Route 20 Corridor Study

Orange County, Virginia



Analysis and Recommendations for Transportation Improvements to Virginia Route 20 from US Route 522 at Unionville to Virginia Route 3 at Wilderness

July 2006

ROUTE 20 CORRIDOR STUDY

Orange County, Virginia

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on behalf of the: **Rappahannock-Rapidan Regional Commission**

in cooperation with
Orange County, Virginia
Virginia Department of Transportation
and
Federal Highway Administration

July 2006

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Executive Summary

This study examined 13.4 miles of Virginia Route 20 in Orange County, extending from US Route 522 at Unionville to Virginia Route 3 at Wilderness. Route 20 is the major east-west highway in Orange County, serving residents and businesses in central and eastern Orange County as well as connecting population centers in Orange County and the Town of Orange with the Fredericksburg region's Route 3 and I-95 corridors. Route 20 is a two-lane rural highway with access to driveways and secondary roads provided by at-grade intersections. Traffic signals are located at two intersections, the US Route 522 (Zachary Taylor Highway) intersection with Route 20; and the Virginia Route 3 (Germana Highway) intersection with Route 20. All other intersections on Route 20 are controlled by stop signs on the side streets.

This study seeks to develop a framework for transportation planning in the corridor, and to assist in efforts to provide improvements to better serve traffic flow and safety, as well as to preserve the rights-of-way that will be needed to serve existing and future travel demands. The study identified transportation concerns and recommendations based on existing conditions (traffic and roadway geometrics), and identified recommendations to address these same concerns for a planning horizon of 20 years or more (the planning horizon for the study is 2030). The study process included traffic counts, traffic forecasts, roadway operations analysis, reviews and analyses of traffic accident reports, and observation of roadway operations and safety in the field.

Public involvement also played a key role in the study, and outreach meetings to stakeholders and the general public were held early in the study to assist in identifying transportation concerns, and later in the study to allow for public review and comment on preliminary recommendations. Public hearings to take official comment were held as part of the review and adoption process by the Orange County Planning Commission and Board of Supervisors.

Existing and future transportation concerns in the study corridor, as identified by the traffic engineering analyses as well as public input, include overall capacity and safety concerns, as well as location-specific concerns. Preserving and enhancing the functionality and safety of the corridor through both growth management and access management are also major issues within the study corridor. The Wilderness Battlefield in the eastern portion of the study corridor is both a local and national historic resource, and balancing transportation needs with the preservation of the battlefield and surrounding areas is also a key concern.

Throughout the study corridor, Route 20 is a two-lane undivided rural roadway with generally 12-foot travel lanes. Shoulder widths generally vary from 1 to 3 feet. With the exception of the two signalized intersections in the study corridor, a westbound right turn lane on Route 20 at its intersection with Route 611, and turn lanes for the Locust Grove Elementary and Middle Schools, there are currently no turn lanes at the intersections along Route 20. This lack of turn lanes was cited as a major need in the corridor.

The following locations were identified by the analysis as well as public input as areas of particular concern for existing traffic flow and/or safety:

- Intersection and vicinity of Route 20 and Route 650 (Independence Road)
- Intersection and vicinity of Route 20 and Route 621 South (Mine Run Road)
- Portion of Route 20 east of Route 692 (Burr Hill Road/Grasty Gold Mine Road)
- Intersection and vicinity of Route 20 and Route 611 (Zoar Road/Gold Dale Road)
- Intersection and vicinity of Route 20 and Route 601 (Flat Run Road)

Route 20 has experienced substantial growth in traffic over the past 10 to 15 years, ranging from annual growth rates of 1.4 percent in the western portions of the study corridor to 4.0 percent at the eastern end. While Orange County is actively managing its growth and seeks to maintain the rural character of the study corridor, it is anticipated that traffic will continue to grow (this study assessed two different growth scenarios). This additional traffic will result in increased congestion on Route 20, and more intersections in the study corridor would operate at deficient service levels, with motorist travel delays well in excess of what VDOT considers acceptable. Increased traffic on both Route 20 and side streets is also expected to exacerbate some of the existing safety concerns that were identified by the study.

There are a total of 224 access points along the study corridor today (counting both directions on Route 20); an average of just under 17 access points per roadway mile. The number of access points is a matter of concern because studies have consistently shown that the number of driveways per mile is a key indicator of accident frequency. Safety and traffic flow on Route 20 would, therefore, be enhanced through efforts to consolidate access points and control the number and location of new driveways.

Many of the traffic operations and safety issues identified by this study were confirmed and reiterated by those who attended this study's two public meetings. Meeting participants also emphasized the need for better enforcement of speed limits, control of growth, and proactive transportation planning in the corridor to address existing needs and to plan for future improvements. Based on the technical analyses and public input, this study includes recommendations that fall into three broad categories. The first includes improvements to intersections to improve operations and safety. These improvements are generally to add turn lanes at key locations. The second category of improvement relates to the capacity of Route 20 itself. Both moderate and low-growth traffic forecasts indicate a long-term need for widening most or all of Route 20 through the study area by the year 2030. This study recommends, therefore, that Orange County work to preserve rights-of-way in order to minimize the future impacts of any widening projects.

The third category of recommendations includes actions to manage access along Route 20, as well as transportation planning actions that support land use measures to control and manage growth. Management of access seeks to reduce the growth in access points onto Route 20, and to focus access to a limited number of well-designed entrance points. The access management recommendations in this study also seek to promote the use of secondary roads or parallel circulation roads to provide access to individual parcels, and

to requiring setbacks for new structures. These recommendations will provide additional teeth to regulations to discourage strip development and help to preserve the rural look of the corridor by requiring setbacks. Because access points also require the clearing of vegetation to provide for adequate sight distances, controlling the number, location, and design of access points also preserves and enhances the natural landscaping of a corridor. The access management recommendations of this study would also apply to any future widening of Route 20. One key recommendation is that any widening of Route 20 should incorporate a median, which will provide an important mechanism for limiting and managing access. The implementation of these planning recommendations would be through the Comprehensive Plan overlay zoning, and through the use of this study to guide the local circulation provisions that accompany any new development.

This study incorporates short-, mid-, and long-term recommendations. Short-term improvements are recommended to be implemented within the next 5 years. The shortterm recommendations are primarily intersection improvements for safety as well as planning actions that Orange County should take within the same five-year timeframe. Mid-term improvements are those that would be implemented within the 5 to 10 year timeframe. These include some of the larger intersection improvements that require some lead time in terms additional studies, design, and/or accrual of funding for construction. Long-term projects are those that would be implemented over a timeframe of 10 years or more. These include the widening of Route 20 which would require detailed location studies, environmental studies, and design. Several of the long-term recommendations relate to improvements that are contingent on property uses changing, and are intended to guide decisions that would be necessary if and when a property converts to more intensive uses. While the long-term recommendations are many years away, it is important to note that this study does recommend planning actions that set the groundwork for the long-term recommendations (i.e., establishing planning corridors and set-backs to preserve rights-of-way for future widening).

Study recommendations are summarized below:

- Changes to the Orange County Comprehensive Plan to provide the policy foundation for zoning and regulatory procedures that can be used to preserve the functionality and safety of Route 20.
- Establishment of corridor overlay zoning in the study corridor that will implement access management and preserve rights-of-way in this corridor.
- Improve the intersections of Route 20 with the following side roads:
 - Route 522: add turn lanes and shift the intersection of Route 522 and Village Road to the south.
 - Route 671: consolidate the two intersections of Route 671 with Route 20 into one single intersection.
 - Route 650: shift intersection to the east to come in across from Route 741 East; add turn lanes.
 - Route 621 East: add turn lanes; over the long-term, consolidate the east and west intersections of Route 621.

- Route 692: consolidate the east and west intersections of Route 692 into a single intersection.
- Route 611: add turn lanes; consider signalization.
- Route 601: add turn lanes; improve grades; consider signalization; over the long-term, consider access to properties south of Route 20 at this same upgraded intersection.
- Over the long-term, widen Route 20 to four lanes to provide for needed capacity and safety. It is anticipated that widening would be required between Route 611 and Route 3 first.
- Establish a planning corridor for a four-lane Route 20 between Route 601 and Route 3. This planning corridor would be located north of existing Route 20. The preservation of this corridor would be needed to provide an alternative roadway alignment to widening along existing Route 20 through sensitive historic areas. Continue to coordinate with the National Park Service to refine the alignment for this planning corridor.

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Chapter 1 – Existing Conditions

Virginia Route 20, named the "Constitution Route" traverses approximately 90 miles through the central part of Virginia in a southwest to northeast direction from Route 15 in central Buckingham County to Route 3 at Wilderness in eastern Orange County. Over most of its length, Route 20 is a rural two-lane highway that not only serves the travel needs of residents, businesses, and visitors; it connects some of Virginia's major historical and cultural resources and is an important scenic asset. There are about 36 miles of Route 20 in Orange County and the Town of Orange. This report documents the study of Route 20 in the eastern portion of Orange County, extending from US Route 522 near Unionville to Route 3 at Wilderness, a distance of approximately 13.4 miles.

