

EXECUTIVE SUMMARY

Introduction

The Interstate 90 (I-90) Exit 61 to Exit 67 Corridor Study has investigated two primary areas of need:

1. **I-90 Corridor Capacity:** Traffic analyses were conducted to assess the need for additional travel lanes along I-90, regional roadway network improvements, or other multimodal mobility enhancements to provide acceptable traffic operations and safety now and into the long-range future.
2. **Interchange Access:** The current interchange at Exit 63 provides only for movements to and from the west, not in compliance with current Federal Highway Administration (FHWA) policy requiring that service interchanges provide for all movements. The study investigates options to bring Exit 63 into compliance with FHWA policy.

The study area encompasses approximately 6 miles of I-90 and the areas on either side of I-90.

Study Process

The major elements that comprise the study include the Needs and Solutions Analyses, Public, Stakeholder and Agency Involvement and the Environmental Overview. These work elements proceeded along parallel paths throughout the project, culminating in the final selection of corridor-wide solutions.

Existing Conditions

To understand how the transportation system functions along the I-90 corridor between the Exit 61 and Exit 63 interchanges, the project team performed an inventory of the existing transportation system. This inventory included the following elements:

- ▶ I-90 geometric conditions
- ▶ Traffic conditions, including current traffic volumes, Ellsworth Air Force Base (AFB) travel patterns, and freeway and intersection operations
- ▶ Crash experience
- ▶ Intelligent Transportation Systems (ITS) inventory of locations and types of devices

The following sections provide an overview of existing traffic conditions in the study area:

Traffic Volumes and Operations

Recorded traffic volumes along I-90 and surface street intersections are currently within capacity throughout most of the study area. I-90 traffic volumes in the study area range between 8,000 and 33,000 vehicles per day (vpd), which result in Level of Service (LOS) A and LOS B conditions. Intersections and turn movements at intersections generally operate at LOS D or better during the peak hours. The Elk Vale Road interchange operates at a LOS C during the peak hours but eastbound to southbound turn movement does experience higher delay than other turn movements at the intersection. At the Elk Vale Road / S. Service Road intersection, turn movements to Elk Vale Road do experience LOS F conditions in the peak hours. The County Highway 1416 intersections with Radar Hill Road and Ellsworth Road show

LOS F conditions for the northbound approaches as northbound vehicles attempt to turn left to westbound County Highway 1416.

Traffic Safety

A traffic safety analysis of crash data between 2011 and 2015 was conducted at the study intersections and along the I-90 corridor. Over this period there were just under 100 crashes reported along the I-90 corridor and more than half of these crashes involved a fixed object. A safety performance analysis of I-90 crashes did not show any crash patterns that deviated significantly from the norm. However, the crash analysis did show a relatively high number of off-road and over-turning crashes along the Exit 63 westbound on-ramp of which about two-thirds occurred during poor roadway surface conditions.

A few intersections within the study limits did show crash patterns. These intersections are:

- ▶ County Highway 1416 / Radar Hill Road – Of the 46 crashes at this intersection, the predominant crash type (74 percent) were angle crashes.
- ▶ County Highway 1416 / Commercial Gate Road – Of the 18 recorded crashes at this intersection, nine (50 percent) were angle crashes.
- ▶ Elk Vale Road / S. I-90 Service Road – Only eleven crashes were recorded at this intersection but eight were angle crashes.

ITS Infrastructure

The existing ITS infrastructure in the study area consists of dynamic message signs (DMS), road weather information systems (RWIS), an automated traffic recorder (ATR), cameras, and road closure gates. Limitations of the current ITS infrastructure to address current needs include:

- ▶ The need for personnel to manually operate road closure gates/flashers
- ▶ Limited remote detection of roadway conditions, hampering the ability for emergency responders to reach incidents and/or maintenance forces to address concerns
- ▶ Multiple communications paths for ITS devices
- ▶ Closed-circuit television (CCTV) only supplying still images
- ▶ Lack of unified control interface for devices/cameras

Environmental

An environmental overview was completed for the study area with a focus on the immediate vicinity of the mainline I-90 alignment. The resources reviewed, findings and next steps associated with future projects are outlined in **Table ES-1**.

