



Roadway Safety Assessments (RSA): The Cornerstone of Virginia's Strategic Highway Safety Plan



Highway Safety Improvement Program (HSIP)

Traffic Engineering Division



VA Strategic Highway Safety Plan

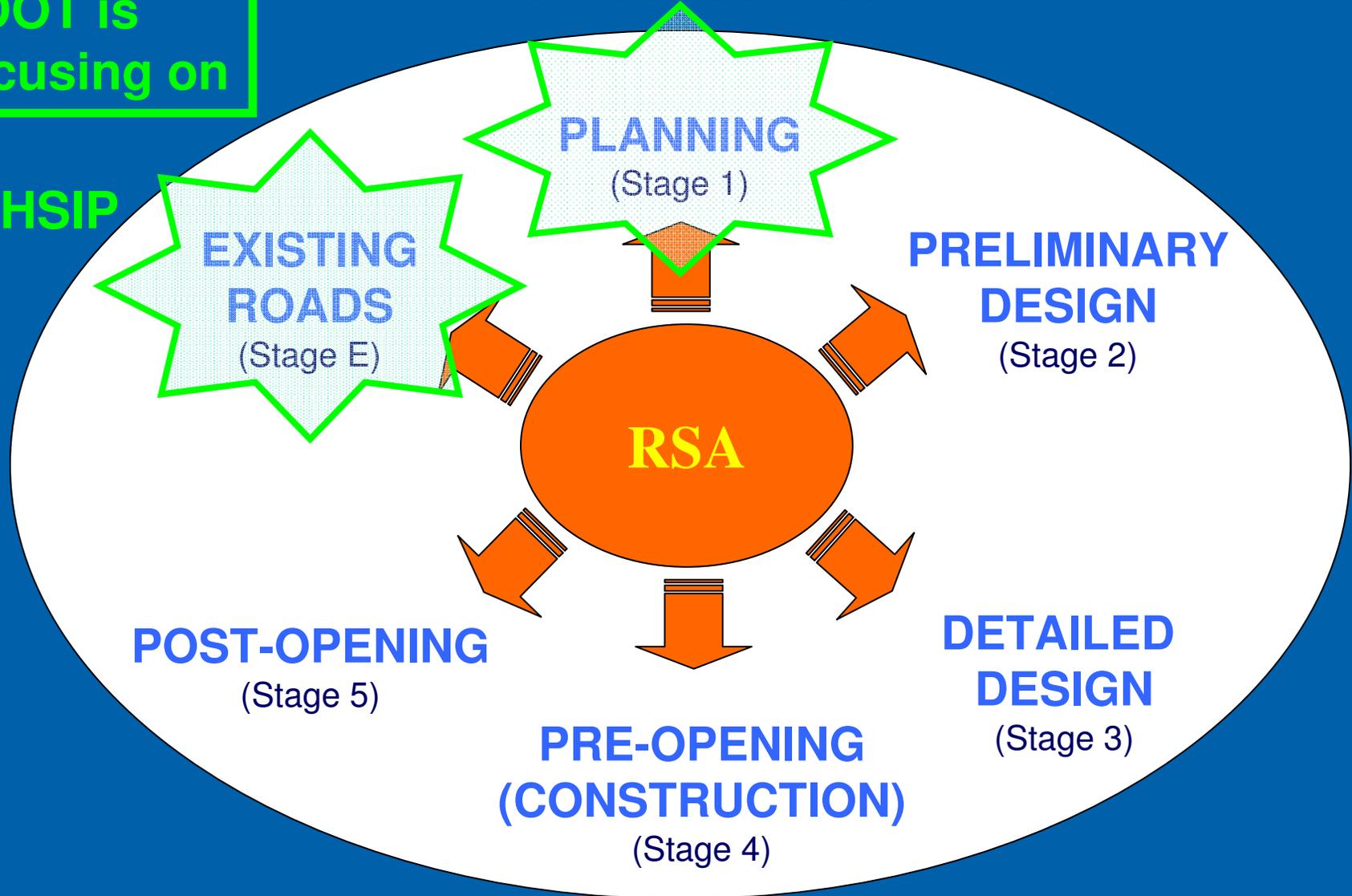
- Engineering Emphasis Areas & Strategies
- 50 Strategies resulting in 150 Actions
- RSA component to many strategies -
 - Intersections : IS-2 (RSA), 4, 5, 7
 - Roadway Departure : RD-2 (RSA), 4, 5 and 6
 - Bike and Pedestrian Safety : PB-2 (RSA), 7, 10 and 11
 - Human Factors : AD-7, SD-4, LE-4, CV-2
- <http://www.vdot.virginia.gov/info/hwysafetyplan.asp>

When RSA can be performed ?

