

Technical Memorandum #4

Capital Cost Evaluation

This document briefly summarizes the methods used to calculate opinions of probable cost for the transit service options developed for the Red Rock Corridor Alternatives Analysis Update.



October 21, 2013



Contents

1. Introduction	1
2. No-Build (Current Conditions) Option	1
a. Vehicles	1
b. Infrastructure	2
c. Summary	2
3. Express Bus Option	2
a. Vehicles	3
b. Infrastructure	3
c. Summary	4
4. BRT Option	4
a. Vehicles	4
b. Infrastructure Costs	5
c. Right of Way Acquisition	7
d. Summary	7
5. Commuter Rail Option	8
a. Vehicles	8
b. Infrastructure	8
c. Cost Sharing	11
d. Access Fees	11
e. Summary	11
6. Overall Summary	12



List of Tables

Table 1 – Vehicle Costs – No-Build (Current Conditions) Option.....	1
Table 2 – Infrastructure Costs – No-Build (Current Conditions) Option	2
Table 3 – Total Costs – No-Build (Current Conditions) Option	2
Table 4 – Vehicle Costs – Express Bus Option	3
Table 6 – Vehicle Costs – BRT Option.....	4
Table 7 – Infrastructure Costs – BRT Option.....	7
Table 8 – Right of Way Costs – BRT Option	7
Table 9 – Total Costs – BRT Option.....	8
Table 10 – Vehicle Costs – Commuter Rail.....	8
Table 11 – Downtown Minneapolis to Union Depot Section – Commuter Rail Option.....	9
Table 12 – Union Depot to Hastings Section – Commuter Rail	10
Table 13 – Hastings to Red Wing Section – Commuter Rail.....	10
Table 14 – Total – Commuter Rail Option	12
Table 15 – Summary of Planning Level Capital Cost Estimates	12

List of Appendices

APPENDIX A – Original Bus-Only Shoulder Lane Cost Estimates

APPENDIX B – Original BRT Cost Estimates

APPENDIX C – Original Commuter Rail Cost Estimates



1. INTRODUCTION

This memo describes the assumptions made and the outcomes of the cost estimation exercise carried out for the Red Rock Corridor AAU. Where possible, cost information was gathered from recent and relevant studies, such as the Gateway Corridor AA and the 2007 Red Rock Corridor AA. Original opinions of probable cost were developed where there were gaps, and details of these estimates are provided in the appendices.

A 3.5% annual escalation rate was used to estimate costs in 2013 dollars.

2. NO-BUILD (CURRENT CONDITIONS) OPTION

A. VEHICLES

The No Build (Current Conditions) Option represents an increase in frequency on two of the three express bus routes that currently serve the Red Rock Corridor to serve future demand. The capital cost estimate is based in part on the number of additional vehicles required to meet this future schedule. While buses in the existing fleet will need to be replaced in future years as they reach the end of their useful life, it is assumed that normal replacement will be paid for from existing funding streams (e.g. metro sales tax, federal funding) and through existing Metro Council bus procurement procedures. For the purpose of this study, it is also assumed that the additional vehicles can be accommodated by the capacity of existing bus maintenance and storage facilities, and so no facility costs are included with this option's cost estimate.

Vehicle costs are summarized in Table 1. A contingency of 5% is applied to the cost of these vehicles. A relatively low contingency was selected due to the relative certainty about the cost of these vehicles. It is assumed that they will be coach buses or articulated buses, both of which are on the order of \$600,000.

Table 1 – Vehicle Costs – No-Build (Current Conditions) Option

Cost Element	Units	Unit Cost (\$2013)	Opinion of Probable Cost (\$2013)
Additional buses for Route 361	2	\$600,000	\$1,200,000
Additional buses for Route 364	0	\$600,000	\$0
Additional buses for Route 365	7	\$600,000	\$4,200,000
Spares	2	\$600,000	\$1,200,000
SUBTOTAL			\$6,600,000
Contingency (5%)			\$330,000
TOTAL – VEHICLES	11	-	\$6,930,000



B. INFRASTRUCTURE

Bus-only shoulder lanes are assumed to be incorporated into this option along a portion of TH 61 that is expected to experience congestion in future years. Background on the cost estimate of this enhancement is provided in Appendix A. Some segments of the corridor require minor repairs and adjustments, while others require full shoulder replacement. The estimate is based on an understanding of the existing conditions of the roadway. The impacted section is between 1-94 and Jamaica Avenue and the cost estimate reflects upgrades to 22.4 lane-miles of roadway.

Table 2 – Infrastructure Costs – No-Build (Current Conditions) Option

Cost Element	Opinion of Probable Cost (\$2013)
Bus-Only Shoulder Lanes	\$920,000
Construction Staging (10%)	\$90,000
SUBTOTAL	\$1,010,000
Engineering (20%)	\$200,000
Contingencies (30%)	\$300,000
Oversight (10%)	\$100,000
TOTAL – BUS-ONLY SHOULDER LANES	\$1,610,000

C. SUMMARY

The summary of this option is shown in Table 3.

Table 3 – Total Costs – No-Build (Current Conditions) Option

Cost Element	Opinion of Probable Cost (\$2013)
Vehicles	\$6,930,000
Bus-Only Shoulder Lanes	\$1,610,000
TOTAL	\$8,540,000

3. EXPRESS BUS OPTION

It is assumed that the express bus option would include bus-only shoulder lanes as well as an expanded vehicle fleet.



A. VEHICLES

A unit cost of \$600,000 will be used to estimate the cost of coach and/or articulated buses for the Red Rock Corridor AAU. This is consistent with typical costs for articulated buses and the recent purchase of coach buses by Metro Transit. It is the unit cost used for vehicles in the No Build (Current Conditions) Option.

Schedule-wise, it is assumed that the new express bus overlay service will be similar to the commuter rail service, with 10 trips per day, in which case four buses would be needed for revenue service and one would be required as a spare. The express bus option will include both the new overlay route as well as the routes described in the No Build (Current Conditions).

Vehicle needs are summarized in Table 4.

Table 4 – Vehicle Costs – Express Bus Option

Cost Element	Units	Unit Cost (\$2013)	Total (\$2013)
Additional buses for Route 361	2	\$600,000	\$1,200,000
Additional buses for Route 364	0	\$600,000	\$0
Additional buses for Route 365	7	\$600,000	\$4,200,000
Buses for the overlay Express Bus Route	4	\$600,000	\$2,400,000
Spares	3	\$600,000	\$1,800,000
SUBTOTAL			\$9,600,000
Contingency (5%)			\$480,000
TOTAL – VEHICLES	16	-	\$10,080,000

B. INFRASTRUCTURE

It is assumed that the Express Bus Option would receive the same level of investment in bus-only shoulder lanes as the No Build (Current Conditions) Option. Bus-only shoulder lanes are assumed to be incorporated into this option along a portion of TH 61 that is expected to experience congestion in future years. Background on the cost estimate of this enhancement is provided in Appendix A. Some segments of the corridor require minor repairs and adjustments, while others require full shoulder replacement. The estimate is based on an understanding of the existing conditions of the roadway. The impacted section is between 1-94 and Jamaica Avenue and the cost estimate reflects upgrades to 22.4 lane-miles of roadway.

The bus-only shoulder lane costs are summarized in Table 2.



C. SUMMARY

Table 5 summarizes the opinion of probable cost of the Express Bus Option.

Table 5 – Total Costs – Express Bus Option

Cost Element	Opinion of Probable Cost (\$2013)
Vehicles	\$10,080,000
Bus-Only Shoulder Lanes	\$1,610,000
TOTAL	\$11,690,000

4. BRT OPTION

A. VEHICLES

For estimating purposes, it was assumed that the cost of a BRT vehicle would be \$800,000. Metro Council does not have standards for the BRT vehicles, but this value represents a bus that is enhanced in one or more areas for operational efficiencies, customer comfort, or community acceptance. A higher contingency factor was applied to the vehicle cost estimate compared to other options due to uncertainty in the level of customization that would be required.

A summary of the vehicle needs is provided in Table 6.

Table 6 – Vehicle Costs – BRT Option

Cost Element	Units	Unit Cost (\$2013)	Total (\$2013)
Additional buses for Route 361	2	\$600,000	\$1,200,000
Additional buses for Route 364	0	\$600,000	\$0
Additional buses for Route 365	7	\$600,000	\$4,200,000
BRT Buses	6	\$800,000	\$4,800,000
Spares – Express Buses	3	\$600,000	\$1,800,000
Spares – BRT Buses	2	\$800,000	\$1,600,000
SUBTOTAL			\$13,000,000
Contingency (10%)			\$1,300,000
TOTAL – VEHICLES	20	-	\$14,300,000



B. INFRASTRUCTURE COSTS

For the BRT option, cost estimates were developed for infrastructure changes that would make bus service more direct and more reliable. As with the No Build (Current Conditions) and Express Bus Option, it was assumed that there would be investments in bus-only shoulder lanes between Jamaica Avenue and I-94. Bus-only shoulder lane costs are summarized in Table 2.

In the case of the Lower Afton Road Station, the investments were largely driven by the understanding that the current station is at capacity, and any improvements in service would strain the capacity at this station even further. Therefore, the cost estimate includes a parking facility with 275 spaces. The cost estimate for this structure was assumed to be approximately \$5,330,000, or \$19,374 per space.¹

While infrastructure solutions were initially proposed to support shortened BRT travel times to and from the Newport Park and Ride, input from stakeholders indicated that the community would not support any more major construction in the vicinity of the Highway 61 and I-494 interchange. Therefore, buses will use the existing roadway network to get to and from Newport Station.

As for the Cottage Grove Station, two options for improving access/egress to this station were proposed. The first involved new bus ramps that would bring northbound BRT buses over and across Highway 61 to access the Cottage Grove Park and Ride. This would result in a single station that could serve all passenger boardings and alightings. The second option involved a split station arrangement, in which customers could access the northbound BRT station via a pedestrian bridge that connected the Cottage Grove Park and Ride to the northbound side of Highway 61. The second option was carried forward because it was more consistent with the designs already in place in the Region for BRT stations.

Over the course of the study, it was requested that the cost estimate reflect investments in customer comfort such as covered and climate-controlled pedestrian bridges and elevators.

Details of the cost estimates associated with BRT are provided in Appendix B and summarized below on a station-by-station basis. They assume no investments are needed at Union Depot to accommodate BRT. Also note that the scope of the BRT Option has changed over the course of the project, so costs carried forward vary slightly from those in the original cost estimate.

¹ This unit cost comes from a Carl Walker, Inc. newsletter called Parking Structure Cost Outlook for 2013



Lower Afton Road Station

Site Preparation	\$585,525
Traffic Control	\$150,000
Removals	\$205,000
Drainage	\$44,000
Utilities	\$132,500
Roadway/PnR	\$6,011,200
Structures	\$1,423,500
Traffic Signals	\$110,000
Signing/Striping	\$32,920
BRT Boarding Areas	\$490,000
Landscaping	\$25,000
Enclosed Bridge	\$1,523,800
Elevators	\$400,000
Subtotal	\$11,130,000

Newport Station

BRT Boarding Area	\$360,000
Subtotal	\$360,000

Cottage Grove

Site Preparation	\$458,340
Traffic Control	\$90,000
Removals	\$35,000
Drainage	\$10,000
Utilities	\$20,000
Roadway/PnR	\$1,509,020
Structures	\$1,722,000
Traffic Signals	\$250,000
Signing/Striping	\$48,000
BRT Boarding Area	\$490,000
Landscaping	\$13,000
Enclosed Bridge	\$1,523,800
Elevators	\$400,000
Subtotal	\$6,570,000

Hastings Station

BRT Boarding Area	\$400,000
Subtotal	\$400,000

The summary of infrastructure cost estimates is shown in Table 7.



