

MEMORANDUM

TO: Mr. Scott Pedersen
Minnesota Department of Transportation

Mr. Jim Gates, Deputy Director of Public Works
City of Bloomington

Mr. Bob Vorpahl, Program Development Engineer
Metropolitan Airports Commission

FROM: Don Demers, Principal
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DATE: June 27, 2008

SUBJECT: I-494 AND TH 77 CORRIDOR FORECASTING AND CONCEPT DEVELOPMENT
CONCEPTS AND LANE ASSIGNMENT REPORT

The purpose of this memorandum is to document the concept development efforts for this project. In general, the work consisted of the following three distinct components to determine if any changes to either the 2001 I-494 Environmental Impact Statement Geometric Layout (I-494 EIS Layout) are warranted, based upon the updated traffic forecasts or if short-term improvements are needed prior to implementation of the I-494 layout. The three components were:

- Review of the current I-494 EIS layout against the design year traffic forecasts prepared with this project;
- Review of the 34th Avenue corridor against current year traffic forecasts;
- Review of the existing I-494 corridor (no-build condition) using the ten year traffic forecasts prepared with this project.

Using the traffic forecasts for this project, traffic lane assignments were prepared using the existing lane geometry (no-build condition) and the I-494 geometric layout (build condition) to assess if potential operational concerns might exist. Concept layouts and revised traffic lane assignments were developed to address the potential areas of operational concern. All concepts and traffic-lane assignments were presented to the Project Management Team (PMT). The PMT then selected concepts to be carried forward based on traffic-lane assignment, cost implications, and impacts. These concepts were also drafted in Microstation.

DESCRIPTION OF STUDY AREA

The concept development and traffic lane assignment effort for the I-494 EIS layout focused on the following seven locations within the study area:

- Location 1 – Eastbound I-494 (Portland Avenue to TH 77)
- Location 2 – Westbound I-494 (Portland Avenue to TH 77)
- Location 3 – I-494/TH 77 Interchange
- Location 4 – I-494/24th Avenue Interchange
- Location 5 – I-494/34th Avenue Interchange
- Location 6 – Thunderbird Road to eastbound I-494
- Location 7 – TH 5/Post Road Interchange

The 34th Avenue corridor was also evaluated from Appletree Square to 73rd Street based on existing counts taken in 2007 and 2008. The I-494 (No-Build Condition) from TH 100 to TH 5 was also evaluated based on 2020 traffic forecast projections.

DATA COLLECTION AND PEAK HOUR TRAFFIC VOLUMES

Intersection turning movement counts were collected for the a.m. and p.m. peak hours on July 31, 2007 and August 1, 2007 are shown in the Appendix in Figures 1 and 2. Existing freeway traffic volumes for April 2007 were obtained from Mn/DOT loop detectors and are shown in Figure 3.

Future year peak hour traffic volumes (year 2020 and 2030) were developed using the existing volumes and future-year traffic forecast results from the Twin Cities Regional Travel Demand Model to develop these peak hour traffic volumes. Additional information on daily traffic forecasts developed for this study may be found in the *I-494 & TH 77 Corridor Forecasting and Concept Development Forecast Technical Memorandum* dated May 29, 2008.

Arterial intersection forecast volumes for year 2030 are shown in Figures 4 and 5, and freeway mainline forecast volumes are shown in Figure 6. For year 2020, intersection volumes are shown in Figures 7 and 8 and freeway mainline forecast volumes in Figure 9.

DESIGN YEAR TRAFFIC LANE ASSIGNMENT AND CONCEPT DEVELOPMENT

Traffic lane assignments using the 20-year (2030) traffic forecasts were prepared for the I-494 EIS layout and the existing TH 5 configuration at Post Road. This effort identified several potential areas of operational concern. Concept layouts with revised traffic lane assignments were then prepared to address the potential areas of concern. The I-494 EIS layout and lane assignments are shown in Figures 10 through 14. The Post Road configuration and lane assignments are shown in Figures 15 through 17.

A description of each concept alternative with its screening results are summarized below and in Table 1 following the concept descriptions. The table lists the advantages and disadvantages identified as part of this work and if additional right of way beyond the current layout footprint is needed. Concept sketches and the respective traffic lane assignments are included in the Appendix Figures 18 through 43.

Location 1, Concept A – Add an eastbound auxiliary lane between Portland Avenue and the northbound TH 77 exit loop. Potential right of way constraint noted at the Water Park of America. The lane assignment indicates that the concept will address the capacity concern of eastbound I-494 between Portland Ave and TH 77. This concept should be carried forward. See Appendix Figures 18 and 19.

Location 2, Concept A – Extend the fifth westbound lane east to the 24th Avenue entrance, add a second auxiliary lane between the Portland Avenue exit and the TH 77 entrance, and provide a two lane westbound exit at Portland Avenue. The lane assignment indicates that the concept will address the capacity concern of the westbound I-494 through lanes at TH 77 and the merge concern at the TH 77 entrance. The concept should be carried forward. See Appendix Figures 20 and 21.

Location 2, Concept B – Bridge braid the westbound exit to Portland Avenue with the westbound entrance from TH 77, in addition to an auxiliary lane between these ramps. The lane assignment indicates that the concept will address the capacity concern of the westbound I-494 through lanes at TH 77 and the merge concern at the TH 77 entrance. However, this concept does require additional right of way and therefore should not be carried forward. See Appendix Figures 22 and 23.

Location 2, Concept C – Shift the westbound Portland Avenue exit to the TH 77 exit and combine it with the CD road for the TH 77 loop. Then bridge braid the exit with the westbound entrance from TH 77. The lane assignment indicates that the concept will address the merge concern at the TH 77 entrance but does not address the capacity concern of the westbound I-494 through lanes at TH 77, and may worsen the TH 77 exit. The concept also requires additional right of way. This concept should not be carried forward. See Appendix Figures 24 through 26.

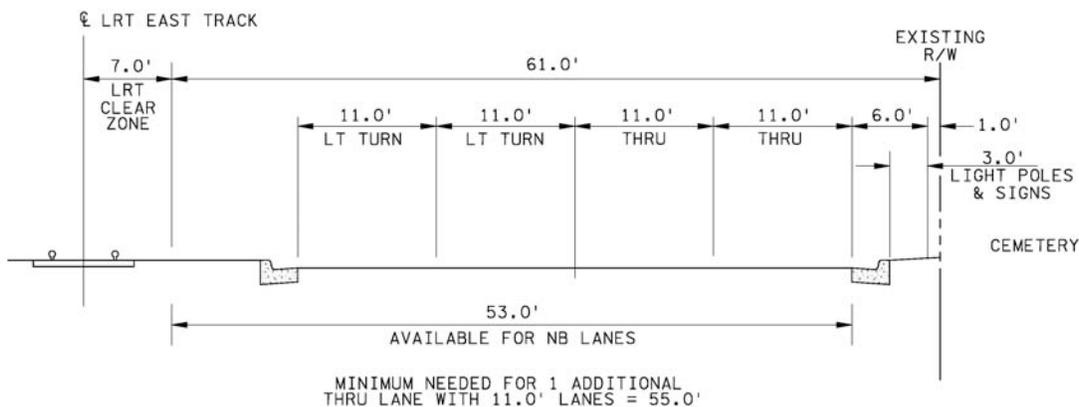
Location 3, Concept A – Extend the eastbound auxiliary lane between Portland Avenue and the northbound TH 77 exit loop (Location 1, Concept A) to the 24th Avenue exit. The lane assignment suggests the concept does not provide any additional operational benefit beyond Location 1, Concept A. This concept should not be carried forward. See Appendix Figures 27 and 28.

Location 3, Concept B – Provide a two-lane entrance to eastbound I-494 from TH 77 and add a second westbound auxiliary lane and a two-lane exit to 34th Avenue exit. The lane assignment indicates that the concept will address the weaving concern of eastbound I-494 between the TH 77 entrance and the 34th Avenue exit. This concept should not be carried forward since concept 5E will address this operational concern. See Appendix Figures 29 and 30.

Location 3, Concept C – Merge the westbound 24th Avenue entrance with the two-lane entrance from northbound TH 77. The lane assignment indicates that the concept will address the capacity concern for westbound I-494 at TH 77, but would worsen the merging concern of the westbound I-494 entrance from TH 77. This concept should not be carried forward. See Appendix Figures 31 and 32.

Location 5, Concept A – Provide for a folded diamond to the west side of 34th Avenue and reduce left turn movements across the median LRT at the two ramp intersections, but perpetuate the westbound weave movements between the 34th Avenue entrance and the exit to TH 77. Current access movements to 34th Avenue from both TH 5 and I-494 retained. Concept was not pursued since it does not address 34th Avenue capacity needs. See Appendix Figure 33.

The 34th Avenue Corridor currently has constraints along both sides prohibiting the addition of another northbound through lane. The northbound lanes have the LRT along its median and the Fort Snelling National Cemetery along its east side. A review of the current configuration along northbound at Airport Drive identifies the following dimensions. It is unlikely another through lane could be fit into the space available given the known constraints.



Location 5 Concept B – provide for a folded diamond in the southwest quadrant of the 34th Avenue interchange and an eastbound to northbound inverted loop to eliminate left turns across the LRT for the south ramp intersection; and provide for a bridge braid to eliminate the westbound weave movements between the 34th Avenue entrance and the exit to TH 77. Current access movements to 34th Avenue from both TH 5 and I-494 retained. Concept was not pursued since it does not address 34th Avenue capacity needs. See Appendix Figure 34.

Location 5 Concept C – provide for a folded diamond to the west side of 34th Avenue and an eastbound to northbound inverted loop to eliminate left turns across the LRT for both ramp intersections; and provide for a bridge braid to eliminate the westbound weave movements between the 34th Avenue entrance and the exit to TH 77. Current access movements to 34th Avenue from both TH 5 and I-494 retained except from westbound TH 5 to southbound 34th Avenue. Concept was not pursued since it does not address 34th Avenue capacity needs. See Appendix Figure 35.

Location 5 Concept D – provide for a single point urban interchange with existing 34th Avenue, with LRT remaining in the median of 34th Avenue. The ramps would include a bridge braid for the westbound entrance from 34th under the westbound exit to TH 77, and extending the eastbound TH 77 and 24th Avenue entrance to the location of the TH 5 interchange. The lane assignment suggests the concept addresses the weaving concern of both eastbound and westbound I-494 between TH 77 and 34th Avenue. However, the concept does not provide for the ability to expand northbound 34th Avenue north of I-494, and it may worsen the eastbound entrance merge to I-494 at TH 5. Concept was not pursued since it does not address 34th Avenue capacity needs. See Appendix Figure 36.

Location 5 Concept E – provide for a single point urban interchange with a relocated 34th Avenue, with LRT bridging over I-494 on the east side of the relocated 34th Avenue. The ramps would include a bridge braid for the westbound entrance from 34th under the westbound exit to TH 77, and extending the eastbound TH 77 and 24th Avenue entrance to the location of the TH 5 interchange. The lane assignment suggests the concept addresses the weaving concern of both eastbound and westbound I-494 between TH 77 and 34th Avenue, and allows for expansion of 34th Avenue north of I-494. However, the concept may worsen the eastbound entrance merge to I-494 at TH 5. Reconstruction of 34th Avenue to shift all lanes to the west of the existing LRT facility, provide for additional through lanes along 34th Avenue, and accommodate grade separation of LRT at I-494 would require approximately 14 acres of right of way (10 acres north of I-494 and 4 acres south of I-494). Reconstruction of the LRT facility between Appletree Square and 73rd Street for grade separation over I-494 and the 34th Avenue interchange would likely cost \$30 to \$40 million (2007 dollars). The concept could be carried forward pending further study of the bridge types and right of way impacts. See Appendix Figures 37 through 39.

Location 5 Concept F – provide for a folded diamond interchange to the west of a relocated 34th Avenue, with LRT remaining on the east side of the relocated 34th Avenue. The City of Bloomington and MAC were not ready to pursue this concept, so it does not show bridge braid options nor have traffic lane assignments. Construction of a folded diamond interchange to the west of existing 34th Avenue would require approximately 24 acres of right of way (15 acres north of I-494 and 9 acres south of I-494). MAC and the City of Bloomington were not ready to carry this option forward, but it should be retained for further study if concept 5E is not pursued. See Appendix Figure 40.

Location 6 Concept A – provide for an eastbound entrance to I-494 from Thunderbird Road. A traffic lane assignment for this concept was not prepared as the concept shows this access merging with the eastbound entrance from 24th Avenue. The group discussed if this access would occur with the existing I-494 configuration or be deferred until the layout configuration were constructed. Further discussion is merited for this concept. See Appendix Figure 41.

Location 7 Concept A – provide for a two-lane entrance from Glumack Drive to westbound TH 5 and a second auxiliary lane between Glumack Drive and the exit to Post Road. The lane assignment suggests the concept addresses the weaving concern along westbound TH 5 between these ramps. The concept should be carried forward. See Appendix Figures 42 and 43.

Table 1 – Concept Alternatives Screening

Location	Current 494 Layout 2030 Operations		Concept Alternatives	Concept Alternatives 2030 Addresses Concern		Additional Right of Way Needed Beyond Current Layout Footprint	Comments	Recommended Action
	AM	PM		AM	PM			
1) EB 494 (Portland Avenue to TH 77)	No Concerns	▪ EB 494 through lanes over capacity	1A	--	Yes	None	Bloomington noted a tighter TH 77 ramp radius might reduce right of way impacts of the Water Park of America.	Carry forward.
2) WB 494 (Portland Avenue to TH 77)	▪ Merge/weave @ TH 77 entrance	▪ Merge/weave @ TH 77 entrance	2A	Yes	Yes	1 acre N of 494	Bloomington prefers over Concept 3C.	Carry forward.
			2B	Yes	Yes	2 acres N of 494	Bloomington prefers over Concept 3C, and noted it is likely more expensive than Concept 2A.	Dismiss due to additional right of way impact.
			2C	Yes	No	2 acres N of 494	Access to Portland Avenue from 24 th Avenue not provided.	Dismiss
3) I-494/TH 77 Interchange	No Concerns	▪ WB 494 through lanes over capacity	3A	--	No	None		Dismiss since no additional benefit over 1A.
			3B	--	No	None		Dismiss since 5E addresses concern.
			3C	--	Yes, but worsens WB exit at TH 77	2 acres N of 494	Bloomington prefers Concept 2A as this concept has a higher construction cost.	Dismiss since WB TH 77 entrance merge worsens.
4) I-494/24 th Avenue Interchange	No Concerns	No Concerns	--	--	--			--
5) I-494/34 th Avenue Interchange	▪ EB 494 weave between TH 77 entrance and 34th Avenue exit ▪ WB 494 weave between TH 5 entrance and 34th Avenue exit	▪ EB 494 weave between TH 77 entrance and 34th Avenue exit ▪ WB 494 weave between TH 5 entrance and 34th Avenue exit ▪ WB 494 weave between 34th Avenue entrance and TH 77 exit	5A	Concept not pursued	Concept not pursued	Concept not pursued		Dismiss since concept does not address 34th Avenue capacity needs.
			5B	Concept not pursued	Concept not pursued	Concept not pursued		
			5C	Concept not pursued	Concept not pursued	Concept not pursued		
			5D	Yes	Yes	5 acres N of 494 1 acre S of 494	Bloomington noted potential safety question due to left turns from the ramps angling towards the 34 th Avenue median LRT. Detailed operations analysis needed to evaluate before the concept could be carried forward.	
			5E ⁽¹⁾	Yes	Yes	10 acres N of 494 4 acres S of 494	Bloomington noted the American Boulevard LRT Station may be affected, the concept has higher construction cost than Concept 5D, and that access to the hotel on the east side may be difficult.	Carry forward for further study to determine bridge types and if right of way needs can be reduced ⁽¹⁾ .
			5F	Concept not pursued but anticipate concerns would be addressed	Concept not pursued but anticipate concerns would be addressed	15 acres N of 494 9 acres S of 494	Bloomington noted may be least cost concept, but has largest right of way impact. American Boulevard LRT Station might be affected and access to the hotel on the east side may be difficult.	Retain for further study if 5E not pursued.
			5G	Not Applicable	Not Applicable	None	Short term low cost improvements to optimize operation of 34 th Avenue intersections	Carry forward for further evaluation.
6) Thunderbird Road to EB I-494	Not Applicable	Not Applicable	6A	Not Applicable	Not Applicable	2 acres S of 494	Bloomington noted this concept should improve 24 th Avenue operations.	Monitor development activity near the Mall of America.
7) TH 5/Post Road Interchange	▪ WB TH 5 weave between Glumack entrance and Post Road exit	▪ WB TH 5 weave between Glumack entrance and Post Road exit	7A	Yes	Yes	None		Carry forward.

⁽¹⁾ LRT Relocation estimated at \$30 million to \$40 million (2007 dollars).

The concept alternatives prepared for this study are based upon 2030 traffic forecast information found in the *I-494 & TH 77 Corridor Forecasting and Concept Development Forecast Technical Memorandum* dated June 24, 2008. As noted in this technical memorandum, the forecasts are based on specific socioeconomic and roadway assumptions. Those assumptions and changes to them should be reviewed and updated if necessary in the future prior to project development.

I-494 CORRIDOR WITH TEN-YEAR FORECASTS

Traffic lane assignments using the ten year (2020) traffic forecasts were prepared for the existing I-494 lane geometry and interchange configurations between TH 100 and TH 5. The 2020 forecasts indicated that the majority of this stretch of I-494 would be at or over capacity during both the morning and evening peak hours. Traffic lane assignments were then prepared with the assumption that an additional through lane of capacity (either a new through lane or a dynamic shoulder lane) could be provided along I-494 but the existing interchange configurations would remain. This effort suggests that the additional lane may accommodate the growth in traffic until 2020, together with some isolated auxiliary lane additions. Traffic lane assignments for the existing condition and one additional through lane are shown in Appendix Figures 44 through 53. To allow the additional lane to be added, the following bridges may need to be prioritized for replacement by 2020:

- Xerxes Avenue over I-494 (No. 9126) – approx. 52 feet between piers
- I-494 over I-35W (Nos. 6850 and 6851) – approx. 56-foot deck width (each direction)
- CP Rail at Pleasant Avenue over I-494 (No. 9289) – approx. 58 feet between center pier and abutment
- Nicollet Avenue over I-494 (No. 9077) – approx. 56 feet between center pier and abutment
- Portland Avenue over I-494 (No. 9079) – approx. 54 feet between center pier and abutment
- 12th Avenue over I-494 (No. 9080) - approximately 55 feet between center pier and abutment
- TH 77 over I-494 (Nos. 9081 and 9082) – approx. 58 feet between center pier and slope paving (eastbound I-494), and approx. 66 feet between center pier and retaining wall in front of the abutment (westbound I-494)

These bridges may need replacement by 2020 depending upon auxiliary lane needs:

- France Avenue over I-494 – (No. 27892) – approx. 70 feet between center pier and slope paving
- Pedestrian Bridge over I-494 – (No. 9078) approx. 76 feet between piers

These bridges may need widening by 2020 depending upon the eastern termini of an additional lane:

- I-494 over 34th Avenue (No. 27765) – approx. 71-foot deck width
- I-494 over the TH 5 loop ramps (No. 27767) – approx. 57-foot deck width (EB); and 83-foot deck width (WB)
- I-494 over the Minnesota River – information restricted

To pursue this idea the following would be needed to develop such a project:

- Prepare design year (2030) traffic forecast for the capacity provided by the additional through lane.
- Prepare concept drawings for the additional through lane and the related interchange modifications and auxiliary lanes and perform planning level operations screening.
- Prepare a geometric layout and perform operational micro-simulation to confirm improvements would result in satisfactory corridor operations.
- Update the environmental documents and prepare the Interstate Access Request.

34TH AVENUE CORRIDOR WITH CURRENT VOLUMES

Introduction

As part of the I-494/TH 77 Corridor Forecasting and Concept Development Study, potential low-cost improvements were evaluated for the 34th Avenue corridor. These potential improvements consist of traffic signal timing modifications and minor roadway geometric improvements. The purpose of these improvements is to improve traffic operations for current/near term conditions without altering LRT travel times or schedules. The study limits consisted of 34th Avenue from Appletree Square to 73rd Street. The evaluation included the a.m. peak, afternoon “shift change” peak (2:00 to 3:00 p.m.) and p.m. peak periods. The a.m. and p.m. peak hour volumes generated as part of the I-494/TH 77 study are displayed in Appendix Figure 5. In addition, an afternoon “shift change” peak hour volume set was developed using the Mn/DOT I-494/34th Avenue ramp volumes (March 2008), turning movement counts collected in April 2008 and March 2007 and information provided in the *MSP Phase I and Phase 2 2020 Plan Environmental Assessment (2005)* prepared by Kimley-Horn and Associates, Inc. Existing geometrics and afternoon “shift change” peak hour volumes are displayed in Appendix Figure 54.

This segment of 34th Avenue serves a Light Rail Transit (LRT) line in the median, with a frequency of 16 trains per hour. Currently, LRT preempts the traffic signals using a time-based preemption. The traffic signals operate as a northbound/southbound green phase during LRT passage, with the exception of Appletree Square, where only the northbound green is allowed during passage.

Existing Observations

Site observations were conducted during the peak periods April 30, 2008. Several observations were made, identifying operational and safety issues. One major safety concern involving LRT and passenger vehicle conflicts is occurring at the I-494/34th Avenue interchange. It was observed that the LRT preemption ended as the train approached the intersection, resulting in the signal switching back to “normal” operations. The first phase to receive the green interval after preemption was the I-494 off ramps. At that time, a preemption call was placed by the LRT, which ended the off-ramp green phase. The motorists making the left-turn movement from the off ramps noticed the train approaching and stopped in the 34th Avenue through lanes. The train then stopped, allowing these vehicles to clear the intersection. This was observed at both the north and south I-494/34th Avenue ramp intersections. During the five hours of observations, this occurred four times.

The following observations were also made during the peak periods:

- During the a.m. peak hour, extremely long queues developed on the westbound off ramp (approximately 1,300 feet) and significant queues developed on the eastbound off ramp (approximately 750 feet).
- During the afternoon “shift change” and p.m. peak hours, significant queues developed on both the eastbound and westbound off ramp (approximately 600 feet).
- Minimal queues developed on 34th Avenue, between the ramp intersections during all three peak periods.
- The free right-turn movement from the I-494 westbound off ramp to 34th Avenue had inconsistent operations. Some vehicles would operate as a free movement and some would operate as a yield condition. This inconsistent driver behavior created several “near miss” accidents.

Traffic Analysis

Traffic operations analysis was conducted using the VISSIM traffic analysis model. Existing conditions for the a.m. peak hour, afternoon shift change peak hour, and p.m. peak hour were analyzed along the 34th Avenue corridor from Appletree Square to 73rd Street. Current signal timing was obtained from the City of Bloomington and used in the model. Travel times were calculated for the ten traffic movements at the I-494 interchange along with the northbound and southbound LRT movements.

Based on the results of the analysis, significant travel times developed for the off ramps from I-494 during the a.m. peak hour. This is consistent with site observations conducted in April. During the afternoon shift change peak and the p.m. peak, no significant operational problems developed in the study area.

Current signal timing at the interchange is intended to minimize stops within the interchange, reducing the potential for LRT/passenger vehicle conflicts. This timing was evaluated to determine if adjustment could be made that would improve passenger vehicle operations while maintaining current LRT operations. An alternative timing plan was developed (Modified Timing) for each peak hour to better distribute green time to the phases with the greatest demand. This alternative would optimize existing signal timing along the corridor. This includes reducing cycle lengths, optimizing splits, shortening north/south green time and increasing off ramp green time. Shorter cycle lengths will reduce the percentage of cycles experiencing preemption. Another alternative was analyzed where LRT would be controlled by the traffic signals (No Preemption). Under this alternative, LRT would not preempt the signals and would require obeying the traffic signals just as passenger vehicles (downtown Minneapolis operations). The purpose of this alternative is to determine the worst effects to LRT travel times and to understand the potential improvement to vehicular traffic. This alternative was only analyzed during the a.m. peak hour.

