# VALUE ENGINEERING STUDY

# OF

# *KY 4 (New Circle Road) MAJOR WIDENING*

**ITEM NUMBER: 7-366.00**

**Fayette County, Kentucky**

**VE Study: February 14-19, 2010**
**Draft Report: February 2010**
**Final Draft Report: April 2010**
**Final Report: June 2010**

## Prepared by:

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

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## In Association With:

## KENTUCKY TRANSPORTATION CABINET

**VALUE ENGINEERING STUDY**
**TEAM LEADER**

**William F. Ventry, P.E., C.V.S.**
**C.V.S. Registration No. 840603 (LIFE)**

**DATE**

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# I. EXECUTIVE SUMMARY

## INTRODUCTION

This Value Engineering report summarizes the results of the Value Engineering study performed by VE Group for the Kentucky Transportation Cabinet (KYTC). The study was performed during the week of February 14-19, 2010.

The subject of the study was the Major Widening of New Circle Road and reconstruction of the interchange at Newtown Pike.

## PROJECT DESCRIPTION

The project is approximately two miles long. It is an existing 4 lane facility that has partially controlled access and also has local access. There are two existing interchanges with at grade access between them. It is approximately 1,800' between the two interchanges. There are heavy truck traffic movements in some directions and it is a congested area.

The project will improve the existing 4-lane to a 6-lane typical section.

The New Circle Road/Newtown Pike interchange will be reconfigured into a partial cloverleaf while the Georgetown Road Interchange will receive some upgrades. The existing bridges at the cloverleaf interchange will be replaced with two new bridges.

The existing bridge at LexMark will be replaced with a new 2-lane bridge.

The local access on the south side will be eliminated and replaced with a frontage road.

The existing pavement will be rehabilitated and there will be a new pavement widening.

There will be right-of-way acquired primarily at the north side access points, thereby limiting access. There will also be significant utility impacts. There is also a 12’ x 6’ box culvert that will be extended.

The total estimated cost for the project as proposed is **$ 34,050,000.**

| NEW CIRCLE ROAD/KY 4 WIDENING @ NEWTOWN PIKE/KY922 INTERCHANGE ALTERNATE 8 (PARCLO INTERCHANGE) | |
|---|---|
| NEW TOWN PIKE INTERCHANGE (PARCLO) | $12,692,000 |
| SOUTH FRONTAGE ROAD | $7,350,000 |
| UTILITIES | $5,000,000 |
| NORTH FRONTAGE ROAD(RW) | $4,470,000 |
| NEW TOWN PIKE BRIDGE OVER KY4 | $2,508,000 |
| LEXMARK EAST ACCESS ROAD | $1,198,702 |
| LEXMARK BRIDGE | $831,298 |
| **TOTAL** | **$34,050,000** |

Therefore, a Value Engineering Study is warranted for this project.

# I. EXECUTIVE SUMMARY

## METHODOLOGY

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
- Service life
- Salvage Value
- Construction Cost
- Constructability
- Maintenance Of Traffic
- Design Requirements
- Life cycle Cost

## VALUE ANALYSIS RESULTS & RECOMMENDED ALTERNATIVES

Although it was concluded that the "As Proposed" (original) design satisfied the goals, objectives, and required functions for this project, the Study Team identified new ideas for the improvement of the proposed design for 4 different functional areas of the project.

Each alternative write-up included in the development section consists of a summary of the original design, a description of the proposed change, a life-cycle cost comparison where applicable, and descriptive evaluation of the advantages and disadvantages of the alternatives.

Sketches and design calculations, where appropriate, are also included. The cost comparisons reflect units and quantities, wherever possible, to determine cost and possible savings.

There are 8 recommended alternatives that improve the value of this project by eliminating unnecessary functions (avoid costs) or by providing required functions that may not have been included in the project. Since the KYTC does not bank the money to accrue the funds to cover the future costs, Total LCC in present-day dollars (although there is no allowance for inflation), probably best represents the commitment to the funding of future costs that will be incurred and are therefore utilized to calculate the cost avoidance savings.

# I. EXECUTIVE SUMMARY

**SUMMARY OF HIGHEST RATED ALTERNATIVES**

## A. NEW CIRCLE ROAD/NEWTOWN PIKE INTERCHANGE BRIDGE

***Recommendation Number 1:*** The Value Engineering Team recommends that Value Engineering Alternative Number 2 be implemented. This Value Engineering Alternative widens the existing bridges and reduces the width of lanes and shoulders on New Circle Road to avoid replacing the bridges**.**

**ALTERNATIVE COST COMPARISON**

| Number | Initial Cost | O&M Costs | Future Costs | Total Costs | PW of LCC |
|---|---|---|---|---|---|
| As-Proposed | $ 4,038,883 | $2,500/yr | $0 | $ 4,038,883 | 4,087,595 |
| VE Alternative 2 | $1,072,621 | $16,000/yr | $4,038,883 | $1,072,621 | $1,972,951 |
| Cost Savings | $2,966,262 | | | $2,966,262 | 2,114,644 |

If this recommendation cannot be implemented, then the Value Engineering Team recommends that Value Engineering Alternative Number 1 be implemented. This Value Engineering Alternative uses a two span bridge to shorten the proposed new bridges.

**ALTERNATIVE COST COMPARISON**

| Number | Initial Cost | O&M Costs | Future Costs | Total Costs | PW of LCC |
|---|---|---|---|---|---|
| As-Proposed | $4,038,883 | N/A | N/A | $4,038,883 | N/A |
| VE Alternative 1 | $2,860,876 | N/A | N/A | $2,860,876 | N/A |
| Cost Savings | $1,178,007 | | | $1,178,007 | N/A |

## B. LEXMARK BRIDGE

***Recommendation Number 2:*** The Value Engineering Team recommends that Value Engineering Alternative Number 1 be implemented. This Value Engineering Alternative eliminates the existing bridge and does not replace it.

**ALTERNATIVE COST COMPARISON**

| Number | Initial Cost | O&M Costs | Future Costs | Total Costs | PW of LCC |
|---|---|---|---|---|---|
| As-Proposed | $1,184,222 | N/A | N/A | $1,184,222 | N/A |
| VE Alternative 1 | $72,419 | N/A | N/A | $72,419 | N/A |
| Cost Savings | $1,111,803 | | | $1,111,803 | N/A |

**SUMMARY OF HIGHEST RATED ALTERNATIVES** *(continued)*

## B. LEXMARK BRIDGE *(continued)*

If this recommendation cannot be implemented, then the Value Engineering Team recommends that Value Engineering Alternative Number 2 be implemented. This Value Engineering Alternative raises the existing bridge and reduces the width of the shoulders on New Circle Road.

**ALTERNATIVE COST COMPARISON**

| Number | Initial Cost | O&M Costs | Future Costs | Total Costs | PW of LCC |
|---|---|---|---|---|---|
| As-Proposed | $1,184,222 | $2,500/yr | $0 | $1,184,222 | $1,232,934 |
| VE Alternative 2 | $341,114 | $5,000/yr | $1,184,222 | $341,114 | $614,459 |
| Cost Savings | $843,108 | | | $843,108 | $618,476 |

If this recommendation cannot be implemented, then the Value Engineering Team recommends that Value Engineering Alternative Number 3 be implemented. This Value Engineering Alternative shortens the proposed new bridge.

**ALTERNATIVE COST COMPARISON**

| Number | Initial Cost | O&M Costs | Future Costs | Total Costs | PW of LCC |
|---|---|---|---|---|---|
| As-Proposed | $1,184,222 | N/A | N/A | $1,184,222 | N/A |
| VE Alternative 3 | $906,069 | N/A | N/A | $906,069 | N/A |
| Cost Savings | $278,153 | | | $278,153 | N/A |

## C. SOUTH FRONTAGE ROAD INTERSECTION

***Recommendation Number 3:*** The Value Engineering Team recommends that Value Engineering Alternative Number 2 be implemented. This Value Engineering Alternative leaves the existing frontage road intersection as is.

**ALTERNATIVE COST COMPARISON**

| Number | Initial Cost | O&M Costs | Future Costs | Total Costs | PW of LCC |
|---|---|---|---|---|---|
| As-Proposed | $2,560,402 | N/A | N/A | $2,560,402 | N/A |
| VE Alternative 2 | $1,096,892 | N/A | N/A | $1,096,892 | N/A |
| Cost Savings | $1,463,510 | | | $1,463,510 | N/A |

**SUMMARY OF HIGHEST RATED ALTERNATIVES** *(continued)*

## C. SOUTH FRONTAGE ROAD INTERSECTION *(continued)*

If this recommendation cannot be implemented, then the Value Engineering Team recommends that Value Engineering Alternative Number 1 be implemented. This Value Engineering Alternative uses a roundabout to connect the on/off ramp with the frontage road.

**ALTERNATIVE COST COMPARISON**

| Number | Initial Cost | O&M Costs | Future Costs | Total Costs | PW of LCC |
|---|---|---|---|---|---|
| As-Proposed | $2,560,402 | N/A | N/A | $2,560,402 | N/A |
| VE Alternative 1 | $1,545,226 | N/A | N/A | $1,545,226 | N/A |
| Cost Savings | $1,015,176 | | | $1,015,176 | N/A |

## D. NEW CIRCLE ROAD/NEWTOWN PIKE INTERCHANGE

***Recommendation Number 4:*** The Value Engineering Team recommends that Value Engineering Alternative Number 1 be implemented. This Value Engineering Alternative uses a diverging diamond interchange with the existing bridges.

**ALTERNATIVE COST COMPARISON**

| Number | Initial Cost | O&M Costs | Future Costs | Total Costs | PW of LCC |
|---|---|---|---|---|---|
| As-Proposed | $15,803,188 | $2,500/yr | $0 | $15,803,188 | $15,857,900 |
| VE Alternative 1 | $12,280,914 | $16,000/yr | $3,522,274 | $12,280,914 | $13,101,654 |
| Cost Savings | $3,522,274 | | | $3,522,274 | $2,750,247 |

If this recommendation cannot be implemented, then the Value Engineering Team recommends that Value Engineering Alternative Number 2 be implemented. This Value Engineering Alternative uses a diverging diamond interchange and widens the existing bridges into the median.

**ALTERNATIVE COST COMPARISON**

| Number | Initial Cost | O&M Costs | Future Costs | Total Costs | PW of LCC |
|---|---|---|---|---|---|
| As-Proposed | $15,803,188 | $2,500/yr | $0 | $15,803,188 | $15,851,900 |
| VE Alternative 2 | $13,183,042 | $16,000/yr | $2,620,146 | $13,183,042 | $13,864,797 |
| Cost Savings | $2,620,146 | | | $2,620,146 | $1,987,103 |

**SUMMARY OF HIGHEST RATED ALTERNATIVES** *(continued)*

## D. NEW CIRCLE ROAD/NEWTOWN PIKE INTERCHANGE *(continued)*

If this recommendation cannot be implemented, then the Value Engineering Team recommends that Value Engineering Alternative Number 3 be implemented. This Value Engineering Alternative uses a diverging diamond interchange with new bridges.

**ALTERNATIVE COST COMPARISON**

| Number | Initial Cost | O&M Costs | Future Costs | Total Costs | PW of LCC |
|---|---|---|---|---|---|
| As-Proposed | $15,803,188 | N/A | N/A | $15,803,188 | N/A |
| VE Alternative 3 | $15,425,946 | N/A | N/A | $15,425,946 | N/A |
| Cost Savings | $377,242 | | | $377,242 | N/A |

# I. EXECUTIVE SUMMARY

| FEDERAL HIGHWAY ADMINISTRATION (FHWA) CATEGORIES | | | | | | |
|---|---|---|---|---|---|---|
| | **Safety** | **Mobility** | **Operations** | **Environment** | **Innovative Construction** | **Other Features** |
| **RECOMENDATIONS** | | | | | | |
| **Recommendation Number 1:** ***New Circle Road/Newtown Pike Interchange Bridge*** | | | | | | |
| The Value Engineering Team recommends that Value Engineering Alternative Number 2 be implemented. This Value Engineering Alternative widens the existing bridges and reduces the width of lanes and shoulders ON New Circle Road to avoid replacing the bridges. | | | | | | x |
| If this recommendation cannot be implemented, then the Value Engineering Team recommends that Value Engineering Alternative Number 1 be implemented. This Value Engineering Alternative uses a two span bridge to shorten the proposed new bridges. | | | | | | x |
| **Recommendation Number 2:** ***LexMark Bridge*** | | | | | | |
| The Value Engineering Team recommends that Value Engineering Alternative Number 1 be implemented. This Value Engineering Alternative eliminates the existing bridge and does not replace it. | | | | | | x |
| If this recommendation cannot be implemented, then the Value Engineering Team recommends that Value Engineering Alternative Number 2 be implemented. This Value Engineering Alternative raises the existing bridge and reduces the width of the shoulders on New Circle Road. | | | | | | x |

*table continued*

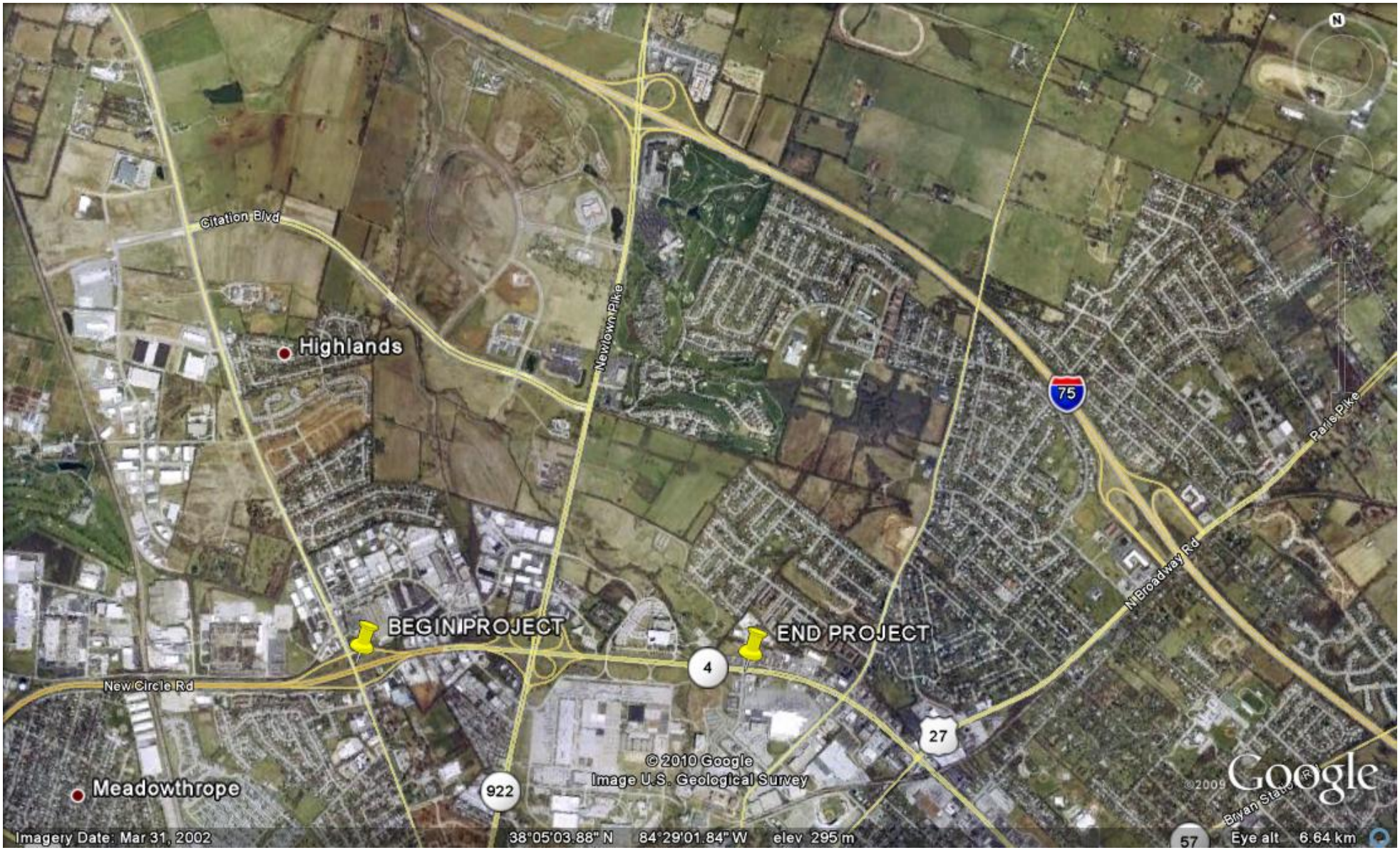
# I. EXECUTIVE SUMMARY

| FEDERAL HIGHWAY ADMINISTRATION (FHWA) CATEGORIES | | | | | | |
|---|---|---|---|---|---|---|
| | **Safety** | **Mobility** | **Operations** | **Environment** | **Innovative Construction** | **Other Features** |
| **RECOMENDATIONS** | | | | | | |
| **Recommendation Number 2:** ***LexMark Bridge*** *(continued)* | | | | | | |
| If this recommendation cannot be implemented, then the Value Engineering Team recommends that Value Engineering Alternative Number 3 be implemented. This Value Engineering Alternative shortens the proposed new bridge. | | | | | | x |
| **Recommendation Number 3:** ***South Frontage Road Intersection*** | | | | | | |
| The Value Engineering Team recommends that Value Engineering Alternative Number 2 be implemented. This Value Engineering Alternative leaves the existing frontage road intersection as is. | | | | | | x |
| If this recommendation cannot be implemented, then the Value Engineering Team recommends that Value Engineering Alternative Number 1 be implemented. This Value Engineering Alternative uses a roundabout to connect the on/off ramp with the frontage road | | | | | x | |
| **Recommendation Number 4:** ***New Circle Road/Newtown Pike Interchange*** | | | | | | |
| The Value Engineering Team recommends that Value Engineering Alternative Number 1 be implemented. This Value Engineering Alternative uses a diverging diamond interchange with the existing bridges. | | | | | x | |

*table continued*

| FEDERAL HIGHWAY ADMINISTRATION (FHWA) CATEGORIES | | | | | | |
|---|---|---|---|---|---|---|
| | **Safety** | **Mobility** | **Operations** | **Environment** | **Innovative Construction** | **Other Features** |
| **RECOMENDATIONS** | | | | | | |
| **Recommendation Number 4:** ***New Circle Road/Newtown Pike Interchange*** *(continued)* | | | | | | |
| If this recommendation cannot be implemented, then the Value Engineering Team recommends that Value Engineering Alternative Number 2 be implemented. This Value Engineering Alternative uses a diverging diamond interchange and widens the existing bridges into the median. | | | | | x | |
| If this recommendation cannot be implemented, then the Value Engineering Team recommends that Value Engineering Alternative Number 3 be implemented. This Value Engineering Alternative uses a diverging diamond interchange with new bridges. | | | | | x | |
| **TOTAL** | **0** | **0** | **0** | **0** | **4** | **6** |
| | **Safety** | **Mobility** | **Operations** | **Environment** | **Innovative Construction** | **Other Features** |

# II. LOCATION OF PROJECT



# III. TEAM MEMBERS AND PROJECT DESCRIPTION

## TEAM MEMBERS

| NAME | AFFILIATION | EXPERTISE | PHONE/ EMAIL |
|---|---|---|---|
| Bill Ventry, P.E., C.V.S., LIFE | VE Group, L.L.C | Team Leader | 850/627-3900 bill@ventryengineering.com |
| Thomas A. Hartley, P.E., C.V.S. | VE Group, L.L.C. | Interchange, Pavement, Drainage | 850/627-3900 thartley09@bellsouth.net |
| Robert Semones, P.E., R.L.S. | VE Group, L.L.C. | Bridge Structures and Drainage Structures | 850/627-3900 rsemones@mis.net |
| Siamak Shafaghi, P. E. | KYTC | Quality Assurance | 502/564-3280 siamak.shafaghi@ky.gov |
| Gary Raymer, P. E. | KYTC | Quality Assurance Construction | 502/564-3280 gary.raymer@ky.gov |

# III. TEAM MEMBERS AND PROJECT DESCRIPTION

## PROJECT DESCRIPTION

The project is approximately two miles long. It is an existing 4-lane facility that has partially controlled access and also has local access. There are two existing interchanges with at grade access between them. It is approximately 1,800' between the two interchanges. There are heavy truck traffic movements in some directions and it is a congested area.

The project will improve the existing 4-lanes to a 6-lane typical section.

The New Circle Road/Newtown Pike interchange will be reconfigured into a partial cloverleaf while the Georgetown Road Interchange will receive some upgrades. The existing bridges at the cloverleaf interchange will be replaced with two new bridges.

The existing bridge at LexMark will be replaced with a new 2-lane bridge.

The local access on the south side will be eliminated and replaced with a frontage road.

The existing pavement will be rehabilitated and there will be a new pavement widening.

There will be right-of-way acquired primarily at the north side access points, thereby limiting access. There will also be significant utility impacts. There is also a 12’ x 6’ box culvert that will be extended.

The total estimated cost for the project as proposed is **$ 34,050,000.**

| NEW CIRCLE ROAD/KY 4 WIDENING @ NEWTOWN PIKE/KY922 INTERCHANGE<br>ALTERNATE 8 (PARCLO INTERCHANGE) | |
|---|---|
| NEW TOWN PIKE INTERCHANGE (PARCLO) | $12,692,000 |
| SOUTH FRONTAGE ROAD | $7,350,000 |
| UTILITIES | $5,000,000 |
| NORTH FRONTAGE ROAD(RW) | $4,470,000 |
| NEW TOWN PIKE BRIDGE OVER KY4 | $2,508,000 |
| LEXMARK EAST ACCESS ROAD | $1,198,702 |
| LEXMARK BRIDGE | $831,298 |
| **TOTAL** | **$34,050,000** |

Therefore, a Value Engineering Study is warranted for this project.

# IV. INVESTIGATION PHASE

| VALUE ENGINEERING STUDY BRIEFING<br>*KY 4 (New Circle Road) MAJOR WIDENING*<br>**February 14-19, 2010** | | |
|---|---|---|
| **NAME** | **AFFILIATION** | **PHONE/EMAIL** |
| Bill Ventry | VE Group, L.L.C. | 850/627-3900<br>bill@ventryengineering.com |
| Siamak Shafaghi | KYTC | 502/564-3280<br>Siamak.Shafaghi@ky.gov |
| Robert Semones | VE Group, L.L.C. | 850/627-3900<br>rsemones@mis.net |
| Tom Hartley | VE Group, L.L.C. | 850/627-3900<br>thartley09@bellsouth.net |
| Stephen Sewell | Palmer Engineering | 859/744-1218<br>ssewell@palmernet.com |
| David Lindeman | Palmer Engineering | 859/744-1218<br>dlindeman@palmernet.com |
| Brian Aldridge | Entran Engineering | 502/213-7564<br>baldridge@entran.us |
| Glenn Hardin | Entran Engineering | 859/233-2100<br>ghardin@entran.us |
| Boday Borres | KYTC | 502/564-3280<br>Boday.Borres@ky.gov |

# IV. INVESTIGATION PHASE

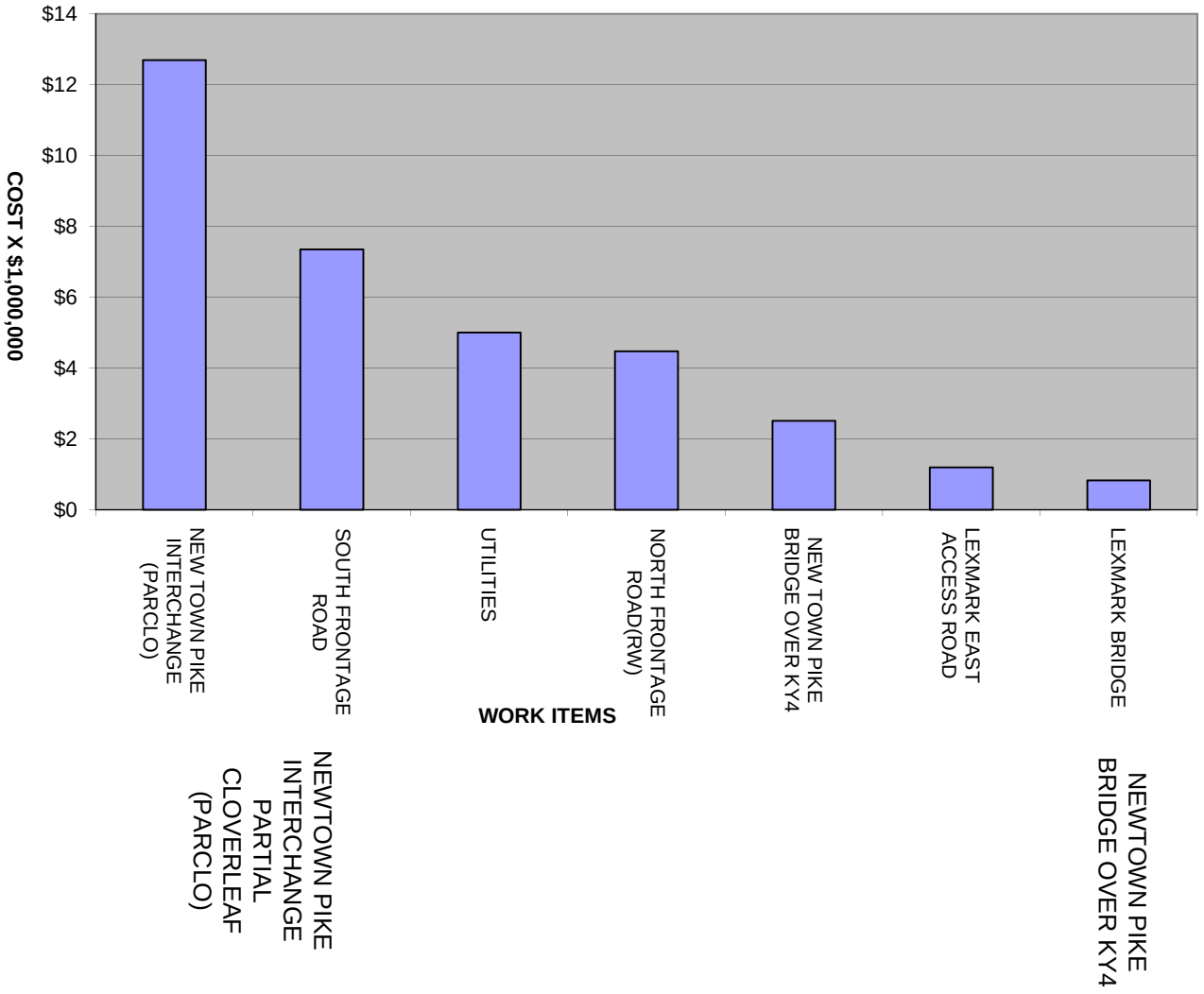
**STUDY RESOURCES**
***KY 4 (New Circle Road) MAJOR WIDENING***
**February 14-19, 2010**

| NAME | AFFILIATION | PHONE/EMAIL |
|---|---|---|
| Anne Irish | KYTC, Bridge Maintenance | 502/564-4559 |
| Mike Vaughn | KYTC, District 7 | 859/246-2355 |
| Richard Powell | KYTC, Structures Design | 502/564-4560 |
| Tylan Smither | KYTC, Right of Way | 502/564-3280 |
| Joshua Rogers | KYTC, Bridge Maintenance | 502/564-4556 |
| Michael Baase | KYTC | 502/564-4780 |

# IV. INVESTIGATION PHASE

The Pareto Chart is a tool used to identify and rank the costs of various elements of the project. These areas are then used in a Functional Analysis Worksheet to determine where there are possible alternatives that will add value to the project.

