I-4 BEYOND the ULTIMATE

SYSTEMS ACCESS MODIFICATION REPORT (SAMR) RE-EVALUATION

I-4 Beyond the Ultimate Project
North Section – from East of SR 434 to East of SR 472

Financial Project ID: 432100-1-22-01

Prepared For:
FLORIDA DEPARTMENT OF TRANSPORTATION
DISTRICT FIVE

MARCH 2017

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1. INTRODUCTION

Interstate 4 (I-4) is an integral part of Central Florida's transportation system. I-4 carries the greatest number of people and vehicles of any transportation facility in the region and serves many of the area's primary activity centers. When I-4 opened in February 1965, it was designed to serve intrastate and interstate travel by providing a critical link between the east and west coasts of Central Florida. Although this role continues to be a crucial transportation function of I-4, the highway has evolved to one that serves many shorter trips. Today, the highway serves as the primary link between hotel/motel complexes and tourist attractions such as Walt Disney World, Universal Studios, Sea World, the International Drive Resort Area and downtown Orlando. In addition, since I-4 is the only southwest to northeast limited access facility that is centrally located between the predominant employment centers and the major suburbs to the northeast, it has become the primary commuting corridor in the Central Florida Metropolitan Area.

The original I-4 Systems Access Modification Report (I-4 SAMR), dated April 2000, was completed as the technical justification for approval of new access and modification of existing access to approximately 74 miles of I-4, between CR 532 in Osceola County to west of I-95 in Volusia County. Supported by a 3-tier Multimodal Master Plan (MMMP) and a PD&E study, the I-4 SAMR evaluated several alternatives for the I-4 corridor and recommended a list of improvements including additional lanes, barrier-separated HOV lanes, construction of auxiliary lanes, replacement of bridge structures, etc. The document was approved by the Federal Highway Administration (FHWA) on June 13, 2000 with a subsequent update in 2003, and an update to the Ultimate I-4 section (west of Kirkman Road to east of SR 434) in 2010.

There have been several NEPA related actions since the original SAMR submittal and subsequent updates. After completion of the I-4 MMMP, the Florida Department of Transportation (FDOT) elected to move forward with the next phase of the I-4 project development with three PD&E sections:

1. PD&E Section 1 - Environmental Assessment (EA) for I-4 from CR 532 in Osceola County to SR 528 (Beachline Expressway) in Orange County.
2. PD&E Section 2 - Environmental Impact Statement (EIS) for I-4 from SR 528 (Beachline Expressway) in Orange County to SR 472 in Volusia County.
3. PD&E Section 3 - EA for I-4 from SR 472 in Volusia County to I-95 in Volusia County.

EAs were completed for Sections 1 and 3, while an Environmental Impact Statement (EIS) was completed for Section 2. Only a portion of Section 2 (SR 435/Kirkman Road to SR 434) received a Record of Decision (ROD). That portion of Section 2 (SR 435/Kirkman Road to SR 434), known as the I-4 Ultimate Project, moved forward and began construction in February 2015.

1.1. Project Description

The I-4 SAMR Re-Evaluation Study in support of the I-4 Beyond the Ultimate (BtU) PD&E study includes two sections on either side of the I-4 Ultimate project area: the South Section and the North Section. The study area limits of the South Section are 1.0 mile west of the US 27 interchange to 0.5 miles east of the SR 435 (Kirkman Road) interchange. The project limits of the north section are from 0.5 miles west of SR 434 to 0.5 miles north of Orange Camp Road. The two sections of the I-4 SAMR Re-evaluation are further

divided into five segments in the I-4 BtU PD&E study, as illustrated in **Figure 1** and **Figure 2**. The project limits for the I-4 BtU PD&E segments are listed below.

- Segment 1: I-4 from West of CR 532 (Polk/Osceola County Line) to West of SR 528 (Beachline Expressway).
- Segment 2: I-4 from West of SR 528 (Beachline Expressway) to West of SR 435 (Kirkman Road).
- Segment 3: I-4 from 1 mile East of SR 434 to East of US 17/92 (Seminole/Volusia County Line).
- Segment 4: I-4 from East of SR 15/600/US 17/92 (Seminole/Volusia County Line) to 1/2 mile East of SR 472.
- Segment 5: I-4 from West of SR 25/US 27 to West of CR 532 (Polk/Osceola County Line).

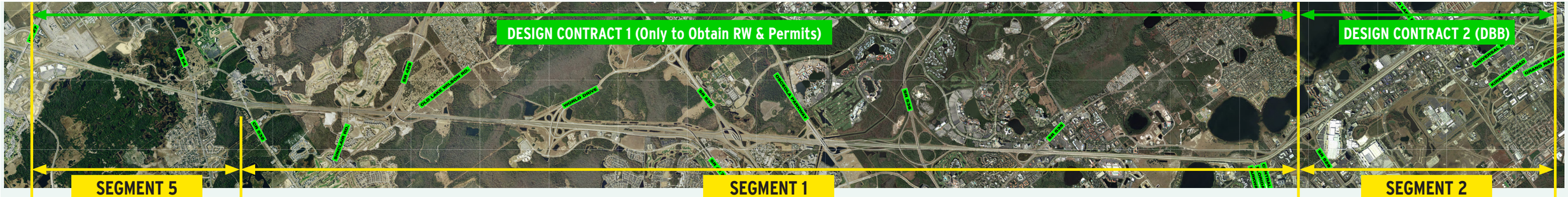
Segment 5 was added to the I-4 BtU PD&E study later in order to extend the western limit of express lanes to US 27, as requested by FHWA due to logical termini. This segment is located to the west of Segment 1, thus the reason Segment 5 is adjacent to Segment 1.

1.2. Purpose and Need

The purpose of the I-4 BtU project is to improve traffic operations, enhance connectivity, and improve safety on I-4 and the interchange cross-streets in the immediate vicinity of I-4. Without improvements to I-4, congestion will continue to increase and travel times and potential crashes will continue to increase for the residents, employees, freight carriers, and visitors of the region. This will negatively impact the economy and quality of life of the region. Improvements to the operation and safety of I-4 and the interchange areas will better accommodate future population increases, improve mobility, and support economic growth in the region.

The I-4 BtU SAMR re-evaluation is needed due to changes proposed in the Modified Build scenario as compared to the previously approved Original Build scenario. The changes include:

- A proposed change in the project typical sections: The proposed change is to the inside median of the I-4 corridor from US 27 in Polk County to SR 472 in Volusia County. The design change is to switch from HOV (High Occupancy Vehicle) lanes in the median (number of HOV lanes varied from one to two in each direction), to four express lanes, two in each direction. The conversion from HOV lanes to Express Lanes (ELs) is consistent with the I-4 Ultimate project. The conversion to ELs is consistent with statewide FDOT policy (Topic No. 525-030-020-a) and what is being implemented in the I-4 Ultimate section. The HOV to EL conversion was identified as a minor change in the Project Reevaluation Form for the ROW acquisition phase for a portion of the I-4 Ultimate.
- Proposed changes to interchange configurations: Several interchange configurations have been modified to better accommodate traffic volumes and improve interstate and cross-street operations.



SEGMENT 5

SR 400 (I-4) from West of SR 25/US 27 to West of CR 532 (Polk/Osceola County Line) Polk County (16320)

EA/FONSI - 1998
(201210) West of Memorial Boulevard (SR 546) to the Polk/Osceola County Line

DESIGN - MARCH 2015
(XXXXXX-1) I-4 (SR 400) from West of US 27 to West of CR 532 (Polk/Osceola County Line) - Polk County
(431456-1) I-4 (SR 400) from West of CR 532 (Polk/Osceola County Line) to East of SR 522 (Osceola/Orange County Line) - Osceola County

CONSTRUCTION

SEGMENT 1

SR 400 (I-4) from West of CR 532 (Polk/Osceola County Line) to West of SR 528 Beachline Expressway Osceola County (92130) and Orange County (75280)

EA/FONSI - 1999
(242526 & 242483) CR 532 (Polk/Osceola County Line) to West of SR 528 Beachline Expressway

DESIGN - MARCH 2015
(242484-8) SR 400 (I-4) from East of SR 522 Osceola Parkway (Osceola/Orange County Line) to West of SR 528 Beachline Expressway – Orange County

CONSTRUCTION

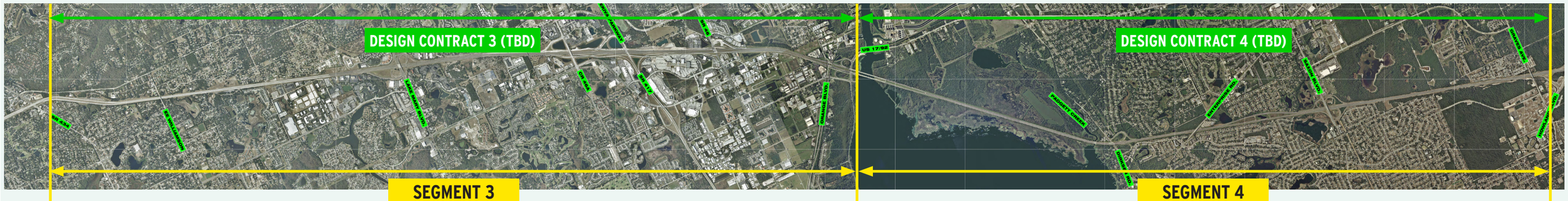
SEGMENT 2

SR 400 (I-4) from West of SR 528 Beachline Expressway to West of SR 435 Kirkman Road Orange County (75280)

FEIS - 2002
(242486, 242592 & 242703) West of SR 528 Beachline Expressway to SR 472 (Orange, Seminole, Volusia)

DESIGN - MARCH 2015
(242484-7) SR 400 (I-4) from West of SR 528 Beachline Expressway to West of SR 435 Kirkman Road – Orange County

CONSTRUCTION



SEGMENT 3

SR 400 (I-4) from 1 Mile East of SR 434 to East of SR 15/600 US 17/92 (Seminole/Volusia County Line) Seminole County (77160)

FEIS - 2002
(242486, 242592 & 242703) West of SR 528 Beachline Expressway to SR 472 (Orange, Seminole, Volusia)

DESIGN - JUNE 2015
(242592-4) SR 400 (I-4) from 1 Mile East of SR 434 to East of SR 15/600 US 17/92 (Seminole/Volusia County Line) – Seminole County

CONSTRUCTION

SEGMENT 4

SR 400 (I-4) from East of SR 15/600 US 17/92 (Seminole/Volusia County Line) to 1/2 Mile East of SR 472 Volusia County (79110)

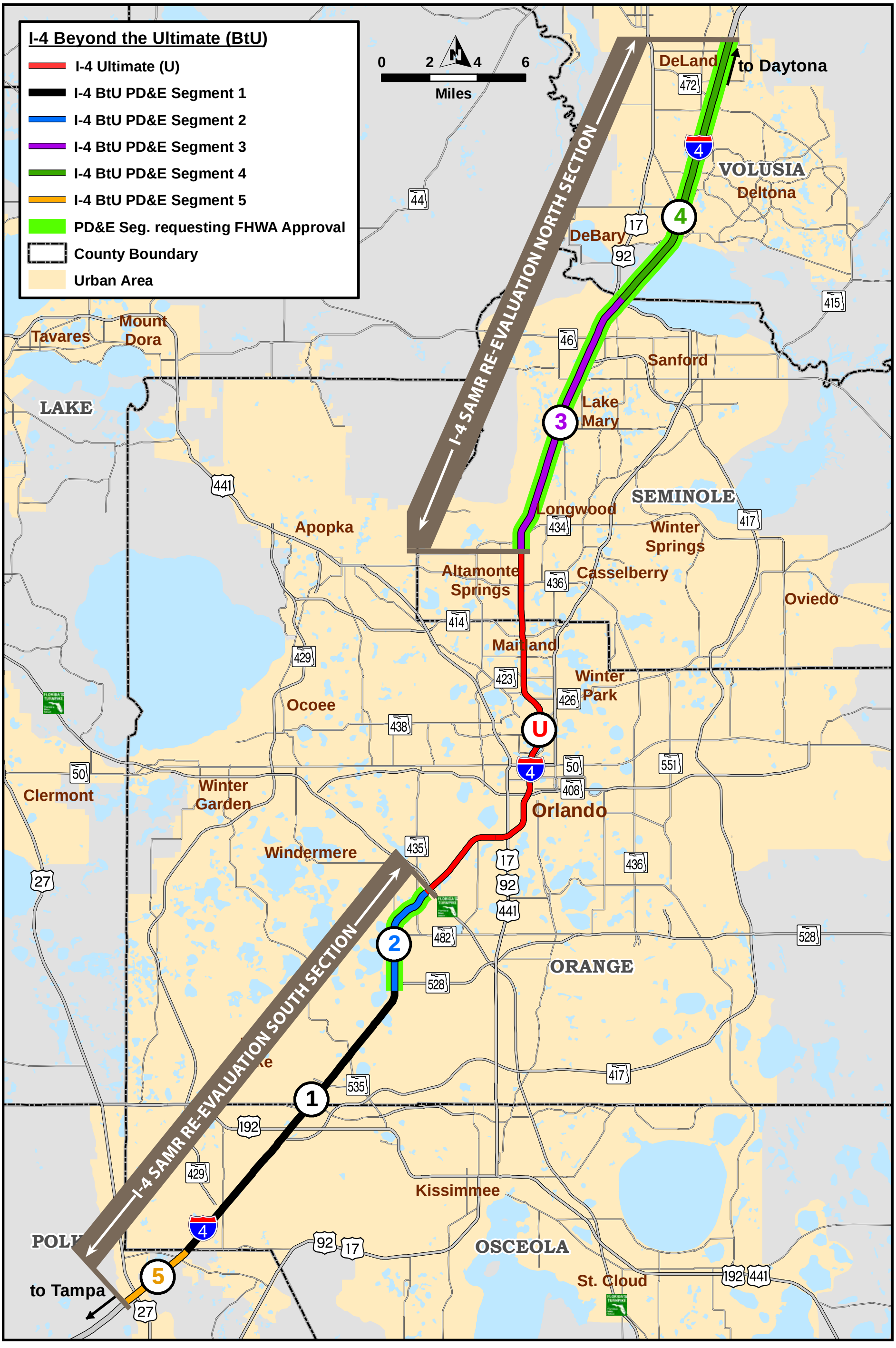
DESIGN - JUNE 2015
(408464-2) SR 400 (I-4) from East of SR 15/600 US 17/92 (Seminole/Volusia County Line) to 1/2 Mile East of SR 472 – Volusia County

CONSTRUCTION

FDOT

I-4 SAMR Re-Evaluation

Figure 1
I-4 Beyond the Ultimate PD&E Segments



FDOT

I-4 SAMR Re-Evaluation

Figure 2
I-4 BtU PD&E Segments &
I-4 SAMR Re-Evaluation Sections

Figure 3 and **Figure 4** show the Original Build and Modified Build typical sections for the North Section, and **Figure 5** shows the Original and Modified Build network changes. The Original Build alternative was initially approved using a 2020 horizon year. However, some of the Original Build interchange configurations do not adequately serve the higher traffic volumes associated with the revised 2040 horizon year. EL connections also had to be accommodated with the change in cross-section.

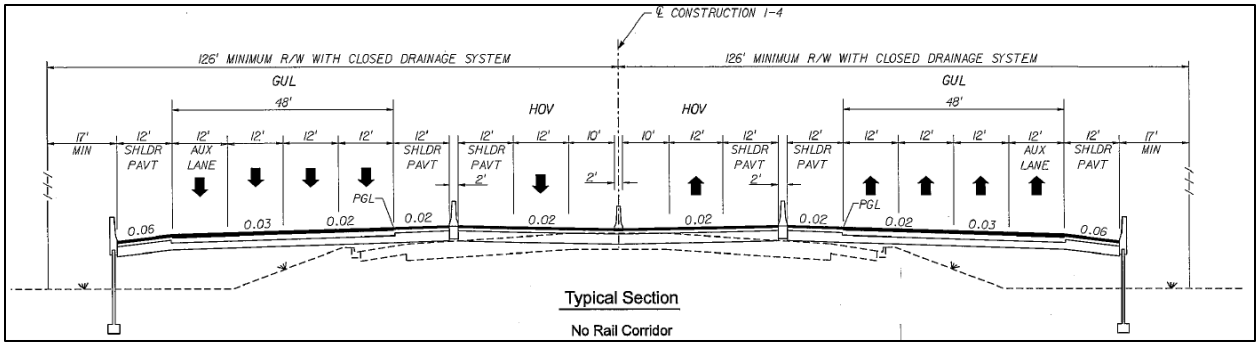


Figure 3 Original Build Typical Section (North Section)

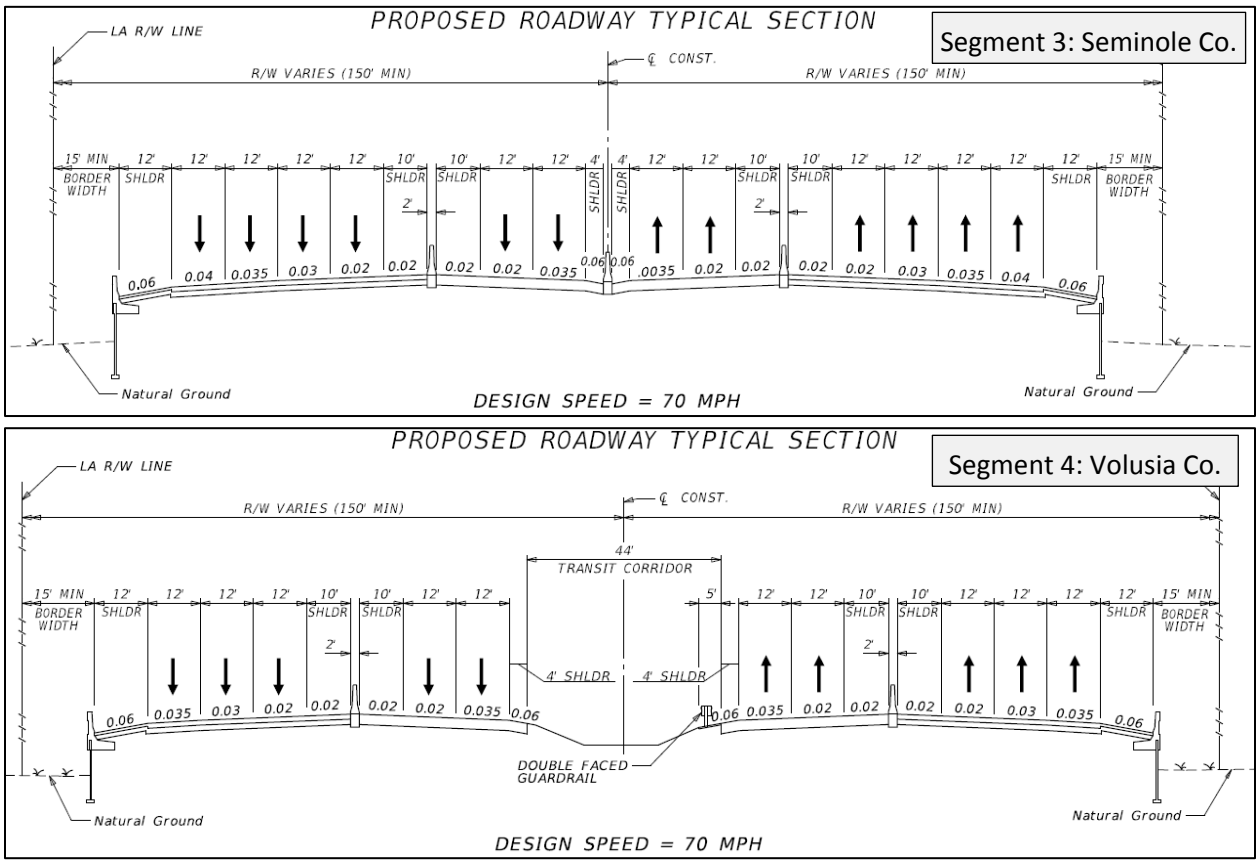
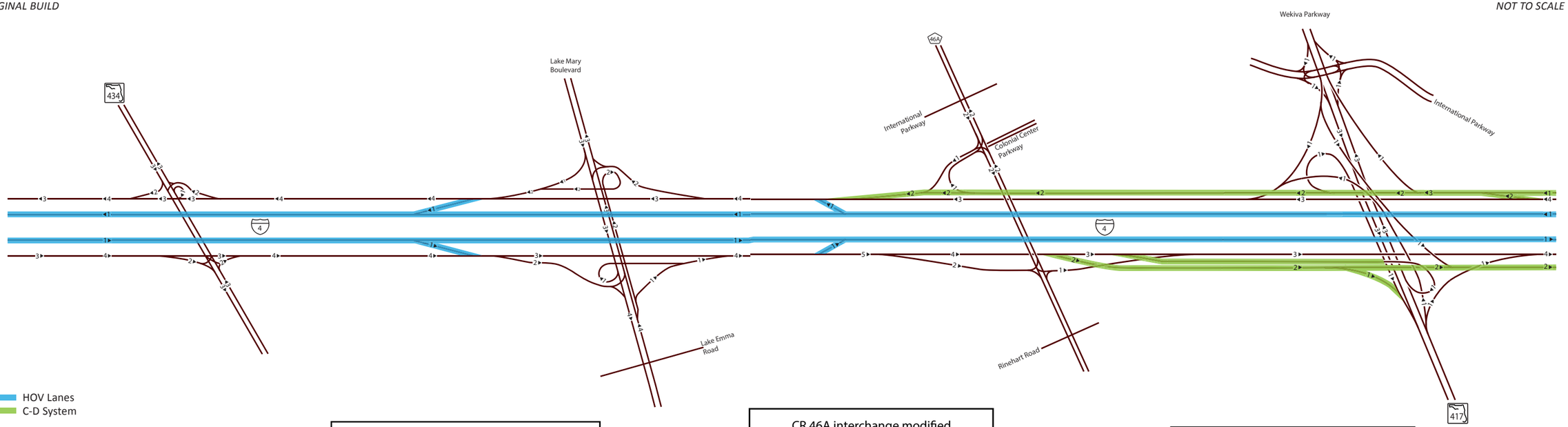


Figure 4 Modified Build Typical Sections (North Section)

ORIGINAL BUILD

NOT TO SCALE

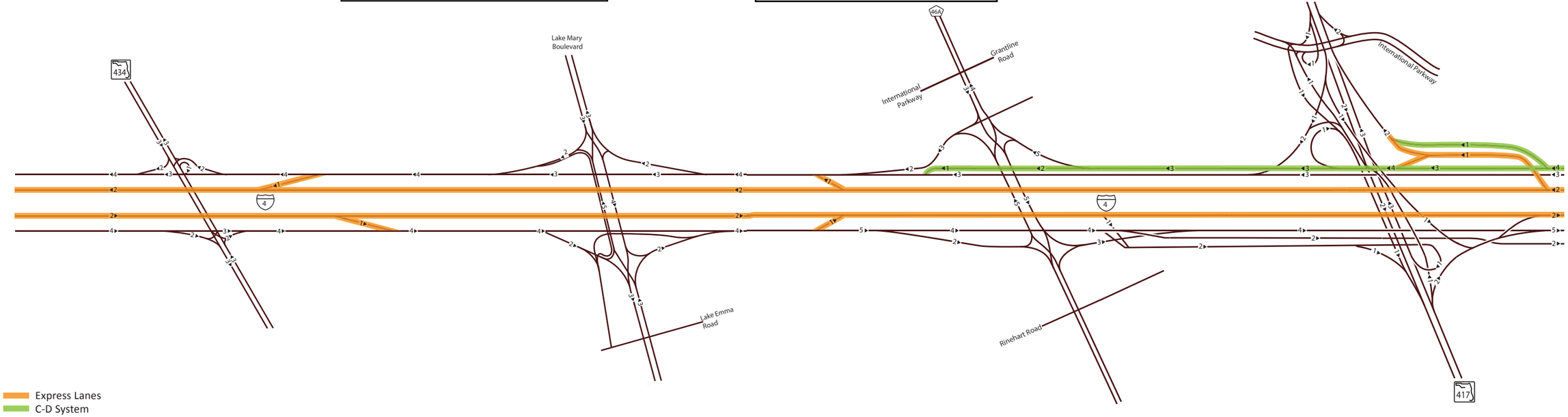


Lake Mary Blvd interchange modified to Diverging Diamond interchange with the addition of ramp access at Lake Emma Rd

CR 46A interchange modified to Diverging Diamond interchange with corridor and intersection improvements at Rinehart Rd

Express lane connections were added to the SR 417 interchange

MODIFIED BUILD



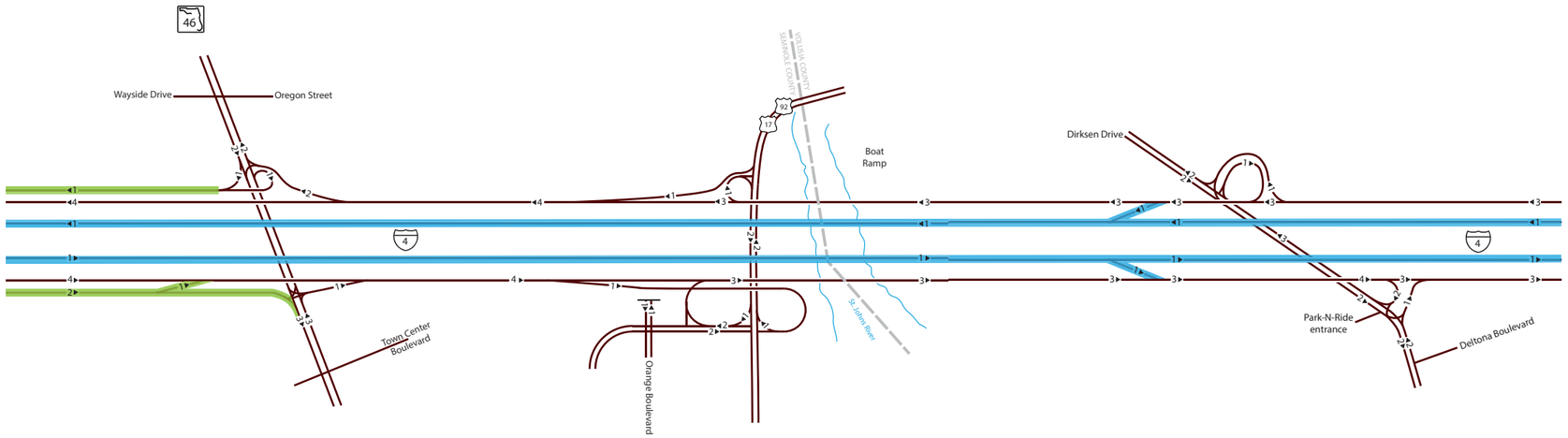
Date: 8.26.2016

I-4 SAMR Re-Evaluation

Figure 5 (1 of 3) - Original and Modified Build Transportation Networks (North Section)

ORIGINAL BUILD

NOT TO SCALE

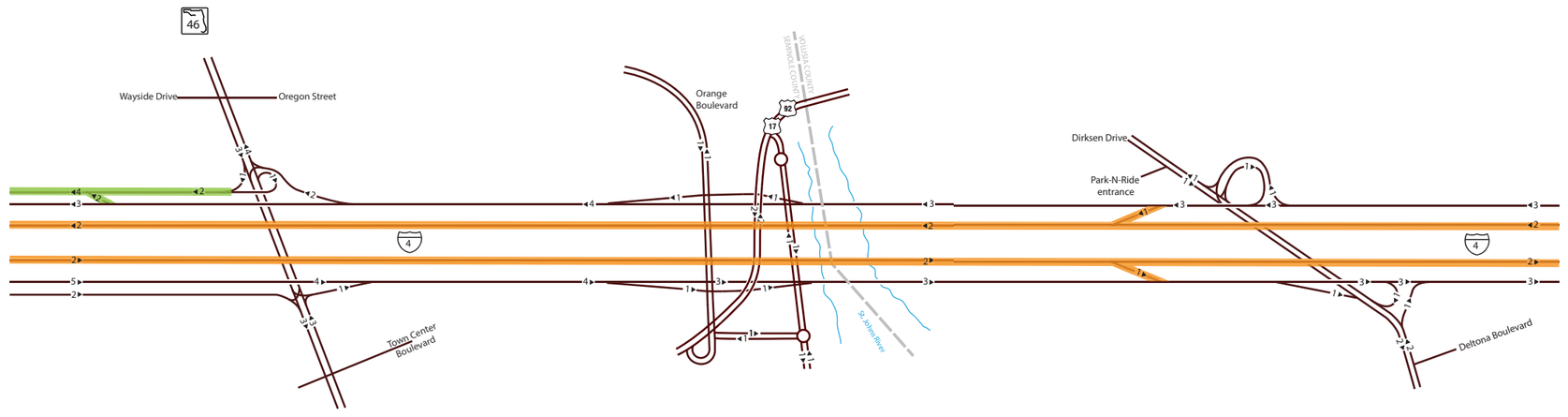


HOV Lanes
C-D System

US 17-92 interchange modified to full access dimaond interchange

Dirksen Drive interchange modified to add an Eastbound-to-Eastbound ramp.

