Appendix A. Alternatives Analysis Summary and Preferred Alternative Analysis Memos

Alternatives Analysis Summary Memo

MEMORANDUM

DATE: December 3, 2019

SUBJECT: Steese Expressway/Johansen Expressway Interchange: Summary of Build Alternative Memos

The Alternatives Analysis Report for the Steese Expressway/Johansen Expressway Interchange project was completed in November 2018 and was presented to the public via several outlets, including an Open House (held December 6, 2018), an online survey that was open to the public from November 28, 2018 to January 4, 2019, and in one-on-one meetings with local businesses. The Alternatives Analysis Report compared 12 alternatives using screening criteria that had been developed with the project Steering Committee. Based on the results of the screening criteria analysis, as well as public comment, three build alternatives at the intersection were chosen to be included in the Environmental Assessment:

- Tight Diamond Interchange: The Tight Diamond Interchange will be grade separated with northbound and southbound traffic on the Steese Expressway crossing over the Johansen Expressway unimpeded. Movements along Johansen Expressway will be controlled by two signalized intersections located at the ramp terminals. (Figure 1)
- Diverging Diamond Interchange: The Diverging Diamond interchange will also grade separate Steese Expressway traffic over the Johansen Expressway, similar to the Tight Diamond, except that the ramp terminals will be controlled by two cross-over signalized intersections, allowing free-flow left and right turns at the ramp terminals. (Figure 2)
- Echelon Interchange: The Echelon Interchange consists of two grade separated signalized intersections, each one serving only one direction of traffic on the Steese Expressway and one direction of traffic on the Johansen Expressway. This allows high volume conflicting movements to travel through different intersections, providing more green time for all movements. (Figure 3)

In addition, the option to extend Farmers Loop Road Extension to connect Farmers Loop Road with the Johansen Expressway at Old Steese Highway is included in the Environmental Assessment. The new connection would offer traffic maintenance during construction, and would provide a secondary route in the case of an incident closing Steese Expressway that is expected to be lost with the closure of City Lights Boulevard. (Figure 4)

This memo summarizes additional design efforts and analyses completed to either address stakeholder concerns or provide information needed for the Environmental Assessment. This memo also reevaluates the three build alternatives against the screening criteria initially presented in the Alternatives Analysis Report.

Table 1 summarizes the alternative enhancements considered to address stakeholder concerns.

Table 1: Alternative Enhancement Matrix

Alternative Description	Enhancement Title	Enhancement Description	Advantages	Disadvantages	Incorporated?	Reason for Evaluating	See Discussion
All Interchanges	Bridge Clearance	Determine cost reasonable structure design height (18, 19, or 22-ft) for accommodating overheight traffic.	19-ft determined cost reasonable	22-ft cost prohibitive	Y	Trucking industry comment	on page 16
All Interchanges	Cemetery Internal Circulation	Resolve internal circulation issues at the Birch Hill Cemetery due to closure of City Lights Boulevard south of the northern entrance.	N/A	N/A	Y	Determine if curing ROW take impacts to the cemetery is feasible.	on page 15
All Interchanges	Dedicated Farmers Loop Ramp	Evaluate options to reduce weaving conflicts for traffic heading from Johansen Expressway to Farmers Loop Road.	Reduces weaving conflict for Farmers Loop bound Johansen traffic	Confusing to drivers, cost prohibitive, increases project footprint with no measurable capacity benefit	N	Public comment	on page 16
Diverging Diamond Interchange	City Lights Access	Provide continued City Lights Boulevard connection to Lazelle Road (one-way northbound).	Maintain current traffic pattern for regular users and emergency response time	Cemetery impacts, ramp weaving conflicts, cost	Y	Public comments, maintaining existing cemetery circulation	on page 11
Echelon Interchange	City Lights Access	Provide continued City Lights Boulevard connection to Lazelle Road.	Maintain current traffic pattern for regular users and emergency response time	Cemetery impacts	TBD	Public comments, maintaining existing cemetery circulation	on page 11
Echelon Interchange	D Street Connection	Evaluate options to provide access for properties using D Street for access to Lazelle Road.	Provides westbound access for D Street traffic, can accommodate future subdivision growth	Cost	Y	Minimize adverse traffic impacts to area properties	on page 11
Echelon Interchange	Echelon Swap	Reverse intersection legs on bridge structure (NB/WB elevated vs. SB/EB elevated)	Lowest cost, best car dealership visibility	Increased pedestrian crossing time	Y	Cost, visual impacts	on page 9
Tight Diamond Interchange	City Lights Access	Provide continued City Lights connection to Lazelle Road (one-way northbound).	Maintain current traffic pattern for regular users and emergency response time	Cemetery impacts, ramp weaving conflicts, cost	Y	Public comments, maintaining existing cemetery circulation	on page 11
Tight Diamond Interchange	Dual Lefts	Replace triple eastbound lefts with dual lefts at the Johansen/Steese Expressways ramp signal.	Familiar to local drivers	Will not meet required capacity needs	N	Public comment	on page 15
Tight Diamond Interchange	Roundabout Intersections	Replace signalized intersections with roundabouts.	Will meet capacity requirements without FTWW gate relocation traffic	Dual lane roundabouts required, will not meet capacity requirements if FTWW gate is relocated	N	Public comment	on page 15

Summary of Changes to Proposed Alternative Designs

Based on the additional design efforts and analyses, the following changes were made to the design for the three build alternatives prior to including them in the Environmental Assessment document:

- For all three interchange alternatives, the minimum bridge clearance was raised from 18 feet to 19 feet to accommodate overheight vehicles, due to comments from the freight community.
- In recognition of the urban nature of the project, and to reduce ROW impacts, the proposed typical section for the Farmers Loop Road Extension was narrowed from 12-foot lanes with 8-foot shoulders (40-foot paved) to 11-foot lanes with 4-foot shoulders (30-foot paved).
- For the Echelon alternative, the elevated and at-grade intersections were swapped, so that the intersection with the smaller footprint is carried on the elevated bridge.
- For the Echelon alternative, the eastbound approach is designed with a channelized right turn lane. (In the Alternatives Analysis Report, the eastbound right turns are accommodated with a through-and-right turn lane.)

Several options for maintaining a connection to City Lights Boulevard were considered for the various alternatives:

- One-way connection from the northbound on ramp to City Lights Boulevard (Tight Diamond or Diverging Diamond Interchange)
- Left-in-left-out connection to and from the eastbound departure lanes on Lazelle Road (traveling under the westbound approach lanes – Echelon Interchange only)

Traffic Control Considerations during Construction

An analysis of the surrounding road network during construction, based on proposed detour routes, indicated that travel times would increase by as much as 30 minutes during the heaviest traffic periods under detoured traffic and led to proposed mitigations to implement during construction. Proposed mitigations, include:

- Construct Farmers Loop Road Extension prior to any construction at the Steese Expressway/Johansen Expressway intersection. Consider installing a 100-foot long right turn lane on Farmers Loop Road Extension for vehicles turning right onto Farmers Loop Road.
- Do not construct improvements planned for Old Steese Highway at the same time as the Steese-Jo intersection improvements.
- Install a temporary signal at the Farmers Loop Road/Farmers Loop Road Extension intersection.
- Install a temporary signal at the Northside Boulevard/Harold Bentley Avenue intersection.
- Consider changes to lane assignments to provide more capacity for heavy detour movements at some intersections.
- Install flashing yellow arrow for permitted left turns at impacted signalized intersections. Flashing yellow arrow is already planned for some of these intersections.
- Adjust signal timing.

By making the proposed mitigations during construction, travel times would only be 5 to 10 more minutes than it takes under existing conditions.

Build Alternative Impacts Memos

These four memos (attached) provide a description of the concept designs for the three build alternatives proposed for the Environmental Assessment, as well as design considerations for comparing the alternatives, including traffic management and constructability, drainage, maintenance, visibility to the car dealership, and access to the Birch Hill Cemetery. The memos also present the preliminary bridge designs, impacts to right-of-way (ROW), and a rough order of magnitude cost estimate to construct the alternatives. The referenced figures show the proposed designs.

Memo	Design Alternative	See Figure
BAI1	Tight Diamond Interchange	Figure 1
BAI2	Diverging Diamond Interchange	Figure 2
BAI3	Echelon Interchange	Figure 3
BAI4	Old Steese to Farmers Loop Road Connection	Figure 4

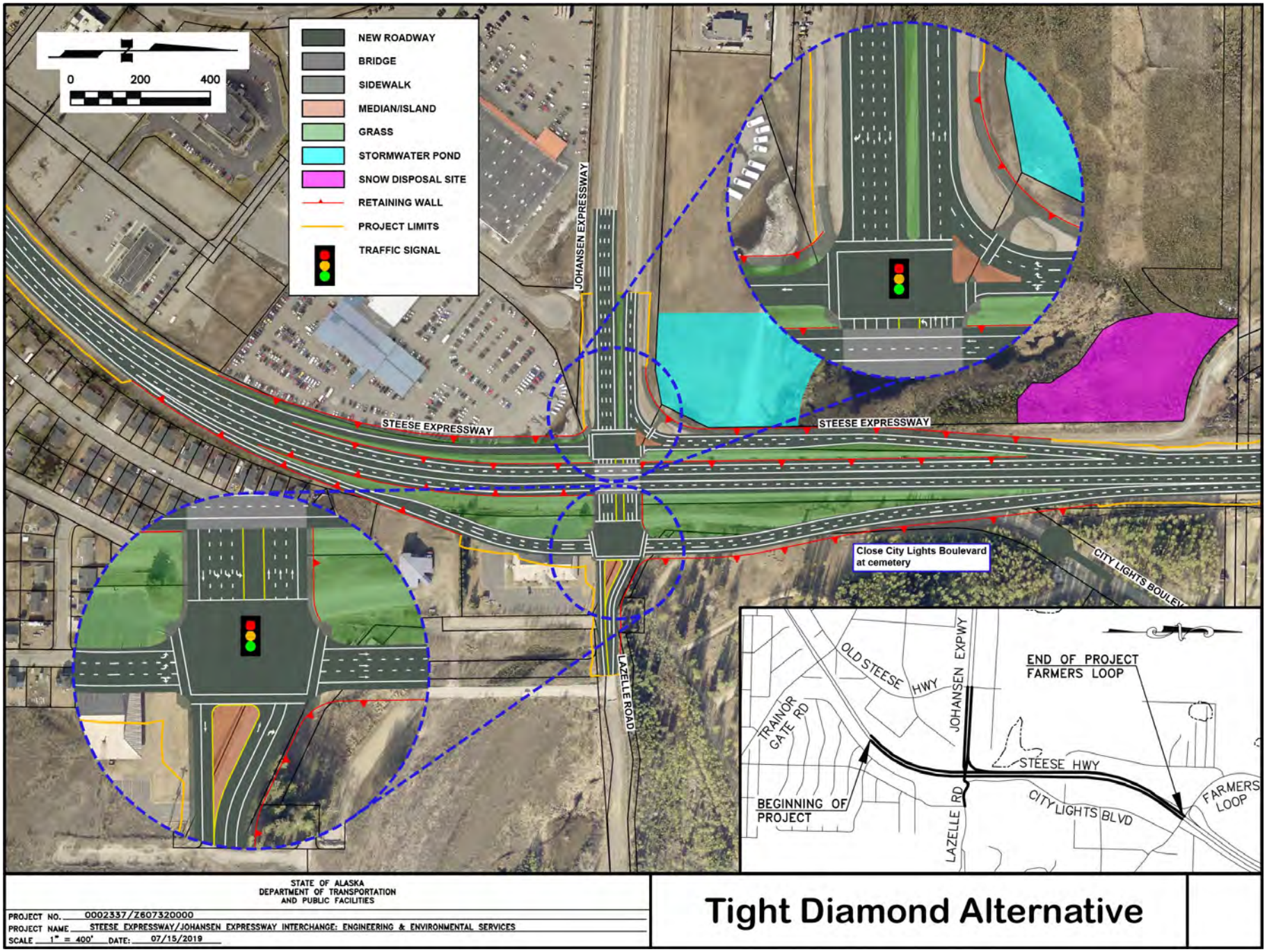


Figure 1: Tight Diamond Interchange Proposed Design

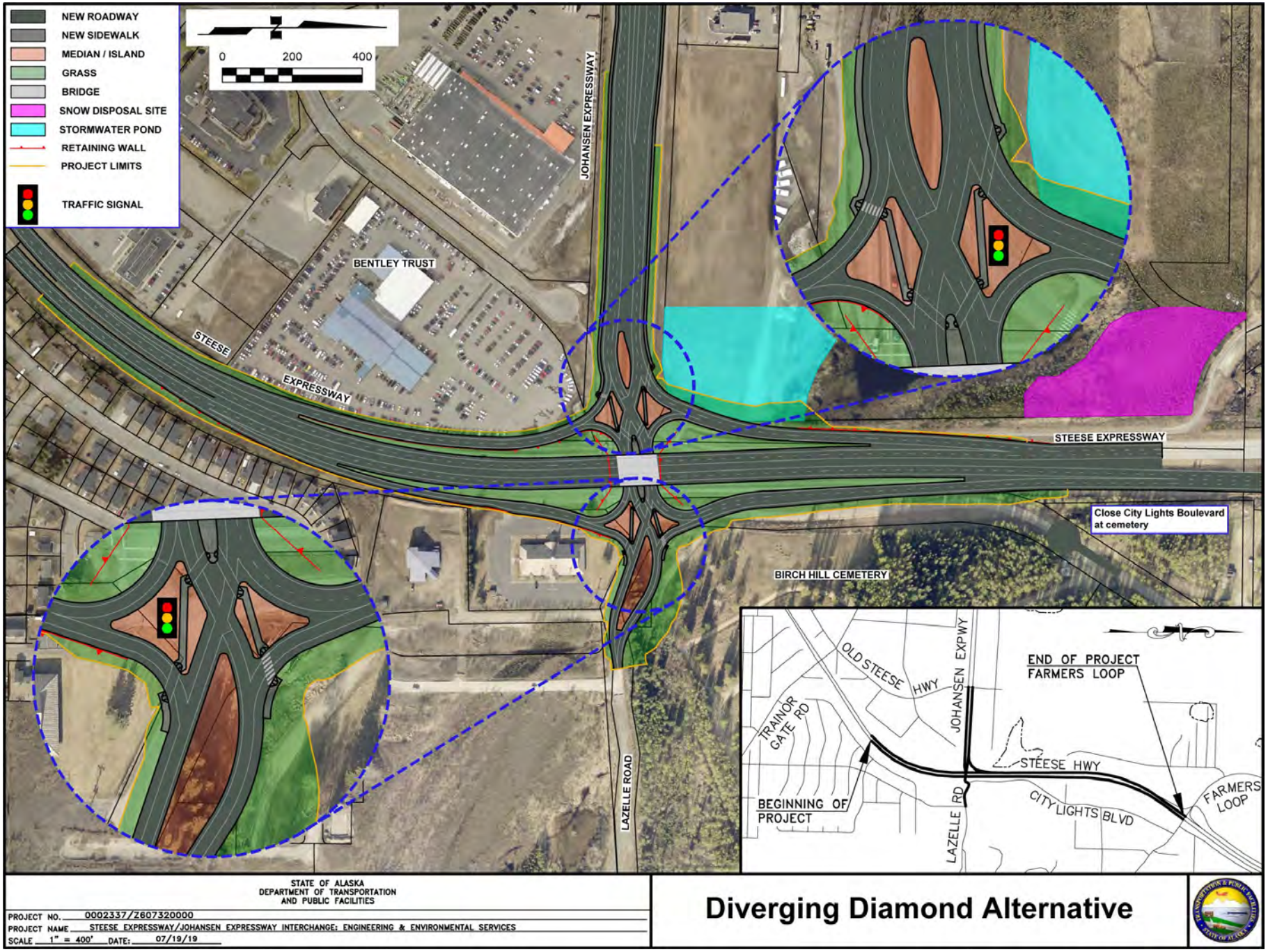


Figure 2: Diverging Diamond Interchange Proposed Design

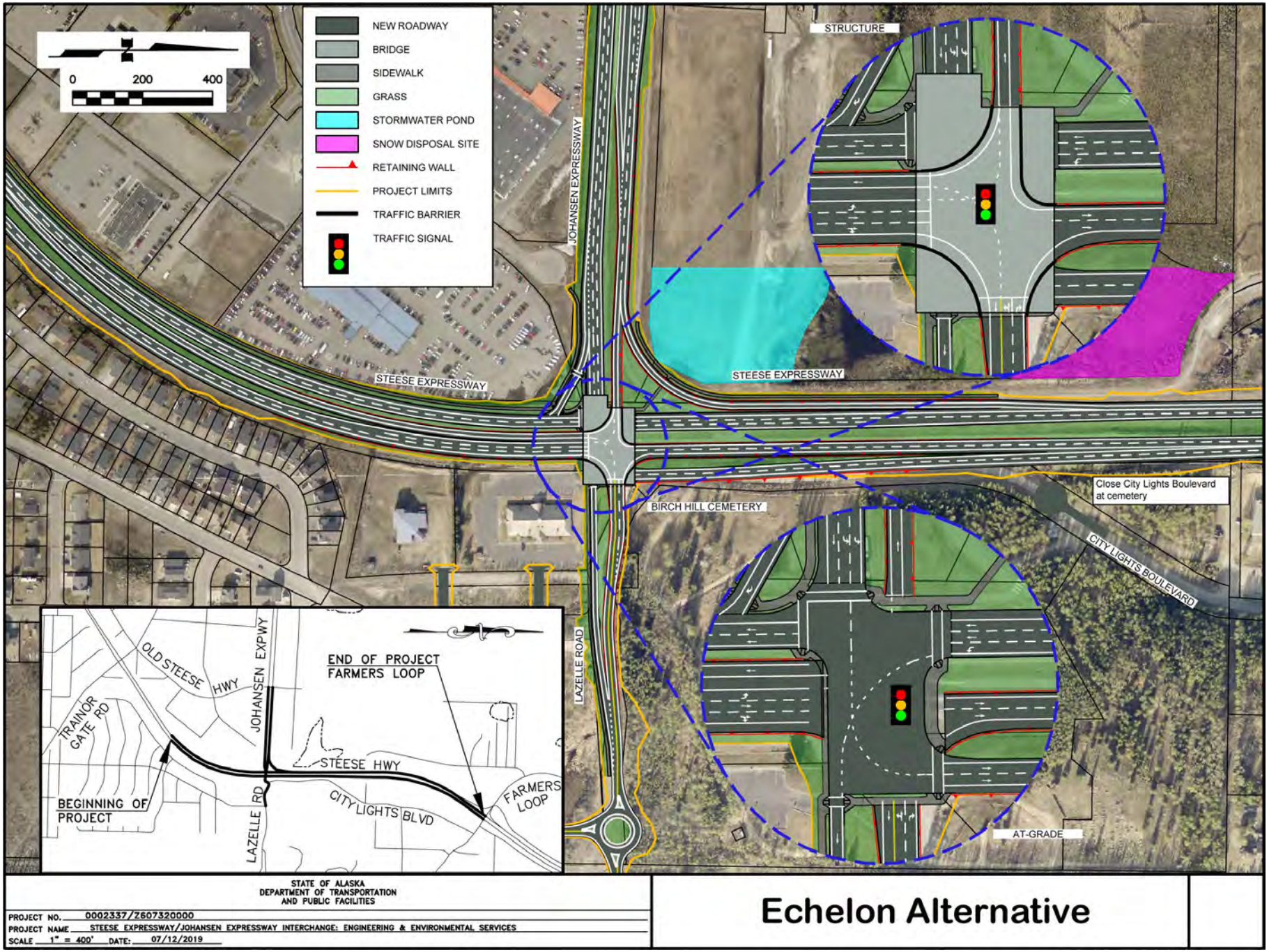


Figure 3: Echelon Interchange Proposed Design

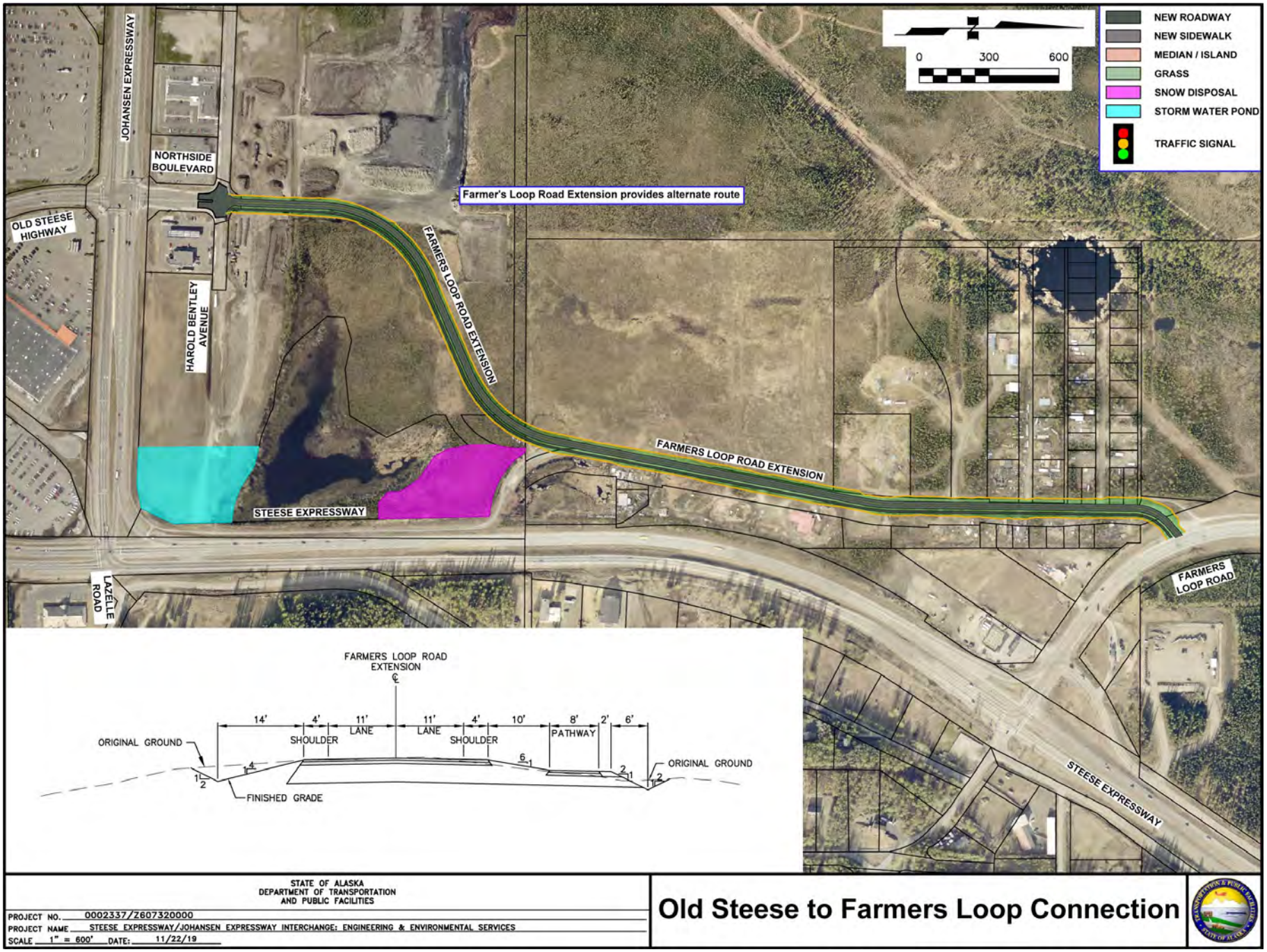


Figure 4: Old Steese to Farmers Loop Road Connection Proposed Design

Build Alternative Evaluations

Eight memos (attached) were written to evaluate different aspects of the design and operations and to document design changes that were made. Table 2 summarizes the memos and their respective considerations. A summary of each memo is provided in the following sections.

