

THE CROSSINGS DEVELOPMENT

Traffic Impact Study

Sugar Grove, Illinois

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Prepared for:
Crown Community Development

Kimley»»Horn

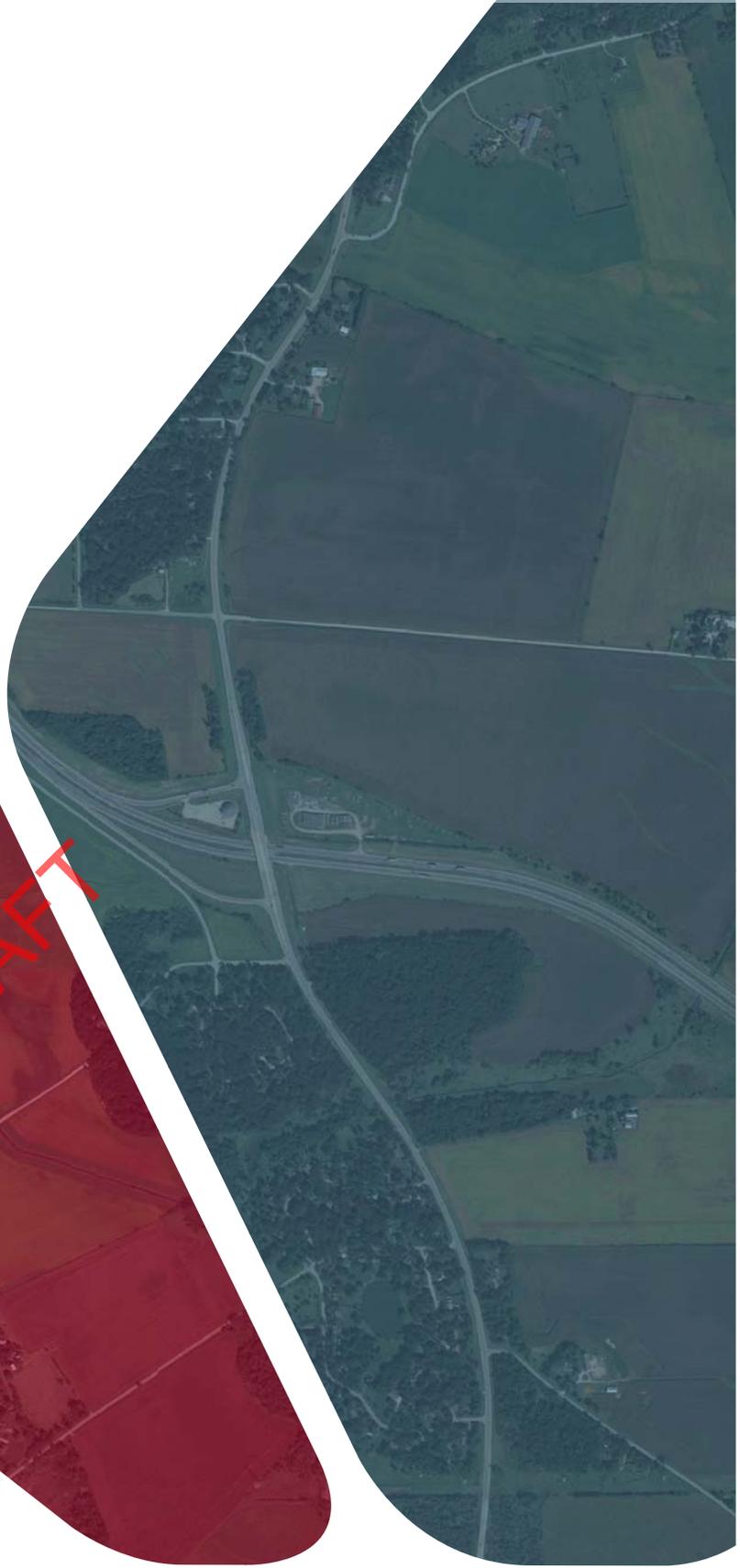


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EXECUTIVE SUMMARY

Kimley-Horn was retained by Crown Community Development to prepare a traffic impact study for a proposed mixed-use development in Sugar Grove, Illinois. The subject site encompasses approximately 760 acres north and south of the Interstate 88 (I-88) interchange with IL Route 47. The initial phase of development, referred to as Phase A, includes approximately 4,062,225 square feet of industrial warehouse/distribution use. Phase A would encompass approximately 335 acres of the subject property. The remaining 425 acres are anticipated to be developed with a mix of uses, including industrial warehouse/distribution, retail, and residential. Based on the current development plan, full buildout of the 760-acre property may include a total of approximately 8,084,125 square feet of industrial warehouse/distribution use, 149,000 square feet of retail space, and 177 residential units.

This traffic impact study evaluates existing and future traffic conditions for area intersections and the proposed site access driveways along IL Route 47; site access driveways proposed along Seavey Road and Denny Road were not included in the analysis. The cross-sections for Seavey Road and Denny Road were negotiated with the Village of Sugar Grove separate from this traffic impact study. Traffic conditions were evaluated along IL Route 47 at key intersections between Green Road and Old Oaks Road/College Drive.

This traffic impact study evaluates future Year 2030 traffic conditions with the development of Phase A. Based on the results of this analysis, infrastructure improvements to support Phase A access and the addition of site-generated traffic to the local roadway are recommended. Because additional infrastructure improvements may be needed to support continued traffic growth within the area, a preliminary analysis of Year 2040 traffic conditions was also provided in order to define potential impacts of future background traffic and site-generated traffic at full buildout. The improvements contemplated to support Year 2040 traffic conditions are considered preliminary; as the development plan is refined and background traffic volumes are realized, the Year 2040 analysis will be updated.

Several infrastructure improvements are currently planned within the study area in order to accommodate future traffic growth and development. This study referenced design plans for a full I-88 interchange with IL Route 47. In addition, a Phase I study for improvements to the IL Route 47 corridor within the study area was applied to the analysis of Year 2040 traffic conditions. In order to quantify the impact of site-generated traffic and identify mitigation measures needed to support the proposed development, the planned infrastructure improvements were included in the analysis of future traffic conditions.

With development of Phase A, a new site access roadway would be constructed in order to facilitate access to the industrial warehouse/distribution development in Zone E. The new roadway is proposed to align with Scott Road and extend east of IL Route 47 (referred to as Denny Road for the purposes of this study). In addition, Merrill Road would be realigned opposite South Thornapple Tree Road (referred to as Realigned Merrill Road for the purposes of this study). Realigned Merrill Road would provide for improved spacing distance from Scott Road and provide for channelization at the new four-leg intersection. The two roadways would intersect and form a roundabout east of IL Route 47 with Denny Road continuing to the east (referred to as Denny Road Extension for the purposes of this study) and Merrill Road continuing to the southeast (referred to as Merrill Road Existing for the

purposes of this study). The roundabout would facilitate reduced travel speeds and improved safety conditions. Denny Road Extension would be constructed along the southern boundary of Phase A in order to facilitate access to the industrial warehouse/distribution use and provide for regional connectivity to the area roadway network. Near its eastern terminus, a roundabout would be installed in order to reduce travel speeds, minimize cut-thru traffic in the residential neighborhood to the south, and provide a turnaround area for wayward trucks. A three-lane cross-section with a single travel lane in each direction is anticipated for Denny Road/Denny Road Extension. Truck and passenger vehicle access would be provided via both Denny Road and Realigned Merrill Road/Merrill Road.

Based on the projected future traffic volumes with background traffic growth and development of Phase A, a new traffic signal is anticipated to be warranted at the intersection of IL Route 47/I-88 Westbound Ramps and Scott Road/Denny Road. At the intersection of IL Route 47/I-88 Westbound Ramps, restriping of the east leg to facilitate dual left-turn lanes is anticipated. In order to facilitate site access via Denny Road, dedicated left-turn lanes are anticipated on the north and south legs of its intersection with IL Route 47. In addition, dedicated left-turn lanes are anticipated on the east and west legs. At the intersection of IL Route 47/Thornapple Tree Road/Realigned Merrill Road, dedicated left-turn lanes are anticipated on the north and south legs. A dedicated right-turn lane is also expected on the east leg. Additional details related to the improvements identified above are provided in the *Recommendations & Conclusion* section of this report.

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1. INTRODUCTION

Kimley-Horn was retained by Crown Community Development to perform a traffic impact study for a proposed mixed-use development in Sugar Grove, Illinois. The subject site is comprised of select parcels north and south of the Interstate 88 (I-88) interchange with IL Route 47. Between the I-88 interchange and Seavey Road, the subject site includes parcels on both the east and west sides of IL Route 47; north of Seavey Road, the subject site is located on the east side of IL Route 47 only. South of the I-88 interchange with IL Route 47, the subject site includes parcels located on the east side of IL Route 47 generally between Finley Road and Merrill Road. An aerial view of the study location and the surrounding roadway network is presented in **Exhibit 1**.

The conceptual development plan includes a total of 8,084,125 square feet of industrial warehouse/distribution use, 149,000 square feet of retail use, and 177 single-family residential units. The concept site plan is organized by development zone (Zone A to Zone F) based on geographic boundaries (e.g., roadways, wetlands), land use, and access. The proposed development is anticipated to be constructed in phases. As this development progresses, infrastructure improvements may be necessary in the relatively near term to facilitate site access and support the addition of site-generated traffic on the local roadway network. In order to quantify the impact of site-generated traffic, and to identify near-term infrastructure needs, this study evaluates the impact of Phase A under a Year 2030 build scenario. Because further infrastructure improvements may be needed to support continued traffic growth within the study area, a Year 2040 Build condition was also evaluated to analyze the impact of future background traffic and site-generated traffic at full buildout. **Table 1** summarizes the assumed phasing for the proposed development.

Table 1. Summary of Proposed Development

Zone	Land Use		
	Industrial Warehouse (square feet)	Retail (square feet)	Residential (units)
Phase A			
Zone E	4,062,225	--	--
Subtotal Phase A	4,062,225	--	--
Phase B			
Zone A	423,000	--	--
Zone B	1,634,900	56,660	--
Zone C	1,964,000	--	--
Zone D	--	92,340	--
Zone F	--	--	177
Subtotal Phase B	4,021,900	149,000	177
Total	8,084,125	149,000	177

With development of Phase A, two new east-west roadways would be constructed to facilitate access to the industrial warehouse/distribution development. A new roadway is proposed to align with Scott Road and extend east of IL Route 47 (referred to as Denny Road for the purposes of this study). In addition, Merrill Road would be realigned opposite South Thornapple Tree Road (referred to as Realigned Merrill Road for the purposes of this study).



Access to Phase A and B would include site access driveways to IL Route 47. For purposes of this analysis, the proposed site access driveways along IL Route 47 were included as described below. Site access driveways to Zone E would be constructed as part of Phase A while site access driveways to Zone A, Zone B, Zone C, Zone D, and Zone F would be constructed as part of Phase B. Site access driveways proposed along Seavey Road and Denny Road were not included in the analysis.

- **Zone A** – A right-out (RO) access driveway to IL Route 47 (Access C) located approximately 220 feet south of Seavey Road.
- **Zone B** – A full-access driveway aligned opposite Oakleaf Drive (Access A) and a right-in/right-out (RIRO) access driveway (Access B) located approximately 640 feet south of Access A.
- **Zone C** – A right-in (RI) access driveway (Access D) would be provided approximately 500 feet south of Seavey Road.
- **Zone D** – A single full-access driveway (Access E) is assumed to be provided along IL Route 47 south of Finley Road.
- **Zone E** – Site access driveways would be provided along Denny Road. As described in the *Recommendations & Conclusion* section of this report, a three-lane cross-section with a single lane in each direction is recommended for Denny Road.

The residential component included in Zone F is assumed to be accessed via Merrill Road southeast roundabout recommended at Denny Road/Realigned Merrill Road/Merrill Road Existing. The site access details for Zone F are subject to change as the plan is further refined; therefore, the site access driveways for Zone F were not included in the analysis.

As a part of this study, the existing network was analyzed to determine the current operations at the study intersections. Site trip generation characteristics were established for each development phase and added to background traffic volumes in order to assess the site's impact on the area roadway network. This report presents and documents Kimley-Horn's data collection, summarizes the evaluation of traffic conditions on the surrounding roadways, identifies recommendations to mitigate operational issues, and details the potential impact of development traffic on the adjacent roadway network.

2. EXISTING CONDITIONS

Kimley-Horn conducted field observations to collect relevant information pertaining to the site, existing land uses in the surrounding area, current traffic volumes and operational conditions, lane configurations and traffic controls, and other key roadway characteristics. A detailed account of this information and findings are provided below.

2.1. Existing Land Uses

The subject site is located in Sugar Grove, Illinois and is comprised of parcels north and south of the I-88 interchange with IL Route 47. Between the I-88 interchange and Seavey Road, the subject site includes parcels on both the east and west sides of IL Route 47; north of Seavey Road, the subject site is located on the east side of IL Route 47 only. South of the I-88 interchange with IL Route 47, the subject site includes parcels located on the east side of IL Route 47 generally between Finley Road and Merrill Road.

The subject site is currently undeveloped agricultural land. The west side of IL Route 47 is currently developed with single-family residential uses. Waubensee Community College is located on the east side of IL Route 47 less than one and one-half miles south of the I-88 interchange. Regional access to the subject property and surrounding area is provided via Interstate 88, which currently provides a partial interchange with IL Route 47.

2.2. Existing Roadway Characteristics

Based on a field investigation within the study area, the following information was obtained about the existing roadway network.

Illinois Route 47 (IL Route 47) is a north-south roadway which provides access to the subject property. IL Route 47 is classified as a Strategic Regional Arterial (SRA) by the Illinois Department of Transportation (IDOT). IDOT's SRA system is designed to promote mobility on key routes throughout Chicagoland with the use of such strategies as access control and limited signalization. Through the study area, IL Route 47 provides a single travel lane in each direction. At the existing partial interchange with I-88, a westbound on-ramp and an eastbound off-ramp are provided. A single travel lane is provided on each ramp. The IL Route 47 overpass extends above I-88 and provides two travel lanes in each direction with a center median. A dedicated left-turn lane is provided on IL Route 47 at the I-88 Westbound On-Ramp. The I-88 Eastbound Off-Ramp is under minor-leg stop-control and includes a channelized right-turn lane with storage for approximately one vehicle. At its signalized intersection with Old Oaks Road/College Drive, IL Route 47 provides a dedicated left-turn lane, one through lane, and one shared through/right-turn lane on the north leg. On the south leg, IL Route 47 provides a dedicated left-turn lane, two through lanes, and a dedicated right-turn lane. Through the study area, the posted speed limit on IL Route 47 is 55 miles per hour (MPH). For purposes of this analysis, a speed limit of 35 MPH was assumed for the I-88 on- and off-ramps. IL Route 47 is under IDOT jurisdiction.

Green Road is an east-west local road located north of the subject site. Green Road provides a single travel lane in each direction. At its unsignalized T-intersection with IL Route 47, Green Road provides

a single shared left- and right-turn lane. There is no posted speed limit on Green Road; for purposes of this analysis, a 50 MPH speed limit was assumed. Green Road is under the jurisdiction of the Blackberry Township.

Seavey Road is an east-west local road located north of the I-88 interchange with IL Route 47. East of IL Route 47, Seavey Road is a gravel road with a single travel lane in each direction. West of IL Route 47, a portion of Seavey Road is paved with a single travel lane in each direction. At its intersection with IL Route 47, Seavey Road operates under minor-leg stop-control and provides a single shared lane on the east and west legs. A 30 MPH speed limit is posted on Seavey Road east of IL Route 47. West of IL Route 47, a speed limit is not posted; for purposes of this analysis, a 30 MPH speed limit was assumed. Seavey Road is under the jurisdiction of Blackberry Township.

Finley Road is an east-west local road which extends west of IL Route 47. Finley Road provides a single travel lane in each direction. At its T-intersection with IL Route 47, Finley Road provides a single shared left- and right-turn lane and operates under minor-leg stop-control. There is no posted speed limit on Finley Road; for purposes of this analysis, a 25 MPH speed limit was assumed. Near its intersection with IL Route 47, Finley Road is under the jurisdiction of Blackberry Township.

Thornapple Tree Road is an east-west local loop roadway located on the west side of IL Route 47. Its northern T-intersection with IL Route 47 is located north of Scott Road, and its southern T-intersection is located south of Merrill Road. Thornapple Tree Road provides one travel lane in each direction. There is no posted speed limit on Thornapple Tree Road; for purposes of the analysis, a 25 MPH speed limit was assumed. At each T-intersection with IL Route 47, Thornapple Tree Road provides a single lane in each direction and operates under minor-leg stop control. Thornapple Tree Road is under the jurisdiction of Sugar Grove Township.

Scott Road is an east-west Major Collector roadway which extends west of IL Route 47. Scott Road provides one travel lane in each direction. At its T-intersection with IL Route 47, Scott Road provides a shared left- and right-turn lane and operates under minor-leg stop-control. The posted speed limit on Scott Road is 25 MPH. Near its intersection with IL Route 47, Scott Road is under the jurisdiction of Blackberry Township.

Merrill Road is an east-west Major Collector roadway that extends east of IL Route 47 south of the subject site. Merrill Road provides a single travel lane in each direction. The posted speed limit on Merrill Road is 45 MPH. At its T-intersection with IL Route 47, Merrill Road provides a single lane in each direction and operates under minor-leg stop-control. Merrill Road is under the jurisdiction of Sugar Grove Township.

Old Oaks Road is a local east-west roadway which extends west of IL Route 47 and is aligned opposite College Drive. A single travel lane is provided in each direction. At its signalized intersection with IL Route 47, Old Oaks Road provides a dedicated left-turn lane and a shared through/right-turn lane. There is no posted speed limit on Old Oaks Road; for purposes of the analysis, a 25 MPH speed limit was assumed. Old Oaks Road is under the jurisdiction of Sugar Grove Township.

College Drive is an east-west private roadway located south of the subject site. College Drive extends east of IL Route 47 and is aligned opposite Old Oaks Road. College Drive provides a single

travel lane in each direction. At its signalized intersection with IL Route 47, College Drive provides a dedicated left-turn lane and one shared through/right-turn lane. The posted speed limit on College Drive is 20 MPH; however, based on limitations of the capacity analysis, a 25 MPH speed limit was assumed.

2.3. Traffic Count Data

Turning movement count data was collected for the weekday peak periods in June 2018 at the intersections listed below. Counts were conducted on a typical weekday from 7:00 to 9:00AM and from 4:00 to 6:00PM in order to capture peak travel periods in the vicinity of the proposed development.

