



Value Engineering Study Report

January 2015

Jefferson County I-264/US 42 Interchange and I-264 Widening
Item No. 5-804.00 and 5-594.00

Study Date: December 8-12, 2014



Disclaimer

The information contained in this report is the professional opinions of the VE Team members during the Value Engineering Study. These opinions were based on the information provided to the VE Team at the time of the study. As the project continues to develop, new information will become available and this information will need to be evaluated on how it may affect the recommendations and findings in this report. All costs displayed in the report are based on best available information at the time of the VE study and, unless otherwise noted, are in current year dollars. Any graphics, photos, drawings, maps, etc., used in the report were supplied by the study sponsor or developed during the time of the study.

Study Statistics

Number of Recommendations: 5

Recommended Value Added:
\$2.80M to \$4.75M

Total Number of Team Members: 8

FHWA: Employees 0

KYTC Employees: 2

Others: 0

Estimated Cost of Study: \$54,100

Consultant Fee: \$44,100

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Executive Summary

Introduction

This value engineering (VE) study report summarizes the events of the VE study conducted for the Kentucky Transportation Cabinet (KYTC) and facilitated by HDR.

The subject of the study was the proposed project that addresses the proposed reconstruction of the existing interstate 264 (I-264) interchange at US 42 as well as the widening of I-264 (Item No.'s 5-804.00 and 5-594.00). The project is located in northeastern Jefferson County.

The study was conducted from December 8-12, 2014 with the presentation of findings on December 12, 2014.

The objective of the study, through execution of the VE Job Plan, was to:

- Review and understand the various concepts of the project.
- Conduct a thorough review and analysis of the key project issues using a multidiscipline, cross-functional team.
- Improve the value of the project through innovative measures aimed at improving the performance while reducing costs of the project.

Project Description

The proposed highway project (Item Numbers 5-594.00 and 5-804.00) includes improvements to I-264 (Watterson Expressway) between the Westport Road and I-71 Interchanges as well as reconstruction of the US 42 (Brownsboro Road) interchange. I-264 will be widened to provide three basic through lanes in each direction, as well as auxiliary lanes between interchanges.

Two-lane ramps will be added from I-264 eastbound to I-71 northbound and at the I-264 off-ramp to Westport Road. A two-lane on-ramp will be provided at US 42 to I-264 westbound. The study area is illustrated in **Figure 1**.

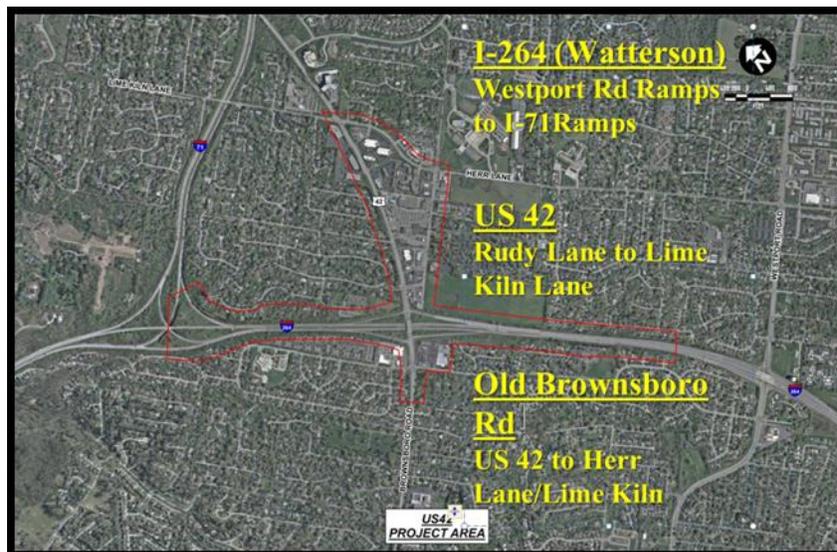


Figure 1: Study Area

The preferred alternative for the I-264/US 42 interchange is Alternative 1- Single Point Urban Interchange (SPUI). The SPUI has one signalized intersection for all the through and left-turning movements of the interchange. The single signal replaces the two existing signals and creates additional spacing between the intersections at Rudy Lane and KY 22 (also referred to as Old Brownsboro Road).

The opposing two-lane left-turning movements operate simultaneously, providing for a more efficient use of green time when high left-turn volumes are present. Due to the heavy peak hour volume, a triple left turn will be needed from US 42 westbound to I-264 westbound. Alternative 1 – SPUI is illustrated in **Figure 2**.

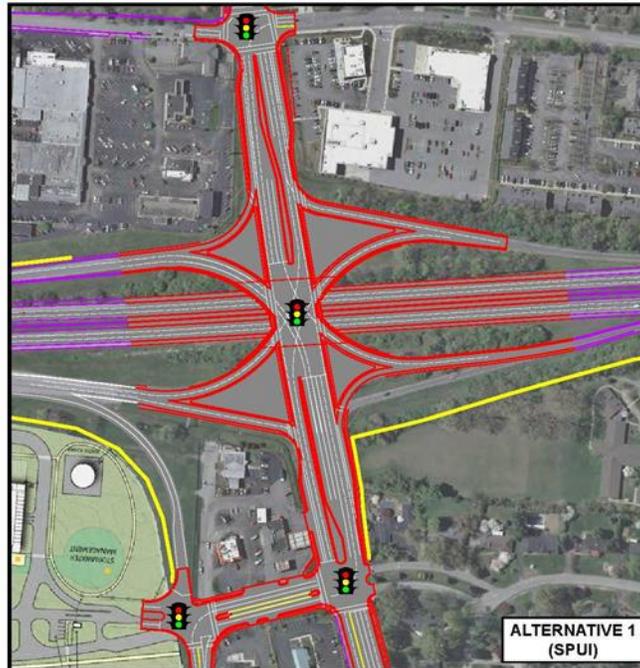


Figure 2: Baseline - Alternative #1 SPUI

The current total project cost estimate, as presented to the VE Team, is \$45.2M. This includes construction costs of \$14M for the I-264/US 42 Interchange Alternative 1 SPUI, \$25.7M for I-264 widening, \$0.4M for improvements to the US 42/Rudy Lane intersection and \$5.1M in right-of-way and utilities cost.

VE Recommendations

The VE Team generated 37 ideas (Table 5) for the project. These concepts were compared and evaluated against the baseline developed by the project team. This comparison and evaluation resulted in five recommendations.

As the VE Team developed recommendations, the performance of each is rated against the baseline concept. Changes in performance are always based upon the overall impact to the total project. Once performance and cost data have been developed by the VE Team, the net change in value of the VE recommendations can be compared to the baseline concept. The overall change in performance and value improvement of the recommendations compared to the baseline concept are provided in the following table. For details on performance attributes please see **Appendix D**.

Table 1 - Summary of Recommendations

No.	Description	Initial Cost Savings (Increase)	Performance (%)	Value (%)
VE-1	Alternative 2 Modification	(\$3.62M)	24%	15%
VE-2	RIRO at Northfield Drive	(\$0.27M)	13%	12%
VE-3	Drop third through lane on I-264 at the split to I-71	\$0.82M	-2%	0%
VE-4	Adding I-264 EB and WB on ramps for KY 22	(\$5.3M)	15%	3%
VE-5	Alt. 1 SPUI Modifications	\$0.0M	4%	4%

Because of the nature of the project and focus of the VE Team, various recommendations presented are mutually exclusive and cannot all be implemented. Recommendation VE-1 is mutually exclusive to VE-4 and VE-5. The VE Team created three scenarios to illustrate how some of the potential combinations could be chosen for implementation.

Table 2 - Potential Scenarios

No.	Description	Initial Cost Savings (Increase)	Scenario 1	Scenario 2	Scenario 3
VE-1	Alternative 2 Modification	(\$3.62M)			(\$3.62M)
VE-2	RIRO at Northfield Drive	(\$0.27M)	(\$0.27M)	(\$0.27M)	(\$0.27M)
VE-3	Drop third through lane on I-264 at the split to I-71	\$0.82M	\$0.82M	\$0.82M	\$0.82M
VE-4	Adding I-264 EB and WB on ramps for KY 22	(\$5.30M)	(\$5.30M)	(\$5.30M)	
VE-5	Alt. 1 SPUI Modifications	\$0.0M		\$0.0M	
Total Costs of Scenario Ideas:			(\$4.75M)	(\$4.75M)	(\$3.00M)

The overall change in performance and value improvement of the scenarios compared to the baseline are provided in the following table. For details on performance attributes please see **Appendix D**.

Table 3 - Value Matrix

OVERALL PERFORMANCE		Performance (P)	% Change Performance	Cost (C)	% Change Cost	Value Index (P/C)	% Value Improvement
	Baseline	500		\$45.2		11.06	
1	Scenario 1: Base Case, Drop third through lane on I-264 at the split to I-71, RIRO at Northfield Drive, Adding I-264 EB and WB on ramps for KY 22	654	31%	\$50.0	-10.6%	13.08	18%
2	Scenario 2: Adding I-264 EB and WB on ramps for KY 22 + SPUI Modifications, RIRO at Northfield Drive, Drop third through lane on I-264 at the split to I-71	664	33%	\$50.0	-10.6%	13.28	20%
3	Scenario 3: DDI with Ideas 1 and 2, Drop third through lane on I-264 at the split to I-71, RIRO at Northfield Drive	683	37%	\$47.8	-5.8%	14.29	29%

As illustrated in the above table, all three scenarios have much higher performance scores than the baseline with change in performance above 30% for all three scenarios. Each of the three scenarios is adding cost to the project. However, the performance over cost index for all three scenarios is higher than the baseline resulting in overall higher value improvements of 18% to 29% over the baseline.

Value Engineering Punch List

The individual recommendations are summarized below in the Value Engineering Punch List. The detailed information about each recommendation is included in VE Recommendation & Design Comments section of this report.

VALUE ENGINEERING PUNCH LIST										
ITEM NO. 5-804.0 and 5-594.00		PROJECT COUNTY: Jefferson			DATE OF STUDY: 12/08/2014 to 12/12/2014			VE # 201404		
VE Alternative Number	VE Team Top Pick	Description	Activity (Y,N,UC-Date)	Implemented Life Cycle Cost Savings	Original Cost	Alternative Cost	Initial Cost Saving	Life Cycle Cost Savings (Total Present Worth)	FHWA Categories	Remarks
Recommendations										
VE-1		Alternative 2 Modification			\$13.99M	\$17.61M	\$3.62M	N/A	Safety Operations	
VE-2		Idea No.27 - RIRO at Northfield Drive			\$0	\$0.27M	\$0.27M	N/A	Operations	
VE-3		Idea No. 30 - Drop third through lane on I-264 at the split to I-71			\$25.71M	\$24.89M	(\$0.82M)	N/A	Safety Operations	
VE-4		Idea No. 36 - Adding I-264 EB and WB on ramps for KY 22			\$13.99M	\$19.29M	\$5.30M	N/A	Safety Operations	
VE-5		Idea No. 37 - Alt. 1 SPUI Modifications			\$13.99M	\$13.99M	\$0	N/A	Safety Operations	
Other Design Comments and/or Design Suggestions										
DC-1		Idea No. 17 - Extend Glen Eagle Drive to meet KY 22 at Lime Kiln Lane.			N/A	N/A	N/A	N/A	Safety Operations	
DC-2		Idea No. 19 - Design ramps to allow for future ramp metering			N/A	N/A	N/A	N/A	Safety Operations	
DC-3		Idea No. 24 - Continue the bicycle lanes through the intersections at US 42 @ Rudy Lane and KY 22 @ US 42 and add merge			N/A	N/A	N/A	N/A	Safety	
DC-4		Idea No. 29 - Eliminate the bicycle lanes and have a shared use path			N/A	N/A	N/A	N/A	Safety Operations	
DC-5		Idea No. 31 - Asymmetrical partial splintered DDI			N/A	N/A	N/A	N/A	Safety Operations Other	
DC-6		Idea No. 35 - Undertake a review (either internal or external) of the VISSIM Modelling for the 2040 through traffic volumes from the VA site to the US 42 @ KY 22 intersection			N/A	N/A	N/A	N/A	Other	
Implementation Meeting:										

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VE Team Members

The VE Team included:

- John Broadus, HDR – Structures
- Joe Cochran, HDR – Roadway
- David Lee, HDR – Traffic
- Smith Siromaskul, HDR – Traffic/Interchanges
- Tammy Dow, HDR – VE Team Leader
- Shawn Russell, KYTC – VE Coordinator
- Kevin Bailey, KYTC – Construction
- Adam Kirk, KTC – Traffic
- Nathan Holt, HDR – Roadway
- Brent Sweger, KYTC
- Anthony Norman, KYTC



Certification

This is to verify that the Value Engineering Study was conducted in accordance with standard value engineering principles and practices.



Tammy Dow, CVS®
VE Team Leader

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Introduction

This VE report summarizes the events of the VE study conducted for the Kentucky Transportation Cabinet (KTC) and facilitated by HDR. The proposed highway project (Item Numbers 5-594.00 and 5-804.00) includes improvements to I-264 (Watterson Expressway) between the Westport Road and I-71 Interchanges as well as reconstruction of the I-264/US 42 (Brownsboro Road) interchange.

Value Engineering Process

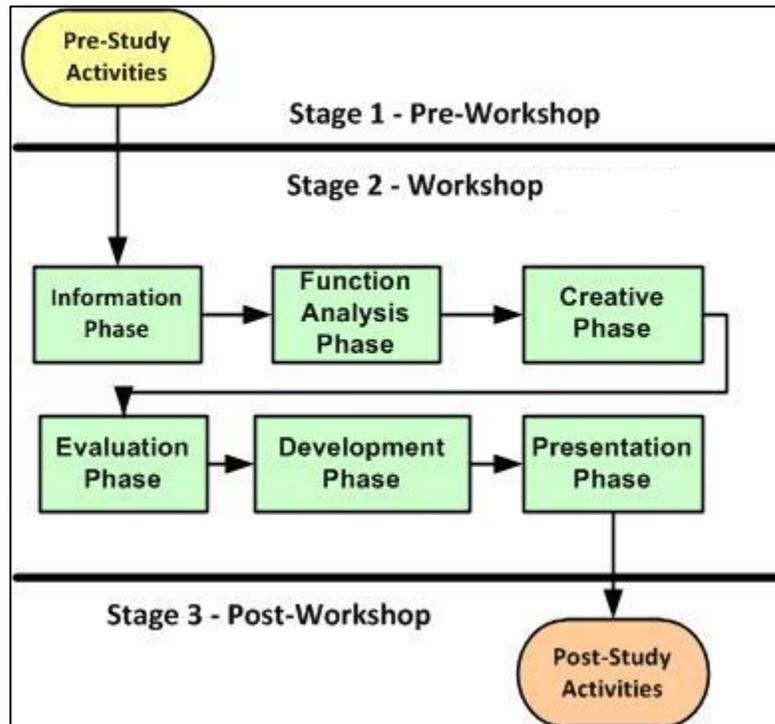


Figure 3: VE Study Process

The VE Team employed the SAVE International® six-step VE Job Plan in analyzing the project (**Figure 3**). This process is composed of the following phases:

Information Phase – The objective of this phase was to obtain a thorough understanding of the project by reviewing the project’s documents, drawings and cost estimates. The baseline was presented to the

VE Team by the design team and a lengthy question and answer session followed. Based on the information presented, the VE Team determined that changes were required to the US 42/KY 22 intersection in order to improve operations at the I-264/US 42 interchange.

Function Analysis Phase – The purpose of this phase was to identify and define the primary and secondary functions of the project. A Function Analysis System Technique (FAST) diagram was developed. The FAST Diagram for this project shows that “Improve Operations” is the basic function (i.e. the primary reason for the project). The key secondary functions include “Reduce Delay”, “Increase Capacity”, “Accommodate Multi-Modal” and “Reduce Conflicts”.

Analysis of the functions intended to be performed by the project helped the VE Team focus on the purpose and need of the project and, consequently, how to craft recommended concepts that would provide the required functions.

Creative Phase – During this phase, the VE Team employed creative techniques such as team brainstorming to develop a number of alternative concepts that satisfy the project’s various functions.

The idea list was grouped by function. All of the ideas generated were recorded in **Appendix D**. This phase generated 37 individual ideas that were moved into the Evaluation Phase.

Evaluation – The purpose of this phase was to evaluate the alternative concepts developed by the VE Team during the brainstorming sessions.

Although each project is different, the evaluation process for each VE effort can be thought of in its simplest form as a way of combining, evaluating, and narrowing ideas until the VE Team agrees on the recommendations to be moved forward.

To assist in this effort, specific performance criteria were developed in cooperation with the project team. These criteria were weighted, using a paired comparison approach as well as the 100 Point Allocation Method, and resulted in the criteria used to evaluate ideas and alternative concepts. These criteria are identified later in **Appendix D**.

Development – This phase of the process takes the concepts or ideas that ranked the highest from the Evaluation Phase and further develops them into full VE recommendations. In many cases, it is possible that one or more ideas can be combined to form an overall recommendation, which were evaluated further by the VE Team.

In the case of this project, of the original 37 ideas that were generated during the Creative Phase, five of those ideas were taken forward, and developed further into VE recommendations. For the Development Phase, narratives, drawings, calculations, and cost estimates were prepared for each recommendation.

Presentation – The VE Team presented their finding in the form of an oral presentation on the final day of the study. The presentation can be found in **Appendix E**.

Scope of the Value Engineering Study

The purpose of the VE Study was to:

- Review and understand the various concepts of the project.
- Conduct a thorough review and analysis of the key project issues using a multidiscipline, cross-functional team.
- Improve the value of the project through innovative measures aimed at improving the performance while reducing costs of the project.

Project Description

The primary purpose of this project (Item Number 5-594.00 and 5-804.00) is to improve system operation by reducing delays/congestion along I-264 and the interchange at US 42. Constructed in the early 1970's, the existing interchange configuration at US 42 is inadequate for this densely developed area of Jefferson County. US 42 (a major arterial) links northern Jefferson and Oldham Counties to downtown Louisville. The study area is provided in **Figure 4**.



Figure 4: Study Area

Demands on the interchange during the peak periods (AM/PM) causes congestion and delays as the existing interchange has four traffic signals within 1,440 feet. Furthermore, a proposed Veteran's Administration (VA) Hospital in the southeast quadrant of the existing interchange could increase delays and congestion at the interchange.

I-264 (Watterson Expressway) has been widened to three lanes in each direction, to increase capacity, from I-264 (near the Sherman Minton Bridge) to just west of the recently constructed interchange to Westport Road. Future demands on the Interstate system require an evaluation of system operation and capacity.

The secondary goals of this project include improving multi-modal facilities and aesthetics.

I-264 (Watterson Expressway Widening)

The preferred alternative for I-264 is Alternative B (**Figure 5-12**). It consists of providing three general purpose lanes in each direction, with auxiliary lanes and acceleration/deceleration lanes at the interchanges. All three of the interchange alternatives considered are compatible with Alternative B and can be used interchangeably.

Proceeding eastbound from the Westport Road interchange, a single-lane entrance ramp will enter from Westport Road to form an auxiliary lane. This auxiliary lane will be exit-only, with an option lane at US 42 and three through lanes proceeding eastbound. A single entrance lane from US 42 will become an auxiliary lane between US 42 and the exit to northbound I-71. The exit to northbound I-71 will consist of an exit-only lane and an option lane; three lanes will proceed eastbound to southbound I-71. The third lane will drop downstream of the bridge over the southbound I-71 to westbound I-264 ramp. The two-lane ramp from I-264 eastbound to I-71 northbound will transition to three lanes in the area of the current third auxiliary lane.

Proceeding westbound from the I-71 northbound to I-264 ramp, the three lane section will remain, with a fourth deceleration lane provided to a two-lane exit to US 42. This exit will have an exit-only and an option lane. The US 42 westbound on ramp will be two lanes, with the outside lane dropped after merging with I-264 westbound. A four lane section will remain with the outside lane becoming an exit only lane at Westport Road. The Westport Road off-ramp will be two lanes, with one being exit-only and the other being an option lane, leaving three through lanes on westbound I-264.

Figures 5 to 12 illustrate the preferred alternative for the I-264 (Watterson Expressway Widening) within the study area.

I-264/US 42 Interchange Preferred Alternative

The Single Point Urban Interchange (SPUI) is the preferred I-264/US42 Interchange Alternative (**Figures 13 to 15**). The SPUI has one signalized intersection for all the through and left-turning movements of the interchange. The single signal replaces the two existing signals and creates additional spacing between the intersections at Rudy Lane and KY 22. Opposing two-lane left-turning movements operate simultaneously, providing for a more efficient use of green time when high left-turn volumes are present. Presently, there are 1,094 left-turning vehicles from westbound US 42 to westbound I-264 in the AM peak hour. These volumes are forecasted to increase to 1,360 vehicles per hour (vph) in the design year 2040. Due to this heavy peak hour volume, a triple left turn will be needed to provide a Level of Service (LOS) D.

The SPUI Alternative would require replacement of the existing structure, and a grade change on US 42 to develop adequate clearance over I-264. While the opposing turn lanes create a narrower bridge at the signal, ramps converging at the single point create skewed beams that increase the cost of the structure.

A third general purpose lane is added along eastbound US 42 between the KY 22 intersection and Glenview Avenue. Improvements along KY 22 include a dual left-turn lane southbound to the VA Hospital entrance. An additional eastbound lane is added to receive the southbound dual left turn. The second lane is dropped at the eastern entrance of the Crossgate subdivision. US 42 ties back to the existing lane configuration just west of the Rudy Lane intersection. This alternative will require strip right-of-way, temporary construction easements, and have no relocations.

Value Engineering Study Report
 Jefferson County I-264/US 42 Interchange and I-264 Widening

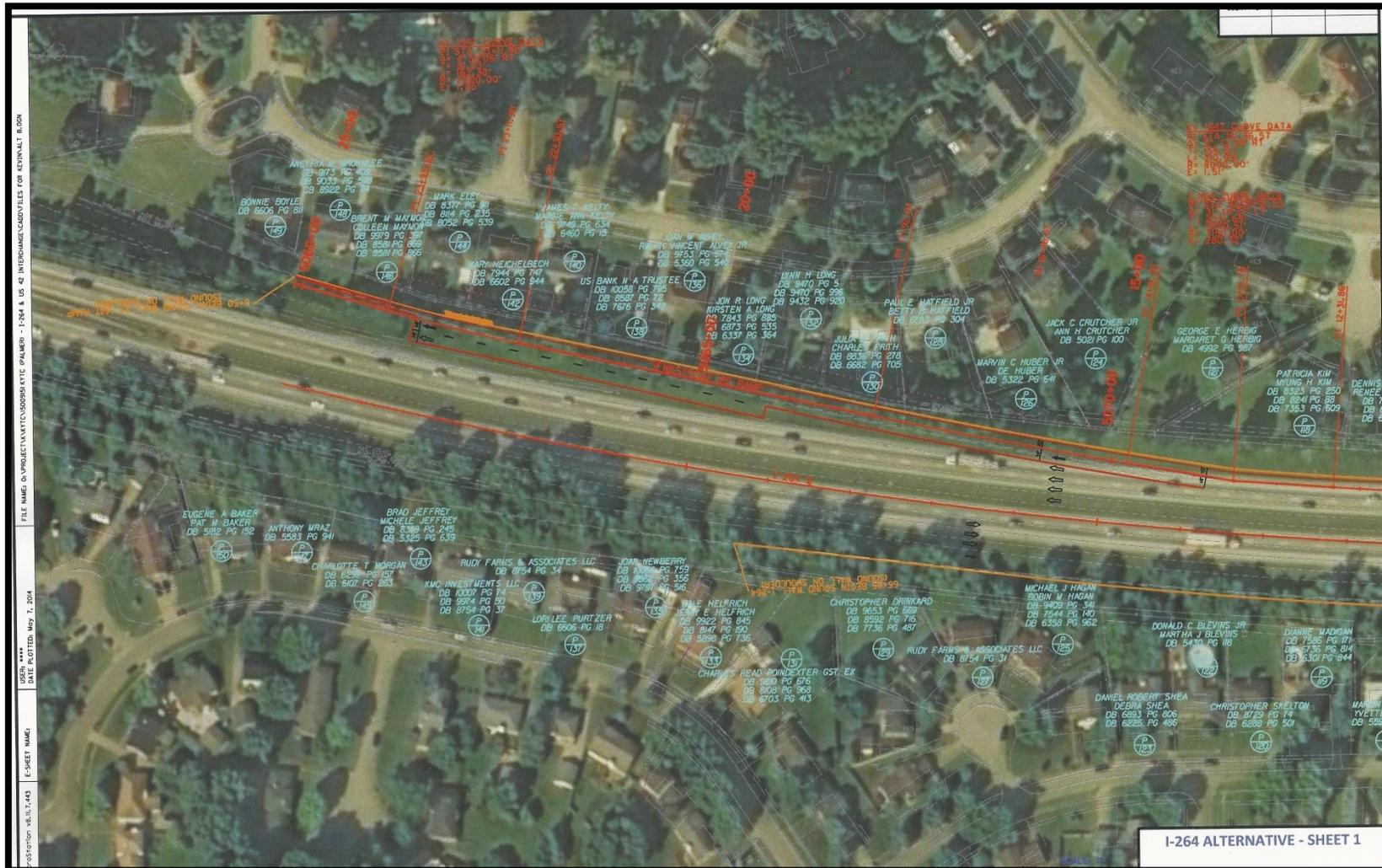


Figure 5: Alternative B: Preferred I-264 Widening Alternative – Sheet 1 (DRAFT)

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 Jefferson County I-264/US 42 Interchange and I-264 Widening

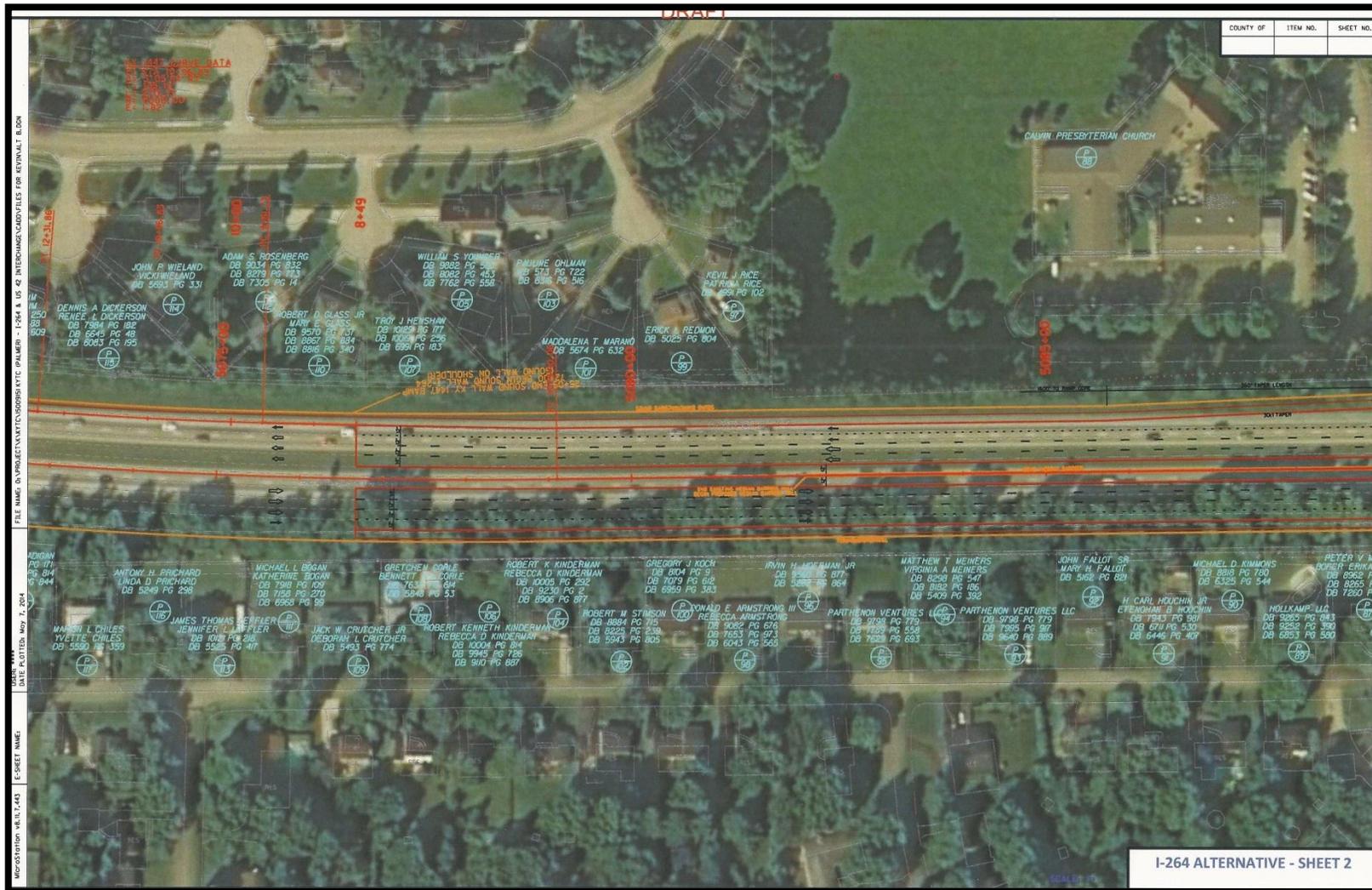


Figure 6: Alternative B: Preferred I-264 Widening Alternative – Sheet 2 (DRAFT)

