

# Technical Memorandum 6

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## US 52 Safety, Access, and Interchange Location Study Interchange Design and Evaluation

South Limits of Cannon Falls to Hader  
Goodhue County, Minnesota  
S.P. 2506-66

September 24, 2012

**Prepared For:**



**Prepared By:**



**HRG: 832470J**

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## Introduction

The primary objective of the US 52 Safety, Access, and Interchange Location Study is to address the severe safety issues along US 52 within the project area and to implement the long-term vision for US 52, which includes conversion to a fully access-controlled freeway facility. The ultimate goal for the US 52 corridor is to remove all at-grade intersections and signals, which will include the construction of an interchange in the vicinity of County State Aid Highway (CSAH) 9 or CSAH 1.

As part of the alternative development and evaluation process for the US 52 Safety, Access, and Interchange Location Study, CSAH 9 was identified as the recommended location for a future interchange along US 52, as it will best accomplish the study goals. The closure of access to US 52 at CSAH 14 and extension of CSAH 14 to CSAH 24 on the north have also been identified as recommended improvements (refer to *Technical Memorandum 4: Evaluation of Alternatives*).

The purpose of this technical memorandum is to present the analysis of alternative design concepts developed for the proposed interchange at US 52 and CSAH 9, as well as an evaluation of alternatives for the rerouting of CSAH 1, east of US 52.

### *Study Area*

The one-mile wide project area for the study is a 10-mile corridor along US 52. It extends from the southern limits of Cannon Falls in Goodhue County at the junction of Highview Road and US 52, to south of County Road (CR) 50 (near Hader). The overall project study area is shown Figure 1. The focus of this technical memorandum is the area in the vicinity of the US 52 and CSAH 9 intersection and the north-south township and county roads to the east of the intersection (i.e., 90th Ave, 100th Ave, and County Road (CR) 56).

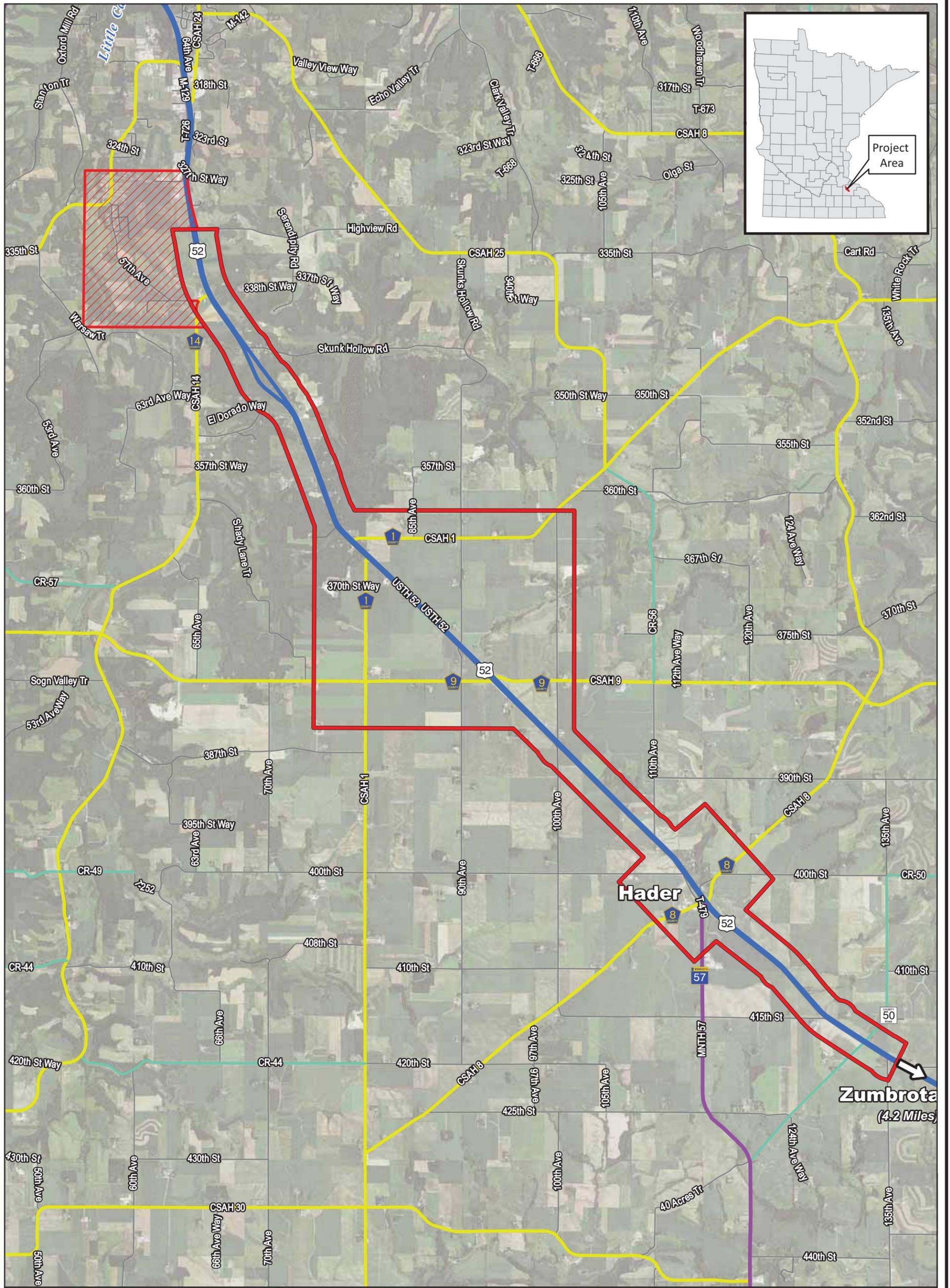
### *Planning Context and Vision*

Several local and regional planning documents have been developed to guide the existing and future transportation system of the project area. These include the Statewide Inter-Regional Corridor (IRC) planning efforts, regional corridor studies, and the Goodhue County Transportation and Comprehensive Plans. These studies establish the long term vision to “Develop US 52 as a fully access-controlled, freeway facility, in order to maintain the corridor’s function as a high-speed, high-mobility route.” In addition, a common finding of these efforts is that there is an urgent need to address the critical safety and operational problems which currently exist along US 52 within the study area. A common recommendation of these studies is to close at-grade access along US 52 overtime, in order to improve safety and operations. This includes a recommendation to construct an interchange along US 52 within the vicinity of CSAH 1 and CSAH 9. For a full assessment of the planning context of the study area, refer to Technical Memorandum 2 – Project Background.

### *Purpose and Needs Summary*

In order to identify and evaluate the range of improvements needed to accomplish the long term vision of the corridor (i.e., develop US 52 as a fully access-controlled freeway facility), a focused purpose and needs statement was developed.

