MARY AND SONS

Waldoboro Walking Trails
Final Report

Prepared for:
Town of Waldoboro, Maine

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Executive Summary

This report contains analysis, designs, and recommendations for all aspects of the Waldoboro Walking Trails project performed by Mary and Sons. Mary and Sons has also provided a cost analysis of all aspects of the project. Below is a brief description of the final designs of each aspect provided in this report.

Sidewalk Design:

A new sidewalk design along Route 1 will allow for safe pedestrian access to the new walking trails system, as well as to the Town Office located at the corner of Route 1 and Jefferson Street. The eastern portion of the new sidewalk will run along the southern side of Route 1 from the intersection of Main Street to the location of the culvert. The western portion of the new sidewalk will continue along the northern side of Route 1 from the culvert to the intersection of Jefferson Street. The sidewalks have been designed as 4 ft wide, 3 in raised, and will be constructed using a hot mix asphalt. Mary and Sons has designed American Disability Act (ADA) accessibility at all driveways along the sidewalks for ease of pedestrian use.

Upon investigation of the current drainage along Route 1, Mary and Sons has determined that there is no need for new drainage additions to the existing system. There are no underground utilities that will be interfered with during construction of the sidewalk.

Kalers Corner Footbridge:

A footbridge has been designed to cross the Medomak River, connecting the walking trails to the park located along Kalers Corner Street. This footbridge will give access to the walking trails for foot and bike traffic from the opposing side of the Medomak River. The footbridge is 8 ft wide and 80 ft long consisting of two W33x130 girders. It will be supported by two slab foundations, one existing on each side of the Medomak River. The reinforced concrete slab foundations are 10 ft long by 5 ft wide with 3 ft of thickness.

Additionally, Mary and Sons has provided quotes for two different prefabricated bridge options as well. These two options are provided by Bridge Brothers and Contech Engineering Solutions LLC. Providing our custom designed girder bridge along with the prefabricated options gives the Town of Waldoboro flexibility in the chosen design of a footbridge.

Culvert Retrofit and Walkway:

Mary and Sons has designed a new walkway and water passage channel through the culvert location on Route 1 between Jefferson Street and Main Street. The redesign of this culvert will continue to allow for sufficient water passage of the stream, while connecting the sidewalks to the walking trails. This will allow for pedestrians to cross Route 1 through the retrofitted culvert without any traffic interference. Mary and Sons has determined that demolition of the existing culvert floor will be required to begin construction of the new water channel and walkway.

The walkway is designed as a 4 ft wide concrete path raised 2 ft above the bottom of the water channel, resulting in 7 ft of clearance between the walkway and ceiling of the culvert. The walkway will not be suitable for bike traffic and is not designed to be ADA compliant.

Mary and Sons has not designed any baffles to be added to the new water channel inside the culvert. It is suggested that the Town of Waldoboro consider the addition of a new baffling system once the walkway construction has been completed.

Walking Trails:

The primary walking trail begins at the culvert located on Route 1 and traverses southwest alongside a stream, until reaching the intersection Jefferson Street and Elm Street. The walking trail then continues up the side of Elm Street and traverses west to the footbridge location. Two 4 ft wide walking trails will connect the new sidewalk along Route 1 to the culvert walkway, one on each side of the culvert. These two connecting trails will have a compacted crushed stone finish, providing safety and drainage benefits for pedestrians.

Cost Analysis:

Mary and Sons performed a cost analysis for each individual aspect of the project discussed above. Below is a table consisting of the total cost of each individual project as well as an estimated project construction duration. The cost related to the custom design bridge represents the total cost of both of the custom girder bridge as well as the foundations. Pricing of prefabricated bridge options will be discussed later.

Sub-Project	Individual Project Cost	Project Duration Estimate (hours)
Route 1 Sidewalk	$93,000	120
Custom Design Bridge	$145,000	240
Walk-Under Culvert	$60,000	160
Walking Trails	$57,000	96
Total	**$355,000**	**616**

Acknowledgements

Mary and Sons would like to give thanks to the help and mentorship provided by professors and professionals in the completion of this capstone report.

To Max Johnstone, our client from the Town of Waldoboro as the Planning and Development Director, thank you for answering any questions we had in a timely manner. Having a client that was easy to work with and discuss design options with was very helpful throughout the work process. We are also thankful for allowing us to practice our engineering skills that we have learned over the past four years.

Mary and Sons would also like to express our gratitude to the faculty at The University of Maine for their expertise and advice, specifically:

- Professors Edwin Nagy, Eric Landis, and Xenia Rofes for their assistance resolving structural concerns and design considerations regarding the footbridge superstructure design and walk through culvert.
- Professor Aaron Gallant for providing suggestions and advice, as well as lecture material when implementing soil analysis throughout the project and foundation design for the footbridge.
- Professor Derek Nener-Plante for assisting with requirements for the sidewalk design, as well as key advice on material selection.
- Maine DOT representative Douglas Coombs for the existing elevations of Route 1.

Mary and Sons would also like to thank the following professional individuals:

- Jeffery Mcguire from CPM Constructors for answering questions regarding the construction of the culvert. Jeffery was the Superintendent of the culvert project when it was replaced in 2015 for MaineDOT and provided insight to design parameters at that time of construction.

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Introduction

This report specifies the design work and recommendations provided by the University of Maine, 2021 Civil Engineering Capstone Group, Mary and Sons. The purpose of the project is to provide the Town of Waldoboro a system of connecting walking trails in downtown Waldoboro near the Waldoboro Town Office along Route 1 as shown below in Figure 1.2. Traditional wooded walking trails and paved sidewalks are combined with a walkway through an existing culvert and a new footbridge crossing the Medomak River to provide walking access between the Kalers Corner Rest area and Elm Street. The project takes place on either public property or private property which permits recreational use of the impacted land. Following completion of preliminary research, a 10% design for a girder bridge crossing the Medomak River, a 10% design for a walkway spanning through the existing culvert and a full design of a sidewalk along Route 1 are all provided. The girder bridge design includes detailed recommendations on the superstructure of the footbridge and the supporting foundations on either side of the river bank. The designs allow pedestrians to safely cross the Medomak River and Route 1 with no disturbances.

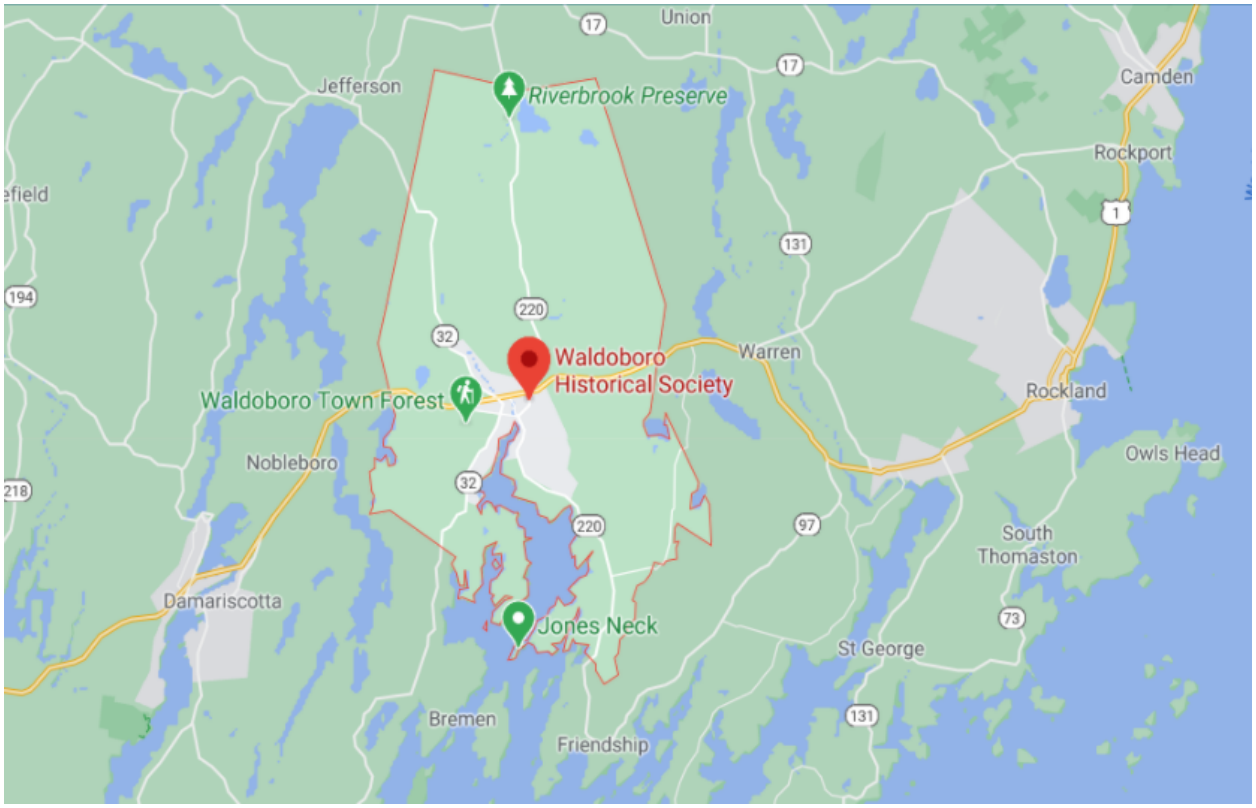

Figure 1.1 - Location of the Project

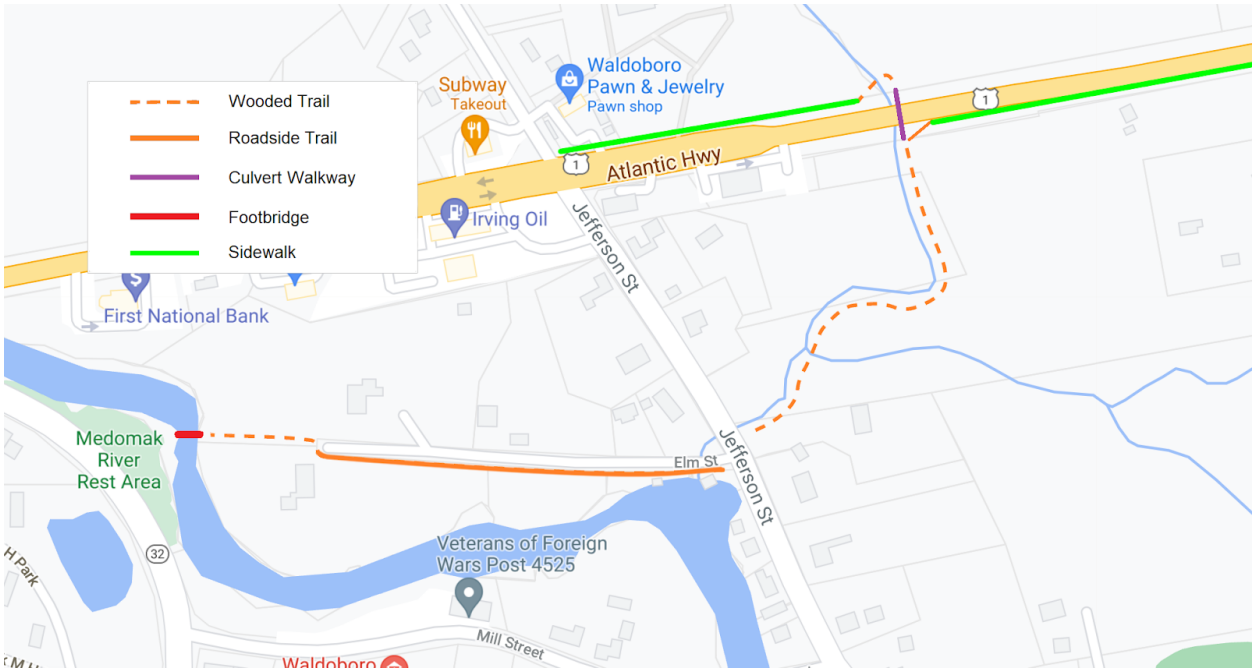

Figure 1.2 - Visual Scope of Project

Mary and Sons is a group of six senior Civil Engineering students at the University of Maine. This report is required in a senior capstone design course. Under no circumstance shall this work be taken for use in replacement of work done by a professional engineer. The goal of the course is to teach students real life engineering applications before graduation. Please see the Disclaimer section on page 26 for more information.

Team Members

This section provides contact information of each team member of Mary and Sons.

Mary and Sons

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Exclusions

- Mary and Sons did not fill out any permits that would be required in completing the project.
- Mary and Sons did not design the embankment of the sidewalk.
- Mary and Sons did not size or select catch basins for the drainage system.
- Mary and Sons did not design anchorage connections between the footbridge girder base plates and the footbridge foundations.
- Mary and Sons did not design any railing or lighting systems for the footbridge.
- Mary and Sons did not present any options for ramp accessibility onto the footbridge.
- Mary and Sons did not prepare any demolition plans for the demolition required within the culvert.
- Mary and Sons did not specify what fill is to be used in the retrofit of the culvert floor.
- Mary and Sons did not redesign any baffling for the new water channel in the culvert.
- Mary and Sons did not design the connection between the walkway and the existing concrete within the culvert.
- Mary and Sons did not present any options for the railing system suggested for the culvert walkway.
- Mary and Sons did not account for any clearing that may be required for the walking trails, as requested by the client.
- Mary and Sons did not include cost of material delivery in the cost estimations.

1. Permitting and Zoning

1.1 Conclusions and Recommendations

Both state and town permitting will be required to ensure the standards of both municipalities are met. The Town of Waldoboro will require the filing of a Site Plan Review and Subdivision Ordinance Preliminary Application (Appendix A.1.1) for the site of the Route 1 sidewalk redesign, the culvert walkway renovation, and footbridge implementation. This will be followed by a comprehensive construction plan, site evaluation, and public hearing for approval. In addition, a Sign Permit Application (Appendix A.1.2) will need to be filed for signage along the walking trails that connect all of the proposed infrastructure subprojects. Finally, at the local level a Shoreland Zoning Permit Application (Appendix A.1.3) will be submitted and reviewed for the footbridge construction. The site falls inside the Shoreland area in accordance to Article 7 in the *Town of Waldoboro Land Use Ordinance*. This will also be reviewed by the planning board simultaneously with the previously mentioned Site Plan Review and Subdivision Ordinance Preliminary Application.

State regulations, mainly regarding environmental protections, will also need to be met prior in order to proceed successfully. The Department of Environmental Protection Permit by Rule Notification Form (Appendix A.1.4) will need to be filed for the Route 1 sidewalk renovation, culvert walkway renovation, and footbridge implementation. Due to the permanent disturbance of waterways on the Medomak River where the footbridge will be constructed an Application for a Natural Resources Protection Act Permit (Appendix A.1.5) will have to be submitted and reviewed. If revisions are made to the construction plan after approval, there is a revision application that can be found on the Maine Department of Environmental Protection website. No erosion control permits will be necessary but engineers and commercial construction crews will be required to follow Maine Erosion and Sediment Control Best Management Practices while construction is underway.

The locations where sidewalk renovation will occur are within the Route 1 Commercial B District (Appendix A.1.6). This zone was referenced specifically under ordinances 6.6.5 and 6.6.6 from the *Town of Waldoboro Land Use Ordinance*. The location of the footbridge across the Medomak River is within the Shoreland Area according to the Waldoboro Tax Maps.

The sidewalk along Route 1 is designed as a raised sidewalk with proper handicap accessibility to meet Americans with Disabilities Act (ADA) regulations.

1.2 Assumptions

It is assumed that all permits and ordinances found on the Town of Waldoboro and Maine Department of Environmental Protection websites were complete and accurate to the date 1/29/2021.

2. Sidewalk Design

2.1 Sidewalk Location

The proposed sidewalk will start at Main Street on the East end of Route 1 and continue down Route 1 towards the Town Office and Jefferson St on the West end. The sidewalk crosses over the redesigned culvert to connect Route 1 pedestrian traffic with the Town Office. The exact location can be seen in Figure 2.2. The location of the sidewalk was chosen based on factors like the existing physical obstacles, flow of foot traffic, workability for construction, and to avoid overhead utility relocation. The chosen location is from STA 0+00 LT to STA 18+50 LT, then the sidewalk starts again on the opposite side of the street from STA 22+50 LT to STA 27+00 LT indicated in Figure 2.2. The map of stationing can be seen in Figure 2.1. The location allows pedestrians to safely walk down Route 1 and have access to the walking trails from the sidewalk. The sidewalk utilizes the culvert walkway to switch sides of the street, allowing for access to the Town Office as well.

Figure 2.1 - Stationing of Sidewalk

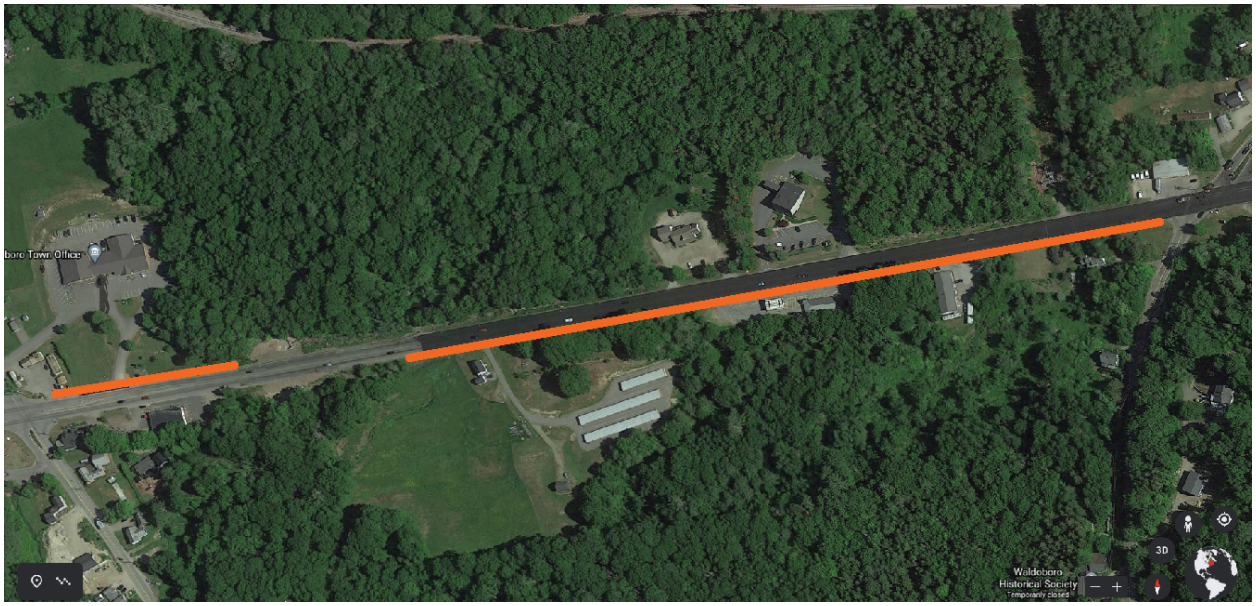

Figure 2.2 - Sidewalk Location

2.2 Geotechnical Analysis

The geotechnical engineering report, conducted as a Web Soil Survey, shows the existing soils located under the proposed sidewalk location are classified as SM, ML, and PT. These soil classifications are according to the Unified Soil Classification System (USCS). The majority of the soil's top layer is classified as PT which is an organic soil indicating it is mainly decomposed plant material. The soils found in the proposed location of the sidewalk are Lyman-Rock outcrop-Tunbridge complex, Swanville silt loam, and Udorthents Urban land complex. The soil map indicating location of the soil type can be seen below labeled Figure 2.3. These results go into more detail classifying the soils listed above and include the USCS soil classification.

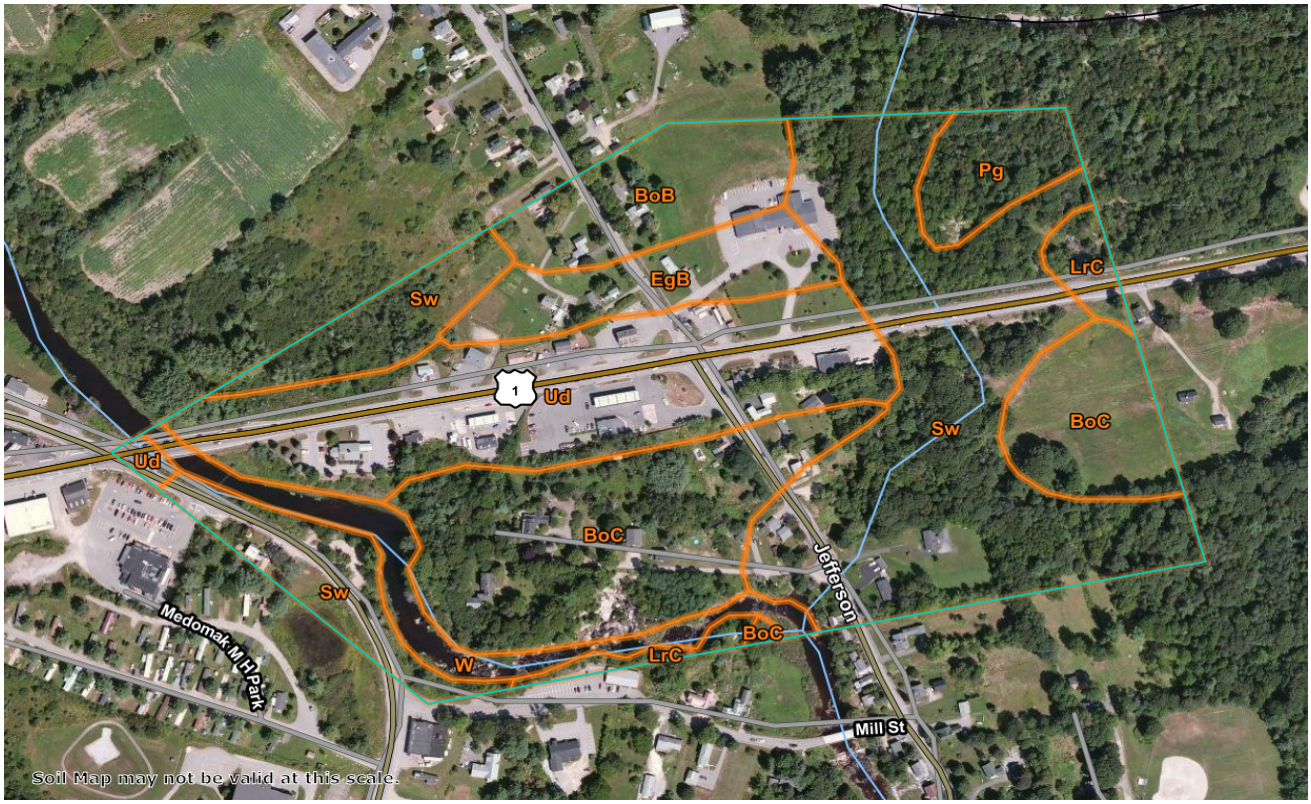

Figure 2.3 - Sidewalk Web Soil Survey Soil Map

2.3 Sidewalk Results

Mary and Sons has designed a raised sidewalk along Route 1 on the right side when looking from the Town Office to the Main St intersection. The sidewalk will be 4 ft wide with a 3 in raise off the existing pavement, as seen in the sidewalk cross section detail (Appendix A.2.1). These are minimum requirements for Maine, found from the Federal Highway Association (FHA) practices and procedures. The material was selected from the Maine DOT standard specifications as 9.5 HMA (incidental) for the asphalt and Type A base Course as the base. The sidewalk is designed for a 0.5% slope of the sidewalk towards the gutter line to direct stormwater off the road and into existing drainage. Lastly, hot mix asphalt (HMA) was selected by the client and Mary and Sons due to the low impact of foot traffic and aesthetic requests from the Town of Waldoboro.

2.3.1 Drainage

Mary and Sons discovered that there is still a functioning drainage system in place along Route 1. The current drainage system is working to satisfaction, as there are no major heaves from infiltration or fatigue cracking along the shoulder of the road from moisture collection. At this time there is no need to implement a new drainage system for the sidewalk renovation will not

impact the current designed system. The locations of existing utilities were collected from the local/state documents received from the Town of Waldoboro. Utility mapping indicates that there are no existing underground utilities that interfere with the construction of the proposed sidewalk. All electricity conduits are overhead, and all water and sewer networks are West of our proposed location and are located along Route 1 in front of the Town Office.

2.3.2 Signage Plan

The 15 signs listed in Table 2.1 will need to be removed and relocated away from the road just outside of the location of the sidewalk. If there is a need for removal or relocation of any signs, the state will determine relocation and removal. Signs will also need to be added at the stationing location listed in Table 2.2 indicating the path down to the walk under culvert that crosses under the road.