Table ES- 1. Environmental Overview Results

Resource	Findings	Next Steps for Project Implementation
Floodplains	Main floodways associated with Box Elder Creek, designated as 100-year floodplain	Provide relevant documentation associated with any project efforts. Conduct floodplain modeling as needed.

Table ES- I. Environmental Overview Results

Resource	Findings	Next Steps for Project Implementation
Historic Resources	70 properties identified as potentially historic.	Sites should be evaluated further for National Register Eligibility. Project designs should seek ways to avoid or minimize impacts.
Hazardous Materials	Multiple potential hazardous materials sites based on U.S. Environmental Protection Agency (EPA) information. Exit 61 shows higher concentration of potential sites.	Any projects must abide by hazardous waste handling regulations.
Wetlands	Numerous wetlands identified in the study area of varying quality.	Wetland delineation should occur to ensure accurate identification of wetlands – leading to necessary permitting and mitigation. This can be time consuming.
Wildlife/Threatened and Endangered	Area habitat consistent with several species, particularly wetlands, streams, ponds, ditches and other drainages. No migratory bird nests noted on field visit.	Detailed survey would need to be conducted for recommended species.
Section 4(f)	Two park properties were identified as Section 4(f) resources.	The next steps of the Section 4(f) process require evaluations of publicly owned parks, trails, and open space lands to be conducted to determine if there are any impacted properties that qualify for protection under Section 4(f).
Section 6(f)	According to the South Dakota Department of Transportation (SDDOT) information, two 6(f) properties are located within or adjacent to the environmental study area.	For Section 6(f) properties located in the areas of the improvements, alternatives should be designed to avoid a conversion of these properties. If a conversion of land cannot be avoided, efforts will be made to mitigate effects to these properties.
Noise	Numerous noise sensitive areas exist within the study area, some of which are located within Ellsworth AFB noise areas.	A full evaluation of traffic noise following the Guidelines (Figure 1) will likely need to occur later in the project development process because some improvement(s) ultimately recommended through the corridor study likely will be “Type I” and require a traffic noise analysis. Depending on project location, coordination with Ellsworth AFB may be required.

Table ES- I. Environmental Overview Results

Resource	Findings	Next Steps for Project Implementation
Environmental Justice	Approximately one-half of the study area includes minority population concentrations that exceed 16.4 percent. Low income threshold of 17 percent exceeded in all but one census block group in the area.	Evaluations of impacts to low income and minority populations would be necessary.

Cumulative impacts were evaluated using a 5-step process by which geographic and temporal limits were identified, future actions considered, and resources affected. Findings of the analysis indicate that it is not anticipated that recommended actions proceeding from the corridor study would substantially contribute to cumulative impacts.

Year 2045 No Action Conditions

To understand future transportation needs, Year 2045 traffic projections were developed using Rapid City Area Metropolitan Planning Organization (RCAMPO) land use forecasts and the travel demand model. Over the next 20 to 30 years, households in the study area are expected to increase by more than double and employment is expected to increase by a factor of 3.6.

Traffic Forecasts

Year 2045 traffic forecasts and the associated traffic volume growth factors developed using the regional travel demand model showed 29-year growth factors ranging from roughly 1.4 to 2.9. Overall, significant growth is expected throughout the study area. Higher growth rates are anticipated along the Elk Vale Road and Liberty Boulevard corridors. Slower growth is expected along I-90 and County Highway 1416.

Traffic Operations

Current I-90 capacity is sufficient to accommodate the expected growth in traffic. Both mainline and ramp/merge segments east and west of Exit 61 are expected to operate at LOS C during peak hours. East of Exit 63, interstate operations are LOS B or better. Anticipated growth will cause some operational issues by Year 2045 at intersections along Elk Vale Road and along County Highway 1416. The intersections with anticipated operational issues include:

- ▶ Elk Vale Road / I-90 Ramp Terminal
- ▶ Elk Vale Road / South I-90 Service Road
- ▶ Elk Vale Road / Mall Drive
- ▶ County Highway 1416 / Radar Hill Road
- ▶ County Highway 1416 / Ellsworth Road

Operational improvement strategies for consideration at these locations include traffic control changes, lane additions, and consolidation of closely spaced intersections.