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 Jefferson County I-264/US 42 Interchange and I-264 Widening



Figure 8: Alternative B: Preferred I-264 Widening Alternative – Sheet 4 (DRAFT)

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 Jefferson County I-264/US 42 Interchange and I-264 Widening

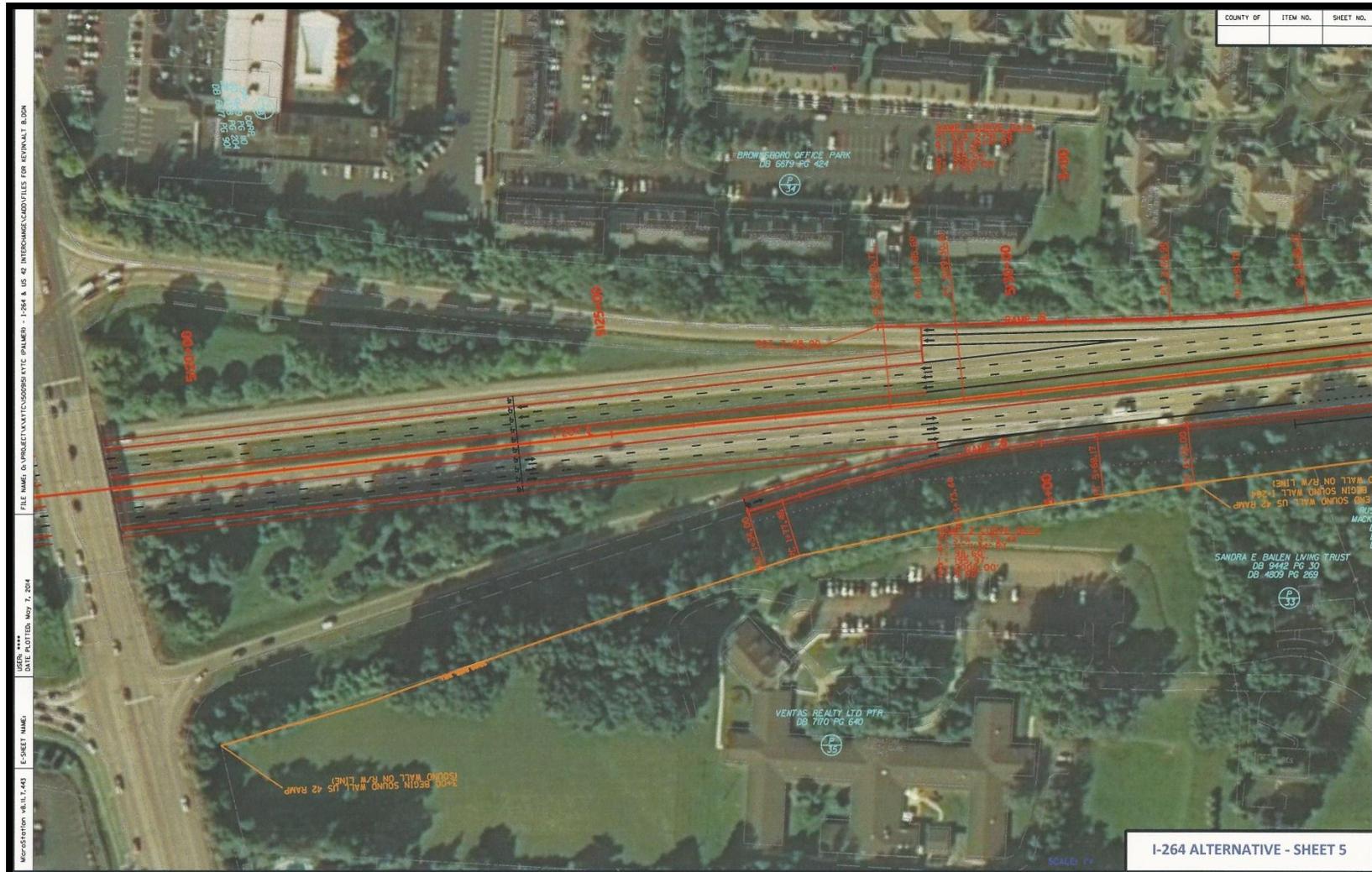


Figure 9: Alternative B: Preferred I-264 Widening Alternative – Sheet 5 (DRAFT)



Figure 12: Alternative B: Preferred I-264 Widening Alternative – Sheet 8 (DRAFT)

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Jefferson County I-264/US 42 Interchange and I-264 Widening



Figure 13: Baseline - Alternative #1 SPUI

Value Engineering Study Report
 Jefferson County I-264/US 42 Interchange and I-264 Widening

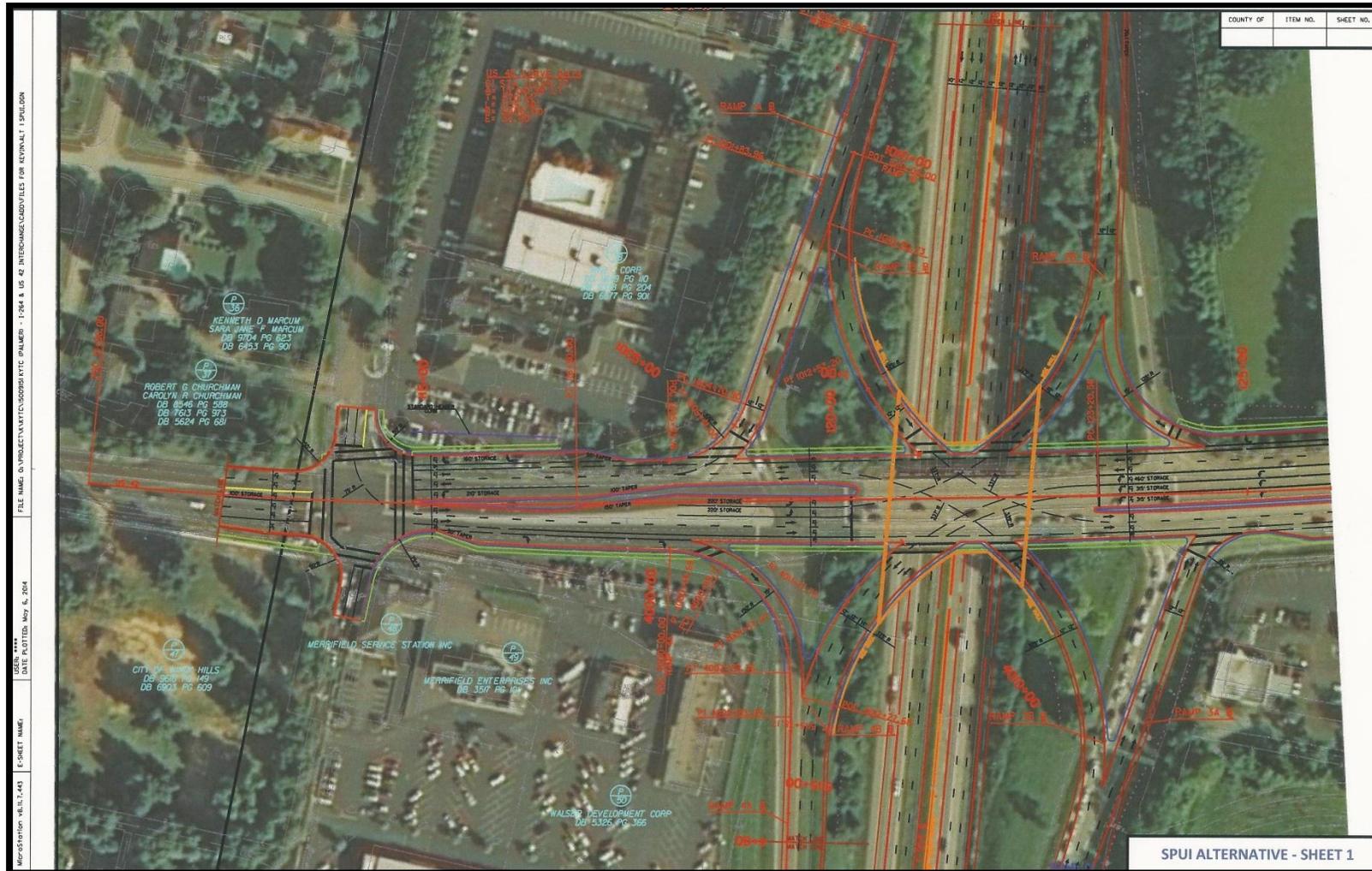


Figure 14: Baseline - Alternative #1 SPUI – Sheet 1 (DRAFT)

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Recommendations

Introduction

Evaluation of the 37 ideas generated by the VE Team resulted in five individual recommendations to the baseline concept. The VE recommendation documented in this section are presented as written by the team during the VE study. While they have been edited for the draft VE report to correct errors or better clarify the recommendation, they represent the VE Team's findings during the VE study.

FHWA Functional Benefit Criteria

FHWA requires the transportation agencies to evaluate each approved recommendation in terms of the project feature or features that recommendation benefits. If a specific recommendation can be shown to provide benefit to more than one feature described below, count the recommendation in *each category that is applicable*. These same criteria can be found on each of the individual recommendations that follow.

- **Safety:** Recommendations that mitigate or reduce hazards on the facility
- **Operations:** Recommendations that improve real-time service and/or local, corridor, or regional levels of service of the facility.
- **Environment:** Recommendations that successfully avoid or mitigate impacts to natural and or cultural resources.
- **Construction:** Recommendations that improve work zone conditions, or expedite the project delivery.
- **Other:** Recommendations not readily categorized by the above performance indicators.

Individual Recommendations

Each recommendation consists of a summary of the baseline concept, a description of the suggested change, a listing of its advantages and disadvantages, a cost comparison, change in performance, and a brief narrative comparing the baseline design with the recommendation. Sketches, calculations, and performance measure ratings are also presented. The cost comparisons reflect a comparable level of detail as in the estimate.

In order to be consistent, the VE Team recommendation descriptions used the travel directions shown in **Figure 16**.

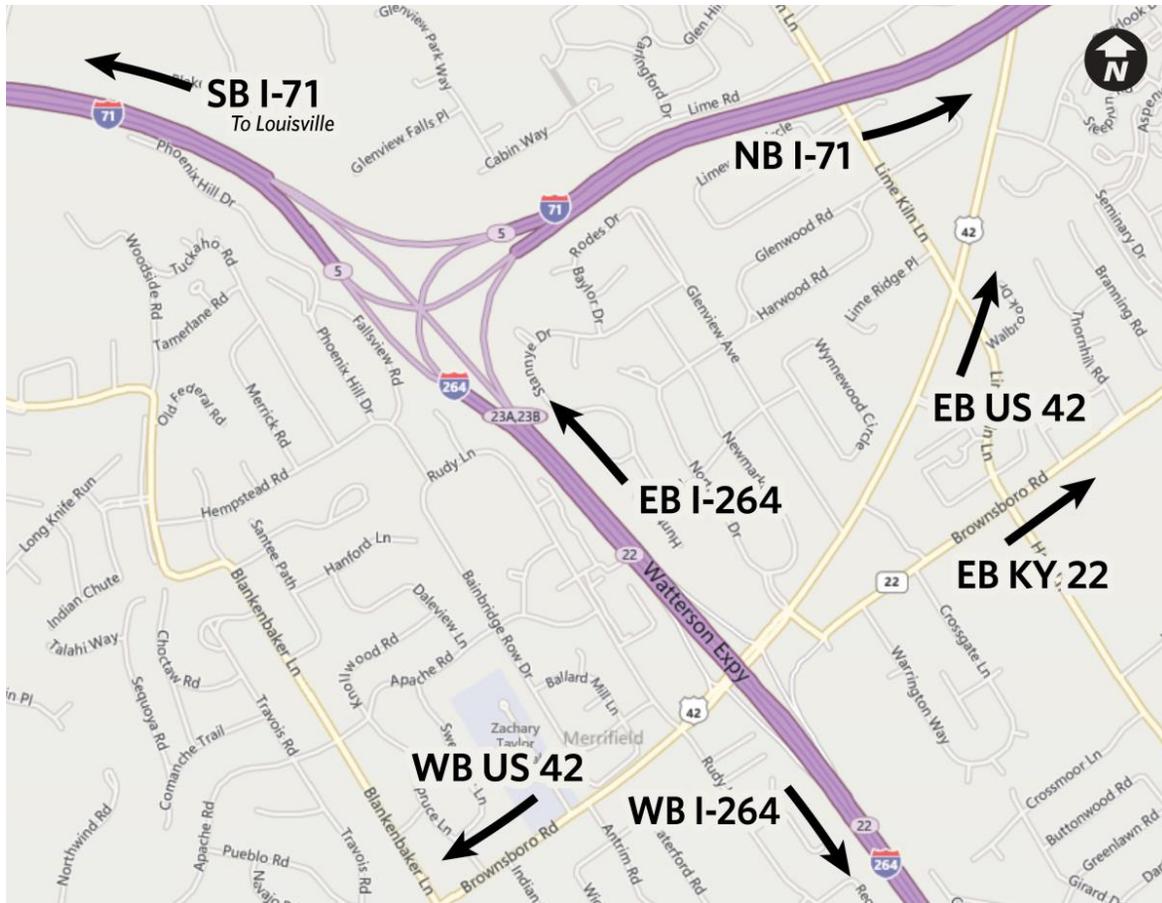


Figure 16: Travel Direction Descriptions

VE RECOMMENDATION VE-1 ALTERNATIVE 2 MODIFICATION		Idea No. 5		
Baseline				
The baseline design is a SPUI at the I-264/US 42 interchange and a full intersection at US 42/KY 22.				
Recommendation				
<p>The recommended design is a modification of Alternate 2 (Diverging Diamond Interchange (DDI)) which includes a six-lane DDI (three lanes each direction) on US 42, a full signalized intersection at US 42/KY 22 at its existing location, a six lane section on KY 22 from US 42 to the VA Hospital entrance including three inbound lanes and two outbound lanes and a two-way left turn lane (TWLTL), and a four lane section on KY 22 from the VA Hospital entrance to McDonalds including two lanes outbound to McDonalds, one lane inbound to VA intersection, and a TWLTL. The baseline maintains the slip ramp to KY 22 from the I-264 exit ramp.</p> <p>This recommendation is to modify the signal at the existing US 42/KY 22 intersection by eliminating the northbound through and northbound left turns. The northbound approach at the existing US 42/KY 22 intersection will be restricted to right turn only onto US 42. Right and left turns are provided from US 42 into KY 22 at the existing intersection. A new single lane connection from KY 22 to EB I-264 (toward I-71) is provided by passing below the EB I-264 exit ramp. A new two lane connection is provided from KY 22 to the EB I-264 exit ramp and adds a signal on the ramp. A third lane is added to EB I-264 exit ramp downstream of the new signal on the ramp to allow for traffic to move from KY 22 to WB I-264 on ramp. KY 22 from the VA access to McDonald's includes two lanes westbound from McDonald's to the VA intersection one lane eastbound to McDonald's, and a TWLTL.</p>				
<ul style="list-style-type: none"> • Simplifies signalized intersection and left turn conflicts at US 42/KY 22 intersection • Improves US 42 operations • Improves KY 22 operations • Improves I-264 ramp operations 		<ul style="list-style-type: none"> • Increased cost due to one additional bridge the pass entrance ramp under exit ramp, and retaining walls • Wider US 42 DDI bridge to add one lane • Longer US 42 DDI bridge • Adds a signalized intersection on EB I-264 exit ramp 		
Cost Summary		Cost		
Baseline		\$13.99M		
Recommendation		\$17.61M		
Difference		(\$3.62M)		
FHWA Function Benefit				
<i>Safety</i>	<i>Operations</i>	<i>Environment</i>	<i>Construction</i>	<i>Other</i>
✓	✓			

VE RECOMMENDATION VE-1 ALTERNATIVE 2 MODIFICATION	Idea No. 5
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Discussion/Sketches/Photos

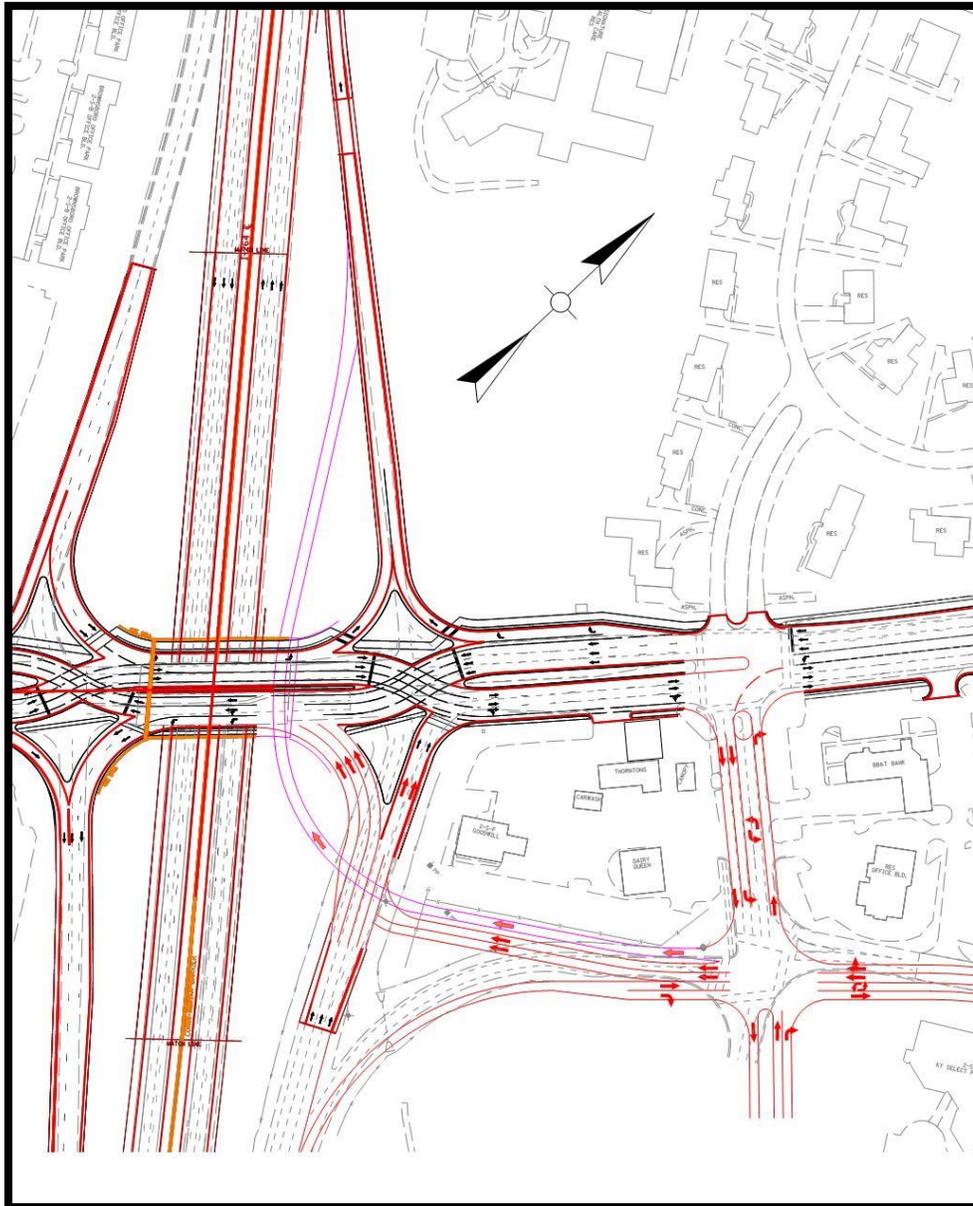


Figure 17: VE-1 Alternative Concept

As shown in **Figure 17**, the alternative concept is based on the DDI interchange alternative previously developed by the design team. The recommendation is to simplify the existing US 42/KY 22 intersection. Traffic on KY 22 will access westbound US 42 and westbound I-264 via an extension of KY 22 to the I-264 eastbound exit ramp through a new signalized intersection. KY 22 traffic bound for eastbound I-264 (toward I-71) will access via a lane that passes below the eastbound I-264 exit ramp and merges onto I-264. A bridge and retaining walls will be required to pass KY 22 below the exit ramp. The intersection at the VA Hospital access and KY 22 will be signalized.

VE RECOMMENDATION VE-1 ALTERNATIVE 2 MODIFICATION				Idea No. 5	
Cost Estimate					
KY 22 Configuration					
ITEM	QUANTITY	UNIT	UNIT COST	COST	
Pavement - Lanes from 6 to 5	440	SY	\$ 65.00	\$ (28,600)	
ROW - Areas at VA entrance	22550	SF	LS	\$ 100,000	
Pavement - Add 2 lanes to ramp	1280	SY	\$ 65.00	\$ 83,200	
Pavement - Add 3rd lane to SPUI ramp	450	SY	\$ 65.00	\$ 29,250	
TOTALS				\$ 183,850	
Additional Structure Costs					
ITEM	QUANTITY	UNIT	UNIT PRICE	COST	
New Underpass Bridge	3780	SF	\$ 125.00	\$ 472,500	
Add'l Mainline Bridge Cost	4132	SF	\$ 125.00	\$ 516,500	
Retaining Walls	12000	SF	\$ 75.00	\$ 900,000	
SUB-TOTAL				\$ 1,889,000	
DDI Bridge Savings vs. SPUI	22000	SF	\$ (25.00)	\$ (550,000)	
NET-TOTAL				\$ 1,339,000	
Additional KY 22 Costs					
ITEM	QUANTITY	UNIT	UNIT PRICE	COST	
Pavement	1731	SY	\$ 65.00	\$ 112,515	
Pavement (reduction)	440	SY	\$ 65.00	\$ 28,600	
SUB-TOTAL				\$ 141,115	
NB Ramp					
ITEM	QUANTITY	UNIT	UNIT PRICE	COST	
Earthwork	30000	CY	\$ 10.00	\$ 300,000	
Pavement	5000	SY	\$ 65.00	\$ 325,000	
Guardrail	2250	LF	\$ 15.00	\$ 33,750	
SUB-TOTAL				\$ 658,750	
Contingency (30%)	1	LS	\$ 696,814.50	\$ 696,815	
			Total Add'l		
			\$ 4,119,530		
				Total VE-1	
				\$ 17,609,041	

VE RECOMMENDATION VE-1 ALTERNATIVE 2 MODIFICATION		Idea No. 5	
PERFORMANCE MEASURES		<i>Performance</i>	<i>Baseline</i>
Attributes and Rating Rationale for Proposal		<i>Baseline</i>	<i>Recommendation</i>
Mainline Operations – I-264 No significant impact to I-264.	<i>Rating</i>	5	5
	<i>Weight</i>	35	
	<i>Contribution</i>	175	175
Mainline Operations – US 42 Access from KY to I-264 is now independent of US 42. Access to US 42 is rerouted but operates significantly better than the baseline. Traffic from KY 22 to WB US 42 accesses at the interchange without impacting signal operations/phasing.	<i>Rating</i>	5	9
	<i>Weight</i>	20	
	<i>Contribution</i>	100	180
Mainline Operations – KY 22 Access from KY to I-264 is now independent of US 42. Access to US 42 is rerouted but operates significantly better than the baseline. Traffic from KY 22 to WB US 42 accesses at the interchange without impacting signal operations/phasing.	<i>Rating</i>	5	9
	<i>Weight</i>	13	
	<i>Contribution</i>	65	117
Local Assess Significant reduction in network congestion in the project area will enhance local access and mobility.	<i>Rating</i>	5	7
	<i>Weight</i>	6	
	<i>Contribution</i>	30	42
Maintainability Requires additional pavement and structure.	<i>Rating</i>	5	3
	<i>Weight</i>	4	
	<i>Contribution</i>	20	12
Construction Impacts Ramp split is to be reconstructed.	<i>Rating</i>	5	4
	<i>Weight</i>	5	
	<i>Contribution</i>	25	20
Environmental Impacts Minor impacts to properties near the VA	<i>Rating</i>	5	4.5

VE RECOMMENDATION VE-1 ALTERNATIVE 2 MODIFICATION		Idea No. 5	
Hospital entrance.	Weight	14	
	Contribution	70	63
Project Schedule May require additional construction staging.	Rating	5	4
	Weight	3	
	Contribution	15	12
Total Performance		500	621
Net Change in Performance			24%

VE RECOMMENDATION VE-2 RIRO AT NORTHFIELD DRIVE		Idea No. 27		
Baseline				
The existing US 42/KY 22 intersection includes full access to Northfield Drive (the north leg). The existing signal utilizes split phase operation.				
Recommendation				
Restrict access to and from Northfield Drive to right-in/right-out (RIRO). The intersection will remain signalized though the northbound through and eastbound left into Northfield Drive would be prohibited as well as the southbound through and left turn from Northfield Drive. Access to Northfield Drive from the directions that would be restricted by this access change would be redirected through Glenview Avenue.				
Advantages		Disadvantages		
<ul style="list-style-type: none"> Improves efficiency of the US 42/KY 22 intersection by eliminating a signal phase and eliminating the green time required to serve Northfield Drive Improves interchange operations by eliminating downstream blocking at the KY 22 intersection 		<ul style="list-style-type: none"> Potential resistance from residents on Northfield Drive 		
Cost Summary		Cost		
Baseline		\$0		
Recommendation		\$272,423		
Difference		(\$272,423)		
FHWA Function Benefit				
<i>Safety</i>	<i>Operations</i>	<i>Environment</i>	<i>Construction</i>	<i>Other</i>
	✓			

VE RECOMMENDATION VE-2 RIRO AT NORTHFIELD DRIVE	Idea No. 27
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Discussion/Sketches/Photos



Figure 18: RIRO at Northfield Drive

Cost Estimate

ROW - Northfield	1	LS	\$ 25,000.00	\$25,000.00
MOT	1	ls	\$ 30,000.00	\$30,000.00
Curb and Gutter	300	LF	\$ 25.00	\$7,500.00
Std Median Barrier I	2000	SY	\$ 60.00	\$120,000.00
Base	65	tons	\$ 150.00	\$9,750.00
Surface	45	tons	\$ 150.00	\$6,750.00
CSB	65	tons	\$ 25.00	\$1,625.00
Roadway Ex	255	cy	\$ 30.00	\$7,650.00
Sodding	150	SY	\$ 5.00	\$750.00
Remove Signal Eq.	1	LS	\$ 3,000.00	\$3,000.00
Sidewalk 4 In	60	SY	\$ 55.00	\$3,300.00
				\$190,325.00
Contingency (30%)				\$57,097.50
TOTAL COST				\$272,422.50

VE RECOMMENDATION VE-2 RIRO AT NORTHFIELD DRIVE		Idea No. 27	
PERFORMANCE MEASURES	<i>Performance</i>	<i>Baseline</i>	<i>Recommendation</i>
Attributes and Rating Rationale for Proposal			
Mainline Operations – I-264 No significant impact to I-264.	<i>Rating</i>	5	5
	<i>Weight</i>	35	
	<i>Contribution</i>	175	175
Mainline Operations – US 42 Eliminating a signal phase at US 42/KY 22 will improve operations on all approaches.	<i>Rating</i>	5	7
	<i>Weight</i>	20	
	<i>Contribution</i>	100	140
Mainline Operations – KY 22 Eliminating a signal phase at US 42/KY 22 will improve operations on all approaches.	<i>Rating</i>	5	7
	<i>Weight</i>	13	
	<i>Contribution</i>	65	91
Local Assess Increases adverse travel for those coming to and from the north leg of the US 42/KY 22 intersection.	<i>Rating</i>	5	4.5
	<i>Weight</i>	6	
	<i>Contribution</i>	30	27
Maintainability No significant change.	<i>Rating</i>	5	5
	<i>Weight</i>	4	
	<i>Contribution</i>	20	20
Construction Impacts No significant change.	<i>Rating</i>	5	5
	<i>Weight</i>	5	
	<i>Contribution</i>	25	25
Environmental Impacts No significant change.	<i>Rating</i>	5	5
	<i>Weight</i>	14	

VE RECOMMENDATION VE-2 RIRO AT NORTHFIELD DRIVE		Idea No. 27	
	<i>Contribution</i>	70	70
Project Schedule No significant change.	<i>Rating</i>	5	5
	<i>Weight</i>	3	
	<i>Contribution</i>	15	15
Total Performance		500	563
Net Change in Performance		13%	

VE RECOMMENDATION VE-3 DROP THIRD THROUGH LANE ON I-264 AT THE SPLIT TO I-71		Idea No. 30		
Baseline				
The baseline concept maintains three lanes on eastbound I-264 to southbound I-71 past the bridge over NB I-71 and the SB I-71 ramp to WB I-264 before tapering down to two lanes at a rate of 70:1 over 840 FT. This requires widening the existing bridge.				
Recommendation				
The recommended concept recognizes that I-264 ends at the interchange and the roadway in question is a ramp and not a freeway mainline. The concept begins lane drop taper just after the EB ramp gore so that it ends just prior to the existing bridge (utilizing the same taper rate as the baseline). This concept allows the existing bridge to be maintained.				
<ul style="list-style-type: none"> • Eliminates need to widen eastbound I-264 to I-71 southbound bridge • Reduces roadway costs • Reduces potential for throw-away costs when I-71 Interchange is modified 		<ul style="list-style-type: none"> • Advanced warning of the lane reduction will overlap with the I-264 to I-71 northbound and southbound diverge signage 		
Cost Summary		Cost		
Baseline	\$820,170			
Recommendation	\$0			
Difference	\$820,170			
FHWA Function Benefit				
<i>Safety</i>	<i>Operations</i>	<i>Environment</i>	<i>Construction</i>	<i>Other</i>
✓	✓			

VE RECOMMENDATION VE-3 DROP THIRD THROUGH LANE ON I-264 AT THE SPLIT TO I-71	Idea No. 30
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Discussion/Sketches/Photos

Baseline Concept

As shown in **Figure 19**, the current baseline concept is based on the eastbound I-264 to I-71 southbound ramp having three lanes maintained over the bridge and tapering down to two lanes at a rate of 70:1 over 840 FT.