**PARETO CHART**



# IV. INVESTIGATION PHASE

## FUNCTIONAL ANALYSIS WORKSHEET

***KY 4 (New Circle Road) MAJOR WIDENING***

February 14-19, 2010

| ITEM | FUNCT. VERB | FUNCT. NOUN | * TYPE | COST | WORTH | VALUE INDEX |
|---|---|---|---|---|---|---|
| New Circle Road/Newtown Pike Interchange | Provide | Access | B | $ 15,150,000 | $ 10,000,000 | 1.51 |
| Interchange Bridge | Span | Roadway | B | $ 2,400,000 | $ 1,800,000 | 1.33 |
| LexMark Bridge | Span<br>Provide | Roadway<br>Access | B<br>S | $ 800,000 | $ 200,000 | 4.00 |
| LexMark Access Roads | Provide | Access | B | $ 1,200,000 | $ 1,200,000 | 1.00 |
| South Frontage Roads | Provide | Access | B | $ 7,350,000 | $ 6,350,000 | 1.15 |
| North Access Right of Way | Acquire | Property | B | $ 4,500,000 | $ 4,500,000 | 1.00 |
| Utility Relocations | Relocate | Utilities | B | $ 5,000,000 | $ 5,000,000 | 1.00 |

***B – Basic S - Secondary**

Basic and Secondary: Each project has a purpose or function, e.g., increase capacity. Items of work that support this function are basic functions. Items of work that do not support the basic function, e.g., landscaping do nothing to improve the basic function.

** 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. NEW CIRCLE ROAD/NEWTOWN PIKE INTERCHANGE BRIDGE**

**B. LEXMARK BRIDGE**

**C. SOUTH FRONTAGE ROAD INTERSECTION**

**D. NEW CIRCLE ROAD/NEWTOWN PIKE INTERCHANGE**

# V. SPECULATION PHASE

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

## A. NEW CIRCLE ROAD/NEWTOWN PIKE INTERCHANGE BRIDGE

- Widen and raise existing bridge
- Provide two spans with vertical abutments
- Reduce the width of lanes and shoulders to avoid replacing the bridges

## B. LEXMARK BRIDGE

- Eliminate the existing bridge and do not replace
- Raise the existing bridge and reduce the widths of the shoulders to avoid replacing the bridge
- Shorten the proposed new bridge
- Use the existing pier in the median for a new bridge

## C. SOUTH FRONTAGE ROAD INTERSECTION

- Use a roundabout to connect the on/off ramp with the frontage road
- Connect access road to private road
- Eliminate frontage road and provide right in and right out only
- Leave the existing frontage road as is

## D. NEW CIRCLE ROAD/NEWTOWN PIKE INTERCHANGE

- Use a diverging diamond interchange
- Single point urban interchange
- Full cloverleaf interchange

# VI. EVALUATION PHASE

## A. ALTERNATIVES

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

### A. NEW CIRCLE ROAD/NEWTOWN PIKE INTERCHANGE BRIDGE

| | |
|---|---|
| ***Value Engineering Alternative Number 1:*** | ***Shorten the proposed new bridge.*** |
| ***Value Engineering Alternative Number 2:*** | ***Widen the existing bridges and reduce the width of lanes and shoulders to avoid replacing the bridges.*** |

### B. LEXMARK BRIDGE

| | |
|---|---|
| ***Value Engineering Alternative Number 1:*** | ***Eliminate the existing bridge and do not replace.*** |
| ***Value Engineering Alternative Number 2:*** | ***Raise the existing bridge and reduce the widths of the shoulders to avoid replacing the bridge.*** |
| ***Value Engineering Alternative Number 3:*** | ***Shorten the proposed new bridge.*** |
| ***Value Engineering Alternative Number 4:*** | ***Use the existing pier in the median for a new bridge.*** |

### C. SOUTH FRONTAGE ROAD INTERSECTION

| | |
|---|---|
| ***Value Engineering Alternative Number 1:*** | ***Use a roundabout to connect the on/off ramp with the frontage road.*** |
| ***Value Engineering Alternative Number 2:*** | ***Leave the existing frontage road intersection as is.*** |

### D. NEW CIRCLE ROAD/NEWTOWN PIKE INTERCHANGE

| | |
|---|---|
| ***Value Engineering Alternative Number 1:*** | ***Use a diverging diamond interchange with the existing bridges.*** |
| ***Value Engineering Alternative Number 2:*** | ***Use a diverging diamond interchange and widen the existing bridges into the median.*** |
| ***Value Engineering Alternative Number 3:*** | ***Use a diverging diamond interchange with a new bridge.*** |

# VI. EVALUATION PHASE

## B. 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 "As Proposed."

## A. NEW CIRCLE ROAD/NEWTOWN PIKE INTERCHANGE BRIDGE

**"As Proposed":** **Replace the existing bridge with a new four span bridge.**

Advantages

- Long service life
- Less future maintenance
- Could meet vertical clearance requirement
- Could meet horizontal clearance

Disadvantages

- High construction cost
- High maintenance of traffic

Conclusion

**CARRY FORWARD FOR FURTHER DEVELOPMENT**

***Value Engineering Alternative Number 1: Shorten the proposed new bridge***.

Advantages

- Long service life
- Less future maintenance
- Could meet vertical clearance requirement
- Could meet horizontal clearance
- Less construction cost

Disadvantages

- High maintenance of traffic

Conclusion

**CARRY FORWARD FOR FURTHER DEVELOPMENT**

## A. NEW CIRCLE ROAD/NEWTOWN PIKE INTERCHANGE BRIDGE *(continued)*

***Value Engineering Alternative Number 2:*** ***Widen the existing bridges and reduce the widths of lanes and shoulders to avoid replacing the bridge.***

Advantages

- Low construction cost
- Low maintenance of traffic
- Salvages the remaining life of the existing bridge

Disadvantages

- May require variance for horizontal and vertical clearance

Conclusion

**CARRY FORWARD FOR FURTHER DEVELOPMENT**

## B. LEXMARK BRIDGE

**"As Proposed":** **Replace existing bridge with new two lane bridge.**

Advantages

- Long service life
- Less future maintenance
- Could meet vertical clearance requirement
- Could meet horizontal clearance
- Could provide bike lane on new bridge

Disadvantages

- High construction cost
- High maintenance of traffic

Conclusion

**CARRY FORWARD FOR FURTHER DEVELOPMENT**

***Value Engineering Alternative Number 1: Eliminate the existing bridge and do not replace.***

Advantages

- Low construction cost
- No vertical clearance issues
- No horizontal clearance issues
- No future maintenance
- Low maintenance of traffic

Disadvantages

- Eliminates connection to LexMark properties

Conclusion

**CARRY FORWARD FOR FURTHER DEVELOPMENT**

## B. LEXMARK BRIDGE *(continued)*

***Value Engineering Alternative Number 2: Raise the existing bridge and reduce the widths of the shoulders to avoid replacing the bridge.***

Advantages

- Low construction cost
- Could meet vertical clearance
- Low maintenance of traffic
- Salvages the remaining life of the existing bridge

Disadvantages

- May require variance for horizontal clearance

Conclusion

**CARRY FORWARD FOR FURTHER DEVELOPMENT**

***Value Engineering Alternative Number 3: Shorten the proposed new bridge.***

Advantages

- Long service life
- Less future maintenance
- Could meet vertical clearance requirement
- Could meet horizontal clearance
- Could provide bike lane on new bridge
- Less construction cost

Disadvantages

- High maintenance of traffic

Conclusion

**CARRY FORWARD FOR FURTHER DEVELOPMENT**

## B. LEXMARK BRIDGE *(continued)*

***Value Engineering Alternative Number 4: Use the existing pier in the median for a new bridge.***

Advantages

- Long service life for superstructure
- Less future maintenance on superstructure
- Could meet vertical clearance requirement
- Could meet horizontal clearance
- Could provide bike lane on new bridge
- Less construction cost

Disadvantages

- High maintenance of traffic
- Lower service life on median pier

Conclusion

**DROPPED FROM FURTHER CONSIDERATION**

## C. SOUTH FRONTAGE ROAD INTERSECTION

**"As Proposed":** **Separate frontage road entrance from ramp intersection.**

Advantages

- Less conflict with ramp intersection

Disadvantages

- Impacts three right-of-way parcels

Conclusion

**CARRY FORWARD FOR FURTHER DEVELOPMENT**

***Value Engineering Alternative Number 1: Use a roundabout to connect the on/off ramp with the frontage road.***

Advantages

- May avoid impact to two right-of-way parcels on east side of intersection

Disadvantages

- May impact one right-of-way parcel on the west side

Conclusion

**CARRY FORWARD FOR FURTHER DEVELOPMENT**

***Value Engineering Alternative Number 2: Leave the existing frontage road intersection as is.***

Advantages

- May avoid impact to three right-of-way parcels on east side of intersection

Disadvantages

- Frontage road still in close proximity to ramp

Conclusion

**CARRY FORWARD FOR FURTHER DEVELOPMENT**

## D. NEW CIRCLE ROAD/NEWTOWN PIKE INTERCHANGE

**"As Proposed":** **Partial cloverleaf interchange.**

Advantages

- Improves weave/merge problems
- Better traffic operations
- Long service life
- Provides for bike/pedestrian access

Disadvantages

- High construction cost
- High maintenance of traffic

Conclusion

**CARRY FORWARD FOR FURTHER DEVELOPMENT**

***Value Engineering Alternative Number 1: Use a diverging diamond interchange with the existing bridges.***

Advantages

- Does not require replacement of the existing bridge
- Eliminates weave/merge problems
- Low construction cost
- Low construction time
- Low maintenance of traffic

Disadvantages

- May be unfamiliar to local drivers
- Higher future bridge maintenance
- Slight vertical clearance variance

Conclusion

**CARRY FORWARD FOR FURTHER DEVELOPMENT**

## D. NEW CIRCLE ROAD/NEWTOWN PIKE INTERCHANGE *(continued)*

***Value Engineering Alternative Number 2:*** ***Use a diverging diamond interchange and widen the existing bridges into the median***.

Advantages

- Does not require replacement of the existing bridge
- Eliminates weave/merge problems
- Medium construction cost
- Medium construction time
- Medium maintenance of traffic
- Good bike/pedestrian access

Disadvantages

- May be unfamiliar to local drivers
- Higher future bridge maintenance
- Slight vertical clearance variance

Conclusion

**CARRY FORWARD FOR FURTHER DEVELOPMENT**

***Value Engineering Alternative Number 3:*** ***Use a diverging diamond interchange with new bridges.***

Advantages

- Eliminates weave/merge problems
- Long service life
- Provides for bike/pedestrian

Disadvantages

- May be unfamiliar to local drivers
- High construction cost
- High maintenance of traffic

Conclusion

**CARRY FORWARD FOR FURTHER DEVELOPMENT**

# VII. DEVELOPMENT PHASE

## A. NEW CIRCLE ROAD/NEWTOWN PIKE INTERCHANGE BRIDGE

**(1) AS PROPOSED**

**(2) VALUE ENGINEERING ALTERNATIVE NUMBER 1**
***Shorten the proposed new bridge.***

**(3) VALUE ENGINEERING ALTERNATIVE NUMBER 2**
***Widen the existing bridges and reduce the width of lanes and shoulders to avoid replacing the bridges***

## B. LEXMARK BRIDGE

**(1) AS PROPOSED**

**(2) VALUE ENGINEERING ALTERNATIVE NUMBER 1**
***Eliminate the existing bridge and do not replace.***

**(3) VALUE ENGINEERING ALTERNATIVE NUMBER 2**
***Raise the existing bridge and reduce the widths of the shoulders to avoid replacing the bridge.***

**(4) VALUE ENGINEEEING ALTERNATIVE NUMBER 3**
***Shorten the proposed new bridge.***

**(5) VALUE ENGINEERING ALTERNATIVE NUMBER 4**
*dropped during the evaluation phase*

## C. SOUTH FRONTAGE ROAD INTERSECTION

**(1) AS PROPOSED**

**(2) VALUE ENGINEERING ALTERNATIVE NUMBER 1**
***Use a roundabout to connect the on/off ramp with the frontage road.***

**(3) VALUE ENGINEERING ALTERNATIVE NUMBER 2**
***Leave the existing frontage road intersection as is.***

## D. NEW CIRCLE ROAD/NEWTOWN PIKE INTERCHANGE

**(1) AS PROPOSED**

**(2) VALUE ENGINEERING ALTERNATIVE NUMBER 1**
***Use a diverging diamond interchange with the existing bridges.***

**(3) VALUE ENGINEERING ALTERNATIVE NUMBER 2**
***Use a diverging diamond interchange and widen the existing bridges into the median.***

**(4) VALUE ENGINEEEING ALTERNATIVE NUMBER 3**
***Use a diverging diamond interchange with a new bridge.***

# VII. DEVELOPMENT PHASE

**VALUE ENGINEERING STUDY INTERIM MEETING**
***KY 4 (New Circle Road) MAJOR WIDENING***
**February 14-19, 2010**

| NAME | AFFILIATION | PHONE/EMAIL |
|---|---|---|
| Bill Ventry | VE Group, L.L.C. | 850/627-3900<br>bill@ventryengineering.com |
| Siamak Shafaghi | KYTC | 502/564-3280<br>siamak.shafaghi@ky.gov |
| Robert Semones | VE Group, L.L.C. | 850/627-3900<br>rsemones@mis.net |
| Tom Hartley | VE Group. L.L.C. | 850/627-3900<br>thartley09@bellsouth.net |
| Stephen Sewell | Palmer Engineering | 859/744-1218<br>ssewell@palmernet.com |
| David Lindeman | Palmer Engineering | 859/744-1218<br>dlindeman@palmernet.com |
| Keith Caudill | KYTC | 502/564-3280<br>keith.caudill@ky.gov |
| Michael Baase | KYTC | 502/564-4780<br>michael.baase@ky.gov |
| Gary Raymer, P. E. | KYTC | 502/229-6751<br>gary.raymer@ky.gov |

# VII. DEVELOPMENT PHASE

## A. New Circle Road/Newtown Pike Interchange Bridge

### "Existing Bridge"

The "Existing Bridge" is a twin, four span, steel girder structure (49'-3", 56'-6", 56'-6", 49'-3") 42' roadway width with pile end bents.


**EXISTING BRIDGE**

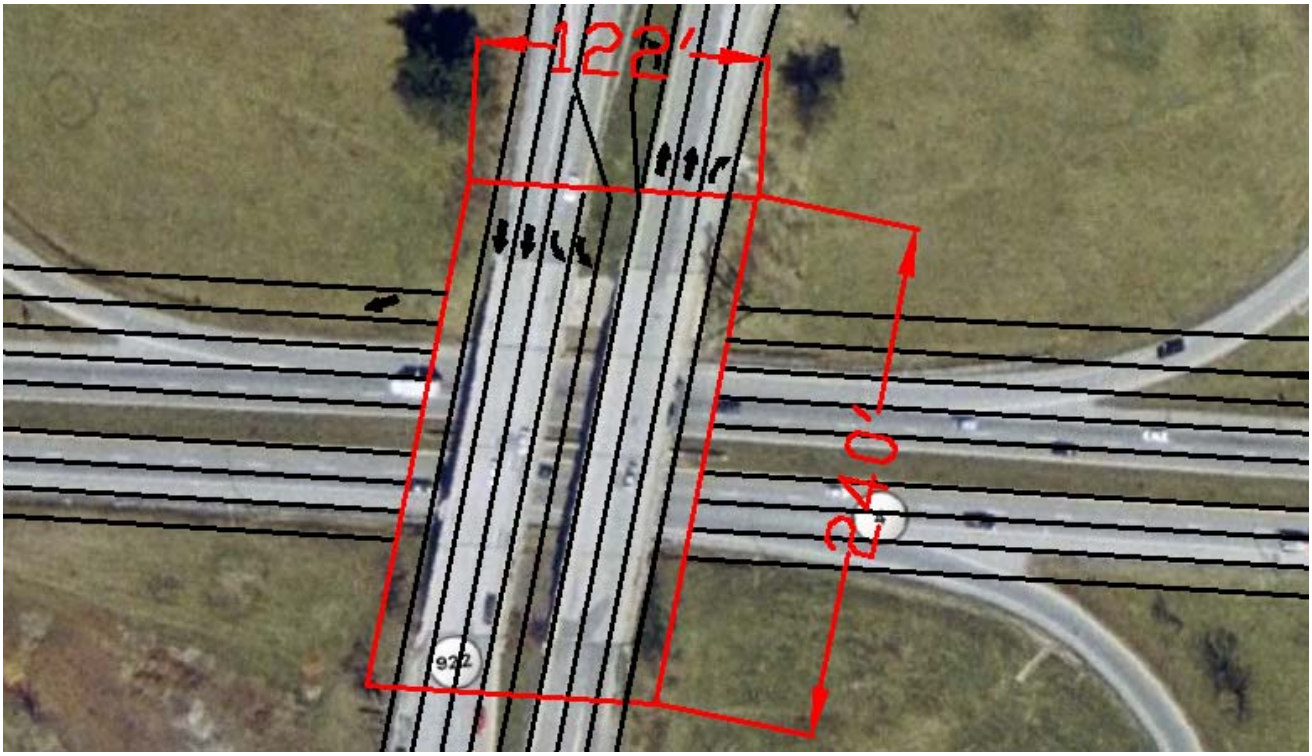
According to KYTC maintenance, the remaining life of the existing structures is 35-40 years.

# VII. DEVELOPMENT PHASE

## A. New Circle Road/Newtown Pike Interchange Bridge

### 1. "As Proposed"

The "As Proposed" structure is a four span Type III Pre-cast I Beam (PCIB), 240 L.F. x 122 L.F. (Deck area is 29,280 square feet).




**"AS PROPOSED"**

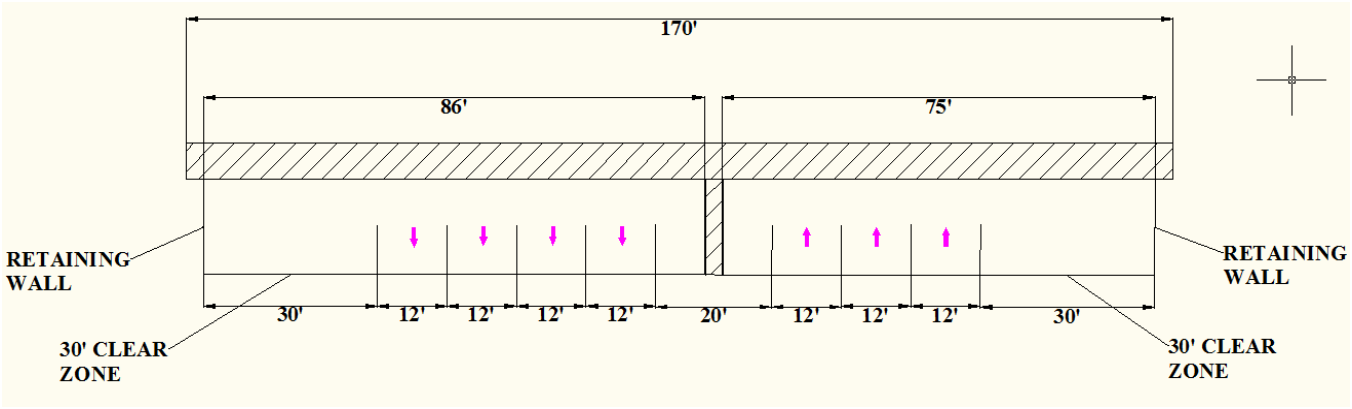
# VII. DEVELOPMENT PHASE

## A. New Circle Road/Newtown Pike Interchange Bridge

### *2. Value Engineering Alternative Number 1*

Value Engineering Alternative Number 1 consists of eliminating the end spans. This would eliminate 70 L.F. of bridge and approximately 8,400 square feet of deck area.


**VALUE ENGINEERING ALTERNATIVE 1**




**VALUE ENGINEERING ALTERNATIVE 1 NEW TOWN PIKE BRIDGE ELEVATION**

## *SHORTEN PROPOSED NEWTOWN BRIDGE 70'*
## VALUE ENGINEERING ALTERNATIVE NUMBER 1
## COST COMPARISON SHEET

| DESCRIPTION | UNITS | UNIT COST | PROP'D QTY. | PROP'D COST | V.E. QTY. | V.E. COST |
|---|---|---|---|---|---|---|
| STRUCTURE | SF | $100.00 | 29,280 | $2,928,000 | 20,740 | $2,074,000 |
| OTHER CONSTRUCTION ITEMS (20%) | LS | | 1 | $585,600 | 1 | $414,800 |
| **SUBTOTAL** | | | | **$3,513,600** | | **$2,488,800** |
| MOBILIZATION (THIS IS SUB+CONTIN. X % =) | | | 4.5% | $173,923 | 4.5% | $123,196 |
| CONTINGENCY | | | 10.0% | $351,360 | 10.0% | $248,880 |
| **GRAND TOTAL** | | | | **$4,038,883** | | **$2,860,876** |

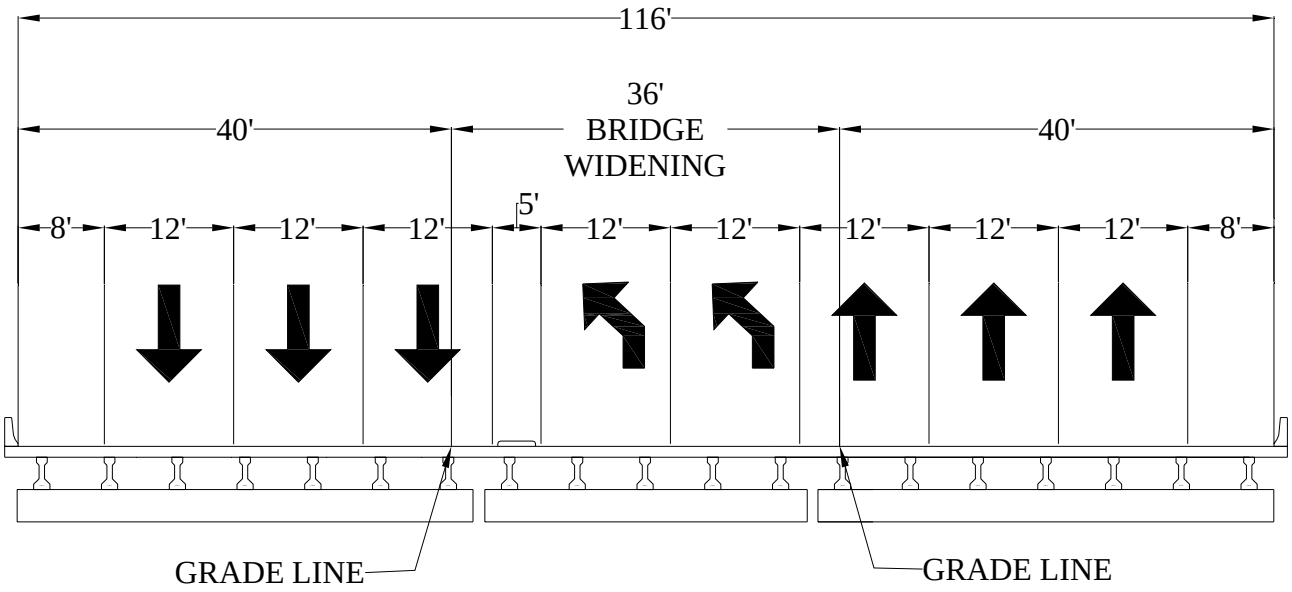
**POSSIBLE SAVINGS: $1,178,007**

# VII. DEVELOPMENT PHASE

## A. New Circle Road/Newtown Pike Interchange Bridge

### *3. Value Engineering Alternative Number 2*

Value Engineering Alternative Number 2 consists of using the existing bridges on New Circle Road by removing 6’ on each side and widening them 36’ on the inside to accommodate the extra lanes and proposed widening on Newtown Pike.

