



I-81 Corridor Improvement Study

Tier 2 – I-77/I-81 Overlap

Alternatives Technical Report

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This technical report describes the process used to identify the range of alternatives evaluated for the I-77/I-81 Overlap Study and the factors considered in their evaluation. The Tier 1 Record of Decision approved an improvement concept that consists of a non-separated variable lane highway facility that involves constructing no more than two general purpose lanes in each direction, where needed, to address 2035 traffic demands. Therefore, the range of alternatives considered is constrained by the decision reached in Tier 1 concerning the conceptual improvements to be considered and the location of the corridor. The alternatives were developed based on the identified purpose and need, traffic and engineering considerations, environmental impacts, and the conditions and constraints of the study area, as described in the following sections. Recommendations for the preliminary alternatives to be carried forward for detailed evaluation are also included. These alternatives are subject to change and refinement as more detailed information is developed. The preliminary alternatives recommended to be carried forward for detailed evaluation are identified below:

- The No-Build Alternative, which is being studied consistent with the National Environmental Policy Act (NEPA) regulations and to serve as a baseline for alternatives comparison.
- An alternative that adds one lane in each direction to the roadway section co-designated for I-77 and I-81 (the I-77/I-81 overlap section), referred to as Alternative D-81/77 or Alternative 10.
- An alternative on new location, referred to as Alternative CI-81 or Alternative 7.

Alternatives Development, Analysis, and Screening

Engineering Considerations

Engineering considerations include the physical features, terrain, and utilities in the study area that would affect the ability to construct an alternative. Engineering considerations also include the design criteria that govern the geometric roadway configurations of potential alternatives.

Physical Features

Physical features include the horizontal and vertical alignments of the roadways to which potential alternatives could connect (*i.e.*, I-81, I-77, Route 610, Route 94, U.S. Route 52, Route 649, U.S. Route 11, and other streets). Buildability involves physical space limitations and requirements for maintaining traffic flow during construction, primarily on I-81, I-77, U.S. Route 11, and U.S. Route 52.

Utilities

Utilities include power lines, gas lines, water lines, and sewer lines that would have to be relocated if disrupted by a proposed alternative. Such relocations increase construction costs and can temporarily disrupt service. Utilities in the project area include high-voltage power lines supported on large steel towers, a major gas line, and a major sewer line.

Terrain

Terrain refers to the hills and valleys that would require cut and fill earthwork to construct an alternative at acceptable grades and with suitable connections to other roadways and driveways.

Design Criteria

Design criteria were compiled based on VDOT's Road Design Manual and guidance from VDOT design and location engineers. The following design criteria and typical cross section elements were assumed:

- Classification Interstate
- Design speed 70 mph
- Posted speed 65 mph
- Maximum grade Rolling 4 percent
Mountainous 5 percent
- Minimum right-of-way width 200 feet
- Paved shoulders 12 feet inside and 12 feet outside for a roadway cross section of six or more lanes
4 feet inside and 12 feet outside for a four-lane roadway cross section
- Limited access
- 12-foot travel lanes
- Grade separated interchanges or crossings at all streets

Traffic Considerations

The hourly traffic volumes (Year 2035 volumes), used in the Tier 1 EIS, were updated for the traffic analysis for I-77/I-81 Overlap Study. To determine the roadway cross section needed for a highway on new location, available origin-destination data were reviewed to estimate how much traffic on the I-77/I-81 overlap section is local traffic (*i.e.*, trips solely within the overlap section or with either an origin or destination in the overlap section), how much is "I-77 traffic" (*i.e.*, trips on I-77 with both an origin and destination outside the study area or

with connections from I-77) and how much is “I-81 traffic” (*i.e.*, trips on I-81 with both an origin and destination outside the study area or with connections from I-81).

A freeway segment analysis was used to determine volume to capacity ratios (V/C) and a corresponding Level of Service (LOS) for each segment of each alternative. The number of lanes needed for each segment is that which would be sufficient to have the roadway meet urban interstate design criteria and operate at LOS C.

If “I-81 traffic” were relocated to a facility on new location, a four-lane interstate would be sufficient to accommodate demands through 2035, and the existing six-lane overlap section would be sufficient to accommodate I-77 and local traffic demands through 2035. If “I-77 traffic” were relocated to a facility on new location, a six-lane interstate would be needed to accommodate demands through 2035, and the existing six-lane overlap section would be sufficient to accommodate I-81 and local traffic demands through 2035. However, in this scenario, the existing overlap section would provide a full lane of additional capacity in each direction beyond what is needed to handle traffic demands. Relocating “I-77 traffic” would essentially require the construction of unneeded additional capacity, adding unnecessary costs and increasing environmental impacts.

The analysis completed as part of the *I-81 Corridor Study Tier 1 EIS* indicated that widening I-81 to eight lanes would be sufficient to accommodate both I-81 and I-77 traffic demands through 2035. While this facility is sufficient to accommodate Year 2035 demands to LOS C conditions, little additional capacity would be provided to accommodate demands beyond 2035.

Because all interstate facilities must provide at least four lanes and because, in this case, two separate interstate facilities would provide a combined total of ten lanes, a secondary analysis was completed to determine whether the new facility could be constructed as a principal arterial highway rather than as an interstate facility. Since two-lane interstate facilities are not built, a principal arterial highway is the first logical test case. Construction of the new facility as a principal arterial highway would allow the use of lower roadway geometric design criteria which, in turn, would reduce costs and environmental impacts. The primary purpose of this analysis was to determine whether a principal arterial highway with one travel lane in each direction would be sufficient to accommodate 2035 traffic demands. The analysis considered three possibilities, as shown in Table 1 and described below.

Table 1 Principal Arterial Highway Analysis

Facility Type	Northbound LOS ¹	Southbound LOS ¹
Freeway (Interstate)	B	C
Two-Lane Highway	F	F
4-lane Multilane Highway	D	D
6-lane Multilane Highway	C	C

Note: Represents the 2035 analysis year

1 Level of Service

A preliminary basic freeway segment analysis was completed for a four-lane interstate highway to determine a base level of service for comparison purposes.¹ The analysis shows that, on a four-lane interstate facility, LOS B can be achieved northbound and LOS C can be achieved southbound. Both these results meet the level of service standard set by FHWA for interstate highway operations in urban areas (LOS C or better).²

To compare to the basic freeway analysis, a two-lane (one lane in each direction) principal arterial highway analysis was completed using the same traffic volume and topography parameters (rolling terrain). A multilane principal arterial highway was also analyzed. A Class I highway was assumed. This type of highway is defined by high travel speeds (generally a free flow speed of 60 to 65 mph), a very limited (if any) number of traffic signals, and few driveways or intersecting streets. Based on AASHTO roadway geometric criteria, a principal arterial highway should be designed to operate at LOS C.