The purpose of the project is to identify recommended locations for US 52 transportation system improvements that improve safety and access, enhance regional connectivity and mobility, and respect the environmental context of the area. As described above, this includes the selection of the a future interchange location along US 52 at CSAH 9, as well as related county road improvements east of US 52.

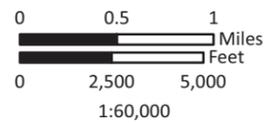


**FIGURE 1  
PROJECT AREA MAP**

**US 52 Safety, Access, and  
Interchange Location Study**

**Goodhue County, Minnesota**

- US 52 Project Study Area
- CSAH 14 Subarea
- Corporate Boundaries
- US Highway
- Minnesota Highway
- County State Aid Highway
- County Road



The following is a summary of the need statements developed for this project. Refer to Technical Memorandum 3 – Project Issues and Needs, for a detailed explanation of the project’s purpose and need.

1. Improve Safety:

Safety improvement is the primary driving factor behind this project. Based on an analysis of the most recent crash data, the US 52 and CSAH 9 intersection was identified as safety deficient because it exhibits crash frequency and severity rates higher than the district averages. In fact, based on MnDOT rankings this intersection has the second highest crash cost in the state for non-signalized intersections.<sup>1</sup> An interchange at US 52 and CSAH 9 will improve safety at this dangerous intersection.

2. Improve Access Management:

With the high amount of access points along US 52, safe and reliable mobility is difficult to achieve. An interchange at US 52 and CSAH 9 will consolidate access to US 52 and close access points within the interchange influence area.

3. Improve System Connectivity and Mobility:

As access along US 52 is closed, the supporting regional roadway networks (i.e., CSAH 14, CSAH 1, CSAH 9, etc.) will need to be improved in order to accommodate the redirected traffic which currently has direct access to US 52 and now must use the regional network to access US 52. Likewise with improvements to the regional network, local access and local connections will need to be improved and in some cases created to provide necessary property access and connectivity.

Upon construction of a US 52 interchange at CSAH 9, local connections will need to be provided for properties within the interchange influence area (i.e., two township roadways and one residential driveway) and new regional connections are required with the rerouting of CSAH 1 through the US 52/CSAH 9 interchange and along 90th Avenue, 100th Avenue, or CR 56. As described in *Technical Memorandum 5: Access Management Overview*, the interchange influence area is the distance between the end of an on/off ramp to the first driveway, median opening, or intersection, needed to accommodate merging and diverging traffic.

4. Respect Social, Economic, and Environmental Context:

As roadway improvements are implemented to address the safety, access management, connectivity and mobility, the social, economic, and environmental context needs extensive consideration. Protection of the natural environment must be weighed equally as do the social impacts encountered by the public who use the new facilities and by those who live near the facilities. An interchange at US 52 and CSAH 9 will impact the surrounding social and environmental context. Analysis of interchange design configuration will seek to minimize impacts to the surrounding landscape and social contexts.

5. Provide a Cost Effective Solution:

As improvements are developed and evaluated, cost is an important consideration. Being fiscally responsible in a time of limited resources is paramount and improvements should not only provide the most overall benefit, but also the greatest return on investment.

## Interchange Design Evaluation

Moving forward in this Technical Memorandum, discussion will center on the summary of the interchange location determination (documented in Technical Memorandum 4 – Evaluation of Alternatives), the analysis completed for the three alternatives developed for the rerouting of CSAH 1

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<sup>1</sup> Based on MnDOT crash data averages over the five year period of 2006 – 2010.

east of US 52, and the preliminary analysis completed for three interchange design configuration alternatives at US 52 and CSAH 9.

## **A. Preferred Location of Interchange**

A range of analyses and evaluations were conducted, and public input was gathered to determine the location of an interchange along US 52 at CSAH 1, CSAH 9 or in between CSAH 1 and CSAH 9 (refer to *Technical Memorandum 4: Alternative Evaluation*). A total of seven different interchange location alternatives were developed with varying types of interchange design and frontage road configurations. These alternatives were presented and evaluated based on their ability to achieve the project goals of safety, access management, connectivity and mobility, social, economic, and environmental, and cost effectiveness (i.e., purpose and need). Each goal had set measures of effectiveness used to evaluate each alternative and rate the alternative using a color scheme of green (meets goal or positive impact), yellow (neutral or no impact), and red (does not meet the goal or negative impact).

Two interchange type alternatives at US 52 and CSAH 1 (4.A - partial cloverleaf and 4.B - diamond) were evaluated and both were rated as neutral for all goals except for cost effectiveness where they were determined to not meet the goal.

For the two alternatives with an interchange located between CSAH 1 and CSAH 9 (4.C.1 – diamond and 4.C.2 - diamond with frontage road), the ratings were mostly neutral for both alternatives with one alternative receiving a negative score for access management while the other alternative received a positive score for safety.

A split diamond interchange with ramps at CSAH 1 and CSAH 9 was considered with one alternative having frontage roads along US 52 (4.D.2) while the other alternative (4.D.1) did not. These alternatives rated negatively for the cost effectiveness and social, economic, and environment goals but rated positively for the safety and connectivity and mobility goals. The alternative with frontage roads rated positively for access management while the alternative without frontage roads was rated neutral.

The remaining alternative evaluated (4.E) was a diamond interchange located at US 52 and CSAH 9. This alternative rated positively for all the goals with the exception of the mobility and connectivity goal which it rated neutral.

Based on the detailed alternatives analysis described above and the public input received, the locally supported interchange location selected was US 52 and CSAH 9. Therefore, further analysis of the US 52 and CSAH 9 interchange location was completed, including the development of preliminary design concepts and the evaluation of county road connectivity improvements east of US 52 (i.e., rerouting CSAH 1).

## **B. Interchange Concepts at CSAH 9**

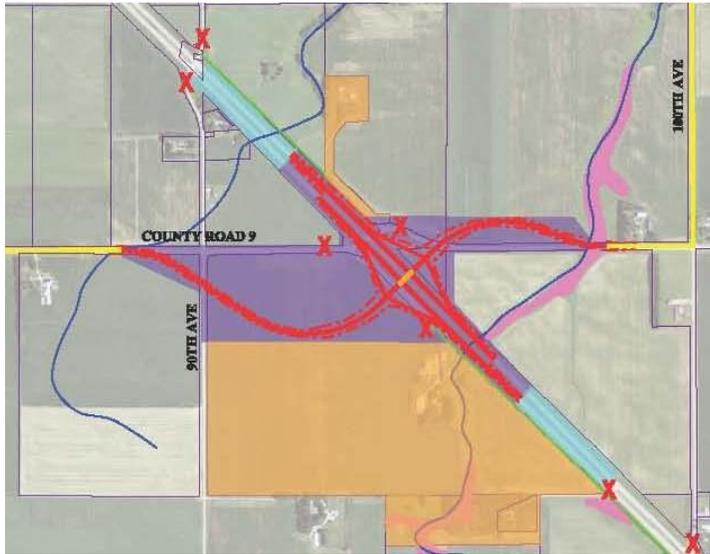
With the selection of US 52 and CSAH 9 as the locally supported interchange location, alternative interchange design concepts were developed in order to evaluate initial impacts to the surrounding area.