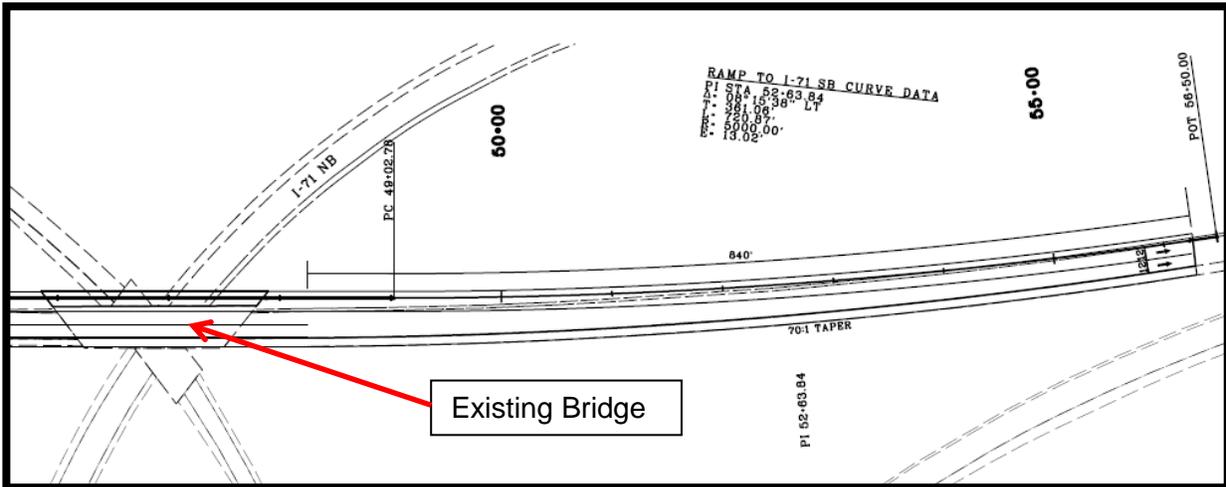


Figure 19: Baseline

VE Concept

As shown in **Figure 20**, the purpose of the recommendation is to begin the taper prior to the existing bridge to allow it to remain as is. This eliminates throw-away costs incurred, of widening the bridge, when the I-71 interchange is modified.

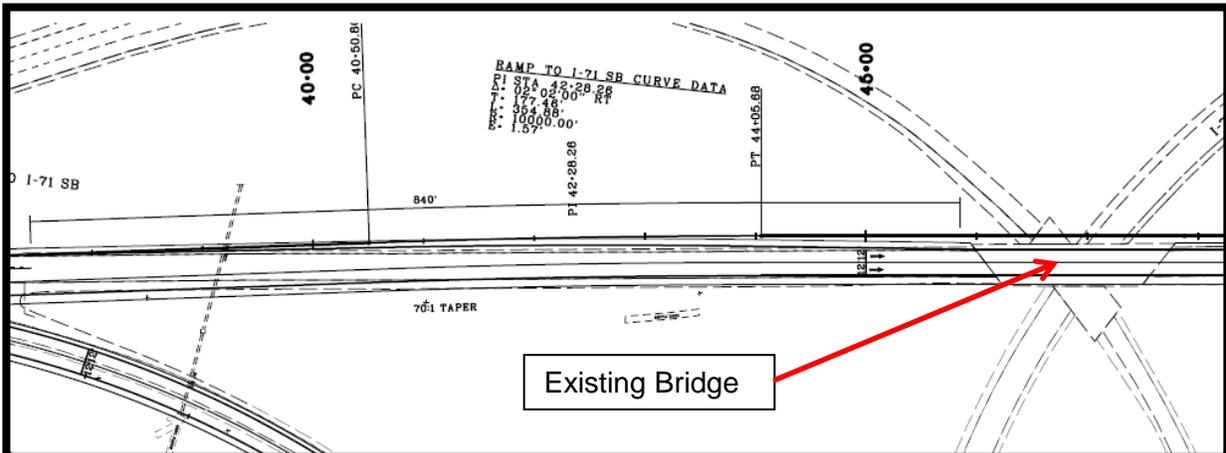


Figure 20: VE-3 Alternative Concept

During the presentation, the Design Team indicated that the beginning point of the taper was based on MUTCD signing guidance. The VE Team's review of the MUTCD did not indicate any restrictions that would preclude moving the taper closer to the ramp gore.

VE RECOMMENDATION VE-3					Idea No.
DROP THIRD THROUGH LANE ON I-264 AT THE SPLIT TO I-71					30
Cost Estimate					
Bridge over Ramp 3 & 5	1	LS	\$500,000	\$500,000	
Sawcut Pavement	850	LF	\$2	\$1,700	
Guardrail Single Face	850	LF	\$15	\$12,750	
Remover Guardrail	850	LF	\$2	\$1,700	
CL4 Asph Base 1.5D	1125	TONS	\$80	\$90,000	
CI4 Asph Surf .38A	130	TONS	\$90	\$11,700	
DGA Base	700	TONS	\$25	\$17,500	
Drain Blanket Ty II	625	TONS	\$45	\$28,125	
MOT	1	LS	\$20,000	\$20,000	
				<u>\$683,475</u>	
Contingency	20%			<u>\$136,695</u>	
Total Savings				<u>\$820,170</u>	

VE RECOMMENDATION VE-3 DROP THIRD THROUGH LANE ON I-264 AT THE SPLIT TO I-71		Idea No. 30	
PERFORMANCE MEASURES Attributes and Rating Rationale for Proposal	<i>Performance</i>	<i>Baseline</i>	<i>Recommendation</i>
Mainline Operations – I-264 Slight change in operations due to a more advanced lane drop.	<i>Rating</i>	5	4.5
	<i>Weight</i>	35	
	<i>Contribution</i>	175	158
Mainline Operations – US 42 No change to baseline.	<i>Rating</i>	5	5
	<i>Weight</i>	20	
	<i>Contribution</i>	100	100
Mainline Operations – KY 22 No change to baseline.	<i>Rating</i>	5	5
	<i>Weight</i>	13	
	<i>Contribution</i>	65	65
Local Assess No change to baseline.	<i>Rating</i>	5	5
	<i>Weight</i>	6	
	<i>Contribution</i>	30	30
Maintainability Slightly less bridge to maintain.	<i>Rating</i>	5	5.5
	<i>Weight</i>	4	
	<i>Contribution</i>	20	22
Construction Impacts Existing bridge can remain in place	<i>Rating</i>	5	6
	<i>Weight</i>	5	
	<i>Contribution</i>	25	30
Environmental Impacts No change to baseline.	<i>Rating</i>	5	5
	<i>Weight</i>	14	

VE RECOMMENDATION VE-3 DROP THIRD THROUGH LANE ON I-264 AT THE SPLIT TO I-71		Idea No. 30	
	<i>Contribution</i>	70	70
Project Schedule No change to baseline.	<i>Rating</i>	5	5.5
	<i>Weight</i>	3	
	<i>Contribution</i>	15	17
	Total Performance		500
Net Change in Performance			-2%

VE RECOMMENDATION VE-4 CREATING EB & WB RAMPS FOR KY 22		Idea No. 36		
Baseline				
Traffic from KY 22 utilizes the US 42 ramps to access either direction of I-264.				
Recommendation				
Direct NB and SB ramps on-ramps onto I-264 are provided for KY 22 and VA Hospital traffic via an extension of KY 22. This reduces traffic volumes at the US 42/KY 22 intersection (as well as at the I-264/US 42 Interchange).				
Advantages		Disadvantages		
<ul style="list-style-type: none"> • Improve operations at US 42/KY 22 intersection • Improve operations at I-264/US 42 ramp terminals 		<ul style="list-style-type: none"> • Increased Costs • Increased ROW impacts (primarily tract on NE corner of KY 22/VA Hospital intersection) • Adds additional signal on the I-264 WB on-ramp (that will require coordination with the signal on US 42) 		
Cost Summary		Cost		
Baseline		\$13.99M		
Recommendation		\$19.29M		
Difference		(\$5.30M)		
FHWA Function Benefit				
<i>Safety</i>	<i>Operations</i>	<i>Environment</i>	<i>Construction</i>	<i>Other</i>
✓	✓			

<p style="text-align: center;">VE RECOMMENDATION VE-4 CREATING EB & WB RAMPS FOR KY 22</p>	<p style="text-align: center;">Idea No. 36</p>
<p style="text-align: center;">Discussion/Sketches/Photos</p>	
<p>This recommendation can be considered as a “stand alone” alternative to the existing conditions or included with any of the other alternatives considered (SPUI or DDI). However, it is assumed that either a SPUI or a DDI will be constructed and costs are provided for each alternative. The NB and SB ramps are also independent – either or both could be provided. By providing direct access to I-264 for KY 22 and VA Hospital traffic, operations at both the US 42/KY 22 intersection and the I-264/US 42 ramp terminal intersections would be improved.</p> <p><u>EB I-264 On Ramp (toward I-71)</u> A proposed EB ramp meets the criteria for entrance ramp separation on I-264 (1,000 FT separation). A proposed EB ramp could either be designed as a “stand-alone” entrance ramp or as a CD road and tied into EB ramp from US 42. The stand-alone ramp is considered in this recommendation for cost purposes.</p> <p>Assumptions:</p> <ul style="list-style-type: none"> • The ramp would be constructed to go under the existing (or future) EB off-ramp from I-264 to US 42. A review of a conceptual profile indicates the ramp could be constructed with adequate clearance under the existing ramp with the use of MSE walls on both sides of the ramp. Since the off-ramp from EB I-264 is being rebuilt with all of the proposed alternatives, the off-ramp profile could be adjusted to provide additional clearance, if necessary. • In order to provide an additional through lane for KY 22 traffic desiring to utilize I-264, right-of-way (ROW) would be required from the tract on the NE corner of the KY 22/VA Hospital intersection. This ROW would likely require modifications to the existing building to eliminate the drive-thru for the fast food restaurant. • An additional left turn lane would be required for traffic coming out of the VA Hospital. It is assumed these modifications to the proposed plan for the VA Hospital could be easily accommodated and would not require any additional cost to the US 42 project. • Costs are provided for MSE walls although it is possible they may not be needed due to the existing rock conditions. <p><u>WB I-264 On Ramp</u> Assumptions:</p> <ul style="list-style-type: none"> • The proposed ramp from KY 22 to WB I-264 would be constructed to go over the existing (or future) EB off-ramp from I-264 to US 42 and over mainline I-264. Additional MSE walls would also be required due to the close proximity of the two ramps from KY 22 to EB and WB ramps (and the existing slip ramp from EB I-264). • Due to the proximity of this connection to US 42 and the volumes involved, a preliminary evaluation indicates this intersection will require signalization. In order to minimize impact with the signal on US 42, coordination would be required. If this recommendation is considered, the possibility of merging this traffic directly with the WB on-ramp (instead of using a signalized intersection) should be evaluated though there may be issues tapering away the add lane prior to entering westbound I-264. 	

VE RECOMMENDATION VE-4 CREATING EB & WB RAMPS FOR KY 22	Idea No. 36
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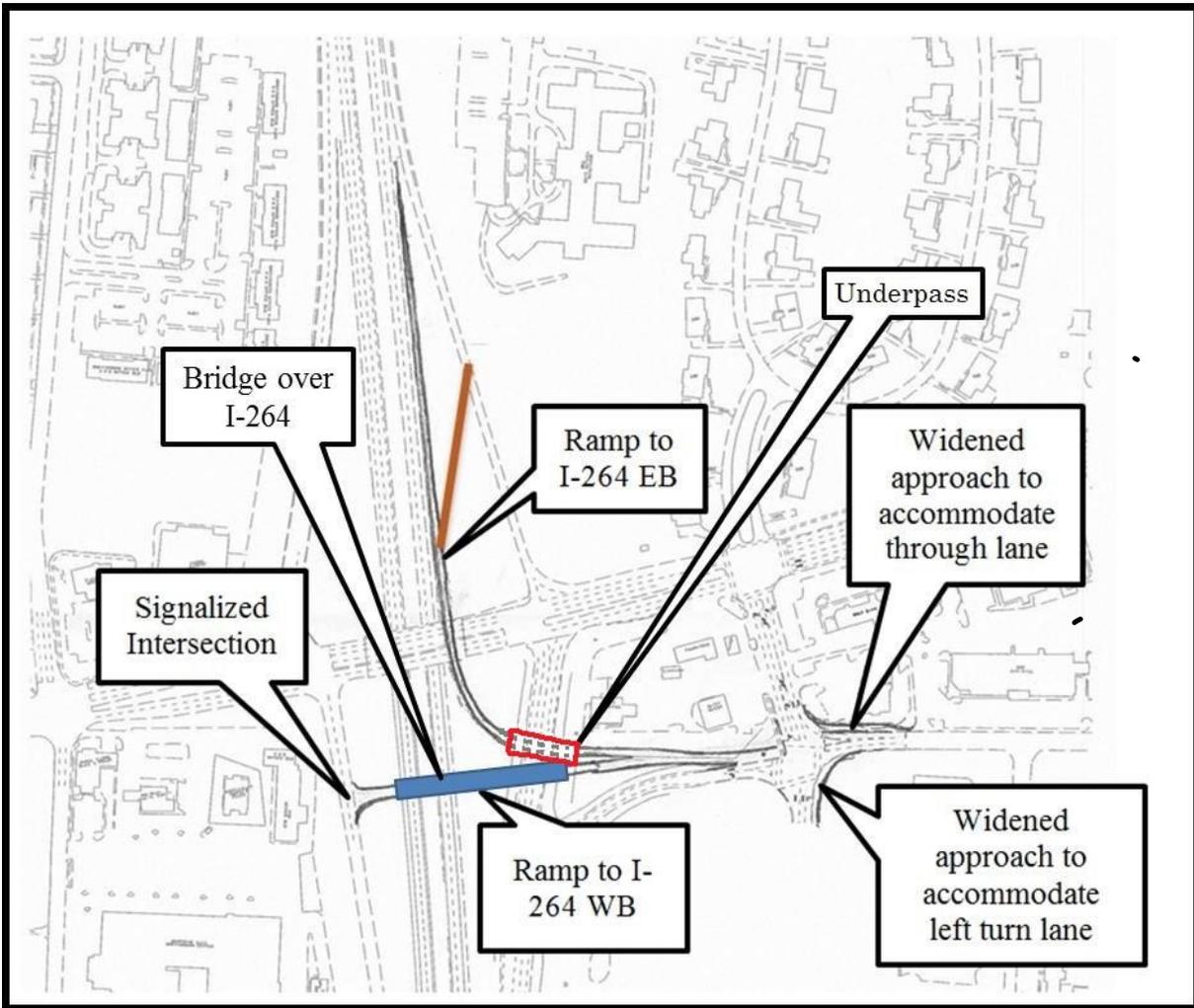


Figure 21: VE-4 Alternative Concept

Cost Estimates

WB Ramp - SPUJ

Item	Unit	Qty	Original Design		Recommended Design		
			Unit Cost	Total	Qty	Unit Cost	Total
Earthwork	CY				30,000	\$10	\$300,000
Pavement	SY				5,000	\$65	\$325,000
Structures -2	LS				1		\$1,100,000
Ret. Walls	SF				8,000	\$75	\$600,000
Guardrail	LF				2,250	\$15	\$33,750
R/W	LS				1		\$400,000
Contingency	LS				1		\$825,000
TOTAL							\$3,583,750

VE RECOMMENDATION VE-4 CREATING EB & WB RAMPS FOR KY 22					Idea No. 36		
<u>WB Ramp - DDI</u>							
Item	Unit	Qty	Original Design		Recommended Design		
			Unit Cost	Total	Qty	Unit Cost	Total
Earthwork	CY				30,000	\$10	\$300,000
Pavement	SY				5,000	\$65	\$325,000
Structures -2	LS				1		\$1,000,000
Ret. Walls	SF				8,000	\$75	\$600,000
Guardrail	LF				2,250	\$15	\$33,750
R/W	LS				1		\$400,000
Contingency	LS				1		\$800,000
TOTAL							\$3,458,750
 <u>EB Ramp</u>							
Item	Unit	Qty	Original Design		Recommended Design		
			Unit Cost	Total	Qty	Unit Cost	Total
Earthwork	CY				12,000	\$ 5	\$ 60,000
Pavement	SY				1,800	\$65	\$117,000
Structures - 2	LS				2		\$875,000
MSE Walls	SF				2,000	\$75	\$150,000
Guardrail	LF				300	\$15	\$ 4,500
Signalization	LS				1		\$120,000
Contingency	LS				1		\$400,000
TOTAL							\$1,726,500

VE RECOMMENDATION VE-4 CREATING EB & WB RAMPS FOR KY 22		Idea No. 36	
PERFORMANCE MEASURES Attributes and Rating Rationale for Proposal	<i>Performance</i>	<i>Baseline</i>	<i>Recommendation</i>
Mainline Operations – I-264 No change to baseline.	<i>Rating</i>	5	5
	<i>Weight</i>		
	<i>Contribution</i>	175	175
Mainline Operations – US 42 Significant improvement in operations along US 42 as traffic from KY 22 heading to I-264 is kept away from US 42.	<i>Rating</i>	5	8
	<i>Weight</i>	20	
	<i>Contribution</i>	100	160
Mainline Operations – KY 22 Significant improvement in operations along US 42 as traffic from KY 22 heading to I-264 is kept away from US 42.	<i>Rating</i>	5	8
	<i>Weight</i>	13	
	<i>Contribution</i>	65	104
Local Assess Significant reduction in network congestion in the project area will enhance local access and mobility.	<i>Rating</i>	5	7
	<i>Weight</i>	6	
	<i>Contribution</i>	30	42
Maintainability Significant increase in structures.	<i>Rating</i>	5	2
	<i>Weight</i>	4	
	<i>Contribution</i>	20	8
Construction Impacts Reconstruction of slip ramp required. Construction of additional alignments both above and below existing SB I-264 off ramp as well as a new structure over I-264.	<i>Rating</i>	5	2
	<i>Weight</i>	5	
	<i>Contribution</i>	25	10

VE RECOMMENDATION VE-4 CREATING EB & WB RAMPS FOR KY 22		Idea No. 36	
Environmental Impacts Minor impacts to properties near the VA entrance.	<i>Rating</i>	5	4.5
	<i>Weight</i>	14	
	<i>Contribution</i>	70	63
Project Schedule Additional construction staging likely required with additional structure over I-264.	<i>Rating</i>	5	4
	<i>Weight</i>	3	
	<i>Contribution</i>	15	12
Total Performance		500	574
Net Change in Performance			15%

VE RECOMMENDATION VE-5 MODIFIED SPUI DESIGN		Idea No. 37		
Baseline				
Single Point Urban Interchange (SPUI) with triple WB left turn lanes and dual left turn lanes for the other left turns.				
Recommendation				
Single Point Urban Interchange with triple southbound left turn lanes (from the westbound I-264 exit ramp) and dual left turn lanes for the all other left turns. A third eastbound receiving lane on US 42 would be added to accommodate the southbound lefts. The additional lane would be dropped at the KY 22 intersection as a dedicated right turn lane.				
Advantages		Disadvantages		
<ul style="list-style-type: none"> Improves operational efficiency of the interchange by providing additional storage on the southbound left turn movement Eliminates triple left turn lanes from WB LT to the WB I-264 on ramp reducing merging issues on the ramp 		<ul style="list-style-type: none"> Does not address failure at US 42/KY 22 intersection 		
Cost Summary		Cost		
Baseline		\$13.99M		
Recommendation		\$13.99M		
Difference		\$0		
FHWA Function Benefit				
<i>Safety</i>	<i>Operations</i>	<i>Environment</i>	<i>Construction</i>	<i>Other</i>
✓	✓			

VE RECOMMENDATION VE-5 MODIFIED SPUI DESIGN	Idea No. 37
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Discussion/Sketches/Photos

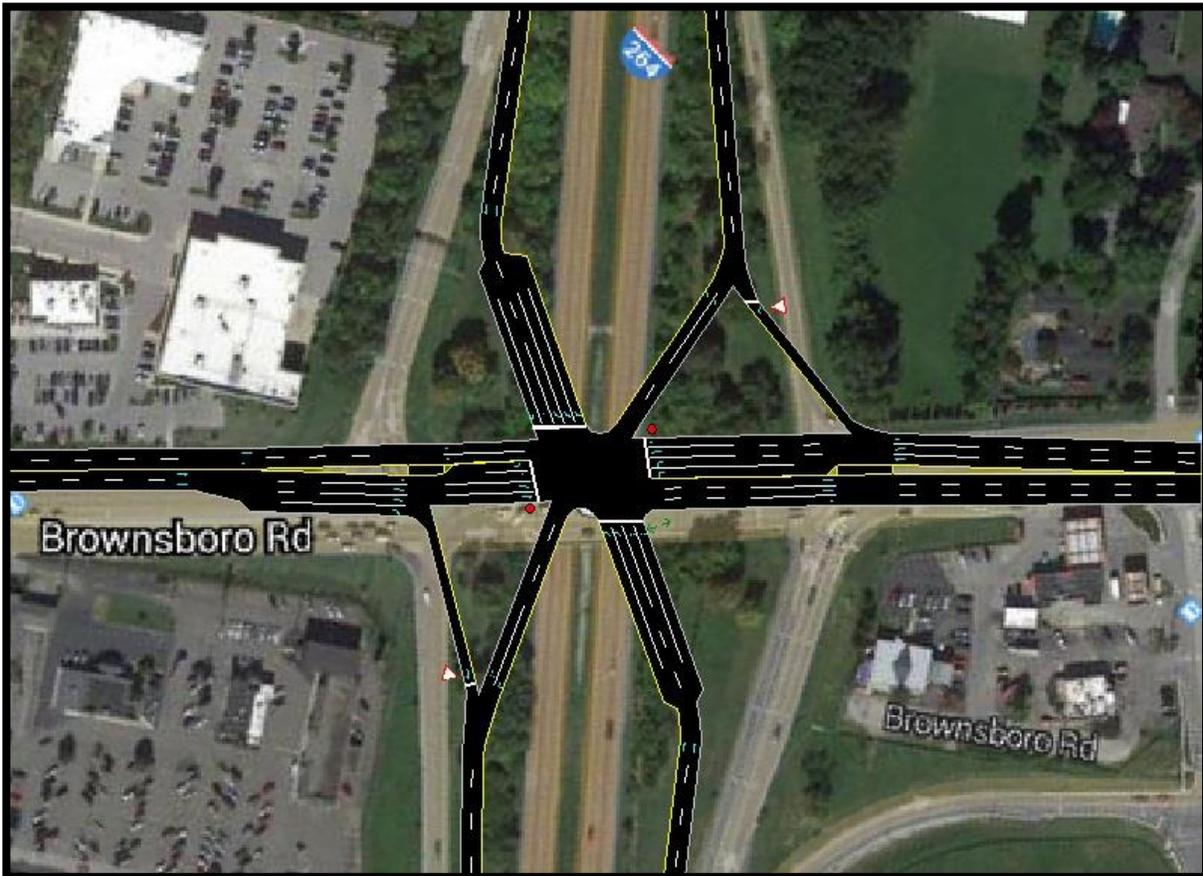


Figure 22: VE-5 Alternative Concept

Note that while this does improve the flow at the SPUI slightly, this recommendation does not address the failure of the intersection at US 42 and KY 22 which will still result in the failure of the corridor. When analyzed in isolation, this recommendation slightly improves the SPUI by increasing the departing throughput eastbound on US 42. Within the overall network, there is no net effect as the critical component of the corridor is left unaddressed.

Triple turn lanes require three receiving lanes. The baseline concept results in three receiving lanes on the northbound I-264 entrance ramp. The recommended concept shifts the triple left turns to allow the three receiving lanes to be utilized to aid in throughput on US 42 as well. As a significant traffic volume turns right onto KY 22, dropping the third EB lane on US 42 as a right turn lane to KY 22 is more prudent than putting three lanes on an entrance ramp and then tapering three lanes down to one.

VE RECOMMENDATION VE-5 MODIFIED SPUI DESIGN		Idea No. 37	
PERFORMANCE MEASURES Attributes and Rating Rationale for Proposal	<i>Performance</i>	<i>Baseline</i>	<i>Recommendation</i>
Mainline Operations – I-264 Reduces queuing potential for southbound left turn off-ramp.	<i>Rating</i>	5	5
	<i>Weight</i>	35	
	<i>Contribution</i>	175	175
Mainline Operations – US 42 Improves EB throughput from the interchange toward KY 2.2	<i>Rating</i>	5	6
	<i>Weight</i>	20	
	<i>Contribution</i>	100	120
Mainline Operations – KY 22 No significant change.	<i>Rating</i>	5	5
	<i>Weight</i>	13	
	<i>Contribution</i>	65	65
Local Assess No significant change.	<i>Rating</i>	5	5
	<i>Weight</i>	6	
	<i>Contribution</i>	30	30
Maintainability No significant change.	<i>Rating</i>	5	5
	<i>Weight</i>	4	
	<i>Contribution</i>	20	20
Construction Impacts No significant change.	<i>Rating</i>	5	5
	<i>Weight</i>	5	
	<i>Contribution</i>	25	25
Environmental Impacts No significant change.	<i>Rating</i>	5	5
	<i>Weight</i>	14	
	<i>Contribution</i>	70	70
Project Schedule No significant change	<i>Rating</i>	5	5
	<i>Weight</i>	3	
	<i>Contribution</i>	15	15
Total Performance		500	520
Net Change in Performance			4%

Design Considerations

In addition to the recommendations above, the VE Team generated a number of ideas that they felt were important enough to be documented and should be further considered by the project team.

Idea-17: Extend Glen Eagle Drive to meet KY 22 at Lime Kiln Lane - One option for connecting KY 22 to US 42 is to extend Glen Eagle Drive to meet KY 22 at Lime Kiln Lane. This option would redirect some of the traffic currently using the US 42/KY 22 intersection. The redistribution of the traffic to two intersections would help to alleviate some of the left turning traffic at the existing US 42/KY 22 intersection and will improve the overall network.

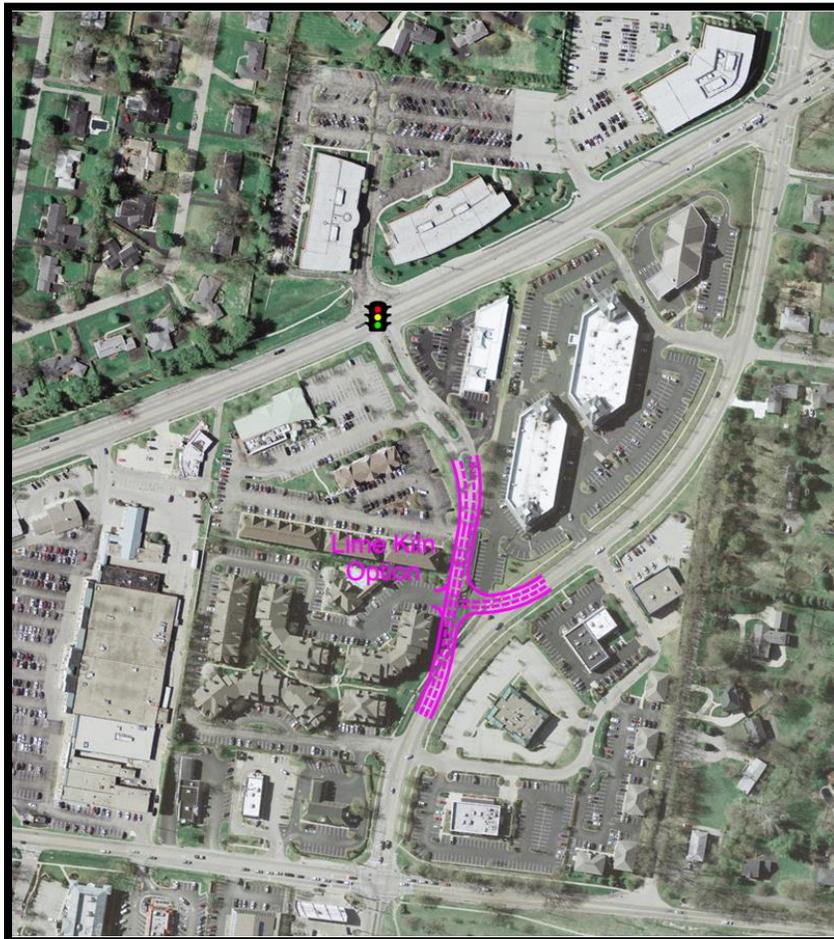


Figure 23: Design Consideration - Idea No. 17

Idea No. 19 - Design ramps to allow for future ramp metering – Ramp metering may be necessary in the future. Adding in the appropriate lane widening and conduit for the future metering now will reduce construction costs when added in the future.

