

APPENDIX A

EVALUATION OF BUILD ALTERNATIVES

- Evaluation of Build Alternatives Memo
- SD100 Alignment Alternatives due to Xcel Energy High Pressure Gas Line Memo

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Evaluation of Build Alternatives Memo
August 2013 (Revised December 2013)

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To: Study Advisory Team	
From: HDR Engineering Inc.	Project: SD 100
Date: August 2013 (Revised December 2013)	Job No: 32194

RE: Evaluation of Build Alternatives

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ATTACHMENT B (Dated June 2013)	Alternative 4 & 4a – Plan and Profile Sheet
ATTACHMENT C (Dated May 2013)	Private Utility Meeting Minutes
ATTACHMENT D (Dated May 2013)	Private Utility Relocation Cost Estimates
ATTACHMENT E (Dated May 2013)	Stakeholder Meeting Minutes
ATTACHMENT F (Dated April 2013)	Initial Alternatives Discussion Memo
ATTACHMENT G (Dated April 2013)	Initial Alternatives Comparison Matrix
ATTACHMENT H	Private Utility Correspondence (WAPA)

The purpose of the memo is to:

- To provide a recommendation for narrowing down the list of build alternatives by discussing the difference in the environmental impacts of the recently developed nine build alternatives. Two previous build alternatives (2003 EA Preferred Alternative and the Revised Build Alternative) will not be further evaluated in this memo but will be included in the EA. Screening of these additional build alternatives will allow the NEPA process to move forward by reducing the number of alternatives for detailed analysis and helping identify a reasonable and practicable alternative.
- The screening of alternatives within this memo will concentrate on the portion of the alternative's alignment from the southern edge of the Cactus Hills area north to I-90. Evaluation of entire lengths of the alternative alignments will be included in the EA (I-90 to Madison).

I. Project Background

In 2006, the South Dakota Department of Transportation (SDDOT) initiated the completion of a EA which evaluated the impacts of the 2003 EA Preferred Alternative and the Revised Build Alternative. The Revised Build Alternative was originally developed as a comparison to the 2003 alignment in order to reduce environmental impacts, including impacts to Cactus Hills and the length of the bridge needed to span the Big Sioux River. At that time through meetings with Western Area Power Administration (WAPA) and Xcel Energy, it was determined that the Revised Build Alternative was feasible and became a preferred alignment based on the following (See Attachment H for correspondence):

1. 2003 EA Preferred Alternative required a significant structure to span the Big Sioux River floodway to avoid a CLOMR/LOMR.
2. WAPA and Xcel's relocation cost estimates in 2006 were significantly less than the structure estimate. Also, there were no issues with powering down during phases of bridge construction.

Since the time of the Revised Build Alternative development, utility regulations have become more stringent, additional load is being carried by the transmission lines resulting in an additional 8 feet of sag at mid-span, and challenges to gain approval for powering down the lines have developed. To discuss these new issues, a utility meeting was held on May 2nd, 2013 with all private utility companies located in the Study Area from Maple Street north (See Attachment C for meeting minutes). From this meeting and follow-up coordination, the private utility companies provided updated estimates (Attachment D) for the Revised Build Alternative and additional alignment alternatives (presented below) to assist project stakeholders in their alternative alignment decision making process.

The new private utility issues have resulted in discussions amongst the Project's stakeholders regarding the constructability of the Revised Build Alternative, especially the bridge which would underpass major WAPA transmission lines. For these reasons, additional alternatives were developed in attempt to avoid/minimize major issues and costs associated with WAPA and Xcel transmission line conflicts during both construction and post construction activities. Several stakeholder meetings were held including conference and video conference calls during the development and analysis of the alternatives (See Attachment E for meeting minutes and Attachment B for Alternative 4a). In preparation for the meetings, a memo (Attachment F) and matrix (Attachment G) were prepared that described the Alternatives including key points concerning each alternative. The actions/issues/conflicts associated with each of the build alternatives are outlined in following sections.

The environmental resources evaluated in this memo were chosen due to the notable impact differences between the build alternatives' impacts. The resources discussed in this memo include utilities and railroads. The differences in impacts to these resources associated with the alternatives were used to screen the build alternatives. If the Study Advisory Team concurs with the information in this memo, these sections would be incorporated as part of Chapter 2 to document the screening process, thus carrying forward the build

alternatives chosen for detailed analysis in addition to the No-Build, Revised Build, and 2003 EA Preferred Alternative in the EA.

II. Range of Alternatives

A range of build alternatives were developed, including preliminary analysis to identify the actions/issues/conflicts associated with each alternative. The range of alternatives includes Alternatives 1 thru 8 and Alternative 4a (Attachment A). During the development of the build alternatives, HDR first determines if the build alternative meets all design criteria. During preliminary analysis, three build alternatives, Alternatives 5, 6, and 8, will not be carried forward for additional consideration due to the following:

- **Alternative 5** (Figure 5) was eliminated due to geometric issues. The separation between the 60th Street North/Redwood Boulevard/SD100 intersection and the proposed I-90 interchange would be too close to provide acceptable intersection (signal) spacing and would not allow for adequate spacing for vehicle storage. Furthermore, the need for an acquisition of the Yogi Bear's Jellystone Camp-Resort and the additional road length make this alternative unfavorable.
- **Alternative 6** (Figure 6) also has geometric issues due to large horizontal curves needed to shift the alignment east. The location and length of the curves would require two bridges (over Burlington Northern Sante Fe (BNSF) and Big Sioux River) to be curved with super elevation transitioning also occurring on the bridge over the Big Sioux River. Also insufficient distance between the end of the curve just south of I-90 would require a super elevation transition to carry into the I-90 interchange, requiring the south intersection to be in super elevation. This causes a site distance issue which would not meet the goals of improving safety of the traveling public.
- **Alternative 8** (Figure 8) was eliminated due to geometric issues related to Rice Street and the intersection with the Ellis & Eastern Railroad (E&E) west of the Rice Street / SD100 intersection. The alignment of Alternative 8 is furthest west of all of the alternatives and creates a vertical profile issue with Rice Street. As Rice Street is elevated from the east to intersect with SD100, there is insufficient distance between SD100 and the railroad to accommodate an at-grade intersection without raising the tracks approximately 6 feet. This would require reconstruction of 1,200 feet of tracks and also replacement of wooden railroad bridge located northeast of the proposed Rice Street/E&E intersection.

Alternatives 1, 2, 3, 4, 4a, and 7 do meet design criteria. The actions/issues/conflicts associated with these build alternatives are displayed in Figures 1 through 8.

III. Evaluation of Build Alternatives

The following discussion analyzes resources that had notable differences among the build alternatives. The potential impacts to railroads and utilities for each build alternative are described in the following text.

- **Railroads:** The build alternatives differ in the accommodation requirements to satisfy the existing and future railroad crossings. BNSF and Ellis and Eastern (E&E) railroad are the two existing railroads that the proposed alignments of Alternatives 1-4, 4a, and 7 would intersect. Currently, at-grade crossings are located along E&E on Rice Street just east of Timberline Ave and along BNSF on Timberline Ave. Alternatives 1-4, 4a, and 7 would include grade-separated crossings with SD100 at both railroad crossings and would accommodate extra parallel track expansion.
 - *Alternatives 1, 2, and 3:* The existing Rice Street with the E & E is an at-grade crossing. Alternatives 1, 2, and 3 would maintain this at-grade crossing at its current location since the alignments intersect with Rice Street further east.
 - *Alternatives 4, 4a, and 7:* Due to the location of these alternatives with respect to the existing Rice Street/E&E intersection, realignment of Rice Street is required to maintain an at-grade intersection. The proposed intersection would shift south of the existing at-grade crossing. The existing at-grade crossing would be closed to accommodate the E&E policy of not adding additional at-grade crossings.

- Utilities: The build alternatives vary in the amount of impacts to existing utilities. WAPA and Xcel have considerable amounts of existing infrastructure within the Study Area. Therefore, the degree of adjusting and/or relocating transmission lines would create elevated costs and have major impacts with regards to the constructability of some of the build alternatives. The constructability of the bridge over the Big Sioux River differs among build alternatives with the main concern being utility impacts.

It must be noted that during discussions with the primary utility companies (WAPA & Xcel), the utility companies were very confident stating that any roadway construction and specifically bridge construction would not be allowed under their lines and would require shut down (very difficult) or relocation (utility preferred and likely).

- Alignment Alternatives:

Following is additional Alternative discussion:

- *Alternative 1 (Figure 1)*: The goal of this alignment was to improve the angle of crossing of the WAPA line while maintaining an acceptable crossing angle of the BNSF and BSR. Although avoiding direct conflicts of the WAPA lines at the abutment, there are conflicts during pier construction and setting of the beams. Adjustments and relocations of WAPA and Xcel lines are likely. If power down of lines are acceptable, possible methods to construct the bridge include:
 - Bigger cranes to accommodate booms that will need to be used at lower angles.
 - “Launching the beams” This would most likely require intermediate bracing to launch the beams.
- *Alternative 2 (Figure 2)*: The goal of this alignment was to increase the curve to the south of the BSR in an attempt to locate the bridge west of the WAPA lines. Although the alignment improved on the conflicts associated with the BSR bridge, overhead conflicts with WAPA lines, however, do occur at abutment #1 at the BNSF grade separate crossing. If power down of lines are acceptable, possible methods to construction may include:
 - Using wall type abutments where the footings would be at or near existing ground line providing an additional 25'± of vertical clearance.
 - Drive piling at existing ground line, splice piling at ground line, and building embankment around the piling.
- *Alternative 3 (Figure 3)*: This alignment is adjusted slightly from Alternative 1 which improves the crossing angle of the WAPA transmission line at the BSR bridge. Similar to Alternative 1, constructability remains an issue with setting the beams and interior piers. Possible methods of construction to accommodate these challenges are similar to those identified with Alternative 1.
- *Alternatives 4 and 4a (Figures 4 & 4a)*: These alignments shift west of the WAPA station more closely following Timberline Avenue and intersects with I-90 at the current location. The differences with these alignments occur south of Rice Street (in the in the southern Cactus Hills area) and are the same in the segment where the major utility impacts are a concern. The alignment for the alternatives avoids all WAPA towers and transmission lines; however, conflicts remain with Xcel (distribution), L&O Power (distribution), East River Electric (distribution), and Sioux Valley Electric (distribution). The current access to the WAPA substation will be cut off and will require construction of a new permanent access.
- *Alternative 7 (Figure 7)*: This alignment is similar to Alternatives 4 and 4a, since the alignment shifts to the west of the WAPA station and avoids conflicts with all WAPA infrastructure. The difference in the alignment south of Rice Street is an attempt to minimize impacts to the Cactus Hills area. The alignment follows the eastern edge of the Cactus Hills area and incorporates to horizontal curves just south of Rice Street to

avoid all WAPA conflicts. Conflicts remain with Xcel (distribution), L&O Power (distribution), East River Electric (distribution), and Sioux Valley Electric (distribution). The current access to the WAPA substation would be cut off and require construction of a new permanent access.

IV. Recommendation for Evaluation of Alternatives

Based on the advantages and disadvantages of each alternative discussed in the previous sections, it is recommended that Alternatives 4, 4a, and 7 be carried forward for further analysis in the EA. If the Study Advisory Team concurs with the following discussion, this discussion would be included in Chapter 2 to support the screening process for eliminating build alternatives:

A. Alternatives to Eliminate For Further Analysis

Alternatives 5, 6, and 8 would be discarded from further analysis due to not meeting design and constructability criteria.

Alternatives 1, 2, and 3 would be discarded from further analysis due to the existing WAPA and Xcel utilities causing major complications to the constructability of the bridge.

B. Alternatives to Carry Forward For Further Analysis

HDR proposes to carry forward Alternatives 4, 4a, and 7. These build alternatives have fewer impacts to the existing utilities, therefore improve the constructability and reduce costs to the Project. Construction of the bridge below existing power lines or the need to relocate utilities in the vicinity of the bridge would be avoided with these alternatives. It is important to note that these build alternatives were developed to ensure constructability of any future extension of Benson Road (per City of Sioux Falls Feasibility Study completed in 2001). Therefore, these build alternatives would best address the issues related to utilities, constructability, and rail crossings.

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Index of Attachments

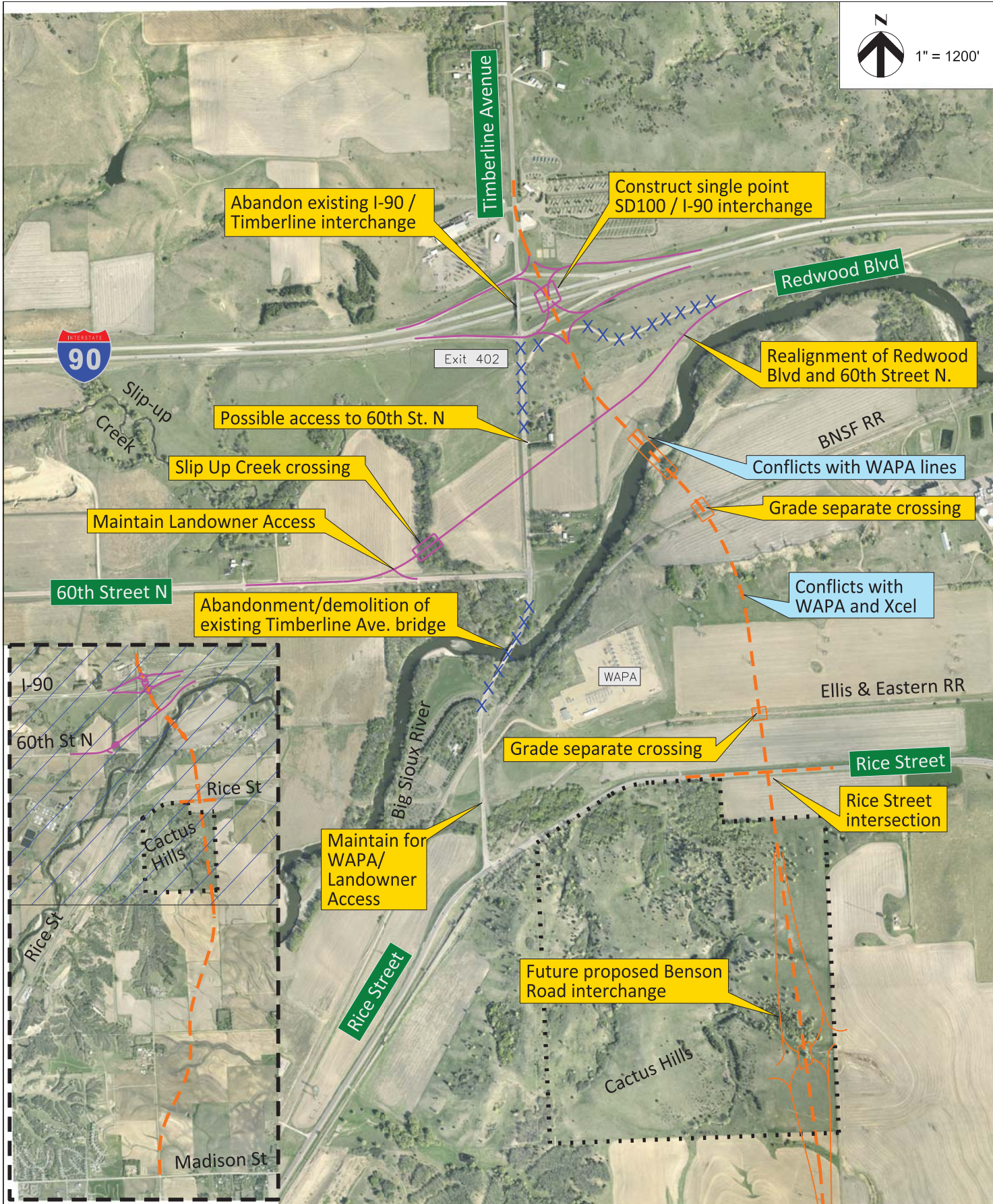
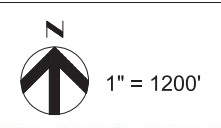
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ATTACHMENT A
(Figures 1-8 – Alternatives 1 through 8 and 4a)
Dated November 2013)

Appendix A

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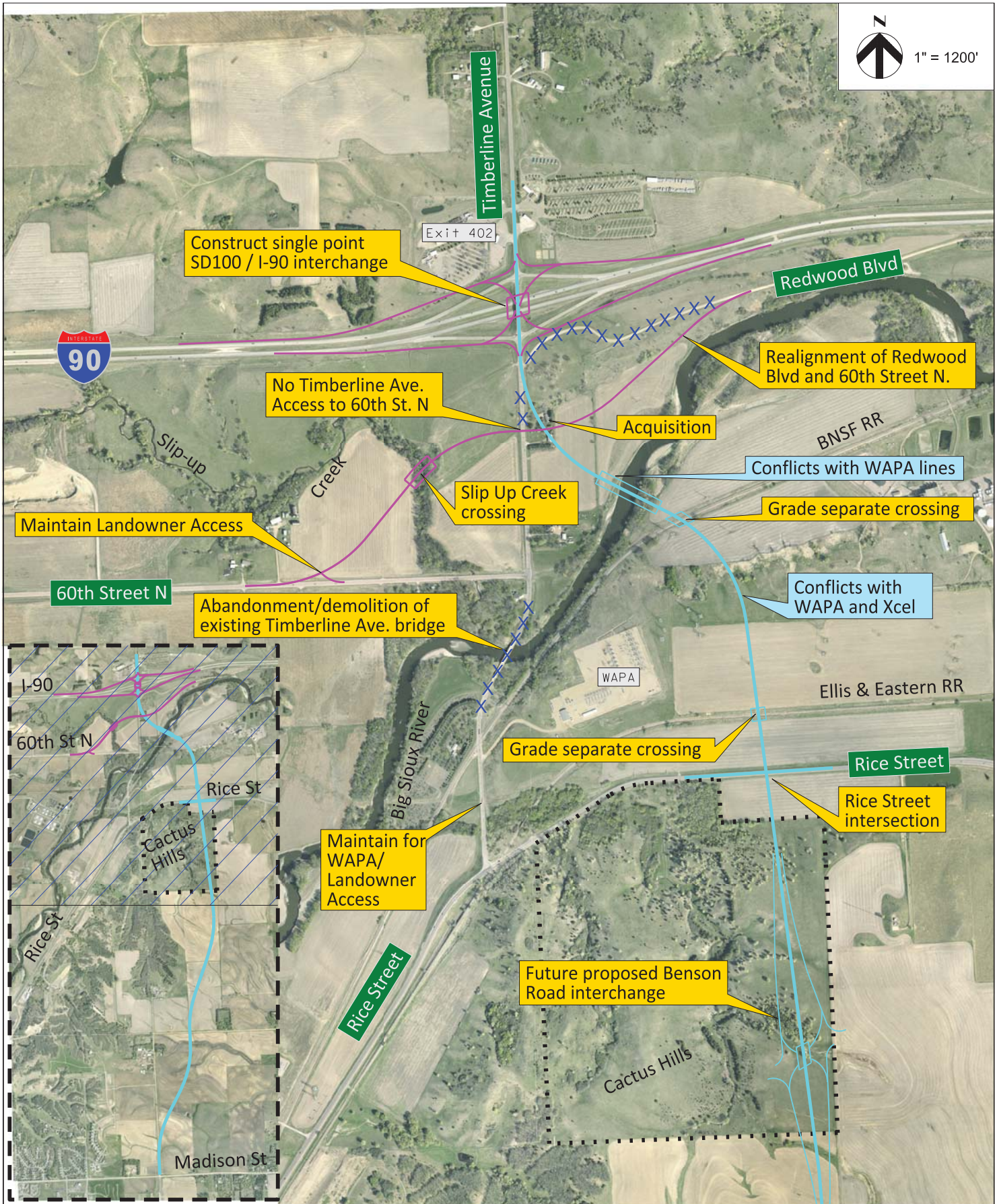
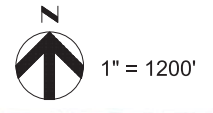


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Alternative 1
Northern Segment of SD100

Figure
1



Date of Aerial Photography: 2012

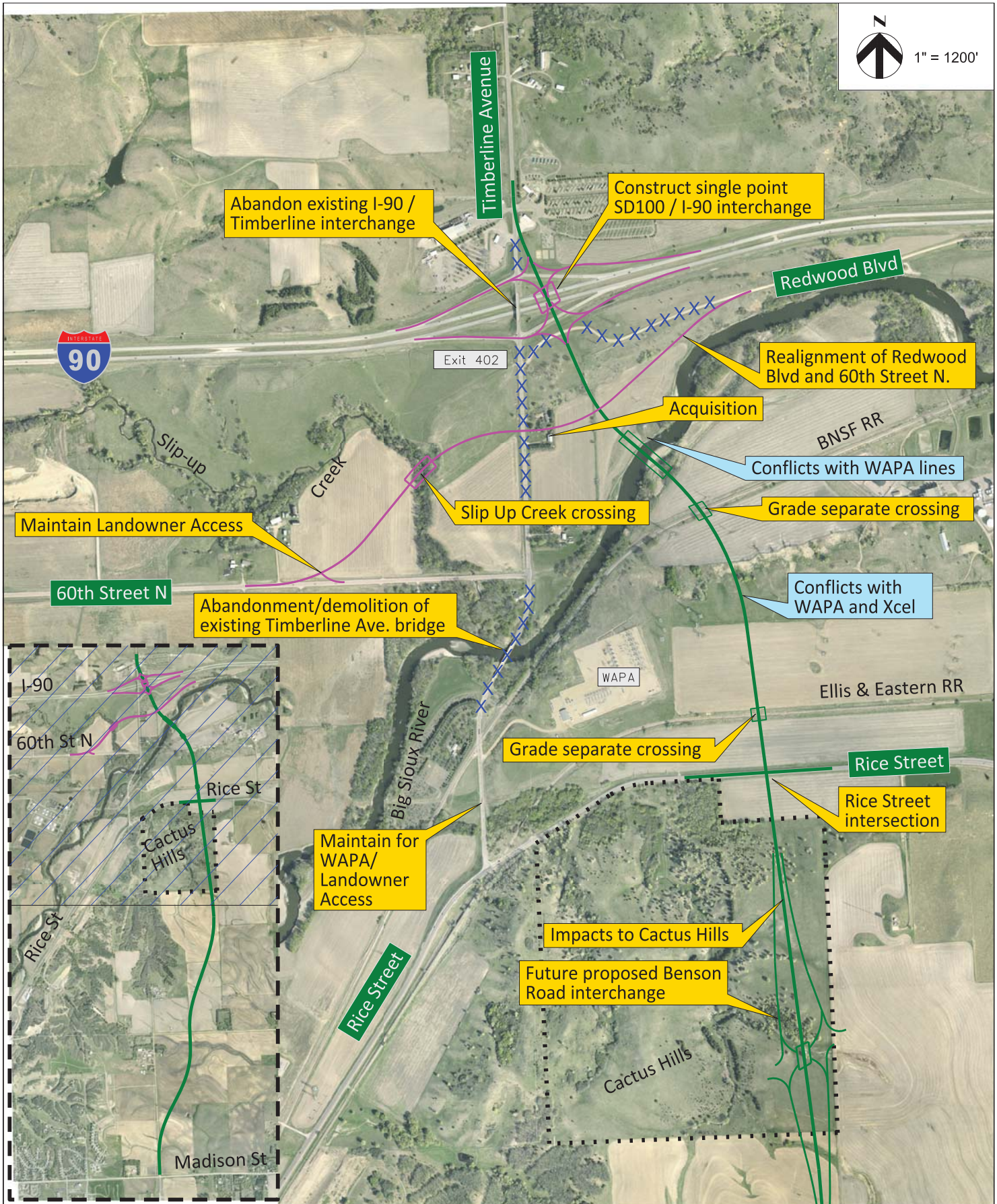


Alternative 2
Northern Segment of SD100

Figure
2



1" = 1200'



Date of Aerial Photography: 2012

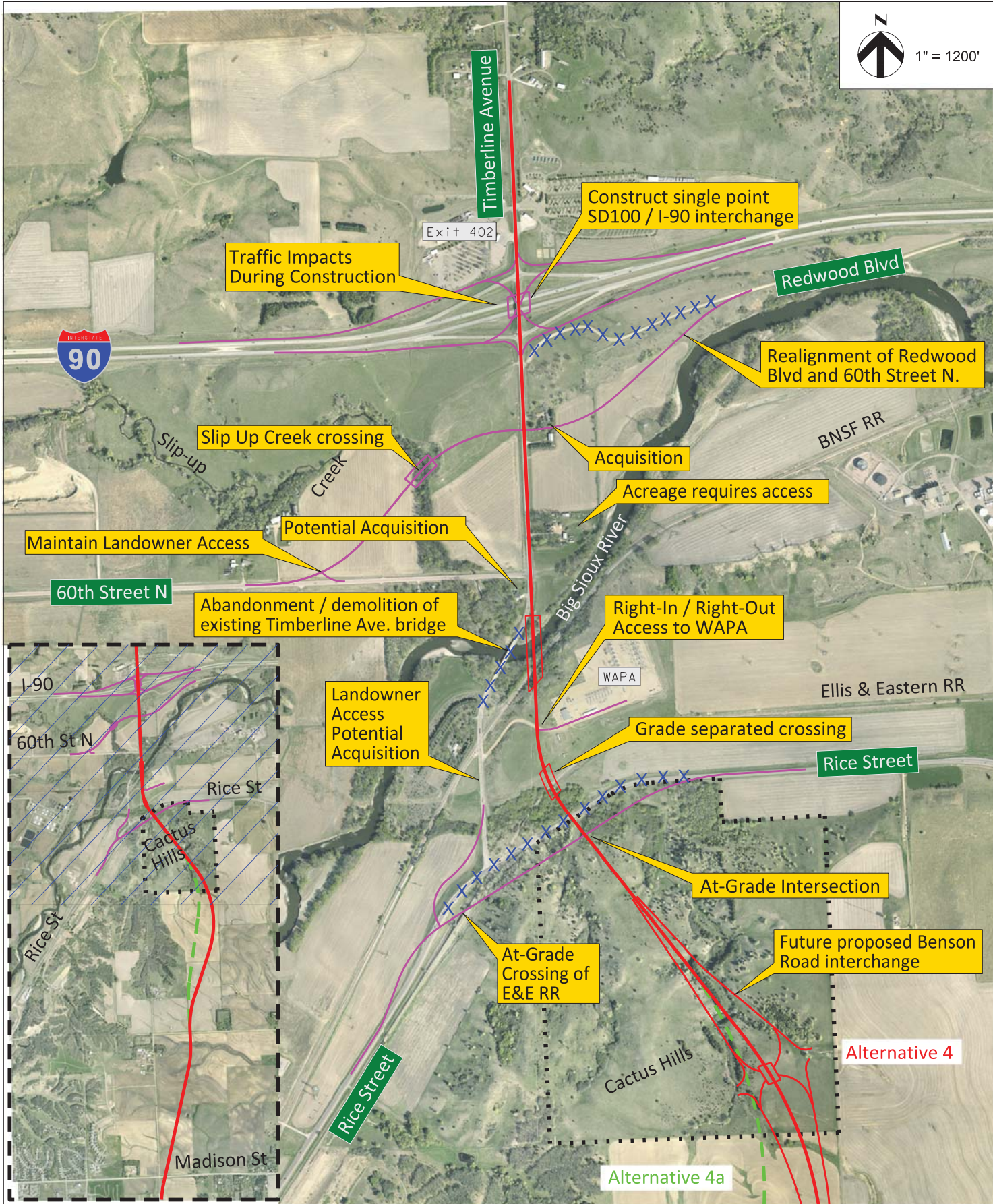
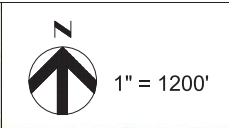


Alternative 3

Northern Segment of SD100

Figure

3



Date of Aerial Photography: 2012

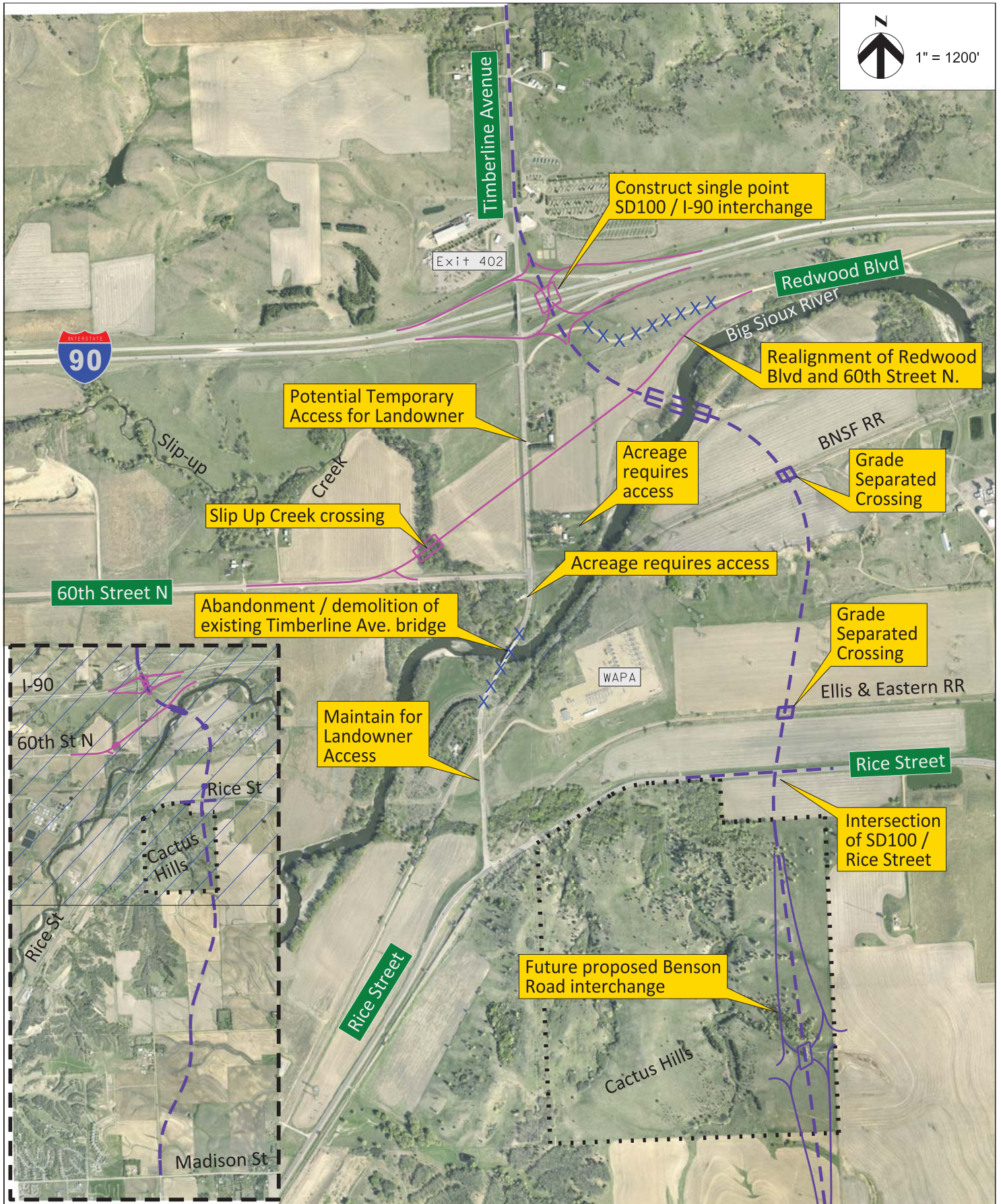


Alternatives 4 and 4a
Northern Segment of SD100

Figure
4/4a



1" = 1200'



Date of Aerial Photography: 2012



Alternative 5

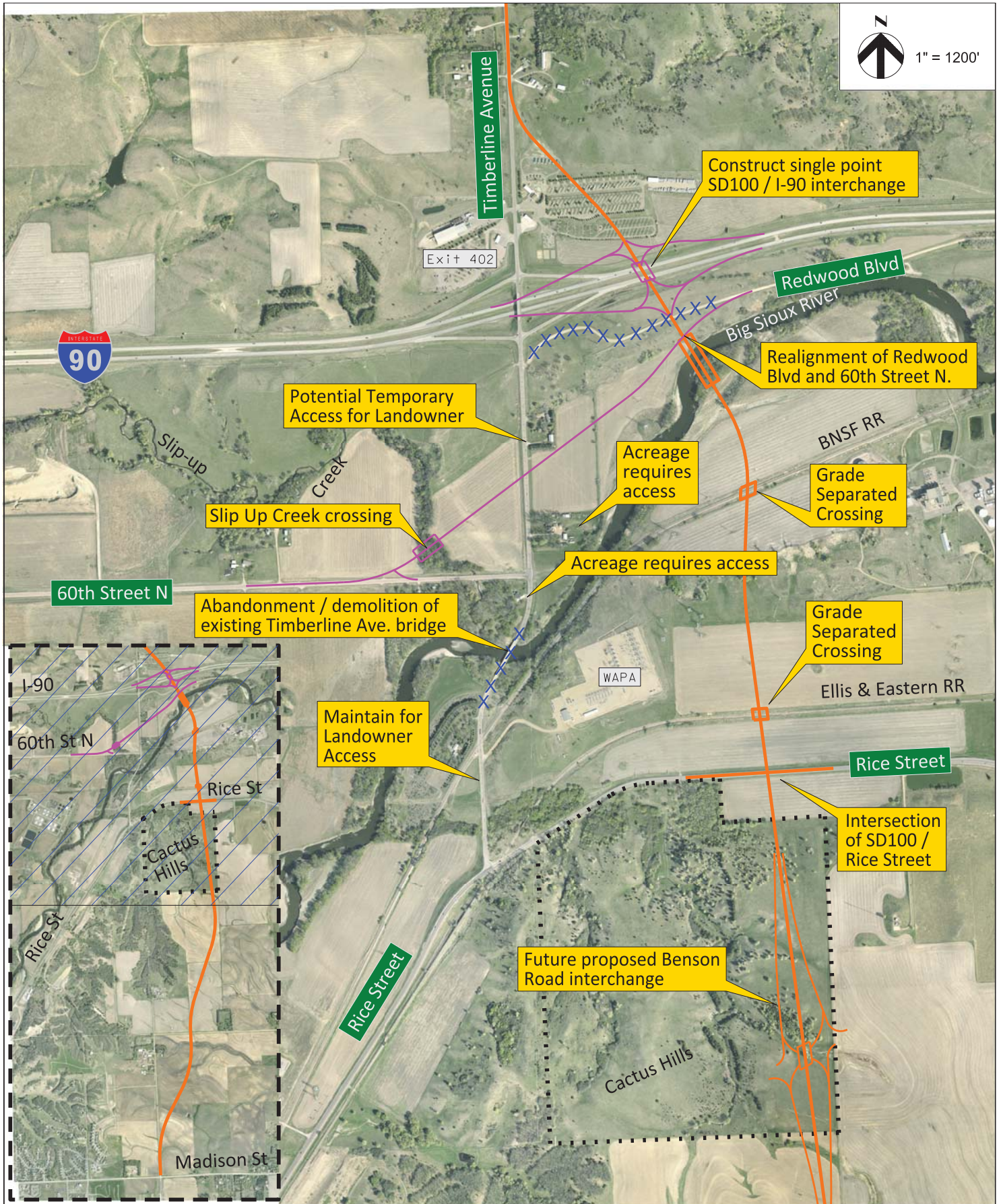
Northern Segment of SD100

Figure

5



1" = 1200'



Date of Aerial Photography: 2012

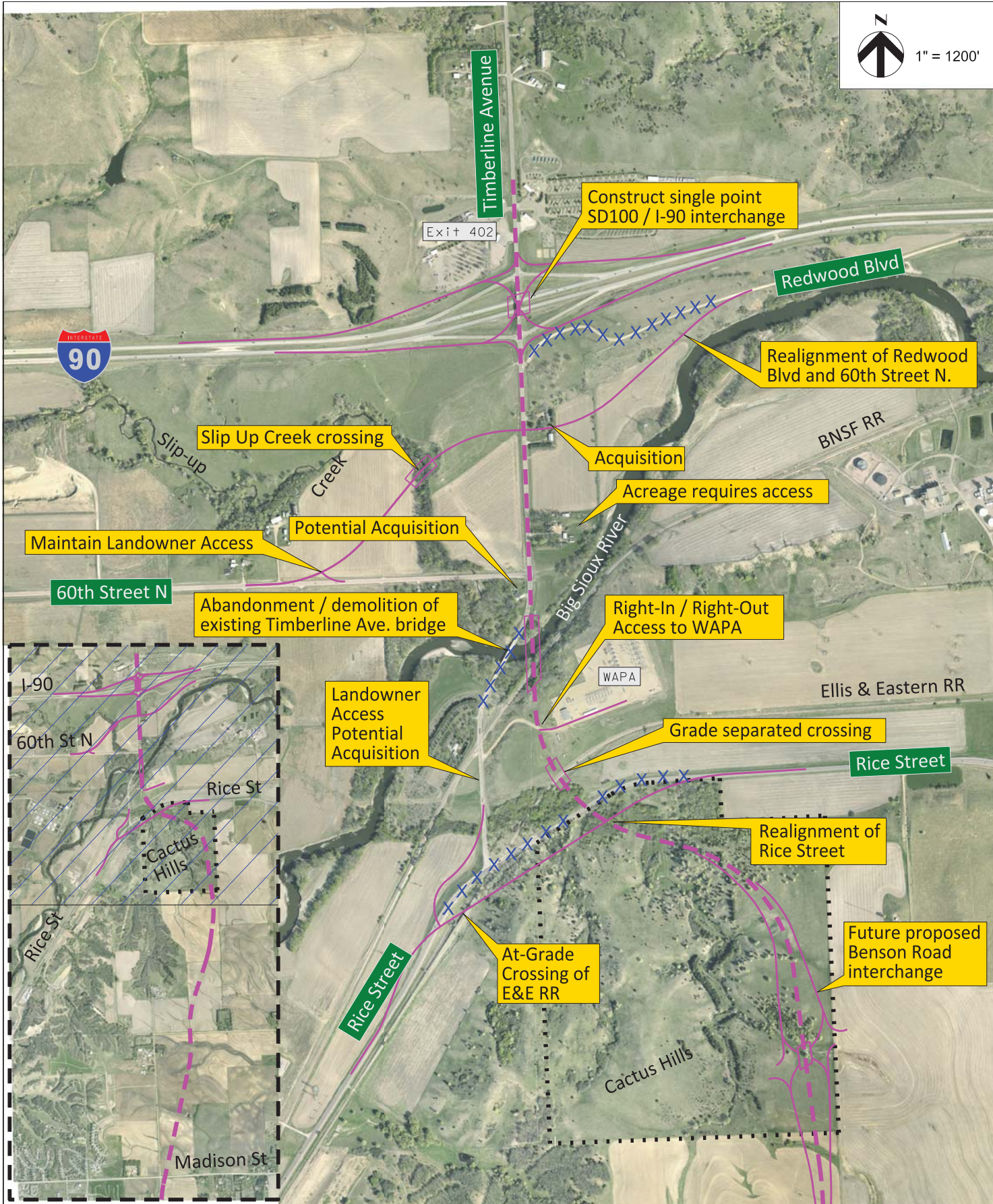
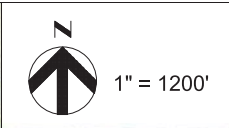


Alternative 6

Northern Segment of SD100

Figure

6

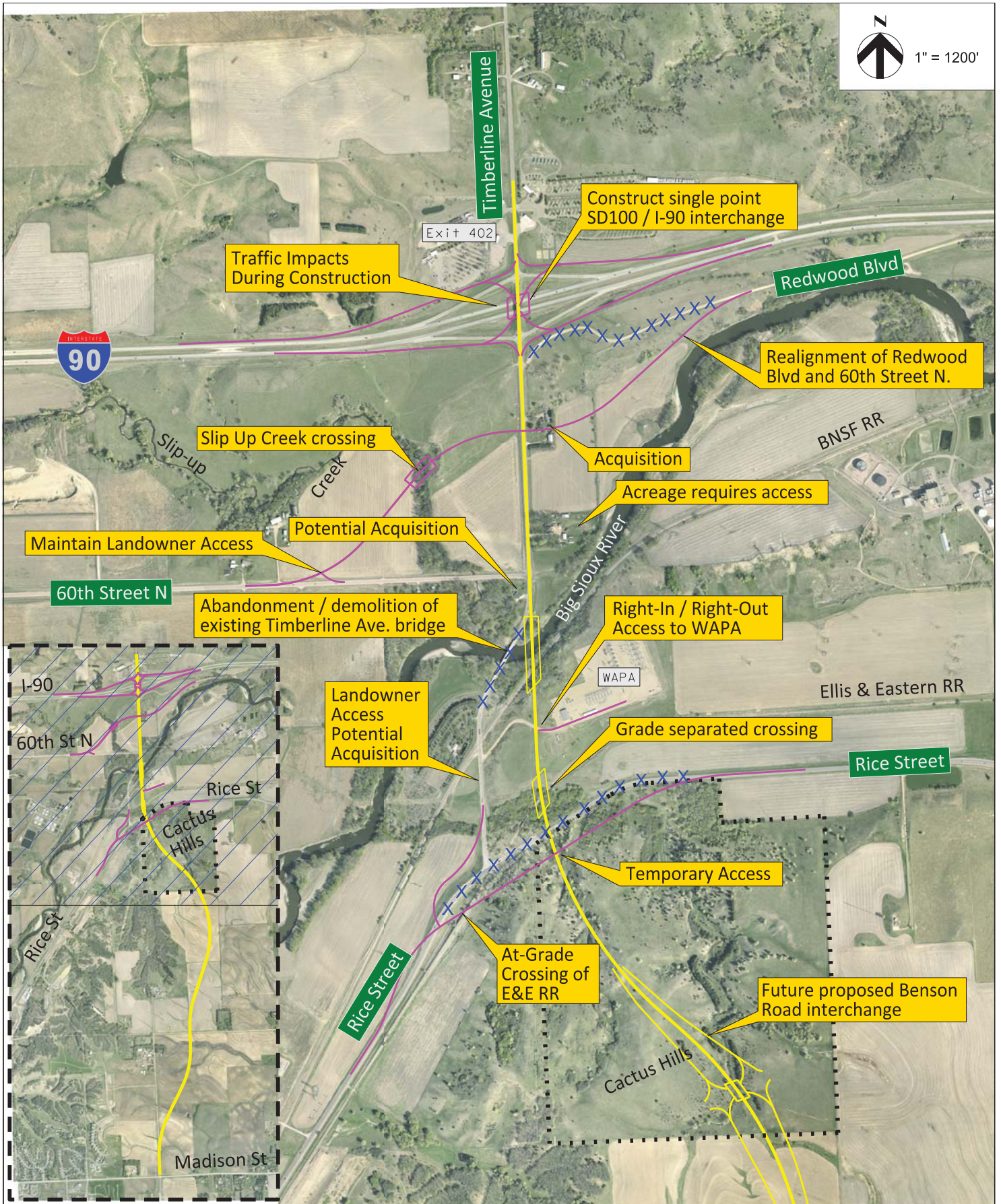


Date of Aerial Photography: 2012



Alternative 7
Northern Segment of SD100

Figure
7



Date of Aerial Photography: 2012



Alternative 8

Northern Segment of SD100

Figure

8

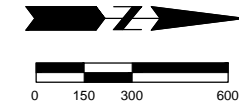
ATTACHMENT B
(Alternative 4 & 4a – Plan and Profile Sheet)
(Dated November 2013)