Table 7 – Infrastructure Costs – BRT Option

Cost Item	BRT Option
Lower Afton Road Station	\$11,130,000
Newport Station	\$360,000
Cottage Grove	\$6,570,000
Hastings	\$400,000
Bus Only Shoulder Lanes	\$1,010,000
SUBTOTAL	\$14,890,000
Engineering (20%)	\$2,980,000
Contingency (30%)	\$4,470,000
Oversight (10%)	\$1,490,000
TOTAL - INFRASTRUCTURE	\$31,150,000

C. RIGHT OF WAY ACQUISITION

The anticipated costs of right of way for the BRT option are shown in Table 8. The estimates were developed from gauging the acreage of land that would need to be acquired to facilitate the development of the conceptual infrastructure, multiplied by \$70,000, a unit cost developed by scanning recent land sales in the Region. It is acknowledged that these estimates could vary widely based on the unit cost used, and so a high level of contingency has been applied to these estimates.

Table 8 – Right of Way Costs – BRT Option

Location	BRT Option
Lower Afton Road	\$213,000
Cottage Grove	\$26,000
SUBTOTAL	\$239,000
Contingency (50%)	\$119,500
TOTAL – RIGHT OF WAY	\$358,500

D. SUMMARY

A summary of the opinion of probable cost for this option is shown in Table 9.



Table 9 – Total Costs – BRT Option

Cost Item	Red Rock AAU (\$2013)
Vehicle Total	\$14,300,000
Infrastructure Total	\$31,150,000
Right of Way Total	\$360,000
TOTAL	\$45,810,000

5. COMMUTER RAIL OPTION

A. VEHICLES

The vehicle unit costs that were assumed in the Gateway Corridor AA were used for the Red Rock Corridor AAU. Assuming that five train sets will be required for service in the corridor, and that a 5% contingency be added to the value, the cost estimate for vehicles is \$58.14 million as shown in Table 10.

Table 10 – Vehicle Costs – Commuter Rail

Cost Element	Units	Gateway Corridor AA Unit Cost (\$2012)	Red Rock Corridor AAU Unit Cost (\$2013)	Red Rock Corridor AAU (\$2013)
Commuter Rail Trainsets (1 locomotive and 2 passenger cars)	5	\$10,700,000	\$11,070,000	\$55,370,000
SUBTOTAL				\$55,370,000
Contingency (5%)				\$2,770,000
TOTAL - VEHICLES				\$58,140,000

B. INFRASTRUCTURE

Costs for commuter rail in the Red Rock corridor are provided for three distinct sections.

1. Downtown Minneapolis to Union Depot Section

It was assumed that this section would use the same route and cost assumptions as were made in the 2012 Gateway Corridor AA for Segment 1 of the Commuter Rail Option (Option 7). This segment is 12.1 miles long and allows for through routing of trains at Union Depot. It makes use of existing track on the BNSF Wayzata and Midway subdivisions and the CP Merriam subdivision.



The \$248.49 million (\$2013) estimate for infrastructure to support commuter rail includes contingency, professional services, and oversight. It does not include costs for electrification (which would be required to support high speed rail), upgrades to Union Depot, upgrades to Target Field Station, or stations between the Downtowns.

Table 11 – Downtown Minneapolis to Union Depot Section – Commuter Rail Option

Cost Element	Gateway Corridor AA (\$2012)	Red Rock Corridor AAU (\$2013)
Stations	\$2,550,000	\$2,640,000
Guideway & Track Elements	\$73,850,000	\$76,430,000
Sitework & Special Conditions	\$45,040,000	\$46,620,000
Systems	\$15,310,000	\$15,840,000
ROW, Land, Existing Improvements	\$13,310,000	\$13,770,000
SUBTOTAL		\$155,300,000
Engineering (20%)		\$31,060,000
Contingency (30%)		\$46,590,000
Oversight (10%)		\$15,530,000
TOTAL - INFRASTRUCTURE		\$248,490,000

2. Union Depot to Hastings Section

Cost estimates for the Union Depot to Hastings section were provided in the 2007 Red Rock Corridor AA, which drew on the 2001 Commuter Rail Feasibility Study. The more recent East Metro Capacity Study (EMCS) also studied this section, but it looked at the needs of all existing and future users in the corridor and did not fully separate the investments that would be needed for commuter rail from those that would be needed for freight, Amtrak, and higher speed passenger rail service. The same factors for contingency, professional services, and oversight were used as were applied in the Gateway Corridor AA to provide consistency with the cost estimate for the downtown Minneapolis to Union Depot section.

The \$266.33 million (\$2013) estimate for infrastructure to support commuter rail includes a maintenance/operations facility, upgrades to the track and structures around Hoffman Junction to connect Union Depot to the mainline track, capacity improvements, and station elements as shown in Table 12.



Table 12 – Union Depot to Hastings Section – Commuter Rail

Cost Element	Red Rock Corridor AA / Commuter Rail Feasibility Study (\$2007)	Red Rock AAU (\$2013)
Maintenance / Operations Facility	\$24,920,000	\$30,630,000
Capacity Upgrade	\$18,450,000	\$22,680,000
Hoffman Junction / Union Depot	\$74,080,000	\$91,060,000
Storage Track Improvements	\$370,000	\$450,000
Stations	\$17,590,000	\$21,620,000
SUBTOTAL		\$166,450,000
Engineering (20%)		\$33,290,000
Contingency (30%)		\$49,940,000
Oversight (10%)		\$16,650,000
TOTAL - INFRASTRUCTURE		\$266,330,000

The above estimate includes stations at Hastings, Cottage Grove, Newport, and Lower Afton Road. However, they do not reflect the additional station area planning work that was carried out in 2012.

3. Hastings to Red Wing Section

The section south of Hastings is 20.4 miles long and required an original opinion of probable cost. This is because no previous study had considered commuter rail in this segment. The request for estimate and the estimate details are included in Appendix C. The summary is shown in Table 13.

Table 13 – Hastings to Red Wing Section – Commuter Rail

Cost Element	Red Rock AAU (\$2013)
Hastings Station – Second Platform	\$3,420,000
Prairie Island Station	\$3,850,000
SUBTOTAL	
Engineering (20%)	\$1,450,000
Contingency (30%)	\$2,180,000
Oversight (10%)	\$730,000
TOTAL - INFRASTRUCTURE	
	\$11,630,000



The estimates do not include any costs for improving the mainline, although special trackwork should be considered at the stations, as well as any real estate costs. Also, the estimates do not include park and ride costs, as it is assumed that parking is currently available in some form at all of the stations.

The platforms were assumed to be similar to the existing 425' platforms at Elk River, Anoka, and Fridley on the Northstar Commuter Rail line and that the overall station designs would be consistent with the Northstar 2006 Design Criteria.

C. COST SHARING

In the Union Depot to Hastings section, 100% of costs are attributed to the Red Rock Corridor estimate. Higher speed passenger rail could potentially share in the costs, or even Amtrak, but these services are likely less frequent and would not trigger the need for more infrastructure. This section was addressed in the East Metro Capacity Study (EMCS) to some extent, which looked at options for improving speeds and capacity in the study corridor for all rail traffic, most of which is freight traffic. It noted specific investments which would be required solely for passenger rail, such as a new flyover to connect Union Depot to the mainline passenger tracks and a new bridge over the Mississippi River near Hastings. Other investments, such as switch upgrades, new track, and track reconfiguration to reduce train occupancy on the mainline tracks, would benefit all train service. If commuter rail is implemented in the Red Rock Corridor, ongoing discussions will take place regarding any potential cost sharing with freight or higher speed passenger rail. At this time, it is not appropriate to assume any cost sharing. The EMCS did not make an effort to attribute costs to individual railroads or operators, nor did it include some elements that would be required if a commuter rail line were to be constructed, such as a maintenance facility and vehicles.

D. ACCESS FEES

In addition to infrastructure costs, there is a high probability that a commuter rail option will require some sort of access fee to be paid to the owner railroads to guarantee long-term access. This could be paid in the form of a one-time lump sum payment, but it could also come in the form of access in exchange for a recurring payment, land, or other concessions.

The Northstar commuter rail project required such a payment, and this payment could easily be in excess of \$100 million. At this time, we have not included a placeholder value for the access fee in the cost estimate carried forward, but it should be recognized as a potentially large cost item.

E. SUMMARY

The summary of the opinion of probable cost for the commuter rail option is shown in Table 14.



Table 14 – Total – Commuter Rail Option

Cost Element	Total (\$2013)
Downtown Minneapolis to Union Depot	\$248,490,000
Union Depot to Hastings	\$266,330,000
Hastings to Red Wing	\$11,630,000
Vehicles	\$58,140,000
TOTAL	\$584,590,000

6. OVERALL SUMMARY

The opinions of probable cost for the four options carried forward in the Red Rock Corridor AAU are provided in Table 15.

Table 15 – Summary of Planning Level Capital Cost Estimates

	No Build (Current Conditions)	Express Bus	BRT	Commuter Rail
Planning Level Capital Cost Estimates	\$8,540,000	\$11,690,000	\$45,810,000	\$584,590,000



APPENDIX A – Original Bus-Only Shoulder Lane Cost Estimates

Memo



Stantec

To: Jay Demma
St. Paul MN Office

From: John Langholff
St. Paul MN Office

File: Red Rock Corridor -
Upgrade Bus Only Option.docx

Date: August 9, 2013

**Reference: Red Rock Corridor (US 61) – I-94 to Jamaica Ave.
Upgrade to Bus Only Shoulders
Project No. 193801759**

Assumptions were made to produce a cost estimate for upgrading the existing shoulders to bus only lanes on the Red Rock Corridor (US 61) from I-94 in St. Paul to Jamaica Avenue in Cottage Grove (see attached map):

