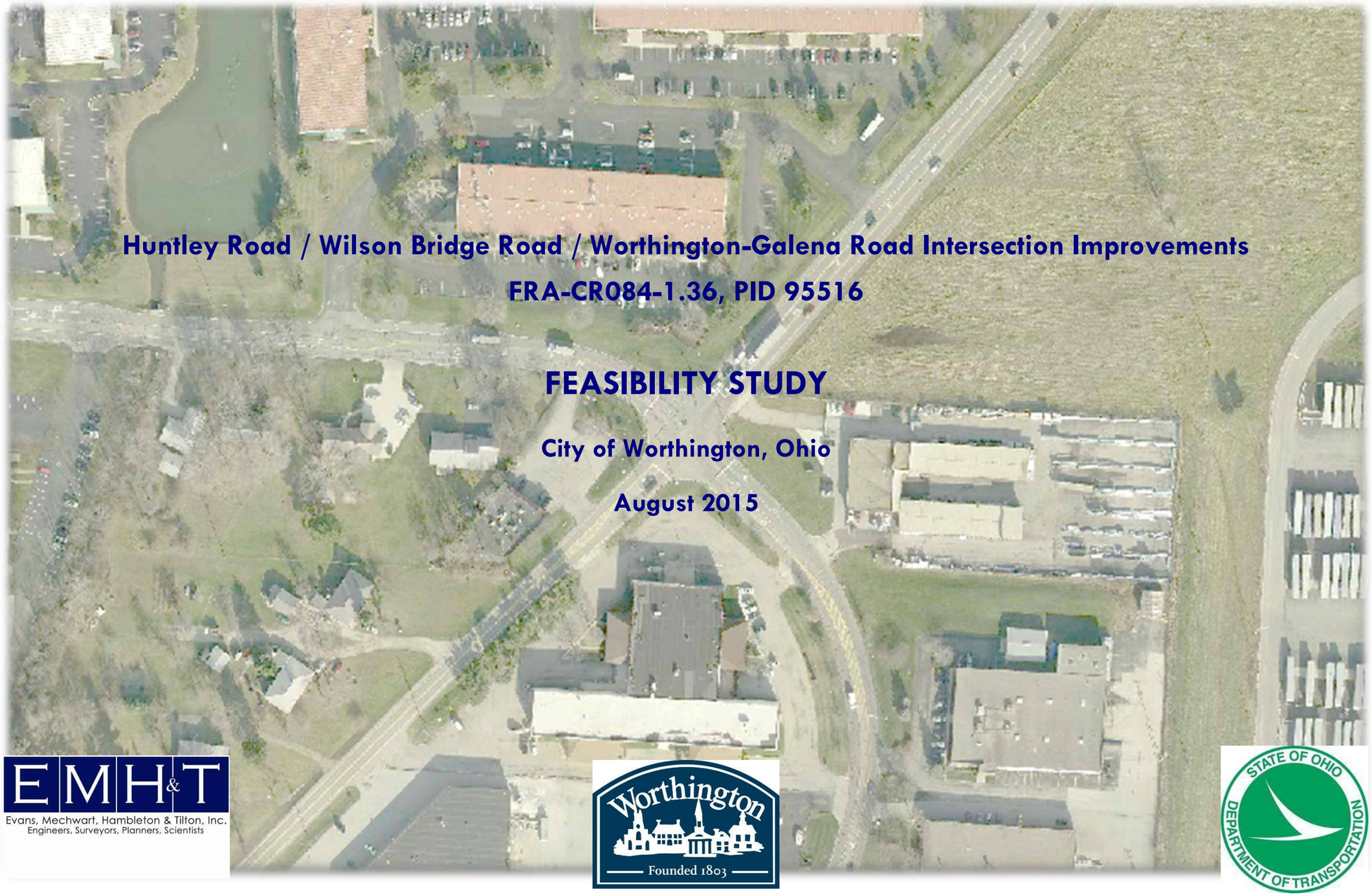

Huntley Road / Wilson Bridge Road / Worthington-Galena Road Intersection Improvements

FRA-CR084-1.36, PID 95516

FEASIBILITY STUDY

City of Worthington, Ohio

August 2015

EMH&T
Evans, Mechwart, Hambleton & Tilton, Inc.
Engineers, Surveyors, Planners, Scientists

Worthington
Founded 1803

STATE OF OHIO
DEPARTMENT OF TRANSPORTATION

PREFACE

This Feasibility Study has been prepared for the City of Worthington's Huntley Road/ Wilson Bridge Road/ Worthington-Galena Road Intersection Improvements by:

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The purpose of this report is to document planning and engineering studies performed for the project. This report and associated professional services have been provided to the Worthington City Engineer per professional service agreement dated July 1, 2014.

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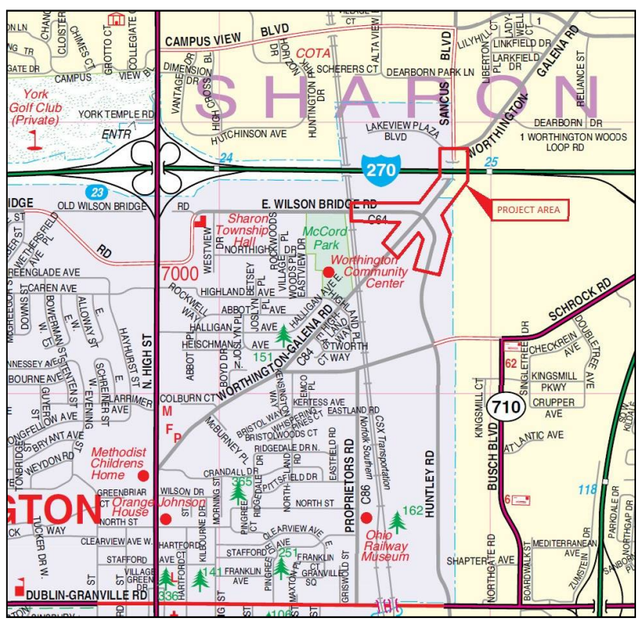
1. EXECUTIVE SUMMARY

The project is located within Franklin County, Ohio and is known as FRA-CR84-1.36, PID 95516. Federal funds have been awarded via MORPC to the project; therefore, the project will follow the ODOT design review process. The MORPC project number is 1272. The general study area of this project is the Worthington-Galena Road/Sancus Boulevard intersection to the North, the Huntley Road/CSX Railroad intersection to the South, the Worthington-Galena Road/CSX-NS Railroad intersection to the South-West, and the Wilson Bridge Road/CSX-NS Railroad intersection to the West. The majority of the roadway improvements will occur within the City of Worthington corporation limits with the residual portion of improvements occurring within the City of Columbus.

Multiple intersection improvement alternatives were evaluated, four of which were identified as "Feasible" and were more fully studied. After evaluating the four feasible alternatives, "Signalized Realignment #2" has emerged as the Preferred Alternative pending input from the City of Worthington and ODOT.

2. INTRODUCTION/BACKGROUND



Reducing congestion at this intersection has been a priority for the City of Worthington for a number of years. In 2012, the City of Worthington successfully applied for funding through MORPC's Attributable Funds program and was awarded funding for the right-of-way and construction phases of the project.

In 2014, Worthington engaged EMH&T to advance traffic studies and identify feasible alternatives for improving the intersection.

Huntley Road is a north-south roadway extending from SR-161, through Schrock Road, to Worthington-Galena Road. Within the project study area Huntley Road is a three-lane curb and gutter section. East Wilson Bridge Road is an east-west connector extending from US-23 to Worthington-Galena Road. Like Huntley Road, Wilson Bridge Road is generally a three-lane roadway with curb and gutter.

Worthington-Galena Road extends southwest-to-northeast from US-23 to Sancus Blvd and continues northeast into Westerville. The south leg of Worthington-Galena Road consists of a

two-lane roadway with open-ditch drainage. The north leg widens from three-lanes up to IR-270 where it widens to a four-lane divided section as it passes under the interstate. Worthington-Galena Road is the only roadway crossing of IR-270 between US-23 and IR-71.

Land uses within the project study area are mostly industrial and office with a few single-family residential structures. A concrete sidewalk at the western edge of the project study area, west of the CSX/NS Railroad is the only pedestrian facility within 1500 feet of the project study area.

3. ALTERNATIVES

Based upon traffic analysis and geometric design evaluation, four potential intersection improvements are presented herein as feasible alternatives. Alternative layout exhibits can be found in **Appendix A**. Below are descriptions of each alternative:

<u>Signalized Widening</u>
Widen all four legs of the intersection while generally following the existing roadway alignments and replace the existing signal at the Huntley/ Wilson Bridge/ Worthington-Galena intersection.

<u>Widening & Roundabout</u>
Widen all four legs of the intersection while generally following the existing roadway alignments except for the intersection area where a modern roundabout would replace the existing signal.

<u>Signalized Realignment #1</u>
Realign Huntley Road and the north leg of Worthington-Galena Road to the east to facilitate through movements in the north-south direction. Realign the south leg of Worthington-Galena Road further west to intersect Wilson Bridge Road at a new signalized intersection.

<u>Signalized Realignment #2</u>
Realign Huntley Road and the north leg of Worthington-Galena Road to the east to facilitate through movements in the north-south direction. Realign the south leg of Worthington-Galena Road adjacent to Rush Run to minimize property impacts compared to the Signalized Realignment #1 alternative.

The development of these options is discussed in the sections below along with further details regarding the scope of each of the four feasible alternatives, along with other alternatives that were considered but dismissed.

4. TRAFFIC ANALYSIS

EMH&T conducted turning movement traffic counts at the Huntley Road/Wilson Bridge Road/Worthington-Galena Road intersection on October 21, 2014 between the hours of 7-9 AM, 11 AM-1 PM, and 2-6 PM. Turning movement counts were also conducted at the Worthington-Galena Road/Sancus Boulevard/Lakeview Plaza Boulevard intersection on October 15, 2014 between the hours of 7-9 AM and 4-6 PM. Significant queues were observed during peak hours on most of the approaches to both of these intersections. EMH&T recorded queue lengths during the count times and at the end of each count period to assist in estimating current traffic demand

that is not being served. Raw count data and queue counts were provided to the ODOT Office of Technical Services with a request for certified traffic projections for this project.

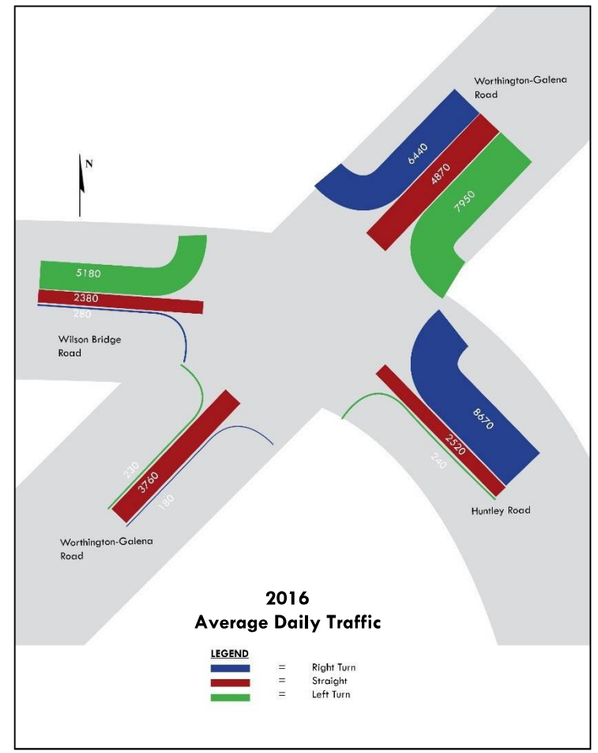
The Wilson Bridge corridor has been the subject of recent planning by the City of Worthington. As one of the City's primary economic centers the corridor presents significant opportunities for strategic redevelopment. The Wilson Bridge Corridor Study was published in 2011 to provide a vision and plan for a study area that extended from the Olentangy River to the western limits of this intersection project. New and redeveloped office, hotel, and medium density residential uses were planned for the portion of Wilson Bridge Road between US 23 and this project. The Wilson Bridge Corridor Study was shared with ODOT forecasters and accounted for in the development of traffic projections for this project.

Based on traffic count and queue data, as well as land use projections for the study area, ODOT certified traffic projections for the project on January 16, 2015. See **Appendix G** for detailed traffic information. ODOT certified volumes provide a basis for assessment of intersection operations and improvement alternatives under opening year (2016) and design year (2036) conditions.

Existing Conditions

Traffic patterns at the Huntley Road/Wilson Bridge Road/Worthington-Galena Road intersection are characterized by heavy turn movements to and from the north leg of Worthington-Galena Road. The nearby diagram shows the relative volume of traffic in each intersection movement, with the width of the line representing the volume of traffic in that movement. The left turn from southbound Worthington-Galena Road to Huntley Road and reciprocal right turn from Huntley Road to Worthington-Galena Road are the largest movements in the intersection. Next largest

are the eastbound left turn from Wilson Bridge Road to Worthington-Galena Road and the reciprocal right turn from Worthington-Galena Road to Wilson Bridge Road. Through movements are relatively less significant with the highest through volume amounting to slightly more than half of the highest turning volume.



The prevalence of turning traffic over through traffic, coupled with the lane configuration of the intersection, contributes to poor performance under existing conditions. Three of the four legs of the intersection provide three lanes consisting of one through-right lane, one left turn lane and one departure lane. The Huntley Road approach is similar but adds one dedicated right turn lane approaching the intersection. The intersection is signalized and provides protected-permitted left turn phasing for eastbound and southbound left turn movements. The westbound right turn movement from Huntley Road to Worthington-Galena Road has a right turn phase overlapped with the reciprocal left turn. The existing configuration of the intersection produces Level of Service (LOS) F under existing conditions (2016 certified volumes) and LOS F under design year conditions. Significant queues, exceeding the length of existing turn lanes, are observable under existing conditions.

Signal Warrant Analysis

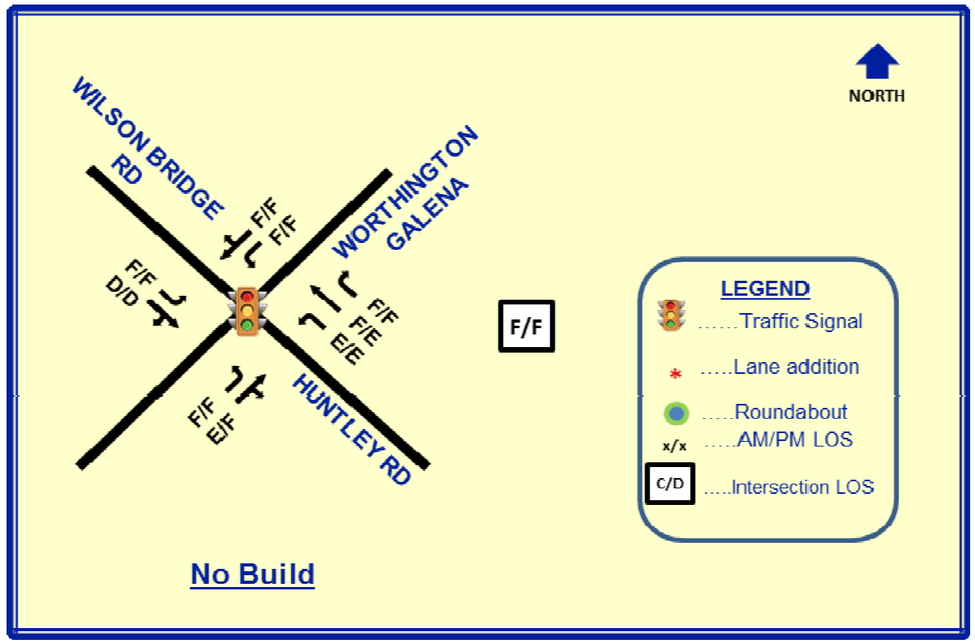
Traffic signal warrants were evaluated for the Huntley Road/Wilson Bridge Road/Worthington-Galena Road intersection using thresholds established by the Ohio Manual of Uniform Traffic Control Devices § 4C (Ohio Department of Transportation) (OMUTCD). Counted traffic volumes were compared to volume criteria specified in Warrant 1, Eight-Hour Warrant, Warrant 2, Four-Hour Warrant, and Warrant 3, Peak-Hour Warrant. Results show that existing traffic volumes satisfy warrant thresholds for all three warrants and that signal control is justified at this intersection. Detailed traffic signal warrant sheets are included in **Appendix G**.

Alternatives Analysis

The following alternatives were identified and analyzed for their ability to address congestion, alignment and other deficiencies. The concepts developed for consideration are presented and outlined below:

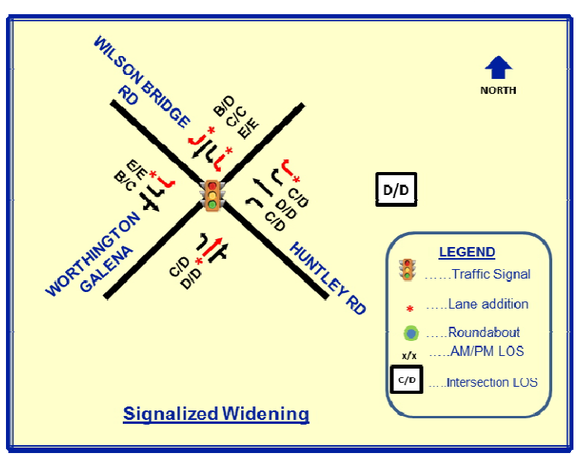
No Build

This alternative demonstrates the effect of leaving the intersection as is through the 2036 design year.



Signalized Widening (Feasible)

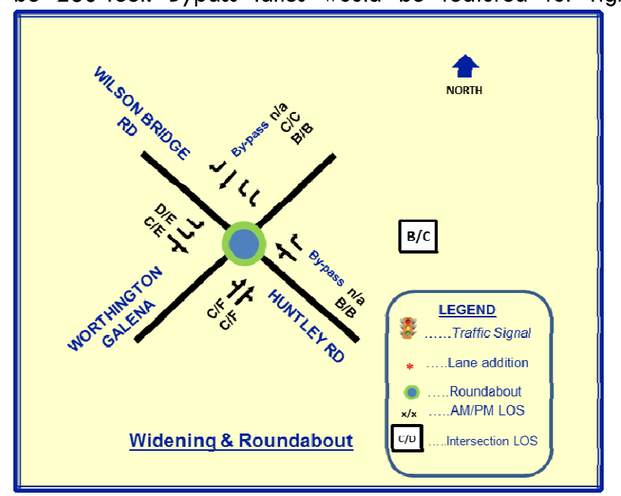
The current intersection would be widened to provide added turn lanes and receiving lanes in order to improve signalized level of service. This alternative maintains the intersection in a four leg configuration under signal control. Turn lanes added include a second westbound right turn lane, a southbound right turn lane and a second southbound left turn lane on Worthington-Galena Road, an eastbound left turn lane on Wilson Bridge Road and a through lane on the northbound approach of Worthington-Galena Road. This configuration would require additional receiving lanes extending beyond the intersection on Worthington-Galena Road



north of the intersection (receiving the eastbound dual left turn lanes) and on Huntley Road east of the intersection to accommodate the dual southbound left turn lane from Worthington-Galena Road.

Widening & Roundabout (Feasible)

In this alternative, the existing intersection would be replaced with a modern roundabout that would include added entry lanes and departure lanes and the standard circulatory road that is needed to form a roundabout. Portions of the circulatory road would be three-lanes in width in order to provide sufficient capacity and the inscribed circle diameter would be 260-feet. Bypass lanes would be featured for right turns from Huntley Rod to Worthington-Galena northbound and from southbound Worthington-Galena Road to Wilson Bridge Road westbound.



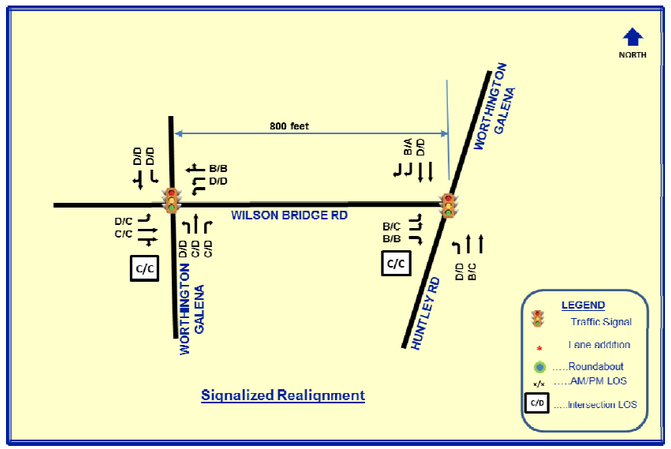
Bypass lanes would not introduce traffic into the central circulator lanes within the roundabout but would create the need for an exclusive receiver lane on the egress side of the roundabout extending beyond the intersection. A second eastbound receiver lane would be required on Huntley Road and a second westbound receiver lane would be required on Wilson Bridge Road. Worthington-Galena Road would require three northbound receiver lanes north of the Huntley Road/Wilson Bridge Road/Worthington-Galena Road intersection which introduces consideration of lane changes on the approach to the nearby Sancus Boulevard/Worthington-Galena Road/Lakeview Plaza Boulevard intersection and the limited horizontal width under the I-270 overpass just north of the intersection.

Signalized Realignment #1 (Feasible)

This alternative replaces the current intersection with two 'split' intersections that are shifted from the current intersection location. The central feature of the realignment is creation of a north-south through movement between Worthington-Galena Road and Huntley Road so that the heavy southbound left turn and westbound right turn movements at the current intersection become through movements at the easternmost of the two new intersections.

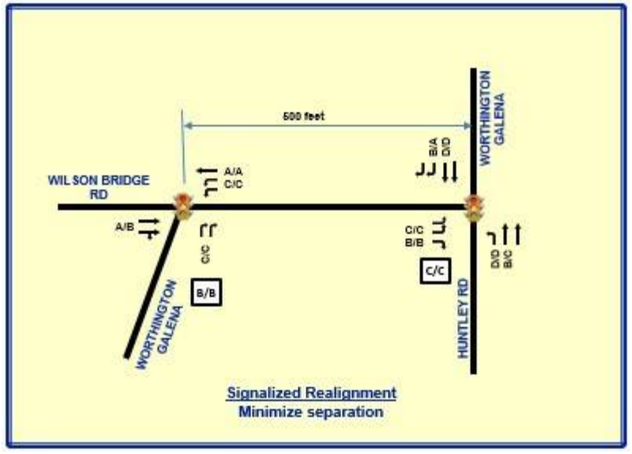
The two new intersections would be located 800 feet apart, with one intersection approximately 550 feet west of the current intersection and the second approximately 250 feet east of the current intersection. The west intersection would be created by realigning the south leg of Worthington-Galena Road so that it intersects Wilson Bridge Road opposite the existing access to the Rush Creek Commerce Center. All four legs of this west intersection

would operate under signal control. The east intersection would also operate under signal control as a three-leg intersection with Wilson Bridge Road terminating at Huntley Road to the south and Worthington-Galena Road to the north. As a subset of this alternative, the same two-intersections were tested with modern roundabouts instead of signal control and two signalized intersections closer together were tested as a strategy to perhaps lessen the right-of-way impacts of this alternative.



Signalized Realignment Minimized Spacing (Considered & Dismissed)

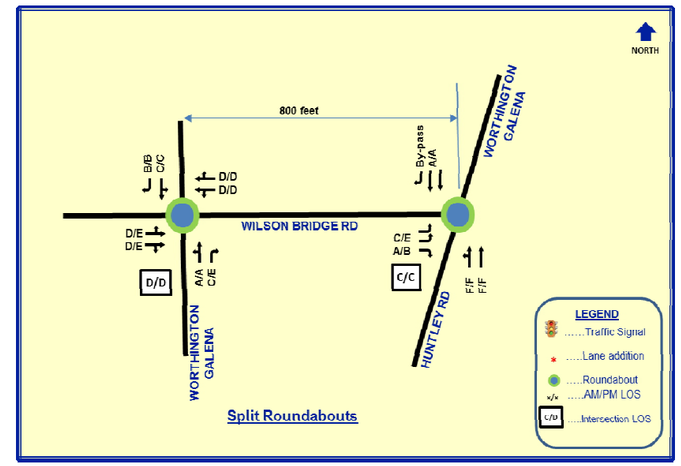
This alternative is similar in design to the Signalized Realignment #1, except that the two intersections are spaced 500 feet instead of 800 feet. The purpose of the reduced intersection separation is to minimize right-of-way impacts. A disadvantage of this layout is the inability to create a four-leg intersection with the Rush Run Commerce Center. Adequate access to this commerce center, as well as, the intersection spacing and queue storage lengths are keys to the feasibility of this concept.



Split Roundabouts (Considered & Dismissed)

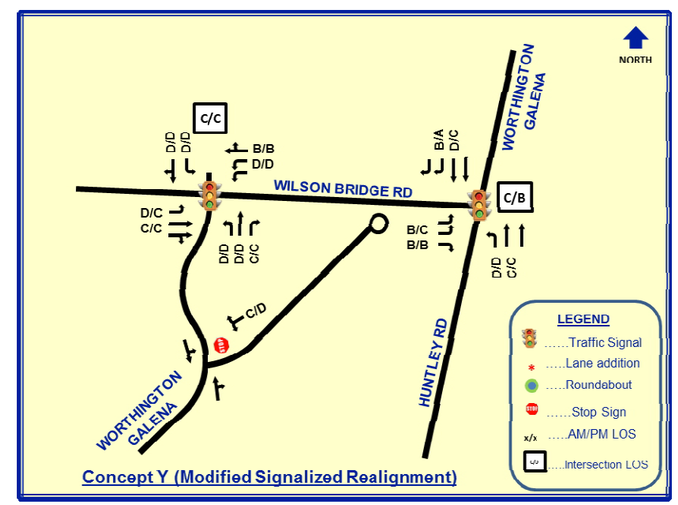
Similar to the Signalized Realignment #1, this alternative replaces the current intersection with two "split" intersections located approximately 800 feet apart along the Wilson Bridge Road alignment. The realignment of Huntley Road and the north leg of Worthington-Galena Road as the north/south corridor and the relocation of the south leg of Worthington-Galena Road to the west are similar to the Signalized Realignment. The difference is that the two

intersections are controlled by modern roundabouts rather than traffic signals. These two roundabouts would be smaller than a single roundabout located at the existing intersection because the movements would be split between the two locations, with each roundabout having two circulator lanes on the inner circle. Consequently, these two roundabouts would have a smaller inside diameter for the central island of 180 feet.



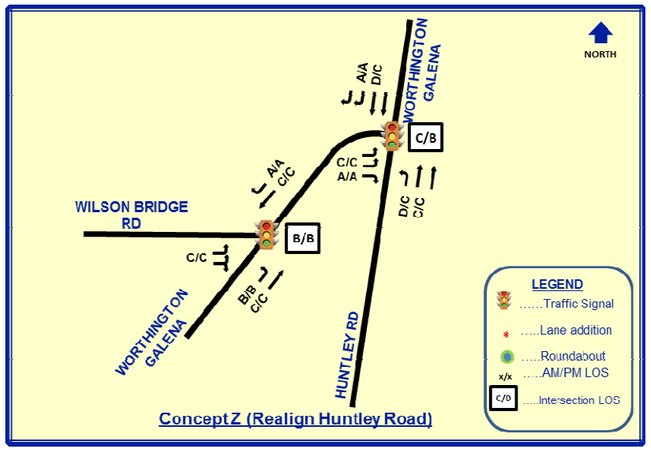
Signalized Realignment #2 (Concept Y) (Feasible)

Concept Y is a modification of the signalized realignment in which the existing intersection movements are split into two intersection locations and Huntley Road and the north leg of Worthington-Galena Road are aligned to facilitate north-south through movements. The difference from the Signalized Realignment discussed above is that the south leg of Worthington-Galena Road intersects Wilson Bridge Road a little further west so that the Worthington-Galena Road relocation avoids residential structures to a greater extent. Intersection operations are similar to the Signalized Realignment and the primary difference is the proximity of road improvements to Rush Run and the rail grade crossing and modifications needed to align access to the north side of Wilson Bridge Road with the south leg of Worthington Galena Road.



Concept Z (Realign Huntley Road) (Considered & Dismissed)

This concept maintains the existing Worthington-Galena Road/Wilson Bridge Road intersection but disconnects the Huntley Road approach. Huntley Road is realigned to facilitate a north-south through movement with Worthington-Galena Road northeast of the current intersection and a connector roadway links the existing intersection with Huntley Road under signal control. Both intersections have the advantage of operating in an efficient 'tee' intersection configuration but intersection spacing and queue storage are keys to the feasibility of this concept. By retaining the existing intersection location, this configuration also retains the existing spacing along Wilson Road from the current railroad crossing, keeping this distance as it currently is.



Intersection Capacity Analysis

Capacity analyses were prepared for each intersection developed for consideration, as well as the current intersection with projected design year traffic levels. Intersections are graded using a Level of Service (LOS) designation expressed in terms of letter grades with LOS A representing the highest quality traffic flow and minimal delay, and LOS F representing poor traffic operations and significant delay.

Capacity analyses were completed using Synchro 8 with HCM methodology for signals and SIDRA software for modern roundabouts. For roundabout analyses, the letter grade for LOS can be tied to either the stop-controlled criteria found in the Highway Capacity Manual or signalized criteria. Stop controlled criteria were used to determine roundabout LOS in accordance with ODOT recommended practice. Results for each alternative are summarized in **Appendix H**.

As illustrated on the capacity analysis table in **Appendix H**, the No Build alternative does not provide sufficient traffic capacity under opening year (2016) or design year (2036) conditions. Multiple intersection approaches operate at LOS F in both horizon years with average delay approaching 4 minutes per vehicle by the design year.

The existing intersection can be improved to operate at LOS D overall by adding lanes and signal phases to the existing configuration. But the eastbound left turn and southbound left turn movements would operate at LOS E by the design year. Poor Level of Service on the eastbound approach could lead to increased queuing toward the adjacent rail grade crossing. Eastbound queues have been observed extending west of the grade crossing under existing conditions. The

dual turn movements required on 3 of the 4 intersection approaches imply improvements to create receiving lanes and carry them to a logical termini.

Replacing the existing intersection with a modern roundabout does not resolve capacity deficiencies in the design year. While LOS C or better was attained for the intersection overall, the eastbound and northbound approaches operated at LOS E and F respectively. Portions of the circulating roadway were expanded to three lanes in order to achieve these poor results even though there would be concerns about introducing such a large roundabout in an area where the driving public may not have much prior experience with modern roundabouts of this size. The challenge inherent in a roundabout at this location appears to be that the heavy southbound left turn movement from Worthington-Galena Road to Huntley Road is relatively unopposed by traffic in the circulating roadway at the southbound entry point. As a result, insufficient gaps are created in the southbound left turn flow to allow traffic on the west and south legs to enter the roundabout.

The remaining alternatives realign intersection approaches to create a north-south through flow between Worthington-Galena Road and Huntley Road. This configures traffic controls in a way that is more consistent with travel patterns and thus provides the most significant improvement in performance. Doing so requires splitting movements into two intersections, both under signal or roundabout control, referred to as the east intersection and the west intersection. The "Signalized Realignment #1 and #2" alternatives maintain approximately 800 feet of separation between the two signalized intersections and provide LOS C overall for both intersections in the design year, with no movement worse the LOS D.

Anticipated queues can be accommodated on Wilson Bridge Road between the two intersections but most of the space is needed for queues. As a result of queue lengths and intersection spacing, access management on Wilson Bridge Road will be a critical part of achieving safety and performance goals. No access is preferred between the east and west intersections and right-in/right-out access with a raised center median is the minimum recommended access management on Wilson Bridge Road.

While the west intersection is closer to the rail grade crossing than the existing intersection, an additional eastbound through lane is included in these alternatives, partly to increase queue capacity between the grade crossing and the west intersection. With the additional lane, queue storage capacity in the "build" condition is similar to the storage available under existing "no-build" conditions. In addition, analysis shows that the improved performance of the intersections will produce shorter queues in the eastbound direction. Nevertheless, existing conditions create observable eastbound queues that extend west of the railroad crossing at times. Preemption treatments that help keep the crossing clear of queued traffic are discussed in Section 9, Railroad Assessment.

Modern roundabouts were considered to control the east and west intersections in lieu of traffic signals in the realignment alternatives. The west intersection achieved LOS D overall but with LOS E movements while the east intersection provided LOS F overall with several poor performing movements. This poor performance, coupled with the challenge of responding to blockages caused by train traffic, disfavor the use of modern roundabouts in this scenario.

Finally, Concept Z (Realigned Huntley Road) provides a two-signal concept that maintains the existing intersection location while providing for north-south through movements on a new alignment connecting Huntley Road to the north leg of Worthington-Galena Road. Both signalized intersections achieved acceptable Level of Service in the design year (LOS C or better overall with no movement worse than LOS D). The limited distance between the two signalized intersections and proximity of the northern intersection to the I-270 underpass provides inadequate queue storage. Also, proximity to the adjacent signalized intersection at Worthington-Galena Road/Sancus Boulevard limits the distance available for lane selection for northbound traffic approaching Sancus Boulevard.

Detailed capacity analysis reports are included for reference in **Appendix H**.

Alternatives Comparison

A comparison of concepts was made to help narrow the focus on likely solutions to address the current capacity deficiencies at the Worthington-Galena Road/Huntley Road/Wilson Bridge Road intersection. Results from the capacity analyses were successful in identifying alternatives that were superior in terms of traffic performance. Other factors also considered were access management needs, right-of-way needs, and relationship to the rail grade crossing.

This traffic operations review indicates the following:

- Improving the intersection in its existing location does not provide the capacity to accommodate design year volumes whether it is improved as a signal controlled intersection or as a modern roundabout. The scale of improvements needed to achieve the results reported herein would impact surrounding property by widening the intersection approaches significantly, require access modifications to accommodate long turn bays, and potentially queue traffic over the adjacent rail grade crossing due to poor performance.

- Realigning Huntley Road and the north leg of Worthington-Galena Road to provide a north-south through connection, and separating movements into two signalized intersections provided the best performance. The same alternative under roundabout control did not provide adequate performance. The necessary widening and relocation of roadways impact surrounding property but may be more flexible with respect to access management on Huntley Road compared to improving the existing intersection. This alternative improves access to the northwest quadrant of the intersection by signalizing it. Widening plus improved performance is expected to reduce the incidence of traffic queues reaching the rail grade crossing even though a new signalized intersection will be located closer to the crossing than the existing intersection. Coordinated control of the crossing should be considered in conjunction with any alternative however.

- A two-signal alternate that maintains the existing intersection location and adds a signalized intersection to the north provides adequate levels of service but reduces intersection spacing in the Worthington-Galena Road corridor. The resultant intersection spacing does not support anticipated queues and compresses the distance in which northbound drivers can select a lane on the approach to the Worthington-Galena Road/Sancus Boulevard intersection.

- A few alternatives were discarded during the evaluation stage due to concerns with the layout involving capacity, safety and queuing. The shortened signalized realignment was eliminated due to the lack of adequate spacing between the two adjacent signals that resulted in queues from each signal potentially interfering with the adjacent intersection. The split roundabout alternatives were eliminated due to the expected poor level of service for some approach legs. Additionally, Concept Z (Realigned Huntley Road) was eliminated due to the closely spaced intersections that did not leave adequate room for queue storage during peak hours. Exhibits showing the alternatives considered and dismissed are located in **Appendix J**.

5. ROADWAY ASSESSMENT

Design Designation Information

Roadway Assessment has been based upon the following design designation information:

Table 5A
Design Designation Information

	Worthington-Galena Road		Wilson Bridge Road	Huntley Road
	North Leg	*South Leg*	*West Leg*	*East Leg*
Opening Year ADT (2016)	28,930	7,220	13,630	19,120
Design Year ADT (2036)	36,870	9,560	17,030	21,940
DHV (2036)	4,040	1,160	1,620	2,200
Dir. Dist.	52%	56%	55%	53%
Trucks (24hr B&C)	4%	4%	4%	4%
Posted Speed	35mph	35mph	35mph	35mph
Design Speed	35mph	35mph	35mph	35mph
Functional Classification	Urban Collector		Urban Collector	Urban Collector

Geometrics

Existing roadway alignments were analyzed and it is noted that several existing horizontal curves do not satisfy current Normal Design Criteria (NDC) for 35 mph design speed (actual design speed met in parentheses):

1. Worthington Galena Road north of IR-270 (25 mph)
2. Wilson Bridge Road north west of Worthington-Galena Road (25 mph)
3. Huntley Road east of Worthington-Galena Road (30 mph)

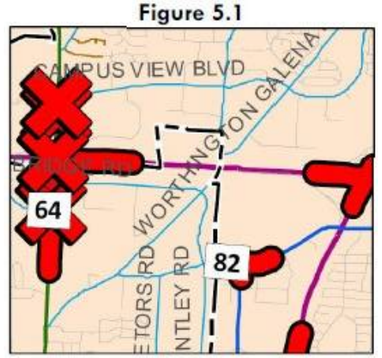
Geometric improvements to Curve #1 above are not proposed under any of the proposed alternatives as it would require significant geometric modifications to the existing Worthington-Galena Rd/Sancus Road intersection which is beyond the scope of this project. A Design Exception may be required for this existing geometric condition.

The geometric deficiencies associated with Curves #2 and #3 would be eliminated under the Widening & Roundabout and Realignment alternatives. However, the Signalized Widening

alternative would hold the existing centerline alignment in this area and would not improve the geometrics of Curves #2 and #3, likely requiring a Design Exception.

Since the project does not fall within a segment or intersection identified as a Safety Analyst Location by ODOT (see Figure 5.1), proposed design features can likely equal existing design features without justification as described in ODOT L&D Manual, Volume 1, Section 105.5.1.2.

Figure 5.1



It is also noted that the westbound through lane on Huntley Road at Worthington-Galena Road is poorly aligned with the receiving lane on Wilson Bridge Road. All four feasible alternatives would correct or eliminate this geometric deficiency.

Pedestrian Facilities

No existing pedestrian facilities are located within the study area; however, pedestrian facilities are proposed as part of this project. Logical termini for these facilities were examined for all legs of the intersection. To the north, the nearest sidewalk is located at the Sancus Boulevard/Dearborn Park Lane intersection approximately 1500 feet north of the project limits. However, pedestrian pushbuttons with concrete landings are located at the Worthington-Galena Road/Sancus Boulevard intersection. To the south, existing bike lanes are located on Schrock Road, approximately 1100 feet south of the project limits. To the southwest existing sidewalks are located at the Worthington-Galena Road/Highland Avenue intersection, approximately 1500 feet southwest of the project limits. To the west an existing sidewalk and public park is located along Wilson Bridge Road, approximately 500 feet west of the anticipated limit of roadway improvements.

Based on the proximity of existing pedestrian facilities it is recommended that the proposed facilities extend north to the Worthington-Galena Road/Sancus Boulevard intersection and west to the existing sidewalk and public park along Wilson Bridge Road west of the existing railroad tracks. It is recommended that the pedestrian facilities along the other legs of the intersection extend to the project limits in order to provide logical termini for future projects.

A significant obstacle for extending the pedestrian facilities to the logical termini along Wilson Bridge Road is the railroad crossing just east of the existing pedestrian facilities. See Section 9, Railroad Assessment, for additional information regarding the railroad crossing.

Typical Section

Preliminary pavement design calculations were prepared for cost estimating purposes and are included in **Appendix I**. While geotechnical investigations were not performed in preparation of this study, a 3% CBR was assumed for calculation purposes. Both rigid and flexible pavement types were evaluated, however, for the purpose of this report, flexible pavement is proposed in order to match the existing road network.

Based on record information, the existing pavement sections within the project area are 30+ years old and exhibit various stages of structural fatigue. For estimating purposes, full depth reconstruction has been assumed for the majority of the roadways, except the southern half of Huntley Road which has been assumed to be resurfaced. As the project design advances, salvaging of existing pavement could be evaluated as a potential cost savings measure.

In the opening year, truck traffic on any leg of the intersection does not exceed 1,500 trucks per day – defined by ODOT standards as "Heavy." Therefore, heavy duty pavement types including Item 442 (Superpave) and Item 302 asphalt concrete base have not been proposed.

Access Management

In the existing condition there are six commercial full-access points within 200 feet of the Huntley/ Wilson Bridge/ Worthington-Galena intersection. Restriction or potential removal of these access points, and others, would likely enhance safety and improve intersection operations and therefore, has been studied as part of this alternatives analysis for the purposes of construction cost estimating and identification of right-of-way impacts. Access management design will be further advanced for the preferred alternative during subsequent phases of project development.

Maintaining Traffic

Preliminary maintenance of traffic (MOT) has been studied for the four feasible alternative improvements outlined within this report. Based on the use of the roadways, it is assumed that maintaining at least one lane of traffic in each direction will be required during construction where feasible; however, some detouring may be appropriate at certain stages of construction. Phased construction should be utilized to minimize impacts to vehicular and pedestrian traffic.

Reduced lane widths during each phase of construction will be necessary to perform the pavement widening and for the inclusion of either portable barrier or drums (depending on drop-off conditions) to separate traffic from the work zone area. Lane widths of 10 feet minimum are recommended to be maintained. Listed below are descriptions of the preliminary MOT schemes for each alternative.

Signalized Widening:

Construction will follow a simple part-width multi-phase construction scheme. One lane in each direction will be maintained in all directions. In phase one, traffic will utilize two lanes of the existing roadway and allow for construction of the proposed road. In phase two the traffic will be shifted onto the newly constructed road to allow for the remainder of the proposed roadway to be constructed. Temporary pavement will be utilized where required to maintain two lanes of traffic. The MOT traffic signals will utilize the existing/proposed signals when feasible.

Widening & Roundabout:

Construction for this alternative will be a complicated MOT scheme, potentially involving a detour and temporary signals as described herein. Worthington-Galena Road south of the intersection will be closed and accessed via a detour utilizing Schrock Road and Huntley Road. In phase one temporary pavement and a large portion of the proposed Worthington-Galena Road, including the roundabout, will be constructed "off-line" before any existing traffic is affected. In phase two, the traffic will be shifted to one lane in each direction, the south leg of Worthington Galena Road will be detoured, and a temporary signal will be installed at a location within the newly

constructed area. Part-width construction will be utilized to construct improvements to Wilson Bridge Road, Huntley Road, and Worthington-Galena Road where the proposed construction is outside the proposed roundabout. In phase three, the temporary signal will be shifted to a second location to allow for the remainder of the proposed roadway to be completed.

Signalized Realignment #1 & #2:
Construction for these alternatives will be a modified part-width scheme. Phase one will include all temporary pavement work as well as proposed roadway construction that will not impact the existing roadway. Existing traffic patterns will not be affected as part of the phase one construction. Phase two will involve traditional part-width construction for Worthington-Galena Road, Wilson Bridge Road, and Huntley Road in order to maintain one lane in each direction at all times. The proposed intersections will be utilized throughout the MOT phases.

See table 5A for the estimated cost of maintenance of traffic for each alternative.

Table 5A
Maintenance of Traffic - Opinion of Cost

Description	Alternative		
	Signalized Widening	Widening & Roundabout	Signalized Realignment 1/2
Additional Temp. R/W	$8,000	$5,000	$5,000
Cut/Fill/Shoring	$25,000	$20,000	$20,000
MOT Signals	$20,000	$120,000	$20,000
MOT Drainage	$25,000	$20,000	$20,000
Temporary Pavement	$103,000	$83,000	$85,000
MOT Pavement Markings	$6,000	$5,000	$6,000
MOT Lump	$150,000	$150,000	$150,000
Subtotal:	$337,000	$403,000	$306,000
25% Contingency:	$84,300	$100,800	$76,500
Estimated Grand Total:	**$421,300**	**$503,800**	**$382,500**

6. STORMWATER DRAINAGE ASSESSMENT

Drainage Overview
The existing storm water conveyance is provided by ditches along Worthington-Galena Road and by curb, gutter, and storm sewer along Wilson Bridge Road and Huntley Road. There are three existing drainage outlets within the project limits. Worthington-Galena Road drains south and eventually outlets into Rush Run via an 18" pipe approximately 950 feet south of the intersection. Wilson Bridge Road drains west and outlets via an 18" pipe through the side of a 9'x5' box culvert at Rush Run. Huntley Road flows south via a storm sewer and outlets via a 48" pipe into Rush Run at a location just south of the CSX railroad spur approximately 650 feet west of Huntley

Road. Existing drainage patterns and outfall locations will be maintained to the maximum extent practicable.