Results of the travel time analysis are displayed in Table 2 below.

Table 2
34th Avenue Short-Term Concepts
Travel Times (seconds)

Movement	A.M. Peak Hour			Afternoon Shift Change Peak Hour		P.M. Peak Hour	
	Existing Timing	Modified Timing	No Preemption	Existing Timing	Modified Timing	Existing Timing	Modified Timing
Northbound LRT	260	250	379	250	250	254	250
Southbound LRT	258	253	428	252	251	262	251
Northbound 34th LT to I-494	105	139	62	96	103	108	122
Northbound 34th Thru	63	50	99	68	54	64	54
Northbound 34th RT to I-494	25	25	69	25	26	31	29
Southbound 34th LT to I-494	91	160	106	86	121	89	114
Southbound 34th Thru	59	48	118	64	58	54	44
Southbound 34th RT to I-494	21	21	56	26	26	22	21
Eastbound I-494 LT to 34th	212	115	96	129	91	150	98
Eastbound I-494 RT to 34th	86	39	54	45	39	38	38
Westbound I-494 LT to 34th	482	101	112	127	111	129	120
Westbound I-494 RT to 34th	207	44	118	44	43	39	39

Based on the analysis, the Modified Timing Alternative measurably improves operations at the 34th Avenue/I-494 interchange during the a.m. peak hour without impacting LRT operations. Slight improvements are expected during the shift change and p.m. peak hour. The No Preemption alternative produces similar vehicular travel times as the Modified Timing alternative during the a.m. peak hour, but travel times for the LRT are expected to increase by approximately 50% between American Boulevard and Airport Lane under the no preemption timing plan.

Recommendations of the Modified Timing Alternative are:

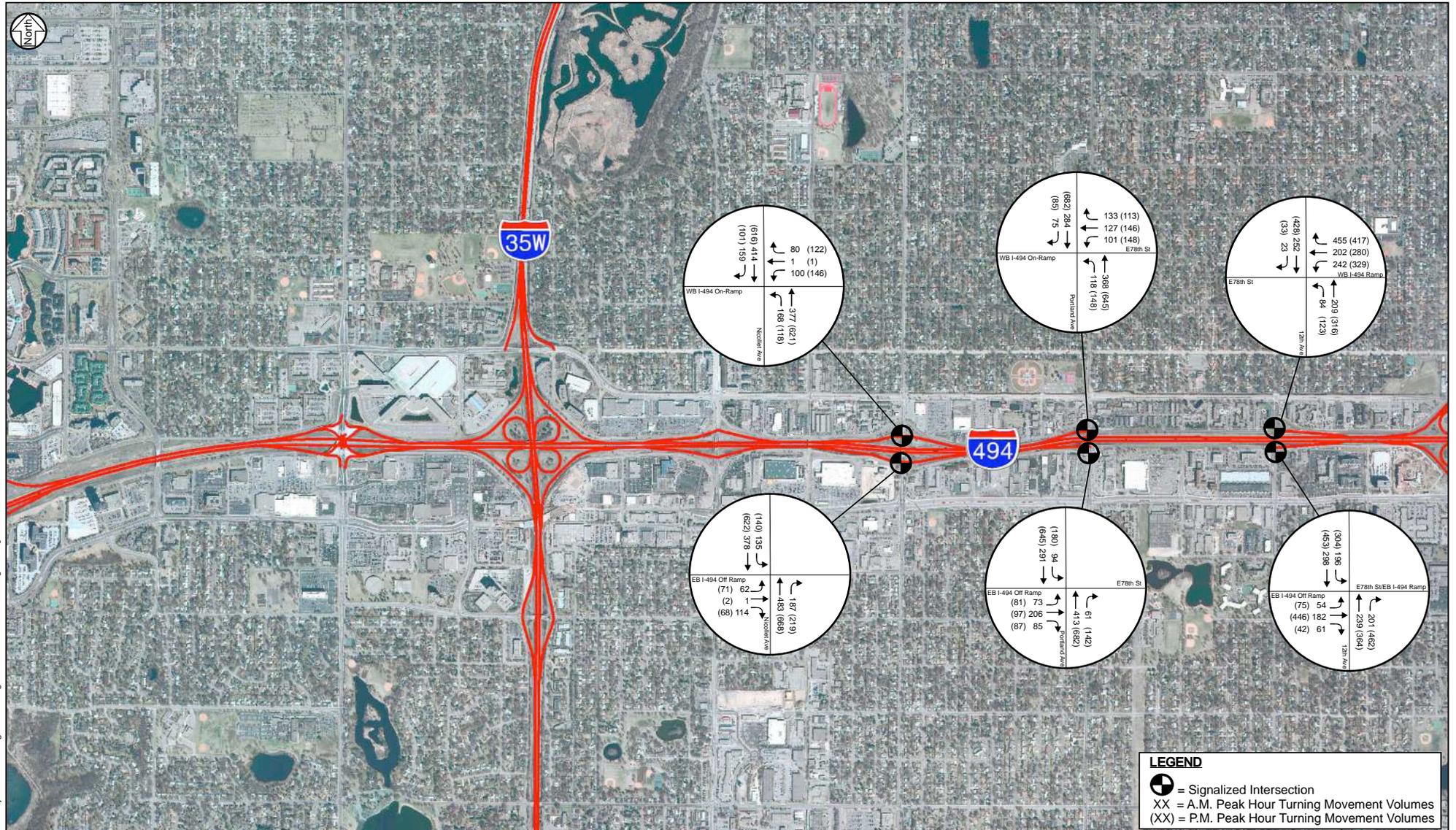
- Coordinate the traffic signals along the corridor
 - 112 second cycle length was used to coincide with train schedules
 - Other cycle lengths could be implemented during the shift change peak, when train frequency is reduced
- 34th Avenue/I-494 interchange
 - Revise Phasing
 - AM Peak – Concurrent exit ramp greens, lagging left turns to entrance ramps
 - Shift change and PM Peak – Proposed phasing is equal to existing, but other patterns may be better
 - Revise preemption exit phases which could be selected by time of day
 - Off ramps during the a.m. peak and 34th Avenue lefts during the shift change and p.m. peaks
- 34th Avenue/American Boulevard
 - Revise phasing – use lead-lag lefts on 34th Avenue (lag southbound left)
 - Revise preemption exit phases which could be selected by time of day
 - Southbound left during the a.m. peak and eastbound during the p.m. peak

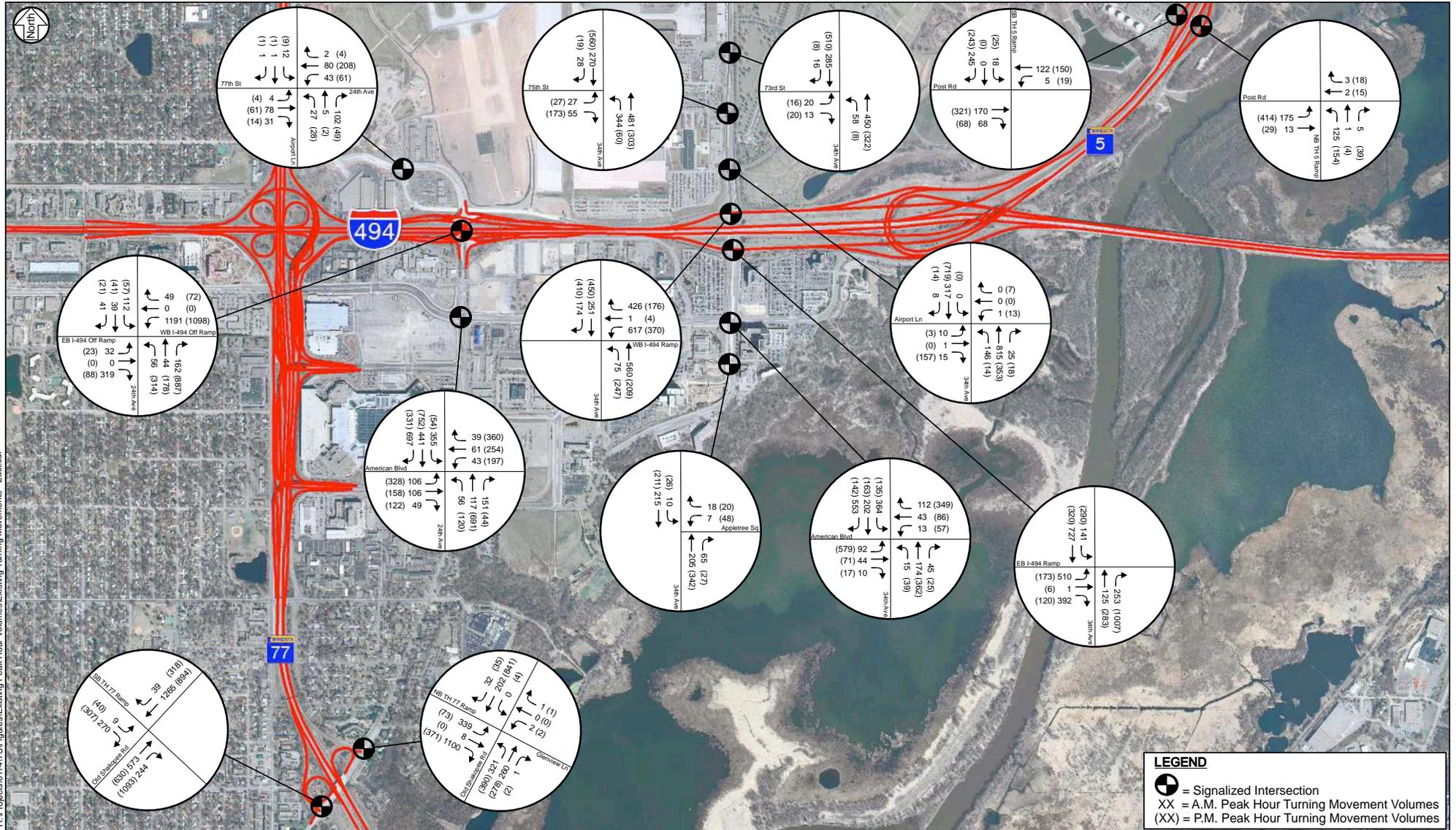
Other improvements to be considered to improve traffic operations, but not included in the modeling, are as follows:

- 34th Avenue/I-494 interchange
 - Signal controlled dual right turns on the off ramps to improve weave conditions – Concept 5G shown in Appendix Figure 55.
 - Time northbound and southbound train arrivals to be concurrent at I-494 when possible.
 - Time signals' coordinated phase greens to match scheduled LRT arrivals.
- 34th Avenue/American Boulevard
 - Future LRT stations (both south and north of I-494) were not analyzed. These stations appear to not impact operations and perhaps provide an opportunity to better coordinate train movements through the I-494 interchange.
 - Revise geometrics to allow simultaneous opposing left turns - Concept 5G shown in Appendix Figure 55.

DD/TP/bls

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Gary Warren, Metropolitan Airports Commission

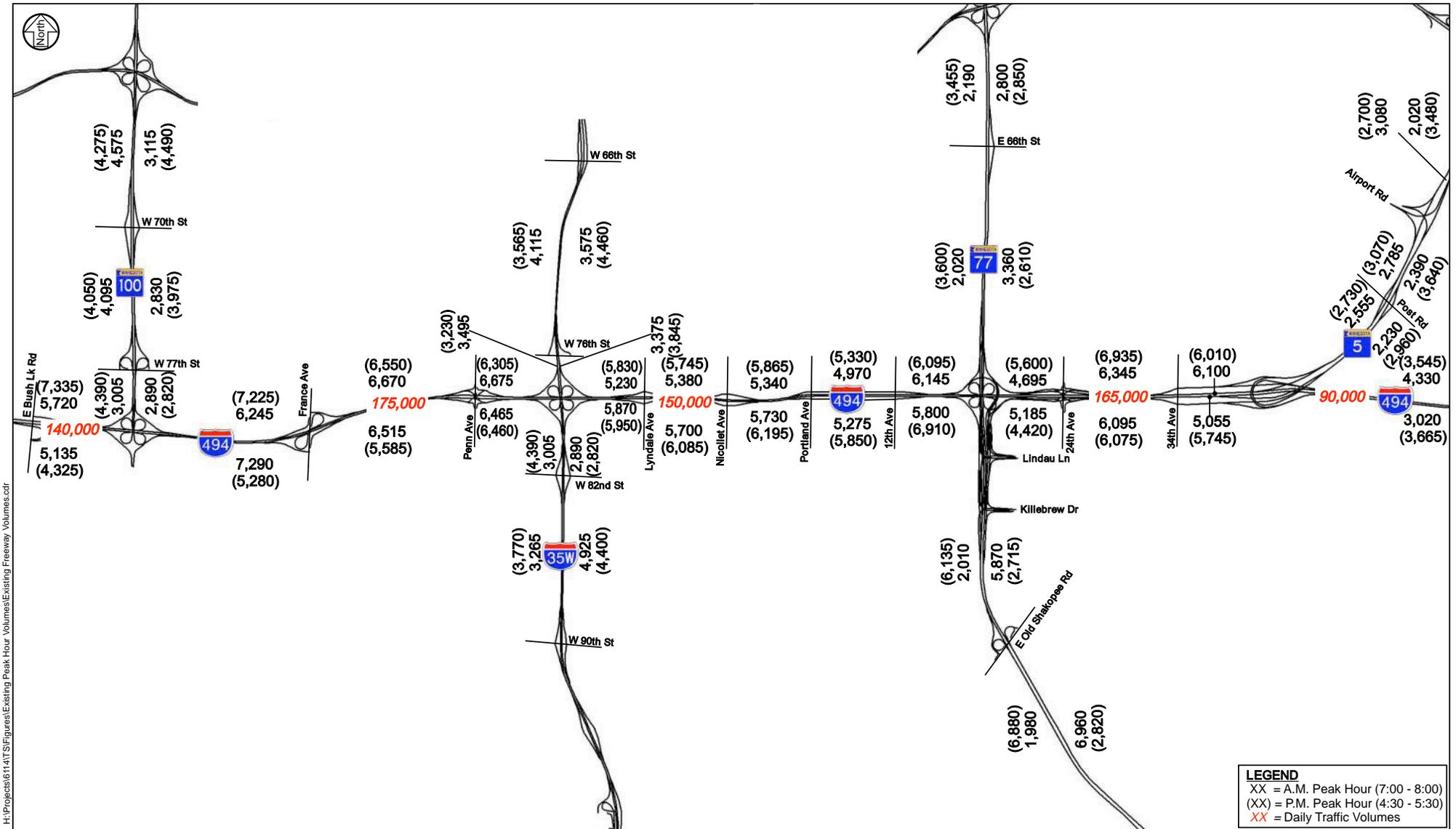




EXISTING TURNING MOVEMENT COUNTS - TH 77 TO TH 5
 FORECASTING & CONCEPT DEVELOPMENT I-494 & TH 77
 SP 2785-349



Figure 2

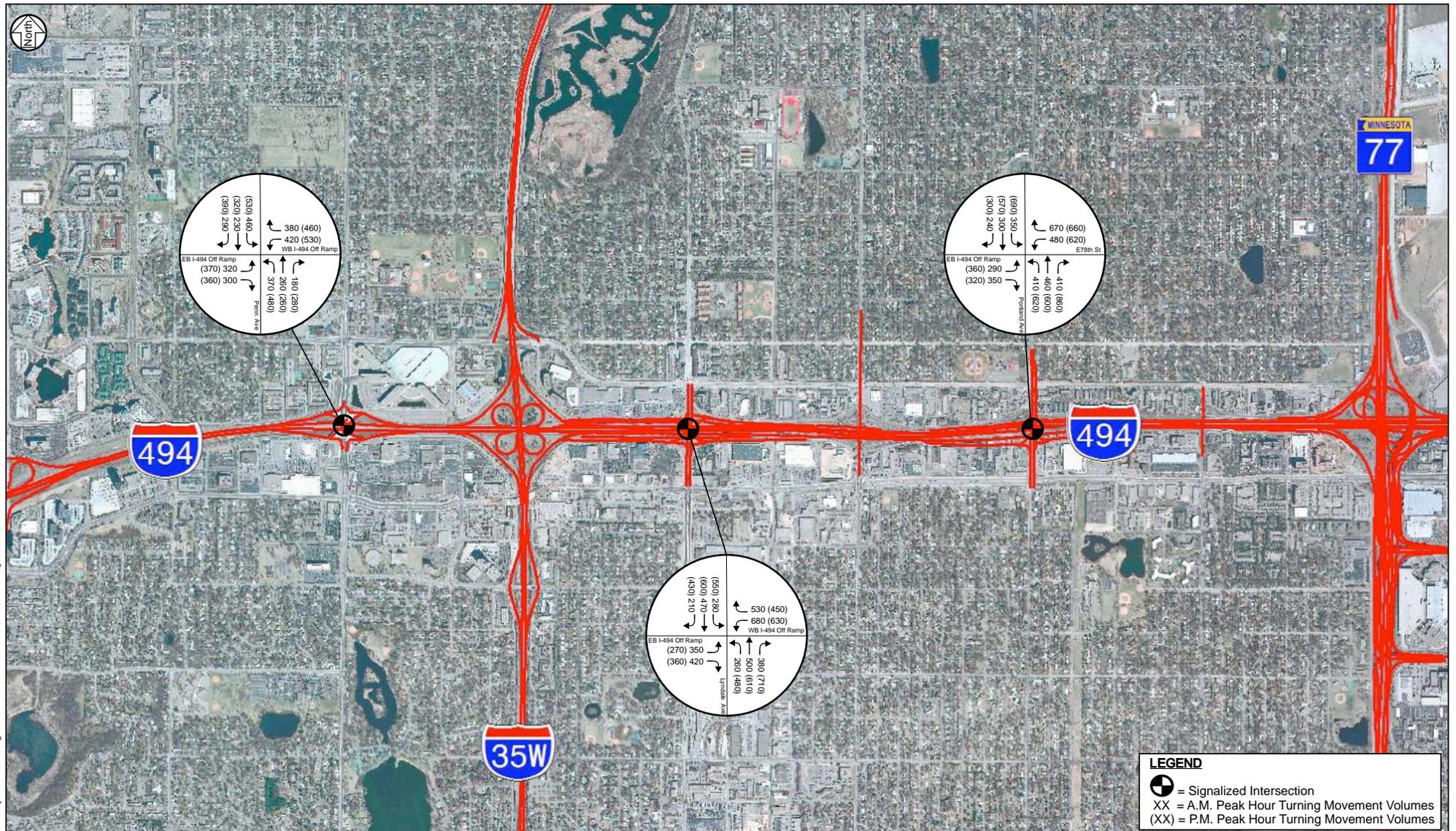


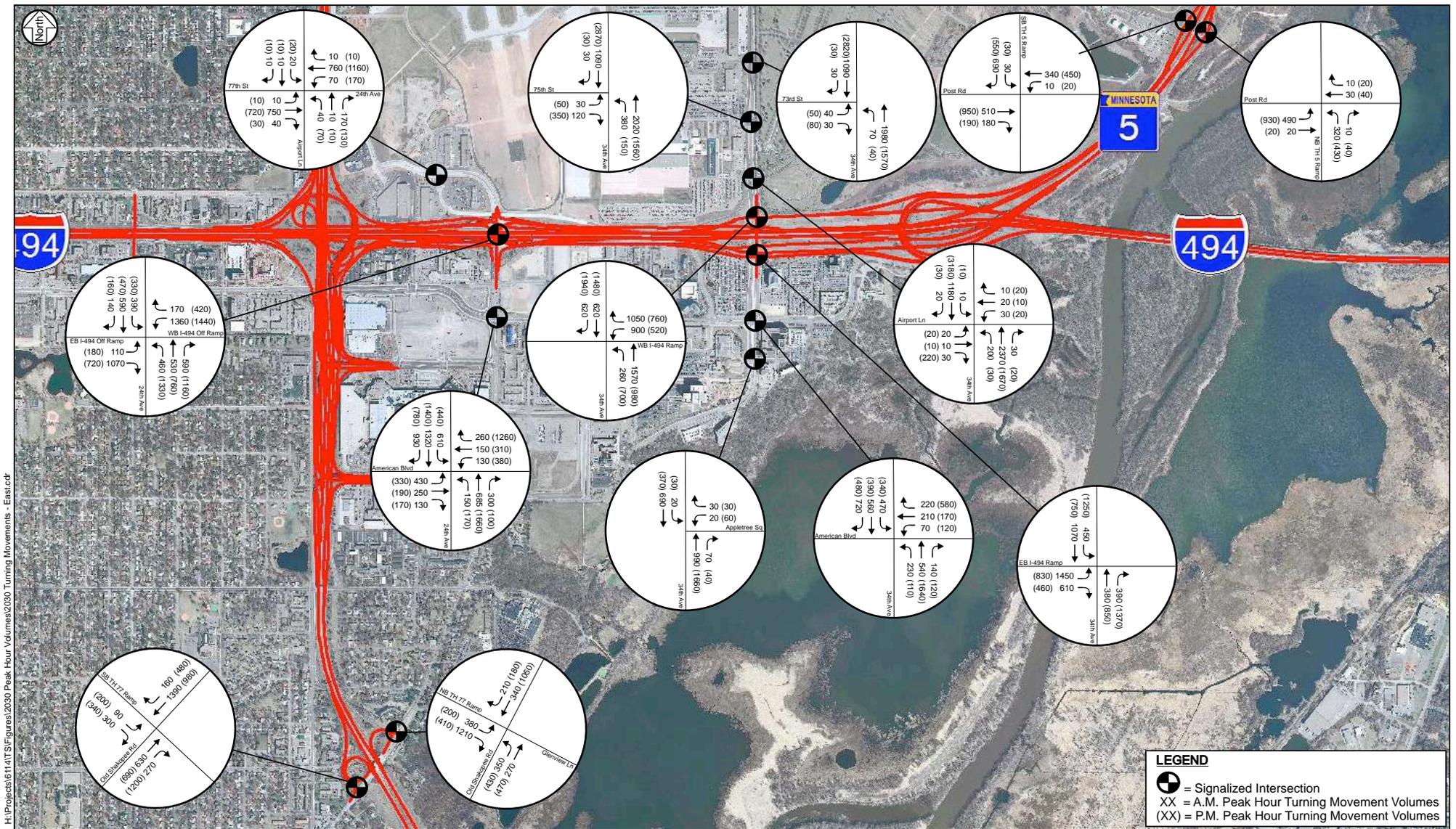
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EXISTING FREEWAY VOLUMES
 FORECASTING & CONCEPT DEVELOPMENT I-494 & TH 77
 SP 2785-349