VDOT is focusing on

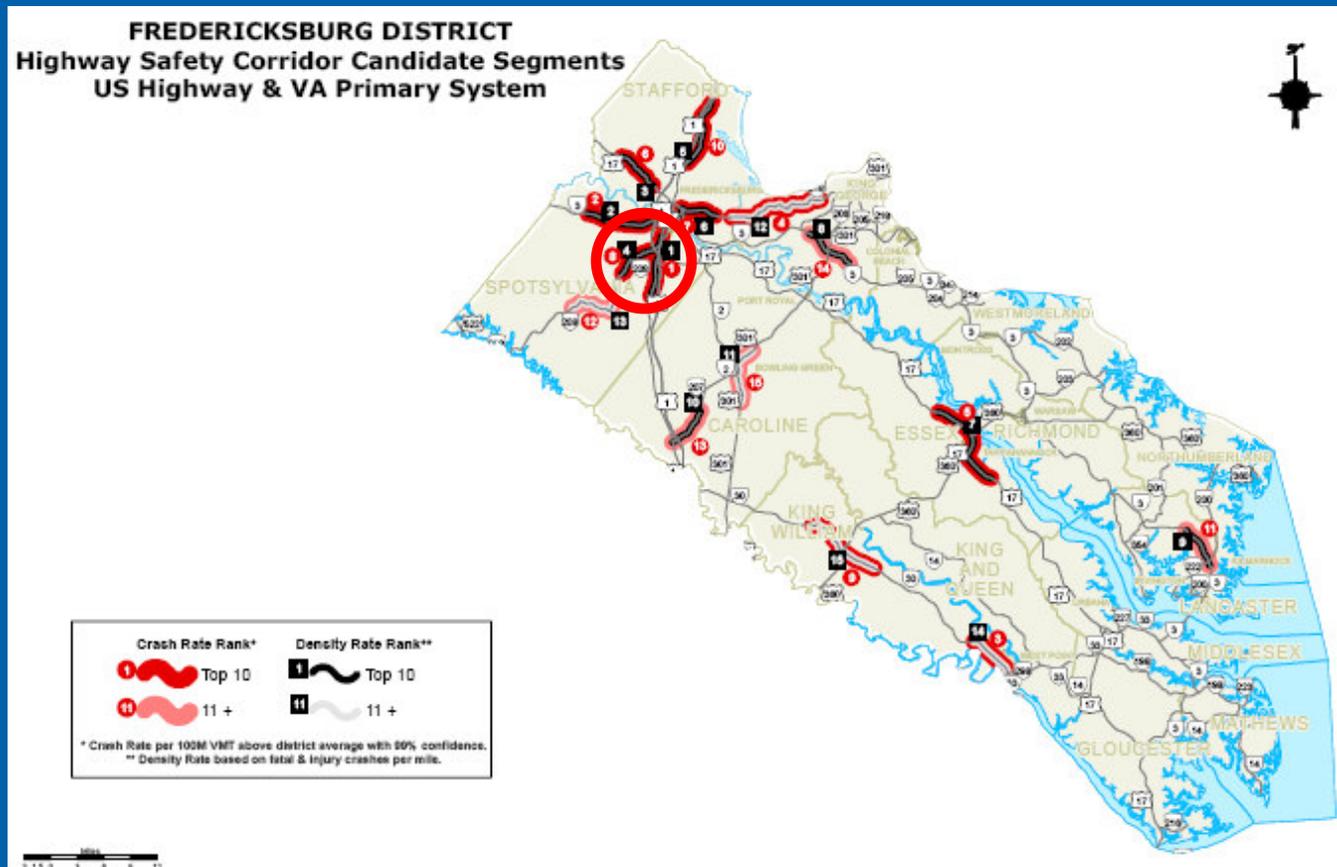
Corridor Studies

HSIP



Prioritize High Crash Corridors

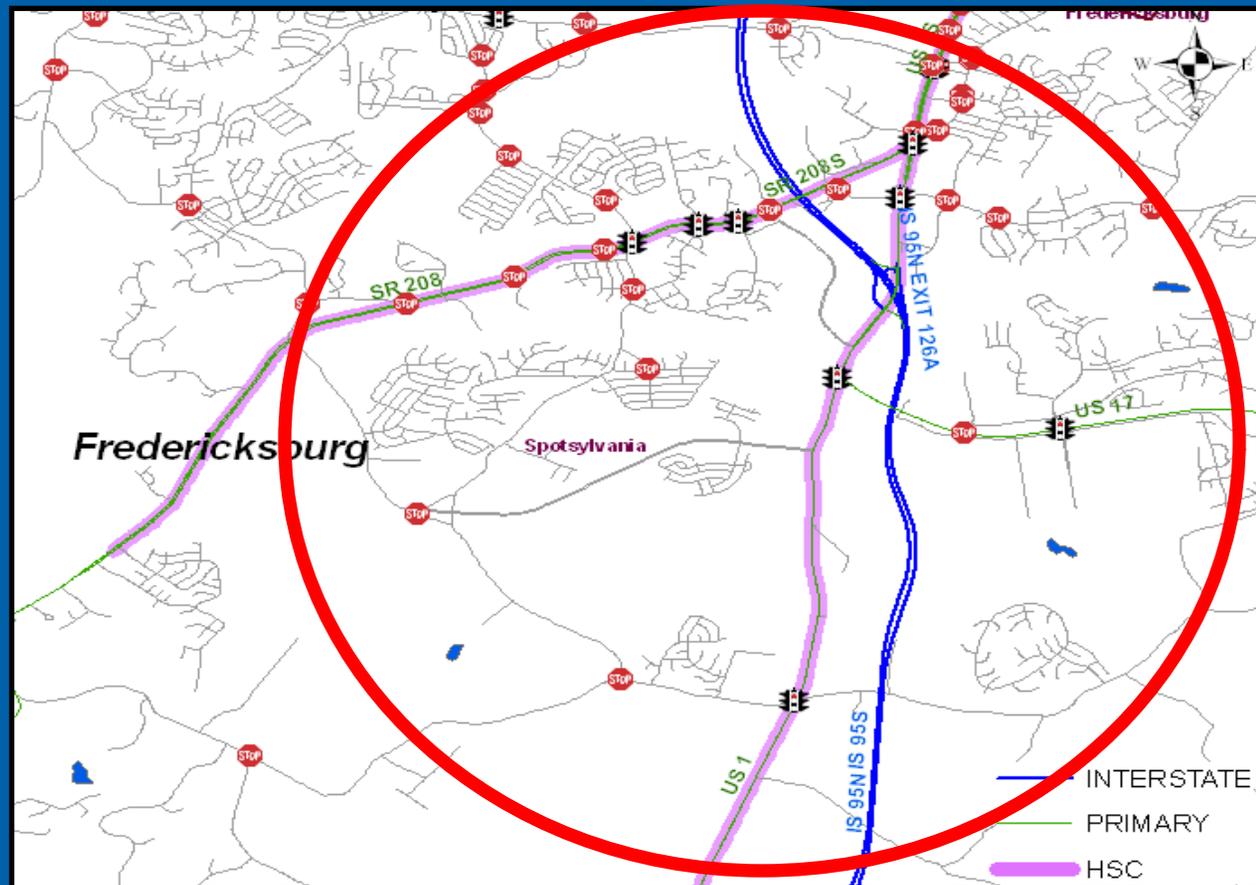
- Use candidate Interstate and Primary system Highway Safety Corridors
- Focus on corridors with highest death + injury densities



