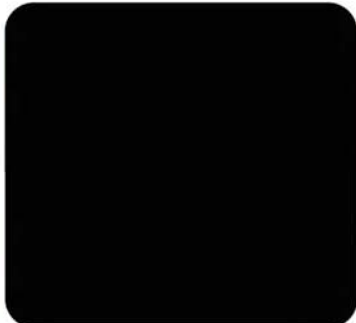


**ROUTE 863 TO
US ROUTE 58 WEST
CONNECTOR STUDY**

FINAL REPORT FEBRUARY 2012



ROUTE 863 TO US ROUTE 58 WEST CONNECTOR STUDY

FINAL REPORT

February 2012

Prepared for:
DANVILLE-PITTSYLVANIA AREA
METROPOLITAN PLANNING ORGANIZATION

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The contents of this report reflect the view of the author(s) who are responsible for the facts and accuracy of the data presented herein. The contents do not necessarily reflect the views or policies of the Federal Highway Administration and/or the Commonwealth of Virginia Transportation Board. This report does not constitute a standard, specification or regulation. FHWA acceptance of this report as evidence of fulfillment of the objectives of this planning study does not constitute endorsement/approval of the need for any recommended improvements nor does it constitute approval of their location and design or a commitment to fund any such improvements. Additional project level environmental studies of alternatives may be necessary.

EXECUTIVE SUMMARY

The Danville–Pittsylvania Metropolitan Planning Organization (MPO) in cooperation with the Virginia Department of Transportation, City of Danville, and Pittsylvania County, has engaged URS Corporation to perform the Route 863 (Moorefield Bridge Road) to Route 58 West (Martinsville Highway) Connector Study. The goal of the connector study is to define the need and optimal method for serving travel demand between the intersection of State Route 863 at State Route 750 (Mount Cross Road) to the north with the interchange of U.S. Route 58 West and the Danville Expressway to the south.

Planning for the connector on a new alignment has evolved up to its inclusion in the *Danville-Pittsylvania Long-Range Transportation Plan: Year 2035*, which recommended an improvement in the form of two lanes on a new alignment. Funding in the Transportation Plan for this connection was limited to Preliminary Engineering.¹

This corridor study provides conceptual alternatives for the MPO to consider. The study offers a recommendation and documents all of the other alternatives considered. The findings and recommendations detailed in this report will provide the MPO and the County with a set of actions that can be incorporated into local plans and policies so that an alignment for the preferred alternative can be preserved until funding becomes available.

EXISTING CONDITIONS

Volumes and Service Levels: Morning and afternoon peak period turning movement traffic counts were conducted at six intersections, and daily directional traffic volumes were collected at seven roadway locations. Using the results of the traffic volume counts, capacity analyses were performed, and the results show that - with one exception - intersections are performing at service levels of C or better. The exception occurs at the Mount Cross Road and Moorefield Bridge Road intersection, where in the AM peak hour, motorists on the northbound Moorefield Bridge approach (STOP sign controlled) are delayed by the heavy stream of eastbound vehicles on Mount Cross Road. Installation of turn lanes would address this deficiency.

The roadway segments on existing Route 863 were found to be operating at either service level A or B, and all movements at the U.S. Route 58 interchange with the Danville Expressway were found to be operating at service level A.

Safety: Crash reports for the years 2005 – 2007 were analyzed, and the results indicated that crashes are not a severe problem. On Route 863, the total crash rate and injury crash rate are moderately higher than the statewide rate for roadways with the rural minor collector functional classification. Crashes have also occurred at

intersections, but not at a frequency or severity that would indicate hazardous conditions.

ENVIRONMENTAL RESOURCES

A detailed scan of environmental resources in the study area was conducted, and known resources were mapped. With one exception the preliminary evaluation of the data did not indicate the presence of resources that would severely constrain the development of alignments for the connector road. The exception, Seven Springs Farm, a farmstead containing multiple buildings and other resources that was listed on the National Register of Historic Places (NRHP) and the Virginia Landmark Register (VLR) in 2008. However, the property is largely surrounded by trees, which greatly restricts the extent of the viewshed from the property. Care has been taken to avoid this resource in the development of alternative alignments. By avoiding the Seven Springs Farm, no adverse effects are likely to occur to the resource.

YEAR 2035 FORECASTED CONDITIONS

No Build Alternative: Forecasts of year 2035 traffic volumes were developed. A major factor in the high rate of forecasted volume growth is the Mega Park, a major economic development site located along Berry Hill Road south of U.S. Route 58 West and west of the Danville Expressway

When compared with existing conditions, forecasted service deteriorates to deficient levels (LOS E and F) at several unsignalized intersections. The low service levels are a product of traffic volumes on either Mount Cross Road or U.S. Route 58 becoming sufficiently high so that adequate gaps in the traffic stream will be less frequent, and motorists on the minor street approaches (particularly those executing left turns) will find it more difficult to safely execute turning movements. Some of these intersections will likely meet traffic signal warrants, and as a signalized intersection, service will improve to adequate levels.

Service levels on the roadway segments and at the U.S. Route 58 interchange with the Danville Expressway remain in the A-B range.

STATEMENT OF PURPOSE AND NEED

Based on the analysis of existing and forecasted conditions, the purpose and need for the Route 863 to U.S. Route 58 West Connector is based on addressing the following issues:

1. Establishing an arterial level facility to provide access to the Mega Park via an appropriately classified functional facility will divert growing traffic volumes from inadequate collector roadways.
2. Forecasted growing traffic volumes on Moorefield Bridge Road and Pine Lake Road will not be compatible with existing and planned residential land use development located near or immediately adjacent to the rights of way.

¹ *Technical Report, Danville-Pittsylvania Long-Range Transportation Plan: Year 2035*. Danville-Pittsylvania Metropolitan Planning Organization. August, 16, 2010. p. 47.

3. Improving access to the Danville Expressway from the north will divert traffic volumes from unsuitable collector and local streets to a Rural Principal Arterial with ample available capacity forecasted through the year 2035.

ALIGNMENT ALTERNATIVES

The two alternatives developed - Alternatives 1 and 2 – as well as the corridor typical section are shown in the report in **Figure 10**.

The typical section and impacted area was developed in a conservative manner based on the appropriate the cross section developed in the *VDOT Road Design Manual*. For purposes of this study the impact area or right-of-way is 188 feet in width. This right-of-way width can accommodate a four-lane divided roadway with four lanes – each 12 feet in width, a median of 24 feet in width, outside shoulders each with 10 feet in width, and inside shoulders each with 4 feet in width. The remaining right of way width accommodates with open drainage (ditches and/or swales).

The two alignments were developed in a manner that was sensitive to mapped environmental resource so that each avoids residential areas and the historic Seven Springs Farm. Alternative 1 extends to the north from the U.S. Route 58 interchange, and as it approaches Sandy River, the alignment shifts to east-northeast to the intersection of Moorefield Bridge Road and Mount Cross Road. Alternative 2 extends from the U.S. Route 58 interchange and immediately curves to the east and remains south of residential area along Westridge Drive. As Alternative 2 approaches Moorefield Bridge Road it turns north and runs parallel to, and west of Moorefield Bridge Road.

Evaluation Criteria: Nine evaluation criteria were used to evaluate the improvement alternatives:

1. Capacity
2. System Performance
3. Safety
4. Cost
5. Right Of Way Impacts
6. Environmental Impacts
7. Economic Impacts
8. Financial Impacts
9. Consistency with Local Plans

Cost Estimates: Cost estimates were prepared for each alternative using VDOT Transportation & Mobility Planning Division's statewide planning level cost estimates. A rural two-lane roadway with a pavement width of 22 feet was chosen as the typical cross-section for estimating purposes. Right-of-way costs and utility relocation costs were estimated at 30% of the construction costs.

Route 863 to Route 58 West Connector Study

Estimated costs of \$15.9 million for improvements to the interchange of the Danville Expressway with U.S. Route 58 West have also been included. The roadway construction costs included a 25% markup for preliminary engineering and construction contingencies. The cost estimates of the two alignments in 2011 dollars were estimated as follows:

• Alternative 1	\$39,600,000
• Alternative 2	\$38,400,000

Build Alternative: Based on the findings of the capacity analysis, the difference between the two forecasted Build Alternatives (Alternative Alignments 1 & 2) is negligible. The year 2035 daily volume on the Connector Road is forecast at 2,200 vehicles.

The intersection of Moorefield Bridge Road and Mount Cross Road is forecast to meet traffic signal warrants, and in addition to a traffic signal, left turn lanes on the northbound, eastbound and westbound approaches will also be needed to achieve optimal signal operation.

Two other unsignalized intersections continue to show poor service – U.S. Route 58 with Westover Drive and with Pine Lake Drive. The minor street traffic volumes at either location are not likely to be high enough for the intersections to meet traffic signal warrants.

In general, the Build Alternative conditions service levels were found to be similar to those analyzed under No Build Alternative conditions. Substantial improvements to traffic service resulting from either alignment of the Connector Road were not forecasted to occur.

Economic Analysis: Implementing either of the alignment improvements of the proposed Connector Road will require that funding be provided to cover the estimated \$39.6 million cost. Estimates of future revenue for roadway improvements incorporated in the *Year 2035 Long-Range Transportation Plan* identified approximately \$2.4 million annually in the MPO area. When combined with previously programmed funds, the total revenue forecasted through 2035 in the *Plan* is \$68.5 million. Of that amount, \$15.9 million was allocated for projects already under construction (such as the replacement of the Robertson Bridge) and \$13.3 million was allocated for programmatic areas (such as bridge replacement and transportation enhancement), leaving \$39.3 million for other improvement projects. Consequently, for the Connector Road to be funded within the planning period of the *Year 2035 Long-Range Transportation Plan*, all forecasted construction funds within the MPO area would need to be allocated to this single project, and all funds allocated in the *Plan* for other projects would have to be reallocated to the Connector Road.

Benefit Cost Analysis: The travel time under the No Build Alternative conditions from Mount Cross Road to the Danville Expressway with U.S. Route 58 – a distance of approximately 4.4 miles along existing Route 863 and U.S. Route 58 – is forecast at 6.7 minutes. In comparison, the travel time under the Build Alternative conditions from Mount Cross Road to the Danville Expressway with U.S. Route 58 – a distance of approximately 4.23 miles over the Connector Road – is forecast at 5.7 minutes. Motorists using the Connector Road are forecast to save approximately 1 minute in travel time to complete the trip.

With a forecasted year 2035 daily volume of 2,200 vehicles using the Connector Road, the daily travel time savings is forecast at 2,200 minutes and the annual time savings is forecast at 12,100 hours. The results of this analysis indicate that the Connector Road would provide annual travel time benefits of \$183,315 (in 2011 dollars).

With an estimated cost of \$39.6 million and estimated service life of 40 years the annualized construction cost for the Connector Road is estimated at \$990,000 (in 2011 dollars). When compared to the construction costs, the value of user benefits is less than one-fifth – approximately 18.5%.

PREFERRED ALTERNATIVE

URS Corporation recommends selection of the No Build Alternative as the Preferred Alternative.

When compared with the two alignments in the Build Alternative, the Preferred Alternative (the No Build Alternative) was selected because of the following principal reasons:

1. Existing Route 863 has sufficient roadway and intersection capacity to accommodate forecasted volumes under No Build Alternative conditions;
2. The Build Alternative costs are prohibitive and do not produce benefits commensurate with construction costs; and,
3. There is no funding for either construction or right-of-way acquisition identified in the current *Year 2035 Long-Range Transportation Plan*.

Although the No Build Alternative does not provide for construction of a two-lane connector facility on new alignment, it is recognized that deficiencies will remain on the existing alignment of Route 863 (Moorefield Bridge Road). Specifically, geometric improvement to the existing alignment – particularly in the area of the crossing of Sandy River – will need to be addressed. In addition, improvements at key intersections – such as installing turn lanes and a traffic signal at the Mount Cross Road intersection, should be evaluated and funded. By not pursuing improvements along a new alignment and focusing roadway investments along the existing Route 863 corridor, the safety and capacity of the roadway will be enhanced and preserved so that through the year 2035 motorists using this route will be provided adequate service.

Permit Evaluation: With the recommendation of the No Build Alternative as the preferred alternative, potential environmental resources identified along the Build Alternative alignments will not be impacted. Moderate impacts may occur where roadway alignment improvements crossing Sandy River are recommended and where intersection turn lane improvements cause right of way acquisition. Potential impacts in the areas will be defined when more detailed engineering studies are conducted.

Public Involvement: The public involvement program provided three opportunities for interested citizens to participate in the process. The first Citizens Information Meeting (CIM) was held on Wednesday, July 13, 2011 between 4 p.m. and 7 p.m. at the Brosville Elementary School in Pittsylvania, Virginia. A total of 17 citizens signed the attendance sheet, and two alternative alignments were submitted for consideration.

The second CIM was held on Wednesday, September 21, 2011 from 4-6 p.m. at Brosville Elementary School. Six citizens signed the attendance sheet, and two comment sheets were submitted: one indicating a preference for Alternative 1 and the other stating that the project cannot be justified.

The third and final CIM was held on Tuesday, November 15, 2011 at Brosville Library from 4-6 p.m. Two citizens signed the attendance sheet, and no comments were submitted.

Finally, an additional opportunity for citizen comment was provided at the MPO Board Meeting held on March 29, 2012 at the Danville Regional Airport.