Table 2: Design Considerations and the Referencing Build Alternatives Evaluation Memo

Memo	Build Alternatives Evaluation	Design Considerations	See Figure
BAE1	Comparative Analysis of Echelon with westbound/northbound lanes at-grade versus southbound/eastbound lanes at-grade and optional at-grade channelized right turns	Echelon: Exchange lanes entering at-grade intersection and lanes entering elevated intersection	Figure 5
		Echelon: Added channelized at-grade eastbound right turn lane	
BAE2	Modifications to D Street realignment to address replat and future subdivision	Echelon: Lazelle Road U-turn roundabout and D Street subdivision connection	Figure 6
BAE3	City Lights Boulevard and Birch Hill Cemetery Access	Echelon: City Lights Boulevard access to Lazelle Road	Figure 6
		Tight Diamond and Diverging Diamond: One-way connection from northbound on-ramp to City Lights Boulevard	Figure 7
		All Interchanges: Changes to cemetery access roads	Figure 9
BAE4	Dual Left Turns and Roundabouts at the Tight Diamond Interchange Ramp Intersections	Tight Diamond: Intersection traffic control was not changed	Figure 10
BAE5	Bridge Clearance Options Analysis	Minimum bridge clearance changed from 18 feet to 19 feet	N/A
BAE6	Dedicated ramp from Johansen to Farmers Loop	Dedicated eastbound left turn ramp to Farmers Loop Road not recommended	Figure 11
BAE7	Constructability Review	All Interchanges are constructable.	Figure 12
BAE8	Construction Detour Traffic Impacts	Farmers Loop Road Extension: Consider constructing 100-foot long northbound right turn lane.	Figure 13 through Figure 15

Echelon Interchange – Exchange at-grade and elevated intersections (see BAE1)

Figure 5 compares the Echelon design from the Alternatives Analysis Report and the proposed Echelon design for the Environmental Assessment. The design for the Echelon Interchange initially shows the intersection of the eastbound and southbound approaches elevated on a bridge, with the intersection of the westbound and northbound approaches at-grade. The BAE1 memo analyzes the Echelon with the eastbound-southbound intersection at-grade and westbound-northbound intersection elevated on a bridge structure. The memo compares the vehicle and pedestrian operations for both configurations. Because the westbound-northbound intersection has a smaller footprint, the bridge structure is smaller when the westbound-northbound intersection is elevated. While vehicle and pedestrian delay is not the same for both configurations, the delay is similar. Therefore, the changed configuration is recommended for the design shown in the Environmental Assessment.

Echelon Interchange – Channelized at-grade right turns (see BAE1)

For the Echelon Interchange design in the Alternatives Analysis Report, the right turn movements are accommodated in shared through-and-right lanes. (Except for the heavy southbound right turn movement, which is accommodated as a free right turn movement.) While the report indicates that the right turn volumes for these movements could be accommodated by the shared through-and-right design, the BAE1 memo looks at the operational benefit and design impacts of building separate right turn lanes for the westbound, northbound, and eastbound right turn movement. Based on the analysis, the eastbound right turn is recommended as a separated right turn channelized at-grade lane under yield control. This would provide increased capacity at the eastbound signal; pedestrians would cross the turn lane with acceptable delay (< 5 seconds per pedestrian); and minimal additional ROW would be needed. However, due to ROW impacts, separated channelized right turn lanes for the northbound and westbound movements are not recommended.

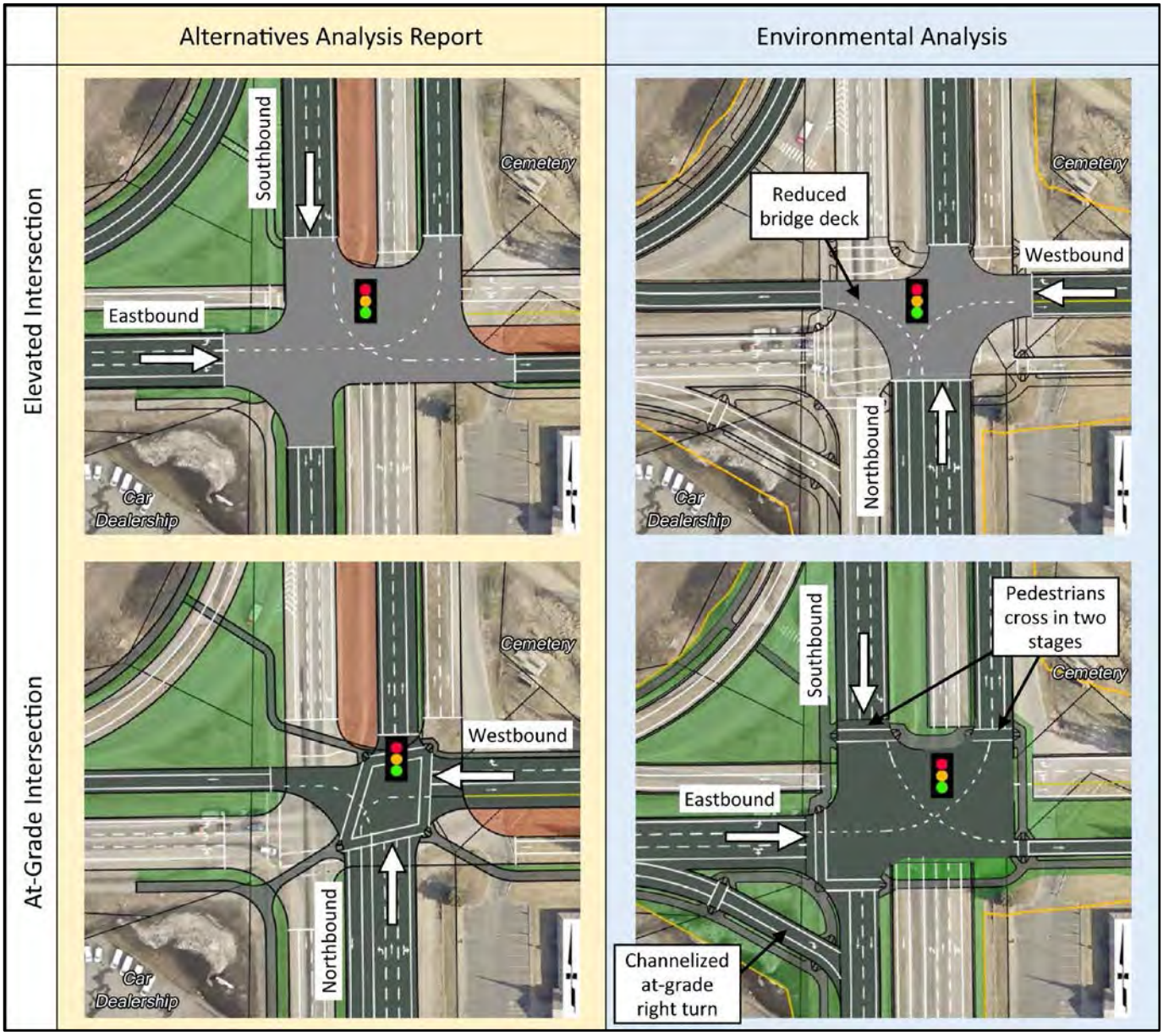


Figure 5: Changes in Echelon Design from Alternatives Analysis Report to Environmental Assessment Document

Echelon Interchange – U-turn roundabout and D St Subdivision (see BAE2)

Figure 6 shows the Lazelle Road leg of the Echelon Interchange. Under this alternative, the westbound approach lanes of Lazelle Road are elevated and the eastbound departure lane is at-grade. This limits vehicle movements at driveways or side streets to right-in-right-out (or left-in-left-out) only. A roundabout on Lazelle Road would allow U-turn movements, providing for additional movements like accessing the Steese Expressway/Johansen Expressway echelon from the churches through a right turn followed by a U-turn. The memo analyzes a U-turn roundabout along Lazelle Road, as well as another option to connect the roundabout to a platted road in the Lazelle Estates Subdivision. Both roundabouts operated similarly with less than 10 seconds of delay per vehicle in the PM peak (the highest volume time period). A roundabout is recommended as part of the Echelon alternative, including a connection to the Lazelle Estates Subdivision. Figure 6 shows the proposed roundabout design.

Figure 6: Design Options for Lazelle Road and City Lights Boulevard with Echelon Alternative

Access to City Lights Boulevard (see BAE3)

Under the Echelon alternative, City Lights Boulevard could be brought under the elevated westbound lanes on Lazelle Road and connect to the eastbound departure lane, allowing left-in-left-out movements only (see Figure 6). Because the Echelon alternative expands the Steese Highway footprint to the east, a section of City Lights Boulevard would have to be reconstructed and there would be impacts to the cemetery's winter storage building. Additionally, the new road would either impact 500 feet of electrical transmission line or several gravesites. Plan and profile concept design for this option can be found in the BAE3 memo.

Under the Tight Diamond or Diverging Diamond alternatives, access to City Lights Boulevard is only feasible as a one-way ramp from the northbound Steese Expressway on-ramp to City Lights Boulevard. This is because the signalized intersection for the northbound off- and on-ramps overlaps City Lights Boulevard in its existing location and the steep slopes in the northeast quadrant make it impractical to move City Lights Boulevard far enough east to be outside of the proposed footprint. Figure 7 shows the potential one-way access ramp to City Lights Boulevard for each of these alternatives. A one-way access ramp is also possible for the Echelon

interchange, shown in Figure 8. Note that for the Diverging Diamond and Echelon alternatives, only eastbound, westbound, and southbound traffic can access this ramp.

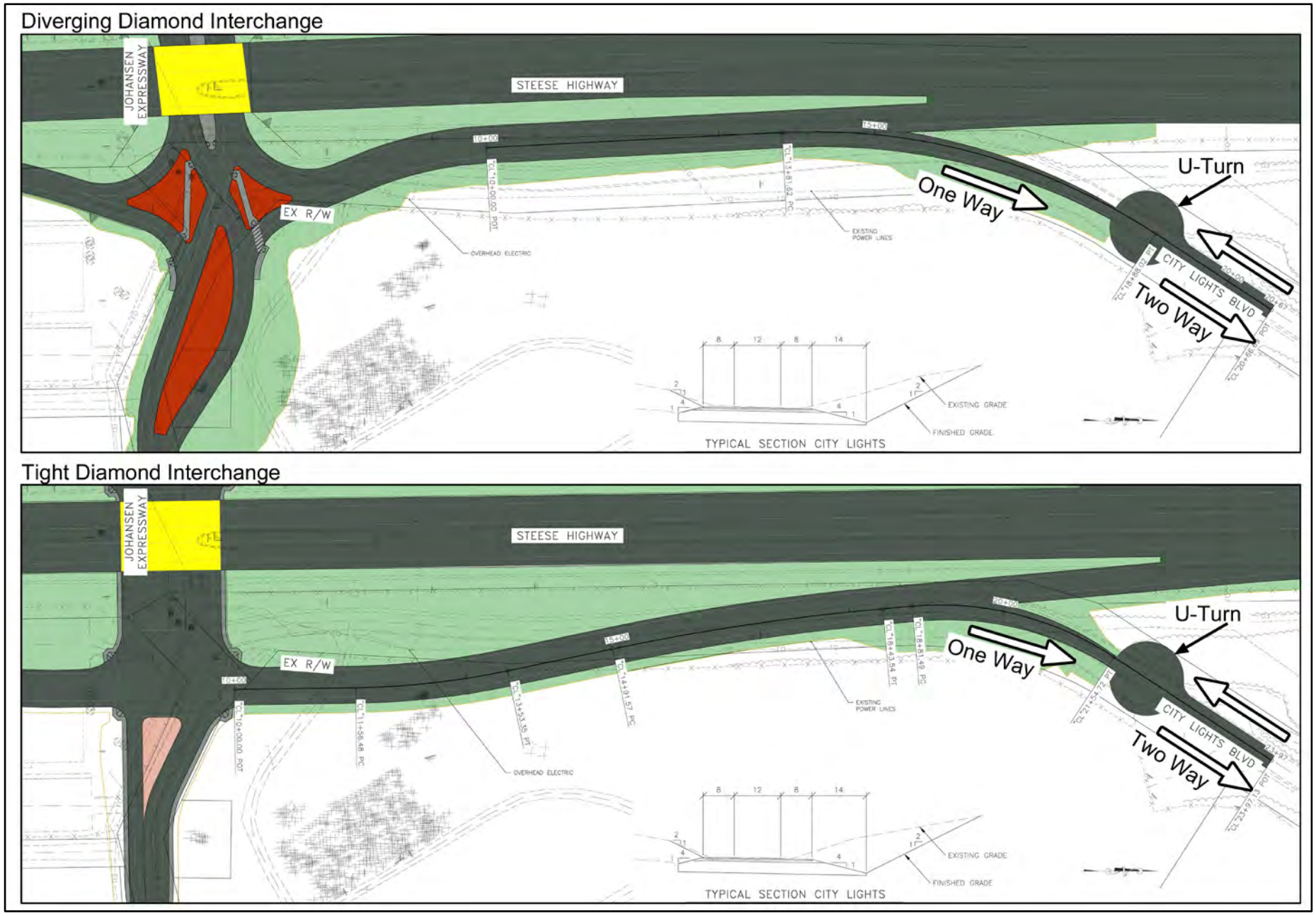


Figure 7: Design Options for City Lights Boulevard with Diverging Diamond and Tight Diamond Alternatives

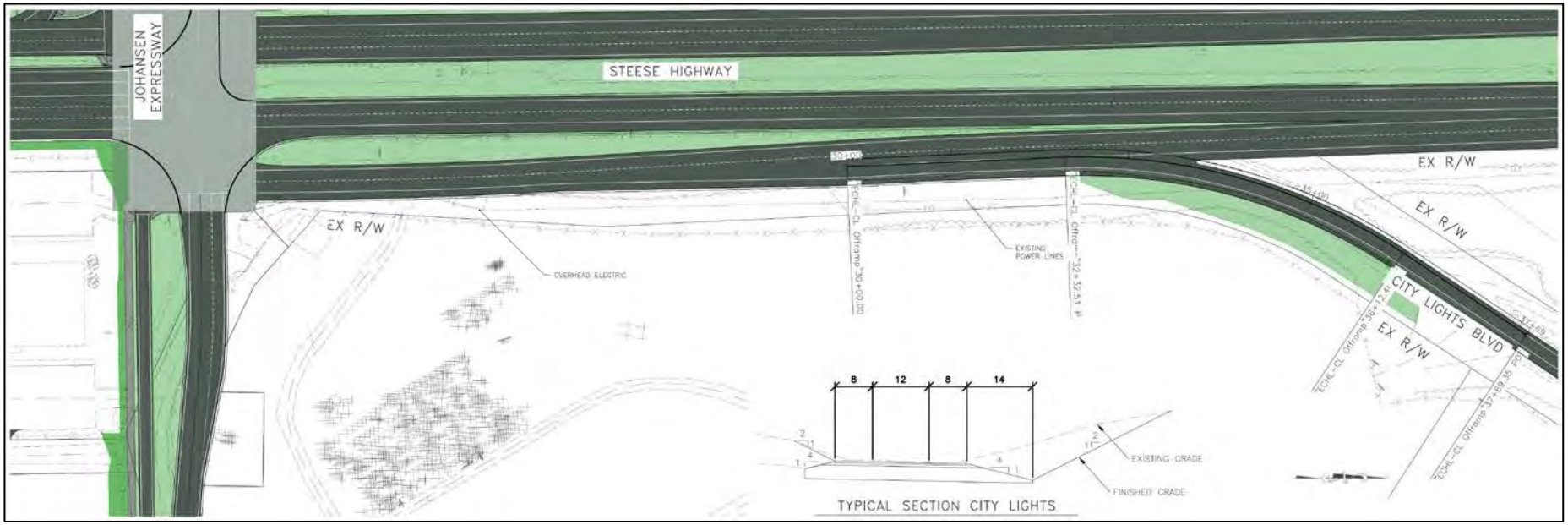


Figure 8: Potential Northbound Off-Ramp to City Lights Boulevard for Echelon Alternative

Access to Birch Hill Cemetery (see BAE3)

If City Lights Boulevard is terminated near the north access point to the Birch Hill Cemetery, the existing south driveway of the cemetery could be connected to City Lights Boulevard at the terminus through a new roadway built east of the existing City Lights Boulevard ROW. Figure 9 shows this potential access roadway. If, under the Echelon alternative, the proposed left-in-left-out access from City Lights Boulevard to the eastbound lane of Lazelle Road is built, then this connection would not be possible.

For all alternatives, internal circulation changes at the cemetery could allow the existing north entrance driveway to handle all vehicles entering and exiting the cemetery.

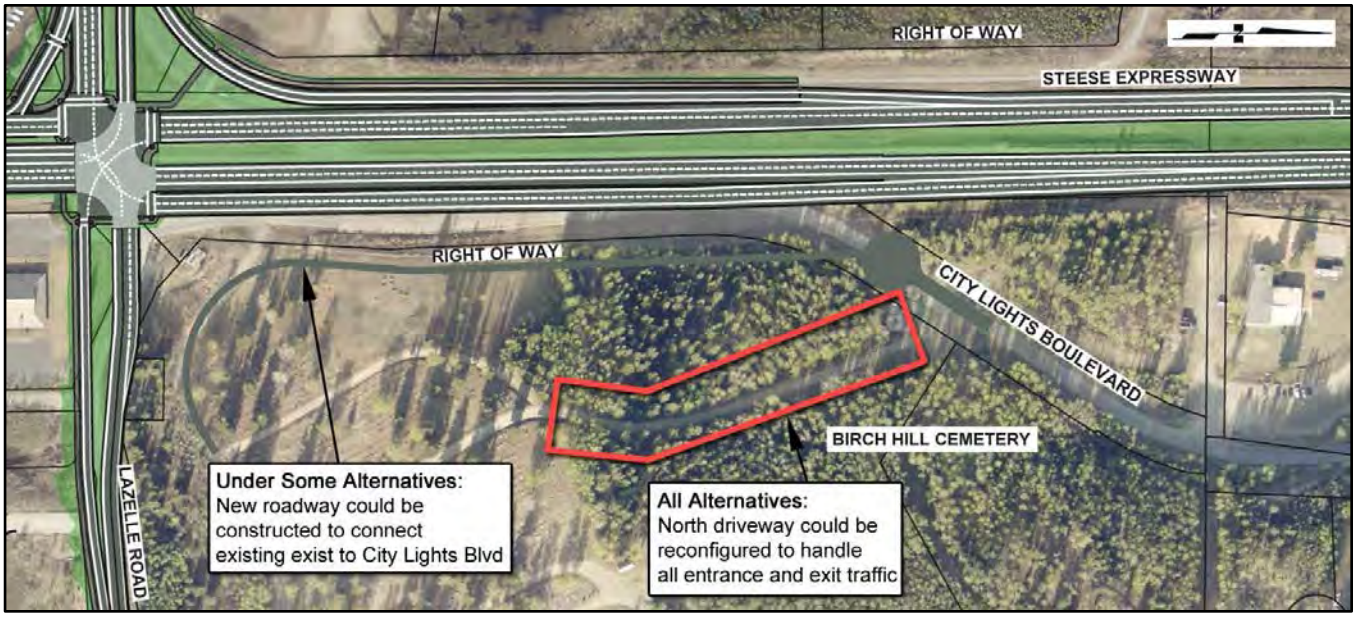


Figure 9: Cemetery Access Options

Tight Diamond Interchange – Intersection traffic control (see BAE4)

The Alternatives Analysis Report proposed three eastbound left turn lanes to head north on the Steese Expressway at the northbound ramp intersection of the Tight Diamond Interchange. Two other options for lane configuration or traffic control at this ramp intersection were considered: dual left turn lanes and roundabouts. Figure 10 shows the lane configurations that were analyzed. The analysis shows that triple left turns is the only configuration that works acceptably without additional ROW and traffic delay impacts; therefore, no changes were made to the design of this alternative as a result of this analysis.