MODIFIED BUILD



Express Lanes
C-D System

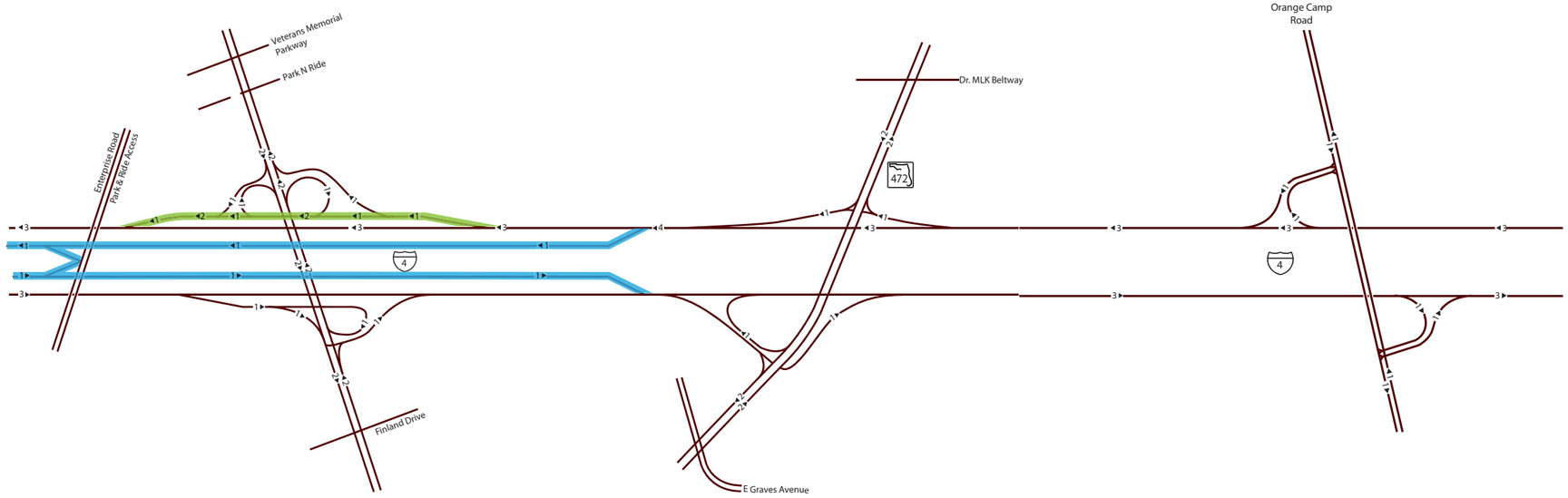
Date: 8.26.2016

I-4 SAMR Re-Evaluation

Figure 5 (2 of 3) - Original and Modified Build Transportation Networks (North Section)

ORIGINAL BUILD

NOT TO SCALE



HOV Lanes
C-D System

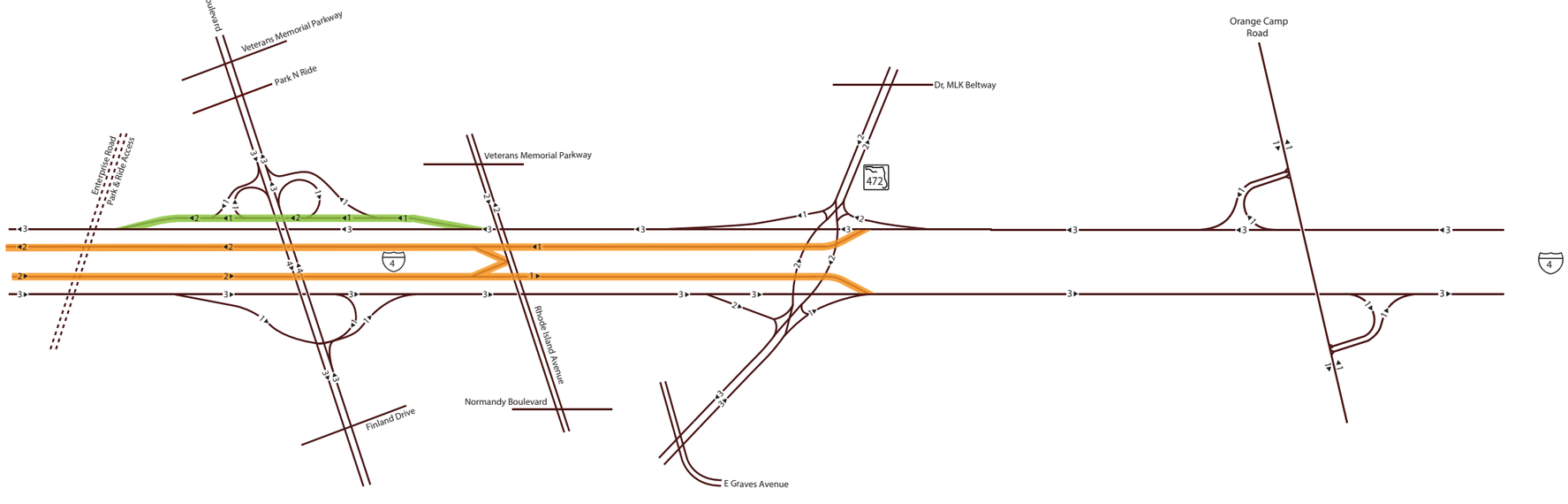
HOV access at Enterprise Rd replaced with Express Lane access to Rhode Island Ave

Saxon Blvd widened to six lanes through the interchange area

SR 472 interchange modified to Diverging Diamond interchange, with Express Lane access relocated east of SR 472

Orange Camp Rd ramp intersections were signalized in the modified build

MODIFIED BUILD



Express Lanes
C-D System

Date: 8.26.2016

FDOT

I-4 SAMR Re-Evaluation

Figure 5 (3 of 3) - Original and Modified Build Transportation Networks (North Section)

This reevaluation also addresses the operational impacts of converting the HOV lanes to tolled express lanes. The express lanes will be separated from the general use travel lanes by two shoulders with a barrier wall between the shoulders. A variable pricing tolling plan is proposed for the express lanes. The tolls will vary by time of day and day of week to maintain acceptable levels of service in the express lanes.

The tolls will be collected electronically through existing E-Pass, SunPass and other systems currently in place in the Orlando metropolitan area. The conversion to express lanes will maintain the same right of way limits as documented previously and will not change the impacts to the social, natural or physical environment.

The I-4 SAMR Re-Evaluation Study documents the travel demand modeling, traffic forecasting, and operational analysis for all five I-4 BtU PD&E segments. This report documents the findings of the North Section analysis. The findings of the South Section analysis are documented in a separate report.

1.3. Request for Approval and Commitments

Approval of the I-4 SAMR Re-evaluation Study (all segments) is needed before requesting final approval of the environmental studies through the I-4 widening project. An approved Interchange Access Request document (for this project the North and South SAMR) is needed to obtain the Record of Decision to meet the National Environmental Policy Act (NEPA) requirements for Segments 2, 3, and 4 as those segments are part of the same EIS. Approval of the SAMR reevaluation for Segments 5 and 1 is needed to obtain acceptance for the EA re-evaluation study that includes Segments 5 and 1.

With this submittal, the FDOT is seeking approval of the I-4 SAMR Re-evaluation Study (all segments) to support the NEPA studies and is seeking approval of the Daryl Carter Parkway interim interchange improvement to support construction of the interim interchange alternative that is currently programmed.

The FDOT has committed to re-evaluating the traffic impacts of each segment during the design phase. This will allow for updates to be made to key tools such as the regional travel demand model, the use of state-of-the-art analysis procedures, and the collection and analysis of current traffic conditions. The FDOT is also committed to continuing to work with FHWA in defining a methodology and following an agreed to review process for future re-evaluation studies. The FDOT has made the following commitments to support future re-evaluations:

- The regional macroscopic travel demand model, referred to as the Central Florida Regional Planning Model (CFRPM) version 6.1, has been updated to include time of day capabilities, include all of Polk County, and update land use and network data;
- An updated version of the CFRPM, referred to as version 6.2, which includes an update to a 2015 base year and a 2045 horizon year including an emphasis on theme park and attractions data and expanded validation metrics. This work is on-going;
- The use of a mesoscopic dynamic traffic assignment model (VISUM SBA) to evaluate route choice decisions. This work is on-going; and
- The use of a microscopic model (VISSIM) to evaluate express lanes operations and overall traffic operations.

The FDOT has made the following commitments in the study area:

- Segment 2: Design plans are currently being prepared. Final design will begin after a Record of Decision (ROD) is received. Right of way is programmed for fiscal year 2017 to 2021. Construction is fully funded for fiscal year 2020;
- Daryl Carter Parkway Interim Interchange: The preparation of design plans is under way. Right of way to support the project will be donated by adjacent property owners (the final drafts of the right of way agreements are being prepared). Construction is fully funded for fiscal year 2020;
- Segment 1: Design plans are currently being prepared. Final design will begin after the EA/FONSI reevaluation is completed and location design concept acceptance (LDCA) is received. Right of way is programmed for fiscal year 2018 to 2022;
- Segment 5: Design plans are currently being prepared. Final design will begin after the reevaluation of the EA/FONSI is completed and LDCA is received;
- Segment 3: Design plans are currently being prepared. Final design will begin after a Record of Decision (ROD) is received. The R/W phase for this project is funded in fiscal year 2022 to 2025. The Wekiva section 8 design-build (DB) project planned to be let in August of 2018 will construct the final aliment of the I-4 general use lanes between CR 46A and SR 46; and
- Segment 4: Design plans are currently being prepared. Final design will begin after a Record of Decision (ROD) is received.

2. FHWA 8 INTERSTATE ACCESS POLICY POINT CONSIDERATIONS AND REQUIREMENTS

The following section provides a response to the FHWA eight interstate access policy point considerations and requirements. It is noted that the I-4 SAMR Re-Evaluation Study consists mostly of existing interchanges that are being modified and the conversion of previously planned HOV lanes to Express Lanes. It is also noted that the I-4 SAMR Re-Evaluation Study is an analysis of the operating conditions under the currently approved geometric and operating conditions (referred to as the Original Build alternative) and the operating conditions based on the revised geometric and operating conditions (referred to as the Modified Build alternative).

2.1. Policy Point 1

The need being addressed by the request cannot be adequately satisfied by existing interchanges to the Interstate, and/or local roads and streets in the corridor can neither provide the desired access, nor can they be reasonably improved (such as access control along surface streets, improving traffic control, modifying ramp terminals and intersections, adding turn bays or lengthening storage) to satisfactorily accommodate the design-year traffic demands (23 CFR 625.2(a)).

Response:

The I-4 SAMR Re-Evaluation Study consists mostly of existing interchanges that are being modified and the conversion of previously planned HOV lanes to express lanes to better accommodate the future traffic demands in the region. This is consistent with the direction of the Policy Point. The following interchanges with I-4 are being modified:

Segment	North Section
Segment 3	Lake Mary Blvd
	CR 46A
	SR 417
	SR 46
	US 17/92
Segment 4	Dirksen Drive
	Saxon Blvd
	SR 472

Compared to the Original Build alternative, the Modified Build alternative will add a new access connection at Lake Emma Road (within the Lake Mary Boulevard interchange) and will relocate the proposed express lane connection from Enterprise Road to Rhode Island Avenue.

Modified Interchange Locations

As shown previously in Figure 5, several interchange configurations have been modified to better accommodate traffic volumes and improve interstate and cross-street operations. This is consistent with the intention of Policy Point #1. The operational and safety benefit of the modifications is documented in the response to Policy Point #3.

Lake Emma Road

A new connection is being added at Lake Emma Road within Segment 3. This connection will provide access to and from I-4 eastbound and to I-4 westbound within the Lake Mary Boulevard interchange. The proposed connection was shown previously in **Figure 5**. This connection was not included in the original SAMR submittal or the 2003 update. It is noted that the connection does not increase the number of access points to the I-4 general use or Express Lane system, but are connections to the Lake Mary Boulevard interchange ramps.

The purpose of the Lake Emma Road connection is to reduce the number of vehicles traveling through the congested I-4/Lake Mary Boulevard interchange and through the congested Lake Mary Boulevard/Lake Emma Road signalized intersection. The need to reduce the number of vehicles through this area is shown by the failing operations and the vehicle queuing issues under the No Build and Build conditions that focus primarily on the I-4/Lake Mary Boulevard interchange area. The alternatives analysis showed that unless capacity was added to the closely spaced Lake Mary Boulevard/Lake Emma Road signalized intersection or the volume of vehicles using the intersection was decreased that vehicle queuing impacts would negatively impact the I-4/Lake Mary Boulevard interchange. When alternatives to add capacity at the Lake Mary Boulevard/Lake Emma Road signalized intersection were discussed with the local jurisdictions, opposition to the significant right of way and business impacts that would be caused by expanding the intersection were expressed. The local jurisdictions supported the Lake Emma Road connection.

The proposed Lake Emma Road connection improves the overall operation of the I-4/Lake Mary Boulevard interchange. By providing a direct connection to Lake Emma Road, the number of vehicles utilizing the interchange ramps to and from Lake Mary Boulevard and the number of vehicles traveling on Lake Mary Boulevard through the interchange area will be reduced. The reduction in volume through the Lake Mary Boulevard interchange along with the conversion to a diverging diamond interchange configuration results in improved overall operation as compared to the Original Build condition and as compared to the condition with just the DDI and no connections to Lake Emma Road. It is noted that improvements to the current interchange at Lake Mary Boulevard and at the Lake Mary Boulevard/Lake Emma Road intersection without the connection at Lake Emma Road will not result in acceptable operations. The Lake Mary

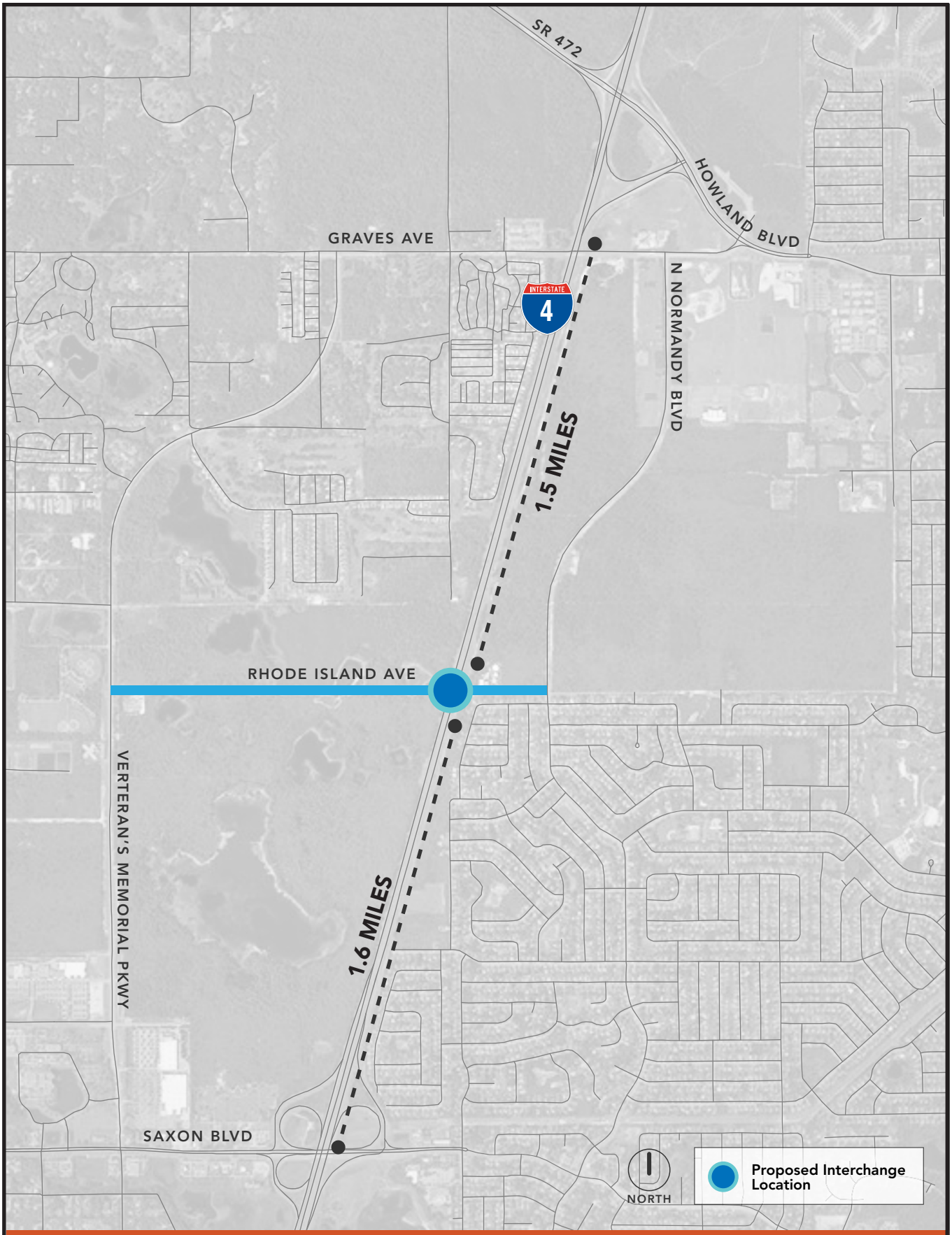
Boulevard/Lake Emma Road interchange alternative evaluation memorandum is included in **Appendix A**.

Rhode Island Avenue

The express lane connection at Enterprise Road in the Original Build scenario is being relocated to Rhode Island Avenue in the Modified Build scenario. The connection at Rhode Island Avenue in Segment 4 will provide access to the westbound express lanes and from the eastbound express lanes. No connections to the I-4 general purpose lanes are included in the concept. The proposed connection was shown previously in **Figure 5**, and the location with respect to the adjacent interchanges is illustrated in **Figure 6**.

The decision to move the access point from the previously approved location at Enterprise Road was made in consultation with the local governments of Volusia County, Orange City, and the City of Deltona. Volusia County has identified Rhode Island Avenue as a future crossing of I-4. The crossing would bridge I-4 and connect Veteran's Memorial Parkway to the west and Normandy Boulevard to the east. The purpose of the I-4 crossing is to improve east-west travel between the growing areas of Orange City and the City of Deltona and to relieve traffic on Saxon Boulevard and SR 472. City and County studies from the past have identified the Rhode Island Avenue extension and I-4 overpass as a preferred improvement for the area. However, the project has never moved forward due to lack of funding. The I-4 BtU project provides an opportunity to accelerate completion of the extension during construction of Segment 4. Meetings with Volusia County, Orange City, and the City of Deltona identified that a connection to I-4 utilizing the planned crossing at Rhode Island Avenue would be better utilized and more consistent with future development plans than the previously approved connection at Enterprise Road. The Rhode Island Avenue location also improves access to the proposed Park-and-Ride facility in the area, and the City and County are also considering potential locations for a multimodal facility in the area. Volusia County, Orange City, and the City of Deltona have expressed support for the proposed connection at Rhode Island Avenue to the I-4 Express Lane system.

Overall the connection improves the accessibility to the Express Lane system for the surrounding land uses in Orange City and the City of Deltona and is expected to reduce traffic primarily at the congested Saxon Boulevard interchange. The provision of access to the Express Lane system at Rhode Island Boulevard is expected to improve the operation of the Saxon Boulevard interchange area by reducing the overall demand for the access point at Saxon Boulevard.



FDOT

I-4 SAMR Re-Evaluation

Figure 6 - North Section Proposed Rhode Island Avenue Interchange Location

2.2. Policy Point 2

The need being addressed by the request cannot be adequately satisfied by reasonable transportation system management (such as ramp metering, mass transit, and HOV facilities), geometric design, and alternative improvements to the Interstate without the proposed change(s) in access (23 CFR 625.2(a)).

Response:

The I-4 SAMR Re-Evaluation Study consists mostly of existing interchanges that are being modified to better accommodate the future traffic demands in the region. This is consistent with the direction of the Policy Point. New access connections are being added at Lake Emma Road and Rhode Island Avenue.

At the system level, transportation system management alternatives are being implemented and evaluated throughout the corridor. Transportation system management alternatives implemented and being evaluated include:

- HOV Facilities: HOV facilities were considered and evaluated in the I-4 BtU as part of the Original Build alternative. Ultimately, the addition of HOV facilities would not adequately serve future traffic demands, as demonstrated in Section 7 of this report.
- Express Lane System: The I-4 Beyond the Ultimate project extends the Express Lane system currently being implemented as part of the I-4 Ultimate project which utilizes electronic, dynamic tolling and limited access points as a congestion management strategy. The conversion to ELs is consistent with statewide FDOT policy (Topic No. 525-030-020-a) and what is being implemented in the I-4 Ultimate section. The HOV to EL conversion was identified as a minor change in the Project Reevaluation Form for the ROW acquisition phase for a portion of the I-4 Ultimate.
- The SunRail commuter rail system: SunRail currently runs between Sand Lake Road to the south and DeBary to the north. Expansion is funded from Sand Lake Road to Poinciana in the south. Additional on-going projects are studying the feasibility of extending SunRail to Orlando International Airport to the south and through Volusia County to the north.
- Express Lane System: The I-4 Beyond the Ultimate project extends the Express Lane system currently being implemented as part of the I-4 Ultimate project.
- Traveler Information Systems: As part of the I-4 Beyond the Ultimate implementation, an advanced traveler information system is being implemented. The ITS system will expand the currently under construction system being implemented as part of the on-going I-4 Ultimate project. The traveler information system will provide better information to system users throughout the region. The proposed ATIS will improve the detection (both in density and technology) being used along I-4, increasing the speed by which the RTMC is aware of field conditions, leading to improved response times. Additionally, the

presence of Express Lanes will increase the number of Road Rangers who account for the vast majority of incidents created within the ATIS, further enhancing detection..

- Ramp Metering: The implementation of ramp metering at a regional level continues to be evaluated. The use of state-of-the-art technology, including decision support systems, may help adequately balance the needs of the freeway and arterial/local road systems.

The transportation system management alternatives implemented will not address the future capacity needs of the I-4 corridor through the study area.

Lake Emma Road

A new connection is being added at Lake Emma Road in Segment 3. The area will continue to be served by transit, including the SunRail commuter rail service. Transportation system management strategies such as ITS and ramp metering are being considered for implementation in the Modified Build Alternative in addition to the proposed geometric recommendations. Several geometric alternatives, as documented in the Lake Mary Boulevard/Lake Emma Road interchange alternative evaluation memorandum in **Appendix A** were also evaluated. The provision of transportation system management strategies and the modification of the existing interchange and intersection geometries on Lake Mary Boulevard cannot adequately address the design year capacity needs in the area.

Rhode Island Avenue

The managed lane connection at Enterprise Road in the Original Build scenario is being relocated to Rhode Island Avenue in the Modified Build scenario. The connection at Rhode Island Avenue in Segment 4 will provide access to the westbound express lanes and from the eastbound express lanes. The connection improves the accessibility of the Express Lane system for the surrounding land uses in Orange City. The area will continue to be served by transit, including the SunRail commuter rail service. Transportation system management strategies such as ITS and ramp metering are being considered for implementation in the Modified Build Alternative in addition to the proposed geometric recommendations. The expected traffic accessing the I-4 Express Lane system at Rhode Island Avenue cannot be adequately satisfied by reasonable transportation system management alternatives at the adjacent interchanges of Saxon Boulevard and SR 472.

As previously noted, transportation system management alternatives are included and are under evaluation at the adjacent interchanges of Saxon Boulevard and SR 472. Ramp metering and advanced signal timing concepts will be evaluated for implementation. These transportation system management alternatives are not expected to be able to adequately address the future capacity needs of the adjacent interchanges of Saxon Boulevard and SR 472. Geometric improvements to Saxon Boulevard and to SR 472 and the intersections in the vicinity of the

interchange ramps are included as part of the Modified Build alternative. It is noted that the access to and from Rhode Island Avenue is limited to the Express Lane system. No additional access to the I-4 general purpose lanes is proposed.

2.3. Policy Point 3

An operational and safety analysis has concluded that the proposed change in access does not have a significant adverse impact on the safety and operation of the Interstate facility (which includes mainline lanes, existing, new, or modified ramps, ramp intersections with crossroad) or on the local street network based on both the current and the planned future traffic projections. The analysis shall, particularly in urbanized areas, include at least the first adjacent existing or proposed interchange on either side of the proposed change in access (23 CFR 625.2(a), 655.603(d) and 771.111(f)). The crossroads and the local street network, to at least the first major intersection on either side of the proposed change in access, shall be included in this analysis to the extent necessary to fully evaluate the safety and operational impacts that the proposed change in access and other transportation improvements may have on the local street network (23 CFR 625.2(a) and 655.603(d)). Requests for a proposed change in access must include a description and assessment of the impacts and ability of the proposed changes to safely and efficiently collect, distribute and accommodate traffic on the Interstate facility, ramps, intersection of ramps with crossroad, and local street network (23 CFR 625.2(a) and 655.603(d)). Each request must also include a conceptual plan of the type and location of the signs proposed to support each design alternative (23 U.S.C. 109(d) and 23 CFR 655.603(d)).

Response:

Operations Analysis

This I-4 SAMR Re-Evaluation Study includes traffic analyses for the Existing Year (2011), Opening Year (2020), Interim Year (2030) and Design Year (2040) conditions. The future year analyses were conducted for both the Original Build and Modified Build conditions. Analyses were conducted for the mainline freeway segments, ramp junctions (merges and diverges), weaving sections, Express Lane entry and exit points, and intersections at the ramp terminals and crossroads within the area of influence.

A high-level summary of the operational analysis is shown in **Figure 7** through **Figure 12**. Based on the operational analysis conducted for this study, the following observations were made:

<u>2020 Opening Year</u>

- 2020 AM and PM Peak Period: All sections of the Modified Build scenario (mainline freeway sections, weave sections, and ramp junctions) operate at the same or better LOS grade than comparable sections of the Original Build scenario; and
- The following intersections projected to operate at LOS F during the AM and/or PM peak period under the Original Build scenario are now projected to operate at LOS D or better under the Modified Build scenario:

- SR 46 at I-4 eastbound off-ramp, US 17-92 at I-4 eastbound ramps, US 17-92 at I-4 westbound ramps, Orange Camp Road at I-4 westbound ramps,
- Lake Mary Boulevard at Lake Emma Road, CR 46A at Rinehart Road, Saxon Boulevard at Finland Drive, and SR 472 at Graves Avenue.

2030 Interim Year

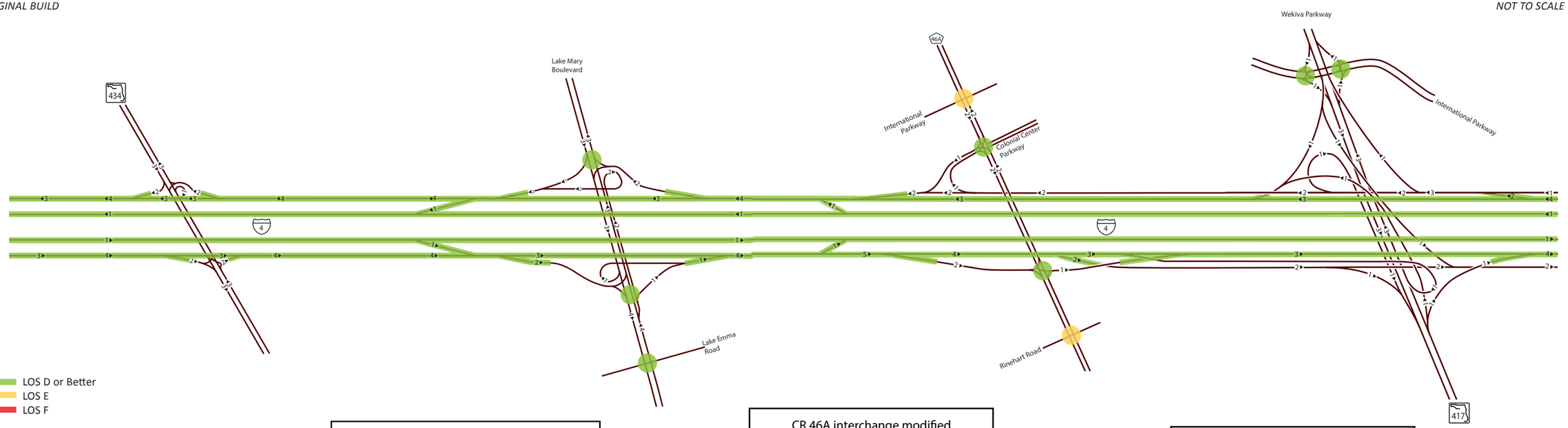
- 2030 AM and PM Peak Period: All sections of the Modified Build scenario (mainline freeway sections, weave sections, and ramp junctions) operate at the same or better LOS grade than comparable sections of the Original Build scenario; and
- The following intersections projected to operate at LOS F during the AM and/or PM peak period under the Original Build scenario are now projected to operate at LOS D or better under the Modified Build scenario:
  - CR 46A at I-4 eastbound off-ramp, CR 46A at I-4 westbound ramps/Colonial Center Parkway, SR 46 at I-4 eastbound off-ramp, US 17-92 at I-4 eastbound ramps, US 17-92 at I-4 westbound ramps, SR 472 at I-4 eastbound ramps, Orange Camp Road at I-4 westbound ramps, Orange Camp Road at I-4 eastbound ramps,
  - Lake Mary Boulevard at Lake Emma Road, CR 46A at International Parkway, CR 46A at Rinehart Road, Saxon Boulevard at Finland Drive, SR 472 at Dr. Martin Luther King Beltway, and SR 472 at Graves Avenue.

2040 Design Year

- 2040 AM and PM Peak Period: All sections of the Modified Build scenario (mainline freeway sections, weave sections, and ramp junctions) operate at the same or better LOS grade than comparable sections of the Original Build scenario.
- The following intersections projected to operate at LOS F during the AM and/or PM peak period under the Original Build scenario are now projected to operate at LOS D or better under the Modified Build scenario:
  - Lake Mary Boulevard at I-4 eastbound off-ramp, CR 46A at I-4 eastbound ramps, CR 46A at I-4 westbound ramps/Colonial Center Parkway, SR 46 at I-4 eastbound off-ramp, US 17-92 at I-4 eastbound ramps, US 17-92 at I-4 westbound ramps, Orange Camp Road at I-4 eastbound ramps, Orange Camp Road at I-4 westbound ramps,
  - Lake Mary Boulevard at Lake Emma Road, CR 46A at International Parkway, CR 46A at Rinehart Road, Dirksen Drive at Deltona Boulevard, Saxon Boulevard at Finland Drive, SR 472 at Dr. Martin Luther King Beltway, and SR 472 at Graves Avenue.
- During the PM peak period, the SR 472 at I-4 eastbound and westbound ramp intersections are projected to operate at LOS F under the Original Build scenario and LOS E under the Modified Build scenario.

ORIGINAL BUILD

NOT TO SCALE

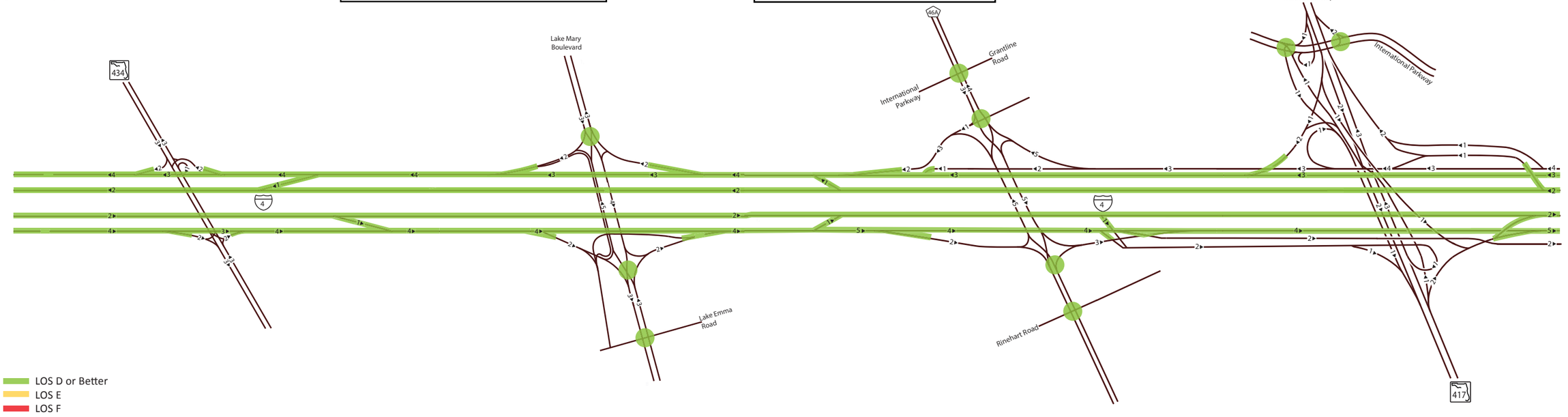


Lake Mary Blvd interchange modified to Diverging Diamond interchange with the addition of ramp access at Lake Emma Rd

CR 46A interchange modified to Diverging Diamond interchange with corridor and intersection improvements at Rinehart Rd

Express lane connections were added to the SR 417 interchange

MODIFIED BUILD



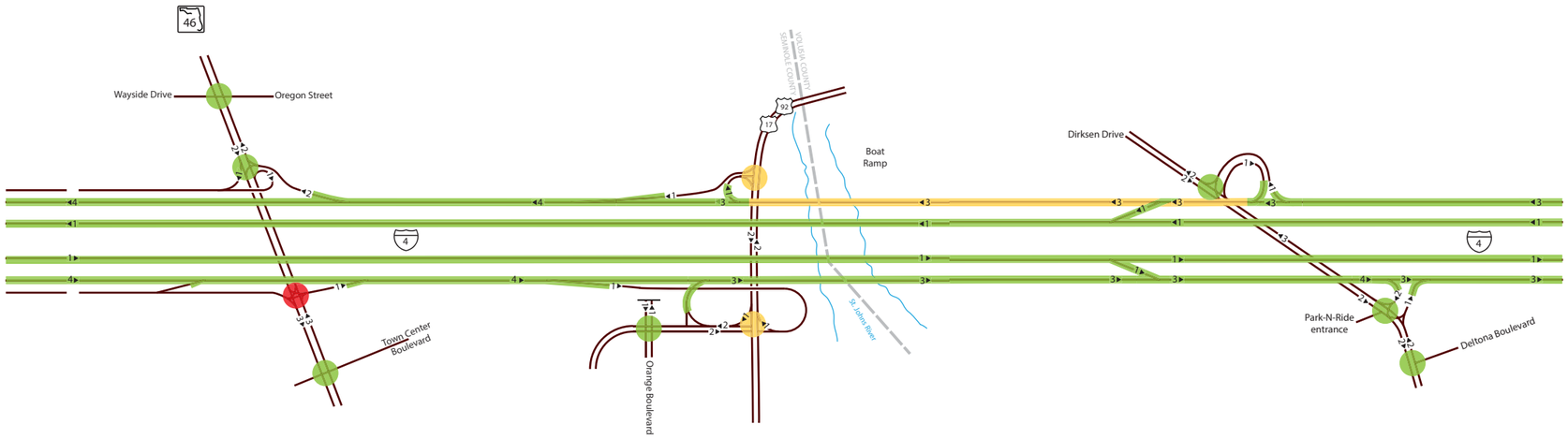
Date: 8.26.2016

I-4 SAMR Re-Evaluation

Figure 7 (1 of 3)
2020 AM Peak Hour Operations (North Section)

ORIGINAL BUILD

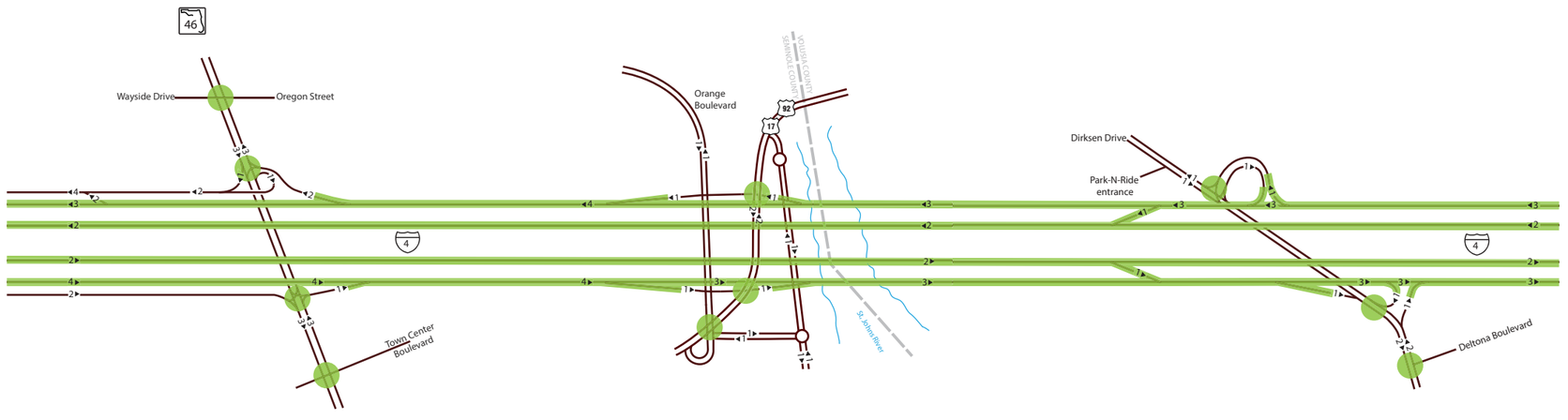
NOT TO SCALE



US 17-92 interchange modified to full access dimaond interchange

Dirksen Drive interchange modified to add an Eastbound-to-Eastbound ramp.