**ROUTE 863 TO U.S. ROUTE 58 WEST CONNECTOR STUDY
TABLE OF CONTENTS**

I. INTRODUCTION.....1
I.1 Study Purpose..... 1
I.2 Public Involvement..... 1
I.3 Report Format..... 1

II. EXISTING CONDITIONS2
II.1 Traffic Counts..... 2
II.2 Capacity Analysis..... 4
II.3 Crash Frequencies..... 6

III. ENVIRONMENTAL RESOURCES8
III.1 Resource Inventory..... 8
III.2 Resource Mapping..... 8

IV. YEAR 2035 FORECASTED CONDITIONS.....13
IV.1 Forecast Methodology.....13
IV.2 Year 2035 No Build Alternative.....13
IV.3 No Build Alternative Capacity Analysis.....13
IV.4 Purpose and Need.....15

V. ANALYSIS OF IMPROVEMENT ALTERNATIVES16
V.1 Alignment Alternatives.....16
V.2 Evaluation Criteria.....16
V.3 Environmental Impacts of Alignment Alternatives.....18
V.4 Cost Estimates.....19
V.5 Year 2035 Capacity Analysis: Build Alternatives.....19
V.6 Economic Analysis.....22
V.7 Benefit Cost Analysis.....23
V.8 Preferred Alternative.....23
V.9 Permit Evaluation.....24
V.10 Public Involvement.....24

VI. CONCLUSIONS AND RECOMMENDATIONS.....25
VI.1 Summary and Conclusions.....25
VI.2 Recommendations.....27

List of Tables

1. Daily and Peak Hour Traffic Counts.....4
 2. Level of Service (LOS) Conceptual Descriptions4
 3. Comparison of Unsignalized and Signalized Service Levels5
 4. Summary of Intersection Service Levels: Year 2011 Peak Hours.....5
 5. Existing Conditions Service Levels: Two-Lane Roadway6
 6. Existing Conditions Service Levels: Route 58 West Interchange.....6
 7. Summary of Route 863 Crash Rates, Frequency and Severity6
 8. Summary of Intersection Service Levels: No Build Alternative13
 9. No Build Alternative Service Levels: Two-Lane Roadway.....15
 10. No Build Alternative Service Levels: Route 58 Interchange15
 11. Summary of Environmental Impacts: Connector Road18
 12. Summary of Intersection Service Levels: Build Alternative.....19
 13. Build Alternative: 2-Lane Pavement Section Capacity Analysis.....21

List of Figures

1. Route 863 to Route 58 West Connector Study Area2
 2. Existing Conditions Volumes and Service Levels3
 3. Conceptual Examples of Levels of Service5
 4. Crash Frequencies7
 5. Soils Map9
 6. Hazardous Sites Map.....10
 7. Environmental Constraints Map.....11
 8. Cultural Resources Map.....12
 9. No Build Alternative Forecasted Volumes & Service Levels.....14
 10. Alignment Alternatives 1 and 217
 11. Build Alternative Volumes and Service Levels20
 12. Build Alternative Improvements to Interchange.....21



I INTRODUCTION

The Danville–Pittsylvania Metropolitan Planning Organization (MPO) in cooperation with the Virginia Department of Transportation, City of Danville, and Pittsylvania County, has engaged URS Corporation to perform the Route 863 (Moorefield Bridge Road) to Route 58 West (Martinsville Highway) Connector Study. The goal of the connector study is to define the need and optimal method for serving travel demand between the intersection of State Route 863 at State Route 750 (Mount Cross Road) to the north with the interchange of U.S. Route 58 West and the Danville Expressway to the south. The study area is shown in **Figure 1**

With the exception of a short segment immediately north of Westover Drive, the alignment on which Route 863 is located lies within Pittsylvania County. Planning for the connector on a new alignment has evolved up to its inclusion in the *Danville-Pittsylvania Long-Range Transportation Plan: Year 2035*, which recommended an improvement in the form of 2 lanes on a new alignment. Funding in the Transportation Plan for this connection was limited to Preliminary Engineering.¹

This corridor study provides the MPO with a more detailed assessment of the proposal previously set forth in the *Long Range Transportation Plan*. It provides conceptual alternatives for the MPO to consider. The study offers a recommendation and documents all of the other alternatives considered. The findings and recommendations detailed in this report will provide the MPO and the County with a set of actions that can be incorporated into local plans and policies so that an alignment for the preferred alternative can be preserved until funding becomes available.

The functional classification for Route 863 is Rural Major Collector in Pittsylvania County and Urban Minor Arterial in the City of Danville.

I 1 STUDY PURPOSE

The purpose of this study is to define and evaluate demand and to identify the optimal method for serving travel between the intersection of Mount Cross Road and Moorefield Bridge Road and the Route 58 West interchange with the Danville Expressway. In addition to evaluating the existing alignment on Route 863, this study also considers a limited access facility, which if extended north of Mount Cross Road would ultimately complete the final quadrant of a limited access facility forming a beltway around Danville. One key purpose of the study is to ensure efficient travel for commuters from the residential areas north and west of Danville to the proposed Mega Park.

I 2 PUBLIC INVOLVEMENT

The public involvement process included three Citizen Information Meetings. The first was held on July 13, 2011; the second was held on September 21, 2011; and, the final meeting was held on November 15, 2011. The first two meetings were informal and were held at Brosville Elementary School in Pittsylvania County, and the last meeting was held at Brosville Library. At the first meeting, citizens were presented with basic information such as traffic volumes, crash data, and forecasts of year 2035 conditions without any improvements (the No Build Alternative). They were asked to provide comments and suggestions on what should be considered in the development of alternatives.

At the second Citizens Information Meeting, citizens were shown the alternatives, the results of their collective preferences, the consultant's preferred alternative, and the reasons for the selection of the preferred alternative. Here again, they were asked to provide comments.

At the third and final Citizens Information Meeting, citizens were shown the alternatives. The citizens were informed of the preferred alternative and the reasons for selecting it. Comments were again solicited from the citizens.

Finally, an additional opportunity for citizen comment was provided at the MPO Board on March 29, 2012 at the Danville Regional Airport.

I 3 REPORT FORMAT

Following this introduction, Section II provides a summary of existing conditions. Environmental constraints are documented in Section III. The Year 2035 No Build Alternative will be described with a statement of the purpose and need for the connector road in Section IV. Next, Section V summarizes the development and analysis of the alternatives, and Section VI summarizes the study's findings and confirms the recommended alternatives for the Route 863 to Route 58 West Connector Road.

¹ *Technical Report, Danville-Pittsylvania Long-Range Transportation Plan: Year 2035*. Danville-Pittsylvania Metropolitan Planning Organization. August, 16, 2010. p. 47.



II EXISTING CONDITIONS

Existing conditions on Route 863 were defined using traffic count data collected in the field and through the review of traffic data and reports by others.

II 1 TRAFFIC COUNTS

Turning movement traffic counts were conducted during the a.m. and p.m. peak periods in April and May of 2011 at the following intersections:

1. Mount Cross Road at Route 863 (Moorefield Bridge Road)
2. Westover Drive at Route 863
3. Westover Drive at Route 58 Business (Riverside Drive)
4. Route 58 Bus. (Martinsville Hwy.) at Meadowview Dr./Berry Hill Rd.
5. Pine Lake Road at River Ridge Road
6. Pine Lake Road at Route 58 West

The a.m. peak period occurs between 7:00-9:00 a.m. and the p.m. peak period occurs between 4:00-6:00 p.m. Traffic count data has been aggregated in 15-minute intervals during these periods, and the peak hour is defined as the four consecutive 15-minute intervals when traffic volumes are the highest during the 2-hour peak period.

Traffic signal timings used to conduct capacity analysis for the existing conditions were provided by VDOT, and the only existing traffic signal is located at the intersection of Route 58 West and Berry Hill Road/Meadowview Drive.

Peak hour turning movement counts for study area intersections are summarized in **Figure 2: Existing Conditions Traffic Volumes and Service Levels**

Automated daily directional traffic counts were collected on the following roadway segments:

1. River Ridge Road (2)
2. Westridge Drive
3. Ragsdale Drive
4. Pine Lake Road
5. Meadowview Drive (2)
6. Meadow Brook Circle
7. Moorefield Bridge Road (2)





Table 1 displays a summary of the daily directional traffic counts on study area roadways.

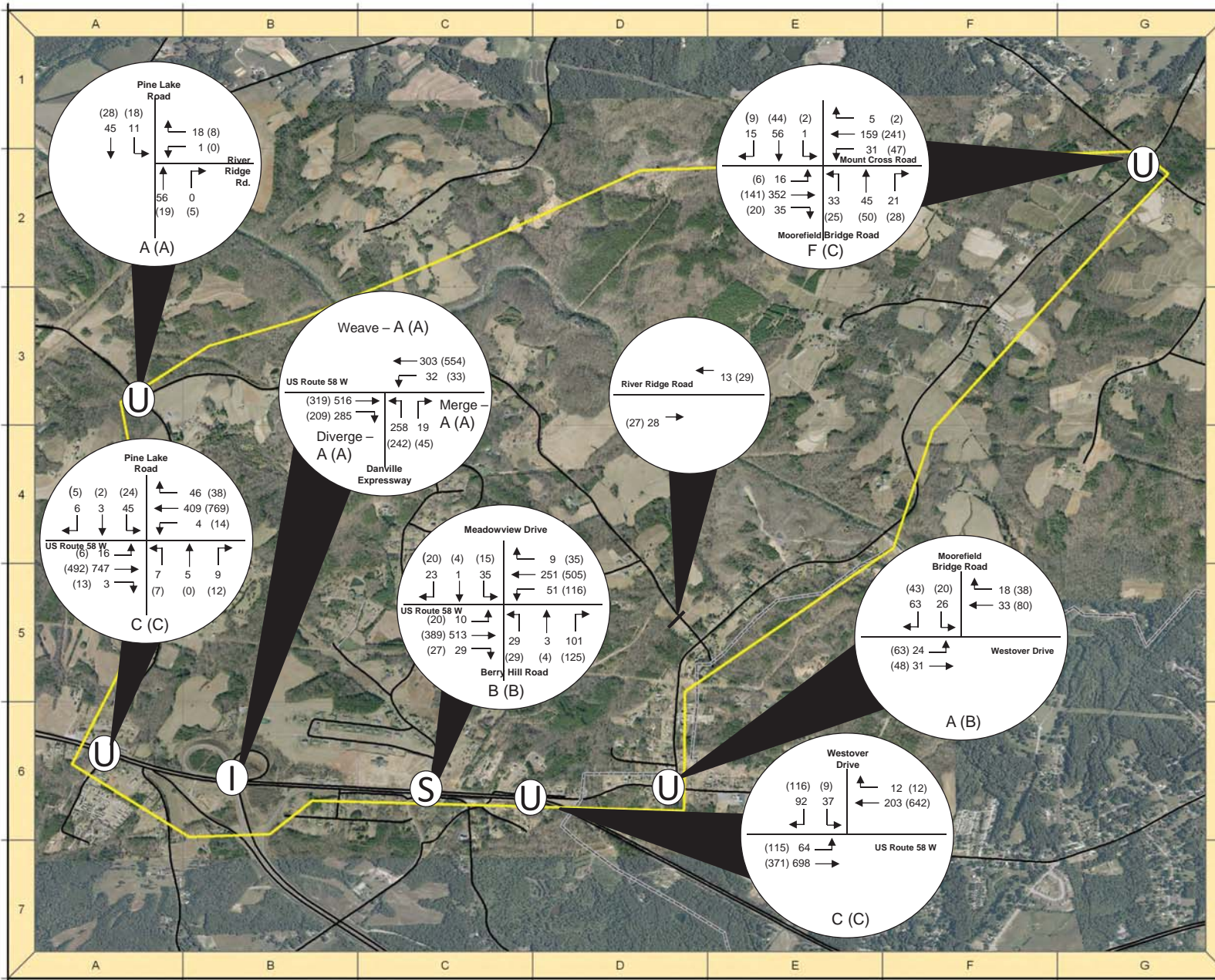
Route 863 To Route 58 West Connector Study

Danville Urbanized Area Metropolitan Planning Organization
Danville, Virginia

Figure 2: Existing Conditions Traffic Volumes and Levels of Service

Legend

-  - Study Area Boundary
- 54 (65) - AM (PM) Peak Hour Volumes
- B (C) - AM (PM) Level of Service
-  - Signalized Intersection
-  - Unsignalized Int.
-  - Interchange



February 2012

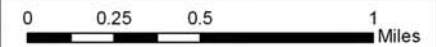


TABLE 1
Daily and Peak Hour Traffic Volume Counts

Roadway Segment	Direction	Daily Volume	AM Peak Hour	PM Peak Hour
River Ridge Road (West of Moorefield Bridge Road)	EB	277	28	27
	WB	242	10	29
	Total	519	38	56
River Ridge Road (East of Pine Lake Road)	EB	87	10	18
	WB	99	10	14
	Total	186	20	32
Pine Lake Road (North of Route 58)	NB	378	31	49
	SB	361	36	43
	Total	739	67	92
Westridge Road (West of Meadowview Drive)	EB	214	27	17
	WB	212	7	28
	Total	426	34	45
Ragsdale Road (West of Meadowview Drive)	EB	50	5	4
	WB	46	4	4
	Total	96	9	8
Meadow Brook Circle (West of Meadowview Drive)	EB	72	9	7
	WB	71	5	11
	Total	143	14	18
Meadowview Drive (North of Route 58)	NB	495	23	53
	SB	497	54	46
	Total	992	77	99
Meadowview Drive (South of River Ridge Road)	NB	168	12	17
	SB	143	9	18
	Total	311	21	35
Moorefield Bridge Road (North of Westover Drive)	NB	811	59	86
	SB	885	116	69
	Total	1,696	175	155
Moorefield Bridge Road (South of Mount Cross Road)	NB	1,070	80	121
	SB	1,068	106	105
	Total	2,138	186	226

II 2 CAPACITY ANALYSIS

The intersection capacity analyses were performed using Synchro 7 software, which develops estimates of service levels using the methodology developed in the *Highway Capacity Manual* (HCM 2000). Capacity analysis is used to determine a Level of Service (LOS) for a given intersection, and the analysis procedures differ depending upon the type of traffic control at the intersection - signalized or unsignalized. The LOS is based on estimated average vehicle delay, and service levels range from LOS A, the best, to LOS F, the worst. **Table 2** provides a conceptual description of service levels.