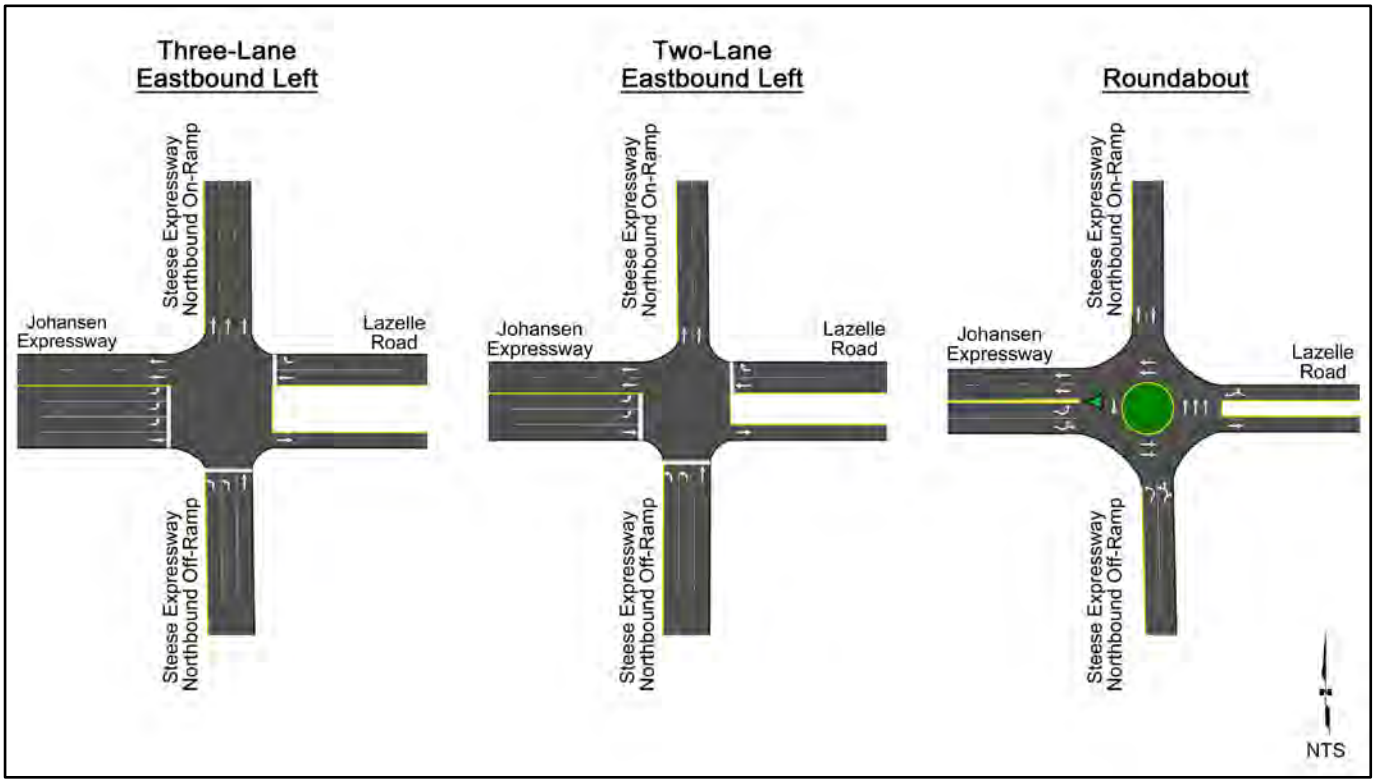


Figure 10: Lane Configurations Considered for Steese Expressway Northbound Ramp Intersection for Tight Diamond Alternative

Minimum Bridge Clearance (see BAE5)

The proposed vertical bridge clearance for the interchanges is 18 feet for the Alternatives Analysis Report. Memo BAE5 looks at the impacts of taller bridge clearance heights to account for oversize freight vehicles traveling through the intersection. Both 19-foot minimum clearance and 21-foot minimum clearance were considered. As a result of this analysis, the minimum bridge clearance for the presentation of the alternatives in the Environmental Assessment is 19 feet. This will provide for oversized vehicles traveling north of Fairbanks, at an additional cost of approximately $215,000.

Dedicated Eastbound Left Turn Ramp to Farmers Loop Road (see BAE6)

The interchange alternatives all have northbound ramps from the Johansen Expressway entering Steese Expressway from the right side. Drivers desiring to turn left at Farmers Loop Road would have to make multiple lane changes in order to enter the left turn lanes at Farmers Loop Road. Three ramp entrance scenarios were analyzed and compared to determine the optimal ramp entrance location: right ramp entrance, left ramp entrance, and a split ramp entrance (see Figure 11). The split ramp entrance would provide a ramp dedicated to vehicles from Johansen Expressway turning left at Farmers Loop Road. Although the split ramp configuration has the least number of lane changes of the three alternatives, it is not recommended because all three alternatives have similar capacity and the split ramp has additional ROW impacts. The left ramp entrance is not recommended because it requires the greatest number of lane changes. Based on this analysis, no changes were made to how vehicles entered Steese Expressway.

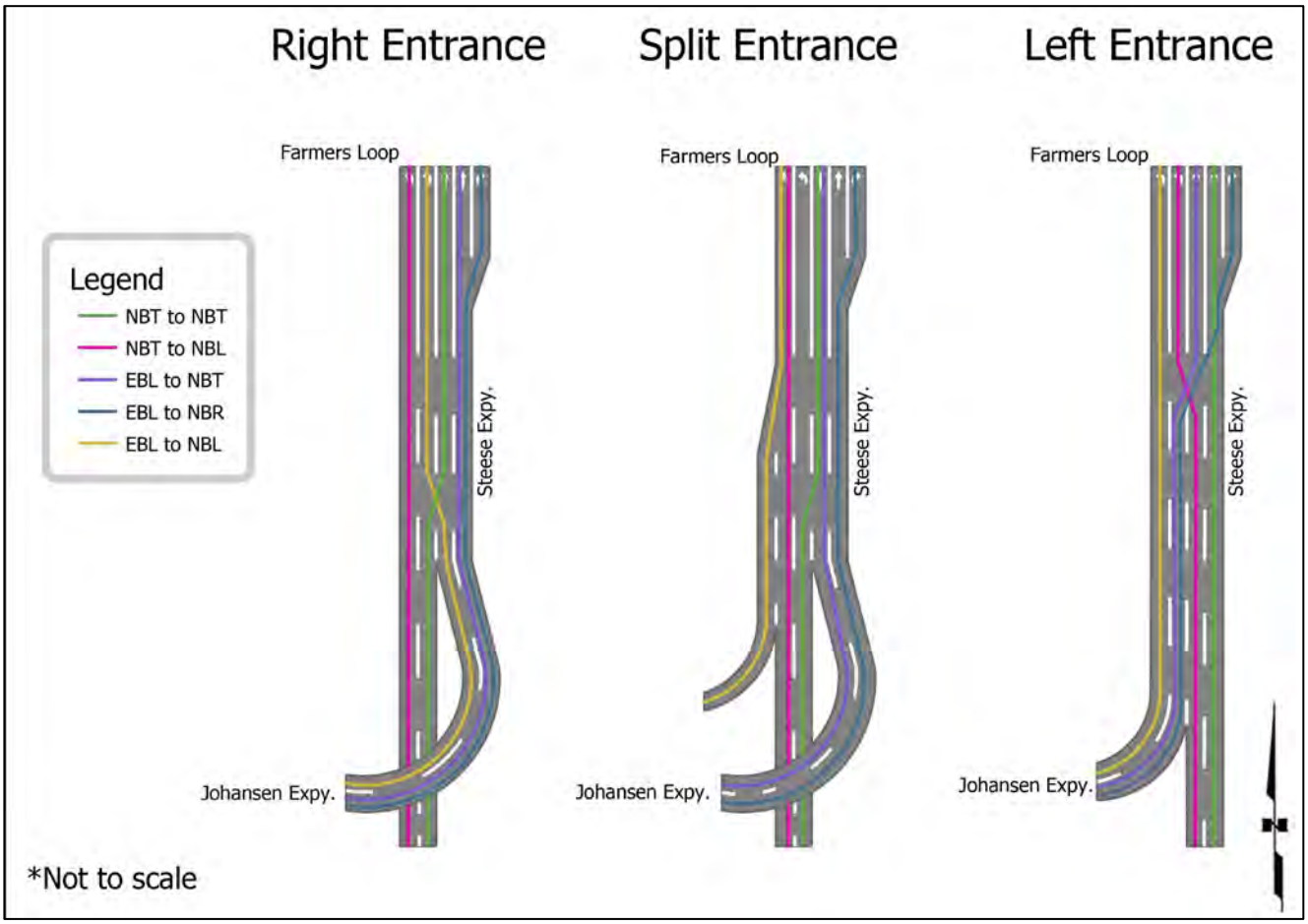


Figure 11. Lane Entrance Types and Depiction of Mandatory Lane Changes

Constructability (see BAE7)

The BAI memos were reviewed for constructability in four general categories: detour traffic, storage yard, construction impacted properties, and the project construction of the individual alternatives.

Figure 12 shows the proposed closures, detours, and storage yard sites during construction. These are the same for each of the three alternatives.

Detour Traffic: The memo describes suggested traffic control and detours to divert traffic from the Steese-Jo intersection, understanding that the intersection will need to be generally open during construction. The Farmers Loop Road Extension connection would help divert traffic away from the intersection during construction. Closing Lazelle Road (diverting traffic to Trainor Gate Road) and encouraging northbound left turn traffic to use College Road will also remove traffic from the intersection. This would help control traffic through the construction zone and facilitate construction activities.

Storage Yard: The most favorable location for a potential staging yard is the undeveloped lots east of the Church of Jesus Christ of Latter-day Saints and the Shannon Park Baptist Church because it is close to the intersection, is out of the way of the majority of traffic, and can be used for offices, a fabrication yard, and a staging yard. Other potential areas include the undeveloped area northwest of the intersection and the area north of the wetland conservation area. The location of the yards is crucial, as yards outside the immediate area of the intersection would require longer travel time for materials, labor and management, which would slow down production and increase costs.

Construction Impacted Properties: The car dealership, churches, and cemetery are expected to be impacted by construction operations. Traffic construction easements (TCE) will be needed on north and east sides of the car dealership. The churches and cemetery will be impacted by the closure of Lazelle Road and potential TCEs; concerns are expected from church and cemetery personnel.

Comments on individual alternatives are summarized in the BAI memos.

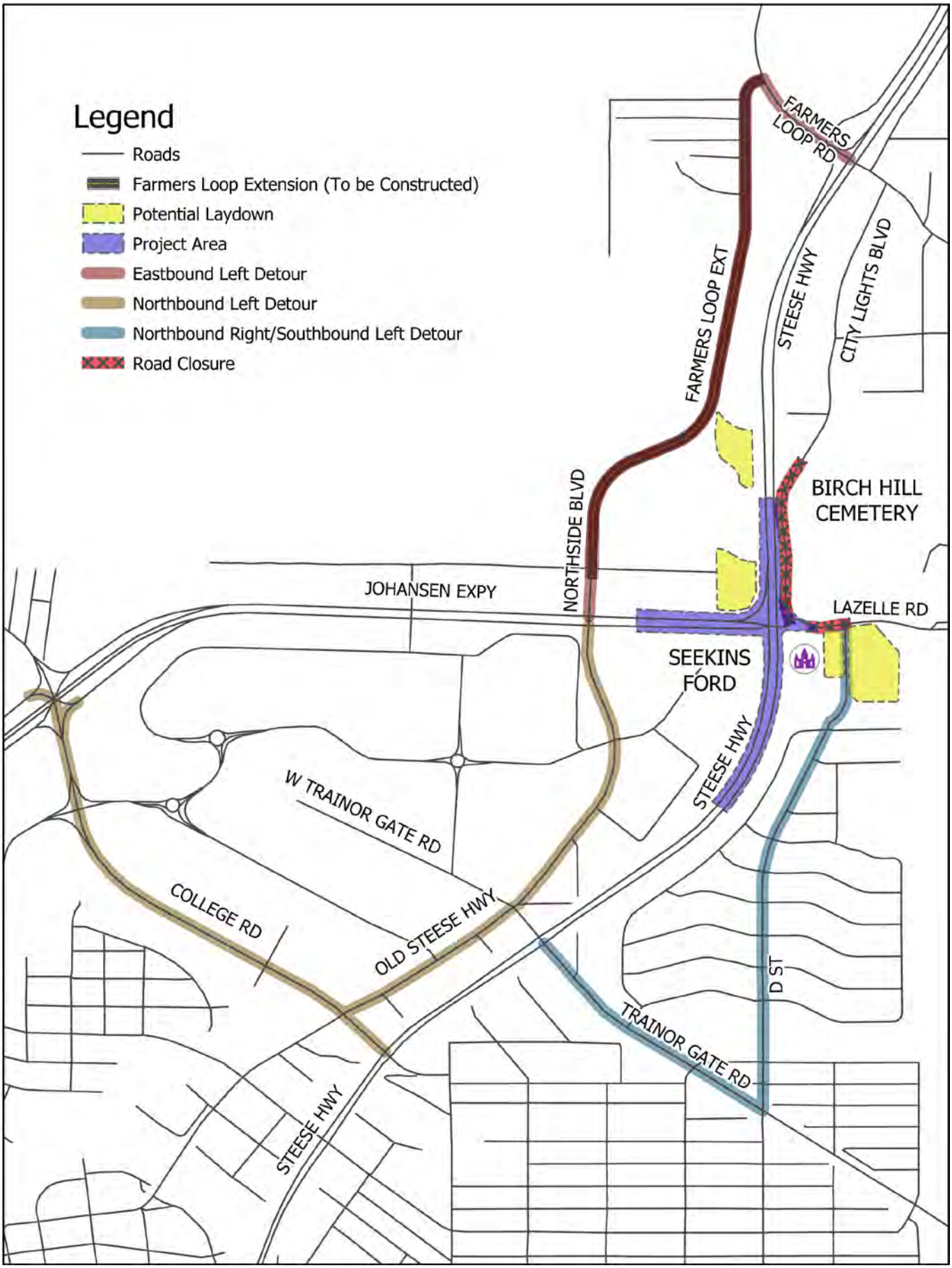


Figure 12: Proposed Construction Closures, Detours, and Storage Yards

Effect of Proposed Construction Detours on Surrounding Road Network (see BAE8)

During construction, it is expected that two major movements will need to be diverted from the Steese-Jo intersection: the eastbound left turn and the northbound left turn. For both of these movements, drivers will be instructed to turn left prior to the main intersection and travel to their destination via the surrounding road network. Where the detoured traffic is found to significantly impact traffic, mitigations are proposed to reduce the delay.

Under existing conditions, it takes drivers making these movements approximately 5 minutes to travel through the corridor. During construction with no mitigations, travel times through the detoured routes will increase to approximately 30 minutes for eastbound left turn vehicles and about 10 minutes for most northbound left turn traffic. The proposed mitigations are expected to reduce detoured travel times to approximately 5 to 10 minutes.

Figure 13 shows the affected intersections and proposed mitigations for the eastbound left turn detour in the PM peak (there are no significant impacts in the AM peak for this detour. Figure 14 and Figure 15 show the affected intersections and the proposed mitigations for the northbound left turn detour, as well as detours due to the Lazelle Road closure, in the AM and PM peaks, respectively.

The benefits of the mitigations are ranked as followed:

- HIGH – Mitigation alleviates delays from impacted movements
- MEDIUM – Mitigation alleviates delays, but impacted movements will still have long delays
- LOW – Mitigation has no significant change to operations

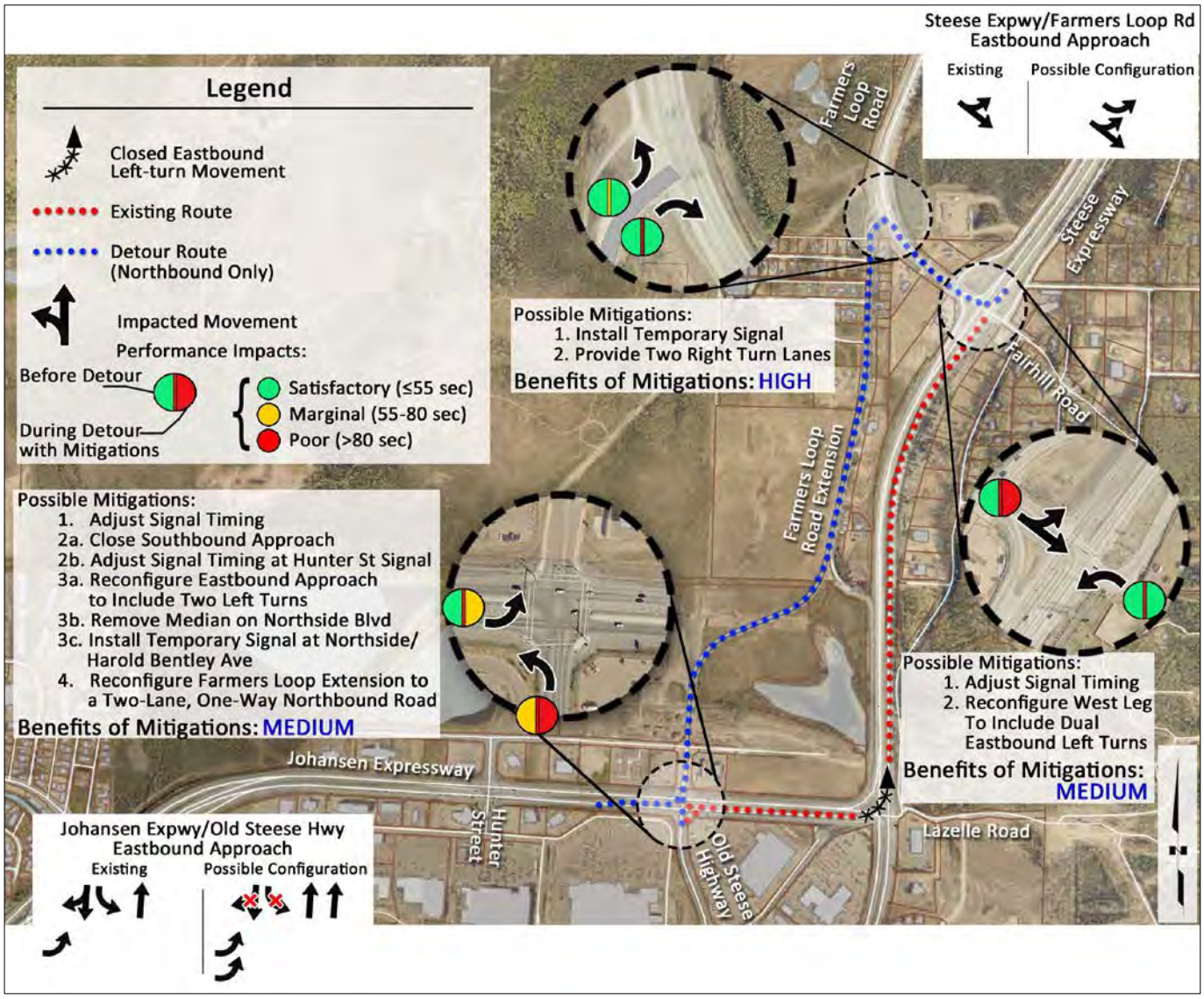


Figure 13: Impacted Intersections Caused by Detour of Eastbound Left Turns from Steese-Jo, PM Peak