Appendix A

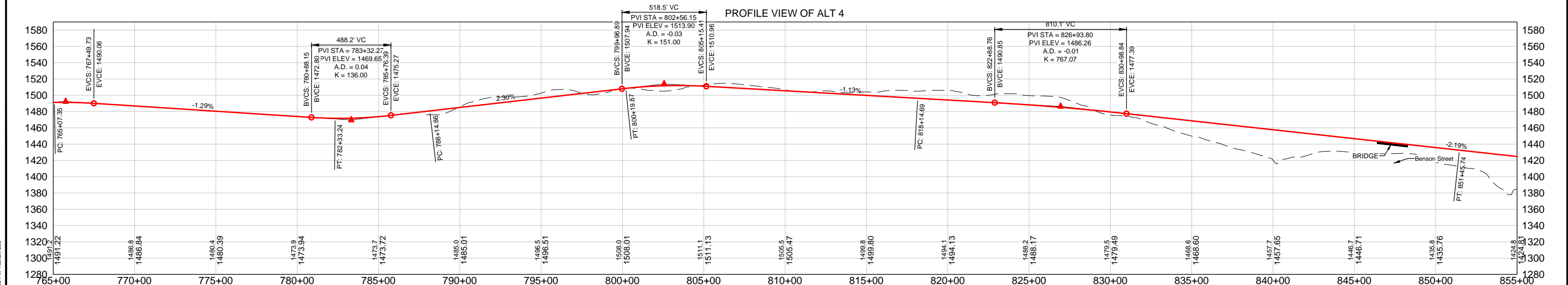
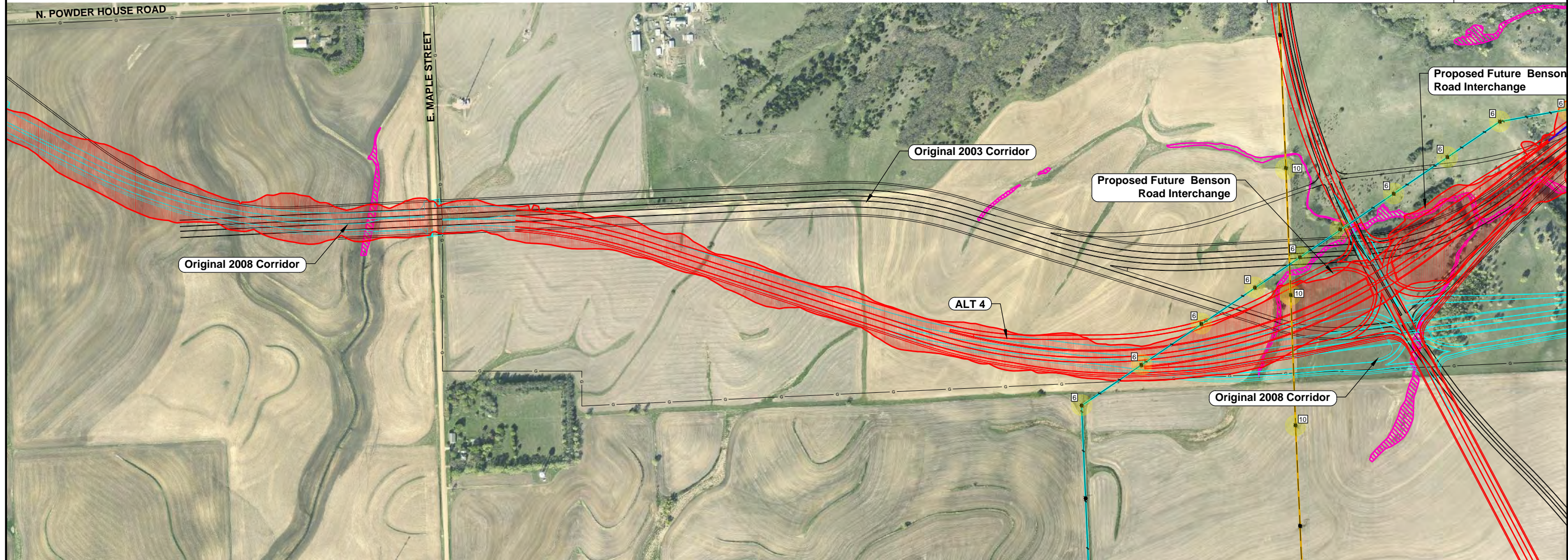
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LEGEND					
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	EAST RIVER ELECTRIC		WAPA		
	L & O POWER		XCEL ENERGY		

ALTERNATIVE ALIGNMENT NO. 4



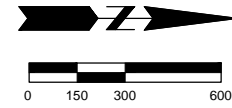
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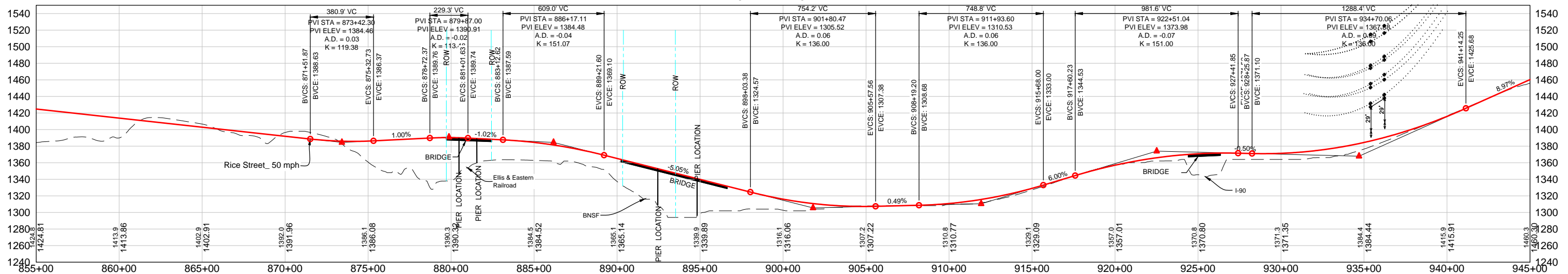


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--- EAST RIVER ELECTRIC	--- WAPA	--- FLOODWAY
--- L & O POWER	--- XCEL ENERGY	--- EA (2012)

UTILITY COST	
\$220,000	EAST RIVER ELECTRIC
\$600,000	L & O POWER
\$0.0	SIOUX VALLEY ELECTRIC
\$500,000	WAPA
\$2.2 M	XCEL ENERGY
\$0.0	PRAIRIE ROSE



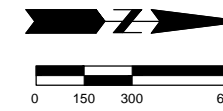
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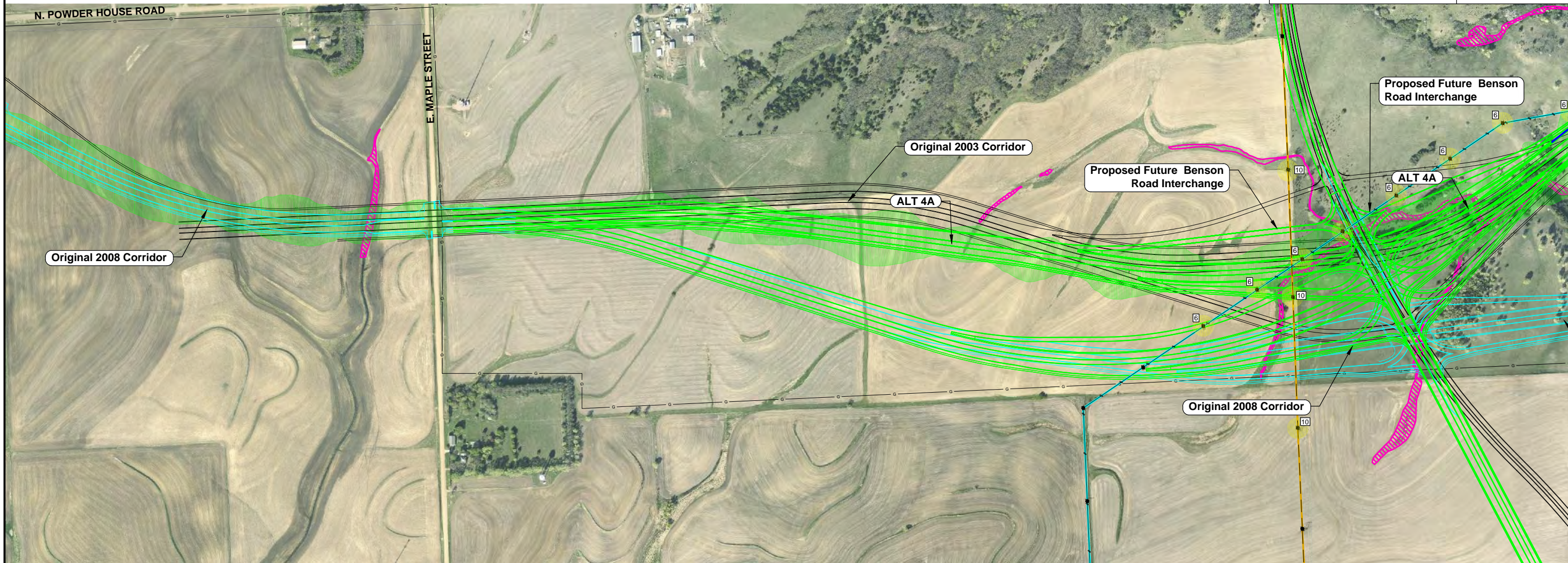
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	EAST RIVER ELECTRIC		WAPA		
	L & O POWER		XCEL ENERGY		

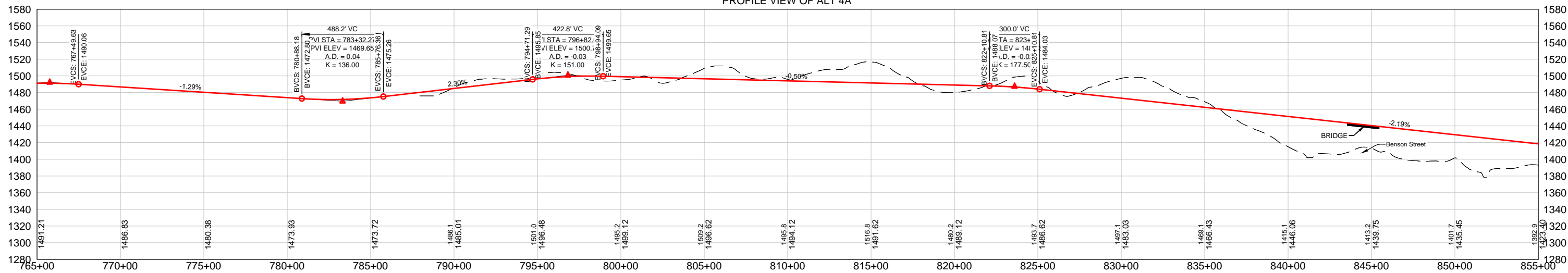
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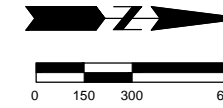
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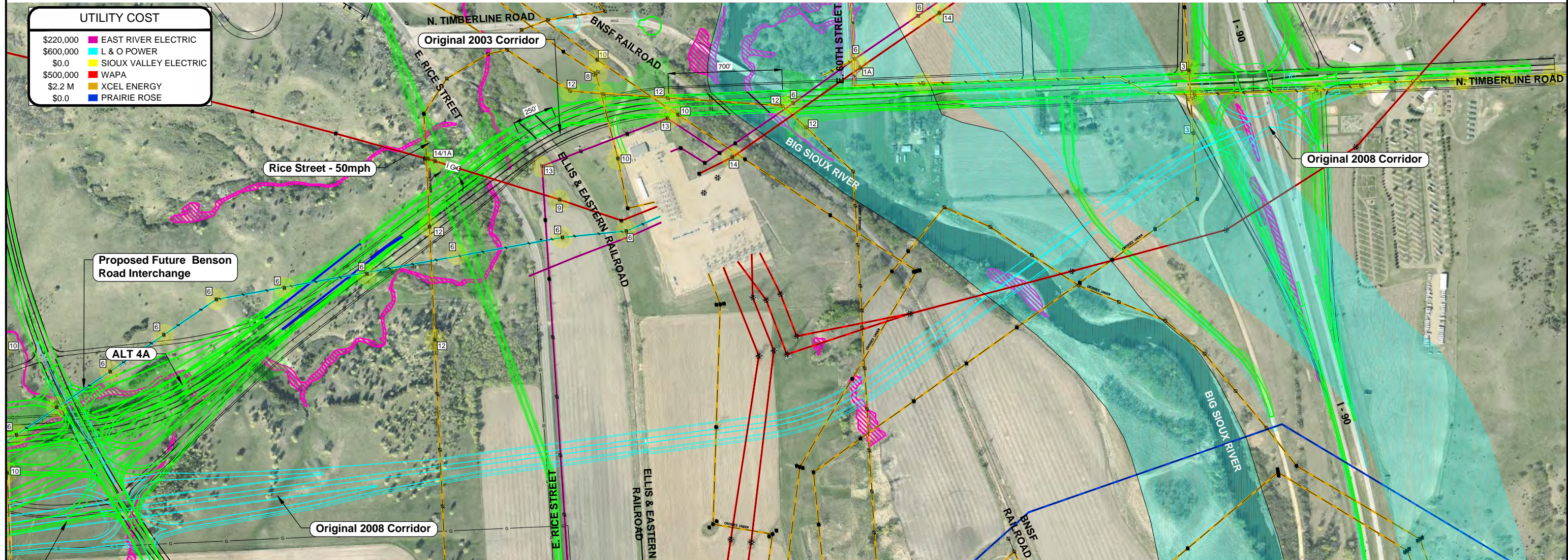
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--- EAST RIVER ELECTRIC	--- WAPA	---
--- L & O POWER	--- XCEL ENERGY	---

ALTERNATIVE ALIGNMENT NO. 4A

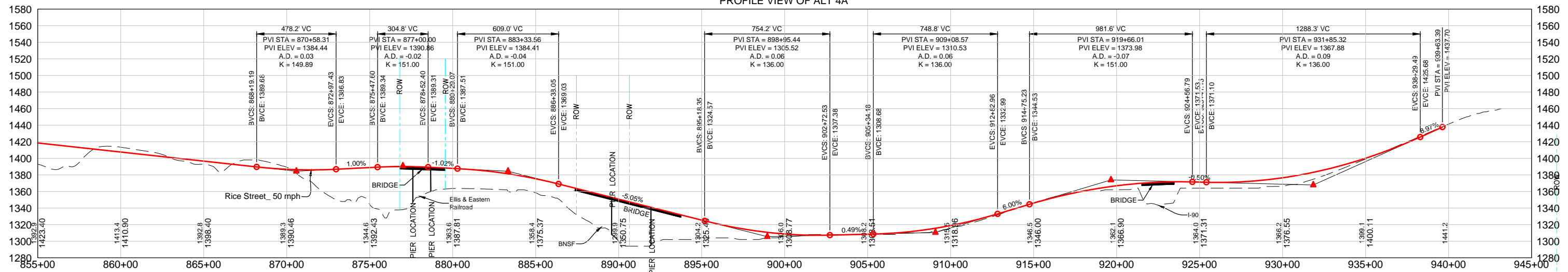


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\$600,000	L & O POWER
\$0.0	SIOUX VALLEY ELECTRIC
\$500,000	WAPA
\$2.2 M	XCEL ENERGY
\$0.0	PRAIRIE ROSE



PROFILE VIEW OF ALT 4A



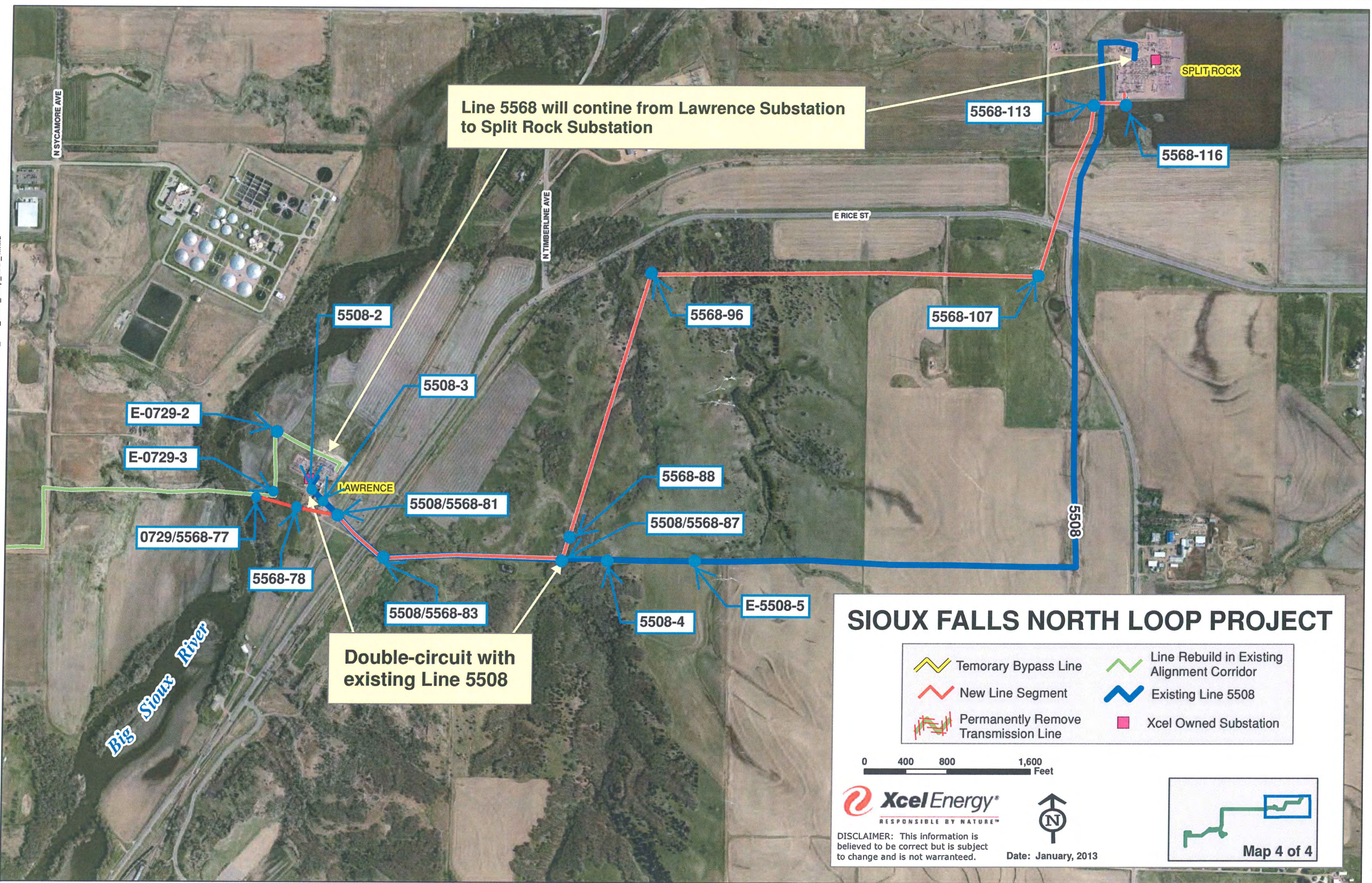
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ATTACHMENT C
(Private Utility Meeting Minutes)
(Dated May 2013)

- Meeting minutes available upon request.
- The following figures have been included for reference.

Appendix A

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Line 5568 will continue from Lawrence Substation to Split Rock Substation

Double-circuit with existing Line 5508

SIoux FALLS NORTH LOOP PROJECT

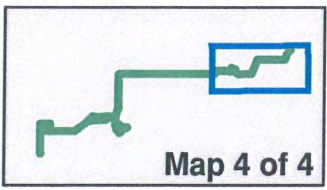
- Temporary Bypass Line
- New Line Segment
- Line Rebuild in Existing Alignment Corridor
- Existing Line 5508
- Permanently Remove Transmission Line
- Xcel Owned Substation

0 400 800 1,600 Feet



DISCLAIMER: This information is believed to be correct but is subject to change and is not warranted.

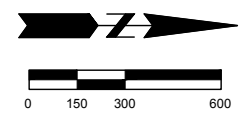
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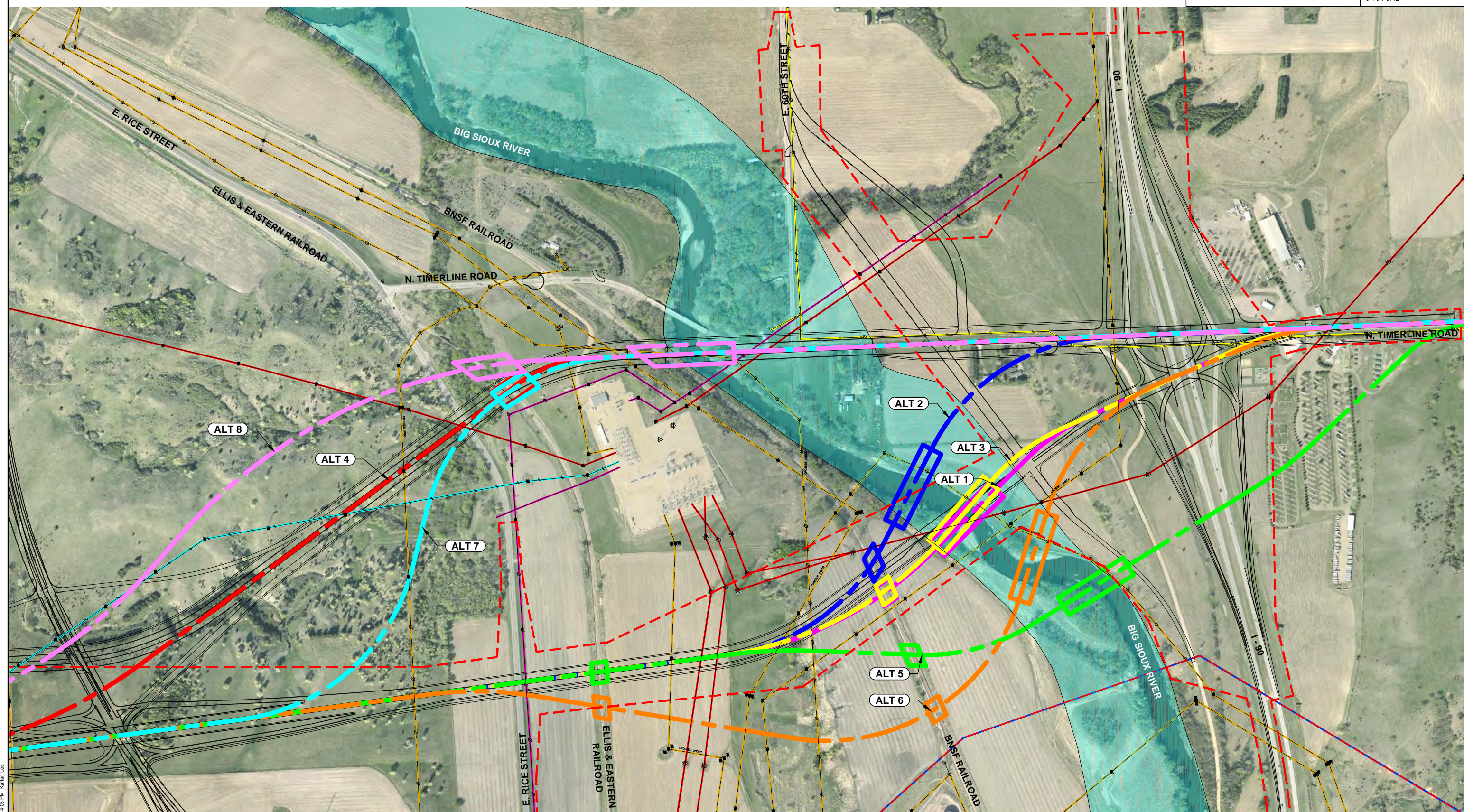
Map 4 of 4

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---	EAST RIVER ELECTRIC	WAPA
---	L & O POWER	XCEL ENERGY
---		PRAIRIE ROSE FLOODWAY
---		EA (2012)

ALTERNATIVE ALIGNMENT LAYOUT



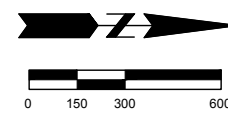
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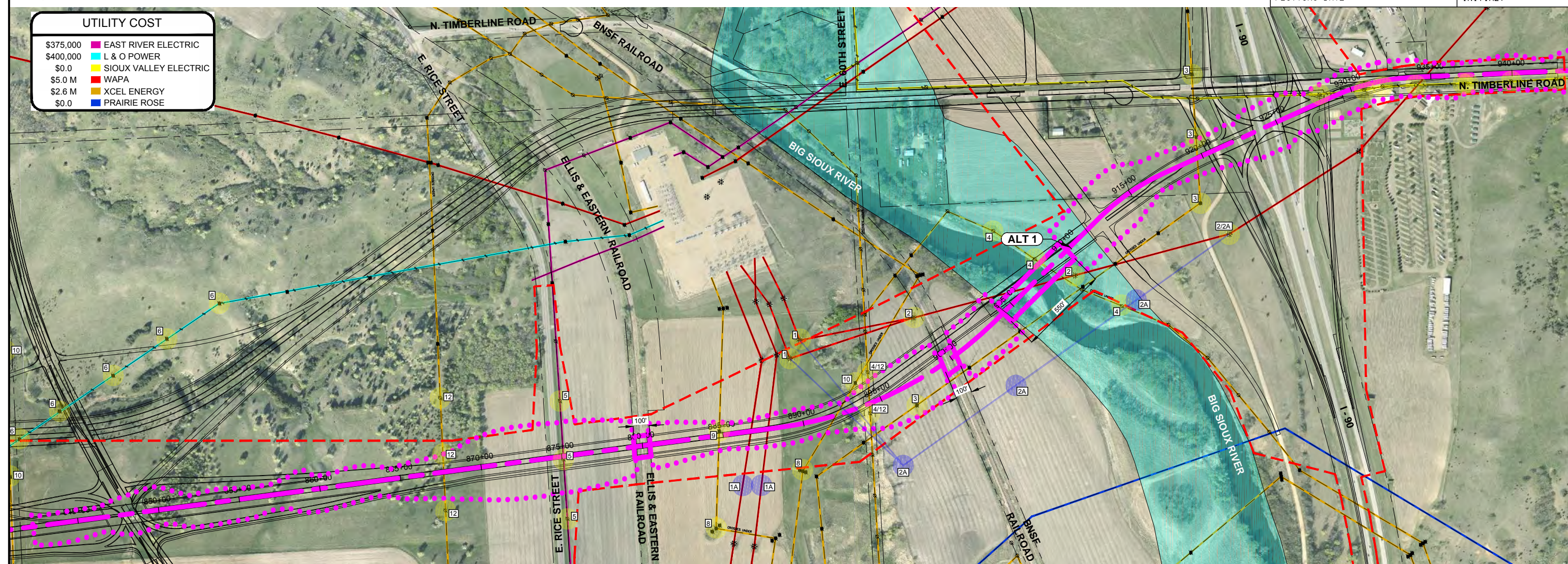
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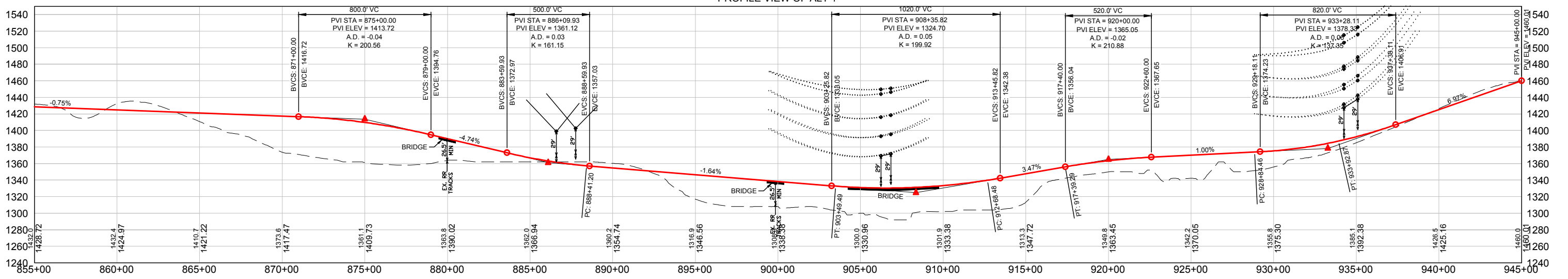


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--- EAST RIVER ELECTRIC	--- WAPA	--- FLOODWAY
--- L & O POWER	--- XCEL ENERGY	--- EA (2012)

UTILITY COST	
\$375,000	EAST RIVER ELECTRIC
\$400,000	L & O POWER
\$0.0	SIOUX VALLEY ELECTRIC
\$5.0 M	WAPA
\$2.6 M	XCEL ENERGY
\$0.0	PRAIRIE ROSE



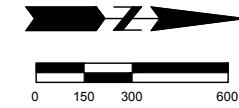
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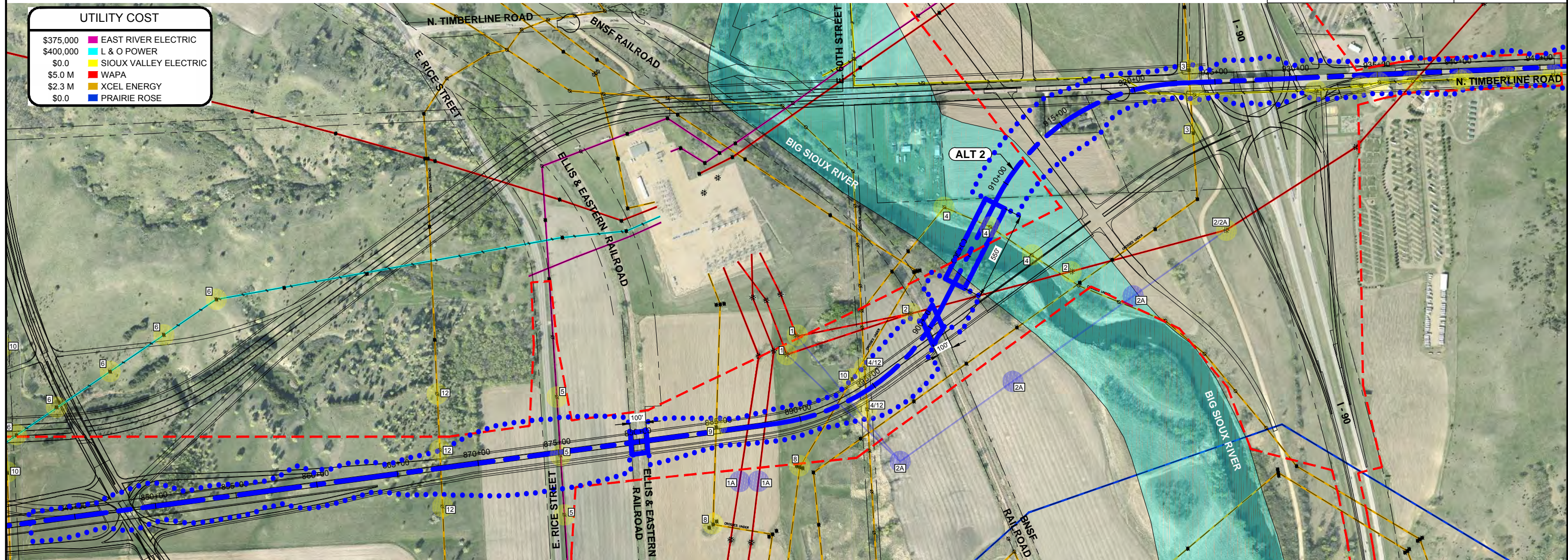
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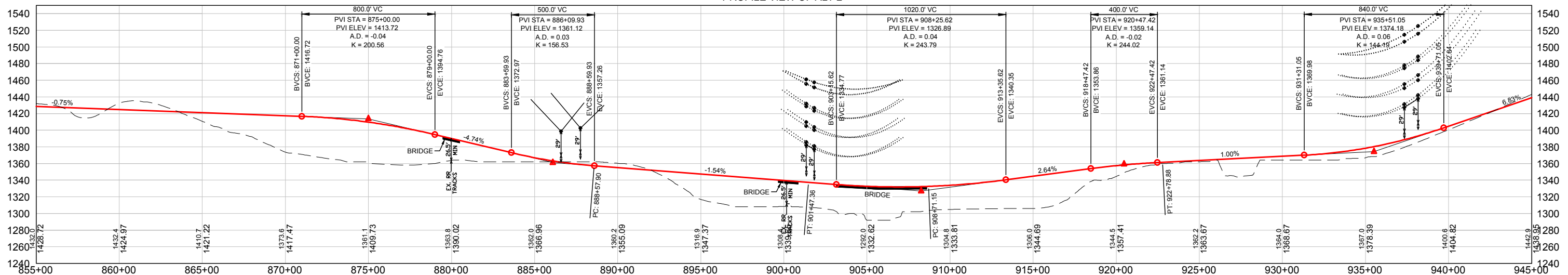


LEGEND		
--- EXISTING ELECTRIC	--- SIOUX VALLEY ELECTRIC	--- PRAIRIE ROSE
--- EAST RIVER ELECTRIC	--- WAPA	--- FLOODWAY
--- L & O POWER	--- XCEL ENERGY	--- EA (2012)

UTILITY COST	
\$375,000	EAST RIVER ELECTRIC
\$400,000	L & O POWER
\$0.0	SIOUX VALLEY ELECTRIC
\$5.0 M	WAPA
\$2.3 M	XCEL ENERGY
\$0.0	PRAIRIE ROSE

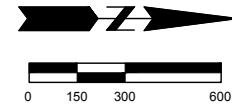


PROFILE VIEW OF ALT 2



PLOT DATE: 5/1/2013 4:30 PM Keffler, Lee

ALTERNATIVE ALIGNMENT NO. 3



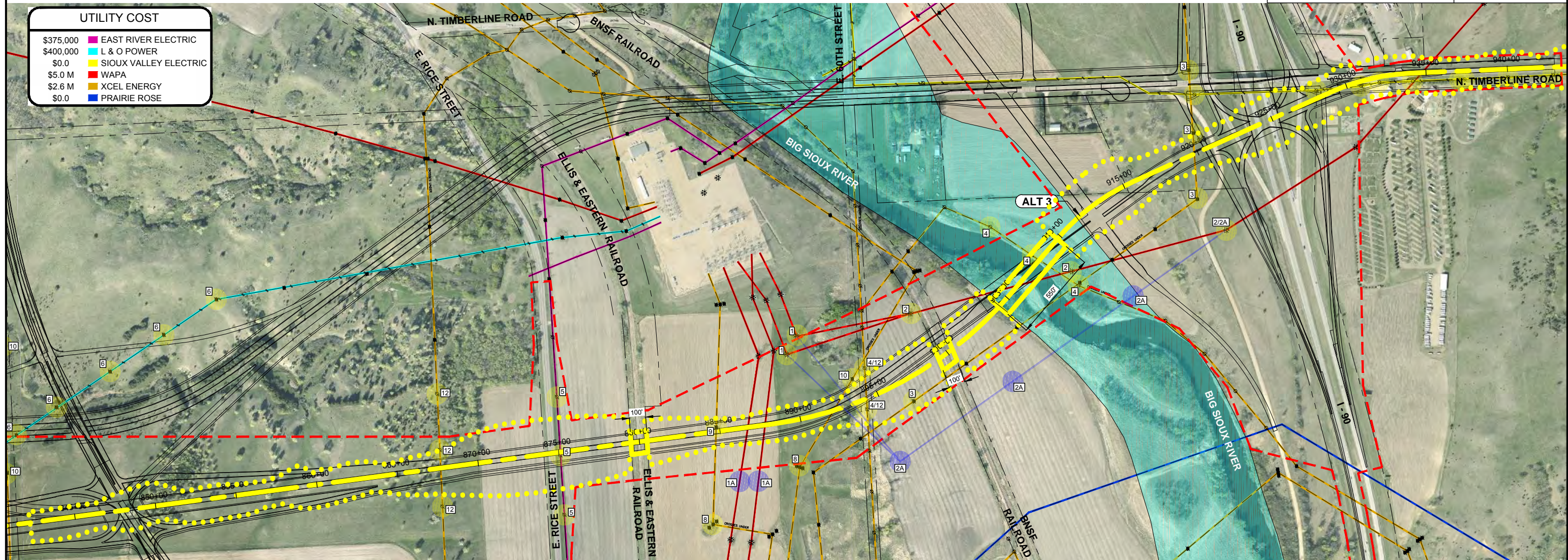
STATE OF SOUTH DAKOTA	PROJECT	SHEET NO.	TOTAL SHEETS
	P 1282(06)	4	#
FILE: 2-ALTERNATIVE PLAN & PROFILE.DWG		REV DATE: INITIAL:	
PLOT DATE: 5/1/2013			

LEGEND

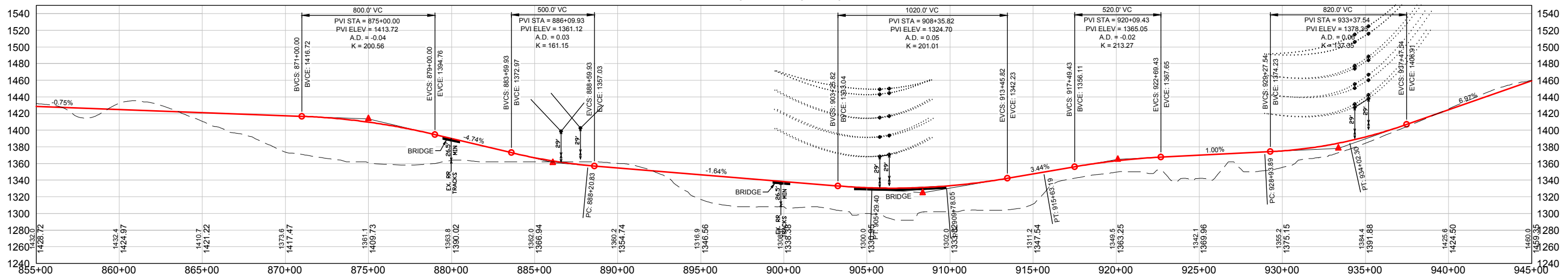
--- EXISTING ELECTRIC	--- SIOUX VALLEY ELECTRIC	--- PRAIRIE ROSE
--- EAST RIVER ELECTRIC	--- WAPA	--- FLOODWAY
--- L & O POWER	--- XCEL ENERGY	--- EA (2012)

UTILITY COST

\$375,000	■ EAST RIVER ELECTRIC
\$400,000	■ L & O POWER
\$0.0	■ SIOUX VALLEY ELECTRIC
\$5.0 M	■ WAPA
\$2.6 M	■ XCEL ENERGY
\$0.0	■ PRAIRIE ROSE



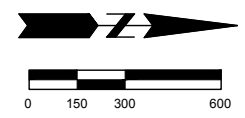
PROFILE VIEW OF ALT 3



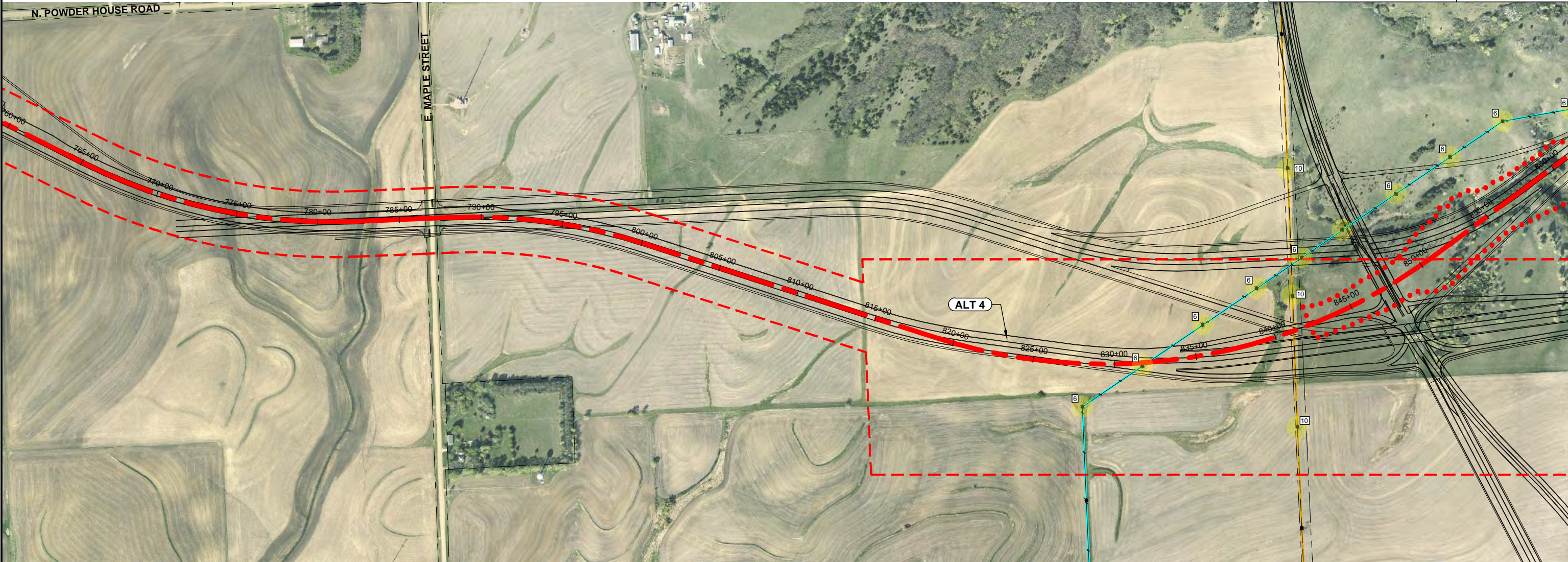
PLOT DATE: 5/1/2013 4:30 PM Keffler, Lee