MODIFIED BUILD



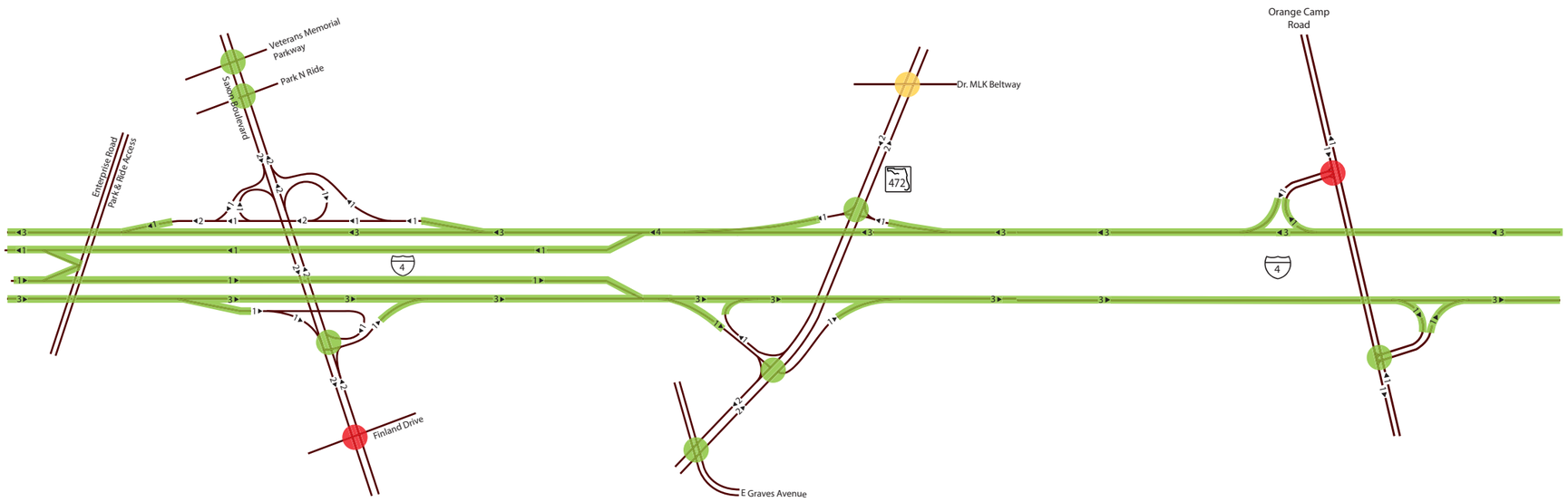
Date: 8.26.2016

I-4 SAMR Re-Evaluation

Figure 7 (2 of 3)
2020 AM Peak Hour Operations (North Section)

ORIGINAL BUILD

NOT TO SCALE



LOS D or Better
LOS E
LOS F

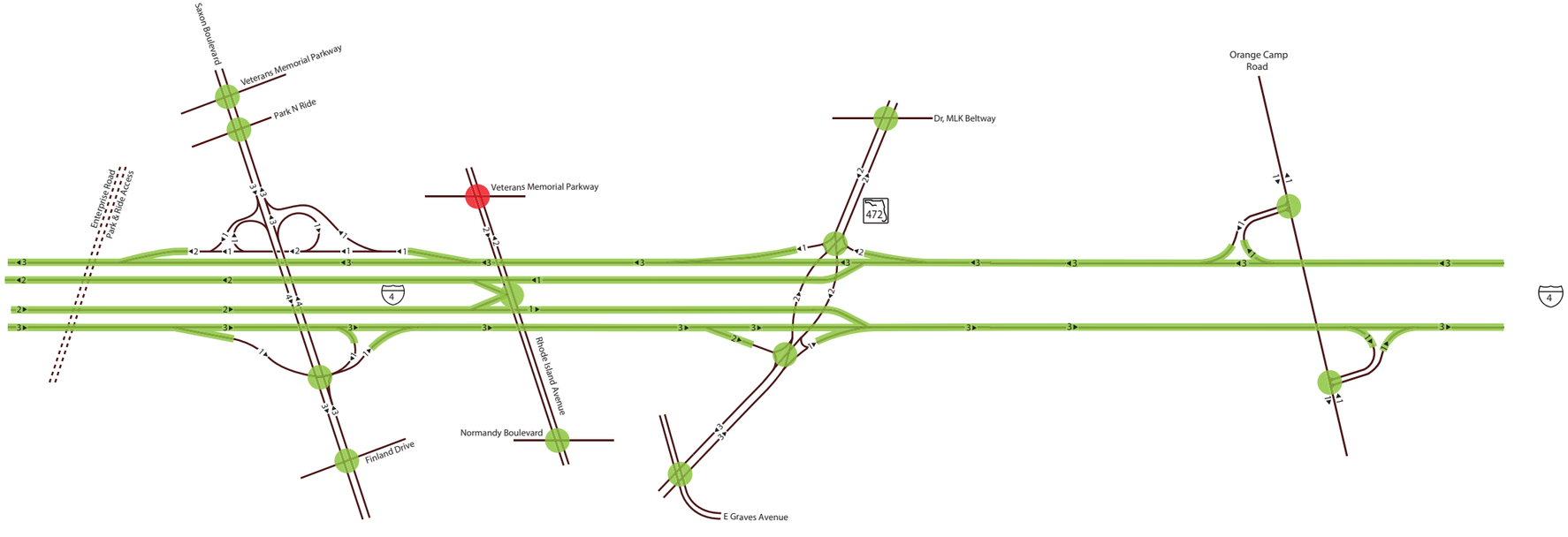
HOV access at Enterprise Rd replaced with Express Lane access to Rhode Island Ave

Saxon Blvd widened to six lanes through the interchange area

SR 472 interchange modified to Diverging Diamond interchange, with Express Lane access relocated east of SR 472

Orange Camp Rd ramp intersections were signalized in the modified build

MODIFIED BUILD



LOS D or Better
LOS E
LOS F

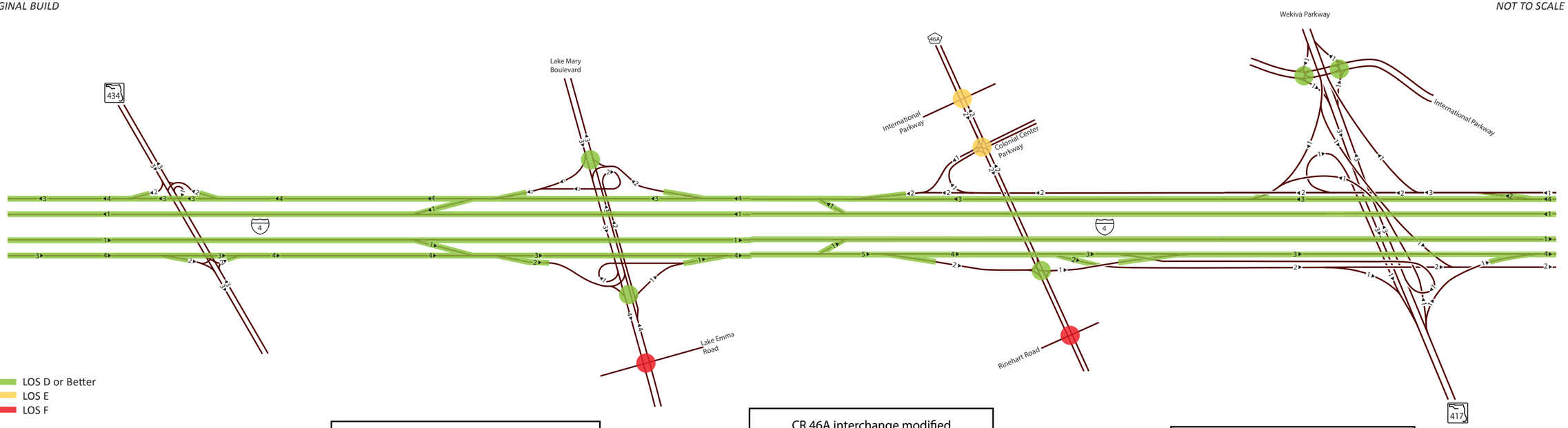
Date: 8.26.2016

I-4 SAMR Re-Evaluation

Figure 7 (3 of 3)
2020 AM Peak Hour Operations (North Section)

ORIGINAL BUILD

NOT TO SCALE



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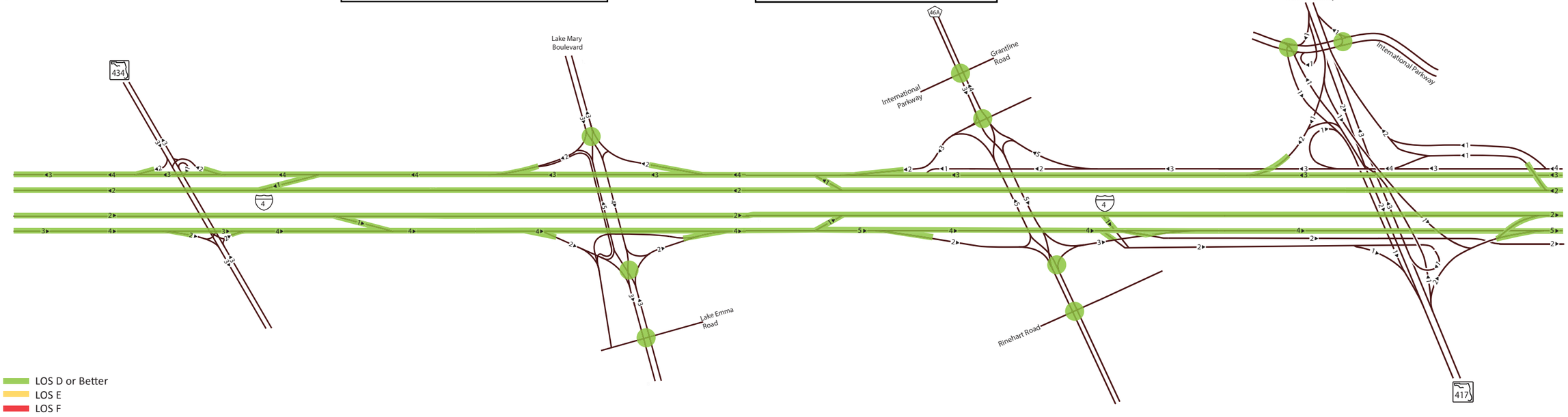
CR 46A interchange modified to Diverging Diamond interchange with corridor and intersection improvements at Rinehart Rd

Express lane connections were added to the SR 417 interchange

MODIFIED BUILD



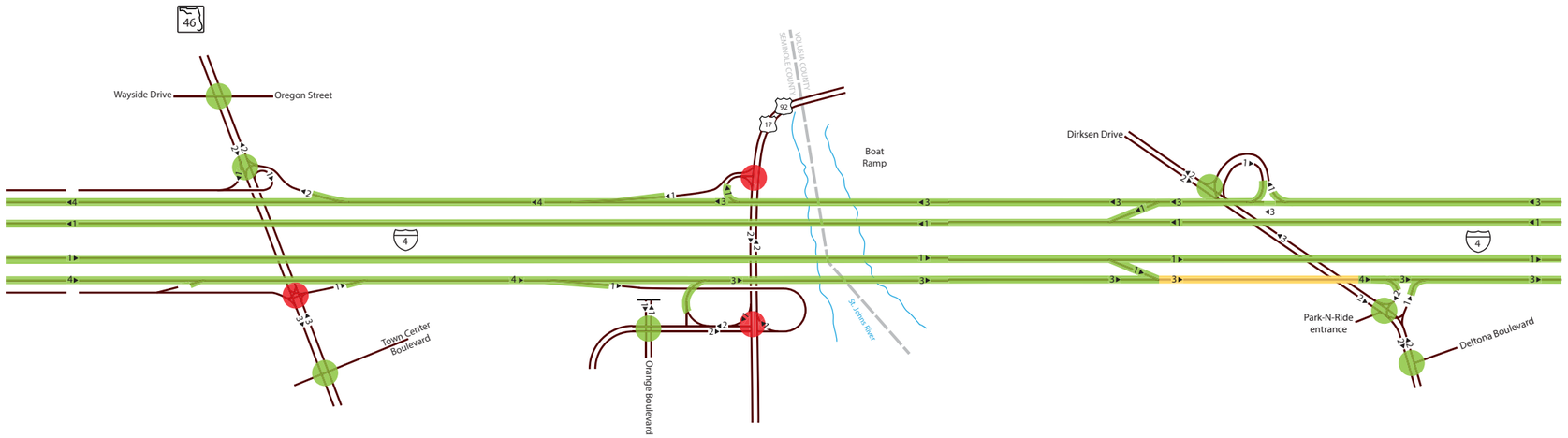
Date: 8.26.2016

I-4 SAMR Re-Evaluation

Figure 8 (1 of 3)
2020 PM Peak Hour Operations (North Section)

ORIGINAL BUILD

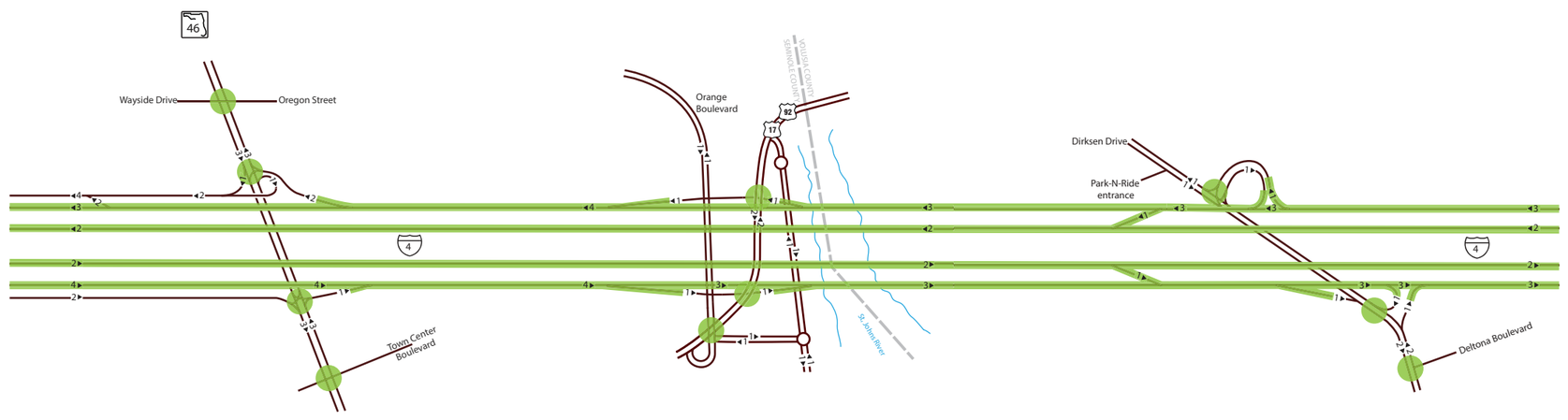
NOT TO SCALE



US 17-92 interchange modified to full access dimaond interchange

Dirksen Drive interchange modified to add an Eastbound-to-Eastbound ramp.

MODIFIED BUILD



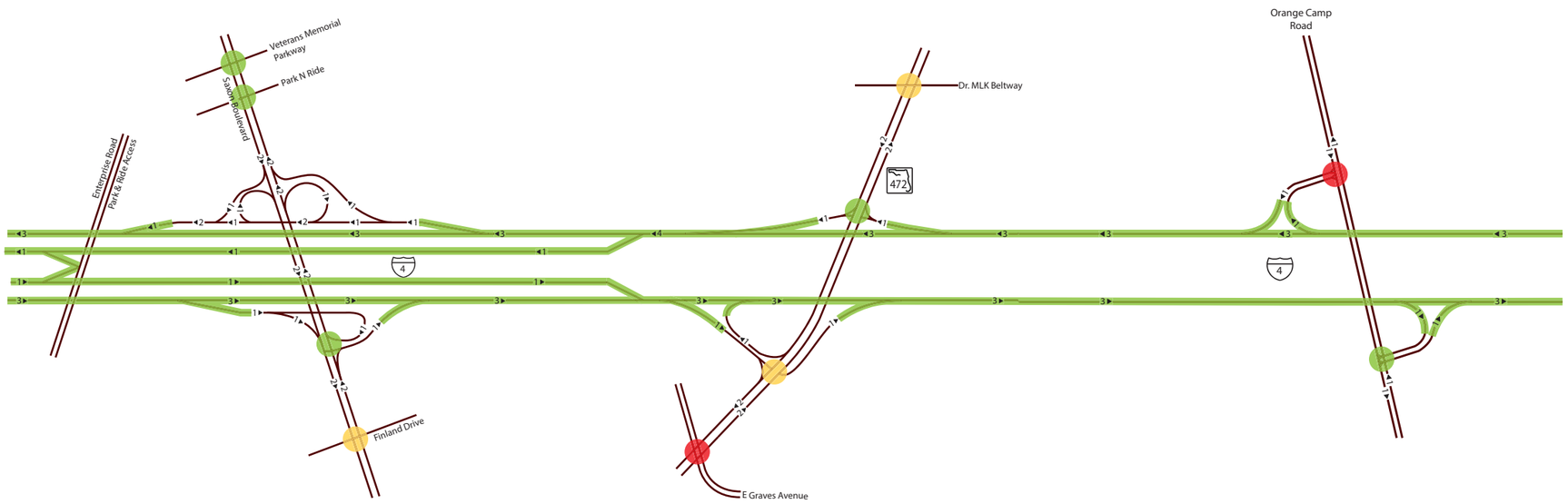
Date: 8.26.2016

I-4 SAMR Re-Evaluation

Figure 8 (2 of 3)
2020 PM Peak Hour Operations (North Section)

ORIGINAL BUILD

NOT TO SCALE



LOS D or Better
LOS E
LOS F

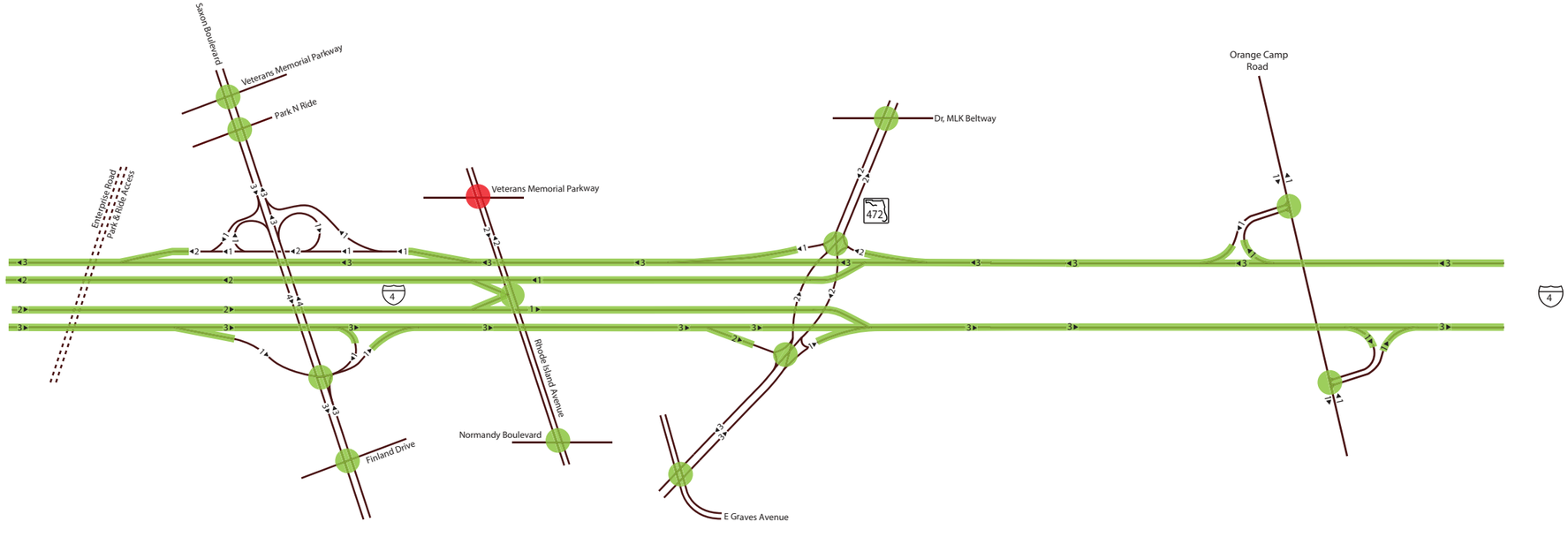
HOV access at Enterprise Rd replaced with Express Lane access to Rhode Island Ave

Saxon Blvd widened to six lanes through the interchange area

SR 472 interchange modified to Diverging Diamond interchange, with Express Lane access relocated east of SR 472

Orange Camp Rd ramp intersections were signalized in the modified build

MODIFIED BUILD



LOS D or Better
LOS E
LOS F

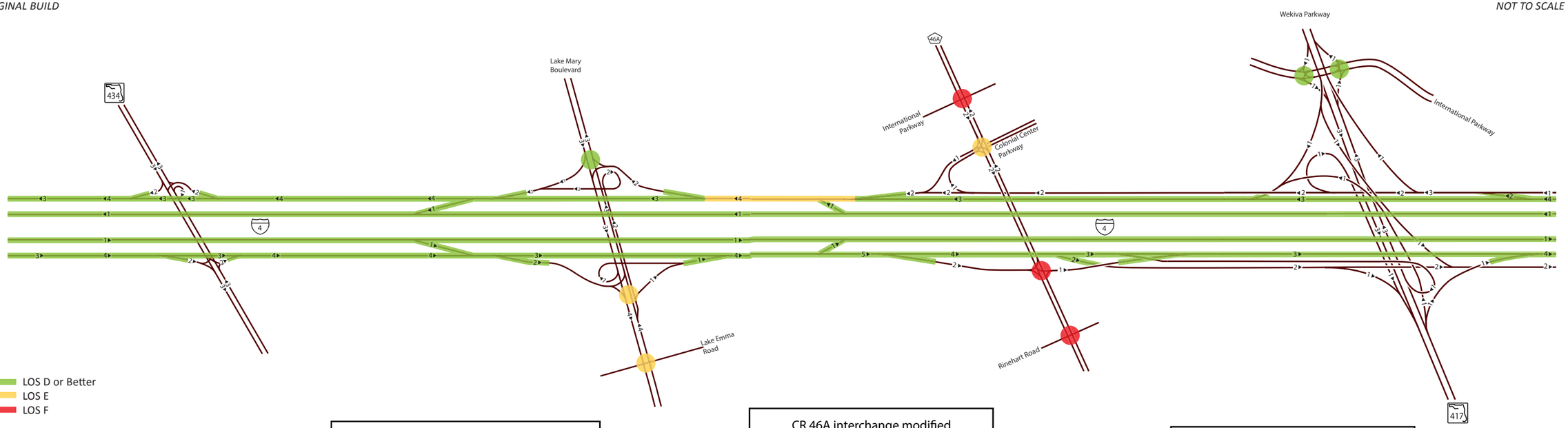
Date: 8.26.2016

I-4 SAMR Re-Evaluation

Figure 8 (3 of 3)
2020 PM Peak Hour Operations (North Section)

ORIGINAL BUILD

NOT TO SCALE



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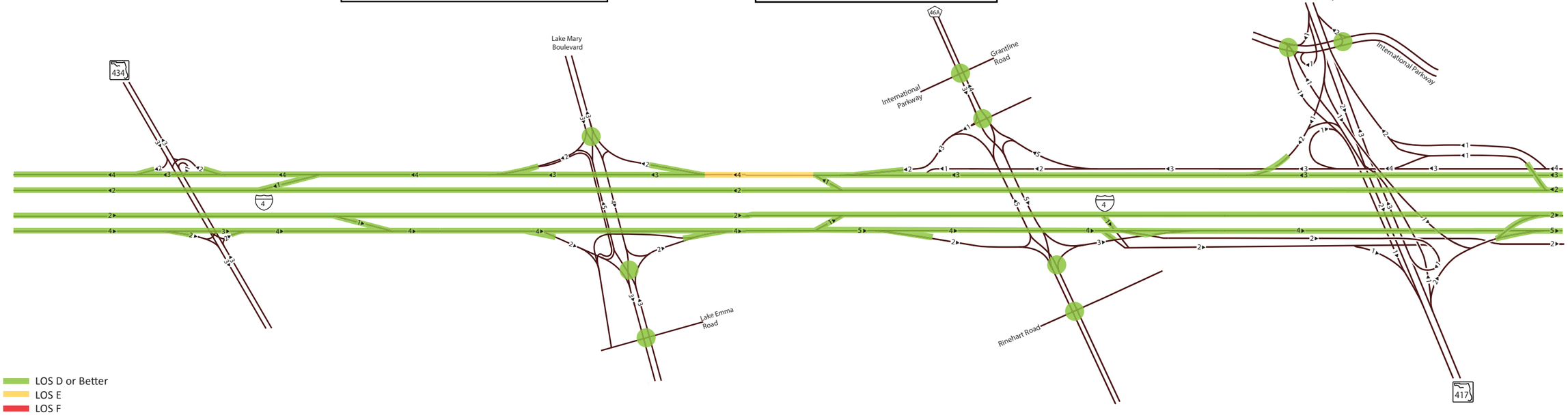
CR 46A interchange modified to Diverging Diamond interchange with corridor and intersection improvements at Rinehart Rd

Express lane connections were added to the SR 417 interchange

MODIFIED BUILD



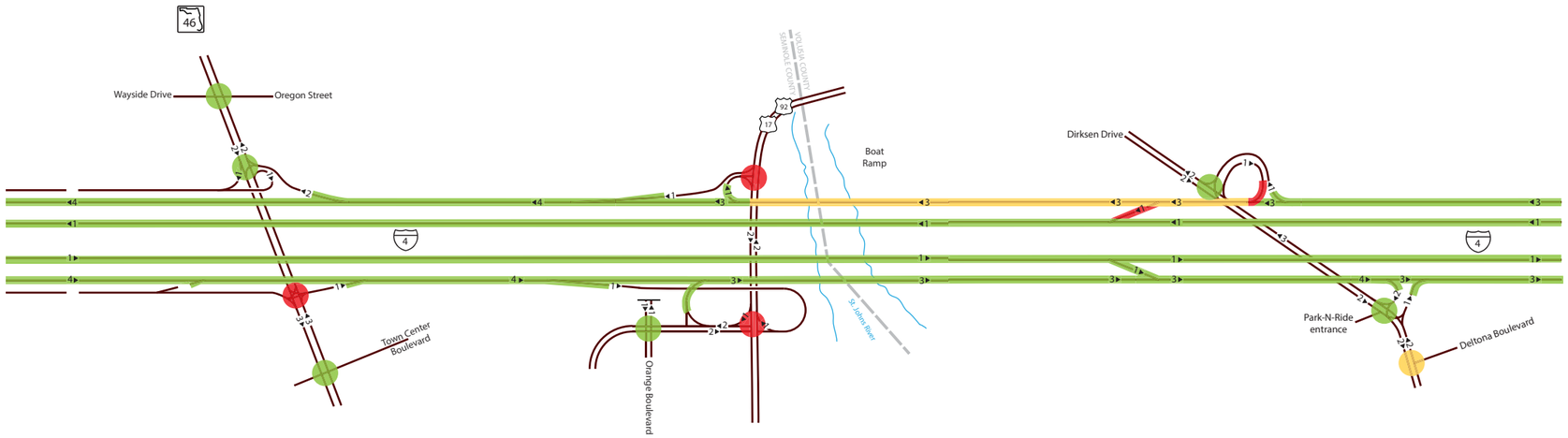
Date: 8.26.2016

I-4 SAMR Re-Evaluation

Figure 9 (1 of 3)
2030 AM Peak Hour Operations (North Section)

ORIGINAL BUILD

NOT TO SCALE

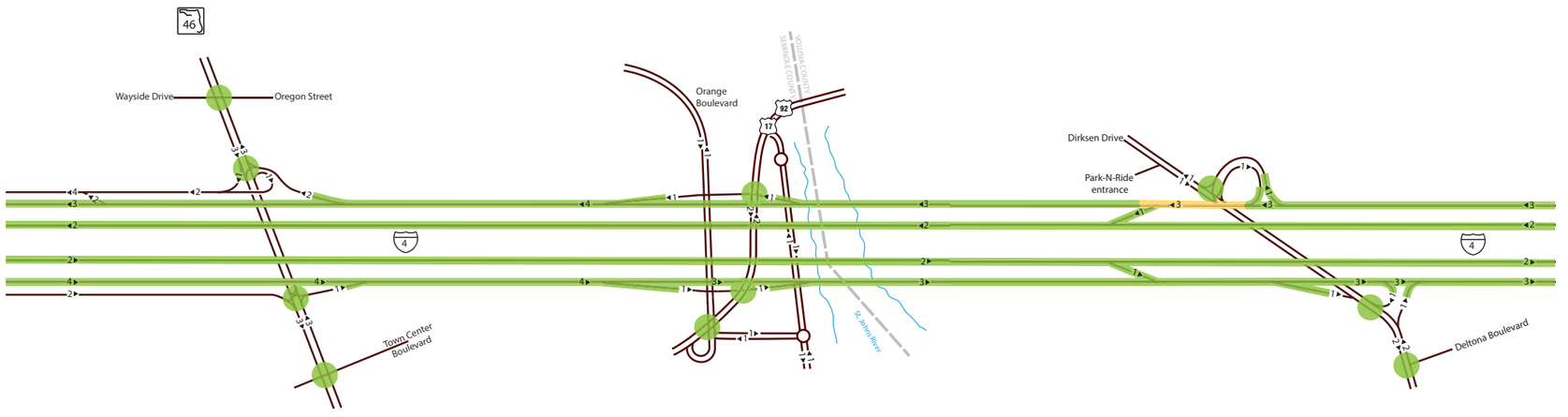


LOS D or Better
LOS E
LOS F

US 17-92 interchange modified to full access dimaond interchange

Dirksen Drive interchange modified to add an Eastbound-to-Eastbound ramp.

