



## CONCEPTUAL ALTERNATIVE SOLUTIONS

### *Identification of Conceptual Alternative Solutions*

In Step 3 of the Project Development Process, the Project Team and Implementation Committee developed several Conceptual Alternative Solutions ("concepts") to address the identified needs. These concepts were developed by the project team, reviewed by ODOT, and presented to the Implementation Committee on March 14, 2005. The team met with geometric design specialists from ODOT's Office of Roadway Engineering Services on March 16, 2005, to obtain opinions on the interchange concepts. In addition, the team met with the City of Cincinnati on March 24, 2005, to discuss each interchange area in more detail. Comments have been reflected in the development and evaluation of the concepts presented in this report.

All options are listed in the evaluation matrix on the following page and described in the pages that follow. The discussion of concepts is divided into two sections – I-75 Mainline options and Interchange Options. Within each section, there is a description of all of the concepts recommended for advancement, as well as those that were considered and dismissed. In the subsequent section, Recommendations, additional information is provided for each concept that has been recommended for further consideration in Step 5 of the PDP.

In addition to tight physical constraints, such as the existing railroad facilities and the channelized Mill Creek, the I-75 Mill Creek Expressway study area includes numerous community issues. The area contains several community parks and recreational facilities, state parks, churches, schools and several noteworthy cemeteries. In addition, several emergency service locations are sited within the study area. Currently, thirteen of the fifteen census tracts within the study area have a higher unemployment rate than the Cincinnati Metropolitan Area (Cincinnati/Hamilton CMSA). The study area contains a higher numbers of minority persons, persons living below the poverty level and those with disabilities compared to the region as a whole. The needs of the community and the potential impacts to important social, economic and environmental resources were considered in evaluation of solutions to address the transportation needs, in addition to safety, mobility, and cost factors. For more detail on the evaluation factors, please refer to the evaluation matrix on the following page.



## ***I-75 Mainline Concepts***

Based upon the future no-build traffic volumes, capacity analyses were conducted to develop an initial estimate on the number of lanes needed to achieve LOS D in 2030. The findings are presented in the tables below. Those shown with an asterisk (\*) represent the existing number of lanes in that section.

<b>2030 Interstate 75 Freeway Segments</b>					
<b>Segment</b>		<b>Southbound</b>		<b>Northbound</b>	
<b>From</b>	<b>To</b>	<b>AM</b>	<b>PM</b>	<b>AM</b>	<b>PM</b>
Western Hills Viaduct	Hopple Street	6 lanes	5 lanes	5 lanes	6 lanes
Hopple Street	Bates Avenue	6 lanes	5 lanes	4 lanes*	5 lanes
Bates Avenue	I-74			5 lanes	6 lanes
I-74	Mitchell Avenue	4 lanes	5 lanes	5 lanes	4 lanes
Mitchell Avenue	SR 562	5 lanes	5 lanes	5 lanes	4 lanes
SR 562	Towne Street	5 lanes	5 lanes	5 lanes	4 lanes*
Towne Street	Paddock Road			5 lanes	5 lanes
<b>2030 Interstate 74 Freeway Segments</b>					
<b>Segment</b>		<b>Westbound</b>		<b>Eastbound</b>	
<b>From</b>	<b>To</b>	<b>AM</b>	<b>PM</b>	<b>AM</b>	<b>PM</b>
I-75	Spring Grove/Elmore	4 lanes*	4 lanes*	4 lanes	3 lanes*
Spring Grove/Elmore	Colerain	3 lanes*	4 lanes		
Colerain	Montana	3 lanes*	4 lanes	3 lanes*	3 lanes*
<b>2030 SR 562 Freeway Segments</b>					
<b>Segment</b>		<b>Westbound</b>		<b>Eastbound</b>	
<b>From</b>	<b>To</b>	<b>AM</b>	<b>PM</b>	<b>AM</b>	<b>PM</b>
I-75	Paddock	2 lanes*	2 lanes*	3 lanes	2 lanes*

These results are based upon the No Build volumes. Travel demand modeling will be conducted to determine how much additional traffic will be drawn to I-75 under each mainline improvement scenario. Because early traffic model results indicate that providing additional capacity on I-75 will continue to draw traffic off other routes, achieving the acceptable standard of LOS D for all sections within the I-75 Mill Creek Expressway project may not be achievable.