TABLE 2
LEVELS OF SERVICE LOS CONCEPTUAL DESCRIPTIONS

LOS	Conditions	Conceptual Description
LOS A	Free-flow conditions	Vehicles can maneuver within the traffic stream and easily maintain the posted speed limit.
LOS B	Stable flow conditions	A spatial separation of vehicles allows easy maneuverability and drivers can maintain the posted speed.
LOS C	Stable flow conditions	Maneuverability and speeds are more restricted with higher traffic volumes.
LOS D	Approaches unstable flow conditions	Temporary restrictions to the traffic flow may cause substantial drops in operating speed and drivers have little freedom to maneuver.
LOS E	Represents the capacity of the facility	The traffic flow is unstable, vehicles are unable to pass, and there may be momentary stoppages in the traffic flow.
LOS F	Forced flow conditions	Traffic has low operating speeds and volumes exceeding capacity. This is often described as "stop and go" conditions.

In general, LOS A and LOS B indicate little or no delay, LOS C indicates modest delay, LOS D indicates delay is increasing and noticeable, LOS E indicates the limit of acceptable delay and LOS F is characteristic of over-saturated conditions. A graphic illustration of the concept of service is provided in **Figure 3**



Figure 3: Conceptual Examples of Levels of Service

Table 3 shows the intervals of average vehicle delays (in seconds) and the resulting level of service for each interval. Service levels for signalized intersections are based on the average vehicle delay for all vehicles using the intersection. In contrast, service levels for unsignalized intersections are developed for each movement that conflicts with the major street through movement. For simplicity in documenting the service of unsignalized intersections in this report, the intersection service level is indicated by the lowest service level exhibited by the conflicting movements. Although left turn movements from the major street approaches may exhibit low service levels, in this analysis the lowest individual movement levels of service typically involves left turn movements from the minor street.

Level of Service	Unsignalized Intersections	Signalized Intersections
A	≤10	≤10
B	>10≤15	>10≤20
C	>15≤25	>25≤35
D	>25≤35	>35≤55
E	>35≤50	>55≤80
F	>50	>80

Table summarizes service levels for existing conditions at all the intersections at which traffic counts were conducted. **Table** shows that with one exception, intersections are performing at service levels of C or better. The exception occurs at Mount Cross Road and Moorefield Bridge Road, where in the AM peak hour, motorists on the northbound Moorefield Bridge approach (STOP sign controlled) are delayed by the heavy stream of eastbound vehicles on Mount Cross Road. Installation of turn lanes would address this deficiency.

INTERSECTION	AM PEAK HOUR	PM PEAK HOUR
Moorefield Bridge @ Westover Drive*	A	B
US Route 58 W @ Meadowview/Berry Hill	B	B
Westover Drive @ Route 58*	C	C
Pine Lake Rd @ River Ridge Rd*	A	A
Pine Lake Rd @ US Route 58 W*	C	C
Mount Cross Rd @ Moorefield Bridge*	F	C

*The lowest approach movement LOS is shown for unsignalized intersections.

In addition to analyzing the capacity of intersections, capacity was analyzed on roadway segments. In capacity analysis, two-lane facilities like Route 863 are evaluated based on the percent time the average motorist spends following another vehicle. Based on the "percent time spent following" (PTSF) a letter grade is defined for the level of service. Additionally, the analysis calculates the volume to capacity ratio ($V/C = 1$ is the capacity of the road).

Table 5 summarizes the service levels for Route 863 as a 2-lane facility from Mount Cross Road to Westover Drive. The analysis shows LOS A for the northbound direction and LOS B in the southbound direction in the AM peak hour, and LOS B for both directions in the PM peak hour. It should be noted that along this segment of Route 863 few passing zones are provided, a condition that has a significant influence on the percent time spent following and on the resulting level of service. However, low volumes are reflected in good service levels.

Table 5 Existing Conditions Service Levels Two Lane Roadway Rt 863 from Mount Cross Road to Westover Drive				
Peak Hour Direction	LOS	PTSF	V/C	
AM/Northbound	A	35.1%	0.06	
AM/Southbound	B	46.0%	0.08	
PM/Northbound	B	47.3%	0.09	
PM/Southbound	B	44.4%	0.09	

Table 6 summarizes the existing conditions levels of service for the Route 58 West interchange. All of the movements are operating with LOS A conditions in both peak hours.

Table 6 Existing Conditions Service Levels Route 58 West Interchange		
Movement	AM LOS	PM LOS
EB Route 58 Diverge	A	A
EB Route 58 Merge	A	A
WB Route 58 Weave	A	A

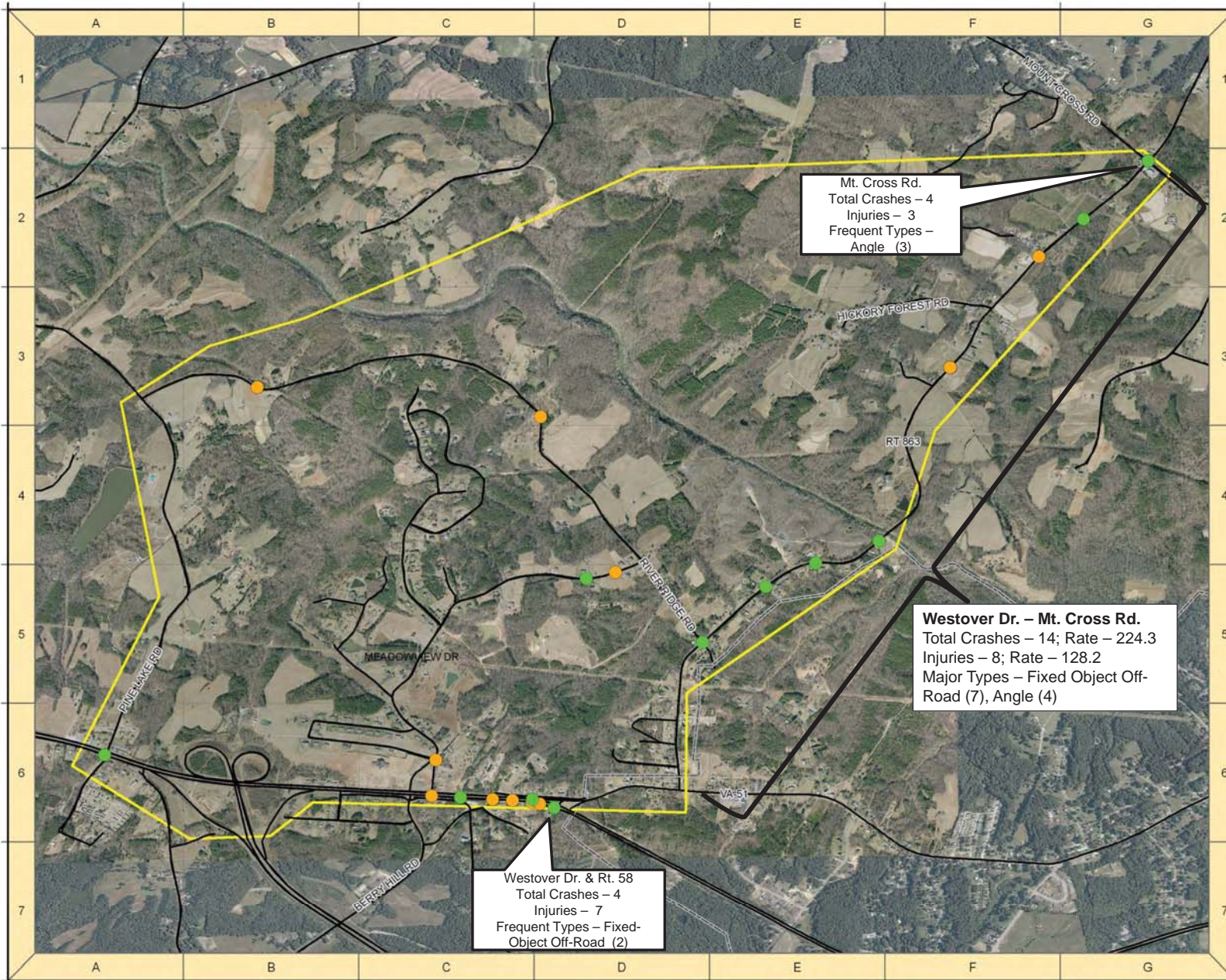
11.3 CRASH FREQUENCIES

Crash reports for the years 2005 – 2007 were analyzed, and the results indicated that crashes are not a severe problem. On Route 863, the total crash rate and injury crash rate are moderately higher than the statewide rate for roadways with the rural minor collector functional classification. Crashes have also occurred at intersections, but not at a frequency or severity that would indicate hazardous conditions. Crash locations and types are presented in **Figure : Crash Records Map**

From a corridor-wide perspective, the crashes exhibited in **Figure** show a relatively even distribution along Route 863. That is, crashes are not clustered in certain locations – at intersections, for example. When combined with the relatively high percentage of crashes involving collisions with off-road obstructions, the crash patterns indicate that special attention should be placed on roadway geometry in developing improvement alternatives. The most frequent types of crashes along Route 863 involved collisions with off road fixed objects – 7, and angle crashes – 7. Elsewhere in the study area only one cluster of crashes was documented - along Route 58 West from Meadowview Drive to Westover Drive.

Table presents a summary of the crash rates for Route 863, and the results indicate that crash rates are higher than statewide averages for the same classification of road (rural minor collector). The generally higher crash and injury rates can be attributed to a segment of road that has rolling terrain, numerous horizontal curves, little to no paved shoulders, lack of turn lanes, and poor access management.

Table Summary of Route 863 Crash Rates Frequency and Severity rates in per million vehicle miles of travel							
Segment	Length	Crashes	Injuries	Fatalities	Crash Rate	Injury Rate	Fatality Rate
Mt. Cross – Westover Dr.	3.0	14	8	0	224.3	128.2	0.0
Statewide Average Rural Minor Collectors					108.3	65.5	



Route 863 To Route 58 West Connector Study

Danville Urbanized Area Metropolitan Planning Organization
 Danville, Virginia

Figure 4: Crash Records Map

Legend

- Property Damage Only
- Injury Crash
- Route 863 Study Area
- City of Danville City Limits

County Crash Data Dates – 2005-2007

Statewide Average Crash Rates for Rural Minor Collectors (2005-2007)

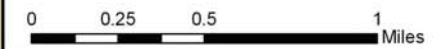
- Crash Rate – 194.0 per 100 million miles traveled
- Injury Rate – 83.7 per 100 million miles traveled
- Fatality Rate – 6.5 per 100 million miles traveled

Mt. Cross Rd.
 Total Crashes – 4
 Injuries – 3
 Frequent Types – Angle (3)

Westover Dr. – Mt. Cross Rd.
 Total Crashes – 14; Rate – 224.3
 Injuries – 8; Rate – 128.2
 Major Types – Fixed Object Off-Road (7), Angle (4)

Westover Dr. & Rt. 58
 Total Crashes – 4
 Injuries – 7
 Frequent Types – Fixed-Object Off-Road (2)

February 2012



III ENVIRONMENTAL RESOURCES

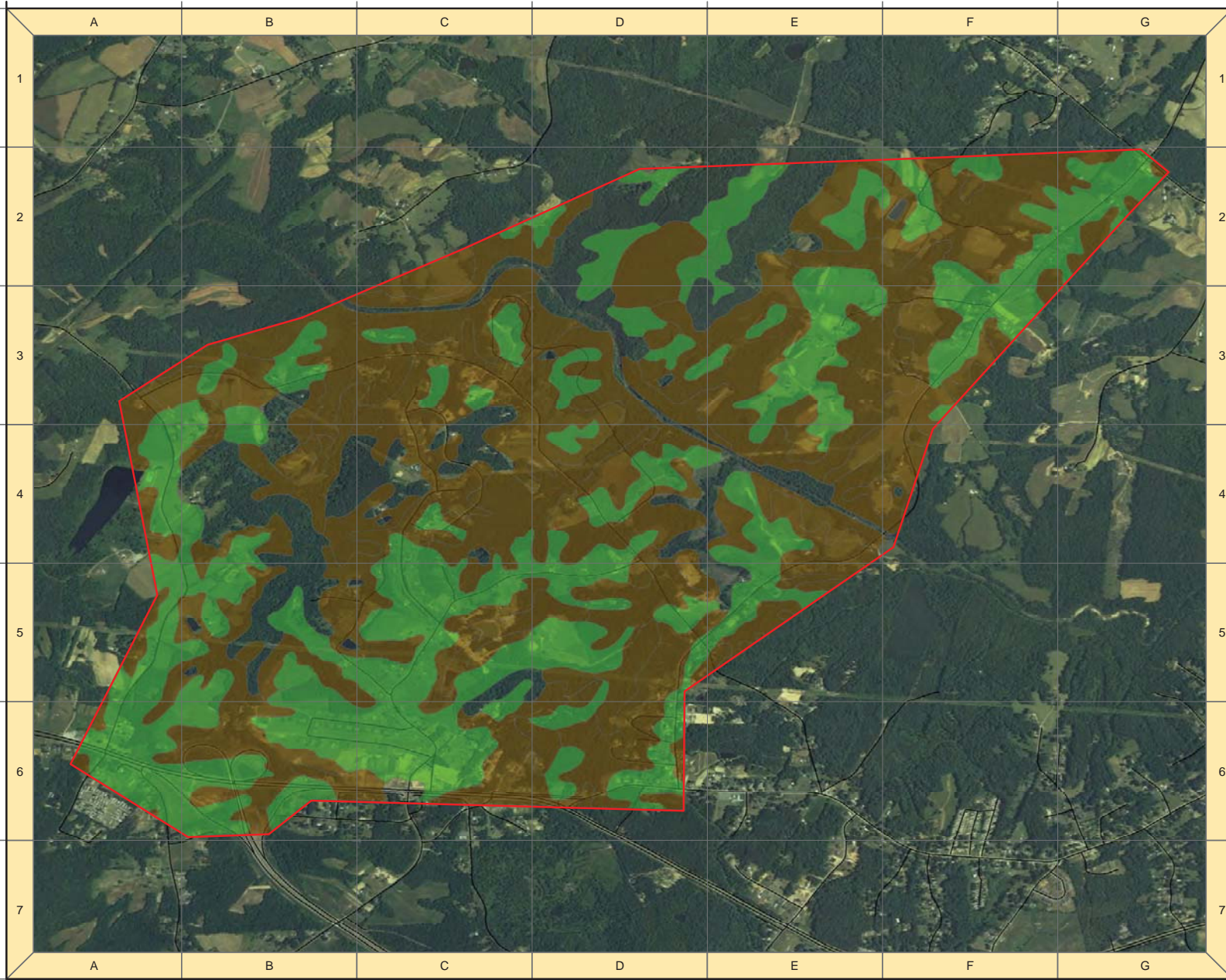
III 1 RESOURCE INVENTORY

A detailed scan of environmental resources in the study area was conducted, and known resources were mapped. The constraint mapping was used to develop roadway alternatives and to assess impacts of each alternative. In addition, census data were compared to minority and poverty rates for the City of Danville and for Pittsylvania County to determine if the project would negatively impact minority or disadvantaged populations.

