TRAFFIC ANALYSIS & CONCEPTUAL DESIGN REPORT

109 CC

FINAL REPORT

NOVEMBER 12, 2018

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I. INTRODUCTION

A. Purpose

Lochmueller Group (Lochmueller) prepared the following Traffic Analysis and Concept Design Report to evaluate transportation infrastructure alternatives at the intersection of Route 109 and Route CC (Wild Horse Creek Rd.), which lies at the border between the City of Chesterfield and City of Wildwood. Currently, the intersection operates poorly, especially in the afternoon peak period where significant delay and queueing occurs most weekdays, and is a key bottleneck within the overall roadway network for the area. The purpose of this study was to evaluate existing conditions along with the operational performance of upgrading the intersection to a traffic signal or roundabout in the future (Build condition) relative to Existing conditions. Once a preferred alternative is identified, Lochmueller then would fully develop the alternative to the conceptual level for estimating and future programming purposes.

B. Study Overview

The traffic analysis area included the intersection and each approach, while also denoting and accounting for impacts several hundred feet upstream on S. Eatherton Road, Route CC, Wild Horse Creek Road, and Route 109. The study area map is illustrated in **Figure 1**.

While traffic counts were collected for the morning, afternoon, and evening peaks on a weekday, as well as the weekend peak, the study focused on traffic conditions during the morning and afternoon peak hours for commuter traffic, as these periods represent the busiest times of the day for the study area. The report includes the evaluation of existing conditions, which were used primarily for the calibration of traffic flow models, which serves as a baseline upon which to compare the planned improvements. The Build condition includes the planned improvements, which for purposes of this evaluation were limited to either a signal or a roundabout. Build scenarios were evaluated on the basis of a 2045 horizon year.

Figure 1: Study Area Map

II. PROCESS & ANALYSIS

A. Data Collection & Field Inventory

1. Traffic Data

Turning movement counts were collected over several days in late Spring 2018 (6am – 9pm on 3 weekdays, 8am – 3 pm on each weekend day), totaling 59 total hours of data. This data was further supplemented by 24/7 pneumatic tube counts over a 7 day period, to determine daily and weekly fluctuations in demand for each approach to the intersection.

2045 traffic volumes were forecasted using an assumed flat 1% growth rate in volume for each approach, per year. This represents a relatively conservative method from a volume projection standpoint, allowing for an anticipated demand that would be commensurate with moderate growth in the far western St. Louis County area.

2. Field Inventory

Lochmueller staff performed detailed inventories of field conditions over the course of several days. The inventories captured both physical and operational characteristics of the study area near the intersection. To supplement survey data provided by MoDOT staff, the physical inventory emphasized static features of the roadway and included items such as posted speed limits, the number of lanes and designations, general topography elements including ditches and exiting culverts, and verification of above ground utilities.

The operational inventory focused on traffic flow conditions. Locations and extents of queues, areas of frequent conflict, and notation of apparent sight distance issues. Lane changing behavior, vehicle turning speeds, and gap acceptance were also observed. Prevailing queue lengths at the intersection were inventoried during both the morning and evening peak periods.

B. Operational Analysis & Concept Development

3. Operations – Initial Screening

The initial traffic analysis was based upon Synchro (traffic signal) and Sidra (roundabout) traffic analysis software. This step was used as a means to vet each intersection control type for any fatal flaws or significant risks, prior to moving forward with the full VISSIM microsimulation development.

The traffic performance measures were graded using levels of service in accordance with the Highway Capacity Manual (HCM), last updated by the Transportation Research Board in 2010. Levels of services (LOS), which range from LOS A (“free flow”) to LOS F (“oversaturated”), are measures of traffic flow that consider factors such as speed, delay, interruptions, safety, and driver comfort and convenience. LOS C, which is commonly used for design purposes, represents a roadway with volumes utilizing approximately 70 to 80 percent of its capacity. **Table 1** summarizes the criterion for signalized intersections, as well as unsignalized intersections and roundabouts, as defined in the HCM.

Table 1: Intersection Level of Service Thresholds

Level of Service	Control Delay per Vehicle (sec/veh)	
	Signalized	Unsignalized/Roundabouts
A	≤ 10	0-10
B	> 10-20	> 10-15
C	> 20-35	> 15-25
D	> 35-55	> 25-35
E	> 55-80	> 35-50
F	> 80	> 50

Traffic Signal Alternative

For the signal alternative, given the dominant movements at the intersection are travelling to and from the north and south legs, and the south and east legs, the signalized configuration requires dual southbound lanes on the north leg, dual northbound lanes on the south leg, and dual westbound left turn lanes on the east leg. Consequently, two receiving lanes were then also required for the north and south legs of the intersection, with a downstream merge to a single lane in each case. The lane drop on the north leg was placed several hundred feet downstream of the intersection, given the presence of horizontal and vertical curvature that is expected to remain in some scale in the proposed condition. The schematic-level lane configuration used within the Synchro models is shown as **Figure 2.**