Solutions

Project Solutions Process

In response to transportation deficiencies and project needs, the Study Advisory Team (SAT) developed a comprehensive list of corridor solutions and categorized these into the following groups:

- ▶ **I-90 Mainline:** SDDOT plans to reconstruct the pavement of I-90 between Exit 61 and Exit 63 by the year 2023. Solutions were based on the need to evaluate different approaches to the pavement reconstruction effort to accommodate the potential for widening between Exit 61 and Exit 63.
- ▶ **Exit 63 Reconstruction:** The current Exit 63 interchange is not a full movement interchange. Interchange alternatives were developed for consideration based on the basic need to provide full movement access at Exit 63 to I-90, either at the existing Exit 63 location or at a nearby cross street.
- ▶ **ITS Components:** Various ITS devices exist in the I-90 corridor. Solutions focused on enhancing this existing system and to address safety issues in the corridor.
- ▶ **Other Projects:** Based on Year 2045 traffic volumes, there will be other deficiencies in the transportation system. Other project solutions are traffic control and capacity improvements at intersections to mitigate these future deficiencies.
- ▶ **External Scenarios:** These are new roadway connections and network enhancements that are independent of solutions in the other groups of solutions but, if implemented, would impact traffic operations along I-90 and at study intersections.

Exit 63 Alternatives and Screening

The focus for Exit 63 was to evaluate different interchange alternatives that provided full movements to and from I-90. To evaluate the feasibility and performance of the interchange alternatives, a set of screening criteria were established along these key core values.

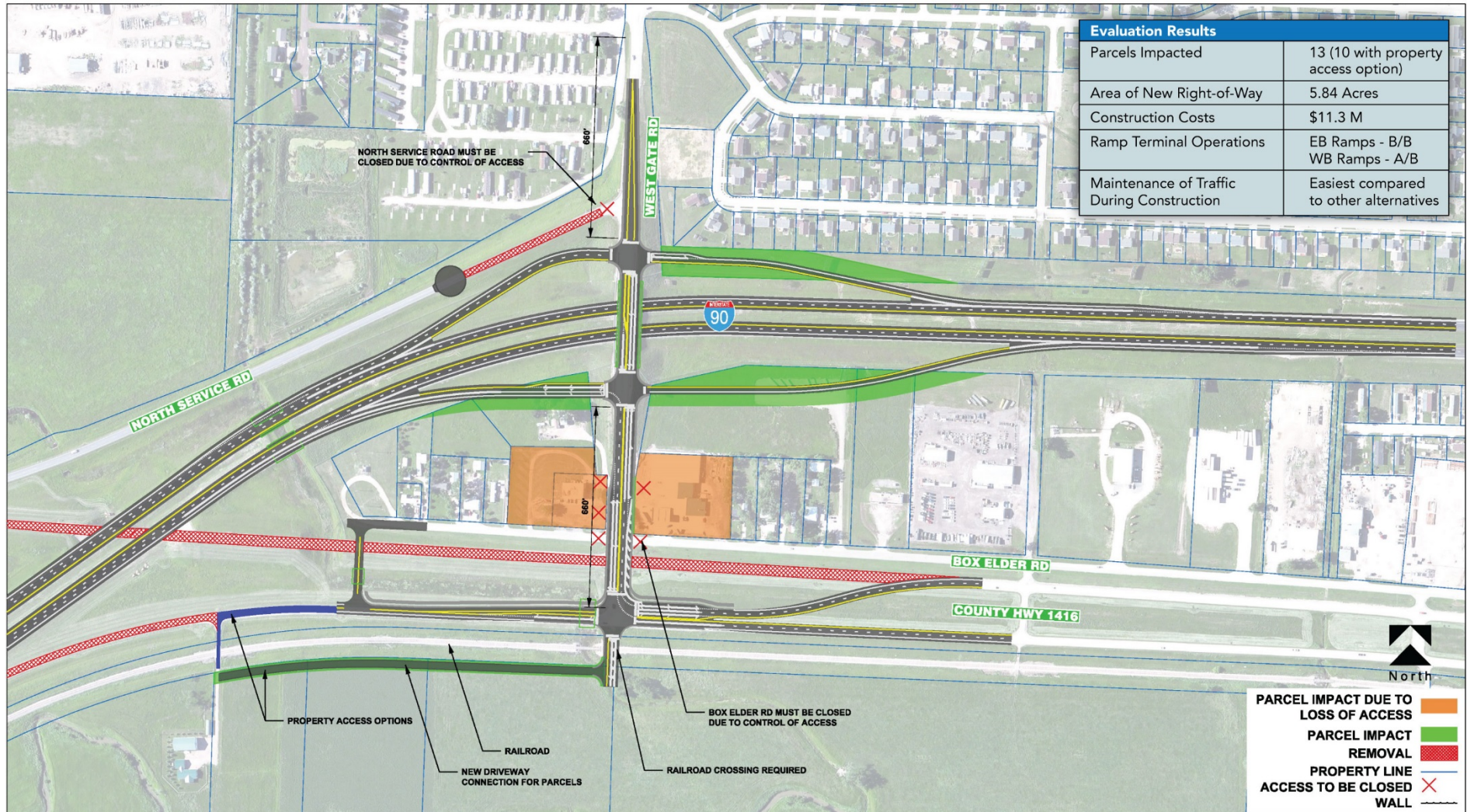
- ▶ Ellsworth AFB impacts
- ▶ Physical impacts
- ▶ Compatibility with Existing Plans
- ▶ Construction Phasing and Implementation
- ▶ Design Criteria
- ▶ Public Comment