The proposed intersection improvements will require improving the storm sewer drainage system; however, the existing system will be maintained if possible. The drainage design for the proposed storm system will follow the Ohio Department (ODOT) Location and Design Manual, Volume 2. Storm sewer shall be sized using the 10-year storm event and checked for the hydraulic gradient using a 25-year storm event as provided in the ODOT rainfall intensity-frequency-duration curves.

Drainage Culverts
An existing box culvert is located at Rush Run along Wilson Bridge Road. The 9'x5' four sided cast-in-place culvert was constructed in 1983 and is anticipated to be structurally sound. The proposed widening along Wilson Bridge Road will require extending this culvert approximately 13 feet to the north and 19 feet to the south. New headwalls and wingwalls will be required at both ends of the culvert extension.

An existing 48" corrugated pipe culvert with stone headwalls is located at Rush Run along Worthington-Galena Road, approximately 1000 feet southwest of the Worthington-Galena Road/Wilson Bridge Road/Huntley Road Intersection. This culvert was originally installed prior to 1937. In 1937 Worthington-Galena Road was widened, the culvert was extended, and the stone headwalls were installed. The Signalized Realignment #2 alternative will impact this culvert. It is recommended that the culvert be removed and replaced if this alternative is selected.

Post-Construction Best Management Practices
Post-construction storm water best management practices (BMPs) will be required for this project. Regulations require BMPs for projects that create more than one acre of earth disturbed area (EDA). All alternatives surpass this EDA threshold. According to ODOT L&D Manual, Volume 2, Section 1115 each alternative is classified as a new construction project.

Signalized Widening:
The anticipated earth disturbed area (EDA) is approximately 10 acres. It is anticipated that the new impervious pavement within the new right-of-way will be less than one acre; therefore, treatment by biofilters, filter strips, and/or a manufactured system will be required. In accordance with ODOT L&D Manual, Volume 2, Section 1115, water quality treatment will be required for approximately 70% of the EDA based on preliminary calculations. Post-construction BMP's will be necessary to treat approximately 7 acres of runoff from the earth disturbed area.

Widening & Roundabout:
The anticipated earth disturbed area (EDA) is approximately 11.5 acres. New impervious pavement within the new right-of-way will be greater than one acre; therefore, water quality and water quantity treatment will be required. Treatment by a detention basin, retention basin, bioretention cell, infiltration basin, or wetland will be required. In accordance with ODOT Location and Design Manual, Volume 2, Section 1115, storm water treatment will be required for approximately 70% of the EDA based on preliminary calculations. Post-construction BMP's will be necessary to treat approximately 8 acres of runoff from the earth disturbed area.

Signalized Realignment #1 & #2:
The anticipated earth disturbed area (EDA) is approximately 10.5 acres. New impervious pavement within the new right-of-way will be greater than one acre; therefore, water quality and water quantity treatment will be required. Treatment by a detention basin, retention basin, bioretention cell, infiltration basin, or wetland will be required. In accordance with ODOT Location and Design Manual, Volume 2, Section 1115, storm water treatment will be required for approximately 70% of the EDA based on preliminary calculations. Post-construction BMP's will be necessary to treat approximately 7.5 acres of runoff from the earth disturbed area.

Treatment requirements and strategies for the Preferred Alternative will be further refined in subsequent stages of plan development.

7. RIGHT OF WAY ASSESSMENT

A boundary survey was performed in December 2014 in order to determine property lines and existing right-of-way limits. Record centerlines were recreated from record information supplemented with recovered centerline monumentation. All property lines were established using recorded plats.

The existing right-of-way width for each leg are listed below:

- Worthington-Galena Road (North) – Variable Width
- Worthington-Galena Road (South) – 60 Feet
- Wilson Bridge Road – 70 Feet
- Huntley Road – 60 Feet

To accommodate any of the feasible alternatives, acquisition of right-of-way and temporary easements will be required. A detailed breakdown of the anticipated right-of-way costs can be found in **Appendix C**. Listed below are brief descriptions of the potential right-of-way needs for each alternative.

Signalized Widening:
In order to accommodate the roadway widening, right-of-way strip takes will be required on all four legs of the intersection. In addition, temporary construction easements will be required to construct the improvements. The drives to parcel 100-002695 will be removed due to access management constraints. The estimated right-of-way cost assumes this parcel to become a total take. A relocation fee for the commercial site is included in the right-of-way estimate.

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Widening & Roundabout:
Along the entry legs of the roundabout, right-of-way strip takes will be required. More significant takes will be required near the roundabout on parcels 100-002695, 100-002422, and 610-146441. For the purpose of developing the estimated right-of-way cost it was assumed that parcel 100-002695 would become a total take. A relocation fee for this commercial site is included in the right-of-way estimate. In addition, temporary construction easements will be required to construct the improvements.

Signalized Realignment #1:
The realignment of Huntley Road and the north and south legs of Worthington-Galena Road significantly impacts the right-of-way. Two commercial structures (parcels 100-002695 and 100-002692) and two residential structures (100-002690 and 100-002703) will be physically impacted by this alternative. For the purpose of developing the estimated right-of-way cost it was assumed that these parcels would become total takes. Relocation fees were also added to the estimate to relocate the businesses and residents. In addition, strip takes will be required along the non-realigned portion of the improvements.

Signalized Realignment #2:
The realignment of Huntley Road and the north and south legs of Worthington-Galena Road significantly impacts the right-of-way. Two commercial structures (parcels 100-002695 and 100-002704) will be impacted but the two residential structures that would be impacted by Signalized Realignment #1 are avoided in this alternative. For the purpose of developing the estimated right-of-way cost it was assumed that the two commercial parcels with impacted structures would become total takes. Relocation fees were also added to the estimate to relocate the businesses. In addition, strip takes will be required along the non-realigned portion of the improvements.

8. UTILITY ASSESSMENT

Existing utility information was obtained via field markings, record plans, and GIS information. Multiple utility requests were submitted though the Ohio Utilities Protection Service (OUPS) on October 10, 2014 for field markings and record plan information. The OUPS tickets submitted for this project include the following: B428300639, B428300640, B428300641, B428300642, B428300644, B428300645, B428300649, and B428300650. See **Appendix E** for the existing utility exhibits.

Through OUPS it was determined that the following utilities are located within the project limits: American Electric Power, AEP Transmission, Columbia Gas, Columbus Fibernet, Fibertech Networks, AT&T Communications, Level 3 Communications, Windstream Communications, Verizon/MCI, XO Communications, WOW!, the City of Columbus Department of Technology, the City of Columbus Division of Water, City of Columbus Division of Sewerage and Drainage, and the City of Worthington Water.

A number of private utilities are likely to be in conflict with the roadway improvements, excavations, and/or storm sewer construction. Most of the conflicts will occur inside the existing

right-of-way, placing the financial responsibility on the private utility owner. Two exceptions are the AT&T facilities on the west side of Worthington-Galena Road, and the Columbia Gas high-pressure mains along Huntley Road and along the northern leg of Worthington-Galena Road. It is assumed the project would be financially responsible for relocation of these utilities and the cost estimate included in **Appendix B**, has been prepared accordingly for each alternative.

In regard to public utilities, a significant concern is the potential impact to the 30 inch Columbus water main located on the south side of Wilson Bridge Road and along the west side of Huntley Road. During design all efforts will be taken to avoid cover issues, utility conflicts, and storm crossing conflicts with this waterline. In addition to the 30" Columbus waterline there are 8" and 12" Worthington waterlines and a 16" Columbus waterline. Cover and utility crossings will be checked during design and issues will be avoided to the maximum extent practicable. However, if conflicts cannot be avoided waterline lowerings may need to occur. An 8" Worthington sanitary sewer is also located with the improvements. Sanitary manhole rims will need to be adjusted to grade and utility conflicts with the sanitary sewer will be avoided.

9. RAILROAD ASSESSMENT

Pedestrian Crossing

Three railroad crossings are located approximately 1350 feet west of the Worthington-Galena Road/East Wilson Bridge Road/Huntley Road intersection. The two western railroad lines are operated by Norfolk Southern (NS) and the eastern line is operated by CSX. Both railroad tracks are frequently in use. The NS tracks experience 32 crossings per day, while 6 crossings occur on the CSX tracks per day.

The proposed intersection improvement provides pedestrian facilities, including a 5' sidewalk on the north side of Wilson Bridge Road and a 10' shared-use path on the south side. EMH&T determined that the logical termini for these facilities along Wilson Bridge Road to be an existing concrete sidewalk west of the railroad crossing and McCord Park which is also located to the west of the railroad crossing. Pedestrian access is not currently provided across the tracks; therefore, proposed at-grade crossings were examined.

Any at-grade crossing will need to adhere to several design standards, including: the OMUTCD Chapter 8D, the Norfolk Southern Public Projects Manual, the CSX Public Project Information Manual, and the ADA Standards for Accessibility Design. CSX and NS design requirement coincide that pedestrian crossings are strictly prohibited unless inside a roadway easement or roadway right-of-way. Therefore, the crossings will need to occur either within the Wilson Bridge Road right-of-way, or additional right-of-way and/or a roadway easement will need to be acquired from NS and CSX. For the purposes of this study, the pedestrian route considered is located within the existing right-of-way and permanent acquisitions will not be required.

Construction of the pedestrian crossings will include gate and signal relocations, pedestrian gate installations, track work, walk and path improvements, and drainage improvements. In addition, because two railroad entities are involved there will be two separate review, approval, and

permitting processes. Fees associated with signal design and engineering reviews will be required for both railroads.

At the time of this submission, the estimated cost to construct the sidewalk and asphalt shared-use crossings is **$625,000**. Cost data is provided in Table 9A.

Table 9A
Pedestrian Railroad Crossing - Opinion of Cost

Description	Quantity	Unit	Unit Cost	Total
Norfolk Southern Railroad				
Grade Crossing Signal - Signal/Gate Arm	1	Lump	$60,000	$60,000
Grade Crossing Ped Signal - Signal/Gate Arm	3	Each	$60,000	$180,000
Track Work	30	Track Ft	$500	$15,000
Flagging Operations	15	Day	$1,000	$15,000
Signal Design	1	Lump	$30,000	$30,000
Engineering Review	1	Lump	$15,000	$15,000
Temporary Construction Easement	1	Lump	$5,000	$5,000
Sub-Total:				**$320,000**
CSX Transportation Railroad				
Grade Crossing Ped Signal - Signal/Gate Arm	3	Each	$60,000	$180,000
Track Work	30	Track Ft	$500	$15,000
Flagging Operations	15	Day	$1,000	$15,000
Signal Design	1	Lump	$30,000	$30,000
Engineering Review	1	Lump	$15,000	$15,000
Temporary Construction Easement	1	Lump	$5,000	$5,000
Sub-Total:				**$260,000**
Pedestrian Facility Improvements				
Concrete Walk	1	Lump	$20,000	$20,000
Asphalt Path	1	Lump	$20,000	$20,000
Drainage	1	Lump	$5,000	$5,000
Sub-Total:				**$45,000**
Total:				**$625,000**

Railroad Preemption

Railroad preemption is the transfer of normal signal operation to a special mode when a train is approaching. The purpose of railroad preemption is to clear vehicular traffic off of the railroad tracks to prevent an at-grade collision.

The Ohio Manual of Uniform Traffic Control Devices recommends preemption when one of two conditions is satisfied. If a crossing is located within 200 feet of a signal, preemption is

recommended. All of the studied alternatives exceed the 200 feet spacing requirement. The second condition states that preemption should be considered if the spacing exceeds 200 feet and queueing extends to the crossing.

Theoretical queue lengths for the signalized realignment alternative were calculated using SimTraffic. The queue lengths were calculated to simulate stacking if both through lanes are utilized, as well as, if only one lane is utilized. Although one lane utilization is improbable it could occur if there is an accident or other situation that would close a lane. For the Signalized Realignment Alternative #2, the proposed spacing between the west Wilson Bridge Road signal to the railroad tracks is approximately **750 feet**. Listed below are the queuing results for the design year traffic at the west intersection on Wilson Bridge Road:

2036 AM Peak Hour Queue Length:
Two Lanes Utilized: **200/230 feet**
One Lane Utilized: **485 feet**

2036 PM Peak Hour Queue Length:
Two Lanes Utilized: **240/280 feet**
One Lane Utilized: **890 feet**

2036 PM 2nd Highest Peak Hour Queue Length:
Two Lanes Utilized: **215/235 feet**
One Lane Utilized: **470 feet**

The queue length calculations indicate that vehicle stacking may occur across the railroad tracks during the PM peak hour if only one travel lane is utilized. In order to determine the potential frequency of stacking on railroad tracks, the second highest PM peak hour was then checked. Based on the calculation, stacking to the railroad tracks will not occur during this hour; therefore, only one hour in the day will theoretically queue to the tracks.

The theoretical queue calculations show the PM peak hour queue as problematic if only one lane is utilized; however, one lane utilization is improbable. All other calculated queue lengths are significantly less than the 750 feet provided spacing to the railroad tracks. Ms. Cathy Stout, safety manager at the Ohio Rail Development Commission (ORDC), was contacted to provide expertise in railroad preemption. After discussing this project and the proposed impacts with ORDC, it is likely that a "queue cutter" signal is not warranted at this location. However, two additional measures should be considered in the event that queuing does occur. Signage improvements should be considered to warn eastbound drivers not to stop on the railroad tracks. This would be considered an improvement since existing signage is not present. Second, vehicular detection can be installed to the east of the railroad crossing. A vehicle queue approaching the tracks would be detected and the signal would be preempted to clear the queue.

Railroad preemption requirements and approach will be further studied and discussed with the ORDC for the preferred alternative in subsequent stages of plan development.

Quiet Zone

A quiet zone is a section of rail line that contains one or more consecutive at-grade crossings at which train horns are not sounded when trains are approaching a crossing. The prohibited use of train horns only applies to trains entering the crossing and does not apply to train horn use at rail yards; therefore, any horn use at the Anheuser-Busch plant would not be covered in the quiet zone. Quiet zones also do not eliminate the use of train bells at crossings.

Based on the Federal Railroad Administration's records, there are currently eight quiet zones in the state of Ohio, none in central Ohio. Based on the research performed, a quiet zone within the area of this project is feasible; however, due to the increased risk of a crossing collision the City would be required to strictly comply with a set of rules and requirements to establish the quiet zone.

A quiet zone is required to be 0.5 miles in length, minimum. Due to the close proximity of crossings at Worthington-Galena Road, Wilson Bridge Road, Schrock Road, and Huntley Road and the location of residential areas south of Wilson Bridge Road it is recommended that four crossings be included in the quiet zone. Train horns are required to be sounded 15-20 seconds, or ¼ mile, before the crossing; therefore, to get an effective outcome implementing a quiet zone at the crossings with Wilson Bridge Road, Worthington-Galena Road, Schrock Road, and Huntley Road are recommended.

Pedestrian crossings and the location of McCord Park are concerns that will need addressed if a quiet zone is pursued. Additional gate or fence systems to corral pedestrians on the sidewalks and/or shared-use path may be required. A fence or other separation measure may be required to provide separation between McCord Park and the railroad. We also recommend that the City consult with its legal department to understand potential liability issues associated with a quiet zone.

In order to mitigate the increased risk of an at-grade collision in a quiet zone, roadway and/or railroad equipment improvements are necessary. These improvements can range from installation of a four-quadrant gate system to installing concrete medians or other channelizing devices. The cost of the improvements and maintenance after installation is the responsibility of the City. In order to determine the required crossing improvements a preliminary engineering study would be needed. The City would be required to enter an engineering agreement with the railroads and pay an administration fee for this work to begin. Improvements to each crossing could vary from $50,000 to $500,000 depending on the crossing improvements required. The City will be required to maintain the improvements which can cost an additional $4,000 to $10,000 annually based upon information provided by the railroads. If all four crossings are quieted, the total annual maintenance can range from **$16,000 to $40,000** and the construction cost of improvements may range from **$200,000 to $2,000,000.**

10. ENVIRONMENTAL ASSESSMENT

Preliminary field reviews of the project area were conducted in November 2014, April 2015, and July 2015. A secondary source environmental review was also conducted to identify any known environmental "red flag" issues in the study area. This investigation was undertaken with the knowledge that the project will eventually require a full environmental review by the Ohio

Department of Transportation due to the use of federal money in the financing of this project. The preliminary environmental review findings are summarized below. An Environmental Field Review Summary and Exhibit are included in **Appendix D.**

There is one 4(f) property, McCord Park, located in the study area. There is also one stream, Rush Run, which flows through the project area. There are eleven (11) sites of potential environmental concern regarding hazardous materials located within or adjacent to the project which may require an ESA Screening or a Phase I Environmental Site Assessment (ESA). Air quality and noise analyses may be required for the project based on the vicinity of sensitive land uses and the proposed project scope.

In addition to these findings, a public involvement meeting is required for the project, in order to meet ODOT and FHWA guidelines. It is important that the public is involved early in the decision making process, as required by ODOT's Project Development Process. The purpose of a public involvement meeting is to present and discuss the proposed project and to solicit public comments regarding potential social, economic, and environmental impacts.

11. ALTERNATIVES COMPARISON

To compare the four Feasible Alternatives, several key criteria are summarized below in Table 11A.

Table 11A
Alternative Comparison Matrix

Criteria	Alternative			
	Signalized Widening	**Widening & Roundabout**	**Signalized Realignment #1**	**Signalized Realignment #2**
Right-of-Way Impact	WD = 2.15 Ac. Temp. = 0.15 Ac. Total Take = 1	WD = 4.60 Ac. Temp. = 0.15 Ac. Total Take = 1	WD = 4.85 Ac. Temp. = 0.35 Ac. Total Take = 4	WD = 5.75 Ac. Temp. = 0.45 Ac. Total Take = 2
Environmental Impact	Hazardous Sites = 7 Jur. Features = 1	Hazardous Sites = 7 Jur. Features = 1	Hazardous Sites = 7 Jur. Features = 1	Hazardous Sites = 7 Jur. Features = 2
Driver Comfort	Medium	Low	High	High
Capacity	Overall LOS = D/D Worst Leg LOS = E	Overall LOS = B/C Worst Leg LOS = F	Overall LOS = C/C Worst Leg LOS = D	Overall LOS = C/C Worst Leg LOS = D
M/T (Impact to Traveling Public)	Medium	High	Medium	Medium
Total Project Cost	**$9,782,333 estimated**	**$10,621,285 estimated**	**$12,122,848 estimated**	**$11,814,893 estimated**

Considering the criteria summarized above, as well as other findings of this study, it has been determined that the signalized realignment alternatives provide the best long-term solution to the congestion issues at the existing intersection. Based on the limited total take parcels, as well as the total project cost, it is recommended that **Signalized Realignment #2** be advanced as the Preferred Alternative that best satisfies the goals of the project.

The design team will work with the City of Worthington staff and ODOT to work toward final selection and approval of the preferred alternative.

12. COST ESTIMATING SUMMARY AND NARRATIVE

Preliminary cost estimates were completed for each alternative studied and are included in **Appendix B** of this report. The quantities are based on the design presented in the preliminary alternative exhibits in **Appendix A**. The estimates include a 10% contingency and an inflation amount of 11% based on ODOT's current FY-12'-16' Business Plan Inflation Calculator.

For right-of-way cost estimating, it was necessary to estimate the per acre land value of each parcel. Franklin County Auditor's land values were used as a starting point. For simplification of cost estimating, the land values for several properties were averaged to determine the per acre value for the entire project. This average was increased from approximately $90k/acre (Auditor) to $100k/acre (Estimated) to account for economy of scale associated with smaller strip-takes. Temporary easements were estimated to be 25% of the land value, or $25k/acre. Damage fees were also added to the estimate to account for loss or damage to landscaping, trees, signs, etc.

For the expected total takes, an additional $100k was included for reimbursable business relocations and $50k was included for reimbursable residential relocations. This increase is intended to account for items beyond property value, such as additional relocation expenses and loss of business. In addition, administrative, appropriation, and incidental adjustments were added to the estimate, and a 10% contingency was included for settlements.

13. PROJECT FUNDING AND SCHEDULE

In addition to local contributions, the following funding sources are expected to be requested for this project construction, utility relocations, and/or right-of-way acquisition:

1) **MORPC Attributable Funds:** $5,243,470 awarded in 2012 (80% of Construction and Right-of-Way as estimated in 2012), additional funding to be requested during 2016 update.

2) **OPWC Grant:** applications due September 2017 (assuming commencement of construction in 3/2019)

A project **summary schedule** by year is listed below (assumes ODOT LPA process).

2015

- Feasibility Study Submitted
- Hold Public Meeting
- Preferred Alternative Approved

2016

- Stage 1 Submittal (March)
- Stage 2 Submittal (September)
- Complete R/W Design
- Receive Environmental Clearance
- Begin R/W Acquisition

2017

- Stage 3 Submittal (February)
- Complete Detailed Design
- Advance R/W Acquisition
- Advance Utility Relocation Design
- Apply for OPWC Funds

2018

- Complete R/W Acquisition
- Receive R/W Clearance
- Complete Private Utility Relocations
- Advertise, Bid, Award
- Begin Construction

2020

- Construction Completed

A more detailed Gantt Chart Schedule is included in **Appendix F** of this report.

Appendix A

PRELIMINARY

HUNTLEY / E. WILSON BRIDGE / WORTHINGTON-GALENA SIGNALIZED WIDENING ALTERNATIVE

E. WILSON BRIDGE ROAD

NORFOLK SOUTHERN R/R

CSX R/R

I.R. 270 (WESTBOUND)

I.R. 270 (EASTBOUND)

LAKE VIEW PLAZA BLVD

SANCUS BLVD

WORTHINGTON-GALENA ROAD

WORTHINGTON-GALENA ROAD

HUNTLEY ROAD

CSX R/R

Ex R/W

Ex LA-R/W

N/A X3

LEGEND

- Study Area Boundary
- Railroad
- Pavement Removal
- Corporation Limit
- Proposed Pavement
- Sidewalks
- Seed/Sod
- Upgraded Signal

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1 inch =150 feet

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HUNTLEY / E. WILSON BRIDGE / WORTHINGTON-GALENA WIDENING AND ROUNDABOUT ALTERNATIVE

PRELIMINARY - NOT FOR CONSTRUCTION

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PRELIMINARY - NOT FOR CONSTRUCTION

HUNTLEY / E. WILSON BRIDGE / WORTHINGTON-GALENA SIGNALIZED REALIGNMENT 2 ALTERNATIVE

PRELIMINARY - NOT FOR CONSTRUCTION

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2 Xrefs: 2014117fr-XF-AERO-PHOTO, 2014117fr-CP-ROAD-N-ALT-D

Appendix B

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Engineers, Surveyors, Planners, Scientists

Preliminary Opinion of Project Cost

Signalized Widening Alternative

August 12, 2015

DESCRIPTION	ESTIMATED COST
Engineering & Design	
PE - Environmental / Preliminary Development	$210,000
PE - Detailed Design	$565,000
PE Subtotal (A) =	**$775,000**
Right-of-Way	
Right-of-Way Acquisition Services =	$240,000
Purchase of Right-of-Way =	$1,036,333
Relocation of Private Utilities =	$200,000
Right-of-Way Subtotal (B) =	**$1,476,333**
Construction	
Roadway Subtotal =	$1,096,000
Erosion Control Subtotal =	$80,000
Drainage Subtotal =	$666,000
Pavement Subtotal =	$1,725,000
Water Works Subtotal =	$72,000
Sanitary Sewer Subtotal =	$9,000
Traffic Control Subtotal =	$98,000
Lighting Subtotal =	$316,000
Traffic Signal Subtotal =	$340,000
Maintenance of Traffic Subtotal =	$217,000
Railroad Pedestrian Crossing Subtotal =	$625,000
Miscellaneous Subtotal =	$410,000
2015 Probable Construction Cost Subtotal =	$5,654,000
10% Contingency =	$565,000
2015 Propable Construction Cost with Contingency =	$6,219,000
Construction Engineering (10%) =	$565,000
2015 Estimated Construction Subtotal =	$6,784,000
Inflation from 2015 to 2018 (11%) =	$747,000
2018 Estimated Construction Subtotal (C) =	**$7,531,000**
PROBABLE PROJECT COST (A+B+C) =	**$9,782,333**

Notes

Pricing reflects probable construction costs obtainable in the project locality on the date of this statement of probable costs. Unit rates have been obtained from historical records and/or discussion with contractors. The unit rates reflect current bid costs in the area. This estimate is a determination of fair market value for the construction of this project. It is not a prediction of low bid. Pricing assumes competitive bidding for every portion of the construction work for all subcontractors and general contractors. Experience indicates that a fewer number of bidders may result in higher bids, conversely an increased number of bidders may result in more competitive bids.

Since EMH&T has no control over the cost of labor, material, equipment, or over the contractor's method of determining prices, or over the competitive bidding or market conditions at the time of bid, the statement of probable construction cost is based on industry practice, professional experience and qualifications, and represents EMH&T's best judgment as a consultant familiar with the construction industry. EMH&T does not guarantee that the proposals, bids, or the construction cost will not vary from opinions of probable cost prepared by them.

EMH&T
Evans, Mechwart, Hambleton & Tilton, Inc.
Engineers, Surveyors, Planners, Scientists

Preliminary Opinion of Project Cost
Signalized Widening Alternative
August 12, 2015

Item	Description	Quantity	Units	Unit Cost	Extended Total
	Roadway				
201	Clearing and Grubbing, As Per Plan	1	L. Sum	$ 50,000.00	$ 50,000
202	Catch Basin Removed	22	Each	$ 600.00	$ 13,200
202	Manhole Removed	8	Each	$ 800.00	$ 6,400
202	Guardrail Removed	60	Ft.	$ 5.00	$ 300
202	Concrete Drive Removed	15,950	Each	$ 5.00	$ 79,750
202	Fence Removed	550	Ft.	$ 3.00	$ 1,650
202	Curb and Gutter Removed	5,120	Ft.	$ 7.00	$ 35,840
203	Excavation	18,820	C.Y.	$ 10.00	$ 188,200
203	Embankment	18,820	C.Y.	$ 10.00	$ 188,200
204	Proof Rolling	10	Hour	$ 100.00	$ 1,000
204	Subgrade Compaction	24,430	S.Y.	$ 1.00	$ 24,430
204	Subgrade Compaction (SUP)	4,330	S.Y.	$ 1.00	$ 4,330
204*	Excavation of Subgrade	4,080	C.Y.	$ 11.00	$ 44,880
204*	Granular Material, Type B	4,080	C.Y.	$ 25.00	$ 102,000
204*	Geotextile Fabric	7,330	S.Y.	$ 1.50	$ 10,995
606	Guardrail, Type MGS	60	Ft.	$ 15.00	$ 900
606	Anchor Assembly, MGS Type B	2	Each	$ 1,500.00	$ 3,000
606	Anchor Assembly, MGS Type T	2	Each	$ 900.00	$ 1,800
606	Impact Attenuator, Type 1 (Bidirectional)	2	Each	$ 1,200.00	$ 2,400
607	Fence, Type CL	550	Ft.	$ 20.00	$ 11,000
608	4" Concrete Walk	7,060	S.F.	$ 6.00	$ 42,360
608	8" Concrete Walk	2,120	S.F.	$ 8.00	$ 16,960
608	Curb Ramp	10	Each	$ 600.00	$ 6,000
608	Detectable Warning	10	Each	$ 450.00	$ 4,500
622	Concrete Barrier, Single Slope, Type B	360	Ft.	$ 60.00	$ 21,600
622	Concrete Barrier, End Section, Type B	6	Each	$ 6,300.00	$ 37,800
SPEC	Mailbox Removed and Reset	4	Each	$ 250.00	$ 1,000
SPEC	Retaining Wall (Assumes no Veneer)	1,320	S.F.	$ 110.00	$ 145,200
SPEC	Roadway Misc.	1	L. Sum	$ 50,000.00	$ 50,000
				Roadway Subtotal =	**$ 1,096,000**
	Erosion Control				
207	Perimeter Filter Fabric Fence	4,860	Ft.	$ 2.00	$ 9,720
207*	Construction Seeding and Mulching	22,620	S.Y.	$ 0.50	$ 11,310
653	Topsoil Furnished and Placed (T=3")	1,890	C.Y.	$ 20.00	$ 37,800
659	Seeding and Mulching, Class 1	22,620	S.Y.	$ 0.50	$ 11,310
659	Repair Seeding and Mulching	1,140	S.Y.	$ 0.50	$ 570
659	Commericial Fertilizer	2.04	Ton	$ 500.00	$ 1,020
659	Lime	4.68	Ac.	$ 120.00	$ 562
659	Water	123	M. Gal	$ 17.00	$ 2,091
SPEC	Erosion Control Misc.	1	L. Sum	$ 5,000.00	$ 5,000
				Erosion Control Subtotal =	**$ 80,000**
	Drainage				
611	12" Conduit, Type B	880	Lin. Ft.	$ 76.00	$ 66,880
611	15" Conduit, Type B	698	Lin. Ft.	$ 100.00	$ 69,800
611	18" Conduit, Type B	500	Lin. Ft.	$ 113.00	$ 56,500
611	24" Conduit, Type B	265	Lin. Ft.	$ 159.00	$ 42,135
611	30" Conduit, Type B	400	Lin. Ft.	$ 175.00	$ 70,000
611	36" Conduit, Type B	442	Lin. Ft.	$ 200.00	$ 88,400
611	Catch Basin , No. 3A	17	Each	$ 2,000.00	$ 34,000
611	Manhole , No. 3	12	Each	$ 3,500.00	$ 42,000
SPEC	Water Quality Retention Basin	1	L. Sum	$ 95,000.00	$ 95,000
SPEC	Precast Concrete Outlet	2	Each	$ 500.00	$ 1,000
SPEC	Extending 9' X 5' Box Culvert	1	L. Sum	$ 90,000.00	$ 90,000
SPEC	Drainage Misc.	1	L. Sum	$ 10,000.00	$ 10,000
				Drainage Subtotal =	**$ 666,000**

EMH&T
Evans, Mechwart, Hambleton & Tilton, Inc.
Engineers, Surveyors, Planners, Scientists

Preliminary Opinion of Project Cost
Signalized Widening Alternative
August 12, 2015

Item	Description	Quantity	Units	Unit Cost	Extended Total
	Pavement				
254	Pavement Planing (T=1.25")	2,590	S.Y.	$ 3.00	$ 7,770
301	Asphalt Concrete Base	6,110	C.Y.	$ 120.00	$ 733,200
304	Aggregate Base	4,080	C.Y.	$ 40.00	$ 163,200
304	Aggregate Base (SUP)	730	C.Y.	$ 40.00	$ 29,200
407	Tack Coat	980	Gal.	$ 2.50	$ 2,450
407	Tack Coat (Resurfacing)	110	Gal.	$ 2.50	$ 275
407	Tack Coat for Intermediate Course	1,840	Gal.	$ 2.50	$ 4,600
423	Crack Seal	125	Lb.	$ 3.50	$ 438
448	Asphalt Concrete Intermediate Course, Type 1, PG64-22	1,190	C.Y.	$ 150.00	$ 178,500
448	Asphalt Concrete Surface Course, Type 1, PG64-22	850	C.Y.	$ 170.00	$ 144,500
448	Asphalt Concrete Surface Course, Type 1, PG64-22 (SUP)	310	C.Y.	$ 200.00	$ 62,000
448	Asphalt Concrete Surface Course, Type 1, PG64-22 (Resurfacing)	90	C.Y.	$ 170.00	$ 15,300
452	Non-Reinforced Concrete Pavement (T=8")	1,780	S.Y.	$ 70.00	$ 124,600
609	Concrete Median (T=9")	25	S.Y.	$ 100.00	$ 2,500
609	Curb, Straight 18"	975	Ft.	$ 13.00	$ 12,675
609	Combination Curb and Gutter	8,420	Ft.	$ 17.00	$ 143,140
SPEC	Pavement Misc.	1	L. Sum	$ 100,000.00	$ 100,000
				Pavement Subtotal =	**$ 1,725,000**
	Water Works				
801	8 Inch Water Pipe and Fittings	75	Ft.	$ 100.00	$ 7,500
801	12 Inch Water Pipe and Fittings	350	Ft.	$ 120.00	$ 42,000
807	Valve Adjusted to Grade	8	Each	$ 250.00	$ 2,000
809	Fire Hydrant Relocated	6	Each	$ 2,500.00	$ 15,000
SPEC	Water Works Misc.	1	L. Sum	$ 5,000.00	$ 5,000
				Water Works Subtotal =	**$ 72,000**
	Sanitary Sewer				
611	Manhole Adjusted to Grade	6	Each	$ 500.00	$ 3,000
611	Manhole Reconstructed to Grade	6	Each	$ 900.00	$ 5,400
				Sanitary Sewer Subtotal =	**$ 9,000**
	Traffic Control				
SPEC	Traffic Control	4,860	Ft.	$ 20.00	$ 97,200
				Traffic Control Subtotal =	**$ 98,000**
	Lighting				
SPEC	Lighting	4860	Ft.	$65.00	$ 315,900
				Lighting Subtotal =	**$ 316,000**
	Traffic Signal				
SPEC	Traffic Signal	1	Each	$ 200,000.00	$ 200,000
SPEC	Traffic Signal Removed	1	Each	$ 20,000.00	$ 20,000
SPEC	Interconnect	2,400	Ft.	$ 50.00	$ 120,000
				Traffic Signal Subtotal =	**$ 340,000**
	Maintenance of Traffic				
SPEC	Temporary Right-of-Way	1	L. Sum	$ 8,000.00	$ 8,000
SPEC	Temporary Cut/Fill/Shoring	1	L. Sum	$ 25,000.00	$ 25,000
SPEC	Temporary Signals	1	L. Sum	$ 20,000.00	$ 20,000
SPEC	Temporary Drainage	1	L. Sum	$ 25,000.00	$ 25,000
SPEC	Temporary Pavement	1	L. Sum	$ 105,000.00	$ 105,000
SPEC	MOT Pavement Markings	1	L. Sum	$ 6,000.00	$ 6,000
SPEC	Maintenance of Traffic, Misc.	1	L. Sum	$ 28,000.00	$ 28,000
				Maintenance of Traffic Subtotal =	**$ 217,000**
	Railroad Pedestrian Crossing				
SPEC	Railroad Crossing	1	L. Sum	$ 625,000.00	$ 625,000
				Railroad Pedestrian Crossing Subtotal =	**$ 625,000**
	Miscellaneous				
614	Maintaining Traffic	1	L. Sum	$ 150,000.00	$ 150,000
619	Field Office, Type C	10	Month	$ 2,000.00	$ 20,000
623	Construction Layout Stakes	1	L. Sum	$ 40,000.00	$ 40,000
624	Mobilization	1	L. Sum	$ 200,000.00	$ 200,000
				Miscellaneous Subtotal =	**$ 410,000**
* Denotes Contingency				CONSTRUCTION COST SUBTOTAL =	**$ 5,654,000**

EMH&T
Evans, Mechwart, Hambleton & Tilton, Inc.
Engineers, Surveyors, Planners, Scientists

Preliminary Opinion of Project Cost

Roundabout Alternative

August 12, 2015

DESCRIPTION	ESTIMATED COST
Engineering & Design	
PE - Environmental / Preliminary Development	$210,000
PE - Detailed Design	$600,000
PE Subtotal (A) =	**$810,000**
Right-of-Way	
Right-of-Way Acquisition Services =	$230,000
Purchase of Right-of-Way =	$1,386,285
Relocation of Private Utilities =	$200,000
Right-of-Way Subtotal (B) =	**$1,816,285**
Construction	
Roadway Subtotal =	$1,305,000
Erosion Control Subtotal =	$144,000
Drainage Subtotal =	$666,000
Pavement Subtotal =	$2,096,000
Water Works Subtotal =	$46,000
Sanitary Sewer Subtotal =	$9,000
Traffic Control Subtotal =	$87,000
Lighting Subtotal =	$283,000
Traffic Signal Subtotal =	$20,000
Maintenance of Traffic Subtotal =	$291,000
Railroad Pedestrian Crossing Subtotal =	$625,000
Miscellaneous Subtotal =	$430,000
2015 Probable Construction Cost Subtotal =	$6,002,000
10% Contingency =	$600,000
2015 Propable Construction Cost with Contingency =	$6,602,000
Construction Engineering (10%) =	$600,000
2015 Estimated Construction Subtotal =	$7,202,000
Inflation from 2015 to 2018 (11%) =	$793,000
2018 Estimated Construction Subtotal (C) =	**$7,995,000**
PROBABLE PROJECT COST (A+B+C) =	**$10,621,285**

Notes

Pricing reflects probable construction costs obtainable in the project locality on the date of this statement of probable costs. Unit rates have been obtained from historical records and/or discussion with contractors. The unit rates reflect current bid costs in the area. This estimate is a determination of fair market value for the construction of this project. It is not a prediction of low bid. Pricing assumes competitive bidding for every portion of the construction work for all subcontractors and general contractors. Experience indicates that a fewer number of bidders may result in higher bids, conversely an increased number of bidders may result in more competitive bids.

Since EMH&T has no control over the cost of labor, material, equipment, or over the contractor's method of determining prices, or over the competitive bidding or market conditions at the time of bid, the statement of probable construction cost is based on industry practice, professional experience and qualifications, and represents EMH&T's best judgment as a consultant familiar with the construction industry. EMH&T does not guarantee that the proposals, bids, or the construction cost

EMH&T
Evans, Mechwart, Hambleton & Tilton, Inc.
Engineers, Surveyors, Planners, Scientists

Preliminary Opinion of Project Cost
Roundabout Alternative
August 12, 2015

Item	Description	Quantity	Units	Unit Cost	Extended Total
	Roadway				
201	Clearing and Grubbing, As Per Plan	1	L. Sum	$ 50,000.00	$ 50,000
202	Building Demolished (7200 Huntley Rd)	1	Each	$ 55,000.00	$ 55,000
202	Catch Basin Removed	22	Each	$ 600.00	$ 13,200
202	Manhole Removed	8	Each	$ 800.00	$ 6,400
202	Guardrail Removed	60	Ft.	$ 5.00	$ 300
202	Concrete Drive Removed	12,900	Each	$ 5.00	$ 64,500
202	Fence Removed	850	Ft.	$ 3.00	$ 2,550
202	Curb and Gutter Removed	4,820	Ft.	$ 7.00	$ 33,740
203	Excavation	22,460	C.Y.	$ 14.00	$ 314,440
203	Embankment	21,450	C.Y.	$ 10.00	$ 214,500
204	Proof Rolling	13	Hour	$ 100.00	$ 1,300
204	Subgrade Compaction	30,080	S.Y.	$ 1.00	$ 30,080
204	Subgrade Compaction (SUP)	4,810	S.Y.	$ 1.00	$ 4,810
204*	Excavation of Subgrade	5,020	C.Y.	$ 11.00	$ 55,220
204*	Granular Material, Type B	5,020	C.Y.	$ 25.00	$ 125,500
204*	Geotextile Fabric	9,030	S.Y.	$ 1.50	$ 13,545
606	Guardrail, Type MGS	60	Ft.	$ 15.00	$ 900
606	Anchor Assembly, MGS Type B	2	Each	$ 1,500.00	$ 3,000
606	Anchor Assembly, MGS Type T	2	Each	$ 900.00	$ 1,800
606	Impact Attenuator, Type 1 (Bidirectional)	2	Each	$ 1,200.00	$ 2,400
607	Fence, Type CL	850	Ft.	$ 20.00	$ 17,000
608	4" Concrete Walk	2,670	S.F.	$ 6.00	$ 16,020
608	Curb Ramp	12	Each	$ 600.00	$ 7,200
608	Detectable Warning	12	Each	$ 450.00	$ 5,400
622	Concrete Barrier, Single Slope, Type B	360	Ft.	$ 60.00	$ 21,600
622	Concrete Barrier, End Section, Type B	6	Each	$ 6,300.00	$ 37,800
SPEC	Mailbox Removed and Reset	4	Each	$ 250.00	$ 1,000
SPEC	Retaining Wall (Assumes no Veneer)	1,320	S.F.	$ 110.00	$ 145,200
SPEC	Roadway Misc.	1	L. Sum	$ 60,000.00	$ 60,000
				Roadway Subtotal =	**$ 1,305,000**
	Erosion Control				
207	Perimeter Filter Fabric Fence	4,350	Ft.	$ 2.00	$ 8,700
207*	Construction Seeding and Mulching	41,980	S.Y.	$ 0.50	$ 20,990
653	Topsoil Furnished and Placed (T=3")	3,500	C.Y.	$ 20.00	$ 70,000
659	Seeding and Mulching, Class 1	41,980	S.Y.	$ 0.50	$ 20,990
659	Repair Seeding and Mulching	2,100	S.Y.	$ 0.50	$ 1,050
659	Commericial Fertilizer	3.78	Ton	$ 500.00	$ 1,890
659	Lime	8.68	Ac.	$ 120.00	$ 1,042
659	Water	227	M. Gal	$ 17.00	$ 3,859
SPEC	Erosion Control Misc.	1	L. Sum	$ 15,000.00	$ 15,000
				Erosion Control Subtotal =	**$ 144,000**
	Drainage				
611	12" Conduit, Type B	880	Lin. Ft.	$ 76.00	$ 66,880
611	15" Conduit, Type B	698	Lin. Ft.	$ 100.00	$ 69,800
611	18" Conduit, Type B	500	Lin. Ft.	$ 113.00	$ 56,500
611	24" Conduit, Type B	265	Lin. Ft.	$ 159.00	$ 42,135
611	30" Conduit, Type B	400	Lin. Ft.	$ 175.00	$ 70,000
611	36" Conduit, Type B	442	Lin. Ft.	$ 200.00	$ 88,400
611	Catch Basin , No. 3A	17	Each	$ 2,000.00	$ 34,000
611	Manhole , No. 3	12	Each	$ 3,500.00	$ 42,000
SPEC	Water Quality Retention Basin	1	L. Sum	$ 95,000.00	$ 95,000
SPEC	Precast Concrete Outlet	2	Each	$ 500.00	$ 1,000
SPEC	Extending 9' X 5' Box Culvert	1	L. Sum	$ 90,000.00	$ 90,000
SPEC	Drainage Misc.	1	L. Sum	$ 10,000.00	$ 10,000
				Drainage Subtotal =	**$ 666,000**

EMH&T
Evans, Mechwart, Hambleton & Tilton, Inc.
Engineers, Surveyors, Planners, Scientists

Preliminary Opinion of Project Cost
Roundabout Alternative
August 12, 2015

Item	Description	Quantity	Units	Unit Cost	Extended Total
	Pavement				
254	Pavement Planing (T=1.25")	2,590	S.Y.	$ 3.00	$ 7,770
301	Asphalt Concrete Base	7,520	C.Y.	$ 120.00	$ 902,400
304	Aggregate Base	5,020	C.Y.	$ 40.00	$ 200,800
304	Aggregate Base (SUP)	810	C.Y.	$ 40.00	$ 32,400
407	Tack Coat	1,210	Gal.	$ 2.50	$ 3,025
407	Tack Coat (Resurfacing)	110	Gal.	$ 2.50	$ 275
407	Tack Coat for Intermediate Course	2,260	Gal.	$ 2.50	$ 5,650
423	Crack Seal	125	Lb.	$ 3.50	$ 438
448	Asphalt Concrete Intermediate Course, Type 1, PG64-22	1,470	C.Y.	$ 150.00	$ 220,500
448	Asphalt Concrete Surface Course, Type 1, PG64-22	1,050	C.Y.	$ 170.00	$ 178,500
448	Asphalt Concrete Surface Course, Type 1, PG64-22 (SUP)	340	C.Y.	$ 200.00	$ 68,000
448	Asphalt Concrete Surface Course, Type 1, PG64-22 (Resurfacing)	90	C.Y.	$ 170.00	$ 15,300
452	Non-Reinforced Concrete Pavement (T=8")	1,220	S.Y.	$ 70.00	$ 85,400
609	Curb, Straight 18"	4,010	Ft.	$ 13.00	$ 52,130
609	Combination Curb and Gutter	8,000	Ft.	$ 17.00	$ 136,000
609	Mountable Concrete Curb	535	Ft.	$ 21.00	$ 11,235
SPEC	Truck Apron Pavement (Brick on Concrete Base)	505	S.Y.	$ 150.00	$ 75,750
SPEC	Pavement Misc.	1	L. Sum	$ 100,000.00	$ 100,000
				Pavement Subtotal =	**$ 2,096,000**
	Water Works				
801	12 Inch Water Pipe and Fittings	200	Ft.	$ 120.00	$ 24,000
807	Valve Adjusted to Grade	8	Each	$ 250.00	$ 2,000
809	Fire Hydrante Relocated	6	Each	$ 2,500.00	$ 15,000
SPEC	Water Works Misc.	1	L. Sum	$ 5,000.00	$ 5,000
				Water Works Subtotal =	**$ 46,000**
	Sanitary Sewer				
611	Manhole Adjusted to Grade	6	Each	$ 500.00	$ 3,000
611	Manhole Reconstructed to Grade	6	Each	$ 900.00	$ 5,400
				Sanitary Sewer Subtotal =	**$ 9,000**
	Traffic Control				
SPEC	Traffic Control	4,350	Ft.	$ 20.00	$ 87,000
				Traffic Control Subtotal =	**$ 87,000**
	Lighting				
SPEC	Lighting	4350	Ft.	$65.00	$ 282,750
				Lighting Subtotal =	**$ 283,000**
	Traffic Signal				
SPEC	Traffic Signal Removed	1	Each	$ 20,000.00	$ 20,000
				Traffic Signal Subtotal =	**$ 20,000**
	Maintenance of Traffic				
SPEC	Temporary Right-of-Way	1	L. Sum	$ 5,000.00	$ 5,000
SPEC	Temporary Cut/Fill/Shoring	1	L. Sum	$ 20,000.00	$ 20,000
SPEC	Temporary Signals	1	L. Sum	$ 120,000.00	$ 120,000
SPEC	Temporary Drainage	1	L. Sum	$ 20,000.00	$ 20,000
SPEC	Temporary Pavement	1	L. Sum	$ 83,000.00	$ 83,000
SPEC	MOT Pavement Markings	1	L. Sum	$ 5,000.00	$ 5,000
SPEC	Maintenance of Traffic, Misc.	1	L. Sum	$ 38,000.00	$ 38,000
				Maintenance of Traffic Subtotal =	**$ 291,000**
	Railroad Pedestrian Crossing				
SPEC	Railroad Crossing	1	L. Sum	$ 625,000.00	$ 625,000
				Railroad Pedestrian Crossing Subtotal =	**$ 625,000**
	Miscellaneous				
614	Maintaining Traffic, As Per Plan	1	L. Sum	$ 150,000.00	$ 150,000
619	Field Office, Type C	20	Month	$ 2,000.00	$ 40,000
623	Construction Layout Stakes	1	L. Sum	$ 40,000.00	$ 40,000
624	Mobilization	1	L. Sum	$ 200,000.00	$ 200,000
				Miscellaneous Subtotal =	**$ 430,000**
* Denotes Contingency		CONSTRUCTION COST SUBTOTAL =			**$ 6,002,000**

EMH&T
Evans, Mechwart, Hambleton & Tilton, Inc.
Engineers, Surveyors, Planners, Scientists

Preliminary Opinion of Project Cost

Signalized Realignment 1 Alternative

August 12, 2015

DESCRIPTION	ESTIMATED COST
Engineering & Design	
PE - Environmental / Preliminary Development	$210,000
PE - Detailed Design	$631,000
PE Subtotal (A) =	**$841,000**
Right-of-Way	
Right-of-Way Acquisition Services =	$240,000
Purchase of Right-of-Way =	$2,438,848
Relocation of Private Utilities =	$200,000
Right-of-Way Subtotal (B) =	**$2,878,848**
Construction	
Roadway Subtotal =	$1,437,000
Erosion Control Subtotal =	$92,000
Drainage Subtotal =	$612,000
Pavement Subtotal =	$1,867,000
Water Works Subtotal =	$52,000
Sanitary Sewer Subtotal =	$9,000
Traffic Control Subtotal =	$110,000
Lighting Subtotal =	$358,000
Traffic Signal Subtotal =	$540,000
Maintenance of Traffic Subtotal =	$180,000
Railroad Pedestrian Crossing Subtotal =	$625,000
Miscellaneous Subtotal =	$426,000
2015 Probable Construction Cost Subtotal =	$6,308,000
10% Contingency =	$631,000
2015 Propable Construction Cost with Contingency =	$6,939,000
Construction Engineering (10%) =	$631,000
2015 Estimated Construction Subtotal =	$7,570,000
Inflation from 2015 to 2018 (11%) =	$833,000
2018 Estimated Construction Subtotal (C) =	**$8,403,000**
PROBABLE PROJECT COST (A+B+C) =	**$12,122,848**

Notes

Pricing reflects probable construction costs obtainable in the project locality on the date of this statement of probable costs. Unit rates have been obtained from historical records and/or discussion with contractors. The unit rates reflect current bid costs in the area. This estimate is a determination of fair market value for the construction of this project. It is not a prediction of low bid. Pricing assumes competitive bidding for every portion of the construction work for all subcontractors and general contractors. Experience indicates that a fewer number of bidders may result in higher bids, conversely an increased number of bidders may result in more competitive bids.