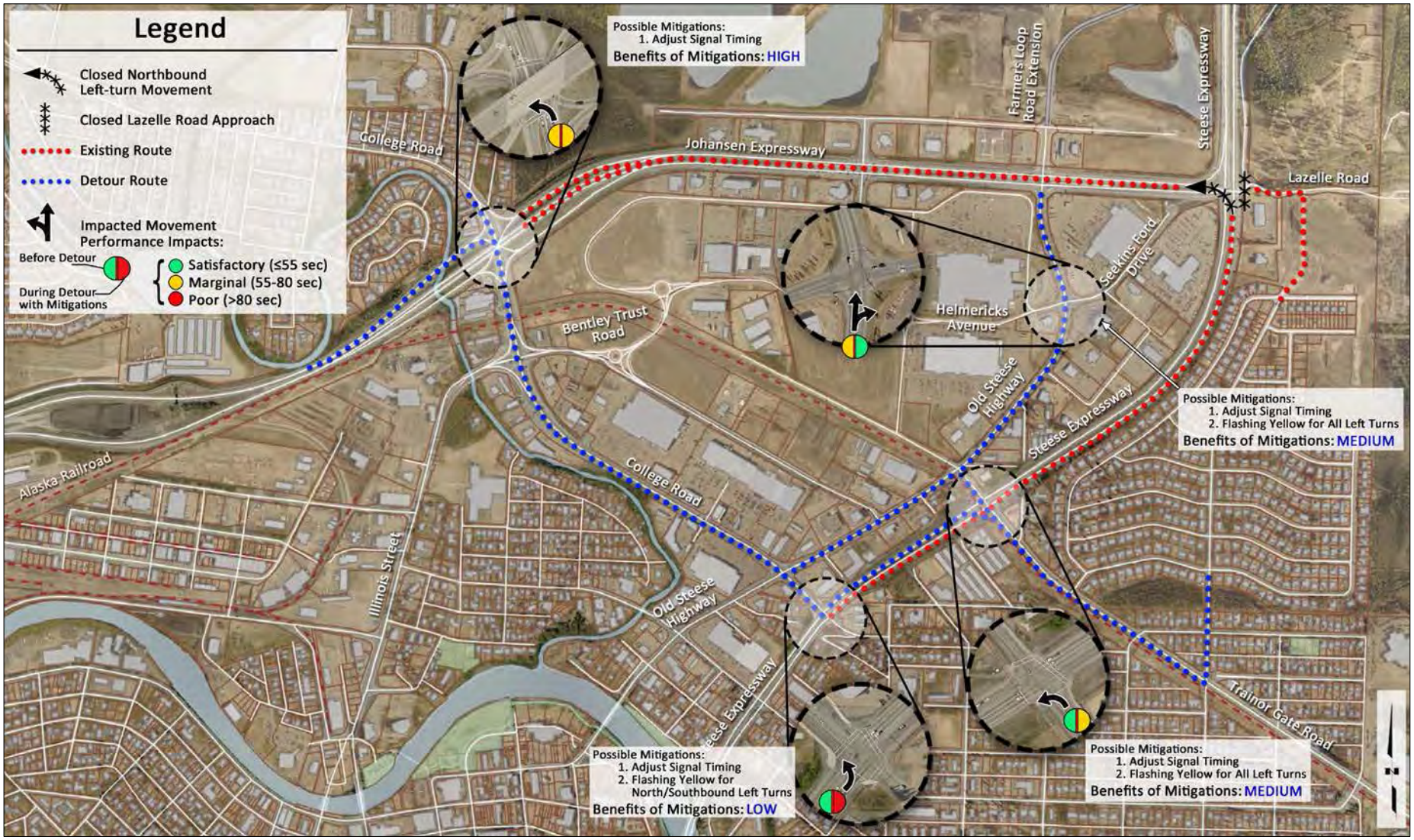


Figure 14: Impacted Intersection Movements Caused by Detour of Northbound Left Turns from Steese-Jo, AM Peak

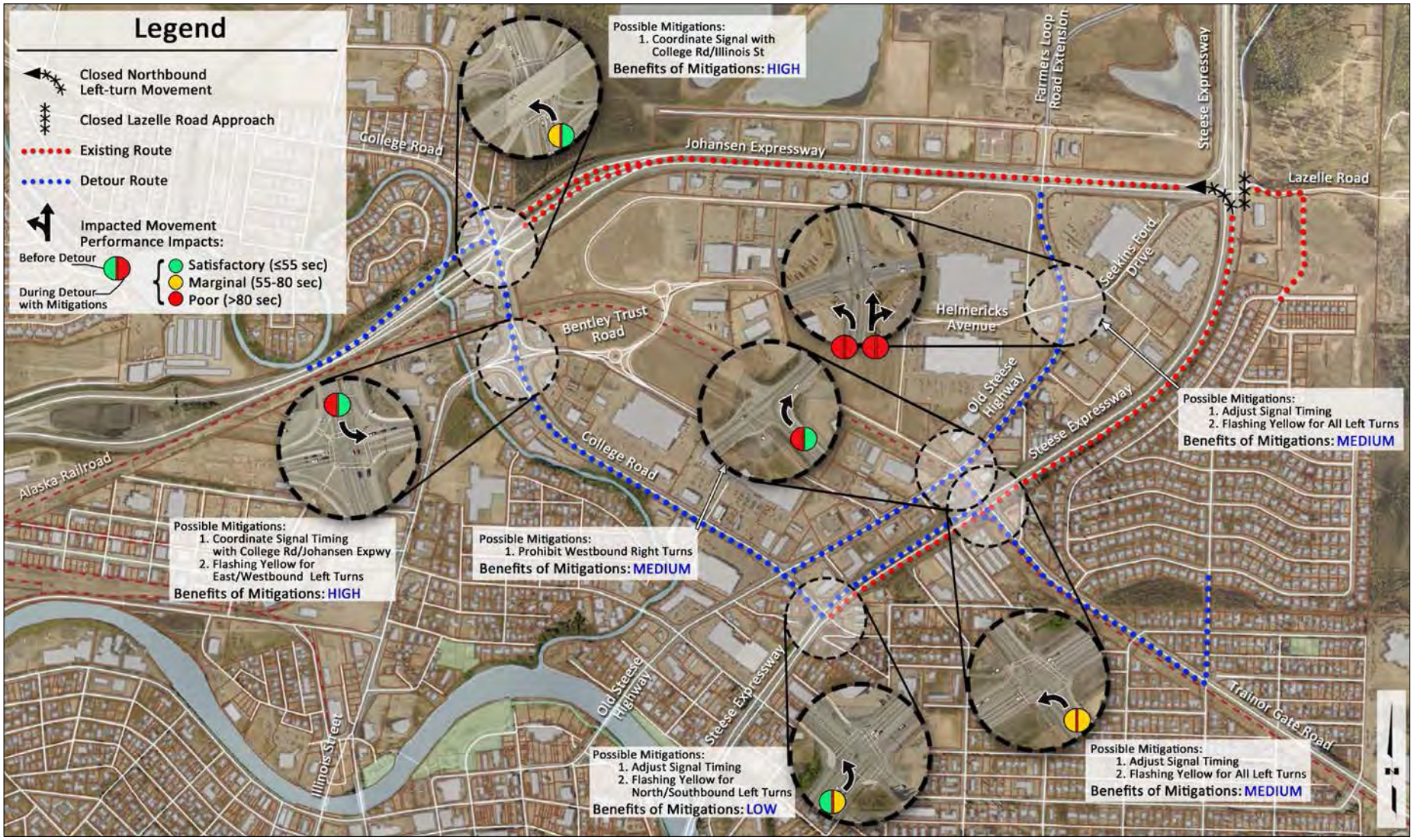


Figure 15: Impacted Intersection Movements Caused by Detour of Northbound Left Turns from Steese-Jo, PM Peak

Updated Screening Evaluation

Using the same screening criteria set forth in the Alternatives Analysis Report, the three build alternatives were reevaluated based on the recommended design changes. Table 3 presents the scores of the reevaluation. The scores for the Tight Diamond and Diverging Diamond remain the same; the score for the Echelon slightly decreased from its previous score.

In terms of the screening evaluation, the ROW acquisition score is the only criteria that could potentially be altered based on the proposed changes. In preparation for the Environmental Analysis, the decision of when to use retaining walls in the design for each alternative was standardized, so that cost and ROW impacts could be compared more consistently between alternatives. The use of retaining walls was limited to preserving the cemetery, wetland conservation area or any building structures. As a result, the concept design for the Tight Diamond and Diverging Diamond Interchanges used fewer retaining walls, resulting in an increase in the amount of land to be acquired, while the Echelon Interchange had an increase in retaining walls and a decrease in land acquisition area. These changes alone did not change the overall scores for the Minimize ROW acquisition criteria.

The change to the Echelon Interchange score resulted from including the U-turn roundabout, which requires additional land acquisition from the cemetery and changed the score for avoiding physical impacts to the cemetery from -0.5 to -1 and brought the total score for the alternative from 22.8 to 22.2. The Echelon Interchange score remains the highest of the three alternatives.

Table 3: Updated Screening Criteria Results

		Tight Diamond Interchange	Diverging Diamond Interchange	Echelon Interchange
GOALS (50%)	**Weight**			
Reduce congestion.	5	2	2	2
Improve non-motorized user safety.	3.5	1	1	2
Improve freight mobility.	3.25	2	2	2
Improve multi-modal connectivity.	2	1	1	2
Improve drainage.	1.25	1	1	1
Goals Score (Rating x Weight)**:**		23.25	23.25	28.75
IDENTIFIED ISSUES (35%)	**Weight**			
Vehicular delay.	5	2	2	2
Proximity of Farmers Loop Road.	5	1	1	1
Non-motorized safety.	4	1	1	2
Proximity of Old Steese Highway.	3	2	1	2
Proximity of City Lights Boulevard.	2	0	1	-2
Identified Issues Score (Rating x Weight)**:**		25	24	25
CONSTRAINTS (15%)	**Weight**			
Maintain Lazelle Rd access, including accommodating Ft Wainwright gate relocation.	5	-2	-1.5	0
Accommodate overheight/overweight vehicles	5	0	0	0
Maintain access to commercial areas (Northside, Bentley).	4	0	0	0
Avoid physical impact to cemetery	4	-1	-1	-1
Avoid physical impact to conservation area	3.5	0	0	0
Snow storage and snow removal techniques.	3	0	-2	0
Minimize ROW acquisition.	2	-1	-1	-1
Constraints Score (Alternative x Weight)**:**		-16	-19.5	-6
TOTAL		**18.0**	**17.1**	**22.2**

Preferred Alternative Summary Memo

DATE: November 29, 2019

SUBJECT: BAI2: Diverging Diamond Build Alternative Impacts

Alternative Concept

This alternative would construct a Diverging Diamond Interchange as shown in Attachment A. This is a relatively new type of interchange that has been gaining popularity throughout the United States. The first Diverging Diamond Interchange built in Alaska is at the Muldoon Road interchange with the Glenn Highway and has been under operation for about one year.

Figure 1 shows how vehicles move through the interchange. The northbound and southbound through traffic on the Steese Expressway would be carried up and over the intersection without stopping. East- and westbound traffic will each cross to the left as they approach the bridge, and then cross back to the right after the bridge. With this configuration, right turn movements are made onto a ramp before the crossover as standard right turns. The left turn movements are made onto a ramp after the crossover, so that the left turn movement enters the ramp freely, similar to a right turn movement. The crossover intersections and the off ramp merge intersections are signalized with two phases.

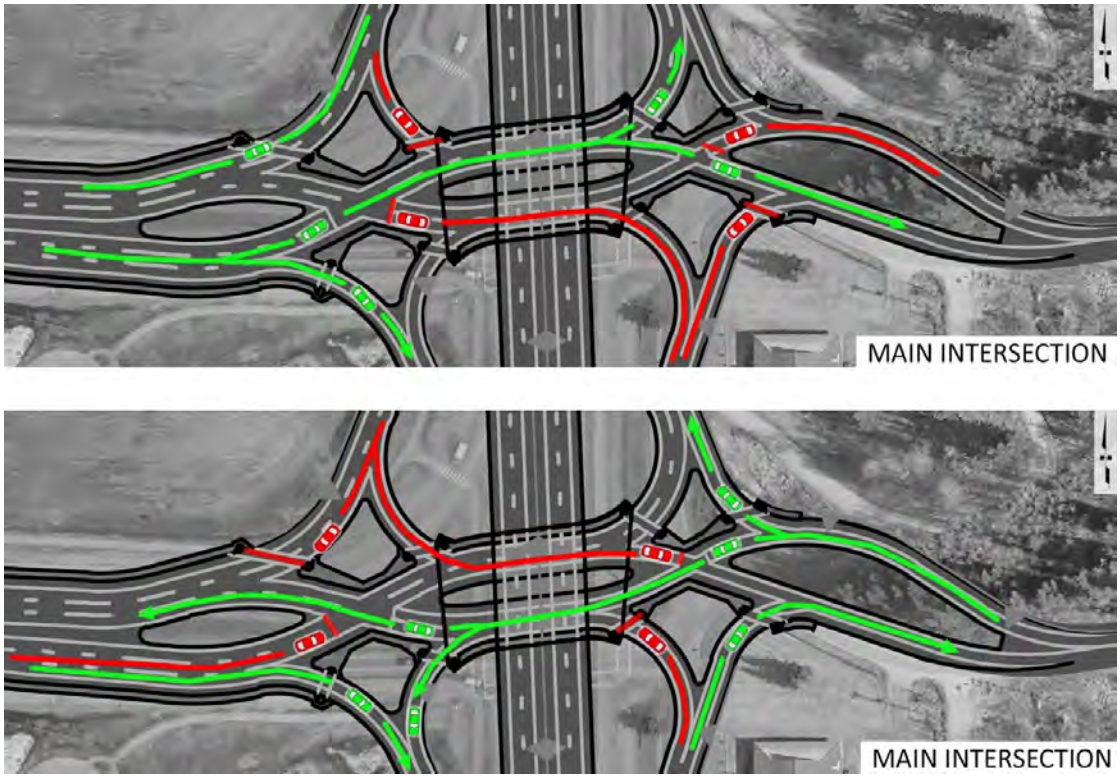


Figure 1: Vehicular Movements through Diverging Diamond Alternative

The Diverging Diamond Interchange has fewer conflict points than a Conventional Diamond Interchange. This configuration works well when there are either heavy left or right turn movements on or off of the ramps. Thus, it accommodates the heavy eastbound left turn movement in the PM peak.

Many interchanges of this type have been built in the United States, including the one recently constructed in Anchorage, Alaska.

Design Criteria sheets for the Diverging Diamond Interchange are provided in Attachment B.

Traffic Management and Constructability Considerations

This interchange would be constructed in six phases in order to maintain traffic through the intersection. This will require some temporary roadway and traffic detouring. Short-term (i.e., overnight) closures of Johansen Expressway across Steese Highway will likely be required to place the overpass girders. A conceptual Traffic Management and Construction Phasing Plan is included in Attachment C.

Traffic impacts during construction for the DDI were considered. Closing or restricting Lazelle Road traffic would help reduce these impacts. Specific impacts during each construction phase are included in Attachment C.

Girder selection for the structures will be an issue. The typical concrete girder design is more economical overall when compared to steel. The shipping of steel girders and the volatility of steel prices tend to significantly offset savings of design and construction efficiency. The proposed structure is a common type for Alaska and can be completed with conventional methods and gives more opportunities for local contractors to bid. Note that if steel girders are chosen, there will most likely be a temporary bent at the splice. Another steel girder erection method would pair the girders full length, transport them from the laydown area to the site, and set them in place using two large cranes; this method may limit the project to a select few capable contractors. Single span concrete girders can be set using a two crane pick or a single crane pick if a reasonably large crane is available. An overall Constructability Review memo is included in Attachment D.

Drainage Considerations

Surface water near the Steese Johansen interchange generally flows from the south and east toward the northwest. Currently, water is collected by drainage swales and curb and gutter systems and directed to culverts that flow under the intersections toward the northwest quadrant. However, the slopes across the intersection are minimal, resulting in ponding.

A stormwater pond is proposed for the northwest quadrant of the interchange for water runoff to drain to, serving areas in the general vicinity of the interchange. The proposed improvements to the interchange will include designs to capture surface water runoff and transport it to the same general location. Proposed surface grade improvements at the existing intersection will be raised two to three feet to allow culvert conveyance under the proposed roadways.

The proposed Steese and Johansen Expressway roadways fall on their existing roadways outside the interchange. Consequently, drainage to existing medians and drainage ditches will be maintained in these areas.

Surface water that runs off the proposed bridge decks will be captured in a series of inlets grates and culverts, ultimately draining to the stormwater pond in the northwest quadrant. Drainage design will follow the guidance provided in FHWA HEC-21 Design of Bridge Deck Drainage (HEC-21). The proposed medians will be graded to low points located to capture runoff and transport away from the highway.

Localized drainage at both the church and Ford dealership will need to be evaluated closely and may require special drainage treatments to carry surface water to the proposed stormwater pond. Currently, both locations do not drain well and experience problems related to ponding.

Maintenance Considerations

Additional Lane Miles

This alternative adds approximately 1.8 lane-miles of roadway compared to the existing intersection; as such the cost of maintenance needed for the Diverging Diamond Interchange will be higher. The additional lane miles are due to an increase in the number of travel lanes, the crossover configuration, and the on and off ramps.

Snow Removal

Snow is typically stored on the outer, right side of the road. In the Diverging Diamond Interchange, because of the crossovers, the outside shoulder of the road will be to the left of the travel lane. The Diverging Diamond Interchange also has additional raised medians (required for traffic delineation) and lane-miles which will require snow removal. This alternative also encompasses the Steese Expressway bridge, new exit and entrance ramps, and associated retaining walls. Snow will need to be carried off the bridge and plowed into depressed medians where barriers are present. Due to these changes in geometry, the Diverging Diamond will require more snow

removal effort and different operations from usual for DOT&PF maintenance forces. In addition, the complex geometry through the interchange will not be conducive to high efficiency gang plow operations that can be used on the rest of the Steese and Johansen Expressway corridors.

Because of the barriers and ramp proximity, snow may need to be loaded and hauled off; therefore, a new snow dump is proposed in the vicinity of the existing Farmers Loop Road Extension/bike path.

Additional Signals

The Diverging Diamond Interchange will require two signalized intersections along the Johansen Expressway: one for the southbound on and off ramps and one for the northbound on and off ramps. Currently there is one signalized intersection.

Preliminary Bridge Design

The preliminary bridge design considered three options for construction of the Diverging Diamond Interchange bridge, a Single Span Deck Bulb-Tee, Single Span Steel Glider, or Two Span Deck Bulb-Tee. The Single Span Deck Bulb-Tee has the shortest span, lowest initial cost, and is familiar to contractors throughout Alaska. It is recommended that this structure type be used for the Diverging Diamond Interchange bridge. A Preliminary Bridge Selection Memo is included in Attachment E.

Bridge Vertical Clearance

The proposed design provides a 19 ft minimum bridge vertical clearance to allow for oversized vehicles.

Bridge Opening

The proposed bridge opening along the eastbound Johansen Expressway/westbound Lazelle Road is 122 feet wide by 19 feet high. However, the opening for eastbound or westbound traffic (distance between retaining wall and the edge of the center island) is approximately 50 feet wide by 19 feet high. Vehicles not fitting within this opening will need to use Goldstream Road.

Other Considerations

Car Dealership Visibility

The car dealership in the southwest quadrant of the Steese Expressway/Johansen Expressway intersection will have visibility impacts with the construction of the Diverging Diamond Interchange. The southbound and northbound through movements along the Steese Expressway will be elevated over the intersection and will have guardrail or concrete barriers along them. As a result, the dealership will have little visibility from northbound traffic, and about one third of the lot will be obscured for southbound traffic.

Additionally, vehicles heading westbound along Lazelle Road to turn north on to the Steese Expressway will not be able to see the dealership.

However, traffic on Johansen Expressway will continue to have an unimpeded view of the dealership.

Figure 2 present the car dealership visibility from Steese Expressway for the Diverging Diamond Interchange. The obstructed views are based on a 3.5-foot driver eye height, 31-inch tall guardrails, and a visibility to 1 foot above grade on the car lot.