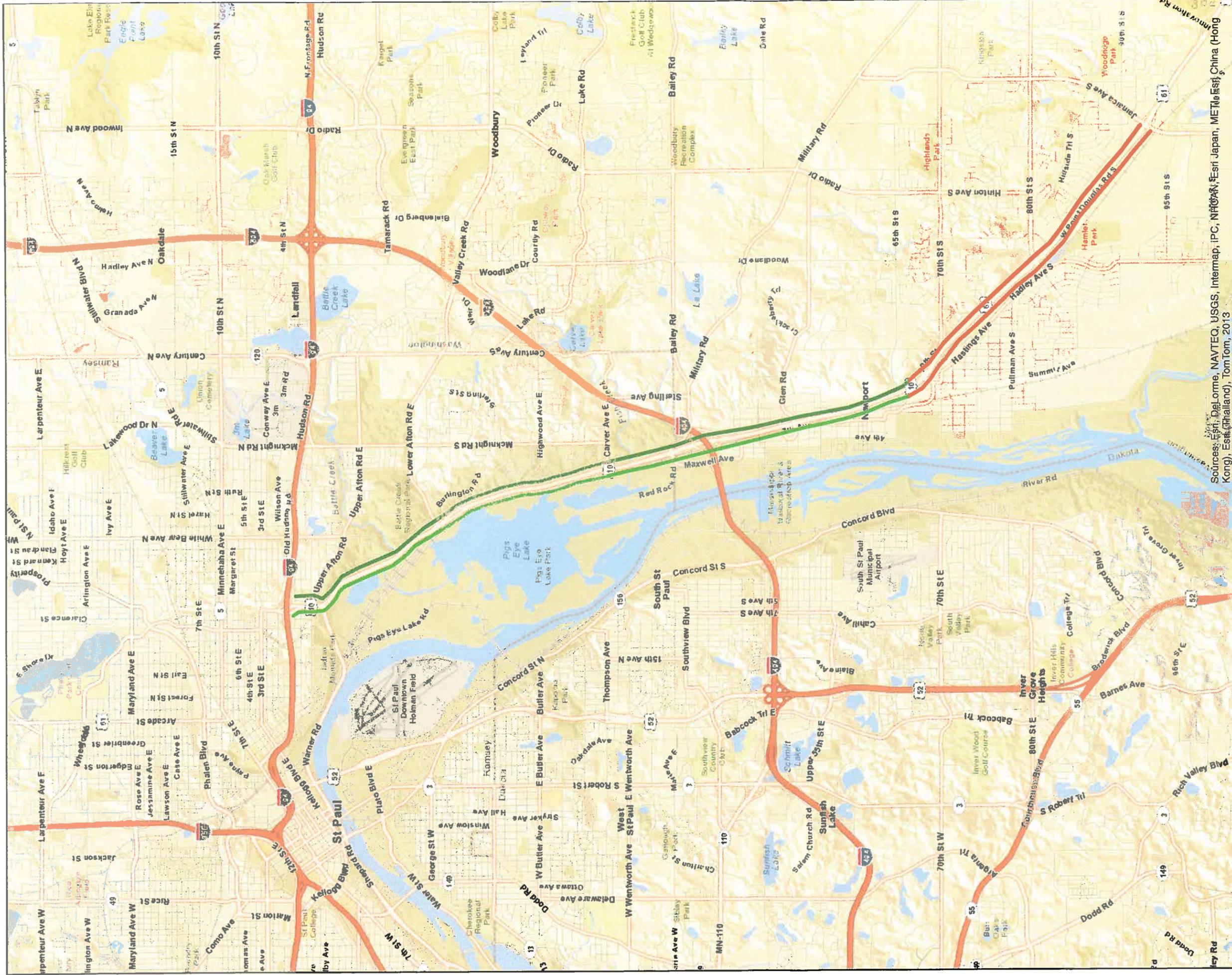
1. The existing shoulder pavement on US 61 from I-94 to 70th Street is assumed to have an adequate width of 10 feet and an adequate depth of 7 inches based on e-mails to Jay Demma from Carl Jensen at MNDOT dated 8/5/2013 (~~see attached~~). The exact location of existing bus only shoulders in this part of the corridor is unknown at this time.
2. The existing shoulder pavement on US 61 from 70th Street to Jamaica Avenue is assumed to have an adequate width of 10 feet and an inadequate depth of four inches based on the attached Typical Sections from plans dated 11/26/2009 (see attached).
3. The cost estimate is based on the attached MNDOT report titled "Bus Only Shoulders in the Minneapolis/St. Paul Area" updated 11/29/2010. The costs in "Table 2. Cost Associated with Implementing Buses Only Shoulders," were increased by 25% to account for the change in average bid prices for aggregate and bituminous from 2010 to 2012. A 10% cost for construction staging as well as a 20% contingency were added to the estimate to determine a total cost for upgrading to bus only shoulders on the Red Rock Corridor (US 61) between I-94 and Jamaica Avenue.

Costs Associated with Implementing Bus-Only Shoulders			
Condition	Costs plus signing and striping	Lane Miles	Total
Shoulder width and bituminous depth are adequate. Minor shoulder repairs and catch basin adjustments are needed.	\$6,250.00	15.8	\$98,750.00
Shoulder must be removed; granular base adjusted and increased bituminous depth replaced.	\$125,000.00	6.6	\$825,000.00
		Total	\$923,750.00
		10% Construction Staging	\$92,375.00
		20% Contingencies	\$184,750.00
		Revised Total	\$1,200,875.00

STANTEC CONSULTING SERVICES INC.

John Langholff
 Designer
 John.Langholff@stantec.com

One Team. Infinite Solutions.



Bus Rapid Transit Options (BRT) Upgrade Bus Only Shoulders Highway 61 between I-94 and Jamaica Ave

Red Rock Corridor

Existing Shoulder Depth

- █ NB 4"
- █ SB 4"
- █ NB 7"
- █ SB 7"



Sources: Esri, DeLorme, NAVTEQ, USGS, Intermap, iPC, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (the land), TomTom, 2013

August 15, 2013

Jamaica to Both (2009)

T.H. 61 UNBONDED CONCRETE OVERLAY

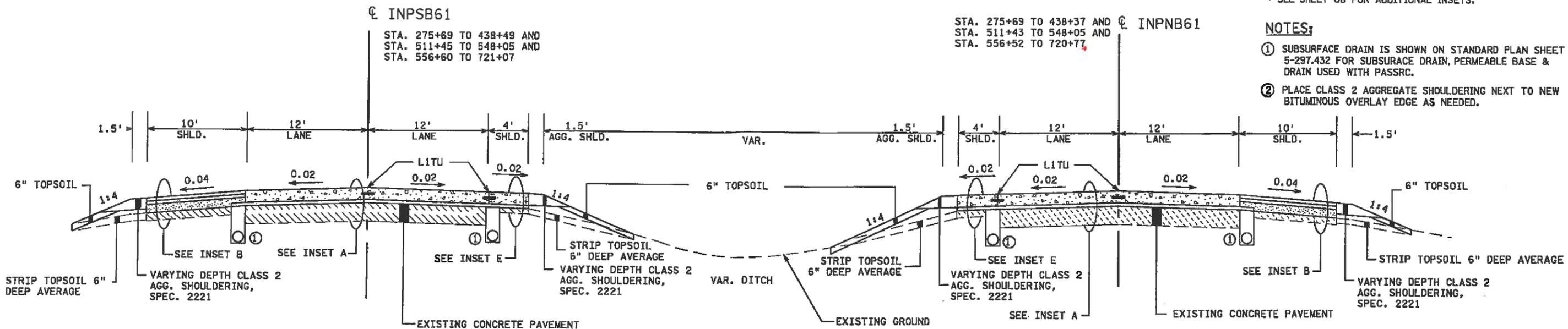
GENERAL NOTES:

- ALL CROSS SLOPES ARE IN FT. PER FT.
- SEE SHEET 68 FOR ADDITIONAL INSETS.

NOTES:

- SUBSURFACE DRAIN IS SHOWN ON STANDARD PLAN SHEET 5-297.432 FOR SUBSURFACE DRAIN, PERMEABLE BASE & DRAIN USED WITH PASSRC.
- PLACE CLASS 2 AGGREGATE SHOULDERING NEXT TO NEW BITUMINOUS OVERLAY EDGE AS NEEDED.

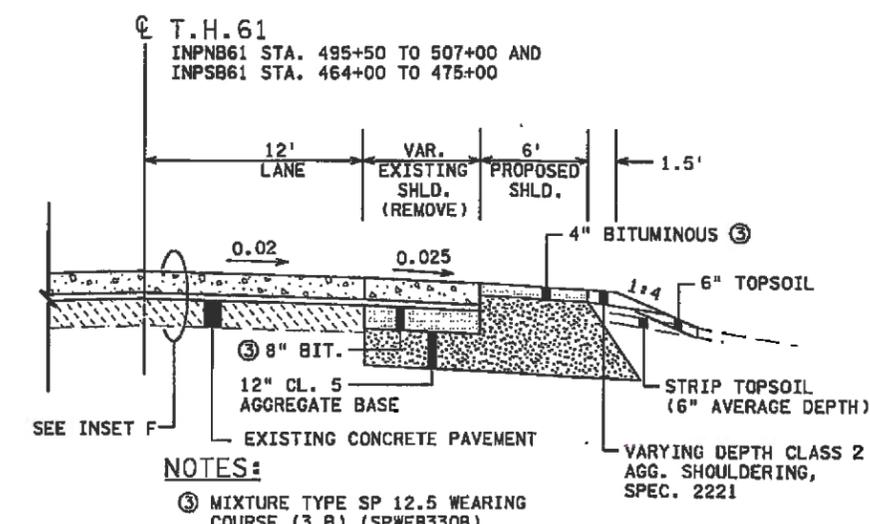
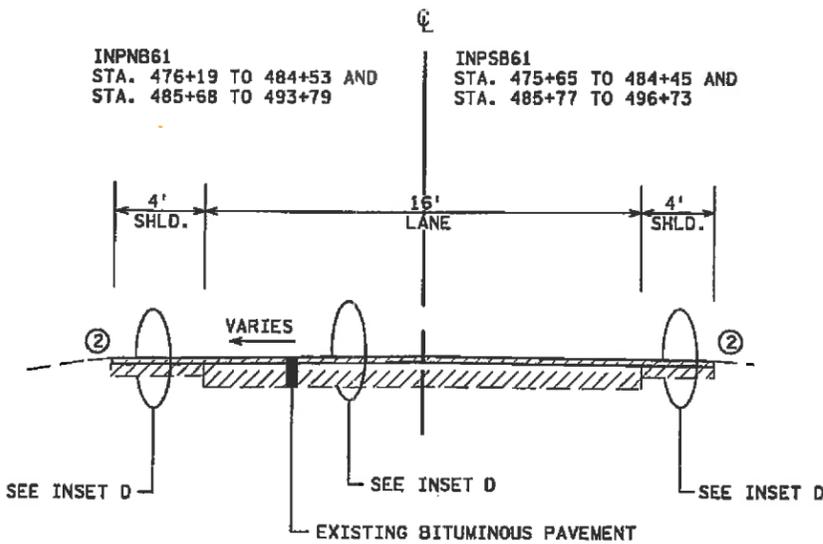
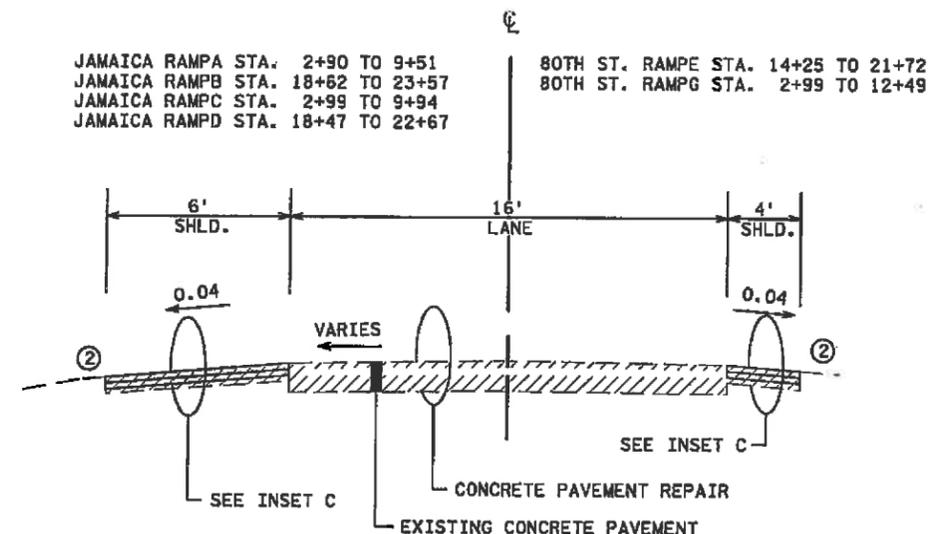
PLOTTED/REVISED: 02-MAR-2010 07:53



JAMAICA AND BOTH STREET RAMPS

INNOVATION DRIVE RAMPS

INNOVATION DRIVE ENTRANCE RAMPS ACCELERATION LANE WIDENING



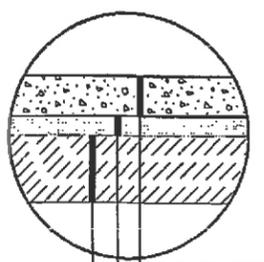
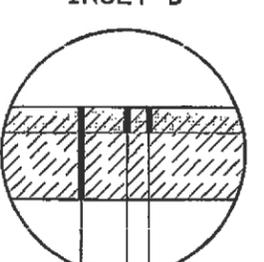
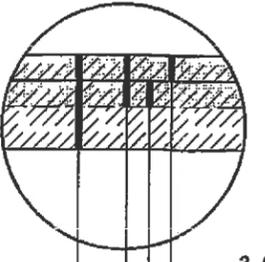
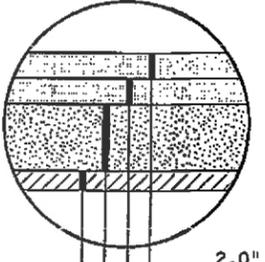
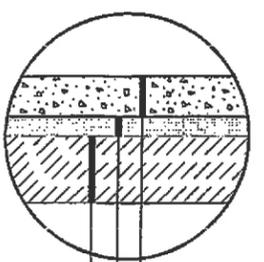
INSET A

