



**GROUP, L.L.C.**

*PROVIDING VALUE ENGINEERING SERVICES*

**VE 201105**

**VALUE ENGINEERING STUDY  
OF**

***US 41A  
HOPKINS COUNTY***

**PROJECT ITEM NUMBER: 02-0137.00**

***FINAL REPORT: AUGUST 31, 2011***

**Study was conducted in  
Frankfort, Kentucky  
June 27-July 1, 2011**

**Prepared by:**

***VE GROUP, L.L.C.***

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**In Association With:**

**KENTUCKY TRANSPORTATION CABINET  
~DIVISION OF HIGHWAY DESIGN~**



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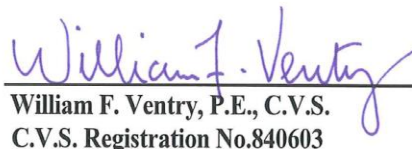
***VE GROUP, L.L.C.***

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**In Association With:**

**KENTUCKY TRANSPORTATION CABINET  
~DIVISION OF HIGHWAY DESIGN~**

**VALUE ENGINEERING STUDY  
TEAM LEADER**

  
William F. Ventry, P.E., C.V.S.  
C.V.S. Registration No.840603

**August 31, 2011**  
**DATE**

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# I. EXECUTIVE SUMMARY

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## INTRODUCTION

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This Value Engineering report summarizes the results of the Value Engineering study performed by VE Group, L.L.C., for the Kentucky Transportation Cabinet (KYTC). The study was performed during the week of **June 27-July 1, 2011**.

The subject of the study was *US 41A in Hopkins County*.

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## PROJECT DESCRIPTION

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The US 41A project is divided into two parts.

The first part of the design begins at Industrial Road and goes to the KY 1178 Connector. This part of the project connects with a two lane rural section at Industrial Road and has a three lane rural typical section until the KY 1178 Connector.

The KY 1178 Connector has a four lane typical section and runs between US 41A and KY 1178 approximately 400'.

The second part of the project design begins at the KY 1178 Connector and continues to the US 41 intersection. This part of the project has a five lane urban typical section with curb and gutter.

A realignment begins at approximately station 555+00 and ends at approximately station 634+00.

There currently are signalized intersections proposed at Industrial Road, Pride Avenue and US 41.

The estimated construction cost is approximately \$19,000,000 and estimated Right-of-Way is approximately \$5,500,000.

# I. EXECUTIVE SUMMARY

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## METHODOLOGY

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The Value Engineering Team followed the basic Value Engineering procedure for conducting this type of analysis.

This process included the following phases:

1. Investigation
2. Speculation
3. Evaluation
4. Development
5. Presentation
6. Report Preparation

Evaluation criteria identified as a basis for the comparison of alternatives included the following:

- Future Maintenance Cost
- Construction Time
- Construction Cost
- Constructability
- Service Life
- Salvage Value
- Design Requirements
- Maintenance Of Traffic
- Life Cycle Cost

# I. EXECUTIVE SUMMARY

## RESULTS – AREAS OF FOCUS

The following Areas of Focus were analyzed by the Value Engineering Team and from these areas the following Value Engineering Alternatives were developed and are recommended for Implementation:

<b>SUMMARY OF RECOMMENDATIONS</b>				
<b>Recommendation Number and Areas of Focus</b>	<b>Description of Recommendation</b>	<b>Const. Cost Savings</b>	<b>Life Cycle Cost(LCC) Savings</b>	<b>VE Team Selected</b>
<b>Recommendation Number 1: ALIGNMENT</b>	<b>VE ALTERNATIVE NO. 1:</b> Use the existing alignment, leave the roadway connection as is, lengthen the right turn lane on US 41A and use a preemptive signal.	\$ 880,645	\$ 880,645	<b>X</b>
<b>Recommendation Number 2: ALIGNMENT</b>	<b>VE ALTERNATIVE NO. 2:</b> Use the existing alignment and close the US 41A/ KY 1178 connection between US 41A and KY 1178 and remove the railroad crossing.	\$ 1,830,132	\$ 1,830,132	<b>X</b>
<b>Recommendation Number 3: ROADWAY EXCAVATION</b>	<b>VE ALTERNATIVE NO. 3:</b> Steepen the cut slopes to 2:1.	\$ 109,264	\$ 109,264	<b>X</b>
<b>Recommendation Number 4: TYPICAL SECTION</b>	<b>VE ALTERNATIVE NO. 4:</b> Use a 4' raised median.	<b>\$ 2,347,250</b> <b>INCREASE</b>	<b>\$ 2,347,250</b> <b>INCREASE</b>	
<b>Recommendation Number 5: TYPICAL SECTION</b>	<b>VE ALTERNATIVE NO. 5:</b> Begin the 6' median at station 640+00, eliminate the continuous turn lanes, use roundabouts at the intersections at station 640+00, station 664+00 and Pride Avenue and use a 3 lane section for the remainder of the project.	\$ 239,163	\$ 239,163	<b>X</b>
<b>Recommendation Number 6: TYPICAL SECTION</b>	<b>VE ALTERNATIVE NO. 6:</b> Use a 14' flush median.	<b>\$ 469,850</b> <b>INCREASE</b>	<b>\$ 469,850</b> <b>INCREASE</b>	

# I. EXECUTIVE SUMMARY

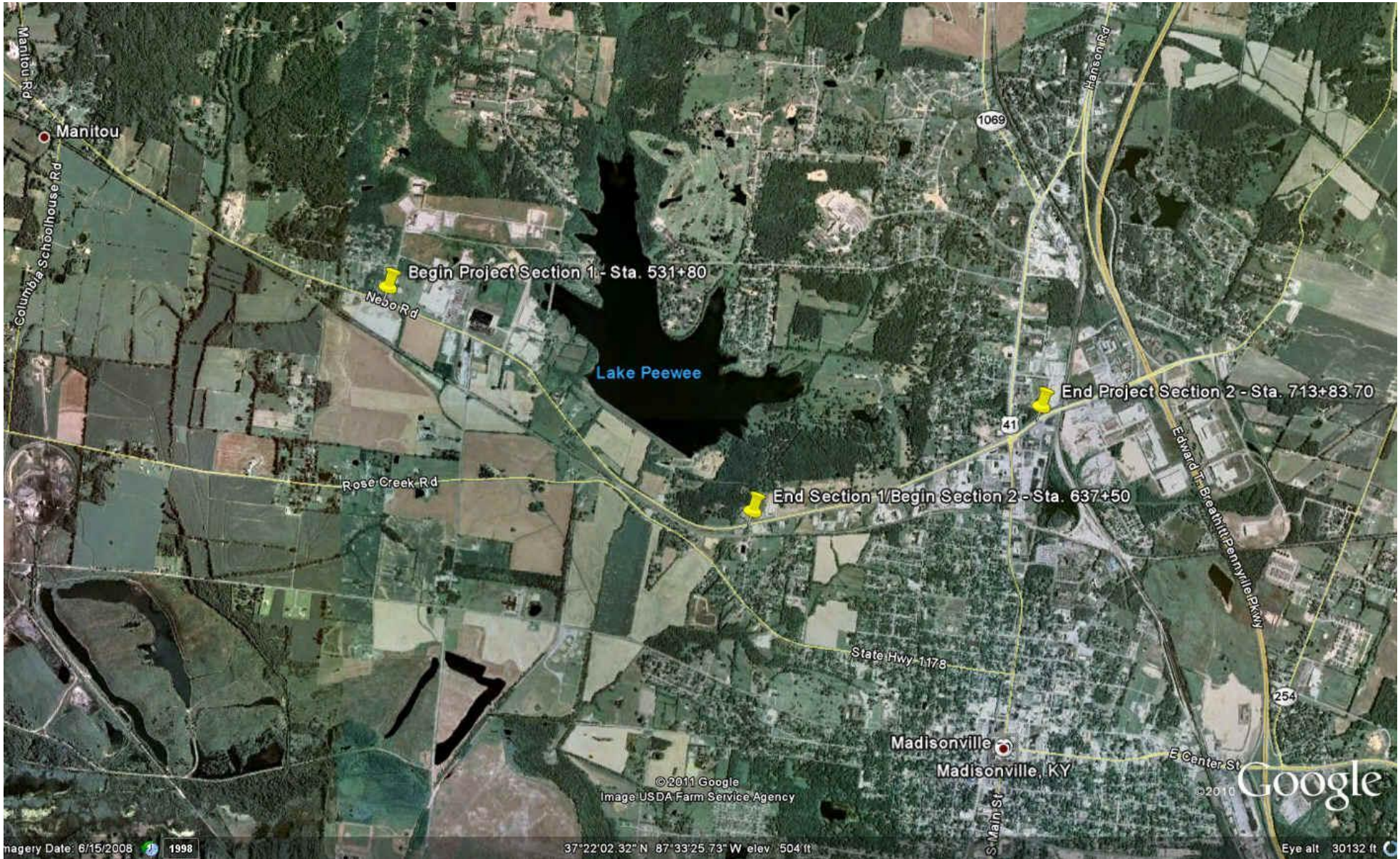
## RESULTS – AREAS OF FOCUS

### SUMMARY OF RECOMMENDATIONS *(continued)*

Recommendation Number and Areas of Focus	Description of Recommendation	Const. Cost Savings	Life Cycle Cost(LCC) Savings	VE Team Selected
<b>Recommendation Number 7: RAILROAD CROSSINGS</b>	<b>VE ALTERNATIVE NO.7:</b> Purchase the Industrial Park spur line.	\$ 1,223,530	\$ 1,223,530	<b>X</b>
<b>Recommendation Number 8: INTERSECTIONS</b>	<b>VE ALTERNATIVE NO. 8:</b> Use a continuous flow intersection at the US 41A/US 41 intersection.	\$ 272,086 <b>INCREASE</b>	\$ 272,086 <b>INCREASE</b>	<b>X</b>
<b>Recommendation Number 9: INTERSECTIONS</b>	<b>VE ALTERNATIVE NO. 9:</b> Use a roundabout at Industrial Road.	\$ 198,923	\$ 198,923	<b>X</b>
<b>Recommendation Number 10: INTERSECTIONS</b>	<b>VE ALTERNATIVE NO. 10:</b> Use a roundabout at Pride Avenue.	\$ 55,328	\$ 55,328	<b>X</b>
<b>Summary/combination of VE Team selected Alternatives</b>		<b>\$ 4,264,899</b>	<b>\$ 4,264,899</b>	<b>8</b>



## II. LOCATION OF PROJECT



### III. TEAM MEMBERS AND PROJECT DESCRIPTION

#### VALUE ENGINEERING TEAM MEMBERS

NAME	AFFILIATION	EXPERTISE	PHONE
William F. Ventry, P.E., C.V.S.~Life	VE Group, L.L.C.	Project Manager/Team Leader	850/627-3900
Tom Hartley, P.E., C.V.S.	VE Group, L.L.C.	Geometric Design/Constructability/Cost Estimating	850/627-3900
Duncan Silver, P.E, L.S.	VE Group, L.L.C.	Traffic Analysis/Geometric Design	850/627-3900
Brent Sweger, P. E.	KYTC	Traffic, Planning, VE	502/564-3280
Gary Raymer, P.E.	KYTC	Construction	502/564-3280
Ben Baker, P.E.	KYTC	Construction	502/564-4780

### III. TEAM MEMBERS AND PROJECT DESCRIPTION

#### PROJECT DESCRIPTION

The US 41A project is divided into two parts.

The first part begins at Industrial Road and goes to the KY 1178 Connector. This part of the project connects with a two lane rural section at Industrial Road and has a three lane rural typical section until the KY 1178 Connector.

The KY 1178 Connector has a four lane typical section and runs between US 41A and KY 1178 approximately 400'.

The second part of the project begins at the KY 1178 Connector and continues to the US 41 intersection. This part of the project has a five lane urban typical section with curb and gutter.

A realignment begins at approximately station 555+00 and ends at approximately station 634+00.

There are signalized intersections proposed at Industrial Road, Pride Avenue and US 41.

The estimated construction cost is approximately \$19,000,000 and estimated Right-of-Way is approximately \$5,500,000.

### III. TEAM MEMBERS AND PROJECT DESCRIPTION

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#### PROJECT DESCRIPTION (*continued*)

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The proposed improvement to US 41A begins at Industrial Road and continues eastward to its intersection with US 41 in Madisonville. The proposed roadway follows the existing corridor with minor shifts to minimize right-of-way and utility impacts, facilitate maintenance of traffic during construction and improve tie-ins to cross roads. The route is classified as an Urban Principal Arterial.

The current design begins at the Industrial Road intersection with a rural Typical Section that consists of three 11' lanes with 8' shoulders, 2' of which are paved. From there, using the same typical section, it generally follows the existing corridor, with minor shifts to the north or south to minimize right-of-way impacts, to KY 1178.

At KY 1178, there is a larger shift to the north to provide adequate stacking distance between the intersection and the at-grade railroad crossing on KY 1178. Also at KY 1178, the Typical Section changes to an urban five lane section with 11' lanes and no shoulders. From KY 1178, the alignment continues eastward transitioning over 3500' to match the existing centerline. It then follows the existing centerline eastward to US 41.

## IV. INVESTIGATION PHASE

### VALUE ENGINEERING STUDY BRIEFING

<i>US 41A HOPKINS COUNTY June 27-July 1, 2011</i>		
<b>NAME</b>	<b>AFFILIATION</b>	<b>PHONE</b>
William F. Ventry	VE Group, L.L.C.	850/627-3900
Tom Hartley	VE Group, L.L.C.	850/627-3900
Duncan Silver	VE Group, L.L.C.	850/627-3900
Brent Sweger	KYTC	502/564-3280
Gary Raymer	KYTC	502/564-3280
Ben Baker	KYTC	502/564-4780
Richard Guidi	GRW Engineers	859/331-9220

## IV. INVESTIGATION PHASE

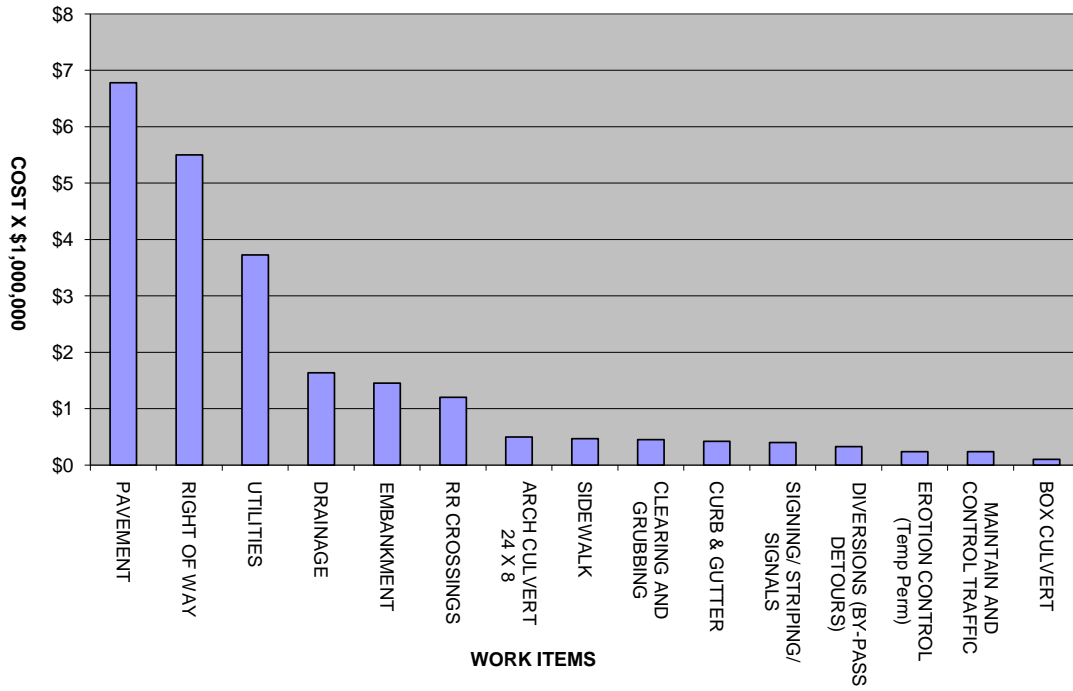
### STUDY RESOURCES

<i>US 41A HOPKINS COUNTY June 27-July 1, 2011</i>		
<b>NAME</b>	<b>AFFILIATION</b>	<b>PHONE</b>
Allen Rust	KYTC, Railroad	502/564-3210
Everett Green	KYTC, District 2	270/824-7080
Jennifer Cox	KYTC, D 2, R/W	270/824-7080
Adam Kirk	Kentucky Transportation Center	859/257-4513

# IV. INVESTIGATION PHASE

## PARETO WORKSHEET

**PARETO CHART**



## IV. INVESTIGATION PHASE

### FUNCTIONAL ANALYSIS WORKSHEET

<b>US 41A HOPKINS COUNTY June 27-July 1, 2011</b>						
ITEM	<u>FUNCT.</u> VERB	<u>FUNCT.</u> NOUN	* TYP E	COST	WORTH	VALUE INDEX
Pavement	Support	Vehicles	B	\$ 6,800,000	\$ 6,000,000	1.13
Drainage	Convey	Water	B	\$ 1,600,000	\$ 1,400,000	1.14
Roadway Excavation	Establish Establish	Grades Typical	B S	\$ 1,600,000	\$ 1,400,000	1,14
Arch Culvert	Convey Span	Water Creek	B S	\$ 500,000	\$ 250,000	2.00
Sidewalks	Support	Pedestrians	B	\$ 470,000	\$ 300,000	1.56
Clearing & Grubbing	Remove Prepare	Objects Site	B S	\$ 450,000	\$ 450,000	1.00
Curb & Gutter	Convey Control	Water Access	B S	\$ 420,000	\$ 420,000	1.00
Signing, Stripping and Signing	Guide	Motorist	B	\$ 400,000	\$ 400,000	1.00
Diversion By pass	Maintain	Traffic	B	\$ 330,000	\$ 330,000	1.00
Erosion Control	Control	Erosion	B	\$ 240,000	\$ 240,000	1.00
Traffic Control	Maintain	Traffic	B	\$ 240,000	\$ 240,000	1.00
Railroad Crossing	Support	Vehicles	B	\$ 1,200,000	\$ 200,000	6.00
Right-of-Way	Obtain	Rights	B	\$ 5,500,000	\$ 4,500,000	1.22
Utilities	Reduce	Impacts	B	\$ 3,700,000	\$ 3,700,000	1.00

**\*B – Basic      S – Secondary**

\*\* Note: This worksheet is a tool of the Value Engineering process and is only used for determining the areas that the Value Engineering Team should focus on for possible alternatives. The column for COST indicates the approximate amount of the cost as shown in the cost estimate. The column for WORTH is an estimated cost for the lowest possible alternative that would provide the FUNCTION shown. Many times the lowest cost alternatives are not considered implementable but are used only to establish a worth for a function. A value index greater than 1.00 indicates the Value Engineering Team intends to focus on this area of the project.

## **IV. INVESTIGATION PHASE**

The following areas have a value index greater than 1.00 on the preceding Functional Analysis Worksheet and therefore have been identified by the Value Engineering Team as Areas of Focus and investigation for the Value Engineering process:

**A. ALIGNMENT**

**B. DRAINAGE**

**C. ROADWAY EXCAVATION**

**D. ARCH CULVERT**

**E. TYPICAL SECTION**

**F. RAILROAD CROSSINGS**

**G. INTERSECTIONS**

**H. DESIGN COMMENTS**

## V. SPECULATION PHASE

Ideas generated, utilizing the brainstorming method, for performing the functions of previously identified areas of focus.

### A. ALIGNMENT

- Use the existing alignment
- Realign KY 1178
- Close the roadway connection between US 41A and KY 1178
- Leave the roadway connection as is and lengthen the right turn lane on US 41 A and provide a traffic signal

### B. DRAINAGE

- Use the existing outfalls for the new closed drainage system outfalls
- Use curb and gutter on the north side with open ditches on the south side
- Use curb and gutter with open ditches

***-DROPPED DURING SPECULATION PHASE SINCE NO REASONABLE ALTERNATIVES COULD BE FORMULATED.***

### C. ROADWAY EXCAVATION

- Dispose of waste in the area between the new US 41A alignment and old US 41A
- Raise the profile of the new alignment
- Raise the grades in the cut areas
- Steepen the cut slopes to 2:1

### D. ARCH CULVERT

- Use a single span bridge
- Use a double box culvert
- Use a steel arch

***-DROPPED DURING SPECULATION PHASE SINCE NO REASONABLE ALTERNATIVES COULD BE FORMULATED.***



## V. SPECULATION PHASE

### E. TYPICAL SECTION

- Use a 4' raised median
- Use median openings a roadways only
- Use a 14' flush median
- Use a 6' median, eliminate the continuous turn lanes with roundabouts at the intersections
- Begin the 5 lane section at station 638+00 with the three lane section for the remainder of the project

### F. RAILROAD CROSSINGS

- Purchase the Industrial Park spur line
- Close the crossing between US 41 A and KY 1178

### G. INTERSECTIONS

- Use a continuous flow intersection at the US 41A/US 41 Intersection
- Use a roundabout at Industrial Road
- Use a roundabout at Pride Avenue

### H. ACCESS ROADS

- Develop an access road plan in conjunction with the city

***-MOVED TO DESIGN COMMENTSs***

## VI. EVALUATION PHASE

### ◆ ALTERNATIVES

The following Alternatives were formulated during the "eliminate and combine" portion of the Evaluation Phase.