Figure 2: Synchro Model Configuration

The most significant operational issue to inspect with the proposed signalized intersection is the assumed lane utilization for each of the dual lane approaches (southbound through, northbound through, westbound left). NCHRP Report 707 provides some quantitative guidance to determine likely lane utilization factors for cases of auxiliary lanes through signalized intersections (lanes that form just

upstream of the intersection and taper in downstream of the intersection). When utilized with a Synchro analysis, this becomes an iterative process, as the resulting auxiliary lane volume (vehicles using the added lane that eventually drops downstream) affects the Lane Utilization Factor within Synchro's settings, which then affects the saturated flow rate of the dual lane approaches.
Utilizing volume data, assumed green time from the models, and various actuated cycle lengths, utilization factors ranging from 0.61 to 0.80 were calculated. Elements such as driver behavior (aggressiveness), lengths of merge areas, and magnitude of peak hour volume, were also considered in the analysis. For example, commuter traffic in this area will likely learn to use the continuous lane, which therefore could lead to relatively unbalanced utilization.

As part of a sensitivity analysis, to represent lane utilization toward the "best case scenario" end of the scale, lane utilization factors ranging from 0.70 to 0.75 were initially used in the AM and PM models. The resulting levels of service were generally acceptable for each peak period, as shown below. However, there would be some queueing concerns in the PM peak, with a westbound left turn queue of approximately 450' and a southbound queue of up to 525'.

If more conservative lane utilization factors are used (0.61 to 0.65), which assume a greater lane imbalance, the operation of the intersection degrades quickly, with similar or moderately worse levels of service, but significantly worse queueing and queue clearance conditions. For example, the northbound queue in the AM peak reaches over 500' (an improvement over existing queues, but not ideal). More significantly, the southbound approach and the westbound left turn movement cross into the over-capacity state, meaning queues would not clear each cycle, and indeterminate queues and blocking could occur (queues would be at least 700' on each approach for the majority of the peak period).

Operational measures of effectiveness (MOEs) for each signal scenario (conservative and aggressive lane utilization) are summarized in **Table 2** and **Table 3** below, based upon Synchro output. Note the "#" symbol indicates Synchro recognizes the volume demand at the 95th percentile exceeds capacity. A "~" footnote indicates intermittent phase failures are likely, and an exact queue is indeterminate.

Table 2: Signal 2045 MOEs – Aggressive Lane Utilization

Intersection & Movements	AM Analysis Results			PM Analysis Results		
	LOS (Delay)	Avg Queue (ft)	Max Queue (ft)	LOS (Delay)	Avg Queue (ft)	Max Queue (ft)
MO-109/CC						
Overall Intersection	**C (22.2)**	--	--	**D (42.6)**	--	--
Eastbound Left-turn	B (12.3)	2	12	B (18.0)	0	4
Eastbound Through-Right	C (32.1)	39	92	E (63.6)	39	#95
Eastbound Approach	***C (30.3)***	***39***	***92***	***E (62.9)***	***39***	***#95***
Westbound Left-turn	C (34.4)	110	160	D (52.8)	447	441
Westbound Through-Right	A (7.1)	6	20	B (15.5)	44	68
Westbound Approach	***C (30.8)***	***110***	***160***	***D (47.8)***	***447***	***441***
Northbound Left-turn	B (14.3)	4	15	C (22.7)	8	23
Northbound Through	C (26.5)	183	#393	C (31.7)	167	263
Northbound Right-turn	A (9.0)	31	146	A (4.9)	0	51
Northbound Approach	***B (19.0)***	***183***	***#393***	***C (21.1)***	***167***	***263***
Southbound Left-turn	B (14.3)	3	12	C (21.6)	8	19
Southbound Through-Right	C (20.9)	111	196	D (51.3)	436	527
Southbound Approach	***C (20.9)***	***111***	***196***	***D (51.3)***	***436***	***527***

Table 3: Signal 2045 MOEs – Conservative Lane Utilization

Intersection & Movements	AM Analysis Results			PM Analysis Results		
	LOS (Delay)	Avg Queue (ft)	Max Queue (ft)	LOS (Delay)	Avg Queue (ft)	Max Queue (ft)
MO-109/CC						
Overall Intersection	**C (25.7)**	--	--	**E (57.3)**	--	--
Eastbound Left-turn	B (14.6)	3	14	B (20.0)	1	4
Eastbound Through-Right	D (38.3)	47	103	F (91.1)	53	126
Eastbound Approach	***D (36.1)***	***47***	***103***	***F (90.0)***	***53***	***126***
Westbound Left-turn	D (40.8)	154	210	E (71.1)	~713	533
Westbound Through-Right	A (8.3)	7	22	B (18.3)	64	76
Westbound Approach	***D (36.4)***	***154***	***210***	***E (64.0)***	***~713***	***533***
Northbound Left-turn	B (14.7)	4	15	C (26.4)	10	25
Northbound Through	C (30.4)	247	506	D (36.0)	212	317
Northbound Right-turn	B (11.6)	60	209	A (7.8)	21	82
Northbound Approach	***C (22.3)***	***247***	***506***	***C (24.9)***	***212***	***317***
Southbound Left-turn	B (14.9)	4	145	C (24.5)	9	22
Southbound Through-Right	C (22.5)	145	245	E (72.7)	~696	686
Southbound Approach	***C (22.5)***	***145***	***245***	***E (71.8)***	***~696***	***686***