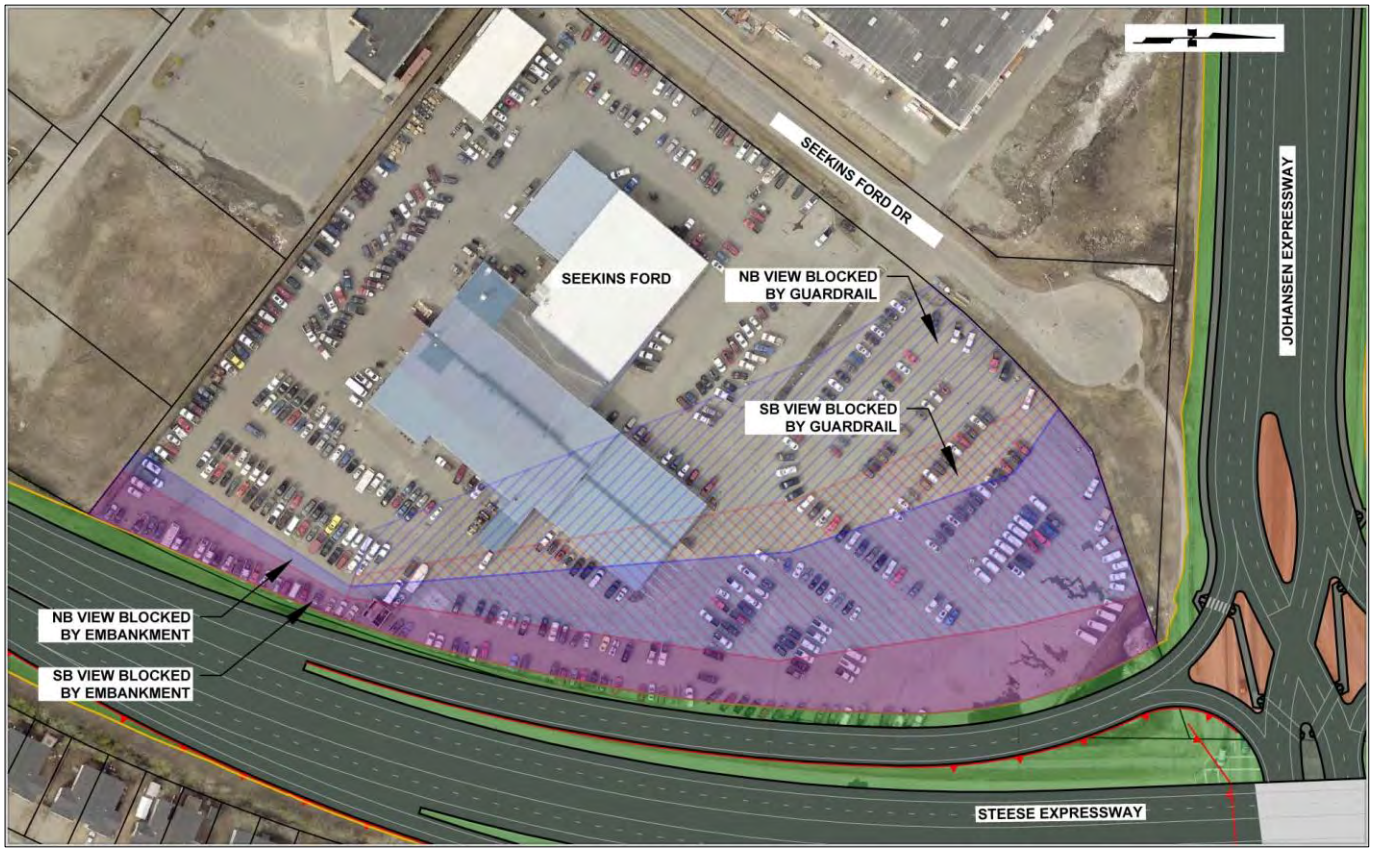


Figure 2: Car Dealership Visibility from Steese Expressway

Birch Hill Cemetery Access

Under this alternative, the southern Birch Hill Cemetery Access will be inaccessible as City Lights Boulevard will be dead ended just south of the northern Birch Hill Cemetery entrance.

Right-of-Way (ROW) Impacts

Construction of the Diverging Diamond Interchange will impact five parcels and approximately 1.5 acres of land. Attachment F presents the ROW impacts under the Diverging Diamond Interchange alternative.

Rough Order of Magnitude (ROM) Cost Estimate

The Diverging Diamond Interchange alternative is estimated to cost $50.5 million as shown in Table 1. The ROM Cost Summary is provided in Attachment G.

Table 1: Diverging Diamond Interchange ROM Cost Estimate

Category	Estimated Cost
Project Development	$6,000,000
Right of Way	$900,000
Utilities	$3,500,000
Construction Total	$40,100,000
Total Project Estimated Cost	**$50,500,000**

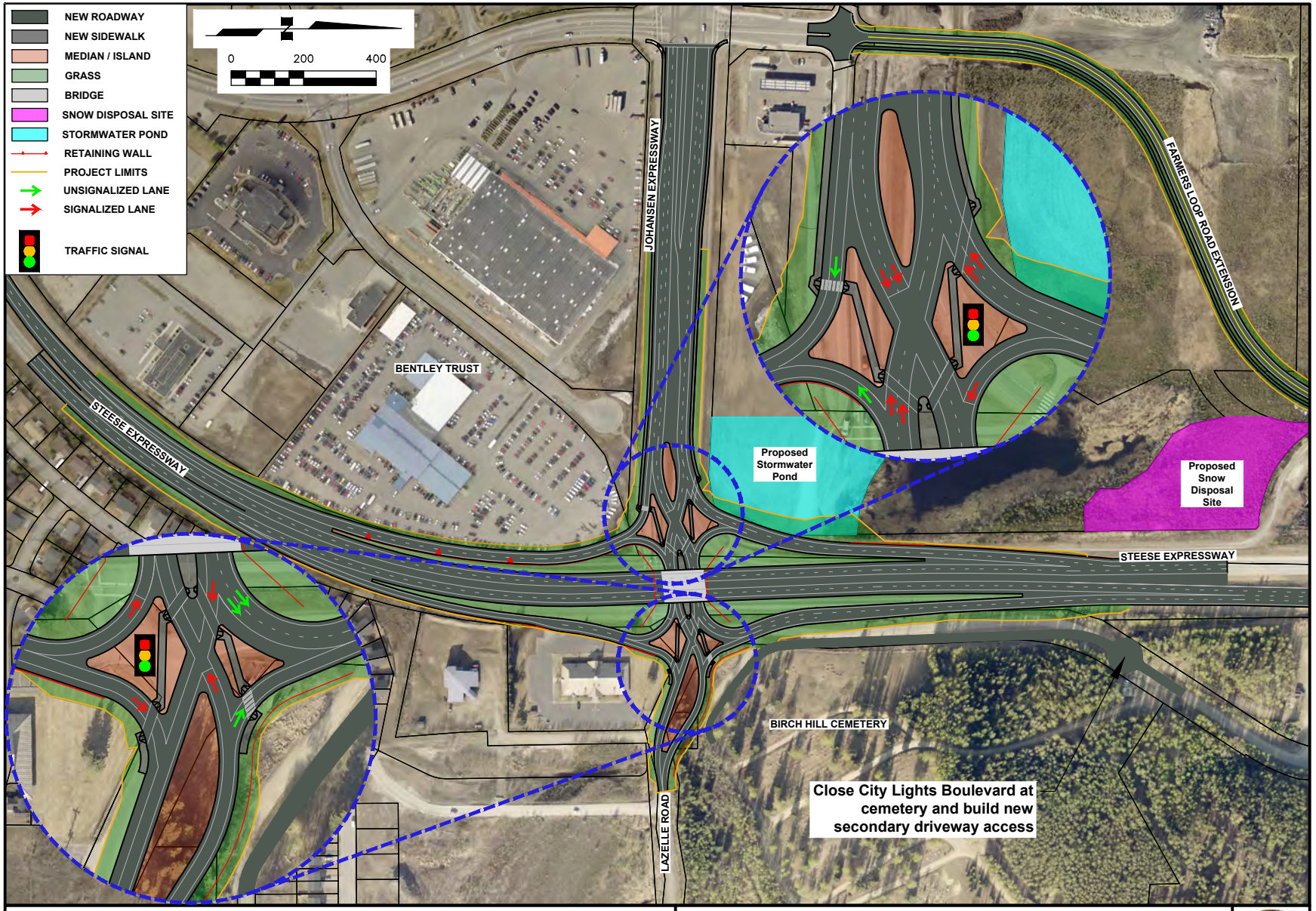
The above Order-of-Magnitude Estimate is in 2018 dollars based on conceptual design. Final costs of the project will depend on labor and material costs, site conditions, productivity, market conditions, scope, and other variable factors.

Attachments

A. Diverging Diamond Interchange Layout
B. Design Criteria Sheets
C. Traffic Management and Construction Phasing Plan
D. Constructability Review Memo
E. Preliminary Bridge Selection Memo
F. ROW Impacts Figure
G. ROM Cost Estimate

ATTACHMENT A

Diverging Diamond Interchange Layout



STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION
AND PUBLIC FACILITIES

PROJECT NO. 0002337/Z607320000
PROJECT NAME STEESE EXPRESSWAY/JOHANSEN EXPRESSWAY INTERCHANGE: ENGINEERING & ENVIRONMENTAL SERVICES
SCALE 1" = 400' DATE: 02/26/20

Diverging Diamond Alternative

ATTACHMENT B

Design Criteria Sheets

Project Name: Steese Expressway/Johansen Expressway Interchange				
☑ New Construction/Reconstruction ☐ Reconstruction (3R) ☐ Other:				
Project Number: Z607320000/0002337 ☑ NHS ☐ Non NHS				
Road Name: JOHANSEN EXPRESSWAY				
Functional Classification:	Principal Arterial			
Design Year:	2045	**Present ADT:**	21,000	
Design Year ADT:	29,500	**Mid Design Period ADT:**	26,000 (2035)	
DHV:	11%	**Directional Split:**		
Percent Trucks:	8%	**Equivalent Axle Loading:**		
Pavement Design Year:	2045	**Design Vehicle:**	WB-109D	
Terrain:	Level	**Number of Roadways:**	1	
Design Speed:	60 mph (GDHS, 2011: Sect 7.3.2)			
Width of Traveled Way:	12' lanes (GDHS, 2011: Sect 7.3.3)			
Width of Shoulders:	**Outside:**	10'	**Inside:**	4'
Cross Slope:	2% (GDHS, 2011: Sect 7.3.2 (1.5-3%)			
Superelevation Rate:	6% Max (HPCM: Sect 1160.5.6)			
Minimum Radius of Curvature:	3500' Desirable (HPCM: Figure 1120-1), 1330' Min (GDHS, 2011: Table 3-9)			
Minimum K-Value for Vertical Curve:	**Sag:**	136 (SSD) (GDHS, 2011: Table 3-36)	**Crest:**	151 (SSD) / 357 (PSD) (GDHS, 2011: Table 3-34,35)
Maximum Allowable Grade:	5% (GDHS, 2011: Table 7-4)			
Minimum Allowable Grade:	0.3% Min, 0.5% Desirable (GDHS, 2011: Sect 7.3.2)			
Stopping Sight Distance:	570' (GDHS, 2011: Table 7-1)			
Lateral Offset to Obstruction:	1.5' min beyond face of curb, 3' min beyond face of curb at intersections 4' from edge of traveled way with no curb (if shoulders are less than 4') (GDHS, 2011: Sect 6.3.4)			
Vertical Clearance:	16'6" (Interchange/Grade Separation), 17'6" (Ped Structures/Bottom Signal Housing), 18'6" (Sign Bridges), 20'6" (Overhead Utilities) (HPCM: Table 1130:1)			
Bridge Width:	N/A			
Bridge Structural Capacity:	N/A			
Passing Sight Distance:	1000' (GDHS, 2011: Table 7-1)			
Surface Treatment:	**T/W:**	Asphalt Concrete	**Shoulders:**	Asphalt Concrete
Side Slope Ratios:	**Foreslopes:**	4:1	**Backslopes:**	
Degree of Access Control:	Full			
Median Treatment:	Ditch and/or Raised			
Illumination:	Continuous			
Curb Usage and Type:				
Bicycle Provisions:	Separated, min 8' wide, shared-use pathway (10' separation) and curb ramps at intersection			
Pedestrian Provisions:	Separated, min 8' wide, shared-use pathway (10' separation) and curb ramps at intersection			
Misc. Criteria:	Clear Zone: 24'-26'			

Proposed - Designer/Consultant: _____ **Date:** _____

Accepted - Engineering Manager: _____ **Date:** _____

Approved - Preconstruction Engineer: _____ **Date:** _____

Shaded criteria are the *FWHA 13 controlling criteria*. For NHS routes only, these criteria must meet the minimums established in the Green Book (*AASHTO A Policy on Geometric Design of Highways and Streets*). For all other routes, these criteria must meet the minimums established in the *Alaska Highway Preconstruction Manual*. Otherwise a Design Exception must be approved.

Design Criterion marked with a " # " do not meet minimums and have a Design Exception(s) and/or Design Waiver(s) approved. See Appendix __ for Design Exception/Design Waiver approval(s) and approved design criteria values.

Project Name: Steese Expressway/Johansen Expressway Interchange				
☑ New Construction/Reconstruction ☐ Reconstruction (3R) ☐ Other:				
Project Number: Z607320000/0002337 ☑ NHS ☐ Non NHS				
Road Name: STEESE EXPRESSWAY				
Functional Classification:	Principal Arterial			
Design Year:	2045	**Present ADT:**	14,000/ 25,000	
Design Year ADT: (South/North of intxn)	16,000/ 38,000	**Mid Design Period ADT:**	15,000 / 34,000 (2035)	
DHV:	11%	**Directional Split:**		
Percent Trucks:	8%	**Equivalent Axle Loading:**		
Pavement Design Year:	2045	**Design Vehicle:**	WB-109D	
Terrain:	Level	**Number of Roadways:**	2	
Design Speed:	60 mph (GDHS, 2011: Sect 7.3.2)			
Width of Traveled Way:	12' lanes (GDHS, 2011: Sect 7.3.3)			
Width of Shoulders:	**Outside:**	10'	**Inside:**	4'
Cross Slope:	2% (GDHS, 2011: Sect 7.3.2 (1.5-3%)			
Superelevation Rate:	6% Max (HPCM: Sect 1160.5.6)			
Minimum Radius of Curvature:	3500' Desirable (HPCM: Figure 1120-1), 1330' Min (GDHS, 2011: Table 3-9)			
Minimum K-Value for Vertical Curve:	**Sag:**	136 (SSD) (GDHS, 2011: Table 3-36)	**Crest:**	151 (SSD) / 357 (PSD) (GDHS, 2011: Table 3-34,35)
Maximum Allowable Grade:	5% (GDHS, 2011: Table 7-4)			
Minimum Allowable Grade:	0.3% Min, 0.5% Desirable (GDHS, 2011: Sect 7.3.2)			
Stopping Sight Distance:	570' (GDHS, 2011: Table 7-1)			
Lateral Offset to Obstruction:	1.5' min beyond face of curb, 3' min beyond face of curb at intersections 4' from edge of traveled way with no curb (if shoulders are less than 4') (GDHS, 2011: Sect 6.3.4)			
Vertical Clearance:	16'6" (Interchange/Grade Separation), 17'6" (Ped Structures/Bottom Signal Housing), 18'6" (Sign Bridges), 20'6" (Overhead Utilities) (HPCM: Table 1130:1)			
Bridge Width:	N/A			
Bridge Structural Capacity:	N/A			
Passing Sight Distance:	1000' (GDHS, 2011: Table 7-1)			
Surface Treatment:	**T/W:**	Asphalt Concrete	**Shoulders:**	Asphalt Concrete
Side Slope Ratios:	**Foreslopes:**	4:1	**Backslopes:**	
Degree of Access Control:	Full			
Median Treatment:	Ditch and/or Raised			
Illumination:	Yes			
Curb Usage and Type:				
Bicycle Provisions:	Separated, min 8' wide, shared-use pathway (10' separation) and curb ramps at intersection			
Pedestrian Provisions:	Separated, min 8' wide, shared-use pathway (10' separation) and curb ramps at intersection			
Misc. Criteria:	Clear Zone: 24'-26'			

Proposed - Designer/Consultant: _____ **Date:** _____

Accepted - Engineering Manager: _____ **Date:** _____

Approved - Preconstruction Engineer: _____ **Date:** _____

Shaded criteria are the *FWHA 13 controlling criteria*. For NHS routes only, these criteria must meet the minimums established in the Green Book (*AASHTO A Policy on Geometric Design of Highways and Streets*). For all other routes, these criteria must meet the minimums established in the *Alaska Highway Preconstruction Manual*. Otherwise a Design Exception must be approved.

Design Criterion marked with a " # " do not meet minimums and have a Design Exception(s) and/or Design Waiver(s) approved. See Appendix __ for Design Exception/Design Waiver approval(s) and approved design criteria values.

Project Name: Steese Expressway/Johansen Expressway Interchange				
☑ New Construction/Reconstruction ☐ Reconstruction (3R) ☐ Other:				
Project Number: Z607320000/0002337 ☐ NHS ☑ Non NHS				
Road Name: LAZELLE ROAD				
Functional Classification:	Minor Collector			
Design Year:	2045	**Present ADT:**	1,300	
Design Year ADT:	9,800	**Mid Design Period ADT:**	8,800 (2035)	
DHV:	11%	**Directional Split:**		
Percent Trucks:		**Equivalent Axle Loading:**		
Pavement Design Year:		**Design Vehicle:**	WB-67	
Terrain:	Level	**Number of Roadways:**	1	
Design Speed:	30 mph (GDHS, 2011: Sect 6.3.1)			
Width of Traveled Way:	12' (GDHS, 2011: Sect 6.3.2)			
Width of Shoulders:	**Outside:**	8' (GDHS, 2011: Table 6-5)	**Inside:**	
Cross Slope:	2% (GDHS, 2011: Sect 6.3.1)			
Superelevation Rate:	6% Max (HPCM: Sect 1160.5.6)			
Minimum Radius of Curvature:	350' Desirable (HPCM: Figure 1120-1), 231' Min (GDHS, 2011: Table 3-7)			
Minimum K-Value for Vertical Curve:	**Sag:**	37 (SSD)	**Crest:**	19 (SSD) / 89 (PSD)
Maximum Allowable Grade:	9% (GDHS, 2011: Table 6-8)			
Minimum Allowable Grade:	0.3% Min, 0.5% Desirable			
Stopping Sight Distance:	200' (GDHS, 2011: Table 3-34)			
Lateral Offset to Obstruction:	1.5' min beyond face of curb, 3' min beyond face of curb at intersections 4' from edge of traveled way with no curb (if shoulders are less than 4')			
Vertical Clearance:	15' (Ped/Bicycle Structures/Sign Bridges), 14' (Underpasses) (GDHS, 2011: Sect 6.3.3)			
Bridge Width:	N/A			
Bridge Structural Capacity:	N/A			
Passing Sight Distance:	500' (GDHS, 2011: Table 3-35)			
Surface Treatment:	**T/W:**	Asphalt Concrete	**Shoulders:**	Asphalt Concrete
Side Slope Ratios:	**Foreslopes:**	4:1 or flatter	**Backslopes:**	3:1 or flatter
Degree of Access Control:	None			
Median Treatment:	Ditch and/or Raised			
Illumination:				
Curb Usage and Type:				
Bicycle Provisions:	Separated, min 8' wide, shared-use pathway (10' separation) and curb ramps at intersection			
Pedestrian Provisions:	Separated, min 8' wide, shared-use pathway (10' separation) and curb ramps at intersection			
Misc. Criteria:	Clear Zone: 12-14'			

Proposed - Designer/Consultant: _____ **Date:** _____

Accepted - Engineering Manager: _____ **Date:** _____

Approved - Preconstruction Engineer: _____ **Date:** _____

Shaded criteria are the *FWHA 13 controlling criteria*. For NHS routes only, these criteria must meet the minimums established in the Green Book (*AASHTO A Policy on Geometric Design of Highways and Streets*). For all other routes, these criteria must meet the minimums established in the *Alaska Highway Preconstruction Manual*. Otherwise a Design Exception must be approved.

Design Criterion marked with a " # " do not meet minimums and have a Design Exception(s) and/or Design Waiver(s) approved. See Appendix __ for Design Exception/Design Waiver approval(s) and approved design criteria values.