#### A. ALIGNMENT

*Value Engineering Alternative No. 1: Use the existing alignment, leave the roadway connection as is and lengthen the right turn lane on US 41 A and provide a traffic signal.*

*Value Engineering Alternative No. 2: Use the existing alignment and close the roadway connection between US 41A and KY 1178.*

#### B. DRAINAGE

***-DROPPED DURING SPECULATION PHASE SINCE NO REASONABLE ALTERNATIVES COULD BE FORMULATED.***

#### C. ROADWAY EXCAVATION

*Value Engineering Alternative No. 3: Steepen the cut slopes to 2:1.*

#### D. ARCH CULVERT

***-DROPPED DURING SPECULATION PHASE SINCE NO REASONABLE ALTERNATIVES COULD BE FORMULATED.***

#### E. TYPICAL SECTION

*Value Engineering Alternative No. 4: Use a 4' raised median.*

*Value Engineering Alternative No. 5: Begin the 6' median at station 640, eliminate the continuous turn lanes, use roundabouts at the intersections at station 640, station 664, Pride Avenue and use a 3 lane typical section for the remainder of the project.*

*Value Engineering Alternative No. 6: Use a 14' flush median.*

## VI. EVALUATION PHASE

### ◆ ALTERNATIVES

#### F. RAILROAD CROSSINGS

*Value Engineering Alternative No. 7: Purchase the Industrial Park spur line.*

#### G. INTERSECTIONS

*Value Engineering Alternative No. 8: Use a continuous flow intersection at the US 41A/US 41 Intersection.*

*Value Engineering Alternative No. 9: Use a roundabout at Industrial Road.*

*Value Engineering Alternative No. 10: Use a roundabout at Pride Avenue.*

#### H. DESIGN COMMENTS

*Design Comment No. 1: Use rock and fabric rather than chemical stabilization.*

*Design Comment No. 2: Use the area between the new and existing alignment for waste.*

*Design Comment No. 3: Develop an access plan with the city.*

## VI. EVALUATION PHASE

### ◆ ADVANTAGES AND DISADVANTAGES

The following Advantages and Disadvantages were developed for the Value Engineering Alternatives previously generated during the speculation phase. It also includes the Advantages and Disadvantages for the Original Design.

#### A. ALIGNMENT

**Original Design: Lengthen the connection between US 41A and KY 1178 and realign US 41A.**

##### Advantages

- Eliminates the backup from the railroad crossing onto US 41A
- Waste can be used on the new alignment
- Low traffic control during construction
- Single phase construction of arch culvert

##### Disadvantages

- Higher Right-of-Way costs
- Does not use the remaining life of the existing pavement
- Higher construction cost

##### Conclusion

**CARRY FORWARD FOR FURTHER DEVELOPMENT AND EVALUATION.**

***Value Engineering Alternative No. 1: Use the existing alignment, leave the roadway connection as is and lengthen the right turn lane on US 41 A and provide a traffic signal.***

##### Advantages

- Less Right-of-Way cost
- Less construction cost
- Less environmental impact

##### Disadvantages

- Higher traffic control costs
- Requires two phase arch culvert construction

##### Conclusion

**CARRY FORWARD FOR FURTHER DEVELOPMENT AND EVALUATION.**

## VI. EVALUATION PHASE

### ◆ ADVANTAGES AND DISADVANTAGES

#### A. ALIGNMENT

**Original Design:** Lengthen the connection between US 41A and KY 1178 and realign US 41A  
(*continued*).

*Value Engineering Alternative No. 2: Use the existing alignment and close the roadway connection between US 41A and KY 1178.*

#### Advantages

- Eliminates a railroad crossing
- Eliminates traffic backup on US 41A
- Lower construction cost
- Lower Right-of-Way cost
- Low environmental impacts

#### Disadvantages

- Loss of direct access to KY 1178
- Longer travel time for some local drivers

#### Conclusion

**CARRY FORWARD FOR FURTHER DEVELOPMENT AND EVALUATION.**

## VI. EVALUATION PHASE

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### ◆ ADVANTAGES AND DISADVANTAGES

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#### B. DRAINAGE

*-DROPPED DURING SPECULATION PHASE SINCE NO REASONABLE ALTERNATIVES  
COULD BE FORMULATED.*

## VI. EVALUATION PHASE

### ◆ ADVANTAGES AND DISADVANTAGES

#### C. ROADWAY EXCAVATION

**Original Design:** Use 4:1 cut slopes.

##### Advantages

- Easier maintenance
- May be less erosion
- Better site distance

##### Disadvantages

- Requires disposal of waste
- Requires additional Right-of-Way

##### Conclusion

**CARRY FORWARD FOR FURTHER DEVELOPMENT AND EVALUATION.**

*Value Engineering Alternative No. 3: Steepen the cut slopes to 2:1.*

##### Advantages

- Reduces waste
- Reduce Right-of-Way
- Lower construction cost

##### Disadvantages

- May be more difficult maintenance

##### Conclusion

**CARRY FORWARD FOR FURTHER DEVELOPMENT AND EVALUATION.**

## VI. EVALUATION PHASE

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### ◆ ADVANTAGES AND DISADVANTAGES

---

#### D. ARCH CULVERT

*-DROPPED DURING SPECULATION PHASE SINCE NO REASONABLE ALTERNATIVES  
COULD BE FORMULATED.*



## VI. EVALUATION PHASE

### ◆ ADVANTAGES AND DISADVANTAGES

#### E. TYPICAL SECTION

**Original Design: 11' flush median with 11' lanes.**

##### Advantages

- Improves capacity
- Reduces left turn conflicts
- Separation between opposing lanes

##### Disadvantages

- Risk of cross over accidents
- Narrow turn lanes

##### Conclusion

**CARRY FORWARD FOR FURTHER DEVELOPMENT AND EVALUATION.**

*Value Engineering Alternative No. 4: Use a 4' raised median.*

##### Advantages

- Reduced crossover accidents
- Clearly defines turning locations

##### Disadvantages

- Higher construction cost
- Raised median may cause drainage issues

##### Conclusion

**CARRY FORWARD FOR FURTHER DEVELOPMENT AND EVALUATION.**

## VI. EVALUATION PHASE

### ◆ ADVANTAGES AND DISADVANTAGES

#### E. TYPICAL SECTION

**Original Design:** 11' flush median with 11' lanes (*continued*).

*Value Engineering Alternative No. 5: Begin the 6' median at station 640+00, eliminate the continuous turn lanes, use roundabouts at the intersections at station 640+00, station 664+00, Pride Avenue and use a 3 lane typical section for the remainder of the project.*

##### Advantages

- Removes crossover accidents
- Clearly defines turning movements
- Provides for u-turns at roundabouts
- Fewer conflict points
- Less construction cost
- Better traffic operation

##### Disadvantages

- Requires additional Right-of-Way at intersections
- Possible additional utility conflicts

##### Conclusion

**CARRY FORWARD FOR FURTHER DEVELOPMENT AND EVALUATION.**

*Value Engineering Alternative No. 6: Use a 14' flush median.*

##### Advantages

- Improves left turn operations because lane is wider

##### Disadvantages

- Higher construction cost

##### Conclusion

**CARRY FORWARD FOR FURTHER DEVELOPMENT AND EVALUATION.**

## VI. EVALUATION PHASE

### ◆ ADVANTAGES AND DISADVANTAGES

#### F. RAILROAD CROSSINGS

**Original Design: Improve the existing crossings.**

##### Advantages

- No disruption to railroad
- Better crossing
- Upgraded warning system

##### Disadvantages

- High construction cost
- Roadway has to match the railroad grade
- One of the railroad crossings may be abandoned

##### Conclusion

**CARRY FORWARD FOR FURTHER DEVELOPMENT AND EVALUATION.**

***Value Engineering Alternative No. 7: Purchase the Industrial Park spur line.***

##### Advantages

- Allows the improvement of the grades on US 41A
- Eliminates a railroad crossing
- Eliminates the Bean Cemetery Road retaining walls
- Allows for the opportunity to improve nearby access roads
- Existing rail line may be abandoned or be a candidate for abandonment

##### Disadvantages

- Removes access to the north side of the industrial park

##### Conclusion

**CARRY FORWARD FOR FURTHER DEVELOPMENT AND EVALUATION.**

## VI. EVALUATION PHASE

### ◆ ADVANTAGES AND DISADVANTAGES

#### G. INTERSECTIONS

**Original Design:** Conventional intersection designs, some single left turn lanes, some double left turn lanes and some are signalized.

##### Advantages

- Drivers are familiar with the design.

##### Disadvantages

- Limited capacity
- One's with signals have off peak delays

##### Conclusion

**CARRY FORWARD FOR FURTHER DEVELOPMENT AND EVALUATION.**

***Value Engineering Alternative No. 8: Use a continuous flow intersection at the US 41A/US 41 Intersection.***

##### Advantages

- Increase capacity
- Reduced delays

##### Disadvantages

- Higher Right-of-Way cost
- May be higher construction cost
- More difficult pedestrian crossing

##### Conclusion

**CARRY FORWARD FOR FURTHER DEVELOPMENT AND EVALUATION.**

## VI. EVALUATION PHASE

### ◆ ADVANTAGES AND DISADVANTAGES

#### G. INTERSECTIONS

**Original Design:** Conventional intersection designs, some single left turn lanes, some double left turn lanes and some are signalized (*continued*).

*Value Engineering Alternative No. 9: Use a roundabout at Industrial Road.*

##### Advantages

- Provides a transition from rural to urban
- No signal required
- Low maintenance cost because no signal
- Fewer conflict points

##### Disadvantages

- May be a conflict for through traffic during a shift change
- Small amount of additional Right-of-Way
- Possible additional utility conflict

##### Conclusion

**CARRY FORWARD FOR FURTHER DEVELOPMENT AND EVALUATION.**

*Value Engineering Alternative No. 10: Use a roundabout at Pride Avenue.*

##### Advantages

- Accommodates geometry better
- Improves access management
- Eliminates a signal
- Low maintenance cost because no signal
- Fewer conflict points

##### Disadvantages

- Small amount of additional Right-of-Way
- Possible additional utility conflict

##### Conclusion

**CARRY FORWARD FOR FURTHER DEVELOPMENT AND EVALUATION.**

## VII. DEVELOPMENT PHASE

### A. ALIGNMENT

- ORIGINAL DESIGN
- *Value Engineering Alternative No. 1: Use the existing alignment, leave the roadway connection as is and lengthen the right turn lane on US 41A and provide a traffic signal.*
- *Value Engineering Alternative No. 2: Use the existing alignment and close the roadway connection between US 41A and KY 1178.*

### B. DRAINAGE

*-DROPPED DURING SPECULATION PHASE SINCE NO REASONABLE ALTERNATIVES COULD BE FORMULATED.*

### C. ROADWAY EXCAVATION

- ORIGINAL DESIGN
- *Value Engineering Alternative No. 3: Steepen the cut slopes to 2:1.*

### D. ARCH CULVERT

*-DROPPED DURING SPECULATION PHASE SINCE NO REASONABLE ALTERNATIVES COULD BE FORMULATED.*

### E. TYPICAL SECTION

- ORIGINAL DESIGN
- *Value Engineering Alternative No. 4: Use a 4' raised median.*
- *Value Engineering Alternative No. 5: Begin the 6' median at station 640+00, eliminate the continuous turn lanes, use roundabouts at the intersections at station 640+00, station 664+00, Pride Avenue and use a 3 lane typical section for the remainder of the project.*
- *Value Engineering Alternative No. 6: Use a 14' flush median.*

## VII. DEVELOPMENT PHASE

### F. RAILROAD CROSSINGS

- ORIGINAL DESIGN
- *Value Engineering Alternative No. 7: Purchase the Industrial Park spur line.*

### G. INTERSECTIONS

- ORIGINAL DESIGN
- *Value Engineering Alternative No. 8: Use a continuous flow intersection at the US 41A/US 41 Intersection.*
- *Value Engineering Alternative No. 9: Use a roundabout at Industrial Road.*
- *Value Engineering Alternative No 10: Use a roundabout at Pride Avenue.*

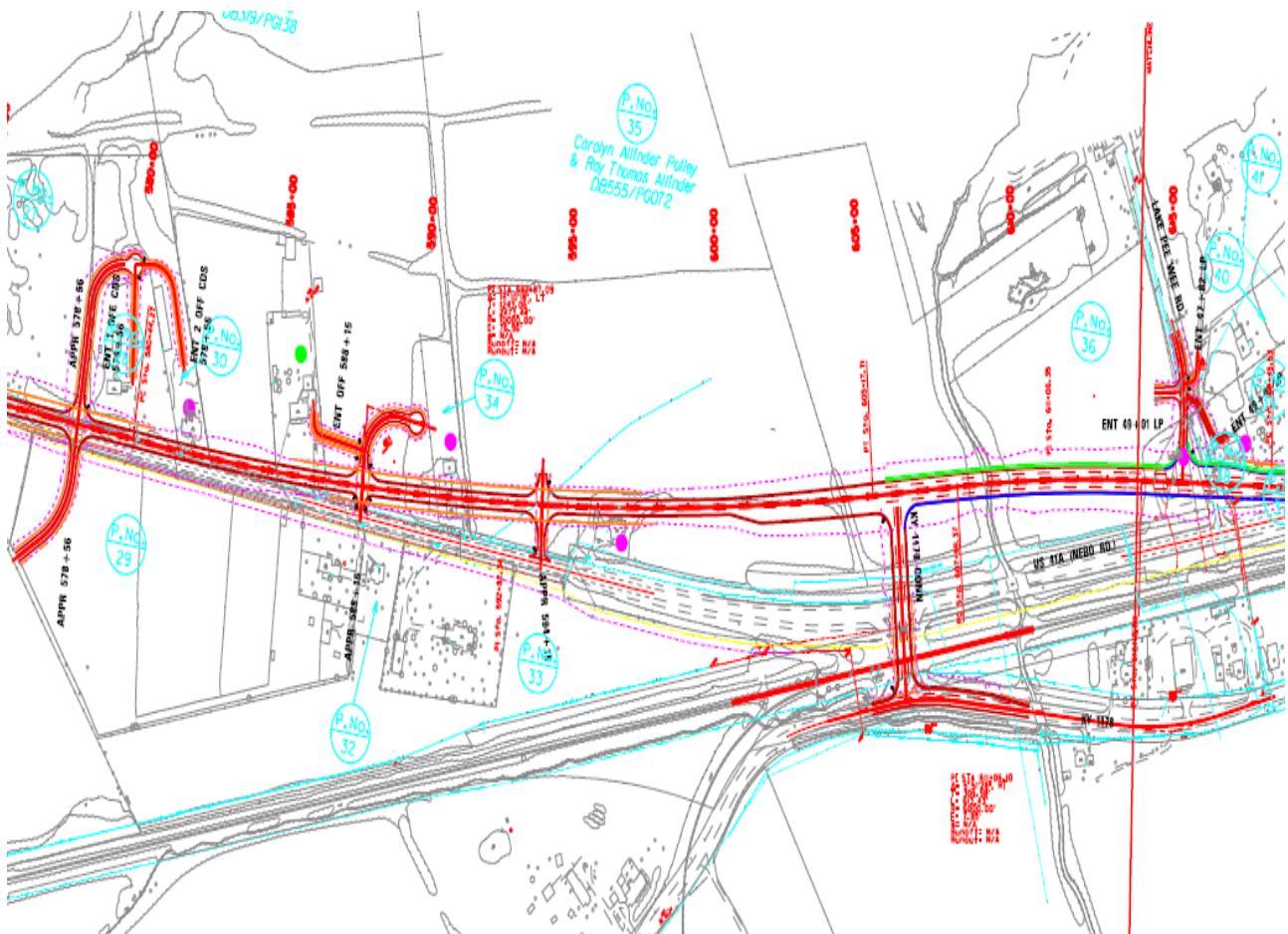
## VII. DEVELOPMENT PHASE

### A. ALIGNMENT

#### Original Design

In the Original Design, the new US 41A roadway is relocated to the north of existing US 41A, approximately 250'.

This realignment was to provide additional storage for vehicles turning onto the KY 1178 connector from US 41A, when a train was crossing and traffic backed up onto US 41A.

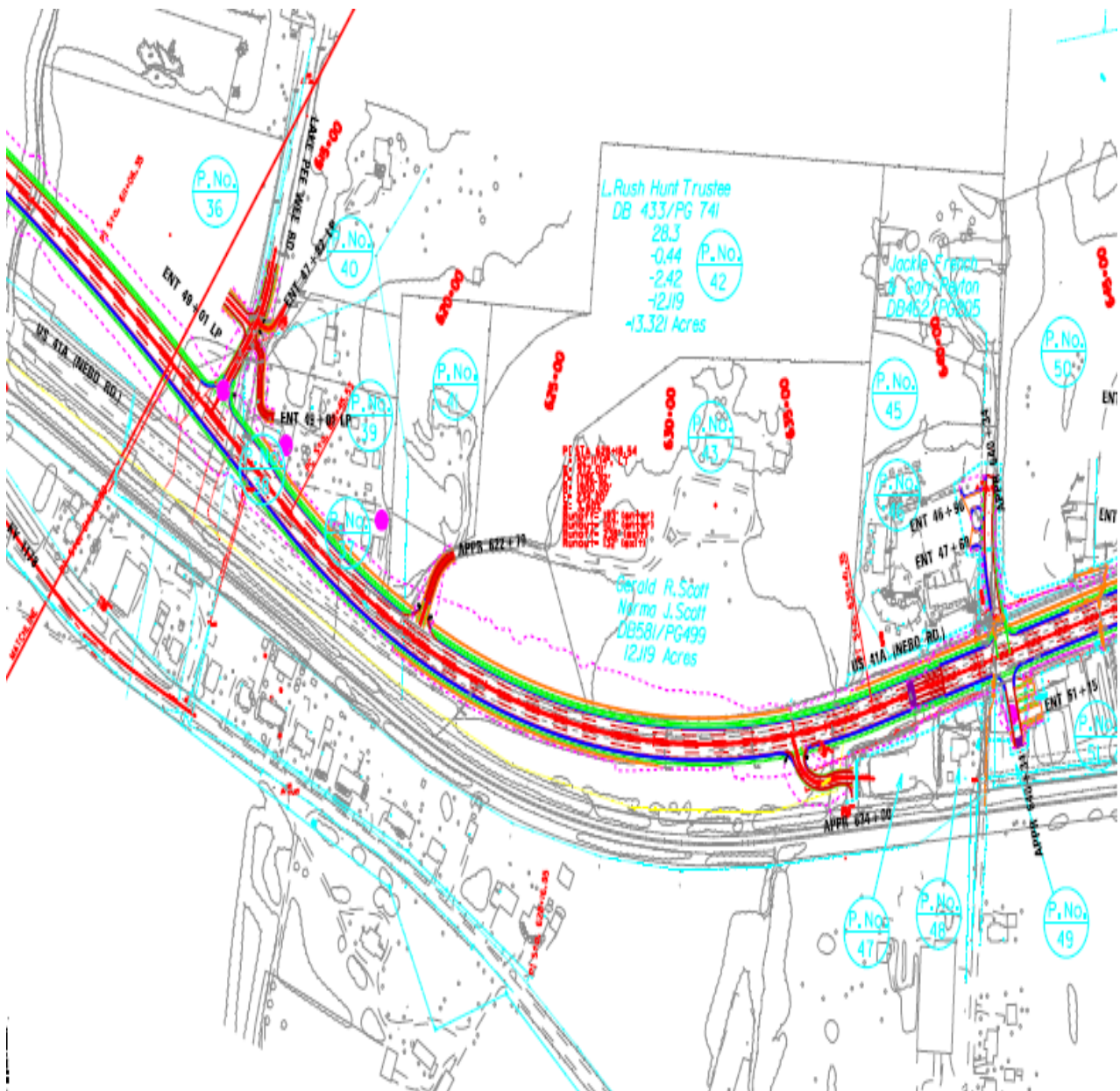




# VII. DEVELOPMENT PHASE

## A. ALIGNMENT

### Original Design (continued)



## VII. DEVELOPMENT PHASE

### A. ALIGNMENT

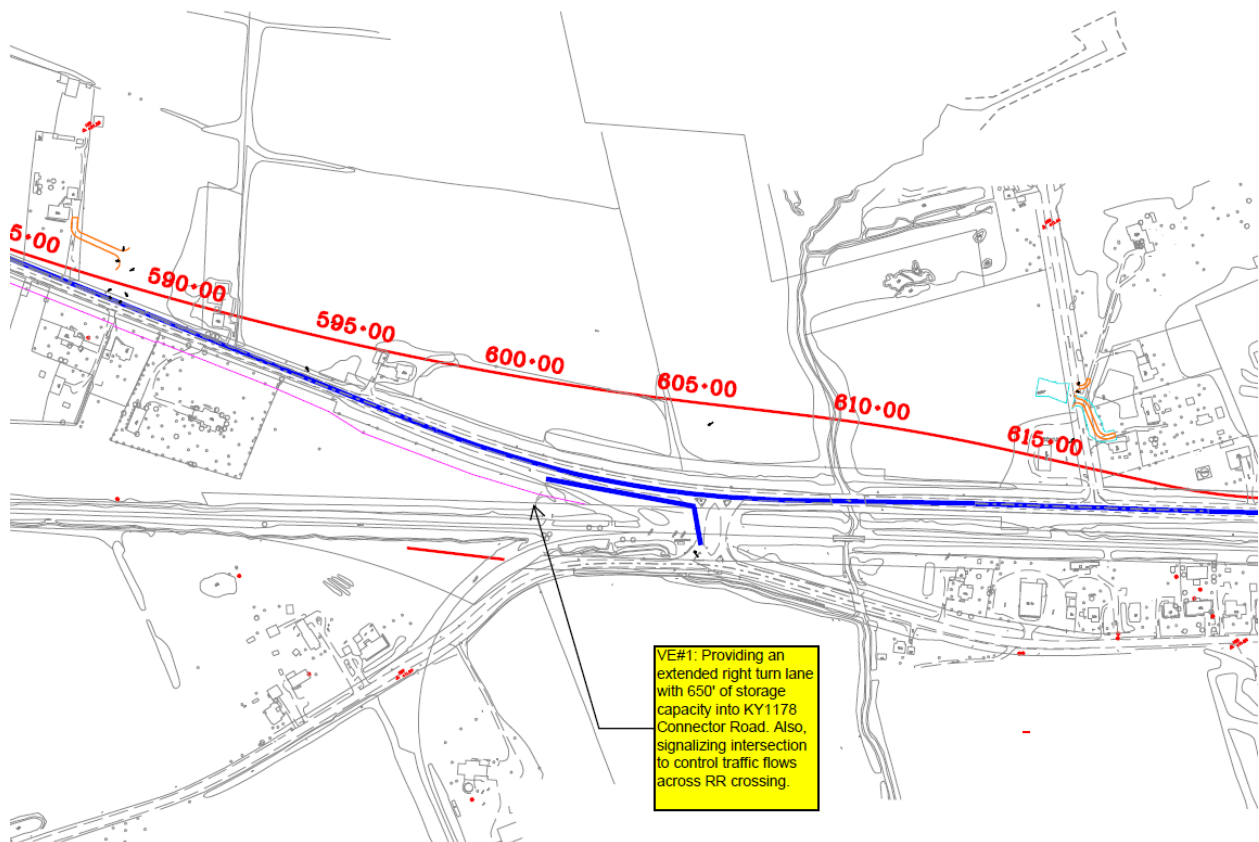
***Value Engineering Alternative No. 1: Use the existing alignment, leave the roadway connection as is and lengthen the right turn lane on US 41A and provide a traffic signal.***

Value Engineering Alternative No. 1 consists basically of using the existing US 41A alignment by overlaying the existing pavement and widening on the north side of the roadway from station 575+00 to station 630+00.