The results of the two-lane principal arterial highway analysis are that a two-lane principal arterial highway would experience LOS F conditions. This type of facility would not meet the established purpose and need or level of service criteria and is, therefore, dismissed from consideration.

A four-lane principal arterial highway is projected to operate at LOS D in each direction and does not meet the level of service criterion. A four-lane principal arterial highway is, therefore, also dismissed from consideration. A six-lane principal arterial highway would operate at LOS C in each direction and meets the level of service criterion. However, since the six-lane principal arterial highway would require an additional lane in each direction to provide the same level of service as a four-lane interstate highway, this concept was dismissed from further consideration. A four-lane interstate highway facility on new location is, therefore, being carried forward for detailed evaluation.

¹ This analysis is based on preliminary volumes and may not match the ultimate level of service results presented in the Traffic Technical Report.

² Based on *A Policy on Geometric Design of Highways and Streets*, AASHTO, Washington DC, 2004. Federal guidance defined the study area as urban in the Tier 1 EIS.

Interstate Designation for Roadway on New Location

23 CFR 470, Appendix A requires that a final environmental document be approved prior to a State officially proposing to FHWA that a roadway be part of the Interstate system. In addition, for purposes of the traffic analysis, the name for each alternative on new location had to be assumed because it has a bearing on the amount of traffic that would use the facility. Since federal regulations do not dictate the roadway designation for a new location alternative, a designation (either I-81 or I-77) had to be assumed. It is reasonable to assume that a new location roadway would be designated as I-81 as discussed in the *Traffic Considerations* section above and in the following:

- Designating the roadway as I-81 would allow the 2035 traffic to be accommodated with four lanes, as opposed to six lanes if it were designated as I-77. Constructing four lanes as opposed to six lanes would reduce environmental impacts and cost.
- The Town of Wytheville prefers that the existing roadway remains as I-77 (see the Scoping Summary Report).

Environmental Considerations

Aerial photographs taken in 2007, supplied by VDOT and GIS database information from the Town of Wytheville and state and federal agencies were used to develop aerial mosaic and planimetric base mapping. The mapping and field reconnaissance were used to identify environmental constraints in the study area. The principal environmental constraints include:

Water Resources, Floodplains, and Wetlands

Reed Creek and its associated wetlands and floodplains are in the study area. There is a heavy concentration of streams south and southwest of the I-77/I-81 overlap section. Impacts to these resources require compliance with various federal and state regulations and federal executive orders.

Threatened and Endangered Species

Impacts to Federal threatened and endangered species are not anticipated.

Section 4(f) Properties

These are publicly owned public parks and recreation properties and historic properties that, under Section 4(f) of the 1966 Department of Transportation Act, must be avoided unless there is no feasible and prudent alternative and all planning has been done to minimize harm, or the use will have a *de minimis* impact. Such properties in the study area include:

- Wythe County Poorhouse Farm (DHR# 098-0030)
- Fort Chiswell Site (DHR# 098-0026)
- Fort Chiswell Mansion (DHR# 098-0005)

- Judge James Ewell Brown House (DHR# 098-5033)
- McGavock Family Cemetery (DHR# 098-0022)

Sections of the Cove Mountain Battlefield study area, Battlefield core area, and the Battlefield area of integrity are also within the study area.

Agricultural and Forestal Districts

There are no Virginia Agricultural and Forestal Districts in the study area.

Prime Farmland

Much of the land within the study area remains in agricultural uses (e.g., production of cattle, poultry, corn, and hay). Prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, fiber, forage, oilseed, and other agricultural crops with minimum inputs of fuel, fertilizer, pesticides, and labor, and without intolerable soil erosion. Some people are sensitive to losses of farmland because of perceived picturesque qualities. Farms are also businesses, the displacements of which represent economic impacts.

Commercial/Industrial Properties

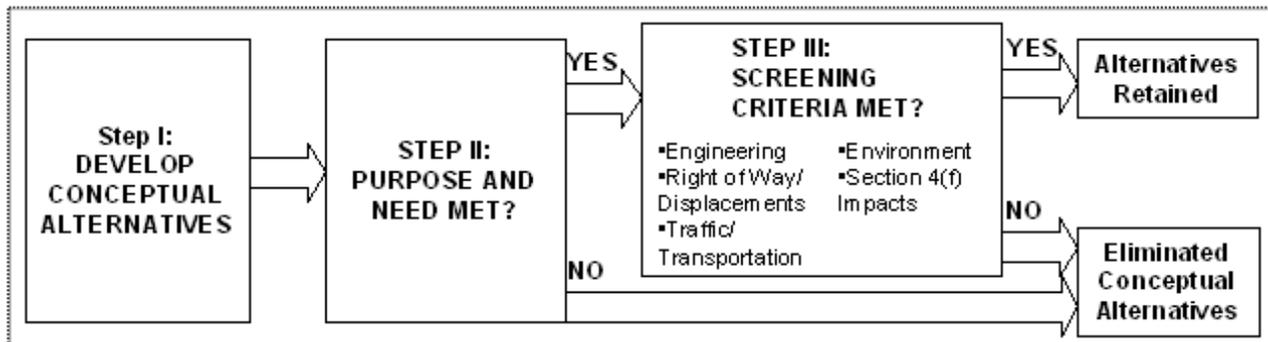
There are multiple commercial and industrial properties in and around the study area. Progress Park Industrial Park is one of the larger of these properties, occupying 1,210 acres within the study area.

Residential Properties

There are residential subdivisions throughout the study area.

Preliminary Alternatives

The flowchart below illustrates the steps in the alternative development and screening process. This process involved developing a wide range of alternatives initially and then narrowing the options to two CBAs for detailed consideration.



Using aerial photographic base mapping and the factors described above, preliminary alternatives were identified (see Figure 1)³. Figure 1 is a map that depicts 1,000-foot wide corridors. Preliminary alternatives were developed from these corridors using the nodes (connecting points) illustrated. The nodes for the new location alternatives were developed primarily at locations where it was desirable to have the new alignment pass through areas that either best accommodated the geometric requirements for the new alignment or through areas that minimized impacts to known environmental constraints. In addition, node locations were established at the various tie-in points so that the new alignment would connect to the existing I-77 and I-81 facilities. The nodes formed a total of 18 alternatives that connect to either I-77 or I-81. Each alternative was evaluated using the following criteria:

- Ability to meet the Purpose and Need
- Traffic
 - Number of lanes required to meet level of service standard
- Engineering
 - Design speed
 - Grade
 - Right of Way needs
 - Estimated roadway construction cost (millions) (excluding right-of-way and utility costs)
- Environmental Impacts
 - Number of stream crossings
 - Linear footage of stream crossings
 - Number of threatened and endangered species impacted
 - Number of Park Land Uses [4(f)]
 - Number of Park Land Involvements [4(f)]
 - Acres of wetland impacted
 - Acres of prime farmland impacted
 - Number of historic resources impacted [Section 106/4(f)]
 - Acres of battlefields impacted [Section 106/4(f)]
- Acres of parcels impacted
- Number of residential parcels impacted

³ No new information has arisen that requires the reconsideration of improvements that were rejected during the Tier 1 study.