ATTACHMENT C

Traffic Management and Construction Phasing Plan

DATE: November 29, 2019

SUBJECT: Diverging Diamond Interchange – Traffic Management and Construction Phasing Plan

This memo is the conceptual traffic management and construction phasing plan for the Diverging Diamond Interchange alternative. In this plan the Diverging Diamond Interchange is constructed in six separate phases. A description of how existing traffic is maintained and which elements are to be constructed are shown under each phase. The existing roadways for the Steese Expressway/Johansen Expressway intersection are shown in Figure 1. The plan assumes the following:

- Build interchange ramps and retaining walls first to temporarily carry Steese Expressway traffic
- At least two continually maintained through lanes in each direction are required for the Steese Expressway
- Unless another detour route is provided, at least two continually maintained eastbound Johansen Expressway to northbound Steese Expressway turn lanes are required
- Lazelle Road traffic can be temporarily closed and detoured to other access points for night time or weekend road closures

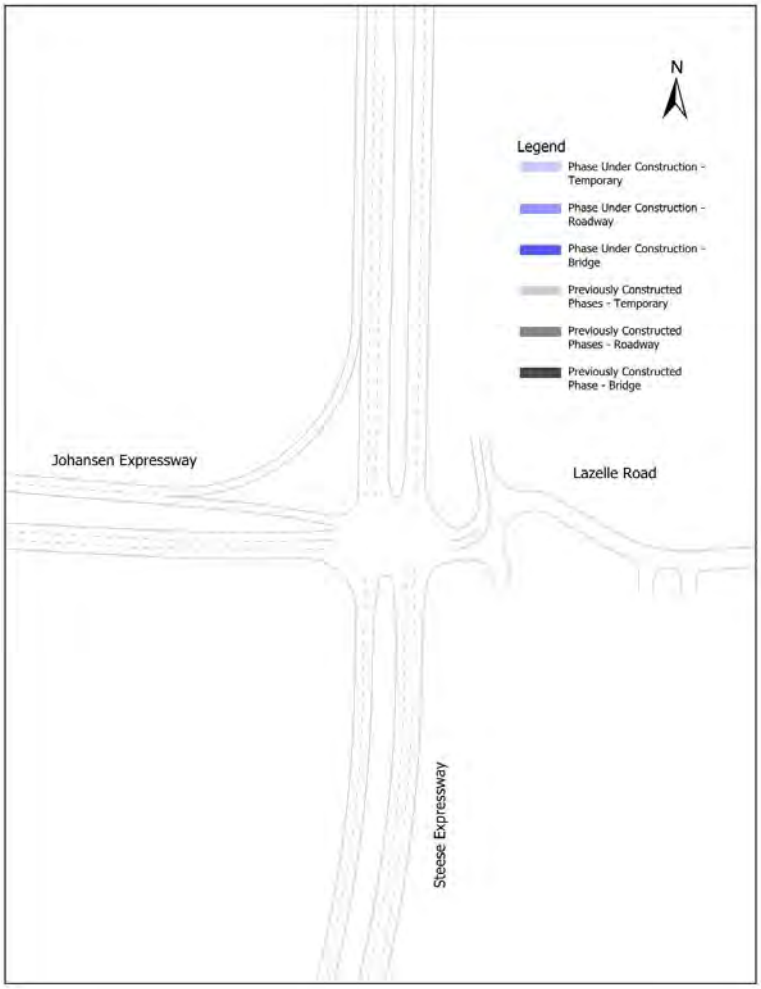


Figure 1: Existing Roadways

Phase 1

Maintenance of Traffic

In this phase of construction, the Steese Expressway and Johansen Expressway traffic will have minimal impacts. Traffic will run normally with the existing traffic signal. Temporary northbound and southbound connections between the on and off ramps will be constructed, traffic may be detoured if needed on existing shoulders during construction. Access to Lazelle Road will be closed at the intersection for all phases of construction; D Street can be used as secondary access to this area. City Lights Boulevard will be dead ended north of the intersection, City Lights Boulevard can be accessed from the Farmers Loop/ Steese Expressway intersection.

Construction Activities

Construction under this phase will include the following activities and is shown in Figure 2.

- Steese Expressway southbound and northbound entrance and exit ramps
- Temporary southbound and northbound through lanes (for use in next phases of construction)
- Temporary signals (for use in next phases of construction)
- City Lights Boulevard will be dead ended south of the northern Birch Hill Cemetery entrance.
- Lazelle Road access from the intersection will be closed

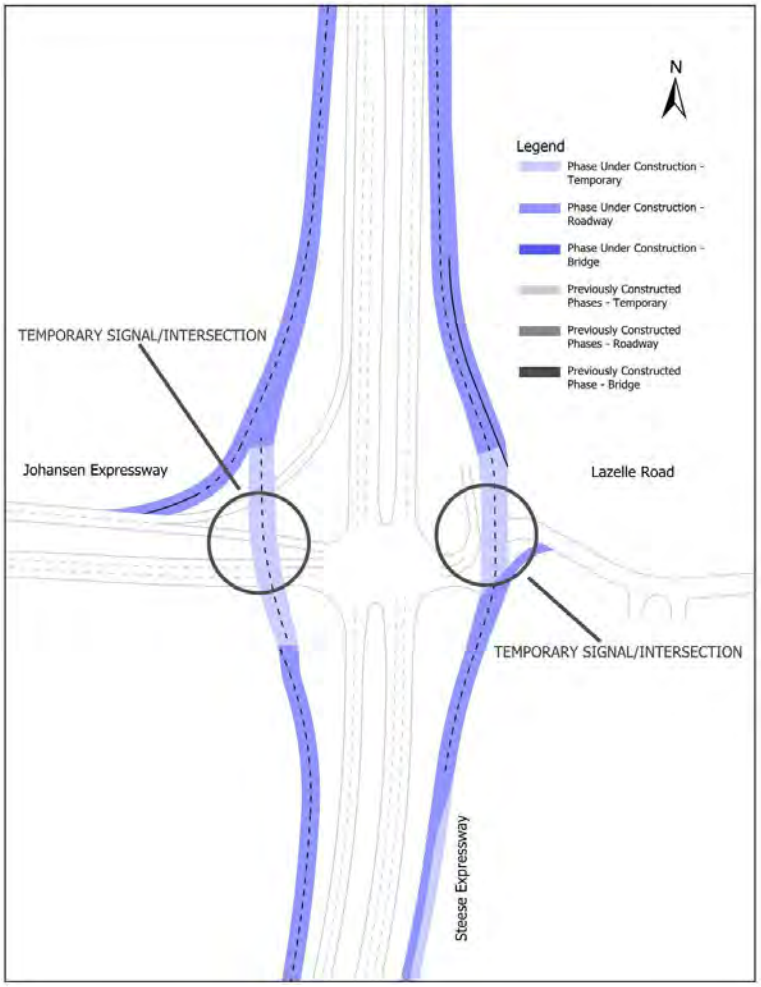


Figure 2: Phase 1 Construction

Phase 2

Maintenance of Traffic

In this phase of construction, the Steese Expressway traffic will be detoured off of the Steese Expressway onto the new southbound and northbound entrance and exit ramps constructed in Phase 1. Southbound and northbound through movements will use the previously constructed temporary roads. Traffic will interact like a tight diamond configuration at two temporary intersections controlled by temporary traffic signals. Northbound left traffic will be detoured at the Trainor Gate/Steese Expressway intersection to the Old Steese Expressway/ Johansen Expressway intersection for the remainder of construction.

Construction Activities

Construction under this phase will include the following activities and is shown in Figure 3.

- North leg of the Steese Expressway and north bridge abutments

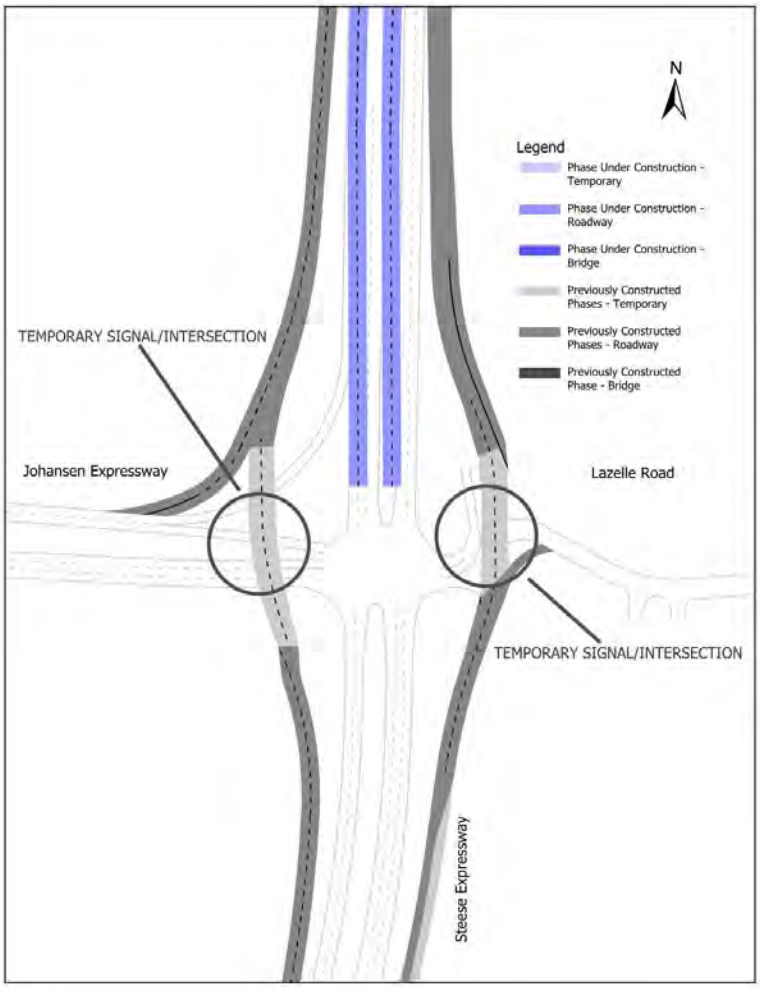


Figure 3: Phase 2 Construction

Phase 3

Maintenance of Traffic

In this phase of construction, traffic will continue to interact like a tight diamond configuration at two temporary intersections controlled by temporary traffic signals. The Steese Expressway will remain routed onto the newly built ramp lanes.

Construction Activities & Considerations

Construction under this phase will include the following activities and is shown in Figure 4.

- Eastbound portion of crossover
- Lazelle Road

Construction considerations under this phase may include the following.

- Issues are expected getting traffic to weave through the construction zone during the switch over

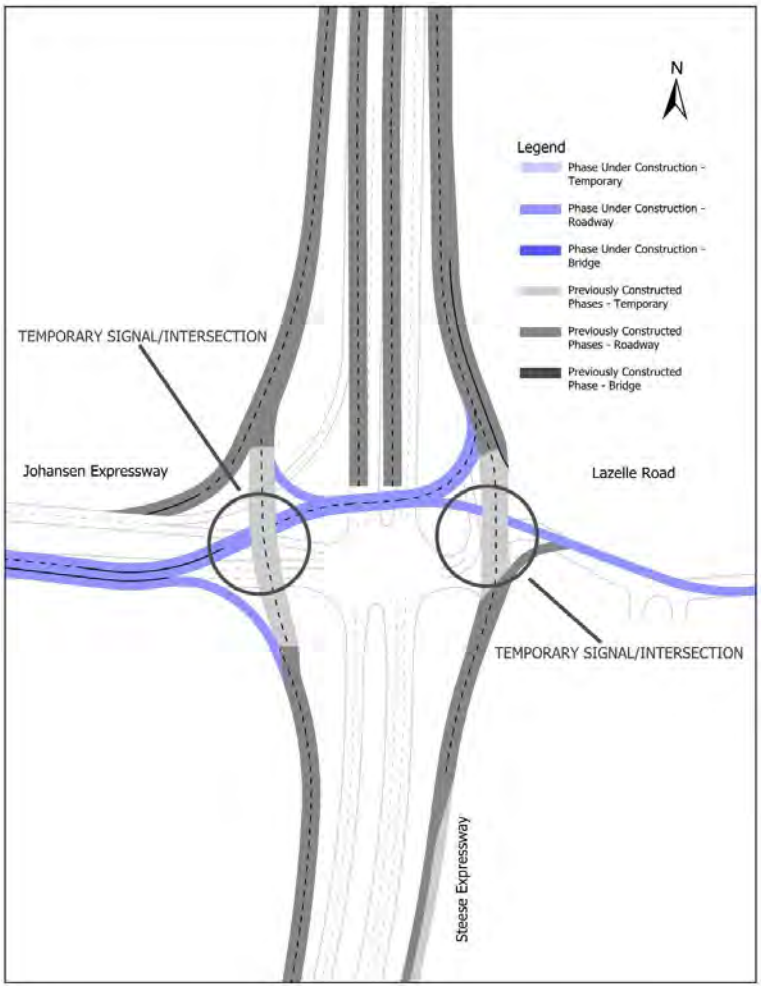


Figure 4: Phase 3 Construction

Phase 4

Maintenance of Traffic

In this phase of construction, traffic will continue to interact like a tight diamond configuration at two temporary intersections controlled by temporary traffic signals. The Steese Expressway will remain routed onto the newly built ramp lanes.

Construction Activities

Construction under this phase will include the following activities and is shown in Figure 5.

- South leg of the Steese Expressway and south bridge abutments

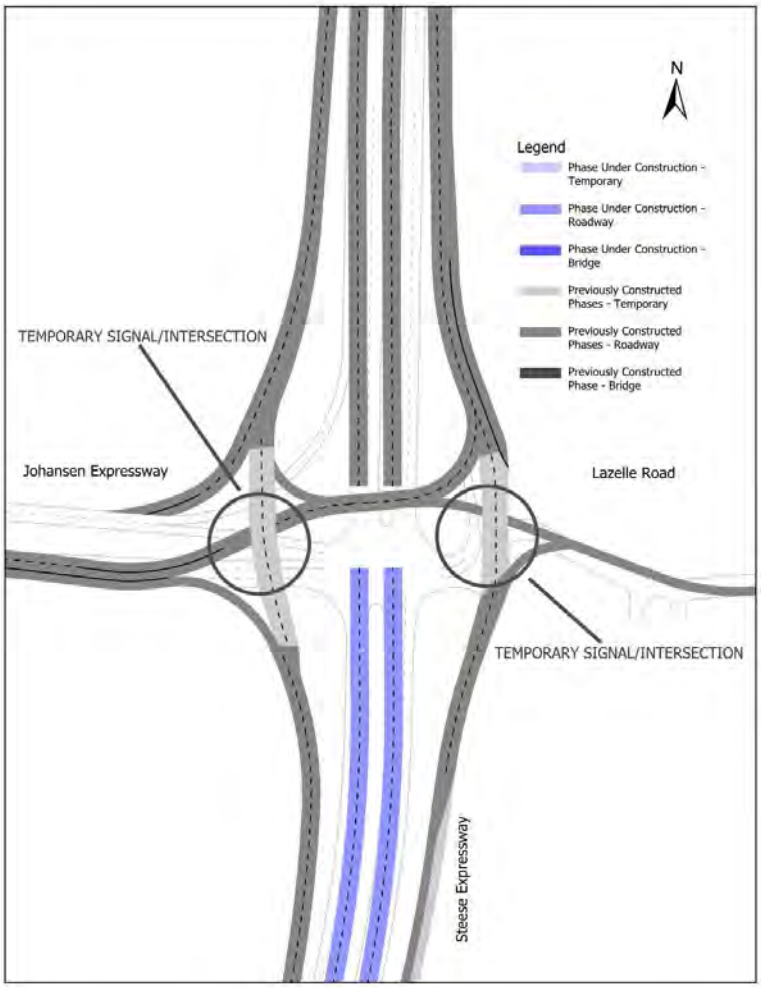


Figure 5: Phase 4 Construction

Phase 5

Maintenance of Traffic

In this phase of construction, traffic will continue to interact like a tight diamond configuration at two temporary intersections controlled by temporary traffic signals. The Steese Expressway will remain routed onto the newly built ramp lanes. The Steese Expressway bridge over the Johansen Expressway will be built with night closures.

Construction Activities & Considerations

Construction under this phase will include the following activities and is shown in Figure 6.

- Steese Expressway Bridge over Johansen Expressway.

Construction considerations under this phase may include the following.

- Conflicts are expected during the girder erection and concrete deck placement, requiring night work and closures
- Building the southbound structure early so southbound traffic can drive on the structure instead of on the ramps can potentially reduce construction/traffic conflicts

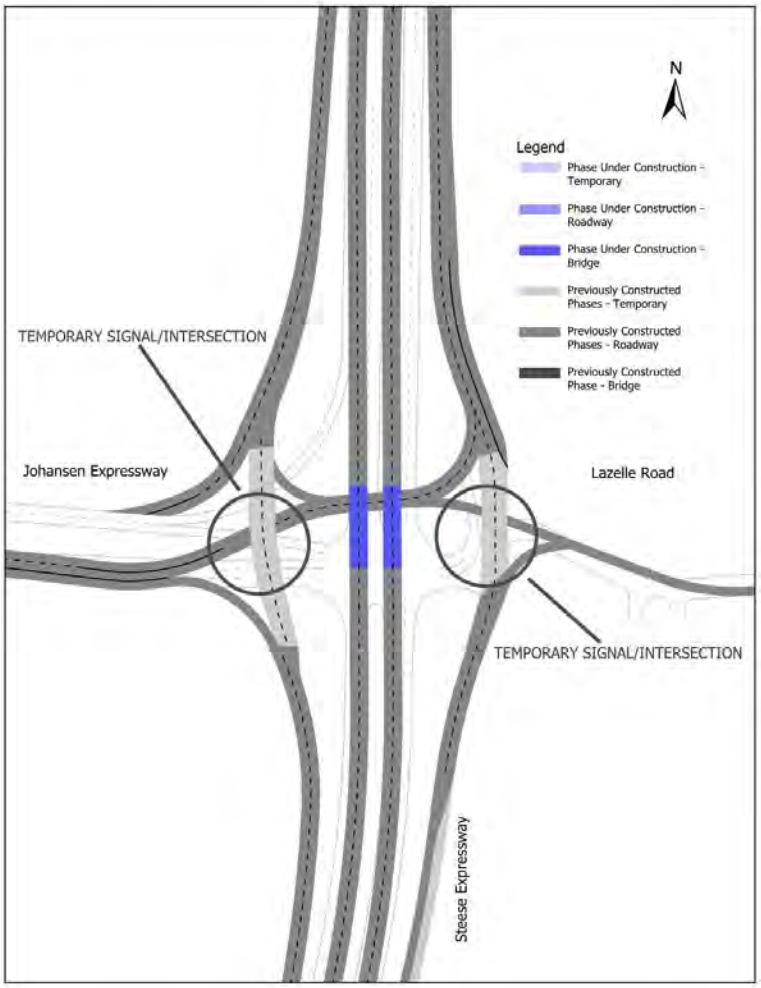


Figure 6: Phase 5 Construction

Phase 6

Maintenance of Traffic

In this phase of construction, the Steese Expressway traffic will be routed back onto the newly built Steese Expressway. Eastbound left traffic will use the crossover built in Phase 3, northbound left will remain on the detour route, and southbound right traffic will continue to use the newly built southbound ramp.

Construction Activities

Construction under this phase will include the following activities and is shown in Figure 7.

- Westbound portion of the crossover
- Final Crossover intersections and ramp intersections
- Traffic Signals

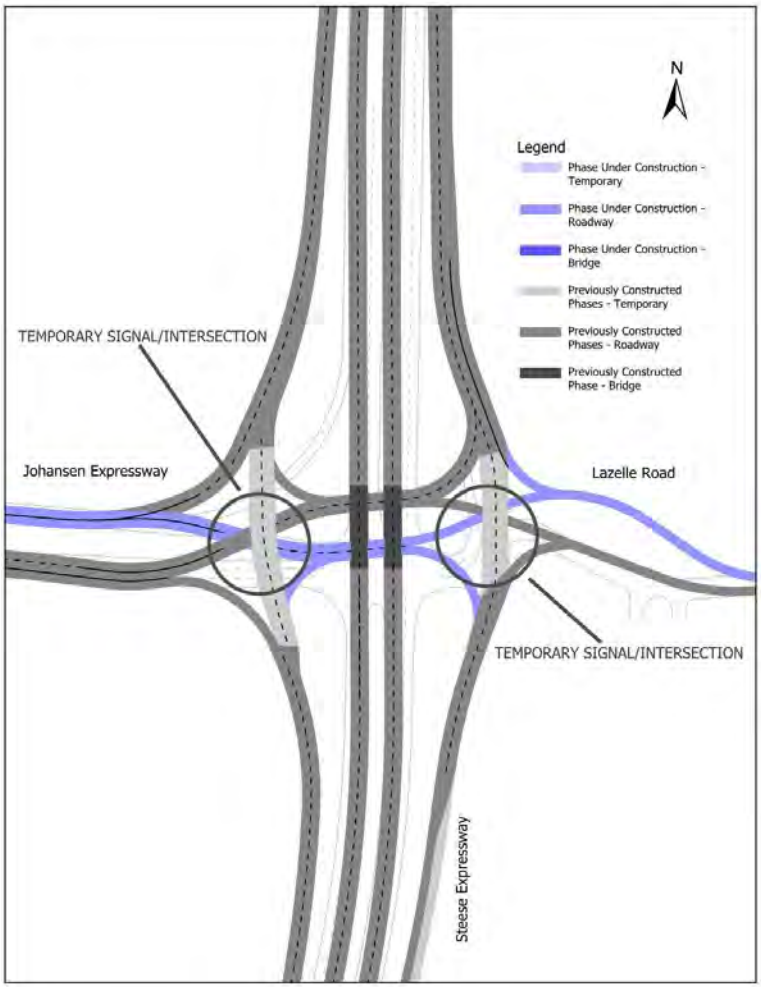


Figure 7: Phase 6 Construction

Final Configuration

The final Steese Expressway/ Johansen Expressway Diverging Diamond lane configuration is shown in Figure 8.