Table 2.1 - Sign Removal Description and Location

Station (LT)	Sign #	Sign Description
1+50	1	Route 1, Route 220 directional
4+00	2	Rockland, Washington, Friendship Directional (green)
4+50	3	Directional Intersection (arrows)
5+00	4	40 MPH speed limit
6+00	5	Mid Coast Marine Supply
6+50	6	Traffic Light Indication
8+00	7	JCT 220
10+50	8	Shell Gas Station
12+00	9	Historical Society Museum
16+00	10	40 MPH speed limit
22+50	11	AllPlay and Vannah Insurance Agency
23+50	12	Waldoboro Historical Village
24+00	13	Crosswalk Ahead
26+50	14	Directional Intersection (arrows)
27+00	15	Crosswalk Here (with light)

Table 2.2 - Sign Addition Location and Description

Sign Addition List		
18+00		Crosswalk ahead (indicates walk under culver crossing)
24+00		Crosswalk ahead (indicates walk under culver crossing)

2.3.3 Traffic Control Plan

The traffic control plan (TCP) developed by Mary and Sons lists the channelization devices and approach signage that are suggested throughout the sidewalk construction site, as shown below (Appendix A.2.2). It is not expected that any of the sidewalk renovation will dramatically affect vehicle traffic patterns. If not all, most of the sidewalk improvements will be able to be done without shutting down any lanes of traffic, especially along the wide stretch of Route 1. In special occasions where the contractor will need more space for installing the sidewalk, provisions should be made for alternate one-way movement through the constricted section. Within the TCP, typical applications from the Manual of Uniform Traffic Control Devices are given to display how safe work zones will be maintained while minimizing traffic interferences for both shoulder work with minor encroachment and a full lane closure if needed.

2.3.4 ADA Requirement List

ADA Requirements pertaining to the sidewalk design:

- Handicap accessible curb ramps are required at every location of a crosswalk.
- For curb ramps constructed after January 26, 1992 (post-ADA), the slope must be 8.33% (1:12) or less.
- The cross slope of the ramp run itself may not exceed 2% (1:50). (On a curb ramp, the cross slope is the slope perpendicular to [across] the direction of pedestrian travel on the ramp run.)
- The ramp, or ramp run, must be at least 36 in wide, not including the flared sides.
- The ramp run must have detectable warnings – i.e., dome-shaped bumps – that extend the full width and depth of the ramp.
- Transitions from the ramp to the walkway, gutter, and street must be flush (level) and free of abrupt level changes.
- The gutter must have a slope of no more than 5% (1:20) toward the ramp.

All information was found from Chapter 6 of ADA Best Practices Tool Kit for State and Local Governments.

3. Kalers Corner Footbridge Design

3.1 Hydraulic Analysis of the Medomak River

3.1.1 Conclusions and Recommendations

The Medomak River has a watershed area of approximately 106.1 square miles between freshwater watershed and watershed below the head of tide. There are 48.1 square miles that lie in the Town of Waldoboro and the below head of tide watershed spans 26 square miles at the head of the river. Due to the large stake the town has in the river Mary and Sons is aware of the importance of implementing and reviewing an environmental protection plan while footbridge construction is underway. The Medomak River has a width of 74.3 ft at the proposed location of the footbridge. Based upon an open channel analysis of this location, it is strongly recommended that the foundations of the footbridge not constrict the river to a width any less than 37 ft wide which based on the design they will not. The 80 square miles of freshwater watershed could subsequently be affected so Mary and Sons designed the footbridge foundation on the existing bank.

3.1.2 Assumptions

It was assumed that the river is a rectangular channel in the calculations corresponding to the open channel analysis. It was also assumed that the slope and Manning's roughness values were constant throughout the proposed footbridge location.

3.2 Footbridge Foundation Design

3.2.1 Subsurface Conditions

A Web Soil Survey was conducted by Mary and Sons for the area of design around the Medomak River. The gathered information in the report was pulled from various tables containing properties on the water content of each individual soil, the depth to water tables, and engineering properties such as soil classifications. The report provided the necessary variables for bearing capacity and settlement calculations. From the report, Mary and Sons can conclude that the subsurface soil at the eastern foundation location is Bootbay silty clay (BoC, CL per USCS) with a water table depth of 23 cm. The subsurface soil at the western foundation location is Swanville silt loam (Sw, CL per USCS) with a water table depth of 15 cm. After extensive research through websites and resources, Mary and Sons could not gather any boring information on the surrounding embankment on the Medomak River.

3.2.2 Conclusions and Recommendations

The foundations will be optimally adequate in settlement and bearing capacity with a width of 5 ft, a length of 10 ft, and a depth of 3 ft. The foundation dimensions were optimized through

calculating the maximum expected settlement. Allowable settlements at foundation locations were determined to be 2 in, with an allowable differential settlement of 1/250. The settlement under the eastern proposed foundation was calculated to be 1.7 in, while the settlement under the western proposed foundation was calculated to be 1.9 in, The differential settlement was determined to be 20 times less than the allowable differential settlement. It was concluded that the designed foundation will sustain any bearing capacity limitations by a factor of safety of 1.61, which satisfies the requirement of a factor of safety of 1.5.

The minimum required reinforcement of the foundations was calculated in accordance with ACI Code-318-19 to provide adequate strength and serviceability for the loading of the foundations. The reinforcement of the foundations will consist of size #7 rebar running longitudinally in both directions on top and on bottom of the foundation. A total of 40 #7 bars will be used in the foundation, 26 of which will have a length of 54 in, with the remaining 14 having a length of 114 in. Three CAD drawings of the foundations can be seen in Appendix A.3.1 Footbridge Drawing Package.

3.2.3 Assumptions

Existing geotechnical information was used to make the conclusions that are stated within this document. It is assumed that the soil parameters displayed on the Web Soil Survey are accurate to those that are present at the footbridge foundation locations. As stated before, a subsurface investigation would confirm or reject this assumption and is highly recommended to support the conclusions.

The reinforcement design was computed under the assumption that the construction contractor will use nonprestressed normal weight concrete (f'c = 4,000 psi) and standard nonprestressed deformed rebar reinforcement (fy = 60,000 psi).

3.3 Footbridge Superstructure Design

3.3.1 Structural Analysis

The loading conditions on the footbridge were found using AASHTO LRFD Bridge Design Specifications and the LRFD Guide Specifications for the Design of Pedestrian Bridges. The unfactored governing loads applied to each girder are:

- Total dead load: 230 plf
    - Self Weight of Beam: 130 plf
    - Weight of steel grate deck: 50 plf
- Total live load: 476 plf
    - Maintenance Vehicle: 476 plf
- Total vertical wind load: 80 plf
- Total horizontal wind load: 138 plf

The loads were factored using Strength I per AASHTO LRFD Bridge Design specifications. The unfactored load on the deck was calculated to be 164 psf. The analysis was done by hand and then checked using Risa 2D modeling.

3.3.2 Structural Steel Member Design

Mary and Sons designed an 80 ft long by 8 ft wide bridge crossing the Medomak River at Kalers Corner. The main superstructure in the custom design is composed of a steel grate deck on top of two 80 ft W33x130 beams. Mary and Sons received a quote from Indiana Gratings on the steel grate deck which is composed of an 8 ft x 80 ft, 1/2 in x 3/16 in, 19W4 welded steel bar grating. The cross members bracing the two girders are composed of two single angles (L 3x2-1/2x1/4) which are welded to connector plates welded to the 80 ft footbridge girders. The cross members are spaced at 20 ft along the span of the bridge. The 80 ft girders are supported by steel base plates on top of the concrete foundation. The visual display and details of the custom superstructure design can be seen in Appendix A.3.1 Footbridge Drawing Package. These designs were based on the loads provided in the structural analysis.

3.3.3 Assumptions

In the structural analysis of the footbridge, the load due to the decking was assumed to be 25 psf. As design came to completion, the steel grate decking used in design came out to weigh 11 psf. Since Mary and Sons is not designing handrails or anything else that might sit permanently above the deck, 25 psf was used for the entire analysis to leave room for additions.

The structural design process assumed no preference in superstructure material. The overall aesthetic design of the bridge was briefly discussed and steel was deemed sufficient as the structural member material. Although a wood or concrete footbridge is possible, steel was chosen as the deck material to ensure the structure could fully span the river without any intermediate support. In addition, a steel grate deck is more durable and lighter than an alternative wood deck and will not require any snow removal, thus reducing maintenance costs for the Town of Waldoboro. Although wood has a cheaper up-front cost material, Mary and Sons recommends a steel grate deck for the longevity of the footbridge and can conclude it is a better long-term economic decision.

3.3.4 Conclusions and Recommendations

For the custom bridge design, if additional components such as handrails or light fixtures are added, they should not exceed 14 psf since assumed total deck weight was 25 psf and the steel grate decking has a weight of 11 psf.

3.4 Soil Erosion & Water Protection Control Plan

The three main goals of the Soil Erosion & Water Protection Control Plan are to protect the river banks, reduce the impact on the surrounding vegetation, and eliminate debris from reaching the

Medomak River. Plan details and recommendations were all made based on the Maine Department of Environmental Protection's Maine Erosion and Sediment Control Best Management Practices (BMPs) Manual for Designers and Engineers and specific laws relevant to the project.

The existing foundation has been left on the eastern bank of the river and it will need to be removed and properly transported off the site to a predetermined location. The existing foundation consists of large retaining wall boulders that will need to be transported to a local gravel pit selected by the contractor of the job. The amount of the foundation that will be removed will be decided on sight but to accommodate this removal and prevent erosion, riprap will be placed from the end of the new foundation to the waterline. This is required per the Erosion and Sediment Control Law, Title 38 M.R.S.A. Section 420-C (Appendix A.3.2 SEWPCP Documents). If extra support is needed, erosion protection riprap will be installed along the siding of the foundations. Riprap is to be placed as soon as possible after removal and needs to be checked weekly while construction is underway. Riprap is sized based on the chart in Appendix A.3.2 SEWPCP Documents from the State of Maine Aquatic Resources Management Strategy Forum Stream Smart Road Crossing Pocket Guide. The mean channel slope found in the StreamStats Report of the Medomak River was 6.06%. The maximum flow depth of the Medomak is above 3 ft, thus 18 - 24 in riprap sizing is required along the embankment.

The first thing done to minimize the impact of construction on the surrounding vegetation is to leave the soil untouched as long as possible. Each river bed vegetation (e.g. shrubbery, small trees, grass) and soil will be removed to accommodate equipment and enable proper placement of the designed foundation. Once vegetation is removed and soil is exposed, mulch and seeding will be laid following construction completion to reverse impact as per the Natural Resources Protection Act, Title 38 M.R.S.A. Section 480 A-JJ (Appendix A.3.2 SEWPCP Documents). Mulching will be done with an Erosion Control Mix and requires inspections weekly and following storm events. The Erosion Control Mix must follow the standards described in Appendix A.3.2 SEWPCP Documents and is to be chosen by the contractor on site. Seedling will also be chosen on site and is to be placed following mulching.

No water flow should be necessary for excavation of the site and is to be avoided to prevent runoff into the Medomak River. To prevent construction debris from reaching the waterway, silt fences will be placed just above the waterline. Silt fences are cheap and easy to implement and provide ample protection of the waterway. Fences should be inspected weekly and are to be removed when the project reaches completion. The foundation design proposed by Mary and Sons does not require work in the waterways, thus no permit will be requested and entry by workers or machinery is strictly prohibited. To further protect the Medomak River, all footbridge features that can be manufactured off-site should be and then transported on-site when they are ready to be secured. Since no waterway work is permitted, footbridge decking is to be lifted into

place to secure into the foundation. Both of these measures will minimize on site stockpiles and debris ending up in the waterway.

The job site is to be inspected weekly and following any storm events. In preparation for storm events the contractor is responsible for covering any stockpiles to prevent contaminated runoff into the waterway. The contractor is also held responsible for proper disposal of all waste including removed foundation, vegetation, and soil.

4. Culvert Retrofit and Walkway

4.1 Hydraulic Analysis of Culvert

4.1.1 Conclusions and Recommendations

Demolition of the existing culvert floor is required for construction of the walkway design. Once demolition is complete, Mary and Sons has proposed a redesigned 5 ft wide rectangular channel for the water passage. Through analysis of the modified culvert channel, Mary & Sons anticipates a 1.24 ft rise in average water elevation during a 100 year flood level event. Through analysis, Mary and Sons has also determined that the channel should not be constricted to a width less than 4.0 ft, any larger of a constriction will lead to a choke upstream.

4.1.2 Assumptions

The analysis of the stream through the culvert was performed based on the information provided by the USGS StreamStats program. It is assumed that the data provided by the USGS is accurate. Hydraulic analysis was performed by Mary & Sons based on the assumption that demolition of the existing culvert floor is complete.

4.2 Walkway Design

4.2.1 Walkway Design & Recommendations

Mary and Sons recommends that the walkway conservatively be 2.0 ft above the water channel bed due to extrapolated estimates used in the StreatStats report. This would leave 7 ft clearance between the walkway and the top of the open culvert. The water channel will be constricted to 5.0 ft upon construction of the walkway, greater than the 4.0 ft minimum width determined through the channel analysis. Similar to the walkway height, this channel constriction is conservatively set to be 1.0 ft wider than the allowable constriction, due to the extrapolated estimates in the StreatStats report. A 4.0 ft wide walkway will be in accordance with the Federal Highway Administration Bicycle & Pedestrian Transportation Standard. A sketch of the newly designed channel and walkway can be seen attached in Appendix A.4.1 Culvert Retrofit Sketch.

Mary and Sons suggests that a 3.5 ft tall railing be installed along the channel side of the walkway per recommendations from the Federal Highway Administration.

4.2.2 Assumptions

The walkway through the culvert was designed under the assumption that demolition of the existing culvert floor surface has been completed. The walkway was also designed under the assumption that the calculated 100 year flood height for the new culvert geometry is accurate.

4.3 Connection to Walking Trail and Sidewalks

4.3.1 Path Connection & Signage Plan

As requested from the client, the walking trail entrance path will consist of 2 in crushed stone overlaying an aggregate base at depths of 0.5 ft and 1.5 ft. Both layers will need to be compacted. A geotextile slope protection option was proposed to the client by Mary and Sons to further protect the walking trail, as it sits on a steep inclined hill. The length of the entrance of the trail, from the sidewalk to the culvert trail, will be around a 350 ft linear run. The figure seen below, Figure 4.1, shows the proposed location of the trail which aims to hug the tree line and stay as far away from the property border as possible. An estimate for the cost of the walking trail (Appendix A.4.2 Cost Estimation of Culvert Walking Trail) was also conducted to give the client an idea of the pricing of the options available. A crushed stone slope protection fabric was included in the estimation as a proposed idea by Mary and Sons to provide safety and efficiency to the trail. The client will have a choice on if they want the protection or not with an included comparison on the cost for both options.

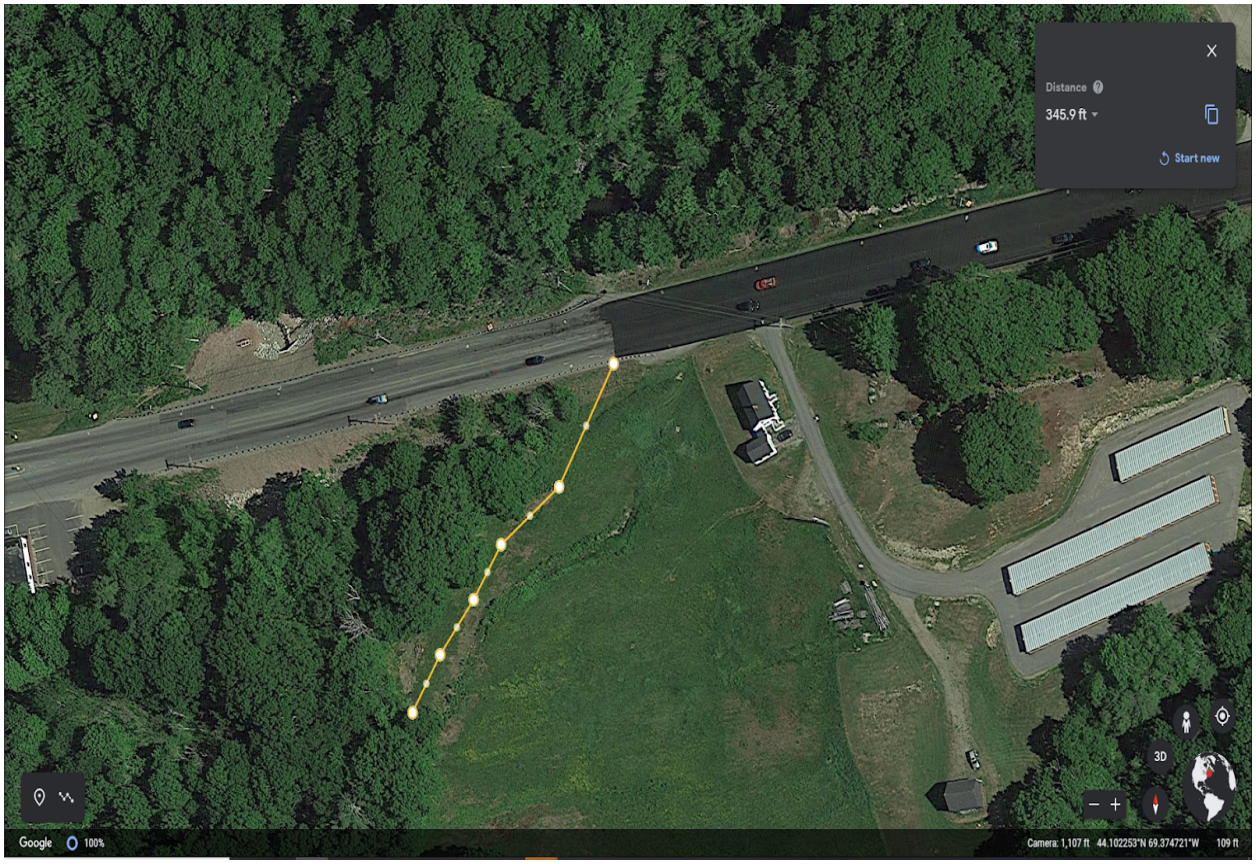

Figure 4.1 - Location of Culvert Walking Trail

There are no signs that are legally required for the proposed walkway going through the culvert. It may be advisable to install “Tunnel Ahead” signs at either end of the sidewalk entrances to the walkway, as to not surprise any pedestrians. In addition it was found that the soil is rated “very limited” due to a high level of saturation in the areas surrounding the stream. It may be beneficial for the town to consider signage to warn users of saturated soil and wet concrete to prevent slipping or falling. However, signage is completely optional for the Town of Waldoboro and is not required per any state regulations.

5. Walking Trails Design

5.1 Mapping Layout

Mapping of the proposed walking trails along with the sidewalk connection is shown below in Figure 5.1. This trail begins with access to pedestrians from either the footbridge located at Kalers Corner or from the sidewalk along Route 1 near the culvert and Town Office. Starting at the culvert entrance users will then follow along the stream bed through the woods until reaching Jefferson Street. Users will need to safely cross and continue to the beginning of Elm Street

requiring the installation of a crosswalk. The trail design then follows the short wooded trail down Elm Street and ends at the footbridge across the Medomak. Additionally, the trail will need to cross the inlet river at the point specified on Figure 5.1, but given the unsubstantial width of the channel a commercial trail bridge will suffice.

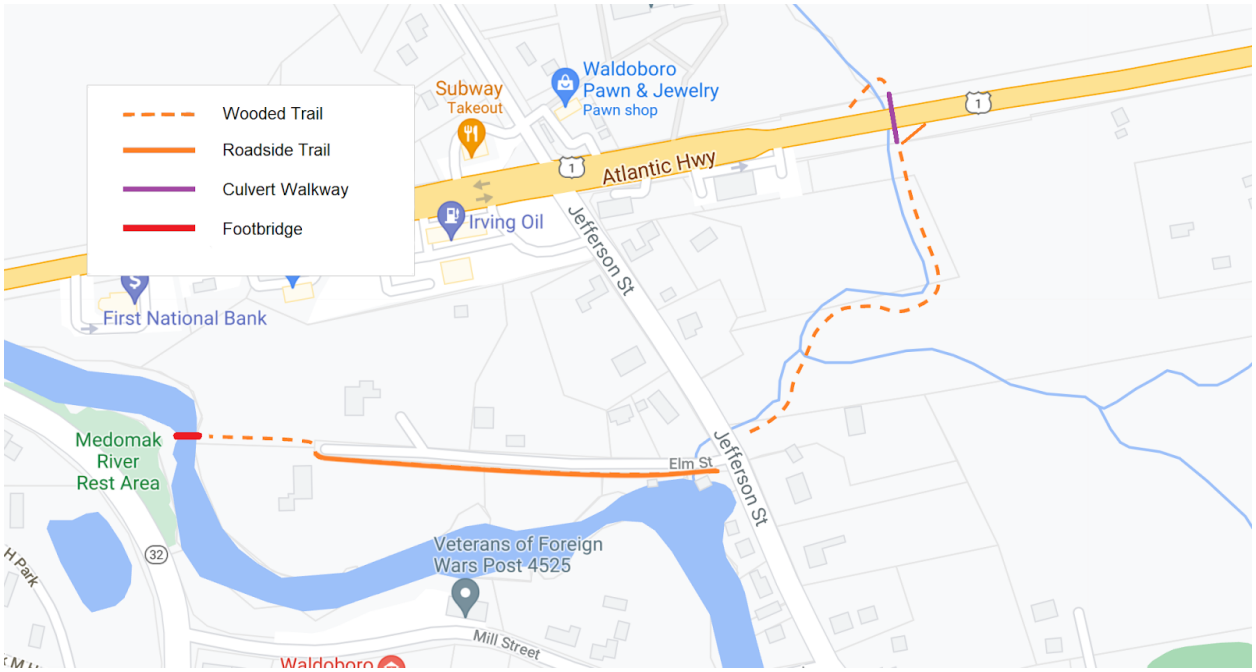

Figure 5.1 - Walking Trail Mapping

5.2 Slope Stability and Design

5.2.1 Design

A slope stability analysis was done to confirm that a 4 ft wide walking trail with a 3:1 slope can be constructed to connect the Route 1 sidewalk to the trail going through the culvert sloping perpendicular to the existing 2:1 side slope. The slope stability calculation conservatively modeled the slope and only considered the worst-case scenario. It can be concluded based on the slope stability analysis that the slope is stable under dry and drained conditions. Considering the underlying soil is granular and the slope is relatively steep, the water should be drained efficiently. However, the negative effects of possible water infiltration in the sloping soil reduces the stability of the slope and should be considered during construction. This being the case, the use of a rip rap at the bottom of any slope, along with a stabilizing geotextile fabric can be implemented to increase the stability of the slope. Fine-grained soils such as clay and silt shall not be permitted for use as they are more susceptible to infiltrated water.

Seen in Figure 5.2, based on the cut/fill design a total volume of 666 cubic ft of fill material will be needed to achieve a 3:1 walking trail slope from the sidewalk down to the trail. This Slope extends for approximately 70 ft.