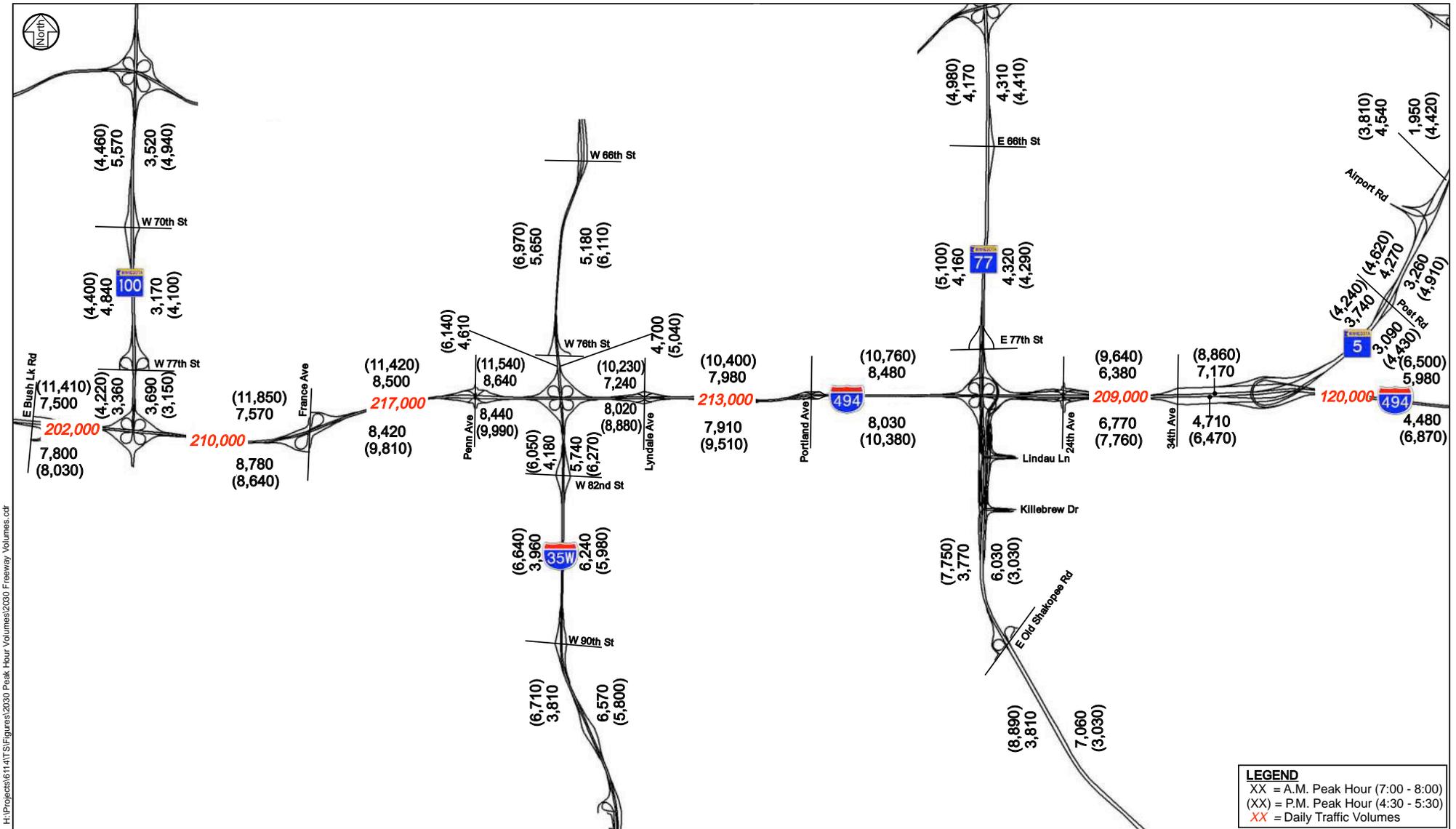
Figure 3





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Figure 5

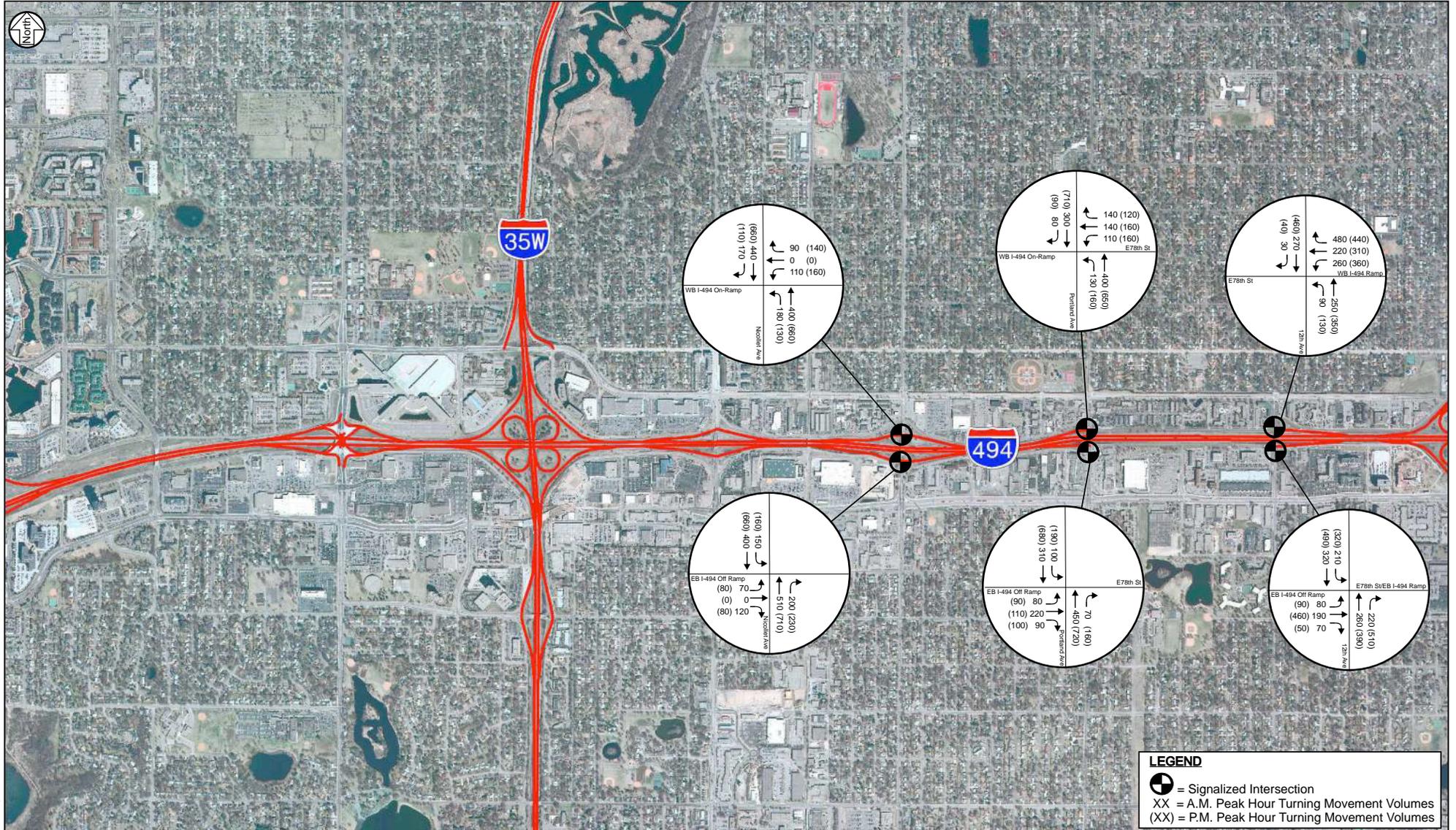


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YEAR 2030 FREEWAY VOLUMES
 FORECASTING & CONCEPT DEVELOPMENT I-494 & TH 77
 SP 2785-349

Figure 6



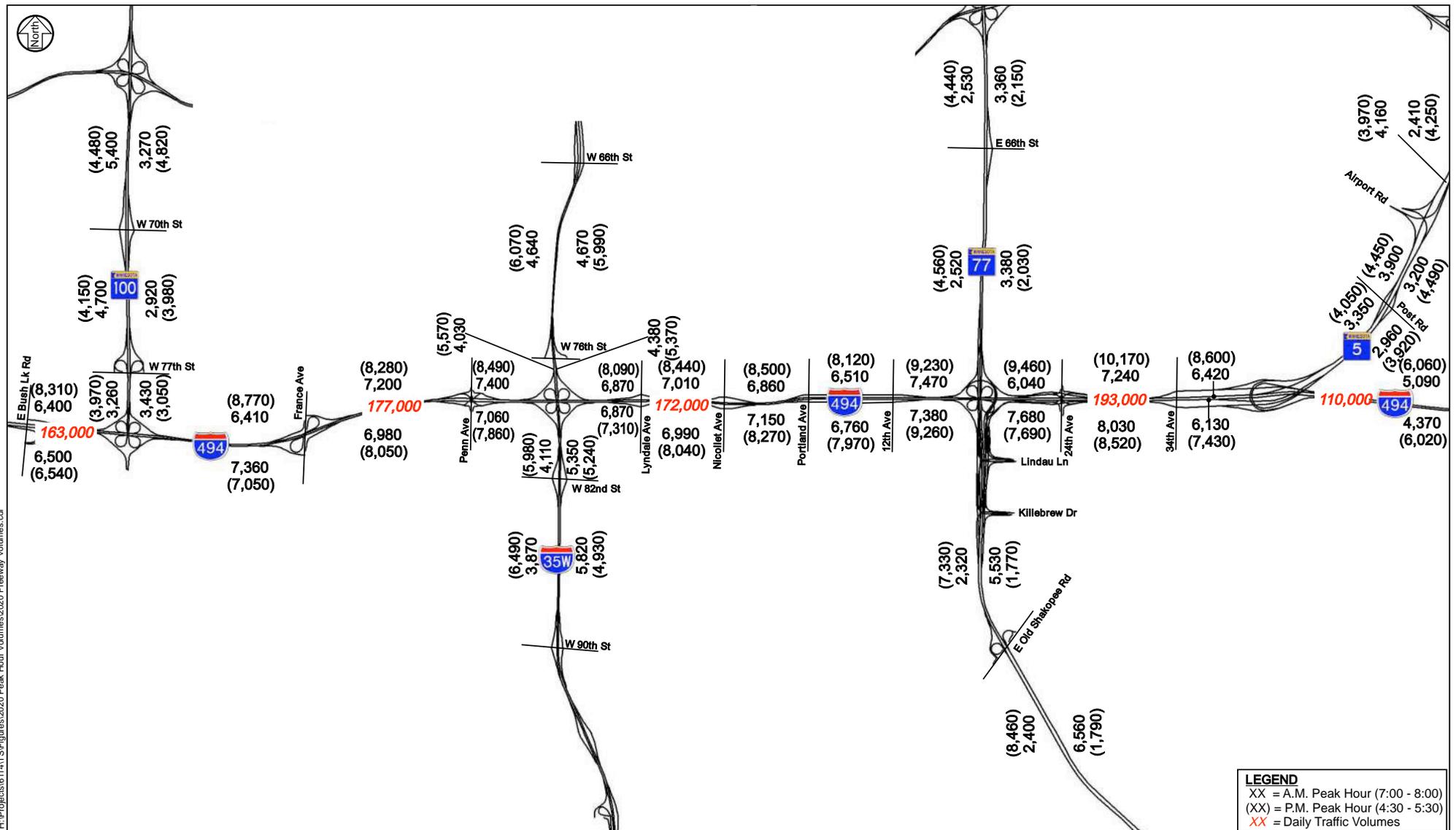
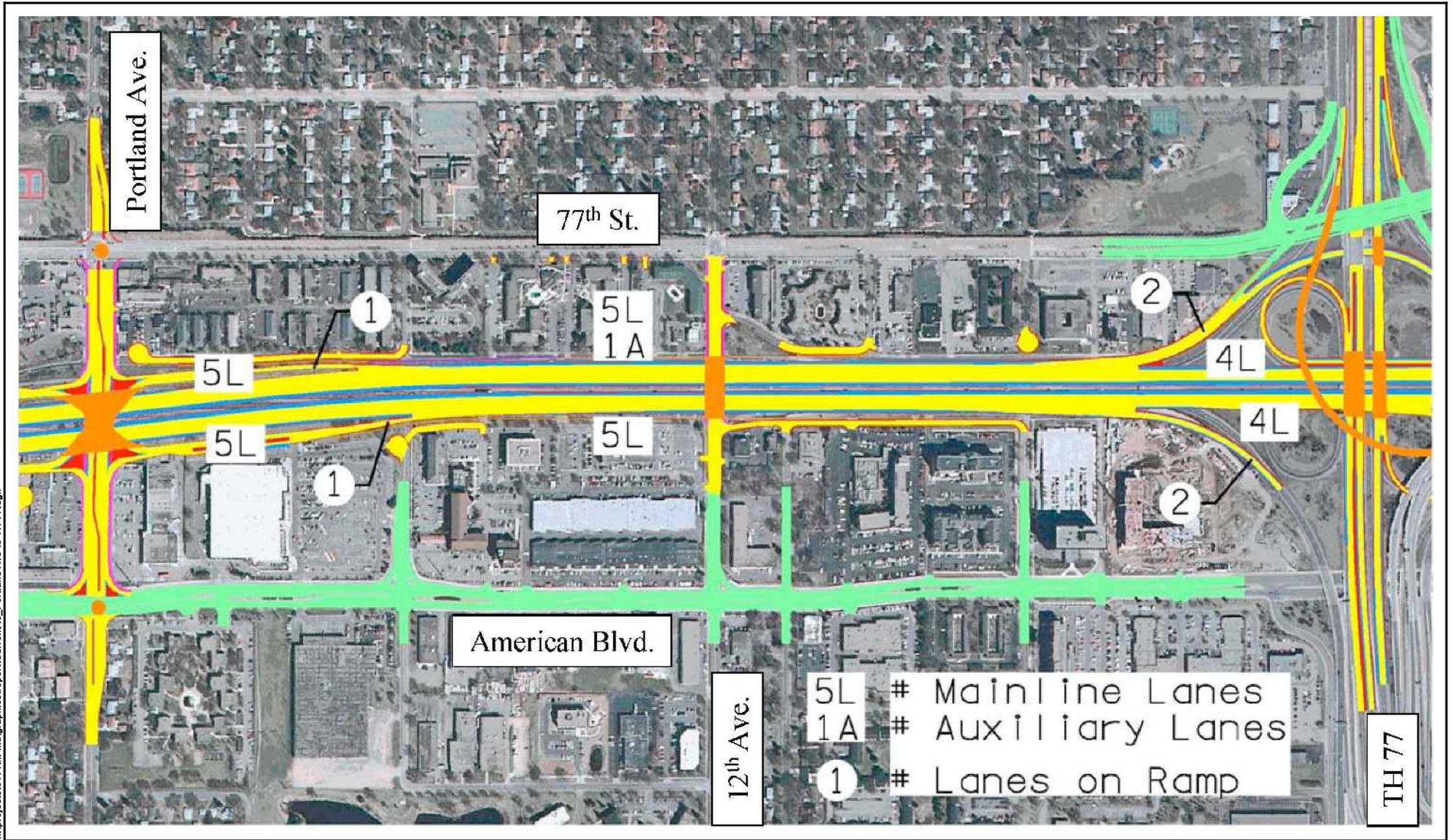


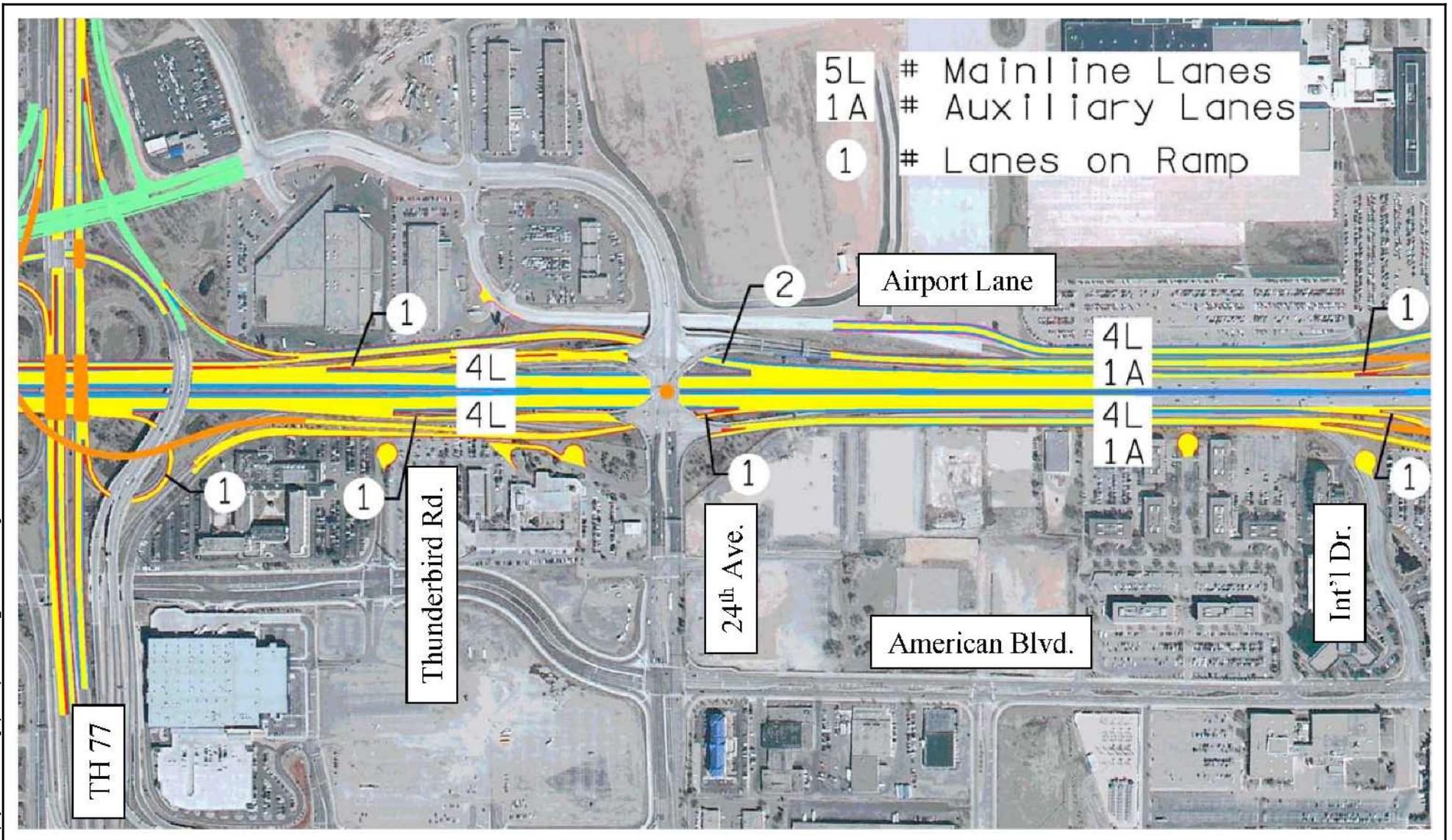
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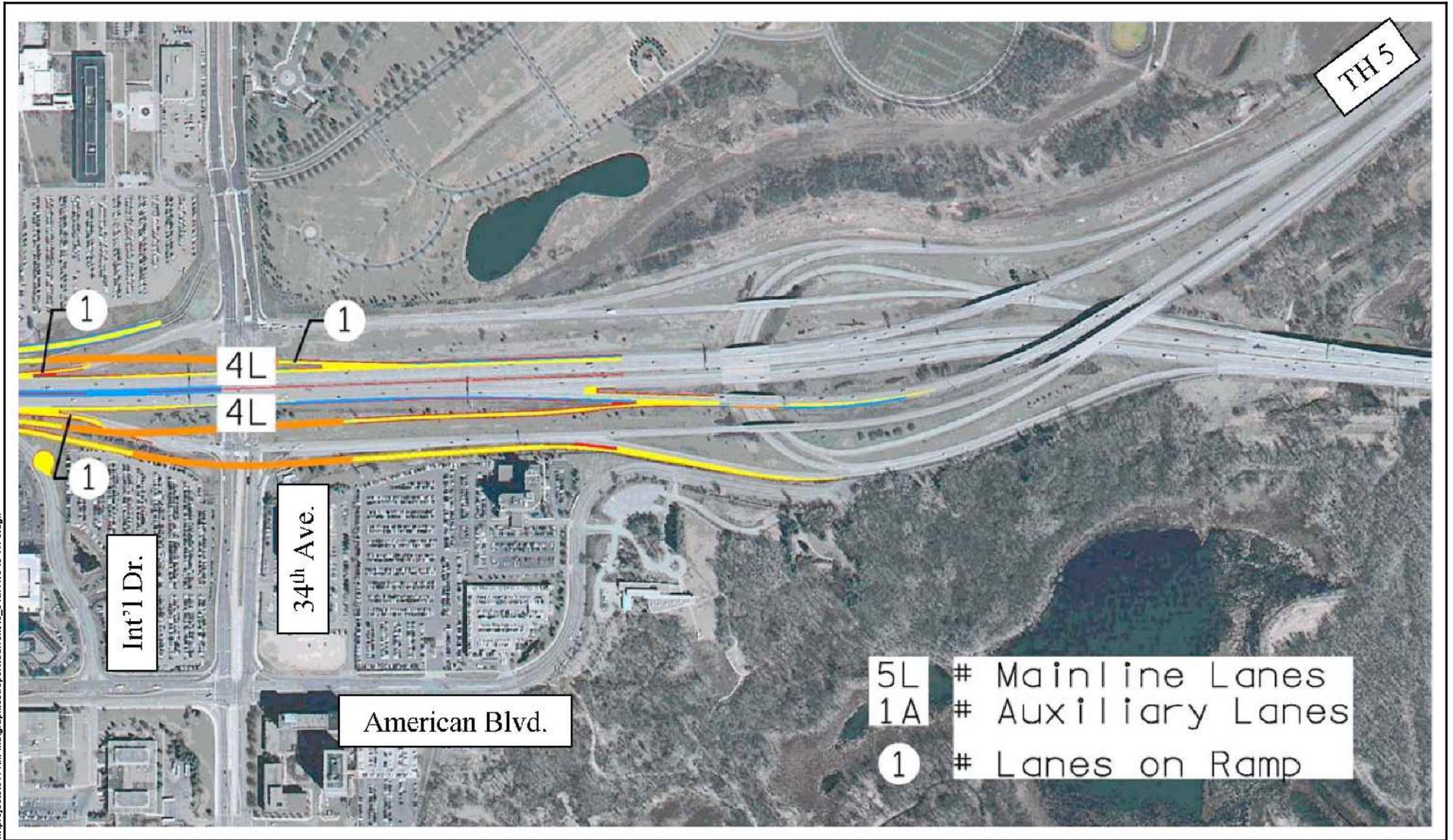
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CURRENT I-494 LAYOUT - PORTLAND AVE. TO TH 77
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Figure 10





AM

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Location	Portland Ave WB On Ramp	Portland Ave WB Off Ramp	TH 77 WB On Ramp	24th Ave WB On Ramp	TH 77 WB Off Ramp	34th Ave WB On Ramp	24th Ave WB Off Ramp	TH 5 WB On Ramp	TH 5/34th Ave WB Off Ramp													
Station	664	696	722	742	771	786	805	817	844													
I-494 Westbound																						
Freeway Geometrics																						
	650	1150	1150	1150	1260	2530	600	1030	880	1670	2840	1650	340	1990	1990	1990						
	1460	1460	1460	1460	1460	1460	1460	1460	1460	1460	1460	1460	1460	1460	1460	1460						
	1460	1460	1460	1460	1460	1460	1460	1460	1460	1460	1460	1460	1460	1460	1460	1460						
	1470	1470	1470	1470	1470	1470	1470	1470	1470	1470	1470	1470	1470	1470	1470	1470						
	2940	2940	2940	2940	2940	2940	2940	2940	2940	2940	2940	2940	2940	2940	2940	2940						
	7980	7330	8480	5950	5350	6380	5500	7170	4330	5980												
I-494 Eastbound																						
Freeway Geometrics																						
	7910	7270	8030	6840	6290	5110	6770	4710	2610	4480												
	2920	2920	3220	3220	3420	3220	3220	3150	3150	2560	2430	2430	1430	2030	2360	2360	2360	1740	2610	2610	2980	
	1450	1450	1450	1450	1450	1450	1450	1450	1450	1450	1450	1450	1450	1450	1450	1450	1450	1450	1450	1450	1450	1450
	1450	1450	1450	1450	1450	1450	1450	1450	1450	1450	1450	1450	1450	1450	1450	1450	1450	1450	1450	1450	1450	1450
	640	640	640	640	640	640	640	640	640	640	640	640	640	640	640	640	640	640	640	640	640	640
	640	760	1190	1190	550	1180	1660	2060	2060	2060	2060	2100	1870	2100	2100	2100	2100	2100	2100	2100	2100	2100
Station	668	701	721	735	746	767	790	810	838													
Location	Portland Ave EB Off Ramp	Portland Ave EB On Ramp	SB TH 77 EB Off Ramp	NB TH 77 EB Off Ramp	24th Ave EB Off Ramp	TH 77 EB On Ramp	34th Ave EB Off Ramp	TH 5 EB Off Ramp	TH 5 /34th/24th EB On Ramp													



