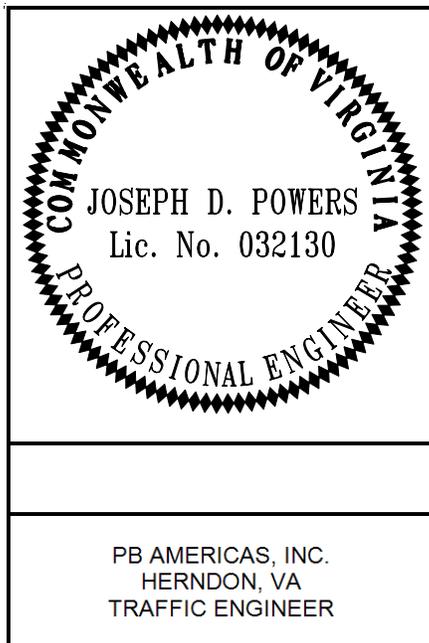




**FAIRFAX COUNTY PARKWAY (ROUTE 7100) AND
FRANCONIA-SPRINGFIELD PARKWAY (ROUTE 7900) SAFETY
STUDY REPORT**

**TASK ORDER 96
VIRGINIA DEPARTMENT OF TRANSPORTATION
TRAFFIC ENGINEERING FOR NORTHERN OPERATION
REGION
LIMITED SERVICES CONTRACT – YEAR 3**



November 2010



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Executive Summary

The purpose of this project is to evaluate locations along the Fairfax County and Franconia-Springfield Parkways where motorists are crossing the medians and colliding and to provide recommendations for safety countermeasures. The limits for the study are between Route 7 and I-95 (about 28.34 miles) but excluding the portion of the Fairfax County Parkway in the vicinity of the Fair Lakes Parkway/Fairfax County Parkway intersection since there are current VDOT roadway improvement plans for this area.

The crash data and police reports for all fatal or injury median crashes that occurred within the project limits for the years 2007 through 2009 were obtained. These crashes total 3 fatal crashes and 33 injury crashes. Accident clusters were developed in order to focus improvements on the areas where median crashes have occurred most frequently. The clusters account for 29 of the 36 total median crashes, including the three fatal crashes.

The accident clusters were reviewed and potential countermeasures were assigned to roadway segments based on the strategy of selecting measures that will counter the undesirable geometric elements found within the cluster most effectively in order to minimize median crashes. The following Long-term and short-term countermeasures were considered at all locations and planning level unit costs were developed:

Long-term Countermeasures

- Install Median Barrier – Installation of median barrier provides a positive barrier between the northbound and southbound traffic; however, it will also increase the number of less severe accidents such as guardrail hits by motorists who are now able to recover in the median.
- Provide Median Shoulder Improvements – Widen existing paved shoulders to 4 feet and provide an additional 4-foot graded shoulder in order to provide a recovery area, particularly on the insides of curves.
- Superelevation Modification – Increase the rate of superelevation to 6% or higher at the insides of curves where the radius is less than 1190 feet or where a sharper curve is located at the end of a long tangent to support the higher speeds of the traveling vehicles.
- Intersection Modifications/Turn Restrictions – Modify intersection with full access to only allow right-in/right-out. This countermeasure was only found to be applicable at Burke Centre Pkwy.

Short-term Countermeasures

- Rumble Strips – Install rumble strips to both edges of the northbound and southbound roadways. The VDOT standard RS-1 rumble strip which is 16" long and placed 6" outside the edge of the travel lane would be utilized.
- Enhanced Pavement Markings – Install 6" or higher contrast pavement marking lines or raised pavement markers along the edge of the travel lanes and for or along the skips between lanes for both northbound and southbound roadways.
- Red Signal Ahead Warning Sign – Provide a dynamic message sign on a mast arm above the roadway to warn approaching drivers of a red signal condition at the next signal so that they slow down and look for stopped traffic.



Recommendations

The following long term and short-term recommendations were developed.

Long Term Safety Countermeasures	Location	Cost
Median Barrier	7 locations totaling 17,050 feet	\$1,536,000
Median Shoulder Improvements	2 locations totaling 2,800 feet	\$92,000
Superelevation Modification	2 locations totaling 2,100 feet	\$693,000
Intersection Modifications	1 location (Burke Centre Pkwy)	\$300,000

Total cost to implement Long Term Safety Countermeasures: \$2,621,000

Short Term Safety Countermeasures		Cost
Rumble Strips/Enhanced Pvt Markings	3 locations totaling 28,800 feet	\$692,000
Red Signal Ahead Sign	3 locations	\$81,000

Total cost to implement Short Term Safety Countermeasures: \$773,000



Introduction

The purpose of this project is to evaluate locations along the Fairfax County and Franconia-Springfield Parkways where motorists are crossing the medians and colliding and to provide recommendations for safety countermeasures to reduce these types of crashes. It should be noted that the placement of median barrier could potentially increase the number of property damage and minor injury accidents due to elimination of recovery area and deflecting vehicles back into travel lanes. The limits for the study are between Route 7 and I-95 but excluding the portion of the Fairfax County Parkway in the vicinity of the Fair Lakes Parkway/Fairfax County Parkway intersection since there are current VDOT roadway improvement plans for this area. See Figure 1 for a map of the project study area.

Purpose of this Report

The purpose of this report is to:

- Summarize existing conditions and median crash information for Fairfax County and Franconia-Springfield Parkway.
- Present a screening analysis of the median crash data in order to determine the limits of crash clusters that will be the priority for modifications to mitigate median crashes.
- Provide an assessment of potential roadway modifications including the costs and benefits of each potential modification and a process for determining the applicability of each.
- Recommended roadway modifications and recommended areas for further analysis.

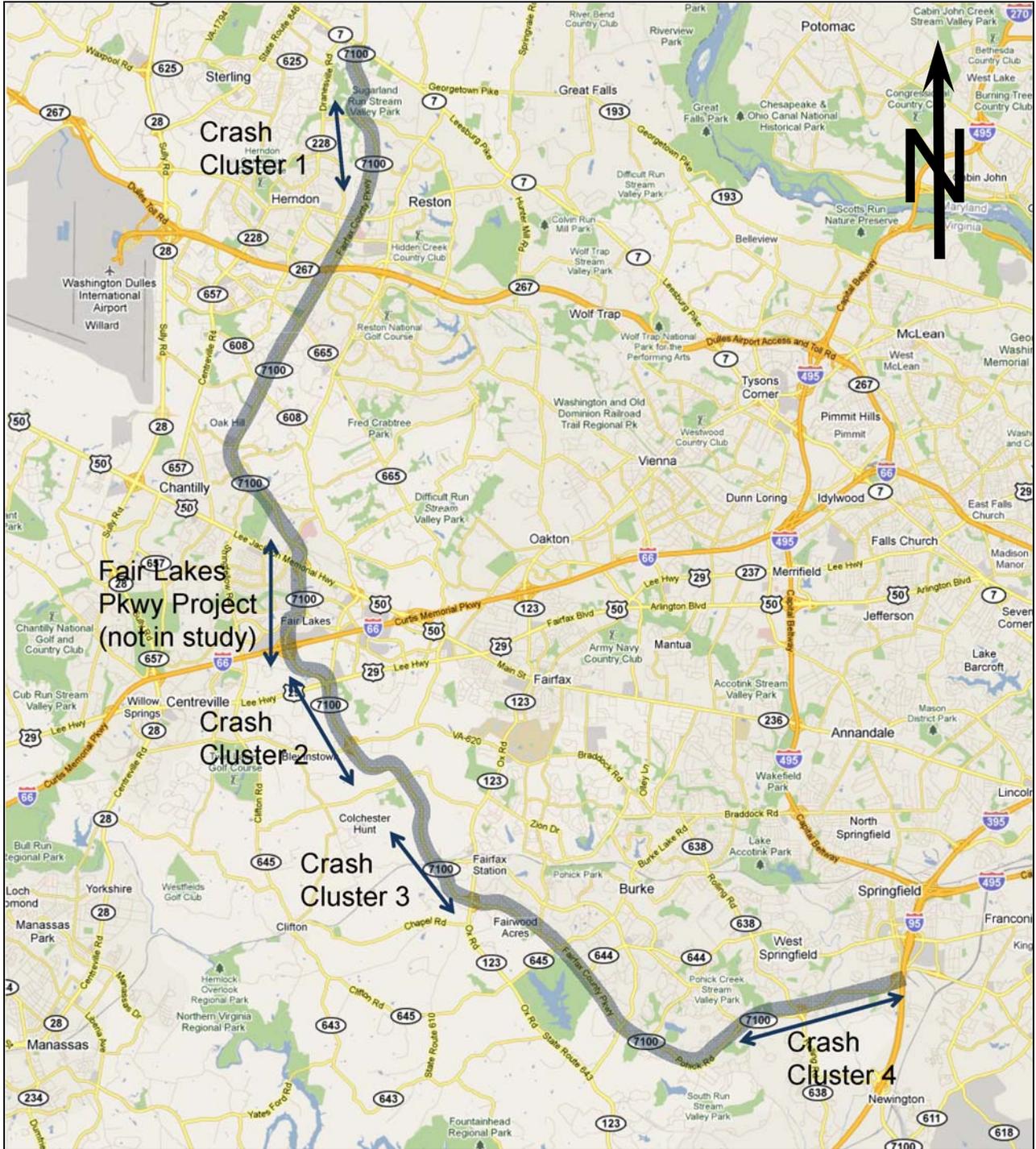


Figure 1: Project Study Area



Background and Existing Conditions

Fairfax County Parkway extends approximately 26.2 miles From Route 7 to Rolling Road where Franconia-Springfield Parkway continues another 2.14 miles to I-95. The Fairfax County Parkway extension along the existing Rolling Road alignment and the connection to the southern segment of Fairfax County Parkway that terminates at Route 1 is not a part of this project.

The roadway is classified as an Urban Other Principal Arterial for the entire limits of the project. It is a 4- or 6-lane divided highway generally made up of 12-foot travel lanes, 10 to 11 foot right shoulders, and 3 to 4 foot left shoulders. A grassed median of up to 36 feet is provided for most of the roadway length although much of the southern portion is characterized by 16-foot medians and 4-foot concrete medians where there are auxiliary turn lanes.

The posted speed limit is 50 mph and the design speed is also 50 mph. The parkway was originally posted at 45 mph and designed at 50 mph; however, the speed limit was raised to 50 mph after speed studies were conducted in the 1990's. Typically a roadway would be designed for a speed of at least 5 mph above the posted speed limit. In the case of the Fairfax County Parkway a design speed of 55 mph would be expected and this is what has been used in the consideration of safety countermeasures.