- Number of business parcels impacted
- Estimated roadway construction cost (millions) (excluding right-of-way and utility costs)

Appendix A illustrates the quantities associated with the alternatives in each evaluation criteria.

Alternatives Eliminated from Detailed Study

As a result of the alternative screening analysis and process, several alternatives were eliminated from consideration and are not being carried forward for detailed study. A majority of those alternatives were eliminated based on their impacts to the physical and human environment.

Table 2 lists the eliminated alternatives and reasons for their elimination.

Table 2 Alternatives Eliminated from Detailed Study (see Figure 1 for alternative alignments)

Alternative	Description	Basis for Elimination
A-81	I-81 on new alignment "A" north of existing highway	Linear footage of stream crossings, impacts to wetlands, and prime farmland
A1-81	I-81 on new alignment "A" north of existing highway	Impacts to residential parcels
A2-77	I-77 on new alignment "A" north of existing highway	Acres of parkland involvement, impacts to battlefields New roadway would require six lanes as opposed to four lanes
B-81	I-81 on new alignment "B" north of existing highway	Number of stream crossings required
B1-77	I-77 on new alignment "B" north of existing highway	Impacts to prime farmland and battlefields New roadway would require six lanes as opposed to four lanes
C-81	I-81 on new alignment "C" north of existing highway	Impacts to business parcels
C2-77	I-77 on new alignment "C" north of existing highway	Acres of parkland involvement, impacts to battlefields New roadway would require six lanes as opposed to four lanes
C3-77	I-77 on new alignment "C" north of existing highway	New roadway would require six lanes as opposed to four lanes



Table 2 Alternatives Eliminated from Detailed Study (continued)

Alternative	Description	Basis for Elimination
E-81	I-81 on new alignment "E" south of existing highway	Number of stream crossings required, acres of parkland involvement, impacts to battlefields
E1-81	I-81 on new alignment "E" south of existing highway	Number of stream crossings required, acres of parkland involvement, impacts to prime farmland
E2-81	I-81 on new alignment "E" south of existing highway	Acres of parkland involvement, impacts to prime farmland, battlefields, residential parcels, and business parcels
E3-77	I-77 on new alignment "E" south of existing highway	Number of stream crossings required, new roadway would require six lanes as opposed to four lanes
E4-77	I-77 on new alignment "E" south of existing highway	Number of stream crossings required, acres of parkland involvement, impacts to battlefields, residential parcels, and business parcels New roadway would require six lanes as opposed to four lanes
E5-77	I-77 on new alignment "E" south of existing highway	Number of stream crossings required, acres of parkland involvement, and impacts to prime farmlands New roadway would require six lanes as opposed to four lanes
F-77	I-77 on new alignment "F" south of existing highway	New roadway would require six lanes as opposed to four lanes. In addition, the U.S. Army Corps of Engineers does not prefer the southern alignments because of the higher number of stream crossings. The U.S. Army Corps of Engineers has jurisdiction by law pursuant to their permitting authority under Section 404 of the Clean Water Act.
F1-77	I-81 on new alignment "F" south of existing highway	New roadway would require six lanes as opposed to four lanes

Alternatives Carried Forward

Through the screening of preliminary alternatives, a Candidate “Build” Alternative with I-81 on new location was chosen for further consideration and is being carried forward in the NEPA process for detailed study (see Figure 2). An alternative that considers widening the existing facility is also being carried forward, as decided in the Tier 1 Record of Decision. This alternative would allow I-77 and I-81 to remain co-located as an eight-lane facility. As opposed to the preliminary alternatives in the screening analysis that were developed using 1,000-foot corridors, the candidate build alternatives were developed within a 500-foot corridor.

No Build

The No-Build Alternative is being studied consistent with NEPA regulations and to serve as a baseline for alternatives comparison. The No Build condition is reflective of the expected corridor conditions during the design year if no improvement was made to the corridor beyond the minor modifications currently programmed in the most recent version of the Commonwealth’s Six-Year Improvement Program. These improvements include mostly safety upgrades and paving services, which while critical to the long-term viability of the corridor, do little to address current and anticipated capacity needs.

Candidate Build Alternative C1-81 (Alternative A)

Alternative C1-81 is an Interstate 81 designation on new location that is immediately north of the I-77/I-81 overlap section. The I-77/I-81 overlap section would then be designated as I-77 only, as discussed above. Alternative C1-81 extends from Node 3 to 5, Node 5 to 11, Node 11 to 14, and Node 14 to 16. Alternative C1-81 will be designated as Candidate Build Alternative A in the EA and all related technical resource documents.

The new section of I-81 would be a four-lane highway designed to Interstate standards. Alternative A would include service roads and/or overpasses to facilitate connectivity from one side of the proposed interstate facility to the other.

For this alternative, conceptual interchange improvements have been developed at Interchanges 72 and Interchange 81 to provide connectivity between the two separate facilities.⁴ For purposes of this technical report, both I-81 and I-77 are treated as northbound/southbound movements, (1) Northbound I-81 to Roanoke; (2) Southbound I-81 to Bristol; (3) Northbound I-77 to West Virginia; (4) Southbound I-77 to North Carolina. At

⁴ These conceptual interchange improvements were developed for the purposes of this study *only* and will be refined during the detailed design phase, if a build alternative is selected.