Roundabout Alternative

Continuing with the information that the dominant movements at the intersection are traveling to and from the north and south legs, and the south and east legs, the roundabout layout was analyzed for the single and dual lane entries at each leg. Guidance regarding the need for two-lane entries generally states conflicting volumes on the order of 1,000vph – 1,300vph would be considered on the border of being functional at a single lane (dependent upon balance of entering volume). If the conflicting volumes are more than 1,300vph, acceptable operation becomes challenging with anything other than two-lane entries and multiple circulating lanes for at least a portion of the roundabout.

Similar to the signal analysis, the heavy conflicting movements (especially in the PM peak) require added laneage on multiple approaches to the intersection. In the case of the roundabout, the significant westbound to southbound movement (603vph) conflicting with the similarly substantial southbound through movement (678vph) in the PM peak dictates two circulating lanes for the north and west portions of the roundabout. The heavy northbound through and right turns in the AM peak requires a right turn bypass, either tight to the roundabout or with a high angle bypass lane, in order to operate sufficiently. Consequently, a second receiving through lane is only needed for the south leg heading south.

Once a functional roundabout layout was established, other approach and circulating lane configurations were tested in search of opportunities to further optimize the design. In each case, a reduction in approach lanes resulted in unacceptable delay or queueing.

As shown in the attached level of service and queue table from SIDRA (**Table 4**), it is anticipated that a roundabout generally configured as modeled (layout shown as **Figure 3**) would operate at an excellent level for both the AM and PM peak periods. Note that LOS values when using a Sidra analysis is based upon Degree of Saturation, rather than delay per vehicle.