LEGEND					
	EXISTING ELECTRIC		SIoux VALLEY ELECTRIC		PRAIRIE ROSE
	EAST RIVER ELECTRIC		WAPA		FLOODWAY
	L & O POWER		XCEL ENERGY		EA (2012)

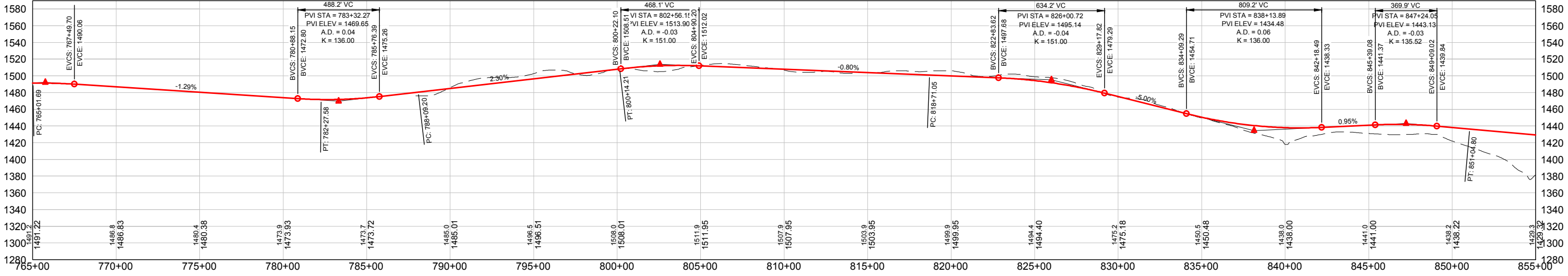
ALTERNATIVE ALIGNMENT NO. 4



STATE OF SOUTH DAKOTA	PROJECT	SHEET NO.	TOTAL SHEETS
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FILE: 2-ALTERNATIVE PLAN & PROFILE.DWG		REV DATE:	
PLOT DATE: 5/1/2013		INITIAL:	



PROFILE VIEW OF ALT 4



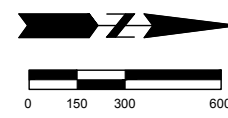
PLOT DATE: 5/1/2013 4:31 PM Keffler, Lee

ALTERNATIVE ALIGNMENT NO. 4

STATE OF SOUTH DAKOTA	PROJECT	SHEET NO.	TOTAL SHEETS
	P 1282(06)	5B	#
FILE: 2-ALTERNATIVE PLAN & PROFILE.DWG		REV DATE:	
PLOTING DATE: 5/1/2013		INITIAL:	

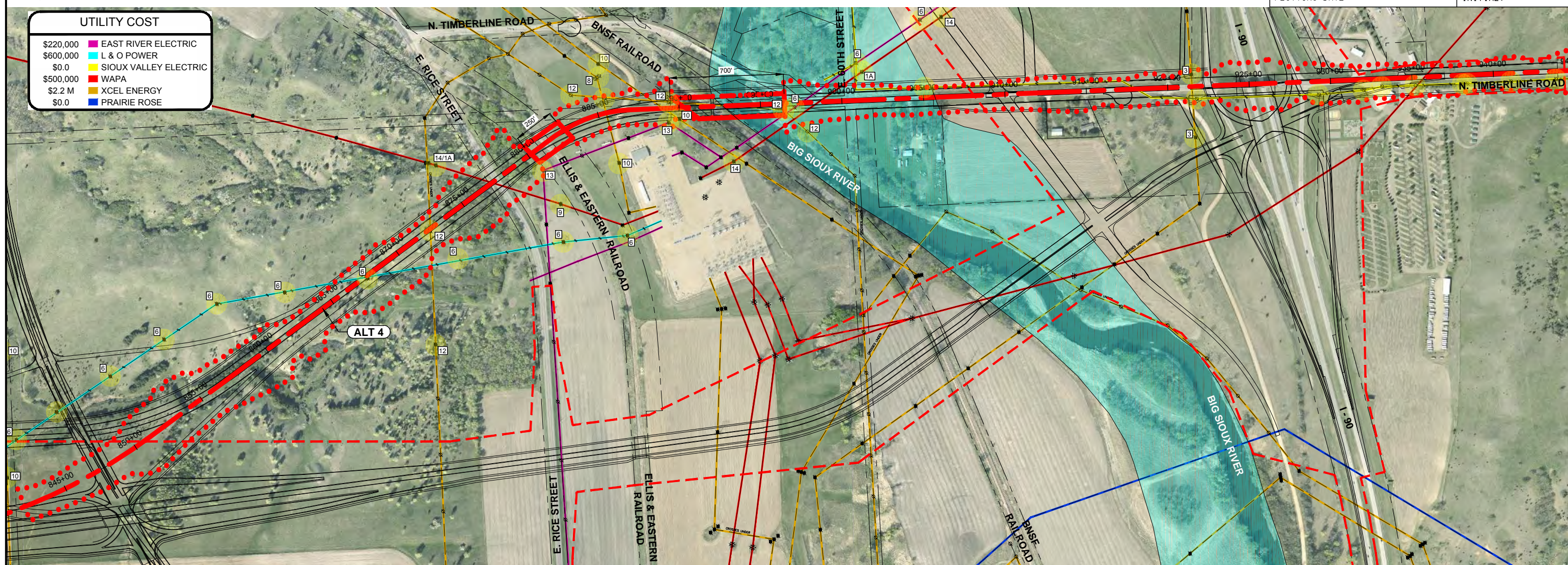
LEGEND

---	EXISTING ELECTRIC	---	SIoux VALLEY ELECTRIC	---	PRAIRIE ROSE
---	EAST RIVER ELECTRIC	---	WAPA	---	FLOODWAY
---	L & O POWER	---	XCEL ENERGY	---	EA (2012)

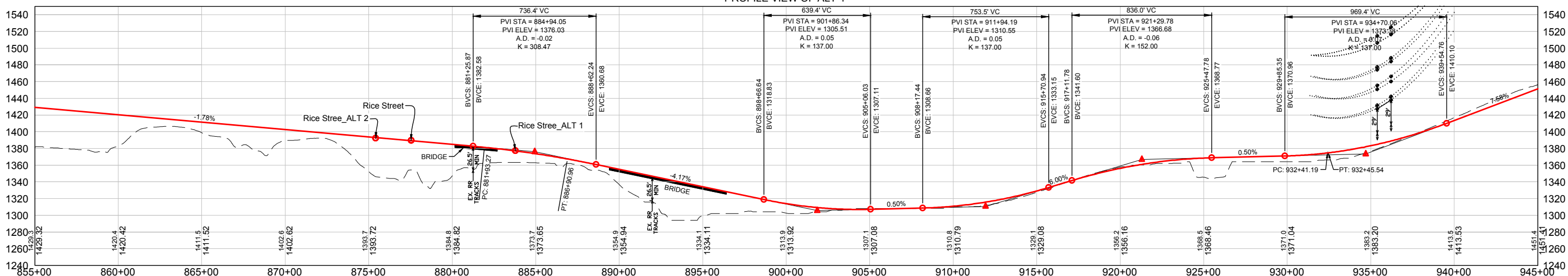


UTILITY COST

\$220,000	EAST RIVER ELECTRIC
\$600,000	L & O POWER
\$0.0	SIoux VALLEY ELECTRIC
\$500,000	WAPA
\$2.2 M	XCEL ENERGY
\$0.0	PRAIRIE ROSE



PROFILE VIEW OF ALT 4



PLOT DATE: 5/1/2013 4:31 PM Keffler, Lee

ALTERNATIVE ALIGNMENT NO. 5

LEGEND

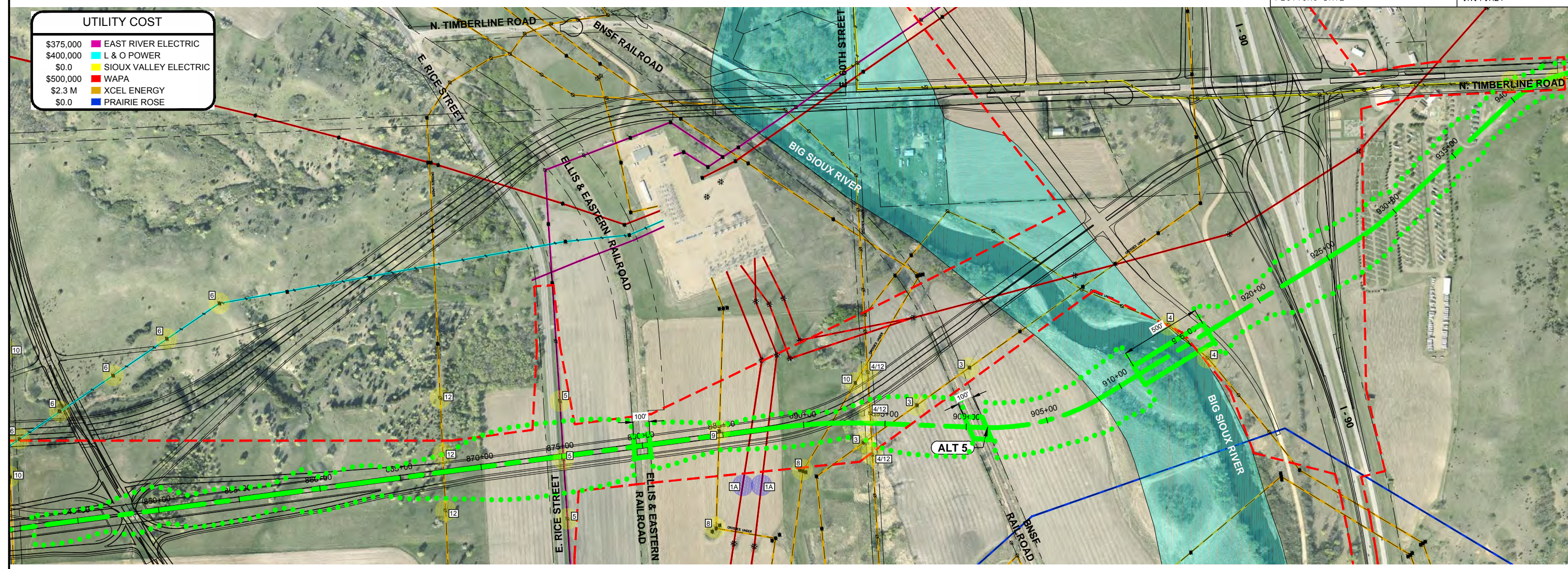
---	EXISTING ELECTRIC	---	SIoux VALLEY ELECTRIC	---	PRAIRIE ROSE
---	EAST RIVER ELECTRIC	---	WAPA	---	FLOODWAY
---	L & O POWER	---	XCEL ENERGY	---	EA (2012)

STATE OF SOUTH DAKOTA	PROJECT	SHEET NO.	TOTAL SHEETS
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FILE: 2-ALTERNATIVE PLAN & PROFILE.DWG		REV DATE: INITIAL:	
PLOT DATE: 5/1/2013			

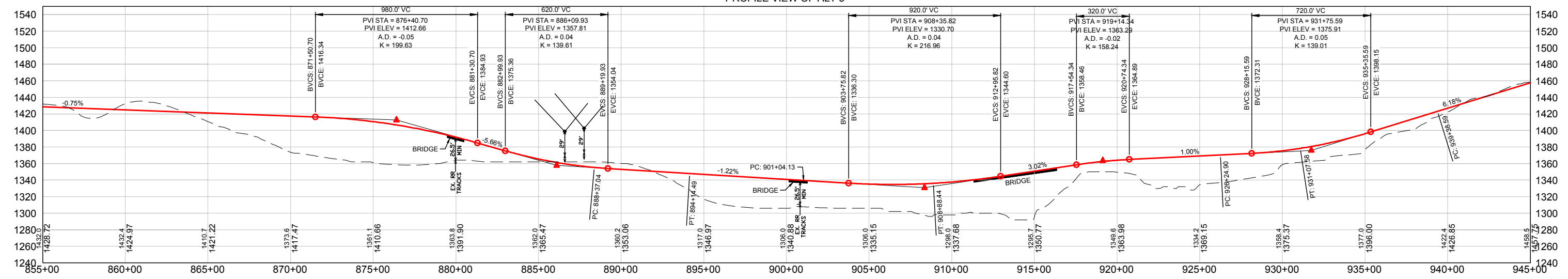


UTILITY COST

\$375,000	EAST RIVER ELECTRIC
\$400,000	L & O POWER
\$0.0	SIoux VALLEY ELECTRIC
\$500,000	WAPA
\$2.3 M	XCEL ENERGY
\$0.0	PRAIRIE ROSE



PROFILE VIEW OF ALT 5



PLOT DATE: 5/1/2013 4:32 PM Keffler, Lee

ALTERNATIVE ALIGNMENT NO. 6

STATE OF SOUTH DAKOTA	PROJECT	SHEET NO.	TOTAL SHEETS
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PLOT DATE: 5/1/2013		INITIAL:	

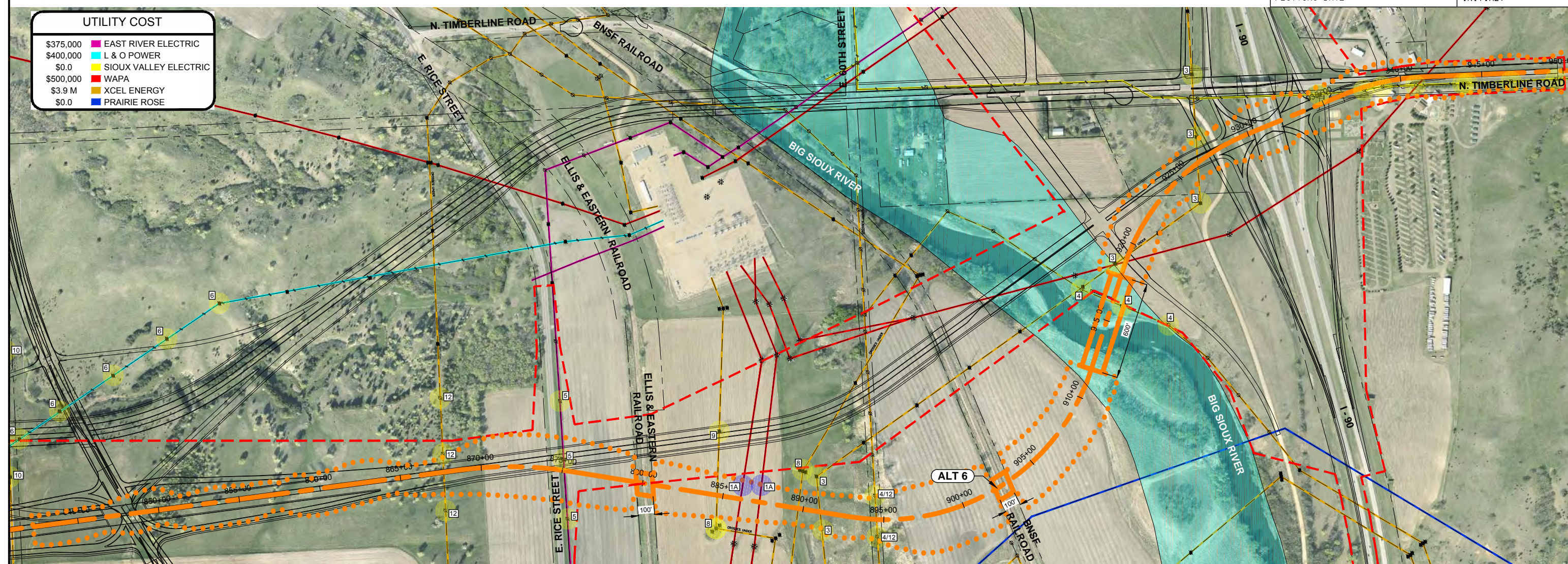


LEGEND

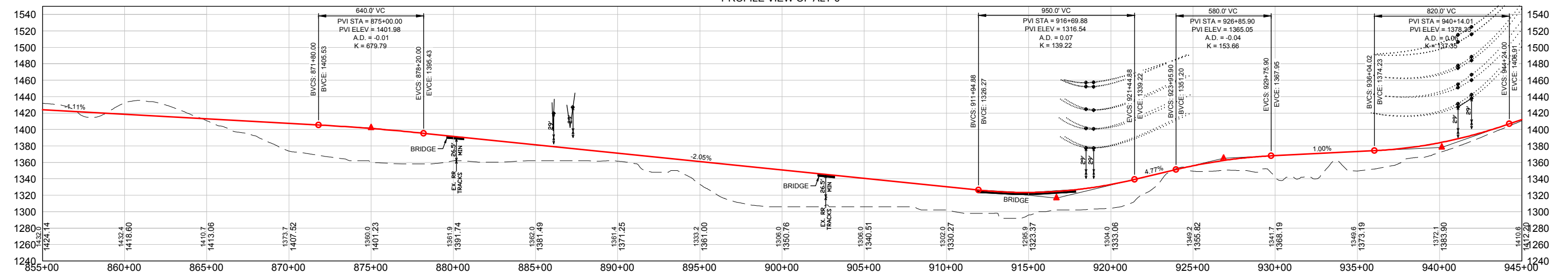
--- EXISTING ELECTRIC	--- SIOUX VALLEY ELECTRIC	--- PRAIRIE ROSE
--- EAST RIVER ELECTRIC	--- WAPA	--- FLOODWAY
--- L & O POWER	--- XCEL ENERGY	--- EA (2012)

UTILITY COST

\$375,000	EAST RIVER ELECTRIC
\$400,000	L & O POWER
\$0.0	SIOUX VALLEY ELECTRIC
\$500,000	WAPA
\$3.9 M	XCEL ENERGY
\$0.0	PRAIRIE ROSE



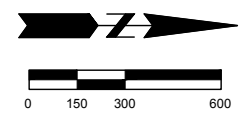
PROFILE VIEW OF ALT 6



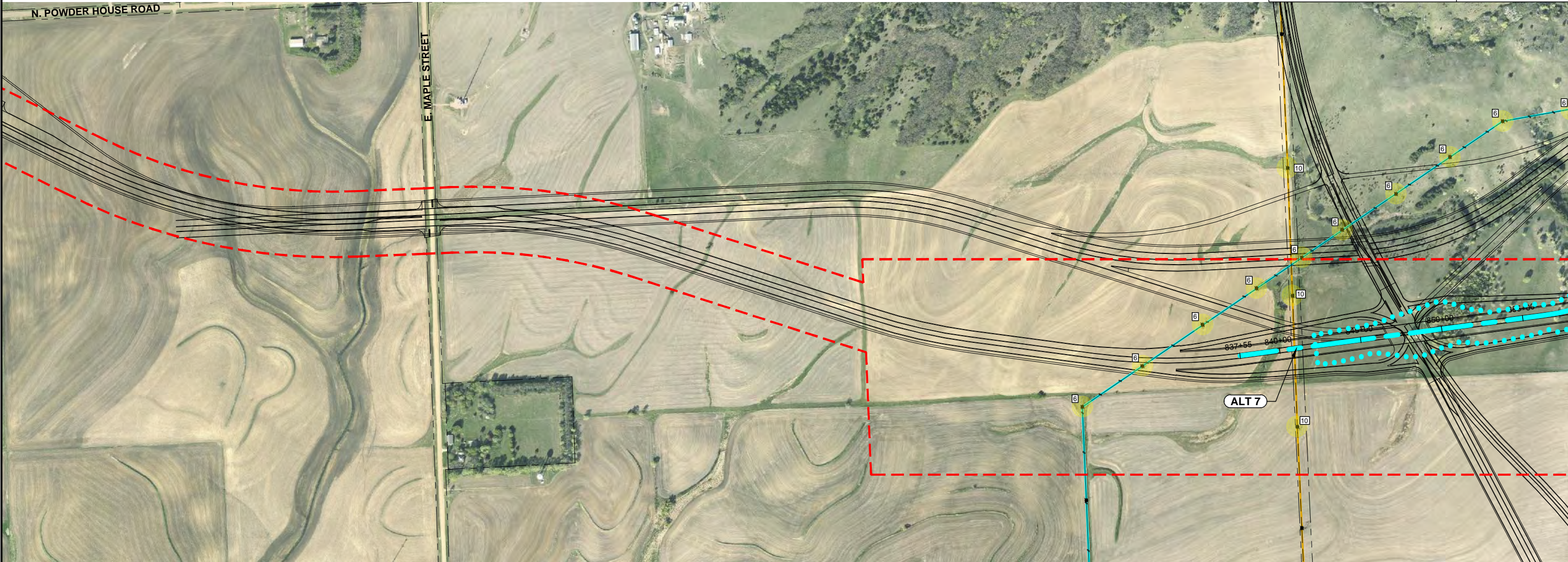
PLOT DATE: 5/1/2013 4:32 PM Keffler, Lee

LEGEND		
---	EXISTING ELECTRIC	SIoux VALLEY ELECTRIC
---	EAST RIVER ELECTRIC	WAPA
---	L & O POWER	XCEL ENERGY
---	PRAIRIE ROSE FLOODWAY	EA (2012)

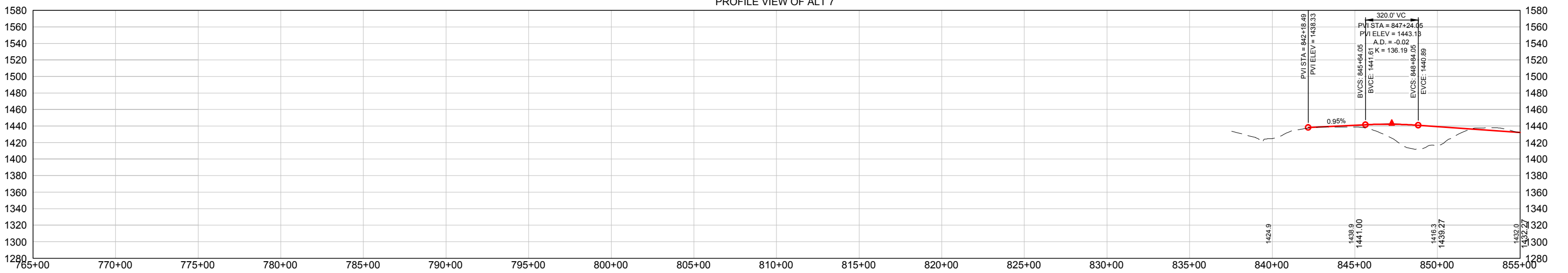
ALTERNATIVE ALIGNMENT NO. 7



STATE OF SOUTH DAKOTA	PROJECT	SHEET NO.	TOTAL SHEETS
	P 1282(06)	8A	#
FILE: 2-ALTERNATIVE PLAN & PROFILE.DWG		REV DATE: INITIAL:	
PLOT DATE: 5/1/2013			



PROFILE VIEW OF ALT 7



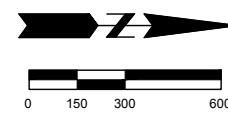
PLOT DATE: 5/1/2013 4:33 PM Keffler, Lee

ALTERNATIVE ALIGNMENT NO. 7

LEGEND

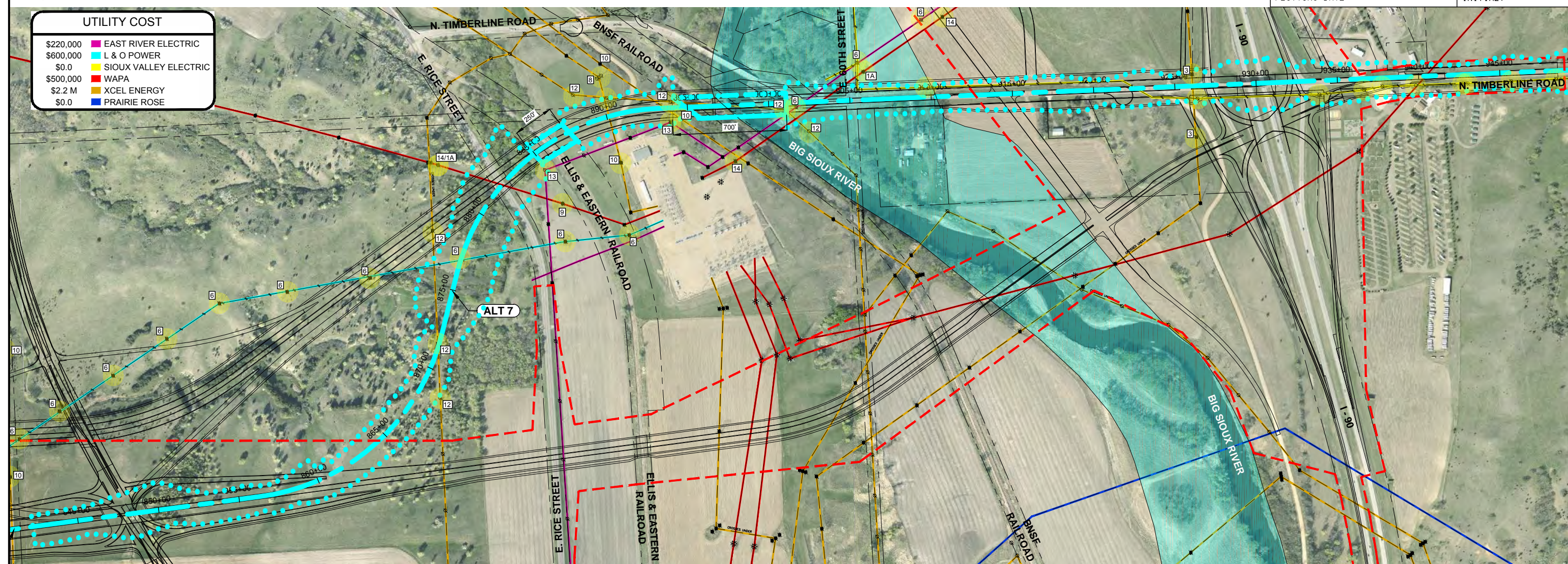
---	EXISTING ELECTRIC	---	SIoux VALLEY ELECTRIC	---	PRAIRIE ROSE
---	EAST RIVER ELECTRIC	---	WAPA	---	FLOODWAY
---	L & O POWER	---	XCEL ENERGY	---	EA (2012)

STATE OF SOUTH DAKOTA	PROJECT	SHEET NO.	TOTAL SHEETS
	P 1282(06)	8B	#
FILE: 2-ALTERNATIVE PLAN & PROFILE.DWG		REV DATE: INITIAL:	
PLOT DATE: 5/1/2013			

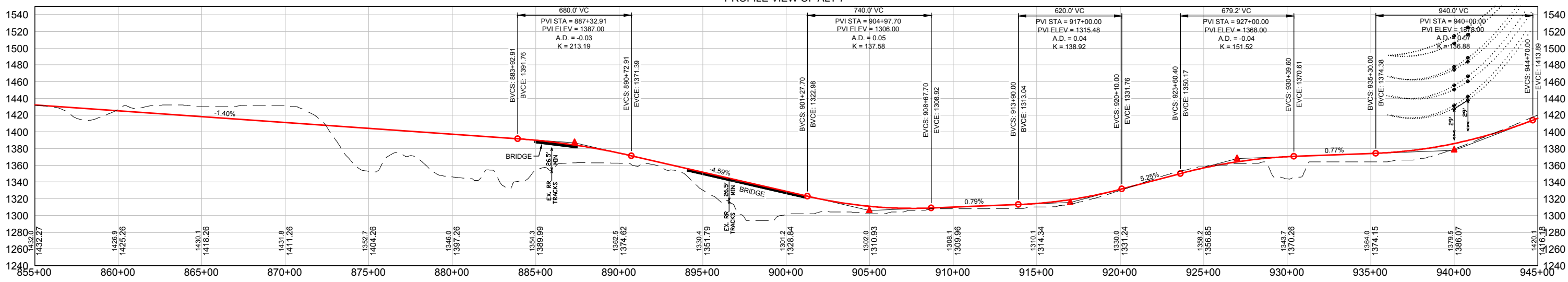


UTILITY COST

\$220,000	EAST RIVER ELECTRIC
\$600,000	L & O POWER
\$0.0	SIoux VALLEY ELECTRIC
\$500,000	WAPA
\$2.2 M	XCEL ENERGY
\$0.0	PRAIRIE ROSE



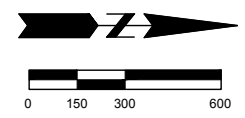
PROFILE VIEW OF ALT 7



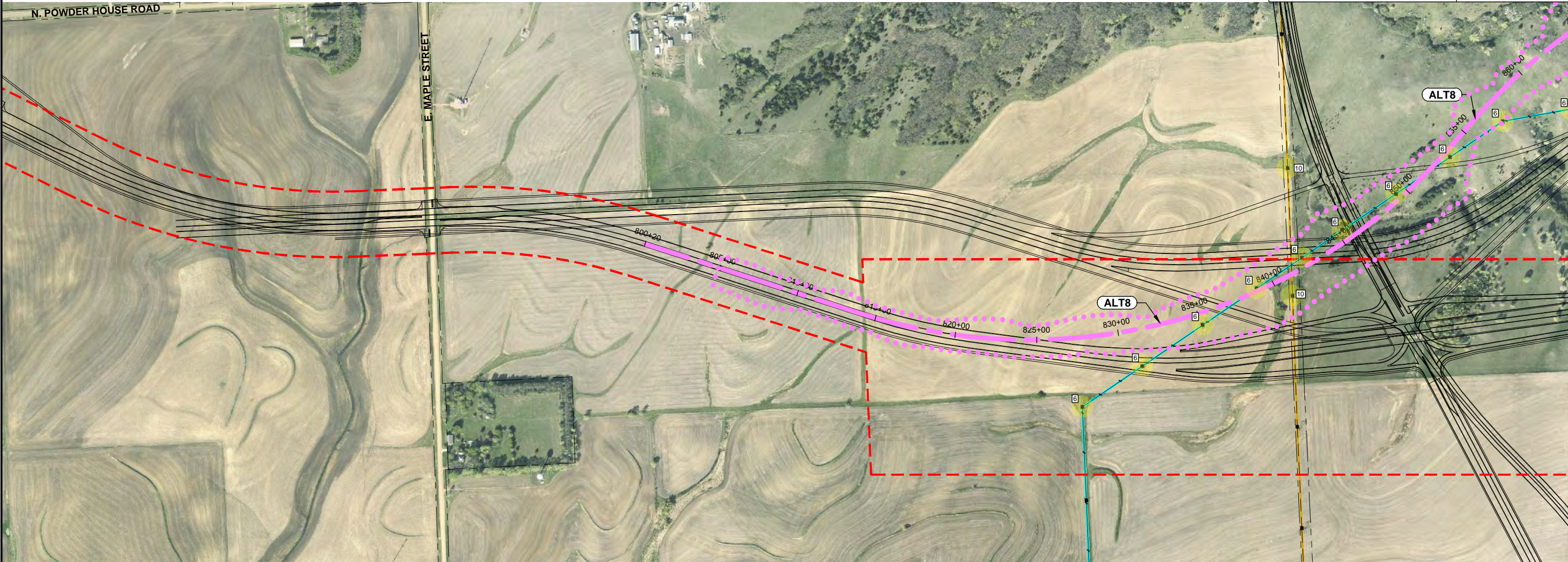
PLOT DATE: 5/1/2013 4:33 PM Keffler, Lee

LEGEND			
	EXISTING ELECTRIC		SIoux VALLEY ELECTRIC
	EAST RIVER ELECTRIC		WAPA
	L & O POWER		XCEL ENERGY
	PRAIRIE ROSE		FLOODWAY
	EA (2012)		

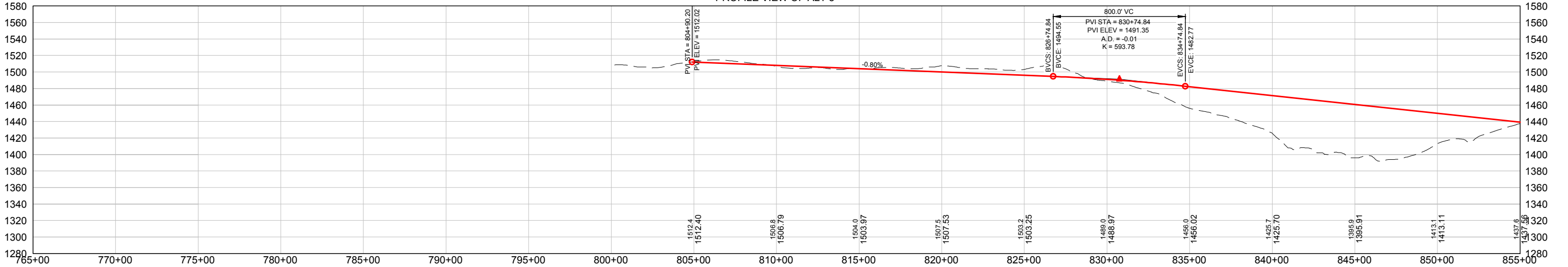
ALTERNATIVE ALIGNMENT NO. 8



STATE OF SOUTH DAKOTA	PROJECT	SHEET NO.	TOTAL SHEETS
	P 1282(06)	9A	#
FILE: 2-ALTERNATIVE PLAN & PROFILE.DWG		REV DATE:	INITIAL:
PLOT DATE: 5/1/2013			



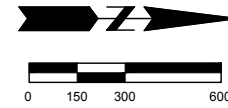
PROFILE VIEW OF ALT 8



PLOT DATE: 5/1/2013 4:34 PM Keffler, Lee

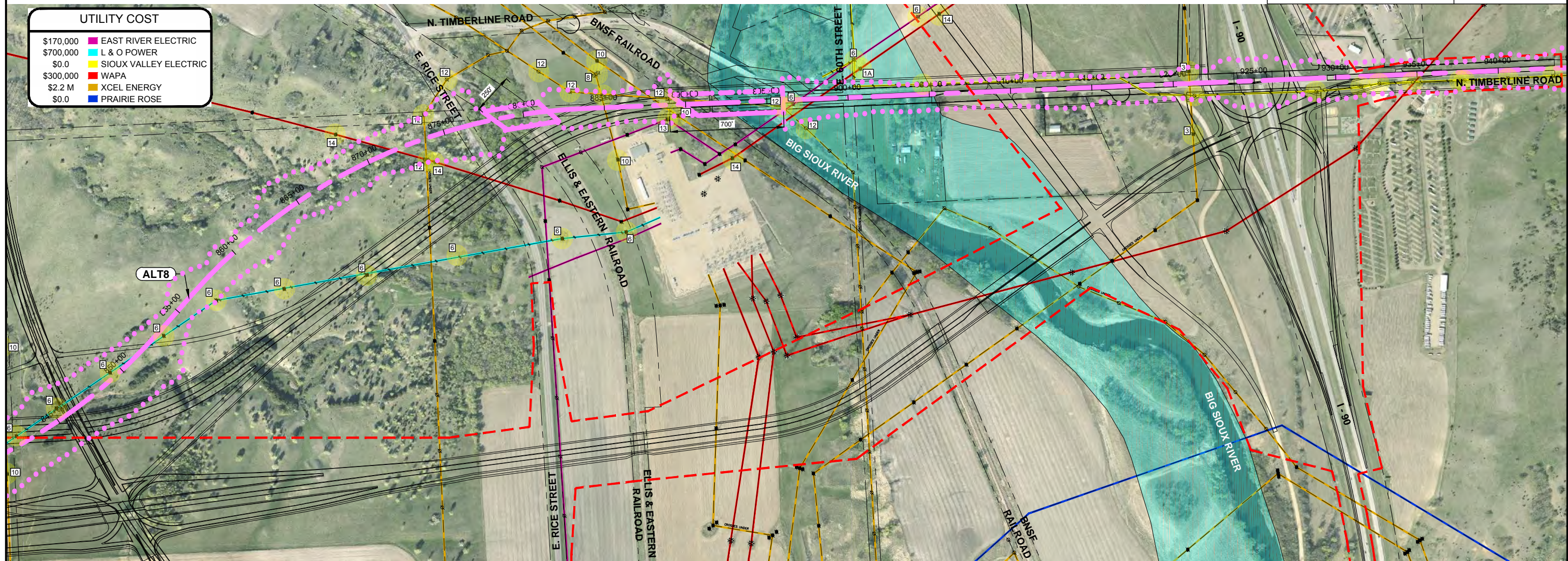
ALTERNATIVE ALIGNMENT NO. 8

STATE OF SOUTH DAKOTA	PROJECT	SHEET NO.	TOTAL SHEETS
	P 1282(06)	9B	#
FILE: 2-ALTERNATIVE PLAN & PROFILE.DWG		REV DATE: INITIAL:	
PLOT DATE: 5/1/2013			

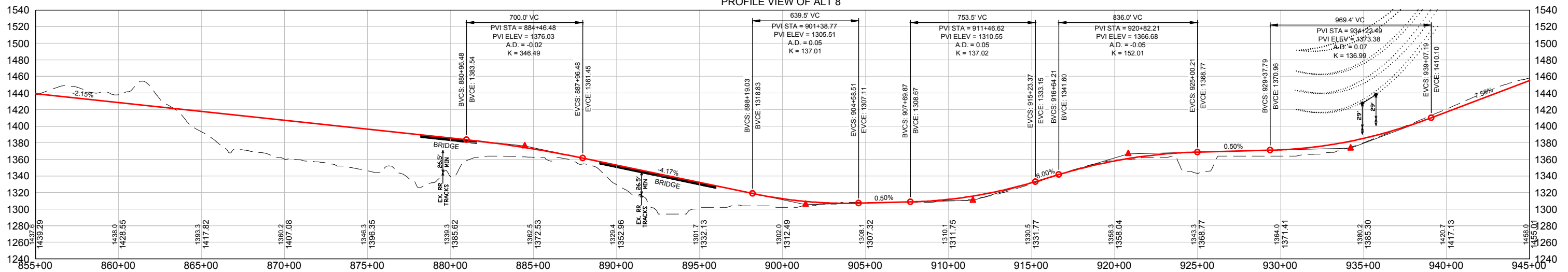


LEGEND		
--- EXISTING ELECTRIC	--- SIOUX VALLEY ELECTRIC	--- PRAIRIE ROSE
--- EAST RIVER ELECTRIC	--- WAPA	--- FLOODWAY
--- L & O POWER	--- XCEL ENERGY	--- EA (2012)

UTILITY COST	
\$170,000	EAST RIVER ELECTRIC
\$700,000	L & O POWER
\$0.0	SIOUX VALLEY ELECTRIC
\$300,000	WAPA
\$2.2 M	XCEL ENERGY
\$0.0	PRAIRIE ROSE



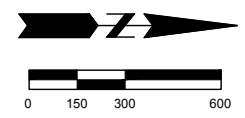
PROFILE VIEW OF ALT 8



PLOT DATE: 5/1/2013 4:34 PM Keffler, Lee

LEGEND			
---	EXISTING ELECTRIC	---	SIoux VALLEY ELECTRIC
---	EAST RIVER ELECTRIC	---	WAPA
---	L & O POWER	---	XCEL ENERGY
---		---	PRAIRIE ROSE FLOODWAY
---		---	EA (2012)

EXISTING UTILITY INDEX



STATE OF SOUTH DAKOTA	PROJECT	SHEET NO.	TOTAL SHEETS
	P 1282(06)	10	#
FILE: 2-ALTERNATIVE PLAN & PROFILE.DWG		REV DATE:	
PLOTTING DATE: 5/2/2013		INITIAL:	

H-steel frame

Steel Lattice Single Circuit

NO. 1A

WAPA
\$250,000 (install/removed)

Steel Mono Pole

Steel Lattice Double Circuit

NO. 2A

WAPA
\$1,000,000 (install/removed)

Single steel structure double circuit

Single wood structure

Single Wood Structure - Tangent

NO. 1

WAPA
\$600,000 (install/removed)

NO. 2

WAPA
\$1,000,000 (install/removed)

NO. 3

XCEL ENERGY
\$275,000 (install)
\$45,000 (removed)
\$4,000 under build (install/ removed)

NO. 4

XCEL ENERGY
\$10,000 (install/removed)

NO. 5

EAST RIVER ELECTRIC
\$10,000 (install)
\$2,500 (removed)

H-Structure Wood

H-Structure Wood

Running corner wood structure

H-angle wood structure

H-wood structure

NO. 6

L & O POWER
\$30,000 (install)
\$4,000 (removed)

EAST RIVER ELECTRIC
\$35,000 (install)
\$5,000 (removed)

NO. 7

EAST RIVER ELECTRIC
\$35,000 (install)
\$5,000 (removed)

NO. 8

XCEL ENERGY
\$210,000 (install)
\$45,000 (removed)

NO. 9

XCEL ENERGY
\$210,000 (install)
\$45,000 (removed)

WAPA
\$30,000 (install/removed)

NO. 10

XCEL ENERGY
\$150,000 (install)
\$45,000 (removed)