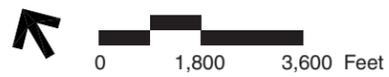
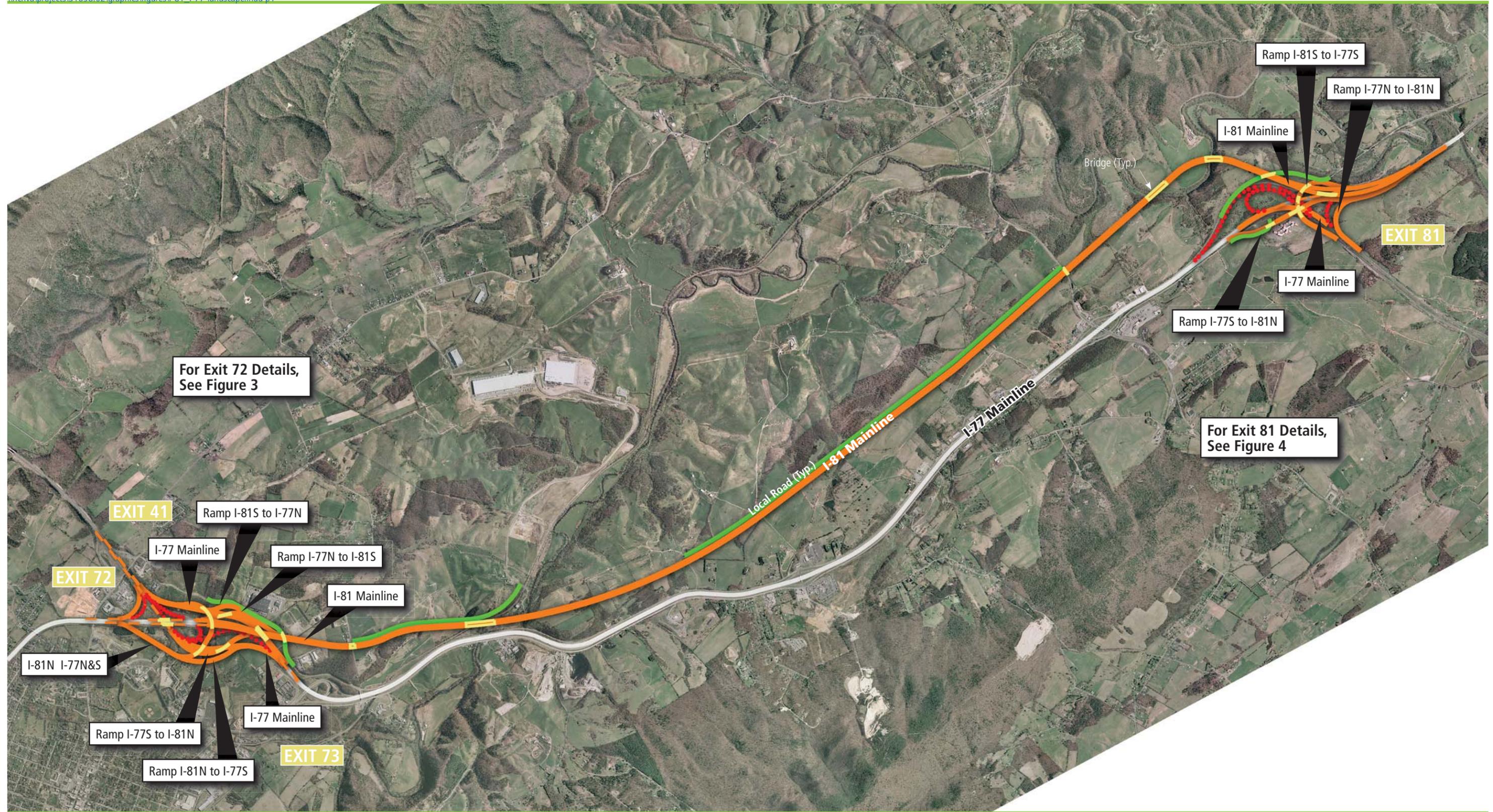


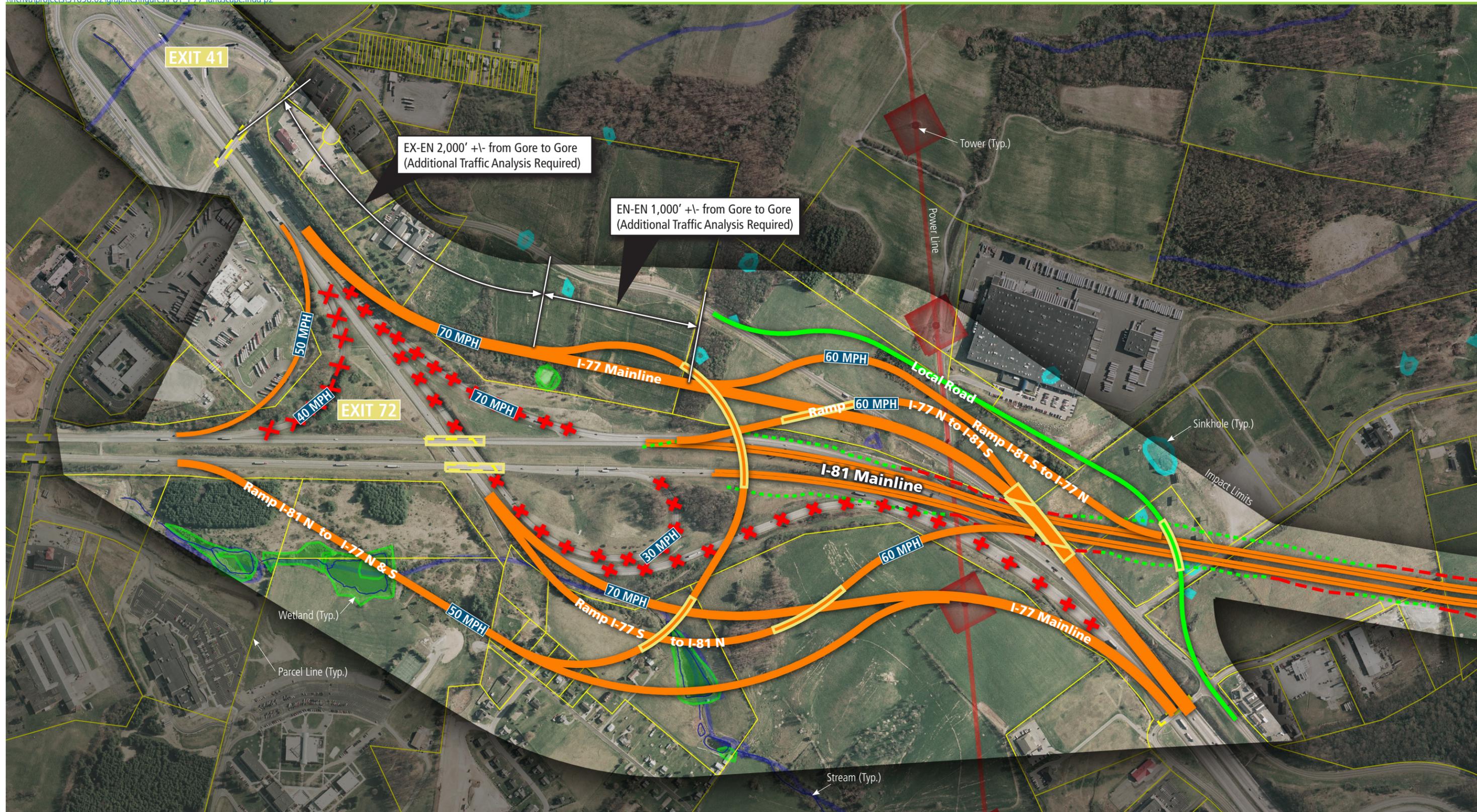
Interchange 72, the following directional movements are incorporated into the conceptual design (see the accompanying figures).