Eleven initial alternatives were developed for reconstruction of the Exit 63 interchange. These alternatives are shown in **Appendix G** and are grouped around these cross streets with I-90 – West Gate Road, County Highway 1416, Radar Hill Road, Commercial Gate Road, and Bennett Road. Using screening criteria through two rounds of screening, these eleven alternatives were narrowed to two feasible scenarios. These two scenarios are described in the following sections.

Feasible Option I: Alternative #1 - Westgate Diamond

The conceptual design of Feasible Option I is shown on **Figure ES-1**. This scenario scored well for driver expectancy because of its diamond configuration, constructability as it could be largely constructed off-line, and implementation as it had the lowest cost.

Figure ES-1. Feasible Option I: Westgate Road Diamond Interchange



Feasible Option 2: Alternative #4 - County Highway 1416 Diamond

The second feasible option is Alternative 4, which is the extension of County Highway 1416 over I-90 to a new diamond interchange. The SAT also requested that for Alternative 4, a diverging diamond interchange (DDI) be evaluated.

The conceptual design of Feasible Option 2 is shown on **Figure ES-2**. The primary reasons Feasible Option 2 was advanced were due to high driver expectancy, fewer property impacts, meeting of design criteria and control of access standards, and positive public feedback.

I-90 Corridor Solutions

Several key findings were discovered when evaluating options for the future widening of I-90. These findings were:

- ▶ Year 2045 traffic volumes did not warrant the need for a six-lane I-90.
- ▶ The widening needed to match the existing lane alignment under the Elk Vale Road overpass.
- ▶ Due to the railroad right-of-way, it was best to have all widening occur to the north.
- ▶ The widening needed to utilize the existing bridges south of Exit 63.

Given these conditions and constraints, the proposed I-90 widening solution is auxiliary lanes between Exits 61 and 63. The widening would occur to the north but would avoid impacts or modifications to existing structures and the existing median width would be maintained. In terms of phasing, it is likely that the pavement rebuilding project of Year 2023 will not construct these auxiliary lanes but will put in place the grading needed to accommodate these new lanes.

Figure ES-3 illustrates the proposed widening through existing and proposed typical sections. Note the outside lane in both directions is the proposed auxiliary lane.