The additional storage required when a train is present at the railroad crossing, will be provided by increasing the proposed right turn lane another 250' for storage.

The Value Engineering Team also suggest adding a Railroad Preemptive Signal for the turn lanes to prevent the left turn from blocking the through traffic when trains are crossing the connector.

This would possibly save \$410,645 in construction costs and possibly save \$470,000 in reduced Right-of-Way for a total possible savings of \$880,645.



**ALIGNMENT  
VALUE ENGINEERING ALTERNATIVE NO. 1  
COST COMPARISON SHEET**

DESCRIPTION	UNITS	UNIT COST	PROP'D QTY.	PROP'D COST	V.E. QTY.	V.E. COST
CRUSHED STONE BASE	TONS	\$15,00	6647.0	\$99,705	3878.0	\$58,170
ASPHALT TREATED DRAINAGE BLANKET	TONS	\$36,00	11560.0	\$416,160	6744.0	\$242,784
ASPHALT BASE	TONS	\$54.00	10332.0	\$557,928	8180.0	\$441,720
ASPHALT SURFACE	SY	\$60.00	1987.0	\$119,220	1987.0	\$119,220
RAILROAD PREEMPTIVE SIGNAL	LS	\$50,000.00	0.0	\$0	1.0	\$50,000
RAILROAD CROSSING	LS	\$100,000.00	1.0	\$100,000	1.0	\$100,000
RAILROAD UTILITY COSTS	LS	\$500,000.00	1.0	\$500,000	1.0	\$500,000
<b>SUBTOTAL</b>				<b>\$1,793,013</b>		<b>\$1,511,894</b>
MOBILIZATION (THIS IS SUB+CONTIN. X % =)		<b>4.5%</b>		\$108,926		\$91,848
MAINTENANCE OF TRAFFIC		<b>5.0%</b>		\$89,651		\$75,595
ENGINEERING & CONTINGENCIES		<b>35.0%</b>		\$627,555		\$529,163
RIGHT OF WAY	LS			\$695,000		\$225,000
<b>GRAND TOTAL</b>				<b>\$3,314,144</b>		<b>\$2,433,499</b>

**POSSIBLE SAVINGS: \$880,645**

## VII. DEVELOPMENT PHASE

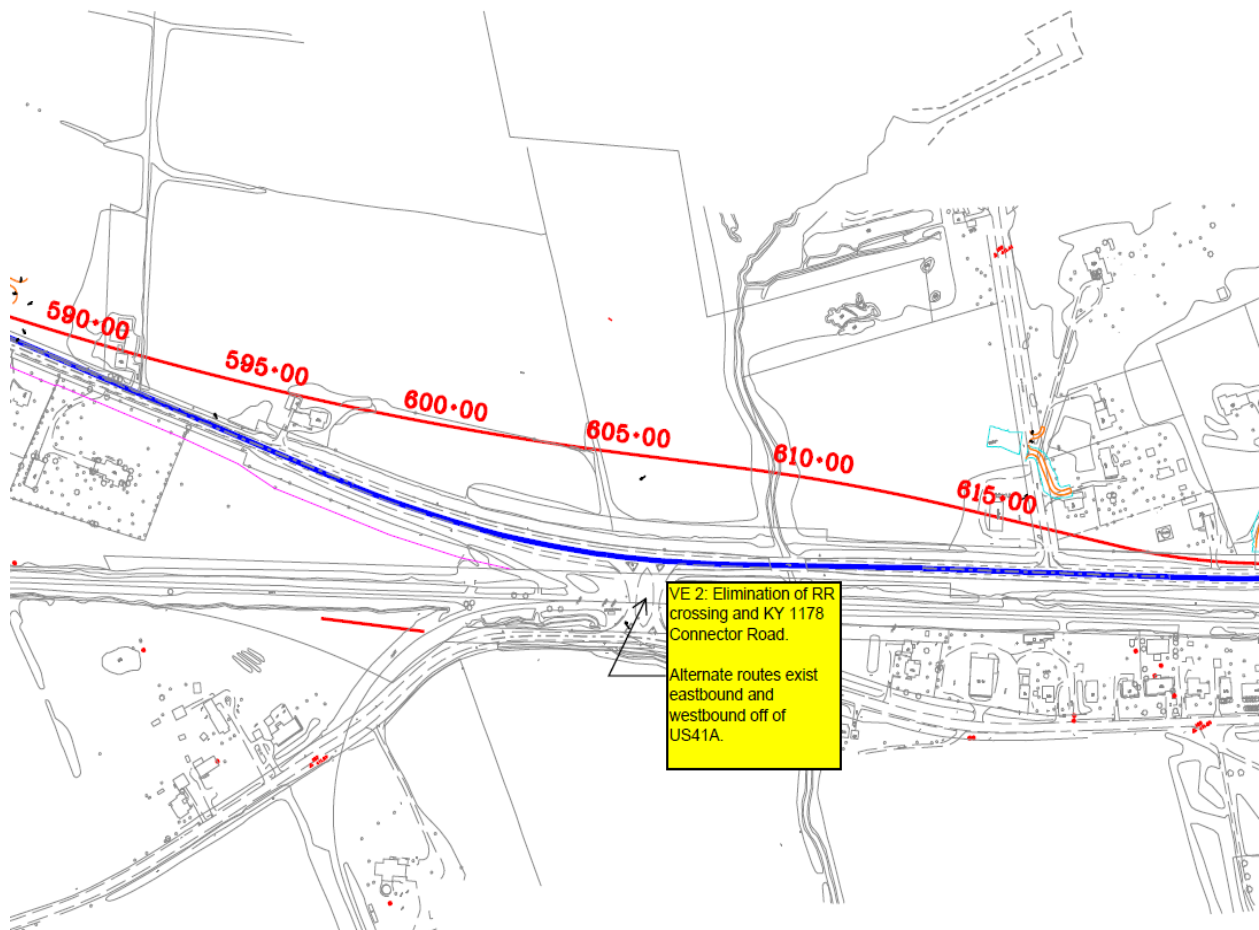
### A. ALIGNMENT

***Value Engineering Alternative No. 2: Use the existing alignment and close the roadway connection between US 41A and KY 1178.***

Value Engineering Alternative No. 2 is similar to Value Engineering Alternative No. 1 by using the existing alignment but in lieu of providing right turn storage, the connector to KY 1178 will be closed and the railroad crossing will be removed.

There are other access points west and east of this connector available for the public to get from US 41A to KY 1178.

This results in \$1,830,130 possible savings plus eliminating potential conflicts with the railroad during construction.



**ALIGNMENT  
VALUE ENGINEERING ALTERNATIVE NO. 2  
COST COMPARISON SHEET**

DESCRIPTION	UNITS	UNIT COST	PROP'D QTY.	PROP'D COST	V.E. QTY.	V.E. COST
CRUSHED STONE BASE	TONS	\$15,00	6647.0	\$99,705	3878.0	\$58,170
ASPHALT TREATED DRAINAGE BLANKET	TONS	\$36,00	11560.0	\$416,160	6744.0	\$242,784
ASPHALT BASE	TONS	\$54.00	10332.0	\$557,928	8180.0	\$441,720
ASPHALT SURFACE	SY	\$60.00	1987.0	\$119,220	1987.0	\$119,220
RAILROAD CROSSING	EACH	\$100,000.00	1.0	\$100,000	0.0	\$0
RAILROAD UTILITY COSTS	LS	\$500,000.00	1.0	\$500,000	0.0	\$0
<b>SUBTOTAL</b>				<b>\$1,793,013</b>		<b>\$861,894</b>
MOBILIZATION (THIS IS SUB+CONTIN. X % =)		4.5%		\$108,926		\$52,360
MAINTENANCE OF TRAFFIC		5.0%		\$89,651		\$43,095
ENGINEERING & CONTINGENCIES		35.0%		\$627,555		\$301,663
RIGHT OF WAY				\$695,000	-	\$225,000
<b>GRAND TOTAL</b>				<b>\$3,314,144</b>		<b>\$1,484,012</b>

**POSSIBLE SAVINGS:**

**\$1,830,132**

## **VII. DEVELOPMENT PHASE**

### **B. DRAINAGE**

*-DROPPED DURING SPECULATION PHASE SINCE NO REASONABLE ALTERNATIVES  
COULD BE FORMULATED.*

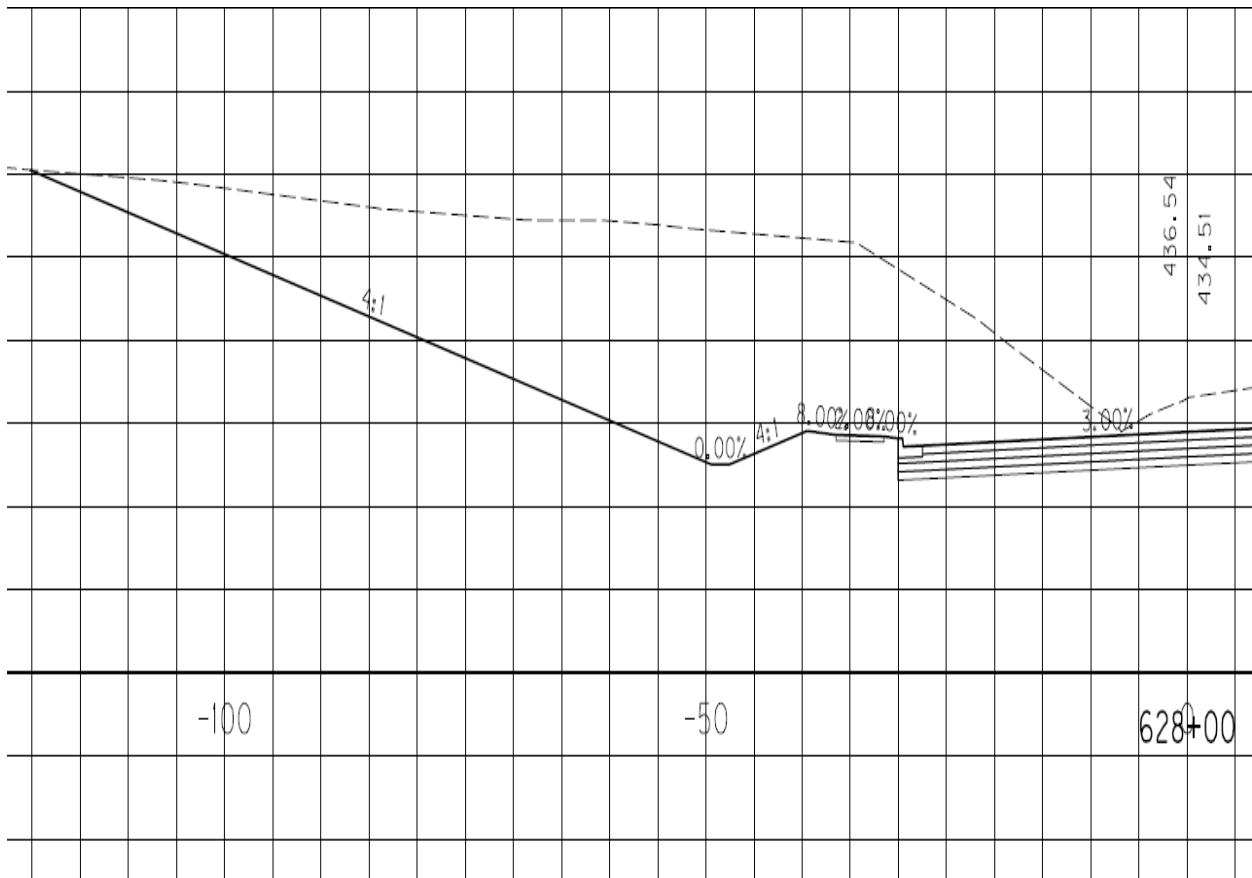
## VII. DEVELOPMENT PHASE

### C. ROADWAY EXCAVATION

#### Original Design

The Original Design for the project has approximately 182,000 cubic yards of excavation and 119,000 cubic yards of fill which results in 63,000 cubic yards of waste not taking in consideration any shrinkage or swell factors.

The roadway cross section is shown to be constructed between stations 620+00 and 633+00 using 4:1 cut slopes.



## VII. DEVELOPMENT PHASE

### C. ROADWAY EXCAVATION

#### *Value Engineering Alternative No. 3: Steepen the cut slopes to 2:1.*

Value Engineering Alternative No. 3 would change the slopes from station 620+00 to 633+00 from a maximum of 4:1 to a maximum of 2:1. This will result in a reduction of approximately 8,500 cubic yards of waste material without any impact to the stability of the slopes.

This would result in a possible savings of \$109,264 and also reduce the amount of Right-of-Way needed.





**ROADWAY EXCAVATION  
VALUE ENGINEERING ALTERNATIVE NO. 3  
COST COMPARISON SHEET**

DESCRIPTION	UNITS	UNIT COST	PROP'D QTY.	PROP'D COST	V.E. QTY.	V.E. COST
ROADWAY EXCAVATION	CY	\$8.80	182000.0	\$1,601,600	173500.0	\$1,526,800
<b>SUBTOTAL</b>				<b>\$1,601,600</b>		<b>\$1,526,800</b>
MOBILIZATION (THIS IS SUB+CONTIN. X % =)		<b>4.5%</b>		\$97,297		\$92,753
MAINTENANCE OF TRAFFIC		<b>5.0%</b>		\$80,080		\$76,340
ENGINEERING & CONTINGENCIES		<b>35.0%</b>		\$560,560		\$534,380
<b>GRAND TOTAL</b>				<b>\$2,339,537</b>		<b>\$2,230,273</b>

**POSSIBLE SAVINGS: \$109,264**

## **VII. DEVELOPMENT PHASE**

### **D. ARCH CULVERT**

***-DROPPED DURING SPECULATION PHASE SINCE NO REASONABLE ALTERNATIVES  
COULD BE FORMULATED.***

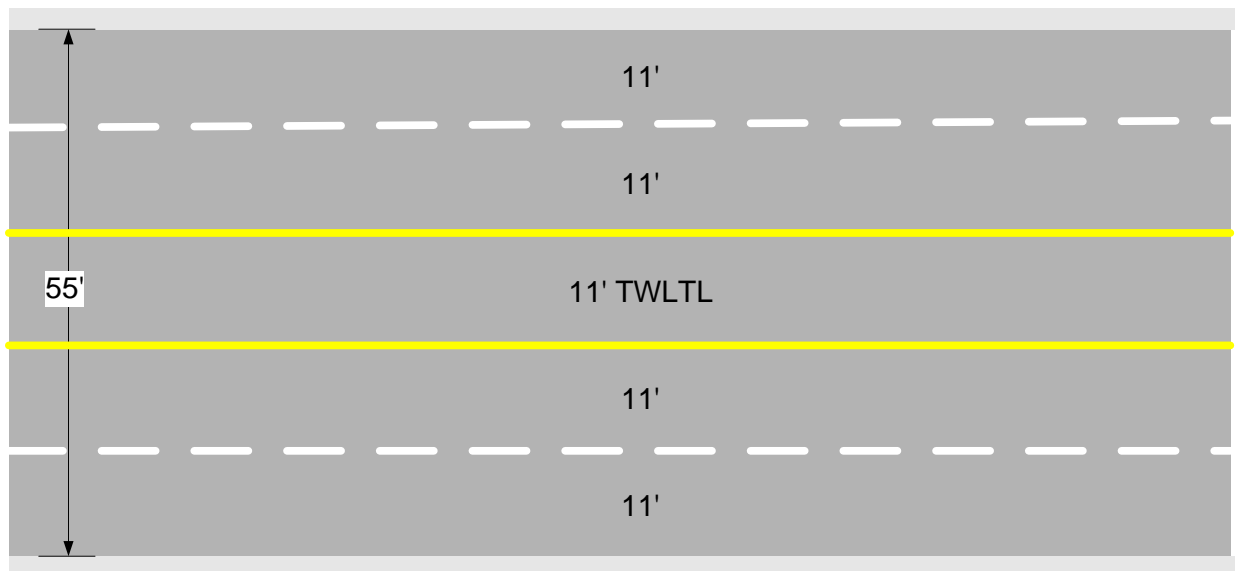
## VII. DEVELOPMENT PHASE

### E. TYPICAL SECTION

#### Original Design

The Original Design provides for two different cross sections along the mainline:

- Rural two 11' travel lanes plus a 11' two-way left-turn lane (TWLTL) plus eight foot shoulders (2' paved/6' DGA.)
- Urban four 11' travel lanes plus a 11' TWLTL plus curb and gutter.



## VII. DEVELOPMENT PHASE

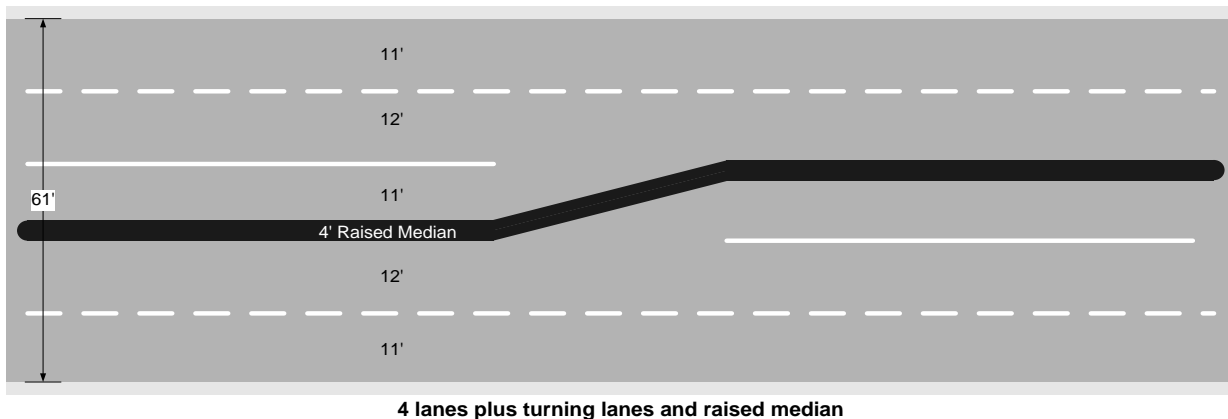
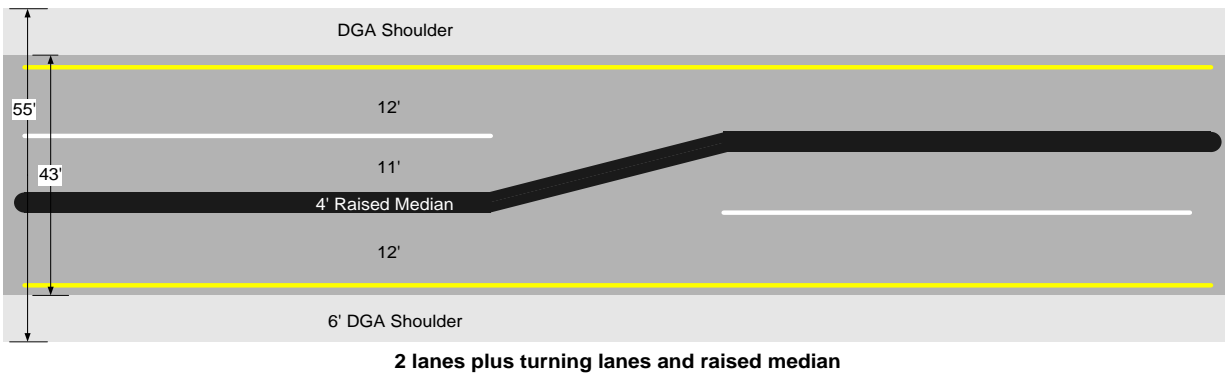
### E. TYPICAL SECTION

#### *Value Engineering Alternative No. 4: Use a 4' raised median.*

The Value Engineering Team recommends modifying the typical section throughout the project to add a raised median to form channelized turning lanes in lieu of the continuous two-way left turn lane (TWLTL.)