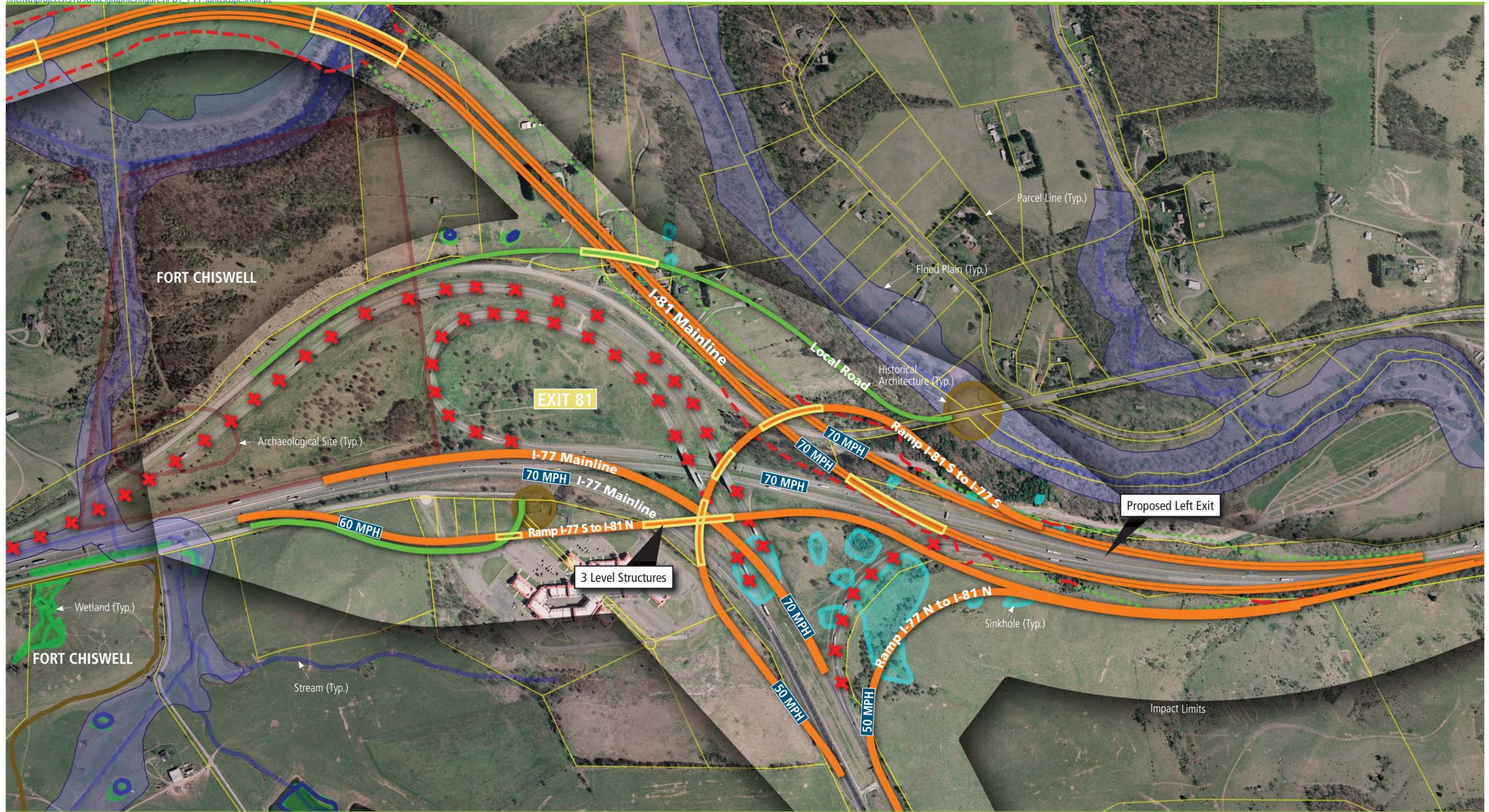
- Southbound I-81 to Northbound I-77: Traffic would use a new directional ramp.
- Southbound I-81 to Southbound I-77: This movement would not be accommodated at Interchange 72, but at Interchange 81.
- Northbound I-81 to Northbound I-77: Traffic would use a new directional flyover, eliminating the existing low speed loop ramp.
- Northbound I-81 to Southbound I-77: Traffic would use a new directional ramp.
- Southbound I-77 to Southbound I-81: Traffic would use a new ramp (similar to the existing ramp) that provides a higher design speed.
- Southbound I-77 to Northbound I-81: Traffic would use a new directional ramp.
- Northbound I-77 to Southbound I-81: Traffic would use a new directional ramp.
- Northbound I-77 to Northbound I-81: This movement would not be accommodated at Interchange 72, but at Interchange 81.

At Interchange 81, the following directional movements are incorporated into the conceptual design.

- Southbound I-81 to Southbound I-77: Traffic would use a new directional flyover, eliminating the existing low speed loop ramp.
- Southbound I-81 to Northbound I-77: Traffic would use a left exit ramp from I-81 on existing pavement tying into I-77.
- Northbound I-81 to Northbound I-77: This movement would not be accommodated at Interchange 81, but at Interchange 72.
- Northbound I-81 to Southbound I-77: This movement would not be accommodated at Interchange 81, but at Interchange 72.
- Southbound I-77 to Northbound I-81: Traffic would use a new directional ramp.
- Southbound I-77 to Southbound I-81: This movement would not be accommodated at Interchange 81, but at Interchange 72.
- Northbound I-77 to Northbound I-81: Traffic would use a new ramp (similar to the existing) that provides a higher design speed.
- Northbound I-77 to Southbound I-81: This movement would not be accommodated at Interchange 81, but at Interchange 72.







Candidate Build Alternative D-81/77 (Alternative B)

Alternative D-81/77 would add one travel lane (and additional left/right shoulder width) in each direction on the roadway section co-designated as I-77 and I-81 (the I-77/I-81 overlap section) thereby creating an eight-lane typical roadway section that meets interstate standards. This alternative extends from Node 3 to 5 and from Node 5 to 18.

Alternative D-81/77 will be designated as Candidate Build Alternative B in the EA and all related technical resource documents.