MODIFIED BUILD



LOS D or Better
LOS E
LOS F

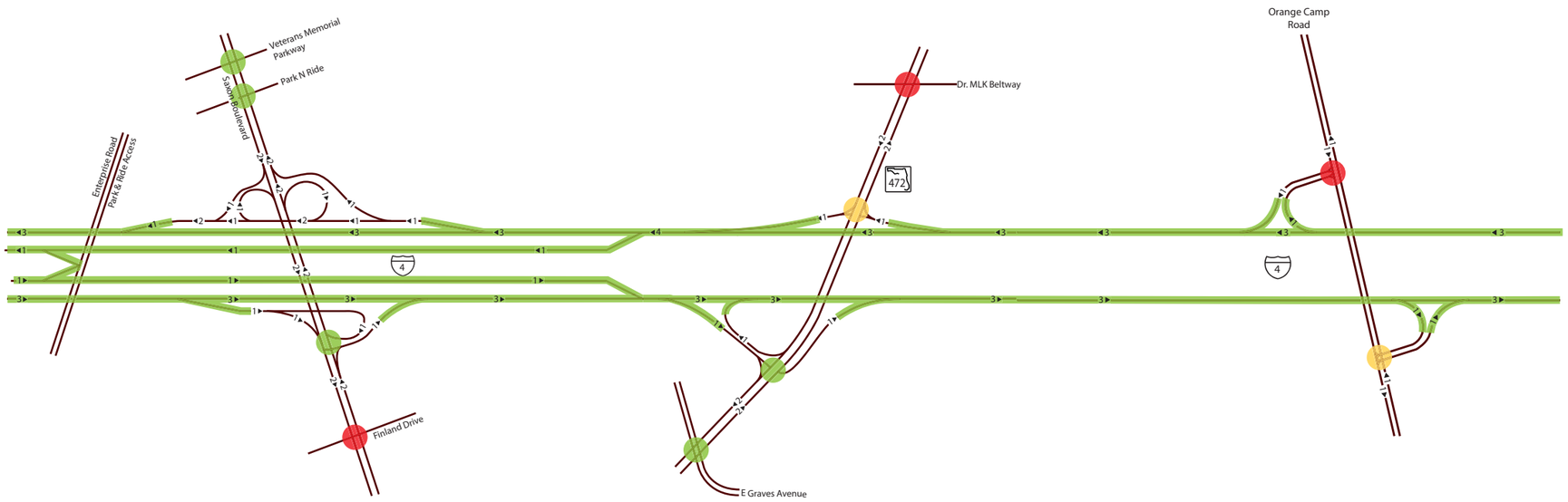
Date: 8.26.2016

I-4 SAMR Re-Evaluation

Figure 9 (2 of 3)
2030 AM Peak Hour Operations (North Section)

ORIGINAL BUILD

NOT TO SCALE



LOS D or Better
LOS E
LOS F

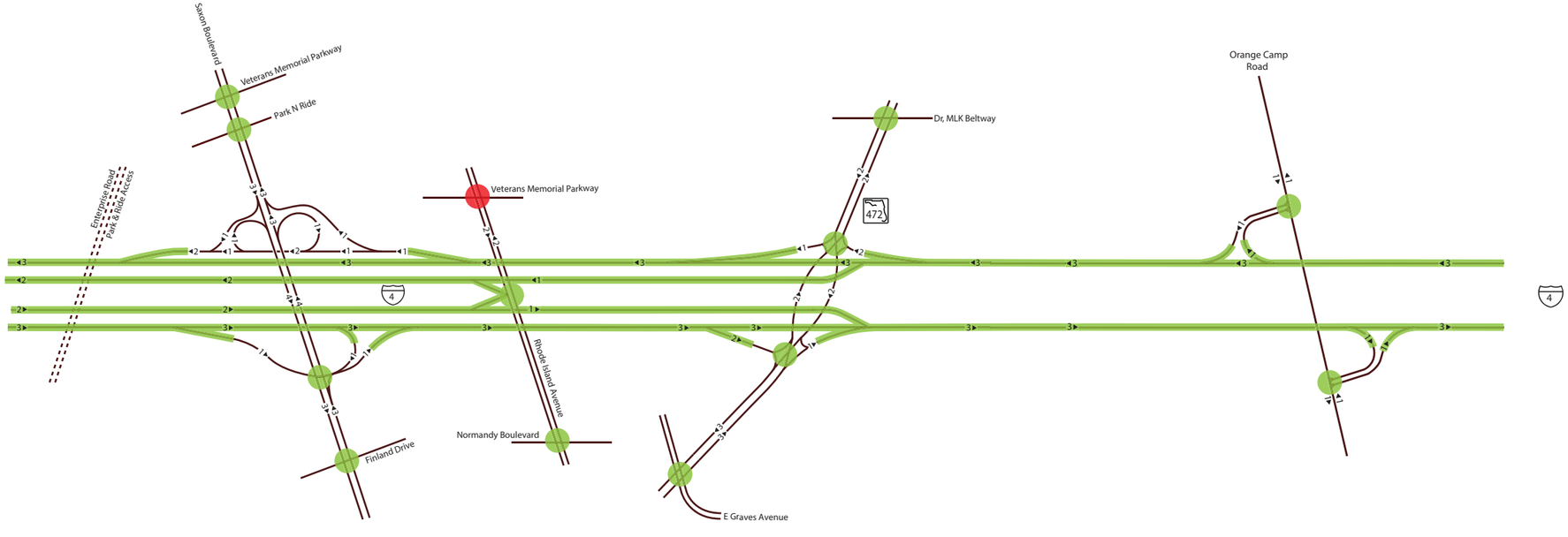
HOV access at Enterprise Rd replaced with Express Lane access to Rhode Island Ave

Saxon Blvd widened to six lanes through the interchange area

SR 472 interchange modified to Diverging Diamond interchange, with Express Lane access relocated east of SR 472

Orange Camp Rd ramp intersections were signalized in the modified build

MODIFIED BUILD



LOS D or Better
LOS E
LOS F

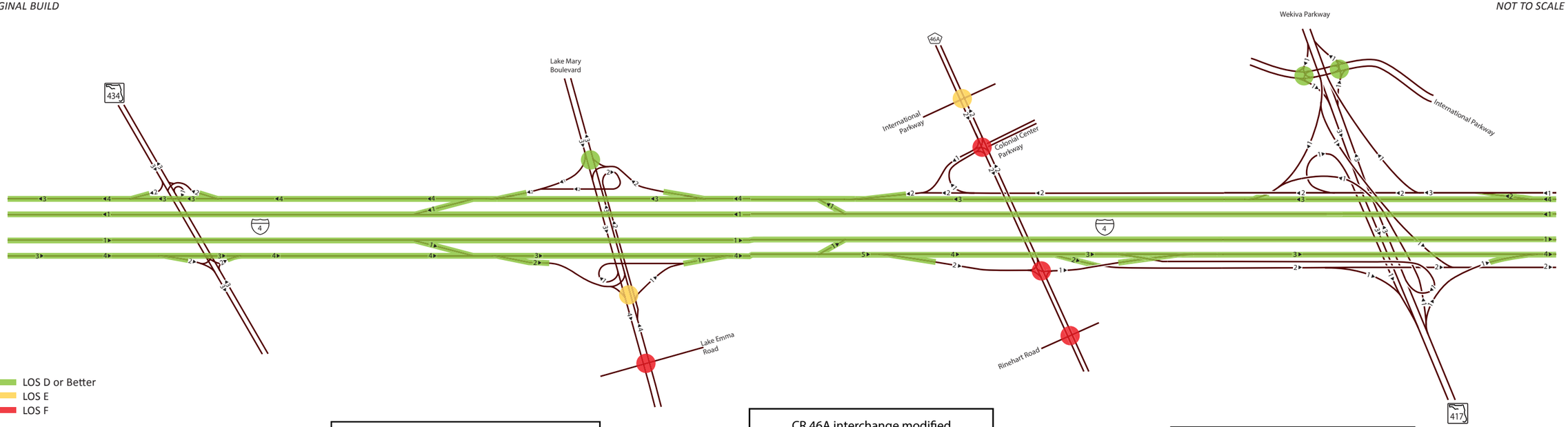
Date: 8.26.2016

I-4 SAMR Re-Evaluation

Figure 9 (3 of 3)
2030 AM Peak Hour Operations (North Section)

ORIGINAL BUILD

NOT TO SCALE



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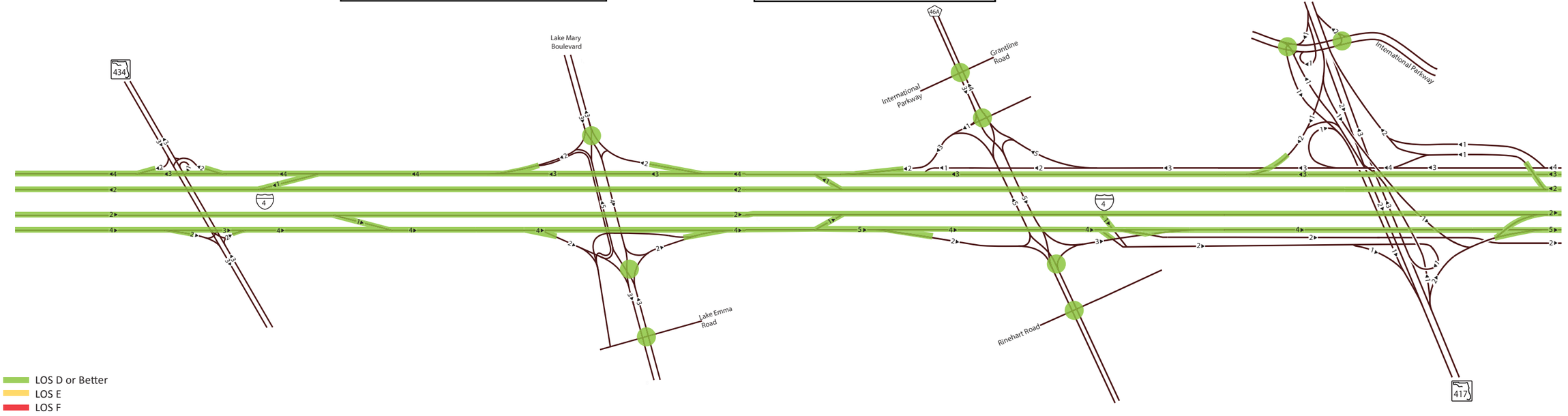
CR 46A interchange modified to Diverging Diamond interchange with corridor and intersection improvements at Rinehart Rd

Express lane connections were added to the SR 417 interchange

MODIFIED BUILD



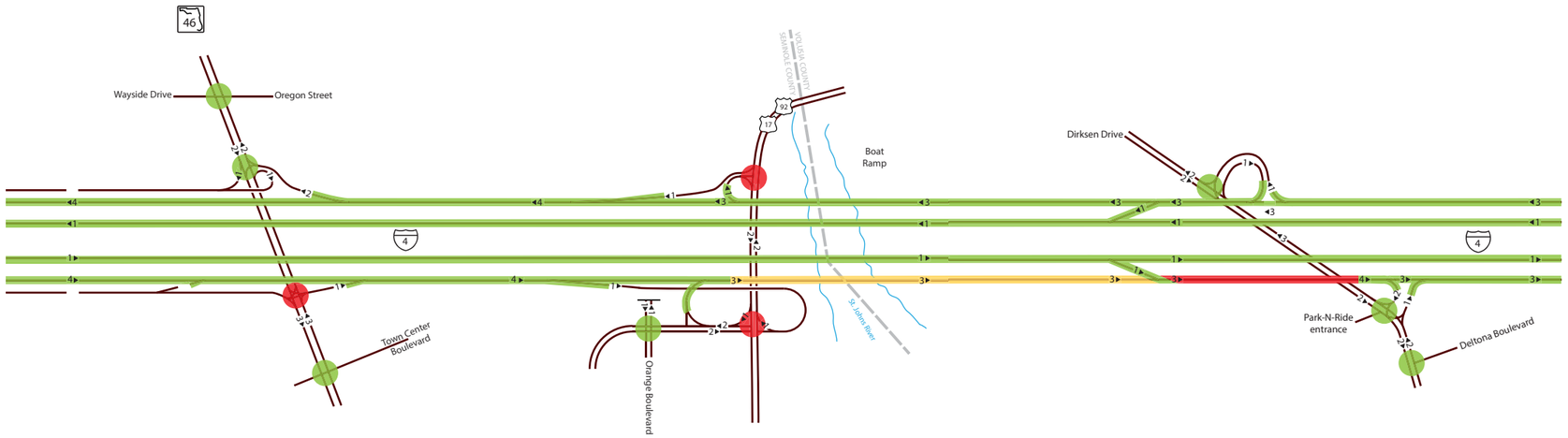
Date: 8.26.2016

I-4 SAMR Re-Evaluation

Figure 10 (1 of 3)
2030 PM Peak Hour Operations (North Section)

ORIGINAL BUILD

NOT TO SCALE

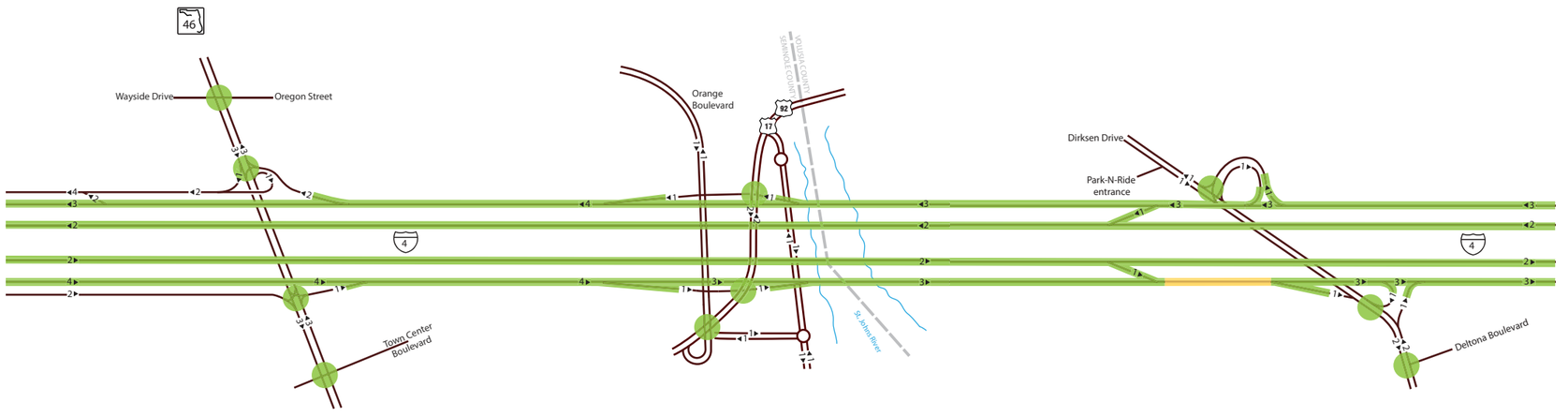


LOS D or Better
LOS E
LOS F

US 17-92 interchange modified to full access dimaond interchange

Dirksen Drive interchange modified to add an Eastbound-to-Eastbound ramp.

MODIFIED BUILD



LOS D or Better
LOS E
LOS F

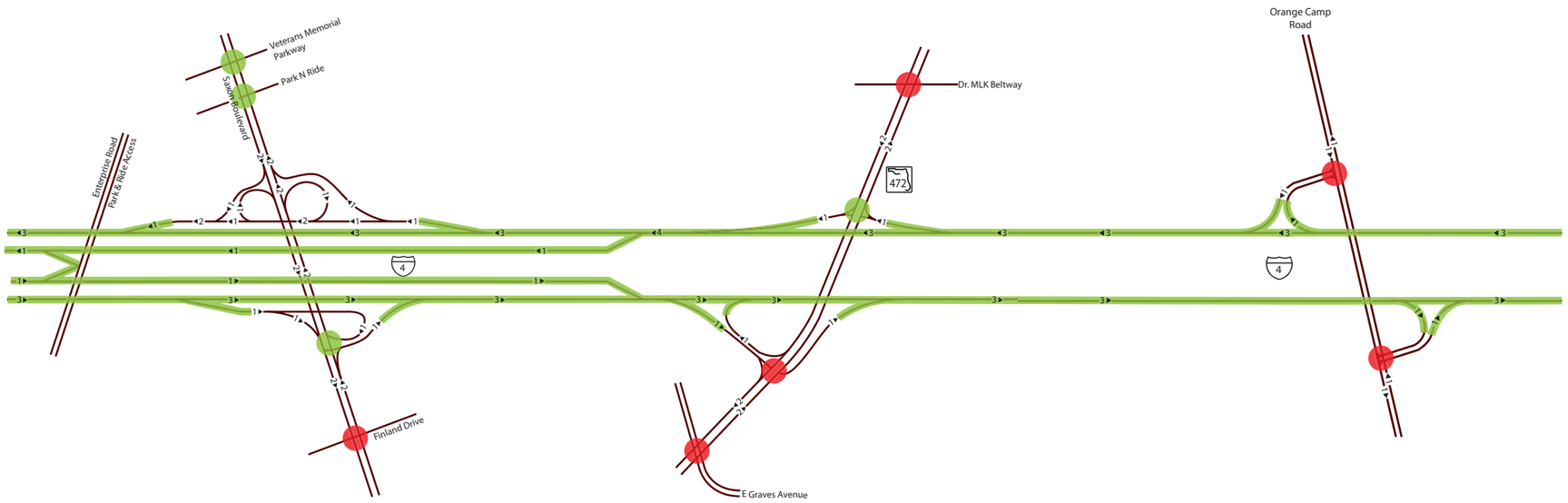
Date: 8.26.2016

I-4 SAMR Re-Evaluation

Figure 10 (2 of 3)
2030 PM Peak Hour Operations (North Section)

ORIGINAL BUILD

NOT TO SCALE



LOS D or Better
LOS E
LOS F

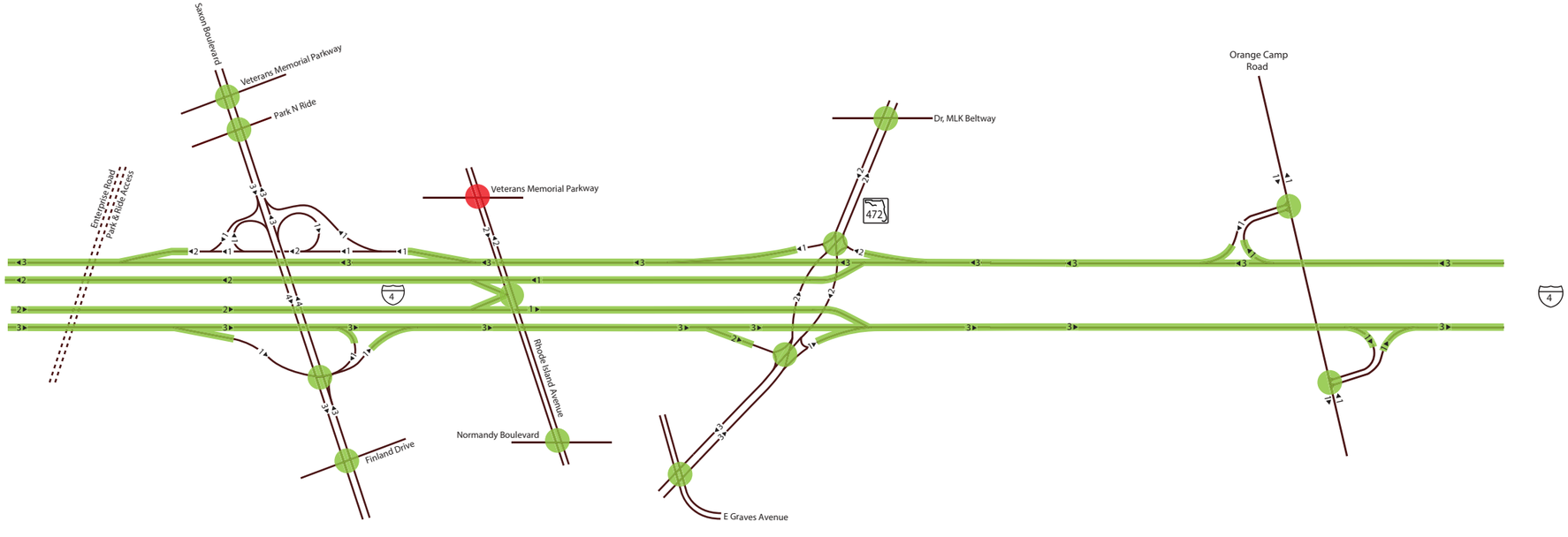
HOV access at Enterprise Rd replaced with Express Lane access to Rhode Island Ave

Saxon Blvd widened to six lanes through the interchange area

SR 472 interchange modified to Diverging Diamond interchange, with Express Lane access relocated east of SR 472

Orange Camp Rd ramp intersections were signalized in the modified build

MODIFIED BUILD



LOS D or Better
LOS E
LOS F

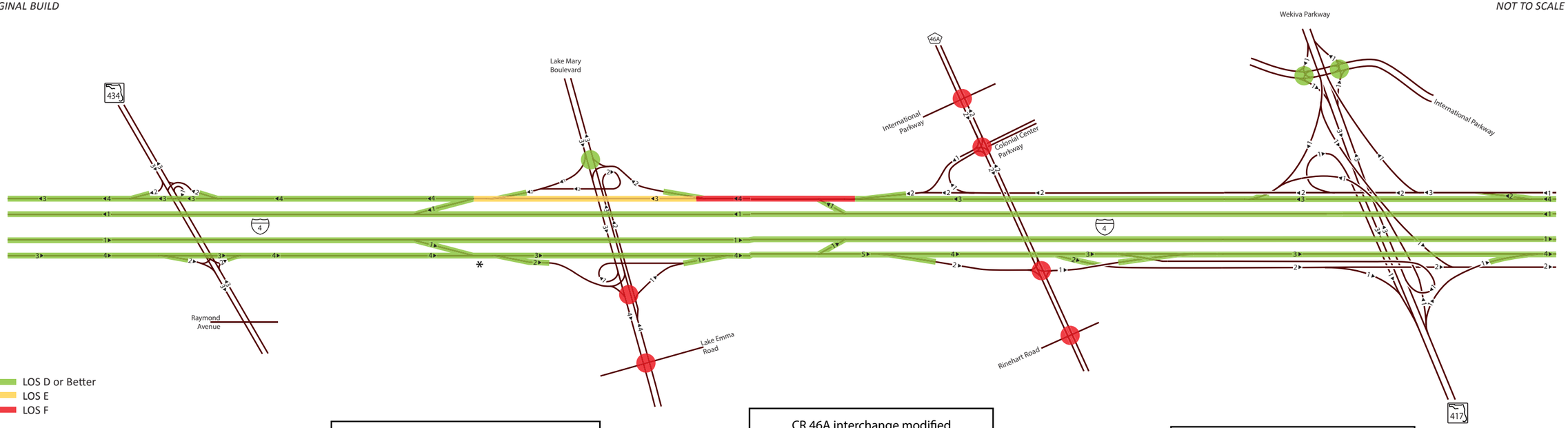
Date: 8.26.2016

I-4 SAMR Re-Evaluation

Figure 10 (3 of 3)
2030 PM Peak Hour Operations (North Section)

ORIGINAL BUILD

NOT TO SCALE

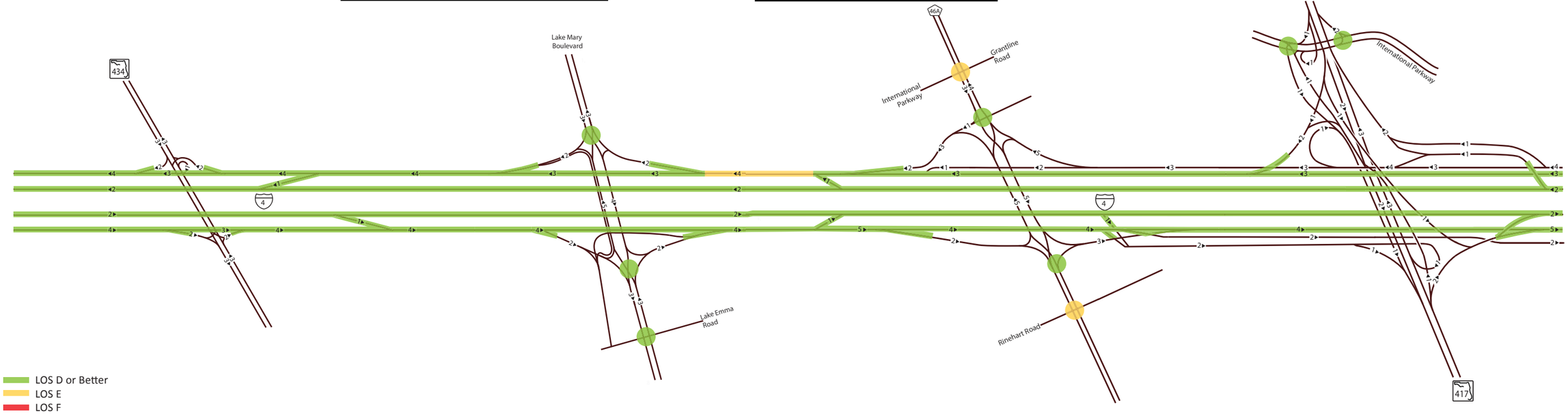


Lake Mary Blvd interchange modified to Diverging Diamond interchange with the addition of ramp access at Lake Emma Rd

CR 46A interchange modified to Diverging Diamond interchange with corridor and intersection improvements at Rinehart Rd

Express lane connections were added to the SR 417 interchange

MODIFIED BUILD



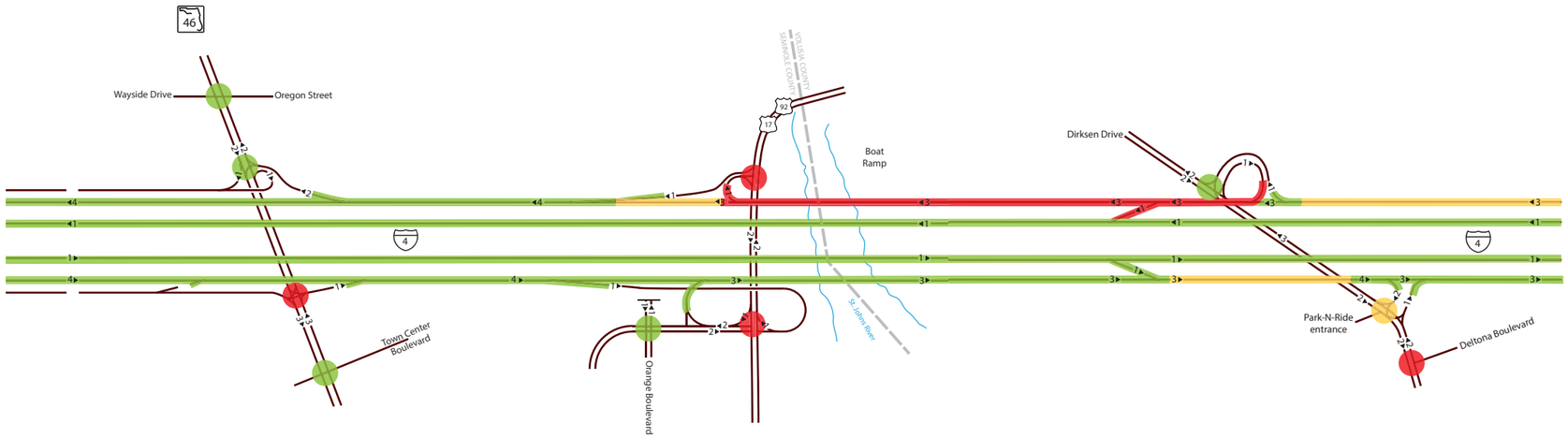
Date: 8.26.2016

I-4 SAMR Re-Evaluation

Figure 11 (1 of 3)
2040 AM Peak Hour Operations (North Section)

ORIGINAL BUILD

NOT TO SCALE

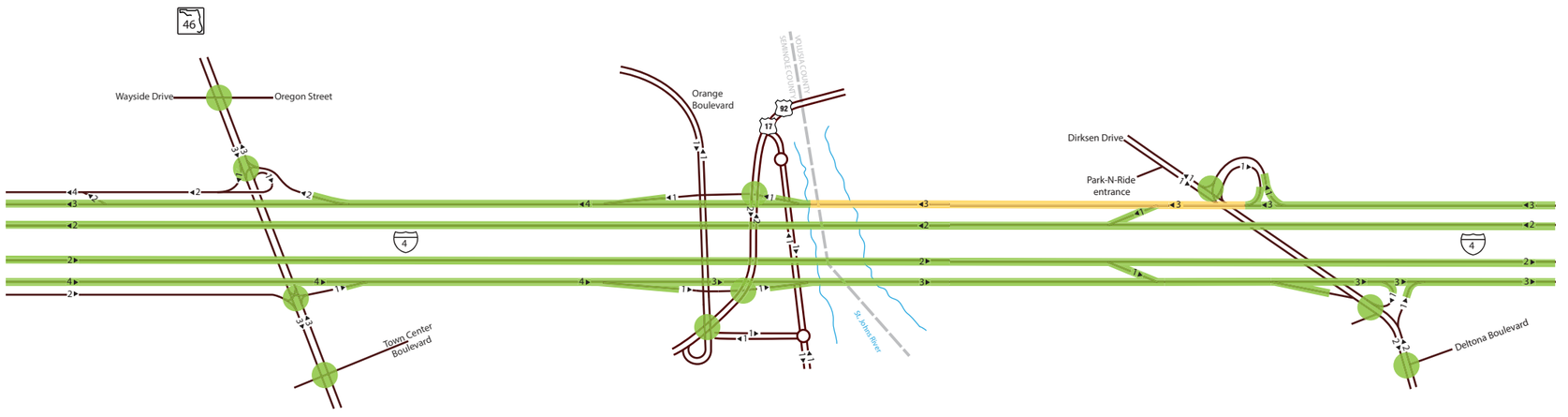


LOS D or Better
LOS E
LOS F

US 17-92 interchange modified to full access dimaond interchange

Dirksen Drive interchange modified to add an Eastbound-to-Eastbound ramp.