Since EMH&T has no control over the cost of labor, material, equipment, or over the contractor's method of determining prices, or over the competitive bidding or market conditions at the time of bid, the statement of probable construction cost is based on industry practice, professional experience and qualifications, and represents EMH&T's best judgment as a consultant familiar with the construction industry. EMH&T does not guarantee that the proposals, bids, or the construction cost will not

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Preliminary Opinion of Project Cost
Signalized Realignment 1 Alternative
August 12, 2015

Item	Description	Quantity	Units	Unit Cost	Extended Total
	Roadway				
201	Clearing and Grubbing, As Per Plan	1	L. Sum	$ 50,000.00	$ 50,000
202	Building Demolished (7200 Huntley Rd)	1	Each	$ 55,000.00	$ 55,000
202	Building Demolished (445 E Wilson Bridge Rd)	1	Each	$ 25,000.00	$ 25,000
202	Building Demolished (7069 Worthington Galena Rd)	1	Each	$ 20,000.00	$ 20,000
202	Building Demolished (7059 Worthington Galena Rd)	1	Each	$ 20,000.00	$ 20,000
202	Catch Basin Removed	22	Each	$ 600.00	$ 13,200
202	Manhole Removed	8	Each	$ 800.00	$ 6,400
202	Guardrail Removed	60	Ft.	$ 5.00	$ 300
202	Concrete Drive Removed	24,240	Each	$ 5.00	$ 121,200
202	Fence Removed	850	Ft.	$ 3.00	$ 2,550
202	Curb and Gutter Removed	4,805	Ft.	$ 7.00	$ 33,635
203	Excavation	26,140	C.Y.	$ 10.00	$ 261,400
203	Embankment	26,140	C.Y.	$ 10.00	$ 261,400
204	Proof Rolling	11	Hour	$ 100.00	$ 1,100
204	Subgrade Compaction	25,970	S.Y.	$ 1.00	$ 25,970
204	Subgrade Compaction (SUP)	4,180	S.Y.	$ 1.00	$ 4,180
204*	Excavation of Subgrade	4,330	C.Y.	$ 11.00	$ 47,630
204*	Granular Material, Type B	4,330	C.Y.	$ 25.00	$ 108,250
204*	Geotextile Fabric	7,800	S.Y.	$ 1.50	$ 11,700
606	Guardrail, Type MGS	60	Ft.	$ 15.00	$ 900
606	Anchor Assembly, MGS Type B	2	Each	$ 1,500.00	$ 3,000
606	Anchor Assembly, MGS Type T	2	Each	$ 900.00	$ 1,800
606	Impact Attenuator, Type 1 (Bidirectional)	2	Each	$ 1,200.00	$ 2,400
607	Fence, Type CL	850	Ft.	$ 20.00	$ 17,000
608	4" Concrete Walk	6,290	S.F.	$ 6.00	$ 37,740
608	8" Concrete Walk	2,910	S.F.	$ 8.00	$ 23,280
608	Curb Ramp	10	Each	$ 600.00	$ 6,000
608	Detectable Warning	10	Each	$ 450.00	$ 4,500
622	Concrete Barrier, Single Slope, Type B	360	Ft.	$ 60.00	$ 21,600
622	Concrete Barrier, End Section, Type B	6	Each	$ 6,300.00	$ 37,800
SPEC	Mailbox Removed and Reset	4	Each	$ 250.00	$ 1,000
SPEC	Retaining Wall (Assumes no Veneer)	1,320	S.F.	$ 110.00	$ 145,200
SPEC	Roadway Misc.	1	L. Sum	$ 65,000.00	$ 65,000
				Roadway Subtotal =	**$ 1,437,000**
	Erosion Control				
207	Perimeter Filter Fabric Fence	5,500	Ft.	$ 2.00	$ 11,000
207*	Construction Seeding and Mulching	25,370	S.Y.	$ 0.50	$ 12,685
653	Topsoil Furnished and Placed (T=3")	2,120	C.Y.	$ 20.00	$ 42,400
659	Seeding and Mulching, Class 1	25,370	S.Y.	$ 0.50	$ 12,685
659	Repair Seeding and Mulching	1,270	S.Y.	$ 0.50	$ 635
659	Commericial Fertilizer	2.29	Ton	$ 500.00	$ 1,145
659	Lime	5.25	Ac.	$ 120.00	$ 630
659	Water	137	M. Gal	$ 17.00	$ 2,329
SPEC	Erosion Control Misc.	1	L. Sum	$ 8,000.00	$ 8,000
				Erosion Control Subtotal =	**$ 92,000**
	Drainage				
611	12" Conduit, Type B	1,520	Lin. Ft.	$ 76.00	$ 115,520
611	15" Conduit, Type B	645	Lin. Ft.	$ 100.00	$ 64,500
611	18" Conduit, Type B	391	Lin. Ft.	$ 113.00	$ 44,183
611	24" Conduit, Type B	157	Lin. Ft.	$ 159.00	$ 24,963
611	36" Conduit, Type B	326	Lin. Ft.	$ 200.00	$ 65,200
611	Catch Basin , No. 3A	28	Each	$ 2,000.00	$ 56,000
611	Manhole , No. 3	13	Each	$ 3,500.00	$ 45,500
SPEC	Water Quality Retention Basin	1	L. Sum	$ 95,000.00	$ 95,000
SPEC	Precast Concrete Outlet	2	Each	$ 500.00	$ 1,000
SPEC	Extending 9' X 5' Box Culvert	1	L. Sum	$ 90,000.00	$ 90,000
SPEC	Drainage Misc.	1	L. Sum	$ 10,000.00	$ 10,000
				Drainage Subtotal =	**$ 612,000**

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Preliminary Opinion of Project Cost
Signalized Realignment 1 Alternative
August 12, 2015

Item	Description	Quantity	Units	Unit Cost	Extended Total
	Pavement				
254	Pavement Planing (T=1.25")	4,870	S.Y.	$ 3.00	$ 14,610
301	Asphalt Concrete Base	6,500	C.Y.	$ 120.00	$ 780,000
304	Aggregate Base	4,330	C.Y.	$ 40.00	$ 173,200
304	Aggregate Base (SUP)	700	C.Y.	$ 40.00	$ 28,000
304	Aggregate Base (Drive)	100	C.Y.	$ 40.00	$ 4,000
407	Tack Coat	1,040	Gal.	$ 2.50	$ 2,600
407	Tack Coat (Resurfacing)	200	Gal.	$ 2.50	$ 500
407	Tack Coat (Drive)	20	Gal.	$ 2.50	$ 50
407	Tack Coat for Intermediate Course	1,950	Gal.	$ 2.50	$ 4,875
423	Crack Seal	90	Lb.	$ 3.50	$ 315
448	Asphalt Concrete Intermediate Course, Type 1, PG64-22	1,270	C.Y.	$ 150.00	$ 190,500
448	Asphalt Concrete Intermediate Course, Type 1, PG64-22 (Drive)	30	C.Y.	$ 150.00	$ 4,500
448	Asphalt Concrete Surface Course, Type 1, PG64-22	910	C.Y.	$ 170.00	$ 154,700
448	Asphalt Concrete Surface Course, Type 1, PG64-22 (SUP)	290	C.Y.	$ 200.00	$ 58,000
448	Asphalt Concrete Surface Course, Type 1, PH64-22 (Drive)	20	C.Y.	$ 170.00	$ 3,400
448	Asphalt Concrete Surface Course, Type 1, PG64-22 (Resurfacing)	170	C.Y.	$ 170.00	$ 28,900
452	Non-Reinforced Concrete Pavement (T=8")	1,880	S.Y.	$ 70.00	$ 131,600
609	Curb, Straight 18"	1,190	Ft.	$ 13.00	$ 15,470
609	Combination Curb and Gutter	10,050	Ft.	$ 17.00	$ 170,850
SPEC	Pavement Misc.	1	L. Sum	$ 100,000.00	$ 100,000
				Pavement Subtotal =	**$ 1,867,000**
	Water Works				
801	12 Inch Water Pipe and Fittings	250	Ft.	$ 120.00	$ 30,000
807	Valve Adjusted to Grade	8	Each	$ 250.00	$ 2,000
809	Fire Hydrante Relocated	6	Each	$ 2,500.00	$ 15,000
SPEC	Water Works Misc.	1	L. Sum	$ 5,000.00	$ 5,000
				Water Works Subtotal =	**$ 52,000**
	Sanitary Sewer				
611	Manhole Adjusted to Grade	6	Each	$ 500.00	$ 3,000
611	Manhole Reconstructed to Grade	6	Each	$ 900.00	$ 5,400
				Sanitary Sewer Subtotal =	**$ 9,000**
	Traffic Control				
SPEC	Traffic Control	5,500	Ft.	$ 20.00	$ 110,000
				Traffic Control Subtotal =	**$ 110,000**
	Lighting				
SPEC	Lighting	5,500	Ft.	$65.00	$ 357,500
				Lighting Subtotal =	**$ 358,000**
	Traffic Signal				
SPEC	Traffic Signal	2	Each	$ 200,000.00	$ 400,000
SPEC	Traffic Signal Removed	1	Each	$ 20,000.00	$ 20,000
SPEC	Interconnect	2,400	Ft.	$ 50.00	$ 120,000
				Traffic Signal Subtotal =	**$ 540,000**
	Maintenance of Traffic				
SPEC	Temporary Right-of-Way	1	L. Sum	$ 5,000.00	$ 5,000
SPEC	Temporary Cut/Fill/Shoring	1	L. Sum	$ 20,000.00	$ 20,000
SPEC	Temporary Signals	1	L. Sum	$ 20,000.00	$ 20,000
SPEC	Temporary Drainage	1	L. Sum	$ 20,000.00	$ 20,000
SPEC	Temporary Pavement	1	L. Sum	$ 85,000.00	$ 85,000
SPEC	MOT Pavement Markings	1	L. Sum	$ 6,000.00	$ 6,000
SPEC	Maintenance of Traffic, Misc.	1	L. Sum	$ 24,000.00	$ 24,000
				Maintenance of Traffic Subtotal =	**$ 180,000**
	Railroad Pedestrian Crossing				
SPEC	Railroad Crossing	1	L. Sum	$ 625,000.00	$ 625,000
				Railroad Pedestrian Crossing Subtotal =	**$ 625,000**
	Miscellaneous				
614	Maintaining Traffic, As Per Plan	1	L. Sum	$ 150,000.00	$ 150,000
619	Field Office, Type C	18	Month	$ 2,000.00	$ 36,000
623	Construction Layout Stakes	1	L. Sum	$ 40,000.00	$ 40,000
624	Mobilization	1	L. Sum	$ 200,000.00	$ 200,000
				Miscellaneous Subtotal =	**$ 426,000**
* Denotes Contingency		CONSTRUCTION COST SUBTOTAL =			**$ 6,308,000**

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Preliminary Opinion of Project Cost

Signalized Realignment 2 Alternative

August 12, 2015

DESCRIPTION	ESTIMATED COST
Engineering & Design	
PE - Environmental / Preliminary Development	$210,000
PE - Detailed Design	$659,000
PE Subtotal (A) =	**$869,000**
Right-of-Way	
Right-of-Way Acquisition Services =	$260,000
Purchase of Right-of-Way =	$1,709,893
Relocation of Private Utilities =	$200,000
Right-of-Way Subtotal (B) =	**$2,169,893**
Construction	
Roadway Subtotal =	$1,459,000
Erosion Control Subtotal =	$108,000
Drainage Subtotal =	$657,000
Pavement Subtotal =	$2,022,000
Water Works Subtotal =	$52,000
Sanitary Sewer Subtotal =	$9,000
Traffic Control Subtotal =	$120,000
Lighting Subtotal =	$390,000
Traffic Signal Subtotal =	$540,000
Maintenance of Traffic Subtotal =	$180,000
Railroad Pedestrian Crossing Subtotal =	$625,000
Miscellaneous Subtotal =	$426,000
2015 Probable Construction Cost Subtotal =	$6,588,000
10% Contingency =	$659,000
2015 Propable Construction Cost with Contingency =	$7,247,000
Construction Engineering (10%) =	$659,000
2015 Estimated Construction Subtotal =	$7,906,000
Inflation from 2015 to 2018 (11%) =	$870,000
2018 Estimated Construction Subtotal (C) =	**$8,776,000**
PROBABLE PROJECT COST (A+B+C) =	**$11,814,893**

Notes

Pricing reflects probable construction costs obtainable in the project locality on the date of this statement of probable costs. Unit rates have been obtained from historical records and/or discussion with contractors. The unit rates reflect current bid costs in the area. This estimate is a determination of fair market value for the construction of this project. It is not a prediction of low bid. Pricing assumes competitive bidding for every portion of the construction work for all subcontractors and general contractors. Experience indicates that a fewer number of bidders may result in higher bids, conversely an increased number of bidders may result in more competitive bids.

Since EMH&T has no control over the cost of labor, material, equipment, or over the contractor's method of determining prices, or over the competitive bidding or market conditions at the time of bid, the statement of probable construction cost is based on industry practice, professional experience and qualifications, and represents EMH&T's best judgment as a consultant familiar with the construction industry. EMH&T does not guarantee that the proposals, bids, or the construction cost will not

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Preliminary Opinion of Project Cost
Signalized Realignment 2 Alternative
August 12, 2015

Item	Description	Quantity	Units	Unit Cost	Extended Total
	Roadway				
201	Clearing and Grubbing, As Per Plan	1	L. Sum	$ 50,000.00	$ 50,000
202	Building Demolished (7200 Huntley Rd)	1	Each	$ 55,000.00	$ 55,000
202	Building Demolished (431 E Wilson Bridge Rd)	1	Each	$ 25,000.00	$ 25,000
202	Catch Basin Removed	22	Each	$ 600.00	$ 13,200
202	Manhole Removed	8	Each	$ 800.00	$ 6,400
202	Guardrail Removed	60	Ft.	$ 5.00	$ 300
202	Concrete Drive Removed	25,680	S.F.	$ 5.00	$ 128,400
202	Fence Removed	850	Ft.	$ 3.00	$ 2,550
202	Curb and Gutter Removed	4,805	Ft.	$ 7.00	$ 33,635
203	Excavation	28,098	C.Y.	$ 10.00	$ 280,980
203	Embankment	28,098	C.Y.	$ 10.00	$ 280,980
204	Proof Rolling	12	Hour	$ 100.00	$ 1,200
204	Subgrade Compaction	28,110	S.Y.	$ 1.00	$ 28,110
204	Subgrade Compaction (SUP)	4,140	S.Y.	$ 1.00	$ 4,140
204*	Excavation of Subgrade	4,690	C.Y.	$ 11.00	$ 51,590
204*	Granular Material, Type B	4,690	C.Y.	$ 25.00	$ 117,250
204*	Geotextile Fabric	8,440	S.Y.	$ 1.50	$ 12,660
606	Guardrail, Type MGS	60	Ft.	$ 15.00	$ 900
606	Anchor Assembly, MGS Type B	2	Each	$ 1,500.00	$ 3,000
606	Anchor Assembly, MGS Type T	2	Each	$ 900.00	$ 1,800
606	Impact Attenuator, Type 1 (Bidirectional)	2	Each	$ 1,200.00	$ 2,400
607	Fence, Type CL	850	Ft.	$ 20.00	$ 17,000
608	4" Concrete Walk	6,950	S.F.	$ 6.00	$ 41,700
608	8" Concrete Walk	2,390	S.F.	$ 8.00	$ 19,120
608	Curb Ramp	10	Each	$ 600.00	$ 6,000
608	Detectable Warning	10	Each	$ 450.00	$ 4,500
622	Concrete Barrier, Single Slope, Type B	360	Ft.	$ 60.00	$ 21,600
622	Concrete Barrier, End Section, Type B	6	Each	$ 6,300.00	$ 37,800
SPEC	Mailbox Removed and Reset	4	Each	$ 250.00	$ 1,000
SPEC	Retaining Wall (Assumes no Veneer)	1,320	S.F.	$ 110.00	$ 145,200
SPEC	Roadway Misc.	1	L. Sum	$ 65,000.00	$ 65,000
				Roadway Subtotal =	**$ 1,459,000**
	Erosion Control				
207	Perimeter Filter Fabric Fence	6,535	Ft.	$ 2.00	$ 13,070
207*	Construction Seeding and Mulching	30,140	S.Y.	$ 0.50	$ 15,070
653	Topsoil Furnished and Placed (T=3")	2,520	C.Y.	$ 20.00	$ 50,400
659	Seeding and Mulching, Class 1	30,140	S.Y.	$ 0.50	$ 15,070
659	Repair Seeding and Mulching	1,510	S.Y.	$ 0.50	$ 755
659	Commericial Fertilizer	2.72	Ton	$ 500.00	$ 1,360
659	Lime	6.23	Ac.	$ 120.00	$ 748
659	Water	163	M. Gal	$ 17.00	$ 2,771
SPEC	Erosion Control Misc.	1	L. Sum	$ 8,000.00	$ 8,000
				Erosion Control Subtotal =	**$ 108,000**
	Drainage				
611	12" Conduit, Type B	1,520	Lin. Ft.	$ 76.00	$ 115,520
611	15" Conduit, Type B	645	Lin. Ft.	$ 100.00	$ 64,500
611	18" Conduit, Type B	391	Lin. Ft.	$ 113.00	$ 44,183
611	24" Conduit, Type B	157	Lin. Ft.	$ 159.00	$ 24,963
611	36" Conduit, Type B	326	Lin. Ft.	$ 200.00	$ 65,200
611	Catch Basin , No. 3A	28	Each	$ 2,000.00	$ 56,000
611	Manhole , No. 3	13	Each	$ 3,500.00	$ 45,500
SPEC	Water Quality Retention Basin	1	L. Sum	$ 95,000.00	$ 95,000
SPEC	Precast Concrete Outlet	2	Each	$ 500.00	$ 1,000
SPEC	Extending 9' X 5' Box Culvert	1	L. Sum	$ 100,000.00	$ 100,000
SPEC	Replacing 48" Culvert	1	L. Sum	$ 35,000.00	$ 35,000
SPEC	Drainage Misc.	1	L. Sum	$ 10,000.00	$ 10,000
				Drainage Subtotal =	**$ 657,000**

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Preliminary Opinion of Project Cost
Signalized Realignment 2 Alternative
August 12, 2015

Item	Description	Quantity	Units	Unit Cost	Extended Total
	Pavement				
254	Pavement Planing (T=1.25")	5,360	S.Y.	$ 3.00	$ 16,080
301	Asphalt Concrete Base	7,030	C.Y.	$ 120.00	$ 843,600
304	Aggregate Base	4,690	C.Y.	$ 40.00	$ 187,600
304	Aggregate Base (SUP)	690	C.Y.	$ 40.00	$ 27,600
304	Aggregate Base (Drive)	100	C.Y.	$ 40.00	$ 4,000
407	Tack Coat	1,130	Gal.	$ 2.50	$ 2,825
407	Tack Coat (Resurfacing)	220	Gal.	$ 2.50	$ 550
407	Tack Coat (Drive)	20	Gal.	$ 2.50	$ 50
407	Tack Coat for Intermediate Course	2,110	Gal.	$ 2.50	$ 5,275
423	Crack Seal	90	Lb.	$ 3.50	$ 315
448	Asphalt Concrete Intermediate Course, Type 1, PG64-22	1,370	C.Y.	$ 150.00	$ 205,500
448	Asphalt Concrete Intermediate Course, Type 1, PG64-22 (Drive)	30	C.Y.	$ 150.00	$ 4,500
448	Asphalt Concrete Surface Course, Type 1, PG64-22	980	C.Y.	$ 170.00	$ 166,600
448	Asphalt Concrete Surface Course, Type 1, PG64-22 (SUP)	290	C.Y.	$ 200.00	$ 58,000
448	Asphalt Concrete Surface Course, Type 1, PH64-22 (Drive)	20	C.Y.	$ 170.00	$ 3,400
448	Asphalt Concrete Surface Course, Type 1, PG64-22 (Resurfacing)	190	C.Y.	$ 170.00	$ 32,300
452	Non-Reinforced Concrete Pavement (T=8")	2,510	S.Y.	$ 70.00	$ 175,700
609	Curb, Straight 18"	1,285	Ft.	$ 13.00	$ 16,705
609	Combination Curb and Gutter	10,050	Ft.	$ 17.00	$ 170,850
SPEC	Pavement Misc.	1	L. Sum	$ 100,000.00	$ 100,000
				Pavement Subtotal =	**$ 2,022,000**
	Water Works				
801	12 Inch Water Pipe and Fittings	250	Ft.	$ 120.00	$ 30,000
807	Valve Adjusted to Grade	8	Each	$ 250.00	$ 2,000
809	Fire Hydrant Relocated	6	Each	$ 2,500.00	$ 15,000
SPEC	Water Works Misc.	1	L. Sum	$ 5,000.00	$ 5,000
				Water Works Subtotal =	**$ 52,000**
	Sanitary Sewer				
611	Manhole Adjusted to Grade	6	Each	$ 500.00	$ 3,000
611	Manhole Reconstructed to Grade	6	Each	$ 900.00	$ 5,400
				Sanitary Sewer Subtotal =	**$ 9,000**
	Traffic Control				
SPEC	Traffic Control	6,000	Ft.	$ 20.00	$ 120,000
				Traffic Control Subtotal =	**$ 120,000**
	Lighting				
SPEC	Lighting	6,000	Ft.	$65.00	$ 390,000
				Lighting Subtotal =	**$ 390,000**
	Traffic Signal				
SPEC	Traffic Signal	2	Each	$ 200,000.00	$ 400,000
SPEC	Traffic Signal Removed	1	Each	$ 20,000.00	$ 20,000
SPEC	Interconnect	2,400	Ft.	$ 50.00	$ 120,000
				Traffic Signal Subtotal =	**$ 540,000**
	Maintenance of Traffic				
SPEC	Temporary Right-of-Way	1	L. Sum	$ 5,000.00	$ 5,000
SPEC	Temporary Cut/Fill/Shoring	1	L. Sum	$ 20,000.00	$ 20,000
SPEC	Temporary Signals	1	L. Sum	$ 20,000.00	$ 20,000
SPEC	Temporary Drainage	1	L. Sum	$ 20,000.00	$ 20,000
SPEC	Temporary Pavement	1	L. Sum	$ 85,000.00	$ 85,000
SPEC	MOT Pavement Markings	1	L. Sum	$ 6,000.00	$ 6,000
SPEC	Maintenance of Traffic, Misc.	1	L. Sum	$ 24,000.00	$ 24,000
				Maintenance of Traffic Subtotal =	**$ 180,000**
	Culvert				
SPEC	3'x7' Box Culvert	1	L. Sum	$ 150,000.00	$ 150,000
				Maintenance of Traffic Subtotal =	**$ 150,000**
	Railroad Pedestrian Crossing				
SPEC	Railroad Crossing	1	L. Sum	$ 625,000.00	$ 625,000
				Railroad Pedestrian Crossing Subtotal =	**$ 625,000**
	Miscellaneous				
614	Maintaining Traffic, As Per Plan	1	L. Sum	$ 150,000.00	$ 150,000
619	Field Office, Type C	18	Month	$ 2,000.00	$ 36,000
623	Construction Layout Stakes	1	L. Sum	$ 40,000.00	$ 40,000
624	Mobilization	1	L. Sum	$ 200,000.00	$ 200,000
				Miscellaneous Subtotal =	**$ 426,000**
* Denotes Contingency				CONSTRUCTION COST SUBTOTAL =	**$ 6,738,000**

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Date Printed: 8/13/2015

Appendix C

Worthington-Galena Road/Wilson Bridge Road/Huntley Road
Preliminary Right-of-Way Opinion of Probable Cost
Signalized Widening Alternative

Ownership #	Parcel #s	Owner	Type	Take Area	Unit	Unit Cost*	Type	Value Factor	Parcel Take	Relocation Fee	Damages	Subtotal
1	100-005891	Cabot II-OH1W02-W05 LLC	WD	0.132	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 13,200	$ -	$ -	$ 13,200
2	100-005932	R C II Partners LLC	WD	0.456	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 45,600	$ -	$ -	$ 45,600
			T	0.001	Acre	$ 100,000	Temp. Easement	25%	$ 25	$ -	$ -	$ 25
4	100-002422 610-146441	Anheuser-Busch Co Inc	WD	0.101	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 10,100	$ -	$ -	$ 10,100
5	100-005934	Lakeview Commercial Properties LLC	WD	0.032	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 3,200	$ -	$ 1,000	$ 4,200
7	100-002699	State of Ohio Highway	WD	0.024	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 2,400	$ -	$ -	$ 2,400
			T	0.001	Acre	$ 100,000	Temp. Easement	25%	$ 25	$ -	$ -	$ 25
8	100-004060, 100-004074, 100-002402	RSFI Partners LLC	WD	0.067	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 6,700	$ -	$ -	$ 6,700
			T	0.005	Acre	$ 100,000	Temp. Easement	25%	$ 125	$ -	$ -	$ 125
10	100-002704	Pizzuti Pasquale & Pierina	WD	0.022	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 2,200	$ -	$ -	$ 2,200
			T	0.004	Acre	$ 100,000	Temp. Easement	25%	$ 100	$ -	$ -	$ 100
11	100-002697	Montgomery Robert M	WD	0.022	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 2,200	$ -	$ -	$ 2,200
			T	0.003	Acre	$ 100,000	Temp. Easement	25%	$ 75	$ -	$ -	$ 75
12	100-002692	Hashmi Shereen	WD	0.033	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 3,300	$ -	$ -	$ 3,300
			T	0.004	Acre	$ 100,000	Temp. Easement	25%	$ 100	$ -	$ -	$ 100
13	100-002696	Ondecko Mary A	WD	0.034	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 3,400	$ -	$ -	$ 3,400
			T	0.004	Acre	$ 100,000	Temp. Easement	25%	$ 100	$ -	$ -	$ 100
14	100-002691	Capital Enterprises	WD	0.085	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 8,500	$ -	$ -	$ 8,500
			T	0.025	Acre	$ 100,000	Temp. Easement	25%	$ 625	$ -	$ -	$ 625
15	100-000085	Geldreich Family L P	WD	0.249	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 24,900	$ -	$ 10,000	$ 34,900
			T	0.006	Acre	$ 100,000	Temp. Easement	25%	$ 150	$ -	$ -	$ 150
16	100-002695	Canini Ilva A Su Co-TR, Salmons Mary Ann Su Co-TR, Eckel Lina Su Co-TR	WD *	0.206	Acre	-	Fee Simple Reservation Access	100%	$ 390,000	$100,000	$ -	$ 490,000
17	100-002690	Cautela Carlo	WD	0.023	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 2,300	$ -	$ -	$ 2,300
			T	0.002	Acre	$ 100,000	Temp. Easement	25%	$ 50	$ -	$ -	$ 50
19	100-002112	Mayfam Realty	WD	0.160	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 16,000	$ -	$ 3,000	$ 19,000
			T	0.009	Acre	$ 100,000	Temp. Easement	25%	$ 225	$ -	$ -	$ 225
20	100-002703	Cautela Colombo LE Truman Pia Rmdr	WD	0.010	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 1,000	$ -	$ -	$ 1,000
			T	0.001	Acre	$ 100,000	Temp. Easement	25%	$ 25	$ -	$ -	$ 25
21	100-002698	Top World Legacy LLC	WD	0.000	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 10	$ -	$ -	$ 10
23	100-002461	Limnos Management LLC	T	0.002	Acre	$ 100,000	Temp. Easement	25%	$ 50	$ -	$ -	$ 50
24	100-002463 100-002684	Worthington Galena LLC	WD	0.145	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 14,500	$ -	$ 1,500	$ 16,000
			T	0.016	Acre	$ 100,000	Temp. Easement	25%	$ 400	$ -	$ -	$ 400
25	100-005525	Huntley Property Group LLC	WD	0.073	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 7,300	$ -	$ 4,000	$ 11,300
			T	0.022	Acre	$ 100,000	Temp. Easement	25%	$ 550	$ -	$ -	$ 550
26	100-005526	Huntley Road Holdings LLC	WD	0.001	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 100	$ -	$ -	$ 100
			T	0.015	Acre	$ 100,000	Temp. Easement	25%	$ 375	$ -	$ -	$ 375
27	100-002584 100-002441	VFC Properties 20 LLC	WD	0.234	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 23,400	$ -	$ 6,000	$ 29,400
			T	0.022	Acre	$ 100,000	Temp. Easement	25%	$ 550	$ -	$ -	$ 550
28	100-002795	CRV-XI Huntley Road LTD	T	0.005	Acre	$ 100,000	Temp. Easement	25%	$ 125	$ -	$ -	$ 125
29	100-000922	Nuclear Consulting Services Inc	WD	0.030	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 3,000	$ -	$ -	$ 3,000
			T	0.005	Acre	$ 100,000	Temp. Easement	25%	$ 125	$ -	$ -	$ 125

Notes:
1. Estimated unit costs of property are based on Franklin County Auditor's Information
2. Relocation is the cost of relocating a person or business to a new address. ($50,000 for a residential parcel, $100,000 for a commercial or industrial)
3. Damages are estimated costs of damages that may happen on the property as a result of take.
4. Administrative settlements are an assumption that 15% of parcels will settle with an administrative settlement at an average of 20% over offer.
5. Appropriation adjustment is an assumption that 10% of parcels will be appropriated at an amount of 50% over offer.
6. Incidental Adjustments are an assumption that ODOT will have some incidental expenses for closing; it is 2.5% of the settlement amount.

* Anticipated Total Take Parcel

Total Estimated Cost of Property	$ 713,000
Administrative Adjustment	$ 128,340
Appropriation Adjustment	$ 106,950
Incidental Adjustment	$ 16,043
Contingency (10%)	$ 72,000
Total Right of Way Purchase Cost	$ 1,036,333
Acquisition Services ($10,000/Parcel)	$ 240,000

Worthington-Galena Road/Wilson Bridge Road/Huntley Road
Preliminary Right-of-Way Opinion of Probable Cost
Roundabout Alternative

Ownership #	Parcel #s	Owner	Type	Take Area	Unit	Unit Cost*	Type	Value Factor	Parcel Take	Relocation Fee	Damages	Subtotal
1	100-005891	Cabot II-OH1W02-W05 LLC	WD	0.220	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 22,000	$ -	$ -	$ 22,000
			T	0.008	Acre	$ 100,000	Temp. Easement	25%	$ 200	$ -	$ -	$ 200
2	100-005932	R C II Partners LLC	WD	0.456	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 45,600	$ -	$ 15,000	$ 60,600
			T	0.001	Acre	$ 100,000	Temp. Easement	25%	$ 25	$ -	$ -	$ 25
4	100-002422 610-146441	Anheuser-Busch Co Inc	WD	1.730	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 173,000	$ -	$ -	$ 173,000
5	100-005934	Lakeview Commercial Properties LLC	WD	0.032	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 3,200	$ -	$ 1,000	$ 4,200
7	100-002699	State of Ohio Hiway	WD	0.014	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 1,400	$ -	$ -	$ 1,400
			T	0.003	Acre	$ 100,000	Temp. Easement	25%	$ 75	$ -	$ -	$ 75
8	100-004060, 100-004074, 100-002402	RSFI Partners LLC	WD	0.069	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 6,900	$ -	$ -	$ 6,900
			T	0.004	Acre	$ 100,000	Temp. Easement	25%	$ 100	$ -	$ -	$ 100
10	100-002704	Pizzuti Pasquale & Pierina	WD	0.023	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 2,300	$ -	$ 1,000	$ 3,300
11	100-002697	Montgomery Robert M	WD	0.013	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 1,300	$ -	$ 5,000	$ 6,300
12	100-002692	Hashmi Shereen	WD	0.019	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 1,900	$ -	$ -	$ 1,900
13	100-002696	Ondecko Mary A	WD	0.008	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 800	$ -	$ -	$ 800
14	100-002691	Capital Enterprises	WD	0.017	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 1,700	$ -	$ -	$ 1,700
			T	0.009	Acre	$ 100,000	Temp. Easement	25%	$ 225	$ -	$ -	$ 225
15	100-000085	Geldreich Family L P	WD	0.513	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 51,300	$ -	$ 25,000	$ 76,300
			T	0.026	Acre	$ 100,000	Temp. Easement	25%	$ 650	$ -	$ -	$ 650
16	100-002695	Canini Ilva A Su Co-TR, Salmons Mary Ann Su Co-TR, Eckel Lina Su Co-TR	WD *	0.687	Acre	-	Fee Simple Reservation Access	100%	$ 390,000	$ 100,000	$ -	$ 490,000
17	100-002690	Cautela Carlo	T	0.003	Acre	$ 100,000	Temp. Easement	25%	$ 75	$ -	$ -	$ 75
19	100-002112	Mayfam Realty	WD	0.243	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 24,300	$ -	$ -	$ 24,300
			T	0.009	Acre	$ 100,000	Temp. Easement	25%	$ 225	$ -	$ -	$ 225
20	100-002703	Cautela Colombo LE Truman	T	0.002	Acre	$ 100,000	Temp. Easement	25%	$ 50	$ -	$ -	$ 50
23	100-002461	Limnos Management LLC	T	0.021	Acre	$ 100,000	Temp. Easement	25%	$ 525	$ -	$ -	$ 525
24	100-002463 100-002684	Worthington Galena LLC	WD	0.115	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 11,500	$ -	$ 1,500	$ 13,000
			T	0.017	Acre	$ 100,000	Temp. Easement	25%	$ 425	$ -	$ -	$ 425
25	100-005525	Huntley Property Group LLC	WD	0.121	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 12,100	$ -	$ 4,000	$ 16,100
			T	0.008	Acre	$ 100,000	Temp. Easement	25%	$ 200	$ -	$ -	$ 200
26	100-005526	Huntley Road Holdings LLC	WD	0.036	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 3,600	$ -	$ 2,000	$ 5,600
			T	0.002	Acre	$ 100,000	Temp. Easement	25%	$ 50	$ -	$ -	$ 50
27	100-002584 100-002441	VFC Properties 20 LLC	WD	0.234	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 23,400	$ -	$ 7,500	$ 30,900
			T	0.016	Acre	$ 100,000	Temp. Easement	25%	$ 400	$ -	$ -	$ 400
28	100-002795	CRV-XI Huntley Road LTD	T	0.004	Acre	$ 100,000	Temp. Easement	25%	$ 100	$ -	$ -	$ 100
29	100-000922	Nuclear Consulting Services Inc	WD	0.031	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 3,100	$ -	$ 1,000	$ 4,100
			T	0.004	Acre	$ 100,000	Temp. Easement	25%	$ 100	$ -	$ -	$ 100

Notes:
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4. Administrative settlements are an assumption that 15% of parcels will settle with an administrative settlement at an average of 20% over offer.
5. Appropriation adjustment is an assumption that 10% of parcels will be appropriated at an amount of 50% over offer.
6. Incidental Adjustments are an assumption that ODOT will have some incidental expenses for closing; it is 2.5% of the settlement amount.

* Anticipated Total Take Parcel

Total Estimated Cost of Property	$ 954,000
Administrative Adjustment	$ 171,720
Appropriation Adjustment	$ 143,100
Incidental Adjustment	$ 21,465
Contingency (10%)	$ 96,000
Total Right of Way Purchase Cost	$1,386,285
Acquisition Services ($10,000/Parcel)	$ 230,000

Worthington-Galena Road/Wilson Bridge Road/Huntley Road
Preliminary Right-of-Way Opinion of Probable Cost
Signalized Realignment #1 Alternative

Ownership #	Parcel #s	Owner	Type	Take Area	Unit	Unit Cost*	Type	Value Factor	Parcel Take	Relocation Fee	Damages	Subtotal
1	100-005891	Cabot II-OH1W02-W05 LLC	WD	0.140	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 14,000	$ -	$ -	$ 14,000
			T	0.007	Acre	$ 100,000	Temp. Easement	25%	$ 175	$ -	$ -	$ 175
2	100-005932	R C II Partners LLC	WD	0.205	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 20,500	$ -	$ 10,000	$ 30,500
			T	0.011	Acre	$ 100,000	Temp. Easement	25%	$ 275	$ -	$ -	$ 275
4	100-002422 610-146441	Anheuser-Busch Co Inc	WD	1.669	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 166,900	$ -	$ -	$ 166,900
5	100-005934	Lakeview Commercial Properties LLC	WD	0.032	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 3,200	$ -	$ 1,000	$ 4,200
7	100-002699	State of Ohio Hiway	WD	0.035	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 3,500	$ -	$ -	$ 3,500
			T	0.003	Acre	$ 100,000	Temp. Easement	25%	$ 75	$ -	$ -	$ 75
8	100-004060, 100-004074, 100-002402	RSFI Partners LLC	WD	0.170	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 17,000	$ -	$ 1,000	$ 18,000
			T	0.009	Acre	$ 100,000	Temp. Easement	25%	$ 225	$ -	$ -	$ 225
10	100-002704	Pizzuti Pasquale & Pierina	WD	0.036	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 3,600	$ -	$ 1,000	$ 4,600
			T	0.003	Acre	$ 100,000	Temp. Easement	25%	$ 75	$ -	$ -	$ 75
11	100-002697	Montgomery Robert M	WD	0.047	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 4,700	$ -	$ 4,500	$ 9,200
			T	0.003	Acre	$ 100,000	Temp. Easement	25%	$ 75	$ -	$ -	$ 75
12	100-002692	Hashmi Shereen	WD *	0.421	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 240,000	$ 100,000	$ -	$ 340,000
13	100-002696	Ondecko Mary A	WD	0.070	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 7,000	$ -	$ -	$ 7,000
			T	0.159	Acre	$ 100,000	Temp. Easement	25%	$ 3,975	$ -	$ -	$ 3,975
14	100-002691	Capital Enterprises	WD	0.006	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 600	$ -	$ -	$ 600
			T	0.006	Acre	$ 100,000	Temp. Easement	25%	$ 150	$ -	$ -	$ 150
15	100-000085	Geldreich Family L P	WD	0.067	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 6,700	$ -	$ 500	$ 7,200
			T	0.042	Acre	$ 100,000	Temp. Easement	25%	$ 1,050	$ -	$ -	$ 1,050
16	100-002695	Canini Ilva A Su Co-TR, Salmons Mary Ann Su Co-TR, Eckel Lina Su Co-TR	WD *	0.618	Acre	-	Fee Simple Reservation Access	100%	$ 390,000	$ 100,000	$ -	$ 490,000
17	100-002690	Cautela Carlo	WD *	0.155	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 180,000	$ 50,000	$ -	$ 230,000
19	100-002112	Mayfam Realty	WD	0.311	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 31,100	$ -	$ 4,500	$ 35,600
			T	0.003	Acre	$ 100,000	Temp. Easement	25%	$ 75	$ -	$ -	$ 75
20	100-002703	Cautela Colombo LE Truman Pia Rmdr	WD *	0.192	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 180,000	$ 50,000	$ -	$ 230,000
21	100-002698	Top World Legacy LLC	WD	0.151	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 15,100	$ -	$ 1,000	$ 16,100
			T	0.003	Acre	$ 100,000	Temp. Easement	25%	$ 75	$ -	$ -	$ 75
23	100-002461	Limnos Management LLC	T	0.037	Acre	$ 100,000	Temp. Easement	25%	$ 925	$ -	$ -	$ 925
24	100-002463 100-002684	Worthington Galena LLC	WD	0.146	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 14,600	$ -	$ 1,500	$ 16,100
			T	0.020	Acre	$ 100,000	Temp. Easement	25%	$ 500	$ -	$ -	$ 500
25	100-005525	Huntley Property Group LLC	WD	0.035	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 3,500	$ -	$ -	$ 3,500
			T	0.004	Acre	$ 100,000	Temp. Easement	25%	$ 100	$ -	$ -	$ 100
26	100-005526	Huntley Road Holdings LLC	WD	0.036	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 3,600	$ -	$ -	$ 3,600
			T	0.002	Acre	$ 100,000	Temp. Easement	25%	$ 50	$ -	$ -	$ 50
27	100-002584 100-002441	VFC Properties 20 LLC	WD	0.233	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 23,300	$ -	$ 3,000	$ 26,300
			T	0.021	Acre	$ 100,000	Temp. Easement	25%	$ 525	$ -	$ -	$ 525
28	100-002795	CRV-XI Huntley Road LTD	WD	0.006	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 600	$ -	$ -	$ 600
			T	0.004	Acre	$ 100,000	Temp. Easement	25%	$ 100	$ -	$ -	$ 100
29	100-000922	Nuclear Consulting Services Inc	WD	0.031	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 3,100	$ -	$ 1,000	$ 4,100
			T	0.007	Acre	$ 100,000	Temp. Easement	25%	$ 175	$ -	$ -	$ 175

Notes:
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3. Damages are estimated costs of damages that may happen on the property as a result of take.
4. Administrative settlements are an assumption that 15% of parcels will settle with an administrative settlement at an average of 20% over offer.
5. Appropriation adjustment is an assumption that 10% of parcels will be appropriated at an amount of 50% over offer.
6. Incidental Adjustments are an assumption that ODOT will have some incidental expenses for closing; it is 2.5% of the settlement amount.

