



## EVALUATION OF CONCEPTUAL ALTERNATIVES

The following sections summarize the engineering and environmental issues associated with the proposed project, including where applicable an explanation of additional studies that will be completed in future steps of the PDP. Where the impacts vary by alternative, the impact of each option is discussed independently.

Several mainline alternatives are discussed in detail under the Design Issues section and the Traffic Operations discussion. Only those mainline options that were found to meet design and operations standards, as discussed in those sections, are discussed in detail for the remaining impact categories. Two mainline alternatives are analyzed in detail – the 4-Lane Continuity Alternative and the 5/4-Lane Alternative. Drawings of these alternatives may be found in the Exhibits section of this report.

### **Design Issues**

The following discussion focuses on evaluation of alternatives on a design-related basis. Where multiple alternatives exist, a comparative evaluation is also included.

The narrative notes the locations of impacted bridges for information. Please note that all impacted bridges within the corridor, with the exception of the Ludlow Viaduct and the Paddock Road bridge, are assumed to be full replacement due to age and condition. These structures are anticipated to require major rehabilitation, or more likely replacement, regardless of the I-75 widening project. At the Ludlow Viaduct and Paddock Road bridges, consideration is given for options to avoid or reduce impacts to these structures.

### ***Mainline Alternatives***

**I75-A: 4-Lane Continuity with Auxiliary Lanes** – This alternative begins approximately 0.1 miles south (SLM 2.30) of the Western Hills Viaduct (WHV) and terminates approximately 0.2 miles south (SLM 10.10) of SR 126. The only identified design exception at this time is for the mainline shoulder width and vertical clearance at the Paddock Road overhead bridge.

This alternative is illustrated on Exhibits A1-A17. The following is a discussion of relevant design features of this alternative by section:

#### **WHV (Sta 126+00 to Sta 155+00) (See Exhibits A-1 to A-2.)**

The existing mainline section is four lanes and bifurcated to accommodate the I-75 NB left hand exit ramp at the WHV interchange. With this alternative, the section would largely remain



unchanged and the existing pavement potentially suitable for concrete overlay. Existing shoulder widths are substandard ( $\cong$  13' outside /  $\cong$  6' median) and obtaining standard widths would impact the Harrison Avenue at-grade bridge, WHV overhead bridge (SB direction) piers, and I-75 NB to WHV ramp overhead bridge piers. The existing profile can be retained through this section.

Upgrading the WHV ramp terminals to current high-speed standards poses potential impacts to properties and bridges. In the NB direction, the terminals may be sufficient or require little modification, but in the SB direction both WHV ramps have low speed (30 MPH exit and 35 MPH entrance) ramps requiring deceleration and acceleration lengths. For the SB exit, approximately 400 feet of deceleration lane would be necessary (potentially impacting the west side property at Sta 139+00). With the SB entrance ramp, approximately 500 feet of additional acceleration taper length would be necessary requiring widening of the Harrison Avenue at-grade bridge.

The existing transit tubes are located on the east side near the freeway between Sta 144+00 and Sta 149+00. Widening at this location may require a low retaining wall.

**Marshall Avenue (Sta 155+00 to Sta 168+00)** (See Exhibit A-2.)

The WHV bifurcated median is closed in by Sta 155+00. At this point, additional width is required for shoulder widening. The existing Marshall Avenue bridge would require approximately 24' of widening to achieve standard shoulder widths. However, review of structure records indicates it to be a candidate for replacement.

**Hopple Street (Sta 168+00 to Sta 210+00)** (See Exhibits A-2 to A-4.)

Like the WHV interchange, the Hopple Street interchange contains a left hand exit ramp from I-75 NB. Consequently, the median is also bifurcated between Sta 168+00 to Sta 200+00. Although the 4-Lane Continuity Alternative exhibits indicate a closed median, this would only be necessary if the interchange is improved as described by the interchange alternatives. If the interchange alternatives are not constructed and the left hand exit ramp retained, the bifurcated median could remain and the overhead bridges unaffected. However, as with the WHV interchange section, shoulder widths are substandard and may not be able to be widened under overhead bridges without affecting piers.

Ramp terminals at the Hopple Street interchange appear to meet current standards and should only require minor modifications if any.

