER

OFF-STREET PARKING REQUIREMENTS

CODE SECTION	REQUIRED	PROPOSED
§ 34.03.E	**GROCERY STORE:** 1 SPACE PER 200 SF GFA (44,234 SF)(1/200 SF) = 221 SPACES	**197 SPACES (W)**
§ 27.04.A.3	90° PARKING: 9 FT X 19 FT W/ 22 FT AISLE	9 FT X 19 FT W/ 22-30 FT AISLES
§ 27.04.B.2	OFF STREET LOADING: 1 SPACE, 10 FT X 50 FT	PROVIDED
§ 27.05.6	INTERIOR LOT LANDSCAPING: 20 SF OF LANDSCAPING PER SPACE	PROVIDED

(W) WAIVER

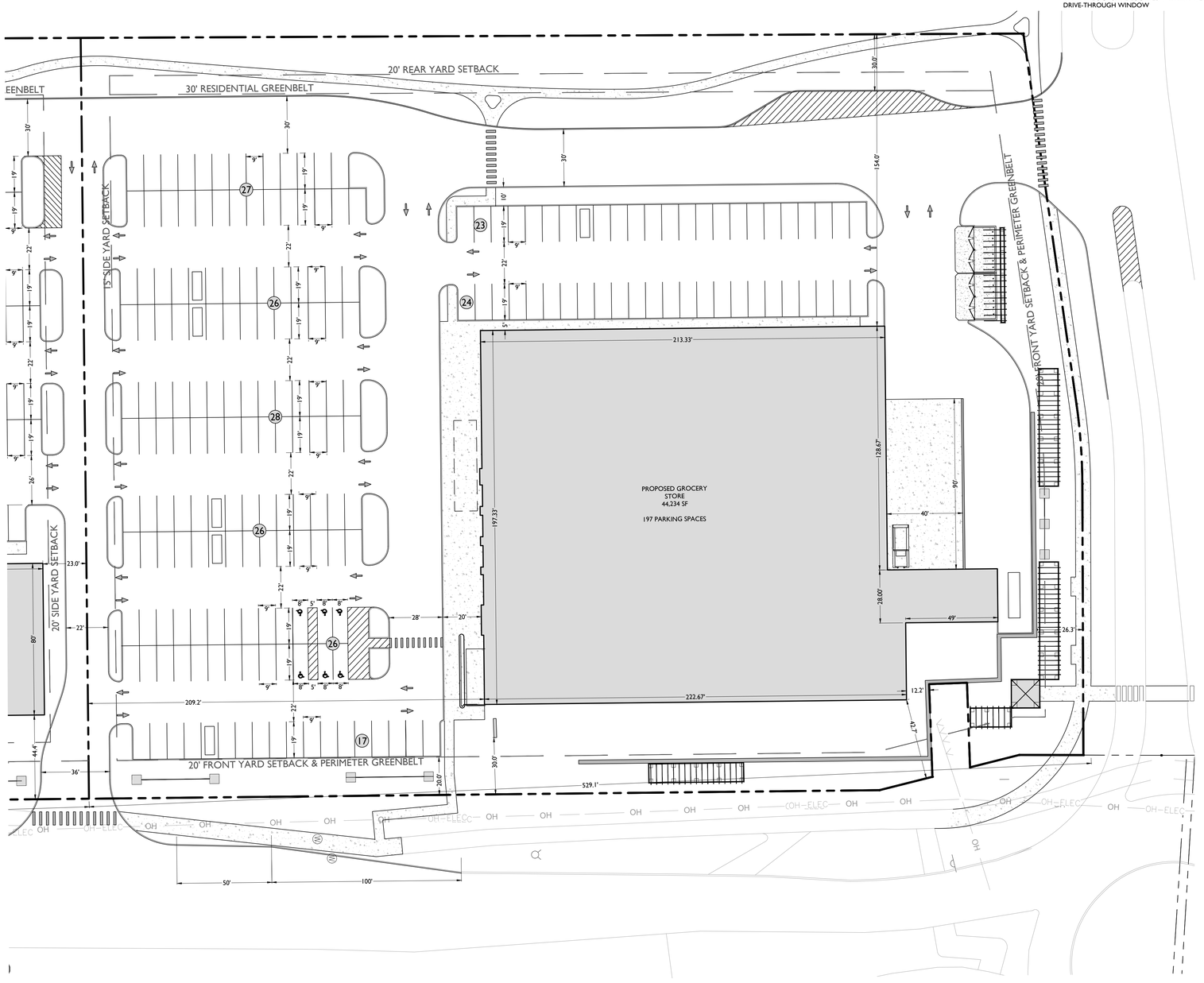
SIGNAGE REQUIREMENTS

CODE SECTION	REQUIRED	PROPOSED
SIGN ORDINANCE § 153-20 (*)	**NUMBER OF SIGNS:** ONE PER ZONING LOT, ONE PER MULTI-TENANT SIGN, OR ONE SHOPPING CENTER SIGN	**1 SIGN**
	SIGN AREA: OVERALL HEIGHT 6 FT TO 8 FT 40 SF PER SIDE (MAX. 80 SF TOTAL)	**80 SF**
	SETBACK: 30 FT FROM RIGHT-OF-WAY	**30.0 FT**

(*) THE SIGN AREA MAY BE INCREASED BY ONE (1) SQUARE FOOT PER SIDE FOR EACH TWO (2) FEET BY WHICH THE SIGN IS SET BACK BEYOND THE MINIMUM REQUIRED SETBACK, PROVIDED THAT THE RESULTING SIGN AREA IS NOT MORE THAN THREE (3) TIMES THE SIGN AREA PERMITTED IN THE DISTRICT AND IS NOT GREATER THAN ONE HUNDRED AND FIFTY (150) SQUARE FEET.

ADDITIONAL GROUND SIGNS MAY BE PERMITTED FOR EACH ZONING LOT IF THE FOLLOWING CONDITIONS APPLY:
A. TWO (2) GROUND SIGNS MAY BE PERMITTED ON A CORNER LOT THAT HAS AT LEAST TWO HUNDRED (200) FEET OF FRONTAGE ON EACH OF TWO (2) THOROUGHFARES OR COLLECTOR STREETS, PROVIDED THAT ONLY ONE (1) SIGN IS ORIENTED TOWARD EACH THOROUGHFARE OR STREET

THE FOLLOWING ADDITIONAL GROUND SIGNS MAY BE PERMITTED:
A. DRIVE-IN OR DRIVE-THROUGH RESTAURANTS MAY BE PERMITTED TWO GROUND SIGNS IN ADDITION TO THE GROUND SIGNS PERMITTED, PROVIDED THAT THE SIGNS ARE LOCATED WITHIN TWENTY (20) FEET FROM THE FIRST DRIVE-THROUGH WINDOW



SYMBOL	DESCRIPTION
	PROPERTY LINE
	SETBACK LINE
	PROPOSED CURB
	PROPOSED FLUSH CURB
	PROPOSED SIGNS / BOLLARDS
	PROPOSED BUILDING
	PROPOSED CONCRETE
	PROPOSED RETAINING WALL
	PROPOSED BUILDING DOORS

GENERAL NOTES

1. THE CONTRACTOR SHALL VERIFY AND FAMILIARIZE THEMSELVES WITH THE EXISTING SITE CONDITIONS AND THE PROPOSED SCOPE OF WORK (INCLUDING DIMENSIONS, LAYOUT, ETC.) PRIOR TO INITIATING THE IMPROVEMENTS IDENTIFIED WITHIN THESE DOCUMENTS. SHOULD ANY DISCREPANCY BE FOUND BETWEEN THE EXISTING SITE CONDITIONS AND THE PROPOSED WORK THE CONTRACTOR SHALL NOTIFY STONEFIELD ENGINEERING & DESIGN, LLC. PRIOR TO THE START OF CONSTRUCTION.
2. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS AND ENSURE THAT ALL REQUIRED APPROVALS HAVE BEEN OBTAINED PRIOR TO THE START OF CONSTRUCTION. COPIES OF ALL REQUIRED PERMITS AND APPROVALS SHALL BE KEPT ON SITE AT ALL TIMES DURING CONSTRUCTION.
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30' 0' 30' 60'
GRAPHIC SCALE IN FEET
1" = 30'

ISSUE	DATE	BY	DESCRIPTION
1	06/29/2022	MPH	FOR CONCEPTUAL PLAN PUD REVIEW

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Phone 248.247.1115

SITE DEVELOPMENT PLANS

BALDWIN VILLAGE
PROPOSED COMMERCIAL DEVELOPMENT - THE PLAZA

PID: 09-32-301-001 & 09-32-301-014
SWC OF BALDWIN ROAD & JUDAH ROAD
CHARTER TOWNSHIP OF ORION
OAKLAND COUNTY, MICHIGAN 48359

J. REID COOKSEY
LICENSED PROFESSIONAL ENGINEER

STONEFIELD engineering & design

SCALE: 1" = 30' | PROJECT ID: DET-210395

TITLE: SITE PLAN (NEIGHBORHOOD GROCERY STORE)

DRAWING: C-6

V:\DET\2021\DET-210395-ALEC-N\7-SOUTH BALDWIN ROAD & JUDAH ROAD, ORION TOWNSHIP, MI\CAD\DWG\TOPSHEET\20-10-04-06-SITE.DWG

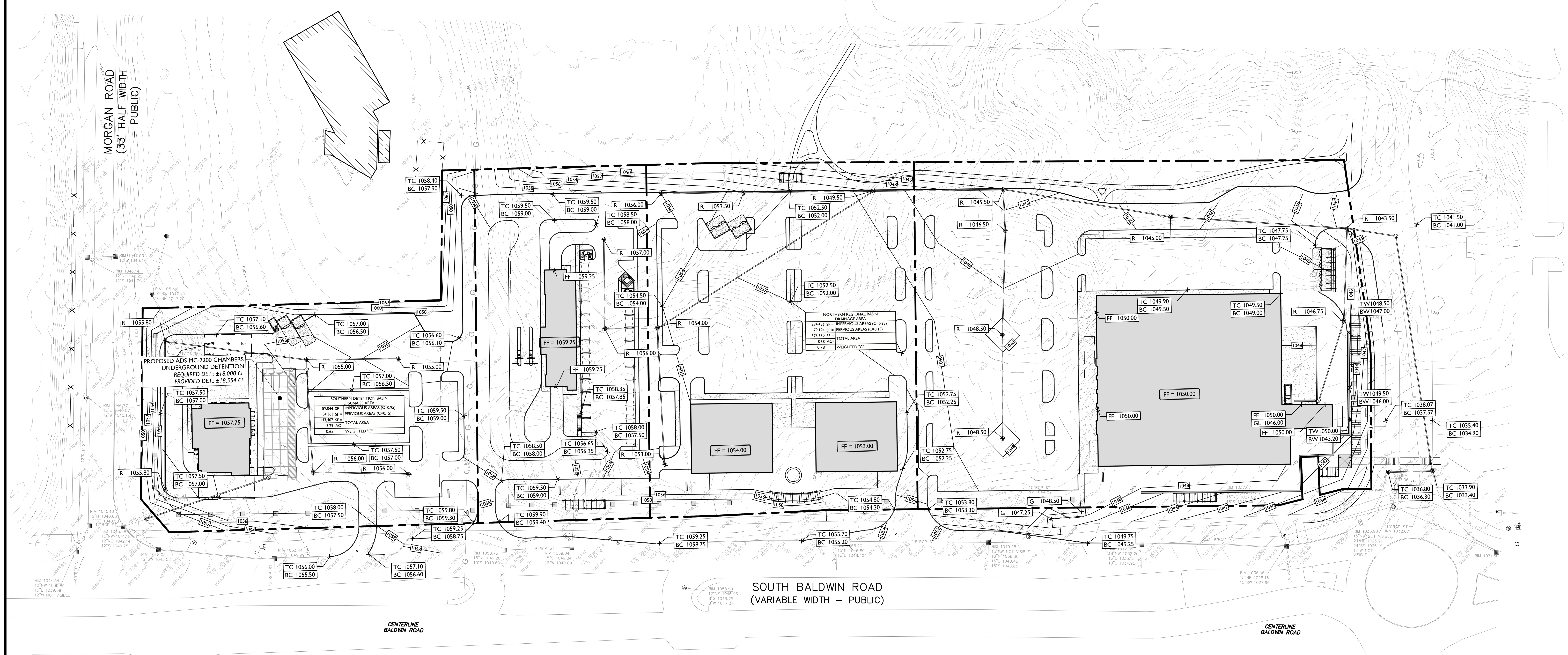
GRADING NOTES

1. ALL SOIL AND MATERIAL REMOVED FROM THE SITE SHALL BE DISPOSED OF IN ACCORDANCE WITH LOCAL, STATE, AND FEDERAL REQUIREMENTS. ANY GROUNDWATER DE-WATERING PRACTICES SHALL BE PERFORMED UNDER THE SUPERVISION OF A QUALIFIED PROFESSIONAL. THE CONTRACTOR IS REQUIRED TO OBTAIN ALL NECESSARY PERMITS FOR THE DISCHARGE OF DE-WATERED GROUNDWATER. ALL SOIL IMPORTED TO THE SITE SHALL BE CERTIFIED CLEAN FILL. CONTRACTOR SHALL MAINTAIN RECORDS OF ALL FILL MATERIALS BROUGHT TO THE SITE.
2. THE CONTRACTOR IS REQUIRED TO PROVIDE TEMPORARY AND/OR PERMANENT SHORING WHERE REQUIRED DURING EXCAVATION ACTIVITIES, INCLUDING BUT NOT LIMITED TO UTILITY TRENCHES, TO ENSURE THE STRUCTURAL INTEGRITY OF NEARBY STRUCTURES AND STABILITY OF THE SURROUNDING SOILS.
3. PROPOSED TOP OF CURB ELEVATIONS ARE GENERALLY 4 INCHES TO 7 INCHES ABOVE EXISTING GRADES UNLESS OTHERWISE NOTED. THE CONTRACTOR WILL SUPPLY ALL STAKEOUT CURB GRADE SHEETS TO STONEFIELD ENGINEERING & DESIGN, LLC. FOR REVIEW AND APPROVAL PRIOR TO POURING CURBS.
4. THE CONTRACTOR IS RESPONSIBLE TO SET ALL PROPOSED UTILITY COVERS AND RESET ALL EXISTING UTILITY COVERS WITHIN THE PROJECT LIMITS TO PROPOSED GRADE IN ACCORDANCE WITH ANY APPLICABLE MUNICIPAL, COUNTY, STATE AND/OR UTILITY AUTHORITY REGULATIONS.
5. MINIMUM SLOPE REQUIREMENTS TO PREVENT PONDING SHALL BE AS FOLLOWS:
   - CURB GUTTER: 0.50%
   - CONCRETE SURFACES: 1.00%
   - ASPHALT SURFACES: 1.00%
6. A MINIMUM SLOPE OF 1.00% SHALL BE PROVIDED AWAY FROM ALL BUILDINGS. THE CONTRACTOR SHALL ENSURE POSITIVE DRAINAGE FROM THE BUILDING IS ACHIEVED AND SHALL NOTIFY STONEFIELD ENGINEERING & DESIGN, LLC. IF THIS CONDITION CANNOT BE MET.
7. FOR PROJECTS WHERE BASEMENTS ARE PROPOSED, THE DEVELOPER IS RESPONSIBLE TO DETERMINE THE DEPTH TO GROUNDWATER AT THE LOCATION OF THE PROPOSED STRUCTURE. IF GROUNDWATER IS ENCOUNTERED WITHIN THE BASEMENT AREA, SPECIAL CONSTRUCTION METHODS SHALL BE UTILIZED AND REVIEWED/APPROVED BY THE CONSTRUCTION CODE OFFICIAL. IF SUMP PUMPS ARE UTILIZED, ALL DISCHARGES SHALL BE CONNECTED DIRECTLY TO THE PUBLIC STORM SEWER SYSTEM WITH APPROVAL FROM THE GOVERNING STORM SEWER SYSTEM AUTHORITY.

ADA NOTES

1. THE CONTRACTOR SHALL MAINTAIN A MAXIMUM 2.00% SLOPE IN ANY DIRECTION WITHIN THE ADA PARKING SPACES AND ACCESS AISLES.
2. THE CONTRACTOR SHALL PROVIDE COMPLIANT SIGNAGE AT ALL ADA PARKING AREAS IN ACCORDANCE WITH STATE GUIDELINES.
3. THE CONTRACTOR SHALL MAINTAIN A MAXIMUM 5.00% RUNNING SLOPE AND A MAXIMUM OF 2.00% CROSS SLOPE ALONG WALKWAYS WITHIN THE ACCESSIBLE PATH OF TRAVEL (SEE THE SITE PLAN FOR THE LOCATION OF THE ACCESSIBLE PATH). THE CONTRACTOR IS RESPONSIBLE TO ENSURE THE ACCESSIBLE PATH OF TRAVEL IS 36 INCHES WIDE OR GREATER UNLESS INDICATED OTHERWISE WITHIN THE PLAN SET.
4. THE CONTRACTOR SHALL MAINTAIN A MAXIMUM 2.00% SLOPE IN ANY DIRECTION AT ALL LANDINGS. LANDINGS INCLUDE, BUT ARE NOT LIMITED TO, THE TOP AND BOTTOM OF AN ACCESSIBLE RAMP, AT ACCESSIBLE BUILDING ENTRANCES, AT AN AREA IN FRONT OF A WALK-UP ATM, AND AT TURNING SPACES ALONG THE ACCESSIBLE PATH OF TRAVEL. THE LANDING AREA SHALL HAVE A MINIMUM CLEAR AREA OF 60 INCHES BY 60 INCHES UNLESS INDICATED OTHERWISE WITHIN THE PLAN SET.
5. THE CONTRACTOR SHALL MAINTAIN A MAXIMUM 8.33% RUNNING SLOPE AND A MAXIMUM 2.00% CROSS SLOPE ON ANY CURB RAMPS ALONG THE ACCESSIBLE PATH OF TRAVEL. WHERE PROVIDED, CURB RAMP FLARES SHALL NOT HAVE A SLOPE GREATER THAN 10.00% IF A LANDING AREA IS PROVIDED AT THE TOP OF THE RAMP. FOR ALTERATIONS, A CURB RAMP FLARES SHALL NOT HAVE A SLOPE GREATER THAN 8.33% IF A LANDING AREA IS NOT PROVIDED AT THE TOP OF THE RAMP. CURBS RAMPS SHALL NOT RISE MORE THAN 6 INCHES IN ELEVATION WITHOUT A HANDRAIL. THE CLEAR WIDTH OF A CURB RAMP SHALL BE NO LESS THAN 36 INCHES WIDE.
6. ACCESSIBLE RAMPS WITH A RISE GREATER THAN 6 INCHES SHALL CONTAIN COMPLIANT HANDRAILS ON BOTH SIDES OF THE RAMP AND SHALL NOT RISE MORE THAN 30" IN ELEVATION WITHOUT A LANDING AREA IN BETWEEN RAMP RUNS. LANDING AREAS SHALL ALSO BE PROVIDED AT THE TOP AND BOTTOM OF THE RAMP.
7. A SLIP RESISTANT SURFACE SHALL BE CONSTRUCTED ALONG THE ACCESSIBLE PATH AND WITHIN ADA PARKING AREAS.
8. THE CONTRACTOR SHALL ENSURE A MAXIMUM OF ¼ INCHES VERTICAL CHANGE IN LEVEL ALONG THE ACCESSIBLE PATH. WHERE A CHANGE IN LEVEL BETWEEN ¼ INCHES AND ½ INCHES EXISTS, CONTRACTOR SHALL ENSURE THAT THE TOP ¼ INCH CHANGE IN LEVEL IS BEVELED WITH A SLOPE NOT STEEPER THAN 1 UNIT VERTICAL AND 2 UNITS HORIZONTAL (2:1 SLOPE).
9. THE CONTRACTOR SHALL ENSURE THAT ANY OPENINGS (GAPS OR HORIZONTAL SEPARATION) ALONG THE ACCESSIBLE PATH SHALL NOT ALLOW PASSAGE OF A SPHERE GREATER THAN ½ INCH.

SYMBOL	DESCRIPTION
	PROPERTY LINE
100	PROPOSED GRADING CONTOUR
G 100.00	PROPOSED GRADE SPOT SHOT
TC 100.50 / BC 100.00	PROPOSED TOP OF CURB / BOTTOM OF CURB SPOT SHOT
FC 100.00	PROPOSED FLUSH CURB SPOT SHOT
TW 102.00 / BW 100.00	PROPOSED TOP OF WALL / BOTTOM OF WALL SPOT SHOT
	PROPOSED STORMWATER STRUCTURES
	PROPOSED STORMWATER PIPING



60' 0' 60' 120'

GRAPHIC SCALE IN FEET
1" = 60'

FOR CONCEPTUAL PLAN PUD REVIEW

ISSUE	DATE	BY	DESCRIPTION
1	06/29/2022	MPH	FOR CONCEPTUAL PLAN PUD REVIEW

NOT APPROVED FOR CONSTRUCTION

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Phone 248.247.1115

SITE DEVELOPMENT PLANS

BALDWIN VILLAGE

PROPOSED COMMERCIAL DEVELOPMENT - THE PLAZA

PID: 09-32-301-001 & 09-32-301-014
SWC OF BALDWIN ROAD & JUDAH ROAD
CHARTER TOWNSHIP OF ORION
OAKLAND COUNTY, MICHIGAN 48359

STATE OF OHIO CHARLES D. OLIVO REGISTERED PROFESSIONAL ENGINEER

J. REID COOKSEY, P.E.
LICENSED PROFESSIONAL ENGINEER

STONEFIELD engineering & design

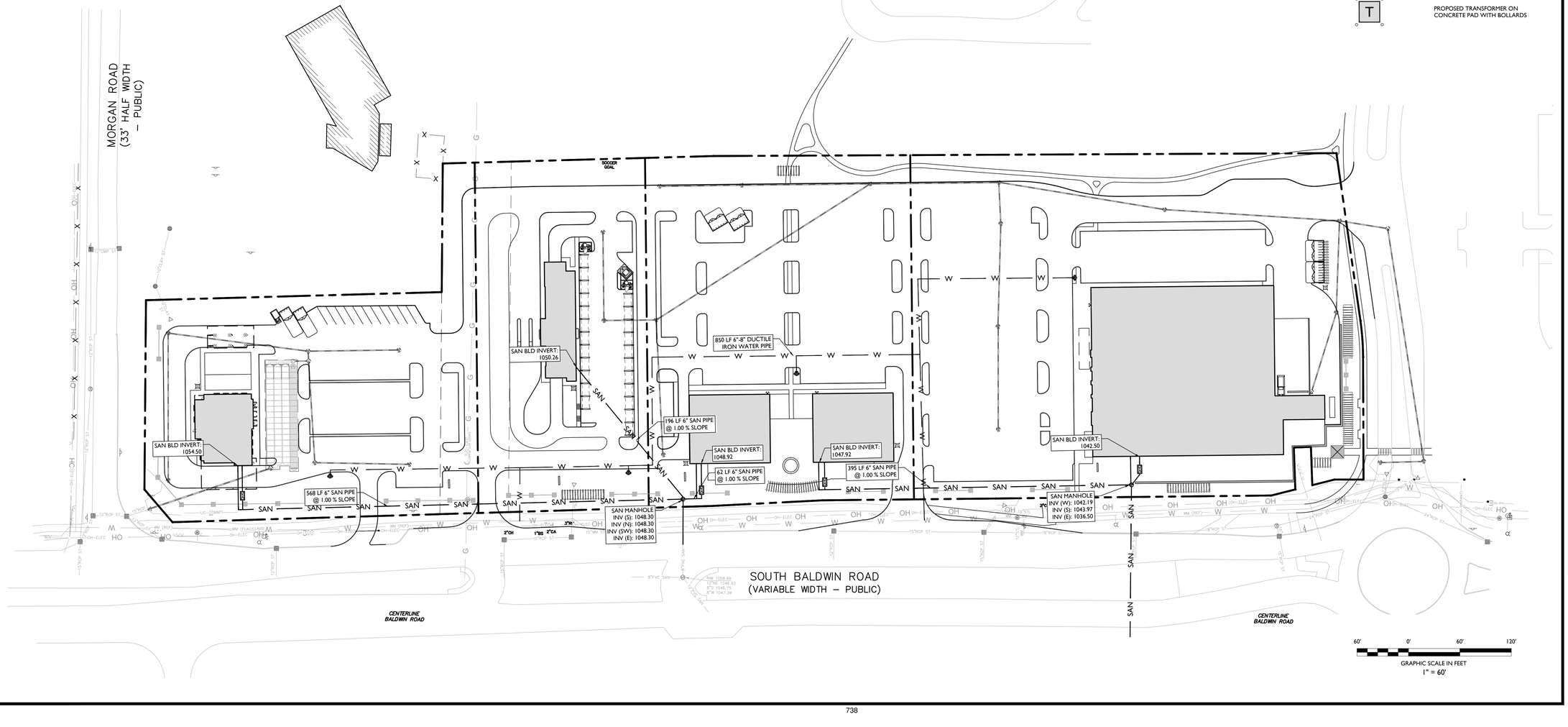
SCALE: 1" = 60' PROJECT ID: DET-210395

TITLE:

GRADING PLAN (OVERALL)

DRAWING:

C-7



SYMBOL / DESCRIPTION

SYMBOL	DESCRIPTION
	PROPERTY LINE
SAN	PROPOSED SANITARY LATERAL
W	PROPOSED DOMESTIC WATER SERVICE
E/T/C	PROPOSED ELECTRICAL/DATA CONDUITS
G	PROPOSED GAS LINE
	PROPOSED VALVE
	PROPOSED WATER TEE / BEND
	PROPOSED FIRE HYDRANT
	PROPOSED FIRE DIRECT CONNECTION (FDC)
S	PROPOSED SANITARY MANHOLE / CLEANOUT
T	PROPOSED TRANSFORMER ON CONCRETE PAD WITH BOLLARDS

ISSUE	DATE	BY	DESCRIPTION
1	06/29/2022	MPH	FOR CONCEPTUAL PLAN PUD REVIEW

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SWC OF BALDWIN ROAD & JUDAH ROAD
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OAKLAND COUNTY, MICHIGAN 48359

STATE OF OHIO
CHARLES D. COOKSEY
J. REID COOKSEY, P.E.
LICENSED PROFESSIONAL ENGINEER

STONEFIELD engineering & design

SCALE: 1" = 60' | PROJECT ID: DET-210395

TITLE: UTILITY PLAN (OVERALL)

DRAWING: C-8

V:\DET\2021\DET-210395-ALAN\SITE\SOUTH BALDWIN ROAD & JUDAH ROAD, ORION TOWNSHIP, MI\ADMIN\PLOT\DP-08-UTIL.DWG

S:\PROJECTS\2018\2018-346 BALDWIN VILLAGE - JH\SURVEY-DEPT\TOPO\BASE\DWG\BASE-ALTA-COMMERCIAL.dwg

LEGAL DESCRIPTION
(Per PEA Group)

PROPOSED COMMERCIAL PARCEL
A parcel of land over part of the Southwest 1/4 of Section 32, Town 4 North, Range 10 East, Orion Township, Oakland County, Michigan, more particularly described as follows:

Commencing at the West 1/4 corner of said section 32; thence along the west line of said section, S00°01'58"W, 878.45 feet; thence S89°52'06"E, 780.14 feet to the POINT OF BEGINNING; thence N00°38'07"W, 839.93 feet to the east–west 1/4 line of said Section 32; thence along said east–west 1/4 line, S87°00'01"E, 379.58 feet to the west line of Baldwin Road (variable width), as recorded in Liber 49504, Page 823, Oakland County Records; thence along said west line the following ten (10) courses:
1) S00°46'00"E, 13.34 feet;
2) S00°26'01"E, 74.96 feet;
3) S14°44'02"E, 26.81 feet
4) S87°22'00"W, 44.67 feet;
5) S02°38'00"E, 20.00 feet;
6) N87°22'00"E, 48.95 feet;
7) S14°44'02"E, 28.84 feet;
8) S01°12'37"E, 321.60 feet;
9) S01°10'56"E, 202.42 feet and
10) S03°57'38"E, 135.47 feet;
thence continuing along the west line of said Baldwin Road and the north line of Morgan Road (33 foot half width), as recorded in Liber 49604, Page 574, Oakland County Records, the following three (3) courses:
1) S01°56'50"E, 627.77 feet;
2) S49°02'08"W, 50.30 feet and
3) N89°54'37"W, 221.05 feet;
thence N01°56'50"W, 345.22 feet;
thence N89°54'37"W, 150.00 feet;
thence N01°56'49"W, 315.91 feet to the POINT OF BEGINNING.
Containing 12.57 acres of land, more or less.

SCHEDULE B EXCEPTIONS
(Per Fidelity National Title Insurance Company, Commitment #A0741518 Revision 2, Dated November 2, 2021)

12. Rights of the public to any portion of the Land lying within the bounds of any street, road, alley or highway.
13. Right(s) of Way and/or Easement(s) and rights incidental thereto, as granted in documents:
Granted to: Consumers Power Company (now known as Consumers Energy) successor to Iosco Land Company
Recording Nos: Liber 36 of Miscellaneous Records, Page 153, and Liber 36 of Miscellaneous Records, Page 395.
As affected by Notice recorded at Liber 1030, Page 589. [Not plottable. The 1930 & 1935 documents describes land that includes the proposed subject parcel for gas main purposes.]
14. Right(s) of Way and/or Easement(s) and rights incidental thereto, as granted in documents:
Granted to: Michigan Gas Storage Company
Recording No: Liber 2750, Page 135.
As further disclosed by Notice of Claim thereto recorded at Liber 9714, Page 598. [As plotted.]
15. Terms, Covenants, and Conditions of Deed as set forth below: Recording No: Liber 4157, Page 123. [Not plottable. The 1960 documents describes land that includes the proposed subject parcel.]
16. Right(s) of Way and/or Easement(s) and rights incidental thereto, as granted in a document:
Granted to: Michigan Bell Telephone Company Recording No: Liber 6580, Page 676.
[Not plotted. Easement area lies within the existing Baldwin Road right–of–way.]
17. Right(s) of Way and/or Easement(s) and rights incidental thereto as set forth in a document:
In favor of: Charter Township of Orion
Recording No: Liber 19999, Page 90. [Not plotted. Easement area lies within the existing Baldwin Road right–of–way.]
18. Right(s) of Way and/or Easement(s) and rights incidental thereto as set forth in documents:
In favor of: Board of County Road Commissioners of the County of Oakland
Recording Nos: Liber 49604, Page 574, and Liber 49684, Page 709. [As shown – Highway easement & acquisition for public highway. Documents also grant temporary grading easements – not shown.]

SCHEDULE B EXCEPTIONS
(Per Fidelity National Title Insurance Company, Commitment #A0742572 Revision 2, Dated November 2, 2022)

10. No liability is assumed by the Company for tax increase occasioned by retroactive revaluation or change in land usage or loss of any Principal Residence Exemption status for the Land.
11. Rights of the public to any portion of the Land lying within the bounds of any street, road, alley or highway.
12. Rights of tenants under unrecorded leases and any and all parties claiming by, through and thereunder.
13. Right(s) of Way and/or Easement(s) and rights incidental thereto as set forth in a document: In favor of: Iosco Land Company Recording No: Liber 36 Miscellaneous Records, Page 153 [Not plottable. The 1930 document describes overall parcel that encompasses the proposed subject parcel.]
14. Declaration of Taking for Water and Sewer Improvements
Recording Date: March 10, 1999 Recording No.: Liber 19654, Page 452 [Not plotted. Easement area lies within the existing Baldwin Road right–of–way.]
15. Consent Judgment for public water main
Recording Date: September 25, 2000
Recording No.: Liber 21841, Page 173 [Not plotted. Easement area lies within the existing Baldwin Road right–of–way.]
16. Permanent Easement for Storm Sewer
Recording Date: November 4, 2002
Recording No.: Liber 26989, Page 38 [Not plotted. Easement area lies within the existing Baldwin Road right–of–way, lying north of the subject parcel.]
17. Intentionally deleted.
18. Declaration of Taking for Baldwin Road
Recording Date: June 23, 2016
Recording No.: Liber 49504, Page 823 AND
Recording Date: July 21, 2016
Recording No.: Liber 49604, Page 574 [As shown – Highway easement & acquisition for public highway. Documents also grant temporary grading easements – not shown.]
19. Possession and Use Agreement
Executed by: The Road Commission for the County of Oakland and Gingelville Land Company, L.L.C., a Michigan limited liability company
Recording Date: July 21, 2016
Recording No.: Liber 49604, Page 621 [As shown – Highway easement & acquisition for public highway. Documents also grant temporary grading easements – not shown.]
20. Consent Judgment Oakland County Circuit Court Case 2016–154105–CC
Recording Date: June 19, 2017
Recording No.: Liber 50778, Page 390 [Not plottable. Document states any easement rights by Consumers Energy be preserved and not altered by the Road Commission of Oakland County taking of any highway easement rights.]

BENCHMARKS
(GPS DERIVED – NAVD88)

BM #300
ARROW ON HYDRANT, WEST SIDE OF BALDWIN, JUST NORTH OF MORGAN ROAD.
ELEV. – 1055.30

BM #301
ARROW ON HYDRANT, WEST SIDE OF BALDWIN ROAD, ACROSS FROM SOUTH BOUND BALDWIN ROAD TURN AROUND.
ELEV. – 1061.57

BM #302
ARROW ON HYDRANT, WEST SIDE OF BALDWIN ROAD, JUST SOUTH OF JUDAH ROAD.
ELEV. – 1045.86

FLOODPLAIN NOTE:
BY GRAPHICAL PLOTTING, SITE IS WITHIN ZONE 'X', AREA DETERMINED TO BE OUTSIDE OF THE 0.2% ANNUAL CHANCE FLOODPLAIN PER FLOOD INSURANCE RATE MAP NUMBER 26125C0358F, DATED SEPTEMBER 29, 2006.

SURVEYOR'S NOTES:
A As of the date of this survey, there are no known right–of–way changes.

CERTIFICATE OF SURVEY

To: FIDELITY NATIONAL TITLE
RED SHALOM, LLC
SHALOM BAPTIST CHURCH OF PONTIAC
ALRIG USA

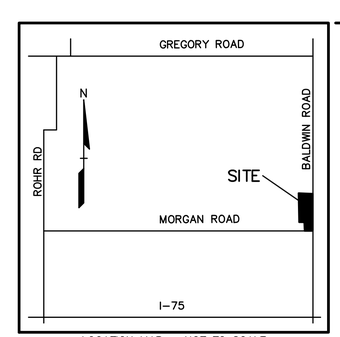
This is to certify that this map or plat and the survey on which it is based were made in accordance with the 2021 Minimum Standard Detail Requirements for ALTA/NSPS Land Title Surveys, jointly established and adopted by ALTA and NSPS, and includes Items 2, 3, 4, 5, 8, 13 and 17 of Table A thereof. The field work was completed on February 16, 2022.

Kevin T. Roach, PS No. 4001047971
(kroach@peagroup.com) Agent for PEA Group

LEGEND

- IRON FOUND
- IRON SET
- NAIL FOUND
- NAIL & CAP SET
- BRASS PLUG SET
- MONUMENT FOUND
- MONUMENT SET
- SEC. CORNER FOUND
- R RECORDED
- M MEASURED
- C CALCULATED

EXISTING
- OH–ELEC – ELEC., PHONE OR CABLE TV O.H. LINE, POLE & GUY WIRE
- UG–CATV – UNDERGROUND CABLE TV, CATV PEDESTAL
- UG–PHONE – TELEPHONE U.G. CABLE, PEDESTAL & MANHOLE
- UG–ELEC – ELECTRIC U.G. CABLE, MANHOLE, METER & HANDHOLE
- GAS MAIN, VALVE & GAS LINE MARKER
- WATERMAIN, HYD., GATE VALVE, TAPPING SLEEVE & VALVE
- SANITARY SEWER, CLEANOUT & MANHOLE
- STORM SEWER, CLEANOUT & MANHOLE
- COMBINED SEWER & MANHOLE
- SQUARE, ROUND & BEEHIVE CATCH BASIN, YARD DRAIN
- POST INDICATOR VALVE
- WATER VALVE BOX/HYDRANT VALVE BOX, SERVICE SHUTOFF
- MAILBOX, TRANSFORMER, IRRIGATION CONTROL VALVE
- UNIDENTIFIED STRUCTURE
- SPOT ELEVATION
- CONTOUR LINE
- FENCE
- GUARD RAIL
- STREET LIGHT
- SIGN



LOCATION MAP – NOT TO SCALE

REFERENCE DRAWINGS

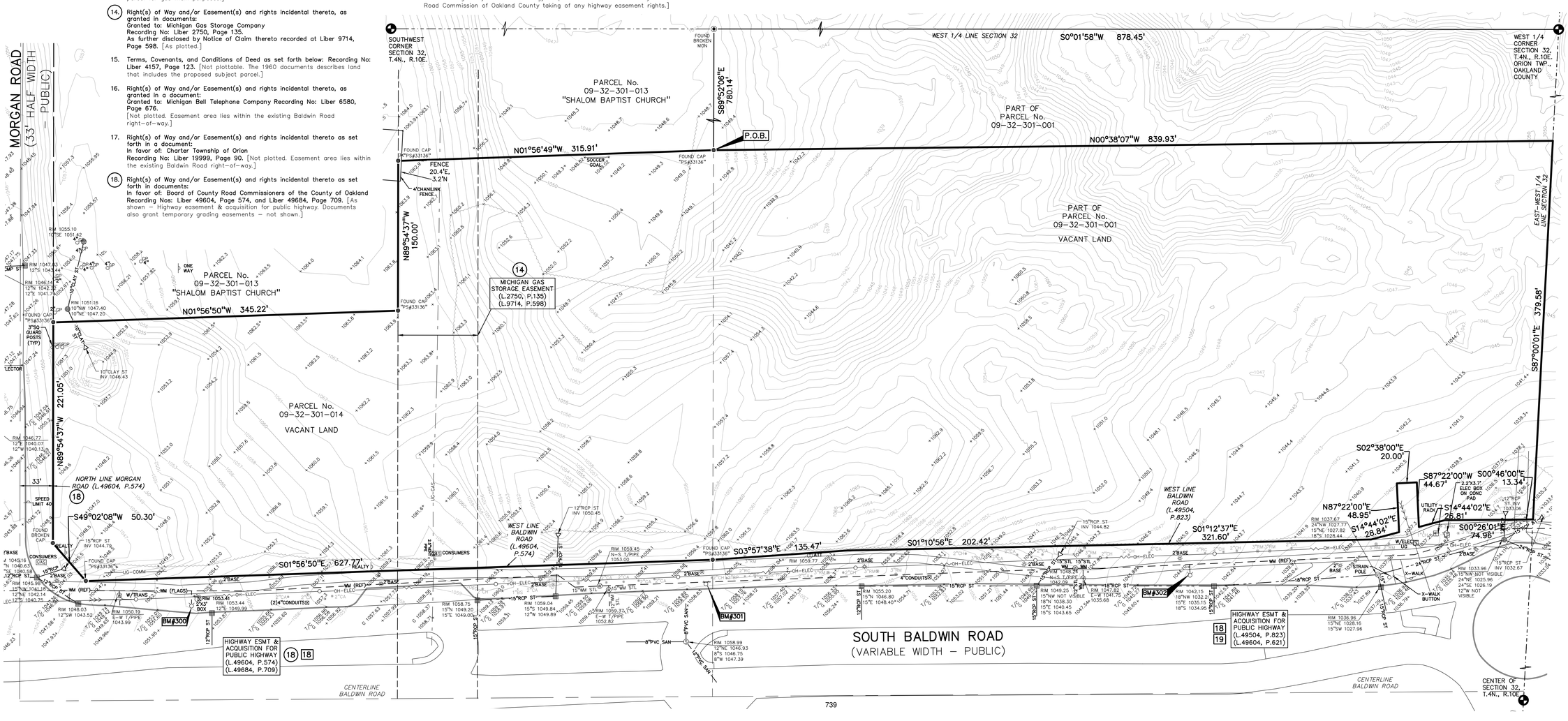
WATER MAIN	"BALDWIN ROAD RECONSTRUCTION MORGAN ROAD TO GREGORY ROAD TO CONSTRUCTION PLAN STA 8+50 TO STA 16+00", OHM, JOB NO. 0170-13-0040, SHEET 55, DATED 3/24/17
SANITARY SEWER	"BALDWIN ROAD RECONSTRUCTION MORGAN ROAD TO GREGORY ROAD TO CONSTRUCTION PLAN STA 8+50 TO STA 16+00", OHM, JOB NO. 0170-13-0040, SHEET 55, DATED 3/24/17
STORM SEWER	"BALDWIN ROAD RECONSTRUCTION MORGAN ROAD TO GREGORY ROAD TO CONSTRUCTION PLAN STA 8+50 TO STA 16+00", OHM, JOB NO. 0170-13-0040, SHEET 55, DATED 3/24/17
FLOOD PLAIN	FEMA F.I.R.M. MAP #26125C0358F, DATED 9/29/06

0 25 50 100
SCALE: 1" = 50'

811 Know what's below. Call before you dig.

CAUTION!!
THE LOCATIONS AND ELEVATIONS OF EXISTING UNDERGROUND UTILITIES AS SHOWN ON THIS DRAWING ARE ONLY APPROXIMATE. NO GUARANTEE IS EITHER EXPRESSED OR IMPLIED AS TO THEIR ACCURACY OR COMPLETENESS. THEREOF THE CONTRACTOR SHALL BE EXCLUSIVELY RESPONSIBLE FOR DETERMINING THE EXACT UTILITY LOCATIONS AND ELEVATIONS PRIOR TO THE START OF CONSTRUCTION.

PRELIMINARY



PEA GROUP
t: 844.813.2949
www.peagroup.com

CLIENT
ALRIG USA
21 E. LONG LAKE ROAD, SUITE 101
BLOOMFIELD HILLS, MI 48304

PROJECT TITLE
BALDWIN VILLAGE - COMMERCIAL PARCEL
BALDWIN ROAD
ORION TOWNSHIP, MI

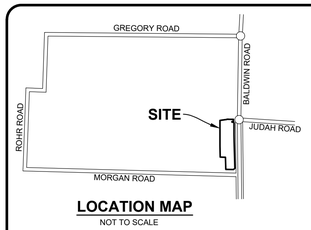
REVISIONS
-

ORIGINAL ISSUE DATE:
MARCH 11, 2022

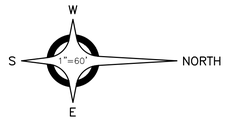
DRAWING TITLE
TOPOGRAPHIC ALTA/NSPS LAND TITLE SURVEY

PEA JOB NO.	2018-346
P.M.	JBT
DN.	LR/EH
SUR.	KTR

DRAWING NUMBER:
ALTA



LOCATION MAP
NOT TO SCALE



SOUTHWEST CORNER
SECTION 32, T.4N., R.10E.,
ORION TOWNSHIP,
OAKLAND COUNTY, MI
LIBER 17530, PAGE 342, O.C.R.

EAST LINE OF MORGAN PINES & WEST LINE OF SECTION 32
N 01°32'26" W 878.86' (REC. N 00°01'58" W 878.45')

WEST QUARTER CORNER
SECTION 32, T.4N., R.10E.,
ORION TOWNSHIP,
OAKLAND COUNTY, MI
LIBER 17534, PAGE 57, O.C.R. &
POINT OF BEGINNING OF
PARCEL 09-32-301-001

MORGAN PINES
LIBER 17172 OF PLATS,
PAGE 278, O.C.R.

LOT 5

LOT 4

N 88°30'44" E 780.13' (REC. S 89°52'06" E)

PART OF PARCEL 09-32-301-001
22.85± ACRES

PARCEL 09-32-301-013
SHALOM BAPTIST CHURCH

POINT OF BEGINNING OF
PARCEL 09-32-301-014

N 02°12'41" W 726.84'

N 03°31'14" W 316.13' (REC. N 01°56'50" W 315.91')

FCI #33136

S 88°30'56" W 150.00'
(REC. N 89°54'37" W)

HIGHWAY EASEMENT AND
ACQUISITION FOR PUBLIC HIGHWAY
LIBER 49604, PAGE 574 AND
LIBER 49684, PAGE 709, O.C.R.
ITEM 18

℄ MORGAN ROAD
(33 FT. HALF WIDTH)

N 03°31'14" W 345.22' (REC. N 01°56'50" W)

MICHIGAN GAS STORAGE EASEMENT
LIBER 2750, PAGE 135 AND
ITEM 14

NORTH LINE OF COMMON TO LOT 4 & LOT 5 OF
MORGAN PINES & ITS EXTENSION THEREOF

S 88°30'44" W 1188.31' (REC. N 89°57'30" W)

N. 88°30'44" E. 408.18' (REC. S 89°52'06" E)

PROPOSED COMMERCIAL PARCEL
11.87± ACRES

PART OF PARCEL 09-32-301-014
5.00± ACRES

N 79°53'57" E 197.50'

S 88°34'29" E 1153.31' (REC. EAST)

S 88°34'29" E 1153.31'

EAST & WEST QUARTER LINE OF SECTION 32

PARCEL 09-32-151-020
30.11± ACRES

Δ = 7°55'04"
R = 306.00'
ARC = 42.29'
CHORD = N 83°51'29" E
DIST. 42.25'

N 87°49'35" E 143.11'

POINT OF BEGINNING
OF PROPOSED
COMMERCIAL PARCEL

S 01°47'47" E 33.81'
S 86°00'14" W 44.67'
S 03°59'46" E 20.00'
N 86°00'14" E 48.95'
S 16°05'48" E 28.84'
S 16°05'48" E 26.81
S 01°47'47" E 74.96'
S 01°47'47" W 41.15'
S 02°07'46" E 17.61'
SIC

N 89°54'37" W 376.04'

S 88°30'59" W 220.74'

S 47°26'53" W 50.25'

S 03°40'05" E 628.40'

S 04°52'07" E 130.33'

S 02°32'42" E 202.42'

S 02°34'23" E 321.60'

WEST RIGHT OF WAY
OF BALDWIN ROAD

WEST RIGHT OF WAY
OF BALDWIN ROAD

HIGHWAY EASEMENT AND
ACQUISITION FOR PUBLIC HIGHWAY
LIBER 49504, PAGE 823 AND
LIBER 49604, PAGE 621, O.C.R.
ITEMS 18 & 22

HIGHWAY EASEMENT AND
ACQUISITION FOR PUBLIC HIGHWAY
LIBER 49604, PAGE 574 AND
LIBER 49684, PAGE 709, O.C.R.
ITEM 18

S 00°06'56" E 447.40'

S 00°22'41" E 245.92'

N 00°39'55" W 815.90' (REC.)

℄ BALDWIN ROAD
(WIDTH VARIES)

BALDWIN ROAD
(WIDTH VARIES)

CENTER POST
SECTION 32, T.4N., R.10E.,
ORION TOWNSHIP,
OAKLAND COUNTY, MI
LIBER 34503, PAGE 834, O.C.R.

FLOODPLAIN NOTE:
BY GRAPHICAL PLOTTING, SITE IS WITHIN ZONE "X" AREA DETERMINED TO BE OUTSIDE OF TEH 2% ANNUAL CHANCE FLOODPLAIN PER FLOOD INSURANCE RATE MAP NUMBER 26125C0358F, DATED SEPTEMBER 29, 2006

LEGEND

FI = ● = FOUND IRON

FCI = FOUND CAPPED IRON

SIC = ○ = SET IRON

LEGAL DESCRIPTION

PARCEL No. 09-32-301-014

PART OF THE NORTHWEST QUARTER OF THE SOUTHWEST QUARTER OF SECTION 32, TOWN 4 NORTH, RANGE 10 EAST, ORION TOWNSHIP, OAKLAND COUNTY, MICHIGAN, BEING DESCRIBED AS: BEGINNING AT A POINT LOCATED SOUTH 00 DEGREES 01 MINUTES 58 SECONDS WEST 878.45 FEET AND SOUTH 89 DEGREES 52 MINUTES 06 SECONDS EAST 780.14 FEET FROM THE WEST QUARTER CORNER, SECTION 32, TOWN 4 NORTH, RANGE 10 EAST; THENCE 89 DEGREES 52 MINUTES 06 SECONDS EAST 547.10 FEET TO THE CENTERLINE OF BALDWIN ROAD (VARIABLE WIDTH); THENCE SOUTH 00 DEGREES 22 MINUTES 41 SECONDS EAST 245.92 FEET ALONG SAID CENTERLINE; THENCE SOUTH 00 DEGREES 06 MINUTES 56 SECONDS EAST 447.40 FEET ALONG SAID CENTERLINE TO THE CENTERLINE OF MORGAN ROAD (33 FEET HALF WIDTH); THENCE NORTH 89 DEGREES 54 MINUTES 37 SECONDS WEST 376.04 FEET ALONG SAID CENTERLINE OF MORGAN ROAD; THENCE NORTH 01 DEGREES 56 MINUTES 50 SECONDS WEST 378.24 FEET; THENCE NORTH 89 DEGREES 54 MINUTES 37 SECONDS WEST 150.00 FEET; THENCE NORTH 01 DEGREES 56 MINUTES 50 SECONDS WEST 315.91 FEET TO THE POINT OF BEGINNING.

DESCRIPTION
AS-SURVEYED PARCEL No. 09-32-301-014

PART OF THE SOUTHWEST QUARTER OF SECTION 32, TOWN 4 NORTH, RANGE 10 EAST, ORION TOWNSHIP, OAKLAND COUNTY, MICHIGAN, BEING DESCRIBED AS:

COMMENCING AT THE WEST QUARTER CORNER OF SECTION 32; THENCE ALONG THE WEST LINE OF SECTION 32 SOUTH 01 DEGREES 32 MINUTES 26 SECONDS EAST 878.86 FEET (RECORD SOUTH 00 DEGREES 01 MINUTES 58 SECONDS WEST 878.45 FEET) TO THE NORTH LINE COMMON TO LOT 4 AND LOT 5 OF MORGAN PINES AS RECORDED IN LIBER 17172 OF PLATS, PAGE 278, OAKLAND COUNTY RECORDS; THENCE ALONG THE NORTH LINE COMMON TO LOT 4 AND LOT 5 OF MORGAN PINES AND ITS EXTENSION THEREOF NORTH 88 DEGREES 30 MINUTES 44 SECONDS EAST (RECORD SOUTH 89 DEGREES 52 MINUTES 06 SECONDS EAST) 780.13 FEET TO THE POINT OF BEGINNING; THENCE CONTINUING NORTH 88 DEGREES 30 MINUTES 44 SECONDS EAST (RECORD SOUTH 89 DEGREES 52 MINUTES 06 SECONDS EAST) 408.18 FEET TO THE WESTERLY RIGHT OF WAY LINE OF BALDWIN ROAD (WIDTH VARIES); THENCE ALONG THE WESTERLY RIGHT OF WAY LINE OF BALDWIN ROAD AND THE NORTHERLY RIGHT OF WAY LINE OF MORGAN ROAD THE FOLLOWING THREE (3) COURSES: SOUTH 03 DEGREES 40 MINUTES 05 SECONDS EAST 628.40 FEET, SOUTH 47 DEGREES 26 MINUTES 53 SECONDS WEST 50.25 FEET AND SOUTH 88 DEGREES 30 MINUTES 59 SECONDS WEST 220.74 FEET; THENCE NORTH 03 DEGREES 31 MINUTES 14 SECONDS WEST (RECORD NORTH 01 DEGREES 56 MINUTES 50 SECONDS WEST) 345.22 FEET; THENCE SOUTH 88 DEGREES 30 MINUTES 56 SECONDS WEST (RECORD NORTH 89 DEGREES 54 MINUTES 37 SECONDS WEST) 150.00 FEET; THENCE NORTH 03 DEGREES 31 MINUTES 14 SECONDS WEST 316.13 FEET (RECORD NORTH 01 DEGREES 56 MINUTES 50 SECONDS WEST 315.91 FEET) TO THE POINT OF BEGINNING. CONTAINING 5.00 ACRES, MORE OR LESS.

SUBJECT TO ANY AND ALL EASEMENTS AND RIGHTS OF WAY OF RECORD OR OTHERWISE.

LEGAL DESCRIPTION

PARCEL No. 09-32-301-001

PART OF THE NORTHWEST QUARTER OF THE SOUTHWEST QUARTER OF SECTION 32, TOWN 4 NORTH, RANGE 10 EAST, ORION TOWNSHIP, OAKLAND COUNTY, MICHIGAN, BEING DESCRIBED AS: BEGINNING AT THE WEST QUARTER CORNER, THENCE SOUTH 00 DEGREES 23 MINUTES 30 SECONDS EAST 878.86 FEET, THENCE SOUTH 89 DEGREES 57 MINUTES 30 SECONDS EAST 1324.80 FEET, THENCE NORTH 00 DEGREES 39 MINUTES 55 SECONDS WEST 815.90 FEET, THENCE WEST TO THE BEGINNING.

DESCRIPTION
AS-SURVEYED PARCEL No. 09-32-301-001

PART OF THE SOUTHWEST QUARTER OF SECTION 32, TOWN 4 NORTH, RANGE 10 EAST, ORION TOWNSHIP, OAKLAND COUNTY, MICHIGAN, BEING DESCRIBED AS:

BEGINNING AT THE WEST QUARTER CORNER OF SECTION 32; THENCE ALONG THE EAST AND WEST QUARTER LINE OF SECTION 32 SOUTH 88 DEGREES 34 MINUTES 29 SECONDS EAST (RECORD EAST) 1153.31 FEET TO THE WESTERLY RIGHT OF WAY LINE OF BALDWIN ROAD (WIDTH VARIES) THE FOLLOWING TEN (10) COURSES: SOUTH 02 DEGREES 07 MINUTES 46 SECONDS EAST 17.61 FEET, SOUTH 01 DEGREES 47 MINUTES 47 SECONDS EAST 74.96 FEET, SOUTH 16 DEGREES 05 MINUTES 48 SECONDS EAST 26.81 FEET, SOUTH 86 DEGREES 00 MINUTES 14 SECONDS WEST 44.67 FEET, SOUTH 03 DEGREES 59 MINUTES 46 SECONDS EAST 20.00 FEET, NORTH 86 DEGREES 00 MINUTES 14 SECONDS EAST 48.95 FEET, SOUTH 16 DEGREES 05 MINUTES 48 SECONDS EAST 28.84 FEET, SOUTH 02 DEGREES 34 MINUTES 23 SECONDS EAST 321.60 FEET, SOUTH 02 DEGREES 32 MINUTES 42 SECONDS EAST 202.42 FEET AND SOUTH 04 DEGREES 52 MINUTES 07 SECONDS EAST 130.33 FEET; THENCE ALONG THE NORTH LINE COMMON TO LOT 4 AND LOT 5 OF MORGAN PINES AND ITS EXTENSION THEREOF AS RECORDED IN LIBER 17172 OF PLATS, PAGE 278, OAKLAND COUNTY RECORDS SOUTH 88 DEGREES 30 MINUTES 44 SECONDS WEST (RECORD NORTH 89 DEGREES 57 MINUTES 30 SECONDS WEST) 1188.31 FEET TO THE EAST LINE OF MORGAN PINES AND THE WEST LINE OF SECTION 32; THENCE ALONG THE EAST LINE OF MORGAN PINES AND THE WEST LINE OF SECTION 32 NORTH 01 DEGREES 32 MINUTES 26 SECONDS WEST (RECORD NORTH 00 DEGREES 23 MINUTES 30 SECONDS WEST) 878.86 FEET TO THE WEST QUARTER CORNER OF SECTION 32 AND THE POINT OF BEGINNING. CONTAINING 22.85 ACRES, MORE OR LESS.

SUBJECT TO ANY AND ALL EASEMENTS AND RIGHTS OF WAY OF RECORD OR OTHERWISE.

LEGAL DESCRIPTION

PROPOSED COMMERCIAL PARCEL
PARCEL No. 09-32-301-014 AND PART OF PARCEL No. 09-32-301-001

PART OF THE SOUTHWEST QUARTER OF SECTION 32, TOWN 4 NORTH, RANGE 10 EAST, ORION TOWNSHIP, OAKLAND COUNTY, MICHIGAN, BEING DESCRIBED AS:

COMMENCING AT THE WEST QUARTER CORNER OF SECTION 32; THENCE ALONG THE EAST AND WEST QUARTER LINE OF SECTION 32 SOUTH 88 DEGREES 34 MINUTES 29 SECONDS EAST 1153.31 FEET TO THE WEST RIGHT OF WAY LINE OF BALDWIN ROAD (WIDTH VARIES); THENCE ALONG THE WEST RIGHT OF WAY LINE OF BALDWIN ROAD THE FOLLOWING TWO (2) COURSES: SOUTH 02 DEGREES 07 MINUTES 46 SECONDS EAST 17.61 FEET AND SOUTH 01 DEGREES 47 MINUTES 47 SECONDS WEST 41.15 FEET TO THE POINT OF BEGINNING; THENCE CONTINUING ALONG THE WESTERLY RIGHT OF WAY LINE OF BALDWIN ROAD AND THE NORTHERLY RIGHT OF WAY LINE OF MORGAN ROAD THE FOLLOWING TWELVE (12) COURSES: SOUTH 01 DEGREES 47 MINUTES 47 SECONDS EAST 33.81 FEET, SOUTH 16 DEGREES 05 MINUTES 48 SECONDS EAST 26.81 FEET, SOUTH 86 DEGREES 00 MINUTES 14 SECONDS WEST 44.67 FEET, SOUTH 03 DEGREES 59 MINUTES 46 SECONDS EAST 20.00 FEET, NORTH 86 DEGREES 00 MINUTES 14 SECONDS EAST 48.95 FEET, SOUTH 16 DEGREES 05 MINUTES 48 SECONDS EAST 28.84 FEET, SOUTH 02 DEGREES 34 MINUTES 23 SECONDS EAST 321.60 FEET, SOUTH 02 DEGREES 32 MINUTES 42 SECONDS EAST 202.42 FEET, SOUTH 04 DEGREES 52 MINUTES 07 SECONDS EAST 130.33 FEET; THENCE SOUTH 88 DEGREES 30 MINUTES 44 SECONDS WEST 345.22 FEET; THENCE NORTH 03 DEGREES 31 MINUTES 14 SECONDS WEST 345.22 FEET; THENCE NORTH 88 DEGREES 30 MINUTES 56 SECONDS WEST 150.00 FEET; THENCE NORTH 03 DEGREES 31 MINUTES 14 SECONDS WEST 316.13 FEET; THENCE NORTH 02 DEGREES 12 MINUTES 41 SECONDS WEST 726.84 FEET; THENCE NORTH 79 DEGREES 53 MINUTES 57 SECONDS EAST 197.50 FEET; THENCE EASTERLY ALONG A TANGENT CURVE CONCAVE TO THE SOUTH HAVING A CENTRAL ANGLE OF 7 DEGREES 55 MINUTES 04 SECONDS, A RADIUS OF 306.00 FEET, AN ARC DISTANCE OF 42.29 FEET AND WHOSE CHORD IS NORTH 83 DEGREES 51 MINUTES 29 SECONDS EAST 42.25 FEET; THENCE NORTH 87 DEGREES 49 MINUTES 58 SECONDS EAST 143.11 FEET TO THE POINT OF BEGINNING. CONTAINING 11.87 ACRES, MORE OR LESS.

SUBJECT TO ANY AND ALL EASEMENTS AND RIGHTS OF WAY OF RECORD OR OTHERWISE.

EASEMENT SCHEDULE

PER FIDELITY NATIONAL TITLE COMPANY
COMMITMENT NO. A0773254, DATED APRIL 4, 2022

ITEM	LIBER	PAGE	ENTITY	TYPE	STATUS
13	36 36 1004	155 455 484	CONSUMERS POWER COMPANY (NOW KNOWN AS CONSUMERS ENERGY)	RIGHTS OF WAY AND/OR EASEMENTS AND RIGHTS	NOT PLOTTABLE
14	2750	135	MICHIGAN GAS STORAGE COMPANY	GAS EASEMENT	NOT PLOTTABLE
15	4557	123	MICHIGAN STATE HIGHWAY DEPARTMENT	WARRANTY DEED	NOT PLOTTABLE
16	3580	576	MICHIGAN BELL TELEPHONE COMPANY	RIGHTS OF WAY AND/OR EASEMENTS AND RIGHTS	NOT PLOTTED - EASEMENT LIES WITHIN THE EXISTING BALDWIN ROAD RIGHT OF WAY
17	19350	90	CHARTER TOWNSHIP OF ORION	RIGHTS OF WAY AND/OR EASEMENTS AND RIGHTS	NOT PLOTTED - EASEMENT LIES WITHIN THE EXISTING BALDWIN ROAD RIGHT OF WAY
18	49504 49604 49684	823 574 709	BOARD OF COUNTY ROAD COMMISSIONERS OF THE COUNTY OF OAKLAND	RIGHTS OF WAY AND/OR EASEMENTS AND RIGHTS	PLOTTED
19	39654	852	CHARTER TOWNSHIP OF ORION	DECLARATION OF TAKING FOR WATER AND SEWER IMPROVEMENTS	NOT PLOTTED - EASEMENT LIES WITHIN THE EXISTING BALDWIN ROAD RIGHT OF WAY
20	21841	173	CHARTER TOWNSHIP OF ORION	EASEMENT AND RIGHTS OF WAY	NOT PLOTTED - EASEMENT LIES WITHIN THE EXISTING BALDWIN ROAD RIGHT OF WAY
21	25789	38	R & H DEVELOPMENT COMPANY	PERMANENT EASEMENT FOR STORM SEWER	NOT PLOTTED - EASEMENT LIES WITHIN THE EXISTING BALDWIN ROAD RIGHT OF WAY
22	49504	821	THE ROAD OF COMMISSION FOR THE COUNTY OF OAKLAND	HIGHWAY EASEMENT AND ACQUISITION FOR PUBLIC HIGHWAY	PLOTTED
23	50778	850	CONSUMERS ENERGY	PRESERVE EASEMENT RIGHTS BY CONSUMERS ENERGY	NOT PLOTTABLE

TO: FIDELITY NATIONAL TITLE COMMITMENT No. A0773254, DATED APRIL 4, 2022,
SILVERMAN ACQUISITIONS, LLC,
GINGELVILLE LAND COMPANY, LLC,
RED EQUITIES,
ALRIG USA ACQUISTIONS, LLC

THIS IS TO CERTIFY THAT THIS MAP OR PLAT AND THE SURVEY ON WHICH IT IS BASED WERE MADE IN ACCORDANCE WITH THE 2021 MINIMUM STANDARD DETAIL REQUIREMENTS FOR ALTA/NSPS LAND TITLE SURVEYS, JOINTLY ESTABLISHED AND ADOPTED BY ALTA AND NSPS, AND INCLUDES ITEMS: 2, 3, 4, 8, 13 AND 17 OF TABLE A THEROF. THE FIELDWORK WAS COMPLETED ON 5-23-2021.

PURSUANT TO THE ACCURACY STANDARDS AS ADOPTED BY ALTA AND NSPS AND IN EFFECT ON THE DATE OF THIS CERTIFICATION, UNDERSIGNED FURTHER CERTIFIES THAT IN MY PROFESSIONAL OPINION, AS A LAND SURVEYOR REGISTERED IN THE STATE OF MICHIGAN, THE RELATIVE POSITIONAL ACCURACY OF THIS SURVEY DOES NOT EXCEED THAT WHICH IS SPECIFIED THEREIN.

DATE OF PLAT OR MAP: JUNE 1, 2022

MICHAEL A. TRUAX, PS #4001060863

STATE OF MICHIGAN
MICHAEL ALBERT TRUAX
PROFESSIONAL SURVEYOR
No. 4001060863
LICENSED PROFESSIONAL SURVEYOR

ANDERSON, ECKSTEIN AND WESTRICK, INC.
CIVIL ENGINEERS SURVEYORS ARCHITECTS
51301 Schoenherr Road
Shelby Township
Michigan 48315
Phone 586 726 1234
Fax 586 726 8780
www.aewinc.com
ENGINEERING STRONG COMMUNITIES

740

DATE	SUBMITTALS/REVISIONS

PROJECT NAME:

BALDWIN VILLAGE

SHEET TITLE:

ALTA SURVEY
COMMERCIAL PARCEL

CLIENT:
ORCO INVESTMENTS, INC.

PRELIMINARY	CONSTRUCTION	RECORD
DRAWN BY:	CHECKED BY:	DATE:
MJS	MAT	JUNE 2022

SCALE:
1" = 60'
0 30 60 120

Know what's below. Call 72 hours before you dig.

UTILITY INFORMATION, AS SHOWN, INDICATES APPROXIMATE LOCATIONS AND TYPES OF EXISTING FACILITIES ONLY, AS DISCLOSED BY RECORDS PROVIDED TO THIS FIRM FROM THE VARIOUS UTILITY COMPANIES. NO GUARANTEE IS GIVEN OR IMPLIED AS TO THE COMPLETENESS OR ACCURACY THEREOF.

PRIOR TO CONSTRUCTION, ALL LOCATIONS AND DEPTHS OF EXISTING OVERHEAD AND UNDERGROUND UTILITIES (IN CONFLICT WITH THE CONSTRUCTION OF THESE PROPOSED IMPROVEMENTS) SHALL BE VERIFIED IN THE FIELD. DURING THE CONSTRUCTION, THE CONTRACTOR SHALL PROTECT AND SUPPORT ALL UTILITIES THAT ARE ENCOUNTERED. (ALL COSTS FOR UTILITY LOCATION VERIFICATION, SUPPORT AND PROTECTION SHALL BE INCLUDED IN THE PROPOSED PAY ITEM CONFLICTING WITH THAT UTILITY).

DURING CONSTRUCTION, THE CONTRACTOR SHALL USE EXTREME CAUTION WHEN OPERATING NEAR ANY AND ALL OVERHEAD AND / OR BURIED UTILITIES.

PROJECT NO.
0519-0052

M:\0519\0519-0052\DWG\CIVIL\ALTA SURVEY-COMMERCIAL.DWG
01_ALTA-Commercial--6/7/2022 4:54:24 PM

SHEET NO.
1

BALDWIN VILLAGE

Site Plan For Conceptual PUD

Section 32, T.4N., R.10E.,
Orion Township, Oakland County, Michigan

741

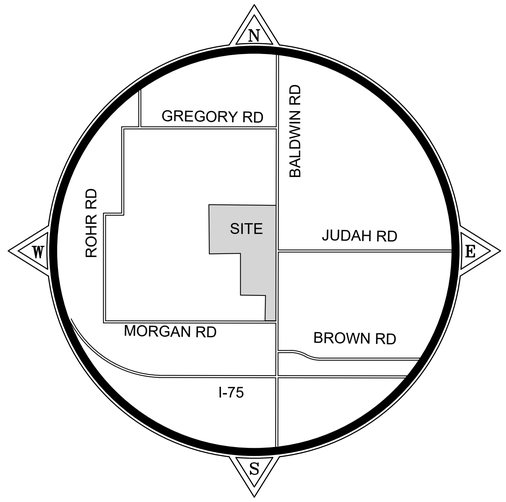
LEGAL DESCRIPTION

PROPOSED RESIDENTIAL PARCEL
PARCEL No. 09-32-151-020, PARCEL No. 09-32-151-021, AND PART OF PARCEL No. 09-32-301-001

PART OF THE WEST HALF OF SECTION 32, TOWN 4 NORTH, RANGE 10 EAST, ORION TOWNSHIP, OAKLAND COUNTY, MICHIGAN, BEING DESCRIBED AS:

BEGINNING AT THE WEST QUARTER CORNER OF SECTION 32; THENCE ALONG THE WEST LINE OF SECTION 32 THENCE NORTH 02 DEGREES 18 MINUTES 02 SECONDS WEST 1081.20 FEET; THENCE NORTH 88 DEGREES 08 MINUTES 03 SECONDS EAST 1253.53 FEET TO THE WEST RIGHT OF WAY LINE OF BALDWIN ROAD (WIDTH VARIES); THENCE ALONG THE WEST RIGHT OF WAY LINE OF BALDWIN ROAD THE FOLLOWING SIX (6) COURSES; SOUTH 01 DEGREES 40 MINUTES 08 SECONDS WEST 177.44 FEET, SOUTH 03 DEGREES 41 MINUTES 00 SECONDS WEST 47.35 FEET, NORTH 87 DEGREES 28 MINUTES 28 SECONDS WEST 28.77 FEET, SOUTH 01 DEGREES 44 MINUTES 21 SECONDS WEST 29.85 FEET, SOUTH 87 DEGREES 12 MINUTES 27 SECONDS EAST 27.76 FEET AND SOUTH 03 DEGREES 41 MINUTES 00 SECONDS WEST 148.44 FEET; THENCE SOUTH 03 DEGREES 39 MINUTES 58 SECONDS WEST 133.62 FEET, THENCE SOUTH 02 DEGREES 07 MINUTES 58 SECONDS WEST 171.01 FEET, NORTH 89 DEGREES 38 MINUTES 06 SECONDS WEST 52.12 FEET, SOUTH 00 DEGREES 27 MINUTES 59 SECONDS EAST 20.00 FEET, SOUTH 89 DEGREES 38 MINUTES 06 SECONDS EAST 52.12 FEET, SOUTH 00 DEGREES 27 MINUTES 59 SECONDS EAST 189.56 FEET, SOUTH 00 DEGREES 21 MINUTES 54 SECONDS WEST 146.38 FEET, SOUTH 41 DEGREES 14 MINUTES 46 SECONDS WEST 37.71 FEET, SOUTH 02 DEGREES 06 MINUTES 04 SECONDS EAST 58.68 FEET TO THE EAST AND WEST QUARTER LINE OF SECTION 32; THENCE ALONG THE EAST AND WEST QUARTER LINE OF SECTION 32, SOUTH 02 DEGREES 07 MINUTES 46 SECONDS EAST 17.61 FEET AND SOUTH 01 DEGREES 47 MINUTES 47 SECONDS EAST 41.15 FEET; THENCE SOUTH 87 DEGREES 49 MINUTES 58 SECONDS WEST 143.11 FEET; THENCE WESTERLY ALONG A NON-TANGENT CURVE CONCAVE TO THE SOUTH HAVING A CENTRAL ANGLE OF 7 DEGREES 55 MINUTES 04 SECONDS, A RADIUS OF 306.00 FEET, AN ARC DISTANCE OF 42.29 FEET AND WHOSE CHORD IS SOUTH 83 DEGREES 51 MINUTES 29 SECONDS WEST 42.25 FEET; THENCE SOUTH 79 DEGREES 53 MINUTES 57 SECONDS WEST 197.50 FEET; THENCE SOUTH 02 DEGREES 12 MINUTES 41 SECONDS EAST 726.84 FEET; THENCE SOUTH 88 DEGREES 30 MINUTES 44 SECONDS WEST 780.13 FEET TO THE WEST LINE OF SECTION 32; THENCE ALONG THE WEST LINE OF SECTION 32 NORTH 01 DEGREES 32 MINUTES 26 SECONDS WEST 878.86 FEET TO THE WEST QUARTER CORNER OF SECTION 32 AND THE POINT OF BEGINNING, CONTAINING 46.83 ACRES, MORE OR LESS.

SUBJECT TO ANY AND ALL EASEMENTS AND RIGHTS OF WAY OF RECORD OR OTHERWISE.



INDEX TO SHEETS

PROPRIETOR
JACOBSON MOCERI ORION LLC
3005 UNIVERSITY DRIVE
AUBURN HILLS, MICHIGAN 48326
248-340-9400

ENGINEER
ANDERSON, ECKSTEIN AND WESTRICK, INC.
51301 SCHOENHERR ROAD
SHELBY TOWNSHIP, MI 48315

STATE OF MICHIGAN
STEPHEN V. PANGORI
LICENSE No. 6201037769
LICENSED PROFESSIONAL ENGINEER

STEPHEN V. PANGORI, P.E.
MICHIGAN REGISTRATION # 6201037769

C1

0361-0067 BALDWIN VILLAGE

M:\0361\0361-0067\DWG\CIVIL\TEMP\BALDWIN VILLAGE-DIM-UTILITY-GRADING.DWG Layout: C1_Title 7/5/2022 1:35:37 PM

LEGAL DESCRIPTION

PROPOSED RESIDENTIAL PARCEL

PARCEL No. 09-32-151-020, PARCEL No. 09-32-151-021, AND PART OF PARCEL No. 09-32-301-001

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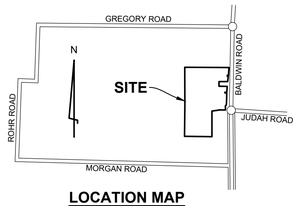

LOCATION MAP

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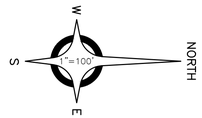

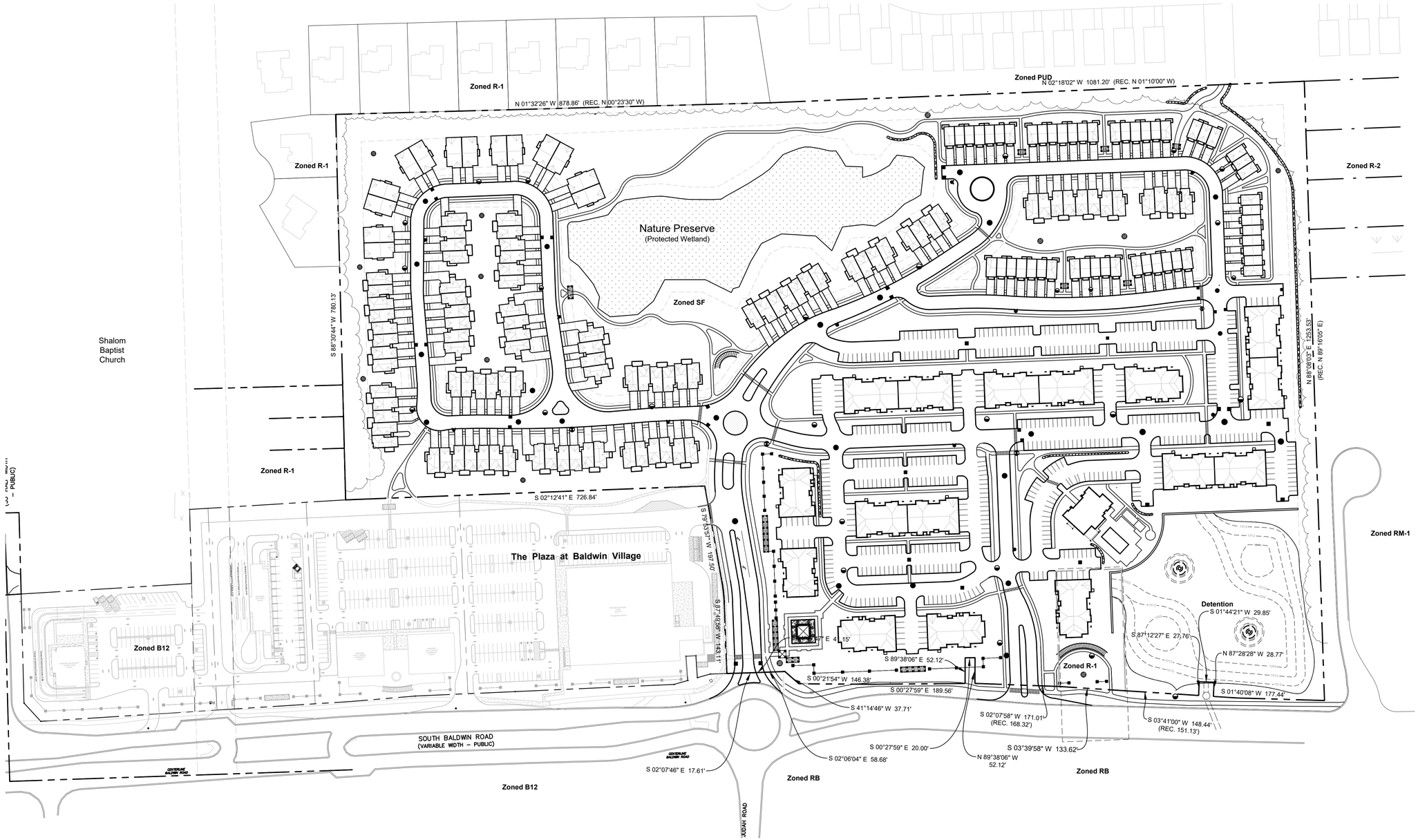

ANDERSON, ECKSTEIN AND WESTRICK, INC.