This widening would occur between Interchange 72 and Interchange 81. To accommodate the widened section of roadway in this corridor, conceptual design improvements would be developed for the adjacent service roads, entrance/exit ramps at Interchanges 73/77/80, and overpasses. In addition, a substandard horizontal curve would be corrected at approximately Milepost 76.0, sight lines improved via a rock cut on the inside of a curve at approximately Milepost 74.5, and substandard vertical clearances of structures would be corrected to meet standards.

Also for this alternative, conceptual interchange improvements have been developed at Interchanges 72 and Interchange 81⁵. As with Alternative C1-81, for purposes of this technical report, both I-81 and I-77 are treated as northbound/southbound movements, (1) Northbound I-81 to Roanoke; (2) Southbound I-81 to Bristol; (3) Northbound I-77 to West Virginia; (4) Southbound I-77 to North Carolina. At Interchange 72, the following directional movements are incorporated into the conceptual design (see the accompanying figures).

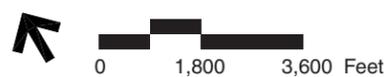
- Southbound I-81 to Northbound I-77: Traffic would continue to use the existing ramp. Traffic destined for I-77 Interchange 41 would exit early to connect with a directional ramp to Interchange 41.
- Northbound I-81 to Northbound I-77: Traffic would use a new directional flyover, eliminating the existing low speed loop ramp.
- Southbound I-77 to Southbound I-81: Traffic would use a new ramp (similar to the existing) that provides a higher design speed.
- Southbound I-77 to Northbound I-81: Traffic would use a new ramp (similar to the existing) that provides a higher design speed.

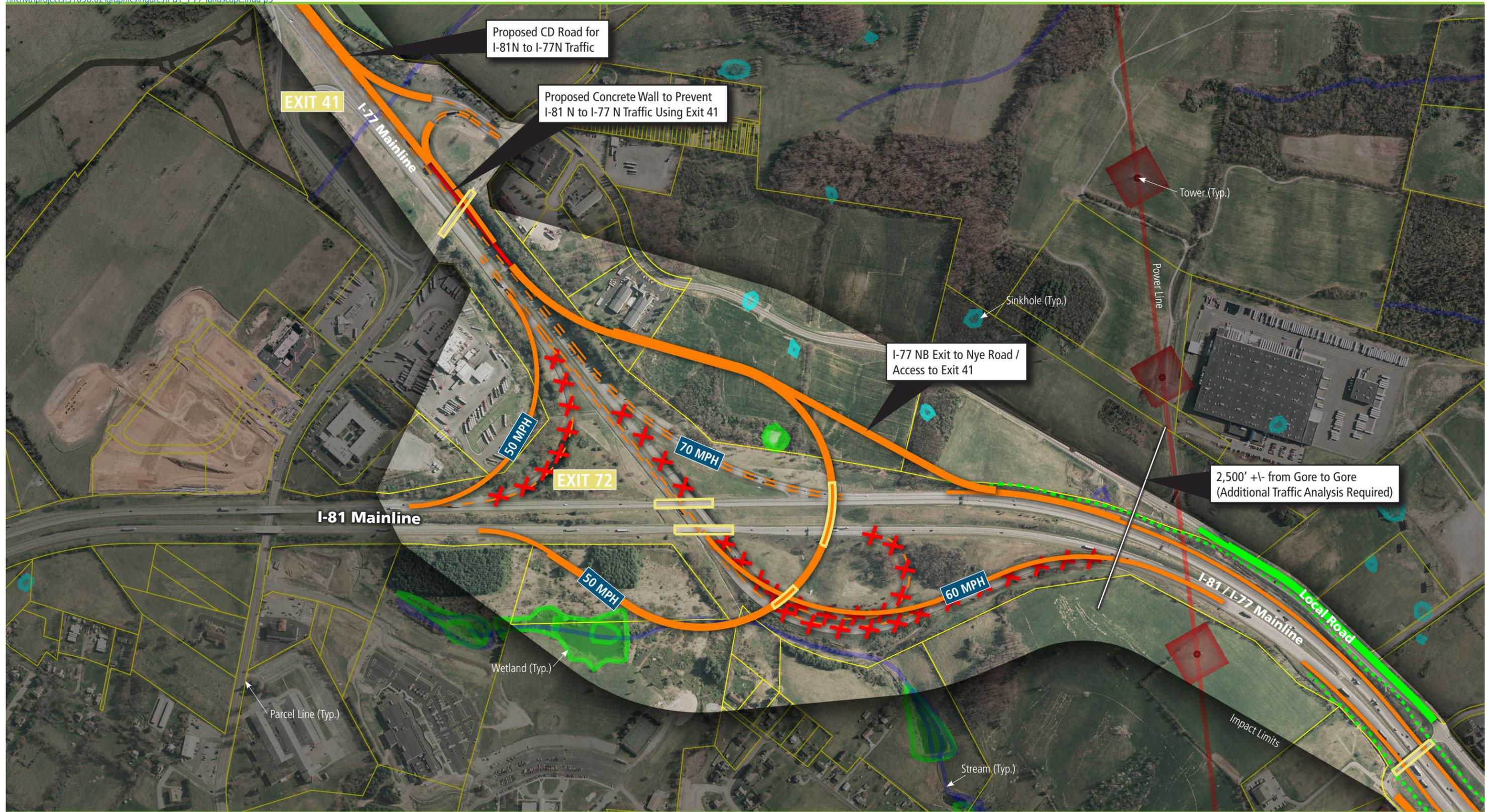
⁵ These conceptual interchange improvements were developed for the purposes of this study *only* and will be refined during the detailed design phase, if a build alternative is selected.