Therefore, the ODOT and the Implementation Committee have agreed to further consider three I-75 Mainline concepts – Four-Lane Continuity with Auxilliary Lanes, Five-Lane Continuity, and Four-Lane Continuity with Elevated Express Lanes. During Step 5, the potential transportation benefits may be more accurately compared to the potential impacts and costs. The actual number of lanes ultimately planned for I-75 will be determined based upon public involvement, physical constraints, impacts, costs and revised traffic model results developed during Step 5 of the PDP.



## **I-75 Mainline Concepts – Recommended for Further Work**

**I-75-NB – No Build.** This concept would involve no improvements other than routine maintenance. No capacity improvements would be made. This option would fail to meet the Purpose and Need of the project, but will be carried forward for comparison in future steps.

**I-75-A – Four Lane Continuity with Auxiliary Lanes.** This concept would involve adding a fourth lane on the outside in each direction north of I-74. Four lanes currently exist south of I-74. This alternative was recommended by the NSTI for further consideration. This option provides the opportunity to improve safety and congestion to a limited degree while minimizing property impacts and costs.

**I-75-B – Five Lane Continuity -** This concept would involve providing five continuous freeway lanes through the study area, adding one lane in each direction south of I-74 and two lanes in each direction north of I-74. This option would provide additional capacity improvement, but at a higher cost and impacts.

**I-75-C – Four Lane Continuity with Elevated Express Lanes –** This concept would involve providing four lanes at-grade through the study area, adding one through lane in each direction north of I-74, plus the construction of elevated express lanes. This option has the potential to provide superior improved capacity and safety benefits; however, it would be expected to be extremely expensive and intrusive to the surrounding communities. This option may be less problematic if implemented for only a portion of the study area and will be carried forward for further evaluation.

## **I-75 Mainline Concepts – Considered and Dismissed**

**I75-1 Existing 4 / 3 Lanes Plus Collector-Distributor System -** The addition of a collector-distributor (C-D) system throughout the Study Area would improve traffic operations and reduce congestion by eliminating excessive weaving and separating through traffic from local traffic. However, assuming a minimum of two lanes each way for the C-D system, the additional space required and interchange infrastructure would make this alternative prohibitively expensive. Additionally, with more space between interchanges north of I-74, the C-D system would provide diminishing value as it extends north.

**I75-2 Existing 4 / 3 Lanes Plus Elevated Express Lanes -** Adding elevated express lanes to convey traffic traveling through the Study Area would benefit from this arrangement by provided dedicated lanes, however, much like the C-D system, the cost to build the elevated roadways would be prohibitive. The existing at-grade lanes would not have adequate capacity, requiring more than two elevated lanes in each direction to be necessary.

**I75-3 Existing 4 / 3 Lanes Plus Elevated Reverse Flow Special Designation Lanes -** This alternative would include constructing special lanes to be used for high occupancy vehicles (HOV) and



would be reversible. This configuration provides a poor level of service by not increasing the at-grade freeway capacity and servicing an expected small relative volume of HOV vehicles.

**175-4 Existing 4 / 3 Lanes Plus Elevated Reverse Flow Lanes** - Reverse flow lanes can be very beneficial when there exists substantial directional volumes, however, through the Study Area, traffic volumes appear directionally balanced. For this reason, reverse flow lanes would not be appropriate.

**175-5 Four Lane Continuity Plus Collector-Distributor System** - A C-D system can provide operational benefits by separating local traffic from through traffic, thus reduce excessive weaving. However, an at-grade C-D system through the Study Area corridor would result in substantial property impacts and the need for extensive use of retaining walls.

**175-6 Four Lane Continuity Plus Frontage Roads** - This alternative was dismissed for the same reasons as Alternative 175-1 above.

**175-7 Four Lane Continuity Plus Express Lanes** - The probable arrangement of lanes for this alternative would be to construct express lanes on the inside adjacent to the median and non-express lanes to the outsides. Such a cross section would be very wide and result in substantial property impacts and cost compared to the expected traffic benefits.

**175-8 Four Lane Continuity Plus Reverse Flow Lanes** - As discussed above, reverse flow lanes provide best utility when there exists substantial directional volumes, which are not present on I-75 through the Study Area.