INSET B

INSET C

INSET D

INSET E



7.0" PROPOSED CONCRETE PAVEMENT
 1.5" PERMEABLE ASPHALT STABILIZED STRESS RELIEF COURSE (PASSRC)
 EXISTING CONCRETE PAVEMENT

2.0" TYPE SP 12.5 WEARING COURSE MIXTURE (3,B) (SPWEB330B)
 2.0" TYPE SP 12.5 WEARING COURSE MIXTURE (3,B) (SPWEB330B)
 4.5" AGGREGATE BASE CLASS 5 (CV)
 EXISTING BIT SHOULDER

INSET C (FOR SHOULDERS OF JAMAICA AND BOTH STREET RAMPS)
 2.0" TYPE SP 12.5 WEARING COURSE MIXTURE (3,B) (SPWEB330B)
 2.0" TYPE SP 12.5 WEARING COURSE MIXTURE (3,B) (SPWEB330B)
 4.0" BITUMINOUS MILL
 EXISTING SHOULDER PAVEMENT

INSET D (FOR INNOVATION RAMPS & SHOULDERS)
 2.0" TYPE SP 12.5 WEARING COURSE MIXTURE (4,E) (SPWEB440E)
 2.0" BITUMINOUS MILL
 EXISTING SHOULDER OR RAMP PAVEMENT

7.0" PROPOSED CONCRETE PAVEMENT
 1.5" PERMEABLE ASPHALT STABILIZED STRESS RELIEF COURSE (PASSRC)
 EXISTING BIT SHOULDER OR BIT TURN LANE

DISTRICT #: METRO
 PLOT NAME: 08205-111.js
 FILENAME: 08205-111.js.dgn

Bus Only Shoulders in the Minneapolis/St. Paul Area

The Minnesota Department of Transportation has collaborated with Metro Transit, suburban opt-out transit providers, the Metropolitan Council and cities and counties to form Team Transit. The purpose of Team Transit is to initiate deployment of transit related enhancements within the Metro area. By encouraging these enhancements, such as park and ride lots, ramp meter bypasses, and bus-only shoulders, Team Transit hopes to encourage current single-occupant drivers to choose transit and to offer incentives to keep current transit riders.

Since the bus-only shoulder began in 1992 there has been 295 miles of bus-only shoulders added to the roadways. Out of the 295 miles of bus-only shoulders, approximately 9 miles are located on City and County roads. The segments range from 0.3 to 9.0 miles in length. The segment lengths vary depending on location. Guidelines have been developed by Team Transit and approved by the Federal Highway Administration. The bus-only shoulders are operational at any time when traffic in the adjacent mainlanes is moving at less than 35 MPH. Buses may not travel more than 15 MPH faster than the mainline and the maximum speed allowed on the shoulder is 35 MPH. The geometric design standards are available on the Team Transit web at:

<http://www.dot.state.mn.us/metro/teamtransit/>

Along with the guidelines above, the Metropolitan Council and MnDOT authorize the transit operators eligible to use the bus-only shoulders. The director of Team Transit furnishes the Minnesota State Patrol East and West Metro captains with the list of authorized transit operators. The Minnesota State Patrol is responsible for enforcement. The director of Team Transit is also responsible for providing transit providers with operating instructions and the guidelines. Bus drivers are encouraged to use their best judgment when operating on the shoulder. Buses must yield to any vehicle that enters the shoulder as well as vehicles merging or exiting at interchanges.

Bus-only shoulders are typically located on the outside shoulder and the segment is signed as such. Signs warning of buses on shoulders are placed at intersections within the segment to alert drivers entering the roadway to watch for buses on the shoulder.

Costs

Construction costs for these projects may vary depending on whether a shoulder is being converted or is part of new construction project. Table 2 indicates different scenarios and the associated costs for implementation on a freeway or expressway. Operating and maintenance costs include the additional cost of snow and debris removal in these areas. There are also increased costs to repair, resurface or reconstruct damaged shoulders.

Table 2. Costs Associated with Implementing Bus-Only Shoulders

Condition	Costs plus signing and striping
Shoulder width and bituminous depth are adequate. Catch basins do not need adjustment. Signing and striping are only requirements.	\$ 1,500 per mile – Freeway \$ 2,500 per mile - Expressway

Shoulder width and bituminous depth are adequate. Minor shoulder repairs and catch basin adjustments are needed.	\$ 5,000 per mile – Freeway \$ 5,000 per mile – Expressway
Shoulder width is adequate but bituminous depth requires a 2” overlay. This assumes shoulder and roadway can be overlaid at the same time.	\$ 12,000 per mile – Freeway \$ 12,000 per mile - Expressway
Same as above but adjacent roadway is not being overlaid. Shoulder must be removed; granular base adjusted and increased bituminous depth replaced.	\$ 80,000 - \$ 100,000 per mile
Shoulder width and depth replacement are required.	\$ 42,000 - \$ 66,000 per mile for both freeway and expressway
Installing a 12 ft shoulder rather than a 10 ft shoulder in a new construction project.	\$ 30,000 per mile for both freeway and expressway

Time Savings and Ridership

A study of bus-only shoulders in the Twin Cities area completed in June 1997 indicated that travel time savings was highly variable. The completed travel time runs resulted in a maximum time savings of nine minutes for buses using the shoulder compared with 10 minutes utilizing the ramp meter bypass and 17 minutes utilizing the high-occupancy vehicle (HOV) lane.

The study analyzed ridership over nine routes and found that, overall there was a 9.2 percent increase in ridership over a two year period. Total system ridership experienced a 6.5 percent decrease over the same time period. A majority of riders felt that the bus-only shoulders resulted in travel time savings.

SRF Consulting also surveyed bus drivers on routes with bus-only shoulder use to determine driver reaction and use of the shoulders. Sixteen drivers were interviewed and results indicate that most of the drivers use the shoulders during congested periods. The drivers perceived a travel time savings of 5-20 minutes.

Safety

~was this info taken from the SRF study? If so, please state so.

None of the drivers had been involved in a crash nor did they know of any other drivers involved in crashes while using the shoulders. However, many drivers felt that they would use the facilities more often if the shoulders were wider. In fact, on I-35W the shoulder is only 9.5 ft wide.

In January of 2001, MnDOT also conducted additional crash analysis on the 175 miles of bus-only shoulders. Crash data over the last 10 years has been analyzed and there have only been 20 crashes involving buses and each crash resulted in property damage only.

Conclusions

The use of bus-only shoulders is an integral part of the Team Transit partnership to quickly deploy transportation improvements that support moving more people more quickly on congested roadways.

Updated November 29, 2010

While the effectiveness is highly variable, bus-only shoulder use is perceived by the public to result in time-savings and trip predictability. As this application is applied in new construction, optimal specifications may be implemented. This will increase bus driver participation that could result in more utilization. Additionally, the Minnesota legislature is currently considering legislation that will allow registered vanpools and charter buses to use the bus-only shoulders.

References

1. SRF Consulting Group, *Study of Bus-Only Shoulders*, Minnesota Department of Transportation Report 1998-06U.
2. Minnesota Department of Transportation and Team Transit, *Team Transit Market Research: Bus-Only Shoulder Evaluation*. January 1998.
3. Lott, Heather. Minnesota Department of Transportation, Phone Conversation, March 18, 2002. (651) 582-1722



APPENDIX B – Original BRT Cost Estimates

**RED ROCK CORRIDOR
CONCEPT LEVEL CONSTRUCTION COST OPINION
for
BRT FULL INVESTMENT ALTERNATIVE**

June 28, 2013



OVERVIEW

The WCRRA is considering transit alternatives to the Red Rock corridor from St Paul to Hastings. The corridor is approximately 19 miles long and generally on/along the Trunk Highway (TH) 61. This memorandum addresses the feasibility and concept level construction costs for the BRT – Full Investment transit alternative.

The BRT – Full Investment alternative takes advantage of the TH 61 to the extent practical. It diverges from the highway at the proposed Park and Ride sites and at the far north end from St. Paul Union Station to just south of the I-94 / TH 61 interchange. The focus of this effort was to:

- ✓ Provide a technical feasibility review of the concept alignments at three proposed Park And Ride/Station sites;
 - Lower Afton Rd.
 - Newport Park
 - Cottage Grove
- ✓ Provide concept level construction cost opinions for proposed infrastructure improvements for the BRT-Full Investment alternative.

TECHNICAL ASSESSMENT

Lower Afton Road Park And Ride. The existing park and ride facility is located on the south side of Lower Afton Rd., and has approximately 125 stalls. It is understood that the facility is undersized, and that there are access and potential safety issues associated with it. This corridor study is considering abandoning the existing park and ride site and locating a proposed facility on park land north of Lower Afton Road. For costing purposes, it is assumed that the proposed facility will be twice the size of the existing, or 250 stalls.

The northbound BRT would approach the site by crossing through the Lower Afton Rd. intersection, making a short weave with the right turn on ramp traffic from Lower Afton Rd., and then come to a stop in a pullout at the station. The weave distance and stopping distance determined the location of the BRT station as shown in Figure 1. The southbound station would have access to the park and ride facility via a pedestrian bridge over TH 61. Figure 1 also shows the proposed location of a 12-foot wide pedestrian bridge with switch-back access ramps.

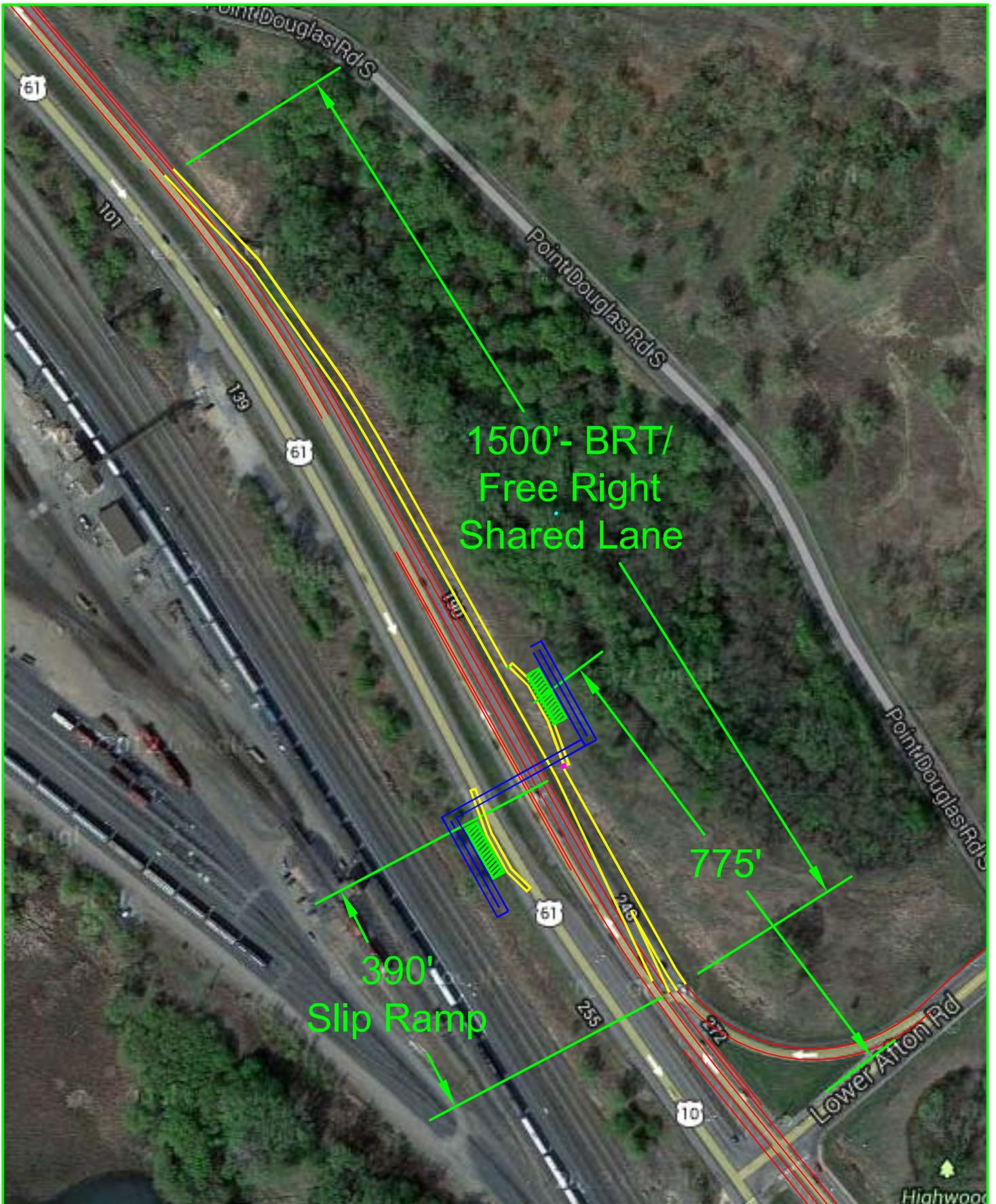
It is assumed that the Lower Afton Rd. ramp onto northbound TH 61 is lightly used, and that due to speeds the weave distance for the BRT can be kept to a minimum. However, it is suggested, that during design, consideration be given to installing a right turn lane and eliminate the on ramp. This would eliminate the weave concerns, and allow the station to be located much closer to Lower Afton Rd.