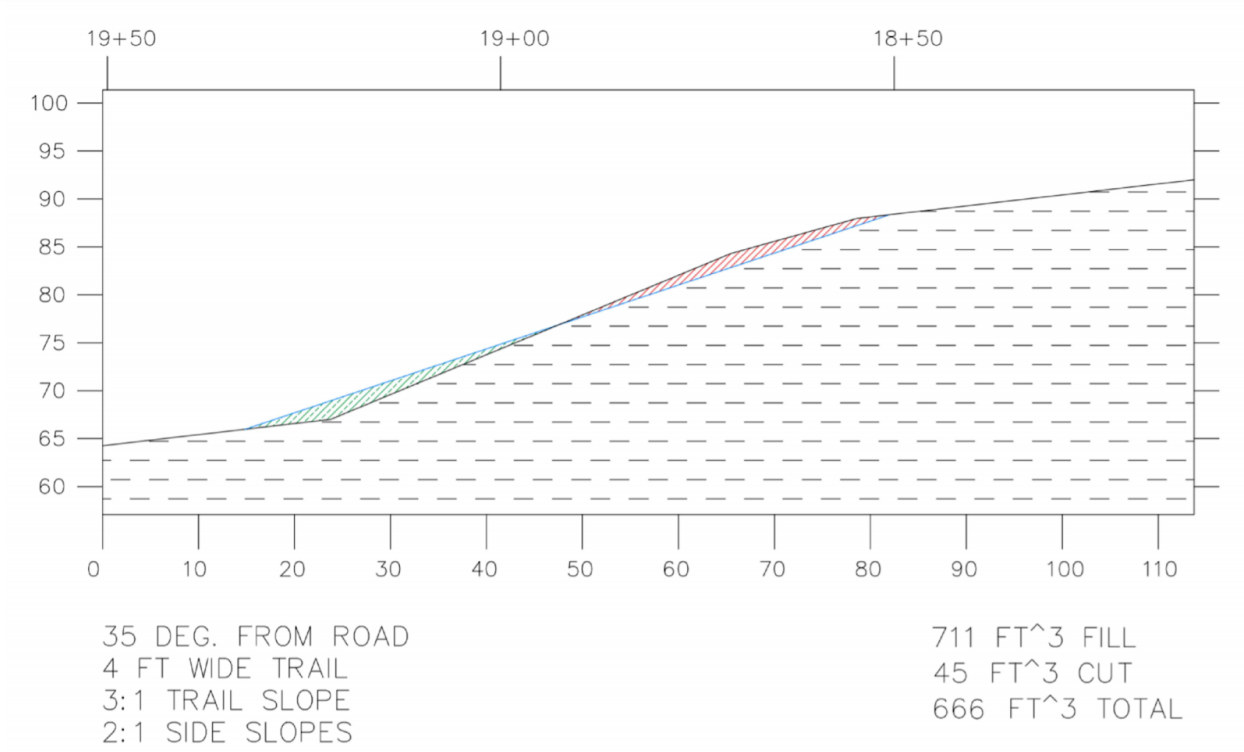

Figure 5.2 - Walking Trail Cut/Fill Chart

5.2.2 Assumptions

The subsurface profile indicated that the sloping soil is fill overlying sand, both being classified as sandy silts. The assumption that a dry, sandy slope is present since it is much safer in this situation than if a clay or silt based soil was present.

5.3 Land Usage Rights

Following the review of the Town of Waldoboro Land Use Ordinance, it was determined that no permits were needed for the construction of the walking trail and no guidelines were set for the public access trails across private property. The client expressed that in the past they have asked permission every year to utilize this land as to ensure the private owner has full control if need be. Mary and Sons suggests continuing this relationship with the property owner, for there are only two areas which would need special permission for the proposed trail. These areas will be the crushed stone trail leading down from the sidewalk located along Route 1, through the wooded area beneath Route 1, across Jefferson Street, to the end of Elm Street reaching the new footbridge. Appendix A.5 shows the tax maps containing the walking trail location and property lines around the trails. The walking trails can be seen on the West end (Elm Street), crossing through the woods, to the East end by the culvert and trail entrance adjacent to Route 1.

6. Cost Estimations

6.1 Conclusions and Recommendations

The materials and implementation of the sidewalk along Route 1 is estimated to cost about $93,000.

The materials and implementation of the walk-under culvert design is estimated to cost about $60,000.

The walking trails design included two options. One option has a crushed stone slope protection and the other without. With the crushed stone slope protection the project will cost about $57,000 and without the slope protection it will cost about $50,000. These estimates include the cost of the cut fill plan for the path from the sidewalk to the walk-under culvert. Based on our slope stability calculations we recommend using the crushed stone slope protection option.

The custom designed footbridge along with the foundations is estimated to cost about $145,000. This price also includes the quote received from Indiana Gratings for a steel grate deck. Quotes for prefabricated bridges were collected from Bridge Brothers and Contech. The prefabricated options only include price of the footbridge superstructure and do not include the price of the

foundations. Bridge Brothers supplied a quote of $120,441 with a metal grate deck and $98,561 with a pine deck. The estimated total project schedule given was 16 weeks. The Contech quote offered was $85,000 dollars. This quote includes a concrete or wood deck both listed at the same price and delivery. Contech did not give us an estimated project duration. Our custom foundations are estimated to cost about $70,000. Therefore, including the cost of foundations with the other prefabricated bridge quotes, our custom design bridge is the likely cheapest since our cost estimate includes a deck and implementation. All quotes can be seen in and spreadsheet calculations can be seen in Appendix A.6.

All of the subprojects come together for a total estimated cost of $355,000 with an estimated project duration of 16 weeks.

Table 6.1 - Cost Estimate Summary based on Our Recommendations

Sub-Project	Individual Project Cost	Project Duration Estimate (hours)
Route 1 Sidewalk	$93,000	120
Walk-Under Culvert	$60,000	160
Walking Trails	$57,000	96
Custom Design Bridge	$145,000	240
Total	**$355,000**	**616**

6.2 Assumptions

For the sidewalk, the time of the project was estimated to take 3 weeks. For the footbridge, the time of the project was estimated to take 6 weeks total, including construction of the foundations. The cost of the walking trails along with the cost of the cut/fill plan for the slope leading to the walk-under culver from the sidewalk was estimated to take 3 weeks. Time estimates are based on previous experiences on construction sites from the Mary and Sons team and consulted professionals. Some jobs team members have been on include bridge, sidewalk, and other smaller reinforced concrete projects such as dam and parking garage rehabilitation. These projects have consisted of similar components to those required in this project.

It was assumed that all heavy equipment would need to be rented. It was also assumed that these machines will only be used for a partial time of the project since this equipment will not be running for the entire duration of the project. Assumptions of the running time for the equipment is also based on past experience gained from Mary and Sons members.

DISCLAIMER

The materials contained in this document and any supporting documentation were developed by us as students as part of our education in the College of Engineering in order to gain supervised engineering problem-solving experience. Therefore, information and recommendations, while useful for understanding a particular project's scope and possibilities for implementing solutions, should not be relied upon solely for the purposes of advancing a project beyond conceptual levels.

Furthermore, such material should not substitute for or replace the services of a design professional practicing in the areas of engineering or architecture, particularly for projects whose direct or indirect impact may affect the safety, health, or welfare of the public.

We students who prepared this information look forward to the opportunity to serve with fidelity the public, our future employers, and clients. In providing you with this information, our intention is to uphold and enhance the honor, integrity, and dignity of the engineering profession. We thank you for the opportunity to develop our skills through our work on this project.

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Appendix

Appendix A.1 : Permitting and Zoning Ordinance Documents

Appendix A.2 : Sidewalk Design

Appendix A.3 : Footbridge Design and Drawings

Appendix A.4 : Culvert Walkway

Appendix A.5 : Walking Trails

Appendix A.6 : Cost Estimations

A.1 : Permitting and Zoning Ordinance Documents

A.1.1 : Site Plan Review and Subdivision Ordinance Preliminary Application

Application Number_____
Fees Preliminary_____ Pd_____
Fees Final_____ Pd_____

Town of Waldoboro

Site Plan Review and Subdivision Ordinance Preliminary Application

(Please Type or Print)

Type of Application: __Site Plan Review __Subdivision Ordinance
__Shoreland Zone __Flood Plain __Hazardous Materials

Brief description of proposed project: _____
_____
_____
_____.

Address: _____ Zoning District: _____ Map: _____ Lot: _____
Name of Applicant: _____
Address: _____ Town: _____ State: _____ Zip: _____
Telephone Numbers: _____
Local Contact, Name: _____ Telephone: _____
Name of Owner (if not applicant): _____
Address: _____ Town: _____ State: _____ Zip: _____

Applicant must attach a copy of deed, signed option agreement or lease agreement. If applicant is a corporation, attach certificate from the Secretary of State (Maine) showing authority to do business in Maine.

Name of Applicant's Engineer: _____ Telephone: _____
Address: _____ Town: _____ State: _____ Zip: _____
Name of Applicant's Attorney: _____ Telephone: _____
Address: _____ Town: _____ State: _____ Zip: _____
Name of Applicant's Soil Scientist _____ Telephone: _____
Address: _____ Town: _____ State: _____ Zip: _____
Name of Applicant's Land Surveyor: _____ Telephone: _____
Address: _____ Town: _____ State: _____ Zip: _____

I certify that the information contained in this application is correct to the best of my knowledge.

Signature (applicant): _____ Date: _____
Title: _____

Action by the CEO, Planning Board, Board of Appeals

Informal Pre-Application Review:	Date: _____	By: _____
Preliminary Review:	Date: _____	By: _____
Site Walk:	Date: _____	By: _____
Public Hearing:	Date: _____	By: _____
Modifications:	Date: _____	By: _____
Final Review:	Date: _____	By: _____
Modifications:	Date: _____	By: _____
Appeals:	Date: _____	By: _____
Certificate of Occupancy:	Date: _____	By: _____

A.1.2 : Sign Permit Application

For Office Use Only

Fee Paid: $_____ **Sign Permit #: _____**

Inspection Date: ___-___-___ **Issue Date: ___-___-___**

SIGN PERMIT APPLICATION

TOWN OF WALDOBORO

1600 Atlantic Highway

Waldoboro, Maine 04572

(207) 832-5369 | ceo@waldoboromaine.org

Property Owner: _____ Telephone: ____-____-_____

Mailing Address: _____ State: _____ Zip: _____

Name of Contractor/Applicant: _____

Mailing Address: _____Telephone: ____-____-_____

Property Address: _____

Tax Map: _____ Lot: _____ Zoning District: _____ Acres: _____

Number of Sign(s) Requested: _____ Est. Cost of Project: $_____ Height of Sign(s) _____

Type of Sign(s): ☐ Freestanding ☐ Attached ☐ Illuminated Exterior Dimensions: _____

Setbacks: Road Right of Way: _____ Property Line: _____

I HEREBY CERTIFY THAT THE PROPOSED WORK IS AUTHORIZED BY THE OWNER AND THAT I HAVE BEEN AUTHORIZED BY THE OWNER TO MAKE THIS APPLICATION. I ALSO CERTIFY THAT THE INFORMATION CONTAINED IN THIS APPLICATION IS ACCURATE TO THE BEST OF MY KNOWLEDGE AND AGREE TO CONFORM TO THE WALDOBORO LAND USE ORDINANCE AND TO APPLICABLE LAWS OF THIS JURISDICTION. I UNDERSTAND THAT A CERTIFICATE OF C OMPLIANCE MUST BE ISSUED BEFORE I INSTALL THE SIGN

Signature (property owner/applicant): _____ Date: _____

Permit fee: $40.00 per sign and $50.00 refundable deposit for temporary.

CEO: _____ Date received by CEO: ___-___-___

Fee Paid: $_____ Status: _____

Reason for Denial: _____

Set Backs

Property Line…….. 20’

Road Way…… 2’

Right-of-way…… 2’

Freshwater Pond…… 100’

Wetland, Stream, or Medomak River…….. 75’

SITE PLAN/ PLOT PLAN

TOWN OF WALDOBORO

SITE PLAN MUST ACCOMPANY THIS APPLICATION AND INCLUDE THE FOLLOWING:

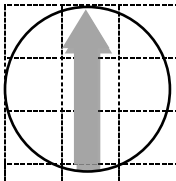
A. Lot dimensions

B. Names and locations of roads, streets, and bodies of water

C. Exact location of existing and proposed sign(s) and distance from lot lines

D. Scaled sketch of proposed sign(s)

Scale: 1 box = _____' _____"



NORTH

A.1.3 : Shoreland Zoning Permit Application

For Office Use Only

Fee Paid: $_____ **Permit #: _____**

Inspection Date: ___-___-___ **Issue Date: ___-___-___**

SHORELAND ZONING PERMIT APPLICATION

TOWN OF WALDOBORO

1600 Atlantic Highway

Waldoboro, Maine 04572

(207) 832-5369 | ceo@waldoboromaine.org

As outlined in Article 7 of the Waldoboro Land Use Ordinance, certain uses within the shoreland area require a permit from the Code Enforcement Officer or Planning Board. A shoreland zoning permit shall be obtained *in addition to* a building or other permit, where necessary.

Property Owner: _____ Telephone: ____-____-_____

Mailing Address: _____ State: _____ Zip: _____

Name of Contractor/Applicant: _____

Mailing Address: _____Telephone: ____-____-_____

Property Address: _____

Map: _____ Lot: _____ Zoning District: _____ Acres: _____ Sewer: _____ Septic: _____

Y/ N # Bedrooms

Detailed description of proposed project/use:

_____

_____

_____

_____

Dimensions: _____ Stories: _____ Approximate Cost of Project: $_____

(Excluding plumbing & electrical work- separate permits required)

Mobile/Manufactured Home: Year_____ Make_____

Mobile homes moving from another Municipality must provide written proof that all outstanding property taxes have been paid.

I HEREBY CERTIFY THAT THE PROPOSED WORK IS AUTHORIZED BY THE OWNER AND THAT I HAVE BEEN AUTHORIZED BY THE OWNER TO MAKE THIS APPLICATION. I ALSO CERTIFY THAT THE INFORMATION CONTAINED IN THIS APPLICATION IS ACCURATE TO THE BEST OF MY KNOWLEDGE AND AGREE TO CONFORM TO THE WALDOBORO LAND USE ORDINANCE AND TO ALL APPLICABLE LAWS OF THIS JURISDICTION.

Signature (property owner/applicant): _____ Date: _____

Application must include:

- Site plan, including location of road, property lines water bodies and wetlands, septic, and well, including location and dimensions of proposed building.
- Proof of right, title, or interest in property
- If applicable, the completed Subsurface Wastewater Disposal System application.
- Erosion and sedimentation control plan (See Article 7 sec. 18)

SITE PLAN/ PLOT PLAN

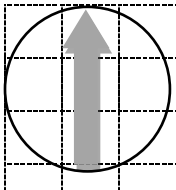
TOWN OF WALDOBORO

Minimum Required Information:

1. Property lines
2. Location of all buildings on the lot
3. Location of proposed structures, showing all setbacks
4. Location of well(s) and septic system(s)
5. Wetlands, brooks, and other water bodies within 100ft of the project

Structural Data: Width: _____ Length: _____Height: _____

Scale: 1 box = _____' _____"



TOWN OF WALDOBORO
Information for Permit Holders and Applicants

Please Note: All local Land Use, Shoreland Zoning, Flood Plain Ordinances and regulations still apply.

Other Codes Used in the Town of Waldoboro:

1. National Electrical Code, (NEC) published by the National Fire Protection Association
2. NFPA 101 Life Safety Code, published by the National Fire Protection Association
3. The Maine Uniform Building and Energy Code (MUBEC)

* Building permit will expire if the work is not complete within two (2) years from the date permit was issued. Work on the project should not continue after the two (2) year period without obtaining a new permit.

Lot Dimensional Requirements

District:	Rural	Residential	Rural Village Business	Village	Historic Village	Downtown Business	Route 1 Rural	Route 1 Urban	Industrial
Minimum Lot Size	80,000 sq. ft.	80,000 sq. ft.	*5,000*-80,000 sq. ft.	*5,000*-80,000 sq. ft.	*None*	*None*	80,000 sq. ft.	*5,000*-80,000 sq. ft.	80,000 sq. ft.
Road and Shore Frontage	200 ft.	200 ft.	150 ft	150 ft	*75* ft	*None*	400 ft	150 ft	200 ft
Road Setback	75 ft.	75 ft.	*25* ft.	*25* ft.	*25* ft.	*None*	100 ft	*25* ft.	150 ft.
Side, Rear Setbacks	30 ft.	30 ft.	*15* ft.	*15* ft.	*15* ft.	*None*	30 ft.	*15* ft.	30 ft.
Max. Lot Coverage	40%	40%	*50%*	*50%*	*50%*	*100%*	40%	40%	40%
Maximum Building Height: 3 ½ stories or 42 feet									
SHORELAND ZONING: High Water Line Setback – 100 feet, Maximum Building Height – 35 Feet									

A.1.4 : Permit by Rule Notification Form

DEPARTMENT OF ENVIRONMENTAL PROTECTION

PERMIT BY RULE NOTIFICATION FORM

(For use with DEP Regulation, Natural Resources Protection Act - Permit by Rule Standards, Chapter 305)

APPLICANT INFORMATION (Owner)		AGENT INFORMATION (If Applying on Behalf of Owner)	
Name:		Name:	
Mailing Address:		Mailing Address:	
Mailing Address:		Mailing Address:	
Town/State/Zip:		Town/State/Zip:	
Daytime Phone #:	Ext:	Daytime Phone #:	Ext:
Email Address:		Email Address:	

PROJECT INFORMATION

Part of a larger project? (check 1):	❑ Yes ❑ No	After the Fact? (check 1):	❑ Yes ❑ No	Project involves work below mean low water? (check 1):	❑ Yes ❑ No	Name of waterbody:	
Project Town:		Town Email Address:				Map and Lot Number:	
Brief Project Description:							
Project Location & Brief Directions to Site:							

PERMIT BY RULE (PBR) SECTIONS (Check at least one): I am filing notice of my intent to carry out work that meets the requirements for Permit-by-Rule (PBR) under DEP Rules, Chapter 305. I and my agent(s), if any, have read and will comply with all of the standards in the Sections checked below.

- ❑ **Sec. (2) Act. Adj. to Prot. Natural Res.**
- ❑ **Sec. (3) Intake Pipes**
- ❑ **Sec. (4) Replacement of Structures**
- ❑ **Sec. (6) Movement of Rocks or Veg.**
- ❑ **Sec. (7) Outfall Pipes**
- ❑ **Sec. (8) Shoreline Stabilization**
- ❑ **Sec. (9) Utility Crossing**
- ❑ **Sec. (10) Stream Crossing**
- ❑ **Sec. (11) State Transportation Facilities**
- ❑ **Sec. (12) Restoration of Natural Areas**
- ❑ **Sec. (13) F&W Creat./Water Qual. Improv.**
- ❑ **Sec. (15) Public Boat Ramps**
- ❑ **Sec. (16) Coastal Sand Dune Projects**
- ❑ **Sec. (17) Transfer/Permit Extension**
- ❑ **Sec. (18) Maintenance Dredging**
- ❑ **Sec. (19) Act. Near SVP Habitat**
- ❑ **Sec. (20) Act. Near Waterfowl/Bird Habitat**

NOTE: Municipal permits also *may* be required. Contact your local code enforcement office for information. Federal permits may be required for stream crossings and for projects involving wetland fill. Contact the Army Corps of Engineers at the Maine Project Office for information.

NOTIFICATION FORMS CANNOT BE ACCEPTED WITHOUT THE NECESSARY ATTACHMENTS AND FEE

- ❑ ***Attach*** **all required submissions for the PBR Section(s) checked above. The required submissions for each PBR Section are outlined in Chapter 305 and may differ depending on the Section you are submitting under.**
- ❑ ***Attach*** a location map that clearly identifies the site (U.S.G.S. topo map, Maine Atlas & Gazetteer, or similar).
- ❑ ***Attach*** *Proof of Legal Name* if applicant is a corporation, LLC, or other legal entity. Provide a copy of Secretary of State's *registration information* (available at http://icrs.informe.org/nei-sos-icrs/ICRS?MainPage=x). Individuals and municipalities are not required to provide any proof of identity.

FEE: Pay by credit card at the **Payment Portal**. The Permit-by-Rule fee may be found here https://www.maine.gov/dep/feeschedule.pdf and is currently $256.

- ❑ **Attach payment confirmation from the Payment Portal when filing this notification form.**

Signature & Certification:

- I authorize staff of the Departments of Environmental Protection, Inland Fisheries & Wildlife, and Marine Resources to access the project site for the purpose of determining compliance with the rules**.**
- I understand that this PBR becomes effective 14 calendar days after receipt by the Department of this completed form, the required submissions, and fee, *unless the Department approves or denies the PBR prior to that date.*

By signing this Notification Form, I represent that the project meets all applicability requirements and standards in Chapter 305 rule and that the applicant has sufficient title, right, or interest in the property where the activity takes place.

Signature of Agent or Applicant (may be typed):		**Date:**	

***Keep a copy as a record of permit*.** Email this completed form with attachments to DEP at: DEP.PBRNotification@maine.gov
DEP will send a copy to the Town Office as evidence of DEP's receipt of notification. No further authorization will be issued by DEP after receipt of notice. A PBR is valid for two years, except Section 4, "Replacement of Structures," are valid for three years. **Work carried out in violation of the Natural Resources Protection Act or any provision in Chapter 305 is subject to enforcement.**

A.1.5 : Application for a Natural Resources Protection Act Permit

Department of Environmental Protection
Bureau of Land & Water Quality
17 State House Station
Augusta, Maine 04333
Telephone: 207-287-7688

FOR DEP USE
ATS #_____
L- _____
Total Fees: _____
Date: Received _____

APPLICATION FOR A NATURAL RESOURCES PROTECTION ACT PERMIT

➔**PLEASE TYPE OR PRINT IN *BLACK INK ONLY***

1. Name of Applicant:		**5.Name of Agent:**	
2. Applicant's Mailing Address:		**6. Agent's Mailing Address:**	
3. Applicant's Daytime Phone #:		**7. Agent's Daytime Phone #:**	
4. Applicant's Email Address (Required from *either* applicant or agent):		**8. Agent's Email Address:**	

9. Location of Activity: (Nearest Road, Street, Rt.#)		**10. Town:**		**11. County:**	

12. Type of Resource: (Check all that apply)	❑ River, stream or brook ❑ Great Pond ❑ Coastal Wetland ❑ Freshwater Wetland ❑ Wetland Special Significance ❑ Significant Wildlife Habitat ❑ Fragile Mountain	**13. Name of Resource:**	
		14. Amount of Impact: (Sq.Ft.)	**Fill:** **Dredging/Veg Removal/Other:**

15. Type of Wetland: (Check all that apply)	❑ Forested ❑ Scrub Shrub ❑ Emergent ❑ Wet Meadow ❑ Peatland ❑ Open Water ❑ Other_____	**FOR FRESHWATER WETLANDS**		
		Tier 1	*Tier 2*	*Tier 3*
		❑ 0 - 4,999 sq ft. ❑ 5,000-9,999 sq ft ❑ 10,000-14,999 sq ft	❑ 15,000 – 43,560 sq. ft.	❑ > 43,560 sq. ft. or ❑ smaller than 43,560 sq. ft., not eligible for Tier 1

16. Brief Activity Description:	

17. Size of Lot or Parcel & UTM Locations:	☐ _____square feet, or ☐ _____acres UTM Northing: _____ UTM Easting: _____
18. Title, Right or Interest:	❑ own ❑ lease ❑ purchase option ❑ written agreement

19. Deed Reference Numbers:	Book#: Page:	**20. Map and Lot Numbers:**	Map #:	Lot #:	
21. DEP Staff Previously Contacted:		**22. Part of a larger project:**	❑ Yes ❑ No	**After-the-Fact:**	❑ Yes ❑ No

23. Resubmission of Application?:	❑ Yes➔ ❑ No	**If yes, previous application #**		**Previous project manager:**	
24. Written Notice of Violation?:	❑ Yes ➔ ❑ No	**If yes, name of DEP enforcement staff involved:**		**25. Previous Wetland Alteration:**	❑ Yes ❑ No

26. Detailed Directions to the Project Site:	

27. TIER 1	**TIER 2/3 AND INDIVIDUAL PERMITS**	
❒ Title, right or interest documentation ❒ Topographic Map ❒ Narrative Project Description ❒ Plan or Drawing (8 1/2" x 11") ❒ Photos of Area ❒ Statement of Avoidance & Minimization ❒ Statement/Copy of cover letter to MHPC	❒ Title, right or interest documentation ❒ Topographic Map ❒ Copy of Public Notice/Public Information Meeting Documentation ❒ Wetlands Delineation Report (Attachment 1) that contains the Information listed under Site Conditions ❒ Alternatives Analysis (Attachment 2) including description of how wetland impacts were Avoided/Minimized	❒ Erosion Control/Construction Plan ❒ Functional Assessment (Attachment 3), if required ❒ Compensation Plan (Attachment 4), if required ❒ Appendix A and others, if required ❒ Statement/Copy of cover letter to MHPC ❒ Description of Previously Mined Peatland, if required

28. FEES Amount Enclosed:	

CERTIFICATIONS AND SIGNATURES LOCATED ON PAGE 2

IMPORTANT: IF THE SIGNATURE BELOW IS NOT THE APPLICANT'S SIGNATURE, ATTACH LETTER OF AGENT AUTHORIZATION SIGNED BY THE APPLICANT.

By signing below the applicant (or authorized agent), certifies that he or she has read and understood the following :

DEP SIGNATORY REQUIREMENT

PRIVACY ACT STATEMENT

Authority: 33 USC 401, Section 10; 1413, Section 404. Principal Purpose: These laws require permits authorizing activities in or affecting navigable waters of the United States, the discharge of dredged or fill material into waters of the United States, and the transportation of dredged material for the purpose of dumping it into ocean waters. Disclosure: Disclosure of requested information is voluntary. If information is not provided, however, the permit application cannot be processed nor a permit be issued.