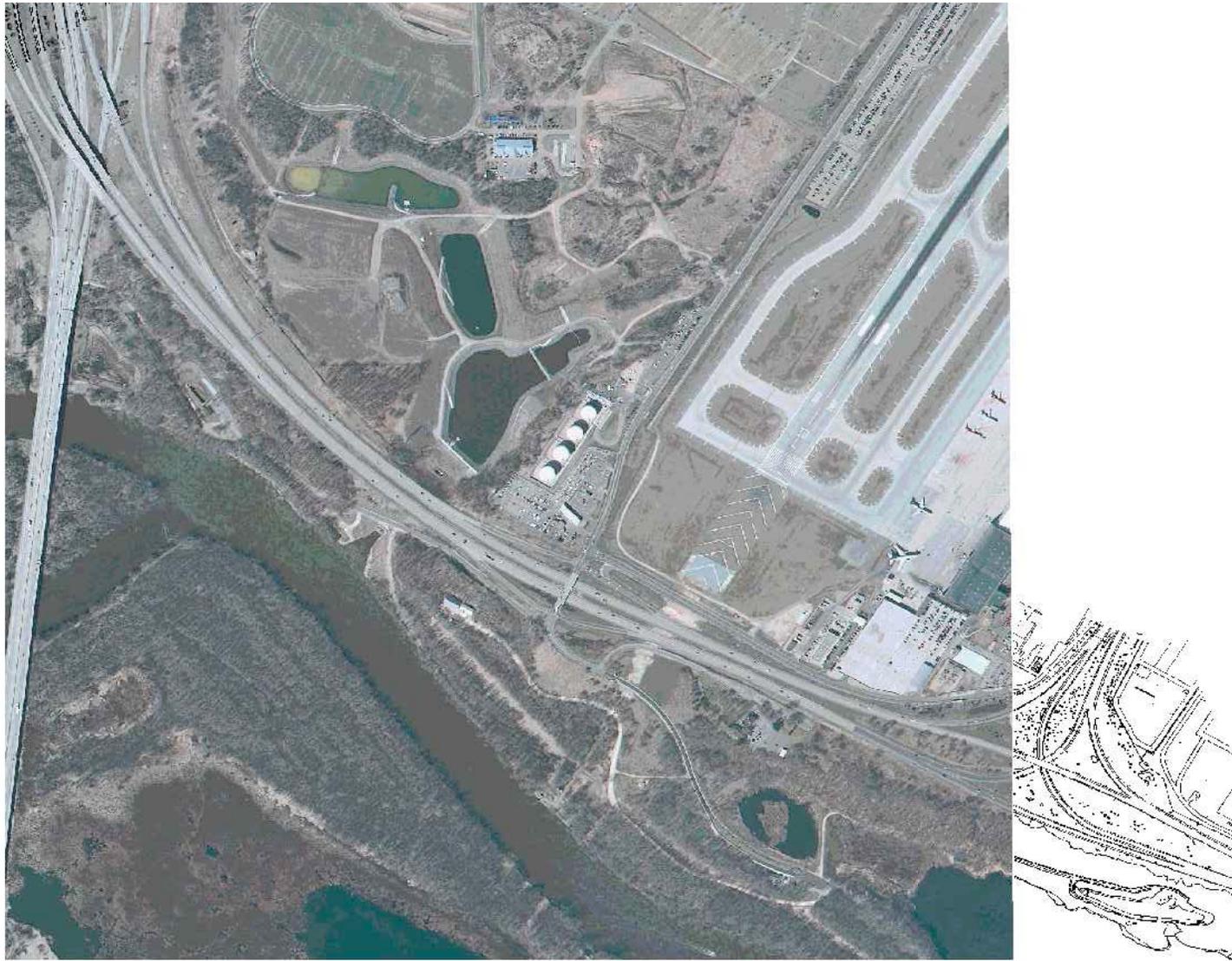
PM

h:\projects\6114\hi-mul\graphics\report\Current I-494 Westbound.dgn

Location	Portland Ave WB On Ramp			Portland Ave WB Off Ramp			TH 77 WB On Ramp	24th Ave WB Off Ramp			TH 77 WB Off Ramp	34th Ave WB On Ramp		24th Ave WB Off Ramp	TH 5 WB On Ramp	TH 5/34th Ave WB Off Ramp													
Station	664			696			722	742			771	786		805	817	844													
I-494 Westbound Freeway Geometrics																													
		920	920		1280																								
	1890	1890	1890	1890	1890	1890	1890	1890	1890	1890	1890	1890	1890	1890	1890	1890													
	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900													
	10400			9480			10760				8680			7190		9640			7000			8860			5310			6500	
I-494 Eastbound Freeway Geometrics																													
		9510			8830			10380			7840			7320			6420			7760			6470			3890			6870
	1770	1770	1770	1770	1770	1770	1770	1770	1770	1770	1770	1770	1770	1770	1770	1770	1770	1770	1770	1770	1770	1770	1770	1770	1770	1770	1770	1770	1770
	1760	1760	1760	1760	1760	1760	1760	1760	1760	1760	1760	1760	1760	1760	1760	1760	1760	1760	1760	1760	1760	1760	1760	1760	1760	1760	1760	1760	1760
	680	680	680	680	680	680	680	680	680	680	680	680	680	680	680	680	680	680	680	680	680	680	680	680	680	680	680	680	680
Station	668			701			721	735			746	767		790	810		838												
Location	Portland Ave EB Off Ramp			Portland Ave EB On Ramp			SB TH 77 EB Off Ramp	NB TH 77 EB Off Ramp			24th Ave EB Off Ramp	TH 77 EB On Ramp		34th Ave EB Off Ramp	TH 5 EB Off Ramp		TH 5 /34th/24th EB On Ramp												



h:\projects\6114\hi-mu\graphical\report\Existing TH 5_a\photo.dgn



EXISTING TH 5 - I-494 TO GLUMACK DRIVE
Forecasting & Concept Development I-494 & TH 77
S.P. 2785 - 349

→
N NO SCALE

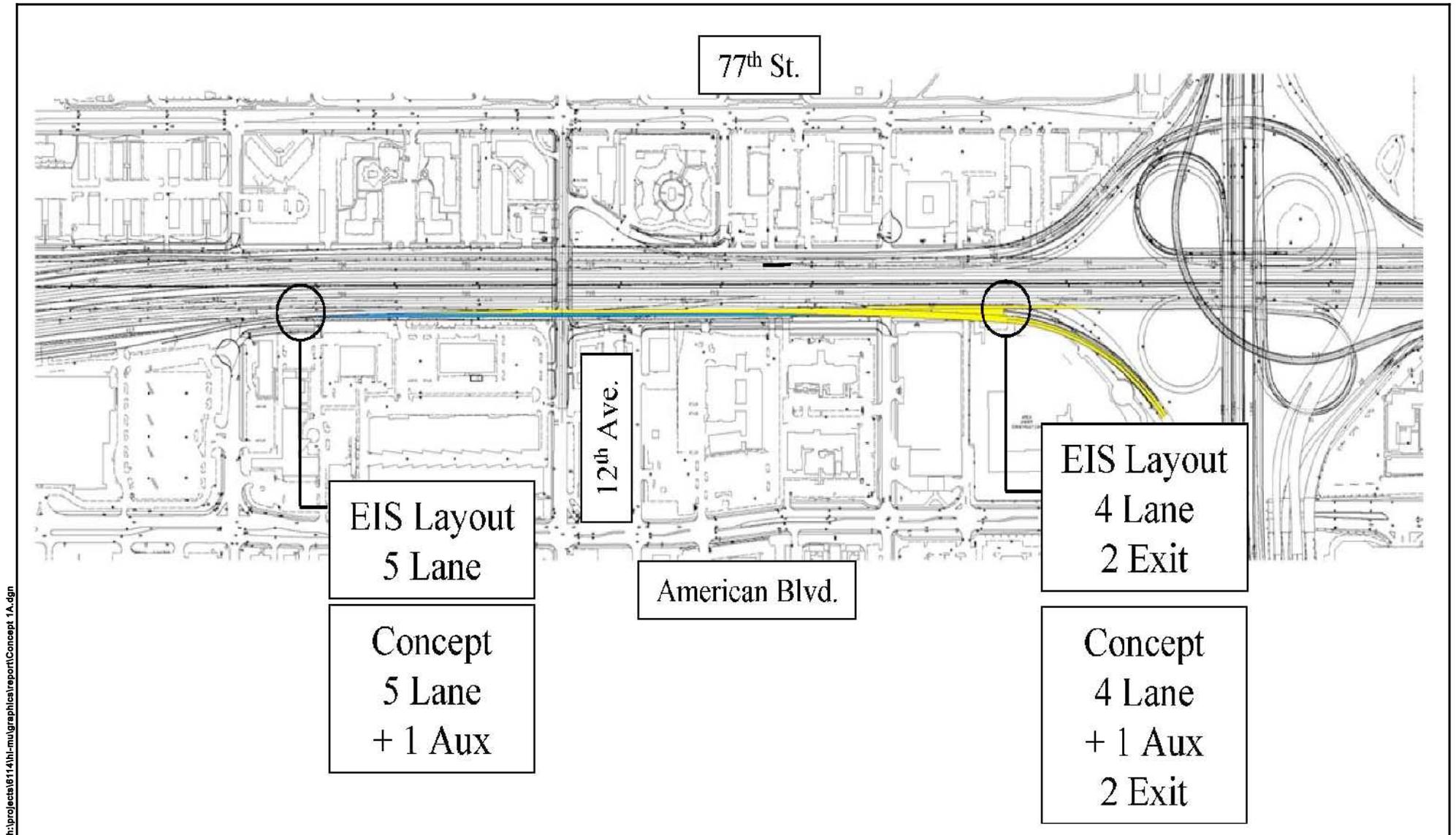
Figure 15

PM

h:\projects\6114\hi-mu\graphics\report\Existing TH 5_2030 PM peak hour.dgn

Location	TH 5 Junction with WB I-494	34th Ave Off Ramp	Post Road On Ramp	Post Road Off Ramp	Glumack Drive On Ramp
Station	0	28	44	61	75
TH 5 Westbound Freeway Geometrics					
	1770	1770	1770	1700	1700
	1780	1780	1780	1700	1700
	3550	4240	4040	4620	2370
	690	690	840	840	640
TH 5 Eastbound Freeway Geometrics					
	1290	1290	1290	860	860
	1290	1290	1290	860	860
	2580	2580	4430	3960	4910
	1850	1850	1170	1170	1170
Station	0	30	45	60	72
Location	TH 5 Junction with EB I-494	TH 5 Inside Add Lane	34th Ave On Ramp	Post Road Off Ramp	Post Road On Ramp





h:\projects\6114\hi-mul\graphical\report\Concept_1A.dgn



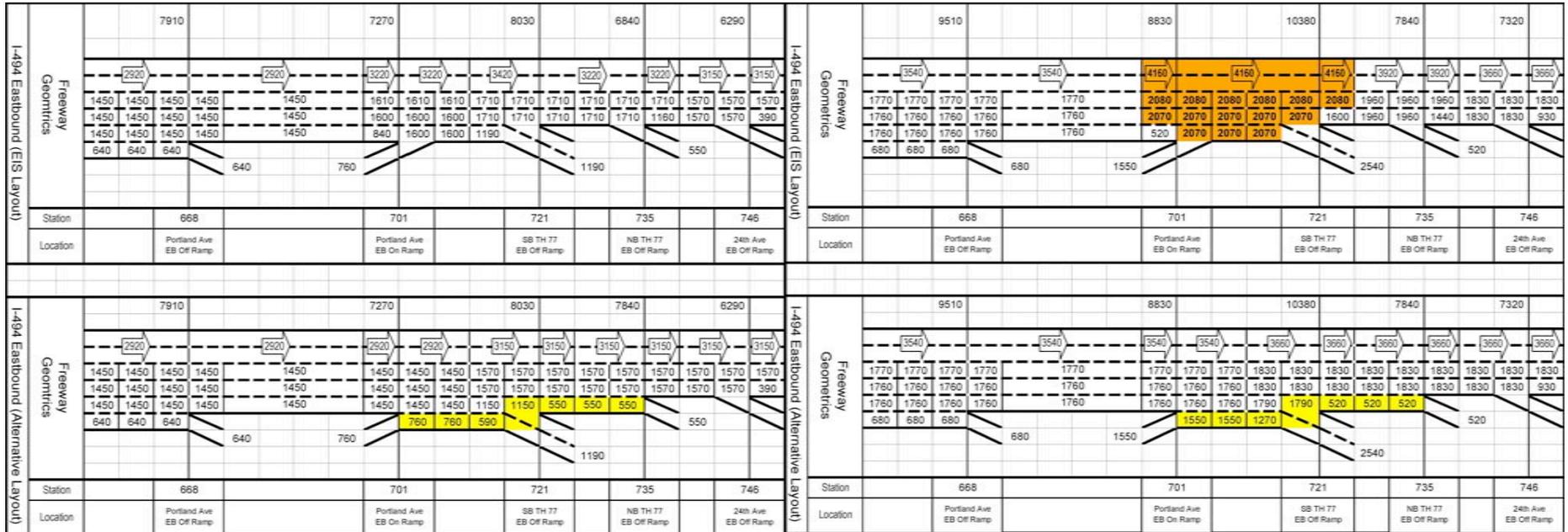
CONCEPT 1A - AUXILIARY LANE BETWEEN PORTLAND AVE. AND TH 77 NB LOOP
 Forecasting & Concept Development I-494 & TH 77
 S.P. 2785 - 349

↑
N NO SCALE

Figure 18

AM

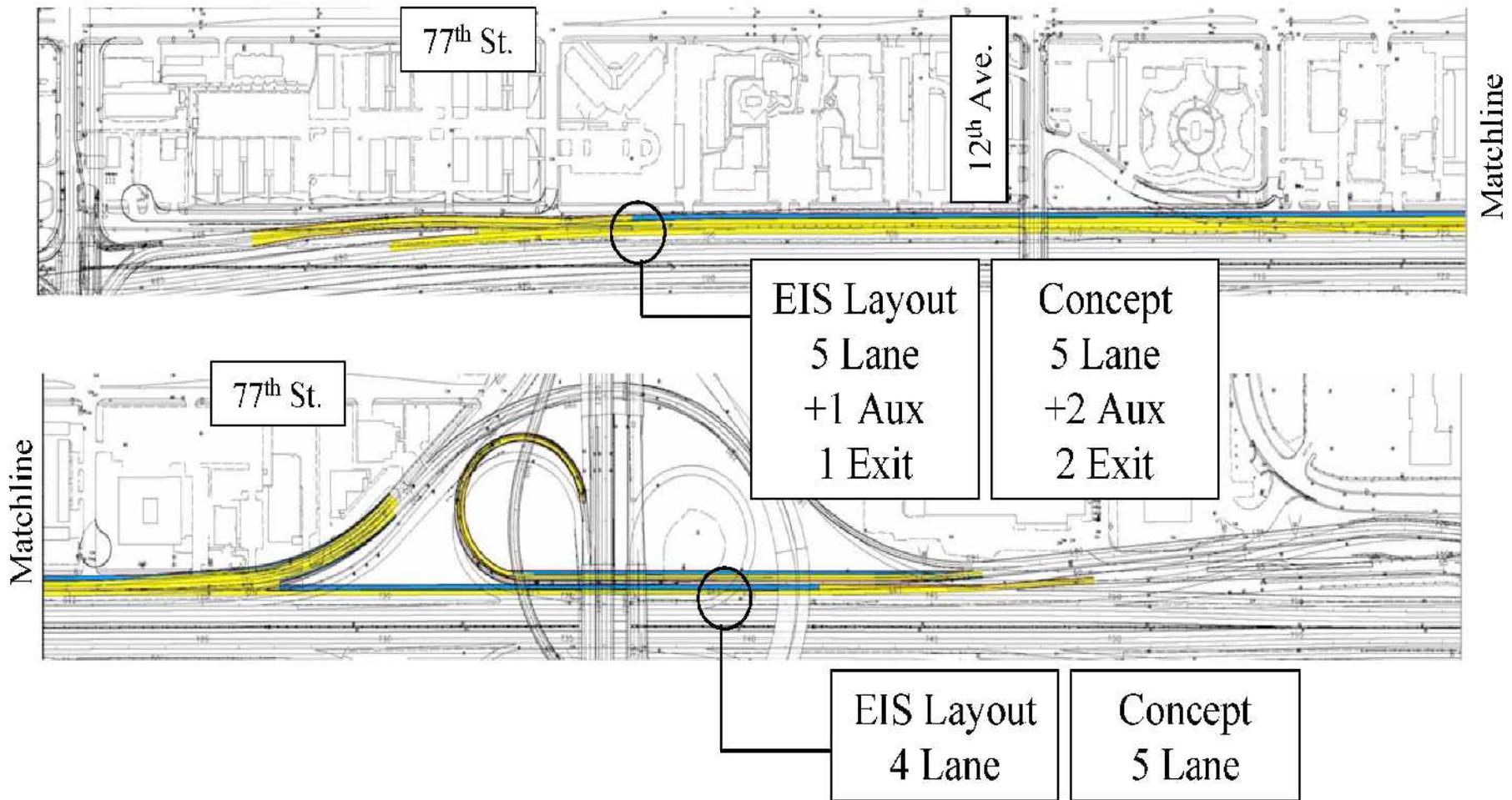
PM



h:\projects\6114\hi-mul\graphics\report\concept_1a_2030_peak_hour.dgn



h:\projects\6114\hi-mul\graphical\report\Concept 2A.dgn



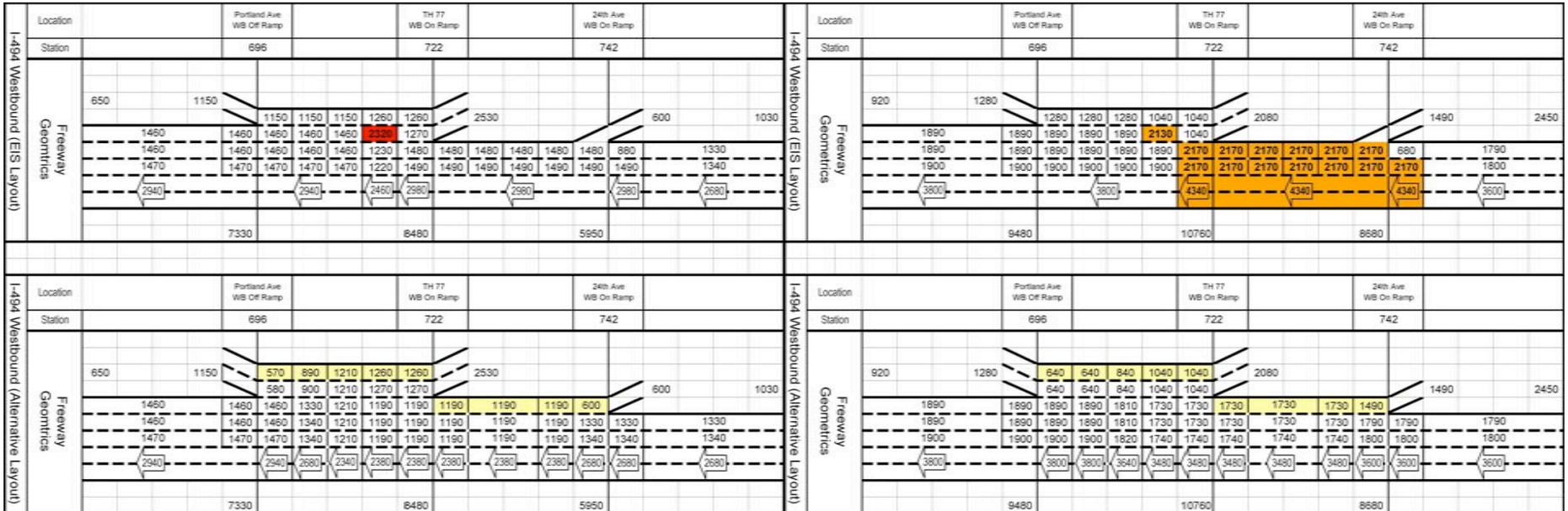
CONCEPT 2A - EXTEND 5TH LANE TO 24th AVE. RAMP
 Forecasting & Concept Development I-494 & TH 77
 S.P. 2785 - 349