### ***Interchange Concept Alternatives***

Three different interchange design concepts were studied and brought to the public for comment: 4.E.1 - diamond interchange with perpendicular bridge, 4.E.2 - diamond interchange with skewed bridge, and 4.E.3 - partial cloverleaf (parclo) interchange with skewed bridge. Refer to Appendix A for full illustrations of each alternative.

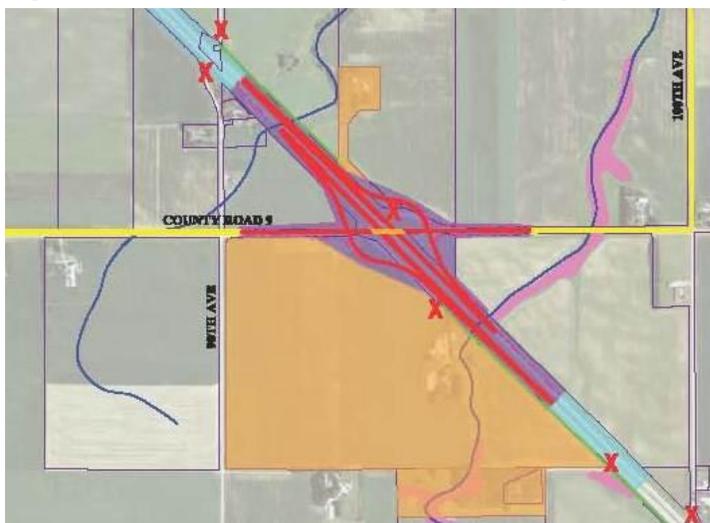
The diamond interchange with perpendicular bridge alternative (Figure 2) changes the horizontal alignment of CSAH 9 to provide a perpendicular crossing of US 52. CSAH 9 would travel over US 52 with connections between CSAH 9 and US 52 made via diagonal ramps. This route takes advantage of an existing hill along the west side of US 52 where the proposed CSAH 9 alignment crosses US 52. This alignment can be constructed with minimal impacts to existing CSAH 9.

**Figure 2: Alternative 4.E.1 – Diamond Interchange with Perpendicular Bridge**



The diamond interchange with skewed bridge alternative (Figure 3) maintains CSAH 9 on existing horizontal alignment and has the smallest right of way impact when compared to alternatives 4.E.1 and 4.E.3. CSAH 9 would travel over US 52 with connections between CSAH 9 and US 52 made via diagonal ramps.

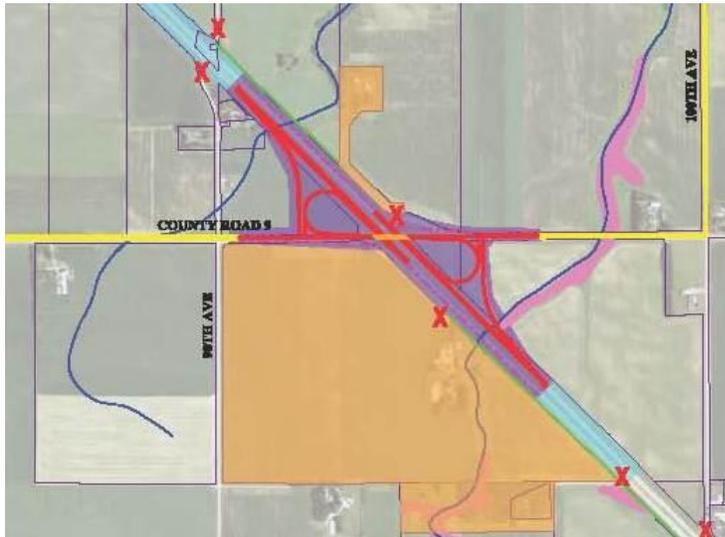
**Figure 3: Alternative 4.E.2 – Diamond Interchange with Skewed Bridge**



The parclo interchange with skewed bridge alternative (Figure 4) maintains CSAH 9 on existing horizontal alignment and minimizes the right of way and farmland impacts in the southwest and northeast quadrants. The right of way and farmland impacts in the southwest and northeast quadrants are minimized by the use of loop ramps in the northwest and southeast quadrants. All connections between US 52 and

CSAH 9 are made using diagonal ramps or loops either in the northwest or southeast quadrant. The parclo design provides loop ramps for CSAH 9 traffic entering US 52 and provides diagonal ramps for US 52 traffic exiting to CSAH 9. This alternative moves the left turn lanes from in between the southbound US 52 ramp/loop terminal and the northbound US 52 ramp/loop terminal (crossing over the bridge) and places left turn lanes at the CSAH 9 approaches prior to reaching the ramp/loop terminals. This design makes it such that the bridge width will not inhibit capacity of CSAH 9 as lengthening turn lanes on ground is easier than widening a bridge to accommodate longer turn lanes.

**Figure 4: Alternative 4.E.3 – Parclo Interchange with Skewed Bridge**



### ***Evaluation of Interchange Concept Alternatives***

Each of the three alternatives were analyzed to identify fatal flaws and to make an initial determination of how each alternative meets or doesn't meet the project goals listed below and defined in Technical Memorandum 4 – Evaluation of Alternatives.

#### **Safety**

Looking at the safety goal and the measures of effectiveness, each alternative reduces the crash rate, would improve roadway geometry and sight distance, as the interchange would be designed using current design standards. The parclo interchange with skewed bridge alternative scores lower in safety as the speed variation between the loop entrance and mainline US 52 is greater than the speed variation between the diagonal ramp and mainline US 52. Additionally, as the parclo interchange is a relatively unfamiliar type of interchange, there may be a greater learning curve as drivers become familiar with the nuances of the design.

#### **Access Management**

For the access management goal all of the alternatives close at-grade access points along US 52 and it appears there is no differentiation between the alternatives.

#### **Connectivity and Mobility**

Looking at the connectivity and mobility goal each alternative meets the goal and it appears there is no differentiation between the alternatives.

#### **Social, Economic, and Environmental**

Initial comparison of the social, economic, and environmental goal there is some differences between the alternatives. The diamond interchange with perpendicular bridge alternative (4.E.1) has the most right of

way impact and higher impacts to farmland whereas the diamond interchange with skewed bridge (4.E.2) and parclo interchange (4.E.3) with skewed bridge have less right of way impact, and less impacts to farmland especially in the southwest quadrant of the US 52 and CSAH 9 intersection.