The existing condition in the NB direction is for the outside lane to become an exit-only lane to I-74 with the Bates Avenue entrance ramp merging onto this lane. This mainline alternative would

require adding an auxiliary lane from the Bates Avenue / Hopple Street entrance ramp to form a five lane segment.

The Bates Avenue overhead bridge has median piers located at the back of shoulder which would be affected by median shoulder widening. Similarly, the Monmouth Street overhead structure is supported by piers at the back of outside shoulders that will be impacted by shoulder widening and extended I-74 ramp lanes in the SB direction. The additional SB lane extending through the Hopple Street interchange would impact existing overhead bridge piers located at the outside edge of shoulder.

**I-74 (Sta 210+00 to Sta 255+00)** (See Exhibits A-4 to A-5.)

In the NB direction, the existing number of lanes transitions at the I-74 exit terminal from four approach lanes to three through lanes and two ramp lanes. At this point, one lane widening in the NB direction would commence. However, in order to achieve required lane balance per the Green Book, an auxiliary lane would be constructed on the outside between Hopple Street and the I-74 exit ramp. This would result in five lanes approaching the I-74 interchange with four through and two exiting lanes.



A large commercial building is located on the east side of the freeway between Sta 217+00 and 219+00. With the construction of an auxiliary lane, the need for a low retaining wall would be probable. An overhead pedestrian bridge located at Sta 219+00 would also be impacted by the auxiliary lane widening and need to be replaced.

In the SB direction south of I-74, the two-lane entrance ramp would merge with the four-lane mainline as a parallel-type entrance terminal. As a result, the outside lane would be an exit-only lane to Hopple Street while the other add lane must continue through the Hopple Street interchange and merge onto the mainline south of Hopple Street. The parallel ramp terminal would correct the existing tapered inside merge. Existing commercial buildings located on the west side of the freeway would require a retaining wall to avoid relocation.

The at-grade bridge over the I-75 NB to I-74 WB ramp would require shoulder and lane widening. The I-74 EB to I-75 NB / Central Parkway overhead bridge would be impacted by the lane addition and shoulder widening since the structure's piers are located at the back of existing outside shoulder.

In the event that the I-74 interchange alternatives are not implemented and the existing I-74 EB to I-75 NB ramp remains, a retaining wall would need to be constructed on the east side of the mainline due to the mainline widening.

In the SB direction, the I-74 exit ramp is low speed (20 MPH) with no deceleration length. In addition to the additional SB travel lane, a deceleration lane approximately 480' in length would also be required (beginning just south of the Ludlow Viaduct).

The Ludlow Viaduct was reconstructed in the early 1990's with future widening of I-75 taken into account. As a result, the existing structure should not be impacted by this alternative.



Three existing main railroad tracks owned by CSX and NS are in close proximity to the I-75 mainline on the west side with a future fourth main planned and assumed located between the freeway and tracks. The lateral distance between the tracks and proposed SB outside shoulder is 47'. Although the fourth main can still be accommodated, a retaining wall will be necessary. Although the wall would be outside the required 25' minimum crash design limit, a crashworthy retaining wall is recommended.

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**Hillside (Sta 255+00 to Sta 315+00) (See Exhibits A-8 to A-9.)**

The section of freeway north of the Ludlow Viaduct is constrained on both sides. On the east side are hill sides, park lands (Mt. Storm) and cemetery. On the west side are CSX tracks, the Mill Creek and numerous billboards. Crossing the mainline are overhead electric transmission lines (138 KV and 69 KV) at Sta 284+00 with towers located near the freeway. The entire area is geologically unstable and will require special designs for earthwork and retaining walls.