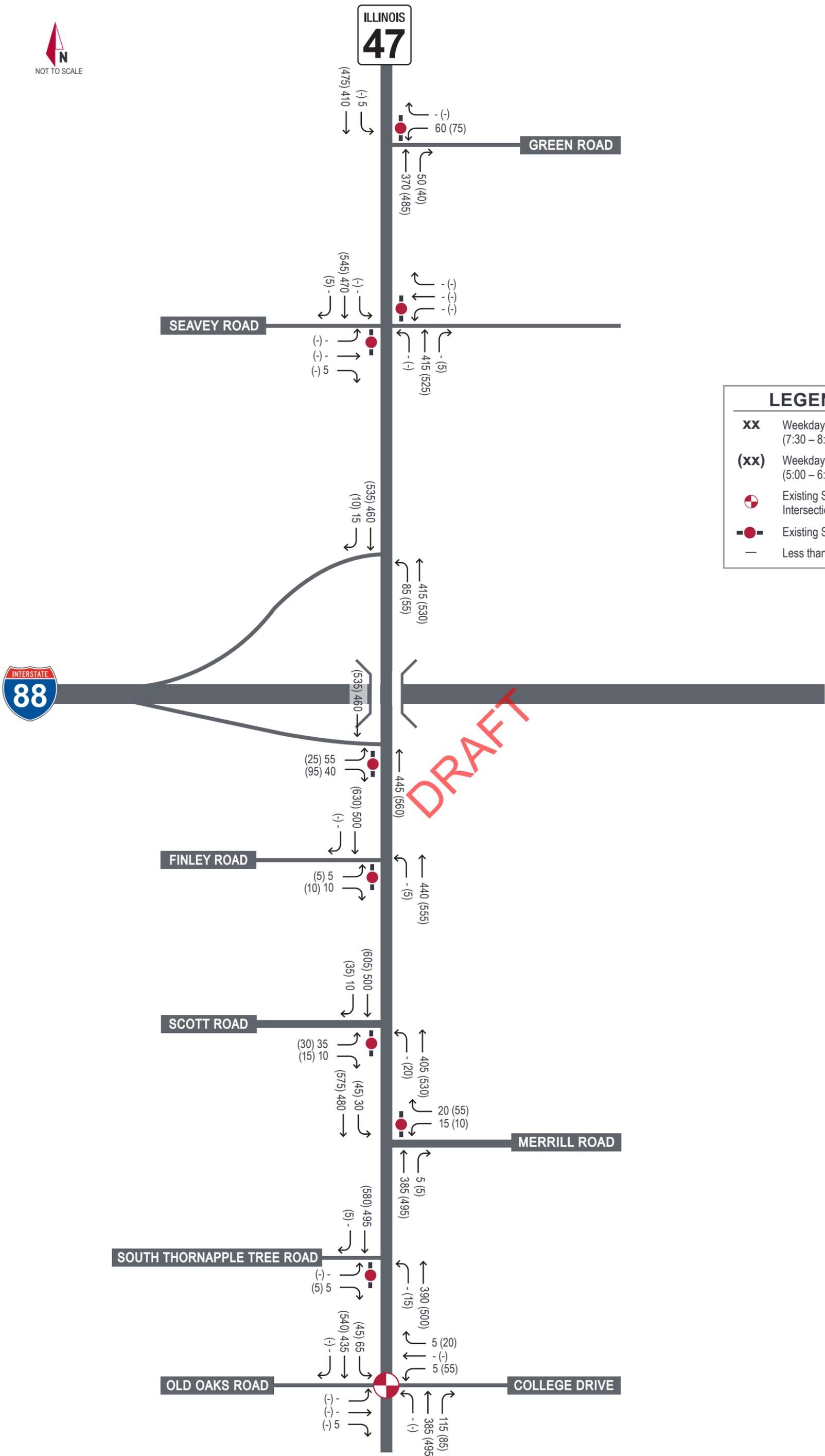
- IL Route 47 / Green Road
- IL Route 47 / Seavey Road
- IL Route 47 / I-88 WB On-Ramp
- IL Route 47 / I-88 EB Off-Ramp
- IL Route 47 / Finley Road
- IL Route 47 / Scott Road
- IL Route 47 / South Thornapple Tree Road
- IL Route 47 / Merrill Road
- IL Route 47 / Old Oaks Road / College Drive

The resulting count data reveals that peak traffic volumes occur within the study area on weekdays from 7:30 to 8:30AM and 5:00 to 6:00PM. The existing peak hour volumes were rounded to the nearest multiple of five and balanced between intersections. Existing peak hour vehicle traffic volumes are presented in **Exhibit 2**. A summary of the traffic count data is provided in the appendix.

Weekday count data reveals that volumes along IL Route 47 are generally evenly distributed during the morning and evening peak hours. Similarly, traffic volumes on Green Road, Finley Road, Merrill Road, Thornapple Tree Road, and Old Oaks Road are generally evenly distributed during the peak hours. Traffic volumes on Scott Road are generally higher in the eastbound direction during the morning peak hour as compared to the westbound direction. During the evening peak hour, traffic volumes on Scott Road are generally evenly distributed in the eastbound and westbound directions.

2.4. Existing Levels of Service

Traffic volume data was analyzed with Synchro capacity analysis software in order to determine the quality of operation in the existing network. Operation is characterized according to the amount of control delay at each intersection approach and quantified into a level of service (LOS). The LOS grades shown below, which are provided in the Transportation Research Board's Highway Capacity Manual (HCM), quantify and categorize a driver's discomfort, frustration, fuel consumption, and travel times experienced as a result of intersection control and the resulting traffic queuing. LOS D is typically the minimum acceptable LOS accepted by agencies in Northeastern Illinois (including IDOT), and a minimum LOS C is required for through movements on SRA routes such as IL Route 47. A detailed description of each LOS rating can be found in **Table 2**.



LEGEND	
xx	Weekday AM Peak (7:30 – 8:30am)
(xx)	Weekday PM Peak (5:00 – 6:00pm)
	Existing Signalized Intersection
	Existing Stop Sign
	Less than Five Vehicles

Table 2. Level of Service Grading Descriptions¹

Level of Service	Description
A	Minimal control delay; traffic operates at primarily free-flow conditions; unimpeded movement within traffic stream.
B	Minor control delay at signalized intersections; traffic operates at a fairly unimpeded level with slightly restricted movement within traffic stream.
C	Moderate control delay; movement within traffic stream more restricted than at LOS B; formation of queues contributes to lower average travel speeds.
D	Considerable control delay that may be substantially increased by small increases in flow; average travel speeds continue to decrease.
E	High control delay; average travel speed no more than 33 percent of free flow speed.
F	Extremely high control delay; extensive queuing and high volumes create exceedingly restricted traffic flow.

¹Highway Capacity Manual 2010

Table 3 presents the range of control delay for each LOS rating as detailed in the HCM. Because signalized intersections are expected to carry a larger volume of vehicles and stopping is required during red time, note that higher delays are tolerated for the corresponding LOS ratings.

Table 3. Level of Service Grading Criteria¹

Level of Service	Average Control Delay (s/veh) at:	
	Unsignalized Intersections	Signalized Intersections
A	0 – 10	0 – 10
B	> 10 – 15	> 10 – 20
C	> 15 – 25	> 20 – 35
D	> 25 – 35	> 35 – 55
E	> 35 – 50	> 55 – 80
F ²	> 50	> 80

¹Highway Capacity Manual 2010

²All movements with a Volume to Capacity (v/C) ratio greater than 1 receive a rating of LOS F.

Based on these standards, capacity results were identified for the study intersections under existing conditions. At the intersection of IL Route 47/Old Oaks Road/College Drive, the traffic signal is currently running “free” and is not on an interconnected signal system. In order to evaluate traffic conditions and reflect the responsive nature of the signal cycles, the signal was optimized with an assumed minimum cycle length of 90 seconds. Per IDOT requirements, right-turn-on-red (RTOR) movements were not included in the analysis. Although a 20 MPH speed limit is posted on College Drive, the HCM 2010 analysis supports a minimum speed limit of 25 MPH; therefore, a 25 MPH speed limit was applied to College Drive.

Level of service data for the study intersections is reported in **Table 4**. For each study intersection, the results are based on Synchro’s HCM 2010 reports, copies of which are provided in the Appendix. In this table, operation on each approach is quantified according to the average delay per vehicle and the corresponding level of service. Overall intersection operation is reported for the signalized intersection only.

Table 4. Existing (2018) Levels of Service

Intersection	AM Peak Hour		PM Peak Hour	
	Delay (s/veh)	LOS	Delay (s/veh)	LOS
IL Route 47 / Green Road △				
Westbound	19	C	25+	D
Southbound (Left)	8	A	9	A
IL Route 47 / Seavey Road △				
Eastbound	15-	B	20	C
Westbound	15+	C	20	C
Northbound (Left)	8	A	9	A
Southbound (Left)	8	A	9	A
IL Route 47 / I-88 EB Off-Ramp △				
Eastbound	17	C	10-	A
IL Route 47 / Finley Road △				
Eastbound	14	B	17	C
Northbound (Left)	9	A	9	A
IL Route 47 / Scott Road △				
Eastbound	18	C	25-	C
Northbound (Left)	9	A	9	A
IL Route 47 / Merrill Road △				
Westbound	15-	B	15+	C
Southbound (Left)	8	A	9	A
IL Route 47 / South Thornapple Tree Road △				
Eastbound	13	B	14	B
Northbound (Left)	9	A	9	A
IL Route 47 / Old Oaks Road / College Drive *				
Eastbound	23	C	23	C
Westbound	22	C	21	C
Northbound	6	A	7	A
Southbound	6	A	7	A
Intersection	6	A	8	A

* – Signalized Intersection △ – Minor-Leg Stop-Controlled Intersection

As shown in Table 4, the northbound and southbound approaches and movements along IL Route 47 are currently operating at LOS A during each peak hour. The eastbound and westbound approaches are operating at LOS D or better during each peak hour. The 95th percentile queues estimated for the turn movements at the unsignalized intersections are approximately one vehicle or less during each peak hour. At the signalized intersection of IL Route 47/Old Oaks Road/College Drive, the 95th percentile queues are currently accommodated within the existing storage lanes. The 95th percentile queue estimated for the northbound right-turn lane is approximately two vehicles (50 feet) or less during each peak hour. The 95th percentile queues estimated for the northbound and southbound left-turn lanes are approximately one vehicle (25 feet) or less during each peak hour.

3. FUTURE DEVELOPMENT CONDITIONS

This section of the report outlines the proposed development plan, summarizes site-specific traffic characteristics, develops future traffic projections for analysis, and presents the results of the future capacity analysis.

3.1. Development Characteristics & Site Access

The initial phase of The Crossings comprises approximately 335 acres on the northeast quadrant of IL Route 47/South Thornapple Tree Road (referred to as Zone E). The development plan of Zone E includes a total of approximately 4,062,225 square feet of industrial warehouse/distribution use, which would be constructed as Phase A. Full buildout of the remaining 425 acres (Zones A-D and Zone F) is anticipated to be constructed in phases; the development plan contemplated for Phase B is discussed in *Section 4. Future Concept Conditions*. A conceptual site plan is provided in the Appendix.

With development of Phase A, a new site access roadway would be constructed in order to facilitate access to the industrial warehouse/distribution development in Zone E. The new roadway is proposed to align with Scott Road and extend east of IL Route 47 (referred to as Denny Road for the purposes of this study). Merrill Road would be realigned opposite South Thornapple Tree Road (referred to as Realigned Merrill Road for the purposes of this study).

Denny Road and Realigned Merrill Road would intersect and form a roundabout east of IL Route 47 with Denny Road continuing to the east (referred to as Denny Road Extension for the purposes of this study) and Merrill Road continuing to the southeast (referred to as Merrill Road Existing for the purposes of this study). As discussed in the *Recommendations & Conclusion* section of this report, a roundabout is recommended at this intersection in order to enhance safety conditions and reduce travel speeds.

As part of development of Phase A, Denny Road Extension would be constructed across the southern boundary of Zone E. Denny Road Extension would facilitate access to Zone E and provide regional connectivity to the area roadway network. Near its eastern terminus, a roundabout would be installed on Denny Road Extension in order to reduce travel speeds, minimize cut-thru traffic in the future residential neighborhood to the south (Zone F), and provide a turnaround area for wayward trucks.

Truck access to the industrial warehouse/distribution uses included in Phase A would be provided via Denny Road/Denny Road Extension only; trucks would be prohibited on Realigned Merrill Road and Merrill Road Existing. Passenger vehicle access would be permitted via both Denny Road and Realigned Merrill Road.

3.2. Trip Generation, Distribution, & Assignment

In order to calculate site-generated traffic projections for the site, data was referenced from the Institute of Transportation Engineers (ITE) manual Trip Generation, Tenth Edition. Trip generation data for the ITE Land Use Code (LUC) corresponding to the proposed uses are shown in **Table 5**. Where provided, the trip generation formula was assumed. A copy of ITE data is provided in the

Appendix.

Table 5. ITE Trip Generation Data by Land Use

ITE Land Use / Unit	Unit	Type	Weekday		
			Daily	AM Peak	PM Peak
High-Cube Transload and Short-Term Storage Warehouse (LUC 154)	Per 1,000 sq. ft.	Passenger Vehicles	0.946X 50% in/50% out	0.056X 77% in/23% out	0.077X 28% in/72% out
		Heavy Vehicles ¹	0.454X 50% in/50% out	0.024X 77% in/23% out	0.023X 28% in/72% out

T – Site-generated trips X – 1,000 square feet gross floor area

¹ The ITE *Trip Generation, Tenth Edition* manual does not provide data for heavy vehicles. Per guidance provided in the ITE manual for LUC 154, data provided in the *High-Cube Warehouse Vehicle Trip Generation Analysis*, published in October 2016 was assumed. Tables 5-7 of the *High-Cube Warehouse Vehicle Trip Generation Analysis* outline the daily and peak hour trip generation rates for heavy vehicles. A copy of the supplemental data is provided in the appendix. The in/out distribution percentages were obtained from the *Trip Generation, Tenth Edition* manual.

The site-generated trips generated during the peak hour were rounded to the nearest multiple of five for the purposes of this analysis, and daily trips were rounded to the nearest multiple of ten. A summary of projected site trips is provided in **Table 6**.

Table 6. Site-Generated Traffic Projections¹

Land Use	Size	Type	Daily	Weekday					
				AM Peak			PM Peak		
				In	Out	Total	In	Out	Total
Phase A									
High-Cube Transload and Short-Term Storage Warehouse (LUC 154)	4,062,225 sq. ft.	Passenger Cars	3,840	175	50	225	90	225	315
		Heavy Vehicles	1,840	75	20	95	25	70	95
Total (Phase A)			5,680	250	70	320	115	295	410

¹In/Out volumes are rounded to the nearest multiple of five. For rounding purposes, the total volumes are a sum of in and out trips.

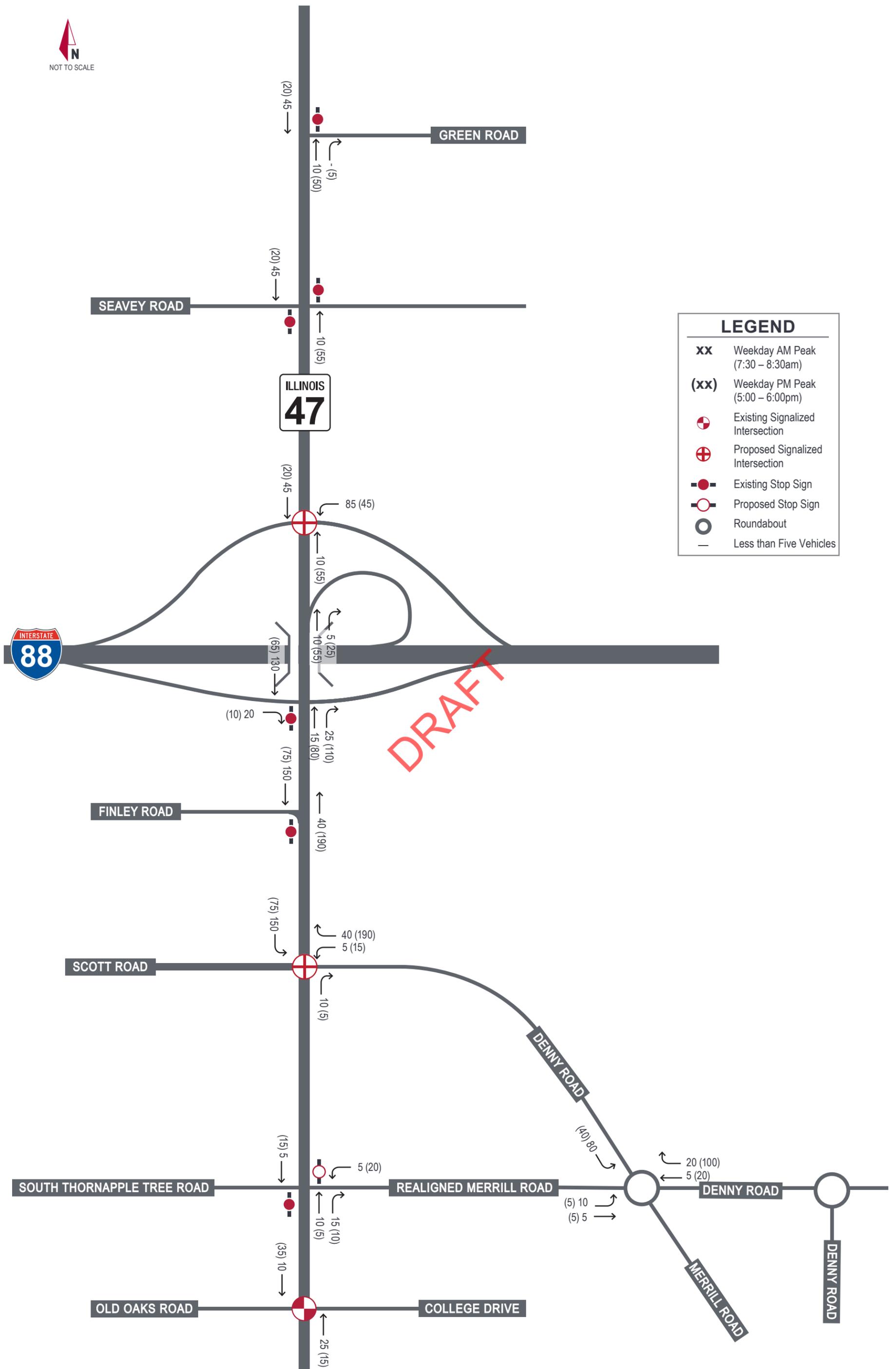
The distribution of site-generated truck traffic was based on prevailing truck traffic volumes/patterns and the planned I-88 interchange improvements at IL Route 47. The distributions estimated for passenger vehicle traffic are based on a number of factors, including the nature of surrounding land uses, prevailing traffic volumes/patterns, characteristics of the street system, and the ease with which motorists can travel over various sections of that system. The planned interchange improvements were also considered for the estimated passenger vehicle distributions. The estimated trip distributions are summarized in **Table 7**.