### Cost Effectiveness

A planning level cost estimate was developed for each of the alternatives and is based on earthwork (using proposed horizontal and vertical alignment), bridge length, bituminous pavement, and right of way acquired.

The planning level cost of a skewed bridge (4.E.2 and 4.E.3) is greater than a perpendicular bridge (4.E.1) but the skewed bridge cost is offset by the reduction in land acquisition needed for construction for the perpendicular bridge alternative resulting in fairly similar costs for each interchange configuration presented.

Looking at staging strategies for each of the alternatives the diamond interchange with skewed bridge and the parclo interchange with skewed bridge alternatives would be constructed on top of the existing CSAH 9 alignment requiring CSAH 9 to be detoured or construction of a temporary bypass. The diamond interchange with perpendicular bridge alternative would have little to no impact to existing CSAH 9 traffic while under construction as the alternative follows a new alignment.

### ***Summary of Results***

The final interchange design configuration will not be selected at this phase in the project development process. Once funding has been secured, the formal environmental assessment and design process for the project can begin, at which point a detailed evaluation of interchange design alternatives will occur and a final design will be selected. By combining the three interchange design configuration footprints together, a larger, composite interchange footprint has been identified and will be used to guide future planning and development within the area. Figure 5 shows the composite Interchange Footprint.

## **C. CSAH 1 Rerouting**

In order to accomplish the safety, access management, mobility and connectivity goals of the project, the proposed interchange at US 52 and CSAH 9 would include closures of the at-grade access to US 52 within the interchange influence area (i.e., two township roadways and one residential driveway). Initially, it would also include access restrictions (i.e., right-in/right-out only) at US 52 and CSAH 1 and eventually complete closure of the existing at-grade intersection.

To maintain adequate local and regional connectivity, supporting county and local road improvements will be needed. Local roadway improvements would provide access to properties no longer served by US 52 and redirect the access to the local or regional roadway network.

Regional improvements are would be required as well with the access restrictions and future closure of access at the CSAH 1 and US 52 intersections. The proposed rerouting of CSAH 1 would begin at the existing CSAH 1 and CSAH 9 intersection. From this point CSAH 1 would follow along the CSAH 9 alignment over US 52 to one of the three alternatives identified: 90th Avenue, 100th Avenue or County Road 56 and then tie into existing CSAH 1. The existing portions of CSAH 1 from the intersection of CSAH 1 and CSAH 9 to US 52 and from US 52 to 90th Avenue, 100th Avenue or County Road 56 may be re-designated from a county road to a township road and would become the responsibility of the township.

**FIGURE 5: COMBINED INTERCHANGE  
FOOTPRINT AREA  
FOR ALTERNATIVES 4E.1 – 4.E.3**

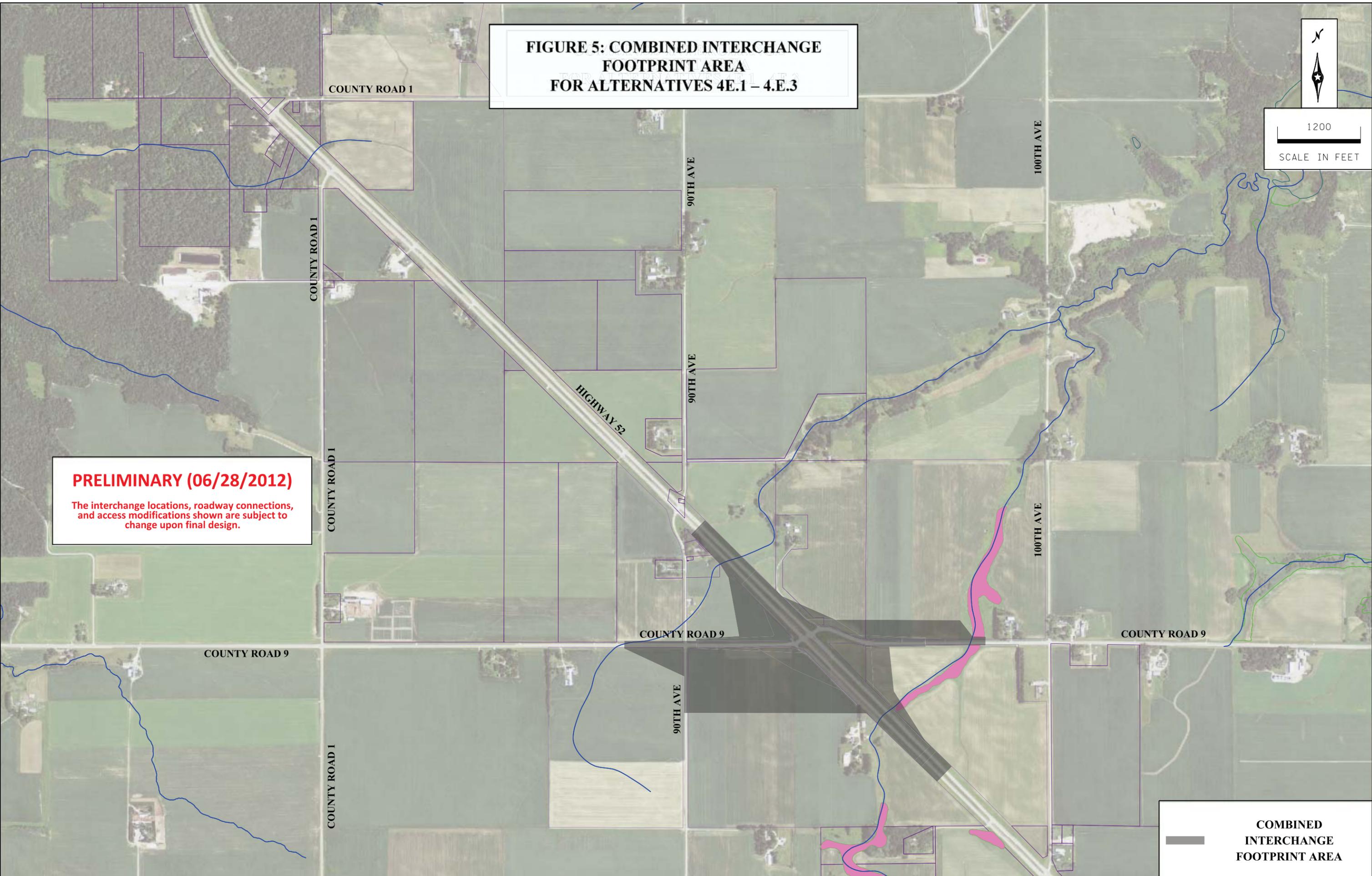


1200  
SCALE IN FEET

**PRELIMINARY (06/28/2012)**

The interchange locations, roadway connections, and access modifications shown are subject to change upon final design.