The existing mainline has numerous geometric deficiencies including horizontal SSD, superelevation transition length, and shoulder width. This alternative would correct these deficiencies and improve safety. However, because the railroad limits any westward widening, impacts to hillsides on the east side of the freeway will result in extensive use of retaining walls extending the length of this section with 32' maximum height. TranSystems performed a detailed

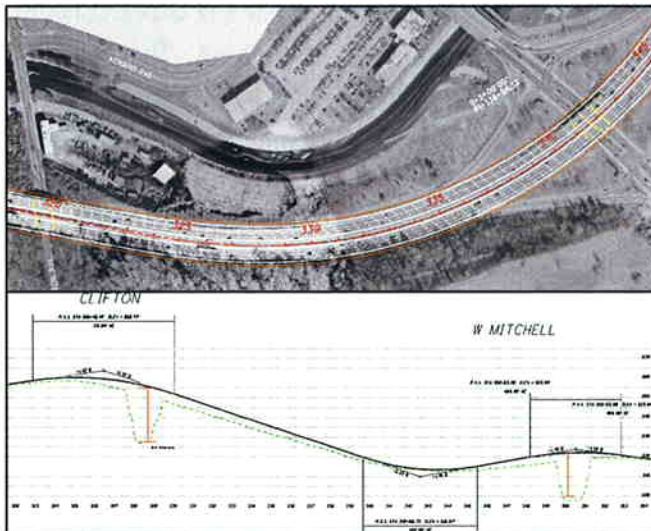




investigation for ODOT on alignment locations within this section of mainline. This evaluation is described in more detail in the Consideration of Design Exceptions discussion on page 27.

**Clifton Avenue (Sta 315+00 to Sta 330+00)** (See Exhibits A-9 to A-10.)

The existing mainline experiences high crash rates NB due to the crest vertical curve at Clifton Avenue combined with substandard SSD of the horizontal curve beginning at Sta 325+00 and congestion at the Mitchell Avenue exit ramp.



This mainline alternative addresses the geometric deficiencies of the mainline by meeting 60 MPH design speed criteria but a more complete safety solution would also improve operation of ramp intersections at Mitchell Avenue to reduce traffic queuing onto the freeway.

The Clifton Avenue at-grade bridge would require widening for the additional lane and to obtain required shoulder widths. The vertical alignment would need to be adjusted upward in order to

obtain minimum vertical clearance on Clifton Avenue. A review of the structure records indicates this bridge to be a candidate for replacement particularly with respect to the vertical profile correction ( $\cong 5'$ ).

On the west side of the freeway, embankment construction would impact the commercial property between Sta 322+00 and 325+00.

**Mitchell Avenue (Sta 330+00 to Sta 355+00)** (See Exhibit A-10.)

The existing mainline experiences a high frequency of accidents, ranking it 11th in Ohio Freeway Safety Hot Spots. A contributing factor is traffic congestion that occurs on the Mitchell Avenue ramps. Capacity improvements to the ramp intersections that provide better egress from I-75 is recommended (refer to interchange Alternative MIT-A). The existing at-grade bridge over Mitchell Avenue would require widening to accommodate standard shoulder widths and the





mainline lane addition; however, a review of the structure records indicates that it is a candidate for replacement.

Existing ramp terminals do not meet current high-speed requirements. The I-75 NB entrance terminal is bounded on the east side by a retaining wall that would need to be reconstructed for the mainline widening and additional terminal width.

**Mill Creek (Sta 355+00 to Sta 370+00) (See Exhibit A-11.)**

This section of I-75 passes through a confined space between a bend in the Mill Creek concrete channel on the west and landfill (currently used as a recreation field) to the east. The proposed widening for this alternative is symmetric about the center line which results in approximately 7' of lateral clearance to the top of concrete channel. Details of the channel should be further investigated to determine the feasibility of constructing a barrier or retaining wall near the channel.

Literature and field research identifying the boundary of the landfill will also need to be undertaken to determine the extent of available space on the east side if shifting the mainline away from the channel is necessary.

**Railroad & City of St. Bernard (Sta 370+00 to Sta 405+00) (See Exhibit A-11 to A-12.)**

This section contains railroad tracks on the west side of I-75 that are a minimum of approximately 40' offset from the proposed outside edge of shoulder and 10' lower than the roadway. A retaining wall might potentially be required to reduce embankment onto railroad property.

On the east side, several large buildings are in close proximity to the freeway including the St. Bernard Post Office and Fire Department. The proposed widening is not expected to affect these structures; however, surface parking lots would be impacted. The City of St. Bernard also owns building facilities on the west side between Sta 391+00 to Sta 399+00 to which the single access drive will be eliminated by the widening. Consequently, to avoid impacting the only access to Ross Avenue Park on the east side and provide sufficient curvature and transition lengths to meet the 60 MPH design speed, widening is proposed to be asymmetric toward the west to avoid encroaching on the park.