The median would serve several purposes. It would reduce the potential for crossover vehicular crashes (compared to an undivided roadway.) The median also helps clearly delineate the turning locations for entrances to drivers. Finally, the positive separation will keep turning vehicles and those that may be using it as an acceleration lane from conflicting. Finally, it will clearly outline where current and future access will be along the corridor.

To achieve this, the road will need to be widened by six feet, which is an increase to the project cost. An integral concrete four feet six-inch raised concrete median. An additional one foot of pavement would be added to allow for a 12' travel lane. The project team will also need to accommodate for intermittent drainage outlets along the median in the superelevated section.



**TYPICAL SECTION  
VALUE ENGINEERING ALTERNATIVE NO. 4  
COST COMPARISON SHEET**

DESCRIPTION	UNITS	UNIT COST	PROP'D QTY.	PROP'D COST	V.E. QTY.	V.E. COST
PAVEMENT	SY	\$43.00	98200.0	\$4,222,600	110520.0	\$4,752,360
EARTHWORK (Raised median)	CY	\$8.80	196400.0	\$1,728,320	203800.0	\$1,793,440
4' RAISED MEDIAN	LF	\$55.00	0.0	\$0	18400.0	\$1,012,000
<b>SUBTOTAL</b>				<b>\$5,950,920</b>		<b>\$7,557,800</b>
MOBILIZATION (THIS IS SUB+CONTIN. X % =)		4.5%		\$361,518		\$459,136
MAINTENANCE OF TRAFFIC		5.0%		\$297,546		\$377,890
ENGINEERING & CONTINGENCIES		35.0%		\$2,082,822		\$2,645,230
<b>GRAND TOTAL</b>				<b>\$8,692,806</b>		<b>\$11,040,056</b>

**INCREASED COST:                      \$2,347,250**

## VII. DEVELOPMENT PHASE

### E. TYPICAL SECTION

***Value Engineering Alternative No. 5: Begin the 6' median at station 640+00, eliminate the continuous turn lanes, use roundabouts at the intersections at station 640+00, station 664+00, Pride Avenue and use a 3 lane typical section for the remainder of the project.***

The Value Engineering Team recommends modifying the urban typical section throughout the project to add a six-foot raised median between stations 635+00 and 705+00. There are three roundabouts located on this section to allow for u-turns to facilitate access to properties along the corridor. The division point between two through lanes (rural section) and four through lanes (urban section) is shifted from station 605+00 to 635+00 (3,000').

The projected volumes on this section of road for 2032 are 22500 vehicles per day. Using the traffic forecasts assumed 2% growth rate factor, by 2036, the volumes on this road may exceed 24,000 per day. Design memo 03-09, recommends that a non-traversable median be used in lieu of a TWLTL when daily volumes exceed 24,000. This is to help better facilitate traffic flow and maintain a safer roadway environment by controlling turning movements.

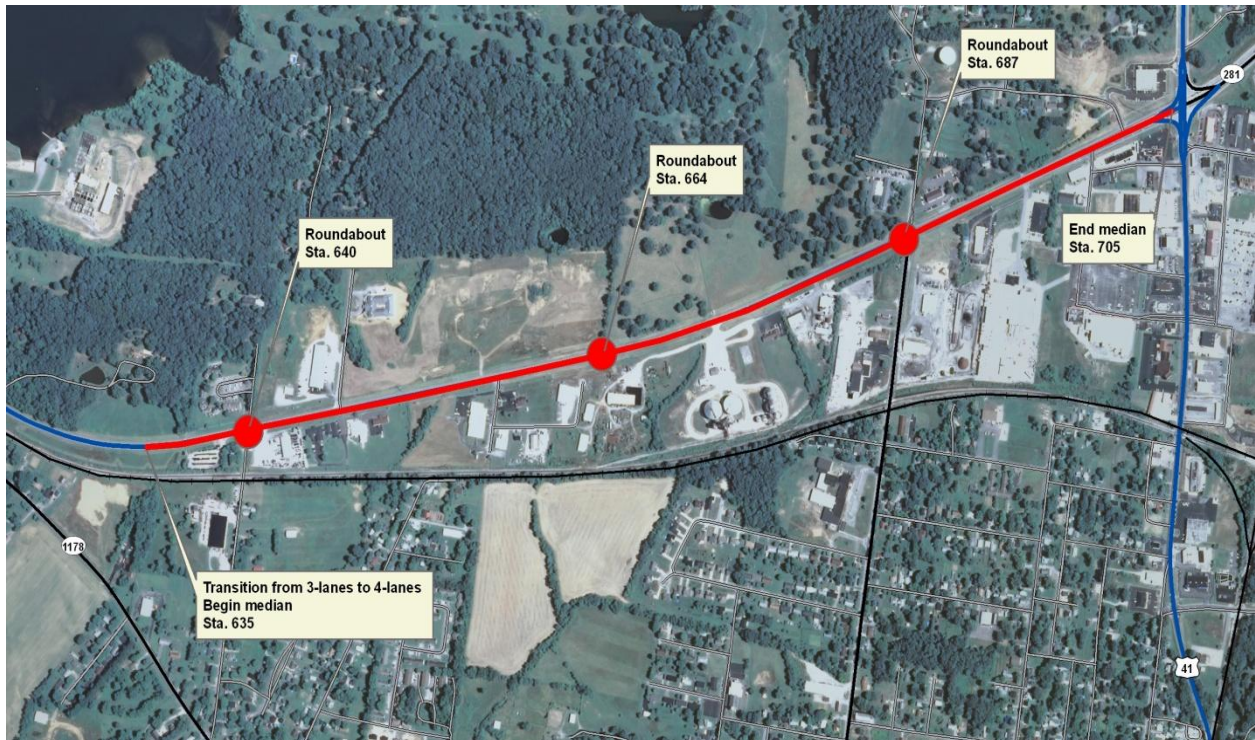
Preliminary analysis indicates that roundabouts will work sufficiently at the given intersections. Pride Avenue was analyzed because it will the intersection with the heaviest traffic volumes. Forecasted PM design hour volumes using a 2031 forecast year were input into both the Kentucky Transportation Center (KTC), Roundabout Capacity Tool, KTC Intersection Tool and the FHWA Alternative Intersection Selection Tool (AIST) show that a major/minor roundabout design will work for this location. A major/minor roundabout typically has two lanes entering the roundabout along the mainline highway and one lane entering from the side street or entrance. During the future DHV, delays are be project at less than 9 seconds on average for all vehicles and there is no more than one car queued in all directions.

This design will not require additional right-of-way (ROW) through most of the corridor. It will require additional minor ROW takings at the three intersections to fit the roundabouts. Overall, the construction costs will in increase slightly with this alternative.

## VII. DEVELOPMENT PHASE

### E. TYPICAL SECTION

*Value Engineering Alternative No. 5: Begin the 6' median at station 640+00, eliminate the continuous turn lanes, use roundabouts at the intersections at station 640+00, station 664+00, Pride Avenue and use a 3 lane typical section for the remainder of the project (continued).*

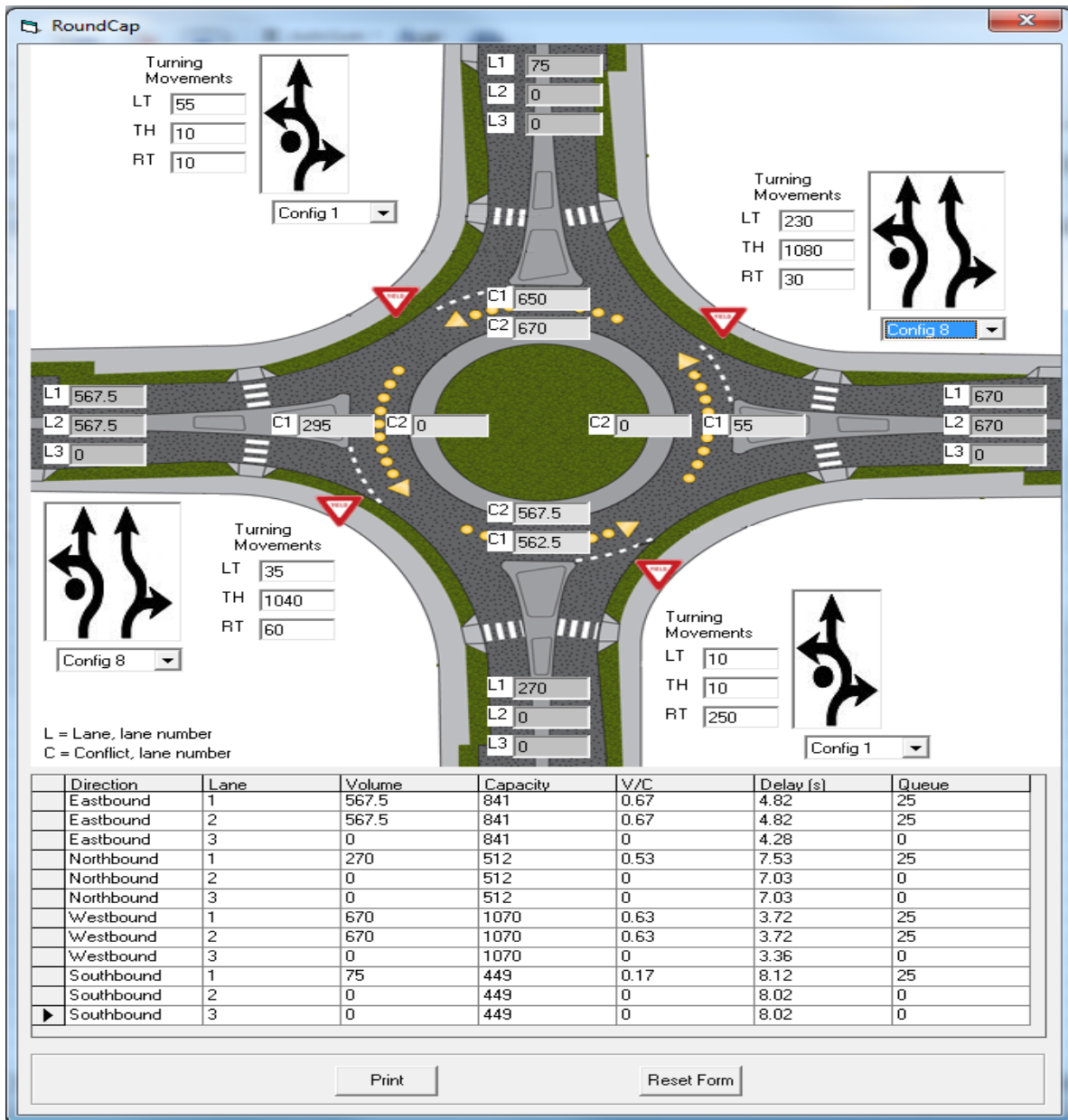


**4 lanes with raised median**

## VII. DEVELOPMENT PHASE

### E. TYPICAL SECTION

*Value Engineering Alternative No. 5: Begin the 6' median at station 640+00, eliminate the continuous turn lanes, use roundabouts at the intersections at station 640+00, station 664+00, Pride Avenue and use a 3 lane typical section for the remainder of the project (continued).*



**Output from KTC Roundabout Capacity Tool: US41A at Pride Avenue**



**TYPICAL SECTION  
VALUE ENGINEERING ALTERNATIVE NO. 5  
COST COMPARISON SHEET**

DESCRIPTION	UNITS	UNIT COST	PROP'D QTY.	PROP'D COST	V.E. QTY.	V.E. COST
PAVEMENT	SY	\$43.00	98200.0	\$4,222,600	86200.0	\$3,706,600
EATHWORK	CY	\$8.80	196400.0	\$1,728,320	172400.0	\$1,517,120
6' RAISED MEDIAN	LF	\$70.00	0.0	\$0	7900.0	\$553,000
<b>SUBTOTAL</b>				<b>\$5,950,920</b>		<b>\$5,776,720</b>
MOBILIZATION (THIS IS SUB+CONTIN. X % =)		<b>4.5%</b>		\$361,518		\$350,936
MAINTENANCE OF TRAFFIC		<b>5.0%</b>		\$297,546		\$288,836
ENGINEERING & CONTINGENCIES		<b>35.0%</b>		\$2,082,822		\$2,021,852
RIGHT OF WAY (ROUNDAABOUT ONLY)	SF	\$1.70		\$0	9,000	\$15,300
<b>GRAND TOTAL</b>				<b>\$8,692,806</b>		<b>\$8,453,644</b>

**POSSIBLE SAVINGS:    \$239,163**

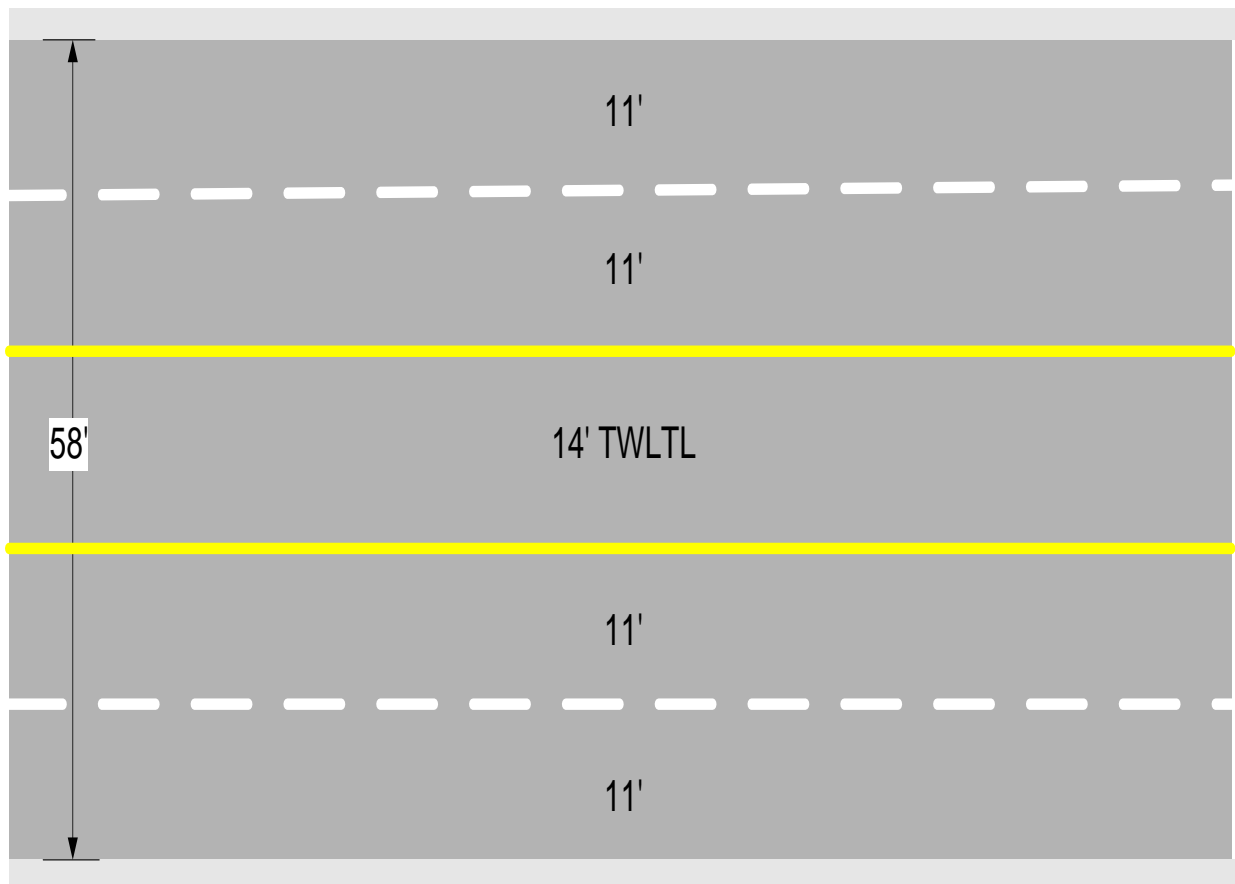
## VII. DEVELOPMENT PHASE

### E. TYPICAL SECTION

*Value Engineering Alternative No. 6: Use a 14' flush median.*

The Value Engineering Team recommends modifying the typical section to increase the TWLTL from 11' to 14'. The purpose is to allow for a greater space for turning vehicles to maneuver safely. This should reduce the chances for sideswipe crashes between turning vehicles and vehicles traveling in both directions. It also gives sufficient room for wider commercial vehicles to queue for making left turns.

This Alternative will have an increased construction costs for wider pavement.



**TYPICAL SECTION  
VALUE ENGINEERING ALTERNATIVE NO. 6  
COST COMPARISON SHEET**

DESCRIPTION	UNITS	UNIT COST	PROP'D QTY.	PROP'D COST	V.E. QTY.	V.E. COST
PAVEMENT (MEDIAN)	SY	\$43.00	98200.0	\$4,222,600	104350.0	\$4,487,050
EARTHWORK	CY	\$8.80	196400.0	\$1,728,320	202900.0	\$1,785,520
<b>SUBTOTAL</b>				<b>\$5,950,920</b>		<b>\$6,272,570</b>
MOBILIZATION (THIS IS SUB+CONTIN. X % =)		<b>4.5%</b>		\$361,518		\$381,059
MAINTENANCE OF TRAFFIC		<b>5.0%</b>		\$297,546		\$313,629
ENGINEERING & CONTINGENCIES		<b>35.0%</b>		\$2,082,822		\$2,195,400
<b>GRAND TOTAL</b>				<b>\$8,692,806</b>		<b>\$9,162,657</b>

**INCREASED COST**

**\$469,850**

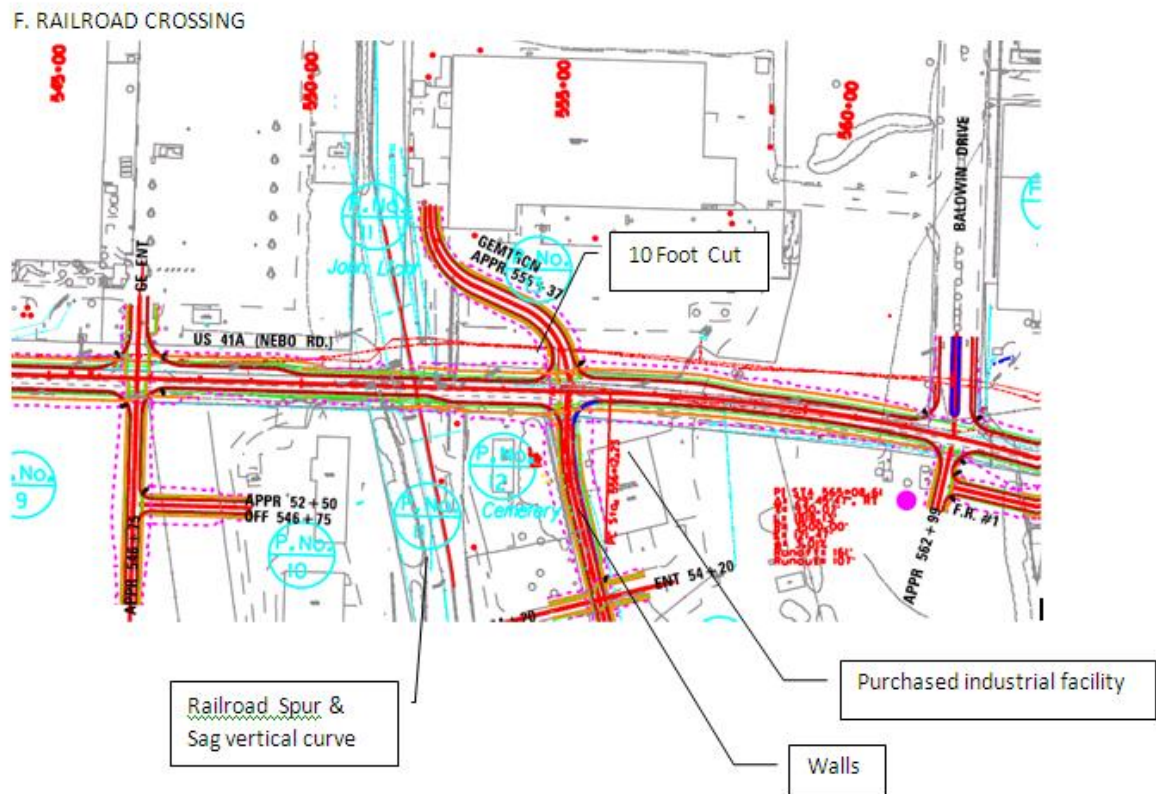
## VII. DEVELOPMENT PHASE

### F. RAILROAD CROSSINGS

#### Original Design

The Original Design accommodates an existing railroad industrial spur across US 41A.