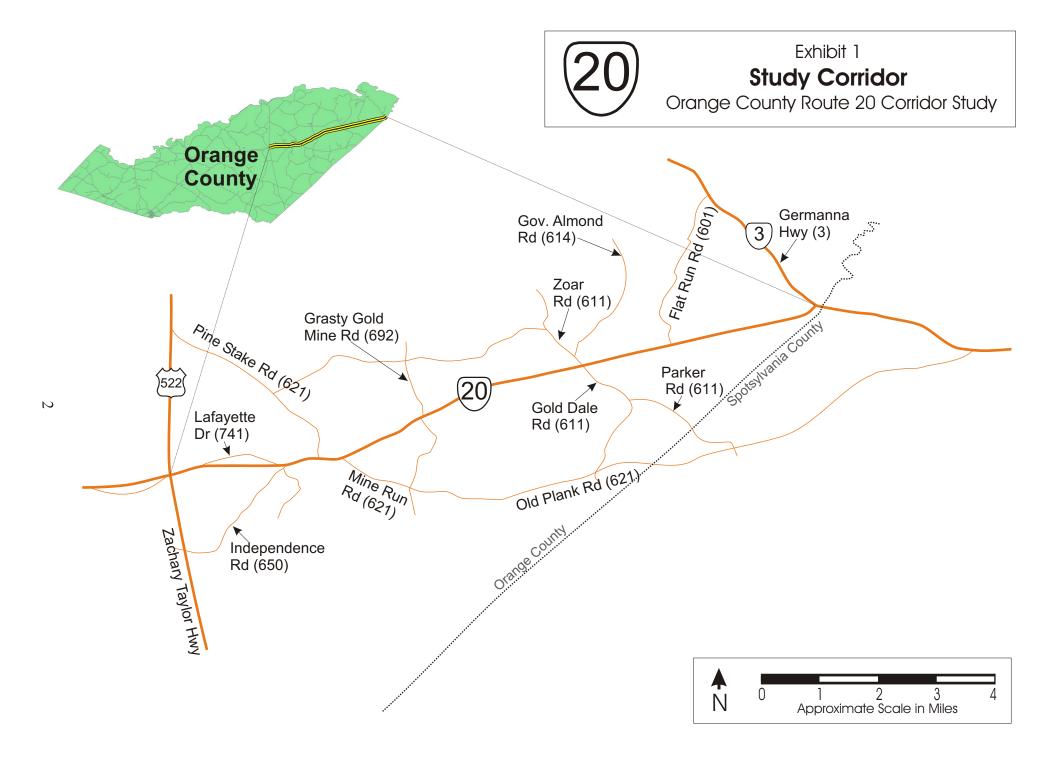
Route 20 through the study area serves central and eastern Orange County, serving residents and businesses within the corridor as well as connecting population centers in Orange County and the Town of Orange with the Fredericksburg region's Route 3 and I-95 corridors. Land uses in and near the study corridor are primarily agricultural, with pockets of commercial and residential land uses. The eastern end of the study corridor encompasses a major historic and tourist resource: the National Park Service's Wilderness Battlefield Park, the location of Civil War's Battle of the Wilderness in May of 1864.

This study incorporates an analysis of traffic growth in the corridor as well as estimates of future travel demands. This important transportation corridor has experienced substantial growth in traffic over the past 10 to 15 years, and this growth is expected to continue. This is particularly true in the historically sensitive eastern portions of the corridor. The Route 20 Corridor Study was performed to develop plans and recommendations to accommodate existing and future travel demands in a safe, efficient, and context-sensitive manner.

This study identified transportation concerns and recommendations based on existing conditions (traffic and roadway geometrics), and identified recommendations to address these same concerns for a year 2030 planning horizon. The existing conditions analyses for the corridor study included assessing traffic flow, safety, access, and roadway geometrics. To support these analyses, traffic counts were taken, roadway operations analysis was performed, traffic accident reports were retrieved and analyzed, and field observations were made. In addition, traffic forecasts were developed for the year 2030. Study recommendations that address both existing and projected concerns before they become major problems allows for better overall transportation and land use planning. The study, therefore, also seeks to develop a framework for transportation planning in the corridor, and to assist in efforts to preserve the rights-of-way that will be needed to serve existing and future travel demands.

1.1 Roadway Geometry

Throughout the study corridor, Route 20 is a two-lane undivided rural roadway with generally 12-foot travel lanes. Shoulder widths generally vary from 1 to 3 feet. Passing



is not allowed (double yellow line) on approximately 85 percent of Route 20 through the study area. The posted speed limit on most of Route 20 is 55 miles per hour, with speed reductions in several areas due to roadway geometry and/or safety concerns.

Traffic signals are located at two intersections with Route 20: US Route 522 (Zachary Taylor Highway), and Virginia Route 3 (Germana Highway). All other intersections on Route 20 are controlled by stop signs on the side streets. With the exception of a westbound right turn lane on Route 20 at its intersection with Route 611, there are currently no turn lanes at the stop-sign controlled intersections in the corridor. Turn lanes have been constructed to serve traffic for the Locust Grove Elementary and Middle Schools in the middle section of the study corridor.

Including side roads and driveways, there are 224 access points on Route 20 through the study area. This represents an average of just under 17 access points per mile (combining both directions on Route 20). These access points are shown in Exhibit 2.

Exhibit 2 **Summary of Access Points**

		Distance	Number of access points			nber of a		
From To		(miles)	EB	WB	Total	EB	WB	Total
Route 522	Route 650	2.27	26	19	45	11.5	8.4	19.8
Route 650	Route 621 East	1.10	16	12	28	14.5	10.9	25.5
Route 621 East	Route 692 East	1.88	12	11	23	6.4	5.9	12.2
Route 692 East	Route 611	3.37	25	19	44	7.4	5.6	13.1
Route 611	Route 601	1.77	30	17	47	16.9	9.6	26.6
Route 601	Route 3	2.98	17	20	37	5.7	6.7	12.4
	Totals	13.37	126	98	224	9.4	7.3	16.8

Note: EB – on eastbound lanes; WB – on westbound lanes

1.2 Traffic Data

Traffic counts were performed on Route 20 in February 2006. Forty-eight hour machine counts were performed on three segments of Route 20 and at four locations on side roads off of Route 20. These counts were performed on weekdays (excluding Monday mornings and Friday afternoons) and included classification of vehicles by type (i.e., car and truck). The locations for these 48-hour machine counts, as well as the 24-hour volumes at each location are summarized in Exhibit 3. For all locations in the corridor, the highest daily volumes occurred between the hours of 4:00 and 6:00 p.m. The morning peak period was generally between 7:00 and 9:00 a.m. Traffic on Route 20 itself does exhibit characteristics of commuter flows, with uneven directional flows during peak hours on both the eastern and western portions of the roadway. For the eastern end near Wilderness, peak traffic flows are eastbound in the morning hours heading towards Route 3 and Fredericksburg, with reverse directionality in the evening. Peaking is even more pronounced for the western portion of the study corridor near Unionville, with 74 of all morning peak traffic heading westbound towards the Town of

Orange and 71 percent of all evening traffic heading eastbound away from the Town of Orange.

Exhibit 3 **Summary of Segment Counts**

		AM Peak Hour Volumes			ık Hour ımes	Percent Trucks/Buses	
Count Location	24- Hour Traffic	East/ North- bound	West/ South- bound	East/ North- bound	West/ South- bound	Single Unit	Multi- Unit
Route 20 between Route 741 West and Route 741 East	7,159	342 (26%)	984 (74%)	973 (71%)	405 (29%)	4.0%	4.3%
Route 20 at Mine Run (between Route 740 and Route 729)	7,244	371 (58%)	265 (42%)	305 (50%)	301 (50%)	7.9%	5.9%
Route 20 between Route 611 and Route 601	9,156	399 (60%)	264 (40%)	247 (43%)	328 (57%)	6.4%	6.1%
Route 522 South of Route 20	3,579	473 (56%)	365 (44%)	328 (43%)	439 (57%)	6.7%	5.1%
Route 621 South of Route 20	2,173	225 (69%)	218 (49%)	175 (50%)	175 (50%)	10.4%	6.5%
Route 611 South of Route 20	1,585	144 (58%)	64 (31%)	70 (36%)	125 (64%)	8.1%	3.8%
Route 3 South of Route 20	20,174	81 (43%)	58 (42%)	55 (35%)	100 (65%)	11.9%	2.5%

Notes: The percent of traffic traveling in each direction is shown in parenthesis. Multi-unit trucks are tractor trailers.

Intersection turning movement counts were performed at six locations in the corridor. These counts were also conducted in February 2006. The counts were conducted on weekdays between the hours of 6:30 and 9:00 a.m. and 4:00 and 6:30 p.m. at the following locations:

- A. Route 20 at Route 522 (Zachary Taylor Highway)
- B. Route 20 at Route 650 (Independence Road)
- C. Route 20 at Route 621 South (Mine Run Road)
- D. Route 20 at Route 611 (Zoar Road/Gold Dale Road)
- E. Route 20 at Route 601 (Flat Run Road)
- F. Route 20 at Route 3 (Germana Highway)

Peak hour turning movements for the a.m. and p.m. peak hour are shown in Exhibits 4 and 5, respectively.