CIVIL ENGINEERS SURVEYORS ARCHITECTS

51301 Schoenherr Road
Shelby Township
Michigan 48315

Phone 586 726 1234
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www.aewinc.com

ENGINEERING STRONG COMMUNITIES

742

DATE	SUBMITTALS/REVISIONS

PROJECT NAME:

BALDWIN VILLAGE
ORION TOWNSHIP, MI

SHEET TITLE:

PRELIMINARY SITE PLAN

CLIENT:

JACOBSON MOCERI ORION, LLC

■ PRELIMINARY	□ CONSTRUCTION	□ RECORD
DRAWN BY:	CHECKED BY:	DATE:
DB	SVP	JUNE 2022

SCALE:

1" = 100'

0 50 100 200

Know what's below. Call 72 hours before you dig.

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PROJECT NO.

0361-0067

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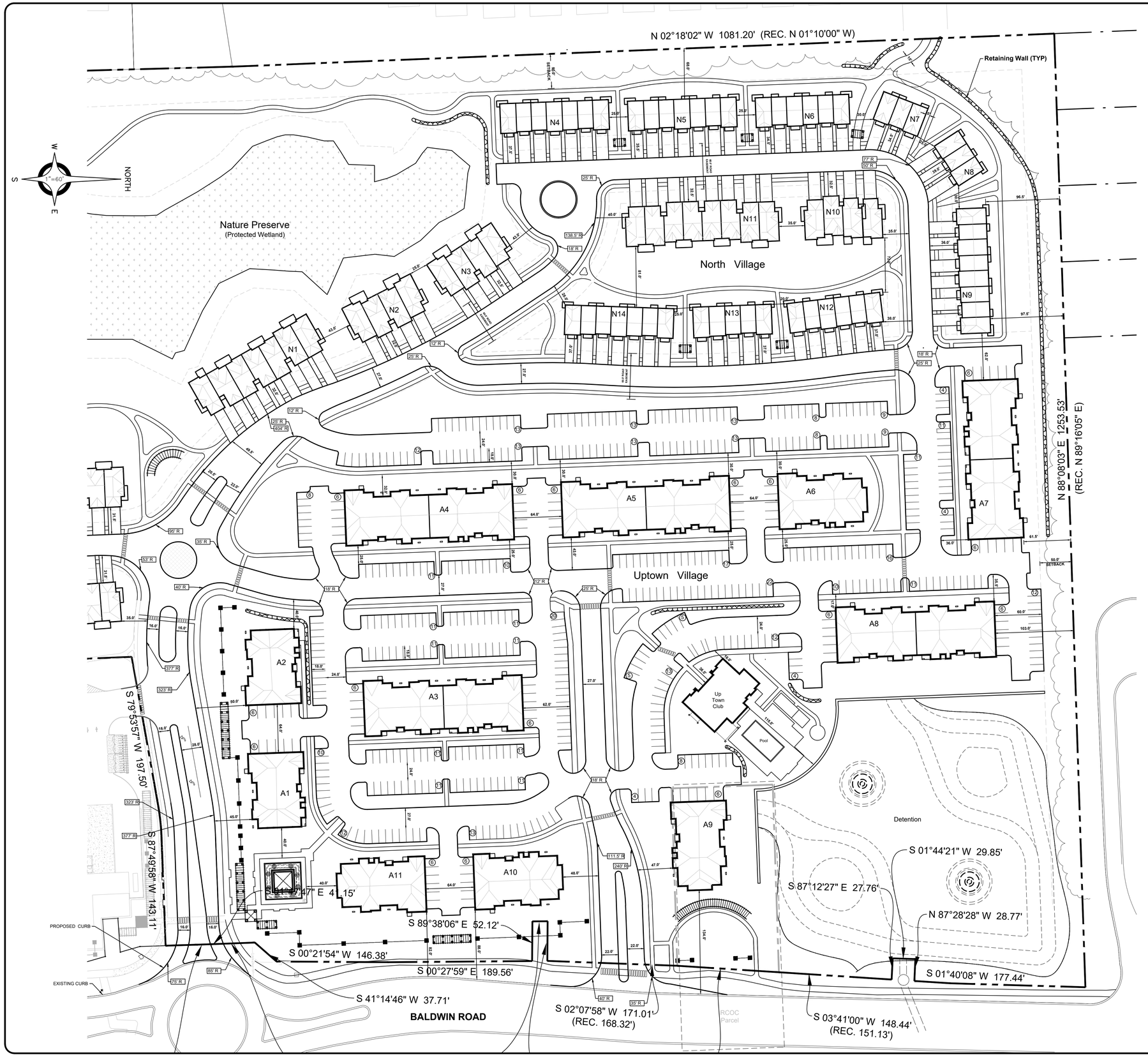

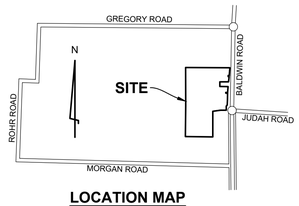

LOCATION MAP
NOT TO SCALE

North Village Summary

79	Townhome Units
79	Total Units

Uptown Village Parking Summary

96	Garage Parking Spaces
576	Surface Parking Spaces
672	Total parking Spaces
304	Total Residences
2.2	Parking Spaces/Residence

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ENGINEERING STRONG COMMUNITIES

743

DATE	SUBMITTALS/REVISIONS

PROJECT NAME:

BALDWIN VILLAGE
ORION TOWNSHIP, MI

SHEET TITLE:

SITE DIMENSION PLAN (NORTH)
North Village and Uptown Village

CLIENT:
JACOBSON MOCERI ORION, LLC

PRELIMINARY ☐ CONSTRUCTION ☐ RECORD

DRAWN BY:	CHECKED BY:	DATE:
DB	SVP	JUNE 2022

SCALE: 1" = 60'
0 30 60 120

Know what's below. Call 72 hours before you dig.

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PROJECT NO.
0361-0067

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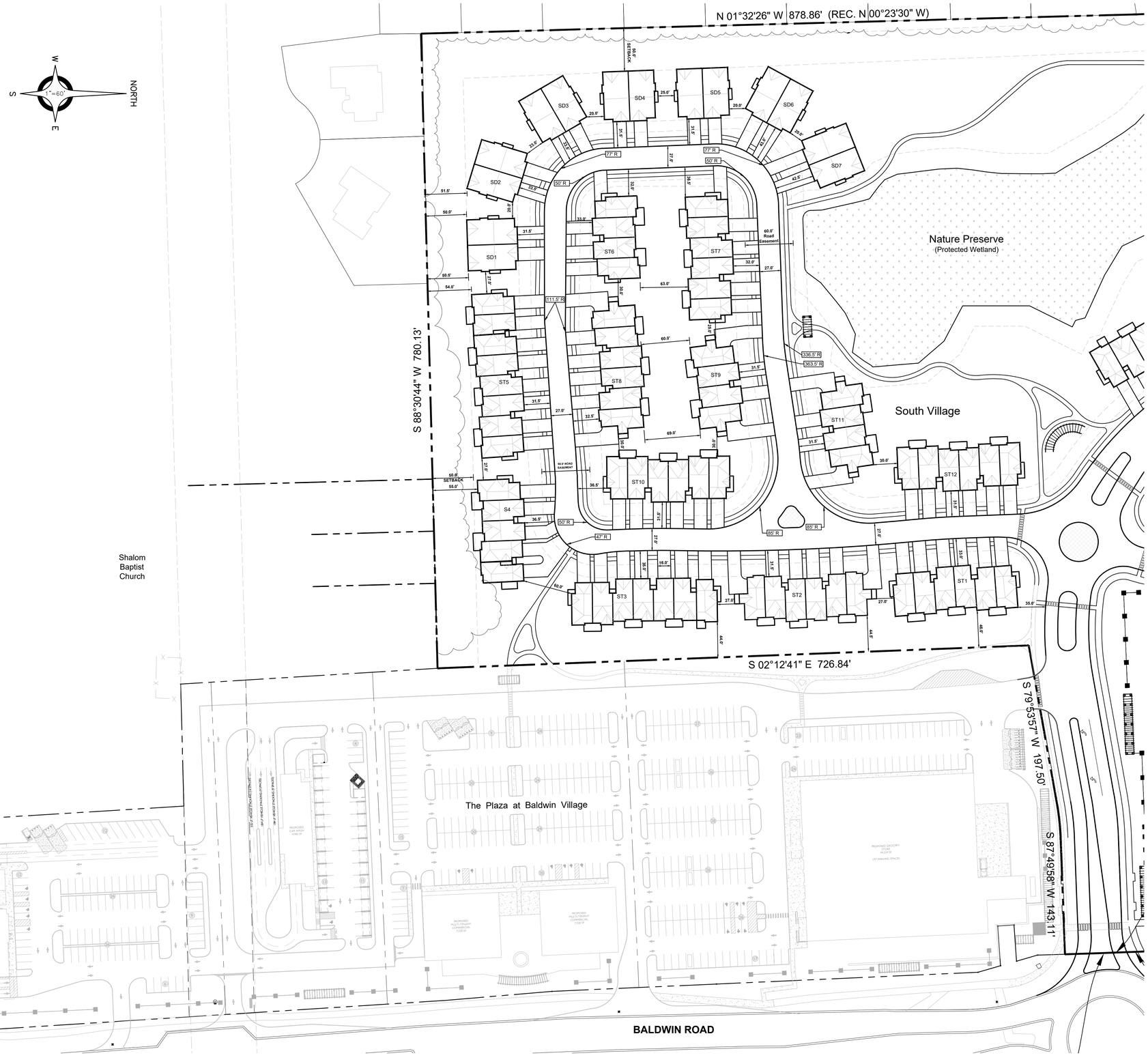

LOCATION MAP
NOT TO SCALE

South Village Summary

68	Townhouse Units
14	Duplex Units
82	Total Units

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ENGINEERING STRONG COMMUNITIES

744

DATE	SUBMITTALS/REVISIONS

PROJECT NAME:

BALDWIN VILLAGE
ORION TOWNSHIP, MI

SHEET TITLE:

SITE DIMENSION PLAN (SOUTH)
South Village

CLIENT:
JACOBSON MOCERI ORION, LLC

■ PRELIMINARY ☐ CONSTRUCTION ☐ RECORD

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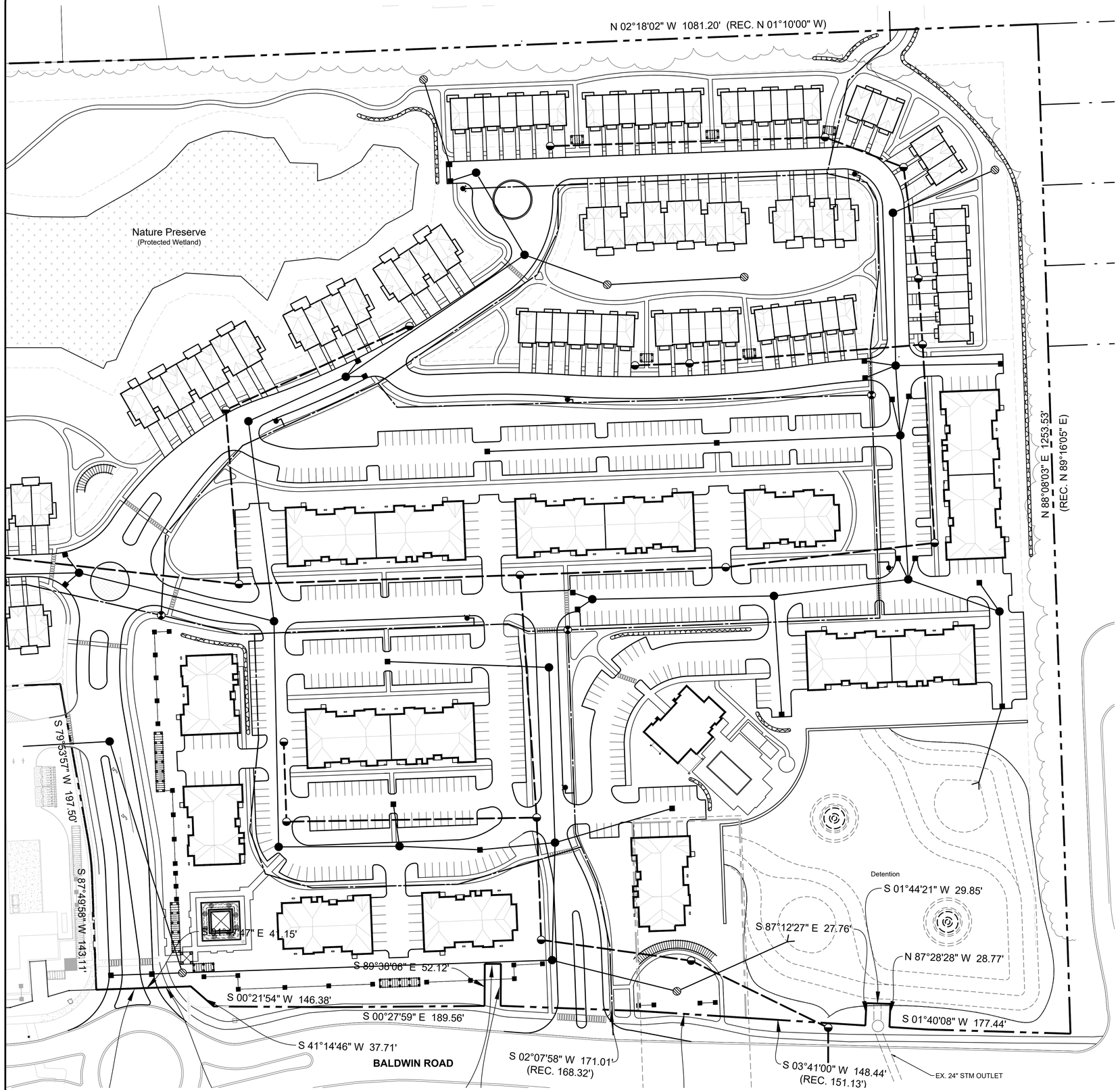

PRELIMINARY
OAKLAND COUNTY DETENTION CALCULATIONS
Baldwin Village - Residential and 8.6 Acres Commercial
30-Jun-22

Part A: Determination of Surface Runoff

Total Site Area	A_t	=	9544	ac
Runoff Coefficient	C	=	0.63	
Time of Concentration	t_c	=	37.00	min
Rainfall Return Period	p	=	100	years
Rainfall Depth	P_{100}	=	5.40	inch
Rainfall Intensity (Eq. II-7)	I	=	3.72	in/hr
Peak Runoff (Eq. II-1)	Q	=	160.23	cfs
Volume (Eq. II-2)	V	=	484,643	cf

Part C: Channel Protection Volume Control

Required CPVC Volume (Eq. II-9)	V_{CPV}	=	184,821	cf
Provided CPVC Volume	V_{PROV}	=		cf

Part D: Water Quality Control

Required Water Quality Volume (Sec. II-11)	V_{WQ}	=	126,786	cf
Option 1: Manufactured Treatment System (MTS)				
Water Quality Rate (Eq. II-19)	Q_{WQ}	=	47.22	cfs
Option 2: Swales				
Required Retention Volume (Eq. II-19)	V_r	=	126,786	cf

Part E: Channel Protection Rate Control: Extended Detention

Required Extended Detention Volume (Eq. II-21)	V_{ED}	=	210,693	cf
Head	h_{ED}	=	1.65	ft
Required No. of Hinch Holes (Eq. II-22)	H_{NO}	=	37	

Part F: Detention and Flood Control Facilities

25 Year Post Development Flow Rate (Eq. II-23)	Q_{25W}	=	130.33	cfs
Variable Release Rate (Eq. II-25)	Q_{VAR}	=	31.00	cfs/ac
25 Year Post Development Peak Discharge	Q_{PEAK}	=	0.24	cfs
Storage Curve Factor (Sec. II-26)	R	=	0.68	
25 Year Post Development Runoff Volume (Sec. II-27)	V_{25P}	=	659,949	cf
100-Year Detention Volume (Eq. II-28)	V_{DET}	=	**445,502**	**cf**

DETENTION POND

Elevation	Depth (ft)	Forebay Area (sf)	Volume (cf)	Σ Forebay Volume (cf)	Main Area (sf)	Total Area (sf)	Total Volume (cf)	Σ Total Volume (cf)
1015		27500			109,000	136,500		569,259
	1.00						132,394	
1014		24165			104,165	128,330		436,865
	1.00						124,225	
1013		20832			99,332	120,164		312,641
	1.00						101,277	
1012		17499		37,361	66,000	83,499		211,364
	1.00		15,803				79,126	
1011		14166		21,578	60,557	74,833		132,237
	1.00		12,462				70,455	
1010		10833		9,116	55,333	66,166		61,782
	1.00		9,116				61,787	
1009		7500			50,000	57,500		

LEGEND

- HYDRANT
- GATE VALVE & WELL
- 8" WATER MAIN
- SANITARY MANHOLE
- 8" SANITARY SEWER
- STORM MANHOLE
- STORM CATCH BASIN
- STORM SEWER

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745

DATE	SUBMITTALS/REVISIONS

PROJECT NAME:

BALDWIN VILLAGE
ORION TOWNSHIP, MI

SHEET TITLE:

PRELIMINARY UTILITY PLAN (NORTH)
North Village and Uptown Village

CLIENT:
JACOBSON MOCERI ORION, LLC

■ PRELIMINARY ☐ CONSTRUCTION ☐ RECORD

DRAWN BY:	CHECKED BY:	DATE:
DB	SVP	JUNE 2022

SCALE:
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0361-0067

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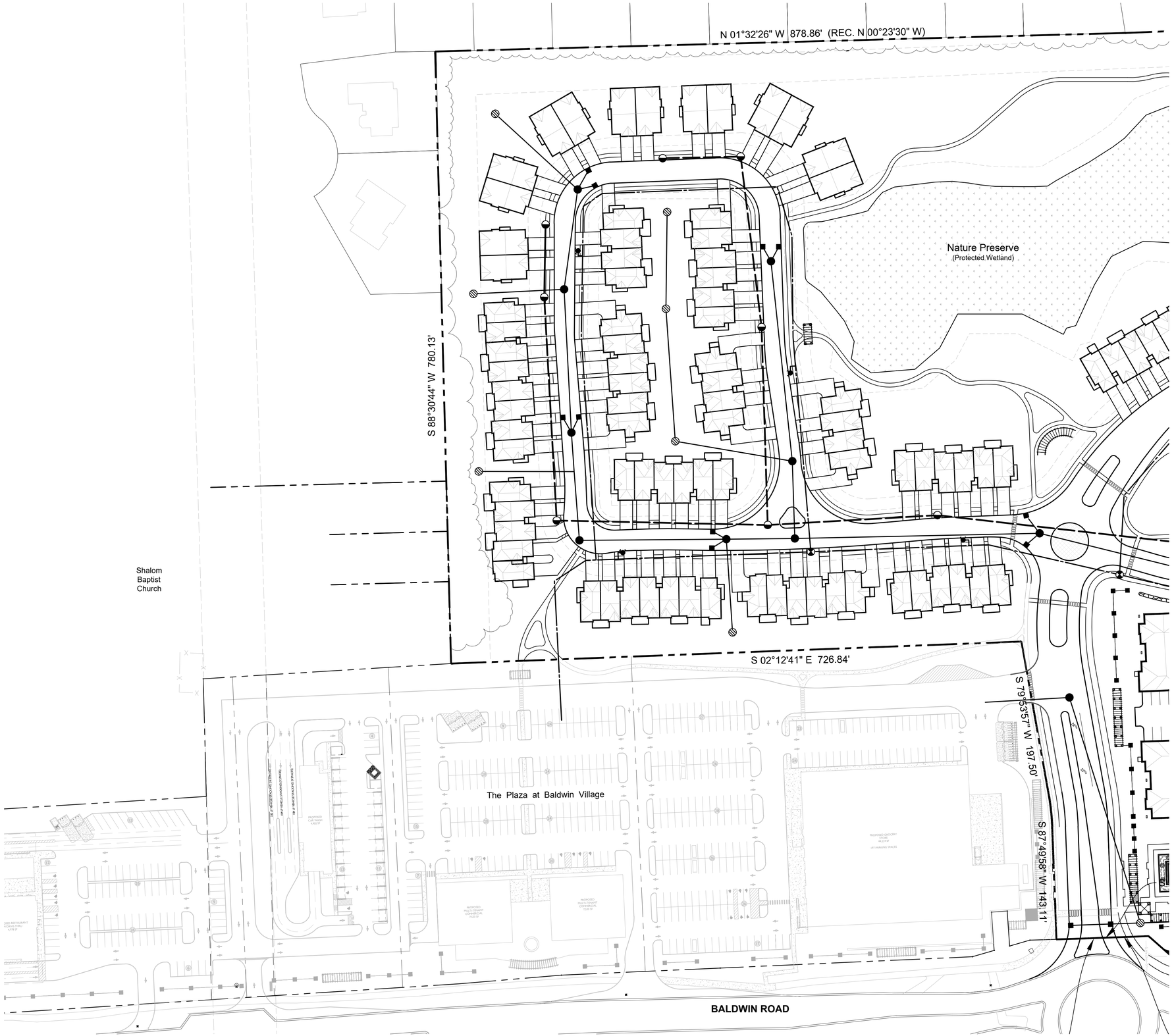

LEGEND

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ENGINEERING STRONG COMMUNITIES

746

DATE	SUBMITTALS/REVISIONS

PROJECT NAME:

BALDWIN VILLAGE
ORION TOWNSHIP, MI

SHEET TITLE:

PRELIMINARY UTILITY PLAN (SOUTH)

South Village

CLIENT:
JACOBSON MOCERI ORION, LLC

■ PRELIMINARY ☐ CONSTRUCTION ☐ RECORD

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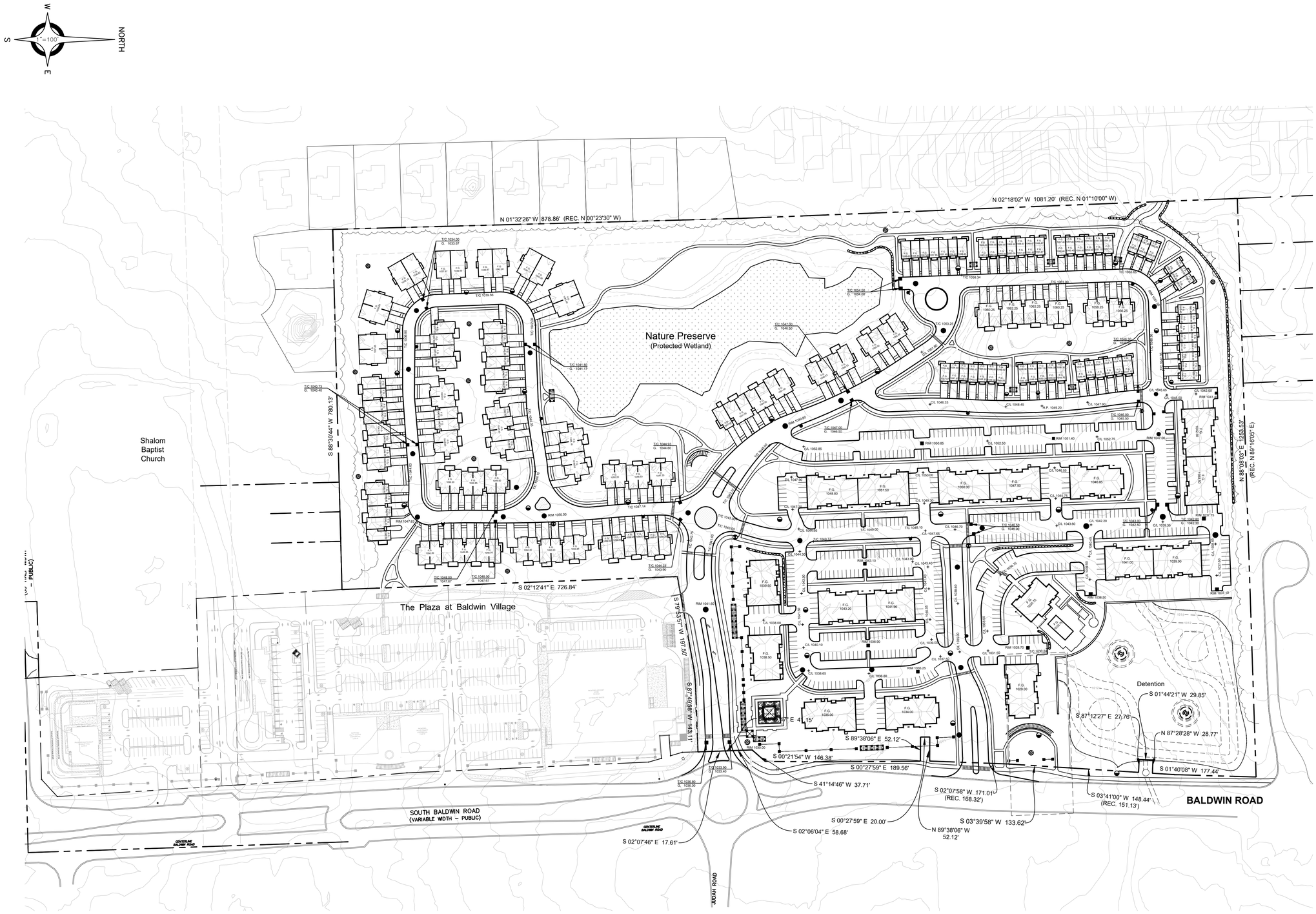

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747

DATE	SUBMITTALS/REVISIONS

PROJECT NAME:

BALDWIN VILLAGE
ORION TOWNSHIP, MI

SHEET TITLE:

PRELIMINARY GRADING PLAN

CLIENT:
JACOBSON MOCERI ORION, LLC

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PROJECT NO.
0361-0067

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SHEET NO.
C7

LEGEND

- BOUNDARY LINE
- CENTERLINE DITCH
- SPOT ELEVATION ("+" INDICATES ELEVATION LOCATION UNLESS OTHERWISE INDICATED)
- SIGN
- MAILBOX
- BUMPER BLOCK
- POWER POLE
- LIGHT POLE
- SANITARY MANHOLE
- SANITARY SEWER
- HYDRANT
- GATE VALVE & WELL
- VALVE BOX
- SHUT OFF VALVE
- WATER MAIN
- STORM CATCH BASIN (PAVT.)
- STORM CATCH BASIN (FIELD)
- STORM MANHOLE
- STORM SEWER
- GAS MAIN
- OVHD. UTIL.
- UTILITY MARKER

BENCH MARKS (NAVD88 DATUM)

BENCH MARK NO. 1
CHISELED "X" ON N.E. RIM OF MIDDLE ROAD BASIN @ S. SIDE GINGELL DR., S. SIDE CUL-DE-SAC
ELEVATION: 1038.49

BENCH MARK NO. 2
CHISELED "X" ON N.E. RIM OF ROAD BASIN ON THE S. SIDE OF GINGELL DR. 125'± W. OF BALDWIN RD.
ELEVATION: 1023.96

BENCH MARK NO. 3
TOP OF HYDRANT ON THE W. SIDE OF BALDWIN RD. 200'± S. OF GINGELL DR.
ELEVATION: 1019.76

BENCH MARK NO. 4
TOP OF HYDRANT ON W. SIDE OF BALDWIN RD., OPPOSITE #4303
ELEVATION: 1025.09

BENCH MARK NO. 5
TOP OF HYDRANT, W. SIDE BALDWIN, 100'± N. OF ℄ JUDAH EXTENDED
ELEVATION: 1034.41

BENCH MARK NO. 6
CHISELED "X" ON N. RIM MBT MH, 40'± W. OF B/CURB BALDWIN, 50'± N. OF ℄ JUDAH EXTENDED.
ELEVATION: 1034.15

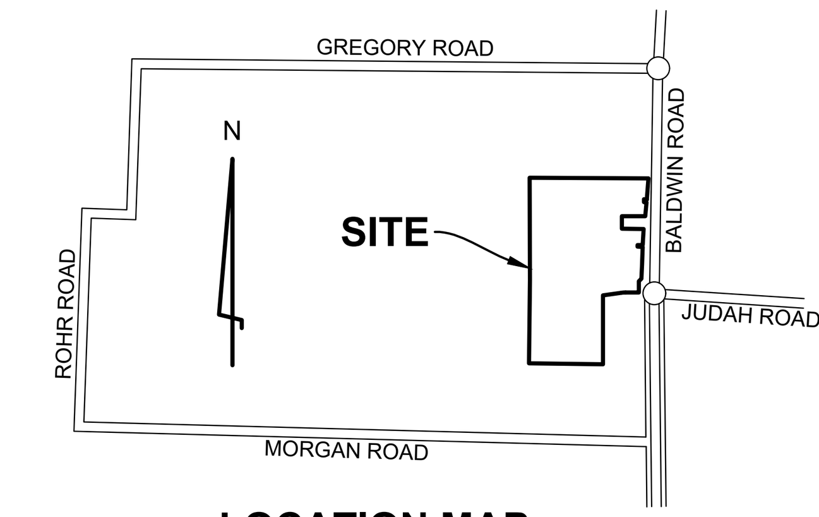
LEGAL DESCRIPTION

PROPOSED RESIDENTIAL PARCEL
PARCEL No. 09-32-151-020, PARCEL No. 09-32-151-021, AND PART OF PARCEL No. 09-32-301-001

PART OF THE WEST HALF OF SECTION 32, TOWN 4 NORTH, RANGE 10 EAST, ORION TOWNSHIP, OAKLAND COUNTY, MICHIGAN, BEING DESCRIBED AS:

BEGINNING AT THE WEST QUARTER CORNER OF SECTION 32; THENCE ALONG THE WEST LINE OF SECTION 32 THENCE NORTH 02 DEGREES 18 MINUTES 02 SECONDS WEST 1081.20 FEET; THENCE NORTH 88 DEGREES 08 MINUTES 03 SECONDS EAST 1253.53 FEET TO THE WEST RIGHT OF WAY LINE OF BALDWIN ROAD (WIDTH VARIES); THENCE ALONG THE WEST RIGHT OF WAY LINE OF BALDWIN ROAD THE FOLLOWING SIX (6) COURSES: SOUTH 01 DEGREES 40 MINUTES 08 SECONDS WEST 177.44 FEET, SOUTH 03 DEGREES 41 MINUTES 00 SECONDS WEST 47.35 FEET, NORTH 87 DEGREES 28 MINUTES 28 SECONDS WEST 28.77 FEET, SOUTH 01 DEGREES 44 MINUTES 21 SECONDS WEST 29.85 FEET, SOUTH 87 DEGREES 12 MINUTES 27 SECONDS EAST 27.76 FEET AND SOUTH 03 DEGREES 41 MINUTES 00 SECONDS WEST 148.44 FEET; THENCE SOUTH 03 DEGREES 39 MINUTES 58 SECONDS WEST 133.62 FEET, THENCE SOUTH 02 DEGREES 07 MINUTES 58 SECONDS WEST 171.01 FEET, NORTH 89 DEGREES 38 MINUTES 06 SECONDS WEST 52.12 FEET, SOUTH 00 DEGREES 27 MINUTES 59 SECONDS EAST 20.00 FEET, SOUTH 89 DEGREES 38 MINUTES 06 SECONDS EAST 52.12 FEET, SOUTH 00 DEGREES 27 MINUTES 59 SECONDS EAST 189.56 FEET, SOUTH 00 DEGREES 21 MINUTES 54 SECONDS WEST 146.38 FEET, SOUTH 41 DEGREES 14 MINUTES 46 SECONDS WEST 37.71 FEET, SOUTH 02 DEGREES 06 MINUTES 04 SECONDS EAST 58.68 FEET TO THE EAST AND WEST QUARTER LINE OF SECTION 32, SOUTH 02 DEGREES 07 MINUTES 46 SECONDS EAST 17.61 FEET AND SOUTH 01 DEGREES 47 MINUTES 47 SECONDS EAST 41.15 FEET; THENCE SOUTH 87 DEGREES 49 MINUTES 58 SECONDS WEST 143.11 FEET; THENCE WESTERLY ALONG A NON-TANGENT CURVE CONCAVE TO THE SOUTH HAVING A CENTRAL ANGLE OF 7 DEGREES 55 MINUTES 04 SECONDS, A RADIUS OF 306.00 FEET, AN ARC DISTANCE OF 42.29 FEET AND WHOSE CHORD IS SOUTH 83 DEGREES 51 MINUTES 29 SECONDS WEST 42.25 FEET; THENCE SOUTH 79 DEGREES 53 MINUTES 57 SECONDS WEST 197.50 FEET; THENCE SOUTH 02 DEGREES 12 MINUTES 41 SECONDS EAST 726.84 FEET; THENCE SOUTH 88 DEGREES 30 MINUTES 44 SECONDS WEST 780.13 FEET TO THE WEST LINE OF SECTION 32; THENCE ALONG THE WEST LINE OF SECTION 32 NORTH 01 DEGREES 32 MINUTES 26 SECONDS WEST 878.86 FEET TO THE WEST QUARTER CORNER OF SECTION 32 AND THE POINT OF BEGINNING. CONTAINING 46.83 ACRES, MORE OR LESS.

SUBJECT TO ANY AND ALL EASEMENTS AND RIGHTS OF WAY OF RECORD OR OTHERWISE.



LOCATION MAP

NOT TO SCALE

ANDERSON, ECKSTEIN AND WESTRICK, INC.
CIVIL ENGINEERS SURVEYORS ARCHITECTS
51301 Schoenherr Road
Shelby Township
Michigan 48315
Phone 586 726 1234
Fax 586 726 8780
www.aewinc.com
ENGINEERING STRONG COMMUNITIES

DATE	SUBMITTALS/REVISIONS

PROJECT NAME:

BALDWIN VILLAGE

SHEET TITLE:

TOPOGRAPHIC SURVEY

CLIENT:

ORION TOWNSHIP

☐ PRELIMINARY (checked) ☐ CONSTRUCTION ☐ RECORD

DRAWN BY:	CHECKED BY:	DATE:
KMD	X	JUNE 2022

SCALE: 1" = 80' (0 40 80 160)

811 Know what's below. Call 72 hours before you dig.

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PROJECT NO.

0361-0067

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SHEET NO.

C8

Parallel Plan Data Comparison :

PARCEL SIZE :

58.70 Net Acres
00.84 RCOC Parcel Net
59.54 Total Net Acres

6.30 BIZ District Zoning
53.24 Gingellville Village Center Overlay District Zoning

UNDERLYING ZONING DISTRICTS :

Gingellville Village Center Overlay District
Zoning Area : 53.24 acres

10.65 acres Open Space (20%)
2.60 acres Preserved Wetland
2.65 acres Detention Basin
33.60 acres Residential Area
3.74 acres Commercial Area

Gingellville Village Center Overlay District
Residential Density Calculation :

20 units per acre Permitted Residential Density
33.60 acres x 20 units per ac = 672 permitted units

Gingellville Village Center Overlay District
Commercial Area :

3.74 acres 115,000 SF Commercial / Retail / Hotel

Brown Road Industrial Zone (BIZ) District
Zoning Area : 6.30 acres

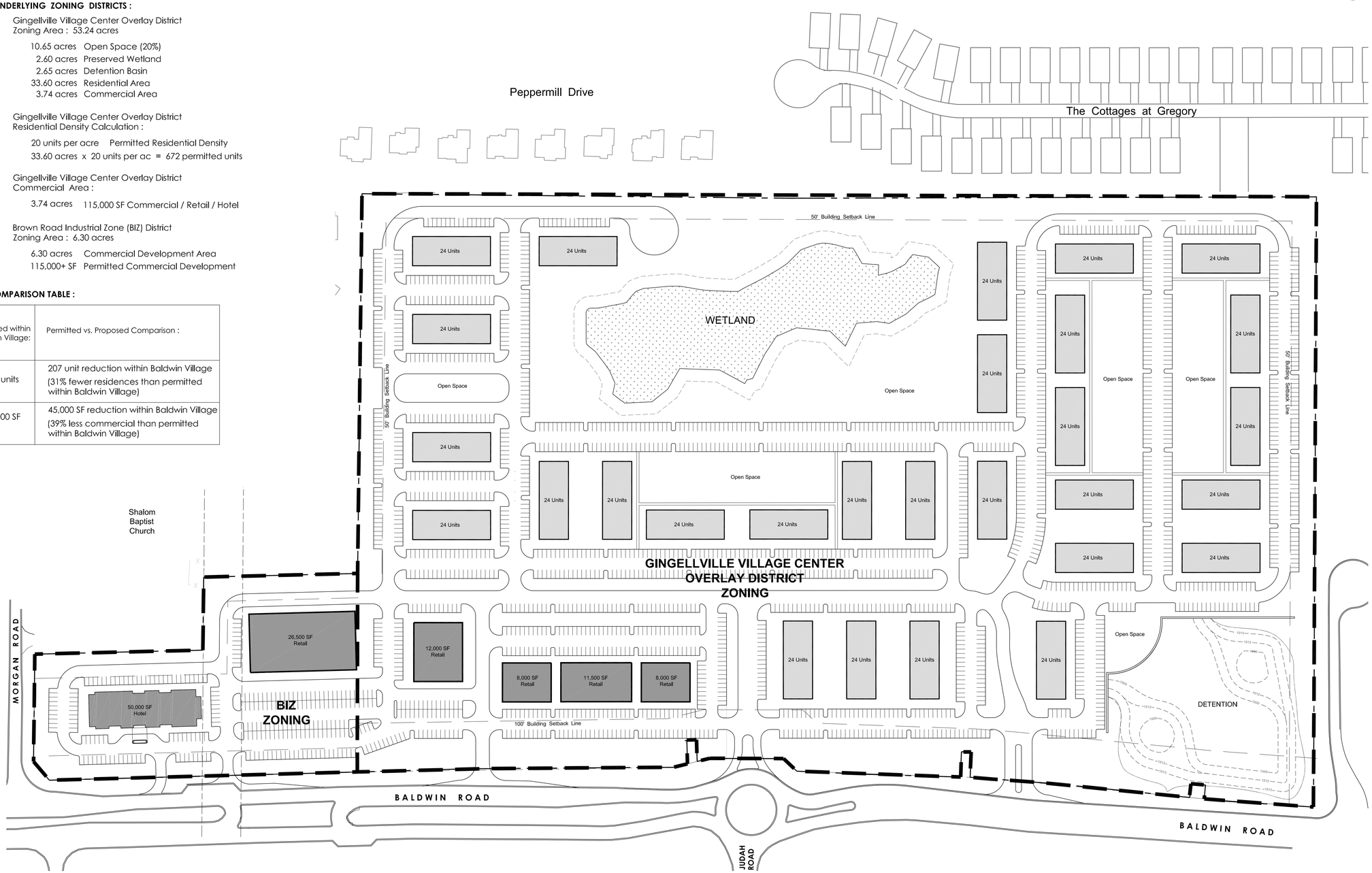
6.30 acres Commercial Development Area
115,000+ SF Permitted Commercial Development

PARALLEL PLAN vs. BALDWIN VILLAGE COMPARISON TABLE :

Land Use:	Permitted under Existing Gingellville & BIZ District Zoning:	Proposed within Baldwin Village:	Permitted vs. Proposed Comparison :
Residential:	672 units	465 units	207 unit reduction within Baldwin Village (31% fewer residences than permitted within Baldwin Village)
Commercial:	115,000 SF	70,000 SF	45,000 SF reduction within Baldwin Village (39% less commercial than permitted within Baldwin Village)

Underlying Zoning District - Parallel Plan:

SCALE: 1" = 100'



STATE OF MICHIGAN
REGISTERED LANDSCAPE ARCHITECT
JAMES T. EPPINK
LANDSCAPE ARCHITECT
No. 1309

J EPPINK PARTNERS, INC.
Urban Design Studio
Landscape Architecture
Traditional Town Planning
9336 Sashabaw Road
Clarkston, Michigan 48348
248.922.0789

Project:
Baldwin Village
Orion Township, Mi.

Applicant / Developer:
RED Equities, LLC
121 W. Long Lake, Suite 200
Bloomfield Hills, MI 48304

Development Team:

Residential:
Moceri Companies

Residential:
S.R. Jacobson
Development Company

Commercial:
ALRIG USA

Sheet:
Parallel Site Plan

Issues / Revisions
Conceptual PUD Submittal 07-06-22

Drawn by:

Checked By
JTE

Date
July 20, 2022

Scale
As Shown

Not for Construction

Sheet
PP-1

July 6, 2022

Baldwin Village Conceptual PUD Application

"Oakland County's Best New Neighborhood"

ALRIG USA

MOCERI
Michigan's Legendary Dream Builder

S.R. JACOBSON
DEVELOPMENT CORPORATION

SILVERMAN
A RED EQUITIES DEVELOPMENT

Baldwin Village

RED Equities, LLC

Moceri Companies

S.R. Jacobson

ALRIG USA

Baldwin Village

Project Narrative

We are pleased to submit the attached Baldwin Village site plan and PUD application.

Baldwin Village proposes a mixed-use neighborhood comprised of open space, natural features, residential villages, and exciting retail and restaurants all within a beautiful, walkable community.

Baldwin Village delivers on the vision of the Orion Township Master Plan and the objectives of the Gingellville Village Center Overlay Distrcit by establishing an interconnected neighborhood with varied housing choices, connections to adjacent neighborhoods, best in class retail and restaurant uses, and the preservation of environmental features and wooded buffers on the site.

Recognizing that the Baldwin Village site sits within the Gingellville Village Center Overlay Distrcit, we've carefully reviewed and incorporated the principles and standards of the district to ensure that Baldwin Village is not only the most successful mixed-use neighborhood in the region, but that it also meets and exceeds the development objectives of Orion Township.

Big Picture:

- The recently improved Baldwin Road and its access points support the traffic and circulation patterns needed for a well located 15-minute neighborhood
- The site plan proposes a moderate density of fewer than ten residences per acre within the residential component. This of course is well below the twenty units per acre density permitted in the Gingellville Village Center Overlay District ordinance
- The proposed open space (nearly 20%) far exceeds the required 15%

Attention to Detail:

- The planned commercial uses are appropriately sized and located within the mixed-use PUD and serve as a transition between the more intense commercial at Brown Road and the neighborhood commercial to the north
- We have included a copy of the Gingellville Village Center Overlay Distrcit Ordinance on the following pages and have added our comments highlighting our team's commitment and the project's ability to meet and exceed the objectives and vision of the ordinance.

We believe you will find that everything within the Baldwin Village site plan incorporates the objectives of the Overlay Distrcit, the goals of Orion Township, and will provide a vibrant, best-in-class community.

Within this booklet you'll find renderings which bring the site plan, architecture, iconic grand entrance, and neighborhood features to life. We hope these help you to envision the quality, beauty, and excitement that you'll experience when living in, shopping & eating at, or visiting Baldwin Village.

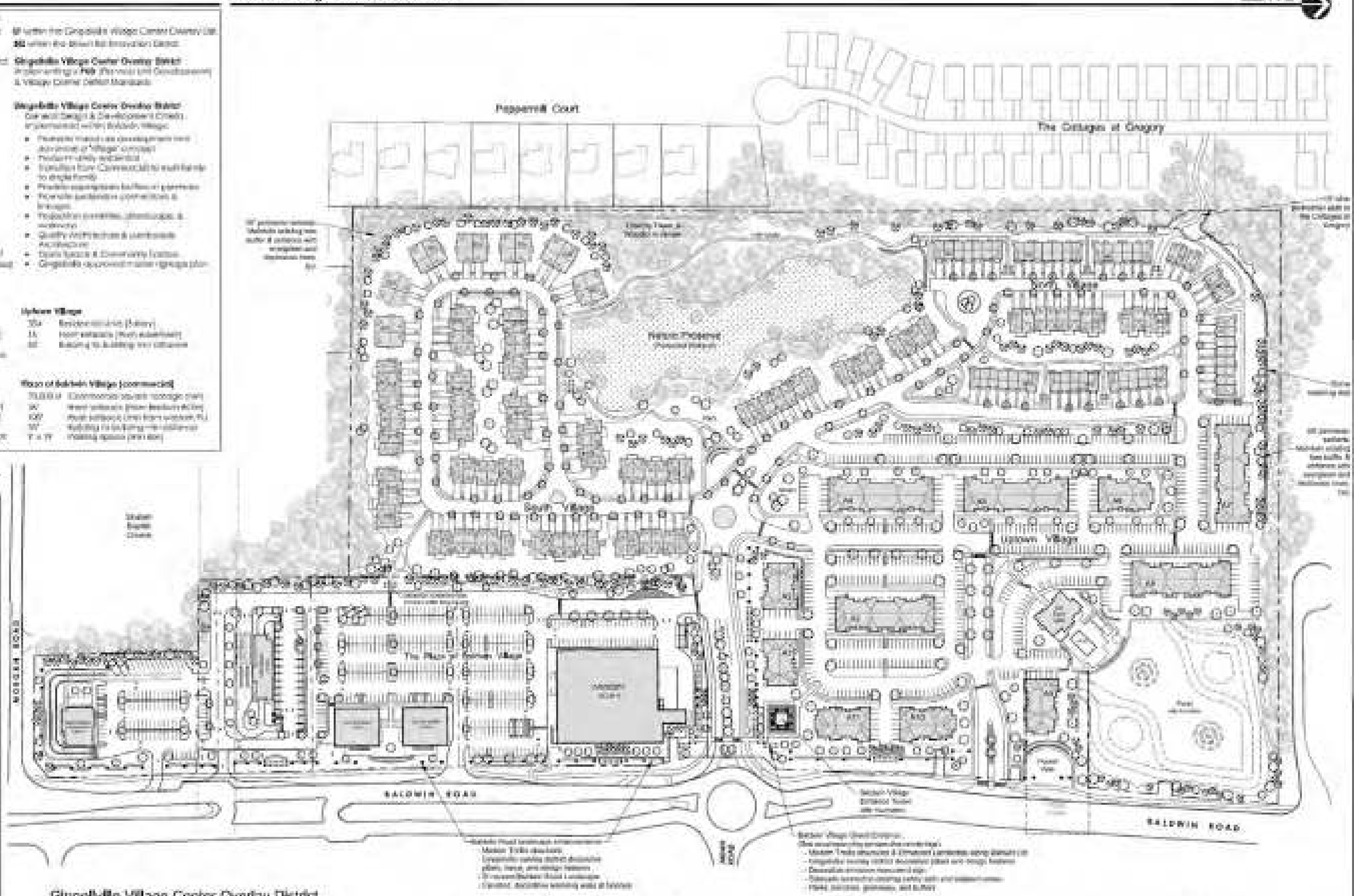
We are tremendously proud of Baldwin Village, its programming, plans, and amenities. We appreciate everyone's involvement to date, and we look forward to continued collaboration to complete this exciting, 15-minute mixed-use PUD.

Very truly yours – Baldwin Village,

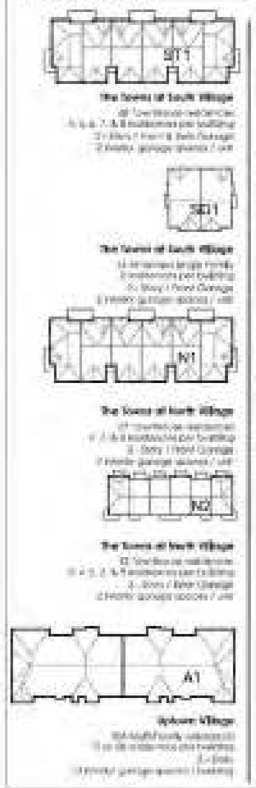
Gilbert "Buzz" Silverman	Dominic Moceri	Scott Jacobson	Gabe Schuchman
RED Equities, LLC	Moceri Companies	S.R. Jacobson	ALRIG USA

Project Data:

Baldwin Village - Master Site Plan:



Building Legend:



Gingellville Village Center Overlay District & Brown Road Innovation Zone (BIZ)

Overlay District Parallel Plan & Design Standards:

Deviation Table:

Baldwin Village Features:

Baldwin Village

Orion Township, MI

RED Equities, LLC

Moceri Companies

S.R. Jacobson

ALRIG USA

Master Site Plan

MP-1

Baldwin Village

"Oakland County's best new Neighborhood"

SILVERMAN
A RED EQUITIES DEVELOPMENT

MOCERI

S.R. JACOBSON

ALRIG USA

J EPPINK PARTNERS, INC
Urban Design Studio

STONEFIELD

DAG

Baldwin Village

Project Data

PARCEL SIZE :

53.30	Gross Acres
58.70	Net Acres
55.84	ROCAC Parcel Net
52.54	Total Net Acres
47.67	Net Residential Acres
4.87	Net Commercial Acres

Open Space : 20%
Preservation of Wetland
Establishment of perimeter buffer

Residential Density :
466 Proposed Residences
9.76 Residences / acre

Residential Roads (private):
Road Easement 60'
Road Width 28' (back of curb)

Perimeter Setbacks:
50' min. North, South, West (residential)
30' min. Baldwin Rd. frontage (residential)
35' min. Baldwin Rd. frontage (commercial)

Zoning :

Current: SF within the Gingellville Village Center Overlay Dist.
BIZ within the Brown Rd Innovation District

Proposed: **Gingellville Village Center Overlay District**
implementing a PUD (Planned Unit Development)
& Village Center District Standards

Gingellville Village Center Overlay District
General Design & Development Criteria
implemented within Baldwin Village.

- Promote mixed use development that advances a "Village" concept
- Predominately residential
- Transition from Commercial to multi family to single family
- Provide appropriate buffers at perimeter
- Promote pedestrian connections & linkages
- Address amenities, streetscape, & walkways
- Quality Architecture & Landscape Architecture
- Open Spaces & Community Spaces
- Gingellville approved master signage plan

Item:	Ordinance Objective:	Baldwin Village - Proposed:
Open Space	15% / 10%	20% overall
Gingellville permitted Density	20 DU / acre 20 x 47.67 = 953 permitted	9.76 residences proposed 9.76 x 47.67 = 465 proposed
Residential Type	Attached Single Family Attached Multi Family Detached Single Family	Attached Single Family Attached Multi Family
Commercial Uses Permitted within BIZ District	Restaurant (w/ or w/o thru) Retail Restaurant Car Wash	Restaurant (w/ or w/o thru) Retail Restaurant Car Wash

Residential Components:

North Village Townhomes

79	Townhomes (2 story)
10'	front setback (from easement)
30'	Rear setback (minimum)
20'	Building to building min distance

Uptown Village

204	Residential Units (3 story)
15'	front setback (from easement)
40'	Building to building min distance

South Village Townhomes

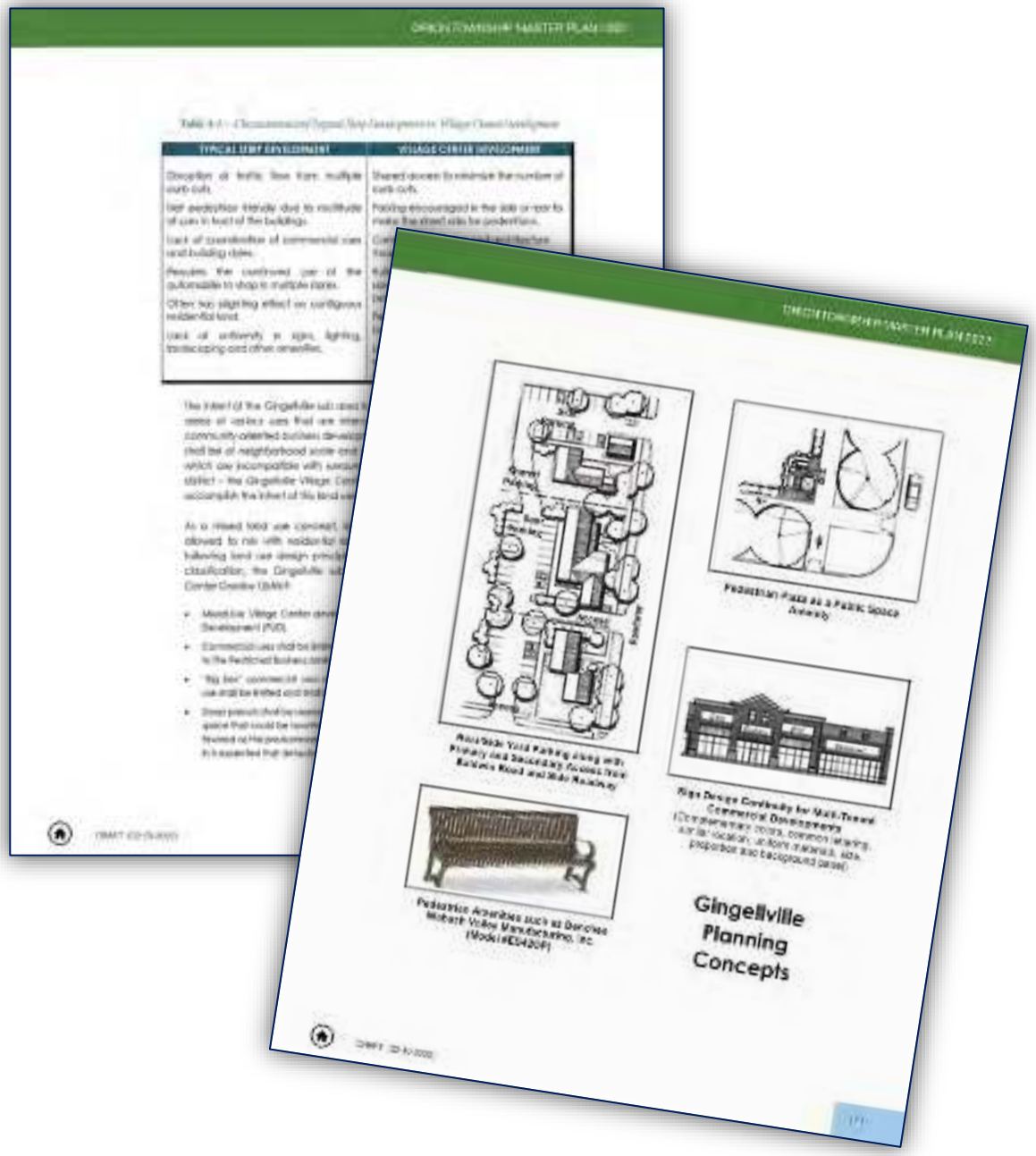
68	Townhomes (2 story)
14	Attached Single Family (2-story)
15'	front setback (from easement)
30'	Rear setback (minimum)
20'	Building to building min distance

Plaza at Baldwin Village (commercial)

20,000 s.f.	Commercial square footage (net)
25'	front setback (from Baldwin ROW)
100'	Rear setback (min. from western PL)
60'	Building to building min distance
9' x 19'	Parking space (min size)

Baldwin Village

Gingellville Overlay District



Baldwin Village is located within the **Gingellville Village Center Overlay District** and the **Brown Road Innovation Zone** (BIZ). The Orion Township Master Plan calls for this area to be developed to create a 'village-like" atmosphere with various uses that are interconnected, pedestrian friendly, and blend community-oriented business with residential uses. It further defines the 'fifteen minute' neighborhood and directs that the Gingellville Village Overlay District and Brown Road Innovation Zone standards outlined in the Township's Zoning Ordinance be used in the design and development of this area.

Baldwin Village creates a mixed-use, interconnected, 15-minute neighborhood that provides 20% open space, landscaped parks, buffers, and natural preservation areas, along with three residential villages and a community targeted commercial village, all with harmonious, high-caliper architecture, site design amenities, and an iconic entry experience and landscape at the gateway to Orion Township.

The Gingellville Village Center Overlay District and the Brown Road Innovation Zone provide standards that supersede underlying zoning. The Baldwin Village development plan meets or exceeds the standards and objectives of the Overlay districts, and the proposed density of Baldwin Village is less than half of the density permitted within the Gingellville Overlay District.

Township Zoning Ordinance: Section 33.03:

Baldwin Village meets the intent and objectives of the Gingellville and BIZ Overlay districts' land uses, design, and dimensional standards. Section 33.03 of the Gingellville Overlay District further grants the Planning Commission the authority to waive or modify the standards in order to achieve the complexity of a master planned, mixed use community such as Baldwin Village.

The following pages contain the Gingellville Village Center Overlay Distrcit section found within the Orion Township Zoning Ordinance. We have annotated the Overlay Ordinance to highlight Baldwin Village's compliance with the intent, objectives, design, uses, and vision of the Gingellville District.

Section 33.00 – Preamble

Baldwin Village
Commitment & Comments

The Gingellville Village Center Overlay District encompasses the area as illustrated on the Charter Township of Orion Zoning Map. The purpose of the Gingellville Village Center Overlay District shall be to promote the development of the area in accordance with the Gingellville Village Planning and Design Guidelines in such a manner that will: maintain, preserve and enhance historic resources; allow for a mixed use concept of new development that advances the creation of a "Village"; arrive at a residential pattern which addresses both style and architecture appropriate for the area; and, develop a vehicular and pedestrian circulation pattern appropriate for a "Village" while recognizing current community and lifestyle issues.

Section 33.01 – Principal Uses Permitted

All uses within the Gingellville Village Center Overlay District shall be restricted to those listed as either permitted principal uses and/or special uses in the underlying zoning district or those uses listed as approved as a separate Planned Unit Development.

A. Unless otherwise zoned, commercial uses shall be limited to low intensity retail, office or professional uses similar to the Restricted Business zoning district (RB).

Approximately half of the Baldwin Village (BV) retail plaza is currently zoned BIZ to which additional acreage has been added for a total of 12.5 acres of commercial use. Only 7 additional acres were added to the retail out of the 50 acres. In total, 4 parcels have been assembled to form the entire BV development. None of the assembled parcels are greater than 20-acres.

B. Unless otherwise zoned, "Big Box" or intensive commercial uses shall be restricted. Maximum floor area for commercial use shall be limited and shall be consistent with the Village character (generally not greater than thirteen thousand (13,000) square feet per tenant). *(amended 06.28.11)*

The BV grocery market will be a deviation from this standard which we believe will be widely supported by the Planning Commission, Trustees, and stakeholders. This grocery is the key component to develop the 15-minute mixed-use luxury residential neighborhood PUD.

C. Unless otherwise zoned, commercial or office uses shall not extend more than five hundred thirty-five (535) feet beyond the future right-of-way of Baldwin Road. Parcel areas deeper than five hundred thirty-five (535) feet shall be reserved for residential uses. *(amended 06.28.11)* Baldwin Village complies

D. Unless otherwise zoned, multi-family, attached housing shall not extend more than one thousand (1,000) feet east or west of the future right-of-way of Baldwin Road. *(amended 06.28.11)* Baldwin Village complies

E. Mixed-Use PUD projects within the Village Center are intended to be predominately residential. Not more than fifty percent (50%) of the total floor area for a mixed PUD project shall be non-residential. However, the Township Board and Planning Commission may consider deviations from the fifty percent (50%) maximum non-residential floor area if it is determined that the project will not create excessive traffic impacts, is consistent with high quality design standards and will not adversely impact surrounding residential areas. *(amended 06.28.11)*

Baldwin Village complies - nearly 50% of the toal land area is dedicated to residential uses.

F. The Schedule of Regulations for the underlying zoning district shall be applied for density, height, setback, lot size, lot width, lot coverage, floor area, etc. When a proposed use otherwise permitted in the overlay is not listed as a permitted use in the underlying district, the Planning Commission shall use the standards in the district which most closely corresponds to the permitted use(s), and these may be modified by the Planning Commission if necessary to meet the spirit and intent of the overlay district. *(added 06.13.20)* Agreed

G. Commercial buildings shall not contain a continuous building frontage of more than two hundred fifty (250) feet without a break or separation of building. Agreed

H. For large scale mixed use projects over forty (40) acres in size, at least sixty percent (60%) of the development acreage shall be reserved for single family detached residential uses. Housing for senior citizens shall be excluded from this restriction.

This is an assembly of multiple parcels, all less than 40-acres in size. Alternatively we could split into several phased PUDs at the Twp's request.

I. Mixed use developments including residential and commercial uses are encouraged as part of a PUD. Single family residences are favored as the predominate land use in the mixed use developments and may be interspersed with a mixture of multi-family/attached housing or local business uses.

Baldwin Village is programed to be the iconic neighborhood Orion Township Mixed-Use PUD. Current market conditions and demand were carefully studied during our residential analysis to meet today's customer profile. The resulting 15-minute neighborhood made up of best-in-class village retail, luxury multi-family residential mix.

Section 33.02 – Design Standards

In addition to complying with the design standards set forth in this section, all proposed development and construction within the Village Center shall comply with the "Gingellville Village Design Plan and Guidelines" which shall be adopted by resolution of the Charter Township of Orion Board of Trustees, upon recommendation of the Orion Township Planning Commission. General Design Standards are listed as follows:

We will continue to work collaboratively with Orion Township Planners, Staff, Planning Commission, Board of Trustees, and stakeholders and are committed to providing a best in class neighborhood that includes superior architecture, planning, landscape, design, and planning.

A. General Standards.

1. Land uses shown as single family, to lower density residential uses including single family detached units to the east and west of Baldwin Road, with appropriate buffers and screening on the perimeter.

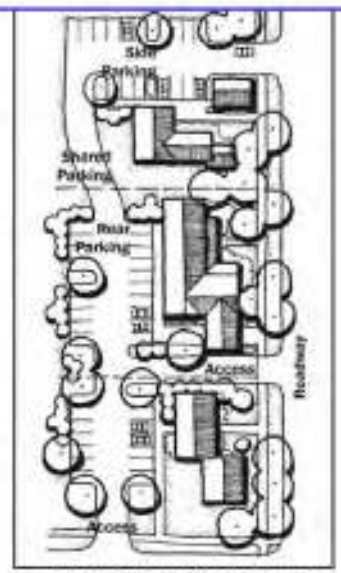
2. The Village Center developments shall promote pedestrian connection and linkage.

3. Secondary access shall be required by either parallel access roads or perpendicular access from Baldwin Road.

4. Rear yard parking or at least a significant portion of rear yard and side yard parking shall be required.

5. Pedestrian amenities such as streetscape, street furniture, benches, lighting, pavers and extensive landscaping shall be required and shall meet the standards as listed in the Gingellville Village Design Plan and Guidelines or approved equivalent as determined by the Building Department.

6. All projects shall demonstrate quality architecture and landscaping consistent with the Gingellville Village Design Plan and Guidelines.



Rear/Side Yard Parking along with Primary and Secondary Access from Baldwin Road and Side Roadway

B. Open Space and Community Design Feature.

Will meet or exceed the standard. Currently BV provides greater than 20% Open Space

1. Residential Uses. An active or passive recreation/open space plan shall be submitted to Planning Commission for consideration. The plan shall demonstrate that at least fifteen percent (15%) of the gross land area is maintained for recreation/open space amenities which accurately reflect the intended demographics of the development.

Required open space may be fulfilled in other parcels or non-contiguous areas of the overlay district subject to approval of the Planning Commission and other restrictions which will guarantee permanent open space.

Will meet or exceed the standard

3. All Non-Residential Uses. Each non-residential establishment shall contribute to the establishment or enhancement of community and public spaces by providing at least two (2) of the following: patio/seating area, pedestrian plaza with benches, window shopping walkway, outdoor playground area, outdoor sculpture, Kiosk area, water feature, clock tower or other such deliberately shaped area and/or a focal feature or amenity that, in the sole discretion of the Township, is determined to adequately enhance such community and public spaces. All

Will meet or exceed the standard. BV will provide community gathering areas, outdoor plazas, architectural site amenities, and a robust landscape

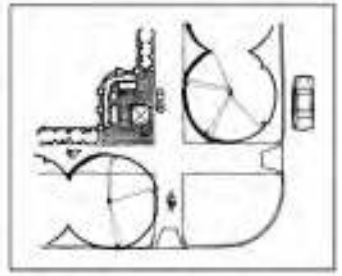
Pedestrian Amenities such as Benches Wabash Valley Manufacturing, Inc. (Model #E842OP)

non-residential PUD's shall provide at least ten percent (10%) open space as required in Section 30.03.

In addition to the many attributes of the 'Best new neighborhood in Oakland County', BV anticipates it will contribute to the Two safety path and/or park funds

4. Money in Lieu of Construction. In lieu of establishment of public space amenities, such as pedestrian plazas, window shopping walkways, outdoor play area, outdoor sculpture, kiosks, water features, clock tower, etc., the Township Planning Commission and/or Township Board may accept a sum of money equivalent to the actual cost of construction for the public space amenities. Money in lieu of construction shall only be allowed for sites where there are practical difficulties, spatial limitations or other factors which prevent on-site construction of public amenities. The amount shall be placed in escrow or other named accounts as established by the Township Board for ongoing or future construction of public space amenities within the Gingellville Village Center Overlay District.

Compliance with Gingellville Village Design Plan and Guidelines. Money in lieu of construction for public space amenities shall be directed to projects in accordance with the Gingellville Village Design Plan and Guidelines. Funds shall be designated for projects approved by the Planning Commission and Township Board which implement components of the Concept Plan for the Village of Gingellville (see Map 3 at end of Article) or other public space amenities within the Gingellville Village Center Overlay District.



Pedestrian Plaza as a Public Space Amenity

Will meet or exceed. BV is an interconnected 15-minute neighborhood which provide multiple vehicular and pedestrian options, all meeting circulation and safety standards

Site Access, Parking and Loading. Site access, parking and loading shall be controlled in the interest of public safety. Each building or group of buildings and its parking or service area shall be subject to the following restrictions:

1. Provisions for circulation between developments on adjacent parcels shall be required through joint drives and cross-access connections.

2. Driveway placement must be such that loading and unloading activities will not hinder vehicle ingress or egress. All loading areas for non-residential uses shall be located within rear yard or side yard areas, and/or screened.

3. Access management standards shall be in accordance with Section 27.14.

Will meet or exceed. Sidewalks, paths, and waking trails are provided throughout and with exterior connections

D. Pedestrian Pathways and Sidewalks. Vehicular access and circulation shall be planned to ensure safe pedestrian movement within the development. Pedestrian systems shall provide safe, all-weather, efficient, and aesthetically pleasing means of on-site movement and shall be an integral part of the overall site design concept. Pedestrian pathway connections to parking areas, buildings, other amenities and between on-site and perimeter pedestrian systems and safety paths shall be planned and installed wherever feasible.

Will meet or exceed standards

E. Signage. All signs permitted within the Gingellville Village Center Overlay District shall be subject to the provisions of Ordinance No. 153 unless a stricter provision is provided below. In addition to the overall intent of this section, the intent of this subsection is to ensure that signs within the Gingellville Village Center Overlay District shall be uniform in size, design, appearance and material. Accordingly, all signs within the Gingellville Village Center Overlay District shall be subject to the following requirements and standards *(amended 02.21.06)*:

1. All signs shall be designed so as to be integral and compatible with the architecture and landscaping component of the development.

Sign Design Continuity for Multi-Tenant Commercial Developments
(Complementary colors, common lettering, similar location, uniform materials, size, proportion and background panel)

Will meet or exceed standards

2. Multi-tenant commercial developments shall have signs that share common design elements. This may be accomplished through design continuity of the following:

- uniform color or a harmonious range of complementary colors for all signage
- common lettering and/or graphic style
- similar location of sign on the building frontage
- uniform construction materials
- uniform size and proportion
- uniform background panel

Will meet or exceed standards

3. Multi-tenant developments shall require submittal of a Common or Master Signage Plan which illustrates the above listed design elements. The Common or Master Signage Plan shall be submitted in conjunction with Ordinance No. 153 Procedures and Requirements and shall include building sections / elevations as well as the location, size, scale and materials of all proposed signs. *(amended 02.21.06)*

Will meet or exceed standards

4. Shielded external illumination is encouraged to reduce glare. No portion of the sign shall have a luminance greater than fifteen (15) foot candles measured at four (4) feet perpendicular to any surface.

Pedestrian Lighting Detail
Antique Street Lamps Mfg. Inc.
(Model # DS7K)

Will meet or exceed standards

5. It is recommended that signs with internal illumination provide a dark background with lighter colored lettering or logo. An internally lit sign with white background will generally exceed the maximum allowable luminance.

Will meet or exceed standards

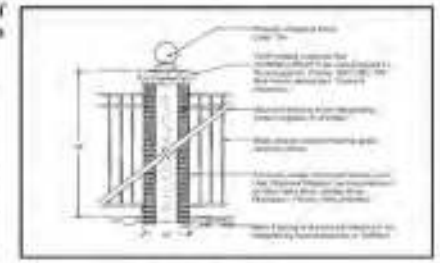
6. The light from illuminated signs shall be shielded at its source in a manner that will not shine light on adjacent properties or onto public streets or sidewalks.

Will meet or exceed standards

F. Lighting. All lighting shall conform to the requirements of Section 27.11, in order to maintain vehicle and pedestrian safety, site security, and accentuate architectural details.

1. All street and parking lot lighting shall be installed in accordance with the Gingellville Village Design Plan and Guidelines or approved equivalents.

2. Pedestrian lighting shall be provided for pedestrian walkways, building entries and other areas where illumination is needed to permit safe pedestrian travel.



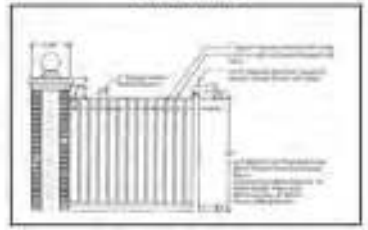
Parking Lot Screening
Pillar Detail

Will meet or exceed standards

G. Landscaping / Greenbelts / Buffers / Screening Elements. All landscape features of the site shall conform to the requirements detailed in the Charter Township of Orion Zoning Ordinance and the Gingellville Village Design Plan and Guidelines, in order to ensure that the image of the Village is promoted by the organization, unification and character of the district.

Will meet or exceed standards

1. Parking Lot Screening Along Baldwin Road. The screening of parking lots along Baldwin Road shall conform with the Gingellville Village Design Plan and Guidelines and the pillar and fence details provided herein. The plantings to occur along the screening fence will also be in accordance with the Gingellville Village Design Plan and Guidelines (consisting of perennials and compact shrubs along the fence).



Parking Lot Screening
Fence Detail

H. Architecture.

Will meet or exceed standards

1. An individual building shall not exceed five thousand (5,000) square feet per tenant. Existing buildings or new buildings within the GB District shall be excluded from this requirement. General architectural standards are listed as follows:

   a. All buildings shall have a roof pitch of no less than four (4) feet of rise (vertical) over twelve (12) feet of run (horizontal).

   b. The exterior of the building shall appear to have an abundance of individual uses through the inclusion of windows and varying architectural treatments, while the interior may consist of one individual use. Large expanses of blank walls are to be avoided.

   c. Architectural interest shall be provided through the use of repetitious patterns of color, texture and material modules, at least one of which shall repeat horizontally. Each module should repeat at intervals of no more than fifty (50) feet.

   d. Building facades greater than one hundred (100) feet in length shall incorporate recesses, projections and or windows along at least twenty percent (20%) of the length of the facade. Varying roof lines, projections/recesses etc. are encouraged to enhance "Village" characteristics. Windows, awnings, and arcades must total at least sixty percent (60%) of a facade length abutting a public street.

   e. Primary building entrances shall be clearly defined and recessed, or framed by a sheltering element such as an awning, arcade or portico in order to provide shelter from the summer sun and winter weather.

I. Building Materials.

Will meet or exceed standards

1. Materials shall blend with those existing on adjacent properties.

2. One dominant material shall be selected, with a preference towards masonry and stone.

J. Residential Appearance, Building Height and Density. *(amended 08.15.20)*

BV will provide a high-quality, high-design architecture that will have unifying styling, design, layout, and materials. Full architectural plans will submitted at the appropriate point for review

Lots having sufficient width shall require side entrance garages.

Front facing garages shall extend no more than six (6) feet past front living area.

Front porches are required for all single family residences. Porches shall be a minimum size of eight (8) feet in width and six (6) feet in depth.

At least fifty percent (50%) of the front elevation of a dwelling, excluding garage door, shall be masonry material such as brick, stone, or cementitious siding. Cultured stone shall be acceptable.

Although this ordinance anticipates residential density up to 20 units per acre, BV proposes 10 units per acre or less, while still providing significant open space, architectural design, and neighborhood amenities

3. Residential density shall not exceed nine (9) dwelling units per acre for the portion of the development that is designated for residential use. This maximum density may be increased to twenty (20) dwelling units per acre and the maximum height / number of stories may be increased to three (3) stories / forty five (45) feet if all the following conditions are met: *(added 06.15.20)*

   a. Minimum residential open space shall be twenty (20) percent. There shall be a square, green or similar open space park or plaza that includes benches, shade trees, walking paths (sidewalks and/or trails), and similar amenities within or at the edge of the residential area.

   b. Front facing garages shall be recessed from the front living area by at least five (5) feet.

   c. If multiple-family units are proposed, they shall be of a townhouse, bungalow court, small multiplex (triplex or quadplex), or duplex variety. When these building types are proposed, the Planning Commission may permit reduced setbacks, consistent with Section 33.03, based upon consideration of the building type, development concept, and adjacent land uses. Apartments are also permitted as part of the density bonus and additional building height bonus, provided they shall have no building dimension, measured in a straight line, that exceeds one hundred sixty (160) feet.

BV complies with this standard

   d. No building exceeding thirty-five feet in height shall be located closer than one hundred feet from an adjacent single-family residential district.

K. Fences.

Will meet or exceed standards

1. The finished side of all fences shall face the common property line boundary or the public right-of-way.

2. Only the following fence materials shall be allowed: wood (or vinyl closely resembling wood) wrought iron (or aluminum closely resembling wrought iron) stone or brick. All other fence materials, including chain link and vinyl-clad chain link are prohibited unless placed in side or rear yards or screened from public view by landscaping or other means.

L. Building Roofs.

Will meet or exceed standards

1. In instances where roof vents, roof-mounted mechanical equipment, pipes, etc., can be viewed from ground level, they shall be grouped together, painted to match roof color to reduce their appearance, and screened from view.

2. There shall be variations in roof lines to reduce the massive scale of the structure and add visual interest. Single roof planes covering more than three thousand (3,000) square feet must be broken up by dormers, cross-ridges, minor roofs, chimneys or similar features.

M. Screening of Exterior Electrical Equipment and Transformers.

Will meet or exceed standards

1. Transformers that may be visible from any primary visual exposure area shall be screened with either plantings or a durable noncombustible enclosure which are unified and harmonious with the overall architectural theme.

2. Exterior-mounted electrical equipment shall be mounted on the interior of a building wherever possible, or shall be located where it is substantially screened form public view. Such equipment shall never be located on the street side or primary exposure side of any building.

Section 33.03 – Modification of Standards

A. The Planning Commission shall have the authority to waive or modify the standards of Section 33.01 or 33.02 upon consideration of the following:

1. The standards of this section would prevent reasonable use of the site.

2. Existing site design including architecture, parking, driveways, etc. are placed in a manner which makes application of standards impractical.

3. Limited lot area and the arrangement of existing features provide inadequate space to accommodate design requirements.

4. Other design constraints and considerations as defined by the Planning Commission.

5. The requirements of Sections 33.01 and 33.02 may be modified by way of a Planned Unit Development approved in accordance with Section 30.03.

Baldwin Village has been strategically designed by our best-in-class team to be an exciting, iconic, luxurious, 15-minute neighborhood that will serve as a gateway to Orion Township, a transition from the newly improved Baldwin Road to the existing single family neighborhoods to the west, and to clearly be 'the Best New Neighborhood in Oakland County'. Through the Modifications and Standards (Section 33.03), this ordinance wisely anticipated that changes in the world, changes in consumer preference, evolution of Orion Township, and expanding design excellence, may necessitate some modifications to the stated Gingellville District standards. This section empowers Twp stakeholders to review great plans like Baldwin Village and make the necessary, subjective adaptions needed to achieve the vision and market demand of Baldwin Village. We applaud this approach and are committed to collaborating closely with the Twp on the criteria and appropriate modifications to these standards in order to create Baldwin Village as the true 15-minute, best in class, luxury residential and mixed-use neighborhood.

Baldwin Village

The Grand Entrance

Baldwin Village will be vibrant, successful, and beautiful. The architecture of the homes and commercial buildings are highly designed, have timeless materials, and will be harmonious throughout the development. Unifying site architecture elements such as modern trellises, a dramatic entrance tower surrounded by fountains, decorative walls, pillars, and landscape will be placed throughout the neighborhood to mark key areas, protect and expand buffers, and beautify the community.

Gingellville Village Center Design Standards will be implemented, and the entire Baldwin Road frontage will be well landscaped and beautifully maintained.

758

The Grand Entrance into the neighborhood will become an iconic gateway into Orion Township and will provide a beautiful sense of arrival into Baldwin Village and as a gateway into Orion Township.