↑
N
NO SCALE

Figure 20

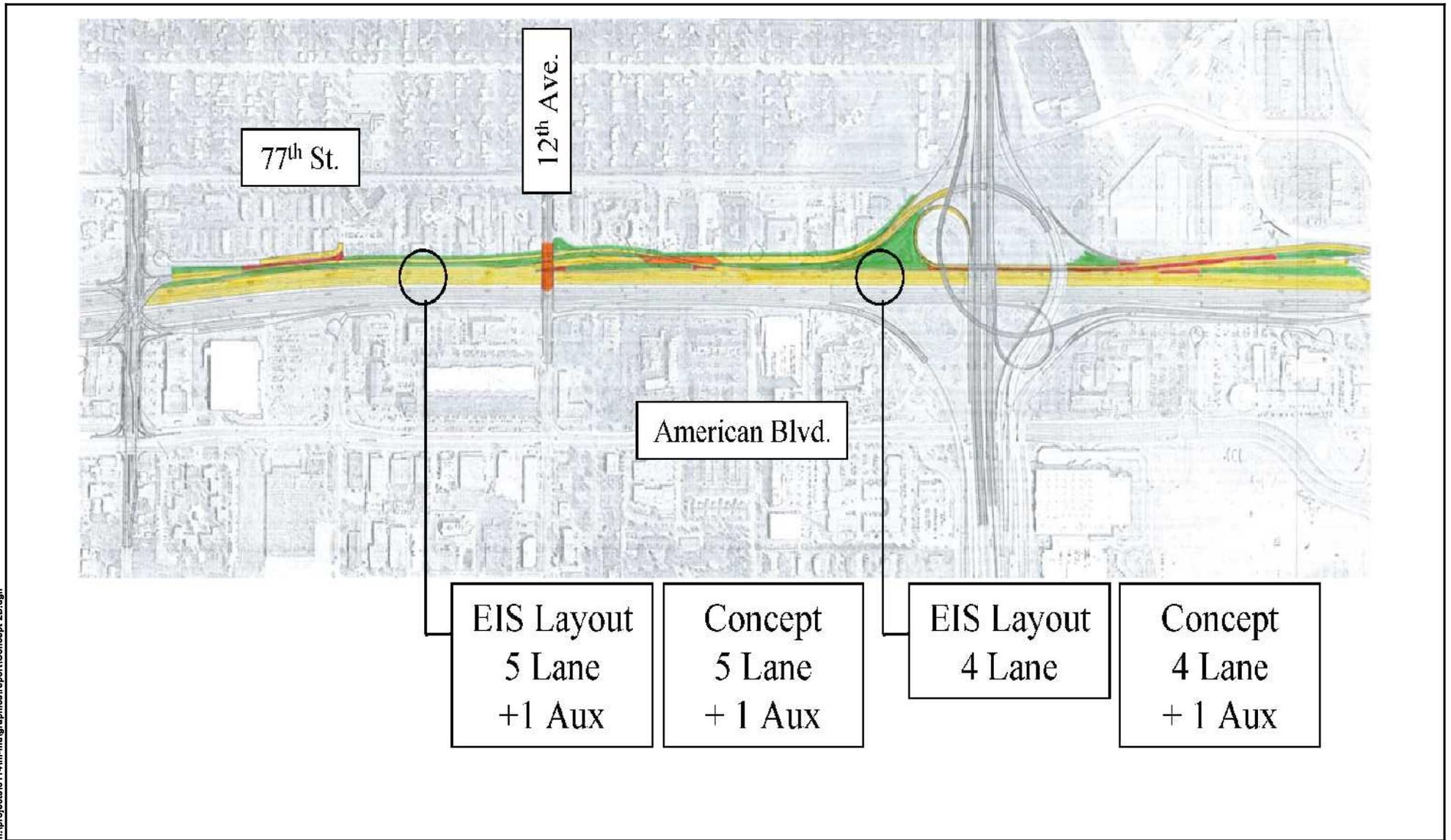
AM

PM



h:\projects\6114\hi-mul\graphics\report\Concept 2A_2030 peak hour.dgn

h:\projects\6114\hi-mu\graphical\report\Concept 2B.dgn

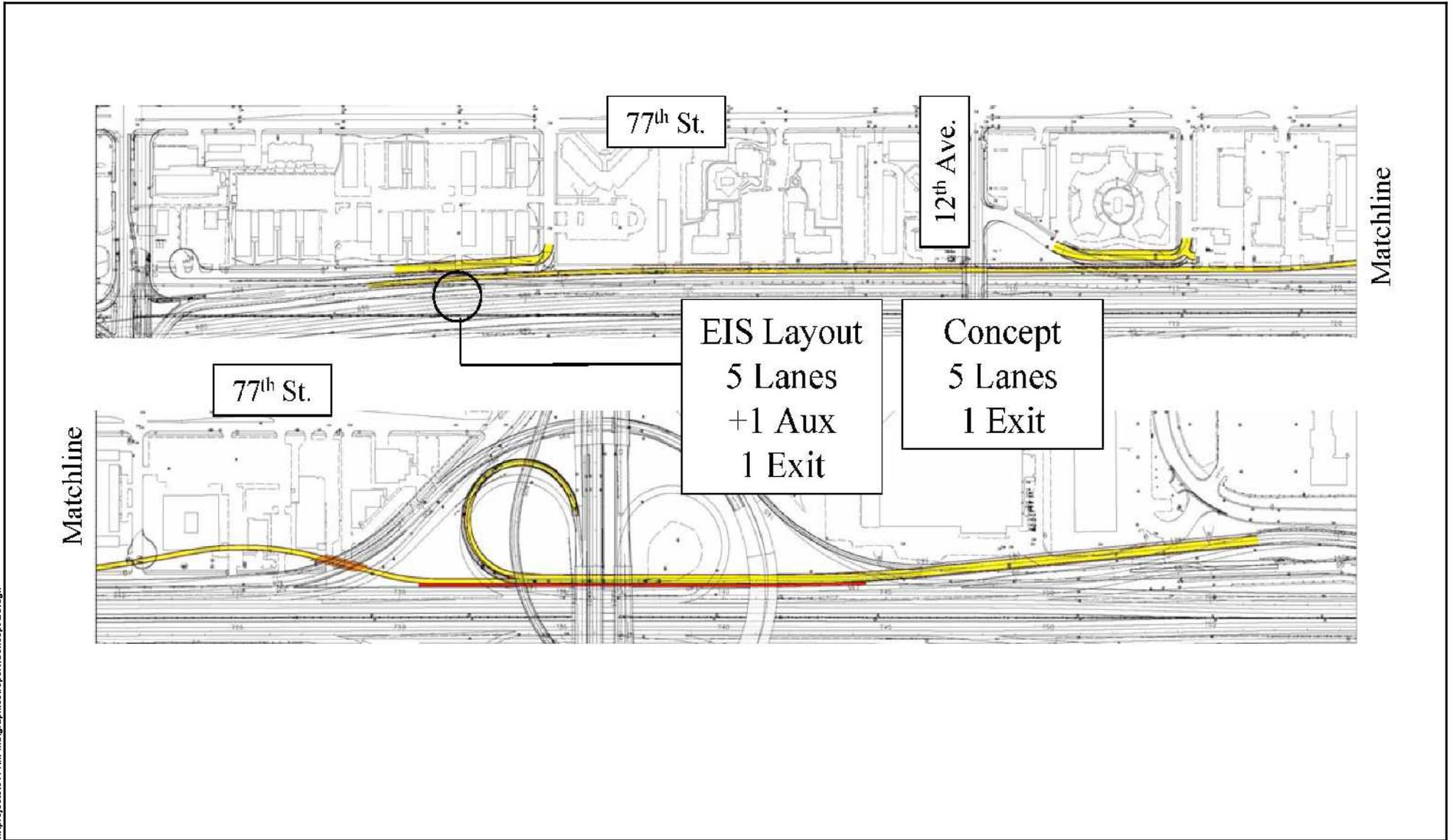


CONCEPT 2B - BRIDGE BRAID PORTLAND AVE. EXIT WITH TH 77 ENTRANCE
Forecasting & Concept Development I-494 & TH 77
S.P. 2785 - 349

↑
N NO SCALE

Figure 22

h:\projects\6114\hi-mul\graphical\report\Concept 2C.dgn

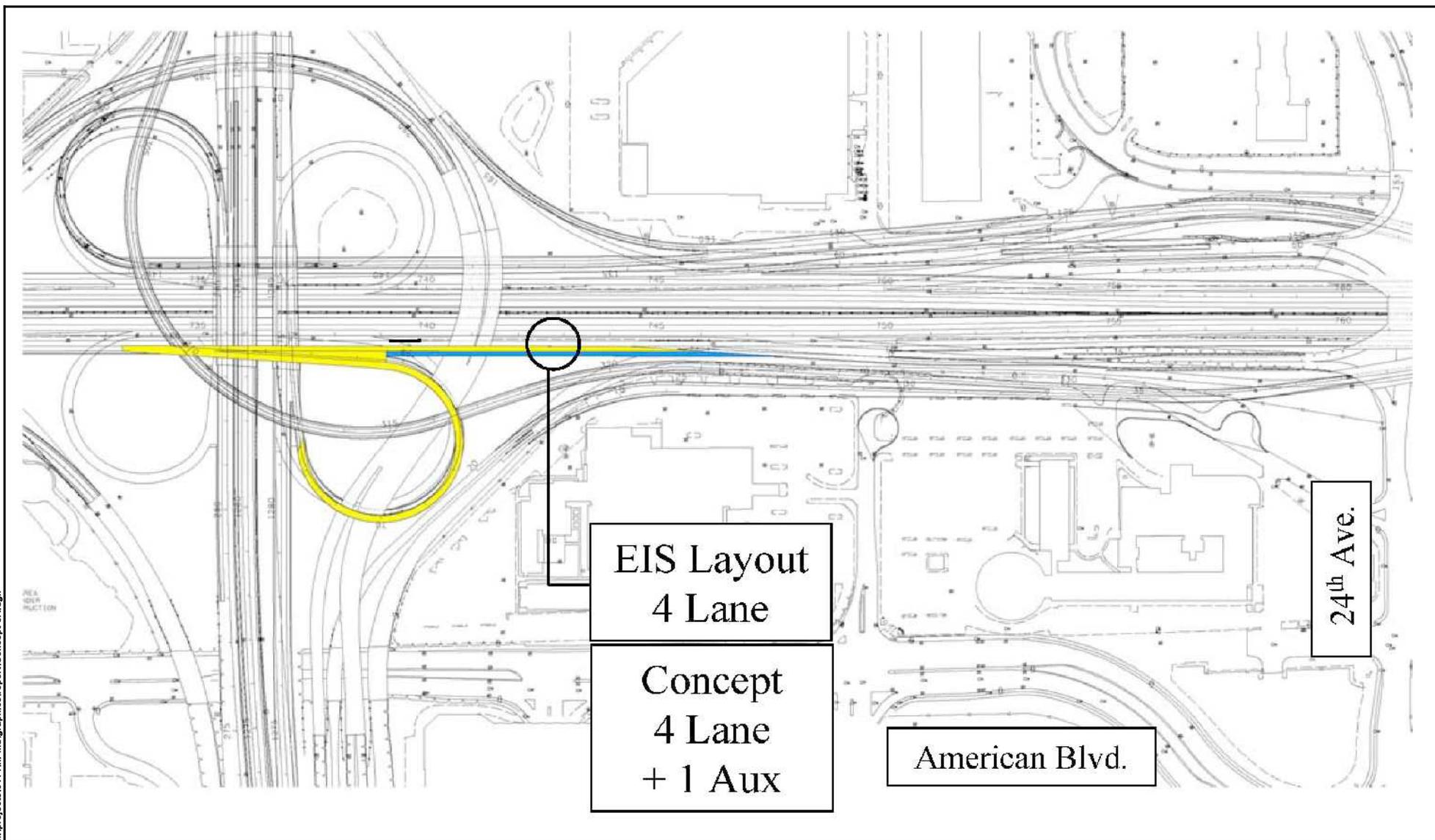


CONCEPT 2C - WB EXIT FOR PORTLAND AVE. COMBINED WITH TH 77 EXIT
 Forecasting & Concept Development I-494 & TH 77
 S.P. 2785 - 349

↑
N NO SCALE

Figure 24

h:\projects\6114\hi-mu\graphics\report\Concept 3A.dgn



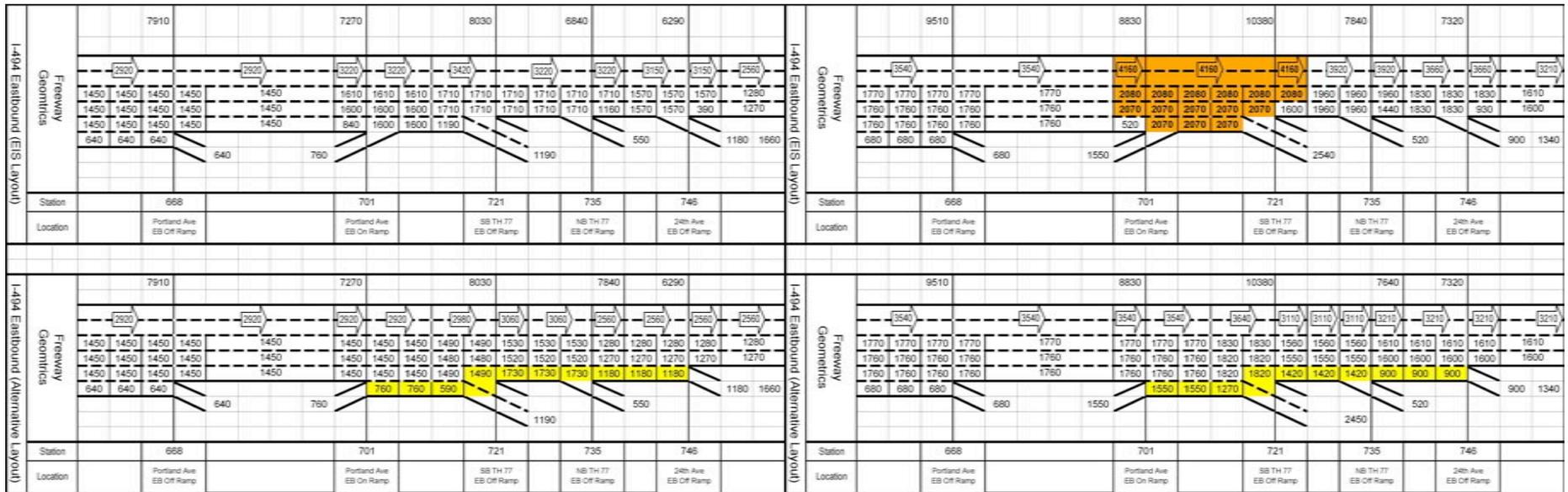
CONCEPT 3A - EXTEND EB AUXILIARY LANE TO 24th AVE. EXIT
Forecasting & Concept Development I-494 & TH 77
S.P. 2785 - 349

↑
N NO SCALE

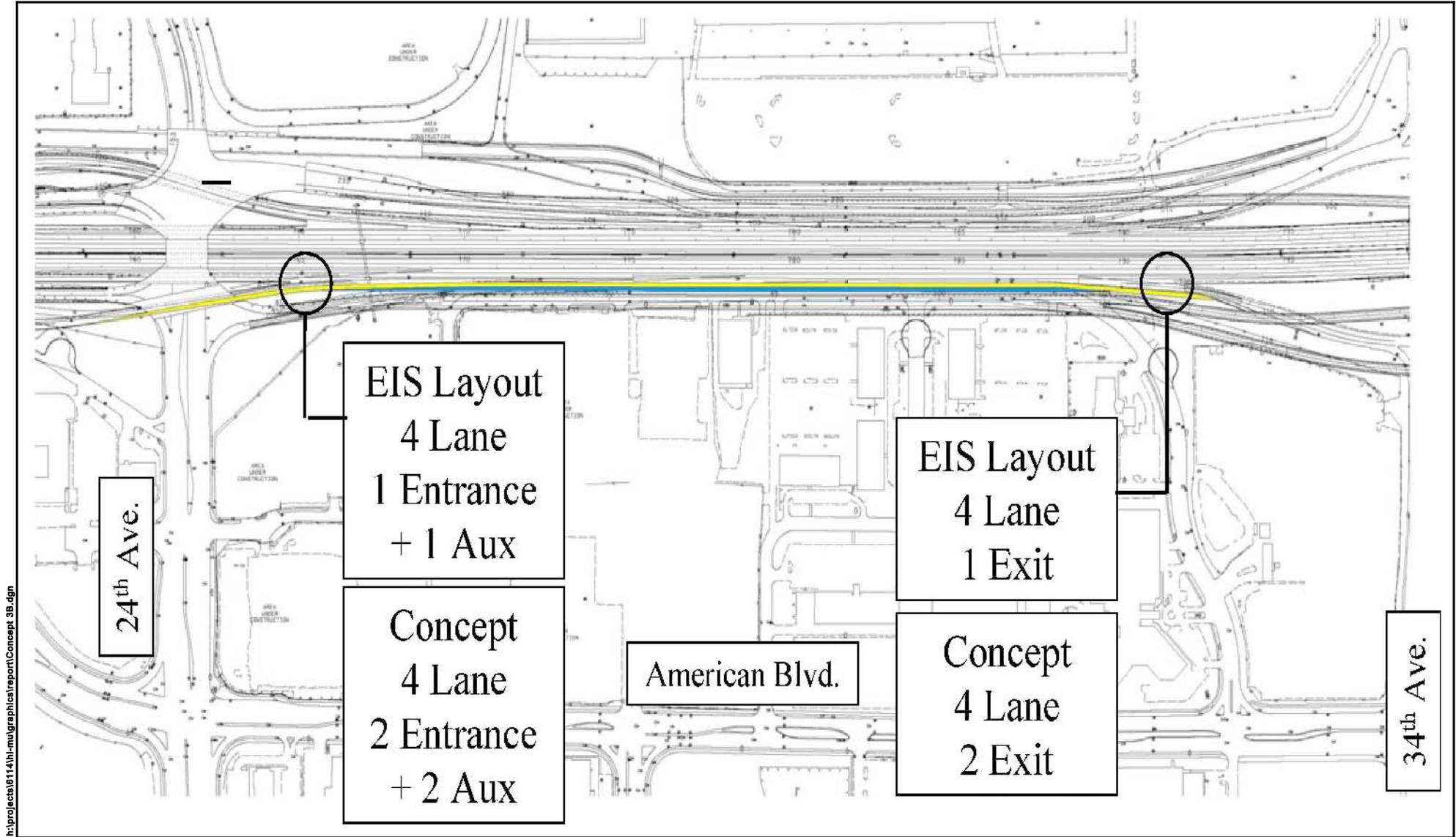
Figure 27

AM

PM



h:\projects\6114\hi-mul\graphics\report\Concept 3A_2030 peak hour.dgn



h:\projects\61141\h-m\graphic\report\Concept_3B.dgn

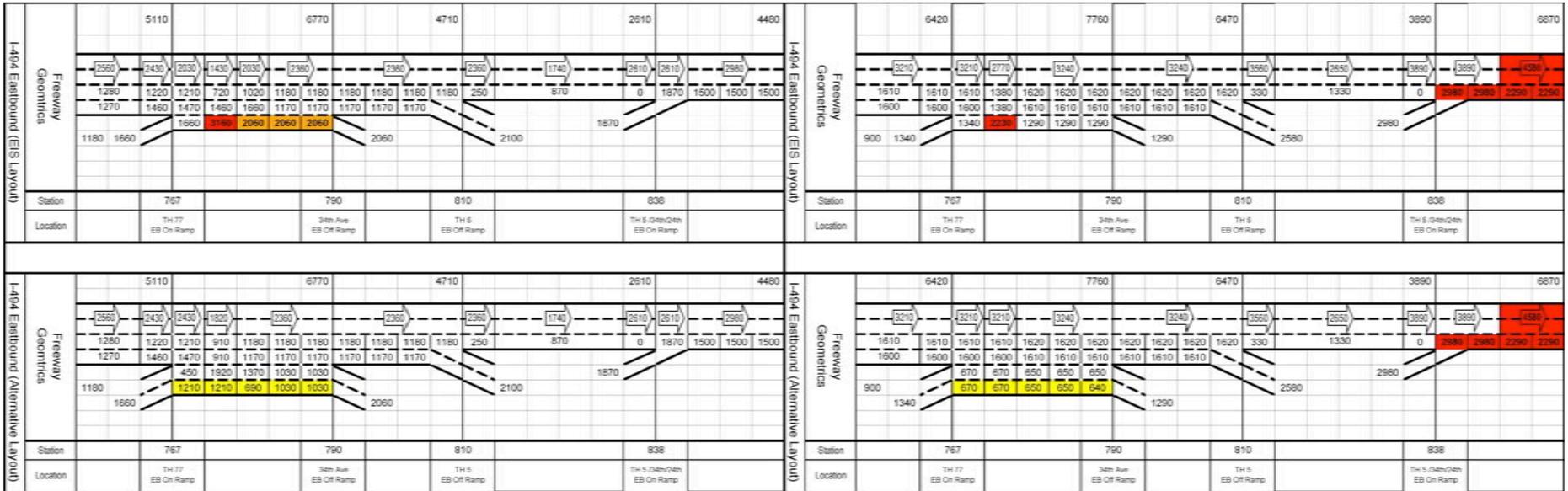


CONCEPT 3B - 2 LANE ENTRANCE FROM TH 77, 2 LANE EXIT TO 34th AVE. WITH AUXILIARY LANES BETWEEN THE RAMPS
 Forecasting & Concept Development I-494 & TH 77
 S.P. 2785 - 349

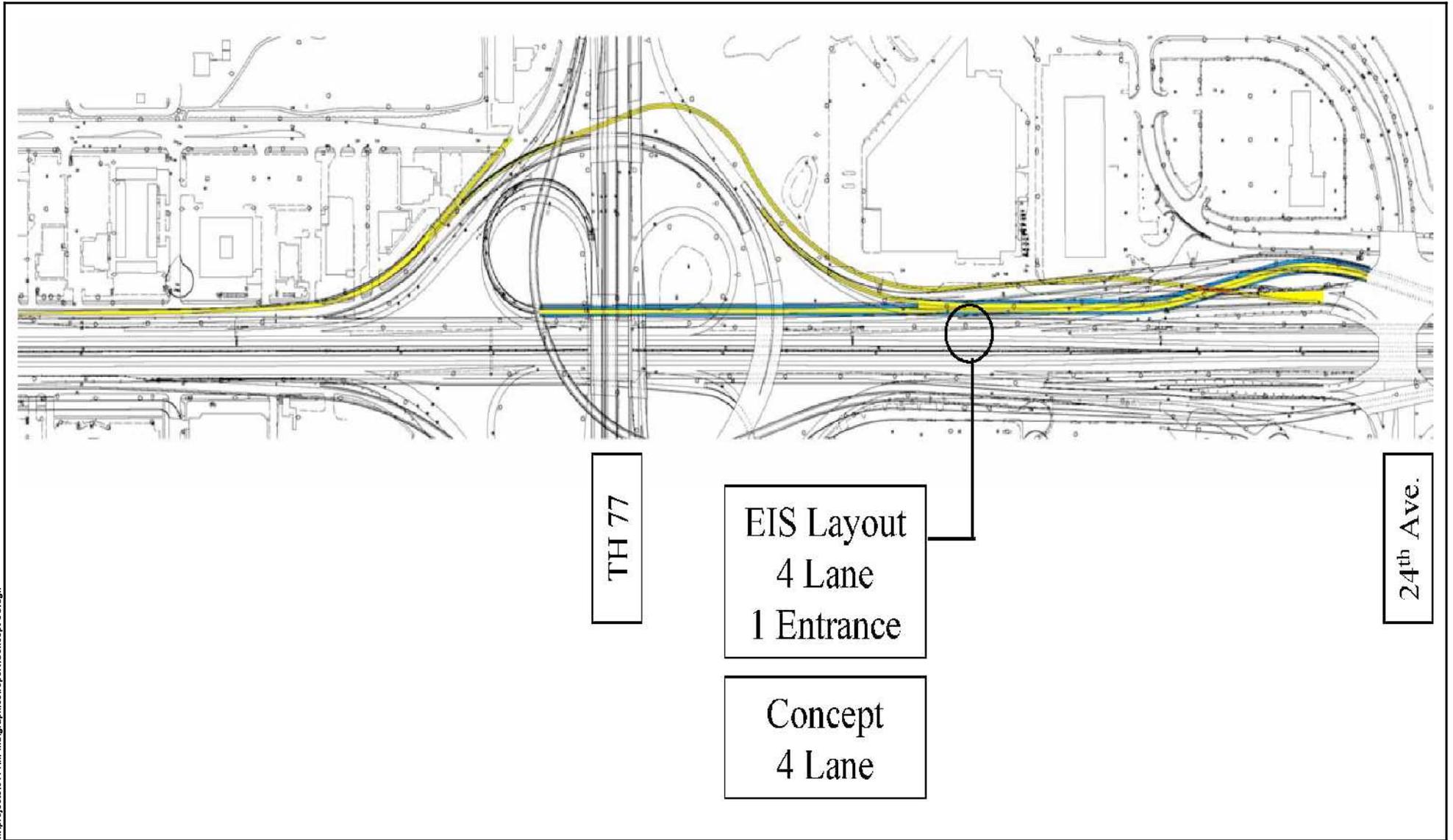
↑
N NO SCALE

AM

PM



h:\projects\6114\hi-mul\graphics\report\Concept 3B_2030 peak hour.dgn



TH 77

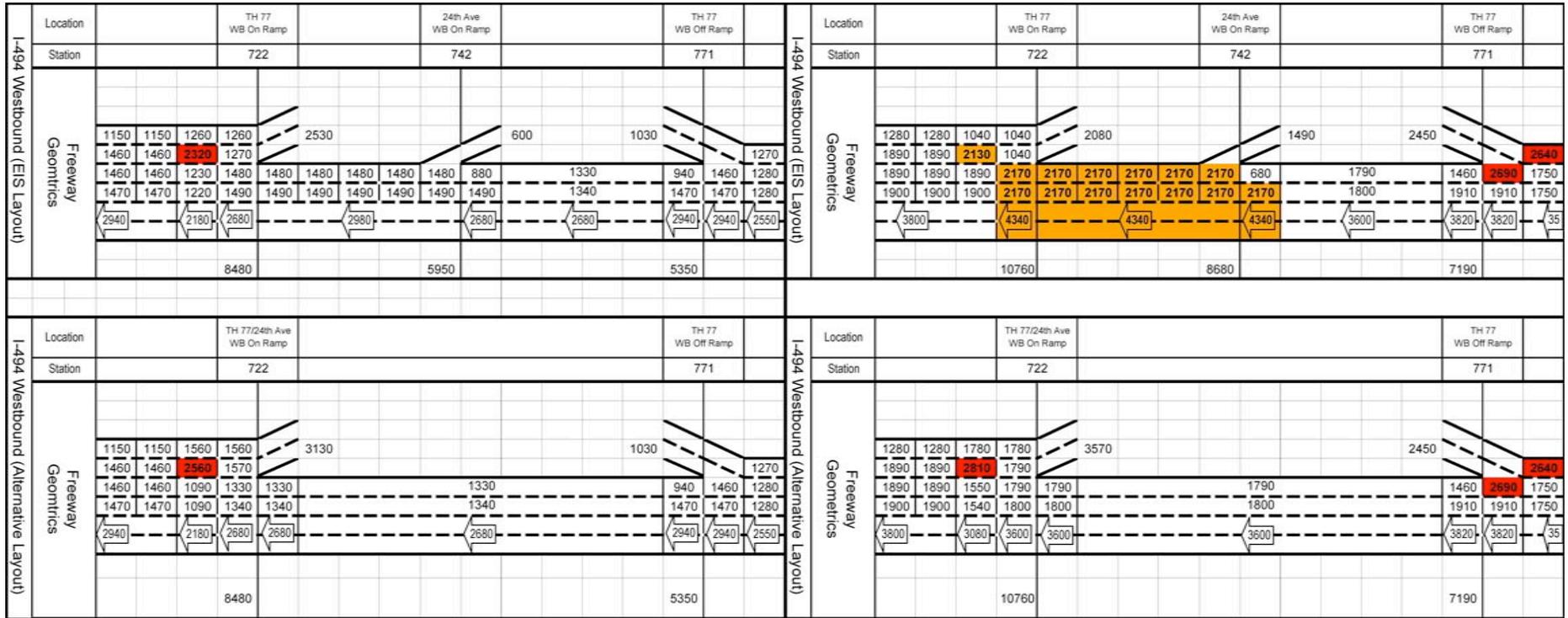
EIS Layout
4 Lane
1 Entrance

Concept
4 Lane

24th Ave.