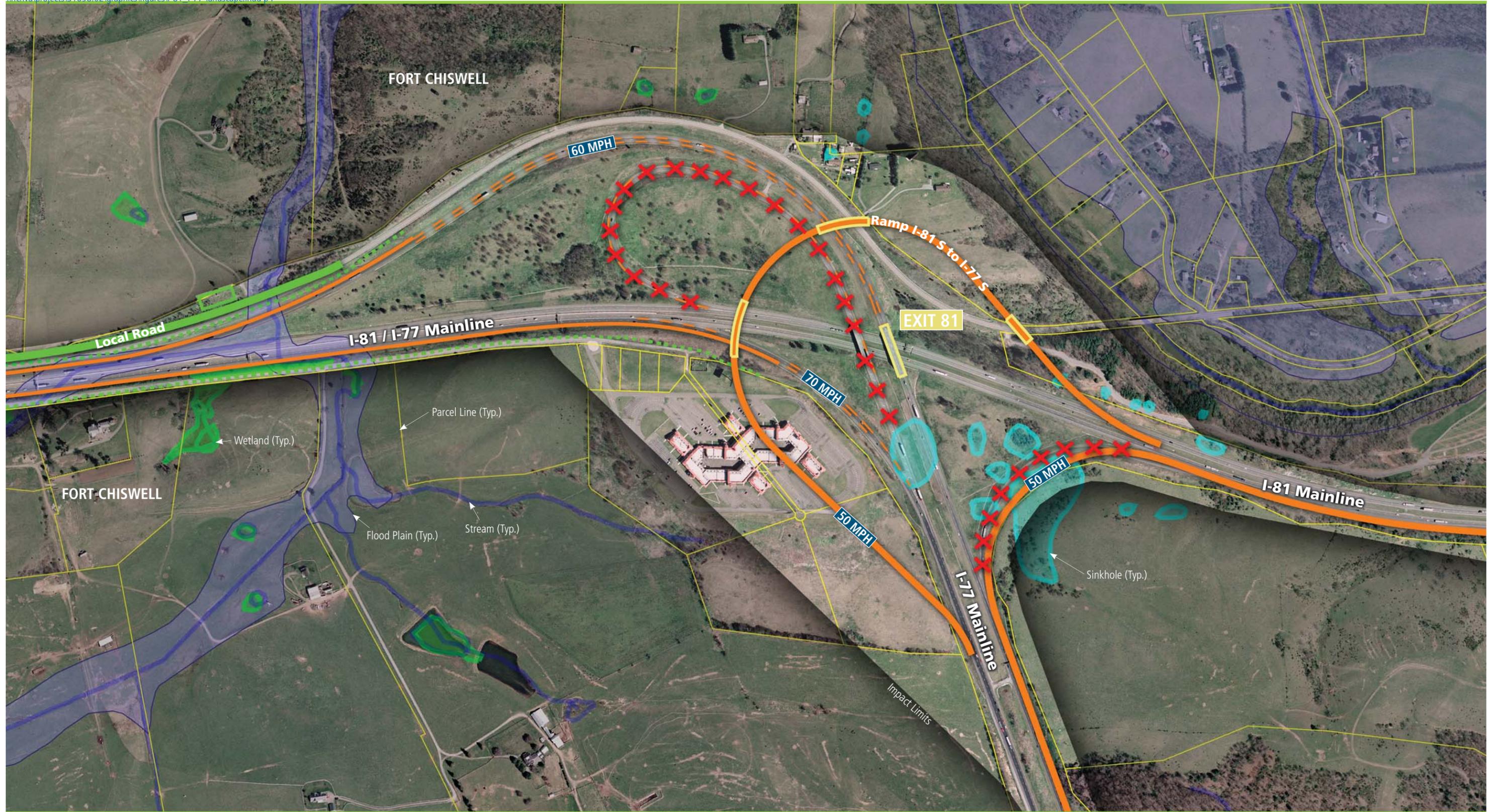


At Interchange 81, the following directional movements are incorporated into the conceptual design.

- Southbound I-81 to Southbound I-77: Traffic would use a new directional flyover, eliminating the existing low speed loop ramp.
- Northbound I-81 to Southbound I-77: Traffic would continue to use the existing ramp.
- Northbound I-77 to Southbound I-81: Traffic would continue to use the existing ramp.
- Northbound I-77 to Northbound I-81 Traffic would continue to use the existing ramp.







Appendix A

Alt #	Alternative Label	Segments	Selection Criteria												
			Number of Stream Crossings	Linear Footage of Stream Crossings	T & E Species Impacted	Number of Park Land Uses [4(f)]	Number of Park Land Involvements (acres) [4(f)]	Acres of wetlands Impacted	Acres of Prime Farmlands Impacted	Number of Historic Resources Impacted [4(f)]	Acres of Battlefields Impacted [4(f)]	Number of Parcels Impacted (acres)	Number of Residential Parcels Impacted	Number of Business Parcels Impacted	Estimated Construction Cost (in Millions)
1	Route A-81	1 to 8	2	5910	0	1	28.1	1.3	46.1			271	43	21	\$28.5
		8 to 17	9	15935	0	1	8	0.3	135			727	174	2	\$66.9
		17 to 16	3	11292	0			0.5	77.4			204.4	25	0	\$23.2
		TOTALS	14	33137	0	2	36.1	2.1	258.5	11	28.1	1202.4	242	23	\$118.6
2	Route A1-81	1 to 7	0	0	0	1	29.7	0	22.8			205.1	57	0	\$21.2
		7 to 8	0	2392	0			0	13.2			102.8	12	0	\$8.7
		8 to 17	9	15935	0	1	8	0.3	135			727	174	1	\$66.9
		17 to 16	3	11292	0			0.5	77.4			204.4	25	0	\$23.2
		TOTALS	12	29619	0	2	37.7	0.8	248.4	12	29.7	1239.3	268	1	\$120.0
3	Route A2-77	2 to 7	2	5850	0	1	52.2	0	42.2			157.3	0	0	\$22.4
		7 to 8	0	2392	0			0	13.2			102.8	12	0	\$11.9
		8 to 17	9	15935	0	1	8	0.3	135			727	174	1	\$91.8
		17 to 18	1	1,024.00				0.1	11.5			64.7	4	0	\$10.2
		TOTALS	12	25201	0	2	60.2	0.4	201.9	10	52.2	1051.8	190	1	\$136.3
4	Route B-81	1 to 6	1	2129	0	1	28	0	34.8			167.7	88	27	\$19.2
		6 to 14	11	22572	0			1.8	180.2			868.4	34	0	\$69.0
		14 to 16	4	12275	0			0.5	115.6			247.2	42	0	\$26.4
		TOTALS	16	36976	0	1	28	2.3	330.6	10	28.1	1283.3	164	27	\$114.6
5	Route B1-77	2 to 6	4	7464	0	1	39	0.1	61.1			206.8	22	0	\$29.2
		6 to 14	11	22572	0			1.8	180.2			868.4	34	0	\$94.7
		14 to 18	0	1,995.00				0.1	49.6			106.7	5	0	\$15.0
		TOTALS	15	32031	0	1	39	2	290.9	6	46.2	1181.9	71	0	\$138.9
6	Route C-81	1 to 6	1	2129	0	1	28		34.8			167.7	88	27	\$19.2
		6 to 10	2	3019	0				10.2			194.1	6	0	\$16.6
		10 to 11	5	7826	0			0.1	23.9			368.3	8	0	\$31.8
		11 to 14	1	3522	0				6.5			240.3	16	1	\$22.0
		14 to 16	4	12275	0			0.5	115.6			247.2	42	0	\$26.4
		TOTALS	13	28771	0	1	28	0.6	191	6	28.1	1217.6	160	28	\$116.0
7	Route C1-81	(3)5 to 11	6	10791	0			1.9	57.3			596.1	29	6	\$2.9
		11 to 14	1	3522	0				6.5			240.3	16	1	\$52.6
		14 to 16	4	12275	0			0.5	115.6			247.2	42	0	\$22.1
		TOTALS	11	26588	0		0	2.4	179.4	7	0	1083.6	87	7	\$104.0