759
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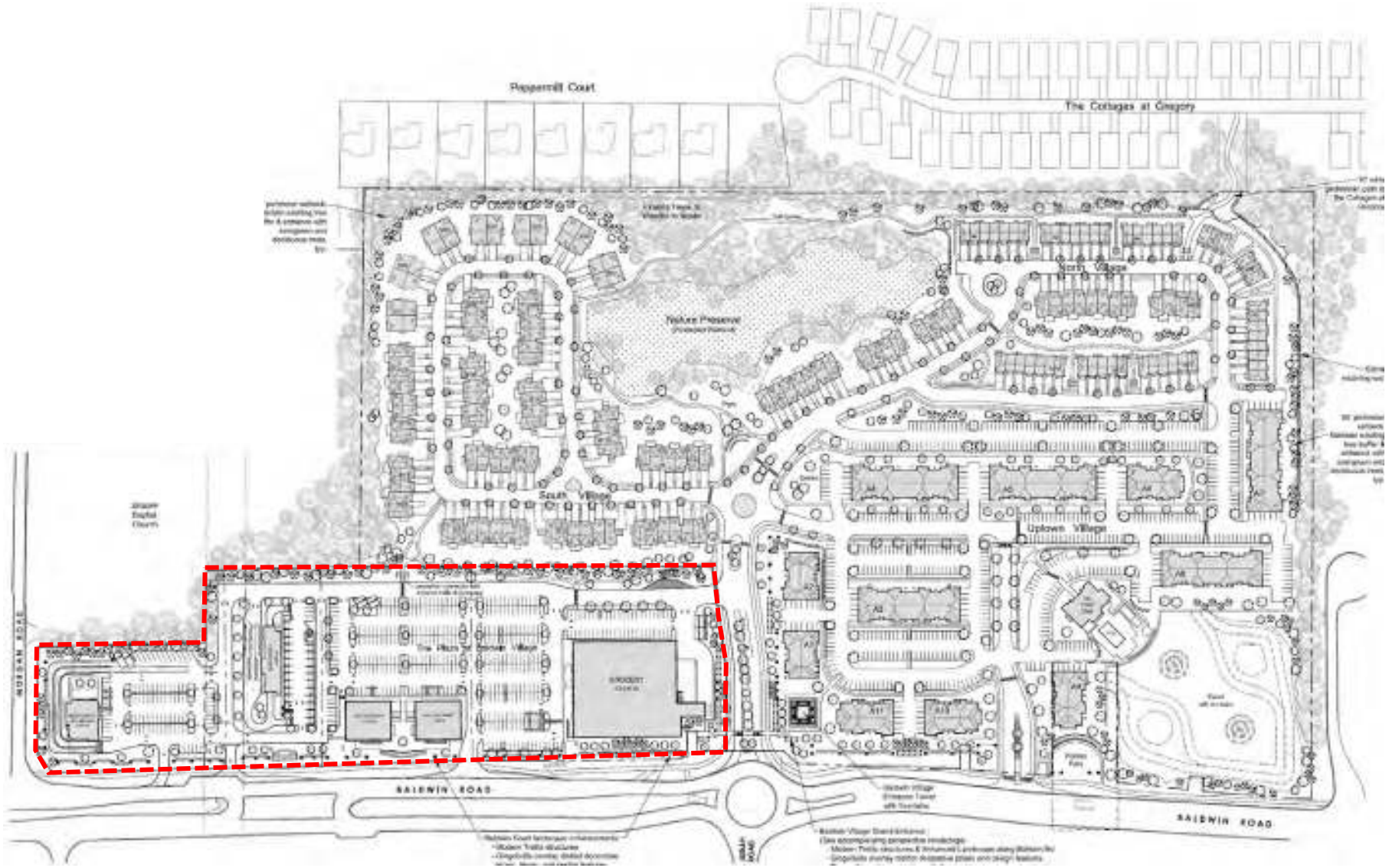
762

Baldwin Village

The Plaza at Baldwin Village

ALRIG USA



The Plaza at Baldwin Village will bring exciting retail, restaurants, and commercial to the development that will serve the residents of Baldwin Village, Orion Township, and visitors to the area.

Commercial uses will be accessed from the Grand Entrance as well as three additional ingress / egress points along Baldwin Road. Internal sidewalks, trails, and connections to the existing Baldwin Road safety path will make it easy to walk and ride bikes to restaurants and shops from all areas.

The restaurants, shops and grocery will have active outdoor areas, patios, and plazas in addition to the well landscaped plantings, greenbelt, and buffers.

763

Retail Uses:

Grocery	44,234 sf
Multi-tenant retail / rest	15,040 sf
Carwash	4,905 sf
Restaurant	4,978 sf

11.87 acres Commercial Area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Baldwin Village

Residential

MOCERI
Michigan's Legendary Dream Builder

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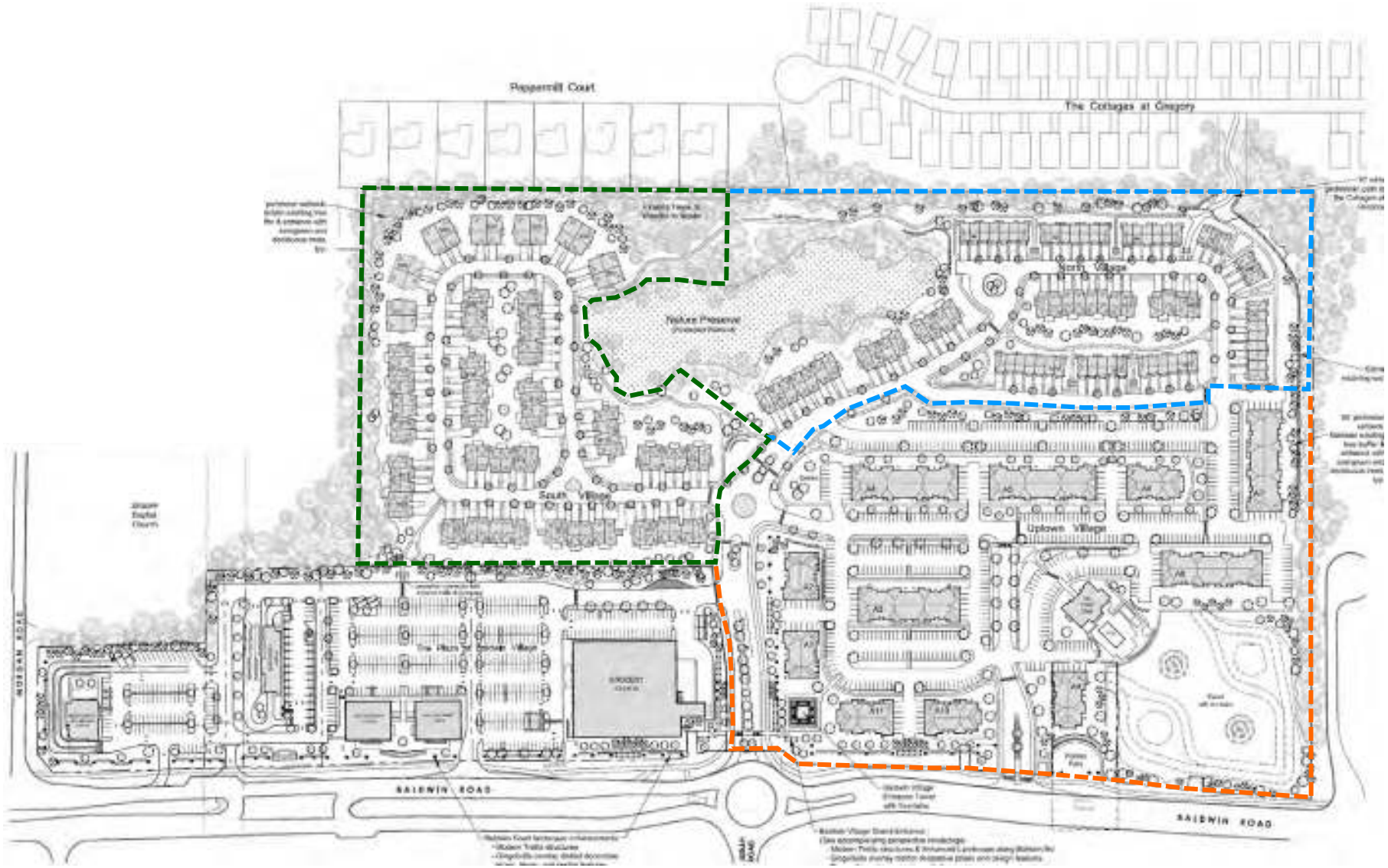
DEVELOPMENT COMPANY



Three residential villages will be constructed at Baldwin Village; *North Village*, *South Village*, and *Uptown Village*. Each with various residential choices ranging from unique townhomes, attached single family, and multi-family.

Nearly 20% of Baldwin Village will be open space, natural preservation areas, and large wooded perimeter buffers. Sidewalks and trails will create connections throughout the neighborhood making it easy for kids, families, and neighbors to enjoy the neighborhood and walk to nearby parks, community gathering areas, restaurants and shops.

774

Residential Uses:

North Village
79 Townhomes

South Village
68 Townhomes
14 SF attached

Uptown Village
304 multi-family residences

Uptown Village

776

Uptown Village
Clubhouse

Uptown Village
Clubhouse

North Village

Townhome (Rear Garage)

North Village

Townhome (Front Garage)

South Village

Townhome (Front & Side Garage)

781

South Village

Single Family Attached

Baldwin Village

PUD Public Benefits and Project Attributes

- ***Baldwin Village creates the ideal '15-minute village neighborhood' for residents and surrounding areas***
- ***Provides nearly 20% open space with an interconnected walkable retail & residential mixed-use master plan***
- ***The preserved wetland becomes the centerpiece of the community***
- ***Maintain and enhance large wooded buffers at the residential boundaries***
- ***Grand entrance & beautifully landscape Baldwin Road creates an iconic gateway into the Township***
- ***Ensures a comprehensive Stormwater Management system***
- ***Provides a cross-section of high-quality housing opportunities***
- ***Provides safe, exciting, upscale retail convenience and continued economic growth***
- ***Strategically provides transitional land uses from commercial, residential, natural preservation, and buffers***
- ***Financial contribution for the Orion Twp Safety Path improvement fund***
- ***Financial contribution for the Camp Agawam Accessible Kayak Launch***

Conceptual Site Plan
Kayak Launch - Camp Agawam

Baldwin Village will certainly be 'Oakland County's Best New Neighborhood" and will be a successful addition to this community.

As a development team, we're proud to make this large investment in Orion Township and appreciate the opportunity to work closely with the Township officials and staff, Planning Commission, Board of Trustees, and expert consultants. We are committed to ensure that every detail is right and we're confident in the future of Baldwin Village.

This list outlines key attributes of the Baldwin Village project, features within the mixed-use neighborhood, and our team's commitment to make additional investment into important community amenities that help make Orion Township a great place to live and raise a family.

July 6, 2022

Baldwin Village Conceptual PUD Application

"Oakland County's Best New Neighborhood"

ALRIG USA

MOCERI
Michigan's Legendary Dream Builder

S.R. JACOBSON
DEVELOPMENT CORPORATION

SILVERMAN
A RED EQUITIES DEVELOPMENT

PEA GROUP

844.813.2949
PEAGROUP.COM

December 14, 2021
PEA Project No: 2018-348

email: Buzz@silverman.com

Gilbert "Buzz" Silverman
Chairman and CEO
Silverman Companies
121 W Long Lake Road, Suite 150
Bloomfield Hills, MI 48304

RE: **Wetland Delineation – Baldwin Village**
Baldwin Road and Judah
Orion Township, Oakland County, Michigan

On November 11, 2021, PEA Group evaluated the subject property for the field indicators of the presence of wetlands as defined by the State of Michigan. Pink wetland survey ribbons were used to delineate a wetland boundary on the site when all three wetland indicators were present (wetland hydrology, hydric soils, and hydrophytic vegetation) as defined by USACE wetland delineation manual (1987) and the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Midwest Region (Version 2.0).

The site consists of approximately 57 acres of undeveloped land. It is located east of Baldwin Road and north of Morgan Road. The properties surrounding this parcel are currently developed as residential, religious or is currently being developed as residential. The site has rolling topography with hills, valleys and saddles. The site has a high point of approximately 1100 with low points of approximately 1010; a site elevation change of approximately 90 feet. Overall, the vegetation was consistent throughout the site. The site consisted of several dominant tree species including red, white, and black oaks, black cherry, and pin cherry, as well as sassafras, red and silver maples. Dominant shrubs found on the property included burning bush and buckthorn. Other dominant vegetation identified was vines including oriental bittersweet and riverbank grape. The dominant vegetation found on the site was classified as upland species. In addition, the entire site consists of sandy to sandy-loamy soil profiles. The wetland hydric soils were also a sandy loamy profile. Three (3) wetlands were found on the property. The following report summarizes the characteristics of the wetlands on the property as they appeared at the time of the delineation.

Wetland 'A': Flags A-1 to A-57

This wetland is located within the western and central section of the site and is approximately 2.71 acres in size. It appears to travel along the approximate 1037 elevation. The wetland is an open water pond with obligate shrub species on the interior. The open water is deep at the edges/ transition area. The wetland

transitions quickly out of the open water and up into sloped upland with dominant upland species. No herbaceous species were observed at the time of delineation. Impacts to the edges of the wetland appear to have minimal effect on the scrub-shrub portion of the wetland complex.

Wetland A contained wetland vegetation buttonbush (*Cephalanthus occidentalis)* within the interior of the open water pond and Michigan holly (*Ilex verticillata*) on the upland edges/ exterior edges of the wetland. The wetland contained numerous indicators of hydrology including surface water, high water table, saturation, and inundation visible on aerial imagery. The wetland contained the hydric soil indicator (S5) Sandy Redox. Upland species including pin cherry, black cherry, black oak and red oak were found along the wetland boundary. The wetland boundary was found where the hydrology indicators were no longer present and the vegetation switches to primarily upland species.

Wetland 'B': Flags B-1 to B-5

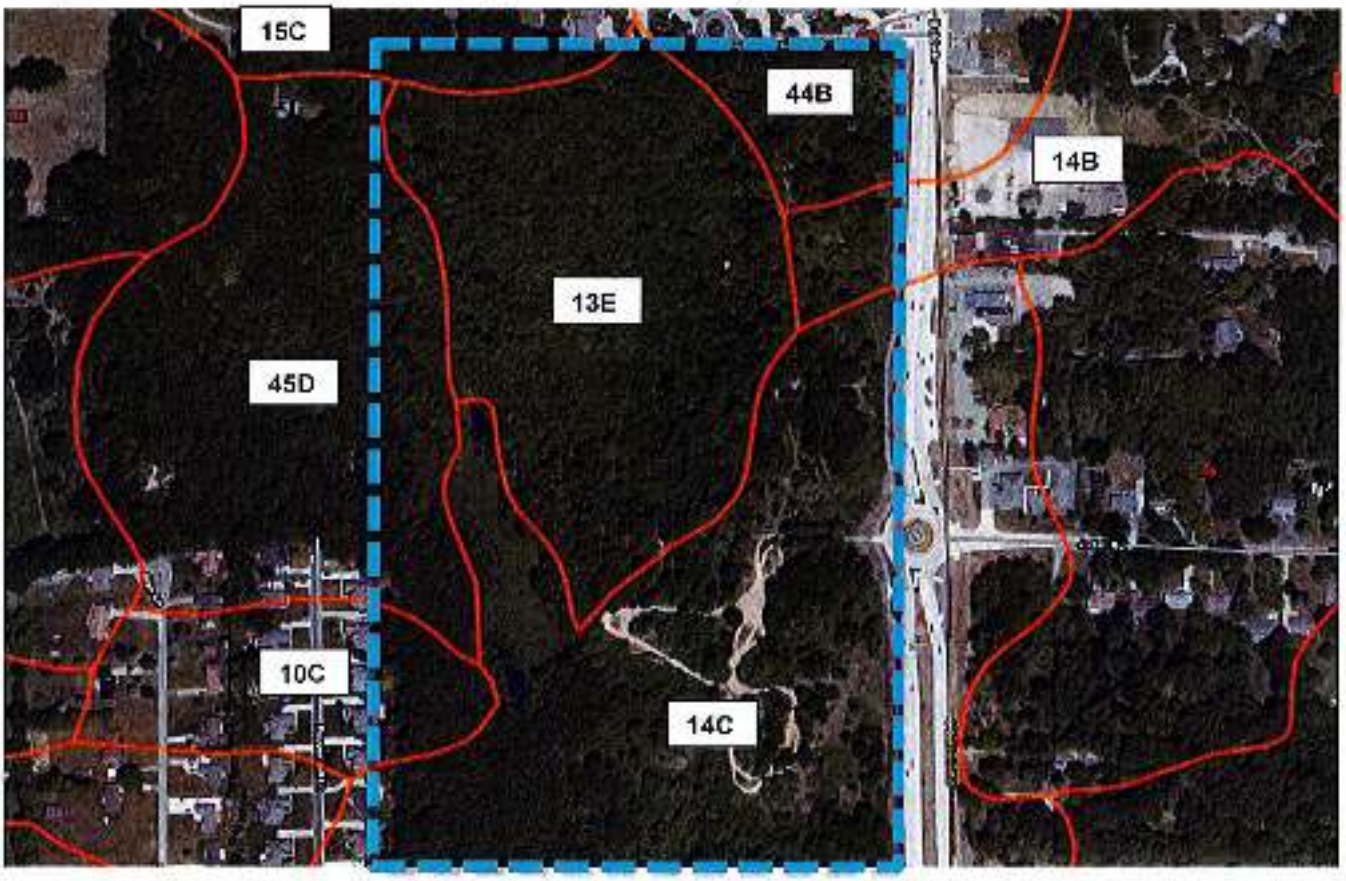
This wetland is located just east of Wetland A northern tip and at the bottom of a valley. It appears that Wetland A drains into Wetland B when the surface water breaches the approximate elevation of 1038. Wetland B is very small with only approximately 124 square feet in size. It contained wetland vegetation riverbank grape (Vitis riparia). This wetland was sparsely vegetated. No herbaceous plant material was observed during the field visit; however, spring/summer forbs and sedges may be present. The wetland contained numerous indicators of hydrology including water-stained leaves, high water table and soil saturation. The wetland contained the hydric soil indicator (S5) Sandy Redox. Upland species including honeysuckle, red oak and black oak trees were found along the wetland boundary. The wetland boundary was found where the hydrology indicators were no longer present and the vegetation switches to primarily upland species.

Wetland 'C': Flags C-1 to C-6

This wetland is located within the northeastern portion of the site. Wetland C is also very small and sits at the bottom of a valley; it is approximately 965 square feet in size. It contained wetland vegetation including silver maple (*Acer saccharinum*), glossy buckthorn (*Frangula alnus*) and burr oak (*Quercus macrocarpa*). The wetland contained numerous indicators of hydrology including water-stained leaves and presence of reduced iron. The wetland contained the hydric soil indicator (S5) Sandy Redox. Upland species including burning bush, honeysuckle, red oak and black oak trees were found along the wetland boundary. The wetland boundary was found where the hydrology indicators were no longer present and the vegetation switches to primarily upland species.

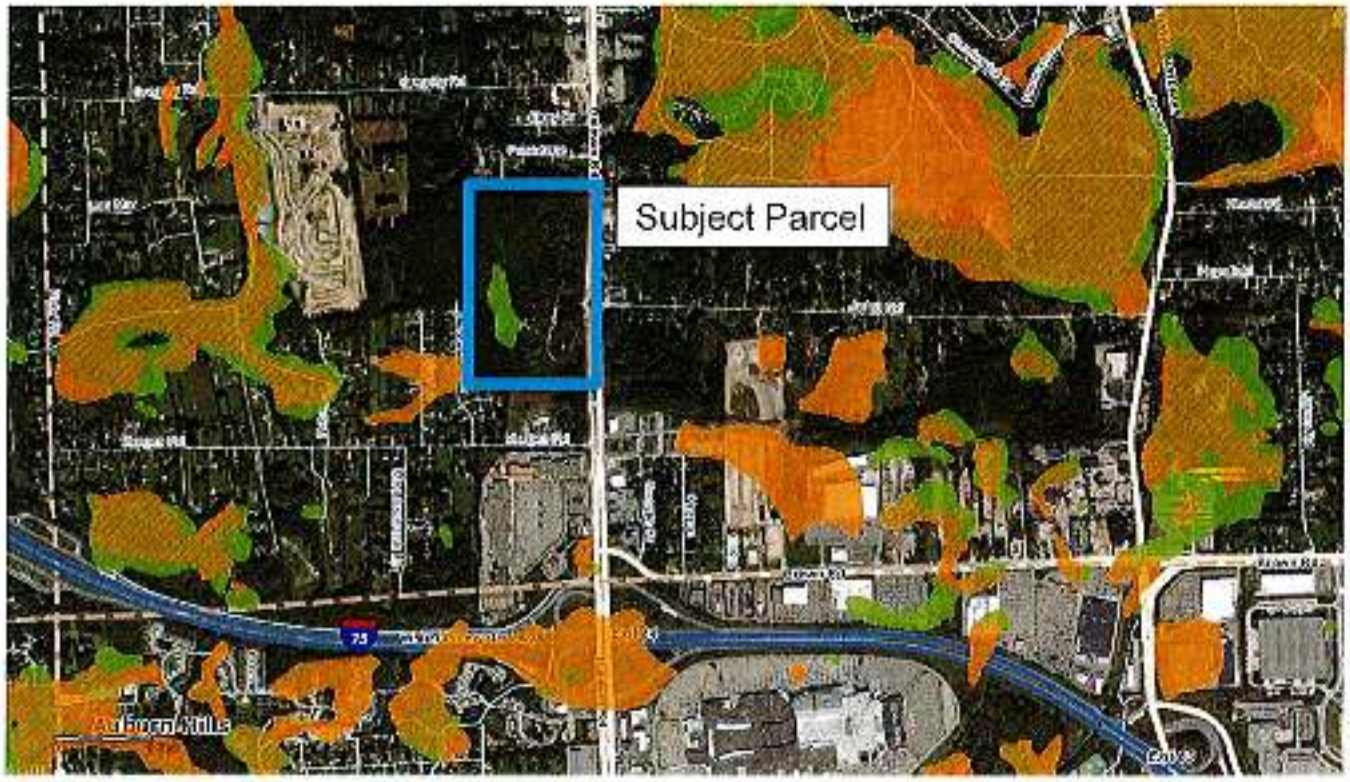
NRCS Web Soil Survey Map

10C: Marlette sandy loam; 13E: Oshtemo-Boyer loamy sands; 14B & 14C: Oakville fine sands; 15C: Spinks loamy sands; 44B: Riddles sandy loam); 45D: Arkport loamy fine sand



EGLE Wetland Mapper

Green areas are wetlands as identified on national wetland inventory and MIRIS maps.
Yellow areas are areas which have wetland soils.
Green/yellow areas are areas identified on NWI and MIRIS maps and soil areas which include wetland soils.



Wetland Map


EWL 65
WETLAND C
EWL 66
EWL 31
EWL 29
EWL 32
EWL 33
EWL 22
WETLAND B
EWL 34
EWL 26
EWL 37
EWL 39
EWL 19
EWL 40
EWL 18
EWL 43
EWL 16
EWL 45
EWL 14
EWL 13
WETLAND A
2
EWL 48
EWL 9
EWL 8
EWL 49
EWL 50
EWL 7
EWL 6
EWL 51
EWL 5
Point_generic 1
EWL 52
EWL 61
EWL 2
EWL 56
EWL 59
Baldwin Rd

Michigan Department of Environment, Great Lakes, and Energy

Wetlands within 500' of an inland lake, pond, river, or stream, as defined by Part 303 of the Wetlands Protection Act are considered a regulated wetland.

Wetlands that are not within 500' of an inland lake, pond, river or stream, but are more than 5 acres in size are considered regulated wetlands.

Wetlands that are listed within the rare or imperiled MDEQ list found on the Michigan's Rare Wetlands section of the website (26 of the 33 wetland communities are rare; 8 of the 26 rare are imperiled).

Wetlands with a documented presence of a threatened or endangered species.

Mitigation
EGLE typically requires that only wetland alterations that total over 1/3 of an acre in size be mitigated per the EGLE|USACE Joint Permit Application language. EGLE may also require mitigation of smaller areas of disturbance at their discretion per the Wetland Protection Act that calls for zero net loss wetlands. Mitigation may be constructed on-site, off-site or credits may be purchased from pre-approved EGLE wetland mitigation banks.

Opinion of Regulatory Status

Many factors influence the extent of a wetland boundary, including weather patterns, drainage, changes in vegetation, and activities on the site or on adjacent properties at the time of the investigation. The wetland observations completed by PEA for the subject parcel are based on the conditions at the site at the time of our investigation and current policy regarding the procedures used to delineate wetlands.

Please be advised that EGLE, U.S. Army Corps of Engineers, and the U.S. Environmental Protection Agency regulate wetlands and ultimately reserve final judgement on the extent of wetlands on any given site. The determination of a wetland on a specific site can vary depending on the conditions offered above as well as on the agency representative conducting the determination, and current wetland regulations.

The following regulatory status of the wetlands is the opinion of PEA Group based on the field conditions at the time of the wetland delineation of November 11, 2021.

Wetland A: Non-Regulated - fails all rules of Part 303.
Wetland B: Non-Regulated - fails all rules of Part 303.
Wetland C: Non-Regulated - fails all rules of Part 303.

Prepared by:
PEA Group

Theresa Pardington, PLA, PWS, ISA-CA
Project Coordinator | Wetland Scientist

WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: PN:18-346 Baldwin and Judah City/County: Orion / Oakland Sampling Date: 11/11/2021

Applicant/Owner: Silverman Companies State: MI Sampling Point: Wetland A

Investigator(s): T. Pardington PWS, M. Rugenstein WPIT Section, Township, Range: 04N10E32

Landform (hillslope, terrace, etc.): depression / hills Local relief (concave, convex, none): concave

Slope (%): 5-18 Lat: 42.71500 Long: -83.31055 Datum: N/A

Soil Map Unit Name: 14C- 14C—Oakville fine sand, 6 to 18 percent slopes NWI classification: ScrubShrub / TEBAIS

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____ Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____ Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	Is the Sampled Area within a Wetland? Yes X No ____
Hydric Soil Present?	Yes X No ____	
Wetland Hydrology Present?	Yes X No ____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 FT)	Absolute % Cover	Dominant Species?	Indicator Status
1. N/A			
2.			
3.			
4.			
5.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15 FT)			
1. Cephalanthus occidentalis	80	Y	OBL
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: 5 FT)			
1. N/A			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	= Total Cover		
Woody Vine Stratum (Plot size: 30 FT)			
1. N/A			
2.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ____	x 1 = ____
FACW species ____	x 2 = ____
FAC species ____	x 3 = ____
FACU species ____	x 4 = ____
UPL species ____	x 5 = ____
Column Totals: ____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks: (Include photo numbers here or on a separate sheet.)

20% open water. Upland vegetation at wetland boundary: pin cherry, black cherry, black oak and red oak

SOIL

Sampling Point: Wet A

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 2/2	95	7.5YR 3/4	5			sandy	
4-12	10YR 4/1	100						

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- X Sandy Gleyed Matrix (S4)
- X Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Dark Surface (S7)
- ___ Iron-Manganese Masses (F12)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No ____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- X Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- X Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- X Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No ____ Depth (inches): _____

Water Table Present? Yes X No ____ Depth (inches): 5 from SS

Saturation Present? (includes capilary fringe) Yes X No ____ Depth (inches): 5 from SS

Wetland Hydrology Present? Yes X No ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections) if available:

Remarks:

Surface water was not found in soil pit, there is surface water found in the wetland.

WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: PN:18-346 Baldwin and Judah | City/County: Orion / Oakland | Sampling Date: 11/11/2021
Applicant/Owner: Silverman Companies | State: MI | Sampling Point: Wetland B
Investigator(s): T. Pardington PWS, M. Rugenstein WPIT | Section, Township, Range: 04N10E32
Landform (hillslope, terrace, etc.): depression / hills | Local relief (concave, convex, none): concave
Slope (%): 12-40 | Lat: 42.71568 | Long: -83.31085 | Datum:
Soil Map Unit Name: 13E- Oshtemo-Boyer loamy sands, 12-40% slopes | NWI classification:
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____ Soil ____ or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____ Soil ____ or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	Is the Sampled Area within a Wetland? Yes X No ____
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 FT)	Absolute % Cover	Dominant Species?	Indicator Status
1. na			
2.			
3.			
4.			
5.			
	____ = Total Cover		
Sapling/Shrub Stratum (Plot size: 15 FT)			
1. na			
2.			
3.			
4.			
5.			
	____ = Total Cover		
Herb Stratum (Plot size: 5 FT)			
1. Vitis riparia	10		FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	Y = Total Cover		
Woody Vine Stratum (Plot size: 30 FT)			
1. na			
2.			
	____ = Total Cover		

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)
Total Number of Dominant Species Across All Strata: 1 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of	Multiply by
OBL species ____	x 1 = ____
FACW species ____	x 2 = ____
FAC species ____	x 3 = ____
FACU species ____	x 4 = ____
UPL species ____	x 5 = ____
Column Totals: ____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:
- ____ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- ____ 3 - Prevalence Index is ≤3.0[1]
- ____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks: (Include photo numbers here or on a separate sheet.)

Wetland Area was sparsely vegetated within areas of wetland hydrology indicators. No herbaceous plant materials were observed. Upland vegetation found at the wetland boundary included Black Cherry, pin cherry and sassafrass.

SOIL

Sampling Point: B

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 2/1	100						Sandy loam
4-11	10YR 4/1	100						
11-16	10YR 7/1	90						
	10YR 4/1	10						

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- X Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Dark Surface (S7)
- ___ Iron-Manganese Masses (F12)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No ____

Remarks:

* assumption was made that redox was present but due to the high volume of water/ saturation, not able to be observed that day.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- X Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No ____ Depth (inches): ____

Water Table Present? Yes X No ____ Depth (inches): 8"

Saturation Present? (includes capillary fringe) Yes X No ____ Depth (inches): 7"

Wetland Hydrology Present? Yes X No ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Note: Rained the day before sampling. Assume that redox was present but was not observable due to the high water content

WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: Baldwin and Judah | City/County: Orion / Oakland | Sampling Date: 11/11/2021

Applicant/Owner: Silverman Companies | State: MI | Sampling Point: Wetland C

Investigator(s): T. Pardington PWS, M. Rugenstein WPIT | Section, Township, Range: 04N10E32

Landform (hillslope, terrace, etc.): depression / hills | Local relief (concave, convex, none): concave

Slope (%): 12-40 | Lat: 42.71737 | Long: -83.30911 | Datum: N/A

Soil Map Unit Name: 13E- Oshtemo-Boyer loamy sands, 12-40% slopes | NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	Is the Sampled Area within a Wetland? Yes X No ____
Hydric Soil Present?	Yes X No ____	
Wetland Hydrology Present?	Yes X No ____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 FT)	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer saccharinum	5	Y	FACW
2.			
3.			
4.			
5.			
	____ = Total Cover		
Sapling/Shrub Stratum (Plot size: 15 FT)			
1. Quercus macrocarpa	10	Y	FAC
2. Frangula alnus	10	Y	FACW
3. Acer negundo	5	Y	FAC
4.			
5.			
	25 = Total Cover		
Herb Stratum (Plot size: 5 FT)			
1. N/A			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	0 = Total Cover		
Woody Vine Stratum (Plot size: 30 FT)			
1. N/A			
2.			
	0 = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of	Multiply by:
OBL species	x 1 =
FACW species 15	x 2 = 30
FAC species 15	x 3 = 45
FACU species	x 4 =
UPL species	x 5 =
Column Totals 30 (A)	75 (B)

Prevalence Index = B/A = 2.5

Hydrophytic Vegetation Indicators:

- ____ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- X 3 - Prevalence Index is ≤3.0[1]
- ____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks: (Include photo numbers here or on a separate sheet.)

The wetland was sparsely vegetated.
Upland vegetation found at the wetland boundary included burning bush and box elder.

SOIL

Sampling Point: C

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 2/2	85	7.5YR 3/4	15				
6-15	10YR 4/1	100						

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- X Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Dark Surface (S7)
- ___ Iron-Manganese Masses (F12)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- X Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- X Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): _____

Water Table Present? Yes ___ No X Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): _____

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

TRAFFIC IMPACT STUDY

Baldwin Village
Orion Township, Michigan

Prepared for

ALRIG USA
30200 Telegraph Rd
Bingham Farms, MI 48025

Jacobson Moceri Orion, LLC
3005 University Drive
Auburn Hills, MI 48326

July, 2022

AEW Project No. 0361-0067

Prepared by: **Mohammad Lutfi, P.E., PTOE**

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TABLE OF CONTENTS

EXECUTIVE SUMMARY

This report presents the methodologies, analyses, and results of the Traffic Impact Study (TIS) for the multi-use land development, Baldwin Village. Baldwin Village consist of:

- 465 units of multi-family housing
- Two (2) sit-down restaurants
- Chick-fil-a restaurant
- Two (2) retail developments
- Supermarket.

The project site is situated on the west side of the Baldwin Road between Morgan Road and North of Judah Road. It is expected that full-build-out will be complete by 2024. The proposed access plan includes four (5) drives off Baldwin Road:

- North of Judah Road
- Baldwin Road at Judah Road Roundabout
- North of the southbound to northbound Baldwin Road crossover
- A proposed connection to the northbound to southbound Baldwin Road crossover (Entry Only)
- North of Morgan Road (Exit Only)

Existing traffic data was collected on May 10, 2022, and signal timing was obtained from RCOC. Analysis of the existing conditions indicate that all the study intersections operate at an acceptable level of service (LOS). The existing traffic conditions were simulated, utilizing SimTraffic11, and were analyzed for queue lengths. The analysis resulted in no significant queues.

- ITE Land use codes 220, 934, 820, 850, and 948 were selected.
- The development is estimated to generate 693 trips in the AM Peak and 1,465 trips in the PM peak.
- In accordance to the Orion Township ordinance, the trip generation was calculated using the sum of the average rate and one the standard deviation.

The expected number of trips for the proposed Chick-Fil-A that would be generated by the proposed restaurant was estimated by observing an existing Chick-Fil-A in Caledonia, Kalamazoo and Okemos, MI with size 4,877, 4,730, and 4,996 Square-feet.

Analysis of the build conditions resulted in a failing LOS at:

- Baldwin Road and Judah Road/Baldwin Village Roundabout: PM Peak
- NB to SB Crossover and Baldwin Village inward south driveway: PM Peak

To reduce delay and improve the level of service a new signal is recommended at the northbound to southbound crossover and Baldwin Village inward south driveway intersection.

FIGURES

TABLES

APPENDICES

1.0 INTRODUCTION

1.1 Project Overview

This report presents the methodologies, analyses, and results of the Traffic Impact Study (TIS) for the multi-use land development, Baldwin Village. Baldwin Village consists of multi-family housing, two (2) sit down restaurants, a Chick-Fil-A restaurant, two (2) retail developments, and a supermarket. The project site is situated on the west side of the Baldwin Road between Morgan Road and North of Judah Road. The study area and the preliminary site plan is shown in **Figure 1.1and 1.2**, respectively. It is expected that full-build-out will be complete by 2024. The proposed development's access plan includes a proposed west side leg off the existing roundabout and four (5) proposed driveways off Baldwin Road. The five proposed driveways are located:

- North of Judah Road
- North of the southbound to northbound Baldwin Road crossover
- A proposed connection to the northbound to southbound Baldwin Road crossover (Entry Only)
- North of Morgan Road (Exit Only)

Figure 1.1 – Proposed Development Location

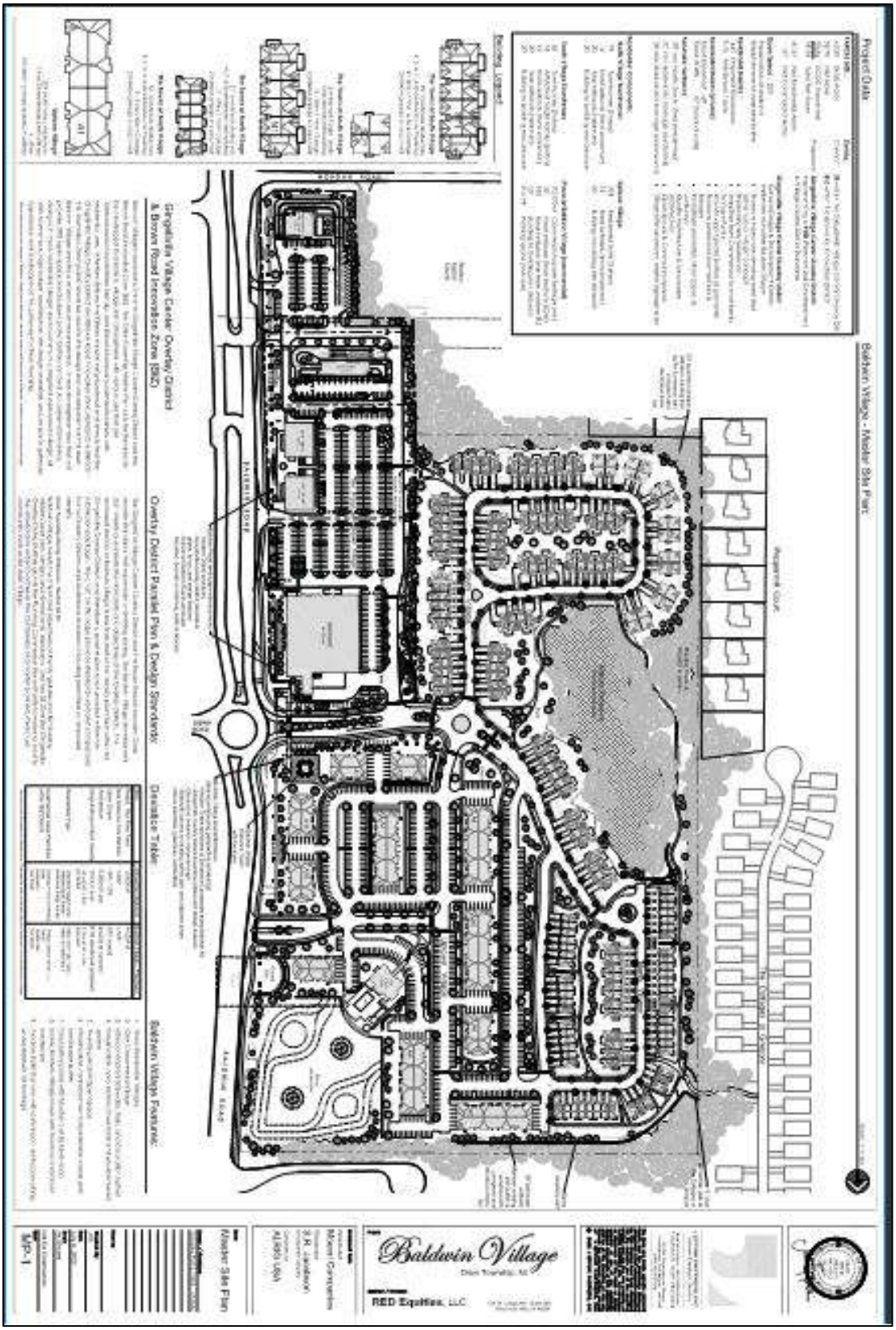

Figure 1.2 – Preliminary Site Plan

The objective of this study is to evaluate the impact of the proposed development will have on the traffic patterns and flow of the surrounding area.

The scope of this study was developed based on Anderson, Eckstein & Westrick, Inc. (AEW) knowledge of the study area, accepted traffic engineering practice, and information published by the Institute of Transportation Engineers (ITE). The study analyses were completed using Synchro and SimTraffic, Version 11 traffic analysis software.

The specific objectives of the study are to:

- Quantify existing traffic volumes and operations.
- Develop a trip generation for the proposed multi-use development.
- Calculate future traffic volumes including the trips generated by the proposed development.
- Calculate the level of service for each condition and conduct a queue analysis.
- Perform a right-turn deceleration lane analysis for the proposed driveways.

1.2 Scope of Study

The overall scope of the traffic study is to identify and evaluate the potential impacts the new development will have on the typical traffic patterns.

The intersections analyzed for this study area are presented in **Figure 1.3** and include:

1. Judah Road & Baldwin Road (Roundabout)
2. Southbound to Northbound Baldwin Road Crossover (Unsignalized)
3. Northbound to Southbound Baldwin Road Crossover (Unsignalized)
4. Morgan Road & Baldwin Road (Unsignalized)
5. Jordan Road & Baldwin Road (Unsignalized)
6. Baldwin Commons and Baldwin Road (Signalized)

Figure 1.3 - Study Intersections

2.0 STUDY AREA CHARACTERISTICS

2.1 Roadway Characteristics

The project traffic study area includes:

- Baldwin Road
- Judah Road
- Morgan Road
- Jordan Road

Table 2.1 – Roadway Characteristics presents the functional classification, controlling jurisdiction, average daily traffic (ADT), posted speed and general lane description for each of the study area roadways.

Table 2.1 - Roadway Characteristics

Road	Functional Classification	Controlling Jurisdiction	ADT	Posted Speed	Lane Description
Baldwin Road	Minor Arterial	RCOC	28,947	45 MPH	4 lane divided highway North of Baldwin Commons 5 lane divided highway South of Baldwin Commons
Judah Road	Local	RCOC	446	35 MPH	2 lane gravel road
Morgan Road	Local	RCOC	1,406	40 MPH	2 lanes
Jordan Road	Local	RCOC	N/A	25 MPH	2 lanes

(Traffic Sources: SEMCOG Jurisdiction Map and Functional Classification Map)

2.2 Non-Motorized Characteristics

Currently there is a sidewalk on the east and west side of Baldwin Road from Judah to Baldwin Commons. Crosswalks are located at all legs of the roundabout at Baldwin Road and Judah Road, and on the west side of Baldwin Commons and Baldwin Road.

No bus stops are located within the study area.

3.0 EXISTING TRAFFIC ANALYSIS

The existing data collected used to develop the existing conditions can be found in Appendix A – Existing Data Collected. Existing traffic count data was obtained on May 10, 2022 at the following intersections:

1. Judah Road & Baldwin Road (Roundabout)
2. Southbound to Northbound Baldwin Road Crossover (Unsignalized)
3. Northbound to Southbound Baldwin Road Crossover (Unsignalized)
4. Morgan Road & Southbound Baldwin Road (Unsignalized)
5. Jordan Road & NB Baldwin Road (Unsignalized)
6. Baldwin Commons & Baldwin Road (Signalized)

The peak hour volume for each intersection was used for this study and volumes were balanced upward through the study network. At locations where access is provided between study intersections, "dummy" intersections were used to account for sink and

source volumes, and through volumes were carried along the main study roadways. 2022 existing peak hour traffic is presented below in **Figure 3.1** and the traffic control and lane use of the roadway network is provided in **Figure 3.2**.

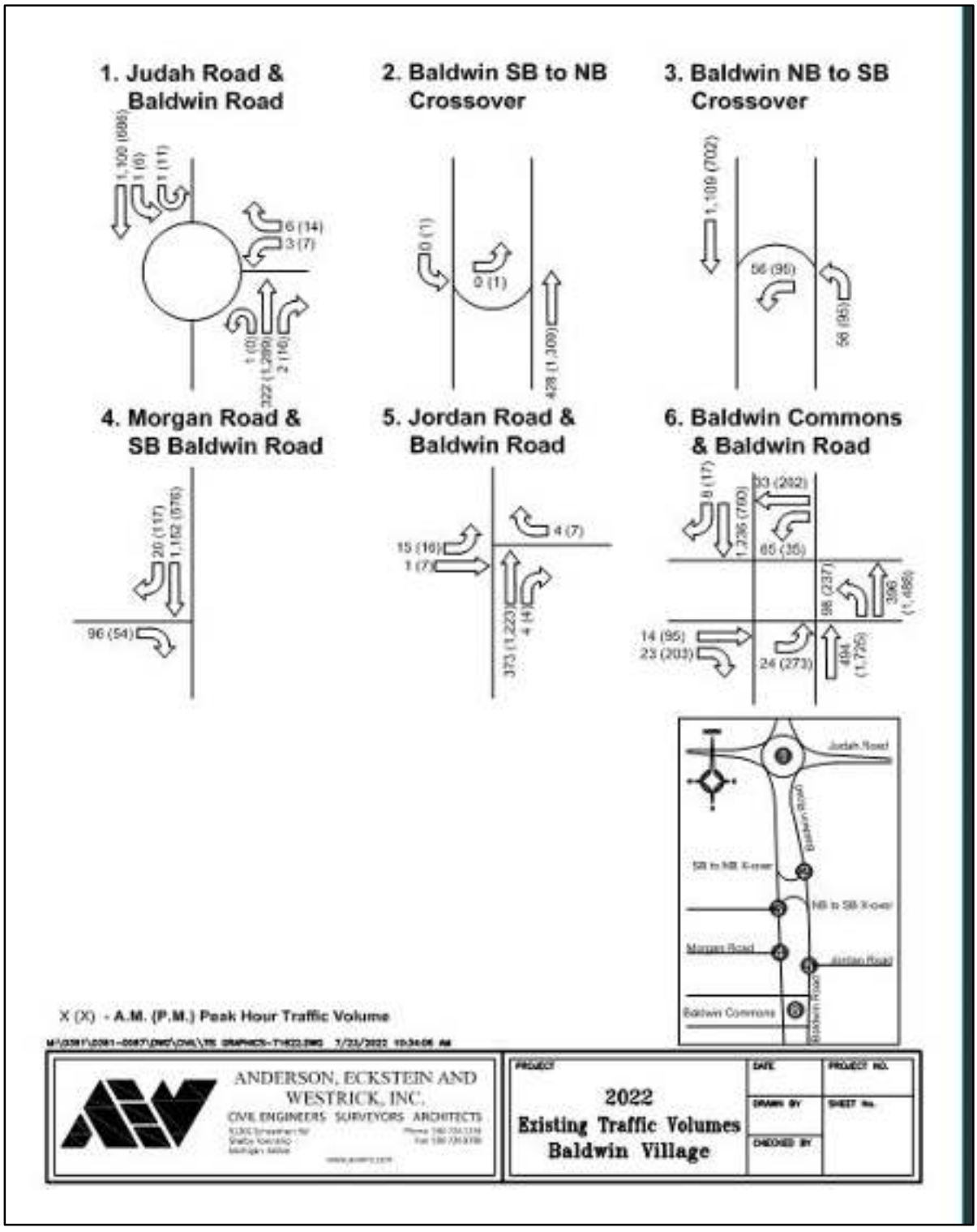

Figure 3.1 - 2022 Existing Peak Hour Volumes

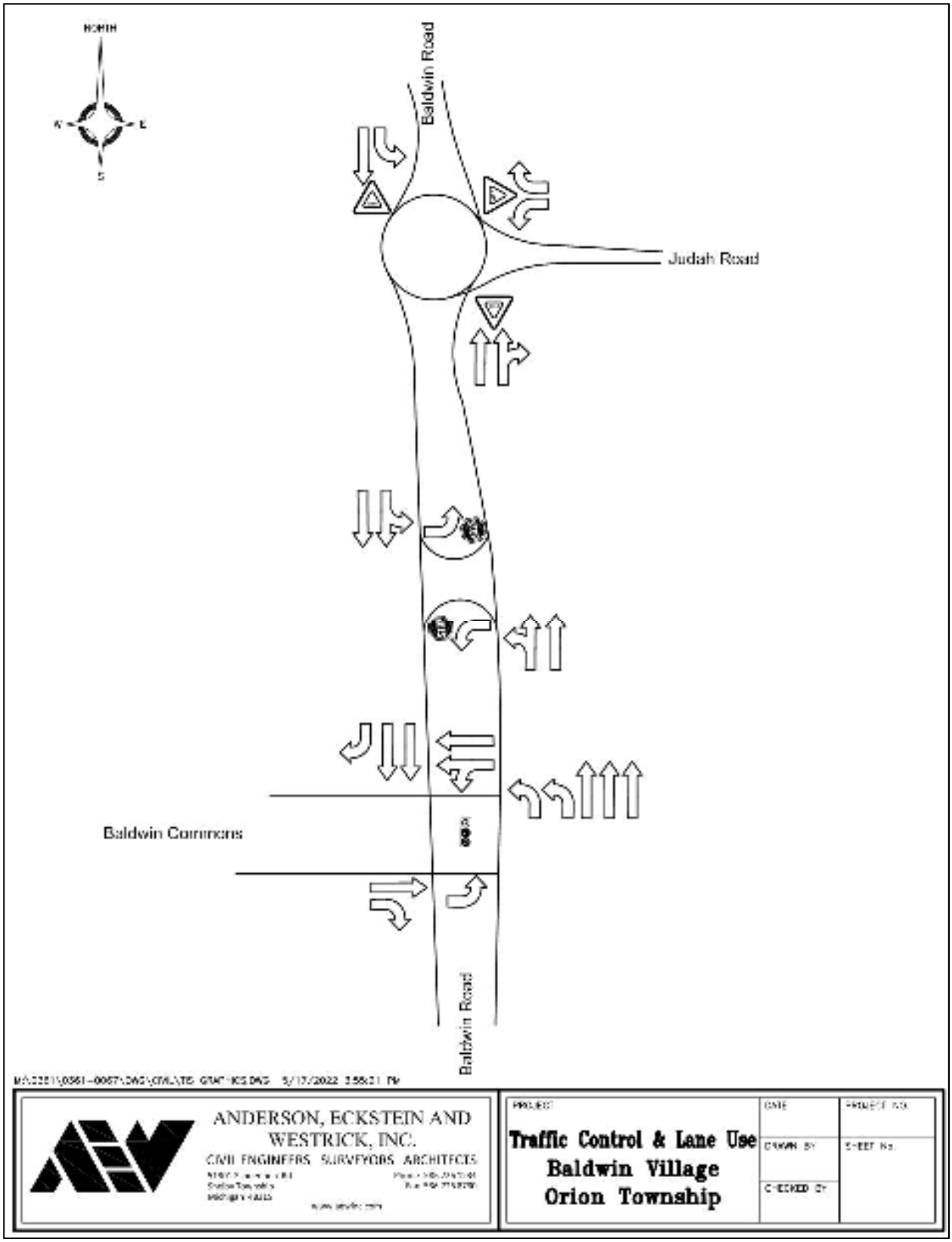

Figure 3.2 - Existing Lane Configuration & Traffic Control

3.1 Traffic Operations Analysis Methodology

Trafficware's Synchro 11 was used to perform intersection capacity analysis and assign Levels of Service (LOS) for the study intersections and lane group movements based on the Highway Capacity Manual, 6th Edition (HCM6) methodologies. LOS is a letter grade that describes traffic operations based on the amount of delay experienced by vehicles at an intersection, along an intersection approach (e.g., eastbound, westbound), or in a specific lane group (e.g., eastbound right turn, eastbound through-left). LOS can range from A-F with A representing the conditions in which vehicles experience the least amount of delay, and F representing the conditions in which vehicles experience the most delay. The LOS D is typically used as a threshold for "acceptable" operations and is sometimes described as being "near capacity". The LOS E is often described as operations "at capacity", while LOS F describes conditions "over capacity". Additionally, LOS for the stop-controlled intersections was reported by approach. **Table 3.1** provides information regarding the delay thresholds for LOS.

Table 3.1 - Level of Service Definitions and Criteria

Level-of-Service (LOS)	Signalized Intersections Delay (seconds)	Un-Signalized Intersections Delay (seconds)
A	< 10.0	< 10.0
B	10.1 – 20.0	10.1 – 15.0
C	20.1 – 35.0	15.1 – 25.0
D	35.1 – 55.0	25.1 – 35.0
E	55.1 – 80.0	35.1 – 50.0
F	> 80.0	> 50.0

3.2 Existing LOS Analysis

The peak hour intersection volumes, existing approach peak hour factors (PHF), truck percentages, and default lane utilization factors were used for the Existing and Background analyses. In **Table 3.2**, below, the existing LOS is shown, Appendix B – Existing Condition Reports LOS & Queue Analysis shows the detailed existing conditions calculated in HCS2022, Synchro 11 and SimTraffic11. HCS2022 was utilized to calculate the LOS for the roundabout located at Baldwin Road and Judah Road, Synchro11 was utilized for the remaining study intersections.

Table 3.2 - 2022 Existing Condition Level of Service Peak Hour Analysis

Intersection	Approach	Lane Group	2022 Existing (LOS)	
			AM-Peak LOS/Delay	PM Peak LOS/Delay
Baldwin Road & Judah Road Roundabout	Westbound	Entry Lane	A/3.6	A/9.5
	Northbound	Left Entry Lane	A/3.5	A/7.5
		Right Entry Lane	A/3.7	A/8.4
	Southbound	Left Entry Lane	A/6.3	A/4.8
		Right Entry Lane	A/7.0	A/5.2
	Intersection Overall		**A/6.0**	**A/6.9**
Southbound to Northbound Crossover Unsignalized	Eastbound	2-Left	A/9.6	B/14.8
	Northbound	3-Thru	Free Flow	Free Flow
	Intersection Overall		**Free Flow**	**A/0.0**
Northbound to Southbound Crossover Unsignalized	Westbound	Left	B/14.0	B/11.6
	Southbound	2-Thru	Free Flow	Free Flow
	Intersection Overall		**A/0.7**	**B/1.4**
Baldwin Road & Baldwin Commons – West Side Signalized	Eastbound	Thru	D/51.2	C/31.5
		Right	D/50.5	C/27.4
	Westbound	Thru&Thru/Left	A/3.0	A/5.1
	Southbound	2-Thru	B/11.4	D/52.8
		Right	A/6.8	C/33.3
	Intersection Overall		**B/12.0**	**D/38.4**
Baldwin Road & Baldwin Commons – East Side Signalized	Eastbound	Left	A/2.1	A/2.0
	Northbound	2-Left	D/50.0	D/35.4
		3-Thru	A/2.2	B/16.0
	Intersection Overall		**B/11.4**	**B/16.0**
Jordan Road & Baldwin Road Unsignalized	Westbound	Right	A/9.1	B/11.7
	Northbound	2-Thru&Thru/Right	Free Flow	Free Flow
	Intersection Overall		**A/0.1**	**A/0.1**
Morgan Road & Baldwin Road Unsignalized	Eastbound	Right	C/16.4	B/11.8
	Southbound	Thru&Thru/Right	Free Flow	Free Flow
	Intersection Overall		**A/1.2**	**A/0.6**

The results of the existing condition analysis indicate that all of the study intersections overall and intersection movement levels of service currently operate at a LOS D or better.

4.0 BACKGROUND AND FUTURE TRAFFIC GROWTH

4.1 Background Trip Generation

To properly evaluate the impact the proposed development will have on the current traffic network, the existing traffic volume must be projected to the build-out year to obtain the background traffic. The background traffic is the traffic growth not related to the development. In order to determine the growth rate of the study area, the Southeast Michigan Council of Governments (SEMCOG) and a previous traffic study conducted by OHM was referenced. The historical data and population forecasts showed a growth rate of 0.9% per year. Due to the projected build-out year of 2024, a growth rate of 1.8% was applied to the existing traffic volumes to obtain the background traffic volumes. The background traffic volume can be fund below in **Figure 4.1**.

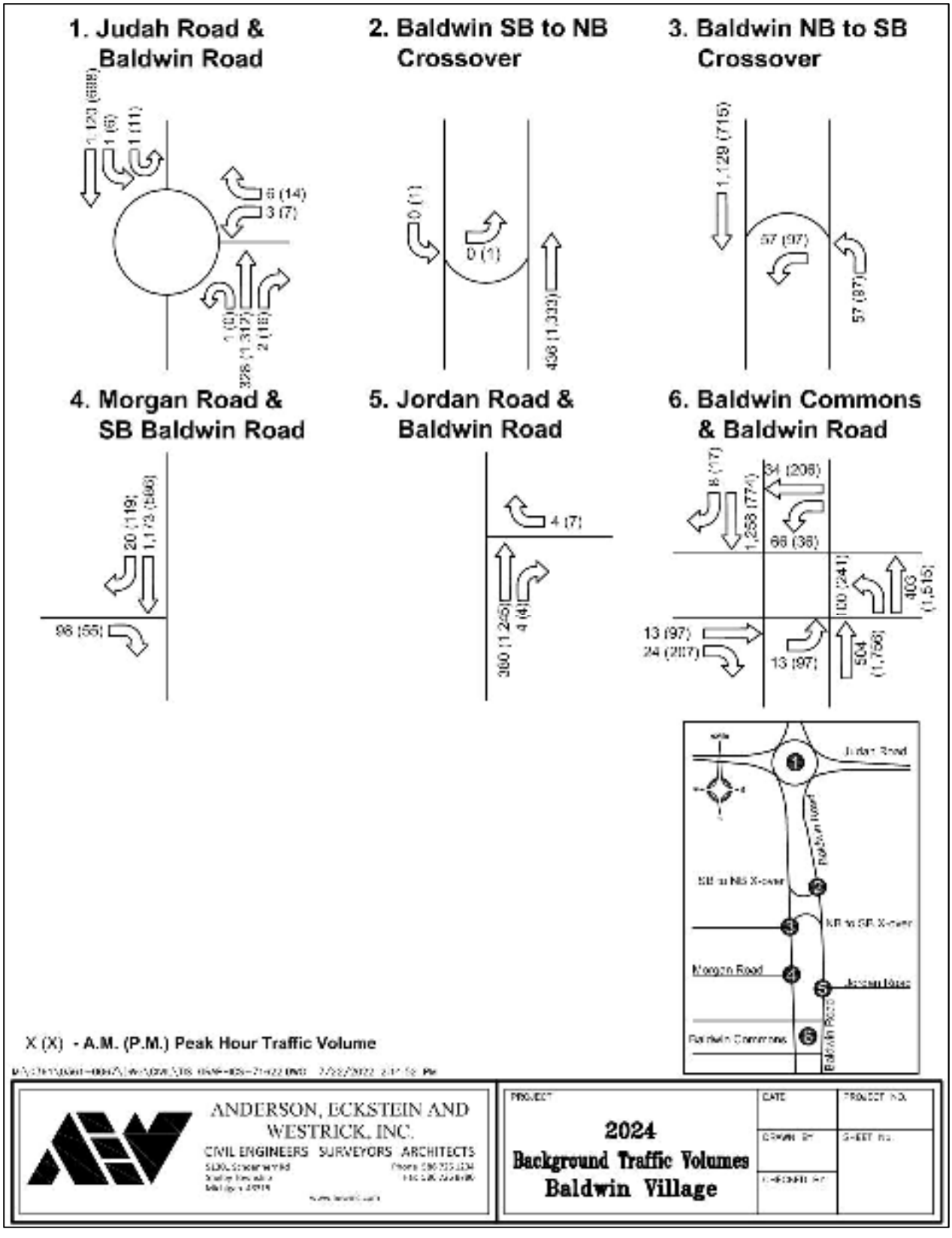

Figure 4.1 – 2024 Background Conditions Traffic Counts

4.2 Background Level of Service

In **Table 4.2**, below, the existing LOS and the background condition LOS is shown, Appendix C – Background Condition Reports LOS & Queue Analysis, shows the detailed background conditions calculated in HCS2022, Synchro11 and SimTraffic11 using the new traffic volumes adjusted by the aforementioned growth factor. HCS2022 was utilized to calculate the LOS for the roundabout located at Baldwin Road and Judah Road, Synchro11 was utilized for the remaining study intersections.

Table 4.2 – 2024 Background Level of Service Peak Hour Analysis

Intersection	Approach	Lane Group	2022 Existing (LOS)		2024 Background (LOS)	
			AM-Peak LOS/Delay	PM Peak LOS/Delay	AM-Peak LOS/Delay	PM Peak LOS/Delay
Baldwin Road & Judah Road Roundabout	Westbound	Entry Lane	A/3.6	A/9.5	A/3.6	A/9.8
	Northbound	Left Entry Lane	A/3.5	A/7.5	A/3.6	A/7.7
		Right Entry Lane	A/3.7	A/8.4	A/3.7	A/8.7
	Southbound	Left Entry Lane	A/6.3	A/4.8	A/6.4	A/4.9
		Right Entry Lane	A/7.0	A/5.2	A/7.1	A/5.2
	Intersection Overall		**A/6.0**	**A/6.9**	**A/6.0**	**A/7.1**
Southbound to Northbound Crossover Unsignalized	Eastbound	2-Left	Free Flow	B/14.8	A/9.6	C/15.0
	Northbound	3-Thru	Free Flow	Free Flow	Free Flow	Free Flow
	Intersection Overall		**Free Flow**	**A/0.0**	**Free Flow**	**A/0.0**
Northbound to Southbound Crossover Unsignalized	Westbound	Left	B/14.0	B/11.6	B/14.2	B/11.7
	Southbound	2-Thru	Free Flow	Free Flow	Free Flow	Free Flow
	Northbound	Left	A/7.3	A/7.4	A/7.3	A/7.4
		2-Thru	Free Flow	Free Flow	Free Flow	Free Flow
	Intersection Overall		**A/0.7**	**B/1.4**	**A/0.7**	**B/1.4**
Baldwin Road & Baldwin Commons – West Side Signalized	Eastbound	Thru	D/51.2	C/31.5	D/51.1	D/52.2
		Right	D/50.5	C/27.4	D/50.5	D/48.3
	Westbound	Thru&Thru/Left	A/3.0	A/5.1	A/3.0	A/3.6
	Southbound	2-Thru	B/11.4	D/52.8	B/11.6	C/30.6
		Right	A/6.8	C/33.3	A/6.8	C/22.5
	Intersection Overall		**B/12.0**	**D/38.4**	**B/12.1**	**C/30.6**
Baldwin Road & Baldwin Commons – East Side Signalized	Eastbound	Left	A/2.1	A/2.0	A/2.0	A/4.2
	Northbound	2-Left	D/50.0	D/35.4	D/50.0	C/27.8
		3-Thru	A/2.2	B/16.0	A/2.2	A/4.0
	Intersection Overall		**B/11.4**	**B/16.0**	**B/11.4**	**A/7.1**
Jordan Road & Baldwin Road Unsignalized	Westbound	Right	A/9.1	B/11.7	A/9.1	A/9.5
	Northbound	2-Thru&Thru/Right	Free Flow	Free Flow	Free Flow	Free Flow
	Intersection Overall		**A/0.1**	**A/0.1**	**A/0.1**	**A/0.1**
Morgan Road & Baldwin Road Unsignalized	Eastbound	Right	C/16.4	B/11.8	C/16.7	A/0.1
	Southbound	Thru&Thru/Right	Free Flow	Free Flow	Free Flow	B/11.5
	Intersection Overall		**A/1.2**	**A/0.6**	**A/1.3**	**A/0.8**

The results of the background condition analysis indicate that all of the study intersections overall and intersection movement levels of service currently operate at a LOS D or better.

5.0 PROPOSED BUILD CONDITIONS

5.1 Build Trip Generation

The AM and PM peak hour vehicle trips that would be generated by the proposed development were forecasted based on the ITE Trip Generation Manual 11th Edition and

engineering judgement. Land use codes 220, 934, 820, 850, and 948 were selected. The development is estimated to generate 693 trips in the AM Peak and 1,465 trips in the PM peak. The detailed trip generated is shown in **Table 5.1**, below. In accordance to the Orion Township ordinance, the trip generation was calculated using the sum of the average rate and one the standard deviation.

Table 5.1 – Proposed Build Trip Generation

Land Use	Units	Land Use Code	Weekday AM Peak Hour Generated Trips			Weekday PM Peak Hour Generated Trips		
			Enter	Exit	Total	Enter	Exit	Total
Average Rate + 1 Standard Deviation				0.52			0.66	
Multifamily Housing (Low Rise)	465 Units	220	58	184	242	193	114	307
Average Rate + 1 Standard Deviation				21.18			15.23	
High Turnover Restaurant (Sit-Down)	2,260 Sft	932	26	22	48	21	13	34
Average Rate + 1 Standard Deviation				21.18			15.23	
High Turnover Restaurant (Sit-Down)	2,260 Sft	932	26	22	48	21	13	34
Average Rate + 1 Standard Deviation				4.95			9.78	
Varity Store	5,260 Sft	814	14	12	26	26	25	51
Average Rate + 1 Standard Deviation				4.95			4.66	
Varity Store	5,260 Sft	814	14	12	26	26	25	51
Average Rate + 1 Standard Deviation				4.3			12.27	
Supermarket	44,234 Sft	850	112	78	190	271	271	542
Average Rate + 1 Standard Deviation				N/A			111	
Automated Car Wash	Car Wash Tunnel (1) Entry)	948	-	-	-	56	55	111
		Trip Ratio		.022			.065	
Existing Chick-Fil-A	4,868 Sft	Trip Distribution	51%	49%		51%	49%	
Proposed Chick-Fil-A	4,978 Sft		57	56	113	167	168	335
Generated Trips			**307**	**386**	**693**	**781**	**684**	**1,465**

Due to the unique traffic conditions Chick-fil-a restaurants experience, the ITE Trip Generation Manual 11th Edition was not referenced. The expected number of trips that would be generated by the proposed restaurant was estimated by observing an existing Chick-Fil-a restaurant in Caledonia, Kalamazoo and Okemos, MI with size 4,877, 4,730, and 4,996 Square-feet.

5.2 Trip Distribution

The trip distribution was calculated based on the existing traffic patterns. The generated trips were distributed accordingly to the background traffic volumes. The trip distribution map can be found below in **Figure 5.1**. and trip generation in **Figure 5.2**.

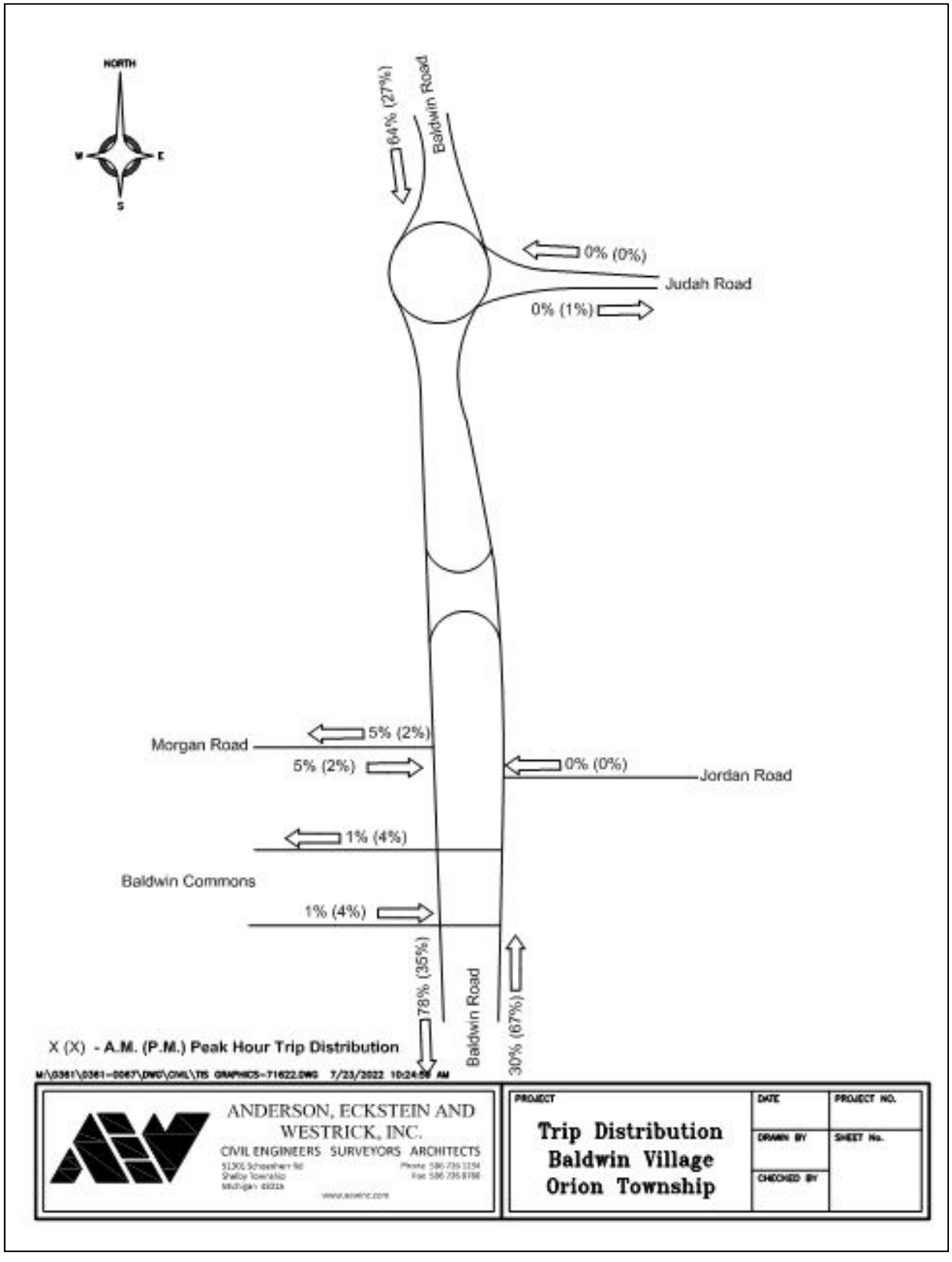

Figure 5.1 – Trip Distribution

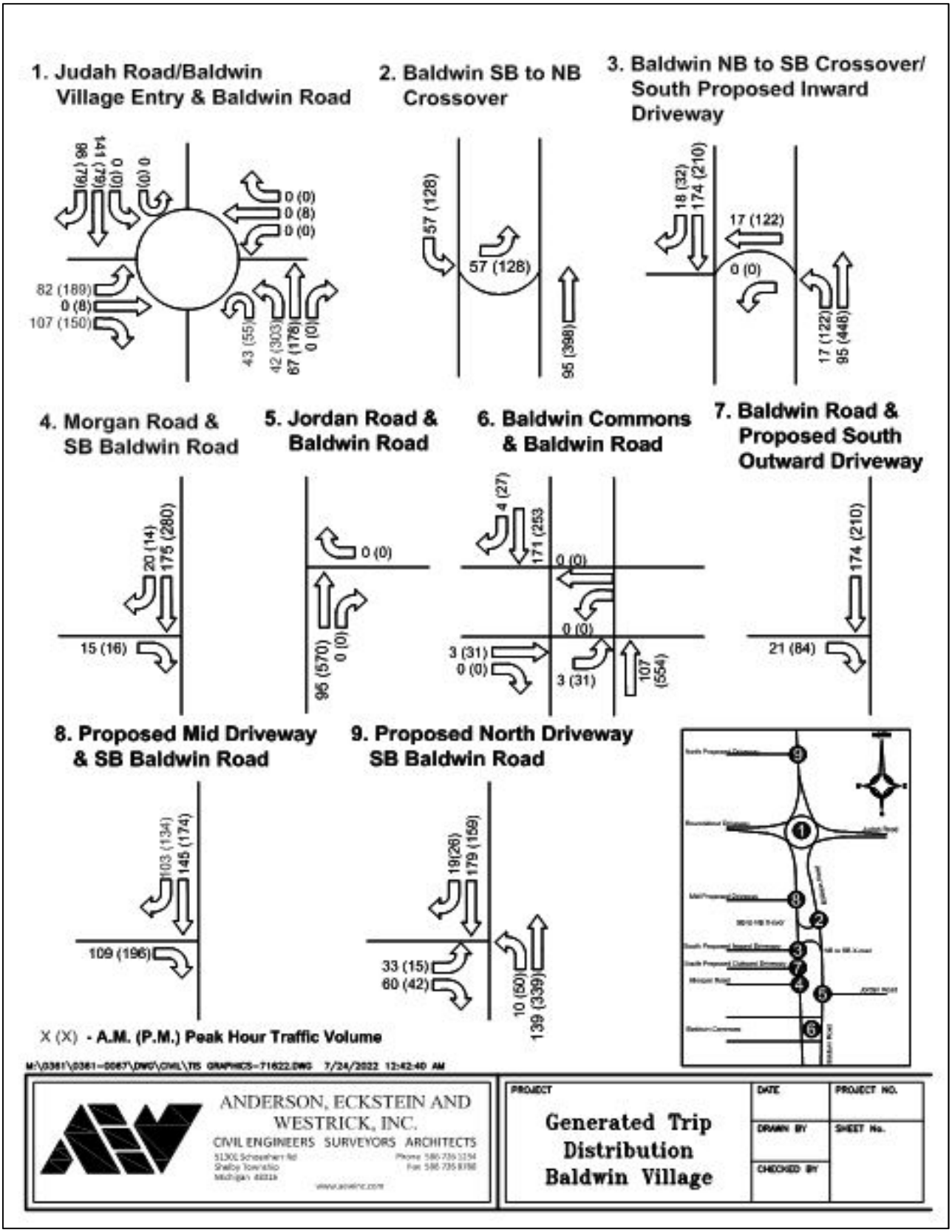

Figure 5.2 – Trip Generation

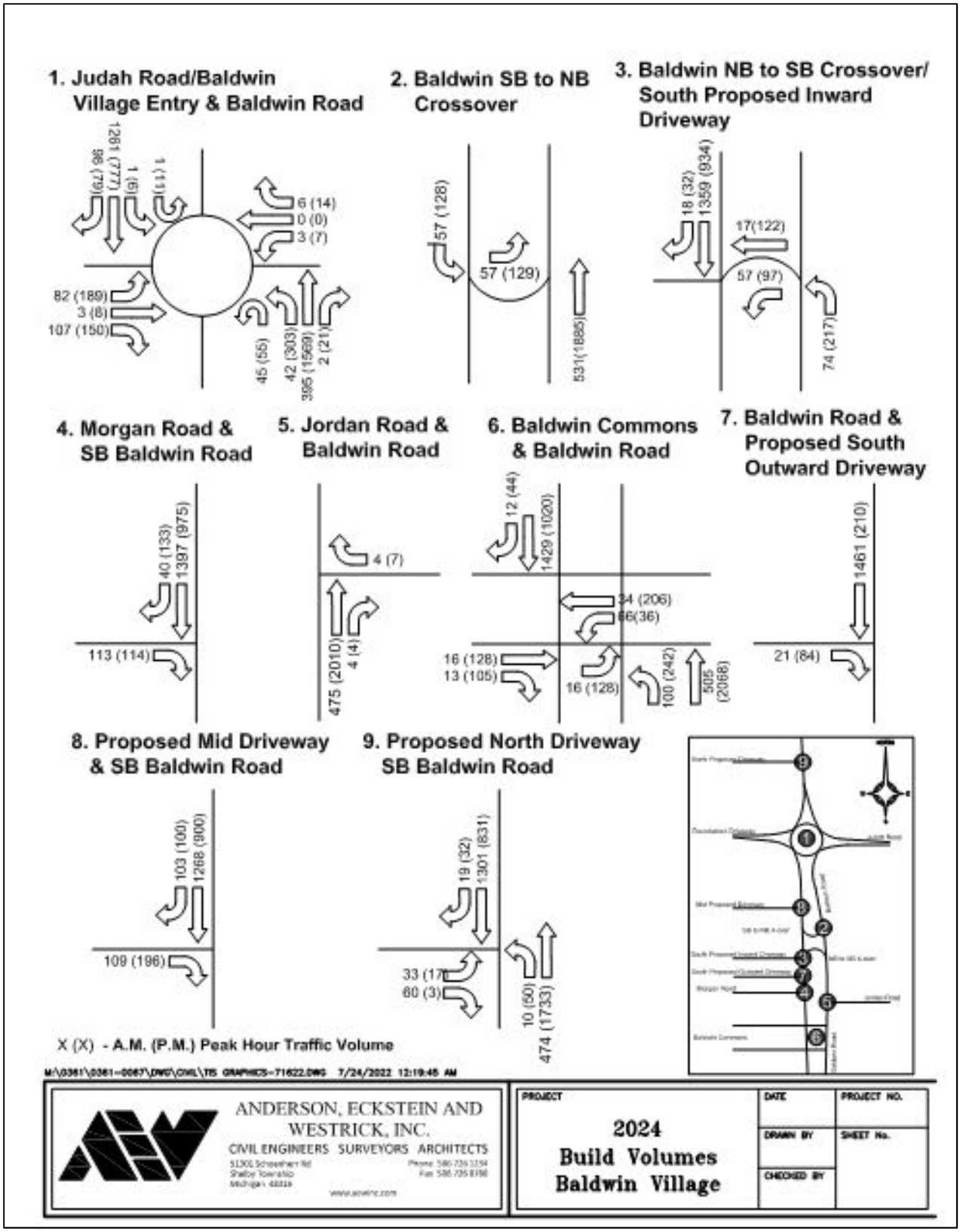

Figure 5.3 – 2024 Build Conditions Traffic Count

6.0 BUILD CONDITIONS

The build conditions were implemented in Synchro11 and simulated using SimTraffic11. The LOS was calculated and presented below in Table 6.1. **Table 6.1** also presents the background LOS for comparison. The full reports for the build conditions can be found in Appendix D – Build Condition Reports LOS & Queue Analysis. HCS2022 was utilized to calculate the LOS for the roundabout located at Baldwin Road and Judah Road, Synchro11 was utilized for the remaining study intersections.