Figure 3: Modeled Roundabout Configuration - Sidra

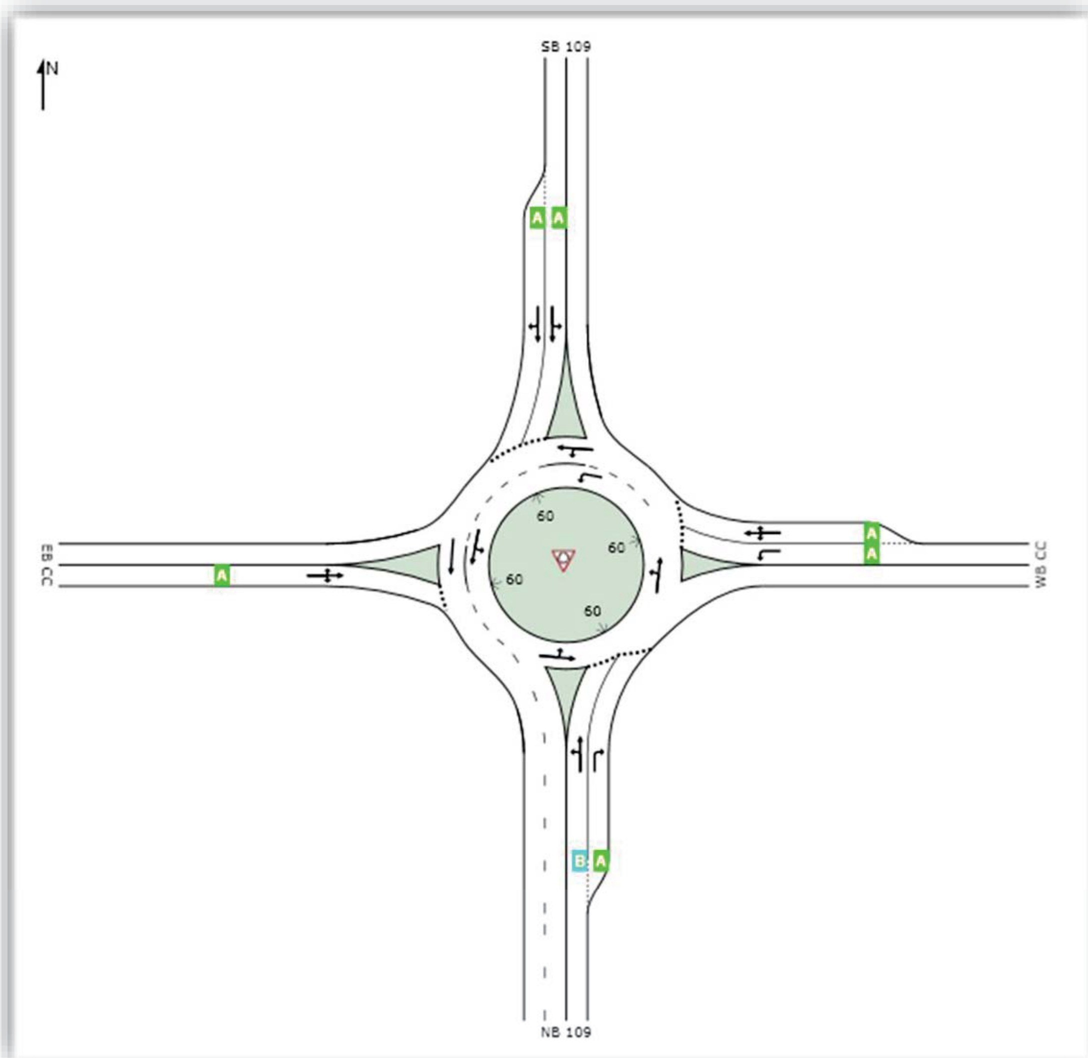


Table 4: 2045 Roundabout MOEs – Sidra Analysis

Intersection & Movements	AM Analysis Results (Sidra)			PM Analysis Results (Sidra)		
	LOS (Delay)	Avg Queue (ft)	Max Queue (ft)	LOS (Delay)	Avg Queue (ft)	Max Queue (ft)
MO-109/CC						
Overall Intersection	**C (9.6)**	--	--	**A (9.2)**	--	--
Eastbound Left-turn	A (12.7)	11	27	A (14.8)	9	21
Eastbound Through	A (8.4)	11	27	A (10.5)	9	21
Eastbound Right-turn	A (8.5)	11	27	A (10.6)	9	21
Westbound Left-turn	A (21.4)	46	114	A (13.3)	32	78
Westbound Through	A (16.4)	46	114	A (8.8)	32	78
Westbound Right-turn	A (16.2)	46	114	A (8.6)	32	78
Northbound Left-turn	C (12.3)	86	214	A (11.1)	25	62
Northbound Through	C (8.0)	86	214	A (6.8)	25	62
Northbound Right-turn	C (7.9)	109	270	A (6.5)	19	47
Southbound Left-turn	A (8.3)	18	45	A (11.6)	37	92
Southbound Through	A (4.2)	18	45	A (7.4)	37	92
Southbound Right-turn	A (4.9)	18	45	A (8.1)	37	92

4. Concept Sketch Development

5. Given the initial traffic operations screening revealed potential risks with a signalized alternative, Lochmueller drafted a technical memorandum to the MoDOT team to recommend moving forward with a roundabout option only. This recommendation was ultimately accepted, leading to Lochmueller's traffic and design teams developing several roundabout concept layouts that aimed to minimize costs and impacts to adjacent properties. Three options (attached in the Appendix) were created at a sketch level and presented to MoDOT at a project review meeting. The sketch alternatives each depicted the roundabout centered generally in the same location, with modifications for the layouts of certain approach and departure lanes. Upon discussion, the decision was made to move forward with Option 2 for full concept design and estimating. This option also served as the background in the VISSIM model, allowing for exact replication of the proposed roundabout geometry.

5. VISSIM Traffic Model Calibration

VISSIM is a microsimulation tool that accurately replicates individual vehicles and their interactions within complex traffic streams, such as multi-lane roundabouts. VISSIM models were developed for both Existing and Build conditions, assuming the preferred roundabout alternative. Both the AM and PM peak hours were simulated for each condition.

The VISSIM traffic simulation model calibration process begins with the development of a base model, which aims to replicate existing study area conditions. A robust data collection effort was required to support this effort, including existing queue extents, roadway geometry, turning speeds, gap acceptance, etc. The first step in base model development involved coding the roadway geometry (number of approach lanes, circulating lanes, departure lanes and link lengths) with links and connectors using the proposed concept sketch as a template.

Once the basic network established, free-flow speed distributions were created. For the approaches to the intersection, the distribution was informed by posted speed limits and correlated with speeds measured in the field upstream of the queued sections. In addition to free-flow speeds, reduced speed zones were established for locations along the roundabout approaches to match the typical intersection approach speeds.

In the next step, the stop-controlled intersection received stop signs coded into the network. The northbound right turn lane, required yielding and was coded with conflict areas and priority rules, in order to allow for further refinement of the gap times or yielding characteristics of the existing intersection.

Traffic volumes are represented in VISSIM as an origin-destination matrix estimated from turning movement counts. The matrix specifies the model's traffic patterns and the routes vehicles take to traverse the model network. Traffic entering the model network was coded using static vehicle inputs, which for a single intersection is fairly straightforward. Vehicle inputs specify traffic volumes and vehicle compositions, which were grouped into passenger vehicles, trucks, and buses.