III 2 RESOURCE MAPPING

Soils, stream, and census data were further manipulated to enhance the usefulness of the mapping. USGS topographic quadrangle blue line streams were digitized to improve the reliability of stream layers. Soils data were evaluated based on Prime Farmland and Farmland of Statewide Importance soil types provided by Pittsylvania County and the City of Danville, VA Soil and Water Conservation District. Historic resources were also identified and evaluated. The environmental resources are shown in the following figures: **Figure 5 Soils Map**, **Figure 6 Hazardous Sites Map**, **Figure 7 Environmental Constraints**, and **Figure 8 Cultural Resources Map**.

A preliminary evaluation of the information identified in **Figures 5** does not indicate the presence of resources that would severely constrain the development of alignments for the connector road. In contrast, **Figure 8** includes a site of concern. Seven Springs Farm (071-5255) is a farmstead containing multiple buildings and other resources and was listed on the National Register of Historic Places (NRHP) and the Virginia Landmark Register (VLR) in 2008. The Seven Springs Farmstead consists of a pre-1840 log dwelling, a detached log kitchen, a stone aquifer, and a cemetery (plus two non-contributing outbuildings). Constructing a new roadway within the viewshed of the Seven Springs Farm may constitute an adverse effect on the NRHP-listed property. However, the property is largely surrounded by trees, which greatly restricts the extent of the viewshed from the property. The only open view extends to the south-southeast where the stone-lined driveway intersects Meadowview Drive. Care has been taken to avoid this resource in the development of alternative alignments of the Route 863 connector. By avoiding the Seven Springs Farm and its southerly-facing viewshed, no adverse effects are likely to occur to the resource.



Route 863 to Route 58 West Connector Study

Danville Urbanized Area Metropolitan Planning Organization
 Danville, Virginia

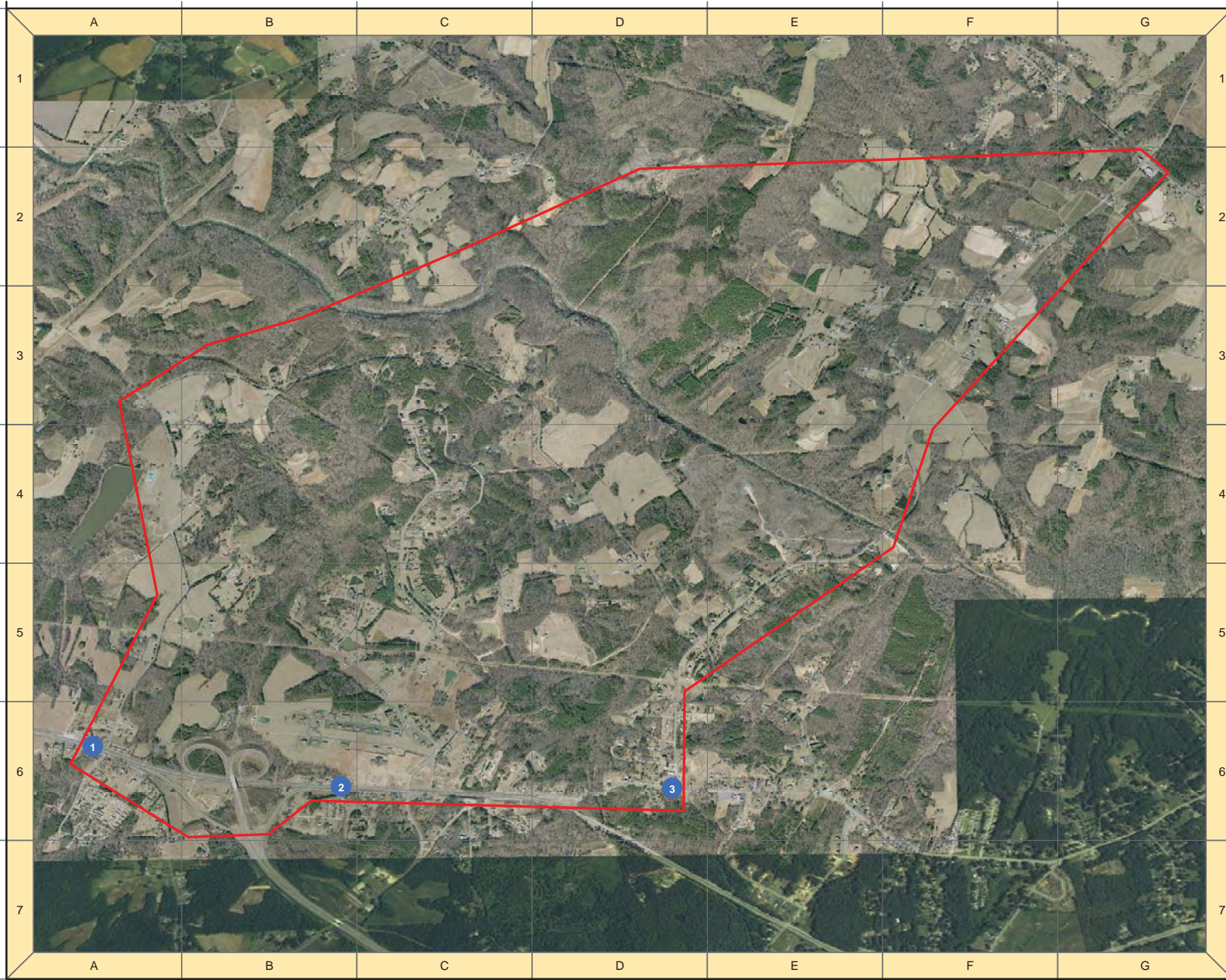
Figure 5: Soils Map

Legend

- Route 863 to Route 58 West Connector Study Area
- Prime Farmland Soils
- Farmland of Statewide Importance
- Roads

February 2012









Route 863 to Route 58 West Connector Study

Danville Urbanized Area Metropolitan Planning Organization
 Danville, Virginia

Figure 6: Hazardous Sites Map

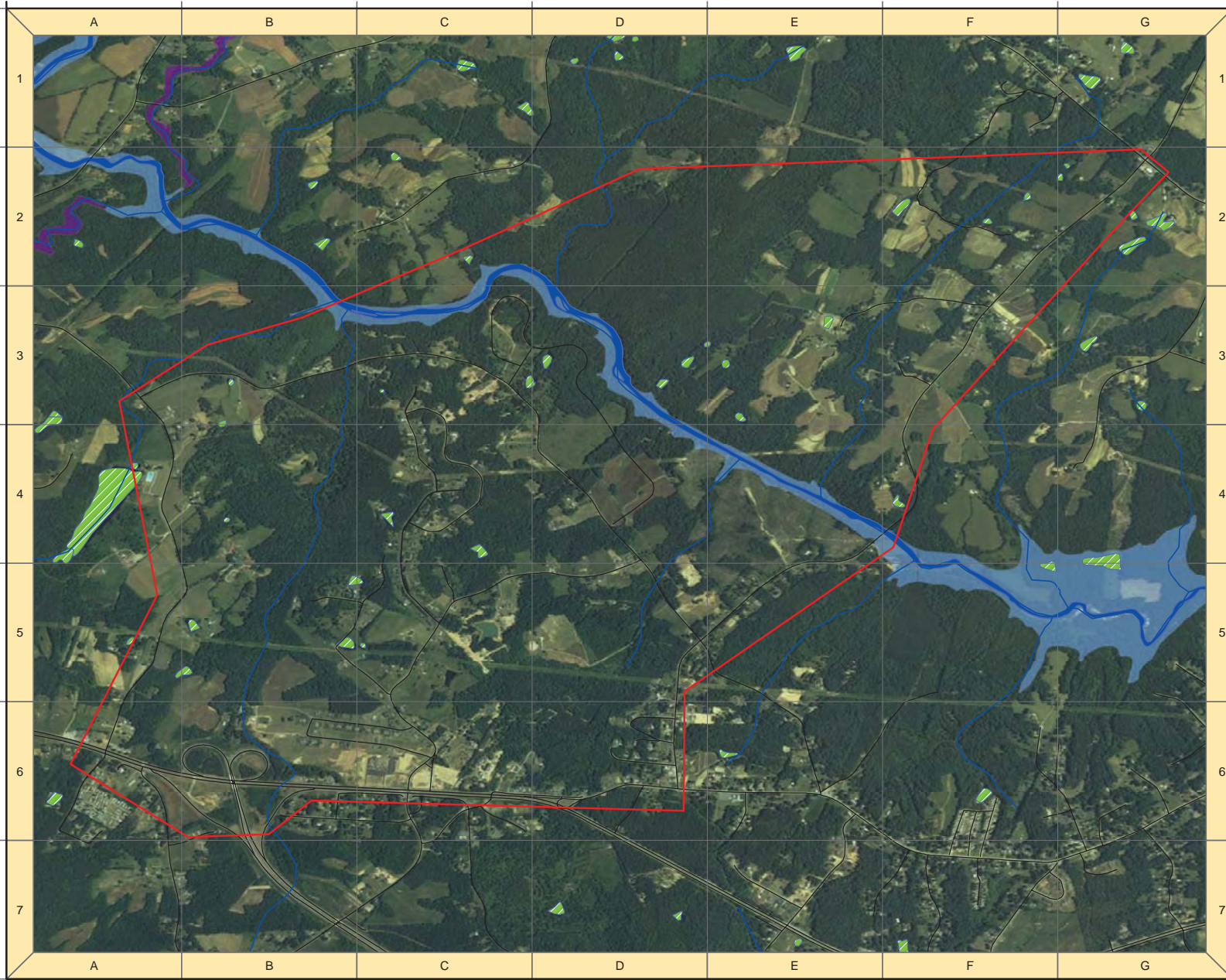
Legend

-  Route 863 to Route 58 West Connector Study Area
-  Gas Station
-  Commercial
-  Residential

Sources: EDR

February 2012





Route 863 to Route 58 West Connector Study

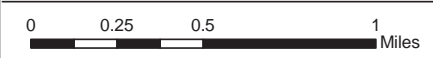
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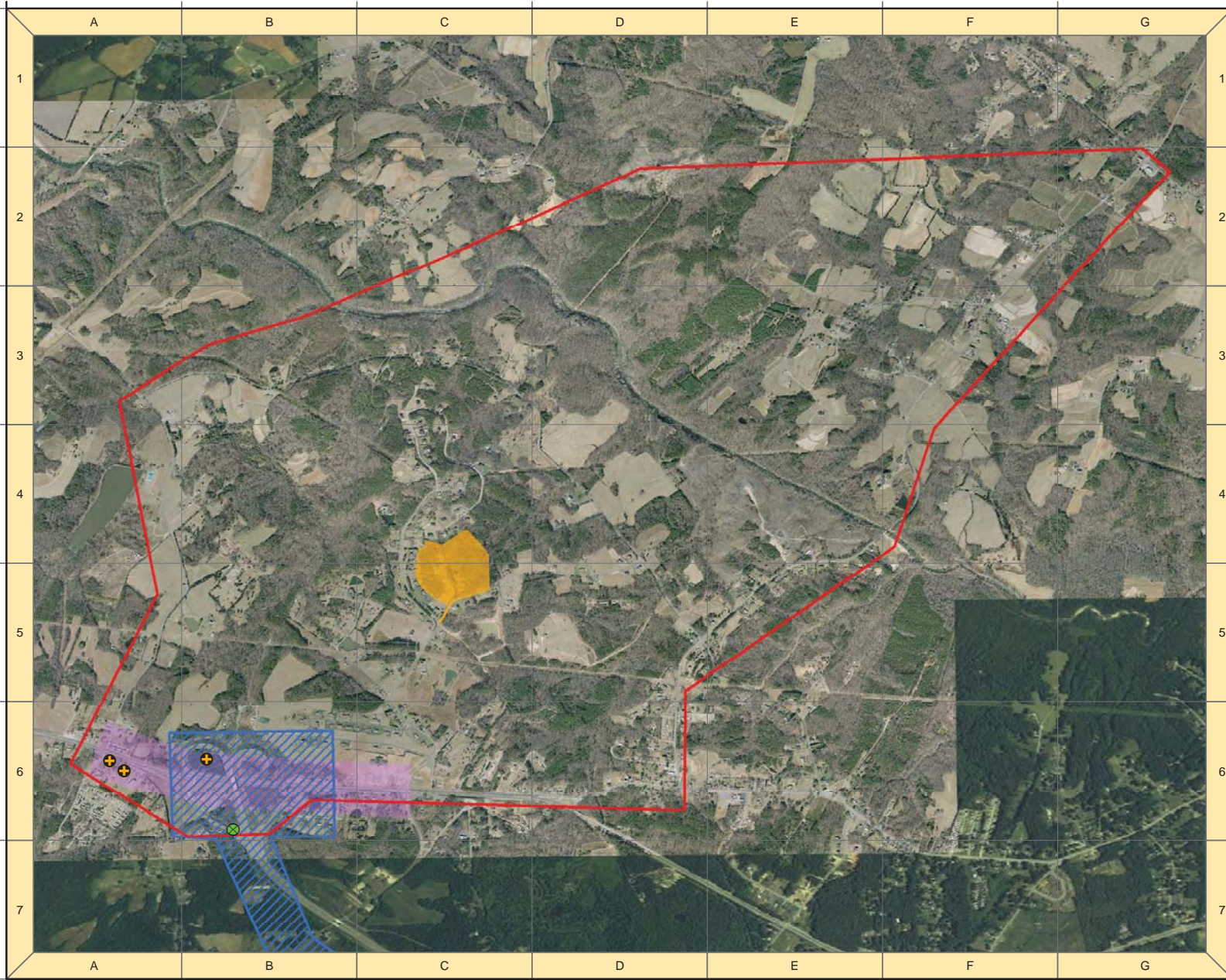
Figure 7: Environmental Constraints

Legend

- Route 863 to Route 58 West Connector Study Area
- Streams
- Open Water
- NWI Wetlands
- Flood Zone A
- Flood Zone AE
- 🏫 School
- ⚰ Cemetery
- ⛪ Church
- Roads

February 2012












Route 863 to Route 58 West Connector Study

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 Danville, Virginia

Figure 8: Cultural Resources Map

Legend

-  Route 863 to Route 58 West Connector Study Area
-  Archaeological Sites
-  Historic Sites
-  Historic Properties
-  Disturbed/Developed Area
-  Culturally Sensitive Area
-  Previously Surveyed Area

February 2012



IV YEAR 2035 FORECASTED CONDITIONS

IV 1 FORECAST METODOLOGY

Forecasts of year 2035 traffic volumes were developed using the travel demand modeling software and the Year 2035 Danville-Pittsylvania Area travel demand model, which is developed and maintained by VDOT. The model was developed for the Danville-Pittsylvania MPO in association with development of the current long range transportation plan.

