Department of Transportation

FRA/LIC-161-22.10/0.00 (PID 117878)

Feasibility Study

Prepared by:

WOOLPERT

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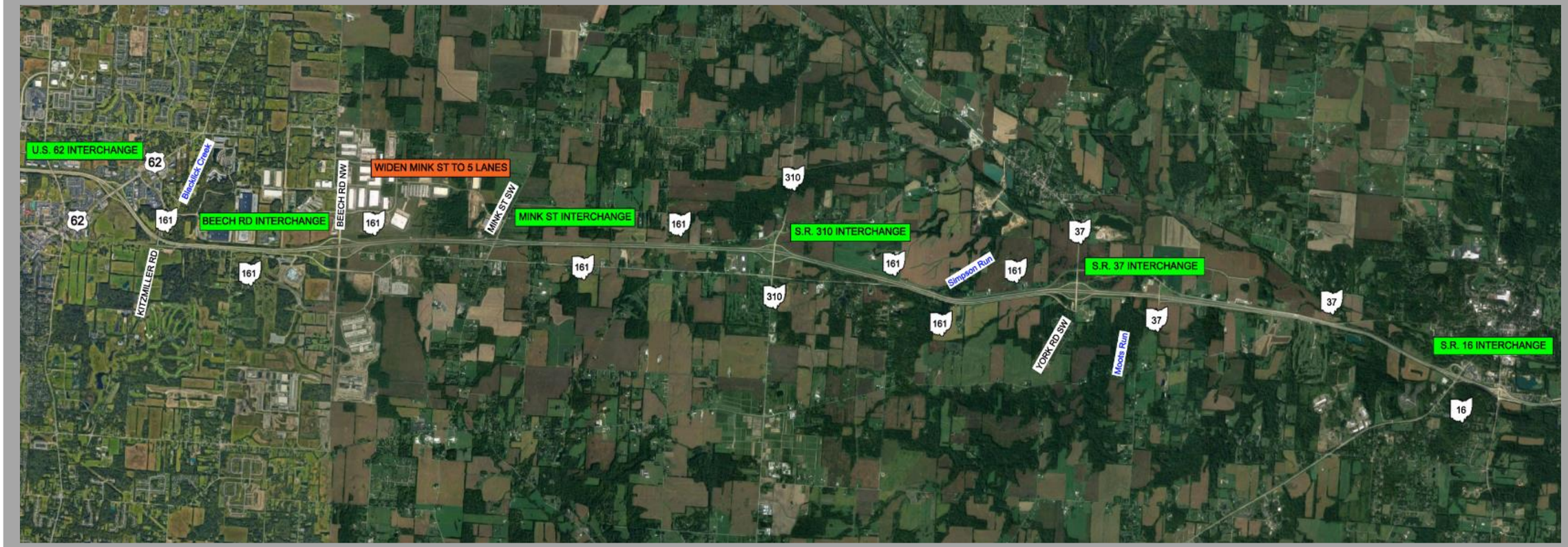

ODOT District 5

9600 Jacksontown Road, Jacksontown, OH 43030

Prepared by Woolpert, Inc.
One Easton Oval, Suite 400
Columbus, Ohio 43219

Woolpert.com

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Introduction

Project Background

State Route 161 (SR-161) is an east-west state highway in central Ohio. The FRA/LIC-161-22.10/0.00 (PID 117878) Feasibility Study focuses on SR-161 from the US-62 interchange to the SR-37 interchange and SR-37 from the SR-161 interchange to the SR-16 interchange. This section of highway serves two counties (Franklin and Licking), three cities (New Albany, Johnstown, and Pataskala), two villages (Granville and Alexandria), and four townships (Plain, Jersey, Granville, and St. Albans).

This phase of the proposed roadway improvements consists of widening SR-161 in both directions for approximately 15 miles from the US-62 interchange to the Village of Granville, as well as potentially improving the following existing interchanges: SR-161/Beech Road, SR-161/Mink Street, SR-161/SR-310 (Hazelton-Etna Road), SR-161/SR-37 (Johnstown-Alexandria Road/York Road); and SR-37/SR-16 (Columbus Road).

Major employment centers in the area include the New Albany International Business Park, the Personal Care and Beauty Campus in New Albany, Denison University in Granville, the Owens Corning Science and Technology Campus in Granville Township, the Owens Corning research facility in Newark, and the Thornwood Drive industrial corridor in Newark. In addition, Facebook (Meta) and Google recently built large data centers near the SR-161/Beech Road interchange, and Facebook announced plans to expand their data center beginning in 2026. Municipalities abutting and in the vicinity of the project are adopting land use plans intended to foster further growth and development.

On January 21, 2022, the Intel company announced plans to construct a new Chip Manufacturing Facility at the New Albany International Business Park. They intend to construct two advanced semiconductor manufacturing facilities with expected completion of the factories by 2026-27 and a goal of them becoming operational in 2027-2028. The influx of commercial and industrial development in the area surrounding SR-161/SR-37 presents a substantial increase in job creation, along with an anticipated corresponding increase in traffic volumes.

Purpose and Need

The purpose of this project is to improve mobility and reduce congestion within the SR-161/SR-37 corridor in order to facilitate and support current and anticipated economic growth in the area.

Primary Needs

Mobility and Congestion –County population growth from the 2010 U.S. census to the 2022 population estimates shows that Franklin County and Licking County rank 1st and 8th respectively in the list of the fastest growing counties in Ohio. The Licking County Transit Board's *Transit Development Plan* (2020) indicated that nearly 20% of Newark residents and 25% of Granville residents work in New Albany or Columbus. The number of employees and residents who commute between Franklin and Licking Counties is expected to increase as new development occurs in western Licking County, such as the Intel Chip Manufacturing Facility at New Albany's International Business Campus.

Based on the scenario in which the proposed full build out of the Intel facility exists, and no changes have been made to the existing condition of the roadways (the No-Build), the following impacts to mobility and congestion within the corridor can be anticipated:

- **SR-161 / SR-37 Mainline –** Mainline LOS will operate at LOS E and LOS F during AM and PM Peak hours.
- **Beech Road Interchange –** Ramps will operate at LOS E in AM and PM Peak hours.
- **Mink Road Interchange –** Ramps and adjacent local roadways will operate at LOS F in AM and PM Peak hours.
- **SR-310 Interchange -** Ramps and adjacent local roadways will operate at LOS F in AM and PM Peak hours.
- **SR-37 (York Road) Interchange -** Ramps and adjacent local roadways will operate at LOS E and LOS F in AM and PM Peak hours.
- **SR-16 (Columbus Road) Interchange** – Ramps will operate at LOS F in AM and PM Peak hours.

Economic Development – There is substantial economic development already occurring along SR-161/SR-37 between the Cities of New Albany and Newark. Numerous municipal authorities and private sectors within Licking County have developed planning initiatives, like GROW Licking County and Framework Licking County, created to align communities on a desired future with the goal to facilitate economic development throughout Licking County. The Licking County Area Transportation Study (LCATS) *Long Range Transportation Plan (LRTP) for Fiscal Years 2021-2050* (2020) includes a long-range plan to support economic development and states that county transportation infrastructure is crucial to economic development in Licking County and that SR-161 plays a key role by improving the transportation linkage between Columbus and Newark.

Figure 1: Study Area Map

Certified Traffic for Traffic Analysis

ODOT's Office of Statewide Planning & Research, Modeling & Forecasting Section prepared certified traffic forecasts for use in traffic analysis and roadway design. Traffic forecasts were based on traffic data collected between 2021 and 2023 and growth data provided by the Mid-Ohio Regional Planning Commission (MORPC). Opening Year traffic was set as 2028 and Design Year traffic as 2048. Final certified traffic was approved for use on October 29, 2024. See Appendix B for the Certified Traffic Plates.

For the purposes of consistency, the following naming convention is referred to in the Certified Traffic and will be used throughout this document:

No Build: SR-161 is a four-lane facility (two lanes in each direction)
Build: SR-161 is a six-lane facility (three lanes in each direction)

Existing Traffic Volumes: Intel traffic is not present
No Build Traffic Volumes: SR-161 is a 2-lane facility but adds Intel full build-out traffic volumes
Build Traffic Volumes: SR-161 is a 3-lane facility and adds Intel full build-out traffic volumes

No-Build Geometry: roadway geometry as it exists now
Build Geometry: roadway geometry needed to achieve acceptable traffic MOEs (LOS, delay, v/c, and queuing)

This Feasibility Study focused on the 2048 Build Scenario (SR-161 is a six-lane facility) and compared Build Traffic Volumes across existing and improved roadway geometry.

Stakeholder & Public Involvement Meetings

A Public Engagement Plan (PEP) was developed in September of 2023 for the project. A copy of the PEP is available in EnviroNet. The PEP identified numerous project stakeholders, representing government officials, emergency service providers, local schools, transit authorities, and local and regional planning authorities. In summer of 2023, meetings were held with multiple stakeholders to gather information pertinent to the development of the Feasibility Study. Representatives from the following stakeholders were included:

- Franklin County Engineer's Office
- Licking County Engineer's Office
- City of New Albany
- Plain Township
- Jersey Township
- Granville Township
- Village of Granville
- City of Johnstown
- Central Ohio Transit Authority
- Licking County Transit
- ODOT Office of Transit
- Heath-Newark-Licking County Port Authority
- MORPC
- LCATS
- Framework Licking County
- Planning Next
- GROW Licking County
- The New Albany Company

Topics discussed during the one-on-one meetings varied by stakeholder, but generally included the following themes:

- Known and anticipated development plans, such as future rezoning, potential annexations, and expected private development
- Various ongoing studies being performed related to long-range planning, land-use and comprehensive plans, and access management
- Active and planned transportation projects, including local road realignments, upgrades, extensions, added turn lanes, and other anticipated capital improvements
- Transit plans for the study area, including potential new public transit routes, dedicated transit lanes, and the development of mobility hubs
- Aesthetic considerations and the need to conserve the rural character of the corridor
- Emergency access, including the inclusion of additional U-turn locations along SR-161/37
- Coordination of this project with other existing and planned infrastructure projects in the area

Moving forward, both stakeholder and public meetings will be held to present the results of the Draft Feasibility Study and to solicit feedback, (i.e., adjacent property owners, tenants, and/or businesses along the corridor). The feedback will be used to finalize the Feasibility Study. These meetings will be virtual and may include an in-person component as well, to be determined based on the results of the Feasibility Study and consideration of previous Stakeholder feedback. A second meeting will occur once proposed impacts associated with the project are better understood. The format of these meetings will be determined based on the extent of proposed impacts and feedback solicited from previous public involvement efforts.

Alternatives Considered

SR-161/SR-37 Widening

Stage 1 plans and cost estimate have been submitted for widening SR-161/SR-37 to three lanes in each direction from Blacklick Creek to just west of the SR-37 and SR-16 interchange. FRA-161-15.80 (PID 116322) widens SR-161 from the SR-161 and SR-3 interchange to Blacklick Creek and ODOT project LIC-16/37-14.24/15.72 (PID 95445) widens SR-161/SR-37/SR-16 from the SR-37 and SR-16 interchange to the SR-16 and Thornwood Crossing interchange.

SR-161/SR-37 is proposed to be widened to the inside instead of the outside because of the lessened impacts to right-of-way and environmental issues and the existing wide median.

Beech Road Interchange

The study area is centered on the existing Beech Road diamond interchange with SR-161, specifically Ramp C, the eastbound ramp off of SR-161 approaching Beech Road. Within the Beech Road corridor study limits, Ramp C is the only movement anticipated to operate unacceptable in the design year. One alternative, widening Ramp C for an additional lane, is compared to a No-Build alternative. The alternatives were analyzed and compared to one another in the Key Issues section according to impacts on the following criteria:

- Traffic Assessment
- Roadway Assessment
- Environmental Assessment
- Right-of-Way Requirements
- Utility Impacts
- Safety Assessment
- Multimodal Assessment
- Lighting Impacts
- Maintenance of Traffic Assessment
- Cost

Each of these issues is graded as Excellent, Good, Average, Below Average, or Poor in the matrix in Table 23. Please refer to Appendix H for alternative exhibits and typical sections, and Appendix M for cost estimates.

Alternative 1 – Widening for Additional Lane

The existing three lane configuration of Ramp C is L-LTR-R. This alternative widens the ramp to the proposed four lane configuration of L-L-TR-R.

Alternative 2 – No-Build

This alternative makes no changes to the existing ramp.

Mink Street Interchange

The study area focuses on the existing Mink Street tight diamond interchange with SR-161, extending south on Mink Street through the Worthington Road intersection and north through the Innovation Campus Way intersection.

Three conceptual build alternatives were developed to address increased traffic capacity needs within the Mink Street study area as brought forth by the Certified Traffic Analysis. Each of these alternatives addresses a different interchange design for connecting SR-161 and Mink Street while servicing higher traffic volumes. The alternatives, as well as a No-Build condition, were analyzed and compared to one another in the Key Issues section according to impacts on the following criteria:

- Traffic Assessment
- Roadway Assessment
- Environmental Assessment
- Structural Assessment
- Geotechnical Assessment
- Right-of-Way Requirements
- Utility Impacts
- Safety Assessment
- Multimodal Assessment
- Lighting Impacts
- Maintenance of Traffic Assessment
- Cost

For all alternatives each of these issues is graded as Excellent, Good, Average, Below Average, or Poor in the matrix in Table 24. Please refer to Appendix I1, I2, and I3 for alternative exhibits and typical sections, and Appendix M for cost estimates. Tie ins north and south along Mink Street are considered in the Key Issues section and Appendices I5.

Alternative 1 – Tight Diamond

The **tight diamond** alternative allows for additional turning movements and through lanes at the intersections and on Mink Street as required by the Certified Traffic Analysis. A tight diamond design is a compressed version of a diamond interchange that consists of two signalized ramp intersections, which operate on one controller. This design was considered because of its improved traffic operation features and allowance of vehicles to queue outside the ramp intersections. The conceptual tight diamond design supports the needs of the study area due to its improvement of the existing tight diamond condition.

Alternative 2 – Diverging Diamond

The **DDI** (Diverging Diamond Interchange) alternative allows for additional turning movements and through lanes at the intersections and on Mink Street as required by the Certified Traffic Analysis. The DDI alternative was considered due to its improved safety features, such as a reduction in conflict points, a singular median sidewalk with limited exposure to crossing traffic, and natural traffic calming effects that result from crossover intersections characteristic of DDI designs. The DDI was also considered due to its

increased operational efficiency as exhibited by its lack of an exclusive left-turn signal phase and use of a two-phase signal operation, which increases the volume capacity. A conceptual DDI design supports the needs of the study area due to its accommodations for limited right-of-way and heavy left turn volumes both onto and off the ramps.

Alternative 3 - PARCLO

The **PARCLO** (Partial Cloverleaf Interchange) alternative allows for additional turning movements and through lanes at the intersections and on Mink Street as required by the Certified Traffic Analysis, as well as full access of movements between and along Mink Street and SR-161. In a PARCLO design, right-turns are used for the major turning movements at exits and entrances. This design supports traffic efficiency and safety due to its elimination of weaving between the loop ramps. A conceptual PARCLO design supports the needs of the study area due to its accommodations for heavy left turn volumes both onto and off the ramps.

Alternative 4 – No-Build

This alternative makes no changes to the existing tight diamond interchange.

Alternatives Considered and Dismissed

The **SPUI** (Single Point Urban Interchange) alternative was dismissed due to its geometric constraints and exceptionally high footprint within the study area. A SPUI design is not feasible at the existing SR-161 structure location due to its severe skew alignment, geometric constraints from available median widths, and requirements for longer clearances, widths, and structure lengths. The proposed structure for this option was not fully investigated, but this alternative would have required an approximate single span length between 200 to 250 feet to clear the ramps and lane configuration along Mink Street, yielding significantly higher structure costs compared to the other alternatives. Appendix I4 sheet 1 shows the schematic view of this.

When considered at a new location to allow for a 90-degree crossing (shown in Appendix I4 sheet 2), geometric constraints were again encountered due to median widths working against placing effective exit and entrances with the required number of lanes from the Certified Traffic Analysis. This configuration requires longer clearance lengths and extra width at the central intersection. A new location requires the re-alignment of both Mink Street and the SR-161 structure, resulting in significant increases in right-of-way impact and cost. Therefore, the SPUI alternative positioned at a new location was also dismissed.

SR-310 Interchange

The study area focuses on the existing SR-161 diamond interchange at SR-310. The study extends south through the Worthington Road intersection, and north through the Jug Street intersection.

Two conceptual build alternatives were developed for the SR-310 improvement. Each utilized the same general alignments as the existing roadway and ramps. The alternatives were developed to increase traffic capacity at the intersections. The alternatives, as well as a No-Build condition, were analyzed and compared to one another in the Key Issues section according to impacts on the following criteria:

- Traffic Assessment
- Roadway Assessment
- Environmental Assessment
- Structural Assessment
- Right-of-Way Requirements
- Utility Impacts
- Safety Assessment
- Multimodal Assessment
- Lighting Impacts
- Maintenance of Traffic Assessment
- Cost

For both alternatives each of these issues is graded as Excellent, Good, Average, Below Average, or Poor in the matrix in Table 25. Please refer to Appendix J1 and J2 for alternative exhibits, cross sections and typical sections, and Appendix M for cost estimates.

Alternative 1 - Signals

The **signals** alternative increases capacity at the intersections in the study area with the addition of traffic signals at SR-310 and Jug Street, SR-310 and Jersey Mill Road, SR-310 and the SR-161 westbound ramps, and SR-310 and the SR-161 eastbound ramps. Roadway widening is also included in this alternative to accommodate additional lanes.

Alternative 2 - Roundabouts

The **roundabouts** alternative increases capacity at the intersections in the study area with the addition of roundabouts at SR-310 and Jersey Mill Road, SR-310 and the SR-161 westbound ramps, and SR-310 and the SR-161 eastbound ramps. Similarly to Alternative 1, this alternative also includes a new signal at SR-310 and Jug Street and roadway widening to accommodate additional lanes.

Alternative 3 – No-Build

This alternative makes no changes to the existing diamond interchange.

SR-37 Interchange

The study area focuses on the existing SR-161 diamond interchange at SR-37. The study extends south through the Worthington Road intersection, and north through Moots Run Road intersection.

Two conceptual build alternatives were developed for the SR-37 improvement. Each utilized the same general alignment as the existing roadway. The alternatives were developed to increase traffic capacity at the intersections. The alternatives, as well as a No-Build condition, were analyzed and compared to one another in the Key Issues section according to impacts on the following criteria:

- Traffic Assessment
- Roadway Assessment
- Environmental Assessment
- Structural Assessment
- Right-of-Way Requirements
- Utility Impacts
- Safety Assessment
- Multimodal Assessment
- Lighting Impacts
- Maintenance of Traffic Assessment
- Cost

For all alternatives each of these issues is graded as Excellent, Good, Average, Below Average, or Poor in the matrix in Table 26. Please refer to Appendix K1 and K2 for alternative exhibits, cross sections and typical sections, and Appendix M for cost estimates.

Alternative 1 - Signals

The **signals** alternative increases capacity at the intersections in the study area with the addition of traffic signals at the SR-37 and Moots Run Road, SR-37 and the SR-161 westbound ramps, and SR-37 and the SR-161 eastbound ramps. Limited roadway widening is included in this alternative to accommodate additional lanes.

"No Build" Alt missing

Alternative 2 - Roundabouts

The **roundabouts** alternative increases capacity at the intersections in the study area with the addition of roundabouts at SR-37 and the SR-161 westbound ramps and SR-37 and the SR-161 eastbound ramps. Similarly to Alternative 1, this alternative also includes a new signal at SR-37 and Moots Run Road and limited roadway widening to accommodate additional lanes.

SR-16 Interchange

The study area is centered on the existing SR-37 interchange with Columbus Road (SR-16), extending north to the westbound SR-37 ramps and Weaver Drive intersection, and south to the Columbus Road and Granview Road intersection. The westbound exit ramp is a partial cloverleaf ramp coming to a stop condition at Columbus Road. The westbound entrance, eastbound entrance, and eastbound exit ramps of SR-37 follow a diamond structure.

One alternative, installing traffic signals at both the Columbus Road intersection with the SR-37 westbound ramps and the Columbus Road intersection with the SR-37 eastbound ramps, is compared to a No-Build alternative that maintains the existing stop conditions at both locations. The alternatives were analyzed and compared to one another in the Key Issues section according to impacts on the following criteria:

- Traffic Assessment
- Roadway Assessment
- Environmental Assessment
- Right-of-Way Requirements
- Utility Impacts
- Safety Assessment
- Multimodal Assessment
- Lighting Impacts
- Cost

For both alternatives each of these issues is graded as Excellent, Good, Average, Below Average, or Poor in the matrix in Table 27. Please refer to Appendix L for alternative exhibits and typical sections, and Appendix M for cost estimates.

Alternative 1 – Signals

This **signals** alternative installs signals at both the Columbus Road intersection with the SR-37 westbound ramps and the Columbus Road intersection with the SR-37 eastbound ramps. Turning movements are to remain unchanged from existing.

Alternative 2 – No-Build

This alternative makes no changes to the existing stop conditions at the Columbus Road intersection with the SR-37 westbound ramps and the Columbus Road intersection with the SR-37 eastbound ramps.

Key Issues

An assessment was completed for the proposed Build alternatives considered at each interchange for the categories listed below. Each category was considered critical to determining each alternative's feasibility. Design of the various intersection and segment improvements within the study area was based on the roadway design speeds and functional classifications shown in Table 1.

Table 1: Roadway Classification

Road Name	Posted/Design Speed (MPH)	Functional Classification
SR-161/SR-37	65	Principal Arterial Freeway
Beech Road	45	Major Collector
Mink Street	45	Urban Principal Arterial
SR-310	55	Major Collector (North) Minor Arterial (South)
SR-37	55	Principal Arterial (North) Major Collector (South)
SR-16	45	Major Collector (North) Principal Arterial (South)

If Mink is 35 mph, is Beech also 35 mph?