1.3 Safety Analysis

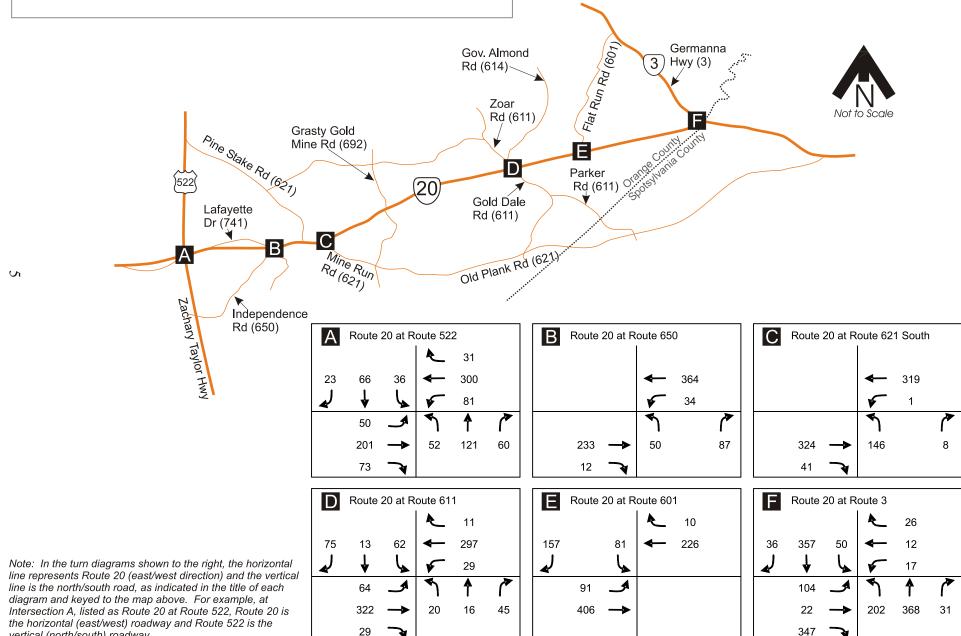
Roadway safety in the study corridor was assessed based on an analysis of vehicle crash records for the three-year period from January 2002 through December 2004. There were a total of 123 vehicular crashes during the three year period from January 2002 through



Exhibit 4

2006 AM Peak Turning Movements

Orange County Route 20 Corridor Study



vertical (north/south) roadway.

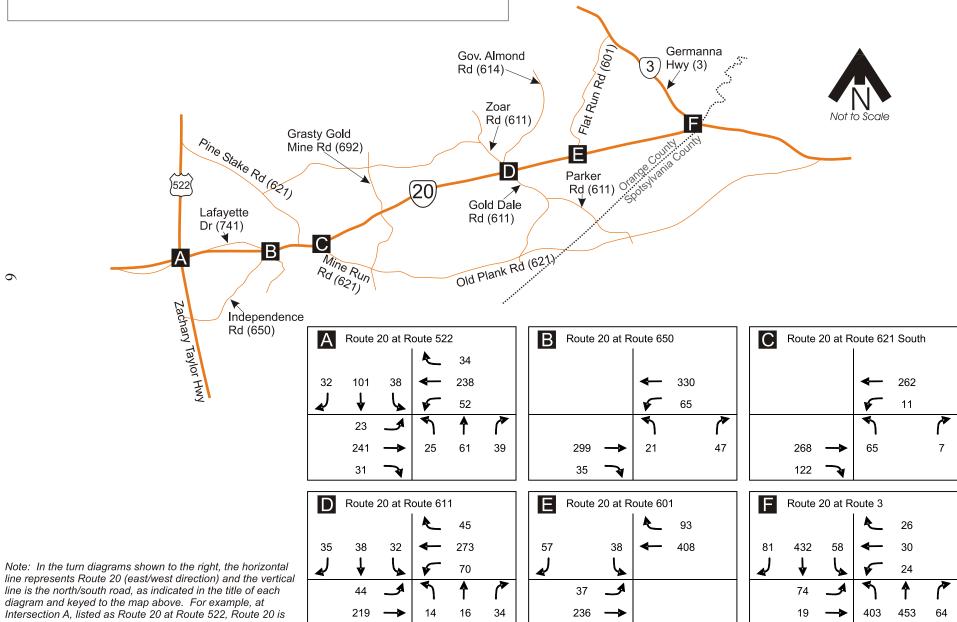


Exhibit 5

2006 PM Peak Turning Movements

Orange County Route 20 Corridor Study

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the horizontal (east/west) roadway and Route 522 is the vertical (north/south) roadway.

December 2004, with the number of crashes remaining relatively constant between 2002 and 2003 (37 in 2002, 36 in 2003). Between 2003 and 2004, however, there was an increase in crashes of approximately 10 percent (to 50 crashes).

The analysis of accidents included assessing the total number of accidents in any calendar year and identifying trends in the number and/or types of accidents at various locations. Locations with high numbers of accidents relative to the entire study corridor were analyzed in conjunction with field investigation to determine potential causes and recommended solutions. The analysis was also supplemented by field observations of traffic safety and by input from the general public, Orange County officials, and VDOT.

For comparison with similar roadway facilities across the Commonwealth, accident rates were also calculated based on both total accidents per 100 million vehicle miles (MVM) and for equivalent property damage only (PDO) accidents per 100 million vehicle miles. Accident rates for intersections are based on the number of accidents as compared to the total number of vehicles that enter the intersection. The calculation compares annual accidents to annual entering vehicles (measured in millions). For roadway segments, the calculation compares total annual accidents to total vehicle miles (number of annual vehicles times the length of the segment in miles). The increased severity and cost associated with accidents involving injuries or fatalities is accounted for by calculating the PDO equivalent. Standard methodologies used by VDOT factor a fatal accident by 12, an injury accident by 3, and a PDO accident by 1 to calculate PDO equivalents.

For the entire study corridor, there were approximately 108 accidents per 100 million vehicle miles and 230 equivalent PDO accidents per 100 million vehicle miles. This accident rate is less than average within the Commonwealth. In 2000, the average crash rate on Virginia primary arterials was 157 per 100 million vehicle miles. Additional corridor-wide accident statistics are shown in Exhibit 6.

Exhibit 6
Corridor-Wide Accident Summary

Category	Attribute	Number of Accidents	Percent
Total accidents ov	Total accidents over three years		
Year Breakdown	2002	37	30.1%
	2003	36	29.3%
	2004	50	40.7%
Accident Type	Rear-End	43	35%
	Angle	23	18.7%
	Head-On	3	2.4%
	Sideswipe	17	13.8%
	Fixed Object	32	26%
	Other	5	4.1%
Time of Day	Daylight	74	60.2%
	Dark	45	36.6%
	Dawn or Dusk	4	3.3%

Exhibit 6
Corridor-Wide Accident Summary

Category	Attribute	Number of Accidents	Percent
Crash Severity	Property Damage Only	72	58.5%
	Injury	47	38.2%
	Fatality	4	3.3%

Exhibits 7 through 10 show accident statistics by segment and intersection. Exhibit 11 summarizes the accidents that occurred in the corridor by VDOT-designated milepost. This graphic sums accidents by half-mile segment centered at every 0.1-mile interval on Route 20. While this results in accidents being counted more than once (the reader is cautioned not to sum all of the accidents in this graph as it will overestimate total accidents), this graphic is useful in identifying geographically where accidents are occurring. Exhibit 11 also shows both the raw number of crashes (shown with the blue line) as well as the PDO-equivalent number of crashes (shown with the red line). As noted above, the PDO-equivalent factors crashes by their severity, with a fatal crash using a factor of 12, an injury crash using a factor of 3, and a PDO crash using a factor of 1. The result provides a composite measure of the relative severity of crashes throughout the study corridor.