**175-9 Four Lane Continuity Plus Elevated Reverse Flow Lanes** - See Alternative 175-8.

**175-10 Four Lane Continuity Plus Elevated Reverse Flow Special Designation Lanes** - A lack of any significant volume of HOV traffic and balanced directional traffic flows combined with the high cost of elevating the reverse flow lanes caused this alternative to be dismissed.

**175-11 Four Lane Continuity Double Stack Plus Collector-Distributor System** - While this alternative would reduce the overall cross sectional width by stacking the freeway lanes, it is cost prohibitive. The structure carrying vehicles the length of the Study Area combined with elevated ramps at interchanges results in the alternative not feasible from cost alone.

**175-12 Four Lane Continuity Plus Elevated Truck Lanes** - Although truck volumes are relatively high within the I-75 corridor, the volumes are primarily local and, thus would not benefit from a separate truck facility that could not be accessed at service interchanges.

**175-13 Five Lane Continuity Double Stack** - See Alternative 175-11.



**I75-14 Five Lane Continuity Dual Divided Freeway** - A dual divided freeway separates two freeways at-grade to eliminate vehicle weaving otherwise experienced when two freeways are combined. An application of this design would be to separate traffic to/from I-74 from I-75 through traffic. However, the volumes generated by I-74 would not warrant this treatment and the property impacts would be substantial.

**I75-15 Five Lane Continuity with Separated Truck Lanes** - As stated above, truck volumes within the corridor are primarily local trips and not through trips. Providing a separate truck facility would not be warranted and the remaining lanes used by non-trucks would not have sufficient capacity. Separate at-grade truck facilities also create costly ramp construction for vehicles to enter and exit the appropriate lanes.

**I75-16 Six Lane Continuity with Separated Truck Lanes** - See Alternative I75-15.

## ***Interchange Concepts***

### **Hopple Street – Recommended for Further Work**

**HOP-NB – No Build** - This concept would involve no improvements other than routine maintenance. No capacity improvements would be made. This option would fail to meet the Purpose and Need of the project, but will be carried forward for comparison in future steps.

**HOP-A – Tight Urban Diamond Interchange (TUDI)** - This concept would involve reconstructing the existing interchange as a tight diamond, narrowing the median of I-75, relocating Hopple Street to grade-separate the Central Parkway intersection, and constructing a connector road from Central Parkway to MLK Drive. The Bates Avenue bridge and ramp would be closed. This option would be expected to reduce congestion on the freeway and improve operation on the arterial with moderate property impacts and cost. Some existing right-of-way could be reclaimed.

**HOP-B – Offset Roundabout Diamond Interchange** – This concept would involve reconstructing the Hopple Street interchange as an offset roundabout diamond. A modern roundabout intersection would be constructed on the west side of I-75, which would accommodate all ramps. The I-75 northbound ramps would be constructed as flyovers over I-75. The Bates Avenue bridge and entrance ramp would be closed. This option would provide improved operational and safety performance at a moderate cost with low property impacts.





## **Hopple Street – Considered and Dismissed**

**HOP-1 Diamond with Fly-Over Loop (NSTI Alternative D)** - This alternative involved constructing a northbound freeway exit ramp fly-over over the Hopple Street Viaduct structure and merging with the southbound exit ramp. This alternative was dismissed due to the excessive cost of constructing the Hopple Street fly-over ramp as well as poor operation of the weave created by the ramp merge.

**HOP-2 Single Point Urban Interchange (SPUI)** - This alternative was deemed not feasible due to skew angle formed by Hopple Street and I-75 of greater than 15 degrees.

**HOP-3 Single Roundabout Diamond Interchange (SRDI)** - Because the SRDI has not been constructed in the United States yet, this alternative was dismissed over concerns with driver confusion and the assumed extensive structure over the freeway.

**HOP-4 Double Roundabout Diamond Interchange (DRDI)** - The east roundabout intersection could not be feasibly sited with the nearby intersection of Central Parkway and MLK Drive combined with vertical grade differences.

**HOP-5 Diamond with I-75 SB Exit Ramp North of I-74** - This alternative would involve constructing an exit ramp from I-75 to Hopple Street beginning north of the I-74 interchange in order to eliminate excessive weaving. The exit terminal would be undesirably placed within the I-74 system interchange and be carried through the interchange to the west side of I-75 before requiring an extreme low speed horizontal curve to avoid impacts to Spring Grove Road and adjacent properties.