CORPS SIGNATORY REQUIREMENT

USC Section 1001 provides that: Whoever, in any manner within the jurisdiction of any department or agency of the United States knowingly and willfully falsifies, conceals, or covers up any trick, scheme, or disguises a material fact or makes any false, fictitious or fraudulent statements or representations or makes or uses any false writing or document knowing same to contain any false, fictitious or fraudulent statements or entry shall be fines not more than $10,000 or imprisoned not more than five years or both. I authorize the Corps to enter the property that is subject to this application, at reasonable hours, including buildings, structures or conveyances on the property, to determine the accuracy of any information provided herein.

DEP SIGNATORY REQUIREMENT

"I certify under penalty of law that I have personally examined the information submitted in this document and all attachments thereto and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe the information is true, accurate, and complete. I authorize the Department to enter the property that is the subject of this application, at reasonable hours, including buildings, structures or conveyances on the property, to determine the accuracy of any information provided herein. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Further, I hereby authorize the DEP to send me an electronically signed decision on the license I am applying for with this application by emailing the decision to the address located on the front page of this application (see #4 for the applicant and #8 for the agent)."

_____ Date:_____

SIGNATURE OF AGENT/APPLICANT

NOTE: Any changes in activity plans must be submitted to the DEP and the Corps in writing and must be approved by both agencies prior to implementation. Failure to do so may result in enforcement action and/or the removal of the unapproved changes to the activity.

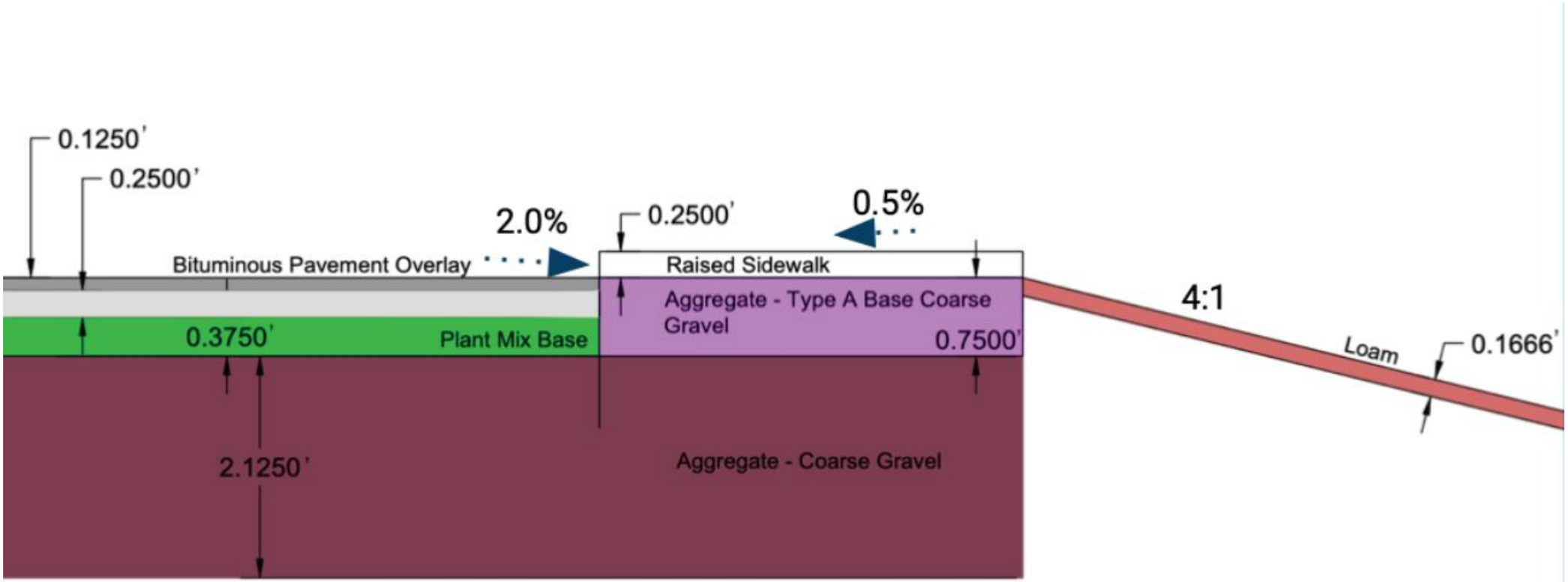
A.1.6 : Land Use Ordinance Regulations 6.6.5 & 6.6.6

6.6.5 Route One Commercial A District. The purpose of the Route One Commercial A District, which applies to portions of Route One, is to replace the strip development with well-planned, attractive, well – landscaped development, to encourage a uniform street-scape along the corridor, to minimize roadway openings onto Route One, and to provide vehicle connections between lots. The district is designated for a mix of residential/commercial uses, commercial uses, light industry/manufacturing, agriculture and forestry.

6.6.6 Route One Commercial B District. The purpose of the Route One Commercial B District is to allow business and light industry/manufacturing development along Route One with fewer restrictions than in the Route One Commercial A District.

A.2 : Sidewalk Design

A.2.1 : Sidewalk Cross Section



SITE: Waldoboro, Maine, U.S. Route 1	1/1 DRAWING NO.		1 PROJECT NO.	4/5/2021 DATE.	
TITLE: Sidewalk Cross Section	1":5' SCALE AT A4.	MA DRAWN.	EB CHECKED.	A REVISION.	

MARY AND SONS

A.2.2 : Traffic Control Plan

Mary and Sons Traffic Control Plan - Waldoboro, ME 2/10/21

Summary

Mary and Sons is working with the town of Waldoboro on a series of walking trails throughout the downtown Waldoboro area. One aspect of the project is improving and installing a sidewalk along Route 1 from the Town Office to the intersection at Moody's and then on Main St. to the Old Route 1 intersection. This Traffic Control Plan has been developed to provide the Town of Waldoboro guidelines for traffic control measures to provide safe, continuous and effective traffic flow throughout the sidewalk improvements.

Signage and Channelization

This traffic control plan is provided in accordance with Part VI of the 2009 edition of the Manual on Uniform Traffic Control Devices (MUTCD). Channelization devices will be used to delineate travel lanes throughout the project at spacing called for in Part VI of the 2009 edition of the MUTCD. Channelization devices that may be used include:

Drums
Cones
Temporary Pavement Markings

Approach signing and work area signing will be placed at locations in accordance with Part VI of the 2009 edition of the MUTCD. Temporary tripod easels shall be labeled NCHRP 350 and 2009 MUTCD compliant daytime use only. Easels will be weighted by use of tethered sandbags when used. Sandbags shall be in contact with the ground. Signs that are not on tripod mounted signs shall be installed using two breakaway posts. Approach signage that may be used include:

Road Work 500 Feet (Ahead)
Shoulder Closed Ahead
One Lane Road Ahead
Lane Shift Arrows
Flagger Sign
Be Prepared to Stop
End Road Work

Mary and Sons plan for all signs to be in accordance with the 2009 version of the MUTCD for an urban high-speed road. This temporary sign package will be similar to MUTCD Typical Application 6 - Shoulder Work with Minor Encroachment (TA-6) and Typical Application 3 - Work on the Shoulders (TA-3) when close to intersections. In special occasions where the contractor will need more space for installing the sidewalk, provisions should be made for alternate one-way movement through the constricted section via methods such as flagger control, a flag transfer, a pilot car, or stop or yield control. Typical Application 10 - Lane Closure on a Two-Lane Road Using Flaggers (TA-10) visually shows how flaggers can be used to safely provide an alternate one-way road to provide a wider work space.

Vehicle and Pedestrian Traffic Considerations

It is not expected that any of the sidewalk construction will dramatically affect vehicle traffic patterns. On the roughly half-mile span of sidewalk improvements from the Town Office to the intersection at Moody's, the road is wide enough to mark off the shoulder and shift vehicle traffic to maintain at least two lanes of alternating traffic. The other span of sidewalk improvements from Main St. to the Old Route 1 intersection is on a much more narrow road and will be more susceptible to vehicle traffic interference. A full lane closure may be needed on this strip of shoulder work with the road being more narrow than Route 1. The AADT is much lower (AADT of 2030 according to 2019 MeDOT Public Map Viewer) on Main St. than Route 1 (AADT of 14220 according to 2019 MeDOT Public Map Viewer) which will make it a much better road for shutting down a lane from a vehicle traffic congestion standpoint. It is expected that most of the sidewalk improvements will be able to be done without shutting down any lanes of traffic, but traffic delineation will have to take place to provide a safe work zone on the shoulder of the road.

There will be no special detours during the sidewalk improvements in this project.

There are no current sidewalks where the sidewalk improvements are implemented and it can be expected that there will be minimal pedestrian traffic. Pedestrians will have to be restricted from work areas by the use of barrels, cones, caution tape, barricades and signs. (Reference MUTCD TA 6H-28)

Closing Statement

This Traffic Control Plan conforms to the requirements of the 2009 edition of the MUTCD. All Traffic Control Devices conforms to the requirements of the MUTCD and NCHRP 350 guidelines.

References

Maine.gov. (n.d.). Retrieved February 10, 2021, from https://www.maine.gov/mdot/mapviewer/

Manual on uniform traffic control devices: For streets and highways. (2009). In *Manual on uniform traffic control devices: For streets and highways*. Washington, D.C.: U.S. Dept. of Transportation, Federal Highway Administration.

APPENDIX

Figure 6C-1. Component Parts of a Temporary Traffic Control Zone

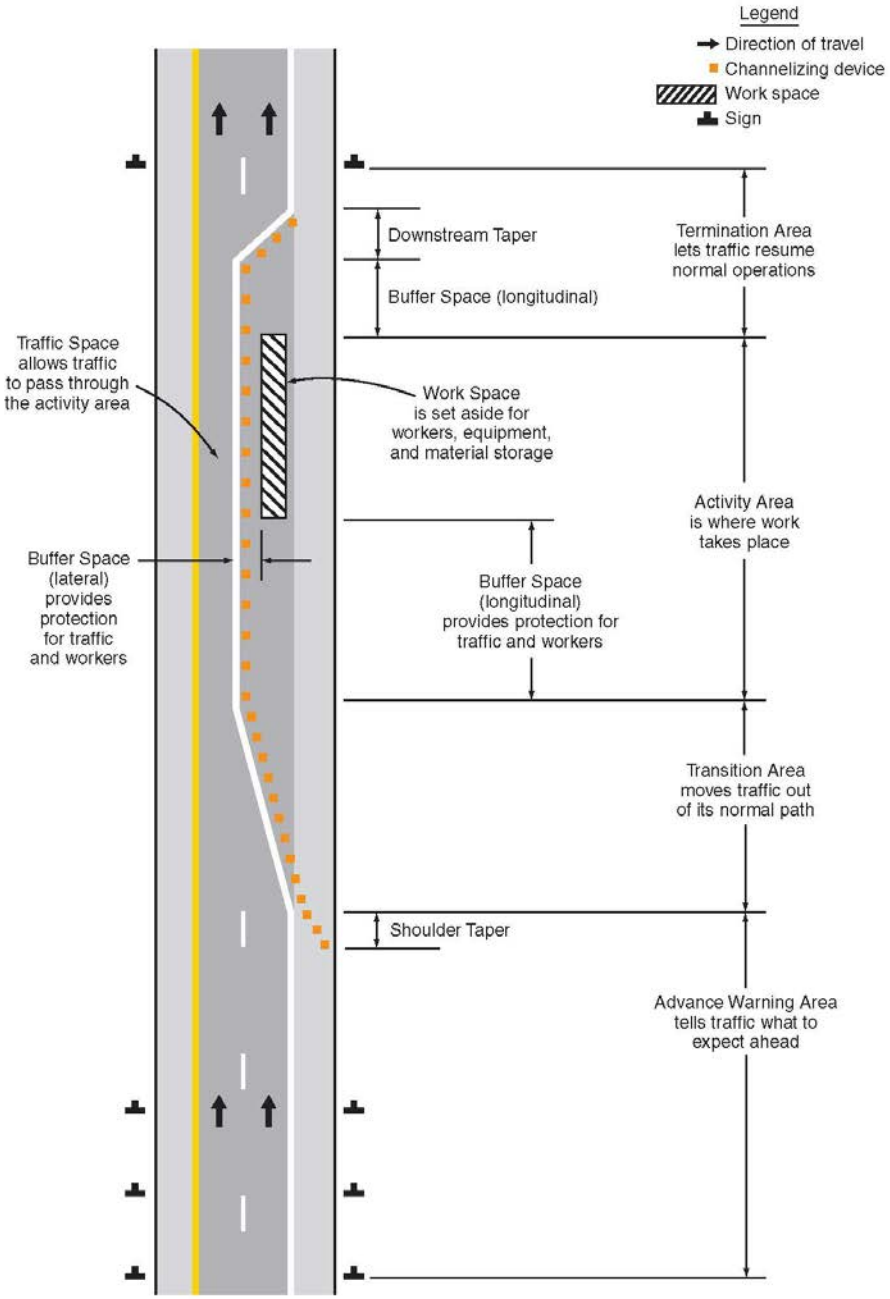


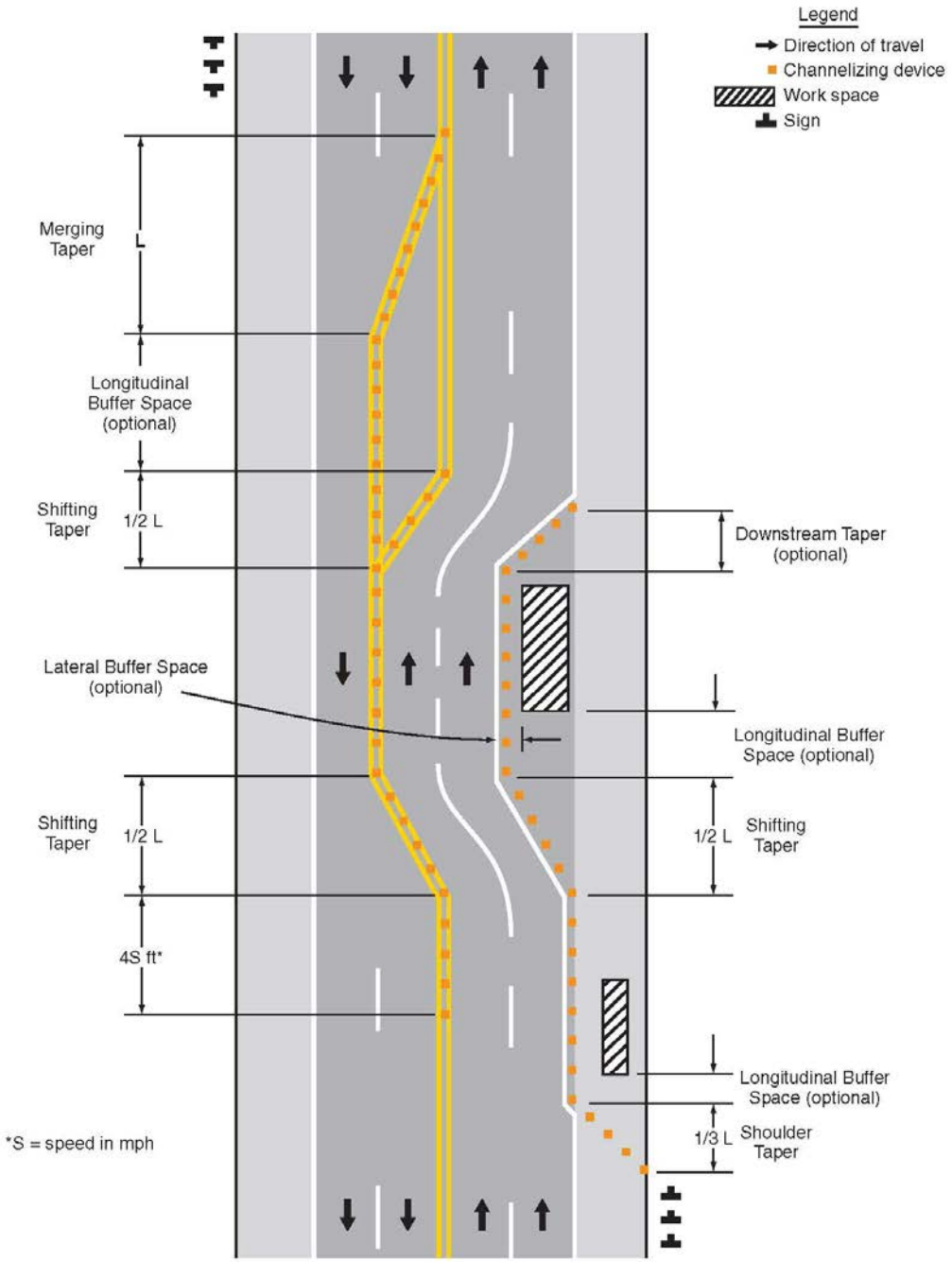
Table 6C-1. Recommended Advance Warning Sign Minimum Spacing

Road Type	Distance Between Signs**		
	A	B	C
Urban (low speed)*	100 feet	100 feet	100 feet
Urban (high speed)*	350 feet	350 feet	350 feet
Rural	500 feet	500 feet	500 feet
Expressway / Freeway	1,000 feet	1,500 feet	2,640 feet

* Speed category to be determined by the highway agency

** The column headings A, B, and C are the dimensions shown in Figures 6H-1 through 6H-46. The A dimension is the distance from the transition or point of restriction to the first sign. The B dimension is the distance between the first and second signs. The C dimension is the distance between the second and third signs. (The "first sign" is the sign in a three-sign series that is closest to the TTC zone. The "third sign" is the sign that is furthest upstream from the TTC zone.)

Figure 6C-2. Types of Tapers and Buffer Spaces



Section 6C.07 Termination Area

Support:

1 The termination area is the section of the highway where road users are returned to their normal driving path. The termination area extends from the downstream end of the work area to the last TTC device such as END ROAD WORK signs, if posted.

Option:

2 An END ROAD WORK sign, a Speed Limit sign, or other signs may be used to inform road users that they can resume normal operations.

3 A longitudinal buffer space may be used between the work space and the beginning of the downstream taper.

Section 6C.08 Tapers

Option:

1 Tapers may be used in both the transition and termination areas. Whenever tapers are to be used in close proximity to an interchange ramp, crossroads, curves, or other influencing factors, the length of the tapers may be adjusted.

Support:

2 Tapers are created by using a series of channelizing devices and/or pavement markings to move traffic out of or into the normal path. Types of tapers are shown in Figure 6C-2.

3 Longer tapers are not necessarily better than shorter tapers (particularly in urban areas with characteristics such as short block lengths or driveways) because extended tapers tend to encourage sluggish operation and to encourage drivers to delay lane changes unnecessarily. The test concerning adequate lengths of tapers involves observation of driver performance after TTC plans are put into effect.

Guidance:

4 *The appropriate taper length (L) should be determined using the criteria shown in Tables 6C-3 and 6C-4.*

5 *The maximum distance in feet between devices in a taper should not exceed 1.0 times the speed limit in mph.*

Option:

MUTCD guidance on device spacing says the maximum distance in feet between devices in a taper should not exceed 1.0 times the speed limit in mph. This distance in feet may be modified to a maximum of 1.25 times the speed limit in mph to correspond with the pavement marking cycle length (length of one broken line segment plus one gap).

Devices in a downstream taper or a one-lane, two-way taper may be placed at a spacing of approximately 25 feet.

Table 6C-3. Taper Length Criteria for Temporary Traffic Control Zones

Type of Taper	Taper Length
Merging Taper	at least L
Shifting Taper	at least 0.5 L
Shoulder Taper	at least 0.33 L
One-Lane, Two-Way Traffic Taper	50 feet minimum, 100 feet maximum
Downstream Taper	50 feet minimum, 100 feet maximum

Note: Use Table 6C-4 to calculate L

Table 6C-4. Formulas for Determining Taper Length

Speed (S)	Taper Length (L) in feet
40 mph or less	$L = \frac{WS^2}{60}$
45 mph or more	$L = WS$

Where: L = taper length in feet
W = width of offset in feet
S = posted speed limit, or off-peak 85th-percentile speed prior to work starting, or the anticipated operating speed in mph

Support:

6 A merging taper requires the longest distance because drivers are required to merge into common road space.

Guidance:

7 *A merging taper should be long enough to enable merging drivers to have adequate advance warning and sufficient length to adjust their speeds and merge into an adjacent lane before the downstream end of the transition.*

Support:

8 A shifting taper is used when a lateral shift is needed. When more space is available, a longer than minimum taper distance can be beneficial. Changes in alignment can also be accomplished by using horizontal curves designed for normal highway speeds.

Guidance:

9 *A shifting taper should have a length of approximately 1/2 L (see Tables 6C-3 and 6C-4).*

Support:

10 A shoulder taper might be beneficial on a high-speed roadway where shoulders are part of the activity area and are closed, or when improved shoulders might be mistaken as a driving lane. In these instances, the same type, but abbreviated, closure procedures used on a normal portion of the roadway can be used.