US 41A's vertical alignment is a sag vertical curve with the low point the existing railroad spur grade. In order to provide the desired sight distance the east side of the vertical curve is flattened. The Original Design vertical alignment results in a nine to ten foot cut on the east side of the railroad spur. The resulting cut necessitates the Right-of-Way acquisition of an industrial facility, retaining walls on an access road and relocation of an industrial access. The project has excess excavation that will have to be wasted.



# VII. DEVELOPMENT PHASE

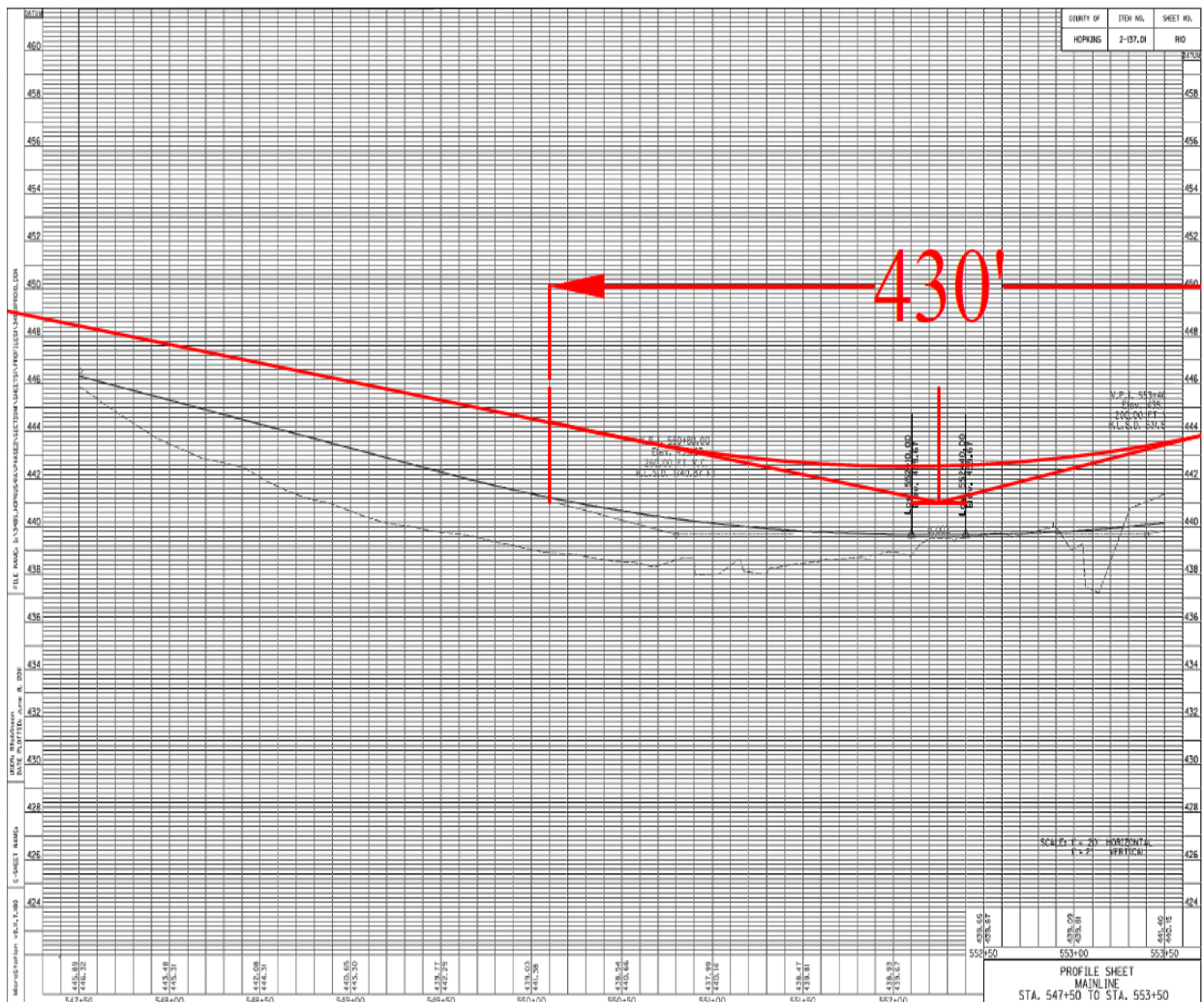
## F. RAILROAD CROSSINGS

### Value Engineering Alternative No. 7: Purchase the Industrial Park spur line.

The Value Engineering Team recommends purchasing the railroad spur. The removal of the railroad spur will eliminate the railroad protection system and crossing material. Without the railroad spur the profile of US 41A could be modified to increase the sight distance, reduce the amount of excavation, and eliminate the purchasing of an industrial facility. The vertical alignment will reduce the excavation and bring the project closer to a balance project.

The Value Engineering Team estimated the value of the railroad spur to be the same per acre cost as the cost to purchase parcel #14 Gary E. Peyton, the industrial facility purchased in the Original Design.

### VALUE ENGINEERING RECOMMENDED US 41A PROFILE

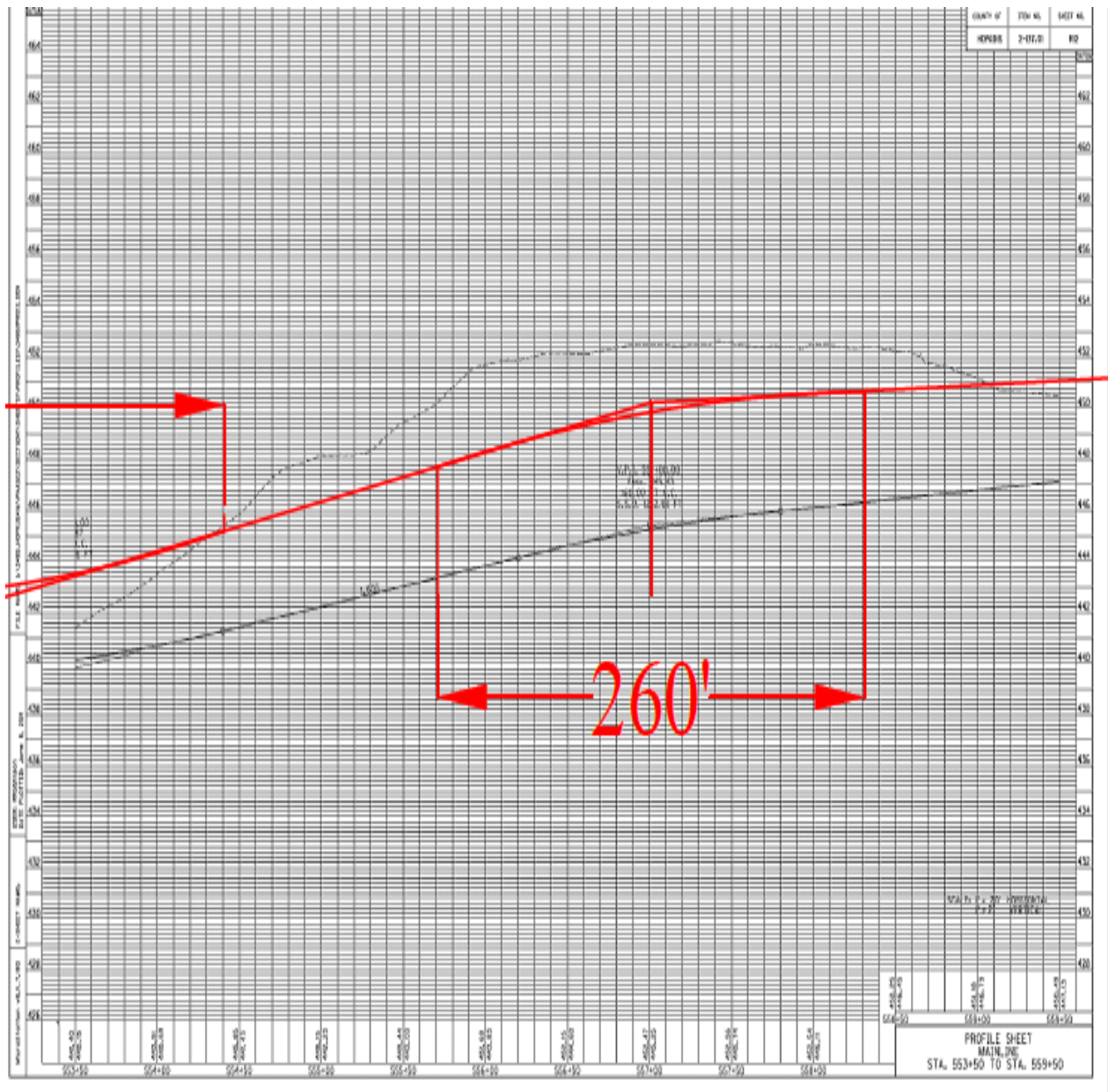


# VII. DEVELOPMENT PHASE

## F. RAILROAD CROSSINGS

*Value Engineering Alternative No. 7: Purchase the Industrial Park spur line (continued).*

### VALUE ENGINEERING RECOMMENDED US 41A PROFILE



**RAILROAD CROSSING  
VALUE ENGINEERING ALTERNATIVE NO. 7  
COST COMPARISON SHEET**

DESCRIPTION	UNITS	UNIT COST	PROP'D QTY.	PROP'D COST	V.E. QTY.	V.E. COST
RAILROAD CROSSING	EA	\$600,000.00	1.0	\$600,000	0.0	\$0
EARTHWORK	CY	\$8.80	30500.0	\$268,400	3850.0	\$33,880
WALLS	CY	\$350.00	400.0	\$140,000	0.0	\$0
<b>SUBTOTAL</b>				<b>\$1,008,400</b>		<b>\$33,880</b>
MOBILIZATION (THIS IS SUB+CONTIN. X % =)		<b>4.5%</b>		\$61,260		\$2,058
MAINTENANCE OF TRAFFIC		<b>5.0%</b>		\$50,420		\$1,694
ENGINEERING & CONTINGENCIES		<b>35.0%</b>		\$352,940		\$11,858
RIGHT OF WAY	LS	\$1.00	450,000	\$450,000	650,000	\$650,000
<b>GRAND TOTAL</b>				<b>\$1,923,020</b>		<b>\$699,490</b>

**POSSIBLE SAVINGS: \$1,223,530**

# VII. DEVELOPMENT PHASE

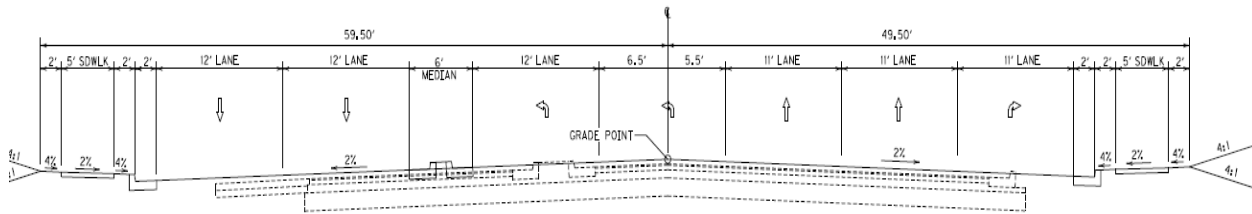
## G. INTERSECTIONS

### Original Design

The Original Design for this intersection is for a conventional 4 legged intersection with dual left turn lanes for North Main Street/US 41 and single left turn lanes for Nebo Road/US 41A.

## TYPICAL SECTIONS

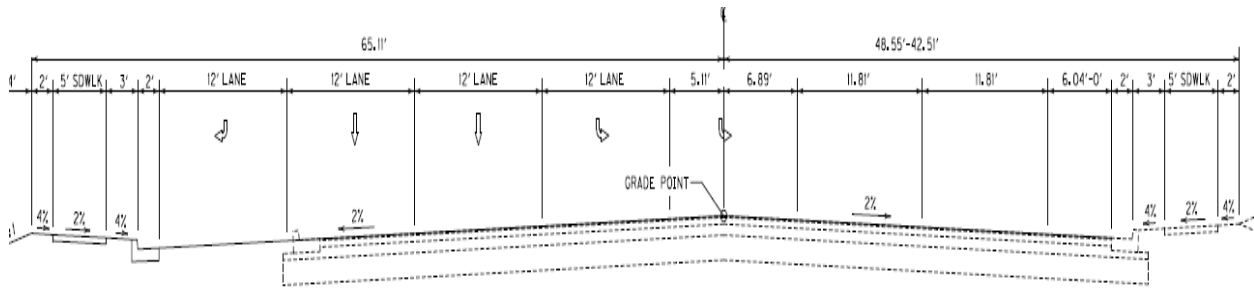
RIGHT OF WAY  
PLANS



**7 LANE - URBAN NORMAL CUT/FILL SECTION**

**U. S. 41 (NORTH MAIN ST.)**  
STA 47+00 TO STA. 50+00

### NORTH MAIN STREET/US 41 SOUTH APPROACH



**5 LANE - URBAN NORMAL CUT/FILL SECTION**

**U. S. 41 (NORTH MAIN ST.)**  
STA 326+00 TO STA. 329+50

### NORTH MAIN STREET/US 41 NORTH APPROACH



# VII. DEVELOPMENT PHASE

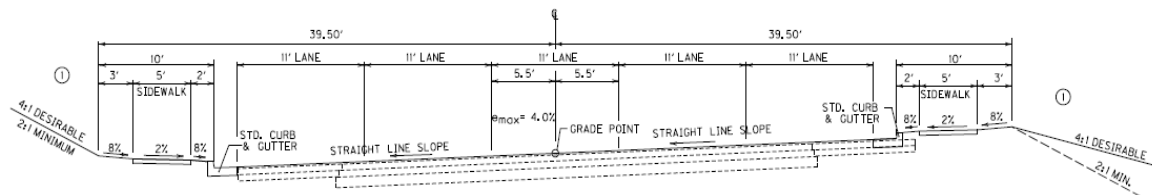
## G. INTERSECTIONS

Original Design (continued)

### NEBO ROAD/US 41 EAST AND WEST APPROACH

## TYPICAL SECTION

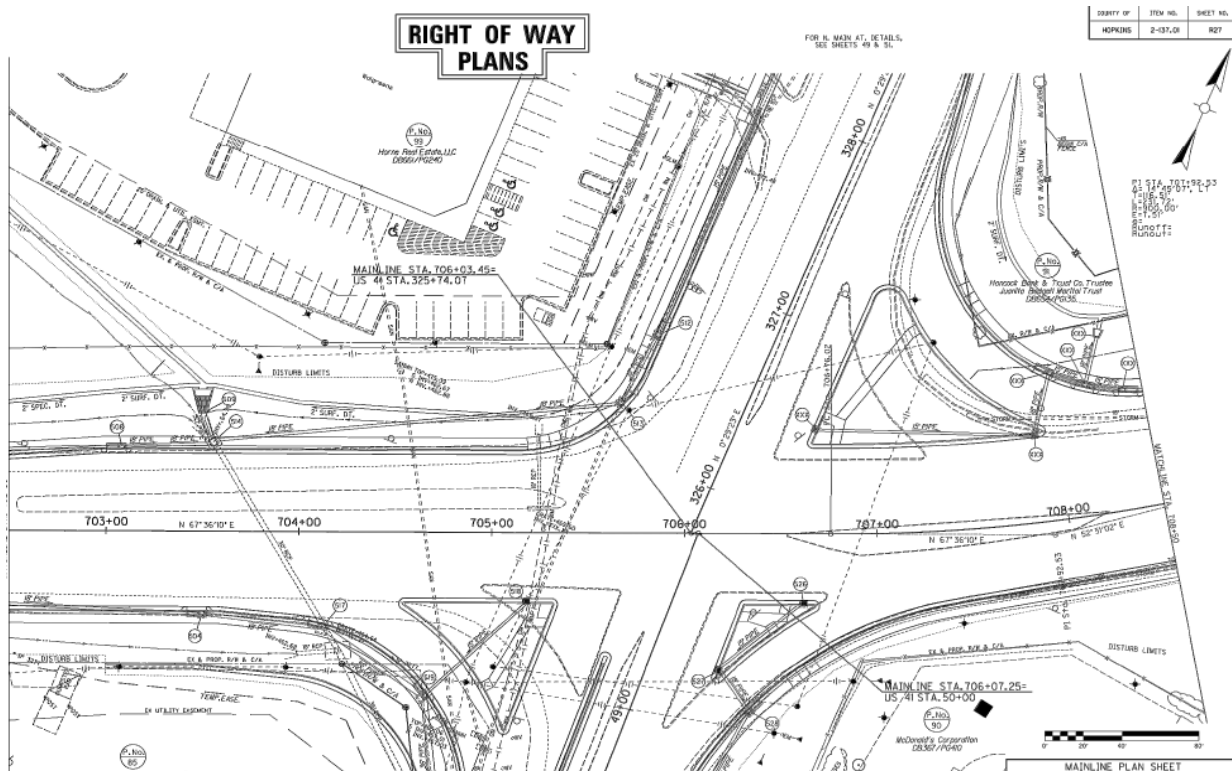
**RIGHT OF WAY  
PLANS**



**5 - LANE URBAN SUPERELEVATION CUTFILL SECTION**

**U.S. 41A - NEBO ROAD**

STA. 701+50.00 TO STA. 713+83.70 SEE ELEVATION DEVELOPMENT SHEETS.



### NEBO ROAD/US 41A - NORTH MAIN STREET/US 41 PLAN VIEW

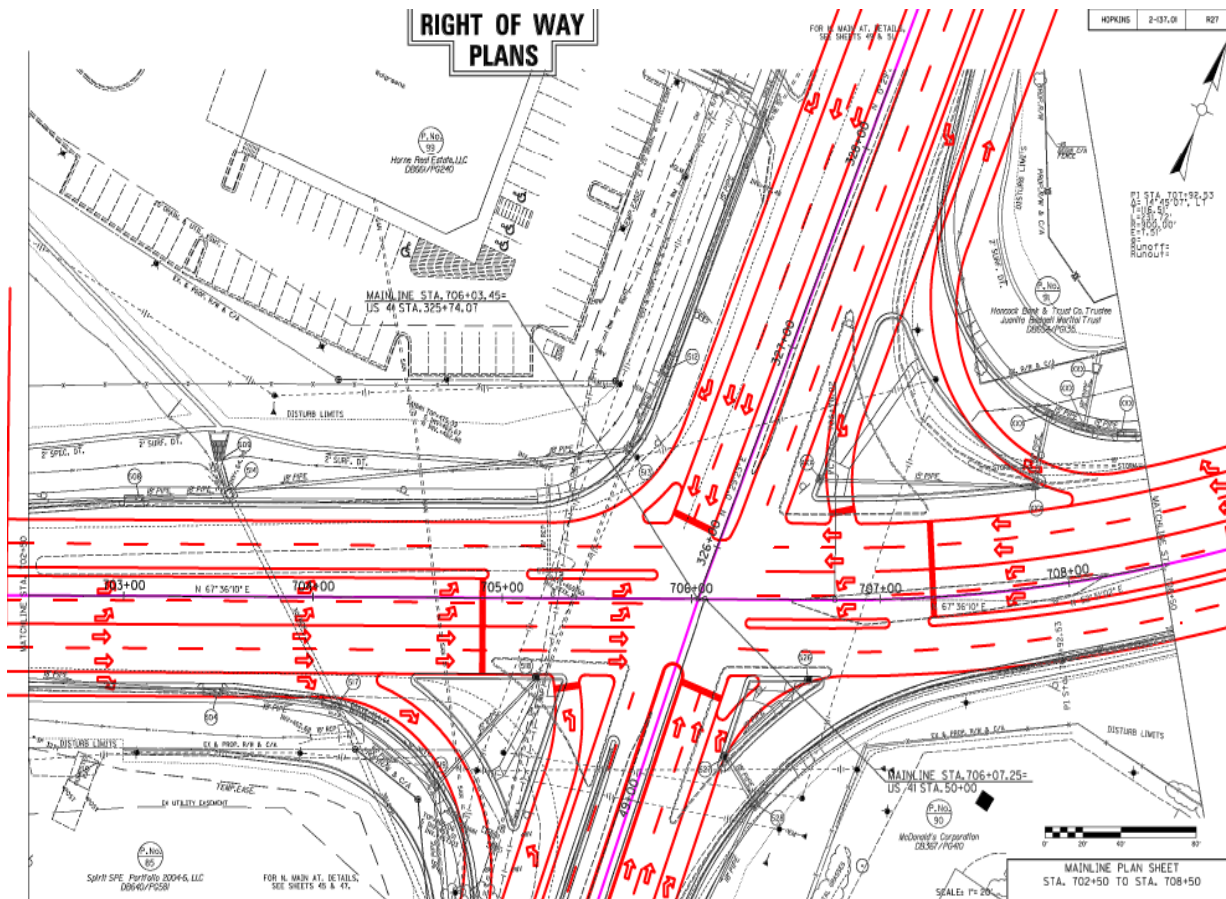
Traffic analysis on the original intersection design indicates this intersection will operate satisfactorily for the design hour traffic.

## VII. DEVELOPMENT PHASE

### G. INTERSECTIONS

#### *Value Engineering Alternative No. 8: Use a continuous flow intersection at the US 41A/US 41 Intersection.*

This Value Engineering Alternative will configure the interchange with a Partial Continuous Flow Intersection or also know as a Partial Displaced Left Turn Intersection as shown below.