SR-161/SR-37 Widening

Traffic Assessment

Capacity analysis was performed for the 2048 No Build and Build conditions, evaluating a two-lane and three-lane configuration for SR-161/SR-37. Woolpert used Highway Capacity Software (HCS) 2024 version 8.3 freeway facilities and conducted the analysis on SR-161 from US-62 to Lancaster Road.

The capacity analysis evaluated the alternatives against the ODOT Analysis and Traffic Simulation (OATS) Manual operational goals for mainline facilities, including:

- LOS D or better for basic, merge, diverge, and weaving segments
- Demand-to-Capacity (d/c) ratio < 0.93

HCS Freeway Capacity Results

HCS Freeway Level of Service results are presented in Table 2 and Table 3 for the following alternatives:

- 2048 No Build - 2-Lane Configuration with Full Build-out Traffic Volumes
- 2048 Build - 3-Lane Configuration with Full Build-out Traffic Volumes

Eastbound Analysis

In the 2048 AM peak period, the 2-lane eastbound configuration encounters brief instances of LOS E at US-62 and approaching the Beech Road interchange, with volume-to-capacity (v/c) and demand-to-capacity (d/c) ratios exceeding 0.93 at the Beech Road interchange. The 3-lane configuration mitigates this condition, but the diverge segment at US-62 in the eastbound direction remains at LOS E. Overall, the 3-lane configuration presents a notable decrease in density along the facility, with improvements in travel time and space mean speed in the 2048 AM peak period.

In the 2048 PM peak period, the 2-lane eastbound configuration fails consistently from Beech Road through Lancaster Road, with demand approaching capacity (v/c > 0.93) from Beech Road through SR-310, and all segments achieving LOS F from east of SR-310 through Lancaster Road. In the 2048 PM peak 3-lane configuration, all segments perform at LOS D or better, and all v/c and d/c ratios meet ODOT OATS performance objectives. The 3-lane configuration presents improvements in space mean speed, density, and travel time when compared to the 2-lane alternative in the 2048 PM peak period.

Westbound Analysis

In the 2048 AM peak period, the 2-lane westbound configuration fails from Lancaster Road through SR-310, with d/c ratios exceeding 1.0 between Lancaster Road and Columbus Road/SR-16 in both the No Build and Build 2-lane configurations. D/c ratios exceeding 0.93 are consistent in the westbound direction from Lancaster Road through SR-310 with instances of segments at LOS D or worse from Lancaster Road through Beech Road. The 3-lane configuration addresses all instances of v/c and d/c exceeding 0.93 in the 2048 AM No Build and Build peak period and drastically improves space mean speed, reduces facility density, and improves facility travel time.

In the 2048 PM peak period, the 2-lane westbound configuration fails at the Beech Road interchange with LOS E along with v/c and d/c ratios at or exceeding 1.0. The segments exiting the study area operate at

LOS D but with acceptable v/c and d/c ratios. The 3-lane configuration operates at LOS D or better in all segments, with acceptable v/c and d/c ratios in all segments. The 3-lane configuration also achieves minor improvements in travel time, space mean speed, and reductions in facility density.

Table 2: 2048 SR-161 Eastbound HCS Results AM/PM

Eastbound HCS Results – Build Traffic (Facility)				
Category	**2048 AM 2 Lanes**	**2048 AM 3 Lanes**	**2048 PM 2 Lanes**	**2048 PM 3 Lanes**
Facility Length, mi	18.03	18.03	18.03	18.03
Space Mean Speed, mi/h	67.6	70.4	53.8	69.7
Density, pc/mi/ln	17.7	11.9	37.9	21.9
Density, veh/mi/ln	16.2	10.9	36	20.8
Travel Time, min	16	15.4	20.1	15.5
LOS	C	B	F	C

Table 3: 2048 SR-161 Westbound HCS Results AM/PM

Westbound HCS Results – Build Traffic (Facility)				
Category	**2048 AM 2 Lanes**	**2048 AM 3 Lanes**	**2048 PM 2 Lanes**	**2048 PM 3 Lanes**
Facility Length, mi	17.97	17.97	17.97	17.97
Space Mean Speed, mi/h	56.7	70.1	67.3	72.5
Density, pc/mi/ln	35.8	21.7	19.4	12.7
Density, veh/mi/ln	32.7	19.8	18.6	12.3
Travel Time, min	19	15.4	16.2	14.9
LOS	F	C	F	B

Capacity Analysis Summary
Overall, the 3-lane configuration meets ODOT OATS performance objects in nearly all cases, and achieves capacity and operational improvements when compared to the 2-lane configuration in both the 2048 AM and PM peak periods.

Roadway Assessment

The roadway and geometric design criteria for the conceptual alignments follows the standards set by the ODOT Location and Design (L&D) Manual, Volume 1. The design criteria used for the build alternatives are as follows:

SR-161/SR-37

- Functional Classification = Principal Arterial Freeway
- Design Speed = 70 mph
- Posted Speed = 65 mph
- Lane Width = 12 ft
- Paved Shoulder Width = 10 ft (widened to 12 ft at bridges)

The existing SR-161 layout from Blacklick Creek to the SR-37 interchange and SR-37 from the SR-161 interchange to the SR-16 interchange is a divided highway consisting of two 12’ travel lanes, 10’ outside paved shoulder, and 6’ inside paved shoulder in each direction with a drainage ditch in the median. The proposed layout is to widen for a 12’ travel lane and 10’ paved shoulder from the inside edge of traveled way towards the median and regrade the median ditch to continue runoff of the same drainage areas. At the west end of the project, the existing median is 60’ between the edges of traveled way and tapers to 84’ before Beech Road. The proposed median starts at 36’ between the new widened edges of traveled way and follows the same taper to reach 60’ before Beech Road.

There are no changes to the alignment or profiles of the existing lanes and widened lanes continue existing superelevation, which complies with the Location and Design Manual Volume 1 standard. Stormwater runs through open ditches and is collected in enclosed storm sewers. Minimal proposed pipes and structures are needed and most existing catch basins are adjusted or reconstructed to grade and stay in use, pending a condition assessment.

Environmental Assessment

A high-level environmental analysis using secondary source data and a desktop review was conducted for the entire project, including each proposed concept. The preliminary estimated construction limits for each concept were compared to known environmental resources to determine potential, estimated impacts. If a Build concept is advanced, further studies will evaluate refinements to the concepts to minimize impacts to both the human and natural environment. All environmental analysis exhibits are included in Appendix N.

The proposed project will widen SR-161 to the inside for the length of the study area. All impacts will occur within the existing right-of-way. Reference Environmental Resources exhibits SR-161 A-K in Appendix N.

Aquatic Resources
The western end of the project is located within the Upper Scioto Watershed (HUC 05060001), and the remainder of the project is located within the Licking Watershed (HUC 05040006). Per the Ohio EPA 401 Water Quality Certification for Nationwide Permits (NWP) map, the portion of the project from the

western end through the Beech Road interchange is located within an area designated as “Possibly Eligible” for coverage under a NWP, though additional field screening procedures are required. The remainder of the project is eligible for a NWP. Based on a review of the USGS StreamStats data, there are 20 mapped streams that flow through the project area. Any impacts below the Ordinary High Water Mark (OHWM) of jurisdictional streams will be subject to regulation by the U.S. Army Corps of Engineers (USACE) and by the Ohio EPA.

The National Wetland Inventory (NWI) Wetlands Mapper was reviewed for the project area. According to available NWI data, nine (9) mapped wetland features are located within or directly adjacent to the project area. Some features may no longer be present due to development in the area. Impacts to jurisdictional wetlands are subject to regulation by the USACE and by the Ohio EPA. Impacts to non-jurisdictional (isolated) wetlands are subject to regulation by the Ohio EPA.

A thorough ecological field investigation will be conducted during the Preliminary Engineering Phase of the project to confirm the existence of and determine the locations of these features, and to identify any additional aquatic resources present within the project area.

Floodplains

A review of the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) was conducted. Portions of the project are located within FEMA designated Special Flood Hazard Areas (SFHA), including the 100-year floodplain and the floodway. Impacts in these areas will require coordination with the local floodplain administrator. Additional hydraulic studies and a determination of floodplain impacts, including determinations of floodplain permitting requirements, will be conducted during the Preliminary Engineering Phase of the project.

Threatened and Endangered Species

According to the United States Fish and Wildlife Service (USFWS), no portion of the proposed project is located within a bat buffer, a bald eagle buffer, or within an eastern massasauga range polygon. The USFWS Information for Planning and Consultation (IPaC) website was reviewed (February 2025) and the following species are listed for the project area:

- *Myotis sodalis* (Indiana bat) – Endangered
- *Myotis septentrionalis* (Northern long-eared bat) – Threatened
- *Obovaria subrotunda* (Round hickorynut) – Threatened

Additionally, the bald eagle (*Haliaeetus leucocephalus*) is also protected under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. The widening of SR-161 may require minor impacts to wooded habitat for both federal and state listed bat species. Based on a review of aerial maps, the project area likely does not contain suitable habitat for the bald eagle. The eastern massasauga uses a range of habitats including wet prairies, fens, and other wetlands, as well as drier upland habitat. A more detailed review for potential Threatened and Endangered species habitat will be conducted as part of the future ecological investigation.

All native freshwater mussel species are protected in the State of Ohio (Section 1533.324 of the Ohio Revised Code). In addition, 12 species are federally listed. Per ODNR’s Ohio Mussel Survey Protocol (OMSP) updated in 2024, streams within the project area that have a drainage area greater than five square miles, or are listed as a “grouped” stream, require reconnaissance for the presence of freshwater mussels. Two (2) streams have a drainage area greater than 5 square miles at the point where it passes through the project area; Blacklick Creek (7.37 mi^2) and Moots Run (10.4 mi^2). Blacklick Creek is a Group 1 stream in the Ohio Mussel Survey Protocol (OMSP), meaning that it is a small to mid-sized stream where federally listed species are not expected to be present. Moots Run is unlisted in the OMSP. Ecological investigations on both Blacklick Creek and Moots Run will include a reconnaissance survey for freshwater mussels following the OMSP.

Based on a search of the ODNR Natural Heritage Database, there is a record for the state-listed potentially threatened Three-birds Orchid (*Triphora trianthophoros*) approximately 0.35 mile south of SR-161 west of SR-16. The habitat for this species includes mature deciduous forest. Impacts to mature forest may require a species survey and relocation during the bloom period in August. ODNR had no additional records for rare or endangered species or other significant features within the project area or within a one-mile radius of the project area.

Cultural Resources

The project area was studied extensively as part of the original roadway construction of SR-161 on the current alignment. Based on a review of the State Historic Preservation Office’s (SHPO) GIS website, there are three (3) sites determined to be eligible for listing on the National Register of Historic Places (NRHP) located within the project limits and within the existing right-of-way of SR-161. These sites are no longer present. Should the project require additional right-of-way, additional evaluation of known history/architecture sites and/or archaeological sites may be required during the NEPA clearance phase of the project.

Regulated Materials

A review of ODOT’s Ohio Regulated Properties Search (ORPS) website was completed to assist in identifying potential regulated materials concerns within the project area. There are two (2) records from the Ohio EPA Spills Database for a release of crude oil in 2001 at SR-37 and bovine milk in 2008 near the eastern end of the project area. There is also a Potential Area of Concern from ODOT-OES for a release of crude oil in 1956 when an ODOT contractor hit a crude oil pipeline near the now defunct Raccoon International Golf Club, west of Morse Road. The crude oil settled into the Chinney Run and Raccoon Creek beds and was covered over by layers of sediments. No Dig signs have been erected in the area.

The project area was also reviewed for adjacent properties that are considered a “high risk” land use, e.g., gas stations, dry cleaners, automotive repair/service/oil change, body shops, electrical substations, railroad maintenance/sidings, junkyards/scrapyards, landfills, oil/chemical warehouses/storage, or any industrial/manufacturing use. Based on a review of Google Aerial imagery, the majority of the study area has either “exempt” or “low risk” land use categories. One (1) automotive dealership is located south of SR-161 and west of SR-310, adjacent to the project. There are no ORPS records associated with this property. If needed, additional investigations into this property will occur during the Preliminary Engineering Phase of the project.

Section 4(f)/Section 6(f) Resources
Based on a review of aerial maps, no protected Section 4(f) resources – publicly owned parks, recreation areas, wildlife and waterfowl refuges, recreational water trails, and publicly and privately-owned historic sites – are present in or adjacent to the project area. Based on a review of the Land and Water Conservation Fund projects map available from the Trust for Public Land, there are no Section 6(f) properties currently located in or immediately adjacent to the project area.

Air Quality
All of Ohio is now in attainment for carbon monoxide (CO). Therefore, the project is considered exempt from a project level conformity analysis for CO. Franklin and Licking Counties are not located within a PM 2.5 nonattainment or maintenance area, thus, no further PM 2.5 analysis is required. Due to the presence of sensitive land uses within 500-feet of the project, and the project's proposal to add capacity, a Qualitative MSAT analysis will be required, following ODOT's and FHWA's processes. As ozone is handled at the regional level, the project must be listed in the 2024-2027 Statewide Transportation Improvement Program (STIP) for ozone to be addressed. A request should be made to place the project on the STIP to ensure it is included in the latest regional conformity analysis. The NEPA decision document cannot be signed until the project is in an approved STIP.

Noise
Potential Noise Sensitive Areas (NSA) were identified through a review of existing aerial mapping. The ODOT *Flowchart for When a Noise Analysis is Needed* (ODOT, 11/23/2012) was consulted to determine whether a noise analysis would be required for the project. As the overall proposed project includes the increase the number of through traffic lanes along SR-161, potential noise impacts will need to be assessed for the entire project area during the NEPA clearance phase of the project, regardless of the preferred alternative. A Noise Analysis will be conducted following ODOT's processes and procedures.

Farmlands
The east end of the project area, west of Mink Street, and the western end of the project area, including SR-16 are considered urbanized areas. Land within an urbanized area or committed to urban development or water storage is not subject to the Farmland Protection Policy Act (FPPA). As the extent of the project between these urbanized areas will occur entirely within the existing SR-161 right-of-way, no impact to farmlands will occur.

Water Wells and Drinking Water Resources
As the work proposed on SR-161 will occur entirely within the existing right-of-way, no impacts to any active drinking water wells will occur. Near the SR-16, a Ground Water Drinking Water Source Protection Area for the Village of Granville Community System is located within the project area. Impacts in this area may require coordination with the local public water system and plan notes. There are no Sole Source Aquifers in Franklin or Licking Counties.

Community Impacts
Potential impacts to the local community will be assessed throughout project development and the NEPA clearance phase of the project. The community impacts assessment will include an analysis of the project's potential to impact community cohesion, local health and educational facilities, public utilities, fire, police, emergency services, religious institutions, or public transportation facilities. As the widening of SR-161 will occur entirely within existing right-of-way, there will be no displacement of residents or businesses. Future public involvement activities and community outreach efforts will be inclusive and designed to reach groups that are typically more difficult to engage.

Safety Assessment
Densities in the 2-lane configuration exceed 36 passenger cars per mile per lane (pc/mi/ln) for the facility, with higher densities and poor LOS performance found primarily east of SR-310 in both the eastbound and westbound direction. Heavy congestion on the mainline is associated with increased crash rates, and higher likelihood of drivers changing lanes due to this congestion.

The additional through capacity of adding a third SR-161 lane will reduce overall congestion. While an additional lane is also expected to increase fixed object crashes where reduced median widths necessitate the use of concrete median barrier and/or cable median, capacity improvements are expected to improve safety at a higher rate versus the increase in fixed object crashes. In addition, by designing SR-161 mainline improvements with safety at the forefront, the capacity improvement provided with a third lane will provide a safer condition for 2048 volumes versus the existing two-lane section. See Appendix G for existing safety priority locations within Licking County, which covers the study area.

Lighting Impacts
High mast lighting currently exists within the center grass median along SR-161 at the Beech, SR-310, and SR-37 interchanges. Per ODOT District 5 preference, the existing high mast light towers will be relocated outside of the median due to restricted ditch drainage and the need for guardrail protection. Mainline light towers will be relocated on the outside of the pavement.
A minimum of 10 mainline light towers will be impacted at the Beech interchange, 9 at SR-310, and 11 at SR-37 along SR-161.

ITS Impacts
There are ODOT-owned ITS CCTV cameras at the following locations:

- Beech interchange on the south side of SR-161 west of Beech
- SR-310 interchange on the north side of SR-161 just east of the SR-310 overpass
- SR-37 interchange on the north side of SR-161 just east of the SR-37 overpass
- SR-16 interchange on the south side of SR-161 just east of the SR-16 overpass

Impacts to the cameras and support poles are not anticipated from the SR-161 third lane widening, however, improvements at the interchanges may impact underground conduit carrying power and communication cables. Furthermore, this project will include the installation of micro-duct conduit and pullboxes along SR-161 and a new CCTV camera and support pole at the Mink interchange.

Maintenance of Traffic Assessment

SR-161 Mainline Corridor

The widening of the SR-161 corridor through the project limits can be constructed in two major phases using part-width construction strategy by maintaining eastbound traffic on the eastbound lanes and westbound traffic on the westbound lanes. The first phase will shift traffic in both directions to the outside portion of the existing roadway, utilizing temporary pavement as necessary, to maintain two lanes in each direction. Widening will occur to the inside, toward the median, in both directions using a concrete barrier to separate the two lanes of traffic and the construction zone. The bridge widening over Chinney Creek and Blacklick creek will occur using the same strategy as the roadway widening of two major construction phases. The second phase will shift two lanes of traffic in both directions to the inside on the pavement and bridge constructed in Phase 1, allowing for the outside pavement and bridge to be constructed. A concrete barrier will be used to separate the two lanes of traffic and the construction zone.

SR-161 Blacklick Creek Bridge Widening

The widening of both bridges over Blacklick Creek can be constructed in two major phases using part-width construction strategies. The first phase will shift traffic to the outside on each bridge with widening and overlay occurring on the inside toward the median. The second phase will shift traffic to the inside, toward the median, on each bridge with construction occurring on the outside to complete new overlay. Two lanes of traffic in each direction will be maintained during construction. This MOT strategy is compatible with the widening that will occur along SR-161.

SR-161 at Mink Street

The SR-161 bridge replacements at the Mink Street interchange will be constructed in 2 major phases, with one bridge replaced during each phase. During each phase, traffic on SR-161 will utilize a crossover to place both directions of travel in one direction of SR-161, utilizing temporary pavement to achieve the crossover in the existing grass median.

For example, Phase 1 could see two lanes of SR-161 EB traffic being crossed over to the existing westbound lanes, allowing a total of four lanes (two eastbound and two westbound lanes) on the existing westbound lanes. This allows the SR-161 EB bridge over Mink Street to be constructed in its entirety. Then during Phase 2, the two lanes of SR-161 WB traffic would be crossed over to the eastbound lanes, allowing a total of four lanes (two EB and two WB lanes) in the eastbound lanes. Then the SR-161 WB bridge over Mink Street can be constructed in its entirety. Portable concrete barrier shall be utilized to divide opposing traffic flow.

The crossovers shall be placed on each side of the bridge over Mink Street to allow for 1,000 feet of distance between the end of the crossover and the bridge, with temporary pavement and grading as necessary to maintain the roadway. The exit and entrance ramps for Mink Street will be maintained throughout construction.

The expected typical section for two-way traffic on the existing bridge will be 2-ft offset from the outside barrier, two 11-ft travel lanes for eastbound traffic, a 2-ft offset on either side of the portable concrete barrier that separates the two directions of traffic, two 11-ft travel lanes for westbound traffic, and a 2-ft offset to the outside for a total typical section width of 54 feet.

This MOT strategy is compatible with the widening that will occur along the SR-161 mainline. The details of concurrent construction and necessary safety and traffic considerations will be determined as the project moves into plan production.

SR-161 Chinney Creek Bridge Widening

The widening of both bridges over Chinney Creek can be constructed in two major phases using part-width construction strategies. The first phase will shift traffic to the outside on each bridge with widening occurring on the inside toward the median. The second phase will shift traffic to the inside, toward the median, on each bridge with construction occurring on the outside. Two lanes of traffic in each direction will be maintained during construction. This MOT strategy is compatible with the widening that will occur along SR-161.

Beech Road Interchange

Traffic Assessment

Woolpert conducted capacity analysis for the 2048 No Build and one Build alternative at the SR-161/Beech Road interchange using HCS 2024 version 8.3. ODOT's OATS Manual Operational Goals of Mainline and Intersections formed the basis of the analysis, including:

- Overall Intersection LOS D or better
- Intersection Approach LOS E or better
- Control LOS E or better
- Volume to Capacity (v/c) ratio of < 0.93
- Queue Storage Ratio (QSR) of < 1.0

Existing Roadway Condition

The analysis area for the Beech Road interchange capacity analysis includes Beech Road from Worthington Road to Smith's Mill Road. Beech Road through the study area is generally a four-lane section divided by a raised landscaped median. Left turn lanes, either single or dual, are present at all signalized intersections in the study area. Exclusive and shared right turn lanes are also present at several signalized intersections. At the interchange, signalized traditional diamond ramp terminals are present for both the SR-161 eastbound and westbound ramps. At the eastbound ramp terminal, existing eastbound lane use is L-LTR-R and at the westbound ramp terminal existing lane use is L-TR-R.

HCS Capacity Analysis Results

Failing movements occur only at the SR-161 eastbound ramps in both the 2048 AM and PM peak periods, but all intersections perform at LOS D or better in each peak period. At the eastbound ramps, the eastbound right turn movement and northbound through movements both operate at LOS F with a v/c > 1.0 in the AM peak period. In the PM peak period, the eastbound right turn operates at LOS E with a v/c of approximately 0.93. Elsewhere, left turn movements are most common movements with failing (LOS E) movements, but no movements outside of the interchange operate at a LOS F in either peak period.

A summary of the HCS LOS results are presented in Table 4. Full results are available in Appendix D.