Single Wood Structure - Suspension

Single wood structure

Single Wood Structure - Corner Assembly

H-wood frame

NO. 11

EAST RIVER ELECTRIC
\$12,000 (install)
\$3,000 (removed)

NO. 12

XCEL ENERGY
\$7,500 (install/removed)

NO. 13

EAST RIVER ELECTRIC
\$45,000 (install)
\$5,000 (removed)

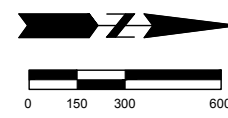
NO. 14

WAPA
\$20,000 (install/removed)

PLOT DATE: 5/2/2013 8:46 AM Keffler, Lee

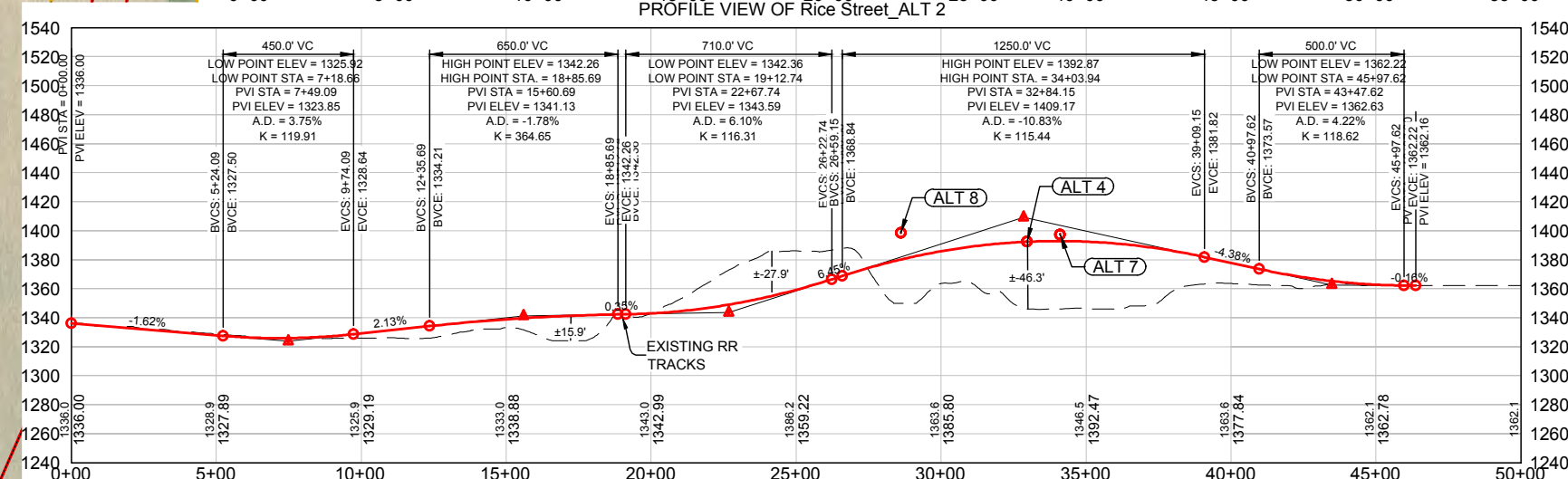
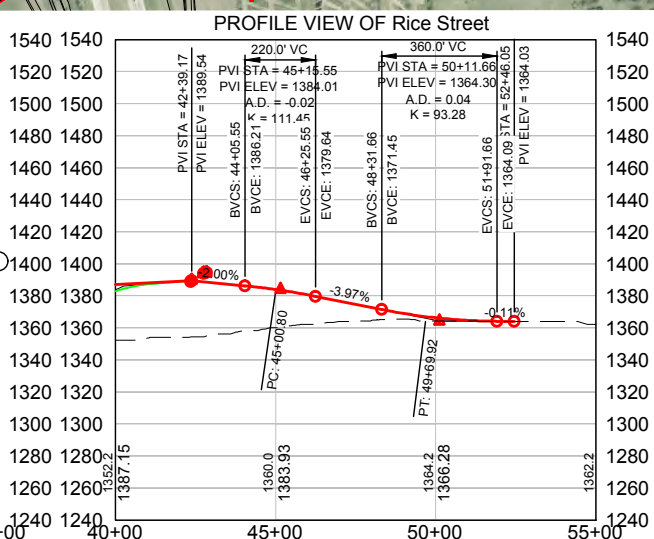
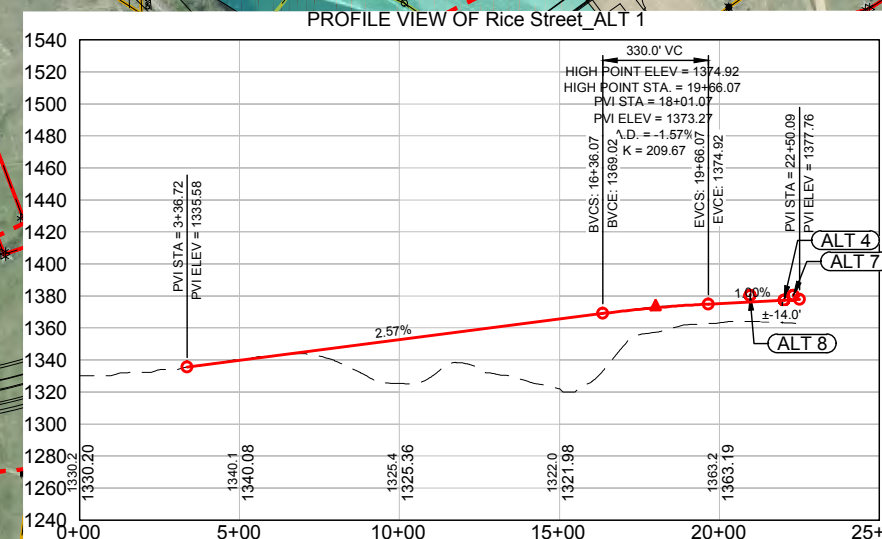
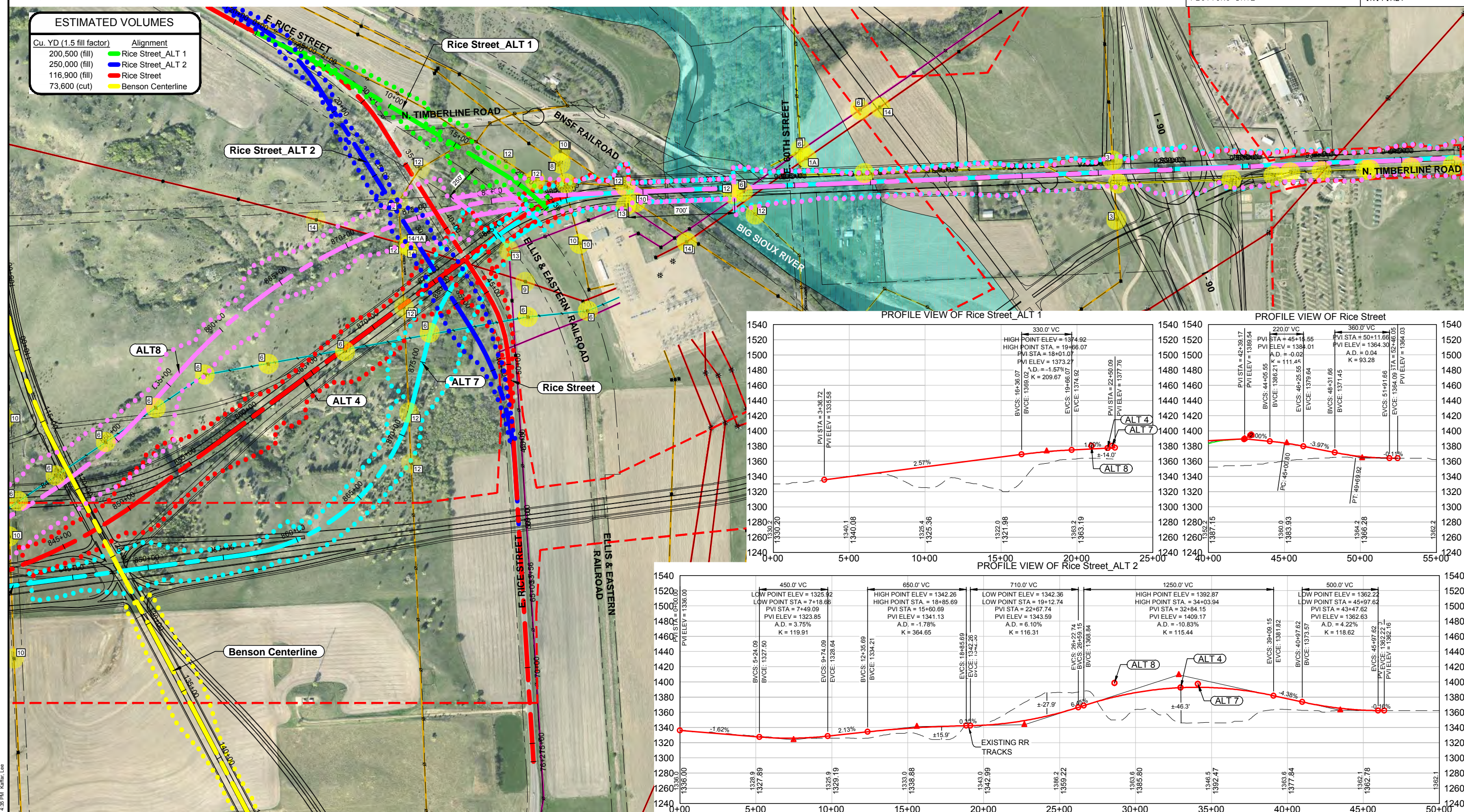
RICE STREET OPTIONS

STATE OF SOUTH DAKOTA	PROJECT	SHEET NO.	TOTAL SHEETS
	P 1282(06)	11	#
FILE: 2-ALTERNATIVE PLAN & PROFILE.DWG		DATE: 5/1/2013	
PLOT DATE: 5/1/2013		INITIAL:	



LEGEND		
--- EXISTING ELECTRIC	--- SIOUX VALLEY ELECTRIC	--- PRAIRIE ROSE
--- EAST RIVER ELECTRIC	--- WAPA	--- FLOODWAY
--- L & O POWER	--- XCEL ENERGY	--- EA (2012)

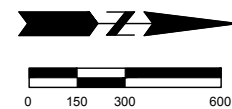
ESTIMATED VOLUMES	
Cu. YD (1.5 fill factor)	Alignment
200,500 (fill)	Rice Street_ALT 1
250,000 (fill)	Rice Street_ALT 2
116,900 (fill)	Rice Street
73,600 (cut)	Benson Centerline



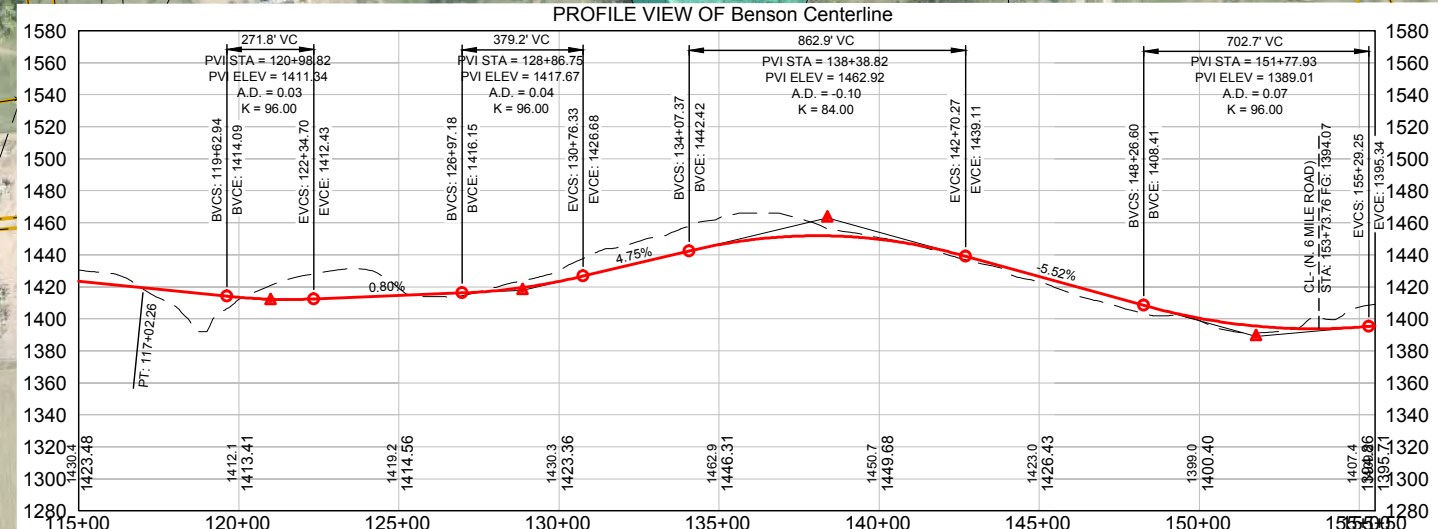
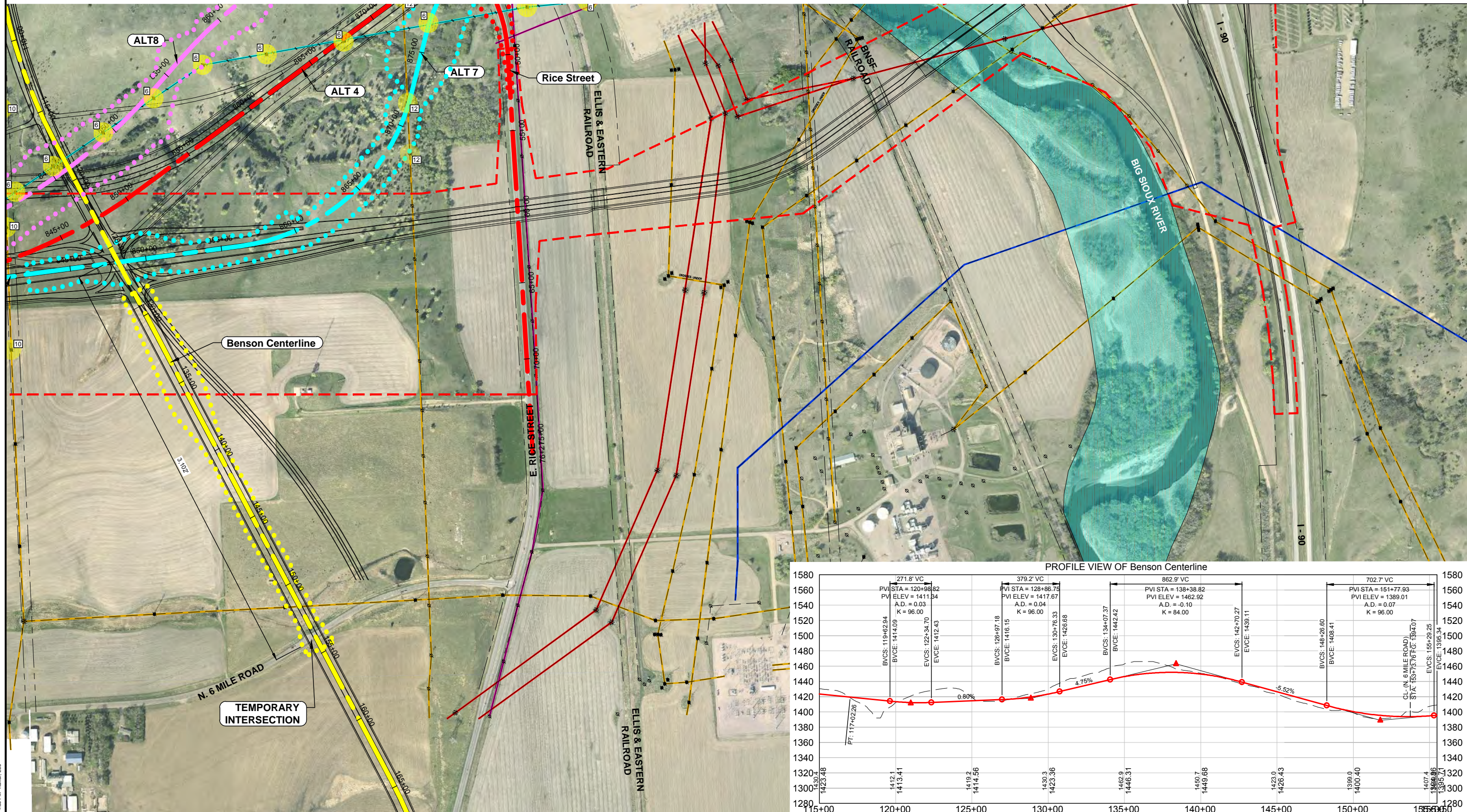
PLOT DATE: 5/1/2013 4:35 PM Keffler, Lee

LEGEND			
---	EXISTING ELECTRIC	---	SIoux VALLEY ELECTRIC
---	EAST RIVER ELECTRIC	---	WAPA
---	L & O POWER	---	XCEL ENERGY
---		---	PRAIRIE ROSE FLOODWAY
---		---	EA (2012)

RICE STREET OPTIONS - BENSON



STATE OF SOUTH DAKOTA	PROJECT	SHEET NO.	TOTAL SHEETS
	P 1282(06)	12	#
FILE: 2-ALTERNATIVE PLAN & PROFILE.DWG		REV DATE: INITIAL:	
PLOTING DATE: 5/1/2013			



PLOT DATE: 5/1/2013 4:36 PM Keffler, Lee

ATTACHMENT D
(Private Utility Relocation Cost Estimates)
(Dated May 2013)

Appendix A

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SD100 Alignment Alternative Comparison Private Utility Costs

Alternate	East River Electric Cost	L & O Power Cost	WAPA Costs	Xcel Energy Cost	Total Private Utility Costs	Private Utility Costs (Ranking)
1	\$ 375,000	\$ 400,000	\$5,000,000	\$2,570,000	\$ 8,345,000	8
2	\$ 375,000	\$ 400,000	\$5,000,000	\$2,260,000	\$ 8,035,000	6
3	\$ 375,000	\$ 400,000	\$5,000,000	\$2,560,000	\$ 8,335,000	7
4	\$ 220,000	\$ 600,000	\$ 500,000	\$2,200,000	\$ 3,520,000	2
5	\$ 375,000	\$ 400,000	\$ 500,000	\$2,260,000	\$ 3,535,000	4
6	\$ 375,000	\$ 400,000	\$ 500,000	\$3,870,000	\$ 5,145,000	5
7	\$ 220,000	\$ 600,000	\$ 500,000	\$2,200,000	\$ 3,520,000	2
8	\$ 170,000	\$ 700,000	\$ 300,000	\$2,210,000	\$ 3,380,000	1

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ATTACHMENT E
(Stakeholder Meeting Minutes)
(Dated May 2013)

- Meeting minutes available upon request.

Appendix A

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SD100 Alignment Alternative Comparison

Overall Ranking (with out Length)		
Alternate	Sum	Ranking
1	33	5
2	29	1
3	35	7
4	29	1
5	33	5
6	38	8
7	31	3
8	32	4

Overall Ranking (with out Length & Volumes)		
Alternate	Sum	Ranking
1	29	5
2	26	2
3	30	6
4	27	4
5	26	2
6	32	8
7	30	6
8	24	1

Overall Ranking (Utilities Power Only)		
Alternate	Sum	Ranking
1	\$ 8,345,000	8
2	\$ 8,035,000	6
3	\$ 8,335,000	7
4	\$ 3,520,000	2
5	\$ 3,535,000	4
6	\$ 5,145,000	5
7	\$ 3,520,000	2
8	\$ 3,380,000	1

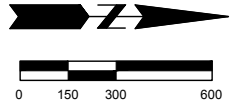
Overall Ranking (SUM)		
Alternate	Sum	Ranking
1	104	6
2	96	3
3	109	7
4	92	1
5	99	4
6	121	8
7	101	5
8	93	2

Overall Ranking (RANKING)		
Alternate	Sum	Ranking
1	19	6
2	12	3
3	26	7
4	8	1
5	15	4
6	29	8
7	18	5
8	10	2

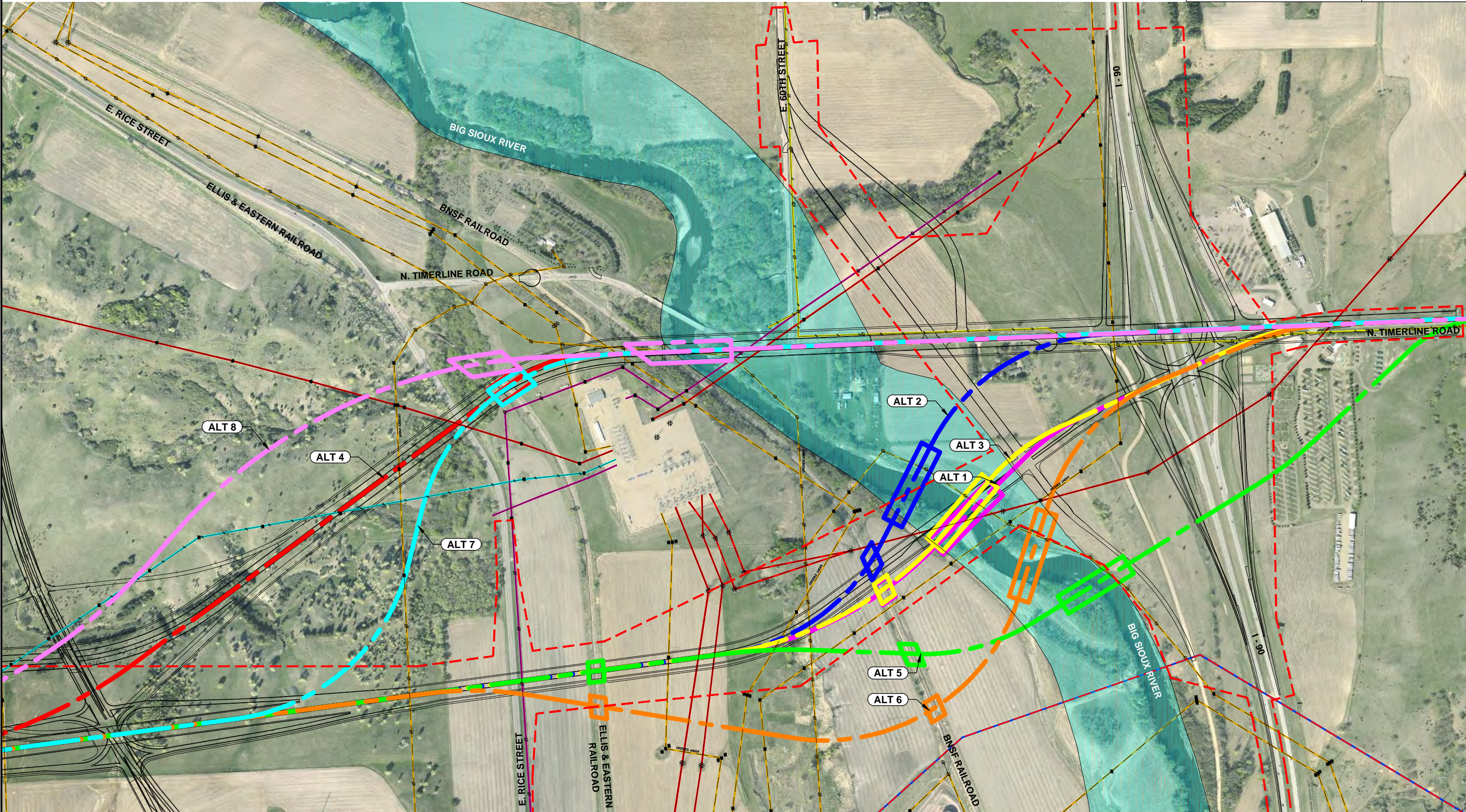
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LEGEND		
--- EXISTING ELECTRIC	SIoux VALLEY ELECTRIC	PRAIRIE ROSE
--- EAST RIVER ELECTRIC	WAPA	FLOODWAY
--- L & O POWER	XCEL ENERGY	EA (2012)

ALTERNATIVE ALIGNMENT LAYOUT



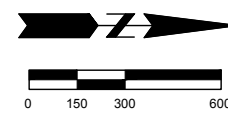
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	P 1282(06)	1	#
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PLOT DATE: 5/1/2013			



PLOT DATE: 5/1/2013 4:03 PM Keffler, Lee

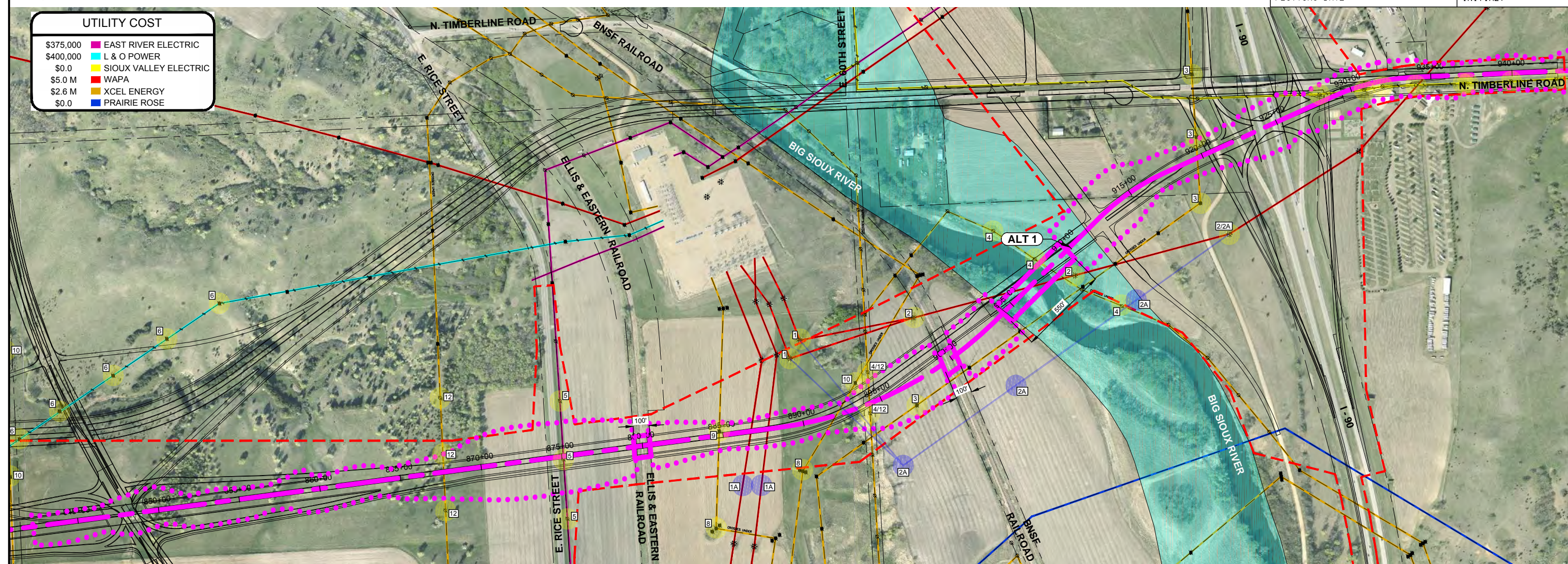
ALTERNATIVE ALIGNMENT NO. 1

STATE OF SOUTH DAKOTA	PROJECT	SHEET NO.	TOTAL SHEETS
	P 1282(06)	2	#
FILE: 2-ALTERNATIVE PLAN & PROFILE.DWG		REV DATE: INITIAL:	
PLOT DATE: 5/1/2013			

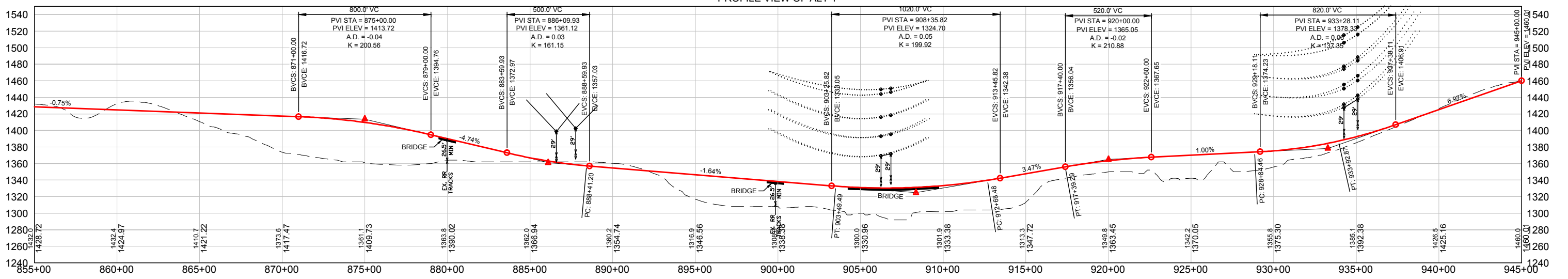


LEGEND		
--- EXISTING ELECTRIC	--- SIOUX VALLEY ELECTRIC	--- PRAIRIE ROSE
--- EAST RIVER ELECTRIC	--- WAPA	--- FLOODWAY
--- L & O POWER	--- XCEL ENERGY	--- EA (2012)

UTILITY COST	
\$375,000	EAST RIVER ELECTRIC
\$400,000	L & O POWER
\$0.0	SIOUX VALLEY ELECTRIC
\$5.0 M	WAPA
\$2.6 M	XCEL ENERGY
\$0.0	PRAIRIE ROSE



PROFILE VIEW OF ALT 1



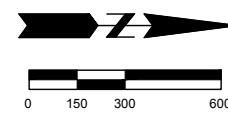
PLOT DATE: 5/1/2013 4:20 PM Keffler, Lee

ALTERNATIVE ALIGNMENT NO. 2

LEGEND

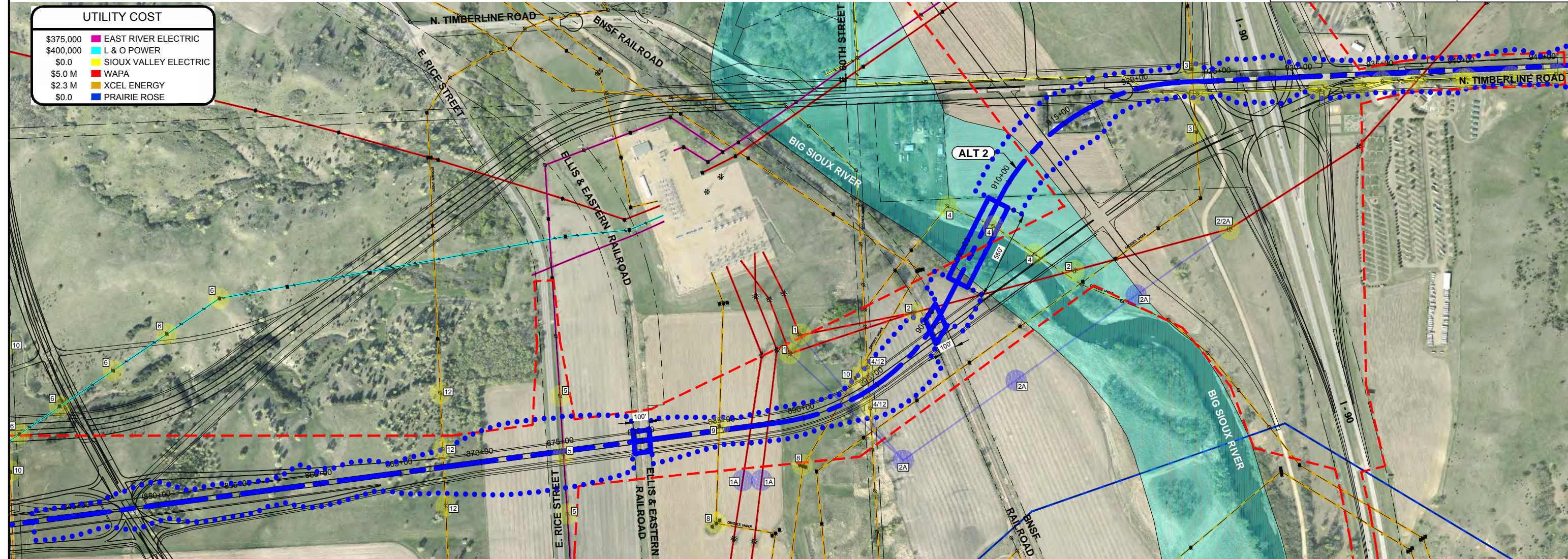
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---	EAST RIVER ELECTRIC	---	WAPA	---	FLOODWAY
---	L & O POWER	---	XCEL ENERGY	---	EA (2012)

STATE OF SOUTH DAKOTA	PROJECT	SHEET NO.	TOTAL SHEETS
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FILE: 2-ALTERNATIVE PLAN & PROFILE.DWG		REV DATE: INITIAL:	
PLOT DATE: 5/1/2013			

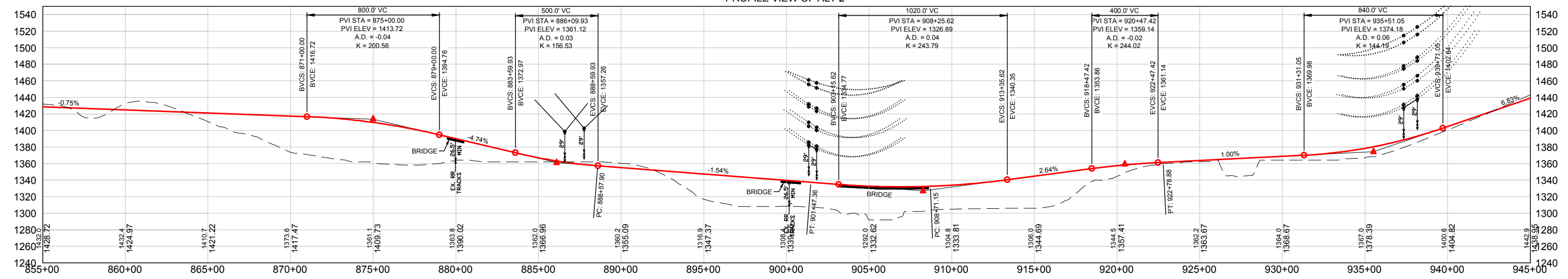


UTILITY COST

\$375,000	EAST RIVER ELECTRIC
\$400,000	L & O POWER
\$0.0	SIoux VALLEY ELECTRIC
\$5.0 M	WAPA
\$2.3 M	XCEL ENERGY
\$0.0	PRAIRIE ROSE

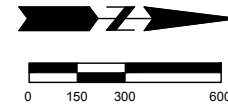


PROFILE VIEW OF ALT 2



PLOT DATE: 5/1/2013 4:30 PM Keffler, Lee

ALTERNATIVE ALIGNMENT NO. 3



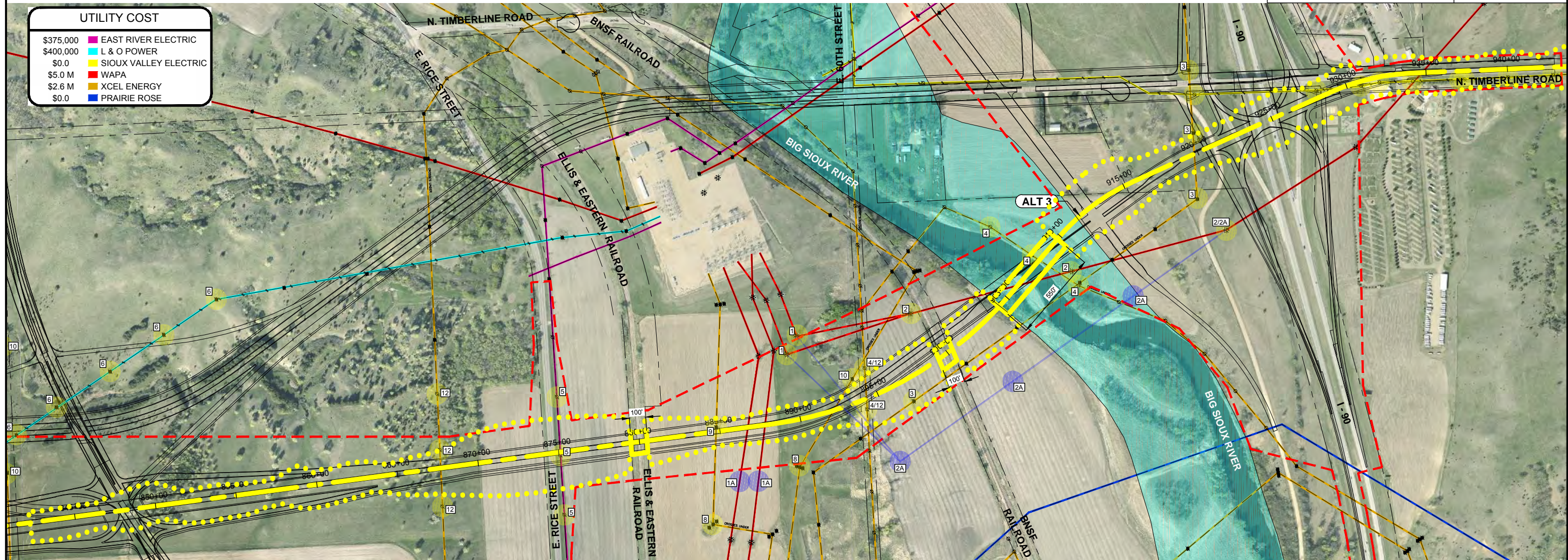
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	P 1282(06)	4	#
FILE: 2-ALTERNATIVE PLAN & PROFILE.DWG		REV DATE: INITIAL:	
PLOT DATE: 5/1/2013			

LEGEND

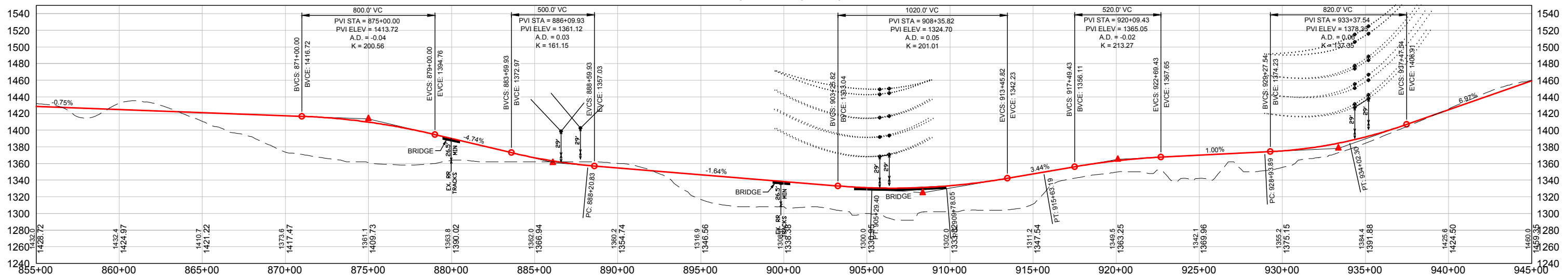
--- EXISTING ELECTRIC	--- SIOUX VALLEY ELECTRIC	--- PRAIRIE ROSE
--- EAST RIVER ELECTRIC	--- WAPA	--- FLOODWAY
--- L & O POWER	--- XCEL ENERGY	--- EA (2012)

UTILITY COST

\$375,000	■ EAST RIVER ELECTRIC
\$400,000	■ L & O POWER
\$0.0	■ SIOUX VALLEY ELECTRIC
\$5.0 M	■ WAPA
\$2.6 M	■ XCEL ENERGY
\$0.0	■ PRAIRIE ROSE



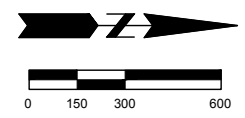
PROFILE VIEW OF ALT 3



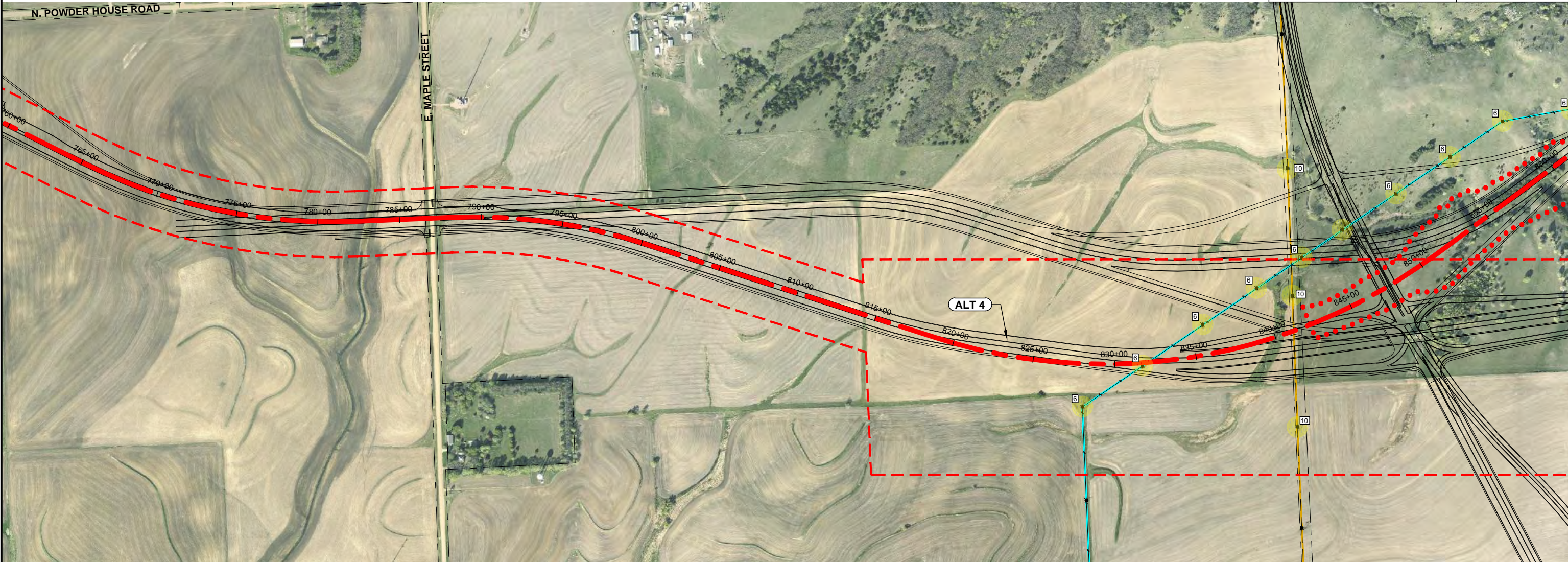
PLOT DATE: 5/1/2013 4:30 PM Keffler, Lee