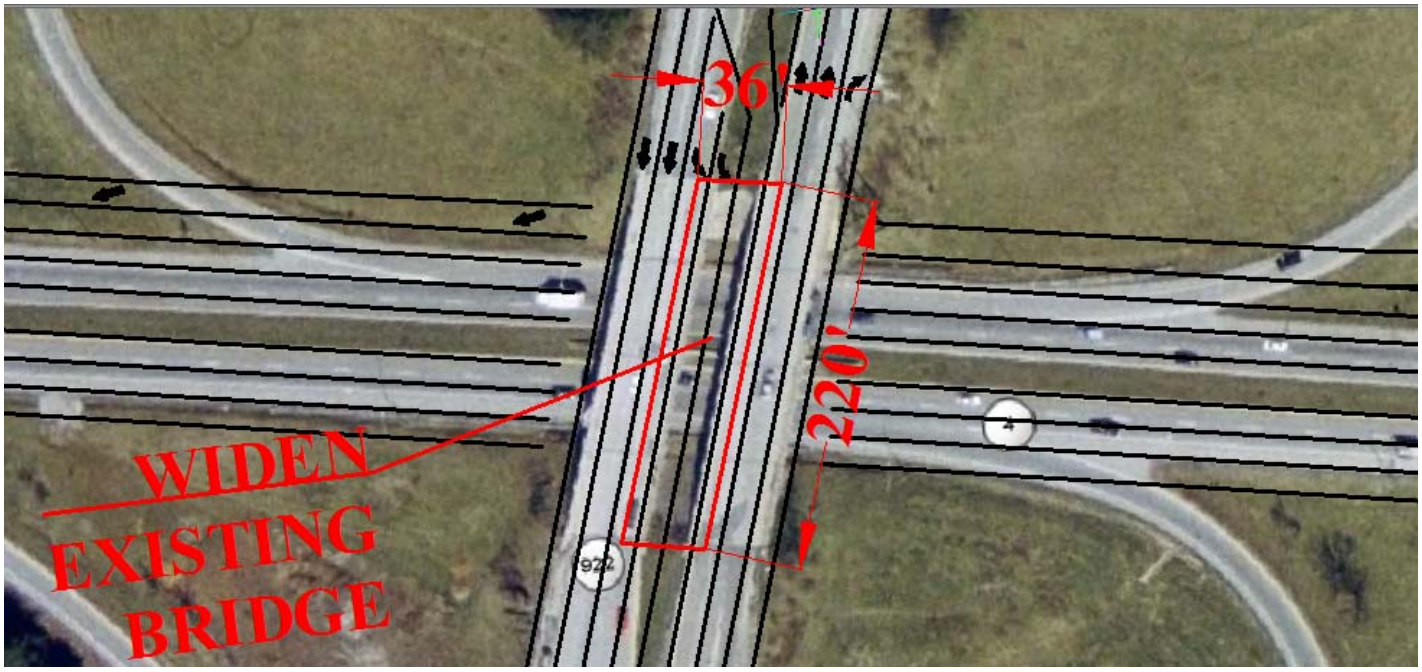



According to KYTC bridge inspection personnel, the remaining life of the existing bridges is approximately 35 to 40 years.

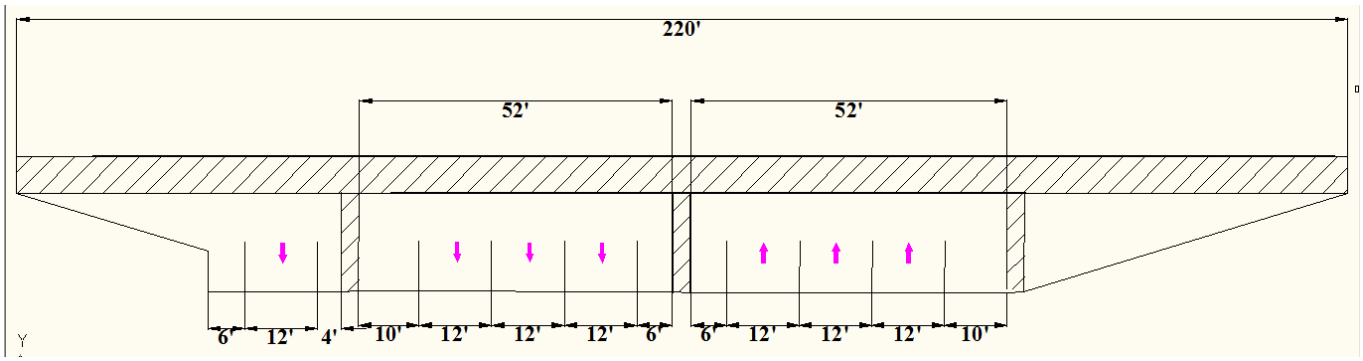
# VII. DEVELOPMENT PHASE

## A. New Circle Road/Newtown Pike Interchange Bridge

### *3. Value Engineering Alternative Number 2* *(continued)*




**VALUE ENGINEERING ALTERNATIVE 2**
**WIDEN EXISTING BRIDGE IN MEDIAN**




**VALUE ENGINEERING ALTERNATIVE 2 ROADWAY TYPICAL**

## *WIDEN EXISTING NEWTOWN BRIDGES 36'*
## VALUE ENGINEERING ALTERNATIVE NUMBER 2
## COST COMPARISON SHEET

| DESCRIPTION | UNITS | UNIT COST | PROP'D QTY. | PROP'D COST | V.E. QTY. | V.E. COST |
|---|---|---|---|---|---|---|
| STRUCTURE | SF | $100.00 | 29,280 | $2,928,000 | 7,776 | $777,600 |
| OTHER CONSTRUCTION ITEMS (20%) | LS | | 1 | $585,600 | 1 | $155,520 |
| **SUBTOTAL** | | | | **$3,513,600** | | **$933,120** |
| MOBILIZATION (THIS IS SUB+CONTIN. X % =) | | | 4.5% | $173,923 | 4.5% | $46,189 |
| CONTINGENCY | | | 10.0% | $351,360 | 10.0% | $93,312 |
| **GRAND TOTAL** | | | | **$4,038,883** | | **$1,072,621** |

**POSSIBLE SAVINGS: $2,966,262**

**NEWTOWN PIKE/NEW CIRCLE ROAD INTERCHANGE BRIDGE COMPARISON**

**75 Year Life Cycle Cost Comparison LCC**

**Enter the Interest Rate = 5%**

| | | AS PROPOSED | | VE ALT #2 | |
|---|---|---|---|---|---|
| | | BRIDGE REPLACEMENT | | WIDEN BRIDGE REPLACE BRIDGE IN 40 YRS | |
| Year | | Total | Present Worth | Total | Worth |
| 0 | INITIAL COST | $4,038,883 | -$4,038,883 | $1,072,621 | -$1,072,621 |
| 1 | ANNUAL MAINT | $2,500 | -$2,381 | $16,000 | -$15,238 |
| 2 | ANNUAL MAINT | $2,500 | -$2,268 | $16,000 | -$14,512 |
| 3 | ANNUAL MAINT | $2,500 | -$2,160 | $16,000 | -$13,821 |
| 4 | ANNUAL MAINT | $2,500 | -$2,057 | $16,000 | -$13,163 |
| 5 | ANNUAL MAINT | $2,500 | -$1,959 | $16,000 | -$12,536 |
| 6 | ANNUAL MAINT | $2,500 | -$1,866 | $16,000 | -$11,939 |
| 7 | ANNUAL MAINT | $2,500 | -$1,777 | $16,000 | -$11,371 |
| 8 | ANNUAL MAINT | $2,500 | -$1,692 | $16,000 | -$10,829 |
| 9 | ANNUAL MAINT | $2,500 | -$1,612 | $16,000 | -$10,314 |
| 10 | ANNUAL MAINT | $2,500 | -$1,535 | $16,000 | -$9,823 |
| 11 | ANNUAL MAINT | $2,500 | -$1,462 | $16,000 | -$9,355 |
| 12 | ANNUAL MAINT | $2,500 | -$1,392 | $16,000 | -$8,909 |
| 13 | ANNUAL MAINT | $2,500 | -$1,326 | $16,000 | -$8,485 |
| 14 | ANNUAL MAINT | $2,500 | -$1,263 | $16,000 | -$8,081 |
| 15 | ANNUAL MAINT | $2,500 | -$1,203 | $16,000 | -$7,696 |
| 16 | ANNUAL MAINT | $2,500 | -$1,145 | $16,000 | -$7,330 |
| 17 | ANNUAL MAINT | $2,500 | -$1,091 | $16,000 | -$6,981 |
| 18 | ANNUAL MAINT | $2,500 | -$1,039 | $16,000 | -$6,648 |
| 19 | ANNUAL MAINT | $2,500 | -$989 | $16,000 | -$6,332 |
| 20 | ANNUAL MAINT | $2,500 | -$942 | $16,000 | -$6,030 |
| 21 | ANNUAL MAINT | $2,500 | -$897 | $16,000 | -$5,743 |
| 22 | ANNUAL MAINT | $2,500 | -$855 | $16,000 | -$5,470 |
| 23 | ANNUAL MAINT | $2,500 | -$814 | $16,000 | -$5,209 |
| 24 | ANNUAL MAINT | $2,500 | -$775 | $16,000 | -$4,961 |
| 25 | ANNUAL MAINT | $2,500 | -$738 | $16,000 | -$4,725 |
| 26 | ANNUAL MAINT | $2,500 | -$703 | $16,000 | -$4,500 |
| 27 | ANNUAL MAINT | $2,500 | -$670 | $16,000 | -$4,286 |
| 28 | ANNUAL MAINT | $2,500 | -$638 | $16,000 | -$4,081 |
| 29 | ANNUAL MAINT | $2,500 | -$607 | $16,000 | -$3,887 |
| 30 | ANNUAL MAINT | $2,500 | -$578 | $16,000 | -$3,702 |
| 31 | ANNUAL MAINT | $2,500 | -$551 | $16,000 | -$3,526 |
| 32 | ANNUAL MAINT | $2,500 | -$525 | $16,000 | -$3,358 |
| 33 | ANNUAL MAINT | $2,500 | -$500 | $16,000 | -$3,198 |
| 34 | ANNUAL MAINT | $2,500 | -$476 | $16,000 | -$3,046 |
| 35 | ANNUAL MAINT | $2,500 | -$453 | $16,000 | -$2,901 |
| 36 | ANNUAL MAINT | $2,500 | -$432 | $16,000 | -$2,763 |
| 37 | ANNUAL MAINT | $2,500 | -$411 | $16,000 | -$2,631 |
| 38 | ANNUAL MAINT | $2,500 | -$392 | $16,000 | -$2,506 |
| 39 | ANNUAL MAINT | $2,500 | -$373 | $16,000 | -$2,386 |

| | | | | | |
|---|---|---|---|---|---|
| 40 | REPLACE BRIDGE | $2,500 | -$355 | $4,038,883 | -$573,706 |
| 41 | ANNUAL MAINT | $2,500 | -$338 | $2,500 | -$338 |
| 42 | ANNUAL MAINT | $2,500 | -$322 | $2,500 | -$322 |
| 43 | ANNUAL MAINT | $2,500 | -$307 | $2,500 | -$307 |
| 44 | ANNUAL MAINT | $2,500 | -$292 | $2,500 | -$292 |
| 45 | ANNUAL MAINT | $2,500 | -$278 | $2,500 | -$278 |
| 46 | ANNUAL MAINT | $2,500 | -$265 | $2,500 | -$265 |
| 47 | ANNUAL MAINT | $2,500 | -$252 | $2,500 | -$252 |
| 48 | ANNUAL MAINT | $2,500 | -$240 | $2,500 | -$240 |
| 49 | ANNUAL MAINT | $2,500 | -$229 | $2,500 | -$229 |
| 50 | ANNUAL MAINT | $2,500 | -$218 | $2,500 | -$218 |
| 51 | ANNUAL MAINT | $2,500 | -$208 | $2,500 | -$208 |
| 52 | ANNUAL MAINT | $2,500 | -$198 | $2,500 | -$198 |
| 53 | ANNUAL MAINT | $2,500 | -$188 | $2,500 | -$188 |
| 54 | ANNUAL MAINT | $2,500 | -$179 | $2,500 | -$179 |
| 55 | ANNUAL MAINT | $2,500 | -$171 | $2,500 | -$171 |
| 56 | ANNUAL MAINT | $2,500 | -$163 | $2,500 | -$163 |
| 57 | ANNUAL MAINT | $2,500 | -$155 | $2,500 | -$155 |
| 58 | ANNUAL MAINT | $2,500 | -$148 | $2,500 | -$148 |
| 59 | ANNUAL MAINT | $2,500 | -$141 | $2,500 | -$141 |
| 60 | ANNUAL MAINT | $2,500 | -$134 | $2,500 | -$134 |
| 61 | ANNUAL MAINT | $2,500 | -$127 | $2,500 | -$127 |
| 62 | ANNUAL MAINT | $2,500 | -$121 | $2,500 | -$121 |
| 63 | ANNUAL MAINT | $2,500 | -$116 | $2,500 | -$116 |
| 64 | ANNUAL MAINT | $2,500 | -$110 | $2,500 | -$110 |
| 65 | ANNUAL MAINT | $2,500 | -$105 | $2,500 | -$105 |
| 66 | ANNUAL MAINT | $2,500 | -$100 | $2,500 | -$100 |
| 67 | ANNUAL MAINT | $2,500 | -$95 | $2,500 | -$95 |
| 68 | ANNUAL MAINT | $2,500 | -$91 | $2,500 | -$91 |
| 69 | ANNUAL MAINT | $2,500 | -$86 | $2,500 | -$86 |
| 70 | ANNUAL MAINT | $2,500 | -$82 | $2,500 | -$82 |
| 71 | ANNUAL MAINT | $2,500 | -$78 | $2,500 | -$78 |
| 72 | ANNUAL MAINT | $2,500 | -$75 | $2,500 | -$75 |
| 73 | ANNUAL MAINT | $2,500 | -$71 | $2,500 | -$71 |
| 74 | ANNUAL MAINT | $2,500 | -$68 | $2,500 | -$68 |
| 75 | ANNUAL MAINT | $2,500 | -$64 | $2,500 | -$64 |
| 75 | SALVAGE | $0 | $0 | $1,884,812 | -$48,537 |
| | | | **-$4,087,595** | | **-$1,972,951** |
| | | | **LCC SAVING** | | **$2,114,644** |
| | TOTAL O&M | $187,500 | -$48,712 | $4,750,383 | -$851,793 |

V E O&M INCLUDES REPLACEMENT OF BRIDGE IN 40 YRS

# VII. DEVELOPMENT PHASE

## B. LexMark Bridge

### "Existing"

The "Existing" structure is a two span (80'-0", 80'-0"), Reinforced Concrete Deck Girder (RCDG) bridge.

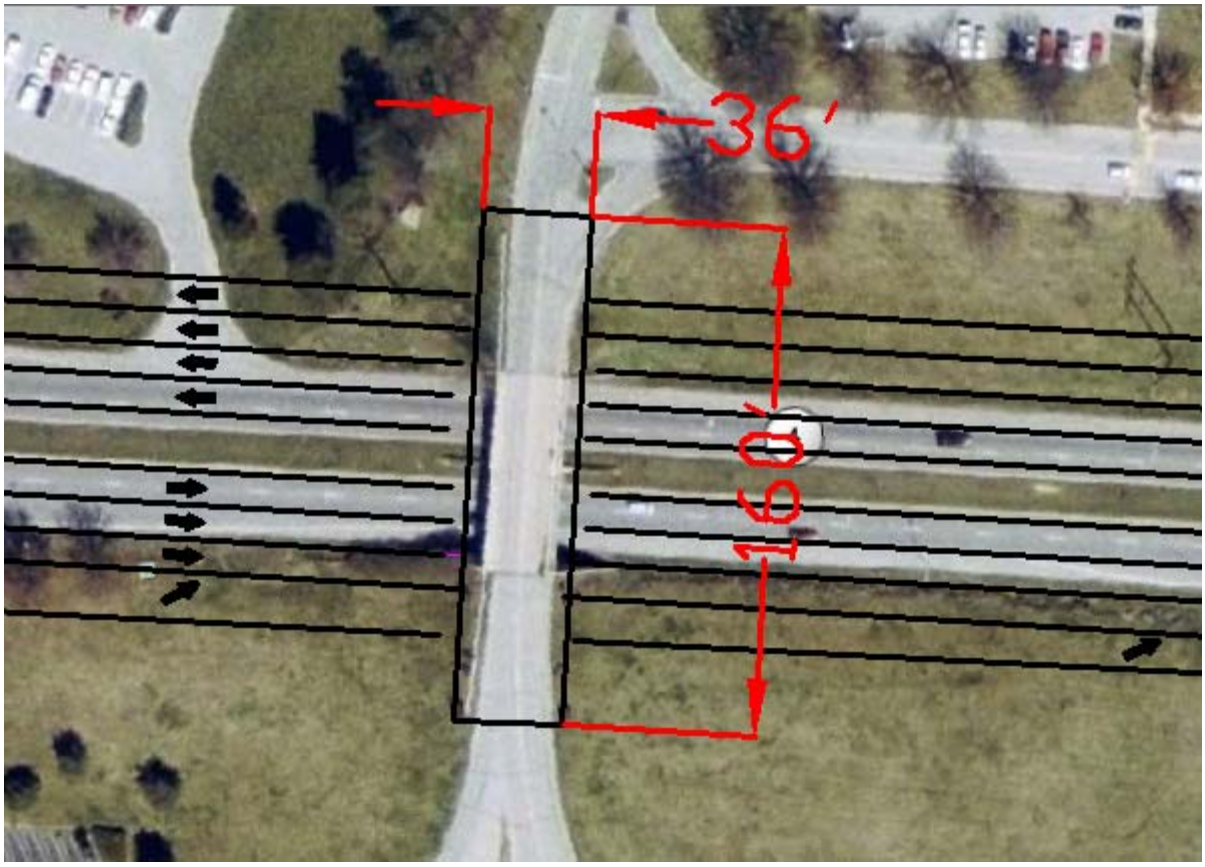
**EXISTING LEXMARK BRIDGE SHOWING PIER AND VERTICAL ABUTMENTS**

# VII. DEVELOPMENT PHASE

## B. LexMark Bridge

### 1. "As Proposed"

The "As Proposed" structure is a two span (80'-0", 80'-0"), PCIB bridge. 160' x 36'



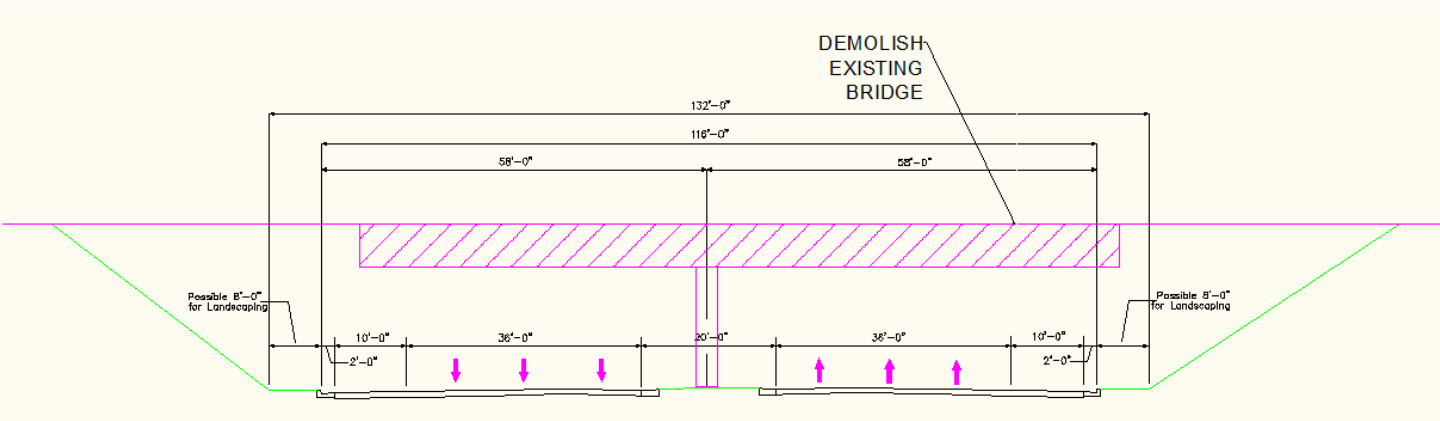

**"AS PROPOSED" LEXMARK BRIDGE, PLAN VIEW**

# VII. DEVELOPMENT PHASE

## B. LexMark Bridge

### *2. Value Engineering Alternative Number 1*

Value Engineering Alternative Number 1 consists of eliminating the bridge, assuming the bridge is no longer needed due to change in property ownership. The proposed bike path could be added to the Newtown Pike Bridge as with the "As Proposed" or Value Engineering Alternatives Number 2 and 3, shown in Section VII, D.




**VALUE ENGINEERING ALTERANTIVE NUMBER 1**
**DEMOLISH LEXMARK BRIDGE**

## *ELIMINATE THE EXISTING BRIDGE*
## VALUE ENGINEERING ALTERNATIVE NUMBER 1
## COST COMPARISON SHEET

| DESCRIPTION | UNITS | UNIT COST | PROP'D QTY. | PROP'D COST | V.E. QTY. | V.E. COST |
|---|---|---|---|---|---|---|
| REMOVE OLD BRIDGE | SF | $15.00 | 4,200 | $63,000 | 4,200 | $63,000 |
| STRUCTURE | SF | $138.10 | 5,760 | $795,456 | - | $0 |
| CRUSHED STONE BASE | TN | $23.00 | - | $0 | - | $0 |
| CLASS II BASE | TN | $60.00 | 750 | $45,000 | - | $0 |
| CLASS II SURFACE | TN | $75.00 | 310 | $23,250 | - | $0 |
| ROADWAY EXC. | CY | $25.00 | 1,500 | $37,500 | - | $0 |
| MAINT. TRAFFIC | LS | $1.00 | 66,000 | $66,000 | - | $0 |
| **SUBTOTAL** | | | | **$1,030,206** | | **$63,000** |
| MOBILIZATION (THIS IS SUB+CONTIN. X % =) | | 4.5% | | $50,995 | | $3,119 |
| TRAFFIC CONTROL/MOT | | 0.0% | | $0 | | $0 |
| CONTINGENCY | | 10.0% | | $103,021 | | $6,300 |
| **GRAND TOTAL** | | | | **$1,184,222** | | **$72,419** |

**POSSIBLE SAVINGS: $1,111,803**

# VII. DEVELOPMENT PHASE

## B. LexMark Bridge

### *3. Value Engineering Alternative Number 2*

Value Engineering Alternative Number 2 consists of raising the grade of the existing bridge to adjust the vertical clearance from 15’1” to 16’ using the existing pier and End Bents. This alternative will provide 12’ lane widths on New Circle Road but would reduce shoulder widths to 4’, 4.5’, and 6’ as a practical solution.