Table 4: Beech Road HCS Intersection Summary AM/PM

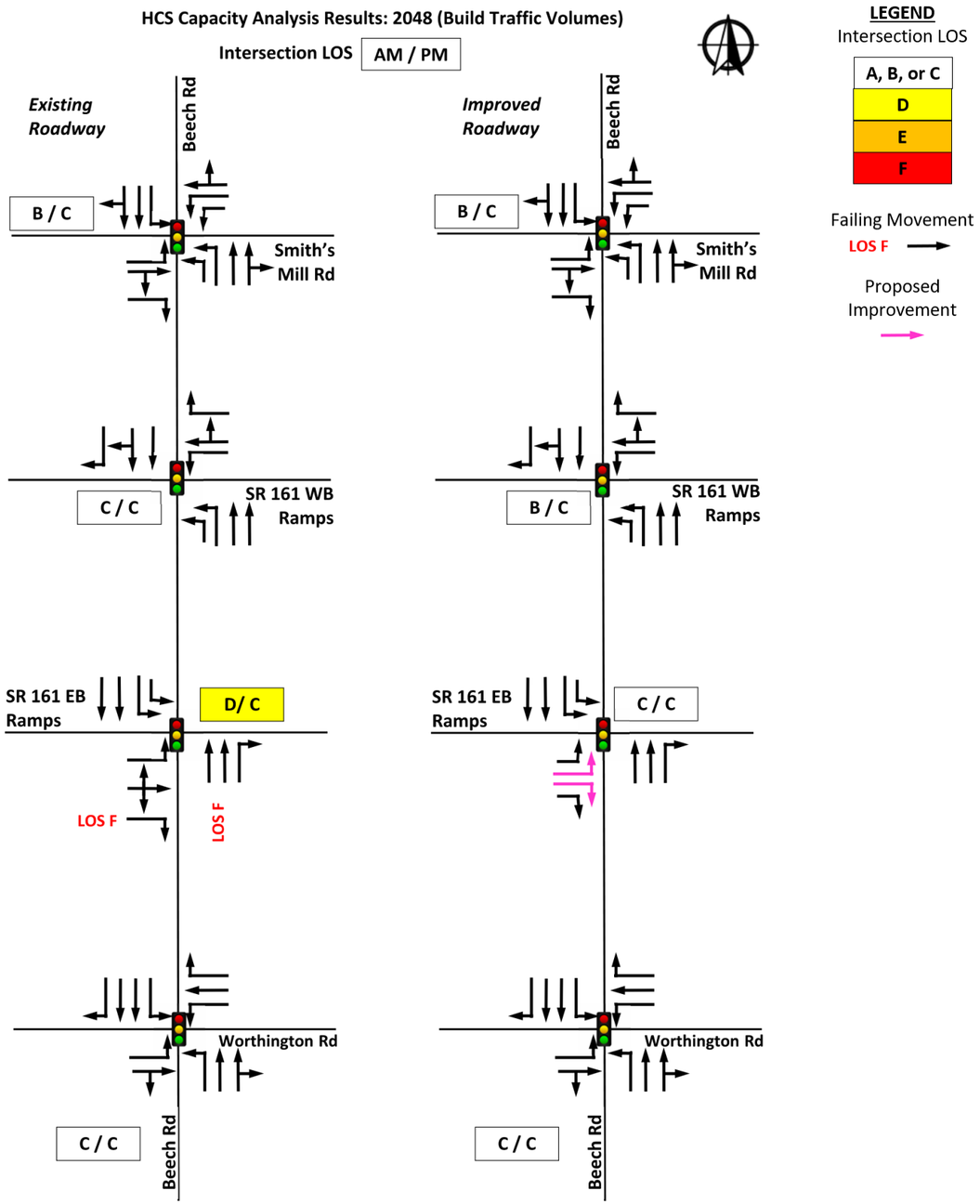
INTERSECTION w/ Beech	2048 No Build AM		2048 Build AM		2048 No Build PM		2048 Build PM	
	LOS	DELAY	LOS	DELAY	LOS	DELAY	LOS	DELAY
Worthington	C	22.1	C	24.1	C	29.8	C	32.3
EB Ramps	D	52.6	C	28.7	C	23.6	C	20.1
WB Ramps	C	25.4	B	19.6	C	22.8	C	26.9
Smith's Mill	B	14.9	B	19.4	C	32.3	C	28.9

Improved Roadway Geometry

Woolpert evaluated improving the eastbound ramp from L-LTR-R lane use to L-L-TR-R lane use and optimized signal timings along the entire corridor. No additional geometric improvements are proposed in this alternative. HCS analysis of the Build alternative indicates that eastbound exit ramp operations are notably improved in the AM and PM peak periods, with LOS D or better for all eastbound exit ramp movements and v/c ratios below 0.93.

Several individual left-turn movements operate at LOS E in the Build condition, however following signal timing optimization these movements achieve the OATS performance objectives of v/c ratios below 0.93 and QSR's below 1.0. In the Build Condition, all intersections achieve LOS C or better overall in the AM and PM peak periods.

Figure 2: SR-161 2048 Capacity Analysis Summary



Roadway Assessment

The roadway and geometric design criteria for the conceptual alignments follows the standards set by the ODOT Location and Design (L&D) Manual, Volume 1. The design criteria used for the build alternatives are as follows:

Beech Road

- Functional Classification = Major Collector
- Design Speed = 45 mph
- Posted Speed = 45 mph
- Lane Width = 12 ft
- Paved Shoulder Width = 4 ft
- 2 ft curb and gutter

Ramp C

- Functional Classification = Principal Arterial Freeway
- Design Speed = 55 mph
- Posted Speed = 55 mph
- Lane Width = 12 ft
- Shoulder Width = 3 ft min.

Alternative 1 – Widening for Left Turn Lane

The existing Ramp C layout consists of three 12' lanes, a 3' inside shoulder, and a 6' outside shoulder. Alternative 1 provides the needed travel lanes to increase level of service by widening the pavement 12' to provide dual left turn lanes, a through/right lane, and a right turn lane. No changes are needed for the centerline or profile and the widened lane continues the existing superelevation. Stormwater continues to be collected in the open ditch in the ramp infield. No Design Exceptions are expected for the build alternative.

Alternative 2 – No-Build

The No-Build alternative keeps the existing lane configuration.

Environmental Assessment

The proposed project will widen the exit ramp from SR-161 EB to Beech Road. All impacts will occur within the existing right-of-way. Reference Environmental Resources exhibits SR-161 Exhibit B, in Appendix N.

Aquatic Resources

Based on a review of the USGS StreamStats data and the National Wetland Inventory (NWI) Wetlands Mapper, there are no aquatic resources present within the project area. A thorough ecological field investigation will be needed to identify any aquatic resources present within the project area.

Floodplains
A review of the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) was conducted. The Beech Road interchange is located entirely in Zone X (unshaded), which is an area determined to be outside the 0.2% annual chance floodplain. No floodplain coordination is required for impacts related to the Beech Road interchange.

Threatened and Endangered Species
According to the USFWS, no portion of the proposed project is located within a bat buffer, a bald eagle buffer, or within an eastern massasauga range polygon. There is no suitable wooded habitat for federal and state listed bat species within the Beech Road interchange. There are no streams to support freshwater mussel species within the Beech Road interchange. The eastern massasauga uses a range of habitats including wet prairies, fens, and other wetlands, as well as drier upland habitat. Based on a search of the Natural Heritage Database, ODNR had no records for rare or endangered species or other significant features within a one-mile radius of the Beech Road interchange.

Cultural Resources
The project area was studied extensively as part of the original roadway construction of SR-161 on the current alignment. Based on a review of the State Historic Preservation Office's (SHPO) GIS website, there are no sites listed on or determined to be eligible for listing on the National Register of Historic Places (NRHP) located in or near the Beech Road interchange. All proposed impacts will occur within existing disturbed right-of-way.

Regulated Materials
Based on a review of ODOT's Ohio Regulated Properties Search (ORPS) website shows no records within or adjacent to the Beech Road interchange. Based on a review of Google Aerial imagery, the SR-161 exit ramp to Beech Road is located on parcels that are currently vacant/undeveloped, and were previously residential/undeveloped, which are considered "exempt" land use categories.

Section 4(f)/Section 6(f) Resources
Based on a review of aerial maps, no protected Section 4(f) resources – publicly owned parks, recreation areas, wildlife and waterfowl refuges, recreational water trails, and publicly and privately-owned historic sites – are present in or adjacent to the Beech Road interchange. Based on a review of the Land and Water Conservation Fund projects map available from the Trust for Public Land, there are no Section 6(f) properties currently located in or immediately adjacent to the Beech Road interchange.

Air Quality
All of Ohio is now in attainment for carbon monoxide (CO). Therefore, the project is considered exempt from a project level conformity analysis for CO. Licking County is not located within a PM 2.5 nonattainment or maintenance area, thus, no further PM 2.5 analysis is required. While there are no sensitive land uses within 500-feet of the SR-161 EB exit ramp to Beech Road, the project overall proposes to add capacity within 500-feet of sensitive land uses. Therefore, a Qualitative MSAT analysis will be required, following ODOT's and FHWA's processes. As ozone is handled at the regional level, the project must be listed in the 2024-2027 Statewide Transportation Improvement Program (STIP) for ozone to be addressed. A request should be made to place the project on the STIP to ensure it is included in the latest regional conformity analysis. The NEPA decision document cannot be signed until the project is in an approved STIP.

Noise
Potential Noise Sensitive Areas (NSA) were identified through a review of existing aerial mapping. The ODOT *Flowchart for When a Noise Analysis is Needed* (ODOT, 11/23/2012) was consulted to determine whether a noise analysis would be required for the project. As the overall proposed project includes the increase the number of through traffic lanes along SR-161, potential noise impacts will need to be assessed for the entire project area during the NEPA clearance phase of the project, regardless of the preferred alternative. A Noise Analysis will be conducted following ODOT's processes and procedures.

Farmlands
As the proposed changes to the Beech Road interchange will occur entirely within the existing SR-161 right-of-way, no impact to farmlands will occur.

Water Wells and Drinking Water Resources
As the work proposed on the Beech Road interchange will occur entirely within the existing right-of-way, no impacts to any active drinking water wells will occur. The Beech Road interchange is not located within a Drinking Water Source Protection Area. There are no Sole Source Aquifers in Licking County.

Community Impacts
The area surrounding the Beech Road interchange consists primarily of commercial and agricultural land uses, with the exception of residential homes southeast of the interchange. Given the anticipated increase in traffic resulting from ongoing development in the area, residents living near the Beech Road interchange may benefit from the proposed widening of the exit ramp from SR-161 EB to Beech Road, which will reduce delay times for SR-161 EB motorists exiting at Beech Road, resulting in shorter queues and less engine idling at the interchange. Community impacts will be assessed as part of the NEPA process.

Right-of-Way Requirements
All work and grading for Alternative 1 is expected to remain inside the existing limited access easement. No temporary easements are anticipated.

Utility Impacts
Pedestrian push button poles on the northwest corner of the Ramp C and Beech Road intersection are expected to conflict with the proposed lanes and are to be moved north. A fiber optic pullbox owned by Columbus FiberNet near the intersection conflicts with the new lane and is to be relocated approximately 10 feet north with conduit length increased to connect. Lighting conduit and traffic signal conduit cross Ramp C in the proposed pavement sections, but neither are anticipated to be in conflict.

Safety Assessment

Adding another left turn lane on the eastbound SR-161 ramp is expected to improve intersection traffic operations. Improved operations because of the additional capacity will reduce congestion related crashes at the eastbound exit ramp intersection. Crash reductions can also be expected along the Beech Road corridor as optimized signal timings reduce congestion and improve operations at individual signals.

Multimodal Assessment

Mobility hubs are not expected to be located along Beech Road per ODOT's Central Ohio Workforce Transit Plan of February 2024. Therefore Alternative 1 offers no additional multimodal access compared to the No-Build alternative.

Lighting Impacts

Outside of mainline SR-161, interchange lighting at Beech Road is not expected to be impacted.

Maintenance of Traffic Assessment

The widening of the SR-161 EB exit ramp onto Beech Road can be constructed in one major phase. Ramp traffic will shift to the outside lanes and shoulder of the existing ramp while the ramp is widened to the inside to construct the final proposed condition.

Costs

A construction cost estimate was prepared for Alternative 1 with consideration for high-cost generators such as pavement and earthwork. Other incidentals were expressed as percentages of total construction cost due to limited detailed information. The cost estimate was inflated to 2030 for the anticipated construction mid-point date. An additional 30% contingency was applied to the construction cost based on the planning level of design. Table 5 shows the construction cost for the alternatives and Appendix M shows itemized costs.

Table 5: Beech Road Alternatives Cost

Alternative	Description	Construction Costs (in 2030 Dollars)	Right-of-way Costs
1	Widened Left Turn Lane	$4,613,950	$0
2	No-Build	$0	$0

Mink Street Interchange

Traffic Assessment

Woolpert conducted capacity analysis for the 2048 No Build, and three Build alternatives. In addition to HCS, TransModeler version 7.0 was utilized as a supplemental tool to analyze the Build alternatives.

Existing Roadway Condition

The study area for the Mink Street interchange capacity analysis includes Mink Street from Worthington Road to Innovation Campus Way. Capacity analysis of the Mink Street corridor includes recent improvements implemented by the City of New Albany, including widening Mink Street from two lanes to five lanes from the SR-161 westbound ramps north.

South of the SR-161 westbound ramp terminal intersection, there is a single southbound through lane and two northbound through lanes. A single northbound and southbound left turn lane is provided between the westbound and eastbound ramp terminals. Mink Street north of Worthington Road is a single through lane until approximately 450 ft south of the eastbound ramp terminal intersection, where a second through lane forms and is carried north through the interchange. A northbound exclusive right turn lane also forms approximately 450 ft south of the eastbound ramp terminal intersection. In the No Build condition, both the eastbound and westbound exit ramp approaches are striped for L-LTR lane use.

Existing Roadway Traffic Analysis

Through movement v/c and QSR-ratios consistently rise above 1.0 along the Mink Street corridor from Worthington Road, through the interchange north beyond Innovation Way. Peak period through volumes from the Certified Traffic indicate upwards of 3,000 vehicles in a single direction (relative to AM versus PM peak) on Mink Street between the SR-161 westbound ramp terminal intersection and north of Innovation Way, which exceeds the capacity of the No Build five lane section.

At Worthington Road, heavy north/south Mink Street demand creates through movement failures in both the AM and PM peak periods. In the AM peak period, northbound QSR-exceed 4.4 with control delays exceeding 120 seconds/vehicle. In the PM peak, southbound demand mirrors the AM performance, with a QSR-for through movements exceeding 2.7 and delays well into the LOS F regime. Overall, the intersection performs at a failing LOS in both peak periods, primarily due to a lack of through capacity on Mink St.

At the SR-161 interchange, eastbound left turn demand exceeds 1,000 vehicles in the AM peak period, producing a v/c of 1.19 and a QSR-of nearly 4.0 in the eastbound LTR (rightmost) lane. At the eastbound ramp terminal intersection, northbound through demand of just over 1,200 vehicles in the AM peak produces a v/c ratio of 1.02. Overall, with signal timing improvements, the eastbound ramps perform at an overall LOS of E, with failing LOS on both the northbound and eastbound approaches. At the westbound ramp terminal intersection, northbound demand from Mink Street and the eastbound exit ramp creates queueing issues for the northbound movement, with a QSR-of 1.66. While the eastbound ramp somewhat meters the volume approaching the westbound ramps, the short spacing between both interchange terminals results in spillback queueing that backs up into the eastbound terminal intersection.

In the PM peak period, the pattern is reversed with southbound demand exceeding capacity at multiple points. At the westbound ramp terminal intersection, southbound right v/c approaches 1.1, with a QSR-exceeding 2.7. Further south at the eastbound ramp terminal intersection, the combination of heavy southbound volume demand, a single southbound through lane, and minimal spacing between interchange terminals results in v/c ratios exceeding 1.0 for all southbound movements and QSR-exceeding 6.0 for the southbound through and 3.3 for the southbound left turn.

At Innovation Way Road, peak period through demand on Mink Street eliminates nearly all available gaps to the point where LOS on the Innovation Way TWSC approaches exceed realistic values, indicating nearly no vehicles completing their turning movement during the analysis period.

Overall, 2048 traffic volumes result in failing approach LOS at each study intersection and failing overall LOS at multiple study intersections. Where signalization is not currently present, through demand reduces available gaps in the traffic stream to nearly zero, resulting in delays on uncontrolled approaches. The lack of through capacity to meet demand results in spillback queueing between adjacent intersections, which further exacerbates 2048 No Build operational performance.

HCS Capacity Analysis Results

Summaries of HCS LOS results are presented in Table 6 and Table 7. Supplemental Build analysis results from TransModeler are shown in Table 8 and Table 9. Full results are presented in Appendix D.

Where 2048 traffic volumes produced deficiencies versus the OATS Operational Goals, Woolpert modified signal timing and phasing to improve operations. Where signal timing and phasing modifications alone failed to achieve OATS operational goals, Woolpert modified No Build geometry including additional through capacity and turn lanes in combination with signal timing optimization to reach OATS operational goals. The following improvements apply to all three build condition analyses:

- Mink Street widened to two through lanes in both directions starting at a point just south of Worthington Road to the SR-161 eastbound ramp terminal (applies to all three alternatives with minor differences based on interchange geometry)
- Installation of an additional southbound Mink Street travel lane between the SR-161 eastbound ramp and Worthington Road which becomes the Worthington Road intersection southbound right turn lane
- Mink Street widened to three through lanes in both directions starting at the SR-161 eastbound ramp terminal (with minor variations between alternatives) north of Innovation Way.
- Innovation Way intersection converted to signalized intersections
- The rightmost northbound through lane becomes a drop right turn lane at Beaver Road

Improved Roadway Condition Corridor HCS Analysis

In the 2048 Build condition, the improvements described above result in improved operations at all study intersections, primarily due to increased through capacity and better balance in green time distribution between the through movement on Mink Street and secondary movements.

At Worthington Road, the introduction of two through lanes on Mink in both directions greatly improves operations versus the No Build geometry. Specifically, in the AM peak period, the intersection and all movements operate at an acceptable LOS with acceptable v/c ratios and QSR. In the PM peak period, southbound demand continues to result in a failing approach LOS and v/c ratio > 1.0, but overall, the intersection sees an improved operational performance compared to the No Build condition.

North of the interchange, operations at Innovation Way meet OATS performance objectives in the AM and PM peak periods after signalization, optimization, and capacity enhancements as described above.

Build Condition Interchange HCS Analysis

Woolpert evaluated the operational efficiencies of the following Build condition interchange configurations:

- Alternative 1 – Diamond Interchange
- Alternative 2 – Diverging Diamond Interchange (DDI)
- Alternative 3 – Partial Cloverleaf Interchange

HCS analysis indicates all three Build alternatives perform well during peak periods, achieving acceptable LOS at the interchange and v/c ratios below 1.0. Woolpert optimized signal timings in HCS to balance delay to the extent possible, without compromising operations on major movements.

Overall, the DDI alternative performed the best in HCS, followed by the Partial Cloverleaf, and the traditional Diamond configuration. While HCS indicates acceptable operations at each intersection, the analysis may not fully account for the dynamics of volume moving from intersection to intersection during peak periods, where spillback queueing and max-out conditions are anticipated when considering the total volume moving within the study area. To further evaluate individual interchange configurations against the background of the Mink Corridor, and at the request of ODOT's Office of Roadway Engineering, Woolpert simulated each interchange configuration in TransModeler.