Exhibits 7 through 10 and Exhibit 11 indicate that, relative to the study corridor as a whole, those locations with potential safety concerns include the following:

- Intersection and vicinity of Route 20 and Route 650 (Independence Road)
- Intersection and vicinity of Route 20 and Route 621 South (Mine Run Road)
- Portion of Route 20 east of Route 692 (Burr Hill Road/Grasty Gold Mine Road)
- Intersection and vicinity of Route 20 and Route 611 (Zoar Road/Gold Dale Road)
- Intersection and vicinity of Route 20 and Route 601 (Flat Run Road)

Exhibit 7
Accident Summary by Year

Location			Accidents By Year				
Type	From	To	2002	2003	2004	All Years	
Intersection	At Route 522		2	5	5	12	
Segment	Route 522	Route 619/757	3	2	3	8	
Intersection	At Route 650		3	0	3	6	
Segment	Route 650	Route 621 East	1	5	3	9	
Intersection	At Route 621 South		2	2	5	9	
Segment	Route 621 South	Route 692	3	3	5	11	
Intersection	At Route 692		0	0	1	1	
Segment	Route 692	Route 611	7	5	5	17	
Intersection	At Route 611		3	2	4	9	
Segment	Route 611	Route 601	2	6	7	15	
Intersection	At Route 601		3	3	1	7	
Segment	Route 601	Route 3	8	3	6	17	
Intersection	At Route 3		0	0	2	2	
_		TOTALS	37	36	50	123	

Exhibit 8 **Accident Summary by Type**

		Accident Suim	Accident Type					
Location Type	From	То	Rear- End	Angle	Head- On	Side- swipe	Fixed Object	Other
Intersection	At Route 522		2	10	0	0	0	0
Segment	Route 522	Route 650	3	1	0	3	1	0
Intersection	At Route 650		5	0	0	0	1	0
Segment	Route 650	Route 621 East	4	2	0	1	2	0
Intersection	At Route 621 South		4	2	0	1	2	0
Segment	Route 621 South	Route 692	5	0	0	3	2	1
Intersection	At Route 692		1	0	0	0	0	0
Segment	Route 692	Route 611	5	1	1	3	5	2
Intersection	At Route 611		4	4	0	0	1	0
Segment	Route 611	Route 601	6	0	1	2	6	0
Intersection	At Route 601		4	1	0	0	2	0
Segment	Route 601	Route 3	0	1	1	4	10	1
Intersection	At Route 3		0	1	0	0	0	1
		TOTALS	43	23	3	17	32	5

Exhibit 9 **Accident Summary by Light Conditions and Severity**

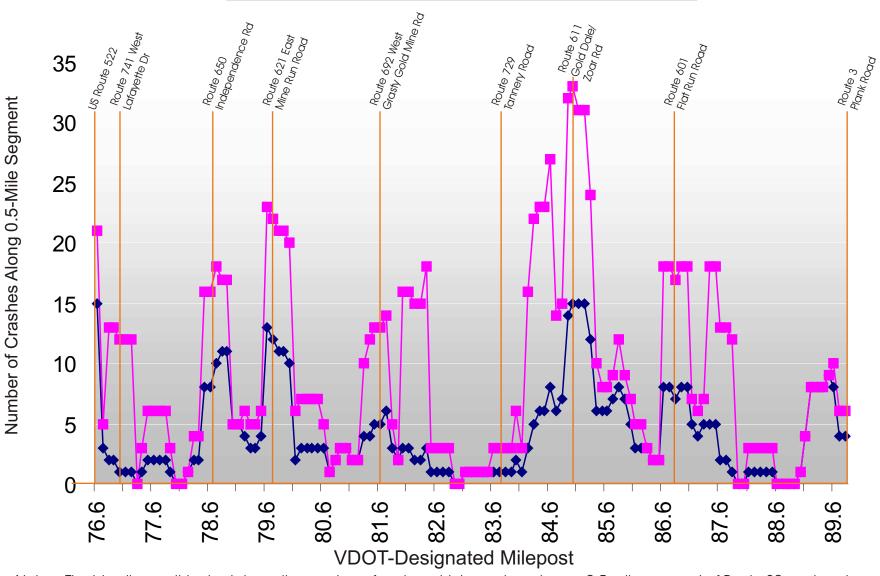
				ne of I			erity	
Location Type	From	То	Day- light	Dark	Dawn/ Dusk	Property Damage Only	Injury	Fatal
Intersection	At Route 522		8	4	0	10	2	0
Segment	Route 522	Route 650	6	2	0	3	4	1
Intersection	At Route 650		4	2	0	3	3	0
Segment	Route 650	Route 621 East	8	1	0	8	1	0
Intersection	At Route 621 South		4	4	1	5	4	0
Segment	Route 621 South	Route 692	6	3	2	4	7	0
Intersection	At Route 692		1	0	0	1	0	0
Segment	Route 692	Route 611	7	9	1	5	10	2
Intersection	At Route 611		7	2	0	4	5	0
Segment	Route 611	Route 601	9	6	0	12	3	0
Intersection	At Route 601		3	4	0	2	5	0
Segment	Route 601	Route 3	9	8	0	14	2	1
Intersection	At Route 3		2	0	0	1	1	0
	<u> </u>	TOTALS	74	45	4	72	47	4

Exhibit 10 **Accident Rates**

Location Type	From	То	Accidents per Million Vehicles*	Equivalent Property Damage Only Accidents per Million Vehicles *
Intersection	At Route 522		108.92	145.22
Segment	Route 522	Route 650	49.24	166.20
Intersection	At Route 650		71.75	143.49
Segment	Route 650	Route 621 East	116.78	142.73
Intersection	At Route 621 South		104.70	197.77
Segment	Route 621 South	Route 692	78.12	177.56
Intersection	At Route 692		11.71	11.71
Segment	Route 692	Route 611	59.09	205.09
Intersection	At Route 611		81.23	171.49
Segment	Route 611	Route 601	94.33	132.06
Intersection	At Route 601		63.74	154.81
Segment	Route 601	Route 3	62.42	117.50
Intersection	At Route 3		8.55	17.10

^{* --} For segments, rate is per 100 million vehicle miles traveled (MVMT). For intersections, rate is per 100 million entering vehicles (MEV).

Exhibit 11 Location of Crashes (2002-2004) Orange County Route 20 Corridor Study



Notes: The blue line on this chart shows the number of motor vehicle crashes along a 0.5 mile segment of Route 20 centered on a particular milepost. The red line shows the property-damage equivalent number of crashes along 0.5 mile segments. The red line provides a measure of the relative severity of crashes (see text for additional discussion of this concept). Note that for both data sets, the values are for 0.5 mile segments, but are shown every 0.1 mile. Crashes, therefore, are shown in multiple segments.

1.4 Roadway Operations Analyses

Traffic operations in the study corridor were analyzed using the concept of levels of service. The analysis grades traffic operations as a level of service rating from A to F, with A representing excellent traffic flow with minimal delays and F representing failure in traffic operations and very long delays. For most areas in the state, including the section of Route 20 examined in this study, VDOT rates levels of service A, B, or C as acceptable and levels of service D, E, or F as unacceptable. The level of service analysis using grades A through F was used for all the intersections in the study corridor.

As shown in Exhibit 12, all of the roadway segments analyzed operate at level of service A, B, or C for existing conditions with the exception of Route 20 between Route 611 and Route 601, which operates at level D during the AM peak hours. The intersection of Route 20 at Route 611 operates at an unacceptable level of service D in the AM peak hours as shown in Exhibit 13.

Exhibit 12 **Summary of Segment Level of Service (Existing Conditions)**

Segment	24-Hour Traffic	AM Peak Hour Level of Service	PM Peak Hour Level of Service
Route 20 between Route 741 West and Route 741 East	7,159	С	С
Route 20 at Mine Run (between Route 740 and Route 729)	7,244	С	С
Route 20 between Route 611 and Route 601	9,156	D	С
Route 522 South of Route 20	3,579	В	В
Route 621 South of Route 20	2,173	A	A
Route 611 South of Route 20	1,585	A	A
Route 3 South of Route 20	20,174	В	В

Exhibit 13

Summary of Intersection Level of Service
(Existing Conditions)

	2006		
Intersection of Route 20 with:	AM Peak	PM Peak	
Route 20 at Route 522	A	A	
Route 20 at Route 650	В	В	
Route 20 at Route 621	C	C	
Route 20 at Route 611	D	C	
Route 20 at Route 601	С	С	
Route 20 at Route 3	A	A	

1.5 Public Participation and Input

The traffic engineering analysis described in this chapter provides an objective and quantitative assessment of transportation operations and safety in the study corridor. Some transportation concerns do not become apparent through engineering analyses, however, and are best identified by speaking with those who live, work, and/or travel the corridor. To collect this important input, public meetings were held in the study corridor on February 22, 2006 and March 29, 2006. Approximately 65 people attended the public meetings; several others provided comments either by e-mail or telephone.

The public meetings provided a forum for questions to be asked and answered and for comments to be taken. At both public meetings, significant portions of the discussion time were spent in answering questions about the study. Questions generally covered the following areas (brief information on responses, where appropriate, is included in parentheses):

- Study process, as well as how projects proceed through the overall transportation planning process
- Traffic forecasting process and assumptions (described in this report)
- Feasibility of decreasing speed limits and increasing enforcement (assessed as part of the development of study recommendations)
- Availability of data on use of Route 20 by county and non-county residents (origin-destination surveys were not performed as part of this study)
- Availability of data on number of crashes that involve county and non-county residents (this type of breakdown is not available from the crash data sets)

Comments received at the meetings are summarized below. In general, safety was cited frequently as a major concern.