**COMBINED  
INTERCHANGE  
FOOTPRINT AREA**



### ***CSAH 1 Rerouting Alternatives***

Three CSAH 1 rerouting alternatives were studied by the project management team and brought to the public for comment: 90th Avenue, 100th Avenue, and County Road 56. Refer to Figure 6 for illustrations of each alternative. Detailed drawings of each alternative alignment are included in Appendix B.

- **90th Avenue**: The 90th Avenue route is partially on new alignment and partially on an existing township road. Beginning at the southern terminus, the 90th Avenue route follows a new alignment running approximately parallel to US 52, before tying into existing 90th Avenue and continuing north to CSAH 1. It then follows the existing CSAH 1 alignment to the east to the northern terminus point.
- **100th Avenue**: The 100th Avenue route is an existing township road and follows the existing horizontal alignment of 100th Avenue from the southern terminus at CSAH 9 to CSAH 1. It then follows CSAH 1 to the northern terminus.
- **County Road 56**: The County Road 56 route follows an existing county road from the southern terminus at CSAH 9 to CSAH 1 on the north, and then follows CSAH 1 to the northern terminus.

It should be noted that CSAH 1 and 9 are part of the County State Aid Highways system. As CSAH routes, these roads are required to meet design standards that accommodate higher traffic volumes and more heavy commercial vehicles (trucks) than County Roads or Township Roads. The connection between CSAH 1 and CSAH 9 will become a portion of CSAH 1 and therefore will need to be built to meet CSAH design standards; which include pavement strength, lane width, shoulder width, clear-zone width, and right of way width. Therefore, our analysis comparing the three potential routes includes the scenario of either building a new road on a new alignment (90th Avenue) or rebuilding the existing road to meet current CSAH standards on its current alignment (100th Avenue and County Road 56.).

### ***Evaluation of CSAH 1 Rerouting Alternatives***

#### **Safety**

Regarding the safety goal, 100th Avenue rated the highest because the horizontal alignment had the least amount of curves when compared to 90th Avenue and CR 56. 90th Avenue requires two significant horizontal curves and CR 56 also has several horizontal curves along its alignment. Additionally there is an existing limestone quarry along 100th Avenue with trucks traveling to and from the quarry daily, creating safety and mobility problems. Selecting and upgrading this alignment to CSAH design standards (including the improvement of sight lines and eliminating dust so cars and heavy trucks can better see each other along the route), would thereby improve safety and operations and is an additional benefit of selecting this route.

#### **Access Management**

County routes are expected to provide a higher degree of mobility than township roads and therefore at-grade access should be minimized based on the Goodhue County Access Management Guidelines. The 90th Avenue alternative rated the best in terms of access management as this route had the least amount of existing access points. 100th Avenue and CR 56 had more access points resulting in a lower rating.

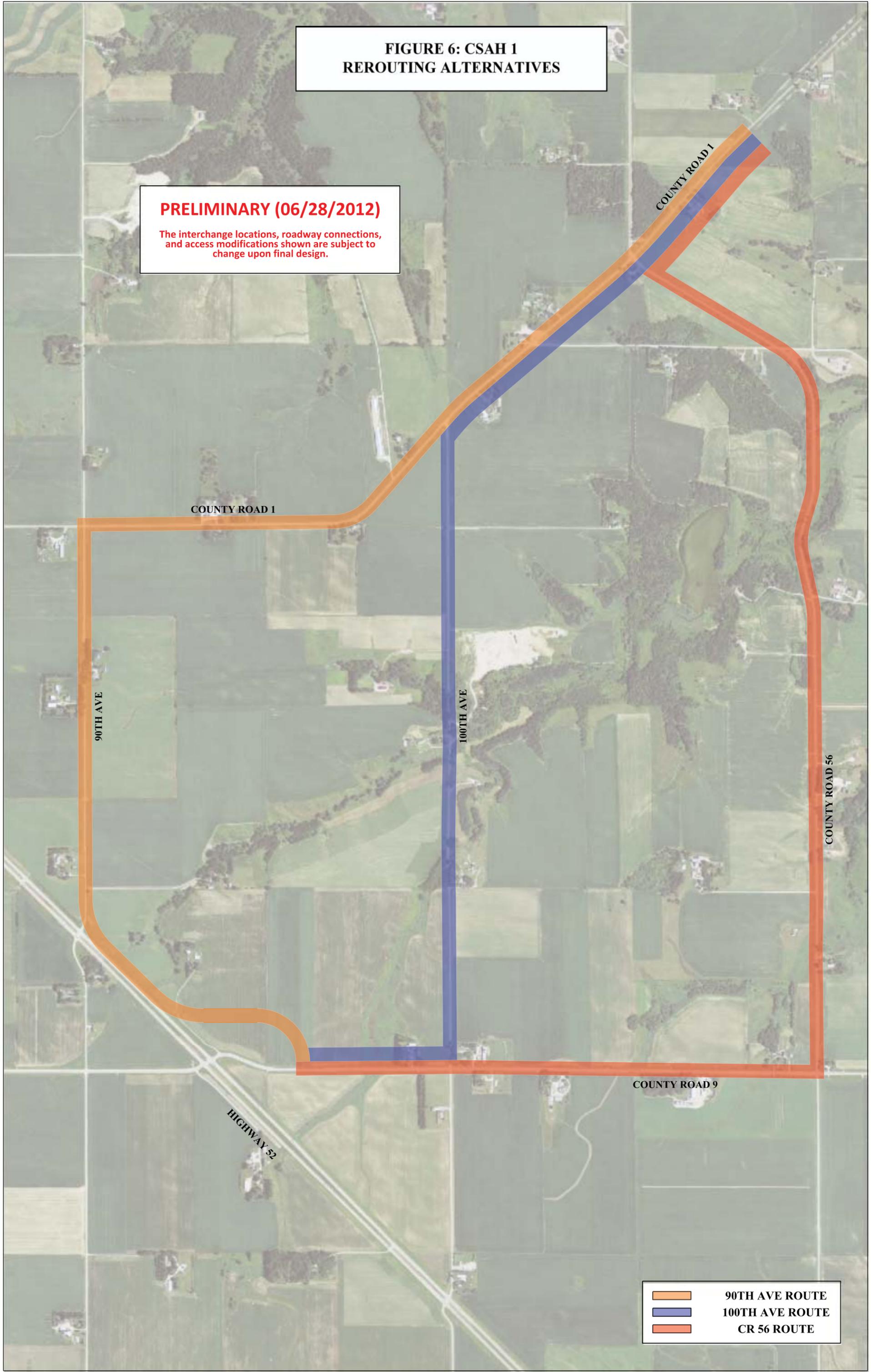
#### **Connectivity and Mobility**

For the connectivity and mobility goal, 100th Avenue route rated highly because it is the most direct route for regional through traffic, it had the lowest travel time and requires the least amount of backtracking. Both 90th Avenue and CR 56 would require drivers to backtrack, are longer routes and take longer to travel when compared against 100th Avenue. Additionally, in the future when US 52 is completely converted to a freeway facility, properties located along existing CSAH 1 and along the east side of US 52 north of CSAH 1 will have their direct access to US 52 closed. Their access will be re-routed to the interchange at CSAH 9. The rerouting of this traffic would follow along 90th Avenue, 100th Avenue or CR 56. The most direct route is desired for the rerouted traffic making CR 56 the least favorable route and 90th Avenue or 100th Avenue more favorable routes.