AM

PM

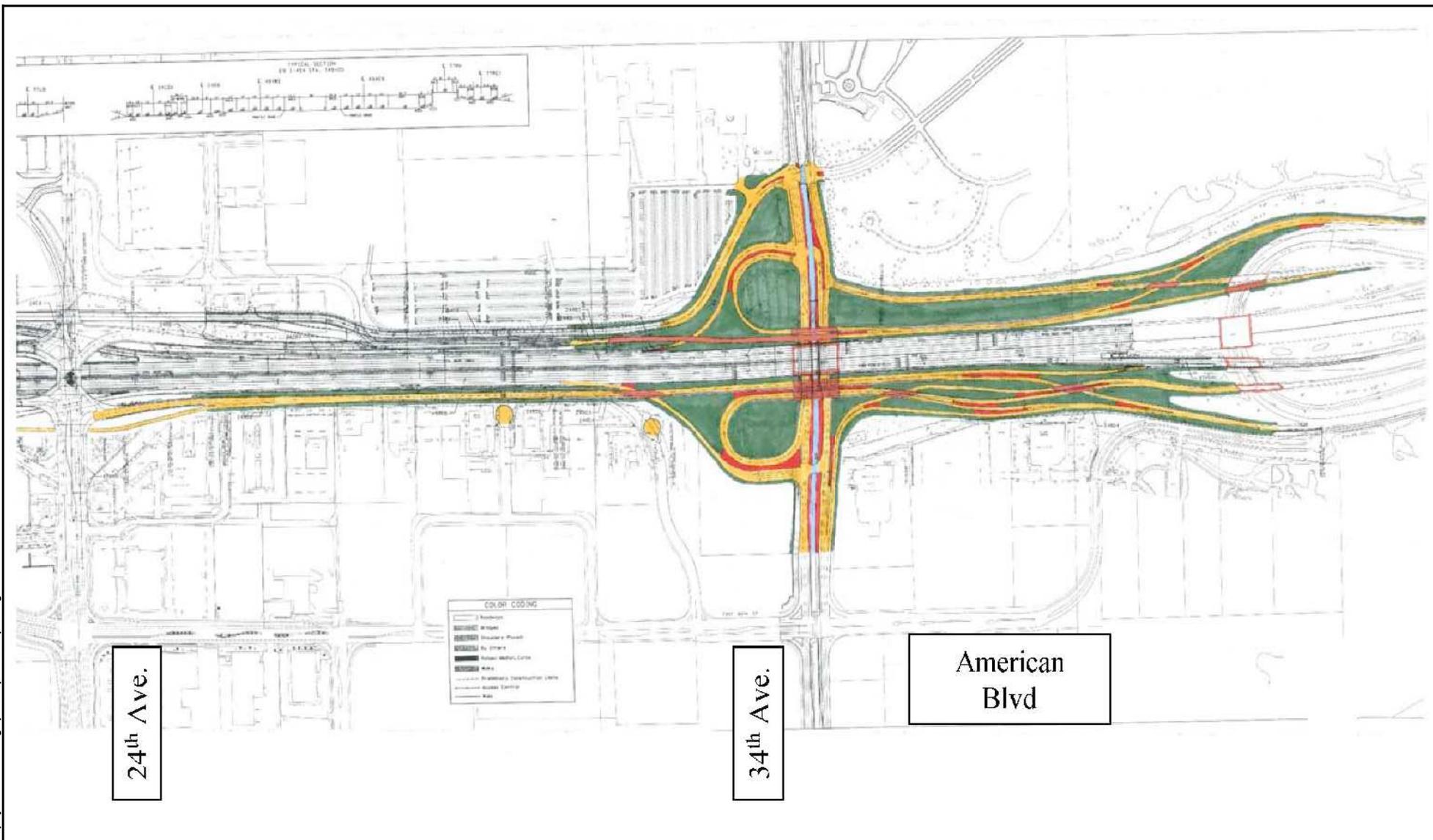


h:\projects\6114\hi-mu\graphics\report\Concept 3C_2030 peak hour.dgn



Figure 32

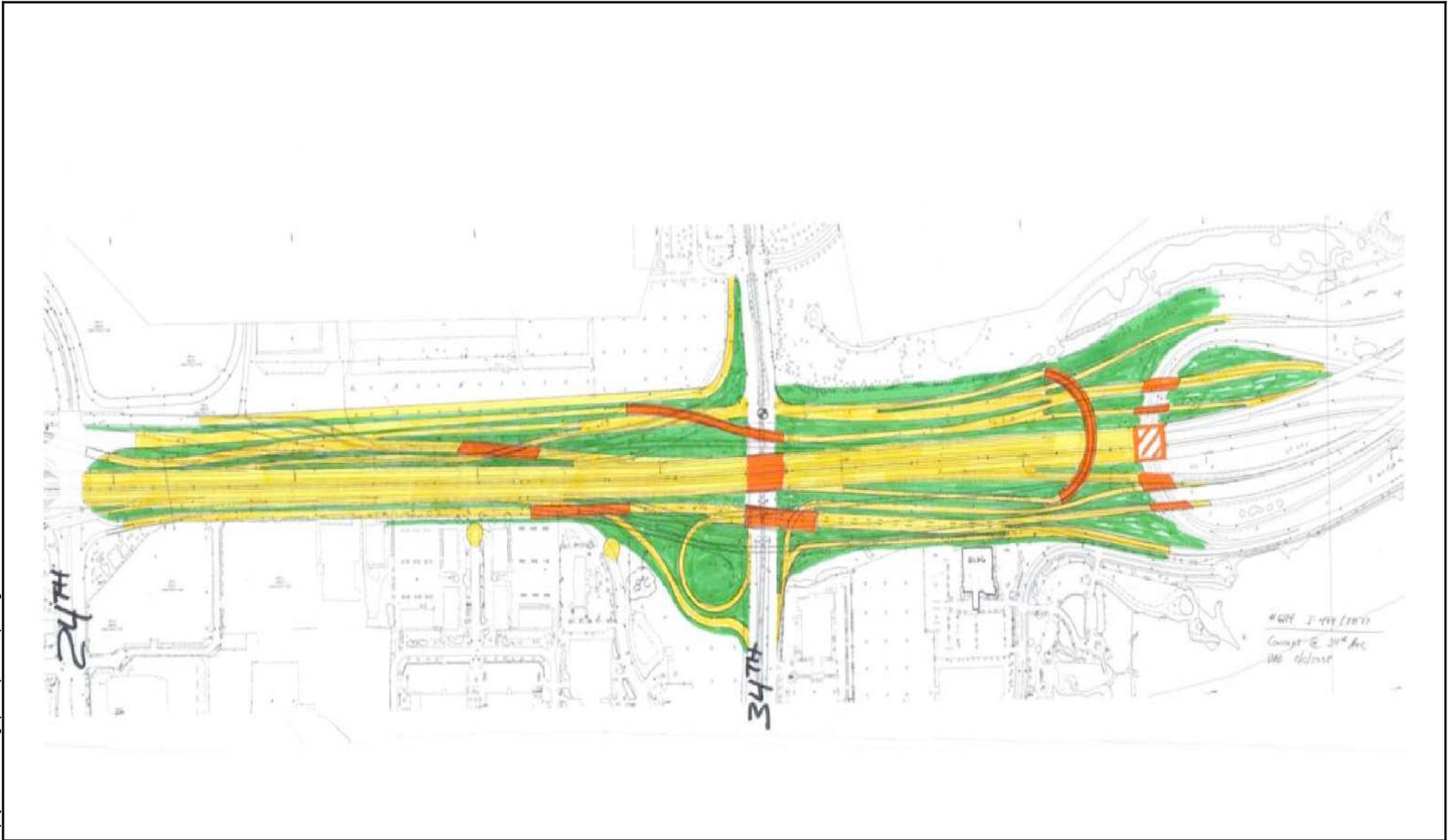
h:\projects\16114\hi-mu\graphical\report\Concept 5A.dgn



CONCEPT 5A - FOLDED DIAMOND WITH REDUCED CONFLICT RAMP INTERSECTIONS
 Forecasting & Concept Development I-494 & TH 77
 S.P. 2785 - 349

↑
N NO SCALE

h:\projects\6114\h-m\graphical\report\Concept_5B.dgn

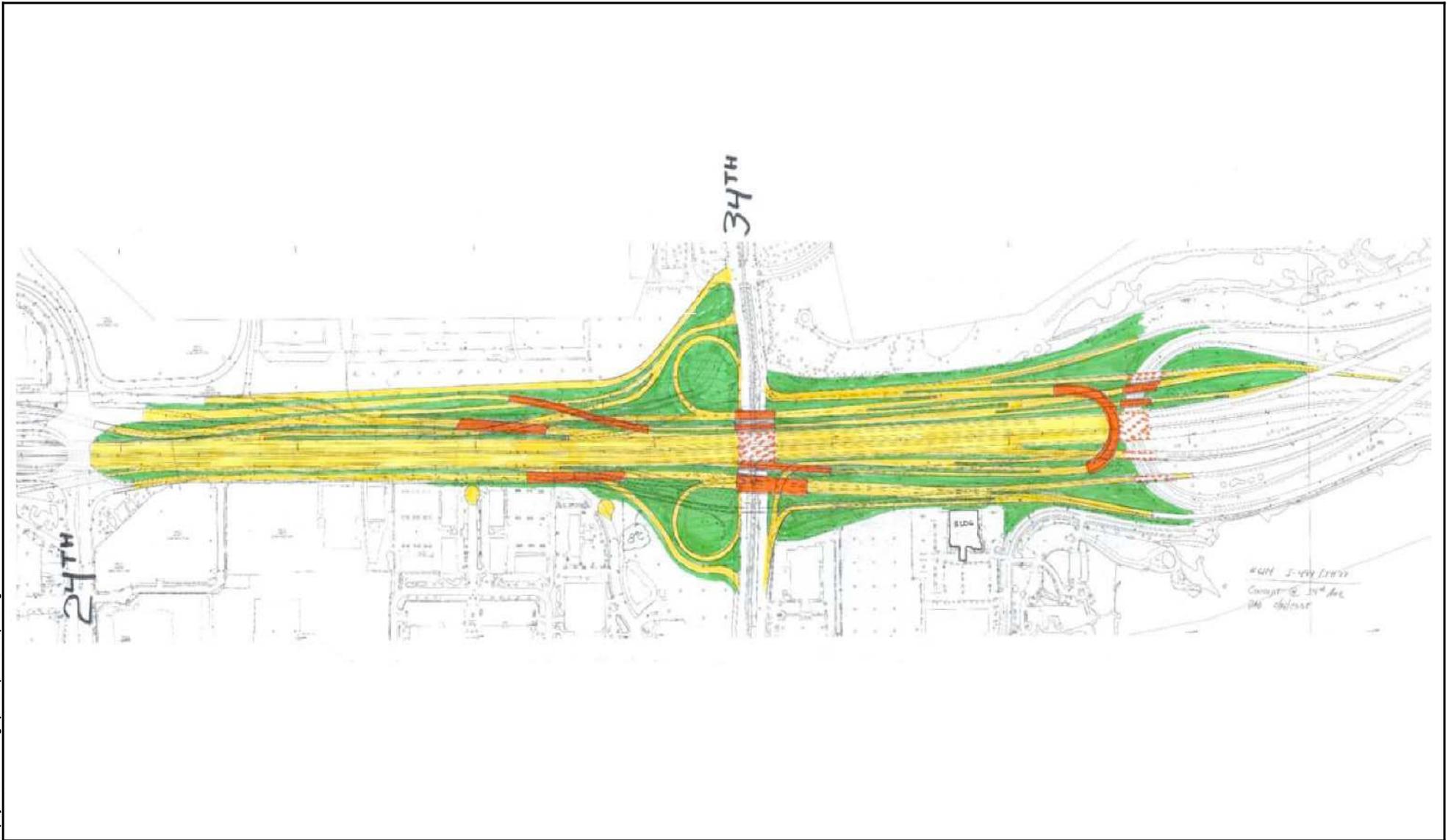


CONCEPT 5B - LOOP IN SW QUADRANT AND INVERTED LOOP TO EAST OF 34th AVE., 1 RAMP INTERSECTION CROSSING LRT
Forecasting & Concept Development I-494 & TH 77
S.P. 2785 - 349

↑
N NO SCALE

Figure 34

h:\projects\6114\hi-mu\graphical\report\Concept_5C.dgn



CONCEPT 5C - FOLDED DIAMOND AND INVERTED LOOP TO EAST OF 34th AVE., NO RAMP INTERSECTIONS CROSSING LRT
Forecasting & Concept Development I-494 & TH 77
S.P. 2785 - 349

↑
N NO SCALE

Figure 35

h:\projects\6114\hi-mul\graphical\report\Concept 5D.dgn

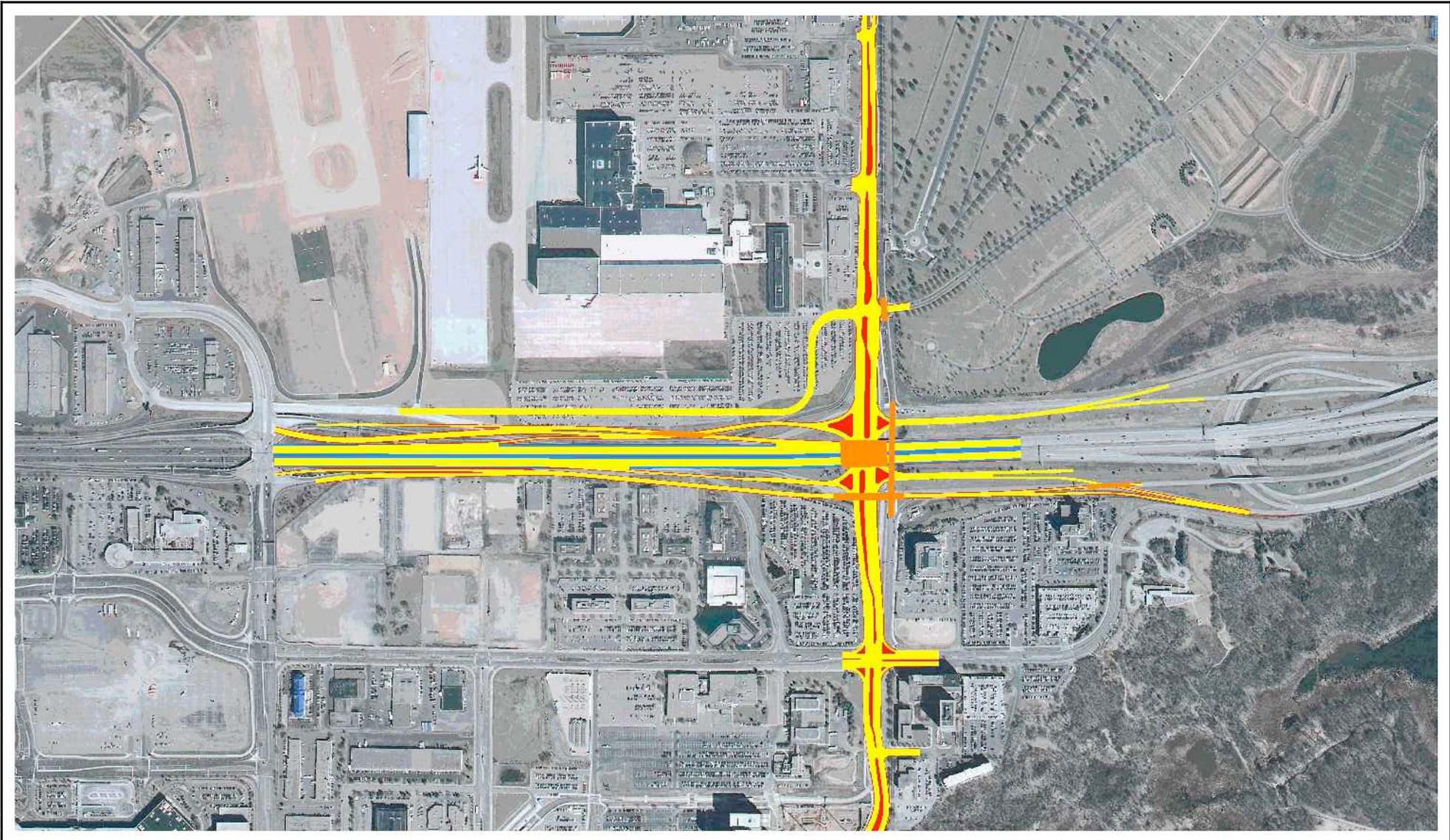


CONCEPT 5D - SINGLE POINT INTERCHANGE WITH EXISTING 34th AVE.
Forecasting & Concept Development I-494 & TH 77
S.P. 2785 - 349

↑
N NO SCALE

Figure 36

h:\projects\6114\HI-MU\Graphical\Report\Concept 5E.dgn



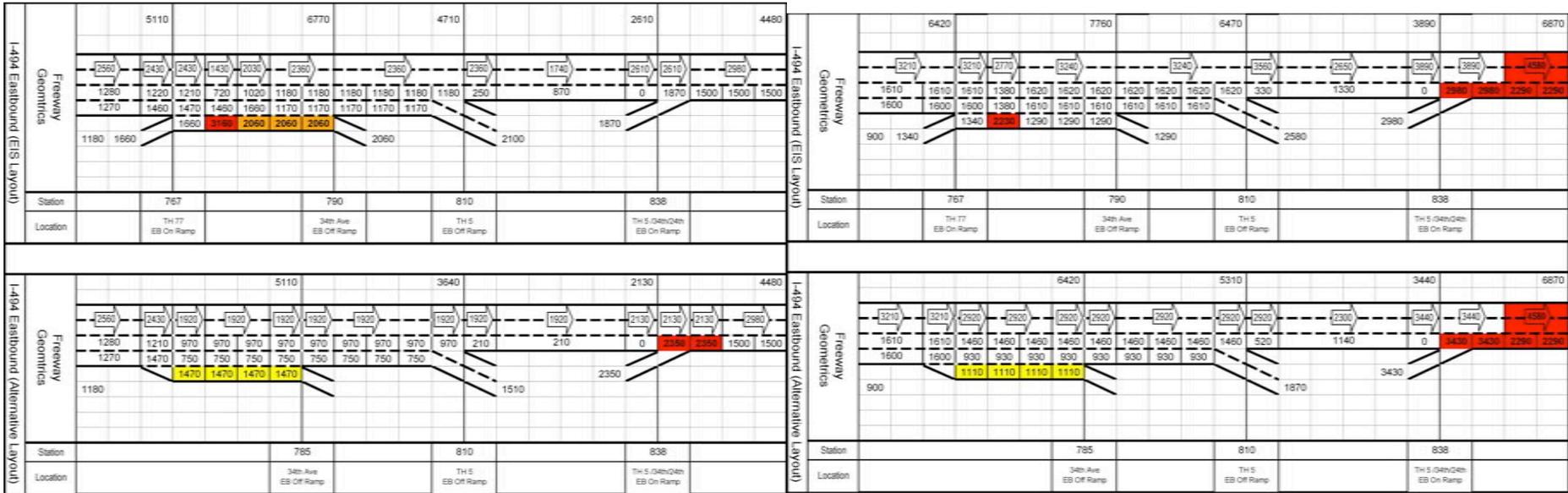
CONCEPT 5E - SINGLE POINT INTERCHANGE WITH RELOCATED 34th AVE.
Forecasting & Concept Development I-494 & TH 77
S.P. 2785 - 349

↑
N NO SCALE

Figure 37

AM

PM

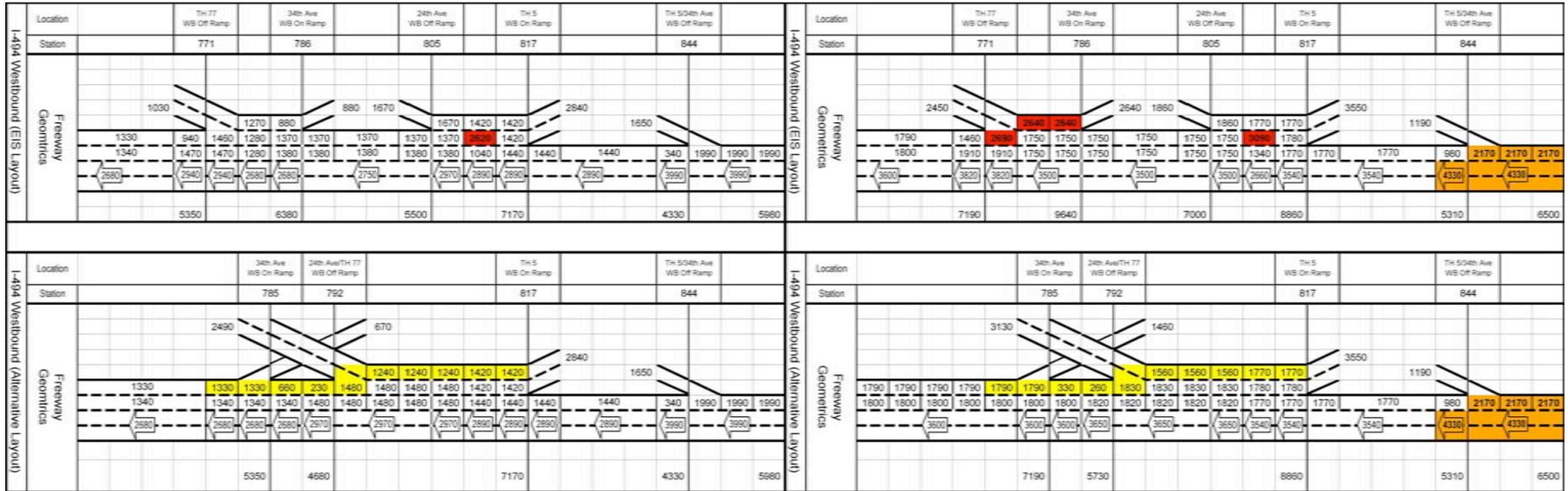


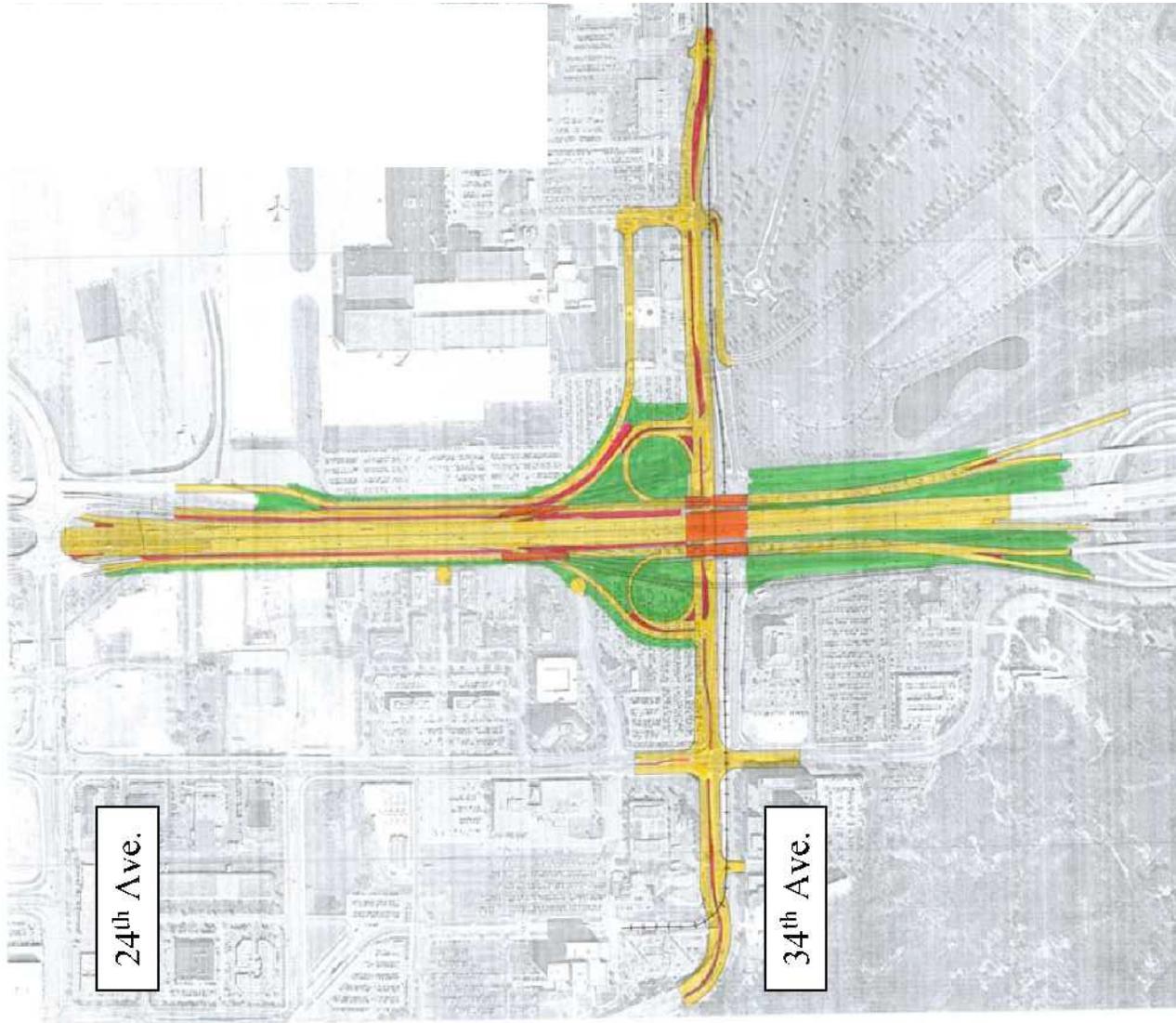
h:\projects\6114\hi-mul\graphics\report\Concept 5D & 5E_eb 2030 peak hour.dgn

AM

PM

h:\projects\6114\hi-mu\graphics\report\Concept 5D & 5E_wb 2030 peak hour.dgn





24th Ave.