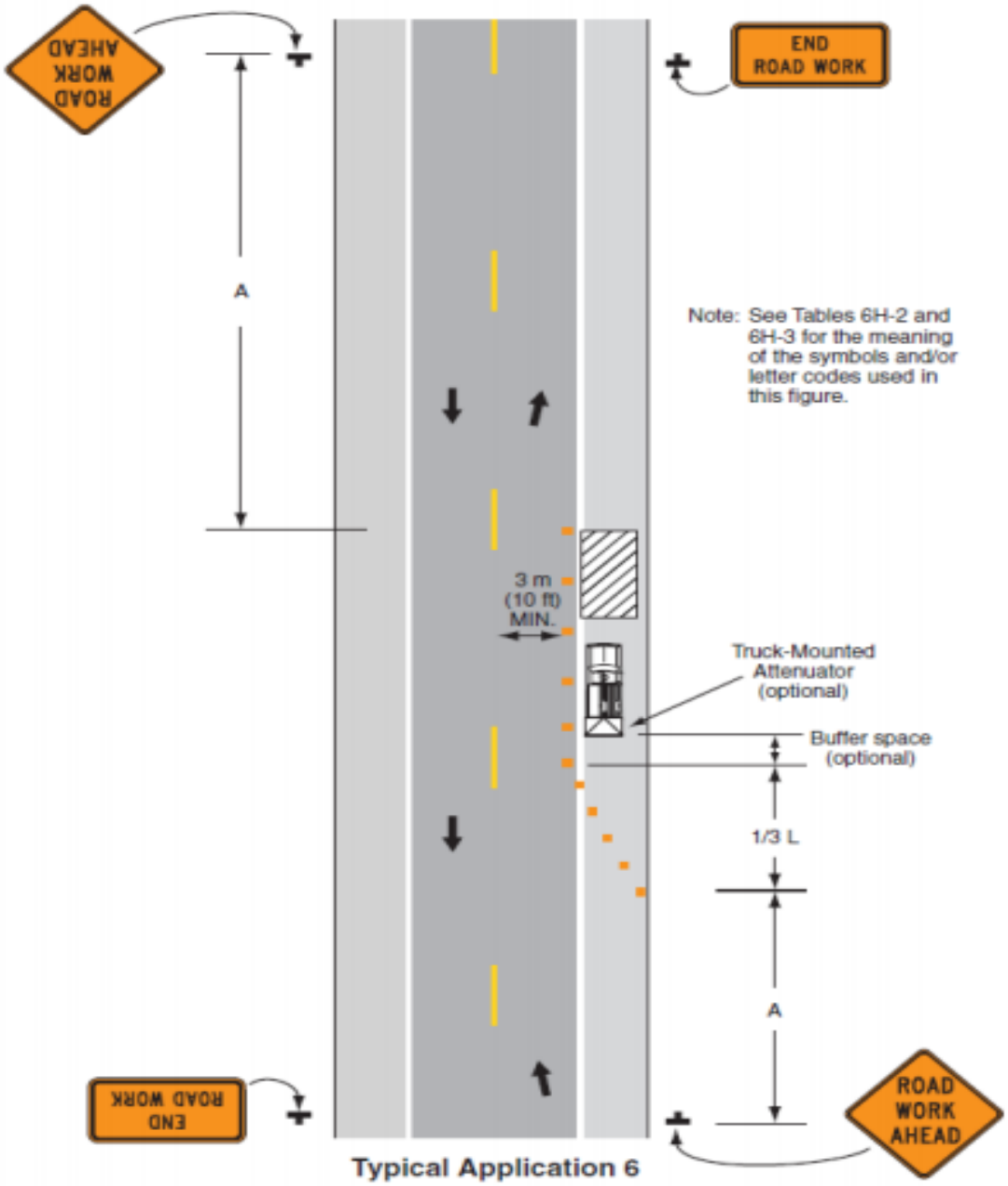
Guidance:

11 *If used, shoulder tapers should have a length of approximately 1/3 L (see Tables 6C-3 and 6C-4). If a shoulder is used as a travel lane, either through practice or during a TTC activity, a normal merging or shifting taper should be used.*

Support:

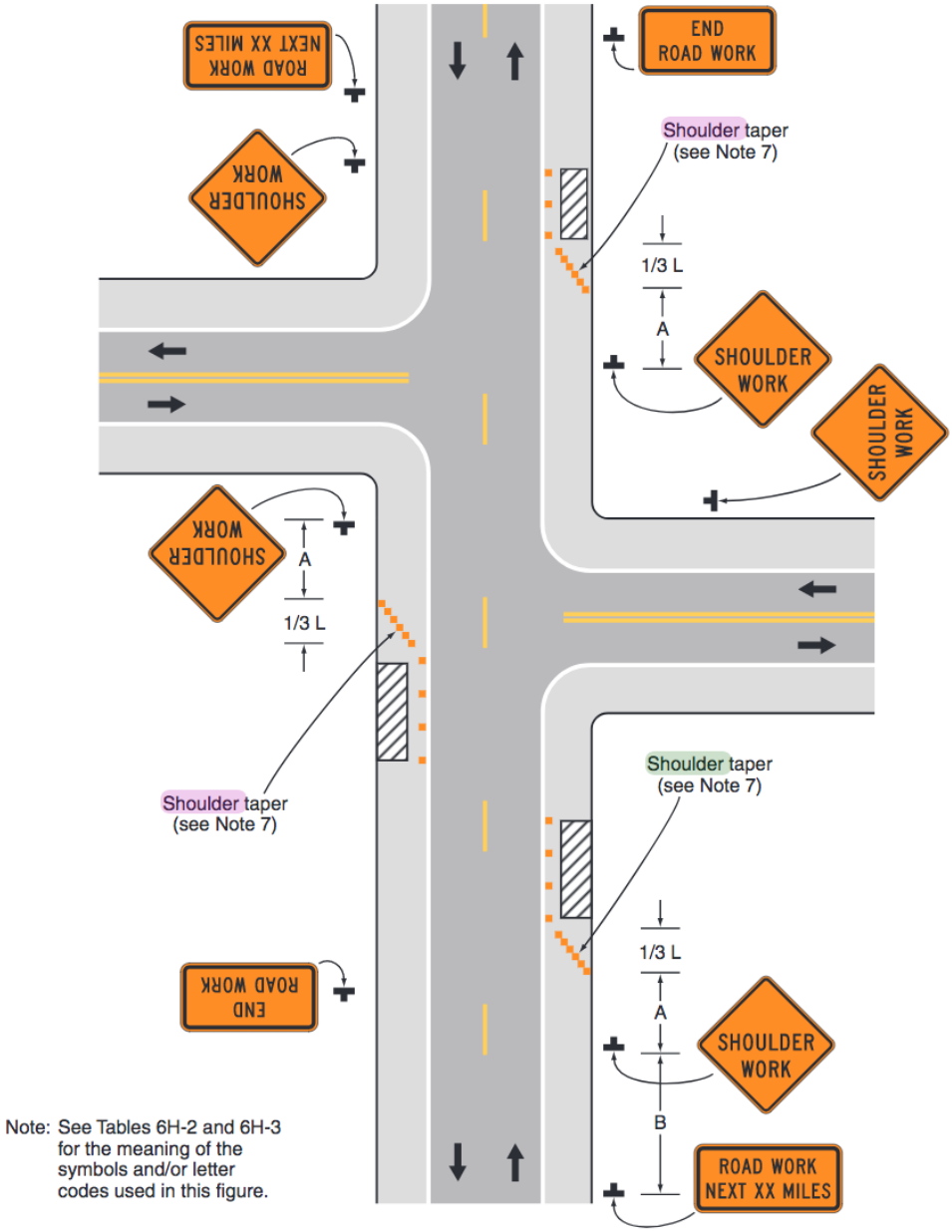
12 A downstream taper might be useful in termination areas to provide a visual cue to the driver that access is available back into the original lane or path that was closed.

Figure 6H-6. Shoulder Work with Minor Encroachment (TA-6)



Typical Application 6

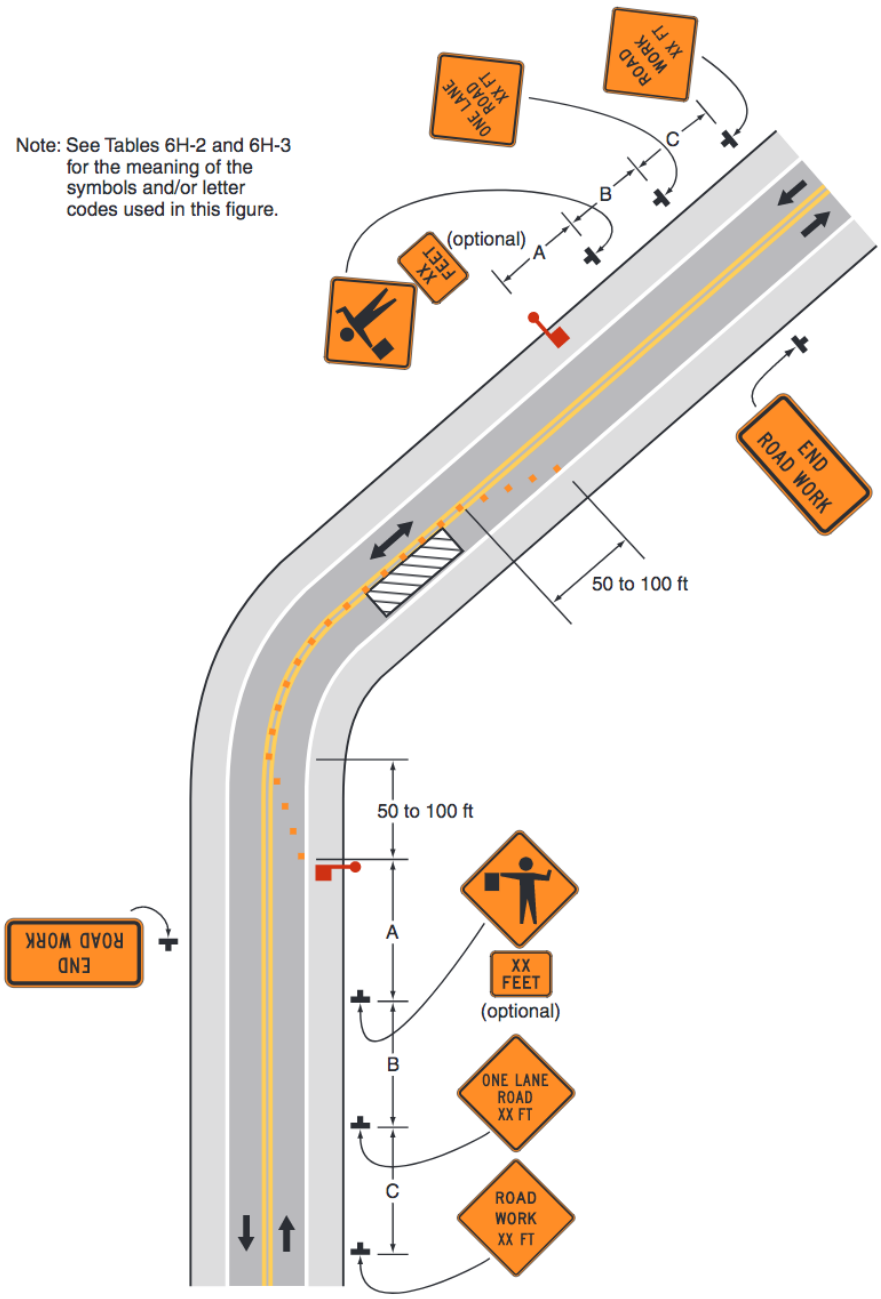
Figure 6H-3. Work on the Shoulders (TA-3)



Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.

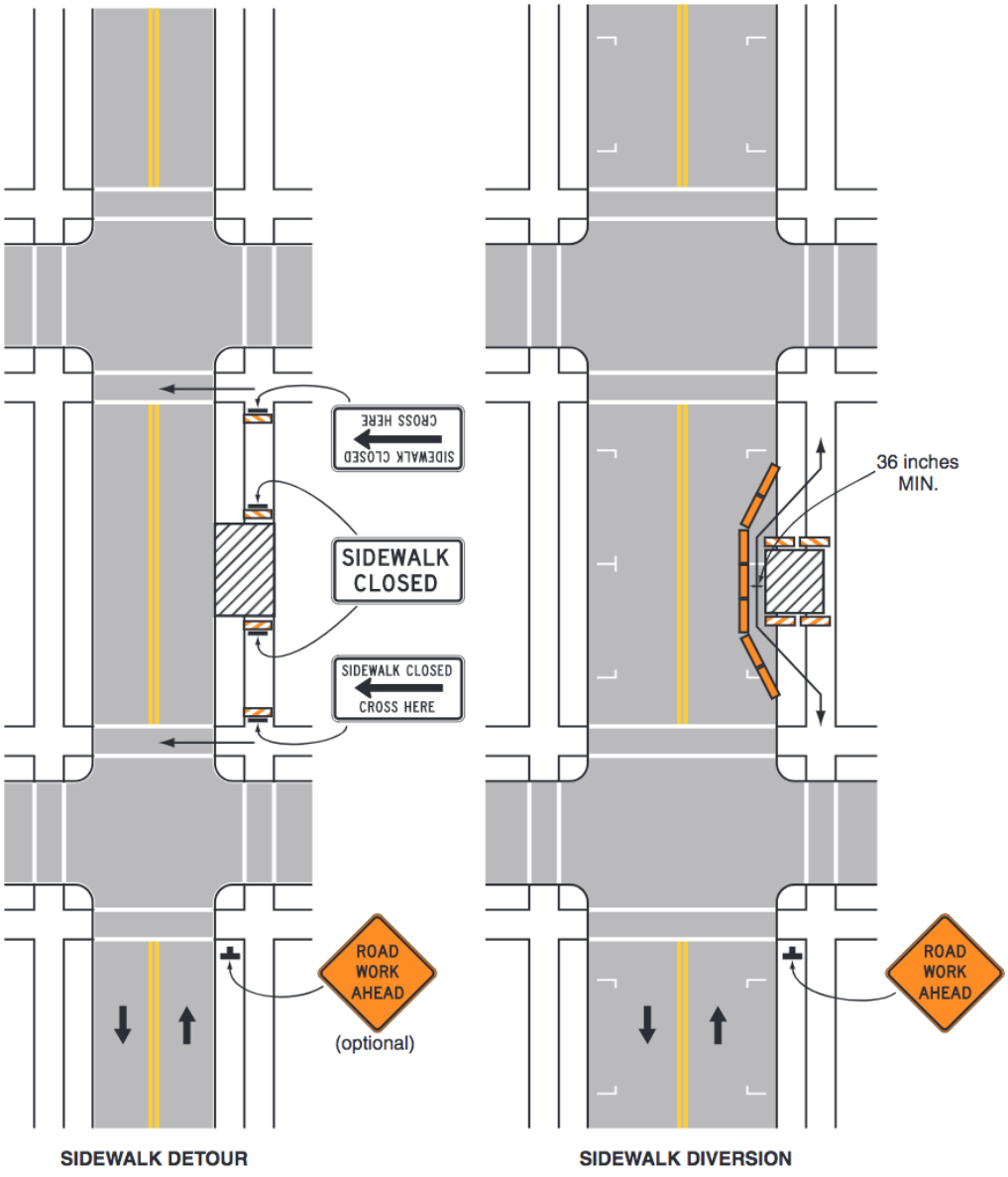
Typical Application 3

Figure 6H-10. Lane Closure on a Two-Lane Road Using Flaggers (TA-10)



Typical Application 10

Figure 6H-28. Sidewalk Detour or Diversion (TA-28)

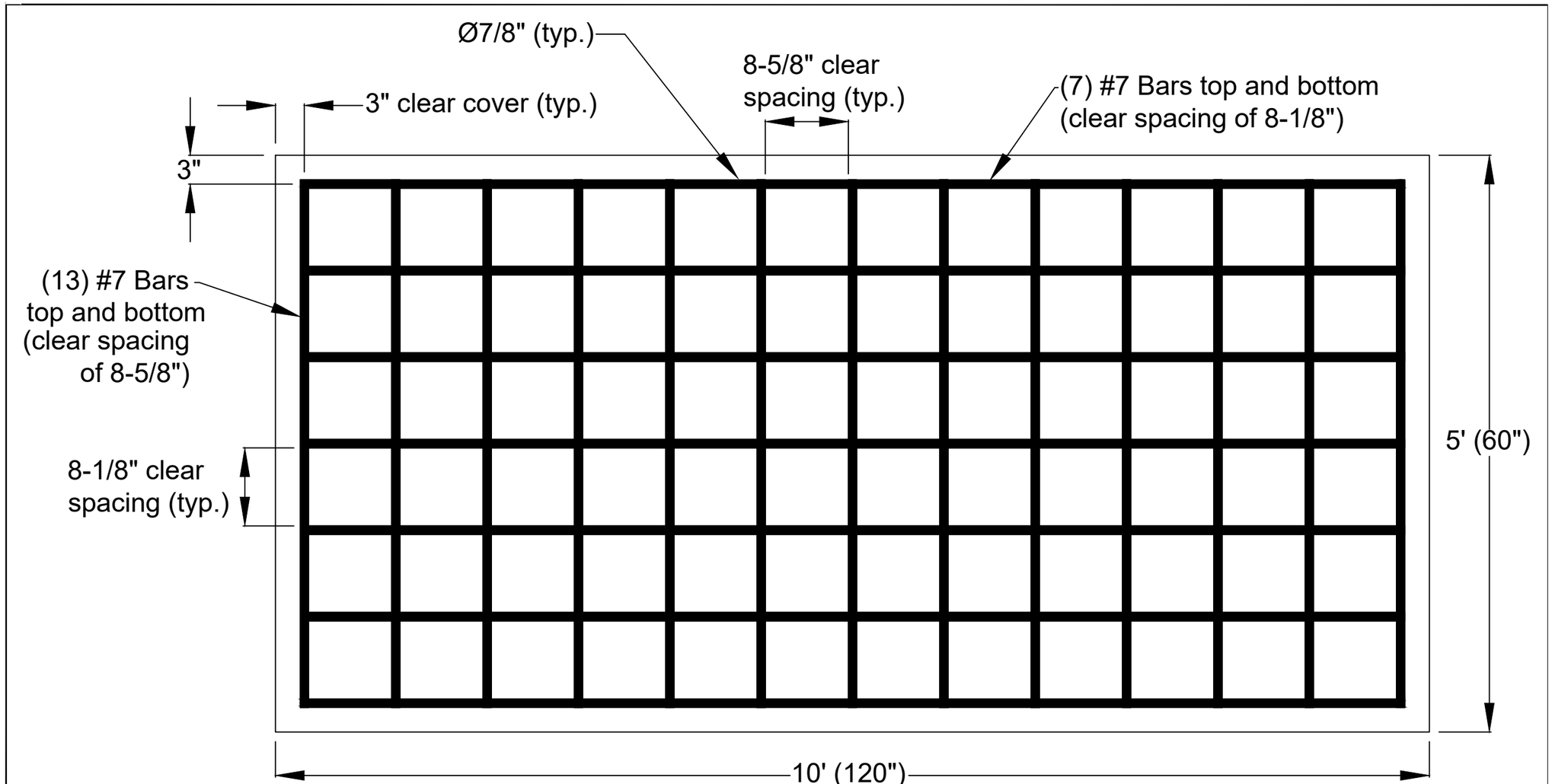


Typical Application 28

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.

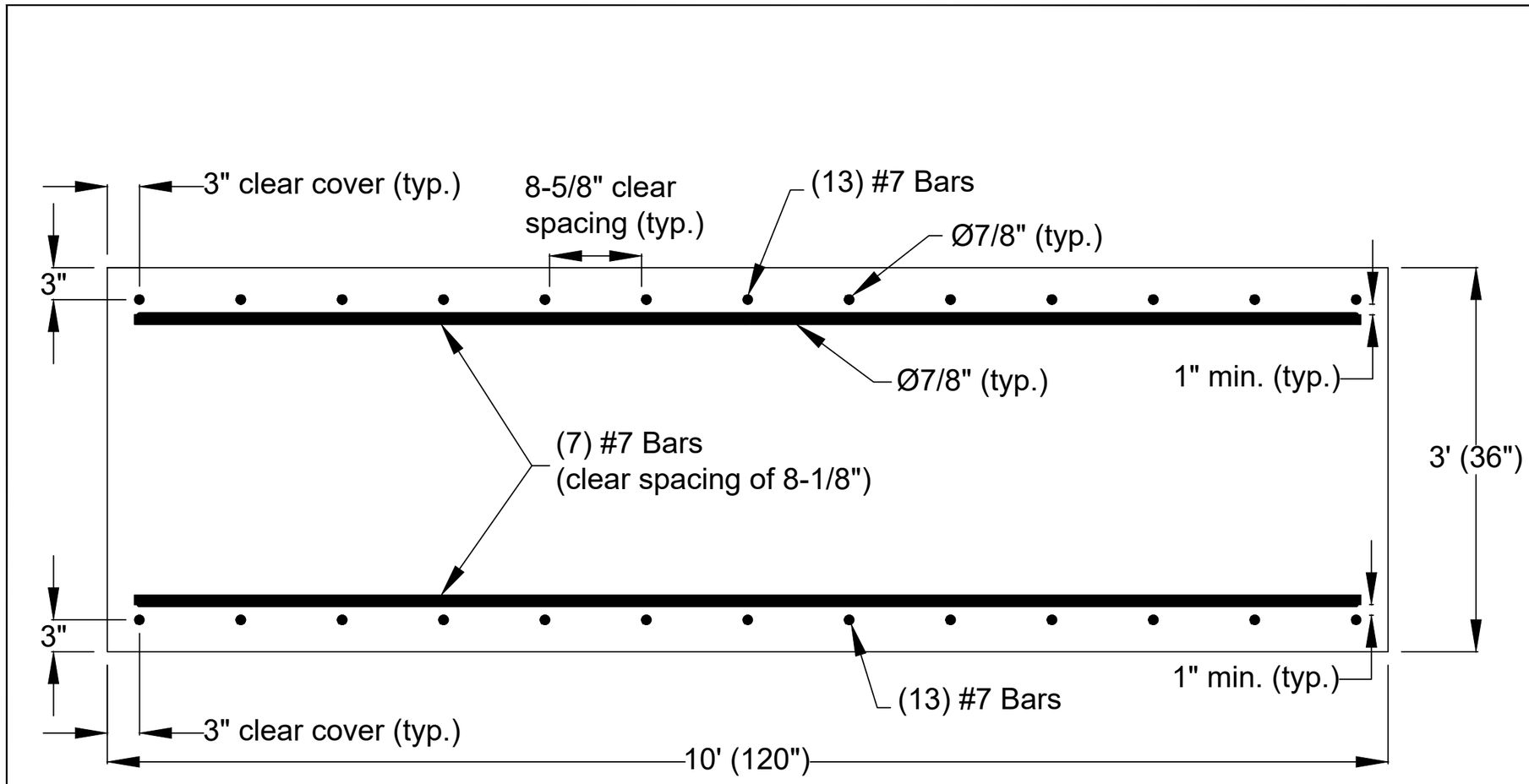
Appendix A.3 : Footbridge Design and Drawings

Appendix A.3.1 : Footbridge Drawings Package



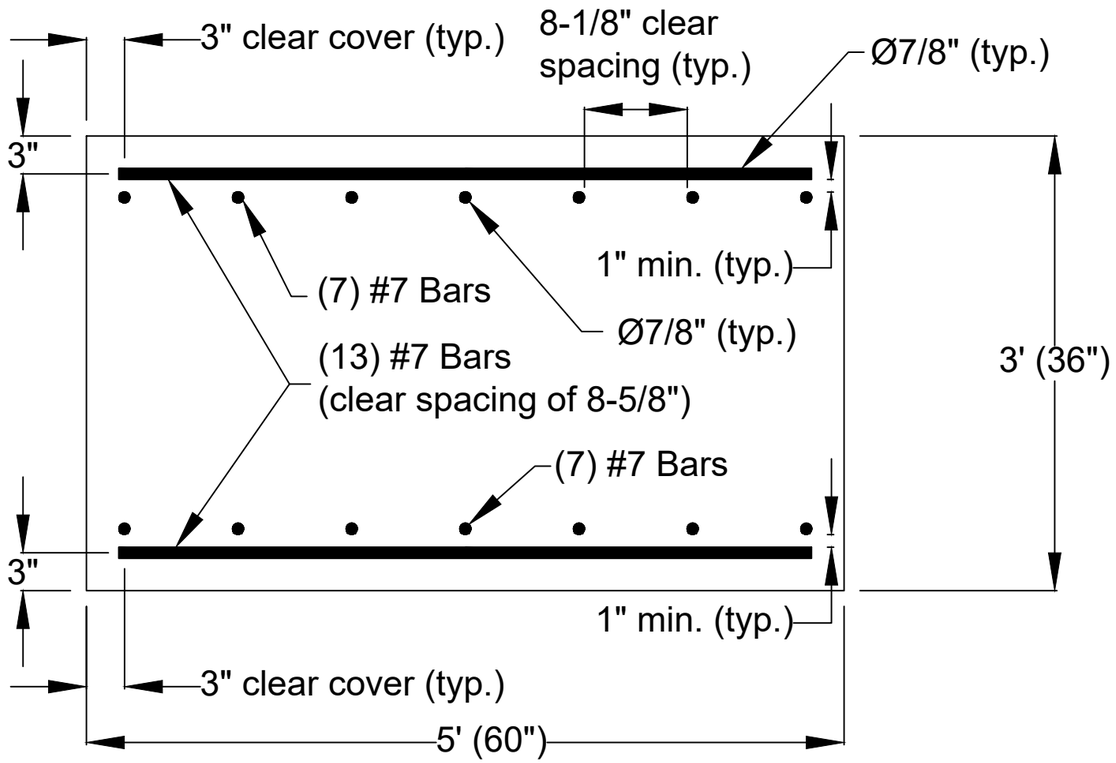
Plan View

SITE: Waldoboro, Maine, Kalers Corner	1/3 DRAWING NO.		1 PROJECT NO.	3/17/2021 DATE.	MARY AND SONS
TITLE: Footbridge Foundation Design (2D)	1":1' SCALE AT A4.	AS DRAWN.	KP CHECKED.	A REVISION.	



East-West Elevation

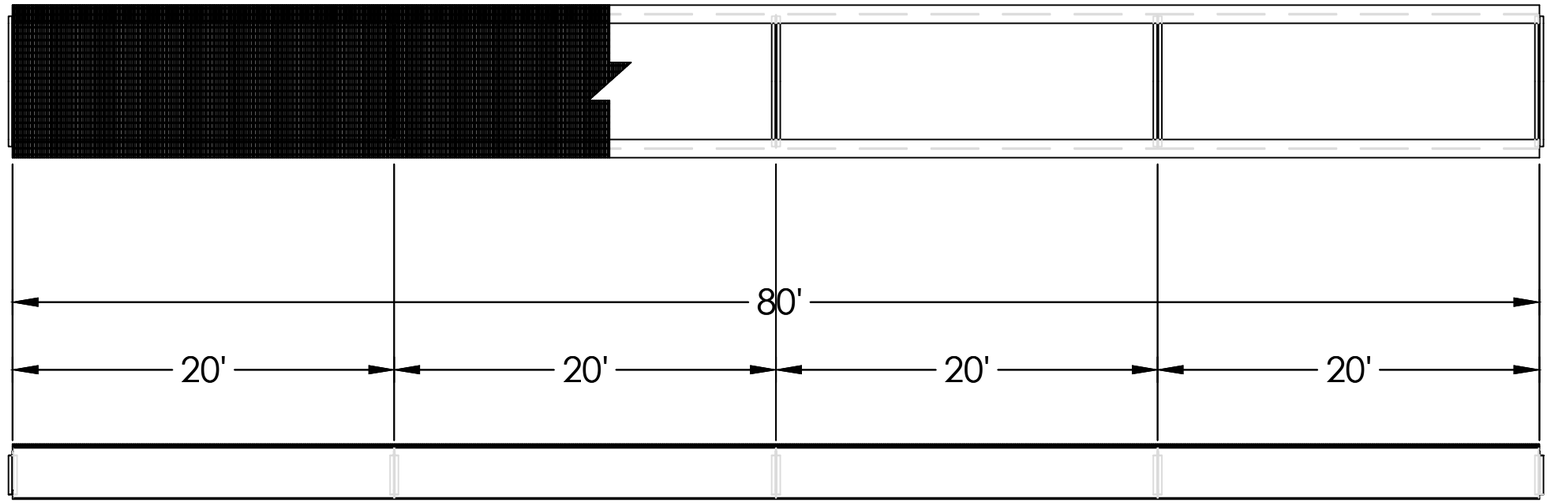
SITE: Waldoboro, Maine, Kalers Corner	2/3 DRAWING NO.		1 PROJECT NO.	3/17/2021 DATE.	MARY AND SONS
TITLE: Footbridge Foundation Design (2D)	1": 1' SCALE AT A4.	AS DRAWN.	KP CHECKED.	A REVISION.	