Idea No. 24 - Continue the bicycle lanes through the intersections at US 42 @ Rudy Lane and KY 22 @ US 42 and add merge – This will create a continuous bike lane through the area.

Idea No. 29 - Eliminate the bicycle lanes and have a shared use path - Based on information provided, it is the VE Teams understanding that this option may be used by more people and the short bike lanes through the corridor would probably not be used. It is our understanding that bike lanes are rarely

swept so because of debris, experienced cyclists would just take the travel lane anyway. An 8 FT path on each side could be justified (rather than 10 FT). This actually could be a cost savings to the project.

Idea No. 31 - Asymmetric partially splintered DDI - Move the diverge point for the I-71 interchange to the minimum distance downstream of the EB I-264 exit gore to US 42. This will put the I-71 diverge point, somewhere beneath the US 42 bridge (this will require lengthening of the eastern span). Braid the US 42 entrance ramp to EB I-264 over one of the ramps to I-71 and land the entrance ramp from US 42 between the two ramps to I-71. Allow a split on the US 42 entrance ramp right and left to allow access from US 42 to either I-71 ramp. This concept provides full access to either direction of I-71 and eliminates the weave entirely. The concept will also be compatible with future system improvements including the switching of right/left to the different directions of I-71.

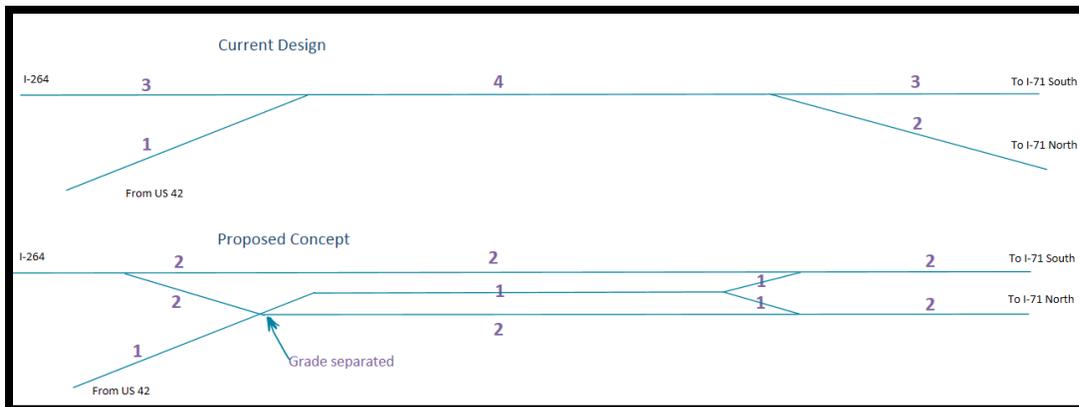


Figure 24: Design Consideration – Idea No. 31

Idea No. 35 - Undertake a review (either internal or external) of the VISSIM Modelling for the 2040 through traffic volumes from the VA site to the US 42 @ KY 22 intersection - The VE Team recommends revisiting the volume balancing that occurred during the post processing of the travel demand model. The critical element within the project area is the intersection of US 42 and KY 22. The most critical movement at this intersection is the south approach of the US 42/KY 22 intersection.

There is a significant disparity in the volume NB on KY 22. The south leg at US 42 has 465 vph less than the north leg of the KY 22/Slip ramp intersection. While we recognize that these volumes need not match exactly, the significant drop in NB traffic on such a short segment should be revisited. See **Figures 25 & 26**. It appears likely that the traffic exiting the VA site heading NB was not added into the volume at US 42/KY 22. We suspect that the WBR at the KY 22/Slip Ramp intersection has a typographical error and the 20 vph should be 990 vph. This correction does not impact the earlier statement.

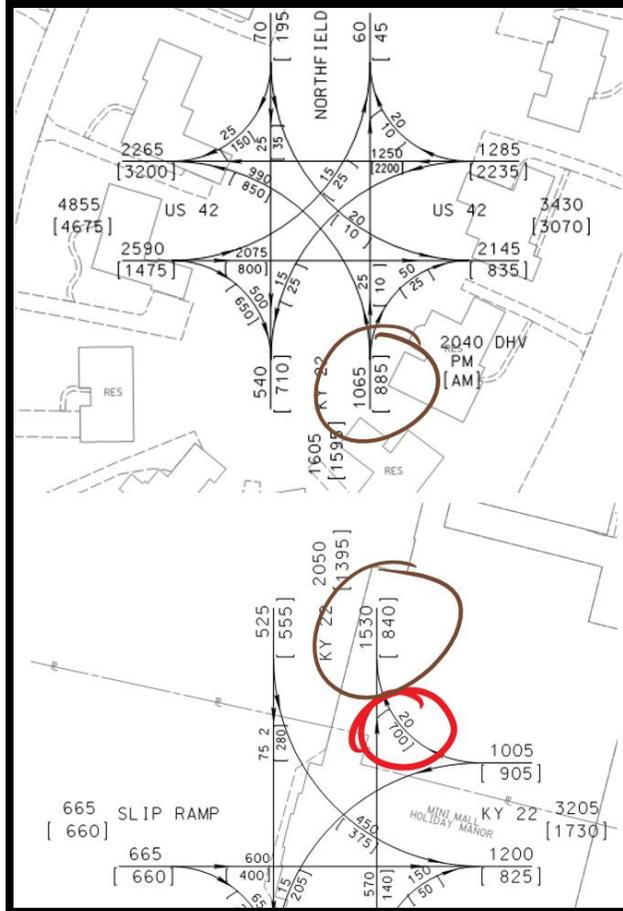


Figure 25: Design Consideration – Idea No. 35

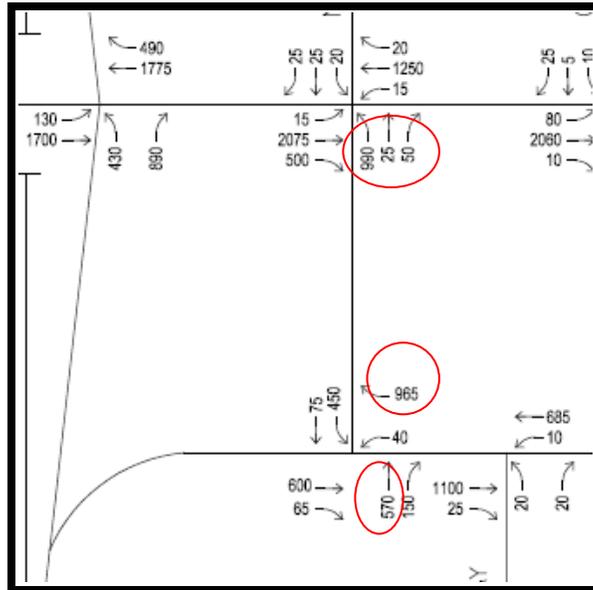


Figure 26: Design Consideration – Idea No. 35

Appendix A. Study Participants

					VE Study Attendees <i>Jefferson County I-264/US 42 Interchange and I-264 Widening</i>				
December 2014					NAME	ORGANIZATION	POSITION/DISCIPLINE	TELEPHONE	CELL
8	9	10	11	12				E-MAIL	
				✓	Asher, Jill	KYTC			
								jill.asher@ky.gov	
✓	✓	✓	✓	✓	Bailey, Kevin	KYTC	Construction		
								kevin.bailey@ky.gov	
✓	✓	✓	✓	✓	Broadus, John	HDR	Structures	502.909.3254	
								john.broadus@hdrinc.com	
				✓	Brown, Robert	KYTC			
								robertf.brown@ky.gov	
				✓	Bullock, Matt	KYTC	D5		
								matt.bullock@ky.gov	
✓	✓	✓	✓	✓	Cochran, Joe	HDR	Roadway	859.629.4836	
								joe.cochran@hdrinc.com	
				✓	Dadi, Biratu	URS			
								biratu.dadi@urs.com	
				✓	Damron, Kevin	Palmer			
								kdamron@palmernet.com	
✓	✓	✓	✓	✓	Dow, Tammy	HDR	VE Team Leader	289.695.4673	
								tammy.dow@hdrinc.com	

 KENTUCKY TRANSPORTATION CABINET					VE Study Attendees <i>Jefferson County I-264/US 42 Interchange and I-264 Widening</i>					
December 2014					NAME	ORGANIZATION	POSITION/DISCIPLINE	TELEPHONE	CELL	
8	9	10	11	12				E-MAIL		
				✓	Gulick, Bill	KYTC			bill.gulick@ky.gov	
		✓	✓		Holt, Nathan	HDR	Roadway	859.629.4894		nathan.holt@hdrinc.com
✓	✓	✓	✓	✓	Kirk, Adam	KTC	Traffic			adam.kirk@uky.gov
✓	✓		✓	✓	Lee, David	HDR	Traffic	502.909.3255		david.lee@hdrinc.com
✓				✓	Lindeman, David	Palmer				dlindeman@palmernet.com
✓				✓	Meade, Brian	URS		502.322.8453		brian.meade@urs.com
✓				✓	Meyer, Kelly	HDR		502.909.3257		Kelly.meyer@hdrinc.com
				✓	McLain, Ashley	Palmer		859.744.1218		amclain@palmernet.com
✓	✓	✓		✓	Norman, Anthony	KYTC				anthony.norman@ky.gov
✓	✓	✓	✓	✓	Russell, Shawn	KYTC	Construction	502.782.4926		shawn.russell@ky.gov

					VE Study Attendees <i>Jefferson County I-264/US 42 Interchange and I-264 Widening</i>					
										December 2014
8	9	10	11	12	E-MAIL					
✓					Sawyer, Karl	Palmer		502.491.2411		ksawyer@palmernet.com
✓	✓	✓		✓	Siromaskul, Smith	HDR	Interchange		503.449.1524	smith.siromaskul@hdrinc.com
✓	✓	✓		✓	Sweger, Brent	KYTC		502.782.4912		brent.sweger@ky.gov
				✓	Thomas, Mitch	URS				mitch.thomas@urs.com
✓				✓	Thompson, Travis	KYTC	Project Manager	502.210.5481		travis.thompson@ky.gov
				✓	West, John	KYTC	D5 Team	502-210-5473		jonathan.west@ky.gov
				✓	Witt, Thomas	KYTC				thomas.witt@ky.gov

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Appendix B. Pareto Cost Models

The VE Team leader prepared a cost model from the cost estimate, which was provided by the project team. The model was organized to identify major construction elements or trade categories, the designer’s estimated costs, and the percent of total project cost for the significant cost.

Table 4: Cost Model – Baseline Concept

Cost Item	Cost	Cumulative (%)	% of Total
I-264 Contingency (30%)	\$5,932,127	13.1%	13.1%
Alt. 1 SPUI New Bridge	\$5,500,000	12.2%	25.3%
I-264 Pavement - Class 4 Asphalt Base 1.5OD PG64-22	\$5,166,800	11.4%	36.7%
I-264 Rail Sys Sound Barrier	\$4,140,000	9.2%	45.9%
US 42 Right of Way (5-804.00)	\$3,581,000	7.9%	53.8%
Alt. 1 SPUI Contingency (30%)	\$3,229,512	7.1%	60.9%
I-264 Pavement	\$2,476,405	5.5%	66.4%
I-264 Widening Noise Barrier	\$2,060,280	4.6%	70.9%
Alt. 1 Pavement Class 3 Asphalt Base 1.5OD PG64-22	\$1,726,520	3.8%	74.8%
I-264 Concrete Median Barrier	\$1,625,000	3.6%	78.3%
Alt. 1 SPUI Pavement	\$1,591,925	3.5%	81.9%
Alt. 1 SPUI Roadway	\$1,294,125	2.9%	84.7%
I-264 Drainage	\$1,106,810	2.4%	87.2%
I-264 Right of Way (5-594.00)	\$966,000	2.1%	89.3%
I-264 Remove Sound Barrier	\$795,000	1.8%	91.1%
Utility Estimate (5-594/5-804)	\$655,000	1.4%	92.5%
I-264 Widening Roadway	\$651,961	1.4%	94.0%
I-264 Mobilization	\$567,668	1.3%	95.2%
I-264 Bridge Over Ramp 3 & 5 (Widen)	\$500,000	1.1%	96.3%
I-264 Interstate Lighting in Median	\$400,000	0.9%	97.2%
Rudy Lane Estimate	\$328,532	0.7%	97.9%
Alt. 1 SPUI Mobilization	\$309,044	0.7%	98.6%
I-264 Demobilization	\$283,834	0.6%	99.2%
Alt. 1 SPUI Drainage	\$188,905	0.4%	99.7%
Alt. 1 SPUI Demobilization	\$154,522	0.3%	100.0%

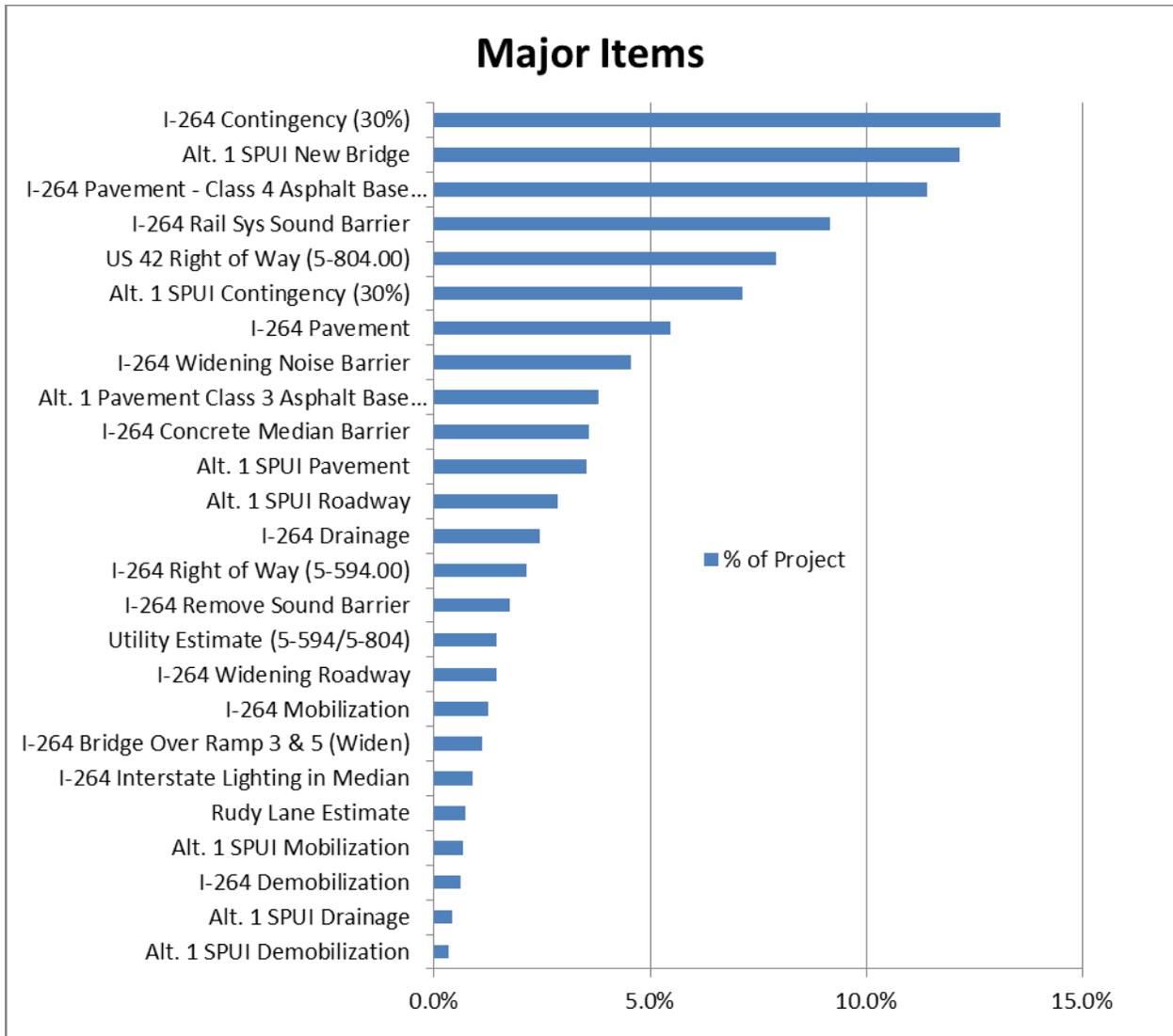


Figure 27: Cost Model

Appendix C. Function Analysis

Function analysis results in a unique view of the study project. It transforms project elements into functions, which moves the VE Team mentally away from the original design and takes it toward a functional concept of the project.

Functions are defined in verb-noun statements to reduce the needs of the project to their most elemental level. Identifying the functions of the major design elements of the project allows a broader consideration of alternative ways to accomplish the functions.

FAST Diagram

The Functional Analysis System Technique (FAST) diagram arranges the functions in logical order so that when read from left to right; the functions answer the question “How?” If the diagram is read from right to left, the functions answer the question “Why?” Functions connected with a vertical line are those that happen at the same time as, or are caused by, the function at the top of the column.

The FAST diagram (**Figure 27**) provided the VE Team with an understanding of which functions offer the best opportunity for cost or performance improvement. The FAST Diagram for this project shows that “Improve Operations” is the basic function (i.e. the primary reason for the project). The key secondary functions include “Reduce Delay”, “Increase Capacity”, “Accommodate Multi-Modal” and “Reduce Conflicts”.

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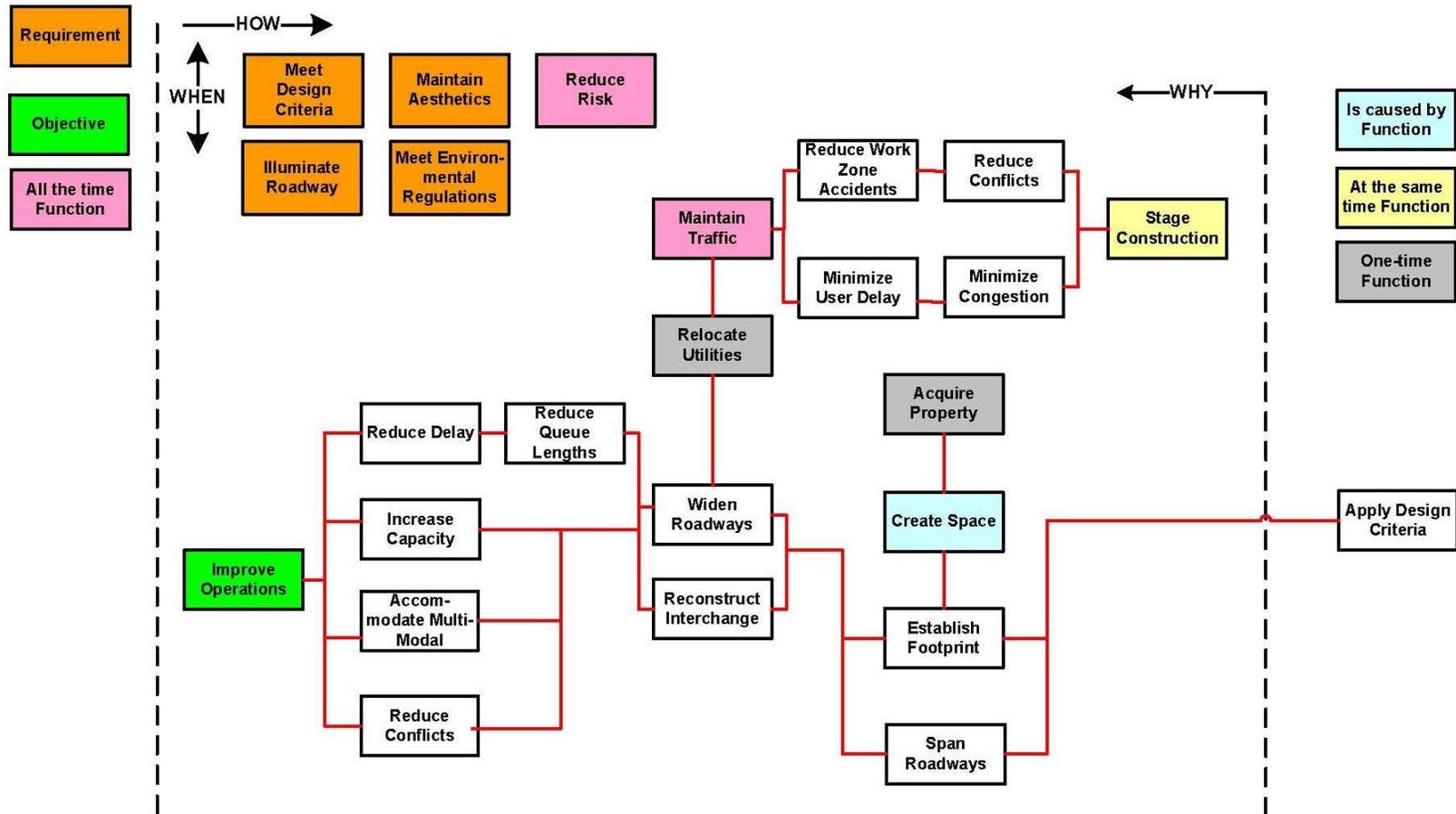


Figure 27: Functional Analysis System Technique (FAST) Diagram

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Appendix D. Creative List and Evaluation

During the Creative Phase the VE Team, as a group, generated ideas on how to perform the function “Improve Operations”. All of the ideas generated were recorded in **Table 5**, below. The final disposition of each idea is included at the end of this Appendix.

Table 5: Creative Idea List

Idea No.	Description
Item: I-264, US 42, KY 22	
Function: Improve Operations	
1.	DDI Alternative with creating a northbound on-ramp from KY 22 (go under the existing ramps)
2.	DDI Alternative with two lanes out of the spur and tie into the middle and left lane of the northbound off ramp left turn
3.	Modified Turbine
4.	Improved cross connection between US 42 and KY 22 (Keeping signal at US 42/KY 22 and provide a new signalized intersection at US 42 and the green strip near the shopping center)
5.	Alternative 2 Modification
6.	Flyover for KY 22 left turn over I-264 to connect with westbound I-264 with the SPUI
7.	SPUI with westbound US 42 to westbound I-264 as a flyover
8.	Partially Splintered DDI
9.	At grade flyover ramp for westbound left turns
10.	Rotary Interchange with signals at US 42/KY 22 and US 42/Rudy Lane
11.	Drop lane for US 42 to westbound I-264 on ramp traffic before Westport Road Interchange
12.	Connect KY 22 to US 42 on new alignment and make US 42 and the new connection one-way between Rudy Lane and KY 22 intersections
13.	Create new connection from KY 22 and US 42
14.	Align Glenview with the shopping center intersection and eliminate Northfield entrance
15.	Offset single point interchange
16.	Split diamond with one-way streets
17.	Extend Glen Eagle Drive to meet KY 22 at Lime Kiln Lane
18.	KY 22 extension to westbound I-264 on ramp and westbound dual lefts at US 42 /KY 22
19.	Design ramps to allow for future ramp metering
20.	12-foot two-way left turn lane widths
21.	Eliminate the eastbound auxiliary lane on I-264 between Westport and US 42 interchanges
22.	Partial Echelon Interchange

Idea No.	Description
23.	Partial Echelon Interchange with KY 22 extension to westbound I-264
24.	Continue the bicycle lanes through the intersections at US 42/Rudy Lane and US 22/KY 22 and add merge
25.	Eliminate one lane of the westbound triple left-turn lanes on the SPUI and add one eastbound through lane (total of 3 EB through lanes)
26.	Flatten the curves for the SPUI ramps
27.	RIRO at Northfield Drive
28.	Multi-use path on the north side from the shopping center to Rudy lane along US 42
29.	Eliminate the bicycle lanes and have a shared use path
30.	Drop third through lane on eastbound I-264 at the split to I-71
31.	Asymmetrical partial splintered TDI
32.	Drop third through lane on I-264 at the split to I-71 and not have the full auxiliary lane to the ramp and only a one lane to northbound I-71 (interim solution)
33.	Idea 3 Modified
34.	Modified Echelon
35.	Undertake a review (either internal or external) of the VISSIM Modelling for the 2040 through traffic volumes from the VA site to the US 42/KY 22 intersection
36.	Adding I-264 EB and WB on ramps for KY 22
37.	Alt. 1 SPUI Modifications

Idea Evaluation

Although each project is different, the evaluation process for each VE effort can be thought of in its simplest form as a way of combining, evaluating, and narrowing ideas until the VE Team agrees on the recommendations to be forwarded. **Figure 28** depicts the typical information flow for the VE process.

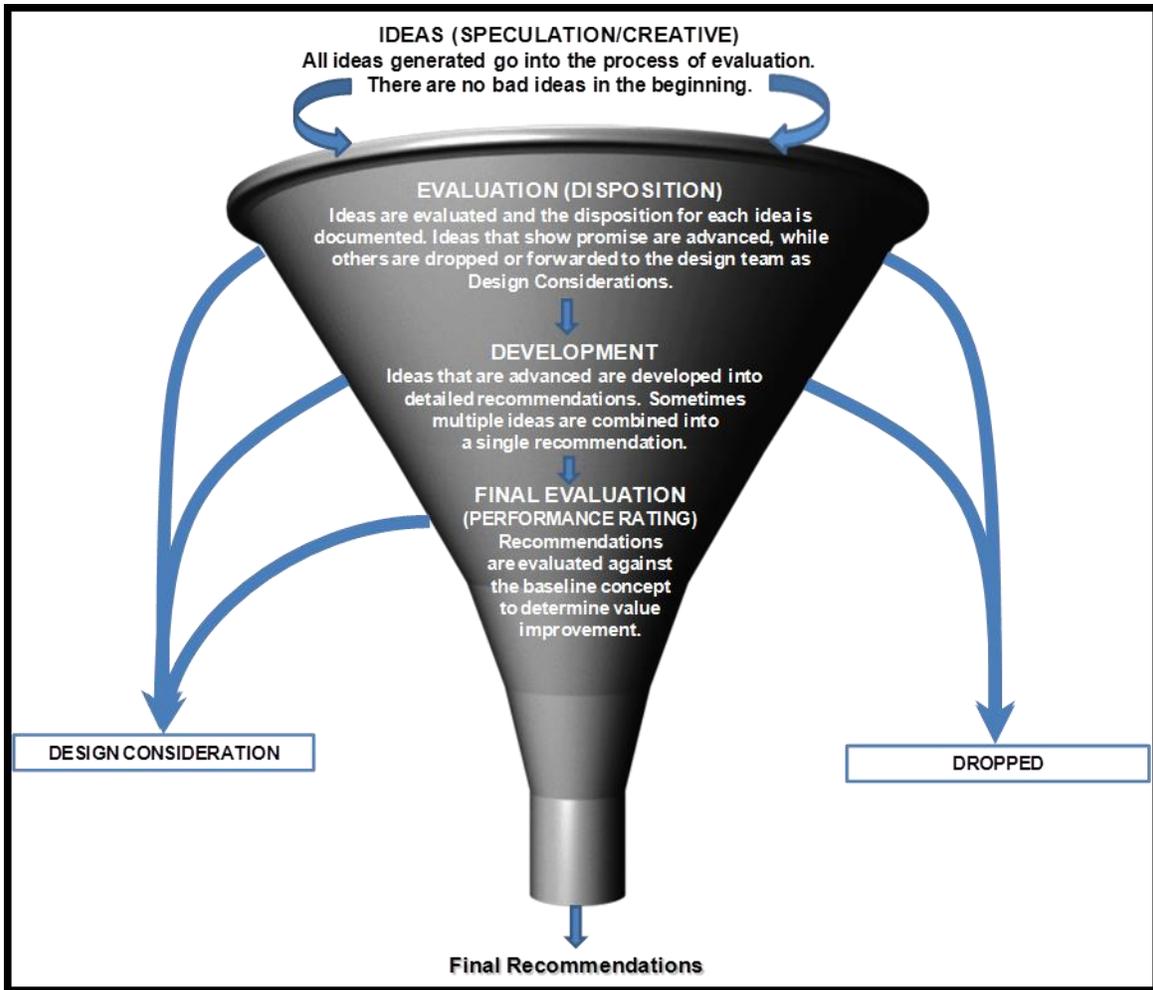


Figure 28: VE Process Information Flow

Evaluation Process

A tiered evaluation process was used to evaluate the ideas generated by the VE Team. The process involves an initial ranking of the idea using a “Gut Feel Index” which takes into consideration the constraints, controlling decisions and the advantages and disadvantages based on their relationships to the original concept.

Each idea was then carefully evaluated, with the VE Team reaching consensus on the overall ranking of the idea (ranking values 1 through 5, as defined below).