* Anticipated Total Take Parcel

Total Estimated Cost of Property	$ 1,679,000
Administrative Adjustment	$ 302,220
Appropriation Adjustment	$ 251,850
Incidental Adjustment	$ 37,778
Contingency (10%)	$ 168,000
Total Right of Way Purchase Cost	$ 2,438,848
Acquisition Services ($10,000/Parcel)	$ 240,000

Worthington-Galena Road/Wilson Bridge Road/Huntley Road
Preliminary Right-of-Way Opinion of Probable Cost
Signalized Realignment #2 Alternative

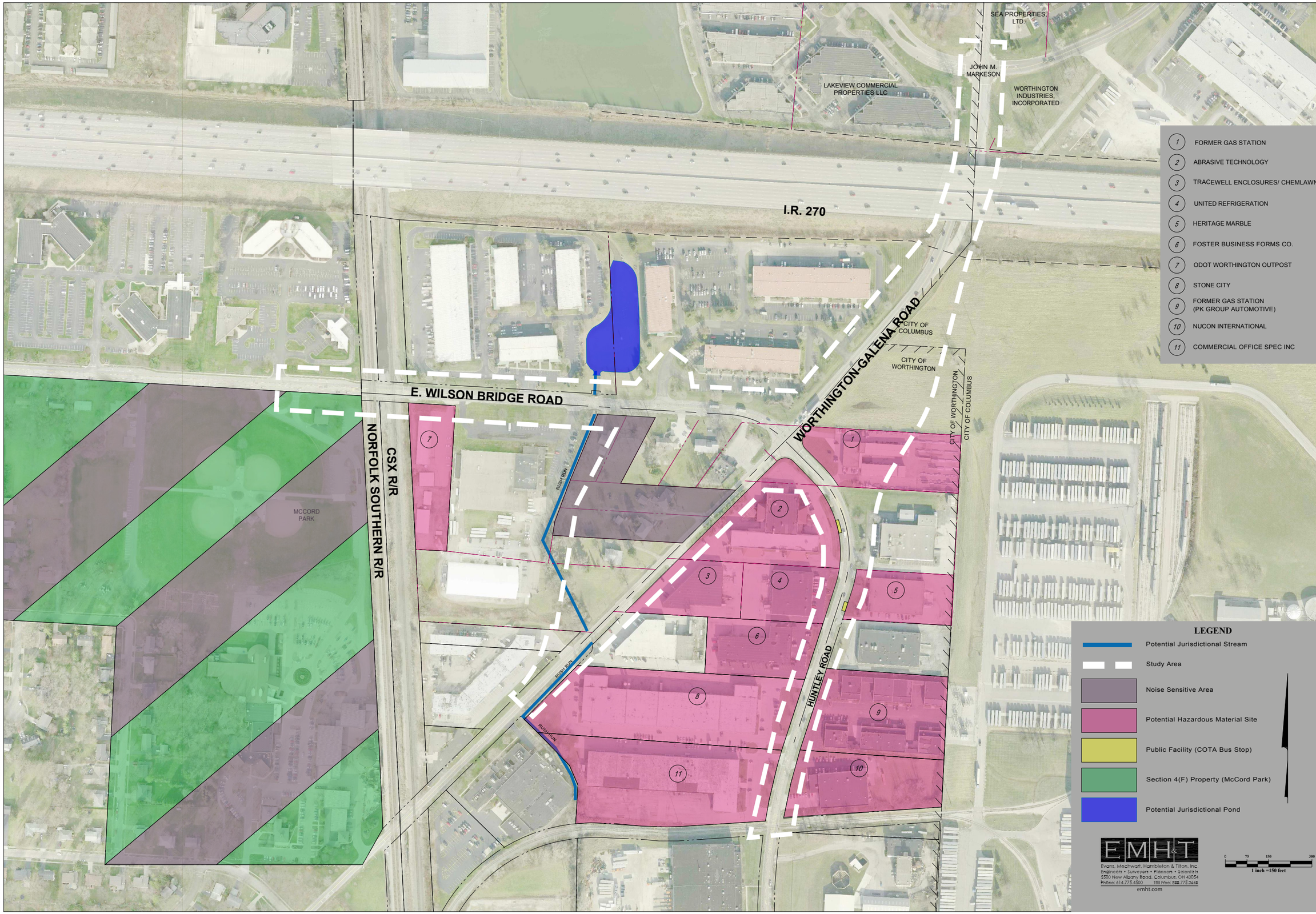
Ownership #	Parcel #s	Owner	Type	Take Area	Unit	Unit Cost*	Type	Value Factor	Parcel Take	Relocation Fee	Damages	Subtotal
1	100-005891	Cabot II-OH1W02-W05 LLC	WD	0.142	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 14,200	$ -	$ -	$ 14,200
			T	0.007	Acre	$ 100,000	Temp. Easement	25%	$ 175	$ -	$ -	$ 175
2	100-005932	R C II Partners LLC	WD	0.191	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 19,100	$ -	$ 10,000	$ 29,100
			T	0.194	Acre	$ 100,000	Temp. Easement	25%	$ 4,850	$ -	$ -	$ 4,850
4	100-002422 610-146441	Anheuser-Busch Co Inc	WD	1.669	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 166,900	$ -	$ -	$ 166,900
5	100-005934	Lakeview Commercial Properties LLC	WD	0.032	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 3,200	$ -	$ 1,000	$ 4,200
7	100-002699	State of Ohio Hiway	WD	0.035	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 3,500	$ -	$ -	$ 3,500
			T	0.003	Acre	$ 100,000	Temp. Easement	25%	$ 75	$ -	$ -	$ 75
8	100-004060, 100-004074, 100-002402	RSFI Partners LLC	WD	0.778	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 77,800	$ -	$ 1,000	$ 78,800
			T	0.009	Acre	$ 100,000	Temp. Easement	25%	$ 225	$ -	$ -	$ 225
10	100-002704	Pizzuti Pasquale & Pierina	WD	0.059	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 5,900	$ -	$ 1,000	$ 6,900
			T	0.003	Acre	$ 100,000	Temp. Easement	25%	$ 75	$ -	$ -	$ 75
11	100-002697	Montgomery Robert M	WD *	0.498	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 117,500	$ 50,000	$ -	$ 167,500
12	100-002692	Hashmi Shereen	WD	0.112	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 11,200	$ -	$ 4,500	$ 15,700
			T	0.000	Acre	$ 100,000	Temp. Easement	25%	$ -	$ -	$ -	$ -
13	100-002696	Ondecko Mary A	WD	0.046	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 4,630	$ -	$ -	$ 4,630
			T	0.000	Acre	$ 100,000	Temp. Easement	25%	$ -	$ -	$ -	$ -
14	100-002691	Capital Enterprises	WD	0.006	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 600	$ -	$ -	$ 600
			T	0.006	Acre	$ 100,000	Temp. Easement	25%	$ 150	$ -	$ -	$ 150
15	100-000085	Geldreich Family L P	WD	0.067	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 6,700	$ -	$ 500	$ 7,200
			T	0.042	Acre	$ 100,000	Temp. Easement	25%	$ 1,050	$ -	$ -	$ 1,050
16	100-002695	Canini Ilva A Su Co-TR, Salmons Mary Ann Su Co-TR, Eckel Lina Su Co-TR	WD *	0.618	Acre	-	Fee Simple Reservation Access	100%	$ 390,000	$ 100,000	$ -	$ 490,000
17	100-002690	Cautela Carlo	WD	0.218	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 21,800	$ -	$ 5,000	$ 26,800
			T	0.000	Acre	$ 100,000	Temp. Easement	25%	$ -	$ -	$ -	$ -
19	100-002112	Mayfam Realty	WD	0.311	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 31,100	$ -	$ 4,500	$ 35,600
			T	0.003	Acre	$ 100,000	Temp. Easement	25%	$ 75	$ -	$ -	$ 75
20	100-002703	Cautela Colombo LE Truman Pia Rmdr	WD	0.189	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 18,900	$ -	$ 5,000	$ 23,900
			T	0.000	Acre	$ 100,000	Temp. Easement	25%	$ -	$ -	$ -	$ -
21	100-002698	Top World Legacy LLC	WD	0.151	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 15,100	$ -	$ 5,000	$ 20,100
			T	0.003	Acre	$ 100,000	Temp. Easement	25%	$ 75	$ -	$ -	$ 75
23	100-002461	Limnos Management LLC	T	0.049	Acre	$ 100,000	Temp. Easement	25%	$ 1,230	$ -	$ -	$ 1,230
24	100-002463 100-002684	Worthington Galena LLC	WD	0.146	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 14,600	$ -	$ 1,500	$ 16,100
			T	0.020	Acre	$ 100,000	Temp. Easement	25%	$ 500	$ -	$ -	$ 500
25	100-005525	Huntley Property Group LLC	WD	0.035	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 3,500	$ -	$ -	$ 3,500
			T	0.004	Acre	$ 100,000	Temp. Easement	25%	$ 100	$ -	$ -	$ 100
26	100-005526	Huntley Road Holdings LLC	WD	0.036	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 3,600	$ -	$ -	$ 3,600
			T	0.002	Acre	$ 100,000	Temp. Easement	25%	$ 50	$ -	$ -	$ 50
27	100-002584 100-002441	VFC Properties 20 LLC	WD	0.233	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 23,300	$ -	$ 3,000	$ 26,300
			T	0.027	Acre	$ 100,000	Temp. Easement	25%	$ 675	$ -	$ -	$ 675
28	100-002795	CRV-XI Huntley Road LTD	WD	0.006	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 600	$ -	$ -	$ 600
			T	0.004	Acre	$ 100,000	Temp. Easement	25%	$ 100	$ -	$ -	$ 100
29	100-000922	Nuclear Consulting Services Inc	WD	0.031	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 3,100	$ -	$ 1,000	$ 4,100
			T	0.007	Acre	$ 100,000	Temp. Easement	25%	$ 175	$ -	$ -	$ 175
30	100-002444	6969 Worth-Galena LLC	WD	0.111	Acre	$ 100,000	Fee Simple Reservation Access	100%	$ 11,100	$ -	$ 3,000	$ 14,100
			T	0.039	Acre	$ 100,000	Temp. Easement	25%	$ 975	$ -	$ -	$ 975
31	100-002431	Eastwood Properties LTD	T	0.009	Acre	$ 100,000	Temp. Easement	25%	$ 225	$ -	$ 2,000	$ 2,225

Notes:
1. Estimated unit costs of property are based on Franklin County Auditor's Information
2. Relocation is the cost of relocating a person or business to a new address. ($50,000 for a residential parcel, $100,000 for a commercial or industrial)
3. Damages are estimated costs of damages that may happen on the property as a result of take.
4. Administrative settlements are an assumption that 15% of parcels will settle with an administrative settlement at an average of 20% over offer.
5. Appropriation adjustment is an assumption that 10% of parcels will be appropriated at an amount of 50% over offer.
6. Incidental Adjustments are an assumption that ODOT will have some incidental expenses for closing; it is 2.5% of the settlement amount.
* Anticipated Total Take Parcel

Total Estimated Cost of Property	$ 1,177,000
Administrative Adjustment	$ 211,860
Appropriation Adjustment	$ 176,550
Incidental Adjustment	$ 26,483
Contingency (10%)	$ 118,000
Total Right of Way Purchase Cost	$ 1,709,893
Acquisition Services ($10,000/Parcel)	$ 260,000

Appendix D

HUNTLEY / E. WILSON BRIDGE / WORTHINGTON-GALENA ENVIRONMENTAL EXHIBIT



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MEMO

Date: December 22, 2014

To: Neil Schwartz, P. E.

From: Christy Pirkle and Christine Rahtz, Environmental Dept.

Subject: Worthington-Galena Road Intersection Improvements – Environmental Field Review Summary

Copies: Mike Brehm

The City of Worthington is proposing improvements to the intersection of Worthington-Galena Road and Huntley Road in the City of Worthington, Franklin County, Ohio. The purpose of this memo is to provide a summary of known environmental information for the study area to help in the decision-making process in choosing the preferred alternative for intersection improvements.

EMH&T's Environmental Scientists conducted a cursory field review of the project area on November 25, 2014. In addition, a secondary source environmental review was conducted to identify any known environmental "red flag" issues in the study area. This investigation was undertaken with the knowledge that the project will eventually require a full environmental review by the Ohio Department of Transportation. Several environmental parameters were evaluated, including those listed below.

- Parkland, nature preserves, and wildlife areas
- Cultural resources (cemeteries, historic buildings, historic bridges, known archaeological sites)
- Potential surface waters and wetlands (existing wet areas, streams, rivers and watercourses)
- Public facilities
- Threatened and endangered species and/or habitat
- Air quality non-attainment areas or concerns
- Landfills, Superfund sites and/or evidence of hazardous materials
- Sensitive environmental justice areas
- Noise

Exhibit 1 shows the project area and pertinent environmental considerations. The study included a review of available aerial photography, resource mapping and databases, as well as a cursory field review of the study area to identify any obvious environmental concerns. Key environmental issues that were identified are discussed in detail below.

This memo is intended to serve as a summary of the screening for potential environmental resources concerns only. Additional studies, agency coordination, and/or reviews will be necessary, following ODOT procedures and protocols.

SUMMARY OF KEY ENVIRONMENTAL ISSUES

A baseline assessment of the project area was conducted by EMH&T through a combination of secondary source literatures searches and a preliminary field review conducted by EMH&T on November 25, 2014. The results of this baseline evaluation are discussed below. All known environmental resources have been indicated on the Environmental Resource Summary Map (Exhibit 1).

Section 4(f) and Section 6(f) Parklands

Section 4(f) of the Department of Transportation (DOT) Act of 1966 stipulates that the Federal Highway Administration (FHWA) and other DOT agencies cannot approve the use of land from publicly owned parks, recreational areas, wildlife and waterfowl refuges, or public and private historical sites unless specific conditions are met.

Based on aerial maps and a cursory field review, there are no parks or other recreational areas located in the immediate vicinity of the project area.

Section 6(f) of the Land and Water Conservation Act applies to the conversion of recreation lands that have received Land and Water Conservation Fund (LWCF) money to non-recreational purposes. Approval must be sought from the US Department of the Interior – National Park Service for the conversion of any such lands.

The U.S. Department of Interior/National Park Service listings of LWCF grant properties for Summit County was reviewed by EMH&T on December 4, 2014. No Section 6(f) properties are located in the project area.

Public Facilities

One (1) Central Ohio Transit Authority (COTA) bus stop is located within the project area. Coordination with COTA will need to be conducted as the project progresses. Additionally, coordination will need to be conducted with police/fire/emergency medical services in order to assess the impact of any change in traffic patterns or closures for construction.

Surface Waters and Wetlands

Surface waters, including streams and wetlands, are protected under Sections 404 and 401 of the Clean Water Act. Impacts to streams or wetlands require a Section 404 permit from the U.S. Army Corps of Engineers (USACE) and/or a Section 401 permit from the Ohio EPA. Impacts to isolated wetlands require a State Isolated Wetland Permit from the Ohio EPA. According to the USGS 7.5' Topographic Map Series *Northwest Columbus, Ohio* and *Northeast Columbus, Ohio* quadrangles (USGS 2010), Rush Run flows through the western portion of the project area under

E. Wilson Bridge Road. Rush Run flows approximately 3.7 miles to a confluence with the Olentangy River. Rush Run, a potentially jurisdictional stream, was identified and photographed during a field investigation conducted by EMH&T on November 25, 2014 (Photograph 1).

Photograph 1. View of Rush Run flowing south under E. Wilson Bridge Road facing south

Photograph 2. View of freshwater pond and Rush Run facing northeast

The National Wetland Inventory (NWI) Wetlands Mapper was reviewed for the project area. No NWI features are indicated within the study area. One (1) freshwater pond was identified on an adjacent property at the northwest boundary of the project area, which drains to Rush Run (Photograph 2). Because this pond appears to be online with Rush Run, it is potentially jurisdictional and impacts to the pond would require a permit from the USACE and, potentially, the Ohio EPA.

Two (2) poorly drained areas were identified within the project area during the field investigation conducted by EMH&T on November 25, 2014. The first is located west of Worthington-Galena Road and south of Interstate 270 and consists of primarily *Phragmites australis* (common reed) (Photograph 3). The second poorly drained area is located east of Worthington-Galena Road on parcel #100002422, owned by Anheuser-Busch. This wet area consists of primarily hydrophytic plant species, including *Eleocharis sp.* (spikerush), *Leersia orzoides* (rice cutgrass), *Apocynum cannabinum* (Indianhemp), *Salix sp.* (willow), and *Fraxinus pennsylvanica* (green ash) (Photograph 4). To be characterized as a wetland, an area must have hydrology, hydrophytic vegetation, and hydric soils. The USACE Wetland Delineation Manual Midwest Regional Supplement describes field indicators of hydric soils in this area. According to this manual, the soils in these wet areas did not demonstrate hydric characteristics, therefore **it was determined that these areas were not wetlands and are not subject to regulation by the USACE.**

The general locations of ecological resources identified within the project area are shown on Exhibit 1.

Photograph 3. Area of poor drainage west of Worthington-Galena Road facing north; Area determined to be non-jurisdictional based on lack of hydric soils

Photograph 4. Area of poor drainage located east of Worthington-Galena Road facing east; Area determined to be non-jurisdictional based on lack of hydric soils

Threatened and Endangered Species

The Endangered Species Act of 1973 provides for the conservation of species that are endangered or threatened throughout all or a significant portion of their range, and the conservation of the ecosystems on which they depend. The United States Fish and Wildlife Service (USFWS) list of *Federally Listed Species by Ohio Counties* (April 2014) includes the following species for Franklin County: *Myotis sodalis* (Indiana bat) – Endangered; *Myotis septentrionalis* (Northern long-eared bat) – Proposed as Endangered; *Noturus trautmani* (Scioto Madtom) – Endangered; *Villosa fabalis* (Rayed bean) – Endangered; *Epioblasma triquetra* (Snuffbox) – Endangered; *Epioblasma torulosa rangiana* (Northern riffleshell) – Endangered; *Pleurobema clava* (Clubshell) – Endangered; *Quadrula cylindrica cylindrical* (Rabbitsfoot) – Threatened; and *Haliaeetus leucocephalus* (bald eagle) – Species of Concern.

In correspondence dated November 17, 2014, the ODNR Division of Wildlife stated that they had no capture records for Indiana bat within a 5-mile radius of the study area and no hibernacula within a 10-mile radius (Appendix A). Based on the cursory field investigation performed by EMH&T on November 25, 2014, **no trees were observed that would provide suitable habitat for Indiana bat.**

Rush Run is a perennial stream that flows through the western portion of the study area under E. Wilson Bridge Road. Rush Run flows approximately 3.7 miles from the project area to a confluence with the Olentangy River. Per the ODNR Ohio Mussel Survey Protocol (OMSP) updated in April 2014, Rush Run is an uncategorized stream with a drainage area of 0.35 square miles at

the proposed point of impact. As such, a visual presence/absence reconnaissance survey for freshwater mussels is not required. However, should investigators observe evidence of mussels during subsequent ecological investigations, a mussel survey may be warranted.

According to the USFWS, the bald eagle is protected under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. The eagle uses super canopy trees (trees that are taller than the surrounding trees) as nesting habitat. The ideal habitat for the bald eagle is a secluded site within 2 miles of water so the bird has access to a source of fish. According to the ODNR, the closest known bald eagle nest is located 2.5 miles to the northwest. No bald eagle nests or suitable habitat were observed during the cursory field investigation performed by EMH&T on November 25, 2014.

Cultural Resources

Section 106 of the National Historic Preservation Act of 1966 requires federal agencies to take into account the effects of their actions on historic properties. EMH&T staff archaeologists reviewed the Ohio Historic Preservation Office's (OHPO) GIS website to determine if there were any known cultural resources in the vicinity of the project site. The information gathered from the review indicates **that there are no known cultural resources in the vicinity of the project area**. A copy of the map showing cultural resources in project area is attached in Appendix B.

Hazardous Materials

In order to evaluate the possibility of hazardous substances or petroleum products being present or migrating onto the project area from adjacent properties, Environmental Data Resources, Inc. (EDR) of Milford, Connecticut was retained to review all information recorded in federal and state databases. Examining the potential for contamination of a property is a standard component of the due diligence process. A copy of the EDR Radius Maps (EDR, 11/12/2014) is included in Appendix C. Forty-five (45) listings, representing thirty (30) discrete sites, were reported to be within the Wothington-Galena Road/Huntley Road Intersection Improvement search area. Of these, EMH&T determined **four (4) EDR listings, representing three (3) discrete sites, could contain potential environmental concerns on properties in or immediately adjacent to the project area** (Photographs 5-7). This includes the following properties: Ohio Bell Telephone, a former gas station with removed underground storage tanks (USTs); Abrasives Technology, a RCRA-Small Quantity Generator; and Tracewell Enclosures and Chemlawn, RCRA-Non Generators. Three (3) orphan sites (sites with insufficient information) were also listed in the EDR report.

Photograph 5. View of EDR property listing for Ohio Bell Telephone, facing east

Photograph 6. View of EDR property listing for Abrasive Technology, facing east

Photograph 7. View of EDR property listing for Tracewell Enclosures and Chemlawn, facing northeast

Photograph 8. United Refrigeration, a potential site of environmental concern, facing southwest

Photograph 9. Heritage Marble, a potential site of environmental concern, facing northeast

The cursory field investigation performed by EMH&T on November 25, 2014 of the study area and adjacent properties revealed additional activities or conditions suggestive of environmental concerns, including one (1) HVAC supply center and one (1) business involved in manufacturing home building materials (Photographs 8-9). **An ESA Screening of the proposed project area would be necessary to determine whether these properties or the properties listed in the EDR warrant further Phase I ESA investigations and/or development of plan notes with respect to the activities proposed to be conducted in association with the project.** All sites identified in the EDR report and during EMH&T's cursory field investigation are indicated on Exhibit 1.

Environmental Justice

The United States Department of Transportation (USDOT) must ensure nondiscrimination under Title VI of the Civil Rights Act of 1964 and many other laws, regulations, and policies. Environmental Justice is defined as: the fair treatment and meaningful involvement of all people regardless of race, color, sex, national origin, or income with respect to the development, implementation and enforcement of environmental laws, regulations, and policies.

Based on the results of the USEPA EJ View literature search (Appendix D), the data indicate that there are EJ populations within the project area that are above the 40% threshold as indicated in the ODOT-OES's Environmental Justice guidance document (Revised 2/2014). Of the block groups within the project area, one (1) block group has a minority population above 40%. No block groups have a low income population above 40% within the project study area. Because ODOT/FHWA funds will be used for the project, further investigation of this potential issue must

be conducted. Maps depicting the Block Group low-income and minority data have been included in Appendix D.

Air Quality

The federal Clean Air Act (CAA) was enacted to reduce air pollution and establish clean air standards. If a project receives federal funding, conformity with the SIPs must be demonstrated with respect to carbon monoxide (CO), ozone (O3), particulate matter (PM 2.5/PM 10), and Mobile Source Air Toxics (MSATs).

Franklin County is not within a carbon monoxide (CO) Nonattainment Area according to the USEPA Carbon Monoxide Area (1979 Standard) CO Designation and Classification Information (10/2014). Additionally, the project is not projected to cause an increase in Average Daily Traffic (ADT) greater than 10,000 vehicles within 10 years of construction. Therefore, the project is considered exempt from a project level conformity analysis for CO.

Franklin County is in an 8-hour Ozone (2008 Standard) Nonattainment Area (Columbus, OH) according to the USEPA Ohio 8-Hr Ozone (2008) Nonattainment Area State Map (10/2014). However, if the project is ultimately listed in the State Transportation Improvement Plan (STIP) or Mid-Ohio Regional Planning Commission (MORPC) Transportation Improvement Plan (TIP), ozone will be addressed for the project.

Franklin County is located within a Particulate Matter (PM)-2.5 Maintenance Area according to the USEPA Ohio PM-2.5 (2006 Standard) Nonattainment Areas map (10/2014). Based on the current and future traffic projections and the fact that the intersection improvement project is not adding roadway capacity, a PM 2.5 Hot Spot Analysis and a Mobile Source Air Toxics (MSAT) Analysis are not expected to be needed.

Noise

Noise is considered unwanted sound, particularly when the sound causes annoyance. One of the most significant sources of noise is transportation, specifically traffic noise. The ODOT *Flowchart for When a Noise Analysis is Needed* (ODOT, 11/23/2012) was consulted to determine whether a noise analysis would be potentially required for the project. As the project will neither add through lanes to the roadways, nor will it result in changes to the existing horizontal and vertical profile, a noise analysis would not be warranted for the project.

SUMMARY OF FINDINGS

Based on the environmental resources assessed during this review, a few potential environmental concerns have been identified which will need to be addressed in order to move forward with the proposed intersection improvements at Worthington-Galena Road/Huntley Road.

Table 1 includes a summary of the environmental resources that will need to be part of the environmental review and documentation completed for ODOT. The level of environmental review required by ODOT is anticipated to be a low level Categorical Exclusion.

Table 1: Summary of Potential Environmental Concerns

Environmental Issue	Potential Impact
Section 4(f) Properties	No
Section 6(f) Properties	No
Streams	Yes
Potential Wetlands	No
Potentially Jurisdictional Ditches	No
Threatened & Endangered Species or Habitat	No
Cultural Resources	No
Hazardous Materials	Yes
Environmental Justice	No
Public Facilities	Yes
Air Quality	No
Noise	No

Yes = Resource may be potentially affected
No = Resource is not likely to be affected

There is one stream, Rush Run, located within the project area. There are also five (5) sites of potential environmental concern regarding hazardous materials which may require an ESA Screening or a Phase I Environmental Site Assessment (ESA). The locations of these features are shown on Exhibit 1.

In addition to these findings, **a public involvement meeting is recommended for the project.** It is important that the public is involved early in the decision making process, as required by ODOT's Project Development Process. The purpose of a public involvement meeting is to present and discuss the proposed project and to solicit public comments regarding potential social, economic, and environmental impacts.

Information provided in this memo can assist in evaluating alternatives for intersection improvements at Worthington-Galena Road and Huntley Road. If you have any questions or concerns, please contact Christy Pirkle, at 614-775-4516 or via email at cpirkle@emht.com.

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APPENDIX A:

ODNR Biodiversity Database Search

Ohio Department of Natural Resources

JOHN R. KASICH, GOVERNOR — JAMES ZEHRINGER, DIRECTOR

Ohio Division of Wildlife
Scott Zody, Chief
2045 Morse Rd., Bldg. G
Columbus, OH 43229-6693
Phone: (614) 265-6300

November 17, 2014

Christine Rahtz
EMH&T
5500 New Albany Rd.
New Albany, OH 43054

Dear Ms. Rahtz,

After reviewing the Natural Heritage Database, I find the Division of Wildlife has no records of rare or endangered species in the Worthington-Galena Rd./Huntley Rd. intersection improvement project area, including a one mile radius, in Sharon Township, Franklin County, Ohio. We are unaware of any unique ecological sites, geologic features, animal assemblages, scenic rivers, state wildlife areas, nature preserves, parks or forests, national wildlife refuges, parks or forests or other protected natural areas within a one mile radius of the project area. We have no records for Indiana Bat (Myotis sodalis) capture locations within a five mile radius or hibernacula within a ten mile radius of the project site. The nearest Bald Eagle record is approximately 2 ½ miles to the northwest of the project area.

Our inventory program has not completely surveyed Ohio and relies on information supplied by many individuals and organizations. Therefore, a lack of records for any particular area is not a statement that rare species or unique features are absent from that area. This letter only represents a review of rare species and natural features data within the Ohio Natural Heritage Database. It does not fulfill coordination under the National Environmental Policy Act (NEPA) or the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S. C. 661 et seq.) and does not supersede or replace the regulatory authority of any local, state or federal agency nor relieve the applicant of the obligation to comply with any local, state or federal laws or regulations.

Please contact me at 614-265-6818 if I can be of further assistance.

Sincerely,

Debbie Woischke

Debbie Woischke
Ohio Natural Heritage Database Program

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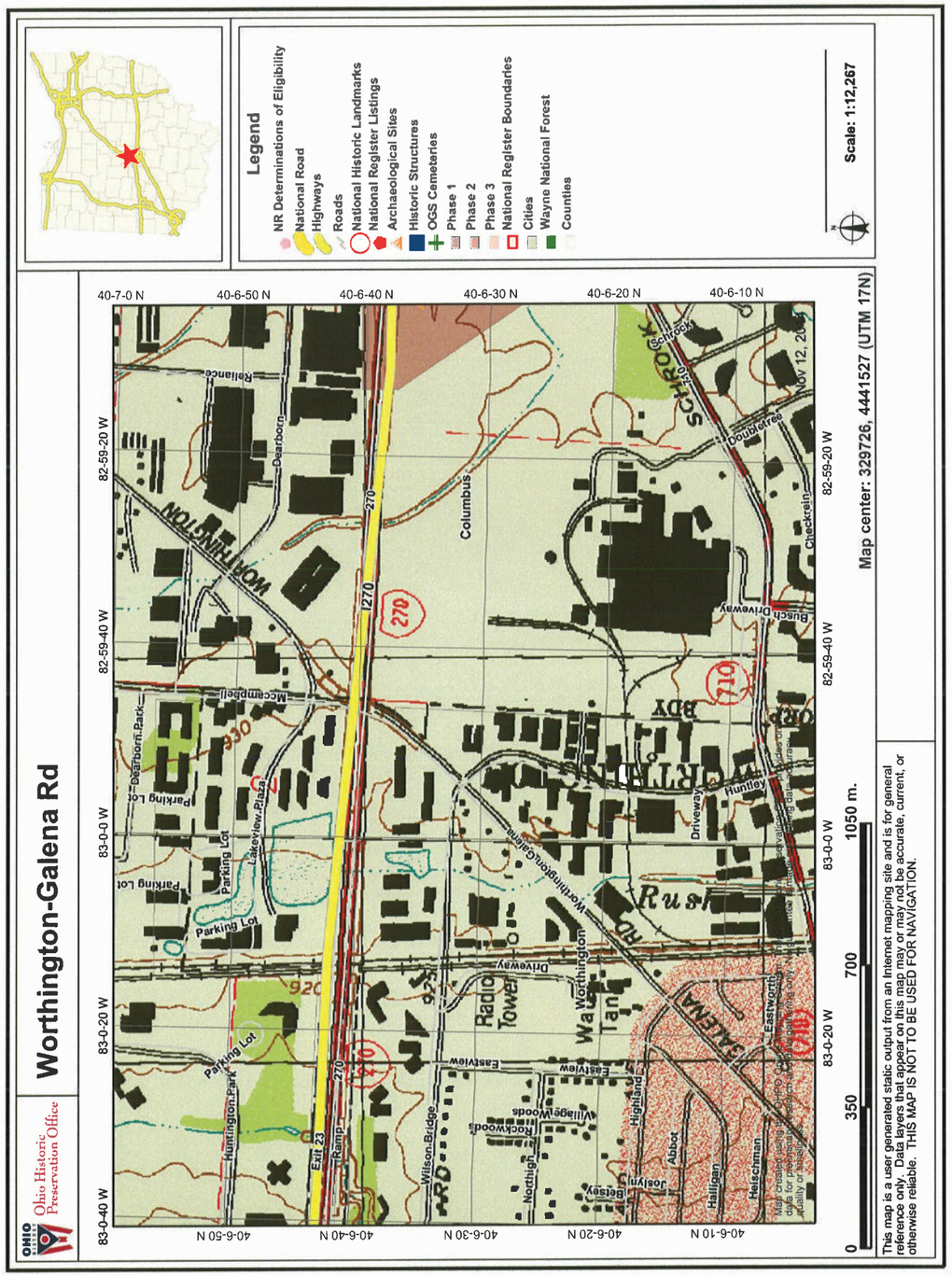
APPENDIX B:

Cultural Resources OHPO Map



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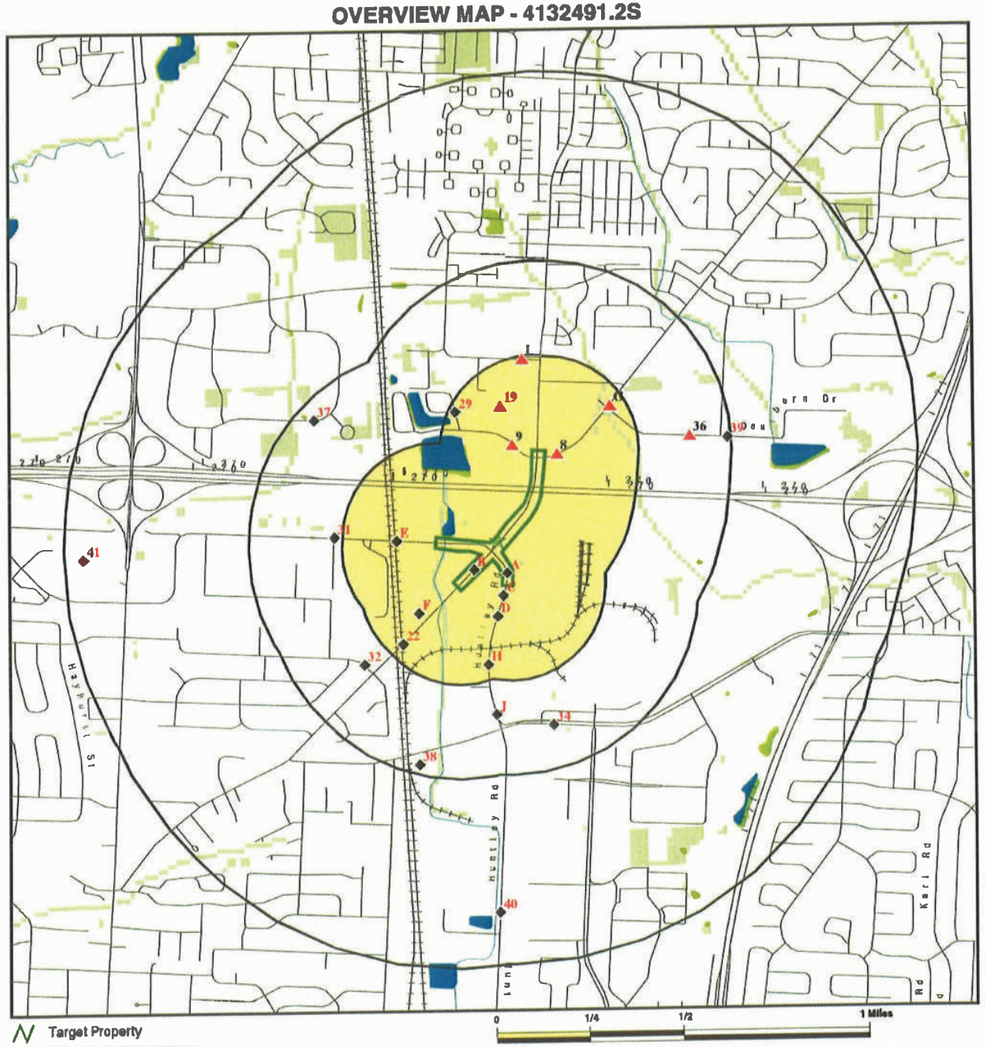
APPENDIX C:

EDR™ Radius Maps

OVERVIEW MAP - 4132491.2S



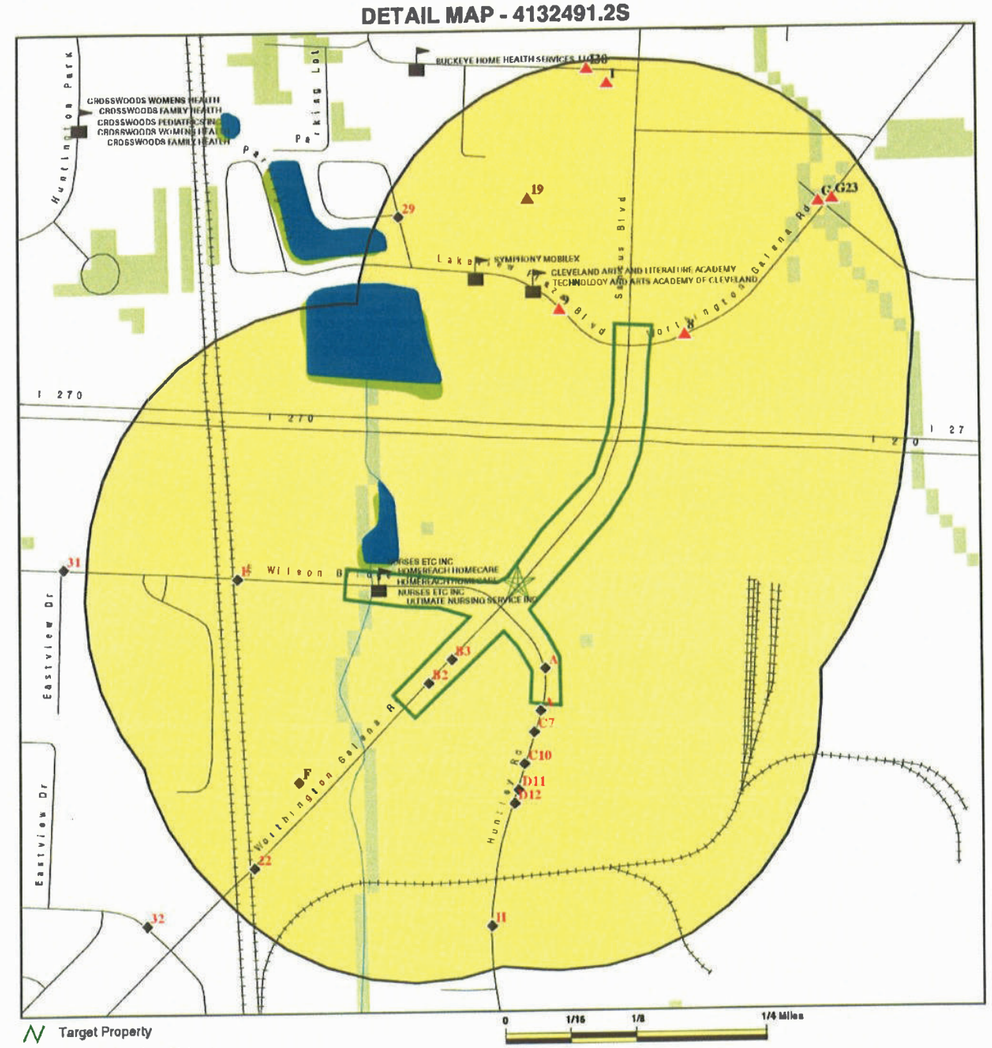
- Target Property
- Sites at elevations higher than or equal to the target property
- Sites at elevations lower than the target property
- Manufactured Gas Plants
- National Priority List Sites
- Dept. Defense Sites
- Indian Reservations BIA
- Oil & Gas pipelines from USGS
- 100-year flood zone
- 500-year flood zone
- National Wetland Inventory
- State Wetlands

This report includes Interactive Map Layers to display and/or hide map information. The legend includes only those icons for the default map view.

SITE NAME: Huntley/Worthington-Galena Intersection Improvemnt ADDRESS: Worthington Galena Road Columbus OH 43085 LAT/LONG: 40.1092 / 82.9981	CLIENT: EMH & T CONTACT: Marty Shuter INQUIRY #: 4132491.2s DATE: November 12, 2014 12:54 pm

Copyright © 2014 EDR, Inc. © 2010 Tele Atlas Rel. 07/2009.