The 2009 traffic volumes range from an Annual Average Daily Traffic (AADT) volume of 47,000 to 73,000 within the project limits. Weekday traffic volumes are between 51,000 and 81,000. This volume is composed of between 1% and 3% truck traffic.

The following evaluation criteria apply within the project limits based on the roadway classification, design speed, and traffic volumes discussed above:

- Clear Zone: Since the Fairfax County and Franconia-Springfield Parkway are posted at 50 MPH the clear zone reverts to the rural clear zone standards. This clear zone applies to both the outside and the median of the roadway: 22' – 24' (For 6:1 Slopes for 55 MPH and an ADT greater than 6000)
- Stopping Sight Distance: Fairfax County and Franconia-Springfield Parkways are posted at 50 MPH and we assume a design speed of 55 MPH. This yields a SSD of 495'
- Intersection Sight Distance: The required intersection sight distance for a 4 lane major divided road with a median based on a 55 MPH design speed is: Sight Distance Right = 710', Sight Distance Left = 670'

There are 46 median breaks within the project limits. These median breaks are composed of 30 signalized intersections, 13 unsignalized intersections, and 3 emergency crossovers. There are 7 roadway underpasses and 13 overpasses. There are also six locations where a street crossing intersects Fairfax County Parkway with a right-in right-out only so that no median break is provided. The roadway crossings within the project limits, the distance to the next crossing, the type of crossing, and whether a median break is provided in the following table.

Roadway	Distance	Crossing Type	Median Break
Route 7	0.04	Underpass	No
Route 7 - south side ramps	0.37	Signalized	Yes
Sugarland Road	0.56	Signalized	Yes
Heather Way	0.39	Unsignalized T	Yes



Roadway	Distance	Crossing Type	Median Break
Wiehle Ave	0.31	Signalized	Yes
Sugarland Valley Drive	0.68	Unsignalized T	Yes
Lake Newport Road	0.36	Signalized	Yes
N. Walnut Branch Road	0.2	Signalized	Yes
S. Walnut Branch Road	0.44	Unsignalized T	No
Baron Cameron Ave	0.37	Underpass	No
New Dominion Pkwy	0.23	Signalized	Yes
Spring Street Ramps	0.09	Signalized	Yes
Spring Street	0.26	Underpass	No
DTR - north side ramps	0.06	Signalized	Yes
DTR	0.07	Underpass	No
DTR - south side ramps	0.31	Signalized	Yes
Sunrise valley Dr	0.71	Signalized	Yes
Fox Mill Road	0.74	Signalized	Yes
Pinecrest Road	0.73	Overpass	No
West Ox Road	1.07	Signalized	Yes
Franklin Farm Road	0.52	Signalized	Yes
Springhaven Dr/Tuckaway Dr	0.29	Signalized	Yes
Stringfellow Road	0.81	Signalized	Yes
Old Plains Road	0.6	Unsignalized T	No
Rugby Road	0.41	Signalized	Yes
Route 50 - north side ramps	0.12	Signalized	Yes
Route 50 - Lee Jackson Mem. Hwy	0.12	Overpass	No
Route 50 - south side ramps	0.11	Signalized	Yes
Emergency crossover	0.15	Emergency crossover	Yes
N. Lake Drive	0.36	Unsignalized T	Yes
Monument Dr	0.17	Signalized	Yes
Fair Lakes Pkwy	0.39	Signalized	Yes
Fair Lakes Circle	0.35	Overpass	No
I-66 - Custis Memorial Pkwy	0.22	Overpass	No
VDOT Maintenance Yard Access	0.81	Unsignalized	Yes
Route 29 - Lee Hwy	1.04	Overpass	No
Emergency crossover	0.22	Emergency crossover	Yes
Braddock Road	1.26	Overpass	No
Popes Head Road	0.17	Signalized	Yes
Colchester Meadow Lane	0.62	Unsignalized	Yes
Ladues End Lane/Nomes Court	0.79	Unsignalized	Yes
Fairfax Station Road	0.27	Underpass	No
Burke Centre Pkwy	0.28	Signalized	Yes
Clara Barton Dr	0.57	Overpass	No



Roadway	Distance	Crossing Type	Median Break
Route 123 - Ox Road	0.46	Overpass	No
Freds Oaks Road	0.61	Unsignalized	Yes
New Road	0.17	Unsignalized T	Yes
Wendy Ann Court	0.14	Unsignalized T	No
Karmich Street/Roberts Pkwy	0.15	Signalized	Yes
Knolls Pond Lane	0.32	Unsignalized T	No
Burke Lake Road	0.72	Signalized	Yes
Old Keene Mill Road	0.49	Signalized	Yes
Portside Drive/Waterline Drive	0.4	Unsignalized	Yes
Rolling View Drive/Pilothouse Road	0.22	Unsignalized	Yes
Lee Chapel Road	0.33	Signalized	Yes
Reservation Dr	0.34	Signalized	Yes
Huntsman Blvd	0.17	Signalized	Yes
Huntsman Court	0.21	Unsignalized T	No
Modisto Lane	0.18	Unsignalized	Yes
Cervantes Lane	0.45	Unsignalized T	No
Hooes Road/Seabrook Lane	0.04	Overpass	No
Emergency crossover	0.1	Emergency crossover	Yes
Pohick Road	0.35	Overpass	No
Hooes Road	0.58	Unsignalized T	Yes
Sydenstricker Road/Shady Palm Dr	0.22	Overpass	No
Olde Lantern Way/Gambrill Road	0.47	Overpass	No
Whitlers Creek	0.14	Signalized	Yes
Stream Way	0.3	Unsignalized T	Yes
Rolling Road	1.24	Overpass	No
Spring Village Dr/Bonniemill Lane	0.8	Signalized	Yes
Backlick Road	0.1	Underpass	No
Interstate 95		Underpass	No

Recent or Proposed Improvements

The Fair Lakes Parkway project broke ground in October 2010. This project will provide improvements along Fairfax County Parkway between I-66 and Rugby Road. These improvements will include an interchange that will eliminate the signalized at-grade intersections at Fair Lakes Parkway and at Monument Drive. Due to these modifications, this section of the Fairfax County Parkway was not included in this study. The limits of this project has been shown on the Location Map on page 4 of this report.

A BRAC project is under construction to extend Fairfax County Parkway through the Engineering Proving Grounds. This project includes modifications to the existing Interchange at Rolling Road and will include modifications to the median of Fairfax County Parkway including the addition of



median barrier between Stream Way and the Rolling Road bridge. The addition of this barrier has been taken into account in the recommendations provided in this report.

Other recent improvements within the project limits include spot improvements at the Sunrise Valley Drive and West Ox Road intersections which are under construction, and proposed improvements including the addition of a southbound third lane between Route 29 and Braddock Road, and guardrail replacement throughout the corridor.

Evaluation of Crash Data and Development of Clusters

The Fairfax County Police provided crash data and police reports for all fatal or injury median crashes that occurred within the project limits for the years 2007 through 2009. These crashes total 3 fatal crashes and 33 injury crashes. The crashes were plotted on aerial imagery covering the project limits and the resulting display of median crash locations is provided in the Appendix.

Accident clusters were developed in order to focus improvements on the areas where median crashes are most likely to occur. During project scoping, it was determined that an accident cluster would be defined as four or more accidents occurring within a two to three mile roadway section. Four accident clusters were identified based on these criteria. The clusters account for 29 of the 36 total median crashes, including all three of the fatal crashes. The locations of the clusters are indicated on the Median Crash Location display. The crashes are summarized in the following table including the accident ID number, direction of travel, whether the crash took place during the day or night, and notes describing the general nature or cause of the crash.

Accident ID	Direction	Time	Geometry	Notes
NOT IN CLUSTER: Route 7 to Heather Way				
0.97 miles, 0 crashes				
CLUSTER 1: Heather Way to N. Walnut Branch Rd				
1.74 miles, 4 crashes				
899	NB	Day	Curve	at intersection / rear end
567	NB	Day	Tangent	avoid animal
363	NB	Day	Curve	motorcycle w/stuck accelerator
277	NB	Night	Tangent	at intersection / rear end
NOT IN CLUSTER: N. Walnut Branch Rd to 0.5 Mi N. of Route 29				
10.21 miles, 5 crashes				
359	SB	Night	Tangent	speeding / no headlight / motorcycle
889	SB	Day	Tangent	driver coughing / blacked out
083	NB	Night	Curve	speeding / fled scene
298	SB	Day	Curve	driver seizure
413	NB	Day	Tangent	at intersection / rear end
CLUSTER 2: 0.5 Mi N. of Route 29 to 0.19 Mi N. of Popes Head Rd				
2.83 miles, 5 crashes				
963	SB	Night	Tangent	driver lost control
796	NB	Day	Curve	icy bridge / rear end
858	SB	Day	Tangent	illegal left turn
058	NB	Day	Curve	overcorrection
312	SB	Day	Tangent	traffic / avoid rear end



Accident ID	Direction	Time	Geometry	Notes
NOT IN CLUSTER: 0.19 Mi N. of Popes Head Rd to Ladues End				
0.98 miles, 0 crashes				
CLUSTER 3: Ladues End to 0.19 Mi N. of Route 123				
1.72 miles, 7 crashes				
571	NB	Night	Curve	driver lost control
167 FATAL	SB	Day	Curve	airborn after hitting median ditch
830	SB	Day	Curve	driver lost control
383	NB	Day	Curve	turning NB from burke centre pkwy
056	SB	Night	Curve	driver lost control
505	NB	Night	Curve	speeding
766	NB	Day	Curve	driver lost control
NOT IN CLUSTER: 0.19 Mi N. of Route 123 to 0.26 Mi N. of Sydenstricker Rd				
6.36 miles, 2 crashes				
600	SB	Day	Tangent	icy roadway
121	SB	Night	Tangent	at intersection
CLUSTER 4: 0.26 Mi N. of Sydenstricker Rd to Interstate 95				
3.53 miles, 13 crashes				
340	NB	Night	Curve	changing a cd
736	SB	Night	Curve	overcorrection
007	NB	Day	Curve	at intersection / speeding
170	NB	Night	Tangent	avoid animal
951	SB	Day	Curve	driver lost control
874	NB	Day	Curve	driver lost control
279 FATAL	NB	Day	Curve	driver lost control
203 FATAL	NB	Day	Curve	driver lost control
270	SB	Day	Tangent	overcorrection
713	NB	Day	Curve	driver lost control
762	NB	Day	Curve	snow / ice on roadway
206	NB	Day	Tangent	driver lost control
472	SB	Day	Tangent	at intersection

The median crashes located within the crash clusters have been shown on plans that were developed for each of the four crash clusters. These plans are based on GIS data and additional information has been added based on design plans and field reviews. In addition to the GIS base mapping and the accident locations, the following information that could impact future crashes or safety countermeasures was added to the plans:

- Horizontal curve radii and maximum superelevation rates
- Mountable and Non-mountable curb locations
- Signalized intersections (indicated with traffic signal head)
- Existing median barrier
- Longitudinal slopes, Crests, and Sags (only where vertical sight distance was determined to be an issue)
- Limits of roadway where total median width is less than 30 feet

Typical sections were developed within each cluster to depict the typical cross sectional elements within the cluster. These sections are shown at the bottom of each plan sheet. The cluster plans also indicate the recommended safety countermeasures; however, this is described further in the recommendations section of the report.