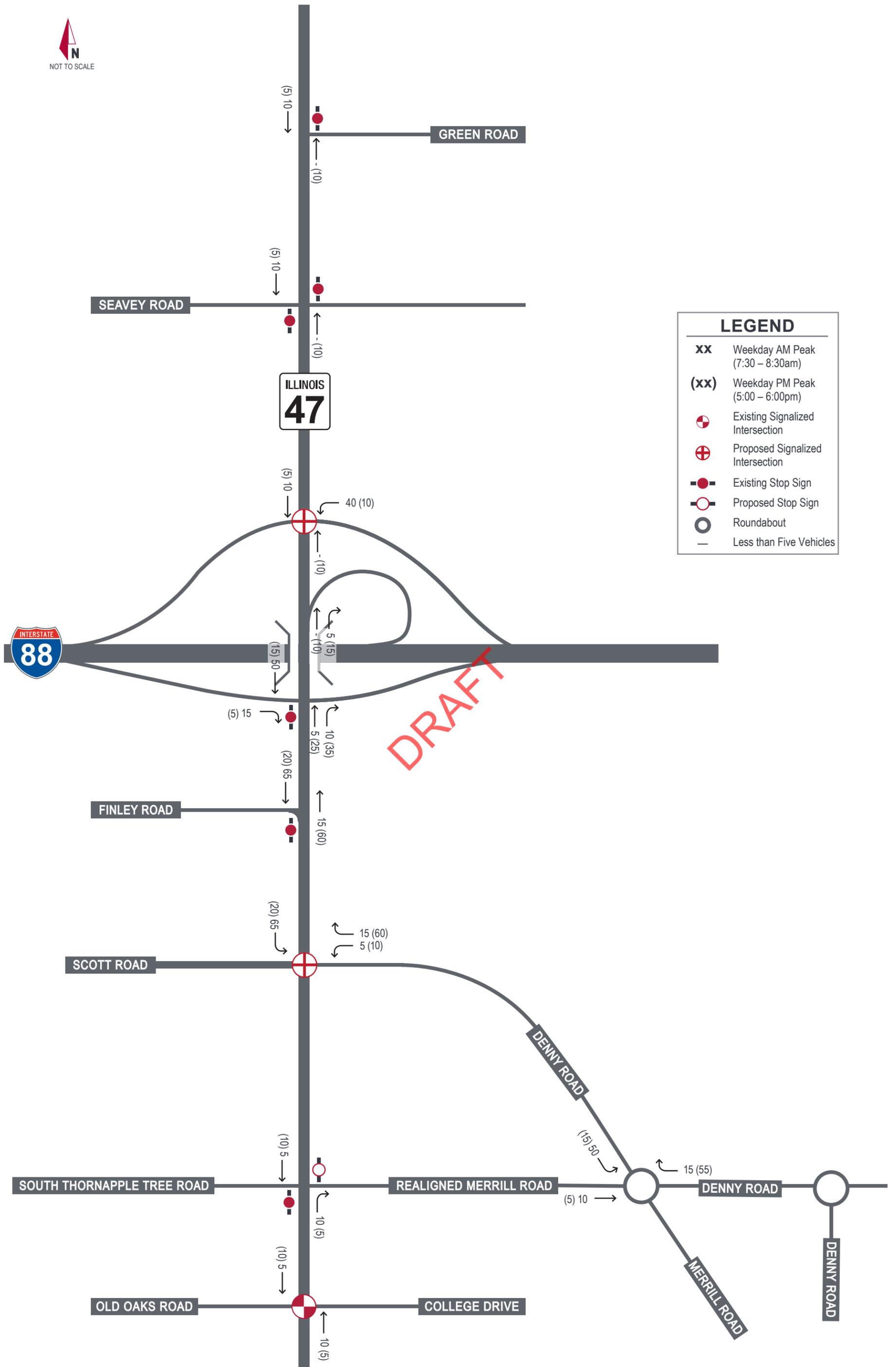
Table 7. Estimated Trip Distribution

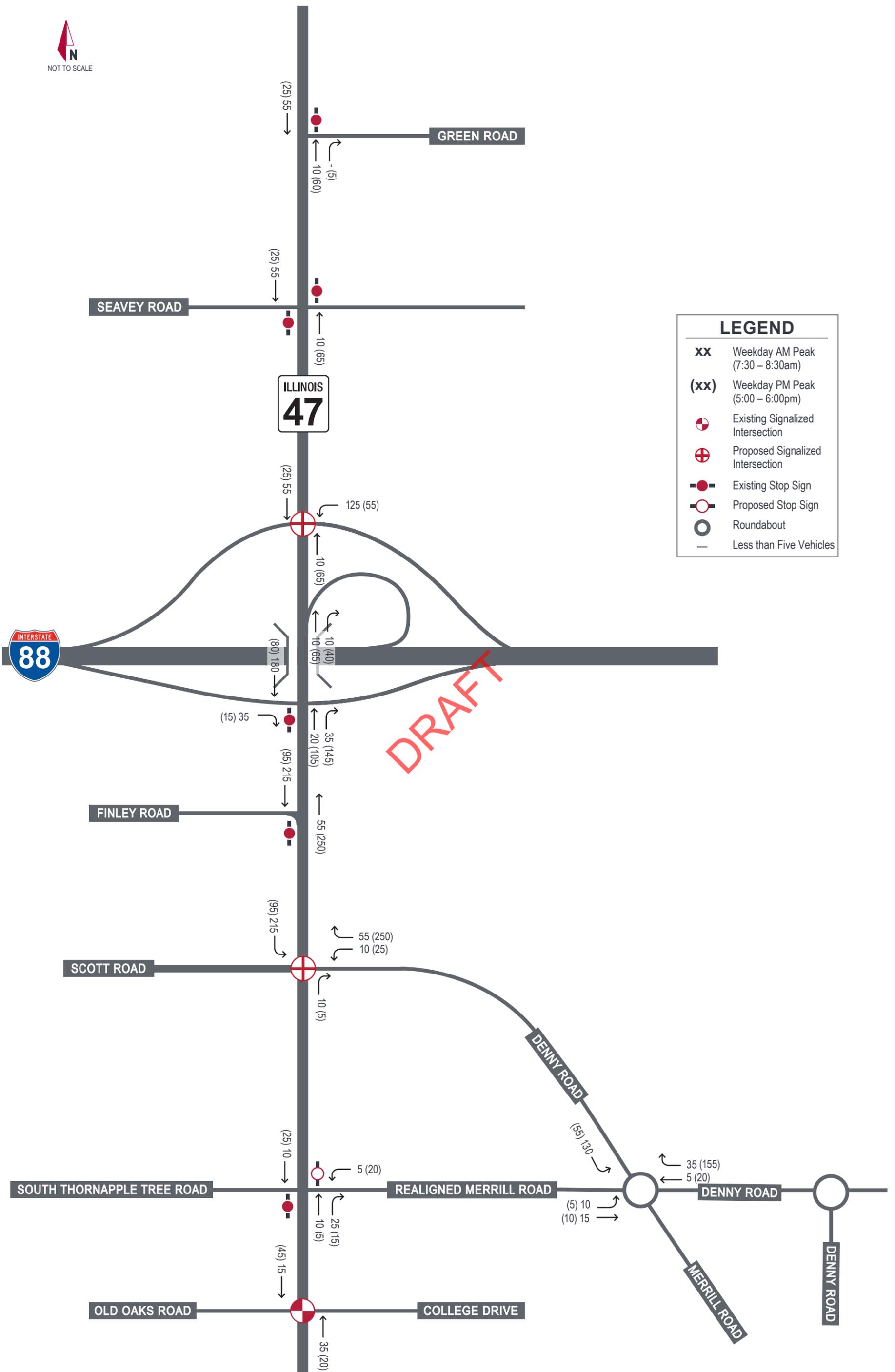
Traveling to/from:	Portion of Site Traffic	
	Passenger Vehicles	Heavy Vehicles
East on I-88	50%	50%
West on I-88	10%	20%
North on IL Route 47	25%	15%
South on IL Route 47	15%	15%
Total	100%	100%

Traffic generated by the subject site was assigned to the study intersections and the proposed site access according to this distribution. Phase A site traffic assignment for passenger vehicles and trucks are illustrated in **Exhibits 3 and 4**, respectively. Total site traffic assignment for Phase A is depicted in **Exhibit 5**.

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3.3. Future Capacity Analysis

In order to quantify the impact of site-generated traffic estimated for Phase A, and to identify infrastructure needs to support site access and the addition of site-generated traffic to the local roadway network, a Year 2030 Build scenario was developed.

Background Traffic Growth

Background traffic volumes were estimated using data from the Chicago Metropolitan Agency for Planning (CMAP). Based on the scale of the proposed development and a review of initial Year 2040 traffic projections, CMAP adjusted the future background traffic volumes in order to exclude the approximately 760-acre subject property. An official letter from CMAP documenting the projected Year 2040 traffic volume on the study roadways is provided in the Appendix. Based on the information received from CMAP, annual traffic growth on area roadways is projected to occur at the rates identified in **Table 8**. The total future background traffic volumes for Year 2030 are presented in **Exhibit 6**. For purposes of the analysis of future traffic conditions, it was assumed approximately 25 percent of future background traffic (Exhibit 6) on Merrill Road would be redistributed to Denny Road Extension.

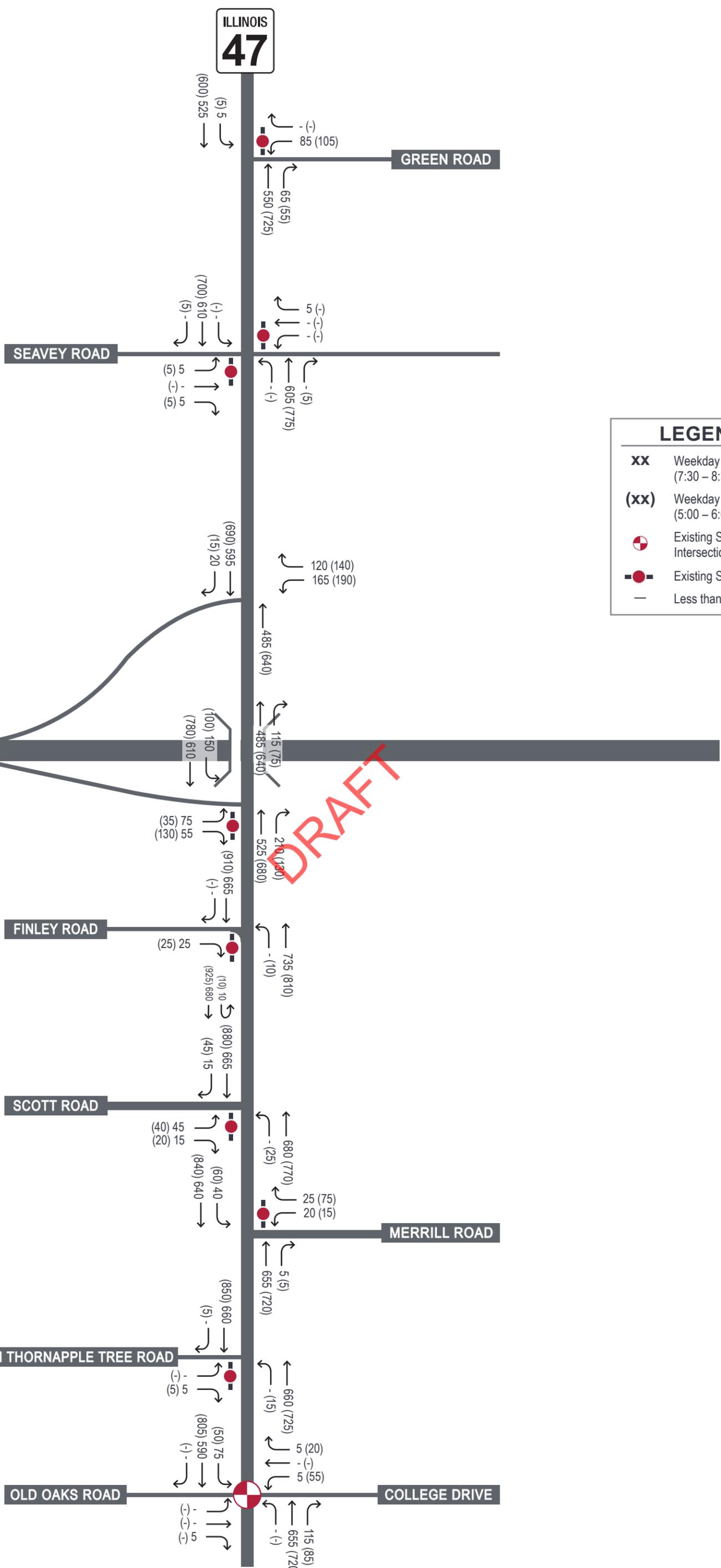
Table 8. Future Growth Rates

Roadway Segment	Growth Rate
IL Route 47 between I-88 and Green Road ¹	2.76%
IL Route 47 between I-88 and Old Oaks Road / College Road ¹	1.42%
Green Road east of IL Route 47	2.46%
Seavey Road east of IL Route 47	2.47%
Seavey Road west of IL Route 47	2.57%
I-88 WB on-ramp west of IL Route 47	2.27%
I-88 EB off-ramp west of IL Route 47	2.55%
Finley Road west of IL Route 47	4.04%
Scott Road west of IL Route 47	2.56%
Merrill Road east of IL Route 47	2.53%

¹A growth rate of 2.76% was applied to traffic volumes on IL Route 47 north of the I-88 ramps, and a growth rate of 1.42% was applied to traffic volumes on IL Route 47 south of the I-88 ramps. For purposes of this analysis, an average growth rate of 2.09% was applied to traffic volumes on IL Route 47 at the I-88 ramps.



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LEGEND	
XX	Weekday AM Peak (7:30 – 8:30am)
(xx)	Weekday PM Peak (5:00 – 6:00pm)
	Existing Signalized Intersection
	Existing Stop Sign
—	Less than Five Vehicles

Planned Area Improvements

Several improvements are planned for the I-88 interchange with IL Route 47. Based on the Intersection Design Study (IDS) and planned construction in 2019, the following improvements were assumed to be completed by others and in place under the Year 2030 Build scenario. A copy of the IDS is included in the Appendix.

- **IL Route 47 / I-88 Westbound Ramps**

- The east leg was assumed to be constructed as a single lane westbound off-ramp. Per the IDS, a 35 MPH speed limit was assumed for the off-ramp.
- A dedicated right-turn lane was assumed to be provided on the east leg (i.e., westbound off-ramp). Per the IDS, the right-turn lane would provide 350 feet of storage with a 350-foot taper.
- A dedicated left-turn lane was assumed to be provided on the east leg (i.e., westbound off-ramp) and a second left-turn lane would be striped out. Based on the IDS, the left-turn lane would provide 255 feet of storage.
- A dedicated right-turn lane was assumed to be provided on the north leg. According to the IDS, the turn lane would provide 265 feet of storage with a 265-foot taper.
- A westbound loop on-ramp was assumed to be constructed less than 200 feet south of the intersection. Per the IDS, a 35 MPH speed limit was assumed for the loop on-ramp.

- **IL Route 47 / I-88 Eastbound Ramps**

- A dedicated right-turn lane was assumed to be provided on the south leg. Per the IDS, the turn lane would provide 295 feet of storage with a 265-foot taper.
- Dual left-turn lanes were assumed to be provided on the north leg. The outside lane would be striped out until future traffic volumes meet minimum traffic volume criteria for dual left-turn lanes. Per the IDS, the turn lanes would provide 315 feet of storage with a 325-foot taper. It is anticipated the southbound left-turn would operate with a single left-turn lane under the Year 2030 Build scenario.
- Dual right-turn lanes were assumed to be provided on the west leg (i.e., eastbound off-ramp). According to the IDS, the turn lanes would provide 290 feet of storage with a 300-foot taper. It is anticipated the off-ramp would operate with a single right-turn lane under the Year 2030 Build scenario.
- The I-88 Eastbound Off-Ramp was assumed to continue to operate under minor-leg stop-control.

- **IL Route 47 / Finley Road**

- The west leg was assumed to be a three-quarter access with a barrier median to preclude eastbound left-turn movements. “No Left Turn” signage was assumed to be posted for traffic traveling eastbound on Finley Road.
- A dedicated left-turn lane was assumed on the south leg of the intersection. The turn lane was assumed to provide 265 feet of storage with a 265-foot taper.

In addition to planned interchange improvements, for purposes of the Year 2030 Build analysis, a speed limit of 30 MPH was assumed for Denny Road and Realigned Merrill Road.

Signal Warrant Analyses

Evening peak hour traffic projections for the following intersections were compared to criteria provided in the Manual on Uniform Traffic Control Devices (MUTCD) to determine whether a traffic signal may be warranted under the Year 2030 Build scenario:

- IL Route 47 / Seavey Road
- IL Route 47 / I-88 Westbound Ramps
- IL Route 47 / I-88 Eastbound Ramps
- IL Route 47 / Scott Road / Denny Road
- IL Route 47 / South Thornapple Tree Road / Realigned Merrill Road

Signal warrant analyses were performed according to criteria set by the Manual on Uniform Traffic Control Devices (MUTCD) for Warrant 1 (Eight-Hour Warrant), Condition A (Minimum Vehicular Volume) and Condition B (Interruption of Continuous Traffic). Warrant 1 can be satisfied by meeting the following conditions: Condition A (Minimum Vehicular Volume) or Condition B (Interruption of Continuous Traffic). The combined Condition A & B cannot be used if the major route is an SRA route, which is the case for IL Route 47. The signal warrant analysis is typically completed with at least eight hours of traffic count data for an intersection. Because only peak hour projections can be formulated for the proposed development, typical IDOT practice allows a signal warrant to instead be evaluated by reducing evening peak hour volumes to 55 percent of their projected total to represent the minimum volume during a given eight-hour period. Minor-street right-turning volumes were also reduced at the study intersections in accordance with Pagone's Theorem, per IDOT requirements. These reduced volumes were compared to MUTCD criteria for signal warrant analysis.

Table 9 reports the signal warrant analyses conducted for the Year 2030 Build scenario.