#### **VALUE ENGINEERING PARTIAL DISPLACED LEFT TURN INTERSECTION**

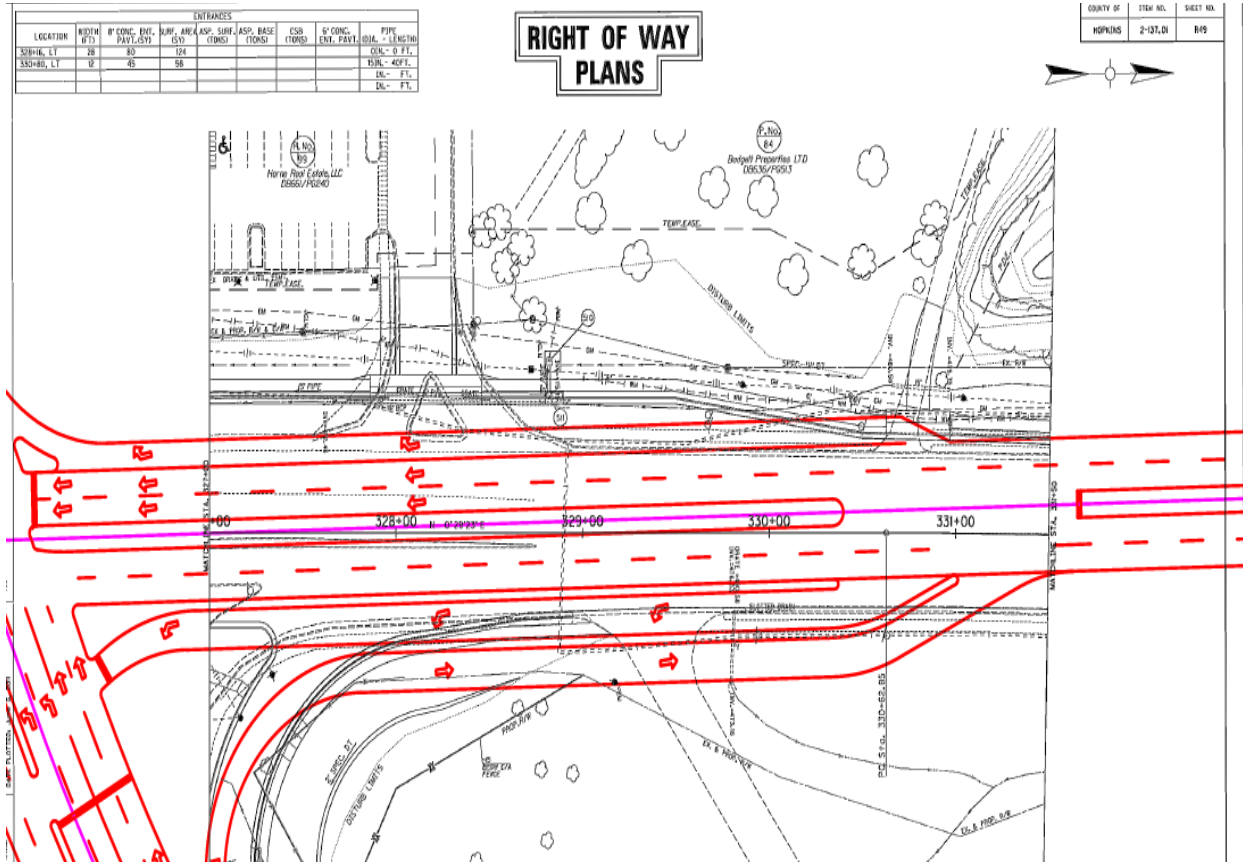
It is a Partial Displaced Left Turn Intersection because only the north and south left turn movements are displaced. This unique configuration removes the north and south left turn movements from the signal timing by allowing the left turn movement to occur at the same time as the through movement has a green light. This eliminates one signal phase providing additional time to the other three phases.

This design will require more curb and gutter, have a slightly larger foot print, more pavement and a more complex signalization system. The signal system will require additional signals for the displaced lefts.

# VII. DEVELOPMENT PHASE

## G. INTERSECTIONS

*Value Engineering Alternative No. 8: Use a continuous flow intersection at the US 41A/US 41 Intersection (continued).*

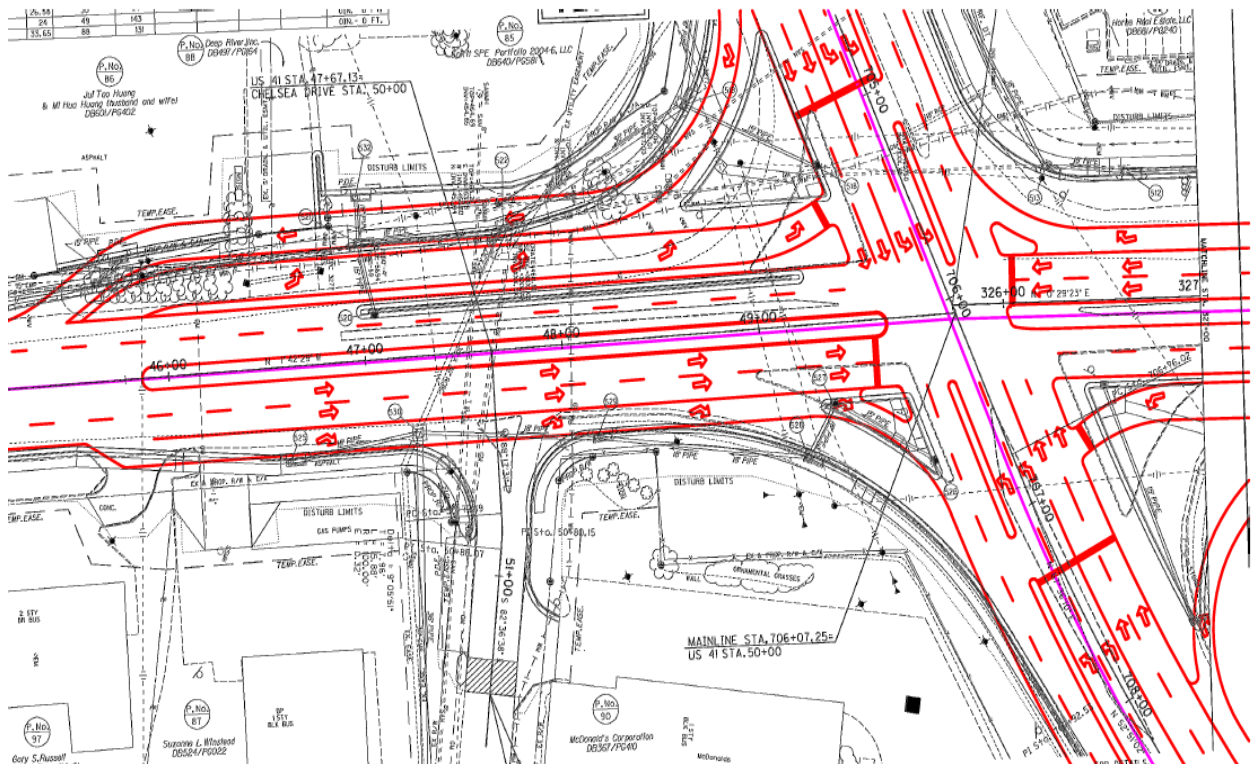


**VALUE ENGINEERING NORTH APPROACH**

## VII. DEVELOPMENT PHASE

### G. INTERSECTIONS

#### *Value Engineering Alternative No. 8: Use a continuous flow intersection at the US 41A/US 41 Intersection (continued).*



### VALUE ENGINEERING SOUTH APPROACH

As seen in the sketch above and on the previous page, the left turns cross the opposing traffic lanes in advance of the signal and are queued at the stop until they get a green arrow at the same time as the through movement and for the same length of time. Cross traffic right turns are channeled outside the left turn lane and merge into traffic upstream from the signal that allow left turns into their displaced left turn lane.

Traffic analysis was completed on the FHWA Alternative Intersection Selection Tool. The analysis indicated both the conventional as well as the Displaced Left Turn Intersection will operate satisfactorily in the design year, but the Displaced Left Turn Intersection will provide more capacity and should have a longer useful design life.

**INTERSECTIONS**  
*(US 41A/US 41 INTERSECTION)*  
**VALUE ENGINEERING ALTERNATIVE NO. 8**  
**COST COMPARISON SHEET**

DESCRIPTION	UNITS	UNIT COST	PROP'D QTY.	PROP'D COST	V.E. QTY.	V.E. COST
PAVEMENT	SY	\$43.00	15635.9	\$672,343	17612.8	\$757,349
CURB & GUTTER	LF	\$20.00	7408.0	\$148,160	9970.9	\$199,418
SIGNALS	EA	\$100,000.00	1.0	\$100,000	1.5	\$150,000
<b>SUBTOTAL</b>				<b>\$920,503</b>		<b>\$1,106,768</b>
MOBILIZATION (THIS IS SUB+CONTIN. X % =)		4.5%		\$55,921		\$67,236
MAINTENANCE OF TRAFFIC		5.0%		\$46,025		\$55,338
ENGINEERING & CONTINGENCIES		35.0%		\$322,176		\$387,369
<b>GRAND TOTAL</b>				<b>\$1,344,625</b>		<b>\$1,616,711</b>

**INCREASED COST:                      \$272,086**

## VII. DEVELOPMENT PHASE

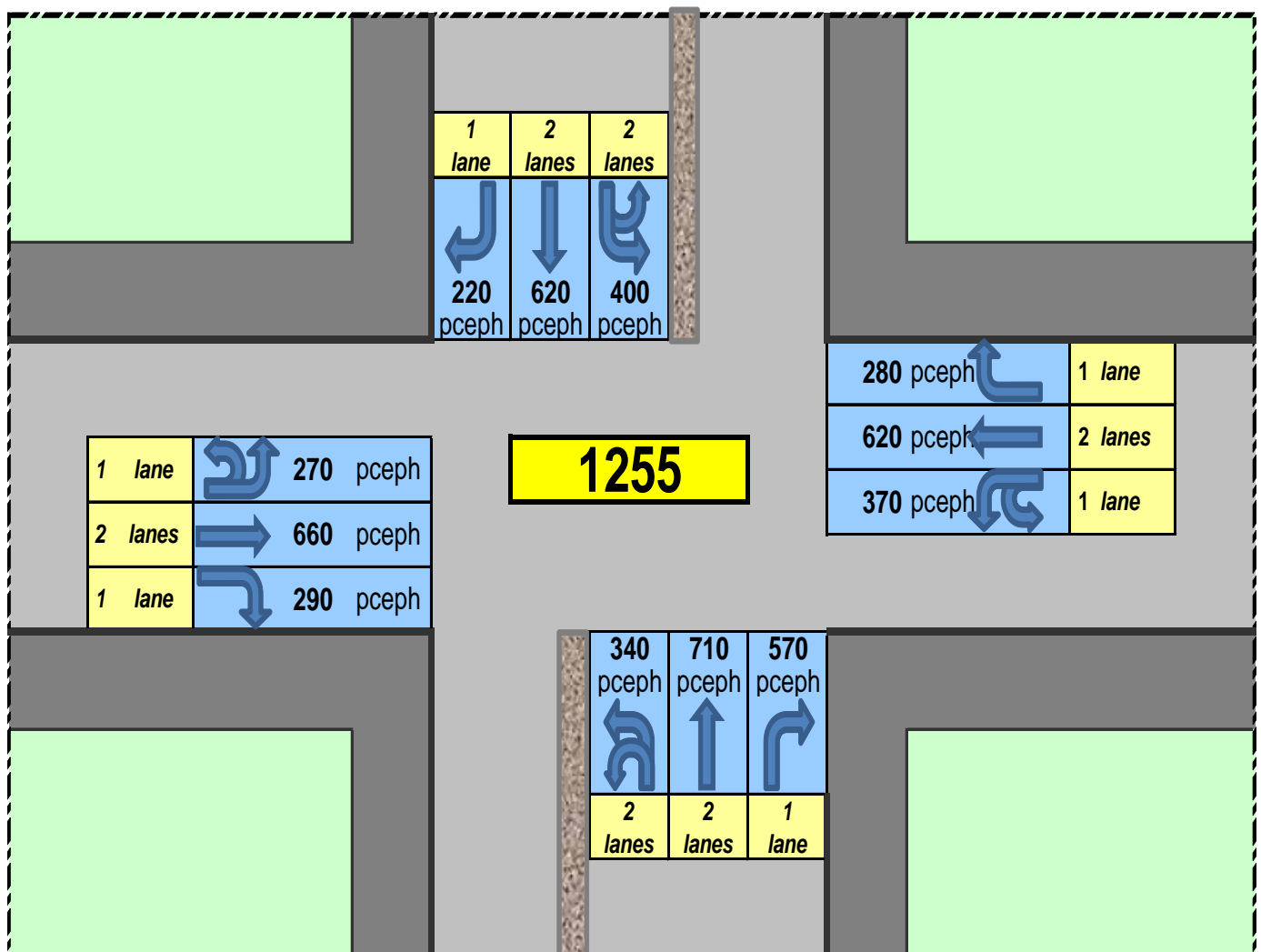
### G. INTERSECTIONS

*Value Engineering Alternative No. 8: Use a continuous flow intersection at the US 41A/US Intersection (continued).*

#### TRAFFIC ANALYSIS:

### Conventional Intersection

< 1200	1200 -1400	<u>Critical lane volume sum</u>
1400 -1600	> 1600	

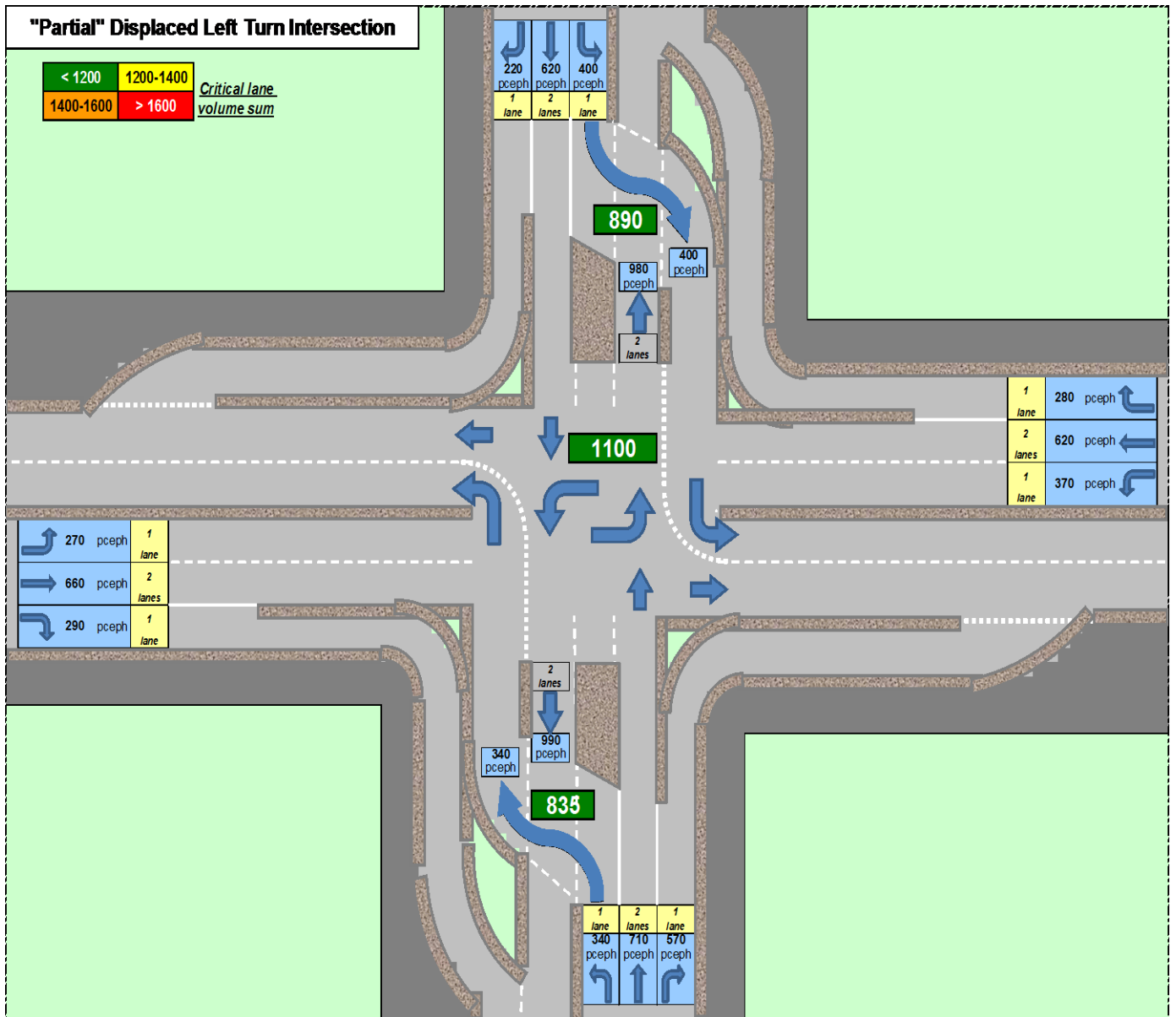


**PM PEAK**

# VII. DEVELOPMENT PHASE

## G. INTERSECTIONS

*Value Engineering Alternative No. 8: Use a continuous flow intersection at the US 41A/US 41 Intersection (continued).*



PM PEAK

## VII. DEVELOPMENT PHASE

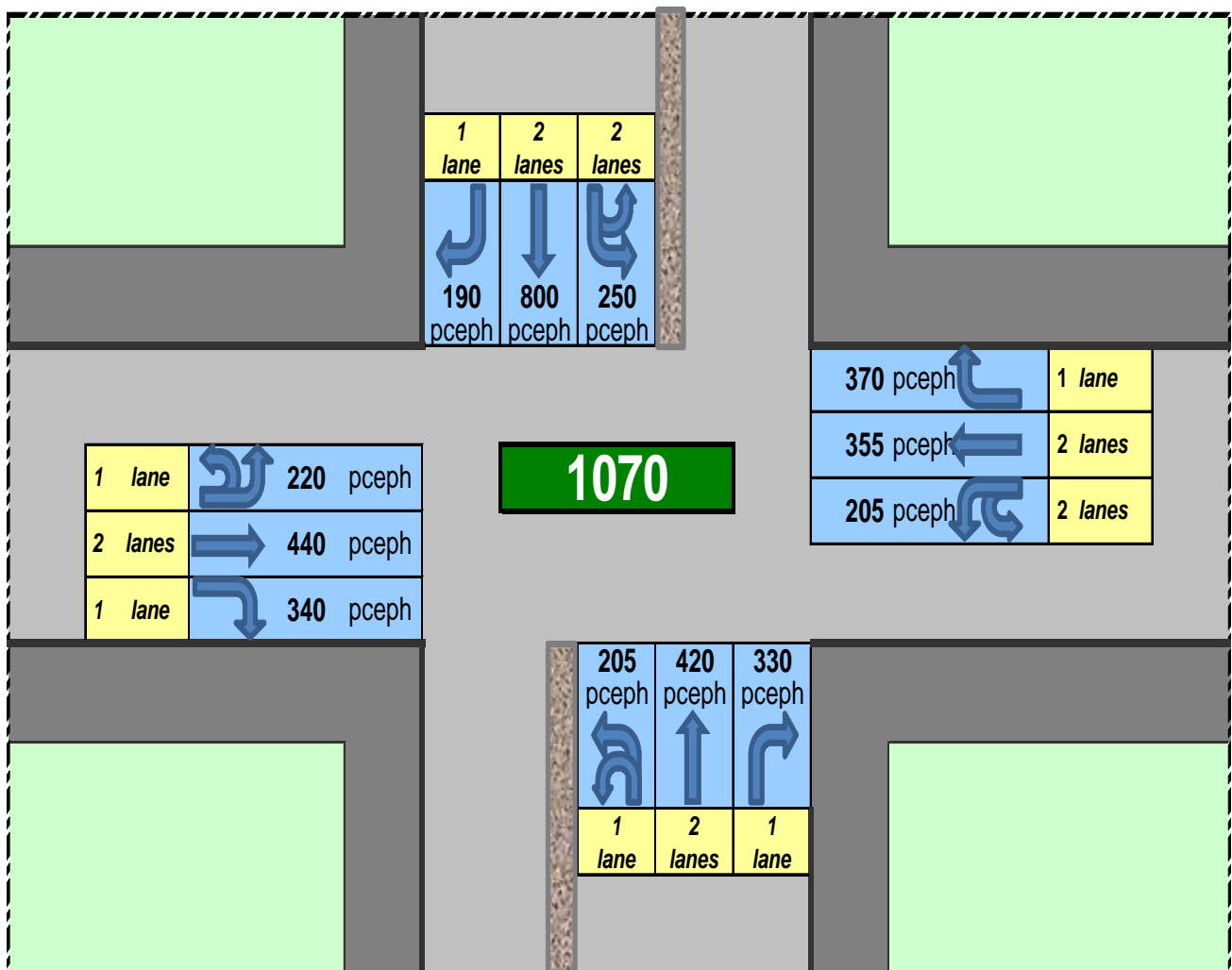
### G. INTERSECTIONS

*Value Engineering Alternative No. 8: Use a continuous flow intersection at the US 41A/US 41 Intersection (continued).*