- 5 = Great Opportunity
- 4 = Good Opportunity
- 3 = Design Consideration (comparable to project team’s approach)
- 2 = Minor Value Degradation
- 1 = Major Value Degradation
- 0 = Withdrawn (unacceptable impact, doesn’t meet the project purpose and need, or is already a design requirement)

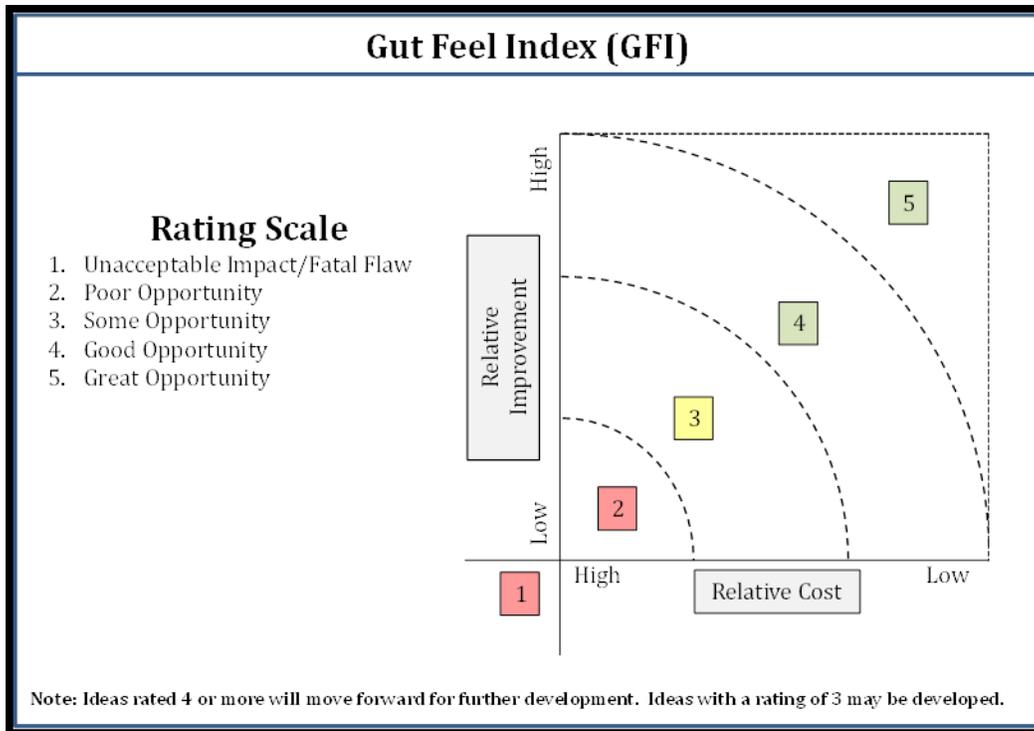


Figure 29: Gut Feel Index (GFI)

This ranking resulted in the initial disposition of the idea. High-ranked ideas (those ranked 3.5 or higher) were developed further; low-ranked ones (those ranked two or lower) were dropped from further consideration; and those that were considered to be equivalent to the baseline (ranked three) were documented as design considerations.

The initial ranking of the ideas can be found in the following evaluation forms.

Idea Evaluation

Item: I-264, US 42, KY 22 and local access

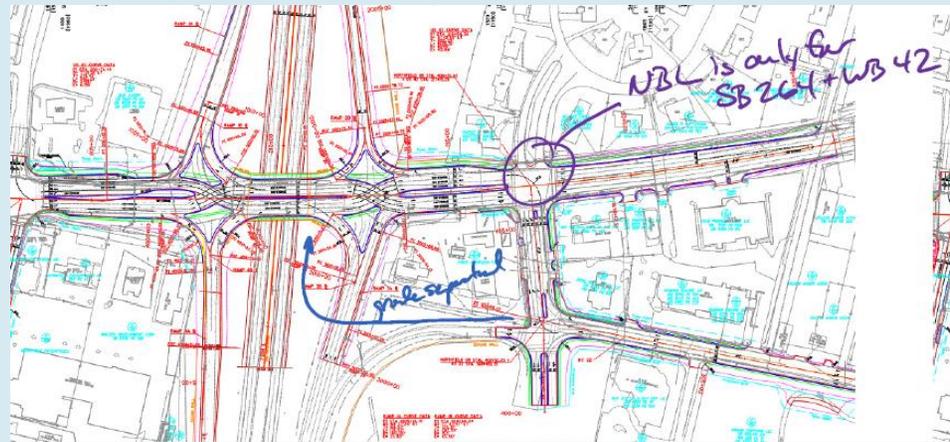
Function: Improve Operations

Idea Number	Description		Advantages			Disadvantages	
1	DDI Alternative with creating a northbound on-ramp from KY 22 (go under the existing ramps)		<ul style="list-style-type: none"> Improves operations at the US 42/KY 22 intersection Improves KY 22 and US 42 operations 			<ul style="list-style-type: none"> Increased cost due to one additional bridge, retaining walls Increase length of US 42 bridge 	
Mainline Operations (I-264)	Mainline Operations (US 42)	Mainline Operations (KY 22)	Local Access	Maintainability	Construction Impacts	Environmental Impacts	Project Schedule
↔	↑	↑	↔	↓	↓	↔	↔

Justification/Comments/Disposition:

Rating: 4

This idea was developed with Idea 5.



Ranking Scale:

5 = Great Opportunity

4 = Good Opportunity

3 = Design Consideration

(comparable to project team's approach)

2 = Minor value degradation

1 = Major value degradation

0 = Withdrawn (unacceptable impact, doesn't meet purpose and need, or is already a design requirement)

Green = Advanced as recommendation

Yellow = Forwarded as design consideration

Red = Dropped from future consideration

Performance Attributes: ↑ Improvement, ↔ No change, ↓ Degradation

Idea Number	Description		Advantages			Disadvantages	
2	DDI Alternative with two lanes out of the spur and tie into the middle and left lane of the eastbound off ramp left turn		<ul style="list-style-type: none"> • Significant reduction in US 42/KY 22 northbound left turn volumes • Reduces the number of signals for the KY 22 to eastbound I-264 movement 			<ul style="list-style-type: none"> • Does not meet driver expectancy 	
<i>Mainline Operations (I-264)</i>	<i>Mainline Operations (US 42)</i>	<i>Mainline Operations (KY 22)</i>	<i>Local Access</i>	<i>Maintainability</i>	<i>Construction Impacts</i>	<i>Environmental Impacts</i>	<i>Project Schedule</i>
↔	↑	↑	↔	↓	↔	↔	↔
<i>Justification/Comments/Disposition:</i>							

Ranking Scale: 5 = Great Opportunity
 4 = Good Opportunity
 3 = Design Consideration (comparable to project team's approach)

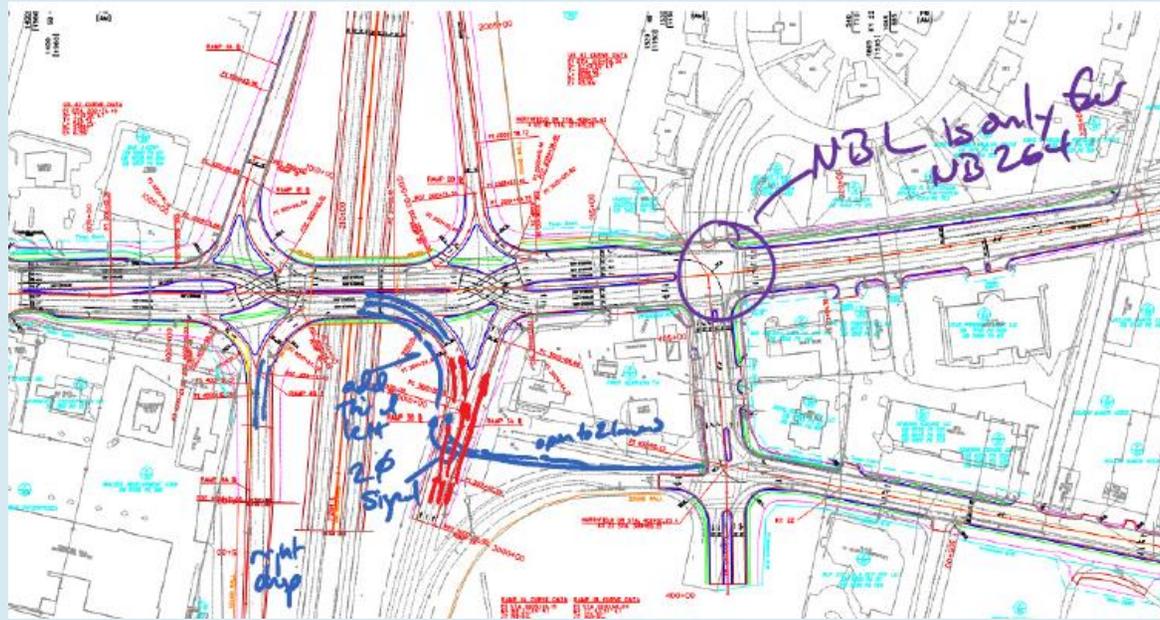
2 = Minor value degradation
 1 = Major value degradation
 0 = Withdrawn (unacceptable impact, doesn't meet purpose and need, or is already a design requirement)

■ = Advanced as recommendation
 ■ = Forwarded as design consideration
 ■ = Dropped from future consideration

Performance Attributes: ↑ Improvement, ↔ No change, ↓ Degradation

Rating: 4

This idea was developed with Idea 5.



Ranking Scale: 5 = Great Opportunity
 4 = Good Opportunity
 3 = Design Consideration
 (comparable to project team's approach)

2 = Minor value degradation
 1 = Major value degradation
 0 = Withdrawn (unacceptable impact, doesn't meet purpose and need, or is already a design requirement)

■ = Advanced as recommendation
 ■ = Forwarded as design consideration
 ■ = Dropped from future consideration

Performance Attributes: ↑ Improvement, ↔ No change, ↓ Degradation

Idea Number	Description		Advantages			Disadvantages	
3	Modified Turbine		<ul style="list-style-type: none"> Operational improvement Improves MOT Fewer construction phases Better operations for traffic during construction 			<ul style="list-style-type: none"> Increased signal maintenance Circuitous movement for EB US 42 	
Mainline Operations (I-264)	Mainline Operations (US 42)	Mainline Operations (KY 22)	Local Access	Maintainability	Construction Impacts	Environmental Impacts	Project Schedule
↔	↔	↑	↔	↓	↑	↓	↑
<i>Justification/Comments/Disposition:</i>							

Ranking Scale: 5 = Great Opportunity
 4 = Good Opportunity
 3 = Design Consideration (comparable to project team's approach)

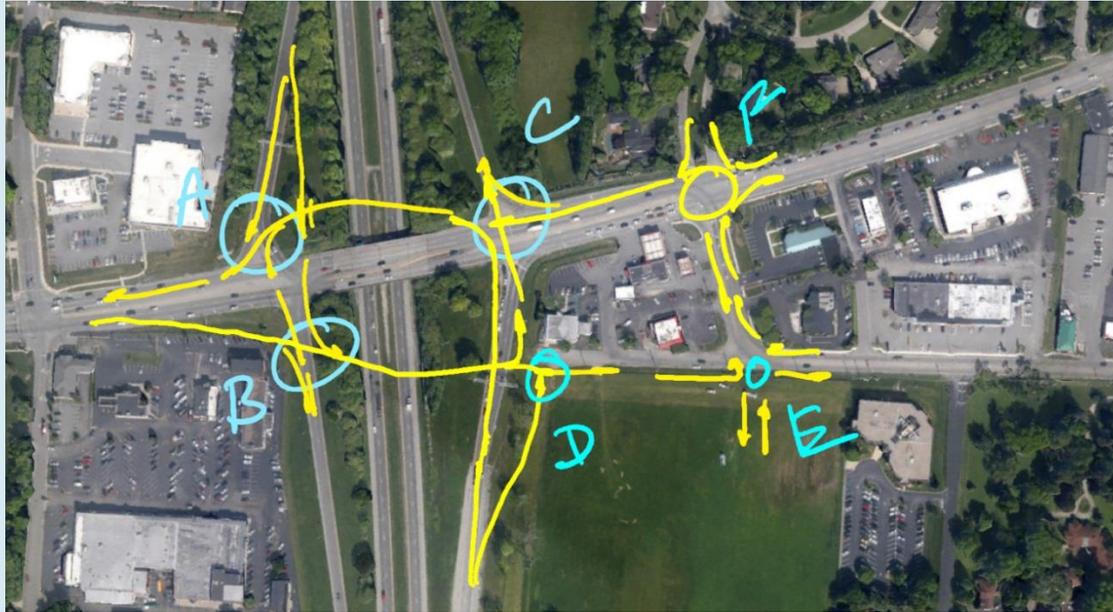
2 = Minor value degradation
 1 = Major value degradation
 0 = Withdrawn (unacceptable impact, doesn't meet purpose and need, or is already a design requirement)

■ = Advanced as recommendation
■ = Forwarded as design consideration
■ = Dropped from future consideration

Performance Attributes: ↑ Improvement, ↔ No change, ↓ Degradation

Rating: 2

After review, the VE Team preferred Idea No. 33 to this alternative.



Ranking Scale: 5 = Great Opportunity
 4 = Good Opportunity
 3 = Design Consideration
 (comparable to project team's approach)

2 = Minor value degradation
 1 = Major value degradation
 0 = Withdrawn (unacceptable impact, doesn't meet purpose and need, or is already a design requirement)

■ = Advanced as recommendation
 ■ = Forwarded as design consideration
 ■ = Dropped from future consideration

Performance Attributes: ↑ Improvement, ⇔ No change, ↓ Degradation

Idea Number	Description		Advantages			Disadvantages	
4	Improved cross connection between US 42 and KY 22 (Keeping signal at US 42/KY 22 and provide a new signalized intersection at US 42 and the green strip near the shopping center)		<ul style="list-style-type: none"> Removes volumes from the US 42/KY 22 intersection Puts traffic into queues for westbound earlier Improves operations 			<ul style="list-style-type: none"> Increased costs due to utilities in this location Property would be required 	
Mainline Operations (I-264)	Mainline Operations (US 42)	Mainline Operations (KY 22)	Local Access	Maintainability	Construction Impacts	Environmental Impacts	Project Schedule
↔	↑	↑	↑	↔	↔	↓	↔

Justification/Comments/Disposition:

Rating: 4.5

After review, the VE Team preferred Idea No. 17 to this alternative.



Ranking Scale:

5 = Great Opportunity

4 = Good Opportunity

3 = Design Consideration

(comparable to project team's approach)

2 = Minor value degradation

1 = Major value degradation

0 = Withdrawn (unacceptable impact, doesn't

meet purpose and need, or is already a design requirement)

Green = Advanced as recommendation

Yellow = Forwarded as design consideration

Red = Dropped from future consideration

Performance Attributes: ↑ Improvement, ↔ No change, ↓ Degradation

Idea Number	Description		Advantages			Disadvantages	
5	Ideas No. 1 and 2 combined and the northbound left is eliminated		<ul style="list-style-type: none"> Improves operations at the US 42/KY 22 intersections Improves KY 22 and US 42 operations 			<ul style="list-style-type: none"> Increased cost due to one additional bridge, retaining walls Increase length of US 42 bridge 	
Mainline Operations (I-264)	Mainline Operations (US 42)	Mainline Operations (KY 22)	Local Access	Maintainability	Construction Impacts	Environmental Impacts	Project Schedule
↔	↑	↑	↔	↓	↔	↔	↔

Justification/Comments/Disposition:

Rating: 4	
-----------	--

Ranking Scale: 5 = Great Opportunity 2 = Minor value degradation
 4 = Good Opportunity 1 = Major value degradation
 3 = Design Consideration 0 = Withdrawn (unacceptable impact, doesn't meet purpose and need, or is already a design requirement)
 (comparable to project team's approach)

= Advanced as recommendation
 = Forwarded as design consideration
 = Dropped from future consideration

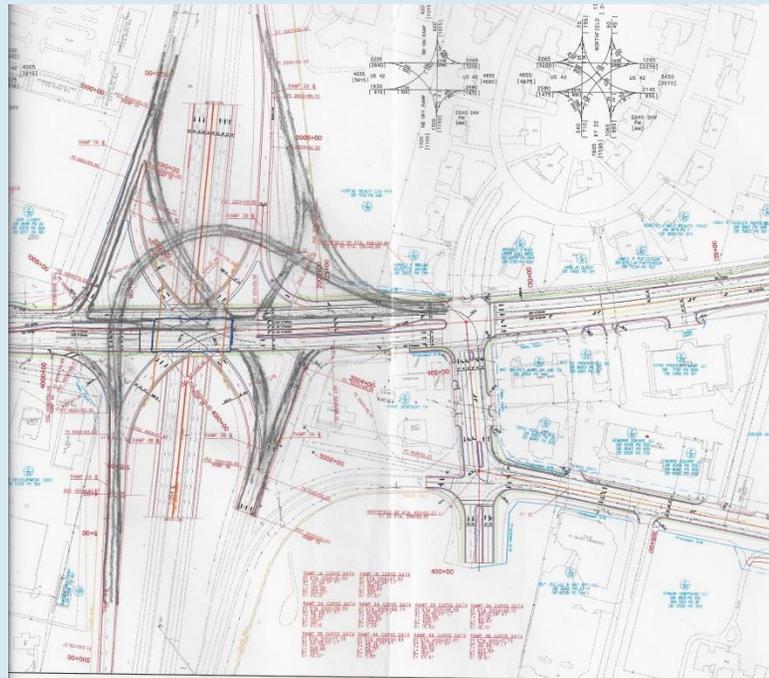
Performance Attributes: ↑ Improvement, ↔ No change, ↓ Degradation

Value Engineering Study Report
 Jefferson County I-264/US 42 Interchange and I-264 Widening

Idea Number	Description		Advantages			Disadvantages	
6	Flyover for KY 22 left turn over I-264 to connect with westbound I-264 with the SPUI		<ul style="list-style-type: none"> Improves operations along US 42 and KY 22 			<ul style="list-style-type: none"> 	
Mainline Operations (I-264)	Mainline Operations (US 42)	Mainline Operations (KY 22)	Local Access	Maintainability	Construction Impacts	Environmental Impacts	Project Schedule

Justification/Comments/Disposition:

Rating: 2



Ranking Scale:

5 = Great Opportunity

4 = Good Opportunity

3 = Design Consideration

(comparable to project team's approach)

2 = Minor value degradation

1 = Major value degradation

0 = Withdrawn (unacceptable impact, doesn't meet purpose and need, or is already a design requirement)

■ = Advanced as recommendation

■ = Forwarded as design consideration

■ = Dropped from future consideration

Performance Attributes: ↑ Improvement, ↔ No change, ↓ Degradation

Idea Number	Description		Advantages			Disadvantages	
7	SPUI with westbound US 42 to westbound I-264 as a flyover		•			•	
Mainline Operations (I-264)	Mainline Operations (US 42)	Mainline Operations (KY 22)	Local Access	Maintainability	Construction Impacts	Environmental Impacts	Project Schedule
<i>Justification/Comments/Disposition:</i>							
Rating: 2	This alternative will operate similar to Alternative 3 Flyover.						

Ranking Scale: 5 = Great Opportunity
 4 = Good Opportunity
 3 = Design Consideration
 (comparable to project team's approach)

2 = Minor value degradation
 1 = Major value degradation
 0 = Withdrawn (unacceptable impact, doesn't meet purpose and need, or is already a design requirement)

■ = Advanced as recommendation
 ■ = Forwarded as design consideration
 ■ = Dropped from future consideration

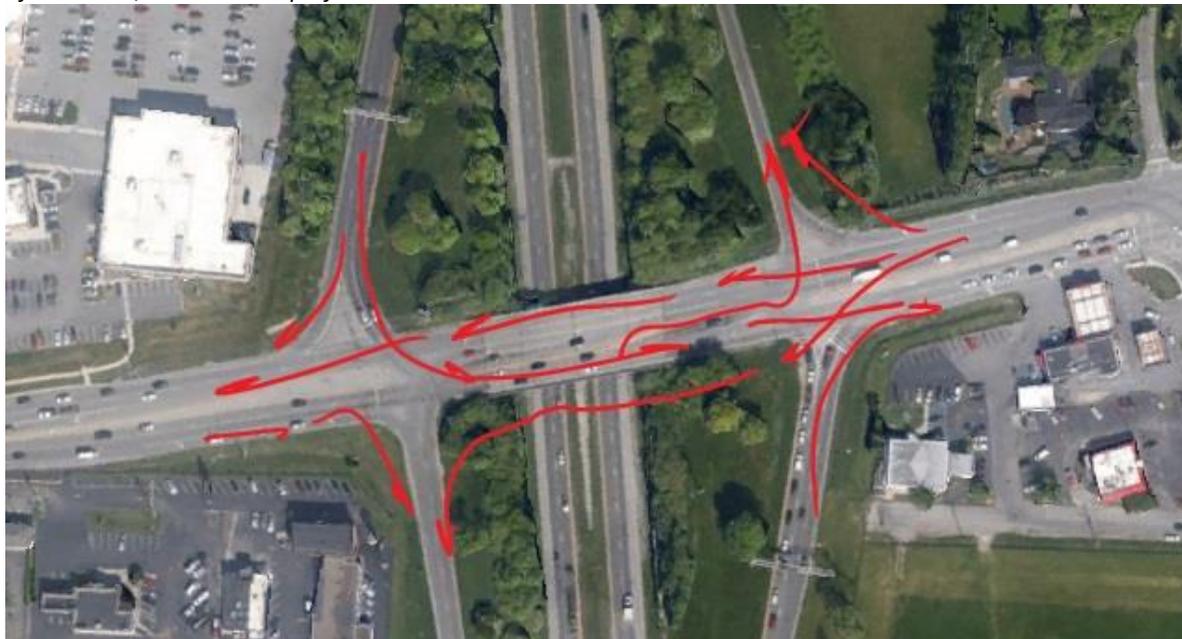
Performance Attributes: ↑ Improvement, ↔ No change, ↓ Degradation

Idea Number	Description		Advantages			Disadvantages	
8	Partially Splintered DDI		<ul style="list-style-type: none"> Improves operations over the SPUI Simplified bridge geometry 			<ul style="list-style-type: none"> Left turn queue storage is pushed closer to the interchange 	
Mainline Operations (I-264)	Mainline Operations (US 42)	Mainline Operations (KY 22)	Local Access	Maintainability	Construction Impacts	Environmental Impacts	Project Schedule
↔	↑	↔	↔	↔	↔	↔	↔

Justification/Comments/Disposition:

Rating: 4

After review, the VE Team preferred Idea No. 5 to this alternative.



Ranking Scale:

5 = Great Opportunity

4 = Good Opportunity

3 = Design Consideration

(comparable to project team's approach)

2 = Minor value degradation

1 = Major value degradation

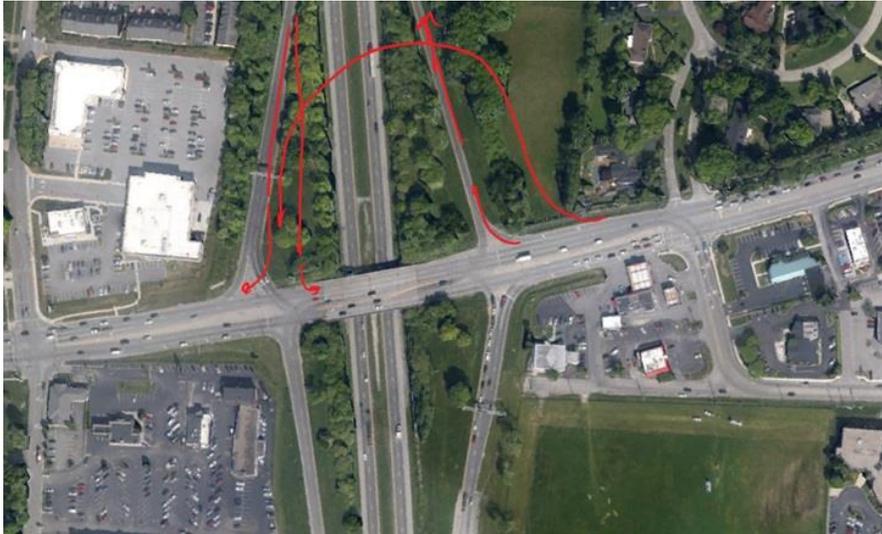
0 = Withdrawn (unacceptable impact, doesn't meet purpose and need, or is already a design requirement)

■ = Advanced as recommendation

■ = Forwarded as design consideration

■ = Dropped from future consideration

Performance Attributes: ↑ Improvement, ↔ No change, ↓ Degradation

Idea Number	Description		Advantages			Disadvantages	
9	At grade flyover ramp for westbound left turns		<ul style="list-style-type: none"> Reduces conflicts for westbound left turns Improves operations 			<ul style="list-style-type: none"> Additional structures Increase cost Increase ROW 	
Mainline Operations (I-264)	Mainline Operations (US 42)	Mainline Operations (KY 22)	Local Access	Maintainability	Construction Impacts	Environmental Impacts	Project Schedule
↔	↑	↔	↔	↓	↓	↓	↔
Justification/Comments/Disposition:							
Rating: 0	<p>Upon further development, this idea cannot be accomplished geometrically.</p> 						

Ranking Scale: 5 = Great Opportunity
 4 = Good Opportunity
 3 = Design Consideration
 (comparable to project team's approach)

2 = Minor value degradation
 1 = Major value degradation
 0 = Withdrawn (unacceptable impact, doesn't meet purpose and need, or is already a design requirement)

■ = Advanced as recommendation
■ = Forwarded as design consideration
■ = Dropped from future consideration

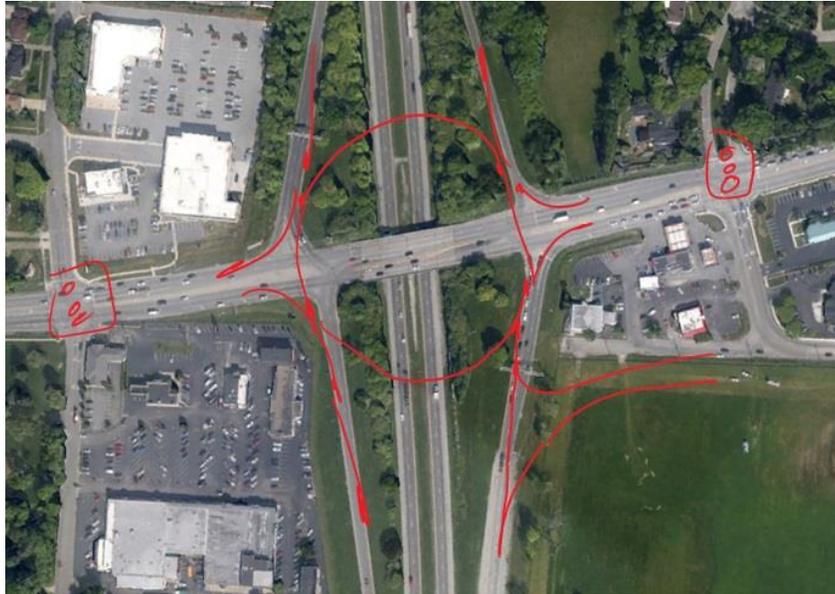
Performance Attributes: ↑ Improvement, ↔ No change, ↓ Degradation

Idea Number	Description		Advantages			Disadvantages	
10	Rotary Interchange with signals at US 42/KY 22 and US 42/Rudy Lane intersections		•			•	
Mainline Operations (I-264)	Mainline Operations (US 42)	Mainline Operations (KY 22)	Local Access	Maintainability	Construction Impacts	Environmental Impacts	Project Schedule
					↑	↔	↓

Justification/Comments/Disposition:

Rating: 0

This idea cannot be accomplished geometrically.