LEGEND					
	EXISTING ELECTRIC		SIoux VALLEY ELECTRIC		PRAIRIE ROSE
	EAST RIVER ELECTRIC		WAPA		FLOODWAY
	L & O POWER		XCEL ENERGY		EA (2012)

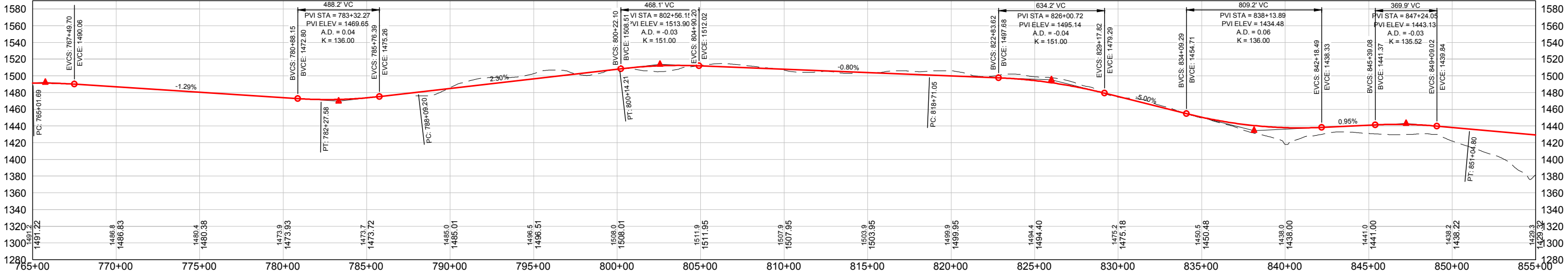
ALTERNATIVE ALIGNMENT NO. 4



STATE OF SOUTH DAKOTA	PROJECT	SHEET NO.	TOTAL SHEETS
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FILE: 2-ALTERNATIVE PLAN & PROFILE.DWG		REV DATE:	
PLOT DATE: 5/1/2013		INITIAL:	



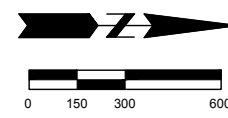
PROFILE VIEW OF ALT 4



PLOT DATE: 5/1/2013 4:31 PM Keffler, Lee

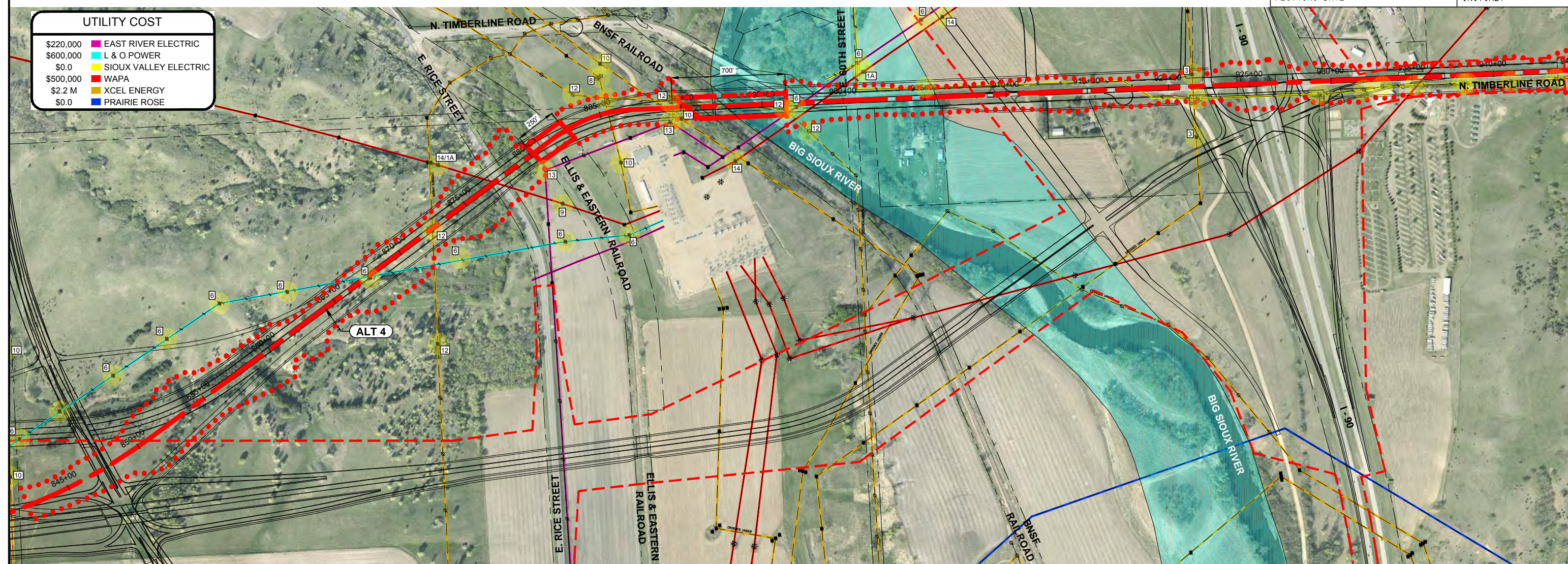
ALTERNATIVE ALIGNMENT NO. 4

STATE OF SOUTH DAKOTA	PROJECT	SHEET NO.	TOTAL SHEETS
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FILE: 2-ALTERNATIVE PLAN & PROFILE.DWG		REV DATE:	
PLOTING DATE: 5/1/2013		INITIAL:	

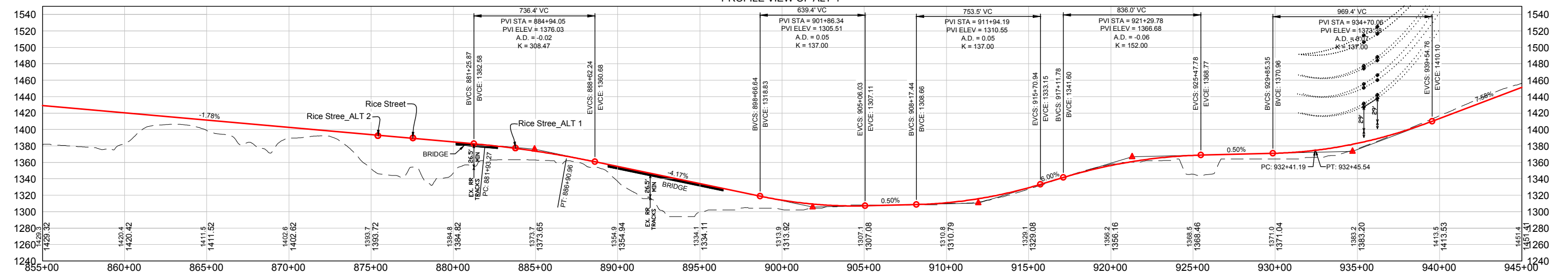


LEGEND		
--- EXISTING ELECTRIC	--- SIOUX VALLEY ELECTRIC	--- PRAIRIE ROSE
--- EAST RIVER ELECTRIC	--- WAPA	--- FLOODWAY
--- L & O POWER	--- XCEL ENERGY	--- EA (2012)

UTILITY COST	
\$220,000	EAST RIVER ELECTRIC
\$600,000	L & O POWER
\$0.0	SIOUX VALLEY ELECTRIC
\$500,000	WAPA
\$2.2 M	XCEL ENERGY
\$0.0	PRAIRIE ROSE



PROFILE VIEW OF ALT 4



PLOT DATE: 5/1/2013 4:31 PM Keffler, Lee

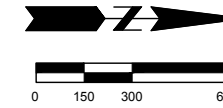
ALTERNATIVE ALIGNMENT NO. 5

LEGEND

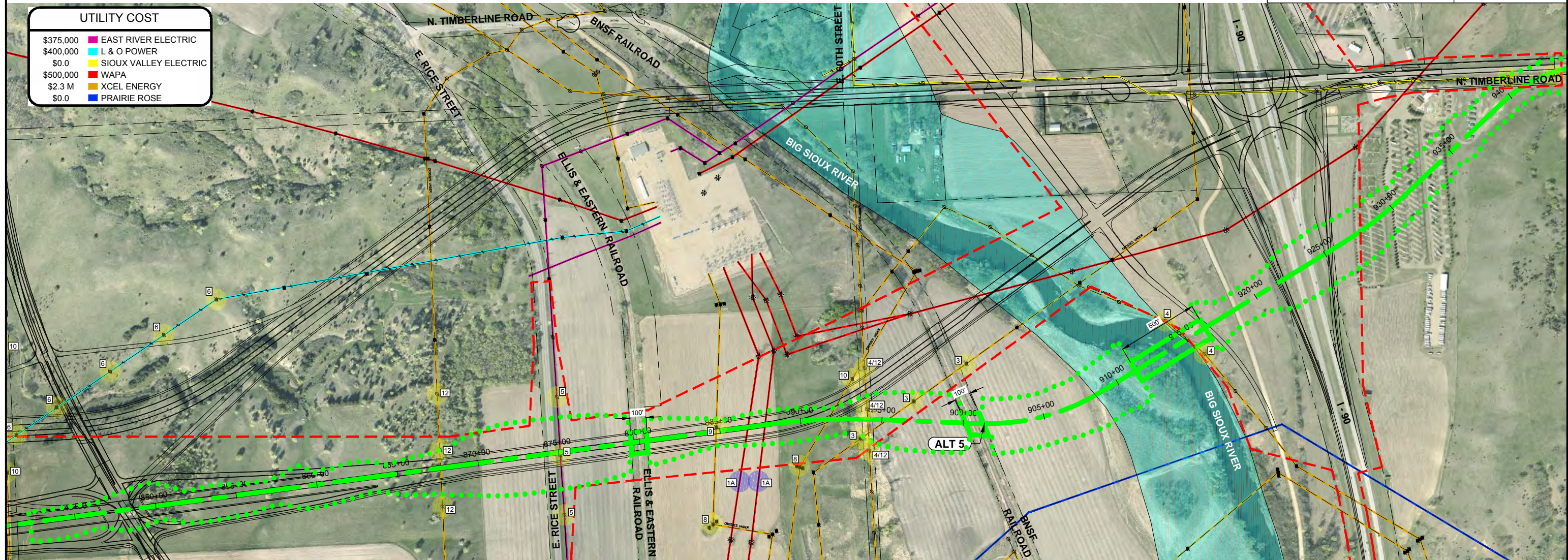
---	EXISTING ELECTRIC	---	SIoux VALLEY ELECTRIC	---	PRAIRIE ROSE
---	EAST RIVER ELECTRIC	---	WAPA	---	FLOODWAY
---	L & O POWER	---	XCEL ENERGY	---	EA (2012)

UTILITY COST

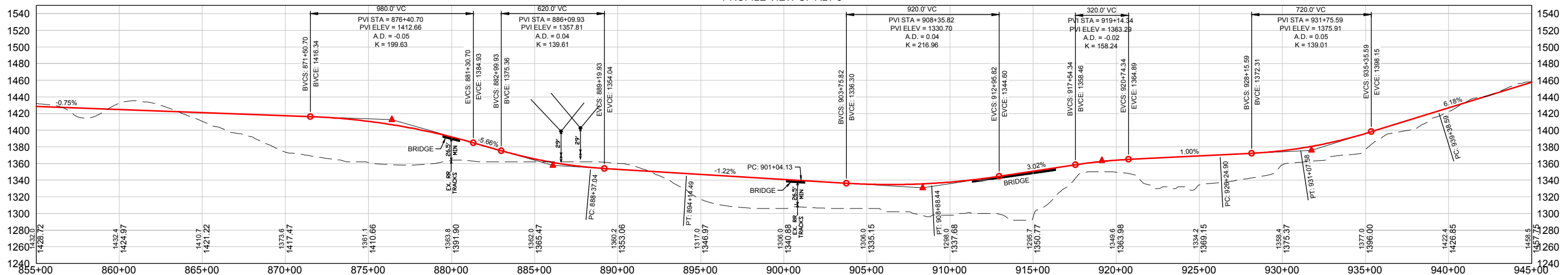
\$375,000	EAST RIVER ELECTRIC
\$400,000	L & O POWER
\$0.0	SIoux VALLEY ELECTRIC
\$500,000	WAPA
\$2.3 M	XCEL ENERGY
\$0.0	PRAIRIE ROSE



STATE OF SOUTH DAKOTA	PROJECT	SHEET NO.	TOTAL SHEETS
	P 1282(06)	6	#
FILE: 2-ALTERNATIVE PLAN & PROFILE.DWG		REV DATE: INITIAL:	
PLOT DATE: 5/1/2013			



PROFILE VIEW OF ALT 5



PLOT DATE: 5/1/2013 4:32 PM Keffler, Lee

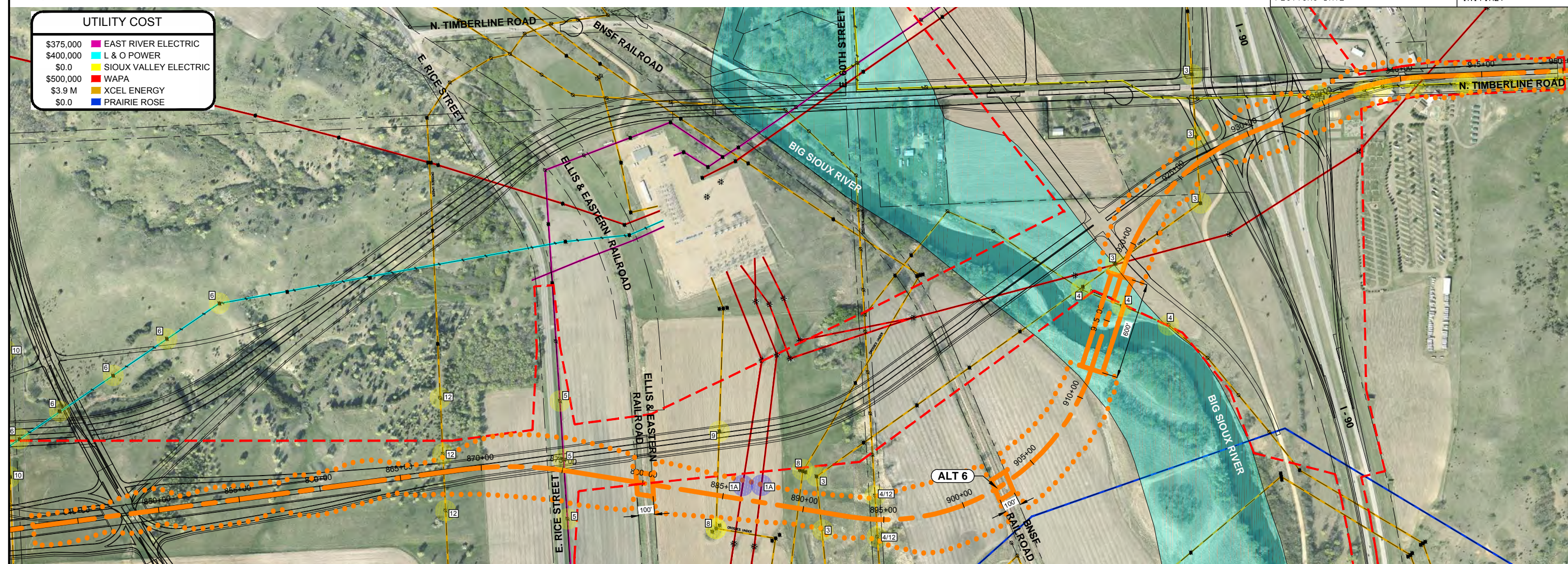
ALTERNATIVE ALIGNMENT NO. 6

STATE OF SOUTH DAKOTA	PROJECT	SHEET NO.	TOTAL SHEETS
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FILE: 2-ALTERNATIVE PLAN & PROFILE.DWG		REV DATE:	
PLOT DATE: 5/1/2013		INITIAL:	

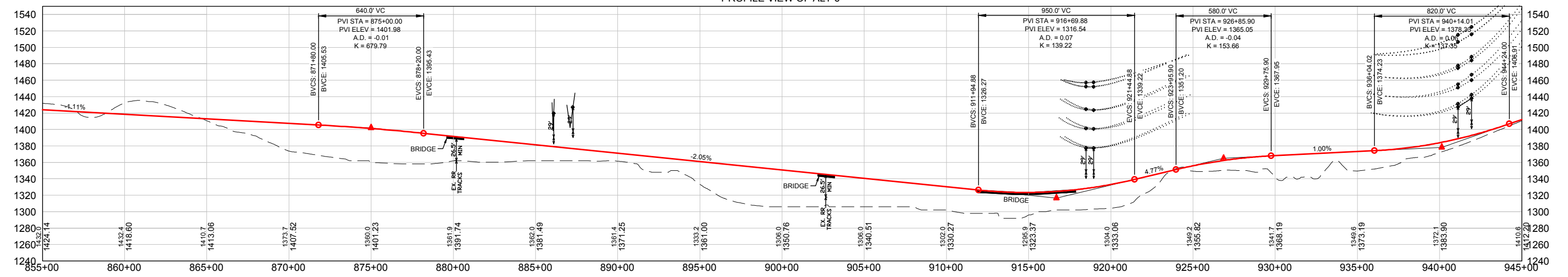


LEGEND		
--- EXISTING ELECTRIC	--- SIOUX VALLEY ELECTRIC	--- PRAIRIE ROSE
--- EAST RIVER ELECTRIC	--- WAPA	--- FLOODWAY
--- L & O POWER	--- XCEL ENERGY	--- EA (2012)

UTILITY COST	
\$375,000	EAST RIVER ELECTRIC
\$400,000	L & O POWER
\$0.0	SIOUX VALLEY ELECTRIC
\$500,000	WAPA
\$3.9 M	XCEL ENERGY
\$0.0	PRAIRIE ROSE



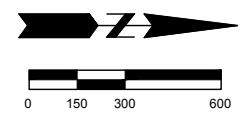
PROFILE VIEW OF ALT 6



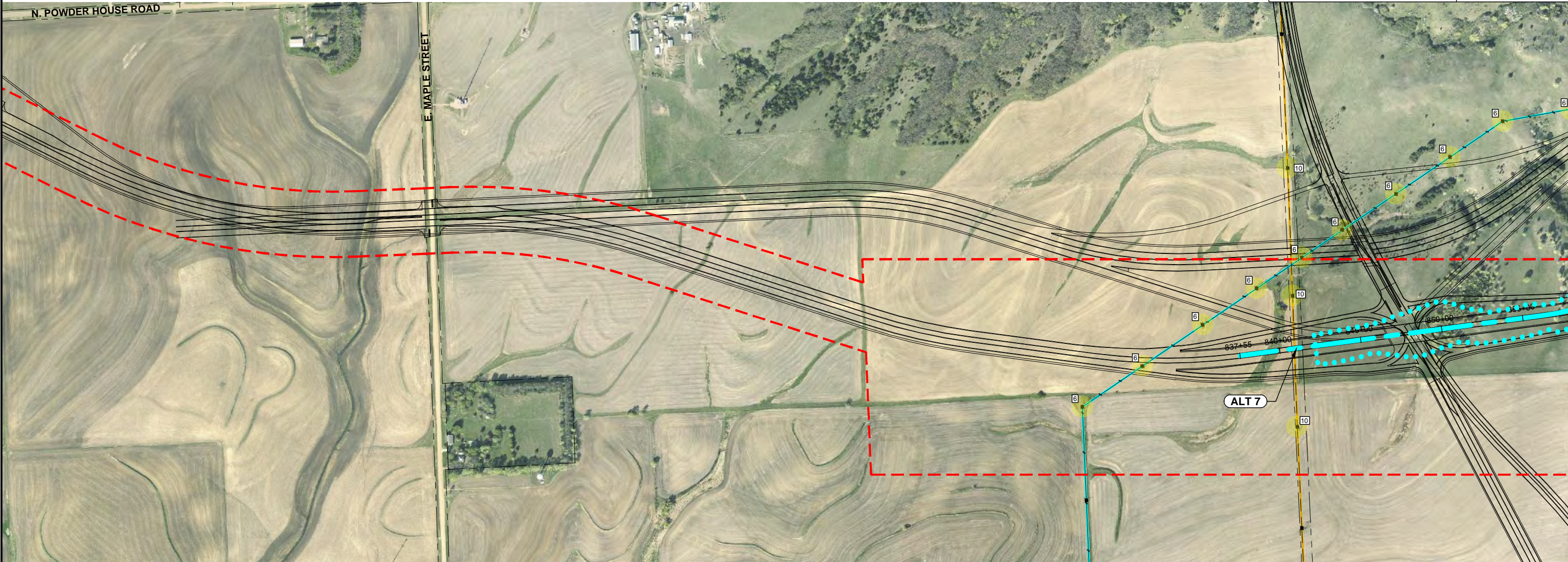
PLOT DATE: 5/1/2013 4:32 PM Keffler, Lee

LEGEND		
---	EXISTING ELECTRIC	SIoux VALLEY ELECTRIC
---	EAST RIVER ELECTRIC	WAPA
---	L & O POWER	XCEL ENERGY
---	PRAIRIE ROSE FLOODWAY	EA (2012)

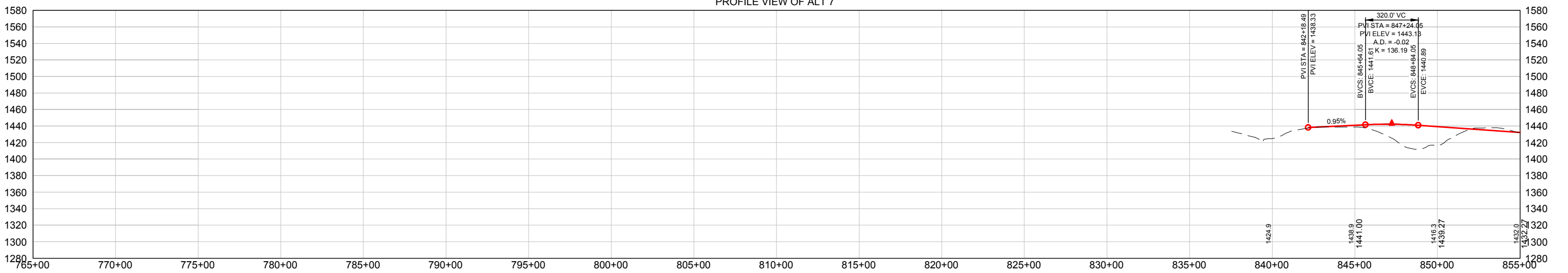
ALTERNATIVE ALIGNMENT NO. 7



STATE OF SOUTH DAKOTA	PROJECT	SHEET NO.	TOTAL SHEETS
	P 1282(06)	8A	#
FILE: 2-ALTERNATIVE PLAN & PROFILE.DWG		REV DATE: INITIAL:	
PLOT DATE: 5/1/2013			



PROFILE VIEW OF ALT 7



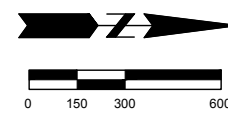
PLOT DATE: 5/1/2013 4:33 PM Keffler, Lee

ALTERNATIVE ALIGNMENT NO. 7

LEGEND

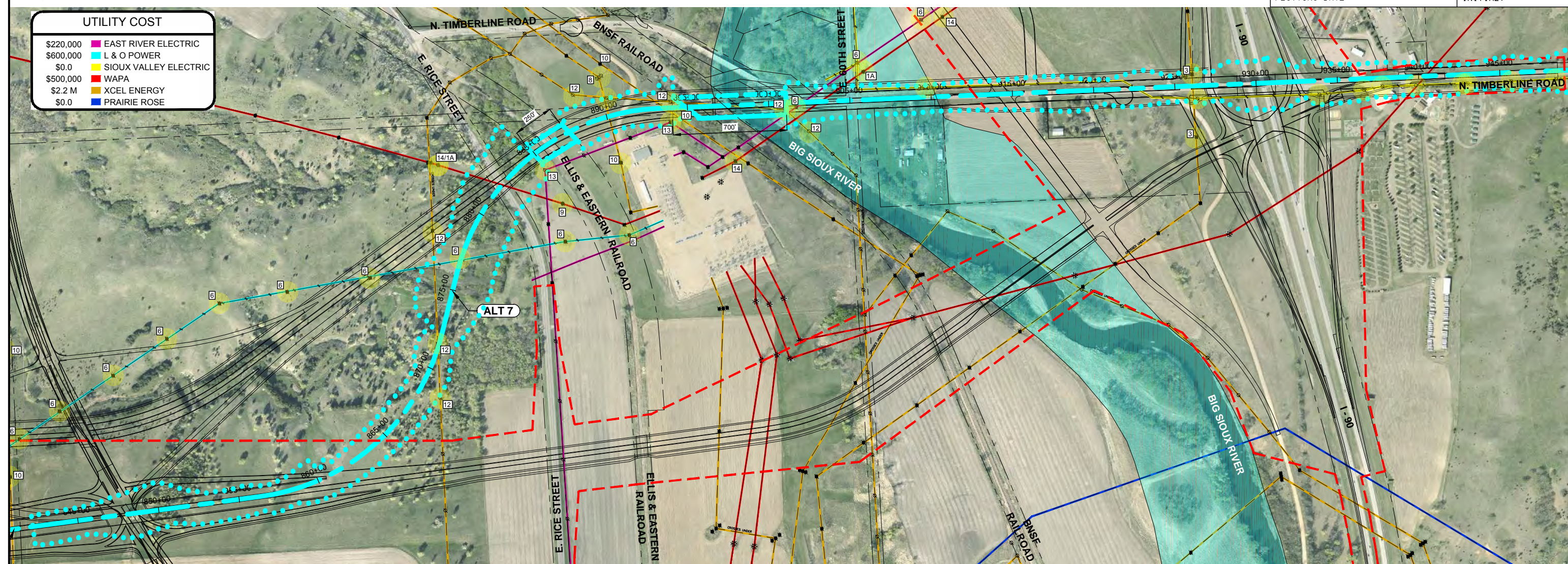
---	EXISTING ELECTRIC	—	SIoux VALLEY ELECTRIC	—	PRAIRIE ROSE
---	EAST RIVER ELECTRIC	---	WAPA	---	FLOODWAY
---	L & O POWER	---	XCEL ENERGY	---	EA (2012)

STATE OF SOUTH DAKOTA	PROJECT	SHEET NO.	TOTAL SHEETS
	P 1282(06)	8B	#
FILE: 2-ALTERNATIVE PLAN & PROFILE.DWG		REV DATE: INITIAL:	
PLOT DATE: 5/1/2013			

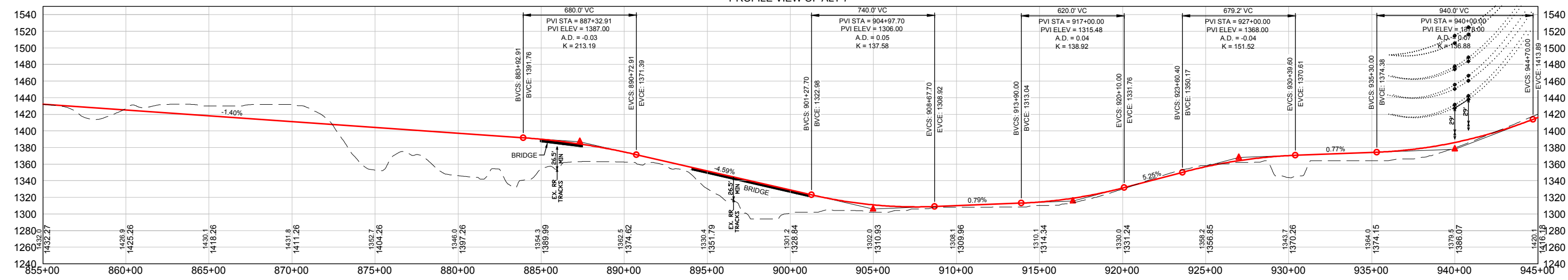


UTILITY COST

\$220,000	EAST RIVER ELECTRIC
\$600,000	L & O POWER
\$0.0	SIoux VALLEY ELECTRIC
\$500,000	WAPA
\$2.2 M	XCEL ENERGY
\$0.0	PRAIRIE ROSE



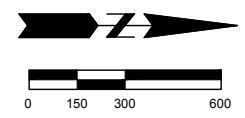
PROFILE VIEW OF ALT 7



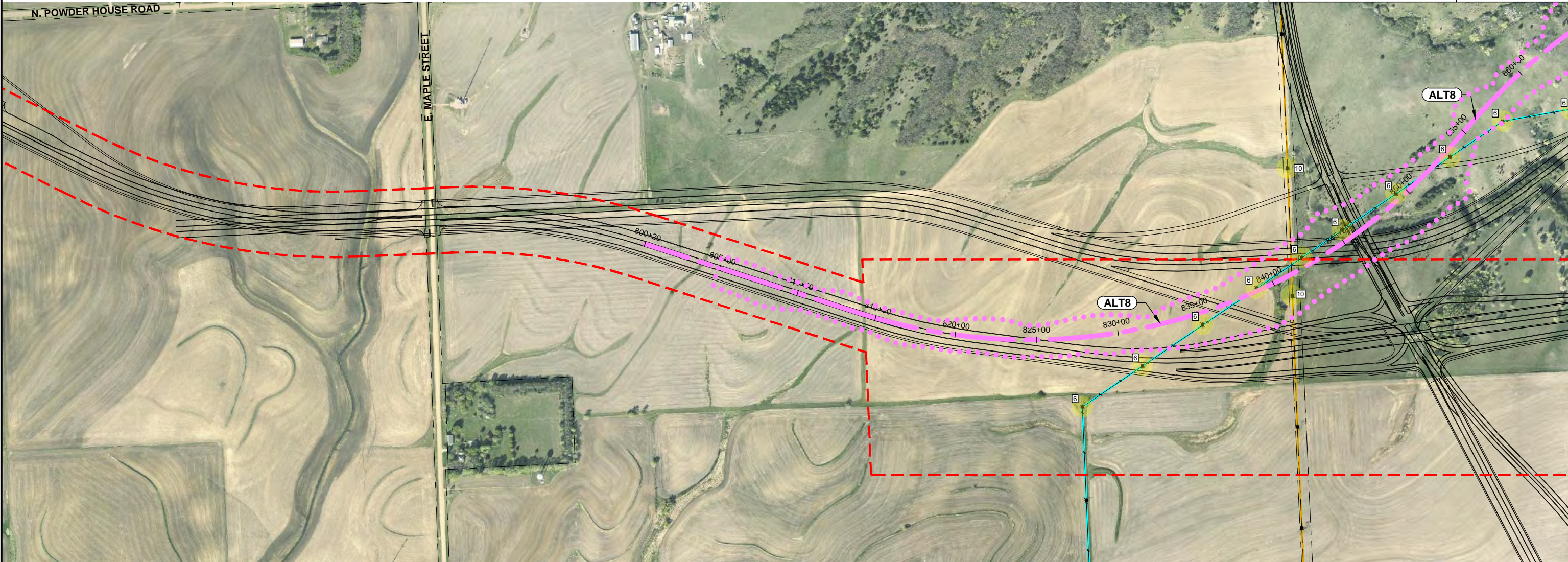
PLOT DATE: 5/1/2013 4:33 PM Keffler, Lee

LEGEND			
	EXISTING ELECTRIC		SIoux VALLEY ELECTRIC
	EAST RIVER ELECTRIC		WAPA
	L & O POWER		XCEL ENERGY
	PRAIRIE ROSE		FLOODWAY
	EA (2012)		

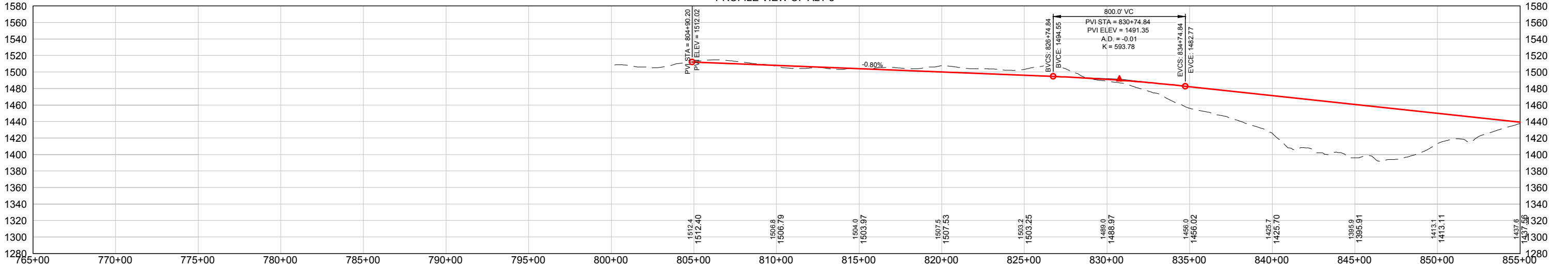
ALTERNATIVE ALIGNMENT NO. 8



STATE OF SOUTH DAKOTA	PROJECT	SHEET NO.	TOTAL SHEETS
	P 1282(06)	9A	#
FILE: 2-ALTERNATIVE PLAN & PROFILE.DWG		REV DATE:	
PLOT DATE: 5/1/2013		INITIAL:	



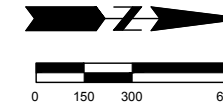
PROFILE VIEW OF ALT 8



PLOT DATE: 5/1/2013 4:34 PM Keffler, Lee

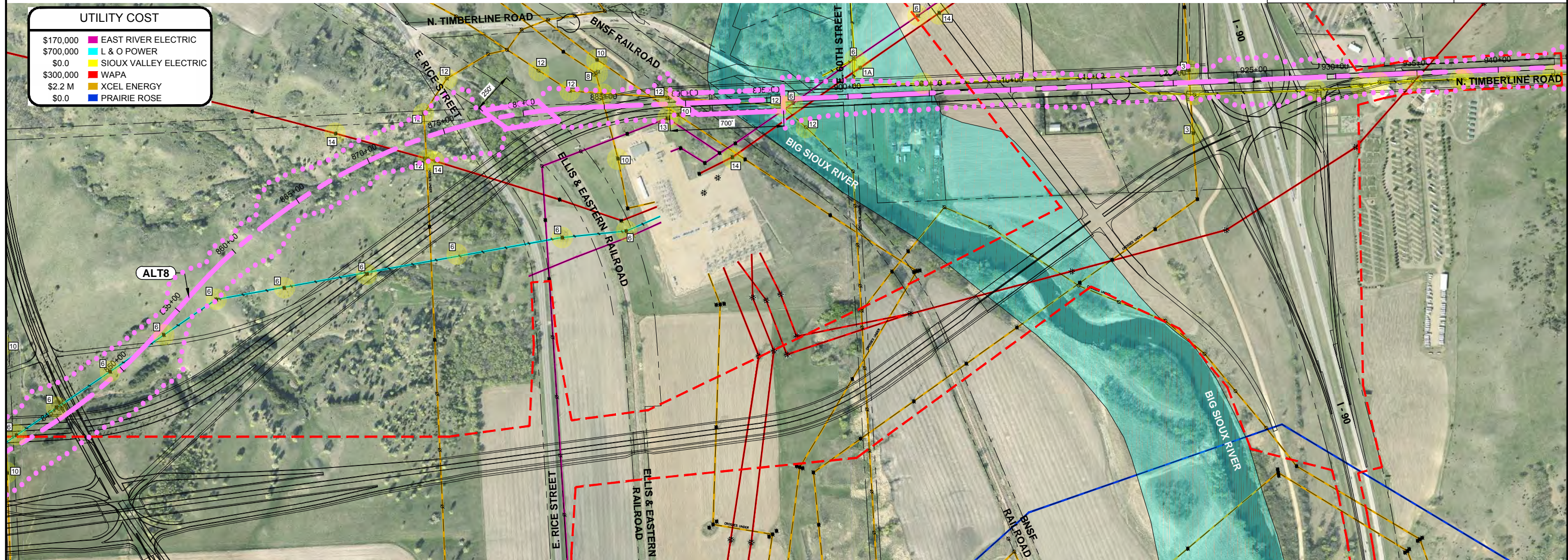
ALTERNATIVE ALIGNMENT NO. 8

STATE OF SOUTH DAKOTA	PROJECT	SHEET NO.	TOTAL SHEETS
	P 1282(06)	9B	#
FILE: 2-ALTERNATIVE PLAN & PROFILE.DWG		REV DATE: INITIAL:	
PLOT DATE: 5/1/2013			

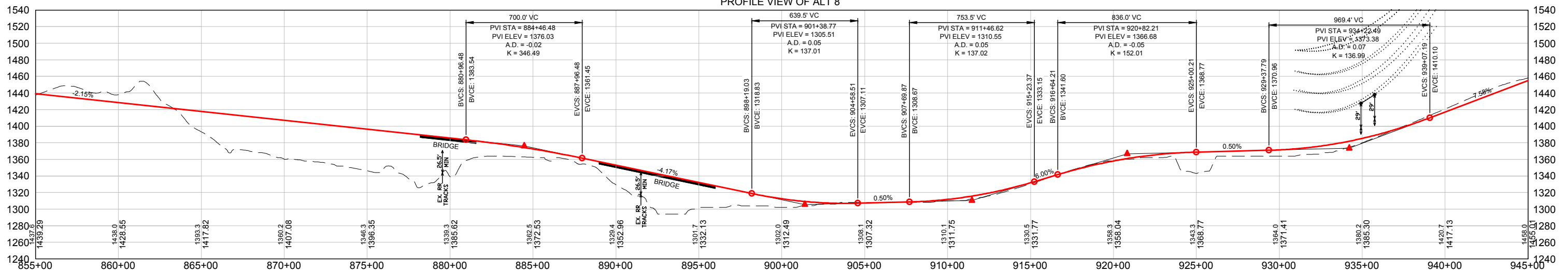


LEGEND		
--- EXISTING ELECTRIC	--- SIOUX VALLEY ELECTRIC	--- PRAIRIE ROSE
--- EAST RIVER ELECTRIC	--- WAPA	--- FLOODWAY
--- L & O POWER	--- XCEL ENERGY	--- EA (2012)

UTILITY COST	
\$170,000	EAST RIVER ELECTRIC
\$700,000	L & O POWER
\$0.0	SIOUX VALLEY ELECTRIC
\$300,000	WAPA
\$2.2 M	XCEL ENERGY
\$0.0	PRAIRIE ROSE



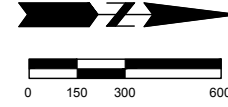
PROFILE VIEW OF ALT 8



PLOT DATE: 5/1/2013 4:34 PM Keffler, Lee

LEGEND			
---	EXISTING ELECTRIC	---	SIoux VALLEY ELECTRIC
---	EAST RIVER ELECTRIC	---	WAPA
---	L & O POWER	---	XCEL ENERGY
---		---	PRAIRIE ROSE FLOODWAY
---		---	EA (2012)

EXISTING UTILITY INDEX



STATE OF SOUTH DAKOTA	PROJECT	SHEET NO.	TOTAL SHEETS
	P 1282(06)	10	#
FILE: 2-ALTERNATIVE PLAN & PROFILE.DWG		REV DATE:	
PLOT DATE: 5/2/2013		INITIAL:	

H-steel frame

Steel Lattice Single Circuit

NO. 1A

WAPA
\$250,000 (install/removed)

Steel Mono Pole

Steel Lattice Double Circuit

NO. 2A

WAPA
\$1,000,000 (install/removed)

Single steel structure double circuit

Single wood structure

Single Wood Structure - Tangent

NO. 1

WAPA
\$600,000 (install/removed)

NO. 2

WAPA
\$1,000,000 (install/removed)

NO. 3

XCEL ENERGY
\$275,000 (install)
\$45,000 (removed)
\$4,000 under build (install/ removed)

NO. 4

XCEL ENERGY
\$10,000 (install/removed)

NO. 5

EAST RIVER ELECTRIC
\$10,000 (install)
\$2,500 (removed)

H-Structure Wood

H-Structure Wood

Running corner wood structure

H-angle wood structure

H-wood structure

NO. 6

L & O POWER
\$30,000 (install)
\$4,000 (removed)

EAST RIVER ELECTRIC
\$35,000 (install)
\$5,000 (removed)

NO. 7

EAST RIVER ELECTRIC
\$35,000 (install)
\$5,000 (removed)

NO. 8

XCEL ENERGY
\$210,000 (install)
\$45,000 (removed)

NO. 9

XCEL ENERGY
\$210,000 (install)
\$45,000 (removed)

WAPA
\$30,000 (install/removed)

NO. 10

XCEL ENERGY
\$150,000 (install)
\$45,000 (removed)

Single Wood Structure - Suspension

Single wood structure

Single Wood Structure - Corner Assembly

H-wood frame

NO. 11

EAST RIVER ELECTRIC
\$12,000 (install)
\$3,000 (removed)

NO. 12

XCEL ENERGY
\$7,500 (install/removed)

NO. 13

EAST RIVER ELECTRIC
\$45,000 (install)
\$5,000 (removed)

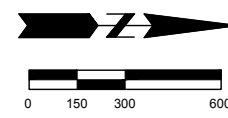
NO. 14

WAPA
\$20,000 (install/removed)