Table 6.1 – Build Level of Service Peak Hour Analysis

Intersection	Approach	Lane Group	2024 Background (LOS)		2024 Build (LOS)	
			AM-Peak LOS/Delay	PM Peak LOS/Delay	AM-Peak LOS/Delay	PM Peak LOS/Delay
Baldwin Road & Judah Road Roundabout	Eastbound	Entry Lane	n/a	n/a	C/18.1	C/17.2
	Westbound	Entry Lane	A/3.6	A/9.8	A/4.4	C/21.6
	Northbound	Left Entry Lane	A/3.6	A/7.7	A/4.3	D/26.8
		Right Entry Lane	A/3.7	A/8.7	A/4.6	F/65.7
	Southbound	Left Entry Lane	A/6.4	A/4.9	A/8.5	A/9.1
		Right Entry Lane	A/7.1	A/5.2	A/9.7	B/10.2
	Intersection Overall		**A/6.0**	**A/7.1**	**A/8.0**	**C/22.7**
Southbound to Northbound Crossover Unsignalized	Eastbound	2-Left	Free Flow	C/15.0	B/10.1	D/27.2
	Northbound	3-Thru	Free Flow	Free Flow	Free Flow	Free Flow
	Intersection Overall		**Free Flow**	**A/0.0**	**A/0.3**	**A/1.7**
Northbound to Southbound Crossover/Baldwin Village Inward Driveway Unsignalized	Westbound	Left	B/14.2	B/11.7	C/18.6	B/14.5
		Thru/Left*	B/14.2	B/11.7	D30.5	E/43.9
	Southbound	2-Thru	Free Flow	Free Flow	Free Flow	Free Flow
		Right*	Free Flow	Free Flow	Free Flow	Free Flow
	Intersection Overall		**A/0.7**	**B/1.4**	**A/2.2**	**A/6.5**
Baldwin Road & Baldwin Village Outward South Driveway - Unsignalized	Eastbound	Right	n/a	n/a	C/18.4	C/15.7
	Southbound	2-Thru	n/a	n/a	Free Flow	Free Flow
	Intersection Overall				**A/1.0**	**A/1.8**
Baldwin Road & Baldwin Commons – West Side Signalized	Eastbound	Thru	D/51.6	D/52.2	D/51.2	D/51.7
		Right	D/50.5	C/48.3	D/50.5	D/46.2
	Westbound	Thru&Thru/Left	A/3.0	A/3.6	A/4.6	A/2.6
	Southbound	2-Thru	B/11.8	C/30.4	B/14.3	D/52.7
		Right	A/6.9	C/22.5	A/7.2	C/28.0
	Intersection Overall		**B/12.2**	**C/30.6**	**B/14.5**	**D/43.9**
Baldwin Road & Baldwin Commons – East Side Signalized	Eastbound	Left	A/2.3	A/2.2	A/2.4	A/5.9
	Northbound	2-Left	D/49.8	C/28.1	D/49.0	C/24.7
		3-Thru	A/2.2	B/14.8	A/2.2	6.3
	Intersection Overall		**B/10.8**	**B/14.7**	**A/9.9**	**A/8.1**
Jordan Road & Baldwin Road Unsignalized	Westbound	Right	A/9.1	A/9.0	A/9.2	A9.1
	Northbound	2-Thru&Thru/Right	Free Flow	Free Flow	Free Flow	Free Flow
	Intersection Overall		**A/0.1**	**A/0.1**	**A/0.4**	**A/0.1**
Morgan Road & Baldwin Road Unsignalized	Eastbound	Right	C/16.6	A/0.1	C/21.6	C/16.3
	Southbound	Thru&Thru/Right	Free Flow	B/11.9	Free Flow	Free Flow
	Intersection Overall		**A/1.2**	**A/0.6**	**A/1.6**	**A/1.5**
Baldwin Village North Driveway & Baldwin Road Unsignalized	Eastbound	Left/Right	n/a	n/a	C/26.1	C/24.1
	Northbound	Left	n/a	n/a	B/12.9	C/16.2
		2-Thru	n/a	n/a	Free Flow	Free Flow
	Southbound	Thru&Thru/Right	n/a	n/a	Free Flow	Free Flow
	Intersection Overall				**A/0.4**	**A/0.6**
Baldwin Village Mid Driveway & Baldwin Road Unsignalized	Eastbound	Right	**n/a**	**n/a**	C/21.0	C/18.2
	Southbound	Thru&Thru/Right	**n/a**	**n/a**	Free Flow	Free Flow
	Intersection Overall				**A/1.5**	**A/3.1**

*Includes build movement

The results of the build analysis indicate that most of the study intersections overall and intersection movement levels of service currently operate at a LOS D or better with a few exceptions operating at unacceptable LOS as shown in **Table 6.1**. The following intersections/intersection movements operate at a LOS E or F:

- PM Peak: Baldwin Road & Judah Road; Northbound Right Entry Lane
- PM Peak: Northbound to Southbound Crossover/Baldwin Village Inward South Driveway; Westbound Thru/Left

7.0 QUEUE ANALYSIS

A queueing analysis was conducted to determine the 95th percentile queues at the study area intersections to determine the impacts generated due to the proposed development to the study intersections. SimTraffic11 was utilized to simulate 5 runs of the peak hours, which were evaluated to give the most accurate queue length. **Table 7.1** – Queueing Analyses presents the queueing results.

Table 7.1 – Existing, Background and Build Queue Length Peak Hour Analysis

Intersection	Approach	Movement	2021 Existing Condition		2024 Background Condition		2024 Build Condition	
			AM - Peak Queue Length (ft)	PM - Peak Queue Length (ft)	AM - Peak Queue Length (ft)	PM - Peak Queue Length (ft)	AM - Peak Queue Length (ft)	PM - Peak Queue Length (ft)
Baldwin Road & Judah Road Roundabout	Eastbound	Left/Thru/Right					73	157
	Westbound	Left/Thru/Right	11	30	16	26	14	33
	Northbound	U-Turn/Left/Thru	-	93	9	92	25	218
		Thru/Right	-	97	-	88	-	231
	Southbound	U-Turn/Left/Thru	19	16	37	16	115	106
		Thru	13	-	30	4	97	73
SB to NB Baldwin X-Over Unsignalized	Eastbound	Left	-	4	-	7	28	68
		Left	-	-	-	-	8	70
	Southbound	Left	-	-	-	-	-	183
		Thru	-	-	-	-	-	168
		Thru	-	-	-	-	-	143
Baldwin Road & Baldwin Village Outward Driveway - Unsignalized	Eastbound	Right					74	74
	Southbound	Thru					-	-
		Thru					-	-
NB to SB Baldwin X-Over/Baldwin Village Inward Driveway Unsignalized	Westbound	Left	40	38	40	40	47	58
		Left/Thru	28	45	33	49	59	112
	Southbound	Thru	-	-	-	-	9	-
		Thru/Right	-	-	-	-	3	6
	Northbound	Left	-	-	-	-	6	73
		Thru	-	-	-	-	-	4
		Thru	-	-	-	-	-	9
Baldwin Road & Baldwin Commons – East Side Signalized	Eastbound	Left	6	19	4	37	4	58
	Northbound	Left	143	213	135	210	135	235
		Left	45	159	36	159	49	224
		Thru	89	334	91	325	105	360
		Thru	27	241	30	294	47	315
		Thru	9	181	11	332	11	329
Baldwin Road & Baldwin Commons – West Side Signalized	Eastbound	Thru	44	251	44	270	46	281
		Right	18	73	20	51	22	71
	Westbound	Left/Thru	9	25	8	32	-	41
		Thru	-	9	-	11	-	22
	Southbound	Thru	244	282	251	265	302	276
		Thru	259	295	266	275	326	291
		Right	38	105	49	109	86	82
Jordan Road & Baldwin Road - Unsignalized	Westbound	Right	13	14	13	15	18	14
	Northbound	Thru/Right	-	7	-	7	-	10
Morgan Road & Baldwin Road Unsignalized	Eastbound	Right	74	46	65	42	78	43
	Southbound	Thru	-	-	-	-	-	44
		Thru/Right	-	-	-	-	-	-
Baldwin Road & Baldwin Village North Driveway Unsignalized	Eastbound	Left/Right					54	41
	Northbound	Left					17	39
		Thru					-	-
		Thru					-	-
	Southbound	Thru					-	-
		Thru/Right					15	3
Baldwin Road & Baldwin Village Mid Driveway Unsignalized	Eastbound	Right					57	71
	Southbound	Thru					7	14
		Thru/Right					6	9

8.0 CRASH ANALYSIS

A crash analysis was conducted throughout the roadway network. Five years of crash data was collected and reviewed (2017-2021). Traffic crash reports and summaries were obtained from the Transportation Improvement Association's Traffic Crash Analysis Tool (TCAT) website. A summary of crashes by type is provided in **Table 8.1**, copies of crash report summaries can be found in Appendix E.

Table 8.1 - Crash Type Summary

Intersection	Crash Type	Crashes	% of Total	KAB Crashes	%KAB
Baldwin Road & Judah Road	Single	5	28%	0	0%
	Head-on	0	0%	0	0%
	Angle	1	6%	0	0%
	Rear-end	3	16%	0	0%
	Sideswipe	9	50%	1	100%
	Back	0	0%	0	0%
	Other includes, Bike, Ped, Motorcycle	0	0%	0	0%
	Total	**18**	**100%**	**1**	**100%**
Baldwin Road & Baldwin Commons	Single	0	0%	0	0
	Head-on	1	10%	0	0
	Angle	0	0%	0	0
	Rear-end	6	60%	0	0
	Sideswipe	3	30%	0	0
	Back	0	0%	0	0
	Other includes, Bike, Ped, Motorcycle	0	0%	0	0
	Total	**10**	**100%**	**-**	**-**
Baldwin Road & Morgan Road	Single	1	13%	0	0
	Head-on	0	0%	0	0
	Angle	1	13%	0	0
	Rear-end	3	37%	0	0
	Sideswipe	3	37%	0	0
	Back	0	0%	0	0
	Other includes, Bike, Ped, Motorcycle	0	0%	0	0
	Total	**8**	**100%**	**-**	**-**
Baldwin Road & Jordan Road	Single	0	0%	0	0
	Head-on	0	0%	0	0
	Angle	0	0%	0	0
	Rear-end	4	50%	0	0
	Sideswipe	4	50%	0	0
	Back	0	0%	0	0
	Other includes, Bike, Ped, Motorcycle	0	0%	0	0
	Total	**8**	**100%**	**-**	**-**

Note: KAB Crashes are fatal and severe crashes as noted by the KABCO scale: K= fatal crash, A=incapacitating injury, B=non-incapacitating injury, C=possible injury, and O= no injury.

Within the last 5 years 44 crashes have occurred at the study intersections. Only 1 crash resulted in an injury, with 1 person being injured.

9.0 SIGNAL WARRANT

Traffic control signals should not be installed unless one or more of the signal warrants in the Michigan Manual on Uniform Traffic Control Devices (MMUTCD) are met. Information should be obtained by means of engineering studies and compared with the requirements set forth in the warrants. If the requirements are not met, traffic signals should not be put in operation. When a traffic control signal is indicated as being

warranted, it is presumed that the signal and all related traffic control devices and markings are installed according to the standards set forth in the MMUTCD. A signal warrant was conducted for the northbound to southbound crossover on Baldwin Road. The warrant was ran utilizing a 24-hour trip generation and the projected 24-hour traffic counts. An investigation of the need for a traffic signal included an analysis of the factors contained in nine warrants:

- Warrant 1: Eight-Hour Vehicular Volume
- Warrant 2: Four-Hour Vehicular Volume
- Warrant 3: Peak Hour
- Warrant 4: Pedestrian Volume
- Warrant 5: School Crossing
- Warrant 6: Coordinated Signal System
- Warrant 7: Crash Experience
- Warrant 8: Roadway Network
- Warrant 9: Intersection Near a Grade Crossing

A summary of the traffic signal warrant analysis is provided in **Table 9.1** and the complete analysis can be found in Appendix F. The analysis resulted in a signal being warranted at the intersection of Baldwin Village inward south driveway and Baldwin Road.

Table 9.1 – Traffic Signal Warrant Analysis Summary

Warrant		**Baldwin Rd & NB to SB X/O at Inward Drive**
		Warrant Met
Warrant 1: Eight-Hour Vehicular Volume	Condition A	NO
	Condition B	Yes
	Combination of A & B	N/A
Warrant 2: Four-Hour Vehicular Volume		Yes
Warrant 3: Peak Hour		Yes
Warrant 4: Pedestrian Volume		No
Warrant 5: School Crossing		N/A
Warrant 6: Coordinated Signal System		N/A
Warrant 7: Crash Experience		No
Warrant 8: Roadway Network		N/A
Warrant 9: Intersection Near a Grade Crossing		N/A

10.0 RIGHT TURN LANE/TAPER WARRANT

An analysis for a right-turn lane or taper requirement was conducted for the proposed drives located on Baldwin Road. The current speed limit on Baldwin Road is 45 miles per hour.

The Warrant for Right Turn Deceleration Lane published by Michigan Department of Transportation (MDOT) was utilized for this analysis. This analysis considers the peak hour directional traffic volumes and the peak hour right turns. Figure 10.1, below, shows the MDOT graph with the projected build volumes.

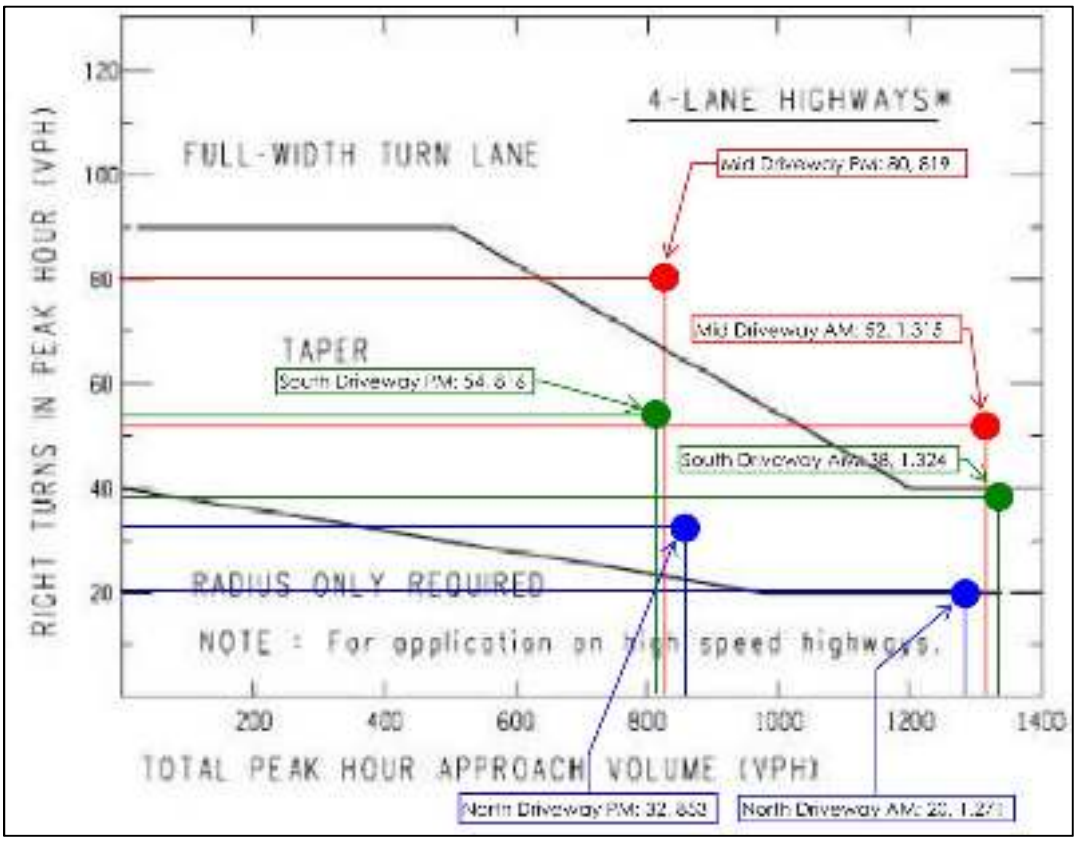

Figure 10.1 – Right-Turn Lane/Taper Analysis

The results of the analysis concluded that a full-width right-turn lane is warranted for the mid proposed driveway and a right-turn taper is warranted for the north and the south driveway.

11.0 CONCLUSION AND RECOMMENDATIONS

Traffic counts were taken on May 10, 2022 to obtain the existing conditions of the study site. The existing conditions were simulated in Synchro11 and the level of service was calculated. The existing conditions concluded that all the study intersections have an acceptable level of service.

The background data was calculated by applying a 1.8% (0.9% per year) growth rate to project the traffic volumes to the build year of 2024.

The build data was simulated in Synchro11 and Simtraffic11 with the trip distributions based of the existing traffic patterns at Baldwin Road, Judah Road, Baldwin Commons, and Morgan Road. The build conditions resulted in a failed approach level of service in the PM peak at the northbound to southbound Baldwin Road crossover. The failing approach is the westbound thru/left movement entering the Baldwin Village inward south driveway. The PM peak at this approach resulted in a level of service "E" with a delay of 43.9 seconds.

A right-turn deceleration lane analysis was conducted utilizing MDOT's warrant published in "Geometric Design Guidance." The analysis resulted in a need for a full-width right turn lane for the proposed north driveway, and a right-turn taper for the proposed middle driveway and south driveway.

To reduce delay and provide an acceptable level of service at the northbound to southbound Baldwin Road crossover and the Baldwin Village inward south drive, it is recommended that a signal is installed at the intersection. The level of service with the mitigation recommendation can be found below in Table 11.1.

Table 11.1 – Build with Mitigation Level of Service

Intersection	Approach	Lane Group	2024 Build (LOS)		Mitigation Strategy
			AM-Peak LOS/Delay	PM Peak LOS/Delay	
Baldwin Road & Judah Road **Roundabout**	Eastbound	Entry Lane	C/18.1	C/17.2	No Mitigation Recommended
	Westbound	Entry Lane	A/4.4	C/21.6	
	Northbound	Left Entry Lane	A/4.3	D/26.8	
		Right Entry Lane	A/4.6	F/65.7	
	Southbound	Left Entry Lane	A/8.5	A/9.1	
		Right Entry Lane	A/9.7	B/10.2	
	Intersection Overall		**A/8.0**	**C/22.7**	
Southbound to Northbound Crossover **Unsignalized**	Eastbound	2-Left	B/10.1	D/27.2	No Mitigation Recommended
	Northbound	3-Thru	Free Flow	Free Flow	
	Intersection Overall		**A/0.3**	**A/1.7**	
Northbound to Southbound Crossover/Baldwin Village Inward Driveway **Unsignalized**	Westbound	Left	C/18.6	B/30.7	New Signal Installation
		Thru/Left*	D30.5	C/34.0	
	Southbound	2-Thru	Free Flow	Free Flow	
		Right*	Free Flow	Free Flow	
	Intersection Overall		**A/2.2**	**A/6.5**	
Baldwin Road & Baldwin Village Outward South Driveway - Unsignalized	Eastbound	Right	C/18.4	C/15.7	No Mitigation Recommended
	Southbound	2-Thru	Free Flow	Free Flow	
	Intersection Overall		**A/1.0**	**A/1.8**	
Baldwin Road & Baldwin Commons – West Side **Signalized**	Eastbound	Thru	D/51.2	D/51.7	No Mitigation Recommended
		Right	D/50.5	D/46.2	
	Westbound	Thru&Thru/Left	A/4.6	A/2.6	
	Southbound	2-Thru	B/14.3	D/52.7	
		Right	A/7.2	C/28.0	
	Intersection Overall		**B/14.5**	**D/43.9**	
Baldwin Road & Baldwin Commons – East Side **Signalized**	Eastbound	Left	A/2.4	A/5.9	No Mitigation Recommended
	Northbound	2-Left	D/49.0	C/24.7	
		3-Thru	A/2.2	6.3	
	Intersection Overall		**A/9.9**	**A/8.1**	
Jordan Road & Baldwin Road **Unsignalized**	Westbound	Right	A/9.2	A9.1	No Mitigation Recommended
	Northbound	2-Thru&Thru/Right	Free Flow	Free Flow	
	Intersection Overall		**A/0.4**	**A/0.1**	
Morgan Road & Baldwin Road **Unsignalized**	Eastbound	Right	C/21.6	C/16.3	No Mitigation Recommended
	Southbound	Thru&Thru/Right	Free Flow	Free Flow	
	Intersection Overall		**A/1.6**	**A/1.5**	
Baldwin Village North Driveway & Baldwin Road **Unsignalized**	Eastbound	Left/Right	C/26.1	C/24.1	No Mitigation Recommended
	Northbound	Left	B/12.9	C/16.2	
		2-Thru	Free Flow	Free Flow	
	Southbound	Thru&Thru/Right	Free Flow	Free Flow	
	Intersection Overall		**A/0.4**	**A/0.6**	
Baldwin Village Mid Driveway & Baldwin Road **Unsignalized**	Eastbound	Right	C/21.0	C/20.2	No Mitigation Recommended
	Southbound	Thru&Thru/Right	Free Flow	Free Flow	
	Intersection Overall		**A/1.5**	**A/3.1**	

APPENDIX A - EXISTING DATA COLLECTED

Project: Lake Orion Twp. Traffic Impact Study
Corridor: Baldwin Road
Weather: Sunny, Dry Temp. 70's
Video VCU ID#: SCU8EY SW, SCU5RA NW & SCU5DV NE

Traffic Data Collection, LLC
7504 Sawgrass Drive
www.tdccounts.com
Washington, Michigan, United States 48094
Ph. (586) 786-5407
Reliable Traffic Data

Count Name: TMC_1 Judah & Baldwin Roundabout_5-10-22
Site Code: TMC_1
Traffic Data Collection, LLC
Start Date: 05/10/2022

Turning Movement Data

Start Time	Baldwin Road Southbound						Judah Road Westbound						Baldwin Road Northbound						Field Driveway Eastbound						Int. Total
	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	
7:00 AM	0	226	1	1	0	228	1	0	2	0	0	3	0	54	0	1	0	55	0	0	0	0	0	0	286
7:15 AM	0	290	0	0	0	290	2	0	1	0	1	3	0	60	0	0	0	60	0	0	0	0	0	0	353
7:30 AM	0	292	0	0	0	292	3	0	2	0	0	5	2	80	0	0	0	82	0	0	0	0	0	0	379
7:45 AM	0	289	1	0	0	290	1	0	0	0	0	1	0	80	0	1	0	81	0	0	0	0	0	0	372
Hourly Total	0	1097	2	1	0	1100	7	0	5	0	1	12	2	274	0	2	0	278	0	0	0	0	0	0	1390
8:00 AM	0	229	0	1	0	230	0	0	0	0	0	0	0	102	0	0	0	102	0	0	0	0	0	0	332
8:15 AM	0	232	0	0	0	232	1	0	0	0	0	1	3	115	0	0	0	118	0	0	0	0	0	0	351
8:30 AM	0	218	0	1	0	219	4	1	2	0	0	7	1	104	0	0	0	105	0	0	1	0	0	1	332
8:45 AM	0	191	1	1	0	193	0	0	1	0	0	1	2	105	0	0	0	107	0	0	0	0	0	0	301
Hourly Total	0	870	1	3	0	874	5	1	3	0	0	9	6	426	0	0	0	432	0	0	1	0	0	1	1316
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4:00 PM	0	171	2	1	0	174	3	0	0	0	2	3	6	265	0	0	0	271	0	0	1	0	0	1	449
4:15 PM	0	157	0	2	0	159	5	0	4	0	0	9	2	295	0	0	1	297	0	0	1	0	0	1	466
4:30 PM	0	155	1	1	0	157	3	0	3	0	0	6	0	278	0	0	0	278	0	0	1	0	0	1	442
4:45 PM	0	143	0	4	0	147	6	0	1	0	0	7	5	312	0	0	2	317	0	0	2	0	0	2	473
Hourly Total	0	626	3	8	0	637	17	0	8	0	2	25	13	1150	0	0	3	1163	0	0	5	0	0	5	1830
5:00 PM	0	187	1	3	0	191	3	0	2	0	1	5	4	334	0	0	0	338	0	0	1	0	0	1	535
5:15 PM	0	171	3	2	0	176	2	1	3	0	3	6	4	355	0	0	0	359	0	0	1	0	0	1	542
5:30 PM	0	185	2	2	0	189	3	1	1	0	1	5	3	288	0	0	0	291	0	0	0	0	0	0	485
5:45 PM	0	142	3	0	0	145	4	0	8	0	5	12	2	285	0	2	0	289	0	0	0	0	0	0	446
Hourly Total	0	685	9	7	0	701	12	2	14	0	10	28	13	1262	0	2	0	1277	0	0	2	0	0	2	2008
Grand Total	0	3278	15	19	0	3312	41	3	30	0	13	74	34	3112	0	4	3	3150	0	0	8	0	0	8	6544
Approach %	0.0	99.0	0.5	0.6	-	-	55.4	4.1	40.5	0.0	-	-	1.1	98.8	0.0	0.1	-	-	0.0	0.0	100.0	0.0	-	-	-
Total %	0.0	50.1	0.2	0.3	-	50.6	0.6	0.0	0.5	0.0	-	1.1	0.5	47.6	0.0	0.1	-	48.1	0.0	0.0	0.1	0.0	-	0.1	-
Lights	0	3208	13	19	-	3240	39	3	29	0	-	71	32	3061	0	4	-	3097	0	0	8	0	-	8	6416
% Lights	-	97.9	86.7	100.0	-	97.8	95.1	100.0	96.7	-	-	95.9	94.1	98.4	-	100.0	-	98.3	-	-	100.0	-	-	100.0	98.0
Buses	0	8	0	0	-	8	0	0	0	0	-	0	0	5	0	0	-	5	0	0	0	0	-	0	13
% Buses	-	0.2	0.0	0.0	-	0.2	0.0	0.0	0.0	-	-	0.0	0.0	0.2	-	0.0	-	0.2	-	-	0.0	-	-	0.0	0.2
Single-Unit Trucks	0	46	1	0	-	47	2	0	1	0	-	3	2	34	0	0	-	36	0	0	0	0	-	0	86
% Single-Unit Trucks	-	1.4	6.7	0.0	-	1.4	4.9	0.0	3.3	-	-	4.1	5.9	1.1	-	0.0	-	1.1	-	-	0.0	-	-	0.0	1.3
Articulated Trucks	0	16	1	0	-	17	0	0	0	0	-	0	0	12	0	0	-	12	0	0	0	0	-	0	29
% Articulated Trucks	-	0.5	6.7	0.0	-	0.5	0.0	0.0	0.0	-	-	0.0	0.0	0.4	-	0.0	-	0.4	-	-	0.0	-	-	0.0	0.4
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Bicycles on Road	-	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	-	0.0	-	0.0	-	-	0.0	-	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	3	-	-	-	-	-	3	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	23.1	-	-	-	-	-	100.0	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	-	0	-	-	-	-	-	10	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	76.9	-	-	-	-	-	0.0	-	-	-	-	-	-	-	-

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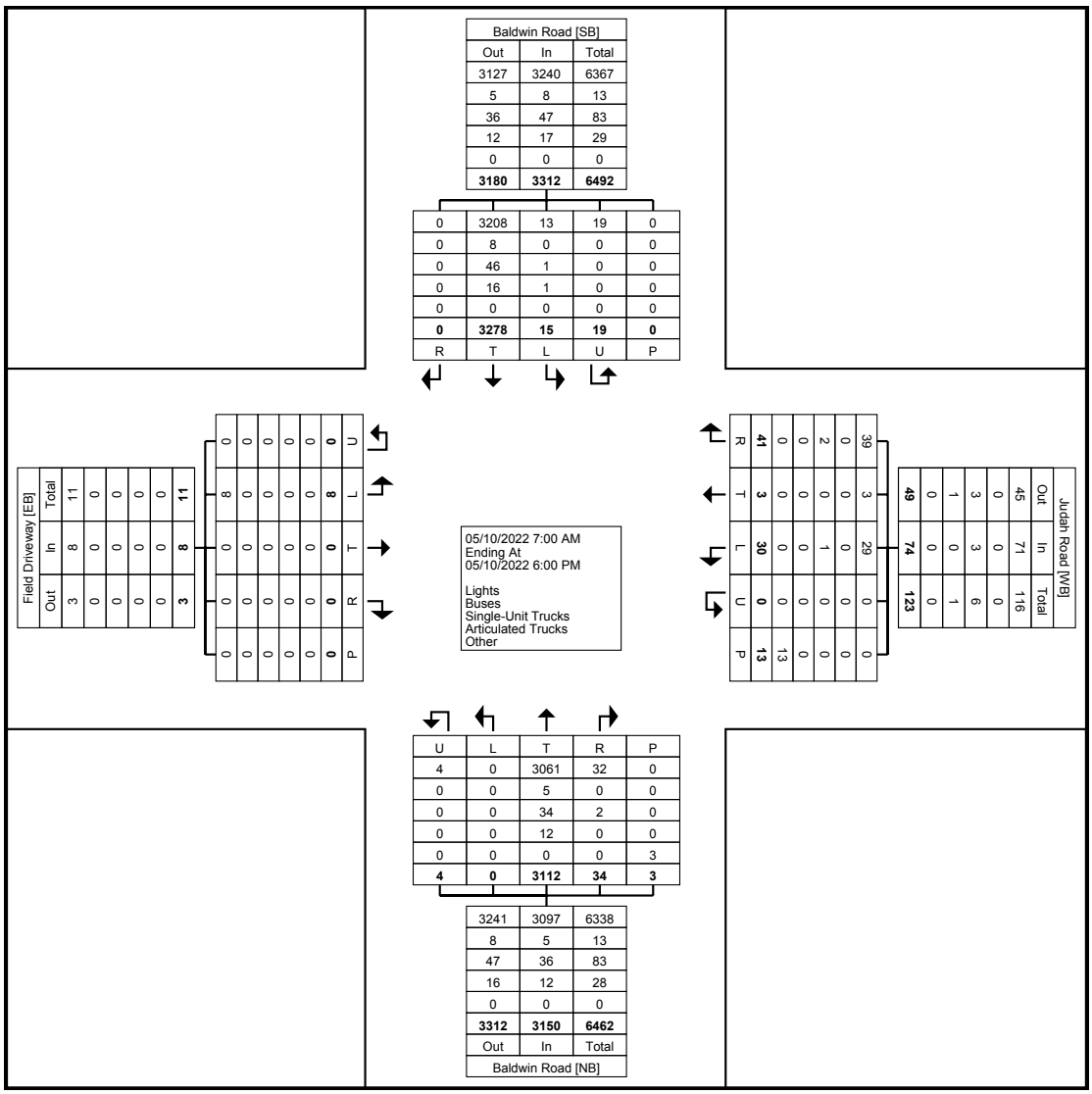

Turning Movement Data Plot

Project: Lake Orion Twp.
Traffic Impact Study
Corridor: Baldwin Road
Weather: Sunny, Dry Temp. 70's
Video VCU ID#: SCU8EY SW, SCU5RA NW & SCU5DV NE

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Washington, Michigan, United States 48094
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Reliable Traffic Data

Approach Data

Start Time	Sb Street Southbound						Wb Street Westbound						Nb Street Northbound						Eb Street Eastbound					
	Peds CCW	Peds CW	Circulating	Out	In	Next	Peds CCW	Peds CW	Circulating	Out	In	Next	Peds CCW	Peds CW	Circulating	Out	In	Next	Peds CCW	Peds CW	Circulating	Out	In	Next
7:00 AM	0	0	3	56	227	0	0	0	56	1	3	2	0	0	2	229	55	54	0	0	230	0	0	0
7:15 AM	0	0	1	63	289	0	1	0	62	0	3	1	0	0	0	292	62	60	0	0	290	0	0	0
7:30 AM	0	0	2	83	292	0	0	0	81	2	5	2	0	0	1	295	83	80	0	0	294	0	0	0
7:45 AM	0	0	1	83	289	0	0	0	82	1	1	0	0	0	1	290	82	80	0	0	290	0	0	0
Hourly Total	0	0	7	285	1097	0	1	0	281	4	12	5	0	0	4	1106	282	274	0	0	1104	0	0	0
8:00 AM	0	0	0	104	230	0	0	0	101	0	0	0	0	0	0	228	101	102	0	0	230	0	0	0
8:15 AM	0	0	1	116	233	0	0	0	116	3	1	0	0	0	0	233	119	115	0	0	233	0	0	0
8:30 AM	0	0	3	111	219	0	0	0	105	1	7	2	0	0	2	220	105	104	0	0	221	1	1	0
8:45 AM	0	0	1	107	193	0	0	0	107	2	1	1	0	0	1	192	108	105	0	0	194	0	0	0
Hourly Total	0	0	5	438	875	0	0	0	429	6	9	3	0	0	3	873	433	426	0	0	878	1	1	0
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4:00 PM	0	0	0	271	174	0	1	1	264	8	3	0	0	0	2	172	270	265	0	0	174	0	0	0
4:15 PM	0	0	5	308	160	0	0	0	291	3	8	4	0	1	2	162	293	295	0	0	164	0	0	0
4:30 PM	0	0	2	285	155	0	0	0	277	2	5	3	0	0	3	160	276	278	0	0	157	0	0	0
4:45 PM	0	0	1	331	147	0	0	0	306	6	7	1	0	2	2	144	310	312	0	0	148	0	0	0
Hourly Total	0	0	8	1195	636	0	1	1	1138	19	23	8	0	3	9	638	1149	1150	0	0	643	0	0	0
5:00 PM	0	0	2	345	192	0	1	0	333	6	4	2	0	0	4	189	335	334	0	0	194	0	0	0
5:15 PM	0	0	4	362	177	0	1	2	353	7	6	3	0	0	5	175	356	355	0	0	181	1	0	0
5:30 PM	0	0	2	294	191	0	0	1	289	4	5	1	0	0	2	184	291	288	0	0	193	0	0	0
5:45 PM	0	0	10	289	145	0	3	2	288	5	12	8	0	0	3	152	290	285	0	0	156	0	0	0
Hourly Total	0	0	18	1290	705	0	5	5	1263	22	27	14	0	0	14	700	1272	1262	0	0	724	1	0	0
Grand Total	0	0	38	3208	3313	0	7	6	3111	51	71	30	0	3	30	3317	3136	3112	0	0	3349	2	1	0
Approach %	-	-	0.6	48.9	50.5	0.0	-	-	95.3	1.6	2.2	0.9	-	-	0.3	34.6	32.7	32.4	-	-	99.9	0.1	0.0	0.0
Total %	-	-	0.2	14.1	14.6	0.0	-	-	13.7	0.2	0.3	0.1	-	-	0.1	14.6	13.8	13.7	-	-	14.7	0.0	0.0	0.0
Lights	-	-	37	3152	3238	0	-	-	3052	48	68	29	-	-	29	3242	3075	3061	-	-	3273	2	1	0
% Lights	-	-	97.4	98.3	97.7	-	-	-	98.1	94.1	95.8	96.7	-	-	96.7	97.7	98.1	98.4	-	-	97.7	100.0	100.0	-
Buses	-	-	0	5	8	0	-	-	5	0	0	0	-	-	0	8	5	5	-	-	8	0	0	0
% Buses	-	-	0.0	0.2	0.2	-	-	-	0.2	0.0	0.0	0.0	-	-	0.0	0.2	0.2	0.2	-	-	0.2	0.0	0.0	-
Single-Unit Trucks	-	-	1	36	47	0	-	-	40	3	3	1	-	-	1	53	42	34	-	-	48	0	0	0
% Single-Unit Trucks	-	-	2.6	1.1	1.4	-	-	-	1.3	5.9	4.2	3.3	-	-	3.3	1.6	1.3	1.1	-	-	1.4	0.0	0.0	-
Articulated Trucks	-	-	0	15	20	0	-	-	14	0	0	0	-	-	0	14	14	12	-	-	20	0	0	0
% Articulated Trucks	-	-	0.0	0.5	0.6	-	-	-	0.5	0.0	0.0	0.0	-	-	0.0	0.4	0.4	0.4	-	-	0.6	0.0	0.0	-
Bicycles on Road	-	-	0	0	0	0	-	-	0	0	0	0	-	-	0	0	0	0	-	-	0	0	0	0
% Bicycles on Road	-	-	0.0	0.0	0.0	-	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	-
Bicycles on Crosswalk	0	0	-	-	-	-	3	0	-	-	-	-	0	3	-	-	-	-	0	0	-	-	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	42.9	0.0	-	-	-	-	-	100.0	-	-	-	-	-	-	-	-	-	-
Pedestrians	0	0	-	-	-	-	4	6	-	-	-	-	0	0	-	-	-	-	0	0	-	-	-	-
% Pedestrians	-	-	-	-	-	-	57.1	100.0	-	-	-	-	-	0.0	-	-	-	-	-	-	-	-	-	-

Project: Lake Orion Twp.
Traffic Impact Study
Corridor: Baldwin Road
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Reliable Traffic Data

Count Name: TMC_1 Judah & Baldwin Roundabout_5-10-22
Site Code: TMC_1
Traffic Data Collection, LLC
Start Date: 05/10/2022

Turning Movement Peak Hour Data (7:15 AM)

Start Time	Baldwin Road Southbound						Judah Road Westbound						Baldwin Road Northbound						Field Driveway Eastbound						Int. Total
	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	
7:15 AM	0	290	0	0	0	290	2	0	1	0	1	3	0	60	0	0	0	60	0	0	0	0	0	0	353
7:30 AM	0	292	0	0	0	292	3	0	2	0	0	5	2	80	0	0	0	82	0	0	0	0	0	0	379
7:45 AM	0	289	1	0	0	290	1	0	0	0	0	1	0	80	0	1	0	81	0	0	0	0	0	0	372
8:00 AM	0	229	0	1	0	230	0	0	0	0	0	0	0	102	0	0	0	102	0	0	0	0	0	0	332
Total	0	1100	1	1	0	1102	6	0	3	0	1	9	2	322	0	1	0	325	0	0	0	0	0	0	1436
Approach %	0.0	99.8	0.1	0.1	-	-	66.7	0.0	33.3	0.0	-	-	0.6	99.1	0.0	0.3	-	-	0.0	0.0	0.0	0.0	-	-	-
Total %	0.0	76.6	0.1	0.1	-	76.7	0.4	0.0	0.2	0.0	-	0.6	0.1	22.4	0.0	0.1	-	22.6	0.0	0.0	0.0	0.0	-	0.0	-
PHF	0.000	0.942	0.250	0.250	-	0.943	0.500	0.000	0.375	0.000	-	0.450	0.250	0.789	0.000	0.250	-	0.797	0.000	0.000	0.000	0.000	-	0.000	0.947
Lights	0	1080	1	1	-	1082	6	0	3	0	-	9	2	303	0	1	-	306	0	0	0	0	-	0	1397
% Lights	-	98.2	100.0	100.0	-	98.2	100.0	-	100.0	-	-	100.0	100.0	94.1	-	100.0	-	94.2	-	-	-	-	-	-	97.3
Buses	0	1	0	0	-	1	0	0	0	0	-	0	0	2	0	0	-	2	0	0	0	0	-	0	3
% Buses	-	0.1	0.0	0.0	-	0.1	0.0	-	0.0	-	-	0.0	0.0	0.6	-	0.0	-	0.6	-	-	-	-	-	-	0.2
Single-Unit Trucks	0	13	0	0	-	13	0	0	0	0	-	0	0	15	0	0	-	15	0	0	0	0	-	0	28
% Single-Unit Trucks	-	1.2	0.0	0.0	-	1.2	0.0	-	0.0	-	-	0.0	0.0	4.7	-	0.0	-	4.6	-	-	-	-	-	-	1.9
Articulated Trucks	0	6	0	0	-	6	0	0	0	0	-	0	0	2	0	0	-	2	0	0	0	0	-	0	8
% Articulated Trucks	-	0.5	0.0	0.0	-	0.5	0.0	-	0.0	-	-	0.0	0.0	0.6	-	0.0	-	0.6	-	-	-	-	-	-	0.6
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Bicycles on Road	-	0.0	0.0	0.0	-	0.0	0.0	-	0.0	-	-	0.0	0.0	0.0	-	0.0	-	0.0	-	-	-	-	-	-	0.0
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	-	0	-	-	-	-	-	1	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	100.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Traffic Data Collection, LLC
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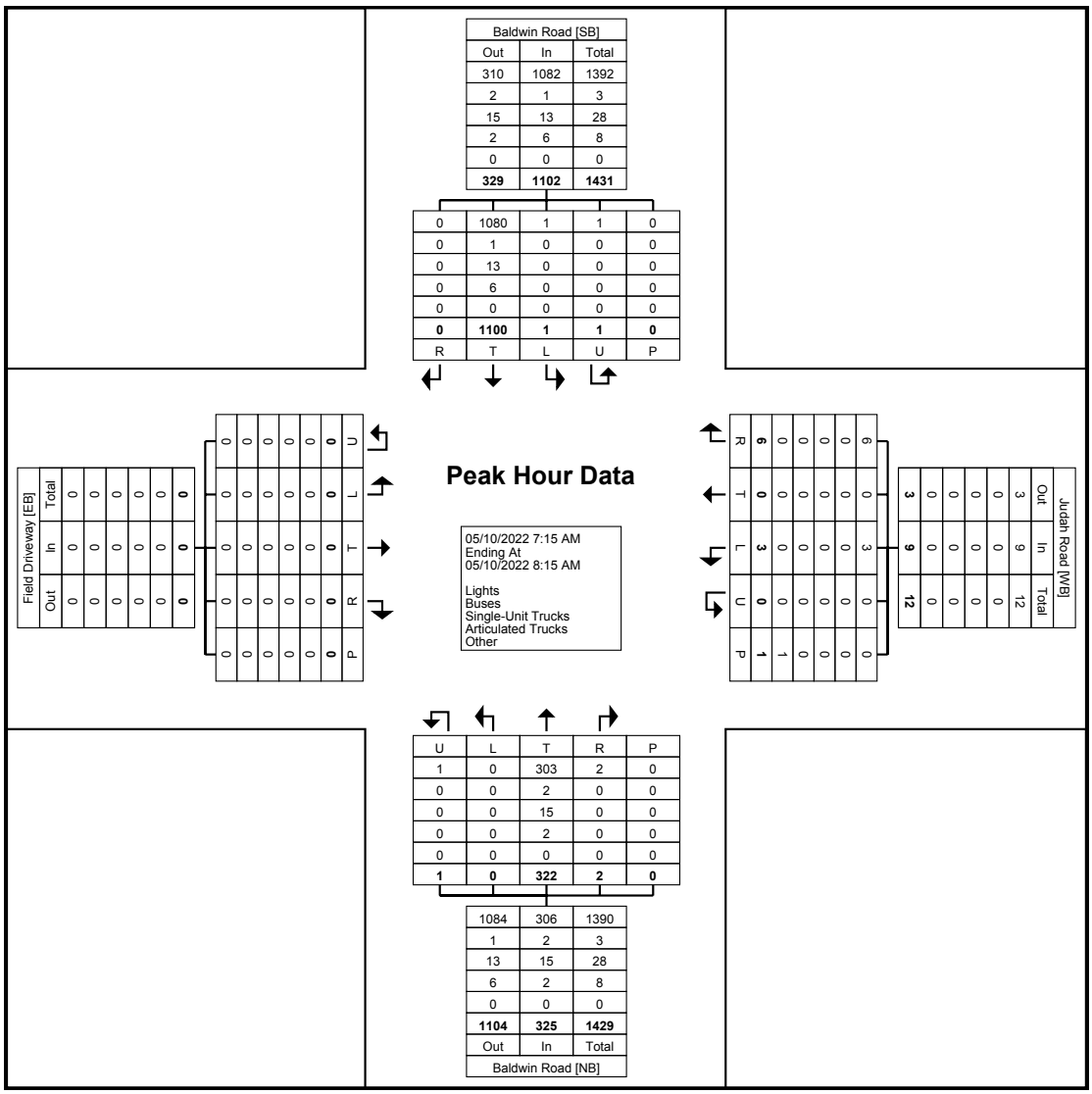

Turning Movement Peak Hour Data Plot (7:15 AM)

Project: Lake Orion Twp.
Traffic Impact Study
Corridor: Baldwin Road
Weather: Sunny, Dry Temp. 70's
Video VCU ID#: SCU8EY SW, SCU5RA NW & SCU5DV NE

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Ph. (586) 786-5407
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Count Name: TMC_1 Judah & Baldwin Roundabout_5-10-22
Site Code: TMC_1
Traffic Data Collection, LLC
Start Date: 05/10/2022

Turning Movement Peak Hour Data (4:45 PM)

Start Time	Baldwin Road Southbound						Judah Road Westbound						Baldwin Road Northbound						Field Driveway Eastbound						Int. Total
	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	
4:45 PM	0	143	0	4	0	147	6	0	1	0	0	7	5	312	0	0	2	317	0	0	2	0	0	2	473
5:00 PM	0	187	1	3	0	191	3	0	2	0	1	5	4	334	0	0	0	338	0	0	1	0	0	1	535
5:15 PM	0	171	3	2	0	176	2	1	3	0	3	6	4	355	0	0	0	359	0	0	1	0	0	1	542
5:30 PM	0	185	2	2	0	189	3	1	1	0	1	5	3	288	0	0	0	291	0	0	0	0	0	0	485
Total	0	686	6	11	0	703	14	2	7	0	5	23	16	1289	0	0	2	1305	0	0	4	0	0	4	2035
Approach %	0.0	97.6	0.9	1.6	-	-	60.9	8.7	30.4	0.0	-	-	1.2	98.8	0.0	0.0	-	-	0.0	0.0	100.0	0.0	-	-	-
Total %	0.0	33.7	0.3	0.5	-	34.5	0.7	0.1	0.3	0.0	-	1.1	0.8	63.3	0.0	0.0	-	64.1	0.0	0.0	0.2	0.0	-	0.2	-
PHF	0.000	0.917	0.500	0.688	-	0.920	0.583	0.500	0.583	0.000	-	0.821	0.800	0.908	0.000	0.000	-	0.909	0.000	0.000	0.500	0.000	-	0.500	0.939
Lights	0	667	6	11	-	684	14	2	7	0	-	23	16	1281	0	0	-	1297	0	0	4	0	-	4	2008
% Lights	-	97.2	100.0	100.0	-	97.3	100.0	100.0	100.0	-	-	100.0	100.0	99.4	-	-	-	99.4	-	-	100.0	-	-	100.0	98.7
Buses	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Buses	-	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	-	-	-	0.0	-	-	0.0	-	-	0.0	0.0
Single-Unit Trucks	0	16	0	0	-	16	0	0	0	0	-	0	0	5	0	0	-	5	0	0	0	0	-	0	21
% Single-Unit Trucks	-	2.3	0.0	0.0	-	2.3	0.0	0.0	0.0	-	-	0.0	0.0	0.4	-	-	-	0.4	-	-	0.0	-	-	0.0	1.0
Articulated Trucks	0	3	0	0	-	3	0	0	0	0	-	0	0	3	0	0	-	3	0	0	0	0	-	0	6
% Articulated Trucks	-	0.4	0.0	0.0	-	0.4	0.0	0.0	0.0	-	-	0.0	0.0	0.2	-	-	-	0.2	-	-	0.0	-	-	0.0	0.3
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Bicycles on Road	-	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	-	-	-	0.0	-	-	0.0	-	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	1	-	-	-	-	-	2	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	20.0	-	-	-	-	-	100.0	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	-	0	-	-	-	-	-	4	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	80.0	-	-	-	-	-	0.0	-	-	-	-	-	-	-	-

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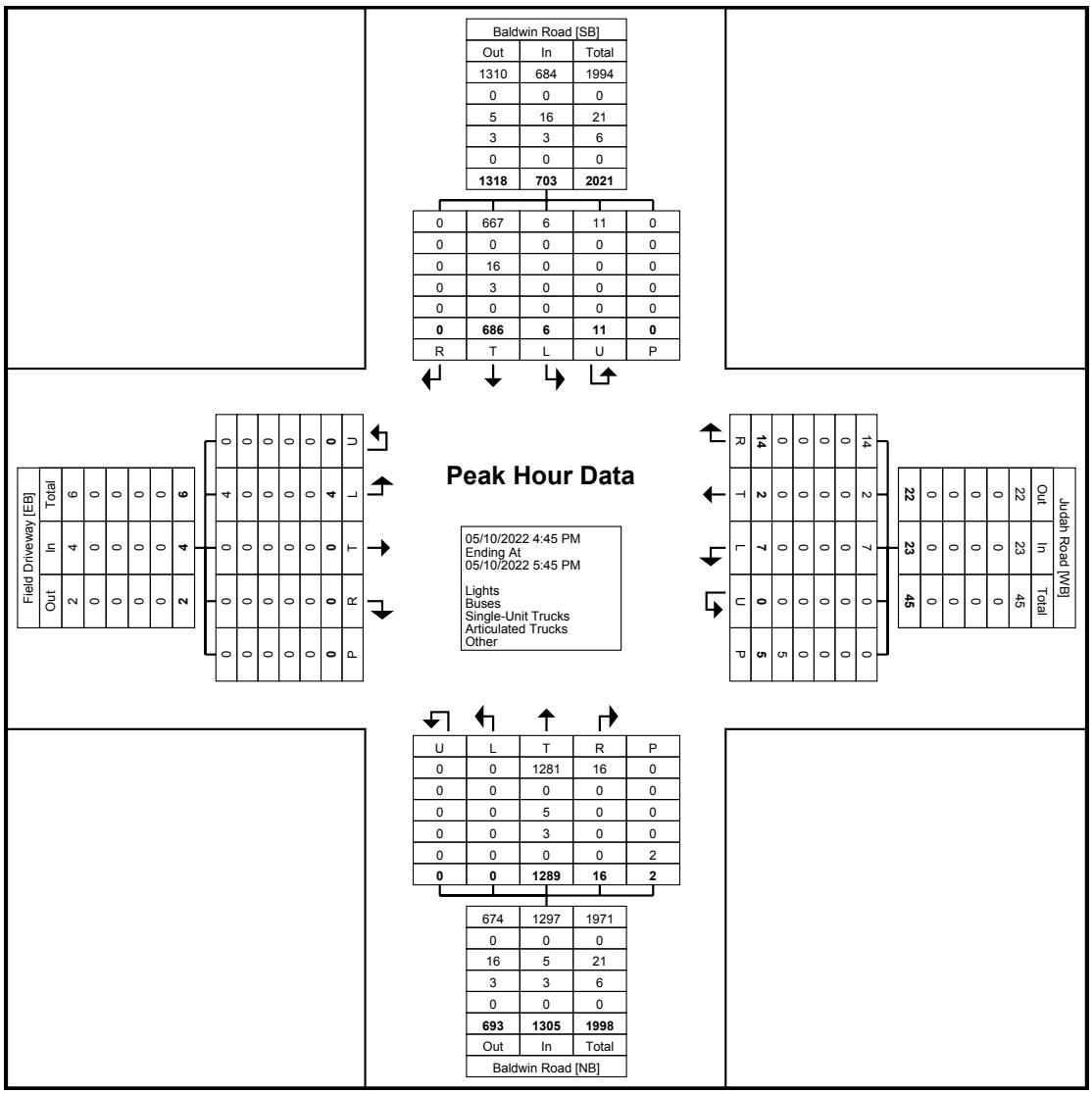

Turning Movement Peak Hour Data Plot (4:45 PM)

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TDC Traffic Comments: 4 hour video multi-modal intersection vehicle classification turning movement count conducted during typical weekday (Tuesday) from 7:00-9:00 AM morning & 4:00-6:00 PM afternoon peak hours, while school was in session. Daily peak hour reports provided for morning & afternoon peak hour study periods.

TMC was performed with Miovision video VCU scout recording cameras for Kalama Wolf In Binden Sheep, Lake Orion Traffic Impact Study for AEW.
Roundabout yield controlled intersection. Push button HAWK ped. signals for SB & NB Baldwin legs. Baldwin Road is a divided roadway south of intersection. VCU cameras were located within SE, NW &NE intersection quadrants. All intersection shared video files have been uploaded to Miovision DataLink cloud platform.

Classification Summary Details & Percentages: Six (6) Groupings:
1) Lights Includes: FHWA Classes 1-3 (Motorcycles, Pick Up Trucks, Vans, Light Goods Vehicles)
2) Buses Includes: FHWA Class 4 (School Buses & Regional Transportation Metro Buses)
3) Single-Unit Trucks Includes: FHWA Classes 5-7 (2-4 Axle SU Medium Trucks)
4) Articulated Trucks Includes: FHWA Classes 8-12 (Heavy Trucks W/Single & Multi Unit Trailers)
5) Bicycles On Road Includes: All bicycles on the roadway
6) Bicycles On Crosswalk Includes: All bicycles using sidewalk
7) Pedestrians Includes: All pedestrians using crosswalk

TMC_1 Judah & Baldwin Roundabout_5-10-22 - TMC

Tue May 10, 2022
Full Length (7 AM-9 AM, 4 PM-6 PM)
All Classes (Lights, Single-Unit Trucks, Articulated Trucks, Buses, Pedestrians, Bicycles on Road, Bicycles on Crosswalk)
All Movements
ID: 948428, Location: 42.715226, -83.307533, Site Code: TMC_1 Traffic Data Collection, LLC

Provided by: Traffic Data Collection, LLC
7504 Sawgrass Drive, www.tdccounts.com,
Washington, MI, 48094, US

Leg	Baldwin Road						Judah Road						Baldwin Road						Field Driveway						
Direction	Southbound						Westbound						Northbound						Eastbound						
Time	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	Int
2022-05-10 7:00AM	0	226	1	1	**228**	0	1	0	2	0	**3**	0	0	54	0	1	**55**	0	0	0	0	0	**0**	0	**286**
7:15AM	0	290	0	0	**290**	0	2	0	1	0	**3**	1	0	60	0	0	**60**	0	0	0	0	0	**0**	0	**353**
7:30AM	0	292	0	0	**292**	0	3	0	2	0	**5**	0	2	80	0	0	**82**	0	0	0	0	0	**0**	0	**379**
7:45AM	0	289	1	0	**290**	0	1	0	0	0	**1**	0	0	80	0	1	**81**	0	0	0	0	0	**0**	0	**372**
Hourly Total	0	1097	2	1	**1100**	0	7	0	5	0	**12**	1	2	274	0	2	**278**	0	0	0	0	0	**0**	0	**1390**
8:00AM	0	229	0	1	**230**	0	0	0	0	0	**0**	0	0	102	0	0	**102**	0	0	0	0	0	**0**	0	**332**
8:15AM	0	232	0	0	**232**	0	1	0	0	0	**1**	0	3	115	0	0	**118**	0	0	0	0	0	**0**	0	**351**
8:30AM	0	218	0	1	**219**	0	4	1	2	0	**7**	0	1	104	0	0	**105**	0	0	0	1	0	**1**	0	**332**
8:45AM	0	191	1	1	**193**	0	0	0	1	0	**1**	0	2	105	0	0	**107**	0	0	0	0	0	**0**	0	**301**
Hourly Total	0	870	1	3	**874**	0	5	1	3	0	**9**	0	6	426	0	0	**432**	0	0	0	1	0	**1**	0	**1316**
4:00PM	0	171	2	1	**174**	0	3	0	0	0	**3**	2	6	265	0	0	**271**	0	0	0	1	0	**1**	0	**449**
4:15PM	0	157	0	2	**159**	0	5	0	4	0	**9**	0	2	295	0	0	**297**	1	0	0	1	0	**1**	0	**466**
4:30PM	0	155	1	1	**157**	0	3	0	3	0	**6**	0	0	278	0	0	**278**	0	0	0	1	0	**1**	0	**442**
4:45PM	0	143	0	4	**147**	0	6	0	1	0	**7**	0	5	312	0	0	**317**	2	0	0	2	0	**2**	0	**473**
Hourly Total	0	626	3	8	**637**	0	17	0	8	0	**25**	2	13	1150	0	0	**1163**	3	0	0	5	0	**5**	0	**1830**
5:00PM	0	187	1	3	**191**	0	3	0	2	0	**5**	1	4	334	0	0	**338**	0	0	0	1	0	**1**	0	**535**
5:15PM	0	171	3	2	**176**	0	2	1	3	0	**6**	3	4	355	0	0	**359**	0	0	0	1	0	**1**	0	**542**
5:30PM	0	185	2	2	**189**	0	3	1	1	0	**5**	1	3	288	0	0	**291**	0	0	0	0	0	**0**	0	**485**
5:45PM	0	142	3	0	**145**	0	4	0	8	0	**12**	5	2	285	0	2	**289**	0	0	0	0	0	**0**	0	**446**
Hourly Total	0	685	9	7	**701**	0	12	2	14	0	**28**	10	13	1262	0	2	**1277**	0	0	0	2	0	**2**	0	**2008**
Total	0	3278	15	19	**3312**	0	41	3	30	0	**74**	13	34	3112	0	4	**3150**	3	0	0	8	0	**8**	0	**6544**
% Approach	0%	99.0%	0.5%	0.6%	**-**	-	55.4%	4.1%	40.5%	0%	**-**	-	1.1%	98.8%	0%	0.1%	**-**	-	0%	0%	100%	0%	**-**	-	-
% Total	0%	50.1%	0.2%	0.3%	**50.6%**	-	0.6%	0%	0.5%	0%	**1.1%**	-	0.5%	47.6%	0%	0.1%	**48.1%**	-	0%	0%	0.1%	0%	**0.1%**	-	-
Lights	0	3208	13	19	**3240**	-	39	3	29	0	**71**	-	32	3061	0	4	**3097**	-	0	0	8	0	**8**	-	6416
% Lights	0%	97.9%	86.7%	100%	**97.8%**	-	95.1%	100%	96.7%	0%	**95.9%**	-	94.1%	98.4%	0%	100%	**98.3%**	-	0%	0%	100%	0%	**100%**	-	98.0%
Single-Unit Trucks	0	46	1	0	**47**	-	2	0	1	0	**3**	-	2	34	0	0	**36**	-	0	0	0	0	**0**	-	86
% Single-Unit Trucks	0%	1.4%	6.7%	0%	**1.4%**	-	4.9%	0%	3.3%	0%	**4.1%**	-	5.9%	1.1%	0%	0%	**1.1%**	-	0%	0%	0%	0%	**0%**	-	1.3%
Articulated Trucks	0	16	1	0	**17**	-	0	0	0	0	**0**	-	0	12	0	0	**12**	-	0	0	0	0	**0**	-	29
% Articulated Trucks	0%	0.5%	6.7%	0%	**0.5%**	-	0%	0%	0%	0%	**0%**	-	0%	0.4%	0%	0%	**0.4%**	-	0%	0%	0%	0%	**0%**	-	0.4%
Buses	0	8	0	0	**8**	-	0	0	0	0	**0**	-	0	5	0	0	**5**	-	0	0	0	0	**0**	-	13
% Buses	0%	0.2%	0%	0%	**0.2%**	-	0%	0%	0%	0%	**0%**	-	0%	0.2%	0%	0%	**0.2%**	-	0%	0%	0%	0%	**0%**	-	0.2%
Bicycles on Road	0	0	0	0	**0**	-	0	0	0	0	**0**	-	0	0	0	0	**0**	-	0	0	0	0	**0**	-	0
% Bicycles on Road	0%	0%	0%	0%	**0%**	-	0%	0%	0%	0%	**0%**	-	0%	0%	0%	0%	**0%**	-	0%	0%	0%	0%	**0%**	-	0%
Pedestrians	-	-	-	-	-	0	-	-	-	-	-	10	-	-	-	-	-	0	-	-	-	-	-	0	
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	76.9%	-	-	-	-	-	0%	-	-	-	-	-	-	-
Bicycles on Crosswalk	-	-	-	-	-	0	-	-	-	-	-	3	-	-	-	-	-	3	-	-	-	-	-	0	
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	23.1%	-	-	-	-	-	100%	-	-	-	-	-	-	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

TMC_1 Judah & Baldwin Roundabout_5-10-22 - TMC
Tue May 10, 2022
Full Length (7 AM-9 AM, 4 PM-6 PM)
All Classes (Lights, Single-Unit Trucks, Articulated Trucks, Buses, Pedestrians, Bicycles on Road, Bicycles on Crosswalk)
All Movements
ID: 948428, Location: 42.715226, -83.307533, Site Code: TMC_1 Traffic Data Collection, LLC

Provided by: Traffic Data Collection, LLC
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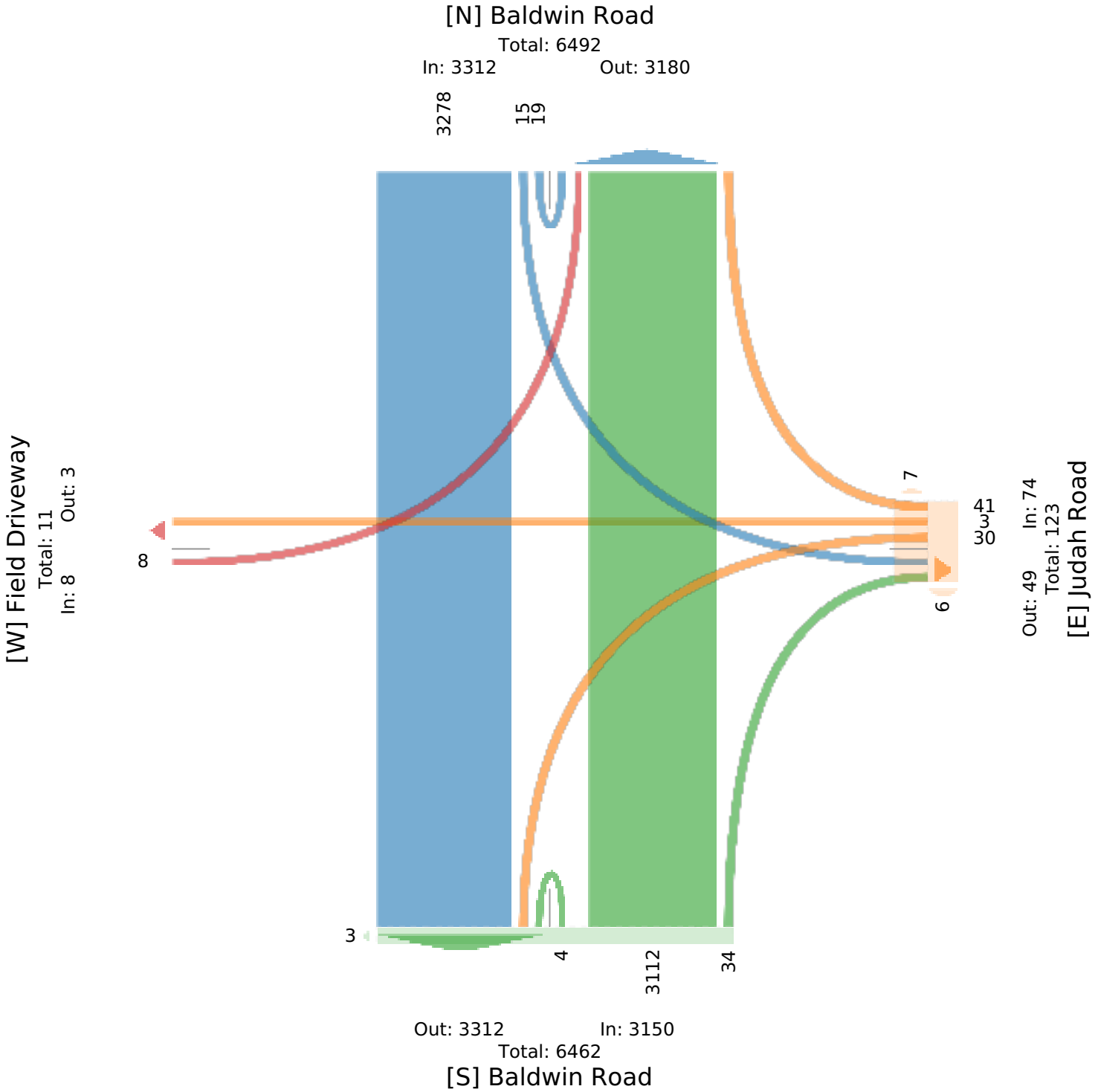

TMC_1 Judah & Baldwin Roundabout_5-10-22 - TMC

Tue May 10, 2022
AM Peak (7:15 AM - 8:15 AM)
All Classes (Lights, Single-Unit Trucks, Articulated Trucks, Buses, Pedestrians, Bicycles on Road, Bicycles on Crosswalk)
All Movements
ID: 948428, Location: 42.715226, -83.307533, Site Code: TMC_1 Traffic Data Collection, LLC

Provided by: Traffic Data Collection, LLC
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Washington, MI, 48094, US

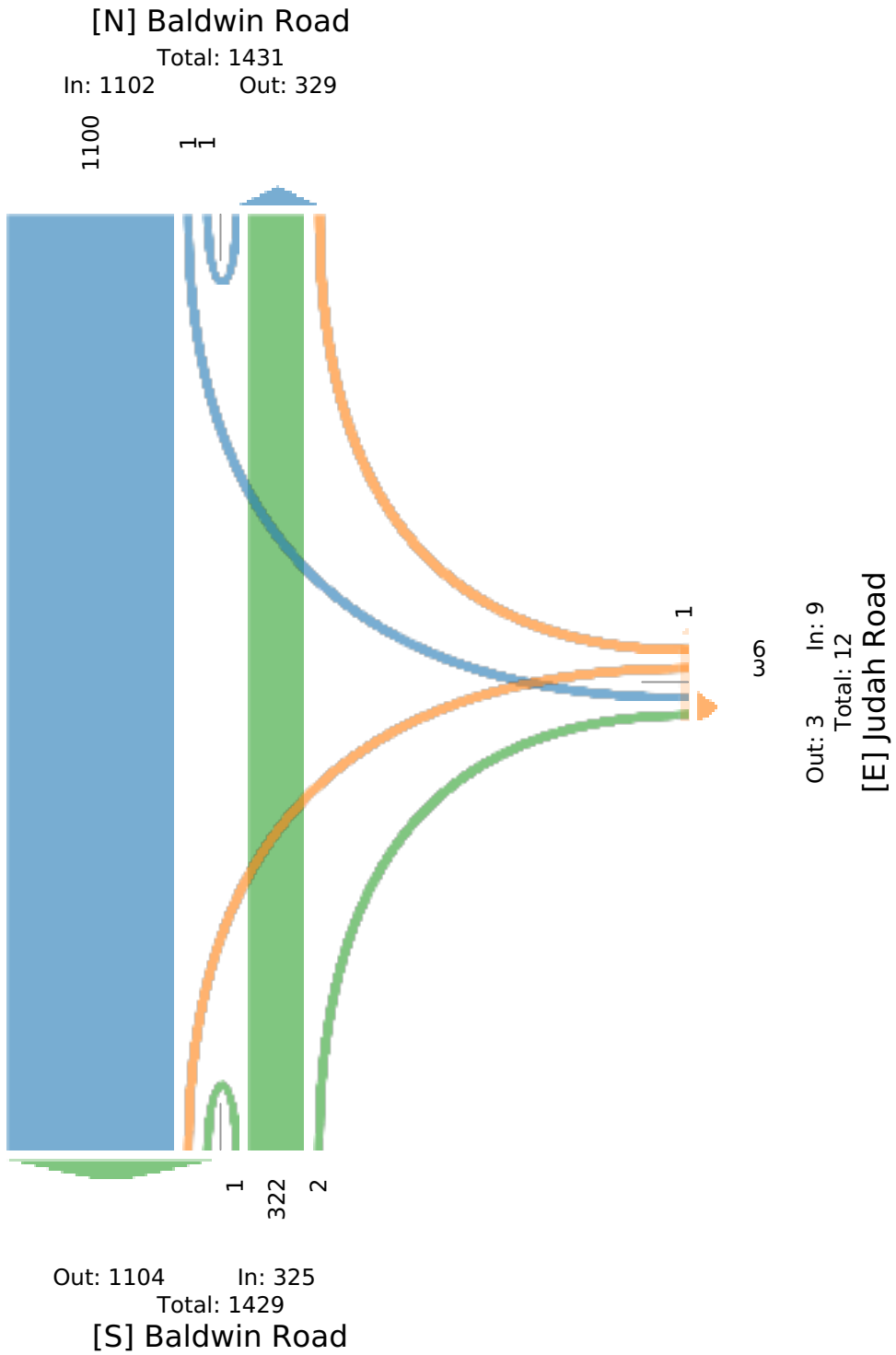
Leg	Baldwin Road						Judah Road						Baldwin Road						Field Driveway						
Direction	Southbound						Westbound						Northbound						Eastbound						
Time	R	T	L	U	**App**	Ped*	R	T	L	U	**App**	Ped*	R	T	L	U	**App**	Ped*	R	T	L	U	**App**	Ped*	**Int**
2022-05-10 7:15AM	0	290	0	0	**290**	0	2	0	1	0	**3**	1	0	60	0	0	**60**	0	0	0	0	0	**0**	0	**353**
7:30AM	0	292	0	0	**292**	0	3	0	2	0	**5**	0	2	80	0	0	**82**	0	0	0	0	0	**0**	0	**379**
7:45AM	0	289	1	0	**290**	0	1	0	0	0	**1**	0	0	80	0	1	**81**	0	0	0	0	0	**0**	0	**372**
8:00AM	0	229	0	1	**230**	0	0	0	0	0	**0**	0	0	102	0	0	**102**	0	0	0	0	0	**0**	0	**332**
Total	0	1100	1	1	**1102**	0	6	0	3	0	**9**	1	2	322	0	1	**325**	0	0	0	0	0	**0**	0	**1436**
% Approach	0%	99.8%	0.1%	0.1%	**-**	-	66.7%	0%	33.3%	0%	**-**	-	0.6%	99.1%	0%	0.3%	**-**	-	0%	0%	0%	0%	**-**	-	-
% Total	0%	76.6%	0.1%	0.1%	**76.7%**	-	0.4%	0%	0.2%	0%	**0.6%**	-	0.1%	22.4%	0%	0.1%	**22.6%**	-	0%	0%	0%	0%	**0%**	-	-
PHF	-	0.942	0.250	0.250	**0.943**	-	0.500	-	0.375	-	**0.450**	-	0.250	0.789	-	0.250	**0.797**	-	-	-	-	-	**-**	-	0.947
Lights	0	1080	1	1	**1082**	-	6	0	3	0	**9**	-	2	303	0	1	**306**	-	0	0	0	0	**0**	-	1397
% Lights	0%	98.2%	100%	100%	**98.2%**	-	100%	0%	100%	0%	**100%**	-	100%	94.1%	0%	100%	**94.2%**	-	0%	0%	0%	0%	**-**	-	97.3%
Single-Unit Trucks	0	13	0	0	**13**	-	0	0	0	0	**0**	-	0	15	0	0	**15**	-	0	0	0	0	**0**	-	28
% Single-Unit Trucks	0%	1.2%	0%	0%	**1.2%**	-	0%	0%	0%	0%	**0%**	-	0%	4.7%	0%	0%	**4.6%**	-	0%	0%	0%	0%	**-**	-	1.9%
Articulated Trucks	0	6	0	0	**6**	-	0	0	0	0	**0**	-	0	2	0	0	**2**	-	0	0	0	0	**0**	-	8
% Articulated Trucks	0%	0.5%	0%	0%	**0.5%**	-	0%	0%	0%	0%	**0%**	-	0%	0.6%	0%	0%	**0.6%**	-	0%	0%	0%	0%	**-**	-	0.6%
Buses	0	1	0	0	**1**	-	0	0	0	0	**0**	-	0	2	0	0	**2**	-	0	0	0	0	**0**	-	3
% Buses	0%	0.1%	0%	0%	**0.1%**	-	0%	0%	0%	0%	**0%**	-	0%	0.6%	0%	0%	**0.6%**	-	0%	0%	0%	0%	**-**	-	0.2%
Bicycles on Road	0	0	0	0	**0**	-	0	0	0	0	**0**	-	0	0	0	0	**0**	-	0	0	0	0	**0**	-	0
% Bicycles on Road	0%	0%	0%	0%	**0%**	-	0%	0%	0%	0%	**0%**	-	0%	0%	0%	0%	**0%**	-	0%	0%	0%	0%	**-**	-	0%
Pedestrians	-	-	-	-	-	0	-	-	-	-	-	1	-	-	-	-	-	0	-	-	-	-	-	0	
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-
Bicycles on Crosswalk	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	0%	-	-	-	-	-	-	-	-	-	-	-	-	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

TMC_1 Judah & Baldwin Roundabout_5-10-22 - TMC

Tue May 10, 2022
AM Peak (7:15 AM - 8:15 AM)
All Classes (Lights, Single-Unit Trucks, Articulated Trucks, Buses, Pedestrians, Bicycles on Road, Bicycles on Crosswalk)
All Movements
ID: 948428, Location: 42.715226, -83.307533, Site Code: TMC_1 Traffic Data Collection, LLC

Provided by: Traffic Data Collection, LLC
7504 Sawgrass Drive, www.tdccounts.com,
Washington, MI, 48094, US



TMC_1 Judah & Baldwin Roundabout_5-10-22 - TMC

Tue May 10, 2022
PM Peak (4:45 PM - 5:45 PM) - Overall Peak Hour
All Classes (Lights, Single-Unit Trucks, Articulated Trucks, Buses, Pedestrians, Bicycles on Road, Bicycles on Crosswalk)
All Movements
ID: 948428, Location: 42.715226, -83.307533, Site Code: TMC_1 Traffic Data Collection, LLC

Provided by: Traffic Data Collection, LLC
7504 Sawgrass Drive, www.tdccounts.com,
Washington, MI, 48094, US

Leg	Baldwin Road						Judah Road						Baldwin Road						Field Driveway						
Direction	Southbound						Westbound						Northbound						Eastbound						
Time	R	T	L	U	**App**	Ped*	R	T	L	U	**App**	Ped*	R	T	L	U	**App**	Ped*	R	T	L	U	**App**	Ped*	**Int**
2022-05-10 4:45PM	0	143	0	4	**147**	0	6	0	1	0	**7**	0	5	312	0	0	**317**	2	0	0	2	0	**2**	0	**473**
5:00PM	0	187	1	3	**191**	0	3	0	2	0	**5**	1	4	334	0	0	**338**	0	0	0	1	0	**1**	0	**535**
5:15PM	0	171	3	2	**176**	0	2	1	3	0	**6**	3	4	355	0	0	**359**	0	0	0	1	0	**1**	0	**542**
5:30PM	0	185	2	2	**189**	0	3	1	1	0	**5**	1	3	288	0	0	**291**	0	0	0	0	0	**0**	0	**485**
Total	0	686	6	11	**703**	0	14	2	7	0	**23**	5	16	1289	0	0	**1305**	2	0	0	4	0	**4**	0	**2035**
% Approach	0%	97.6%	0.9%	1.6%	**-**	-	60.9%	8.7%	30.4%	0%	**-**	-	1.2%	98.8%	0%	0%	**-**	-	0%	0%	100%	0%	**-**	-	-
% Total	0%	33.7%	0.3%	0.5%	**34.5%**	-	0.7%	0.1%	0.3%	0%	**1.1%**	-	0.8%	63.3%	0%	0%	**64.1%**	-	0%	0%	0.2%	0%	**0.2%**	-	-
PHF	-	0.917	0.500	0.688	**0.920**	-	0.583	0.500	0.583		**- 0.821**	-	0.800	0.908	-	-	**0.909**	-	-	-	0.500		**- 0.500**	-	0.939
Lights	0	667	6	11	**684**	-	14	2	7	0	**23**	-	16	1281	0	0	**1297**	-	0	0	4	0	**4**	-	2008
% Lights	0%	97.2%	100%	100%	**97.3%**	-	100%	100%	100%	0%	**100%**	-	100%	99.4%	0%	0%	**99.4%**	-	0%	0%	100%	0%	**100%**	-	98.7%
Single-Unit Trucks	0	16	0	0	**16**	-	0	0	0	0	**0**	-	0	5	0	0	**5**	-	0	0	0	0	**0**	-	21
% Single-Unit Trucks	0%	2.3%	0%	0%	**2.3%**	-	0%	0%	0%	0%	**0%**	-	0%	0.4%	0%	0%	**0.4%**	-	0%	0%	0%	0%	**0%**	-	1.0%
Articulated Trucks	0	3	0	0	**3**	-	0	0	0	0	**0**	-	0	3	0	0	**3**	-	0	0	0	0	**0**	-	6
% Articulated Trucks	0%	0.4%	0%	0%	**0.4%**	-	0%	0%	0%	0%	**0%**	-	0%	0.2%	0%	0%	**0.2%**	-	0%	0%	0%	0%	**0%**	-	0.3%
Buses	0	0	0	0	**0**	-	0	0	0	0	**0**	-	0	0	0	0	**0**	-	0	0	0	0	**0**	-	0
% Buses	0%	0%	0%	0%	**0%**	-	0%	0%	0%	0%	**0%**	-	0%	0%	0%	0%	**0%**	-	0%	0%	0%	0%	**0%**	-	0%
Bicycles on Road	0	0	0	0	**0**	-	0	0	0	0	**0**	-	0	0	0	0	**0**	-	0	0	0	0	**0**	-	0
% Bicycles on Road	0%	0%	0%	0%	**0%**	-	0%	0%	0%	0%	**0%**	-	0%	0%	0%	0%	**0%**	-	0%	0%	0%	0%	**0%**	-	0%
Pedestrians	-	-	-	-	-	0	-	-	-	-	-	4	-	-	-	-	-	0	-	-	-	-	-	0	
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	80.0%	-	-	-	-	-	0%	-	-	-	-	-	-	-
Bicycles on Crosswalk	-	-	-	-	-	0	-	-	-	-	-	1	-	-	-	-	-	2	-	-	-	-	-	0	
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	20.0%	-	-	-	-	-	100%	-	-	-	-	-	-	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