Figure 3: Mink St 2048 Capacity Analysis Summary

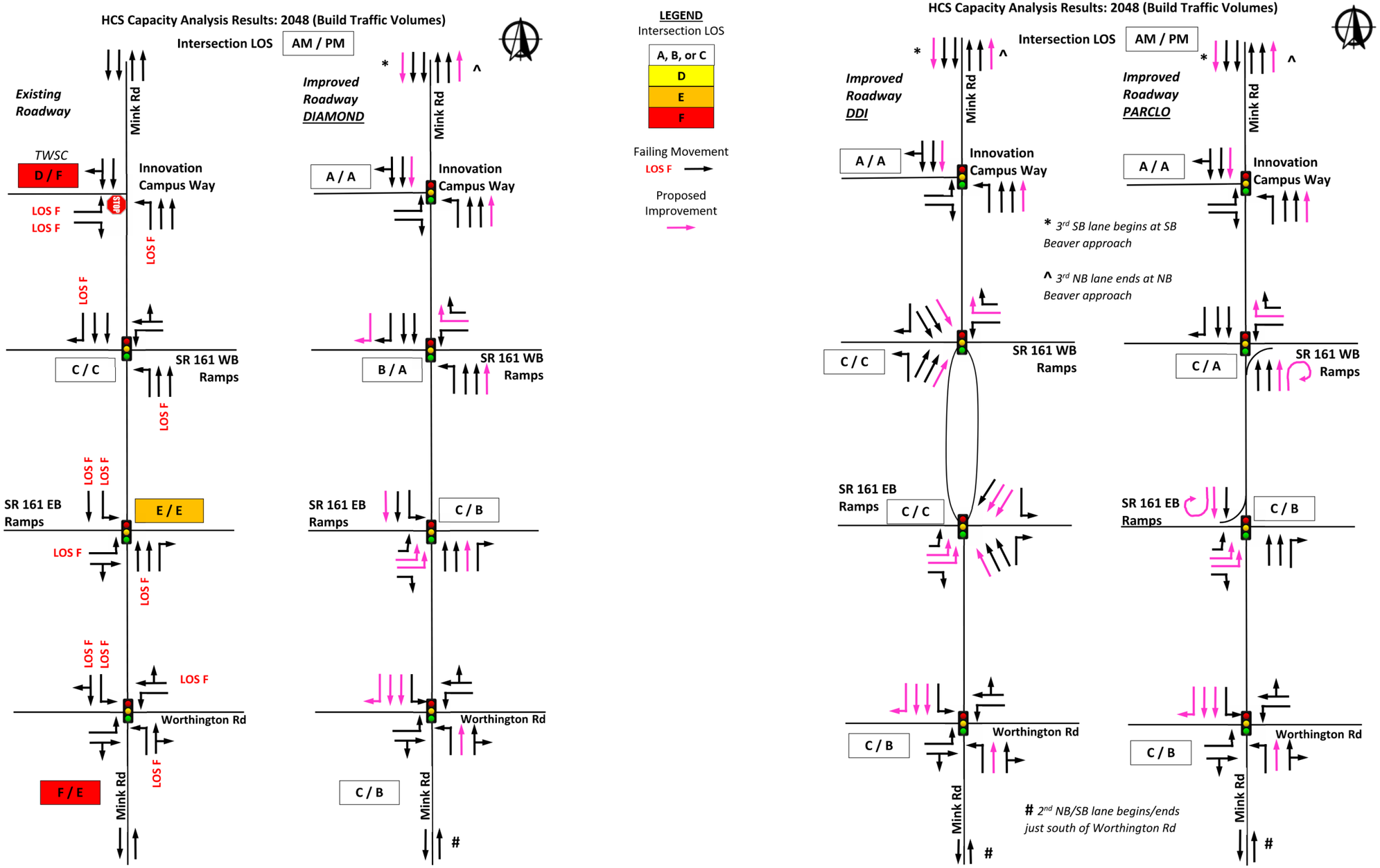


Table 6: 2048 Mink Street HCS Intersection Summary AM

INTERSECTION w/ Mink	2048 No Build AM		2048 Build - Diamond AM		2048 Build - DDI AM		2048 Build - Parclo AM	
	LOS	DELAY	LOS	DELAY	LOS	DELAY	LOS	DELAY
Worthington	F	95.9	C	32.4	C	27.5	C	30.7
EB Ramps	E	63.4	C	24.0	C	26.6	C	25.2
WB Ramps	C	24.5	B	18.5	C	30.5	C	20.8
Innovation	D	28.9	A	4.2	A	6.1	A	4.3

Table 7: 2048 Mink Street HCS Intersection Summary PM

INTERSECTION w/ Mink	2048 No Build PM		2048 Build - Diamond PM		2048 Build - DDI PM		2048 Build - Parclo PM	
	LOS	DELAY	LOS	DELAY	LOS	DELAY	LOS	DELAY
Worthington	E	75.5	B	15.6	B	15.6	B	19.8
EB Ramps	E	65.5	B	17.8	C	27.1	B	15.0
WB Ramps	C	30.4	A	4.2	C	24.7	A	7.2
Innovation	F	n/a	A	5.6	A	6.5	A	7.1

TransModeler Interchange Analysis Results

Given the limitations of HCS, particularly with the alternative interchanges in the Build conditions, Woolpert used TransModeler 7.0 to supplement HCS analysis of the Mink Street corridor and the Build interchange alternatives. TransModeler is especially useful in the evaluation of queuing related to the interchange and its impacts on the broader Mink Street corridor. Woolpert evaluated all Build interchange alternatives in TransModeler, which in turn drove the preliminary design process for each alternative. Table 8 and Table 9 present a comparison of Alternative 1, Alternative 2, and Alternative 3 based on the results of 10 simulation runs in TransModeler for both the 2048 AM and 2048 PM peak periods.

Table 8: 2048 Mink Street TransModeler Intersection Summary AM

INTERSECTION w/ Mink	Alt 1 Diamond		Alt 2 DDI		Alt 3 Parclo	
	2048 AM		2048 AM		2048 AM	
	LOS	Delay	LOS	Delay	LOS	Delay
Worthington	D	46.3	C	24.1	C	30.3
EB Ramps	F	81.8	C	31.9	B	10.4
WB Ramps	C	23.5	C	22.1	A	9.7
Innovation	B	10.0	A	4.4	A	5.7

Table 9: 2048 Mink Street TransModeler Intersection Summary PM

INTERSECTION w/ Mink	Alt 1 Diamond		Alt 2 DDI		Alt 3 Parclo	
	2048 PM		2048 PM		2048 PM	
	LOS	Delay	LOS	Delay	LOS	Delay
Worthington	F	99.9	B	13.8	B	16.8
EB Ramps	D	54.0	B	15.7	B	11.9
WB Ramps	B	15.9	D	39.5	A	4.7
Innovation	D	37.8	D	35.3	A	8.7

TransModeler analysis indicates that both the DDI and Partial Cloverleaf configurations outperform the Diamond interchange configuration, including better operations within the interchange and along the Mink Street corridor. For the Diamond configuration, spillback queueing from the eastbound exit ramp onto mainline SR-161 eastbound was observed at various times during AM peak period simulation runs. Signal timing optimization improved but did not eliminate this spillback during the AM peak analysis. The spillback condition was not observed in HCS but given the volumes and potential for some lane use imbalance the result observed in the TransModeler simulation is not unexpected.

AM peak spillback onto SR-161 from the eastbound exit ramp was not observed in either the DDI or partial cloverleaf configuration. In the AM peak period, efficient signal phasing is utilized to prioritize northbound movements out of each interchange configuration, which does create some inefficiency for lesser movements but still meets OATS performance objectives.

Notable differences in operations between the partial cloverleaf and the DDI are observed in the PM peak period. For the DDI, southbound queueing at the westbound ramp crossover intersection is greater compared to the partial cloverleaf. Woolpert originally anticipated a T-T-TR-R southbound lane configuration at the westbound DDI crossover, but the utility of the southbound TR option lane is nearly nullified by repetitive southbound through blocking of this lane. This is not a net negative, however, as a single lane (T-T-T-R) slip lane to westbound SR-161 is sufficient for acceptable operations and produces a safer merging condition downstream where the northbound left turn from Mink Street onto westbound SR-161 meets the

Mink Street southbound right. For the partial cloverleaf, however, acceptable southbound operations can be achieved using a T-T-R lane configuration, removing an entire southbound lane through the interchange compared to the DDI.

A primary advantage of the DDI over the partial cloverleaf and diamond configurations is in efficiencies for left turn movements off the ramps onto Mink Street. The DDI can display green to the eastbound left concurrent with the southbound through at the southern (eastbound SR-161) crossover interchange whereas the partial cloverleaf and diamond require these movements to occur in separate phases. By allowing for several overlapping movements to occur at the same time, the DDI can process vehicle movements through the interchange more efficiently. While individual intersection LOS results may vary, the true benefit of the DDI is realized in efficiency moving through the interchange from one end to another.

HCS versus TransModeler Results

Particularly with the DDI, HCS was not able to accurately capture the interaction between the interchange intersections, as well as the interaction between the interchange intersections and the adjacent intersections. The TransModeler simulations show similar results with the traditional diamond and Parclo interchange, but varied results with the DDI. The TransModeler DDI simulations account for realistic signal phasing, timing, and coordination within the interchange and along Mink Street.

North of Innovation Campus Way

As requested by ODOT's Office of Roadway Engineering, Woolpert evaluated capacity along Mink north of Innovation Campus Way. To do so, certified traffic was expanded to included Mink Street at Beaver Road and Clover Valley Road.

At Beaver Road, peak period through demand on Mink Street eliminates nearly all available gaps to the point where LOS on Beaver Road TWSC approaches exceed realistic values, indicating nearly no vehicles completing their turning movement during the analysis period.

At Clover Valley Road, demand on Mink Street creates similar operational concerns as are observed at the SR-161 interchange. Clover Valley Road is a critical decision point for vehicles approaching major development areas north of the study area. In the AM peak period, most (62%) of the northbound demand turns left onto Clover Valley Road, while in the PM peak period, major movements are split relatively nearly 50%/50% between eastbound right (from Clover Valley Road onto Mink St) and the Mink Street southbound through. The Clover Valley Road intersection operates at a failing LOS in both the AM and PM No Build peak periods. In the AM peak period the major movement, northbound left, sees a v/c ratio of 1.7, with a QSR-of 7.2; in the PM peak period, the southbound through sees a v/c ratio of 1.2 with a through QSR-of 2.5. Most importantly, the PM peak eastbound right sees a v/c ratio of 1.6 with a QSR-of 25.5.

The following improvements applied at Beaver Road and Clover Valley Road:

- Beaver Road converted to a signalized intersection
- An additional lane is added for westbound Beaver Road approaching Mink Street to create a L-LR lane assignment
- The rightmost Mink Street northbound through lane becomes a drop right turn lane at Beaver Road
- Clover Valley Road widened from two lanes to four lanes, with an exclusive eastbound left turn lane, creating an eastbound L-R-R lane assignment
- Dual left turn lanes added for northbound left turns from Mink Street to Clover Valley Road

In the PM peak period, only two movements fail to meet OATS performance objectives including the Beaver Road westbound approach and the Clover Valley Road eastbound approach. In the case of Beaver Road and Clover Valley Road, heavy demand along with heavy conflicting movements on the Mink Street mainline are responsible for v/c ratios exceeding 1.0. Woolpert explored using a free flow movement for the eastbound right turn at Clover Valley, but without any metering for this movement at Clover Valley, severe spillback queueing from the Beaver Road signal is likely to negate the benefit of a continuous eastbound right turn at Clover Valley Road.

At Beaver Road, triple lefts would alleviate the failing LOS condition from a capacity perspective, but a lane imbalance issue may arise downstream as regular commuters begin positioning themselves to access either Mink Street southbound out of the study area, or either of the SR-161 entrance ramps. One challenge at both Beaver Road and Clover Valley Road in the PM peak period is that side street turning demand is very heavy compared to southbound through demand. There are limited options from a signal timing perspective to increase green time for one movement without compromising another movement of similar demand.

Woolpert explored various alternative intersection designs during the preliminary analysis using draft certified traffic. Following publication of the final certified traffic, further analysis found limited benefit given the current "T" configuration of both the Beaver Road and Clover Valley Road intersections and the final distribution of traffic specifically during the PM peak period. Consolidation of the Beaver Road and Clover Valley Road intersections into one four leg intersection at Clover Valley Road is not advisable given that turning components at this hypothetical intersection would more closely match those found at a systems or service interchange than an at-grade signalized intersection.

While Mink Street north of Innovation Way is expected to have operational issues, these issues will not impede traffic at the interchange or moving away from the interchange. This was confirmed with the supplemental TransModeler analysis. Therefore the traffic analysis presented from Worthington to Innovation Way is still valid independent of the analysis north of Innovation Way. Future study may be warranted for Mink Street north of Innovation Way.

Table 10: Mink Street at Beaver and Clover Valley - HCS AM

INTERSECTION w/ Mink	2048 No Build AM		2048 Build - Diamond AM		2048 Build - DDI AM		2048 Build - Parclo AM	
	LOS	DELAY	LOS	DELAY	LOS	DELAY	LOS	DELAY
Beaver	F	593.0	A	8.8	A	9.7	B	14.5
Clover Valley	F	171.0	C	22.7	C	33.2	C	26.0

Table 11: Mink Street at Beaver and Clover Valley - HCS PM

INTERSECTION w/ Mink	2048 No Build PM		2048 Build - Diamond PM		2048 Build - DDI PM		2048 Build - Parclo PM	
	LOS	DELAY	LOS	DELAY	LOS	DELAY	LOS	DELAY
Beaver	F	4285.5	B	18.1	D	49.6	B	19.8
Clover Valley	F	181.9	E	59.0	D	54.0	E	62.0

Table 12: Mink Street at Beaver and Clover Valley - TransModeler AM

INTERSECTION w/ Mink	Alt 1 Diamond		Alt 2 DDI		Alt 3 Parclo	
	2048 AM		2048 AM		2048 AM	
	LOS	Delay	LOS	Delay	LOS	Delay
Beaver	A	7.8	A	8.9	B	10.0
Clover Valley	B	13.2	B	11.5	C	18.5

Table 13: Mink Street at Beaver and Clover Valley - TransModeler PM

INTERSECTION w/ Mink	Alt 1 Diamond		Alt 2 DDI		Alt 3 Parclo	
	2048 PM		2048 PM		2048 PM	
	LOS	Delay	LOS	Delay	LOS	Delay
Beaver	D	51.2	D	44.0	C	24.5
Clover Valley	F	141.1	E	59.2	F	97.7

Roadway Assessment

The roadway and geometric design criteria for the conceptual alignments follows the standards set by the ODOT Location and Design (L&D) Manual, Volume 1. No design exceptions are expected for any alternatives. The design criteria used for the build alternatives are as follows:

Mink Street

- Functional Classification = Urban Principal Arterial
- Design Speed = 45 mph
- Posted Speed = 45 mph
- Lane Width = 12 ft
- 2 ft curb and gutter

Alternative 1 – Tight Diamond

The tight diamond ramp alignments control the design for this alternative. Proposed ramps were placed slightly off the existing alignment to allow for MOT on the existing ramps during construction. Adjustments to the horizontal alignment of the ramps may be necessary to meet adequate slope transitions between the ramp and the mainline. This alternative includes the equal widening of Mink Street on both sides of its centerline. The proposed exhibit in Appendix B shows 250 feet of available storage for left turns onto SR-161 entrance ramps, as well as additional left-turn storage beyond the ramp intersections.

Alternative 2 – DDI

This design crosses at a 40-degree angle, which reduces the footprint within the study area. However, this configuration results in longer tangents at the crossover intersection, as well as increased widths along the crossover as there is not enough length for reverse curvature to allow for closer lanes. In this design, the bridge pier was placed in the center between Mink Street's northbound and southbound lanes. There may be pedestrian crossing issues on the free flow entrance ramp from southbound Mink Street to westbound SR-161. While it is ideal to place 300 feet between the end of merge and beginning of the transition from two to one lane for signing purposes, the entrance ramp onto westbound SR-161 was designed with 170 feet to prevent further interferences with properties north of the ramp. To allow safe turning movements for the WB-67 design vehicle, curves with 298-foot radii shall have 14-foot lane widths. It is possible to increase the storage lengths for northbound Mink Street to westbound SR-161 left-turn lanes in advance of the crossover. For curvature and geometric information on the ramps and crossover for this design, please refer to Appendix B.

A possible retaining wall north of the Cobbs Road cul-de-sac may be used to avoid encroaching on Wilson's Lawncare and Landscaping.

Alternative 3 – PARCLO

The loop ramp radii control the placement of the directional ramps, and the loop ramps that have radii of less than 200 feet shall have 18-foot lanes. The directional ramps containing heavy movements in this alternative were designed with a radius for turning, however the eastbound SR-161 to northbound Mink Street left turn and the westbound SR-161 to northbound Mink Street right turn can be squared up if desired. For curvature and geometric information on the ramps for this design, please refer to Appendix B.

The major disadvantage to the PARCLO versus the DDI is its footprint. The DDI requires more lanes to achieve acceptable operations, but its total footprint is smaller than a partial cloverleaf. The lack of loop ramps also means earthwork needs are less for the DDI when compared to the partial cloverleaf.

Alternative 4 – No-Build
The No-Build alternative keeps the existing lane configuration with no added pavement or upgraded interchange.

North of Innovation Campus Way and South of Worthington Road Tie-in Options
Two options are presented for tying into existing at both the north and south ends of Mink Street. Full build options widen pavement to fulfill level of service requirements but chases tie in points farther north and south along Mink Street. Lower cost options tie into existing pavement closer to the interchange, but don't achieve acceptable levels of service along Mink Street outside of the interchange.

The north full build scenario tapers to meet the existing four lane section approximately 400 feet north of Clover Valley Road. Beaver Road and Clover Valley Road are also widened accordingly, approximately 1000 feet each from Mink Street. Three drives on the west side of Mink Street and 8 drives on the east side are expected to be impacted. Shared use path is replaced along Mink Street and Clover Valley Road.

The south full build option has a 5 lane section at the Worthington Road and Mink Street intersection and ties in approximately 1400 feet south to meet the existing 2 lane section. Seven drives on the west side of Mink Street and five on the east side are expected to be impacted. Pavement widening also tracks approximately 1200 feet both west and east along Worthington Road from the intersection.

See Appendix I5 for the schematic layout of the north and south full build options. See Appendix M for the full build cost estimate. There is no decision matrix, layout is pending district's comments.

Lower cost options tie in as fast as possible from the interchange. While traffic analysis results show that acceptable levels of service can be met at the interchange intersections in the lower cost option, heavy congestion, particularly from the north, is causing traffic approaching the interchange on Mink Street to be metered, and therefore the results are not representative.

The north and south low cost options are shown for the tie ins at each alternative in Appendices I1, I2, and I3 and included in the cost in Appendices M.

Environmental Assessment

There are three (3) alternatives being proposed for the Mink Road interchange; a tight diamond (Tight Diamond), a partial cloverleaf (PARCLO), and a diverging diamond (DDI). Reference Environmental Resources exhibits Mink Street Tight Diamond, Mink Street PARCLO, and Mink Street DDI in Appendix N.

Aquatic Resources
Based on a review of the USGS StreamStats data, a tributary to the South Fork Licking River flows northwest through the interchange, entering from the southeast and flowing generally westward through the northeast and northwest quadrants. This stream is an ODOT mitigation site associated with the original construction of SR-161 on the current alignment. The South Fork Licking River flows under SR-161 via culvert at the west end of the potential impact area. All alternatives will potentially impact these known aquatic resources. Based on a review of the National Wetland Inventory (NWI) Wetlands Mapper, there are no mapped wetlands within the Mink Street interchange. The Mink Street interchange is located within the Licking Watershed (HUC 05040006). Per the Ohio EPA 401 Water Quality Certification for Nationwide Permits (NWP) map, impacts to aquatic resources associated with proposed work at the Mink Street interchange are eligible for a NWP. Impacts to streams and wetlands will require waterway permits from the USACE and/or Ohio EPA. These permitting actions will need to include coordination of impacts to the ODOT mitigation area, as noted above.

Floodplains
A review of the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) was conducted. The Mink Street interchange is located entirely in Zone X (unshaded), which is an area determined to be outside the 0.2% annual chance floodplain. No floodplain coordination is required for impacts related to the Mink Street interchange.

Threatened and Endangered Species
According to the United States Fish and Wildlife Service (USFWS), no portion of the proposed project is located within a bat buffer, a bald eagle buffer, or within an eastern massasauga range polygon. The USFWS Information for Planning and Consultation (IPaC) website was reviewed (February 2025) and the following species are listed for the project area:

- *Myotis sodalis* (Indiana bat) – Endangered
- *Myotis septentrionalis* (Northern long-eared bat) – Threatened

Additionally, the bald eagle (*Haliaeetus leucocephalus*) is also protected under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. All alternatives may require impacts to wooded habitat for both federal and state listed bat species. However, the PARCLO alternative would require greater impacts than the Tight Diamond or DDI alternatives. A more detailed review for Threatened and Endangered species habitat will be conducted as part of the future ecological investigation. Based on a review of aerial maps, the project area is unlikely to contain suitable habitat for the bald eagle. There are no streams in the project area that have a drainage area greater than 5 square miles. The eastern massasauga uses a range of habitats including wet prairies, fens, and other wetlands, as well as drier upland habitat.

Based on a search of the Natural Heritage Database, ODNR had no records for rare or endangered species or other significant features within the study area or within a one-mile radius of the project area.

Cultural Resources
The project area was studied extensively as part of the original roadway construction of SR-161 on the current alignment. Based on a review of the State Historic Preservation Office's (SHPO) GIS website, there are no sites listed on or determined to be eligible for listing on the National Register of Historic Places (NRHP) located in or near the Mink Street interchange. As permanent new right-of-way is proposed for all alternatives, and a potential relocation may occur with the PARCO alternative, additional evaluation for both history/architecture and/or archaeology may be required during the NEPA clearance phase of the project.

Regulated Materials
Per a review of the Ohio Regulated Properties Search (ORPS) website, there are two (2) records for regulated materials adjacent to the project area. There is a Resource Conservation and Recovery Act (RCRA) record for a Conditionally Exempt Small Quantity Generator (CESQG) located southwest of the Worthington Road intersection with Mink Street. There is a RCRA record for a CESQG located north of SR-161 at the west end of the project area. Neither location will be impacted by any alternative.. Based on a review of Google Aerial imagery, all parcels that may be impacted by the project represent "low risk" or "exempt" land use categories. An RMR Screening will be conducted during the Preliminary Engineering Phase of the project, and it will determine if an additional RM studies are needed.

Section 4(f)/Section 6(f) Resources
There are no publicly owned parks, recreation areas, wildlife and waterfowl refuges, and publicly and privately-owned historic sites present in or adjacent to the project area. There are no properties that have received Land & Water Conservation Fund (LWCF) assistance in or adjacent to the project area.

Air Quality
All of Ohio is now in attainment for carbon monoxide (CO). Therefore, the project is considered exempt from a project level conformity analysis for CO. Licking County is not located within a PM 2.5 nonattainment or maintenance area, thus, no further PM 2.5 analysis is required. Due to the presence of sensitive land uses within 500-feet of the project, and the project's proposal to add capacity, a Qualitative MSAT analysis will be required, following ODOT's and FHWA's processes regardless of the preferred alternative. As ozone is handled at the regional level, the project must be listed in the 2024-2027 Statewide Transportation Improvement Program (STIP) for ozone to be addressed. A request should be made to place the project on the STIP to ensure it is included in the latest regional conformity analysis. The NEPA decision document cannot be signed until the project is in an approved STIP.

Noise
Potential Noise Sensitive Areas (NSA) were identified through a review of existing aerial mapping. The ODOT *Flowchart for When a Noise Analysis is Needed* (ODOT, 11/23/2012) was consulted to determine whether a noise analysis would be required for the project. As the overall proposed project includes the increase the number of through traffic lanes along SR-161, potential noise impacts will need to be assessed for the entire project area during the NEPA clearance phase of the project, regardless of the preferred alternative. A Noise Analysis will be conducted following ODOT's processes and procedures.