To use the model output as part of the forecast process, growth rates were computed by comparing current traffic counts with the year 2035 model forecast volumes. The growth factors computed from this comparison were then applied to the corridor and intersection peak hour traffic counts previously documented in Section II: Existing Conditions. In this sense, the model was used only to develop growth factors and the volumes to which these factors were applied were based on recently collected field counts.

IV 2 YEAR 2035 NO BUILD ALTERNATIVE

The purpose of developing and evaluating the No Build Alternative is to provide a baseline against which to compare proposed improvement alternatives. The No Build Alternative is defined as future conditions if the proposed improvement(s) were not to be completed. It includes the assumption that all other improvements in the transportation plan will have been completed by 2035.

When compared with existing volumes, volumes in the study area are forecast by the year 2035 to grow as follows:

<u>Segment</u>	<u>Increase</u>
Route 863 – South of Mount Cross	241%
Route 863 – North of Westover Drive	304%
Pine Lakes Road – North of Route 58 West	237%
Route 58 West – West of Westover Drive	168%

A major factor in the high rate of forecasted volume growth is the Mega Park, a major economic development site located along Berry Hill Road to the south of Route 58 West and to the west of the Danville Expressway. As it develops, the Mega Park will become a center of employment, and Moorefield Bridge Road will serve as a route of choice for many employees from the north and west commuting to and from the site. The forecasted Year 2035 No Build Alternative volumes and service levels are presented in **Figure** .

IV 3 NO BUILD ALTERNATIVE CAPACITY ANALYSIS

Using the forecasted volumes shown in **Figure** capacity analysis was conducted for the study area intersections. The analysis results are summarized in **Table 8**.

As **Table 8** shows, when compared with existing conditions, forecasted service under the No Build Alternative deteriorates by several levels. Furthermore, several intersections are forecast to operate at deficient service levels (LOS E and F), including Westover Drive @ U.S. Route 58 West, Pine Lake Road @ U.S. Route 58 West, and Mount Cross Road @ Moorefield Bridge Road. Forecasted poor service levels are a product of traffic volumes on Mount Cross Road and U.S. Route 58 West becoming sufficiently high so that adequate gaps in the traffic stream will be less frequent, and motorists on the minor street approaches (particularly those executing left turns) will find it more difficult to safely execute turning movements. Some of these intersections may meet traffic signal warrants in the future, some will not. The analysis of Build Alternative conditions will address the potential for future traffic signals.

INTERSECTION	AM PEA OUR	PM PEA OUR
Moorefield Bridge Rd. @ Westover Drive*	B	C
US Route 58 W @ Meadowview/Berry Hill	B	B
Westover Drive @ US Route 58 West*	C	E
Pine Lake Road @ River Ridge Road*	A	A
Pine Lake Road @ US Route 58 West*	F	F
Mount Cross Rd. @ Moorefield Bridge Rd.*	F	F





*The lowest approach movement LOS is shown for unsignalized intersections.

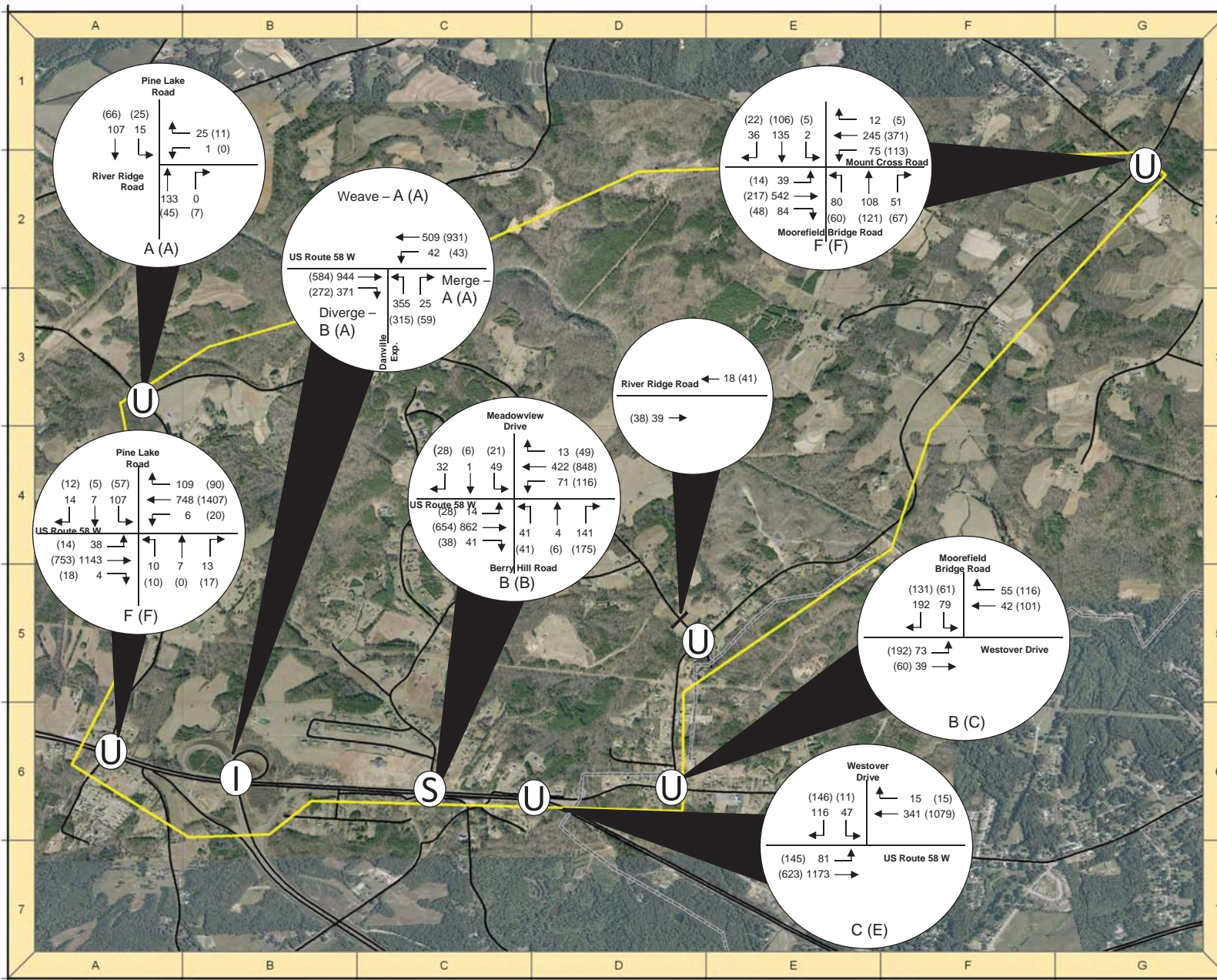
Route 863 To Route 58 West Connector Study

Danville Urbanized Area Metropolitan Planning Organization
 Danville, Virginia

Figure 9: 2035 No Build Alternative Traffic Volumes and Levels of Service

Legend

-  - Study Area Boundary
- 54 (65) - AM (PM) Peak Hour Volumes
- B (C) - AM (PM) Level of Service
-  - Signalized Intersection
-  - Unsignalized Int.
-  - Interchange



February 2012



Table displays the service levels for Route 863 as a two-lane roadway from Mount Cross Road to Westover Drive. In the No Build Alternative, Route 863 shows adequate service levels during both peak hours in both directions. Although the service levels have declined from LOS A-B under existing conditions, they remain within adequate ranges.

Table No Build Alternative Service Levels Two Lane Roadway			
Rt 863 from Mount Cross Road to Westover Drive			
Peak Hour Direction	LOS	PTSF	V/C
AM/Northbound	C	67.1%	0.22
AM/Southbound	C	58.1%	0.18
PM/Northbound	C	60.9%	0.18
PM/Southbound	C	64.0%	0.20

Table 10 summarizes the U.S. Route 58 West interchange levels of service for the No Build Alternative conditions. All movements operate with either LOS A or B conditions.

Table 10 No Build Alternative Service Levels Route 58 West Interchange		
Movement	AM LOS	PM LOS
EB Route 58 West Diverge	B	A
EB Route 58 West Merge	A	A
WB Route 58 West Weave	A	A

IV PURPOSE AND NEED

Based on the analysis of existing and forecasted conditions, the purpose and need for the Route 863 to U.S. Route 58 West Connector is based on addressing the following issues:

1. Establishing an arterial level facility to provide access to the Mega Park via an appropriately classified functional facility will divert growing traffic volumes from inadequate collector roadways.
2. Forecasted growing traffic volumes on Moorefield Bridge Road and Pine Lake Road will not be compatible with existing and planned residential land use development located near or immediately adjacent to the rights of way.
3. Improving access to the Danville Expressway from the north will divert traffic volumes from unsuitable collector and local streets to a Rural Principal Arterial with ample available capacity forecasted through the year 2035.

V ANALYSIS OF IMPROVEMENT ALTERNATIVES

V 1 ALIGNMENT ALTERNATIVES

As recommended in the *Long-Range Transportation Plan*, the Route 863 to U.S. Route 58 West Connector Road is planned to connect the intersection of Mount Cross Road and Moorefield Bridge Road to the interchange of U.S. Route 58 West and the Danville Expressway. This roadway was described as a new alignment in the *Long-Range Transportation Plan* that is to be constructed as a two-lane facility on a four-lane alignment. The *VDOT Road Design Manual* geometric design standards were used in the development of the typical sections. Two alternatives were developed - Alternatives 1 and 2 – and the corridor typical section, all of which are shown in **Figure 10**.

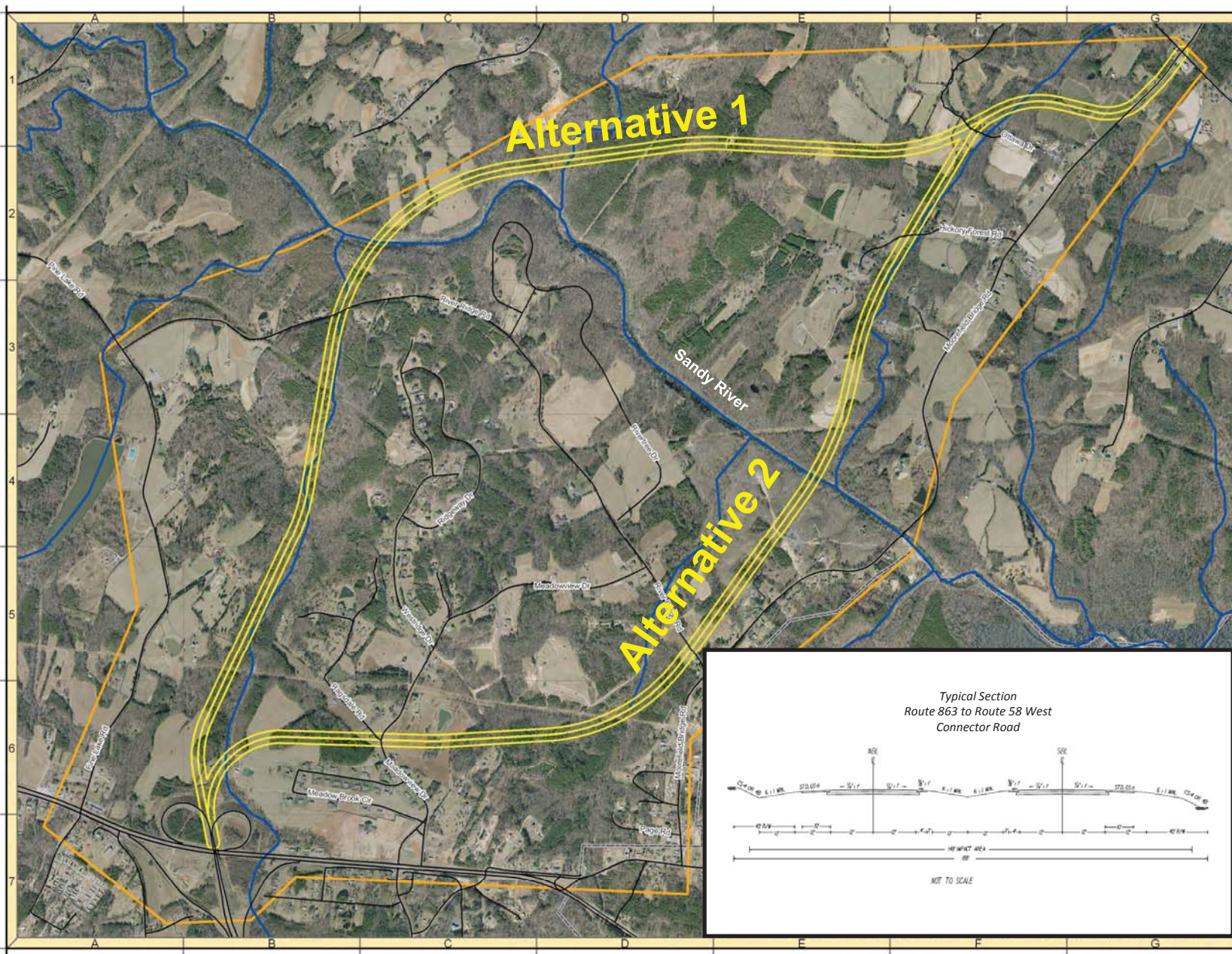
The typical section and impacted area was developed in a conservative manner based on the appropriate the cross section developed in the *VDOT Road Design Manual*. For purposes of this study the impact area or right-of-way is 188 feet in width. This right-of-way width can accommodate a four-lane divided roadway with four lanes – each 12 feet in width, a median of 24 feet in width, outside shoulders each with 10 feet in width, and inside shoulders each with 4 feet in width. The remaining right of way width accommodates with open drainage (ditches and/or swales).