**FIGURE 6: CSAH 1  
REROUTING ALTERNATIVES**

**PRELIMINARY (06/28/2012)**

The interchange locations, roadway connections, and access modifications shown are subject to change upon final design.



-  90TH AVE ROUTE
-  100TH AVE ROUTE
-  CR 56 ROUTE

### Social, Economic, and Environmental

Impacts to adjacent properties would occur along any of the selected routes. The 90th Avenue alternative has the highest right of way impact as a portion of the roadway goes through farmland and wetland areas, on a new alignment.

100th Avenue and CR 56 have smaller right of way impacts when compared to 90th Avenue as both follow existing roadways. 100th Avenue was rated as neutral in-terms of environmental impacts as it crosses very similar features as the other two alternatives. In addition, it would require very little right-of-way acquisition. 100th Avenue would also expose fewer homes (seven) to increased traffic than CR 56 (i.e., seven on 100th Avenue and 10 on CR 56).

The 100th Avenue alignment scored well under the economic impacts category as it would provide a paved route for the mining operations, would eliminate a township maintenance problem, would reduce dust, and add another paved road to the road system in this segment of the County. The township maintenance problem on 100th Avenue is due to the heavy truck traffic into and out of the limestone quarry damaging the roadway.

The overall roadway mileage in the county system and township system would remain relatively the same by selecting 100th Avenue as the new CSAH 1 since existing CSAH 1 from US 52 to 100th Avenue may be turned over to the township for their maintenance. If CR 56 is selected as the new CSAH 1 and the existing CSAH 1 from US 52 to CR 56 were turned over to the township to maintain, more mileage of roadways would go to the township, driving up township maintenance costs while county maintenance costs remain the same.

### Cost Effectiveness

For the cost effectiveness project goal, 100th Avenue was rated the most cost effective when compared to 90th Avenue and CR 56. 90th Avenue has the highest total 'area impacted' driving up the cost (right of way to purchase, grading a new road through farmland and wetlands and regrading the existing roadway to meet CSAH standards). CR 56 is the longest route and complete reconstruction of this route is required to convert from a county road to a CSAH. Additionally if CR 56 was selected, the existing structures where the streams cross CR 56 will require replacement. 100th Avenue would require regrading, however 100th Avenue is a shorter route than CR 56 and 90th Avenue, and impacts less total property area than CR 56 and 90th Avenue resulting in a lower cost. 100th Avenue does have stream crossing structures and these will require replacement. However the county (at the request of the township) will be replacing the large structure just south of the limestone mine next year. Therefore the 100th Avenue alternative would not require a new structure at this location, only the lengthening of that structure.

The staging strategies for the alternatives would all be similar as each road will be required to be closed and detoured during construction. Only 90th Avenue has a portion which can be constructed with no impacts to existing 90th avenue traffic.

A summary of the CSAH 1 rerouting alternative evaluation process is presented in Table 1.

### ***Summary of Results***

Based on the alternative evaluation process described above, the PMT recommended 100th Avenue to be the locally supported alternative for the rerouting of CSAH 1. This alternative will best achieve the project goals and has the potential to produce the greatest overall benefit, with the best return on investment.

**Table 1: CSAH 1 Rerouting Evaluation Summary**

	Safety	Access Management	Mobility and Connectivity	Social, Economic, and Environmental	Cost Effectiveness
90th Ave	0	+	-	-	0
100th Ave	+	0	+	+	+
County Road 56	-	0	0	0	-

**D. PMT Approval of Interchange Design Evaluation**

Technical Memorandum No. 6 – Interchange Design Evaluation, was presented to the PMT on August 7, 2012 for discussion and comments. After review and comment, the memorandum was amended and reissued. Final approval of Technical Memorandum 6 was received on September 24, 2012.