**HOP-6 Diamond with Bates Avenue Ramp to I-74** - In order to address a perceived high volume of traffic from MLK Drive to I-74 by separating vehicles from those bound for I-75, a proposed ramp would bridge over Central Parkway and traverse to I-74. The volumes destined for I-74 from the Bates Avenue ramp would not warrant the expense of constructing the ramp.

**HOP-7 – Diverging Diamond Interchange (DDI)** - This concept would involve reconstructing the interchange as a DDI. This new interchange design provides two-phase signal efficiency by crossing opposing arterial traffic to eliminate left-turn conflicts. This would involve narrowing the I-75 median, relocating Hopple Street to grade-separate the Central Parkway intersection, and constructing a connector road from Central Parkway to MLK Drive. The Bates Avenue bridge and ramp would be closed. This option has the potential for superior operational and safety performance with moderate property impacts and cost; however, it is a new design concept that will require further study.

**HOP-8 – Three Quadrant Diamond Interchange** - This concept would involve reconstructing the interchange as a three quadrant diamond, with the I-75 southbound exit ramp passing under the Hopple Street bridge. This would have the benefit of increasing the distance between the I-74 on-ramp and the



Hopple off-ramp. Other features would be similar to HOP-A. This option would provide improved safety and operational efficiency, potentially improving the conditions for I-74, but with substantial property impacts.

### **I-74/I-75 – Recommended for Further Work**

**I-74-NB – No Build** - This concept would involve no improvements other than routine maintenance. No capacity improvements would be made. This option would fail to meet the Purpose and Need of the project, but will be carried forward for comparison in future steps.

**I-74-A – Fully Directional Interchange with Local Access** – This concept would reconstruct the I-74/I-75 interchange to provide higher speed directional ramps to and from I-75 north, closing the existing ramps at Dreman and Colerain Avenues, and improving access to Colerain Avenue and Central Parkway. This option would provide only moderate safety improvements with moderate operational improvements, but would improve local access. This option has the potential to be costly.

**I-74-B – Fully Directional Interchange with No Local Access** – This option would reconstruct the I-74/I-75 interchange to bring this system-to-system interchange up to current standards. All service ramps would be closed, with new higher speed ramps to serve I-75 north. This concept would have superior operational performance and improved safety, but with impacts to local access.

### **I-74/I-75 – Considered and Dismissed**

**I74-1 Directional Ramps with Elmore Street Access (NSTI Alternative A)** - This alternative was superseded with proposed alternative I74-A for the purpose of providing local access. I74-A is deemed to be a more feasible and alternative with better arterial connectivity.

**I74-2 Directional Ramps Plus Colerain Avenue Access (NSTI Alternative C)** - See Alternative I74-1 above.

### **Colerain/Beekman – Recommended for Further Work**

**COL-NB – No Build** - This concept would involve no improvements other than routine maintenance. No capacity improvements would be made. This option would fail to meet the Purpose and Need of the project, but will be carried forward for comparison in future steps.

**COL-A – Low Impact Improvement/Full Movement Interchange** – This option would involve minor changes to the existing interchange to provide for full movements to I-74. This option would provide moderate operational improvements with low impacts and costs.



**COL-B – Double Roundabout Diamond Interchange (DRDI)** – This concept would involve reconstruction of the existing system interchange as a double roundabout diamond. This option would include providing full movements to I-74. This concept would have very good operational and safety performance and the potential for positive community impacts at a relatively low cost.

### **Colerain/Beekman – Considered and Dismissed**

**COL-1 Single Point Urban Interchange (SPUI)** - This alternative was dismissed due to the excessive skew angle formed between Beekman Street and I-74. The maximum accepted skew angle for the SPUI is 15 degrees.

### **Mitchell Avenue – Recommended for Further Work**

**MIT-NB – No Build** - This concept would involve no improvements other than routine maintenance. No capacity improvements would be made. This option would fail to meet the Purpose and Need of the project, but will be carried forward for comparison in future steps.

**MIT-A – Tight Urban Diamond Interchange (TUDI)** – This option would involve reconstruction of the current intersection as a tight diamond. If traffic volumes do not exceed the limits of this design, the tight urban diamond concept would provide improved operational and safety performance with little or no property impacts and at a moderate cost.