- It seems like adding turn lanes would be the best solution
- There are sight distance issues at Route 611 (from signs adjacent to the roadway; these block the view for some types of vehicles and not others)
- Widening will just bring more traffic (divert from other roads) and encourage more growth
- Concern that widening would not really improve the roadway's safety
- The lack of shoulders on Route 20 is an area of concern
- Should definitely not widen Route 20 through the Wilderness Battlefield area (it really wouldn't be a problem if we just leave the 3 miles through the Battlefield as two lanes)
- Consider lowering the speed limits
- Enforce speed limits more thoroughly and consistently
- There are more crashes than are actually reported, so the crash analysis probably understates some of the safety issues
- The traffic forecasts are probably low, perhaps by a large margin
- Widening Route 20 is an economic development issue; younger county residents don't want to have to travel 60-70 miles for work
- The intersection at Route 601 near the Wilderness Library is a problem area

- o the northbound lane has a hill which can obstruct oncoming traffic
- o traffic on Route 601 has greatly increased since the back entrance to Lake of the Woods has been open
- o Route 601 is used extensively at a cut-through to Route 3 going towards Culpeper
- O Suggest that a speed reduction to 45 mph with blinking 45 mph signs should be considered
- The intersection at Route 611 near the Exxon station (Market at Locust Grove) is also a problem area
 - o Concern about how traffic from the new shopping center will safely access Route 20
 - o Need to strongly consider a traffic light at this location

All of these comments were considered in developing and/or revising the recommendations described in Chapter 3 of this report.

Chapter 2 – Year 2030 Traffic Forecasts and Operations

The transportation recommendations developed for this study are intended to accommodate both existing travel demands and demands to the year 2030. Traffic forecasts for 2030 and analysis of 2030 traffic operations were used to identify future needs and to ensure that the proposed transportation recommendations would adequately and safely accommodate future demand.

2.1 2030 Traffic Forecasts

Year 2030 traffic forecasts for this study are based on historic traffic trends along with the traffic expected to be generated by several planned development projects in the corridor. To calculate expected growth in traffic between 2006 and 2030, historic traffic counts collected by VDOT were tabulated along with the 2006 traffic counts performed for this study. Two scenarios were developed, one projecting moderate growth and the second projecting low growth. Based on historic trends, the following annual growth rates were used to forecast traffic to the year 2030:

- Moderate Growth Scenario
 - 1.3 percent for the western portion of the study corridor between Route
 522 and Route 650
 - o 1.7 percent for the middle portion of the study corridor between Route 650 and Route 611
 - o 3.8 percent for the eastern portion of the study corridor between Route 611 and Route 3
- Low Growth Scenario
 - o 0.9 percent for the western portion of the study corridor between Route 522 and Route 650
 - o 1.2 percent for the middle portion of the study corridor between Route 650 and Route 611
 - o 2.6 percent for the eastern portion of the study corridor between Route 611 and Route 3

As is often typical for studies of this type, the growth rates were not compounded but rather multiplied. By not compounding, the growth rate is effectively a constant volume (rather than a constant percentage) per year.

Expected traffic volumes and resulting levels of service for roadway segments on Route 20 are shown in Exhibit 14. In the moderate growth scenario, traffic volumes on Route 20 are expected to be between 9,400 and 17,600 vehicles per day in the year 2030. The low growth scenario projects that volumes on Route 20 will range between 8,700 and 14,900 vehicles per day.

Exhibit 15 illustrates graphically the expected growth in traffic volume as well as the range of traffic volumes where traffic engineers expect the capacity of a two-lane rural roadway such as Route 20 to be exceeded. The band shown in Exhibit 15 shows the level

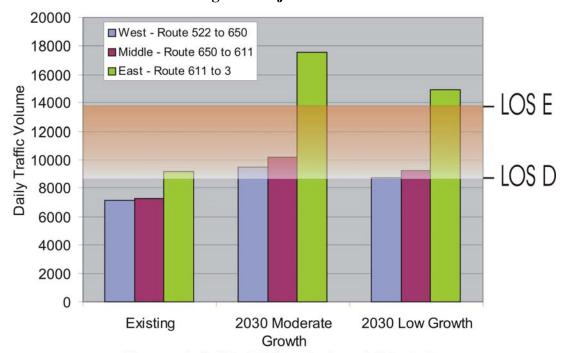
of service D to E range – when traffic volumes enter or exceed the range highlighted by this band, motorists can expect significant delays resulting from traffic congestion.

Exhibit 14 **Summary of Segment Volumes and Level of Service (Year 2030)**

	Moderate Growth Scenario Low Growth Scenari					nario
Segment	24-Hour Traffic	AM LOS	PM LOS	24-Hour Traffic	AM LOS	PM LOS
Route 20 between Route 741 West and Route 741 East	9,464	D	D	8,734	D	С
Route 20 at Mine Run (between Route 740 and Route 729)	10,192	D	D	9,258	D	С
Route 20 between Route 611 and Route 601	17,561	Е	Е	14,906	Е	Е
Route 522 South of Route 20	4,731	C	В	4,366	C	В
Route 621 South of Route 20	3,057	В	В	2,777	В	В
Route 611 South of Route 20	3,040	В	В	2,580	Α	В
Route 3 South of Route 20	38,694	Е	Е	32,843	D	D

AM LOS = AM peak hour level of service; PM LOS = PM peak hour level of service

Exhibit 15 **Chart of Existing and Projected Traffic Volumes**



Please note that the LOS bands shown in this chart are planning-level thresholds – detailed analysis by individual segments may pinpoint deficiencies that may not be apparent based on planning-level analyses.

Peak hour intersection turning movement volumes for the year 2030 are shown in Exhibits 16 and 17 for the moderate growth scenario, and Exhibits 18 and 19 for the low growth scenario.

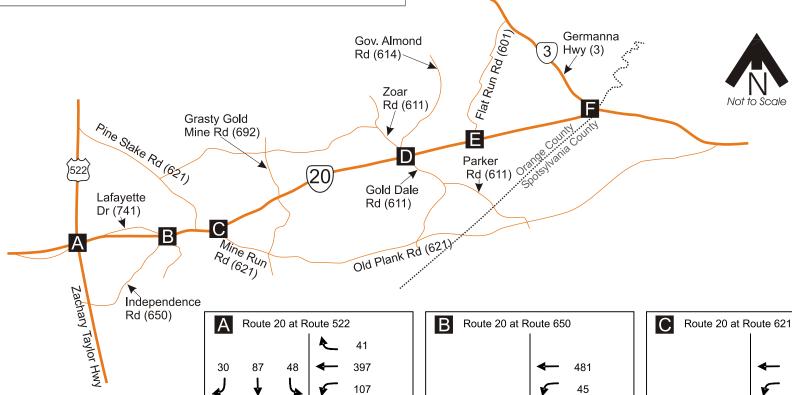
2.2 Year 2030 No-Build Traffic Operations

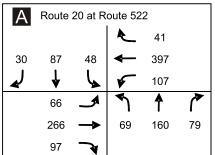
The No-Build scenario refers to the situation that would occur if no major improvements, only routine maintenance, were made in the study corridor between now and 2030. With increased travel demands and no major improvements, traffic operations and safety in the Route 20 corridor are expected to deteriorate. As shown in Exhibits 14 and 15 on the previous page, regardless of the scenario used, the two-lane portions of Route 20 in most parts of the study corridor would operate at inadequate levels of service by the year 2030 (levels of service D and E). One significant effect of this increased traffic and congestion is substantial delays for motorists turning onto Route 20 from side streets. While inadequate level of service does not necessarily indicate that a traffic signal is warranted (a separate traffic signal warrant analysis is required for signal installation), major delays are indicative of both the potential for signalization and of decreased safety as motorists sometimes take greater risks when frustrated with delays. Exhibit 20 shows the results of the intersection level of service analysis for 2030. As this table, shows, 4 of the 6 intersections analyzed are expected to operate at unacceptable levels of service by 2030. The highest levels of delay are expected at the Route 20 intersections with Route 611 and Route 601.

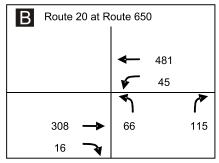
Exhibit 16

2030 AM Peak Turning Movements (Moderate Growth Scenario)

Orange County Route 20 Corridor Study

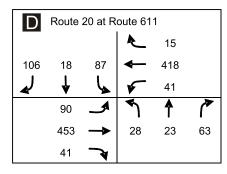


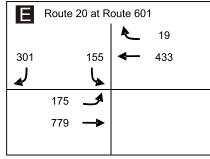




С	Route 20 at Route 621 South				
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			*	1	
			2		~
	456	\rightarrow	205		11
	58	A			

Note: In the turn diagrams shown to the right, the horizontal
line represents Route 20 (east/west direction) and the vertical
line is the north/south road, as indicated in the title of each
diagram and keyed to the map above. For example, at
Intersection A, listed as Route 20 at Route 522, Route 20 is
the horizontal (east/west) roadway and Route 522 is the
vertical (north/south) roadway.