Alt #	Alternative Label	Segments	Selection Criteria												
			Number of Stream Crossings	Linear Footage of Stream Crossings	T & E Species Impacted	Number of Park Land Uses [4(f)]	Number of Park Land Involvements (acres) [4(f)]	Acres of wetlands Impacted	Acres of Prime Farmlands Impacted	Number of Historic Resources Impacted [4(f)]	Acres of Battlefields Impacted [4(f)]	Number of Parcels Impacted (acres)	Number of Residential Parcels Impacted	Number of Business Parcels Impacted	Estimated Construction Cost (in Millions)
8	Route C2-77	2 to 6	4	7464	0	1	39	0.1	61.1			206.8	22	0	\$29.30
		6 to 10	2	3019	0			0	10.2			194.1	6	0	\$22.80
		10 to 11	5	7826	0			0.1	23.9			368.3	8	0	\$43.60
		11 to 14	1	3522	0			0	6.5			240.3	16	1	\$30.30
		14 to 18		1,995.00				0.1	49.6			106.7	5	0	\$15.00
		TOTALS		12	23826	0	1	39	0.3	151.3	2	46.2	1116.2	57	1
9	Route C3-77	(3)5 to 11	6	10791	0			1.9	57.3			596.1	29	6	\$76.00
		11 to 14	1	3522	0				6.5			240.3	16	1	\$30.30
		14 to 18	0	1,995.00				0.1	49.6			106.7	5	0	\$15.10
		TOTALS	7	16308	0		0	2	113.4	2	0	943.1	50	7	\$121.40
10	Route D-81/77 Widening	3 to 5	0	0	0		0	0.3	1.7			5.6	0	0	\$1.70
		5 to 18	12	41271	0	1	1	1.4	70			831.2	349	111	\$55.50
		TOTALS	12	41271	0	1	1	1.7	71.7	0	0	836.8	349	111	\$57.20
11	Route E-81	1 to 4	2	5,920.00	0	1	30.5	2.8	28.3			132.3	44	17	\$19.80
		4 to 12	16	21,123.00	0			0.7	16.6			258.9	46	8	\$61.60
		12 to 13	3	9,520.00	0			0.3	48.6			252.9	48	4	\$22.20
		13 to 16	3	8,763.00	0			1.5	65.5			244.4	11	6	\$27.10
		TOTALS	24	45326	0	1	30.5	5.3	159	7	30.5	888.5	149	35	\$130.70
12	Route E1-81	1 to 6	1	2,129.00	0	1	28	0	34.8			167.7	88	27	\$19.20
		6 to 12	9	16,869.00	0			0	73			559.2	122	0	\$52.00
		12 to 13	3	9,520.00	0			0.3	48.6			252.9	48	4	\$22.20
		13 to 16	3	8,763.00	0			1.5	65.5			244.4	11	6	\$27.10
		TOTALS	16	37281	0	1	28	1.8	221.9	5	28.1	1224.2	269	37	\$120.50
13	Route E2-81	1 to 6	1	2,129.00	0	1	28	0	34.8			167.7	88	27	\$19.20
		6 to 10	2	3,019.00	0			0	10.2			194.1	6	0	\$16.60
		10 to 12	6	11,047.00	0			0.7	36.7			364.8	149	11	\$32.10
		12 to 13	3	9,520.00	0			0.3	48.6			252.9	48	4	\$22.20
		13 to 16	3	8,763.00	0			1.5	65.5			244.4	11	6	\$27.10
		TOTALS	15	34478	0	1	28	2.5	195.8	5	28.1	1223.9	302	48	\$117.20
14	Route E3-77	3 to 4	2	4,866.00	0			1.7	20.6			57.6	9	0	\$12.00
		4 to 12	16	21,123.00	0			0.7	16.6			258.9	46	8	\$84.50
		12 to 13	3	9,520.00	0			0.3	48.6			252.9	48	4	\$30.50
		13 to 15	3	7,850.00	0			1.1	31			210.1	0	0	\$27.90
		TOTALS	24	43359	0		0	3.8	116.8	2	0	779.5	103	12	\$154.90

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15	Route E4-77	2 to 6	4	7,464.00	0	1	39	0.1	61.1			206.8	22	0	\$29.30
		6 to 10	2	3,019.00	0				10.4			194.1	6	0	\$22.80
		10 to 12	6	11,047.00	0			0.7	36.7			364.8	149	11	\$44.10
		12 to 13	3	9,520.00	0			0.3	48.6			252.9	48	4	\$30.50
		13 to 15	3	7,850.00	0			1.1	31			210.1	0	0	\$27.90
		TOTALS	18	38900	0	1	39	2.2	187.8	3	46.2	1228.7	225	15	\$154.60
16	Route E5-77	2 to 6	4	7,464.00	0	1	39	0.1	61.1			206.8	22	0	\$29.30
		6 to 12	9	16,869.00	0			0	73			559.2	123	0	\$71.40
		12 to 13	3	9,520.00	0			0.3	48.6			252.9	48	4	\$30.50
		13 to 15	3	7,850.00	0			1.1	31			210.1	0	0	\$27.90
		TOTALS	19	41703	0	1	39	1.5	213.7	3	46.2	1229	193	4	\$159.10
17	Route F-77	3 to 4	2	4,866.00	0			1.7	20.6			57.6	9	0	\$12.00
		4 to 9	15	17,820.00	0	1	1.7	0.7	16.6			114	2	0	\$75.20
		9 to 15	9	15,942.00	0			0.4	11.8			526.9	59	3	\$64.50
		TOTALS	26	38628	0	1	1.7	2.8	49	3	0	698.5	70	3	\$151.70
18	Route F1-77	2 to 6	4	7,464.00	0	1	39	0.1	61.1			206.8	22	0	\$29.30
		6 to 10	2	3,019.00	0			0	10.2			194.1	6	0	\$22.80
		10 to 9	5	9,211.00	0	1	1.7	0.7	20.1			234.4	29	6	\$37.20
		9 to 15	9	15,942.00	0			0.4	11.8			526.9	59	3	\$64.50
		TOTALS	20	35636	0	2	40.7	1.2	103.2	4	46.2	1162.2	116	9	\$153.80