Prioritize High Crash Locations

- Use annual “critical rate” intersection and segment listing to target review locations
- District maps of high crash intersections are being prepared

High Crash Sig/Unsig Intersections in Spotsylvania County, Fredericksburg District



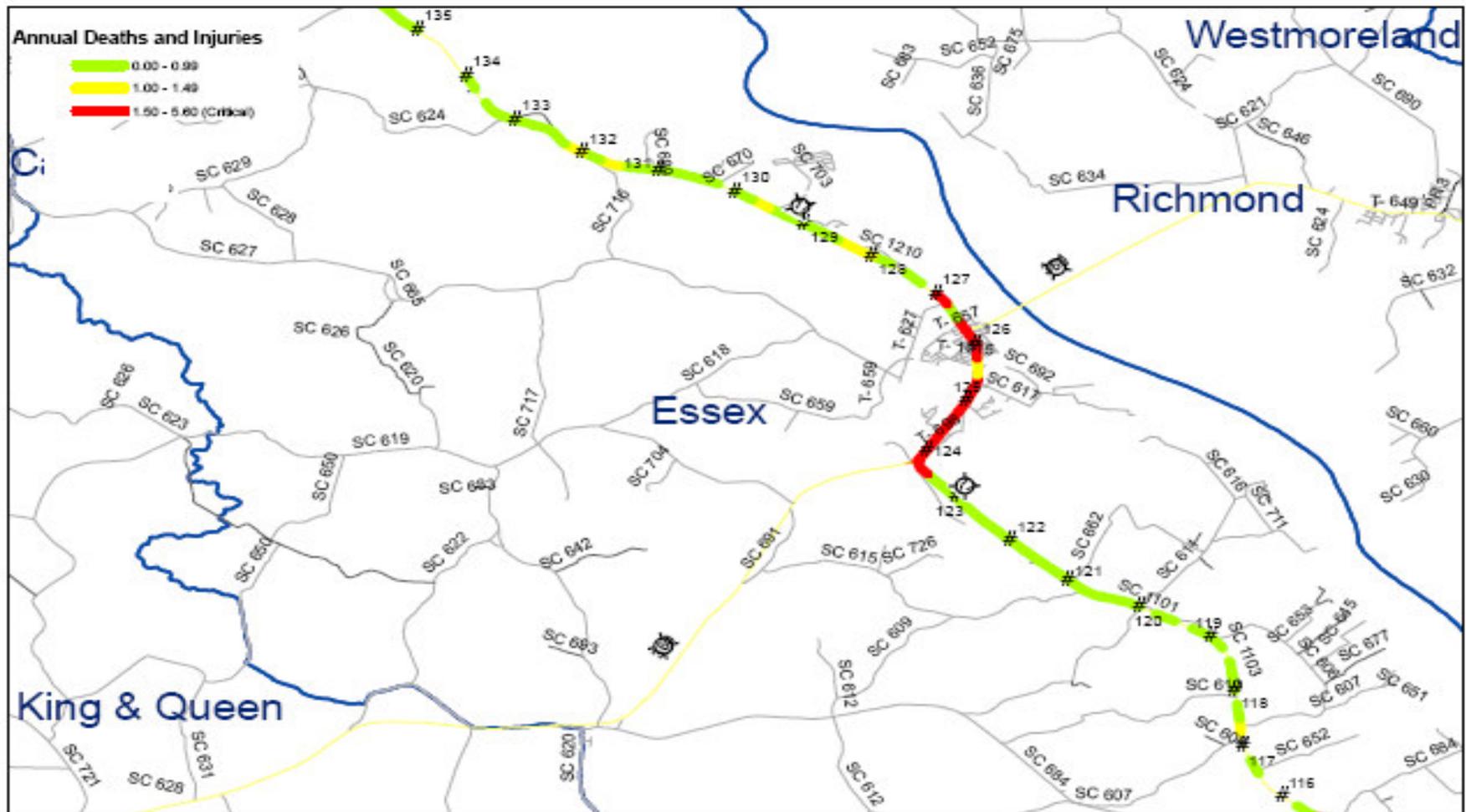


Study Segment Comparisons

- To compare intersection and 0.25 mile densities HSIP Staff are:
 - Defining statewide or district comparison average crash density measures
 - Preparing statewide Interstate and Primary comparison spreadsheets from annual crash reports.

	HTRIS Report (2001 - 2005 Total)					TRIS Report (2001 - 2005 Average)				Statewide Four Lane Divided HWY (No Access Control) 2001 - 2005 Average			
County Sec. Num.	Fatal	Injury	PDO	F + I (%)	Crash Rate (HMVMT)	Death Rate (HMVMT)	Injury Rate (HMVMT)	Crash Density (MI/YR)	F + I Density (MI/YR)	Avg. Injury Rate	Avg. Death Rate	F + I (%)	F + I Density (MI/YR)
Middlesex	5	30	48	42%	60	4.4	34	1.29	0.82	63	1.1	40%	3.58
Essex Sec1	0	29	35	45%	54	0.0	32	1.11	0.67	63	1.1	40%	3.58
Essex Sec2	2	94	109	47%	95	0.9	62	2.06	1.35	63	1.1	40%	3.58
Caroline	0	8	14	36%	36	0.0	18	0.78	0.39	63	1.1	40%	3.58