Since VISSIM starts running with zero vehicles on the network, a warm-up period is needed to initialize the model with traffic prior to capturing data. The warm-up period is known as the seeding period and its length and volume characteristics were selected as part of the model calibration process. Given the scale of this network, a 30-minute seeding period was used to fully establish background traffic before recording results.

Given the inherent stochastic nature of simulation (imposed by random seeds), multiple simulation runs using different seed numbers are required for each scenario and the reported model results were averaged across runs. Based on the characteristics of this model network, it was determined that 10 simulation runs were sufficient to obtain a reasonable level of confidence in the results.

The model calibration process involved a detailed review of model parameters and thorough consideration of adjustments to improve the model's ability to replicate field conditions. The calibration process compared data output from the model, such as flow rates, to field measurements of the same attributes. Example calibration measures undertaken as part of developing this model were as follows:

- Further adjustments to the yielding characteristics and gap times for vehicles entering the stop-controlled intersection at the peak congestion point. This adjustment was critical to replicating observed queue lengths at intersection and more accurately matching travel time data collected in the field.
- Vehicle inputs were specified in 15-minute intervals accordance with actual fluctuations represented from the traffic counts; and
- Lane change distances, which specify the position where vehicles begin to consider making a lane change in advanced of the northbound right turn lane, were adjusted to reflect where vehicles actually change lanes based on field observations.

6. VISSIM Results

The VISSIM model of the existing conditions most accurately provides average delay (LOS) and average/max. queues for each approach and movement. Existing MOEs are summarized in **Table 5.**

Table 5: Existing Intersection MOEs – VISSIM Analysis

Intersection & Movements	Existing AM Analysis Results			Existing PM Analysis Results		
	LOS (Delay)	Avg Queue (ft)	Max Queue (ft)	LOS (Delay)	Avg Queue (ft)	Max Queue (ft)
MO-109/CC						
Overall Intersection	**F (75.2)**	--	--	**F (112.2)**	--	--
Eastbound Left-turn	A (6.3)	3	74	A (5.9)	1	53
Eastbound Through	A (6.6)	3	74	A (5.9)	2	53
Eastbound Right-turn	A (5.1)	3	74	A (4.8)	2	53
Westbound Left-turn	B (14.2)	25	184	F (180.7)	751	1349
Westbound Through	B (13.5)	23	184	F (180.4)	751	1349
Westbound Right-turn	B (14.9)	23	184	F (187.8)	751	1349
Northbound Left-turn	F (141.2)	767	1591	B (12.2)	23	165
Northbound Through	F (131.6)	767	1591	B (11.2)	24	165
Northbound Right-turn	F (103.6)	0	62	A (1.8)	0	24
Southbound Left-turn	C (16.3)	32	213	F (139.3)	634	2088
Southbound Through	C (16.5)	33	213	F (144.6)	634	2088
Southbound Right-turn	C (17.3)	32	213	F (131.4)	634	2088

Similar to the sensitivity analysis completed for the signal alternative in the initial screening phase, the proposed roundabout was tested with varied lane utilizations for the multilane approaches (southbound and westbound). These were controlled in the VISSIM models using connectors and by dictating demand using each lane within the configuration settings. **Table 6** and **Table 7** summarize the performance of the proposed roundabout. The results correlate well with the Sidra analysis completed as part of the initial screening, and indicate the roundabout will function at a high level in 2045, at varying levels of lane utilization.

VISSIM analysis of the roundabout alternative includes induced demand anticipated to use the intersection upon construction of the improvements. Cut-through volume on Eatherton Rd (the local connecting Rte. CC to Rte. 109 east of the project intersection) was collected by the City of Wildwood and provided to Lochmueller. This volume was then grown by the assumed rate to 2045 levels, and input into the horizon year models.

Another added benefit of the roundabout alternative is the staggered flow exiting the dual lane sections of the circulating roadway. As opposed to a signal option, which would cause vehicles to enter the departure lanes side-by-side, the roundabout operation naturally randomizes vehicles progressing to the downstream area where merging is necessary. For that reason, the merge areas proposed for the south and east legs operate well, with little instances of conflicting vehicles.