MODIFIED BUILD



LOS D or Better
LOS E
LOS F

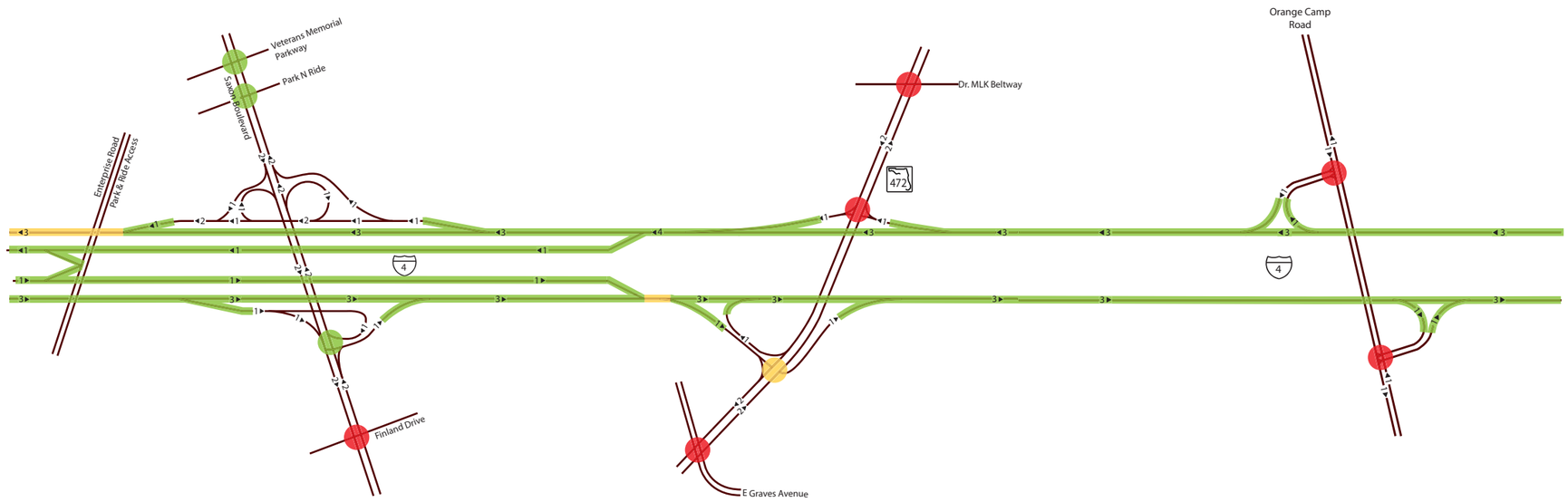
Date: 8.26.2016

I-4 SAMR Re-Evaluation

Figure 11 (2 of 3)
2040 AM Peak Hour Operations (North Section)

ORIGINAL BUILD

NOT TO SCALE



LOS D or Better
LOS E
LOS F

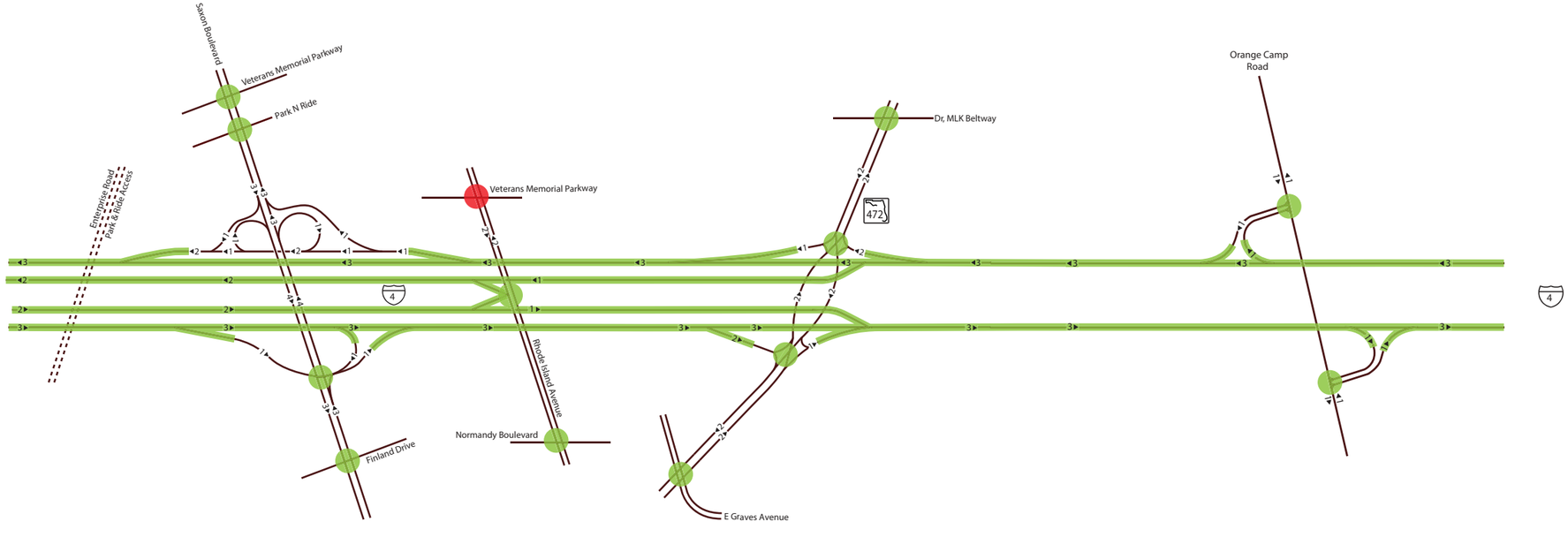
HOV access at Enterprise Rd replaced with Express Lane access to Rhode Island Ave

Saxon Blvd widened to six lanes through the interchange area

SR 472 interchange modified to Diverging Diamond interchange, with Express Lane access relocated east of SR 472

Orange Camp Rd ramp intersections were signalized in the modified build

MODIFIED BUILD



LOS D or Better
LOS E
LOS F

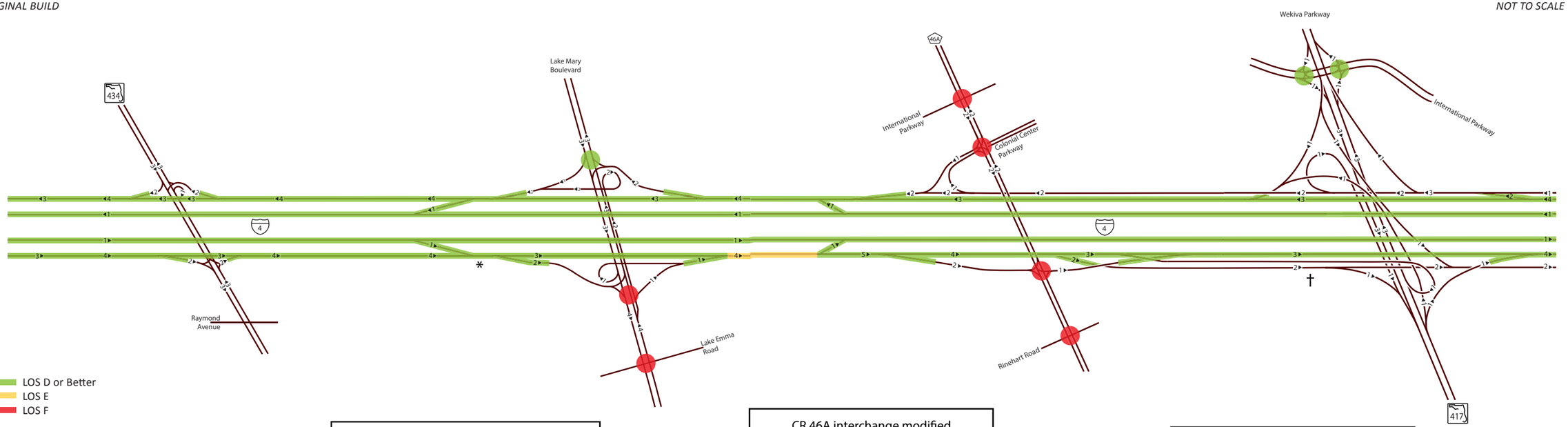
Date: 8.26.2016

I-4 SAMR Re-Evaluation

Figure 11 (3 of 3)
2040 AM Peak Hour Operations (North Section)

ORIGINAL BUILD

NOT TO SCALE

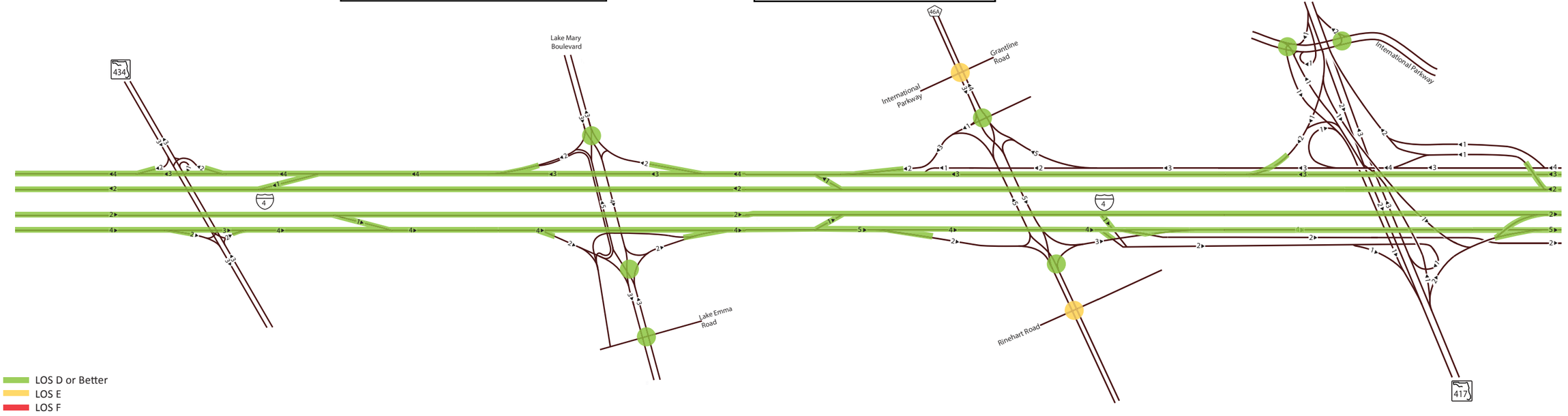


Lake Mary Blvd interchange modified to Diverging Diamond interchange with the addition of ramp access at Lake Emma Rd

CR 46A interchange modified to Diverging Diamond interchange with corridor and intersection improvements at Rinehart Rd

Express lane connections were added to the SR 417 interchange

MODIFIED BUILD



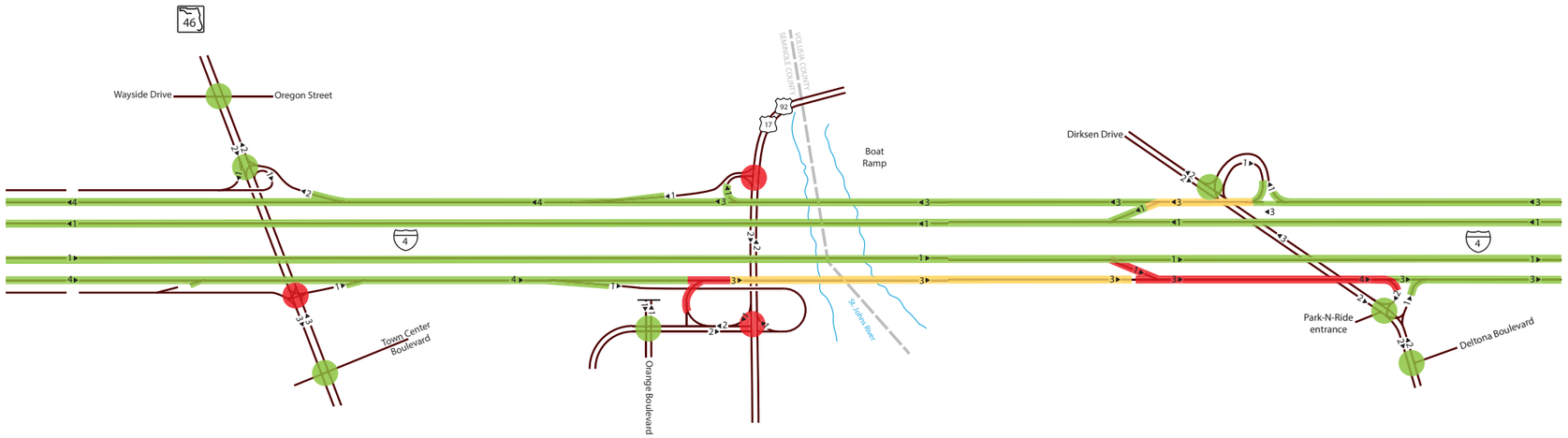
Date: 8.26.2016

I-4 SAMR Re-Evaluation

Figure 12 (1 of 3)
2040 PM Peak Hour Operations (North Section)

ORIGINAL BUILD

NOT TO SCALE

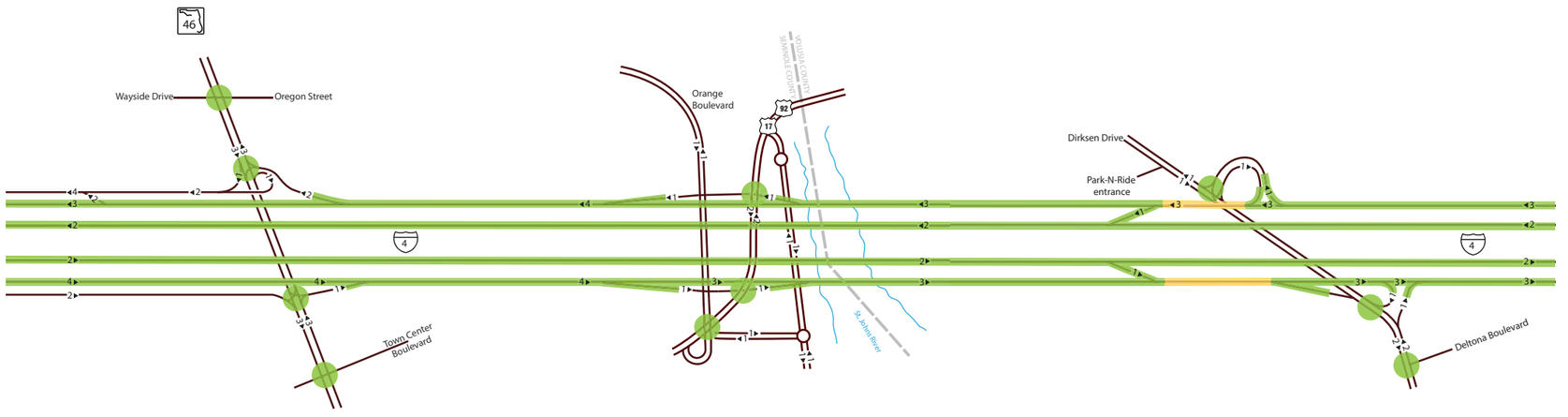


LOS D or Better
LOS E
LOS F

US 17-92 interchange modified to full access dimaond interchange

Dirksen Drive interchange modified to add an Eastbound-to-Eastbound ramp.

MODIFIED BUILD



LOS D or Better
LOS E
LOS F

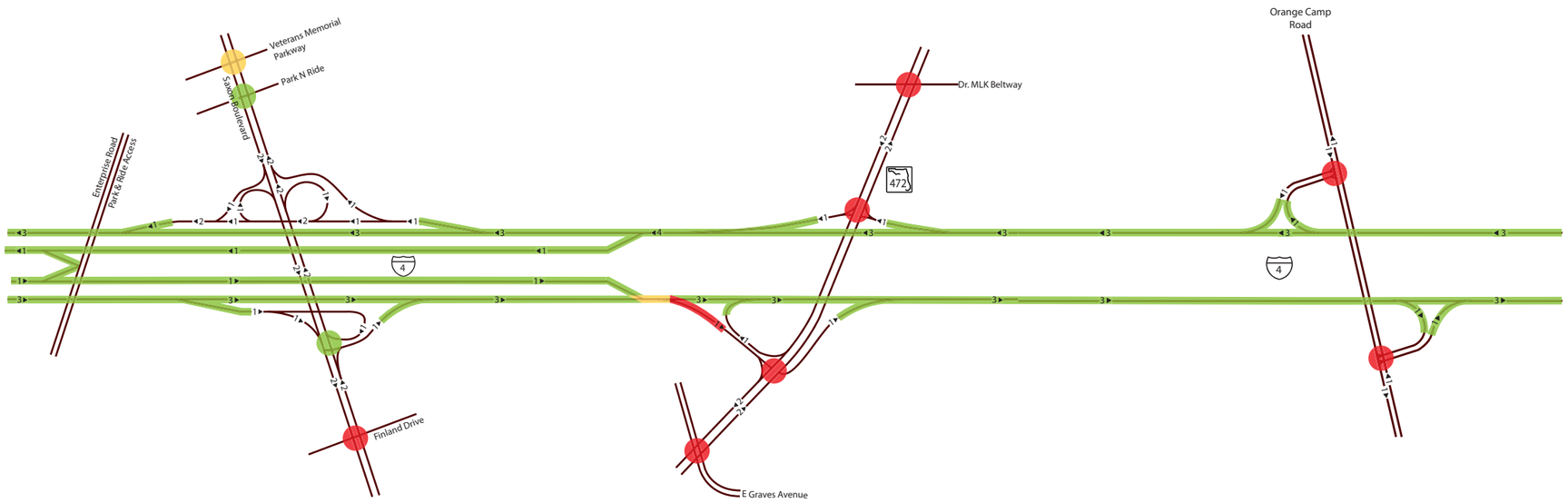
Date: 8.26.2016

I-4 SAMR Re-Evaluation

Figure 12 (2 of 3)
2040 PM Peak Hour Operations (North Section)

ORIGINAL BUILD

NOT TO SCALE



LOS D or Better
LOS E
LOS F

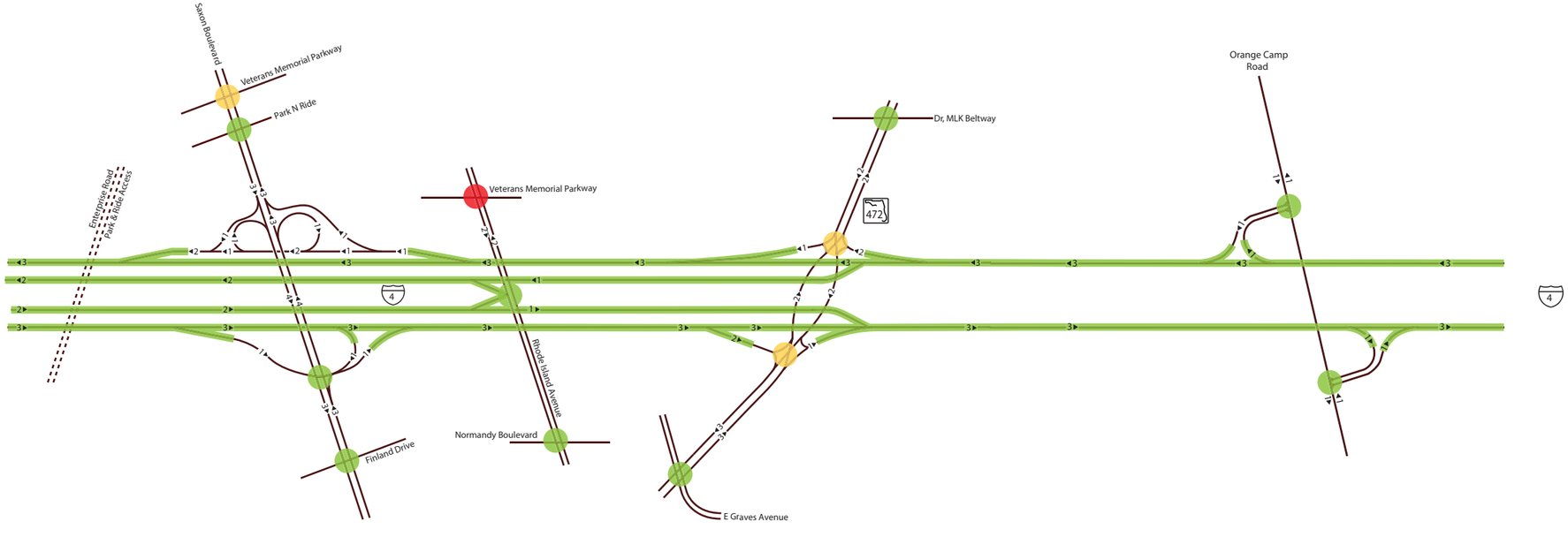
HOV access at Enterprise Rd replaced with Express Lane access to Rhode Island Ave

Saxon Blvd widened to six lanes through the interchange area

SR 472 interchange modified to Diverging Diamond interchange, with Express Lane access relocated east of SR 472

Orange Camp Rd ramp intersections were signalized in the modified build

MODIFIED BUILD



LOS D or Better
LOS E
LOS F

Date: 8.26.2016

FDOT

I-4 SAMR Re-Evaluation

Figure 12 (3 of 3)
2040 PM Peak Hour Operations (North Section)

Safety Analysis

A safety analysis of five years of crash data (2008-2012) was conducted to identify existing safety concerns in the study area. **Table 1** and **Table 2** show a crash summary of the North Section crashes. Crashes were further stratified by crash rates on I-4 (see **Table 3**) and crash rates on the arterial cross-street (see **Table 4**). Additional details on the injury and fatality rates are provided in **Appendix B**. A review of crashes occurring in the vicinity of planned Express Lane entry and exit locations was also conducted. **Table 5** summarizes the locations identified for additional review and potential countermeasures to address safety concerns.

Table 1 Crash Summary – North Section Segment 3 (Seminole County)

Westbound Interstate 4			Eastbound Interstate 4		
Volusia County Line to US 17-92			**US 17-92 to Volusia County Line**		
Total Crashes = 20			**Total Crashes = 38**		
Predominant Crash Types	**# of Crashes**	**% of Total**	**Predominant Crash Types**	**# of Crashes**	**% of Total**
Rear End	4	20.0%	Rear End	8	21.1%
Angle	2	10.0%	Sideswipe	2	5.3%
Sideswipe	2	10.0%	Collision with Motor Vehicle	4	10.5%
Hit Guardrail	6	30.0%	Hit Conc. Barrier Wall	4	10.5%
US 17-92 to SR 46			**SR 46 to US 17-92**		
Total Crashes = 54			**Total Crashes = 82**		
Predominant Crash Types	**# of Crashes**	**% of Total**	**Predominant Crash Types**	**# of Crashes**	**% of Total**
Rear End	11	20.4%	Rear End	22	26.8%
Angle	9	16.7%	Angle	6	7.3%
Sideswipe	7	13.0%	Sideswipe	7	8.5%
Hit Conc. Barrier Wall	4	7.4%	Hit Guardrail	8	9.8%
SR 46 to SR 417			**SR 417 to SR 46**		
Total Crashes = 39			**Total Crashes = 38**		
Predominant Crash Types	**# of Crashes**	**% of Total**	**Predominant Crash Types**	**# of Crashes**	**% of Total**
Rear End	8	20.5%	Rear End	5	13.2%
Angle	5	12.8%	Angle	8	21.1%
Sideswipe	2	5.1%	Hit Guardrail	6	15.8%
Overturned	5	12.8%	Overturned	3	7.9%
SR 417 to Lake Mary Blvd			**Lake Mary Blvd to SR 417**		
Total Crashes = 116			**Total Crashes = 86**		
Predominant Crash Types	**# of Crashes**	**% of Total**	**Predominant Crash Types**	**# of Crashes**	**% of Total**
Rear End	47	40.5%	Rear End	17	19.8%
Angle	15	12.9%	Angle	12	14.0%
Sideswipe	7	6.0%	Sideswipe	9	10.5%
Collision with Motor Vehicle	8	6.9%	Hit Guardrail	11	12.8%
Lake Mary Blvd. to SR 434			**SR 434 to Lake Mary Blvd**		
Total Crashes = 203			**Total Crashes = 150**		
Predominant Crash Types	**# of Crashes**	**% of Total**	**Predominant Crash Types**	**# of Crashes**	**% of Total**
Rear End	93	45.8%	Rear End	59	39.3%
Angle	10	4.9%	Angle	17	11.3%
Sideswipe	17	8.4%	Sideswipe	12	8.0%
Collision with Motor Vehicle	21	10.3%	Hit Guardrail	11	7.3%

Table 2 Crash Summary – North Section Segment 4 (Volusia County)

Westbound Interstate 4			Eastbound Interstate 4		
Orange Camp Rd to SR 472			**SR 472 to Orange Camp Rd**		
Total Crashes = 55			**Total Crashes = 75**		
Predominant Crash Types	**# of Crashes**	**% of Total**	**Predominant Crash Types**	**# of Crashes**	**% of Total**
Rear End	18	32.7%	Rear End	15	20.0%
Angle	4	7.3%	Sideswipe	6	8.0%
Sideswipe	6	10.9%	Collision with Motor Vehicle	7	9.3%
Collision with Parked Car	3	5.5%	Overturned	10	13.3%
SR 472 to Saxon Blvd			**Saxon Blvd to SR 472**		
Total Crashes = 99			**Total Crashes = 79**		
Predominant Crash Types	**# of Crashes**	**% of Total**	**Predominant Crash Types**	**# of Crashes**	**% of Total**
Rear End	18	18.2%	Rear End	20	25.3%
Angle	13	13.1%	Angle	11	13.9%
Collision with Motor Vehicle	11	11.1%	Collision with Motor Vehicle	9	11.4%
Hit Guardrail	16	16.2%	Hit Guardrail	9	11.4%
Saxon Blvd to Dirksen Drive			**Dirksen Drive to Saxon Blvd**		
Total Crashes = 94			**Total Crashes = 103**		
Predominant Crash Types	**# of Crashes**	**% of Total**	**Predominant Crash Types**	**# of Crashes**	**% of Total**
Rear End	21	22.3%	Rear End	24	23.3%
Angle	12	12.8%	Angle	10	9.7%
Sideswipe	10	10.6%	Sideswipe	11	10.7%
Hit Guardrail	11	11.7%	Hit Guardrail	11	10.7%
Dirksen Drive to Seminole County Line			**Seminole County Line to Dirksen Drive**		
Total Crashes = 88			**Total Crashes = 126**		
Predominant Crash Types	**# of Crashes**	**% of Total**	**Predominant Crash Types**	**# of Crashes**	**% of Total**
Rear End	26	29.5%	Rear End	36	28.6%
Angle	6	6.8%	Angle	10	7.9%
Sideswipe	10	11.4%	Sideswipe	13	10.3%
Hit Guardrail	6	6.8%	Collision with Motor Vehicle	9	7.1%

Table 3 Interstate (I-4) Crash Rate Summary – North Section

County	From	To	Functional Classification	Length (miles)	Average AADT (2008-2012)	Total Number of Crashes (2008-2012)	Average Annual Number of Crashes	Crash Rate (MVMT)	Average District Crash Rate for Similar Facilities (2008-2012)	Number of Injuries (2008-2012)	Average Annual Injuries	Injury Rate (MVMT)	Number of Fatalities (2008-2012)	Predominant Crashes	
														Crash Type	Potential Contributing Cause
I-4 Eastbound/Northbound															
Seminole	SR 434	Lake Mary Blvd	INTERSTATE URBAN	4.79	66,962	150	30	0.256	0.473	150	30	0.256	3	Rear End	Congestion
	Lake Mary Blvd	SR 417		2.94	63,100	86	17	0.251	0.473	86	17	0.251	2	Rear End	
	SR 417	SR 46		1.15	40,300	38	8	0.473	0.473	42	8	0.473	2	Angle	Major diverge and weaving
	SR 46	US 17-92		1.80	52,900	82	16	0.460	0.473	95	19	0.547	2	Rear End	
	US 17-92	County Line		0.16	54,400	38	8	**2.518**	0.473	34	7	2.203	0	Rear End	
Volusia	County Line	Dirksen Dr.	INTERSTATE RURAL	3.37	54,400	126	25	0.374	0.375	131	26	0.389	3	Rear End	Congestion
	Dirksen Dr.	Saxon Blvd	INTERSTATE URBAN	2.82	46,658	103	21	0.437	0.473	108	22	0.458	2	Rear End	
	Saxon Blvd	SR 472		3.16	39,100	79	16	0.355	0.473	78	16	0.355	1	Rear End	
	SR 472	Orange Camp Rd		2.10	37,300	75	15	**0.525**	0.473	56	11	0.385	4	Rear End	
I-4 Westbound/Southbound															
Volusia	Orange Camp Rd	SR 472	INTERSTATE URBAN	2.10	34,100	55	11	0.421	0.473	49	10	0.383	2	Rear End	Congestion
	SR 472	Saxon Blvd		3.16	39,600	99	20	0.438	0.473	115	23	0.504	3	Rear End	
	Saxon Blvd	Dirksen Dr.		2.82	47,361	94	19	0.390	0.473	81	16	0.328	2	Rear End	
	Dirksen Dr.	County Line	INTERSTATE RURAL	3.37	54,200	88	18	0.270	0.375	65	13	0.195	2	Rear End	
Seminole	County Line	US 17-92	INTERSTATE URBAN	0.16	54,200	20	4	**1.264**	0.473	43	9	2.843	0	Rear End	
	US 17-92	SR 46		1.80	56,400	54	11	0.297	0.473	38	8	0.216	0	Rear End	
	SR 46	SR 417		1.15	46,900	39	8	0.406	0.473	30	6	0.305	2	Rear End	
	SR 417	Lake Mary Blvd		2.94	62,500	86	17	0.253	0.473	133	27	0.403	3	Rear End	
	Lake Mary Blvd	SR 434		4.79	65,673	203	41	0.357	0.473	188	38	0.331	2	Rear End	

**The crash rates higher than the average FDOT District Five crash rates for similar facilities are highlighted in bold*

Table 4 Arterial Crash Rate Summary – North Section

Road Name	County	From	To	Functional Classification	Length (miles)	Average AADT (2008-2012)	Total Number of Crashes (2008-2012)	Average Annual Number of Crashes	Crash Rate (MVMT)	Average District Crash Rate for Similar Facilities (2008-2012)	Number Of Injuries (2008-2012)	Average Annual Injuries	Injury Rate (MVMT)	Number Of Fatalities (2008-2012)	Predominant Crashes	
															Crash Type	Potential Contributing Cause
Lake Mary Blvd	Seminole	International Pkwy	Lake Emma Rd	URBAN 6+LN 2WY DIVD RASD	0.83	17600	104	21	**3.939**	2.226	52	10	1.875	0	Rear End	Congestion
CR 46A		International Pkwy	Rinehart Rd	URBAN 4-5LN 2WY DIVD RASD	0.84	14800	35	7	1.543	1.730	19	4	0.882	1	Rear End	Congestion
SR 417		I-4 Ramps	0.5 Mile East of Rinehart Rd	TOLL ROAD URBAN	1.35	24360	40	8	**0.666**	0.356	36	7	0.583	2	Overturned	Speeding and roadway conditions
SR 46		Oregon St	Town Center Blvd	URBAN 6+LN 2WY DIVD RASD	0.58	38600	66	13	1.591	2.226	50	10	1.224	2	Rear End	Congestion
US 17/92		Monroe Rd	West of I-4	URBAN 4-5LN 2WY DIVD RASD	0.54	21220	43	9	**2.152**	1.730	39	8	1.913	0	Rear End	Congestion
Dirksen Dr	Volusia	I-4 Ramps	Deltona BLvd	URBAN 4-5LN 2WY DIVD RASD	0.71	6300	31	6	**3.675**	1.730	29	6	3.675	0	Rear End	Congestion
Saxon Blvd		Veterans Memorial Pkwy	Normandy Blvd	URBAN 4-5LN 2WY DIVD RASD	1.53	26500	181	36	**2.433**	1.730	119	24	1.622	1	Rear End	Congestion
SR 472		Graves Ave	MLK Beltway	URBAN 4-5LN 2WY DIVD RASD	1.45	24100	92	18	**1.411**	1.730	93	19	1.490	0	Rear End	Congestion
Orange Camp Rd		West of I-4 Ramps	East of I-4 Ramps	URBAN 2-3LN 2WY DIVD PAVD	0.19	3780	3	1	**3.815**	2.371	2	0	0.000	0	Rear End	Congestion

**The crash rates higher than the average FDOT District Five crash rates for similar facilities are highlighted in bold*

Table 5 Potential Safety Countermeasures

Potential Crash Locations	Issue	Predominant Crash Type	Countermeasures
I-4 Mainline			
SR 472 interchange area	The crash rate is high for the I-4 eastbound segment near the SR 472 interchange.	Rear End	Improved operations along the I-4 mainline are expected to improve operations of express lane merge and diverge near SR 472 interchange area.
Arterials			
Lake Mary Blvd	The injury rates are greater than 1.0	Rear End	Intersection improvements at ramp terminals reduce congestion and occurrences of rear end crashes.
SR 46	The injury rates are greater than 1.0	Rear End	Intersection improvements at ramp terminals reduce congestion and occurrences of rear end crashes.
US 17/92	The injury rates are greater than 1.0	Rear End	The interchange configuration for US 17/92 will be modified to a Diamond configuration with better traffic operations. Improved operations in the modified interchange configuration is expected to positively impact occurrences of rear end crashes.
Dirksen Dr, Saxon Blvd and SR 472 are greater than 1.0	The injury rates are greater than 1.0	Rear End	Intersection improvements at ramp terminals reduce congestion and occurrences of rear end crashes.
Saxon Blvd and SR 472 are greater than 1.0	The injury rates are greater than 1.0	Rear End	Intersection improvements and widening of Saxon Blvd to six lanes will reduce congestion and occurrences of rear end crashes.
SR 472	The injury rates are greater than 1.0	Rear End	The interchange configuration for SR 472 will be modified to a DDI. DDI configuration reduces number of conflict points and improves traffic operations. Reduction is conflict points and congestion is expected to positively impact occurrences of rear end crashes.