34th Ave.

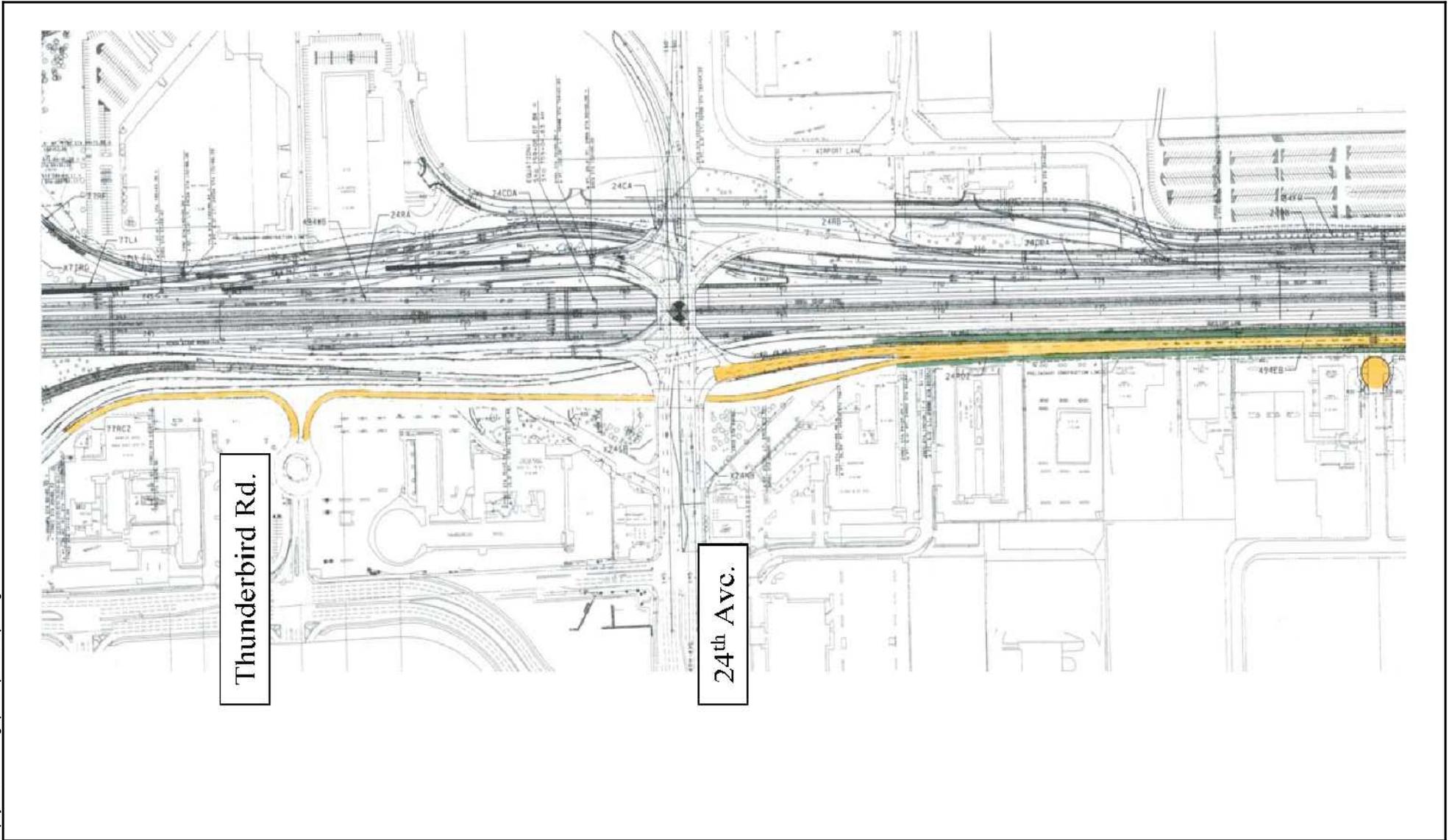


CONCEPT 5F - FOLDED DIAMOND INTERCHANGE WITH RELOCATED 34th AVE.

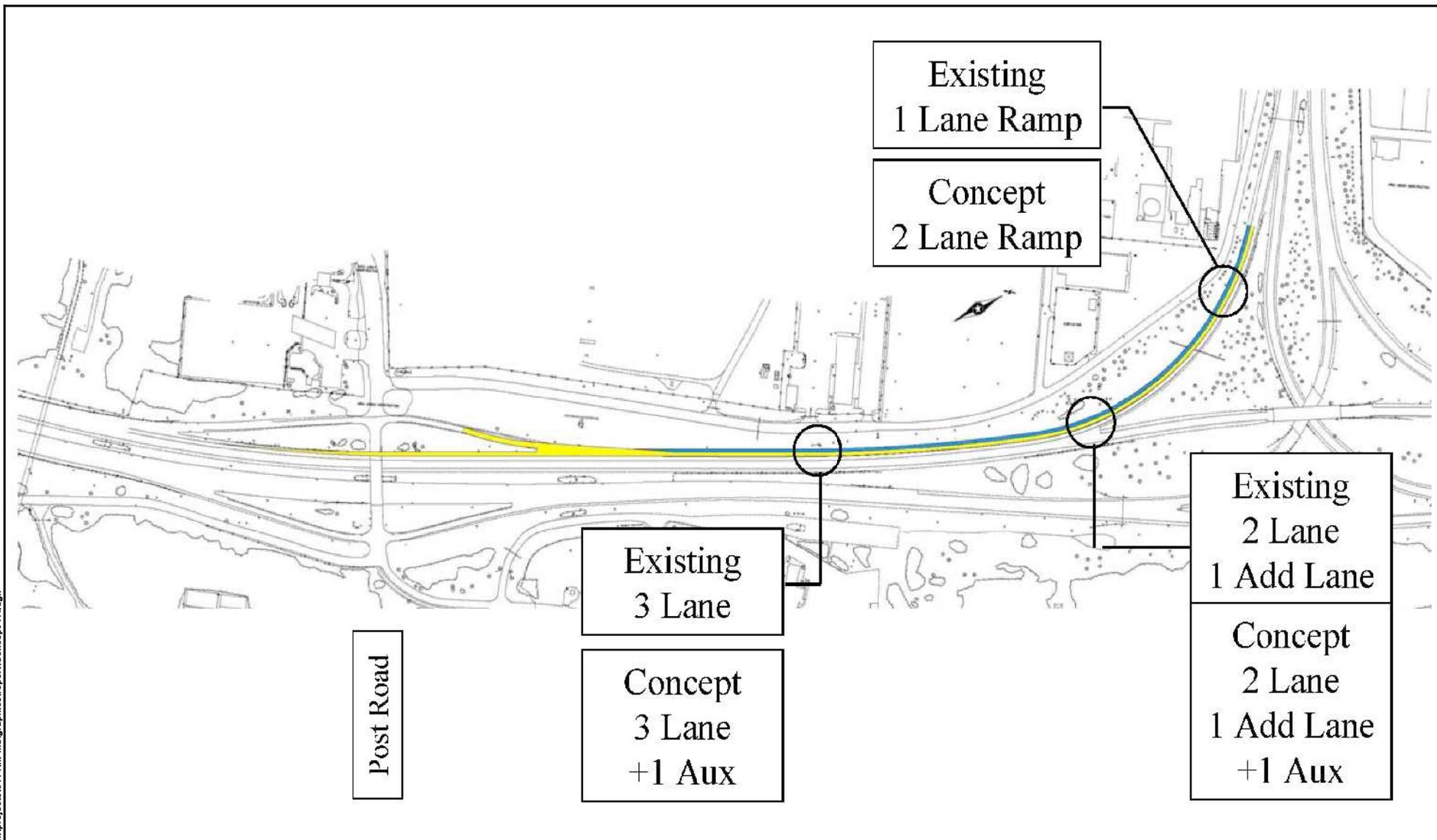
Forecasting & Concept Development I-494 & TH 77
S.P. 2785 - 349

↑
N NO SCALE

Figure 40

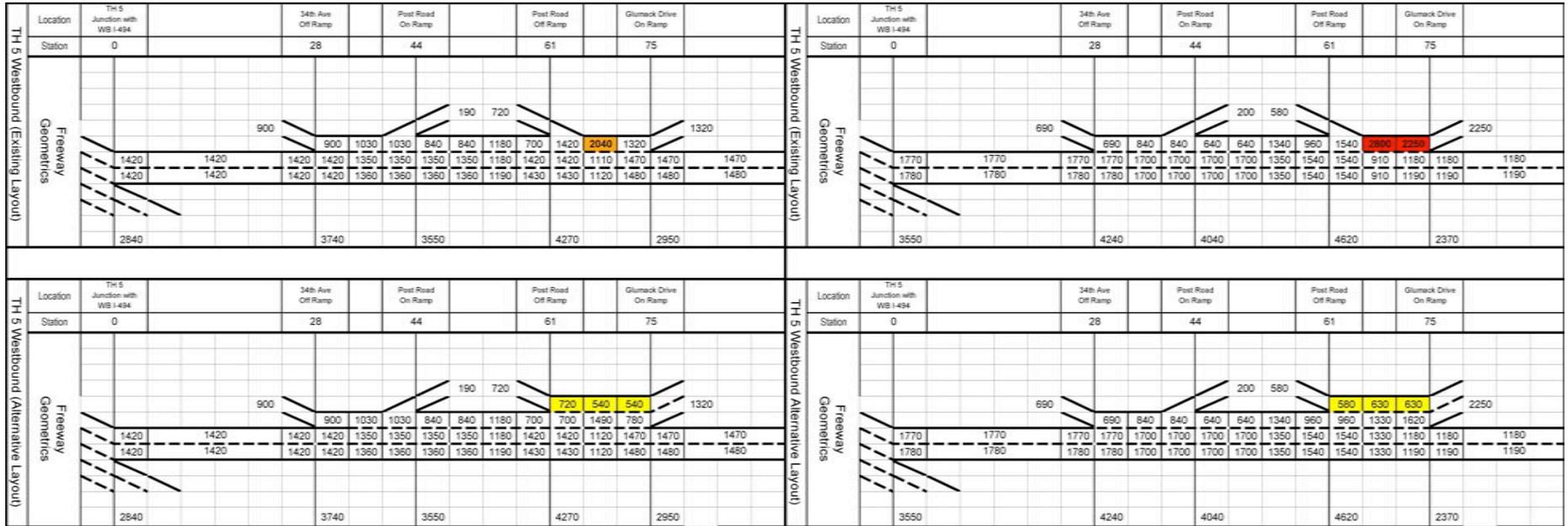


h:\projects\6114\hi-mu\graphical\report\Concept 7A.dgn



AM

PM



h:\projects\6114\hi-mu\graphics\report\Concept 7A_2030 peak hour.dgn



AM

h:\projects\6114\hi-mul\graphics\report\Existing I-494 TH 100 to portland_2020 AM peak hour.dgn

Location	France Ave EB Off Ramp				SB France Ave EB On Ramp		NB France Ave EB On Ramp		Penn Ave EB Off Ramp		Penn Ave EB On Ramp		SB I-35W EB On Ramp		SB I-35W NB Off Ramp		NB I-35W EB On Ramp		Lyndale Ave EB Off Ramp		Lyndale Ave EB On Ramp		Nicollet Ave EB Off Ramp		Nicollet Ave EB On Ramp										
	Station	3500	3500	3500	3500	5000	5000	6000	6000	9000	9000	11000	11500	11500	12500	13000	13000	14000	14500	14500	16000	16000	17000	17000	19000	19000									
I-494 Westbound Freeway Geometrics																																			
				270				280	1340												1000														
		1600	1600	270						580				780		160	590				1370	410													
		1600	1600	2040	2040	2040	2040	1760	1950	2400	2400	2400	2400	2200	2200	1650	2410	2410	1560	2150	2150	1600	1950	1950	1950	1080	2220	2220	2220	2220	2080	2280	2280	2280	
		1600	1600	2040	2040	2040	2050	2050	1950	2400	2400	2400	2400	2210	2210	2410	2410	2410	2150	2150	2150	1960	1960	1960	1960	2220	2220	2220	2220	2290	2290	2290	2290		
	1610	1610	2040	2040	2040	2050	2050	1960	2400	2400	2400	2400	2210	2210	2420	2420	2420	2160	2160	2160	1960	1960	1960	1960	2220	2220	2220	2220	2290	2290	2290	2290			
	6410		6410	6140		6140	5860	5860	7200		7200	6620		6620	7400	7240	7240	7830	6460	6460	6870	5870		5870	7010	7010	6660		6660	6860		6860			
I-494 Eastbound Freeway Geometrics		7360		7360	6130	6130	6560	6560	6980		6980	6430		6430	7060	5900	5900	6860	5950	5950	6870	6390		6390	6990	6990	6800		6800	7150		7150			
		1840	2050	2050	2050	2190	2190	2330	2330	2330	2330	2270	2270	2270	2150	2150	2150	1970	1970	1970	1990	1990	1990	2130	2130	2130	2130	2130	2270	2270	2270	2390	2390	2390	
		1840	2040	2040	2040	2040	2190	2190	2330	2330	2330	2260	2260	2260	2140	2140	2140	1970	1970	1970	1980	1980	1980	2130	2130	2130	2130	2130	2270	2270	2270	2390	2390	2390	
		1840	2040	2040	2040	2040	1750	2180	1900	2320	2320	2320	2450	2450	1900	2140	2140	980	1960	1960	1050	1980	1980	1500	2130	2130	2130	2130	2260	2260	2260	2030	2380	2380	2380
		1840	1230	1230																															
				1230			430	420			550																								
Station		3000		4500		5500				9000				11000	11500		12500	13000		14000	14500		16000	17000		19000									
Location		France Ave EB Off Ramp		SB France Ave EB On Ramp		NB France Ave EB On Ramp				Penn Ave EB Off Ramp				Penn Ave EB On Ramp	SB I-35W EB Off Ramp	SB I-35W EB On Ramp	NB I-35W EB Off Ramp	NB I-35W EB On Ramp		Lyndale Ave EB Off Ramp		Lyndale Ave EB On Ramp		Nicollet Ave EB Off Ramp		Nicollet Ave EB On Ramp									

**EXISTING I-494 (NO-BUILD) - TH 100 TO PORTLAND AVE.
2020 AM PEAK HOUR LANE ASSIGNMENT**

Forecasting & Concept Development I-494 & TH 77
S.P. 2785 - 349



Figure 44

PM

h:\projects\6114\hi-mul\graphics\report\Existing I-494 TH 100 to portland_2020 PM peak hour.dgn

Location	France Ave EB Off Ramp		SB France Ave EB On Ramp		NB France Ave EB On Ramp		Penn Ave EB Off Ramp		Penn Ave EB On Ramp		SB I-35W EB Off Ramp		SB I-35W EB On Ramp		NB I-35W EB Off Ramp		NB I-35W EB On Ramp		Lyndale Ave EB Off Ramp		Lyndale Ave EB On Ramp		Nicollet Ave EB Off Ramp		Nicollet Ave EB On Ramp								
	Station																																
I-494 Westbound Freeway Geometrics																																	
				800			760	1070			760		970	790	660		1300	1030		650		1000		240		300							
	2190	2190	800									1760	2560	2560	1690	2350	2350	1450	2480	2480	2480	1690	2730	2730	2730	2530	2830						
	2190	2190	2650	2650	2650	2410	2400	2760	2760	2000	2500	2500	2500	2560	2560	1690	2350	2350	1450	2480	2480	2480	1690	2730	2730	2730	2530	2830					
	2190	2190	2660	2660	2660	2410	2400	2760	2760	2760	2510	2510	2510	2570	2570	2350	2350	2480	2480	2480	2480	2480	2730	2730	2730	2830	2830						
2200	2200	2660	2660	2660	2410	2410	2760	2760	2760	2510	2510	2510	2570	2570	2360	2360	2360	2480	2480	2480	2480	2740	2740	2740	2840	2840							
8770		8770	7970		7970	7210	7210	8280		8280	7520		7520	8490	7700	7700	8360	7060	7060	8090	7440		7440	8440	8440	8200		8200	8500				
I-494 Eastbound Freeway Geometrics	7050		7050	6380		6380	7380	7380	8050		8050	7410		7410	7860	6630	6630	7320	6090	6090	7310	6870		6870	8040	8040	7880		7880	8270			
	1770	2130	2130	2130	2130	2460	2460	2690	2690	2690	2550	2550	2470	2470	2470	2090	2210	2210	2210	2030	2030	2030	2290	2290	2290	2290	2290	2630	2630	2630	2760	2760	
	1760	2130	2130	2130	2130	2460	2460	2680	2680	2680	2540	2540	2470	2470	2470	2080	2210	2210	2210	2030	2030	2030	2290	2290	2290	2290	2630	2630	2630	2760	2760		
	1760	2120	2120	2120	1460	2460	2010	2680	2680	2680	2580	2960	2960	2470	2470	2470	2080	2210	2210	980	2030	2030	1660	2290	2290	2290	2290	2130	2620	2520	2620	2360	2750
	1760	670	670										640			1610	1230	690	1920	1230	1220	1590			1170	1330			390				
Station		3000		4500		5500				9000			11000	11500		12500	13000		14000	14500		16000		17000			19000						
Location		France Ave EB Off Ramp		SB France Ave EB On Ramp		NB France Ave EB On Ramp			Penn Ave EB Off Ramp			Penn Ave EB On Ramp	SB I-35W EB Off Ramp	SB I-35W EB On Ramp	NB I-35W EB Off Ramp	NB I-35W EB On Ramp	Lyndale Ave EB Off Ramp		Lyndale Ave EB On Ramp		Nicollet Ave EB Off Ramp		Nicollet Ave EB On Ramp			Nicollet Ave EB On Ramp							

**EXISTING I-494 (NO-BUILD) - TH 100 TO PORTLAND AVE.
2020 PM PEAK HOUR LANE ASSIGNMENT**

Forecasting & Concept Development I-494 & TH 77
S.P. 2785 - 349



Figure 45

AM

h:\projects\6114\hi-mulgraphics\report\Existing I-494 portland to TH 5_2020 AM peak hour.dgn

Location	Portland Ave WB On Ramp	WB Right Lane Drop	12th Ave WB On Ramp	SB TH 77 WB On Ramp	SB TH 77 WB Off Loop	NB 77 WB On Loop	24th Ave WB On Ramp	TH 77 WB Off Ramp	24th Ave WB Off Ramp	34th Ave WB On Ramp	TH 5 WB On Ramp	TH 5/34th Ave WB Off Ramp				
Station	675	695	715	725	735	740	750	770	780	790	820	845				
I-494 Westbound Freeway Geometrics																
		350		960		2240 500		120	340 430	1540	2010 820	820	2570	1240		
	2280	2280 1930 2170	2170	1620 1630	1580 1580 1740 1740	1740 1700	1700 1410	1750 1750	1430 1310	1480 1480	1480 1480	1410 1540	1280 1280	450 1690	1690	
	2290	2290 2290 2170	2170	1630 1630	1580 1580 1740 1740	1740 1700	1700 1930	1760 1760	1420 1300	1480 1480	1480 1480	1410 1150	1280 1280	1700 1700	1700	
	2290	2290 2290 2170	2170	1630 1630	1590 1590 1750 1750	1750 1710	1710 1930	1760 1760	1430 1310	1490 1490	1490 1490	1420 1160	1290 1290	1700 1700	1700	
	6860	6510	6510	7470	5230 5730	5610		5270	5700	7240	6420	3850	5090			
I-494 Eastbound Freeway Geometrics		7150		6760	7380	6220 7370	6920	6240	7000	8030	6130	3670	4370			
	2390	2390 2390	2260	2260 2260	1950 2080 2080	1930 1730	2080 2080	2080	1660 1660	1580 1700	1390 1540	1540 1540	1540 1540	1230	1460 1460	1460
	2380	2380 2380	2250	2250 2250	1950 2070 2070	1920 1730	2080 2080	2080	1660 1660	1580 1700	1390 1530	1530 1530	1530 1530	1220	1460 1460	1460
	2380	2380 1990	2250	2250 2250	1950 2070 2070	1920 1730	2080 2080	2080	2920 2920	1580 1700	1380 1530	1530 1530	1530 1530	600	1450 1450	1450
		390		620	1440 90	1600 1730	680		760 760	1030	1900 2490	1900	2460	700		
					1160		450									
Station	675		715	725	735	740	750	770	780	790	810	845				
Location	Portland Ave EB Off Ramp		12th Ave EB On Ramp	SB TH 77 EB Off Ramp	SB TH 77 EB On Loop	NB 77 EB Off Loop	24th Ave EB Off Ramp	TH 77 EB On Ramp	24th Ave WB Off Ramp	34th Ave EB Off Ramp	TH 5 EB Off Ramp	TH 5/34th/24th EB On Ramp				