Map Critical Sections



Crash Summary

Accident Summary

Fatal Accidents	1
Injury Accidents	15
Property Damage Only	24
Total	40

Injury Summary

Fatal Person	2
Injury Person	16
Total Severity	18

Driveraction

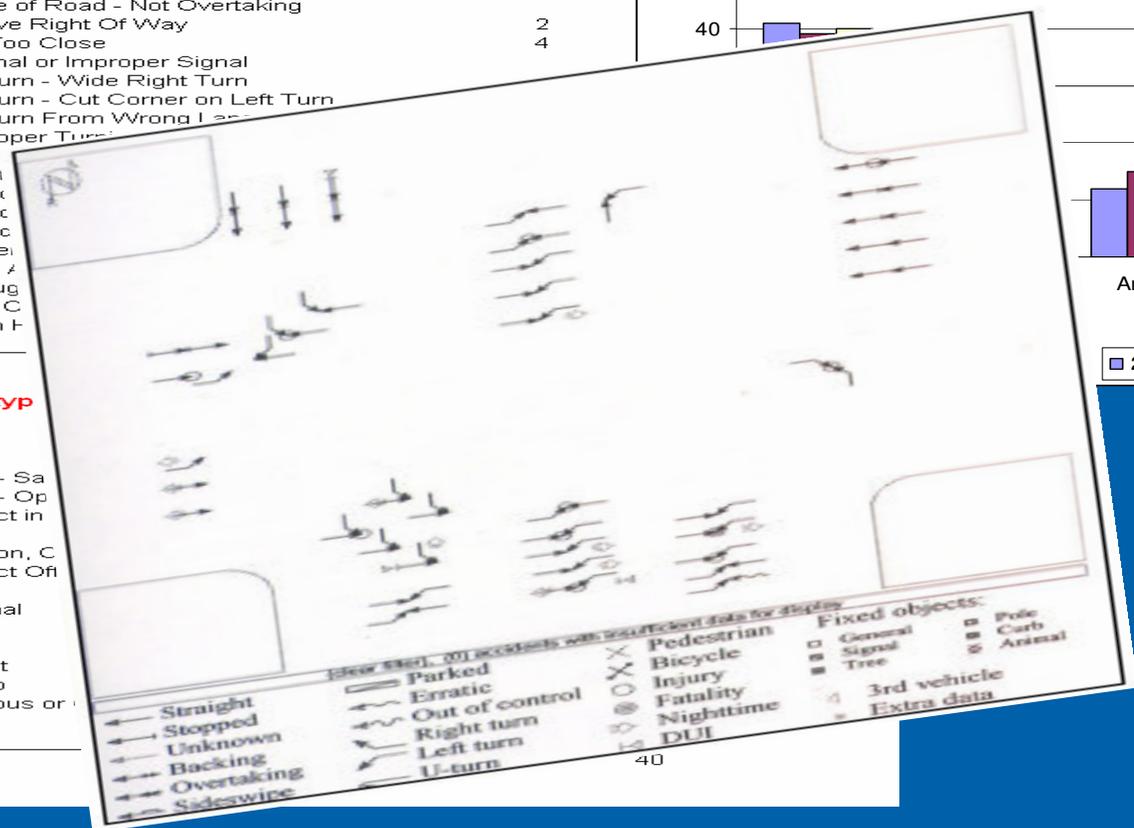
None	
Exceeded Speed Limit	2
Exceeded Safety Speed but Not Speed Limit	1
Overtaking on Hill	
Overtaking on Curve	
Overtaking at Intersection	3
Improper Passing of School Bus	
Cutting In	4
Other Improper Passing	2
Wrong Side of Road - Not Overtaking	
Did Not Have Right Of Way	2
Following Too Close	4
Fail To Signal or Improper Signal	
Improper Turn - Wide Right Turn	
Improper Turn - Cut Corner on Left Turn	
Improper Turn From Wrong Lane	
Other Improper Turn	
Improper B	
Improper Si	
Disregard	
Disregard	
Disregard	
Driver Inattentive	
Fail to Stop	
Drive Through	
Fail To Set C	
Fail To Dim H	

Total

Collisiontyp

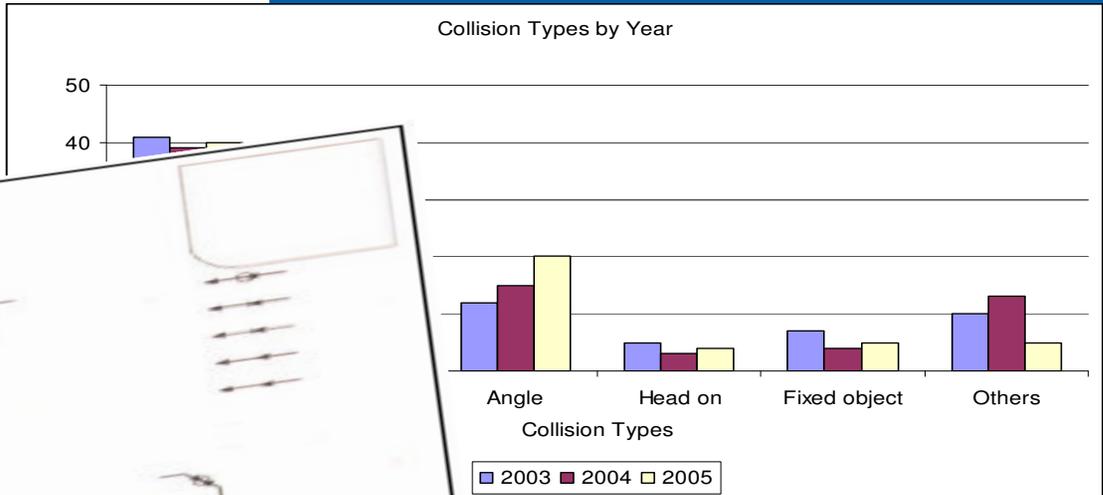
Rear End
Angle
Head On
Sideswipe - Sa
Sideswipe - Op
Fixed Object in
Train
Non-Collision, C
Fixed Object Off
Deer
Other Animal
Pedestrian
Bicyclist
Motorcyclist
Backed Into
Miscellaneous or
Not Stated

Total



- Driver Actions & Driver Conditions
- Vehicle maneuvers
- Collision Diagrams (Intersection)