Safety Countermeasures

A wide range of safety countermeasures were assessed for potential recommendation for this project. These countermeasures are described in the following key references:

- AASHTO Roadside Design Guide – 2006 – Chapter 6 – Median Barriers
- Driving Down Lane-Departure Crashes: A National Priority – April 2008

Many additional references were also utilized to a lesser extent. These included:

- NCHRP Report 633 – Impact of Shoulder Width and Median Width on Safety – 2009
- NCHRP Report 559 – Communicating Changes in Horizontal Alignment - 2006
- NCHRP Report 641 – Guidance for the Design and Application of Shoulder and Centerline Rumble Strips - 2009
- Cross median Crashes: Identification and Countermeasures – Final Report – Department of Civil Engineering, University of Minnesota – June 2008
- Evaluation of Cross Median Crashes – Final Report – Rowan University, Department of Mechanical Engineering, Glassboro, NJ – February 2005
- FHWA-SA-07-001 – Good Practices: Incorporating Safety into Resurfacing and Restoration Projects
- FHWA-SA-07-002 – Low-Cost Treatments for Horizontal Curve Safety
- Evaluation of Median Barrier Safety Issues – Kentucky Transportation Center
- Consideration and Implementation of Proven Safety Countermeasures – FHWA Memorandum – July 10, 2008
- Putting the Brakes on Crossover Crashes: Median Barrier Research and Practice in the U.S. – Bureau of Project Development, Wisconsin Department of Transportation – March 30, 2007

The accident clusters were reviewed and potential countermeasures were assigned to roadway segments based on the strategy of selecting measures that, from a median crash perspective, will most effectively counter the undesirable geometric elements found within the cluster. Long-term and short-term countermeasures were considered at all locations. The short-term countermeasures are generally less costly and could be implemented with minimal engineering utilizing existing maintenance contracts. The long-term countermeasures are more costly and/or would require additional engineering design time.

The countermeasures that were selected for recommended application within the crash clusters are described below. The specific recommended application of these measures is described in further detail in the Recommendations section of this report.



Long-term Countermeasures

Install Median Barrier – Installation of median barrier provides a positive barrier between the northbound and southbound traffic. Types of barrier would include single-faced guardrail, dual-faced guardrail, and cable guardrail.

- Advantages: greatly decreases chance of crossing the median, head on collisions
- Disadvantages: does not reduce crashes; may increase crashes due to elimination of recovery area and deflecting vehicles back into travel lanes; not effective at intersections due to median breaks and the need to provide sight triangles
- Impacts: May require the reconstruction of curb in some locations, may need to regrade ditches to maintain traversable slopes, maintenance due to replacing damaged guardrail
- Application: Install where median width is less than 30 feet and at high median crash locations where a combination of back to back horizontal curves, grades and/or lack of lighting result in a high rate of median crashes
- Design: The median barrier will have to be designed based on actual survey and the resulting intersection and stopping sight distances. Guardrail in the median only affects intersection sight distance at unsignalized intersections where there is a median break and the median is wide enough for guardrail. Right turns on red and left and right turns at a signalized intersection are not impacted by adding guardrail to the median. Median barrier was recommended as a part of this study in the vicinity of only one unsignalized intersection with a median break. The location of the guardrail in this case should be determined based on the intersection sight distance, see Figure 2. Guardrail in the median may reduce the horizontal stopping sight distance along curves based on some preliminary analysis using aerial photographs. The actual stopping sight distance will also depend on the vertical alignment in the locations where barrier is recommended. The designer will need to evaluate all the aspects that are involved with the installation of guardrail in the median including the AASHTO Roadside Design Guide. The horizontal stopping sight line is shown in Figures 3 and 4. Figure 3 is at a raised median that is approximately 18' wide on a curve. Figure 4 shows the horizontal stopping distance sight line for a graded median with a ditch. In some locations along the Parkway the sight line crosses the median and can be affected by the opposing traffic, as shown in Figure 3.

INTERSECTION SIGHT DISTANCE
SUGARLAND VALLEY DRIVE



SOURCE: AASHTO GREEN BOOK & VDOT ROAD DESIGN MANUAL (APPENDIX F)

Figure 2: Median Barrier at Unsignalized Intersection

STOPPING SIGHT DISTANCE

VILLA-DEL-REY CT

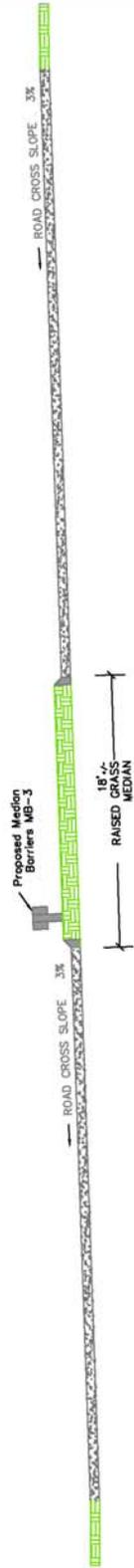


Figure 3: Median Barrier at 18' Wide Raised Median

STOPPING SIGHT DISTANCE

CHEVIOT DR



GUARDRAIL PLACEMENT: SECTION B-B

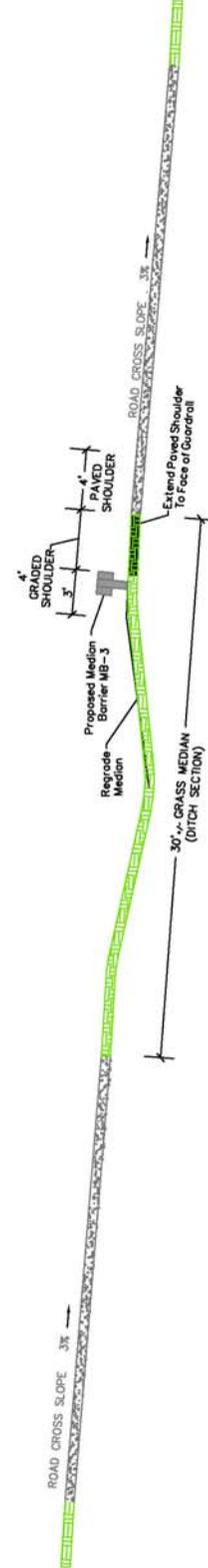
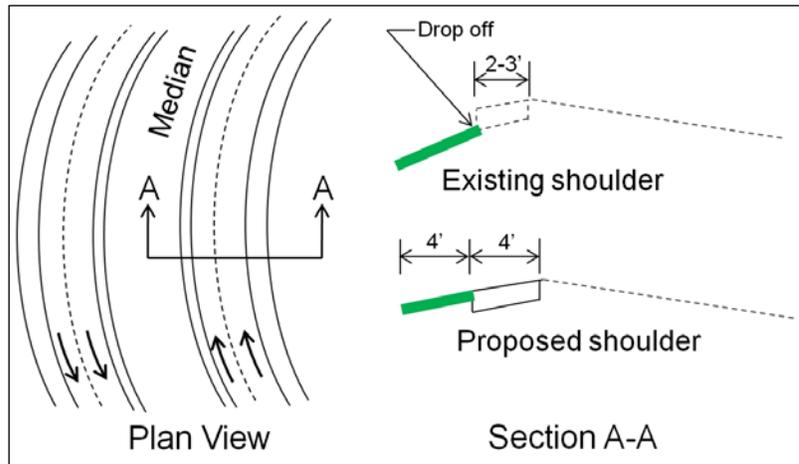


Figure 4: Median Barrier at Graded Median with Ditch

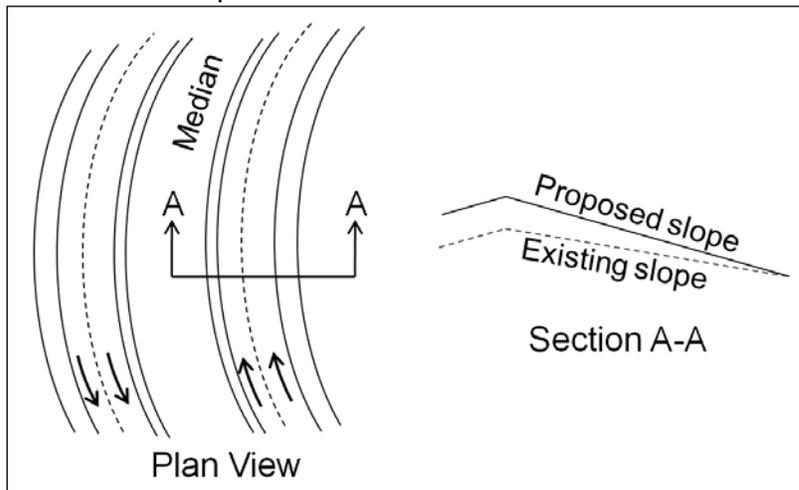
Provide Median Shoulder Improvements – Widen existing left side paved shoulders to 4 feet and provide an additional 4-foot graded shoulder in order to provide a recovery area, particularly on the insides of curves.