**EXISTING I-494 (NO-BUILD) - PORTLAND AVE. TO TH 5
2020 AM PEAK HOUR LANE ASSIGNMENT**

Forecasting & Concept Development I-494 & TH 77
S.P. 2785 - 349



Figure 46

PM

Location	France Ave EB Off Ramp				SB France Ave EB On Ramp		NB France Ave EB On Ramp		Penn Ave EB Off Ramp		Penn Ave EB On Ramp		SB I-35W EB On Ramp		SB I-35W EB Off Ramp		NB I-35W EB On Ramp		NB I-35W EB Off Ramp		Lyndale Ave EB On Ramp		Lyndale Ave EB Off Ramp		Nicollet Ave EB On Ramp		Nicollet Ave EB Off Ramp							
	Station	3500				5000		6000		9000		11000		11500		12500		13000		14000		14500		16000		17000		19000						
I-494 Westbound Freeway Geometrics																																		
				800				760	1070			760		970		790	660		1300	1030		650		1000		240								
		1750	1750	800										1760		1960		1300	1030		1680				1240	240		300						
		1750	1750	1990	1990	1990	1990	1230	1000	2070		2070	1310	1880	1880	950	1920	1920	1100	1760	1760	830	1860	1860	1860	1510	2610	2510	2050	1830	2130	2130		
		1750	1750	1990	1990	1990	1990	1990	2070	2070		2070	2070	1880	1880	1920	1920	1760	1760	1760	1860	1860	1860	1860	1900	1890	1890	2050	2130	2130	2130			
		1760	1760	1990	1990	1990	1990	1990	2070	2070		2070	2070	1880	1880	1930	1930	1930	1770	1770	1770	1860	1860	1860	1860	1900	1900	1900	2050	2130	2130	2130		
		1760	1760	2000	2000	2000	2000	2000	2070	2070		2070	2070	1880	1880	1930	1930	1930	1770	1770	1770	1860	1860	1860	1860	1900	1900	1900	2050	2130	2130	2130		
	8770		8770	7970		7970	7210	7210	8280		8280	7520		7520	8490	7700	7700	8360	7060	7060	8090	7440		7440	8440	8440	8200		8200	8500		8500		
I-494 Eastbound Freeway Geometrics	7050		7050	6380	6380	7380	7380	8050			8050	7410		7410	7860	6630	6630	7320	6090	6090	7310	6870		6870	8040	8040	7880		7880	8270		8270		
	1410	1600	1600	1600	1600	1850	1850	2020	2020	2020	2010	1700	1700	1700	1700	1700	1660	1660	1660	1530	1530	1530	1720	1720	1720	1720	1720	1970	1970	2070	2070	2070		
	1410	1600	1600	1600	1600	1850	1850	2010	2010	2010	2010	1700	1700	1700	1700	1660	1660	1660	1520	1520	1520	1720	1720	1720	1720	1720	1970	1970	2070	2070	2070	2070		
	1410	1590	1590	1590	1590	1840	1840	2010	2010	2010	2010	1690	1690	1690	1690	1690	1660	1660	1660	1520	1520	1520	1720	1720	1720	1720	1720	1970	1970	2070	2070	2070	2070	
	1410	1590	1590	1590	1590	1840	1840	1340	2010	2010	2010	2010	2960	2960	2320	2320	2320	2320	090	1650	1650	420	1520	1520	1150	1710	1710	1710	1710	1550	1970	1670	2060	2060
	1410	670	670													1610		1920				1590				1170	1330							
				670		1000		670				640			450		1230	690		1230	1220		440		1170		160		390					
Station		3000				4500		5500		9000		11000		11500		12500		13000		14000		14500		16000		17000		19000						
Location		France Ave EB Off Ramp				SB France Ave EB On Ramp		NB France Ave EB On Ramp		Penn Ave EB Off Ramp		Penn Ave EB On Ramp		SB I-35W EB Off Ramp		SB I-35W EB On Ramp		NB I-35W EB Off Ramp		NB I-35W EB On Ramp		Lyndale Ave EB Off Ramp		Lyndale Ave EB On Ramp		Nicollet Ave EB On Ramp		Nicollet Ave EB Off Ramp						

**EXISTING I-494 PLUS 1 ADDITIONAL THROUGH LANE EACH DIRECTION
TH 100 TO PORTLAND AVE. - 2020 PM PEAK HOUR LANE ASSIGNMENT**

Forecasting & Concept Development I-494 & TH 77
S.P. 2785 - 349



Figure 49

AM

Location	France Ave EB Off Ramp				SB France Ave EB On Ramp		NB France Ave EB On Ramp		Penn Ave EB Off Ramp		Penn Ave EB On Ramp		SB I-35W EB Off Ramp		SB I-35W EB On Ramp		NB I-35W EB Off Ramp		NB I-35W EB On Ramp		Lyndale Ave EB Off Ramp		Lyndale Ave EB On Ramp		Nicollet Ave EB Off Ramp		Nicollet Ave EB On Ramp				
	Station	3500	3500	3500	3500	5000	5000	6000	6000	9000	9000	11000	11500	12500	13000	14000	14500	14000	14500	16000	16000	17000	17000	17000	17000	19000	19000				
I-494 Westbound Freeway Geometrics				270			280	1340		580		780	160	590		1370	410		1000		1470		350			200					
	1280	1280	270					1340	1340	1340	1920	580		920	160	590		1370	410		1000		1470		350		200				
	1280	1280	1530	1530	1530	1530	1250	460	1460	1460	1320	1650	1220	1650	1050	1810	1810	1020	1610	1610	1110	1460	1460	1460	850	1940	1940	1660	1510	1710	
	1280	1280	1530	1530	1530	1530	1530	1800	1460	1460	1460	1320	1650	1800	1650	1650	1050	1810	1810	1610	1610	1470	1470	1470	1570	1570	1570	1660	1710	1710	
	1280	1280	1540	1540	1540	1540	1540	1800	1470	1470	1470	1320	1660	1800	1660	1660	1050	1810	1810	1620	1620	1620	1470	1470	1470	1570	1570	1570	1670	1720	1720
	1290	1290	1540	1540	1540	1540	1540	1800	1470	1470	1470	1320	1660	1800	1660	1660	1050	1810	1810	1620	1620	1620	1470	1470	1470	1580	1580	1570	1670	1720	1720
6410	6410	6140	6140	6140	6140	5860	5860	7200		7200	6620		6620	7400	7240	7240	7830	6460	6460	6870	5870	5870	7010	7010	6660		6660	6860		6860	
I-494 Eastbound Freeway Geometrics	7360		7360	6130	6130	6560	6560	6980		6980	6430		6430	7060	5900	5900	6860	5950	5950	6870	6390	6390	6990	6990	6800		6800	7150		7150	
	1480	1540	1540	1540	1540	1640	1640	1640	1640	1350	1350	1350	1350	1480	1480	1480	1480	1490	1490	1490	1600	1600	1600	1600	1700	1700	1700	1790	1790	1790	1790
	1470	1530	1530	1530	1530	1640	1640	1640	1640	1340	1340	1340	1340	1470	1470	1470	1470	1490	1490	1490	1600	1600	1600	1600	1700	1700	1700	1790	1790	1790	1790
	1470	1530	1530	1530	1530	1640	1640	1640	1640	1340	1340	1340	1340	1470	1470	1470	1470	1490	1490	1490	1600	1600	1600	1600	1700	1700	1700	1790	1790	1790	1790
	1470	1530	1530	1530	1210	1640	1640	1640	1690	1340	1340	1340	1340	1470	1470	1470	550	1480	1480	1060	1590	1590	1590	1590	800	1700	1700	1430	1780	1780	1780
	1470	1230	1230					420	970	1610	1610	1060	1060	1690	1160	960	1870			1340				600	790						
			1230								550			630		1160	960		910	920		480		600						350	
Station		3000		4500		5500				9000			11000	11500		12500	13000		14000	14500		16000		17000			19000				
Location		France Ave EB Off Ramp		SB France Ave EB On Ramp		NB France Ave EB On Ramp				Penn Ave EB Off Ramp			Penn Ave EB On Ramp	SB I-35W EB Off Ramp	SB I-35W EB On Ramp	NB I-35W EB Off Ramp	NB I-35W EB On Ramp		Lyndale Ave EB Off Ramp		Lyndale Ave EB On Ramp		Nicollet Ave EB Off Ramp		Nicollet Ave EB On Ramp						

**EXISTING I-494 PLUS 1 ADDITIONAL THROUGH LANE AND AUXILIARY LANE
TH 100 TO PORTLAND AVE. - 2020 AM PEAK HOUR LANE ASSIGNMENT**

Forecasting & Concept Development I-494 & TH 77
S.P. 2785 - 349



Figure 50

PM

Location	France Ave EB Off Ramp				SB France Ave EB On Ramp		NB France Ave EB On Ramp		Penn Ave EB Off Ramp		Penn Ave EB On Ramp		SB I-35W EB Off Ramp		SB I-35W EB On Ramp		NB I-35W EB Off Ramp		NB I-35W EB On Ramp		Lyndale Ave EB Off Ramp		Lyndale Ave EB On Ramp		Nicollet Ave EB Off Ramp		Nicollet Ave EB On Ramp						
	Station	3500				5000		6000		9000		11000		11500		12500		13000		14000		14500		16000		17000		19000					
I-494 Westbound Freeway Geometrics																																	
				800			760	1070		760		970		790	660		1300	1030		650		1000			240								
		1750	1750	800				1070	1070	1070	1830	760		1760		1960			1680				1240	240				300					
		1750	1750	1990	1990	1990	1990	1230	1800	1800	1800	1800	1880	1880	1880	1880	1880	1880	1880	1880	1880	1880	1860	1860	1860	1510	2610	2510	2050	1830	2130	2130	2130
		1750	1750	1990	1990	1990	1990	1990	1800	1800	1800	1800	1800	1880	1880	1880	1880	1880	1880	1880	1880	1880	1860	1860	1860	1900	1890	1890	2050	2130	2130	2130	2130
		1760	1760	1990	1990	1990	1990	1990	1800	1800	1800	1800	1800	1880	1880	1880	1880	1880	1880	1880	1880	1860	1860	1860	1900	1900	1900	2050	2130	2130	2130	2130	
	1760	1760	2000	2000	2000	2000	2000	1810	1810	1810	1810	1620	1800	2070	1880	1880	1880	1930	1930	1930	1770	1770	1770	1860	1860	1860	1900	1900	1900	2050	2130	2130	2130
	8770		8770	7970		7970	7210	7210	8280		8280	7520		7520	8490	7700	7700	8360	7060	7060	8090	7440		7440	8440	8440	8200		8200	8500		8500	
I-494 Eastbound Freeway Geometrics	7050		7050	6380	6380	7380	7380	8050		8050	7410		7410	7860	6630	6630	7320	6090	6090	7310	6870		6870	8040	8040	7880		7880	8270		8270		
	1410	1600	1600	1600	1600	1850	1850	1850	1850	1570	1570	1570	1570	1660	1660	1660	1660	1530	1530	1530	1720	1720	1720	1720	1720	1970	1970	2070	2070	2070	2070		
	1410	1600	1600	1600	1600	1850	1850	1850	1850	1560	1560	1560	1560	1660	1660	1660	1660	1520	1520	1520	1720	1720	1720	1720	1720	1970	1970	2070	2070	2070	2070		
	1410	1590	1590	1590	1590	1840	1840	1840	1840	1560	1560	1560	1560	1660	1660	1660	1660	1520	1520	1520	1720	1720	1720	1720	1720	1970	1970	2070	2070	2070	2070		
	1410	1590	1590	1590	1590	1840	1840	1840	1200	1560	1560	1560	1560	1650	1650	1650	420	1520	1520	1150	1710	1710	1710	1710	1550	1970	1970	1670	2060	2060	2060		
	1410	670	670					670	1310	1800	1800	1160	1160	1610	1230		1920			1590				1170	1330				390				
			670		1000			670			640			450		1230	690		1230	1220		440		1170		160							
Station		3000				4500		5500		9000		11000		11500		12500		13000		14000		14500		16000		17000		19000					
Location		France Ave EB Off Ramp				SB France Ave EB On Ramp		NB France Ave EB On Ramp		Penn Ave EB Off Ramp		Penn Ave EB On Ramp		SB I-35W EB Off Ramp		SB I-35W EB On Ramp		NB I-35W EB Off Ramp		NB I-35W EB On Ramp		Lyndale Ave EB Off Ramp		Lyndale Ave EB On Ramp		Nicollet Ave EB Off Ramp		Nicollet Ave EB On Ramp					

**EXISTING I-494 PLUS 1 ADDITIONAL THROUGH LANE AND AUXILIARY LANE
TH 100 TO PORTLAND AVE. - 2020 PM PEAK HOUR LANE ASSIGNMENT**

Forecasting & Concept Development I-494 & TH 77
S.P. 2785 - 349



Figure 51

AM

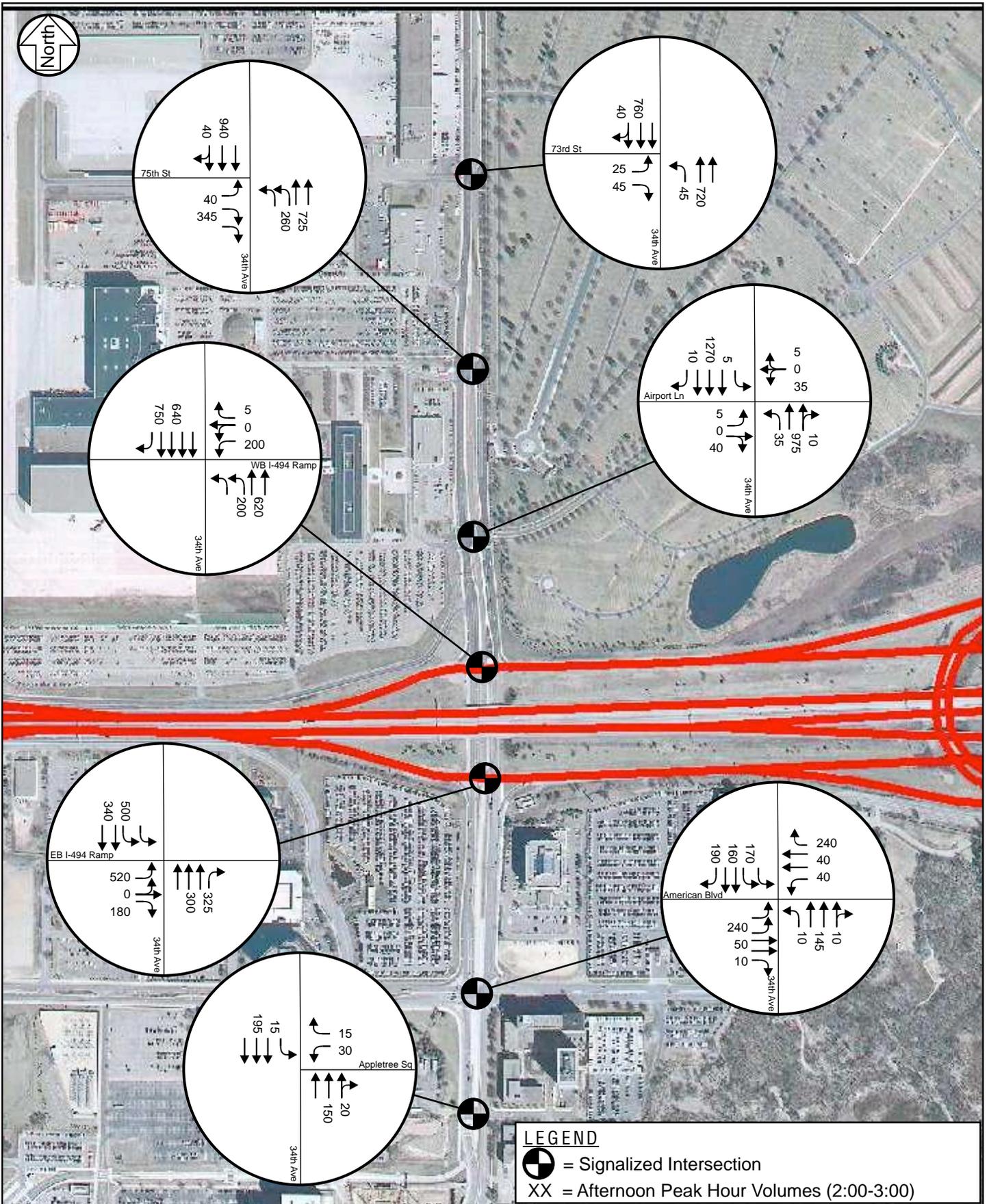
Location	Portland Ave WB On Ramp	WB Right Lane Drop	12th Ave WB On Ramp	SB TH 77 WB On Ramp	SB TH 77 WB Off Loop	NB 77 WB On Loop	24th Ave WB On Ramp	TH 77 WB Off Ramp	24th Ave WB Off Ramp	34th Ave WB On Ramp	TH 5 WB On Ramp	TH 5/34th Ave WB Off Ramp																						
Station	675	695	715	725	735	740	750	770	780	790	820	845																						
I-494 Westbound Freeway Geometrics				960		2240	500			1540		2570																						
		350		1300	1300	1300	2720	2240		620		120																						
	1720	1720	1370	1630	1630	1300	1300	1300	1190	1310	1310	1310	1280	1400	1400	1060	1320	1320	1320	1140	1050	1290	1290	1290	1280	1290	1060	960	960	960	960	30	1270	1270
	1710	1710	1710	1620	1620	1300	1300	1300	1180	1300	1300	1300	1270	1400	1400	1400	1310	1310	1310	1140	1040	1280	1280	1280	1280	1060	960	960	960	960	1270	1270	1270	
	1710	1710	1710	1630	1630	1300	1300	1300	1300	1190	1310	1310	1280	1400	1400	1400	1320	1320	1320	1140	1050	1280	1280	1280	1280	1060	960	960	960	960	1270	1270	1270	
	1720	1720	1720	1630	1630	1310	1310	1310	1310	1190	1310	1310	1280	1410	1410	1410	1320	1320	1320	1140	1050	1290	1290	1290	1290	1060	970	970	970	970	1280	1280	1280	
	6860		6510		6510		7470		5230	5730		5610		5270		5700		7240					6420								3850			5090
I-494 Eastbound Freeway Geometrics		7150				6760	7380		6220	7370		6920		6240	7000		8030					6130								3670			4370	
	1790	1790	1790		1690	1690	1690	1560	1560	1560	1450	1390	1560	1560	1200	1200	1200	820	820	1030	1230	1230	1230	1230	1230	1230	1230	920	1100	1100	1100			
	1790	1790	1790		1690	1690	1690	1550	1550	1550	1440	1380	1560	1560	1190	1190	1190	820	820	1030	1220	1220	1220	1220	1220	1220	910	1090	1090	1090				
	1780	1780	1780		1690	1690	1690	1550	1550	1550	1440	1380	1560	1560	2660	2660	2660	1230	1230	1230	1230	1230	1230	1230	1230	1230	0	920	1090	1090	1090			
	1790	1790	1400		1690	1690	1690	1560	1560	1560	1440	1380	1560	1560	2660	2660	2660	1230	1230	1230	1230	1230	1230	1230	1230	1230	0	920	390	1090	1090			
			390			620		620	1440	90		1160		1150		450		680	760		1030		760	3310	3310	2490				700		2460		
Station	675				715	725	735	740	750		770	780	790		810														845					
Location	Portland Ave EB Off Ramp			12th Ave EB On Ramp	SB TH 77 EB Off Ramp	SB TH 77 EB On Loop	NB 77 EB Off Loop	24th Ave EB Off Ramp		TH 77 EB On Ramp	24th Ave WB Off Ramp	34th Ave EB Off Ramp	TH 5 EB Off Ramp		TH 5/34th/24th EB On Ramp																			

**EXISTING I-494 PLUS 1 ADDITIONAL THROUGH LANE EACH DIRECTION
PORTLAND AVE. TO TH 5 - 2020 AM PEAK HOUR LANE ASSIGNMENT**

Forecasting & Concept Development I-494 & TH 77
S.P. 2785 - 349

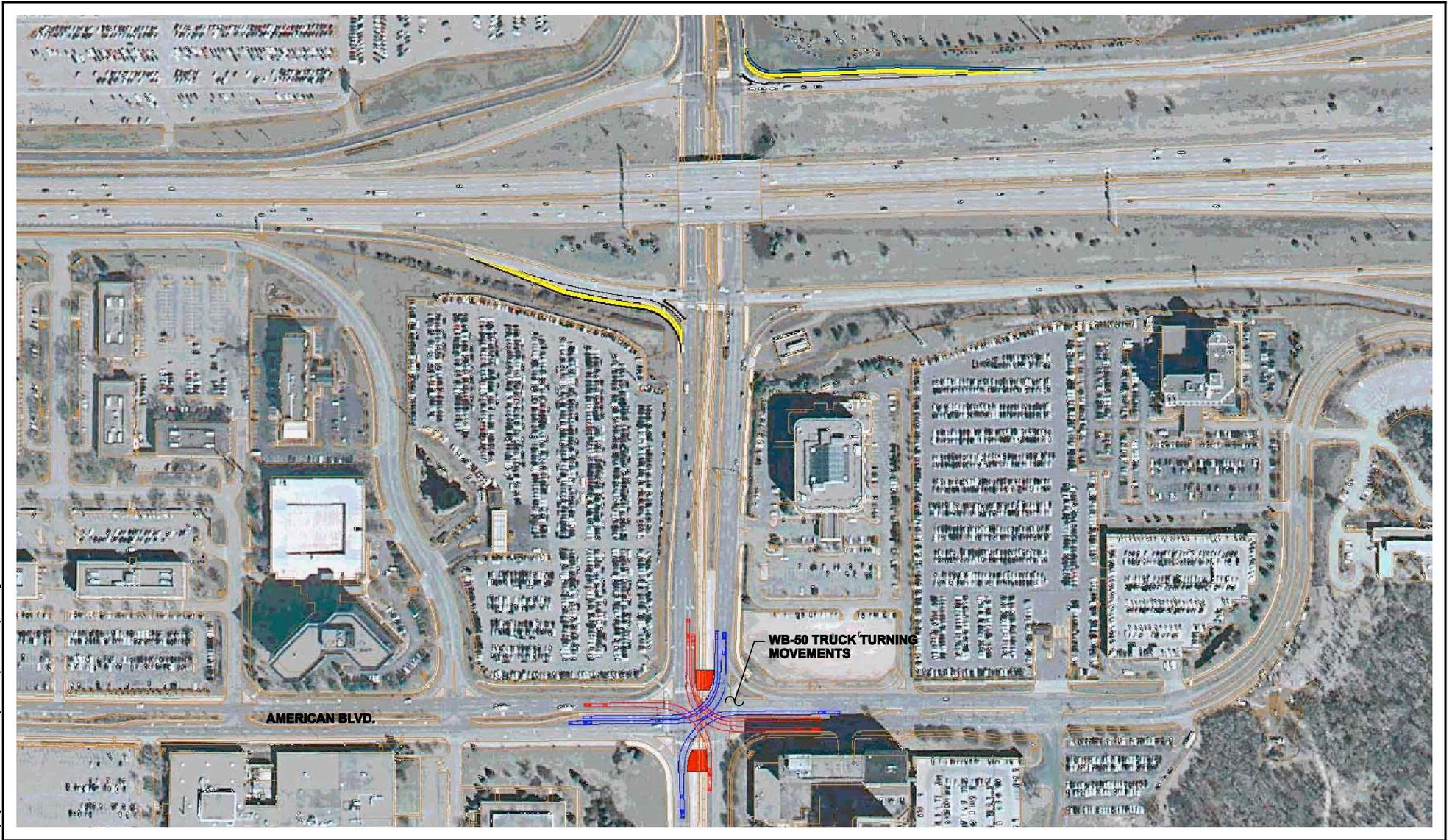


Figure 52



EXISTING PM "SHIFT CHANGE" PEAK HOUR VOLUMES
 FORECASTING & CONCEPT DEVELOPMENT I-494 & TH 77

Figure 54



CONCEPT 5G - SHORT TERM IMPROVEMENTS AT 34TH AVENUE. Dual Right Turns at I-494 Exit Ramps and Concurrent Left Turns at American Blvd.
 Forecasting & Concept Development I-494 & TH 77
 S.P. 2785 - 349

↑
 N NO SCALE