Farmlands
The Mink Street interchange project area is not considered an urbanized area and is therefore subject to the Farmland Protection Policy Act (FPPA). Based on a review of the USDA Natural Resource Conservation Service (NRCS) Web Soil Survey, the undeveloped land around the Mink Street interchange is classified as prime farmland. All alternatives will require new permanent right-of way. The amount of potential new right-of-way needed for the Tight Diamond and DDI alternatives is likely within the F*armland Memorandum of Understanding (MOU) Between the Natural Resource Conservation Service (NRCS) and The Ohio Department of Transportation (ODOT) (Agreement #19552)* and should not require coordination with NRCS. However, the PARCLO alternative does not meet the MOU, and likely will require preparation of the Farmland Conversion Impact Rating (FCIR) form and coordination with NRCS.

Water Wells and Drinking Water Resources
For all alternatives being considered, there are mapped domestic water wells in or adjacent to the project area. Wells shown within the existing right-of-way have likely already been removed as part of a previous project. There are three (3) domestic water wells and one (1) public/semi-public well (shown on the map as "Other") belonging to Jersey Township are mapped on or within the potential impact limits for all alternatives. The presence and location of any active drinking water wells that may be affected by the project will require coordination with the owner following ODOT's Drinking Water Resources Standard Operating Procedure. The Mink Street interchange is not located within a Drinking Water Source Protection Area. There are no Sole Source Aquifers in Licking County.

Community Impacts
The area surrounding the Mink Street interchange consists of a mix of residential, commercial, and agricultural land uses. Given the anticipated increase in traffic resulting from ongoing development in the area, residents living near the Mink Street interchange may benefit from the proposed improvements, which will reduce delay times for motorists, resulting in shorter queues and less engine idling at the interchange and adjacent intersections. All alternatives will provide the benefit of improved mobility, however, the PARCLO alternative will move the roadway substantially closer to two (2) existing residences. Community impacts will be assessed as part of the NEPA process.

Structural Assessment

Existing Structure
The LIC-161-02.27L/R Bridge was originally constructed in 2008 and carries SR-161 over Mink Street. The existing superstructure is a single span (85-foot), 59.5-foot-wide composite reinforced concrete deck on steel beams with a 25.35-deg skew and tangent alignment. Travel width is 56 feet toe-to-toe of existing parapets. In their existing condition, the eastbound (EB) and westbound (WB) bridges each carry two 12-foot lanes but are wide enough to carry three 12-foot lanes, a 12-foot outside shoulder, and an 8-foot inside shoulder. The structure is supported on semi-integral abutments with 12-inch cast-in-place concrete piles.

All the Mink Street interchange realignment alternatives apart from no-build will require replacement of the existing structure to accommodate the added lanes and shared use paths along Mink Street below SR-161. To maintain a minimum 16.5-foot vertical clearance, the SR-161 profile will be raised approximately 3 feet above Mink Street for each alternative. Further beam depth and profile optimization during the full structure type study may allow for additional vertical clearance to more closely match the existing 17-foot clearance height.

Alternative 1 – Tight Diamond
The proposed twin structures are single span (155-foot bearing to bearing) superstructures supported on semi-integral abutments. The deck will be 63.33-foot out-to-out width, 60-foot toe-to-toe of parapets. This will accommodate three 12-foot lanes and two 12-foot shoulders. Due to the span length, prestressed concrete beams are not feasible, and superstructure will be composite concrete deck on steel plate girders. BDM 308.2.2 and NSBA Steel Design Handbook, an economical solution uses six plate girders at approximately 11.5-foot spacing. Foundations are assumed to utilize 14-inch cast-in-place concrete piles, approximately 60-foot long.

Alternative 2 – DDI
The proposed twin structures for this interchange alignment are two-span (115-foot, 115-foot bearing to bearing) superstructures supported on semi-integral abutments and cap and column pier. The deck will be 63.33-foot out-to-out width, 60-foot toe-to-toe of parapets. This will accommodate three 12-foot lanes and two 12-foot shoulders. For this alternative, the superstructure will be a composite concrete deck on either steel beams or prestressed concrete I-beams, which would be further investigated as part of a full structure type study to follow this feasibility study. For the purposes of preliminary cost estimates, foundations are assumed to utilize 12-inch cast-in-place concrete piles, approximately 60-foot long.

Alternative 3 - PARCLO
The proposed twin structures are single-span (170-foot bearing to bearing) superstructures supported on semi-integral abutments and cap and column pier. The deck will be 82.33-foot out-to-out width, 79-foot toe-to-toe of parapets. This will accommodate three 12-foot lanes, a 10-foot inside shoulder, an 8-foot outside shoulder, and a 25-foot ramp plus gore width. Preliminary superstructure is assumed to utilize eight steel plate girders at approximately 11-foot spacing. Foundations are assumed to utilize 14-inch cast-in-place concrete piles, approximately 60-foot long.

Retaining Walls
Retaining walls have been included in the structure assessment of alternatives where they are geometrically required to provide grade separation between roads. All structure alternatives will include construction of a mechanically stabilized earth (MSE) wall in front of each abutment and along the edge of the approaches. A 145-foot to 165-foot total wall length with max height of 18-feet is estimated to be required at each abutment for Alternative 1 and Alternative 3. A 1000-foot long MSE wall is estimated at each abutment for Alternative 4, which includes additional wall length needed for grade separation along the directional ramps from Mink Street. Formliner will be used on any visible MSE wall facing to provide aesthetic surface treatment. Construction costs for the walls have been estimated based on anticipated wall type and size.

Structures Conclusion
Alternatives 1, 2, and 3 are all acceptable from a structures assessment perspective. Alternative 3 requires significantly more retaining wall and additional bridge width and length that differentiate it from the other two feasible alternatives.

Geotechnical Assessment

Information used for this report was provided in the Preliminary Geotechnical Design Memorandum prepared by DLZ dated November 2023. SR-161 was previously realigned and widened from a two-lane roadway to a limited access freeway between New Albany and Granville. Preliminary information within the project corridor was provided from existing borings obtained from TIMS and District 5. The historic boring sheets indicate five or more feet of cuts and fills along SR-161 as part of the previous development work and was therefore not incorporated into final subgrade analysis.

One hundred and seventy-nine borings (179) were performed by DLZ as part of this project and found to be consistent with the historic information. Two borings (B-045-0-23 and B-046-0-23) were taken along the centerline alignment at the Mink Street bridge site. Boring B-045-0-23 is located nearest to the existing structure, behind the existing rear abutment. This boring, taken to a depth of 7-feet which does not provide adequate geotechnical information for foundation analysis at this time, indicates dense clays with some gravel and stone fragments. No rock was encountered within the drilled depth of the borings.

The existing structure was designed using two rows of 60-foot deep 12-inch diameter cast-in-place concrete piling at both abutments. Existing plans indicate the piles were designed for a 77-ton ASD capacity. Assuming a factor of safety of 2 and a resistance factor of 0.55 per BDM Section 405.11.2.C, this provides an LRFD service capacity of 308-kips and a factored capacity of 169-kips. For the purposes of this study, similar pile sizes and lengths were assumed for the preliminary structure cost estimates. Additional geotechnical coordination and investigation will be completed during detail design to verify capacity values and develop further recommendations.

Right-of-Way Requirements

Alternative Number	Number of Parcels Impacted	Total Acres Permanently Impacted
Alternative 1 – Tight Diamond	6	0.804 acres
Alternative 2 – DDI	4	0.242 acres
Alternative 3 – PARCLO	6	7.208 acres

For Alternatives 1 and 2, permanent takes needed in the existing right-of-way fee with limitation of access easement are minimal. The existing right-of-way follows the existing concrete barrier between Cobbs Road and Ramp I. Retaining walls in this area could minimize grading into the right-of-way, pending further cost analysis.

For Alternative 3, major permanent takes in the northeast and southwest quadrants of the interchange are needed because of the loop road sizes. A Jersey Township building located at 1481 Mink Street will be affected by the eastbound exit ramp because of the increased footprint.

Utility Impacts

An existing 6" high pressure gas pipeline owned by Marathon Ashland Oil Co. runs north of SR-161 and crosses Mink Street just north of the existing location of the intersection of Mink Street, Ramp I, and Ramp J. Because proposed Ramps I and J are generally not cutting into the existing pavement for each alternative, the only anticipated issue is for construction vehicle access crossing over this pipeline. Because the PARCLO's loop road and intersection is moved north, there are more crossings of this line which may have additional restrictions for the contractor. Other utility crossings are minor and will affect all alternatives similarly.

Existing drainage structures along Mink Street will need to be moved because of the widened pavement for the north and south full build options as opposed to the low cost tie in options.

Safety Assessment

The forecasted increase in volumes compared to the present-day condition in combination with capacity improvements in the form of new interchange geometry and widening to Mink Street is predicted to marginally increase crashes. Increased crash rates are primarily related to increased volumes, an increased number of lanes, and the conversion of several currently unsignalized intersections to signalized.

When evaluated from a congestion perspective, severe congestion anticipated in the No Build condition creates a higher likelihood of additional rear-end collisions, and the lack of signalization at intersections where turning gaps may be limited or nonexistent increases the likelihood of high-severity and high-speed angle crashes. In the 2048 AM peak period No Build condition, heavy volumes from SR-161 (particularly the eastbound ramp) spillback off the ramp and onto mainline SR-161 eastbound. Extreme congestion is present throughout the No Build corridor, including at unsignalized intersection approaches where delays exceed realistic analysis thresholds. This level of congestion cannot be captured by standard safety analysis models where crashes, followed by secondary and tertiary crashes would be likely along the corridor throughout the day.

The primary safety benefit of each Build Alternative is the reduction in crashes provided by the reduction of peak period congestion. Individual movement delays are reduced through more efficient signal timing and additional capacity along the Mink Street corridor. Individually, each interchange alternative presents more efficient operations in general and mitigates the mainline spillback queueing observed in the No Build condition.

Of the three Build Alternatives, the Diamond configuration (Alternative 1) presents the lowest reduction in delays and lowest efficiency of the three Build alternatives. The Diamond configuration improves interchange terminal spacing and adds capacity. The Partial Cloverleaf configuration (Alternative 3) improves on this by converting several interchange turning movements to free flow movements without conflict points, thereby improving signal efficiency and interchange throughput. The DDI (Alternative 2) takes this a step further by reducing overall vehicle-to-vehicle conflict points by upwards of 50% and uses overlapping movements to maximize interchange throughput. As such, the DDI is expected to provide the highest safety benefit.

Multimodal Assessment

ODOT's Central Ohio Workforce Transit Plan identifies Mink Street as a short-term recommended route to expand existing transit services toward Intel to the north and Reynoldsburg to the south. All full build alternatives are similarly beneficial to these routes. Full build options north and south of the interchange will be more effective than the low cost options.

In addition, the existing SR-161 structures over Mink Street do not provide space for non-motorized users outside of the travel lanes. All Build Alternatives will incorporate pedestrian facilities within the interchange.

Lighting Impacts

Interchange lighting is not present at Mink Street. At a minimum, partial interchange lighting is recommended. North of the interchange, Mink Street has decorative street lighting that will be impacted with all Build Alternatives.

Maintenance of Traffic Assessment

Alternative 1 – Tight Diamond

The widening of Mink Street and conversion to a tight diamond interchange can be constructed in three major phases, using part-width construction strategies. The first phase will shift Mink Street traffic to the west side of the roadway to construct the improvements on the east side. The second phase will shift traffic to the east side of the roadway to construct the improvement on the west side. The ramp reconstruction will follow a similar part-width construction strategy of shifting traffic to one side, widening to the other, then flipping traffic to the constructed side to finish the ramp construction. The third phase would be a cleanup construction phase to finish the interchange.

During detailed MOT development, the number of lanes to maintain along Mink Street through the interchange will be evaluated. Construction phasing will maximize offline construction to limit impacts and lane closures within the interchange. Completion of the ramp tie-ins may necessitate overnight or weekend closure.

This MOT strategy is not compatible with the widening of the SR-161 bridges at Mink Street; the bridges will need to be completed first before the interchange can be reconstructed to provide enough room under the bridges for the necessary traffic shifts.

Alternative 2 – DDI

The widening of Mink Street and conversion to a diverging diamond interchange (DDI) can be constructed in three major phases, using part-width construction strategies. The first phase will shift Mink Street traffic to the west side of the roadway to construct the improvements on the east side. The second phase will shift traffic to the east side of the roadway to construct the improvement on the west side. The ramp reconstruction will follow a similar part-width construction strategy of shifting traffic to one side, widening to the other, then flipping traffic to the constructed side to finish the ramp construction. The third phase would be a cleanup construction phase to finish the DDI, adding final curb at the crossover intersections, median, and finalizing the signal placement and timing of the DDI.

During detailed MOT development, the number of lanes to maintain along Mink Street through the interchange will be evaluated. Construction phasing will maximize offline construction to limit impacts and lane closures within the interchange. Completion of the ramp tie-ins may necessitate overnight or weekend closure.

This MOT strategy is not compatible with the widening of the SR-161 bridges at Mink Street; the bridges will need to be completed first before the interchange can be reconstructed to provide enough room under the bridges for the necessary traffic shifts.

Alternative 3 – PARCLO

The widening of Mink Street and conversion to a partial clover (PARCLO) interchange can be constructed in three major phases, using part-width construction strategies. The first phase will shift Mink Street traffic to the west side of the roadway to construct the improvements on the east side. The second phase will shift traffic to the east side of the roadway to construct the improvement on the west side. The ramp reconstruction will follow a similar part-width construction strategy of shifting traffic to one side, widening to the other, then flipping traffic to the constructed side to finish the ramp construction. The third phase would be a cleanup construction phase to finish the interchange, adding final curbing as needed, median, and finalizing the signal placement.

During detailed MOT development, the number of lanes to maintain along Mink Street through the interchange will be evaluated. Construction phasing will maximize offline construction to limit impacts and lane closures within the interchange. Completion of the ramp tie-ins may necessitate overnight or weekend closure.

This MOT strategy is not compatible with the widening of the SR-161 bridges at Mink Street; the bridges will need to be completed first before the interchange can be reconstructed to provide enough room under the bridges for the necessary traffic shifts.

All Alternatives

U.S. Bike Route 50 passes through the project area along Worthington Road crossing Mink Street. This bike route is to be maintained during all construction phases. The details for maintaining the bike route crossing will be determined as the project moves into plan production.

Costs

A construction cost estimate was prepared for each of the alternatives with consideration for high-cost generators such as pavement, earthwork, and structures. Other incidentals were expressed as percentages of total construction cost due to limited detailed information. The cost estimate was inflated to 2030 for the anticipated construction mid-point date. An additional 30% contingency was applied to the construction cost based on the planning level of design. Table 14 shows the construction cost for the alternatives and Appendix M shows itemized costs.

Table 14: Mink Street Alternatives Cost

Alternative	Description	Construction Costs (in 2030 Dollars)	Right-of-way Costs
1	Tight Diamond Interchange	$36,708,075	$160,800
2	Diverging Diamond Interchange	$44,180,575	$48,400
3	PARCLO Interchange	$56,603,175	$1,441,600
4	No-Build	$0	$0

SR-310 Interchange

Traffic Assessment

Existing Roadway Conditions

The SR-310 study corridor includes the intersections at Worthington Road, the SR-161 Eastbound Ramps, the SR-161 Westbound Ramps, Jersey Mill Road, and Jug Street. State Route 310 is a rural, two-lane undivided Minor Arterial / Major Collector with a posted speed limit of 55 mph. Under the existing conditions, all intersections operate with side street stop control except for Worthington Road which is currently signalized.

Existing Roadway Traffic Analysis

Highway Capacity Software (HCS) was used to analyze the Design Year (2048) peak hour traffic conditions under the existing roadway configuration with the goal of identifying what improvements may be needed to serve the future traffic demand. This would determine whether the existing traffic control and lane configuration would provide acceptable levels of service (LOS) for the 2048 Build volumes and if not, help identify what capacity improvements would be required to do so.

Design Year certified traffic projections indicate that growth in the area will lead to the SR-310 corridor serving approximately 2,000 vehicles during the AM peak hour and about 2,500 vehicles during the PM peak hour. The following are some of the key findings based on the capacity analysis results for the existing roadway configuration and traffic control:

- The SR-310 through lanes at the Worthington Road intersection would be expected to have a volume to capacity (v/c) ratio exceeding 1.0. These capacity constraints and associated increase in delay would have both side street approaches and the overall intersection operating at an unacceptable LOS.
- The SR-161 stop-controlled exit ramps would have an unacceptable LOS as both experience an increase in average delay with at least 700 seconds per vehicle expected during the AM peak hour and at least 1,100 seconds per vehicle expected in the PM peak hour.
- The heavy eastbound right turn volume expected at the Jersey Mill Road intersection during the PM peak hour would result in an unacceptable LOS, over 1,000 seconds of average delay, and a v/c ratio of 3.97.
- The side street approaches at Jug Street would be expected to have an unacceptable LOS with approximately 200-400 seconds of delay per vehicle during the PM peak hour and v/c ratios exceeding 1.0.

Improved Roadway Conditions

These results indicate that the existing SR-310 corridor has insufficient capacity to accommodate the projected traffic volumes, and both lane usage and traffic control changes will need to be considered in order to mitigate the anticipated deficiencies. HCS was then further utilized in accordance with the ODOT Analysis and Traffic Simulation (OATS) manual methodologies to evaluate these potential improvements which resulted in two alternatives. The first alternative would maintain a diamond interchange configuration and utilize traffic signals at the SR-161 interchange ramp terminals, while the second alternative would rely on roundabouts. The lane configuration was assessed for each alternative to determine the most efficient and economical way to achieve acceptable LOS at each intersection, see Figure 4 for the recommend lane use and traffic control for each option.

In addition to the HCS analysis, Transmodeler was also used to further evaluate the roundabout alternative and ensure that it would offer an appropriate solution for the SR-310 corridor. While HCS identified the lane configuration that would be needed at each roundabout from a capacity perspective, a microsimulation model provided a closer look at the free-flow bypass lanes and the traffic interaction that would occur between each intersection, particularly where there was the potential for a weave to occur. Visual observations of the simulations confirmed that SR-310 corridor would function in a satisfactory manner with regard to traffic flow as no operational issues associated with the free-flow bypass lanes, potential weaves, queue spillback between roundabouts, or lane continuity were identified. However, it should be noted that the LOS and delay outputs from Transmodeler did identify some potential capacity deficiencies that were not reflected in the previous HCS results, with several movements experiencing delays that are beyond the LOS F threshold. While these were not observed to have a detrimental impact to the overall operation of the corridor, further investigation into the roundabout geometry and specific lane needs should be considered if roundabouts are chosen as the preferred alternative.

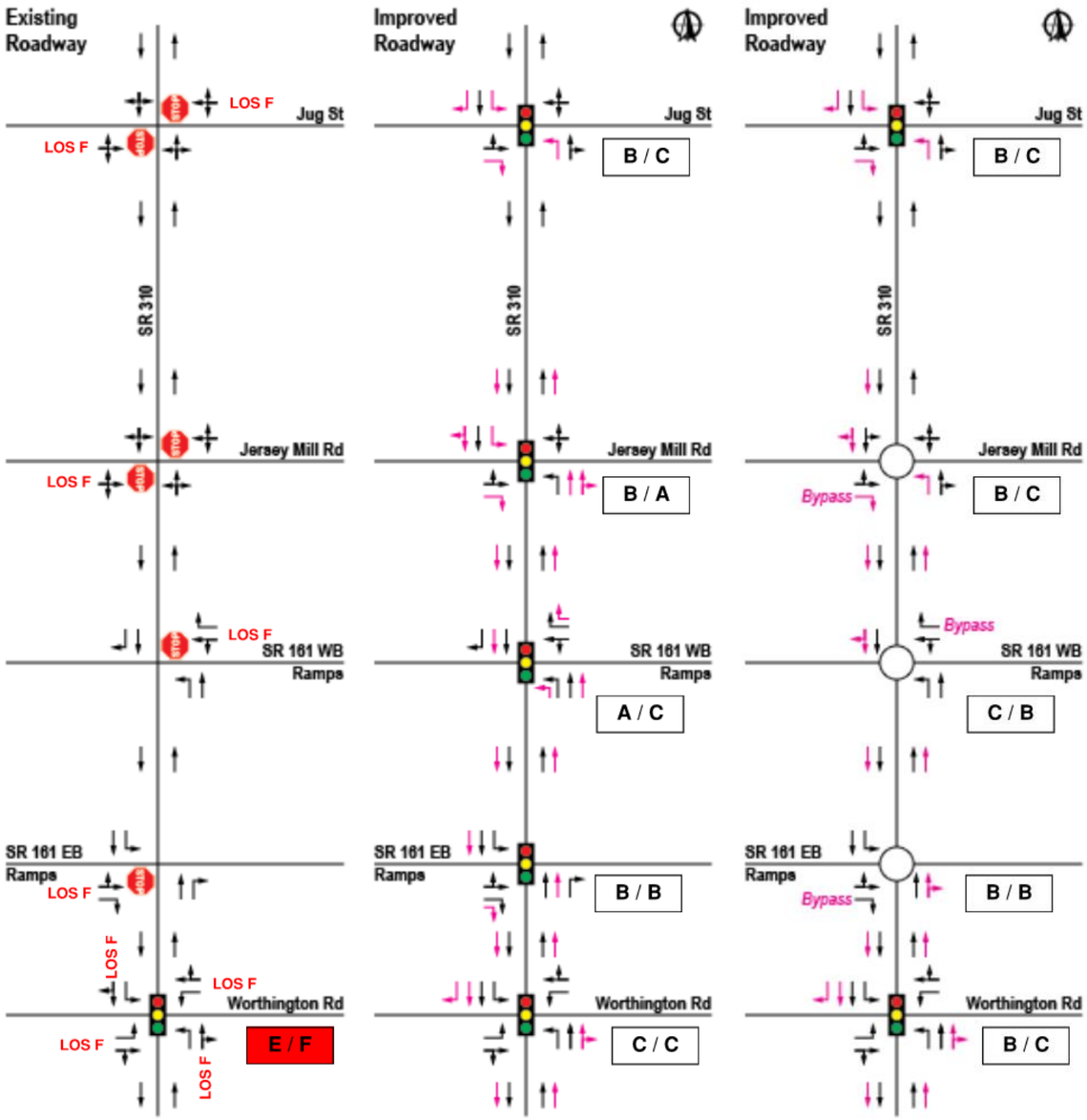
The signalized interchange alternative includes new traffic signals at the SR-161 Eastbound Ramps, the SR-161 Westbound Ramps, Jersey Mill Road, and Jug Street. The signals at Worthington Road, the SR-161 Eastbound Ramps, the SR-161 Westbound Ramps, and Jersey Mill Road were analyzed as a coordinated system, while it was assumed that the traffic signal at Jug Street would remain uncoordinated given its approximate one-mile distance from Jersey Mill Road. This alternative includes the widening of the SR-310 corridor from two lanes to four lanes from south of Worthington Road to north of Jersey Mill Road, as well as strategic turn lane additions to mainline and side street approaches where needed.