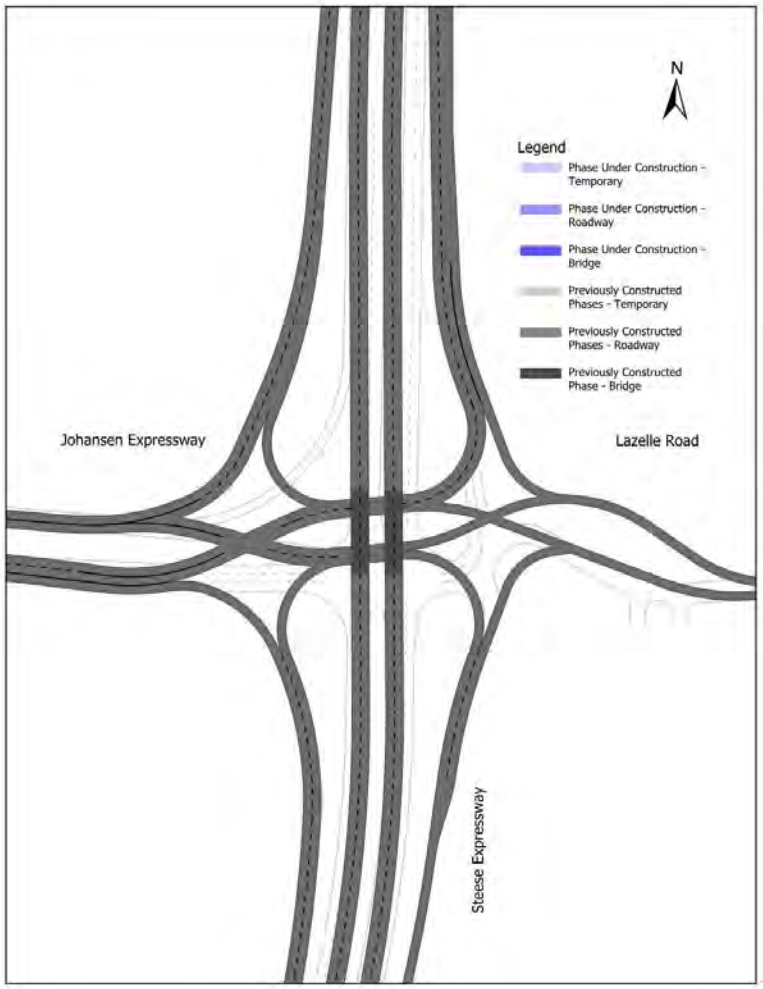


Figure 8: Final Configuration

ATTACHMENT D

Constructability Review Memo

DATE: November 29, 2019

SUBJECT: BAE7: Constructability Review

The four design alternatives (Tight Diamond Interchange, Diverging Diamond Interchange, Echelon Interchange, and Farmers Loop Road Extension) were evaluated to identify constructability concerns.

Comments are broken into four categories:

- Traffic: This is an overall discussion of possible detour routes from a contractor's point of view.
- Yard: Suggested yard sites that work for all options.
- Properties: Properties most likely to be impacted by contractor operations.
- Project Construction: Comments on individual memos.

Traffic

The Farmers Loop Road Extension, when combined with any of the interchange alternatives, can be used as a temporary detour during construction to relieve or divert traffic to facilitate quicker and less expensive construction.

Lazelle Road should be closed during construction. Lazelle Road, Old Birch Hill Road, and Beacon Road traffic could be detoured through D Street and Canol Service Road. Additional signage will be required at College Road and Old Steese Highway suggesting those be used as detours to soften the traffic flow at the interchange. Note that traffic capacity impacts are evaluated under memo BAE8: Construction Detour Traffic Impacts.

The Lazelle Road churches can be accessed off the D street extension with minimal effort. The project contractor may pursue additional property owner agreements for staging areas in this area, and the project team should evaluate use of Temporary Construction Easements (TCE) for work space/staging.

The Birch Hill Cemetery can easily be accessed off City Lights Boulevard from the north during construction.

Steese Expressway traffic can be maintained both directions most of the time barring girder erection and deck pour operations.

Figure 1 presents proposed detour routes for closed movements and potential staging/laydown yards.

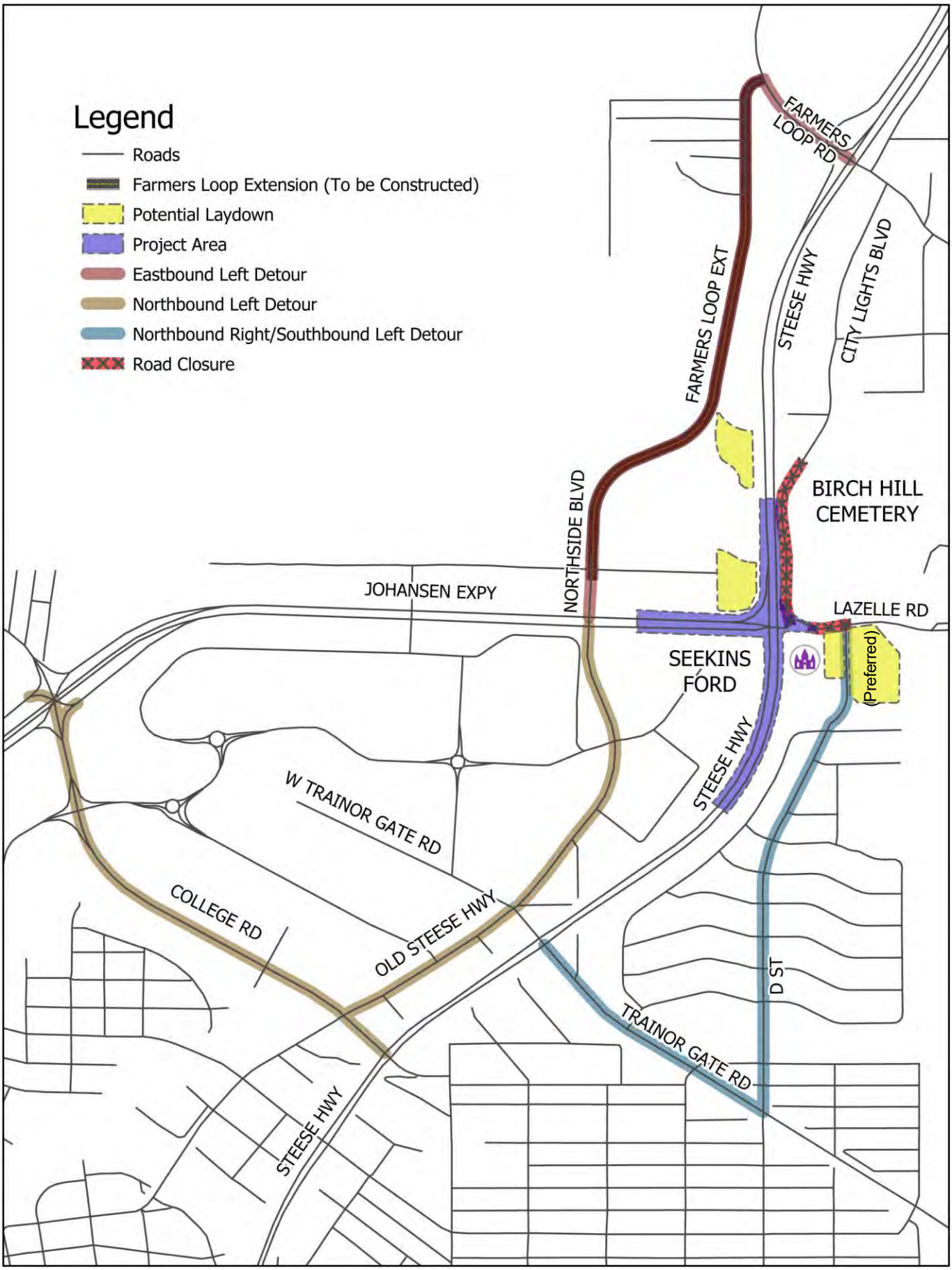


Figure 1: Proposed Detour Routes and Potential Staging/Laydown Yards

Yards

The optimum yard location would be in the field southeast of the Lazelle Road churches. This area is even more favorable if Lazelle Road could be closed or reduced to limited access. The area is out of the way of main traffic flows and would be great for staging girders, offices, fab yards etc. The property is currently owned by the City of Fairbanks.

In addition, the area north of the interchange currently slated for the storm water pond could be temporarily used for staging and laydown provided the area is not too wet. The western portion of this same property could work as well if water is an issue on the east end.

These two areas are prime for any contractor as they are adjacent to the work site and would help materials, labor and management avoid conflict with the traveling public. Staging/laydown yards outside the immediate area will complicate all aspects of the project, slowing productions and increasing price.

There are some possible locations further west on Johansen Expressway along the north side of Harold Bentley Avenue, but access and egress may negatively affect local business. Looking for space south on Steese Expressway is not advisable as this obviously increases the contractor/traveling public conflict as you encroach into thicker residential/business locations. Searching north on Steese Expressway shows no reasonably close areas with proper access to the expressway.

Figure 1 presents the potential staging/laydown yards.

Property issues

The car dealership has some unique impacts to consider. There will be TCE's required on two sides of the property based on the current design. Visibility and vehicle storage during construction may be areas of concern. The two churches and cemetery may have concerns with construction traffic in the immediate area along with potential TCE's and access changes to their properties. Based on the location and potential impacts, the churches and cemetery may prefer to have direct contractor/landowner agreements once the project is awarded.

Project Construction

Discussion on the constructability of the four alternatives are found in the individual Build Alternative Impact (BAI) memos. The interchange alternatives have a significant amount of roadway work, which increase the weather-related risks and potential schedule delays.

No matter what option is chosen, a few key factors will influence the success of this project.

1. Location of the yard(s) for staging, laydown, fabrication and offices is critical. The two areas described are prime locations and will be worth the effort to obtain access.
2. Heavily restricting public access or preferably closing Lazelle Road detouring onto D Street or Canol Service Road will be a huge help in controlling traffic through and around the project.
3. Suggesting a phasing plan with the option for a contractor to modify with approval may lead to a shorter construction duration and less impact to the traveling public.
4. Except for the Echelon option, the structures proposed are straight forward and should encourage competitive pricing. The Echelon structure has its merits and is a viable contender for this interchange, but it is crucial that the right fabricator is used as inexperience could lead to serious construction issues.

ATTACHMENT E

Preliminary Bridge Selection Memo

MEMORANDUM

DATE: November 27, 2019

SUBJECT: Steese-Johansen Expressways Interchange: Preliminary Bridge Selection Memorandum - Diverging Diamond Interchange

Prepared are the preliminary General Layout drawings for the Steese Johansen Interchange Diverging Diamond Interchange crossing. Three bridge options have been developed for consideration.

A summary and list of advantages and disadvantages for each option is provided in the following pages.

MSE walls have been selected to contain fill slopes from spilling into adjacent ramp roadways.

Consideration for options were made for both vertical and spill through abutments.

Based on the list of advantages and disadvantages the recommended option is Option 1, the Single Span Deck Bulb-Tee. The Single Span Deck Bulb-Tee has the shortest span, lowest initial cost, and is a common structure type that is familiar to contractors throughout Alaska.

Assumptions

Maintain a minimum vertical under clearance of 19’-0”.

Foundation types for the bridges are assumed to be supported on deep foundations (i.e. piles at the abutments with spill through soils retained by MSE walls).

Option 1 – Diverging Diamond with Single Span Deck Bulb-Tee

Maximum span length: 138.50 feet

Effective superstructure depth: 6.75 feet

Minimum vertical clearance under bridge: 19.00 feet

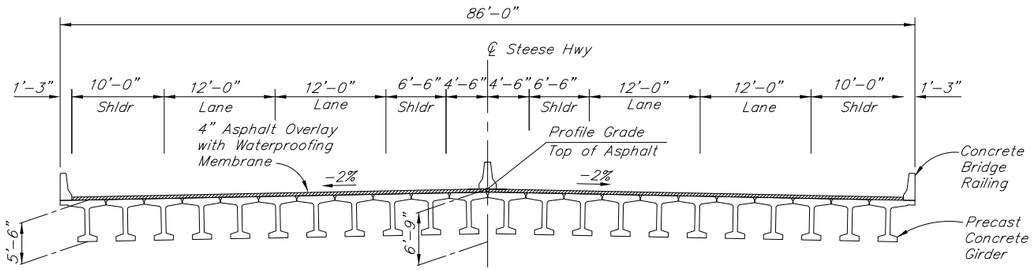
Distance between face of MSE walls: 122.20 feet

Table 1: Diverging Diamond Single Span Deck Bulb-Tee Advantages and Disadvantages

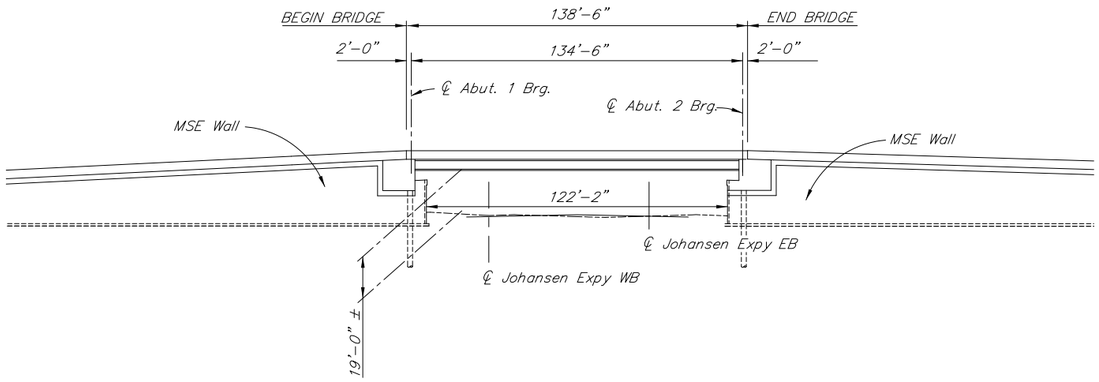
Advantages	Disadvantages
Lowest initial construction cost	Long, heavy girders will require larger crane(s) to erect
Durable structure type	MSE walls fix the available width for future roadway section changes to Johansen Expressway
Little future maintenance	
Common structure type that is familiar to contractors throughout Alaska	
Provides unobstructed view under the bridge	
Shortest bridge option	
Requires the least time to construct	

Figure 1: Similar structure Steese Highway over Chena Hot Springs Road, looking West.

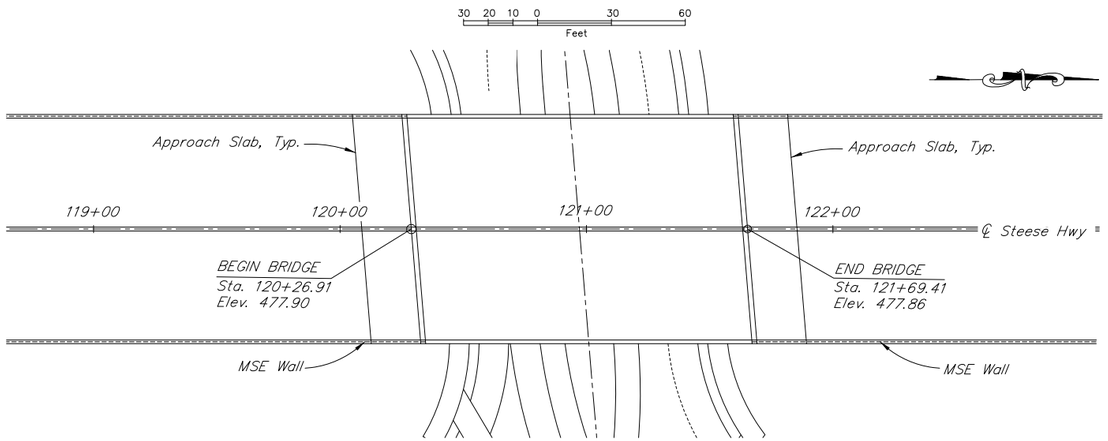
STATE	PROJECT DESIGNATION	YEAR	SHEET NO.	TOTAL SHEETS
ALASKA		2019		



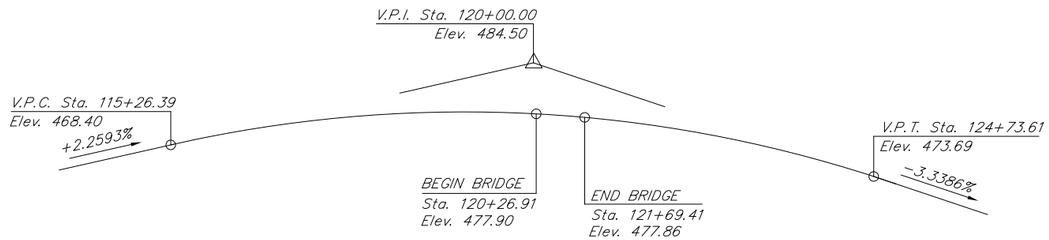
TYPICAL SECTION



ELEVATION



PLAN



PROFILE GRADE DATA

GENERAL NOTES

DESIGN:..... AASHTO LRFD Bridge Design Specifications, 2017 Edition, with latest interim specifications.

Seismic design per AASHTO Guide Specifications for LRFD Seismic Bridge Design, 2011 with latest interim revisions.

LIVE LOAD:..... HL-93

DEAD LOAD:..... Includes 50 psf for all wearing surfaces.

SEISMIC PARAMETERS:..... PGA = 0.27
Ss = 0.65
S1 = 0.20
Site Class = D
Liquefaction Potential = Low
AASHTO 7% probability of ascendance in 75 years.

REINFORCEMENT:..... ASTM A706,Grade 60, Fy = 60,000 psi
ASTM A970 Headed bars, Class HA.
Space reinforcement evenly unless otherwise noted.

PRESTRESSED CONCRETE:..... See "GIRDERS" Dwg.

CONCRETE:..... Class A Concrete unless otherwise noted, f'c = 4,000 psi

STRUCTURAL STEEL:..... ASTM A709, Grade 36T3, Fy = 36,000 psi
Galvanize structural steel in accordance with AASHTO M111 unless shown otherwise.

PRELIMINARY PLAN

DESIGNED BY: E. Thornley	CHECKED: Checker	FOUNDATIONS REVIEWED BY: Engineer			JOHANSEN EXPRESSWAY UNDERCROSSING STEESE HIGHWAY OPTION 1 GENERAL LAYOUT
DRAWN BY: E. Thornley	CHECKED: Designer				BRIDGE NO. DWG. NO.
QUANTITIES BY: J. Travis	CHECKED: Checker				

Option 2 – Diverging Diamond with Single Span Steel Girder

Maximum span length: 200.00 feet

Effective superstructure depth: 10.50 feet

Minimum vertical clearance under bridge: 19.00 feet

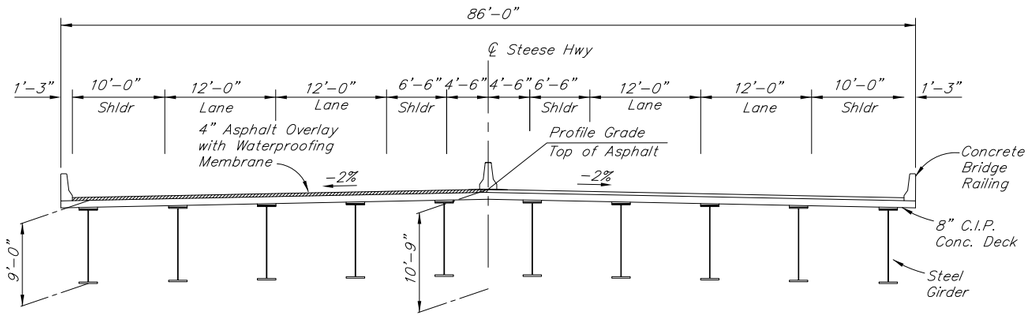
Distance between toe of slope protection: 125.00 feet

Table 2: Diverging Diamond Single Span Steel Girder Advantages and Disadvantages

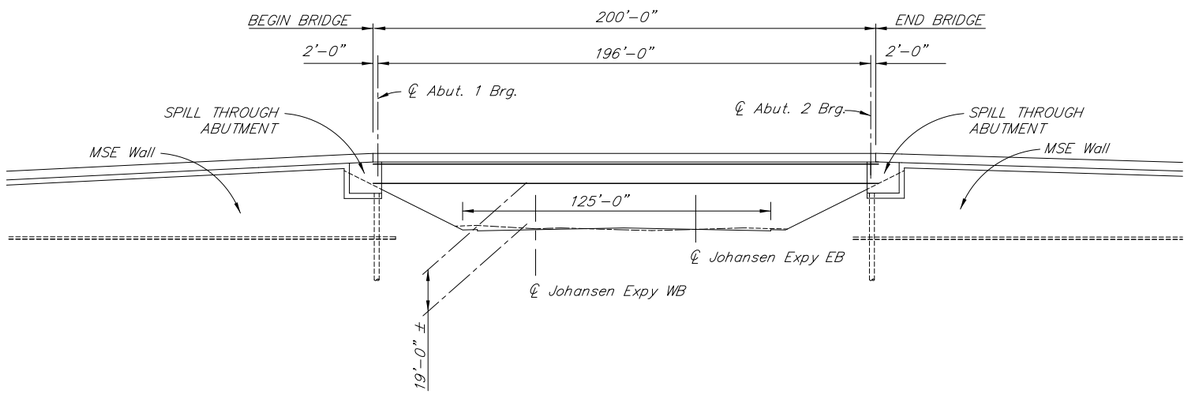
Advantages	Disadvantages
Provides long, clear span that will accommodate future widening of Johansen Expressway	Highest initial construction cost
Provides unobstructed view below bridge	Long, heavy girders may require larger crane(s) to erect or temporary bents at bolted splice locations
Durable structure type	Contractors in Alaska are not as familiar with steel girder bridges with cast-in-place concrete bridge decks
	Construction staging requires more attention for half-width construction
	Steel girder bridges require more maintenance than precast concrete bridges
	Requires profile grade raise of the Steese Highway
	Requires longest time to construct

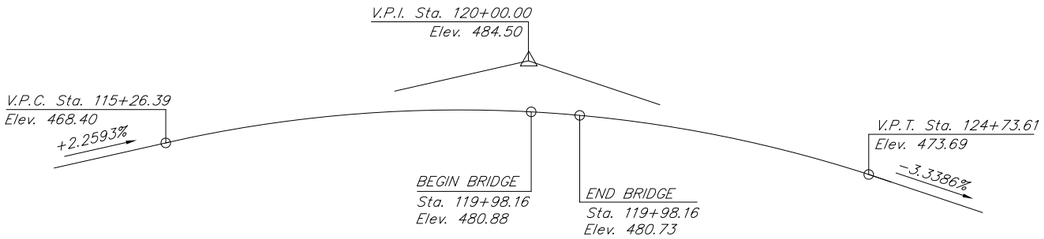
Figure 2: Similar structure Johansen Expressway over College Road, looking North.