It appears the site would be able to drain toward a 12-foot wide box culvert further to the north. The box culvert extends under the highway and railroad and outlets to Pigs Eye Lake. There is overhead power along Point Douglas Rd. South, which is likely to be sufficient for providing parking lot lighting and other power needs for the park and ride facility.

Major Cost Items:

1. Park And Ride Facility (250 Stalls)
2. Pedestrian Bridge

FIGURE 1
Lower Afton Road Park and Ride



3. BRT Station
4. BRT pullout
5. Land Acquisition

Newport Park and Ride – Option 1. In this alternative, the proposed BRT corridor would run along the north side of the Newport Park And Ride facility. Figure 2 shows a concept alignment that considers the vertical clearance over the BNSF railroad and TH 61, as well as their span lengths. For evaluation and costing purposes, it is assumed that steel girder bridges would be used. In this option, the BRT alignment would need to climb roughly 30 feet in the 650 feet available between Maxwell Ave. and the BNSF Railway to achieve the required vertical clearance. The location of the BRT station is shown roughly midway between Maxwell Ave. and the railroad, which means it would be about 15 feet above the surrounding park and ride area, making access to the station impractical. Even if the station were located closer to Maxwell Ave., its 60-foot length requires grades less than 2% (ADA), exacerbating the grades on the BRT ramps. Both northbound and southbound BRT alignments cross over the railroad before diverging into their own alignments. Special structures would need to be considered for accommodating the divergent configuration. The ramp alignments would cross the railroad and highway (northbound ramp only) at roughly 45 degree skews, which require significantly longer spans, hence deeper girders. Due to the restrictive area to make the geometrics of the northbound fly-over work, it is likely that the fly-over would need to be on a curve, further compounding the complexity and cost of the option. Therefore, this option is not considered feasible due to the grades of the BRT ramps on the park and ride site and the costly structural configuration of the ramps over the railroad and highway. Consequently, a concept level construction cost opinion has not been developed.

Newport Park and Ride – Option 2. In this option, the BRT corridor is along the south side of the Park And Ride site. The Park And Ride consists of approximately 250 stalls with an access roadway, BRT station, and cul-de-sac for bus turn around. There is a potential that the at-grade park and ride facility may be replaced with a two story park and ride garage. For this estimate, the garage will be considered for alignment purposes only.

The northbound BRT would approach the park and ride site by exiting TH 61 just north of the existing pedestrian bridge near the 20th Street alignment. As shown in Figure 3, a flyover structure would climb about 22 feet high before crossing over TH 61. A ramp grade of about 4% would be required, and considered desirable since it would assist in slowing the BRT vehicle prior to making the curve to fly over the TH 61. At slower speeds of about 30 mph, the buses could easily negotiate the curve on the super structure and cross the highway with a skew angle of about 30 degrees. Once over the highway and railroad, both northbound and southbound ramps would match up and align along the south side of the park and ride site (Figure 3). In this option, there is greater distance between Maxwell Ave and the BNSF Railroad, resulting in BRT ramp grades of about 3%. The alignment shown is consistent with the ultimate concept site layout for the Park And Ride site.

It is assumed that the slip ramps and bridges will become part of the state highway system and be maintained by MinnDOT. Therefore, there is no ROW acquisition from the state associated with installation of such facilities.

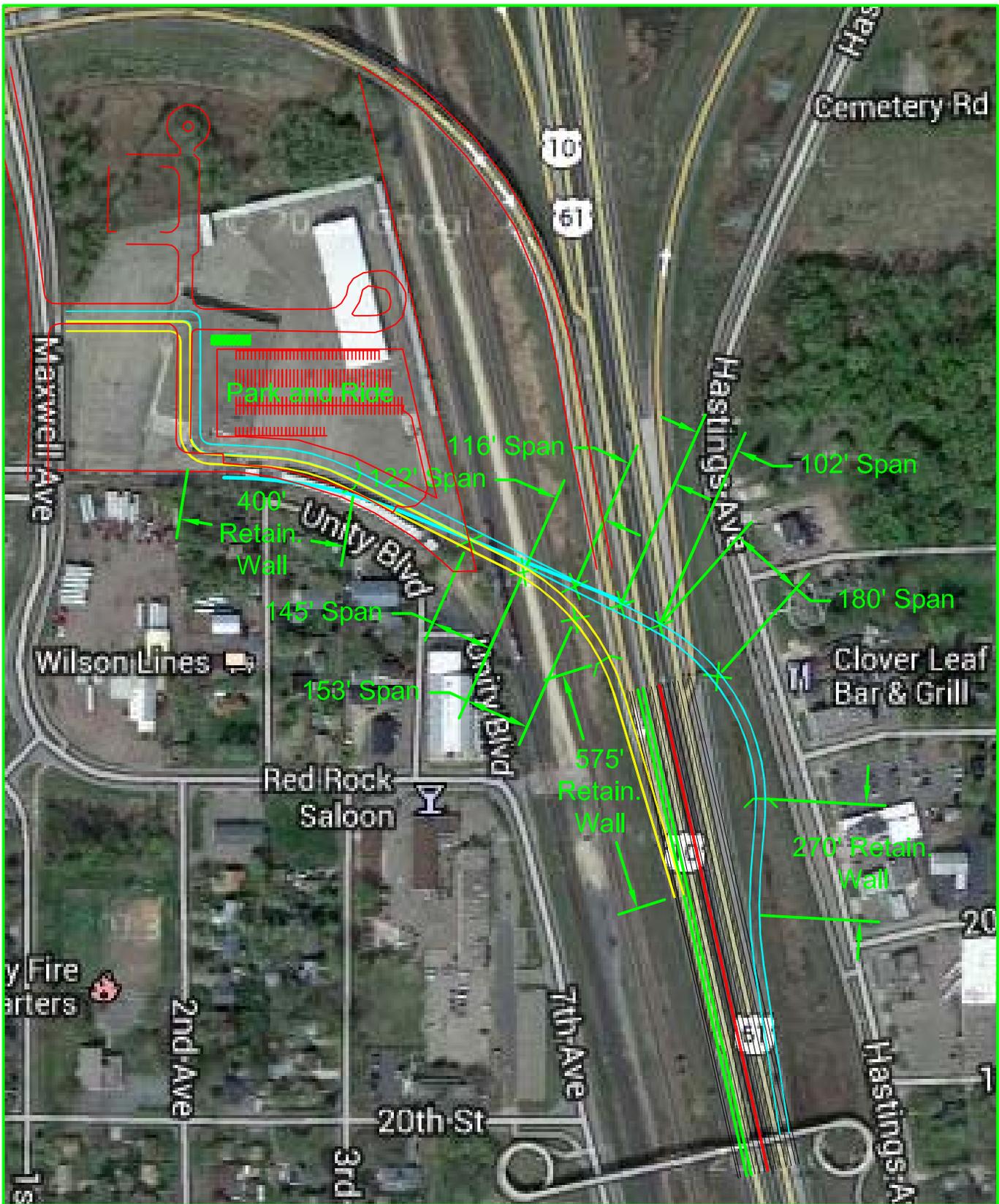
Major Cost Items:

1. Park And Ride Facility (250 stalls)
2. Entrance Road and cul-de-sac

FIGURE 2
Newport Park and Ride (Option 1)



FIGURE 3
Newport Park and Ride (Option 2)



3. Northbound and Southbound BRT slip ramps
4. Bridges over TH 61 and BNSF
5. BRT Station

Cost does not include multi-story parking garage.

Cottage Grove Park And Ride; Concept A. The existing park and ride facility is on the west side and fronts W. Point Douglas Rd., which is about 65 feet west of TH 61. As shown in Figure 4, Concept A considers one station with BRT slip ramps on either side, and situated between W Point Douglas Rd. and TH 61. The southbound BRT would exit TH 61 via a slip ramp (designated as BUS ONLY). It is recommended that a barrier/screen wall be installed to visually separate the highway from the slip ramp and BRT station. The southbound slip ramp would only need to be long enough to accommodate the bus deceleration / acceleration, plus the length of the station.

The northbound BRT would exit TH 61 via a left hand exit (into the median). The ramp would climb at a steep grade to slow the BRT vehicle, and then cross over the southbound TH 61 at approximately 45 degree skew before descending back to grade and to a stop at the station. From that point, the BRT would merge onto W. Point Douglas Rd. for its return to TH 61. A signalized pedestrian crosswalk across W. Point Douglas Rd. is assumed.

Major Cost Items:

1. Northbound and Southbound BRT slip ramps
2. Bridge over TH 61
3. BRT Station
4. Screen Walls

Cottage Grove Park And Ride; Concept B. In this concept, the BRT stations are split (northbound /southbound), allowing for minimal BRT slip ramps. However, a pedestrian overpass is necessary to connect the northbound station to the park and ride. The ramps to the overpass would have a switch-back configuration to minimize the overall footprint. Signalized pedestrian crossings would be provided at E. and W. Point Douglas Rd. Figure 5 shows the refined concept layout of this alternative.