Table 9. Year 2030 Signal Warrant Analyses

Intersection / Warrant Criteria	Traffic Volume		Meets Warrant?
	Major Street	Higher-Volume Minor-Leg Approach	
IL Route 47 / Seavey Road			
One-Lane Major Street/One-Lane Minor Street at 100%			
MUTCD Criteria			
Warrant 1A	500	150	--
Warrant 1B	750	100	--
Year 2030 Build	867	6	No
IL Route 47 / I-88 Westbound Ramps			
Two-Lane Major Street/One-Lane Minor Street at 100%			
MUTCD Criteria			
Warrant 1A	600	150	--
Warrant 1B	900	100	--
Year 2030 Build	789	154	Yes (Warrant 1A)
IL Route 47 / I-88 Eastbound Ramps			
Two-Lane Major Street/One-Lane Minor Street at 100%			
MUTCD Criteria			
Warrant 1A	600	150	--
Warrant 1B	900	100	--
Year 2030 Build	1,111	43	No
IL Route 47 / Scott Road / Denny Road			
One-Lane Major Street/One-Lane Minor Street at 100%			
MUTCD Criteria			
Warrant 1A	500	150	--
Warrant 1B	750	100	--
Year 2030 Build	1,001	97	No (See Below)
IL Route 47 / South Thornapple Tree Road / Realigned Merrill Road			
One-Lane Major Street/One-Lane Minor Street at 100%			
MUTCD Criteria			
Warrant 1A	500	150	--
Warrant 1B	750	100	--
Year 2030 Build	927	39	No

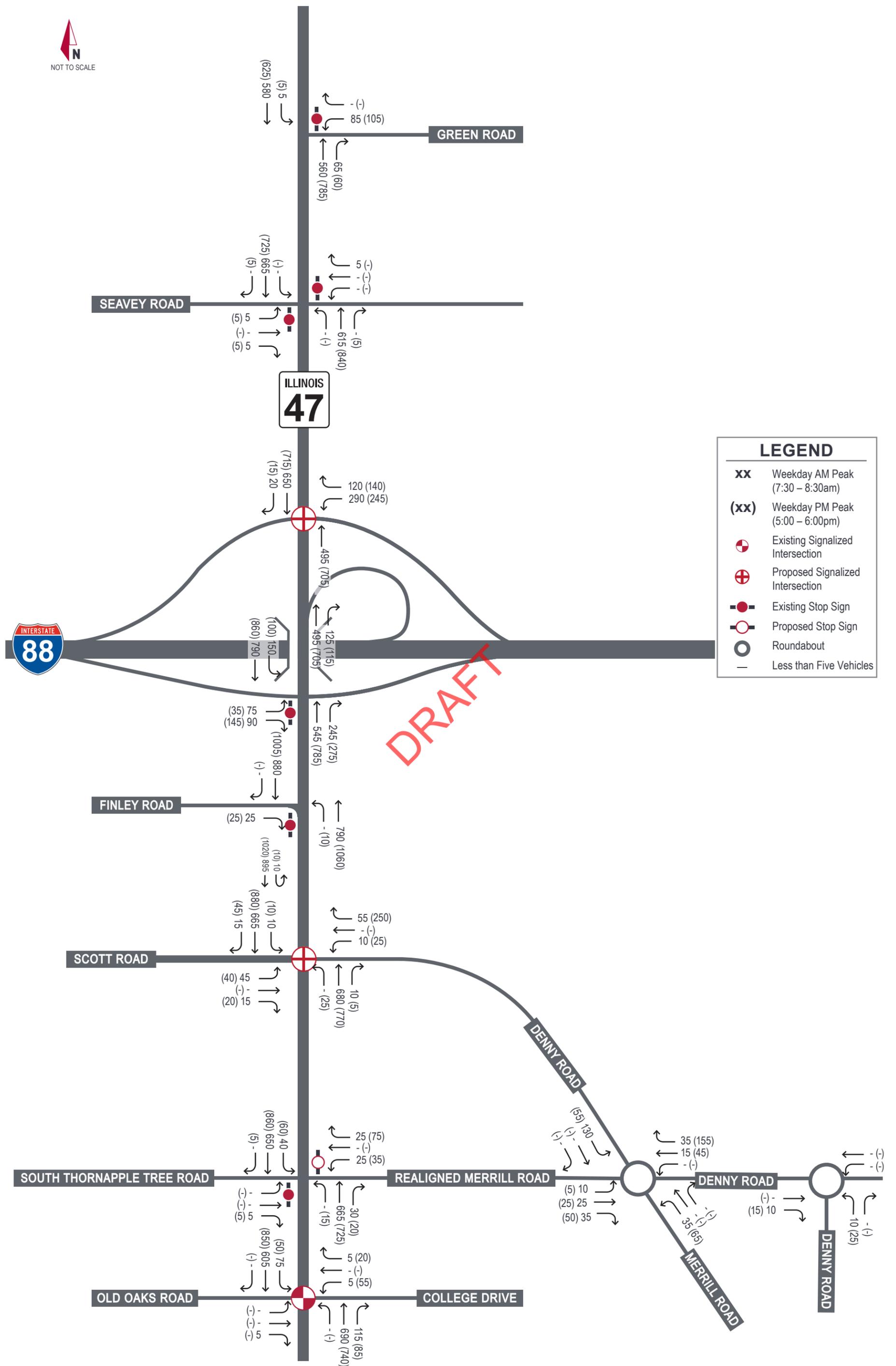
As shown above, a signal is warranted at the intersection of IL Route 47/I-88 Westbound Ramps under the Year 2030 Build scenario. At IL Route 47/Scott Road/Denny Road, the 2030 Build volumes are just below the threshold to warrant a signal. Because the assumption that 25 percent of existing Merrill Road traffic would route via Denny Road is conservative, it is likely that additional traffic would ultimately use Denny Road to reach IL 47 which would result in a signal being warranted. Therefore, traffic signals at the intersections of IL Route 47/Scott Road/Denny Road and IL Route 47/I-88 Westbound Ramps were included in the analysis of Year 2030 Build conditions.

Future (2030) Build Levels of Service

For the analysis of Phase A traffic conditions, site-generated trips (Exhibit 5) were added to Year 2030 future background traffic (Exhibit 6) to yield total volumes at the study intersections. Future traffic projections for the Phase A scenario are illustrated in **Exhibit 7**.

Based on the analysis of Year 2030 Build traffic conditions, several improvements were identified to facilitate site access and mitigate traffic attributable to the proposed development. A summary of the anticipated mitigation included in the Year 2030 Build scenario is provided below. Turn lane warrants and dimensions were evaluated at the study intersections using volume criteria in the IDOT *Bureau of Design and Environment (BDE) Manual*.

- **IL Route 47 / I-88 Westbound Ramps**
 - Per the results of the warrant analysis, install a traffic signal. In order to evaluate traffic conditions and reflect the responsive nature of the signal, the signal was optimized with an assumed minimum cycle length of 90 seconds for each peak hour. Per IDOT requirements, RTOR movements were excluded.
 - Restripe the east leg to facilitate dual left-turn lanes. Per the IDS, the turn lanes should provide 255 feet of storage.
- **IL Route 47 / Scott Road / Denny Road**
 - Construct Denny Road. A three-lane cross-section with a single travel lane in each direction should be provided.
 - Per the results of the signal warrant analysis, install a traffic signal. For purposes of this analysis, a minimum cycle length of 90 seconds was applied to each peak hour, and splits were optimized for future traffic conditions reflected in this study. Per IDOT requirements, RTOR movements were excluded.
 - Install a dedicated left-turn lane on the north and south legs. The turn lanes should provide 265 feet of storage with a 265-foot taper.
 - Provide a dedicated left-turn lane and a shared through/right-turn lane on both the east and west legs of the intersection. Based on a design speed of 30 MPH on Scott Road (25 MPH posted speed limit), the left-turn lane on the west leg should provide 115 feet of storage with a 135-foot taper. Based on an assumed design speed of 35 MPH for Denny Road (30 MPH posted speed limit), the left-turn lane on the east leg should provide 125 feet of storage with a 155-foot taper.
- **IL Route 47 / South Thornapple Tree Road / Realigned Merrill Road**
 - Realign Merrill Road opposite South Thornapple Tree Road. A single travel lane should be provided in each direction. At its intersection with IL Route 47, Merrill Road should operate under minor-leg stop-control.
 - Install a shared left-turn/through lane and a dedicated right-turn lane on the east leg. Based on an assumed design speed of 35 MPH on Realigned Merrill Road, the right-turn lane should provide 125 feet of storage with a 155-foot taper.
 - Install dedicated left-turn lanes on the north and south legs. The turn lanes should provide 265 feet of storage with a 265-foot taper.



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- **Denny Road / Realigned Merrill Road / Merrill Road Existing**
 - Install a roundabout in order to enhance safety conditions and reduce travel speeds.
 - The roundabout should be designed to accommodate trucks and provide a single shared lane on each approach. A dedicated slip lane should be provided on the east leg in order to facilitate westbound right-turn movements, including site-generated truck and passenger vehicle trips, without entering the roundabout.
- **Denny Road Extension**
 - Extend Denny Road to the eastern project boundary in order to facilitate access to Zone E and provide for future regional connectivity.
 - A three-lane cross-section with a single travel lane in each direction should be provided along Denny Road Extension.
 - Install a roundabout near the eastern terminus of Denny Road in order to:
 - Reduce travel speeds on Denny Road Extension;
 - Minimize cut-thru traffic in the future residential neighborhood to the south; and
 - Provide a turnaround for wayward trucks.
 - The roundabout should be designed to accommodate trucks and provide a single shared lane on each approach.

With the planned area improvements and recommended mitigation in place, Year 2030 Build traffic operation is projected as shown in **Table 10**. The results are based on Synchro's HCM 2010 reports, copies of which are included in the Appendix.

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Table 10. Future (2030) Build Levels of Service

Intersection	AM Peak Hour		PM Peak Hour	
	Delay (s/veh)	LOS	Delay (s/veh)	LOS
IL Route 47 / Green Road △				
Westbound	40	E	109	F
Southbound (Left)	9	A	10-	A
IL Route 47 / Seavey Road △				
Eastbound	25+	D	37	E
Westbound	19	C	38	E
Northbound (Left)	9	A	9	A
Southbound (Left)	9	A	10-	A
IL Route 47 / I-88 WB Ramps *				
Westbound	37	D	37	D
Northbound	4	A	3	A
Southbound	4	A	3	A
<i>Intersection</i>	12	B	11	B
IL Route 47 / I-88 EB Ramps △				
Eastbound	>120	F	27	D ¹
Southbound (Left)	9	A	10+	B
IL Route 47 / Finley Road △				
Eastbound (Right)	17	C	20	C
Northbound (Left)	10-	A	11	B
IL Route 47 / Scott Road / Denny Road *				
Eastbound	34	C	39	D
Westbound	35-	C	52	D
Northbound	19	B	25	C
Southbound	11	B	28	C
<i>Intersection</i>	16	B	30	C
IL Route 47 / South Thornapple Tree Road / Realigned Merrill Road △				
Eastbound	21	C	34	D
Westbound	36	E	68	F
Northbound (Left)	9	A	10-	A
Southbound (Left)	9	A	10-	A
Denny Road / Realigned Merrill Road / Merrill Road Existing ○				
Eastbound	5	A	5	A
Westbound	1	A	<1	A
Northbound	5	A	4	A
Southbound	7	A	5	A
<i>Intersection</i>	5	A	3	A

* – Signalized Intersection △ – Minor-Leg Stop-Controlled ○ – Roundabout Intersection

¹Left-turn movement operates at LOS F.

Table 10. Future (2030) Build Levels of Service (continued)

Intersection	AM Peak Hour		PM Peak Hour	
	Delay (s/veh)	LOS	Delay (s/veh)	LOS
Denny Road / Zone E Access (Turnaround) ○				
Eastbound	3	A	3	A
Westbound	3	A	3	A
Northbound	3	A	4	A
<i>Intersection</i>	3	A	3	A
IL Route 47 / Old Oaks Road / College Drive *				
Eastbound	25	C	26	C
Westbound	26	C	27	C
Northbound	6	A	6	A
Southbound	5	A	7	A
<i>Intersection</i>	6	A	7	A

* – Signalized Intersection △ – Minor-Leg Stop-Controlled ○ – Roundabout Intersection

As shown in Table 10, with the addition of background traffic growth, site-generated traffic, and planned improvements, the northbound and southbound through movements on IL Route 47 are projected to operate at LOS C or better at each study intersection.

At the intersection of IL Route 47/Green Road, the westbound approach is projected to operate at LOS E during the morning peak hour and LOS F during the evening peak hour. The projected delay is not uncommon for minor-leg stop-controlled roadways at intersections with heavily traveled arterials such as IL Route 47. Projected 95th percentile queue lengths on Green Road are approximately two vehicles (50 feet) during the morning peak hour and five vehicles (125 feet) during the evening peak hour.

At the intersection of IL Route 47/Seavey Road, the eastbound and westbound approaches are projected to operate at LOS E during the evening peak hour. The projected delay is not uncommon for minor-leg stop-controlled roadways at intersections with heavily traveled arterials such as IL Route 47. Projected 95th percentile queue lengths on Seavey Road are approximately one vehicle (25 feet) or less for both minor-leg approaches during each peak hour.

With the improvements to the I-88 interchange, the westbound off-ramp is projected to operate at LOS D during each peak hour. The projected 95th percentile queue for the westbound left-turn movement is approximately seven vehicles (175 feet) during the morning and evening peak hours. The projected 95th percentile queues would be accommodated within the planned storage lanes; and therefore, queue spillback to the I-88 mainline travel lanes is not anticipated.

The eastbound off-ramp is projected to operate at LOS F during the morning peak hour, and LOS D during the evening peak hour. The delay is not uncommon for a minor-leg stop-controlled intersection with a heavily traveled roadway such as IL Route 47. During the morning peak hour, the 95th percentile queue projected for the left-turn movement is approximately eight vehicles (200 feet), and the right-turn movement is estimated to be approximately one vehicle (25 feet). During the evening peak hour, the 95th percentile queue projected for the left-turn movement is approximately two vehicles (50 feet), and the right-turn movement is estimated to be approximately one vehicle (25 feet). The 95th

percentile queues would be accommodated within the planned storage lanes without spillback to the I-88 mainline travel lanes.

At the intersection of IL Route 47 at Scott Road/Denny Road, the eastbound and westbound approaches are projected to operate at LOS C during the morning peak hour and LOS D during the evening peak hour. The 95th percentile queue projected for the southbound left-turn movement is approximately six vehicles (150 feet) during the morning peak hour and two vehicles (50 feet) during the evening peak hour. These queues would be accommodated within the 265-foot left-turn storage lane. The 95th percentile queue projected for the northbound left-turn movement is approximately one vehicle (25 feet) or less during both peak hours. During each peak hour, the 95th percentile queues projected for the eastbound and westbound left-turn movements are approximately two vehicles (50 feet) or less.

At the intersection of IL Route 47 at South Thornapple Tree Road / Merrill Road, the northbound and southbound left-turn movements are projected to operate at LOS A during the morning and evening peak hours. The eastbound approach is projected to operate at LOS C during the morning peak hour and LOS D during the evening peak hour. The westbound approach is projected to operate at LOS E during the morning peak hour and LOS F during the evening peak hour. On the westbound approach, the 95th percentile queues are approximately one vehicle (25 feet) or less. During the evening peak hour, the 95th percentile queues are approximately three vehicles (75 feet) for the left-turn movement and one vehicle (25 feet) for the right-turn movement.

During both peak hours, the roundabouts are projected to operate at an overall LOS A with each approach operating with limited delay.

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4. FUTURE CONCEPT CONDITIONS

This section of the report outlines the preliminary concept plan for Phase B. In addition, this section of the report summarizes initial estimates for site traffic characteristics, future traffic projections, and capacity analysis results. This preliminary information is provided in order to define anticipated infrastructure improvements which may be needed to support continued traffic growth in the study area. As the development plan for Phase B is further refined and background traffic volumes are realized, additional analyses of Phase B traffic conditions are anticipated.

4.1. Concept Characteristics & Site Access

A mix of uses is contemplated for Phase B of the development. Based on the current plan, Phase B is anticipated to include 4,021,900 square feet of industrial warehouse/distribution use, 149,000 square feet of retail use, and 177 single-family residential units. A conceptual site plan is included in the Appendix.

Access to Phase B would include site access driveways to IL Route 47. For purposes of this analysis, the following proposed site access driveways along IL Route 47 were included. Site access driveways proposed along Seavey Road were not included in the analysis.

- **Zone A** – A right-out (RO) access driveway to IL Route 47 (Access C) located approximately 500 feet south of Seavey Road.
- **Zone B** – A full-access driveway aligned opposite Oakleaf Drive (Access A) and a right-in/right-out (RIRO) access driveway (Access B) located approximately 640 feet south of Access A.
- **Zone C** – A right-in (RI) access driveway (Access D) would be provided approximately 500 feet south of Seavey Road.
- **Zone D** – A single full-access driveway (Access E) is assumed to be provided along IL Route 47 south of Finley Road.

The residential component included in Zone F is assumed to be accessed via Merrill Road southeast of its intersection with IL Route 47. The site access details for Zone F are subject to change as the plan is further refined; therefore, the site access driveways for Zone F were not included in the analysis.

4.2. Trip Generation, Distribution, & Assignment

In order to calculate site-generated traffic projections for the site, data was referenced from the Institute of Transportation Engineers (ITE) manual Trip Generation, Tenth Edition. Trip generation data for the ITE Land Use Code (LUC) corresponding to the proposed uses are shown in **Table 11**. Where provided, the trip generation formula was assumed. A copy of ITE data is provided in the Appendix.

Table 11. ITE Trip Generation Data by Land Use

ITE Land Use / Unit	Unit	Type	Weekday		
			Daily	AM Peak	PM Peak
High-Cube Transload and Short-Term Storage Warehouse (LUC 154)	Per 1,000 sq. ft.	Passenger Vehicles	0.946X 50% in/50% out	0.056X 77% in/23% out	0.077X 28% in/72% out
		Heavy Vehicles ¹	0.454X 50% in/50% out	0.024X 77% in/23% out	0.023X 28% in/72% out
Single-Family Housing (LUC 210)	Per Unit	Passenger Vehicles	$\text{Ln}(T) = 0.92\text{Ln}(U) + 2.71$ 50% in/50% out	$T = 0.71U + 4.80$ 25% in/75% out	$\text{Ln}(T) = 0.96\text{Ln}(U) + 0.20$ 63% in/37% out
Shopping Center (LUC 820)	Per 1,000 sq. ft.	Passenger Vehicles	$\text{Ln}(T) = 0.68\text{Ln}(X) + 5.57$ 50% in/50% out	$T = 0.50X + 151.78$ 62% in/38% out	$\text{Ln}(T) = 0.74\text{Ln}(X) + 2.89$ 63% in/37% out

¹ The ITE *Trip Generation, Tenth Edition* manual does not provide data for heavy vehicles. Per guidance provided in the ITE manual for LUC 154, data provided in the *High-Cube Warehouse Vehicle Trip Generation Analysis*, published in October 2016 was assumed. Tables 5-7 of the *High-Cube Warehouse Vehicle Trip Generation Analysis* outline the daily and peak hour trip generation rates for heavy vehicles. A copy of the supplemental data is provided in the appendix. The in/out distribution percentages were obtained from the *Trip Generation, Tenth Edition* manual.

Per these assumptions and the calculations detailed previously, site-generated traffic projections were calculated for Phase B. The site-generated trips generated during the peak hour were rounded to the nearest multiple of five for the purposes of this analysis, and daily trips were rounded to the nearest multiple of ten. A preliminary summary of Phase B trips is provided in **Table 12**.

Table 12. Site-Generated Traffic Projections¹

Land Use	Size	Type	Weekday						
			Daily	AM Peak			PM Peak		
				In	Out	Total	In	Out	Total
Phase B									
High-Cube Transload and Short-Term Storage Warehouse (LUC 154)	4,021,900 sq. ft.	Passenger Cars	3,800	175	50	225	85	225	310
		Heavy Vehicles	1,830	75	20	95	25	70	95
Single-Family Housing (LUC 210)	177 units	Passenger Cars	1,760	30	100	130	110	65	175
Shopping Center (LUC 820)	149,000 sq. ft.	Passenger Cars	9,780	235	145	380	415	450	865
Subtotal Phase B			17,170	515	315	830	635	810	1,445
Subtotal Phase A (Table 6)			5,680	250	70	320	115	295	410
Total Site-Generated Traffic (Phase A + Phase B)			22,850	765	385	1,150	750	1,105	1,855

¹In/Out volumes are rounded to the nearest multiple of five. For rounding purposes, the total volumes are a sum of in and out trips.