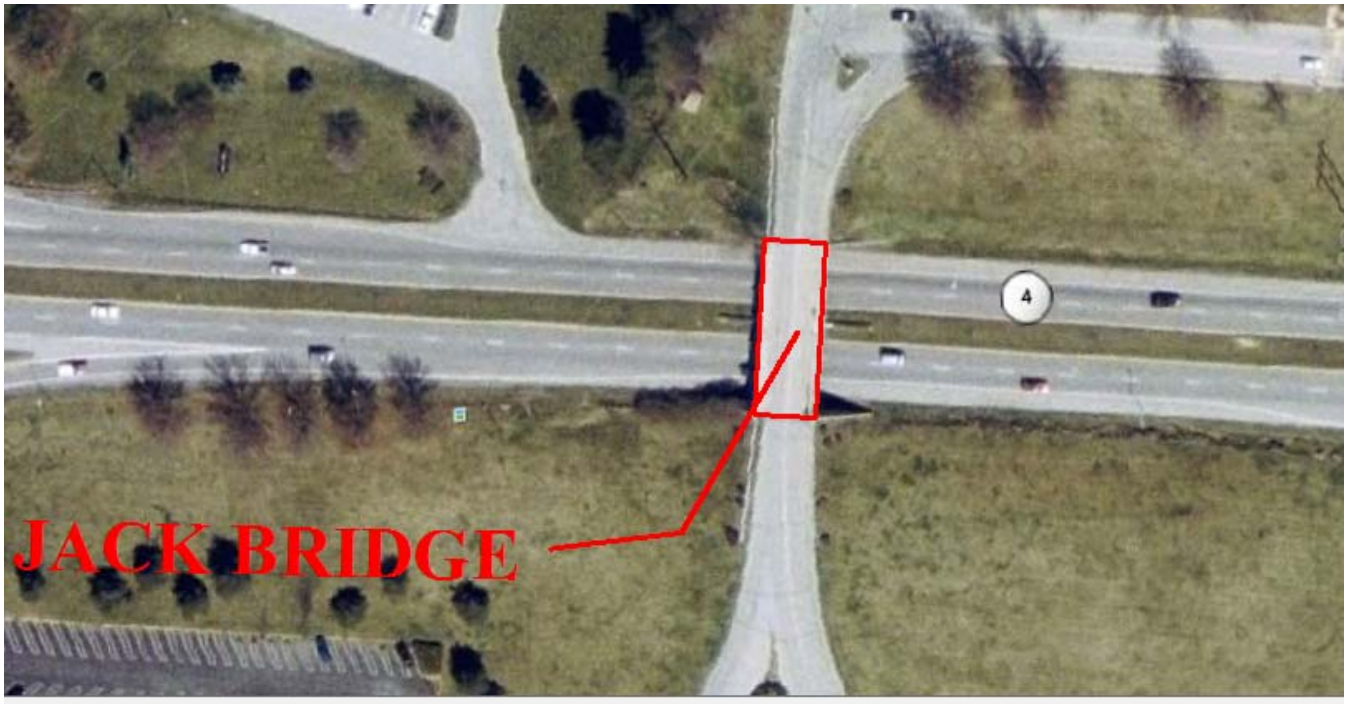
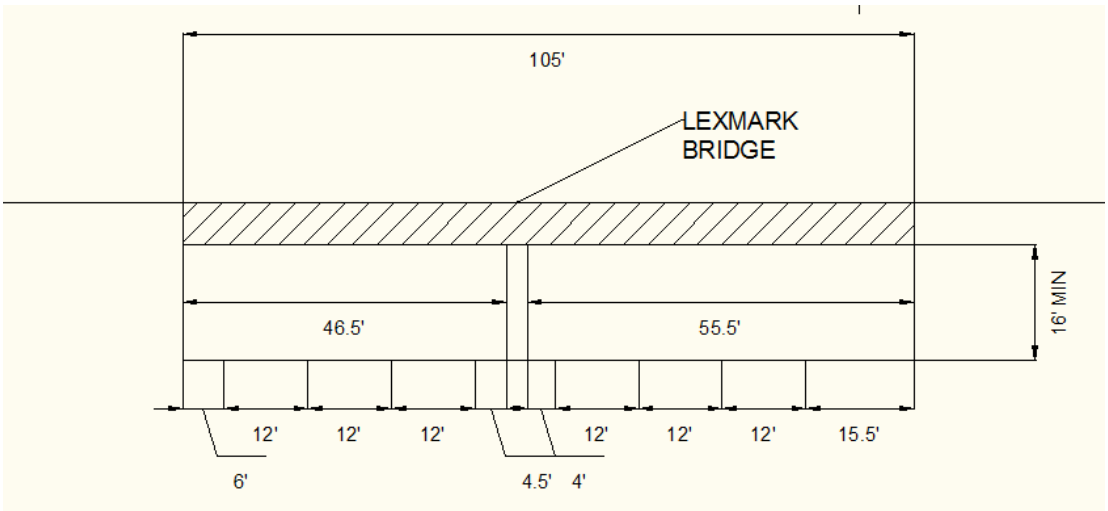



**ILLUSTRATION SHOWING 12’ DRIVING LANES AND 4’, 4.5, and 6’ SHOULDERS ON NEW CIRCLE ROAD**



## *RAISE EXISTING LEXMARK BRIDGE*
## VALUE ENGINEERING ALTERNATIVE NUMBER 2
## COST COMPARISON SHEET

| DESCRIPTION | UNITS | UNIT COST | PROP'D QTY. | PROP'D COST | V.E. QTY. | V.E. COST |
|---|---|---|---|---|---|---|
| REMOVE OLD BRIDGE | SF | $15.00 | 4,200 | $63,000 | - | $0 |
| STRUCTURE | SF | $138.10 | 5,760 | $795,456 | - | $0 |
| CRUSHED STONE BASE | TN | $23.00 | - | $0 | - | $0 |
| CLASS II BASE | TN | $60.00 | 750 | $45,000 | 750 | $45,000 |
| CLASS II SURFACE | TN | $75.00 | 310 | $23,250 | 310 | $23,250 |
| ROADWAY EXC. | CY | $25.00 | 1,500 | $37,500 | 1,500 | $37,500 |
| MAINT. TRAFFIC | LS | $1.00 | 66,000 | $66,000 | 66,000 | $66,000 |
| JACK EXISTING STRUC. | LS | $1.00 | - | $0 | 1 | $125,000 |
| **SUBTOTAL** | | | | **$1,030,206** | | **$296,750** |
| MOBILIZATION (THIS IS SUB+CONTIN. X % =) | | 4.5% | | $50,995 | | $14,689 |
| TRAFFIC CONTROL/MOT | | 0.0% | | $0 | | $0 |
| CONTINGENCY | | 10.0% | | $103,021 | | $29,675 |
| **GRAND TOTAL** | | | | **$1,184,222** | | **$341,114** |

**POSSIBLE SAVINGS: $843,108**

**LEXMARK BRIDGE - RAISE BRIDGE COMPARISON**

**75 Year Life Cycle Cost Comparison LCC**

**Enter the Interest Rate =** 5%

| | | AS PROPOSED | | VE ALT #2 | |
|---|---|---|---|---|---|
| | | BRIDGE REPLACEMENT | | RAISE BRIDGE REPLACE BRIDGE IN 40 YRS | |
| Year | | Total | Present Worth | Total | Worth |
| 0 | INITIAL COST | $1,184,222 | -$1,184,222 | $341,114 | -$341,114 |
| 1 | ANNUAL MAINT | $2,500 | -$2,381 | $5,000 | -$4,762 |
| 2 | ANNUAL MAINT | $2,500 | -$2,268 | $5,000 | -$4,535 |
| 3 | ANNUAL MAINT | $2,500 | -$2,160 | $5,000 | -$4,319 |
| 4 | ANNUAL MAINT | $2,500 | -$2,057 | $5,000 | -$4,114 |
| 5 | ANNUAL MAINT | $2,500 | -$1,959 | $5,000 | -$3,918 |
| 6 | ANNUAL MAINT | $2,500 | -$1,866 | $5,000 | -$3,731 |
| 7 | ANNUAL MAINT | $2,500 | -$1,777 | $5,000 | -$3,553 |
| 8 | ANNUAL MAINT | $2,500 | -$1,692 | $5,000 | -$3,384 |
| 9 | ANNUAL MAINT | $2,500 | -$1,612 | $5,000 | -$3,223 |
| 10 | ANNUAL MAINT | $2,500 | -$1,535 | $5,000 | -$3,070 |
| 11 | ANNUAL MAINT | $2,500 | -$1,462 | $5,000 | -$2,923 |
| 12 | ANNUAL MAINT | $2,500 | -$1,392 | $5,000 | -$2,784 |
| 13 | ANNUAL MAINT | $2,500 | -$1,326 | $5,000 | -$2,652 |
| 14 | ANNUAL MAINT | $2,500 | -$1,263 | $5,000 | -$2,525 |
| 15 | ANNUAL MAINT | $2,500 | -$1,203 | $5,000 | -$2,405 |
| 16 | ANNUAL MAINT | $2,500 | -$1,145 | $5,000 | -$2,291 |
| 17 | ANNUAL MAINT | $2,500 | -$1,091 | $5,000 | -$2,181 |
| 18 | ANNUAL MAINT | $2,500 | -$1,039 | $5,000 | -$2,078 |
| 19 | ANNUAL MAINT | $2,500 | -$989 | $5,000 | -$1,979 |
| 20 | ANNUAL MAINT | $2,500 | -$942 | $5,000 | -$1,884 |
| 21 | ANNUAL MAINT | $2,500 | -$897 | $5,000 | -$1,795 |
| 22 | ANNUAL MAINT | $2,500 | -$855 | $5,000 | -$1,709 |
| 23 | ANNUAL MAINT | $2,500 | -$814 | $5,000 | -$1,628 |
| 24 | ANNUAL MAINT | $2,500 | -$775 | $5,000 | -$1,550 |
| 25 | ANNUAL MAINT | $2,500 | -$738 | $5,000 | -$1,477 |
| 26 | ANNUAL MAINT | $2,500 | -$703 | $5,000 | -$1,406 |
| 27 | ANNUAL MAINT | $2,500 | -$670 | $5,000 | -$1,339 |
| 28 | ANNUAL MAINT | $2,500 | -$638 | $5,000 | -$1,275 |
| 29 | ANNUAL MAINT | $2,500 | -$607 | $5,000 | -$1,215 |
| 30 | ANNUAL MAINT | $2,500 | -$578 | $5,000 | -$1,157 |
| 31 | ANNUAL MAINT | $2,500 | -$551 | $5,000 | -$1,102 |
| 32 | ANNUAL MAINT | $2,500 | -$525 | $5,000 | -$1,049 |
| 33 | ANNUAL MAINT | $2,500 | -$500 | $5,000 | -$999 |
| 34 | ANNUAL MAINT | $2,500 | -$476 | $5,000 | -$952 |
| 35 | ANNUAL MAINT | $2,500 | -$453 | $5,000 | -$906 |
| 36 | ANNUAL MAINT | $2,500 | -$432 | $5,000 | -$863 |
| 37 | ANNUAL MAINT | $2,500 | -$411 | $5,000 | -$822 |
| 38 | ANNUAL MAINT | $2,500 | -$392 | $5,000 | -$783 |

| | | | | | |
|---|---|---|---|---|---|
| 39 | ANNUAL MAINT | $2,500 | -$373 | $5,000 | -$746 |
| 40 | REPLACE BRIDGE | $2,500 | -$355 | $1,184,222 | -$168,214 |
| 41 | ANNUAL MAINT | $2,500 | -$338 | $2,500 | -$338 |
| 42 | ANNUAL MAINT | $2,500 | -$322 | $2,500 | -$322 |
| 43 | ANNUAL MAINT | $2,500 | -$307 | $2,500 | -$307 |
| 44 | ANNUAL MAINT | $2,500 | -$292 | $2,500 | -$292 |
| 45 | ANNUAL MAINT | $2,500 | -$278 | $2,500 | -$278 |
| 46 | ANNUAL MAINT | $2,500 | -$265 | $2,500 | -$265 |
| 47 | ANNUAL MAINT | $2,500 | -$252 | $2,500 | -$252 |
| 48 | ANNUAL MAINT | $2,500 | -$240 | $2,500 | -$240 |
| 49 | ANNUAL MAINT | $2,500 | -$229 | $2,500 | -$229 |
| 50 | ANNUAL MAINT | $2,500 | -$218 | $2,500 | -$218 |
| 51 | ANNUAL MAINT | $2,500 | -$208 | $2,500 | -$208 |
| 52 | ANNUAL MAINT | $2,500 | -$198 | $2,500 | -$198 |
| 53 | ANNUAL MAINT | $2,500 | -$188 | $2,500 | -$188 |
| 54 | ANNUAL MAINT | $2,500 | -$179 | $2,500 | -$179 |
| 55 | ANNUAL MAINT | $2,500 | -$171 | $2,500 | -$171 |
| 56 | ANNUAL MAINT | $2,500 | -$163 | $2,500 | -$163 |
| 57 | ANNUAL MAINT | $2,500 | -$155 | $2,500 | -$155 |
| 58 | ANNUAL MAINT | $2,500 | -$148 | $2,500 | -$148 |
| 59 | ANNUAL MAINT | $2,500 | -$141 | $2,500 | -$141 |
| 60 | ANNUAL MAINT | $2,500 | -$134 | $2,500 | -$134 |
| 61 | ANNUAL MAINT | $2,500 | -$127 | $2,500 | -$127 |
| 62 | ANNUAL MAINT | $2,500 | -$121 | $2,500 | -$121 |
| 63 | ANNUAL MAINT | $2,500 | -$116 | $2,500 | -$116 |
| 64 | ANNUAL MAINT | $2,500 | -$110 | $2,500 | -$110 |
| 65 | ANNUAL MAINT | $2,500 | -$105 | $2,500 | -$105 |
| 66 | ANNUAL MAINT | $2,500 | -$100 | $2,500 | -$100 |
| 67 | ANNUAL MAINT | $2,500 | -$95 | $2,500 | -$95 |
| 68 | ANNUAL MAINT | $2,500 | -$91 | $2,500 | -$91 |
| 69 | ANNUAL MAINT | $2,500 | -$86 | $2,500 | -$86 |
| 70 | ANNUAL MAINT | $2,500 | -$82 | $2,500 | -$82 |
| 71 | ANNUAL MAINT | $2,500 | -$78 | $2,500 | -$78 |
| 72 | ANNUAL MAINT | $2,500 | -$75 | $2,500 | -$75 |
| 73 | ANNUAL MAINT | $2,500 | -$71 | $2,500 | -$71 |
| 74 | ANNUAL MAINT | $2,500 | -$68 | $2,500 | -$68 |
| 75 | ANNUAL MAINT | $2,500 | -$64 | $2,500 | -$64 |
| 75 | SALVAGE | $0 | $0 | $552,637 | -$14,231 |
| | | | **-$1,232,934** | | **-$614,459** |
| | | | **LCC SAVING** | | **$618,476** |
| | TOTAL O&M | $187,500 | -$48,712 | $1,466,722 | -$259,114 |

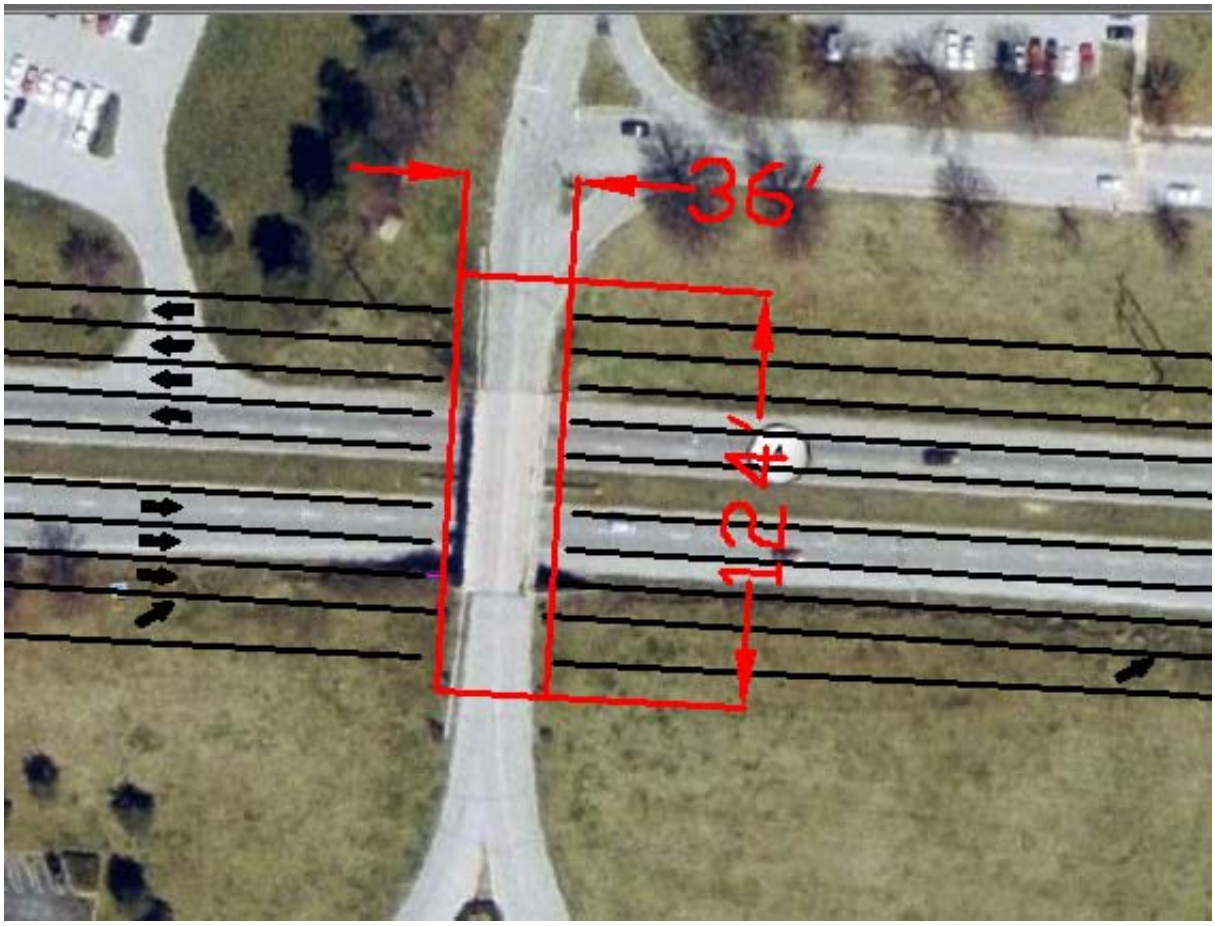
V E O&M INCLUDES REPLACEMENT OF BRIDGE IN 40 YRS

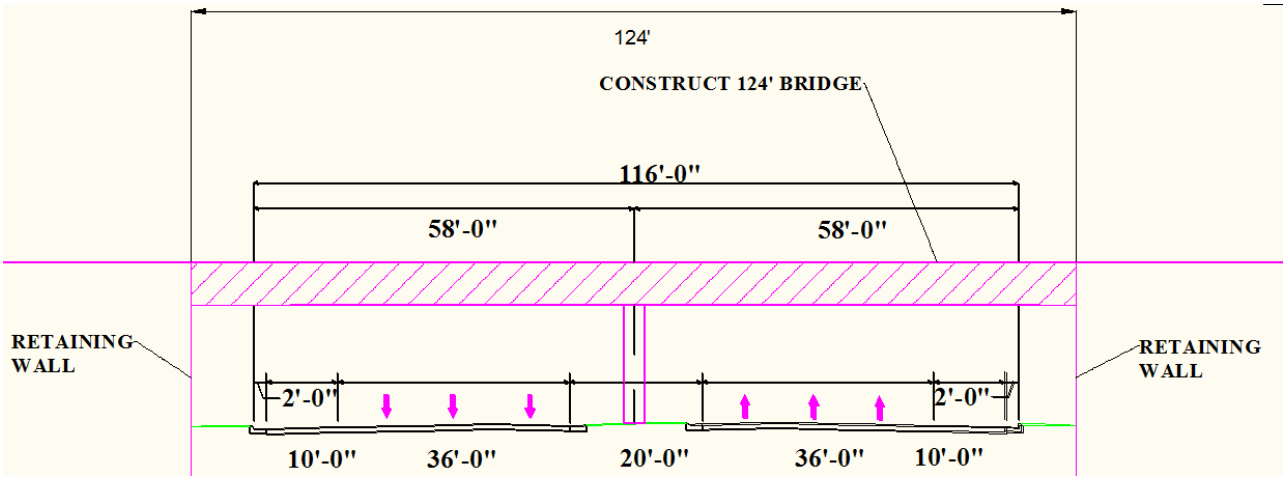
# VII. DEVELOPMENT PHASE

## B. LexMark Bridge

### *4. Value Engineering Alternative Number 3*

Value Engineering Number 3 consists of reducing the proposed Lexmark Bridge from 160’ to 124’. This would eliminate 1,296 square feet of deck area.



## *SHORTEN PROPOSED LEXMARK BRIDGE*
## VALUE ENGINEERING ALTERNATIVE NUMBER 3
## COST COMPARISON SHEET

| DESCRIPTION | UNITS | UNIT COST | PROP'D QTY. | PROP'D COST | V.E. QTY. | V.E. COST |
|---|---|---|---|---|---|---|
| REMOVE OLD BRIDGE | SF | $15.00 | 4,200 | $63,000 | - | $0 |
| STRUCTURE | SF | $138.10 | 5,760 | $795,456 | 4,464 | $616,478 |
| CRUSHED STONE BASE | TN | $23.00 | - | $0 | - | $0 |
| CLASS II BASE | TN | $60.00 | 750 | $45,000 | 750 | $45,000 |
| CLASS II SURFACE | TN | $75.00 | 310 | $23,250 | 310 | $23,250 |
| ROADWAY EXC. | CY | $25.00 | 1,500 | $37,500 | 1,500 | $37,500 |
| MAINT. TRAFFIC | LS | $1.00 | 66,000 | $66,000 | 66,000 | $66,000 |
| **SUBTOTAL** | | | | **$1,030,206** | | **$788,228** |
| MOBILIZATION (THIS IS SUB+CONTIN. X % =) | | 4.5% | | $50,995 | | $39,017 |
| TRAFFIC CONTROL/MOT | | 0.0% | | $0 | | $0 |
| CONTINGENCY | | 10.0% | | $103,021 | | $78,823 |
| **GRAND TOTAL** | | | | **$1,184,222** | | **$906,069** |

**POSSIBLE SAVINGS: $278,153**

# VII. DEVELOPMENT PHASE

## B. LexMark Bridge

### *5. Value Engineering Alternative Number 4*

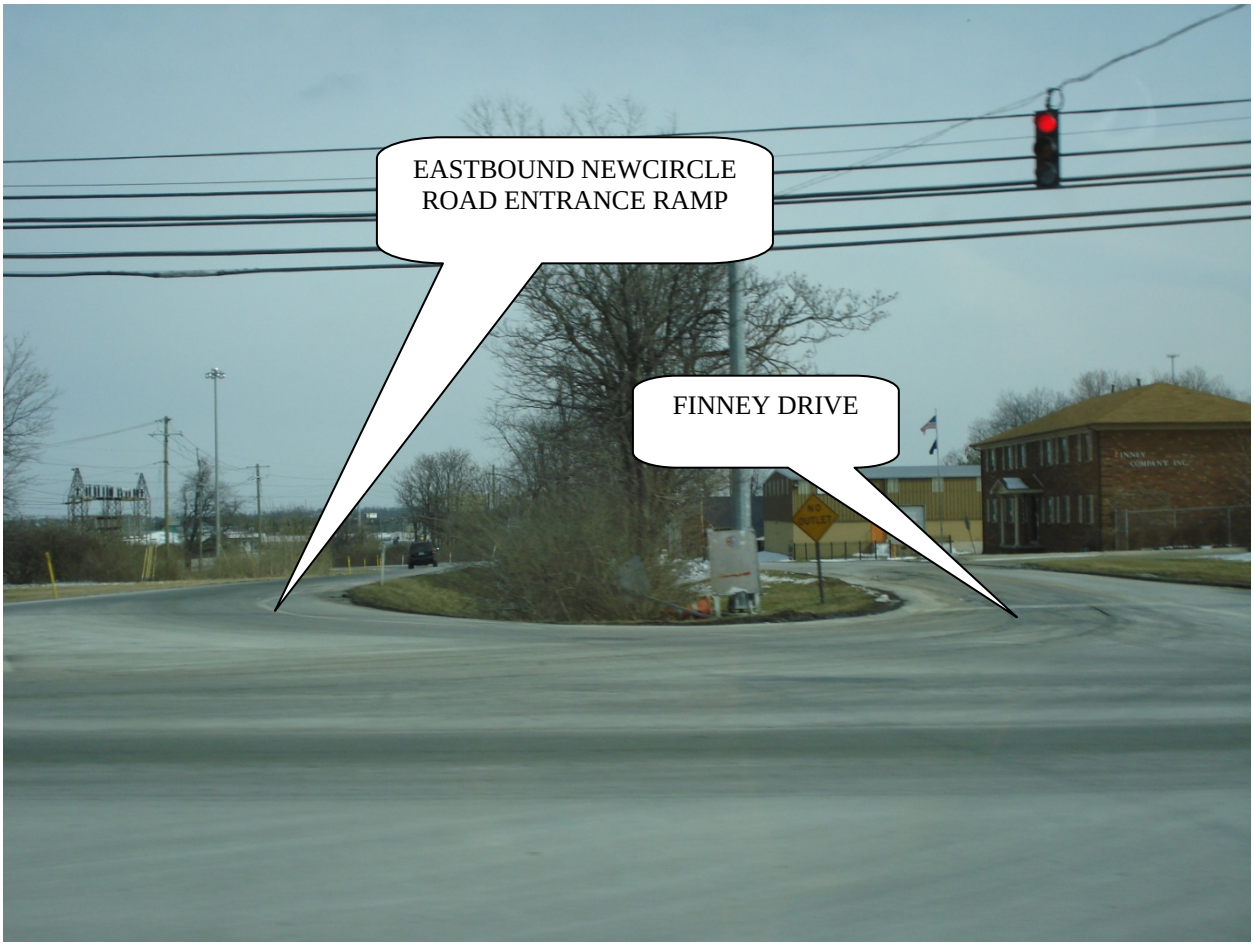
## *DROPPED DURING THE EVALUATION PHASE*

# VII. DEVELOPMENT PHASE

## C. South Frontage Road Intersection

### 1. "As Proposed"

The existing conditions at the New Circle Road eastbound exit, New Circle Road entrance ramp and Georgetown Road in the Georgetown Road/New Circle Road Interchange is made undesirable by the location of the Finney Drive ("As Proposed" South Frontage Road) adjacent to the eastbound entrance ramp as shown below.