Ranking Scale:

5 = Great Opportunity

4 = Good Opportunity

3 = Design Consideration

(comparable to project team's approach)

2 = Minor value degradation

1 = Major value degradation

0 = Withdrawn (unacceptable impact, doesn't meet purpose and need, or is already a design requirement)

■ = Advanced as recommendation

■ = Forwarded as design consideration

■ = Dropped from future consideration

Performance Attributes: ↑ Improvement, ↔ No change, ↓ Degradation

Value Engineering Study Report
 Jefferson County I-264/US 42 Interchange and I-264 Widening

Idea Number	Description		Advantages			Disadvantages	
11	Drop lane for US 42 to westbound I-264 on ramp traffic before Westport Road Interchange		•			•	
Mainline Operations (I-264)	Mainline Operations (US 42)	Mainline Operations (KY 22)	Local Access	Maintainability	Construction Impacts	Environmental Impacts	Project Schedule
<i>Justification/Comments/Disposition:</i>							
Rating: 0	Single lane ramp can not accommodate projected volumes						

Ranking Scale: 5 = Great Opportunity
 4 = Good Opportunity
 3 = Design Consideration (comparable to project team’s approach)
 2 = Minor value degradation
 1 = Major value degradation
 0 = Withdrawn (unacceptable impact, doesn’t meet purpose and need, or is already a design requirement)

■ = Advanced as recommendation
■ = Forwarded as design consideration
■ = Dropped from future consideration

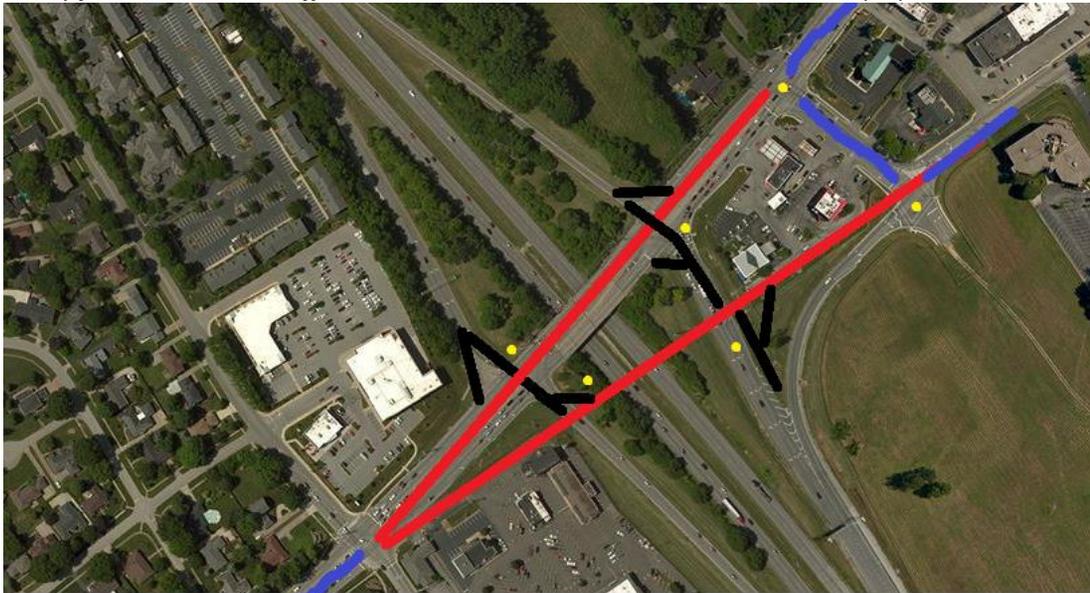
Performance Attributes: ↑ Improvement, ↔ No change, ↓ Degradation

Idea Number	Description		Advantages			Disadvantages	
12	Connect KY 22 to US 42 on new alignment and make US 42 and the new connection one-way between Rudy Lane and KY 22 intersections		<ul style="list-style-type: none"> Improves operations Improves safety 			<ul style="list-style-type: none"> US 42 eastbound departure would be required to take two perpendicular turns 	
Mainline Operations (I-264)	Mainline Operations (US 42)	Mainline Operations (KY 22)	Local Access	Maintainability	Construction Impacts	Environmental Impacts	Project Schedule

Justification/Comments/Disposition:

Rating: 0

Red is one-way traffic, blue is two-way traffic and black is traffic coming on and off of I-264
 Fatally flawed due US 42 traffic volumes will not be able to make the eastbound perpendicular turns



Ranking Scale:

5 = Great Opportunity

4 = Good Opportunity

3 = Design Consideration

(comparable to project team's approach)

2 = Minor value degradation

1 = Major value degradation

0 = Withdrawn (unacceptable impact, doesn't

meet purpose and need, or is already a design requirement)

Green = Advanced as recommendation

Yellow = Forwarded as design consideration

Red = Dropped from future consideration

Performance Attributes: ↑ Improvement, ↔ No change, ↓ Degradation

Idea Number	Description		Advantages			Disadvantages	
13	Create new connection from KY 22 to US 42		•			•	
Mainline Operations (I-264)	Mainline Operations (US 42)	Mainline Operations (KY 22)	Local Access	Maintainability	Construction Impacts	Environmental Impacts	Project Schedule
					↑	↔	↓
<i>Justification/Comments/Disposition:</i>							
Rating: 4	See Idea No. 4 and 17						
Idea Number	Description		Advantages			Disadvantages	
14	Align Glenview with the shopping center intersection and eliminate Northfield entrance		•			•	
Mainline Operations (I-264)	Mainline Operations (US 42)	Mainline Operations (KY 22)	Local Access	Maintainability	Construction Impacts	Environmental Impacts	Project Schedule
					↑	↔	↓
<i>Justification/Comments/Disposition:</i>							
Rating: 2	Proposed road to connect to is on private property.						

Ranking Scale: 5 = Great Opportunity
 4 = Good Opportunity
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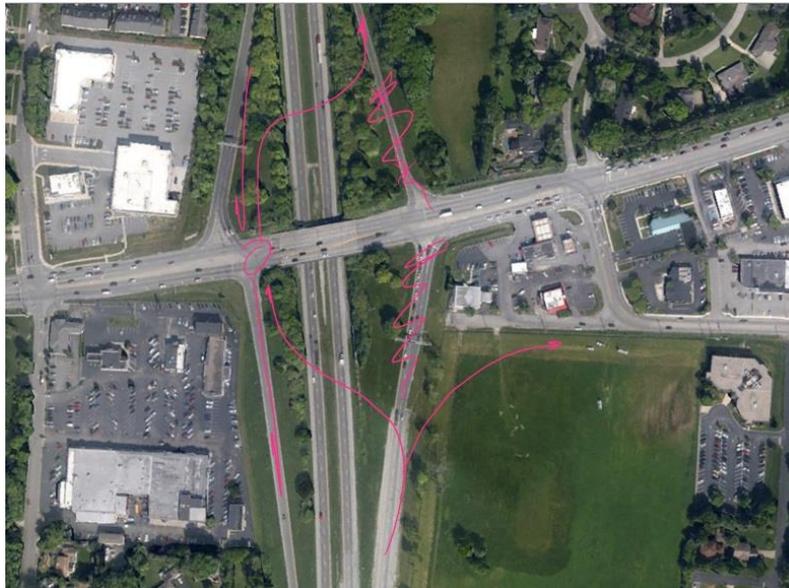
Performance Attributes: ↑ Improvement, ↔ No change, ↓ Degradation

Idea Number	Description		Advantages			Disadvantages	
15	Offset single point interchange		<ul style="list-style-type: none"> Increased storage for the US 42/KY 22 westbound movement Mainline structure is simplified 			<ul style="list-style-type: none"> Increased structures Increased cost 	
Mainline Operations (I-264)	Mainline Operations (US 42)	Mainline Operations (KY 22)	Local Access	Maintainability	Construction Impacts	Environmental Impacts	Project Schedule
↔	↔	↔	↔	↓	↓	↔	↔

Justification/Comments/Disposition:

Rating: 2

Operational this may be slightly better than the base case but there would be a significant increase in maintainability and construction costs due to the increase in the number of bridges.



Ranking Scale:

5 = Great Opportunity

4 = Good Opportunity

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(comparable to project team's approach)

2 = Minor value degradation

1 = Major value degradation

0 = Withdrawn (unacceptable impact, doesn't

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Green = Advanced as recommendation

Yellow = Forwarded as design consideration

Red = Dropped from future consideration

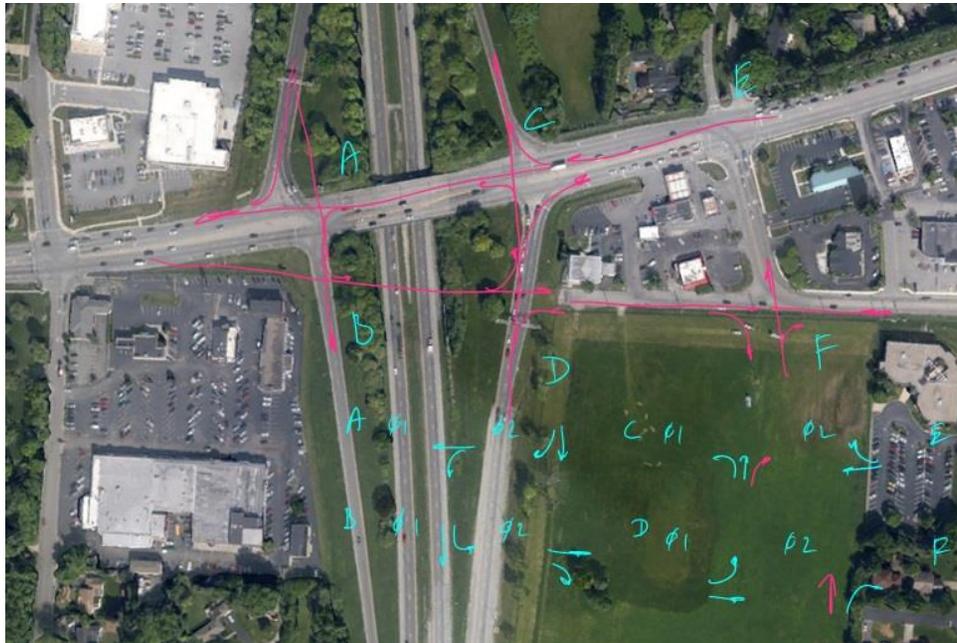
Performance Attributes: ↑ Improvement, ↔ No change, ↓ Degradation

Idea Number	Description		Advantages			Disadvantages	
16	Split diamond with one-way streets		•			•	
Mainline Operations (I-264)	Mainline Operations (US 42)	Mainline Operations (KY 22)	Local Access	Maintainability	Construction Impacts	Environmental Impacts	Project Schedule
					↑	↔	↓

Justification/Comments/Disposition:

Rating: 2

Eastbound through movement is overcapacity



Ranking Scale: 5 = Great Opportunity
 4 = Good Opportunity
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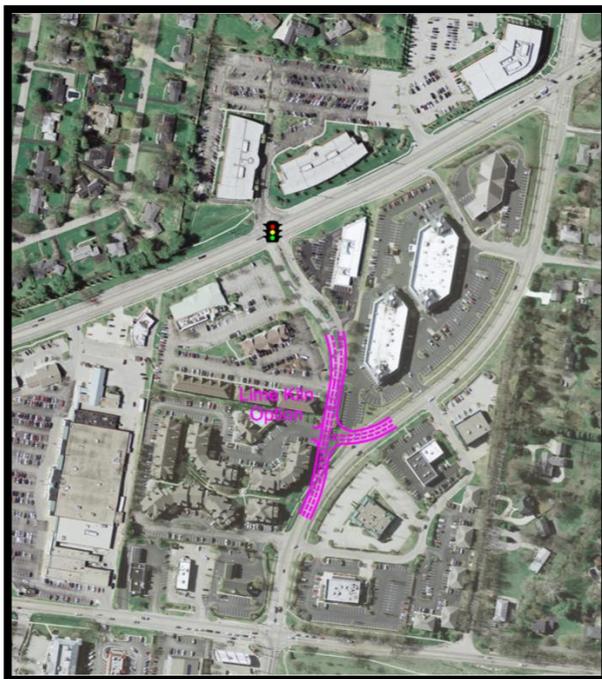
Green square = Advanced as recommendation
 Yellow square = Forwarded as design consideration
 Red square = Dropped from future consideration

Performance Attributes: ↑ Improvement, ↔ No change, ↓ Degradation

Idea Number	Description		Advantages			Disadvantages	
17	Extend Glen Eagle Drive to meet KY 22 at Lime Kiln Lane.		<ul style="list-style-type: none"> Improves operations Increased distance between signalized intersections 				
Mainline Operations (I-264)	Mainline Operations (US 42)	Mainline Operations (KY 22)	Local Access	Maintainability	Construction Impacts	Environmental Impacts	Project Schedule
↔	↑	↑	↓	↔	↔	↓	↔

Justification/Comments/Disposition:

Rating: 3



Ranking Scale: 5 = Great Opportunity
 4 = Good Opportunity
 3 = Design Consideration (comparable to project team's approach)

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Green = Advanced as recommendation
 Yellow = Forwarded as design consideration
 Red = Dropped from future consideration

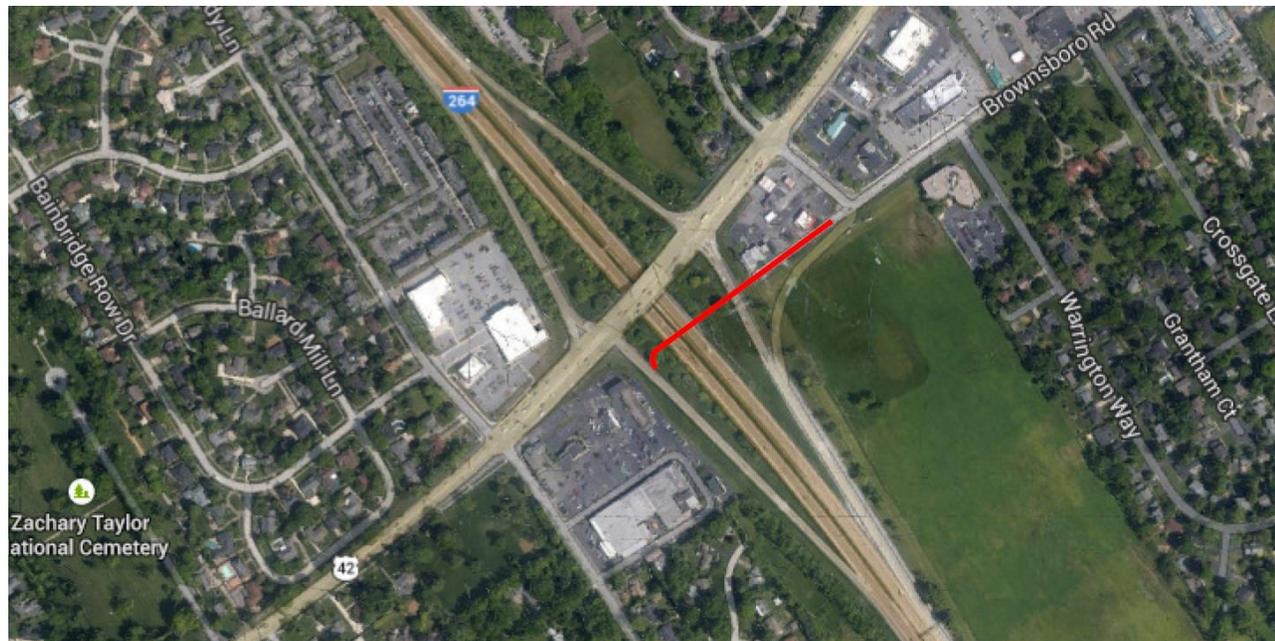
Performance Attributes: ↑ Improvement, ↔ No change, ↓ Degradation

Idea Number	Description		Advantages			Disadvantages	
18	KY 22 extension to eastbound to I-264 ramp and westbound dual lefts at US 42/KY 22		<ul style="list-style-type: none"> Improves operations at US 42/KY 22 			<ul style="list-style-type: none"> Need to raise profile of EB on-ramp Increase structures 	
Mainline Operations (I-264)	Mainline Operations (US 42)	Mainline Operations (KY 22)	Local Access	Maintainability	Construction Impacts	Environmental Impacts	Project Schedule
↔	↑	↑	↔	↔	↑	↔	↔

Justification/Comments/Disposition:

Rating: 4

Developed with Idea 36



Ranking Scale: 5 = Great Opportunity
 4 = Good Opportunity
 3 = Design Consideration (comparable to project team's approach)
 2 = Minor value degradation
 1 = Major value degradation
 0 = Withdrawn (unacceptable impact, doesn't meet purpose and need, or is already a design requirement)

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■ = Dropped from future consideration

Performance Attributes: ↑ Improvement, ↔ No change, ↓ Degradation

Idea Number	Description		Advantages			Disadvantages	
19	Design ramps to allow for future ramp metering		•			•	
<i>Mainline Operations (I-264)</i>	<i>Mainline Operations (US 42)</i>	<i>Mainline Operations (KY 22)</i>	<i>Local Access</i>	<i>Maintainability</i>	<i>Construction Impacts</i>	<i>Environmental Impacts</i>	<i>Project Schedule</i>
<i>Justification/Comments/Disposition:</i>							
Rating: 3							
Idea Number	Description		Advantages			Disadvantages	
20	12-foot two-way left turn lane widths		•			•	
<i>Mainline Operations (I-264)</i>	<i>Mainline Operations (US 42)</i>	<i>Mainline Operations (KY 22)</i>	<i>Local Access</i>	<i>Maintainability</i>	<i>Construction Impacts</i>	<i>Environmental Impacts</i>	<i>Project Schedule</i>
<i>Justification/Comments/Disposition:</i>							
Rating: 0	There is very little two-way left turn widths within the study area that are not 12 foot						

Ranking Scale: 5 = Great Opportunity
 4 = Good Opportunity
 3 = Design Consideration
 (comparable to project team's approach)

2 = Minor value degradation
 1 = Major value degradation
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 ■ = Forwarded as design consideration
 ■ = Dropped from future consideration

Performance Attributes: ↑ Improvement, ⇔ No change, ↓ Degradation

Value Engineering Study Report
 Jefferson County I-264/US 42 Interchange and I-264 Widening

Idea Number	Description		Advantages			Disadvantages	
21	Eliminate the eastbound auxiliary lane on I-264 between the Westport and US 42 interchanges		<ul style="list-style-type: none"> Eliminates need to relocate the sound barrier 			<ul style="list-style-type: none"> Degrades eastbound I-264 operations 	
<i>Mainline Operations (I-264)</i>	<i>Mainline Operations (US 42)</i>	<i>Mainline Operations (KY 22)</i>	<i>Local Access</i>	<i>Maintainability</i>	<i>Construction Impacts</i>	<i>Environmental Impacts</i>	<i>Project Schedule</i>
<i>Justification/Comments/Disposition:</i>							
Rating: 2							

Ranking Scale: 5 = Great Opportunity
 4 = Good Opportunity
 3 = Design Consideration (comparable to project team's approach)

2 = Minor value degradation
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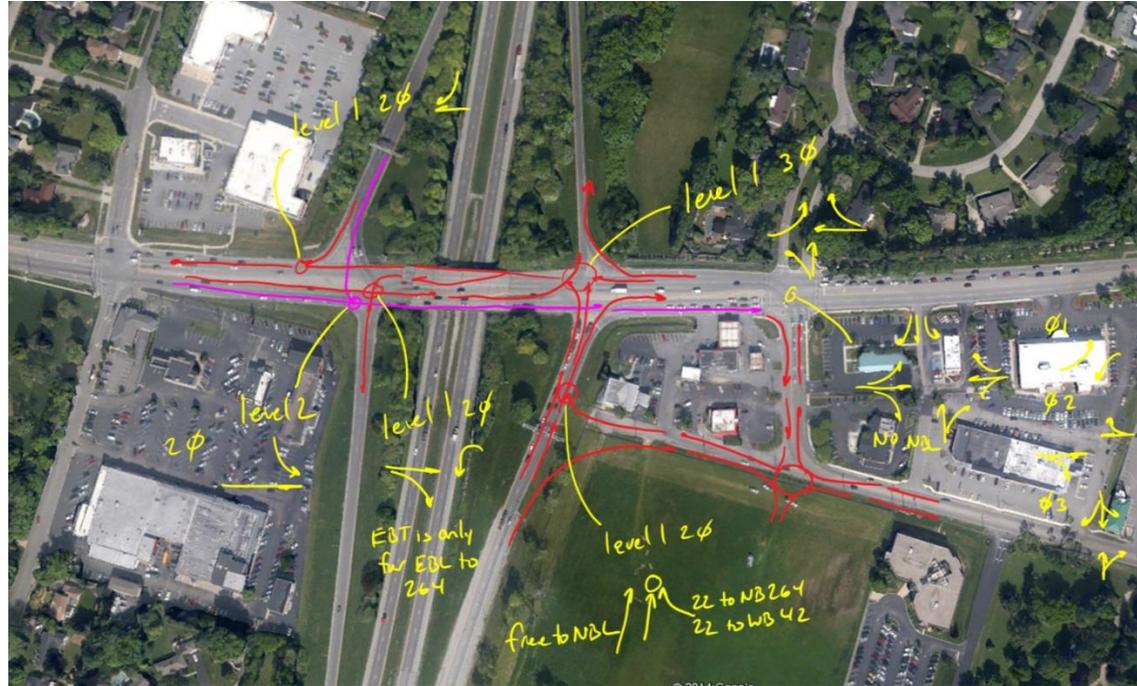
Performance Attributes: ↑ Improvement, ↔ No change, ↓ Degradation

Idea Number	Description		Advantages			Disadvantages	
22	Partial Echelon Interchange		<ul style="list-style-type: none"> Improves operations 			<ul style="list-style-type: none"> Increase structure costs (bridges and retaining walls) 	
Mainline Operations (I-264)	Mainline Operations (US 42)	Mainline Operations (KY 22)	Local Access	Maintainability	Construction Impacts	Environmental Impacts	Project Schedule
↔	↑	↑	↓	↓	↔	↔	↓

Justification/Comments/Disposition:

Rating: 0

This idea will not work geometrically.



Ranking Scale:

5 = Great Opportunity

4 = Good Opportunity

3 = Design Consideration

(comparable to project team's approach)

2 = Minor value degradation

1 = Major value degradation

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meet purpose and need, or is already a design requirement)

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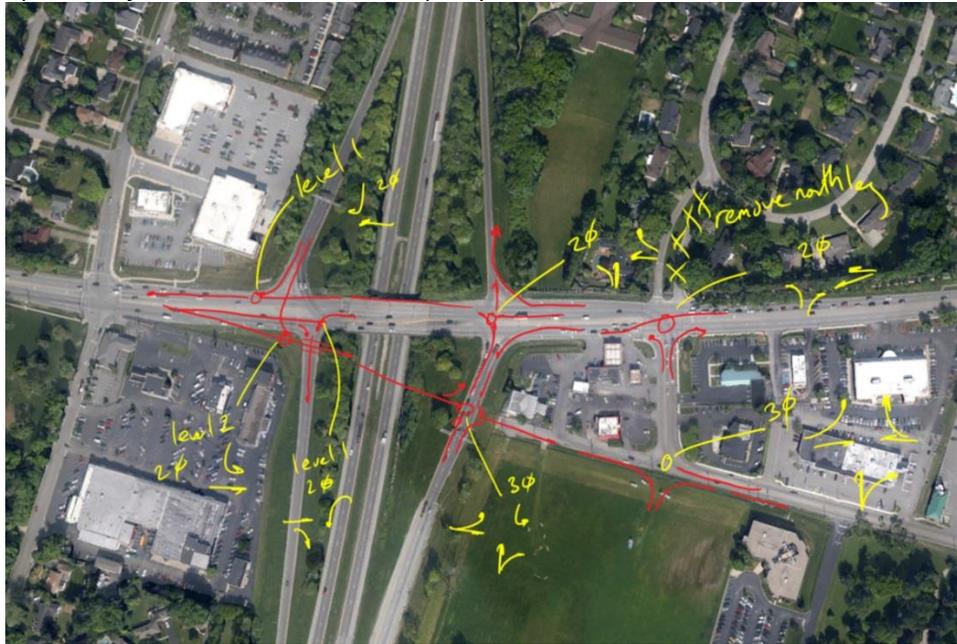
Performance Attributes: ↑ Improvement, ↔ No change, ↓ Degradation

Idea Number	Description		Advantages			Disadvantages	
23	Partial Echelon Interchange with KY 22 extension to eastbound I-264		•			•	
Mainline Operations (I-264)	Mainline Operations (US 42)	Mainline Operations (KY 22)	Local Access	Maintainability	Construction Impacts	Environmental Impacts	Project Schedule

Justification/Comments/Disposition:

Rating: 0

Operations for eastbound US 42 overcapacity



Ranking Scale:

5 = Great Opportunity

4 = Good Opportunity

3 = Design Consideration

(comparable to project team's approach)

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■ = Forwarded as design consideration

■ = Dropped from future consideration

Performance Attributes: ↑ Improvement, ↔ No change, ↓ Degradation

Idea Number	Description		Advantages			Disadvantages	
24	Continue the bicycle lanes through the intersections at US 42/Rudy Lane and US 42/KY 22 and add merge		•			•	
<i>Mainline Operations (I-264)</i>	<i>Mainline Operations (US 42)</i>	<i>Mainline Operations (KY 22)</i>	<i>Local Access</i>	<i>Maintainability</i>	<i>Construction Impacts</i>	<i>Environmental Impacts</i>	<i>Project Schedule</i>
<i>Justification/Comments/Disposition:</i>							
Rating: 3							
Idea Number	Description		Advantages			Disadvantages	
25	Eliminate one lane of the westbound triple left-turn lanes on the SPUI and add one eastbound through lane (total of 3 EB through lanes)		<ul style="list-style-type: none"> • Eliminates three-lane ramp section • Improves safety and operations • Meets driver expectations 			•	
<i>Mainline Operations (I-264)</i>	<i>Mainline Operations (US 42)</i>	<i>Mainline Operations (KY 22)</i>	<i>Local Access</i>	<i>Maintainability</i>	<i>Construction Impacts</i>	<i>Environmental Impacts</i>	<i>Project Schedule</i>
↔	↑	↔	↔	↔	↔	↔	↔
<i>Justification/Comments/Disposition:</i>							
Rating: 4	With Idea 37						

Ranking Scale: 5 = Great Opportunity
 4 = Good Opportunity
 3 = Design Consideration (comparable to project team's approach)

2 = Minor value degradation
 1 = Major value degradation
 0 = Withdrawn (unacceptable impact, doesn't meet purpose and need, or is already a design requirement)

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 ■ = Dropped from future consideration

Performance Attributes: ↑ Improvement, ↔ No change, ↓ Degradation

Idea Number	Description		Advantages			Disadvantages	
26	Flatten the curves for the SPUI ramps		•			•	
<i>Mainline Operations (I-264)</i>	<i>Mainline Operations (US 42)</i>	<i>Mainline Operations (KY 22)</i>	<i>Local Access</i>	<i>Maintainability</i>	<i>Construction Impacts</i>	<i>Environmental Impacts</i>	<i>Project Schedule</i>
					↑	↔	↓
<i>Justification/Comments/Disposition:</i>							
Rating: 2							
Idea Number	Description		Advantages			Disadvantages	
27	RIRO at Northfield Drive		<ul style="list-style-type: none"> Improves operation for both US 42 and KY 22 Improves safety 			<ul style="list-style-type: none"> Potential public resistance 	
<i>Mainline Operations (I-264)</i>	<i>Mainline Operations (US 42)</i>	<i>Mainline Operations (KY 22)</i>	<i>Local Access</i>	<i>Maintainability</i>	<i>Construction Impacts</i>	<i>Environmental Impacts</i>	<i>Project Schedule</i>
↔	↑	↑	↓	↔	↔	↔	↔
<i>Justification/Comments/Disposition:</i>							
Rating: 5							

Ranking Scale: 5 = Great Opportunity
 4 = Good Opportunity
 3 = Design Consideration (comparable to project team's approach)

2 = Minor value degradation
 1 = Major value degradation
 0 = Withdrawn (unacceptable impact, doesn't meet purpose and need, or is already a design requirement)

■ = Advanced as recommendation
 ■ = Forwarded as design consideration
 ■ = Dropped from future consideration

Performance Attributes: ↑ Improvement, ↔ No change, ↓ Degradation

Idea Number	Description		Advantages			Disadvantages	
29	Eliminate the bicycle lanes and have a shared use path		•			•	
<i>Mainline Operations (I-264)</i>	<i>Mainline Operations (US 42)</i>	<i>Mainline Operations (KY 22)</i>	<i>Local Access</i>	<i>Maintainability</i>	<i>Construction Impacts</i>	<i>Environmental Impacts</i>	<i>Project Schedule</i>
<i>Justification/Comments/Disposition:</i>							
Rating: 3	Based on information provided, it is the VE Teams understanding that this option may be used by more people and the short bike lanes through the corridor would probably not be used. It is our understanding that bike lanes are rarely swept so because of debris, experienced cyclists would just take the travel lane anyway. An 8 FT path on each side could be justified (rather than 10 FT). This actually could be a cost savings to the project.						
Idea Number	Description		Advantages			Disadvantages	
30	Drop third through lane on eastbound I-264 at the split to I-71		<ul style="list-style-type: none"> • Eliminates need to widen bridge from eastbound I-264 to southbound I-71 • Reduces costs • Reduces potential for throw away costs when I-71 Interchange is modified 			•	
<i>Mainline Operations (I-264)</i>	<i>Mainline Operations (US 42)</i>	<i>Mainline Operations (KY 22)</i>	<i>Local Access</i>	<i>Maintainability</i>	<i>Construction Impacts</i>	<i>Environmental Impacts</i>	<i>Project Schedule</i>
↔	↔	↔	↔	↔	↓	↔	↔
<i>Justification/Comments/Disposition:</i>							
Rating: 4	With Idea 32						

Ranking Scale: 5 = Great Opportunity
 4 = Good Opportunity
 3 = Design Consideration (comparable to project team's approach)

2 = Minor value degradation
 1 = Major value degradation
 0 = Withdrawn (unacceptable impact, doesn't meet purpose and need, or is already a design requirement)

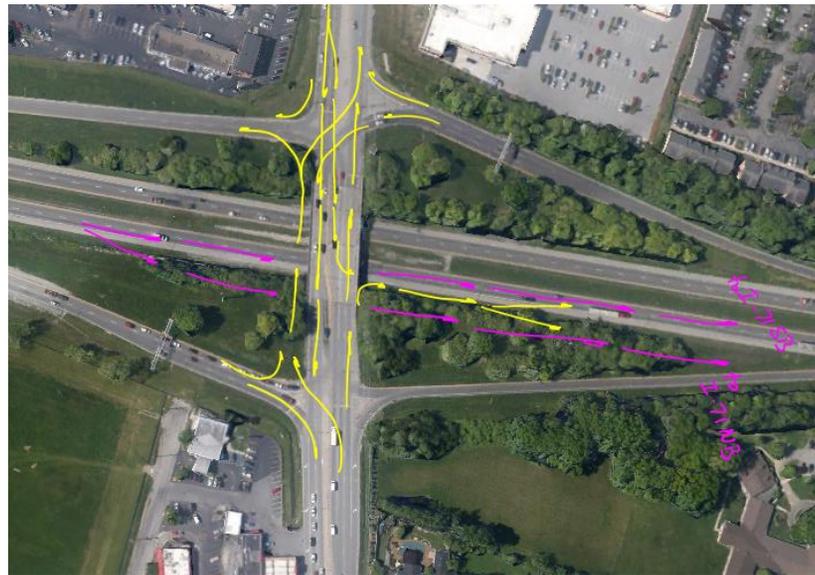
■ = Advanced as recommendation
 ■ = Forwarded as design consideration
 ■ = Dropped from future consideration