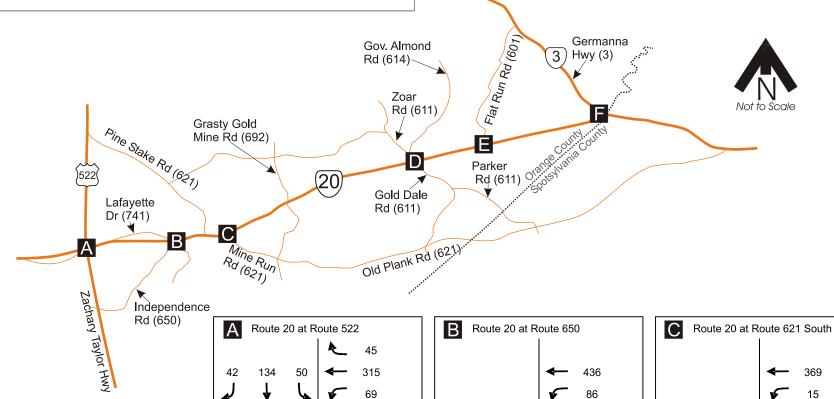


Route 20 at Route 3					
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	42	\rightarrow	387	706	59
	666	7			

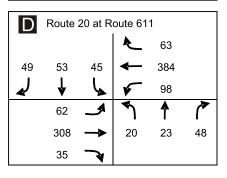
Exhibit 17

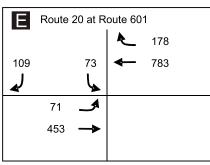
2030 PM Peak Turning Movements (Moderate Growth Scenario)

Orange County Route 20 Corridor Study



Note: In the turn diagrams shown to the right, the horizontal line represents Route 20 (east/west direction) and the vertical line is the north/south road, as indicated in the title of each diagram and keyed to the map above. For example, at Intersection A, listed as Route 20 at Route 522, Route 20 is the horizontal (east/west) roadway and Route 522 is the vertical (north/south) roadway.





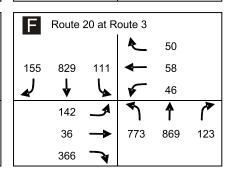
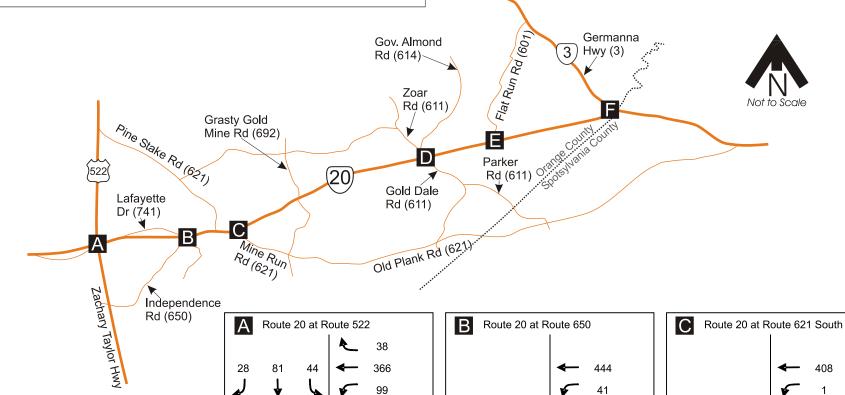


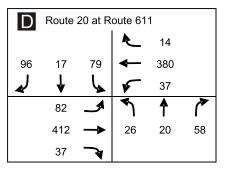
Exhibit 18

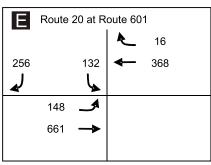
2030 AM Peak Turning Movements (Low Growth Scenario)

Orange County Route 20 Corridor Study



Note: In the turn diagrams shown to the right, the horizontal line represents Route 20 (east/west direction) and the vertical line is the north/south road, as indicated in the title of each diagram and keyed to the map above. For example, at Intersection A, listed as Route 20 at Route 522, Route 20 is the horizontal (east/west) roadway and Route 522 is the vertical (north/south) roadway.





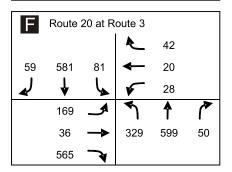
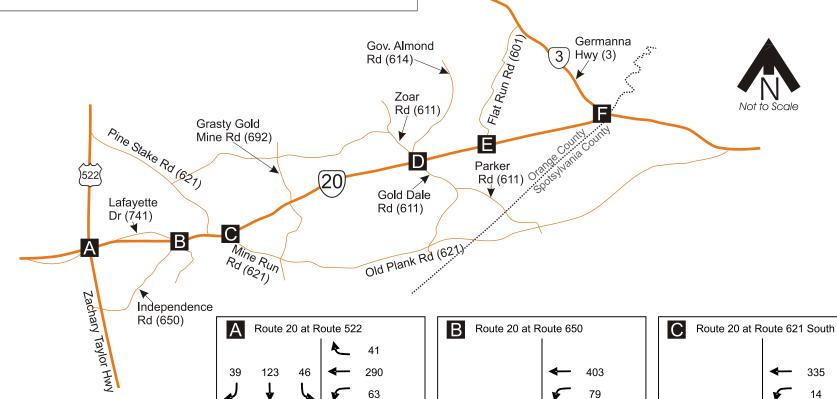


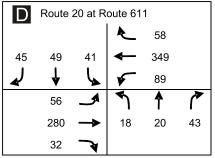
Exhibit 19

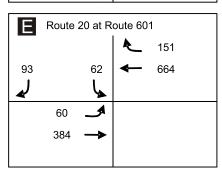
2030 PM Peak Turning Movements (Low Growth Scenario)

Orange County Route 20 Corridor Study



Note: In the turn diagrams shown to the right, the horizontal line represents Route 20 (east/west direction) and the vertical line is the north/south road, as indicated in the title of each diagram and keyed to the map above. For example, at Intersection A, listed as Route 20 at Route 522, Route 20 is the horizontal (east/west) roadway and Route 522 is the vertical (north/south) roadway.





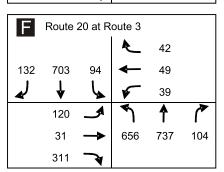


Exhibit 20 **Intersection Peak Hour Level of Service (2030)**

Intersection of Route 20 with:	2030 Moderate Growth		2030 Low Growth	
intersection of Route 20 with:	AM Peak	PM Peak	AM Peak	PM Peak
Route 20 at Route 522	В	A	A	A
Route 20 at Route 650	С	С	C	C
Route 20 at Route 621	F	С	E	C
Route 20 at Route 611	F	F	F	E
Route 20 at Route 601	F	F	F	F
Route 20 at Route 3	D	E	В	D

2.3 Corridor Transportation Issues

Chapter 1 of this report describes existing transportation concerns in the study corridor, identified based on engineering analyses as well as input from the general public. The discussion in previous sections of this chapter highlights that these concerns will be exacerbated by the year 2030 as traffic volumes increase. Exhibit 21 below summarizes some of these existing and projected transportation issues and concerns. Improvements to address these concerns are described in the next chapter.

Exhibit 21 **Summary of Corridor Transportation Issues**

Location	Transportation Issues		
Route 20 at Route 522	Accommodating school bus traffic		
(Zachary Taylor	Delays caused by lack of turn lanes		
Highway)	Dotaly caused by their or carrinates		
Route 20 at Route 650	Substandard intersection geometrics		
(Independence Road)	Safety concerns		
Route 20 between	Narrow shoulders		
Route 650 and Route			
621 South			
Route 20 at and near	• Safety concerns: high number of rear-end crashes suggests need		
Route 621 South (Mine	for turn lanes		
Run Road)	 Inadequate levels of service by 2030 		
Route 20 at Route 611	 Safety concerns and existing capacity concerns: need for turn 		
(Zoar Road/Gold Dale	lanes		
Road)	 Anticipated to operate at level of service F in 2030 		
	• Commercial development at this location, ensuring continued		
	safe access to this development		
Route 20 at Route 601	• Safety concerns and existing capacity concerns: need for turn		
(Flat Run Road)	lanes		
	Hill on northbound lane impinges on sight distance		
	 Anticipated to operate at level of service F in 2030 		
Route 20 between	 Anticipated high level of travel demand in 2030 		
Route 601 and Route 3	Historic resources		
Route 20 at Route 3	 Northbound left turn lane needs to be extended 		
(Germana Highway)	 Anticipated to operate at level of service E in 2030 		

Exhibit 21 **Summary of Corridor Transportation Issues**

Location	Transportation Issues
Overall	Lack of shoulders
	Increased travel demands anticipated to create congestion
	High number of access points suggests value of plans to consolidate existing access points and control number of new access points
	 Need to control growth through combination of land use and transportation measures Need for increased levels of speed enforcement

Chapter 3 – Study Recommendations

As described in previous chapters, this study has identified both existing and future transportation problems in the Route 20 corridor. These concerns were confirmed and reiterated by those who attended the public meetings that were held in the corridor. Meeting participants also supported the need for proactive transportation planning in the corridor to address existing needs and to plan for future improvements. Effective transportation planning in this corridor will provide Orange County, VDOT, and local land-owners with a blueprint for a safe and efficient Route 20.