The at-grade bridge over Vine Street would require widening, however, a review of bridge records indicates that this structure would be a candidate for replacement.



**Norwood Lateral & Towne Street (Sta 405+00 to Sta 480+00)** (See Exhibit A-12 to A-15.)

Just south of the SR 562 system interchange are two railroad tracks crossing over the mainline. The abutments of this structure are located at the back of the existing outside shoulder thus being impacted by mainline widening and SR 562 ramp terminals.

In the NB direction, the exit ramp to SR 562 currently has no deceleration length and would require approximately 500' of deceleration lane length to conform to current high-speed exit terminal standards. In the SB direction, a high-speed entrance terminal would be constructed.

At Sta 418+00, the at-grade bridge over the I-75 SB to SR 562 EB ramp would require widening; however, review of the bridge records indicates that this structure is a candidate for replacement. The SR 562 EB to I-75 SB ramp bridge over I-75 would require replacement due to the widening of the mainline.



**Paddock Road Bridge Over I-75**

The SR 562 WB to I-75 NB and I-75 SB to SR 562 EB ramps are proposed to be widened to two lanes due to future traffic demand. Consequently, the ramp terminals on I-75 would be reconstructed to accommodate the additional lane. In the NB direction, a parallel-type entrance terminal is proposed that would conform to LDM Fig 505-1aE. This would result in add lanes extending 2,000' for the outmost lane and 5,440' for the second lane (acting as an add lane for lane balance). In the SB direction, a high-speed two-lane exit terminal is proposed as per LDM Fig 505-2bE for all facilities. The result is to add an auxiliary lane in advance of the divergence point 2,500' of tangent length plus zero degree 40' diverging curve ( $\cong 350'$ ). The effects of constructing the two-lane entrance and exit terminals will be the need to widen the at-grade bridge over Laidlaw Avenue approximately 70'. A review of bridge records indicates that this structure is a candidate for rehabilitation and widening. North of Laidlaw Avenue is a single track railroad bridge over I-75 (Sta 440+00). The existing abutments are located at the back of existing shoulders thus requiring the structure to be replaced due to the mainline widening.



The Towne Street partial interchange serves to provide exit and entry onto I-75 in NB direction only. The service ramps are recommended to be closed since the spacing is less than the minimum 2,000' per the Green Book standard ramp spacing requirement and if the SR 562 interchange entrance ramp is rebuilt with two lanes, the auxiliary lane will extend through the Towne Street interchange.

The at-grade bridge over Towne Street (Sta 452+00) would require widening approximately 70' due to mainline lane additions and shoulders; however, a review of the bridge records indicates that this structure is a candidate for replacement.

**Paddock Road (Sta 480+00 to Sta 533+00)** (See Exhibit A-16 to A-17.)

At Sta 491+00, the Seymour Avenue overhead bridge would be impacted by the widening and require replacement. The I-75 SB additional lane, shoulder width and Paddock Road entrance terminal combine to extend beyond the pier located at the back of existing shoulder.

The Paddock Road bridge over I-75 was constructed in the late 1990's and is an architectural gateway feature on the corridor. The bridge was constructed with vertical wall abutments offset from the back approximately 7' from the outside edge of shoulder. The abutment has a flat vertical face with protruding corners. Available clearance between unmodified abutment faces under the bridge is approximately 117.75'. With a design exception for shoulder width (4' median and outside shoulders), the minimum amount of space necessary for the four lane mainline alternative is 117.67'. In order to provide a crash barrier in front of the abutment face, a modification of the abutment face would be expected and if so, the bridge should be able to remain. To gain additional shoulder width, modification of the abutment corners should be considered such that the full 125' of clear space between faces is available.

The bridge received a design exception for 15' vertical clearance (15.5' minimum allowable) and the combination of adding a lane with the deepening haunched exterior plate girders may result in less vertical clearance over the outside shoulder. A profile adjustment of the mainline may be necessary to achieve the required minimum clearance.

The HAM-75-10.10 project team has recommended the use of an auxiliary lane between the Paddock Road and SR 126 interchanges in each direction. The lane addition results in five lanes for this alternative with potential impacts to a parallel industrial drive on the west side and extensive length ( $\cong$  1600') of retaining wall along Summit Avenue on the east side.