Performance Attributes: ↑ Improvement, ↔ No change, ↓ Degradation

Idea Number	Description		Advantages			Disadvantages	
31	Asymmetrical partial splintered DDI		<ul style="list-style-type: none"> Removes the weave onto I-264 eastbound Improves operations on US 42 			<ul style="list-style-type: none"> Increased cost 	
Mainline Operations (I-264)	Mainline Operations (US 42)	Mainline Operations (KY 22)	Local Access	Maintainability	Construction Impacts	Environmental Impacts	Project Schedule
↑	↑	↔	↔	↓	↓	↔	↓

Justification/Comments/Disposition:

Rating: 3



Ranking Scale:

- 5 = Great Opportunity
- 4 = Good Opportunity
- 3 = Design Consideration
(comparable to project team's approach)

- 2 = Minor value degradation
- 1 = Major value degradation

0 = Withdrawn (unacceptable impact, doesn't meet purpose and need, or is already a design requirement)

- = Advanced as recommendation
- = Forwarded as design consideration
- = Dropped from future consideration

Performance Attributes: ↑ Improvement, ↔ No change, ↓ Degradation

Idea Number	Description		Advantages			Disadvantages	
32	Drop third through lane on eastbound I-264 at the split to I-71 and not have the full auxiliary lane to the ramp and only a one lane to northbound I-71 (interim solution)		•			•	
Mainline Operations (I-264)	Mainline Operations (US 42)	Mainline Operations (KY 22)	Local Access	Maintainability	Construction Impacts	Environmental Impacts	Project Schedule
					↑	↔	↓
<i>Justification/Comments/Disposition:</i>							
Rating: 4	With Idea No. 30						

Ranking Scale: 5 = Great Opportunity
 4 = Good Opportunity
 3 = Design Consideration
 (comparable to project team's approach)

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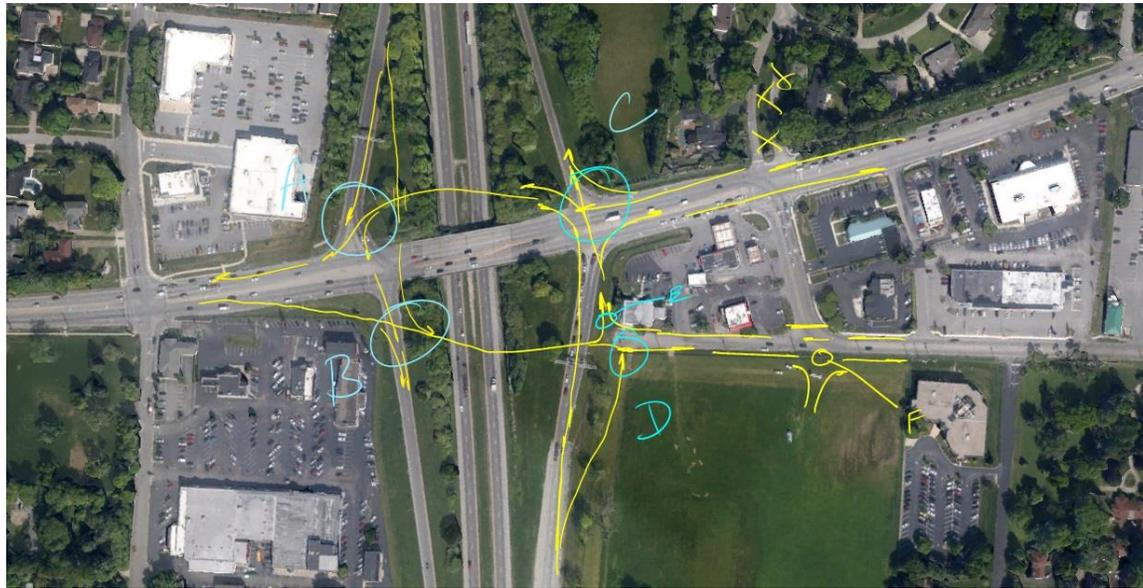
■ = Advanced as recommendation
 ■ = Forwarded as design consideration
 ■ = Dropped from future consideration

Performance Attributes: ↑ Improvement, ↔ No change, ↓ Degradation

Idea Number	Description		Advantages			Disadvantages	
33	Idea 3 Modified		<ul style="list-style-type: none"> Operational improvements Removes a number of signals Two phase signal into the VA Site 			<ul style="list-style-type: none"> 	
Mainline Operations (I-264)	Mainline Operations (US 42)	Mainline Operations (KY 22)	Local Access	Maintainability	Construction Impacts	Environmental Impacts	Project Schedule
↔	↑	↑	↑	↔	↑	↓	↑

Justification/Comments/Disposition:

Rating: 0



This will not work geometrically

Ranking Scale:

5 = Great Opportunity

4 = Good Opportunity

3 = Design Consideration

(comparable to project team's approach)

2 = Minor value degradation

1 = Major value degradation

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■ = Advanced as recommendation

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■ = Dropped from future consideration

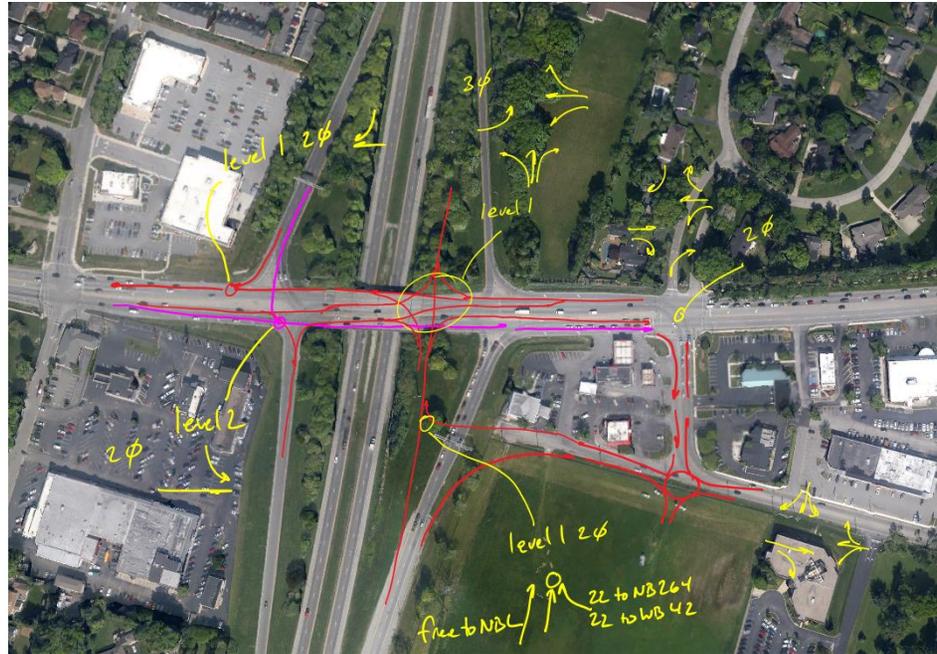
Performance Attributes: ↑ Improvement, ↔ No change, ↓ Degradation

Idea Number	Description		Advantages			Disadvantages	
34	Modified Echelon		<ul style="list-style-type: none"> Improves overall operations Improves the operations of the US 42 @ KY 22 intersection 			<ul style="list-style-type: none"> Increase structures Increase costs Increase in the number of signals 	
Mainline Operations (I-264)	Mainline Operations (US 42)	Mainline Operations (KY 22)	Local Access	Maintainability	Construction Impacts	Environmental Impacts	Project Schedule
↔	↑	↑	↔	↓	↓	↔	↔

Justification/Comments/Disposition:

Rating: 4

Upon further review, Idea 5 was preferred over this alternative.



Ranking Scale:

5 = Great Opportunity

4 = Good Opportunity

3 = Design Consideration

(comparable to project team's approach)

2 = Minor value degradation

1 = Major value degradation

0 = Withdrawn (unacceptable impact, doesn't

meet purpose and need, or is already a design requirement)

Green = Advanced as recommendation

Yellow = Forwarded as design consideration

Red = Dropped from future consideration

Performance Attributes: ↑ Improvement, ↔ No change, ↓ Degradation

Idea Number	Description		Advantages			Disadvantages	
35	Undertake a review (either internal or external) of the VISSIM Modelling for the 2040 through traffic volumes from the VA site to the US 42 @ KY 22 intersection		<ul style="list-style-type: none"> Better informed decision making 			<ul style="list-style-type: none"> 	
<i>Mainline Operations (I-264)</i>	<i>Mainline Operations (US 42)</i>	<i>Mainline Operations (KY 22)</i>	<i>Local Access</i>	<i>Maintainability</i>	<i>Construction Impacts</i>	<i>Environmental Impacts</i>	<i>Project Schedule</i>
<i>Justification/Comments/Disposition:</i>							
Rating: 3							

Ranking Scale: 5 = Great Opportunity
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 3 = Design Consideration
 (comparable to project team's approach)

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 0 = Withdrawn (unacceptable impact, doesn't meet purpose and need, or is already a design requirement)

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■ = Forwarded as design consideration
■ = Dropped from future consideration

Performance Attributes: ↑ Improvement, ↔ No change, ↓ Degradation

Idea Number	Description		Advantages			Disadvantages	
36	Adding I-264 NB and SB on ramps for KY 22		<ul style="list-style-type: none"> Improve operation at the US 42@ KY 22 intersection 			<ul style="list-style-type: none"> Increase costs Increase number of structures 	
Mainline Operations (I-264)	Mainline Operations (US 42)	Mainline Operations (KY 22)	Local Access	Maintainability	Construction Impacts	Environmental Impacts	Project Schedule
↔	↑	↑	↓	↓	↓	↓	↔
Justification/Comments/Disposition:							
Rating: 4							

Ranking Scale: 5 = Great Opportunity
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 3 = Design Consideration (comparable to project team's approach)
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■ = Advanced as recommendation
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■ = Dropped from future consideration

Performance Attributes: ↑ Improvement, ↔ No change, ↓ Degradation

Idea Number	Description		Advantages			Disadvantages	
37	Alt. 1 SPUI Modifications		• Improves operations			•	
<i>Mainline Operations (I-264)</i>	<i>Mainline Operations (US 42)</i>	<i>Mainline Operations (KY 22)</i>	<i>Local Access</i>	<i>Maintainability</i>	<i>Construction Impacts</i>	<i>Environmental Impacts</i>	<i>Project Schedule</i>
<i>Justification/Comments/Disposition:</i>							
Rating: 5							

Ranking Scale: 5 = Great Opportunity
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 3 = Design Consideration
 (comparable to project team's approach)

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 = Dropped from future consideration

Performance Attributes: ↑ Improvement, ↔ No change, ↓ Degradation

Those ideas that move forward from this initial evaluation are developed before being evaluated a second time. This second evaluation uses a unique performance-based process to identify the alternative solution(s) that provide the greatest overall value. This process uses a value matrix tool to evaluate the alternatives against a set of performance attributes (identified and defined with project team and KTC staff) and their relative importance to each other. This approach results in a list of alternative(s) with the highest value that reflects the technical, political, and social environment elements associated with the project.

The following is a general discussion and overview of the performance-based VE process that will be used on the Item No. 5-804.00 and 5-594.00 project.

Performance-Based Process

Using performance attributes is an integral part of the VE process. It provides the cornerstone of the VE process by providing a systematic and structured means of considering the relationship of a project's performance and cost as they relate to value. Project performance must be properly defined and agreed on by the stakeholders at the beginning of the value study. The performance attributes and requirements developed are then used throughout the study to identify, evaluate, and document alternatives.

Introduction

The methodology described herein measures project value by correlating the performance of project scope and schedule to the project costs. The objective of this methodology is to prescribe a systematic, structured approach to study and optimize a project's scope, schedule, and cost.

Value engineering has traditionally been perceived as an effective means for reducing project costs. This paradigm only addresses one part of the value equation, oftentimes at the expense of overlooking the role that VE can play with regard to improving project performance. Project costs are fairly easy to quantify and compare through traditional estimating techniques. Performance is not so easily quantifiable.

The VE Team leader led the team through the methodology, using the power of the process to distill subjective thought into an objective language that everyone can relate to and understand. The dialogue that developed formed the basis for the VE Teams' understanding of the performance requirements of the project and to what degree the current design concept was meeting those requirements. From this baseline, the VE Team can focus on developing alternative concepts that will quantify both performance and cost and contribute to overall project value.

Performance-based VE yields the following benefits:

- Builds consensus among project stakeholders (especially those holding conflicting views)
- Develops a better understanding of a project's goals and objectives
- Develops a baseline understanding of how the project is meeting performance goals and objectives
- Identifies areas where project performance can be improved through the VE process
- Develops a better understanding of a VE alternative's effect on project performance
- Develops an understanding of the relationship between performance and cost in determining value
- Uses value as the true measurement for the basis of selecting the right project or design concept

- Provides decision-makers with a means of comparing costs and performance (i.e., costs vs. benefits) in a way that can assist them in making better decisions.

Methodology

The application of performance-based VE consists of the following steps:

1. Identify key project (scope and delivery) performance attributes and requirements for the project.
2. Establish the hierarchy and impact of these attributes on the project.
3. Establish the baseline of the current project performance by evaluating and rating the effectiveness of the current design concepts.
4. Identify the change in performance of alternative project concepts generated by the study.
5. Measure the aggregate effect of alternative concepts relative to the baseline project's performance as a measure of overall value improvement.

The primary goal of Value Engineering is to improve the value of the project. A simple way to think of value in terms of an equation is as follows:

$$Value = \frac{Performance}{Cost}$$

Assumptions

Before embarking on the details of this methodology, some assumptions need to be identified. The methodology described in the following steps assumes the project functions are well established. Project functions are defined as what the project delivers to its users and stakeholders; a good reference for the project functions can be found in the environmental document's purpose and need statement. Project functions are generally well defined prior to the start of the VE study. In the event that project functions have been substantially modified, the methodology must begin anew (Step 1).

Step 1 – Determine the Major Performance Attributes

Performance attributes can generally be divided between project scope components (highway operations, environmental impacts, and system preservation) and project delivery components. It is important to make a distinction between performance *attributes* and performance *requirements*. Performance requirements are mandatory and binary in nature. All performance requirements **MUST** be met by any VE alternative concept being considered. Performance attributes possess a range of acceptable levels of performance. For example, if the project was the design and construction of a new bridge, a performance requirement might be that the bridge meets all current seismic design criteria. In contrast, a performance attribute might be project schedule, which means that a wide range of alternatives could be acceptable that had different durations.

The VE Team leader will initially request representatives from the project team and external stakeholders to identify performance attributes that they feel are essential to meeting the overall need and purpose of the project. Usually four to seven attributes are selected. It is important that all potential attributes be thoroughly discussed.

The information that comes out of this discussion will be valuable to both the VE Team and the project owner. It is important that each attribute be discretely defined and be quantifiable in some form. By

quantifiable, it is meant that a useable scale must be delineated with values given on a scale of 0 to 10. A “0” indicates unacceptable performance, while a “10” indicates optimal or ideal performance.

The vast majority of performance attributes that typically appear in transportation VE studies have been standardized. This standardized list can be used “as is” or adopted with adjustments as required.

The performance attributes and description used on this project are shown below.

Table 6: Performance Attributes and Description – Item No. 5-804.00 and 5-594.00

Performance Attribute	Description of Attribute
Mainline Operations (I-264)	An assessment of traffic operations and safety within the project limits. Operational considerations include mainline and ramp level of service relative to the 25-year traffic projections, as well as geometric considerations such as design speed, sight distance, lane and shoulder widths, weaving and access control.
Mainline Operations (US 42)	An assessment of traffic operations and safety within the project limits. Operational considerations include mainline, intersection and ramp level of service relative to the 25-year traffic projections, as well as geometric considerations such as design speed, sight distance, lane widths, shoulder widths, weaving and access control.
Mainline Operations (KY 22)	An assessment of traffic operations and safety within the project limits. Operational considerations include mainline, intersection and ramp level of service relative to the 25-year traffic projections, as well as geometric considerations such as design speed, sight distance, lane and shoulder widths, weaving and access control.
Local Assess	An assessment of traffic operations and safety on Rudy Lane and other local roads. Operational considerations include level of service relative to the 25-year traffic projections; geometric considerations such as design speed, sight distance, lane and shoulder widths; bicycle and pedestrian operations and access. Also includes access to residential and commercial property.
Maintainability	An assessment of the long-term maintainability of the transportation facility(s). Maintenance considerations include the overall durability, longevity and maintainability of pavements, structures and systems; ease of maintenance; accessibility and safety considerations for maintenance personnel.
Construction Impacts	An assessment of the temporary impacts to the public during construction related to traffic disruptions, detours and delays; impacts to businesses and residents relative to access, visual, noise, vibration, dust and construction traffic; environmental impacts. Includes utility impacts during construction and disruptions. Includes an assessment of temporary environmental impacts related to air quality.
Environmental Impacts	An assessment of the permanent impacts to the environment including ecological (i.e., air quality, water quality, visual, noise); socioeconomic impacts (i.e., environmental justice, business, residents); impacts to cultural, recreational and historic resources; and right-of-way impacts.

Performance Attribute	Description of Attribute
Project Schedule	An assessment of the total project delivery time as measured from the time of the VE Study to completion of construction.

Step 2 – Determine the Relative Importance of the Attributes

Once the VE Team has agreed on the project’s performance attributes, the next step was to determine the relative importance in relation to each other. This was accomplished through the use of an evaluative tool termed in this report as the “Performance Attribute Matrix.” This matrix compares the performance attributes in pairs, asking the question: “An improvement in which attribute will provide the greatest benefit to the project relative to purpose and need?”

A letter code (e.g., “A”) was entered into the matrix for each pair, identifying which of the two was more important. If a pair of attributes was considered to be of essentially equal importance, both letters (e.g., “A/B”) are entered into the appropriate box. When all pairs had been discussed, the number of “votes” for each was tallied and a percentage (which was used as weighted multipliers later in the process) was calculated.

The result of this exercise for the Item No. 5-804.00 and 5-594.00 is shown below.

Table 6: Weighted Pair-Wise Comparison

What attribute is more important to your project?									Total Points	% of Total
(A) Mainline Operations (I-264)	A	A	A	A	A	A	A		7.0	25%
(B) Mainline Operations (US 42)	B	B	B	B	B	B	B		6.0	21%
(C) Mainline Operations (KY 22)	C	C	C	C	C	C	C		5.0	18%
(D) Local Access	D	D/F	D/G	D					3.0	11%
(E) Maintainability	E/F	E	E						2.5	9%
(F) Construction Impacts	F/G	F/H							2.0	7%
(G) Environmental Impacts	H								1.0	4%
(H) Project Schedule									1.5	5%
Total									28.0	100%
Without emphasis on preference										
A = A is of greater importance										
A/B = A and B are of equal importance										

In addition to the weighted pair-wise comparison method, the VE Team also used the 100 Point Allocation Method to weight the overall performance criteria. Each VE Team member was given 100 points to distribute between each of the performance attributes. For each attribute, the average score was calculated based on the weights provided by each VE Team member.

The resulting weights for the overall performance criteria based upon input from both the Paired Comparison Method and the 100 Point Allocation Method, as well as the average of the two methods is provided below. After much discussion, the VE Team agreed by consensus that the 100 Point Allocation Method weights, highlighted in yellow, are the most representative of the relative importance of the criteria and would be used to compare project alternatives.

Table 7: 100 Point Allocation Method Comparisons

	1	2	3	4	5	6	7	8	100 Point Method Avg.	Pair-Wise	Avg. Weight of Both Methodologies
Mainline Operations (I-264)	30	40	33	50	23	35	40	28	35	25	30
Mainline Operations (US 42)	20	25	15	20	18	25	15	19	20	21	20
Mainline Operations (KY 22)	15	15	12	10	12	15	11	14	13	18	16
Local Access	5	1	8	5	8	5	5	9	6	11	8
Maintainability	5	2	4	0	7	4	8	5	4	9	7
Construction Impacts	0	1	8	5	9	5	5	8	5	7	6
Environmental Impacts	25	15	12	10	15	10	11	14	14	4	9
Project Schedule	0	1	8	0	8	1	5	3	3	5	4
	100	100	100	100	100	100	100	100	100	100	100

As shown by the results, *Mainline Operations for I-264, US 42 and KY 22* were determined to be the most important relative to the project’s purpose and need, while *all others* were considered least important.

Step 3 – Establish the Performance Baseline for the Original Design

The next step in the process was to document the project-specific elements for the performance attributes developed in Step 1. This step establishes a baseline against which the VE alternative concepts can be compared. The baseline for this project is shown below.

Table 8: Performance Attributes and Description – Item No. 5-804.00 and 5-594.00

Performance Attribute	Description of Attribute	Baseline Concept
Mainline Operations (I-264)	An assessment of traffic operations and safety within the project limits. Operational considerations include mainline and ramp level of service relative to the 25-year traffic projections, as well as geometric considerations such as design speed, sight distance, lane and shoulder widths, weaving and access control.	Three through lanes in each direction from Westport to I-71 with one auxiliary lane between Westport and US 42. 12-foot lanes and shoulders. Three WB left turn lanes with a short merge onto westbound I-264. Two lane ramp from eastbound I-264 to I-71 NB and widening the bridge over northbound I-71.

Performance Attribute	Description of Attribute	Baseline Concept
Mainline Operations (US 42)	An assessment of traffic operations and safety within the project limits. Operational considerations include mainline, intersection and ramp level of service relative to the 25-year traffic projections, as well as geometric considerations such as design speed, sight distance, lane widths, shoulder widths, weaving and access control.	Two though lanes per direction. SPUI Interchange at I-264. Short distance between SPUI and adjacent intersections. 6-foot bicycle lanes per direction. US 42/Rudy Lane near capacity. US 42/KY 22 well over capacity.
Mainline Operations (KY 22)	An assessment of traffic operations and safety within the project limits. Operational considerations include mainline, intersection and ramp level of service relative to the 25-year traffic projections, as well as geometric considerations such as design speed, sight distance, lane and shoulder widths, weaving and access control.	The US 42/KY 22 intersection exceeds capacity and large queues are formed. Two lanes in the EB direction to McDonalds. Access to all property is maintained.
Local Access	An assessment of traffic operations and safety on Rudy Lane and other local roads. Operational considerations include level of service relative to the 25-year traffic projections; geometric considerations such as design speed, sight distance, lane and shoulder widths; bicycle and pedestrian operations and access. Also includes access to residential and commercial property.	Adding a two-way left turn lane on Rudy Lane south of US 42.
Maintainability	An assessment of the long-term maintainability of the transportation facility(s). Maintenance considerations include the overall durability, longevity and maintainability of pavements, structures and systems; ease of maintenance; accessibility and safety considerations for maintenance personnel.	Widening of one bridge on I-264 and one on US 42. Three noise barrier walls to be maintained. Retaining walls along I-264.

Performance Attribute	Description of Attribute	Baseline Concept
Construction Impacts	An assessment of the temporary impacts to the public during construction related to traffic disruptions, detours and delays; impacts to businesses and residents relative to access, visual, noise, vibration, dust and construction traffic; environmental impacts. Includes utility impacts during construction and disruptions. Includes an assessment of temporary environmental impacts related to air quality.	Maintain 2 lanes per direction during construction. Potential for throw away costs associated with the construction of temporary bridges in order to maintain two lanes of traffic. Complete relocation of utilities on the north side of US 42 is required. Utilities to be relocated off of the bridge. Auxiliary lanes on northbound I-71 were reduced in length to avoid utilities crossing I-71. Rock removal will potentially create dust issues. Construction noise if piles are required.
Environmental Impacts	An assessment of the permanent impacts to the environment including ecological (i.e., air quality, water quality, visual, noise); socioeconomic impacts (i.e., environmental justice, business, residents); impacts to cultural, recreational and historic resources; and right-of-way impacts.	Noise barriers are required. No accesses are impacted. Minor ROW required.
Project Schedule	An assessment of the total project delivery time as measured from the time of the VE Study to completion of construction.	Phase 2 Design to be completed by Dec. 2015. ROW purchases in 2015. Start of construction summer of 2018. Completion 2020.

Once the baseline definitions for the various attributes have been established, their total performance should be calculated by multiplying the attribute’s weight (which was developed in Step 2) by its rating. While one could assign a 0 to 10 rating for each attribute, using the definitions and scales developed in Step 1, a baseline rating of 5 is typically used as a mid point so that alternatives can be evaluated – better than or worse than the baseline.

Total baseline performance is calculated by multiplying the attribute’s weight (which was developed in Step 2) by its rating (5). The baseline design’s total performance of 500 points can be calculated by adding all of the scores for the attributes. This numerical expression of the original designs performance forms the baseline against which all alternative concepts will be compared.

Step 4 – Evaluate the Performance of the VE Alternative Concepts

Once the performance of the baseline has been established for the original design concept, it can be used to help the VE Team develop performance ratings for individual VE alternative concepts as they are developed during the course of the study. The performance measures form is used to capture this information. This form allows a side-by-side comparison of the baseline design and VE alternative concepts to be performed.

It is important to consider the alternative concept’s impact on the entire project (rather than on discrete components) when developing performance ratings for the alternative concept.

Proposals were evaluated against the baseline for all attributes to compare and contrast the potential for value improvement. As discussed in Step 3, the baseline is given a rating of 5. The following ratings were used to evaluate the performance of the alternative concepts relative to the baseline concept.

Table 9: Performance Attribute Rating Scale

Rating	Performance Attribute Scales
10	Alternative concept is extremely preferred
9	Alternative concept is very strongly preferred
8	Alternative concept is strongly preferred
7	Alternative concept is moderately preferred
6	Alternative concept is slightly preferred
5	<i>Concepts are equally preferred</i>
4	Baseline concept is slightly preferred
3	Baseline concept is moderately preferred
2	Baseline concept is strongly preferred
1	Baseline concept is very strongly preferred
0	Baseline concept is extremely preferred

Step 5 – Compare the Performance Ratings of Alternative Concepts to the Baseline Project

As the VE Team develops alternatives, the performance of each is rated against the original design concept (baseline). Changes in performance are always based on the overall impact to the total project. Once performance and cost data have been developed by the VE Team, the net change in value of the VE alternatives can be compared to the original design concept. The resulting “Value Matrix” provides a summary of these changes and allows a way for the project team to assess the potential impact of the VE recommendations on total project value.

The VE Team groups the VE alternatives into a strategy (or strategies) to provide the decision-makers a clear picture of how the alternatives fit together into possible solutions. At least one strategy is developed to present the VE Team’s consensus of what should be implemented. Additional strategies are developed as necessary to present other combinations to the decision-makers that should be considered. The strategy(s) of VE alternatives are rated and compared against the original concept. The performance ratings developed for the VE strategies are entered into the matrix, and the summary portion of the Value Matrix is completed. The summary provides details on net changes to cost, performance, and value, using the following calculations:

- % Performance Improvement = Δ Performance VE Strategy/Total Performance Original Concept
- Value Index = Total Performance/Total Cost (in Millions)
- % Value Improvement = Δ Value Index VE Strategy/Value Index Original Concept.