Development of the alignment of the two alternatives was conducted using the environmental resource mapping. The most direct path between the two end points of the corridor traverses a developed residential area (along Westridge Drive) and the historic Seven Springs Farm (previously shown in **Figure 8**). Avoiding these two constraints leaves two major routes for evaluation: one north of Westridge Drive and the other south of Westridge Drive. Alternative 1 extends to the north from the U.S. Route 58 interchange, and as it approaches Sandy River, the alignment shifts to east-northeast to the intersection of Moorefield Bridge Road and Mount Cross Road. Alternative 2 extends from the U.S. Route 58 interchange and immediately curves to the east and remains south of residential area along Westridge Drive. As Alternative 2 approaches Moorefield Bridge Road it turns north and runs parallel to, and west of Moorefield Bridge Road. Both alternatives successfully avoid most residences and environmental resources.

V 2 EVALUATION CRITERIA

Prior to developing improvements to address deficiencies on Mount Cross Road, a set of weighted evaluation criteria were developed and adopted by the Project Management Team. The reason for developing the evaluation criteria and weighting before development of alternatives was to avoid introducing bias in the selection process by adopting criteria and weights that would favor one alternative over another. A total of nine evaluation criteria were developed, each with a weighting from 1-3 (the higher weight indicating greater importance among the criteria). A list of the evaluation criteria and the relative weights (in parenthesis) is as follows:

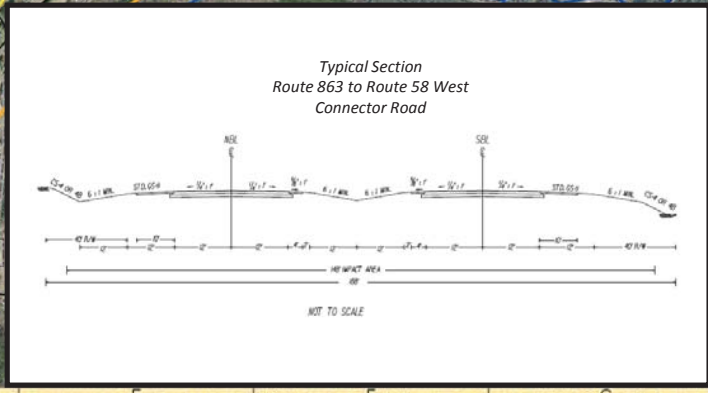
1. Capacity (3) – producing an acceptable (LOS C or better) level of service on roadways, and at signalized or unsignalized intersections.
2. System Performance (3) – a relative comparison of the performance of the overall system within the study area.
3. Safety (3) – by improving capacity or removing conflicts, address geometric and capacity factors in high corridor accident rate.
4. Cost (3) – costs for each alternative were estimated and compared using year 2011 dollars.
5. Right Of Way Impacts (3) – the number of acres, residences, and other structures that are affected by alternative improvements.
6. Environmental Impacts (3) – the amount of wetlands, hazardous waste sites, Section 4(f) & 6(f) properties, and historic & cultural resources that are adversely impacted by alternative improvements. Environmental justice will also be evaluated.
7. Economic Impacts (2) – the costs and benefits of the proposed improvements.
8. Financial Impacts (2) – the impact of funding improvement alternatives on the funding stream for all transportation improvements in the Danville area.
9. Consistency with Local Plans (2) – determining if the proposed improvements in each alternative are consistent with current local transportation and land use.



Route 863 To Route 58 West Connector Study
 Danville Urbanized Area Metropolitan Planning Organization
 Danville, Virginia
Figure 10: Alignment Alternatives and Typical Section

Legend

- Study Area Boundary
- Proposed Alignments



The roadway and right of way features shown on this map are conceptual and FOR TRANSPORTATION PLANNING PURPOSES ONLY and are not to be regarded as final locations. The actual location and detail of these improvements will be determined at the conclusion of NEPA studies and the preliminary engineering stage.

February 2012



V 3 ENVIRONMENTAL IMPACTS OF ALIGNMENT ALTERNATIVES

Each of the two alignment alternatives was analyzed for its potential environmental impacts within the study area based on the inventory of resources previously summarized in Section III. Analysis was conducted using the previously described impact area within a corridor of 188 feet in width, and the results are summarized in **Table 11**

The results in **Table 11** show little difference in impacts among the resources from each alignment alternative. Overall the respective impacts of the new alignments are fairly minimal.

The issue of environmental justice also was considered. Environmental justice addresses the racial and economic demography of potential impacts to residents. Its purpose is to ensure that minorities and disadvantaged populations do not endure a disproportionate burden of the adverse impacts of roadway improvements. When comparing the minority composition and poverty rates in the census tracts that would be impacted by the improvement alternatives for Route 863 with the rates for both Pittsylvania County and the City of Danville as a whole, it was found that the impacted census tracts did not exhibit rates that were higher than the overall city or county rates. These findings were based on year 2010 census of population and housing data.

The study area lies predominantly within Census Tract 110.01 in Pittsylvania County. According to data from the 2010 U.S. Census, minorities comprise 24.5% of the county-wide population, and 15.6% of the county-wide population is designated as living in poverty. In comparison, within Census Tract 110.01, minorities comprise 18.1% of the population and 22.4% are designated as living in poverty. Since the proportion of minorities and persons living in poverty within the study area census tract is lower than that for the county as a whole, the two alignment alternatives for connecting Mount Cross Road with U.S. Route 58 West will not present the issue of environmental justice. In addition, since Census Tract 110.01 includes both alignment alternatives, the issue of environmental justice cannot be applied to differentiate between the two alternatives.

In summary, there is little difference in the environmental impacts among the two improvement alternatives.

**TABLE 11
SUMMARY OF ENVIRONMENTAL IMPACTS
ROUTE 863 TO ROUTE 58 WEST CONNECTOR ROAD
PITTSYLVANIA COUNTY**

POTENTIAL RESOURCE CONSTRAINT	Alternative 1	Alternative 2
Length (mi)	4.32	4.10
Stream Crossing (#)	3	7
Stream Crossing (lf)	1,100	2,092
Flood Zone (ac)	1.84	1.38
Flood Zone (lf)	424	313
NWI Wetlands (ac)	0.381	0.207
Prime Farmland Soils (ac)	0	0
Farmlands of Statewide Importance (ac)	0	0
Hazardous Materials	0	0
Leaking Underground Storage Tank	0	0
Archaeology	0	0
Cemetery	0	0
Church	0	0
School	0	0
Nursing Home	0	0
Recreational Facility	0	0
Parcels Crossed (#) – Residential	31	47
Parcels (#) – Business	0	0
Parcels (#) – City	0	0
Parcels (#) – County	0	0
Parcels (#) – Government	0	0
Parcels (#) – Church	0	0
Parcels (#) – School	0	0
Poverty*	22.4%	22.4%
Minority*	18.1%	18.1%

*Source: 2010 U.S. Census

V COST ESTIMATES

Cost estimates were prepared for each alternative using VDOT Transportation & Mobility Planning Division's statewide planning level cost estimates developed for year 2009 conditions. Using that cost estimating spreadsheet a rural 2-lane with 22' of pavement was chosen as the cross-section for estimating purposes. Right-of-way costs and utility relocation costs were estimated at 30% of the construction costs.

In addition to costs covering the installation of the two lanes of roadway within a right of way width sufficient to accommodate another two lanes in the future, estimated costs for improvements to the interchange of the Danville Expressway with U.S. Route 58 West have also been included. It is obvious from the configuration of the existing interchange that a full-movement cloverleaf had been anticipated when the interchange was initially designed. Since then, however, the range of interchange configurations considered appropriate for facilities serving low to moderate traffic volumes has expanded to include modified diamond, single-point urban, and diverging diamond, to name a few. In addition to encouraging consideration of alternative interchange configurations, in urban locations where ramp traffic volumes are anticipated to be high, FHWA has encouraged designs that eliminate weave movements such as those provided by conventional cloverleaf interchanges.

With the art and science of interchange design continuing to evolve, the ultimate configuration of the Danville Expressway interchange with U.S. Route 58 West and the Route 863 Connector Road will be a product of a study process that is more extensive than anticipated by this study process. Consequently, to include considerations of improvements to the interchange in this analysis, the cost estimates have been based on completions of the cloverleaf configuration.

The roadway construction costs included a 25% markup for preliminary engineering and construction contingencies. The cost estimates of the two alignments in 2011 dollars (2009 cost estimates were inflated by the recommended 3% per year) were estimated as follows:

- Alternative 1 \$39,600,000
- Alternative 2 \$38,400,000

Included in the cost for each alternative is an estimated \$15.9 million to complete the interchange configuration.

V 5 YEAR 2035 CAPACITY ANALYSIS: BUILD ALTERNATIVE

Capacity analysis of the forecasted Build Alternative volumes was conducted. The difference in impact on forecasted traffic volumes from either of the improvement alignments was estimated to be negligible, so the volumes for each alignment alternative are identical. The year 2035 Build Alternative peak hour volumes and service

Route 863 to Route 58 West Connector Study

levels are shown in **Figure 11**. The year 2035 daily volume on the Connector Road is forecast at 2,200 vehicles.

The intersection of Moorefield Bridge Road and Mount Cross Road is forecast to meet traffic signal warrants under year 2035 volume conditions. The 2009 *Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD)*² was used to evaluate the forecasted 2035 volumes for meeting traffic signal volume warrants. Based on the need for a traffic signal at this intersection, left turn lanes on the northbound, eastbound and westbound approaches will also be needed to achieve optimal signal operation.

Determination for meeting traffic signal warrants was based on the application of the four-hour volume (included in the technical appendix). As provided in the warrant and since Mount Cross Road has a speed limit of 45 MPH, the warrant was analyzed at the 70% level. The four-hour volume warrant was used because the peak hour warrant alone is typically not used to justify a traffic signal. The forecasted 2035 AM and PM peak hour volumes (shown in **Figure 11**) were used to develop two of the four hours that were evaluated and 85% of the AM and PM peak hour volumes were used to develop estimates of the second hour of the AM and PM peak hour volumes.

Table 12 displays a summary of the results of the Build Alternative intersection capacity analysis for the study area intersections. Two unsignalized intersections with Route 58 West continue to show poor service – Westover Drive and Pine Lake Drive. Motorists at either intersection would encounter difficulty executing left turn movements from the minor street because of heavy through volumes on Route 58 West. Based on year 2035 forecasts, the minor street traffic volumes are not likely to be high enough for the intersections to meet traffic signal warrants.

INTERSECTION	AM PEA OUR	PM PEA OUR
Moorefield Bridge @ Westover Drive*	B	B
US Route 58 W @ Meadowview/Berry Hill	B	B
Westover Drive @ Route 58*	C	E
Pine Lake Rd @ River Ridge Rd*	A	A
Pine Lake Rd @ US Route 58 W*	F	F
Mount Cross Rd @ Moorefield Bridge	C	B






² *Manual on Uniform Traffic Control Devices (MUTCD) for Streets and Highways: 2009 Edition*. U.S. Department of Transportation, Federal Highway Administration. Washington, D.C., December 2009. pp.437-439.