**I75-B: 5-Lane Continuity** – The impacts of this alternative are the same as Alternative I75-A unless noted below. The basic difference is the addition on one more 12' mainline lane for the length of the project thus causing the footprint to be 24' wider. Exhibits of this alternative are not





provided, as this option was dismissed from further consideration early in Step 5. A technical memorandum is included in Appendix 4 explaining the rationale behind this decision.

The following is a discussion of the main design differences from Alternative I75-A by section:

#### **WHV (Sta 126+00 to Sta 155+00)**

The fifth lane is proposed to be started at the WHV with the WHV EB to I-75 NB entrance ramp as the add lane. There is approximately 86' between piers of the I-75 NB to WHV WB exit ramp over I-75 bridge. To meet standard lane and shoulder widths, a total width of 88' is required for five lanes. Therefore, a design exception for shoulder width is likely at this location of the existing structure would require replacement.

As with Alternative I75-A, WHV interchange ramp terminals would require reconstruction to meet current high-speed standards.

#### **Marshall Avenue (Sta 155+00 to Sta 168+00)**

In the SB direction, the fifth lane is proposed to end just south of the I-75 over Marshall Avenue bridge ( $\cong$  SLM 3.10). The existing bridge would require being widened 48', however, the bridge is recommended for replacement.

At approximately SLM 3.16, there is limited lateral space for widening due to an industrial complex on the west side of the mainline and Central Parkway on the east side. There is approximately 180' of space available before impacting either the buildings or requiring relocation of Central Parkway. The five lane section is 185' (from outside of barrier to outside of barrier) without shoulder width reductions.

#### **Hopple Street (Sta 168+00 to Sta 210+00)**

The existing interchange ramp terminals would require reconstruction to upgrade to current high-speed standards which could affect overhead bridges. In addition, the fifth lane mainline widening in the SB direction would result in reconstruction of the Hopple Street overhead ramp bridges to achieve adequate lateral clearance. With piers at the back of shoulders, the Bates Avenue and Monmouth Street overhead bridges would require reconstruction or demolition due to the additional lane.

In the NB direction, the Bates Avenue entrance ramp would enter the freeway as an auxiliary lane forming a six lane segment to I-74.



### **I-74 (Sta 210+00 to Sta 255+00)**

In the SB direction, the I-74 EB to I-75 SB exit ramp is two lanes that would combine with the five mainline lanes to form a seven lane segment to Hopple Street. The outside most lane is proposed to be an exit-only lane to Hopple Street with six lanes passing under the Hopple Street overhead bridges. Several industrial buildings on the west side of the freeway would likely require relocation.

All overhead bridges in the I-74 interchange would require replacement due to the widening.

The Ludlow Viaduct overhead bridge would also be impacted by this alternative. Unlike Alternative I75-A, the additional lane width is expected to extend into the existing south abutment. Two or three spans at the south end of the bridge would require replacing.

### **Hillside (Sta 255+00 to Sta 315+00)**

The alignment developed for this segment would result in similar impacts to the hillsides as with the Alternative I75-A, but with the retaining walls set nearly one lane width further into the hillside (allowing for some differences in alignment geometry). Additional retaining wall length is expected.

### **Clifton Avenue (Sta 315+00 to Sta 330+00)**

This alternative results in similar impacts (to the 4-lane continuity) through the Clifton Avenue segment with corresponding additional width.

### **Mitchell Avenue (Sta 330+00 to Sta 355+00)**

This alternative results in similar impacts (to the 4-lane continuity) through the Mitchell Avenue segment with corresponding additional width.

### **Mill Creek (Sta 355+00 to Sta 370+00)**

This section of mainline is constrained as described for Alternative I75-A; however, the conditions are more exaggerated with the additional 24' for this alternative. Holding the Mill Creek as a fixed unalterable boundary results in the widening occurring further into the existing landfill. Risk presented by the landfill is unknown as this time.

### **Railroad & City of St. Bernard (Sta 370+00 to Sta 405+00)**

The minimum offset to existing railroad tracks on the west side of the mainline is approximately 25'. Crashworthy retaining walls for much of this segment is recommended with some length potentially