Table 6: Roundabout MOEs – VISSIM Analysis – Aggressive Lane Utilization

Intersection & Movements	Proposed AM Analysis Results			Proposed PM Analysis Results		
	LOS (Delay)	Avg Queue (ft)	Max Queue (ft)	LOS (Delay)	Avg Queue (ft)	Max Queue (ft)
MO-109/CC						
Overall Intersection	**B (11.0)**	--	--	**B (11.8)**	--	--
Eastbound Left-turn	A (5.8)	1	77	C (23.9)	3	73
Eastbound Through	A (4.8)	1	77	C (19.1)	3	73
Eastbound Right-turn	A (3.2)	1	77	A (7.4)	3	73
Westbound Left-turn	B (11.1)	8	135	B (10.8)	9	173
Westbound Through	B (11.2)	8	135	B (10.7)	9	173
Westbound Right-turn	B (12.7)	8	135	B (11.6)	9	173
Northbound Left-turn	B (14.3)	9	470	A (3.1)	1	74
Northbound Through	B (12.7)	9	470	A (3.7)	1	74
Northbound Right-turn	B (12.2)	9	470	A (3.8)	0	0
Southbound Left-turn	A (6.4)	3	101	C (23.2)	57	418
Southbound Through	A (7.3)	3	101	C (19.9)	57	418
Southbound Right-turn	A (8.0)	3	101	A (8.7)	57	418

Table 7: Roundabout MOEs – VISSIM Analysis – Conservative Lane Utilization

Intersection & Movements	Proposed AM Analysis Results			Proposed PM Analysis Results		
	LOS (Delay)	Avg Queue (ft)	Max Queue (ft)	LOS (Delay)	Avg Queue (ft)	Max Queue (ft)
MO-109/CC						
Overall Intersection	**B (11.1)**	--	--	**C (18.1)**	--	--
Eastbound Left-turn	A (5.8)	1	76	C (23.5)	4	76
Eastbound Through	A (4.8)	1	76	C (24.1)	4	76
Eastbound Right-turn	A (2.4)	1	76	A (9.0)	4	76
Westbound Left-turn	B (10.7)	8	139	B (10.6)	12	245
Westbound Through	B (10.6)	8	139	B (10.7)	12	245
Westbound Right-turn	B (12.5)	8	139	B (11.6)	12	245
Northbound Left-turn	B (14.5)	7	358	A (3.3)	1	81
Northbound Through	B (12.8)	7	358	A (3.8)	1	81
Northbound Right-turn	B (12.2)	3	185	A (3.8)	0	0
Southbound Left-turn	A (6.9)	4	127	E (47.2)	181	847
Southbound Through	A (7.6)	4	127	E (39.8)	181	847
Southbound Right-turn	A (7.7)	4	127	B (13.2)	181	847

7. Design Assumptions and Elements

- The conceptual plans attached to this report were developed utilizing 3D models over existing survey information provided by MoDOT. Data provided covered most of the area of improvement, however some sections furthest from the existing intersection required modest assumptions relative to the extent of improvements (such as grading) that would be necessary.

- On the west side of the north leg, given the significant slope away from the edge of the roadway, it was assumed a relatively short MSE wall would be preferable to grading for a significant distance (the resulting cost would be approximate to a slope solution, with far less impact to the adjacent parcel). In general, the roundabout was centered northeast of the existing intersection, in order to minimize the impact to the established gas station on the southeast corner, and negating the need for a total acquisition of any parcels.

- It was also important to consider the access to each of the properties impacted by the proposed roundabout improvements. For the gas station, it is proposed to relocate their access on Route CC to a new full access connection off of existing Cys Lane, allowing entering and exiting vehicles to be as clear as possible from the functional area of the roundabout. Access for the gas station to Route 109 would be converted to right-in/right-out, due to the proximity to the roundabout and limited ability to relocate the entrance southward due to significant slope issues and right-of-way. The proposed roundabout would allow for u-turns that would provide access to southbound Route 109 for vehicles exiting the gas station. It should also be noted the proposed roundabout would provide easier access in and out of the facility due to the significant reduction of queues along each frontage, which periodically block vehicles from entering or leaving the business.

- Given the existing skew at the connection to Skyway Drive on the north leg, and significant slopes off of the roadway, a short section of the side street is proposed to be relocated further north, allowing for greater distance from the intersection, near 90 degree connection, and better sight distance. The concept plans depict the temporary easements and grading/paving quantities associated with this element.

- A driveway for the residential parcel in the southwest corner current acts as a fifth leg to the intersection, connecting in the southwest radius. It is proposed to close off this connection, which would require the property owner to access existing parking areas off of the private drive on the west side of the property. If necessary, accommodations/pavement could be made during right-of-way acquisition to relocate the existing garage structure to connect to the existing west side driveway, or other compensation may be necessary.

- Regarding profile grades and K-values for each approach, the requirements for the following design speeds were attained in the conceptual design:

    - North leg – 25mph
    - West leg – 35mph
    - South leg – 45mph
    - East leg – 35mph

- While the speeds for the south and east legs are slightly less than the post speed limits on those approaches, vehicles on the sections of roadway shown in the plans would be reasonably expected to be decelerating to the roundabout advisory speed or accelerating out of the roundabout.

- The design vehicle used to determine the geometric details within and approaching the roundabout was a WB-67, with little to no encroachment on adjacent or opposing lanes allowed.