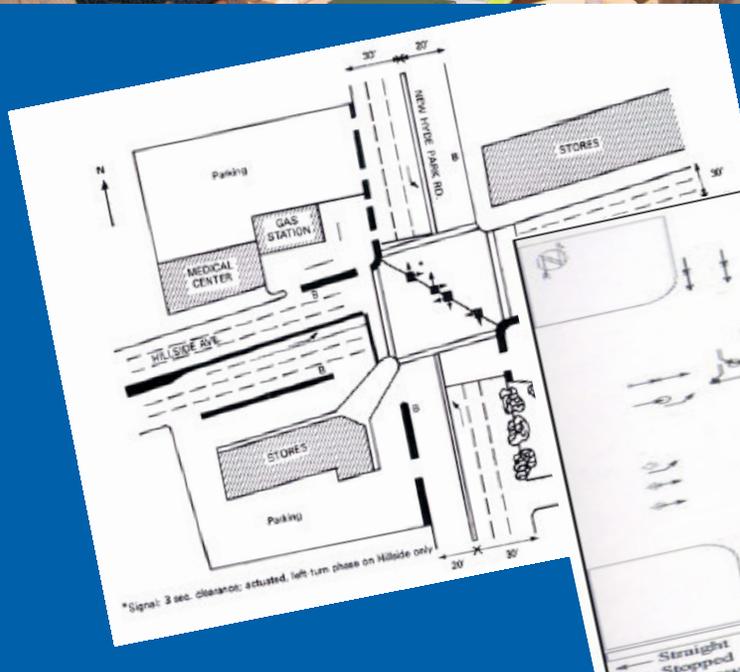
Collision Types by Year



Focus on:

- Crash Factors
- Human Factors
- Weather Influence

RSA Step IV : Compile Information



Accident Summary		Injury Summary	
Fatal Accidents	1	Fatal Person	1
Injury Accidents	15	Injury Person	1
Property Damage Only	24	Total Severity	2
Total	40		1
Driveraction			
None			
Exceeded Speed Limit			3
Exceeded Safety Speed but Not Speed Limit			4
Overtaking on Hill			2
Overtaking on Curve			2
Overtaking at Intersection			2
Improper Passing of School Bus			4
Cutting in			
Other Improper Passing			
Wrong Side of Road - Not Overtaking			
Wrong Side of Right Of Way			
Did Not Have Right Of Way			
Following Too Close			
Following Signal or Improper Signal			
Fail To Signal or Improper Signal			
Improper Turn - Wide Right Turn			
Improper Turn - Cut Corner on Left Turn			



Field Review Assessment Tool (Intersection Module)

Geometric and Functional Design

I3. Main and Auxiliary Lane Design

	Through Lanes				Left Lanes				Right Lanes			
	No. of Lanes	Lane Width (ft)	Average Queue Distance (ft)	Spillback	No. of Lanes	Lane Width (ft)	Length (ft)	Spillback	No. of Lanes	Lane Width (ft)	Length (ft)	Spillback
- INT App 1	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
- INT App 2	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
- INT App 3	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
- INT App 4	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
- INT App 5	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
- INT App 6	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

I4. Functional Design

	Grade (%)	Speed (mph)			Median Types	Effective of Skew	Heavy Vehicle (%)	Drainage Issue	Sidewalks	Crosswalks & Bike Lane	ADA Accessibility
		Design	Posted	85th %							
- INT App 1	<input type="text"/>	<input type="text"/>									
- INT App 2	<input type="text"/>	<input type="text"/>									
- INT App 3	<input type="text"/>	<input type="text"/>									
- INT App 4	<input type="text"/>	<input type="text"/>									
- INT App 5	<input type="text"/>	<input type="text"/>									
- INT App 6	<input type="text"/>	<input type="text"/>									

Proposed Improvement & Remarks



RSA Step VI : Countermeasure Development

Major Cause of Crashes	Possible Countermeasures
Red-light running	<ul style="list-style-type: none"> Remove signal sight obstructions Post "Signal Ahead" warning signs Install/replace signal visors and back plates Add signal back plates Install advance flasher signs Install (additional) 12-inch signal lenses Upgrade signalization Review warrants/consider removing signal Synchronize adjacent signals
Running stop sign	<ul style="list-style-type: none"> Remove sign sight obstructions Install larger signs Install "Stop"/"Yield Ahead" signs Construct rumble strips in pavement Review warrants/consider removing sign Replace "Stop" with "Yield" sign, if feasible Place flashing beacons overhead or on "Stop" sign Place red flags on "Stop" sign Place "Stop" signs on both sides of road
Failing to yield right of way to pedestrians	<ul style="list-style-type: none"> Add stop bars/crosswalks Post "Ped Xing"/"Advance Xing" signs Place advance pavement messages Add/improve lighting Post "School Xing"/"Advance Xing" signs Use crossing guards near schools Reroute pedestrians to safer crossing Signalize pedestrian crossing Install barrier curbing



- HSIP Guidelines provide list of possible countermeasures and associated crash reduction factors
- Document improvements that will reduce risk but do not have known reduction factors, such as:
 - **Signing and marking upgrades**
 - **Bicycle and pedestrian imp.**

IMPROVEMENT TYPE	Service Life	CRF			All	Head On	Rear End	Right Angle	Side Swipe
		Fatal	Injury	PDO					
Realignment Improvement									
Horizontal alignment changes (general)	25	0.25	0.25	0.25	X				
Redesign Intersection	25	0.25	0.25	0.25	X				
Vertical Alignment/Improve vertical curve	25	0.25	0.25	0.25	X				
Improving the Sight Distance	25	0.3	0.3	0.3	X				
Illumination									
Install the street light/roadway segment	20	0.25	0.25	0.25					
Lighting-Intersection and Interchange	20	0.25	0.25	0.25					
Regulation Improvement									
Two-way to One-way operation	20	0.5	0.5	0.5	X				
Convert two-way stop to four way stop	20	0.47	0.47	0.47					
Prohibit Right Turn on Red at signalized inte	10	0.25	0.25	0.25				X	
Drainage									
Provide adequate drainage	10	0.5	0.5	0.5					

- 1) District 2 Maintenance will place temporary flashing lights on the west side of the area.
- 2) Investigate the possibility of splitting the cost of permanent flashers County, similar to the agreement for the flashers on the Geiger Grade.
- 3) Determine the availability of federal safety funds and, if available, in

Guide Posts

- Generally well placed and in good shape.