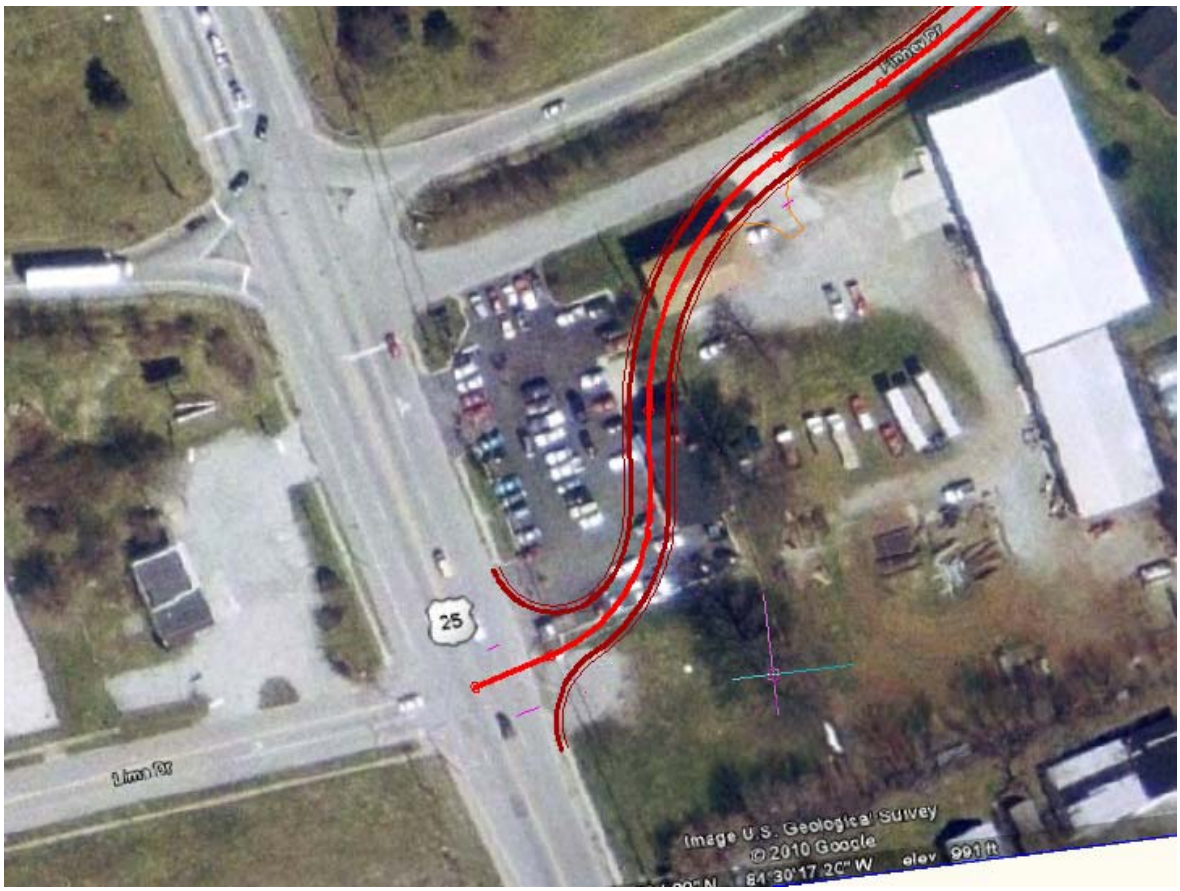

**EXISTING CONDITIONS IN GEORGETOWN ROAD/
NEW CIRCLE ROAD INTERCHANGE**

The "As Proposed" design calls for moving the intersection of Finney Drive and Georgetown Road 250' +/- to the south, opposite to Lima Drive and Georgetown Road intersection as shown on the next page. This configuration will require one whole parcel take and two partial takes on other parcels.

# VII. DEVELOPMENT PHASE

## C. South Frontage Road Intersection

### 1. "As Proposed" *(continued)*



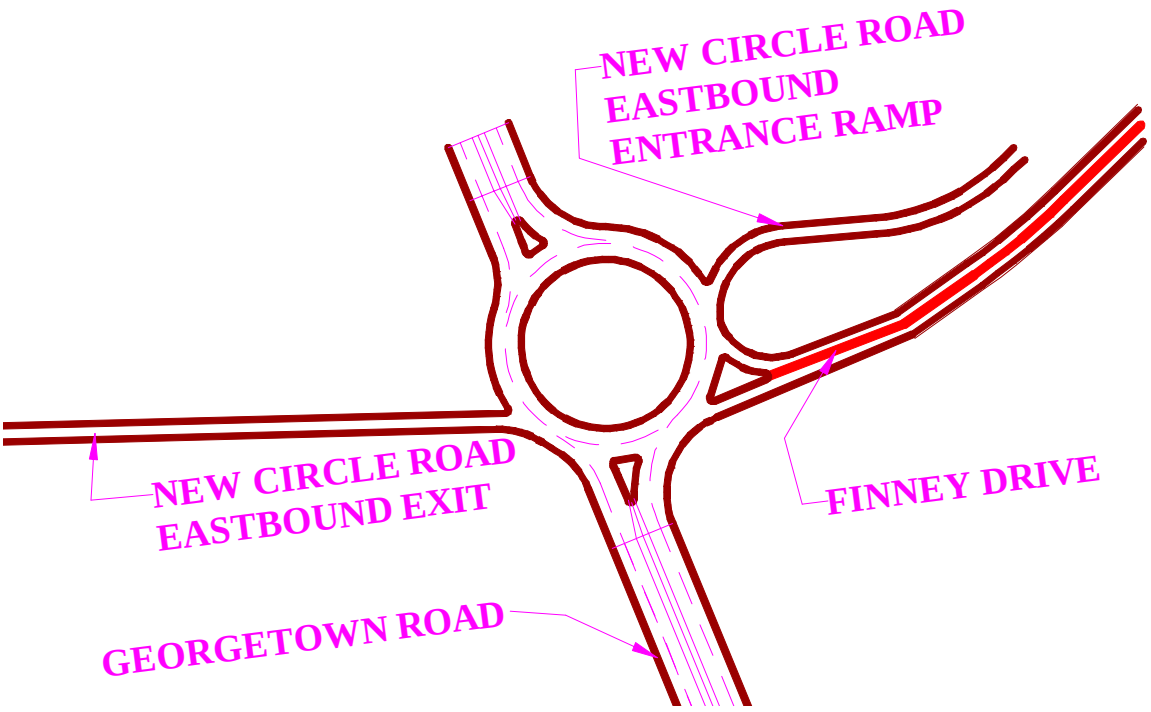

**AS PROPOSED FINNEY DRIVE INTERSECTION**

## C. South Frontage Road Intersection

### *2. Value Engineering Alternative Number 1*

Value Engineering Alternative Number 1 evaluated constructing a roundabout in this location to minimize the amount of right-of-way acquisition. The basic configuration of the roundabout will be a 2-lane roundabout with inner radius of 75', two – 15' lanes and a 12' border outside the travel lanes. It will accommodate the eight – legs of traffic:

1. Eastbound New Circle Road exit ramp
2. Southbound Georgetown Road (off)
3. Northbound Georgetown Road (on)
4. Eastbound Finney Drive (off)
5. Westbound Finney Drive (on)
6. Eastbound New Circle Road entrance ramp
7. Northbound Georgetown Road (off)
8. Southbound Georgetown Road (on)

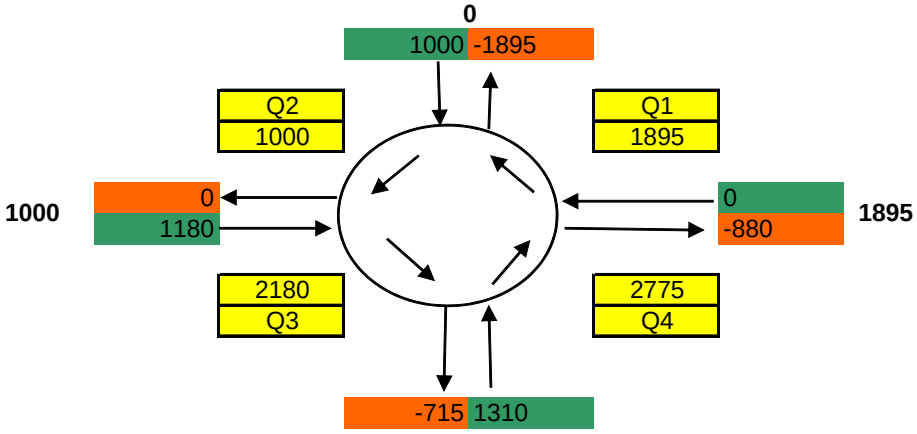



**VALUE ENGINEERING ALTERNATIVE NUMBER 1**
**ROUNDABOUT @ FINNEY DRIVE/GEORGETOWN ROAD**

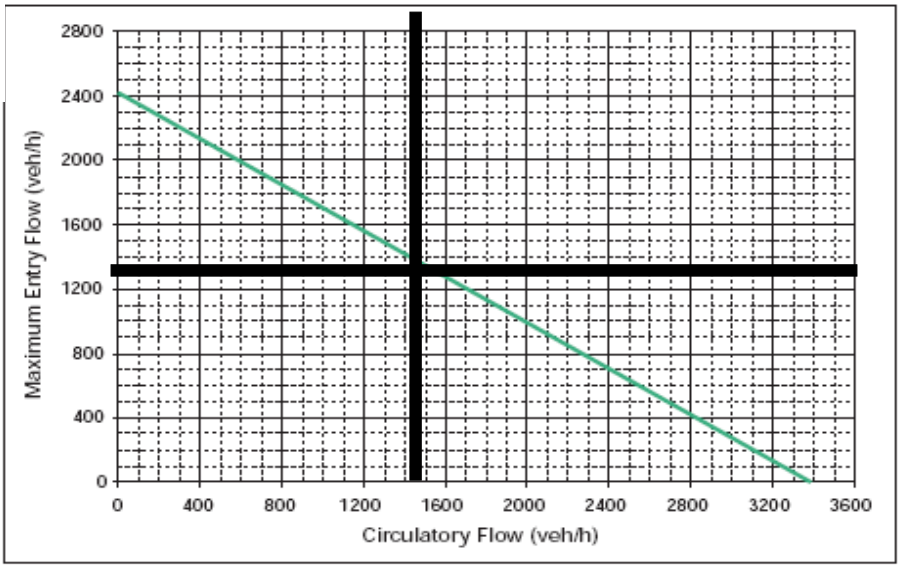
The following traffic analysis indicates the roundabout will be operating near capacity for the 2030 design year.

### 2. *Value Engineering Alternative Number 1* *(continued)*

**NEW CIRCLE ROAD/GEORGETOWN ROAD INTERCHANGE SOUTH APPROACH**




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | 1000 | | | | |
| | | 0 | 460 | 540 | -1895 | | |
| 1000 | QUAD 2 | RT | THRU | LT | OUT | QUAD 1 | 1895 |
| 0 | OUT | | N | | | RT | 0 |
| 925 | LT | | | | | THRU | 0 |
| 1180 0 | THRU | W | | | E | LT | 0 0 |
| 255 | RT | | | | | OUT | -880 |
| 2180 | QUAD 3 | | S | | | QUAD 4 | 2775 |
| | | OUT | LT | THRU | RT | | |
| | | -715 | 0 | 970 | 340 | | |
| | | | 1310 | | | | |



### *2. Value Engineering Alternative Number 1* *(continued)*

The diagonal line indicates the maximum entry flow versus the circulatory flow for the intersection. Finney Road traffic is assumed to be low and has little impact on this analysis. The worst location for this roundabout is where left turning vehicles from eastbound New Circle Road conflict with the northbound Georgetown Road traffic entering the roundabout. The intersection of these two lines is just below the Maximum capacity of the roundabout.

*Note: Maximum capacity for a roundabout: The maximum capacity of a 2 – lane roundabout is the blue line on the graph as shown on Pg 55. This line is determined by the ability of traffic entering the roundabout to merge with traffic already in the roundabout. For evaluation purposes, the leg that has the most traffic is analyzed to determine if the design hour traffic entering (horizontal line on the graph) and the design hour traffic on the circle (vertical line on the graph) intersect below the Blue Line. If it does, the roundabout will operate below capacity and should be considered as a viable alternative treatment of the intersection.*

## *GEORGE TOWN ROAD/SOUTH FRONTAGE ROAD ROUNDABOUT*
## VALUE ENGINEERING ALTERNATIVE NUMBER 1
## COST COMPARISON SHEET

| DESCRIPTION | UNITS | UNIT COST | PROP'D QTY. | PROP'D COST | V.E. QTY. | V.E. COST |
|---|---|---|---|---|---|---|
| CRUSHED STONE BASE | TN | $23.00 | 5,522 | $127,006 | 4,785 | $110,055 |
| CLASS 2 ASPHALT BASE 1.00 D PG64-22 | TN | $60.00 | 5,278 | $316,680 | 3,632 | $217,920 |
| CLASS 2 ASPHALT SURFACE 0.38D PG64-22 | TN | $75.00 | 823 | $61,725 | 886 | $66,450 |
| ROADWAY EMBANKMENT | CY | $25.00 | 6,877 | $171,925 | 6,500 | $162,500 |
| CURB & GUTTER | L.F. | $40.00 | 6,800 | $272,000 | 5,000 | $200,000 |
| MAINTENANCE & CONTROL TRAFFIC | LS | $60,000 | 1 | $60,000 | 1 | $60,000 |
| MISC DRAINAGE | LS | $220,000 | 1 | $220,000 | 1 | $220,000 |
| OTHER | LS | $307,334 | 1 | $307,334 | 1 | $307,334 |
| **SUBTOTAL** | | | | **$1,536,670** | | **$1,344,259** |
| MOBILIZATION / DEMOBILIZATION (THIS IS SUB+CONTIN. X % =) | | 4.5% | | $76,065 | | $66,541 |
| TRAFFIC CONTROL/MOT | | 0.0% | | $0 | | $0 |
| UNKNOWNS | | 10.0% | | $153,667 | | $134,426 |
| RIGHT OF WAY | SF | $25.21 | 31,495.0 | $794,000 | 0.0 | $0 |
| **GRAND TOTAL** | | | | **$2,560,402** | | **$1,545,226** |

**POSSIBLE SAVINGS: $1,015,176**

## C. South Frontage Road Intersection

### *2. Value Engineering Alternative Number 2*

Value Engineering Alternative Number 2 retains the configuration of the existing New Circle Road Exit, New Circle Road Entrance and Finney Drive Intersection. This will eliminate the need to acquire right-of-way from the three parcels and reduce the amount of Finney Drive reconstruction.


**VALUE ENGINEERING ALTERNATIVE NUMBER 2**

It is the Value Engineering Team's understanding that the existing intersection configuration is not a high crash location, but the extension of Finney Drive to the east as a frontage road will add another five traffic generators to the existing three traffic generators on Finney Drive.

## *GEORGE TOWN ROAD/SOUTH FRONTAGE ROAD*
## *USE EXISTING INTERSECTION*
## VALUE ENGINEERING ALTERNATIVE NUMBER 2
## COST COMPARISON SHEET

| DESCRIPTION | UNITS | UNIT COST | PROP'D QTY. | PROP'D COST | V.E. QTY. | V.E. COST |
|---|---|---|---|---|---|---|
| CRUSHED STONE BASE | TN | $23.00 | 5,522 | $127,006 | 2,125 | $48,875 |
| CLASS 2 ASPHALT BASE 1.00 D PG64-22 | TN | $60.00 | 5,278 | $316,680 | 1,615 | $96,900 |
| CLASS 2 ASPHALT SURFACE 0.38D PG64-22 | TN | $75.00 | 823 | $61,725 | 395 | $29,625 |
| ROADWAY EMBANKMENT | CY | $25.00 | 6,877 | $171,925 | 3,500 | $87,500 |
| CURB & GUTTER | L.F. | $40.00 | 6,800 | $272,000 | 2,600 | $104,000 |
| MAINTENANCE & CONTROL TRAFFIC | LS | $60,000 | 1 | $60,000 | 1 | $60,000 |
| MISC DRAINAGE | LS | $220,000 | 1 | $220,000 | 1 | $220,000 |
| OTHER | LS | $307,334 | 1 | $307,334 | 1 | $307,334 |
| **SUBTOTAL** | | | | **$1,536,670** | | **$954,234** |
| MOBILIZATION / DEMOBILIZATION (THIS IS SUB+CONTIN. X % =) | | 4.5% | | $76,065 | | $47,235 |
| TRAFFIC CONTROL/MOT | | 0.0% | | $0 | | $0 |
| UNKNOWNS | | 10.0% | | $153,667 | | $95,423 |
| RIGHT OF WAY | SF | $25.21 | 31,495.0 | $794,000 | 0.0 | $0 |
| **GRAND TOTAL** | | | | **$2,560,402** | | **$1,096,892** |

**POSSIBLE SAVINGS: $1,463,510**

Backup Calculations:

PAVEMENT

| RAMP | LENGTH | WIDTH | AREA/SY |
|---|---|---|---|
| FRONTAGE RD | 3400 | 33 | 12,466.7 |
| | | | 12,466.7 |

| | DEPTH | TN/SY-IN | TN | | |
|---|---|---|---|---|---|
| SURFACE | 1.5 | 0.055 | 1028.5 | $ 60.00 | $ 61,710 |
| ASPH BASE | 6.15 | 0.055 | 4216.9 | $ 75.00 | $ 316,264 |
| STONE BASE | 7.75 | 0.0575 | 5555.5 | $ 23.00 | $ 127,776 |

| ROUND ABT RAMP | | | | | |
|---|---|---|---|---|---|
| VE FRONTAGE F | 2500 | 33 | 9,166.7 | | 3.14159265 |
| ROUND ABT | 471.2389 | 30 | 1,570.8 | 150 | 471.238898 |
| | | | 10,737.5 | | |

| | DEPTH | TN/SY-IN | TN | | |
|---|---|---|---|---|---|
| SURFACE | 1.5 | 0.055 | 885.8 | $ 60.00 | $ 53,150 |
| ASPH BASE | 6.15 | 0.055 | 3631.9 | $ 75.00 | $ 272,396 |
| STONE BASE | 7.75 | 0.0575 | 4784.9 | $ 23.00 | $ 110,052 |

| NO BUILD RAMP | | | |
|---|---|---|---|
| VE FRONTAGE F | 1300 | 33 | 4,766.7 |
| | | | 4,766.7 |

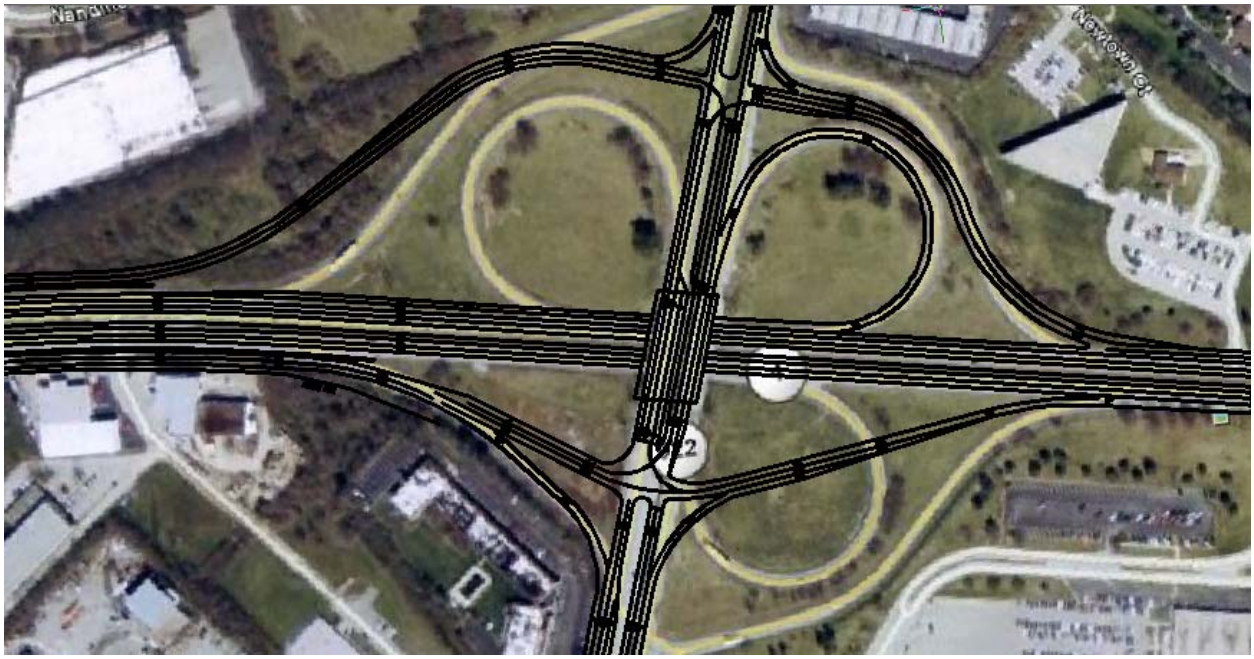
| | DEPTH | TN/SY-IN | TN | | |
|---|---|---|---|---|---|
| SURFACE | 1.5 | 0.055 | 393.3 | $ 60.00 | $ 23,595 |
| ASPH BASE | 6.15 | 0.055 | 1612.3 | $ 75.00 | $ 120,924 |
| STONE BASE | 7.75 | 0.0575 | 2124.1 | $ 23.00 | $ 48,855 |

# VII. DEVELOPMENT PHASE

## D. New Circle Road/Newtown Pike Interchange

### 1. "As Proposed"

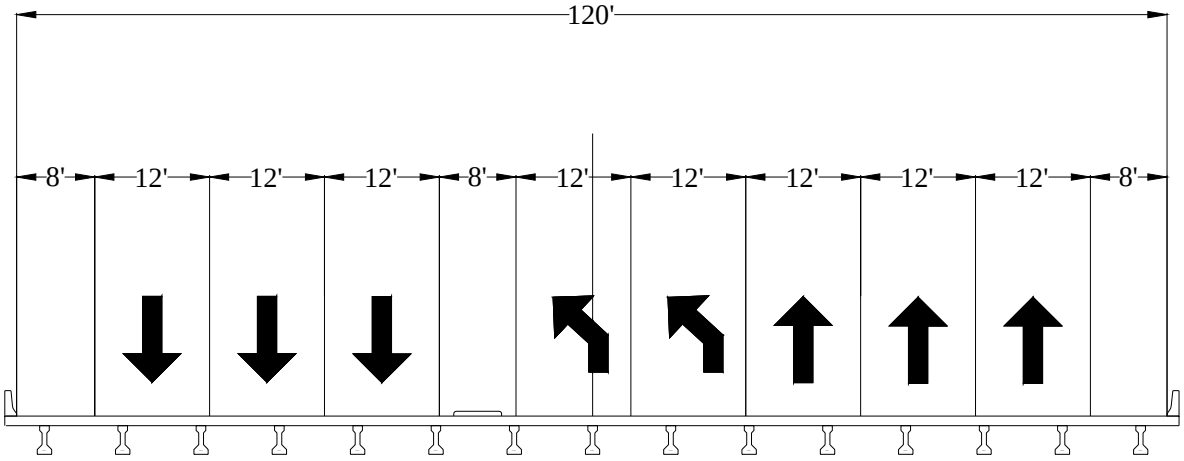
The Newtown Pike/New Circle Road Interchange exists as a Partial Clover Leaf (PARCLO) Configuration with loop ramps in the northeast, northwest, and southeast quadrants. The "As Proposed" design will reconfigure the interchange to a PARCLO "A" Interchange with the eastbound KY 4 to northbound Newtown Pike traffic (southeast quadrant) and the westbound KY 4 to southbound Newtown Pike traffic (northwest quadrant) using loop ramps. The northbound Newtown Pike to westbound KY 4 traffic will be signalized for a protected left turn and it is anticipated the southbound Newtown Pike to eastbound KY 4 traffic will also be signalized. Highway Capacity Manual (HCM) Software indicates the PARCLO will operate at capacity in the 2030 Design Year.



**AS PROPOSED NEWTOWN PIKE/NEW CIRCLE ROAD PARCLO INTERCHANGE**

## D. New Circle Road/Newtown Pike Interchange

### 1. "As Proposed" *(continued)*




**AS PROPOSED NEWTOWN BRIDGE TYPICAL**

## D. New Circle Road/Newtown Pike Interchange

### 1. "As Proposed" *(continued)*

**EXISTING TWIN STEEL BEAM BRIDGES OVER NEW CIRCLE ROAD**

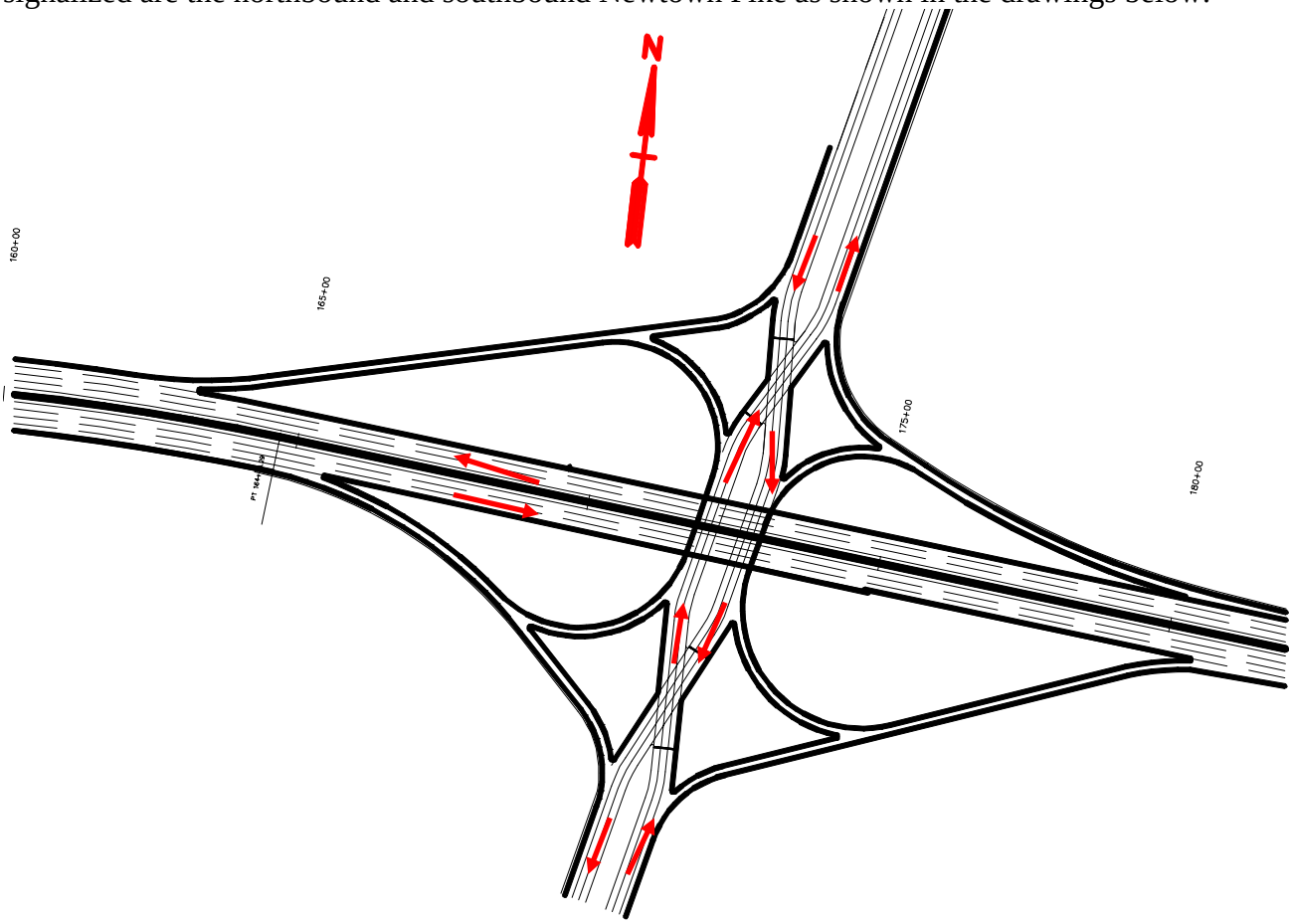

**EXISTING SOUTHBOUND NEWTOWN PIKE BRIDGE OVER NEW CIRCLE ROAD**

The twin steel beam bridges over New Circle Road will be replaced with a single PCI bridge 122' wide and 240' long. This typical section will provide 6' bike lanes on northbound and southbound roadways.