The recommendations of this study fall into three broad categories. The first includes improvements to intersections to improve operations and safety. These improvements are generally to add turn lanes at key locations. The second category of improvement relates to the capacity of Route 20 itself. The traffic forecasts developed by this study indicate a long-term need for widening most or all of Route 20 through the study area by the year 2030. The need for widening is based on both a moderate growth scenario (the most realistic scenario) as well as a low-growth scenario. Based on these forecasts, it is prudent for Orange County to preserve rights-of-way in order to minimize the future impacts of any widening projects.

Orange County is also a largely rural county with a desire to control growth in order to preserve its rural qualities. It is also prudent, therefore, for the County to implement transportation planning practices in the corridor that support land use measures to control growth. The third broad category of recommendations from this study relate to methods of directing most property access in the corridor to a limited number of well-designed locations (driveways and secondary roads), to making use of parallel secondary roads or parallel circulation roads to provide access to individual parcels, and to requiring setbacks for new structures. These recommendations will provide additional teeth to regulations to discourage strip development and they will preserve the rural look of the corridor by requiring setbacks. Because access points also require the clearing of vegetation to provide for adequate sight distances, controlling the number, location, and design of access points also preserves and enhances the natural landscaping of a corridor. The implementation of these planning recommendations would be through the changes to the Comprehensive Plan, implementation of overlay zoning, and use of this study in terms of guiding the local circulation provisions that accompany any new development.

Many of this study's planning recommendations fall under the term access management. Access management is the concept of managing and controlling access in order to preserve the transportation function and safety of a roadway. Access management should also be a key feature of any widening of Route 20. Where it is widened, Route 20 should incorporate a median, as medians provide an important mechanism for limiting and managing access. Limiting of access by controlling the number of driveways and medians promotes safety because it reduces the number of conflict points and reduces the variation in vehicle speeds. Studies have consistently shown that the number of driveways per mile on a roadway is a key indicator of accident frequency. Traffic entering and exiting at driveways, particularly vehicles making left turns, also reduce the

flow of traffic. Limiting access will also, therefore, promote long-term smooth traffic flow in the corridor. Pedestrian and bicycle safety is also substantially degraded as the number of entrance points onto a road increases. Finally, limiting access also serves to reduce or eliminate the strip development that extends along a roadway rather than focusing on a limited number of activity nodes.

Another key feature of the planning recommendations is the establishment of key access points that are spaced relatively evenly through the corridor. These proposed key access points support a hierarchy of access in the study corridor, which is supportive of both good land use and transportation planning. The key access points are illustrated in Exhibit 22, and are listed below:

- US Route 522 (Zachary Taylor Highway)
- Route 650 (Independence Road)
- Route 621 South (Mine Run Road)
- Route 692 (Burr Hill Road/Grasty Gold Mine Road)
- Route 611 (Zoar Road/Gold Dale Road)
- Route 601 (Flat Run Road)
- Route 3 (Germana Highway)

To the extent possible, access to adjacent properties should seek to access Route 20 at the identified key points (either directly, or indirectly through secondary or parallel road connections). In addition, while Orange County zoning and comprehensive planning foresees much of this corridor as agricultural and other low-density uses, the limited amount of commercial properties in the corridor should be focused on these access nodes. Several of this study's specific roadway recommendations support this concept by shifting existing roadways to come into Route 20 at these key access nodes.

Exhibit 22 **Proposed Major Access Nodes On Route 20** Gov. Almond Germanna Rd (614) 3) Hwy (3) Zoar Rd (611) Grasty Gold Pine Stake Rd (621) Mine Rd (692) Parker (20)Rd (611) Gold Dale Lafayette Rd (611) Dr (741) Mine Run Old Plank Rd (621) Independence Rd (650)

This study includes short-, mid-, and long-term recommendations. Short-term improvements are recommended to be implemented within the next 5 years. These improvements include relatively low-cost and low-impact improvements as well as planning actions that Orange County should take within the same five-year timeframe. Mid-term improvements are those that would be implemented within the 5 to 10 year timeframe. These include projects that require some lead time in terms of location and environmental studies, as well as more capital-intensive projects that require some time to accrue funding for construction. Long-term projects are those that would be implemented over a timeframe of 10 years or more. Many long-term recommendations relate to improvements that are contingent on property uses changing. In other words, these recommendations are intended to guide decisions that would be necessary should a property convert to a more intensive use. Improvements such as parallel access roads or shifting entrances should then be part of the re-development. Note that parallel roads are recommended as a planning concept in the Locust Grove area around Route 611.

In the sections below, study recommendations are coded by number for each of the timeframes (i.e., Recommendation S1 is the first short-term recommendations). The improvements for all three timeframes are also depicted in Exhibits 24 through 35 using these same improvement codes.

3.1 Short-Term Recommendations

The implementation of access management in the Route 20 corridor will require that a planning and regulatory framework be established. Short-term (0 to 5 years) recommendations address this requirement, and incorporate a number of intersection and roadway safety improvements that are relatively low-cost.

- S1: Adopt changes to the Orange County Comprehensive Plan to provide the foundation for corridor preservation, corridor overlay zoning, and access management in the Route 20 Corridor. Incorporate references to this Route 20 Corridor Management Plan.
- S2: Begin to implement the access management and local circulation plan by incorporating additional elements into the Corridor Overlay District element of the Orange County Zoning Ordinance. The Corridor Overlay District should extend 1,000 feet on each side of the centerline of Route 20. This will provide Orange County with the mechanism to control the number of access points onto Route 20. The overlay zoning ordinance should:
 - 1. Incorporate minimum frontage requirements commensurate with this state primary highway. This study recommends a minimum parcel frontage of 500 feet for an access point and 800 feet of additional frontage for each additional access point (these requirements were developed based on desirable spacing to accommodate stopping sight distance).
 - 2. Require driveways be located at least 150 feet from the intersections of Route 20 with secondary roads, particularly those roadways identified on page 25 as key access points.

- 3. Provide incentives for shared entrances, inter-parcel access, and/or access via existing or proposed secondary roads, as well as new parallel roads.
- 4. Promote the design of driveways that come in directly across, rather than offset, from existing driveways on the opposite side of Route 20.
- 5. Support the construction of the roadway improvements in this study, particularly those that seek to remove intersection offsets (an example in the study corridor of this type of offset occurs at Route 692 Burr Hill Road and Grasty Gold Mine Road).
- Develop and implement driveway design guidelines that establish the best location for property access as well as measures to enhance the visibility of driveways for motorists.
- 7. Provide setbacks to ensure right-of-way is available to widen Route 20 at such time that it is deemed necessary.

Implementation of access management in the Route 20 Corridor would also include several changes in procedures. These are:

- 1. New agreements for access onto Route 20 should incorporate language stating that such access is temporary until such time that alternative access via localized internal or parallel roads, or a secondary road, is developed. Orange County will need to coordinate with VDOT to apply these guidelines. Where agreements already exist between VDOT and landowners, both Orange County and VDOT should seek to minimize the impacts that any new access points would have on traffic flow and safety.
- 2. The goals of the updated Comprehensive Plan, access management, and localized circulation should be integrated into the subdivision, site plan, and negotiation process with landowners and developers.
- S3: Close western-most entrance of Lafayette Drive (Route 741).
- S4: Upgrade intersection of Route 20 at Route 611 (Zoar Road/Gold Dale Road); add turn lanes on all approaches and perform warrant analysis for signalization (cost assumes installation of traffic signal).
- S5: Upgrade intersection of Route 20 at Route 601 (Flat Run Road); add turn lanes on all approaches.
- S6: Establish Route 20 East Planning Corridor to preserve right-of-way for potential new four-lane alignment of Route 20. This planning corridor would be located north of existing Route 20. The preservation of this corridor would be needed to provide an alternative roadway alignment to widening along existing Route 20 through sensitive historic areas. Continue to coordinate with the National Park Service to refine the alignment for this planning corridor.

3.2 Mid-Term Recommendations

Mid-term improvements are recommended to be implemented in a 5 to 10 year timeframe.

- M1: Upgrade intersection of Route 20 at Route 522 (Zachary Taylor Highway); add left turn lanes on all approaches and shift intersection of Route 522 at Route 671 (Village Road) south.
- M2: Relocate intersection of Route 20 at Route 650 (Independence Road) to come in across from the eastern intersection of Route 741 (Lafayette Drive); upgrade this new four-leg intersection.
- M3: Coordinate with land owners in the area east of existing Route 650 (Independence Road) to improve the definition and design of driveways in this area.
- M4: Upgrade intersection of Route 20 with Route 621 South (Mine Run Road); add turn lanes on all approaches.
- M5: Relocate intersection of Route 621 South (Mine Run Road) and Route 742 (Strawberry Hill Road) to come in approximately 300 feet south of Route 20 (across from existing driveway on west side of Mine Run Road).

3.3 Long-Term Recommendations

Long-term improvements are anticipated to be constructed within a 10 to 20 year timeframe.