- Advantages: Decreases accidental run off the road crashes and crashes due to pavement drop off, increases width of stabilized recovery area, also provides a wider area for disabled vehicles to pull off out of the travel lanes
- Disadvantages: Does not prevent vehicles from crossing median
- Impacts: Regrading of median ditch
- Application: Install to left shoulders of the roadbed located on the inside of curves where the radius is less than 1190 feet or where loss of control is made more likely by the location of a sag within the curve also install within accident clusters where pavement drop off was involved in the cause of the accident



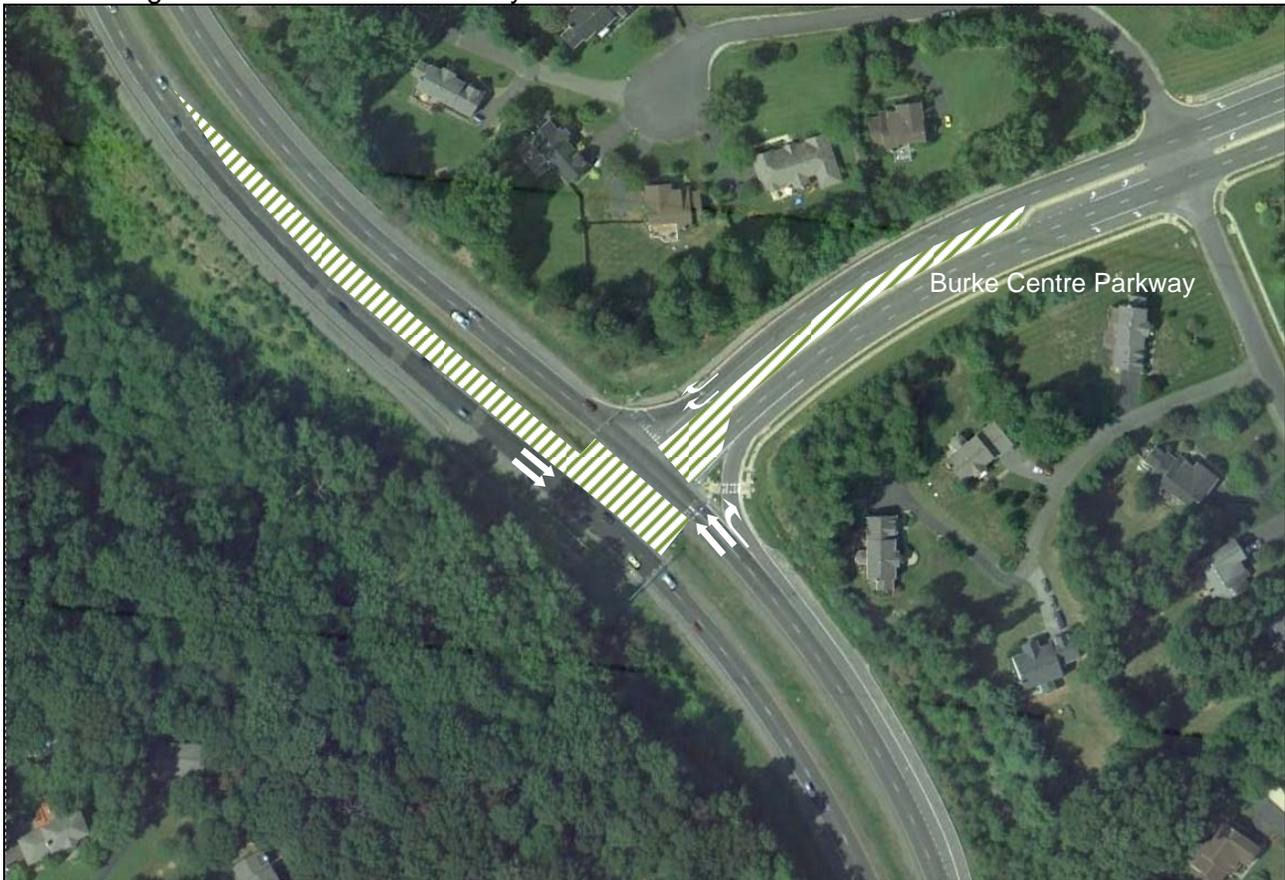
Superelevation Modification – Increase the rate of superelevation to 6% or higher on the roadbed located on the insides of curves where the radius is less than 1190 feet or where a sharper curve is located at the end of a long tangent to support the higher speeds of the traveling vehicles in order to help counter the momentum that pushes vehicles towards the median.

- Advantages: Decreases accidental run off the road crashes by increasing the speed that the curve can be safely driven
- Disadvantages: Does not prevent vehicles from crossing median
- Impacts: Regrading of median ditch and may impact existing retaining walls
- Application: Install to roadbed located the inside of curves where the radius is less than 1190 feet or where loss of control is made more likely by the location of a sag within the curve



Intersection Modifications/Turn Restrictions – Modify intersection with full access to only allow right-in/right-out. This countermeasure was only found to be applicable at Burke Centre Parkway.

- Advantages: Decreases rear end crashes and crashes where vehicles avoiding an unexpected stopped vehicle swerve into the median
- Disadvantages: Reduced access for motorists and a corresponding increase in trip lengths. Increases traffic volumes on adjacent roads that act as alternates to the eliminated turning movements. Improvements may be required to adjacent roads to handle the increased traffic volumes.
- Impacts: Intersection modifications including median, islands, signals, signing, and pavement markings. A study will be required and public meetings will have to be held for changes to existing traffic pattern.
- Application: Construct where a high number of crashes are tied to congestion caused by an intersection and worsened by roadway geometrics that make it difficult to assess the congestion in time to react safely



Intersection Modifications at Burke Centre Parkway

Short-term Countermeasures

Rumble Strips – Install rumble strips to both edges of the northbound and southbound roadways. The VDOT standard RS-1 rumble strip that is 16” long and placed 6” outside the edge of the travel lane would be utilized.

- Advantages: Provides clear warning that vehicle is drifting out of lane allowing increased reaction time for correction
- Disadvantages: Additional noise in urban areas; impacts to bicyclists
- Impacts: Minimal
- Application: Install where accidents occur due to loss of vehicle control, and cannot be attributed to specific issues

Enhanced Pavement Markings – Install 6” pavement marking lines or raised pavement markers along the left edge of the traveled way and/or along the skips between lanes for both northbound and southbound roadways. Pavement markers along the right edge of traveled way are not recommended by the MUTCD.

- Advantages: Provides better guidance to drivers at locations where they may leave the roadway
- Disadvantages: None
- Impacts: Minimal
- Application: Install where vehicles are more likely to leave the roadway. If pavement markers are installed on existing asphalt, a materials engineer should evaluate the existing pavement to see if pavement markers can easily be added or if other work is required in conjunction with the pavement markers.

Red Signal Ahead Warning Sign – Provide a dynamic message sign to warn approaching drivers of a red signal condition at the next signal so that they slow down and look for stopped traffic.

Although this sign could be mounted on a mast arm above the roadway, it would be more cost effective to install ground mounted signs on both sides of the roadway and this is what the planning level cost for this countermeasure is based upon.

- Advantages: Provides active notification to oncoming traffic where sight distance is limited and where traffic queues are significant at the upcoming signalized intersection
- Disadvantages: higher cost than normal signal warning signs
- Impacts: Requires power and connection to signal system, post is a roadside object that must be protected or located outside the clear zone
- Application: Install where accidents occur due to queuing of vehicles in combination with limited sight distance.





Planning Level Unit Costs

Planning level unit costs were developed for the proposed countermeasures in order to provide estimated costs for projects that may be developed to implement the recommendations. These costs were intended to capture the typical construction cost for the countermeasure and include a 25% contingency as well as estimated MOT costs. Most of the countermeasures are linear in nature. In these cases a cost per 100 feet of improvement was developed and this cost includes all work to be performed along 100 feet of centerline distance (e.g. all 4 sets of rumble strips are included). The unit cost for the red light warning sign installation is provided per location and includes providing power and the tie-in to the signal system.

The intersection modification cost that was developed was based on elimination of the crossover and left turn lanes at the intersection of Burke Centre Parkway and Fairfax County Parkway including removal of pavement, addition of a graded median, as well as signing, striping and signal modifications. This project may also entail the following items which were not included in the cost estimate:

- A traffic analysis may have to be performed to model the re-directed traffic
- A public involvement process may be required
- The signal would have to be modified to only control the NB Parkway and Burke Centre Parkway
- Additional signage would be required to direct traffic to new route both on Fairfax County Parkway and Burke Centre Parkway
- Modifications to the intersection of Fairfax County Parkway and Burke Centre Parkway would be required to make this a right-in and right-out
- Roadway improvements may be required to accommodate the faster travel speeds on the Southbound Fairfax County Parkway lanes since there would no longer be a signal at this location
- Improvements may be required to the ramps and loops at the interchange between Fairfax County Parkway and Ox Road. The interchange may have to be rebuilt based on the additional volumes of traffic
- Ox Road may need to be widened to accommodate the additional volume of traffic that would be redirected
- Intersection improvements may be required at Clara Barton Drive and Ox Road
- Intersection improvements may be required at Burke Centre Parkway and Ox Road

Following is a summary of the planning level costs that were utilized in this report:

- Guardrail (MB-3): \$9,000 per 100 LF
- Median Shoulder Improvements: \$3,300 per 100 LF
- Superelevation Modification: \$33,000 per 100 LF
- Intersection Modifications: \$300,000
- Rumble Strips: \$2,400 per 100 LF
- Enhanced Pavement Markings: \$1,100 per 100LF
- Signal Warning Sign: \$27,000 per location

Recommendations

The accident clusters were reviewed and evaluated with respect roadway geometry potential countermeasures were assigned to roadway segments based on the strategy of selecting measures that, from a median crash perspective, would most effectively counter the undesirable geometric elements found within the cluster. PB met with VDOT staff on September 21, 2010, after the crash clusters were developed and preliminary countermeasures were established, to review the recommendations. The recommended countermeasures have been modified based on discussions at that meeting and are presented here in draft form.