The conceptual design plans for I-4 interchange improvements were developed in accordance with the FDOT's Design Standards and Plans Preparation Manual and FHWA's Policy on Geometric Design of Highways and Streets. Adherence to these standards will facilitate safe and efficient traffic operations along the corridor. The safety analysis showed that a large portion of the crashes experienced along I-4 and the arterials were associated with congested traffic conditions. In addition, it was determined that several high crash spots/segments along the corridor were concentrated at or near the interchanges. The improvements proposed will increase capacity

along the mainline and at the interchanges. These capacity improvements will correspondingly improve traffic flow and reduce congestion-related crashes along the corridor. The following corridor level improvements are expected to improve safety along the I-4 mainline:

1. Improvements were considered at a systems level so congestion at one location would not adversely impact operations at another. Reduction in congestion is expected to positively impact occurrences of rear end crashes.
2. Improvement to all interchanges along the corridor resulting in fewer congestion areas. Reduction in congestion is expected to positively impact occurrences of crashes.

It is expected that the Modified Build alternative will not have a significant adverse impact on the safety of the freeway system.

Conceptual Signing Plan

A draft conceptual signing plan has been prepared as part of the I-4 SAMR Re-Evaluation Study. The draft signing plan is included in **Appendix C**.

2.4. Policy Point 4

The proposed access connects to a public road only and will provide for all traffic movements. Less than ``full interchanges'' may be considered on a case-by-case basis for applications requiring special access for managed lanes (e.g., transit, HOVs, HOT lanes) or park and ride lots. The proposed access will be designed to meet or exceed current standards (23 CFR 625.2(a), 625.4(a)(2), and 655.603(d)).

Response:

The I-4 SAMR Re-Evaluation Study consists mostly of existing interchanges that are being modified to better accommodate the future traffic demands in the region. No new access connections are being added to the I-4 general use lanes. A new intersection at Lake Emma Road and new ramp to ramp connections are being made with the I-4/Lake Mary Boulevard interchange ramps to improve the operation of the interchange. At Rhode Island Avenue, the managed lane connection at Enterprise Road in the Original Build scenario is being relocated to Rhode Island Avenue in the Modified Build scenario. The connection at Rhode Island Avenue will provide access to the westbound express lanes and from the eastbound express lanes. No connections to the I-4 general purpose lanes are included in the concept.

Lake Emma Road

A new intersection at Lake Emma Road and new ramp to ramp connections are being made with the I-4/Lake Mary Boulevard interchange ramps to improve the operation of the interchange. The ramp to ramp connections do not increase the number of access points to the I-4 general use or Express Lane system. The connections to I-4 for the Lake Emma Road access are part of the ramp system utilized by the Lake Mary Boulevard interchange.

The proposed Lake Emma Road connection improves the overall operation of the I-4/Lake Mary Boulevard interchange. By providing ramp connections to Lake Emma Road, the number of vehicles utilizing the interchange ramps to and from Lake Mary Boulevard and the number of vehicles traveling on Lake Mary Boulevard through the interchange area will be reduced. The reduction in volume through the Lake Mary Boulevard interchange along with the conversion to a diverging diamond interchange form results in improved overall operation as compared to the Original Build condition and as compared to the condition with just the DDI and no connections to Lake Emma Road. It is noted that improvements to the current interchange at Lake Mary Boulevard and at the Lake Mary Boulevard/Lake Emma Road intersection without the connection at Lake Emma Road will not result in acceptable operations. The Lake Mary Boulevard/Lake Emma Road interchange alternative evaluation memorandum is included in **Appendix A**.

The proposed ramp connections will provide access to and from I-4 eastbound and to I-4 westbound within the Lake Mary Boulevard interchange. Note the Lake Mary Boulevard interchange will still provide access to all movements between I-4 and Lake Mary Boulevard. The proposed connection was shown previously in Figure 5. A connection that would provide access from I-4 westbound to Lake Emma Road was not included due to the geometric constraints and costs associated with providing the flyover-type ramp that would be needed. It is noted that the goal of diverting traffic out of the I-4/Lake Mary Boulevard interchange was successfully achieved and the proposed interchange ramp signals are forecast to operate at LOS D through the 2040 design year without the provision of the I-4 westbound to Lake Emma Road connection. All traffic movements between I-4 and Lake Mary Boulevard are provided

Rhode Island Avenue

The managed lane connection at Enterprise Road in the Original Build scenario is being relocated to Rhode Island Avenue in the Modified Build scenario. The connection at Rhode Island Avenue in Segment 4 will provide access to the westbound express lanes and from the eastbound express lanes. No connections to the I-4 general purpose lanes are included in the concept. The decision to move the access point from the previously approved location at Enterprise Road was made in consultation with the local governments of Volusia County, Orange City, and the City of Deltona. The proposed connection was shown previously in Figure 5.

As shown previously in Figure 5, the Express Lane system ends just east of the I-4/SR 472 interchange, the next interchange to the east. Ramps were not provided at Rhode Island Avenue to provide access to the eastbound express lanes and from the westbound express lanes (making Rhode Island Avenue a "full interchange") due to the lack of utilization that would occur (i.e., drivers would not enter the Express Lane system to pay for a short trip) and operationally the Express Lane system is not planned to serve short trips.

2.5. Policy Point 5

The proposal considers and is consistent with local and regional land use and transportation plans. Prior to receiving final approval, all requests for new or revised access must be included in an adopted Metropolitan Transportation Plan, in the adopted Statewide or Metropolitan Transportation Improvement Program (STIP or TIP), and the Congestion Management Process within transportation management areas, as appropriate, and as specified in 23 CFR part 450, and the transportation conformity requirements of 40 CFR parts 51 and 93.

Response:

The FDOT coordinated with MetroPlan Orlando and the River to Sea Transportation Planning Organization (TPO) throughout the study. The improvements shown in the I-4 SAMR Re-Evaluation Study are included in the adopted long-range transportation plans of each organization. The FDOT also coordinated with Seminole and Volusia counties and the various cities along the corridor. The Modified Build alternative is consistent with local and regional land use and transportation plans throughout the region. Relevant sheets from the MPO and TPO long range transportation plans are included in **Appendix D**. The I-4 BtU project will positively address several performance measures from MetroPlan Orlando's Congestion Management Process, including: Percent of Travel in Generally Acceptable Operating Conditions (Peak Hour), Delay, Travel Time Reliability, Percent Miles Severely Congested, Combination Truck Travel Time Reliability, Combination Truck Delay, Combination Truck Percent Miles Severely Congested, and Peak-Hour Travel Speed.

The FDOT has programmed design funding to further progress the recommendations made in the PD&E study. Initial elements of the design process are underway and the design process will accelerate at the completion of the PD&E process. The FDOT and the local jurisdictions along the corridor are creating Memorandums of Agreement (MOAs) to document the commitments made during the PD&E study.

2.6. Policy Point 6

In corridors where the potential exists for future multiple interchange additions, a comprehensive corridor or network study must accompany all requests for new or revised access with recommendations that address all of the proposed and desired access changes within the context of a longer-range system or network plan (23 U.S.C. 109(d), 23 CFR 625.2(a), 655.603(d), and 771.111).

Response:

The I-4 SAMR Re-Evaluation Study is a comprehensive corridor study that includes 15 interchanges in the South Section and 10 interchanges in the North Section (this report only documents the North Section). This re-evaluation study is a comprehensive corridor study that addresses the needs of the I-4 mainline, Express Lane system, interchanges, and cross-street intersections within its limits. Design traffic volumes were developed using a regional travel demand model and the dynamic routing feature of VISUM. Access changes were analyzed using Highway Capacity Manual methodologies and using the VISSIM microsimulation model. A comprehensive VISSIM model was developed to analyze the complex system interactions that occur throughout the corridor.

2.7. Policy Point 7

When a new or revised access point is due to a new, expanded, or substantial change in current or planned future development or land use, requests must demonstrate appropriate coordination has occurred between the development and any proposed transportation system improvements (23 CFR 625.2(a) and 655.603(d)). The request must describe the commitments agreed upon to assure adequate collection and dispersion of the traffic resulting from the development with the adjoining local street network and Interstate access point (23 CFR 625.2(a) and 655.603(d)).

Response:

The re-evaluation incorporated land use assumptions that were approved through the relevant Metropolitan Planning Organization (MPO/TPO) long-range transportation planning process. As the North Section of the I-4 SAMR Re-Evaluation Study is a comprehensive corridor study that includes 10 interchanges, the study is being driven by forecasted regional growth and not by a specific planned future development.

<u>Rhode Island Avenue</u>

The managed lane connection at Enterprise Road in the Original Build scenario is being relocated to Rhode Island Avenue in the Modified Build scenario. The connection at Rhode Island Avenue in Segment 4 will provide access to the westbound express lanes and from the eastbound express lanes. No connections to the I-4 general purpose lanes are included in the concept. The decision to move the access point from the previously approved location at Enterprise Road was made in consultation with the local governments of Volusia County, Orange City, and the City of Deltona. The proposed connection was shown previously in Figure 5, and the design concept is provided in **Appendix E**.

As part of the decision to move the access point from Enterprise Road to Rhode Island Avenue, the FDOT committed to constructing the Rhode Island Avenue Extension. The FDOT commitment generally included:

- Constructing a new four-lane roadway with bike lanes and sidewalks, approximately 6,670 feet long between Veterans Memorial Parkway and Normandy Boulevard;
- Constructing a new bridge over I-4 in the limits of Volusia County. The preliminary design dimensions of the required Rhode Island Avenue bridge over I-4 are approximately 440 feet by 115 feet;
- Constructing the necessary stormwater ponds for the roadway;
- Designing and constructing the necessary improvements at the intersection of Veterans Memorial Parkway and Rhode Island Avenue and the intersection of Normandy Boulevard and Rhode Island Avenue;
- Designing the roadway, interchange and drainage improvements; and
- Purchasing the necessary right-of-way for the proposed roadway, interchange and drainage improvements.

2.8. Policy Point 8

The proposal can be expected to be included as an alternative in the required environmental evaluation, review and processing. The proposal should include supporting information and current status of the environmental processing (23 CFR 771.111).

Response:

Environmental issues for the Modified Build alternative are being evaluated through the I-4 Beyond the Ultimate PD&E reevaluation study. The study covers approximately 40 miles of the remaining critical portions of I-4, outside of the I-4 Ultimate project area. The study area included the segments of I-4 from Kirkman Road in Orange County south to US 27 in Polk County and from SR 434 in Seminole County to SR 472 in Volusia County. Right-of-way (ROW) required for the proposed improvements are detailed in the Preliminary Engineering Reports and are also shown on the concept plans included in **Appendix E**.

The following environmental documents were previously completed for these segments to comply with Federal and State regulations:

- Environmental Assessment (EA) from US 27 to CR 532 in Polk County,
- EA from CR 532 to SR 528 in Osceola and Orange Counties, and
- Environmental Impact Statement (EIS) from SR 528 to SR 472 (Orange, Seminole and Volusia Counties)

Both of the EAs received Findings of No Significant Impacts (FONSI) which means the project had no significant impacts to the environment. The EIS project received a Record of Decision (ROD) for the segment through downtown Orlando, from SR 435 (Kirkman Rd) in Orange County to SR 434 in Seminole County. The current status of the environmental documentation process for the I-4 Ultimate and the I-4 Beyond the Ultimate projects is shown in **Table 6**.

Table 6 Status of Environmental Documentation

Segment	EA	FONSI	FEIS	ROD	Pending ROD
1: CR 532 to SR 528	X	X			
2: SR 528 to SR 435 (Kirkman Rd)			X		X
3: SR 434 to US 17/92			X		X
4: US 17/92 to SR 472			X		X
5: US 27 to CR 532	X	X			
*SR 435 (Kirkman Rd) to SR 434			X	X	

**This segment is part of the existing I-4 Ultimate project currently under construction, and therefore excluded from the current PD&E study.*

3. METHODOLOGY

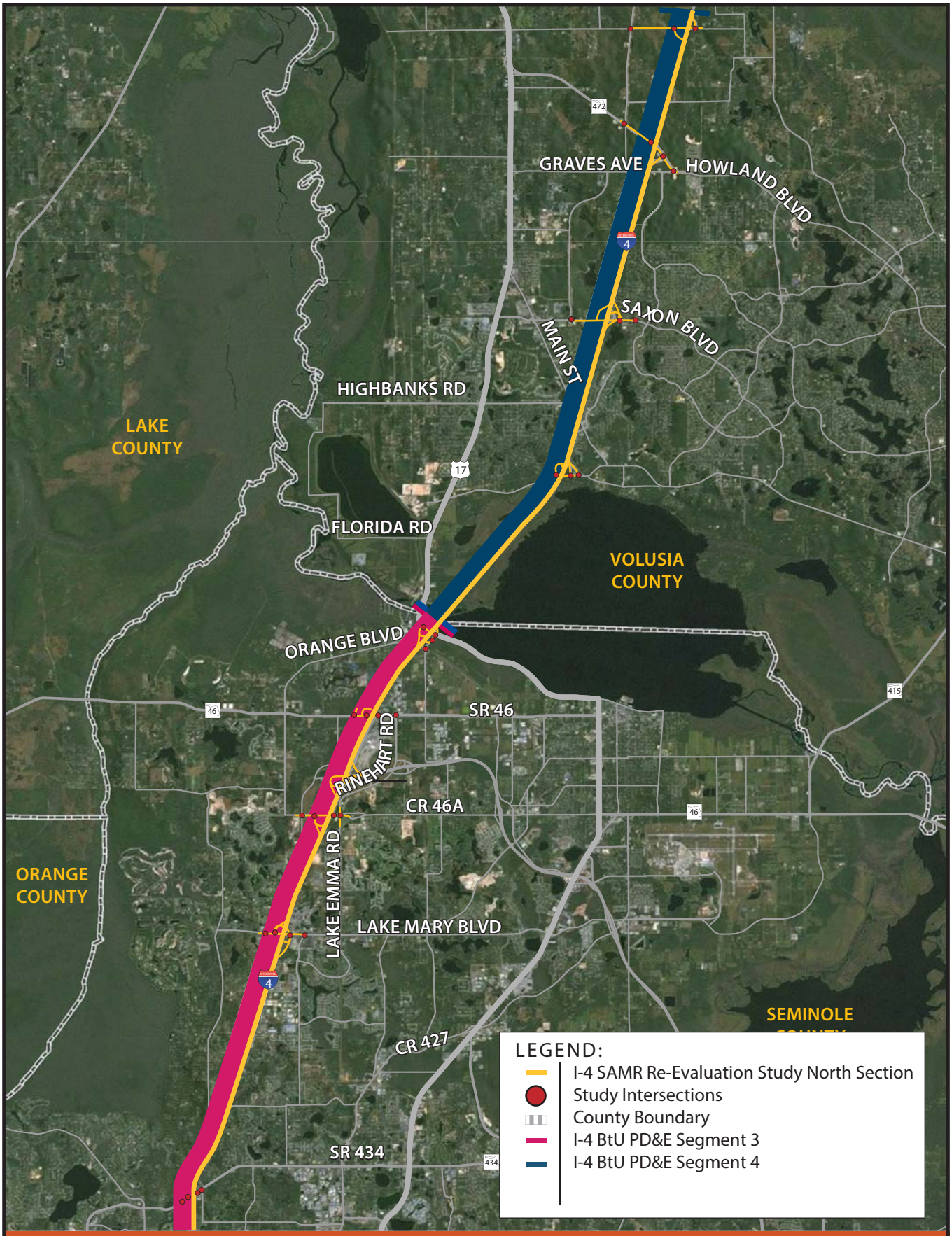
The approved MLOU is provided in **Appendix F**. The analysis methodology is consistent with the FHWA Policy No. 98-3460 (Federal Register; February 11, 1998; Volume 63, Number 28) and procedures outlined in the *Interchange Handbook* and the *Project Traffic Forecasting Handbook* published by FDOT. The methodology was discussed and developed in coordination with FHWA.

3.1. Area of Influence

The Area of Influence (AOI) of the I-4 SAMR Re-Evaluation is a minimum of one interchange on both sides of the subject I-4 BtU PD&E study area. The I-4 interchanges (including ramp merge/diverge areas and weaving areas) included within the AOI of the I-4 SAMR Re-Evaluation are listed in **Table 7**. Along the cross streets, intersections were evaluated within one-half mile on both sides of interchanges within the AOI, or to the nearest signalized intersection if no signalized intersection exists within one-half mile. A list of intersections included in the analysis is shown in **Appendix F**. The North Section AOI is shown graphically in **Figure 13**.

Table 7 Influence Area Interchanges

North Section
Segment 3 Interchanges
SR 434
Lake Mary Blvd
CR 46A
SR 417
SR 46
US 17/92
Segment 4 Interchanges
Dirksen Drive
Saxon Blvd
SR 472
Orange Camp Road



I-4 SAMR Re-Evaluation

Figure 13 - North Section Area of Influence

3.2. Analysis Years

A design year of 2040 was determined in coordination with FHWA for the subject analysis. The following analysis years were agreed upon in the approved MLOU:

For Traffic Operational Analysis

- Existing year 2011
- Opening year 2020
- Interim year(s) 2030
- Design year 2040

For Traffic Forecasting

- Base year Central Florida Regional Planning Model (CFRPM version 5.01) - 2005
- Horizon year CFRPM - 2035

3.3. Considered Alternatives

The Preferred Alternative for each interchange approved as part of the original I-4 SAMR (referred to as Original Build in this document) and the proposed modified concept (referred to as Modified Build in this document) were analyzed for comparison purposes. The Existing No-Build conditions were also analyzed for baseline information. The alternatives for each analysis year are listed in **Table 8**.

Table 8 Analysis Year Alternatives

Analysis Year	Alternative
Year 2011	• Existing Conditions
Opening Year 2020	• Original Build • Modified Build
Interim Year 2030	• Original Build • Modified Build
Design Year 2040	• Original Build • Modified Build

3.4. Analysis Approach

3.4.1. Travel Demand Forecasting

The CFRPM version 5.01 travel demand model was selected for use in the study. The CFRPM version 5.01 travel demand model is the approved model for District Five and at the time the study was initiated in 2012 contained the adopted data from the MPOs and TPOs in the area (i.e. MetroPlan Orlando, Polk (portions included), River to Sea, Space Coast, Lake-Sumter, and Ocala/Marion). The CFRPM version 5.01 travel demand model covers the entire study area. The CFRPM version 5.01 contains model data sets for the base year of 2005, interim years of 2015, 2020, 2025 and 2030 and a year 2035 Cost Feasible network. Based on the agreement made with FHWA at the I-4 BtU workshop on June 11, 2014, the capability of the CFRPM v5.01 was evaluated based on the following factors:

1. Time-of-day (TOD) capabilities and constraints;
2. Value of time parameters;
3. Mode choice parameters;
4. Land use (2010) vs currently used 2005 data;
5. Base year (2010) vs currently used 2005 base year; and
6. Express lane network coding vs HOV network coding.

A separate memo addressing each of the six points is included in **Appendix F**. The sensitivity evaluation has shown that forecasts based upon the CFRPM 5.01 model are satisfactory for the purposes of the operational analysis of the I-4 BtU project. FDOT has committed to reevaluating the complex traffic conditions found in the South Section and the North Section at a later date using updated methodologies (e.g. CFRPM 6.0 with express lane analysis).

3.4.2. Traffic Operational Analysis

Detailed operational analyses were performed for Original Build and Modified Build alternatives for all future analysis years for both the North and South Sections. Operational analyses were performed for both the AM and PM peak hours. The following operational analyses were conducted for future conditions utilizing the design traffic forecasts:

- Freeway analysis
- Freeway weaving analysis
- Ramp merge and diverge analysis
- Queuing analysis
- Intersection analysis
- Express lane Analysis

The operational analysis was conducted using the latest version of the Highway Capacity Manual (HCM 2010) Methodologies. **Table 9** summarizes various analyses and the tools used in this study.

Table 9 Operational Analysis and the Tools

Study Area	Analysis Year	Alternative	Origin Destination	Freeway, Weave, Ramp Merge and Diverge Analysis	Intersection Analysis	Express Lane/ Access Point Analysis	Queue
North Section & South Section	2011	Existing Conditions	VISUM 12.5	VISSIM 7.0	VISSIM 7.0		VISSIM 7.0
	2020 & 2030	Original Build		HCS (HCM 2010)	SYNCHRO 8.0 (HCM 2010)		SYNCHRO 8.0 (HCM 2010)
		Modified Build					
	2040	Original Build	VISUM 12.5	VISSIM 7.0	VISSIM 7.0	VISSIM 7.0	VISSIM 7.0
		Modified Build					

**VISSIM 6.0 was noted for use in the MLOU, but VISSIM 7.0 was released shortly thereafter with improved capabilities. Therefore, the latest version of VISSIM (7.0) was selected for this analysis.*

Level of Service Standards per the State Highway System, Policy No. 000-525- 006, effective, April 18, 2012, Osceola County Comprehensive Plan, Orange County Comprehensive Plan, Seminole County Comprehensive Plan and Volusia County Comprehensive Plan are summarized below:

- I-4: Mainline and Ramps: LOS D

VISSIM models were constructed and calibrated to 2011 existing conditions. Additional information regarding the methodology of the VISSIM model development and calibration criteria is included in the approved MLOU in **Appendix F**. As described in the MLOU, the following measures of effectiveness (MOEs) were used to differentiate between the alternatives.

VISSIM analyses

- Intersection Node Evaluation: Volume, delay, and max queue length for the study area intersections.
- Link Evaluation Segments: Volume, Speed, and Density information for General Use Lanes, Express Lanes and access points within the study area. A temporal and spatial speed profiles for segment evaluation.
- Network-wide Output: Total travel time, total delay time, vehicle-miles of travel, latent volume and latent delay.

HCS and Synchro analyses

- Freeway Analysis: Speed, density and LOS
- Intersection Analysis: Total Delay and LOS

Other operational criteria utilized for the evaluation of alternatives included:

- Queue length;
- Ease of implementation;
- Requirements for structural modifications (bridges, walls);
- Right-of-way impacts;
- Construction impacts; and
- Relative costs of construction.

4. EXISTING CONDITIONS

This section documents the existing (2011) conditions along the I-4 corridor, including transportation network, existing traffic volumes, traffic operations, and crash data for the I-4 mainline and ramps.

4.1. Transportation Network

The existing interchange configurations, intersection geometry, number of lanes, and signal control for the North Section is depicted in **Figure 14**.

4.2. Existing Traffic Data

Data was collected from various sources including the FDOT, Florida's Turnpike Enterprise, Orange County, Osceola County, and Polk County. Field data was also collected to fill in gaps. The signal timing plans for signalized intersections were obtained from Seminole County, Orange County, Osceola County, Polk County and the Reedy Creek Development District. Average travel time runs were conducted along I-4 within the study area. Each segment was driven two times in each direction for the AM and PM peak hours. Field queue length data was collected in March 2013 during the AM and PM peak periods. Turning movement counts (TMCs) for the study intersections were provided by FDOT. Freeway and ramp volumes were obtained from the 2011 Florida Traffic Information (FTI) DVD. Wavetronix SmartSensor detector data was obtained from the FDOT District Five for the truck traffic composition. The I-4 speed information was obtained from the Regional Integrated Transportation Information System (RITIS) detector data.

Traffic data gathered from the previously-identified sources were analyzed, compiled and balanced to develop existing year (2011) AM and PM peak hour volumes for the study area. The approach used for balanced volume development for the existing conditions is summarized as follows:

- The peak hour was determined based on the peak hour at FTI count locations throughout the corridor. Observed peak hours for a majority of the sites were 7:30 to 8:30 in the morning and 4:45 to 5:45 in the evening.
- Ramp traffic was obtained from turning movement counts.
- The raw mainline volumes do not easily balance between FTI count stations throughout the South and North Sections for a variety of reasons, including:
    - FTI counts were not all taken on the same day.
    - Different portions of each section experience different peaking characteristics.
    - Due to the corridor's length and average travel time through each section, balanced volumes are not experienced throughout each section within a 60-minute period.
- To develop balanced volumes for use in microsimulation, one FTI count station in the South Section and the North Section was selected to reasonably represent the congested conditions in each section.
    - These FTI stations are established as anchor points around which the rest of the corridor was balanced by utilizing turning movement data for the ramps and intersections.
    - Several FTI stations were tested as anchor points to minimize departure from the raw mainline volumes.
    - The FTI mainline count locations that were used to balance mainline for both the South Section and the North Section are listed below:

  - The FTI location between SR 535 and Central Florida Parkway for the South Section (FTI Station ID - 750535); and
  - The FTI location south of SR 434 for the North Section (FTI Station ID - 770267).
- Balanced mainline volumes were checked for reasonableness against mainline FTI count locations.

The resulting AM and PM 2011 peak hour volumes are shown for the North Section in **Figure 14**.

4.3. Operational Analysis

An existing conditions traffic operational analysis was performed using the latest VISSIM (version 7.0) microsimulation software. Information on the detailed model development and calibration steps are provided in the I-4 SAMR Reevaluation Existing Conditions Analysis Report included in **Appendix G**.

4.3.1. VISSIM Model Development and Calibration

VISSIM models were constructed and calibrated to 2011 Existing Conditions. The Federal Highway Administration's (FHWA) *Traffic Analysis Toolbox Volume III: Guidelines for Applying Traffic Microsimulation Modeling Software*, 2014 FDOT *Traffic Analysis Handbook* and 2011 Oregon Department of Transportation (ODOT) *Protocol for VISSIM Simulation* were used as guidelines for the development of VISSIM models. North and South Section VISSIM models were created separately to assess traffic operations for both AM and PM peak hours. All models were developed in VISSIM version 7.0 to cover both the AM and PM peak hour from 7:30 AM to 8:30 AM and from 4:45 PM to 5:45 PM as these periods represent the highest traffic volumes along I-4.

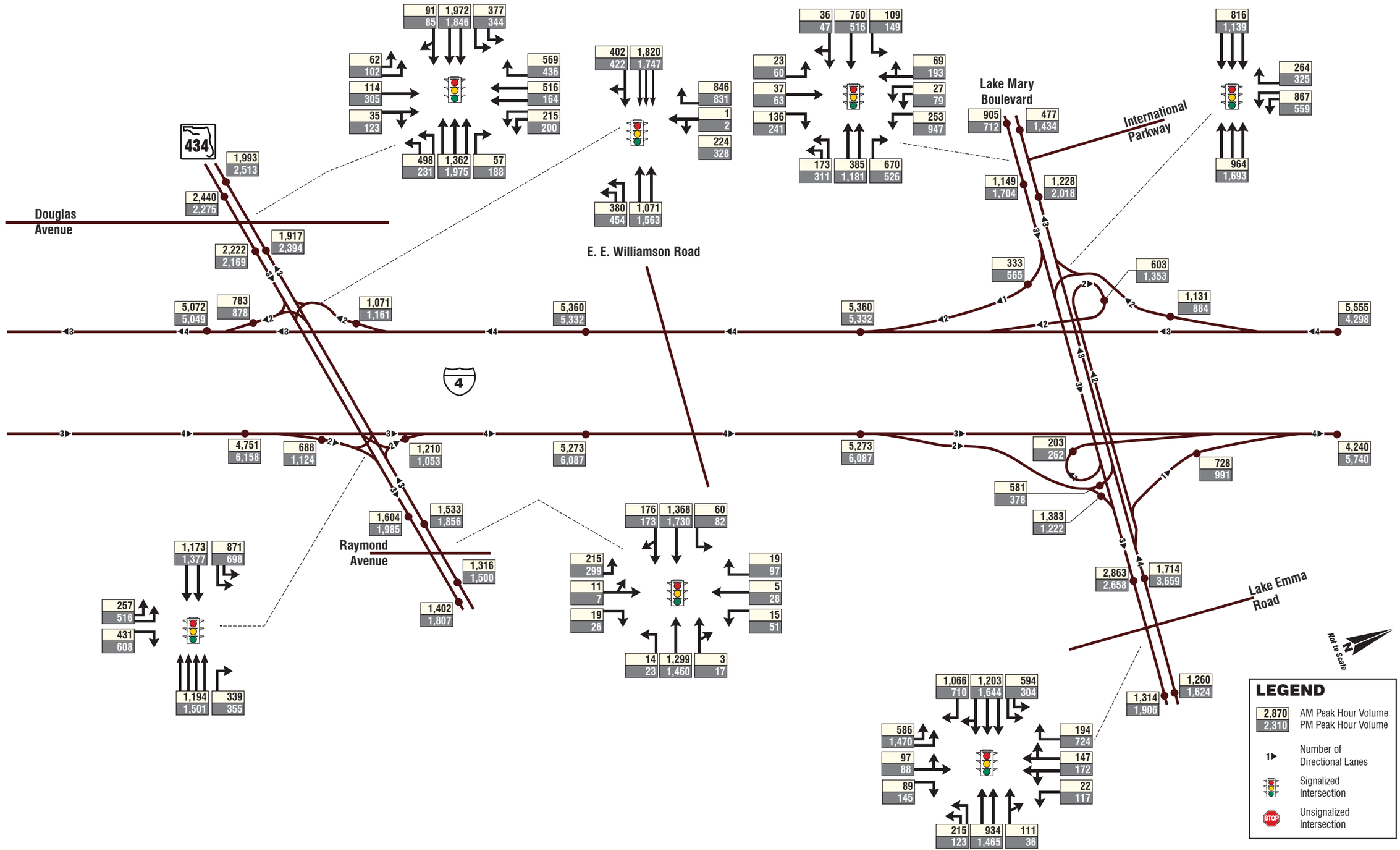
The VISSIM model was utilized to evaluate traffic operations for the Existing Year (2011) Conditions. All simulation output is based on the average data from 12 simulation runs which were conducted using VISSIM version 7.0. Consistent with the approved MLOU, the Measures of Effectiveness (MOEs) that were assessed from the simulation analysis include the following:

- Intersection Node Evaluation: Volume, delay, and max queue length for the study area intersections.
- Link Evaluation Segments: Volume, Speed, and Density information for General Use Lanes and access points within the study area. Temporal and spatial speed profiles for segment evaluation.
- Network-wide Output: Total travel time, total delay time, latent volume and latent delay.