### Conventional Intersection

< 1200	1200 -1400
1400 -1600	> 1600

Critical lane  
volume sum



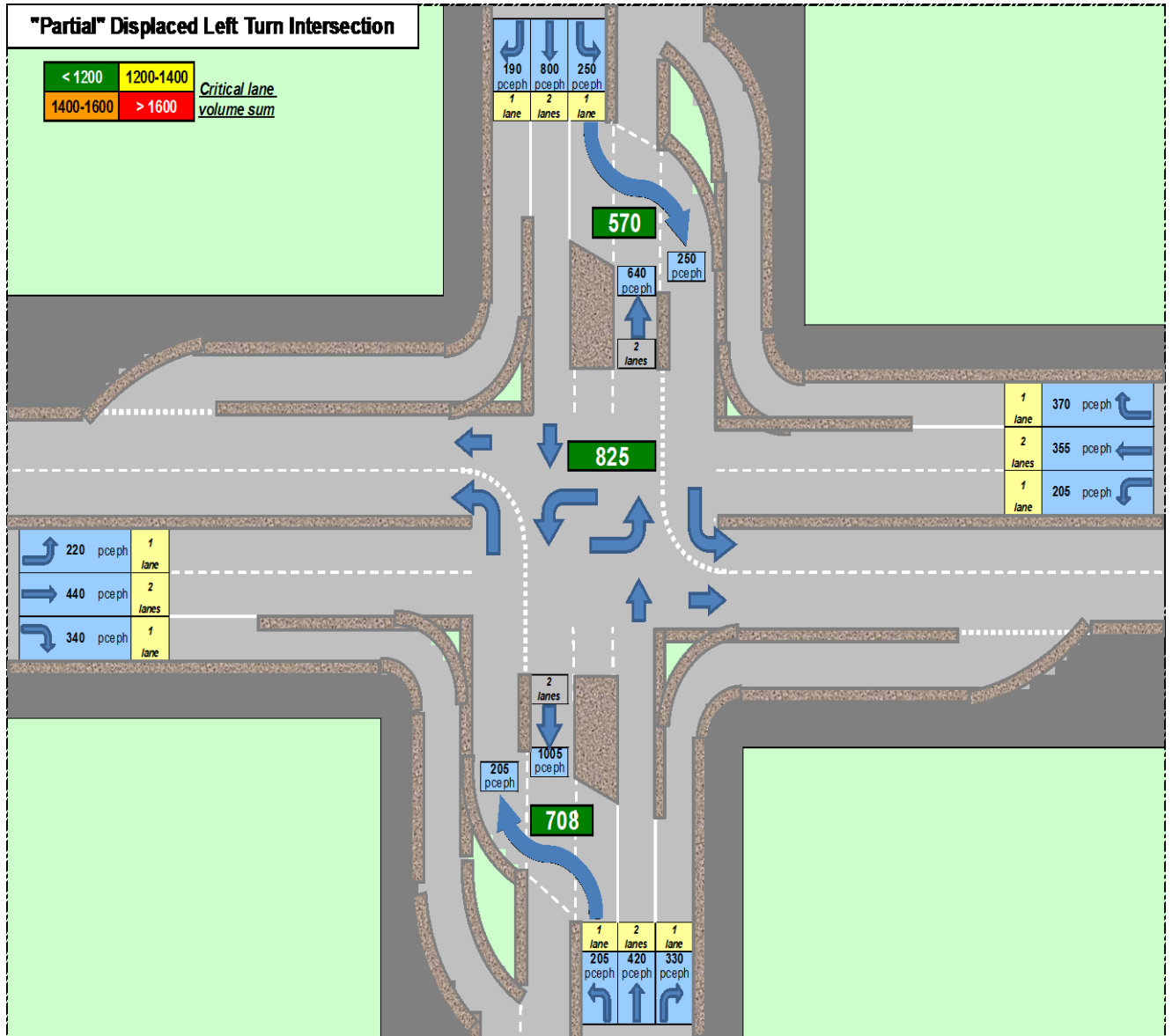
AM PEAK



# VII. DEVELOPMENT PHASE

## G. INTERSECTIONS

*Value Engineering Alternative No. 8: Use a continuous flow intersection at the US 41A/US 41 Intersection (continued).*



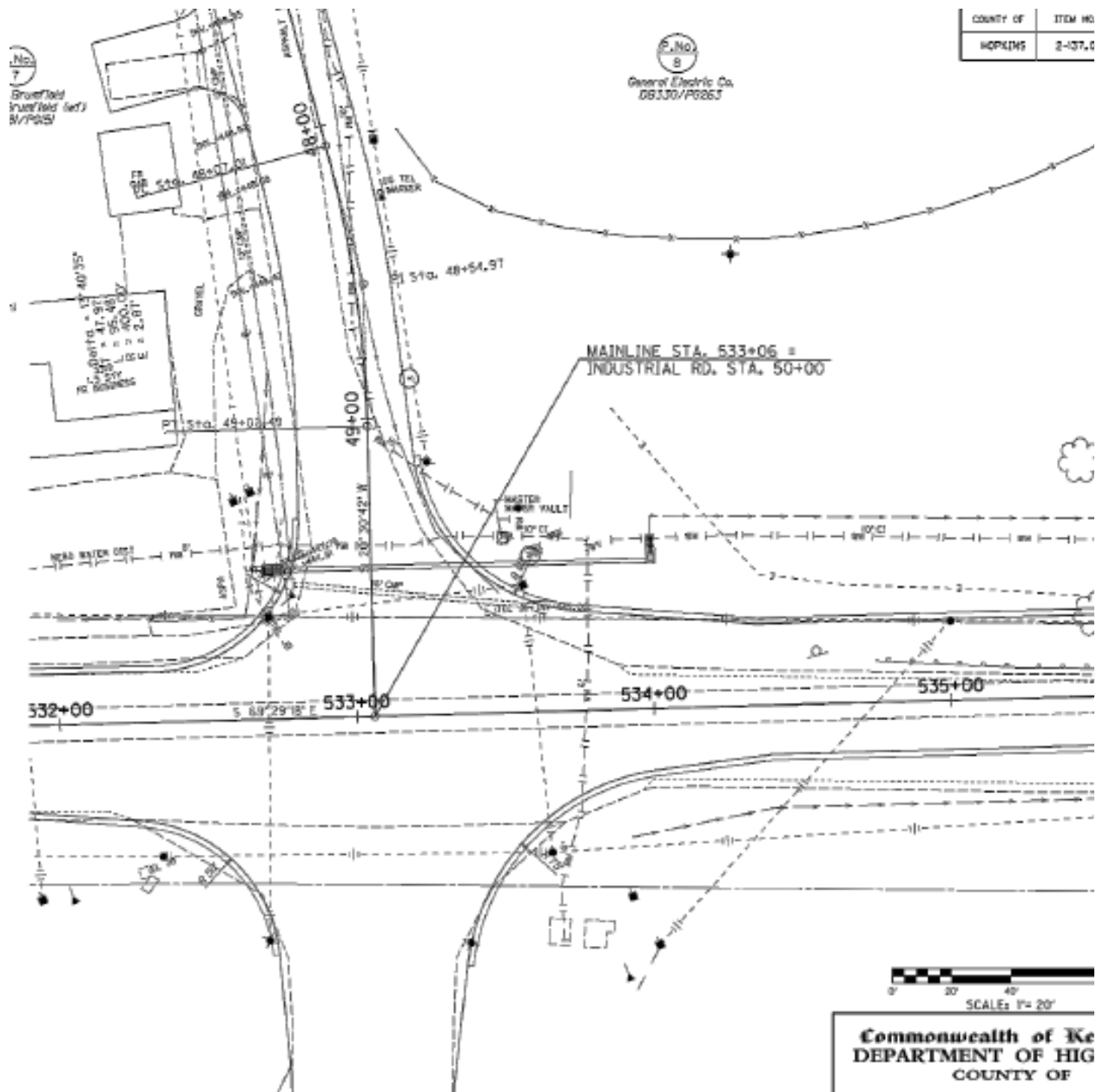
AM PEAK

# VII. DEVELOPMENT PHASE

## G. INTERSECTIONS

### Original Design

The Original Design shows a four legged signalized intersection at the junction of Industrial Road and Nebo Road/US 41A as shown below.



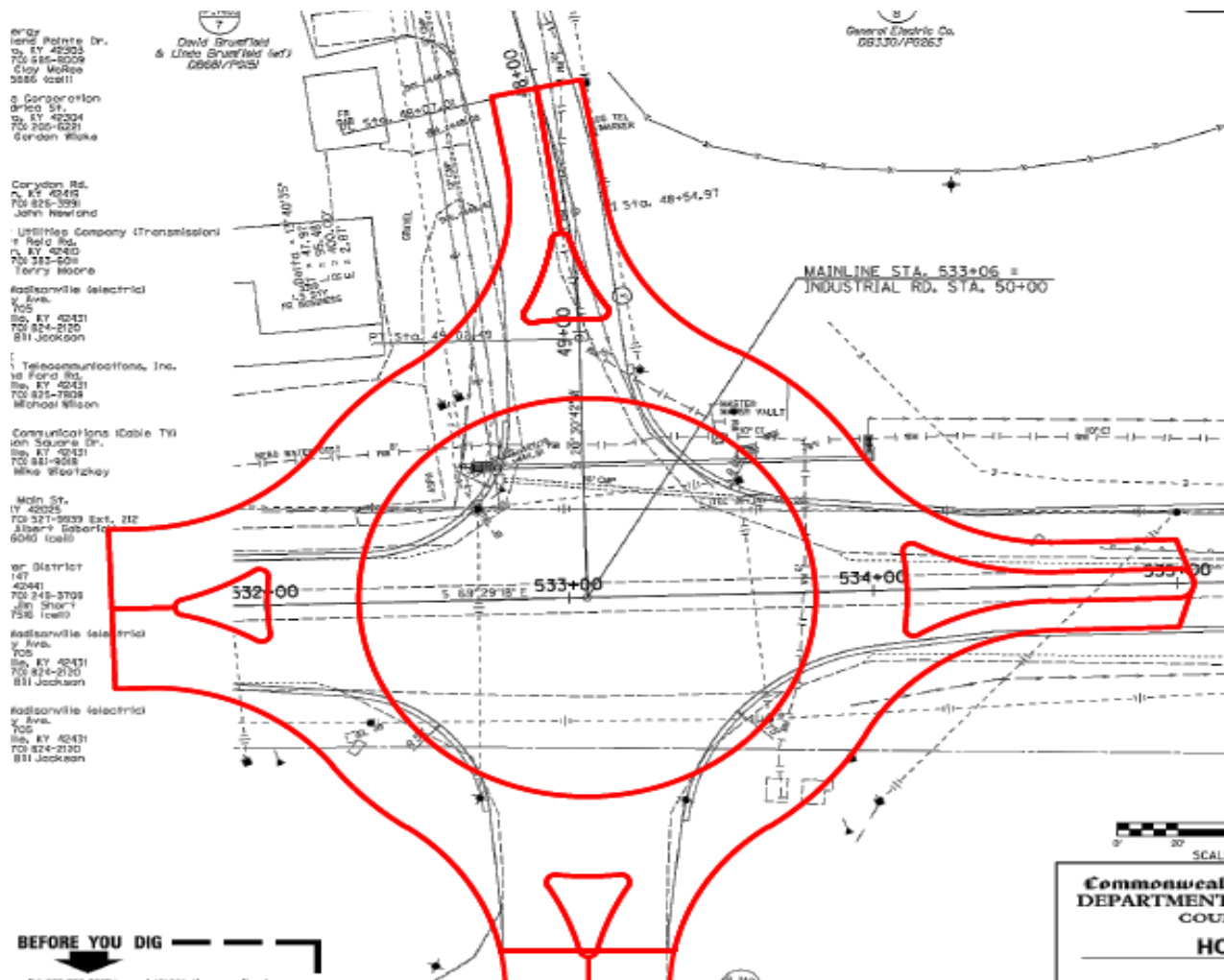
## VII. DEVELOPMENT PHASE

### G. INTERSECTIONS

#### *Value Engineering Alternative No. 9: Use a roundabout at Industrial Road.*

The Value Engineering Team recognizes that at this intersection the roadway will change its characteristics from a high speed rural two lane roadway to a more congested roadway with industrial complexes on both sides of the roadway and within a few miles along with a reduction in speed from 55 MPH to a 45 MPH posted speed.

The Value Engineering Alternative is to construct a roundabout in this location as shown below.



#### VALUE ENGINEERING ALTERNATIVE ROUNDABOUT

The roundabout will alert the driver to the change in characteristics of the roadway. It will also reduce overall delay for the drivers because there is no signal to stop traffic. Additional adjustments to the alignment can be made to avoid any adverse Right-of-Way takes.

**INTERSECTIONS**  
*(NEBO ROAD/US 41A ROUNDABOUT)*  
**VALUE ENGINEERING ALTERNATIVE NO. 9**  
**COST COMPARISON SHEET**

DESCRIPTION	UNITS	UNIT COST	PROP'D QTY.	PROP'D COST	V.E. QTY.	V.E. COST
PAVEMENT	SY	\$43.00	3824.6	\$164,456	2659.6	\$114,361
CURB & GUTTER	LF	\$20.00	1594.4	\$31,888	1907.0	\$38,140
SIGNALS	EA	\$100,000.00	1.0	\$100,000	0.0	\$0
<b>SUBTOTAL</b>				<b>\$296,344</b>		<b>\$152,501</b>
MOBILIZATION (THIS IS SUB+CONTIN. X % =)		4.5%		\$18,003		\$9,264
MAINTENANCE OF TRAFFIC		5.0%		\$14,817		\$7,625
ENGINEERING & CONTINGENCIES		35.0%		\$103,720		\$53,375
RIGHT OF WAY	LS	\$11,195.50			1	\$11,196
<b>GRAND TOTAL</b>				<b>\$432,884</b>		<b>\$233,961</b>

**POSSIBLE SAVINGS:                      \$198,923**

## VII. DEVELOPMENT PHASE

### G. COST COMPARISON SHEET BACK UP CALCULATIONS

#### Right-of-Way

CITY	PAR 5	13067	\$	-	\$	-
GE	PAR 7	5240	\$	1.70	\$	8,908.00
RESIDENCE	PAR 8	9150	\$	0.25	\$	2,287.50
						\$11,195.50

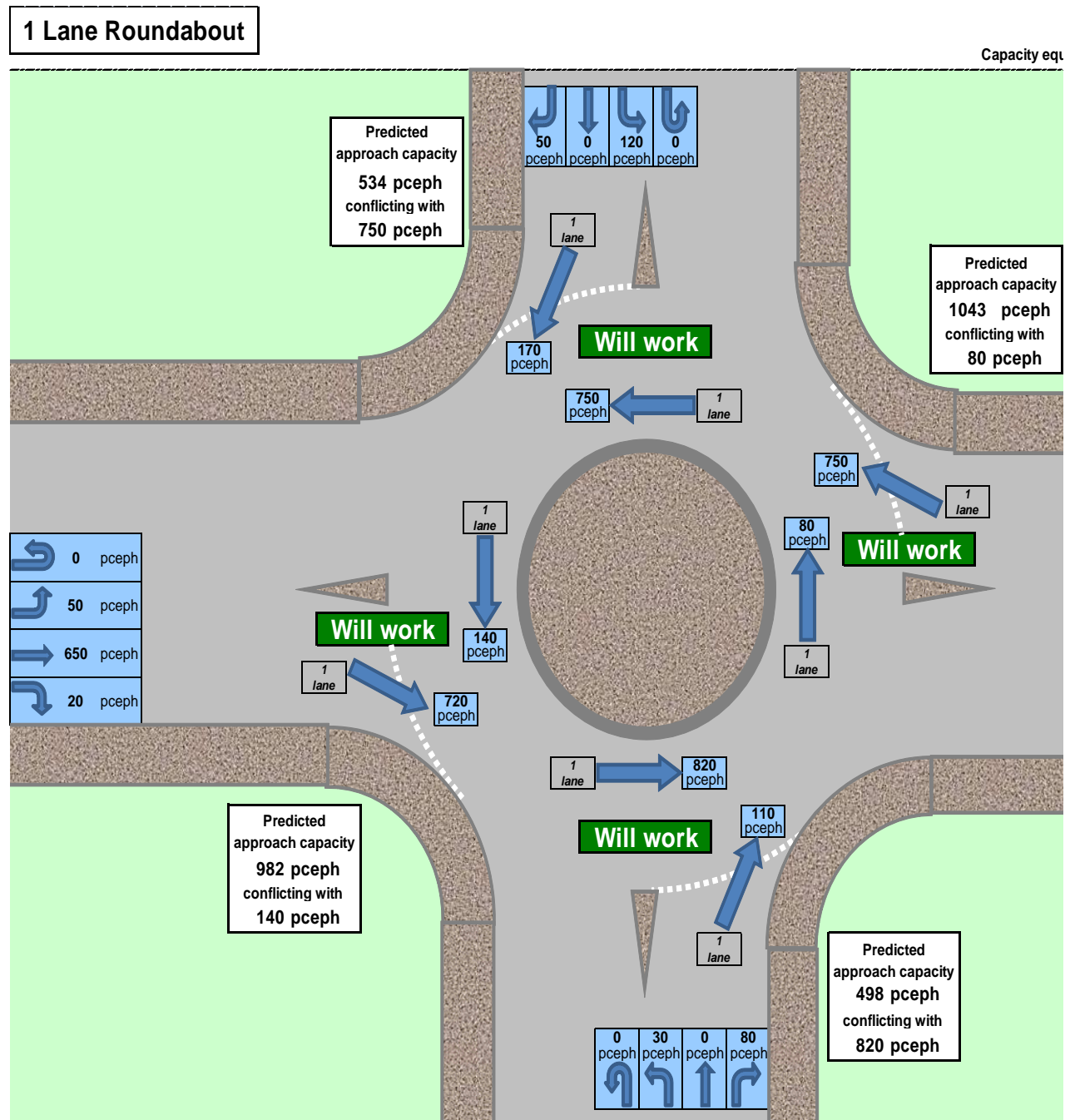
These Right-of-Way costs assume a commercial cost of land at \$1.70/SF and residential land at \$0.25/SF. The City property is considered as a donation.

# VII. DEVELOPMENT PHASE

## G. INTERSECTIONS

*Value Engineering Alternative No. 9: Use a roundabout at Industrial Road (continued).*

### TRAFFIC ANALYSIS:

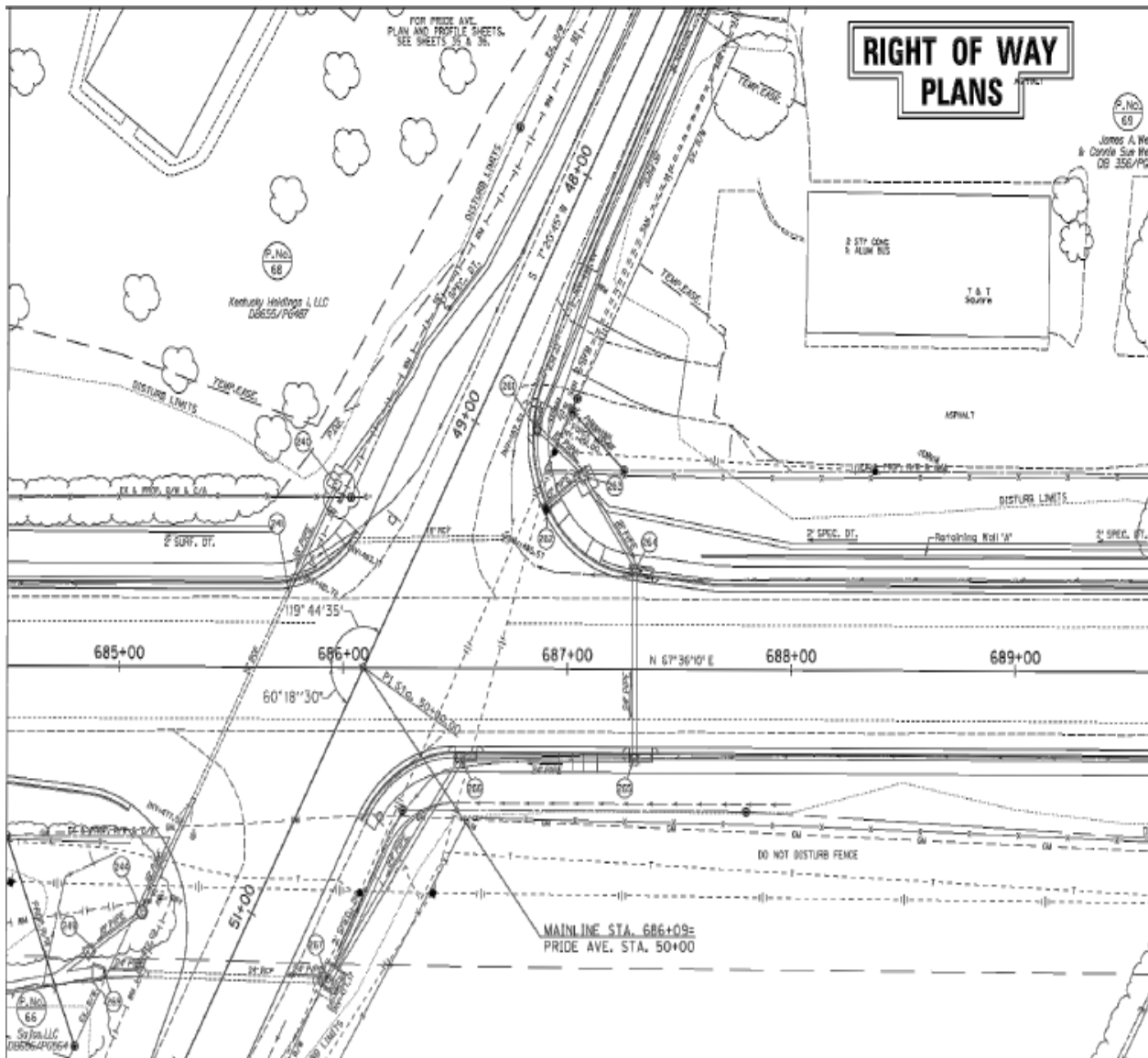


# VII. DEVELOPMENT PHASE

## G. INTERSECTIONS

### Original Design

The Original Design shows a four legged signalized intersection at the junction of Pride Avenue and Nebo Road/US 41A as shown below.