The roundabout interchange alternative includes partial two-lane roundabouts at both the SR-161 Eastbound Ramps and the SR-161 Westbound Ramp, as well as at Jersey Mill Road. Consideration was given to keeping the Jersey Mill Road intersection signalized under this alternative, but given the close proximity to the interchange and the traffic movements occurring between the two, it was found that SR-310 would function better with Jersey Mill Road being a roundabout, too. Similar to the signalized alternative, this option also includes the two-to-four lane widening on SR-310 from south of Worthington Road to north of Jersey Mill Road. Signalization at Worthington Road and Jug Street as well as the corresponding lane configuration would remain the same as the previous alternative.

Improved Roadway Traffic Analysis

Table 15 provides the HCS capacity analysis results including LOS and delay for the signalized interchange option and roundabout option based on the lane configuration and traffic control shown in Figure 4 for the AM peak hour, while Table 16 provides the same for the signalized interchange option and roundabout interchange option based for the PM peak hour.

Figure 4: SR-310 2048 Capacity Analysis Summary



LEGEND
Intersection LOS

A, B, or C
D
E
F

Failing Movement
LOS F →

Proposed Improvement →

Table 15: 2048 SR-310 HCS Intersection Summary AM

INTERSECTION w/ SR-310	No Build 2048 AM		Build - Signal 2048 AM		Build - Roundabouts 2048 AM	
	LOS	DELAY	LOS	DELAY	LOS	DELAY
Worthington	E	69.7	B	18.2	C	26.9
EB Ramps	-	-	B	11.0	B	10.1
WB Ramps	-	-	C	23.8	A	8.5
Jersey Mill	-	-	B	13.8	B	13.6
Jug Street	-	-	B	17.8	B	17.8

(-) TWSC

Table 16: 2048 SR-310 HCS Intersection Summary PM

INTERSECTION w/ SR-310	No Build 2048 PM		Build - Signal 2048 PM		Build - Roundabouts 2048 PM	
	LOS	DELAY	LOS	DELAY	LOS	DELAY
Worthington	F	127.1	C	22.3	C	32.2
EB Ramps	-	-	B	18.2	B	14.3
WB Ramps	-	-	B	19.0	C	15.7
Jersey Mill	-	-	C	33.4	A	7.5
Jug Street	-	-	C	32.2	C	32.2

(-) TWSC

Both alternatives are able to provide acceptable Levels-of-Service with all intersections operating at LOS C or better, with negligible operational differences between the two options. The signalized interchange alternative requires more approach lanes and longer storage lengths at the ramp intersections which would require widening the bridge over SR-161, but a coordinated signal system could better respond to changing traffic volumes and travel patterns over time as the expected growth occurs. The roundabout interchange alternative provides an opportunity to minimize the SR-310 lane needs over SR-161 but may pose challenges in accommodating changes in traffic volumes should future development patterns change.

Roadway Assessment

The roadway and geometric design criteria for the conceptual improvements follow the standards set by the ODOT Location and Design (L&D) Manual, Volume 1. The design criteria used for the build alternatives are as follows:

SR-310

- Functional Classification: Minor Arterial (south of westbound ramps intersection)
  Major Collector (north of westbound ramps intersection)
- Design Speed: 55 mph
- Posted Speed: 55 mph
- Lane Width: 12 ft
- Paved Shoulder: 8 ft
- Curbed Road Shoulder: 2 ft

Ramps

- Design Speed: Varies: Upper = 60 mph; Middle = 50 mph; Lower = 35 mph
- Lane Width: Single Lane = 16 ft; Multi Lane = 12 ft
- Paved Shoulder: Left 3 ft; Right 6 ft

Both alternatives maintain the interchange layout and SR-310 alignment. All the improvements are to the intersections to increase capacity. For consistency, the lane and shoulder widths criteria for an arterial functional classification will be used. During detail design, reductions may be applied where SR-310 is categorized as a collector to avoid right of way acquisition or construction costs. The design pavement build-up matches the existing plans. Note that the pavement switches from flexible asphalt pavement to rigid concrete about 400 ft south of the EB Ramps intersection, then back to asphalt about 350 ft north of the WB Ramps intersection. For the purpose of this report, we assume a full width pavement replacement. During detail design, the pavement could be evaluated for full width or just widening improvements.

Alternative 1 – Signals

As an undivided rural facility with a design speed of 55 mph and DHV higher than 100, the roadside grading was designed following clear zone shaping using 4:1 slopes withing the clear zone (27 feet) and 3:1 outside the clear zone. In areas where 2:1 was used, guardrail was added.

The curve returns radii at the ramp intersections follow Figure 503-5 of the L&D Manual, Volume 1. At the other intersections the minimum radii used are 35 ft or match existing, whichever is larger.

Alternative 2 – Roundabouts

As an undivided rural facility with a design speed of 55 mph and DHV higher than 100, the roadside grading was design following clear zone shaping using 4:1 slopes withing the clear zone (27 feet) and 3:1 outside the clear zone.

In the roundabout and its approaches, however, shoulder criteria for an urban arterial will be followed. A Type 6 curb with a 2 ft offset from the edge of pavement will the used. The lanes widths will also follow roundabout guidance and standards. As the posted speed for SR-310 is 55 mph, extended splitter islands are incorporated in the approaches on SR-310 to alert the drivers of the changing conditions. Additionally, reverse curves were integrated to slow motorists. The splitter islands between the roundabouts were not lengthened as the vehicles coming out of a roundabout will already be driving at a slower speed. Similarly, with the ramp approaches longer splitter islands are not necessary.

Environmental Assessment

There are two (2) alternatives being proposed for the SR-310 interchange; the addition of traffic signals at the existing interchange intersections and the intersection with Jug Street (Signals) and the conversion of the interchange intersections and Jersey Mill Road to roundabouts (Roundabout). Reference Environmental Resources exhibits State Route 310 Signals and Roundabout, in Appendix N.

Aquatic Resources

Based on a review of the USGS StreamStats data, Simpson Run and an unnamed tributary to Raccoon Creek flow through the proposed project area under each alternative. Based on a review of the National Wetland Inventory (NWI) Wetlands Mapper, there are mapped wetlands within the project area under each alternative. The SR-310 interchange is located within the Licking Watershed (HUC 05040006). Per the Ohio EPA 401 Water Quality Certification for Nationwide Permits (NWP) map, impacts to aquatic resources associated with proposed work at the SR-310 interchange are eligible for a NWP. Impacts to streams and wetlands will require waterway permits from the USACE and/or Ohio EPA.

Floodplains

A review of the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) was conducted. Simpson Run east of SR-310 is mapped within a FEMA designated 100-year floodplain. The Signals alternative will impact this area and will require coordination with the local floodplain administrator. No floodplain coordination will be needed for the Roundabout alternative. Additional hydraulic studies and a determination of floodplain impacts, including determinations of floodplain permitting requirements, will be conducted during the Preliminary Engineering Phase of the project.

Threatened and Endangered Species

According to the United States Fish and Wildlife Service (USFWS), no portion of the proposed project is located within a bat buffer, a bald eagle buffer, or within an eastern massasauga range polygon. The USFWS Information for Planning and Consultation (IPaC) website was reviewed (February 2025) and the following species are listed for the project area:

- *Myotis sodalis* (Indiana bat) – Endangered

Additionally, the bald eagle (*Haliaeetus leucocephalus*) is also protected under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. Both alternatives may require impacts to wooded habitat for both federal and state listed bat species. However, the Roundabout alternative would require greater impacts than the Signal alternative. A more detailed review for Threatened and Endangered species habitat will be conducted as part of the future ecological investigation. Based on a review of aerial maps, the project area is unlikely to contain suitable habitat for the bald eagle. There are no streams in the project area that have a drainage area greater than 5 square miles. The eastern massasauga uses a range of habitats including wet prairies, fens, and other wetlands, as well as drier upland habitat.

Based on a search of the Natural Heritage Database, ODNR had no records for rare or endangered species or other significant features within the project area or within a one-mile radius of the project area.

Cultural Resources
The project area was studied extensively as part of the original roadway construction of SR-161 on the current alignment. Based on a review of the State Historic Preservation Office's (SHPO) GIS website, there are no sites listed on or determined to be eligible for listing on the National Register of Historic Places (NRHP) located in or near the SR-310 interchange, Jersey Mill Road, or Jug Street. As permanent new right-of-way is proposed with all alternatives, additional evaluation for archaeological sites may be required during the NEPA clearance phase of the project.

Regulated Materials
Per a review of the Ohio Regulated Properties Search (ORPS) website, there is one (1) record for a Leaking Underground Storage Tank (LUST) located on the parcel southwest of the intersection of Jug Street and SR-310. Impacts to this property will occur under the Signals alternative and will require a review of Bureau of Underground Storage Tanks records for the site. Based on a review of Google Aerial imagery, all parcels that may be impacted by the project represent "low risk" or "exempt" land use categories. An RMR Screening will be conducted during the Preliminary Engineering Phase of the project, and it will determine if any additional RM studies are needed.

Section 4(f)/Section 6(f) Resources
There are no publicly owned parks, recreation areas, wildlife and waterfowl refuges, and publicly and privately-owned historic sites present in or adjacent to the project area.
The Willow Run Golf Course at the southwest end of the project area is a private facility open only to members. There are no properties that have received Land & Water Conservation Fund (LWCF) assistance in or adjacent to the project area.

Air Quality
All of Ohio is now in attainment for carbon monoxide (CO). Therefore, the project is considered exempt from a project level conformity analysis for CO. Licking County is not located within a PM 2.5 nonattainment or maintenance area, thus, no further PM 2.5 analysis is required. Due to the presence of sensitive land uses within 500-feet of the project, and the project's proposal to add capacity, a Qualitative MSAT analysis will be required, following ODOT's and FHWA's processes regardless of the preferred alternative. As ozone is handled at the regional level, the project must be listed in the 2024-2027 Statewide Transportation Improvement Program (STIP) for ozone to be addressed. A request should be made to place the project on the STIP to ensure it is included in the latest regional conformity analysis. The NEPA decision document cannot be signed until the project is in an approved STIP.

Noise
Potential Noise Sensitive Areas (NSA) were identified through a review of existing aerial mapping. The ODOT *Flowchart for When a Noise Analysis is Needed* (ODOT, 11/23/2012) was consulted to determine whether a noise analysis would be required for the project. As the overall proposed project includes the increase the number of through traffic lanes along SR-161, potential noise impacts will need to be assessed for the entire project area during the NEPA clearance phase of the project, regardless of the preferred alternative. A Noise Analysis will be conducted following ODOT's processes and procedures.

Farmlands
The SR-310 interchange project area is not considered an urbanized area and is therefore subject to the Farmland Protection Policy Act (FPPA). Based on a review of the USDA Natural Resource Conservation Service (NRCS) Web Soil Survey, a majority of the undeveloped land around the SR-310 interchange and Jug Street is classified as prime farmland or farmland of local importance. All alternatives will require new permanent right-of way. The amount of potential new right-of-way needed for the Roundabout alternative is within the Farmland Memorandum of Understanding (MOU) Between the Natural Resource Conservation Service (NRCS) and The Ohio Department of Transportation (ODOT) (Agreement #19552), and should not require coordination with NRCS. However, the Signals alternative may not meet the MOU, and may require preparation of the Farmland Conversion Impact Rating (FCIR) form and coordination with NRCS.

Water Wells and Drinking Water Resources
For both alternatives being considered, there are three (3) mapped domestic water wells within or immediately adjacent to the Signals project area. The presence and location of any active drinking water wells that may be affected by the project will require coordination with the owner following ODOT's Drinking Water Resources Standard Operating Procedure. The SR-310 interchange, Jersey Mill Road, and the Jug Street intersection are not located within a Drinking Water Source Protection Area. There are no Sole Source Aquifers in Licking County.

Community Impacts
The area surrounding the SR-310 interchange consists of a mix of residential, commercial, and agricultural land uses. The areas around the intersection with Jug Street is a mix of residential and agricultural land uses. Given the anticipated increase in traffic resulting from ongoing development in the area, residents living near SR-310 interchange and Jug Street may benefit from the proposed improvements, which will reduce delay times for motorists, resulting in shorter queues and less engine idling at the interchange and at Jug Street. All alternatives will provide the benefit of improved mobility. However, the use of a roundabout will result in less traffic noise, reduced queuing, and reduced emissions compared to a traffic signal, leading to fewer adverse impacts on adjacent properties. Community impacts will be assessed as part of the NEPA process.

Structural Assessment

Alternative 1 – Signals
The existing bridge is not wide enough to carry the additional lanes required for the improvements at the ramp intersections for this alternative. The SR-310 structure was built in 2007, and only scheduled for deck patching and sealing. It will be a number of years before superstructure or deck replacement is considered based on life cycle (deck replacement typically preferred around 50 years, full superstructure replacement 75-100 years). Therefore, a widening, from 56 feet to 88 feet toe to toe, is assumed for this assessment. An additional 5 beam lines (10 total prestressed concrete beams) assuming same spacing as existing. At that width, there are also other things to consider such as designing the bearings for expansion in both directions. This will potentially need replacing the existing bearings which will require temp jacking/support of superstructure. The abutments and piers will require widening and design for potential differential thermal movement.

Alternative 2 – Roundabouts
The existing bridge is wide enough to accommodate all the required lanes for this alternative. However, the barrier offset will have to be reduced to 4 feet. A deck widening, without adding beams and only increasing the overhang, could be investigated during detail design.

Existing bridge vertical clearance is 17.17’.

Right-of-Way Requirements

Alternative Number	Number of Parcels Impacted	Total Acres Permanently Impacted	Structures Impacted
Alternative 1 – Signals	2	0.357 acres	0
Alternative 2 – Roundabouts	4	0.566 acres	0

Alternative 1 – Signals
This alternative will require minimal additional right-of-way. The estimated cost for right-of-way acquisition is $71,400. Retaining walls in this area could minimize grading into the right-of-way, pending further cost analysis.

Alternative 2 – Roundabouts
This alternative will require minimal additional right-of-way. The estimated cost for right-of-way acquisition is $113,200.

Utility Impacts

Alternative 1 – Signals
Forty (40) utility poles are within the construction limits and will have to be relocated. Most poles appear to be electric. Underground utilities, such as water and gas, will also be affected by the widening
Alternative 2 – Roundabout
Thirty-one (31) utility poles are within the construction limits and will have to be relocated. Most poles appear to be electric. Underground utilities, such as water and gas, will also be affected by the widening.

Safety Assessment

The alternatives will yield both safety and operational benefits for the SR-310 corridor which experiences high Northbound volumes during the AM peak and high Southbound volumes during the PM peak. Nearly 700 vehicles are expected to exit SR-161 Westbound to travel north on SR-310 during the AM peak hour, and over 500 vehicles are expected to travel from Jersey Mill Rd to SR-310 Southbound during the PM peak hour. These key turning movements, combined with the high corridor volumes overall, will increase the potential for crashes under current traffic control operations.

Increased traffic volumes are likely to result in congestion, delays, and more aggressive driving behaviors as motorists become impatient and accept smaller gaps in traffic. Additionally, the increased traffic volumes will lead to insufficient intersection capacity under existing conditions. The absence of turn lanes and lack of separation between turning and through traffic will result in an increase in rear end crashes. The installation of a new signal is expected to reduce crashes by assigning right of way to drivers and dedicating protected time for side street movements. Signals can reduce angle crashes by up to 77% compared to two-way stop-controlled (TWSC) intersections by eliminating the need for left turning vehicles to find gaps in mainline traffic. Installing a proposed signal can also increase the number of rear end crashes by 58%. While some of the expected crash reduction will be offset by the increased volumes and increased number of lanes on SR-310, there is an anticipated net benefit to installing traffic signals on this corridor, especially when considering the projected side street delays under the existing stop-control condition.

The addition of turn lanes will allow drivers to safely decelerate and move out of the path of through traffic, reducing rear end crashes. Left turn lanes, which require more time to complete turns, have a greater impact on safety compared to right turn lanes as shown in the table above.

Alternatively, roundabouts reduce the number of intersection conflict points from 32 to 8 compared to a traditional intersection. The Crash Modification Factor (CMF) associated with a 58% reduction in crashes refers to a single lane roundabout. Because the proposed roundabouts are not strictly single lanes, the CMF may be less effective. A reduction in crashes should still be anticipated with changing a TWSC intersection to a roundabout. When entering the roundabout, drivers only need to watch traffic from the left and are traveling at lower rates of speed, reducing the likelihood of high impact angle crashes which results in a reduction in fatal and serious injury crashes.

Multimodal Assessment

Mobility hubs are not expected to be located along SR-310 per ODOT's Central Ohio Workforce Transit Plan of February 2024. Therefore Alternatives 1 and 2 offer no additional multimodal access compared to the No-Build alternative. If multimodal accommodations become necessary, additional changes to the existing bridge may be needed.

Lighting Impacts

Outside of mainline SR-161, interchange lighting at SR-310 is not expected to be impacted with either Build Alternative. The roundabout alternative may require additional lighting, and further assessment will be necessary.

Maintenance of Traffic Assessment

The widening of the SR-310 corridor can be constructed in 2 major phases with additional phases added as necessary to construct the on and off ramps to SR-161.The first phase will shift traffic to the east while the west side is constructed. The eastbound exit ramp widening, the westbound entrance ramp, the widening of the bridge over SR-161, Jersey Mill Road widening, and Jugg Street widening may be included as subphases to Phase 1. Construction on the eastbound exit ramp can also be conducted as a series of overnight and weekend closures. The second phase will shift traffic to the west and onto the newly constructed roadway while the east side is constructed. The westbound exit ramp widening may be included as a subphase to Phase 2 or can be constructed through a series of overnight and weekend closures.

U.S. Bike Route 50 passes through the project area along Worthington Road crossing SR-310. This bike route is to be maintained during all construction phases. The details for maintaining the bike route crossing will be determined as the project moves into plan production.

Costs

A construction cost estimate was prepared for each of the alternatives with consideration for high-cost generators such as pavement, earthwork, and structures. Other incidentals were expressed as percentages of total construction cost due to limited detailed information. The cost estimate was inflated to 2030 for the anticipated construction mid-point date. An additional 30% contingency was applied to the construction cost based on the planning level of design. Table 17 shows the construction cost for the alternatives and Appendix M shows itemized costs.

Table 17: SR-310 Alternatives Cost

Alternative	Description	Construction Costs (in 2030 Dollars)	Right-of-way Costs
1	Signals	$30,321,975	$71,400
2	Roundabouts	$17,708,778	$113,200
3	No-Build	$0	$0

SR-37 Interchange

Traffic Assessment

Existing Roadway Conditions

The SR-37 study corridor includes the intersections at Worthington Road, the SR-161 Eastbound Ramps, the SR-161 Westbound Ramps, and Moots Run Road. State Route 37 is a rural, two-lane undivided Principal Arterial / Major Collector with a posted speed limit of 55 mph. Under the existing conditions, all four intersections operate with side street stop control.

Existing Roadway Traffic Analysis

Highway Capacity Software (HCS) was used to analyze the Design Year (2048) peak hour traffic conditions under the existing roadway configuration with the goal of identifying what improvements may be needed to serve the future traffic demand. This would determine whether the existing traffic control and lane configuration would provide acceptable levels of service (LOS) for the 2048 Build volumes and if not, help identify what capacity improvements would be required to do so.