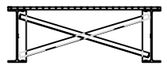


North-South Elevation

SITE: Waldoboro, Maine, Kalers Corner	3/3 DRAWING NO.		1 PROJECT NO.	3/17/2021 DATE.	MARY AND SONS
TITLE: Footbridge Foundation Design (2D)	1": 1' SCALE AT A4.	AS DRAWN.	KP CHECKED.	A REVISION.	

PLAN VIEW

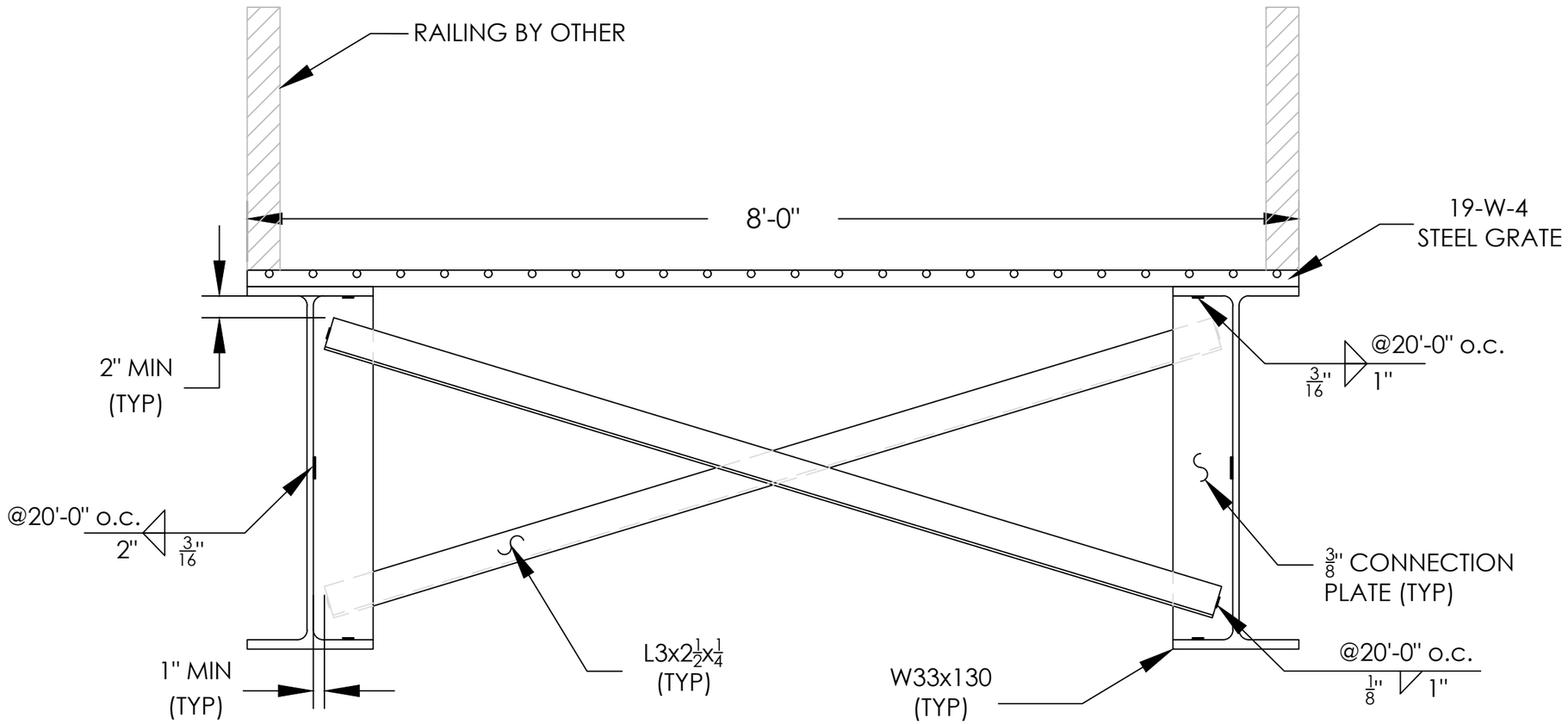




CROSS SECTION

SIDE ELEVATION

SITE: Waldoboro, Maine, U.S. Route 1	1/4 DRAWING NO.		1 PROJECT NO.	3/19/2021 DATE.	MARY AND SONS
TITLE: Medomak River Foot Bridge	1":10' SCALE AT A4.	MS DRAWN.	EB CHECKED.	A REVISION.	

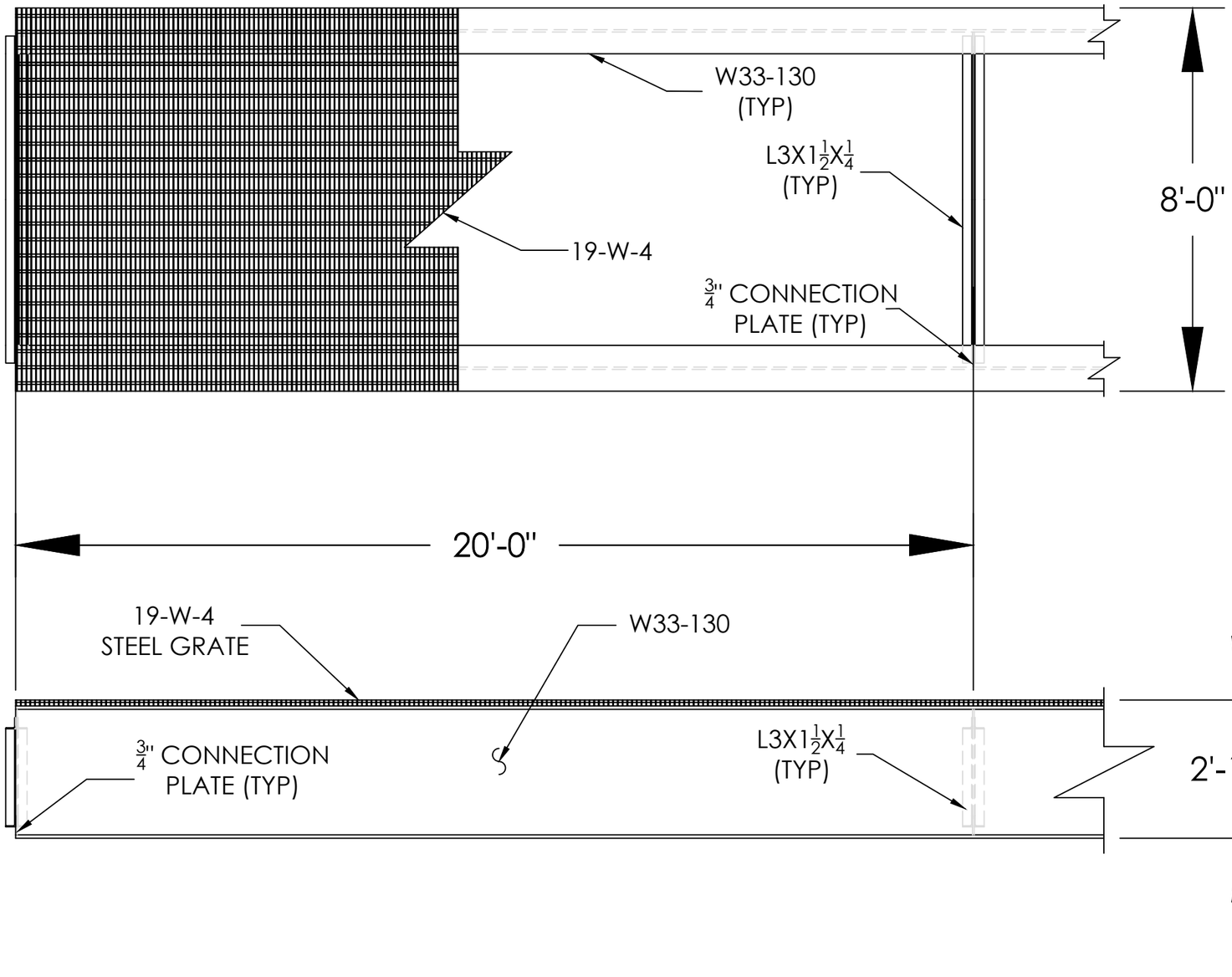


CROSS SECTION
(DIAPHRAGM)

NOTE: STEEL GRATE DECK AND RAILING ARE TO BE ATTACHED VIA WELDS TO BRIDGE GIRDERS

SITE: Waldoboro, Maine, U.S. Route 1	2/4 DRAWING NO.		1 PROJECT NO.	3/19/2021 DATE.
TITLE: Medomak River Foot Bridge	1":1 1/4" SCALE AT A4.	MS DRAWN.	EB CHECKED.	A REVISION.

MARY AND SONS

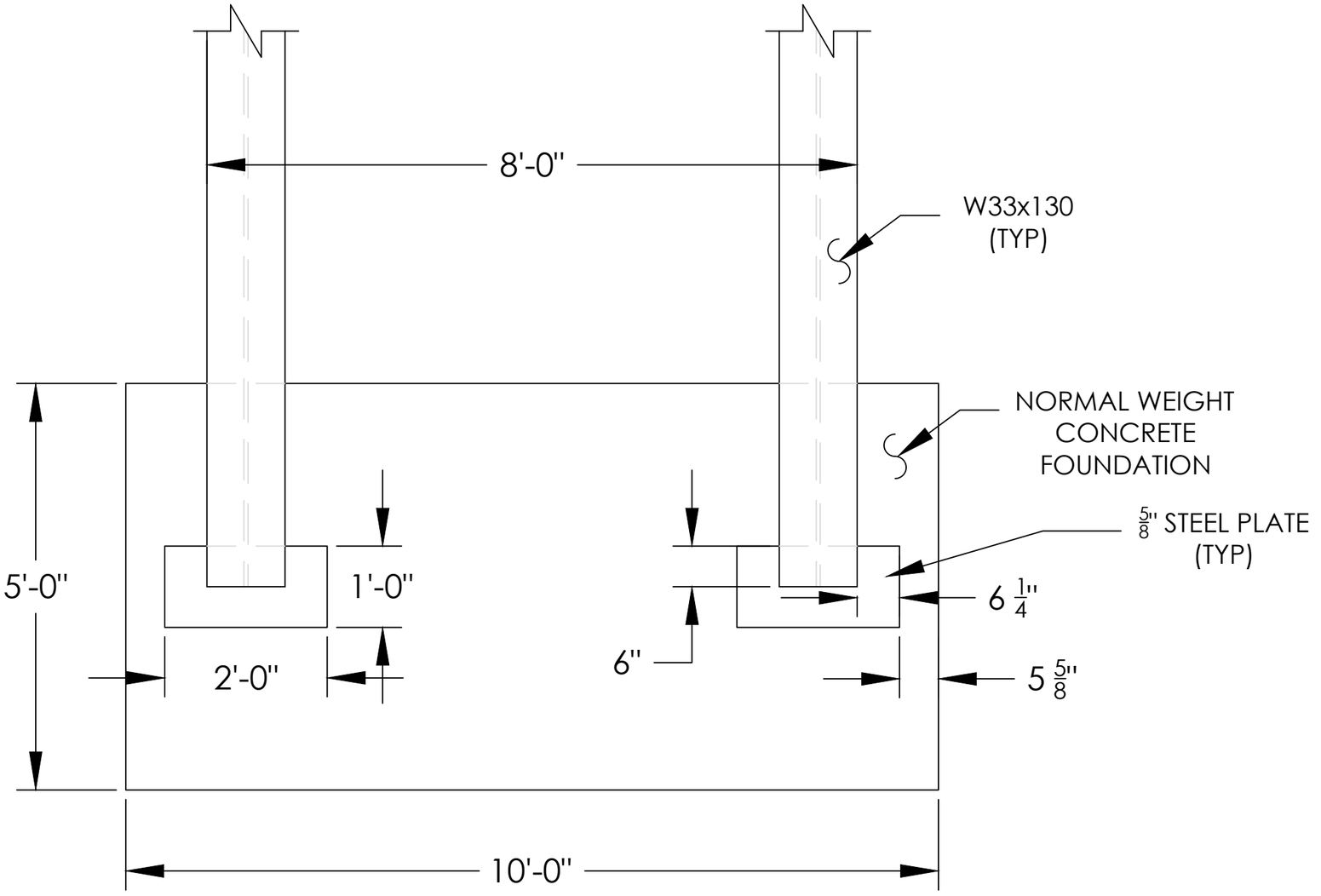


PLAN VIEW

SIDE ELEVATION

SITE: Waldoboro, Maine, U.S. Route 1	3/4 DRAWING NO.		1 PROJECT NO.	3/19/2021 DATE.
TITLE: Medomak River Foot Bridge	1":3 1/3' SCALE AT A4.	MS DRAWN.	EB CHECKED.	A REVISION.

MARY AND SONS



BASE PLATES

SITE: Waldoboro, Maine, U.S. Route 1	4/4 DRAWING NO.		1 PROJECT NO.	3/19/2021 DATE.
TITLE: Medomak River Foot Bridge	1":2' SCALE AT A4.	MS DRAWN.	EB CHECKED.	A REVISION.

MARY AND SONS

Appendix A.3.2 : SEWPCP Documents

Erosion and Sediment Control Law (Title 38 M.R.S.A. Section 420-C) The Erosion and Sedimentation Control Law (Erosion Control Law) applies to all construction projects in organized territories that will cause the filling, displacement or exposure of all earthen materials. The Erosion Control Law requires that appropriate measures prevent unreasonable soil erosion and sedimentation beyond the site or into a protected natural resource (such as a river, stream, brook, lake, pond, or wetland). Erosion control measures must be installed before construction begins, and must be maintained until the site is permanently stabilized.

RIPRAP SIZING

		CHANNEL SLOPE			
		1-2%	2-5%	5-10%	10-20%
MAXIMUM DEPTH OF FLOW (feet)	<0.5	3"	4"	4-6"	6-12"
	1.0	3"	6"	6-12"	12-18"
	2.0	4-6"	6-12"	12-18"	18-24"
	>3.0	6-12"	6-18"	18-24"	24"

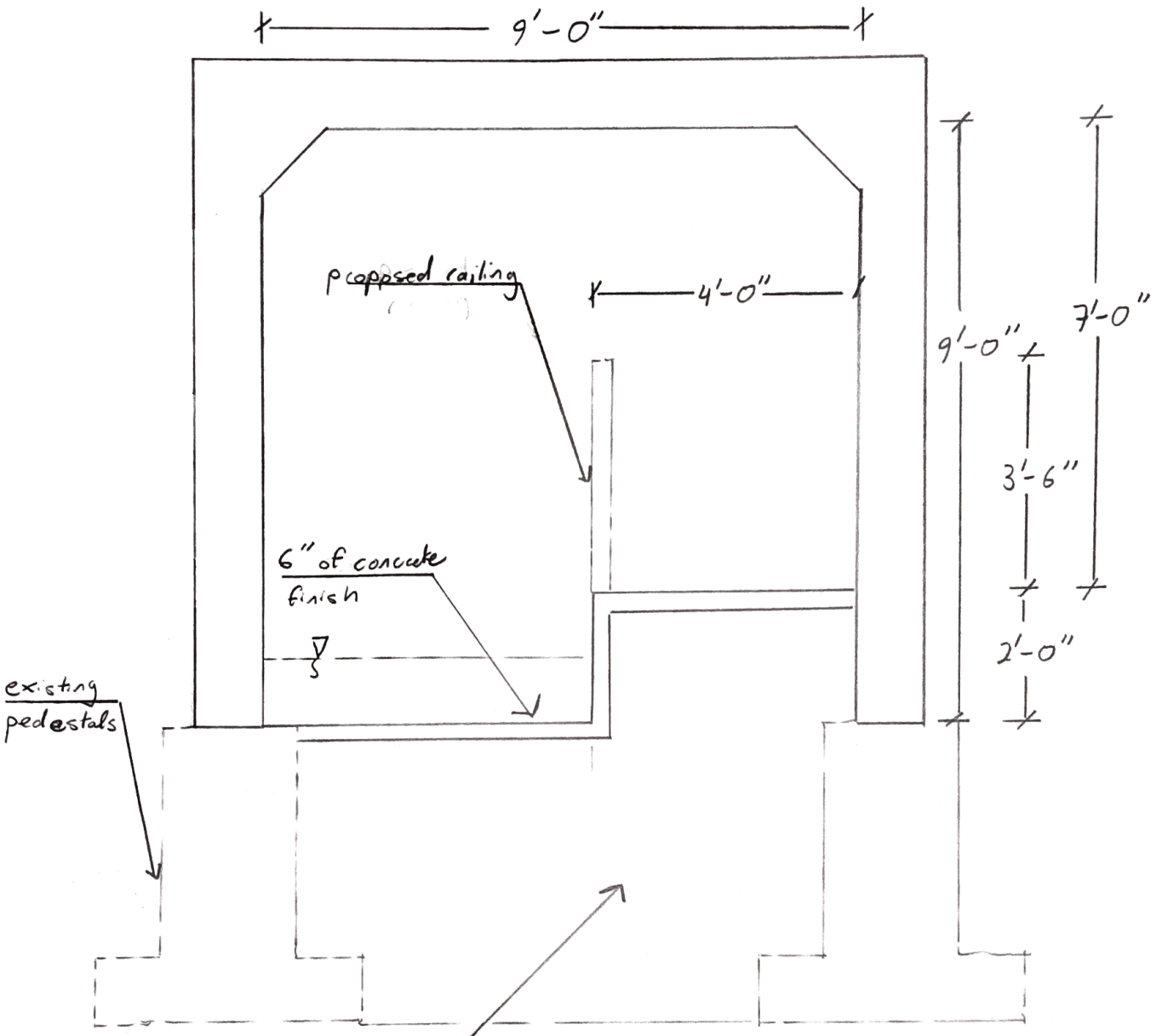
Natural Resources Protection Act (Title 38 M.R.S.A. Sections 480 A-JJ) The Natural Resources Protection Act (NRPA) regulates activities such as disturbing soil, placing fill, dredging, removing or displacing soil, sand or vegetation, draining or dewatering and building permanent structures in, on, over, and adjacent to lakes, ponds, river, streams, brooks, wetlands, coastal sand dunes, and tidal areas in organized territories.

Erosion control mix should contain a well-graded mixture of particle sizes and may contain rocks less than 4" in diameter. Erosion control mix should be free of refuse, physical contaminants, and material toxic to plant growth such as fly ash or yard scraping. Large portions of silts, clays or fine sands are not acceptable in the mix. The mix composition should meet the following standards:

- The organic matter content should be between 80% and 100%, dry weight basis.
- Particle size by weight should be 100% passing a 6" screen and 70% to 85% passing a 0.75" screen.
- The organic portion needs to be fibrous and elongated.
- Soluble salts content shall be < 4.0 mmhos/cm.
- The pH should be between 5.0 and 8.0.

Appendix A.4 : Culvert Walkway

Appendix A.4.1 : Culvert Retrofit Sketch



NOTES:

1. Walkway Width to be 4'-0" in accordance with Federal Highway Administration Bicycle & Pedestrian Transportation Standards
2. Concrete Finish of culvert and walkway to be 0'-6" in accordance with Federal Highway Administration
3. Walkway Railing to be at a height of at least 3'-6" in accordance with Federal Highway Administration

Appendix A.4.2 : Cost Estimation of Culvert Walking Trail

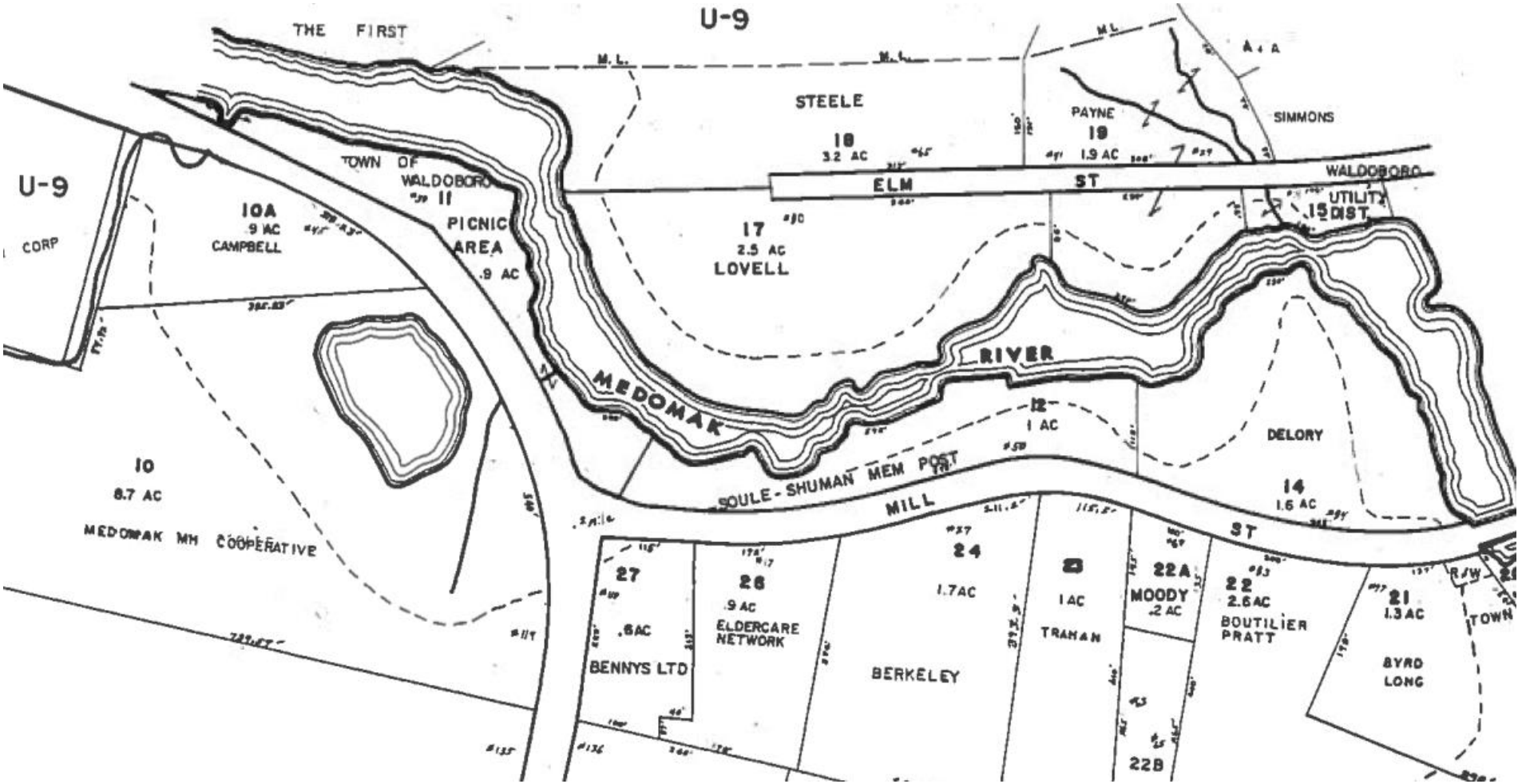
Labor/Tool costs	Unit	Labor Rate	Equipment Rate	Total Hours	Amount Required	Total Project Cost		Time:	
Loader Rental	HR		45	16	1	$ 720.00		Days	2
Operator	HR	26.31	30	16	1	$ 900.96		Hours	16
Roller Rental	HR		30	16	1	$ 480.00			
Dump Truck	HR	21.06	35	16	1	$ 896.96			
Dump Truck Rental	HR		43	16	1	$ 688.00			
Laborer	HR	20.24		16	2	$ 647.68			
Foreman	HR	30		16	1	$ 480.00			
Sum						$ 4,813.60			