Cluster 1

An assessment of the median crashes in this cluster did not indicate that the crashes would likely have been averted through the use of preventative measures. Median barrier is recommended in order to keep vehicles from crossing the median. The limits and quantities of recommended countermeasures are shown below:

Counter-Measure	Location (From)	Location (To)	Length (ft)	Cost
Barrier	0.13 Mi South of Heather Way	0.02 Mi North of Wiehle Ave	1,050	\$95,000
Barrier	0.02 Mi South of Wiehle Ave	0.1 Mi North of Sugarland Valley Dr	900	\$81,000
Barrier	0.13 Mi South of Sugarland Valley Dr	0.02 Mi North of Lake Newport Rd	2,700	\$243,000
Barrier	0.02. South of Lake Newport Rd	0.02 North of Walnut Branch Rd	1,500	\$135,000

Total costs to implement Cluster 1 Recommendations:

Long Term Countermeasures – \$554,000

Short Term Countermeasures – N/A



Looking northbound towards the Wiehle Avenue intersection

Cluster 2

An assessment of the median crashes in this cluster indicated that the crashes might have been averted through the use of preventative measures to help drivers to maintain proper control. Rumble strips on the left and right shoulder edges for both northbound and southbound in conjunction with enhanced pavement markings consisting of a 6" yellow left edgeline and pavement markers on the left edgelines and between the two travel lanes are recommended for the limits of the cluster. A signal warning sign is recommended in advance of the Popes Head Road intersection due to the limited sight distance for southbound vehicles due to a vertical curve that blocks the view of queued of vehicles when the signal is red. Shoulder improvements are recommended for the northbound inside shoulder at the curve south of Braddock Road to provide a recovery area where the shoulder may have deteriorated. The limits and quantities of recommended countermeasures are shown below:

Counter-Measure	Location (From)	Location (To)	Length (ft)	Cost
Rumble Strips	0.68 Mi North of Rte 29	0.19 Mi North of Popes Head Rd	15,500	\$372,000
Median Shoulder Improvements	0.28 Mi South of Braddock Rd	0.55 Mi North of Popes Head Rd	1,800	\$59,000
Red Signal Ahead Sign	0.44 mi South of Braddock Rd	N/A	N/A	\$27,000

Total costs to implement Cluster 2 Recommendations:
 Long Term Countermeasures – \$59,000
 Short Term Countermeasures – \$399,000



Looking southbound from south of Braddock Road interchange

Cluster 3

An assessment of the median crashes in this cluster indicated that four of the crashes (including a fatality) were located in the immediate vicinity of the Burke Centre Parkway intersection and two of the crashes were located on the inside of a substandard horizontal curve. Rumble strips on the left and right shoulder edges for both northbound and southbound in conjunction with enhanced pavement markings consisting of a 6" yellow left edgeline and pavement markers on the left edgelines and between the two travel lanes are recommended for the limits of the cluster. Signal warning signs are recommended at both approaches in advance of the Burke Centre Parkway intersection due to the limited sight distance due to vertical curves on both approaches that blocks the view of queued of vehicles when the signal is red. Superelevation modifications are recommended for the northbound lanes at the substandard horizontal curve located north of Ox Road to help vehicles maintain control (there is a downslope approaching this curve that exasperates the condition). The limits and quantities of recommended countermeasures are shown below:

Counter-Measure	Location (From)	Location (To)	Length (ft)	Cost
Rumble Strips	0.01 Mi South of Ladues End Lane	0.08 Mi North of Rte 123	9,400	\$226,000
Red Signal Ahead Sign	0.02 Mi North of Fairfax Station Road	N/A	N/A	\$27,000
Red Signal Ahead Sign	0.02 Mi South of Clara Barton Drive	N/A	N/A	\$27,000
Superelevation Modification	0.13 Mi South of Clara Barton Drive	0.19 Mi North of Rte 123	1,100	\$363,000
Eliminate Left Turns	Burke Centre Pkwy Intersection	N/A	N/A	\$300,000

Total costs to implement Cluster 3 Recommendations:

Long Term Countermeasures – \$663,000

Short Term Countermeasures – \$280,000



Looking southbound towards the Burke Centre Parkway intersection

Cluster 4

An assessment of the median crashes in this cluster indicated that two of the crashes occurred in the northern portion of this cluster due to driver inattention while 11 of the crashes (including two fatalities) were located in the southern portion of this cluster where the median width is 16 to 18 feet wide. Rumble strips on the left and right shoulder edges for both northbound and southbound in conjunction with enhanced pavement markings consisting of a 6" yellow left edgeline and pavement markers on the left edgelines and between the two travel lanes are recommended for the limits of the cluster. Superelevation modifications and median shoulder improvements are recommended for the southbound lanes for the curve located south of Gambriil Road to help vehicles maintain control. Median barrier is recommended in order to keep vehicles from crossing the median for the portion of this cluster with reduced median width. The limits and quantities of recommended countermeasures are shown below:

Counter-Measure	Location (From)	Location (To)	Length (ft)	Cost
Rumble Strips	0.26 Mi North of Sydenstricker Road	0.19 Mi North of Whitlers Creek Drive	3,900	\$94,000
Superelevation Modification	0.03 Mi North of Gambriil Road	0.15 Mi South of Gambriil Road	1,000	\$330,000
Median Shoulder Improvements	0.03 Mi North of Gambriil Road	0.15 Mi South of Gambriil Road	1,000	\$33,000
Barrier	0.14 Mi North of Whitlers Creek Drive	0.02 Mil North of Whitlers Creek Drive	600	\$54,000
Barrier	0.04 Mi North of Rolling Road	0.02 Mi North of Spring Village Drive	6,650	\$599,000
Barrier	0.02 Mi South of Spring Village Dr	0.07 Mi South of Backlick Rd	3,650	\$329,000

Total costs to implement Cluster 4 Recommendations:

Long Term Countermeasures – \$1,345,000

Short Term Countermeasures – \$94,000



Looking northbound towards the Rolling Road interchange



Summary of Recommended Countermeasure Improvement Costs

If all of the recommended safety countermeasure were implemented, the total costs would be:

Long Term Countermeasures – \$2,621,000

Short Term Countermeasures – \$773,000

Recommendations for Next Steps

- Evaluate existing superelevation rates at all curve locations to determine whether they were constructed per design plans or have changed due to multiple overlays.
- Scope project to eliminate left turns at the intersection of Burke Centre Parkway and Fairfax County Parkway.
- VDOT staff indicated that a project might be in development to rebuild the traffic signal at the Popes Head Road intersection. Consider including the recommended Signal Warning Sign in the scope of that project.