DETAIL MAP - 4132491.2S



- Target Property
- Sites at elevations higher than or equal to the target property
- Sites at elevations lower than the target property
- Manufactured Gas Plants
- Sensitive Receptors
- National Priority List Sites
- Dept. Defense Sites
- Indian Reservations BIA
- Oil & Gas pipelines from USGS
- 100-year flood zone
- 500-year flood zone
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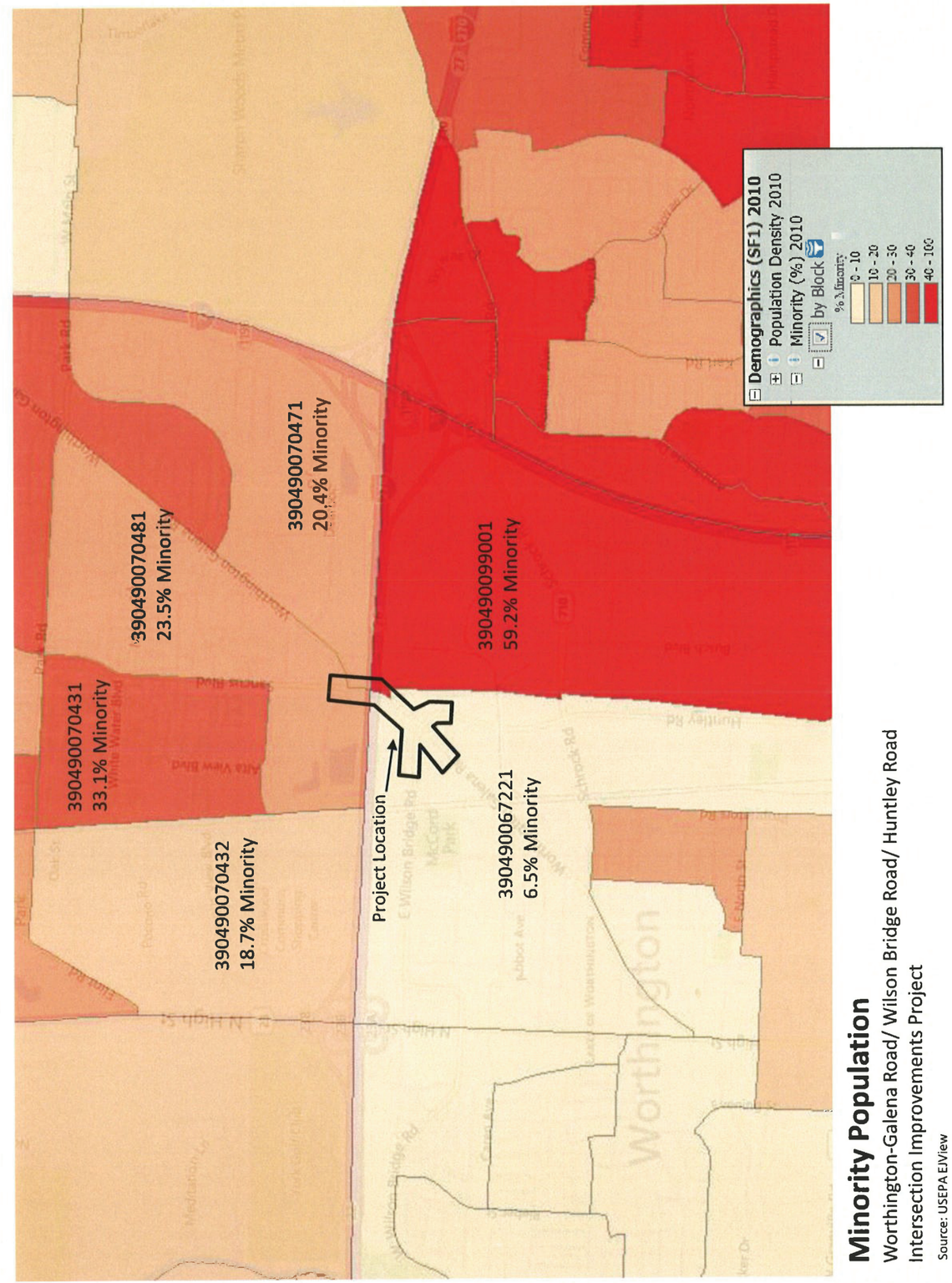
APPENDIX D:

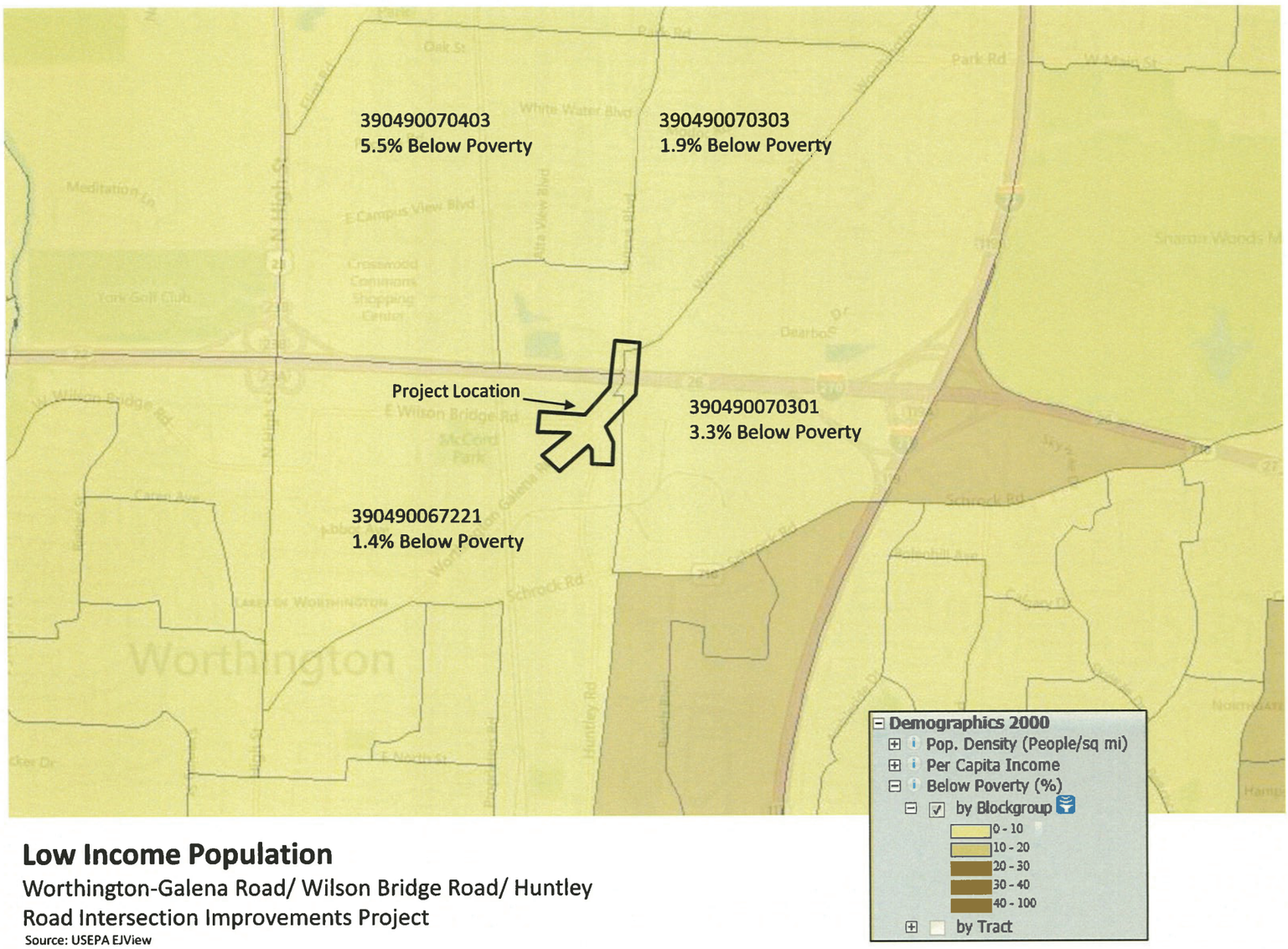
Census Data



Minority Population

Worthington-Galena Road/ Wilson Bridge Road/ Huntley Road Intersection Improvements Project

Source: USEPA EJView



Low Income Population

Worthington-Galena Road/ Wilson Bridge Road/ Huntley Road Intersection Improvements Project

Source: USEPA EJView

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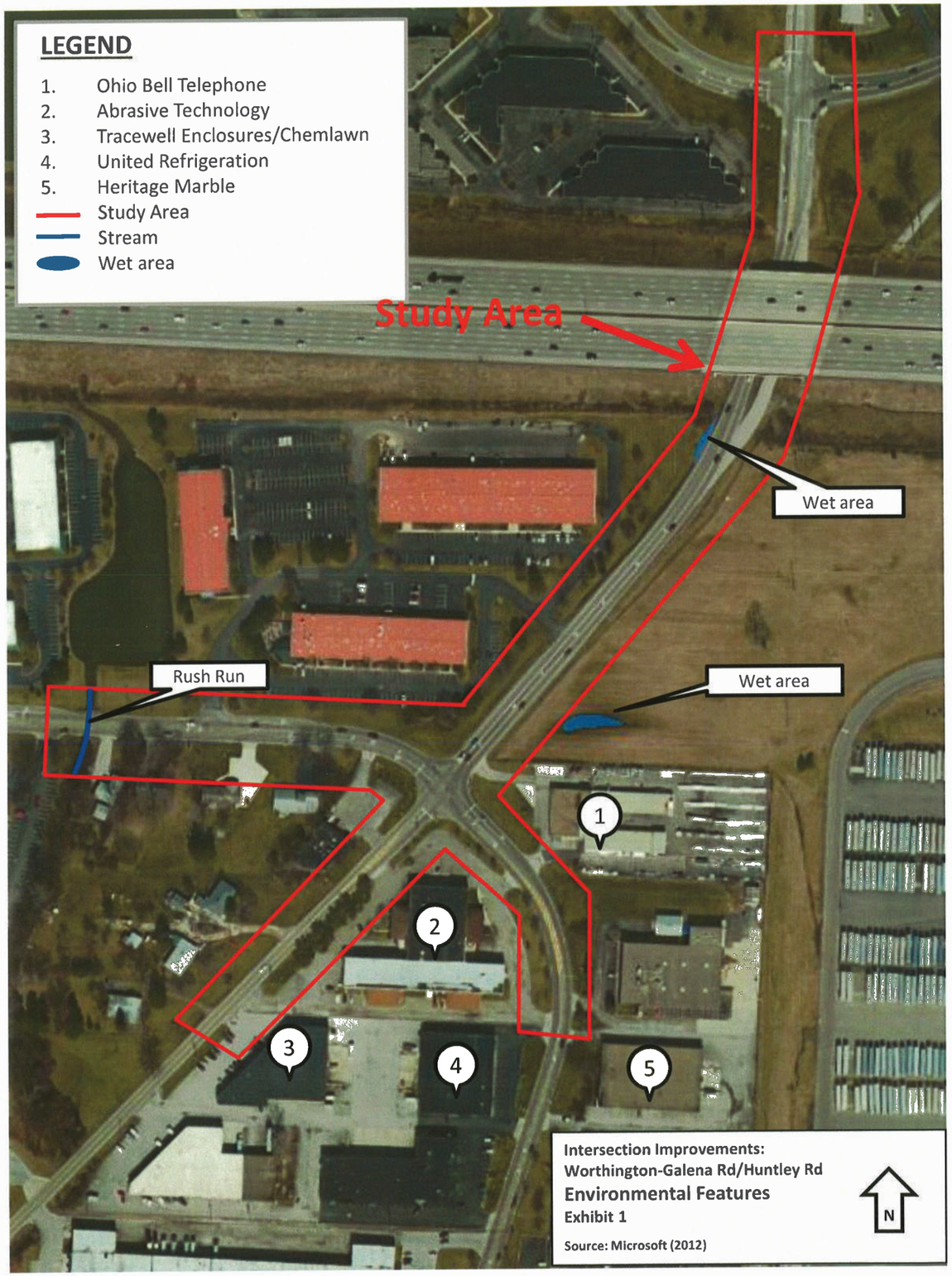
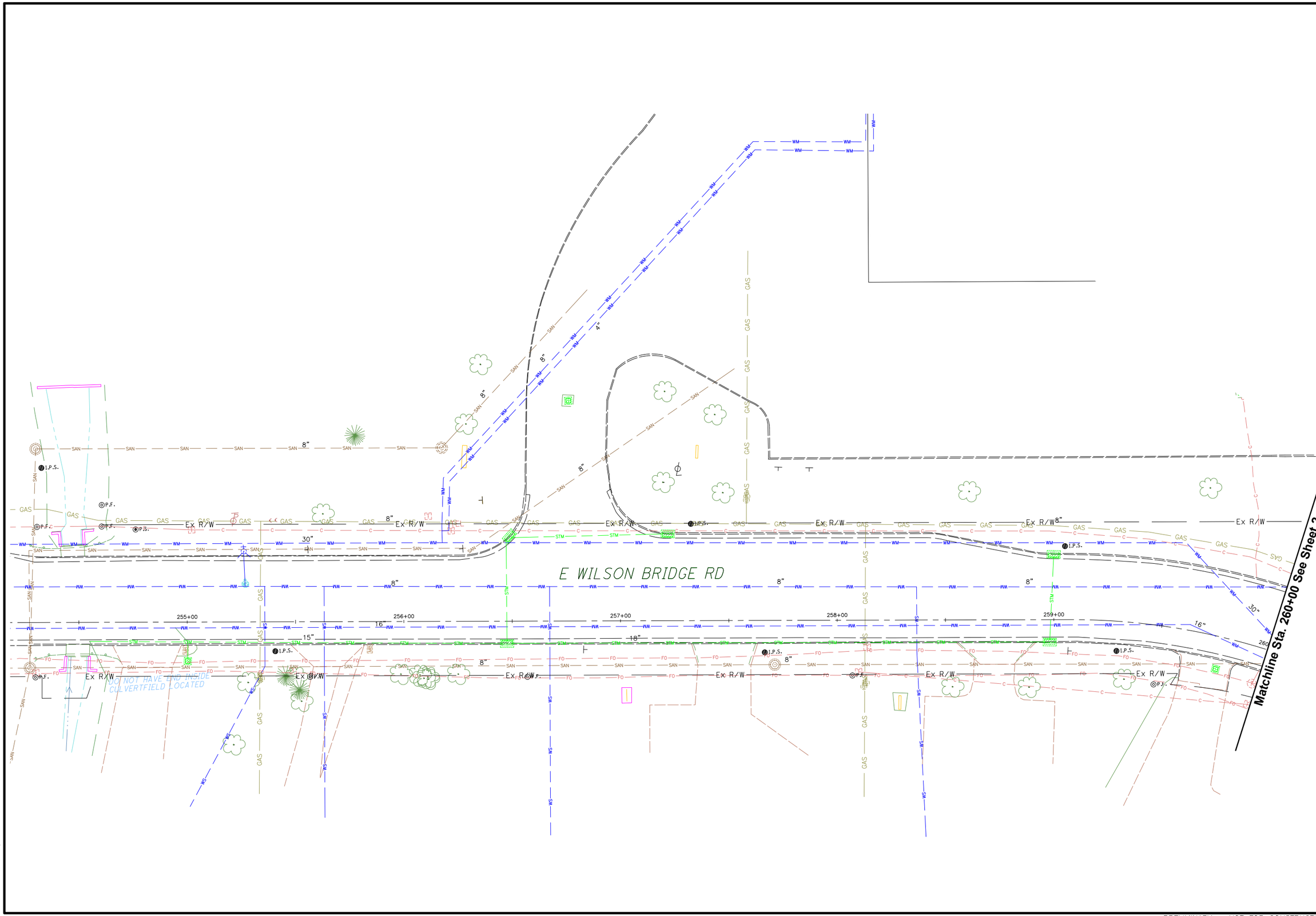
EXHIBITS



Intersection Improvements:
Worthington-Galena Rd/Huntley Rd
Environmental Features
Exhibit 1
Source: Microsoft (2012)

Appendix E



Horz. 1 inch = 20 feet

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EXISTING UTILITIES EXHIBIT

HUNTLEY / WILSON BRIDGE / WORTHINGTON GALENA

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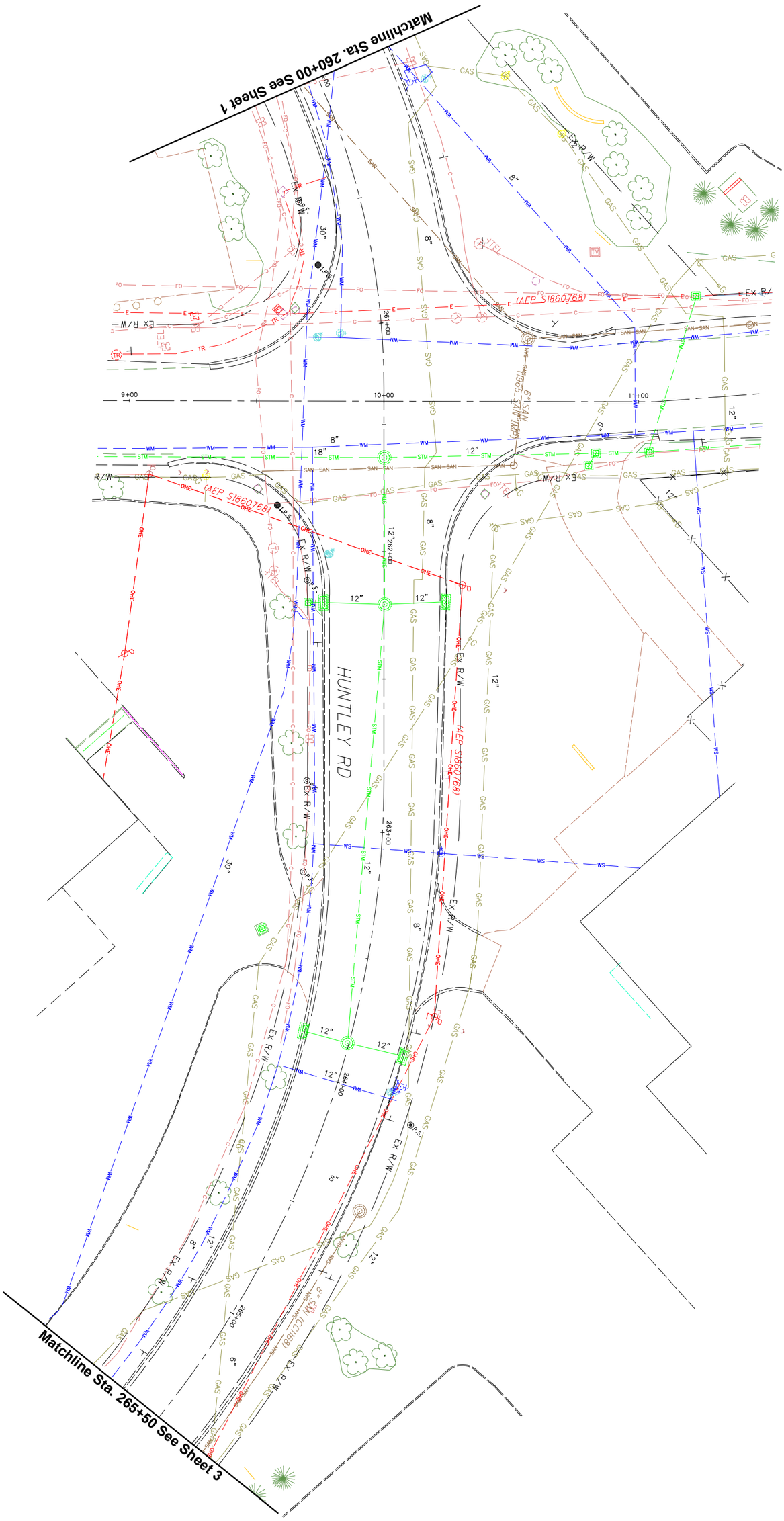

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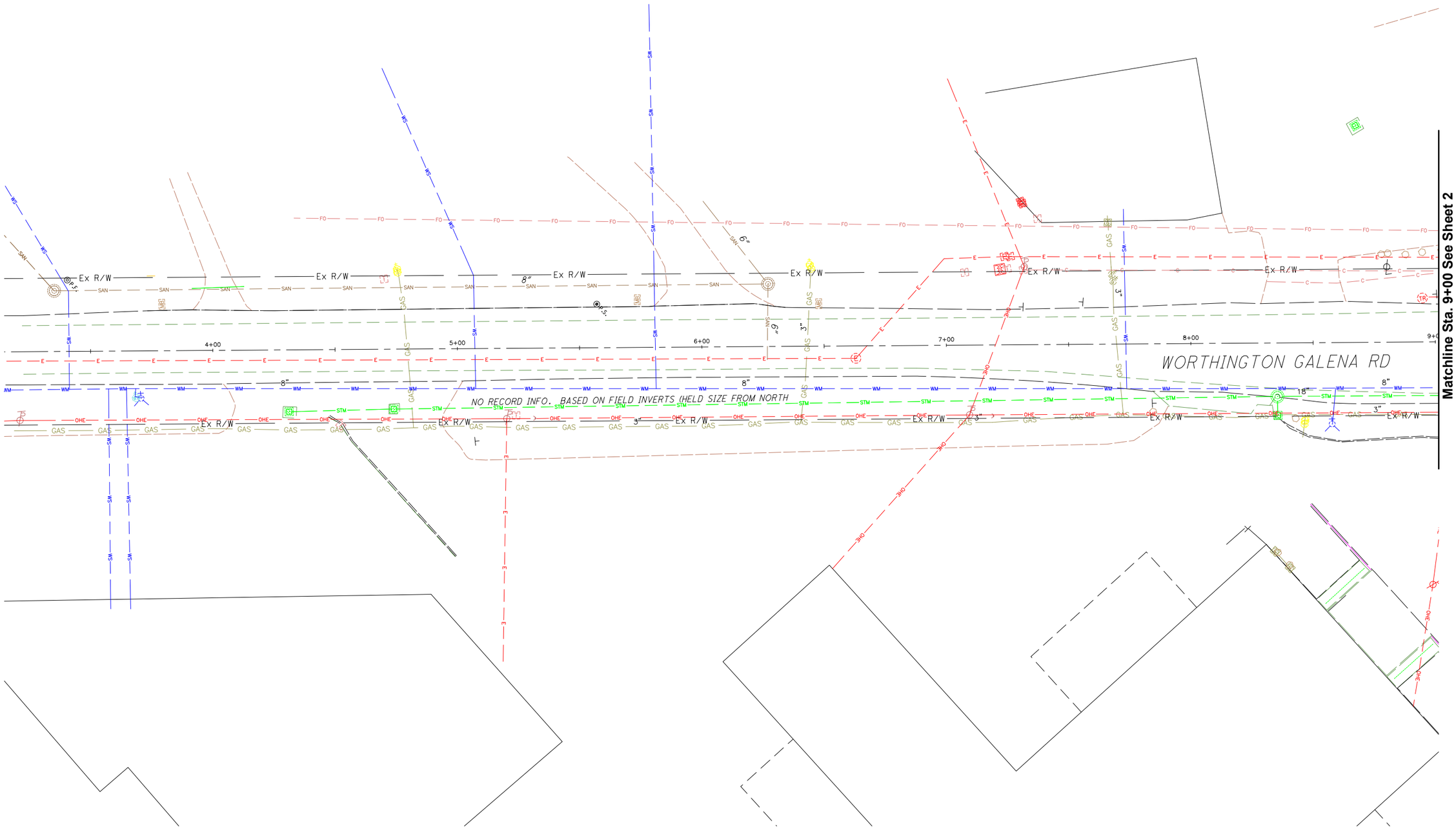

Matchline Sta. 9+00 See Sheet 2

EXISTING UTILITIES EXHIBIT

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HUNTLEY / WILSON BRIDGE / WORTHINGTON GALENA

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EXISTING UTILITIES EXHIBIT

HUNTLEY / WILSON BRIDGE / WORTHINGTON GALENA

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EXISTING UTILITIES EXHIBIT

HUNTLEY / WILSON BRIDGE / WORTHINGTON GALENA

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PRELIMINARY – NOT FOR CONSTRUCTION

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2 Xrefs: 20141176-XS-REFN-E_prime, 20141176-XP-ALRD-PHOTO

EXISTING UTILITIES EXHIBIT

HUNTLEY / WILSON BRIDGE / WORTHINGTON GALENA

CALCULATED

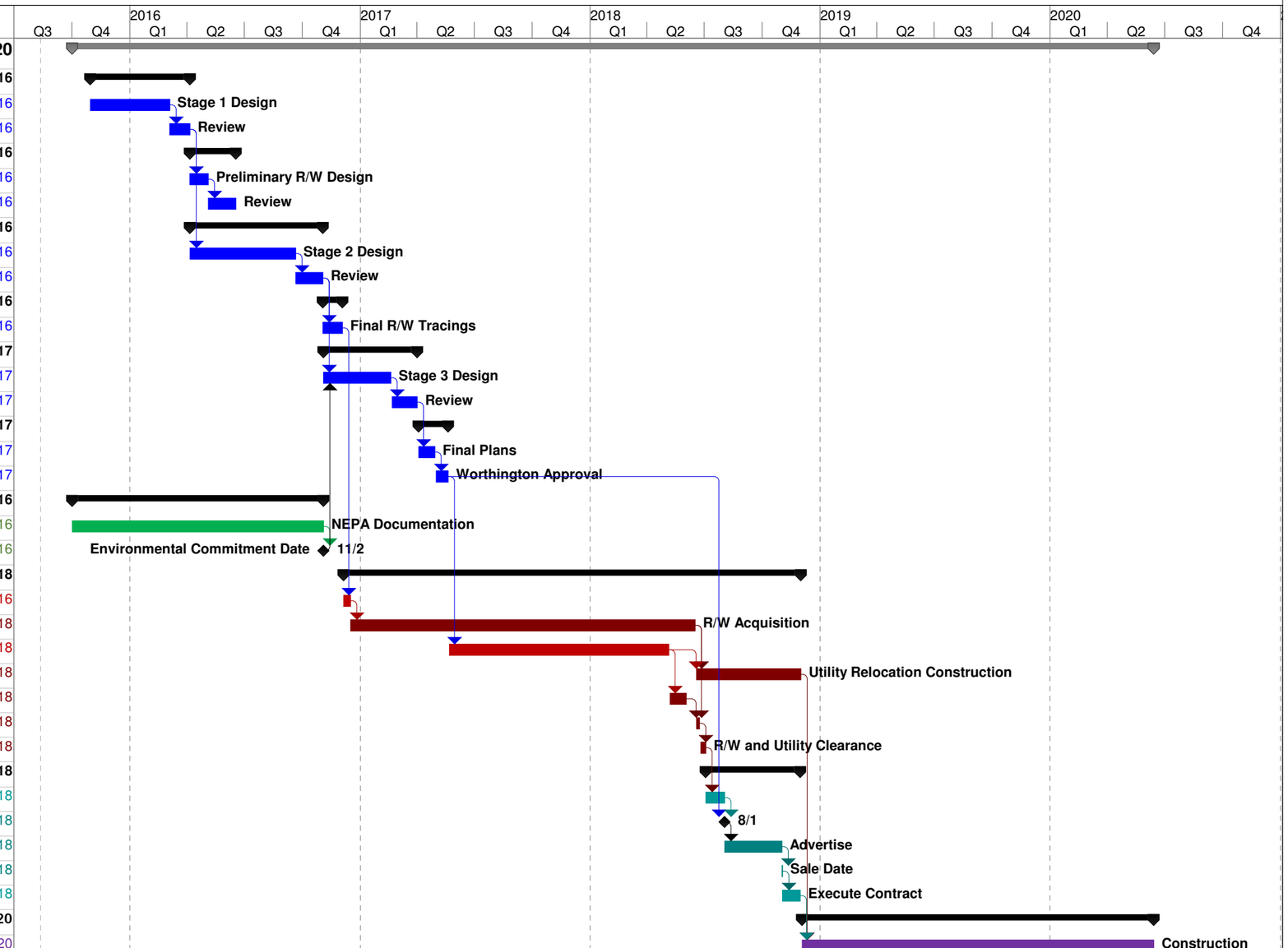
CHECKED

PRELIMINARY — NOT FOR CONSTRUCTION

Appendix F

FRA-CR84-1.36, PID 95516
Huntley / Wilson Bridge / Worthington-Galena Intersection
Project Schedule

ID	Task Name	Duration	Start	Finish
0	**FRA-CR184-1.36, PID 95516**	**1227 days**	**Thu 10/1/15**	**Fri 6/12/20**
1	**Stage 1**	**112 days**	**Fri 10/30/15**	**Mon 4/4/16**
2	Prepare Stage 1	90 days	Fri 10/30/15	Thu 3/3/16
3	Agency Review	22 days	Fri 3/4/16	Mon 4/4/16
4	**Preliminary R/W Plans**	**53 days**	**Tue 4/5/16**	**Thu 6/16/16**
5	Prepare Preliminary R/W Plans	21 days	Tue 4/5/16	Tue 5/3/16
6	Agency Review	32 days	Wed 5/4/16	Thu 6/16/16
7	**Stage 2 & Final R/W Plans**	**151 days**	**Tue 4/5/16**	**Tue 11/1/16**
8	Prepare Stage 2 & Final R/W Review Plans	120 days	Tue 4/5/16	Mon 9/19/16
9	Agency Review	31 days	Tue 9/20/16	Tue 11/1/16
10	**Final R/W Tracings**	**23 days**	**Wed 11/2/16**	**Fri 12/2/16**
11	Prepare Final R/W Tracings	23 days	Wed 11/2/16	Fri 12/2/16
12	**Stage 3 Plans**	**107 days**	**Thu 11/3/16**	**Fri 3/31/17**
13	Prepare Stage 3 Plans	77 days	Thu 11/3/16	Fri 2/17/17
14	Agency Review	30 days	Mon 2/20/17	Fri 3/31/17
15	**Final Plans & Approvals**	**35 days**	**Mon 4/3/17**	**Fri 5/19/17**
16	Final Plan Preparation	20 days	Mon 4/3/17	Fri 4/28/17
17	Worthington Approval	15 days	Mon 5/1/17	Fri 5/19/17
18	**Environmental Documentation**	**285 days**	**Thu 10/1/15**	**Wed 11/2/16**
19	NEPA Documentation & Agency Review	285 days	Thu 10/1/15	Wed 11/2/16
20	Environmental Commitment Date	0 days	Wed 11/2/16	Wed 11/2/16
21	**Right-of-Way and Utilities**	**520 days**	**Mon 12/5/16**	**Fri 11/30/18**
22	Right-of-Way Authorization	9 days	Mon 12/5/16	Thu 12/15/16
23	Right-of-Way Acquisition	391 days	Fri 12/16/16	Fri 6/15/18
24	Utility Relocation Design	250 days	Mon 5/22/17	Fri 5/4/18
25	Utility Relocation Construction	120 days	Mon 6/18/18	Fri 11/30/18
26	Finalize Utility Note	20 days	Mon 5/7/18	Fri 6/1/18
27	LPA Certifies R/W and Utilities	5 days	Mon 6/18/18	Fri 6/22/18
28	ODOT Certifies R/W and Utilities	6 days	Mon 6/25/18	Mon 7/2/18
29	**PS&E, Advertisement, Sale, & Award**	**108 days**	**Tue 7/3/18**	**Thu 11/29/18**
30	Assemble & Review Plan Package	22 days	Tue 7/3/18	Wed 8/1/18
31	Plan Package Received in Central Office	0 days	Wed 8/1/18	Wed 8/1/18
32	Prepare Bid Package & Advertise	65 days	Thu 8/2/18	Wed 10/31/18
33	Sale Date (Earliest)	1 day	Thu 11/1/18	Thu 11/1/18
34	Execute Contract	20 days	Fri 11/2/18	Thu 11/29/18
35	**Construction**	**400 days**	**Mon 12/3/18**	**Fri 6/12/20**
36	Construction	400 days	Mon 12/3/18	Fri 6/12/20



Appendix G

EMH&T

5500 New Albany Road
Columbus, OH 43054
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File Name : Worthington-Galena - Wilson Bridge
Site Code : 00000000
Start Date : 10/21/2014
Page No : 1

Groups Printed- Cars - Trucks

	WORTHINGTON-GALENA Southbound					WILSON BRIDGE Westbound					WORTHINGTON-GALENA Northbound					WILSON BRIDGE Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
07:00 AM	124	61	65	0	250	2	35	124	0	161	1	21	1	0	23	42	24	3	0	69	503
07:15 AM	148	116	87	0	351	6	31	125	0	162	0	30	2	0	32	59	39	3	0	101	646
07:30 AM	149	100	124	0	373	2	40	151	0	193	1	39	1	0	41	76	35	7	0	118	725
07:45 AM	131	76	129	0	336	1	57	167	0	225	3	60	2	0	65	80	40	3	0	123	749
Total	552	353	405	0	1310	11	163	567	0	741	5	150	6	0	161	257	138	16	0	411	2623
08:00 AM	133	115	115	0	363	8	54	183	0	245	3	71	5	0	79	79	51	4	0	134	821
08:15 AM	130	105	97	0	332	4	67	121	0	192	5	63	4	0	72	76	37	5	0	118	714
08:30 AM	129	77	77	0	283	1	70	106	0	177	7	57	6	0	70	60	28	0	0	88	618
08:45 AM	155	92	117	0	364	1	57	121	0	179	3	47	3	0	53	79	67	5	0	151	747
Total	547	389	406	0	1342	14	248	531	0	793	18	238	18	0	274	294	183	14	0	491	2900
*** BREAK ***																					
11:00 AM	75	22	40	0	137	3	34	101	0	138	2	27	2	0	31	34	30	4	0	68	374
11:15 AM	77	31	47	0	155	4	35	92	0	131	4	35	1	0	40	53	34	5	0	92	418
11:30 AM	87	36	62	0	185	7	39	96	0	142	1	30	4	0	35	68	23	2	0	93	455
11:45 AM	97	40	70	0	207	9	29	110	0	148	4	29	5	0	38	78	32	3	0	113	506
Total	336	129	219	0	684	23	137	399	0	559	11	121	12	0	144	233	119	14	0	366	1753
12:00 PM	94	37	58	0	189	4	52	123	0	179	2	37	5	0	44	71	45	3	0	119	531
12:15 PM	93	37	54	0	184	13	46	91	0	150	4	33	9	0	46	60	35	7	0	102	482
12:30 PM	103	36	61	0	200	4	45	100	0	149	6	24	4	0	34	62	40	8	1	111	494
12:45 PM	113	24	64	0	201	3	34	114	0	151	4	36	6	0	46	71	46	2	0	119	517
Total	403	134	237	0	774	24	177	428	0	629	16	130	24	0	170	264	166	20	1	451	2024
*** BREAK ***																					
02:00 PM	86	29	50	0	165	2	33	99	0	134	1	26	4	0	31	57	46	2	0	105	435
02:15 PM	112	50	54	0	216	1	42	87	0	130	6	32	0	0	38	48	38	6	0	92	476
02:30 PM	127	32	70	0	229	5	41	108	0	154	2	38	2	0	42	42	33	3	0	78	503
02:45 PM	110	48	55	0	213	5	38	113	0	156	8	41	5	0	54	66	42	8	0	116	539
Total	435	159	229	0	823	13	154	407	0	574	17	137	11	0	165	213	159	19	0	391	1953
03:00 PM	97	49	66	0	212	6	57	139	0	202	3	52	4	0	59	77	44	3	0	124	597
03:15 PM	133	59	75	0	267	5	49	106	0	160	6	77	4	0	87	66	34	2	0	102	616
03:30 PM	131	54	94	0	279	2	54	122	0	178	6	57	1	0	64	88	59	5	0	152	673
03:45 PM	129	63	119	0	311	1	48	114	0	163	5	62	1	0	68	65	46	3	0	114	656
Total	490	225	354	0	1069	14	208	481	0	703	20	248	10	0	278	296	183	13	0	492	2542
04:00 PM	133	71	112	0	316	2	58	159	0	219	8	65	2	0	75	62	45	4	0	111	721
04:15 PM	162	71	85	0	318	5	39	178	0	222	2	30	5	0	37	60	37	3	0	100	677
04:30 PM	134	47	86	0	267	10	40	149	0	199	1	79	1	0	81	68	61	9	0	138	685
04:45 PM	169	82	118	0	369	2	46	196	0	244	3	51	3	0	57	85	39	7	0	131	801
Total	598	271	401	0	1270	19	183	682	0	884	14	225	11	0	250	275	182	23	0	480	2884
05:00 PM	139	95	142	0	376	4	44	176	0	224	2	93	1	0	96	89	49	4	0	142	838
05:15 PM	161	96	129	0	386	6	39	215	0	260	8	80	2	0	90	63	60	4	0	127	863
05:30 PM	164	120	120	0	404	3	40	224	0	267	2	94	1	0	97	84	52	5	0	141	909
05:45 PM	138	120	102	0	360	5	47	158	0	210	2	79	4	0	85	90	58	3	0	151	806
Total	602	431	493	0	1526	18	170	773	0	961	14	346	8	0	368	326	219	16	0	561	3416
Grand Total	3963	2091	2744	0	8798	136	1440	4268	0	5844	115	1595	100	0	1810	2158	1349	135	1	3643	20095
Apprch %	45	23.8	31.2	0		2.3	24.6	73	0		6.4	88.1	5.5	0		59.2	37	3.7	0		
Total %	19.7	10.4	13.7	0	43.8	0.7	7.2	21.2	0	29.1	0.6	7.9	0.5	0	9	10.7	6.7	0.7	0	18.1	
Cars	3884	2085	2739	0	8708	134	1432	4191	0	5757	115	1586	98	0	1799	2149	1339	135	1	3624	19888
% Cars	98	99.7	99.8	0	99	98.5	99.4	98.2	0	98.5	100	99.4	98	0	99.4	99.6	99.3	100	100	99.5	99
Trucks	79	6	5	0	90	2	8	77	0	87	0	9	2	0	11	9	10	0	0	19	207
% Trucks	2	0.3	0.2	0	1	1.5	0.6	1.8	0	1.5	0	0.6	2	0	0.6	0.4	0.7	0	0	0.5	1

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File Name : Worthington-Galena - Wilson Bridge
Site Code : 00000000
Start Date : 10/21/2014
Page No : 2

	WORTHINGTON-GALENA Southbound					WILSON BRIDGE Westbound					WORTHINGTON-GALENA Northbound					WILSON BRIDGE Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 09:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:30 AM																					
07:30 AM	**149**	100	124	0	**373**	2	40	151	0	193	1	39	1	0	41	76	35	**7**	0	118	725
07:45 AM	131	76	**129**	0	336	1	57	167	0	225	3	60	2	0	65	**80**	40	3	0	123	749
08:00 AM	133	**115**	115	0	363	**8**	54	**183**	0	**245**	3	**71**	**5**	0	**79**	79	**51**	4	0	**134**	**821**
08:15 AM	130	105	97	0	332	4	**67**	121	0	192	**5**	63	4	0	72	76	37	5	0	118	714
Total Volume	543	396	465	0	1404	15	218	622	0	855	12	233	12	0	257	311	163	19	0	493	3009
% App. Total	38.7	28.2	33.1	0		1.8	25.5	72.7	0		4.7	90.7	4.7	0		63.1	33.1	3.9	0		
PHF	.911	.861	.901	.000	.941	.469	.813	.850	.000	.872	.600	.820	.600	.000	.813	.972	.799	.679	.000	.920	.916

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File Name : Worthington-Galena - Wilson Bridge
Site Code : 00000000
Start Date : 10/21/2014
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	WORTHINGTON-GALENA Southbound					WILSON BRIDGE Westbound					WORTHINGTON-GALENA Northbound					WILSON BRIDGE Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 12:00 PM																					
12:00 PM	94	**37**	58	0	189	4	**52**	**123**	0	**179**	2	**37**	5	0	44	**71**	45	3	0	**119**	**531**
12:15 PM	93	37	54	0	184	**13**	46	91	0	150	4	33	**9**	0	**46**	60	35	7	0	102	482
12:30 PM	103	36	61	0	200	4	45	100	0	149	**6**	24	4	0	34	62	40	**8**	**1**	111	494
12:45 PM	**113**	24	**64**	0	**201**	3	34	114	0	151	4	36	6	0	46	71	**46**	2	0	119	517
Total Volume	403	134	237	0	774	24	177	428	0	629	16	130	24	0	170	264	166	20	1	451	2024
% App. Total	52.1	17.3	30.6	0		3.8	28.1	68	0		9.4	76.5	14.1	0		58.5	36.8	4.4	0.2		
PHF	.892	.905	.926	.000	.963	.462	.851	.870	.000	.878	.667	.878	.667	.000	.924	.930	.902	.625	.250	.947	.953

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File Name : Worthington-Galena - Wilson Bridge
Site Code : 00000000
Start Date : 10/21/2014
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	WORTHINGTON-GALENA Southbound					WILSON BRIDGE Westbound					WORTHINGTON-GALENA Northbound					WILSON BRIDGE Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 02:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	139	95	**142**	0	376	4	44	176	0	224	2	93	1	0	96	89	49	4	0	142	838
05:15 PM	161	96	129	0	386	**6**	39	215	0	260	**8**	80	2	0	90	63	**60**	4	0	127	863
05:30 PM	**164**	**120**	120	0	**404**	3	40	**224**	0	**267**	2	**94**	1	0	**97**	84	52	**5**	0	141	**909**
05:45 PM	138	120	102	0	360	5	**47**	158	0	210	2	79	**4**	0	85	**90**	58	3	0	**151**	806
Total Volume	602	431	493	0	1526	18	170	773	0	961	14	346	8	0	368	326	219	16	0	561	3416
% App. Total	39.4	28.2	32.3	0		1.9	17.7	80.4	0		3.8	94	2.2	0		58.1	39	2.9	0		
PHF	.918	.898	.868	.000	.944	.750	.904	.863	.000	.900	.438	.920	.500	.000	.948	.906	.913	.800	.000	.929	.939

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File Name : Worthington-Galena - Sancus
Site Code : 00000000
Start Date : 10/15/2014
Page No : 1

Groups Printed- Cars - Trucks

	SANCUS Southbound					WORTHINGTON-GALENA Westbound					WORTHINGTON GALENA Northbound					LAKEVIEW PLAZA Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
07:00 AM	6	132	8	1	147	120	4	4	0	128	16	84	76	0	176	3	0	3	0	6	457
07:15 AM	0	184	13	0	197	214	6	1	0	221	17	118	87	0	222	2	1	6	0	9	649
07:30 AM	8	204	9	0	221	190	5	0	0	195	19	129	105	0	253	2	0	2	0	4	673
07:45 AM	4	180	15	0	199	150	6	1	0	157	39	157	128	0	324	2	1	16	0	19	699
Total	18	700	45	1	764	674	21	6	0	701	91	488	396	0	975	9	2	27	0	38	2478
08:00 AM	5	188	6	0	199	167	2	1	0	170	28	140	114	0	282	5	1	8	0	14	665
08:15 AM	4	168	13	0	185	166	5	2	0	173	26	136	109	0	271	2	0	17	0	19	648
08:30 AM	5	126	14	0	145	172	9	2	0	183	38	128	124	0	290	3	3	9	0	15	633
08:45 AM	7	136	13	0	156	183	14	1	0	198	35	94	90	0	219	1	2	9	0	12	585
Total	21	618	46	0	685	688	30	6	0	724	127	498	437	0	1062	11	6	43	0	60	2531
*** BREAK ***																					
04:00 PM	0	155	5	0	160	139	4	7	0	150	12	113	126	0	251	6	7	25	0	38	599
04:15 PM	2	135	4	0	141	128	2	3	0	133	8	147	128	1	284	9	2	23	0	34	592
04:30 PM	2	196	1	0	199	166	5	4	0	175	5	152	123	0	280	8	5	42	0	55	709
04:45 PM	1	208	3	0	212	127	5	0	0	132	8	180	109	0	297	8	7	22	0	37	678
Total	5	694	13	0	712	560	16	14	0	590	33	592	486	1	1112	31	21	112	0	164	2578
05:00 PM	3	238	2	0	243	94	2	4	0	100	12	154	136	0	302	24	8	42	0	74	719
05:15 PM	2	231	1	0	234	111	1	2	0	114	4	160	162	0	326	11	7	32	0	50	724
05:30 PM	4	243	2	0	249	67	1	1	0	69	5	137	155	0	297	12	10	39	0	61	676
05:45 PM	0	211	5	0	216	118	1	1	0	120	8	157	133	0	298	4	0	25	0	29	663
Total	9	923	10	0	942	390	5	8	0	403	29	608	586	0	1223	51	25	138	0	214	2782
Grand Total	53	2935	114	1	3103	2312	72	34	0	2418	280	2186	1905	1	4372	102	54	320	0	476	10369
Apprch %	1.7	94.6	3.7	0		95.6	3	1.4	0		6.4	50	43.6	0		21.4	11.3	67.2	0		
Total %	0.5	28.3	1.1	0	29.9	22.3	0.7	0.3	0	23.3	2.7	21.1	18.4	0	42.2	1	0.5	3.1	0	4.6	
Cars	46	2893	113	1	3053	2250	71	27	0	2348	274	2157	1853	1	4285	101	53	315	0	469	10155
% Cars	86.8	98.6	99.1	100	98.4	97.3	98.6	79.4	0	97.1	97.9	98.7	97.3	100	98	99	98.1	98.4	0	98.5	97.9
Trucks	7	42	1	0	50	62	1	7	0	70	6	29	52	0	87	1	1	5	0	7	214
% Trucks	13.2	1.4	0.9	0	1.6	2.7	1.4	20.6	0	2.9	2.1	1.3	2.7	0	2	1	1.9	1.6	0	1.5	2.1