Figure ES-2. Feasible Option 2: County Highway 1416 Diamond Interchange

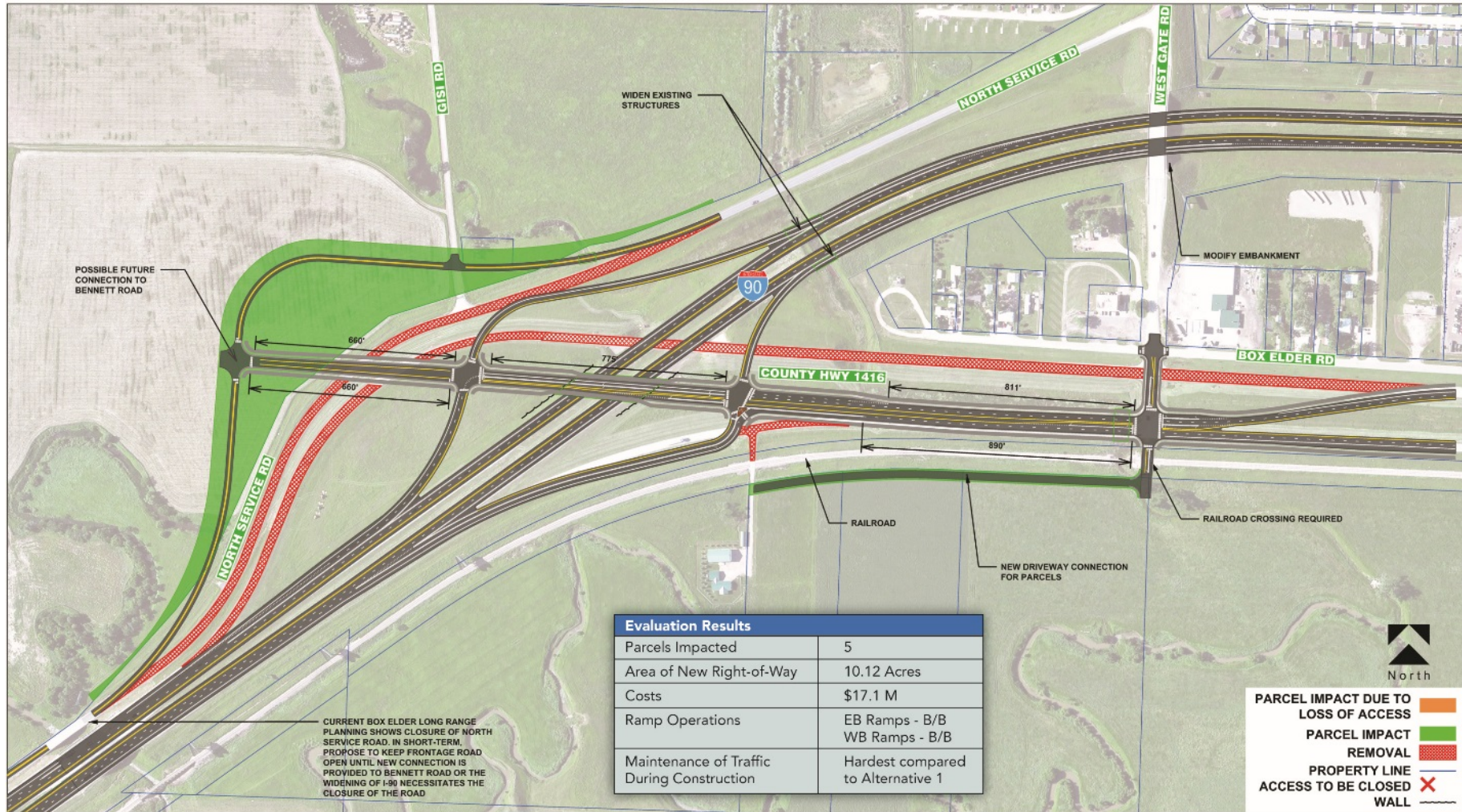
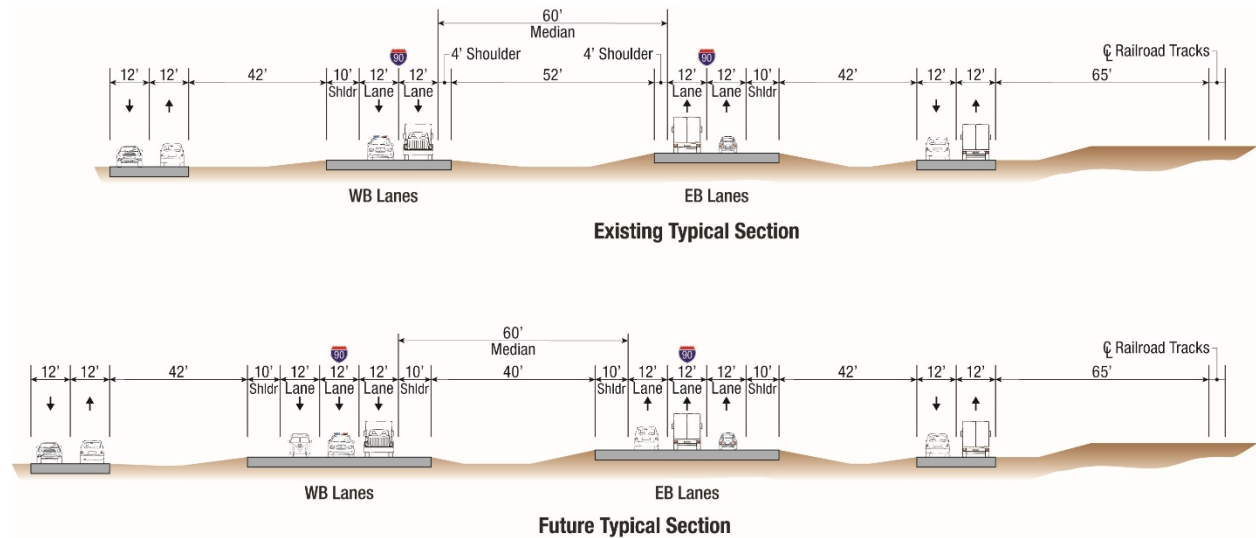