ROADSIDE HAZARDS

Clear Zones

- Generally free of hazards, however the following was noted:
- There is a sharp two to three foot drop off of the roadway into natural Road and Occidental Drive on the south side of US 50. Regrade to a safe slope.

Culverts

- Several culverts under approaches appear to be in clear zone and may p Occidental, Segale, and La Fond are examples. Identify these culverts and either regrade the slope around the culvert i

LEVEL OF SERVICE

Passing Opportunities

- New approaches and Intersections have reduced the length of passing z Road to Chaves Road. Lyon County, NDOT, and developers should coordinate future Improvem
- 1) Construct frontage roads to control access onto US 50 and reduce t
- 2) Require developers to construct acceleration, deceleration, and left these improvements.

- Ten mile hill, there was concern about a sag vertical curve to the east n van stopped at the crest to observe and, at that position and eye height Discussion centered around driver frustration and the limited passing op Dayton. It has been observed that during morning and evening rush ho passing opportunities and reducing passing opportunities in this area mo that historically there appears to be no increase in crashes during the ru Driving easterly in a compact sedan, the night review team stopped beyond the crest and of



- 1) The headlights 15 seconds whi
- 2) It took approxi the teams stopp reappeared. As this would indic 2,640 feet.

The night review team proceeded downhill eastbound and stopped at three more locations. The closest to the sag where oncoming headlights disappeared was approximately 800 feet east of the first observation point. The oncoming vehicle took approximately 22 seconds to reach the teams stopped vehicle. Assuming the vehicle



In the evening of 02/21/01 a night review was performed by Chu Robert Kvam. They again drove the limits in each direction, stopped to a vertical curve at the east end of the ten mile hill, and entered/exited seve

Following is a compilation of the comments and recommendation

GENERAL COMMENT

Note: Bullets indicate observations with the subsequent italics indicating



The roadway co shoulders with r condition throug

ROAD MARKINGS

- Striping was clearly visible during the day, but only moderate at night *Freshen the striping and widen the edge lines from 4 to 6 inches. Th line District wide would increase uniformity throughout the District.*
- Passing is allowed on US 50 through several approaches (i.e. James, are not county roads and District stated these approaches were not s proximity of these low volume approaches to county roads would sig *Identify all approaches through which passing is allowed and assess i be restriped as double yellow.*

SPEED CONTROL

- The 65 mph speed limit appears justified throughout, however the de Chaves Road) should be reassessed periodically. The increased cross speed conflict with the 65 mph through traffic. Also, as new approac lengthen which in turn reduce passing opportunities and increase dir

SIGNS

- The signs were legible during the day, however 30%-40% of the sign Perform a night time sign review to determine which signs need to be
- There are two types of advance street name plaques. The first is a s below. The second is a dual sign with the diamond warning sign abo advisory sign noting the street name using 8 inch lettering below. It of the single signs are located too close to the intersection. By the ti time to decide on an appropriate action. Intersections without left tu the area to suddenly decelerate in the travel lane.
 - 1) Use dual signs for all approaches except those approaches with s Fort Churchill Road). Approaches with multiple names should us
 - 2) Identify advance street name plaques too close to the approach, relocate them to allow sufficient driver decision/action time.
- Animal crossing signs. Over the last five years, between Mark Twain collisions with horses resulting in five injuries and six collisions with o of roadway there are two wild horse signs, one equestrian sign, and c spaced throughout the limits. Fencing may not be effective along a s of approaches.

CORRIDOR EVALUATION

US 50, MP LY 8.68 (near Segale Road) to MP LY 29.99 (JCT. US 95A)

INTRODUCTION

In response to public concern, the Safety/Traffic Division performed a corridor evaluation on US 50 from approximately MP LY 18.00 (west of Segale Road) to MP LY 29.99 (junction of US 50 and US 95A). The purpose was to assess the road from a safety perspective and recommend interim roadway improvements to be employed until the phased widening of this section of US 50 is complete. It is the understanding of the evaluation team that the following concerns have been expressed at various public meetings:

- Consideration of a Daylight/Headlight section and/or lighted reader boards.
- Constructing left turn pockets at various intersections.
- Additional horse warning signs/put flashers on the existing signs.
- Assess sight distance along Ten Mile Hill.
- The lack of an eastbound left turn pocket at Pinto Street (Stagecoach Market).

Since the early 1990s Australia and New Zealand have been employing highway "safety audits" for existing and proposed roadways to meet objectives similar to those stated below. A safety audit for their roadway system is a formal review using standardized procedures. The safety audit concept is beginning to gain acceptance in the United States and is being recognized as a cost-effective tool to reduce risk on the roadway. This corridor evaluation is an initial step towards formalizing an NDOT safety audit procedure and will be beneficial in assessing its value to NDOT. Because the term "safety audit" may imply a standardized process, the term "corridor evaluation" was used for this study.

OBJECTIVES

- Reduce the risk and severity of crashes that may be attributed to the existing road conditions by identifying potential safety problems.
- From a road user's viewpoint, identify confusing and/or misleading messages.
- Improve awareness of safe maintenance practices.

METHODOLOGY

The "Transfund New Zealand Safety Audit Procedures for Existing Roads" (Report No. RA97/6235) was used as a guide for this corridor evaluation and some of the described procedures were used. For example, field review team members were provided a modified prompt list (see Appendix) from the above report in order to organize field comments.