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File Name : Worthington-Galena - Sancus
Site Code : 00000000
Start Date : 10/15/2014
Page No : 2

	SANCUS Southbound					WORTHINGTON-GALENA Westbound					WORTHINGTON GALENA Northbound					LAKEVIEW PLAZA Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15 AM																					
07:15 AM	0	184	13	0	197	**214**	**6**	**1**	0	**221**	17	118	87	0	222	2	**1**	6	0	9	649
07:30 AM	**8**	**204**	9	0	**221**	190	5	0	0	195	19	129	105	0	253	2	0	2	0	4	673
07:45 AM	4	180	**15**	0	199	150	6	1	0	157	**39**	**157**	**128**	0	**324**	2	1	**16**	0	**19**	**699**
08:00 AM	5	188	6	0	199	167	2	1	0	170	28	140	114	0	282	**5**	1	8	0	14	665
Total Volume	17	756	43	0	816	721	19	3	0	743	103	544	434	0	1081	11	3	32	0	46	2686
% App. Total	2.1	92.6	5.3	0		97	2.6	0.4	0		9.5	50.3	40.1	0		23.9	6.5	69.6	0		
PHF	.531	.926	.717	.000	.923	.842	.792	.750	.000	.840	.660	.866	.848	.000	.834	.550	.750	.500	.000	.605	.961

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File Name : Worthington-Galena - Sancus
Site Code : 00000000
Start Date : 10/15/2014
Page No : 3

	SANCUS Southbound					WORTHINGTON-GALENA Westbound					WORTHINGTON GALENA Northbound					LAKEVIEW PLAZA Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:30 PM																					
04:30 PM	2	196	1	0	199	**166**	**5**	**4**	0	**175**	5	152	123	0	280	8	5	**42**	0	55	709
04:45 PM	1	208	**3**	0	212	127	5	0	0	132	8	**180**	109	0	297	8	7	22	0	37	678
05:00 PM	**3**	**238**	2	0	**243**	94	2	4	0	100	**12**	154	136	0	302	**24**	**8**	42	0	**74**	719
05:15 PM	2	231	1	0	234	111	1	2	0	114	4	160	**162**	0	**326**	11	7	32	0	50	**724**
Total Volume	8	873	7	0	888	498	13	10	0	521	29	646	530	0	1205	51	27	138	0	216	2830
% App. Total	0.9	98.3	0.8	0		95.6	2.5	1.9	0		2.4	53.6	44	0		23.6	12.5	63.9	0		
PHF	.667	.917	.583	.000	.914	.750	.650	.625	.000	.744	.604	.897	.818	.000	.924	.531	.844	.821	.000	.730	.977

Ohio Department of Transportation

Central Office • 1980 West Broad Street • Columbus, OH 43223
John R. Kasich, Governor • Jerry Wray, Director

January 16, 2015

Doug Bender
EMH&T
5500 New Albany Rd.
Columbus, OH 43054

RE: FRA-Worthington Galena (No PID) Certified Traffic

Mr. Bender:

In reply to a request received November 26, 2014, attached are the 2016/2036 ADT, A.M. DHV, and P.M. DHV turning movements for the subject project. Please use the following design designations:

	Worthington Galena Rd		**Wilson Bridge Rd**	**Huntley Rd**
	north leg	*south leg*	*west leg*	*east leg*
2016 ADT:	28,930	7,220	13,630	19,120
2036 ADT:	36,870	9,560	17,030	21,940
K:	0.11	0.12	0.09	0.10
2036 DHV:	4,040	1,160	1620	2,200
D:	0.52	0.56	0.55	0.53
T24:	0.04	0.04	0.04	0.04
TD:	0.02	0.02	0.02	0.02

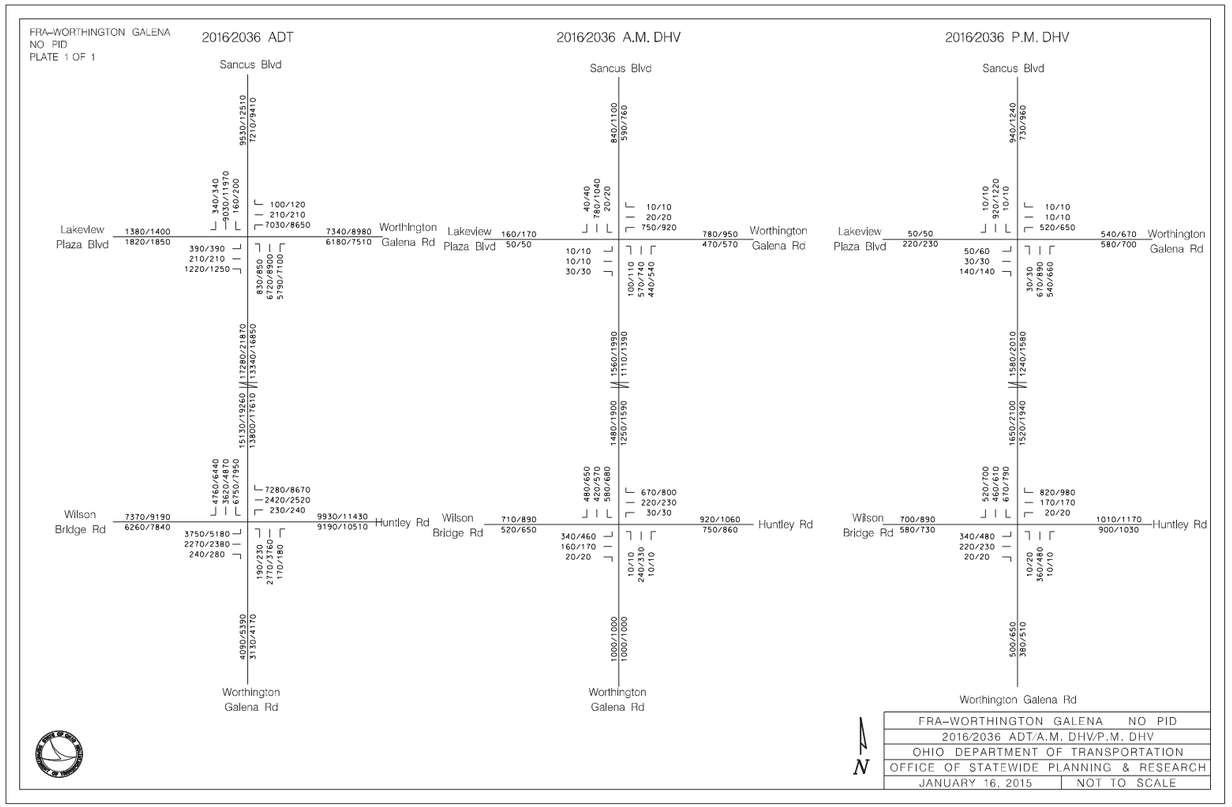
	Sancus Blvd	**Worthington Galena Rd**	**Lakeview Plaza Blvd**	**Worthington Galena Rd**
	north leg	*south leg*	*west leg*	*east leg*
2016 ADT:	16,740	30,620	3,200	13,520
2036 ADT:	21,920	38,720	3,250	16,490
K:	0.10	0.09	0.08	0.08
2036 DHV:	2,200	3,590	280	1,370
D:	0.56	0.56	0.82	0.51
T24:	0.04	0.04	0.04	0.04
TD:	0.02	0.02	0.02	0.02

If you have any questions, please contact me at (614) 466-7826 or at andrew.hurst@dot.state.oh.us.

Sincerely,

Andrew Hurst, PE
Modeling & Forecasting
Office of Statewide Planning & Research
Ohio Department of Transportation

c: David Carlin ,ODOT District 6; M. Byram, OMP – File



Warrants Summary

Information

Analyst	CW	Intersection	Worthington Ga/Wilson Brid
Agency/Co	EMH&T	Jurisdiction	City of Columbus
Date Performed	10/22/2014	Units	U.S. Customary
Project ID	20141176	Time Period Analyzed	7-9am, 11am-1pm, 2-6pm
East/West Street	Wilson Bridge/Huntley	North/South Street	Worthington Galena
File Name	worthington and Wilson Bridge.xhy	Major Street	North-South

Project Description *20141176*

General

Major Street Speed (mph)	35	☐	Population < 10,000
Nearest Signal (ft)	1500	☐	Coordinated Signal System
Crashes (per year)	0	☐	Adequate Trials of Alternatives

Roadway Network

Two Major Routes	☐
Weekend Count	☐
5-yr Growth Factor	0

Geometry and Traffic	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of lanes, N	1	1	0	1	1	1	1	1	0	1	1	0
Lane usage	L	TR		L	T	R	L	TR		L	TR	
Vehicle Volume Averages (vph)	179	112	11	11	120	355	9	132	8	330	174	228
Peds (ped/h) / Gaps (gaps/h)	--	/	--	--	/	--	--	/	--	--	/	--
Delay (s/veh) / (veh-hr)	--	/	--	--	/	--	--	/	--	--	/	--

Warrant 1: Eight-Hour Vehicular Volume	☑
1 A. Minimum Vehicular Volumes (Both major approaches --and-- higher minor approach) --or--	☑
1 B. Interruption of Continuous Traffic (Both major approaches --and-- higher minor approach) --or--	☐
1 80% Vehicular --and-- Interruption Volumes (Both major approaches --and-- higher minor approach)	☑
Warrant 2: Four-Hour Vehicular Volume	☑
2 A. Four-Hour Vehicular Volumes (Both major approaches --and-- higher minor approach)	☑
Warrant 3: Peak Hour	☑
3 A. Peak-Hour Conditions (Minor delay --and-- minor volume --and-- total volume) --or--	☐
3 B. Peak- Hour Vehicular Volumes (Both major approaches --and-- higher minor approach)	☑
Warrant 4: Pedestrian Volume	☐
4 A. Pedestrian Volumes (Four hours --or-- one hour) --and--	☐
4 B. Gaps Same Period (Four hours --or-- one hour)	☐
Warrant 5: School Crossing	☐
5. Student Volumes --and--	☐
5. Gaps Same Period	☐
Warrant 6: Coordinated Signal System	☐
6. Degree of Platooning (Predominant direction or both directions)	☐
Warrant 7: Crash Experience	☐
7 A. Adequate trials of alternatives, observance and enforcement failed --and--	☐
7 B. Reported crashes susceptible to correction by signal (12-month period) --and--	☐
7 C. 80% Volumes for Warrants 1A, 1B --or-- 4 are satisfied	☑
Warrant 8: Roadway Network	☐
8 A. Weekday Volume (Peak hour total --and-- projected warrants 1, 2 or 3) --or--	☐
8 B. Weekend Volume (Five hours total)	☐

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Warrants Volume

Information

Analyst	CW	Intersection	Worthington Ga/Wilson Brid
Agency/Co	EMH&T	Jurisdiction	City of Columbus
Date Performed	10/22/2014	Units	U.S. Customary
Project ID	20141176	Time Period Analyzed	7-9am, 11am-1pm, 2-6pm
East/West Street	Wilson Bridge/Huntley	North/South Street	Worthington Galena
File Name	worthington and Wilson Bridge.xhy	Major Street	North-South

Project Description *20141176*

Warrant 1

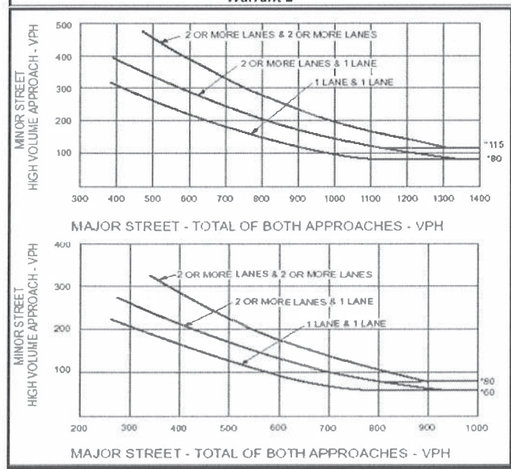
Condition A - Minimum Vehicular Volume

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)			Vehicles per hour on higher-volume minor-street approach (one direction only)		
Major Street	Minor Street	100%*	80%*	70%*	100%*	80%*	70%*
1	1	500	400	350	150	120	105
2 or more	1	600	480	420	150	120	105
2 or more	2 or more	600	480	420	200	160	140
1	2 or more	500	400	350	200	160	140

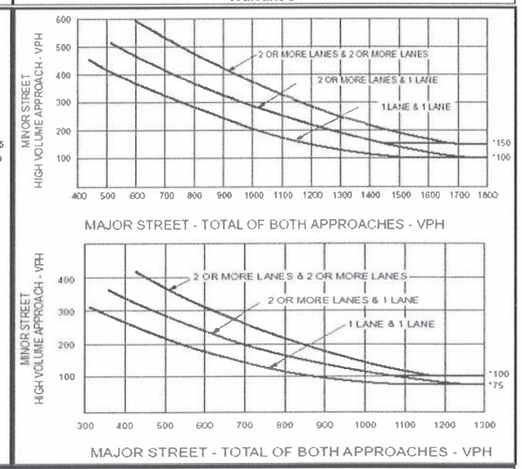
Condition B - Interruption of Continuous Traffic

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)			Vehicles per hour on higher-volume minor-street approach (one direction only)		
Major Street	Minor Street	100%*	80%*	70%*	100%*	80%*	70%*
1	1	750	600	525	75	60	53
2 or more	1	900	720	630	75	60	53
2 or more	2 or more	900	720	630	100	80	70
1	2 or more	750	600	525	100	80	70

Warrant 2



Warrant 3



Volume Summary

Major Street Lanes 2+			Minor Street Lanes 2+		Speed	35		Population	10000+	
Hours	Major Volume	Minor Volume	Total Volume	1A (100%)	1A (80%)	1B (100%)	1B (80%)	2 (100%)	3A (100%)	3B (100%)
07-08	1471	741	2623	Yes	Yes	Yes	Yes	Yes	No	Yes
08-09	1616	793	2900	Yes	Yes	Yes	Yes	Yes	No	Yes
09-10	0	0	0	No	No	No	No	No	No	No
10-11	0	0	0	No	No	No	No	No	No	No
11-12	828	559	1753	Yes	Yes	No	Yes	Yes	No	Yes
12-13	944	629	2023	Yes	Yes	Yes	Yes	Yes	No	Yes
13-14	0	0	0	No	No	No	No	No	No	No
14-15	988	574	1953	Yes	Yes	Yes	Yes	Yes	No	Yes
15-16	1347	703	2542	Yes	Yes	Yes	Yes	Yes	No	Yes
16-17	1520	884	2884	Yes	Yes	Yes	Yes	Yes	No	Yes
17-18	1894	961	3416	Yes	Yes	Yes	Yes	Yes	No	Yes
18-19	0	0	0	No	No	No	No	No	No	No
Totals	10608	5844	20094	8	8	7	8	8	0	8

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Appendix H

Capacity Analysis Results

Geometric	Intersection	Scenario	Eastbound				Westbound				Northbound				Southbound				Int.
			LT	TH	RT	App.	LT	TH	RT	App.	LT	TH	RT	App.	LT	TH	RT	App.	
No-Build Existing Lanes	Huntley/Wilson Bridge/Worthington Galena	2016 AM Peak	F/112.2	C/34.6	C/34.6	F/85.3	D/54.7	F/111.3	F/117.7	F/114.1	E/78.9	D/50.3	D/50.3	D/51.4	D/40.0	E/58.1	E/58.1	D/51.0	E/74.9
		2036 AM Peak	F/298.0	D/37.2	D/37.2	F/221.7	E/56.5	F/96.1	F/157.2	F/141.1	F/85.8	E/70.6	E/70.6	E/71.0	F/131.3	F/193.0	F/193.0	F/170.9	F/162.4
		2016 PM Peak	F/156.3	D/40.6	D/40.6	F/108.5	E/56.3	F/90.6	F/137.1	F/127.6	E/79.3	F/103.3	F/103.3	F/102.6	F/91.0	F/59.4	F/59.4	E/72.2	F/96.7
		2036 PM Peak	F/406.4	D/42.1	D/42.1	F/281.6	E/55.9	E/67.2	F/298.2	F/260.4	F/103.4	F/100.2	F/100.2	F/100.3	F/299.6	F/206.1	F/206.1	F/241.3	F/236.8
Signalized Widening (Feasible)	Huntley/Wilson Bridge/Worthington Galena	2036 AM Peak	E/65.0	B/18.3	B/18.3	D/51.4	C/31.5	D/39.0	C/25.9	C/28.9	C/34.2	D/38.6	D/38.5	D/38.4	E/68.3	C/24.7	B/16.1	D/37.3	D/37.5
		2036 PM Peak	E/66.3	C/24.1	C/24.1	D/51.8	D/38.4	D/44.1	D/37.7	D/38.7	D/38.9	D/53.4	D/53.0	D/52.6	E/65.4	C/24.0	D/50.0	D/48.2	D/46.8
Widening & Roundabout (Feasible)	Huntley/Wilson Bridge/Worthington Galena	2036 AM Peak	D/26.5	C/22.7	C/22.7	D/25.4	B/13.8	B/13.8	N/A	A/3.5	C/21.1	C/20.4	C/19.8	C/20.4	B/10.2	C/20.3	N/A	A/9.8	B/11.6
		2036 PM Peak	E/42.0	E/36.6	E/36.6	E/40.1	B/13.5	B/13.5	N/A	A/2.4	F/53.3	F/51.6	F/50.1	F/51.7	B/10.4	C/19.3	N/A	A/9.6	C/17.4
Signalized Realignment #1 (Feasible)	East Intersection	2036 AM Peak	B/19.5	N/A	B/16.5	B/19.0	N/A	N/A	N/A	N/A	D/40.1	B/19.5	N/A	C/24.6	N/A	D/36.6	B/10.1	B/19.6	C/20.8
		2036 PM Peak	C/22.8	N/A	B/18.5	C/21.9	N/A	N/A	N/A	N/A	D/43.8	C/24.5	N/A	C/27.7	N/A	D/38.0	A/8.1	B/19.3	C/22.2
	West Intersection	2036 AM Peak	D/39.6	C/24.0	C/24.0	C/25.7	D/53.2	B/16.7	B/16.7	C/30.7	D/38.1	C/34.6	C/25.1	C/26.6	D/36.9	D/36.0	D/36.0	D/36.2	C/29.1
		2036 PM Peak	C/27.0	C/26.0	C/25.9	C/26.0	D/52.6	B/13.5	B/13.5	C/29.4	D/46.6	D/41.4	D/40.7	D/41.0	D/46.2	D/43.4	D/43.4	D/44.3	C/31.4
Signalized Realignment Minimize Separation (Considered & Dismissed)	East Intersection	2036 AM Peak	C/20.6	N/A	B/17.3	C/20.0	N/A	N/A	N/A	N/A	D/37.2	B/18.9	N/A	C/23.4	N/A	D/35.2	B/10.1	B/19.1	C/20.5
		2036 PM Peak	C/21.4	N/A	B/17.0	C/20.5	N/A	N/A	N/A	N/A	D/36.5	C/21.1	N/A	C/23.6	N/A	D/35.2	A/9.0	B/18.8	C/20.5
	West Intersection	2036 AM Peak	N/A	A/9.3	A/9.3	A/9.3	C/29.6	A/0.8	N/A	B/12.4	N/A	N/A	C/34.3	C/34.3	N/A	N/A	N/A	N/A	B/14.6
		2036 PM Peak	N/A	B/10.6	B/10.6	B/10.6	C/29.8	A/0.7	N/A	B/12.9	N/A	N/A	C/30.7	C/30.7	N/A	N/A	N/A	N/A	B/15.5
Split Roundabouts (Considered & Dismissed)	East Intersection	2036 AM Peak	C/19.6	N/A	A/9.8	C/17.8	N/A	N/A	N/A	N/A	F/59.7	F/58.7	N/A	F/59.0	N/A	A/10.0	N/A	A/3.9	C/22.2
		2036 PM Peak	E/41.0	N/A	B/13.6	E/35.5	N/A	N/A	N/A	N/A	F/150.0	F/149.0	N/A	F/149.2	N/A	A/9.4	N/A	A/4.1	F/50.5
	West Intersection	2036 AM Peak	D/27.6	D/27.6	D/27.6	D/27.6	D/30.2	D/30.2	D/30.2	D/30.2	A/7.3	A/7.3	C/16.8	C/15.3	C/15.1	C/15.1	B/13.6	B/14.3	D/26.7
		2036 PM Peak	E/41.8	E/41.8	E/41.8	E/41.8	D/26.7	D/26.7	D/26.7	D/26.7	A/8.0	A/8.0	E/42.9	E/38.5	C/17.0	C/17.0	B/14.8	C/16.3	D/32.2
Signalized Realignment #2 (Feasible)	Worthington Galena/Huntley	2036 AM Peak	B/19.6	N/A	B/16.6	B/19.0	N/A	N/A	N/A	N/A	D/46.5	C/21.9	N/A	C/28.0	N/A	D/49.0	B/10.7	C/24.4	C/24.0
		2036 PM Peak	C/20.6	N/A	B/16.7	B/19.8	N/A	N/A	N/A	N/A	D/39.1	C/23.8	N/A	C/26.3	N/A	C/25.4	A/6.1	B/13.4	B/18.5
	Wilson Bridge/Worthington Galena	2036 AM Peak	D/36.8	C/24.3	C/24.3	C/25.7	D/51.1	B/15.5	B/15.5	C/29.2	D/42.9	D/38.9	C/27.9	C/29.7	D/41.6	D/40.5	D/40.5	D/40.8	C/28.8
		2036 PM Peak	C/29.7	C/27.1	C/27.1	C/27.2	D/48.5	B/15.0	B/15.0	C/28.6	D/40.9	D/36.4	C/34.0	C/34.5	D/40.6	D/38.1	D/38.1	D/38.9	C/29.9
Concept Z Realign Huntley Road (Considered & Dismissed)	Worthington Galena/Huntley	2036 AM Peak	C/20.5	N/A	A/7.3	B/18.1	N/A	N/A	N/A	N/A	D/37.6	C/21.2	N/A	C/25.2	N/A	D/41.9	A/5.0	B/18.2	C/20.1
		2036 PM Peak	C/24.7	N/A	A/7.9	C/21.3	N/A	N/A	N/A	N/A	C/33.3	C/22.1	N/A	C/23.9	N/A	C/34.8	A/1.9	B/14.2	B/18.7
	Wilson Bridge/Worthington Galena	2036 AM Peak	C/23.0	N/A	C/23.0	C/23.0	N/A	N/A	N/A	N/A	B/18.2	C/24.4	N/A	C/24.2	N/A	C/31.6	A/2.1	B/14.0	B/17.8
		2036 PM Peak	C/24.4	N/A	C/24.4	C/24.4	N/A	N/A	N/A	N/A	B/17.0	C/23.8	N/A	C/23.5	N/A	C/24.0	A/1.6	B/11.0	B/16.9

Notes:
For signalized intersections: X/X = Level of Service / Average Delay Per Vehicle
For roundabout intersections, the intersection level of service criteria is based on HCM sign control.

HCM 2010 Signalized Intersection Summary
3: Worthington Galena & Wilson Bridge Rd/Huntley Rd

4/13/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	340	160	20	30	220	670	10	240	10	580	420	480
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	370	174	22	33	239	728	11	261	11	630	457	522
Adj No. of Lanes	1	1	0	1	1	1	1	1	0	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	345	549	69	207	245	645	52	456	19	683	458	523
Arrive On Green	0.16	0.34	0.34	0.13	0.13	0.13	0.26	0.26	0.26	0.28	0.58	0.58
Sat Flow, veh/h	1774	1622	205	1182	1863	1583	572	1775	75	1774	795	908
Grp Volume(v), veh/h	370	0	196	33	239	728	11	0	272	630	0	979
Grp Sat Flow(s),veh/h/ln	1774	0	1827	1182	1863	1583	572	0	1850	1774	0	1703
Q Serve(g_s), s	23.0	0.0	11.1	3.5	17.9	18.4	0.2	0.0	17.9	34.9	0.0	80.4
Cycle Q Clear(g_c), s	23.0	0.0	11.1	3.5	17.9	18.4	35.9	0.0	17.9	34.9	0.0	80.4
Prop In Lane	1.00		0.11	1.00		1.00	1.00		0.04	1.00		0.53
Lane Grp Cap(c), veh/h	345	0	618	207	245	645	52	0	475	683	0	980
V/C Ratio(X)	1.07	0.00	0.32	0.16	0.98	1.13	0.21	0.00	0.57	0.92	0.00	1.00
Avail Cap(c_a), veh/h	345	0	618	207	245	645	52	0	475	801	0	980
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	43.0	0.0	34.3	54.3	60.6	41.5	70.0	0.0	45.3	25.4	0.0	29.7
Incr Delay (d2), s/veh	69.1	0.0	0.3	0.4	50.7	76.2	8.9	0.0	5.0	14.6	0.0	28.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	8.7	0.0	5.7	1.2	12.7	38.6	0.6	0.0	9.8	19.6	0.0	45.3
LnGrp Delay(d),s/veh	112.2	0.0	34.6	54.7	111.3	117.7	78.9	0.0	50.3	40.0	0.0	58.1
LnGrp LOS	F		C	D	F	F	E		D	D		E
Approach Vol, veh/h		566			1000			283			1609	
Approach Delay, s/veh		85.3			114.1			51.4			51.0	
Approach LOS		F			F			D			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6	7	8
Phs Duration (G+Y+Rc), s	44.7	41.9		53.4		86.6	29.0	24.4
Change Period (Y+Rc), s	6.0	6.0		6.0		6.0	6.0	6.0
Max Green Setting (Gmax), s	48.0	26.6		47.4		80.6	23.0	18.4
Max Q Clear Time (g_c+I1), s	36.9	37.9		13.1		82.4	25.0	20.4
Green Ext Time (p_c), s	1.7	0.0		6.5		0.0	0.0	0.0

Intersection Summary	
HCM 2010 Ctrl Delay	74.9
HCM 2010 LOS	E

HCM 2010 Signalized Intersection Summary
3: Worthington Galena & Wilson Bridge Rd/Huntley Rd

2/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	460	170	20	30	230	800	10	330	10	680	570	650
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	500	185	22	33	250	870	11	359	11	739	620	707
Adj No. of Lanes	1	1	0	1	1	1	1	1	0	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	327	556	66	220	273	707	48	432	13	631	461	526
Arrive On Green	0.15	0.34	0.34	0.15	0.15	0.15	0.24	0.24	0.24	0.30	0.58	0.58
Sat Flow, veh/h	1774	1634	194	1170	1863	1583	411	1798	55	1774	796	907
Grp Volume(v), veh/h	500	0	207	33	250	870	11	0	370	739	0	1327
Grp Sat Flow(s),veh/h/ln	1774	0	1828	1170	1863	1583	411	0	1853	1774	0	1703
Q Serve(g_s), s	23.0	0.0	12.6	3.7	19.8	22.0	0.0	0.0	28.4	45.0	0.0	87.0
Cycle Q Clear(g_c), s	23.0	0.0	12.6	3.7	19.8	22.0	36.0	0.0	28.4	45.0	0.0	87.0
Prop In Lane	1.00		0.11	1.00		1.00	1.00		0.03	1.00		0.53
Lane Grp Cap(c), veh/h	327	0	622	220	273	707	48	0	445	631	0	988
V/C Ratio(X)	1.53	0.00	0.33	0.15	0.92	1.23	0.23	0.00	0.83	1.17	0.00	1.34
Avail Cap(c_a), veh/h	327	0	622	220	273	707	48	0	445	631	0	988
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	45.5	0.0	36.8	56.2	63.1	41.5	75.0	0.0	54.1	38.2	0.0	31.5
Incr Delay (d2), s/veh	252.6	0.0	0.3	0.3	33.0	115.7	10.8	0.0	16.5	93.2	0.0	161.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	23.0	0.0	6.4	1.2	12.7	52.0	0.6	0.0	16.6	42.4	0.0	84.9
LnGrp Delay(d),s/veh	298.0	0.0	37.2	56.5	96.1	157.2	85.8	0.0	70.6	131.3	0.0	193.0
LnGrp LOS	F		D	E	F	F	F		E	F		F
Approach Vol, veh/h		707			1153			381			2066	
Approach Delay, s/veh		221.7			141.1			71.0			170.9	
Approach LOS		F			F			E			F	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6	7	8
Phs Duration (G+Y+Rc), s	51.0	42.0		57.0		93.0	29.0	28.0
Change Period (Y+Rc), s	6.0	6.0		6.0		6.0	6.0	6.0
Max Green Setting (Gmax), s	45.0	36.0		51.0		87.0	23.0	22.0
Max Q Clear Time (g_c+I1), s	47.0	38.0		14.6		89.0	25.0	24.0
Green Ext Time (p_c), s	0.0	0.0		8.1		0.0	0.0	0.0

Intersection Summary	
HCM 2010 Ctrl Delay	162.4
HCM 2010 LOS	F

HCM 2010 Signalized Intersection Summary
3: Worthington Galena & Wilson Bridge Rd/Huntley Rd

4/13/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	340	220	20	20	170	820	10	360	10	670	460	520
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	370	239	22	22	185	891	11	391	11	728	500	565
Adj No. of Lanes	1	1	0	1	1	1	1	1	0	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	314	504	46	179	213	746	51	386	11	685	491	555
Arrive On Green	0.14	0.30	0.30	0.11	0.11	0.11	0.21	0.21	0.21	0.36	0.61	0.61
Sat Flow, veh/h	1774	1681	155	1114	1863	1583	528	1803	51	1774	800	904
Grp Volume(v), veh/h	370	0	261	22	185	891	11	0	402	728	0	1065
Grp Sat Flow(s),veh/h/ln	1774	0	1835	1114	1863	1583	528	0	1854	1774	0	1703
Q Serve(g_s), s	20.0	0.0	16.2	2.5	13.7	16.0	0.0	0.0	30.0	50.0	0.0	86.0
Cycle Q Clear(g_c), s	20.0	0.0	16.2	2.5	13.7	16.0	30.0	0.0	30.0	50.0	0.0	86.0
Prop In Lane	1.00		0.08	1.00		1.00	1.00		0.03	1.00		0.53
Lane Grp Cap(c), veh/h	314	0	551	179	213	746	51	0	397	685	0	1046
V/C Ratio(X)	1.18	0.00	0.47	0.12	0.87	1.19	0.21	0.00	1.01	1.06	0.00	1.02
Avail Cap(c_a), veh/h	314	0	551	179	213	746	51	0	397	685	0	1046
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	47.3	0.0	40.0	56.0	61.0	37.0	70.0	0.0	55.0	38.8	0.0	27.0
Incr Delay (d2), s/veh	109.0	0.0	0.6	0.3	29.7	100.1	9.3	0.0	48.2	52.3	0.0	32.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	9.5	0.0	8.4	0.8	8.8	49.6	0.6	0.0	20.7	36.4	0.0	49.5
LnGrp Delay(d),s/veh	156.3	0.0	40.6	56.3	90.6	137.1	79.3	0.0	103.3	91.0	0.0	59.4
LnGrp LOS	F		D	E	F	F	E		F	F		F
Approach Vol, veh/h		631			1098			413			1793	
Approach Delay, s/veh		108.5			127.6			102.6			72.2	
Approach LOS		F			F			F			E	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6	7	8
Phs Duration (G+Y+Rc), s	56.0	36.0		48.0		92.0	26.0	22.0
Change Period (Y+Rc), s	6.0	6.0		6.0		6.0	6.0	6.0
Max Green Setting (Gmax), s	50.0	30.0		42.0		86.0	20.0	16.0
Max Q Clear Time (g_c+I1), s	52.0	32.0		18.2		88.0	22.0	18.0
Green Ext Time (p_c), s	0.0	0.0		7.4		0.0	0.0	0.0

Intersection Summary	
HCM 2010 Ctrl Delay	96.7
HCM 2010 LOS	F

HCM 2010 Signalized Intersection Summary
3: Worthington Galena & Wilson Bridge Rd/Huntley Rd

2/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	480	230	20	20	170	980	20	480	10	790	610	700
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	522	250	22	22	185	1065	22	522	11	859	663	761
Adj No. of Lanes	1	1	0	1	1	1	1	1	0	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	296	529	47	210	273	686	48	509	11	557	481	552
Arrive On Green	0.13	0.31	0.31	0.15	0.15	0.15	0.28	0.28	0.28	0.29	0.61	0.61
Sat Flow, veh/h	1774	1688	149	1103	1863	1583	375	1818	38	1774	793	910
Grp Volume(v), veh/h	522	0	272	22	185	1065	22	0	533	859	0	1424
Grp Sat Flow(s),veh/h/ln	1774	0	1837	1103	1863	1583	375	0	1856	1774	0	1702
Q Serve(g_s), s	19.0	0.0	17.9	2.6	14.1	22.0	0.0	0.0	42.0	43.0	0.0	91.0
Cycle Q Clear(g_c), s	19.0	0.0	17.9	2.6	14.1	22.0	42.0	0.0	42.0	43.0	0.0	91.0
Prop In Lane	1.00		0.08	1.00		1.00	1.00		0.02	1.00		0.53
Lane Grp Cap(c), veh/h	296	0	575	210	273	686	48	0	520	557	0	1033
V/C Ratio(X)	1.76	0.00	0.47	0.10	0.68	1.55	0.46	0.00	1.03	1.54	0.00	1.38
Avail Cap(c_a), veh/h	296	0	575	210	273	686	48	0	520	557	0	1033
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	49.3	0.0	41.5	55.7	60.6	42.5	75.0	0.0	54.0	46.2	0.0	29.5
Incr Delay (d2), s/veh	357.1	0.0	0.6	0.2	6.5	255.7	28.4	0.0	46.2	253.4	0.0	176.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	29.4	0.0	9.2	0.8	7.8	77.1	1.3	0.0	28.2	62.2	0.0	93.1
LnGrp Delay(d),s/veh	406.4	0.0	42.1	55.9	67.2	298.2	103.4	0.0	100.2	299.6	0.0	206.1
LnGrp LOS	F		D	E	E	F	F		F	F		F
Approach Vol, veh/h		794			1272			555			2283	
Approach Delay, s/veh		281.6			260.4			100.3			241.3	
Approach LOS		F			F			F			F	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6	7	8
Phs Duration (G+Y+Rc), s	49.0	48.0		53.0		97.0	25.0	28.0
Change Period (Y+Rc), s	6.0	6.0		6.0		6.0	6.0	6.0
Max Green Setting (Gmax), s	43.0	42.0		47.0		91.0	19.0	22.0
Max Q Clear Time (g_c+I1), s	45.0	44.0		19.9		93.0	21.0	24.0
Green Ext Time (p_c), s	0.0	0.0		9.6		0.0	0.0	0.0

Intersection Summary	
HCM 2010 Ctrl Delay	236.8
HCM 2010 LOS	F

HCM 2010 Signalized Intersection Summary
3: Worthington Galena & Wilson Bridge Rd/Huntley Rd

3/14/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	460	170	20	30	230	800	10	330	10	680	570	650
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1863	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	500	185	22	33	250	870	11	359	11	739	620	707
Adj No. of Lanes	2	1	0	1	1	2	1	2	0	2	1	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	533	692	82	316	385	1180	146	610	19	746	843	962
Arrive On Green	0.15	0.42	0.42	0.21	0.21	0.21	0.17	0.17	0.17	0.22	0.45	0.45
Sat Flow, veh/h	3442	1634	194	1170	1863	2787	411	3506	107	3442	1863	1583
Grp Volume(v), veh/h	500	0	207	33	250	870	11	181	189	739	620	707
Grp Sat Flow(s),veh/h/ln	1721	0	1828	1170	1863	1393	411	1770	1844	1721	1863	1583
Q Serve(g_s), s	13.9	0.0	7.1	2.2	11.9	20.0	2.2	9.1	9.1	20.7	26.4	30.7
Cycle Q Clear(g_c), s	13.9	0.0	7.1	2.2	11.9	20.0	2.2	9.1	9.1	20.7	26.4	30.7
Prop In Lane	1.00		0.11	1.00		1.00	1.00		0.06	1.00		1.00
Lane Grp Cap(c), veh/h	533	0	774	316	385	1180	146	308	321	746	843	962
V/C Ratio(X)	0.94	0.00	0.27	0.10	0.65	0.74	0.08	0.59	0.59	0.99	0.74	0.73
Avail Cap(c_a), veh/h	533	0	774	316	385	1180	159	365	381	746	904	1014
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	40.5	0.0	18.2	31.4	35.2	23.4	33.9	36.8	36.8	37.8	21.7	13.5
Incr Delay (d2), s/veh	24.6	0.0	0.2	0.1	3.8	2.5	0.2	1.8	1.7	30.4	2.9	2.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	8.4	0.0	3.6	0.7	6.5	10.1	0.3	4.6	4.8	12.9	14.1	13.9
LnGrp Delay(d),s/veh	65.0	0.0	18.3	31.5	39.0	25.9	34.2	38.6	38.5	68.3	24.7	16.1
LnGrp LOS	E		B	C	D	C	C	D	D	E	C	B
Approach Vol, veh/h		707			1153			381			2066	
Approach Delay, s/veh		51.4			28.9			38.4			37.3	
Approach LOS		D			C			D			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6	7	8
Phs Duration (G+Y+Rc), s	27.0	22.9		47.0		49.9	21.0	26.0
Change Period (Y+Rc), s	6.0	6.0		6.0		6.0	6.0	6.0
Max Green Setting (Gmax), s	21.0	20.0		41.0		47.0	15.0	20.0
Max Q Clear Time (g_c+I1), s	22.7	11.1		9.1		32.7	15.9	22.0
Green Ext Time (p_c), s	0.0	5.7		7.8		8.0	0.0	0.0

Intersection Summary	
HCM 2010 Ctrl Delay	37.5
HCM 2010 LOS	D

HCM 2010 Signalized Intersection Summary
3: Worthington Galena & Wilson Bridge Rd/Huntley Rd

3/14/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	480	230	20	20	170	980	20	480	10	790	610	700
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1863	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	522	250	22	22	185	1065	22	522	11	859	663	761
Adj No. of Lanes	2	1	0	1	1	2	1	2	0	2	1	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	565	662	58	257	323	1194	136	668	14	879	929	789
Arrive On Green	0.16	0.39	0.39	0.17	0.17	0.17	0.19	0.19	0.19	0.26	0.50	0.50
Sat Flow, veh/h	3442	1688	149	1103	1863	2787	375	3545	75	3442	1863	1583
Grp Volume(v), veh/h	522	0	272	22	185	1065	22	260	273	859	663	761
Grp Sat Flow(s),veh/h/ln	1721	0	1837	1103	1863	1393	375	1770	1850	1721	1863	1583
Q Serve(g_s), s	16.4	0.0	11.6	1.8	10.0	19.0	5.5	15.4	15.4	27.2	30.4	50.9
Cycle Q Clear(g_c), s	16.4	0.0	11.6	1.8	10.0	19.0	5.5	15.4	15.4	27.2	30.4	50.9
Prop In Lane	1.00		0.08	1.00		1.00	1.00		0.04	1.00		1.00
Lane Grp Cap(c), veh/h	565	0	720	257	323	1194	136	334	349	879	929	789
V/C Ratio(X)	0.92	0.00	0.38	0.09	0.57	0.89	0.16	0.78	0.78	0.98	0.71	0.96
Avail Cap(c_a), veh/h	565	0	720	257	323	1194	137	339	354	879	934	794
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	45.2	0.0	23.8	38.2	41.6	29.0	38.4	42.3	42.4	40.5	21.4	26.6
Incr Delay (d2), s/veh	21.1	0.0	0.3	0.1	2.4	8.7	0.5	11.0	10.7	24.9	2.6	23.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	9.4	0.0	6.0	0.6	5.4	16.3	0.6	8.5	8.9	15.9	16.1	27.1
LnGrp Delay(d),s/veh	66.3	0.0	24.1	38.4	44.1	37.7	38.9	53.4	53.0	65.4	24.0	50.0
LnGrp LOS	E		C	D	D	D	D	D	D	E	C	D
Approach Vol, veh/h		794			1272			555			2283	
Approach Delay, s/veh		51.8			38.7			52.6			48.2	
Approach LOS		D			D			D			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6	7	8
Phs Duration (G+Y+Rc), s	34.0	26.7		49.0		60.7	24.0	25.0
Change Period (Y+Rc), s	6.0	6.0		6.0		6.0	6.0	6.0
Max Green Setting (Gmax), s	28.0	21.0		43.0		55.0	18.0	19.0
Max Q Clear Time (g_c+I1), s	29.2	17.4		13.6		52.9	18.4	21.0
Green Ext Time (p_c), s	0.0	2.9		9.1		1.8	0.0	0.0

Intersection Summary	
HCM 2010 Ctrl Delay	46.8
HCM 2010 LOS	D

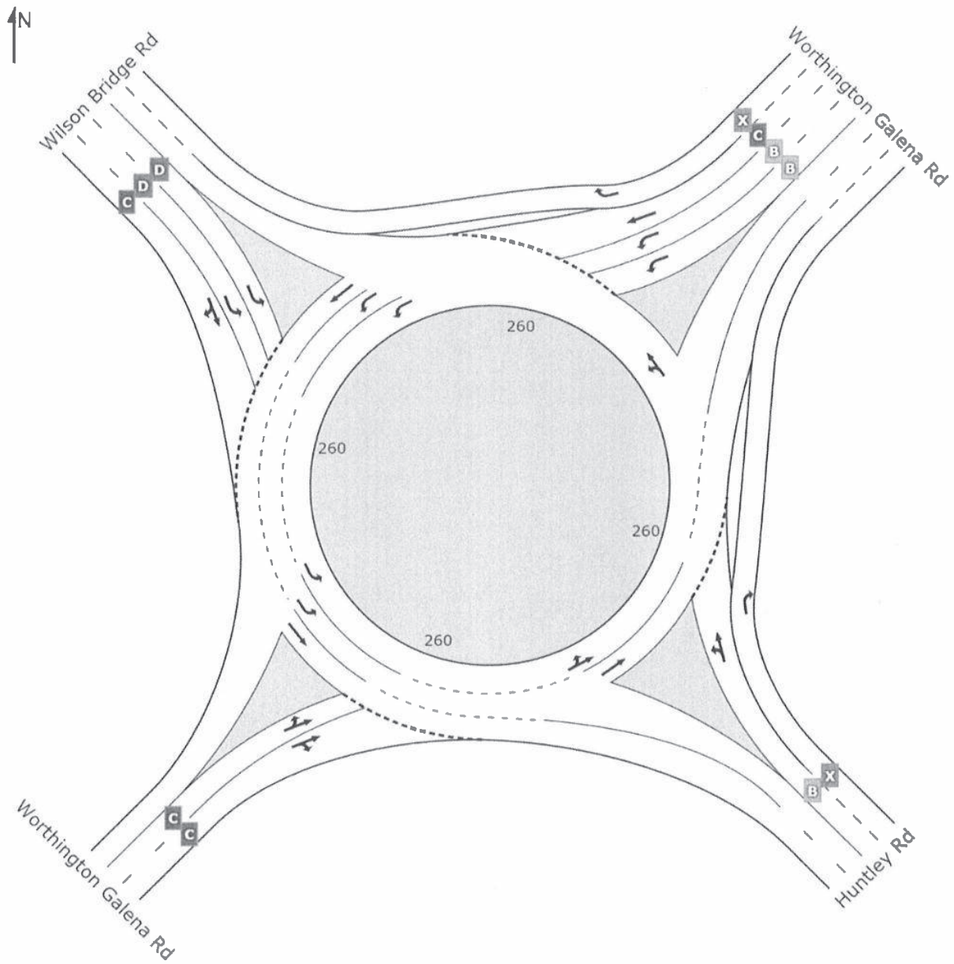
Notes

User approved pedestrian interval to be less than phase max green.