- L1: Consolidate two entrances of Route 671 (Narrow Gauge Road) onto Route 20 to a single entrance; add turn lanes at this new consolidated entrance. This new consolidated entrance should be located at or just west of the existing Route 671 East intersection (the exact location for this entrance would be determined based on property and site design considerations).
- L2: Relocate Route 621 North (Pine Stake Road) intersection with Route 20 to come in across from Route 621 South (Mine Run Road); upgrade this new four-leg intersection.
- L3: Relocate Route 692 South (Grasty Gold Mine Road) to come in across from Route 692 North (Burr Hill Road); upgrade this new four-leg intersection.
- L4: Construct new parallel roadways in the vicinity of Route 611 to provide for interparcel access within this commercial center; parallel circulation roads should be located 400' to 500' from Route 20 centerline.

- L5: Widen Route 20 to four lanes divided from Route 611 to 0.2 miles east of Route 601.
- L6: Relocate Wolds Lane to come in across from Route 601 (Flat Run Road); this roadway would be constructed to provide access, if needed, to parcels on the south side of Route 20.
- L7: Widen Route 20 to four lanes divided from 0.2 miles east of Route 601 to Route 3 (based on further study, a new four-lane divided alignment for Route 20 may be developed).

3.4 Estimated Costs

Cost estimates were developed for the physical improvements described in the three previous sections using standard unit costs provided by VDOT. The resulting cost estimates were then reviewed with County and VDOT staff. These costs are in year 2006 dollars. It is important to recognize that the costs are planning-level estimates only and are subject to adjustment following more detailed engineering analysis. Unforeseen environmental impacts can also have a substantial effect on project costs.

The estimated costs for each improvement are shown in Exhibit 23. The totals for each timeframe are shown below:

Short-term \$1.73 million Mid-term \$2.49 million Long-term \$28.17 million

Exhibit 23 Estimated Costs for Physical Improvements

Code	Description	Estimated Project Length (feet)	Total Estimated Cost
S3	Close western-most entrance of Lafayette Drive (Route 741)	NA	\$10,000
S4	Upgrade intersection of Route 20 at Route 611 (Zoar Road/Gold Dale Road); add turn lanes on all approaches and perform warrant analysis for signalization (cost assumes installation of traffic signal)	NA	\$970,000
S5	Upgrade intersection of Route 20 at Route 601 (Flat Run Road); add turn lanes on all approaches	NA	\$750,000
S6	Establish Route 20 East Planning Corridor to preserve right-of-way for potential new alignment of Route 20	NA	NA

Exhibit 23 Estimated Costs for Physical Improvements

Estimated Costs for Physical Improvements				
Code	Description	Estimated Project Length (feet)	Total Estimated Cost	
M1	Upgrade intersection of Route 20 at Route 522 (Zachary Taylor Highway); add left turn lanes on all approaches and shift intersection of Route 522 at Route 671 (Village Road) south	440	\$1,109,000	
M2	Relocate intersection of Route 20 at Route 650 (Independence Road) to come in across from the eastern intersection of Route 741 (Lafayette Drive); upgrade this new four-leg intersection	1500	\$733,000	
M3	Coordinate with land owners in the area east of existing Route 650 (Independence Road) to improve the definition and design of driveways in this area	NA	NA	
M4	Upgrade intersection of Route 20 with Route 621 South (Mine Run Road); add turn lanes on all approaches	NA	\$500,000	
M5	Relocate intersection of Route 621 South (Mine Run Road) and Route 742 (Strawberry Hill Road) to come in approximately 300 feet south of Route 20 (across from existing driveway on west side of Mine Run Road)	320	\$150,000	
L1	Consolidate two entrances of Route 671 (Narrow Gauge Road) onto Route 20 to a single entrance; add turn lanes at this new consolidated entrance	300	\$500,000	
L2	Relocate Route 621 North (Pine Stake Road) intersection with Route 20 to come in across from Route 621 South (Mine Run Road); upgrade this new four-leg intersection	3260	\$717,000	
L3	Relocate Route 692 South (Grasty Gold Mine Road) to come in across from Route 692 North (Burr Hill Road); upgrade this new four-leg intersection	620	\$600,000	
L4	Construct new parallel roadways in the vicinity of Route 611 to provide for inter-parcel access within this commercial center; parallel circulation roads should be located 400' to 500' from Route 20 centerline	2780	\$1,600,000	

Exhibit 23 Estimated Costs for Physical Improvements

Code	Description	Estimated Project Length (feet)	Total Estimated Cost
L5	Widen Route 20 to four lanes divided from Route 611 to 0.2 miles east of Route 601	11260	\$12,554,000
L6	Relocate Wolds Lane to come in across from Route 601 (Flat Run Road); this roadway would be constructed to provide access, if needed, to parcels in this area	1220	\$292,000
L7	Widen Route 20 to four lanes divided from 0.2 miles east of Route 601 to Route 3 (based on further study, a new four-lane divided alignment for Route 20 may be developed)	10660	\$11,905,000

3.5 Additional Considerations and Estimated Costs

Upgrades to Route 621

As part of this study, consideration was given to upgrading Route 621 (Mine Run Road and Old Plank Road) as an alternative route for traffic traveling to Route 3 towards Fredericksburg. In general, the issue relates to traffic going from the vicinity of Route 20 at Route 621 East to Route 3 at Route 621 (and extending to points further south on Route 3) by one of two paths:

Path 1: Via Route 20 to Wilderness and then south on Route 3 (and vice-versa)

Path 2: Via Route 621

While travel surveys to quantify the actual amount of traffic taking Path 1 versus Path 2 were beyond the scope of this study, it appears that Path 2 does serve as a viable alternative route for some traffic. Observation, comments from those who travel the corridor on a daily basis, as well as the turning movement counts at Route 20 and Route 621, all support the conclusion that Path 2 is a potential alternative route. For this reason, the study team considered upgrading Route 621 as an alternative to widening Route 20. This concept was not ultimately recommended for the following reasons:

1. Taking into account the relative distance and travel speeds, the travel time on Path 2 is about 20 percent longer than Path 1 (18.5 minutes as compared to 15.3 minutes). Path 2 is also slightly longer in terms of distance (13.5 miles versus 13.3 miles). If Route 20 is relocated to follow the planning corridor described previously as Recommendation S6 (thereby adding 0.4 miles to Path 1), it will continue to be quicker for motorists to use Route 20 rather than Route 621 (15.5 minutes versus 18.5 minutes).

- 2. Like Route 20, Route 621 traverses historically sensitive lands and widening it would entail similar levels of potential historic impacts.
- 3. There is ongoing residential development along Route 621 in Spotsylvania County and the road is increasingly taking on more of a role as a lower-speed residential collector roadway. Changing this road to serve more as a throughtraffic road would run counter to the current character of the roadway and its adjoining land uses.
- 4. Route 20 is designated a state primary route, while Route 621 is a secondary road. From an overall transportation planning perspective, it is preferable to keep through traffic on primary routes rather than divert it to secondary roads.

For these reasons, this study does not recommend that Route 621 be developed as an alternative route for Route 20 traffic. Route 621 between Route 20 and Route 3 is currently substandard in terms of geometrics, however, and increasing traffic demands on this road make it critical that improvements to enhance safety be implemented. This study recommends upgrading Route 621 from Route 20 to the Spotsylvania County line (a distance of 6.5 miles) to meet current standards with 12-foot lanes. The estimated cost for this improvement (also in 2006 dollars) is \$9.34 million. Orange County should also coordinate with both Spotsylvania County and the Virginia Department of Transportation to extend the upgrading of Route 621 in Spotsylvania County to its intersection with Route 3.

Additional Costs for Widening Route 20 between Route 601 and Route 3

The cost estimates developed for this study are planning-level estimates that are based on statewide averages for similar types of improvements. The cost estimates for widening Route 20 between Route 601 and Route 3 (Recommendation L7) are based on widening the roadway along its existing alignment. As discussed previously, substantial historic impacts may require that Route 20 be relocated along the planning alignment described as Recommendation S6). This alignment will be slightly longer and require larger amounts of rights-of-way as compared to the existing alignment, thereby resulting in increased costs. An additional significant cost for constructing Route 20 on the S6 alignment would be the need for upgrading the dam in Lake of the Woods. This is because the existing dam would not provide for sufficient flood control to ensure that the new alignment of Route 20, which would be closer to Lake of the Woods, would be outside of flood boundaries. Estimates provided by the Lake of the Woods Association indicate that it would cost between \$2.5 and \$3.0 million to upgrade the dam sufficiently to allow for the S6 alignment to be constructed. This cost would be a required mitigation measure for the new alignment and should be considered as part of the total cost package for this alignment.

It is important to emphasize that all estimated costs would be refined as part of the project development process. Detailed environmental impact analyses will be required to develop the most desirable alignments for providing additional capacity for Route 20. Such studies will consider the full range of impacts and costs, including costs to minimize and mitigate the impacts of the upgraded roadway.