Major Cost Items:

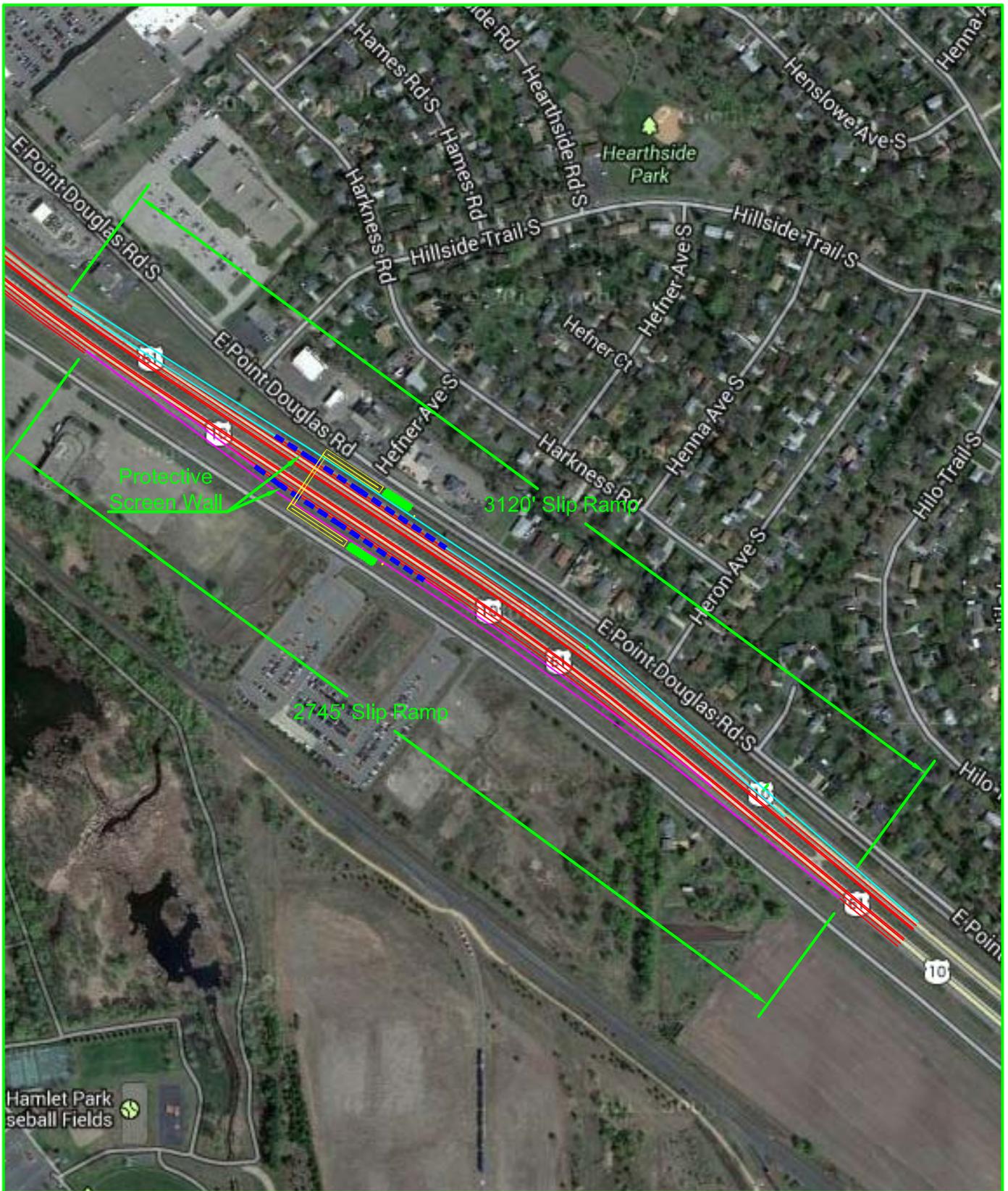
1. Northbound and Southbound BRT slip ramps
2. Pedestrian Bridge over TH 61
3. BRT Split Stations
4. Screen Walls

Comment on the Corridor. As a quality measure, a cursory review of the entire length of the corridor was also conducted. It was noted that there may be concern regarding the right turn movement of the BRT from Warner Rd. onto Sibley St. at the far north end. Just north of the intersection, there is a BNSF Railroad overpass across Sibley St. with a 13'-0" vertical clearance; which should not be a concern. Turning templates (using Autoturn) were applied for a 45-foot bus and a 60-foot articulating bus. The exercise was done using web-based aerial photography, which is not as precise as scalable higher definition photography. Both vehicles, however, appear to be able to make the turn and clear the bridge pier, but with little or no margin. It is recommended that this intersection be reviewed more closely in design. There is a potential that some intersection improvements (curb return) may be required to accommodate the

FIGURE 4
Cottage Grove PNR; Concept A



FIGURE 5
Cottage Grove PNR; Concept B



right turn movement of the BRT onto Sibley St. No other areas of concern along the corridor were identified.

CONCEPT LEVEL CONSTRUCTION COST OPINION

The following pages present concept level construction cost opinions for each of the concepts described above. Cost data is based on information assembled from various sources and factored as appropriate for the project location and cost year.

This Construction Cost Opinion assumes year 2013 dollars, and does not escalate pricing for future years. It is based on improvements envisioned and described herein with a 30% contingency for those items. Based on experience from other similar projects, it is likely that there will be other issues or unforeseeable conditions to cause the construction cost to escalate. It should be noted that the cost of oil and certain other material costs, such as steel and copper, can fluctuate dramatically over time. Likewise the price of labor, while currently is favorable, could readily change in a few years. These factors should be carefully evaluated when the project is better defined.

RED ROCK CORRIDOR - CONCEPT LEVEL CONSTRUCTION COST OPINION

LOWER AFTON RD. PNR						
CATEGORY	ITEM	UNIT	QTY	UNIT PRICE	AMOUNT	REMARKS
Site Prep						
	Temporary Construction Facilities & Fencing	LS	1	\$ 300,000	\$ 300,000	Mob / Demob, prep for staging areas., temp fencing, offices
	Dewatering	AC	2	\$ 30,000	\$ 60,000	
	Environmental Mitigation	AC	3	\$ 50,000	\$ 150,000	wetlands, historic, archeologic, parks
	Survey	LS	1	\$ 75,525	\$ 75,525	Assume 2% of construction costs
Traffic Control						
	Traffic Control - General Purpose	LS	1	\$ 30,000	\$ 30,000	Local roads
	Traffic Control - Lane Closures	LS	1	\$ 120,000	\$ 120,000	Bridge installation over TH 61
Removals						
	Clear / Grub	LS	1	\$ 55,000	\$ 55,000	
	Structures and Obstructions	LS	1	\$ -	\$ -	Includes potential for Hazardous Waste materials (Asbestos).
	Removal of existing Park And Ride facility	LS	1	\$ 85,000	\$ 85,000	
	Site Restoration of existing PNR Facility	LS	1	\$ 65,000	\$ 65,000	
Drainage						
	Site Drainage	LS	1	\$ 44,000	\$ 44,000	Culverts, Storm drains, and Inlets. Assume 800 LF * \$55/LF
Utilities						
	Sewer	LS	1	\$ 25,000	\$ 25,000	
	Water	LS	1	\$ 45,000	\$ 45,000	water for fire protection. Assume 1500' * \$30/ft
	OHP	LS	1	\$ 25,000	\$ 25,000	Transformer and electrical delivery to site
	Electrical	LS	1	\$ 37,500	\$ 37,500	Parking lot lighting / electrical cabinet. Assume \$3000*250 Stalls/20 Stalls per light pole
Roadway / PNR						
	Earthwork	SY	3400	\$ 6	\$ 20,400	
	Subgrade Prep	SF	30000	\$ 2	\$ 60,000	
	AC Pavement - Roadway	SF	30000	\$ 5	\$ 150,000	Assume 6" AC over 10" ABC Accel / Decel lane
	Park And Ride Facility	Stall	250	\$ 3,000	\$ 750,000	On site Grade, Pave, Access, Curb, Gutter, Sidewalk, Signing, Striping
	Concrete Bus Pullout	SF	4000	\$ 10	\$ 40,000	
	Concrete Barrier	LF	0	\$ 32	\$ -	
	Guardrail	LF	1200	\$ 50	\$ 60,000	
	Curb & Gutter	LF	750	\$ 20	\$ 15,000	
	Sidewalk - 8'	LF	2880	\$ 80	\$ 230,400	
	Fence - 6' Chain Link	LF	600	\$ 16	\$ 9,600	
	Lighting - BRT Bridge and Ramp	LF	1050	\$ 29	\$ 30,450	Assume \$3400/150 LF oc + \$6/lf conduit
	Lighting - Ped Bridge Ingress/Egress	LS	1	\$ 67,500	\$ 67,500	Assume 15 lights * \$4500/light
Structures						
	Pedestrian Bridge & Ramps - Steel Girder -12' wide	SF	12600	\$ 110	\$ 1,386,000	
	BRT Bridge Structure - Steel Girder - 22' wide	SF	0	\$ 150	\$ -	
	BRT Bridge Structure - Retaining Walls	SF	0	\$ 55	\$ -	
	Concrete Box Culvert Extension	LF	25	\$ 1,500	\$ 37,500	
	BRT - Barrier wall (12' height)	SF	0	\$ 35	\$ -	
Traffic Signals						
	Signalized Intersections - New signal equipment	EA	0	\$ 125,000	\$ -	

RED ROCK CORRIDOR - CONCEPT LEVEL CONSTRUCTION COST OPINION

LOWER AFTON RD. PNR						
	Modify existing signal equipment	EA	2	\$ 55,000	\$ 110,000	
Signing / Striping						
	Lane Striping - 4" Thermoplastic	LF	1500	\$ 2	\$ 3,000	includes removal
	Edge Striping 4" Theromplastic	LF	4960	\$ 2	\$ 9,920	
	Roadway Signing	LS	1	\$ 20,000	\$ 20,000	Relocate and install new
BRT Stations						
	Station	EA	2	\$ 30,000	\$ 60,000	Structural Concrete - foundation, pad and approach
	Station Furnishings	LS	2	\$ 80,000	\$ 160,000	Misc Metals, MEP, Comm, Station finishes
Landscape						
	Seeding	AC	1	\$ 1,000	\$ 1,000	
	Planting	AC	3	\$ 8,000	\$ 24,000	
	Subtotal				\$ 4,361,795	
	Estimating Contingency (30%)				\$ 1,308,539	Items not identified at this stage
	Contractor Indirects During Construction (20%)				\$ 1,134,067	Tax, Insurance, OH, etc.
	New Infrastructure - Total Amount				\$ 6,804,401	
Right of Way						
	New Right of Way				\$ 210,000	Assume \$70,000/ac*3 ac
	Temporary Construction Easements				\$ 3,000	Assume 65% of normal purchase price/ac
	Alternative Concept Amount				\$ 7,017,401	

RED ROCK CORRIDOR - CONCEPT LEVEL CONSTRUCTION COST OPINION

Newport PNR - Alternative 2 (Southside)						
CATEGORY	ITEM	UNIT	QTY	UNIT PRICE	AMOUNT	REMARKS
Site Prep						
	Temporary Construction Facilities & Fencing	LS	1	\$ 300,000	\$ 300,000	Mob / Demob, prep for staging areas., temp fencing, offices
	Dewatering	AC	1	\$ 30,000	\$ 30,000	
	Environmental Mitigation	AC	1	\$ 50,000	\$ 50,000	wetlands, historic, archeologic, parks
	Survey	LS	1	\$ 211,512	\$ 211,512	Assume 2% of construction costs
Traffic Control						
	Traffic Control - General Purpose	LS	1	\$ 20,000	\$ 20,000	Local roads
	Traffic Control - Lane Closures	LS	1	\$ 120,000	\$ 120,000	Bridge installation over TH 61
Removals						
	Clear / Grub	LS	1	\$ 25,000	\$ 25,000	
	Structures and Obstructions	LS	1	\$ 270,000	\$ 270,000	Assumes Pavement and Building removal including potential for Hazardous Waste materials (Asbestos). Site utilities
Drainage						
	Site Drainage	LS	1	\$ 55,000	\$ 55,000	Culverts, Storm drains, and Inlets. Assume 1000 LF * \$55/LF
	Roadway / Ramp Drainage	LS	1	\$ 63,000	\$ 63,000	Assume 1800 LF * \$35/LF of ramp
Utilities						
	Sewer	LS	1	\$ 15,000	\$ 15,000	
	Water	LS	1	\$ 45,000	\$ 45,000	water for fire protection. Assume 1500' * \$30/ft
	OHP	LS		\$ 25,000	\$ -	Delivery to the site (with transformer).
	Electrical	LS	1	\$ 37,500	\$ 37,500	Parking lot lighting / electrical cabinet. Assume \$3000*250 Stalls/20 Stalls per light pole
Roadway / PNR						
	Earthwork	SY	4700	\$ 6	\$ 28,200	
	Subgrade Prep	SF	40800	\$ 2	\$ 81,600	
	AC Pavement - Roadway	SF	40800	\$ 5	\$ 204,000	Assume 6" AC over 10" ABC
	Park And Ride Facility	Stall	250	\$ 3,000	\$ 750,000	On site Grade, Pave, Access, Curb, Gutter, Sidewalk, Signing, Striping
	Concrete Bus Pullout	SF	2000	\$ 10	\$ 20,000	
	Concrete Barrier	LF	670	\$ 50	\$ 33,500	
	Guardrail	LF	400	\$ 25	\$ 10,000	
	Curb & Gutter	LF	1500	\$ 20	\$ 30,000	
	Sidewalk - 8'	LF	1500	\$ 80	\$ 120,000	
	Fence - 6' Chain Link	LF	600	\$ 16	\$ 9,600	
	Lighting - BRT Bridge and Ramp	LF	4820	\$ 29	\$ 139,780	Assume \$3400/150 LF oc + \$6/lf conduit
Structures						
	BRT Bridge Structure - Steel Girder - 22' wide	SF	42460	\$ 150	\$ 6,369,000	
	BRT Bridge Structure - Retaining Walls	SF	34680	\$ 55	\$ 1,907,400	
Traffic Signals						
	Signalized Intersections - New signal equipment	EA	0	\$ 250,000	\$ -	
	Modify existing signal equipment	EA	0	\$ 40,000	\$ -	
Signing / Striping						
	Relocate OH Bridge Sign Structure	EA	1	\$ 30,000	\$ 30,000	
	Edge Striping 4" Theromplastic	LF	13000	\$ 2	\$ 26,000	
	Roadway Signing	LS	1	\$ 20,000	\$ 20,000	Relocate and install new