TMC_1 Judah & Baldwin Roundabout_5-10-22 - TMC

Tue May 10, 2022

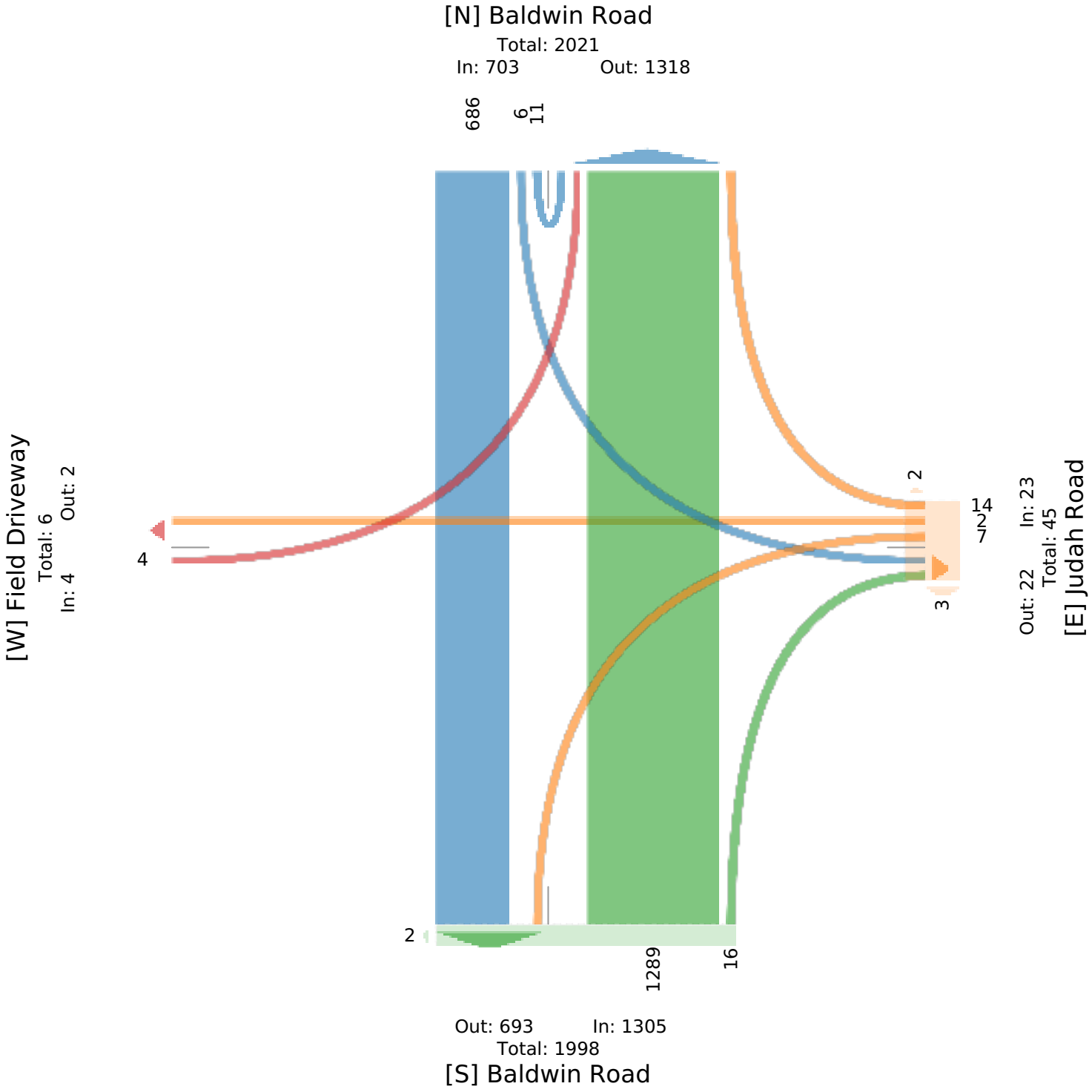
PM Peak (4:45 PM - 5:45 PM) - Overall Peak Hour

All Classes (Lights, Single-Unit Trucks, Articulated Trucks, Buses, Pedestrians, Bicycles on Road, Bicycles on Crosswalk)

All Movements

ID: 948428, Location: 42.715226, -83.307533, Site Code: TMC_1 Traffic Data Collection, LLC

Provided by: Traffic Data Collection, LLC
7504 Sawgrass Drive, www.tdccounts.com,
Washington, MI, 48094, US



Project: Lake Orion Twp.
Traffic Impact Study
Corridor: Baldwin Road
Weather: Sunny, Dry Temp. 70's
Video VCU ID#: SCU34N SE

Traffic Data Collection, LLC
7504 Sawgrass Drive
www.tdccounts.com
Washington, Michigan, United States 48094
Ph. (586) 786-5407
Reliable Traffic Data

Count Name: TMC_2
Baldwin SB-NB XO_S Judah_5-10-22
Site Code: TMC_2
Traffic Data Collection, LLC
Start Date: 05/10/2022

Turning Movement Data

Start Time	NB Baldwin Road Northbound		SB>NB XO; 850' S Judah Rd. Eastbound		
	Thru	App. Total	Left	App. Total	Int. Total
7:00 AM	54	54	0	0	54
7:15 AM	62	62	0	0	62
7:30 AM	83	83	0	0	83
7:45 AM	87	87	0	0	87
Hourly Total	286	286	0	0	286
8:00 AM	101	101	0	0	101
8:15 AM	119	119	0	0	119
8:30 AM	100	100	0	0	100
8:45 AM	108	108	0	0	108
Hourly Total	428	428	0	0	428
9:00 AM	0	0	0	0	0
*** BREAK ***	-	-	-	-	-
Hourly Total	0	0	0	0	0
4:00 PM	283	283	0	0	283
4:15 PM	295	295	0	0	295
4:30 PM	285	285	0	0	285
4:45 PM	333	333	0	0	333
Hourly Total	1196	1196	0	0	1196
5:00 PM	326	326	0	0	326
5:15 PM	357	357	0	0	357
5:30 PM	293	293	1	1	294
5:45 PM	292	292	0	0	292
Hourly Total	1268	1268	1	1	1269
Grand Total	3178	3178	1	1	3179
Approach %	100.0	-	100.0	-	-
Total %	100.0	100.0	0.0	0.0	-
Lights	3115	3115	1	1	3116
% Lights	98.0	98.0	100.0	100.0	98.0
Buses	5	5	0	0	5
% Buses	0.2	0.2	0.0	0.0	0.2
Single-Unit Trucks	42	42	0	0	42
% Single-Unit Trucks	1.3	1.3	0.0	0.0	1.3
Articulated Trucks	16	16	0	0	16
% Articulated Trucks	0.5	0.5	0.0	0.0	0.5

Project: Lake Orion Twp.
Traffic Impact Study
Corridor: Baldwin Road
Weather: Sunny, Dry Temp. 70's
Video VCU ID#: SCU34N SE

Traffic Data Collection, LLC
7504 Sawgrass Drive
www.tdccounts.com
Washington, Michigan, United States 48094
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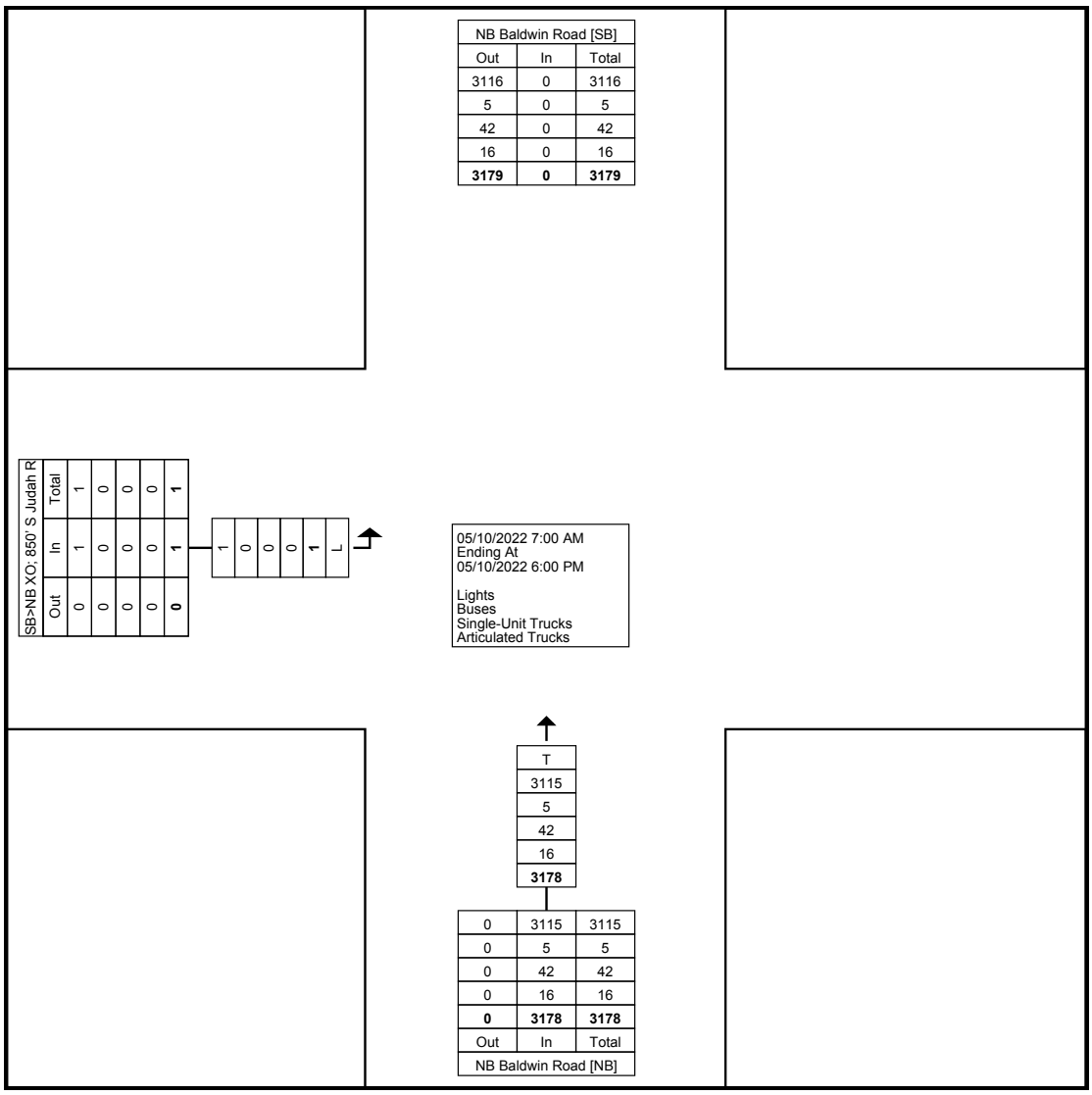
Reliable Traffic Data

Count Name: TMC_2
Baldwin SB-NB XO_S Judah_5-10-22
Site Code: TMC_2
Traffic Data Collection, LLC
Start Date: 05/10/2022
Page No: 2



Turning Movement Data Plot

Project: Lake Orion Twp.
Traffic Impact Study
Corridor: Baldwin Road
Weather: Sunny, Dry Temp. 70's
Video VCU ID#: SCU34N SE

Traffic Data Collection, LLC
7504 Sawgrass Drive
www.tdccounts.com
Washington, Michigan, United States 48094
Ph. (586) 786-5407
Reliable Traffic Data

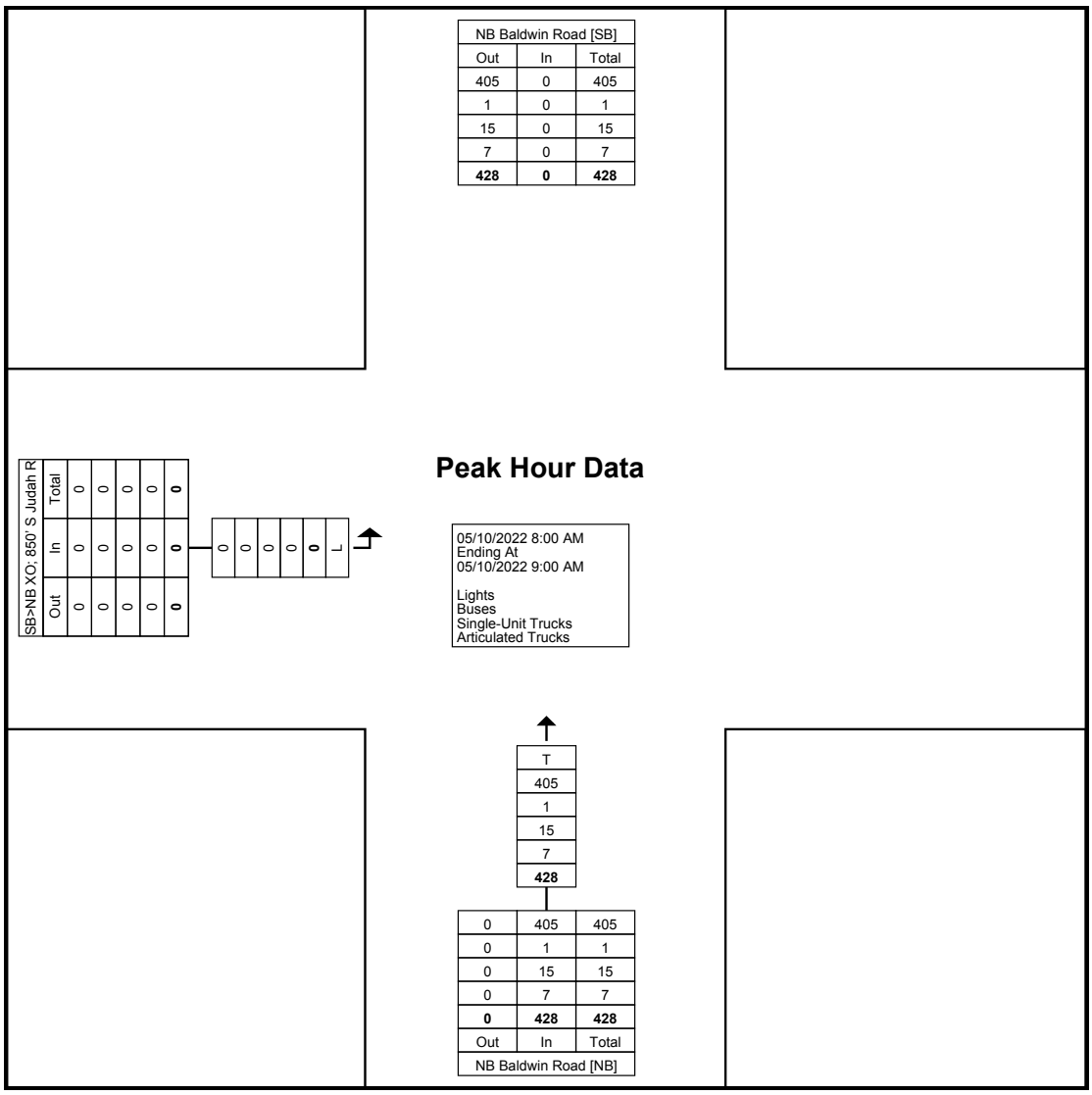
Turning Movement Peak Hour Data (8:00 AM)

Start Time	NB Baldwin Road Northbound		SB>NB XO; 850' S Judah Rd. Eastbound		
	Thru	App. Total	Left	App. Total	Int. Total
8:00 AM	101	101	0	0	101
8:15 AM	119	119	0	0	119
8:30 AM	100	100	0	0	100
8:45 AM	108	108	0	0	108
Total	428	428	0	0	428
Approach %	100.0	-	0.0	-	-
Total %	100.0	100.0	0.0	0.0	-
PHF	0.899	0.899	0.000	0.000	0.899
Lights	405	405	0	0	405
% Lights	94.6	94.6	-	-	94.6
Buses	1	1	0	0	1
% Buses	0.2	0.2	-	-	0.2
Single-Unit Trucks	15	15	0	0	15
% Single-Unit Trucks	3.5	3.5	-	-	3.5
Articulated Trucks	7	7	0	0	7
% Articulated Trucks	1.6	1.6	-	-	1.6

Project: Lake Orion Twp.
Traffic Impact Study
Corridor: Baldwin Road
Weather: Sunny, Dry Temp. 70's
Video VCU ID#: SCU34N SE

Traffic Data Collection, LLC
7504 Sawgrass Drive
www.tdccounts.com
Washington, Michigan, United States 48094
Ph. (586) 786-5407
Reliable Traffic Data

Count Name: TMC_2 Baldwin SB-NB XO_S Judah_5-10-22
Site Code: TMC_2
Traffic Data Collection, LLC
Start Date: 05/10/2022
Page No: 4



Turning Movement Peak Hour Data Plot (8:00 AM)

Project: Lake Orion Twp.
Traffic Impact Study
Corridor: Baldwin Road
Weather: Sunny, Dry Temp. 70's
Video VCU ID#: SCU34N SE

Traffic Data Collection, LLC
7504 Sawgrass Drive
www.tdccounts.com
Washington, Michigan, United States 48094
Ph. (586) 786-5407
Reliable Traffic Data

Turning Movement Peak Hour Data (4:45 PM)

Start Time	NB Baldwin Road Northbound		SB>NB XO; 850' S Judah Rd. Eastbound		
	Thru	App. Total	Left	App. Total	Int. Total
4:45 PM	333	333	0	0	333
5:00 PM	326	326	0	0	326
5:15 PM	357	357	0	0	357
5:30 PM	293	293	1	1	294
Total	1309	1309	1	1	1310
Approach %	100.0	-	100.0	-	-
Total %	99.9	99.9	0.1	0.1	-
PHF	0.917	0.917	0.250	0.250	0.917
Lights	1298	1298	1	1	1299
% Lights	99.2	99.2	100.0	100.0	99.2
Buses	0	0	0	0	0
% Buses	0.0	0.0	0.0	0.0	0.0
Single-Unit Trucks	7	7	0	0	7
% Single-Unit Trucks	0.5	0.5	0.0	0.0	0.5
Articulated Trucks	4	4	0	0	4
% Articulated Trucks	0.3	0.3	0.0	0.0	0.3

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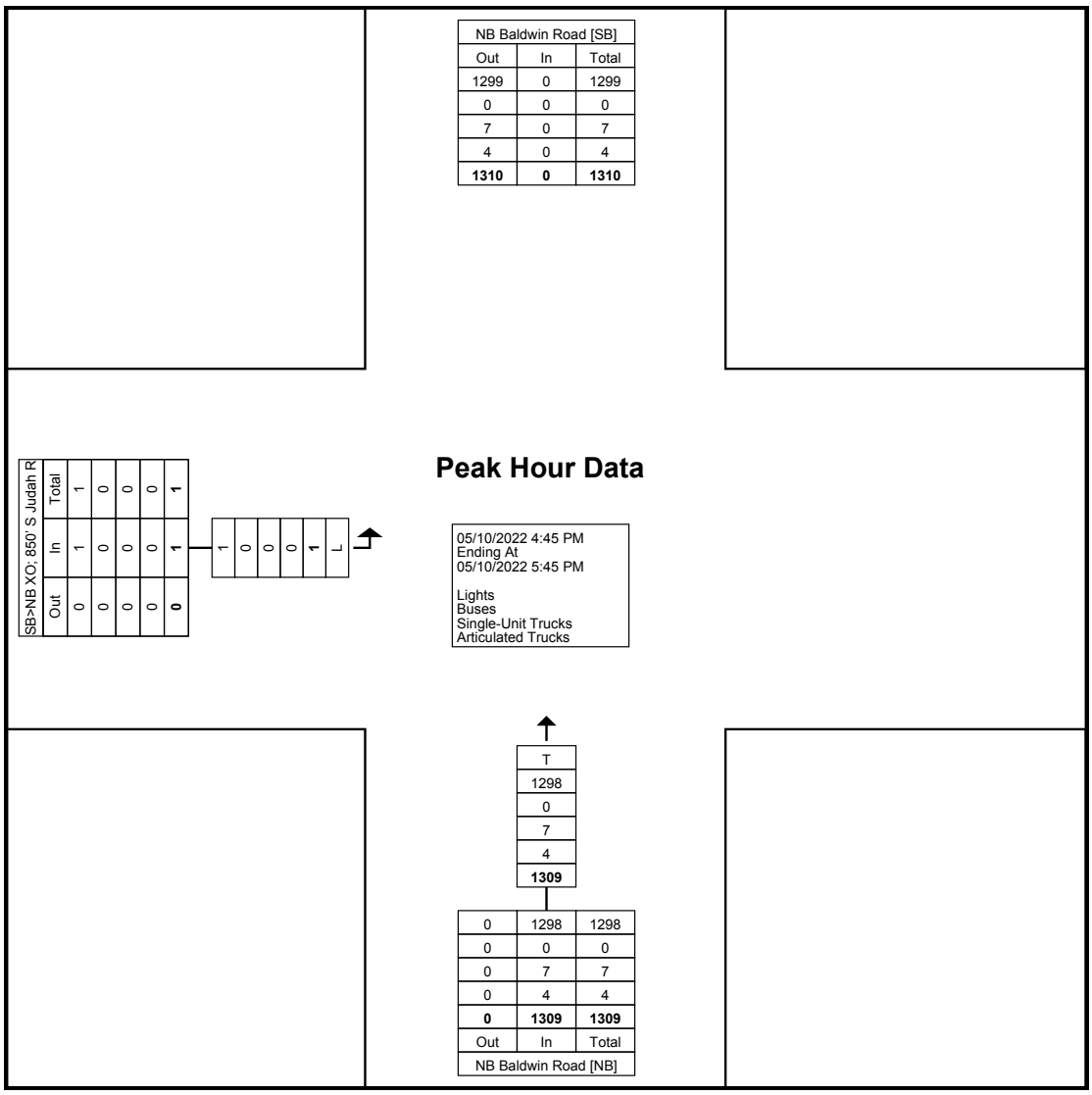

Turning Movement Peak Hour Data Plot (4:45 PM)

Traffic Data Collection, LLC
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www.tdccounts.com
Washington, Michigan, United States 48094
Ph. (586) 786-5407
Reliable Traffic Data

TDC Traffic Comments: 4 hour video multi-modal intersection vehicle classification turning movement count conducted during typical weekday (Tuesday) from 7:00-9:00 AM morning & 4:00-6:00 PM afternoon peak hours, while school was in session. Daily peak hour reports provided for morning & afternoon peak hour study periods.

TMC was performed with Miovision video VCU scout recording cameras for Kalama Wolf In Binden Sheep, Lake Orion Traffic Impact Study for AEW.
Non-signalized intersection. VCU camera was located within SE intersection quadrants. All intersection shared video files have been uploaded to Miovision DataLink cloud platform.

Classification Summary Details & Percentages: Four (4) Groupings:
1) Lights Includes: FHWA Classes 1-3 (Motorcycles, Pick Up Trucks, Vans, Light Goods Vehicles)
2) Buses Includes: FHWA Class 4 (School Buses & Regional Transportation Metro Buses)
3) Single-Unit Trucks Includes: FHWA Classes 5-7 (2-4 Axle SU Medium Trucks)
4) Articulated Trucks Includes: FHWA Classes 8-12 (Heavy Trucks W/Single & Multi Unit Trailers)

TMC_2 Baldwin SB-NB XO_S Judah_5-10-22 - TMC

Tue May 10, 2022
Full Length (7 AM-9 AM, 4 PM-6 PM)
All Classes (Lights, Single-Unit Trucks, Articulated Trucks, Buses)
All Movements
ID: 948436, Location: 42.712943, -83.307213, Site Code: TMC_2 Traffic Data Collection, LLC

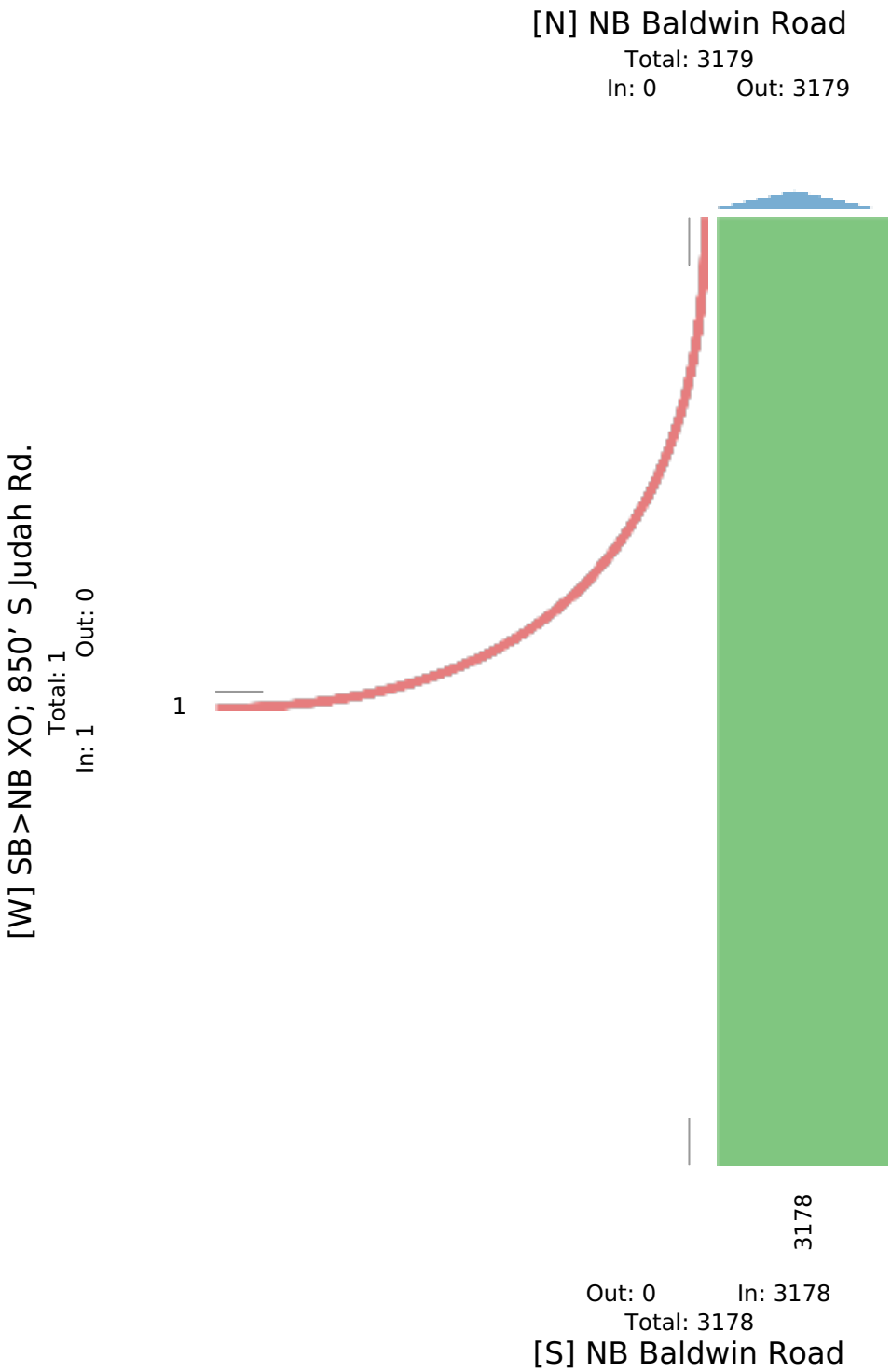
Provided by: Traffic Data Collection, LLC
7504 Sawgrass Drive, www.tdccounts.com,
Washington, MI, 48094, US

Leg Direction	NB Baldwin Road Northbound		SB>NB XO; 850' S Judah Rd. Eastbound		
Time	T	**App**	L	**App**	**Int**
2022-05-10 7:00AM	54	**54**	0	**0**	**54**
7:15AM	62	**62**	0	**0**	**62**
7:30AM	83	**83**	0	**0**	**83**
7:45AM	87	**87**	0	**0**	**87**
Hourly Total	286	**286**	0	**0**	**286**
8:00AM	101	**101**	0	**0**	**101**
8:15AM	119	**119**	0	**0**	**119**
8:30AM	100	**100**	0	**0**	**100**
8:45AM	108	**108**	0	**0**	**108**
Hourly Total	428	**428**	0	**0**	**428**
9:00AM	0	**0**	0	**0**	**0**
Hourly Total	0	**0**	0	**0**	**0**
4:00PM	283	**283**	0	**0**	**283**
4:15PM	295	**295**	0	**0**	**295**
4:30PM	285	**285**	0	**0**	**285**
4:45PM	333	**333**	0	**0**	**333**
Hourly Total	1196	**1196**	0	**0**	**1196**
5:00PM	326	**326**	0	**0**	**326**
5:15PM	357	**357**	0	**0**	**357**
5:30PM	293	**293**	1	**1**	**294**
5:45PM	292	**292**	0	**0**	**292**
Hourly Total	1268	**1268**	1	**1**	**1269**
Total	3178	**3178**	1	**1**	**3179**
% Approach	100%	**-**	100%	**-**	-
% Total	100.0%	**100.0%**	0%	**0%**	-
Lights	3115	**3115**	1	**1**	3116
% Lights	98.0%	**98.0%**	100%	**100%**	98.0%
Single-Unit Trucks	42	**42**	0	**0**	42
% Single-Unit Trucks	1.3%	**1.3%**	0%	**0%**	1.3%
Articulated Trucks	16	**16**	0	**0**	16
% Articulated Trucks	0.5%	**0.5%**	0%	**0%**	0.5%
Buses	5	**5**	0	**0**	5
% Buses	0.2%	**0.2%**	0%	**0%**	0.2%

*L: Left, T: Thru

TMC_2 Baldwin SB-NB XO_S Judah_5-10-22 - TMC
Tue May 10, 2022
Full Length (7 AM-9 AM, 4 PM-6 PM)
All Classes (Lights, Single-Unit Trucks, Articulated Trucks, Buses)
All Movements
ID: 948436, Location: 42.712943, -83.307213, Site Code: TMC_2 Traffic Data Collection, LLC

Provided by: Traffic Data Collection, LLC
7504 Sawgrass Drive, www.tdccounts.com,
Washington, MI, 48094, US



TMC_2 Baldwin SB-NB XO_S Judah_5-10-22 - TMC

Tue May 10, 2022
AM Peak (8 AM - 9 AM)
All Classes (Lights, Single-Unit Trucks, Articulated Trucks, Buses)
All Movements
ID: 948436, Location: 42.712943, -83.307213, Site Code: TMC_2 Traffic Data Collection, LLC

Provided by: Traffic Data Collection, LLC
7504 Sawgrass Drive, www.tdccounts.com,
Washington, MI, 48094, US

Leg Direction	NB Baldwin Road Northbound		SB>NB XO; 850' S Judah Rd. Eastbound		
Time	T	**App**	L	**App**	**Int**
2022-05-10 8:00AM	101	**101**	0	**0**	**101**
8:15AM	119	**119**	0	**0**	**119**
8:30AM	100	**100**	0	**0**	**100**
8:45AM	108	**108**	0	**0**	**108**
Total	428	**428**	0	**0**	**428**
% Approach	100%	**-**	0%	**-**	-
% Total	100%	**100%**	0%	**0%**	-
PHF	0.899	**0.899**	-	**-**	0.899
Lights	405	**405**	0	**0**	405
% Lights	94.6%	**94.6%**	0%	**-**	94.6%
Single-Unit Trucks	15	**15**	0	**0**	15
% Single-Unit Trucks	3.5%	**3.5%**	0%	**-**	3.5%
Articulated Trucks	7	**7**	0	**0**	7
% Articulated Trucks	1.6%	**1.6%**	0%	**-**	1.6%
Buses	1	**1**	0	**0**	1
% Buses	0.2%	**0.2%**	0%	**-**	0.2%

*L: Left, T: Thru

TMC_2 Baldwin SB-NB XO_S Judah_5-10-22 - TMC
Tue May 10, 2022
AM Peak (8 AM - 9 AM)
All Classes (Lights, Single-Unit Trucks, Articulated Trucks, Buses)
All Movements
ID: 948436, Location: 42.712943, -83.307213, Site Code: TMC_2 Traffic Data Collection, LLC

Provided by: Traffic Data Collection, LLC
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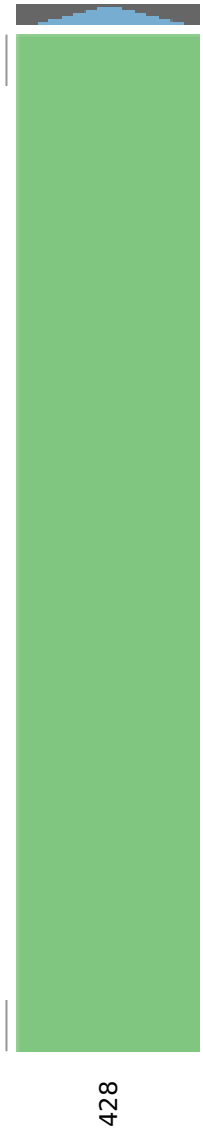
Washington, MI, 48094, US

[N] NB Baldwin Road
Total: 428
In: 0 Out: 428



Out: 0 In: 428
Total: 428
[S] NB Baldwin Road

848

TMC_2 Baldwin SB-NB XO_S Judah_5-10-22 - TMC

Tue May 10, 2022
PM Peak (4:45 PM - 5:45 PM) - Overall Peak Hour
All Classes (Lights, Single-Unit Trucks, Articulated Trucks, Buses)
All Movements
ID: 948436, Location: 42.712943, -83.307213, Site Code: TMC_2 Traffic Data Collection, LLC

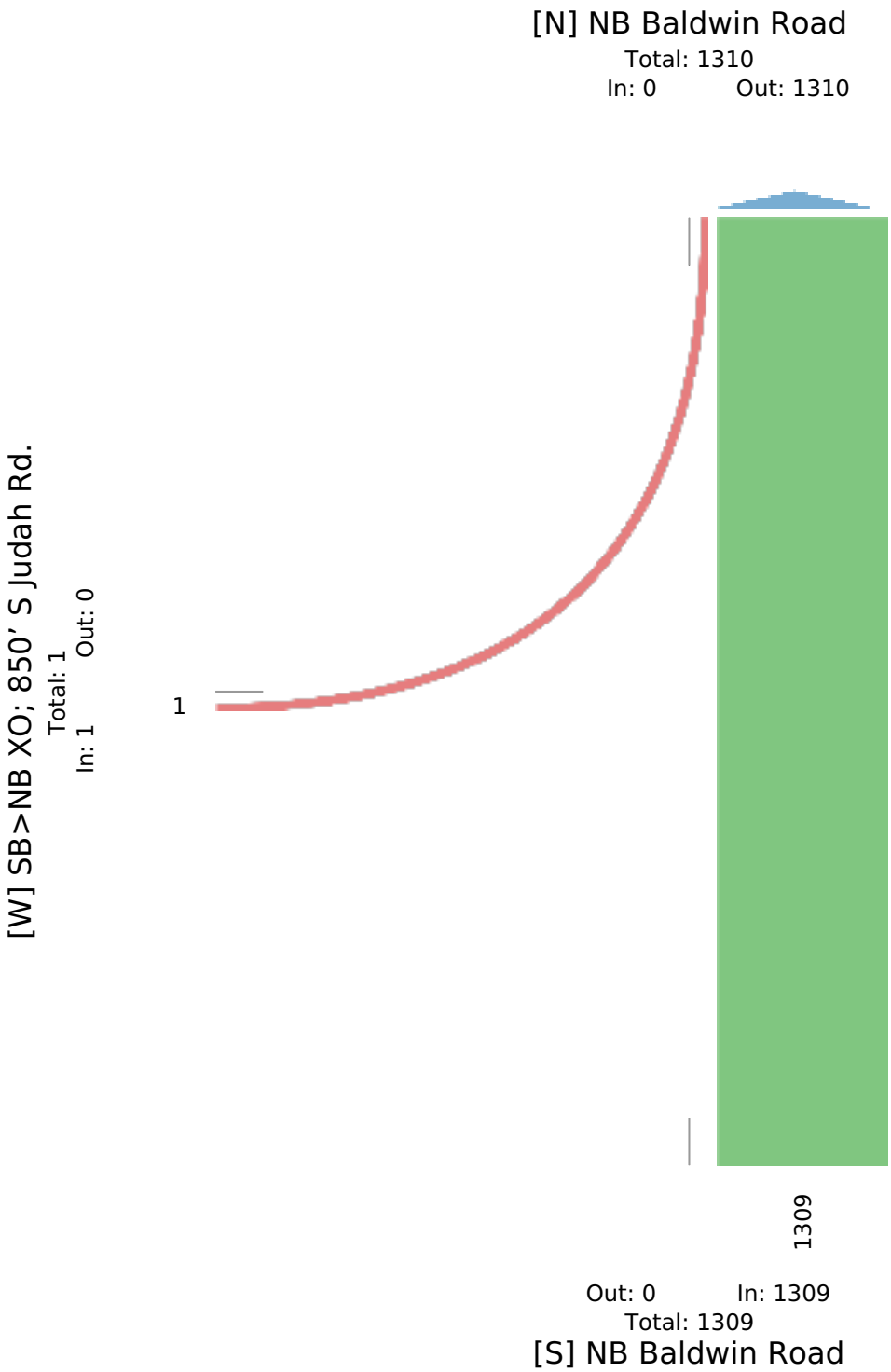
Provided by: Traffic Data Collection, LLC
7504 Sawgrass Drive, www.tdccounts.com,
Washington, MI, 48094, US

Leg Direction	NB Baldwin Road Northbound		SB>NB XO; 850' S Judah Rd. Eastbound		
Time	T	**App**	L	**App**	**Int**
2022-05-10 4:45PM	333	**333**	0	**0**	**333**
5:00PM	326	**326**	0	**0**	**326**
5:15PM	357	**357**	0	**0**	**357**
5:30PM	293	**293**	1	**1**	**294**
Total	1309	**1309**	1	**1**	**1310**
% Approach	100%	**-**	100%	**-**	-
% Total	99.9%	**99.9%**	0.1%	**0.1%**	-
PHF	0.917	**0.917**	0.250	**0.250**	0.917
Lights	1298	**1298**	1	**1**	1299
% Lights	99.2%	**99.2%**	100%	**100%**	99.2%
Single-Unit Trucks	7	**7**	0	**0**	7
% Single-Unit Trucks	0.5%	**0.5%**	0%	**0%**	0.5%
Articulated Trucks	4	**4**	0	**0**	4
% Articulated Trucks	0.3%	**0.3%**	0%	**0%**	0.3%
Buses	0	**0**	0	**0**	0
% Buses	0%	**0%**	0%	**0%**	0%

*L: Left, T: Thru

TMC_2 Baldwin SB-NB XO_S Judah_5-10-22 - TMC
Tue May 10, 2022
PM Peak (4:45 PM - 5:45 PM) - Overall Peak Hour
All Classes (Lights, Single-Unit Trucks, Articulated Trucks, Buses)
All Movements
ID: 948436, Location: 42.712943, -83.307213, Site Code: TMC_2 Traffic Data Collection, LLC

Provided by: Traffic Data Collection, LLC
7504 Sawgrass Drive, www.tdccounts.com,
Washington, MI, 48094, US



850

Project: Lake Orion Twp.
Traffic Impact Study
Corridor: Baldwin Road
Weather: Sunny, Dry Temp. 70's
Video VCU ID#: SCU3HT SW

Traffic Data Collection, LLC
7504 Sawgrass Drive
www.tdccounts.com
Washington, Michigan, United States 48094
Ph. (586) 786-5407
Reliable Traffic Data

Count Name: TMC_3
Baldwin NB-SB XO_S
Judah_5-10-22
Site Code: TMC_3
Traffic Data Collection, LLC
Start Date: 05/10/2022
Page No: 1

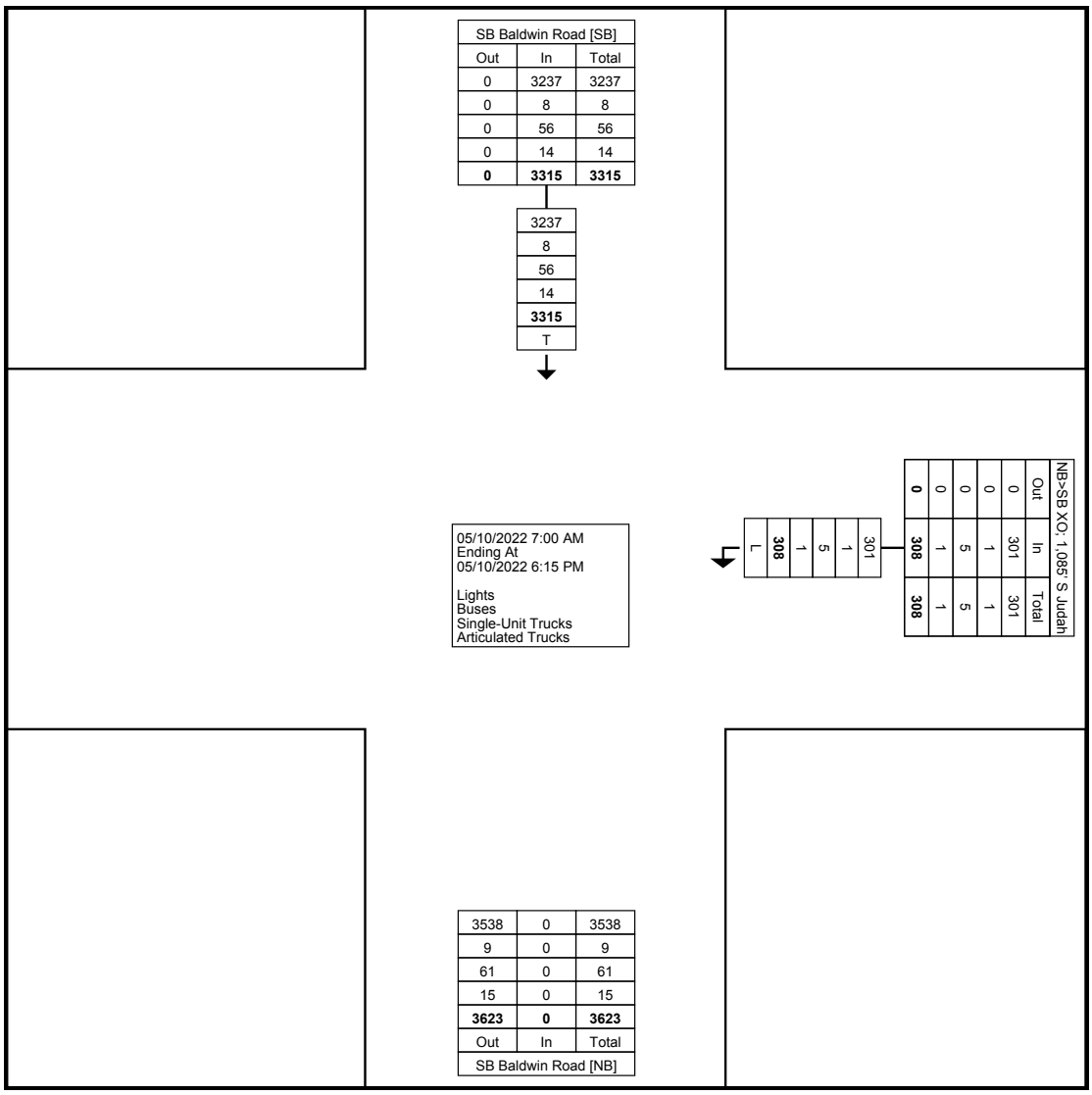
Turning Movement Data

Start Time	SB Baldwin Road Southbound		NB>SB XO; 1,085' S Judah Rd. Westbound		
	Thru	App. Total	Left	App. Total	Int. Total
7:00 AM	223	223	12	12	235
7:15 AM	292	292	16	16	308
7:30 AM	286	286	12	12	298
7:45 AM	287	287	15	15	302
Hourly Total	1088	1088	55	55	1143
8:00 AM	244	244	13	13	257
8:15 AM	229	229	15	15	244
8:30 AM	221	221	18	18	239
8:45 AM	193	193	13	13	206
Hourly Total	887	887	59	59	946
9:00 AM	0	0	0	0	0
*** BREAK ***	-	-	-	-	-
Hourly Total	0	0	0	0	0
4:00 PM	175	175	18	18	193
4:15 PM	161	161	25	25	186
4:30 PM	163	163	28	28	191
4:45 PM	139	139	28	28	167
Hourly Total	638	638	99	99	737
5:00 PM	188	188	20	20	208
5:15 PM	178	178	23	23	201
5:30 PM	179	179	26	26	205
5:45 PM	157	157	26	26	183
Hourly Total	702	702	95	95	797
6:00 PM	0	0	0	0	0
Grand Total	3315	3315	308	308	3623
Approach %	100.0	-	100.0	-	-
Total %	91.5	91.5	8.5	8.5	-
Lights	3237	3237	301	301	3538
% Lights	97.6	97.6	97.7	97.7	97.7
Buses	8	8	1	1	9
% Buses	0.2	0.2	0.3	0.3	0.2
Single-Unit Trucks	56	56	5	5	61
% Single-Unit Trucks	1.7	1.7	1.6	1.6	1.7
Articulated Trucks	14	14	1	1	15
% Articulated Trucks	0.4	0.4	0.3	0.3	0.4

Project: Lake Orion Twp.
Traffic Impact Study
Corridor: Baldwin Road
Weather: Sunny, Dry Temp. 70's
Video VCU ID#: SCU3HT SW

Traffic Data Collection, LLC
7504 Sawgrass Drive
www.tdccounts.com
Washington, Michigan, United States 48094
Ph. (586) 786-5407
Reliable Traffic Data

Count Name: TMC_3
Baldwin NB-SB XO_S Judah_5-10-22
Site Code: TMC_3
Traffic Data Collection, LLC
Start Date: 05/10/2022
Page No: 2



Turning Movement Data Plot

Project: Lake Orion Twp.
Traffic Impact Study
Corridor: Baldwin Road
Weather: Sunny, Dry Temp. 70's
Video VCU ID#: SCU3HT SW

Traffic Data Collection, LLC
7504 Sawgrass Drive
www.tdccounts.com
Washington, Michigan, United States 48094
Ph. (586) 786-5407
Reliable Traffic Data

Count Name: TMC_3
Baldwin NB-SB XO_S
Judah_5-10-22
Site Code: TMC_3
Traffic Data Collection, LLC
Start Date: 05/10/2022

Turning Movement Peak Hour Data (7:15 AM)

Start Time	SB Baldwin Road Southbound		NB>SB XO; 1,085' S Judah Rd. Westbound		
	Thru	App. Total	Left	App. Total	Int. Total
7:15 AM	292	292	16	16	308
7:30 AM	286	286	12	12	298
7:45 AM	287	287	15	15	302
8:00 AM	244	244	13	13	257
Total	1109	1109	56	56	1165
Approach %	100.0	-	100.0	-	-
Total %	95.2	95.2	4.8	4.8	-
PHF	0.949	0.949	0.875	0.875	0.946
Lights	1089	1089	53	53	1142
% Lights	98.2	98.2	94.6	94.6	98.0
Buses	1	1	1	1	2
% Buses	0.1	0.1	1.8	1.8	0.2
Single-Unit Trucks	13	13	2	2	15
% Single-Unit Trucks	1.2	1.2	3.6	3.6	1.3
Articulated Trucks	6	6	0	0	6
% Articulated Trucks	0.5	0.5	0.0	0.0	0.5

Traffic Data Collection, LLC
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Washington, Michigan, United States 48094
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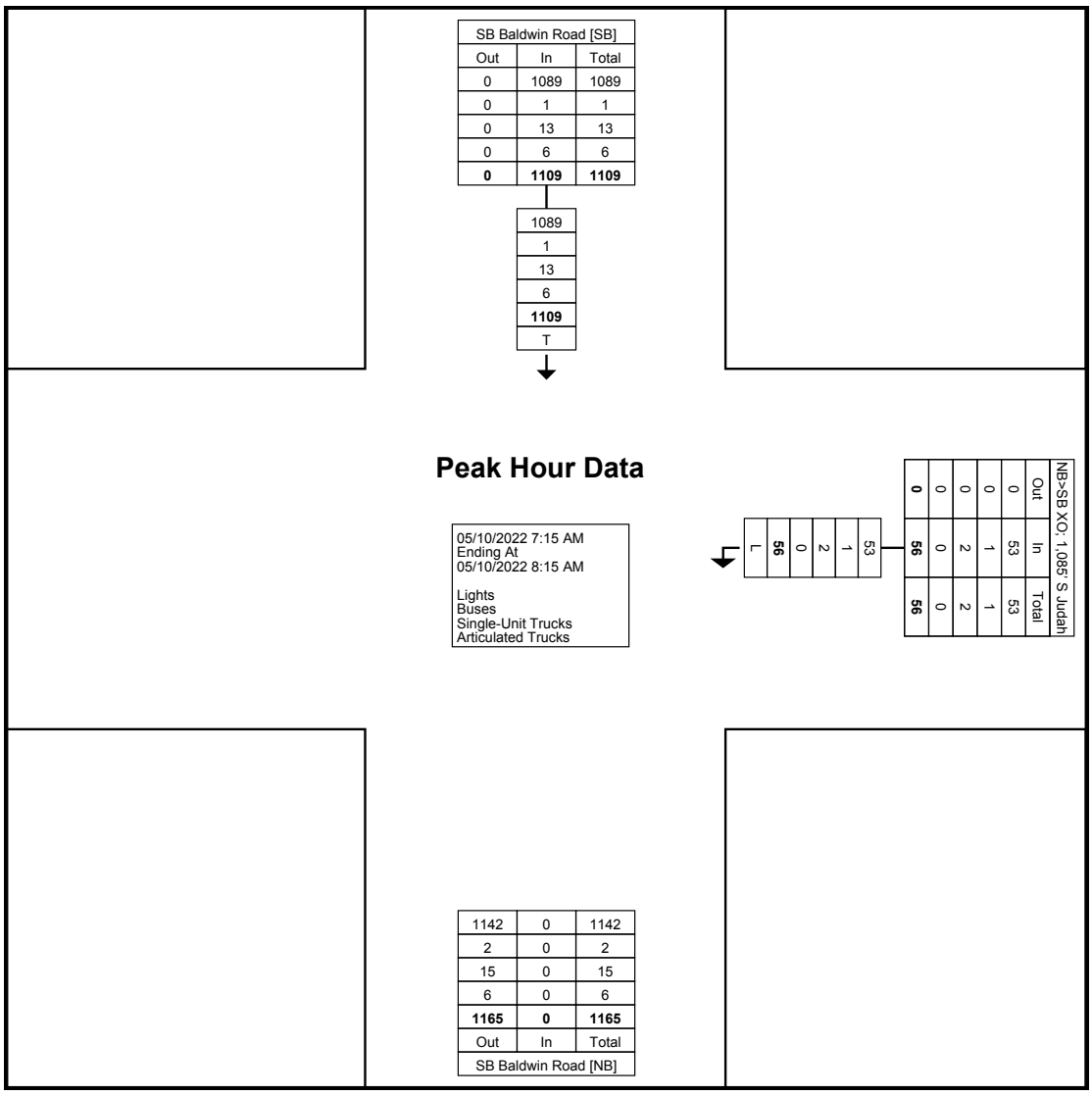
Reliable Traffic Data



Turning Movement Peak Hour Data Plot (7:15 AM)

Traffic Data Collection, LLC
7504 Sawgrass Drive
www.tdccounts.com
Washington, Michigan, United States 48094
Ph. (586) 786-5407
Reliable Traffic Data

Project: Lake Orion Twp.
Traffic Impact Study
Corridor: Baldwin Road
Weather: Sunny, Dry Temp. 70's
Video VCU ID#: SCU3HT SW

Count Name: TMC_3
Baldwin NB-SB XO_S Judah_5-10-22
Site Code: TMC_3
Traffic Data Collection, LLC
Start Date: 05/10/2022

Turning Movement Peak Hour Data (5:00 PM)

Start Time	SB Baldwin Road Southbound		NB>SB XO; 1,085' S Judah Rd. Westbound		
	Thru	App. Total	Left	App. Total	Int. Total
5:00 PM	188	188	20	20	208
5:15 PM	178	178	23	23	201
5:30 PM	179	179	26	26	205
5:45 PM	157	157	26	26	183
Total	702	702	95	95	797
Approach %	100.0	-	100.0	-	-
Total %	88.1	88.1	11.9	11.9	-
PHF	0.934	0.934	0.913	0.913	0.958
Lights	681	681	94	94	775
% Lights	97.0	97.0	98.9	98.9	97.2
Buses	0	0	0	0	0
% Buses	0.0	0.0	0.0	0.0	0.0
Single-Unit Trucks	19	19	1	1	20
% Single-Unit Trucks	2.7	2.7	1.1	1.1	2.5
Articulated Trucks	2	2	0	0	2
% Articulated Trucks	0.3	0.3	0.0	0.0	0.3

Traffic Data Collection, LLC
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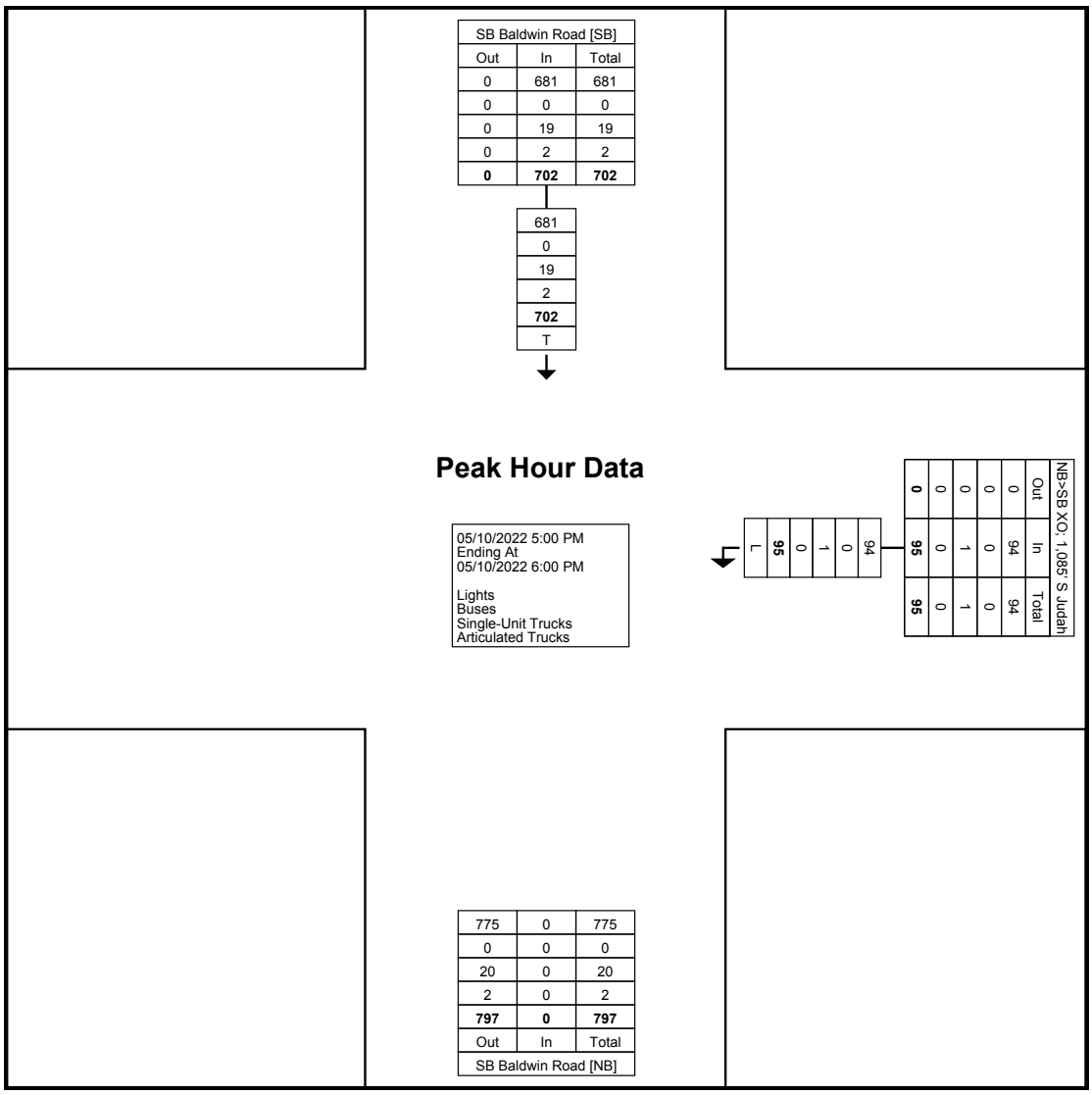
Reliable Traffic Data



Turning Movement Peak Hour Data Plot (5:00 PM)

Traffic Data Collection, LLC
7504 Sawgrass Drive
www.tdccounts.com
Washington, Michigan, United States 48094
Ph. (586) 786-5407
Reliable Traffic Data

TDC Traffic Comments: 4 hour video multi-modal intersection vehicle classification turning movement count conducted during typical weekday (Tuesday) from 7:00-9:00 AM morning & 4:00-6:00 PM afternoon peak hours, while school was in session. Daily peak hour reports provided for morning & afternoon peak hour study periods.

TMC was performed with Miovision video VCU scout recording cameras for Kalama Wolf In Binden Sheep, Lake Orion Traffic Impact Study for AEW.
Non-signalized intersection. VCU camera was located within SW intersection quadrants. All intersection shared video files have been uploaded to Miovision DataLink cloud platform.

Classification Summary Details & Percentages: Four (4) Groupings:
1) Lights Includes: FHWA Classes 1-3 (Motorcycles, Pick Up Trucks, Vans, Light Goods Vehicles)
2) Buses Includes: FHWA Class 4 (School Buses & Regional Transportation Metro Buses)
3) Single-Unit Trucks Includes: FHWA Classes 5-7 (2-4 Axle SU Medium Trucks)
4) Articulated Trucks Includes: FHWA Classes 8-12 (Heavy Trucks W/Single & Multi Unit Trailers)

TMC_3 Baldwin NB-SB XO_S Judah_5-10-22 - TMC

Tue May 10, 2022
Full Length (7 AM-9 AM, 4 PM-6 PM)
All Classes (Lights, Single-Unit Trucks, Articulated Trucks, Buses)
All Movements
ID: 948434, Location: 42.712279, -83.307451, Site Code: TMC_3 Traffic Data Collection, LLC

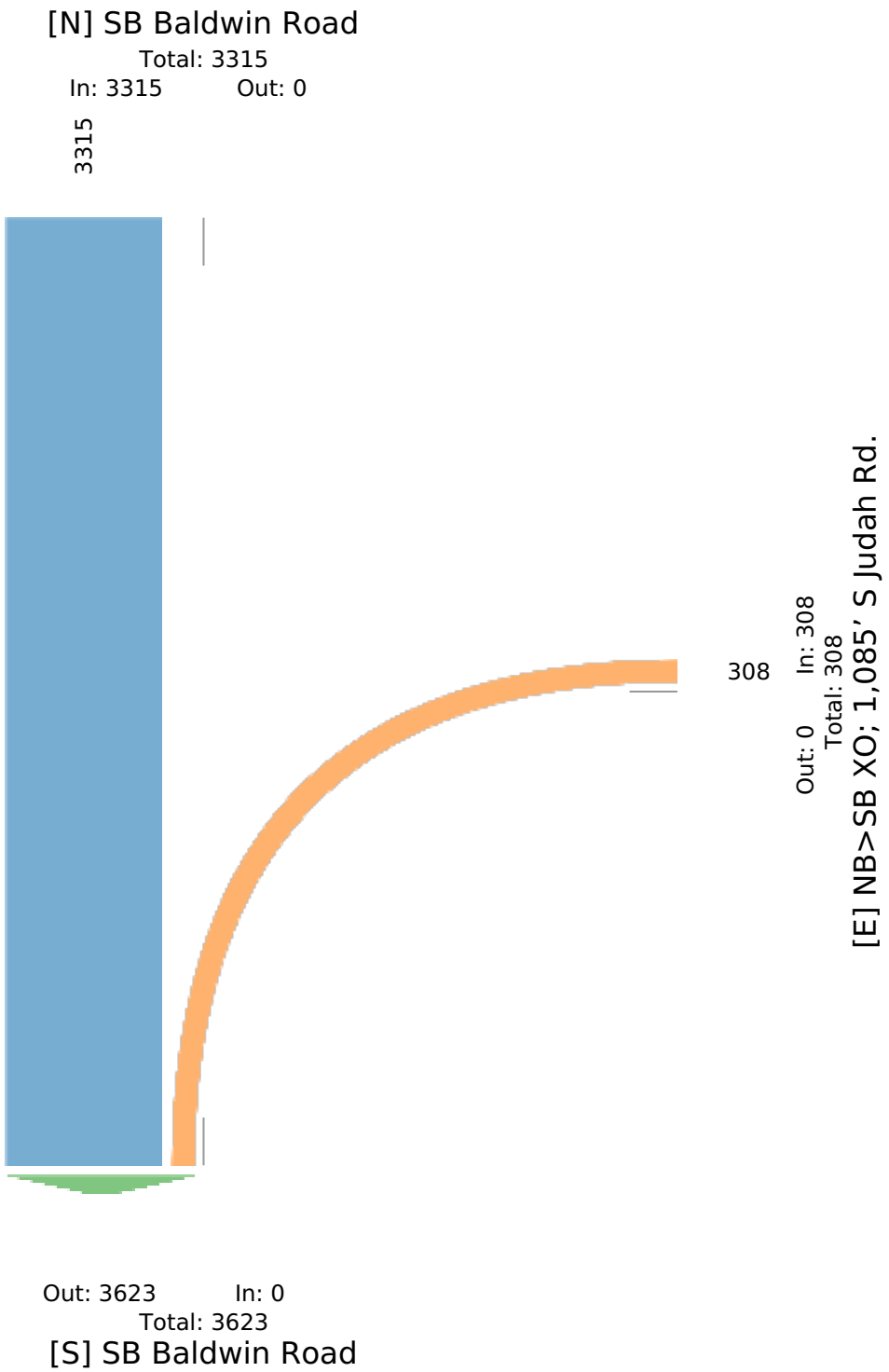
Provided by: Traffic Data Collection, LLC
7504 Sawgrass Drive, www.tdccounts.com,
Washington, MI, 48094, US

Leg Direction	SB Baldwin Road Southbound		NB>SB XO; 1,085' S Judah Rd. Westbound		
Time	T	**App**	L	**App**	**Int**
2022-05-10 7:00AM	223	**223**	12	**12**	**235**
7:15AM	292	**292**	16	**16**	**308**
7:30AM	286	**286**	12	**12**	**298**
7:45AM	287	**287**	15	**15**	**302**
Hourly Total	1088	**1088**	55	**55**	**1143**
8:00AM	244	**244**	13	**13**	**257**
8:15AM	229	**229**	15	**15**	**244**
8:30AM	221	**221**	18	**18**	**239**
8:45AM	193	**193**	13	**13**	**206**
Hourly Total	887	**887**	59	**59**	**946**
9:00AM	0	**0**	0	**0**	**0**
Hourly Total	0	**0**	0	**0**	**0**
4:00PM	175	**175**	18	**18**	**193**
4:15PM	161	**161**	25	**25**	**186**
4:30PM	163	**163**	28	**28**	**191**
4:45PM	139	**139**	28	**28**	**167**
Hourly Total	638	**638**	99	**99**	**737**
5:00PM	188	**188**	20	**20**	**208**
5:15PM	178	**178**	23	**23**	**201**
5:30PM	179	**179**	26	**26**	**205**
5:45PM	157	**157**	26	**26**	**183**
Hourly Total	702	**702**	95	**95**	**797**
6:00PM	0	**0**	0	**0**	**0**
Hourly Total	0	**0**	0	**0**	**0**
Total	3315	**3315**	308	**308**	**3623**
% Approach	100%	-	100%	-	-
% Total	91.5%	**91.5%**	8.5%	**8.5%**	-
Lights	3237	**3237**	301	**301**	3538
% Lights	97.6%	**97.6%**	97.7%	**97.7%**	97.7%
Single-Unit Trucks	56	**56**	5	**5**	61
% Single-Unit Trucks	1.7%	**1.7%**	1.6%	**1.6%**	1.7%
Articulated Trucks	14	**14**	1	**1**	15
% Articulated Trucks	0.4%	**0.4%**	0.3%	**0.3%**	0.4%
Buses	8	**8**	1	**1**	9
% Buses	0.2%	**0.2%**	0.3%	**0.3%**	0.2%

*L: Left, T: Thru

TMC_3 Baldwin NB-SB XO_S Judah_5-10-22 - TMC
Tue May 10, 2022
Full Length (7 AM-9 AM, 4 PM-6 PM)
All Classes (Lights, Single-Unit Trucks, Articulated Trucks, Buses)
All Movements
ID: 948434, Location: 42.712279, -83.307451, Site Code: TMC_3 Traffic Data Collection, LLC

Provided by: Traffic Data Collection, LLC
7504 Sawgrass Drive, www.tdccounts.com,
Washington, MI, 48094, US



859

TMC_3 Baldwin NB-SB XO_S Judah_5-10-22 - TMC

Tue May 10, 2022
AM Peak (7:15 AM - 8:15 AM) - Overall Peak Hour
All Classes (Lights, Single-Unit Trucks, Articulated Trucks, Buses)
All Movements
ID: 948434, Location: 42.712279, -83.307451, Site Code: TMC_3 Traffic Data Collection, LLC

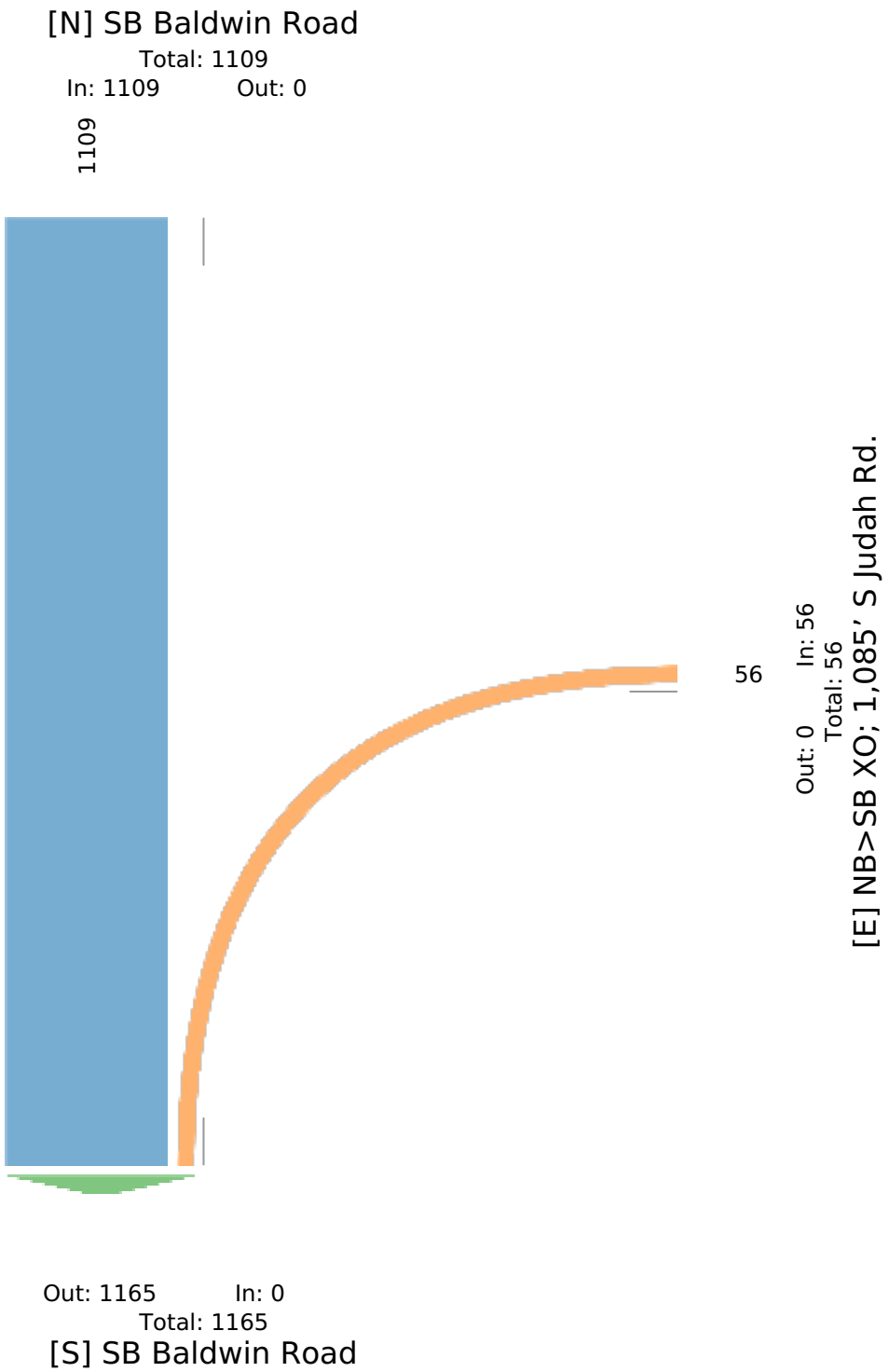
Provided by: Traffic Data Collection, LLC
7504 Sawgrass Drive, www.tdccounts.com,
Washington, MI, 48094, US

Leg Direction	SB Baldwin Road Southbound		NB>SB XO; 1,085' S Judah Rd. Westbound		
Time	T	**App**	L	**App**	**Int**
2022-05-10 7:15AM	292	**292**	16	**16**	**308**
7:30AM	286	**286**	12	**12**	**298**
7:45AM	287	**287**	15	**15**	**302**
8:00AM	244	**244**	13	**13**	**257**
Total	1109	**1109**	56	**56**	**1165**
% Approach	100%	**-**	100%	**-**	-
% Total	95.2%	**95.2%**	4.8%	**4.8%**	-
PHF	0.949	**0.949**	0.875	**0.875**	0.946
Lights	1089	**1089**	53	**53**	1142
% Lights	98.2%	**98.2%**	94.6%	**94.6%**	98.0%
Single-Unit Trucks	13	**13**	2	**2**	15
% Single-Unit Trucks	1.2%	**1.2%**	3.6%	**3.6%**	1.3%
Articulated Trucks	6	**6**	0	**0**	6
% Articulated Trucks	0.5%	**0.5%**	0%	**0%**	0.5%
Buses	1	**1**	1	**1**	2
% Buses	0.1%	**0.1%**	1.8%	**1.8%**	0.2%

*L: Left, T: Thru

TMC_3 Baldwin NB-SB XO_S Judah_5-10-22 - TMC
Tue May 10, 2022
AM Peak (7:15 AM - 8:15 AM) - Overall Peak Hour
All Classes (Lights, Single-Unit Trucks, Articulated Trucks, Buses)
All Movements
ID: 948434, Location: 42.712279, -83.307451, Site Code: TMC_3 Traffic Data Collection, LLC

Provided by: Traffic Data Collection, LLC
7504 Sawgrass Drive, www.tdccounts.com,
Washington, MI, 48094, US



861

TMC_3 Baldwin NB-SB XO_S Judah_5-10-22 - TMC

Tue May 10, 2022
PM Peak (5 PM - 6 PM)
All Classes (Lights, Single-Unit Trucks, Articulated Trucks, Buses)
All Movements
ID: 948434, Location: 42.712279, -83.307451, Site Code: TMC_3 Traffic Data Collection, LLC

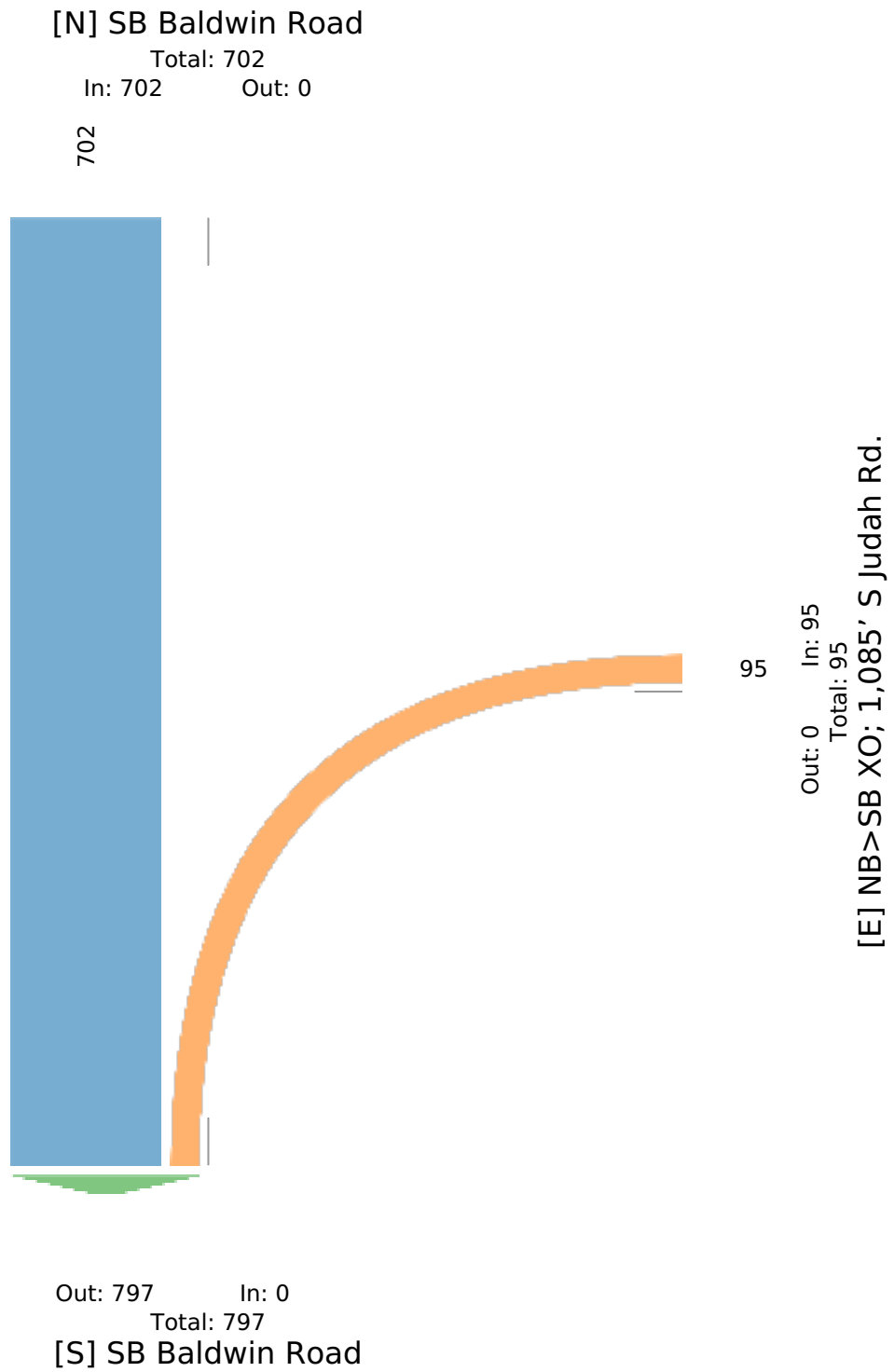
Provided by: Traffic Data Collection, LLC
7504 Sawgrass Drive, www.tdccounts.com,
Washington, MI, 48094, US