Figure ES-3. Existing and Proposed Typical Sections



ITS Solutions

Table ES-2 provides a listing of recommended ITS solutions for the study corridor. These solutions would offer a range of safety and operational benefits to I-90 and roadway network travel.

Table ES-2. ITS Solutions

ITS Solution		Description	Goal/Potential Benefits
1	Roadway condition warning/ anti-icing for existing WB Exit 63 on-ramp to I-90	Use sensors and signs and/or sprayers to reduce crash risk.	Improve safety
2	Intersection conflict warning for County Highway 1416 intersections	Use detection and flashers to alert drivers approaching conflicting traffic.	Improve safety
3	Remotely operated "intelligent" gates	Allows current manual closure gates to be operated remotely.	Improve safety and staff efficiency
4	Additional vehicle detection and surveillance on I-90	Allows data collection and monitoring of "trouble" spots, reducing response time and improving awareness.	Improve mobility and efficiency
5	Fiber optic "trunk" along I-90 to connect devices to unify communications	Enables reliable communications and full-motion video. Places all devices on one high performance network.	Improve mobility and efficiency
6	Control software to unify DMS, CCTV, detection and other operations	Enables monitoring, data collection and control from a single interface. Reduces training time and IT workload.	Improve efficiency
7	Variable speed limit (VSL) signs	Uses "hybrid" active signs to display speed limits that vary based on conditions.	Improves safety

Implementation Plan

The I-90 Exit 61 to Exit 67 Corridor Study provides:

- ▶ A recommended ultimate I-90 typical section and alignment to ensure that actions taken with the grading and surfacing project planned for the Year 2023 can be compatible with and advance the future ultimate plan for widening I-90 to provide six travel lanes.
- ▶ Feasible design options for reconstructing the Exit 63 interchange include the following:

Feasible Option	Description	Estimated Construction Cost
1	West Gate Road Diamond	\$11.3 M
2	County Highway 1416 Diamond	\$17.1 M
2a	County Highway 1416 Diverging Diamond	\$23.8 M

- ▶ ITS Strategies that address identified needs and offer opportunities to provide improved traffic operations and safety with a lower investment level than required for major infrastructure projects.

Figure ES-4 provides an overview of next steps related to each type of recommended action provided in the corridor study.

Figure ES-4. Implementation Steps