RED ROCK CORRIDOR - CONCEPT LEVEL CONSTRUCTION COST OPINION

Newport PNR - Alternative 2 (Southside)						
BRT Stations						
	Station	EA	1	\$ 30,000	\$ 30,000	Structural Concrete - pad and foundation
	Station Furnishings	LS	1	\$ 80,000	\$ 80,000	Misc Metals, MEP, Comm, Station finishes
Landscape						
	Seeding	AC	4	\$ 1,000	\$ 4,000	
	Planting	AC	4	\$ 8,000	\$ 32,000	
	Subtotal				\$ 11,167,092	
	Estimating Contingency (30%)				\$ 3,350,127	Items not identified at this stage
	Contractor Indirects During Construction (20%)				\$ 2,903,444	Tax, Insurance, OH, etc.
	New Infrastructure - Total Amount				\$ 17,420,663	
Right of Way						
	New Right of Way				\$ -	
	Temporary Construction Easements				\$ 42,300	Assume 65% of normal purchase price/ac (adjacent properties)
	Alternative Concept Amount				\$ 17,462,963	

RED ROCK CORRIDOR - CONCEPT LEVEL CONSTRUCTION COST OPINION

Cottage Grove PNR - Concept A (Single Station)						
CATEGORY	ITEM	UNIT	QTY	UNIT PRICE	AMOUNT	REMARKS
Site Prep						
	Temporary Construction Facilities & Fencing	LS	1	\$ 300,000	\$ 300,000	Mob / Demob, prep for staging areas., temp fencing, offices
	Dewatering	AC	1	\$ 30,000	\$ 30,000	
	Environmental Mitigation	AC	1	\$ 50,000	\$ 50,000	wetlands, historic, archeologic, parks
	Survey	LS	1	\$ 116,367	\$ 116,367	Assume 2% of construction costs
Traffic Control						
	Traffic Control - General Purpose	LS	1	\$ 20,000	\$ 20,000	Local roads
	Traffic Control - Lane Closures	LS	1	\$ 120,000	\$ 120,000	Bridge installation over TH 61 and work in State ROW
Removals						
	Clear / Grub	LS	1	\$ 10,000	\$ 10,000	
Drainage						
	Roadway / Ramp Drainage	LS	1	\$ 63,000	\$ 63,000	Storm drains, and Inlets. Assume 1800 LF * \$35/LF of ramp
Utilities						
	Utility Relocations	LS	1	\$ 20,000	\$ 20,000	
Roadway / PNR						
	Earthwork	SY	6720	\$ 6	\$ 40,320	
	Subgrade Prep	SF	60500	\$ 2	\$ 121,000	
	AC Pavement - Roadway	SF	60500	\$ 5	\$ 302,500	Assume 6" AC over 10" ABC
	Concrete Barrier	LF	2620	\$ 32	\$ 83,840	
	Guardrail	LF	450	\$ 50	\$ 22,500	
	Curb & Gutter	LF	200	\$ 20	\$ 4,000	
	Sidewalk - 8'	LF	600	\$ 80	\$ 48,000	
	Fence - 6' Chain Link	LF	2900	\$ 16	\$ 46,400	
	Lighting - BRT Bridge and Ramp	LF	5200	\$ 29	\$ 150,800	Assume \$3400/150 LF oc + \$6/lf conduit
Structures						
	BRT Bridge Structure - Steel Girder - 22' wide	SF	23100	\$ 150	\$ 3,465,000	
	BRT Bridge Structure - Retaining Walls	SF	13200	\$ 55	\$ 726,000	
	BRT - Screen wall (12' height)	SF	4800	\$ 35	\$ 168,000	
Traffic Signals						
	Signalized Intersections - New signal equipment	EA	1	\$ 250,000	\$ 250,000	
Signing / Striping						
	Relocate OH Bridge Sign Structure	EA	0	\$ 30,000	\$ -	
	Edge Striping 4" Theromplastic	LF	12000	\$ 2	\$ 24,000	
	Roadway Signing	LS	1	\$ 20,000	\$ 20,000	Relocate and install new
BRT Stations						
	Station	EA	1	\$ 30,000	\$ 30,000	Structural Concrete - pad and foundation
	Station Furnishings	LS	1	\$ 80,000	\$ 80,000	Misc Metals, MEP, Comm, Station finishes
Landscape						
	Seeding	AC	3	\$ 1,000	\$ 3,000	
	Planting	AC	0	\$ 8,000	\$ -	
	Subtotal				\$ 6,314,727	
	Estimating Contingency (30%)				\$ 1,894,418	Items not identified at this stage

RED ROCK CORRIDOR - CONCEPT LEVEL CONSTRUCTION COST OPINION

Cottage Grove PNR - Concept A (Single Station)						
	Contractor Indirects During Construction (20%)				\$ 1,641,829	Tax, Insurance, OH, etc.
	New Infrastructure - Total Amount				\$ 9,850,974	
Right of Way	New Right of Way				\$ 25,000	Assume \$70,000/ac for ROW transfer from County (W.Point Douglas Rd) to state.
	Temporary Construction Easements				\$ 42,300	Assume 65% of normal purchase price/ac (County Road Easement)
	Alternative Concept Amount				\$ 9,918,274	

RED ROCK CORRIDOR - CONCEPT LEVEL CONSTRUCTION COST OPINION

Cottage Grove PNR - Concept B (Split Stations)						
CATEGORY	ITEM	UNIT	QTY	UNIT PRICE	AMOUNT	REMARKS
Site Prep						
	Temporary Construction Facilities & Fencing	LS	1	\$ 300,000	\$ 300,000	Mob / Demob, prep for staging areas., temp fencing, offices
	Dewatering	AC	1	\$ 30,000	\$ 30,000	
	Environmental Mitigation	AC	1	\$ 50,000	\$ 50,000	wetlands, historic, archeologic, parks
	Survey	LS	1	\$ 78,340	\$ 78,340	Assume 2% of construction costs
Traffic Control						
	Traffic Control - General Purpose	LS	1	\$ 30,000	\$ 30,000	Local roads
	Traffic Control - Lane Closures	LS	1	\$ 60,000	\$ 60,000	Bridge installation over TH 61
Removals						
	Clear / Grub	LS	1	\$ 35,000	\$ 35,000	
Drainage						
	Roadway Drainage	LS	1	\$ 10,000	\$ 10,000	Adjustments to Culverts, Storm drains, and Inlets.
Utilities						
	Utility Relocations	LS	1	\$ 20,000	\$ 20,000	
Roadway / PNR						
	Earthwork	SY	14340	\$ 6	\$ 86,040	
	Subgrade Prep	SF	129000	\$ 2	\$ 258,000	
	AC Pavement - Roadway	SF	129000	\$ 5	\$ 645,000	Assume 6" AC over 10" ABC
	Concrete Barrier	LF	0	\$ 50	\$ -	
	Guardrail	LF	1400	\$ 25	\$ 35,000	
	Curb & Gutter	LF	2040	\$ 20	\$ 40,800	
	Sidewalk - 8'	LF	1200	\$ 80	\$ 96,000	
	Fence - 6' Chain Link	LF	5000	\$ 16	\$ 80,000	
	Lighting - Ped Bridge Ingress/Egress	LS	1	\$ 67,500	\$ 67,500	Assume 15 lights * \$4500/light
	Lighting - BRT Bridge and Ramp	LF	6920	\$ 29	\$ 200,680	Assume \$3400/150 LF oc + \$6/lf conduit
Structures						
	BRT Bridge Structure - Steel Girder - 22' wide	SF	0	\$ 150	\$ -	
	BRT Bridge Structure - Retaining Walls	SF	0	\$ 55	\$ -	
	Pedestrian Bridge & Ramps - Steel Girder -12' wide	SF	12600	\$ 110	\$ 1,386,000	
	BRT - Screen wall (12' height)	SF	9600	\$ 35	\$ 336,000	
Traffic Signals						
	Signalized Intersections - New signal equipment	EA	2	\$ 125,000	\$ 250,000	Pedestrian Crossings
Signing / Striping						
	Relocate OH Bridge Sign Structure	EA	0	\$ 30,000	\$ -	
	Edge Striping 4" Theromplastic	LF	14000	\$ 2	\$ 28,000	
	Roadway Signing	LS	1	\$ 20,000	\$ 20,000	Relocate and install new
BRT Stations						
	Station	EA	2	\$ 30,000	\$ 60,000	Structural Concrete - pad and foundation
	Station Furnishings	LS	2	\$ 80,000	\$ 160,000	Misc Metals, MEP, Comm, Station finishes

RED ROCK CORRIDOR - CONCEPT LEVEL CONSTRUCTION COST OPINION

Cottage Grove PNR - Concept B (Split Stations)						
Landscape						
	Seeding	AC	5	\$ 1,000	\$ 5,000	
	Planting	AC	1	\$ 8,000	\$ 8,000	
	Subtotal				\$ 4,375,360	
	Estimating Contingency (30%)				\$ 1,312,608	Items not identified at this stage Tax, Insurance, OH, etc.
	Contractor Indirects During Construction (20%)				\$ 1,137,594	
	New Infrastructure - Total Amount				\$ 6,825,562	
Right of Way	New Right of Way				\$ 21,000	Assume \$70,000/ac from County
	Temporary Construction Easements				\$ 5,000	Assume 65% of normal purchase price/ac
	Alternative Concept Amount				\$ 6,851,562	



APPENDIX C – Original Commuter Rail Cost Estimates

Commuter Rail

Cost estimates are required for the potential upgrade of the CP corridor between Hastings and Red Wing. This will assist us in evaluating the different options for serving the area south of Hastings as part of this Alternatives Analysis Update.

Given that the ridership south of Hastings is likely to be minimal, the only way a commuter rail extension would be attractive would be if it was inexpensive. Using this logic, the concept for commuter rail is very “bare-bones.”

Amtrak already operates over this section of track, making stops at the Red Wing Station. In general, assume that passenger rail can be provided with minimal upgrades to the track, apart from the addition of some crossovers to facilitate commuter rail movements. A good deal of the line is already double tracked, including segments on which all three stations lie, which will allow mainline traffic to bypass a commuter rail train, if necessary.