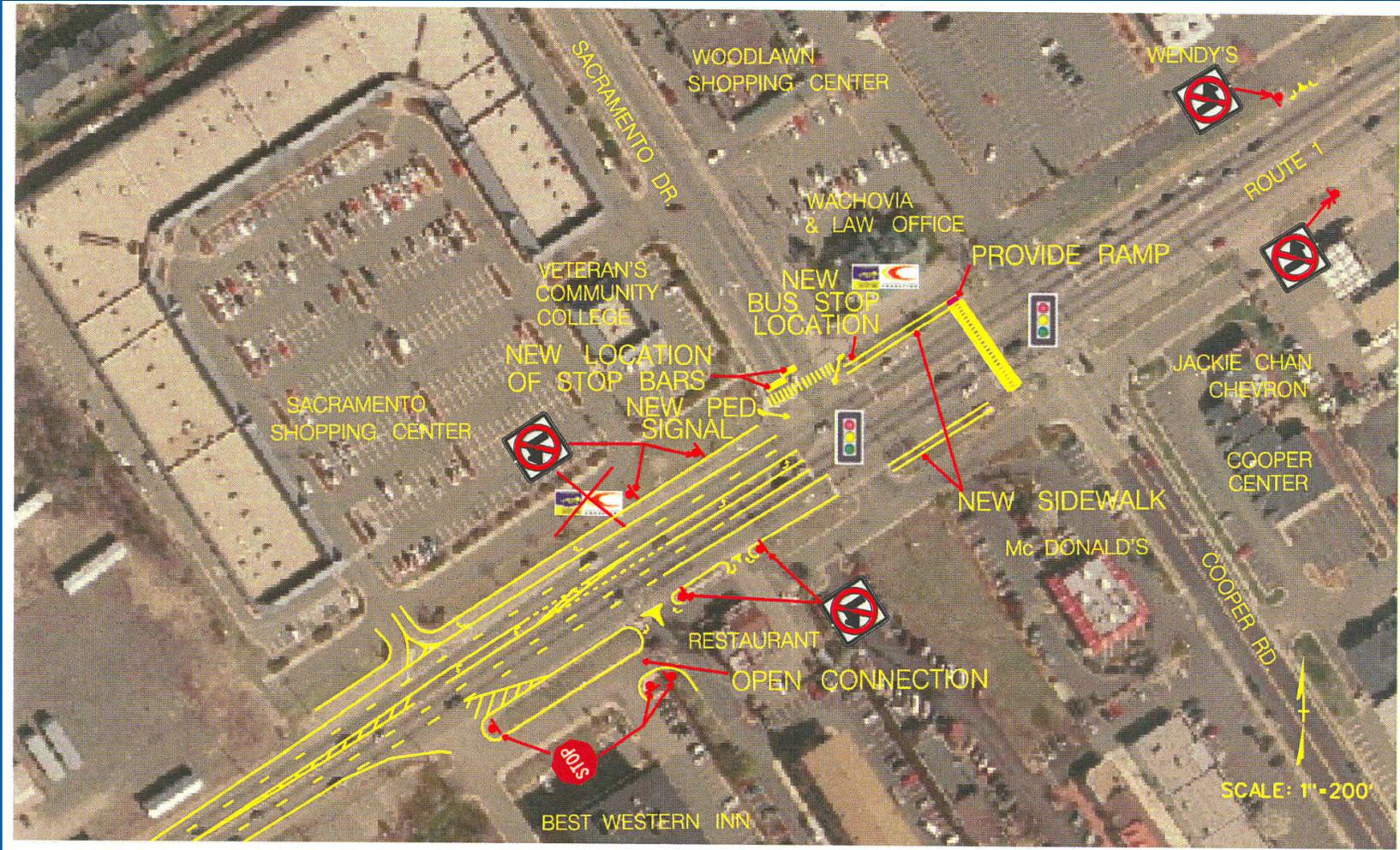
The review team was comprised of the following members:

Jim Wame	Nevada Highway Patrol
Pete Forinash	Lyon County Road Department
Sam Wolkrige	NDOT Maintenance
Debra Stames	NDOT District 2
Robert Kvam	NDOT Specifications
Mark Mindrum	NDOT Traffic
Chuck Reider	NDOT Safety
Jerry Pieretti	NDOT Safety
Jay Van Skikke	NDOT Safety

A kickoff meeting was held 02/21/01 prior to the field review. During this meeting the objectives, goals, scope, evaluation procedure and reporting procedure were discussed (see Appendix).

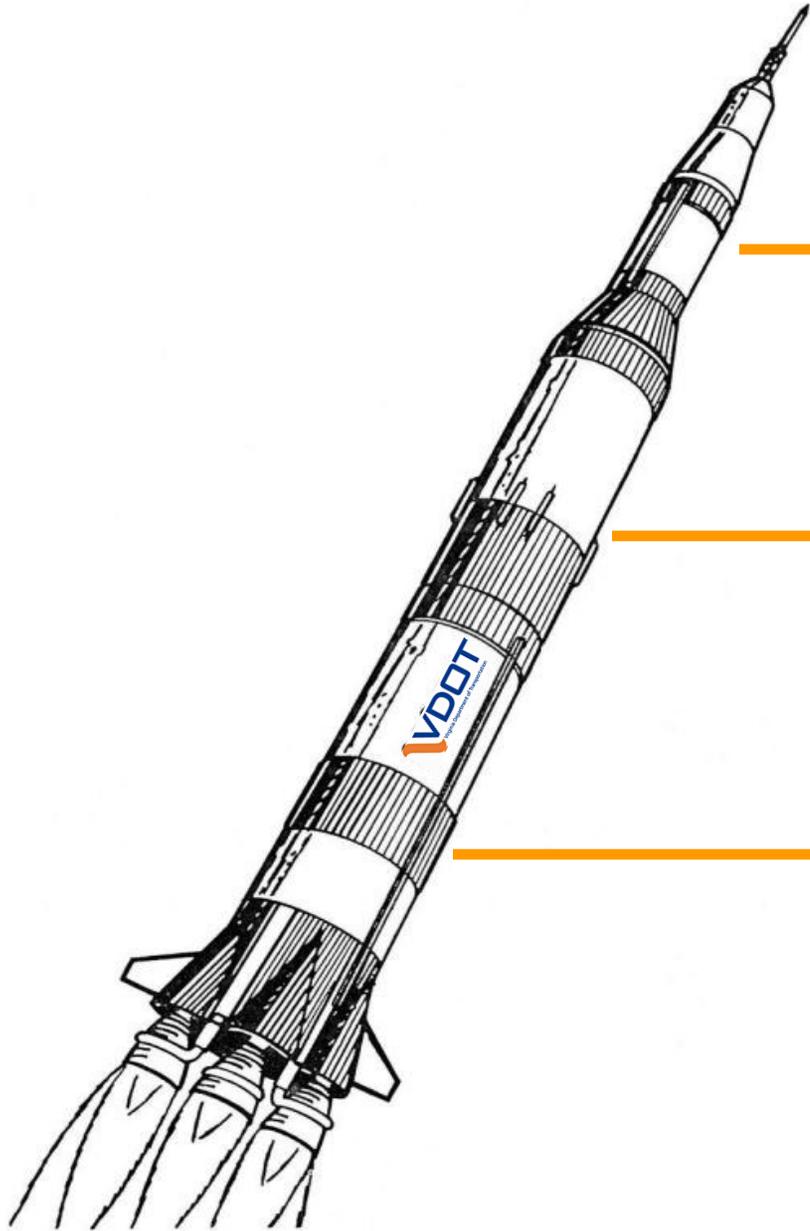
The review team traveled as a unit in a van to allow full team discussion of all the issues noted. The limits were driven in each direction during the day and the team stopped at several locations to discuss items of interest. The team returned to Dayton to discuss findings and summarize recommendations.