Similar to Phase A, the distribution of Phase B truck traffic was based on prevailing truck traffic volumes/patterns and the planned I-88 interchange improvements at IL Route 47. The distributions estimated for passenger vehicle traffic for the industrial warehouse, retail, and residential uses are based on a number of factors, including the nature of surrounding land uses, prevailing traffic volumes/patterns, characteristics of the street system, and the ease with which motorists can travel over various sections of that system. The planned interchange improvements were also considered for the estimated passenger vehicle distributions. The estimated trip distributions are summarized in **Table 13**.

Table 13. Estimated Trip Distribution

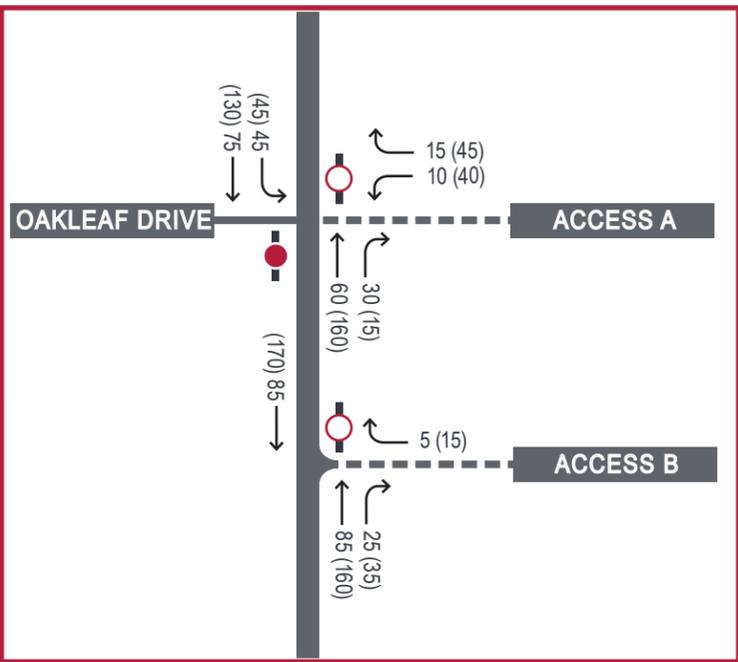
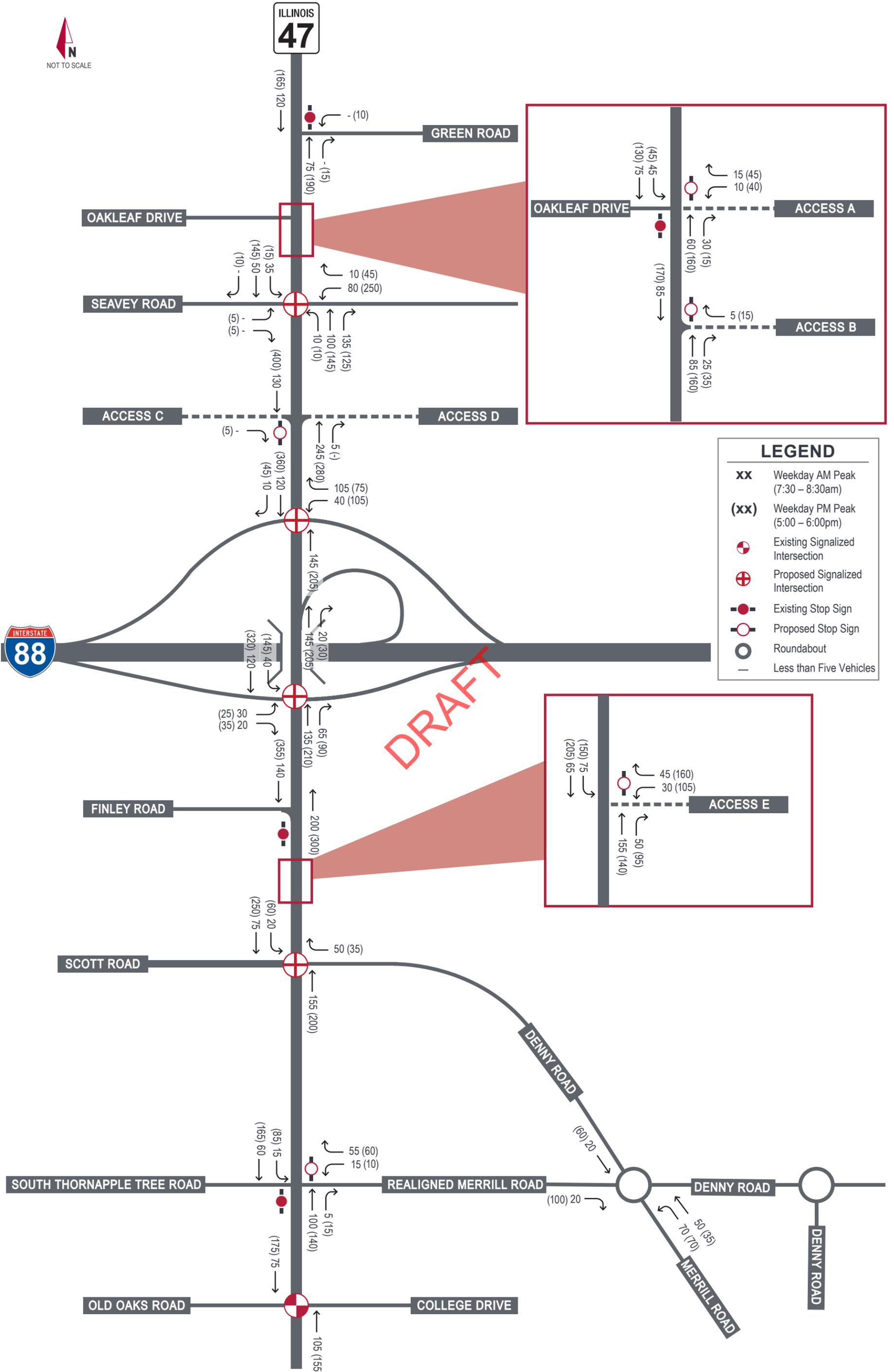
Traveling to/from:	Portion of Site Traffic			
	Industrial Warehouse		Residential	Retail
	Passenger Vehicles	Heavy Vehicles	Passenger Vehicles	Passenger Vehicles
East on I-88	50%	50%	50%	20%
West on I-88	10%	20%	10%	10%
North on IL Route 47	25%	15%	25%	30%
South on IL Route 47	15%	15%	15%	40%
Total	100%	100%	100%	100%

Traffic generated by the subject site was assigned to the study intersections and the proposed site access according to this distribution. Phase B site traffic assignment for passenger vehicles and trucks are illustrated in **Exhibits 8 and 9**, respectively. Total site traffic assignment for Phase B is depicted in **Exhibit 10**.

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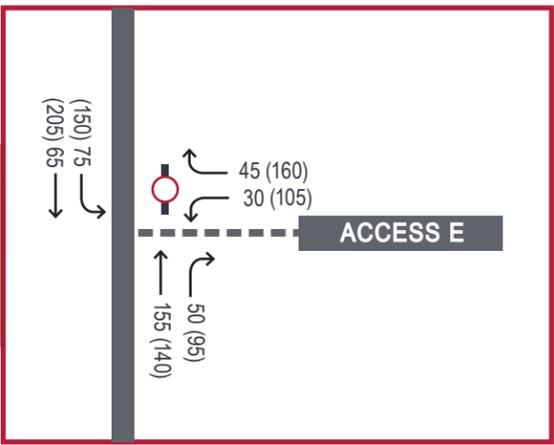


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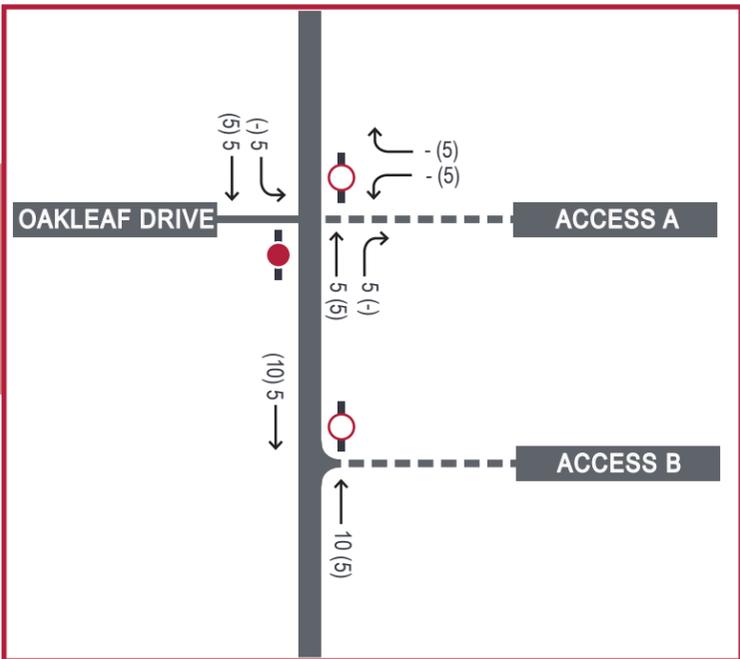
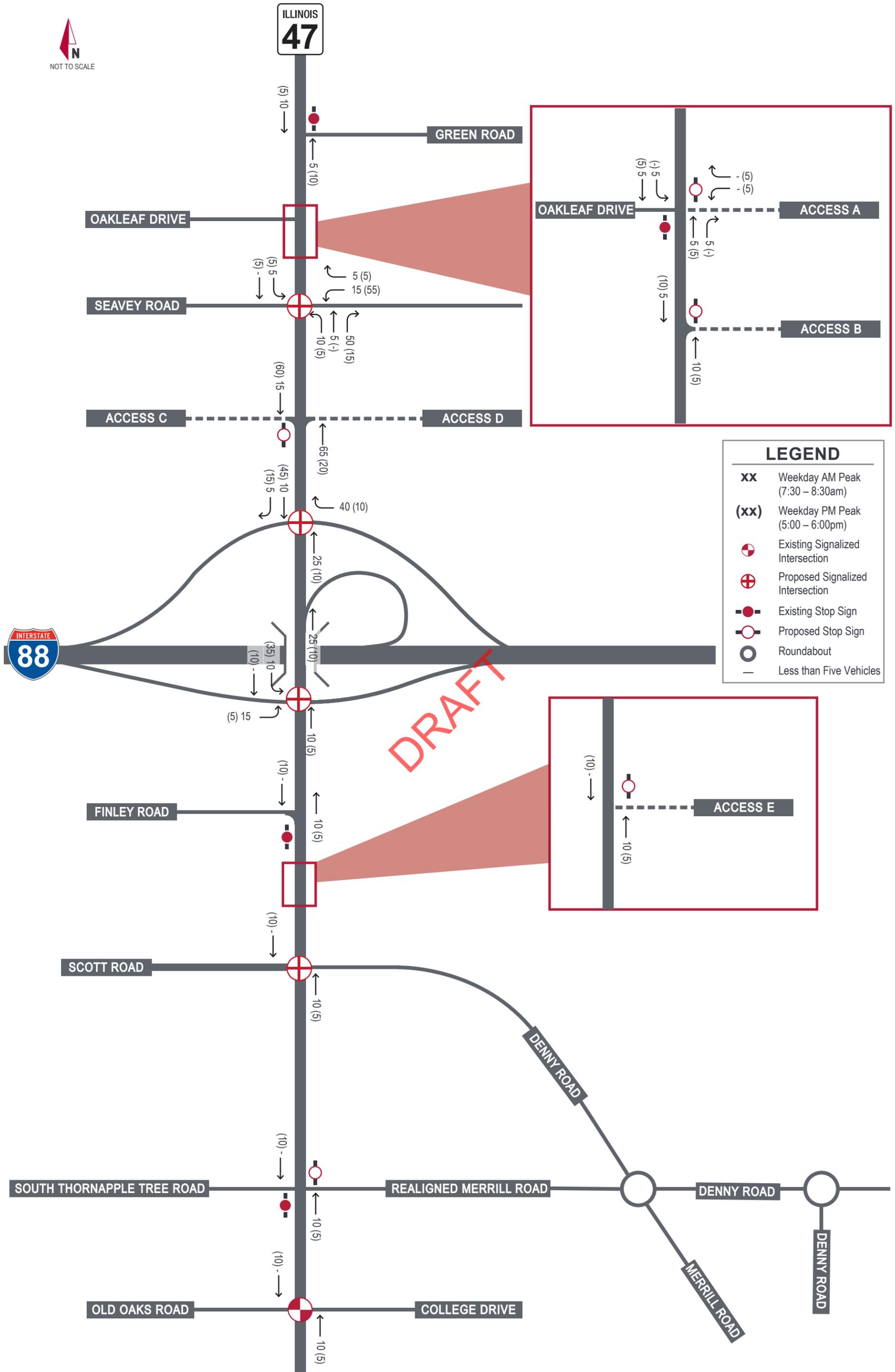


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- xx** Weekday AM Peak (7:30 – 8:30am)
- (xx)** Weekday PM Peak (5:00 – 6:00pm)
- Existing Signalized Intersection
- Proposed Signalized Intersection
- Existing Stop Sign
- Proposed Stop Sign
- Roundabout
- Less than Five Vehicles

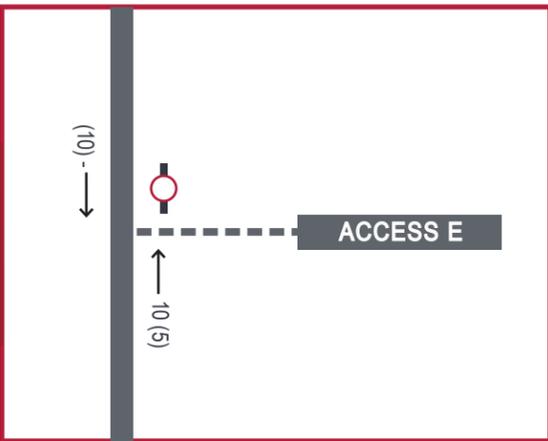


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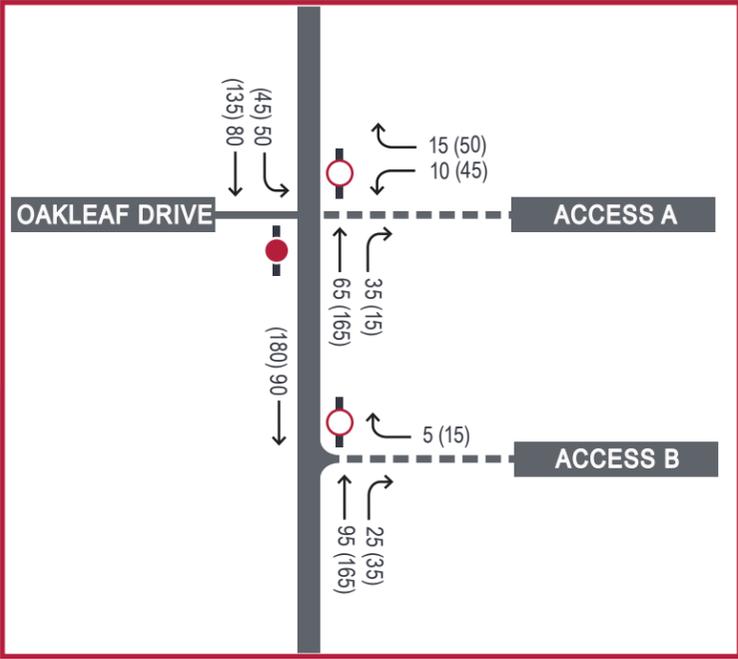
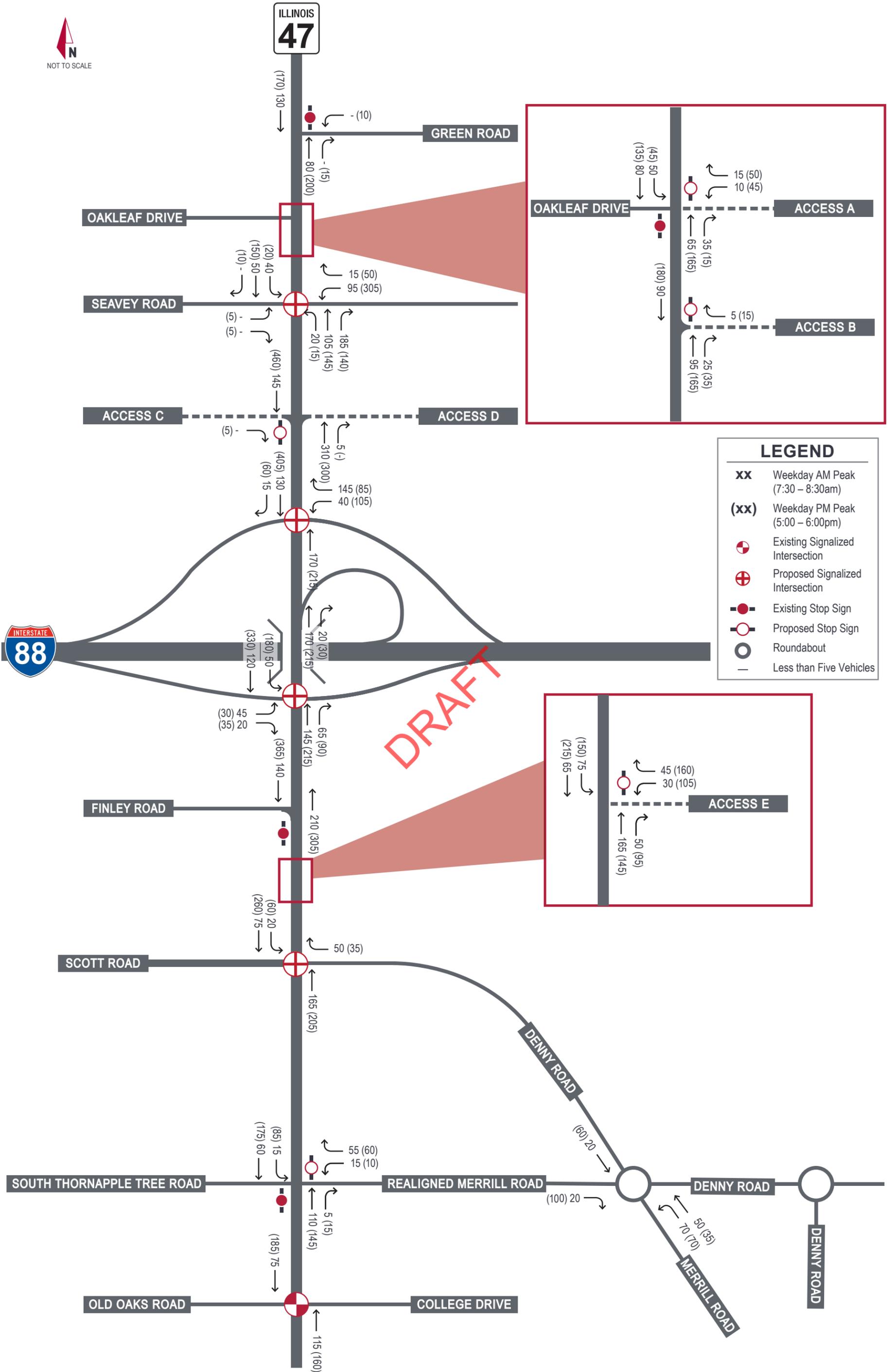
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- xx** Weekday AM Peak (7:30 – 8:30am)
- (xx)** Weekday PM Peak (5:00 – 6:00pm)
-  Existing Signalized Intersection
-  Proposed Signalized Intersection
-  Existing Stop Sign
-  Proposed Stop Sign
-  Roundabout
-  Less than Five Vehicles



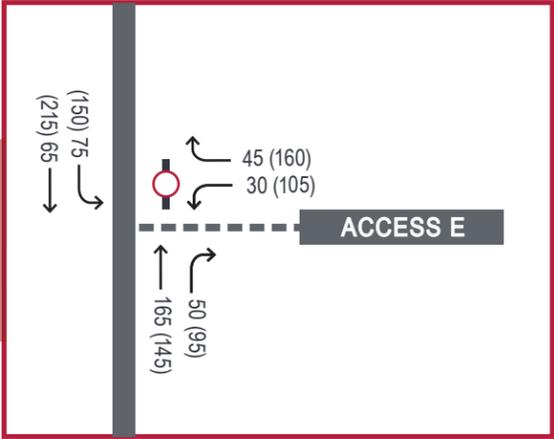


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- xx** Weekday AM Peak (7:30 – 8:30am)
- (xx)** Weekday PM Peak (5:00 – 6:00pm)
- Existing Signalized Intersection
- Proposed Signalized Intersection
- Existing Stop Sign
- Proposed Stop Sign
- Roundabout
- Less than Five Vehicles



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4.3. Future Concept Capacity Analysis

In order to quantify the impact of site-generated traffic estimated for Phase B, and to identify potential infrastructure needs to support site access and the addition of site-generated traffic to the local roadway network, a preliminary Year 2040 Build scenario was developed.