APPENDIX

Median Crash Locations

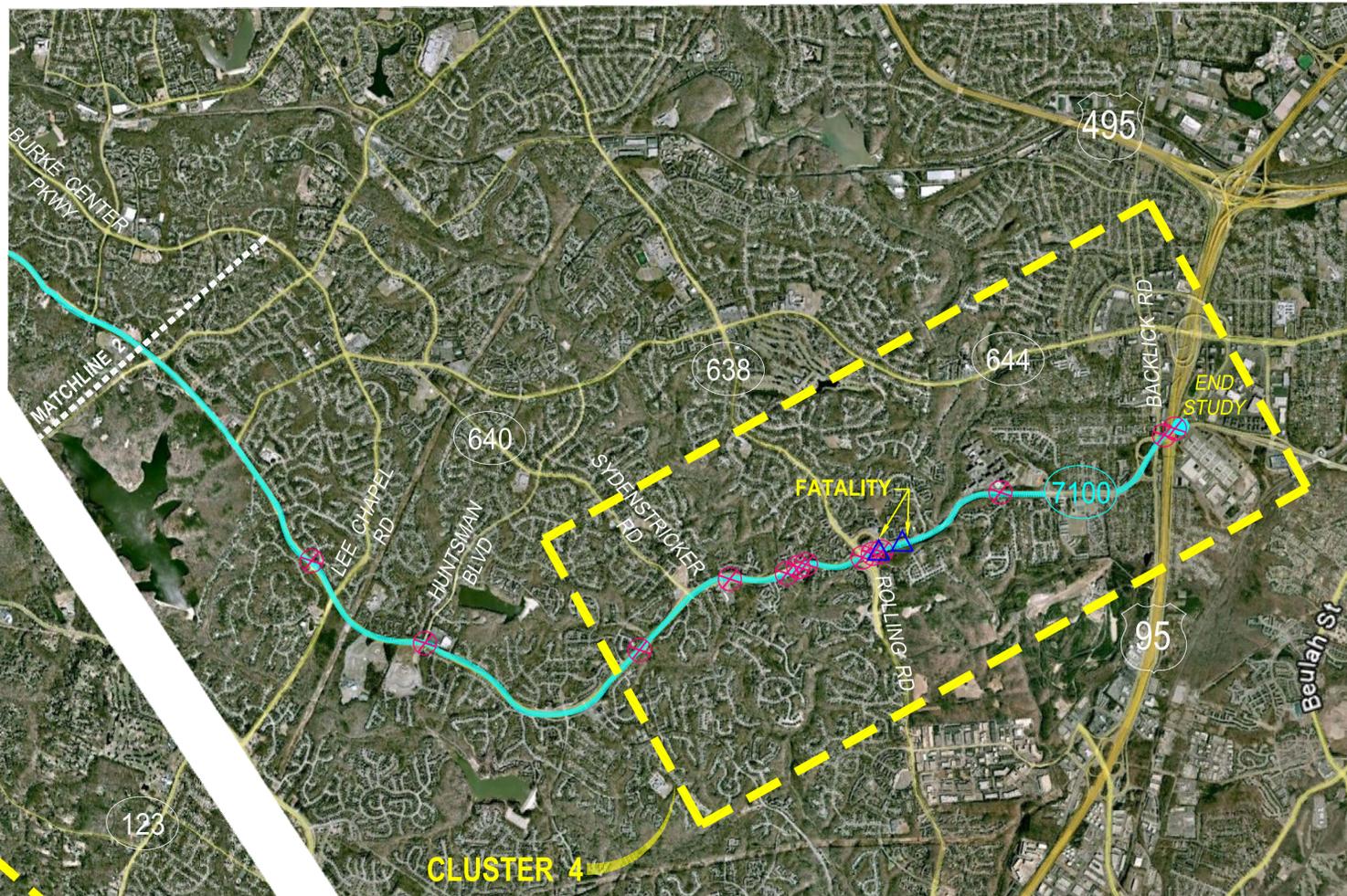
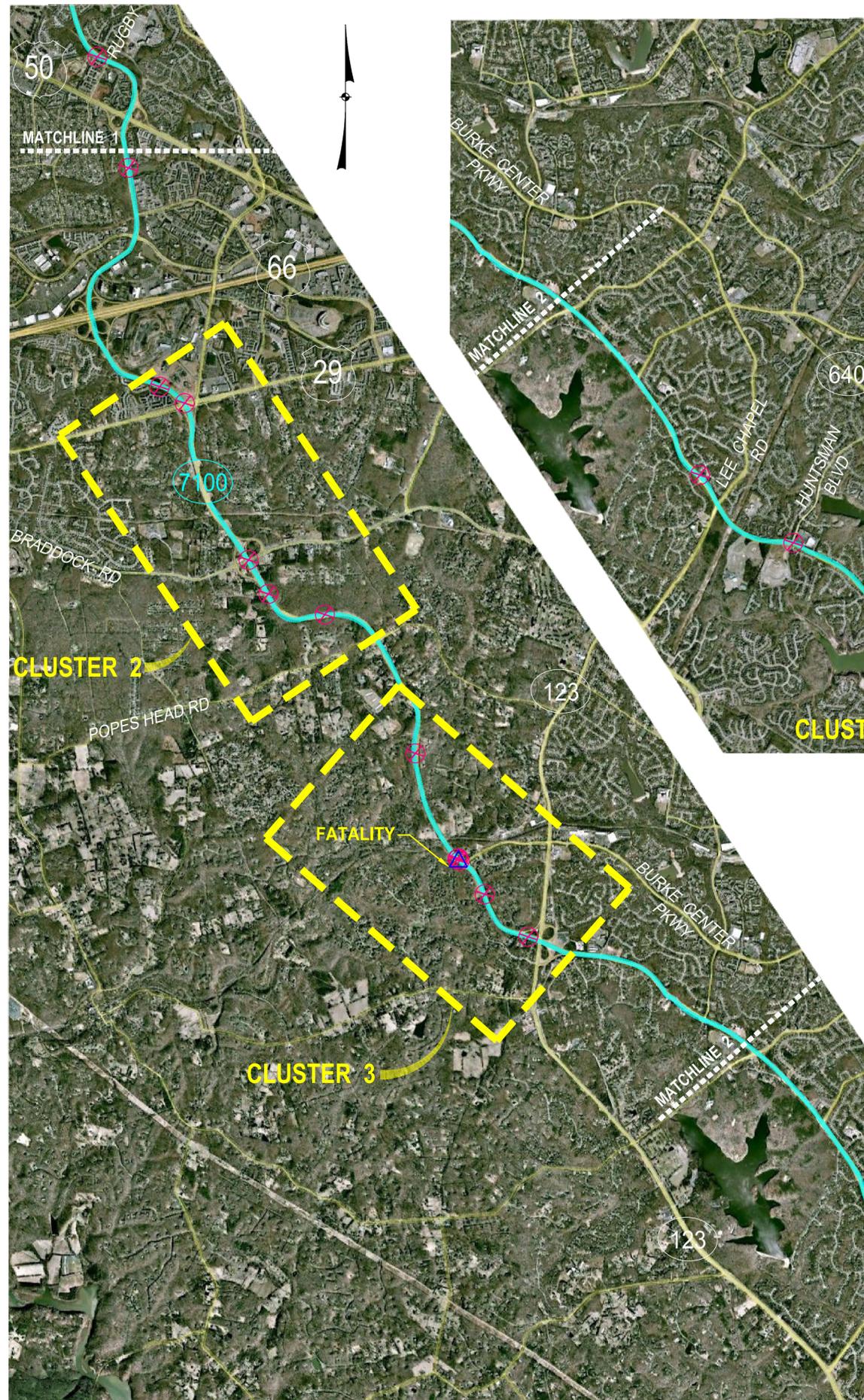
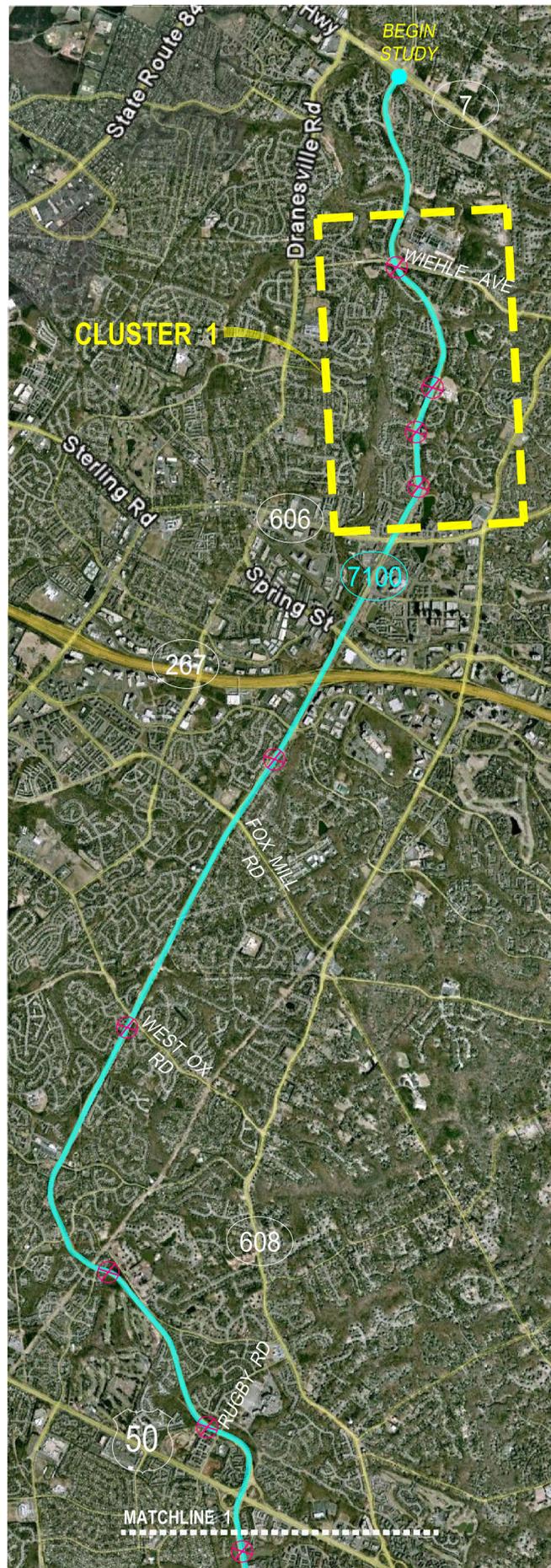
Cluster 1 Plan and Recommendations

Cluster 2 Plan and Recommendations

Cluster 3 Plan and Recommendations

Cluster 4 Plan and Recommendations (sheet 1 of 2)

Cluster 4 Plan and Recommendations (sheet 2 of 2)



FAIRFAX COUNTY PARKWAY MEDIAN CRASH LOCATIONS

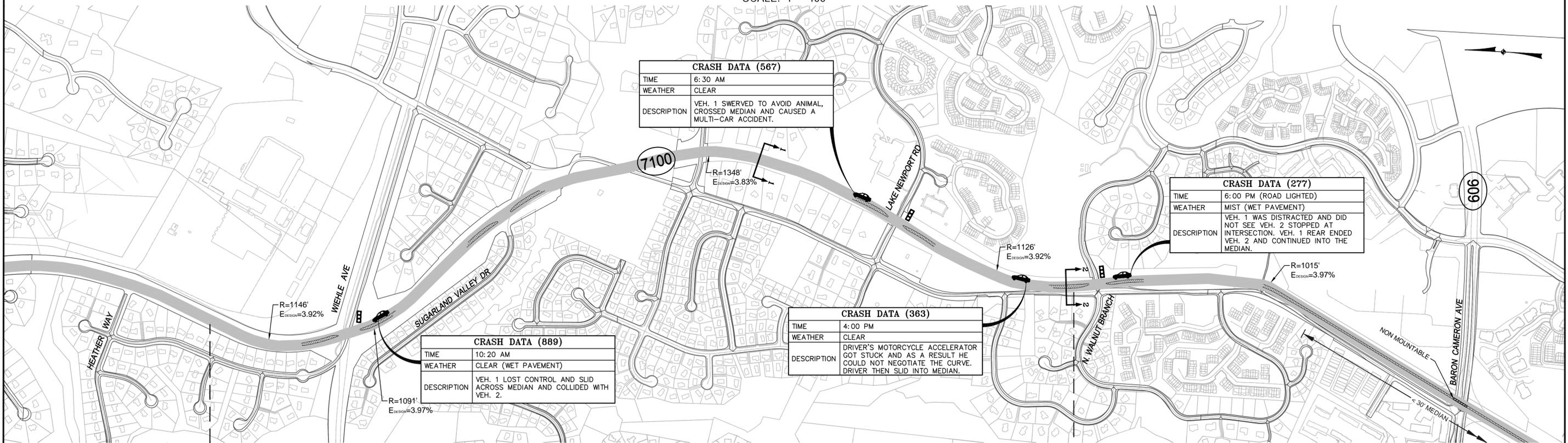
LEGEND

-  CRASH (33 TOTAL)
-  CRASH: FATAL (3 TOTAL)



CLUSTER 1

SCALE: 1" = 400'



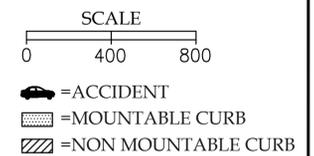
CRASH DATA (567)	
TIME	6:30 AM
WEATHER	CLEAR
DESCRIPTION	VEH. 1 SWERVED TO AVOID ANIMAL, CROSSED MEDIAN AND CAUSED A MULTI-CAR ACCIDENT.

CRASH DATA (277)	
TIME	6:00 PM (ROAD LIGHTED)
WEATHER	MIST (WET PAVEMENT)
DESCRIPTION	VEH. 1 WAS DISTRACTED AND DID NOT SEE VEH. 2 STOPPED AT INTERSECTION. VEH. 1 REAR ENDED VEH. 2 AND CONTINUED INTO THE MEDIAN.

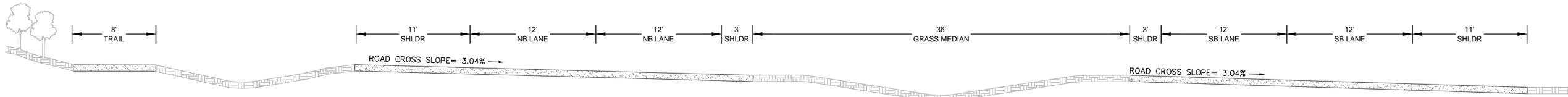
CRASH DATA (889)	
TIME	10:20 AM
WEATHER	CLEAR (WET PAVEMENT)
DESCRIPTION	VEH. 1 LOST CONTROL AND SLID ACROSS MEDIAN AND COLLIDED WITH VEH. 2.

CRASH DATA (363)	
TIME	4:00 PM
WEATHER	CLEAR
DESCRIPTION	DRIVER'S MOTORCYCLE ACCELERATOR GOT STUCK AND AS A RESULT HE COULD NOT NEGOTIATE THE CURVE. DRIVER THEN SLID INTO MEDIAN.