Leg Direction	SB Baldwin Road Southbound		NB>SB XO; 1,085' S Judah Rd. Westbound		
Time	T	**App**	L	**App**	**Int**
2022-05-10 5:00PM	188	**188**	20	**20**	**208**
5:15PM	178	**178**	23	**23**	**201**
5:30PM	179	**179**	26	**26**	**205**
5:45PM	157	**157**	26	**26**	**183**
Total	702	**702**	95	**95**	**797**
% Approach	100%	**-**	100%	**-**	-
% Total	88.1%	**88.1%**	11.9%	**11.9%**	-
PHF	0.934	**0.934**	0.913	**0.913**	0.958
Lights	681	**681**	94	**94**	775
% Lights	97.0%	**97.0%**	98.9%	**98.9%**	97.2%
Single-Unit Trucks	19	**19**	1	**1**	20
% Single-Unit Trucks	2.7%	**2.7%**	1.1%	**1.1%**	2.5%
Articulated Trucks	2	**2**	0	**0**	2
% Articulated Trucks	0.3%	**0.3%**	0%	**0%**	0.3%
Buses	0	**0**	0	**0**	0
% Buses	0%	**0%**	0%	**0%**	0%

*L: Left, T: Thru

TMC_3 Baldwin NB-SB XO_S Judah_5-10-22 - TMC
Tue May 10, 2022
PM Peak (5 PM - 6 PM)
All Classes (Lights, Single-Unit Trucks, Articulated Trucks, Buses)
All Movements
ID: 948434, Location: 42.712279, -83.307451, Site Code: TMC_3 Traffic Data Collection, LLC

Provided by: Traffic Data Collection, LLC
7504 Sawgrass Drive, www.tdccounts.com,
Washington, MI, 48094, US



863

Project: Lake Orion Twp.
Traffic Impact Study
Corridor: Baldwin Road
Weather: Sunny, Dry Temp. 70's
Video VCU ID#: SCU24L SE & SCU61E NE

Traffic Data Collection, LLC
7504 Sawgrass Drive
www.tdccounts.com
Washington, Michigan, United States 48094
Ph. (586) 786-5407
Reliable Traffic Data

Count Name: TMC_4 Baldwin Commons & Baldwin_5-10-22
Site Code: TMC_4
Traffic Data Collection, LLC
Start Date: 05/10/2022

Turning Movement Data

Start Time	Bladwin Road Southbound					Baldwin Road Northbound					Baldwin Commons Shopping Center Eastbound					
	Right	Thru	U-Turn	Peds	App. Total	Thru	Left	U-Turn	Peds	App. Total	Right	Left	U-Turn	Peds	App. Total	Int. Total
7:00 AM	6	249	0	0	255	65	2	20	0	87	5	2	0	0	7	349
7:15 AM	0	329	0	0	329	73	6	22	0	101	9	0	0	0	9	439
7:30 AM	4	294	0	0	298	96	7	14	0	117	5	6	0	0	11	426
7:45 AM	2	338	0	0	340	107	14	16	0	137	4	3	0	0	7	484
Hourly Total	12	1210	0	0	1222	341	29	72	0	442	23	11	0	0	34	1698
8:00 AM	2	275	0	0	277	120	6	13	0	139	5	5	0	0	10	426
8:15 AM	2	248	0	0	250	122	8	14	0	144	1	6	0	0	7	401
8:30 AM	1	242	0	0	243	106	7	6	0	119	5	5	0	0	10	372
8:45 AM	1	216	0	0	217	132	15	18	0	165	1	1	0	0	2	384
Hourly Total	6	981	0	0	987	480	36	51	0	567	12	17	0	0	29	1583
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4:00 PM	2	179	0	0	181	308	48	7	0	363	53	19	0	0	72	616
4:15 PM	3	160	0	0	163	312	51	19	0	382	51	12	0	0	63	608
4:30 PM	5	187	0	0	192	333	54	13	0	400	45	30	0	4	75	667
4:45 PM	5	170	0	0	175	390	57	6	0	453	48	18	0	0	66	694
Hourly Total	15	696	0	0	711	1343	210	45	0	1598	197	79	0	4	276	2585
5:00 PM	3	207	0	0	210	373	51	12	0	436	64	24	0	2	88	734
5:15 PM	4	196	0	0	200	392	40	4	0	436	46	23	0	0	69	705
5:30 PM	3	203	0	0	206	330	38	10	0	378	45	26	0	0	71	655
5:45 PM	4	203	0	0	207	335	53	7	0	395	41	22	0	1	63	665
Hourly Total	14	809	0	0	823	1430	182	33	0	1645	196	95	0	3	291	2759
6:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	47	3696	0	0	3743	3594	457	201	0	4252	428	202	0	7	630	8625
Approach %	1.3	98.7	0.0	-	-	84.5	10.7	4.7	-	-	67.9	32.1	0.0	-	-	-
Total %	0.5	42.9	0.0	-	43.4	41.7	5.3	2.3	-	49.3	5.0	2.3	0.0	-	7.3	-
Lights	47	3619	0	-	3666	3531	451	197	-	4179	421	201	0	-	622	8467
% Lights	100.0	97.9	-	-	97.9	98.2	98.7	98.0	-	98.3	98.4	99.5	-	-	98.7	98.2
Buses	0	5	0	-	5	5	0	0	-	5	0	0	0	-	0	10
% Buses	0.0	0.1	-	-	0.1	0.1	0.0	0.0	-	0.1	0.0	0.0	-	-	0.0	0.1
Single-Unit Trucks	0	58	0	-	58	45	4	1	-	50	2	1	0	-	3	111
% Single-Unit Trucks	0.0	1.6	-	-	1.5	1.3	0.9	0.5	-	1.2	0.5	0.5	-	-	0.5	1.3
Articulated Trucks	0	14	0	-	14	13	2	3	-	18	5	0	0	-	5	37
% Articulated Trucks	0.0	0.4	-	-	0.4	0.4	0.4	1.5	-	0.4	1.2	0.0	-	-	0.8	0.4
Bicycles on Road	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	-	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	0	-	-	-	-	0	-	-	-	-	7	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	100.0	-	-

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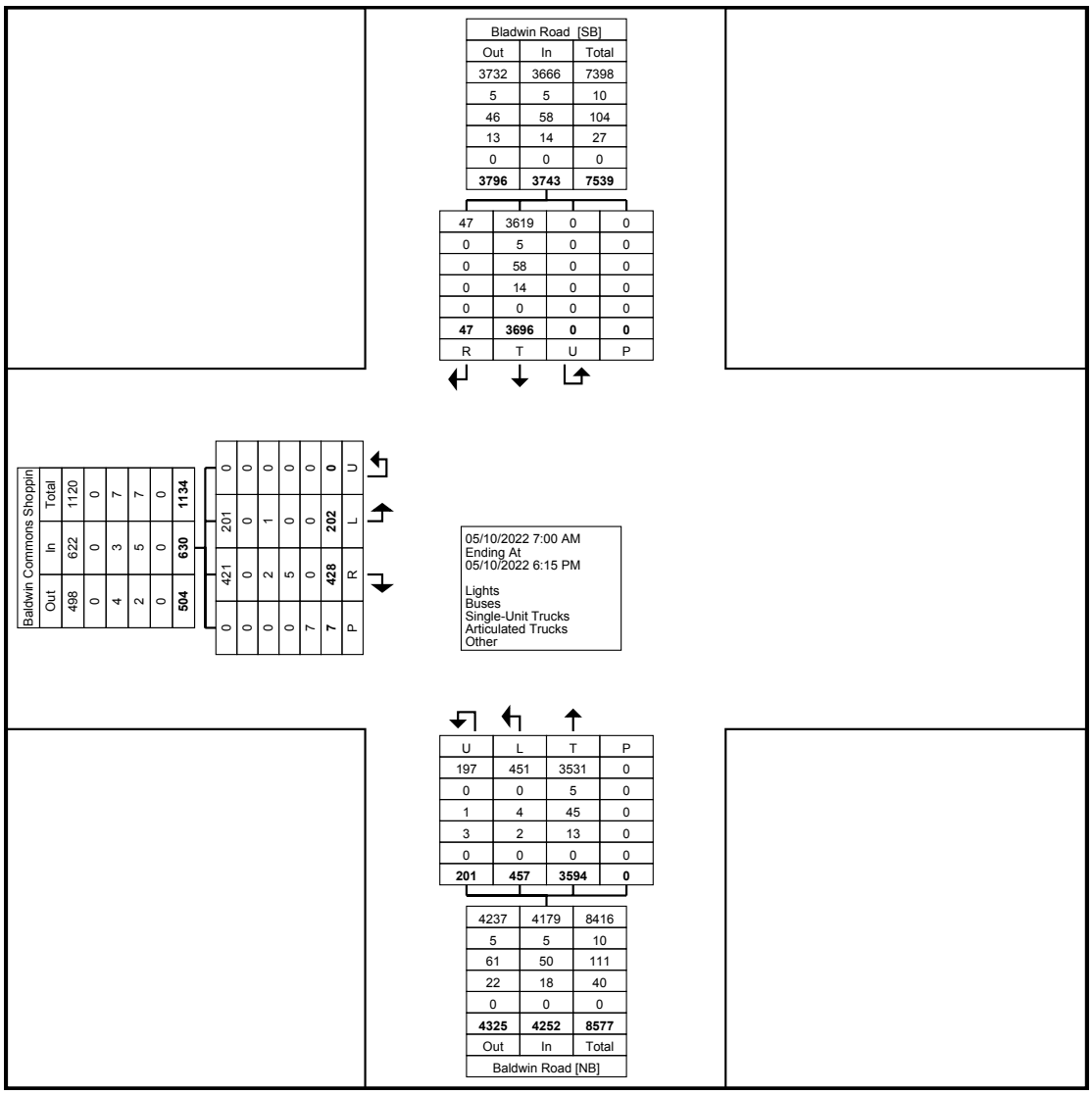

Turning Movement Data Plot

Project: Lake Orion Twp.
Traffic Impact Study
Corridor: Baldwin Road
Weather: Sunny, Dry Temp. 70's
Video VCU ID#: SCU24L SE & SCU61E NE

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Count Name: TMC_4 Baldwin Commons & Baldwin_5-10-22
Site Code: TMC_4
Traffic Data Collection, LLC
Start Date: 05/10/2022
Page No: 3

Turning Movement Peak Hour Data (7:15 AM)

Start Time	Bladwin Road Southbound					Baldwin Road Northbound					Baldwin Commons Shopping Center Eastbound					Int. Total
	Right	Thru	U-Turn	Peds	App. Total	Thru	Left	U-Turn	Peds	App. Total	Right	Left	U-Turn	Peds	App. Total	
7:15 AM	0	329	0	0	329	73	6	22	0	101	9	0	0	0	9	439
7:30 AM	4	294	0	0	298	96	7	14	0	117	5	6	0	0	11	426
7:45 AM	2	338	0	0	340	107	14	16	0	137	4	3	0	0	7	484
8:00 AM	2	275	0	0	277	120	6	13	0	139	5	5	0	0	10	426
Total	8	1236	0	0	1244	396	33	65	0	494	23	14	0	0	37	1775
Approach %	0.6	99.4	0.0	-	-	80.2	6.7	13.2	-	-	62.2	37.8	0.0	-	-	-
Total %	0.5	69.6	0.0	-	70.1	22.3	1.9	3.7	-	27.8	1.3	0.8	0.0	-	2.1	-
PHF	0.500	0.914	0.000	-	0.915	0.825	0.589	0.739	-	0.888	0.639	0.583	0.000	-	0.841	0.917
Lights	8	1217	0	-	1225	372	32	64	-	468	18	13	0	-	31	1724
% Lights	100.0	98.5	-	-	98.5	93.9	97.0	98.5	-	94.7	78.3	92.9	-	-	83.8	97.1
Buses	0	1	0	-	1	2	0	0	-	2	0	0	0	-	0	3
% Buses	0.0	0.1	-	-	0.1	0.5	0.0	0.0	-	0.4	0.0	0.0	-	-	0.0	0.2
Single-Unit Trucks	0	13	0	-	13	19	1	0	-	20	1	1	0	-	2	35
% Single-Unit Trucks	0.0	1.1	-	-	1.0	4.8	3.0	0.0	-	4.0	4.3	7.1	-	-	5.4	2.0
Articulated Trucks	0	5	0	-	5	3	0	1	-	4	4	0	0	-	4	13
% Articulated Trucks	0.0	0.4	-	-	0.4	0.8	0.0	1.5	-	0.8	17.4	0.0	-	-	10.8	0.7
Bicycles on Road	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	-	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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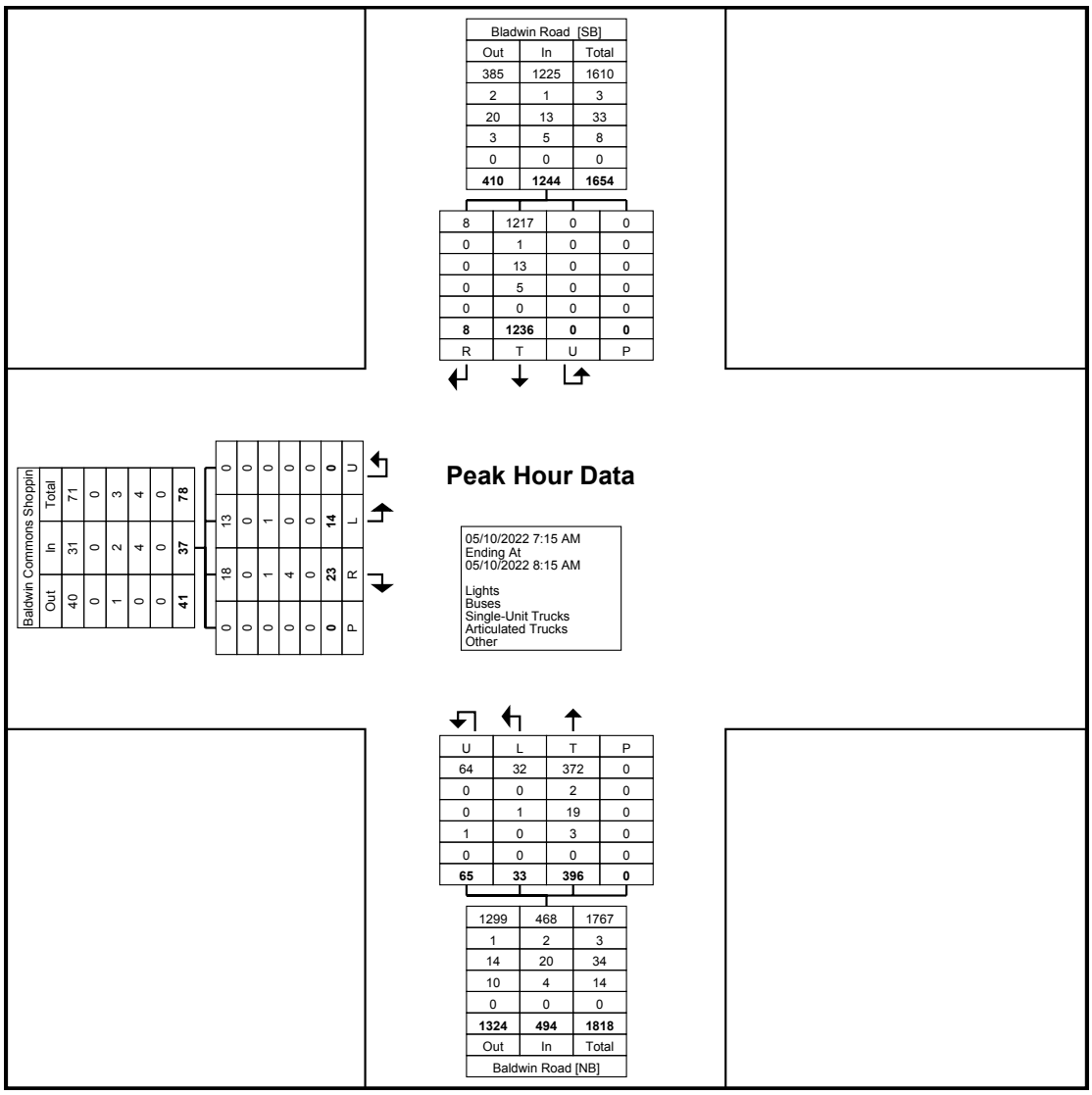

Turning Movement Peak Hour Data Plot (7:15 AM)

Project: Lake Orion Twp.
Traffic Impact Study
Corridor: Baldwin Road
Weather: Sunny, Dry Temp. 70's
Video VCU ID#: SCU24L SE & SCU61E NE

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Reliable Traffic Data

Count Name: TMC_4 Baldwin Commons & Baldwin_5-10-22
Site Code: TMC_4
Traffic Data Collection, LLC
Start Date: 05/10/2022
Page No: 5

Turning Movement Peak Hour Data (4:30 PM)

Start Time	Bladwin Road Southbound					Baldwin Road Northbound					Baldwin Commons Shopping Center Eastbound					
	Right	Thru	U-Turn	Peds	App. Total	Thru	Left	U-Turn	Peds	App. Total	Right	Left	U-Turn	Peds	App. Total	Int. Total
4:30 PM	5	187	0	0	192	333	54	13	0	400	45	30	0	4	75	667
4:45 PM	5	170	0	0	175	390	57	6	0	453	48	18	0	0	66	694
5:00 PM	3	207	0	0	210	373	51	12	0	436	64	24	0	2	88	734
5:15 PM	4	196	0	0	200	392	40	4	0	436	46	23	0	0	69	705
Total	17	760	0	0	777	1488	202	35	0	1725	203	95	0	6	298	2800
Approach %	2.2	97.8	0.0	-	-	86.3	11.7	2.0	-	-	68.1	31.9	0.0	-	-	-
Total %	0.6	27.1	0.0	-	27.8	53.1	7.2	1.3	-	61.6	7.3	3.4	0.0	-	10.6	-
PHF	0.850	0.918	0.000	-	0.925	0.949	0.886	0.673	-	0.952	0.793	0.792	0.000	-	0.847	0.954
Lights	17	747	0	-	764	1481	202	35	-	1718	203	95	0	-	298	2780
% Lights	100.0	98.3	-	-	98.3	99.5	100.0	100.0	-	99.6	100.0	100.0	-	-	100.0	99.3
Buses	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Buses	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	-	-	0.0	0.0
Single-Unit Trucks	0	10	0	-	10	5	0	0	-	5	0	0	0	-	0	15
% Single-Unit Trucks	0.0	1.3	-	-	1.3	0.3	0.0	0.0	-	0.3	0.0	0.0	-	-	0.0	0.5
Articulated Trucks	0	3	0	-	3	2	0	0	-	2	0	0	0	-	0	5
% Articulated Trucks	0.0	0.4	-	-	0.4	0.1	0.0	0.0	-	0.1	0.0	0.0	-	-	0.0	0.2
Bicycles on Road	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	-	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	0	-	-	-	-	0	-	-	-	-	6	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	100.0	-	-

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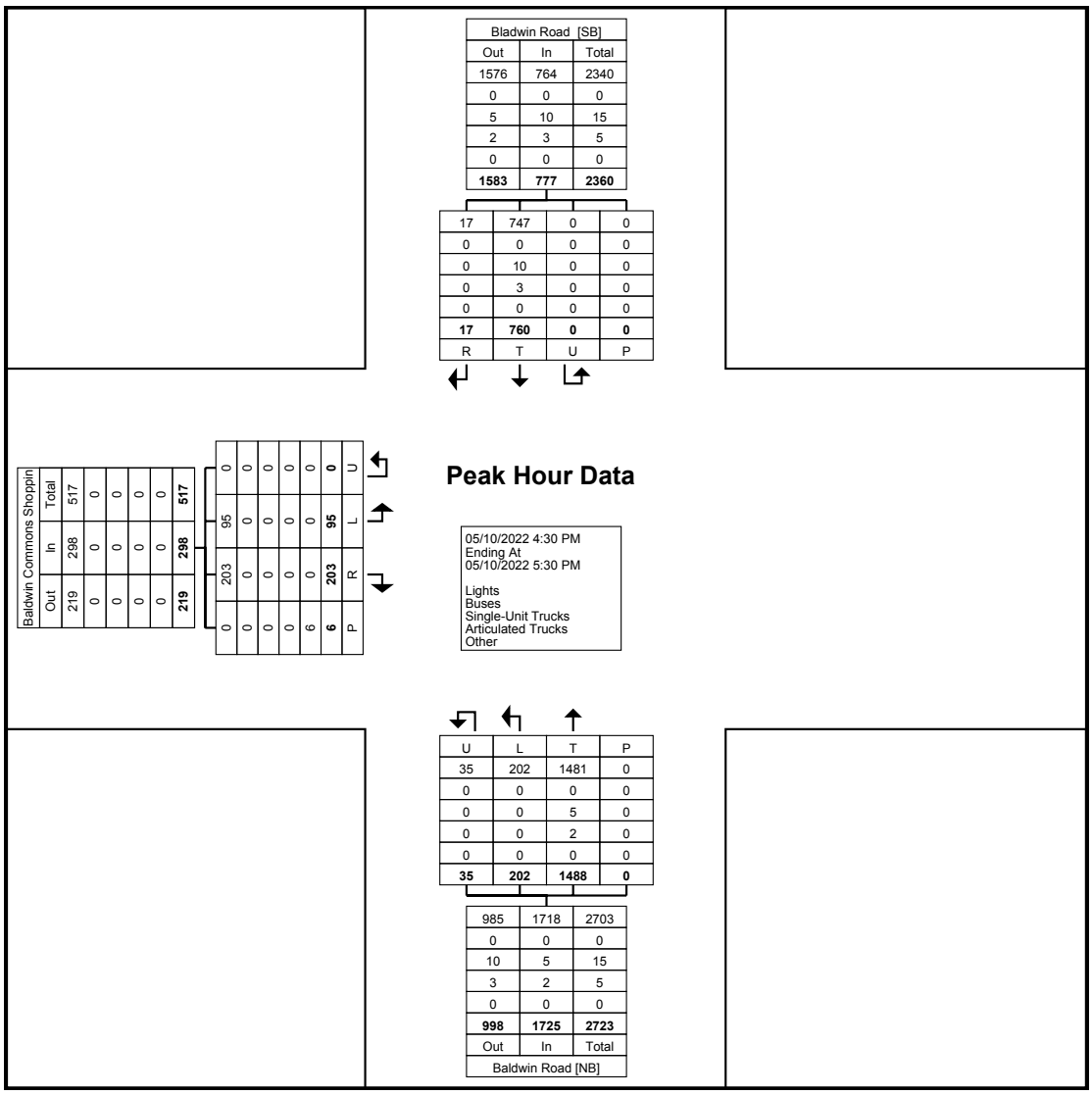

Turning Movement Peak Hour Data Plot (4:30 PM)

Traffic Data Collection, LLC
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TDC Traffic Comments: 4 hour video multi-modal intersection vehicle classification turning movement count conducted during typical weekday (Tuesday) from 7:00-9:00 AM morning & 4:00-6:00 PM afternoon peak hours, while school was in session. Daily peak hour reports provided for morning & afternoon peak hour study periods.

TMC was performed with Miovision video VCU scout recording cameras for Kalama Wolf In Binden Sheep, Lake Orion Traffic Impact Study for AEW.
Signalized controlled intersection. Push button ped. signals for west leg. Baldwin Road & Baldwin Commons are divided roadways. VCU cameras were located within SE &NE intersection quadrants. All intersection shared video files have been uploaded to Miovision DataLink cloud platform.

Classification Summary Details & Percentages: Six (6) Groupings:
1) Lights Includes: FHWA Classes 1-3 (Motorcycles, Pick Up Trucks, Vans, Light Goods Vehicles)
2) Buses Includes: FHWA Class 4 (School Buses & Regional Transportation Metro Buses)
3) Single-Unit Trucks Includes: FHWA Classes 5-7 (2-4 Axle SU Medium Trucks)
4) Articulated Trucks Includes: FHWA Classes 8-12 (Heavy Trucks W/Single & Multi Unit Trailers)
5) Bicycles On Road Includes: All bicycles on the roadway
6) Bicycles On Crosswalk Includes: All bicycles using sidewalk
7) Pedestrians Includes: All pedestrians using crosswalk

TMC_4 Baldwin Commons & Baldwin_5-10-22 - TMC

Tue May 10, 2022
Full Length (7 AM-9 AM, 4 PM-6 PM)
All Classes (Lights, Single-Unit Trucks, Articulated Trucks, Buses, Pedestrians, Bicycles on Road, Bicycles on Crosswalk)
All Movements
ID: 948430, Location: 42.708923, -83.307132, Site Code: TMC_4 Traffic Data Collection, LLC

Provided by: Traffic Data Collection, LLC
7504 Sawgrass Drive, www.tdccounts.com,
Washington, MI, 48094, US

Leg	Bladwin Road					Baldwin Road					Baldwin Commons Shopping Center					
Direction	Southbound					Northbound					Eastbound					
Time	R	T	U	**App**	Ped*	T	L	U	**App**	Ped*	R	L	U	**App**	Ped*	**Int**
2022-05-10 7:00AM	6	249	0	**255**	0	65	2	20	**87**	0	5	2	0	**7**	0	**349**
7:15AM	0	329	0	**329**	0	73	6	22	**101**	0	9	0	0	**9**	0	**439**
7:30AM	4	294	0	**298**	0	96	7	14	**117**	0	5	6	0	**11**	0	**426**
7:45AM	2	338	0	**340**	0	107	14	16	**137**	0	4	3	0	**7**	0	**484**
Hourly Total	12	1210	0	**1222**	0	341	29	72	**442**	0	23	11	0	**34**	0	**1698**
8:00AM	2	275	0	**277**	0	120	6	13	**139**	0	5	5	0	**10**	0	**426**
8:15AM	2	248	0	**250**	0	122	8	14	**144**	0	1	6	0	**7**	0	**401**
8:30AM	1	242	0	**243**	0	106	7	6	**119**	0	5	5	0	**10**	0	**372**
8:45AM	1	216	0	**217**	0	132	15	18	**165**	0	1	1	0	**2**	0	**384**
Hourly Total	6	981	0	**987**	0	480	36	51	**567**	0	12	17	0	**29**	0	**1583**
4:00PM	2	179	0	**181**	0	308	48	7	**363**	0	53	19	0	**72**	0	**616**
4:15PM	3	160	0	**163**	0	312	51	19	**382**	0	51	12	0	**63**	0	**608**
4:30PM	5	187	0	**192**	0	333	54	13	**400**	0	45	30	0	**75**	4	**667**
4:45PM	5	170	0	**175**	0	390	57	6	**453**	0	48	18	0	**66**	0	**694**
Hourly Total	15	696	0	**711**	0	1343	210	45	**1598**	0	197	79	0	**276**	4	**2585**
5:00PM	3	207	0	**210**	0	373	51	12	**436**	0	64	24	0	**88**	2	**734**
5:15PM	4	196	0	**200**	0	392	40	4	**436**	0	46	23	0	**69**	0	**705**
5:30PM	3	203	0	**206**	0	330	38	10	**378**	0	45	26	0	**71**	0	**655**
5:45PM	4	203	0	**207**	0	335	53	7	**395**	0	41	22	0	**63**	1	**665**
Hourly Total	14	809	0	**823**	0	1430	182	33	**1645**	0	196	95	0	**291**	3	**2759**
6:00PM	0	0	0	**0**	0	0	0	0	**0**	0	0	0	0	**0**	0	**0**
Hourly Total	0	0	0	**0**	0	0	0	0	**0**	0	0	0	0	**0**	0	**0**
Total	47	3696	0	**3743**	0	3594	457	201	**4252**	0	428	202	0	**630**	7	**8625**
% Approach	1.3%	98.7%	0%	**-**	-	84.5%	10.7%	4.7%	**-**	-	67.9%	32.1%	0%	**-**	-	-
% Total	0.5%	42.9%	0%	**43.4%**	-	41.7%	5.3%	2.3%	**49.3%**	-	5.0%	2.3%	0%	**7.3%**	-	-
Lights	47	3619	0	**3666**	-	3531	451	197	**4179**	-	421	201	0	**622**	-	8467
% Lights	100%	97.9%	0%	**97.9%**	-	98.2%	98.7%	98.0%	**98.3%**	-	98.4%	99.5%	0%	**98.7%**	-	98.2%
Single-Unit Trucks	0	58	0	**58**	-	45	4	1	**50**	-	2	1	0	**3**	-	111
% Single-Unit Trucks	0%	1.6%	0%	**1.5%**	-	1.3%	0.9%	0.5%	**1.2%**	-	0.5%	0.5%	0%	**0.5%**	-	1.3%
Articulated Trucks	0	14	0	**14**	-	13	2	3	**18**	-	5	0	0	**5**	-	37
% Articulated Trucks	0%	0.4%	0%	**0.4%**	-	0.4%	0.4%	1.5%	**0.4%**	-	1.2%	0%	0%	**0.8%**	-	0.4%
Buses	0	5	0	**5**	-	5	0	0	**5**	-	0	0	0	**0**	-	10
% Buses	0%	0.1%	0%	**0.1%**	-	0.1%	0%	0%	**0.1%**	-	0%	0%	0%	**0%**	-	0.1%
Bicycles on Road	0	0	0	**0**	-	0	0	0	**0**	-	0	0	0	**0**	-	0
% Bicycles on Road	0%	0%	0%	**0%**	-	0%	0%	0%	**0%**	-	0%	0%	0%	**0%**	-	0%
Pedestrians	-	-	-	-	0	-	-	-	-	0	-	-	-	-	7	
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0%	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

TMC_4 Baldwin Commons & Baldwin_5-10-22 - TMC

Tue May 10, 2022
Full Length (7 AM-9 AM, 4 PM-6 PM)
All Classes (Lights, Single-Unit Trucks, Articulated Trucks, Buses, Pedestrians, Bicycles on Road, Bicycles on Crosswalk)
All Movements
ID: 948430, Location: 42.708923, -83.307132, Site Code: TMC_4 Traffic Data Collection, LLC

Provided by: Traffic Data Collection, LLC
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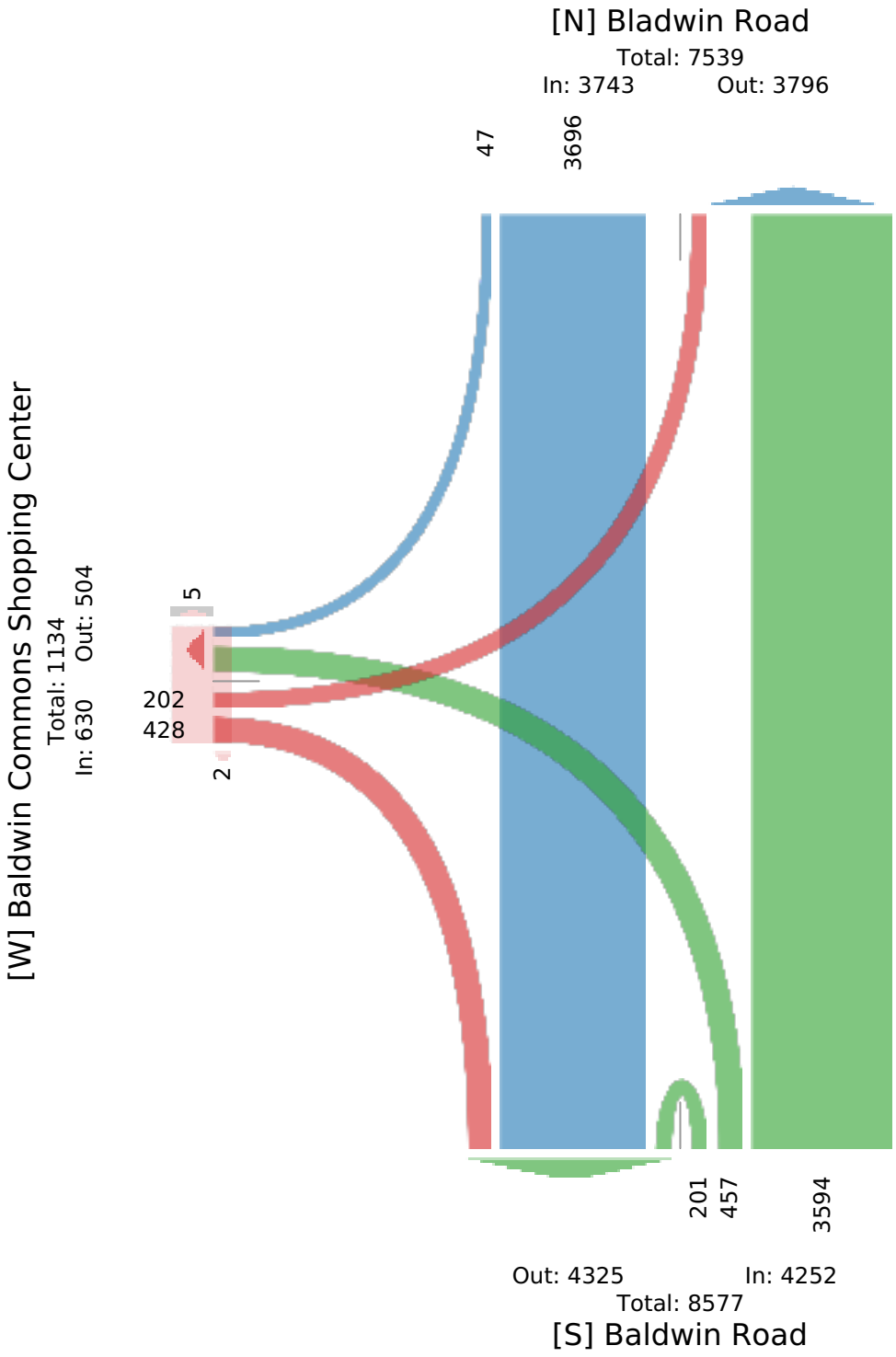
Washington, MI, 48094, US



TMC_4 Baldwin Commons & Baldwin_5-10-22 - TMC

Tue May 10, 2022
AM Peak (7:15 AM - 8:15 AM)
All Classes (Lights, Single-Unit Trucks, Articulated Trucks, Buses, Pedestrians, Bicycles on Road, Bicycles on Crosswalk)
All Movements
ID: 948430, Location: 42.708923, -83.307132, Site Code: TMC_4 Traffic Data Collection, LLC

Provided by: Traffic Data Collection, LLC
7504 Sawgrass Drive, www.tdccounts.com,
Washington, MI, 48094, US

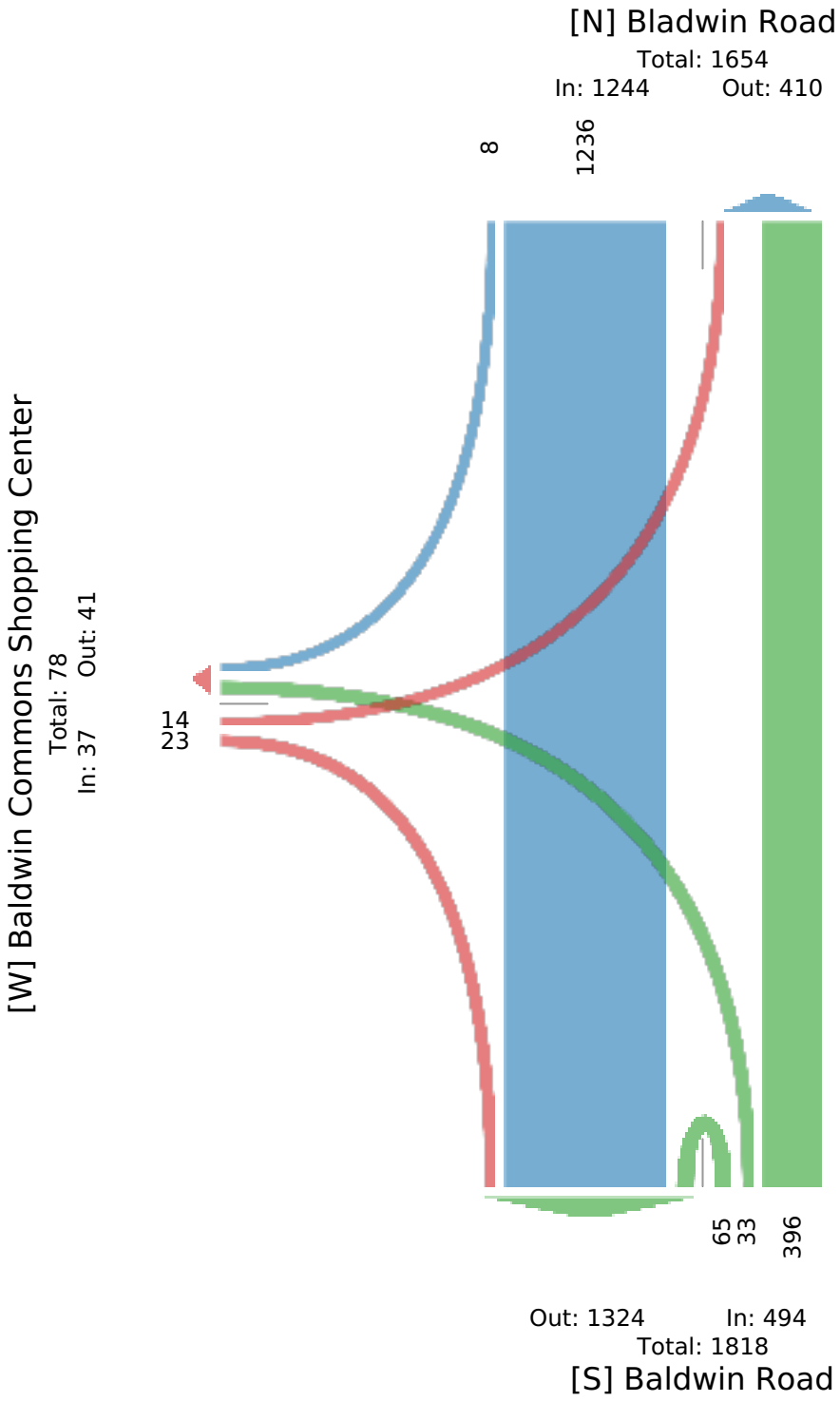
Leg	Bladwin Road					Baldwin Road					Baldwin Commons Shopping Center					
Direction	Southbound					Northbound					Eastbound					
Time	R	T	U	**App**	Ped*	T	L	U	**App**	Ped*	R	L	U	**App**	Ped*	**Int**
2022-05-10 7:15AM	0	329	0	**329**	0	73	6	22	**101**	0	9	0	0	**9**	0	**439**
7:30AM	4	294	0	**298**	0	96	7	14	**117**	0	5	6	0	**11**	0	**426**
7:45AM	2	338	0	**340**	0	107	14	16	**137**	0	4	3	0	**7**	0	**484**
8:00AM	2	275	0	**277**	0	120	6	13	**139**	0	5	5	0	**10**	0	**426**
Total	8	1236	0	**1244**	0	396	33	65	**494**	0	23	14	0	**37**	0	**1775**
% Approach	0.6%	99.4%	0%	**-**	-	80.2%	6.7%	13.2%	**-**	-	62.2%	37.8%	0%	**-**	-	**-**
% Total	0.5%	69.6%	0%	**70.1%**	-	22.3%	1.9%	3.7%	**27.8%**	-	1.3%	0.8%	0%	**2.1%**	-	**-**
PHF	0.500	0.914	-	**0.915**	-	0.825	0.589	0.739	**0.888**	-	0.639	0.583	-	**0.841**	-	0.917
Lights	8	1217	0	**1225**	-	372	32	64	**468**	-	18	13	0	**31**	-	1724
% Lights	100%	98.5%	0%	**98.5%**	-	93.9%	97.0%	98.5%	**94.7%**	-	78.3%	92.9%	0%	**83.8%**	-	97.1%
Single-Unit Trucks	0	13	0	**13**	-	19	1	0	**20**	-	1	1	0	**2**	-	35
% Single-Unit Trucks	0%	1.1%	0%	**1.0%**	-	4.8%	3.0%	0%	**4.0%**	-	4.3%	7.1%	0%	**5.4%**	-	2.0%
Articulated Trucks	0	5	0	**5**	-	3	0	1	**4**	-	4	0	0	**4**	-	13
% Articulated Trucks	0%	0.4%	0%	**0.4%**	-	0.8%	0%	1.5%	**0.8%**	-	17.4%	0%	0%	**10.8%**	-	0.7%
Buses	0	1	0	**1**	-	2	0	0	**2**	-	0	0	0	**0**	-	3
% Buses	0%	0.1%	0%	**0.1%**	-	0.5%	0%	0%	**0.4%**	-	0%	0%	0%	**0%**	-	0.2%
Bicycles on Road	0	0	0	**0**	-	0	0	0	**0**	-	0	0	0	**0**	-	0
% Bicycles on Road	0%	0%	0%	**0%**	-	0%	0%	0%	**0%**	-	0%	0%	0%	**0%**	-	0%
Pedestrians	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

TMC_4 Baldwin Commons & Baldwin_5-10-22 - TMC

Tue May 10, 2022
AM Peak (7:15 AM - 8:15 AM)
All Classes (Lights, Single-Unit Trucks, Articulated Trucks, Buses, Pedestrians, Bicycles on Road, Bicycles on Crosswalk)
All Movements
ID: 948430, Location: 42.708923, -83.307132, Site Code: TMC_4 Traffic Data Collection, LLC

Provided by: Traffic Data Collection, LLC
7504 Sawgrass Drive, www.tdccounts.com,
Washington, MI, 48094, US



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TMC_4 Baldwin Commons & Baldwin_5-10-22 - TMC

Tue May 10, 2022
PM Peak (4:30 PM - 5:30 PM) - Overall Peak Hour
All Classes (Lights, Single-Unit Trucks, Articulated Trucks, Buses, Pedestrians, Bicycles on Road, Bicycles on Crosswalk)
All Movements
ID: 948430, Location: 42.708923, -83.307132, Site Code: TMC_4 Traffic Data Collection, LLC

Provided by: Traffic Data Collection, LLC
7504 Sawgrass Drive, www.tdccounts.com,
Washington, MI, 48094, US

Leg	Bladwin Road					Baldwin Road					Baldwin Commons Shopping Center					
Direction	Southbound					Northbound					Eastbound					
Time	R	T	U	**App**	Ped*	T	L	U	**App**	Ped*	R	L	U	**App**	Ped*	**Int**
2022-05-10 4:30PM	5	187	0	**192**	0	333	54	13	**400**	0	45	30	0	**75**	4	**667**
4:45PM	5	170	0	**175**	0	390	57	6	**453**	0	48	18	0	**66**	0	**694**
5:00PM	3	207	0	**210**	0	373	51	12	**436**	0	64	24	0	**88**	2	**734**
5:15PM	4	196	0	**200**	0	392	40	4	**436**	0	46	23	0	**69**	0	**705**
Total	17	760	0	**777**	0	1488	202	35	**1725**	0	203	95	0	**298**	6	**2800**
% Approach	2.2%	97.8%	0%	**-**	-	86.3%	11.7%	2.0%	**-**	-	68.1%	31.9%	0%	**-**	-	-
% Total	0.6%	27.1%	0%	**27.8%**	-	53.1%	7.2%	1.3%	**61.6%**	-	7.3%	3.4%	0%	**10.6%**	-	-
PHF	0.850	0.918	-	**0.925**	-	0.949	0.886	0.673	**0.952**	-	0.793	0.792	-	**0.847**	-	0.954
Lights	17	747	0	**764**	-	1481	202	35	**1718**	-	203	95	0	**298**	-	2780
% Lights	100%	98.3%	0%	**98.3%**	-	99.5%	100%	100%	**99.6%**	-	100%	100%	0%	**100%**	-	99.3%
Single-Unit Trucks	0	10	0	**10**	-	5	0	0	**5**	-	0	0	0	**0**	-	15
% Single-Unit Trucks	0%	1.3%	0%	**1.3%**	-	0.3%	0%	0%	**0.3%**	-	0%	0%	0%	**0%**	-	0.5%
Articulated Trucks	0	3	0	**3**	-	2	0	0	**2**	-	0	0	0	**0**	-	5
% Articulated Trucks	0%	0.4%	0%	**0.4%**	-	0.1%	0%	0%	**0.1%**	-	0%	0%	0%	**0%**	-	0.2%
Buses	0	0	0	**0**	-	0	0	0	**0**	-	0	0	0	**0**	-	0
% Buses	0%	0%	0%	**0%**	-	0%	0%	0%	**0%**	-	0%	0%	0%	**0%**	-	0%
Bicycles on Road	0	0	0	**0**	-	0	0	0	**0**	-	0	0	0	**0**	-	0
% Bicycles on Road	0%	0%	0%	**0%**	-	0%	0%	0%	**0%**	-	0%	0%	0%	**0%**	-	0%
Pedestrians	-	-	-	-	0	-	-	-	-	0	-	-	-	-	6	
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0%	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

TMC_4 Baldwin Commons & Baldwin_5-10-22 - TMC

Tue May 10, 2022
PM Peak (4:30 PM - 5:30 PM) - Overall Peak Hour
All Classes (Lights, Single-Unit Trucks, Articulated Trucks, Buses, Pedestrians, Bicycles on Road, Bicycles on Crosswalk)
All Movements
ID: 948430, Location: 42.708923, -83.307132, Site Code: TMC_4 Traffic Data Collection, LLC

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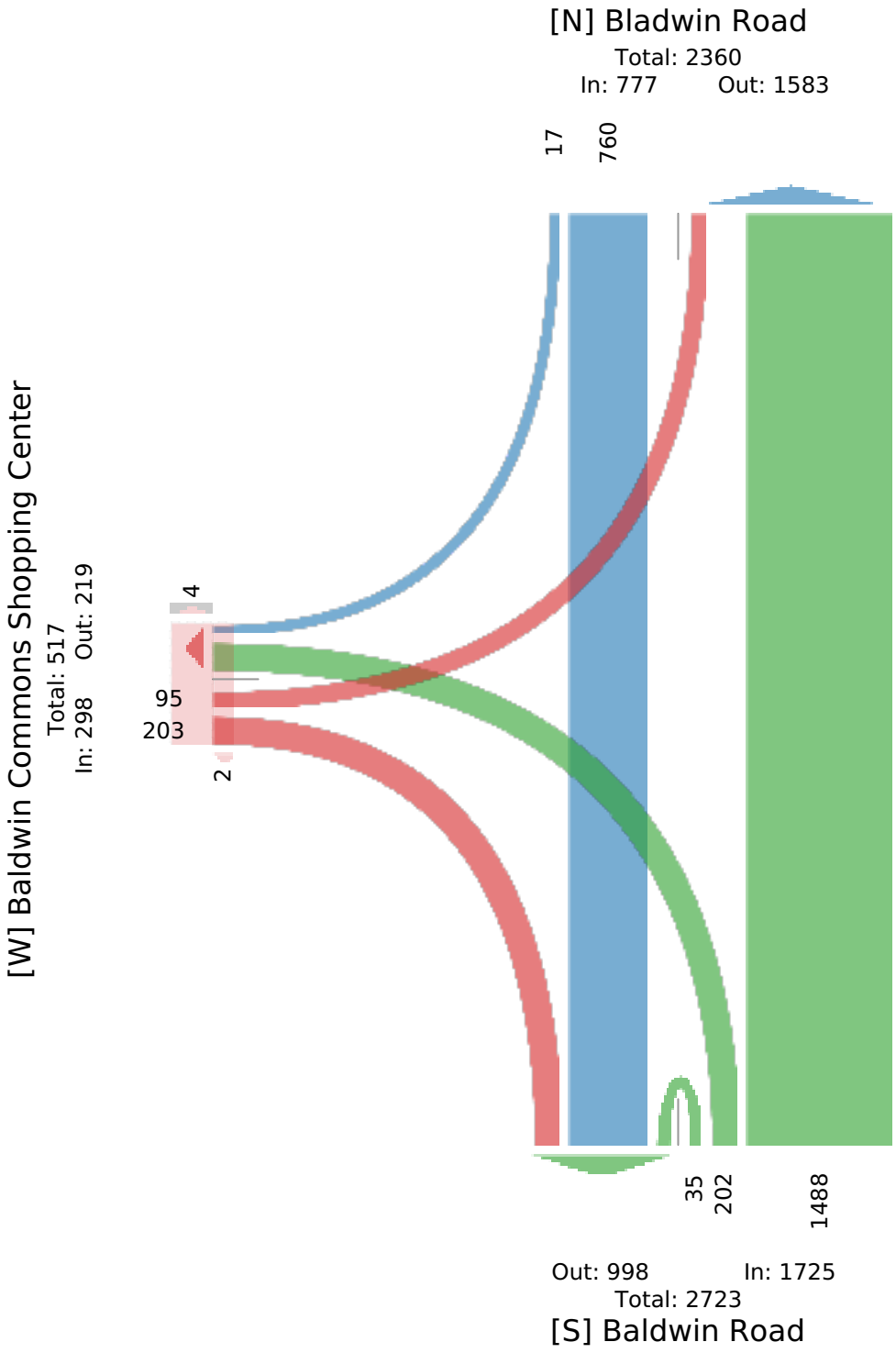
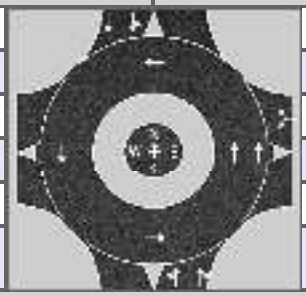


APPENDIX B - EXISTING CONDITION REPORTS LOS & QUEUE ANALYSIS

HCS Roundabouts Report

General Information

Analyst	Carlie delaPaz
Agency or Co.	AEW
Date Performed	6/8/2022
Analysis Year	2022
Time Analyzed	AM Peak - Existing
Project Description	



Site Information

Intersection	Baldwin and Judah
E/W Street Name	Judah
N/S Street Name	Baldwin
Analysis Time Period, hrs	1.00
Peak Hour Factor	0.95
Jurisdiction	RCOC

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	0	0	0	0	1	0	0	0	2	0	0	0	2	0
Lane Assignment							LR		LT		TR		LT		T	
Volume (V), veh/h					0	3		6	1	0	322	2	1	1	1100	
Percent Heavy Vehicles, %					3	3		3	3	3	3	3	3	3	3	
Flow Rate (v_{PCE}), pc/h					0	3		7	1	0	349	2	1	1	1193	
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes					2				1				1			
Pedestrians Crossing, p/h					0				0				0			
Proportion of CAVs	0															

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway, s					4.3276		4.5436	4.5436		4.5436	4.5436	
Follow-Up Headway, s					2.5352		2.5352	2.5352		2.5352	2.5352	

Flow Computations, Capacity and v/c Ratios

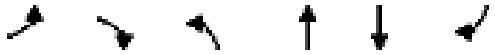
Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h					10		165	187		562	633	
Entry Volume, veh/h					10		161	181		545	615	
Circulating Flow (v_c), pc/h	1199			351			2			4		
Exiting Flow (v_{ex}), pc/h	3			0			357			1197		
Capacity (c_{pce}), pc/h					1054		1417	1417		1415	1415	
Capacity (c), veh/h					1023		1376	1376		1374	1374	
v/c Ratio (x)					0.01		0.12	0.13		0.40	0.45	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh					3.6		3.5	3.7		6.3	7.0	
Lane LOS					A		A	A		A	A	
95% Queue, veh					0.0		0.4	0.5		2.0	2.4	
Approach Delay, s/veh				878 3.6			3.6			6.7		
Approach LOS				A			A			A		
Intersection Delay, s/veh | LOS	6.0						A					

Movement	WBL	WBR	NBU	NBT	NBR	SBU	SBL	SBT
Right Turn Channelized								
Traffic Volume (veh/h)	3	6	1	322	2	1	1	1100
Future Volume (veh/h)	3	6	1	322	2	1	1	1100
Peak Hour Factor	0.65	0.92	0.80	0.80	0.80	0.94	0.94	0.94
Hourly flow rate (vph)	5	7	1	402	2	1	1	1170
Approach Volume (veh/h)	12			405				1172
Crossing Volume (veh/h)	404			2				6
High Capacity (veh/h)	1008			1382				1378
High v/c (veh/h)	0.01			0.29				0.85
Low Capacity (veh/h)	821			1159				1155
Low v/c (veh/h)	0.01			0.35				1.01

Intersection Summary			
Maximum v/c High	0.85		
Maximum v/c Low	1.01		
Intersection Capacity Utilization	40.2%	ICU Level of Service	A



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	1	0	0	333	0	0
Future Volume (Veh/h)	1	0	0	333	0	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.90	0.92	0.92
Hourly flow rate (vph)	1	0	0	370	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	185	0	0			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	185	0	0			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
cM capacity (veh/h)	787	1084	1622			

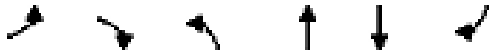
Direction, Lane #	EB 1	EB 2	NB 1	NB 2
Volume Total	0	0	185	185
Volume Left	0	0	0	0
Volume Right	0	0	0	0
cSH	787	787	1700	1700
Volume to Capacity	0.00	0.00	0.11	0.11
Queue Length 95th (ft)	0	0	0	0
Control Delay (s)	9.6	9.6	0.0	0.0
Lane LOS	A	A		
Approach Delay (s)	9.6		0.0	
Approach LOS	A			

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	32.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	56	0	0	0	0	1116
Future Volume (Veh/h)	56	0	0	0	0	1116
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	61	0	0	0	0	1213
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			1224			
pX, platoon unblocked						
vC, conflicting volume	606	0			0	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	606	0			0	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	86	100			100	
cM capacity (veh/h)	428	1084			1622	

Direction, Lane #	WB 1	WB 2	SB 1	SB 2
Volume Total	30	30	606	606
Volume Left	30	30	0	0
Volume Right	0	0	0	0
cSH	428	428	1700	1700
Volume to Capacity	0.07	0.07	0.36	0.36
Queue Length 95th (ft)	6	6	0	0
Control Delay (s)	14.0	14.0	0.0	0.0
Lane LOS	B	B		
Approach Delay (s)	14.0		0.0	
Approach LOS	B			

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	44.7%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	56	333	0	0
Future Volume (Veh/h)	0	0	56	333	0	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.88	0.88	0.92	0.92
Hourly flow rate (vph)	0	0	64	378	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				1230		
pX, platoon unblocked						
vC, conflicting volume	317	0	0			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	317	0	0			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	96			
cM capacity (veh/h)	626	1084	1622			

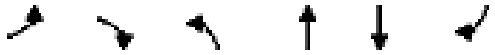
Direction, Lane #	NB 1	NB 2	NB 3
Volume Total	64	189	189
Volume Left	64	0	0
Volume Right	0	0	0
cSH	1622	1700	1700
Volume to Capacity	0.04	0.11	0.11
Queue Length 95th (ft)	3	0	0
Control Delay (s)	7.3	0.0	0.0
Lane LOS	A		
Approach Delay (s)	1.1		
Approach LOS			

Intersection Summary			
Average Delay	1.1		
Intersection Capacity Utilization	44.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	0	0	4	0	373	3	0	0	0
Future Volume (Veh/h)	0	0	0	0	0	4	0	373	3	0	0	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.65	0.92	0.93	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	0	0	6	0	401	3	0	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								655				
pX, platoon unblocked												
vC, conflicting volume	140	404	0	402	402	135	0			404		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	140	404	0	402	402	135	0			404		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	100	100	99	100			100		
cM capacity (veh/h)	811	534	1084	532	535	889	1622			1151		

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	NB 3
Volume Total	0	0	6	160	160	83
Volume Left	0	0	0	0	0	0
Volume Right	0	0	6	0	0	3
cSH	1700	1700	889	1700	1700	1700
Volume to Capacity	0.00	0.00	0.01	0.09	0.09	0.05
Queue Length 95th (ft)	0	0	1	0	0	0
Control Delay (s)	0.0	0.0	9.1	0.0	0.0	0.0
Lane LOS	A	A	A			
Approach Delay (s)	0.0		9.1	0.0		
Approach LOS	A		A			

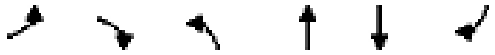
Intersection Summary				
Average Delay	0.1			
Intersection Capacity Utilization	36.1%	ICU Level of Service	A	
Analysis Period (min)	15			



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	96	0	0	1152	20
Future Volume (Veh/h)	0	96	0	0	1152	20
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	104	0	0	1252	22
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				792		
pX, platoon unblocked						
vC, conflicting volume	1263	637	1274			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1263	637	1274			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	75	100			
cM capacity (veh/h)	162	420	541			

Direction, Lane #	EB 1	SB 1	SB 2
Volume Total	104	835	439
Volume Left	0	0	0
Volume Right	104	0	22
cSH	420	1700	1700
Volume to Capacity	0.25	0.49	0.26
Queue Length 95th (ft)	24	0	0
Control Delay (s)	16.4	0.0	0.0
Lane LOS	C		
Approach Delay (s)	16.4	0.0	
Approach LOS	C		

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	43.2%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	14	0	98	396	0	0
Future Volume (vph)	14	0	98	396	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)	5.7		6.1	6.1		
Lane Util. Factor	1.00		0.97	0.91		
Frt	1.00		1.00	1.00		
Flt Protected	0.95		0.95	1.00		
Satd. Flow (prot)	1863		3650	5406		
Flt Permitted	0.95		0.95	1.00		
Satd. Flow (perm)	1863		3650	5406		
Peak-hour factor, PHF	0.92	0.92	0.95	0.95	0.92	0.92
Adj. Flow (vph)	15	0	103	417	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	15	0	103	417	0	0
Heavy Vehicles (%)	2%	2%	1%	1%	2%	2%
Turn Type	Prot		custom	NA		
Protected Phases	4			2 5		
Permitted Phases			5			
Actuated Green, G (s)	10.0		12.4	98.2		
Effective Green, g (s)	10.0		12.4	98.2		
Actuated g/C Ratio	0.08		0.10	0.82		
Clearance Time (s)	5.7		6.1			
Vehicle Extension (s)	3.0		3.0			
Lane Grp Cap (vph)	155		377	4423		
v/s Ratio Prot	c0.01			c0.08		
v/s Ratio Perm			c0.03			
v/c Ratio	0.10		0.27	0.09		
Uniform Delay, d1	50.8		49.6	2.1		
Progression Factor	0.04		1.00	1.00		
Incremental Delay, d2	0.3		0.4	0.0		
Delay (s)	2.1		50.0	2.2		
Level of Service	A		D	A		
Approach Delay (s)	2.1			11.6	0.0	
Approach LOS	A			B	A	

Intersection Summary			
HCM 2000 Control Delay	11.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.12		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	17.9
Intersection Capacity Utilization	26.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	14	23	65	33	0	0	0	0	0	1236	8
Future Volume (vph)	0	14	23	65	33	0	0	0	0	0	1236	8
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		5.7	5.7		6.1						6.1	6.1
Lane Util. Factor		1.00	1.00		0.95						0.95	1.00
Frt		1.00	0.85		1.00						1.00	0.85
Flt Protected		1.00	1.00		0.97						1.00	1.00
Satd. Flow (prot)		1923	1683		3642						3725	1667
Flt Permitted		1.00	1.00		0.74						1.00	1.00
Satd. Flow (perm)		1923	1683		2801						3725	1667
Peak-hour factor, PHF	0.92	0.84	0.84	0.95	0.95	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	17	27	68	35	0	0	0	0	0	1343	9
RTOR Reduction (vph)	0	0	25	0	0	0	0	0	0	0	0	3
Lane Group Flow (vph)	0	17	2	0	103	0	0	0	0	0	1343	6
Heavy Vehicles (%)	2%	4%	1%	1%	1%	2%	2%	2%	2%	2%	2%	2%
Turn Type		NA	Perm	Perm	NA						NA	Perm
Protected Phases		4			5						6	
Permitted Phases			4	5								6
Actuated Green, G (s)		10.0	10.0		12.4						79.7	79.7
Effective Green, g (s)		10.0	10.0		12.4						79.7	79.7
Actuated g/C Ratio		0.08	0.08		0.10						0.66	0.66
Clearance Time (s)		5.7	5.7		6.1						6.1	6.1
Vehicle Extension (s)		3.0	3.0		3.0						3.0	3.0
Lane Grp Cap (vph)		160	140		289						2474	1107
v/s Ratio Prot		c0.01									c0.36	
v/s Ratio Perm			0.00		c0.04							0.00
v/c Ratio		0.11	0.02		1.03dl						0.54	0.01
Uniform Delay, d1		50.9	50.5		50.1						10.6	6.8
Progression Factor		1.00	1.00		0.04						1.00	1.00
Incremental Delay, d2		0.3	0.0		0.7						0.9	0.0
Delay (s)		51.2	50.5		3.0						11.4	6.8
Level of Service		D	D		A						B	A
Approach Delay (s)		50.8			3.0			0.0			11.4	
Approach LOS		D			A			A			B	

Intersection Summary			
HCM 2000 Control Delay	12.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	17.9
Intersection Capacity Utilization	64.0%	ICU Level of Service	C
Analysis Period (min)	15		

dl Defacto Left Lane. Recode with 1 though lane as a left lane.

c Critical Lane Group

Intersection: 2: Baldwin Road & Judah Road

Movement	WB	SB	SB
Directions Served	LR	ULT	T
Maximum Queue (ft)	30	37	18
Average Queue (ft)	1	2	1
95th Queue (ft)	11	19	13
Link Distance (ft)	765	561	561
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 6:

Movement	NB
Directions Served	L
Maximum Queue (ft)	20
Average Queue (ft)	1
95th Queue (ft)	13
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	150
Storage Blk Time (%)	
Queuing Penalty (veh)	

887

Intersection: 8: Baldwin Road

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 9: Baldwin Road & SB to NB X-over

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 10: Baldwin Road & SB to NB X-over

Movement	
Directions Served	
Maximum Queue (ft)	
Average Queue (ft)	
95th Queue (ft)	
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	888

Intersection: 11: Baldwin Road & S. Baldwin Commons

Movement	EB	NB	NB	NB	NB	NB
Directions Served	L	L	L	T	T	T
Maximum Queue (ft)	10	177	103	104	40	24
Average Queue (ft)	1	81	7	39	6	1
95th Queue (ft)	6	143	45	89	27	9
Link Distance (ft)	18	294	294	294	294	294
Upstream Blk Time (%)	1					
Queuing Penalty (veh)	0					
Storage Bay Dist (ft)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 12: S. Baldwin Commons & Baldwin Road

Movement	EB	EB	WB	SB	SB	SB
Directions Served	T	R	LT	T	T	R
Maximum Queue (ft)	65	22	18	270	307	85
Average Queue (ft)	15	5	1	151	169	4
95th Queue (ft)	44	18	9	244	259	38
Link Distance (ft)	220	220	18	345	345	
Upstream Blk Time (%)			2	0	0	
Queuing Penalty (veh)			1	0	0	
Storage Bay Dist (ft)						75
Storage Blk Time (%)					21	
Queuing Penalty (veh)					2	

Intersection: 14: Baldwin Road & NB to SB X-over

Movement	WB	WB
Directions Served	L	L
Maximum Queue (ft)	42	34
Average Queue (ft)	21	7
95th Queue (ft)	40	28
Link Distance (ft)	27	27
Upstream Blk Time (%)	5	3
Queuing Penalty (veh)	1	1
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

889

Intersection: 15: Baldwin Road & NB to SB X-over

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 16: Baldwin Road

Movement	WB
Directions Served	T
Maximum Queue (ft)	81
Average Queue (ft)	35
95th Queue (ft)	73
Link Distance (ft)	26
Upstream Blk Time (%)	30
Queuing Penalty (veh)	7
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 18: Jordan Road & Baldwin Road

Movement	WB
Directions Served	R
Maximum Queue (ft)	21
Average Queue (ft)	2
95th Queue (ft)	13
Link Distance (ft)	569
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	890

Intersection: 20:

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 21:

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 23: Morgan Road & Baldwin Road

Movement	EB
Directions Served	R
Maximum Queue (ft)	92
Average Queue (ft)	41
95th Queue (ft)	74
Link Distance (ft)	412
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

891

Intersection: 24: Baldwin Road

Movement	WB
Directions Served	R
Maximum Queue (ft)	31
Average Queue (ft)	8
95th Queue (ft)	30
Link Distance (ft)	343
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 26:

Movement	EB
Directions Served	R
Maximum Queue (ft)	34
Average Queue (ft)	4
95th Queue (ft)	21
Link Distance (ft)	143
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 28: Baldwin Road

Movement	EB	SB	SB
Directions Served	R	T	T
Maximum Queue (ft)	30	93	93
Average Queue (ft)	6	58	60
95th Queue (ft)	26	81	83
Link Distance (ft)	142	50	50
Upstream Blk Time (%)		6	8
Queuing Penalty (veh)		33	43
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

892

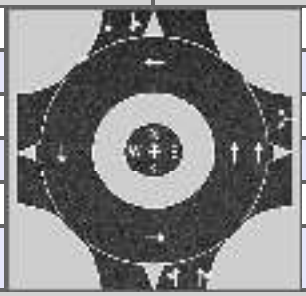
Network Summary

Network wide Queuing Penalty: 88

HCS Roundabouts Report

General Information

Analyst	Carlie delaPaz
Agency or Co.	AEW
Date Performed	6/9/2022
Analysis Year	2022
Time Analyzed	PM Peak - Existing
Project Description	



Site Information

Intersection	Baldwin and Judah
E/W Street Name	Judah
N/S Street Name	Baldwin
Analysis Time Period, hrs	1.00
Peak Hour Factor	0.94
Jurisdiction	RCOC

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	0	0	0	0	1	0	0	0	2	0	0	0	2	0
Lane Assignment							LR		LT		TR		LT		T	
Volume (V), veh/h					0	7		14	0	0	1289	3	11	6	686	
Percent Heavy Vehicles, %					3	3		3	3	3	3	3	3	3	3	
Flow Rate (v_{PCE}), pc/h					0	8		15	0	0	1412	3	12	7	752	
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes					2				1				1			
Pedestrians Crossing, p/h					0				0				0			
Proportion of CAVs	0															

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway, s					4.3276		4.5436	4.5436		4.5436	4.5436	
Follow-Up Headway, s					2.5352		2.5352	2.5352		2.5352	2.5352	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h					23		665	750		362	409	
Entry Volume, veh/h					22		646	728		352	397	
Circulating Flow (v_c), pc/h	779			1424			19			8		
Exiting Flow (v_{ex}), pc/h	10			0			1439			760		
Capacity (c_{pce}), pc/h					423		1396	1396		1410	1410	
Capacity (c), veh/h					411		1355	1355		1369	1369	
v/c Ratio (x)					0.05		0.48	0.54		0.26	0.29	

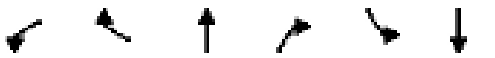
Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh					9.5		7.5	8.4		4.8	5.2	
Lane LOS					A		A	A		A	A	
95% Queue, veh					0.2		2.7	3.4		1.0	1.2	
Approach Delay, s/veh				893 9.5			8.0			5.0		
Approach LOS				A			A			A		
Intersection Delay, s/veh | LOS	6.9						A					

Movement	WBL	WBR	NBT	NBR	SBU	SBL	SBT
Right Turn Channelized							
Traffic Volume (veh/h)	7	14	1289	16	11	6	686
Future Volume (veh/h)	7	14	1289	16	11	6	686
Peak Hour Factor	0.60	0.60	0.91	0.80	0.69	0.60	0.92
Hourly flow rate (vph)	12	23	1416	20	16	10	746
Approach Volume (veh/h)	35		1436				772
Crossing Volume (veh/h)	1432#		26				12
High Capacity (veh/h)	435		1357				1372
High v/c (veh/h)	0.08		1.06				0.56
Low Capacity (veh/h)	324		1136				1150
Low v/c (veh/h)	0.11		1.26				0.67

Intersection Summary			
Maximum v/c High	1.06		
Maximum v/c Low	1.26		
Intersection Capacity Utilization	44.3%	ICU Level of Service	A

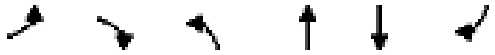
Crossing flow exceeds 1200, method is not applicable



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	0	0	0	0	1	702
Future Volume (Veh/h)	0	0	0	0	1	702
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	0	1	763
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	384	0			0	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	384	0			0	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			100	
cM capacity (veh/h)	591	1084			1622	

Direction, Lane #	SB 1	SB 2	SB 3
Volume Total	1	382	382
Volume Left	1	0	0
Volume Right	0	0	0
cSH	1622	1700	1700
Volume to Capacity	0.00	0.22	0.22
Queue Length 95th (ft)	0	0	0
Control Delay (s)	7.2	0.0	0.0
Lane LOS	A		
Approach Delay (s)	0.0		
Approach LOS			

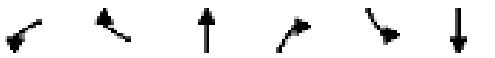
Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	44.4%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	1	0	0	1309	0	0
Future Volume (Veh/h)	1	0	0	1309	0	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.60	0.60	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	2	0	0	1423	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	712	0	0			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	712	0	0			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	100	100			
cM capacity (veh/h)	367	1084	1622			

Direction, Lane #	EB 1	EB 2	NB 1	NB 2
Volume Total	1	1	712	712
Volume Left	1	1	0	0
Volume Right	0	0	0	0
cSH	367	367	1700	1700
Volume to Capacity	0.00	0.00	0.42	0.42
Queue Length 95th (ft)	0	0	0	0
Control Delay (s)	14.8	14.8	0.0	0.0
Lane LOS	B	B		
Approach Delay (s)	14.8		0.0	
Approach LOS	B			

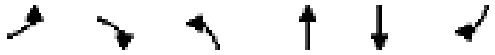
Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	44.4%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	95	0	0	0	0	702
Future Volume (Veh/h)	95	0	0	0	0	702
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.91	0.91	0.92	0.92	0.93	0.93
Hourly flow rate (vph)	104	0	0	0	0	755
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			1223			
pX, platoon unblocked						
vC, conflicting volume	378	0			0	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	378	0			0	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	83	100			100	
cM capacity (veh/h)	597	1084			1622	

Direction, Lane #	WB 1	WB 2	SB 1	SB 2
Volume Total	52	52	378	378
Volume Left	52	52	0	0
Volume Right	0	0	0	0
cSH	597	597	1700	1700
Volume to Capacity	0.09	0.09	0.22	0.22
Queue Length 95th (ft)	7	7	0	0
Control Delay (s)	11.6	11.6	0.0	0.0
Lane LOS	B	B		
Approach Delay (s)	11.6		0.0	
Approach LOS	B			

Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	59.5%	ICU Level of Service	B
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	95	1309	0	0
Future Volume (Veh/h)	0	0	95	1309	0	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	103	1423	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				1230		
pX, platoon unblocked	0.82					
vC, conflicting volume	918	0	0			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	460	0	0			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	94			
cM capacity (veh/h)	407	1084	1622			

Direction, Lane #	NB 1	NB 2	NB 3
Volume Total	103	712	712
Volume Left	103	0	0
Volume Right	0	0	0
cSH	1622	1700	1700
Volume to Capacity	0.06	0.42	0.42
Queue Length 95th (ft)	5	0	0
Control Delay (s)	7.4	0.0	0.0
Lane LOS	A		
Approach Delay (s)	0.5		
Approach LOS			

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	59.5%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	0	0	7	0	1223	4	0	0	0
Future Volume (Veh/h)	0	0	0	0	0	7	0	1223	4	0	0	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	0	0	8	0	1329	4	0	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								655				
pX, platoon unblocked	0.85	0.85		0.85	0.85	0.85				0.85		
vC, conflicting volume	451	1333	0	1331	1331	445	0			1333		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	0	793	0	791	791	0	0			793		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	100	100	99	100			100		
cM capacity (veh/h)	866	273	1084	239	274	926	1622			704		

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	NB 3
Volume Total	0	0	8	532	532	270
Volume Left	0	0	0	0	0	0
Volume Right	0	0	8	0	0	4
cSH	1700	1700	926	1700	1700	1700
Volume to Capacity	0.00	0.00	0.01	0.31	0.31	0.16
Queue Length 95th (ft)	0	0	1	0	0	0
Control Delay (s)	0.0	0.0	8.9	0.0	0.0	0.0
Lane LOS	A	A	A			
Approach Delay (s)	0.0		8.9	0.0		
Approach LOS	A		A			

Intersection Summary				
Average Delay	0.1			
Intersection Capacity Utilization	39.2%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	42	0	0	749	42
Future Volume (Veh/h)	0	42	0	0	749	42
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	46	0	0	814	46
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				792		
pX, platoon unblocked						
vC, conflicting volume	837	430	860			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	837	430	860			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	92	100			
cM capacity (veh/h)	305	573	777			

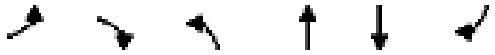
Direction, Lane #	EB 1	SB 1	SB 2
Volume Total	46	543	317
Volume Left	0	0	0
Volume Right	46	0	46
cSH	573	1700	1700
Volume to Capacity	0.08	0.32	0.19
Queue Length 95th (ft)	7	0	0
Control Delay (s)	11.8	0.0	0.0
Lane LOS	B		
Approach Delay (s)	11.8	0.0	
Approach LOS	B		

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	30.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	0	174	1230	0	0	0
Future Volume (Veh/h)	0	174	1230	0	0	0
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	189	1337	0	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			877			
pX, platoon unblocked	0.81	0.81			0.81	
vC, conflicting volume	1337	668			1337	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	952	129			952	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	74			100	
cM capacity (veh/h)	209	729			583	

Direction, Lane #	WB 1	NB 1	NB 2
Volume Total	189	891	446
Volume Left	0	0	0
Volume Right	189	0	0
cSH	729	1700	1700
Volume to Capacity	0.26	0.52	0.26
Queue Length 95th (ft)	26	0	0
Control Delay (s)	11.7	0.0	0.0
Lane LOS	B		
Approach Delay (s)	11.7	0.0	
Approach LOS	B		

Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	49.2%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	273	0	237	1488	0	0
Future Volume (vph)	273	0	237	1488	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)	5.7		6.1	6.1		
Lane Util. Factor	1.00		0.97	0.91		
Frt	1.00		1.00	1.00		
Flt Protected	0.95		0.95	1.00		
Satd. Flow (prot)	1863		3614	5353		
Flt Permitted	0.95		0.95	1.00		
Satd. Flow (perm)	1863		3614	5353		
Peak-hour factor, PHF	0.79	0.79	0.95	0.95	0.92	0.92
Adj. Flow (vph)	346	0	249	1566	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	346	0	249	1566	0	0
Turn Type	Prot		custom	NA		
Protected Phases	4			2 5		
Permitted Phases			5			
Actuated Green, G (s)	40.1		31.2	68.1		
Effective Green, g (s)	40.1		31.2	68.1		
Actuated g/C Ratio	0.33		0.26	0.57		
Clearance Time (s)	5.7		6.1			
Vehicle Extension (s)	3.0		3.0			
Lane Grp Cap (vph)	622		939	3037		
v/s Ratio Prot	c0.19			c0.29		
v/s Ratio Perm			0.07			
v/c Ratio	0.56		0.27	0.52		
Uniform Delay, d1	32.7		35.3	15.9		
Progression Factor	0.03		1.00	1.00		
Incremental Delay, d2	0.9		0.2	0.1		
Delay (s)	2.0		35.4	16.0		
Level of Service	A		D	B		
Approach Delay (s)	2.0			18.7	0.0	
Approach LOS	A			B	A	

Intersection Summary			
HCM 2000 Control Delay	16.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	17.9
Intersection Capacity Utilization	51.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	273	103	35	202	0	0	0	0	0	760	17
Future Volume (vph)	0	273	103	35	202	0	0	0	0	0	760	17
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		5.7	5.7		6.1						6.1	6.1
Lane Util. Factor		1.00	1.00		0.95						0.95	1.00
Frt		1.00	0.85		1.00						1.00	0.85
Flt Protected		1.00	1.00		0.99						1.00	1.00
Satd. Flow (prot)		1961	1667		3698						3725	1667
Flt Permitted		1.00	1.00		0.53						1.00	1.00
Satd. Flow (perm)		1961	1667		1986						3725	1667
Peak-hour factor, PHF	0.79	0.79	0.79	0.92	0.92	0.92	0.87	0.95	0.92	0.91	0.92	0.85
Adj. Flow (vph)	0	346	130	38	220	0	0	0	0	0	826	20
RTOR Reduction (vph)	0	0	87	0	0	0	0	0	0	0	0	15
Lane Group Flow (vph)	0	346	43	0	258	0	0	0	0	0	826	5
Turn Type		NA	Perm	Perm	NA						NA	Perm
Protected Phases		4			5						6	
Permitted Phases			4	5								6
Actuated Green, G (s)		40.1	40.1		31.2						30.8	30.8
Effective Green, g (s)		40.1	40.1		31.2						30.8	30.8
Actuated g/C Ratio		0.33	0.33		0.26						0.26	0.26
Clearance Time (s)		5.7	5.7		6.1						6.1	6.1
Vehicle Extension (s)		3.0	3.0		3.0						3.0	3.0
Lane Grp Cap (vph)		655	557		516						956	427
v/s Ratio Prot		c0.18									c0.22	
v/s Ratio Perm			0.03		c0.13							0.00
v/c Ratio		0.53	0.08		0.50						0.86	0.01
Uniform Delay, d1		32.3	27.3		37.8						42.6	33.3
Progression Factor		1.00	1.00		0.12						1.00	1.00
Incremental Delay, d2		0.8	0.1		0.7						10.2	0.1
Delay (s)		33.1	27.4		5.1						52.8	33.3
Level of Service		C	C		A						D	C
Approach Delay (s)		31.5			5.1			0.0			52.4	
Approach LOS		C			A			A			D	