Design Year certified traffic projections identify a large impact to two specific movements, where it is expected that there will be just over 400 vehicles traveling from SR-161 Westbound to SR-37 Northbound during the AM peak hour and nearly 700 vehicles traveling from SR-37 Southbound to SR-161 Eastbound during the PM peak hour. The following are some of the key findings based on the capacity analysis results for the existing roadway configuration and traffic control:

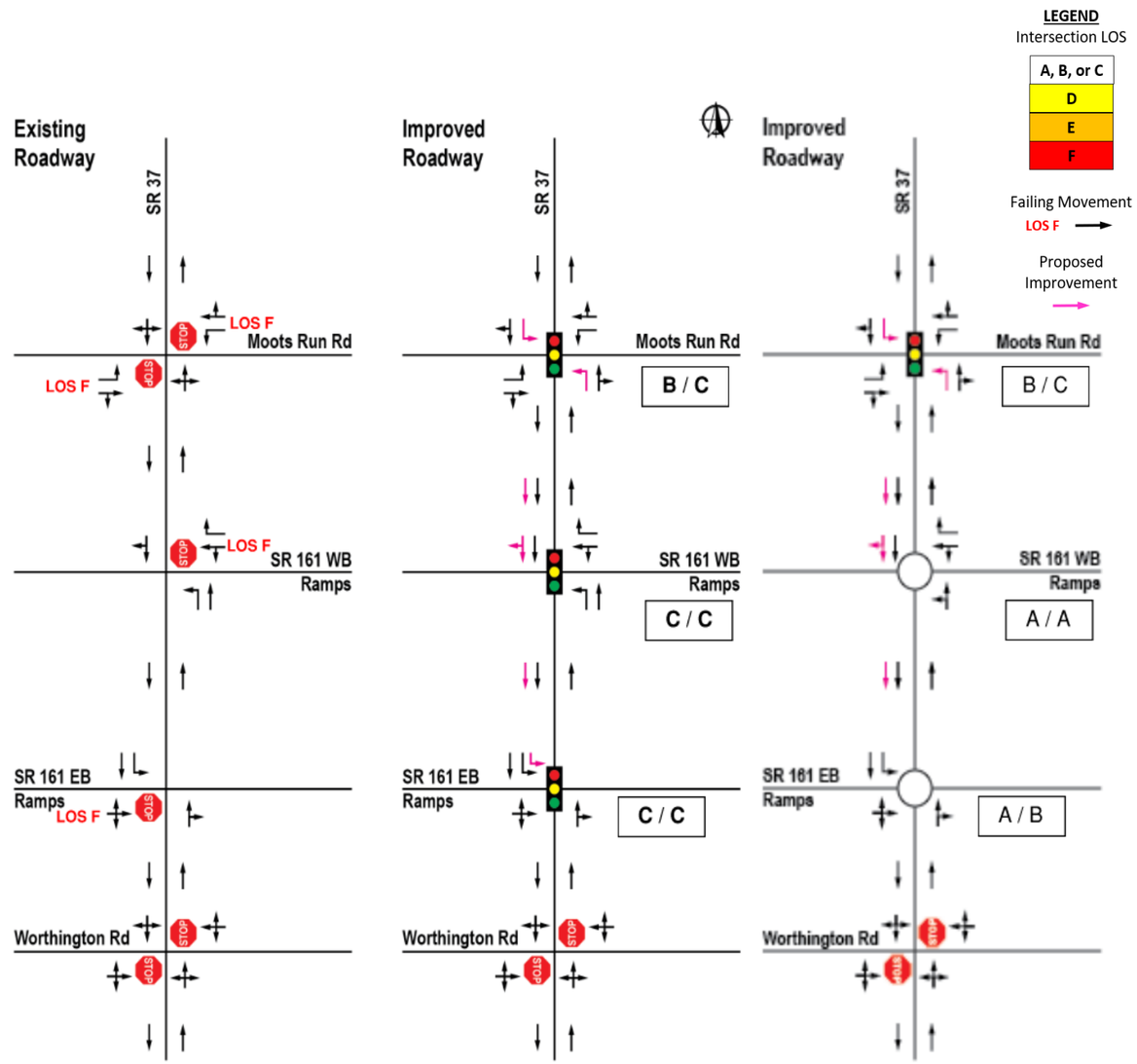
- The Worthington Road intersection would be expected to continue operating at an acceptable LOS under its current unsignalized condition.
- The SR-161 Eastbound stop-controlled exit ramp would experience unacceptable LOS and excessive delay of over 7,000 seconds per vehicle during the PM peak hour.
- The SR-161 Westbound stop-controlled exit ramp would experience unacceptable LOS and nearly 100 seconds of delay during the PM peak hour for left turning vehicles.
- The side street approaches at Moots Run Road would be expected to have an unacceptable LOS and levels of delay during the PM peak hour with v/c ratios exceeding 1.0.

These results indicate that three of the study intersections along the existing SR-37 corridor have insufficient capacity to accommodate the projected traffic volumes, and both lane usage and traffic control changes will need to be considered in order to mitigate the anticipated deficiencies.

Improved Roadway Conditions

HCS was then further utilized in accordance with the ODOT Analysis and Traffic Simulation (OATS) manual methodologies to evaluate these potential improvements which resulted in two alternatives. The first alternative would maintain a diamond interchange configuration and utilize traffic signals at the SR-37 interchange ramp terminals, while the second alternative would rely on roundabouts. The lane configuration was assessed for each alternative to determine the most efficient and economical way to achieve acceptable LOS at each intersection, see Figure 5 for the recommend lane use and traffic control for each option.

Figure 5: SR-37 2048 Capacity Analysis Summary



The signalized interchange alternative includes new traffic signals at the SR-161 Eastbound Ramps, the SR-161 Westbound Ramps, and Moots Run Road. The three new signals were analyzed as a coordinated system within HCS. This alternative includes widening of SR-37 to provide an additional southbound through lane from north of the SR-161 Westbound Ramps to the SR-161 Eastbound Ramps. No changes would be proposed at the Worthington Road intersection under this alternative.

The roundabout interchange alternative includes partial two-lane roundabouts at the SR-161 Eastbound Ramps and the SR-161 Westbound Ramps. Similar to the signalized interchange alternative, SR-37 would again be widened to provide an additional southbound through lane from north of the SR-161 Westbound Ramps to the SR-161 Eastbound Ramps, and no changes would be proposed at the Worthington Road intersection.

Improved Roadway Traffic Analysis

Table 18 provides the HCS capacity analysis results including LOS and delay for the signalized interchange option and roundabout option based on the lane configuration and traffic control shown in Figure 5 in the AM peak hour, while Table 19 provides the same for the signalized interchange option and roundabout interchange option in the PM peak hour.

Table 18: 2048 SR-37 HCS Intersection Summary AM

INTERSECTION w/ SR-37	No Build 2048 AM		Build - Signal 2048 AM		Build - Roundabouts 2048 AM	
	LOS	DELAY	LOS	DELAY	LOS	DELAY
Worthington	-	-	-	-	-	-
EB Ramps	-	-	**C**	**22.1**	**A**	**8.0**
WB Ramps	-	-	**C**	**25.8**	**A**	**8.3**
Moots Run Rd	-	-	**B**	**12.5**	**B**	**16.6**

(-) TWSC

Table 19: 2048 SR-37 HCS Intersection Summary PM

INTERSECTION w/ SR-37	No Build 2048 PM		Build - Signal 2048 PM		Build - Roundabouts 2048 PM	
	LOS	DELAY	LOS	DELAY	LOS	DELAY
Worthington	-	-	-	-	-	-
EB Ramps	-	-	**C**	**27.2**	**B**	**13.2**
WB Ramps	-	-	**C**	**26.2**	**A**	**8.2**
Moots Run Rd	-	-	**C**	**21.9**	**C**	**32.6**

(-) TWSC

Both alternatives are able to provide acceptable Levels-of-Service, but the ramp intersections were found to operate at LOS C under the signalized interchange alternative but at LOS A or B under the roundabout interchange alternative. The signalized interchange alternative requires a slightly wider cross section through the interchange and doesn't function as well from a LOS perspective, but a coordinated signal system may help better respond to changing traffic volumes and travel patterns over time as the expected growth occurs. The roundabout interchange alternative appears to provide better LOS and would result in less delay for motorists, but may pose challenges in accommodating changes in traffic volumes should future development patterns change. It should be noted that although the signalized interchange alternative would result in a four-lane cross section across the SR-161 bridge compared to a three-lane cross section under the roundabout interchange alternative, neither option would require widening of the existing bridge structure.

Roadway Assessment

The roadway and geometric design criteria for the conceptual improvements follow the standards set by the ODOT Location and Design (L&D) Manual, Volume 1. The design criteria used for the build alternatives are as follows:

SR-37

- Functional Classification: Principal Arterial (north of eastbound ramps intersection)
  Major Collector (south of eastbound ramps intersection)
- Design Speed: 55 mph
- Posted Speed: 55 mph
- Lane Width: 12 ft
- Paved Shoulder: 8 ft
- Curbed Road Shoulder: 2 ft

Ramps

- Design Speed: Varies: Upper = 60 mph; Middle = 50 mph; Lower = 35 mph
- Lane Width: Single Lane = 16 ft; Multi Lane = 12 ft
- Paved Shoulder: Left 3 ft; Right 6 ft

Both alternatives maintain the interchange layout and SR-37 alignment. All the improvements are to the intersections to increase capacity. For consistency, the lane and shoulder widths criteria for an arterial functional classification will be used. During detail design reductions may be apply where SR-37 is categorized as a collector to avoid right of way acquisition or construction costs. The design pavement build-up matches the existing plans. Note that the pavement switches from flexible asphalt pavement to rigid concrete about 200 ft south of the EB Ramps intersection, then back to asphalt about 200 ft north of the WB Ramps intersection. For the purpose of this report, we assume a full width pavement replacement. During detail design the pavement could be evaluated for full width or just widening improvements.

Alternative 1 – Signals
As an undivided rural facility with a design speed of 55 mph and DHV higher than 100, the roadside grading was designed following clear zone shaping using 4:1 slopes withing the clear zone (27 feet) and 3:1 outside the clear zone. In areas where 2:1 was used, guardrail was added.

The curve returns radii at the ramp intersections follow Figure 503-5 of the L&D Manual, Volume 1. At the other intersections the minimum radii used are 35 ft, except where existing is larger than the minimum and existing radii are to be maintained.

This alternative requires the widening of the eastbound entrance ramp to accommodate the two southbound left turn lanes. The existing ramp is close to Bracken Road (separated by a ditch). After widening, using clear zone grading, the embankment gets very close to Bracken Road. During detail design, barrier grading with 2:1 slopes or retaining walls can be investigated further.

Alternative 2 – Roundabouts
As an undivided rural facility with a design speed of 55 mph and DHV higher than 100, the roadside grading was design following clear zone shaping using 4:1 slopes withing the clear zone (27 feet) and 3:1 outside the clear zone.

In the roundabout and its approaches, however, shoulder criteria for an urban arterial will be followed. A Type 6 curb with a 2 ft offset from the edge of pavement will the used. The lanes widths will also follow roundabout guidance and standards. As the posted speed for SR-37 is 55 mph extended splitter islands are incorporated in the approaches on SR-37 to alert the drivers of the changing conditions. Additionally, reverse curves were integrated to slow motorists. The splitter islands between the roundabouts were not lengthen as the vehicles coming out of a roundabout will already be driving at a slower speed.

Environmental Assessment

There are two (2) alternatives being proposed for the SR-37 interchange; the addition of traffic signals at the existing interchange intersections (Signals) and the conversion of the interchange intersections to roundabouts (Roundabout). Reference Environmental Resources exhibits State Route 37 Signals and Roundabout, in Appendix N.

Aquatic Resources
Based on a review of the USGS StreamStats data, both alternatives may impact two (2) unnamed tributaries to Moots Run and one (1) unnamed tributary to Raccoon Creek. Based on a review of the National Wetland Inventory (NWI) Wetlands Mapper, there are no mapped wetlands within the project area under each alternative. The SR-37 interchange is located within the Licking Watershed (HUC 05040006). Per the Ohio EPA 401 Water Quality Certification for Nationwide Permits (NWP) map, impacts to aquatic resources associated with proposed work at the SR-310 interchange are eligible for a NWP. Impacts to streams and wetlands will require waterway permits from the USACE and/or Ohio EPA.

Floodplains
A review of the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) was conducted. The northern end of the project area under each alternative is located within FEMA designated Special Flood Hazard Areas (SFHA). The Signals alternative will impact the 500-year and 100-year floodplains; the Roundabout alternative will impact the 500-year floodplain. Impacts in these areas will require coordination with the local floodplain administrator. Additional hydraulic studies and a determination of floodplain impacts, including determinations of floodplain permitting requirements, will be conducted during the Preliminary Engineering Phase of the project.

Threatened and Endangered Species
According to the United States Fish and Wildlife Service (USFWS), no portion of the proposed project is located within a bat buffer, a bald eagle buffer, or within an eastern massasauga range polygon. The USFWS Information for Planning and Consultation (IPaC) website was reviewed (February 2025) and the following species are listed for the project area:

- *Myotis sodalis* (Indiana bat) – Endangered

Additionally, the bald eagle (*Haliaeetus leucocephalus*) is also protected under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. Both alternatives may require impacts to wooded habitat for both federal and state listed bat species. A more detailed review for Threatened and Endangered species habitat will be conducted as part of the future ecological investigation. Based on a review of aerial maps, the project area is unlikely to contain suitable habitat for the bald eagle. There are no streams in the project area that have a drainage area greater than 5 square miles. The eastern massasauga uses a range of habitats including wet prairies, fens, and other wetlands, as well as drier upland habitat.

Based on a search of the Natural Heritage Database, ODNR had no records for rare or endangered species or other significant features within the project area or within a one-mile radius of the project area.

Cultural Resources
The project area was studied extensively as part of the original roadway construction of SR-161 on the current alignment. Based on a review of the State Historic Preservation Office's (SHPO) GIS website, there is one (1) site determined to be eligible for listing on the National Register of Historic Places (NRHP) located within the project limits for the Signals alternative and within the existing right-of-way of SR-161. This site is no longer present. Should the project require additional right-of-way, additional evaluation of known archaeological sites may be required during the NEPA clearance phase of the project.

Regulated Materials
Based on a review of ODOT's Ohio Regulated Properties Search (ORPS) website, under each alternative there is one (1) record from the Ohio EPA Spills Database for a release of crude oil in 2001 within the existing right-of-way. The project area was also reviewed for adjacent properties that are considered a "high risk" land use, e.g., gas stations, dry cleaners, automotive repair/service/oil change, body shops, electrical substations, railroad maintenance/sidings, junkyards/scrapyards, landfills, oil/chemical warehouses/storage, or any industrial/manufacturing use. Based on a review of Google Aerial imagery, the study area contains either "exempt" or "low risk" land use categories.

Section 4(f)/Section 6(f) Resources
There are no publicly owned parks, recreation areas, wildlife and waterfowl refuges, and publicly and privately-owned historic sites present in or adjacent to the project area. There are no properties that have received Land & Water Conservation Fund (LWCF) assistance in or adjacent to the project area.

Air Quality
All of Ohio is now in attainment for carbon monoxide (CO). Therefore, the project is considered exempt from a project level conformity analysis for CO. Licking County is not located within a PM 2.5 nonattainment or maintenance area, thus, no further PM 2.5 analysis is required. Due to the presence of sensitive land uses within 500-feet of the project, and the project's proposal to add capacity a Qualitative MSAT analysis will be required, following ODOT's and FHWA's processes regardless of the preferred alternative. As ozone is handled at the regional level, the project must be listed in the 2024-2027 Statewide Transportation Improvement Program (STIP) for ozone to be addressed. A request should be made to place the project on the STIP to ensure it is included in the latest regional conformity analysis. The NEPA decision document cannot be signed until the project is in an approved STIP.

Noise
Potential Noise Sensitive Areas (NSA) were identified through a review of existing aerial mapping. The ODOT *Flowchart for When a Noise Analysis is Needed* (ODOT, 11/23/2012) was consulted to determine whether a noise analysis would be required for the project. As the overall proposed project includes the increase the number of through traffic lanes along SR-161, potential noise impacts will need to be assessed for the entire project area during the NEPA clearance phase of the project, regardless of the preferred alternative. A Noise Analysis will be conducted following ODOT's processes and procedures.

Farmlands
The SR-37 interchange project area is not considered an urbanized area and is therefore subject to the Farmland Protection Policy Act (FPPA). Based on a review of the USDA Natural Resource Conservation Service (NRCS) Web Soil Survey, a majority of the undeveloped land around the SR-37 interchange is classified as prime farmland or farmland of local importance. All alternatives will require new permanent right-of way. The amount of potential new right-of-way needed for either alternative may not meet the Farmland Memorandum of Understanding (MOU) Between the Natural Resource Conservation Service (NRCS) and The Ohio Department of Transportation (ODOT) (Agreement #19552) and would require coordination with NRCS.

Water Wells and Drinking Water Resources
For both alternatives being considered, there is one (1) domestic water wells mapped within the existing right-of-way. This well presumably was impacted as part of the original construction of SR-161. The SR-37 interchange is not located within a Drinking Water Source Protection Area. There are no Sole Source Aquifers in Licking County. No drinking water coordination is anticipated to be needed for either SR-37 interchange alternative.

Community Impacts
The area surrounding the SR-310 interchange consists primarily of commercial and agricultural land uses, with residential homes to the north and south of the interchange. Given the anticipated increase in traffic resulting from ongoing development in the area, residents living near the SR-37 interchange may benefit from the proposed improvements under each alternative, which will reduce delay times for motorists, resulting in shorter queues and less engine idling at the interchange. Community impacts will be assessed as part of the NEPA process.

Structural Assessment

Alternative 1 – Signals
The existing bridge is 60 feet toe to toe of parapets. The required width to accommodate four 12-foot lanes and provide the required 10 feet barrier offset (per L&D Figure 301-3) is 68 feet. The structure was built in 2007, and only scheduled for deck patching and sealing. It will be a number of years before superstructure or deck replacement is considered based on life cycle (deck replacement typically preferred around 50 years, full superstructure replacement 75-100 years). We are not assuming widening the bridge for this project but reducing the barrier offset to 6 feet. Whenever the deck is schedule for replacement this offset can be improved by increasing the overhang (without widening the piers and abutment).

Alternative 2 – Roundabouts
The existing bridge is wide enough to accommodate all the required lanes for this alternative. Improvements to the structure are not necessary.

Right-of-Way Requirements

Alternative Number	Number of Parcels Impacted	Total Acres Permanently Impacted
Alternative 1 – Signals	7	1.240 acres
Alternative 2 – Roundabouts	10	1.275 acres

Alternative 1 – Signals
This alternative will require additional right-of-way. Seven property owners could be affected, but no residences or buildings will be impacted. The estimated cost for right-of-way acquisition is $249,000.

Alternative 2 – Roundabouts
This alternative will require additional right-of-way. Six property owners could be affected, but no residences or buildings will be impacted. The estimated cost for right-of-way acquisition is $255,000.

Utility Impacts

Alternative 1 – Signals
Thirteen (13) utility/power poles are impacted with this alternative. There is no evidence of underground utilities at the moment.

Alternative 2 – Roundabouts
Twenty-one (21) utility/power poles are impacted with this alternative. There is no evidence of underground utilities at the moment.

Safety Assessment

The SR-37 corridor will experience increased Southbound trips in the PM peak and over 400 vehicles traveling from SR-161 Westbound to SR-37 Northbound in both peak hours. Potential traffic control alternatives were considered due to the heavy turning volume and close proximity of the Moots Run Road intersection to the Westbound ramp terminal.

The increased traffic volumes will lead to insufficient intersection capacity and likely result in congestion, increased delay, and more aggressive driving behaviors as motorists become impatient and accept smaller gaps in traffic. The absence of turn lanes and lack of separation between turning and through traffic will result in an increase in rear end crashes.

The installation of a new signal is expected to reduce crashes by assigning right of way to drivers and dedicating protected time for side street movements. Signals can reduce higher severity angle crashes, but increase the number of rear end crashes, which tend to be lower in severity. While some of the expected crash reduction will be further offset by the increased volumes and increased number of lanes on SR-37, there is an anticipated net benefit to reducing crashing by installing a signal at an existing TWSC intersection.

Alternatively, roundabouts reduce the number of intersection conflict points from 32 to 8 compared to a traditional intersection. The Crash Modification Factor (CMF) associated with a 58% reduction in crashes refers to a single lane roundabout. Because the proposed roundabouts are not strictly signal lanes, the CMF may be less effective. A reduction in crashes should still be anticipated with changing a TWSC intersection to a roundabout. When entering the roundabout, drivers only need to watch traffic from the left and are traveling at lower rates of speed, reducing the likelihood of high impact angle crashes which results in a reduction in fatal and serious injury crashes.

Multimodal Assessment

Mobility hubs are not expected to be located at the SR-37/SR-161 interchange per ODOT's Central Ohio Workforce Transit Plan of February 2024. Therefore Alternatives 1 and 2 offer no additional multimodal access compared to the No-Build alternative. If multimodal accommodations become necessary, additional changes to the existing bridge may be needed.

Lighting Impacts

Outside of mainline SR-161, interchange lighting at SR-37 is not expected to be impacted with either Build Alternative. The roundabout alternative may require additional lighting, and further assessment will be necessary.

Maintenance of Traffic Assessment

The construction of SR-37 can occur in two major phases, using part-width construction strategies. The first phase will shift SR-37 traffic to the west side of the roadway to construct the improvements on the east side. The second phase will shift traffic to the east side of the roadway to construct the improvement on the west side. The ramp reconstruction will follow a similar part-width construction strategy of shifting traffic to one side, widening to the other, then flipping traffic to the constructed side to finish the ramp construction.

During detailed MOT development, the number of lanes to maintain along SR-37 along the corridor will be evaluated. Construction phasing will maximize offline construction to limit impacts and lane closures within the interchange. Completion of the ramp tie-ins may necessitate overnight or weekend closure.

U.S. Bike Route 50 passes through the project area along Worthington Road crossing SR-310. This bike route is to be maintained during all construction phases. The details for maintaining the bike route crossing will be determined as the project moves into plan production.

Costs

A construction cost estimate was prepared for each of the alternatives with consideration for high-cost generators such as pavement, earthwork, and structures. Other incidentals were expressed as percentages of total construction cost due to limited detailed information. The cost estimate was inflated to 2030 for the anticipated construction mid-point date. An additional 30% contingency was applied to the construction cost based on the planning level of design. Table 20 shows the construction cost for the alternatives and Appendix M shows itemized costs.

Table 20: SR-37 Alternatives Cost

Alternative	Description	Construction Costs (in 2030 Dollars)	Right-of-way Costs
1	Signals	$12,680,230	$249,000
2	Roundabouts	$6,939,984	$255,000
3	No-Build	$0	$0

SR-16 Interchange

Traffic Assessment

Existing Roadway Conditions

The Columbus Road (SR-16) study corridor includes the intersections at Granview Road/Kendal Drive, the SR-161 Eastbound Ramps, and the SR-161 Westbound Ramps/Weaver Drive. Columbus Road is a rural, two-lane undivided Principal Arterial / Major Collector with a posted speed limit of 45 mph. Under the existing conditions, both ramp intersections operate with side street stop control while the Granview Road/Kendal Drive intersection is currently signalized.

Existing Roadway Traffic Analysis

Highway Capacity Software (HCS) was used to analyze the Design Year (2048) peak hour traffic conditions under the existing roadway configuration with the goal of identifying what improvements may be needed to serve the future traffic demand. This would determine whether the existing traffic control and lane configuration would provide acceptable levels of service (LOS) for the 2048 Build volumes and if not, help identify what capacity improvements would be required to do so.