PLOT DATE: 5/2/2013 8:46 AM Keffler, Lee

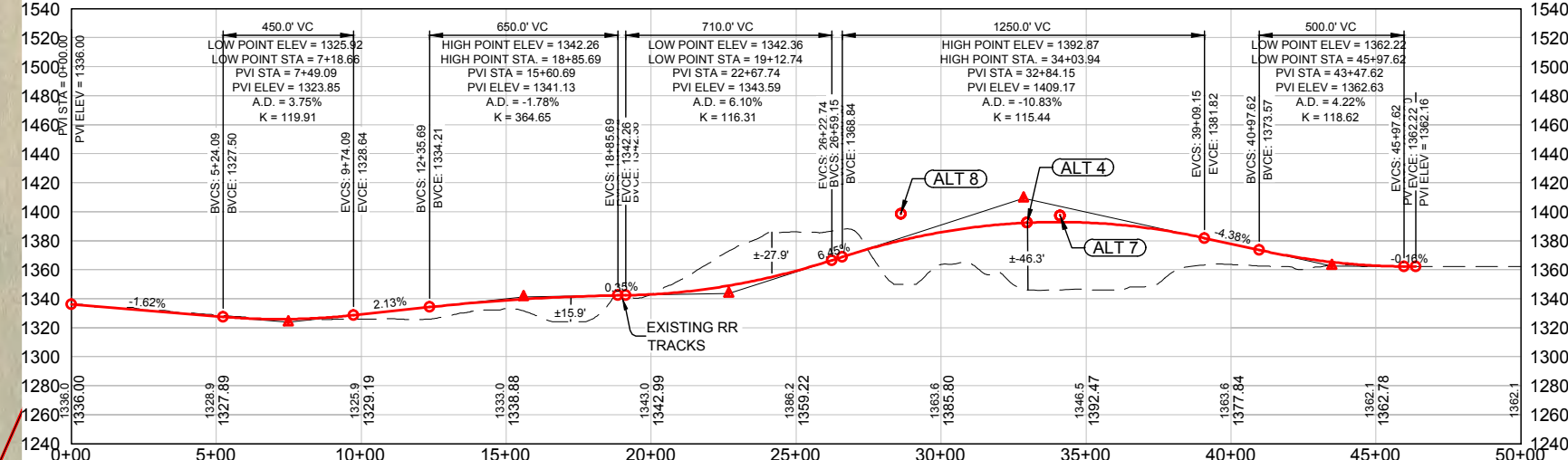
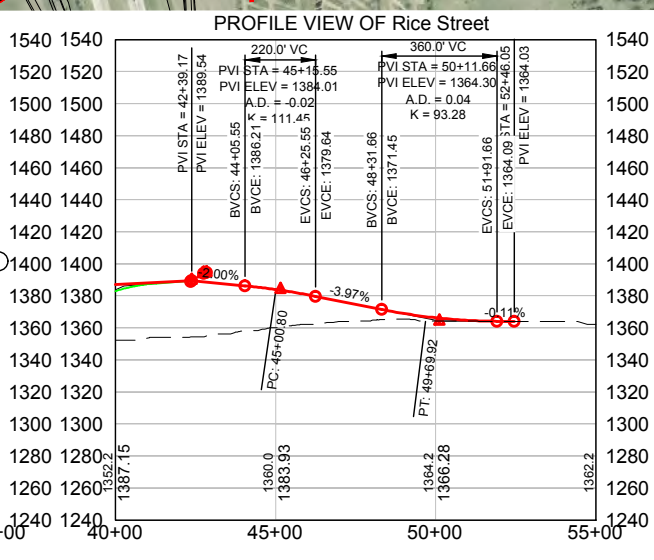
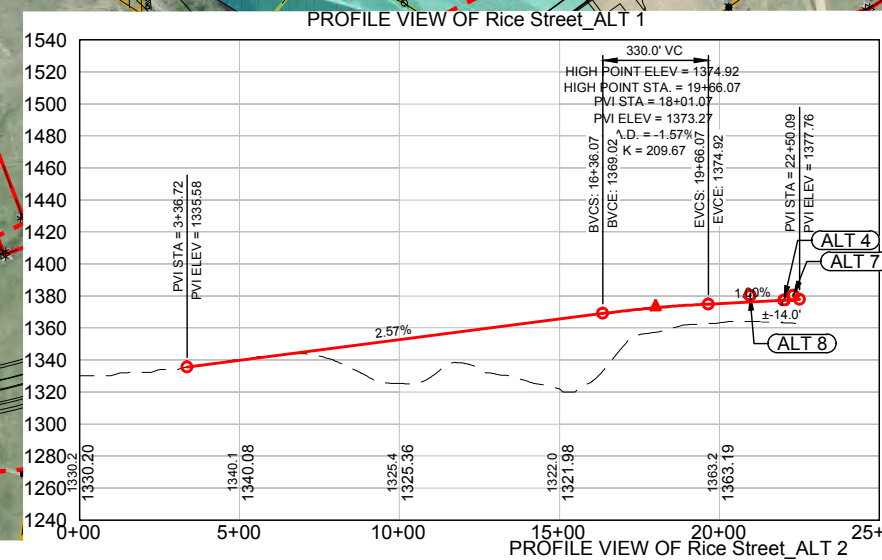
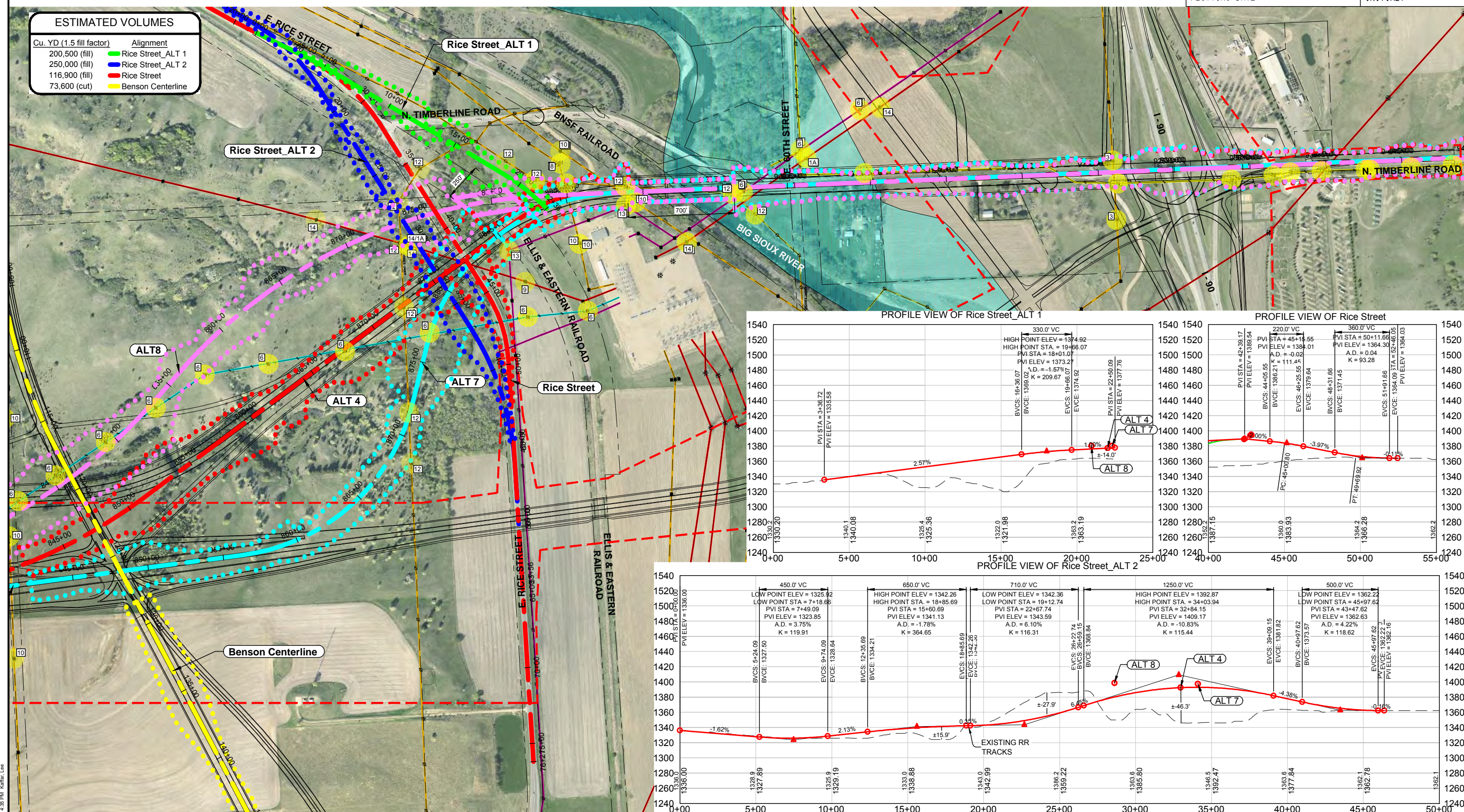
RICE STREET OPTIONS

STATE OF SOUTH DAKOTA	PROJECT	SHEET NO.	TOTAL SHEETS
	P 1282(06)	11	#
FILE: 2-ALTERNATIVE PLAN & PROFILE.DWG		REV DATE: INITIAL:	
PLOT DATE: 5/1/2013			



LEGEND			
---	EXISTING ELECTRIC	---	SIoux VALLEY ELECTRIC
---	EAST RIVER ELECTRIC	---	WAPA
---	L & O POWER	---	XCEL ENERGY
---		---	PRAIRIE ROSE FLOODWAY
---		---	EA (2012)

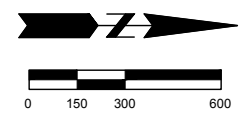
ESTIMATED VOLUMES	
Cu. YD (1.5 fill factor)	Alignment
200,500 (fill)	Rice Street_ALT 1
250,000 (fill)	Rice Street_ALT 2
116,900 (fill)	Rice Street
73,600 (cut)	Benson Centerline



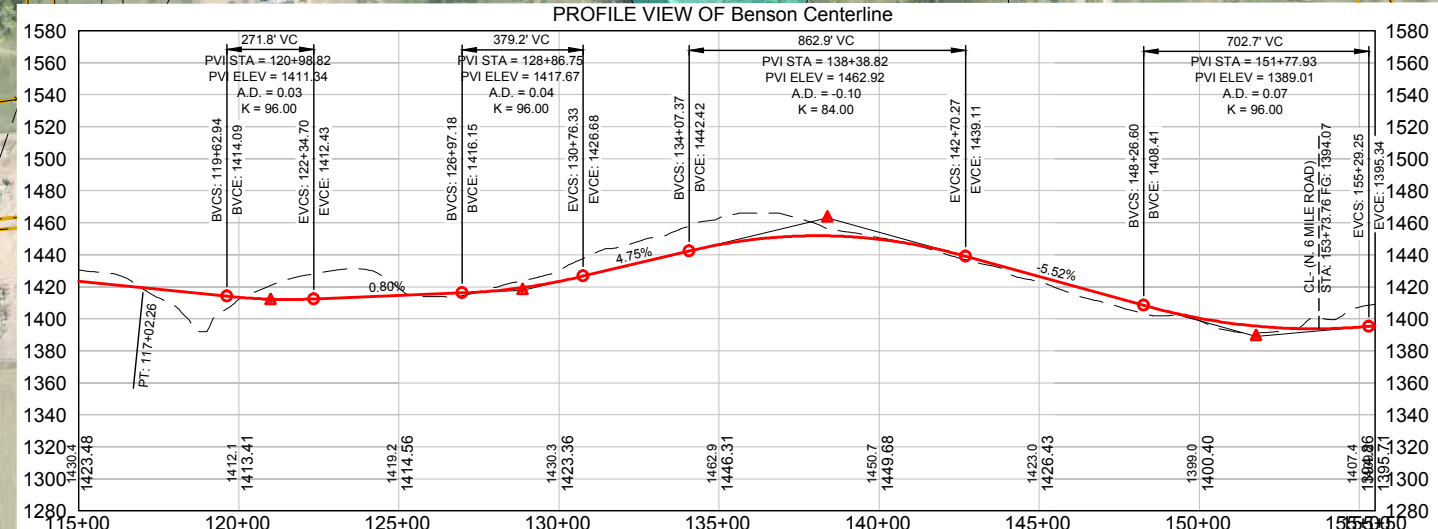
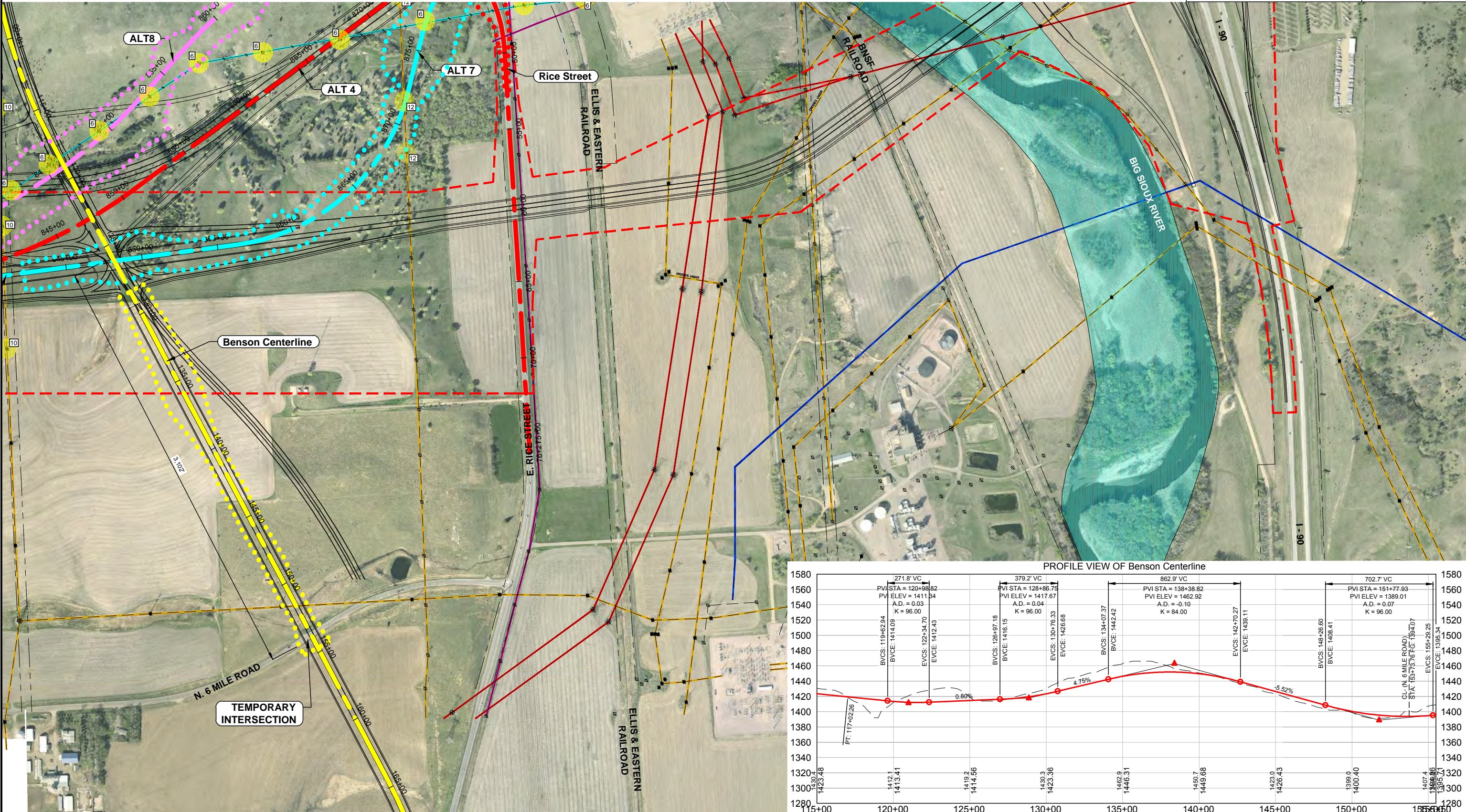
PLOT DATE: 5/1/2013 4:35 PM Keffler, Lee

LEGEND			
	EXISTING ELECTRIC		SIoux VALLEY ELECTRIC
	EAST RIVER ELECTRIC		WAPA
	L & O POWER		XCEL ENERGY
	PRAIRIE ROSE		FLOODWAY
	EA (2012)		

RICE STREET OPTIONS - BENSON



STATE OF SOUTH DAKOTA	PROJECT	SHEET NO.	TOTAL SHEETS
	P 1282(06)	12	#
FILE: 2-ALTERNATIVE PLAN & PROFILE.DWG		REV DATE: INITIAL:	
PLOTING DATE: 5/1/2013			



PLOT DATE: 5/1/2013 4:36 PM Keffler, Lee

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ATTACHMENT F
(Initial Alternatives Discussion Memo)
(Dated April 2013)

Appendix A

To: SDDOT	
From: HDR Engineering, Inc.	Project: SD100-Rice Street to I-90
CC: File	
Date: April 3, 2013	Job No:

RE: SD100 ALIGNMENT OPTIONS THROUGH WAPA TRANSMISSION LINES

Following is a brief summary of preliminary roadway alignments alternatives that were developed and evaluated for SD100 through the WAPA and Xcel substation area in the vicinity of the Big Sioux River. These options were formulated to compare the impacts and costs when considering several different variables of the alignment through the WAPA and Xcel transmission towers and power lines.

The reason for the development and evaluation of additional alignment options is due to several factors that have developed and/or arisen since the development and analysis of the alignment identified in the Supplement to the EA. Identified factors include:

1. Bridge Constructability;
2. Increased costs associated with adjusting/relocating transmission lines;
3. Increased voltage carried by the transmission lines affecting the sag of lines; and
4. Elimination of the rail yard in the vicinity of Timberline Road.

SUPPLEMENTAL EA ALIGNMENT

This alignment was originally developed as a comparison to the 2003 alignment in order to reduce environmental impacts, reduce the length of the bridge needed to span the Big Sioux River, and avoid the proposed future site of the BNSF rail yard potentially located in the vicinity of Timberline Road and the current BNSF mainline. When developing this alignment, the team worked closely with WAPA to minimize impacts to the WAPA and NSP/Xcel infrastructure. The alignment developed consisted of a combination of adjustments and avoidance.

Since the time of this alignment development, new regulations have been adopted which will make any adjustments to the WAPA and Xcel infrastructure more difficult and significantly more expensive. In addition to the costs, WAPA has informed us that they are intending to increase the voltage through the transmission lines causing the lines to sag up to an additional 8' at mid-span.

Also, during project scoping, a concern with the constructability of the bridge over the Big Sioux River has been identified.

Due to the issues identified above, it was determined to develop alignment alternatives that could improve on the constructability of the bridge as well as reduce impacts to WAPA or, if possible, avoid WAPA conflicts altogether. Following is a brief description of eight alignment alternatives developed.

ALTERNATIVE 1

KEY POINTS:

1. Slight alignment adjustment in the vicinity of the Big Sioux River to improve the crossing angle of the WAPA transmission line.
2. Abutment Number 1 is shifted east to avoid WAPA line construction issues.
3. Constructability remains an issue with setting beams and interior piers.
4. Will require adjustments to the WAPA towers or lines just north of Rice Street.
5. Crosses I-90 at the same location as the interchange Supplemental EA alignment.

This alignment consists of only a minor shift when compared to the Supplemental EA alignment and was developed for the purpose of avoiding overhead transmission lines conflicting with Abutment #1 construction. Although succeeding in avoiding abutment #1 conflicts, construction issues will remain with the intermediate piers and the setting of the beams. The issues associated with constructing the intermediate piers will be reduced when compared to the abutments simply due to the elevation difference between the abutments and the pier footings. The vertical difference may allow for more typical construction practices.

The setting of the beams however will require more innovative methods due to the proximity of the WAPA lines. Methods discussed include:

1. Bigger cranes to accommodate booms that will need to be used at lower angles;
2. "Launching the beams". This will most likely require intermediate bracing to launch the beams across.

ALTERNATIVE 2

KEY POINTS:

1. Alignment shift begins just south of the BNSF RR.
2. Entire river structure avoids overhead conflicts with WAPA.
3. Alignment ties into Timberline Road just south of I-90. Proposed interchange located on existing alignment.
4. WAPA conflicts at bridge over BNSF.
5. Will require adjustments to the WAPA towers or lines just north of Rice Street.
6. Will require total buy-out of one acreage.

This alignment was developed to shift the river bridge away from the WAPA lines. Although succeeding with the initial goal, the bridge over the BNSF RR has overhead conflicts at abutment #2.

Methods of constructing abutment #2 at the BNSF RR may include:

1. Using wall type abutments where the footings would be at or near existing ground line providing an additional 25'± of vertical clearance.
2. Drive piling at existing ground line, splice piling at ground line, and build embankment around the piling (similar to MSE wall construction).

ALTERNATIVE 3

KEY POINTS:

1. Slight alignment adjustment in the vicinity of the Big Sioux River to improve the crossing angle of the WAPA transmission line.
2. Abutment Number 1 is shifted east to avoid the WAPA line.
3. Constructability remains an issue with setting beams and interior piers.
4. Will require adjustments to the WAPA towers or lines just north of Rice Street.
5. Crosses I-90 at the same location as the interchange shifted east.

This alignment is similar to Alternative 1, but utilizes an improved angle to the WAPA line. Although improving on the angle to the WAPA line and improves the separation to the lines at abutment #1, construction issues will remain with the intermediate piers and the setting of the beams.

The issues associated with constructing the intermediate piers will be reduced when compared to the abutments simply due to the elevation difference between the abutments and the pier footings. The vertical difference may allow for more typical construction practices.

The setting of the beams however will require more innovative methods due to the proximity of the WAPA lines. Methods discussed include:

1. Bigger cranes to accommodate booms that will need to be used at lower angles;
2. "Launching the beams". This will most likely require intermediate bracing to launch the beams across.

ALTERNATIVE 4

KEY POINTS:

1. Alignment similar to the 2003 EA alignment with improvements at curve locations to accommodate 60 mph design speed.
2. Avoids WAPA towers and transmission lines.
3. Will have conflicts with Xcel (transmission), L&O Power (distribution), East River Electric (distribution), and Sioux Valley Electric (distribution).
4. May require a buy-out (between river and 60th St. N) due to the close proximity of house to the highway.
5. Will create access issues for WAPA and several existing acreages.
6. Require closure of Timberline Road and Interchange during construction.
7. BSR Bridge in tangent section.

This alignment follows the 2003 alignment with improvements to both the horizontal and vertical curves to accommodate 60 mph design speed. The alignment remains on the Supplemental Alignment until just south of the intersection with proposed Benson Road tying into the tangent section of the 2003 alignment.

ALTERNATIVE 5

KEY POINTS:

1. Alignment remains on the Supplemental Alignment until just south of the BNSF RR. At the point the Supplemental Alignment curves left to cross the river, Alt. 5 curves right to remain east of the transmission lines and towers.
2. Avoids WAPA towers and transmission lines for bridge construction.
3. Will require adjustment to either the WAPA towers or lines north of Rice Street.
4. Separation between 60th Street N / SD100 intersection and I-90 interchange is too close not allowing for adequate spacing or vehicle storage.
5. Require buy-out/relocation of campground north of I-90.
6. Interchange east of WAPA interstate crossing.

The goal of this alignment is to stay east of the WAPA and Xcel towers until north of I-90.

ALTERNATIVE 6

KEY POINTS:

1. Avoids WAPA line conflicts for construction of river bridge.
2. Will require adjustment to either the WAPA towers or lines north of Rice Street.
3. Horizontal curve PT just south of the interchange.
4. BNSF bridge in a horizontal curve (superelevation).
5. River bridge in a sag vertical.

The goal of this alignment is to incorporate as close to a perpendicular intersection to the WAPA transmission lines while utilizing the Supplemental Alignment location for the I-90 interchange. This is accomplished by shifting the alignment east beginning just south of Rice Street and curving west in the vicinity of the BNSF RR.

ALTERNATIVE 7

KEY POINTS:

1. Shifts the alignment west to avoid WAPA.
2. Follows 2003 alignment from just north of Rice Street to the end of project.
3. Alignment developed to minimize impacts to Cactus Hills area.
4. Allows for proposed Benson Rd interchange to remain at location of Supplemental Alignment.
5. Without modifying Rice Street, the alignment of the crossing is in a horizontal curve.
6. BSR bridge in a vertical tangent.
7. South end of BSR/BNSF bridge may have super elevation run-out.

8. Will have conflicts with Xcel (transmission), L&O Power (distribution), East River Electric (distribution), and Sioux Valley Electric (distribution).
9. May require a buy-out (between river and 60th St. N) due to the close proximity of house to the highway.
10. Will create access issues for WAPA and several existing acreages.
11. Require closure of Timberline Road and Interchange during construction.

The goal of this alignment is to shift the alignment to the west of the WAPA Substation while maintaining the Supplement EA alignment through the proposed Benson Road interchange. This alignment alternative also attempts to minimize impacts to the Cactus Hills area.

ALTERNATIVE 8

KEY POINTS:

1. Shifts the alignment west to avoid WAPA.
2. Improved horizontal alignment from Rice Street north to the end of the project.
3. Alignment will impact Cactus Hills area.
4. Shifts the proposed Benson Rd interchange west of Supplement and 2003 alignments.
5. Improves the intersection with Rice Street versus Alternative #7.
6. BSR bridge in a vertical and horizontal tangent.
7. Will have conflicts with Xcel (transmission), L&O Power (distribution), East River Electric (distribution), and Sioux Valley Electric (distribution).
8. May require a buy-out (between river and 60th St. N) due to the close proximity of house to the highway.
9. Will create access issues for WAPA and several existing acreages.
10. Require closure of Timberline Road and Interchange during construction.

The goal of this alignment is to improve the horizontal alignment as it turns north and crosses the BNSF and Big Sioux River. This alignment also improves on the 2003 alignment as it better fits the terrain. This alignment will have greater impacts to the Cactus Hills area when compared to all other alternatives except Alternative #4.

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ATTACHMENT G
(Initial Alternatives Comparison Matrix)
(Dated April 2013)

Appendix A

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Table 1 - Relative Rankings Overall										
Factor	Relative Weight	Alternate 1	Alternate 2	Alternate 3	Alternate 4	Alternate 5	Alternate 6	Alternate 7	Alternate 8	
Project Cost	2	3	2	3	2	1	2	2	2	
Bridge (See Below)	2	3	3	3	1	1	3	1	1	
Utility Impacts	3	3	3	3	1	3	3	1	1	
Environmental Impacts	1	1	1	1	3	2	1	2	3	
ROW Impacts	2	1	3	1	2	3	2	2	2	
Traffic Impacts (Constr)	1	1	3	1	3	1	1	3	3	
Geometrics	2	1	2	1	2	3	2	2	1	
Weighted Average		2.08	2.54	2.08	1.77	2.15	2.23	1.69	1.62	
Relative Rank		T4	8	T4	3	6	7	2	1	

Narrative on factor weighting

Project Cost: 1-lowest, 2-median cost, 3-highest cost. (*constructability, utility impacts, R.O.W aquisitions*)

Bridge: 1-best ranking, 2-other rankings, 3-worst ranking

Utility Impacts: 1-avoid transmission lines, 2-some transmission impacts, 3-greatest impacts.

Environmental Impacts: 1-similar to EA preferred, 2-minimal impacts, 3-numerous environmental concerns

ROW Impacts: 1-no issues, 2-access issues, 3-property taking.

Traffic Impacts (Constr): 1-minimal disturbances, 2-partial closure, 3-highway/street closure.

Geometrics: 1-best geometrics, 2-minor geometric issues, 3-worst geometrics.

Table 2-Relative Rankings Bridge										
Factor	Relative Weight	Alternate 1	Alternate 2	Alternate 3	Alternate 4	Alternate 5	Alternate 6	Alternate 7	Alternate 8	
E&E		100	100	100	250	100	100	250	250	
BNSF		100	199	100		100	100			
Big Sioux River		550	550	550	700	500	600	700	700	
Bridge Length	1	1	2	1	3	1	2	3	3	
WAPA Conflicts	3	3	2	3	1	1	2	1	1	
Superelevation	2	2	2	2	2	1	3	2	1	
Vertical Sag	2	3	3	3	1	2	3	1	1	
Weighted Average		2.5	2.25	2.5	1.5	1.25	2.5	1.5	1.25	
Relative Rank		T6	5	T6	T3	T1	T6	T3	T1	

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ATTACHMENT H
(Private Utility Correspondence – WAPA)
(Dated August 2006)

Appendix A

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**Western Area Power Administration
Proposed Transmission Line Modifications
For
East Side Corridor, SD100
Sioux Falls, SD**

Overview

Estimates include design, environmental review, materials and installation costs to modify existing Western owned transmission lines in proximity to its Sioux Falls Substation to accommodate proposed options for east side corridor roadway SD100. All costs are in fiscal year 2006 dollars.

Not included in this review and analysis are:

- Access to the Sioux Falls Substation. The proposed plans will impact the access road and connecting roads to the substation. Maintaining access will need to be addressed.
- Access to transmission line right-of-way during road construction and line modification.
- Permanent transmission line right-of-way access.
- Potential impact of nearby railway modification.
- Surface or crop damage costs.
- Potential environmental restrictions.

Outage Restrictions

At this time outage restrictions for completing the modifications are minimal. Hot summer months shall be avoided.

Option 1

Crossings:

Northwest of Substation: Brookings - Sioux Falls 115-kV Transmission Line (BR-SF).

Crossing C/L: Approximate Project Sta 830 + 52.

Replace two H-frame structures with taller structures, similar type.

South of Substation: Sioux Falls - Gavins Point 115-kV Transmission Line (SF-GP).

Crossing C/L: Approximate Project Sta 809 + 40.

Replace two structures, 3-pole transposition structure, 0/2 (first structure north of road crossing) and HS structure, 0/3 (first structure south of road crossing), with taller structures of similar type.

Cost Estimate:

Direct Labor	\$	35,100
Overhead: Design, Engineering, Realty, Environmental Review	\$	29,500
Material	\$	37,800
Equipment	\$	9,000
<hr/>		
Total	\$	111,400
20% Contingency	\$	22,280
<hr/>		
Total + Contingency	\$	133,680

Option 2

Crossings:

East of Substation, (north line) steel lattice tower: Sioux Falls - Sioux City 230-kV line (SF-SC).

Crossing C/L: Approximate Project Sta 826+25.

Leave existing steel lattice structures unchanged. Install one midspan steel pole H-frame structure located approximately 125 feet west of Option 2 centerline.

East of Substation (south line) steel lattice tower: Sioux Falls - Utica Junction 230-kV line (SF-UJ).

Crossing C/L: Approximate Project Sta 824+60.

Leave existing steel lattice structures unchanged. Install one midspan steel pole H-frame structure located approximately 125 feet west of Option 2 centerline.

North of Substation: Fort Thompson - Sioux Falls 230-kV line, double circuit (FT-SF).

Crossing C/L: Approximate Project Sta 843+90.

Using provided HDR drawings and existing Western drawings, this crossing may meet clearance requirements without further modification. However, further field survey and analysis is needed to determine if clearance requirements are met under proposed design. A cost estimate is provided separately for modifying this line, should it be required. Potential modification includes installing body extensions and new footings to two existing steel lattice towers, 145/4 & 145/5, adjacent to the crossing.

Cost Estimate SF-SC & SF-UJ:

Direct Labor	\$	45,900
Material	\$	63,800
Equipment	\$	9,000
<u>Overhead: Design, Engineering, Realty, Environmental Review</u>	<u>\$</u>	<u>26,000</u>
Total	\$	144,700
<u>20% Contingency</u>	<u>\$</u>	<u>28,940</u>
Total + Contingency	\$	173,640

Cost Estimate FT-SF:

Direct Labor	\$	46,900
Material & Contract	\$	150,200
Equipment	\$	34,100
<u>Overhead: Design, Engineering, Realty, Environmental Review</u>	<u>\$</u>	<u>35,600</u>
Total	\$	266,800
<u>20% Contingency</u>	<u>\$</u>	<u>53,360</u>
Total + Contingency	\$	320,160

Option 3

Modifications required for Option 3 are similar to Option 2, and the cost estimate for Option 2 applies to Option 3. However, on the Fort Thompson - Sioux Falls (SF-FT) Transmission line located north of the substation, the line to roadway clearances are less than in Option 2, and the line is more likely to require the proposed modification.

Appendix A

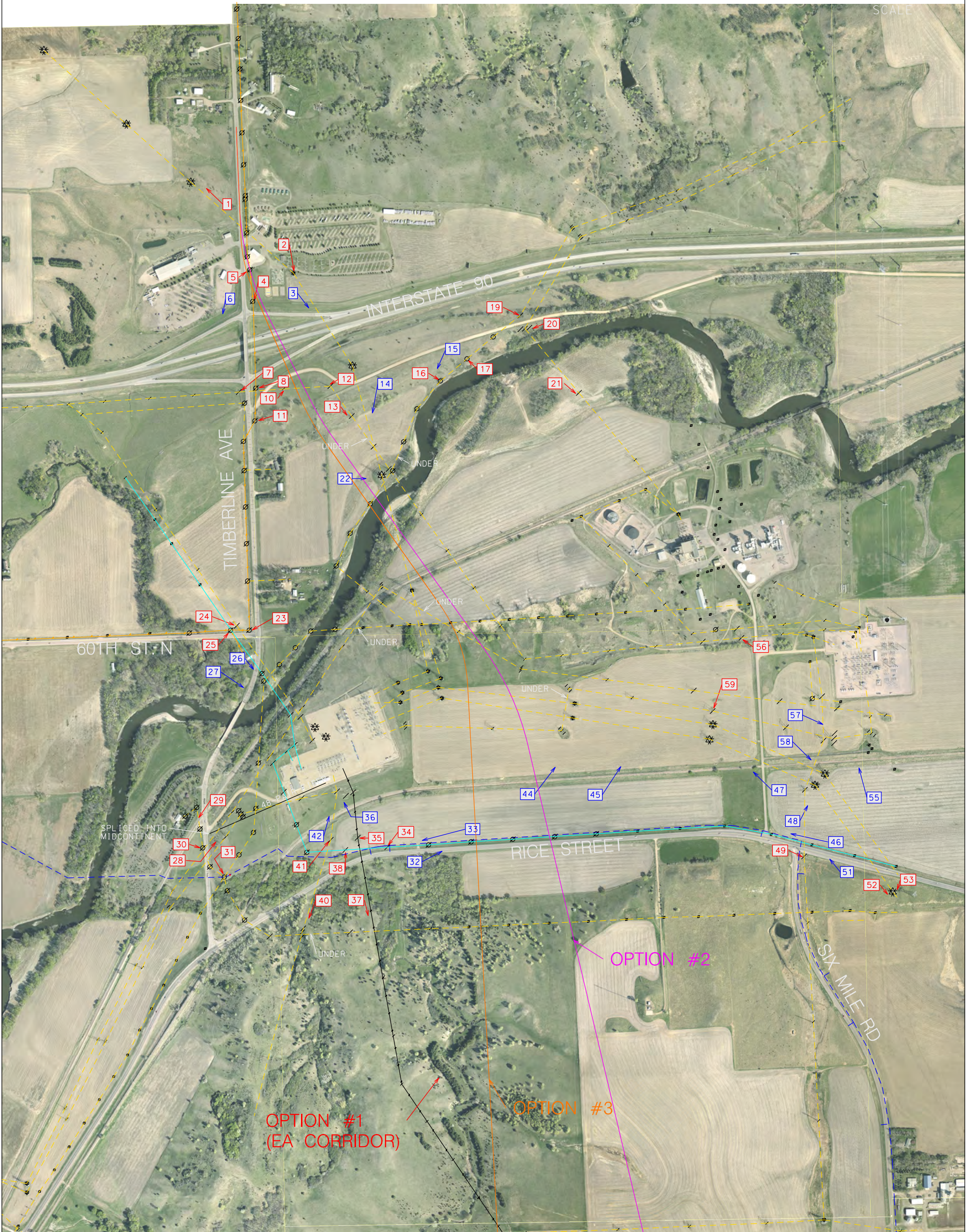
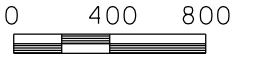
Segment 3 – Utility Lines



LEGEND

- XX POINTING TO SPECIFIC POLES
- XX OVERALL PHOTO SHOT

NOTE: THE DIRECTION OF THE ARROW REPRESENTS THE DIRECTION THE CAMERA WAS FACING



Drawn by: K. Gundvaldson
 Date: 3-31-06
 Checked by: J. Klemme
 Date: 4-3-06
 Revisions: K. Gundvaldson
 Date: 4-26-06



P0100(101)405 PCN 00T7
 SD100 Corridor Preservation
 April 2006

Segment 3 Overhead Lines
 Timberline from Rice to I-90

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SD100 Alignment Alternatives due to
Xcel Energy High Pressure Gas Line Memo

Appendix A

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To:	Sam Gilkerson, SDDOT		
From:	HDR	Project:	SD100 from Madison Street to Maple Street NH 0100(103)417; PCN 00KB
CC:	Shannon Ausen, City of Sioux Falls		
Date:	January 24, 2014; revised 2/11/14; final 2/20/14	Job No:	215467

RE: Xcel Gas Transmission Line Impact Minimization Options

Background

At the 11/20/13 SD100 utility coordination meeting, representatives of Xcel Energy (electrical division in Sioux Falls) noted that a high pressure natural gas transmission line followed the Powderhouse Road alignment from Madison Street to Maple Street. Xcel stated that any impacts to this gas line would be problematic and that the Fargo, ND Xcel Energy office is responsible for maintenance of this gas line.

During utility coordination as part of the Environmental Assessment preparation, Xcel Energy of Fargo did not alert SDDOT about the need to avoid the high pressure gas transmission line.

Figure 1 shows the alignment of the originally proposed SD100 alignment and the location of the 12” gas transmission line.

Follow-up correspondence with John Ness of Xcel Energy (Fargo) determined that:

- Relocation of the gas line is not desired by Xcel Energy.
- Relocation costs would be expensive; verbal estimates from John Ness indicated a range of \$500 to \$1,000 per foot. An updated cost estimate was provided by John Ness on 2/12/13. This cost analysis assumes \$1,000 per foot for gas line relocation costs.
- Xcel Energy would not be responsible for relocation costs.
- Existing easement agreements between Xcel Energy and property owners prohibit a change of ground surface elevation at the gas line. Xcel is concerned about access to the gas line if it is buried beneath a high and long roadway embankment.

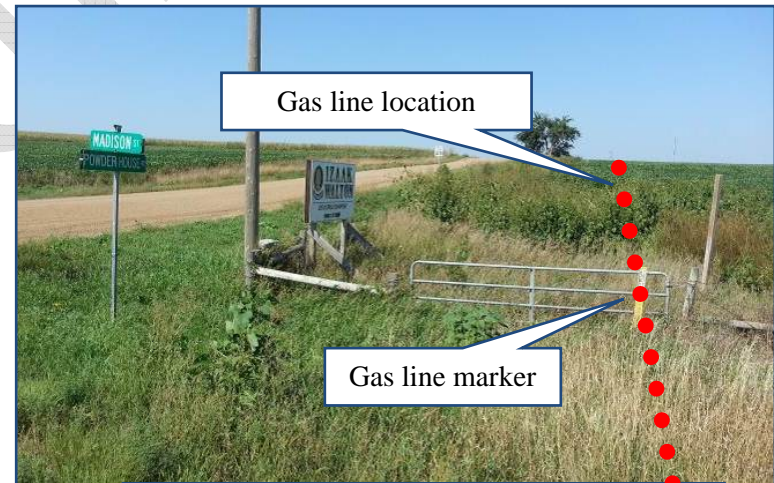


Photo looking north from Madison Street/
Powderhouse Road intersection

Attachment A to this memo contains emails from Xcel Energy related to this subject.

Options to Minimize Impacts to the Xcel Gas Line

Figure 1 illustrates three alignment options (blue, green, yellow) developed to minimize impacts to the gas line; one option shifts SD100 to the west and two options shift SD100 to the east. These alignment options are based on analysis of critical cross section locations (sections A-A, B-B, C-C, and D-D in Figure 1).

The orange alignment option proposes relocation of a section of the gas line while keeping the SD100 alignment along Powderhouse Road as analyzed in the EA.

Figure 2 illustrates the comparative right-of-way acquisition for each of the options. For the green alignment option and the yellow alignment option, the right-of-way acquisition is calculated with and without the triangular remnant parcel between SD100 and Powderhouse Road.

The table below highlights each of these SD100 alignment options (colors correspond to Figure 1):

Alignment	Shift at Madison (Rank)*	Angle at Madison (Rank)	Xcel gas line crossings (Rank)	Remove and replace SD100 pavement south of Madison St (Rank)	Gas line relocation ** (Rank)	Comparative ROW Acquisition (Rank)	Total comparative cost (Rank)	Average Rank
West shift	90° W (4)	82° (3)	3 (4)	530' @ \$3M/mi = \$0.3M (2)	\$0 (1)	13.8 ac @ \$1/sf = \$0.6M (1)	\$0.9M (1)	2.3
Powderhouse	0' (3)	90° (1)	1*** (1)	0' = \$0 (1)	1,900' @ \$1k/ft = \$1.9M (4)	17.8 ac @ \$1/sf = \$0.8M **** (2)	\$2.7M (4)	2.3
East shift 1	180' E (1)	86° (2)	1 (1)	1,930' @ \$3M/mi = \$1.1M (4)	\$0 (1)	27.8 ac @ \$1/sf = \$1.2M (3)	\$2.3M (3)	2.1
Without remnant ROW						18.0 ac @ \$1/sf = \$0.8M (1)	\$1.9M (3)	1.9
East shift 2	190' E (1)	75° (4)	1 (1)	815' @ \$3M/mi = \$0.5M (3)	\$0 (1)	35.9 ac @ \$1/sf = \$1.6M (4)	\$2.1M (2)	2.3
Without remnant ROW						14.3 ac @ \$1/sf = \$0.6M (1)	\$1.1M (2)	1.9

* Shift to east improves vertical sight distance problem on Madison Street.

** Includes construction, fuel supply loss, blowdown gas, filtering at plant site, quality control, replacement electric supply, engineering, supervision, overhead, etc.