## D. New Circle Road/Newtown Pike Interchange

### *2. Value Engineering Alterative Number 1*

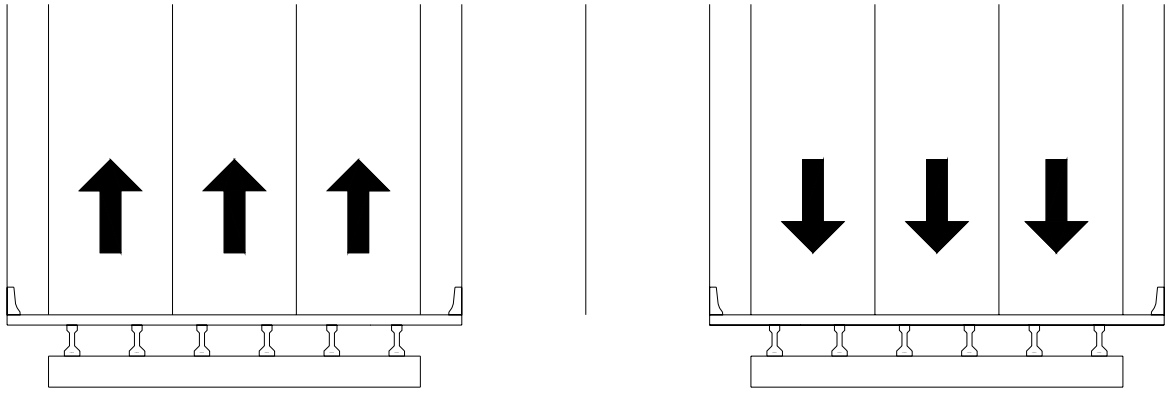
Value Engineering Alternative Number 1 recommends changing the Newtown Pike/New Circle Road Interchange to a Diverging Diamond Interchange (DDI). This configuration removes the conflicting left turn movements from the interchange and the only movements that will be signalized are the northbound and southbound Newtown Pike as shown in the drawings below.




**VALUE ENGINEERING ALTERNATIVE NUMBER 1**
**DIVERGING DIAMOND INTERCHANGE**

This Alternative will use the existing twin bridges and northbound and southbound Newtown Pike traffic will cross over as close to the structure as possible to provide increased separation from flanking intersections. The existing bridge will not provide for pedestrian or bicycle facilities.

The existing structure piers already provide 3-lanes traffic (2-through lanes and an auxiliary lane) under the structure in each direction.



**VALUE ENGINEERING ALTERNATIVE NUMBER 1**
**DDI EXISTING BRIDGE TYPICAL**

Traffic analysis using the HCM software indicates the north approach to the interchange will have a V/C ratio of 0.92 and the south approach will have a V/C ratio of 0.83 compared to the PARCLO where both approaches will be at capacity.

A life cycle cost analysis was completed based on the initial cost of a new bridge and using the existing bridge through its estimated 40 year remaining life. It was estimated the new bridge annual maintenance cost will be $2,500 and the existing bridge annual maintenance cost will be $16,000. For a 75 year life of the new bridge, the interchange total present day costs will be $15,851,900 and the Value Engineering Alternative's present day costs will be $ 13,101,654 for a possible Life Cycle Cost Savings of $2,750,247.

## *NEWTOWN PIKE/NEW CIRCLE ROAD INTERCHANGE - NO BRIDGE*
## VALUE ENGINEERING ALTERNATIVE NUMBER 1
## COST COMPARISON SHEET

| DESCRIPTION | UNITS | UNIT COST | PROP'D QTY. | PROP'D COST | V.E. QTY. | V.E. COST |
|---|---|---|---|---|---|---|
| CRUSHED STONE BASE | TN | $23.00 | 26,300 | $604,900 | 2,5257 | $580,911 |
| CLASS 2 ASPHALT BASE 1.00 D PG64-22 | TN | $60.00 | 23,796 | $1,427,760 | 2,1427 | $1,285,620 |
| CLASS 2 ASPHALT SURFACE 0.38D PG64-22 | TN | $75.00 | 7,619 | $571,425 | 7,245 | $543,375 |
| ROADWAY EMBANKMENT | CY | $25.00 | 15,000 | $375,000 | 15,000 | $375,000 |
| CURB & GUTTER | L.F. | $40.00 | 18,000 | $720,000 | 18,000 | $720,000 |
| MAINTENANCE & CONTROL TRAFFIC | LS | $400,000 | 1 | $400,000 | 1 | $400,000 |
| SIGNALS | LS | $58,000 | 1 | $58,000 | 2 | $116,000 |
| SIGNING | LS | $150,000 | 1 | $150,000 | 1 | $150,000 |
| LIGHTING | LS | $500,000 | 1 | $500,000 | 1 | $500,000 |
| MISC DRAINAGE | LS | $485,000 | 1 | $485,000 | 1 | $485,000 |
| RETAINING WALLS | SF | $50.00 | 2,000 | $100,000 | 2,000 | $100,000 |
| BRIDGE-NEWTOWN | SF | $100.00 | 29,280 | $2,928,000 | 0 | $0 |
| OTHER | LS | $1,948,021 | 1 | $1,948,021 | 1 | $1,948,021 |
| **SUBTOTAL** | | | | **$10,268,106** | | **$7,203,927** |
| MOBILIZATION / DEMOBILIZATION (THIS IS SUB+CONTIN. X % =) | | 4.5% | | $508,271 | | $356,594 |
| TRAFFIC CONTROL/MOT | | 0.0% | | $0 | | $0 |
| UNKNOWNS | | 10.0% | | $1,026,811 | | $720,393 |
| RIGHT OF WAY | SF | $25.71 | 155,576 | $4,000,000 | 155,576 | $4,000,000 |
| **GRAND TOTAL** | | | | **$15,803,188** | | **$12,280,914** |

## POSSIBLE SAVINGS: $3,522,274

**NEWTOWN PIKE/NEW CIRCLE ROAD INTERCHANGE BRIDGE COMPARISON**

**75 Year Life Cycle Cost Comparison LCC**

**Enter the Interest Rate = 5%**

| Year | | AS PROPOSED BRIDGE REPLACEMENT Total | AS PROPOSED BRIDGE REPLACEMENT Present Worth | VE ALT #1 REPLACE BRIDGE IN 40 YRS Total | VE ALT #1 REPLACE BRIDGE IN 40 YRS Worth |
|---|---|---|---|---|---|
| 0 | INITIAL COST | $15,803,188 | -$15,803,188 | $12,280,914 | -$12,280,914 |
| 1 | ANNUAL MAINT | $2,500 | -$2,381 | $16,000 | -$15,238 |
| 2 | ANNUAL MAINT | $2,500 | -$2,268 | $16,000 | -$14,512 |
| 3 | ANNUAL MAINT | $2,500 | -$2,160 | $16,000 | -$13,821 |
| 4 | ANNUAL MAINT | $2,500 | -$2,057 | $16,000 | -$13,163 |
| 5 | ANNUAL MAINT | $2,500 | -$1,959 | $16,000 | -$12,536 |
| 6 | ANNUAL MAINT | $2,500 | -$1,866 | $16,000 | -$11,939 |
| 7 | ANNUAL MAINT | $2,500 | -$1,777 | $16,000 | -$11,371 |
| 8 | ANNUAL MAINT | $2,500 | -$1,692 | $16,000 | -$10,829 |
| 9 | ANNUAL MAINT | $2,500 | -$1,612 | $16,000 | -$10,314 |
| 10 | ANNUAL MAINT | $2,500 | -$1,535 | $16,000 | -$9,823 |
| 11 | ANNUAL MAINT | $2,500 | -$1,462 | $16,000 | -$9,355 |
| 12 | ANNUAL MAINT | $2,500 | -$1,392 | $16,000 | -$8,909 |
| 13 | ANNUAL MAINT | $2,500 | -$1,326 | $16,000 | -$8,485 |
| 14 | ANNUAL MAINT | $2,500 | -$1,263 | $16,000 | -$8,081 |
| 15 | ANNUAL MAINT | $2,500 | -$1,203 | $16,000 | -$7,696 |
| 16 | ANNUAL MAINT | $2,500 | -$1,145 | $16,000 | -$7,330 |
| 17 | ANNUAL MAINT | $2,500 | -$1,091 | $16,000 | -$6,981 |
| 18 | ANNUAL MAINT | $2,500 | -$1,039 | $16,000 | -$6,648 |
| 19 | ANNUAL MAINT | $2,500 | -$989 | $16,000 | -$6,332 |
| 20 | ANNUAL MAINT | $2,500 | -$942 | $16,000 | -$6,030 |
| 21 | ANNUAL MAINT | $2,500 | -$897 | $16,000 | -$5,743 |
| 22 | ANNUAL MAINT | $2,500 | -$855 | $16,000 | -$5,470 |
| 23 | ANNUAL MAINT | $2,500 | -$814 | $16,000 | -$5,209 |
| 24 | ANNUAL MAINT | $2,500 | -$775 | $16,000 | -$4,961 |
| 25 | ANNUAL MAINT | $2,500 | -$738 | $16,000 | -$4,725 |
| 26 | ANNUAL MAINT | $2,500 | -$703 | $16,000 | -$4,500 |
| 27 | ANNUAL MAINT | $2,500 | -$670 | $16,000 | -$4,286 |
| 28 | ANNUAL MAINT | $2,500 | -$638 | $16,000 | -$4,081 |
| 29 | ANNUAL MAINT | $2,500 | -$607 | $16,000 | -$3,887 |
| 30 | ANNUAL MAINT | $2,500 | -$578 | $16,000 | -$3,702 |
| 31 | ANNUAL MAINT | $2,500 | -$551 | $16,000 | -$3,526 |
| 32 | ANNUAL MAINT | $2,500 | -$525 | $16,000 | -$3,358 |
| 33 | ANNUAL MAINT | $2,500 | -$500 | $16,000 | -$3,198 |
| 34 | ANNUAL MAINT | $2,500 | -$476 | $16,000 | -$3,046 |
| 35 | ANNUAL MAINT | $2,500 | -$453 | $16,000 | -$2,901 |
| 36 | ANNUAL MAINT | $2,500 | -$432 | $16,000 | -$2,763 |
| 37 | ANNUAL MAINT | $2,500 | -$411 | $16,000 | -$2,631 |
| 38 | ANNUAL MAINT | $2,500 | -$392 | $16,000 | -$2,506 |

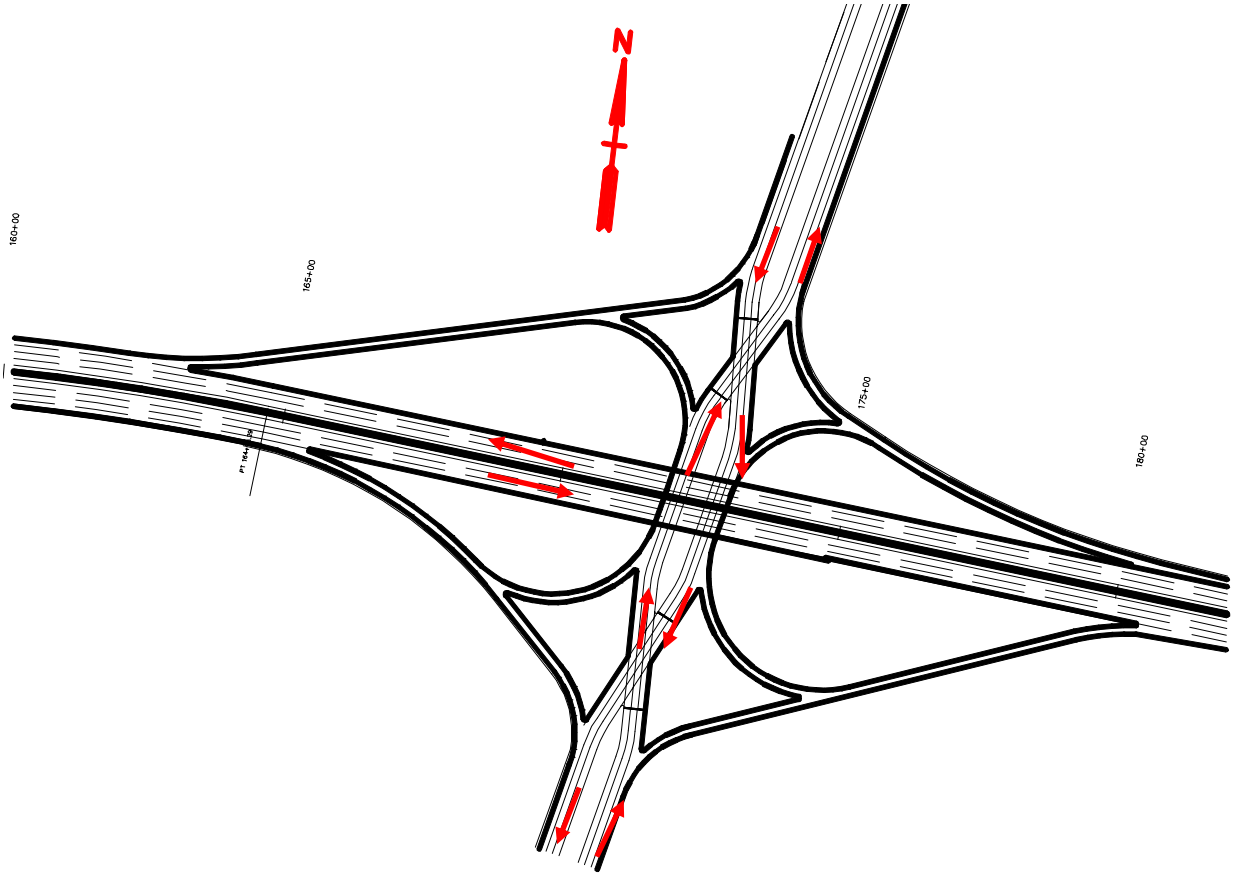
| | | | | | |
|---|---|---|---|---|---|
| 39 | ANNUAL MAINT | $2,500 | -$373 | $16,000 | -$2,386 |
| 40 | REPLACE BRIDGE | $2,500 | -$355 | $3,522,274 | -$500,324 |
| 41 | ANNUAL MAINT | $2,500 | -$338 | $2,500 | -$338 |
| 42 | ANNUAL MAINT | $2,500 | -$322 | $2,500 | -$322 |
| 43 | ANNUAL MAINT | $2,500 | -$307 | $2,500 | -$307 |
| 44 | ANNUAL MAINT | $2,500 | -$292 | $2,500 | -$292 |
| 45 | ANNUAL MAINT | $2,500 | -$278 | $2,500 | -$278 |
| 46 | ANNUAL MAINT | $2,500 | -$265 | $2,500 | -$265 |
| 47 | ANNUAL MAINT | $2,500 | -$252 | $2,500 | -$252 |
| 48 | ANNUAL MAINT | $2,500 | -$240 | $2,500 | -$240 |
| 49 | ANNUAL MAINT | $2,500 | -$229 | $2,500 | -$229 |
| 50 | ANNUAL MAINT | $2,500 | -$218 | $2,500 | -$218 |
| 51 | ANNUAL MAINT | $2,500 | -$208 | $2,500 | -$208 |
| 52 | ANNUAL MAINT | $2,500 | -$198 | $2,500 | -$198 |
| 53 | ANNUAL MAINT | $2,500 | -$188 | $2,500 | -$188 |
| 54 | ANNUAL MAINT | $2,500 | -$179 | $2,500 | -$179 |
| 55 | ANNUAL MAINT | $2,500 | -$171 | $2,500 | -$171 |
| 56 | ANNUAL MAINT | $2,500 | -$163 | $2,500 | -$163 |
| 57 | ANNUAL MAINT | $2,500 | -$155 | $2,500 | -$155 |
| 58 | ANNUAL MAINT | $2,500 | -$148 | $2,500 | -$148 |
| 59 | ANNUAL MAINT | $2,500 | -$141 | $2,500 | -$141 |
| 60 | ANNUAL MAINT | $2,500 | -$134 | $2,500 | -$134 |
| 61 | ANNUAL MAINT | $2,500 | -$127 | $2,500 | -$127 |
| 62 | ANNUAL MAINT | $2,500 | -$121 | $2,500 | -$121 |
| 63 | ANNUAL MAINT | $2,500 | -$116 | $2,500 | -$116 |
| 64 | ANNUAL MAINT | $2,500 | -$110 | $2,500 | -$110 |
| 65 | ANNUAL MAINT | $2,500 | -$105 | $2,500 | -$105 |
| 66 | ANNUAL MAINT | $2,500 | -$100 | $2,500 | -$100 |
| 67 | ANNUAL MAINT | $2,500 | -$95 | $2,500 | -$95 |
| 68 | ANNUAL MAINT | $2,500 | -$91 | $2,500 | -$91 |
| 69 | ANNUAL MAINT | $2,500 | -$86 | $2,500 | -$86 |
| 70 | ANNUAL MAINT | $2,500 | -$82 | $2,500 | -$82 |
| 71 | ANNUAL MAINT | $2,500 | -$78 | $2,500 | -$78 |
| 72 | ANNUAL MAINT | $2,500 | -$75 | $2,500 | -$75 |
| 73 | ANNUAL MAINT | $2,500 | -$71 | $2,500 | -$71 |
| 74 | ANNUAL MAINT | $2,500 | -$68 | $2,500 | -$68 |
| 75 | ANNUAL MAINT | $2,500 | -$64 | $2,500 | -$64 |
| 75 | SALVAGE | $0 | $0 | $1,643,728 | -$42,328 |
| | | | **-$15,851,900** | | **-$13,101,654** |
| | | | **LCC SAVING** | | **$2,750,247** |
| | TOTAL O&M | $187,500 | -$48,712 | $4,233,774 | -$778,411 |

V E O&M INCLUDES REPLACEMENT OF BRIDGE IN 40 YRS

## D. New Circle Road/Newtown Pike Interchange

### *3. Value Engineering Alterative Number 2*

Value Engineering Alternative Number 2 recommends changing the Newtown Pike/New Circle Road Interchange to a Diverging Diamond Interchange. This configuration removes the conflicting left turn movements from the interchange and the only movements that will be signalized are the northbound and southbound Newtown Pike as shown in the drawings below.

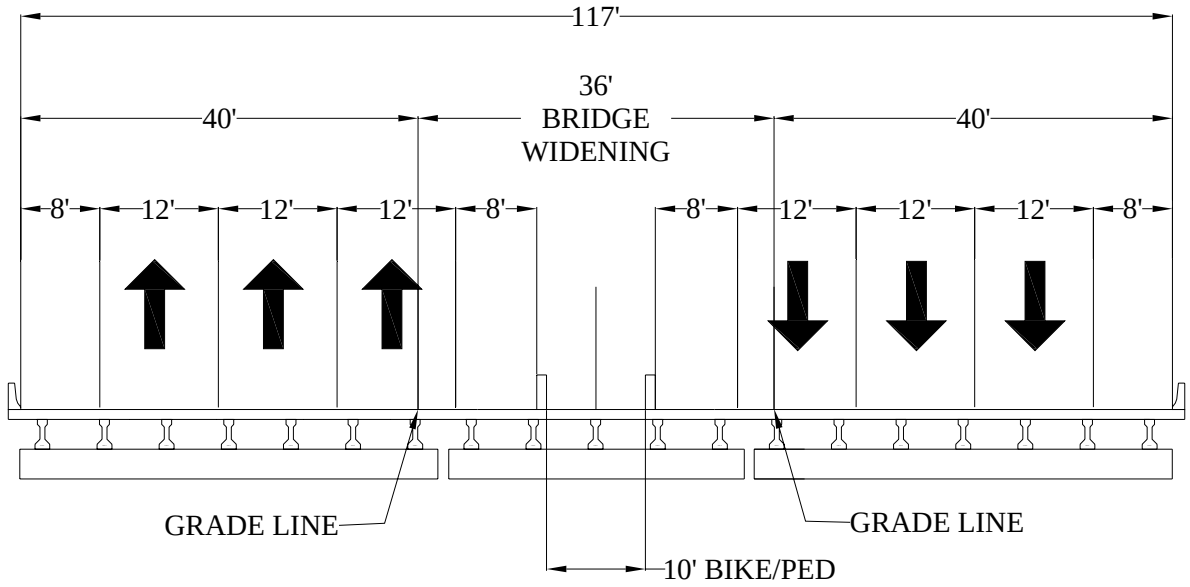



**VALUE ENGINEERING ALTERNATIVE NUMBER 2**
**DIVERGING DIAMOND INTERCHANGE**

This Alternative will widen the existing twin bridges to the median and northbound and southbound Newtown Pike traffic will cross over as close to the structure as possible to provide increased separation from flanking intersections. Widening the existing bridge will provide pedestrian or bicycle facilities in the median protected by barrier walls.

The existing structure piers already provide for 3-lanes of traffic (2-through lanes and an auxiliary lane) under the structure in each direction.

### *3. Value Engineering Alterative Number 2 (continued)*




**VALUE ENGINEERING ALTERNATIVE NUMBER 2**
**EXISTING BRIDGE WIDENING TYPICAL WITH BICYCLE PEDESTRIAN FACILITIES IN MEDIAN**

Traffic analysis using the HCM software indicates the north approach to the interchange will have a V/C ratio of 0.92 and the south approach will have a V/C ratio of 0.83 compared to the PARCLO where both approaches will be at capacity.

A life cycle cost analysis was completed based on the initial cost of a new bridge and using the existing bridge through its estimated 40 remaining life. It was estimated the new bridge annual maintenance cost will be $2500 and the existing bridge annual maintenance cost will be $16,000. For a 75 year life of the new bridge, the interchange total present day costs will be $15,851,900 and the Value Engineering Alternative's present day costs will be $13,101,654 for a possible Life Cycle Cost Savings of $2,750,247.