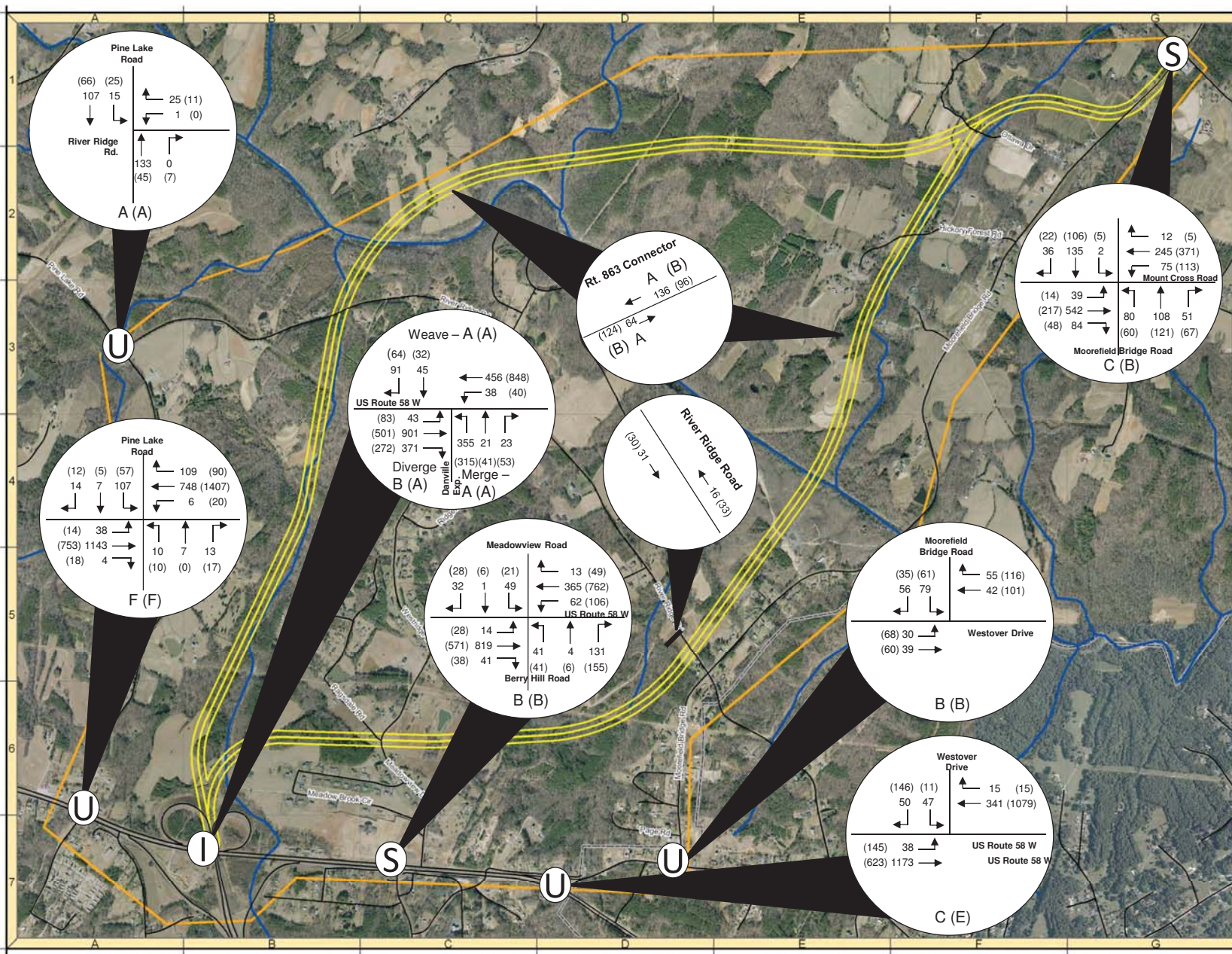
Route 863 To Route 58 West Connector Study

Danville Urbanized Area Metropolitan Planning Organization
Danville, Virginia

Figure 11: 2035 Build Alternative Traffic Volumes and Levels of Service

Legend

-  - Study Area Boundary
-  - Proposed Alignments
- 54 (65) - AM (PM) Peak Hour Volumes
- B (C) - AM (PM) Level of Service
-  - Signalized Intersection
-  - Unsignalized Int.
-  - Interchange



Pine Lake Road

(66)	(25)	←	25 (11)
107	15	↓	1 (0)
↑	133	0	
	(45)	(7)	

River Ridge Rd.

Rt. 863 Connector

←	136 (96)
(124)	64
→	

Weave - A (A)

(64)	(32)	←	456 (848)
91	45	↓	38 (40)
(83)	43	↑	
(501)	901	→	355 21 23
(272)	371	→	(315)(41)(53)

US Route 58 W

Diverge

Merge - B (A)

Moorefield Bridge Road

(22)	(106)	(5)	←	12 (5)
36	135	2	↓	245 (371)
↑			75 (113)	
(14)	39	→	80	108 51
(217)	542	→	(60)	(121) (67)
(48)	84	→		

Mount Cross Road

Pine Lake Road

(12)	(5)	(57)	←	109 (90)
14	7	107	↓	748 (1407)
↑			6	(20)
(14)	38	→	10	7 13
(753)	1143	→	(10)	(0) (17)
(18)	4	→		

Meadowview Road

(28)	(6)	(21)	←	13 (49)
32	1	49	↓	365 (762)
↑			62 (106)	
(28)	14	→	41	4 131
(571)	819	→	(41)	(6) (155)
(38)	41	→		

US Route 58 W

Berry Hill Road

Moorefield Bridge Road

(35)	(61)	←	55 (116)
56	79	↓	42 (101)
↑			
(68)	30	→	
(60)	39	→	

Westover Drive

Westover Drive

(146)	(11)	←	15 (15)
50	47	↓	341 (1079)
↑			
(145)	38	→	
(623)	1173	→	

US Route 58 W

February 2012



Sheet 1 of 1



In general, throughout the study area the Build Alternative conditions service levels are similar to conditions found in the No Build Alternative.

Table 13 summarizes the Build Alternative conditions (two-lane) capacity analysis for both the Route 863 (Moorefield Bridge Road) and for the two alignment alternatives for the Route 863 to Route 58 West Connector Road.

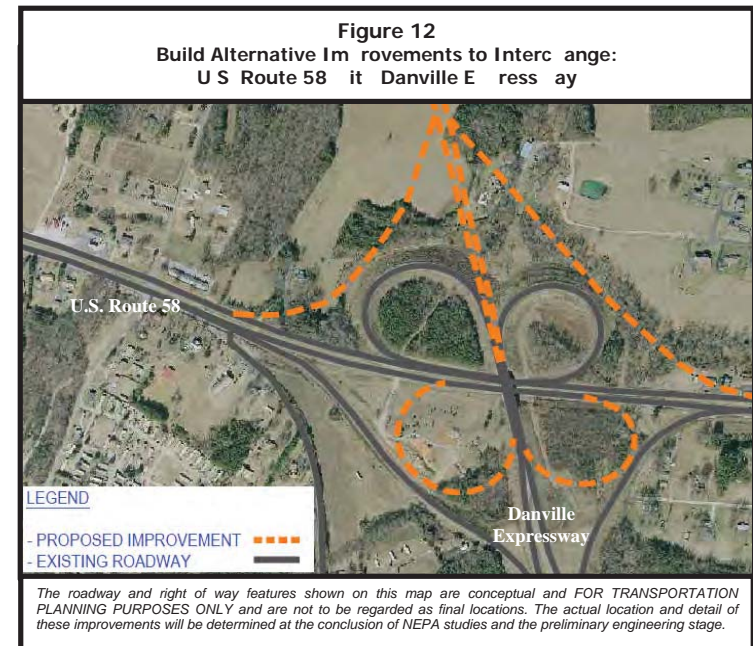
Table 13 Build Alternative 2 Lane Pavement Section Capacity Analysis Route 863 and Connector Road			
Peak Hour Direction	LOS	PTSF	V/C
Route 863 Moorefield Bridge Road			
AM/Northbound	C	64.0%	0.20
AM/Southbound	C	56.6%	0.18
PM/Northbound	C	59.5%	0.18
PM/Southbound	C	64.0%	0.20
Connector Road			
AM/Northbound	A	25.1%	0.05
AM/Southbound	B	48.4%	0.10
PM/Northbound	B	44.7%	0.09
PM/Southbound	A	35.9%	0.07

When compared with the results for the analysis of the No Build Alternative shown previously in **Table 5**, the results in **Table 13** indicate little difference in the service levels with the Build Alternative. For both alternatives, the two-lane roadway service levels are C for each direction during both peak hours on Route 863.

The results in **Table 13** also show excellent service levels forecast for the proposed Connector Road, regardless of the alignment. Service levels are either A or B during each peak hour.

Route 863 to Route 58 West Connector Study

Table 1 summarizes the Build Alternative conditions for the U.S. Route 58 West interchange based on a typical cloverleaf interchange similar to what is presented in **Figure 12**. **Figure 12** presents a simple way to join the Connector Road with the interchange. New ramps are shown with orange lines. No formal analysis was conducted on interchange configurations.



V 6 ECONOMIC ANALYSIS

Implementing either of the alignment improvements of the proposed Connector Road will require that financing be provided to cover the estimated \$39.6 million cost (using the higher of the alternative cost estimates). Moreover, since the project would not be expected to advance to construction until a date to be determined later, the cost (shown in 2011 dollars) will increase in general proportion with the rate of inflation. No estimated date of construction can be presented as of the writing of this report.

While elements of the total cost of the two alternative alignment improvements can be secured through a variety of methods, the greatest proportion of needed funding will need to be provided through the development of the Transportation Improvement Program (TIP) within the Danville (Pittsylvania) area MPO planning process.

Conventional Funding Sources

With an estimated cost of \$39.6 million, implementation of either of the alignment alternatives for the Connector Road would have a substantial impact on current and forecasted financial resources for roadway construction in the Danville/Pittsylvania area. Funding for local highway construction generally comes from VDOT.

In addition to the interstate system, the VDOT construction program funds projects on three principal systems: primary, urban and secondary. Funding for the primary system is allocated at the VDOT District level, and to be eligible, a facility must be in or eligible to be added to the primary system. Since primary highways are generally defined as roads that connect cities and towns with each other, as currently planned, the Connector Road would not be eligible for addition to the primary system.

Estimates of future revenue for roadway improvements incorporated in the *Year 2035 Long-Range Transportation Plan* identified approximately \$2.4 million annually in the MPO area. When combined with previously programmed funds, the total revenue forecasted through 2035 in the *Plan* is \$68.5 million. Of that amount, \$15.9 million was allocated for projects already under construction (such as the replacement of the Robertson Bridge) and \$13.3 million was allocated for programmatic areas (such as bridge replacement and transportation enhancement), leaving \$39.3 million for other improvement projects. Consequently, for the Connector Road to be funded within the planning period of the *Year 2035 Long-Range Transportation Plan*, all forecasted construction funds within the MPO area would need to be allocated to this single project, and all funds allocated in the *Plan* for other projects would have to be reallocated to the Connector Road.

Other Potential Funding Sources

While it is unlikely that sufficient VDOT funds would be available during the planning period through 2035, Pittsylvania County may take steps that will help control the cost of and ensure the availability of a corridor for the future Route 863 Connector. These include:

- **Local Funding** Pittsylvania County may allocate monies from its general fund or proceeds from the use of revenue or charter bonds to fund all or part of the cost of the Connector Road.
- **Amending the Comprehensive Plan** – By adding the Connector Road to the Comprehensive Plan, Pittsylvania County will be showing a facility that is to become part of the planned roadway system. This also establishes the facility as a potential consideration in re-zoning applications in the corridor area. To accept proffers under conditional zoning, the Code of Virginia requires that proffered right of way and construction must be included in the Comprehensive Plan;
- **Include in Capital Improvement Program** – In conjunction with amending the Comprehensive Plan, by also adding all, or any portion, of the Connector Road to the Capital Improvement Program, Pittsylvania County can consider proffers for right of way or construction of part of the facility;
- **Special Tax District:** The Code of Virginia permits localities to establish special tax districts to fund all or part of public facilities. A proportion of property owners within the boundary of the tax district would agree to pay a special tax (in addition to the real property tax) to fund part of the cost of the improvement; and,
- **Tax Increment Financing:** The Code of Virginia permits localities to fund public facilities through the use of tax increment financing. This process enables localities to earmark additional revenues from increases in property taxes collected within a defined district to finance specific improvements.

While none of these options are likely to generate sufficient funds to cover the cost of the Connector Road, they may generate revenues that, in coordination with preservation of the corridor through land use policies, would enable the County to preserve the future corridor from the intrusion of development. Clearly, added development activity in the immediate corridor area will increase the cost of the Connector Road by increasing the cost of right of way acquisition.

V BENEFIT COST ANALYSIS

A simplified analysis of the forecasted year 2035 annualized costs and benefits of the Connector Road has been conducted. Benefits exclusively focus on motorist's travel time savings as compared between the Build and No Build Alternative as estimated during the PM peak hour.

BENEFITS

The estimated travel time under the No Build Alternative from Mount Cross Road to the Danville Expressway with U.S. Route 58 – a distance of approximately 4.4 miles along existing Route 863 and U.S. Route 58 – is forecast at 6.7 minutes. The posted speed limit on the roadway is 45 mph, and delays are encountered at both signalized and unsignalized intersections.

In comparison, the estimated travel time under the Build Alternative from Mount Cross Road to the Danville Expressway with U.S. Route 58 – a distance of approximately 4.23 miles over the Connector Road – is forecast at 5.7 minutes. The posted speed limit on the roadway is 45 mph, and no delays are encountered at any intersections. Consequently, with the Connector Road, motorists will save approximately 1 minute in travel time to complete the trip from Mount Cross Road to the Danville Expressway interchange.

With a forecasted year 2035 daily volume of 2,200 vehicles using the Connector Road, the daily travel time savings is forecast at 2,200 minutes. To convert the daily travel time savings to annual savings, an annualization factor of 330, which adjusts for lower daily volumes during weekend and holiday periods, is applied, which results in an annual time savings of 726,000 minutes or 12,100 hours.

To estimate the value of the saved travel time, the average hourly rate has been applied. To determine the value of time for motorists, the average hourly wage rate for the Danville-Pittsylvania area of \$15.15 was used as a guide.³ The results of this analysis indicate that the Connector Road would provide annual travel time benefits of \$183,315 (in 2011 dollars).

It should be noted that other benefits produced by the Connector Road, such as enhanced safety, would also occur. However, monetizing these benefits on an annualized basis would require detailed analysis that is beyond the scope of this study.

³ Source: Virginia Employment Commission. Labor Market Statistics, Quarterly Census of Employment and Wages Program

Route 863 to Route 58 West Connector Study

COSTS

Development of the annualized cost for construction of the Connector Road involves dividing the cost estimate - \$39.6 million - by an estimated number of years the Connector Road will be in service as proposed – For this study a 40 year service life has been estimated. Over a 40 year period, the annualized construction cost for the Connector Road would be \$990,000 (in 2011 dollars).

While this simplified benefit cost analysis does not consider many factors incorporated in more rigorous analysis, it does indicate that the low volume of vehicles forecasted to use the Connector Road by the year 2035 retards the benefits the road would generate. When compared to the construction costs, the value of user benefits is less than one-fifth – approximately 18.5%.