Table 10: Performance Ratings

Performance Rating of VE Recommendations													
Attribute	Attribute Weight	Recommendation	Performance Rating										Total Performance
			1	2	3	4	5	6	7	8	9	10	
Mainline Operations (I-264)	35	Baseline					5						175
		VE-1					5						175
		VE-2					5						175
		VE-3				4.5							158
		VE-4					5						175
		VE-5					5						175
Mainline Operations (US 42)	20	Baseline					5						100
		VE-1									9		180
		VE-2								7			140
		VE-3					5						100
		VE-4									8		160
		VE-5							6				120
Mainline Operations (KY 22)	13	Baseline					5						65
		VE-1									9		117
		VE-2								7			91
		VE-3					5						65
		VE-4									8		104
		VE-5					5						65
Local Assess	6	Baseline					5						30
		VE-1								7			42
		VE-2				4.5							27
		VE-3					5						30
		VE-4									7		42
		VE-5					5						30
Maintainability	4	Baseline					5						20
		VE-1			3								12
		VE-2					5						20
		VE-3					5.5						22
		VE-4		2									8
		VE-5					5						20
Construction Impact	5	Baseline					5						25
		VE-1				4							20
		VE-2					5						25
		VE-3					6						30
		VE-4		2									10
		VE-5					5						25
Environmental Impacts	14	Baseline					5						70
		VE-1				4.5							63
		VE-2					5						70
		VE-3					5						70
		VE-4				4.5							63
		VE-5					5						70
Project Schedule	3	Baseline					5						15
		VE-1				4							12
		VE-2					5						15
		VE-3					5.5						17
		VE-4				4							12
		VE-5					5						15

Table 11: Value Matrix

VALUE MATRIX							
VE RECOMMENDATIONS							
OVERALL PERFORMANCE		Performance (P)	% Change Performance	Cost (C)	% Change Cost	Value Index (P/C)	% Value Improvement
	Baseline	500		\$45.2		11.06	
VE-1	Idea No. 5 - Ideas No. 1 and 2 combined and the northbound left is eliminated	621	24%	\$48.8	-8.0%	12.72	15%
VE-2	Idea No.27 - RIRO at Northfield Drive	563	13%	\$45.5	-0.6%	12.38	12%
VE-3	Idea No. 30 - Drop third through lane on I-264 at the split to I-71	491	-2%	\$44.4	1.8%	11.06	0%
VE-4	Idea No. 36 - Adding I-264 WB and EB on ramps for KY 22	574	15%	\$50.5	-11.7%	11.37	3%
VE-5	Idea No. 37 - Alt. 1 SPUI Modifications	520	4%	\$45.2	0.0%	11.50	4%

Table 12: Performance Rating for Scenarios

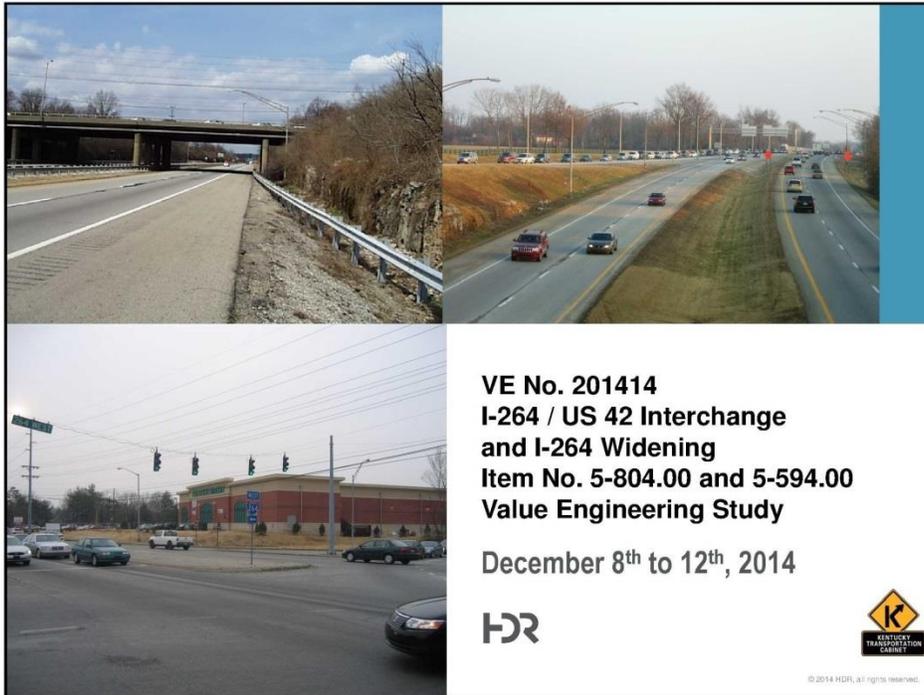
Performance Rating for Scenarios														
Attribute	Attribute Weight	Recommendation	Performance Rating										Total Performance	
			1	2	3	4	5	6	7	8	9	10		
Mainline Operations (I-264)	35	Baseline					5							175
		Scenario 1								7				245
		Scenario 2								7				245
		Scenario 3								7				245
Mainline Operations (US 42)	20	Baseline					5							100
		Scenario 1								8				160
		Scenario 2								8.5				170
		Scenario 3									9			180
Mainline Operations (KY 22)	13	Baseline					5							65
		Scenario 1									9			117
		Scenario 2									9			117
		Scenario 3									9			117
Local Access	6	Baseline					5							30
		Scenario 1				4.5								27
		Scenario 2				4.5								27
		Scenario 3				4.5								27
Maintainability	4	Baseline					5							20
		Scenario 1			3									12
		Scenario 2			3									12
		Scenario 3				4								16
Construction Impact	5	Baseline					5							25
		Scenario 1			3									15
		Scenario 2			3									15
		Scenario 3				4								20
Environmental Impacts	14	Baseline					5							70
		Scenario 1				4.5								63
		Scenario 2				4.5								63
		Scenario 3				4.5								63
Project Schedule	3	Baseline					5							15
		Scenario 1					5							15
		Scenario 2					5							15
		Scenario 3					5							15

Table 13: Value Matrix for Scenarios

VALUE MATRIX FOR SCENARIOS							
OVERALL PERFORMANCE		Performance (P)	% Change Performance	Cost (C)	% Change Cost	Value Index (P/C)	% Value Improvement
	Baseline	500	 	\$45.2	 	11.06	
Scenario 1	Scenario 1: Base Case, Drop third through lane on I-264 at the split to I-71, RIRO at Northfield Drive, Adding I-264 EB and WB on ramps for KY 22	654	31%	\$50.0	-10.6%	13.08	18%
Scenario 2	Scenario 2: Adding I-264 EB and WB on ramps for KY 22 + SPUI Modifications, RIRO at Northfield Drive, Drop third through lane on I-264 at the split to I-71	664	33%	\$50.0	-10.6%	13.28	20%
Scenario 3	Scenario 3: DDI with Ideas 1 and 2, Drop third through lane on I-264 at the split to I-71, RIRO at Northfield Drive	683	37%	\$47.8	-5.8%	14.29	29%

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Appendix E. Report-out Presentation



VE No. 201414
I-264 / US 42 Interchange
and I-264 Widening
Item No. 5-804.00 and 5-594.00
Value Engineering Study

December 8th to 12th, 2014



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VE TEAM

- | | |
|--------------------|----------------|
| ▪ Kevin Bailey | Construction |
| ▪ Adam Kirk | Traffic |
| ▪ Tammy Dow | VE Team Leader |
| ▪ John Broadus | Structures |
| ▪ John Cochran | Roadway |
| ▪ David Lee | Traffic |
| ▪ Shawn Russell | Construction |
| ▪ Smith Siromaskul | Interchange |
| ▪ Nathan Holt* | Roadway |
| ▪ Brent Sweger* | |
| ▪ Anthony Norman* | |

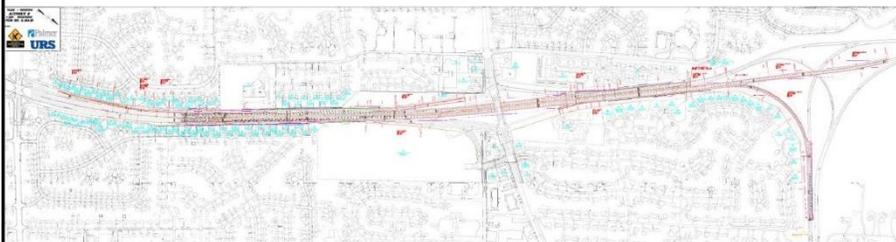
* Part-time



STUDY AREA



BASE CASE (I-264 Widening)

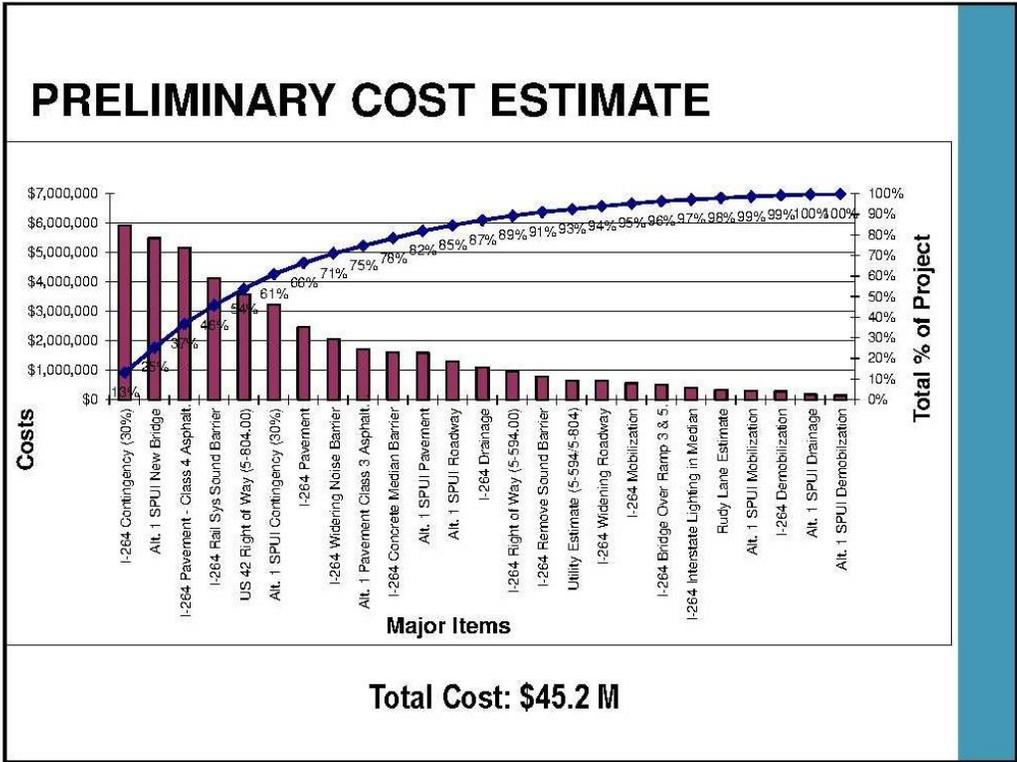


BASE CASE (I-264/US 42 Interchange)



BASE CASE (Additional Works)





PERFORMANCE BASED VE

- Value Engineering has traditionally been perceived as an effective means for reducing project costs.
- This paradigm only addresses one part of the value equation, often times at the expense of overlooking the role that VE can play with regard to improving project performance.

$$\text{Value} = \frac{\text{Performance}}{\text{Cost}}$$

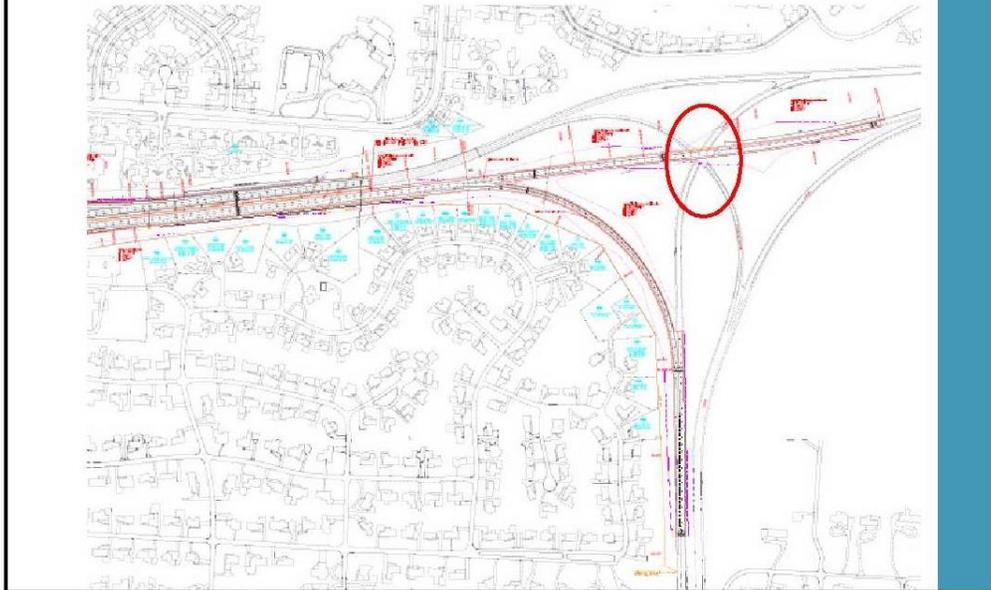
PERFORMANCE ATTRIBUTE AND REQUIREMENT DEFINITIONS		
Standard Performance Attribute	Description of Attribute	Base Case Design
Mainline Operations (I-264)	An assessment of traffic operations and safety within the project limits. Operational considerations include mainline and ramp level of service relative to the 25-year traffic projections, as well as geometric considerations such as design speed, sight distance, lane and shoulder widths, weaving and access control.	Three through lanes in each direction from Westport to I-71 IC with one auxiliary lane between Westport and US 42. 12 foot lanes and shoulders. Three WB left turn lanes with a short weave onto I-264. Two lane ramp onto I-71 NB and widening the bridge over I-71 north.
Mainline Operations (US-42)	An assessment of traffic operations and safety within the project limits. Operational considerations include mainline, intersection and ramp level of service relative to the 25-year traffic projections, as well as geometric considerations such as design speed, sight distance, lane and shoulder widths, weaving and access control.	Two lanes per direction. SPUI Interchange with ramps. Short distance between SPUI and adjacent intersections. 6 foot bicycle lanes per direction. US 42 @ Rudy Lane near capacity.
Mainline Operations (KY 22)	An assessment of traffic operations and safety within the project limits. Operational considerations include mainline, intersection and ramp level of service relative to the 25-year traffic projections, as well as geometric considerations such as design speed, sight distance, lane and shoulder widths, weaving and access control.	The US 42 @ KY 22 intersection exceeds capacity and large queues are formed. Two lanes in the EB direction to McDonalds. Access to all property is maintained.
Local Access	An assessment of traffic operations and safety on Rudy Lane and other local roads. Operational considerations include level of service relative to the 25-year traffic projections; geometric considerations such as design speed, sight distance, lane and shoulder widths; bicycle and pedestrian operations and access. Also includes access to residential and commercial property.	Adding a two way left turn lane on Rudy Lane south of US 42.
Maintainability	An assessment of the long-term maintainability of the transportation facility(s). Maintenance considerations include the overall durability, longevity and maintainability of pavements, structures and systems; ease of maintenance; accessibility and safety considerations for maintenance personnel.	Widening of one bridge on I-264 and one on US 42. Three noise barrier walls to be maintained. Retaining walls along I-264.
Construction Impacts	An assessment of the temporary impacts to the public during construction related to traffic disruptions, detours and delays; impacts to businesses and residents relative to access, visual, noise, vibration, dust and construction traffic; environmental impacts. Includes utility impacts during construction and disruptions. Includes an assessment of temporary environmental impacts related to air quality.	Maintain 2 lanes per direction during construction. Potential for throw away costs associated with the construction of temporary bridges in order to maintain two lanes of traffic. Complete relocation of utilities on the north side of US 42 are required. Utilities to be relocated off of the bridge. Auxiliary lanes on I-71 north were reduced in length to avoid utilities crossing I-71. Rock removal will potentially create dust issues. Construction noise if piles are required.
Environmental Impacts	An assessment of the permanent impacts to the environment including ecological (i.e., air quality, water quality, visual, noise); socioeconomic impacts (i.e., environmental justice, business, residents); impacts to cultural, recreational and historic resources; and right-of-way impacts.	Noise barriers are required. No accesses are impacted. Minor ROW required.
Project Schedule	An assessment of the total project delivery time as measured from the time of the VE Study to completion of construction.	Phase 2 Design be completed by Dec. 2015. ROW purchases in 2015. Start of construction summer of 2018. Completion 2020.

PERFORMANCE ATTRIBUTES

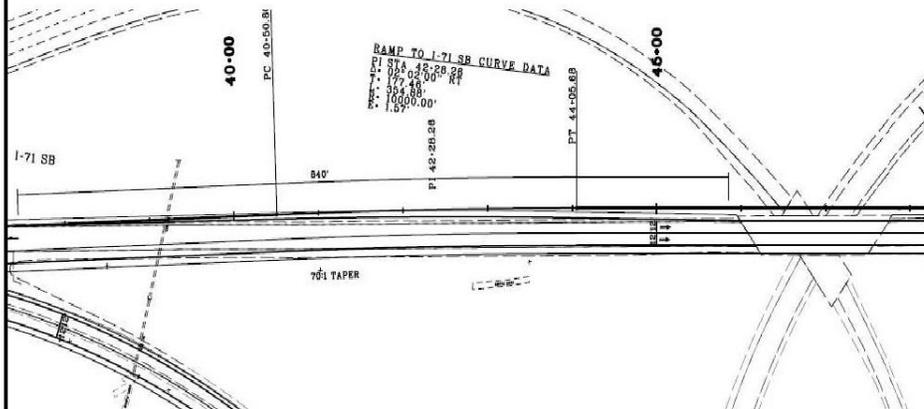
What attribute is more important to your project?								Total Points	% of Total	Adjusted Values
(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)			
(A) Mainline Operations (I-264)	A	A	A	A	A	A	A	7.0	25%	35%
(B) Mainline Operations (US 42)	B	B	B	B	B	B	B	6.0	21%	20%
(C) Mainline Operations (KY 22)	C	C	C	C	C	C	C	5.0	18%	13%
(D) Local Access	D	D/F	D/G	D				3.0	11%	6%
(E) Maintainability	E/F	E	E					2.5	9%	4%
(F) Construction Impacts	F/G	F/H						2.0	7%	5%
(G) Environmental Impacts	H							1.0	4%	14%
(H) Project Schedule								1.5	5%	3%
Total								28.0	100%	100%

Without emphasis on preference
 A = A is of greater importance
 A/B = A and B are of equal importance

AREAS OF FOCUS



Idea 30: Drop third through lane on I-264 at the split to I-71



AREAS OF FOCUS



REALIGNMENT OF LIME KILN VIA GLEN EAGLE



AREAS OF FOCUS



SCENARIOS

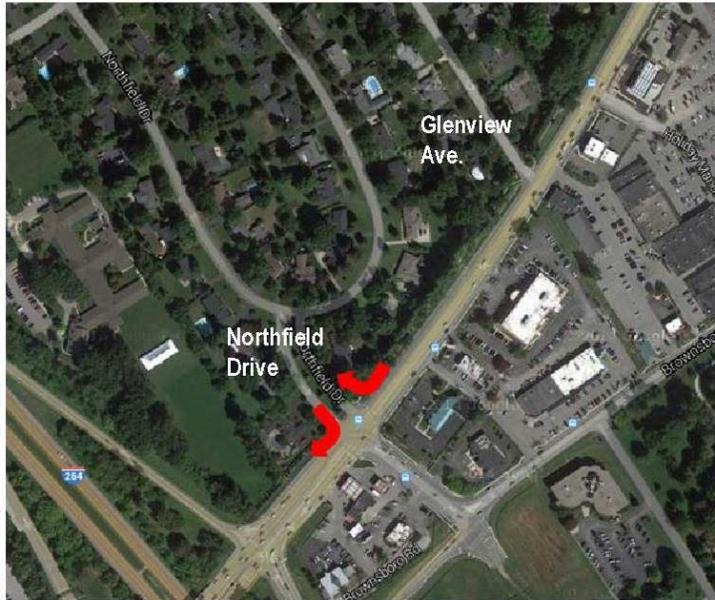
SCENARIOS

- Scenario 1: Base SPUI with Modifications
- Scenario 2: Revised SPUI with Modifications
- Scenario 3: Revised DDI with Modifications

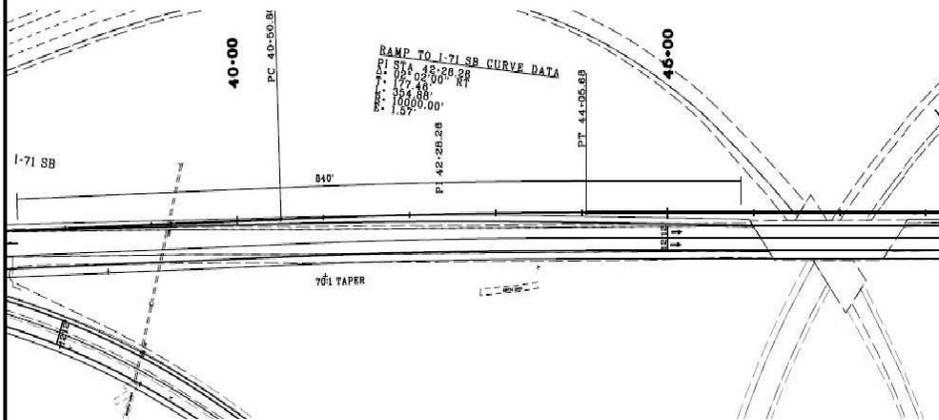
SCENARIO 1: BASE SPUI WITH MODIFICATIONS

- Idea 27: RIRO at Northfield Drive
- Idea 30: Drop third through lane on I-264 at the split to I-71
- Idea 36: Adding I-264 NB and SB on ramps for KY 22

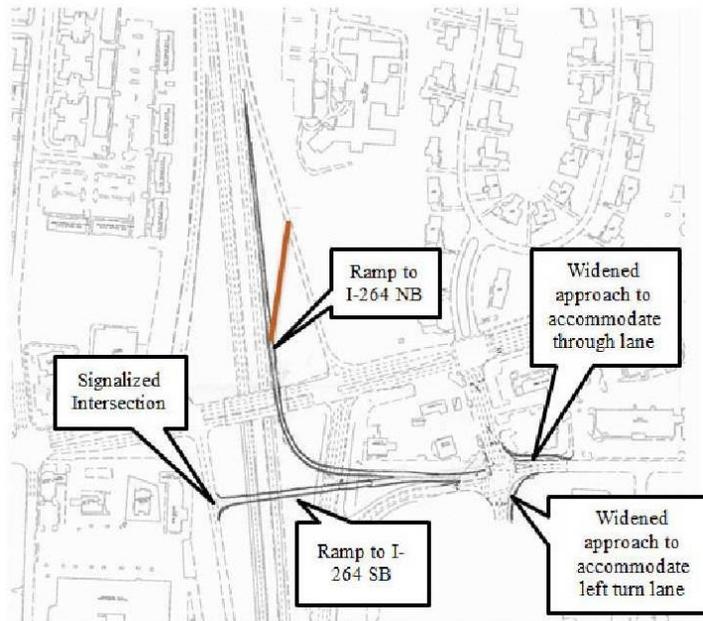
Idea 27: RIRO at Northfield Drive



Idea 30: Drop third through lane on I-264 at the split to I-71



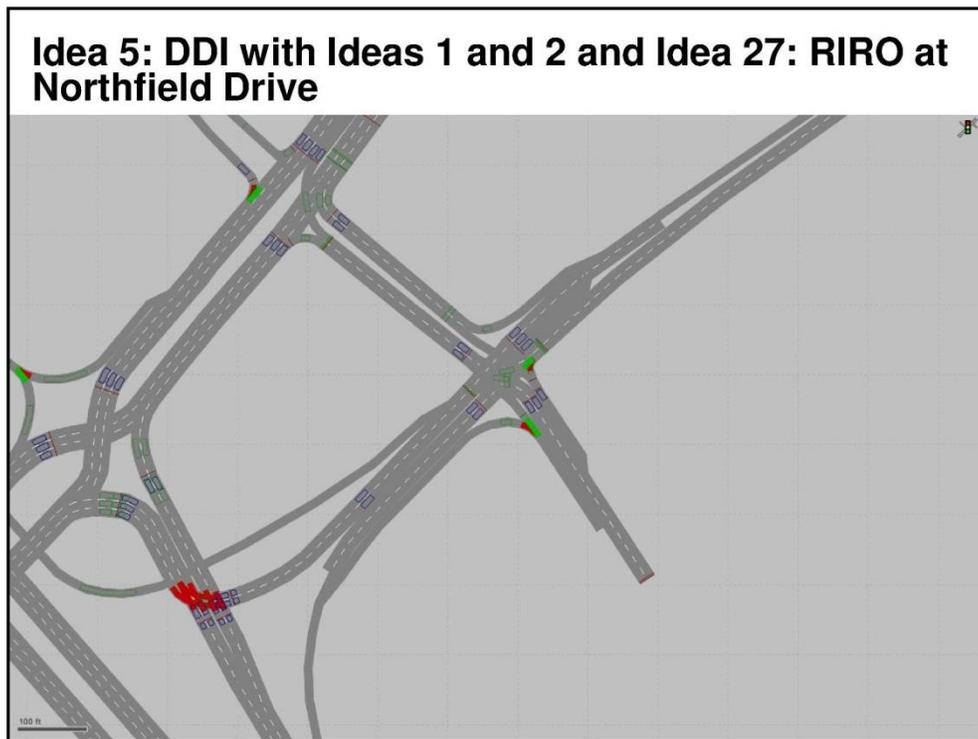
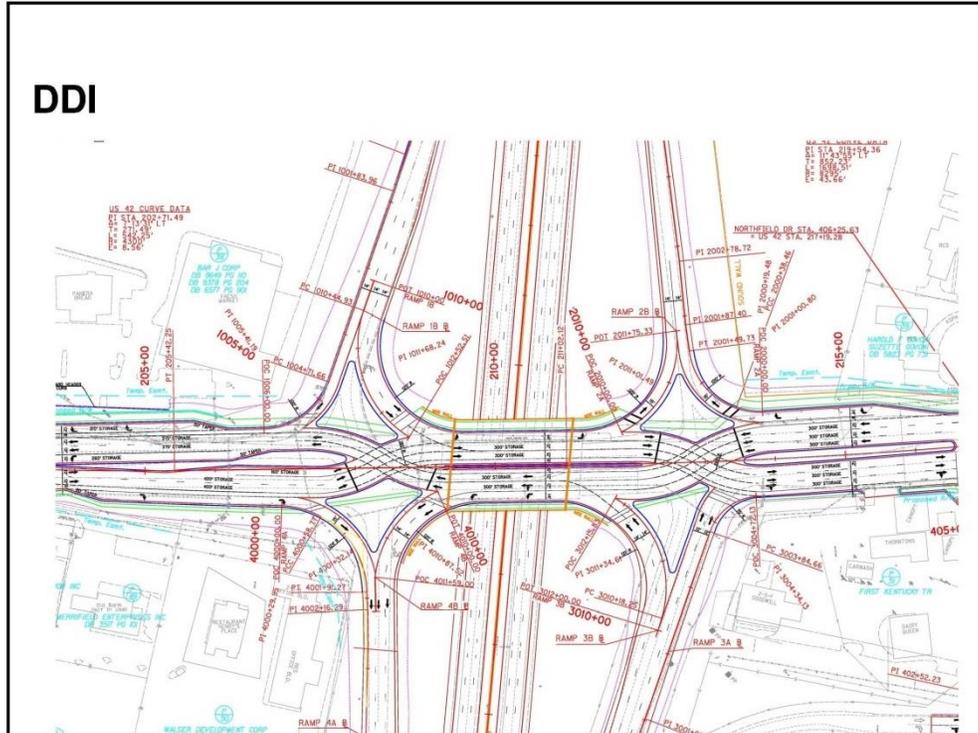
Idea 36: Adding I-264 NB and SB on ramps for KY 22

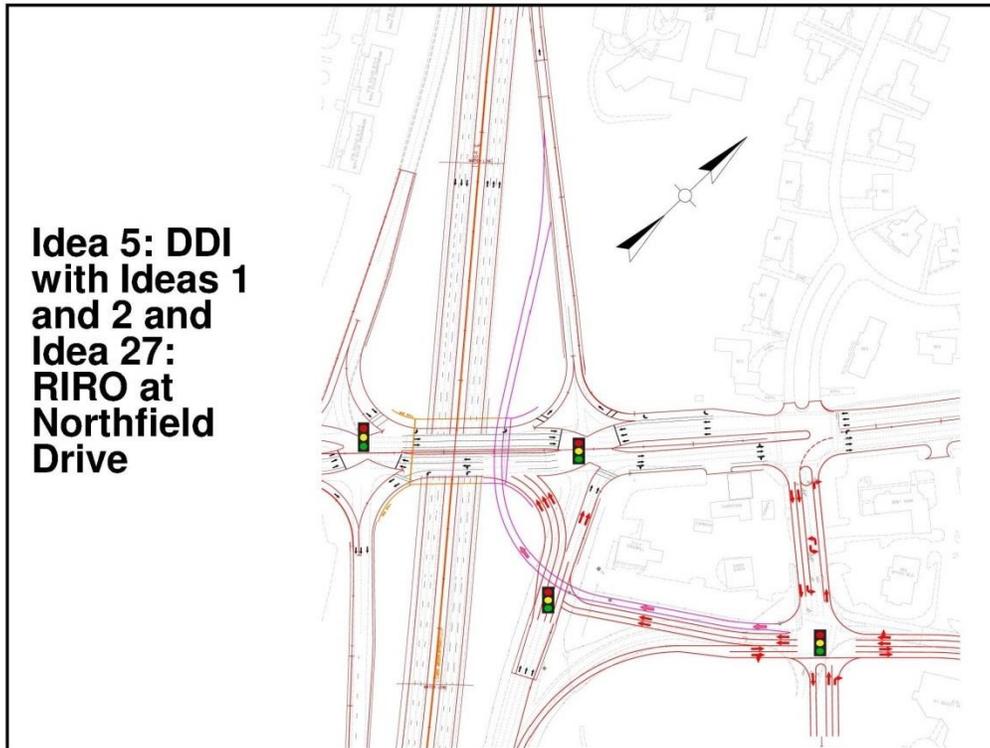


SCENARIO 2: REVISED SPUI WITH MODIFICATIONS

- Idea 27: RIRO at Northfield Drive
- Idea 30: Drop third through lane on I-264 at the split to I-71
- Idea 36: Adding I-264 NB and SB on ramps for KY 22
- Idea 37: SPUI Modifications

* Discussed in Scenario 1





SUMMARY OF RECOMMENDATIONS

OTHER

- **Idea 19** – Design ramps to allow for future ramp metering
- **Idea 24** – Continue bicycle lanes through the intersections at US 42 @ Rudy Lane and US 42 @ KY 22
- **Idea 29** – Eliminate bike lanes and have a shared path

QUESTIONS