**Appendix A: Interchange Design Alternatives**

**ALTERNATIVE 4E.1:  
DIAMOND INTERCHANGE  
AT CR 9**

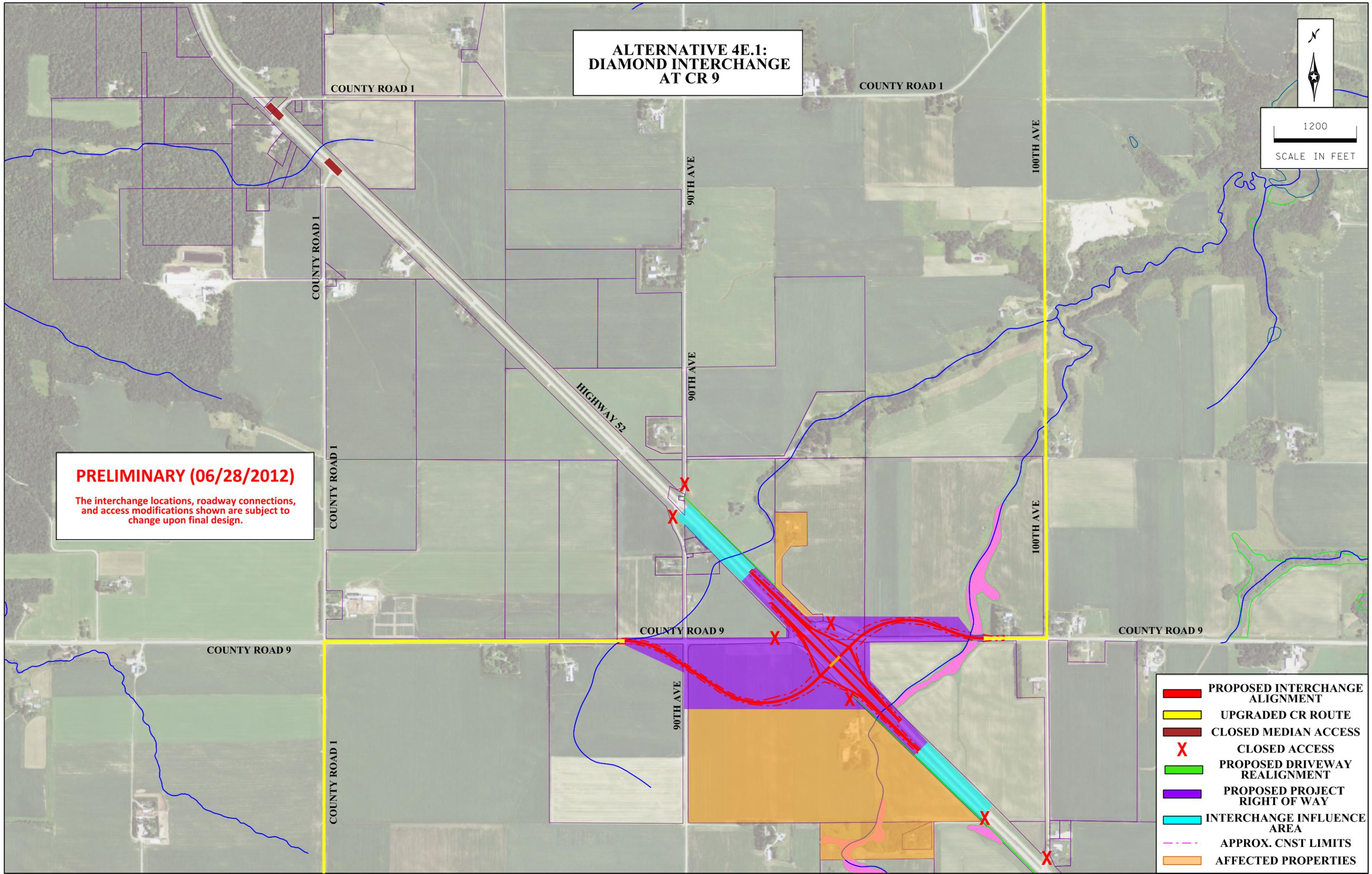


1200  
SCALE IN FEET

**PRELIMINARY (06/28/2012)**

The interchange locations, roadway connections, and access modifications shown are subject to change upon final design.

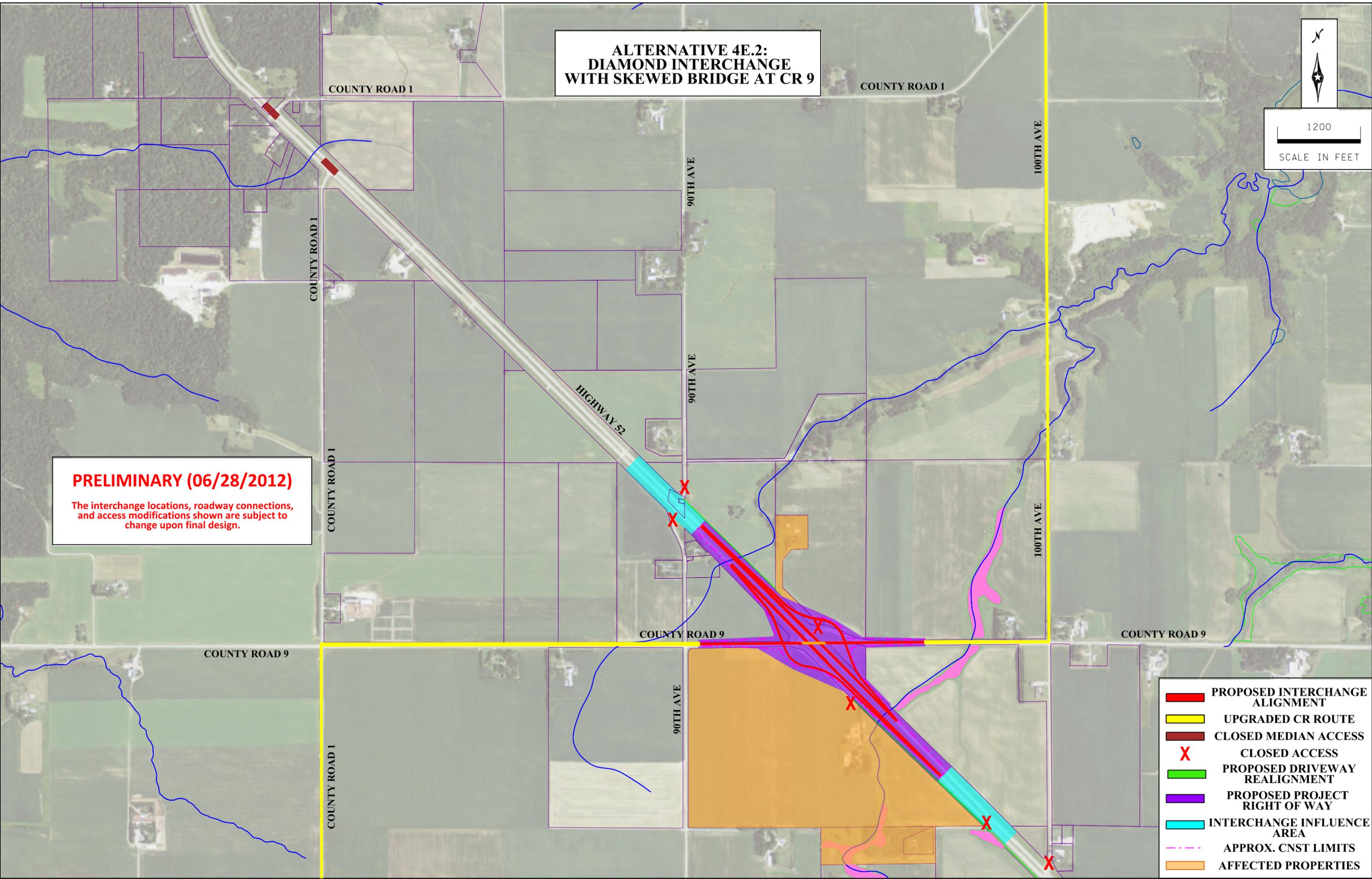
-  PROPOSED INTERCHANGE ALIGNMENT
-  UPGRADED CR ROUTE
-  CLOSED MEDIAN ACCESS
-  CLOSED ACCESS
-  PROPOSED DRIVEWAY REALIGNMENT
-  PROPOSED PROJECT RIGHT OF WAY
-  INTERCHANGE INFLUENCE AREA
-  APPROX. CNST LIMITS
-  AFFECTED PROPERTIES



**ALTERNATIVE 4E.2:  
DIAMOND INTERCHANGE  
WITH SKEWED BRIDGE AT CR 9**

1200  
SCALE IN FEET

**PRELIMINARY (06/28/2012)**  
The interchange locations, roadway connections, and access modifications shown are subject to change upon final design.