Intersection Summary			
HCM 2000 Control Delay	38.4	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	17.9
Intersection Capacity Utilization	56.9%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Intersection: 2: Baldwin Road & Judah Road

Movement	WB	NB	NB	SB
Directions Served	LR	T	TR	ULT
Maximum Queue (ft)	37	146	148	29
Average Queue (ft)	8	24	24	2
95th Queue (ft)	30	93	97	16
Link Distance (ft)	765	107	107	561
Upstream Blk Time (%)		1	1	
Queuing Penalty (veh)		8	9	
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 6:

Movement	NB
Directions Served	L
Maximum Queue (ft)	109
Average Queue (ft)	20
95th Queue (ft)	71
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	150
Storage Blk Time (%)	0
Queuing Penalty (veh)	0

904

Intersection: 8: Baldwin Road

Movement	NW	NW
Directions Served	R	R
Maximum Queue (ft)	15	12
Average Queue (ft)	1	0
95th Queue (ft)	13	7
Link Distance (ft)	386	386
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 9: Baldwin Road & SB to NB X-over

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 10: Baldwin Road & SB to NB X-over

Movement	EB
Directions Served	L
Maximum Queue (ft)	5
Average Queue (ft)	0
95th Queue (ft)	4
Link Distance (ft)	24
Upstream Blk Time (%)	0
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

905

Intersection: 11: Baldwin Road & S. Baldwin Commons

Movement	EB	NB	NB	NB	NB	NB
Directions Served	L	L	L	T	T	T
Maximum Queue (ft)	36	240	196	314	279	219
Average Queue (ft)	3	137	53	214	121	96
95th Queue (ft)	19	213	159	334	241	181
Link Distance (ft)	18	294	294	294	294	294
Upstream Blk Time (%)	5			3	0	
Queuing Penalty (veh)	13			0	0	
Storage Bay Dist (ft)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 12: S. Baldwin Commons & Baldwin Road

Movement	EB	EB	WB	WB	SB	SB	SB
Directions Served	T	R	LT	T	T	T	R
Maximum Queue (ft)	240	102	34	12	306	315	175
Average Queue (ft)	156	30	6	1	184	195	22
95th Queue (ft)	251	73	25	9	282	295	105
Link Distance (ft)	220	220	18	18	345	345	
Upstream Blk Time (%)	3		10	2	0	0	
Queuing Penalty (veh)	0		12	2	0	0	
Storage Bay Dist (ft)							75
Storage Blk Time (%)						39	
Queuing Penalty (veh)						7	

Intersection: 14: Baldwin Road & NB to SB X-over

Movement	WB	WB
Directions Served	L	L
Maximum Queue (ft)	45	48
Average Queue (ft)	28	18
95th Queue (ft)	38	45
Link Distance (ft)	28	28
Upstream Blk Time (%)	10	5
Queuing Penalty (veh)	5	2
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

906

Intersection: 15: Baldwin Road & NB to SB X-over

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 16: Baldwin Road

Movement	WB	SB	SB	SB
Directions Served	T	T	T	R
Maximum Queue (ft)	108	8	4	4
Average Queue (ft)	68	0	0	0
95th Queue (ft)	104	4	4	4
Link Distance (ft)	26	139	139	
Upstream Blk Time (%)	45			
Queuing Penalty (veh)	45			
Storage Bay Dist (ft)				65
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 18: Jordan Road & Baldwin Road

Movement	WB	NB	NB
Directions Served	R	T	TR
Maximum Queue (ft)	18	8	9
Average Queue (ft)	4	0	0
95th Queue (ft)	14	6	7
Link Distance (ft)	569	148	148
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

907

Intersection: 20:

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 21:

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 23: Morgan Road & Baldwin Road

Movement	EB
Directions Served	R
Maximum Queue (ft)	55
Average Queue (ft)	21
95th Queue (ft)	46
Link Distance (ft)	412
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

908

Intersection: 24: Baldwin Road & Jordan Road

Movement	WB
Directions Served	R
Maximum Queue (ft)	132
Average Queue (ft)	59
95th Queue (ft)	109
Link Distance (ft)	343
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 26: Baldwin Road

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 28:

Movement	
Directions Served	
Maximum Queue (ft)	
Average Queue (ft)	
95th Queue (ft)	
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	909

Intersection: 30:

Movement	EB
Directions Served	R
Maximum Queue (ft)	35
Average Queue (ft)	9
95th Queue (ft)	32
Link Distance (ft)	128
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Network Summary

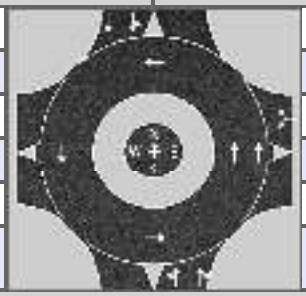
Network wide Queuing Penalty: 103

APPENDIX C - BACKGROUND CONDITION REPORTS LOS & QUEUE ANALYSIS

HCS Roundabouts Report

General Information

Analyst	Carlie delaPaz
Agency or Co.	AEW
Date Performed	6/9/2022
Analysis Year	2024
Time Analyzed	AM Peak - Background Cond
Project Description	



Site Information

Intersection	Baldwin and Judah
E/W Street Name	Judah
N/S Street Name	Baldwin
Analysis Time Period, hrs	1.00
Peak Hour Factor	0.95
Jurisdiction	RCOC

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	0	0	0	0	1	0	0	0	2	0	0	0	2	0
Lane Assignment							LR		LT		TR		LT		T	
Volume (V), veh/h					0	3		6	1	0	328	2	1	1	1120	
Percent Heavy Vehicles, %					3	3		3	3	3	3	3	3	3	3	
Flow Rate (v_{PCE}), pc/h					0	3		7	1	0	356	2	1	1	1214	
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes					2				1				1			
Pedestrians Crossing, p/h					0				0				0			
Proportion of CAVs	0															

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway, s					4.3276		4.5436	4.5436		4.5436	4.5436	
Follow-Up Headway, s					2.5352		2.5352	2.5352		2.5352	2.5352	

Flow Computations, Capacity and v/c Ratios

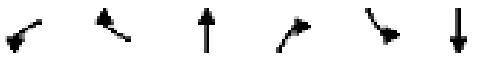
Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h					10		169	190		572	644	
Entry Volume, veh/h					10		164	185		555	626	
Circulating Flow (v_c), pc/h	1220			358			2			4		
Exiting Flow (v_{ex}), pc/h	3			0			364			1218		
Capacity (c_{pce}), pc/h					1047		1417	1417		1415	1415	
Capacity (c), veh/h					1017		1376	1376		1374	1374	
v/c Ratio (x)					0.01		0.12	0.13		0.40	0.46	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh					3.6		3.6	3.7		6.4	7.1	
Lane LOS					A		A	A		A	A	
95% Queue, veh					0.0		0.4	0.5		2.0	2.5	
Approach Delay, s/veh				911 3.6			3.6			6.8		
Approach LOS				A			A			A		
Intersection Delay, s/veh | LOS	6.0						A					

Movement	WBL	WBR	NBU	NBT	NBR	SBU	SBL	SBT
Right Turn Channelized								
Traffic Volume (veh/h)	3	6	1	328	2	1	1	1120
Future Volume (veh/h)	3	6	1	328	2	1	1	1120
Peak Hour Factor	0.65	0.92	0.80	0.80	0.80	0.94	0.94	0.94
Hourly flow rate (vph)	5	7	1	410	2	1	1	1191
Approach Volume (veh/h)	12			413				1193
Crossing Volume (veh/h)	412			2				6
High Capacity (veh/h)	1001			1382				1378
High v/c (veh/h)	0.01			0.30				0.87
Low Capacity (veh/h)	815			1159				1155
Low v/c (veh/h)	0.01			0.36				1.03

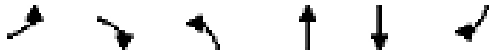
Intersection Summary			
Maximum v/c High	0.87		
Maximum v/c Low	1.03		
Intersection Capacity Utilization	40.7%	ICU Level of Service	A



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	0	0	0	0	0	1129
Future Volume (Veh/h)	0	0	0	0	0	1129
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.90
Hourly flow rate (vph)	0	0	0	0	0	1254
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	627	0			0	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	627	0			0	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			100	
cM capacity (veh/h)	416	1084			1622	

Direction, Lane #	SB 1	SB 2	SB 3
Volume Total	0	627	627
Volume Left	0	0	0
Volume Right	0	0	0
cSH	1700	1700	1700
Volume to Capacity	0.00	0.37	0.37
Queue Length 95th (ft)	0	0	0
Control Delay (s)	0.0	0.0	0.0
Lane LOS			
Approach Delay (s)	0.0		
Approach LOS			

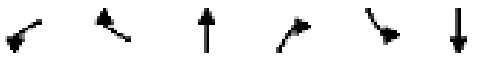
Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	27.9%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	0	436	0	0
Future Volume (Veh/h)	0	0	0	436	0	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.90	0.92	0.92
Hourly flow rate (vph)	0	0	0	484	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	242	0	0			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	242	0	0			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
cM capacity (veh/h)	725	1084	1622			

Direction, Lane #	EB 1	EB 2	NB 1	NB 2
Volume Total	0	0	242	242
Volume Left	0	0	0	0
Volume Right	0	0	0	0
cSH	1700	1700	1700	1700
Volume to Capacity	0.00	0.00	0.14	0.14
Queue Length 95th (ft)	0	0	0	0
Control Delay (s)	0.0	0.0	0.0	0.0
Lane LOS	A	A		
Approach Delay (s)	0.0		0.0	
Approach LOS	A			

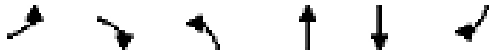
Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	33.0%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	57	0	0	0	0	1129
Future Volume (Veh/h)	57	0	0	0	0	1129
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	62	0	0	0	0	1227
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			1224			
pX, platoon unblocked						
vC, conflicting volume	614	0			0	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	614	0			0	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	85	100			100	
cM capacity (veh/h)	424	1084			1622	

Direction, Lane #	WB 1	WB 2	SB 1	SB 2
Volume Total	31	31	614	614
Volume Left	31	31	0	0
Volume Right	0	0	0	0
cSH	424	424	1700	1700
Volume to Capacity	0.07	0.07	0.36	0.36
Queue Length 95th (ft)	6	6	0	0
Control Delay (s)	14.2	14.2	0.0	0.0
Lane LOS	B	B		
Approach Delay (s)	14.2		0.0	
Approach LOS	B			

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	47.8%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	57	436	0	0
Future Volume (Veh/h)	0	0	57	436	0	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.88	0.88	0.92	0.92
Hourly flow rate (vph)	0	0	65	495	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				1230		
pX, platoon unblocked						
vC, conflicting volume	378	0	0			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	378	0	0			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	96			
cM capacity (veh/h)	573	1084	1622			

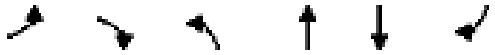
Direction, Lane #	NB 1	NB 2	NB 3
Volume Total	65	248	248
Volume Left	65	0	0
Volume Right	0	0	0
cSH	1622	1700	1700
Volume to Capacity	0.04	0.15	0.15
Queue Length 95th (ft)	3	0	0
Control Delay (s)	7.3	0.0	0.0
Lane LOS	A		
Approach Delay (s)	0.8		
Approach LOS			

Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	47.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	0	0	4	0	380	4	0	0	0
Future Volume (Veh/h)	0	0	0	0	0	4	0	380	4	0	0	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.65	0.92	0.93	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	0	0	6	0	409	4	0	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								655				
pX, platoon unblocked												
vC, conflicting volume	142	413	0	411	411	138	0			413		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	142	413	0	411	411	138	0			413		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	100	100	99	100			100		
cM capacity (veh/h)	808	528	1084	525	529	885	1622			1142		

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	NB 3
Volume Total	0	0	6	164	164	86
Volume Left	0	0	0	0	0	0
Volume Right	0	0	6	0	0	4
cSH	1700	1700	885	1700	1700	1700
Volume to Capacity	0.00	0.00	0.01	0.10	0.10	0.05
Queue Length 95th (ft)	0	0	1	0	0	0
Control Delay (s)	0.0	0.0	9.1	0.0	0.0	0.0
Lane LOS	A	A	A			
Approach Delay (s)	0.0		9.1	0.0		
Approach LOS	A		A			

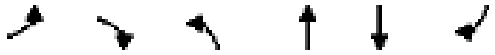
Intersection Summary				
Average Delay	0.1			
Intersection Capacity Utilization	36.5%	ICU Level of Service	A	
Analysis Period (min)	15			



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	98	0	0	1166	20
Future Volume (Veh/h)	0	98	0	0	1166	20
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	107	0	0	1267	22
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				792		
pX, platoon unblocked						
vC, conflicting volume	1278	644	1289			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1278	644	1289			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	74	100			
cM capacity (veh/h)	158	415	534			

Direction, Lane #	EB 1	SB 1	SB 2
Volume Total	107	845	444
Volume Left	0	0	0
Volume Right	107	0	22
cSH	415	1700	1700
Volume to Capacity	0.26	0.50	0.26
Queue Length 95th (ft)	25	0	0
Control Delay (s)	16.7	0.0	0.0
Lane LOS	C		
Approach Delay (s)	16.7	0.0	
Approach LOS	C		

Intersection Summary			
Average Delay	1.3		
Intersection Capacity Utilization	43.7%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	13	0	100	403	0	0
Future Volume (vph)	13	0	100	403	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)	5.7		6.1	6.1		
Lane Util. Factor	1.00		0.97	0.91		
Frt	1.00		1.00	1.00		
Flt Protected	0.95		0.95	1.00		
Satd. Flow (prot)	1863		3650	5406		
Flt Permitted	0.95		0.95	1.00		
Satd. Flow (perm)	1863		3650	5406		
Peak-hour factor, PHF	0.92	0.92	0.95	0.95	0.92	0.92
Adj. Flow (vph)	14	0	105	424	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	14	0	105	424	0	0
Heavy Vehicles (%)	2%	2%	1%	1%	2%	2%
Turn Type	Prot		custom	NA		
Protected Phases	4			2 5		
Permitted Phases			5			
Actuated Green, G (s)	10.0		12.5	98.2		
Effective Green, g (s)	10.0		12.5	98.2		
Actuated g/C Ratio	0.08		0.10	0.82		
Clearance Time (s)	5.7		6.1			
Vehicle Extension (s)	3.0		3.0			
Lane Grp Cap (vph)	155		380	4423		
v/s Ratio Prot	c0.01			c0.08		
v/s Ratio Perm			c0.03			
v/c Ratio	0.09		0.28	0.10		
Uniform Delay, d1	50.8		49.6	2.1		
Progression Factor	0.03		1.00	1.00		
Incremental Delay, d2	0.3		0.4	0.0		
Delay (s)	2.0		50.0	2.2		
Level of Service	A		D	A		
Approach Delay (s)	2.0			11.6	0.0	
Approach LOS	A			B	A	

Intersection Summary			
HCM 2000 Control Delay	11.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.12		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	17.9
Intersection Capacity Utilization	26.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	13	24	66	34	0	0	0	0	0	1258	8
Future Volume (vph)	0	13	24	66	34	0	0	0	0	0	1258	8
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		5.7	5.7		6.1						6.1	6.1
Lane Util. Factor		1.00	1.00		0.95						0.95	1.00
Frt		1.00	0.85		1.00						1.00	0.85
Flt Protected		1.00	1.00		0.97						1.00	1.00
Satd. Flow (prot)		1923	1683		3643						3725	1667
Flt Permitted		1.00	1.00		0.74						1.00	1.00
Satd. Flow (perm)		1923	1683		2794						3725	1667
Peak-hour factor, PHF	0.92	0.84	0.84	0.95	0.95	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	15	29	69	36	0	0	0	0	0	1367	9
RTOR Reduction (vph)	0	0	27	0	0	0	0	0	0	0	0	3
Lane Group Flow (vph)	0	15	2	0	105	0	0	0	0	0	1367	6
Heavy Vehicles (%)	2%	4%	1%	1%	1%	2%	2%	2%	2%	2%	2%	2%
Turn Type		NA	Perm	Perm	NA						NA	Perm
Protected Phases		4			5						6	
Permitted Phases			4	5								6
Actuated Green, G (s)		10.0	10.0		12.5						79.6	79.6
Effective Green, g (s)		10.0	10.0		12.5						79.6	79.6
Actuated g/C Ratio		0.08	0.08		0.10						0.66	0.66
Clearance Time (s)		5.7	5.7		6.1						6.1	6.1
Vehicle Extension (s)		3.0	3.0		3.0						3.0	3.0
Lane Grp Cap (vph)		160	140		291						2470	1105
v/s Ratio Prot		c0.01									c0.37	
v/s Ratio Perm			0.00		c0.04							0.00
v/c Ratio		0.09	0.02		1.06dl						0.55	0.01
Uniform Delay, d1		50.8	50.5		50.0						10.7	6.8
Progression Factor		1.00	1.00		0.04						1.00	1.00
Incremental Delay, d2		0.3	0.0		0.8						0.9	0.0
Delay (s)		51.1	50.5		3.0						11.6	6.8
Level of Service		D	D		A						B	A
Approach Delay (s)		50.7			3.0			0.0			11.6	
Approach LOS		D			A			A			B	

Intersection Summary			
HCM 2000 Control Delay	12.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	17.9
Intersection Capacity Utilization	64.6%	ICU Level of Service	C
Analysis Period (min)	15		

dl Defacto Left Lane. Recode with 1 though lane as a left lane.

c Critical Lane Group

Intersection: 2: Baldwin Road & Judah Road

Movement	WB	NB	SB	SB
Directions Served	LR	UT	ULT	T
Maximum Queue (ft)	35	24	80	63
Average Queue (ft)	2	1	5	3
95th Queue (ft)	16	9	37	30
Link Distance (ft)	765	107	561	561
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 6:

Movement	NB
Directions Served	L
Maximum Queue (ft)	37
Average Queue (ft)	2
95th Queue (ft)	16
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	150
Storage Blk Time (%)	
Queuing Penalty (veh)	

921

Intersection: 8: Baldwin Road

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 9: Baldwin Road & SB to NB X-over

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 10: Baldwin Road & SB to NB X-over

Movement	
Directions Served	
Maximum Queue (ft)	
Average Queue (ft)	
95th Queue (ft)	
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	922

Intersection: 11: Baldwin Road & S. Baldwin Commons

Movement	EB	NB	NB	NB	NB	NB
Directions Served	L	L	L	T	T	T
Maximum Queue (ft)	5	152	92	114	40	24
Average Queue (ft)	0	74	4	40	7	1
95th Queue (ft)	4	135	36	92	30	11
Link Distance (ft)	18	294	294	294	294	294
Upstream Blk Time (%)	1					
Queuing Penalty (veh)	0					
Storage Bay Dist (ft)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 12: S. Baldwin Commons & Baldwin Road

Movement	EB	EB	WB	SB	SB	SB
Directions Served	T	R	LT	T	T	R
Maximum Queue (ft)	58	22	12	284	294	116
Average Queue (ft)	16	6	1	168	188	7
95th Queue (ft)	44	20	8	251	266	49
Link Distance (ft)	220	220	18	345	345	
Upstream Blk Time (%)			1			
Queuing Penalty (veh)			1			
Storage Bay Dist (ft)						75
Storage Blk Time (%)					23	
Queuing Penalty (veh)					2	

Intersection: 14: Baldwin Road & NB to SB X-over

Movement	WB	WB
Directions Served	L	L
Maximum Queue (ft)	35	39
Average Queue (ft)	21	9
95th Queue (ft)	40	33
Link Distance (ft)	27	27
Upstream Blk Time (%)	10	4
Queuing Penalty (veh)	3	1
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

923

Intersection: 15: Baldwin Road & NB to SB X-over

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 16: Baldwin Road

Movement	WB	WB	SB
Directions Served	L	T	T
Maximum Queue (ft)	53	82	9
Average Queue (ft)	18	35	0
95th Queue (ft)	46	70	5
Link Distance (ft)	26	26	139
Upstream Blk Time (%)	9	26	
Queuing Penalty (veh)	3	9	
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 18: Jordan Road & Baldwin Road

Movement	WB	
Directions Served	R	
Maximum Queue (ft)	22	
Average Queue (ft)	2	
95th Queue (ft)	13	
Link Distance (ft)	569	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		924

Intersection: 20:

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 21:

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 23: Morgan Road & Baldwin Road

Movement	EB
Directions Served	R
Maximum Queue (ft)	83
Average Queue (ft)	39
95th Queue (ft)	65
Link Distance (ft)	412
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

925

Intersection: 24: Baldwin Road

Movement	WB
Directions Served	R
Maximum Queue (ft)	31
Average Queue (ft)	11
95th Queue (ft)	34
Link Distance (ft)	343
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 26:

Movement	EB
Directions Served	R
Maximum Queue (ft)	30
Average Queue (ft)	4
95th Queue (ft)	22
Link Distance (ft)	186
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 28: Baldwin Road

Movement	EB
Directions Served	R
Maximum Queue (ft)	29
Average Queue (ft)	5
95th Queue (ft)	24
Link Distance (ft)	124
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

926

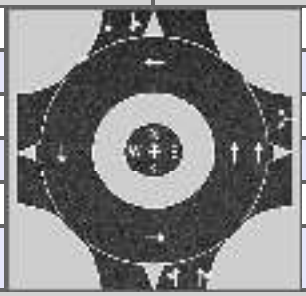
Network Summary

Network wide Queuing Penalty: 19

HCS Roundabouts Report

General Information

Analyst	Carlie delaPaz
Agency or Co.	AEW
Date Performed	6/9/2022
Analysis Year	2024
Time Analyzed	PM Peak - Background Cond
Project Description	



Site Information

Intersection	Baldwin and Judah
E/W Street Name	Judah
N/S Street Name	Baldwin
Analysis Time Period, hrs	1.00
Peak Hour Factor	0.94
Jurisdiction	RCOC

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	0	0	0	0	1	0	0	0	2	0	0	0	2	0
Lane Assignment							LR		LT		TR		LT		T	
Volume (V), veh/h					0	7		14	0	0	1312	16	11	6	698	
Percent Heavy Vehicles, %					3	3		3	3	3	3	3	3	3	3	
Flow Rate (v_{PCE}), pc/h					0	8		15	0	0	1438	18	12	7	765	
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes					2				1				1			
Pedestrians Crossing, p/h					0				0				0			
Proportion of CAVs	0															

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway, s					4.3276		4.5436	4.5436		4.5436	4.5436	
Follow-Up Headway, s					2.5352		2.5352	2.5352		2.5352	2.5352	

Flow Computations, Capacity and v/c Ratios

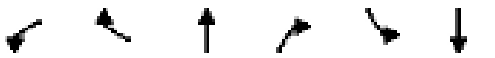
Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h					23		684	772		368	416	
Entry Volume, veh/h					22		664	749		358	403	
Circulating Flow (v_c), pc/h	792			1450			19			8		
Exiting Flow (v_{ex}), pc/h	25			0			1465			773		
Capacity (c_{pce}), pc/h					414		1396	1396		1410	1410	
Capacity (c), veh/h					402		1355	1355		1369	1369	
v/c Ratio (x)					0.06		0.49	0.55		0.26	0.29	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh					9.8		7.7	8.7		4.9	5.2	
Lane LOS					A		A	A		A	A	
95% Queue, veh					0.2		2.9	3.7		1.1	1.3	
Approach Delay, s/veh				9279.8			8.2			5.0		
Approach LOS				A			A			A		
Intersection Delay, s/veh | LOS	7.1						A					

Movement	WBL	WBR	NBT	NBR	SBU	SBL	SBT
Right Turn Channelized							
Traffic Volume (veh/h)	7	14	1312	16	11	6	698
Future Volume (veh/h)	7	14	1312	16	11	6	698
Peak Hour Factor	0.60	0.60	0.91	0.80	0.69	0.60	0.92
Hourly flow rate (vph)	12	23	1442	20	16	10	759
Approach Volume (veh/h)	35		1462				785
Crossing Volume (veh/h)	1458#		26				12
High Capacity (veh/h)	426		1357				1372
High v/c (veh/h)	0.08		1.08				0.57
Low Capacity (veh/h)	316		1136				1150
Low v/c (veh/h)	0.11		1.29				0.68

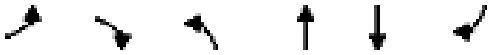
Intersection Summary			
Maximum v/c High	1.08		
Maximum v/c Low	1.29		
Intersection Capacity Utilization	44.9%	ICU Level of Service	A
# Crossing flow exceeds 1200, method is not applicable			



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	0	0	0	0	1	715
Future Volume (Veh/h)	0	0	0	0	1	715
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	0	1	777
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	390	0			0	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	390	0			0	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			100	
cM capacity (veh/h)	586	1084			1622	

Direction, Lane #	SB 1	SB 2	SB 3
Volume Total	1	388	388
Volume Left	1	0	0
Volume Right	0	0	0
cSH	1622	1700	1700
Volume to Capacity	0.00	0.23	0.23
Queue Length 95th (ft)	0	0	0
Control Delay (s)	7.2	0.0	0.0
Lane LOS	A		
Approach Delay (s)	0.0		
Approach LOS			

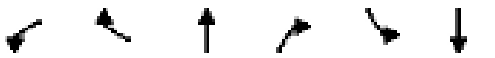
Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	45.0%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	1	0	0	1333	0	0
Future Volume (Veh/h)	1	0	0	1333	0	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.60	0.60	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	2	0	0	1449	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	724	0	0			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	724	0	0			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	100	100			
cM capacity (veh/h)	360	1084	1622			

Direction, Lane #	EB 1	EB 2	NB 1	NB 2
Volume Total	1	1	724	724
Volume Left	1	1	0	0
Volume Right	0	0	0	0
cSH	360	360	1700	1700
Volume to Capacity	0.00	0.00	0.43	0.43
Queue Length 95th (ft)	0	0	0	0
Control Delay (s)	15.0	15.0	0.0	0.0
Lane LOS	C	C		
Approach Delay (s)	15.0		0.0	
Approach LOS	C			

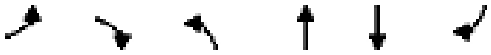
Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	45.0%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	97	0	0	0	0	715
Future Volume (Veh/h)	97	0	0	0	0	715
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.91	0.91	0.92	0.92	0.93	0.93
Hourly flow rate (vph)	107	0	0	0	0	769
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			1223			
pX, platoon unblocked						
vC, conflicting volume	384	0			0	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	384	0			0	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	82	100			100	
cM capacity (veh/h)	591	1084			1622	

Direction, Lane #	WB 1	WB 2	SB 1	SB 2
Volume Total	54	54	384	384
Volume Left	54	54	0	0
Volume Right	0	0	0	0
cSH	591	591	1700	1700
Volume to Capacity	0.09	0.09	0.23	0.23
Queue Length 95th (ft)	7	7	0	0
Control Delay (s)	11.7	11.7	0.0	0.0
Lane LOS	B	B		
Approach Delay (s)	11.7		0.0	
Approach LOS	B			

Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	60.4%	ICU Level of Service	B
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	97	1333	0	0
Future Volume (Veh/h)	0	0	97	1333	0	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	105	1449	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				1230		
pX, platoon unblocked	0.90					
vC, conflicting volume	934	0	0			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	708	0	0			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	94			
cM capacity (veh/h)	311	1084	1622			

Direction, Lane #	NB 1	NB 2	NB 3
Volume Total	105	724	724
Volume Left	105	0	0
Volume Right	0	0	0
cSH	1622	1700	1700
Volume to Capacity	0.06	0.43	0.43
Queue Length 95th (ft)	5	0	0
Control Delay (s)	7.4	0.0	0.0
Lane LOS	A		
Approach Delay (s)	0.5		
Approach LOS			

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	60.4%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	0	0	7	0	1245	4	0	0	0
Future Volume (Veh/h)	0	0	0	0	0	7	0	1245	4	0	0	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	0	0	8	0	1353	4	0	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								655				
pX, platoon unblocked	0.93	0.93		0.93	0.93	0.93				0.93		
vC, conflicting volume	459	1357	0	1355	1355	453	0			1357		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	152	1118	0	1116	1116	145	0			1118		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	100	100	99	100			100		
cM capacity (veh/h)	737	191	1084	151	192	814	1622			577		

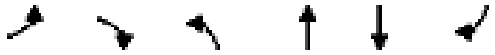
Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	NB 3
Volume Total	0	0	8	541	541	275
Volume Left	0	0	0	0	0	0
Volume Right	0	0	8	0	0	4
cSH	1700	1700	814	1700	1700	1700
Volume to Capacity	0.00	0.00	0.01	0.32	0.32	0.16
Queue Length 95th (ft)	0	0	1	0	0	0
Control Delay (s)	0.0	0.0	9.5	0.0	0.0	0.0
Lane LOS	A	A	A			
Approach Delay (s)	0.0		9.5	0.0		
Approach LOS	A		A			

Intersection Summary				
Average Delay	0.1			
Intersection Capacity Utilization	39.6%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	0	0	1328	6	0	0
Future Volume (Veh/h)	0	0	1328	6	0	0
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	1443	7	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1446	725			1450	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1446	725			1450	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			100	
cM capacity (veh/h)	122	368			463	

Direction, Lane #	WB 1	NB 1	NB 2
Volume Total	0	962	488
Volume Left	0	0	0
Volume Right	0	0	7
cSH	1700	1700	1700
Volume to Capacity	0.00	0.57	0.29
Queue Length 95th (ft)	0	0	0
Control Delay (s)	0.0	0.0	0.0
Lane LOS	A		
Approach Delay (s)	0.0	0.0	
Approach LOS	A		

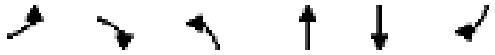
Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	38.4%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	55	0	0	586	119
Future Volume (Veh/h)	0	55	0	0	586	119
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	60	0	0	637	129
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				792		
pX, platoon unblocked						
vC, conflicting volume	702	383	766			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	702	383	766			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	90	100			
cM capacity (veh/h)	373	615	843			

Direction, Lane #	EB 1	SB 1	SB 2
Volume Total	60	425	341
Volume Left	0	0	0
Volume Right	60	0	129
cSH	615	1700	1700
Volume to Capacity	0.10	0.25	0.20
Queue Length 95th (ft)	8	0	0
Control Delay (s)	11.5	0.0	0.0
Lane LOS	B		
Approach Delay (s)	11.5	0.0	
Approach LOS	B		

Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	29.0%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	97	0	241	1515	0	0
Future Volume (vph)	97	0	241	1515	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)	5.7		6.1	6.1		
Lane Util. Factor	1.00		0.97	0.91		
Frt	1.00		1.00	1.00		
Flt Protected	0.95		0.95	1.00		
Satd. Flow (prot)	1863		3614	5353		
Flt Permitted	0.95		0.95	1.00		
Satd. Flow (perm)	1863		3614	5353		
Peak-hour factor, PHF	0.79	0.79	0.95	0.95	0.92	0.92
Adj. Flow (vph)	123	0	254	1595	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	123	0	254	1595	0	0
Turn Type	Prot		custom	NA		
Protected Phases	4			2 5		
Permitted Phases			5			
Actuated Green, G (s)	14.1		41.3	94.1		
Effective Green, g (s)	14.1		41.3	94.1		
Actuated g/C Ratio	0.12		0.34	0.78		
Clearance Time (s)	5.7		6.1			
Vehicle Extension (s)	3.0		3.0			
Lane Grp Cap (vph)	218		1243	4197		
v/s Ratio Prot	c0.07			c0.30		
v/s Ratio Perm			0.07			
v/c Ratio	0.56		0.20	0.38		
Uniform Delay, d1	50.0		27.8	4.0		
Progression Factor	0.02		1.00	1.00		
Incremental Delay, d2	3.0		0.1	0.1		
Delay (s)	4.2		27.8	4.0		
Level of Service	A		C	A		
Approach Delay (s)	4.2			7.3	0.0	
Approach LOS	A			A	A	

Intersection Summary			
HCM 2000 Control Delay	7.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	17.9
Intersection Capacity Utilization	46.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	97	207	36	206	0	0	0	0	0	774	17
Future Volume (vph)	0	97	207	36	206	0	0	0	0	0	774	17
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		5.7	5.7		6.1						6.1	6.1
Lane Util. Factor		1.00	1.00		0.95						0.95	1.00
Frt		1.00	0.85		1.00						1.00	0.85
Flt Protected		1.00	1.00		0.99						1.00	1.00
Satd. Flow (prot)		1961	1667		3698						3725	1667
Flt Permitted		1.00	1.00		0.55						1.00	1.00
Satd. Flow (perm)		1961	1667		2062						3725	1667
Peak-hour factor, PHF	0.79	0.79	0.79	0.92	0.92	0.92	0.87	0.95	0.92	0.91	0.92	0.85
Adj. Flow (vph)	0	123	262	39	224	0	0	0	0	0	841	20
RTOR Reduction (vph)	0	0	224	0	0	0	0	0	0	0	0	12
Lane Group Flow (vph)	0	123	38	0	263	0	0	0	0	0	841	8
Turn Type		NA	Perm	Perm	NA						NA	Perm
Protected Phases		4			5						6	
Permitted Phases			4	5								6
Actuated Green, G (s)		14.1	14.1		41.3						46.7	46.7
Effective Green, g (s)		14.1	14.1		41.3						46.7	46.7
Actuated g/C Ratio		0.12	0.12		0.34						0.39	0.39
Clearance Time (s)		5.7	5.7		6.1						6.1	6.1
Vehicle Extension (s)		3.0	3.0		3.0						3.0	3.0
Lane Grp Cap (vph)		230	195		709						1449	648
v/s Ratio Prot		c0.06									c0.23	
v/s Ratio Perm			0.02		c0.13							0.00
v/c Ratio		0.53	0.19		0.37						0.58	0.01
Uniform Delay, d1		49.9	47.8		29.6						28.9	22.5
Progression Factor		1.00	1.00		0.11						1.00	1.00
Incremental Delay, d2		2.4	0.5		0.3						1.7	0.0
Delay (s)		52.2	48.3		3.6						30.6	22.5
Level of Service		D	D		A						C	C
Approach Delay (s)		49.6			3.6			0.0			30.4	
Approach LOS		D			A			A			C	

Intersection Summary			
HCM 2000 Control Delay	30.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	17.9
Intersection Capacity Utilization	55.8%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Intersection: 2: Baldwin Road & Judah Road

Movement	WB	NB	NB	SB	SB
Directions Served	LR	T	TR	ULT	T
Maximum Queue (ft)	36	143	143	36	6
Average Queue (ft)	6	25	24	1	0
95th Queue (ft)	26	92	88	16	4
Link Distance (ft)	765	107	107	561	561
Upstream Blk Time (%)		1	1		
Queuing Penalty (veh)		6	5		
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 6:

Movement	NB	NB
Directions Served	L	T
Maximum Queue (ft)	93	38
Average Queue (ft)	9	1
95th Queue (ft)	51	27
Link Distance (ft)		259
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	150	
Storage Blk Time (%)	0	
Queuing Penalty (veh)	1	

938

Intersection: 8: Baldwin Road

Movement	NW	NW
Directions Served	R	R
Maximum Queue (ft)	10	8
Average Queue (ft)	0	0
95th Queue (ft)	7	6
Link Distance (ft)	386	386
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 9: Baldwin Road & SB to NB X-over

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 10: Baldwin Road & SB to NB X-over

Movement	EB
Directions Served	L
Maximum Queue (ft)	16
Average Queue (ft)	1
95th Queue (ft)	7
Link Distance (ft)	24
Upstream Blk Time (%)	0
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

939

Intersection: 11: Baldwin Road & S. Baldwin Commons

Movement	EB	NB	NB	NB	NB	NB
Directions Served	L	L	L	T	T	T
Maximum Queue (ft)	47	212	170	311	311	317
Average Queue (ft)	10	139	60	205	141	195
95th Queue (ft)	37	210	159	325	294	332
Link Distance (ft)	18	294	294	294	294	294
Upstream Blk Time (%)	18			3	1	4
Queuing Penalty (veh)	51			0	0	0
Storage Bay Dist (ft)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 12: S. Baldwin Commons & Baldwin Road

Movement	EB	EB	WB	WB	SB	SB	SB
Directions Served	T	R	LT	T	T	T	R
Maximum Queue (ft)	243	65	40	22	292	298	175
Average Queue (ft)	180	24	9	2	170	182	23
95th Queue (ft)	270	51	32	11	265	275	109
Link Distance (ft)	220	220	18	18	345	345	
Upstream Blk Time (%)	11		16	2		0	
Queuing Penalty (veh)	0		20	3		0	
Storage Bay Dist (ft)							75
Storage Blk Time (%)						36	
Queuing Penalty (veh)						6	

Intersection: 14: Baldwin Road & NB to SB X-over

Movement	WB	WB
Directions Served	L	L
Maximum Queue (ft)	40	60
Average Queue (ft)	26	22
95th Queue (ft)	40	49
Link Distance (ft)	28	28
Upstream Blk Time (%)	10	5
Queuing Penalty (veh)	5	2
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

940

Intersection: 15: Baldwin Road & NB to SB X-over

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 16: Baldwin Road

Movement	EB	WB	SB	SB
Directions Served	R	T	T	R
Maximum Queue (ft)	22	88	4	21
Average Queue (ft)	8	56	0	1
95th Queue (ft)	22	91	3	9
Link Distance (ft)	92	26	139	
Upstream Blk Time (%)		37		
Queuing Penalty (veh)		30		
Storage Bay Dist (ft)				65
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 18: Jordan Road & Baldwin Road

Movement	WB	NB	NB
Directions Served	R	T	TR
Maximum Queue (ft)	18	9	9
Average Queue (ft)	4	0	0
95th Queue (ft)	15	7	6
Link Distance (ft)	569	148	148
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

941

Intersection: 20:

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 21:

Movement	
Directions Served	
Maximum Queue (ft)	
Average Queue (ft)	
95th Queue (ft)	
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 23: Morgan Road & Baldwin Road

Movement	EB
Directions Served	R
Maximum Queue (ft)	51
Average Queue (ft)	20
95th Queue (ft)	42
Link Distance (ft)	412
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	942

Intersection: 24: Baldwin Road & Jordan Road

Movement	WB
Directions Served	R
Maximum Queue (ft)	136
Average Queue (ft)	59
95th Queue (ft)	109
Link Distance (ft)	343
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 26: Baldwin Road

Movement	EB
Directions Served	R
Maximum Queue (ft)	38
Average Queue (ft)	6
95th Queue (ft)	26
Link Distance (ft)	199
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 28:

Movement	
Directions Served	
Maximum Queue (ft)	
Average Queue (ft)	
95th Queue (ft)	
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	943

Intersection: 30:

Movement	EB
Directions Served	R
Maximum Queue (ft)	35
Average Queue (ft)	8
95th Queue (ft)	30
Link Distance (ft)	164
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Network Summary

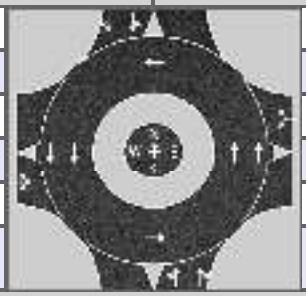
Network wide Queuing Penalty: 130

APPENDIX E - BUILD CONDITION REPORTS LOS & QUEUE ANALYSIS

HCS Roundabouts Report

General Information

Analyst	Carlie delaPaz
Agency or Co.	AEW
Date Performed	6/9/2022
Analysis Year	2024
Time Analyzed	AM Peak - Build Cond
Project Description	



Site Information

Intersection	Baldwin and Judah
E/W Street Name	Judah
N/S Street Name	Baldwin
Analysis Time Period, hrs	1.00
Peak Hour Factor	0.95
Jurisdiction	RCOC

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	2	0	0	0	2	0
Lane Assignment			LTR				LR		LT		TR		LT		TR	
Volume (V), veh/h	0	82	3	107	0	3		6	45	42	395	2	1	1	1261	98
Percent Heavy Vehicles, %	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1
Flow Rate (v_{PCE}), pc/h	0	87	3	114	0	3		6	48	45	420	2	1	1	1341	104
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	2				2				1				1			
Pedestrians Crossing, p/h	0				0				0				0			
Proportion of CAVs	0															

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway, s		4.3276			4.3276		4.5436	4.5436		4.5436	4.5436	
Follow-Up Headway, s		2.5352			2.5352		2.5352	2.5352		2.5352	2.5352	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		204			9		242	273		680	767	
Entry Volume, veh/h		202			9		240	270		673	759	
Circulating Flow (v_c), pc/h	1394			601			92			96		
Exiting Flow (v_{ex}), pc/h	6			149			514			1506		
Capacity (c_{pce}), pc/h		434			852		1306	1306		1301	1301	
Capacity (c), veh/h		430			844		1293	1293		1288	1288	
v/c Ratio (x)		0.47			0.01		0.19	0.21		0.52	0.59	

Delay and Level of Service

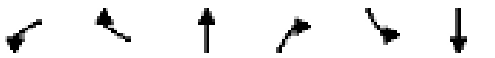
Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		18.1			4.4		4.3	4.6		8.5	9.7	
Lane LOS		C			A		A	A		A	A	
95% Queue, veh		2.6			0.0		0.7	0.8		3.3	4.2	
Approach Delay, s/veh	18.1			945 4.4			4.5			9.1		
Approach LOS	C			A			A			A		
Intersection Delay, s/veh | LOS	8.8						A					

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL
Right Turn Channelized												
Traffic Volume (veh/h)	82	0	107	3	0	6	45	42	395	2	1	1
Future Volume (veh/h)	82	0	107	3	0	6	45	42	395	2	1	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.65	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	89	0	116	3	0	7	49	46	429	2	1	1
Approach Volume (veh/h)		205			10				526			
Crossing Volume (veh/h)		1395#			614				91			
High Capacity (veh/h)		449			852				1290			
High v/c (veh/h)		0.46			0.01				0.41			
Low Capacity (veh/h)		336			682				1075			
Low v/c (veh/h)		0.61			0.01				0.49			

Intersection Summary			
Maximum v/c High	1.13		
Maximum v/c Low	1.36		
Intersection Capacity Utilization	74.4%	ICU Level of Service	D
# Crossing flow exceeds 1200, method is not applicable			

Movement	SBT	SBR
Right Turn Channelized		
Traffic Volume (veh/h)	1261	98
Future Volume (veh/h)	1261	98
Peak Hour Factor	0.94	0.92
Hourly flow rate (vph)	1341	107
Approach Volume (veh/h)	1450	
Crossing Volume (veh/h)	98	
High Capacity (veh/h)	1283	
High v/c (veh/h)	1.13	
Low Capacity (veh/h)	1068	
Low v/c (veh/h)	1.36	

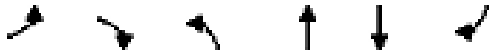
Intersection Summary



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	0	0	0	0	57	1370
Future Volume (Veh/h)	0	0	0	0	57	1370
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	0	62	1489
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	868	0			0	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	868	0			0	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			96	
cM capacity (veh/h)	280	1084			1622	

Direction, Lane #	SB 1	SB 2	SB 3
Volume Total	62	744	744
Volume Left	62	0	0
Volume Right	0	0	0
cSH	1622	1700	1700
Volume to Capacity	0.04	0.44	0.44
Queue Length 95th (ft)	3	0	0
Control Delay (s)	7.3	0.0	0.0
Lane LOS	A		
Approach Delay (s)	0.3		
Approach LOS			

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	25.4%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	57	0	0	427	0	0
Future Volume (Veh/h)	57	0	0	427	0	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	62	0	0	464	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	232	0	0			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	232	0	0			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	92	100	100			
cM capacity (veh/h)	736	1084	1622			

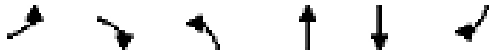
Direction, Lane #	EB 1	EB 2	NB 1	NB 2
Volume Total	31	31	232	232
Volume Left	31	31	0	0
Volume Right	0	0	0	0
cSH	736	736	1700	1700
Volume to Capacity	0.04	0.04	0.14	0.14
Queue Length 95th (ft)	3	3	0	0
Control Delay (s)	10.1	10.1	0.0	0.0
Lane LOS	B	B		
Approach Delay (s)	10.1		0.0	
Approach LOS	B			

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	22.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	57	17	0	0	0	0	0	1359	18
Future Volume (Veh/h)	0	0	0	57	17	0	0	0	0	0	1359	18
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	62	18	0	0	0	0	0	1477	20
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								1224				
pX, platoon unblocked												
vC, conflicting volume	1496	1487	748	738	1497	0	1497			0		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1496	1487	748	738	1497	0	1497			0		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	80	85	100	100			100		
cM capacity (veh/h)	75	123	355	306	121	1084	444			1622		

Direction, Lane #	WB 1	WB 2	SB 1	SB 2
Volume Total	41	39	985	512
Volume Left	41	21	0	0
Volume Right	0	0	0	20
cSH	306	179	1700	1700
Volume to Capacity	0.14	0.22	0.58	0.30
Queue Length 95th (ft)	12	20	0	0
Control Delay (s)	18.6	30.5	0.0	0.0
Lane LOS	C	D		
Approach Delay (s)	24.4		0.0	
Approach LOS	C			

Intersection Summary				
Average Delay	1.2			
Intersection Capacity Utilization	54.1%	ICU Level of Service	A	
Analysis Period (min)	15			



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	74	427	0	0
Future Volume (Veh/h)	0	0	74	427	0	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	80	464	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				1230		
pX, platoon unblocked						
vC, conflicting volume	392	0	0			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	392	0	0			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	95			
cM capacity (veh/h)	556	1084	1622			

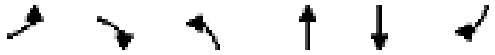
Direction, Lane #	NB 1	NB 2	NB 3
Volume Total	80	232	232
Volume Left	80	0	0
Volume Right	0	0	0
cSH	1622	1700	1700
Volume to Capacity	0.05	0.14	0.14
Queue Length 95th (ft)	4	0	0
Control Delay (s)	7.3	0.0	0.0
Lane LOS	A		
Approach Delay (s)	1.1		
Approach LOS			

Intersection Summary			
Average Delay	1.1		
Intersection Capacity Utilization	54.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	15	0	0	0	0	4	0	449	3	0	0	0
Future Volume (Veh/h)	15	0	0	0	0	4	0	449	3	0	0	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	16	0	0	0	0	4	0	488	3	0	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								655				
pX, platoon unblocked												
vC, conflicting volume	167	491	0	490	490	164	0			491		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	167	491	0	490	490	164	0			491		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	98	100	100	100	100	100	100			100		
cM capacity (veh/h)	778	477	1084	462	478	851	1622			1069		

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	NB 3
Volume Total	8	8	4	195	195	101
Volume Left	8	8	0	0	0	0
Volume Right	0	0	4	0	0	3
cSH	778	778	851	1700	1700	1700
Volume to Capacity	0.01	0.01	0.00	0.11	0.11	0.06
Queue Length 95th (ft)	1	1	0	0	0	0
Control Delay (s)	9.7	9.7	9.2	0.0	0.0	0.0
Lane LOS	A	A	A			
Approach Delay (s)	9.7		9.2	0.0		
Approach LOS	A		A			

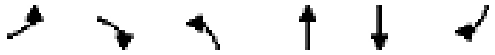
Intersection Summary				
Average Delay	0.4			
Intersection Capacity Utilization	57.7%	ICU Level of Service	B	
Analysis Period (min)	15			



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	113	0	0	1397	40
Future Volume (Veh/h)	0	113	0	0	1397	40
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	123	0	0	1518	43
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				792		
pX, platoon unblocked						
vC, conflicting volume	1540	780	1561			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1540	780	1561			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	64	100			
cM capacity (veh/h)	106	338	419			

Direction, Lane #	EB 1	SB 1	SB 2
Volume Total	123	1012	549
Volume Left	0	0	0
Volume Right	123	0	43
cSH	338	1700	1700
Volume to Capacity	0.36	0.60	0.32
Queue Length 95th (ft)	41	0	0
Control Delay (s)	21.6	0.0	0.0
Lane LOS	C		
Approach Delay (s)	21.6	0.0	
Approach LOS	C		

Intersection Summary			
Average Delay	1.6		
Intersection Capacity Utilization	51.2%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	33	60	10	474	1301	19
Future Volume (Veh/h)	33	60	10	474	1301	19
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	36	65	11	515	1414	21
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				TWLTL	TWLTL	
Median storage veh)				2	2	
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1704	718	1435			
vC1, stage 1 conf vol	1424					
vC2, stage 2 conf vol	280					
vCu, unblocked vol	1704	718	1435			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.3	2.2			
p0 queue free %	80	83	98			
cM capacity (veh/h)	181	372	469			

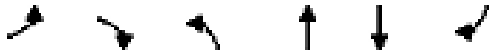
Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	101	11	258	258	943	492
Volume Left	36	11	0	0	0	0
Volume Right	65	0	0	0	0	21
cSH	270	469	1700	1700	1700	1700
Volume to Capacity	0.37	0.02	0.15	0.15	0.55	0.29
Queue Length 95th (ft)	41	2	0	0	0	0
Control Delay (s)	26.1	12.9	0.0	0.0	0.0	0.0
Lane LOS	D	B				
Approach Delay (s)	26.1	0.3			0.0	
Approach LOS	D					

Intersection Summary			
Average Delay	1.3		
Intersection Capacity Utilization	46.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	109	0	0	1318	103
Future Volume (Veh/h)	0	109	0	0	1318	103
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	118	0	0	1433	112
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1489	772	1545			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1489	772	1545			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	65	100			
cM capacity (veh/h)	115	342	426			

Direction, Lane #	EB 1	SB 1	SB 2
Volume Total	118	955	590
Volume Left	0	0	0
Volume Right	118	0	112
cSH	342	1700	1700
Volume to Capacity	0.35	0.56	0.35
Queue Length 95th (ft)	38	0	0
Control Delay (s)	21.0	0.0	0.0
Lane LOS	C		
Approach Delay (s)	21.0	0.0	
Approach LOS	C		

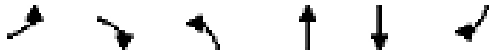
Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	50.8%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	21	0	0	1416	0
Future Volume (Veh/h)	0	21	0	0	1416	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	23	0	0	1539	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				1007		
pX, platoon unblocked						
vC, conflicting volume	1539	770	1539			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1539	770	1539			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	93	100			
cM capacity (veh/h)	106	344	428			

Direction, Lane #	EB 1	SB 1	SB 2
Volume Total	23	770	770
Volume Left	0	0	0
Volume Right	23	0	0
cSH	344	1700	1700
Volume to Capacity	0.07	0.45	0.45
Queue Length 95th (ft)	5	0	0
Control Delay (s)	16.2	0.0	0.0
Lane LOS	C		
Approach Delay (s)	16.2	0.0	
Approach LOS	C		

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	47.2%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	16	0	100	505	0	0
Future Volume (vph)	16	0	100	505	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)	5.7		6.1	6.1		
Lane Util. Factor	1.00		0.97	0.91		
Frt	1.00		1.00	1.00		
Flt Protected	0.95		0.95	1.00		
Satd. Flow (prot)	1863		3650	5406		
Flt Permitted	0.95		0.95	1.00		
Satd. Flow (perm)	1863		3650	5406		
Peak-hour factor, PHF	0.92	0.92	0.95	0.95	0.92	0.92
Adj. Flow (vph)	17	0	105	532	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	17	0	105	532	0	0
Heavy Vehicles (%)	2%	2%	1%	1%	2%	2%
Turn Type	Prot		custom	NA		
Protected Phases	4			2 5		
Permitted Phases			5			
Actuated Green, G (s)	10.0		13.5	98.2		
Effective Green, g (s)	10.0		13.5	98.2		
Actuated g/C Ratio	0.08		0.11	0.82		
Clearance Time (s)	5.7		6.1			
Vehicle Extension (s)	3.0		3.0			
Lane Grp Cap (vph)	155		410	4423		
v/s Ratio Prot	c0.01			c0.10		
v/s Ratio Perm			c0.03			
v/c Ratio	0.11		0.26	0.12		
Uniform Delay, d1	50.9		48.7	2.2		
Progression Factor	0.03		1.00	1.00		
Incremental Delay, d2	0.3		0.3	0.0		
Delay (s)	2.1		49.0	2.2		
Level of Service	A		D	A		
Approach Delay (s)	2.1			9.9	0.0	
Approach LOS	A			A	A	

Intersection Summary			
HCM 2000 Control Delay	9.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.14		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	17.9
Intersection Capacity Utilization	27.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	16	13	66	34	0	0	0	0	0	1517	12
Future Volume (vph)	0	16	13	66	34	0	0	0	0	0	1517	12
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		5.7	5.7		6.1						6.1	6.1
Lane Util. Factor		1.00	1.00		0.95						0.95	1.00
Frt		1.00	0.85		1.00						1.00	0.85
Flt Protected		1.00	1.00		0.97						1.00	1.00
Satd. Flow (prot)		1961	1667		3606						3725	1667
Flt Permitted		1.00	1.00		0.73						1.00	1.00
Satd. Flow (perm)		1961	1667		2734						3725	1667
Peak-hour factor, PHF	0.92	0.84	0.84	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	19	15	72	37	0	0	0	0	0	1649	13
RTOR Reduction (vph)	0	0	14	0	0	0	0	0	0	0	0	4
Lane Group Flow (vph)	0	19	1	0	109	0	0	0	0	0	1649	9
Turn Type		NA	Perm	Perm	NA						NA	Perm
Protected Phases		4			5						6	
Permitted Phases			4	5								6
Actuated Green, G (s)		10.0	10.0		13.5						78.6	78.6
Effective Green, g (s)		10.0	10.0		13.5						78.6	78.6
Actuated g/C Ratio		0.08	0.08		0.11						0.65	0.65
Clearance Time (s)		5.7	5.7		6.1						6.1	6.1
Vehicle Extension (s)		3.0	3.0		3.0						3.0	3.0
Lane Grp Cap (vph)		163	138		307						2439	1091
v/s Ratio Prot		c0.01									c0.44	
v/s Ratio Perm			0.00		c0.04							0.01
v/c Ratio		0.12	0.01		1.11dl						0.68	0.01
Uniform Delay, d1		50.9	50.5		49.2						12.8	7.2
Progression Factor		1.00	1.00		0.08						1.00	1.00
Incremental Delay, d2		0.3	0.0		0.7						1.5	0.0
Delay (s)		51.2	50.5		4.6						14.3	7.2
Level of Service		D	D		A						B	A
Approach Delay (s)		50.9			4.6			0.0			14.3	
Approach LOS		D			A			A			B	

Intersection Summary			
HCM 2000 Control Delay	14.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	17.9
Intersection Capacity Utilization	71.4%	ICU Level of Service	C
Analysis Period (min)	15		

dl Defacto Left Lane. Recode with 1 though lane as a left lane.
c Critical Lane Group

Intersection: 2: Baldwin Road & Baldwin Village Roundabout Entry/Judah Road

Movement	EB	WB	NB	SB	SB
Directions Served	LTR	LTR	ULT	ULT	TR
Maximum Queue (ft)	98	25	41	120	143
Average Queue (ft)	35	2	5	45	24
95th Queue (ft)	73	14	25	115	97
Link Distance (ft)	257	768	107	316	316
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 6:

Movement	NB	NB
Directions Served	L	T
Maximum Queue (ft)	88	34
Average Queue (ft)	10	2
95th Queue (ft)	53	31
Link Distance (ft)		374
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	150	
Storage Blk Time (%)	0	0
Queuing Penalty (veh)	0	0

Intersection: 8: Baldwin Road

Movement	SB
Directions Served	T
Maximum Queue (ft)	7
Average Queue (ft)	0
95th Queue (ft)	5
Link Distance (ft)	107
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 9: Baldwin Road & SB to NB X-over

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 10: Baldwin Road & SB to NB X-over

Movement	EB	EB
Directions Served	L	L
Maximum Queue (ft)	27	17
Average Queue (ft)	8	1
95th Queue (ft)	28	8
Link Distance (ft)	24	24
Upstream Blk Time (%)	1	0
Queuing Penalty (veh)	0	0
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 11: Baldwin Road & S. Baldwin Commons

Movement	EB	NB	NB	NB	NB	NB
Directions Served	L	L	L	T	T	T
Maximum Queue (ft)	5	159	114	128	78	12
Average Queue (ft)	0	71	6	48	11	1
95th Queue (ft)	4	135	49	105	47	11
Link Distance (ft)	18	294	294	294	294	294
Upstream Blk Time (%)	1					
Queuing Penalty (veh)	0					
Storage Bay Dist (ft)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 12: S. Baldwin Commons & Baldwin Road

Movement	EB	EB	SB	SB	SB
Directions Served	T	R	T	T	R
Maximum Queue (ft)	67	30	334	350	175
Average Queue (ft)	17	7	199	222	13
95th Queue (ft)	46	22	302	326	86
Link Distance (ft)	220	220	345	345	
Upstream Blk Time (%)			0	0	
Queuing Penalty (veh)			2	4	
Storage Bay Dist (ft)					75
Storage Blk Time (%)				25	
Queuing Penalty (veh)				3	

Intersection: 14: Baldwin Road & Baldwin Village Inward South Driveway/NB to SB X-over

Movement	WB	WB	SB
Directions Served	L	LT	TR
Maximum Queue (ft)	51	69	7
Average Queue (ft)	26	31	0
95th Queue (ft)	47	59	3
Link Distance (ft)	32	32	63
Upstream Blk Time (%)	15	18	
Queuing Penalty (veh)	7	9	
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 15: Baldwin Road & NB to SB X-over

Movement	NB
Directions Served	L
Maximum Queue (ft)	12
Average Queue (ft)	0
95th Queue (ft)	6
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	250
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 16: Baldwin Road

Movement	WB	WB	SB	SB	SB
Directions Served	L	T	T	T	R
Maximum Queue (ft)	66	81	11	18	4
Average Queue (ft)	20	40	0	1	0
95th Queue (ft)	53	82	8	14	3
Link Distance (ft)	26	26	139	139	
Upstream Blk Time (%)	16	39			
Queuing Penalty (veh)	6	14			
Storage Bay Dist (ft)					65
Storage Blk Time (%)				0	
Queuing Penalty (veh)				0	

Intersection: 18: Jordan Road & Baldwin Road

Movement	WB
Directions Served	R
Maximum Queue (ft)	22
Average Queue (ft)	4
95th Queue (ft)	18
Link Distance (ft)	569
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 20:

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 21:

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 23: Morgan Road & Baldwin Road

Movement	EB
Directions Served	R
Maximum Queue (ft)	96
Average Queue (ft)	43
95th Queue (ft)	78
Link Distance (ft)	412
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 24: Baldwin Road

Movement	WB
Directions Served	R
Maximum Queue (ft)	31
Average Queue (ft)	11
95th Queue (ft)	35
Link Distance (ft)	343
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 26:

Movement	EB
Directions Served	R
Maximum Queue (ft)	30
Average Queue (ft)	5
95th Queue (ft)	22
Link Distance (ft)	191
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 28: Baldwin Road

Movement	EB
Directions Served	R
Maximum Queue (ft)	29
Average Queue (ft)	6
95th Queue (ft)	25
Link Distance (ft)	124
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 30: Baldwin Road & Baldwin Village North Driveway

Movement	EB	NB	SB
Directions Served	LR	L	TR
Maximum Queue (ft)	69	31	21
Average Queue (ft)	25	3	1
95th Queue (ft)	54	17	15
Link Distance (ft)	249		191
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)		75	
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 33: Baldwin Village Mid Driveway

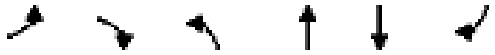
Movement	EB	SB	SB
Directions Served	R	T	TR
Maximum Queue (ft)	66	10	12
Average Queue (ft)	30	0	0
95th Queue (ft)	57	7	6
Link Distance (ft)	242	36	36
Upstream Blk Time (%)		0	0
Queuing Penalty (veh)		0	0
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 37: Baldwin Road & Baldwin Village Outward South Driveway

Movement	EB
Directions Served	R
Maximum Queue (ft)	98
Average Queue (ft)	41
95th Queue (ft)	74
Link Distance (ft)	233
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Network Summary

Network wide Queuing Penalty: 45



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	16	0	100	505	0	0
Future Volume (vph)	16	0	100	505	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)	5.7		6.1	6.1		
Lane Util. Factor	1.00		0.97	0.91		
Frt	1.00		1.00	1.00		
Flt Protected	0.95		0.95	1.00		
Satd. Flow (prot)	1863		3650	5406		
Flt Permitted	0.95		0.95	1.00		
Satd. Flow (perm)	1863		3650	5406		
Peak-hour factor, PHF	0.92	0.92	0.95	0.95	0.92	0.92
Adj. Flow (vph)	17	0	105	532	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	17	0	105	532	0	0
Heavy Vehicles (%)	2%	2%	1%	1%	2%	2%
Turn Type	Prot		custom	NA		
Protected Phases	4			2 5		
Permitted Phases			5			
Actuated Green, G (s)	10.0		13.5	98.2		
Effective Green, g (s)	10.0		13.5	98.2		
Actuated g/C Ratio	0.08		0.11	0.82		
Clearance Time (s)	5.7		6.1			
Vehicle Extension (s)	3.0		3.0			
Lane Grp Cap (vph)	155		410	4423		
v/s Ratio Prot	c0.01			c0.10		
v/s Ratio Perm			c0.03			
v/c Ratio	0.11		0.26	0.12		
Uniform Delay, d1	50.9		48.7	2.2		
Progression Factor	0.03		1.00	1.00		
Incremental Delay, d2	0.3		0.3	0.0		
Delay (s)	2.1		49.0	2.2		
Level of Service	A		D	A		
Approach Delay (s)	2.1			9.9	0.0	
Approach LOS	A			A	A	

Intersection Summary			
HCM 2000 Control Delay	9.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.14		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	17.9
Intersection Capacity Utilization	27.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	16	13	66	34	0	0	0	0	0	1517	12
Future Volume (vph)	0	16	13	66	34	0	0	0	0	0	1517	12
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		5.7	5.7		6.1						6.1	6.1
Lane Util. Factor		1.00	1.00		0.95						0.95	1.00
Frt		1.00	0.85		1.00						1.00	0.85
Flt Protected		1.00	1.00		0.97						1.00	1.00
Satd. Flow (prot)		1961	1667		3606						3725	1667
Flt Permitted		1.00	1.00		0.73						1.00	1.00
Satd. Flow (perm)		1961	1667		2734						3725	1667
Peak-hour factor, PHF	0.92	0.84	0.84	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	19	15	72	37	0	0	0	0	0	1649	13
RTOR Reduction (vph)	0	0	14	0	0	0	0	0	0	0	0	4
Lane Group Flow (vph)	0	19	1	0	109	0	0	0	0	0	1649	9
Turn Type		NA	Perm	Perm	NA						NA	Perm
Protected Phases		4			5						6	
Permitted Phases			4	5								6
Actuated Green, G (s)		10.0	10.0		13.5						78.6	78.6
Effective Green, g (s)		10.0	10.0		13.5						78.6	78.6
Actuated g/C Ratio		0.08	0.08		0.11						0.65	0.65
Clearance Time (s)		5.7	5.7		6.1						6.1	6.1
Vehicle Extension (s)		3.0	3.0		3.0						3.0	3.0
Lane Grp Cap (vph)		163	138		307						2439	1091
v/s Ratio Prot		c0.01									c0.44	
v/s Ratio Perm			0.00		c0.04							0.01
v/c Ratio		0.12	0.01		1.11dl						0.68	0.01
Uniform Delay, d1		50.9	50.5		49.2						12.8	7.2
Progression Factor		1.00	1.00		0.08						1.00	1.00
Incremental Delay, d2		0.3	0.0		0.7						1.5	0.0
Delay (s)		51.2	50.5		4.6						14.3	7.2
Level of Service		D	D		A						B	A
Approach Delay (s)		50.9			4.6			0.0			14.3	
Approach LOS		D			A			A			B	

Intersection Summary			
HCM 2000 Control Delay	14.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	17.9
Intersection Capacity Utilization	71.4%	ICU Level of Service	C
Analysis Period (min)	15		

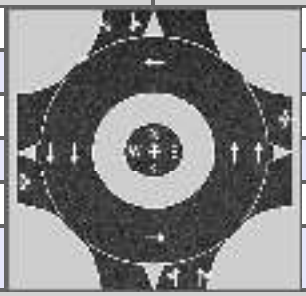
dl Defacto Left Lane. Recode with 1 though lane as a left lane.

c Critical Lane Group

HCS Roundabouts Report

General Information

Analyst	Carlie delaPaz
Agency or Co.	AEW
Date Performed	6/9/2022
Analysis Year	2024
Time Analyzed	PM Peak - Build Cond
Project Description	



Site Information

Intersection	Baldwin and Judah
E/W Street Name	Judah
N/S Street Name	Baldwin
Analysis Time Period, hrs	1.00
Peak Hour Factor	0.94
Jurisdiction	RCOC

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	2	0	0	0	2	0
Lane Assignment			LTR				LTR		LT		TR		LT		TR	
Volume (V), veh/h	0	189	8	150	0	7	0	14	58	300	1569	21	11	6	777	79
Percent Heavy Vehicles, %	3	3	3	3	3	3	3	3	2	2	2	2	3	3	3	3
Flow Rate (v_{PCE}), pc/h	0	207	9	164	0	8	0	15	63	326	1703	23	12	7	851	87
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	2				2				1				1			
Pedestrians Crossing, p/h	0				0				0				0			
Proportion of CAVs	0															

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway, s		4.3276			4.3276		4.5436	4.5436		4.5436	4.5436	
Follow-Up Headway, s		2.5352			2.5352		2.5352	2.5352		2.5352	2.5352	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		380			23		994	1121		450	507	
Entry Volume, veh/h		369			22		975	1099		437	492	
Circulating Flow (v_c), pc/h	941			2311			235			397		
Exiting Flow (v_{ex}), pc/h	39			413			1937			1086		
Capacity (c_{pce}), pc/h		638			199		1147	1147		989	989	
Capacity (c), veh/h		620			193		1124	1124		961	961	
v/c Ratio (x)		0.60			0.12		0.87	0.98		0.45	0.51	

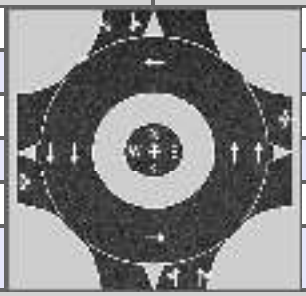
Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		17.2			21.6		26.8	65.7		9.1	10.2	
Lane LOS		C			C		D	F		A	B	
95% Queue, veh		4.3			0.4		16.1	34.8		2.5	3.1	
Approach Delay, s/veh	17.2			21.6			47.4			9.7		
Approach LOS	C			C			E			A		
Intersection Delay, s/veh | LOS	33.7						D					

HCS Roundabouts Report

General Information

Analyst	Carlie delaPaz
Agency or Co.	AEW
Date Performed	6/9/2022
Analysis Year	2024
Time Analyzed	PM Peak - Build Cond
Project Description	



Site Information

Intersection	Baldwin and Judah
E/W Street Name	Judah
N/S Street Name	Baldwin
Analysis Time Period, hrs	1.00
Peak Hour Factor	0.94
Jurisdiction	RCOC

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	2	0	0	0	2	0
Lane Assignment			LTR				LTR		LT		TR		LT		TR	
Volume (V), veh/h	0	253	0	46	0	7	0	14	58	203	1435	21	11	6	777	62
Percent Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Flow Rate (v_{PCE}), pc/h	0	277	0	50	0	8	0	15	64	222	1572	23	12	7	851	68
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	2				2				1				1			
Pedestrians Crossing, p/h	0				0				0				0			
Proportion of CAVs	0															

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway, s		4.3276			4.3276		4.5436	4.5436		4.5436	4.5436	
Follow-Up Headway, s		2.5352			2.5352		2.5352	2.5352		2.5352	2.5352	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		327			23		884	997		441	497	
Entry Volume, veh/h		317			22		858	968		428	483	
Circulating Flow (v_c), pc/h	942			2147			296			294		
Exiting Flow (v_{ex}), pc/h	30			290			1876			973		
Capacity (c_{pce}), pc/h		638			229		1085	1085		1087	1087	
Capacity (c), veh/h		619			222		1053	1053		1055	1055	
v/c Ratio (x)		0.51			0.10		0.82	0.92		0.41	0.46	

Delay and Level of Service

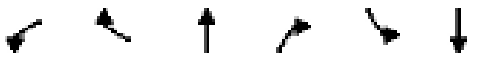
Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		14.5			18.5		21.9	39.9		7.8	8.6	
Lane LOS		B			C		C	E		A	A	
95% Queue, veh		3.1			0.3		11.8	22.4		2.0	2.5	
Approach Delay, s/veh	14.5			968 18.5			31.4			8.2		
Approach LOS	B			C			D			A		
Intersection Delay, s/veh | LOS	22.7						C					

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL
Right Turn Channelized												
Traffic Volume (veh/h)	189	8	150	7	0	14	55	345	1569	21	11	6
Future Volume (veh/h)	189	8	150	7	0	14	55	345	1569	21	11	6
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	205	9	163	8	0	15	60	375	1705	23	12	7
Approach Volume (veh/h)		377			23				2163			
Crossing Volume (veh/h)		932			2357#				233			
High Capacity (veh/h)		658			197				1154			
High v/c (veh/h)		0.57			0.12				1.87			
Low Capacity (veh/h)		513			134				952			
Low v/c (veh/h)		0.73			0.17				2.27			

Intersection Summary				
Maximum v/c High	1.87			
Maximum v/c Low	2.27			
Intersection Capacity Utilization	111.9%	ICU Level of Service	H	
# Crossing flow exceeds 1200, method is not applicable				

Movement	SBT	SBR
Right Turn Channelized		
Traffic Volume (veh/h)	777	79
Future Volume (veh/h)	777	79
Peak Hour Factor	0.92	0.92
Hourly flow rate (vph)	845	86
Approach Volume (veh/h)	950	
Crossing Volume (veh/h)	443	
High Capacity (veh/h)	977	
High v/c (veh/h)	0.97	
Low Capacity (veh/h)	793	
Low v/c (veh/h)	1.20	

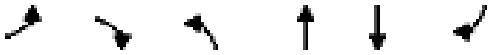
Intersection Summary



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	0	0	0	0	128	966
Future Volume (Veh/h)	0	0	0	0	128	966
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	0	139	1050
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	803	0			0	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	803	0			0	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			91	
cM capacity (veh/h)	294	1084			1622	

Direction, Lane #	SB 1	SB 2	SB 3
Volume Total	139	525	525
Volume Left	139	0	0
Volume Right	0	0	0
cSH	1622	1700	1700
Volume to Capacity	0.09	0.31	0.31
Queue Length 95th (ft)	7	0	0
Control Delay (s)	7.4	0.0	0.0
Lane LOS	A		
Approach Delay (s)	0.9		
Approach LOS			

Intersection Summary			
Average Delay	0.9		
Intersection Capacity Utilization	59.7%	ICU Level of Service	B
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	129	0	0	1885	0	0
Future Volume (Veh/h)	129	0	0	1885	0	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	140	0	0	2049	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1024	0	0			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1024	0	0			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	39	100	100			
cM capacity (veh/h)	231	1084	1622			

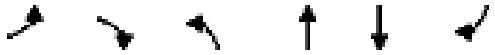
Direction, Lane #	EB 1	EB 2	NB 1	NB 2
Volume Total	70	70	1024	1024
Volume Left	70	70	0	0
Volume Right	0	0	0	0
cSH	231	231	1700	1700
Volume to Capacity	0.30	0.30	0.60	0.60
Queue Length 95th (ft)	31	31	0	0
Control Delay (s)	27.2	27.2	0.0	0.0
Lane LOS	D	D		
Approach Delay (s)	27.2		0.0	
Approach LOS	D			

Intersection Summary			
Average Delay	1.7		
Intersection Capacity Utilization	83.2%	ICU Level of Service	E
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	97	122	0	0	0	0	0	934	32
Future Volume (Veh/h)	0	0	0	97	122	0	0	0	0	0	934	32
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	105	133	0	0	0	0	0	1015	35
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								1224				
pX, platoon unblocked												
vC, conflicting volume	1099	1032	525	508	1050	0	1050			0		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1099	1032	525	508	1050	0	1050			0		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	77	41	100	100			100		
cM capacity (veh/h)	89	231	497	448	226	1084	659			1622		

Direction, Lane #	WB 1	WB 2	SB 1	SB 2
Volume Total	70	168	677	373
Volume Left	70	35	0	0
Volume Right	0	0	0	35
cSH	448	252	1700	1700
Volume to Capacity	0.16	0.67	0.40	0.22
Queue Length 95th (ft)	14	107	0	0
Control Delay (s)	14.5	43.9	0.0	0.0
Lane LOS	B	E		
Approach Delay (s)	35.3		0.0	
Approach LOS	E			

Intersection Summary				
Average Delay	6.5			
Intersection Capacity Utilization	81.7%	ICU Level of Service	D	
Analysis Period (min)	15			



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	219	1885	0	0
Future Volume (Veh/h)	0	0	219	1885	0	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	238	2049	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				1230		
pX, platoon unblocked	0.74					
vC, conflicting volume	1500	0	0			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	970	0	0			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	85			
cM capacity (veh/h)	158	1084	1622			

Direction, Lane #	NB 1	NB 2	NB 3
Volume Total	238	1024	1024
Volume Left	238	0	0
Volume Right	0	0	0
cSH	1622	1700	1700
Volume to Capacity	0.15	0.60	0.60
Queue Length 95th (ft)	13	0	0
Control Delay (s)	7.6	0.0	0.0
Lane LOS	A		
Approach Delay (s)	0.8		
Approach LOS			

Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	81.7%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	16	0	0	0	0	7	0	2010	4	0	0	0
Future Volume (Veh/h)	16	0	0	0	0	7	0	2010	4	0	0	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	17	0	0	0	0	8	0	2185	4	0	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								655				
pX, platoon unblocked	0.82	0.82		0.82	0.82	0.82				0.82		
vC, conflicting volume	736	2189	0	2187	2187	730	0			2189		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	0	1684	0	1682	1682	0	0			1684		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	98	100	100	100	100	99	100			100		
cM capacity (veh/h)	832	76	1084	51	77	890	1622			308		

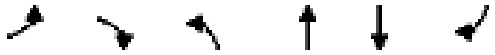
Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	NB 3
Volume Total	8	8	8	874	874	441
Volume Left	8	8	0	0	0	0
Volume Right	0	0	8	0	0	4
cSH	832	832	890	1700	1700	1700
Volume to Capacity	0.01	0.01	0.01	0.51	0.51	0.26
Queue Length 95th (ft)	1	1	1	0	0	0
Control Delay (s)	9.4	9.4	9.1	0.0	0.0	0.0
Lane LOS	A	A	A			
Approach Delay (s)	9.4		9.1	0.0		
Approach LOS	A		A			

Intersection Summary				
Average Delay	0.1			
Intersection Capacity Utilization	76.8%	ICU Level of Service	D	
Analysis Period (min)	15			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	114	0	0	975	133
Future Volume (Veh/h)	0	114	0	0	975	133
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	124	0	0	1060	145
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				792		
pX, platoon unblocked						
vC, conflicting volume	1132	602	1205			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1132	602	1205			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	72	100			
cM capacity (veh/h)	197	442	575			

Direction, Lane #	EB 1	SB 1	SB 2
Volume Total	124	707	498
Volume Left	0	0	0
Volume Right	124	0	145
cSH	442	1700	1700
Volume to Capacity	0.28	0.42	0.29
Queue Length 95th (ft)	28	0	0
Control Delay (s)	16.3	0.0	0.0
Lane LOS	C		
Approach Delay (s)	16.3	0.0	
Approach LOS	C		

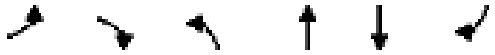
Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	43.0%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	84	0	0	1024	0
Future Volume (Veh/h)	0	84	0	0	1024	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.60	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	140	0	0	1113	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				1007		
pX, platoon unblocked						
vC, conflicting volume	1113	556	1113			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1113	556	1113			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	70	100			
cM capacity (veh/h)	203	474	623			