4.3.2. Intersection Node Evaluation

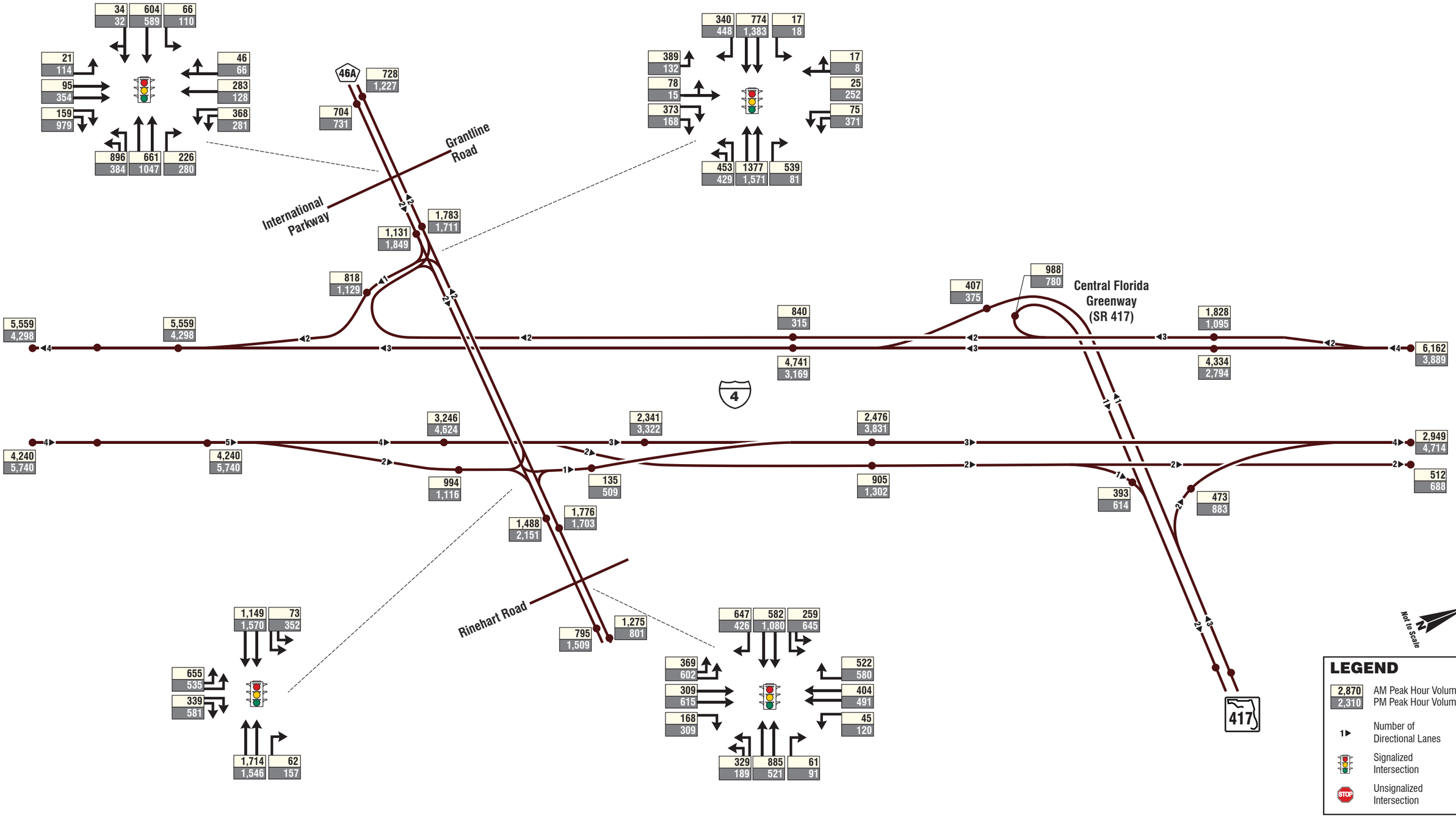
The existing signal timing plans were utilized to perform the intersection analysis. AM and PM peak-hour intersection analyses for the North Section study intersections are summarized in **Table 10**. Node Evaluation output from VISSIM represents an estimated Level of Service based on Highway Capacity Manual metrics. The signal timing plans and detailed output for the Node Evaluation analysis are included in **Appendix G**. The analysis indicates that the following intersections operate at or below LOS E:

- Debary Avenue and Deltona Boulevard operates at LOS E in the AM peak hour; and
- Lake Mary Boulevard and Lake Emma Road operates at LOS F in the PM peak hour.



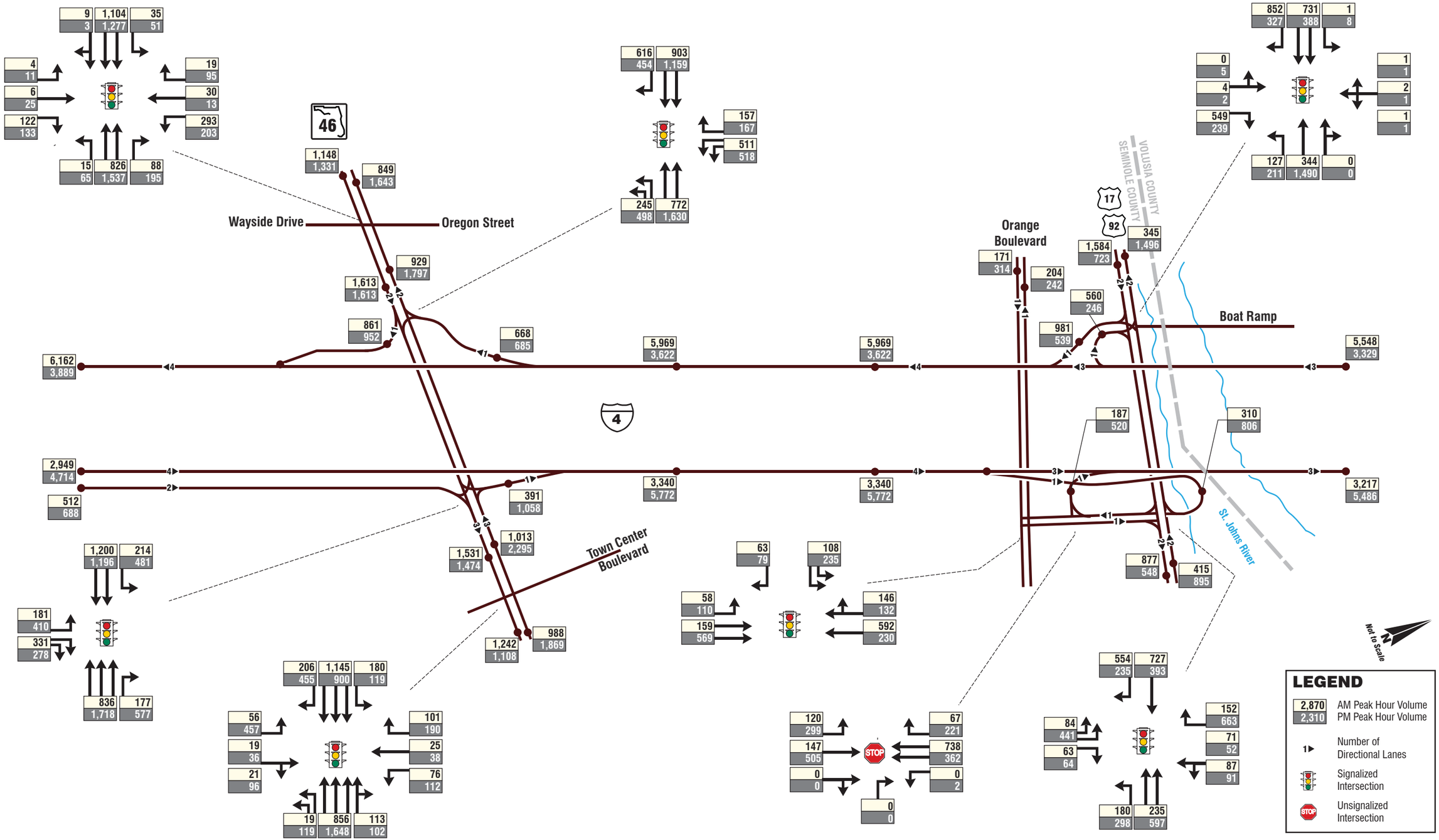
I-4 SAMR Re-evaluation - North Section Existing (2011) Conditions

Figure 14 (Sheet 1 of 6)
Peak Hour Traffic and Geometry



I-4 SAMR Re-evaluation - North Section Existing (2011) Conditions

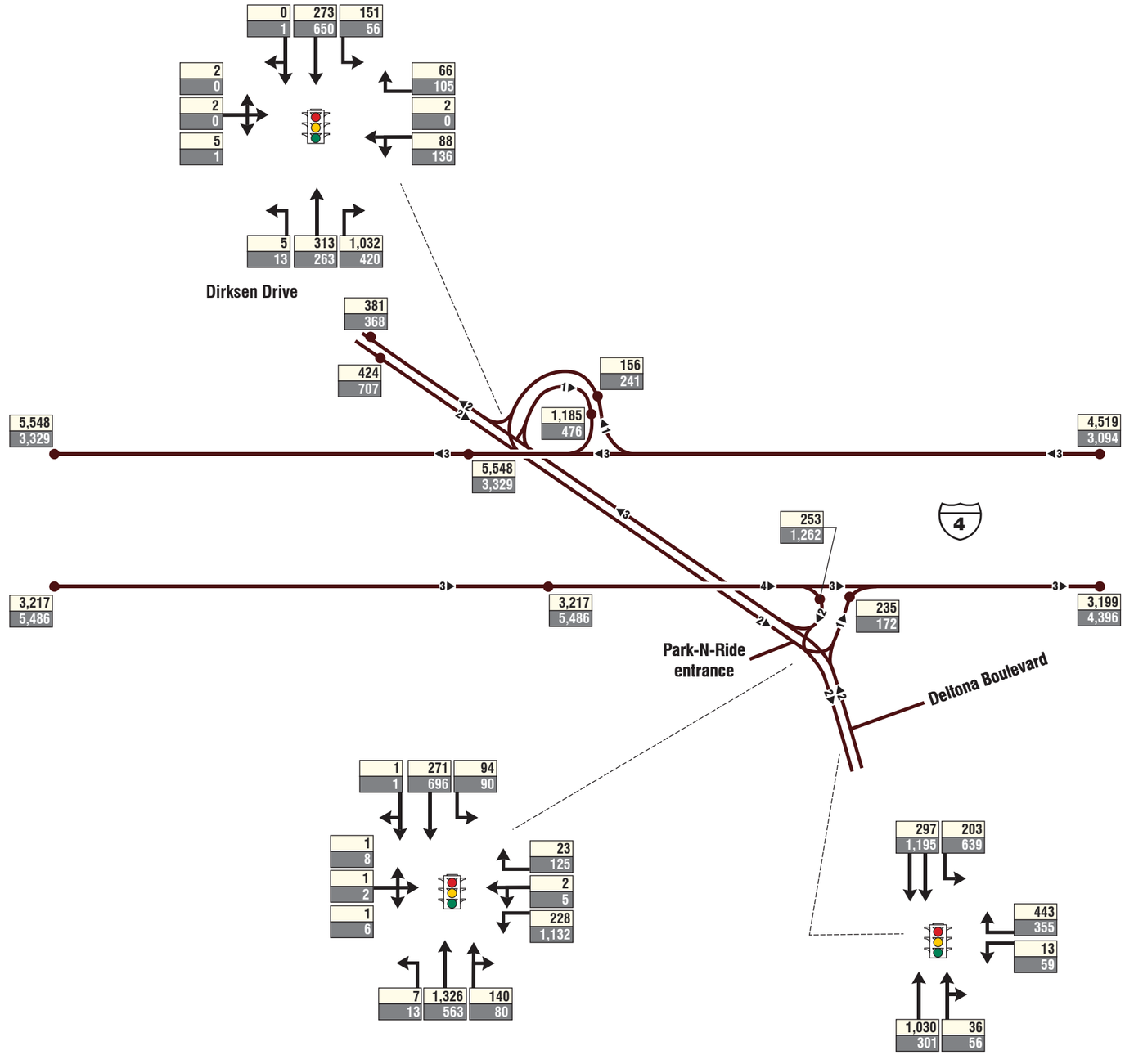
Figure 14 (Sheet 2 of 6)
Peak Hour Traffic and Geometry



FDOT

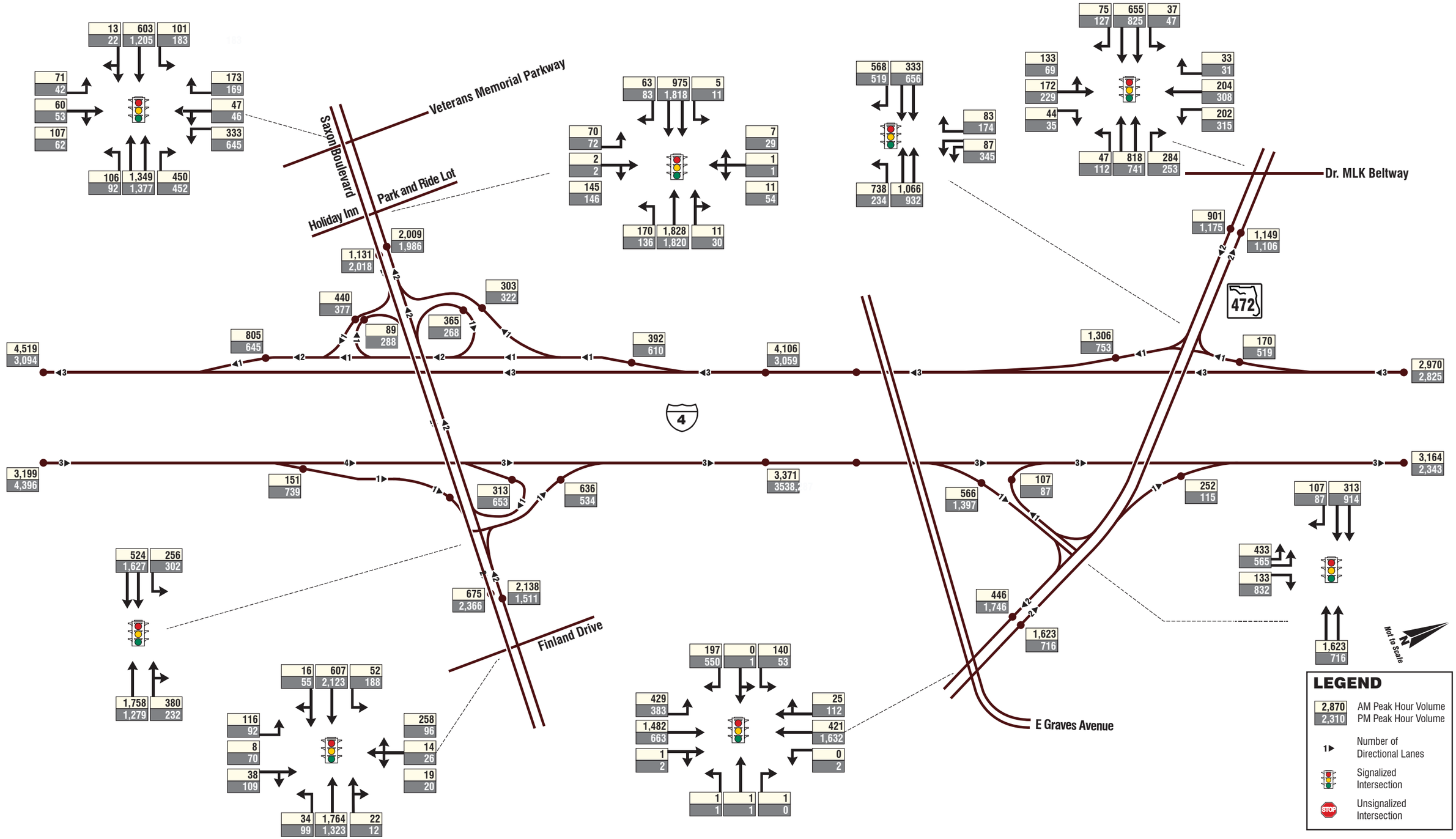
I-4 SAMR Re-evaluation - North Section Existing (2011) Conditions

Figure 14 (Sheet 3 of 6)
Peak Hour Traffic and Geometry



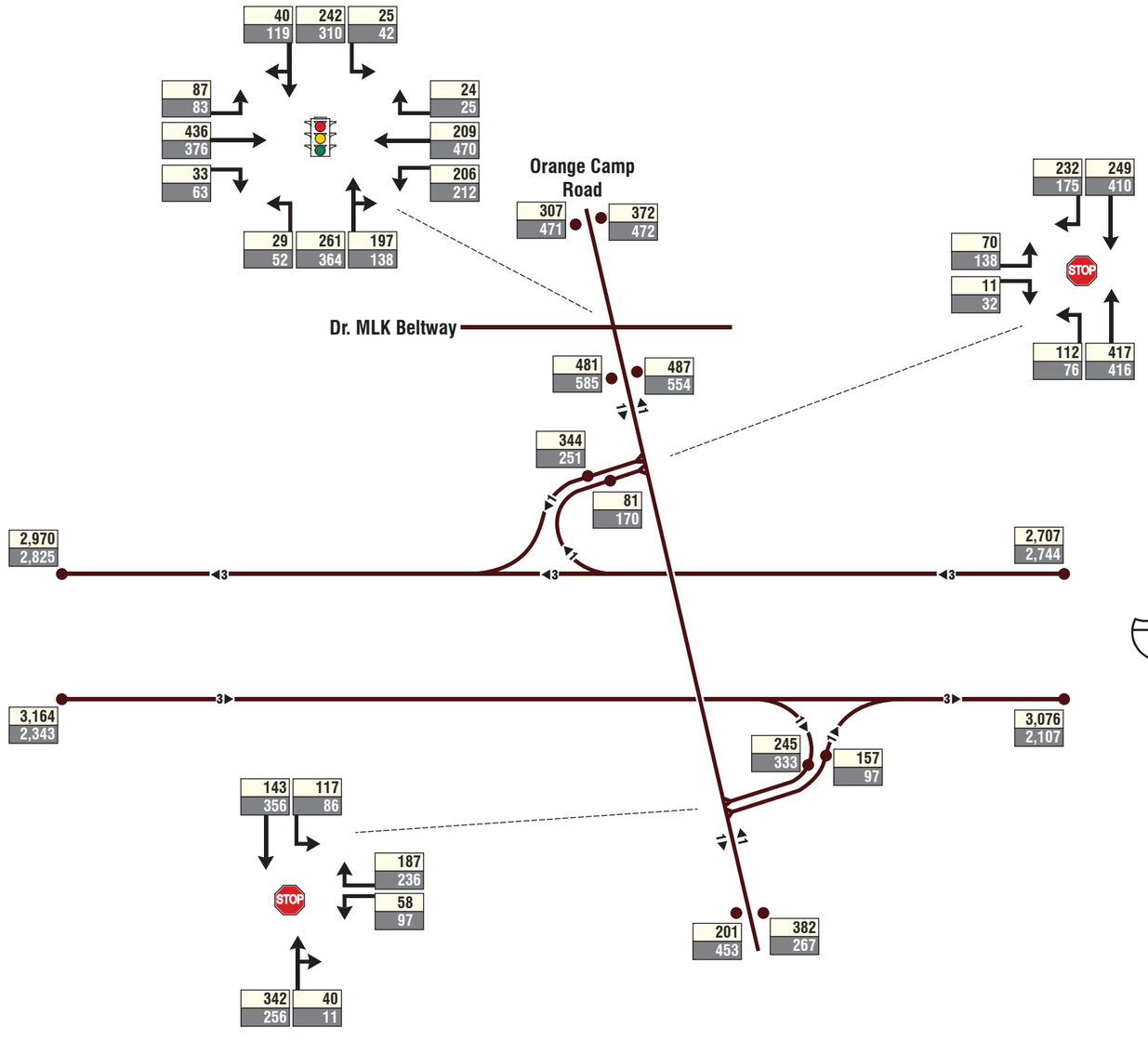
I-4 SAMR Re-evaluation - North Section Existing (2011) Conditions

Figure 14 (Sheet 4 of 6)
Peak Hour Traffic and Geometry



I-4 SAMR Re-evaluation - North Section Existing (2011) Conditions

Figure 14 (Sheet 5 of 6)
Peak Hour Traffic and Geometry



I-4 SAMR Re-evaluation - North Section Existing (2011) Conditions

Figure 14 (Sheet 6 of 6)
Peak Hour Traffic and Geometry

Table 10 Existing (2011) AM and PM Peak Hour Intersection Analysis – North Section

		AM Peak		PM Peak	
Primary Road	Secondary Road	Delay	LOS	Delay	LOS
SR 434	Markham Woods Rd	43.8	D	32.2	C
SR 434	I-4 WB Ramps	19.3	B	27.6	C
SR 434	I-4 EB Ramps	26.4	C	24.3	C
SR 434	Raymond Ave	11.7	B	20.5	C
Lake Mary Blvd	International Pkwy	29.5	C	47.7	D
Lake Mary Blvd	I-4 WB Ramps	34.5	C	22.1	C
Lake Mary Blvd	I-4 EB Ramps	13.4	B	9.7	A
Lake Mary Blvd	Lake Emma Rd	42.2	D	87.0	F
CR 46A	International Pkwy	34.9	C	35.6	D
CR 46A	I-4 WB Ramps	27.4	C	33.0	C
CR 46A	I-4 EB Ramps	21.8	C	26.4	C
CR 46A	Rinehart Rd	34.3	C	43.9	D
SR 46	Oregon St	14.2	B	18.6	B
SR 46	I-4 WB Ramps	18.2	B	27.7	C
SR 46	I-4 EB Ramps	13.7	B	31.7	C
SR 46	Towne Center Blvd	16.2	B	32.0	C
US 17-92	Orange Blvd	11.2	B	16.6	B
CR 15/Monroe St	I-4 EB On-Ramp	1.3	A	1.1	A
US 17-92	I-4 WB Ramps	10.6	B	9.9	A
US 17-92	I-4 EB Off-Ramp	19.0	B	23.4	C
Dirksen Dr	I-4 WB Ramps	8.8	A	6.1	A
Debary Ave	I-4 EB Ramps	12.6	B	24.6	C
Debary Ave	Deltona Blvd	64.6	E	6.9	A
Saxon Blvd	Veterans Memorial Pkwy	18.7	B	22.4	C
Saxon Blvd	Holiday Inn	8.7	A	10.6	B
Saxon Blvd	I-4 EB Ramps	7.5	A	5.7	A
Saxon Blvd	Finland Dr	14.0	B	17.9	B
SR 472	MLK Beltway	28.2	C	33.9	C
SR 472	I-4 WB Ramps	49.2	D	17.2	B
SR 472	I-4 EB Ramps	18.6	B	14.3	B
SR 472	Graves Ave	12.6	B	13.9	B
Orange Camp Rd	MLK Beltway	20.0	B	20.8	C
Orange Camp Rd	I-4 WB Ramps	1.9	A	2.6	A
Orange Camp Rd	I-4 EB Ramps	2.2	A	3.8	A

4.3.3. Link Evaluation Segments

The link evaluation was conducted using the VISSIM microsimulation and is summarized in **Table 11**. Simulated speeds are provided for the freeway segment analysis. The analysis indicates that all freeway segments operate with average speeds greater than 60 mph, with the exception of I-4 eastbound west of SR 434. Additional information on the link performance and the calibration to measured average speeds is provided in **Appendix G**.

Table 11 Existing (2011) Summary of Link Evaluation Segments – North Section

VISSIM ID	Location	Average Speed (mph)	
		AM Peak Hour	PM Peak Hour
I-4 Eastbound			
1000	I-4 EB @ SR 434	65.6	64.8
1010	I-4 EB West of SR 434	49.6	57.7
1030	I-4 EB @ Lake Mary Off Ramp	66.8	66.0
1040	I-4 EB East of CR 46A	67.7	66.5
1050	I-4 EB West of SR 46	67.5	65.7
1060	I-4 EB @ SR 46	68.0	66.3
1070	I-4 EB @ US 17/92	66.8	63.4
1080	I-4 EB East of US 17/92	66.4	67.4
1100	I-4 EB West of Dirksen	66.2	67.2
1110	I-4 EB @ Dirksen Rd	66.2	68.7
1120	I-4 EB East of Dirksen	65.6	67.9
1130	I-4 EB West of Saxon	66.0	68.2
1140	I-4 EB East of Saxon	62.8	69.5
1150	I-4 EB West of SR 472	66.4	69.0
1160	I-4 EB btw SR 472 & Orange Camp	66.5	69.7
1170	I-4 EB @ Orange Camp	65.6	69.5
I-4 Westbound			
2000	I-4 WB btw SR 434 & Lake Mary	70.1	70.1
2020	I-4 WB West of US 17/92	67.5	67.9
2030	I-4 WB West of Lake Mary	68.3	67.8
2040	I-4 WB North of Saxon	63.5	63.3

4.3.1. Network-Wide Performance

Network-wide output summarized in **Table 12** provides additional insight into the VISSIM models. Based on the network performance comparisons, the PM conditions have higher travel time and delay. Low latent demand (vehicles not allowed to enter the network due to congestion) is an indication of well-calibrated models for the Existing year VISSIM analysis.

Table 12 Existing (2011) Network-Wide Performance Results – North Section

Parameter	AM Peak Hour	PM Peak Hour
Total Travel Time (hr)	5,273	5,804
Total Delay Time (hr)	423	661
Average Delay Time (sec/veh)	77	87
Latent Delay Time (hr)	1	8
Number of Arrived Vehicles	38,485	46,342
Latent Vehicles	1	36
Total Delay + Latent Delay (hr)	424	670

4.4. Safety Analysis

A safety analysis was conducted to support the SAMR Re-Evaluation Study in support of the I-4 BtU PD&E study. The safety analysis was performed using the most recent five years (2008-2012) of crash data available when the analysis was initiated. The crash data shape files were obtained from FDOT District Five, and the crash data was researched to identify and extract crashes reported for the study area. Traffic data such as functional classification and AADTs were obtained from the 2013 FDOT Florida Traffic Information (FTI) DVD. In the case of roadway segments for which AADT was not available on the FTI, the nearest FDOT count location was used to obtain historical AADT. The crashes were analyzed to make an assessment of safety conditions along the study corridor. Results from this analysis are discussed below.

4.4.1. Descriptive Crash Analysis

The crash types and crash patterns are summarized in this section. **Table 13** and **Table 14** summarize the four major crash types and patterns by segment for the I-4 corridor for the five-year study period (2008-2012). The crash summary tables show rear-end, sideswipe, and angle collisions as the most common crash types for the study area roadway segments.

4.4.2. Crash Rates

Crash rates expressed as number of crashes per million vehicle miles traveled (MVMT) were calculated from the total number of crashes in a year, daily traffic volume, and the length of the segment under study. Crash rates were then compared to Districtwide crash rates for similar facilities. The Districtwide crash rate statistics are included in **Appendix B**. **Table 15** and **Table 16** provide a summary of the crashes reported in the study area. The expression of crash rate is as follows:

Actual Crash Rate = (Number of crashes per year x 1,000,000) / (ADT x 365 x segment length)

The crash analysis demonstrated that the crash rates on the following roadway segments in the study area are higher than the average crash rates for similar facilities:

- I-4 eastbound and westbound segments from US 17/92 to Volusia County Line; and
- I-4 eastbound segment near the SR 472 interchange.

Table 13 Crash Summary – North Section Segment 3 (Seminole County)

Westbound Interstate 4			Eastbound Interstate 4		
Volusia County Line to US 17-92			**US 17-92 to Volusia County Line**		
Total Crashes = 20			**Total Crashes = 38**		
Predominant Crash Types	**# of Crashes**	**% of Total**	**Predominant Crash Types**	**# of Crashes**	**% of Total**
Rear End	4	20.0%	Rear End	8	21.1%
Angle	2	10.0%	Sideswipe	2	5.3%
Sideswipe	2	10.0%	Collision with Motor Vehicle	4	10.5%
Hit Guardrail	6	30.0%	Hit Conc. Barrier Wall	4	10.5%
US 17-92 to SR 46			**SR 46 to US 17-92**		
Total Crashes = 54			**Total Crashes = 82**		
Predominant Crash Types	**# of Crashes**	**% of Total**	**Predominant Crash Types**	**# of Crashes**	**% of Total**
Rear End	11	20.4%	Rear End	22	26.8%
Angle	9	16.7%	Angle	6	7.3%
Sideswipe	7	13.0%	Sideswipe	7	8.5%
Hit Conc. Barrier Wall	4	7.4%	Hit Guardrail	8	9.8%
SR 46 to SR 417			**SR 417 to SR 46**		
Total Crashes = 39			**Total Crashes = 38**		
Predominant Crash Types	**# of Crashes**	**% of Total**	**Predominant Crash Types**	**# of Crashes**	**% of Total**
Rear End	8	20.5%	Rear End	5	13.2%
Angle	5	12.8%	Angle	8	21.1%
Sideswipe	2	5.1%	Hit Guardrail	6	15.8%
Overturned	5	12.8%	Overturned	3	7.9%
SR 417 to Lake Mary Blvd			**Lake Mary Blvd to SR 417**		
Total Crashes = 116			**Total Crashes = 86**		
Predominant Crash Types	**# of Crashes**	**% of Total**	**Predominant Crash Types**	**# of Crashes**	**% of Total**
Rear End	47	40.5%	Rear End	17	19.8%
Angle	15	12.9%	Angle	12	14.0%
Sideswipe	7	6.0%	Sideswipe	9	10.5%
Collision with Motor Vehicle	8	6.9%	Hit Guardrail	11	12.8%
Lake Mary Blvd. to SR 434			**SR 434 to Lake Mary Blvd**		
Total Crashes = 203			**Total Crashes = 150**		
Predominant Crash Types	**# of Crashes**	**% of Total**	**Predominant Crash Types**	**# of Crashes**	**% of Total**
Rear End	93	45.8%	Rear End	59	39.3%
Angle	10	4.9%	Angle	17	11.3%
Sideswipe	17	8.4%	Sideswipe	12	8.0%
Collision with Motor Vehicle	21	10.3%	Hit Guardrail	11	7.3%

Table 14 Crash Summary – North Section Segment 4 (Volusia County)

Westbound Interstate 4			Eastbound Interstate 4		
Orange Camp Rd to SR 472			**SR 472 to Orange Camp Rd**		
Total Crashes = 55			**Total Crashes = 75**		
Predominant Crash Types	**# of Crashes**	**% of Total**	**Predominant Crash Types**	**# of Crashes**	**% of Total**
Rear End	18	32.7%	Rear End	15	20.0%
Angle	4	7.3%	Sideswipe	6	8.0%
Sideswipe	6	10.9%	Collision with Motor Vehicle	7	9.3%
Collision with Parked Car	3	5.5%	Overturned	10	13.3%
SR 472 to Saxon Blvd			**Saxon Blvd to SR 472**		
Total Crashes = 99			**Total Crashes = 79**		
Predominant Crash Types	**# of Crashes**	**% of Total**	**Predominant Crash Types**	**# of Crashes**	**% of Total**
Rear End	18	18.2%	Rear End	20	25.3%
Angle	13	13.1%	Angle	11	13.9%
Collision with Motor Vehicle	11	11.1%	Collision with Motor Vehicle	9	11.4%
Hit Guardrail	16	16.2%	Hit Guardrail	9	11.4%
Saxon Blvd to Dirksen Drive			**Dirksen Drive to Saxon Blvd**		
Total Crashes = 94			**Total Crashes = 103**		
Predominant Crash Types	**# of Crashes**	**% of Total**	**Predominant Crash Types**	**# of Crashes**	**% of Total**
Rear End	21	22.3%	Rear End	24	23.3%
Angle	12	12.8%	Angle	10	9.7%
Sideswipe	10	10.6%	Sideswipe	11	10.7%
Hit Guardrail	11	11.7%	Hit Guardrail	11	10.7%
Dirksen Drive to Seminole County Line			**Seminole County Line to Dirksen Drive**		
Total Crashes = 88			**Total Crashes = 126**		
Predominant Crash Types	**# of Crashes**	**% of Total**	**Predominant Crash Types**	**# of Crashes**	**% of Total**
Rear End	26	29.5%	Rear End	36	28.6%
Angle	6	6.8%	Angle	10	7.9%
Sideswipe	10	11.4%	Sideswipe	13	10.3%
Hit Guardrail	6	6.8%	Collision with Motor Vehicle	9	7.1%