## *NEWTOWN PIKE/NEW CIRCLE ROAD INTERCHANGE - WIDEN BRIDGE*
## VALUE ENGINEERING ALTERNATIVE NUMBER 2
## COST COMPARISON SHEET

| DESCRIPTION | UNITS | UNIT COST | PROP'D QTY. | PROP'D COST | V.E. QTY. | V.E. COST |
|---|---|---|---|---|---|---|
| CRUSHED STONE BASE | TN | $23.00 | 26,300 | $604,900 | 25,257 | $580,911 |
| CLASS 2 ASPHALT BASE 1.00 D PG64-22 | TN | $60.00 | 23,796 | $1,427,760 | 21,427 | $1,285,620 |
| CLASS 2 ASPHALT SURFACE 0.38D PG64-22 | TN | $75.00 | 7,619 | $571,425 | 7,245 | $543,375 |
| ROADWAY EMBANKMENT | CY | $25.00 | 15,000 | $375,000 | 15,000 | $375,000 |
| CURB & GUTTER | L.F. | $40.00 | 18,000 | $720,000 | 18,000 | $720,000 |
| MAINTENANCE & CONTROL TRAFFIC | LS | $400,000 | 1 | $400,000 | 1 | $400,000 |
| SIGNALS | LS | $58,000 | 1 | $58,000 | 2 | $116,000 |
| SIGNING | LS | $150,000 | 1 | $150,000 | 1 | $150,000 |
| LIGHTING | LS | $500,000 | 1 | $500,000 | 1 | $500,000 |
| MISC DRAINAGE | LS | $485,000 | 1 | $485,000 | 1 | $485,000 |
| RETAINING WALLS | SF | $50.00 | 2,000 | $100,000 | 2,000 | $100,000 |
| BRIDGE-NEWTOWN | SF | $100.00 | 29,280 | $2,928,000 | 7,848 | $784,800 |
| OTHER | LS | $1,948,021 | 1 | $1,948,021 | 1 | $1,948,021 |
| **SUBTOTAL** | | | | **$10,268,106** | | **$7,988,727** |
| MOBILIZATION / DEMOBILIZATION (THIS IS SUB+CONTIN. X % =) | | 4.5% | | $508,271 | | $395,442 |
| TRAFFIC CONTROL/MOT | | 0.0% | | $0 | | $0 |
| UNKNOWNS | | 10.0% | | $1,026,811 | | $798,873 |
| RIGHT OF WAY | SF | $25.71 | 155,576.0 | $4,000,000 | 155,576.0 | $4,000,000 |
| **GRAND TOTAL** | | | | **$15,803,188** | | **$13,183,042** |

## POSSIBLE SAVINGS: $2,620,146

**NEWTOWN PIKE/NEW CIRCLE ROAD INTERCHANGE BRIDGE COMPARISON**

**75 Year Life Cycle Cost Comparison LCC**

**Enter the Interest Rate = 5%**

| Year | | AS PROPOSED BRIDGE REPLACEMENT Total | AS PROPOSED BRIDGE REPLACEMENT Present Worth | VE ALT #2 WIDEN BRIDGE REPLACE BRIDGE IN 40 YRS Total | VE ALT #2 WIDEN BRIDGE REPLACE BRIDGE IN 40 YRS Worth |
|---|---|---|---|---|---|
| 0 | INITIAL COST | $15,803,188 | -$15,803,188 | $13,183,042 | -$13,183,042 |
| 1 | ANNUAL MAINT | $2,500 | -$2,381 | $16,000 | -$15,238 |
| 2 | ANNUAL MAINT | $2,500 | -$2,268 | $16,000 | -$14,512 |
| 3 | ANNUAL MAINT | $2,500 | -$2,160 | $16,000 | -$13,821 |
| 4 | ANNUAL MAINT | $2,500 | -$2,057 | $16,000 | -$13,163 |
| 5 | ANNUAL MAINT | $2,500 | -$1,959 | $16,000 | -$12,536 |
| 6 | ANNUAL MAINT | $2,500 | -$1,866 | $16,000 | -$11,939 |
| 7 | ANNUAL MAINT | $2,500 | -$1,777 | $16,000 | -$11,371 |
| 8 | ANNUAL MAINT | $2,500 | -$1,692 | $16,000 | -$10,829 |
| 9 | ANNUAL MAINT | $2,500 | -$1,612 | $16,000 | -$10,314 |
| 10 | ANNUAL MAINT | $2,500 | -$1,535 | $16,000 | -$9,823 |
| 11 | ANNUAL MAINT | $2,500 | -$1,462 | $16,000 | -$9,355 |
| 12 | ANNUAL MAINT | $2,500 | -$1,392 | $16,000 | -$8,909 |
| 13 | ANNUAL MAINT | $2,500 | -$1,326 | $16,000 | -$8,485 |
| 14 | ANNUAL MAINT | $2,500 | -$1,263 | $16,000 | -$8,081 |
| 15 | ANNUAL MAINT | $2,500 | -$1,203 | $16,000 | -$7,696 |
| 16 | ANNUAL MAINT | $2,500 | -$1,145 | $16,000 | -$7,330 |
| 17 | ANNUAL MAINT | $2,500 | -$1,091 | $16,000 | -$6,981 |
| 18 | ANNUAL MAINT | $2,500 | -$1,039 | $16,000 | -$6,648 |
| 19 | ANNUAL MAINT | $2,500 | -$989 | $16,000 | -$6,332 |
| 20 | ANNUAL MAINT | $2,500 | -$942 | $16,000 | -$6,030 |
| 21 | ANNUAL MAINT | $2,500 | -$897 | $16,000 | -$5,743 |
| 22 | ANNUAL MAINT | $2,500 | -$855 | $16,000 | -$5,470 |
| 23 | ANNUAL MAINT | $2,500 | -$814 | $16,000 | -$5,209 |
| 24 | ANNUAL MAINT | $2,500 | -$775 | $16,000 | -$4,961 |
| 25 | ANNUAL MAINT | $2,500 | -$738 | $16,000 | -$4,725 |
| 26 | ANNUAL MAINT | $2,500 | -$703 | $16,000 | -$4,500 |
| 27 | ANNUAL MAINT | $2,500 | -$670 | $16,000 | -$4,286 |
| 28 | ANNUAL MAINT | $2,500 | -$638 | $16,000 | -$4,081 |
| 29 | ANNUAL MAINT | $2,500 | -$607 | $16,000 | -$3,887 |
| 30 | ANNUAL MAINT | $2,500 | -$578 | $16,000 | -$3,702 |
| 31 | ANNUAL MAINT | $2,500 | -$551 | $16,000 | -$3,526 |
| 32 | ANNUAL MAINT | $2,500 | -$525 | $16,000 | -$3,358 |
| 33 | ANNUAL MAINT | $2,500 | -$500 | $16,000 | -$3,198 |
| 34 | ANNUAL MAINT | $2,500 | -$476 | $16,000 | -$3,046 |
| 35 | ANNUAL MAINT | $2,500 | -$453 | $16,000 | -$2,901 |
| 36 | ANNUAL MAINT | $2,500 | -$432 | $16,000 | -$2,763 |
| 37 | ANNUAL MAINT | $2,500 | -$411 | $16,000 | -$2,631 |
| 38 | ANNUAL MAINT | $2,500 | -$392 | $16,000 | -$2,506 |
| 39 | ANNUAL MAINT | $2,500 | -$373 | $16,000 | -$2,386 |

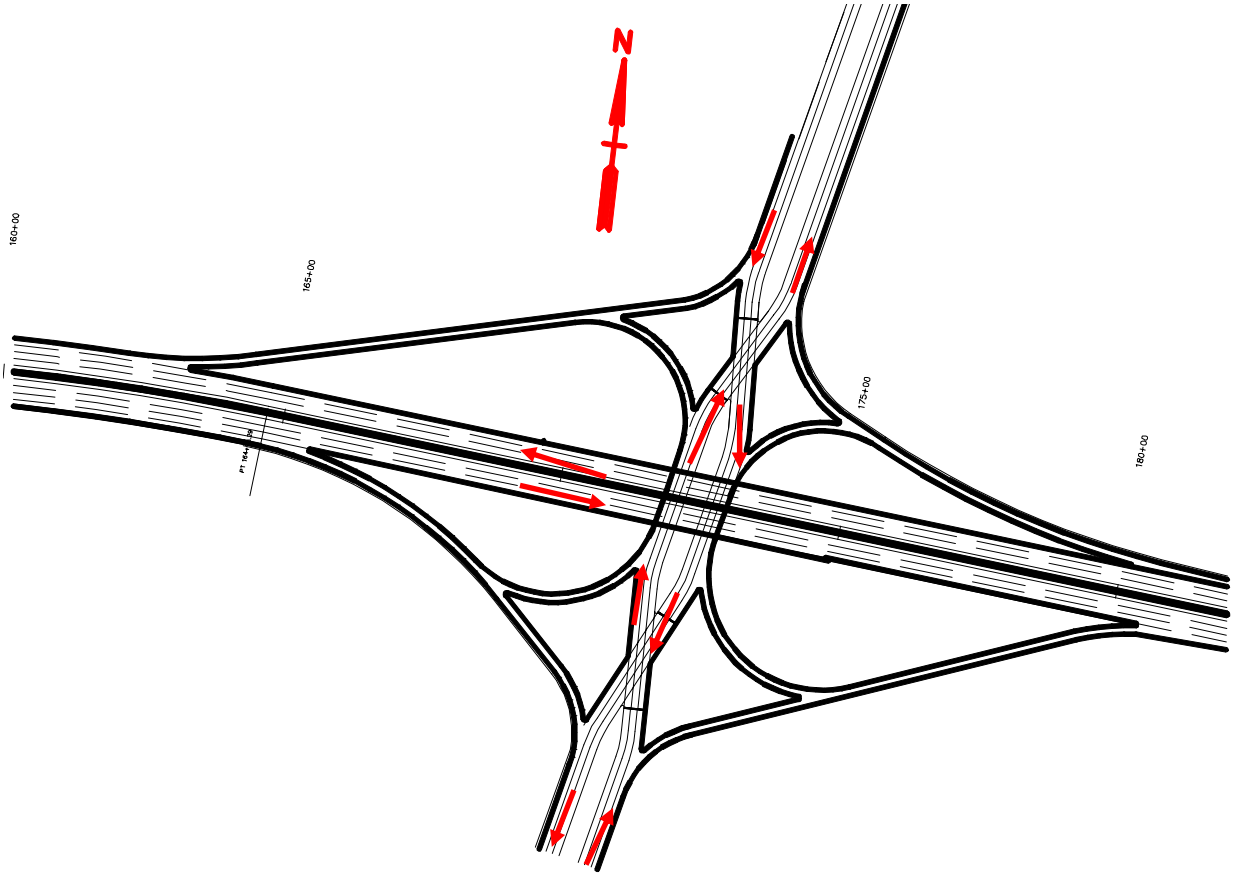
| | | | | | |
|---|---|---|---|---|---|
| 40 | REPLACE BRIDGE | $2,500 | -$355 | $2,620,146 | -$372,180 |
| 41 | ANNUAL MAINT | $2,500 | -$338 | $2,500 | -$338 |
| 42 | ANNUAL MAINT | $2,500 | -$322 | $2,500 | -$322 |
| 43 | ANNUAL MAINT | $2,500 | -$307 | $2,500 | -$307 |
| 44 | ANNUAL MAINT | $2,500 | -$292 | $2,500 | -$292 |
| 45 | ANNUAL MAINT | $2,500 | -$278 | $2,500 | -$278 |
| 46 | ANNUAL MAINT | $2,500 | -$265 | $2,500 | -$265 |
| 47 | ANNUAL MAINT | $2,500 | -$252 | $2,500 | -$252 |
| 48 | ANNUAL MAINT | $2,500 | -$240 | $2,500 | -$240 |
| 49 | ANNUAL MAINT | $2,500 | -$229 | $2,500 | -$229 |
| 50 | ANNUAL MAINT | $2,500 | -$218 | $2,500 | -$218 |
| 51 | ANNUAL MAINT | $2,500 | -$208 | $2,500 | -$208 |
| 52 | ANNUAL MAINT | $2,500 | -$198 | $2,500 | -$198 |
| 53 | ANNUAL MAINT | $2,500 | -$188 | $2,500 | -$188 |
| 54 | ANNUAL MAINT | $2,500 | -$179 | $2,500 | -$179 |
| 55 | ANNUAL MAINT | $2,500 | -$171 | $2,500 | -$171 |
| 56 | ANNUAL MAINT | $2,500 | -$163 | $2,500 | -$163 |
| 57 | ANNUAL MAINT | $2,500 | -$155 | $2,500 | -$155 |
| 58 | ANNUAL MAINT | $2,500 | -$148 | $2,500 | -$148 |
| 59 | ANNUAL MAINT | $2,500 | -$141 | $2,500 | -$141 |
| 60 | ANNUAL MAINT | $2,500 | -$134 | $2,500 | -$134 |
| 61 | ANNUAL MAINT | $2,500 | -$127 | $2,500 | -$127 |
| 62 | ANNUAL MAINT | $2,500 | -$121 | $2,500 | -$121 |
| 63 | ANNUAL MAINT | $2,500 | -$116 | $2,500 | -$116 |
| 64 | ANNUAL MAINT | $2,500 | -$110 | $2,500 | -$110 |
| 65 | ANNUAL MAINT | $2,500 | -$105 | $2,500 | -$105 |
| 66 | ANNUAL MAINT | $2,500 | -$100 | $2,500 | -$100 |
| 67 | ANNUAL MAINT | $2,500 | -$95 | $2,500 | -$95 |
| 68 | ANNUAL MAINT | $2,500 | -$91 | $2,500 | -$91 |
| 69 | ANNUAL MAINT | $2,500 | -$86 | $2,500 | -$86 |
| 70 | ANNUAL MAINT | $2,500 | -$82 | $2,500 | -$82 |
| 71 | ANNUAL MAINT | $2,500 | -$78 | $2,500 | -$78 |
| 72 | ANNUAL MAINT | $2,500 | -$75 | $2,500 | -$75 |
| 73 | ANNUAL MAINT | $2,500 | -$71 | $2,500 | -$71 |
| 74 | ANNUAL MAINT | $2,500 | -$68 | $2,500 | -$68 |
| 75 | ANNUAL MAINT | $2,500 | -$64 | $2,500 | -$64 |
| 75 | SALVAGE | $0 | $0 | $1,222,735 | -$31,487 |
| | | | **-$15,851,900** | | **-$13,864,797** |
| | | | **LCC SAVING** | | **$1,987,103** |
| | TOTAL O&M | $187,500 | -$48,712 | $3,331,646 | -$650,268 |

V E O&M INCLUDESDEMO OF EXISTING STRUCTURE AND WIDENING OF THE NEW STRUCTURE IN 40 YRS

## D. New Circle Road/Newtown Pike Interchange

### *4. Value Engineering Alterative Number 3*

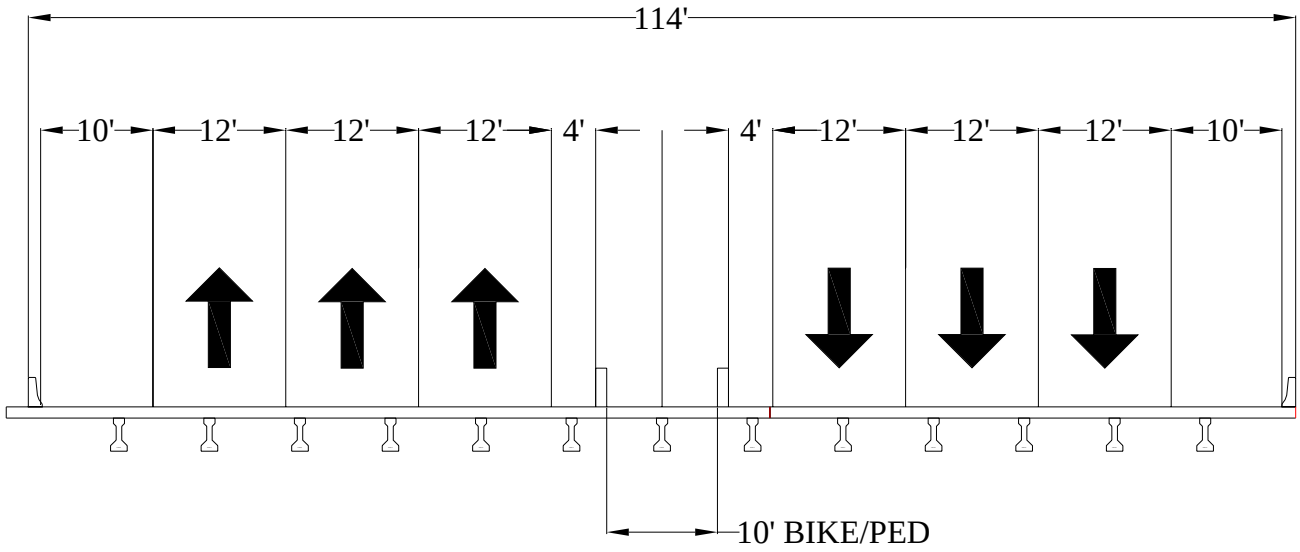
Value Engineering Alterative Number 3 recommends changing the Newtown Pike/New Circle Road Interchange to a Diverging Diamond Interchange (DDI). This configuration removes the conflicting left turn movements from the interchange and the only movements that will be signalized are the northbound and southbound Newtown Pike as shown in the drawings below.




**VALUE ENGINEERING ALTERNATIVE 3 DIVERGING DIAMOND INTERCHANGE**

This Alternative will replace the existing twin bridges with a single structure 107’ wide and northbound and southbound Newtown Pike traffic will cross over as close to the structure as possible to provide increased separation from flanking intersections. The replacement bridge will provide pedestrian or bicycle facilities in the median.

### *4. Value Engineering Alterative Number 3* *(continued)*




**VALUE ENGINEERING ALTERNATIVE NUMBER 3**
**NEW BRIDGE TYPICAL WITH BICYCLE AND**
**PEDESTRIAN FACILITIES IN THE MEDIAN**

Traffic analysis using the HCM software indicates the north approach to the interchange will have a V/C ratio of 0.92 and the south approach will have a V/C ratio of 0.83 compared to the PARCLO where both approaches will be at capacity.

## *NEWTOWN PIKE/NEW CIRCLE ROAD INTERCHANGE -NEW BRIDGE*
## VALUE ENGINEERING ALTERNATIVE NUMBER 3
## COST COMPARISON SHEET

| DESCRIPTION | UNITS | UNIT COST | PROP'D QTY. | PROP'D COST | V.E. QTY. | V.E. COST |
|---|---|---|---|---|---|---|
| CRUSHED STONE BASE | TN | $23.00 | 26,300 | $604,900 | 25,257 | $580,911 |
| CLASS 2 ASPHALT BASE 1.00 D PG64-22 | TN | $60.00 | 23,796 | $1,427,760 | 21,427 | $1,285,620 |
| CLASS 2 ASPHALT SURFACE 0.38D PG64-22 | TN | $75.00 | 7,619 | $571,425 | 7,245 | $543,375 |
| ROADWAY EMBANKMENT | CY | $25.00 | 15,000 | $375,000 | 15,000 | $375,000 |
| CURB & GUTTER | L.F. | $40.00 | 18,000 | $720,000 | 18,000 | $720,000 |
| MAINTENANCE & CONTROL TRAFFIC | LS | $400,000 | 1 | $400,000 | 1 | $400,000 |
| SIGNALS | LS | $58,000 | 1 | $58,000 | 2 | $116,000 |
| SIGNING | LS | $150,000 | 1 | $150,000 | 1 | $150,000 |
| LIGHTING | LS | $500,000 | 1 | $500,000 | 1 | $500,000 |
| MISC DRAINAGE | LS | $485,000 | 1 | $485,000 | 1 | $485,000 |
| RETAINING WALLS | SF | $50.00 | 2,000 | $100,000 | 2,000 | $100,000 |
| BRIDGE-NEWTOWN | SF | $100.00 | 29,280 | $2,928,000 | 27,360 | $2,736,000 |
| OTHER | LS | $1,948,021 | 1 | $1,948,021 | 1 | $1,948,021 |
| **SUBTOTAL** | | | | **$10,268,106** | | **$9,939,927** |
| MOBILIZATION / DEMOBILIZATION (THIS IS SUB+CONTIN. X % =) | | 4.5% | | $508,271 | | $492,026 |
| TRAFFIC CONTROL/MOT | | 0.0% | | $0 | | $0 |
| UNKNOWNS | | 10.0% | | $1,026,811 | | $993,993 |
| RIGHT OF WAY | SF | $25.71 | 155,576.0 | $4,000,000 | 155,576.0 | $4,000,000 |
| **GRAND TOTAL** | | | | **$15,803,188** | | **$15,425,946** |

## POSSIBLE SAVINGS: $377,242

COST EST BACKUP CALCS:

PAVEMENT

| RAMP | LENGTH | WIDTH | AREA/SY |
|---|---|---|---|
| A | 1200 | 25 | 3,333.3 |
| B | 1200 | 25 | 3,333.3 |
| C | 1200 | 25 | 3,333.3 |
| B | 1200 | 25 | 3,333.3 |
| | | | 13,333.3 |

| | DEPTH | TN/SY-IN | TN | | $ | |
|---|---|---|---|---|---|---|
| SURFACE | 1.5 | 0.055 | 1100.0 | $ | 60.00 | $ 66,000 |
| ASPH BASE | 9.5 | 0.055 | 6966.7 | $ | 75.00 | $ 522,500 |
| STONE BASE | 4 | 0.0575 | 3066.7 | $ | 23.00 | $ 70,533 |

| EXISTING RAMP | | | | |
|---|---|---|---|---|
| A | 800 | 25 | 2,222.2 | DIFERENCE |
| B | 1200 | 34 | 4,533.3 | 236.5 |
| C | 800 | 25 | 2,222.2 | 1497.8 |
| D | 700 | 25 | 1,944.4 | 659.3 |
| LOOPD | 900 | 25 | 2,500.0 | |
| LOOPB | 1000 | 25 | 2,777.8 | |
| | | | 16,200.0 | |

| | DEPTH | TN/SY-IN | TN | | $ | |
|---|---|---|---|---|---|---|
| SURFACE | 1.5 | 0.055 | 1336.5 | $ | 60.00 | $ 80,190 |
| ASPH BASE | 9.5 | 0.055 | 8464.5 | $ | 75.00 | $ 634,838 |
| STONE BASE | 4 | 0.0575 | 3726.0 | $ | 23.00 | $ 85,698 |

Traffic Analysis:

HCS2000: Signalized Intersections Release 4.1

VE GROUP
DOT

Phone: Fax:
E-Mail:

PLANNING ANALYSIS

Analyst: HARTLEY
Intersection: PARCLO SOUTH APPROACH
Agency/Co.: KYTC
Area Type: All other areas
Date Performed: 2/8/2010
Jurisdiction:
Analysis Time Period: PM PEAK
Analysis Year: 2030
Project ID: NEW CIRCLE ROAD
East/West Street: NB NEWTOWN PIKE
North/South Street: SB LEFT NEWTOWN PIKE

VOLUME DATA

| | Eastbound | | | Westbound | | | Northbound | | | Southbound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | L | T | R | L | T | R | L | T | R | L | T | R |
| Num. Lanes | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 2 | 3 | 0 |
| Volume | | | | 0 | 2545 | 0 | | | | 305 | 1195 | 0 |
| Parking | | | | | N | | | | | | N | |
| Coord. | | | | | N | | | | | | N | |
| LT Treat. | | | | N | | | | | | P | | |

Peak hour factor: 0.93 Area Type: All other areas

LANE VOLUME WORKSHEET

| | EAST BOUND | WEST BOUND | NORTH BOUND | SOUTH BOUND |
|---|---|---|---|---|
| LEFT TURN MOVEMENT | | | | |
| 1. LT volume | | 0 | | 305 |
| 2. Opposing mainline volume | | 0 | | |
| 3. Number of exclusive LT lanes | | 0 | | 2 |
| Cross Product [2] * [1] | | 0 | | |
| Left Lane Configuration (E=Excl, S=Shrd): | | S | | E |
| Left Turn Treatment Type: | | N | | |
| 4. LT adjustment factor | | 0.850 | | |
| 5. LT lane vol | | 0 | | |
| RIGHT TURN MOVEMENT | | | | |
| Right Lane Configuration (E=Excl, S=Shrd) | | S | | S |
| 6. RT volume | | 0 | | 0 |
| 7. Exclusive lanes | | 0 | | 0 |
| 8. RT adjustment factor | | 0.850 | | 0.850 |
| 9. Exclusive RT lane volume | | | | |
| 10. Shared lane vol | | 0 | | 0 |
| THROUGH MOVEMENT | | | | |
| 11. Thru volume | | 2545 | | 1195 |
| 12. Parking adjustment factor | | 1.00 | | 1.00 |
| 13. No. of thru lanes including shared | | 3 | | 3 |
| 14. Total approach volume | | 2545 | | 1195 |
| 15. Prop. of left turns in lane group | | 0.00 | | 0.00 |
| 16. Left turn equivalence | | | | |
| 17. LT adj. factor: | | 1.000 | | |
| 18. Through lane volume | | 848 | | 398 |
| 19. Critical lane volume | | 848 | | |

Left Turn Check (if [16] > 3.5)
20. Permitted left turn sneaker capacity:

7200/Cmax

## SIGNAL OPERATIONS WORKSHEET

| Phase Plan Selection from Lane Volume Worksheet | EAST BOUND | WEST BOUND | NORTH BOUND | SOUTH BOUND |
|---|---|---|---|---|
| Critical through-RT vol: [19] | | 848 | | |
| LT lane vol: [5] | | 0 | | |
| Left turn protection: (P/U/N) | | N | | |
| Dominant left turn: (Indicate by '<') | | | | |

Selection Criteria based on the specified left turn protection

< Indicates the dominant left turn for each opposing pair

| | | | | |
|---|---|---|---|---|
| Plan 1: | U | U | U | U |
| Plan 2a: | U | P | U | P |
| Plan 2b: | P | U | P | U |
| Plan 3a: | <P | P | <P | P |
| Plan 3b: | P | <P | P | <P |
| Plan 4: | N | N | N | N |

Phase plan selected (1 to 4) 1

Min. cycle (Cmin) 60 Max. cycle (Cmax) 120

| Timing Plan | Value | EAST-WEST Ph 1 | EAST-WEST Ph 2 | EAST-WEST Ph 3 | NORTH-SOUTH Ph 1 | NORTH-SOUTH Ph 2 | NORTH-SOUTH Ph 3 |
|---|---|---|---|---|---|---|---|
| Movement codes | | EWT | | | | | |
| Critical phase vol [CV] | | 848 | 0 | 0 | | | |
| Critical sum [CS] | | | | | | | |
| CBD adjustment [CBD] | 1.00 | | | | | | |
| Reference sum [RS] | 1590 | | | | | | |
| Lost time/phase [PL] | | 4 | 0 | 0 | | | |
| Lost time/cycle [TL] | | | | | | | |
| Cycle length [CYC] | | | | | | | |
| Phase time | | | | | | | |
| Critical v/c Ratio [Xcm] | | | | | | | |
| Status | | | | | | | |