Material Costs	Unit	Cost per Unit	Amount Required	Total Material Cost	
Common Excavation	CY	21.88	129.6	$ 2,836.30	**2 ft deep excavation*
Crushed Stone Fill	CY	69.62	32.4	$ 2,256.20	**0.5 ft of crushed stone*
Agg Base CRS - Crushed	CY	45.02	97.2	$ 4,376.94	**1.5 feet of agg base*
				$ 9,469.44	
Crushed Stone Slope Protection	SY	35.64	194.4	$ 6,930.00	
				$ 16,399.44	**with full protection of trail*

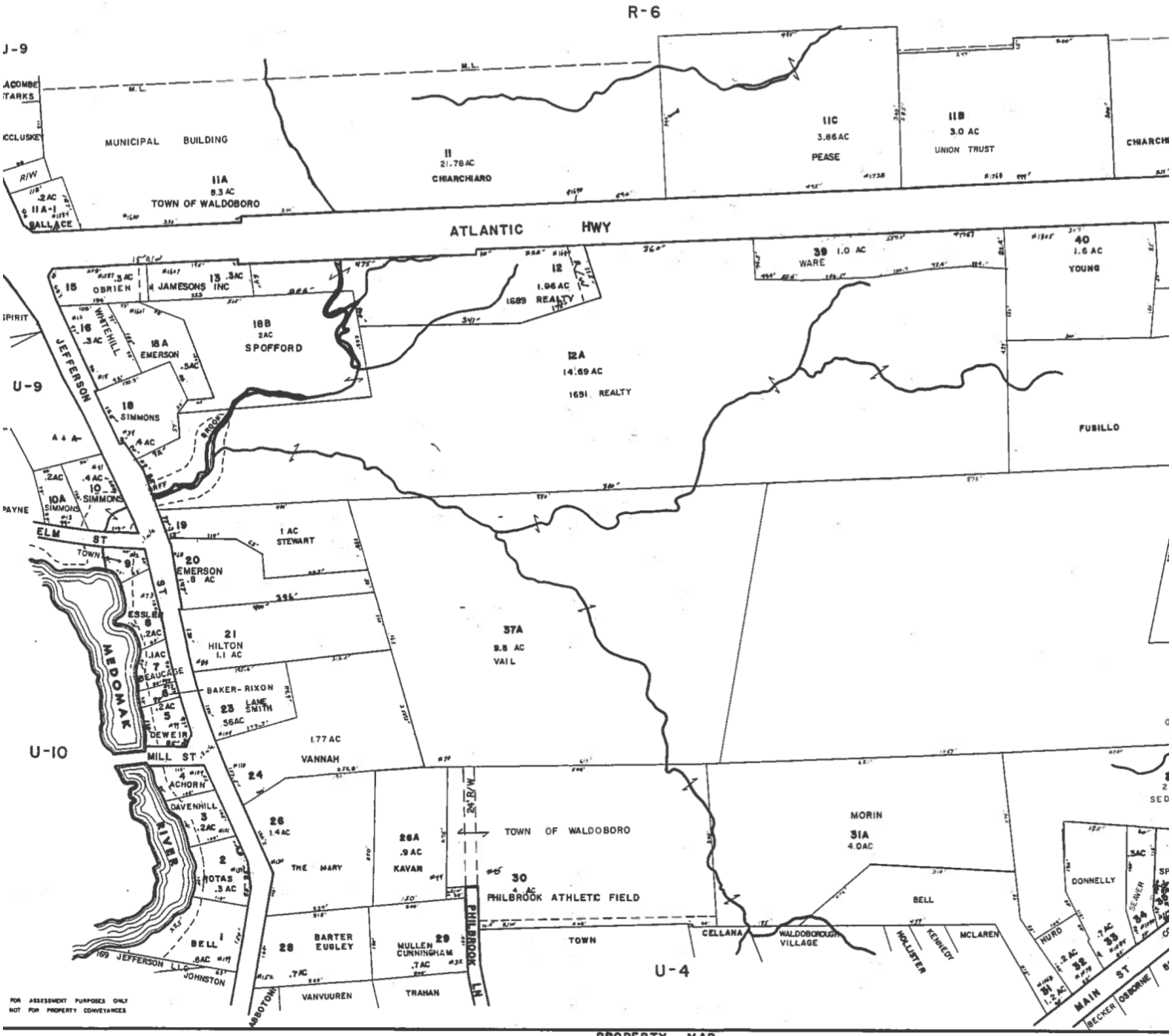
TOTAL:	*with*	$ 14,283.04
	without	$ 21,213.04

Appendix A.5 : Walking Trails Tax Maps

Appendix A.5.1 : Footbridge To Elm Street Area


U-9
THE FIRST
M.L.
STEELE
18
3.2 AC
PAYNE
19
1.9 AC
SIMMONS
A & A
ELM ST
WALDOBORO
UTILITY
15 DIST.
U-9
CORP
10A
.9 AC
CAMPBELL
TOWN OF WALDOBORO
11
PICNIC AREA
.9 AC
17
2.5 AC
LOVELL
MEDOMAK
RIVER
12
1 AC
DELORY
10
8.7 AC
MEDOMAK MH COOPERATIVE
SOULE-SHUMAN MEM POST
MILL ST
14
1.6 AC
27
.8AC
BENNYS LTD
28
.9 AC
ELDERCARE NETWORK
24
1.7AC
BERKELEY
23
1 AC
TRAHAN
22A
.2 AC
MOODY
22
2.6AC
BOUTILIER PRATT
21
1.3AC
BYRD LONG
22B
TOWN

Appendix A.5.2 : Elm Street To Culvert Area



PROPERTY MAP

Appendix A.6 : Cost Estimations

Appendix A.6.1 : Cost Estimation of the Sidewalk

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	**Labor/Tool costs**	**Unit**	**Labor Rate**	**Equipment Rate**	**Total Hours**	**Amount Required**	**Total Project Cost**									
2	Loader	HR	26	40	112.5	1	$ 7,425.00			**Sidewalk Dimensions**			**Estimated time for project**			
3	Loader Rental	HR		45	112.5	1	$ 5,062.50		Width (ft)	4			3	weeks		
4	Office Trailer	MO		250	20	1	$ 5,000.00		Length (ft)	1850			120	hours	(no overtime)	
5	Roller	HR	25	30	112.5	1	$ 6,187.50		Height (ft)	0.5						
6	Roller Rental	HR		30	112.5	1	$ 3,375.00									
7	Dump Truck	HR	21	35	112.5	2	$ 12,600.00									
8	Dump Truck Rental	HR		43	112.5	2	$ 9,675.00									
9	Flagger	HR	13		120	2	$ 3,120.00									
10	Laborer (skilled)	HR	32		120	3	$ 11,520.00									
11	Laborer (unskilled)	HR	18		120	4	$ 8,640.00									
12	Foreman	HR	30		120	1	$ 3,600.00									
13	**Sum**						$ 76,205.00									
14																
15										Total Cost Estimate:	$ 93,744.57					
16																
17	**Material Costs**	**Unit**	**Cost per Unit**	**Amount Required**	**Additonal**	**Total Material Cost**										
18	Common Excavation	CY	22	274	6	$ 6,160.00										
19	Bituminous Pavement Tack	G	14	5	0	$ 70.00										
20	Bituminous Pavement (403.209)	T	176	38	2	$ 7,040.00										
21	Aggregate Base Course - Type A	CY	71	18	2	$ 1,420.00										
22	Detectable Warning Plate	EA	122	16		$ 1,952.00										
23	Cone	EA	16	20		$ 320.00										
24	Signs					$ 577.57										
25	**Sum**					$ 17,539.57										
26																
27	Signs	Number of Signs	Cost of Sign													
28	Shoulder Work	5	$ 78.03													
29	End Road Work	2	$ 66.00													
30	Road Work Ahead	2	$ 86.72													
31	One Lane Road Ahead	2	$ 86.72													
32	Lane Shift Arrows	2	$ 86.70													
33	Flagger Sign	2	$ 86.70													
34	Be prepared to Stop	2	$ 86.70													

Appendix A.6.2 : Cost Estimation of the Footbridge

	A	B	C	D	E	F	G	H	I	J	K
1	**Labor/Equipment costs**	**Unit**	**Labor Rate**	**Equipment Rate**	**Total Hours**	**Amount Rquired**	**Total Project Cost**				
2	Excavator	HR	25	45	60	1	$ 4,200.00			**Estimated time for project**	
3	Excavator Rental	HR		50	60	1	$ 3,000.00			6	weeks
4	45T Crane	HR	31	50	60	1	$ 4,860.00			240	hours
5	Dump Truck	HR	21	35	60	2	$ 6,720.00				
6	Dump Truck Rental	HR		43	60	2	$ 5,160.00				
7	Iron Worker	HR	29		240	2	$ 13,920.00			Steel Grate Deck Cost	$ 12,371.20
8	Laborer (skilled)	HR	32		240	2	$ 15,360.00				
9	Laborer (unskilled)	HR	18		240	2	$ 8,640.00				
10	Foreman	HR	30		240	1	$ 7,200.00				
11	Carpenter	HR	31		240	1	$ 7,440.00				
12	Rigger	HR	23		240	1	$ 5,520.00				
13	Concrete Vibrator	HR		10	240	1	$ 2,400.00				
14	Welder(Machine)	HR		15	240	1	$ 3,600.00				
15	Lull	HR	26	30	240	1	$ 13,440.00				
16	Generator	HR		10	240	1	$ 2,400.00				
17	Pump Truck	HR	175		4	1	1802				
18	Welder	HR	30		240	1	$ 7,200.00				
19	**Sum**						$ 112,862.00				
20											
21											
22											
23	**Material Costs**	**Unit**	**Cost per Unit**	**Amount Required**		**Total Material Cost**				**Total Cost Estimate:**	$ 143,968.60
24	Concrete	CY	125	12		$ 1,500.00					
25	Epoxy Coated Rebar	LB	0.7	1022		$ 715.40					
26	Bearing Plates	LB	0.55	204.24		$ 112.33					
27	Concrete Barrier	EA	150	4		$ 600.00					
28	Forms	SF	2.5	100		$ 250.00					
29	Welding Rods	BOX	190	1		$ 190.00					
30	Duplex Nails	BOX	60	2		$ 120.00					
31	Screws	BOX	50	4		$ 200.00					
32	Impact Gun	EA	150	2		$ 300.00					
33	Hammer Drill	EA	120	1		$ 120.00					
34	W33x130 80ft	LB	0.673	21280		$ 14,321.44					
35	L3x2(1/2)x1/4 88in	LS	3.22	48		$ 154.56					
36	Steel plate 32"x11.5"x3/8"	LB	0.55	275.76		$ 151.67					
37	Signs					$ -					
38	**Sum**					$ 18,735.40					

Appendix A.6.3 : Footbridge Deck Quote

Indiana Gratings Inc.
210 W Douglas Street
P O Box 1762
Martinsville, IN 46151
765-342-7191
Fax: 765/342-0382

Quote 1054

Date: 03/18/2021
Valid Until: 03/28/2021
Printed Date: 03/18/2021

Bill To:

University of Maine
377 Manktown Rd.
Waldoboro, ME 04572

Ship To:

University of Maine
377 Manktown Rd.
Waldoboro, ME 04572

Prospect ID	Contact Name	Terms	Ship Via	F.O.B.	Sales Rep	Ship From
UOFM	ANTHONY	NET 30	Best Way	ORG/FR	BM	IGI

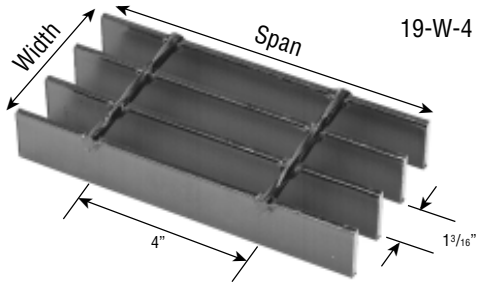
Order Qty	U.O.M.	Item Number Description	Unit Price	Tax	Extended Price
640	SF	N21	19.33000	N	12,371.20
		1 1/2" x 3/16" 19W4 Welded Steel Bar Grating Galvanized Finish - Smooth - Trim Banded 1 Area: 80'0" x 8'0" span			

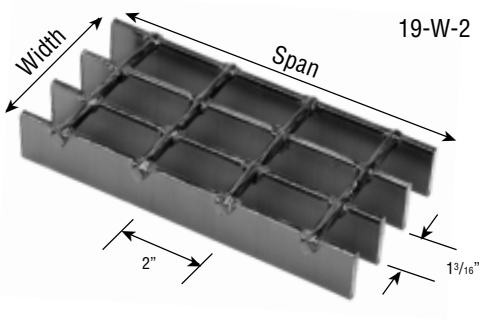
Lead Time: 10-12 working days
1 Shipment is included to Walkdoboro, ME
Weight: 7424#

Non Taxable Subtotal	12,371.20
Taxable Subtotal	0.00
Tax	0.00
Total	12,371.20

SIGN **DATE** **PO #**

LIGHT DUTY WELDED STEEL 19-W-4 / 19-W-2





19-W-4/19-W-2 Panel Width Chart (in.)

Dimensions Are Out-to-Out of Bearing Bars**

No. of Bars	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
3/16″ Bars	1 3/8	2 9/16	3 3/4	4 15/16	6 1/8	7 5/16	8 1/2	9 11/16	10 7/8	12 1/16	13 1/4	14 7/16	15 5/8	16 13/16	18
No. of Bars	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
3/16″ Bars	19 3/16	20 3/8	21 9/16	22 3/4	23 15/16	25 1/8	26 5/16	27 1/2	28 11/16	29 7/8	31 1/16	32 1/4	33 7/16	34 5/8	35 13/16

**Deduct 1/16 for 1/8 bearing bars. Standard panel widths indicated in blue.

Load Table 19-W-4/19-W-2

Bar Size, Inches	Ped Span, Inches	Wt. Lbs. Sq. Ft.	Sec. Prop Sx*, in³ / Ix*, in⁴		Clear Span 2′- 0″	2′- 6″	3′- 0″	3′- 6″	4′- 0″	4′- 6″	5′- 0″	5′- 6″	6′- 0″	6′- 6″	7′- 0″	8′- 0″
3/4 × 3/16	46	5.67	0.178	U	533	341	237	174	133							
				D	0.099	0.155	0.224	0.304	0.397							
			0.067	C	533	426	355	305	266							
				D	0.079	0.124	0.179	0.244	0.317							
1 × 1/8	51	5.15	0.211	U	632	404	281	206	158	125						
				D	0.075	0.116	0.168	0.228	0.298	0.378						
			0.105	C	632	505	421	361	316	281						
				D	0.060	0.093	0.134	0.183	0.239	0.302						
1 × 3/16	57	7.35	0.316	U	947	606	421	309	237	187	152					
				D	0.074	0.116	0.168	0.228	0.298	0.377	0.467					
			0.158	C	947	758	632	541	474	421	379					
				D	0.060	0.093	0.134	0.182	0.239	0.302	0.372					
1 1/4 × 1/8	61	6.20	0.329	U	987	632	439	322	247	195	158	130				
				D	0.060	0.093	0.134	0.182	0.239	0.302	0.373	0.449				
			0.206	C	987	789	658	564	493	439	395	359				
				D	0.048	0.074	0.107	0.146	0.191	0.242	0.298	0.361				
1 1/4 × 3/16	67	9.03	0.493	U	1480	947	658	483	370	292	237	196	164			
				D	0.060	0.093	0.134	0.182	0.238	0.301	0.373	0.451	0.535			
			0.308	C	1480	1184	987	846	740	658	592	538	493			
				D	0.048	0.074	0.107	0.146	0.191	0.241	0.298	0.360	0.429			
1 1/2 × 1/8	70	7.35	0.474	U	1421	909	632	464	355	281	227	188	158			
				D	0.050	0.078	0.112	0.152	0.198	0.252	0.310	0.376	0.447			
			0.355	C	1421	1137	947	812	711	632	568	517	474			
				D	0.040	0.062	0.089	0.122	0.159	0.201	0.248	0.301	0.358			
1 1/2 × 3/16	77	10.94	0.711	U	2132	1364	947	696	533	421	341	282	237	202		
				D	0.050	0.078	0.112	0.152	0.199	0.251	0.310	0.376	0.447	0.525		
			0.533	C	2132	1705	1421	1218	1066	947	853	775	711	656		
				D	0.040	0.062	0.089	0.122	0.159	0.201	0.248	0.300	0.358	0.420		
1 3/4 × 3/16	87	12.62	0.967	U	2901	1857	1289	947	725	573	464	384	322	275	237	181
				D	0.043	0.067	0.096	0.130	0.170	0.215	0.266	0.322	0.383	0.450	0.522	0.680
			0.846	C	2901	2321	1934	1658	1451	1289	1160	1055	967	893	829	725
				D	0.034	0.053	0.077	0.104	0.136	0.172	0.213	0.257	0.306	0.360	0.417	0.545
2 × 3/16	96	14.30	1.263	U	3789	2425	1684	1237	947	749	606	501	421	359	309	237
				D	0.037	0.058	0.084	0.114	0.149	0.189	0.233	0.282	0.335	0.394	0.456	0.596
			1.263	C	3789	3032	2526	2165	1895	1684	1516	1378	1263	1166	1083	947
				D	0.030	0.047	0.067	0.091	0.119	0.151	0.186	0.225	0.268	0.315	0.365	0.477
2 1/4 × 3/16	105	15.87	1.599	U	4796	3069	2132	1566	1199	947	767	634	533	454	392	300
				D	0.033	0.052	0.074	0.101	0.132	0.168	0.207	0.250	0.298	0.350	0.406	0.530
			1.798	C	4796	3837	3197	2741	2398	2132	1918	1744	1599	1476	1370	1199
				D	0.026	0.041	0.060	0.081	0.106	0.134	0.165	0.200	0.238	0.280	0.324	0.424
2 1/2 × 3/16	113	17.55	1.974	U	5921	3789	2632	1933	1480	1170	947	783	658	561	483	370
				D	0.030	0.047	0.067	0.091	0.119	0.151	0.186	0.225	0.268	0.315	0.365	0.477
			2.467	C	5921	4737	3947	3383	2960	2632	2368	2153	1974	1822	1692	1480
				D	0.024	0.037	0.054	0.073	0.095	0.121	0.149	0.180	0.215	0.252	0.292	0.381

U - Safe uniform load in pounds/sq. ft.
C - Safe concentrated load in pounds/ft. grating width
D - Deflection in inches

Loads and deflections given in this table are theoretical, and are based on a unit stress of 18,000 psi.

% Open Area*		
Bars	1/8″	3/16″
4″ cc	83%	77%
2″ cc	76%	71%

*Based on 10.105 bars/ft. of grating width. Bearing bars 1 3/16″ c.c. Add .8 lbs./sq. ft. for 19-W-2.

Note: Grating for spans to the left of the heavy line have a deflection less than 1/4″ for uniform loads of 100 lbs./sq. ft. This is the maximum deflection to afford pedestrian comfort and can be exceeded for other types of load at the discretion of the engineer. The actual Ped (pedestrian) Span under this condition is shown above for each size of grating. When serrated grating is specified, the depth of grating required for a specific load will be 1/4″ greater than that shown in these tables.

Appendix A.6.4 : Prefabricated Bridge Quotes

Anthony Salafia
University of Maine Civil Engineering Program
anthony.salafia@maine.edu

Project: **UMaine Capstone Project**
Location: **Orono, ME**
Contech #:
Date: **February 12, 2021**

The following is a Continental Pedestrian Bridge System ENGINEER'S COST ESTIMATE for the subject project. This ESTIMATE is intended for preliminary estimating purposes only and should **not** be interpreted as a final QUOTATION. The information presented is based on the most current data made available to Contech Engineered Solutions, LLC (CES).

CES will fabricate and deliver the following described Continental Pedestrian Bridge components and appurtenances:

- Option: Pressure treated wood deck
- Bridge Model: Continental Connector Pedestrian Steel Truss
- Configuration: H-section
- Length: 80 ft (out to out dimension)
- Width: 10 ft (clear between structural elements)
- Finish: Unpainted weathering steel
- Decking: Pressure treated wood
- Railing Type: Horizontal safety rails with 4" maximum openings
- Railing Height: 48" above deck
- Included safety features: Steel toe plate, wood rub rail
- Design Code: AASHTO LRFD Guide Specification for Design of Pedestrian Bridges
- Design Vehicle: H-5 (10,000 lbs)
- Live Load: 90 psf
- Wind Load: 35 psf
- Bearing pads and plates: Included
- Preliminary Assembled Weight: 27,000 lbs (to be verified upon final design)
- Number of sections: 2 (field bolting by others)

ESTIMATE: $85,000 Delivered (F.O.B.)

- Option: Concrete Deck
- Bridge Model: Continental Connector Pedestrian Steel Truss
- Configuration: H-section
- Length: 80 ft (out to out dimension)
- Width: 10 ft (clear between structural elements)
- Finish: Unpainted weathering steel
- Decking: Stay-in-place forms, included
- Finished Surface: Reinforced concrete (by others)
- Railing Type: Horizontal safety rails with 4" maximum openings
- Railing Height: 48" above deck
- Included safety features: Steel toe plate, wood rub rail
- Design Code: AASHTO LRFD Guide Specification for Design of Pedestrian Bridges
- Design Vehicle: H-5 (10,000 lbs)
- Live Load: 90 psf
- Wind Load: 35 psf
- Bearing pads and plates: Included
- Preliminary Assembled Weight: 20,000 lbs (to be verified upon final design)
- Number of sections: 2 (field bolting by others)

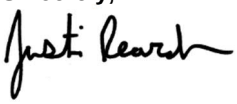
ESTIMATE: $85,000 Delivered (F.O.B.)

Excluded Items:
CES will not or does not include the cost for:

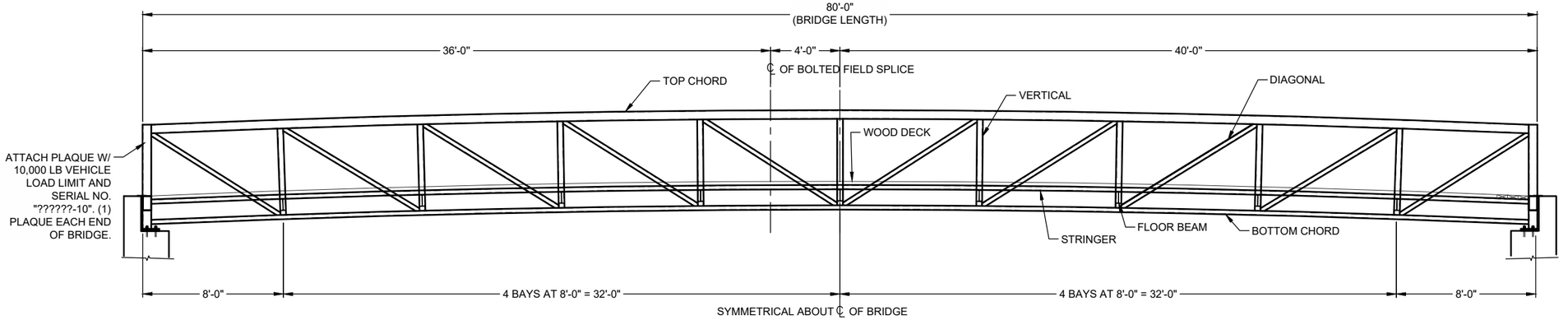
1. Applicable Sales and/or Use Tax
2. All construction surveying, including field measurement and verification of abutments and anchor bolt placement.
3. Design, excavation and construction of bridge foundations and/or piers.
4. Unloading all trucks delivering CES materials.
5. Erection and Installation of the bridge.
6. Providing and installing all anchor bolts. Provide and install any wing wall or approach railings.
7. Materials and work for reinforced concrete deck slab (if applicable).
8. Any costs associated with testing by an independent agency.
9. Costs associated with any special inspection. CES will provide access to facilities and assist with coordination to accommodate special inspection.

We look forward to working with you on this project. If you have any questions, please contact us.

Sincerely,



Justin Reardon, P.E.
Truss Consultant
Contech Engineered Solutions
(207) 885-6125
jreardon@conteches.com



BRIDGE ELEVATION

GENERAL NOTES

1. DESIGN STRESSES ARE IN ACCORDANCE WITH "STANDARD SPECIFICATION FOR HIGHWAY BRIDGES" & "GUIDE SPECIFICATIONS FOR DESIGN OF PEDESTRIAN BRIDGES" BY THE AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO).