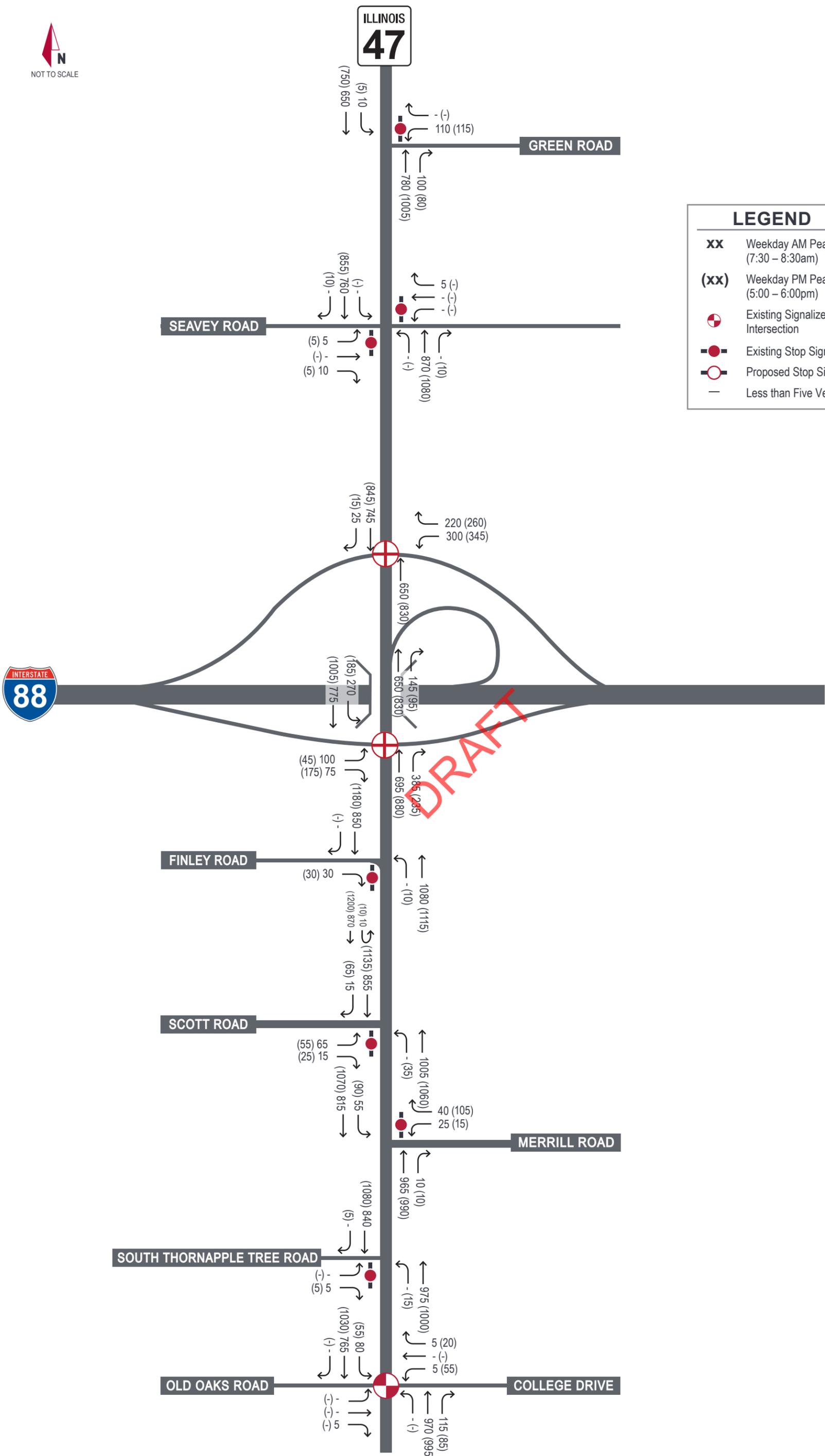
Background Traffic Growth

In order to estimate background traffic volumes for Year 2040, the CMAP growth rates presented in Table 8 were applied to the study intersections. The total future background traffic volumes for Year 2040 are presented in **Exhibit 11**.

Planned Area Improvements

Under the Year 2040 Build scenario, the full interchange improvement was assumed to be completed. Additional improvements were also included in the Year 2040 Build scenario. Based on a completed Phase I study, the IL Route 47 corridor was assumed to be widened to a four-lane cross-section. Planned by others, this improvement would extend from north of Green Road to its southern terminus north of Old Oaks Road/College Drive. As part of this project, a barrier median would be installed along IL Route 47 from south of I-88 to north of Old Oaks Road/College Drive. Median breaks would be provided in order to accommodate turning movements at existing intersections and planned site access driveways. Based on the completed Phase I study, the following improvements were assumed to be completed by others and in place under the Year 2040 Build scenario. These improvements are anticipated in addition to the improvements included in the Year 2030 Build scenario.

- **IL Route 47 / Green Road**
 - The south leg was assumed to provide a single through lane and one dedicated right-turn lane. The right-turn lane was assumed to provide 265 feet of storage with a 265-foot taper.
 - The east leg was assumed to provide separate left- and right-turn lanes. The new dedicated right-turn lane would provide 240 feet of storage and a 240-foot taper.
- **IL Route 47 / Seavey Road**
 - The north and south legs were assumed to provide a dedicated left-turn lane, two through lanes, and a dedicated right-turn lane. The left- and right-turn lanes would provide 265 feet of storage with a 265-foot taper.
 - The east and west legs were assumed to provide a dedicated left-turn lane and one shared through/right-turn lane. The left-turn lanes would provide 185 feet of storage with a 200-foot taper.



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- **IL Route 47 / I-88 Westbound Ramps**
 - As a result of the new traffic signals identified for the IL Route 47 corridor, the traffic signal timing was updated to reflect an optimized network. Per IDOT requirements, RTOR movements were excluded.
- **IL Route 47 / I-88 Eastbound Ramps**
 - Per the full interchange improvements, a traffic signal was assumed to be installed. For purposes of this analysis, a cycle length of 120 seconds was applied to each peak hour, and the network was optimized for future traffic conditions reflected in this study. Per IDOT requirements, RTOR movements were excluded.
 - The right-turn lanes on the west leg (i.e., eastbound off-ramp) were assumed to be restriped in order to provide dual turn lanes. According to the IDS, the turn lanes would provide 290 feet of storage with a 300-foot taper.
 - The left-turn lanes on the north leg were assumed to be restriped in order to provide dual turn lanes. Per the IDS, the turn lanes would provide 315 feet of storage with a 325-foot taper.
- **IL Route 47 / Scott Road / Denny Road**
 - With the mitigation defined under the Year 2030 Build scenario, the following assumptions were applied to the Year 2040 scenario in order to reflect the planned widening along the IL Route 47 corridor:
 - North Leg: A dedicated left-turn lane, two through lanes, and a dedicated right-turn lane.
 - South Leg: A dedicated left-turn lane, one through lane, and one shared through/right-turn lane.
- **IL Route 47 / South Thornapple Tree Road / Realigned Merrill Road**
 - With the mitigation identified under the Year 2030 Build scenario, the following assumptions were applied to the Year 2040 scenario in order to reflect the planned widening along the IL Route 47 corridor:
 - North Leg: A dedicated left-turn lane, one through lane, and one shared through/right-turn lane.
 - South Leg: A dedicated left-turn lane, one through lane, and one shared through/right-turn lane.

Signal Warrant Analyses

Similar to the analysis completed for Phase A, evening peak hour traffic projections for the following intersections were compared to criteria provided in the Manual on Uniform Traffic Control Devices (MUTCD) to determine whether a traffic signal may be warranted under the Year 2040 Build scenario.

- IL Route 47 / Seavey Road
- IL Route 47 / I-88 Eastbound Ramps
- IL Route 47 / Access E
- IL Route 47 / South Thornapple Tree Road / Merrill Road

The intersections of IL Route 47/I-88 Westbound Ramps and IL Route 47/Scott Road/Denny Road were excluded from this analysis as the traffic volumes projected for the Year 2030 Build scenario

meet the criteria for installation of a traffic signal; and therefore, these signals were included for the analysis of both Year 2030 and Year 2040 Build conditions.

The signal warrant analyses were performed according to criteria set by the Manual on Uniform Traffic Control Devices (MUTCD) for Warrant 1 (Eight-Hour Warrant), Condition A (Minimum Vehicular Volume) and Condition B (Interruption of Continuous Traffic). **Table 14** reports the signal warrant analyses conducted for the Year 2040 Build scenario.

Table 14. Year 2040 Signal Warrant Analyses

Intersection / Warrant Criteria	Traffic Volume		Meets Warrant?
	Major Street	Higher-Volume Minor-Leg Approach	
IL Route 47 / Seavey Road			
Two-Lane Major Street/One-Lane Minor Street at 100%			
MUTCD Criteria			
Warrant 1A	600	150	--
Warrant 1B	900	100	--
Year 2040 Build	1,389	184	Yes (Warrant 1A & 1B)
IL Route 47 / I-88 Eastbound Ramps			
Two-Lane Major Street/One-Lane Minor Street at 100%			
MUTCD Criteria			
Warrant 1A	600	150	--
Warrant 1B	900	100	--
Year 2040 Build	1,878	97	No
IL Route 47 / Access E			
Two-Lane Major Street/One-Lane Minor Street at 100%			
MUTCD Criteria			
Warrant 1A	600	150	--
Warrant 1B	900	100	--
Year 2040 Build	1,796	97	No
IL Route 47 / South Thomapple Tree Road / Realigned Merrill Road			
Two-Lane Major Street/One-Lane Minor Street at 100%			
MUTCD Criteria			
Warrant 1A	600	150	--
Warrant 1B	900	100	--
Year 2040 Build	1,452	57	No

As shown above, a signal is warranted at the intersection of IL Route 47/Seavey Road; and therefore, a signal was included in the analysis of the Year 2040 Build scenario. As part of the interchange improvements a traffic signal is planned for the intersection of IL Route 47/I-88 Eastbound Ramps; and therefore, the traffic signal was included in the analysis of Year 2040 Build conditions.

Future (2040) Build Levels of Service

For the preliminary analysis of Phase B traffic conditions, site-generated trips (Exhibit 10) were added to Year 2040 future background traffic (Exhibit 11) to yield total volumes at the study intersections. Future traffic projections for the Phase B scenario are illustrated in **Exhibit 12**.

Based on the analysis of Year 2040 Build traffic conditions, several preliminary improvements were identified to facilitate site access and mitigate initial traffic projections for Phase B. In addition to the improvements identified under the Year 2030 scenario, the following improvements were included in the Year 2040 Build scenario. Turn lane warrants and dimensions were evaluated at the study intersections using volume criteria in the IDOT *BDE Manual*. A summary of the anticipated improvements is provided below. A summary of the improvements identified for Year 2030 and Year 2040 is provided in **Exhibit 13a** through **Exhibit 13e**.

- **IL Route 47 / Seavey Road**
 - Reconstruct Seavey Road as a three-lane cross-section across the subject property frontage. A two-way left-turn center median would facilitate access to industrial warehouse/distribution center uses included in Zone A through Zone C.
 - Per the results of the signal warrant analysis, install a traffic signal. For purposes of this analysis, a cycle length of 120 seconds was applied to each peak hour, and the network was optimized for future traffic conditions reflected in this study.
 - On the east leg of the intersection, install dual left-turn lanes and a dedicated right-turn lane. The left-turn lanes should provide 185 feet of storage with a 300-foot taper, and the right-turn lanes should provide 185 feet of storage with a 200-foot taper.
- **IL Route 47 / Oakleaf Drive / Access A**
 - Install a dedicated left-turn lane on the north and south legs. The turn lanes should provide 265 feet of storage with a 265-foot taper.
 - Provide a single inbound lane and outbound shared left-turn/through and dedicated right-turn lanes for Access A.
 - Post minor-leg stop control for outbound traffic at Access A.
- **IL Route 47 / Access B**
 - Design Access B to preclude left-turn movements.
 - Provide a single inbound lane and a single outbound right-turn only lane for at Access B.
 - Post “No Left Turn” signage and minor-leg stop-control for outbound traffic at Access B.
- **IL Route 47 / Access C / Access D**
 - Design Access C to preclude left-turn movements.
 - Provide a single right-turn only lane for outbound traffic at Access C.
 - Post “No Left Turn” signage and minor-leg stop-control for outbound traffic at Access C.
 - Provide a single inbound lane at Access D. No outbound traffic is permitted at Access D.
- **IL Route 47 / Access E**
 - Install a dedicated left-turn lane on the north leg. The turn lane should provide 265 feet of storage with a 265-foot taper.

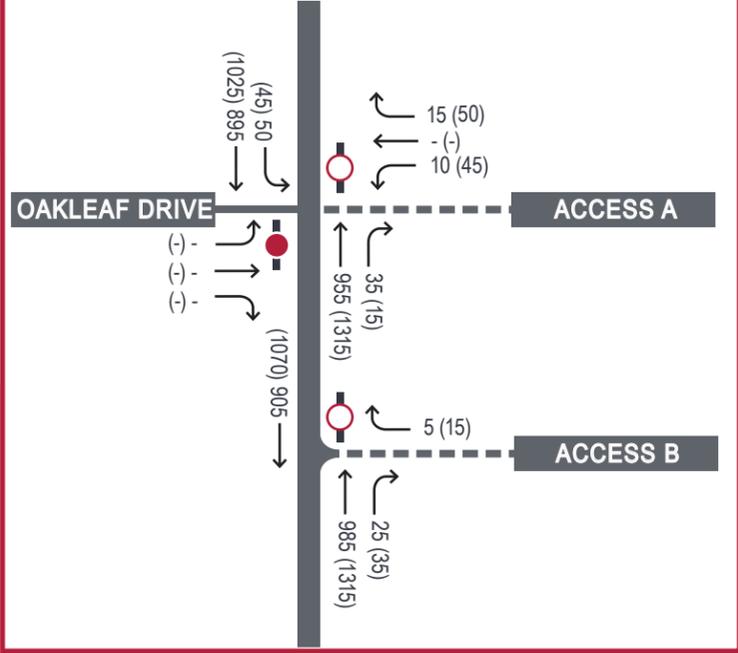
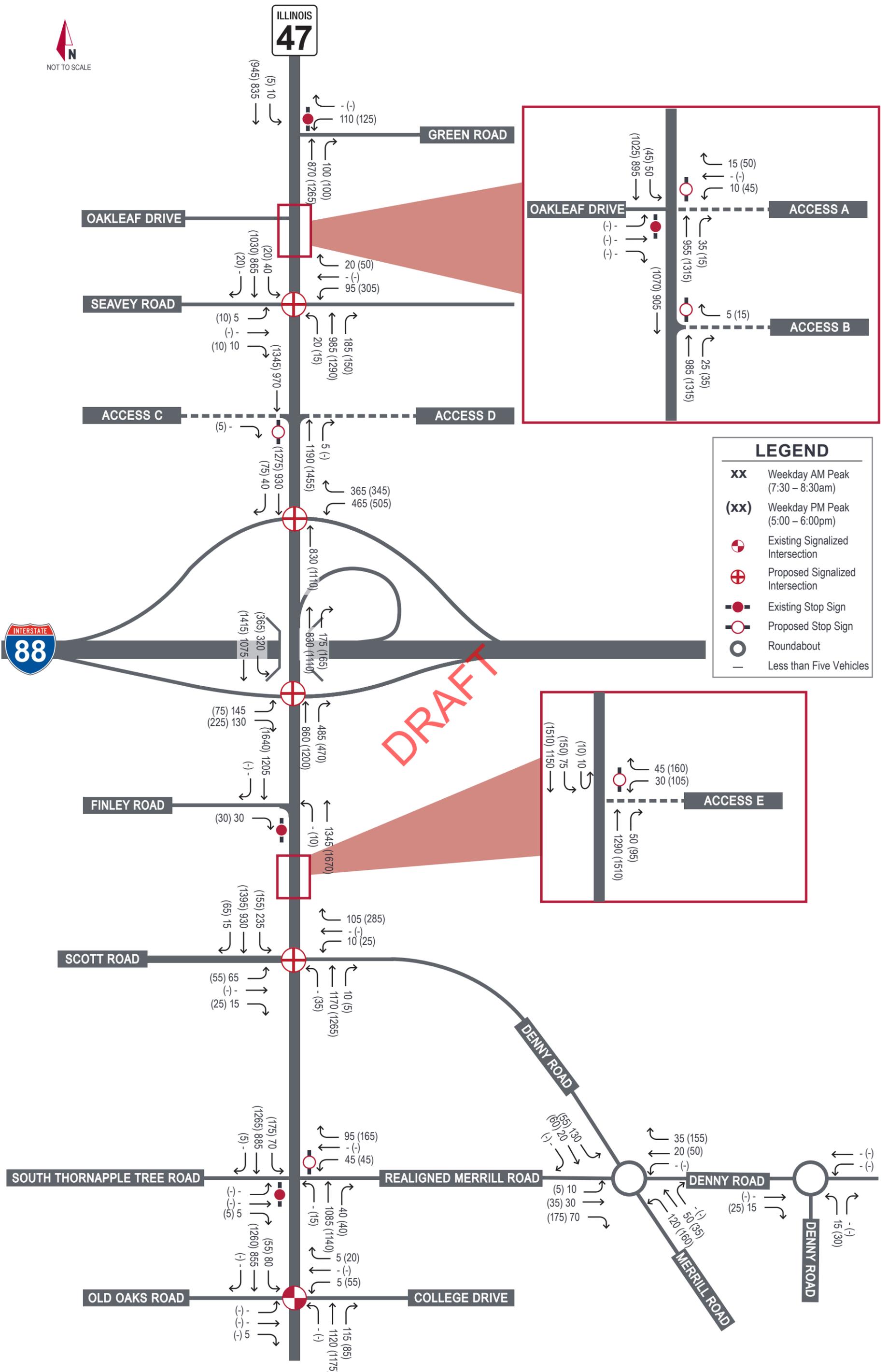
- Provide a dedicated right-turn lane on the south leg. The turn lane should provide 265 feet of storage with a 265-foot taper.
- Provide a single inbound lane and separate outbound left- and right-turn lanes at Access E.
- Post minor-leg stop control for outbound traffic at Access E.
- **IL Route 47 / South Thornapple Tree Road / Realigned Merrill Road**
 - Provide a dedicated right-turn lane on the south leg. The turn lane should provide 265 feet of storage with a 265-foot taper.