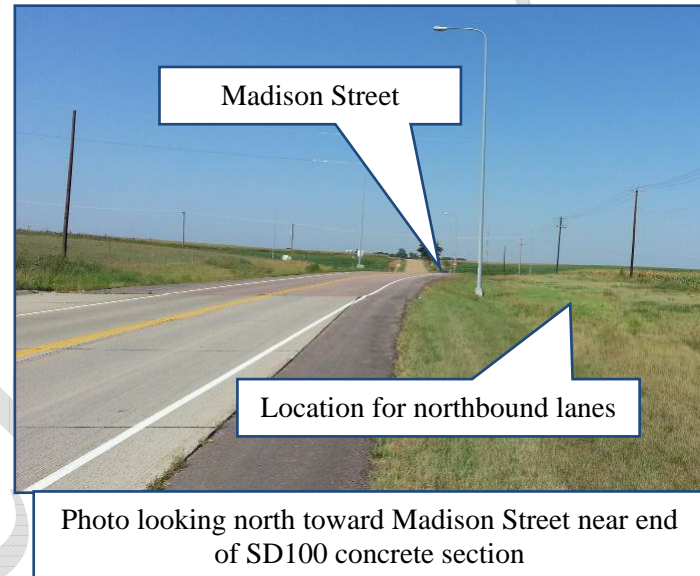
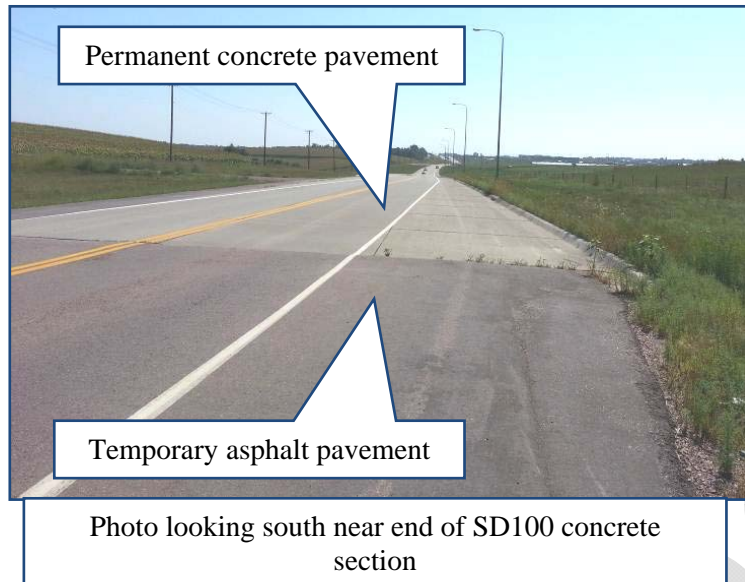
*** With relocated gas line

**** Includes cost of additional ROW for relocated Xcel gas line easement

Pavement Removal South of Madison Street

2010 construction of the permanent SD100 southbound lanes ended approximately 600' south of Madison Street as shown in Figure 1 and in the photos below. A temporary asphalt transition section was constructed to Madison Street with the 2010 project. Construction of the northbound lanes will be delayed until the City of Sioux Falls installs a 30" watermain along side the northbound lanes.

Realignment of SD100 at Madison Street to minimize impacts to the Xcel gas line will result in removal of some of the new concrete pavement and associated storm sewer.



Remnant Parcel

A preliminary plan for the Canterbury Heights East development was approved by the City of Sioux Falls in 2008 (see Attachment B). However, the development plan did not take the Xcel gas line into account and showed residential lots over the top of the Xcel easement.

The Xcel email chain in Attachment A notes that the residential lots on/near the Xcel easement will be unbuildable. This will result in some type of triangular-shaped remnant parcel between the Xcel easement and SD100. Figure 2 illustrates the comparative right-of-way acquisition areas. For the **yellow alignment option** and the **green alignment option**, acquisition areas are shown with and without this triangular parcel since the viability of the parcel will not be known until right-of-way negotiations are underway.

Madison Street Crossing

The Madison Street profile does not fit well with the SD100 pavement cross section, especially to the west of the intersection with the **blue alignment option**. This is illustrated in the section view at the Madison Street centerline shown in Figure 1.

The best "fit" is attained with the **yellow alignment option** and the **green alignment option** because SD100 crosses Madison Street further to the east where the profile of Madison Street flattens out

Sight Distance at Madison Street

A hill to the west of SD100/Powderhouse Road on Madison Street restricts sight distance at the SD100/Madison Street intersection as shown in the photo below. The west shift option would worsen the sight distance problem; the east shift option would improve the sight distance problem.



Photo is looking west along Madison Street. The hill to the west of SD100 reduces the sight distance for vehicles at the SD100/Madison Street intersection.

Maple Street Crossing

The SD100 alignment at Maple Street goes through a low area in the Maple Street profile with steep hills to the east and to the west. There is no feasible way to avoid crossing the Xcel gas line at Maple Street, therefore realignment of SD100 at Maple Street is not proposed.

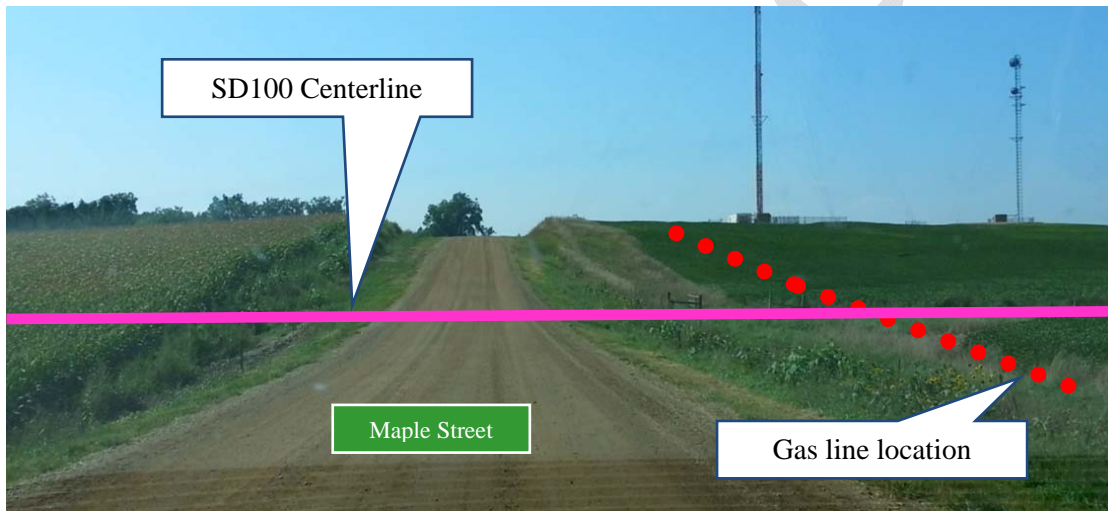


Photo is looking west on Maple Street near the proposed SD100 crossing.

Recommendations

SD100 alignment at Madison Street – Shift SD100 190’ east at Madison Street with the **yellow alignment option** and approximately match the Madison Street profile; benefits include:

- Only 1 Xcel gas line crossing which is at Maple Street
- Improved vertical sight distance to the west on Madison Street
- Minimal number of curves in the SD100 alignment
- Best fit of Madison Street profile and SD100 cross slope
- Best opportunity to avoid purchase of remnant triangular piece between SD100 and Powderhouse Road.

Madison Street improvements with SD100 project –

- Provide a temporary asphalt section with a left turn lane to minimize work on Madison Street (See Figure 1).
- Provide temporary traffic signal, if warranted.
- Permanent improvements to Madison Street will need to entail vertical realignment to resolve the sight distance problem west of SD100 and associated horizontal realignment of Madison Street to avoid impacts to the Xcel gas line and to allow more lanes. A full design analysis for Madison Street at this time is not seen as beneficial and may not be accurate when Madison Street improvements are justified in the future.

SD100 alignment at Maple Street –

- Keep the original SD100 horizontal alignment at Maple Street.
- Raise the vertical alignment by approximately 2’ above the existing Maple Street surface; the elevated SD100 profile will assist with drainage, reduce snow drifting, and improve sight distance to the east and west on Maple Street.
- Work with Xcel to provide encasement/protection for the gas line where SD100 crosses it on the north side of Maple Street.

Maple Street improvements with SD100 –

- Provide a two-lane temporary gravel section with asphalt in the vicinity of SD100 (see Figure 1).
- Shift the Maple Street alignment approximately 25’ south to avoid any impacts to the Xcel gas line.
- Provide temporary traffic signal, if warranted.
- Permanent improvements to Maple Street in conjunction with the SD100 project are not seen as beneficial because:
 - The ultimate Maple Street design (number of lanes, design speed, classification, etc.) is unknown at this time and will be determined by future development in the area as noted in the Northeast Transportation Network Feasibility Study completed by the City of Sioux Falls in 2009.
 - Significant Maple Street horizontal and vertical alignment shifts will be necessary to avoid impacts to the Xcel gas line. These shifts will depend on the ultimate Maple Street design.

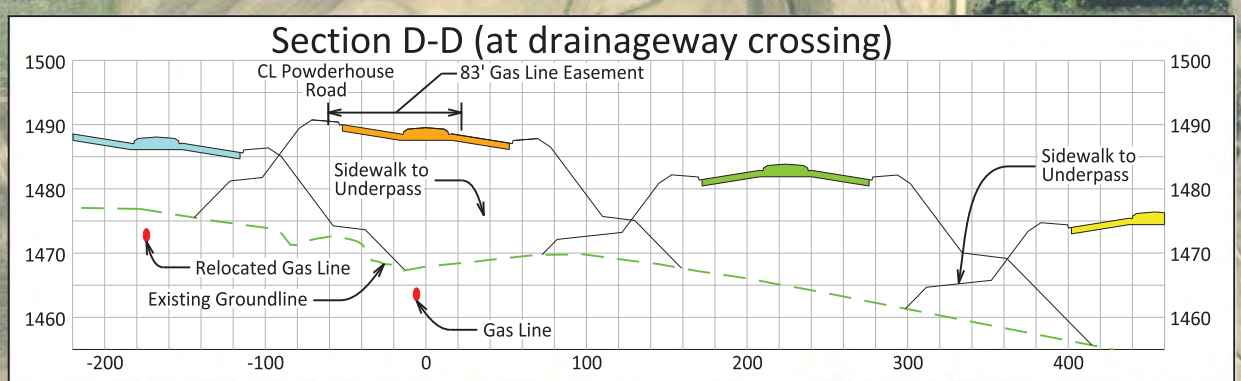
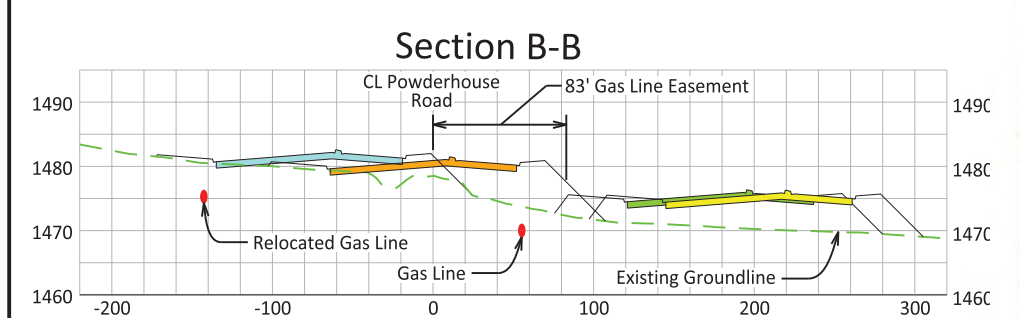
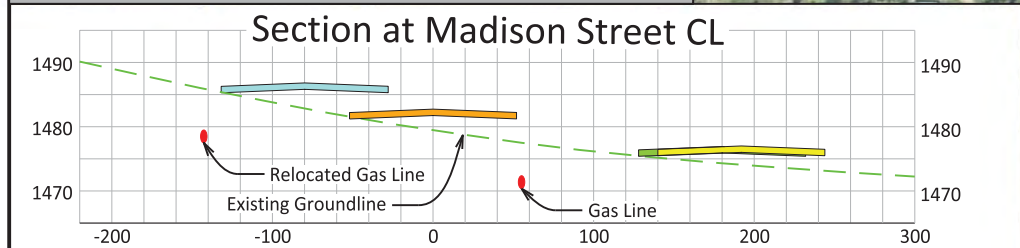
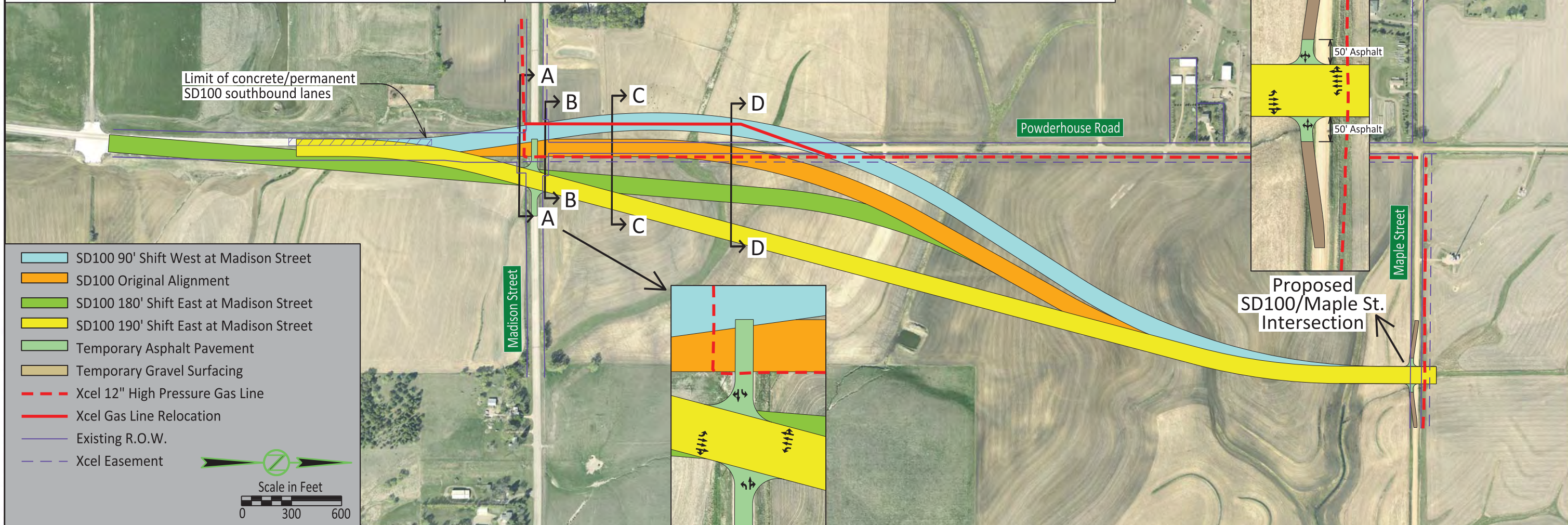
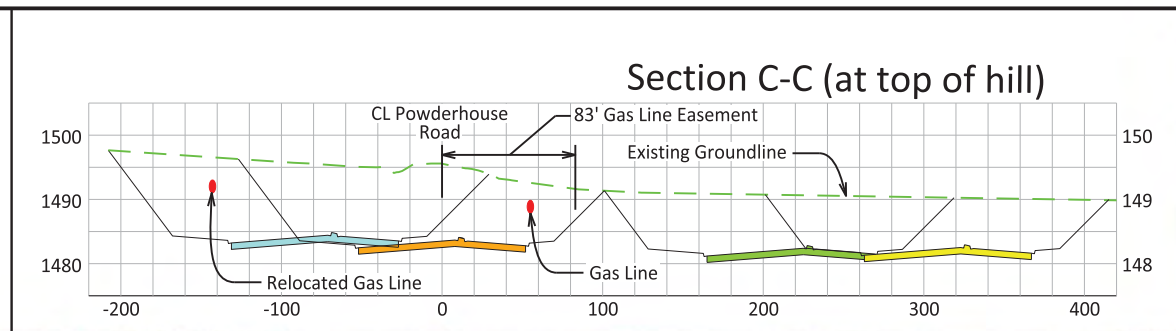
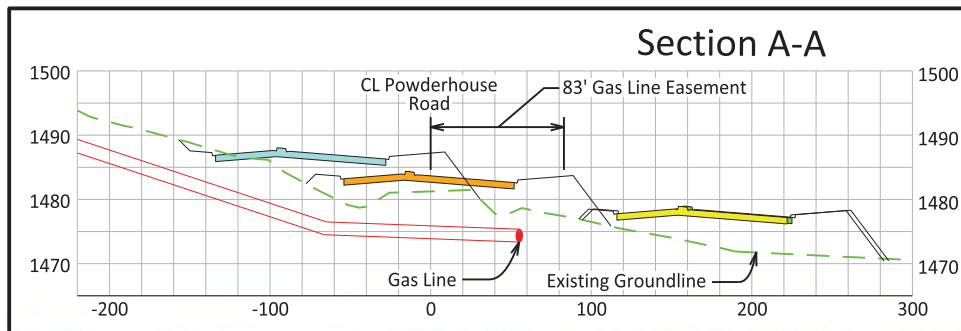
Funding adjustments – The funding agreement between the City of Sioux Falls and SDDOT includes the cost of permanent signal installations at the Madison Street and Maple Street intersections. This funding agreement will need to be adjusted because installation of permanent signals at these intersections with the SD100 project will be delayed until permanent improvements are made to Madison Street and Maple Street.

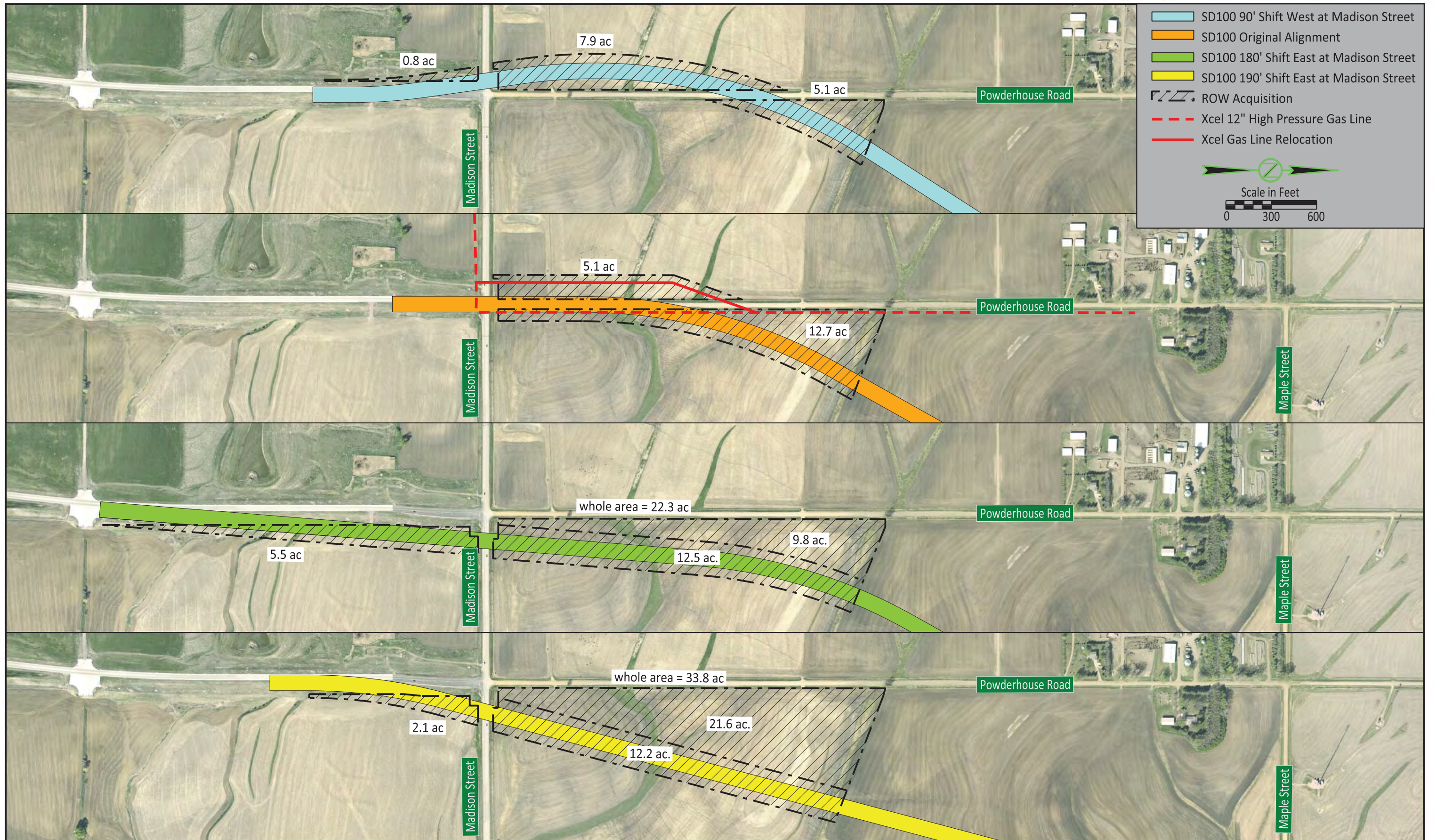
Environmental Assessment (EA) adjustments – Attachment C illustrates the additional cultural resources surveys that have been ordered for the area north of Madison Street and east of Powderhouse Road. These surveys will be conducted when snow cover is gone and when ground conditions allow for shovel tests. The risk of the east SD100 alignment shift impacting any cultural resources is minimal since the area has been under cultivation for many years. The EA will need to be revised to reflect the realignment of SD100.

SD100 (Madison Street to Maple Street design and ROW acquisition schedule – The roadway design based on the above recommendations should commence as soon as there is concurrence with the recommendations by:

- SDDOT
- City of Sioux Falls
- Minnehaha County (They will have eventual jurisdiction of Maple Street.)
- Xcel Energy (gas transmission line group in Fargo)
- Property owners

The initial bid letting date of September 2015 can be reasonably met even with the alignment shift and the basic new start on the design effort. If the ROW acquisition with the 4 affected landowners goes well, the proposed accelerated bid letting date of March 2015 may be attainable.





- SD100 90' Shift West at Madison Street
- SD100 Original Alignment
- SD100 180' Shift East at Madison Street
- SD100 190' Shift East at Madison Street
- ROW Acquisition
- Xcel 12" High Pressure Gas Line
- Xcel Gas Line Relocation

Scale in Feet

Drawn: B. Miller
 Date: 2-12-2014
 Checked: J. Unruh
 Date: 2-12-2014
 Rev: 2-13-2014



**Analysis for Xcel Gas Line Impact
 Right-of-Way Acquisition Comparison**
 SD100 from Madison Street to Maple Street Sioux Falls, SD

Attachment A

Email Correspondence with Xcel Energy (Fargo)

- Email correspondence available upon request.

Appendix A

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Attachment B
Canterbury Heights East Development Plan

Appendix A

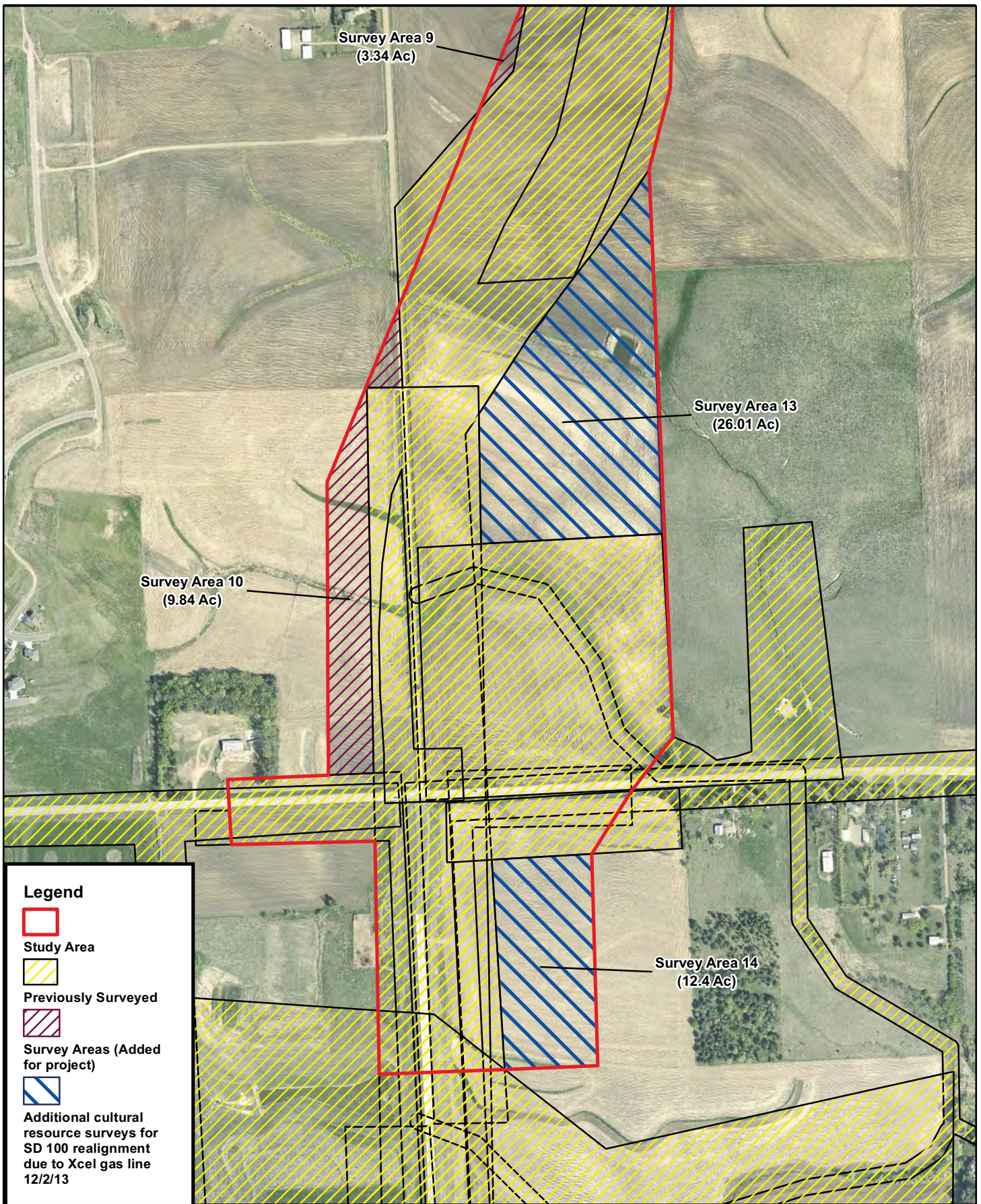
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Attachment C
Cultural Resources Survey Map

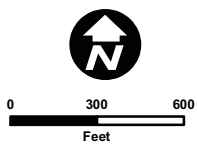
Appendix A

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Legend

-  Study Area
-  Previously Surveyed
-  Survey Areas (Added for project)
-  Additional cultural resource surveys for SD 100 realignment due to Xcel gas line 12/2/13



Cultural Survey Areas-

SD100

DATE
January 2014

FIGURE
2

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APPENDIX B

RICE STREET INTERSECTION MEMO

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To: SDDOT	
From: R. Laughlin	Project: Eastside Corridor
CC: File	
Date: 10/2/2012 (revised 3/26/2013, 12/04/2013, 2/7/2014)	Job No: 032198

RE: Intersection Eastside Corridor/Rice Street

SDDOT has requested information for design and construction phasing of an intersection on Eastside Corridor at Rice Street. Specifically, SDDOT has requested the following information:

- Level of service for a standard intersection –
 - Eastside Corridor – 3 thru lanes, 1 left turn lane for each direction
 - Rice Street – 1 thru lane, 1 left turn lane for each direction
- Will right turn lanes be needed on Rice Street to aid with LOS and delay?
- At approximately what year will an intersection at Eastside Corridor/Rice St. fall below LOS D?

Traffic forecasts were prepared using the regional travel demand model built and maintained by the Sioux Falls MPO and the City of Sioux Falls. Level of service analyses were conducted using HCS 2010 software. The analysis indicates that the standard intersection will be at LOS D with the configuration as identified above soon after the opening of this section of the Eastside Corridor, largely due to the existing traffic demand on Rice Street. Adding right turn lanes on Rice Street will result in LOS C soon after opening.

Traffic growth will cause the standard intersection to fall below LOS D within 3 years of opening, while the intersection with right turn lanes on Rice Street is expected to not fall below LOS D until after 2025.

Both intersection configurations will fall to LOS F by 2035 with severe congestion impacts. The addition of right turn lanes on Rice Street at the intersection appears to be a reasonable investment, buying nearly 10 years in useful life.

An intersection configuration was also developed that provided no less than LOS D for each approach and no less than LOS C for the overall intersection through 2035. That intersection would require double left turn lanes on each approach and separate right turn lanes on each approach on Rice Street. Forecasting past 2035 indicates that this intersection configuration will reach LOS E before 2040. Forecasting lane needs to a five-year increment is at the limit of the precision of currently-available traffic forecasting methods.

A summary figure and analysis output sheets are attached for reference.

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INTERSECTION LANE LAYOUT	INITIAL CONSTRUCTION		2025		2035	
	AM	PM	AM	PM	AM	PM
<p>SD 100</p> <p>RICE ST.</p>	C	D	E	F	F	F
STANDARD LANES						
<p>SD 100</p> <p>RICE ST.</p>	C	C	C	D	E	F
ADD RIGHT TURN LANES						
<p>SD 100</p> <p>RICE ST.</p> <p>(FREE RT.)</p>	C	C	C	C	C	C
OPTIMIZED FOR LANE DEMAND						



SD 100 TRAFFIC ANALYSIS

FIGURE 1
RICE ST. INTERSECTION
LANES AND LEVEL OF SERVICE

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APPENDIX C

INTERCHANGE ALTERNATIVE EVALUATION

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INTERCHANGE ALTERNATIVE EVALUATION

This appendix addresses interchange alternative solutions at Interstate 90 (I-90). Specifically, this appendix presents the process used to identify alternatives, describes the preliminary alternatives identified, explains the process for determining which alternatives to carry forward for detailed study, and presents the rationale for selecting the preferred interchange. This appendix also presents the interchange design criteria, identifies the interchange cost, and considers environmental issues and funding sources.

IDENTIFICATION OF INTERCHANGE LOCATIONS AND ALTERNATIVES

Throughout South Dakota, two types of interchanges predominate: a diamond interchange and a single point urban interchange (SPUI). The diamond interchange is prevalent along the interstate system in rural areas and the SPUI is becoming the norm in urban areas where right-of-way (ROW) is expensive. Variations of the diamond interchange were evaluated for this particular area of this Project.

The three interchange options for SD100 and I-90 include a diamond interchange, tight diamond interchange, and a single point urban interchange. The interchange options connect SD100 and I-90 either at or just east of the current interchange location at Timberline Avenue. Initial interchange configuration investigations concentrated on improving the configuration of the existing interchange by analyzing each interchange configuration.

Comparisons of the impacts of each interchange type for I-90 are discussed below. A more detailed description of potentially affected resources as well as potential impacts from traffic and maintenance of the improved transportation system can be found in Chapter 3, Affected Environment and Environmental Impacts for the preferred interchange option at I-90. A brief summary of each interchange type along with an overview of advantages and disadvantages of each interchange type is summarized below.

I-90/ N. Timberline Avenue Interchange

Diamond Interchange – The current configuration is a diamond interchange. This option would provide for improved spacing across the interchange. The diamond interchange contains a diagonal one-way ramp in each quadrant allowing for traffic to leave or enter the major roadway at higher speeds. The intersections at the ramp ends will be controlled by signals. Due to the need for signals, the spacing between ramp intersections will be no less than one-thousand three-hundred feet, which is standard signal spacing for arterial roadways for the City of Sioux Falls.

- **Advantages**
 - Typical interchange – familiarity
 - Lowest construction cost of options developed
- **Disadvantages**
 - Increased ROW needs
 - Impacts several businesses because of ROW needs

Tight Diamond Interchange – This type of interchange is similar in configuration and driver familiarity to a diamond interchange. However, this interchange type utilizes less ROW by reducing the spacing between ramp intersections on either side of the interchange. Traffic is controlled in a similar method to a SPUI in that the attempt is to store vehicles outside the interchange. However, two signals are utilized instead of one with a SPUI.

- **Advantages**
 - Reduced ROW needs and impacts to businesses

- Lower construction cost when compared to a SPUI
- **Disadvantages**
 - Reduced traffic capacity (major concern)
 - Difficult signal timing (major concern)

Single Point Urban Interchange – This type of interchange is best suited for areas where ROW acquisition is limited. At this location, businesses located north of the interchange are a concern for acquiring additional ROW. The SPUI essentially combines two separate diamond ramp intersections into one large intersection which accommodates all vehicular movements and is controlled by a single traffic signal. The other unique concept of the SPUI is that opposing left turning movements are to the left of each other.

- **Advantages**
 - Reduced ROW needs and impacts to businesses
 - Increased traffic capacity
 - Driver familiarity
- **Disadvantages**
 - Higher construction cost

PREFERRED INTERCHANGE OPTION

Based on an evaluation of advantages and disadvantages of the options identified I-90, the SPUI has been identified as the preferred interchange option for Alternatives 4, 4a, and 7.

For the SD100/I-90 interchange, an Interchange Modification Justification Report (IMJR) has been completed. The IMJR addresses the policy for new or revised access points to the existing Interstate system published in the Federal Register on August 27, 2009.

APPENDIX D

HYDRAULIC EVALUATION

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To: South Dakota Department of Transportation

From: HDR

Project: SD 100

CC:

Date: August 16, 2013

Job No: 32194

Re: Update to 2009 SD 100 Sioux River Bridge Evaluation

Subject

A hydraulic evaluation was performed early in the Environmental Assessment (EA) process to determine the water surface elevation impacts of the SD 100 alternative alignment crossings of the Big Sioux River near I-90. The early analysis included the following five alignments:

- Revised Build Alternative
- Alternative 4
- Alternative 4a
- Alternative 7
- Alternative 8

The Revised Build Alternative crosses the Big Sioux River approximately 2,300 feet downstream of the existing Timberline Avenue Bridge. The Alternative 4, 4a, 7, and 8 alignments have a common Big Sioux River crossing approximately 135 feet downstream of the existing Timberline Avenue Bridge. The two proposed Big Sioux River crossing alignments are shown in Figure 1 and were evaluated to estimate the water surface elevation increase and the extent of impacts due to the bridge crossings for the purpose of the EA. A detailed hydraulic analysis was not completed and will be conducted during final design.

Hydraulic Analysis

Hydraulic model runs were created for the base condition, existing condition, and Revised Build Alternative and Alternative 4, 4a, 7, and 8 proposed conditions. A model run was completed without Timberline Bridge for the Revised Build Alternative and Alternatives 4, 4a, 7, and 8 to determine the potential to mitigate impacts by removing the bridge.

Base Condition

A HEC-RAS hydraulic model was obtained from the City of Sioux Falls in 2009 for the reach of the Big Sioux River from I-229 to just west of Brandon, SD (downstream model). A second HEC-RAS hydraulic model is available for the City of Sioux Falls that includes the area from just downstream of I-229 to upstream of the Big Sioux River diversion around Sioux Falls (upstream model). These two models were not meshed together to create one comprehensive model. To determine the upstream impacts, the amount of increase at XS 33830 in the downstream model was added to the water surface elevation at the downstream most cross section in the upstream model. The upstream model was run and water surface elevations compared to existing conditions to determine the upstream extent of impacts.

The flows were taken from the base condition model and remain unchanged for this analysis. The 100-year flow in the downstream model is 32,000 cubic feet per second (cfs) and all water surface elevations reported in this memo correspond to this design flow. The 100-year flow in the

upstream model is 23,900 cfs, while the maximum capacity flow is 32,400 cfs. The maximum capacity flow in the upstream model was used to assess impacts since this flow corresponded closely with the 100-year flow in the downstream model.

Existing Condition

Four survey cross-sections were inserted into the base condition model, two cross sections at each of the proposed SD 100 Bridge alignments (Figure 2). The cross-sections are based on survey data acquired during the preliminary design of SD 100 and Lidar data flown April 2012 and provided by the City of Sioux Falls. The addition of these four cross-sections caused a maximum of 0.05-ft rise near Timberline bridge.

Proposed Condition

Both proposed crossing locations were analyzed with the following bridge geometry:

- a 780-foot long bridge centered over the main channel,
- 3-foot diameter piers,
- 2:1 abutments,
- 100 feet long spans, and
- low chord 5 feet above the 100-year water surface elevation.

For the Revised Build Alternative, the bridge embankment does not encroach on the floodway and only the piers are in the floodway. However, Alternatives 4, 4a, 7, and 8 Big Sioux River crossing the floodway is approximately 1300-ft wide, and both the proposed bridge embankment and piers encroach on the floodway.

A scenario with the Timberline Avenue Bridge removed from the Alternative 4, 4a, 7, and 8 crossing was evaluated and compared to the model run with Timberline Avenue Bridge.

Results

The Revised Build Alternative resulted in a 0.16-ft rise in the water surface elevations upstream of the structure, a 0.01-ft rise at the tie-in with the upstream model, and the 100-year water surface elevation impacts intersect with the existing model 5.9 miles upstream of the proposed structure.

The Alternatives 4, 4a, 7, and 8 bridge crossing resulted in a 0.26-ft increase in water surface elevations upstream of the proposed structure, a 0.03-ft rise at the tie-in with the upstream model, and 100-year water surface elevation impact intersect with the existing model 6.0 miles upstream of the proposed structure.

The proposed condition Revised Build Alternative and Alternatives 4, 4a, 7, and 8 models were run without the existing Timberline Avenue Bridge and embankment. The estimated impact area due to the Revised Build Alternative bridge with the Timberline Bridge removed is just upstream of Timberline (0.9 miles). The estimated impact area due to Alternatives 4, 4a, 7, and 8 bridge and Timberline Bridge removed projects to just downstream of I-229 (3.6 miles).

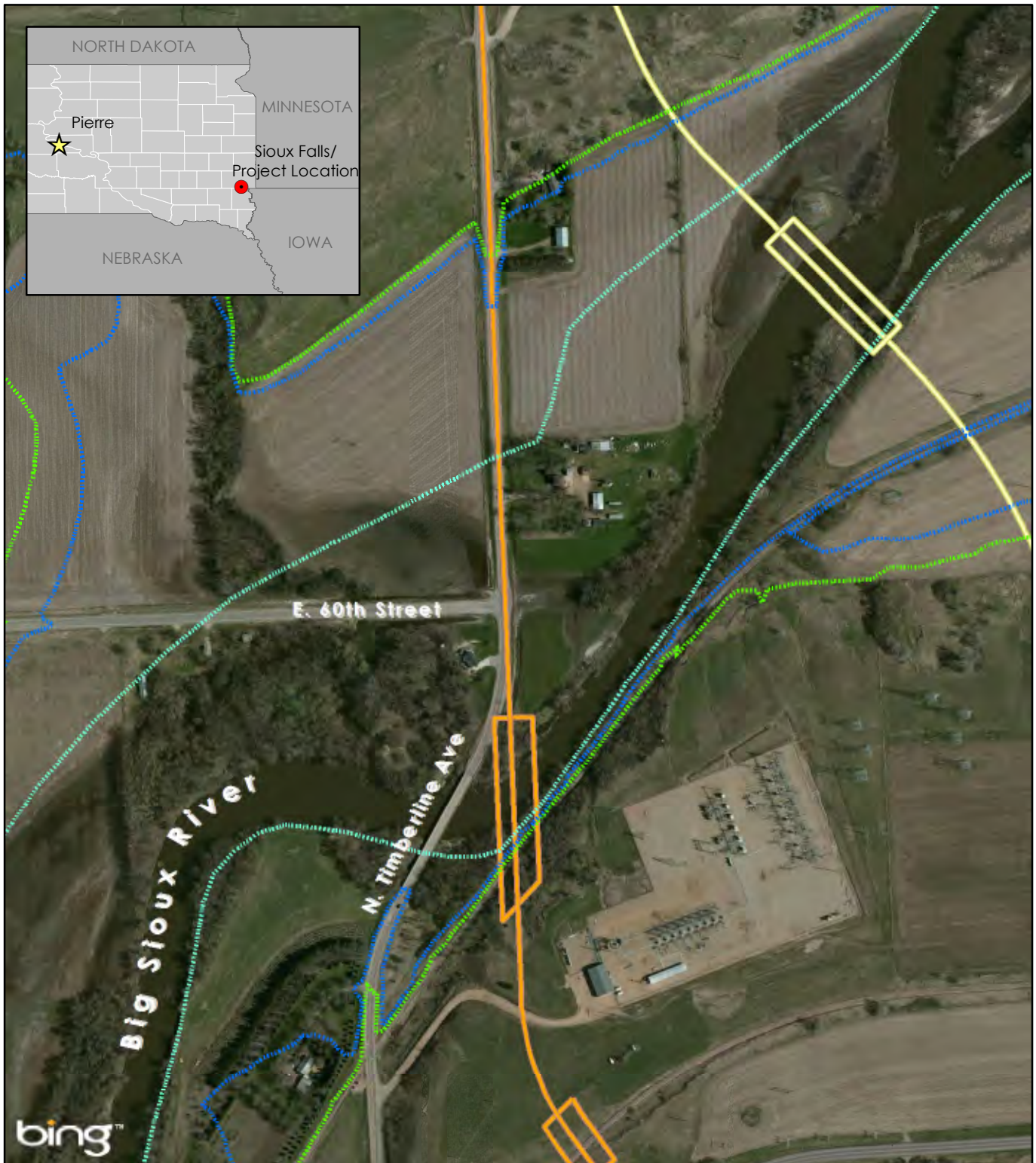
See the attached tables and figures for model results and impacts.

Conclusions

A hydraulic analysis was conducted using available information to estimate extents of water surface elevation impacts for the purpose of the EA. A detailed hydraulic analysis was not conducted but will be required during final design. This reach of the Big Sioux River is sensitive to changes in water surface elevations. Alternatives 4, 4a, 7, and 8 alignment results in a water surface elevation

|
impact with a maximum rise of 0.26 feet and impacts that extend upstream approximately 6.0 miles upstream. The Revised Build Alternative results in a 0.16 feet rise and the impacts extend approximately 5.9 miles upstream. The removal of the existing Timberline bridge will reduce the impacted area for both alternatives. The proposed alignments are in a detailed FEMA study area and both alignments include fill in the floodway.