V 8 PREFERRED ALTERNATIVE

After carefully considering the range of impacts defined in the analysis from the two Build Alternatives, and considering the limited benefit to users and the economic impact on forecasts of available highway improvement funding, URS Corporation recommends selection of the No Build Alternative to the Project Management Team as the Preferred Alternative. However, although the No Build Alternative does not provide for construction of a two-lane facility on new alignment, it is recognized that deficiencies will remain on the existing alignment of Route 863 (Moorefield Bridge Road). Specifically, geometric improvement to the existing alignment – particularly in the area of the crossing of Sandy River – will need to be addressed. In addition, improvement at key intersections – such as installing turn lanes and a traffic signal at the Mount Cross Road intersection, have been added to the No Build Alternative. By not pursuing improvements along a new alignment and focusing roadway investments along the existing Route 863 corridor, the safety and capacity of the roadway will be enhanced and preserved so that through the year 2035 motorists using this route will be provided adequate service.

When compared with the two alignments in the Build Alternative, the Preferred Alternative (the No Build Alternative) was selected because of the following principal reasons:

1. Existing Route 863 has sufficient roadway and intersection capacity to accommodate forecasted volumes under No Build Alternative conditions;
2. The Build Alternative costs are prohibitive and do not produce benefits commensurate with construction costs; and,
3. There is no funding for either construction or right-of-way acquisition identified in the current *Year 2035 Long-Range Transportation Plan*.

V PERMIT EVALUATION

Considering the information shown previously in **Figure 5 a arduous Sites Ma** **Figure 6 Environmental Constraints** and **Figure Cultural Resources Ma** the proposed improvement alignments do not indicate the presence of any constraints that are likely to compromise the ability of either VDOT or the County to potentially implement either alignment alternative.

For either of the Build Alternatives, permits under the Section 404 of the Clean Water Act as administered by the U.S. Army Corps of Engineers (USACE) and relate to potential stream and wetland impacts may be required. In addition, the Virginia Department of Environmental Quality (DEQ) regulates within state waters and wetlands activities under Section 401 of the Clean Water Act (33 U.S.C. §1341), under State Water Control Law (Code of Virginia Title 62.1), and Virginia Administrative Code Regulations 9VAC25-210 et seq., 9VAC25-660 et seq., 9VAC25-670 et seq., 9VAC25-680 et seq., and 9VAC25-690 et seq. Either alignment alternative would involve activities in state waters and wetlands, so a permit will likely be required.

V 10 PUBLIC INVOLVEMENT

The public involvement program conducted as part of the corridor study provided three opportunities for interested citizens to participate in the process. In addition to the citizen information meetings, a web site was established at *DanvilleStudies.com*. Materials were posted to allow citizens to download information.

First Citizens Information Meeting

The first Citizens Information Meeting was held on Wednesday, July 13, 2011 between 4 p.m. and 7 p.m. at the Brosville Elementary School in Pittsylvania, Virginia. The meeting was also advertised in the newspaper and notices were posted on the City's public access cable channel. A total of 17 citizens signed the attendance sheet, and two written comments were submitted with both suggesting alignment alternatives for consideration in the study process.

The materials presented at the first meeting included maps showing environmental constraints, existing peak period traffic volumes, crash locations and frequencies, and year 2035 forecasted peak period traffic volumes and service levels. A brief PowerPoint presentation was provided by URS Corporation staff, in which the project purpose and schedule were detailed.

Second Citizens Information Meeting

On Wednesday, September 21, 2011 the second meeting was held at Brosville Elementary School in Pittsylvania County. The meeting was held from 4-6 p.m. A total of six citizens signed the attendance sheet.

At the second Citizens Information Meeting, citizens were shown the alternatives, the results of their evaluation. The materials presented at the second meeting included maps showing environmental constraints, existing peak period traffic volumes, crash locations and frequencies, and year 2035 forecasted peak period traffic volumes (Build and No Build) and service levels – all previously shown at the first Citizens Information Meeting. New material exhibited included:

- Map based renderings of the two improvement alternatives; and,
- Table of the construction cost estimates for each Build Alternative.

Here again, they were asked to provide comments. Two comment sheets were submitted: one indicating a preference for Alternative 1 and the other stating that the project cannot be justified.

Third Citizens Information Meeting

The third and final meeting was held on Tuesday, November 15, 2011 at Brosville Library from 4-6 p.m. The meeting was also advertised in the newspapers. A total of two citizens signed the attendance sheet.

At this meeting the alternatives were displayed along with their evaluation criteria (traffic volumes, levels of service, etc.). The preferred alternative, the No Build Alternative, was conveyed to the public. Citizens were asked to provide comments on the preferred alternative. The materials presented at the third meeting included maps showing environmental constraints, crash locations and frequencies, and year 2035 forecasted peak period traffic volumes (Build and No Build) and service levels – all previously shown at the second Citizens Information Meeting.

No written comments were submitted.

Finally, an additional opportunity for citizen comment was provided at the MPO Board Meeting held on March 29, 2012 at the Danville Regional Airport.

VI CONCLUSIONS RECOMMENDATIONS

VI 1 SUMMARY AND CONCLUSIONS

The goal of the Route 863 to US Route 58 West Connector Study is to define the optimal alignment for a new connection between Mount Cross Road and the Route 58 West interchange. The Connector Road is a recommended improvement in the *Danville-Pittsylvania Metropolitan Area Year 2035 Long-Range Transportation Plan*. The Plan funds the Connector Road only for preliminary engineering activities. No funds have been identified through the year 2035 for either right of way or construction.

By providing the first segment of an eventual connection of the Danville Expressway at U.S. Route 58 West to the south with U.S. Route 29 North at Blairs, the concept behind the Connector Road is to begin creating the missing northwest quadrant of the beltway around Danville. Another major benefit envisioned with the Connector Road was providing a more expedient way to reach the proposed Mega Park from residential areas north and west of Danville (especially along the Mount Cross corridor).

The study has reviewed two different alignments for the Connector Road. The alignments were developed largely to avoid substantial residential neighborhood development and a historic farm that lie directly between the termini of the Connector Road. The two improvement alignments analyzed include a northern alignment (Alternative 1) and a southern alignment (Alternative 2).

Existing Conditions

To determine existing conditions, AM and PM peak period traffic counts were conducted at several key intersections in the study area. Most of the intersections are currently unsignalized, and one of the unsignalized intersections – Mount Cross Road (Route 750) at Moorefield Bridge Road (Route 863) - was found to function at deficient service levels. The only intersection in the study area that is currently signalized - Meadowview Drive at Route 58 West – was found to operate at adequate service levels.

Using records provided by VDOT, crash types and locations within the study area were analyzed for the three year period from 2005-2007. VDOT records show 14 crashes and 8 injuries on Route 863 during this period. Comparing crash rates on Route 863 to statewide average crash rates for the same facility classification revealed crash and injury rates were moderately higher than the statewide average. Crash locations were distributed evenly through the corridor. The poor geometrics (rolling terrain and lack of shoulder) and access characteristics (frequent residential driveways) of the road are the most influential contributors to the high crash rates.

Route 863 to Route 58 West Connector Study

Environmental Resources

A detailed scan of environmental resources in the Route 863 to Route 58 West Connector study area was conducted and known resources were mapped. The constraint mapping will be used to develop roadway alternatives and to assess alternative impacts.

USGS topographic quadrangle blue line streams were digitized to improve the reliability of stream layers. Soils data were evaluated based on Prime Farmland and Farmland of Statewide Importance soil types provided by Pittsylvania County and the City of Danville, VA Soil and Water Conservation District. Historic resources were also identified and evaluated. The environmental resources were previously shown in the following figures: **Figure 5 Soils Ma**, **Figure 6 a ardous Sites Ma**, **Figure Environmental Constraints** and **Figure 8 Cultural Resources Ma**

A preliminary evaluation of the information identified in **Figures 5** does not indicate the presence of resources that would severely constrain the development of alignments for the connector road. In contrast, **Figure 8** includes a site of concern. Seven Springs Farm (071-5255) is a farmstead containing multiple buildings and other resources and was listed on the National Register of Historic Places (NRHP) and the Virginia Landmark Register (VLR) in 2008. Care should be taken to avoid this resource during the planning stages for the Route 863 Connector project. By avoiding the Seven Springs Farm and its southerly-facing viewshed, no adverse effects should occur to the resource.

The overall finding of the evaluation of environmental resource constraints is that there do not appear to be known environmental resources that would, either individually or in concert with other resources, preclude implementation of either of the Build Alternative alignments. The design and permitting process of the individual improvements will require efforts to either avoid or minimize impacts to existing resources, but if reasonable efforts to achieve such avoidance and minimization are pursued, the need for permits can be minimized.

Year 2035 Forecasted Conditions

The Danville area year 2035 travel demand model was used to develop peak period forecasts. Specifically, growth rates were computed by comparing the baseline (year 2000) model estimates with the year 2035 model forecasts, and the growth factors were then applied to the corridor and intersection peak hour traffic counts collected as part of this study. It should be noted that the travel demand model did include employment located at the Mega Park.

Analysis of the No Build Alternative found that the volumes on Route 863 are forecast to grow from 241-304% by the year 2035. With these higher volumes, capacity analysis determined that service will fall by a level or two from where they are in the existing conditions. Three of the unsignalized study area intersections are forecast with inadequate service levels: Westover Drive @ U.S. Route 58 West, Pine Lake Drive @ U.S. Route 58 West, and Mount Cross Road @ Moorefield Bridge Road. Route 863 and the U.S. Route 58 West interchange continue to provide adequate levels of service.

Purpose and Need

Based on the analysis of existing and forecasted conditions, the purpose and need for the Route 863 to Route 58 West Connector is based on addressing the following issues:

1. Establishing an arterial level facility to provide access to the Mega Park via an appropriately classified functional facility will divert growing traffic volumes from inadequate collector roadways.
2. Forecasted growing traffic volumes on Moorefield Bridge Road and Pine Lake Road will not be compatible with existing and planned residential land use development located near or immediately adjacent to the rights of way.
3. Improving access to the Danville Expressway from the north will divert traffic volumes from unsuitable collector and local streets to a Rural Principal Arterial with ample available capacity forecasted through the year 2035.

Alternatives Development and Analysis

Ten evaluation criteria were developed, each with a weighting from 1-3 (the higher weight indicating greater importance among the criteria). The evaluation criteria are:

- | | |
|-----------------------|---------------------------------|
| 1. Capacity | 5. Right Of Way Impacts |
| 2. System Performance | 6. Environmental Impacts |
| 3. Safety | 7. Economic Impacts |
| 4. Cost | 8. Financial Impacts |
| | 9. Consistency with Local Plans |

Cost Estimates

Using VDOT's planning level cost estimating data developed by VDOT's Transportation Mobility Planning Division cost estimates were developed for the proposed Build Alternatives. The cost estimating procedure was developed in 2009 with a recommended 3% per year inflation rate.

The cost estimates for the two Build Alternatives were as follows:

- Alternative 1 \$39,600,000
- Alternative 2 \$38,400,000

Included in the cost for each alternative is an estimated \$15.9 million to complete the interchange configuration.

Year 2035 Capacity Analysis

When compared to the results for the No Build Alternative, the analysis results of the Build Alternatives only provided for modest improvement in service levels. Two of the unsignalized intersections are still forecast to operate with inadequate service levels. Service at the intersection of Mount Cross Road and Moorefield Bridge Road was found to improve to adequate levels with the implementation of a traffic signal and turn lanes. Forecasted service for Route 863 and for the U.S. Route 58 West interchange was found to be at adequate levels, which also was found in the analysis of the No Build Alternative.

Environmental Impacts

The scan of environmental resources that would be impacted by the Build Alternatives revealed minimal impacts for a project (new alignment) of this nature. There was no substantial difference in the environmental impacts between the two Build Alternatives.

Economic and Financial Impacts

The Route 863 to Route 58 West Connector Road is funded through preliminary engineering in the *Danville-Pittsylvania Metropolitan Area Year 2035 Long-Range Transportation Plan*. In order to fund the project through construction would take a considerable portion of the entire Long Range Plan funding. Because the proposed Build Alternatives only offers marginal benefits the financial commitment necessary for this project is not commensurate with the benefits.

Public Involvement

The public involvement program conducted as part of the corridor study provided three opportunities for interested citizens to participate in the process. The Citizens Information Meetings were held on July 13, 2011 and September 21, 2011 at the Brosville Elementary School in Pittsylvania, Virginia. The last meeting was held November 15, 2011 at the Brosville Library. Comments were received and considered in the conduct of the study.

VI 2 RECOMMENDATIONS

After carefully considering the range of impacts defined in the analysis from the two alignments in the Build Alternatives, and considering the limited benefit to users and the economic impact on forecasts of available highway improvement funding, the No Build Alternative is recommended as the Preferred Alternative.

Although the No Build Alternative does not provide for construction of a two-lane connector facility on new alignment, it is recognized that deficiencies will remain on the existing alignment of Route 863 (Moorfield Bridge Road). Specifically, geometric improvement to the existing alignment – particularly in the area of the crossing of Sandy River – will need to be addressed. In addition, improvements at key intersections – such as installing turn lanes and a traffic signal at the Mount Cross Road intersection, should be evaluated and funded. By not pursuing improvements along a new alignment and focusing roadway investments along the existing Route 863 corridor, the safety and capacity of the roadway will be enhanced and preserved so that through the year 2035 motorists using this route will be provided adequate service.

URS Corporation recommends selection of the No Build Alternative as the Preferred Alternative.

When compared with the two alignments in the Build Alternative, the Preferred Alternative (the No Build Alternative) was selected because of the following principal reasons:

4. Existing Route 863 has sufficient roadway and intersection capacity to accommodate forecasted volumes under No Build Alternative conditions;
5. The Build Alternative costs are prohibitive and do not produce benefits commensurate with construction costs; and,
6. There is no funding for either construction or right-of-way acquisition identified in the current *Year 2035 Long-Range Transportation Plan*.