- The pavement within the intersection and within areas shown to be improved with the project, 8" concrete pavement on 4" of rock base is proposed. A2 shoulders would be provided on the approach sections where appropriate. Given previous issues with visibility of standard pavement markings on new roundabout pavement, it is recommended contrast striping and/or dark gray tinted concrete be utilized.

III. FINDINGS AND CONCLUSIONS

Lochmueller Group prepared the preceding Traffic Analysis and Conceptual Design report for the intersection of Route 109 and Route CC, which currently experiences severe mobility issues. The purpose of this study was to evaluate the operational metrics of the existing intersection, determine required improvements to alleviate the existing congestion during peak periods, and develop conceptual plans allowing for assessment of budgetary costs and impacts to existing properties and utilities.

The following was concluded regarding the appropriate improvements to the intersection:

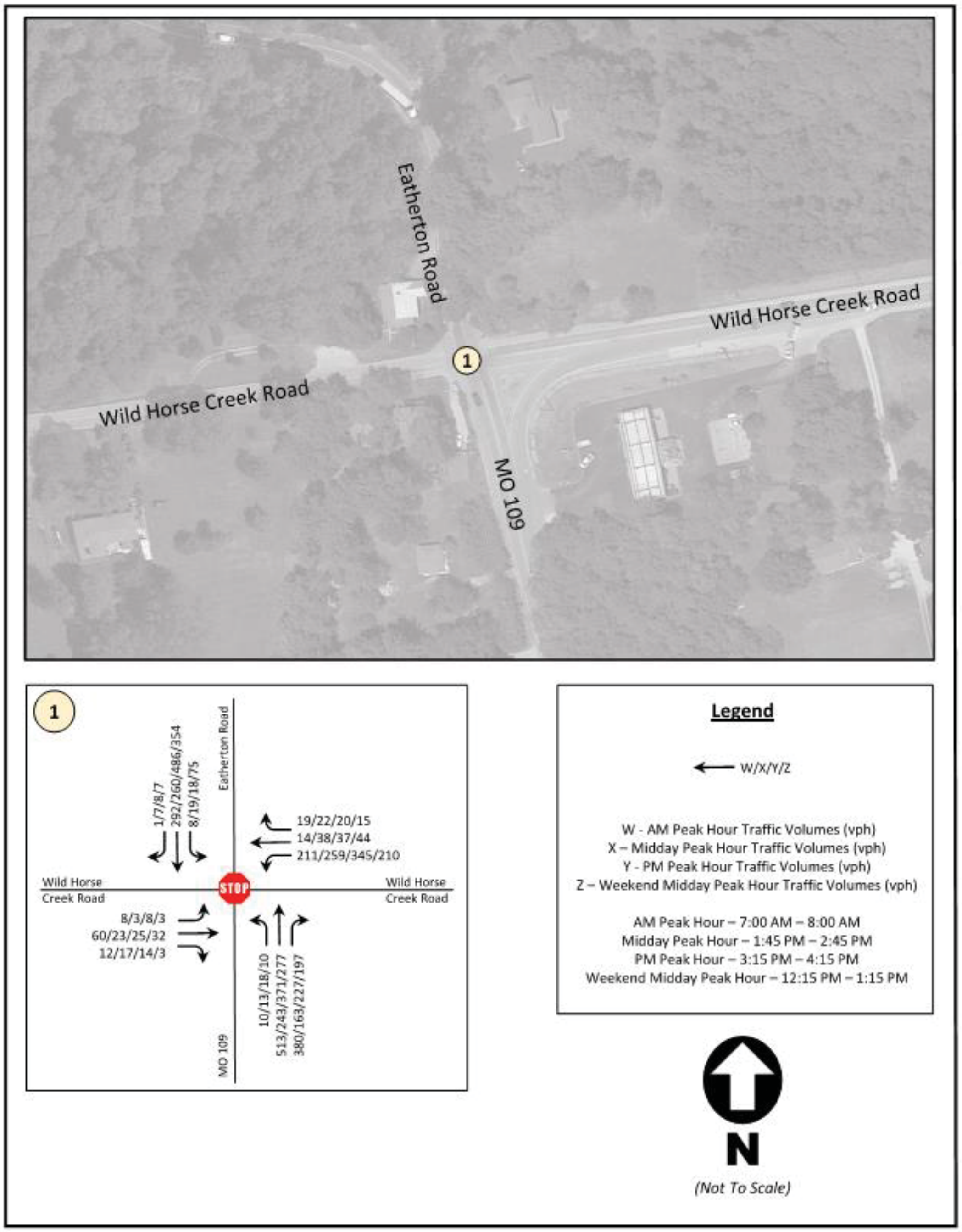
- While a signalized intersection could function within acceptable levels in the horizon year, there is a significant risk that substantial queues and delay could result if less than ideal lane utilizations are experienced on the dual lane approaches necessary for 3 of the 4 legs. Consequently, it was not recommended to pursue detailed VISSIM analysis or conceptual design of a signalized option. Furthermore, the cost to construct a signalized intersection would likely be more than the proposed roundabout, due a need for additional and longer receiving lanes on the north and south legs.