Diagram Improvements





VDOT Rocket : Prioritize Improvements



Stage III (36+ months)
TIP with ROW

Stage II (12-36 months)
HSIP / CMAQ / TE Projects with no ROW

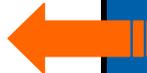
Stage I (0-12 months)
Signal Optimization / Maintenance Fix

Fuel =
Crash Analysis / RSA
Turning Movement Counts / Traffic Signal
Model

HSIP Systematic Funding

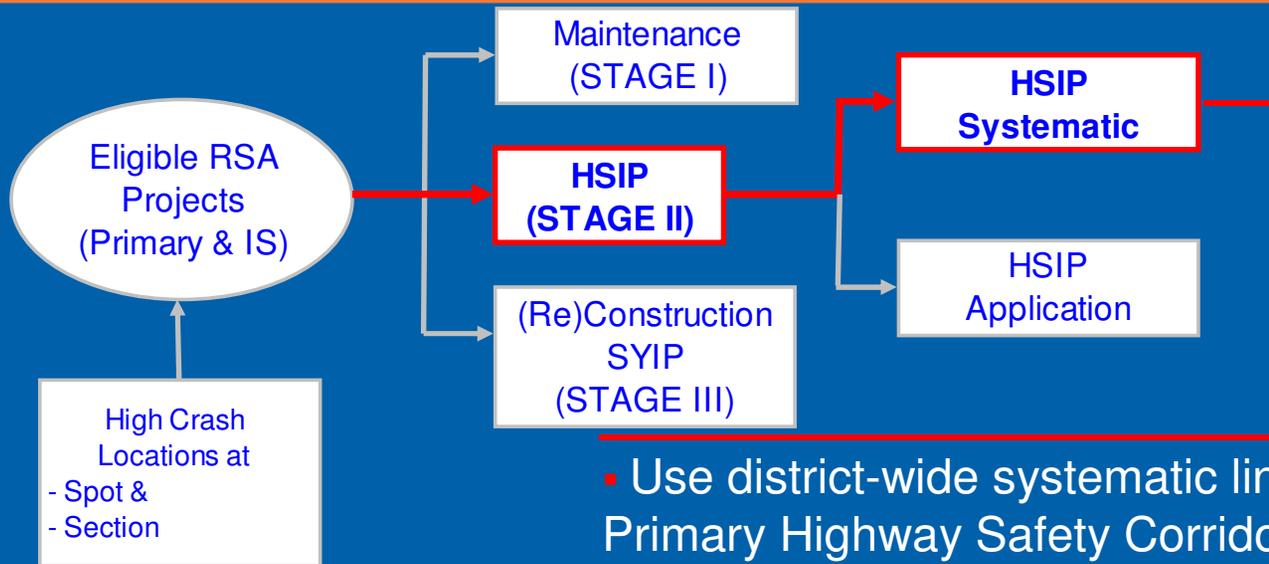
- \$38M for FY07 proportional to District's F+I crashes
- \$20M for FY08 proportional to top 20 F+I crash jurisdictions

Funded Safety Improvement Types
▪ Roadway Safety Assessment (RSA)
▪ Guardrail
▪ Traffic Signs
▪ Traffic Signals & ITS
▪ Traffic Markings
▪ Roadway Lighting
▪ Roadside Safety
▪ Shoulder Improvement
▪ Rumble Strips/Stripes

 *“ Required to develop Project ”*



Eligible HSIP Systematic Project



- Use district-wide systematic line item funding for IS and Primary Highway Safety Corridor candidate segments and jurisdiction line items
- Submit HSIP project request form with:
 - crash analysis and RSA Report including FRAT checklist
 - B/C and/or risk narrative form (XLS) with project elements, costs and schedule by phase from HSIP applications to TED-HSIP staff for approval



HSIP Application – B/C Analysis

HSIP-Application (Rev 05/30/07)

Virginia Department of Transportation
Highway Safety Improvement Program



Highway Safety Project (HSP) FY2008-09 Application

Applicant (Agent)	Virginia Department of Transportation Northern Virginia District	Project Manager	Robert Jastrzebski	Title:	Transp Eng
Street Address:	14685 Avion Parkway	Tel:	703-383-24395	Fax:	
City, State, Zip	Chantilly, Virginia 20151	Priority #	2	If submitting 2+ applications	

Application Type	VDOT District	County	Route (Include Name)	System (1)	Traffic Control	From/Major Road			
SECTION	Northern Virginia	Fairfax	Route 1(Richmond Highway)	Urban (U)	Segment spd <=35	Highland Lane (Route 624)			
Briefly Describe Problem and Proposed Work	There are several pedestrian fatalities along this stretch of Route 1 due to the absence of pedestrian facilities with four flashing warning signs installed on mast arms(two at the cross walk and two								
Severity	Crash Type		Rear End	Sideswipe Same Direction	Left Turn	Right angle	Run off Road	Head On/ Sideswipe - Opposite	Pedestrian
	Fatal	K=1 or 5							



Questions or Information?

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