### **Mitchell Avenue – Considered and Dismissed**

**MIT-1 Double Roundabout Diamond Interchange (DRDI)** - The DRDI was dismissed because Mitchell Avenue is heavily traveled with high truck volumes. This location was considered too sensitive to consider the use of the modern roundabout.

**MIT-2 Single Roundabout Diamond Interchange (SRDI)** - Dismissed for same reasons as Alternative HOP-3 except the freeway would extend over the roundabout.

**MIT-3 Partial Cloverleaf Interchange (NSTI Alternative B)** - This alternative was deemed not feasible due to the large area required to construct the loops. The Mill Creek and commercial development on the west side on I-75 severely constrain the amount of available land.

**MIT-4 – Single Point Urban Interchange (SPUI)** - This option would involve reconstruction of the interchange as a single point urban diamond. This would provide high capacity and low property impacts, but at a high cost. Use of this concept will depend upon the traffic volumes to be served in the design year.

**MIT-5 – Diverging Diamond Interchange (DDI)** - This concept would involve reconstruction of the interchange as a diverging diamond. This new interchange design has the potential for superior





operational performance due to two-phased signalized ramp intersections, created by crossing over the arterial traffic to eliminate left-hand turning conflicts. This option would be expected to have good operational and safety performance with minimal impacts and moderate cost, if the new interchange concept can be accepted by motorists.

### **Norwood Lateral – Recommended for Further Work**

**NOR-NB – No Build** - This concept would involve no improvements other than routine maintenance. No capacity improvements would be made. This option would fail to meet the Purpose and Need of the project, but will be carried forward for comparison in future steps.

**NOR-A – Modified Interchange with Additional Ramp Lanes** – This concept would involve construction of an additional ramp lane to and from the north on I-75. This would improve operational performance and increase safety at a moderate cost and minimal property impacts, particularly in conjunction with TOW-A below.

### **Towne – Recommended for Further Work**

**TOW-NB – No Build** - This concept would involve no improvements other than routine maintenance. The interchange would remain open. This option would fail to meet the Purpose and Need of the project, as it would allow the continued operational and safety problems with the adjacent Norwood Lateral interchange. However, this option will be carried forward for comparison in future steps.

**TOW-A – Interchange Closed** – This concept would involve closing the Towne interchange and removal of the ramps. The existing partial interchange serves a low traffic volume and interferes with the effective, safe operation of the Norwood Lateral interchange. The closure of Towne will be necessary under any improvement scenario for Norwood Lateral. This safety improvement also was recommended by the NSTI study.

### **Paddock Road – Recommended for Further Work**

**PAD-NB – No Build** - This concept would involve no improvements other than routine maintenance. No capacity improvements would be made. This option would fail to meet the Purpose and Need of the project, but will be carried forward for comparison in future steps.

**PAD-A – Low Impact Spot Improvements** – This concept would involve minor improvements to the ramp intersections with Paddock Road to improve turn lane lengths and signal timing. This would provide some operational benefits at a relatively low cost.



**PAD-B – Double Roundabout Diamond Interchange (DRDI)** – This option would involve realigning the ramps and reconstructing the intersections with Paddock Road as modern roundabouts. This option would have the benefit of improving connection with the nearby Summit Road and would be expected to provide safety and operational benefits without impacts to the existing bridge. The adjacent intersection of Paddock and Seymour Road would also be converted to a roundabout intersection to improve capacity and reduce conflicts with the adjacent ramp intersection. This option would have moderate property impacts and costs.

### **Paddock Road – Considered and Dismissed**

**PAD-1 Diamond Interchange with Collector-Distributor System (NSTI Alternative B)** - The C-D system was proposed in order to accommodate a proposed exit ramp the Seymour Avenue. The alternative also indicated relocating Summit Road to the south. A C-D road system would require replacement of the new Paddock Road bridge over I-75. The need to provide separate access to Seymour Avenue could not be established and, was thus dismissed. The proposed relocation of Summit Road would also require substantial cost for business relocation and potential impact to the Paddock Road / Seymour Road intersection.

**PAD-2 Single Point Urban Interchange (SPUI)** - The SPUI alternative was dismissed for Paddock Road due to cost, skew angle and nearby intersections of Summit Road and Seymour Avenue.