Design year certified traffic projections indicate that development in the area will have an impact to future volumes in this area but not to the extent observed along some of the other study corridors. The following are some of the key findings based on the capacity analysis results for the existing roadway configuration and traffic control:

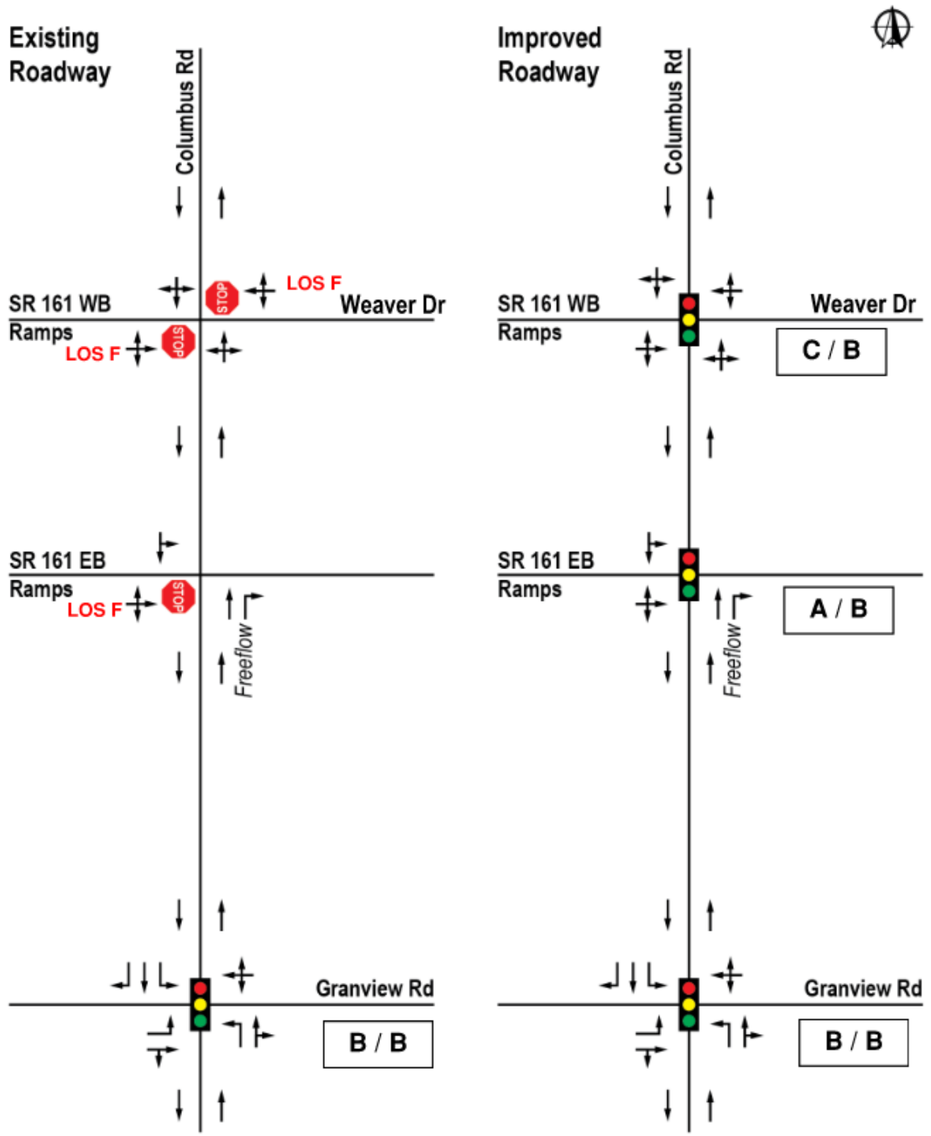
- The Granview Road/Kendal Drive intersection would be expected to continue operating at an acceptable LOS under its current signalized condition.
- The SR-161 Eastbound stop-controlled exit ramp would experience unacceptable LOS and delay of 95 seconds per vehicle during the PM peak hour.
- The SR-161 Westbound Ramps/Weave Drive intersection would experience unacceptable LOS with up to 75 seconds of delay during the AM peak hour and up to 100 seconds of delay during the PM peak hour for the stop-controlled approaches.

These results indicate that two of the study intersections along the Columbus Road (SR-16) corridor have insufficient capacity to accommodate the projected traffic volumes, and both lane usage and traffic control changes will need to be considered in order to mitigate the anticipated deficiencies.

Improved Roadway Conditions

HCS was then further utilized in accordance with the ODOT Analysis and Traffic Simulation (OATS) manual methodologies to evaluate these potential improvements. The lane configuration was assessed to determine the most efficient and economical way to achieve acceptable LOS at each intersection, see Figure 6 for the recommend lane use and traffic control.

Figure 6: SR-16 Traffic Signals Improvements



Improved Roadway Traffic Analysis
The analysis concluded that the existing lane configuration is sufficient and that only the installation of traffic signals at both ramp terminals would be needed to achieve acceptable LOS. The two new signals were analyzed as a coordinated system, while it was assumed that the existing traffic signal at Granview Road/Kendal Drive would remain uncoordinated given its location relative to the interchange. While the Granview Road/Kendal Drive intersection is just within the 3,200-feet threshold specified in the OATS manual, it is recommended to keep it uncoordinated given the limited need to platoon traffic along this particular corridor. Table 21 provides the HCS capacity analysis results including LOS and delay based on the lane configuration and traffic control shown in Figure 6**.**

Table 21: 2048 SR-16 HCS Intersection Summary AM/PM

INTERSECTION w/ SR-16	No Build 2048 AM		Build - Signal 2048 AM		No Build 2048 PM		Build - Signal 2048 PM	
	LOS	DELAY	LOS	DELAY	LOS	DELAY	LOS	DELAY
Grandview Rd	B	15.6	B	15.6	B	19.3	B	19.3
EB Ramps	-	-	A	8.6	-	-	B	10.1
WB Ramps	-	-	C	32.9	-	-	B	17.9

(-) TWSC

The proposed signalization would provide acceptable Levels-of-Service with all intersections operating at LOS C or better, no other widening or changes to the lane configuration would be recommended for the Columbus Road (SR-16) corridor.

Roadway Assessment

No pavement or lane configuration changes are necessary for Alternative 1.

Environmental Assessment

The proposed project will convert existing stop signs to traffic signals at the interchange. Reference Environmental Resources exhibits SR-161 Exhibit K, in Appendix N.

Aquatic Resources
The SR-16 interchange is located within the Licking Watershed (HUC 05040006). Per the Ohio EPA 401 Water Quality Certification for Nationwide Permits (NWP) map, the project is eligible for a NWP. Based on a review of the USGS StreamStats data, there is one (1) mapped stream, Salt Run, that flows through the interchange. Any impacts below the Ordinary High Water Mark (OHWM) of jurisdictional streams will be subject to regulation by the U.S. Army Corps of Engineers (USACE) and by the Ohio EPA.

The National Wetland Inventory (NWI) Wetlands Mapper was reviewed for the project area. According to available NWI data, One (1) mapped wetland feature is located within or directly adjacent to the project area. Impacts to jurisdictional wetlands are subject to regulation by the USACE and by the Ohio EPA. Impacts to non-jurisdictional (isolated) wetlands are subject to regulation by the Ohio EPA.

A thorough ecological field investigation will be needed to confirm the existence of and determine the locations of these features, and to identify any additional aquatic resources present within the project area.

Floodplains
A review of the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) was conducted. Portions of the project are located within FEMA designated Special Flood Hazard Areas (SFHA), including the 500-year and 100-year floodplain and the floodway. Impacts in these areas will require coordination with the local floodplain administrator. Additional hydraulic studies and a determination of floodplain impacts, including determinations of floodplain permitting requirements, will be conducted during the Preliminary Engineering Phase of the project.

Threatened and Endangered Species
According to the United States Fish and Wildlife Service (USFWS), no portion of the proposed project is located within a bat buffer, a bald eagle buffer, or within an eastern massasauga range polygon. The USFWS Information for Planning and Consultation (IPaC) website was reviewed (February 2025) and the following species are listed for the project area:

- *Myotis sodalis* (Indiana bat) – Endangered

Additionally, the bald eagle (*Haliaeetus leucocephalus*) is also protected under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. The project may require impacts to wooded habitat for both federal and state listed bat species. A more detailed review for Threatened and Endangered species habitat and bald eagle habitat will be conducted as part of the future ecological investigation. There are no streams in the project area that have a drainage area greater than 5 square miles. The eastern massasauga uses a range of habitats including wet prairies, fens, and other wetlands, as well as drier upland habitat.

Based on a search of the ODNR Natural Heritage Database, there is a record for the state-listed potentially threatened Three-birds Orchid (*Triphora trianthophoros*) less than 0.5 mile southwest of the SR-16 interchange. The habitat for this species includes mature deciduous forest. Impacts to mature forest may require a species survey and relocation during the bloom period in August. ODNR had no additional records for rare or endangered species or other significant features within the project area or within a one-mile radius of the project area.

Cultural Resources
The project area was studied extensively as part of the original roadway construction of SR-161 on the current alignment. Based on a review of the State Historic Preservation Office's (SHPO) GIS website, there

are no sites listed on or determined to be eligible for listing on the National Register of Historic Places (NRHP) located in or near the SR-16 interchange. Should the project require additional right-of-way, additional evaluation of historic/architectural and/or archaeological sites may be required during the NEPA clearance phase of the project.

Regulated Materials
Per a review of the Ohio Regulated Properties Search (ORPS) website, there are two (2) records for regulated materials adjacent to the project area. There is a Resource Conservation and Recovery Act (RCRA) record for a Conditionally Exempt Small Quantity Generator (CESQG) located north of the SR-16 interchange, at the location of an abandoned gas station. There are no other records associated with this property. There is one (1) record for a Leaking Underground Storage Tank (LUST) located within SR-161 right-of-way east of the interchange. The current status for the listing is Disproved. Neither location will be impacted by the proposed improvements. Based on a review of Google Aerial imagery, all parcels that may be impacted by the project represent "exempt" land use categories. The adjacent former gas station property represents a "high risk" land use.

Section 4(f)/Section 6(f) Resources
The property to the southeast of the interchange is part of the Spring Valley Nature Preserve, managed by the Granville Recreation District. Impacts to this property, both directly and indirectly through temporary occupancy or access restrictions, are not and will require coordination under Section 4(f) of the Department of Transportation Act of 1966. There are no known publicly and privately-owned historic sites present in or adjacent to the SR-16 interchange. Based on a review of the Land and Water Conservation Fund projects map available from the Trust for Public Land, there are no Section 6(f) properties currently located in or immediately adjacent to the SR-16 interchange.

Air Quality
All of Ohio is now in attainment for carbon monoxide (CO). Therefore, the project is considered exempt from a project level conformity analysis for CO. Licking County is not located within a PM 2.5 nonattainment or maintenance area, thus, no further PM 2.5 analysis is required. There are sensitive land uses within 500-feet of the SR-16 interchange and the project overall proposes to add capacity within 500-feet of sensitive land uses. Therefore, a Qualitative MSAT analysis will be required, following ODOT's and FHWA's processes. As ozone is handled at the regional level, the project must be listed in the 2024-2027 Statewide Transportation Improvement Program (STIP) for ozone to be addressed. A request should be made to place the project on the STIP to ensure it is included in the latest regional conformity analysis. The NEPA decision document cannot be signed until the project is in an approved STIP.

Noise
Potential Noise Sensitive Areas (NSA) were identified through a review of existing aerial mapping. The ODOT *Flowchart for When a Noise Analysis is Needed* (ODOT, 11/23/2012) was consulted to determine whether a noise analysis would be required for the project. As the overall proposed project includes the increase the number of through traffic lanes along SR-161, potential noise impacts will need to be assessed for the entire project area during the NEPA clearance phase of the project, regardless of the preferred alternative. A Noise Analysis will be conducted following ODOT's processes and procedures.

Farmlands
The SR-16 interchange project area is located within a census designated urbanized area. Land within an urbanized area or committed to urban development or water storage is not subject to the Farmland Protection Policy Act (FPPA).

Water Wells and Drinking Water Resources
There are no domestic water wells located within the proposed SR-16 interchange project area. The northwest portion of the SR-16 interchange is within a Ground Water Drinking Water Source Protection Area for the Village of Granville Community System. Impacts in this area may require coordination with the local public water system and plan notes. There are no Sole Source Aquifers in Licking County.

Community Impacts
The SR-16 interchange provides direct access for the Village of Granville and Granville Township to SR-161. Given the anticipated increase in traffic resulting from ongoing development in the area, residents living near the SR-37 interchange may benefit from the proposed improvements under each alternative, which will reduce delay times for motorists, resulting in shorter queues and less engine idling at the interchange. Community impacts will be assessed as part of the NEPA process.

Right-of-Way Requirements
There are no right-of-way encroachments or temporary easements needed for the work in Alternative 1.

Utility Impacts
No existing utilities are anticipated to be impacted. An existing fiber optic line crosses the westbound ramps and existing gas and water lines cross Weaver Drive to the east near the intersection. A catch basin southwest of the intersection collects water in the system from the north and outlets in the wooded area to the east. Signal poles and conduit are to be placed to avoid conflicts.

Safety Assessment
Most of the trips along the Columbus Road (SR-16) corridor travel from Northbound Columbus Road to SR-161 Eastbound and from SR-161 Westbound to Columbus Road Southbound. The existing TWSC ramp terminals were determined to be insufficient for the increased traffic volumes. The traffic control coupled with the increased volumes will result in an elevated potential for crashes and more aggressive driving behaviors as motorists become impatient and accept smaller gaps in traffic. This corridor however has lower traffic volumes and the installation of signals without changes to the existing lane configuration should provide adequate improvements to traffic flow and thus safety.

The installation of a new signal is expected to reduce crashes by assigning right of way to drivers and dedicating protected time for side street movements. Signals can reduce angle crashes compared TWSC intersections by eliminating the need for left turning vehicles to find gaps in mainline traffic. Installing a proposed signal can also increase the number of rear end crashes, but overall, installing a signal at an

existing TWSC intersection is expected to reduce the total crashes. There is a net benefit to installing a traffic signal on this corridor, especially when considering the projected delays under the existing stop-control condition.

Multimodal Assessment

The Central Ohio Workforce Transit Plan denotes SR-16 as a short-term recommended route to connect Newark and Granville to Pataskala, Etna, and Reynoldsburg via bus. The implementation of traffic signals at the SR-37 interchange with SR-16 would be beneficial to these bus routes for the safety of turning movements instead of the existing stop conditions with cross traffic not stopping.

Lighting Impacts

Outside of mainline SR-161, interchange lighting at SR-16 is not expected to be impacted.

Costs

A construction cost estimate was prepared for Alternative 1. Incidentals were expressed as percentages of total construction cost due to limited detailed information. The cost estimate was inflated to 2030 for the anticipated construction mid-point date. An additional 30% contingency was applied to the construction cost based on the planning level of design. Table 22 shows the construction cost for the alternatives and Appendix M shows itemized costs.

Table 22: SR-16 Alternatives Cost

Alternative	Description	Construction Costs (in 2030 Dollars)	Right-of-way Costs
1	Signals	$820,950	$0
2	No-Build	$0	$0

Comparison of Alternatives

Comparison matrices were developed to compare alternatives at each interchange based on the assessments described in the Key Issues section. Each alternative was scored as Excellent, Good, Average, Below Average, or Poor related to its impact on each assessment area.

Table 23: Comparison Matrix - Beech Road Interchange

Evaluation Criteria	Alternative 1 Widened Left Turn Lane	Alternative 2 No-Build
Traffic Assessment		
Roadway Assessment		
Environmental Assessment		
Right-of-Way Requirements		
Utility Impacts		
Safety Assessment		
Multimodal Assessment		
Lighting Impacts		
Maintenance of Traffic Assessment		
Construction Cost (2030 dollars)	$4,613,950	$0

Seems high for widening and signal rebuild

Table 24: Comparison Matrix - Mink Street Interchange

Evaluation Criteria	Alternative 1 Tight Diamond	Alternative 2 DDI	Alternative 3 PARCLO	Alternative 4 No-Build
Traffic Assessment				
Roadway Assessment				
Environmental Assessment				
Structural Assessment				
Geotechnical Assessment				
Right-of-Way Requirements				
Utility Impacts				
Safety Assessment				
Multimodal Assessment				
Lighting Impacts				
Maintenance of Traffic Assessment				
Construction Cost (2030 dollars)	$36,708,075	$44,180,575	$56,603,175	$0

Table 25: Comparison Matrix - SR-310 Interchange

Evaluation Criteria	Alternative 1 Signals	Alternative 2 Roundabouts	Alternative 3 No-Build
Traffic Assessment			
Roadway Assessment			
Environmental Assessment			
Structural Assessment			
Right-of-Way Requirements			
Utility Impacts			
Safety Assessment			
Multimodal Assessment			
Lighting Impacts			
Maintenance of Traffic Assessment			
Construction Cost (2030 dollars)	$30,321,975	$17,708,778	$0

Table 26: Comparison Matrix - SR-37 Interchange

Legend

Excellent

Good

Average

Below Average

Poor

Evaluation Criteria	Alternative 1 Signals	Alternative 2 Roundabouts	Alternative 3 No-Build
Traffic Assessment			
Roadway Assessment			
Environmental Assessment			
Structural Assessment			
Right-of-Way Requirements			
Utility Impacts			
Safety Assessment			
Multimodal Assessment			
Lighting Impacts			
Maintenance of Traffic Assessment			
Construction Cost (2030 dollars)	$12,680,230	$6,939,984	$0

Table 27: Comparison Matrix - SR-16 Interchange

Evaluation Criteria	Alternative 1 Traffic Signals	Alternative 2 No-Build
Traffic Assessment		
Roadway Assessment		
Environmental Assessment		
Right-of-Way Requirements		
Utility Impacts		
Safety Assessment		
Multimodal Assessment		
Lighting Impacts		
Construction Cost (2030 dollars)	$820,950	$0

Conclusions and Recommendations

The SR-161 corridor is becoming increasingly significant in connecting people to destinations and workers to employment locations due to economic growth in the area. Improvements to the SR-161 corridor in Franklin and Licking Counties are a priority for ODOT in order to accommodate the area's forecasted traffic volume. To account for this, the PID 117878 project proposed to widen SR-161 mainline in both directions and make associated improvements at key interchanges and local roadways within the project corridor. This Feasibility Study considered interchange alternatives to fulfill this demand and the resulting effects on nearby roads. Alternatives were created for the interchanges based on ODOT's certified traffic volumes.

Beech Road Interchange

Table 23 summarizes the findings of all key issues considered at the SR-161 and Beech Road interchange. Based on the comparative analysis, **Alternative 1 – Widening to accommodate an additional turn lane is the recommended alternative.** The traffic assessment and safety assessment are the main reasons for this choice. The No-Build option fails to meet v/c ratios and QSR's, therefore not fulfilling the purpose and need of this project to accommodate growing traffic volumes. Alternative 1 does fulfill the required v/c ratios and QSR's. Widening also achieves higher level of service for all intersections with signal timing optimization. No environmental, right-of-way, utility, or MOT issues are anticipated for the recommended alternative.

Mink Street Interchange

Table 24 summarizes the findings of all key issues considered at the SR-161 and Mink Street interchange. Based on the comparative analysis, **Alternative 2 – DDI is the recommended alternative.** The traffic assessment and safety assessment are the main reasons for this choice. The DDI's relatively small footprint and efficient left turn movements onto Mink Street are major advantages compared to the other alternatives. Specifically compared to the PARCLO, the lower structure cost of the DDI and minimized right-of-way and utility impacts are also decisive advantages. The No-Build alternative fails to meet LOS, v/c rations, and QSR's, therefore not fulfilling the purpose and need of this study to accommodate growing traffic volumes. No environmental or MOT issues are anticipated for the recommended alternative.

SR-310 Interchange

Table 25 summarizes the findings of all key issues considered at the SR-161 and SR-310 interchange. Based on the comparative analysis, **Alternative 2 – Roundabouts is the recommended alternative**. The traffic assessment and safety assessment are the main reasons for this choice. The need to widen the existing bridge to accommodate the traffic lanes for Alternative 1 – Signals is a major disadvantage, making Alternative 2 a clear choice. The No-Build alternative fails to meet LOS, v/c rations, and QSR's, therefore not fulfilling the purpose and need of this study to accommodate growing traffic volumes. Differences in environmental, right-of-way, utility, and MOT issues are minor between the alternatives.

SR-37 Interchange

Table 26 summarizes the findings of all key issues considered at the SR-161 and SR-37 interchange. Based on the comparative analysis, **Alternative 2 – Roundabouts is the recommended alternative**. The traffic assessment and safety assessment are the main reasons for this choice. The Roundabout's footprint around the westbound exit ramp and how it fits within the existing bridge over SR-161 are major advantages compared to the Signalized alternative. The No-Build alternative fails to meet LOS, v/c rations, and QSR's, therefore not fulfilling the purpose and need of this study to accommodate growing traffic volumes. Differences in environmental, right-of-way, utility, and MOT issues are minor between the alternatives.

SR-16 Interchange

Table 27 summarizes the findings of all key issues considered at the SR-37 and SR-16 interchange. Based on the comparative analysis, **Alternative 1 – Signals is the recommended alternative.** The traffic assessment and safety assessment are the main reasons for this choice. The No-Build alternative has unacceptable LOS and high delays at peak hours, therefore not fulfilling the purpose and need of this study to accommodate growing traffic volumes. Alternative 1 reaches acceptable ranges for both operations. No environmental, right-of-way, utility, or MOT issues are anticipated for the recommended alternative.

Next Steps

With the completion and approval of this Feasibility Study and the recommended alternatives including a review of the study by the public and project stakeholders, the next steps are to continue the project development process with Stage 1 plans for each interchange recommendation and limited Alternative Engineering Report for the Mink Street bridge.