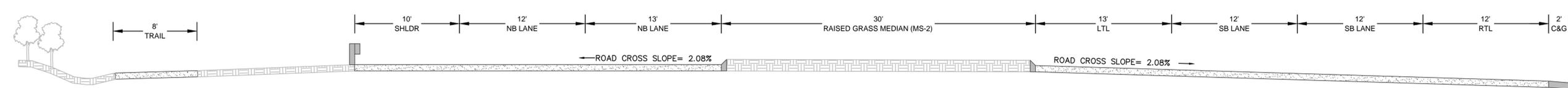
BARRIER



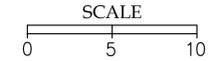
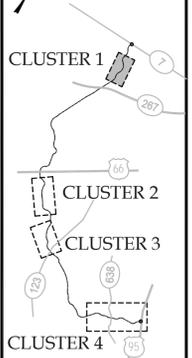
SECTION 1



SECTION 2



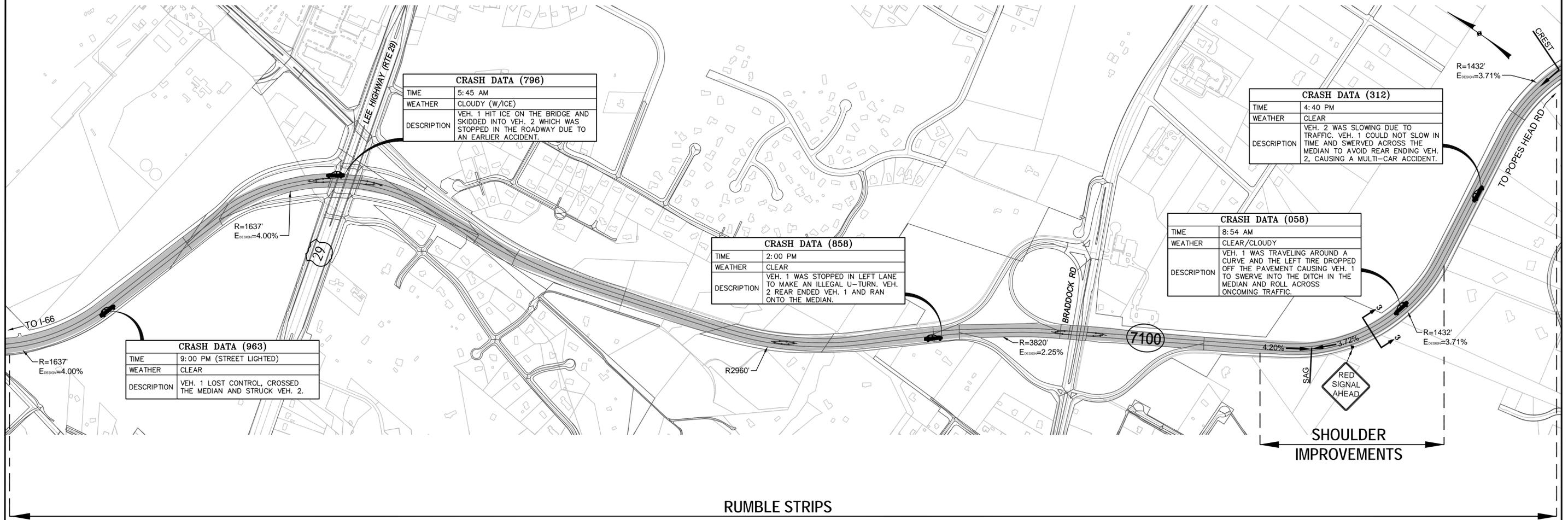
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CLUSTER 2

SCALE: 1" = 400'



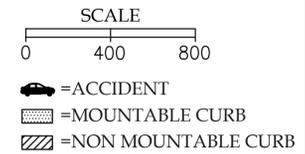
CRASH DATA (796)	
TIME	5:45 AM
WEATHER	CLOUDY (W/ICE)
DESCRIPTION	VEH. 1 HIT ICE ON THE BRIDGE AND SKIDDED INTO VEH. 2 WHICH WAS STOPPED IN THE ROADWAY DUE TO AN EARLIER ACCIDENT.

CRASH DATA (312)	
TIME	4:40 PM
WEATHER	CLEAR
DESCRIPTION	VEH. 2 WAS SLOWING DUE TO TRAFFIC. VEH. 1 COULD NOT SLOW IN TIME AND SWERVED ACROSS THE MEDIAN TO AVOID REAR ENDING VEH. 2, CAUSING A MULTI-CAR ACCIDENT.

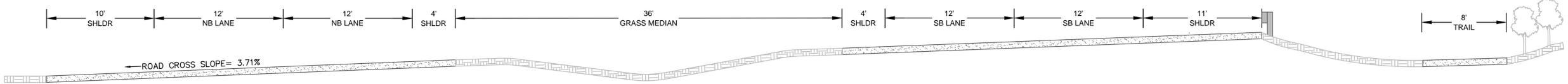
CRASH DATA (858)	
TIME	2:00 PM
WEATHER	CLEAR
DESCRIPTION	VEH. 1 WAS STOPPED IN LEFT LANE TO MAKE AN ILLEGAL U-TURN. VEH. 2 REAR ENDED VEH. 1 AND RAN ONTO THE MEDIAN.

CRASH DATA (058)	
TIME	8:54 AM
WEATHER	CLEAR/CLOUDY
DESCRIPTION	VEH. 1 WAS TRAVELING AROUND A CURVE AND THE LEFT TIRE DROPPED OFF THE PAVEMENT CAUSING VEH. 1 TO SWERVE INTO THE DITCH IN THE MEDIAN AND ROLL ACROSS ONCOMING TRAFFIC.

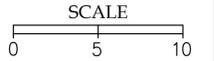
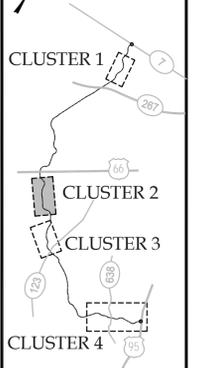
CRASH DATA (963)	
TIME	9:00 PM (STREET LIGHTED)
WEATHER	CLEAR
DESCRIPTION	VEH. 1 LOST CONTROL, CROSSED THE MEDIAN AND STRUCK VEH. 2.



SECTION 3



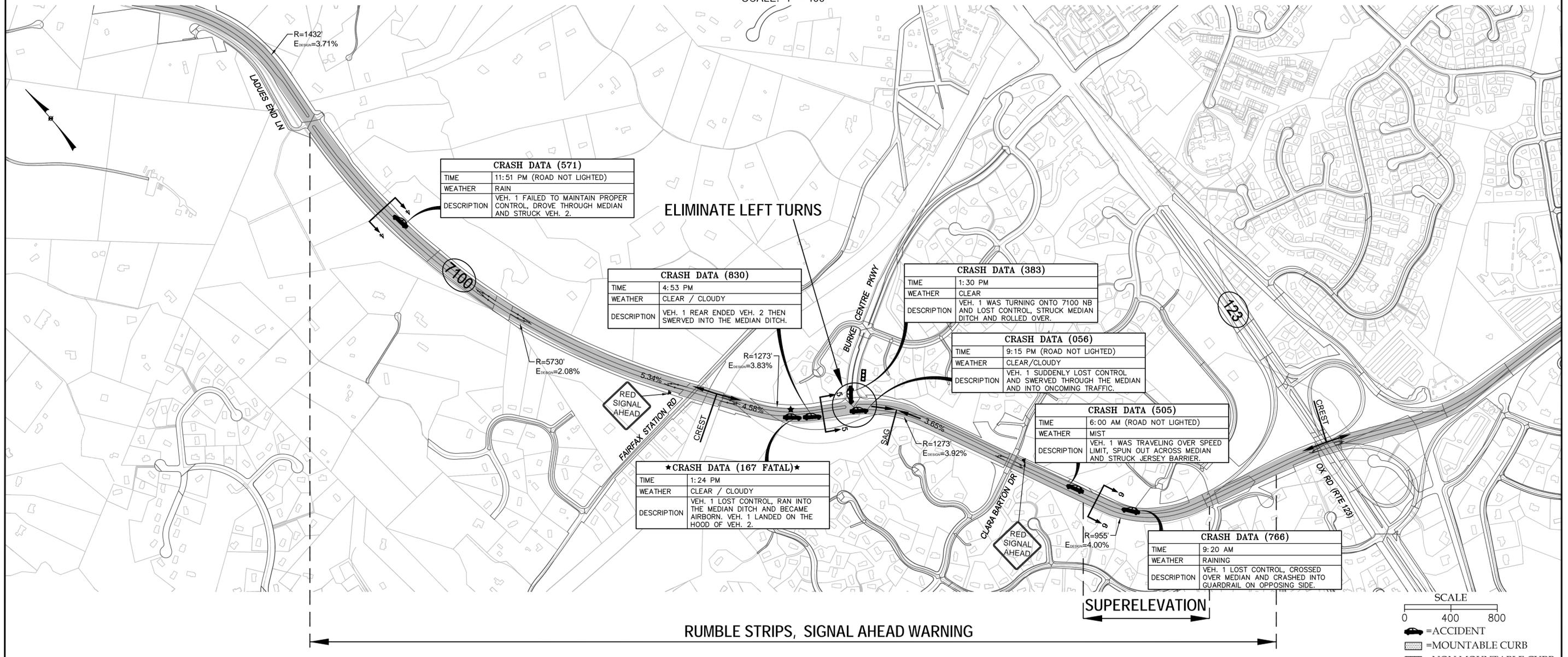
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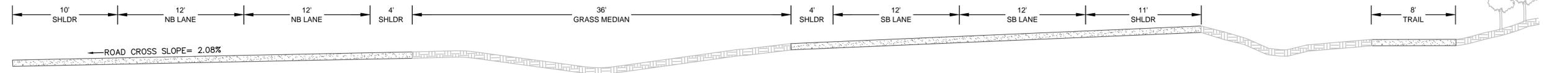
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CLUSTER 3

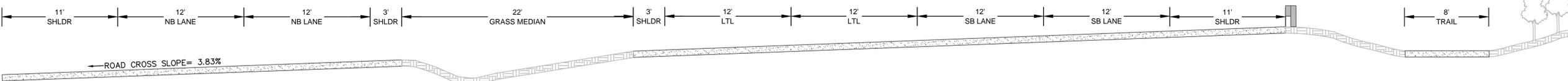
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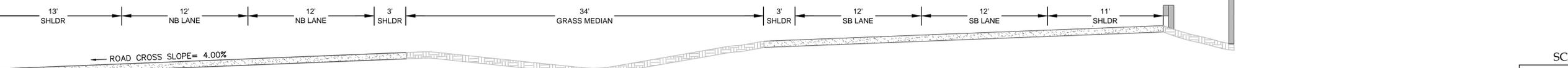
SECTION 4