LEVEL OF SERVICE SUMMARY

Site: 2036 AM B21

Worthington Galena and Wilson Bridge/Huntley Rd. 2014-1176
Concept B- Single roundabout (B21)
2036 AM DHV
Roundabout



	Southeast	Northeast	Northwest	Southwest	Intersection
LOS	A	A	D	C	B

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
HCM Delay Model used. Geometric Delay not included.

MOVEMENT SUMMARY

Site: 2036 AM B21

Worthington Galena and Wilson Bridge/Huntley Rd. 2014-1176
Concept B- Single roundabout (B21)
2036 AM DHV
Roundabout

Movement Performance - Vehicles

	Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
	South East: Huntley Rd											
	3	L	33	2.0	0.475	13.8	LOS B	1.7	43.8	0.62	1.03	23.7
WB	8	T	250	2.0	0.475	13.8	LOS B	1.7	43.8	0.62	0.74	24.8
	18	R	870	2.0	0.548	0.1	X	X	X	X	0.17	33.4
	Approach		1152	2.0	0.548	3.5	LOS A	1.7	43.8	0.15	0.32	30.7
	North East: Worthington Galena Rd											
	1	L	739	2.0	0.450	10.2	LOS B	2.2	56.1	0.54	0.76	24.5
SB	6	T	620	2.0	0.754	20.3	LOS C	7.4	188.2	0.80	0.89	22.3
	16	R	707	2.0	0.445	0.1	X	X	X	X	0.20	33.2
	Approach		2065	2.0	0.754	9.8	LOS A	7.4	188.2	0.43	0.61	25.9
	North West: Wilson Bridge Rd											
	7	L	500	2.0	0.631	26.5	LOS D	2.5	62.6	0.82	1.04	19.7
EB	4	T	185	2.0	0.540	22.7	LOS C	1.9	48.9	0.80	0.93	21.4
	14	R	22	2.0	0.540	22.7	LOS C	1.9	48.9	0.80	0.93	21.2
	Approach		707	2.0	0.631	25.4	LOS D	2.5	62.6	0.82	1.01	20.1
	South West: Worthington Galena Rd											
	5	L	11	2.0	0.492	21.1	LOS C	1.7	42.2	0.79	1.07	21.6
NB	2	T	359	2.0	0.492	20.4	LOS C	1.7	42.2	0.78	0.90	22.2
	12	R	11	2.0	0.492	19.8	LOS C	1.6	41.2	0.77	0.89	22.2
	Approach		380	2.0	0.492	20.4	LOS C	1.7	42.2	0.78	0.90	22.2
	All Vehicles		4304	2.0	0.754	11.6	LOS B	7.4	188.2	0.45	0.62	25.2

X: Not applicable for Continuous movement.

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

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Project: J:\20141176\Calculations\Traffic\SIDRA\WG and Huntley\Final\Single concept B.sip
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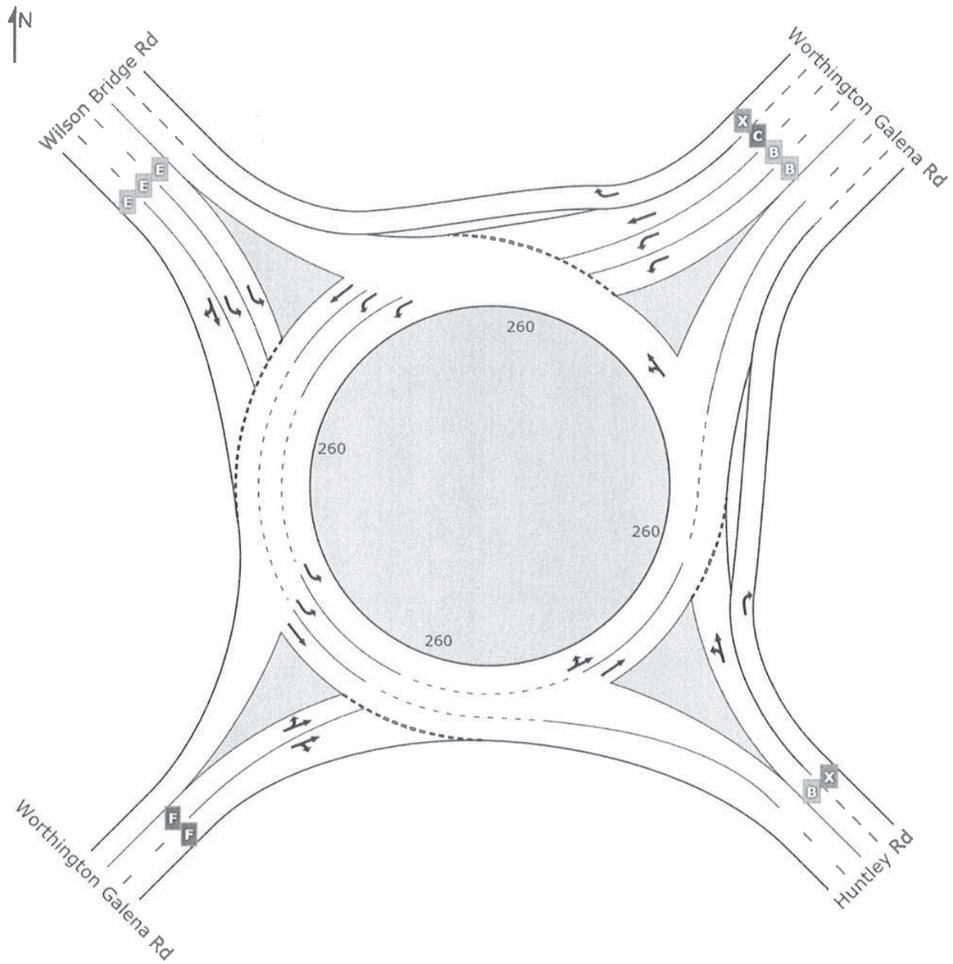
SIDRA INTERSECTION

LEVEL OF SERVICE SUMMARY

Site: 2036 PM B21

Worthington Galena and Wilson Bridge/Huntley Rd. 2014-1176
Concept B- Single roundabout (B21)
2036 PM DHV
Roundabout



	Southeast	Northeast	Northwest	Southwest	Intersection
LOS	A	A	E	F	C

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
HCM Delay Model used. Geometric Delay not included.

MOVEMENT SUMMARY

Site: 2036 PM B21

Worthington Galena and Wilson Bridge/Huntley Rd. 2014-1176
Concept B- Single roundabout (B21)
2036 PM DHV
Roundabout

Movement Performance - Vehicles

	Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
	South East: Huntley Rd											
WB	3	L	22	2.0	0.399	13.5	LOS B	1.3	32.6	0.65	1.03	23.9
	8	T	185	2.0	0.399	13.5	LOS B	1.3	32.6	0.65	0.76	25.0
	18	R	1065	2.0	0.671	0.2	X	X	X	X	0.17	33.4
	Approach		1272	2.0	0.671	2.4	LOS A	1.3	32.6	0.11	0.27	31.5
	North East: Worthington Galena Rd											
SB	1	L	859	2.0	0.489	10.4	LOS B	2.6	65.1	0.51	0.71	24.4
	6	T	663	2.0	0.755	19.3	LOS C	7.8	198.4	0.77	0.78	22.6
	16	R	761	2.0	0.479	0.1	X	X	X	X	0.20	33.2
	Approach		2283	2.0	0.755	9.6	LOS A	7.8	198.4	0.42	0.56	26.0
	North West: Wilson Bridge Rd											
EB	7	L	522	2.0	0.767	42.0	LOS E	3.4	87.2	0.90	1.15	16.6
	4	T	250	2.0	0.738	36.6	LOS E	3.1	79.0	0.88	1.07	17.5
	14	R	22	2.0	0.738	36.6	LOS E	3.1	79.0	0.88	1.07	17.3
	Approach		793	2.0	0.767	40.1	LOS E	3.4	87.2	0.89	1.12	16.8
NB	South West: Worthington Galena Rd											
	5	L	22	2.0	0.835	53.3	LOS F	4.1	105.0	0.93	1.26	15.1
	2	T	522	2.0	0.835	51.6	LOS F	4.1	105.0	0.93	1.20	14.7
	12	R	11	2.0	0.835	50.1	LOS F	4.1	103.9	0.92	1.19	14.7
	Approach		554	2.0	0.835	51.7	LOS F	4.1	105.0	0.93	1.20	14.7
	All Vehicles		4902	2.0	0.835	17.4	LOS C	7.8	198.4	0.47	0.65	22.9

X: Not applicable for Continuous movement.

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

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Project: J:\20141176\Calculations\Traffic\SIDRA\WG and Huntley\Final\Single concept B.sip
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SIDRA INTERSECTION

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	790	180	260	800	680	1220
Number	7	14	5	2	6	16
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	859	196	283	870	739	1326
Adj No. of Lanes	2	1	1	2	2	2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	1419	653	320	1676	1011	1945
Arrive On Green	0.55	0.55	0.13	0.47	0.29	0.29
Sat Flow, veh/h	3442	1583	1774	3632	3632	2787
Grp Volume(v), veh/h	859	196	283	870	739	1326
Grp Sat Flow(s),veh/h/ln	1721	1583	1774	1770	1770	1393
Q Serve(g_s), s	17.7	7.0	11.3	18.0	19.8	28.8
Cycle Q Clear(g_c), s	17.7	7.0	11.3	18.0	19.8	28.8
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	1419	653	320	1676	1011	1945
V/C Ratio(X)	0.61	0.30	0.88	0.52	0.73	0.68
Avail Cap(c_a), veh/h	1419	653	426	1888	1011	1945
HCM Platoon Ratio	1.33	1.33	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.81	0.81	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	17.9	15.5	24.4	19.3	33.9	9.1
Incr Delay (d2), s/veh	1.6	1.0	15.7	0.3	2.7	1.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	8.7	8.4	6.8	8.8	10.0	19.4
LnGrp Delay(d),s/veh	19.5	16.5	40.1	19.5	36.6	10.1
LnGrp LOS	B	B	D	B	D	B
Approach Vol, veh/h	1055			1153	2065	
Approach Delay, s/veh	19.0			24.6	19.6	
Approach LOS	B			C	B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		55.7		49.3	19.7	36.0		
Change Period (Y+Rc), s		6.0		6.0	6.0	6.0		
Max Green Setting (Gmax), s		56.0		37.0	20.0	30.0		
Max Q Clear Time (g_c+I1), s		20.0		19.7	13.3	30.8		
Green Ext Time (p_c), s		25.8		3.9	0.5	0.0		

Intersection Summary	
HCM 2010 Ctrl Delay	20.8
HCM 2010 LOS	C

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	960	240	190	980	790	1310
Number	7	14	5	2	6	16
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	1043	261	207	1065	859	1424
Adj No. of Lanes	2	1	1	2	2	2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	1471	677	243	1672	1167	2110
Arrive On Green	0.57	0.57	0.09	0.47	0.33	0.33
Sat Flow, veh/h	3442	1583	1774	3632	3632	2787
Grp Volume(v), veh/h	1043	261	207	1065	859	1424
Grp Sat Flow(s),veh/h/ln	1721	1583	1774	1770	1770	1393
Q Serve(g_s), s	26.3	10.9	8.9	27.2	25.8	30.4
Cycle Q Clear(g_c), s	26.3	10.9	8.9	27.2	25.8	30.4
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	1471	677	243	1672	1167	2110
V/C Ratio(X)	0.71	0.39	0.85	0.64	0.74	0.67
Avail Cap(c_a), veh/h	1471	677	315	1829	1180	2120
HCM Platoon Ratio	1.33	1.33	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.78	0.78	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	20.5	17.2	27.9	23.9	35.6	7.2
Incr Delay (d2), s/veh	2.3	1.3	15.8	0.6	2.4	0.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	12.8	12.6	5.4	13.5	12.9	23.8
LnGrp Delay(d),s/veh	22.8	18.5	43.8	24.5	38.0	8.1
LnGrp LOS	C	B	D	C	D	A
Approach Vol, veh/h	1304			1272	2283	
Approach Delay, s/veh	21.9			27.7	19.3	
Approach LOS	C			C	B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		62.7		57.3	17.1	45.6		
Change Period (Y+Rc), s		6.0		6.0	6.0	6.0		
Max Green Setting (Gmax), s		62.0		46.0	16.0	40.0		
Max Q Clear Time (g_c+I1), s		29.2		28.3	10.9	32.4		
Green Ext Time (p_c), s		27.1		5.0	0.2	7.1		

Intersection Summary	
HCM 2010 Ctrl Delay	22.2
HCM 2010 LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	80	630	20	600	880	80	10	50	340	30	30	60
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1863	1863	1863	1900
Adj Flow Rate, veh/h	87	685	22	652	957	87	11	54	370	33	33	65
Adj No. of Lanes	1	2	0	2	1	0	1	1	1	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	212	1470	47	710	1150	105	266	377	647	240	114	224
Arrive On Green	0.42	0.42	0.42	0.21	0.68	0.68	0.20	0.20	0.20	0.20	0.20	0.20
Sat Flow, veh/h	538	3500	112	3442	1683	153	1292	1863	1583	959	562	1106
Grp Volume(v), veh/h	87	346	361	652	0	1044	11	54	370	33	0	98
Grp Sat Flow(s),veh/h/ln	538	1770	1843	1721	0	1836	1292	1863	1583	959	0	1668
Q Serve(g_s), s	14.9	14.8	14.8	19.5	0.0	43.8	0.8	2.5	18.9	3.1	0.0	5.2
Cycle Q Clear(g_c), s	31.1	14.8	14.8	19.5	0.0	43.8	6.0	2.5	18.9	5.6	0.0	5.2
Prop In Lane	1.00		0.06	1.00		0.08	1.00		1.00	1.00		0.66
Lane Grp Cap(c), veh/h	212	743	774	710	0	1254	266	377	647	240	0	337
V/C Ratio(X)	0.41	0.47	0.47	0.92	0.00	0.83	0.04	0.14	0.57	0.14	0.00	0.29
Avail Cap(c_a), veh/h	212	743	774	721	0	1254	275	390	658	247	0	349
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.68	0.00	0.68	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	33.8	22.0	22.0	40.8	0.0	12.2	38.0	34.4	24.0	36.7	0.0	35.5
Incr Delay (d2), s/veh	5.8	2.1	2.0	12.3	0.0	4.5	0.1	0.2	1.2	0.3	0.0	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.5	7.6	7.9	10.5	0.0	23.3	0.3	1.3	8.4	0.8	0.0	2.4
LnGrp Delay(d),s/veh	39.6	24.0	24.0	53.2	0.0	16.7	38.1	34.6	25.1	36.9	0.0	36.0
LnGrp LOS	D	C	C	D		B	D	C	C	D		D
Approach Vol, veh/h		794			1696			435			131	
Approach Delay, s/veh		25.7			30.7			26.6			36.2	
Approach LOS		C			C			C			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		8
Phs Duration (G+Y+Rc), s	27.6	50.1		27.2		77.8		27.2
Change Period (Y+Rc), s	6.0	6.0		6.0		6.0		6.0
Max Green Setting (Gmax), s	22.0	43.0		22.0		71.0		22.0
Max Q Clear Time (g_c+I1), s	21.5	33.1		7.6		45.8		20.9
Green Ext Time (p_c), s	0.2	7.8		2.1		15.9		0.3

Intersection Summary	
HCM 2010 Ctrl Delay	29.1
HCM 2010 LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	50	710	20	630	870	50	20	50	490	50	50	50
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1863	1863	1863	1900
Adj Flow Rate, veh/h	54	772	22	685	946	54	22	54	533	54	54	54
Adj No. of Lanes	1	2	0	2	1	0	1	1	1	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	274	1559	44	768	1251	71	224	342	643	191	157	157
Arrive On Green	0.44	0.44	0.44	0.22	0.72	0.72	0.18	0.18	0.18	0.18	0.18	0.18
Sat Flow, veh/h	561	3515	100	3442	1746	100	1280	1863	1583	825	856	856
Grp Volume(v), veh/h	54	389	405	685	0	1000	22	54	533	54	0	108
Grp Sat Flow(s),veh/h/ln	561	1770	1845	1721	0	1845	1280	1863	1583	825	0	1712
Q Serve(g_s), s	7.9	18.8	18.8	23.2	0.0	40.2	1.8	2.9	22.0	7.1	0.0	6.6
Cycle Q Clear(g_c), s	15.4	18.8	18.8	23.2	0.0	40.2	8.4	2.9	22.0	10.0	0.0	6.6
Prop In Lane	1.00		0.05	1.00		0.05	1.00		1.00	1.00		0.50
Lane Grp Cap(c), veh/h	274	785	819	768	0	1322	224	342	643	191	0	314
V/C Ratio(X)	0.20	0.50	0.50	0.89	0.00	0.76	0.10	0.16	0.83	0.28	0.00	0.34
Avail Cap(c_a), veh/h	274	785	819	918	0	1322	224	342	643	191	0	314
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.72	0.00	0.72	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	25.4	23.8	23.8	45.2	0.0	10.5	46.4	41.2	31.9	45.4	0.0	42.7
Incr Delay (d2), s/veh	1.6	2.2	2.1	7.3	0.0	3.0	0.2	0.2	8.9	0.8	0.0	0.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.4	9.7	10.1	11.8	0.0	21.4	0.7	1.5	17.3	1.7	0.0	3.2
LnGrp Delay(d),s/veh	27.0	26.0	25.9	52.6	0.0	13.5	46.6	41.4	40.7	46.2	0.0	43.4
LnGrp LOS	C	C	C	D		B	D	D	D	D		D
Approach Vol, veh/h		848			1685			609			162	
Approach Delay, s/veh		26.0			29.4			41.0			44.3	
Approach LOS		C			C			D			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		8
Phs Duration (G+Y+Rc), s	32.8	59.2		28.0		92.0		28.0
Change Period (Y+Rc), s	6.0	6.0		6.0		6.0		6.0
Max Green Setting (Gmax), s	32.0	48.0		22.0		86.0		22.0
Max Q Clear Time (g_c+I1), s	25.2	20.8		12.0		42.2		24.0
Green Ext Time (p_c), s	1.6	16.2		2.6		20.9		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	31.4
HCM 2010 LOS	C

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	790	180	260	800	680	1220
Number	7	14	5	2	6	16
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	859	196	283	870	739	1326
Adj No. of Lanes	2	1	1	2	2	2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	1389	639	321	1706	1045	1947
Arrive On Green	0.54	0.54	0.13	0.48	0.30	0.30
Sat Flow, veh/h	3442	1583	1774	3632	3632	2787
Grp Volume(v), veh/h	859	196	283	870	739	1326
Grp Sat Flow(s),veh/h/ln	1721	1583	1774	1770	1770	1393
Q Serve(g_s), s	18.2	7.2	11.1	17.7	19.5	28.7
Cycle Q Clear(g_c), s	18.2	7.2	11.1	17.7	19.5	28.7
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	1389	639	321	1706	1045	1947
V/C Ratio(X)	0.62	0.31	0.88	0.51	0.71	0.68
Avail Cap(c_a), veh/h	1389	639	462	1989	1045	1947
HCM Platoon Ratio	1.33	1.33	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.93	0.93	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	18.7	16.2	24.0	18.7	33.0	9.1
Incr Delay (d2), s/veh	1.9	1.2	13.2	0.2	2.2	1.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	8.9	8.5	6.5	8.6	9.9	19.4
LnGrp Delay(d),s/veh	20.6	17.3	37.2	18.9	35.2	10.1
LnGrp LOS	C	B	D	B	D	B
Approach Vol, veh/h	1055			1153	2065	
Approach Delay, s/veh	20.0			23.4	19.1	
Approach LOS	C			C	B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		56.6		48.4	19.6	37.0		
Change Period (Y+Rc), s		6.0		6.0	6.0	6.0		
Max Green Setting (Gmax), s		59.0		34.0	22.0	31.0		
Max Q Clear Time (g_c+I1), s		19.7		20.2	13.1	30.7		
Green Ext Time (p_c), s		27.4		3.6	0.6	0.3		

Intersection Summary	
HCM 2010 Ctrl Delay	20.5
HCM 2010 LOS	C

Signalized Realignment
(minimize separation)

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	960	240	190	980	790	1310
Number	7	14	5	2	6	16
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	1043	261	207	1065	859	1424
Adj No. of Lanes	2	1	1	2	2	2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	1422	654	258	1652	1097	2015
Arrive On Green	0.55	0.55	0.10	0.47	0.31	0.31
Sat Flow, veh/h	3442	1583	1774	3632	3632	2787
Grp Volume(v), veh/h	1043	261	207	1065	859	1424
Grp Sat Flow(s),veh/h/ln	1721	1583	1774	1770	1770	1393
Q Serve(g_s), s	22.9	9.5	7.6	23.0	22.1	28.9
Cycle Q Clear(g_c), s	22.9	9.5	7.6	23.0	22.1	28.9
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	1422	654	258	1652	1097	2015
V/C Ratio(X)	0.73	0.40	0.80	0.64	0.78	0.71
Avail Cap(c_a), veh/h	1422	654	299	1734	1097	2015
HCM Platoon Ratio	1.33	1.33	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.89	0.89	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	18.4	15.4	23.7	20.3	31.4	7.8
Incr Delay (d2), s/veh	3.0	1.6	12.8	0.8	3.8	1.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	11.2	10.8	4.5	11.3	11.3	19.9
LnGrp Delay(d),s/veh	21.4	17.0	36.5	21.1	35.2	9.0
LnGrp LOS	C	B	D	C	D	A
Approach Vol, veh/h	1304			1272	2283	
Approach Delay, s/veh	20.5			23.6	18.8	
Approach LOS	C			C	B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		52.7		47.3	15.7	37.0		
Change Period (Y+Rc), s		6.0		6.0	6.0	6.0		
Max Green Setting (Gmax), s		49.0		39.0	12.0	31.0		
Max Q Clear Time (g_c+I1), s		25.0		24.9	9.6	30.9		
Green Ext Time (p_c), s		20.8		4.6	0.1	0.1		

Intersection Summary	
HCM 2010 Ctrl Delay	20.5
HCM 2010 LOS	C

Signalized Realignment
(minimized separation)

HCM Signalized Intersection Capacity Analysis
3: Worthington Galena & Wilson Bridge (west Intersection) 3/14/2015

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	630	20	600	880	0	340
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0		6.0	6.0		6.0
Lane Util. Factor	0.95		0.97	1.00		0.88
Frt	1.00		1.00	1.00		0.85
Flt Protected	1.00		0.95	1.00		1.00
Satd. Flow (prot)	3523		3433	1863		2787
Flt Permitted	1.00		0.95	1.00		1.00
Satd. Flow (perm)	3523		3433	1863		2787
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	685	22	652	957	0	370
RTOR Reduction (vph)	1	0	0	0	0	0
Lane Group Flow (vph)	706	0	652	957	0	370
Turn Type	NA		Prot	NA		Over
Protected Phases	2		1	6		1
Permitted Phases						
Actuated Green, G (s)	66.2		26.8	105.0		26.8
Effective Green, g (s)	66.2		26.8	105.0		26.8
Actuated g/C Ratio	0.63		0.26	1.00		0.26
Clearance Time (s)	6.0		6.0	6.0		6.0
Vehicle Extension (s)	3.0		3.0	3.0		3.0
Lane Grp Cap (vph)	2221		876	1863		711
v/s Ratio Prot	0.20		c0.19	c0.51		0.13
v/s Ratio Perm						
v/c Ratio	0.32		0.74	0.51		0.52
Uniform Delay, d1	9.0		35.9	0.0		33.6
Progression Factor	1.00		0.75	1.00		1.00
Incremental Delay, d2	0.4		2.6	0.8		0.7
Delay (s)	9.3		29.6	0.8		34.3
Level of Service	A		C	A		C
Approach Delay (s)	9.3			12.4	34.3	
Approach LOS	A			B	C	

Intersection Summary			
HCM 2000 Control Delay	14.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	51.3%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
3: Worthington Galena & Wilson Bridge (west Intersection) 3/14/2015

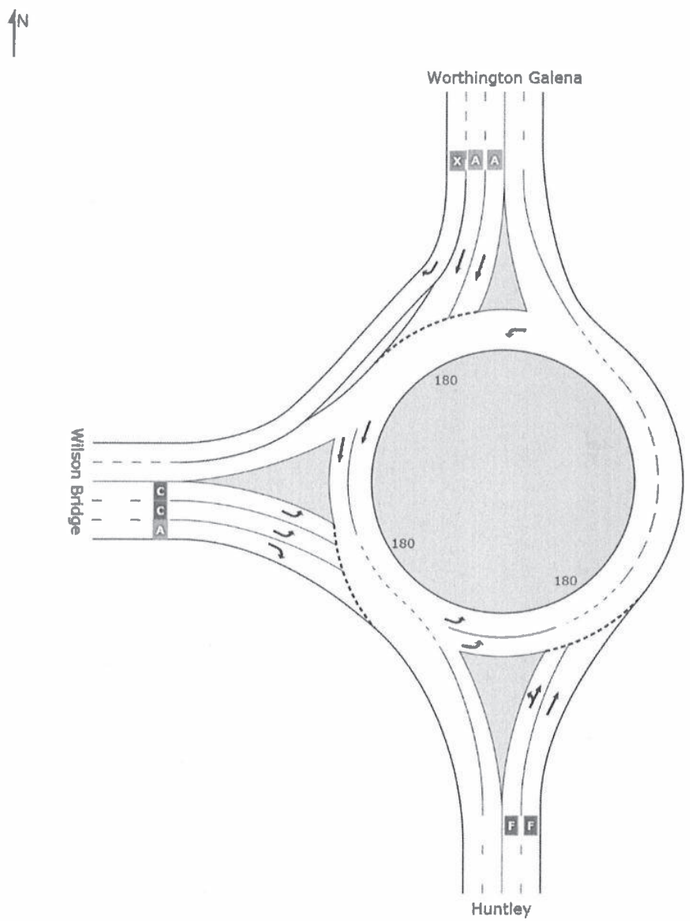
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	710	20	630	870	0	490
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0		6.0	6.0		6.0
Lane Util. Factor	0.95		0.97	1.00		0.88
Frt	1.00		1.00	1.00		0.85
Flt Protected	1.00		0.95	1.00		1.00
Satd. Flow (prot)	3525		3433	1863		2787
Flt Permitted	1.00		0.95	1.00		1.00
Satd. Flow (perm)	3525		3433	1863		2787
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	772	22	685	946	0	533
RTOR Reduction (vph)	2	0	0	0	0	167
Lane Group Flow (vph)	792	0	685	946	0	366
Turn Type	NA		Prot	NA		Over
Protected Phases	2		1	6		1
Permitted Phases						
Actuated Green, G (s)	60.5		27.5	100.0		27.5
Effective Green, g (s)	60.5		27.5	100.0		27.5
Actuated g/C Ratio	0.60		0.28	1.00		0.28
Clearance Time (s)	6.0		6.0	6.0		6.0
Vehicle Extension (s)	3.0		3.0	3.0		3.0
Lane Grp Cap (vph)	2132		944	1863		766
v/s Ratio Prot	0.22		c0.20	c0.51		0.13
v/s Ratio Perm						
v/c Ratio	0.37		0.73	0.51		0.48
Uniform Delay, d1	10.1		32.8	0.0		30.3
Progression Factor	1.00		0.84	1.00		1.00
Incremental Delay, d2	0.5		2.1	0.7		0.5
Delay (s)	10.6		29.8	0.7		30.7
Level of Service	B		C	A		C
Approach Delay (s)	10.6			12.9	30.7	
Approach LOS	B			B	C	

Intersection Summary			
HCM 2000 Control Delay	15.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	50.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

LEVEL OF SERVICE SUMMARY

Site: E 2036AM D2

Worthington Galena and Wilson Bridge/Huntley, 2014-1176
Concept D2, East roundabout
2036 AM DHV
Roundabout



	South	North	West	Intersection
LOS	F	A	C	C

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
HCM Delay Model used. Geometric Delay not included.

MOVEMENT SUMMARY

Site: E 2036AM D2

Worthington Galena and Wilson Bridge/Huntley, 2014-1176
Concept D2, East roundabout
2036 AM DHV
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Huntley											
3	L	283	2.0	0.981	59.7	LOS F	12.9	328.7	0.96	1.65	13.5
8	T	870	2.0	0.981	58.7	LOS F	12.9	328.7	0.96	1.61	13.4
Approach		1152	2.0	0.981	59.0	LOS F	12.9	328.7	0.96	1.61	13.4
North: Worthington Galena											
4	T	739	2.0	0.445	10.0	LOS A	2.2	54.7	0.53	0.55	26.7
14	R	1326	2.0	0.835	0.6	X	X	X	X	0.29	32.0
Approach		2065	2.0	0.835	3.9	LOS A	2.2	54.7	0.19	0.38	29.9
West: Wilson Bridge											
5	L	859	2.0	0.669	19.6	LOS C	3.5	88.3	0.70	0.99	20.8
12	R	196	2.0	0.311	9.8	LOS A	1.0	24.8	0.54	0.70	25.9
Approach		1054	2.0	0.669	17.8	LOS C	3.5	88.3	0.67	0.94	21.5
All Vehicles		4272	2.0	0.981	22.2	LOS C	12.9	328.7	0.51	0.85	20.8

X: Not applicable for Continuous movement.

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

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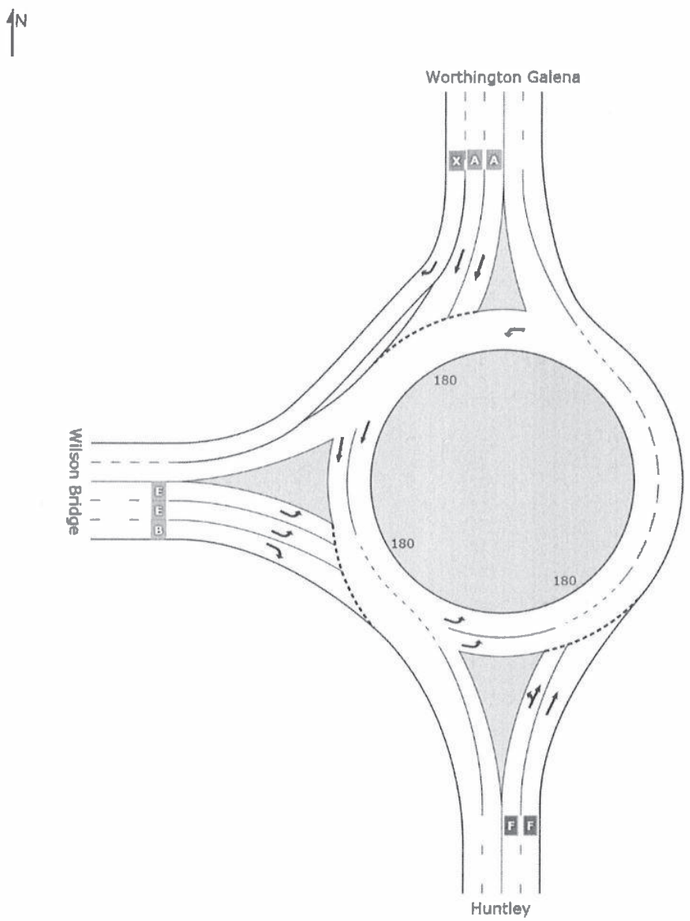
SIDRA INTERSECTION

LEVEL OF SERVICE SUMMARY

Site: E 2036PM D2

Worthington Galena and Wilson Bridge/Huntley, 2014-1176
Concept D2, East roundabout
2036 PM DHV
Roundabout



	South	North	West	Intersection
LOS	F	A	E	F

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
HCM Delay Model used. Geometric Delay not included.

MOVEMENT SUMMARY

Site: E 2036PM D2

Worthington Galena and Wilson Bridge/Huntley, 2014-1176
Concept D2, East roundabout
2036 PM DHV
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Huntley											
3	L	207	2.0	1.241	150.0	LOS F	45.7	1160.7	1.00	3.59	7.5
8	T	1065	2.0	1.241	149.0	LOS F	47.6	1209.8	1.00	3.67	7.0
Approach		1272	2.0	1.241	149.2	LOS F	47.6	1209.8	1.00	3.65	7.1
North: Worthington Galena											
4	T	859	2.0	0.459	9.4	LOS A	2.4	61.5	0.43	0.41	27.0
14	R	1424	2.0	0.897	1.0	X	X	X	X	0.28	31.8
Approach		2283	2.0	0.897	4.1	LOS A	2.4	61.5	0.16	0.33	29.8
West: Wilson Bridge											
5	L	1043	2.0	0.888	41.0	LOS E	7.4	187.5	0.87	1.26	16.1
12	R	261	2.0	0.454	13.6	LOS B	1.7	42.6	0.63	0.80	24.1
Approach		1304	2.0	0.888	35.5	LOS E	7.4	187.5	0.82	1.17	17.1
All Vehicles		4859	2.0	1.241	50.5	LOS F	47.6	1209.8	0.56	1.43	14.5

X: Not applicable for Continuous movement.

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

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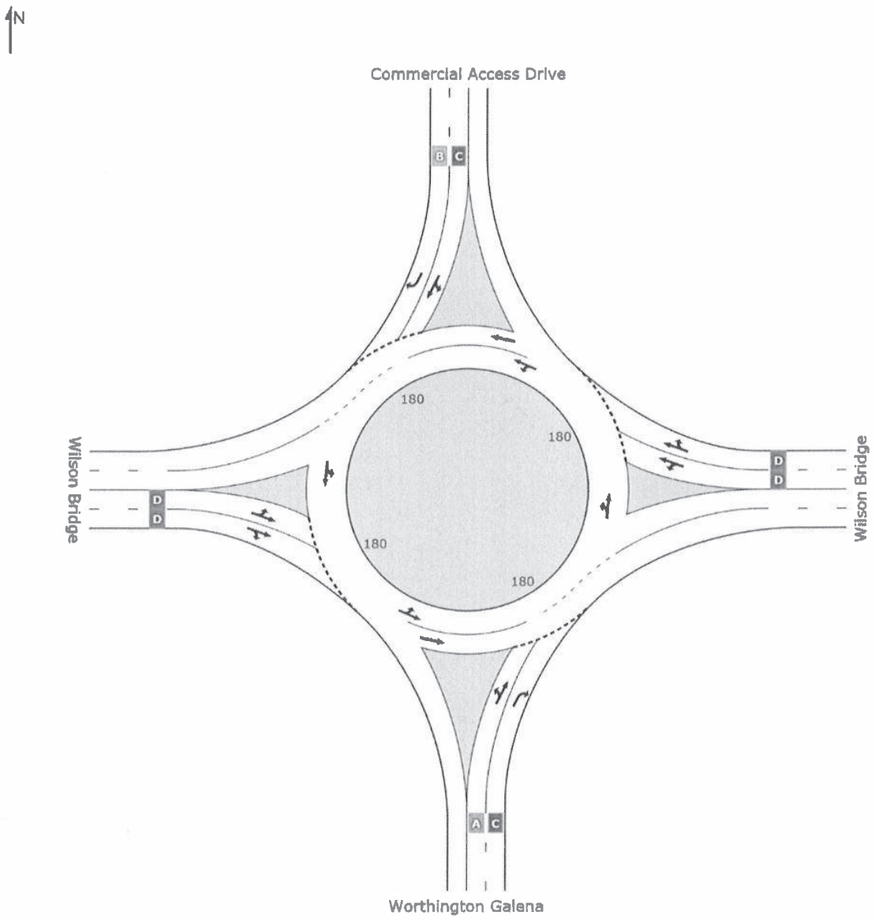
SIDRA INTERSECTION

LEVEL OF SERVICE SUMMARY

Site: W 2036AM

Worthington Galena and Wilson Bridge/Huntley, 2014-1176
Concept D, West roundabout
2036 AM DHV

Roundabout



	South	East	North	West	Intersection
LOS	C	D	B	D	D

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
HCM Delay Model used. Geometric Delay not included.

MOVEMENT SUMMARY

Site: W 2036AM

Worthington Galena and Wilson Bridge/Huntley, 2014-1176
Concept D, West roundabout
2036 AM DHV

Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Worthington Galena											
3	L	11	2.0	0.109	7.3	LOS A	0.3	7.4	0.49	1.04	25.5
8	T	54	2.0	0.109	7.3	LOS A	0.3	7.4	0.49	0.57	28.1
18	R	370	2.0	0.592	16.8	LOS C	2.6	65.2	0.65	0.84	22.8
Approach		435	2.0	0.592	15.3	LOS C	2.6	65.2	0.63	0.81	23.4
East: Wilson Bridge											
1	L	652	2.0	0.894	30.2	LOS D	16.9	429.3	1.00	0.88	18.2
6	T	957	2.0	0.894	30.2	LOS D	16.9	429.3	1.00	0.88	18.7
16	R	87	2.0	0.894	30.2	LOS D	16.9	429.3	1.00	0.88	18.9
Approach		1696	2.0	0.894	30.2	LOS D	16.9	429.3	1.00	0.88	18.5
North: Commercial Access Drive											
7	L	33	2.0	0.203	15.1	LOS C	0.5	13.5	0.75	0.96	19.4
4	T	33	2.0	0.203	15.1	LOS C	0.5	13.5	0.75	0.77	19.5
14	R	65	2.0	0.187	13.6	LOS B	0.5	12.0	0.73	0.77	20.1
Approach		130	2.0	0.203	14.3	LOS B	0.5	13.5	0.74	0.82	19.7
West: Wilson Bridge											
5	L	87	2.0	0.744	27.6	LOS D	5.2	130.8	0.83	1.19	19.2
2	T	685	2.0	0.744	27.6	LOS D	5.2	130.8	0.83	1.04	19.6
12	R	22	2.0	0.744	27.6	LOS D	5.2	130.8	0.83	1.08	19.5
Approach		793	2.0	0.744	27.6	LOS D	5.2	130.8	0.83	1.06	19.5
All Vehicles		3054	2.0	0.894	26.7	LOS D	16.9	429.3	0.89	0.91	19.4

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

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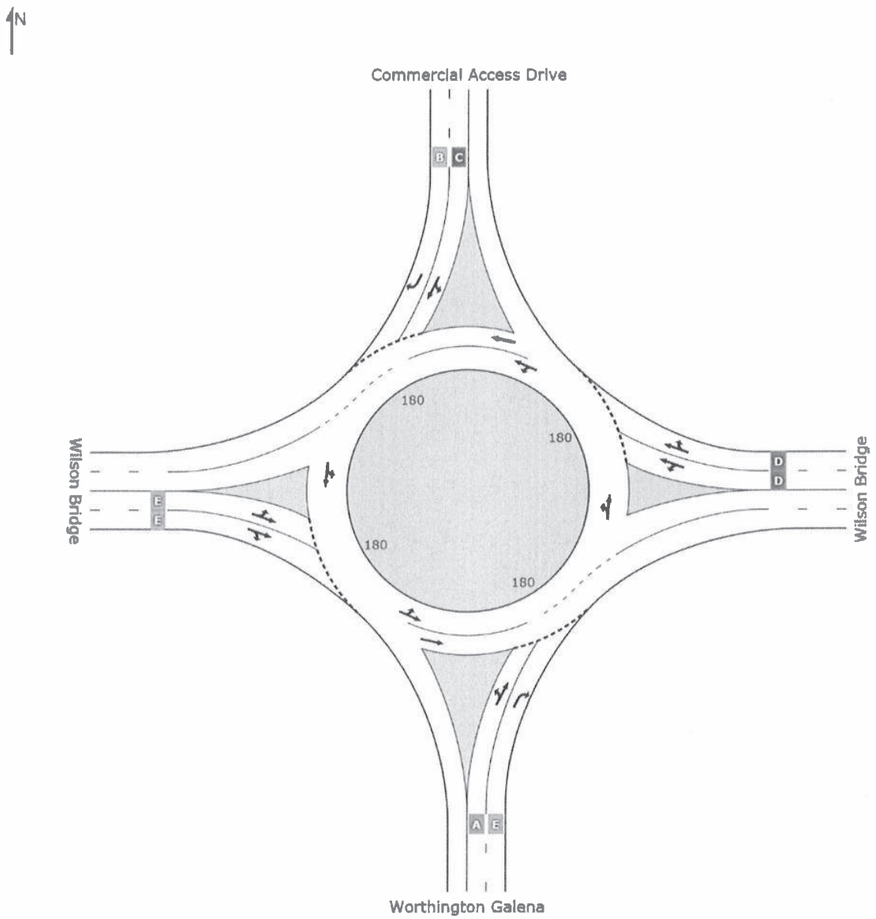
SIDRA INTERSECTION

LEVEL OF SERVICE SUMMARY

Site: W 2036PM

Worthington Galena and Wilson Bridge/Huntley, 2014-1176
Concept D, West roundabout
2036 PM DHV

Roundabout



	South	East	North	West	Intersection
LOS	E	D	C	E	D

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
HCM Delay Model used. Geometric Delay not included.