Direction, Lane #	EB 1	SB 1	SB 2
Volume Total	140	556	556
Volume Left	0	0	0
Volume Right	140	0	0
cSH	474	1700	1700
Volume to Capacity	0.30	0.33	0.33
Queue Length 95th (ft)	31	0	0
Control Delay (s)	15.7	0.0	0.0
Lane LOS	C		
Approach Delay (s)	15.7	0.0	
Approach LOS	C		

Intersection Summary			
Average Delay	1.8		
Intersection Capacity Utilization	38.5%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	15	42	50	1733	831	720
Future Volume (Veh/h)	15	42	50	1733	831	720
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	16	46	54	1884	903	783
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				TWLTL	TWLTL	
Median storage veh)				2	2	
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2344	843	1686			
vC1, stage 1 conf vol	1294					
vC2, stage 2 conf vol	1050					
vCu, unblocked vol	2344	843	1686			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.3	2.2			
p0 queue free %	90	85	86			
cM capacity (veh/h)	162	307	375			

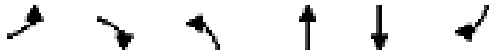
Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	62	54	942	942	602	1084
Volume Left	16	54	0	0	0	0
Volume Right	46	0	0	0	0	783
cSH	250	375	1700	1700	1700	1700
Volume to Capacity	0.25	0.14	0.55	0.55	0.35	0.64
Queue Length 95th (ft)	24	12	0	0	0	0
Control Delay (s)	24.1	16.2	0.0	0.0	0.0	0.0
Lane LOS	C	C				
Approach Delay (s)	24.1	0.5			0.0	
Approach LOS	C					

Intersection Summary				
Average Delay	0.6			
Intersection Capacity Utilization	55.5%	ICU Level of Service		B
Analysis Period (min)	15			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	196	0	0	900	100
Future Volume (Veh/h)	0	196	0	0	900	100
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	213	0	0	978	109
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1032	544	1087			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1032	544	1087			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	56	100			
cM capacity (veh/h)	228	484	638			

Direction, Lane #	EB 1	SB 1	SB 2
Volume Total	213	652	435
Volume Left	0	0	0
Volume Right	213	0	109
cSH	484	1700	1700
Volume to Capacity	0.44	0.38	0.26
Queue Length 95th (ft)	55	0	0
Control Delay (s)	18.2	0.0	0.0
Lane LOS	C		
Approach Delay (s)	18.2	0.0	
Approach LOS	C		

Intersection Summary			
Average Delay	3.0		
Intersection Capacity Utilization	44.9%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	159	0	242	2068	0	0
Future Volume (vph)	159	0	242	2068	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)	5.7		6.1	6.1		
Lane Util. Factor	1.00		0.97	0.91		
Frt	1.00		1.00	1.00		
Flt Protected	0.95		0.95	1.00		
Satd. Flow (prot)	1863		3614	5353		
Flt Permitted	0.95		0.95	1.00		
Satd. Flow (perm)	1863		3614	5353		
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	173	0	263	2248	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	173	0	263	2248	0	0
Turn Type	Prot		custom	NA		
Protected Phases	4			2 5		
Permitted Phases			5			
Actuated Green, G (s)	17.5		46.0	90.7		
Effective Green, g (s)	17.5		46.0	90.7		
Actuated g/C Ratio	0.15		0.38	0.76		
Clearance Time (s)	5.7		6.1			
Vehicle Extension (s)	3.0		3.0			
Lane Grp Cap (vph)	271		1385	4045		
v/s Ratio Prot	c0.09			c0.42		
v/s Ratio Perm			0.07			
v/c Ratio	0.64		0.19	0.56		
Uniform Delay, d1	48.3		24.6	6.2		
Progression Factor	0.02		1.00	1.00		
Incremental Delay, d2	4.1		0.1	0.2		
Delay (s)	5.3		24.7	6.3		
Level of Service	A		C	A		
Approach Delay (s)	5.3			8.3	0.0	
Approach LOS	A			A	A	

Intersection Summary			
HCM 2000 Control Delay	8.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	17.9
Intersection Capacity Utilization	56.2%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	159	207	36	206	0	0	0	0	0	1020	44
Future Volume (vph)	0	159	207	36	206	0	0	0	0	0	1020	44
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		5.7	5.7		6.1						6.1	6.1
Lane Util. Factor		1.00	1.00		0.95						0.95	1.00
Frt		1.00	0.85		1.00						1.00	0.85
Flt Protected		1.00	1.00		0.99						1.00	1.00
Satd. Flow (prot)		1961	1667		3698						3725	1667
Flt Permitted		1.00	1.00		0.56						1.00	1.00
Satd. Flow (perm)		1961	1667		2091						3725	1667
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	173	225	39	224	0	0	0	0	0	1109	48
RTOR Reduction (vph)	0	0	158	0	0	0	0	0	0	0	0	33
Lane Group Flow (vph)	0	173	67	0	263	0	0	0	0	0	1109	15
Turn Type		NA	Perm	Perm	NA						NA	Perm
Protected Phases		4			5						6	
Permitted Phases			4	5								6
Actuated Green, G (s)		17.5	17.5		46.0						38.6	38.6
Effective Green, g (s)		17.5	17.5		46.0						38.6	38.6
Actuated g/C Ratio		0.15	0.15		0.38						0.32	0.32
Clearance Time (s)		5.7	5.7		6.1						6.1	6.1
Vehicle Extension (s)		3.0	3.0		3.0						3.0	3.0
Lane Grp Cap (vph)		285	243		801						1198	536
v/s Ratio Prot		c0.09									c0.30	
v/s Ratio Perm			0.04		c0.13							0.01
v/c Ratio		0.61	0.28		0.33						0.93	0.03
Uniform Delay, d1		48.0	45.6		26.1						39.3	27.9
Progression Factor		1.00	1.00		0.09						1.00	1.00
Incremental Delay, d2		3.6	0.6		0.2						13.4	0.1
Delay (s)		51.7	46.2		2.6						52.7	28.0
Level of Service		D	D		A						D	C
Approach Delay (s)		48.6			2.6			0.0			51.7	
Approach LOS		D			A			A			D	

Intersection Summary			
HCM 2000 Control Delay	43.9	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	17.9
Intersection Capacity Utilization	62.2%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Intersection: 2: Baldwin Road & Baldwin Village Roundabout/Judah Road

Movement	EB	WB	NB	NB	SB	SB
Directions Served	LTR	LTR	ULT	TR	ULT	TR
Maximum Queue (ft)	196	44	199	192	128	112
Average Queue (ft)	88	9	146	132	54	23
95th Queue (ft)	157	33	218	231	106	73
Link Distance (ft)	288	768	107	107	316	316
Upstream Blk Time (%)			54	42		
Queuing Penalty (veh)			463	358		
Storage Bay Dist (ft)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 6:

Movement	NB
Directions Served	L
Maximum Queue (ft)	85
Average Queue (ft)	10
95th Queue (ft)	43
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	150
Storage Blk Time (%)	0
Queuing Penalty (veh)	1

Intersection: 8: Baldwin Road

Movement	SB	NW	NW
Directions Served	T	R	R
Maximum Queue (ft)	7	425	408
Average Queue (ft)	0	170	164
95th Queue (ft)	5	484	479
Link Distance (ft)	107	386	386
Upstream Blk Time (%)		20	20
Queuing Penalty (veh)		172	167
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 9: Baldwin Road & SB to NB X-over

Movement	SB	SB	SB
Directions Served	L	T	T
Maximum Queue (ft)	165	147	137
Average Queue (ft)	38	26	21
95th Queue (ft)	183	168	143
Link Distance (ft)		376	376
Upstream Blk Time (%)	0	1	0
Queuing Penalty (veh)	0	3	0
Storage Bay Dist (ft)	300		
Storage Blk Time (%)	3	0	
Queuing Penalty (veh)	12	0	

Intersection: 10: Baldwin Road & SB to NB X-over

Movement	EB	EB	NB	NB
Directions Served	L	L	T	T
Maximum Queue (ft)	77	81	80	88
Average Queue (ft)	38	31	9	9
95th Queue (ft)	68	70	73	76
Link Distance (ft)	24	24	168	168
Upstream Blk Time (%)	52	37	1	1
Queuing Penalty (veh)	27	19	8	11
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 11: Baldwin Road & S. Baldwin Commons

Movement	EB	NB	NB	NB	NB	NB
Directions Served	L	L	L	T	T	T
Maximum Queue (ft)	56	249	252	333	311	322
Average Queue (ft)	29	160	100	247	156	184
95th Queue (ft)	58	235	224	360	315	329
Link Distance (ft)	18	294	294	294	294	294
Upstream Blk Time (%)	57		0	9	2	4
Queuing Penalty (veh)	199		0	0	0	0
Storage Bay Dist (ft)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 12: S. Baldwin Commons & Baldwin Road

Movement	EB	EB	WB	WB	SB	SB	SB
Directions Served	T	R	LT	T	T	T	R
Maximum Queue (ft)	257	88	45	30	355	370	174
Average Queue (ft)	221	32	17	5	169	183	16
95th Queue (ft)	281	71	41	22	276	291	82
Link Distance (ft)	220	220	18	18	345	345	
Upstream Blk Time (%)	52		33	10	1	1	
Queuing Penalty (veh)	0		41	13	3	3	
Storage Bay Dist (ft)							75
Storage Blk Time (%)						28	
Queuing Penalty (veh)						6	

Intersection: 14: Baldwin Road & Baldwin Village South Driveway/NB to SB X-over

Movement	WB	WB	SB
Directions Served	L	LT	TR
Maximum Queue (ft)	55	109	14
Average Queue (ft)	32	72	1
95th Queue (ft)	51	109	8
Link Distance (ft)	33	33	161
Upstream Blk Time (%)	11	48	
Queuing Penalty (veh)	19	79	
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 15: Baldwin Road & NB to SB X-over

Movement	NB	NB	NB
Directions Served	L	T	T
Maximum Queue (ft)	108	6	11
Average Queue (ft)	18	0	1
95th Queue (ft)	73	4	9
Link Distance (ft)		307	307
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	250		
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 16: Baldwin Road

Movement	EB	WB	SB	SB	SB
Directions Served	R	T	T	T	R
Maximum Queue (ft)	38	91	25	42	45
Average Queue (ft)	9	62	1	2	3
95th Queue (ft)	27	97	18	28	24
Link Distance (ft)	92	26	139	139	
Upstream Blk Time (%)		42	0	0	0
Queuing Penalty (veh)		34	0	1	0
Storage Bay Dist (ft)					65
Storage Blk Time (%)				0	
Queuing Penalty (veh)				0	

Intersection: 18: Jordan Road & Baldwin Road

Movement	WB	NB	NB
Directions Served	R	T	TR
Maximum Queue (ft)	22	11	9
Average Queue (ft)	3	1	0
95th Queue (ft)	14	10	6
Link Distance (ft)	569	148	148
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 20:

Movement	SB
Directions Served	T
Maximum Queue (ft)	11
Average Queue (ft)	0
95th Queue (ft)	8
Link Distance (ft)	93
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 21:

Movement	NB	NB
Directions Served	T	TR
Maximum Queue (ft)	142	143
Average Queue (ft)	33	31
95th Queue (ft)	151	143
Link Distance (ft)	145	145
Upstream Blk Time (%)	7	6
Queuing Penalty (veh)	59	53
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 23: Morgan Road & Baldwin Road

Movement	EB
Directions Served	R
Maximum Queue (ft)	52
Average Queue (ft)	21
95th Queue (ft)	43
Link Distance (ft)	412
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 24: Baldwin Road

Movement	WB
Directions Served	R
Maximum Queue (ft)	192
Average Queue (ft)	93
95th Queue (ft)	170
Link Distance (ft)	343
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 26: Baldwin Road & Baldwin Village Outward South Driveway

Movement	EB
Directions Served	R
Maximum Queue (ft)	94
Average Queue (ft)	40
95th Queue (ft)	74
Link Distance (ft)	299
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 28:

Movement	NB	NB	NB
Directions Served	T	T	TR
Maximum Queue (ft)	20	18	15
Average Queue (ft)	1	1	1
95th Queue (ft)	10	11	11
Link Distance (ft)	57	57	57
Upstream Blk Time (%)		0	
Queuing Penalty (veh)		0	
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 30:

Movement	EB	SB	SB
Directions Served	R	T	T
Maximum Queue (ft)	35	5	4
Average Queue (ft)	9	0	0
95th Queue (ft)	32	3	3
Link Distance (ft)	169	77	77
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 32: Baldwin Road & Baldwin Village North Drive

Movement	EB	NB	SB
Directions Served	LR	L	TR
Maximum Queue (ft)	48	43	4
Average Queue (ft)	15	12	0
95th Queue (ft)	41	39	3
Link Distance (ft)	250		240
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)		75	
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 35: Baldwin Village Mid Driveway

Movement	EB	SB	SB
Directions Served	R	T	TR
Maximum Queue (ft)	90	20	18
Average Queue (ft)	42	1	1
95th Queue (ft)	71	14	9
Link Distance (ft)	284	36	36
Upstream Blk Time (%)		0	0
Queuing Penalty (veh)		1	0
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 38: Baldwin Road

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Network Summary

Network wide Queuing Penalty: 1751

APPENDIX E - CRASH DATA

Crash Detail for 1/1/2017 - 12/31/2021
Criteria: WHERE A.AGENCY_ID = 14 AND A.GeoCoords.STIntersects (GEOMETRY::STGeomFromWKB(GEOGRAPHY::STPointFromText('POINT(-83.3071250450268 42.7089052368062)', 4326).STBuffer(30.48).STAsBinary(),4326)) = 1

#1 **Location:** S BALDWIN (0.864) 400 feet Nof S BALDWIN/BROWN TURN **Crash ID:** 1165943

Date: 09/30/2017 **Day:** Sat **Hour:** 12p **Weather:** clear **Roadway:** dry **Llght:** day

Injy K: 0 **Injy A:** 0 **Injy B:** 0 **Injy C:** 0 **Injy 0:** 4 **How:** rr-end

CVT: Orion Twp **Area:** inter driveway **HBD:** N **Drugs:** N **Complaint #:** 170179750

Unit#	Veh Dir	Action Prior	Event 1	Event 2	Event 3	Event 4	Haz Action	Veh Type	Damage
1	S	go straight	veh in transpt	none	none	none	unable to stop	car	ctrfront
2	S	slow/stop on rd	veh in transpt	none	none	none	none	car	ctrrear
3	S	slow/stop on rd	veh in transpt	none	none	none	none	pickup	ctrrear

UD10: 1165943

#2 **Location:** SB BALDWIN (0.845) 300 feet Nof BROWN RD **Crash ID:** 1332676

Date: 03/02/2018 **Day:** Fri **Hour:** 10a **Weather:** cloudy **Roadway:** wet **Llght:** day

Injy K: 0 **Injy A:** 0 **Injy B:** 0 **Injy C:** 2 **Injy 0:** 0 **How:** head-on/lt

CVT: Orion Twp **Area:** driveway **HBD:** N **Drugs:** N **Complaint #:** 180039878

Unit#	Veh Dir	Action Prior	Event 1	Event 2	Event 3	Event 4	Haz Action	Veh Type	Damage
1	S	go straight	veh in transpt	none	none	none	disrgd traffic cntrl	car	ctrfront
2	NE	left turn	veh in transpt	none	none	none	none	car	rtside

UD10: 1332676

#3 **Location:** S BALDWIN (1.669) 300 feet Nof BROWN RD **Crash ID:** 1450654

Date: 08/01/2018 **Day:** Wed **Hour:** 7am **Weather:** cloudy **Roadway:** dry **Llght:** day

Injy K: 0 **Injy A:** 0 **Injy B:** 0 **Injy C:** 0 **Injy 0:** 2 **How:** rr-end

CVT: Orion Twp **Area:** straight **HBD:** N **Drugs:** N **Complaint #:** 180144573

Unit#	Veh Dir	Action Prior	Event 1	Event 2	Event 3	Event 4	Haz Action	Veh Type	Damage
1	S	slow/stop on rd	veh in transpt	none	none	none	unable to stop	car	ctrfront
2	S	stop on road	veh in transpt	none	none	none	none	car	ctrrear

UD10: 1450654

#4 **Location:** NB BALDWIN (1.688) 400 feet Nof BROWN RD **Crash ID:** 1755273

Date: 06/25/2019 **Day:** Tue **Hour:** 5pm **Weather:** clear **Roadway:** dry **Llght:** day

Injy K: 0 **Injy A:** 0 **Injy B:** 0 **Injy C:** 0 **Injy 0:** 2 **How:** ss-same

CVT: Orion Twp **Area:** straight **HBD:** N **Drugs:** N **Complaint #:** 190121670

Unit#	Veh Dir	Action Prior	Event 1	Event 2	Event 3	Event 4	Haz Action	Veh Type	Damage
1	N	change lanes	veh in transpt	none	none	none	failed to yield	car	rtside
2	N	go straight	veh in transpt	none	none	none	none	car	lftside

UD10: 1755273

#5 **Location:** S BALDWIN (0.84) 278 feet Nof S BALDWIN/BROWN TURN **Crash ID:** 2123861

Date: 10/15/2020 **Day:** Thu **Hour:** 12p **Weather:** cloudy **Roadway:** dry **Llght:** day

Injy K: 0 **Injy A:** 0 **Injy B:** 0 **Injy C:** 0 **Injy 0:** 4 **How:** ss-same

CVT: Orion Twp **Area:** inter driveway **HBD:** N **Drugs:** N **Complaint #:** 200208028

Unit#	Veh Dir	Action Prior	Event 1	Event 2	Event 3	Event 4	Haz Action	Veh Type	Damage
1	W	left turn	veh in transpt	none	none	none	imprp turn	car	lftside
2	W	go straight	veh in transpt	none	none	none	none	car	rtfront

UD10: 2123861

#6 **Location:** S BALDWIN (1.688) 400 feet Nof BROWN RD **Crash ID:** 2173820

Date: 12/15/2020 **Day:** Tue **Hour:** 7pm **Weather:** clear **Roadway:** dry **Llght:** dark/ltd

Injy K: 0 **Injy A:** 0 **Injy B:** 0 **Injy C:** 0 **Injy 0:** 2 **How:** rr-end

CVT: Orion Twp **Area:** straight **HBD:** N **Drugs:** N **Complaint #:** 200249455

Unit#	Veh Dir	Action Prior	Event 1	Event 2	Event 3	Event 4	Haz Action	Veh Type	Damage
1	S	slow/stop on rd	veh in transpt	none	none	none	unable to stop	car	ctrfront
2	S	slow/stop on rd	veh in transpt	none	none	none	none	car	ctrrear

UD10: 2173820

#7 **Location:** SB BALDWIN (0.864) 400 feet Nof BROWN **Crash ID:** 2177747

Date: 12/18/2020 **Day:** Fri **Hour:** 2pm **Weather:** clear **Roadway:** dry **Llght:** day

Injy K: 0 **Injy A:** 0 **Injy B:** 0 **Injy C:** 0 **Injy 0:** 2 **How:** rr-end

CVT: Orion Twp **Area:** straight **HBD:** N **Drugs:** N **Complaint #:** 200251640

Unit#	Veh Dir	Action Prior	Event 1	Event 2	Event 3	Event 4	Haz Action	Veh Type	Damage
1	S	go straight	veh in transpt	none	none	none	unable to stop	car	ctrfront
2	S	stop on road	veh in transpt	none	none	none	none	car	ctrrear

UD10: 2177747

#8 **Location:** NB S BALDWIN (1.678) 350 feet Nof BROWN RD **Crash ID:** 2177751

Date: 12/18/2020 **Day:** Fri **Hour:** 5pm **Weather:** clear **Roadway:** dry **Llght:** dark/ltd

Injy K: 0 **Injy A:** 0 **Injy B:** 0 **Injy C:** 0 **Injy 0:** 2 **How:** ss-same

CVT: Orion Twp **Area:** inter other **HBD:** N **Drugs:** N **Complaint #:** 200251750

Unit#	Veh Dir	Action Prior	Event 1	Event 2	Event 3	Event 4	Haz Action	Veh Type	Damage
1	N	right turn	veh in transpt	none	none	none	imprp lane use	car	lftfront
2	N	left turn	veh in transpt	none	none	none	none	car	rtside

UD10: 2177751

#9 **Location:** NB S BALDWIN (1.688) 400 feet Nof BROWN RD **Crash ID:** 2435246

Date: 11/02/2021 **Day:** Tue **Hour:** 4pm **Weather:** clear **Roadway:** dry **Llght:** day

Injy K: 0 **Injy A:** 0 **Injy B:** 0 **Injy C:** 0 **Injy 0:** 4 **How:** rr-end

CVT: Orion Twp **Area:** straight **HBD:** N **Drugs:** N **Complaint #:** 210228897

Unit#	Veh Dir	Action Prior	Event 1	Event 2	Event 3	Event 4	Haz Action	Veh Type	Damage
1	N	go straight	veh in transpt	none	none	none	failed to yield	car	rtfront
2	N	change lanes	veh in transpt	none	none	none	none	car	lftrear

UD10: 2435246

#10 **Location:** SB S BALDWIN (0.857) 400 feet Nof BROWN RD **Crash ID:** 2476827

Date: 12/07/2021 **Day:** Tue **Hour:** 5am **Weather:** clear **Roadway:** dry **Llght:** dark/ltd

Injy K: 0 **Injy A:** 0 **Injy B:** 0 **Injy C:** 0 **Injy 0:** 2 **How:** rr-end

CVT: Orion Twp **Area:** median **HBD:** N **Drugs:** N **Complaint #:** 210255046

Unit#	Veh Dir	Action Prior	Event 1	Event 2	Event 3	Event 4	Haz Action	Veh Type	Damage
1	S	go straight	veh in transpt	none	none	none	unknown	car	rtfront
2	S	left turn	veh in transpt	none	none	none	unknown	car	rtrear

UD10: 2476827

Crash Type

Count	Type
0	uncoded
0	single
0	head-on
1	head-on/lt
0	angle
6	rr-end
0	rr-end/lt
0	rr-end/rt
3	ss-same
0	ss-opp
0	back
0	other
0	unknown
Totals	10

Lighting Conditions

Count	Type
0	uncoded
7	day
0	dawn
0	dusk
3	dark/ltd
0	dark/unltd
0	other
0	unknown
Totals	10

Weather Conditions

Count	Type
0	uncoded
7	clear
3	cloudy
0	fog
0	rain
0	snow
0	wind
0	sleet/hail
0	blowing snow
0	blowing sand
0	smoke
0	unknown
Totals	10

Road Condition

Count	Type
0	uncoded
9	dry
1	wet
0	ice
0	snow
0	mud
0	slush
0	debris
0	water
0	sand
0	oily
0	other
0	unknown
Totals	10

Crashes by Month

Count	Type
0	January
0	February
1	March
0	April
0	May
1	June
0	July
1	August
1	September
1	October
1	November
4	December
Totals	10

Hazardous Action

Count	Type
10	none
0	speeding
0	spd too slow
2	failed to yield
1	disrgd traffic cntrl
0	wrong way
0	left of center
0	imprp passing
1	imprp lane use
1	imprp turn
0	imprp/no signal
0	imprp backing
4	unable to stop
0	other
2	unknown
0	reckls driving
0	carels driving
Totals	21

Unit Type

Count	Type
0	Bicyclist
0	Engineer
21	Vehicle
0	Pedestrian
Totals	21

Crashes by Year

Count	Type
1	2017
2	2018
1	2019
4	2020
2	2021
Totals	10

Crash Severity

	Fatal	A	B	C	No Injy	Total
Persons	0	0	0	2	0	2
Crashes	0	0	0	1	9	10

Alcohol in Crashes

	Fatal	A	B	C	PDO	Total
Drinking	0	0	0	0	0	0
Not Drinking	0	0	0	1	9	10
Totals	0	0	0	1	9	10

Crashes per Hour by Day

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Total
12a-1a	0	0	0	0	0	0	0	0
1a-2a	0	0	0	0	0	0	0	0
2a-3a	0	0	0	0	0	0	0	0
3a-4a	0	0	0	0	0	0	0	0
4a-5a	0	0	0	0	0	0	0	0
5a-6a	0	0	1	0	0	0	0	1
6a-7a	0	0	0	0	0	0	0	0
7a-8a	0	0	0	1	0	0	0	1
8a-9a	0	0	0	0	0	0	0	0
9a-10a	0	0	0	0	0	0	0	0
10a-11a	0	0	0	0	0	1	0	1
11a-12p	0	0	0	0	0	0	0	0
12p-1p	0	0	0	0	1	0	1	2
1p-2p	0	0	0	0	0	0	0	0
2p-3p	0	0	0	0	0	1	0	1
3p-4p	0	0	0	0	0	0	0	0
4p-5p	0	0	1	0	0	0	0	1
5p-6p	0	0	1	0	0	1	0	2
6p-7p	0	0	0	0	0	0	0	0
7p-8p	0	0	1	0	0	0	0	1
8p-9p	0	0	0	0	0	0	0	0
9p-10p	0	0	0	0	0	0	0	0
10p-11p	0	0	0	0	0	0	0	0
11p-12a	0	0	0	0	0	0	0	0
Totals	0	0	4	1	1	3	1	10

Crash Detail for 1/1/2017 - 12/31/2021
Criteria: WHERE A.AGENCY_ID = 14 AND A.GeoCoords.STIntersects (GEOMETRY::STGeomFromWKB(GEOGRAPHY::STPointFromText('POINT(-83.3074928861112 42.7152462481354)', 4326).STBuffer(30.48).STAsBinary(),4326)) = 1

#1 **Location:** BALDWIN (2.122) 40 feet Nof JUDAH RD **Crash ID:** 9944906

Date: 01/20/2017 **Day:** Fri **Hour:** 6am **Weather:** clear **Roadway:** dry **Llght:** dark/unltd

Injy K: 0 **Injy A:** 0 **Injy B:** 0 **Injy C:** 0 **Injy 0:** 1 **How:** single

CVT: Orion Twp **Area:** inter other **HBD:** N **Drugs:** N **Complaint #:** 170011375

Unit#	Veh Dir	Action Prior	Event 1	Event 2	Event 3	Event 4	Haz Action	Veh Type	Damage
1	N	go straight	animal	none	none	none	none	car	lftfront

UD10: 9944906

#2 **Location:** S BALDWIN (2.116) 10 feet Nof JUDAH RD **Crash ID:** 1054392

Date: 05/25/2017 **Day:** Thu **Hour:** 6pm **Weather:** cloudy **Roadway:** dry **Llght:** day

Injy K: 0 **Injy A:** 0 **Injy B:** 0 **Injy C:** 0 **Injy 0:** 3 **How:** rr-end

CVT: Orion Twp **Area:** straight **HBD:** N **Drugs:** N **Complaint #:** 170092562

Unit#	Veh Dir	Action Prior	Event 1	Event 2	Event 3	Event 4	Haz Action	Veh Type	Damage
1	N	go straight	veh in transpt	none	none	none	unable to stop	car	ctrfront
2	N	slow/stop on rd	veh in transpt	none	none	none	none	car	ctrrear

UD10: 1054392

#3 **Location:** S BALDWIN (2.112) 2640 feet Nof BROWN RD **Crash ID:** 1472280

Date: 08/27/2018 **Day:** Mon **Hour:** 11a **Weather:** cloudy **Roadway:** dry **Llght:** day

Injy K: 0 **Injy A:** 0 **Injy B:** 0 **Injy C:** 0 **Injy 0:** 3 **How:** ss-same

CVT: Orion Twp **Area:** inter driveway **HBD:** N **Drugs:** N **Complaint #:** 180161339

Unit#	Veh Dir	Action Prior	Event 1	Event 2	Event 3	Event 4	Haz Action	Veh Type	Damage
1	N	go straight	veh in transpt	none	none	none	failed to yield	car	lftfront
2	N	left turn	veh in transpt	none	none	none	none	car	rtside

UD10: 1472280

#4 **Location:** S BALDWIN (2.12) 30 feet Nof JUDAH RD **Crash ID:** 1535227

Date: 10/30/2018 **Day:** Tue **Hour:** 12p **Weather:** cloudy **Roadway:** dry **Llght:** day

Injy K: 0 **Injy A:** 0 **Injy B:** 0 **Injy C:** 0 **Injy 0:** 1 **How:** single

CVT: Orion Twp **Area:** w/i intersection **HBD:** N **Drugs:** N **Complaint #:** 180204738

Unit#	Veh Dir	Action Prior	Event 1	Event 2	Event 3	Event 4	Haz Action	Veh Type	Damage
1	S	go straight	other non-fixed obj	none	none	none	unknown	car	ctrfront

UD10: 1535227

#5 **Location:** S BALDWIN (2.116) 10 feet Nof JUDAH RD **Crash ID:** 1628183

Date: 01/29/2019 **Day:** Tue **Hour:** 5pm **Weather:** clear **Roadway:** slush **Llght:** day

Injy K: 0 **Injy A:** 0 **Injy B:** 0 **Injy C:** 0 **Injy 0:** 2 **How:** angle

CVT: Orion Twp **Area:** unknown **HBD:** N **Drugs:** N **Complaint #:** 190018836

Unit#	Veh Dir	Action Prior	Event 1	Event 2	Event 3	Event 4	Haz Action	Veh Type	Damage
1	W	right turn	veh in transpt	none	none	none	failed to yield	car	ctrfront
2	N	go straight	veh in transpt	none	none	none	none	car	rtside

UD10: 1628183

#6 **Location:** BALDWIN (2.112) 10 feet Sof JUDAH **Crash ID:** 1727834

Date: 02/06/2019 **Day:** Wed **Hour:** 9pm **Weather:** snow **Roadway:** ice **Llght:** dark/ltd

Injy K: 0 **Injy A:** 0 **Injy B:** 0 **Injy C:** 0 **Injy 0:** 1 **How:** single

CVT: Orion Twp **Area:** w/i intersection **HBD:** N **Drugs:** N **Complaint #:** 190100418

Unit#	Veh Dir	Action Prior	Event 1	Event 2	Event 3	Event 4	Haz Action	Veh Type	Damage
1	N	go straight	loss of control	none	none	none	other	car	rtfront

UD10: 1727834

#7 **Location:** S BALDWIN (2.12) 30 feet Nof S JUDAH RD **Crash ID:** 1643952

Date: 02/07/2019 **Day:** Thu **Hour:** 11a **Weather:** cloudy **Roadway:** wet **Llght:** day

Injy K: 0 **Injy A:** 0 **Injy B:** 0 **Injy C:** 0 **Injy 0:** 1 **How:** ss-same

CVT: Orion Twp **Area:** unknown **HBD:** N **Drugs:** N **Complaint #:** 190024628

Unit#	Veh Dir	Action Prior	Event 1	Event 2	Event 3	Event 4	Haz Action	Veh Type	Damage
1		go straight	veh in transpt	none	none	none	unknown	truck/bus	none
2	N	go straight	veh in transpt	none	none	none	none	car	rtside

UD10: 1643952

#8 **Location:** S BALDWIN (2.116) 10 feet Nof JUDAH RD **Crash ID:** 1686275

Date: 03/29/2019 **Day:** Fri **Hour:** 4pm **Weather:** clear **Roadway:** dry **Llght:** day

Injy K: 0 **Injy A:** 0 **Injy B:** 0 **Injy C:** 0 **Injy 0:** 2 **How:** ss-same

CVT: Orion Twp **Area:** unknown **HBD:** N **Drugs:** N **Complaint #:** 190059116

Unit#	Veh Dir	Action Prior	Event 1	Event 2	Event 3	Event 4	Haz Action	Veh Type	Damage
1	S	go straight	veh in transpt	none	none	none	failed to yield	car	lftfront
2	S	left turn	veh in transpt	none	none	none	none	car	rtside

UD10: 1686275

#9 **Location:** NB BALDWIN (2.114) 10 feet Wof JUDAH RD **Crash ID:** 1787836

Date: 08/10/2019 **Day:** Sat **Hour:** 8am **Weather:** clear **Roadway:** dry **Llght:** day

Injy K: 0 **Injy A:** 0 **Injy B:** 0 **Injy C:** 0 **Injy 0:** 2 **How:** ss-same

CVT: Orion Twp **Area:** unknown **HBD:** N **Drugs:** N **Complaint #:** 190156132

Unit#	Veh Dir	Action Prior	Event 1	Event 2	Event 3	Event 4	Haz Action	Veh Type	Damage
1	N	start on rdwy	veh in transpt	none	none	none	failed to yield	pickup	lftfront
2	N	go straight	veh in transpt	none	none	none	none	car	rtrear

UD10: 1787836

#10 **Location:** NB BALDWIN (2.114) 10 feet Wof JUDAH RD **Crash ID:** 1822547

Date: 09/20/2019 **Day:** Fri **Hour:** 7am **Weather:** clear **Roadway:** dry **Llght:** day

Injy K: 0 **Injy A:** 0 **Injy B:** 0 **Injy C:** 0 **Injy 0:** 2 **How:** ss-same

CVT: Orion Twp **Area:** unknown **HBD:** N **Drugs:** N **Complaint #:** 190185807

Unit#	Veh Dir	Action Prior	Event 1	Event 2	Event 3	Event 4	Haz Action	Veh Type	Damage
1	N	go straight	veh in transpt	none	none	none	unknown	truck/bus	none
2	N	go straight	veh in transpt	none	none	none	unknown	truck/bus	rtside

UD10: 1822547

#11 **Location:** BALDWIN (2.123) 50 feet Nof JUDAH RD **Crash ID:** 1880780

Date: 11/11/2019 **Day:** Mon **Hour:** 7am **Weather:** snow **Roadway:** snow **Llght:** day

Injy K: 0 **Injy A:** 0 **Injy B:** 0 **Injy C:** 0 **Injy 0:** 2 **How:** ss-same

CVT: Orion Twp **Area:** unknown **HBD:** N **Drugs:** N **Complaint #:** 190222122

Unit#	Veh Dir	Action Prior	Event 1	Event 2	Event 3	Event 4	Haz Action	Veh Type	Damage
1	N	go straight	veh in transpt	none	none	none	speeding	car	rtfront
2	N	go straight	veh in transpt	none	none	none	none	car	lftrear

UD10: 1880780

#12 **Location:** S BALDWIN (2.113) 5 feet Sof JUDAH RD **Crash ID:** 1883476

Date: 11/11/2019 **Day:** Mon **Hour:** 4pm **Weather:** snow **Roadway:** ice **Llght:** day

Injy K: 0 **Injy A:** 0 **Injy B:** 0 **Injy C:** 0 **Injy 0:** 2 **How:** rr-end

CVT: Orion Twp **Area:** unknown **HBD:** N **Drugs:** N **Complaint #:** 190222613

Unit#	Veh Dir	Action Prior	Event 1	Event 2	Event 3	Event 4	Haz Action	Veh Type	Damage
1	N	go straight	veh in transpt	none	none	none	unable to stop	pickup	ctrfront
2	N	slow/stop on rd	veh in transpt	none	none	none	none	pickup	lftrear

UD10: 1883476

#13 **Location:** BALDWIN (2.11) 21 feet Sof JUDAH RD **Crash ID:** 2001765

Date: 04/24/2020 **Day:** Fri **Hour:** 2pm **Weather:** cloudy **Roadway:** dry **Llght:** day

Injy K: 0 **Injy A:** 0 **Injy B:** 0 **Injy C:** 0 **Injy 0:** 2 **How:** ss-same

CVT: Orion Twp **Area:** unknown **HBD:** N **Drugs:** N **Complaint #:** 200083071

Unit#	Veh Dir	Action Prior	Event 1	Event 2	Event 3	Event 4	Haz Action	Veh Type	Damage
1	S	change lanes	veh in transpt	none	none	none	failed to yield	pickup	none
2	S	go straight	veh in transpt	none	none	none	none	car	rtfront

UD10: 2001765

#14 **Location:** S BALDWIN (2.112) 10 feet Sof JUDAH RD **Crash ID:** 2182105

Date: 12/16/2020 **Day:** Wed **Hour:** 4pm **Weather:** snow **Roadway:** ice **Llght:** day

Injy K: 0 **Injy A:** 0 **Injy B:** 0 **Injy C:** 0 **Injy 0:** 2 **How:** rr-end

CVT: Orion Twp **Area:** inter other **HBD:** N **Drugs:** N **Complaint #:** 200250207

Unit#	Veh Dir	Action Prior	Event 1	Event 2	Event 3	Event 4	Haz Action	Veh Type	Damage
1	N	none	veh in transpt	none	none	none	unable to stop	car	lftfront
2	N	none	veh in transpt	none	none	none	none	car	ctrrear

UD10: 2182105

#15 **Location:** S BALDWIN (2.116) 10 feet Nof JUDAH RD **Crash ID:** 2222672

Date: 02/15/2021 **Day:** Mon **Hour:** 9am **Weather:** snow **Roadway:** snow **Llght:** day

Injy K: 0 **Injy A:** 0 **Injy B:** 0 **Injy C:** 0 **Injy 0:** 1 **How:** single

CVT: Orion Twp **Area:** unknown **HBD:** N **Drugs:** N **Complaint #:** 210030377

Unit#	Veh Dir	Action Prior	Event 1	Event 2	Event 3	Event 4	Haz Action	Veh Type	Damage
1	N	go straight	ran off road/r	none	none	none	speeding	car	ctrfront

UD10: 2222672

#16 **Location:** S BALDWIN (2.123) 45 feet Nof JUDAH RD **Crash ID:** 2355097

Date: 08/08/2021 **Day:** Sun **Hour:** 11a **Weather:** cloudy **Roadway:** dry **Llght:** day

Injy K: 0 **Injy A:** 0 **Injy B:** 0 **Injy C:** 0 **Injy 0:** 2 **How:** ss-same

CVT: Orion Twp **Area:** unknown **HBD:** N **Drugs:** N **Complaint #:** 210162673

Unit#	Veh Dir	Action Prior	Event 1	Event 2	Event 3	Event 4	Haz Action	Veh Type	Damage
1	S	avoid veh-ft/bk	veh in transpt	none	none	none	none	motorcycle	lftside
2	S	go straight	veh in transpt	none	none	none	none	motorcycle	rtrear

UD10: 2355097

#17 **Location:** NB BALDWIN (2.112) 10 feet Sof JUDAH RD **Crash ID:** 2377745

Date: 09/04/2021 **Day:** Sat **Hour:** 3pm **Weather:** cloudy **Roadway:** dry **Llght:** day

Injy K: 0 **Injy A:** 0 **Injy B:** 1 **Injy C:** 1 **Injy 0:** 0 **How:** ss-same

CVT: Orion Twp **Area:** unknown **HBD:** N **Drugs:** N **Complaint #:** 210183501

Unit#	Veh Dir	Action Prior	Event 1	Event 2	Event 3	Event 4	Haz Action	Veh Type	Damage
1	N	go straight	ran off road/r	none	none	none	carels driving	car	lftfront
2	N	go straight	veh in transpt	none	none	none	none	car	rtside

UD10: 2377745

#18 **Location:** SB S BALDWIN (1.303) 32 feet NEof JUDAH RD **Crash ID:** 2487957

Date: 12/19/2021 **Day:** Sun **Hour:** 1am **Weather:** clear **Roadway:** slush **Llght:** dark/ltd

Injy K: 0 **Injy A:** 0 **Injy B:** 0 **Injy C:** 0 **Injy 0:** 1 **How:** single

CVT: Orion Twp **Area:** straight **HBD:** Y **Drugs:** N **Complaint #:** 210264518

Unit#	Veh Dir	Action Prior	Event 1	Event 2	Event 3	Event 4	Haz Action	Veh Type	Damage
1	S	go straight	ran off road/r	none	none	none	speeding	car	ctrfront

UD10: 2487957

Crash Type

Count	Type
0	uncoded
5	single
0	head-on
0	head-on/lt
1	angle
3	rr-end
0	rr-end/lt
0	rr-end/rt
9	ss-same
0	ss-opp
0	back
0	other
0	unknown
Totals	18

Lighting Conditions

Count	Type
0	uncoded
15	day
0	dawn
0	dusk
2	dark/ltd
1	dark/unltd
0	other
0	unknown
Totals	18

Weather Conditions

Count	Type
0	uncoded
6	clear
7	cloudy
0	fog
0	rain
5	snow
0	wind
0	sleet/hail
0	blowing snow
0	blowing sand
0	smoke
0	unknown
Totals	18

Road Condition

Count	Type
0	uncoded
10	dry
1	wet
3	ice
2	snow
0	mud
2	slush
0	debris
0	water
0	sand
0	oily
0	other
0	unknown
Totals	18

Crashes by Month

Count	Type
2	January
3	February
1	March
1	April
1	May
0	June
0	July
3	August
2	September
1	October
2	November
2	December
Totals	18

Hazardous Action

Count	Type
14	none
3	speeding
0	spd too slow
5	failed to yield
0	disrgd traffic cntrl
0	wrong way
0	left of center
0	imprp passing
0	imprp lane use
0	imprp turn
0	imprp/no signal
0	imprp backing
3	unable to stop
1	other
4	unknown
0	reckls driving
1	carels driving
Totals	31

Unit Type

Count	Type
0	Bicyclist
0	Engineer
31	Vehicle
0	Pedestrian
Totals	31

Crashes by Year

Count	Type
2	2017
2	2018
8	2019
2	2020
4	2021
Totals	18

Crash Severity

	Fatal	A	B	C	No Injy	Total
Persons	0	0	1	1	0	2
Crashes	0	0	1	0	17	18

Alcohol in Crashes

	Fatal	A	B	C	PDO	Total
Drinking	0	0	0	0	1	1
Not Drinking	0	0	1	0	16	17
Totals	0	0	1	0	17	18

Crashes per Hour by Day

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Total
12a-1a	0	0	0	0	0	0	0	0
1a-2a	1	0	0	0	0	0	0	1
2a-3a	0	0	0	0	0	0	0	0
3a-4a	0	0	0	0	0	0	0	0
4a-5a	0	0	0	0	0	0	0	0
5a-6a	0	0	0	0	0	0	0	0
6a-7a	0	0	0	0	0	1	0	1
7a-8a	0	1	0	0	0	1	0	2
8a-9a	0	0	0	0	0	0	1	1
9a-10a	0	1	0	0	0	0	0	1
10a-11a	0	0	0	0	0	0	0	0
11a-12p	1	1	0	0	1	0	0	3
12p-1p	0	0	1	0	0	0	0	1
1p-2p	0	0	0	0	0	0	0	0
2p-3p	0	0	0	0	0	1	0	1
3p-4p	0	0	0	0	0	0	1	1
4p-5p	0	1	0	1	0	1	0	3
5p-6p	0	0	1	0	0	0	0	1
6p-7p	0	0	0	0	1	0	0	1
7p-8p	0	0	0	0	0	0	0	0
8p-9p	0	0	0	0	0	0	0	0
9p-10p	0	0	0	1	0	0	0	1
10p-11p	0	0	0	0	0	0	0	0
11p-12a	0	0	0	0	0	0	0	0
Totals	2	4	2	2	2	4	2	18

Crash Detail for 1/1/2017 - 12/31/2021
Criteria: WHERE A.AGENCY_ID = 14 AND A.GeoCoords.STIntersects (GEOMETRY::STGeomFromWKB(GEOGRAPHY::STPointFromText('POINT(-83.3068739024205 42.7107133365774)', 4326).STBuffer(30.48).STAsBinary(),4326)) = 1

#1 **Location:** S BALDWIN (0.988) 50 feet Sof MORGAN RD **Crash ID:** 1034180

Date: 04/30/2017 **Day:** Sun **Hour:** 5pm **Weather:** rain **Roadway:** wet **Llght:** day

Injy K: 0 **Injy A:** 0 **Injy B:** 0 **Injy C:** 1 **Injy 0:** 7 **How:** ss-same

CVT: Orion Twp **Area:** straight **HBD:** N **Drugs:** N **Complaint #:** 170075869

Unit#	Veh Dir	Action Prior	Event 1	Event 2	Event 3	Event 4	Haz Action	Veh Type	Damage
1	N	go straight	veh in transpt	none	none	none	none	car	rtfront
2	N	change lanes	veh in transpt	none	none	none	failed to yield	car	lftrear

UD10: 1034180

#2 **Location:** S BALDWIN (1.808) 100 feet Sof MORGAN DR **Crash ID:** 1086989

Date: 06/30/2017 **Day:** Fri **Hour:** 2pm **Weather:** cloudy **Roadway:** dry **Llght:** day

Injy K: 0 **Injy A:** 0 **Injy B:** 0 **Injy C:** 0 **Injy 0:** 2 **How:** ss-same

CVT: Orion Twp **Area:** transition **HBD:** N **Drugs:** N **Complaint #:** 170118200

Unit#	Veh Dir	Action Prior	Event 1	Event 2	Event 3	Event 4	Haz Action	Veh Type	Damage
1	N	go straight	veh in transpt	none	none	none	unknown	car	lftside
2	N	go straight	veh in transpt	none	none	none	unknown	car	none

UD10: 1086989

#3 **Location:** BALDWIN (1.813) 75 feet Sof MORGAN RD **Crash ID:** 1181028

Date: 10/16/2017 **Day:** Mon **Hour:** 1pm **Weather:** clear **Roadway:** dry **Llght:** day

Injy K: 0 **Injy A:** 0 **Injy B:** 0 **Injy C:** 0 **Injy 0:** 2 **How:** ss-same

CVT: Orion Twp **Area:** transition **HBD:** N **Drugs:** N **Complaint #:** 170190215

Unit#	Veh Dir	Action Prior	Event 1	Event 2	Event 3	Event 4	Haz Action	Veh Type	Damage
1	N	go straight	veh in transpt	none	none	none	other	car	rtside
2	N	change lanes	veh in transpt	none	none	none	none	pickup	lftside

UD10: 1181028

#4 **Location:** S BALDWIN (1.818) 50 feet Sof MORGAN RD **Crash ID:** 1435414

Date: 07/05/2018 **Day:** Thu **Hour:** 10a **Weather:** clear **Roadway:** dry **Llght:** day

Injy K: 0 **Injy A:** 0 **Injy B:** 0 **Injy C:** 0 **Injy 0:** 4 **How:** rr-end

CVT: Orion Twp **Area:** straight **HBD:** N **Drugs:** N **Complaint #:** 180126331

Unit#	Veh Dir	Action Prior	Event 1	Event 2	Event 3	Event 4	Haz Action	Veh Type	Damage
1	S	slow/stop on rd	equip fail	none	none	none	unable to stop	car	ctrfront
2	S	stop on road	veh in transpt	none	none	none	none	car	ctrrear

UD10: 1435414

#5 **Location:** S BALDWIN (1.808) 100 feet Sof MORGAN RD **Crash ID:** 1495223

Date: 09/18/2018 **Day:** Tue **Hour:** 8am **Weather:** clear **Roadway:** dry **Llght:** day

Injy K: 0 **Injy A:** 0 **Injy B:** 0 **Injy C:** 0 **Injy 0:** 2 **How:** rr-end

CVT: Orion Twp **Area:** straight **HBD:** N **Drugs:** N **Complaint #:** 180175727

Unit#	Veh Dir	Action Prior	Event 1	Event 2	Event 3	Event 4	Haz Action	Veh Type	Damage
1	S	go straight	veh in transpt	none	none	none	unable to stop	car	ctrfront
2	S	slow/stop on rd	veh in transpt	none	none	none	none	car	ctrrear

UD10: 1495223

#6 **Location:** S BALDWIN (1.813) 75 feet Sof MORGAN RD **Crash ID:** 1648626

Date: 02/16/2019 **Day:** Sat **Hour:** 12p **Weather:** clear **Roadway:** dry **Llght:** day

Injy K: 0 **Injy A:** 0 **Injy B:** 0 **Injy C:** 0 **Injy 0:** 4 **How:** rr-end

CVT: Orion Twp **Area:** straight **HBD:** N **Drugs:** N **Complaint #:** 190030642

Unit#	Veh Dir	Action Prior	Event 1	Event 2	Event 3	Event 4	Haz Action	Veh Type	Damage
1	N	slow/stop on rd	veh in transpt	none	none	none	unable to stop	car	ctrfront
2	N	slow/stop on rd	veh in transpt	none	none	none	none	car	ctrrear

UD10: 1648626

#7 **Location:** NB S BALDWIN (1.807) 35 feet Nof JORDAN ST **Crash ID:** 1843876

Date: 10/11/2019 **Day:** Fri **Hour:** 10p **Weather:** rain **Roadway:** wet **Llght:** dark/ltd

Injy K: 0 **Injy A:** 0 **Injy B:** 0 **Injy C:** 0 **Injy 0:** 2 **How:** ss-same

CVT: Orion Twp **Area:** median **HBD:** N **Drugs:** N **Complaint #:** 190200982

Unit#	Veh Dir	Action Prior	Event 1	Event 2	Event 3	Event 4	Haz Action	Veh Type	Damage
1	N	left turn	veh in transpt	none	none	none	failed to yield	pickup	rtrear
2	N	go straight	veh in transpt	none	none	none	none	pickup	lftfront

UD10: 1843876

#8 **Location:** BALDWIN (1.789) 58 feet Sof MORGAN **Crash ID:** 1970033

Date: 02/09/2020 **Day:** Sun **Hour:** 12p **Weather:** cloudy **Roadway:** dry **Llght:** day

Injy K: 0 **Injy A:** 0 **Injy B:** 0 **Injy C:** 0 **Injy 0:** 2 **How:** rr-end

CVT: Orion Twp **Area:** inter driveway **HBD:** N **Drugs:** N **Complaint #:** 200028473

Unit#	Veh Dir	Action Prior	Event 1	Event 2	Event 3	Event 4	Haz Action	Veh Type	Damage
1	S	go straight	veh in transpt	none	none	none	unable to stop	car	ctrfront
2	S	slow/stop on rd	veh in transpt	none	none	none	none	car	ctrrear

UD10: 1970033

Crash Type

Count	Type
0	uncoded
0	single
0	head-on
0	head-on/lt
0	angle
4	rr-end
0	rr-end/lt
0	rr-end/rt
4	ss-same
0	ss-opp
0	back
0	other
0	unknown
Totals	8

Lighting Conditions

Count	Type
0	uncoded
7	day
0	dawn
0	dusk
1	dark/ltd
0	dark/unltd
0	other
0	unknown
Totals	8

Weather Conditions

Count	Type
0	uncoded
4	clear
2	cloudy
0	fog
2	rain
0	snow
0	wind
0	sleet/hail
0	blowing snow
0	blowing sand
0	smoke
0	unknown
Totals	8

Road Condition

Count	Type
0	uncoded
6	dry
2	wet
0	ice
0	snow
0	mud
0	slush
0	debris
0	water
0	sand
0	oily
0	other
0	unknown
Totals	8

Crashes by Month

Count	Type
0	January
2	February
0	March
1	April
0	May
1	June
1	July
0	August
1	September
2	October
0	November
0	December
Totals	8

Hazardous Action

Count	Type
7	none
0	speeding
0	spd too slow
2	failed to yield
0	disrgd traffic cntrl
0	wrong way
0	left of center
0	imprp passing
0	imprp lane use
0	imprp turn
0	imprp/no signal
0	imprp backing
4	unable to stop
1	other
2	unknown
0	reckls driving
0	carels driving
Totals	16

Unit Type

Count	Type
0	Bicyclist
0	Engineer
16	Vehicle
0	Pedestrian
Totals	16

Crashes by Year

Count	Type
3	2017
2	2018
2	2019
1	2020
Totals	8

Crash Severity

	Fatal	A	B	C	No Injy	Total
Persons	0	0	0	1	0	1
Crashes	0	0	0	1	7	8

Alcohol in Crashes

	Fatal	A	B	C	PDO	Total
Drinking	0	0	0	0	0	0
Not Drinking	0	0	0	1	7	8
Totals	0	0	0	1	7	8

Crashes per Hour by Day

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Total
12a-1a	0	0	0	0	0	0	0	0
1a-2a	0	0	0	0	0	0	0	0
2a-3a	0	0	0	0	0	0	0	0
3a-4a	0	0	0	0	0	0	0	0
4a-5a	0	0	0	0	0	0	0	0
5a-6a	0	0	0	0	0	0	0	0
6a-7a	0	0	0	0	0	0	0	0
7a-8a	0	0	0	0	0	0	0	0
8a-9a	0	0	1	0	0	0	0	1
9a-10a	0	0	0	0	0	0	0	0
10a-11a	0	0	0	0	1	0	0	1
11a-12p	0	0	0	0	0	0	0	0
12p-1p	1	0	0	0	0	0	1	2
1p-2p	0	1	0	0	0	0	0	1
2p-3p	0	0	0	0	0	1	0	1
3p-4p	0	0	0	0	0	0	0	0
4p-5p	0	0	0	0	0	0	0	0
5p-6p	1	0	0	0	0	0	0	1
6p-7p	0	0	0	0	0	0	0	0
7p-8p	0	0	0	0	0	0	0	0
8p-9p	0	0	0	0	0	0	0	0
9p-10p	0	0	0	0	0	0	0	0
10p-11p	0	0	0	0	0	1	0	1
11p-12a	0	0	0	0	0	0	0	0
Totals	2	1	1	0	1	2	1	8

Crash Detail for 1/1/2017 - 12/31/2021
Criteria: WHERE A.AGENCY_ID = 14 AND A.GeoCoords.STIntersects (GEOMETRY::STGeomFromWKB(GEOGRAPHY::STPointFromText('POINT(-83.3074102908243 42.7110727068881)', 4326).STBuffer(30.48).STAsBinary(),4326)) = 1

#1 **Location:** S BALDWIN (0.993) 20 feet Sof MORGAN RD **Crash ID:** 1001497

Date: 03/23/2017 **Day:** Thu **Hour:** 5pm **Weather:** cloudy **Roadway:** dry **Llght:** day

Injy K: 0 **Injy A:** 0 **Injy B:** 0 **Injy C:** 0 **Injy 0:** 2 **How:** ss-same

CVT: Orion Twp **Area:** transition **HBD:** N **Drugs:** N **Complaint #:** 170050828

Unit#	Veh Dir	Action Prior	Event 1	Event 2	Event 3	Event 4	Haz Action	Veh Type	Damage
1	N	change lanes	veh in transpt	none	none	none	carels driving	pickup	rtside
2	N	go straight	veh in transpt	none	none	none	none	car	lftside

UD10: 1001497

#2 **Location:** S BALDWIN (1.829) 10 feet Nof MORGAN RD **Crash ID:** 1081613

Date: 06/25/2017 **Day:** Sun **Hour:** 4pm **Weather:** cloudy **Roadway:** dry **Llght:** day

Injy K: 0 **Injy A:** 0 **Injy B:** 0 **Injy C:** 0 **Injy 0:** 1 **How:** single

CVT: Orion Twp **Area:** straight **HBD:** N **Drugs:** N **Complaint #:** 170114663

Unit#	Veh Dir	Action Prior	Event 1	Event 2	Event 3	Event 4	Haz Action	Veh Type	Damage
1	S	go straight	other non-fixed obj	none	none	none	other	car	ctrfront

UD10: 1081613

#3 **Location:** S BALDWIN (1.823) 20 feet Sof MORGAN RD **Crash ID:** 1115392

Date: 08/07/2017 **Day:** Mon **Hour:** 5pm **Weather:** clear **Roadway:** dry **Llght:** day

Injy K: 0 **Injy A:** 0 **Injy B:** 0 **Injy C:** 0 **Injy 0:** 2 **How:** ss-same

CVT: Orion Twp **Area:** transition **HBD:** N **Drugs:** N **Complaint #:** 170144476

Unit#	Veh Dir	Action Prior	Event 1	Event 2	Event 3	Event 4	Haz Action	Veh Type	Damage
1	N	change lanes	veh in transpt	none	none	none	failed to yield	car	lftfront
2	N	go straight	veh in transpt	none	none	none	none	pickup	rtfront

UD10: 1115392

#4 **Location:** S BALDWIN (1.825) 10 feet Sof MORGAN RD **Crash ID:** 1456104

Date: 08/06/2018 **Day:** Mon **Hour:** 8pm **Weather:** clear **Roadway:** wet **Llght:** day

Injy K: 0 **Injy A:** 0 **Injy B:** 0 **Injy C:** 2 **Injy 0:** 2 **How:** angle

CVT: Orion Twp **Area:** inter other **HBD:** N **Drugs:** N **Complaint #:** 180148262

Unit#	Veh Dir	Action Prior	Event 1	Event 2	Event 3	Event 4	Haz Action	Veh Type	Damage
1	E	enter rdwy	veh in transpt	none	none	none	failed to yield	car	lftfront
2	S	go straight	veh in transpt	none	none	none	none	car	ctrfront

UD10: 1456104

#5 **Location:** SB BALDWIN (0.991) 30 feet Sof MORGAN RD **Crash ID:** 1584724

Date: 12/16/2018 **Day:** Sun **Hour:** 12p **Weather:** clear **Roadway:** dry **Llght:** day

Injy K: 0 **Injy A:** 0 **Injy B:** 0 **Injy C:** 0 **Injy 0:** 2 **How:** rr-end

CVT: Orion Twp **Area:** inter other **HBD:** N **Drugs:** N **Complaint #:** 180236838

Unit#	Veh Dir	Action Prior	Event 1	Event 2	Event 3	Event 4	Haz Action	Veh Type	Damage
1	S	go straight	veh in transpt	none	none	none	unable to stop	car	ctrfront
2	S	stop on road	veh in transpt	none	none	none	none	car	ctrrear

UD10: 1584724

#6 **Location:** SB S BALDWIN (0.991) 30 feet Sof MORGAN RD **Crash ID:** 1881651

Date: 11/07/2019 **Day:** Thu **Hour:** 7am **Weather:** snow **Roadway:** snow **Llght:** day

Injy K: 0 **Injy A:** 0 **Injy B:** 0 **Injy C:** 0 **Injy 0:** 2 **How:** rr-end

CVT: Orion Twp **Area:** inter other **HBD:** N **Drugs:** N **Complaint #:** 190219474

Unit#	Veh Dir	Action Prior	Event 1	Event 2	Event 3	Event 4	Haz Action	Veh Type	Damage
1	S	go straight	veh in transpt	none	none	none	unable to stop	car	ctrfront
2	S	go straight	veh in transpt	none	none	none	none	car	ctrrear

UD10: 1881651

#7 **Location:** E MORGAN (1.108) 0 feet Xof S BALDWIN RD **Crash ID:** 2487951

Date: 12/18/2021 **Day:** Sat **Hour:** 12p **Weather:** snow **Roadway:** ice **Llght:** day

Injy K: 0 **Injy A:** 0 **Injy B:** 0 **Injy C:** 0 **Injy 0:** 3 **How:** rr-end/rt

CVT: Orion Twp **Area:** inter other **HBD:** N **Drugs:** N **Complaint #:** 210264145

Unit#	Veh Dir	Action Prior	Event 1	Event 2	Event 3	Event 4	Haz Action	Veh Type	Damage
1	E	go straight	veh in transpt	none	none	none	unable to stop	car	ctrfront
2	E	stop on road	veh in transpt	none	none	none	none	car	ctrrear

UD10: 2487951

#8 **Location:** MORGAN (1.104) 20 feet Wof S BALDWIN RD **Crash ID:** 2489496

Date: 12/27/2021 **Day:** Mon **Hour:** 11a **Weather:** snow **Roadway:** snow **Llght:** day

Injy K: 0 **Injy A:** 0 **Injy B:** 0 **Injy C:** 0 **Injy 0:** 3 **How:** ss-opp

CVT: Orion Twp **Area:** w/i intersection **HBD:** N **Drugs:** N **Complaint #:** 210269977

Unit#	Veh Dir	Action Prior	Event 1	Event 2	Event 3	Event 4	Haz Action	Veh Type	Damage
1	SW	right turn	veh in transpt	none	none	none	unable to stop	car	rtfront
2	E	stop on road	veh in transpt	none	none	none	none	car	lftfront

UD10: 2489496

Crash Type

Count	Type
0	uncoded
1	single
0	head-on
0	head-on/lt
1	angle
2	rr-end
0	rr-end/lt
1	rr-end/rt
2	ss-same
1	ss-opp
0	back
0	other
0	unknown
Totals	8

Lighting Conditions

Count	Type
0	uncoded
8	day
0	dawn
0	dusk
0	dark/ltd
0	dark/unltd
0	other
0	unknown
Totals	8

Weather Conditions

Count	Type
0	uncoded
3	clear
2	cloudy
0	fog
0	rain
3	snow
0	wind
0	sleet/hail
0	blowing snow
0	blowing sand
0	smoke
0	unknown
Totals	8

Road Condition

Count	Type
0	uncoded
4	dry
1	wet
1	ice
2	snow
0	mud
0	slush
0	debris
0	water
0	sand
0	oily
0	other
0	unknown
Totals	8

Crashes by Month

Count	Type
0	January
0	February
1	March
0	April
0	May
1	June
0	July
2	August
0	September
0	October
1	November
3	December
Totals	8

Hazardous Action

Count	Type
7	none
0	speeding
0	spd too slow
2	failed to yield
0	disrgd traffic cntrl
0	wrong way
0	left of center
0	imprp passing
0	imprp lane use
0	imprp turn
0	imprp/no signal
0	imprp backing
4	unable to stop
1	other
0	unknown
0	reckls driving
1	carels driving
Totals	15

Unit Type

Count	Type
0	Bicyclist
0	Engineer
15	Vehicle
0	Pedestrian
Totals	15

Crashes by Year

Count	Type
3	2017
2	2018
1	2019
2	2021
Totals	8

Crash Severity

	Fatal	A	B	C	No Injy	Total
Persons	0	0	0	2	0	2
Crashes	0	0	0	1	7	8

Alcohol in Crashes

	Fatal	A	B	C	PDO	Total
Drinking	0	0	0	0	0	0
Not Drinking	0	0	0	1	7	8
Totals	0	0	0	1	7	8

Crashes per Hour by Day

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Total
12a-1a	0	0	0	0	0	0	0	0
1a-2a	0	0	0	0	0	0	0	0
2a-3a	0	0	0	0	0	0	0	0
3a-4a	0	0	0	0	0	0	0	0
4a-5a	0	0	0	0	0	0	0	0
5a-6a	0	0	0	0	0	0	0	0
6a-7a	0	0	0	0	0	0	0	0
7a-8a	0	0	0	0	1	0	0	1
8a-9a	0	0	0	0	0	0	0	0
9a-10a	0	0	0	0	0	0	0	0
10a-11a	0	0	0	0	0	0	0	0
11a-12p	0	1	0	0	0	0	0	1
12p-1p	1	0	0	0	0	0	1	2
1p-2p	0	0	0	0	0	0	0	0
2p-3p	0	0	0	0	0	0	0	0
3p-4p	0	0	0	0	0	0	0	0
4p-5p	1	0	0	0	0	0	0	1
5p-6p	0	1	0	0	1	0	0	2
6p-7p	0	0	0	0	0	0	0	0
7p-8p	0	0	0	0	0	0	0	0
8p-9p	0	1	0	0	0	0	0	1
9p-10p	0	0	0	0	0	0	0	0
10p-11p	0	0	0	0	0	0	0	0
11p-12a	0	0	0	0	0	0	0	0
Totals	2	3	0	0	2	0	1	8

APPENDIX F - SIGNAL WARRANT

Summary of Warrants

Spot Number:	0		
Major Street:	Baldwin Road	Minor Street:	NB to SB Crossove
Intersection:	Baldwin Road at NB to SB Crossover		
City/Twp:	Orion Twp		
Date Performed:	6/14/2022	Performed By:	Carlie delaPaz
Date Volumes Collected:	1/0/1900		

Warrant	Condition	Is Warrant Met
Data Validation Error		**NO**
WARRANT 1: Eight-Hour Vehicular Volume		**YES**
	Condition A	NO
	Condition B	YES
	Condition A&B	N/A
WARRANT 2: Four-Hour Vehicular Volume	(70%)	**YES**
WARRANT 3: Peak-Hour Vehicular Volume	(70%)	**YES**
	Condition A	**NO**
	Condition B	**YES**
WARRANT 4: Pedestrian Volume	(70%)	**NO**
	Four Hour	NO
	Peak Hour	NO
(Threshold)	HAWK	NO
(Threshold)	RRFB	NO
WARRANT 5: School Crossing		**NO**
WARRANT 6: Coordinated Signal System		**NO**
WARRANT 7: Crash Experience		**NO**
	Condition A	NO
	Condition B	NO
WARRANT 8: Roadway Network		**NO**
WARRANT 9: Intersection Near a Grade Crossing		**#N/A**

Issue to Be Addressed by Signalization:

0

Courtney Keisman

Subject: FW: Baldwin Village Orion

From: Chris R <cmr71223@protonmail.com>
Sent: Sunday, July 31, 2022 8:45 PM
To: Tammy Girling <tgirling@oriontownship.org>
Subject: Baldwin Village Orion

Hello,

Nice to meet you, my name is Chris Rinehart and my family and I live at 3849 Morgan Road. We have lived at this address for around 19 years.

I understand there is a meeting week of Aug 1 to discuss potential rezoning of property on Baldwin for the "Baldwin Village of Orion" development.

Two issues jump out right away with Chik Fil-A: 1. Location of their driveway (looks like it's by the turn around from north to south bound Baldwin) and 2. Potential back ups onto Baldwin from their drivethru.

The driveway location will make it impossible to make the Michigan left back onto southbound Baldwin.

The drivethru back up will likely happen and will be similar to Starbucks just a little further south on Baldwin. It's not only inconvenient but a traffic hazard.

What can be done to mitigate these conditions? How can Chik guarantee to be a good neighbor? Can Chik's driveways be contained within the development and no entrance or exit onto Baldwin?

I am still familiarizing myself with the rest of the development but would be curious how the existing infrastructure (schools/roads/sewers/water/etc) can support the additional residences.

I think it's fair to say, based on conversations with my neighbors, that the development is not welcome but unstoppable (sad when it should take rezoning).

Please make sure no tax money is spent to support this development (incentives/roadwork/etc) and please make sure it doesn't become an inconvenience for all the residents who were here supporting Orion first. The builder's profits shouldn't be priority over the neighborhood.

Your feedback is appreciated.

Rgds,

Chris Rinehart (248-376-7090)

RECEIVED
AUG 3 2022
Orion Township
Planning & Zoning

Subject Re: Board Meeting 8-3-22 7:00 PM

From Sharon Jasso

To: Board of Trustees

Main Concerns are:

The single-family duplex rentals that align property (Would you consider single family homes) not duplex rentals, if they insist on the duplex, ask for greater than 50 ft. setback perhaps 75 ft. setback??

How many trees are you planning on taking out??

Chick Fila on the corner of Baldwin and Morgan is going to be traffic nightmare.

Its already very difficult for us to turn off and onto Morgan. Combo that with 45 MPH and It's going to be very dangerous. I witness several Chick Fila in the area where traffic is backed up immensely during lunch and dinner. Perhaps a main entrance for the entire complex should be considered and a large queue area for Chick Fila vehicles.

Sharon Jasso

Sharon Jasso
4473 Peppermill Dr.
Rochester Hills

BALDWIN COMMONS, LLC

Columbia Center | 101 W. Big Beaver Road, Suite 200 | Troy, MI 48084
O: 248 680 7180 | www.bmco.com

Planning Commission
Charter Township of Orion
Orion Township Hall
2323 Joslyn Road
Lake Orion, MI 48360

August 2, 2022

RE: PC-22-29, Baldwin Village Planned Unit Development (PUD) Concept and Eligibility Plan, located at 4410 & 4408 S. Baldwin Road (parcel 09-23-301-001), an unaddressed parcel 09-32-301-014 located at the NW corner of Morgan and S. Baldwin Roads, an unaddressed parcel 09-32-151-020 located north of 4408 S. Baldwin, and 4292 S. Baldwin (parcel 09-32-151-021). The applicant RED Equities, LLC, is proposing to rezone the properties to Planned Use Development (PUD) to construct a mixed -use development containing both residential and commercial components on approximately 67 acres.

Planning Commission Members,

Baldwin Commons, LLC, is a longtime business owner in the Charter Township of Orion, and the owners of the Baldwin Commons Shopping Center located at 4960 S. Baldwin Road, a property adjacent to this proposed planned development.

It is our understanding that within the commercial components of this development, the applicant has proposed the inclusion of a car wash and a fast food provider that regularly creates traffic disruptions. Based on this understanding, we are not supportive of these components within the development as they are not upscale or complimentary to what has already been developed within the immediate area. Furthermore, the traffic disruptions associated with these uses will be a deterrent to shoppers looking to visit the businesses within our center, as has been proven throughout the metro Detroit area where this fast food provider is located.

While generally supportive of the PUD, we are not supportive of these two specific uses. We respectfully request these proposed uses be prohibited within the PUD.

Thank you,

Mathew Kiriluk
Managing Member
Baldwin Commons, LLC

Daniel Stern
Member
Baldwin Commons, LLC

Courtney Keisman

Subject: FW: Baldwin Village public hearing

-----Original Message-----
From: Julie Branton <juliebranton@gmail.com>
Sent: Wednesday, August 3, 2022 3:29 PM
To: Tammy Girling <tgirling@oriontownship.org>
Subject: Baldwin Village public hearing

My name is Julie Branton at 3444 Gingell Dr Orion Twp MI

Our condo is in the last bldg to the west in our complex of Great Lakes Ridge & we are directly adjacent to the proposed apartments on the north side of initial plans.
We enjoy the serenity and beauty of having woods next to us and don't want to lose that peaceful privacy surrounding us.
We have a few important concerns to bring up
1) How much of our wood line will we be losing & what will be done to separate us from the view of 3-story apt bldgs? What type of buffer will be put in place? Large shrubs & full trees to keep privacy so we won't see into apartments & they won't see us? Please build as far away as you can from our property line!
2) There is steep downgrade along our propery & how will this be protected from erosion as land is being cleared? Stone wall-brick wall?
3) Dumpsters are a huge concern-back of apts will be facing my bldg & we do not want to see or smell them or worry about animals or rodents being drawn to them-we have children & grandchildren & pets that we are very concerned for their safety.
4) Also traffic!! We always have trouble exiting our complex now-with these roundabouts the traffic never stops. Sometimes a left turn onto north Baldwin Rd requires a right turn to take Judah Rd roundabout to the north. I dread what will happen with more entrances with more traffic. Please consider this when preparing final plans.
Thank you for your attention to our concerns-we love it here & want to maintain the lifestyle we have come to enjoy.

Julie Branton
3444 Gingell Dr
Lake Orion MI 48359

Sent from my iPhone

Courtney Keisman

Subject: FW: 5 year plan

From: S Iles <river88watch@yahoo.com>
Sent: Wednesday, July 27, 2022 9:02 AM
To: Tammy Girling <tgirling@oriontownship.org>
Subject: RE: 5 year plan

Thank you, Ms. Girling, for your prompt and complete response. I read half the plan so far and am struck by its professionalism. The plan articulates the thoroughness of the historical background integrated with current position. So far I see no foundation for rumors, unless they came from the public meetings.

I am reassured that my viewpoint as a semi-rural nature lover are well represented. As a single, fixed income senior, I like the 15 minute community village-like concept (just like prince Charles' designs).

I commend the work of the committee and it's director.

Sincerely,
Susan Iles

Sent from Yahoo Mail on Android

On Tue, Jul 26, 2022 at 4:21 PM, Tammy Girling <tgirling@oriontownship.org> wrote:

Hello,

A link to the master plan draft is on the front page of our website. At the last Planning Commission meeting they approved the master plan with 2 map changes. I was waiting for those changes to be incorporated into the draft and updated on the website but the person that needs to do that is out ill. So, you can still look at the draft plan following the link below but there was a small change made to one parcel in the future land use and residential density maps that will not be in the plan you will be viewing.

There have been many rumors about what this plan is proposing. Please look it over and let me know if you have any specific questions. Again, however, the plan was approved (with the 2 changes I mentioned).

https://cms9files.revize.com/oriontownshipmi/Planning&%20Zoning/Master%20Plan%20Update/2022%2007%2007_OrionTwpMasterPlan_FINAL%20DRAFT%20.pdf

Tammy Girling

Director

Planning & Zoning

2323 Joslyn Road, Lake Orion, MI 48360

O: 248.391.0304, ext. 5000 **C:** 248.978.2132
W: www.oriontownship.org

From: S Iles <river88watch@yahoo.com>
Sent: Sunday, July 24, 2022 8:29 PM
To: Tammy Girling <tgirling@oriontownship.org>
Subject: 5 year plan

Hello,

I have only recently heard about property development in Orion township.

I cannot find the proposed 5 year plan regarding this. Can you provide that information, please?

I have heard some comments on this, and would like the specifics.

I've heard

- a high-density, supposedly affordable below house prices
- developing swampland to construct this
- more high-rise building on the Orion Marine site.

I've seen

- commercial development added everywhere
- Lake Orion view blocked by multi-story dwellings

- a study stating that these developments are consistent with surrounding territory.

I wish to see if any of this planning is true, and if it is still being discussed.

If so, I wish to protest the dismantlement of the VACATION LIVING.

I believe in diversity: some like to live in cities and others prefer nature. The latter do not seem to be represented in the planning.

It would also be nice to be actually notified; I can't find it on OT website; local papers are also silent until after the fact.

So, please send the latest version of the plan, its status, and how key info will be announced in the future.

Regards,

Susan Iles

river88watch@yahoo.com

Orion Township

Courtney Keisman

Subject: FW: Wednesday meeting

From: Tina Hein <tinahein97@yahoo.com>
Sent: Friday, July 22, 2022 3:42 PM
To: Tammy Girling <tgirling@oriontownship.org>
Subject: RE: Wednesday meeting

Dear Tammy,

It is directed to planning commission.

Thanks.

Sent from Yahoo Mail on Android

On Fri, Jul 22, 2022 at 1:42 PM, Tammy Girling <tgirling@oriontownship.org> wrote:

Which Board is this directed too? Planning Commission or Board of Trustees?

Tammy Girling

Director

Planning & Zoning

2323 Joslyn Road, Lake Orion, MI 48360

O: 248.391.0304, ext. 5000 **C:** 248.978.2132
W: www.oriontownship.org

From: Tina Hein <tinahein97@yahoo.com>
Sent: Friday, July 22, 2022 1:40 PM
To: Tammy Girling <tgirling@oriontownship.org>
Subject: Wednesday meeting

Dear Board members,

This past Wednesday I attended the Township meeting regarding the 5 year Master Plan and plans for more housing developments.

I continue to disagree with these plans and understand too much growth in a very short time is not progress like the board was trying to explain to us.

It's definitely not PROGRESS what they are doing to the township and the areas that should be protected which are wetlands and woodlands even if they are man made.

I have actually spoken with my neighbors and the people who live in this township about these plans and their answers are the same which is we don't NEED anymore housing units and development.

We have enough.

As far as these developers suing the township for not allowing more housing, there needs to be a change in the judicial system to not allow over development.

Maybe if most people who are aware and understand what these developers are doing to their township than they could counter sue them and stop it.

The methods of communication to the township in regards to these plans are definitely not working either. Open houses especially after Covid and during busy times like the the summer where most are on vacation don't work.

I would suggest door to door conversations with the people in the areas where more development is going to occur.

The 600 responses from a survey are also not meaningful compared to the 38-40,000 residents who live here.

I want to also reiterate the need for a trauma hospital in either Lake Orion or Oxford area.

I know Oxford tried to get a hospital in, but plan was rejected.

The board disagrees with me now on the hospital idea, but the continued plans to bring in many more people will be common sense in the near future.

Sincerely,

Tina Hein

Sent from Yahoo Mail on Android

*** * * * * NOTICE OF PUBLIC HEARING * * * * ***

The Charter Township of Orion Planning Commission will hold a Public Hearing on Wednesday, August 17, 2022 at 7:05 p.m., at the Orion Township Municipal Complex Board Room, 2323 Joslyn Road, Lake Orion, Michigan 48360, on the following matter:

PC-22-31, 1112-1128 Lapeer Road Rezone, the request is to rezone 1112, 1116, 1120, 1124, 1128, & 1132 S. Lapeer Road (parcel #09-14-201-005) from Restricted Business (RB) to General Business (GB).

If you are not able to attend, you may send correspondence to the Orion Township Hall, 2323 Joslyn Rd. addressed to the Planning Commission to express your concerns and comments. A copy of the proposed rezone is on file in the Planning & Zoning Department office and the Township Clerk's office and may be examined during normal business hours, 8:30 a.m. to 4:30 p.m., Monday through Friday until the date of the public hearing.

Orion Township will provide necessary and reasonable auxiliary aids, and services for individuals with disabilities at the public hearing upon advance notice by writing or calling Penny S. Shults, Township Clerk, 2323 Joslyn Road, Lake Orion, Michigan 48360; (248) 391-0304, ext. 4001. Please contact the Clerk's office at least 72 hours in advance of the public hearing.

Scott Reynolds
Planning Commission

Penny S. Shults
Township Clerk