STATE	PROJECT DESIGNATION	YEAR	SHEET NO.	TOTAL SHEETS
ALASKA		2019		



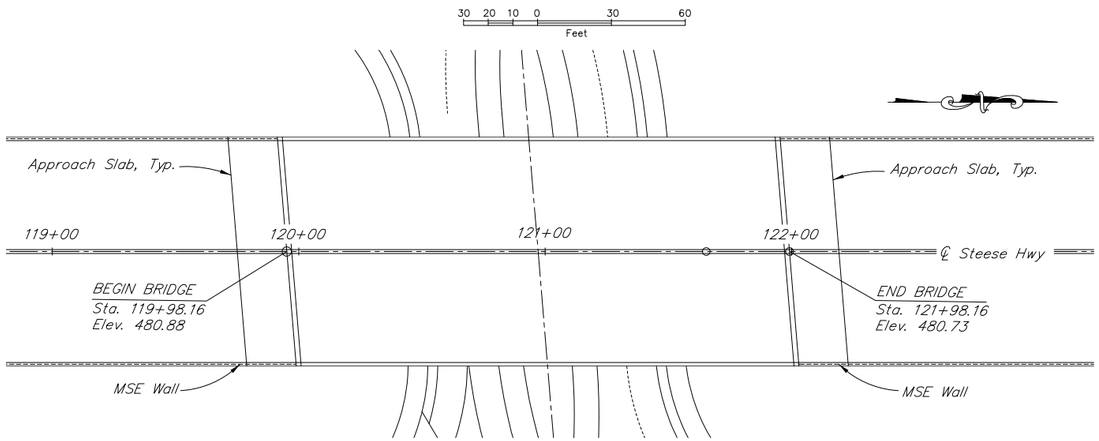
TYPICAL SECTION





PROFILE GRADE DATA

ELEVATION



PLAN

GENERAL NOTES

DESIGN:..... AASHTO LRFD Bridge Design Specifications, 2017 Edition, with latest interim specifications.

Seismic design per AASHTO Guide Specifications for LRFD Seismic Bridge Design, 2011 with latest interim revisions.

LIVE LOAD:..... HL-93

DEAD LOAD:..... Includes 50 psf for all wearing surfaces.

SEISMIC PARAMETERS:..... PGA = 0.27
Ss = 0.65
S1 = 0.20
Site Class = D
Liquefaction Potential = Low
AASHTO 7% probability of ascendance in 75 years.

REINFORCEMENT:..... ASTM A706,Grade 60, Fy = 60,000 psi
Space reinforcement evenly unless otherwise noted.

CONCRETE:..... Class A Concrete unless otherwise noted, f'c = 4,000 psi

STRUCTURAL STEEL:..... ASTM A709, Grade 50T3, Fy = 50,000 psi or American Petroleum Institute (API) 5L X52 PSL2

HIGH STRENGTH BOLTS:..... ASTM A320, Grade L7, Fult = 120,000 psi

PRELIMINARY PLAN

DESIGNED BY: E. Thornley	CHECKED: Checker	FOUNDATIONS REVIEWED BY: Engineer			JOHANSEN EXPRESSWAY UNDERCROSSING
DRAWN BY: E. Thornley	CHECKED: Designer				STEESE HIGHWAY
QUANTITIES BY: J. Travis	CHECKED: Checker				OPTION 2 GENERAL LAYOUT

BRIDGE NO.

DWG. NO.

Option 3 – Diverging Diamond with Two Span Deck Bulb-Tee

Maximum span length: 98.00 feet

Effective superstructure depth: 4.75 feet

Minimum vertical clearance under bridge: 19.00 feet

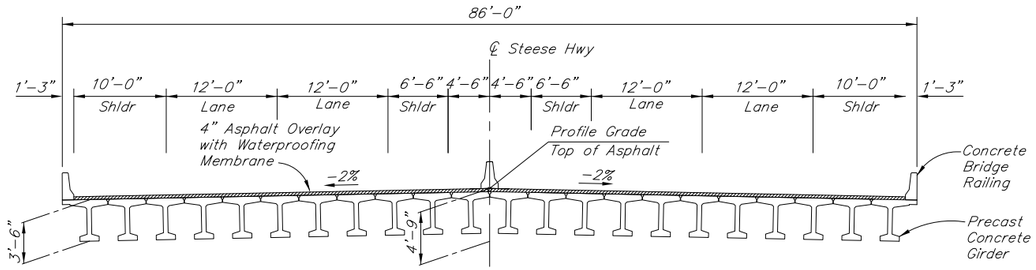
Distance between toe of slope protection: 147 feet

Table 3: Diverging Diamond Two Span Deck Bulb-Tee Advantages and Disadvantages

Advantages	Disadvantages
Requires the smallest effective superstructure depth	Requires intermediate support in median which may obstruct visibility under the bridge
Provides additional horizontal clearance that will accommodate future widening of Johansen Expressway	Additional time and cost to install pier
Common structure type that is familiar to contractors throughout Alaska	Requires piles at the abutment so that the foundations are the same type (i.e. mitigation of differential settlement issues)
Durable structure type	
Requires little future maintenance	
Requires the smallest effective superstructure depth	

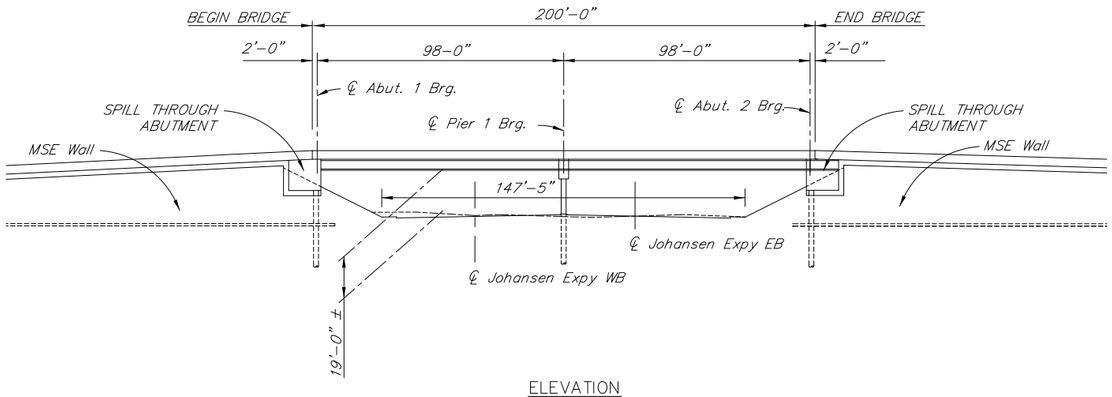
Figure 3: Similar structure Seward Highway over O'Malley Road, looking East.

STATE	PROJECT DESIGNATION	YEAR	SHEET NO.	TOTAL SHEETS
ALASKA		2019		



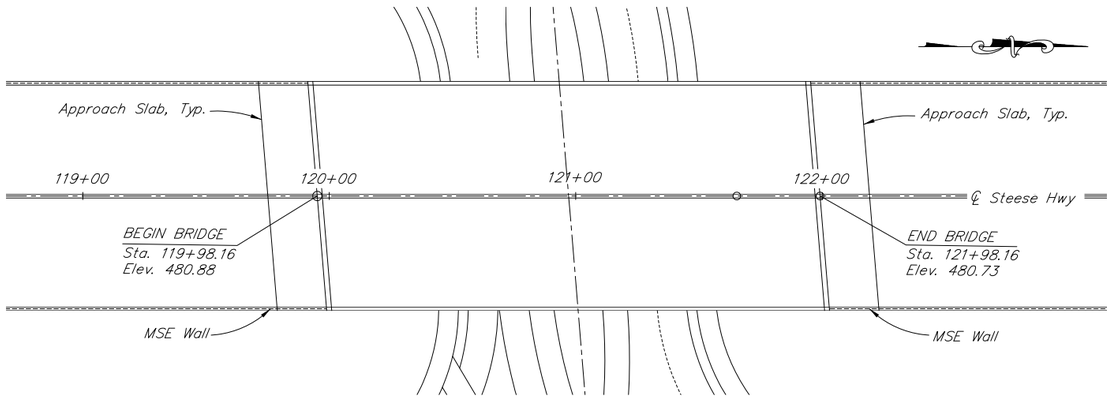
TYPICAL SECTION

12 0 4 8 12
In. Feet



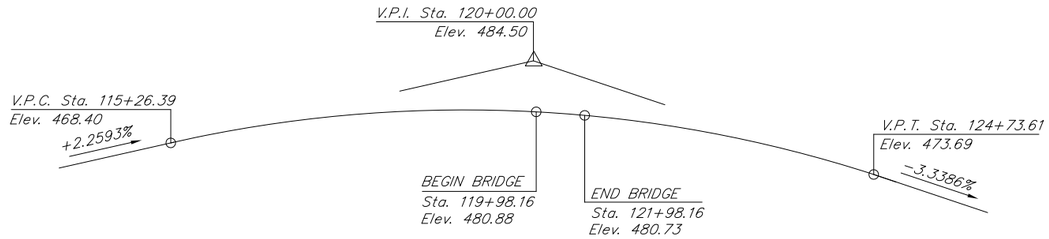
ELEVATION

30 20 10 0 30 60
Feet



PLAN

30 20 10 0 30 60
Feet



PROFILE GRADE DATA

GENERAL NOTES

DESIGN:..... AASHTO LRFD Bridge Design Specifications, 2017 Edition, with latest interim specifications.

Seismic design per AASHTO Guide Specifications for LRFD Seismic Bridge Design, 2011 with latest interim revisions.

LIVE LOAD:..... HL-93

DEAD LOAD:..... Includes 50 psf for all wearing surfaces.

SEISMIC PARAMETERS:..... PGA = 0.27
Ss = 0.65
S1 = 0.20
Site Class = D
Liquefaction Potential = Low
AASHTO 7% probability of ascendance in 75 years.

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ASTM A970 Headed bars, Class HA.
Space reinforcement evenly unless otherwise noted.

PRESTRESSED CONCRETE:..... See "GIRDERS" Dwg.

CONCRETE:..... Class A Concrete unless otherwise noted, f'c = 4,000 psi

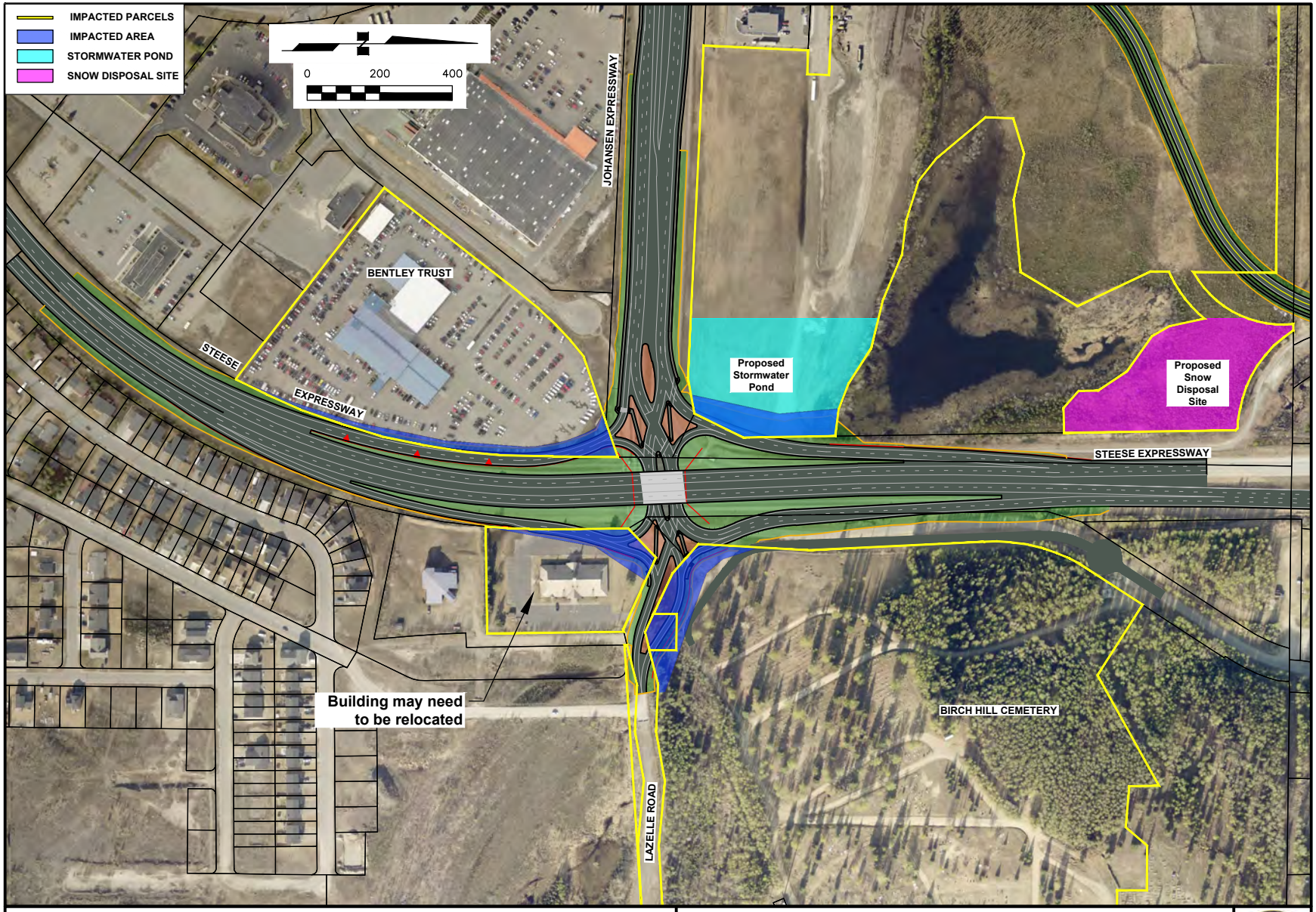
STRUCTURAL STEEL:..... ASTM A709, Grade 36T3, Fy = 36,000 psi
Galvanize structural steel in accordance with AASHTO M111 unless shown otherwise.

PRELIMINARY PLAN

DESIGNED BY: E. Thornley	CHECKED: Checker	FOUNDATIONS REVIEWED BY: Engineer			JOHANSEN EXPRESSWAY UNDERCROSSING STEESE HIGHWAY OPTION 3 GENERAL LAYOUT
DRAWN BY: E. Thornley	CHECKED: Designer				BRIDGE NO. DWG. NO.
QUANTITIES BY: J. Travis	CHECKED: Checker				

ATTACHMENT F

Right-of-Way Impacts Figure



STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION
AND PUBLIC FACILITIES

PROJECT NO. 0002337/Z607320000
PROJECT NAME STEESE EXPRESSWAY/JOHANSEN EXPRESSWAY INTERCHANGE: ENGINEERING & ENVIRONMENTAL SERVICES
SCALE 1" = 400' DATE: 02/26/20

Diverging Diamond Alternative

ATTACHMENT G

Rough Order of Magnitude Cost Estimate

ORDER OF MAGNITUDE COST

Project Name: Steese Expressway/Johansen Expressway Interchange **Date:** 7/19/2019
Location: Fairbanks, AK
Description: Alternate G3 Diverging Diamond Interchange

Instructions: 1. Enter Project Quantities in Yellow boxes. 2. Unit Costs & Percentages shown in red may be modified.

I. PROJECT DEVELOPMENT (Phase 2 Funds)								
	Design Total (Environmental Doc., Permits, Preliminary Engineering, Final Design, Assist During Bidding)			15%	(Of Line 39)			**$ 6,000,000**
II. RIGHT OF WAY (Phase 3 Funds)			Unit	Quantity	Unit Cost	Total		
1	Land Acquisition	Residential	ACRE		$ 100,000	$ -		
		Commercial	ACRE	1.4	$ 450,000	$ 630,000		
2	Mitigation Costs		# Parcels	4	$ 15,000	$ 60,000		
3	Full/Partial Building Take		SF		$ 200	$ -		
4	Demolition/Business Relocation		EA		$ 350,000	$ -		
5	Acquisition/Admin. Costs (per Parcel)		EA	4	$ 10,000	$ 40,000		
6	Others/Contingency		EST	25%	of above	$ 182,500		
7	**Right-of-Way Total** (Lines 1-6)							**$ 900,000**
III. UTILITIES (Phase 7 Funds)			Unit	Quantity	Unit Cost	Total		
8	Utility Modifications Costs	Utility Corridor	MILE		$ 8,000,000	$ -		
		Urban	MILE		$ 4,000,000	$ -		
		Semi Urban	MILE		$ 2,000,000	$ -		
		Rural	MILE	3.4	$ 700,000	$ 2,412,879		
9		Total Above				$ 2,412,879		
10	Engineering Costs	15% (Of Line 9)				$ 361,932		
11	Administration	15% (Of Line 9)				$ 361,932		
12	Construction Eng	15% (Of Line 9)				$ 361,932		
13	**Utilities Total** (Lines 8-12)							**$ 3,500,000**
IV. CONSTRUCTION (Phase 4 Funds)			Unit	Quantity	Unit Cost	Total		
14	Demolition/Clearing		ACRE	1	$ 15,000	$ 21,000		
15	Earthwork		CY	302,969	$ 7	$ 2,120,783		
16	Urban Section	# Lanes:	LANE MILE		$ 1,250,000	$ -		
	- EB Johansen	0.3 mile	SF	87,700	$ 11.84	$ 1,038,116		
	- WB Johansen	0.2 mile	SF	42,700	$ 11.84	$ 505,445		
	- NB Steese	1.1 mile	SF	288,000	$ 11.84	$ 3,409,091		
	- SB Steese	0.7 mile	SF	168,000	$ 11.84	$ 1,988,636		
17	Rural Section	# Lanes:	LANE MILE		$ 1,100,000	$ -		
18	Rehabilitation (3R)	# Lanes:	LANE MILE		$ 230,000	$ -		
19	Freeway Ramps - 2 Lane		SF		$ 9.47	$ -		
	- NB Off	0.3 mile		44,400	$ 9.47	$ 420,455		
	- NB On	0.3 mile		61,400	$ 9.47	$ 581,439		
	- SB Off	0.2 mile		49,750	$ 9.47	$ 471,117		
	- SB On	0.3 mile		60,000	$ 9.47	$ 568,182		
20	Freeway Ramps - 1 Lane		MILE		$ 1,300,000	$ -		
21	Frontage Roads - 2 Lane		MILE	-	$ 1,800,000	$ -		
22	Bridge	LxW: 138.5' x 86'	SF	11,911	$ 250	$ 2,977,750		
23	Retaining Walls		SF	20,000	$ 80	$ 1,600,000		
24	Noise Walls		SF			$ 1,200,000		
25	Additional Drainage System		MILE	3.4	$ 225,000	$ 775,568		
26	Landscaping		MILE	3.4	$ 350,000	$ 1,206,439		
27	Traffic Signal New		EA	2	$ 500,000	$ 1,000,000		
28	Traffic Signal Modification		EA		$ 100,000	$ -		
29	ITS		MILE	-	$ 550,000	$ -		
30	Additional Striping/Signage/Channelization		MILE	3.4	$ 115,000	$ 396,402		
31	Additional Illumination System		MILE	3.4	$ 750,000	$ 2,585,227		
32	Construction Traffic Control		%	10%	of Lines 14-30	$ 2,286,565		
33	Miscellaneous Items		%	10%	of Lines 14-31	$ 2,515,222		
34	Construction Subtotal (Lines 14 - 32)				(Round to nearest 1000)		$ 27,667,000	
35	Mobilization			6%	of Line 33		$ 1,660,020	
36	Others/Contingency			20%	of Line 33		$ 5,533,400	
37	Subtotal	(Lines 33 to 35)						**$ 34,900,000**
38								
39	**Construction Management Total** (Construction Admin., Inspection, etc.)			15%				**$ 5,235,000**
40	**Construction Total**	(Lines 36 and 38)						**$ 40,100,000**
V. Overall Total Cost for all Phases								**$ 50,500,000**

Project Specific Assumptions:

The above Order-of-Magnitude Estimate is in 2018 dollars based on conceptual design. Final costs of the project will depend on labor and