MOVEMENT SUMMARY

Site: W 2036PM

Worthington Galena and Wilson Bridge/Huntley, 2014-1176
Concept D, West roundabout
2036 PM DHV

Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Worthington Galena											
3	L	22	2.0	0.135	8.0	LOS A	0.4	9.2	0.53	0.99	25.2
8	T	54	2.0	0.135	8.0	LOS A	0.4	9.2	0.53	0.60	27.5
18	R	533	2.0	0.901	42.9	LOS E	7.6	192.7	0.88	1.25	15.7
Approach		609	2.0	0.901	38.5	LOS E	7.6	192.7	0.84	1.18	16.6
East: Wilson Bridge											
1	L	685	2.0	0.869	26.7	LOS D	14.6	369.9	0.92	0.78	19.0
6	T	946	2.0	0.869	26.7	LOS D	14.6	369.9	0.92	0.74	19.8
16	R	54	2.0	0.869	26.7	LOS D	14.6	369.9	0.92	0.75	19.8
Approach		1685	2.0	0.869	26.7	LOS D	14.6	369.9	0.92	0.76	19.4
North: Commercial Access Drive											
7	L	54	2.0	0.319	17.0	LOS C	0.9	22.5	0.77	1.01	18.9
4	T	54	2.0	0.319	17.0	LOS C	0.9	22.5	0.77	0.82	18.9
14	R	54	2.0	0.174	14.8	LOS B	0.4	11.4	0.75	0.79	19.7
Approach		163	2.0	0.319	16.3	LOS C	0.9	22.5	0.76	0.87	19.2
West: Wilson Bridge											
5	L	54	2.0	0.860	41.8	LOS E	7.5	190.3	0.89	1.34	16.3
2	T	772	2.0	0.860	41.8	LOS E	7.5	190.3	0.89	1.24	16.2
12	R	22	2.0	0.860	41.8	LOS E	7.5	190.3	0.89	1.27	16.1
Approach		848	2.0	0.860	41.8	LOS E	7.5	190.3	0.89	1.25	16.2
All Vehicles		3304	2.0	0.901	32.2	LOS D	14.6	369.9	0.89	0.97	18.0

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

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SIDRA INTERSECTION

HCM 2010 Signalized Intersection Summary
2: Huntley Rd/Worthington Galena

8/4/2015

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	790	180	260	800	680	1220
Number	7	14	5	2	6	16
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	859	196	283	870	739	1326
Adj No. of Lanes	2	1	1	2	2	2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	1475	679	315	1653	995	1978
Arrive On Green	0.57	0.57	0.13	0.47	0.09	0.09
Sat Flow, veh/h	3442	1583	1774	3632	3632	2787
Grp Volume(v), veh/h	859	196	283	870	739	1326
Grp Sat Flow(s),veh/h/ln	1721	1583	1774	1770	1770	1393
Q Serve(g_s), s	18.5	7.3	12.9	20.0	23.4	23.8
Cycle Q Clear(g_c), s	18.5	7.3	12.9	20.0	23.4	23.8
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	1475	679	315	1653	995	1978
V/C Ratio(X)	0.58	0.29	0.90	0.53	0.74	0.67
Avail Cap(c_a), veh/h	1475	679	418	1877	1016	1994
HCM Platoon Ratio	1.33	1.33	1.00	1.00	0.33	0.33
Upstream Filter(I)	0.89	0.89	1.00	1.00	0.30	0.30
Uniform Delay (d), s/veh	18.1	15.7	28.7	21.7	48.1	10.5
Incr Delay (d2), s/veh	1.5	1.0	17.9	0.3	0.9	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	8.9	9.1	10.4	9.8	11.6	21.2
LnGrp Delay(d),s/veh	19.6	16.6	46.5	21.9	49.0	10.7
LnGrp LOS	B	B	D	C	D	B
Approach Vol, veh/h	1055			1153	2065	
Approach Delay, s/veh	19.0			28.0	24.4	
Approach LOS	B			C	C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		59.7		55.3	21.4	38.3		
Change Period (Y+Rc), s		6.0		6.0	6.0	6.0		
Max Green Setting (Gmax), s		61.0		42.0	22.0	33.0		
Max Q Clear Time (g_c+I1), s		22.0		20.5	14.9	25.8		
Green Ext Time (p_c), s		27.3		4.1	0.5	6.6		

Intersection Summary	
HCM 2010 Ctrl Delay	24.0
HCM 2010 LOS	C

HCM 2010 Signalized Intersection Summary
2: Huntley Rd/Worthington Galena

8/4/2015

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	960	240	190	980	790	1310
Number	7	14	5	2	6	16
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	1043	261	207	1065	859	1424
Adj No. of Lanes	2	1	1	2	2	2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	1485	683	254	1626	1094	2063
Arrive On Green	0.57	0.57	0.10	0.46	0.52	0.52
Sat Flow, veh/h	3442	1583	1774	3632	3632	2787
Grp Volume(v), veh/h	1043	261	207	1065	859	1424
Grp Sat Flow(s),veh/h/ln	1721	1583	1774	1770	1770	1393
Q Serve(g_s), s	23.8	9.9	8.4	25.6	21.7	34.0
Cycle Q Clear(g_c), s	23.8	9.9	8.4	25.6	21.7	34.0
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	1485	683	254	1626	1094	2063
V/C Ratio(X)	0.70	0.38	0.82	0.65	0.79	0.69
Avail Cap(c_a), veh/h	1485	683	309	1737	1094	2063
HCM Platoon Ratio	1.33	1.33	1.00	1.00	1.67	1.67
Upstream Filter(I)	0.77	0.77	1.00	1.00	0.44	0.44
Uniform Delay (d), s/veh	18.4	15.4	26.1	23.0	23.6	5.7
Incr Delay (d2), s/veh	2.2	1.3	13.1	0.8	1.7	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	11.6	11.6	4.9	12.6	10.8	21.6
LnGrp Delay(d),s/veh	20.6	16.7	39.1	23.8	25.4	6.1
LnGrp LOS	C	B	D	C	C	A
Approach Vol, veh/h	1304			1272	2283	
Approach Delay, s/veh	19.8			26.3	13.4	
Approach LOS	B			C	B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		56.6		53.4	16.6	40.0		
Change Period (Y+Rc), s		6.0		6.0	6.0	6.0		
Max Green Setting (Gmax), s		54.0		44.0	14.0	34.0		
Max Q Clear Time (g_c+I1), s		27.6		25.8	10.4	36.0		
Green Ext Time (p_c), s		22.6		5.1	0.2	0.0		

Intersection Summary	
HCM 2010 Ctrl Delay	18.5
HCM 2010 LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	80	630	20	600	880	80	10	50	340	30	30	60
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1863	1863	1863	1900
Adj Flow Rate, veh/h	87	685	22	652	957	87	11	54	370	33	33	65
Adj No. of Lanes	1	2	0	2	1	0	1	1	1	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	232	1537	49	734	1185	108	245	356	640	223	107	212
Arrive On Green	0.44	0.44	0.44	0.21	0.70	0.70	0.19	0.19	0.19	0.19	0.19	0.19
Sat Flow, veh/h	538	3500	112	3442	1683	153	1292	1863	1583	959	562	1106
Grp Volume(v), veh/h	87	346	361	652	0	1044	11	54	370	33	0	98
Grp Sat Flow(s),veh/h/ln	538	1770	1843	1721	0	1836	1292	1863	1583	959	0	1668
Q Serve(g_s), s	15.2	15.7	15.7	21.1	0.0	44.8	0.8	2.8	20.9	3.4	0.0	5.8
Cycle Q Clear(g_c), s	29.5	15.7	15.7	21.1	0.0	44.8	6.7	2.8	20.9	6.2	0.0	5.8
Prop In Lane	1.00		0.06	1.00		0.08	1.00		1.00	1.00		0.66
Lane Grp Cap(c), veh/h	232	777	809	734	0	1293	245	356	640	223	0	319
V/C Ratio(X)	0.38	0.45	0.45	0.89	0.00	0.81	0.04	0.15	0.58	0.15	0.00	0.31
Avail Cap(c_a), veh/h	232	777	809	868	0	1293	245	356	640	223	0	319
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.68	0.00	0.68	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	32.2	22.5	22.5	43.9	0.0	11.7	42.8	38.7	26.6	41.3	0.0	40.0
Incr Delay (d2), s/veh	4.6	1.8	1.8	7.2	0.0	3.8	0.1	0.2	1.3	0.3	0.0	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.5	8.1	8.4	10.8	0.0	23.7	0.3	1.4	9.3	0.9	0.0	2.7
LnGrp Delay(d),s/veh	36.8	24.3	24.3	51.1	0.0	15.5	42.9	38.9	27.9	41.6	0.0	40.5
LnGrp LOS	D	C	C	D		B	D	D	C	D		D
Approach Vol, veh/h		794			1696			435			131	
Approach Delay, s/veh		25.7			29.2			29.7			40.8	
Approach LOS		C			C			C			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		8
Phs Duration (G+Y+Rc), s	30.5	56.5		28.0		87.0		28.0
Change Period (Y+Rc), s	6.0	6.0		6.0		6.0		6.0
Max Green Setting (Gmax), s	29.0	46.0		22.0		81.0		22.0
Max Q Clear Time (g_c+I1), s	23.1	31.5		8.2		46.8		22.9
Green Ext Time (p_c), s	1.4	10.6		2.1		19.1		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	28.8
HCM 2010 LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	50	710	20	630	870	50	20	50	490	50	50	50
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1863	1863	1863	1900
Adj Flow Rate, veh/h	54	772	22	685	946	54	22	54	533	54	54	54
Adj No. of Lanes	1	2	0	2	1	0	1	1	1	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	248	1449	41	771	1206	69	253	373	671	211	171	171
Arrive On Green	0.41	0.41	0.41	0.22	0.69	0.69	0.20	0.20	0.20	0.20	0.20	0.20
Sat Flow, veh/h	561	3515	100	3442	1746	100	1280	1863	1583	825	856	856
Grp Volume(v), veh/h	54	389	405	685	0	1000	22	54	533	54	0	108
Grp Sat Flow(s),veh/h/ln	561	1770	1845	1721	0	1845	1280	1863	1583	825	0	1712
Q Serve(g_s), s	7.9	18.2	18.2	21.2	0.0	40.2	1.6	2.6	22.0	6.3	0.0	5.9
Cycle Q Clear(g_c), s	17.5	18.2	18.2	21.2	0.0	40.2	7.6	2.6	22.0	9.0	0.0	5.9
Prop In Lane	1.00		0.05	1.00		0.05	1.00		1.00	1.00		0.50
Lane Grp Cap(c), veh/h	248	730	761	771	0	1275	253	373	671	211	0	342
V/C Ratio(X)	0.22	0.53	0.53	0.89	0.00	0.78	0.09	0.14	0.79	0.26	0.00	0.32
Avail Cap(c_a), veh/h	248	730	761	907	0	1275	253	373	671	211	0	342
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.71	0.00	0.71	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	27.7	24.3	24.3	41.3	0.0	11.5	40.8	36.3	27.5	39.9	0.0	37.6
Incr Delay (d2), s/veh	2.0	2.8	2.7	7.1	0.0	3.5	0.1	0.2	6.5	0.6	0.0	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.4	9.4	9.8	10.9	0.0	21.5	0.6	1.4	15.2	1.5	0.0	2.8
LnGrp Delay(d),s/veh	29.7	27.1	27.0	48.5	0.0	15.0	40.9	36.4	34.0	40.6	0.0	38.1
LnGrp LOS	C	C	C	D		B	D	D	C	D		D
Approach Vol, veh/h		848			1685			609			162	
Approach Delay, s/veh		27.2			28.6			34.5			38.9	
Approach LOS		C			C			C			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		8
Phs Duration (G+Y+Rc), s	30.6	51.4		28.0		82.0		28.0
Change Period (Y+Rc), s	6.0	6.0		6.0		6.0		6.0
Max Green Setting (Gmax), s	29.0	41.0		22.0		76.0		22.0
Max Q Clear Time (g_c+I1), s	23.2	20.2		11.0		42.2		24.0
Green Ext Time (p_c), s	1.4	13.6		2.7		18.4		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	29.9
HCM 2010 LOS	C

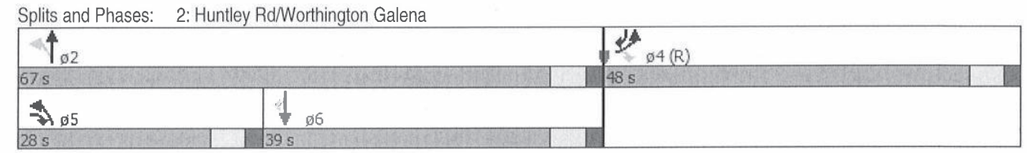
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	790	180	260	800	680	1220
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	550	0	500			300
Storage Lanes	0	1	1			2
Taper Length (ft)	25		25			
Lane Util. Factor	0.97	1.00	1.00	0.95	0.95	0.88
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	3433	1583	1770	3539	3539	2787
Flt Permitted	0.950		0.125			
Satd. Flow (perm)	3433	1583	233	3539	3539	2787
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		34				400
Link Speed (mph)	35			35	35	
Link Distance (ft)	651			806	932	
Travel Time (s)	12.7			15.7	18.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	859	196	283	870	739	1326
Shared Lane Traffic (%)						
Lane Group Flow (vph)	859	196	283	870	739	1326
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	24			12	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9	15			9
Number of Detectors	1	1	1	2	2	1
Detector Template	Left	Right	Left	Thru	Thru	Right
Leading Detector (ft)	20	20	20	100	100	20
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	20	20	20	6	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)				94	94	
Detector 2 Size(ft)				6	6	
Detector 2 Type				Cl+Ex	Cl+Ex	
Detector 2 Channel						
Detector 2 Extend (s)				0.0	0.0	
Turn Type	Prot	pm+ov	pm+pt	NA	NA	pm+ov
Protected Phases	4	5	5	2	6	4
Permitted Phases		4	2			6
Detector Phase	4	5	5	2	6	4

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	28.0	10.0	10.0	28.0	28.0	28.0
Total Split (s)	48.0	28.0	28.0	67.0	39.0	48.0
Total Split (%)	41.7%	24.3%	24.3%	58.3%	33.9%	41.7%
Maximum Green (s)	42.0	22.0	22.0	61.0	33.0	42.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag		Lead	Lead		Lag	
Lead-Lag Optimize?		Yes	Yes		Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	C-Min	None	None	Min	Min	C-Min
Walk Time (s)	7.0			7.0	7.0	7.0
Flash Dont Walk (s)	15.0			15.0	15.0	15.0
Pedestrian Calls (#/hr)	0			0	0	0
Act Effct Green (s)	47.7	73.5	55.3	55.3	29.5	83.2
Actuated g/C Ratio	0.41	0.64	0.48	0.48	0.26	0.72
v/c Ratio	0.60	0.19	0.75	0.51	0.81	0.62
Control Delay	20.5	7.3	37.6	21.2	41.9	5.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	20.5	7.3	37.6	21.2	41.9	5.0
LOS	C	A	D	C	D	A
Approach Delay	18.1			25.2	18.2	
Approach LOS	B			C	B	

Intersection Summary

Area Type: Other
Cycle Length: 115
Actuated Cycle Length: 115
Offset: 114 (99%), Referenced to phase 4:EBL, Start of Green
Natural Cycle: 70
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.81
Intersection Signal Delay: 20.1 Intersection LOS: C
Intersection Capacity Utilization 70.7% ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 2: Huntley Rd/Worthington Galena

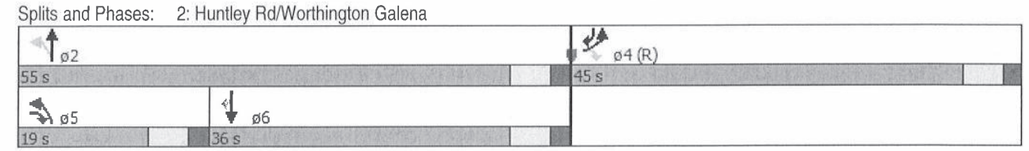


Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	960	240	190	980	790	1310
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	550	0	500			300
Storage Lanes	0	1	1			2
Taper Length (ft)	25		25			
Lane Util. Factor	0.97	1.00	1.00	0.95	0.95	0.88
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	3433	1583	1770	3539	3539	2787
Flt Permitted	0.950		0.116			
Satd. Flow (perm)	3433	1583	216	3539	3539	2787
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		22				405
Link Speed (mph)	35			35	35	
Link Distance (ft)	651			806	932	
Travel Time (s)	12.7			15.7	18.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1043	261	207	1065	859	1424
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1043	261	207	1065	859	1424
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	24			12	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9	15			9
Number of Detectors	1	1	1	2	2	1
Detector Template	Left	Right	Left	Thru	Thru	Right
Leading Detector (ft)	20	20	20	100	100	20
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	20	20	20	6	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)				94	94	
Detector 2 Size(ft)				6	6	
Detector 2 Type				Cl+Ex	Cl+Ex	
Detector 2 Channel						
Detector 2 Extend (s)				0.0	0.0	
Turn Type	Prot	pm+ov	pm+pt	NA	NA	pm+ov
Protected Phases	4	5	5	2	6	4
Permitted Phases		4	2			6
Detector Phase	4	5	5	2	6	4

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	28.0	10.0	10.0	28.0	28.0	28.0
Total Split (s)	45.0	19.0	19.0	55.0	36.0	45.0
Total Split (%)	45.0%	19.0%	19.0%	55.0%	36.0%	45.0%
Maximum Green (s)	39.0	13.0	13.0	49.0	30.0	39.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag		Lead	Lead		Lag	
Lead-Lag Optimize?		Yes	Yes		Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	C-Min	None	None	Min	Min	C-Min
Walk Time (s)	7.0			7.0	7.0	7.0
Flash Dont Walk (s)	15.0			15.0	15.0	15.0
Pedestrian Calls (#/hr)	0			0	0	0
Act Effct Green (s)	41.2	59.5	46.8	46.8	28.5	75.7
Actuated g/C Ratio	0.41	0.60	0.47	0.47	0.28	0.76
v/c Ratio	0.74	0.27	0.71	0.64	0.85	0.64
Control Delay	24.7	7.9	33.3	22.1	34.8	1.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	24.7	7.9	33.3	22.1	34.8	1.9
LOS	C	A	C	C	C	A
Approach Delay	21.3			23.9	14.2	
Approach LOS	C			C	B	

Intersection Summary		
Area Type:	Other	
Cycle Length: 100		
Actuated Cycle Length: 100		
Offset: 88 (88%), Referenced to phase 4:EBL, Start of Green		
Natural Cycle: 70		
Control Type: Actuated-Coordinated		
Maximum v/c Ratio: 0.85		
Intersection Signal Delay: 18.7		Intersection LOS: B
Intersection Capacity Utilization 74.8%		ICU Level of Service D
Analysis Period (min) 15		

Splits and Phases: 2: Huntley Rd/Worthington Galena



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	630	20	10	340	600	880
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	300	0	500			0
Storage Lanes	1	0	1			1
Taper Length (ft)	25		25			
Lane Util. Factor	0.97	0.95	1.00	1.00	1.00	1.00
Frt	0.995					0.850
Flt Protected	0.954		0.950			
Satd. Flow (prot)	3430	0	1770	1863	1863	1583
Flt Permitted	0.954		0.153			
Satd. Flow (perm)	3430	0	285	1863	1863	1583
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)	3					
Link Speed (mph)	35			35	35	
Link Distance (ft)	856			1348	651	
Travel Time (s)	16.7			26.3	12.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	685	22	11	370	652	957
Shared Lane Traffic (%)						
Lane Group Flow (vph)	707	0	11	370	652	957
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	24			12	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9	15			9
Number of Detectors	1		1	2	2	1
Detector Template	Left		Left	Thru	Thru	Right
Leading Detector (ft)	20		20	100	100	20
Trailing Detector (ft)	0		0	0	0	0
Detector 1 Position(ft)	0		0	0	0	0
Detector 1 Size(ft)	20		20	6	6	20
Detector 1 Type	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0		0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0		0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0		0.0	0.0	0.0	0.0
Detector 2 Position(ft)				94	94	
Detector 2 Size(ft)				6	6	
Detector 2 Type				Cl+Ex	Cl+Ex	
Detector 2 Channel						
Detector 2 Extend (s)				0.0	0.0	
Turn Type	Prot		Perm	NA	NA	pm+ov
Protected Phases	2			1	1	2
Permitted Phases			1			1
Detector Phase	2		1	1	1	2

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Switch Phase						
Minimum Initial (s)	4.0		4.0	4.0	4.0	4.0
Minimum Split (s)	28.0		10.0	10.0	10.0	28.0
Total Split (s)	51.0		64.0	64.0	64.0	51.0
Total Split (%)	44.3%		55.7%	55.7%	55.7%	44.3%
Maximum Green (s)	45.0		58.0	58.0	58.0	45.0
Yellow Time (s)	4.0		4.0	4.0	4.0	4.0
All-Red Time (s)	2.0		2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0		6.0	6.0	6.0	6.0
Lead/Lag	Lag		Lead	Lead	Lead	Lag
Lead-Lag Optimize?	Yes		Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	C-Min		None	None	None	C-Min
Walk Time (s)	7.0					7.0
Flash Dont Walk (s)	15.0					15.0
Pedestrian Calls (#/hr)	0					0
Act Effct Green (s)	53.6		49.4	49.4	49.4	115.0
Actuated g/C Ratio	0.47		0.43	0.43	0.43	1.00
v/c Ratio	0.44		0.09	0.46	0.82	0.60
Control Delay	23.0		18.2	24.4	31.2	2.1
Queue Delay	0.0		0.0	0.0	0.4	0.0
Total Delay	23.0		18.2	24.4	31.6	2.1
LOS	C		B	C	C	A
Approach Delay	23.0			24.2	14.0	
Approach LOS	C			C	B	

Intersection Summary			
Area Type:	Other		
Cycle Length: 115			
Actuated Cycle Length: 115			
Offset: 8 (7%), Referenced to phase 2:EBL, Start of Green			
Natural Cycle: 60			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.82			
Intersection Signal Delay: 17.8		Intersection LOS: B	
Intersection Capacity Utilization 67.8%		ICU Level of Service C	
Analysis Period (min) 15			

Splits and Phases: 3: Worthington Galena & Wilson Bridge

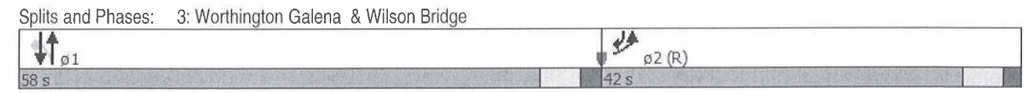
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	710	20	20	490	630	870
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	300	0	500			0
Storage Lanes	1	0	1			1
Taper Length (ft)	25		25			
Lane Util. Factor	0.97	0.95	1.00	1.00	1.00	1.00
Frt	0.996					0.850
Flt Protected	0.954		0.950			
Satd. Flow (prot)	3434	0	1770	1863	1863	1583
Flt Permitted	0.954		0.160			
Satd. Flow (perm)	3434	0	298	1863	1863	1583
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)	3					
Link Speed (mph)	35			35	35	
Link Distance (ft)	856			1348	651	
Travel Time (s)	16.7			26.3	12.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	772	22	22	533	685	946
Shared Lane Traffic (%)						
Lane Group Flow (vph)	794	0	22	533	685	946
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	24			12	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9	15			9
Number of Detectors	1		1	2	2	1
Detector Template	Left		Left	Thru	Thru	Right
Leading Detector (ft)	20		20	100	100	20
Trailing Detector (ft)	0		0	0	0	0
Detector 1 Position(ft)	0		0	0	0	0
Detector 1 Size(ft)	20		20	6	6	20
Detector 1 Type	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0		0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0		0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0		0.0	0.0	0.0	0.0
Detector 2 Position(ft)				94	94	
Detector 2 Size(ft)				6	6	
Detector 2 Type				Cl+Ex	Cl+Ex	
Detector 2 Channel						
Detector 2 Extend (s)				0.0	0.0	
Turn Type	Prot		Perm	NA	NA	pm+ov
Protected Phases	2			1	1	2
Permitted Phases			1			1
Detector Phase	2		1	1	1	2

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Switch Phase						
Minimum Initial (s)	4.0		4.0	4.0	4.0	4.0
Minimum Split (s)	28.0		10.0	10.0	10.0	28.0
Total Split (s)	42.0		58.0	58.0	58.0	42.0
Total Split (%)	42.0%		58.0%	58.0%	58.0%	42.0%
Maximum Green (s)	36.0		52.0	52.0	52.0	36.0
Yellow Time (s)	4.0		4.0	4.0	4.0	4.0
All-Red Time (s)	2.0		2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0		6.0	6.0	6.0	6.0
Lead/Lag	Lag		Lead	Lead	Lead	Lag
Lead-Lag Optimize?	Yes		Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	C-Min		None	None	None	C-Min
Walk Time (s)	7.0					7.0
Flash Dont Walk (s)	15.0					15.0
Pedestrian Calls (#/hr)	0					0
Act Effct Green (s)	42.5		45.5	45.5	45.5	100.0
Actuated g/C Ratio	0.42		0.46	0.46	0.46	1.00
v/c Ratio	0.54		0.16	0.63	0.81	0.60
Control Delay	24.4		17.0	23.8	23.8	1.6
Queue Delay	0.0		0.0	0.0	0.2	0.0
Total Delay	24.4		17.0	23.8	24.0	1.6
LOS	C		B	C	C	A
Approach Delay	24.4			23.5	11.0	
Approach LOS	C			C	B	

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 1 (1%), Referenced to phase 2:EBL, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.81
Intersection Signal Delay: 16.9 Intersection LOS: B
Intersection Capacity Utilization 67.2% ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 3: Worthington Galena & Wilson Bridge



Appendix I

WinPAS

Pavement Thickness Design According to

1993 AASHTO Guide for Design of Pavements Structures

American Concrete Pavement Association

ESAL Determination by Traffic Factor

Agency:
Company:
Contractor:
Project Description: Worthington-Galena North Leg
Location: Worthington OH

Traffic Factor

Estimated Rigid Thickness	0.00	**inches**
Estimated Structural Number	6.0	
Terminal Serviceability	2.5	
Design Life	20	**years**
Annual Growth Rate	1.20	**percent**
Traffic Input by	Day	

Traffic Input by

Total Traffic	2-way
Design Lane Distribution	90 percent
Directional Distribution	50 percent

ESAL Determination by Traffic Input

Traffic Input As

Average Daily Traffic (ADTT)	0.00
> Average Daily Traffic (ADT)	28,930.00
% of Heavy trucks	4.00

ESAL Traffic Factors

Rigid ESAL/Truck	1.09
Flexible ESAL/Truck	0.73

Total Rigid ESAL	4,633,537
Total Flexible ESAL	3,117,495

Monday, April 6, 2015 3:34:07PM Engineer: mrb

WinPAS

Pavement Thickness Design According to

1993 AASHTO Guide for Design of Pavements Structures

American Concrete Pavement Association

Flexible Design Inputs

Agency:
Company:
Contractor:
roject Description: Worthington-Galena North Leg
Location: Worthington OH

Flexible Pavement Design/Evaluation

Structural Number	5.19		**Soil Resilient Modulus**	3,600.00	**psi**
Design ESALs	3,117,495		**Initial Serviceability**	4.50	
Reliability	90.00	**percent**	**Terminal Serviceability**	2.50	
Overall Deviation	0.49				

Layer Pavement Design/Evaluation

Layer Material	Layer Coefficient	Drainage Coefficient	Layer Thickness	Layer SN
Asphalt Cement Concrete	0.43	1.00	1.25	0.54
Asphalt Cement Concrete	0.43	1.00	1.75	0.75
Asphalt Cement Concrete	0.36	1.00	8.50	3.06
Granular Subbase	0.14	1.00	6.00	0.84
	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00
			ΣSN	5.19

Monday, April 6, 2015 3:34:19PM Engineer:mrb

WinPAS

Pavement Thickness Design According to

1993 AASHTO Guide for Design of Pavements Structures

American Concrete Pavement Association

Rigid Design Inputs

Agency:
Company:
Contractor:
Project Description: Worthington-Galena North Leg
Location: Worthington OH

Rigid Pavement Design/Evaluation

PCC Thickness	9.28	**inches**	Load Transfer, J	3.20	
Design ESALs	4,633,537		Mod. Subgrade Reaction, k	72	**psi/in**
Reliability	90.00	percent	Drainage Coefficient, Cd	1.00	
Overall Deviation	0.39		Initial Serviceability	4.20	
Modulus of Rupture	700	psi	Terminal Serviceability	2.50	
Modulus of Elasticity	5,000,000	psi			

Modulus of Subgrade Reaction (k-value) Determination

Resilient Modulus of the Subgrade	3,600.0	**psi**
Resilient Modulus of the Subbase	30,000.0	psi
Subbase Thickness	6.00	inches
Depth to Rigid Foundation	0.00	feet
Loss of Support Value (0,1,2,3)	1.0	
Modulus of Subgrade Reaction	72.40	**psi/in**

WinPAS

Pavement Thickness Design According to

1993 AASHTO Guide for Design of Pavements Structures

American Concrete Pavement Association

ESAL Determination by Traffic Factor

Agency:
Company:
Contractor:
Project Description: Wilson Bridge
Location: Worthington OH

Traffic Factor

Estimated Rigid Thickness	0.00	**inches**
Estimated Structural Number	6.0	
Terminal Serviceability	2.5	
Design Life	20	**years**
Annual Growth Rate	1.40	**percent**
Traffic Input by	Day	

Traffic Input by

Total Traffic 2-way
Design Lane Distribution 100 percent
Directional Distribution 50 percent

ESAL Determination by Traffic Input

Traffic Input As

Average Daily Traffic (ADTT)	0.00
> Average Daily Traffic (ADT)	13,630.00
% of Heavy trucks	4.00

ESAL Traffic Factors

Rigid ESAL/Truck	1.09
Flexible ESAL/Truck	0.73

Total Rigid ESAL	2,473,609
Total Flexible ESAL	1,664,272

WinPAS

Pavement Thickness Design According to

1993 AASHTO Guide for Design of Pavements Structures

American Concrete Pavement Association

Flexible Design Inputs

Agency:
Company:
Contractor:
roject Description: Wilson Bridge
Location: Worthington OH

Flexible Pavement Design/Evaluation

Structural Number	4.76		**Soil Resilient Modulus**	3,600.00	**psi**
Design ESALs	1,664,272		**Initial Serviceability**	4.50	
Reliability	90.00	**percent**	**Terminal Serviceability**	2.50	
Overall Deviation	0.49				

Layer Pavement Design/Evaluation

Layer Material	Layer Coefficient	Drainage Coefficient	Layer Thickness	Layer SN
Asphalt Cement Concrete	0.43	1.00	1.25	0.54
Asphalt Cement Concrete	0.43	1.00	1.75	0.75
Asphalt Cement Concrete	0.36	1.00	7.50	2.70
Granular Subbase	0.14	1.00	6.00	0.84
	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00
			ΣSN	4.83

WinPAS

Pavement Thickness Design According to

1993 AASHTO Guide for Design of Pavements Structures

American Concrete Pavement Association

Rigid Design Inputs

Agency:
Company:
Contractor:
Project Description: Wilson Bridge
Location: Worthington OH

Rigid Pavement Design/Evaluation

PCC Thickness	8.41	**inches**	Load Transfer, J	3.20	
Design ESALs	2,473,609		Mod. Subgrade Reaction, k	72	**psi/in**
Reliability	90.00	percent	Drainage Coefficient, Cd	1.00	
Overall Deviation	0.39		Initial Serviceability	4.20	
Modulus of Rupture	700	psi	Terminal Serviceability	2.50	
Modulus of Elasticity	5,000,000	psi			

Modulus of Subgrade Reaction (k-value) Determination

Resilient Modulus of the Subgrade	3,600.0	**psi**
Resilient Modulus of the Subbase	30,000.0	psi
Subbase Thickness	6.00	inches
Depth to Rigid Foundation	0.00	feet
Loss of Support Value (0,1,2,3)	1.0	

Modulus of Subgrade Reaction	72.40	**psi/in**

WinPAS

Pavement Thickness Design According to

1993 AASHTO Guide for Design of Pavements Structures

American Concrete Pavement Association

ESAL Determination by Traffic Factor

Agency:
Company:
Contractor:
Project Description: Huntley
Location: Worthington OH

Traffic Factor

Estimated Rigid Thickness	0.00	**inches**
Estimated Structural Number	6.0	
Terminal Serviceability	2.5	
Design Life	20	**years**
Annual Growth Rate	0.69	**percent**
Traffic Input by	Day	

Traffic Input by

Total Traffic 2-way
Design Lane Distribution 100 percent
Directional Distribution 50 percent

ESAL Determination by Traffic Input

Traffic Input As

Average Daily Traffic (ADTT)	0.00
> Average Daily Traffic (ADT)	19,120.00
% of Heavy trucks	4.00

ESAL Traffic Factors

Rigid ESAL/Truck	1.09
Flexible ESAL/Truck	0.73

Total Rigid ESAL	3,238,019
Total Flexible ESAL	2,178,575

Monday, April 6, 2015 3:40:09PM Engineer: mrb

WinPAS

Pavement Thickness Design According to

1993 AASHTO Guide for Design of Pavements Structures

American Concrete Pavement Association

Flexible Design Inputs

Agency:
Company:
Contractor:
roject Description: Huntley
Location: Worthington OH

Flexible Pavement Design/Evaluation

Structural Number	4.94		**Soil Resilient Modulus**	3,600.00	**psi**
Design ESALs	2,178,575		**Initial Serviceability**	4.50	
Reliability	90.00	**percent**	**Terminal Serviceability**	2.50	
Overall Deviation	0.49				

Layer Pavement Design/Evaluation

Layer Material	Layer Coefficient	Drainage Coefficient	Layer Thickness	Layer SN
Asphalt Cement Concrete	0.43	1.00	1.25	0.54
Asphalt Cement Concrete	0.43	1.00	1.75	0.75
Asphalt Cement Concrete	0.36	1.00	8.00	2.88
Granular Subbase	0.14	1.00	6.00	0.84
	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00
			ΣSN	5.01

Monday, April 6, 2015 3:39:55PM Engineer:mrb

WinPAS

Pavement Thickness Design According to

1993 AASHTO Guide for Design of Pavements Structures

American Concrete Pavement Association

Rigid Design Inputs

Agency:
Company:
Contractor:
Project Description: Huntley
Location: Worthington OH

Rigid Pavement Design/Evaluation

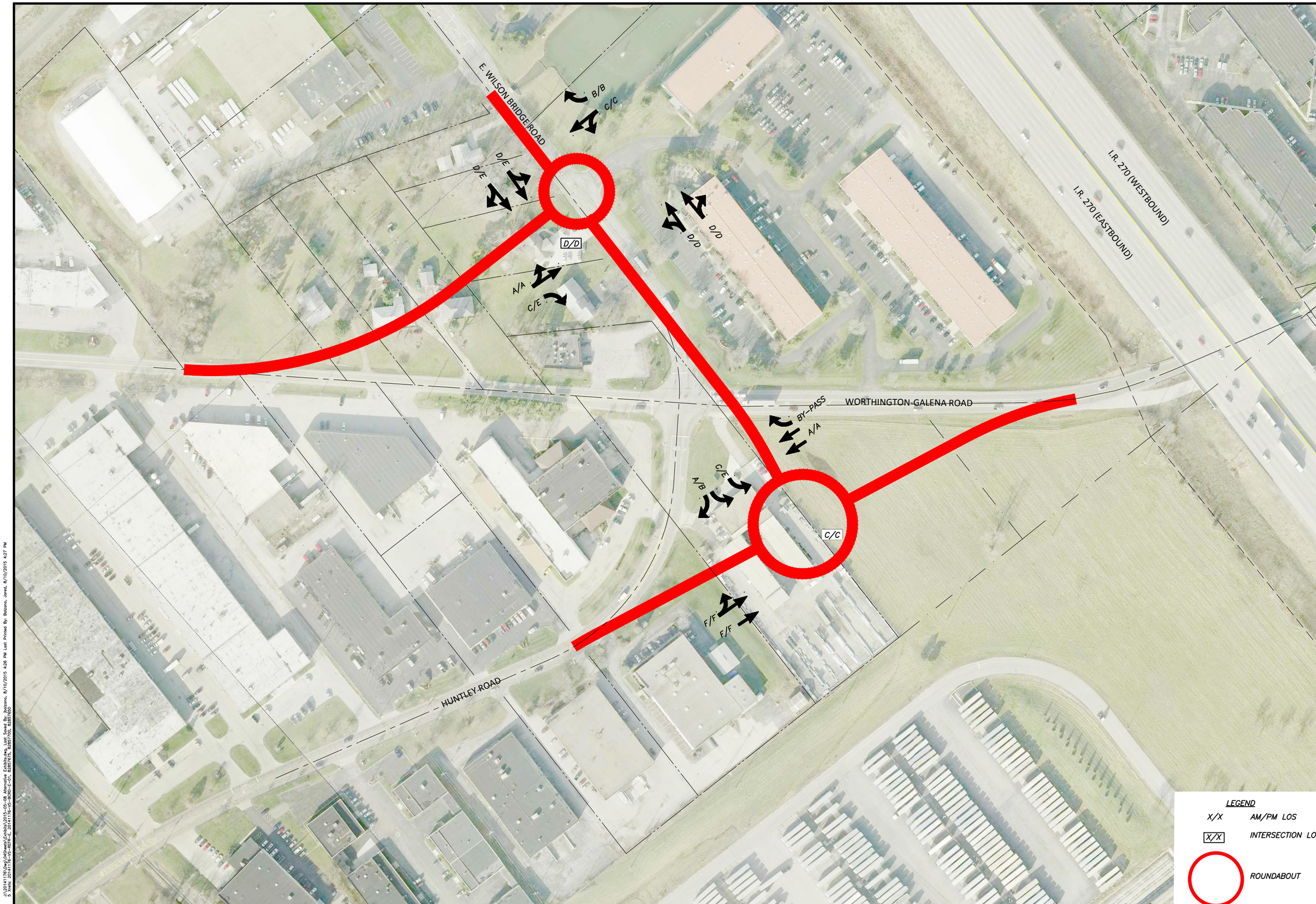
PCC Thickness	8.78	**inches**	Load Transfer, J	3.20	
Design ESALs	3,238,019		Mod. Subgrade Reaction, k	72	**psi/in**
Reliability	90.00	percent	Drainage Coefficient, Cd	1.00	
Overall Deviation	0.39		Initial Serviceability	4.20	
Modulus of Rupture	700	psi	Terminal Serviceability	2.50	
Modulus of Elasticity	5,000,000	psi			

Modulus of Subgrade Reaction (k-value) Determination

Resilient Modulus of the Subgrade	3,600.0	**psi**
Resilient Modulus of the Subbase	30,000.0	psi
Subbase Thickness	6.00	inches
Depth to Rigid Foundation	0.00	feet
Loss of Support Value (0,1,2,3)	1.0	

Modulus of Subgrade Reaction	72.40	**psi/in**

Appendix J



ALTERNATIVE CONCEPT C

HUNTLEY / E. WILSON BRIDGE / WORTHINGTON-GALENA

PRELIMINARY – NOT FOR CONSTRUCTION

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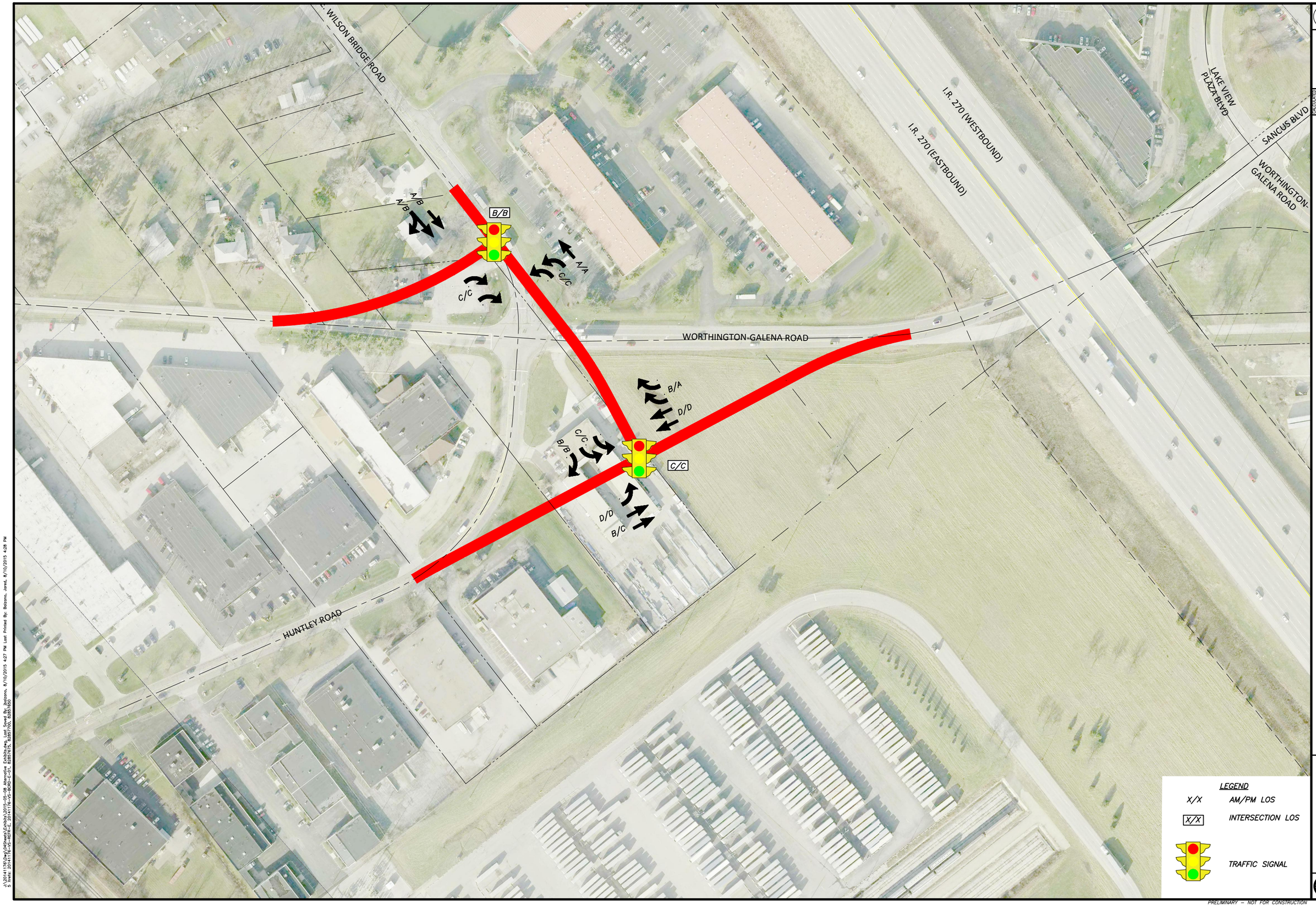

ALTERNATIVE CONCEPT E

HUNTLEY / E. WILSON BRIDGE / WORTHINGTON-GALENA

1

PRELIMINARY – NOT FOR CONSTRUCTION

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ALTERNATIVE CONCEPT Z

HUNTLEY / E. WILSON BRIDGE / WORTHINGTON-GALENA

PRELIMINARY – NOT FOR CONSTRUCTION

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Appendix K

Vertical Datum

The elevations shown are based on the North American Vertical Datum of 1988. Said elevations originated from elevations established by the Franklin County Engineering Department at monument D29RESET. RESET is listed 914.401 feet (NAVD88) on the Franklin County control points were then transferred by conventional leveling procedures to the permanent benchmarks listed hereon. Static/Rapid static GPS observations using the GEOID12A model were used as a check.

Bench Mark	Elevation	Description
D29RESET	914.401	Brass plug in the south east w ingw all of a culvert on Wilson Bridge Road, 0.12 miles w est of Worthington-Galena Road, w est of residence #421.
BM#12	922.43	Chiseled "X" on the south side of a fire hydrant located north of the intersection of East Wilson Bridge Road and Worthington-Galena Road. On the east side of Worthington-Galena Road.
BM#14	928.13	Chiseled square on the southeast corner of a concrete light pole base, located at the northwest corner of the intersection of Worthington-Galena Road and Lakeview Plaza Boulevard.
BM#15	933.82	Chiseled "X" on the east bolt of the third fire hydrant, located north of the intersection of Worthington-Galena Road and Lakeview Plaza Boulevard. On the w est side of Worthington-Galena Road.

Horizontal Datum

The coordinates shown on this map are based on the Ohio State Plane Coordinate System, South Zone, NAD 83 (2011). Said coordinates originated from a field traverse which was tied (referenced) to said coordinate system by positioning solutions derived by the National Geodetic Survey On-Line Positioning User Service (OPUS) processing GPS observations at traverse control points numbered 214, 215, 235, 236, 237, 238, 239 and observations of selected CORS base stations in the National Spatial Reference System. The grid to ground scale factor (1.0000226776) was applied at the location of 0,0.

Points	Northing (Ground)	Easting (Ground)	Elevation	Raw Description	BM# Description
33	768468.5510	1829793.7387	928.44	1165 #33 W/SHIN MAGS	
34	768531.9580	1829716.5221	924.74	1165 #34 W/SHIN MAGS	
214	769037.1000	1829815.3000	928.11	1157 GPS#214 IRSw/cap	
215	770727.3950	1829823.3990	930.88	1157 GPS#215 IRSw/cap	
235	768807.3570	1829453.8790	921.76	1152 GPS#235 IPSw/cap	
236	768566.7340	1829113.0050	919.80	0173 GPS#236 CHIS TRI W/PUN XS	
237	768854.6490	1828593.4160	918.07	1152 GPS#237 IPSw/cap	
238	768351.4440	1828537.5420	917.87	1152 GPS#238 IPSw/cap	
239	768351.4440	1828537.5420	919.93	1152 GPS#239 IPSw/cap	

Vertical Datum Conversion to NGVD 1929

The elevation established by the Franklin County Engineering Department, at monument D29RESET is as follows: Where elevation = 914.401 feet (NAVD88) + 0.531 feet = 914.932 feet in elevation. National Geodetic Vertical Datum of 1929 is 914.932 feet in elevation. 914.401 feet (NAVD88) + 0.531 feet = 914.932 feet (NGVD 29)

LEGEND

- Primary Control Point
- Static GPS Control Point
- Bench Mark Point
- Bench Mark Symbol
- Primary Control Traverse
- GPS Control Baseline (Traverse)

N W E S

Control Plan: Date: Revisions:
Check: Josh Meyer Date: 12/3/2014

City of Worthington, Department of Public Services

Huntley/Wilson Bridge/Worthington-Galena Inter. Impr.

Franklin County, OH

Job No: 2014I176

Date: December 3, 2014

Scale: 1" = 100'

Control Sheet

EMHT

Evans, Mechwart, Hambleton & Tilton, Inc.
Engineers • Surveyors • Planners • Scientists
5500 New Albany Road, Columbus, OH 43054
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12/3/2014 12:34 PM Last Printed By: Webb,Teaggie; 12/3/2014 12:34 PM
4 Xrefs: 2260PDS; 1260PDS; 2285PDS; 5285PDS
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