With these improvements in place, Year 2040 Build traffic operation is projected as shown in **Table 15**. The results are based on Synchro's HCM 2010 reports, copies of which are included in the Appendix.

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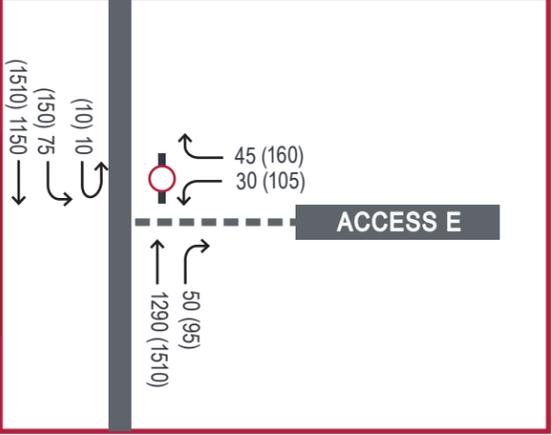


ILLINOIS
47



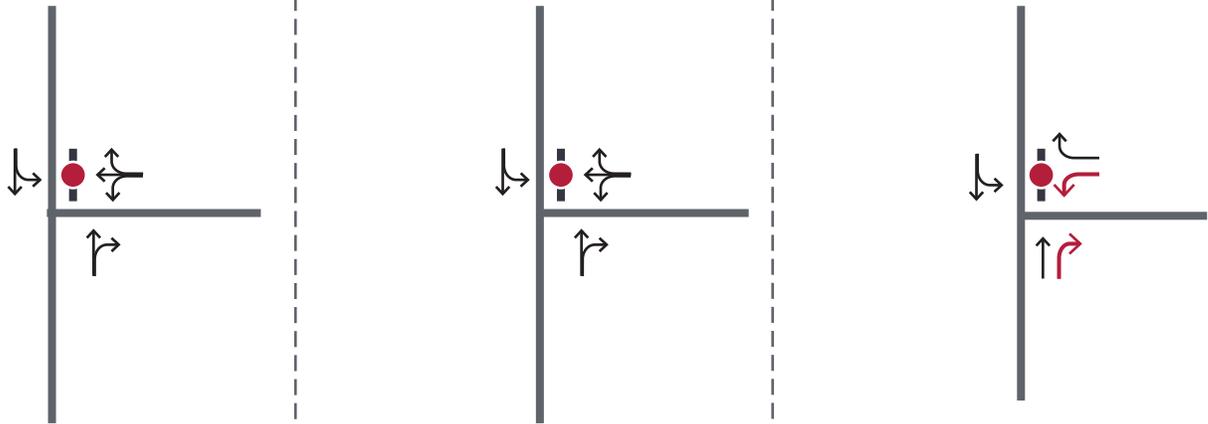
LEGEND

- xx** Weekday AM Peak (7:30 – 8:30am)
- (xx)** Weekday PM Peak (5:00 – 6:00pm)
- Existing Signalized Intersection
- Proposed Signalized Intersection
- Existing Stop Sign
- Proposed Stop Sign
- Roundabout
- Less than Five Vehicles

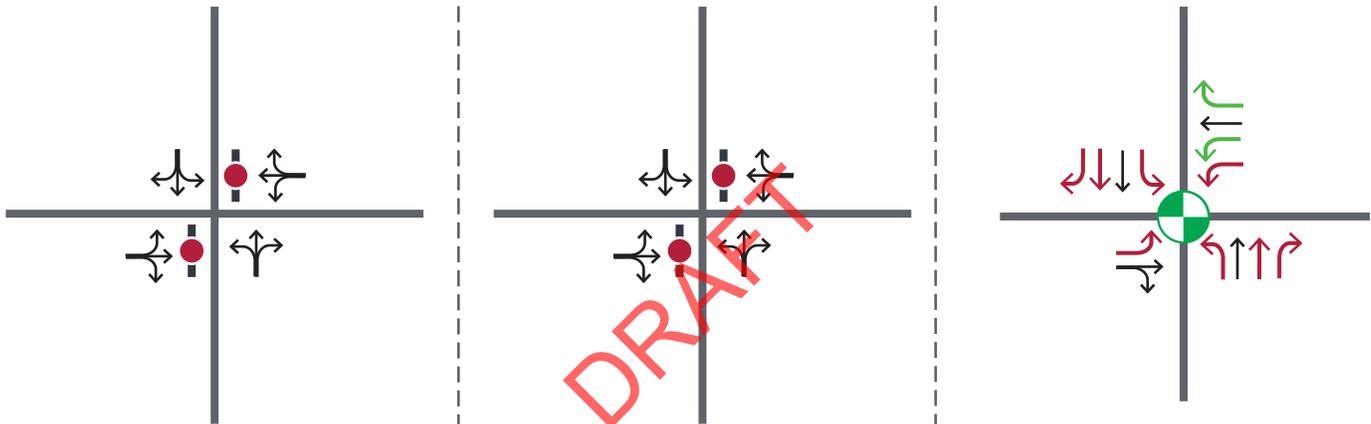


EXISTING (YEAR 2018) PHASE A (YEAR 2030) FULL BUILDOUT (YEAR 2040)

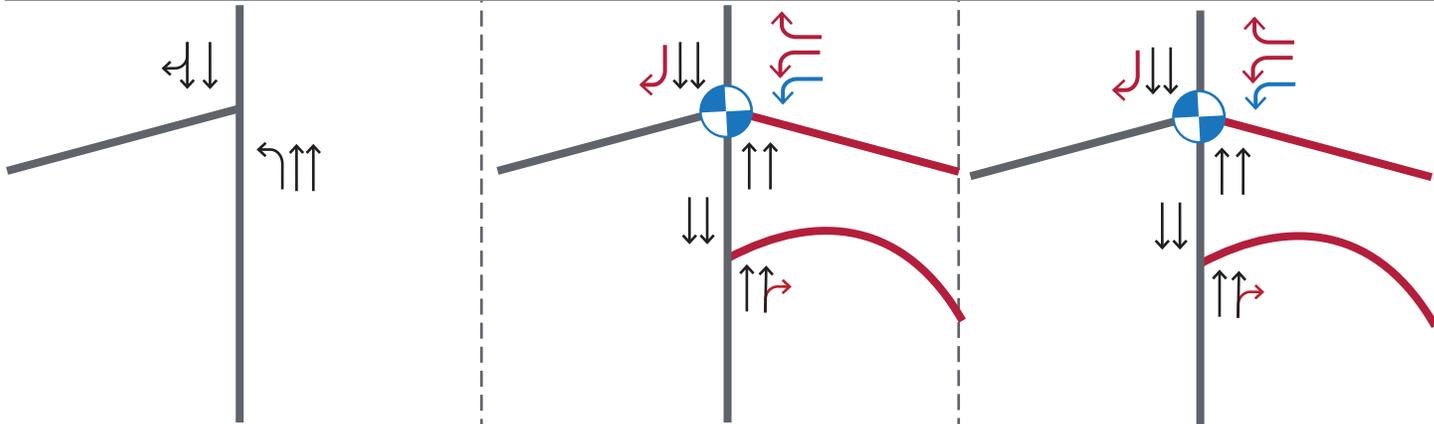
IL ROUTE 47 / GREEN ROAD



IL ROUTE 47 / SEAVEY ROAD



IL ROUTE 47 / I-88 WESTBOUND RAMPS



LEGEND

- Existing Stop Sign
- Future Stop Sign
- ⊙ Existing Signalized Intersection
- ⊕ Year 2030 Signalized Intersection
- ⊕ Full Buildout Signalized Intersection
- ⊕ New Signalized Intersection Planned By Others
- ↔ Existing Geometrics
- ↔ Planned By Others
- ↔ Year 2030 Build Geometrics
- ↔ Full Buildout Geometrics

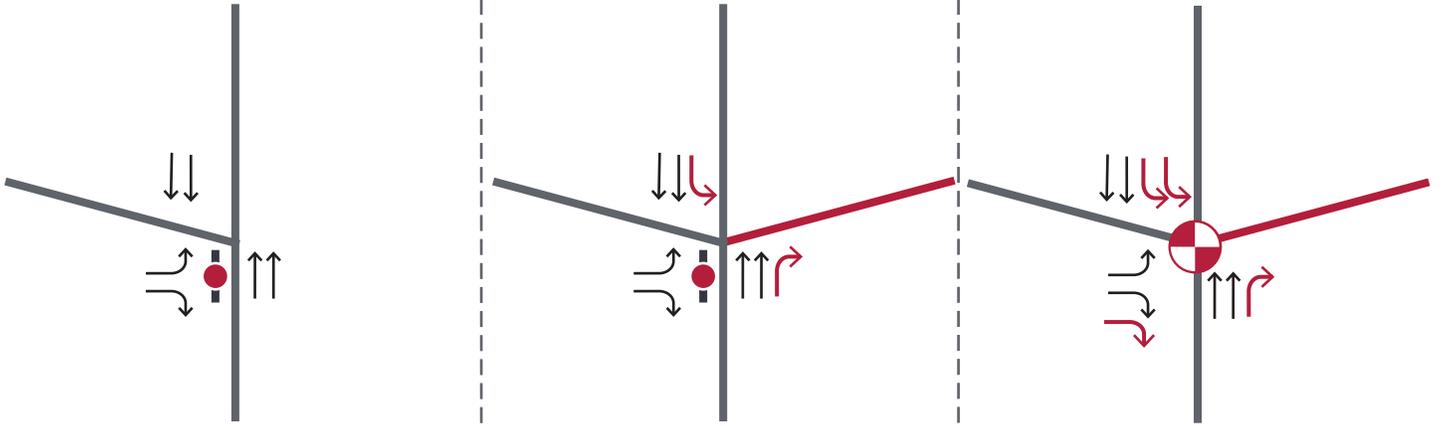
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EXISTING (YEAR 2018)

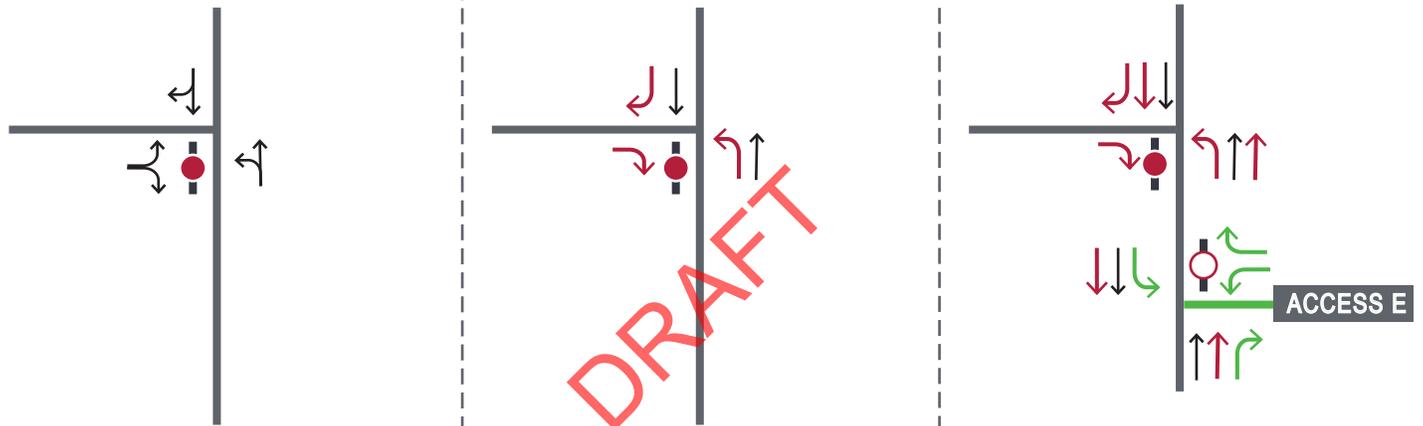
PHASE A (YEAR 2030)

FULL BUILDOUT (YEAR 2040)

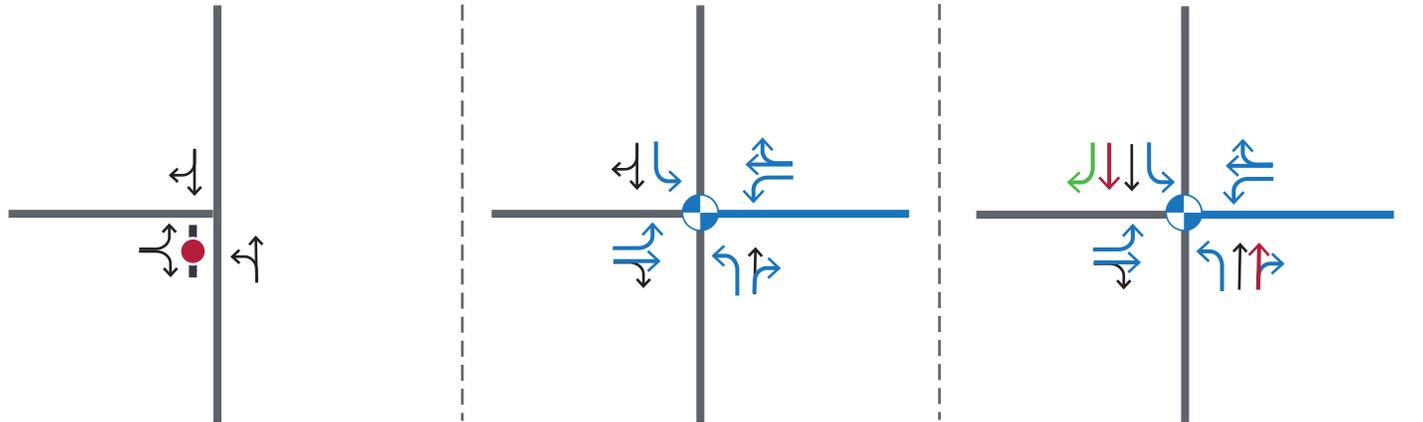
IL ROUTE 47 / I-88 EASTBOUND RAMP



IL ROUTE 47 / FINLEY ROAD / ACCESS E



IL ROUTE 47 / SCOTT ROAD / DENNY ROAD



LEGEND

- Existing Stop Sign
- Future Stop Sign
- ⊙ Existing Signalized Intersection
- ⊙ Year 2030 Signalized Intersection
- ⊙ Full Buildout Signalized Intersection
- ⊙ New Signalized Intersection Planned By Others
- ↔ Existing Geometrics
- ↔ Planned By Others
- ↔ Year 2030 Build Geometrics
- ↔ Full Buildout Geometrics

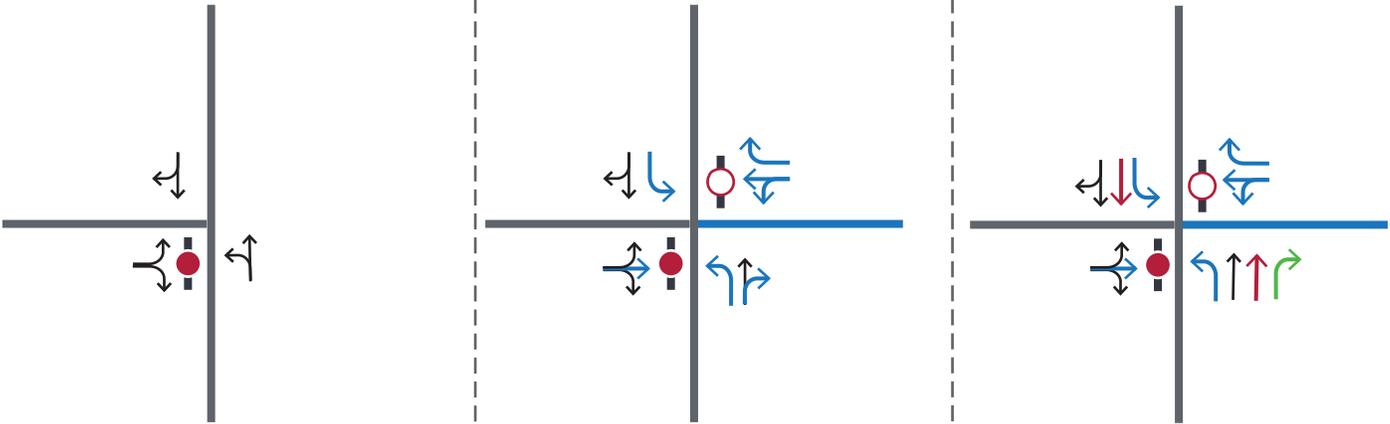
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EXISTING (YEAR 2018)

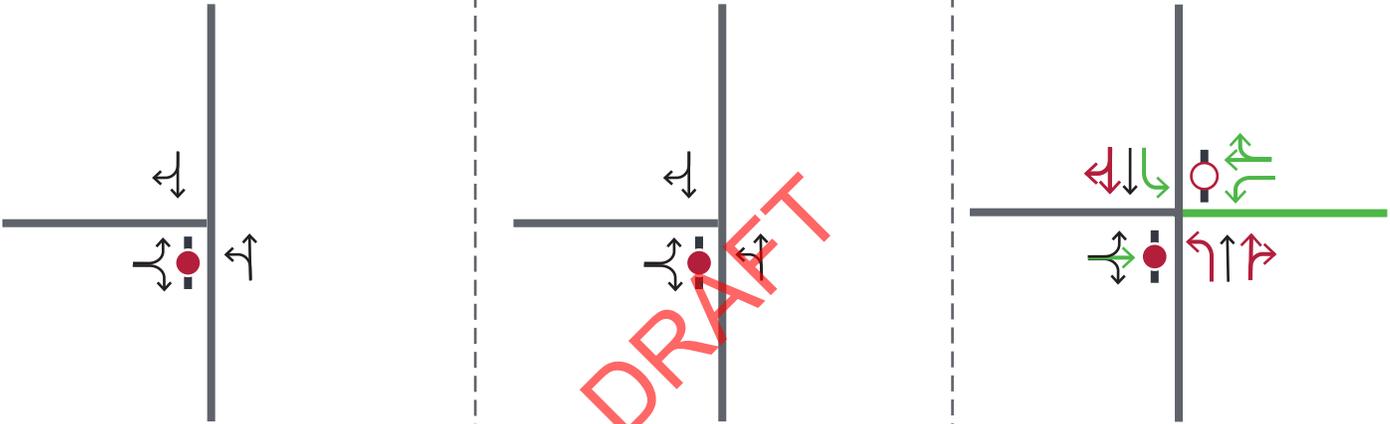
PHASE A (YEAR 2030)