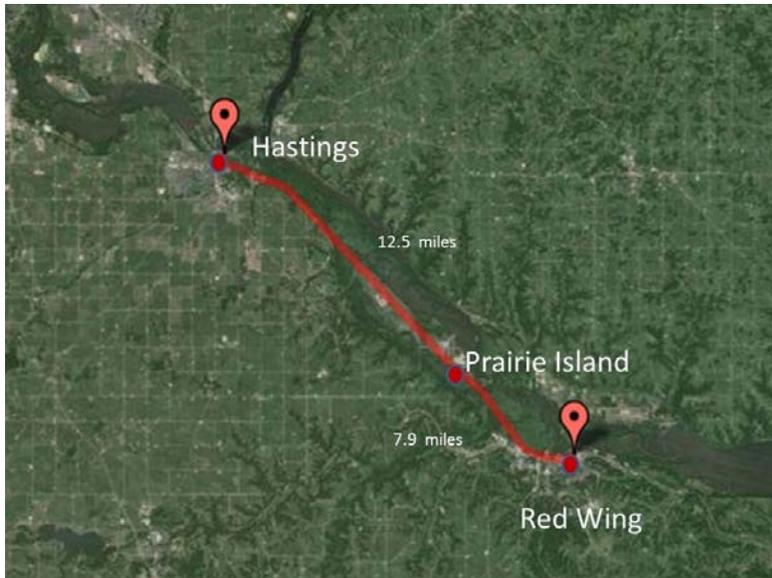
The cost estimate should include the following elements:

- A new passenger station at Prairie Island. Station to include a 600' platform and a small structure for waiting passengers.
- New interlockings (at least two, up to four).
- A new 600' platform at Hastings Station. Assuming that the line is built in phases, a station platform would likely initially be built on the west side of the existing depot at Hastings. In conjunction with an extension, a platform on the east side of the existing depot would facilitate through moves.

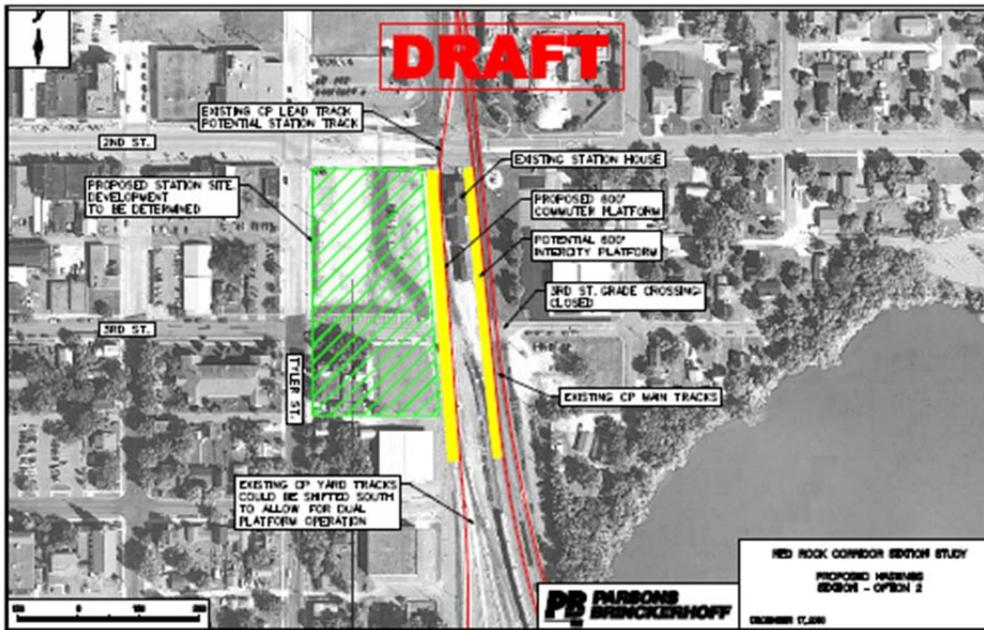
The cost estimate can *exclude* the following:

- A maintenance facility, as this was included in the original Alternative Analysis estimate.
- Vehicle costs
- Parking at the Prairie Island Station; assume that the Casino will allow train passengers to use the existing parking lot
- Parking at the Amtrak Station in Red Wing; assume that an arrangement will be made to allow train passengers to use the existing parking facilities in the vicinity

The following map shows the distances between the proposed stations along the extension.



The following is a diagram of the proposed **Hastings Station** from the Station Area Planning Report. The preferred platform, assuming that Hastings is the terminus, is on the left. If commuter rail were to be extended south, a platform on the right would be a desirable addition.



A conceptual location for the **Prairie Island Station** is shown below. This location was selected because it has double tracking. A location north of Sturgeon Lake Rd would enhance access to the Casino, but it would require additional trackwork. By being located a bit further south, it is closer to the Nuclear Power Plant, an employer. It is not known who owns the property of the proposed station platform site.



Hastings to Red Wing Commuter Rail Estimate						
Hastings Station Platform						
CATEGORY	ITEM	UNIT	QTY	UNIT PRICE	AMOUNT	REMARKS
Site Prep						
	Temporary Construction Facilities & Fencing	LS	1	\$ 300,000	\$ 300,000	Mob / Demob, prep for staging areas, temp fencing, offices
	Survey	LS	1	\$ 60,099	\$ 60,099	Assume 2% of construction
	Relocate Existing Signal Bungalow	LS	1	\$ 50,000	\$ 50,000	
Traffic Control						
	Traffic Control - General Purpose	LS	1	\$ 30,000	\$ 30,000	Local roads
Removals						
	Clear / Grub	LS	1	\$ 20,000	\$ 20,000	
Drainage						
	Site Drainage	LS	1	\$ 10,000	\$ 10,000	
Utilities						
	Utility Relocations	LS	1	\$ 100,000	\$ 100,000	OHP
Station Platform						
	Subgrade Prep	SF	14875	\$ 5	\$ 74,375	35 X 425 footprint
	Structural Concrete and foundations	CY	250	\$ 600	\$ 150,000	Stem wall 425' long along track
	Curb & Gutter	LF	200	\$ 30	\$ 6,000	
	Entrance ramps	EA	2	\$ 12,000	\$ 24,000	
	Sidewalk - 8'	LF	500	\$ 80	\$ 40,000	
	Fence - 6'	LF	485	\$ 16	\$ 7,760	
	Pedestrian Lighting	LS	1	\$ 90,000	\$ 90,000	15 ped lights, SES, conduit
	Track Crossing (Pedestrian)	LS	1	\$ 40,000	\$ 40,000	
	Shelters	SF	830	\$ 130	\$ 107,900	X 28
	Concrete seat wall	LS	1	\$ 8,000	\$ 8,000	2 @ 20'
	Misc Furnishings	LS	1	\$ 7,000	\$ 7,000	trash cans, etc.
	Platform pavers	SF	6820	\$ 22	\$ 150,040	
	Platform concrete	SF	5525	\$ 15	\$ 82,875	
	Tactile warning device	SF	850	\$ 30	\$ 25,500	
	Communications	LS	1	\$ 250,000	\$ 250,000	EMP, PA, VMS, ECB, CCTV
	Fare Collection	LS	1	\$ 340,000	\$ 340,000	2 TVMs + 2 Validators
	Water Service	LS	1	\$ 15,000	\$ 15,000	meter, service line, 2 FHs
	Signing	LS	1	\$ 25,000	\$ 25,000	
	Patron Information Center	LS	1	\$ 12,000	\$ 12,000	
Roadway						
	Pedestrian crossing	LS	1	\$ 250,000	\$ 250,000	track crossing at 2nd St E. to get to get to depot and parking
Landscape						
	Seeding	AC	0.5	\$ 1,000	\$ 500	
	Planting	AC	0.5	\$ 8,000	\$ 4,000	
Track						
	Turnout #15	EA	4	\$ 180,000	\$ 720,000	Switch Machine, Special trackwork,
	Crossover track	TF	200	\$ 250	\$ 50,000	
	Track Signals	LS	1	\$ 245,000	\$ 245,000	Signal and signal house
	Ductbank	LS	1	\$ 120,000	\$ 120,000	Modifications to connect to existing Sig/Comm systems
Subtotal					\$ 3,415,049	
Estimating Contingency (30%)					\$ 1,024,515	Items not identified at this stage
Contractor Indirects During Construction (20%)					\$ 887,913	Tax, Insurance, OH, etc.
New Infrastructure - Total Amount					\$ 5,327,476	
Right of Way						
	New Right of Way				\$ 36,000	Assume \$70,000/ac from County
	Temporary Construction Easements				\$ 15,000	purchase price/ac
Alternative Concept Amount					\$ 5,378,476	

Hastings to Red Wing Commuter Rail Estimate						
Prairie Island Station Platform						
CATEGORY	ITEM	UNIT	QTY	UNIT PRICE	AMOUNT	REMARKS
Site Prep						
	Temporary Construction Facilities & Fencing	LS	1	\$ 300,000	\$ 300,000	Mob / Demob, prep for staging areas, temp fencing, offices
	Survey	LS	1	\$ 69,580	\$ 69,580	Assume 2% of construction costs
	Relocate Existing Signal Bungalow	LS	1	\$ -	\$ -	
Traffic Control						
	Traffic Control - General Purpose	LS	1	\$ 30,000	\$ 30,000	Local roads
Removals						
	Clear / Grub	LS	1	\$ 20,000	\$ 20,000	
Drainage						
	Site Drainage	LS	1	\$ 30,000	\$ 30,000	
Utilities						
	Utility Relocations	LS	1	\$ -	\$ -	OHP
Station Platform						
	Subgrade Prep	SF	14875	\$ 5	\$ 74,375	35 X 425 footprint
	Structural Concrete and Foundations	CY	200	\$ 600	\$ 120,000	Stem wall 425' long along track
	Curb & Gutter	LF	200	\$ 30	\$ 6,000	
	Entrance ramps	EA	2	\$ 12,000	\$ 24,000	
	Sidewalk - 8'	LF	600	\$ 80	\$ 48,000	
	Fence - 6'	LF	550	\$ 16	\$ 8,800	
	Pedestrian Lighting	LS	1	\$ 100,000	\$ 100,000	15 ped lights, SES, conduit
	Track Crossing (Pedestrian)	LS	1	\$ 40,000	\$ 40,000	
	Shelters	SF	830	\$ 130	\$ 107,900	2 @ 15 X 40 (roof size) + 1 @ 15 X 28
	Concrete seat wall	LS	1	\$ 8,000	\$ 8,000	2 @ 20'
	Misc Furniture	LS	1	\$ 7,000	\$ 7,000	trash cans
	Platform pavers	SF	6820	\$ 22	\$ 150,040	
	Platform concrete	SF	5525	\$ 15	\$ 82,875	
	Tactile warning device	SF	850	\$ 30	\$ 25,500	
	Communications	LS	1	\$ 250,000	\$ 250,000	EMP, PA, VMS, ECB, CCTV
	Fare Collection	LS	1	\$ 340,000	\$ 340,000	2 TVMs + 2 Validators
	Water Service	LS	1	\$ 15,000	\$ 15,000	meter, service line, 2 FHs
	Signing	LS	1	\$ 25,000	\$ 25,000	
	Patron Information Center	LS	1	\$ 12,000	\$ 12,000	
Roadway						
	Pedestrian crossing	LS	1	\$ 250,000	\$ 250,000	crossing at Sturgeon Lake Rd. to get to sidewalk on north side and parking lot at casino.
Landscape						
	Seeding	AC	0.5	\$ 1,000	\$ 500	
	Planting	AC	0.5	\$ 8,000	\$ 4,000	
Track						
	Turnout #15	EA	6	\$ 180,000	\$ 1,080,000	Switch Machine, Special trackwork,
	Crossover track	TF	200	\$ 250	\$ 50,000	
	Track Signals	LS	1	\$ 450,000	\$ 450,000	Signals and 2 Signal Houses
	Ductbank	LS	1	\$ 120,000	\$ 120,000	Modifications to connect to existing Sig/Comm systems
	Subtotal				\$ 3,848,570	
	Estimating Contingency (30%)				\$ 1,154,571	Items not identified at this stage
	Contractor Indirects During Construction (20%)				\$ 1,000,628	Tax, Insurance, OH, etc.
	New Infrastructure - Total Amount				\$ 6,003,769	
Right of Way						
	New Right of Way				\$ 36,000	Assume \$70,000/ac from County
	Temporary Construction Easements				\$ 15,000	price/ac
	Alternative Concept Amount				\$ 6,054,769	