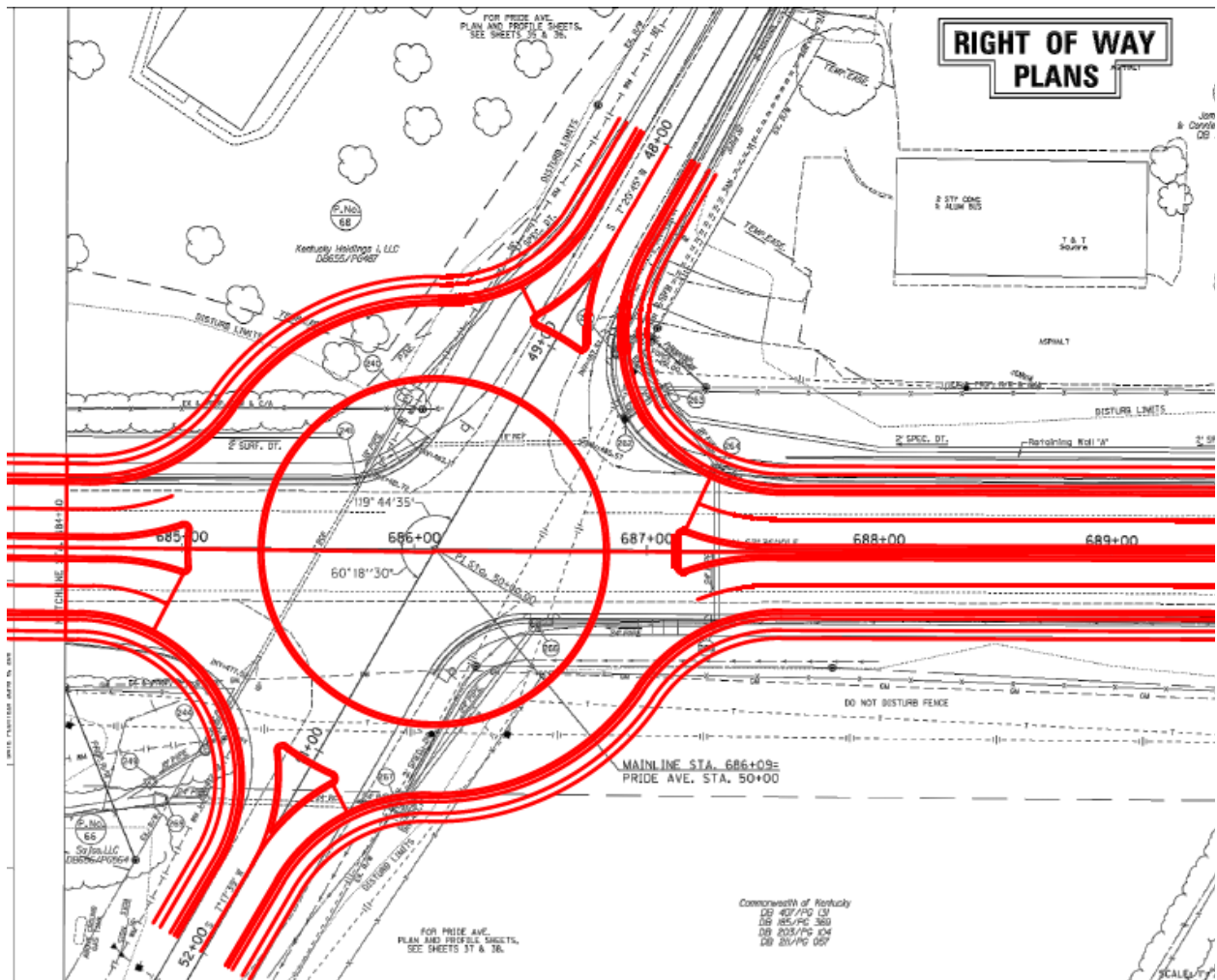


## VII. DEVELOPMENT PHASE

### G. INTERSECTIONS

#### *Value Engineering Alternative No. 10: Use a roundabout at Pride Avenue.*

The Value Engineering Team recognizes that this section of roadway has Access Management issues. Between Pride Avenue and North Main Street/US 41 there are three commercial driveways and one residential driveway. During the AM and PM peaks traffic hours it will be difficult and risky to make left turns into these driveways. To reduce these risks, this Value Engineering Alternative will construct a 4' raised median from Pride Street to North Main Street/US 41 and a roundabout at Pride Avenue. This will require drivers wishing to make left turn to make U-Turns either at the roundabout or the signalized intersection at North Main Street/US 41.



#### VALUE ENGINEERING ALTERNATIVE ROUNDABOUT WITH RAISED MEDIAN

The roundabout will require corner clips in 2 of the 4 corners. It is also understood this intersection is not designed to be signalized now, but it may soon warrant a signal.





## VII. DEVELOPMENT PHASE

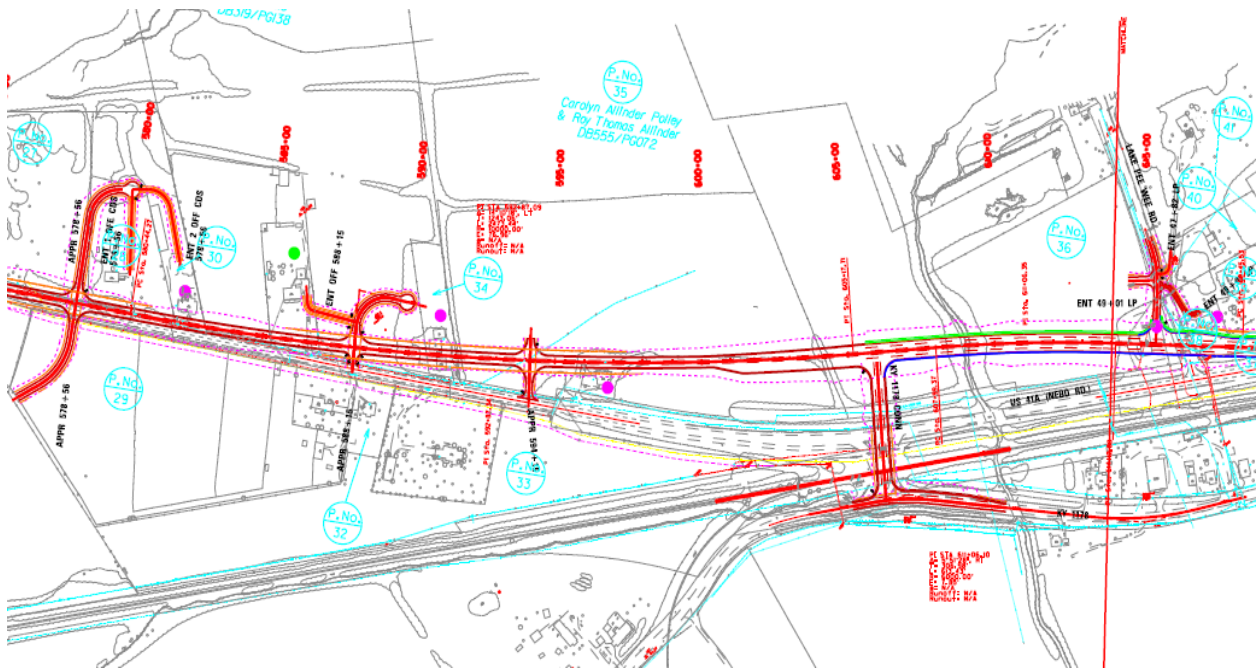
### H. DESIGN COMMENTS

#### DESIGN COMMENT NO. 1

On section one, US 41A, the Geotechnical notes and the Pavement Design both indicate using Chemical Stabilization to create a working platform and is part of the pavement design. Although this can be accomplished from station 575+00 to Station 635+00 the remainder of the project is primarily widening and overlay or so piecemeal that it wouldn't be practical to use chemical stabilization and should use rock and fabric or some other alternative. We recommend the Project Team discuss this issue and decide whether Chemical Stabilization is practical to use in this instance.

#### DESIGN COMMENT NO. 2

The project as proposed has approximately 182,000 cubic yards of excavation and 119,000 cubic yards of fill resulting in 63,000 cubic yards of waste not considering shrink or swell factors. The area between the new alignment and the existing alignment from right of station 598+00 to station 606+00 appears to become a non usable R/W remnant and could be purchased and identified as a waste area to be used by the contractor, possibly reducing the roadway excavation price.

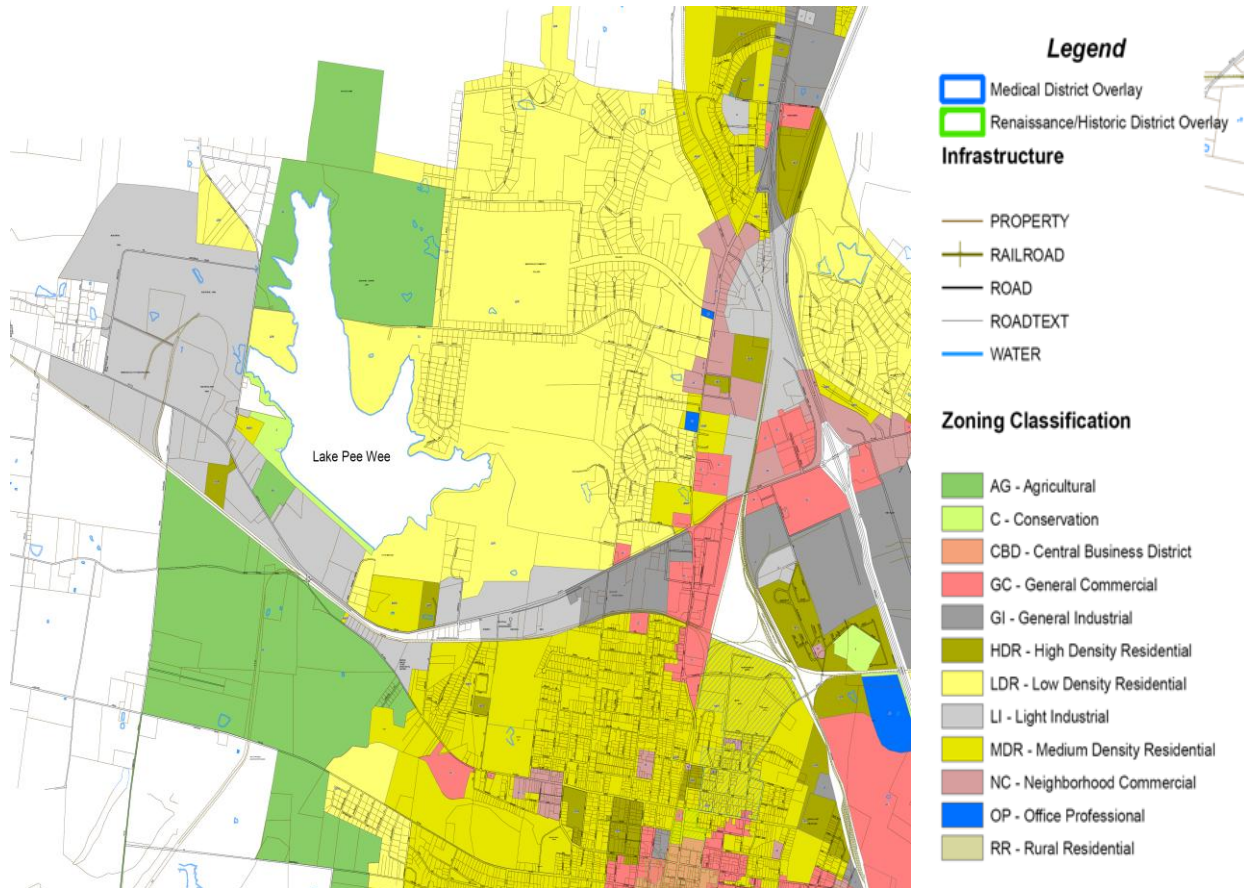


#### DESIGN COMMENT NO. 3

The area served by this road improvement has continued to grow with industrial and commercial development. A short distance from the corridor includes residential and agricultural uses. The Madisonville Zoning Map shows that the property directly fronting the corridor is zoned primarily for industrial and commercial uses.

## VII. DEVELOPMENT PHASE

### H. DESIGN COMMENTS (continued)



**MADISON ZONING MAP**

Much of the land currently does have any development or low density residential which would allow for future growth in this area.

To accommodate this growth and minimize traffic impacts on the US 41A highway, the Value Engineering Team recommends that the city, in conjunction with KYTC, develop a plan to create an interconnected road system to serve these properties as they develop. This plan would allow local officials to coordinate future development site layouts and incrementally build these roads. By carefully planning and building these backage roads, access control can successfully be preserved on US 41A while giving local traffic the opportunity to travel short distances without needing to access US 41A. This will allow the volumes on US 41A to be minimized, maximize the operational efficiency, and extend the useful life of the highway.

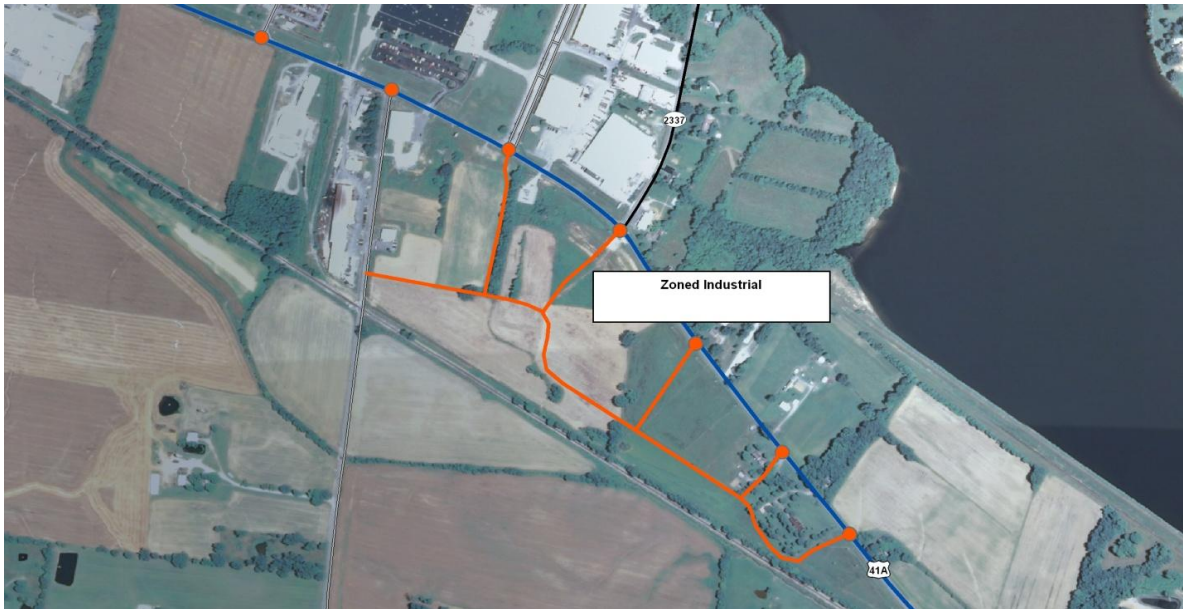
The following are examples of what could be included in a local plan.

## VII. DEVELOPMENT PHASE

### H. DESIGN COMMENTS *(continued)*



**Example of backage road plan, east side of highway project**



**Example of backage road plan, east side of highway project**

## VIII. FINAL PRESENTATION ATTENDEE SHEET

### VALUE ENGINEERING STUDY PRESENTATION

<i>US 41A HOPKINS COUNTY June 27-July 1, 2011</i>		
<b>NAME</b>	<b>AFFILIATION</b>	<b>PHONE</b>
William F. Ventry, P.E., C.V.S.~Life	VE Group, L.L.C.	850/627-3900
Duncan Silver, P.E, L.S.	VE Group, L.L.C.	850/627-3900
Tom Hartley, P.E., C.V.S.	VE Group, L.L.C.	850/627-3900
Richard Guidi	GRW Engineers	859/331-9220
Warren Iulq	GRW Engineers	859/331-9220
Everett Green	KYTC, District 2	270/824-7080
Rachel Catchings	KYTC CO Design	502/564-3280
Jill Asher	KYTC CO Planning	502/564-7183
Jeff Jasper	KYTC CO Design	502/564-3280

## IX. VE PUNCH LIST

ITEM NO. **2.137.00** PROJECT COUNTY: **HOPKINS** DATE OF STUDY: **6/27-7/1, 2011**

VE Alt. #	Description	VE Team Top Picks	Implemented Life Cycle Cost Savings	Original Cost	Alternative Cost	Initial Cost Saving	Tot. Present Worth Life Cycle Cost Savings	Remarks
<b>Roadway/Earthwork/Pavement</b>								
1	Use exist. Align., leave the roadway conn. as is			\$3,314,144	\$2,433,499	\$880,645	\$880,645	
2	Use exist. Align, close the connection			\$3,314,144	\$1,484,012	\$1,830,132	\$1,830,132	
3	Steepen the cut slopes to 2:1.			\$2,339,537	\$2,230,273	\$109,264	\$109,264	
4	Use a 4' raised median.			\$8,692,806	\$11,040,056	(\$2,347,250)	(\$2,347,250)	
5	6' median, eliminate continuous turn lanes			\$8,692,806	\$8,453,644	\$239,163	\$239,163	
6	Use a 14' flush median.			\$8,692,806	\$9,162,657	(\$469,850)	(\$469,850)	
7	Purchase the Industrial Park spur line.			\$1,923,020	\$699,490	\$1,223,530	\$1,223,530	
<b>Intersections</b>								
8	Use a continuous flow intersection			\$1,344,625	\$1,616,711	(\$272,086)	(\$272,086)	
9	Use a roundabout at Industrial Road.			\$432,884	\$233,961	\$198,923	\$198,923	
10	Use a roundabout at Pride Avenue.			\$286,809	\$231,482	\$55,328	\$55,328	
<b><u>DESIGN SUGGESTIONS</u></b>								
Design Suggestion #	Description	Activity	Implemented Life Cycle Cost Savings	Remarks				
1	Use rock and fabric rather than chemical stabilization.							
2	Use the area between the new and existing alignment for waste.							
3	Develop an access plan with the city.							

## VIII. FHWA TABLES

### FHWA CATEGORIES

<b>US 41A HOPKINS COUNTY June 27-July 1, 2011</b>					
RECOMENDATIONS	Safety	Environment	Operation	Construction	Other
<b>Recommendation Number 1:</b> <b>ALIGNMENT. VE ALTERNATIVE NO. 1:</b> Use the existing alignment, leave the roadway connection as is, lengthen the right turn lane on US 41A and use a preemptive signal.					<b>X</b>
<b>Recommendation Number 2:</b> <b>ALIGNMENT. VE ALTERNATIVE NO. 2:</b> Use the existing alignment and close the US 41A/KY 1178 connection between US 41A and KY 1178 and remove the railroad crossing.					<b>X</b>
<b>Recommendation Number 3: ROADWAY EXCAVATION. VE ALTERNATIVE NO. 3.</b> Steepen the cut slopes to 2:1.					<b>X</b>
<b>Recommendation Number 4: TYPICAL SECTION. VE ALTERNATIVE NO. 4.</b> Use a 4' raised median.					<b>X</b>
<b>Recommendation Number 5: TYPICAL SECTION. VE ALTERNATIVE NO. 5.</b> Begin the 6' median at station 640+00, eliminate the continuous turn lanes, use roundabouts at the intersections at station 640+00, station 664+00 and Pride Avenue and use a 3 lane section for the remainder of the project.			<b>X</b>		
<b>Recommendation Number 6: TYPICAL SECTION. VE ALTERNATIVE NO. 6.</b> Use a 14' flush median.					<b>X</b>

## VIII. FHWA TABLES

### FHWA CATEGORIES *(continued)*

<i>US 41A HOPKINS COUNTY June 27-July 1, 2011</i>					
RECOMENDATIONS	Safety	Environment	Operation	Construction	Other
<b>Recommendation Number 7: RAILROAD CROSSINGS. VE ALTERNATIVE NO.7.</b> Purchase the Industrial Park spur line.					<b>X</b>
<b>Recommendation Number 8: INTERSECTIONS. VE ALTERNATIVE NO. 8:</b> Use a continuous flow intersection at the US 41A/US 41 intersection. Purchase the Industrial Park spur line.			<b>X</b>	<b>X</b>	
<b>Recommendation Number 9: VE ALTERNATIVE NO. 9. INTERSECTIONS</b> Use a roundabout at Industrial Road.			<b>X</b>		
<b>Recommendation Number 10: VE ALTERNATIVE NO. 10: INTERSECTIONS.</b> Use a roundabout at Pride Avenue.			<b>X</b>		
<b>TOTAL</b>			<b>4</b>	<b>1</b>	<b>6</b>