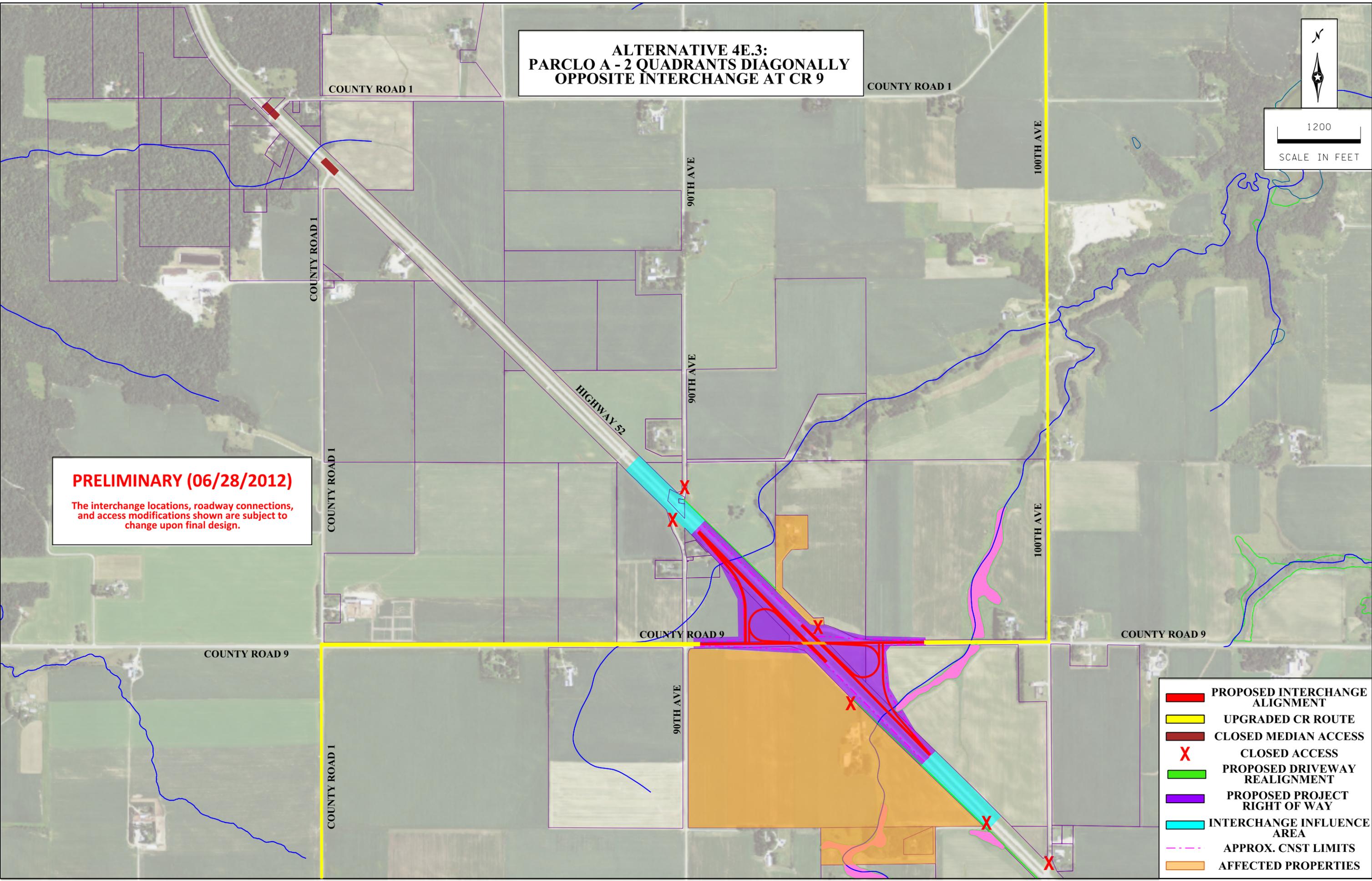


- █ PROPOSED INTERCHANGE ALIGNMENT
- █ UPGRADED CR ROUTE
- █ CLOSED MEDIAN ACCESS
- X CLOSED ACCESS
- █ PROPOSED DRIVEWAY REALIGNMENT
- █ PROPOSED PROJECT RIGHT OF WAY
- █ INTERCHANGE INFLUENCE AREA
- APPROX. CNST LIMITS
- █ AFFECTED PROPERTIES

**ALTERNATIVE 4E.3:  
PARCLO A - 2 QUADRANTS DIAGONALLY  
OPPOSITE INTERCHANGE AT CR 9**

1200  
SCALE IN FEET

**PRELIMINARY (06/28/2012)**  
The interchange locations, roadway connections, and access modifications shown are subject to change upon final design.



- █ PROPOSED INTERCHANGE ALIGNMENT
- █ UPGRADED CR ROUTE
- █ CLOSED MEDIAN ACCESS
- X CLOSED ACCESS
- █ PROPOSED DRIVEWAY REALIGNMENT
- █ PROPOSED PROJECT RIGHT OF WAY
- █ INTERCHANGE INFLUENCE AREA
- - - APPROX. CNST LIMITS
- █ AFFECTED PROPERTIES

**Appendix B : CSAH 1 Rerouting Alternatives**

US 52 SAFETY, ACCESS, AND INTERCHANGE LOCATION STUDY

90TH ALTERNATIVE ALIGNMENT AND CONSTRUCTION LIMITS



LEGEND

 CONSTRUCTION LIMITS

 ADJUSTED SLOPE AREA  
(4:1 to 2:1 or 3:1 to 1:1)

600  
SCALE IN FEET



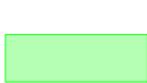
# US 52 SAFETY, ACCESS, AND INTERCHANGE LOCATION STUDY

## 100TH ALTERNATIVE ALIGNMENT AND CONSTRUCTION LIMITS



ALTERNATIVE 100TH AVE

### LEGEND

-  CONSTRUCTION LIMITS (100TH AVE)
-  ADJUSTED SLOPE AREA (4:1 to 2:1 or 3:1 to 1:1)
-  CONSTRUCTION LIMITS (100TH AVE 2)
-  ADJUSTED SLOPE AREA (4:1 to 2:1 or 3:1 to 1:1)

600  
SCALE IN FEET



US 52 SAFETY, ACCESS, AND  
INTERCHANGE LOCATION STUDY

CR-56 ALTERNATIVE  
ALIGNMENT AND CONSTRUCTION LIMITS

ALTERNATIVE CR-56

LEGEND

--- CONSTRUCTION LIMITS

ADJUSTED SLOPE AREA  
(4:1 to 2:1 or 3:1 to 1:1)

750

SCALE IN FEET