HCS2000: Signalized Intersections Release 4.1

VE GROUP
DOT

Phone: Fax:
E-Mail:

## PLANNING ANALYSIS

Analyst: HARTLEY
Intersection: PARCLO NORTH APPROACH
Agency/Co.: KYTC
Area Type: All other areas
Date Performed: 2/8/2010
Jurisdiction:
Analysis Time Period: PM PEAK
Analysis Year: 2030
Project ID: NEW CIRCLE ROAD
East/West Street: NB LEFT NEWTOWN PIKE
North/South Street: SB NEWTOWN PIKE

## VOLUME DATA

| | Eastbound | | | Westbound | | | Northbound | | | Southbound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | L | T | R | L | T | R | L | T | R | L | T | R |
| Num. Lanes | 0 | 0 | 0 | 2 | 3 | 0 | 0 | 3 | 0 | 0 | 0 | 0 |
| Volume | | | | 585 | 2545 | 0 | 0 | 1250 | 0 | | | |
| Parking | | | | | N | | | N | | | | |
| Coord. | | | | | N | | | N | | | | |
| LT Treat. | | | | P | | | P | | | | | |

Peak hour factor: 0.93 Area Type: All other areas

7200/Cmax

## SIGNAL OPERATIONS WORKSHEET

| Phase Plan Selection from Lane Volume Worksheet | EAST BOUND | WEST BOUND | NORTH BOUND | SOUTH BOUND |
|---|---|---|---|---|
| Critical through-RT vol: [19] | | 848 | 417 | |
| LT lane vol: [5] | | 318 | 0 | |
| Left turn protection: (P/U/N) | | P | P | |
| Dominant left turn: (Indicate by '<') | | | | |

| Selection Criteria based on the specified left turn protection | | | | | |
|---|---|---|---|---|---|
| | Plan 1: | U | U | U | U |
| | Plan 2a: | U | P | U | P |
| | Plan 2b: | P | U | P | U |
| < Indicates the dominant left turn for each opposing pair | Plan 3a: | <P | P | <P | P |
| | Plan 3b: | P | <P | P | <P |
| | Plan 4: | N | N | N | N |

Phase plan selected (1 to 4) 2a 1

Min. cycle (Cmin) 60 Max. cycle (Cmax) 120

| Timing Plan | Value | EAST-WEST Ph 1 | EAST-WEST Ph 2 | EAST-WEST Ph 3 | NORTH-SOUTH Ph 1 | NORTH-SOUTH Ph 2 | NORTH-SOUTH Ph 3 |
|---|---|---|---|---|---|---|---|
| Movement codes | | WTL | EWT | | NST | | |
| Critical phase vol [CV] | | 318 | 530 | 0 | 417 | 0 | 0 |
| Critical sum [CS] | 1265 | | | | | | |
| CBD adjustment [CBD] | 1.00 | | | | | | |
| Reference sum [RS] | 1590 | | | | | | |
| Lost time/phase [PL] | | 4 | 4 | 0 | 4 | 0 | 0 |
| Lost time/cycle [TL] | 12 | | | | | | |
| Cycle length [CYC] | 60.0 | | | | | | |
| Phase time | | 16.1 | 24.1 | 0.0 | 19.8 | 0.0 | 0.0 |
| Critical v/c Ratio [Xcm] | 0.99 | | | | | | |
| Status | At capacity | | | | | | |

HCS2000: Signalized Intersections Release 4.1

VE GROUP
DOT

Phone: Fax:
E-Mail:

## PLANNING ANALYSIS

Analyst: HARTLEY
Intersection: DDI SOUTH APPROACH
Agency/Co.: KYTC
Area Type: All other areas
Date Performed: 2/8/2010
Jurisdiction:
Analysis Time Period: PM PEAK
Analysis Year: 2030
Project ID: NEW CIRCLE ROAD
East/West Street: NB NEW CIRCLE ROAD (EB)
North/South Street: SB NEWTOWN PIKE

## VOLUME DATA

| | Eastbound | | | Westbound | | | Northbound | | | Southbound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | L | T | R | L | T | R | L | T | R | L | T | R |
| Num. Lanes | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 |
| Volume | 0 | 2235 | 0 | | | | | | | 0 | 1195 | 0 |
| Parking | | N | | | | | | | | | N | |
| Coord. | | N | | | | | | | | | N | |
| LT Treat. | P | | | | | | | | | P | | |

Peak hour factor: 0.93 Area Type: All other areas

LANE VOLUME WORKSHEET

| | EAST BOUND | WEST BOUND | NORTH BOUND | SOUTH BOUND |
|---|---|---|---|---|
| LEFT TURN MOVEMENT | | | | |
| 1. LT volume | | 585 | 0 | |
| 2. Opposing mainline volume | | 0 | 0 | |
| 3. Number of exclusive LT lanes | | 2 | 0 | |
| Cross Product [2] * [1] | | 0 | 0 | |
| Left Lane Configuration (E=Excl, S=Shrd): | | E | S | |
| Left Turn Treatment Type: | | P | P | |
| 4. LT adjustment factor | | 0.920 | | |
| 5. LT lane vol | | 318 | 0 | |
| RIGHT TURN MOVEMENT | | | | |
| Right Lane Configuration (E=Excl, S=Shrd) | | S | S | |
| 6. RT volume | | 0 | 0 | |
| 7. Exclusive lanes | | 0 | 0 | |
| 8. RT adjustment factor | | 0.850 | 0.850 | |
| 9. Exclusive RT lane volume | | | | |
| 10. Shared lane vol | | 0 | 0 | |
| THROUGH MOVEMENT | | | | |
| 11. Thru volume | | 2545 | 1250 | |
| 12. Parking adjustment factor | | 1.00 | 1.00 | |
| 13. No. of thru lanes including shared | | 3 | 3 | |
| 14. Total approach volume | | 2545 | 1250 | |
| 15. Prop. of left turns in lane group | | 0.00 | 0.00 | |
| 16. Left turn equivalence | | | | |
| 17. LT adj. factor: | | | 1.000 | |
| 18. Through lane volume | | 848 | 417 | |
| 19. Critical lane volume | | 848 | 417 | |
| Left Turn Check (if [16] > 3.5) | | | | |
| 20. Permitted left turn sneaker capacity: | | | | |

LANE VOLUME WORKSHEET

| | EAST BOUND | WEST BOUND | NORTH BOUND | SOUTH BOUND |
|---|---|---|---|---|
| LEFT TURN MOVEMENT | | | | |
| 1. LT volume | 0 | | | 0 |
| 2. Opposing mainline volume | 0 | | | 0 |
| 3. Number of exclusive LT lanes | 0 | | | 0 |
| Cross Product [2] * [1] | 0 | | | 0 |
| Left Lane Configuration (E=Excl, S=Shrd): | S | | | S |
| Left Turn Treatment Type: | P | | | P |
| 4. LT adjustment factor | | | | |
| 5. LT lane vol | 0 | | | 0 |
| RIGHT TURN MOVEMENT | | | | |
| Right Lane Configuration (E=Excl, S=Shrd) | S | | | S |
| 6. RT volume | 0 | | | 0 |
| 7. Exclusive lanes | 0 | | | 0 |
| 8. RT adjustment factor | 0.850 | | | 0.850 |
| 9. Exclusive RT lane volume | | | | |
| 10. Shared lane vol | 0 | | | 0 |
| THROUGH MOVEMENT | | | | |
| 11. Thru volume | 2235 | | | 1195 |
| 12. Parking adjustment factor | 1.00 | | | 1.00 |
| 13. No. of thru lanes including shared | 3 | | | 3 |
| 14. Total approach volume | 2235 | | | 1195 |
| 15. Prop. of left turns in lane group | 0.00 | | | 0.00 |
| 16. Left turn equivalence | | | | |
| 17. LT adj. factor: | 1.000 | | | 1.000 |
| 18. Through lane volume | 745 | | | 398 |
| 19. Critical lane volume | 745 | | | 398 |
| Left Turn Check (if [16] > 3.5) | | | | |
| 20. Permitted left turn sneaker capacity: | | | | |

7200/Cmax

SIGNAL OPERATIONS WORKSHEET

| Phase Plan Selection from Lane Volume Worksheet | EAST BOUND | WEST BOUND | NORTH BOUND | SOUTH BOUND |
|---|---|---|---|---|
| Critical through-RT vol: [19] | 745 | | | 398 |
| LT lane vol: [5] | 0 | | | 0 |
| Left turn protection: (P/U/N) | P | | | P |
| Dominant left turn: (Indicate by '<') | | | | |

Selection Criteria based on the specified left turn protection

< Indicates the dominant left turn for each opposing pair

| | | | | |
|---|---|---|---|---|
| Plan 1: | U | U | U | U |
| Plan 2a: | U | P | U | P |
| Plan 2b: | P | U | P | U |
| Plan 3a: | <P | P | <P | P |
| Plan 3b: | P | <P | P | <P |
| Plan 4: | N | N | N | N |

Phase plan selected (1 to 4) 1 1

Min. cycle (Cmin) 60 Max. cycle (Cmax) 120

| Timing Plan | Value | EAST-WEST Ph 1 | EAST-WEST Ph 2 | EAST-WEST Ph 3 | NORTH-SOUTH Ph 1 | NORTH-SOUTH Ph 2 | NORTH-SOUTH Ph 3 |
|---|---|---|---|---|---|---|---|
| Movement codes | | EWT | | | NST | | |
| Critical phase vol [CV] | | 745 | 0 | 0 | 398 | 0 | 0 |
| Critical sum [CS] | 1143 | | | | | | |
| CBD adjustment [CBD] | 1.00 | | | | | | |
| Reference sum [RS] | 1590 | | | | | | |
| Lost time/phase [PL] | | 4 | 0 | 0 | 4 | 0 | 0 |
| Lost time/cycle [TL] | 8 | | | | | | |
| Cycle length [CYC] | 60.0 | | | | | | |
| Phase time | | 37.9 | 0.0 | 0.0 | 22.1 | 0.0 | 0.0 |
| Critical v/c Ratio [Xcm] | 0.83 | | | | | | |
| Status | Under capacity | | | | | | |

HCS2000: Signalized Intersections Release 4.1

VE GROUP
DOT

Phone: Fax:
E-Mail:

## PLANNING ANALYSIS

| | |
|---|---|
| Analyst: | HARTLEY |
| Intersection: | DDI NORTH APPROACH |
| Agency/Co.: | KYTC |
| Area Type: | All other areas |
| Date Performed: | 2/8/2010 |
| Jurisdiction: | |
| Analysis Time Period: | PM PEAK |
| Analysis Year: | 2030 |
| Project ID: | NEW CIRCLE ROAD |

East/West Street: SB NEWTOWN PIKE (WB)
North/South Street: NB NEWTOWN PIKE

## VOLUME DATA

| | Eastbound | | | Westbound | | | Northbound | | | Southbound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | L | T | R | L | T | R | L | T | R | L | T | R |
| Num. Lanes | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 3 | 0 | 0 | 0 | 0 |
| Volume | | | | 0 | 1250 | 0 | 0 | 2545 | 0 | | | |
| Parking | | | | | N | | | N | | | | |
| Coord. | | | | | N | | | N | | | | |
| LT Treat. | | | | P | | | P | | | | | |

Peak hour factor: 0.93 Area Type: All other areas

## LANE VOLUME WORKSHEET

| | EAST BOUND | WEST BOUND | NORTH BOUND | SOUTH BOUND |
|---|---|---|---|---|
| LEFT TURN MOVEMENT | | | | |
| 1. LT volume | | 0 | 0 | |
| 2. Opposing mainline volume | | 0 | 0 | |
| 3. Number of exclusive LT lanes | | 0 | 0 | |
| Cross Product [2] * [1] | | 0 | 0 | |
| Left Lane Configuration (E=Excl, S=Shrd): | | S | S | |
| Left Turn Treatment Type: | | P | P | |
| 4. LT adjustment factor | | | | |
| 5. LT lane vol | | 0 | 0 | |
| RIGHT TURN MOVEMENT | | | | |
| Right Lane Configuration (E=Excl, S=Shrd) | | S | S | |
| 6. RT volume | | 0 | 0 | |
| 7. Exclusive lanes | | 0 | 0 | |
| 8. RT adjustment factor | | 0.850 | 0.850 | |
| 9. Exclusive RT lane volume | | | | |
| 10. Shared lane vol | | 0 | 0 | |
| THROUGH MOVEMENT | | | | |
| 11. Thru volume | | 1250 | 2545 | |
| 12. Parking adjustment factor | | 1.00 | 1.00 | |
| 13. No. of thru lanes including shared | | 3 | 3 | |
| 14. Total approach volume | | 1250 | 2545 | |
| 15. Prop. of left turns in lane group | | 0.00 | 0.00 | |
| 16. Left turn equivalence | | | | |
| 17. LT adj. factor: | | 1.000 | 1.000 | |
| 18. Through lane volume | | 417 | 848 | |
| 19. Critical lane volume | | 417 | 848 | |
| Left Turn Check (if [16] > 3.5) | | | | |
| 20. Permitted left turn sneaker capacity: | | | | |

7200/Cmax

## SIGNAL OPERATIONS WORKSHEET

| Phase Plan Selection from Lane Volume Worksheet | | EAST BOUND | WEST BOUND | NORTH BOUND | SOUTH BOUND |
|---|---|---|---|---|---|
| Critical through-RT vol: [19] | | | 417 | 848 | |
| LT lane vol: [5] | | | 0 | 0 | |
| Left turn protection: (P/U/N) | | | P | P | |
| Dominant left turn: (Indicate by '<') | | | | | |
| Selection Criteria based on the specified left turn protection | Plan 1: | U | U | U | U |
| | Plan 2a: | U | P | U | P |
| | Plan 2b: | P | U | P | U |
| < Indicates the dominant left turn for each opposing pair | Plan 3a: | <P | P | <P | P |
| | Plan 3b: | P | <P | P | <P |
| | Plan 4: | N | N | N | N |
| Phase plan selected (1 to 4) | | | 1 | 1 | |

Min. cycle (Cmin) 60 Max. cycle (Cmax) 120

| Timing Plan | Value | EAST-WEST Ph 1 | EAST-WEST Ph 2 | EAST-WEST Ph 3 | NORTH-SOUTH Ph 1 | NORTH-SOUTH Ph 2 | NORTH-SOUTH Ph 3 |
|---|---|---|---|---|---|---|---|
| Movement codes | | EWT | | | NST | | |
| Critical phase vol [CV] | | 417 | 0 | 0 | 848 | 0 | 0 |
| Critical sum [CS] | 1265 | | | | | | |
| CBD adjustment [CBD] | 1.00 | | | | | | |
| Reference sum [RS] | 1590 | | | | | | |
| Lost time/phase [PL] | | 4 | 0 | 0 | 4 | 0 | 0 |
| Lost time/cycle [TL] | 8 | | | | | | |
| Cycle length [CYC] | 60.0 | | | | | | |
| Phase time | | 21.1 | 0.0 | 0.0 | 38.9 | 0.0 | 0.0 |
| Critical v/c Ratio [Xcm] | 0.92 | | | | | | |
| Status | Near capacity | | | | | | |

# VIII. SUMMARY OF RECOMMENDATIONS

It is the recommendation of the Value Engineering Team that the following Value Engineering Alternatives be carried into the Project Development process for further development.

***RECOMMENDATION NUMBER 1- New Circle Road/Newtown Pike Interchange Bridge***

The Value Engineering Team recommends that Value Engineering Alternative Number 2 be implemented. This Value Engineering Alternative widens the existing bridges and reduces the width of lanes and shoulders on New Circle Road to avoid replacing the bridges.

If this recommendation can be implemented, there is a possible savings of ***$ 2,966,262.***

If this recommendation can be implemented, there is a possible Life Cycle Cost savings of ***$ 2,114,644.***

If this recommendation cannot be implemented, then the Value Engineering Team recommends that Value Engineering Alternative Number 1 be implemented. This Value Engineering Alternative uses a two span bridge to shorten the proposed new bridges.

If this recommendation can be implemented, there is a possible savings of ***$ 1,178,007.***

***RECOMMENDATION NUMBER 2- LexMark Bridge***

The Value Engineering Team recommends that Value Engineering Alternative Number 1 be implemented. This Value Engineering Alternative eliminates the existing bridge and does not replace it.

If this recommendation can be implemented, there is a possible savings of ***$ 1,111,803.***

If this recommendation cannot be implemented, then the Value Engineering Team recommends that Value Engineering Alternative Number 2 be implemented. This Value Engineering Alternative raises the existing bridge and reduces the width of the shoulders on New Circle Road.

If this recommendation can be implemented, there is a possible savings of ***$ 843,108.***

If this recommendation can be implemented, there is a possible Life Cycle Cost savings of ***$ 618,476.***

# VIII. SUMMARY OF RECOMMENDATIONS

***RECOMMENDATION NUMBER 2- LexMark Bridge (continued)***

If this recommendation cannot be implemented, then the Value Engineering Team recommends that Value Engineering Alternative Number 3 be implemented. This Value Engineering Alternative shortens the proposed new bridge.

If this recommendation can be implemented, there is a possible savings of ***$ 278,153.***

***RECOMMENDATION NUMBER 3- South Frontage Road Intersection***

The Value Engineering Team recommends that Value Engineering Alternative Number 2 be implemented. This Value Engineering Alternative leaves the existing frontage road intersection as is.

If this recommendation can be implemented, there is a possible savings of ***$ 1,463,510.***

If this recommendation cannot be implemented, then the Value Engineering Team recommends that Value Engineering Alternative Number 1 be implemented. This Value Engineering Alternative uses a roundabout to connect the on/off ramp with the frontage road.

If this recommendation can be implemented, there is a possible savings of ***$ 1,015,176.***

***RECOMMENDATION NUMBER 4- New Circle Road/Newtown Pike Interchange***

The Value Engineering Team recommends that Value Engineering Alternative Number 1 be implemented. This Value Engineering Alternative uses a diverging diamond interchange with the existing bridges.

If this recommendation can be implemented, there is a possible savings of ***$ 3,522,274.***

If this recommendation can be implemented, there is a possible Life Cycle Cost savings of ***$ 2,750,247*** for the structure.

# VIII. SUMMARY OF RECOMMENDATIONS

***RECOMMENDATION NUMBER 4- New Circle Road/Newtown Pike Interchange***

If this recommendation cannot be implemented, then the Value Engineering Team recommends that Value Engineering Alternative Number 2 be implemented. This Value Engineering Alternative uses a diverging diamond interchange and widens the existing bridges into the median.

If this recommendation can be implemented, there is a possible savings of ***$ 2,620,146.***

If this recommendation can be implemented, there is a possible Life Cycle Cost savings of ***$ 1,987,103*** for the structure.

If this recommendation cannot be implemented, then the Value Engineering Team recommends that Value Engineering Alternative Number 3 be implemented. This Value Engineering Alternative uses a diverging diamond interchange with new bridges.

If this recommendation can be implemented, there is a possible savings of ***$ 377,242.***

# IX. PRESENTATION ATTENDEE SHEET

***KY 4 (New Circle Road) MAJOR WIDENING***
**VALUE ENGINEERING STUDY PRESENTATION**
**FEBRUARY 15-19, 2010**

| NAME | AFFILIATION | PHONE/EMAIL |
|---|---|---|
| Bill Ventry | VE Group, L.L.C. | 850/627-3900<br>bill@ventryengineering.com |
| Thomas A. Hartley | VE Group, L.L.C. | 850/627-3900<br>thartley09@bellsouth.net |
| Gary Raymer | KYTC | 502/564-3280<br>gary.raymer@ky.gov |
| Robert Semones | VE Group, L.L.C. | 850/627-3900<br>rsemones@mis.net |
| Greg Sharp | Entran Engineering | 859/233-2700<br>gsharp@ENTRAN.US |
| Stephen Sewell | Palmer Engineering | 859/744-1218<br>ssewell@palmernet.com |
| David Lindeman | Palmer Engineering | 859/744-1218<br>dlindeman@palmernet.com |
| Boday Borres | KYTC-Design/QAB | 502/564-3280<br>Boday.borres@ky.gov |
| Brent Sweger | KYTC-Planning | 502/564-7183 |
| Michael Baase | KYTC-Construction | 502/564-4780<br>michael.baase@ky.gov |
| Siamak Shafaghi | KYTC-Design/QAB | 502/564-3280<br>siamak.shafaghi@ky.gov |
| Bob Nunley | KYTC-D-7 Project Development | 859/246-2355 |
| Keith Caudill | KYTC-<br>Division of Highway Design | 502/564-3280<br>keith.caudill@ky.gov |

# X. APPENDIX

## A. ITEMIZED PROJECT COST ESTIMATE

| NEW CIRCLE ROAD/KY 4 WIDENING @ NEWTOWN PIKE/KY922 INTERCHANGE<br>ALTERNATE 8 (PARCLO INTERCHANGE) | |
|---|---|
| NEW TOWN PIKE INTERCHANGE (PARCLO) | $12,692,000 |
| SOUTH FRONTAGE ROAD | $7,350,000 |
| UTILITIES | $5,000,000 |
| NORTH FRONTAGE ROAD (R/W) | $4,470,000 |
| NEW TOWN PIKE BRIDGE OVER KY4 | $2,508,000 |
| LEXMARK EAST ACCESS ROAD | $1,198,702 |
| LEXMARK BRIDGE | $831,298 |
| **TOTAL** | **$34,050,000** |

## B. VALUE ENGINEERING PUNCH LIST

| ITEM NUMBER: 7-366.00 | PROJECT COUNTY: FAYETTE | DATE OF STUDY: 2/14-19/2010 |
|---|---|---|

| VE Alternative No. | Description | Activity | Implemented (life cycle cost savings) | Original Cost | Alternative Cost | Initial Cost Saving | Total Present Worth (Life Cycle Cost Savings) | Remarks |
|---|---|---|---|---|---|---|---|---|
| **Structures (A. New Circle Road/Newtown Pike Interchange Bridge)** | | | | | | | | |
| 1 | This Value Engineering Alternative uses a two span bridge to shorten the proposed new bridges. | | | $4,038,883 | $2,860,876 | $1,178,007 | N/A | |
| 2 | This Value Engineering Alternative widens the existing bridges and reduces the width of lanes and shoulders on New Circle Road to avoid replacing the bridges. | | | $4,038,883 | $1,072,621 | $2,966,262 | $2,114,644 | |

***DESIGN SUGGESTIONS***

| Design Suggestion No. | Description | Activity | Implemented (life cycle cost savings) | Remarks |
|---|---|---|---|---|
| | | | | |
| | | | | |

| VE Alternative No. | Description | Activity | Implemented (life cycle cost savings) | Original Cost | Alternative Cost | Initial Cost Saving | Total Present Worth (Life Cycle Cost Savings) | Remarks |
|---|---|---|---|---|---|---|---|---|
| **Structures (B. LexMark Bridge)** | | | | | | | | |
| 1 | This Value Engineering Alternative eliminates the existing bridge and does not replace it. | | | $1,184,222 | $72,419 | $1,111,803 | N/A | |
| 2 | This Value Engineering Alternative raises the existing bridge and reduces the width of the shoulders on New Circle Road. | | | $1,184,222 | $341,114 | $843,108 | $618,476 | |
| 3 | This Value Engineering Alternative shortens the proposed new bridge. | | | $1,184,222 | $906,069 | $278,153 | n/a | |

***DESIGN SUGGESTIONS***

| Design Suggestion No. | Description | Activity | Implemented (life cycle cost savings) | Remarks |
|---|---|---|---|---|
| | | | | |
| | | | | |

| VE Alternative No. | Description | Activity | Implemented (life cycle cost savings) | Original Cost | Alternative Cost | Initial Cost Saving | Total Present Worth (Life Cycle Cost Savings) | Remarks |
|---|---|---|---|---|---|---|---|---|
| **Roadway (C. South Frontage Road Interchange)** | | | | | | | | |
| 1 | This Value Engineering Alternative uses a roundabout to connect the on/off ramp with the frontage road. | | | $2,560,402 | $1,545,226 | $1,015,176 | n/a | |
| 2 | This Value Engineering Alternative leaves the existing frontage road intersection as is. | | | $2,560,402 | $1,096,892 | 1,463,510 | n/a | |
| ***DESIGN SUGGESTIONS*** | | | | | | | | |
| **Design Suggestion No.** | **Description** | **Activity** | **Implemented** (life cycle cost savings) | **Remarks** | | | | |
| | | | | | | | | |
| | | | | | | | | |

| VE Alternative No. | Description | Activity | Implemented (life cycle cost savings) | Original Cost | Alternative Cost | Initial Cost Saving | Total Present Worth (Life Cycle Cost Savings) | Remarks |
|---|---|---|---|---|---|---|---|---|
| **Interchange (D. New Circle Road/Newtown Pike Interchange)** | | | | | | | | |
| 1 | This Value Engineering Alternative uses a diverging diamond interchange with the existing bridges. | | | $15,803,188 | $12,280,914 | $3,522,274 | $2,750,247 | |
| 2 | This Value Engineering Alternative uses a diverging diamond interchange and widens the existing bridges into the median. | | | $15,803,188 | $13,183,042 | $2,620,146 | $1,987,103 | |
| 3 | This Value Engineering Alternative uses a diverging diamond interchange with new bridges. | | | $15,803,188 | $15,425,946 | $377,242 | n/a | |
| ***DESIGN SUGGESTIONS*** | | | | | | | | |
| **Design Suggestion No.** | **Description** | **Activity** | **Implemented** (life cycle cost savings) | **Remarks** | | | | |
| | | | | | | | | |
| | | | | | | | | |

# X. APPENDIX

## C. POWER POINT PRESENTATION