- The roundabout alternative would require dual lane approaches on the east and north legs, with a northbound to eastbound dedicated right-turn or bypass lane as well. As both the Sidra and VISSIM analyses show, this configuration would operate at very high levels of service for the horizon year.

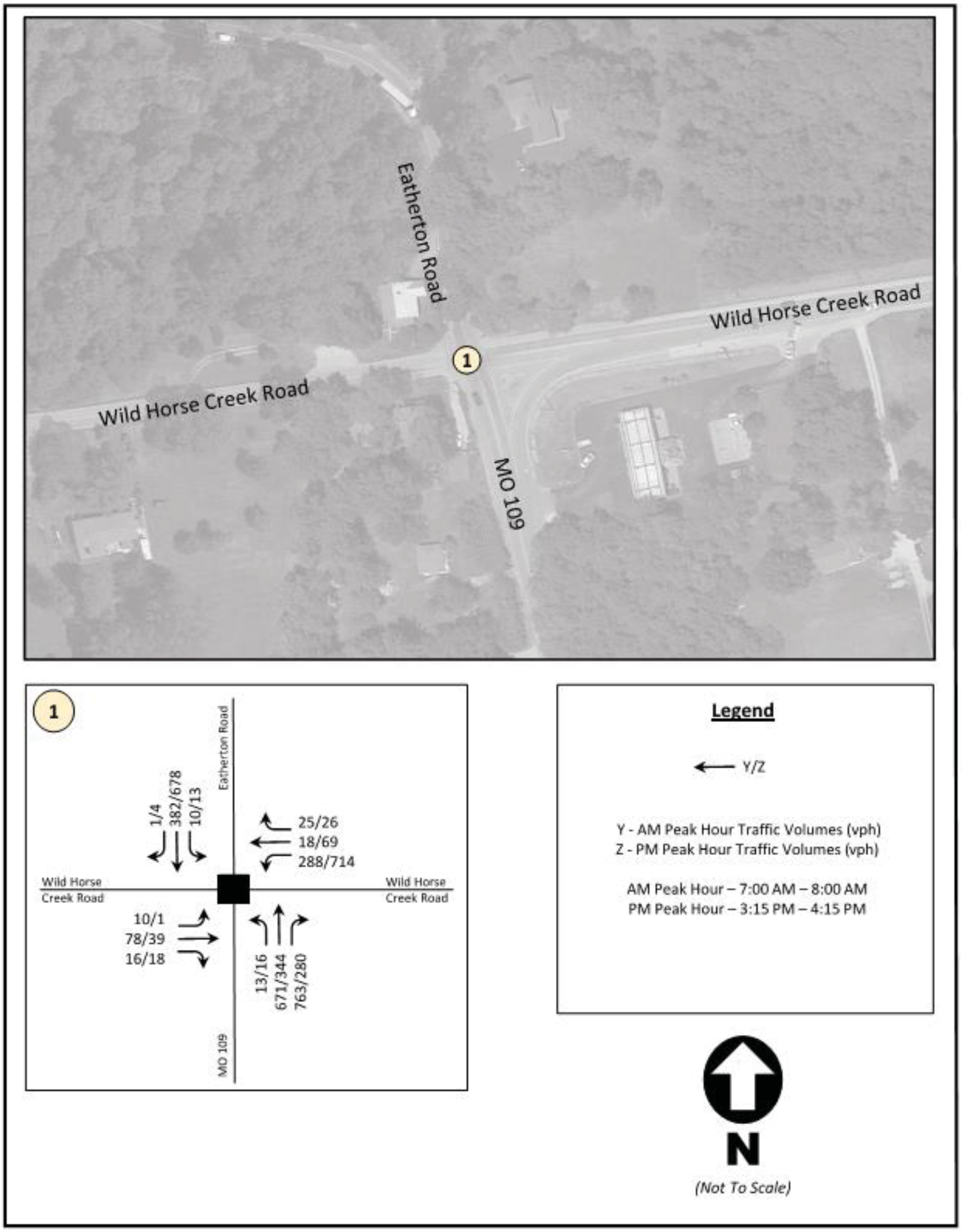
- The estimated cost for the implementation of the improvements is currently shown at $4,129,000. This amount includes $1,192,000 in estimated right-of-way costs, as calculated by MoDOT staff. There are no identified reimbursable utilities impacted by the proposed improvements. Consequently, no utility costs are included, except for a nominal amount to account for a new power connection as part of the proposed roundabout lighting.

A. APPENDIX

B. Volume Exhibits



Existing Traffic Volumes



2045 Traffic Volumes

C. Concept Sketches

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