Appendix D



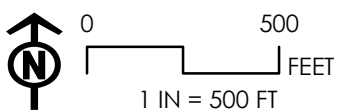
LEGEND

Proposed Alignments

- Revised Build Alternative
- Alternatives 4, 4a, 7 & 8

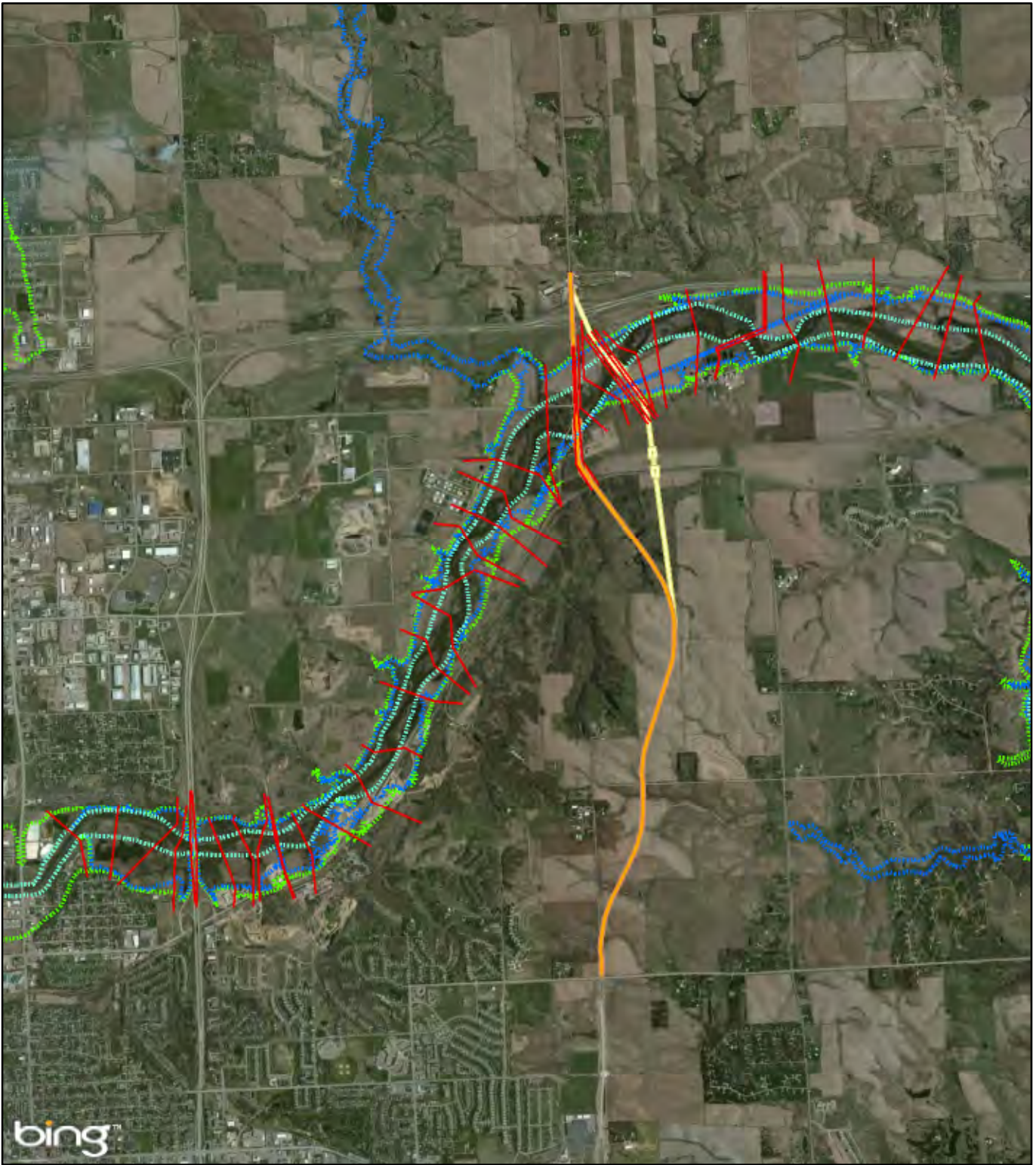
FEMA SHFA

- ⋯ Floodway
- ⋯ 100 Year
- ⋯ 500 Year



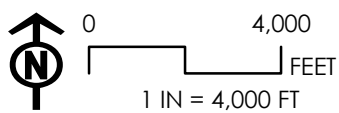
**Figure 1. Project Location Map
Proposed SD-100 Alignments
City of Sioux Falls, South Dakota**





LEGEND

- Modeled Cross-Sections
- ⋯ FEMA SHFA Floodway
- Proposed Alignments Revised Build Alternative
- ⋯ 100 Year
- Alternatives 4, 4a, 7 & 8
- ⋯ 500 Year



**Figure 2. HEC-RAS Model Setup
Proposed SD-100 Alignments
City of Sioux Falls, South Dakota**



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Attachment A
HEC RAS Results

Appendix D

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	River Sta	Base Condition			Existing Condition			Revised (Alt 1)		Alt 4, 4a, 7, and 8		Alt1 No Timberline		Alt4 No Timberline	
		W.S. Elev (ft)	W.S. Elev (ft)	Δ (ft)	W.S. Elev (ft)	Δ (ft)	W.S. Elev (ft)	Δ (ft)	W.S. Elev (ft)	Δ (ft)	W.S. Elev (ft)	Δ (ft)	W.S. Elev (ft)	Δ (ft)	
HEC-RAS: SF_FEMA.prj FLOW = 32,400 CFS	12.07865	1324.63	1324.63	0	1324.63	0	1324.63	0	1324.64	0.01	1324.63	0	1324.63	0	
	11.96796	1324.63	1324.63	0	1324.63	0	1324.63	0	1324.64	0.01	1324.63	0	1324.63	0	
	10.79588	1323.73	1323.73	0	1323.73	0	1323.73	0	1323.74	0.01	1323.73	0	1323.73	0	
	10.23909	1322.87	1322.87	0	1322.87	0	1322.87	0	1322.88	0.01	1322.87	0	1322.87	0	
	10.1932	1322.76	1322.76	0	1322.76	0	1322.76	0	1322.77	0.01	1322.76	0	1322.76	0	
	10.144	NORTH CLIFF AVE BRIDGE													
	10.09603	1322.31	1322.31	0	1322.31	0	1322.32	0.01	1322.32	0.01	1322.31	0	1322.31	0	
	10.04086	1322.34	1322.34	0	1322.35	0.01	1322.36	0.02	1322.36	0.02	1322.34	0	1322.35	0.01	
	9.36074	1321.89	1321.89	0	1321.89	0	1321.90	0.01	1321.90	0.01	1321.89	0	1321.89	0	
	7.78161	1321.08	1321.08	0	1321.09	0.01	1321.10	0.02	1321.10	0.02	1321.08	0	1321.09	0.01	
7.696877	1321.03	1321.03	0	1321.04	0.01	1321.05	0.02	1321.05	0.02	1321.03	0	1321.04	0.01		
6.152494	1320.65	1320.65	0	1320.66	0.01	1320.67	0.02	1320.67	0.02	1320.65	0	1320.66	0.01		
5.127379	1320.49	1320.49	0	1320.50	0.01	1320.52	0.03	1320.52	0.03	1320.49	0	1320.5	0.01		
4.273776	1319.88	1319.88	0	1319.88	0	1319.90	0.02	1319.90	0.02	1319.88	0	1319.88	0		
4.164614	1319.55	1319.55	0	1319.56	0.01	1319.58	0.03	1319.58	0.03	1319.55	0	1319.56	0.01		
4.117	I-229 BRIDGE														
4.069033	1319.38	1319.38	0	1319.39	0.01	1319.41	0.03	1319.41	0.03	1319.38	0	1319.39	0.01		
3.92641	1319.36	1319.36	0	1319.37	0.01	1319.39	0.03	1319.39	0.03	1319.36	0	1319.37	0.01		
3.209207	1319.13	1319.13	0	1319.14	0.01	1319.16	0.03	1319.16	0.03	1319.13	0	1319.14	0.01		
Tie-in location --> HEC-RAS: SD-100.prj FLOW = 32,000 CFS	33830	1319.13	1319.13	0	1319.14	0.01	1319.16	0.03	1319.16	0.03	1319.13	0	1319.14	0.01	
	33178	1319.04	1319.04	0	1319.05	0.01	1319.07	0.03	1319.07	0.03	1319.04	0	1319.05	0.01	
	32611	1318.8	1318.80	0	1318.81	0.01	1318.83	0.03	1318.83	0.03	1318.80	0	1318.81	0.01	
	32183	1318.08	1318.09	0.01	1318.09	0	1318.12	0.03	1318.12	0.03	1318.09	0	1318.10	0.01	
	32159	BAHNSON AVE BRIDGE													
	32135	1317.94	1317.94	0	1317.95	0.01	1317.97	0.03	1317.97	0.03	1317.94	0	1317.95	0.01	
	31389	1317.72	1317.73	0.01	1317.73	0	1317.76	0.03	1317.76	0.03	1317.73	0	1317.74	0.01	
	30596	1317.29	1317.29	0	1317.30	0.01	1317.33	0.04	1317.33	0.04	1317.29	0	1317.31	0.02	
	29050	1316.43	1316.43	0	1316.44	0.01	1316.48	0.05	1316.48	0.05	1316.43	0	1316.45	0.02	
	27729	1315.97	1315.97	0	1315.98	0.01	1316.03	0.06	1316.03	0.06	1315.97	0	1315.99	0.02	
	25855	1314.53	1314.54	0.01	1314.55	0.01	1314.61	0.07	1314.61	0.07	1314.54	0	1314.57	0.03	
24442	1314.3	1314.32	0.02	1314.33	0.01	1314.4	0.08	1314.4	0.08	1314.31	-0.01	1314.35	0.03		
23332	1314.12	1314.14	0.02	1314.15	0.01	1314.23	0.09	1314.23	0.09	1314.13	-0.01	1314.17	0.03		
21717	1313.12	1313.14	0.02	1313.15	0.01	1313.26	0.12	1313.26	0.12	1313.13	-0.01	1313.18	0.04		
20340	1311.93	1311.95	0.02	1311.97	0.02	1312.11	0.16	1312.11	0.16	1311.94	-0.01	1312.02	0.07		
19481	1311.93	1311.96	0.03	1311.98	0.02	1312.12	0.16	1312.12	0.16	1311.95	-0.01	1312.02	0.06		
18446	1311.43	1311.46	0.03	1311.49	0.03	1311.66	0.20	1311.66	0.20	1311.45	-0.01	1311.54	0.08		
17340	1311.1	1311.13	0.03	1311.16	0.03	1311.35	0.22	1311.35	0.22	1311.11	-0.02	1311.22	0.09		
15984	1310.74	1310.78	0.04	1310.81	0.03	1311.02	0.24	1311.02	0.24	1310.77	-0.01	1310.89	0.11		
15439	1310.6	1310.64	0.04	1310.67	0.03	1310.89	0.25	1310.89	0.25	1310.66	0.02	1310.78	0.14		
15408	TIMBERLINE AVE BRIDGE														
15377	1310.52	1310.57	0.05	1310.68	0.11	1310.83	0.26	1310.83	0.26	1310.67	0.10	1310.79	0.22		
15242		1310.21		1310.34	0.13	1310.08	-0.13	1310.08	-0.13	1310.35	0.14	1310.1	-0.11		
15145	ALTERNATIVE 4, 4A, 7, & 8 BRIDGE														
15047		1310.14		1310.27	0.13	1309.96	-0.18	1309.96	-0.18	1310.3	0.16	1310.00	-0.14		
14612	1309.79	1309.82	0.03	1309.97	0.15	1309.82	0	1309.82	0	1309.97	0.15	1309.82	0		
13808	1309.58	1309.61	0.03	1309.77	0.16	1309.61	0	1309.61	0	1309.77	0.16	1309.61	0		
13103		1309.50		1309.60	0.10	1309.50	0	1309.50	0	1309.6	0.10	1309.50	0		
13099	REVISED BUILD ALTERNATIVE BRIDGE														
12807		1309.33		1309.30	-0.03	1309.33	0	1309.33	0	1309.30	-0.03	1309.33	0		
12487	1309.29	1309.29	0	1309.29	0	1309.29	0	1309.29	0	1309.29	0	1309.29	0		
11315	1308.94	1308.94	0	1308.94	0	1308.94	0	1308.94	0	1308.94	0	1308.94	0		
10197	1308.51	1308.51	0	1308.51	0	1308.51	0	1308.51	0	1308.51	0	1308.51	0		
8009	1308.04	1308.04	0	1308.04	0	1308.04	0	1308.04	0	1308.04	0	1308.04	0		
7967	BURLINGTON NORTHERN RAILROAD BRIDGE														
7910	1306.39	1306.39	0	1306.39	0	1306.39	0	1306.39	0	1306.39	0	1306.39	0		
6166	1305.47	1305.47	0	1305.47	0	1305.47	0	1305.47	0	1305.47	0	1305.47	0		
4847	1304.67	1304.67	0	1304.67	0	1304.67	0	1304.67	0	1304.67	0	1304.67	0		
3661	1304.29	1304.29	0	1304.29	0	1304.29	0	1304.29	0	1304.29	0	1304.29	0		
2595	1304.15	1304.15	0	1304.15	0	1304.15	0	1304.15	0	1304.15	0	1304.15	0		
1520	1303.97	1303.97	0	1303.97	0	1303.97	0	1303.97	0	1303.97	0	1303.97	0		
39	1303.72	1303.72	0	1303.72	0	1303.72	0	1303.72	0	1303.72	0	1303.72	0		

	EXISTING UPDATE	BSR ALT1	BSR ALT4	BSR ALT1 - NT	BSR ALT4 - NT
Change at tie-in location	0 ft	0.01 ft	0.03 ft	0 ft	0.01 ft
Change U/S proposed structure	- ft	0.1 ft	-0.13 ft	0.1 ft	-0.11 ft
Impacted extents	- ft	21,342 ft	19,217 ft	11,954 ft	19,217 ft
Maximum rise	0.05 ft	0.16 ft	0.26 ft	0.16 ft	0.22 ft

FLOW = 32,400 CFS

	River Sta	FEMA BASE		FEMA + BSR-EX		FEMA + BSR ALT1		FEMA + BSR ALT4		BSR ALT1 NO TIMB		BSR ALT4 NO TIMB	
		W.S. Elev (ft)	W.S. Elev (ft)	Δ (ft)	W.S. Elev (ft)	Δ (ft)	W.S. Elev (ft)	Δ (ft)	W.S. Elev (ft)	Δ (ft)	W.S. Elev (ft)	Δ (ft)	
BIG SIOUX RIVER - PHASE 1B	12.07865	1323.83	1324.63	0.8	1324.63	0	1324.64	0.01	SAME AS FEMA + BSR-EX NO CHANGE FROM EXISTING CONDITIONS	SAME AS FEMA + BSR-ALT1			
	11.96796	1323.82	1324.63	0.81	1324.63	0	1324.64	0.01					
	10.79588	1322.75	1323.73	0.98	1323.73	0	1323.74	0.01					
	10.23909	1321.72	1322.87	1.15	1322.87	0	1322.88	0.01					
	10.1932	1321.58	1322.76	1.18	1322.76	0	1322.77	0.01					
	10.144	NORTH CLIFF AVE BRIDGE											
	10.09603	1321	1322.31	1.31	1322.31	0	1322.32	0.01					
	10.04086	1321.03	1322.34	1.31	1322.35	0.01	1322.36	0.02					
	9.36074	1320.39	1321.89	1.5	1321.89	0	1321.9	0.01					
	7.78161	1319.15	1321.08	1.93	1321.09	0.01	1321.1	0.02					
	7.696877	1319.08	1321.03	1.95	1321.04	0.01	1321.05	0.02					
	6.152494	1318.26	1320.65	2.39	1320.66	0.01	1320.67	0.02					
	5.127379	1317.88	1320.49	2.61	1320.5	0.01	1320.52	0.03					
	4.273776	1316.74	1319.88	3.14	1319.88	0	1319.9	0.02					
	4.164614	1316.15	1319.55	3.4	1319.56	0.01	1319.58	0.03					
	4.117	I-229 BRIDGE											
	4.069033	1315.71	1319.38	3.67	1319.39	0.01	1319.41	0.03					
	3.92641	1315.59	1319.36	3.77	1319.37	0.01	1319.39	0.03					
	3.209207	1314.56	1319.13	4.57	1319.14	0.01	1319.16	0.03					

BIG SIOUX RIVER - PHASE 1B	FEMA + BSR-EX	FEMA + BSR ALT1	FEMA + BSR ALT4	FEMA + BSR ALT1-NT	FEMA + BSR ALT4-NT
Increase in WSE from BSR model	- ft	0.01 ft	0.03 ft	0 ft	0.01 ft
Impacted extents	- ft	6,888 ft	8,926 ft	0 ft	6,888 ft
Maximum rise	4.57 ft	0.01 ft	0.03 ft	0 ft	0.01 ft

DIVERSION CHANNEL - BELOW THE WEIR	FEMA + BSR-EX	FEMA + BSR ALT1	FEMA + BSR ALT4	FEMA + BSR ALT1-NT	FEMA + BSR ALT4-NT
Increase in WSE from BSR model	- ft	0.01 ft	0.03 ft	0 ft	0.01 ft
Impacted extents	- ft	256 ft	256 ft	0 ft	256 ft
Maximum rise	1 ft	0.01 ft	0.01 ft	0 ft	0.01 ft

BIG SIOUX RIVER - PH2 DOWN & SEC 22	FEMA + BSR-EX	FEMA + BSR ALT1	FEMA + BSR ALT4	FEMA + BSR ALT1-NT	FEMA + BSR ALT4-NT
Increase in WSE from BSR model	- ft	0.01 ft	0.03 ft	0 ft	0.01 ft
Impacted extents	- ft	4,111 ft	4,111 ft	0 ft	4,111 ft
Maximum rise	0.76 ft	0.01 ft	0.01 ft	0 ft	0.01 ft

TOTAL	FEMA + BSR-EX	FEMA + BSR ALT1	FEMA + BSR ALT4	FEMA + BSR ALT1-NT	FEMA + BSR ALT4-NT
Impacted extents in BSR model	-	21,342 ft	19,217 ft	11,954 ft	19,217 ft
Total Impacted Length	-	32,598 ft	32,511 ft	11,954 ft	30,473 ft
Maximum rise	0.05 ft	0.16 ft	0.26 ft	0.16 ft	0.22 ft

APPENDIX E

WETLAND FINDING

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**South Dakota Department of Transportation
Federal Highway Administration**

E.O. 11990 – Wetland Finding

FOR

East Side Corridor (SD100)

Minnehaha County
South Dakota

September 2014

This action complies with Executive Order 11990, Protection of Wetlands

Approved

FHWA Environmental Engineer

Date

Approved

SDDOT Environmental Engineer

Date

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South Dakota Department of Transportation

Federal Highway Administration

E.O. 11990 Wetland Finding

This statement sets forth the basis for a preliminary finding that there is no practicable, prudent or economical alternative to the placing of fill for highway construction in certain wetlands within the future right-of-way of the proposed Northern Segment of SD100 (see Attachment A, Figure 1). All practicable measures to minimize the fill areas and to reduce harm to wetlands have been taken.

Project Description

The proposed project would consist of a new limited access principal arterial roadway being planned to address future transportation system needs and consists of a paved roadway that will connect I-29 to I-90. During the coordination for the EA, FHWA and SDDOT determined the northern portion of the alignment from the interchange of I-90 and N. Timberline Avenue to south of Madison Street (the Northern Segment) to be completed separately from the southern portion of the roadway. The southern portion from the interchange at I-29 and County Road 106 to south of 26th Street is referred to as the Southern Segment. This wetland finding focuses on the SD100 Northern Segment. The roadway would accommodate six lanes with turning lanes at each identified full-intersection locations.

The proposed construction for the preferred alternative would be phased, therefore the following are the SDDOT designated segments within the most recent Statewide Transportation Improvement Plan (STIP):

- Madison to Maple- From Madison Street to Maple Street in Sioux Falls, Grading, Storm Sewer, Curb and Gutter, & PCC Paving
- Maple to Rice- Maple Street to Rice Street, Grading & Surfacing
- I-90 to Rice- I-90 to Rice Street, Construct 4 lane urban section as part of SD100
- I-90 Interchange- I-90 EBL, Exit 402, Construct Interchange

See Chapter 2, Alternatives, in the SD100 Northern Segment EA for further discussion of the proposed roadway.

Alternatives Considered

The range of build alternatives considered for this Project include: the 2003 EA Preferred Alternative, Revised Build Alternative, Alternatives 1-8, and Alternative 4a. The 2003 EA Preferred Alternative was eliminated from further analysis due to no longer meeting the purpose and need for the Project. The 2003 EA Preferred Alternative was eliminated during the preliminary evaluation of the alternatives. Alternatives 5, 6, and 8 were eliminated from further analysis due to not meeting design standards. After the preliminary evaluation, the Study Advisory Team met on May 21, 2013 to identify and initiate the discussion on the benefits and drawbacks of each of the remaining build alternatives (Alternatives 1, 2, 3, 4, 4a, and 7). Following this discussion, Revised Build Alternative and Alternatives 1, 2, and 3 were eliminated from further analysis due to the existing WAPA and Xcel utilities causing major complications to the construction of the bridge. A memorandum was completed to describe the alternatives discussion in further detail (see Appendix A of the Northern Segment SD100 EA).

Within the EA, three build alternatives were pulled forward for further analysis. The three build alternatives include: Alternative 4, Alternative 4a, and Alternative 7. Alternative 4a has been recommended as the preferred alternative.

Basis for Determining the Proposed Action Includes All Practicable Measures to Minimize Harm to Wetlands

Mitigation measures to minimize adverse impacts to wetlands were discussed and considered throughout all aspects of the planning and design of the project. Impacts to wetlands and other waters of the U.S. were considered for all build alternatives. A document was developed that analyzed all impacts and compared the alternatives. This document was coordinated with the U.S. Army Corps of Engineers (USACE) to coordinate the preferred alternative selected to determine if it would be considered also as the Least Environmentally Damaging Practicable Alternative¹ (LEDPA).

Impacted Wetlands

Wetland impact analysis for the preferred alternative was completed utilizing delineated wetlands and preliminary working limits. Preliminary working limits for Alternative 4a were completed for the EA. If a Finding of No Significance Impact (FONSI) is approved for the preferred alternative, this alternative would move forward into final design. The final design working limits will be utilized to determine the final wetland impact numbers for the preferred alternative and will be compared to what is noted here and in the Section 404 permit. If the calculations differ, the wetland finding and Section 404 will be amended.

The preferred alternative would impact a total of 5.03 acres of wetlands. A summary of the wetland impacts is presented below, by identified segments of the preferred alternative. Also, Table 2 summarizes the impacts to other waters of the U.S. (WUS). Wetland and WUS numbers correspond to their identified locations on Figures 2 through 4 (see Attachment A, Figures). Efforts to minimize wetland impacts would be incorporated into the final design.

Table 1. SD100 Northern Segment Wetland Impacts

Identified Segment	Wetland No.	Impact Area within Preliminary Limits (Acres)
Madison to Maple	3	0.38
	4	0.20
	19	0.27
	23	0.01
Maple to Rice	16	1.66
	2	0.08
I-90 to Rice	1	0.15
	17	0.46
	18	0.31
	12	0.02
	14	0.10
	15	0.05
I-90 Interchange	9	0.97
	10	0.21
	11	0.16
Total		5.03

¹ HDR, March 2014. SD100 Preliminary LEDPA Evaluation.

Table 2. SD100 Northern Segment Other Waters of the U.S. Impacts

Identified Segment	WUS No.	Impact Area within Preliminary Limits (Linear Feet)
Madison to Maple	N/A	0
Maple to Rice	WUS1- Culvert	170
	WUS1- Realignment	375
I-90 to Rice	WUS1- Culvert	480
	WUS2- Culvert	75
	WUS3- Bridge	145
I-90 Interchange	N/A	0
Total		1,245

Mitigation Goals

The preferred alternative would be completed in phases due to cost. In order to accurately identify, avoid, and mitigate the wetland areas, each phase will follow this procedure to ensure a Section 404 permit is obtained and remains valid before construction can begin.

- As a phase of the Project is identified and final design is initiated, it would need to be confirmed that the entire Study Area has been delineated. In any areas where a field delineated has not been performed, it would be completed. The wetland delineation would follow the following methodology: 1987 Corps of Engineers Wetland Delineation Manual (USACE, 1987) and the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Great Plains Region (USACE, 2010).
- After the wetland delineation is completed, the final design process will consider wetland impacts by attempting to avoid wetland areas, minimizing impacts to wetland areas that cannot be avoided, and mitigating for impacts.
- Wetlands which cannot be avoided will be mitigated through the use of an off site, on site, or mitigation bank.
- A 404 permit application will be prepared for the entire Project depending upon USACE's direction. To date, USACE has indicated the Project would be one permit application. The permit application(s) will include a wetland delineation report and mitigation plan. Assuming the Project would be an Individual Permit, the wetland permit application will be available to all responsible permitting agencies for review and approval during the required public notice of a Section 404/401 Individual Permit under the Federal Clean Water Act.
- Should it become necessary to modify or otherwise revise this finding with the completion of wetland delineation associated with the individual project's design phases, an updated Wetland Finding will be prepared and circulated for review and concurrence. This update will include a table of non-jurisdictional and jurisdictional wetland including acres of wetlands being impacted at each wetland.

Coordination

The Project and wetland finding have been and will continue to be coordinated with the following agencies:

- U.S. Fish and Wildlife Service
- SD Department of Game, Fish and Parks
- SD Department of Environment and Natural Resources

The permit application(s) will be submitted to the responsible permitting agencies for the review and approval prior to construction of the construction of the Northern Segment of SD100 in anticipation of issuance of a Section 404/401 Permit under the Clean Water Act.

Mitigation Success Criteria and Protection

Mitigation for the Project would be either through an off site, or on site. If a mitigation bank is chosen for mitigation, a potential credit methodology would be the Hydro Geomorphic (HGM) Assessment. HGM would be utilized and the credits needed to replace the function and quality of the impacted wetlands would be purchased. The determinations for mitigation will be finalized as each portion of design is finalized.

Finding

In accordance with Executive Order 11990, NEPA and the Federal Highway Act it has been determined that there is no feasible or practical alternative to the proposed construction. All practical measures to avoid wetland areas have been considered and initiated.

Appendix E


Attachment A

Figures






Appendix E

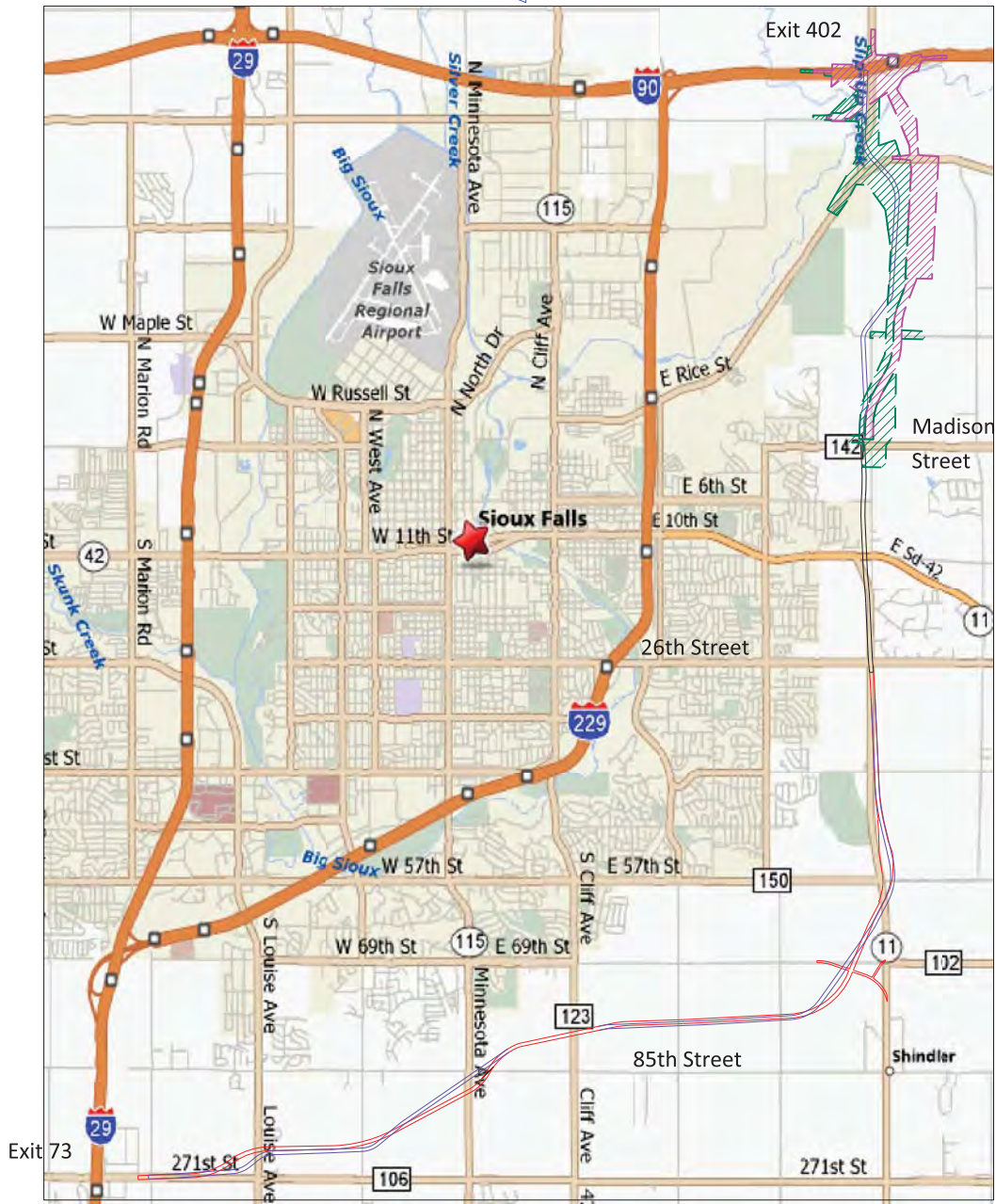
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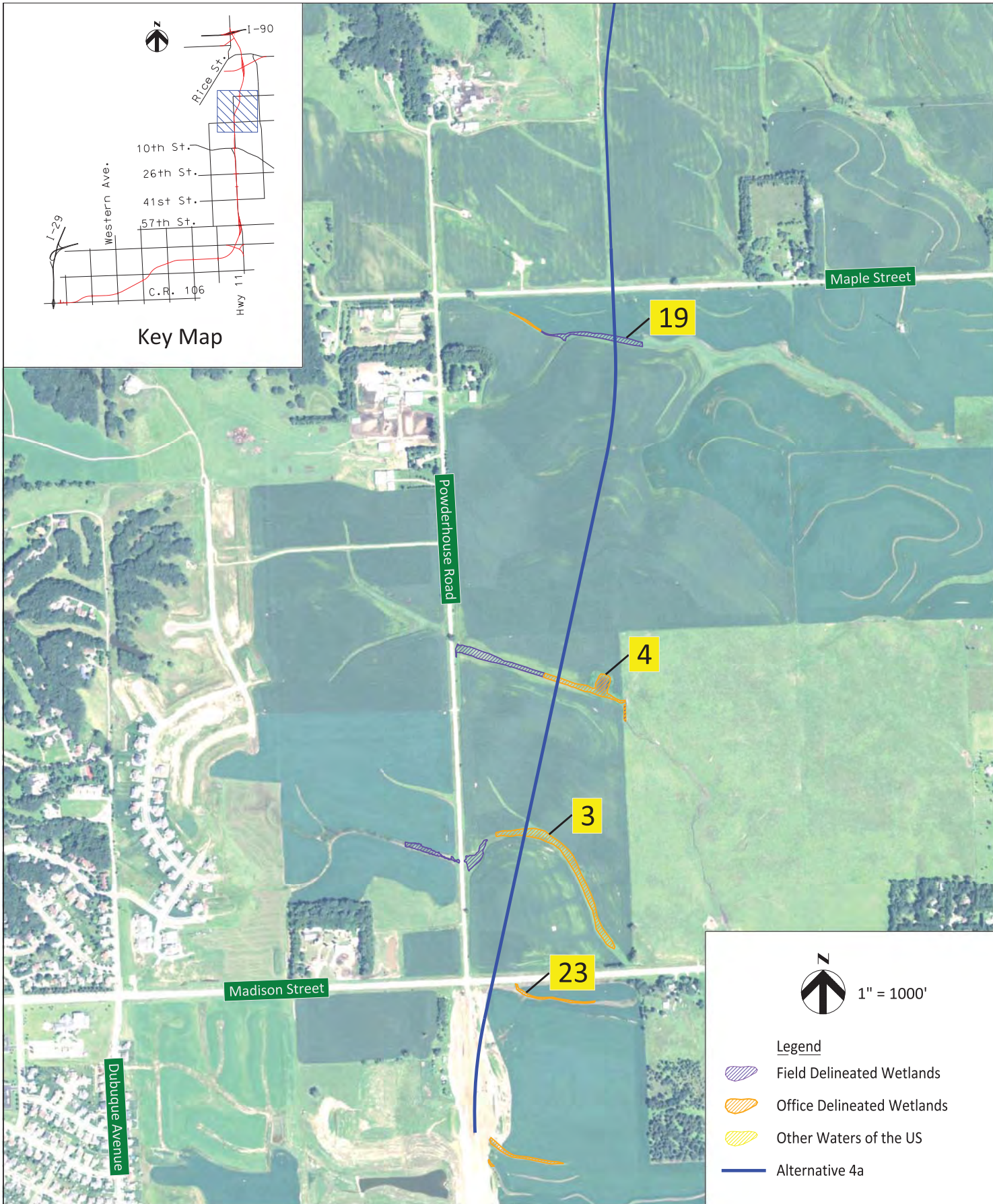
Legend

-  2003 EA Preferred Alternative
-  Revised Build Alternative (Southern Segment)
-  SDDOT Supplemental Segment
-  Previous Study Area
-  Additional Study Area



Project Location Map
Northern Segment of SD100

Figure



Date of Aerial
Photography:
2012

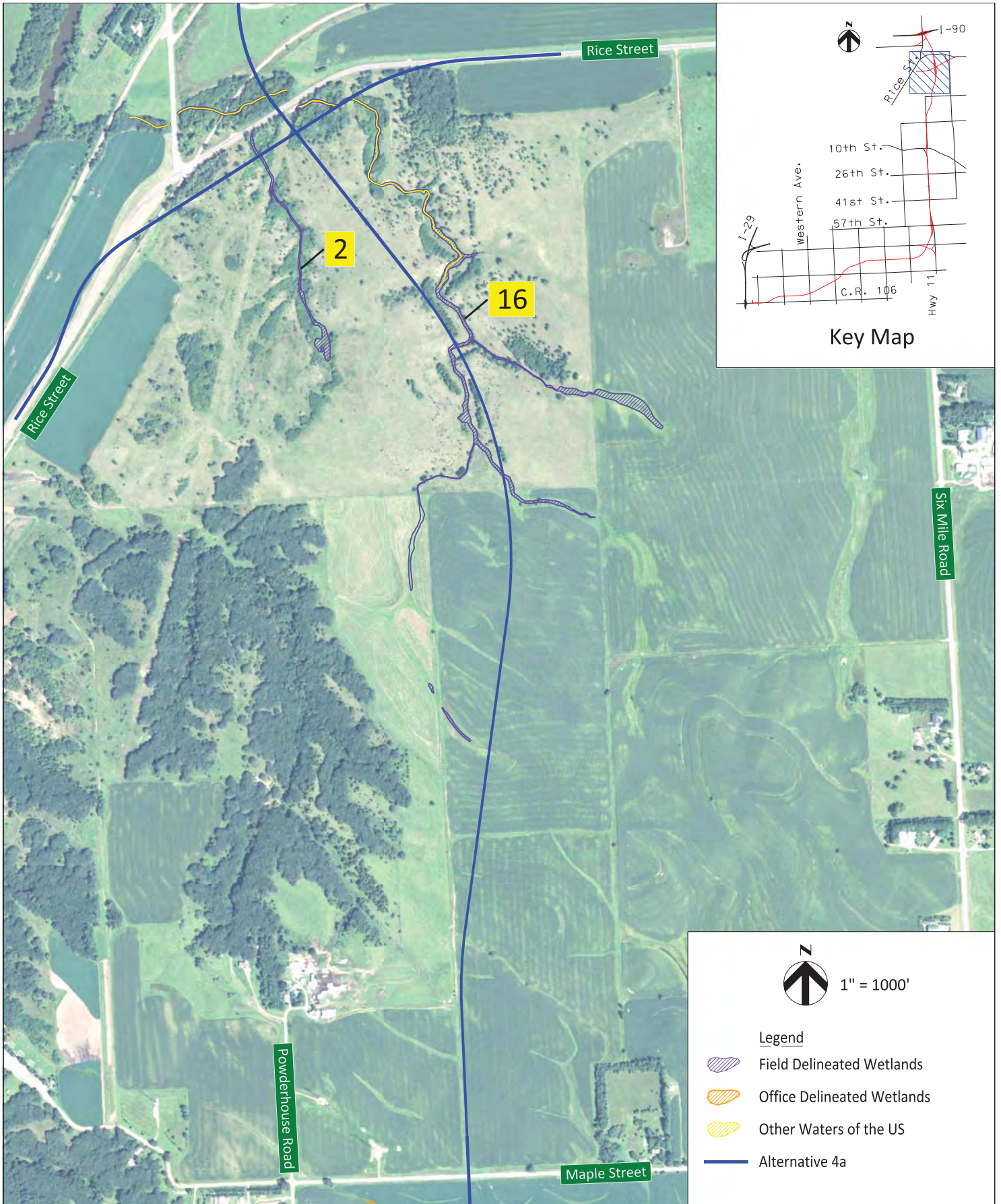


Preferred Alternative Wetland Impacts

Northern Segment of SD100

Figure

2



Date of Aerial
Photography:
2012

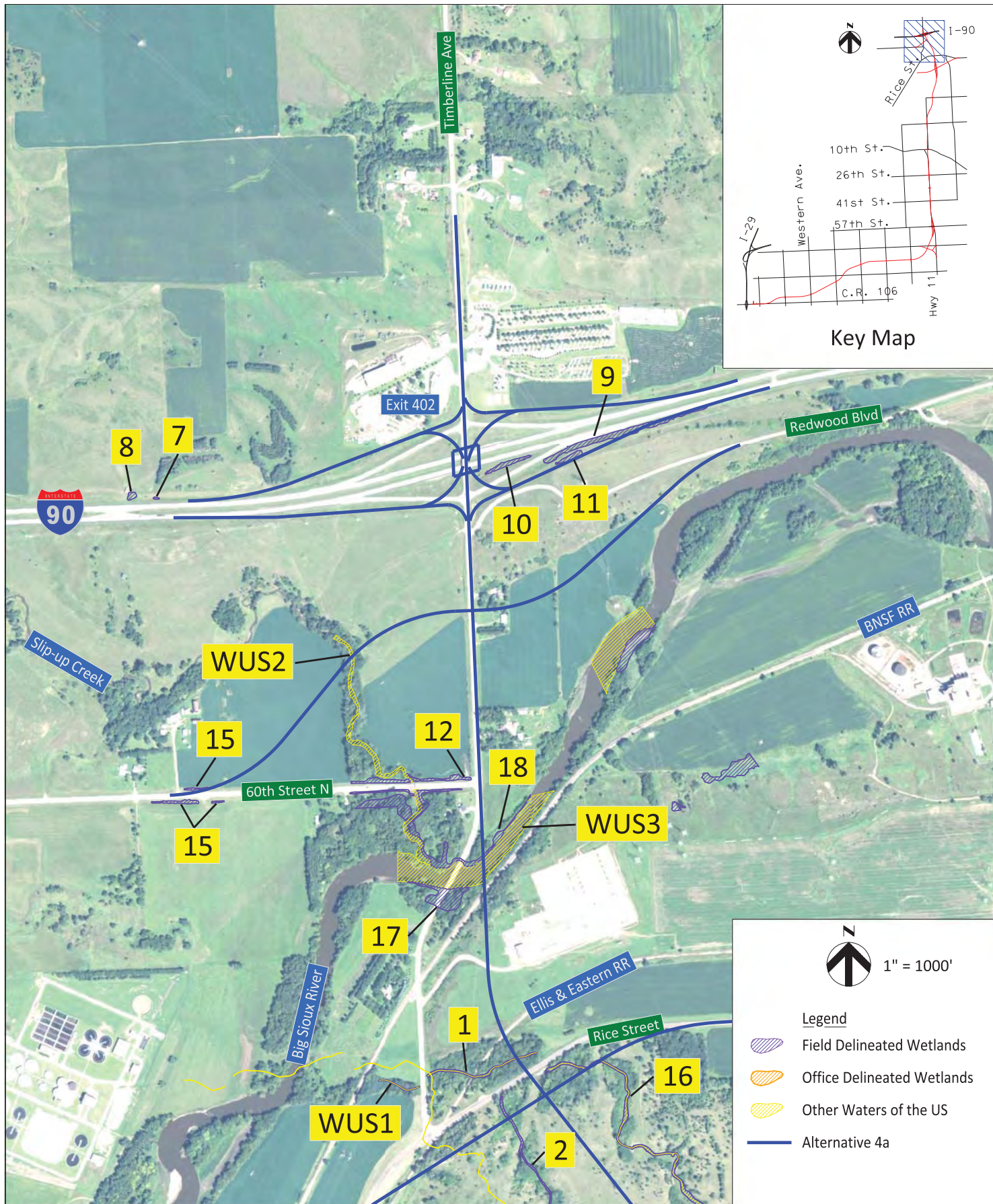


Preferred Alternative Wetland Impacts

Northern Segment of SD100

Figure

3



Date of Aerial
Photography:
2012



Preferred Alternative Wetland Impacts

Northern Segment of SD100

Figure

4