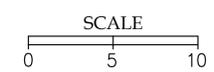
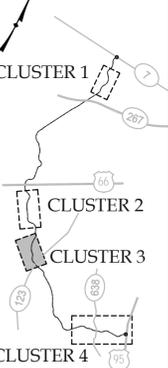
SECTION 5



SECTION 6



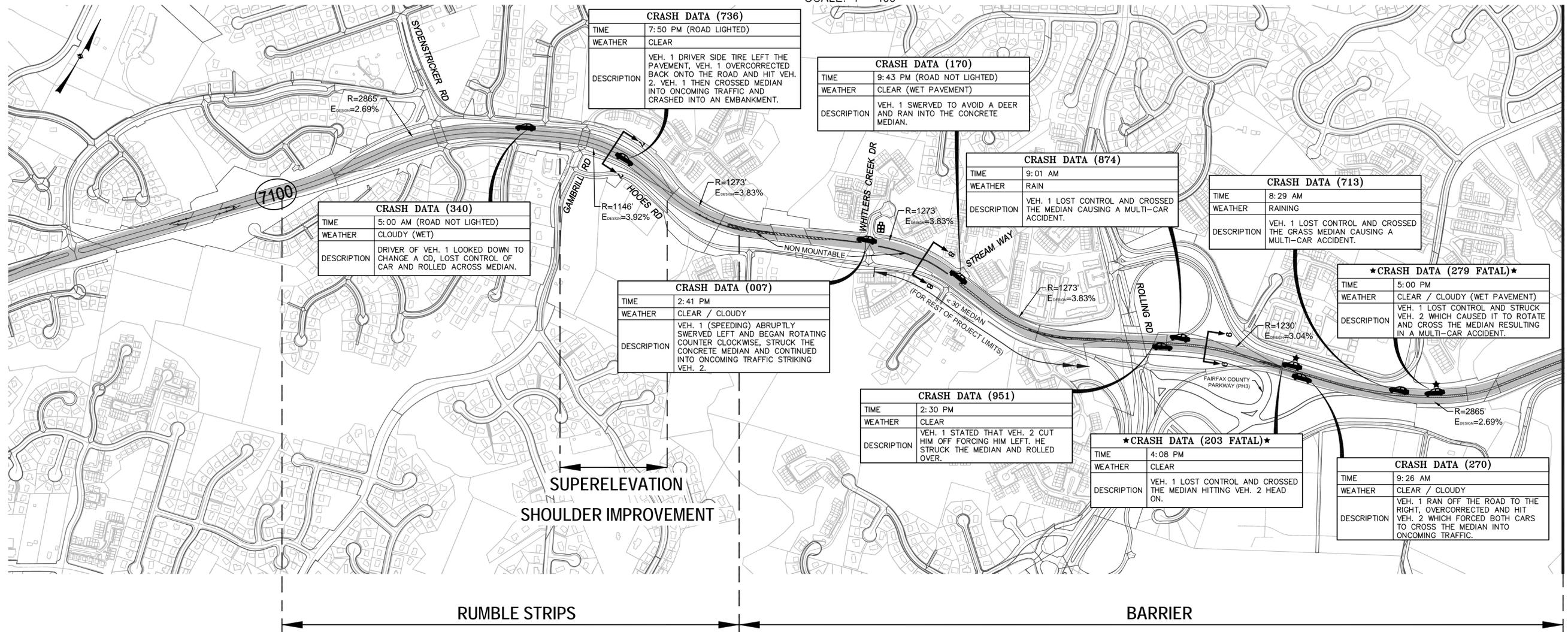
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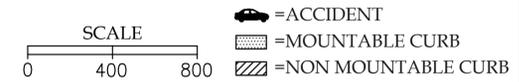
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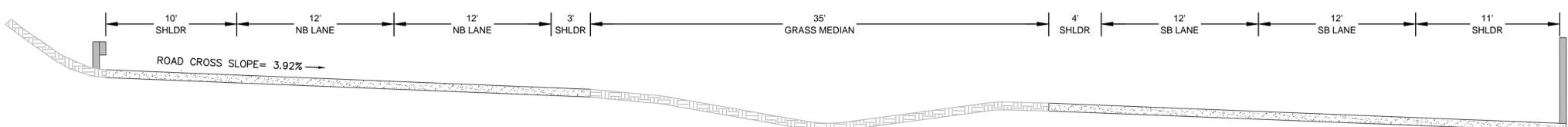
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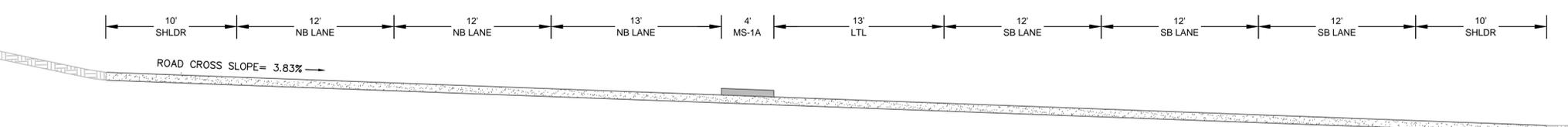
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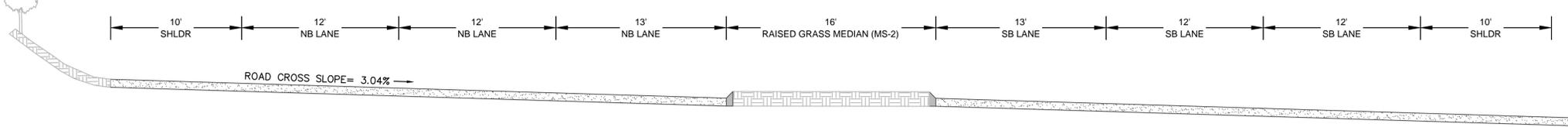
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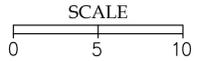
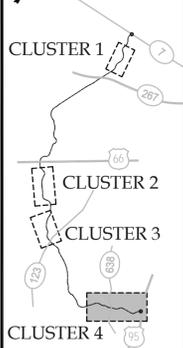
SECTION 8



SECTION 9



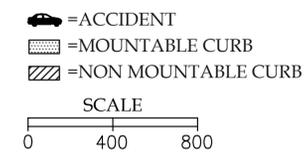
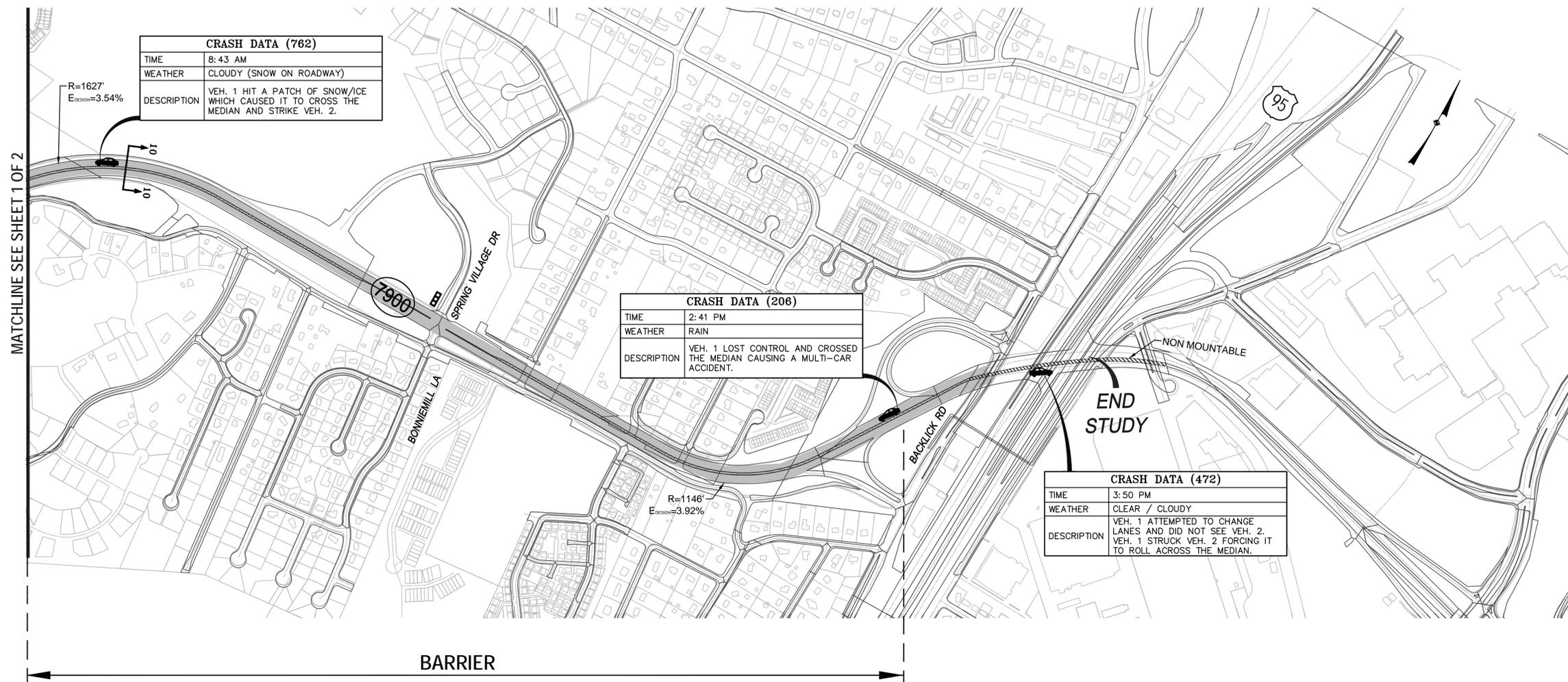
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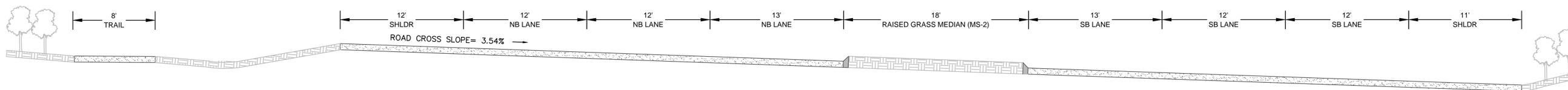
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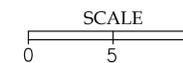
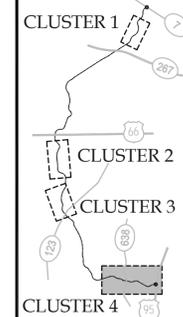
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SECTION 10



KEY MAP



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