2. BRIDGE MEMBERS ARE FABRICATED FROM HIGH STRENGTH, LOW ALLOY, ENHANCED ATMOSPHERIC CORROSION RESISTANT ASTM A847 COLD-FORMED WELDED SQUARE AND RECTANGULAR TUBING, AND ASTM A588, ASTM A606, OR ASTM A242 PLATE AND STRUCTURAL SHAPES (Fy=50,000 PSI).

3. BRIDGE DECKING NOMINAL 3 x 12 SELECT STRUCTURAL FIR (Fb=1,400 PSI min.) OR 3 x 10 SOUTHERN YELLOW PINE (Fb=1,300 PSI min.). ALKALINE COPPER QUATERNARY (ACQ) TO A 0.4 PCF RETENTION OR TO REFUSAL OR AZOLE BIOCIDE (MCA) TO A 0.06 PCF RETENTION OR TO REFUSAL.

4. THE GAS METAL ARC WELDING PROCESS OR FLUX CORED ARC WELDING PROCESS WILL BE USED. WELDING TO BE IN ACCORDANCE WITH AWS D1.1.

5. ALL TOP AND BOTTOM CHORD SHOP SPLICES TO BE COMPLETE PENETRATION TYPE WELDS. WELD BETWEEN TOP CHORD AND END VERTICAL SHALL BE AS DETAILED.

6. UNLESS OTHERWISE NOTED, WELDED CONNECTIONS SHALL BE FILLET WELDS (OR HAVE THE EFFECTIVE THROAT OF A FILLET WELD) OF A SIZE EQUAL TO THE THICKNESS OF THE LIGHTEST GAGE MEMBER IN THE CONNECTION. WELDS SHALL BE APPLIED AS FOLLOWS:

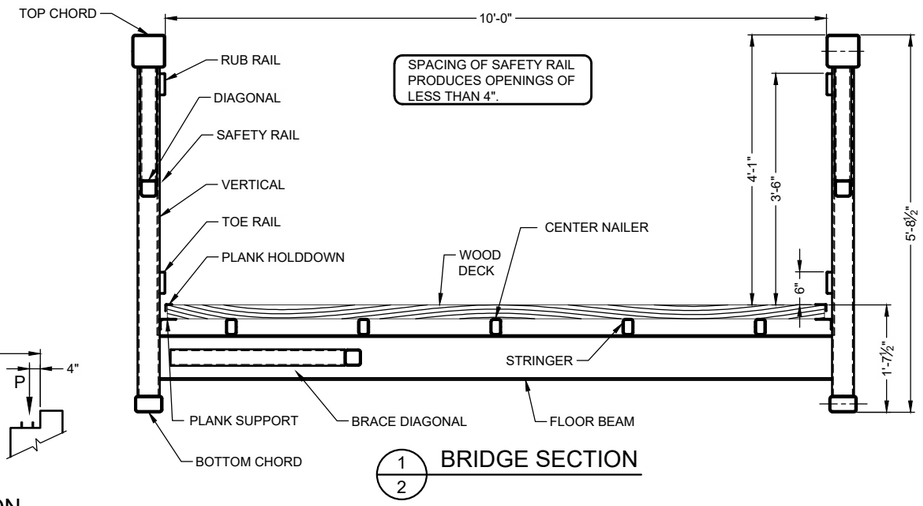
   A. BOTH ENDS OF VERTICALS, DIAGONALS, AND FLOOR BEAMS SHALL BE WELDED ALL AROUND.
   B. BRACE DIAGONALS WILL BE WELDED ALL AROUND.
   C. MISCELLANEOUS NON-STRUCTURAL MEMBERS WILL BE STITCH WELDED TO THEIR SUPPORTING MEMBERS.

7. BRIDGE DESIGN WAS ONLY BASED ON COMBINATIONS OF THE FOLLOWING LOADS WHICH WILL PRODUCE MAXIMUM CRITICAL MEMBER STRESSES.

   A. 90 PSF UNIFORM LIVE LOADING ON THE FULL DECK AREA OR ONE 10,000 LB VEHICLE LOAD. THE LOAD SHALL BE DISTRIBUTED AS A FOUR-WHEEL VEHICLE WITH 80% OF THE LOAD ON THE REAR WHEELS. THE WHEEL TRACK WIDTH OF THE VEHICLE SHALL BE 6'-0" AND THE WHEEL BASE SHALL BE 10'-0". THE VEHICLE SHALL BE POSITIONED SO AS TO PRODUCE THE MAXIMUM STRESSES IN EACH MEMBER, INCLUDING DECKING.
   B. 35 PSF WIND LOAD ON THE FULL HEIGHT OF THE BRIDGE, AS IF ENCLOSED.
   C. 20 PSF UPWARD FORCE APPLIED AT THE WINDWARD QUARTER POINT OF THE TRANVERSE BRIDGE WIDTH (AASHTO 3.15.3).

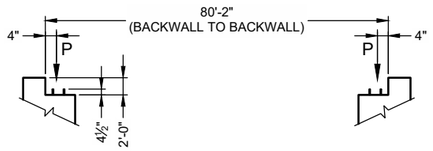
8. CLEANING: ALL EXPOSED SURFACES OF STEEL SHALL BE CLEANED IN ACCORDANCE WITH STEEL STRUCTURES PAINTING COUNCIL SURFACES PREPARATION SPECIFICATIONS NO. 7 BRUSH-OFF BLAST CLEANING. SSPC-SP7-LATEST EDITION.

9. MINIMUM MATERIAL THICKNESS OF 1/4" ON ALL STRUCTURAL MEMBERS.



SPACING OF SAFETY RAIL PRODUCES OPENINGS OF LESS THAN 4".

1/2 BRIDGE SECTION



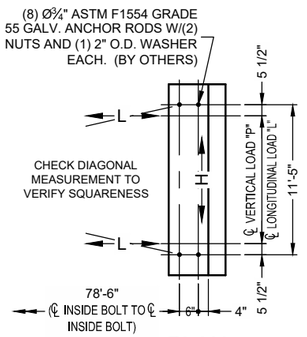
ANCHOR BOLT ELEVATION

COMBINE REACTIONS AS PER LOCAL OR GOVERNING BUILDING CODES AS REQUIRED

BRIDGE REACTIONS		+ DOWNWARD LOAD - UPWARD LOAD	
	P (LBS)	H (LBS)	L (LBS)
DEAD LOAD	6,700		
UNIFORM LIVE LOAD	18,000		
VEHICLE LOAD	5,000		
WIND UPLIFT 20 PSF WINDWARD / LEEWARD	-6,500 / -2,167		
WIND	±2,680	7,995	
THERMAL			1005

"P" - VERTICAL LOAD EACH BASE PLATE (4 PER BRIDGE)
"H" - HORIZONTAL LOAD EACH FOOTING (2 PER BRIDGE)
"L" - LONGITUDINAL LOAD EACH BASE PLATE (4 PER BRIDGE)

BRIDGE LIFTING WEIGHT: 26,800 LBS



PLAN

CONTECH
CONTRACT
DRAWING

MARK	DATE	REVISION DESCRIPTION	BY

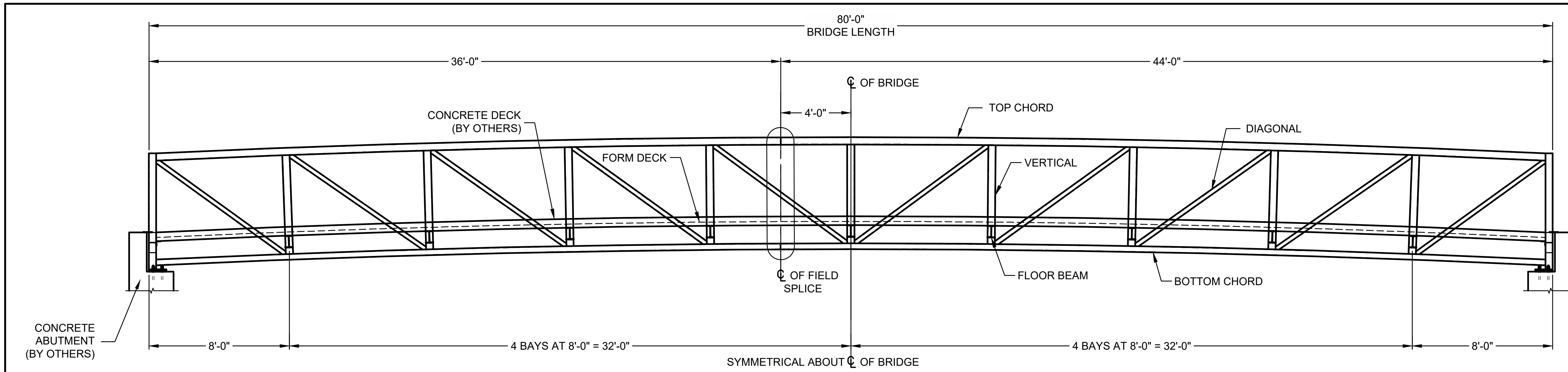
80'-0" x 10'-0"
STANDARD WOOD DECK
PEDESTRIAN BRIDGE
CITY, STATE

CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com
#301 State Highway 29 North, Alexandria, MN 56308
800-328-2047 320-852-7500 320-852-7067 FAX

pi:express-logo.jpg

DATE: 7/1/2014	
DESIGNED: -	DRAWN: -
CHECKED: -	APPROVED: -
PROJECT No.:	SEQUENCE No.:
SHEET: 1 OF 1	

CERTIFIED FABRICATOR



BRIDGE ELEVATION

GENERAL NOTES

1. DESIGN STRESSES ARE IN ACCORDANCE WITH "STANDARD SPECIFICATION FOR HIGHWAY BRIDGES" & "GUIDE SPECIFICATIONS FOR DESIGN OF PEDESTRIAN BRIDGES" BY THE AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO).

2. BRIDGE MEMBERS ARE FABRICATED FROM HIGH STRENGTH, LOW ALLOY, ENHANCED ATMOSPHERIC CORROSION RESISTANT ASTM A847 COLD-FORMED WELDED SQUARE AND RECTANGULAR TUBING, AND ASTM A588, ASTM A606, OR ASTM A242 PLATE AND STRUCTURAL SHAPES (Fy=50,000 PSI).

3. CONCRETE DECK: GALVANIZED FORM DECK SUPPLIED BY CONTECH. CONCRETE, REINFORCING, AND EXPANSION MATERIAL SUPPLIED BY OTHERS. SEE CONCRETE DECK SHEET.

4. THE GAS METAL ARC WELDING PROCESS OR FLUX CORED ARC WELDING PROCESS WILL BE USED. WELDING TO BE IN ACCORDANCE WITH AWS D1.1.

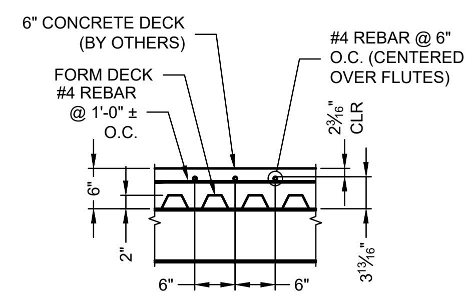
5. ALL TOP AND BOTTOM CHORD SHOP SPLICES TO BE COMPLETE PENETRATION TYPE WELDS. WELD BETWEEN TOP CHORD AND END VERTICAL SHALL BE AS DETAILED.

6. UNLESS OTHERWISE NOTED, WELDED CONNECTIONS SHALL BE FILLET WELDS (OR HAVE THE EFFECTIVE THROAT OF A FILLET WELD) OF A SIZE EQUAL TO THE THICKNESS OF THE LIGHTEST GAGE MEMBER IN THE CONNECTION. WELDS SHALL BE APPLIED AS FOLLOWS:
   A. BOTH ENDS OF VERTICALS, DIAGONALS, AND FLOOR BEAMS SHALL BE WELDED ALL AROUND.
   B. BRACE DIAGONALS WILL BE WELDED ALL AROUND.
   C. MISCELLANEOUS NON-STRUCTURAL MEMBERS WILL BE STITCH WELDED TO THEIR SUPPORTING MEMBERS.

7. BRIDGE DESIGN WAS ONLY BASED ON COMBINATIONS OF THE FOLLOWING LOADS WHICH WILL PRODUCE MAXIMUM CRITICAL MEMBER STRESSES.
   A. 90 PSF UNIFORM LIVE LOADING ON THE FULL DECK AREA OR ONE 10,000 LB VEHICLE LOAD. THE LOAD SHALL BE DISTRIBUTED AS A FOUR-WHEEL VEHICLE WITH 80% OF THE LOAD ON THE REAR WHEELS. THE WHEEL TRACK WIDTH OF THE VEHICLE SHALL BE 6'-0" AND THE WHEEL BASE SHALL BE 10'-0". THE VEHICLE SHALL BE POSITIONED SO AS TO PRODUCE THE MAXIMUM STRESSES IN EACH MEMBER, INCLUDING DECKING.
   B. 35 PSF WIND LOAD ON THE FULL HEIGHT OF THE BRIDGE, AS IF ENCLOSED.
   C. 20 PSF UPWARD FORCE APPLIED AT THE WINDWARD QUARTER POINT OF THE TRANVERSE BRIDGE WIDTH (AASHTO 3.15.3).

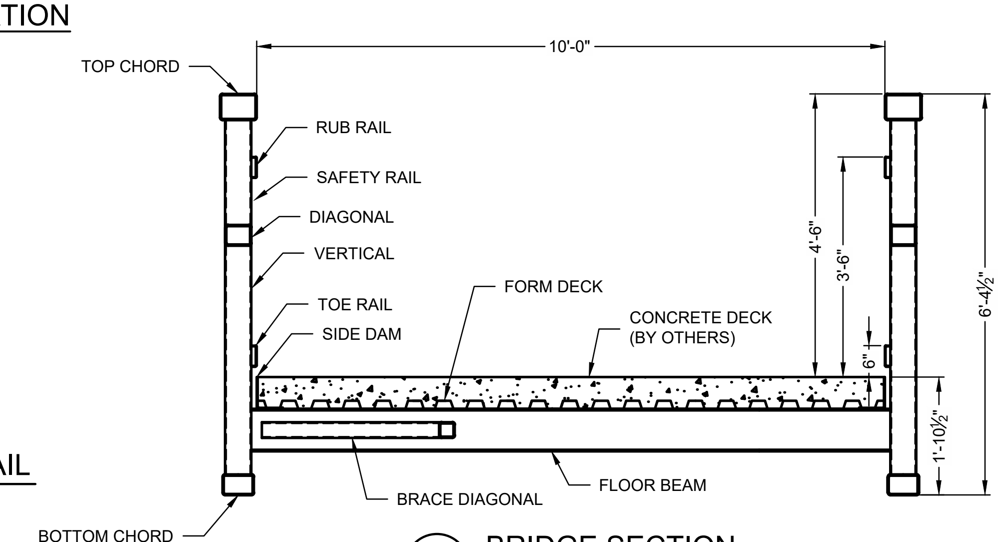
8. CLEANING: ALL EXPOSED SURFACES OF STEEL SHALL BE CLEANED IN ACCORDANCE WITH STEEL STRUCTURES PAINTING COUNCIL SURFACES PREPARATION SPECIFICATIONS NO. 7 BRUSH-OFF BLAST CLEANING. SSPC-SP7-LATEST EDITION.

9. MINIMUM MATERIAL THICKNESS OF 1/4" ON ALL STRUCTURAL MEMBERS.



2/1 TYP SLAB REINFORCEMENT DETAIL

f'c = 3,500 PSI (MINIMUM 28 DAY STRENGTH)
GRADE 60 REINFORCING (fy = 60,000 PSI)



1/1 BRIDGE SECTION

COMBINE REACTIONS AS PER LOCAL OR GOVERNING BUILDING CODES AS REQUIRED

BRIDGE REACTIONS (+ DOWNWARD LOAD, - UPWARD LOAD)	P (LBS)	H (LBS)	L (LBS)
DEAD LOAD ②	17,400		
UNIFORM LIVE LOAD	18,000		
VEHICLE LOAD	5,000		
WIND UPLIFT 20 PSF WINDWARD / LEEWARD	-6,600 / -2,200		
WIND	±3,295	8,925	
THERMAL ②			2,610

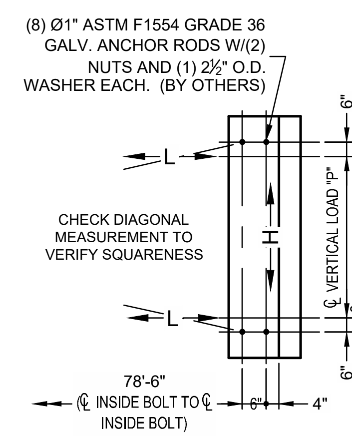
"P" - VERTICAL LOAD EACH BASE PLATE (4 PER BRIDGE)
"H" - HORIZONTAL LOAD EACH FOOTING (2 PER BRIDGE)
"L" - LONGITUDINAL LOAD EACH BASE PLATE (4 PER BRIDGE)

① BRIDGE LIFTING WEIGHT: 20,800 LBS

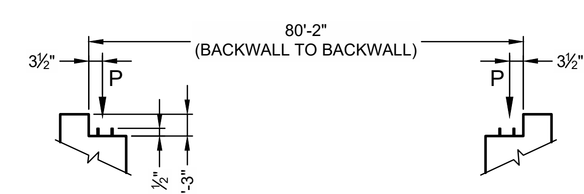
② BRIDGE FINAL WEIGHT: 69,600 LBS

① DOES NOT INCLUDE WEIGHT OF CONCRETE DECK

② INCLUDES WEIGHT OF CONCRETE DECK



PLAN



ANCHOR BOLT ELEVATION

CONTECH
FABRICATION
DRAWING

AISC CERTIFIED FABRICATOR

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MARK	DATE	REVISION DESCRIPTION	BY

80'-0" x 10'-0" AASHTO EXPRESS PEDESTRIAN BRIDGE STANDARD CONCRETE DECK

CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com

CONTINENTAL BRIDGE

DATE: 7/22/2016	
DESIGNED: JRG	DRAWN: JRG
CHECKED: XXX	APPROVED: XXX
PROJECT No.: XXXXXX	SEQUENCE No.: XXX
SHEET: 1 OF 1	

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BRIDGE BROTHERS

e: sales@bridgebrothers.com
t: 866.258.3401
www.bridgebrothers.com

Date: February 16th, 2021

Project: Anthony Salafia - Maine

Scope: Design/Engineering, Manufacturing, & Bridge Supply

Company: Bridge Brothers Inc

Contact: Kenny Adams

Bridge Brothers scope will include all structural engineering associated with the bridges and issue our state stamped PE design package. The bridge structures and all associated designs will be in adherence to AASHTO design guide for bridge structures. See below for further breakdown of our scope of work:

Structural & Civil Engineering:

- Maine PE Stamped Design & Calculation Package for the Bridges

Option 1 Manufacturing: $87,917

- Qty (1) 10' x 80' Pedestrian Bridge
- Weathering Steel Pratt Bridge
- 90 PSF Live Load
- Galvanized/Corrugated Decking
  - PT Pine Decking Option – Add $10,644
  - Metal Grate Decking Option – Add $32,524
- Horizontal Railing

Estimated Project Schedule

● Structural Designs	4 Weeks
● Bridge Manufacturing & Freight	12 Weeks

If you have any questions or require additional information, please call. Pricing is valid for 30 days from date on proposal unless otherwise noted.

* All prices shown are valid for thirty (30) days only unless otherwise stated above. Unless otherwise agreed in writing, the information herein is a proposal only and should not be construed as a promise to perform absent the separate written consent of Bridge Brothers, Inc.

"Due to the current inflation in steel prices this proposal is only valid for 30 days from the time of proposal and subject to the HRC steel index increases or decreases at the time of material order."

Regards,

Kenny Adams / Project Engineer / 770.696.8946 / kadams@bridgebrothers.com

BRIDGE BROTHERS

e: sales@bridgebrothers.com
t: 866.258.3401
www.bridgebrothers.com

Appendix A.6.5 : Cost Estimation of The Walk-Under Culvert

	A	B	C	D	E	F	G	H	I	J	K
1	**Labor/Equipment costs**	**Unit**	**Labor Rate**	**Equipment Rate**	**Total Hours**	**Amount Rquired**	**Total Project Cost**				
2	Skidsteer	HR	27	30	120	1	$ 6,840.00			**Estimated time for project**	
3	Dump Truck	HR	21	35	40	2	$ 4,480.00			4	weeks
4	Dump Truck Rental	HR		43	40	2	$ 3,440.00			160	hours
5	Laborer (skilled)	HR	32		160	2	$ 10,240.00				
6	Laborer (unskilled)	HR	18		160	3	$ 8,640.00				
7	Foreman	HR	30		160	1	$ 4,800.00				
8	Carpenter	HR	31		80	1	$ 2,480.00				
9	Generator	HR		10	160	1	$ 1,600.00				
10	15lb Chipping Hammer	HR		12	80	4	$ 3,840.00				
11	Compressor	HR		48	80	2	$ 8,782.00				
12	**Sum**						$ 55,142.00				
13											
14											
15											
16	**Material Costs**	**Unit**	**Cost per Unit**	**Amount Required**		**Total Material Cost**				Total Cost Estimate:	$ 59,487.00
17	Concrete	CY	125	21		$ 2,625.00					
18	Forms	SF	2.5	218		$ 545.00					
19	Fill Material	CY	13	30		$ 435.00					
20	Duplex Nails	BOX	60	2		$ 120.00					
21	Screws	BOX	50	4		$ 200.00					
22	Impact Gun	EA	150	2		$ 300.00					
23	Hammer Drill	EA	120	1		$ 120.00					
24	**Sum**					$ 4,345.00					

Appendix A.6.6 : Cost Estimation of the Walking Trails

	A	B	C	D	E	F	G	H	I	J	K
1	**Labor/Tool costs**	**Unit**	**Labor Rate**	**Equipment Rate**	**Total Hours**	**Amount Required**	**Total Project Cost**			**Time:**	
2	Loader Rental	HR		45	16	1	$ 720.00			Days	2
3	Operator	HR	36	30	16	1	$ 1,056.00			Hours	16
4	Roller Rental	HR		30	16	1	$ 480.00				
5	Dump Truck	HR	21	35	16	1	$ 896.00				
6	Dump Truck Rental	HR		43	16	1	$ 688.00				
7	Laborer	HR	18		16	2	$ 576.00				
8	Foreman	HR	30		16	1	$ 480.00				
9	**Sum**						$ 4,896.00				
10										Total Cost Estimate:	$ 21,295.44
11	**Material Costs**	**Unit**	**Cost per Unit**	**Amount Required**	**Total Material Cost**						
12	Common Excavation	CY	21.88	129.6	$ 2,836.30	*2 ft deep excavation*					
13	Crushed Stone Fill	CY	69.62	32.4	$ 2,256.20	*0.5 ft of crushed stone*					
14	Agg Base CRS - Crushed	CY	45.02	97.2	$ 4,376.94	*1.5 feet of agg base*					
15					$ 9,469.44						
16	Crushed Stone Slope Protection	SY	35.64	194.4	$ 6,930.00						
17					$ 16,399.44	*with full protection of trail*					
18											
19	**TOTAL:**	*without*	$14,365.44								
20		*with*	$21,295.44								

Appendix A.6.7 : Cost Estimation of the Cut/Fill Plan for the Path Leading from the Sidewalk to Walk-Under Culvert

	A	B	C	D	E	F	G	H	I	J	K
1	**Labor/Equipment costs**	**Unit**	**Labor Rate**	**Equipment Rate**	**Total Hours**	**Amount Rquired**	**Total Project Cost**				
2	Excavator	HR	30	45	80	1	$ 6,000.00			**Estimated time for project**	
3	Excavator Rental	HR		50	80	1	$ 4,000.00			2	weeks
4	Roller	HR	25	30	40	1	$ 2,200.00				
5	Roller Rental	HR		30	40	1	$ 1,200.00			80	hours
6	Dump Truck	HR	21	35	80	2	$ 8,960.00				
7	Dump Truck Rental	HR		43	80	2	$ 6,880.00				
8	Laborer (unskilled)	HR	20		80	2	$ 3,200.00				
9	Foreman	HR	30		80	1	$ 2,400.00				
10	**Sum**						$ 34,840.00				
11											
12											
13										Total Cost Estimate:	$ 35,246.00
14	**Material Costs**	**Unit**	**Cost per Unit**	**Amount Required**		**Total Material Cost**					
15	Fill Material	CY	13	28		$ 406.00					
16	**Sum**					$ 406.00					