FULL BUILDOUT (YEAR 2040)

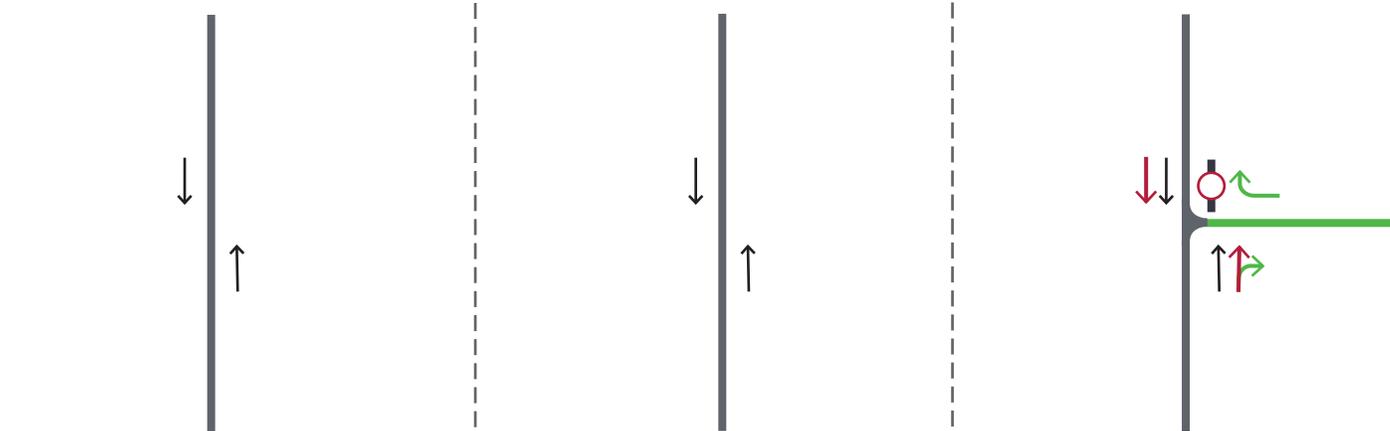
IL ROUTE 47 / SOUTH THORNAPPLE TREE ROAD / REALIGNED MERRILL ROAD



IL ROUTE 47 / OAKLEAF DRIVE / ACCESS A



IL ROUTE 47 / ACCESS B



LEGEND

- Existing Stop Sign
- Future Stop Sign
- Existing Signalized Intersection
- Year 2030 Signalized Intersection
- Full Buildout Signalized Intersection
- New Signalized Intersection Planned By Others
- Existing Geometrics
- Planned By Others
- Year 2030 Build Geometrics
- Full Buildout Geometrics

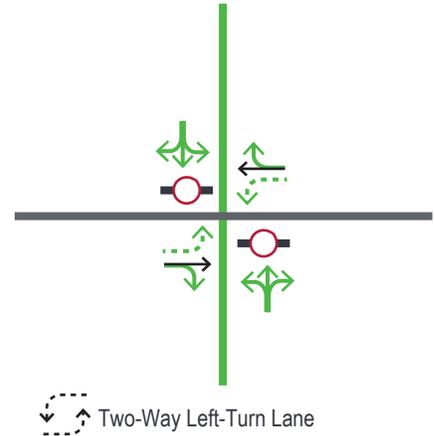
NOT TO SCALE

EXISTING (YEAR 2018)

PHASE A (YEAR 2030)

FULL BUILDOUT (YEAR 2040)

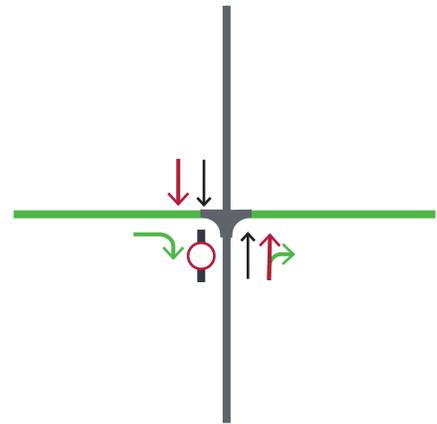
SEAVEY ROAD / SITE ACCESS DRIVEWAYS



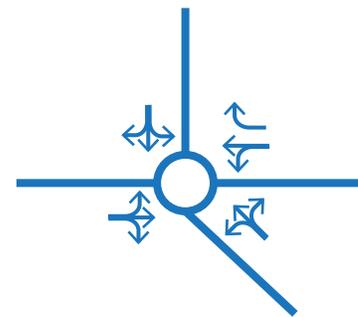
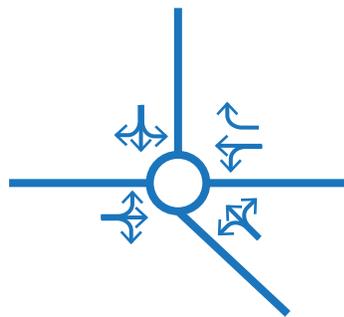
IL ROUTE 47 / ACCESS C / ACCESS D



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REALIGNED MERRILL ROAD / MERRILL ROAD EXISTING / DENNY ROAD



LEGEND

- Existing Stop Sign
- Future Stop Sign
- Existing Signalized Intersection
- Year 2030 Signalized Intersection
- Full Buildout Signalized Intersection
- New Signalized Intersection Planned By Others
- Existing Geometrics
- Planned By Others
- Year 2030 Build Geometrics
- Full Buildout Geometrics

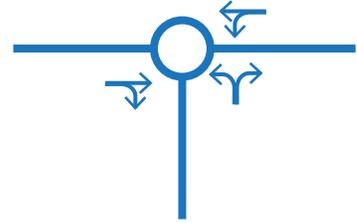
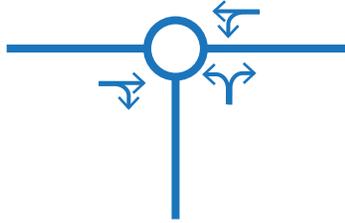
N
NOT TO SCALE

EXISTING (YEAR 2018)

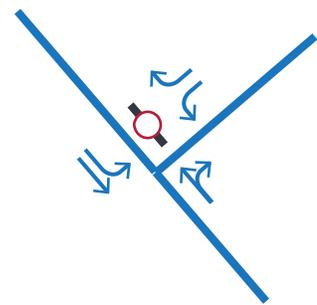
PHASE A (YEAR 2030)

FULL BUILDOUT (YEAR 2040)

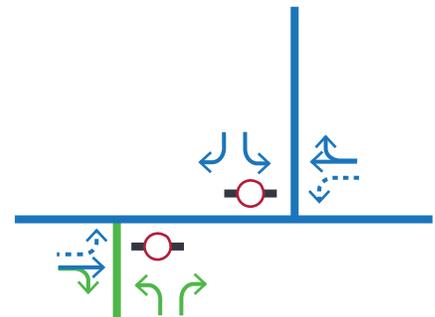
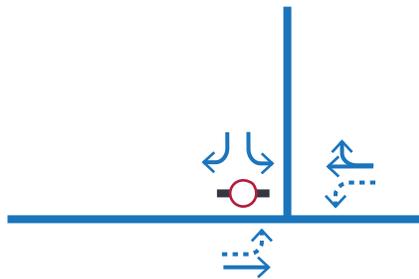
DENNY ROAD EXTENSION



DENNY ROAD / SITE ACCESS DRIVEWAYS



DENNY ROAD EXTENSION / SITE ACCESS DRIVEWAYS



Two-Way Left-Turn Lane

Two-Way Left-Turn Lane

LEGEND

Existing Stop Sign

Future Stop Sign

Existing Signalized Intersection

Year 2030 Signalized Intersection

Full Buildout Signalized Intersection

New Signalized Intersection Planned By Others

Existing Geometrics
 Planned By Others

Year 2030 Build Geometrics
 Full Buildout Geometrics



Table 15. Future (2040) Build Levels of Service

Intersection	AM Peak Hour		PM Peak Hour	
	Delay (s/veh)	LOS	Delay (s/veh)	LOS
IL Route 47 / Green Road △				
Westbound	>120	F	>120	F
Southbound (Left)	10-	A	12	B
IL Route 47 / Oakleaf Drive / Access A △				
Eastbound	53	F	103	F
Westbound	39	E	>120	F
Northbound (Left)	10-	A	11	B
Southbound (Left)	11	B	13	B
IL Route 47 / Access B △				
Westbound	12	B	15+	C
IL Route 47 / Seavey Road *				
Eastbound	44	D	47	D
Westbound	47	D	48	D
Northbound (Left)	10-	A	15	B
Southbound (Left)	8	A	13	B
Intersection	11	B	19	B
IL Route 47 / Access C / Access D △				
Eastbound	12	B	15-	B
IL Route 47 / I-88 WB Ramps *				
Westbound	42	D	43	D
Northbound	33	C	32	C
Southbound	14	B	14	B
Intersection	29	C	27	C
IL Route 47 / I-88 EB Ramps *				
Eastbound	56	E	56	E
Northbound	16	B	15	B
Southbound	13	B	12	B
Intersection	19	B	17	B
IL Route 47 / Finley Road △				
Eastbound	14	B	19	C
Northbound (Left)	12	B	15+	C
IL Route 47 / Access E △				
Westbound	24	C	103	F
Southbound (Left)	15-	B	23	C

* – Signalized Intersection △ – Minor-Leg Stop-Controlled Intersection ○ – Roundabout Intersection

Table 15. Future (2040) Build Levels of Service (continued)

Intersection	AM Peak Hour		PM Peak Hour	
	Delay (s/veh)	LOS	Delay (s/veh)	LOS
IL Route 47 / Scott Road / Denny Road *				
Eastbound	30	C	39	D
Westbound	28	C	44	D
Northbound	26	C	26	C
Southbound	12	B	19	B
Intersection	20-	B	25	C
IL Route 47 / South Thornapple Tree Road / Realigned Merrill Road △				
Eastbound	18	C	40	E
Westbound	24	C	36	E
Northbound (Left)	10-	A	12	B
Southbound (Left)	12	B	14	B
Denny Road / Realigned Merrill Road / Merrill Road Existing ○				
Eastbound	6	A	6	A
Westbound	2	A	1	A
Northbound	6	A	6	A
Southbound	7	A	6	A
Intersection	6	A	5	A
Denny Road / Zone E Access (Turnaround) ○				
Eastbound	3	A	4	A
Westbound	3	A	3	A
Northbound	3	A	4	A
Intersection	3	A	4	A
IL Route 47 / Old Oaks Road / College Drive *				
Eastbound	38	D	38	D
Westbound	37	D	35-	C
Northbound	7	A	7	A
Southbound	5	A	8	A
Intersection	6	A	9	A

* – Signalized Intersection △ – Minor-Leg Stop-Controlled Intersection ○ – Roundabout Intersection

As shown, with the identified improvements northbound and southbound through traffic on IL Route 47 is expected to operate at LOS C or better, consistent with IDOT requirements for an SRA route.

At the intersection of IL Route 47/I-88 Westbound Ramps, the overall intersection is projected to operate at LOS C during each peak hour. The projected 95th percentile queues for the westbound left-turn movement are approximately 11 vehicles (275 feet) during the morning peak hour and 12 vehicles (300 feet) during the evening peak hour, which would be accommodated within the dual left-turn storage lanes. The westbound right-turn movement is projected to have a 95th percentile queue of approximately 19 vehicles (475 feet) during the morning peak hour and 18 vehicles (450 feet) during the evening peak hour. During each peak hour, the queue would exceed the 350-foot storage lane; however, queue spillback to the I-88 mainline travel lanes is not anticipated. The delay projected for the westbound approach is largely attributable to the cycle length (120 seconds) and priority given

to north-south traffic on IL Route 47. As a result, long periods of green time are allocated to the north-south through movements and the westbound off-ramp receives relatively short green times.

The intersection of IL Route 47/I-88 Eastbound Ramps is projected to operate at LOS B during both peak hours. During the morning peak hour, the 95th percentile queues for the eastbound left- and right-turn lanes are projected to be ten vehicles (250 feet) and four vehicles (100 feet), respectively. During the evening peak hour, the 95th percentile queues for the eastbound left- and right-turn movements are approximately five vehicles (125 feet) and seven vehicles (175 feet), respectively. Based on the IDS, approximately 240 feet of storage is planned for the eastbound left-turn movement; therefore, queue spillback to the I-88 mainline travel lanes is not anticipated.

At the intersection of IL Route 47 at South Thornapple Tree Road/Realigned Merrill Road, the northbound and southbound left-turn movements are projected to operate at LOS B or better during each peak hour. The east- and westbound approaches are projected to operate at LOS C during the morning peak hour. The eastbound and westbound approaches are projected to operate at LOS C during the morning peak hour and LOS E during the evening peak hour. In the morning peak hour, the projected 95th percentile queues for the westbound left- and right-turn movements are less than approximately two vehicles (50 feet). The 95th percentile queue for the northbound and southbound left-turn movements is approximately one vehicle (25 feet) or less. During the evening peak hour, the 95th percentile queues for the westbound left- and right-turn movements are approximately three vehicles (75 feet) or less. The northbound and southbound left-turn movements are projected to have 95th percentile queues of approximately two vehicles (50 feet) or less.

At several stop-controlled intersections, the minor-leg approaches are projected to operate with high delay. The projected delay is not uncommon for stop-controlled minor streets at intersections with heavily-traveled arterial roadways such as IL Route 47. At the proposed site access driveways, the 95th percentile queues are approximately one vehicle (25 feet) or less during the morning peak hour. During the evening peak hour, the 95th percentile queues are similar, with the exception of Access A and Access E. Access A is projected to have a queue of approximately six vehicles (150 feet) for the outbound left-turn movement; the projected queue for the right-turn movement is one vehicle (25 feet). Access E is projected to have a queue of approximately seven vehicles (175 feet) for the left-turn movement and three vehicles (75 feet) for the right-turn movement. During both peak hours, the roundabouts are projected to operate at an overall LOS A with each approach operating with limited delay.

RECOMMENDATIONS & CONCLUSIONS

Based on an evaluation of existing and future traffic conditions, the following recommendations were identified to manage projected traffic demand within the study area under the Year 2030 Build scenario. The improvements identified for the Year 2030 scenario are summarized below and depicted in Exhibit 13a through Exhibit 13e. The preliminary improvements contemplated for the Year 2040 scenario are also shown in the exhibits.

- **IL Route 47 / I-88 Westbound Ramps**
 - Per the results of the warrant analysis, install a traffic signal.
 - Restripe the east leg to facilitate dual left-turn lanes. Per the IDS, the turn lanes should provide 255 feet of storage.
- **IL Route 47 / Scott Road / Denny Road**
 - Construct Denny Road. A three-lane cross-section with a single travel lane in each direction should be provided.
 - Per the results of the signal warrant analysis, install a traffic signal.
 - Install a dedicated left-turn lane on the north and south legs. The turn lanes should provide 265 feet of storage with a 265-foot taper.
 - Provide a dedicated left-turn lane and a shared through/right-turn lane on both the east and west legs of the intersection. Based on a design speed of 30 MPH on Scott Road (25 MPH posted speed limit), the left-turn lane on the west leg should provide 115 feet of storage with a 135-foot taper. Based on an assumed design speed of 35 MPH for Denny Road (30 MPH posted speed limit), the left-turn lane on the east leg should provide 125 feet of storage with a 155-foot taper.
- **IL Route 47 / South Thornapple Tree Road / Realigned Merrill Road**
 - Realign Merrill Road opposite South Thornapple Tree Road. A single travel lane should be provided in each direction. At its intersection with IL Route 47, Merrill Road should operate under minor-leg stop-control.
 - Install a shared left-turn/through lane and a dedicated right-turn lane on the east leg. Based on an assumed design speed of 35 MPH on Realigned Merrill Road, the right-turn lane should provide 125 feet of storage with a 155-foot taper.
 - Install dedicated left-turn lanes on the north and south legs. The turn lanes should provide 265 feet of storage with a 265-foot taper.
- **Denny Road / Realigned Merrill Road / Merrill Road Existing**
 - Install a roundabout in order to enhance safety conditions and reduce travel speeds.
 - The roundabout should be designed to accommodate trucks and provide a single shared lane on each approach. A dedicated slip lane should be provided on the east leg in order to facilitate westbound right-turn movements, including site-generated truck and passenger vehicle trips, without entering the roundabout.

- **Denny Road Extension**

- Extend Denny Road to the eastern project boundary in order to facilitate access to Zone E and provide for future regional connectivity.
- A three-lane cross-section with a single travel lane in each direction should be provided along Denny Road Extension.
- Install a roundabout near the eastern terminus of Denny Road in order to:
 - Reduce travel speeds on Denny Road Extension;
 - Minimize cut-thru traffic in the future residential neighborhood to the south; and
 - Provide a turnaround for wayward trucks.
- The roundabout should be designed to accommodate trucks and provide a single shared lane on each approach.

Regardless of the final configuration of the intersection geometrics, several additional items should be taken into consideration when preparing roadway improvement plans for the proposed access points. In order to minimize impacts to vertical sight distance at the proposed site access driveways, care should be taken with landscaping, signage, and monumentation at the existing and proposed access locations to ensure that adequate horizontal sight distance is provided from the new stop bars. If alterations to the site plan or land uses should occur, changes to the analysis within this traffic impact study may be necessary.

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APPENDIX

Conceptual Site Plan

CMAP Growth Projections

Data from the ITE manual Trip Generation, Tenth Edition

Data from the ITE Trip Generation Handbook, Third Edition

Intersection Design Study (IDS) for IL Route 47 and Interstate 88 Ramps

Traffic Count Data

Existing (Year 2018) Capacity Reports

Phase A (Year 2030) Capacity Reports

Full Buildout (Year 2040) Capacity Reports

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CONCEPTUAL SITE PLAN

DRAFT

CMAP GROWTH PROJECTIONS

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DATA FROM THE ITE MANUAL TRIP GENERATION, TENTH EDITION

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DATA FROM THE ITE TRIP GENERATION HANDBOOK, THIRD EDITION

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**INTERSECTION DESIGN STUDY (IDS) FOR IL ROUTE 47 /
INTERSTATE 88 RAMPS**

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TRAFFIC COUNT DATA

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EXISTING CAPACITY REPORTS

Weekday Morning Peak Hour

Weekday Evening Peak Hour

DRAFT

PHASE A (YEAR 2030) CAPACITY REPORTS

DRAFT

Weekday Morning Peak Hour

Weekday Evening Peak Hour

FULL BUILDOUT (YEAR 2040) CAPACITY REPORTS

DRAFT

Weekday Morning Peak Hour

Weekday Evening Peak Hour



Kimley»»Horn

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