Table 15 Interstate (I-4) Crash Rate Summary – North Section

County	From	To	Functional Classification	Length (miles)	Average AADT (2008-2012)	Total Number of Crashes (2008-2012)	Average Annual Number of Crashes	Crash Rate (MVMT)	Average District Crash Rate for Similar Facilities (2008-2012)	Number of Injuries (2008-2012)	Average Annual Injuries	Injury Rate (MVMT)	Number of Fatalities (2008-2012)	Predominant Crashes	
														Crash Type	Potential Contributing Cause
I-4 Eastbound/Northbound															
Seminole	SR 434	Lake Mary Blvd	INTERSTATE URBAN	4.79	66,962	150	30	0.256	0.473	150	30	0.256	3	Rear End	Congestion
	Lake Mary Blvd	SR 417		2.94	63,100	86	17	0.251	0.473	86	17	0.251	2	Rear End	
	SR 417	SR 46		1.15	40,300	38	8	0.473	0.473	42	8	0.473	2	Angle	Major diverge and weaving
	SR 46	US 17-92		1.80	52,900	82	16	0.460	0.473	95	19	0.547	2	Rear End	
	US 17-92	County Line		0.16	54,400	38	8	**2.518**	0.473	34	7	2.203	0	Rear End	
Volusia	County Line	Dirksen Dr.	INTERSTATE RURAL	3.37	54,400	126	25	0.374	0.375	131	26	0.389	3	Rear End	Congestion
	Dirksen Dr.	Saxon Blvd	INTERSTATE URBAN	2.82	46,658	103	21	0.437	0.473	108	22	0.458	2	Rear End	
	Saxon Blvd	SR 472		3.16	39,100	79	16	0.355	0.473	78	16	0.355	1	Rear End	
	SR 472	Orange Camp Rd		2.10	37,300	75	15	**0.525**	0.473	56	11	0.385	4	Rear End	
I-4 Westbound/Southbound															
Volusia	Orange Camp Rd	SR 472	INTERSTATE URBAN	2.10	34,100	55	11	0.421	0.473	49	10	0.383	2	Rear End	Congestion
	SR 472	Saxon Blvd		3.16	39,600	99	20	0.438	0.473	115	23	0.504	3	Rear End	
	Saxon Blvd	Dirksen Dr.		2.82	47,361	94	19	0.390	0.473	81	16	0.328	2	Rear End	
	Dirksen Dr.	County Line	INTERSTATE RURAL	3.37	54,200	88	18	0.270	0.375	65	13	0.195	2	Rear End	
Seminole	County Line	US 17-92	INTERSTATE URBAN	0.16	54,200	20	4	**1.264**	0.473	43	9	2.843	0	Rear End	
	US 17-92	SR 46		1.80	56,400	54	11	0.297	0.473	38	8	0.216	0	Rear End	
	SR 46	SR 417		1.15	46,900	39	8	0.406	0.473	30	6	0.305	2	Rear End	
	SR 417	Lake Mary Blvd		2.94	62,500	86	17	0.253	0.473	133	27	0.403	3	Rear End	
	Lake Mary Blvd	SR 434		4.79	65,673	203	41	0.357	0.473	188	38	0.331	2	Rear End	

**The crash rates higher than the average FDOT District Five crash rates for similar facilities are highlighted in bold*

Table 16 Arterial Crash Rate Summary – North Section

Road Name	County	From	To	Functional Classification	Length (miles)	Average AADT (2008-2012)	Total Number of Crashes (2008-2012)	Average Annual Number of Crashes	Crash Rate (MVMT)	Average District Crash Rate for Similar Facilities (2008-2012)	Number Of Injuries (2008-2012)	Average Annual Injuries	Injury Rate (MVMT)	Number Of Fatalities (2008-2012)	Predominant Crashes	
															Crash Type	Potential Contributing Cause
Lake Mary Blvd	Seminole	International Pkwy	Lake Emma Rd	URBAN 6+LN 2WY DIVD RASD	0.83	17600	104	21	**3.939**	2.226	52	10	1.875	0	Rear End	Congestion
CR 46A		International Pkwy	Rinehart Rd	URBAN 4-5LN 2WY DIVD RASD	0.84	14800	35	7	1.543	1.730	19	4	0.882	1	Rear End	Congestion
SR 417		I-4 Ramps	0.5 Mile East of Rinehart Rd	TOLL ROAD URBAN	1.35	24360	40	8	**0.666**	0.356	36	7	0.583	2	Overturned	Speeding and roadway conditions
SR 46		Oregon St	Town Center Blvd	URBAN 6+LN 2WY DIVD RASD	0.58	38600	66	13	1.591	2.226	50	10	1.224	2	Rear End	Congestion
US 17/92		Monroe Rd	West of I-4	URBAN 4-5LN 2WY DIVD RASD	0.54	21220	43	9	**2.152**	1.730	39	8	1.913	0	Rear End	Congestion
Dirksen Dr	Volusia	I-4 Ramps	Deltona BLvd	URBAN 4-5LN 2WY DIVD RASD	0.71	6300	31	6	**3.675**	1.730	29	6	3.675	0	Rear End	Congestion
Saxon Blvd		Veterans Memorial Pkwy	Normandy Blvd	URBAN 4-5LN 2WY DIVD RASD	1.53	26500	181	36	**2.433**	1.730	119	24	1.622	1	Rear End	Congestion
SR 472		Graves Ave	MLK Beltway	URBAN 4-5LN 2WY DIVD RASD	1.45	24100	92	18	**1.411**	1.730	93	19	1.490	0	Rear End	Congestion
Orange Camp Rd		West of I-4 Ramps	East of I-4 Ramps	URBAN 2-3LN 2WY DIVD PAVD	0.19	3780	3	1	**3.815**	2.371	2	0	0.000	0	Rear End	Congestion

**The crash rates higher than the average FDOT District Five crash rates for similar facilities are highlighted in bold*

5. TRAFFIC FORECAST DEVELOPMENT

This section discusses the development of traffic forecasts used in the future year operational analyses. The future year volumes were developed using the Central Florida Regional Planning Model (CFRPM) as a baseline and then making adjustments based on coordination with other agencies and projects having overlapping study areas. Based on the approved MLOU, future peak hour traffic volumes were developed for the North Section in 2020, 2030, and 2040.

5.1. Travel Demand Model

As discussed in Section 2.4.1, the CFRPM version 5.01 travel demand model was selected for use in the study. The CFRPM version 5.01 contains model data sets for the base year of 2005, interim years of 2015, 2020, 2025, and 2030, and a year 2035 Cost Feasible network. A design year 2040 socioeconomic data set was created using the CFRPM 2035 Cost Feasible data as its base and adjusted to 2040 by creating a growth rate for the population and employment variables using data from the University of Florida, Bureau of Economic and Business Research: Florida Statistical Abstract 2009 (BEBR), and the CFRPM model data itself. More information on the development of the 2040 socioeconomic data set is available in **Appendix H**.

The network model data sets for 2020 and 2030 were used as is for the No-Build scenario. The 2040 network was the 2035 Cost Feasible network with no modifications for the No-Build scenario. The Build alternative included only the changes to I-4 to add the preferred special use lanes (express lanes) and ramps.

As discussed in the MLOU, the CFRPM does not explicitly estimate express lane usage. The forecasted express lane volumes were initially estimated from the CFRPM model, but the final express lane volume estimation was based on the VISSIM analysis that redistributed the total traffic volume between general use and express lanes until a specified target volume was reached for the express lanes. This target volume was governed by a desired level of service for the express lanes. Additional information is provided in the operational analysis section of this report.

5.2. Original Build – 2040 Directional Peak Period / Peak Hour Traffic Development

The Peak Season Weekday Average Daily Traffic (PSWADT) volumes produced from the CFRPM v5.01 were converted to Annual Average Daily Traffic (AADT) by applying the model output conversion factors (MOCF) for I-4 and the arterials. Two distinct methodologies were used to estimate peak period / peak hour volumes for the South and North Sections. The method for the North Section is summarized below. Additional information is provided in the Traffic Volumes Development Report in **Appendix H**.

5.2.1. North Section 2040 DDHVs

FDOT's standard "K" and "D" factor approaches were used to develop the DDHVs for the North Section general use lanes and arterials, consistent with the MLOU. Based upon input from FDOT Central Office and Florida's Turnpike Enterprise, a K factor of 9.7% was used to develop the initial set of peak hour volumes for the express lanes. Initial DDHVs were developed using the FDOT TURNS5 software. The development of the design traffic characteristics and the initial DDHVs for the North Section is detailed in **Appendix H**.

Traffic forecasts were refined at the I-4 and SR 417/Wekiva Parkway interchange after evaluation of relevant traffic forecasts from the 2011 Wekiva Parkway (SR 429)/SR 46 Realignment Preliminary Engineering Report and the 2012 Wekiva Parkway Traffic and Revenue Study. Manual adjustments were made to these volumes to reflect existing traffic patterns and to ensure growth from the existing volumes. Manual volume adjustments also considered reasonable growth rates for localized movements, current land use patterns and future projected developments, population growth rates, and the capacities of the proposed roadway configurations. More information on the adjustments made to the initial DDHVs is provided in **Appendix H**. The 2040 DDHVs for the North Section (Original Build) are displayed in **Figure 15**.

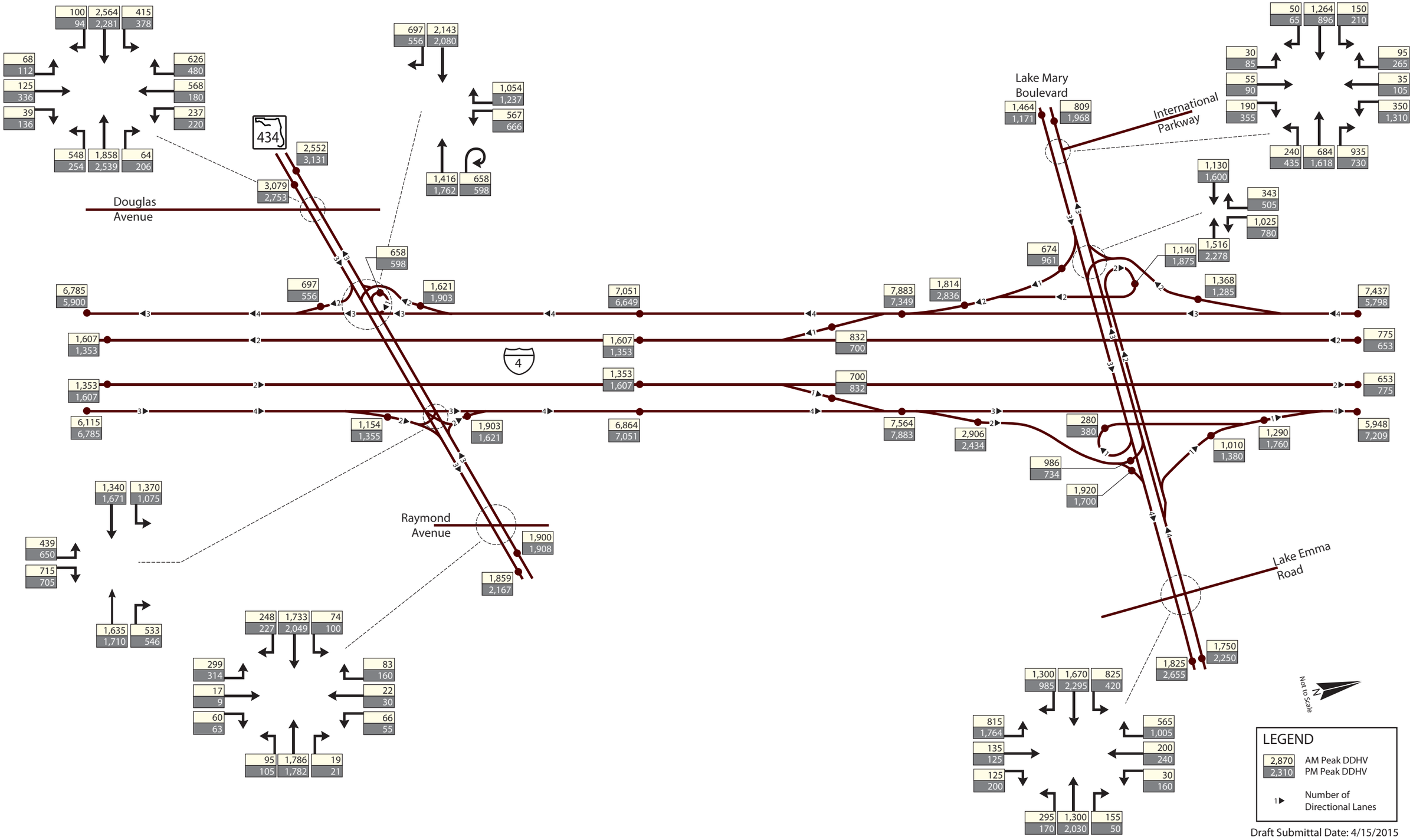
5.3. Original Build – 2020 and 2030 Peak Hour Traffic Development

The Opening (2020) and Interim (2030) Year traffic volumes were developed using the 2040 peak hour volumes described in Section 5.2. The traffic development for the North Section is described as follows.

5.3.1. North Section 2020 and 2030 DDHVs

For the North Section, an average annual growth rate was calculated between the existing (2011) I-4 mainline and ramp peak hour volumes and the 2040 peak hour volumes in order to project the 2020 peak hour volumes for the I-4 mainline and ramps. Manual adjustments were made where necessary after checking volumes for reasonable growth from existing volumes and to balance traffic between interchanges. The 2030 mainline and ramp volumes were then interpolated between the 2020 and 2040 peak hour volumes.

Peak hour intersection turning movement volumes (TMVs) for 2020 and 2030 were interpolated between the available existing volumes and the 2040 peak hour intersection TMVs. The 2020 and 2030 mainline, ramp and intersection volumes were checked for reasonableness and adjusted to balance accordingly. Additional detailed information on the development of 2020 and 2030 volumes is provided in **Appendix H**. The peak hour 2020 and 2030 volumes for the North Section (Original Build) are shown in **Figure 16** and **Figure 17**, respectively.



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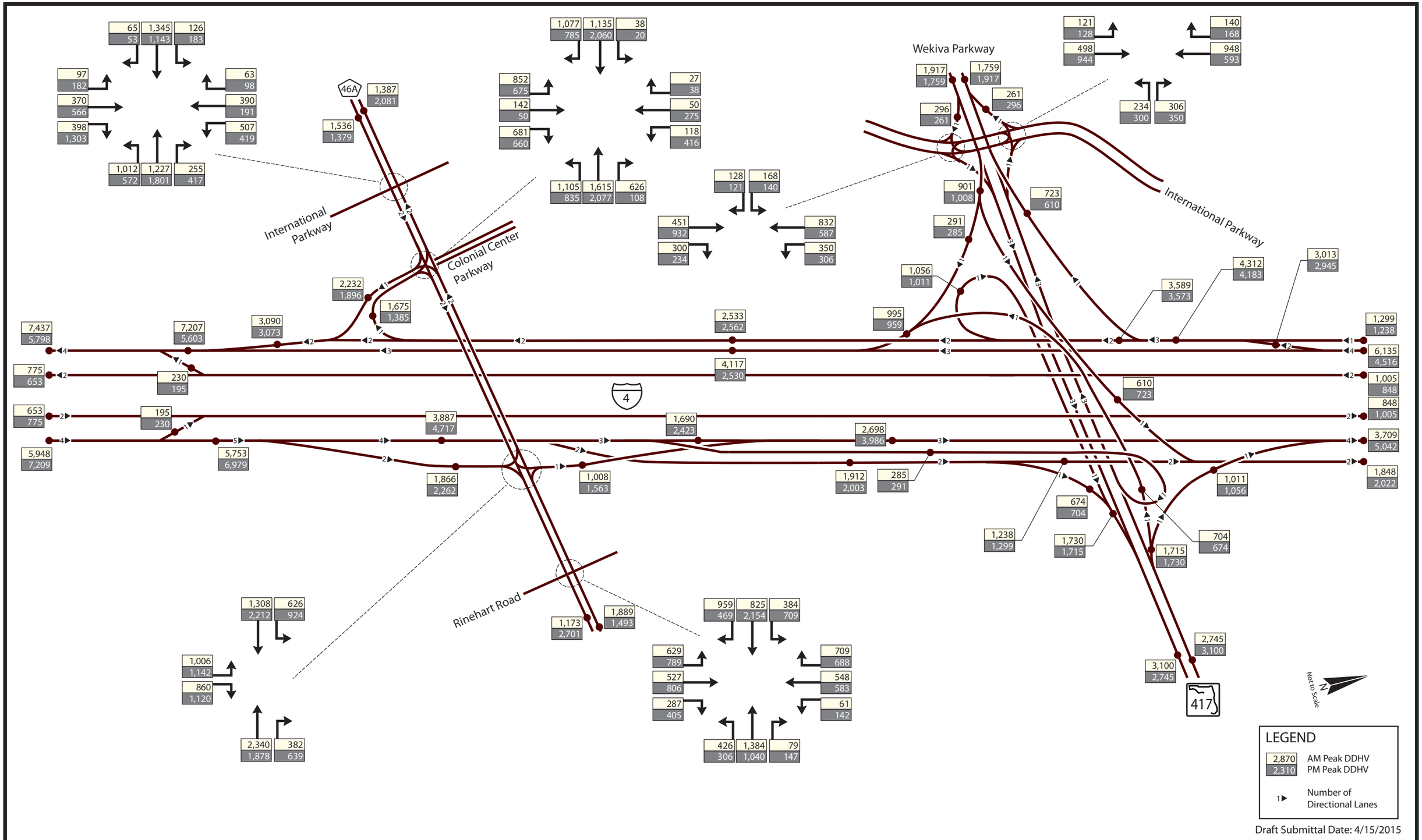

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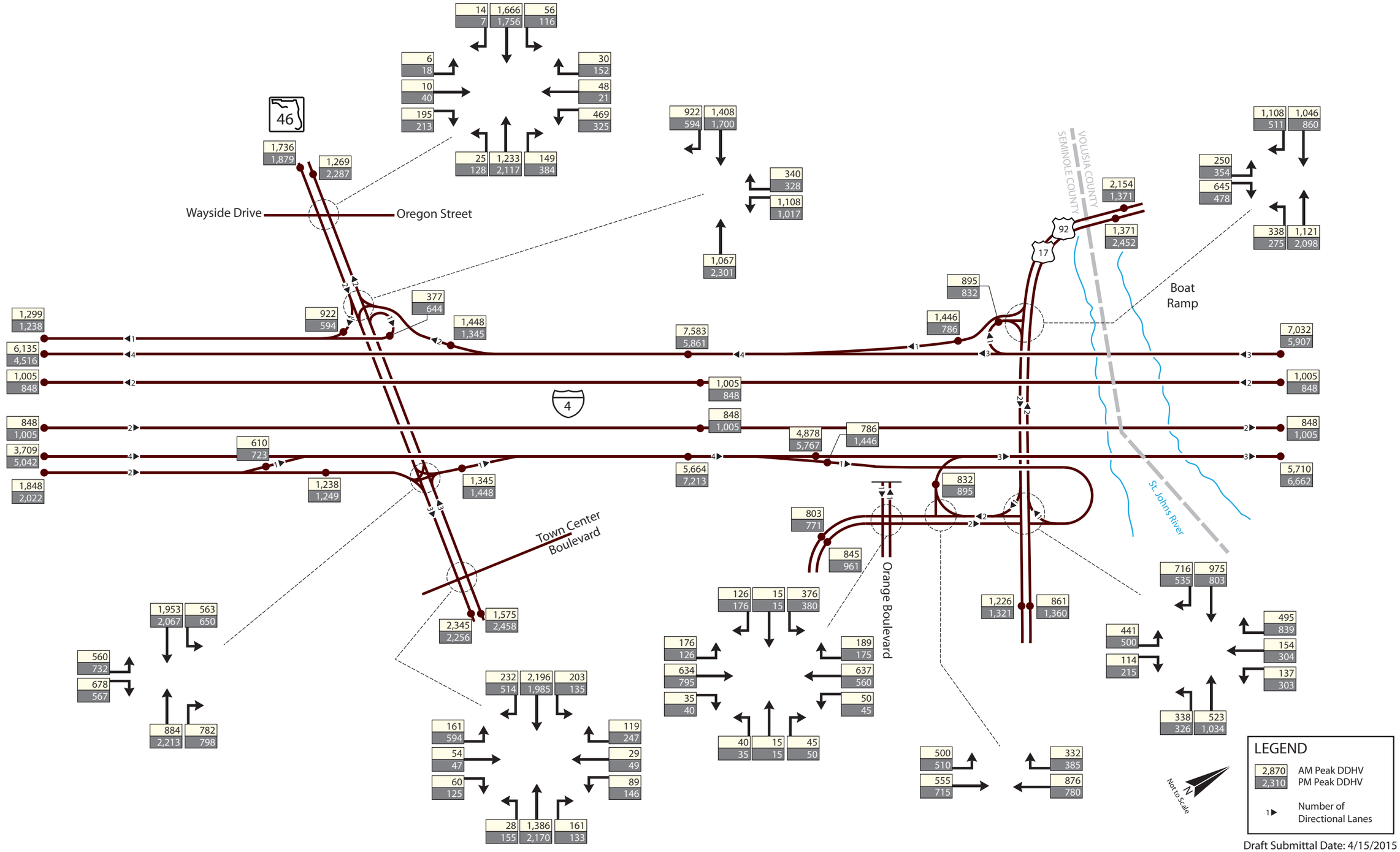

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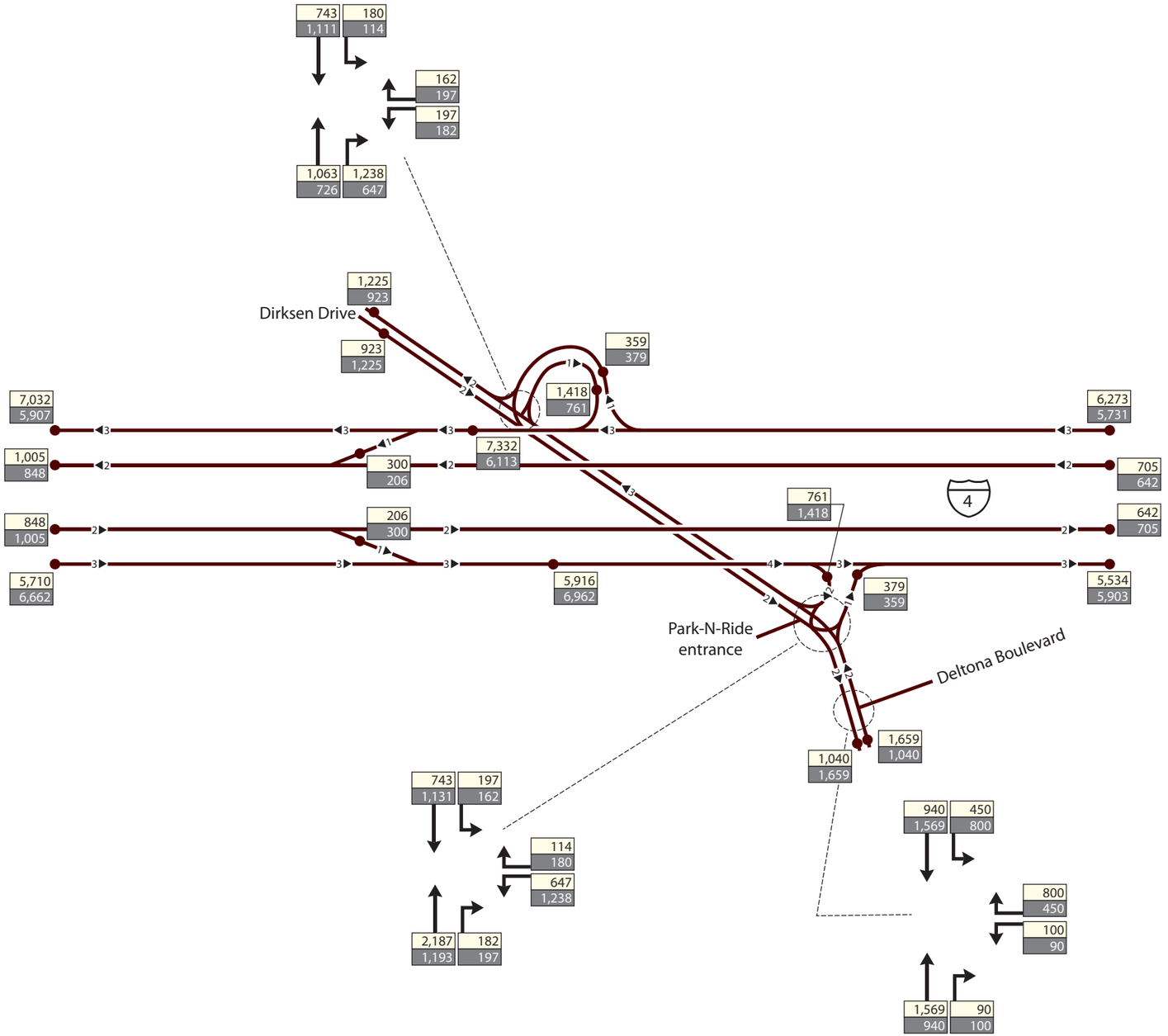

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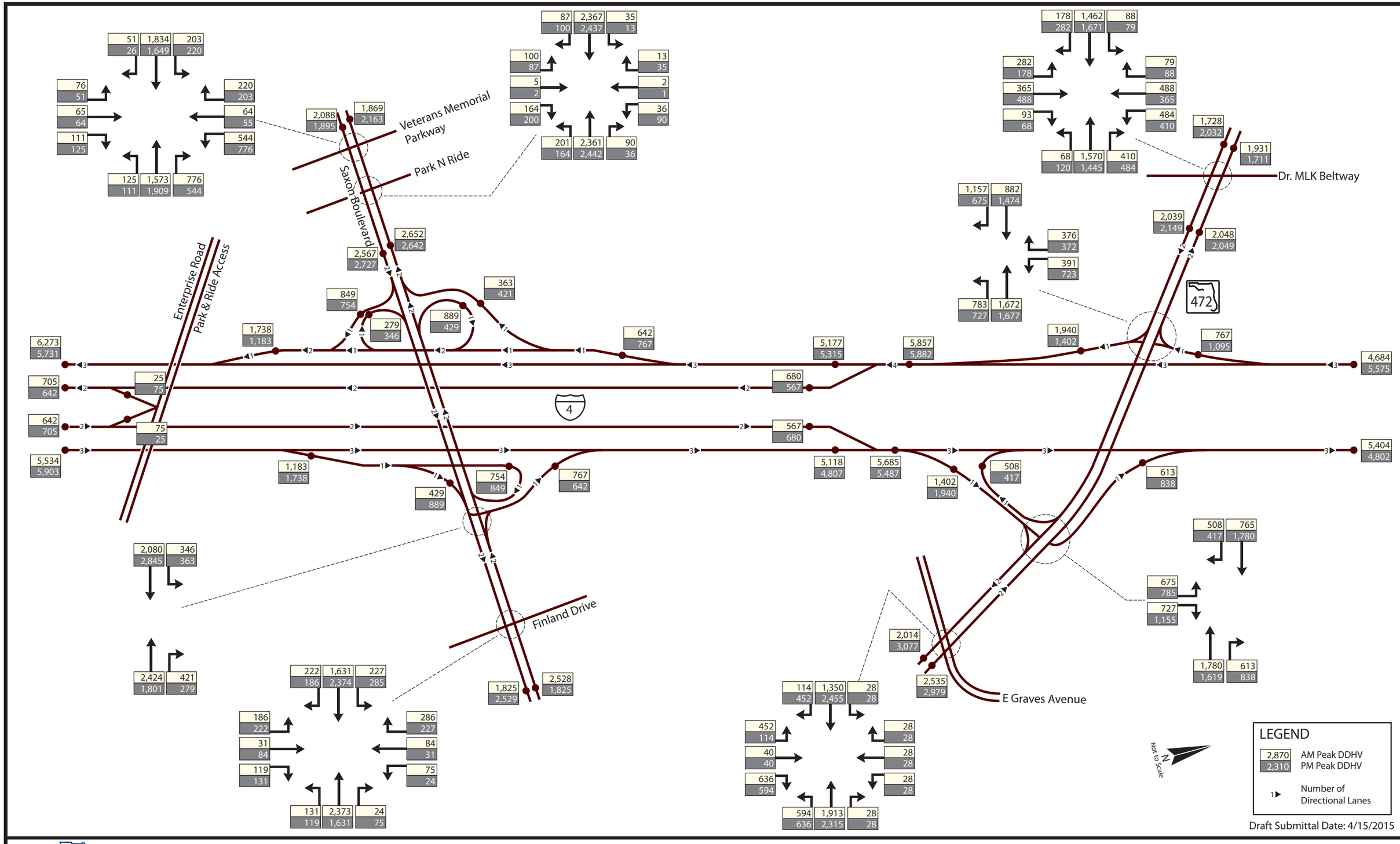

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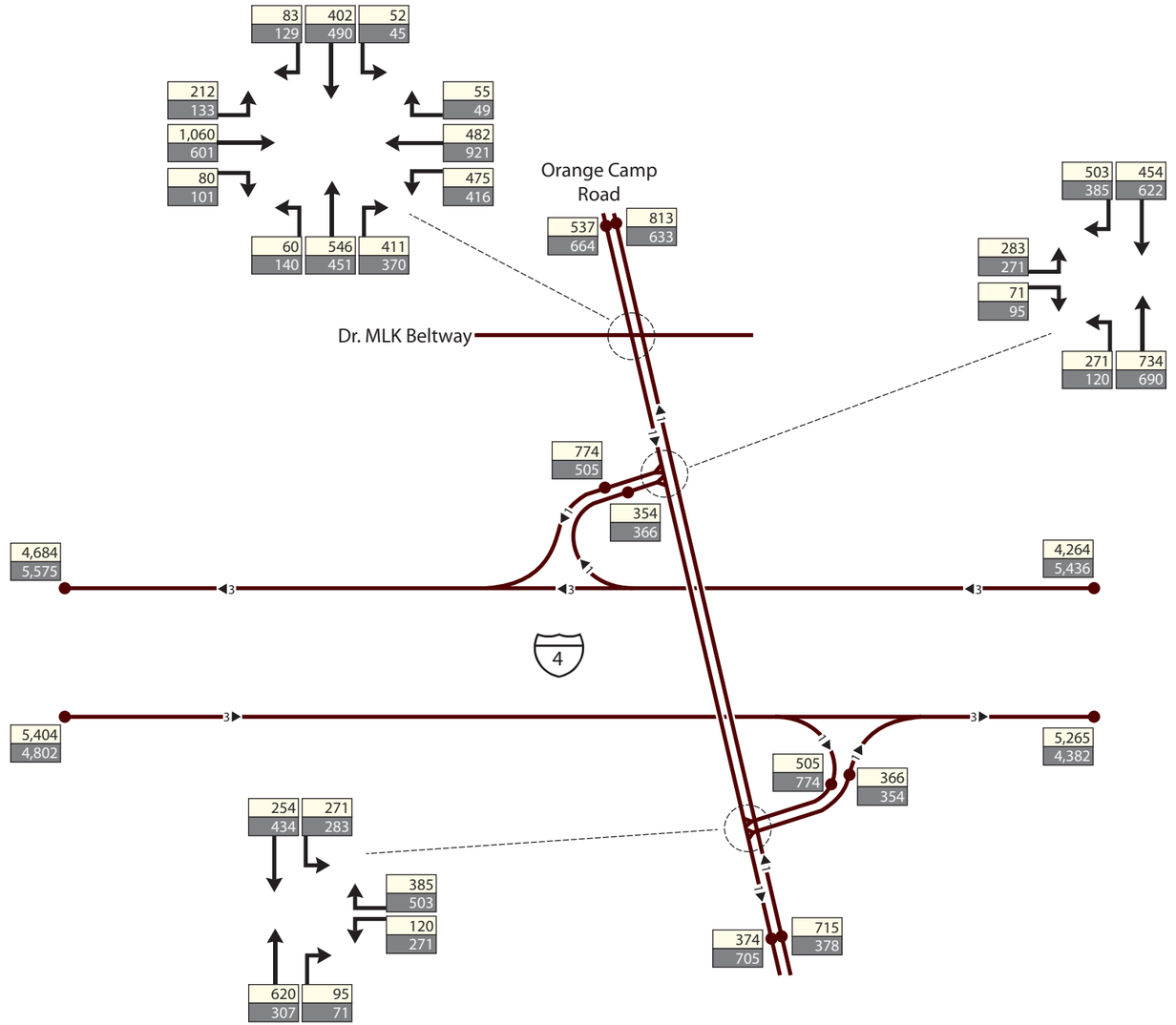

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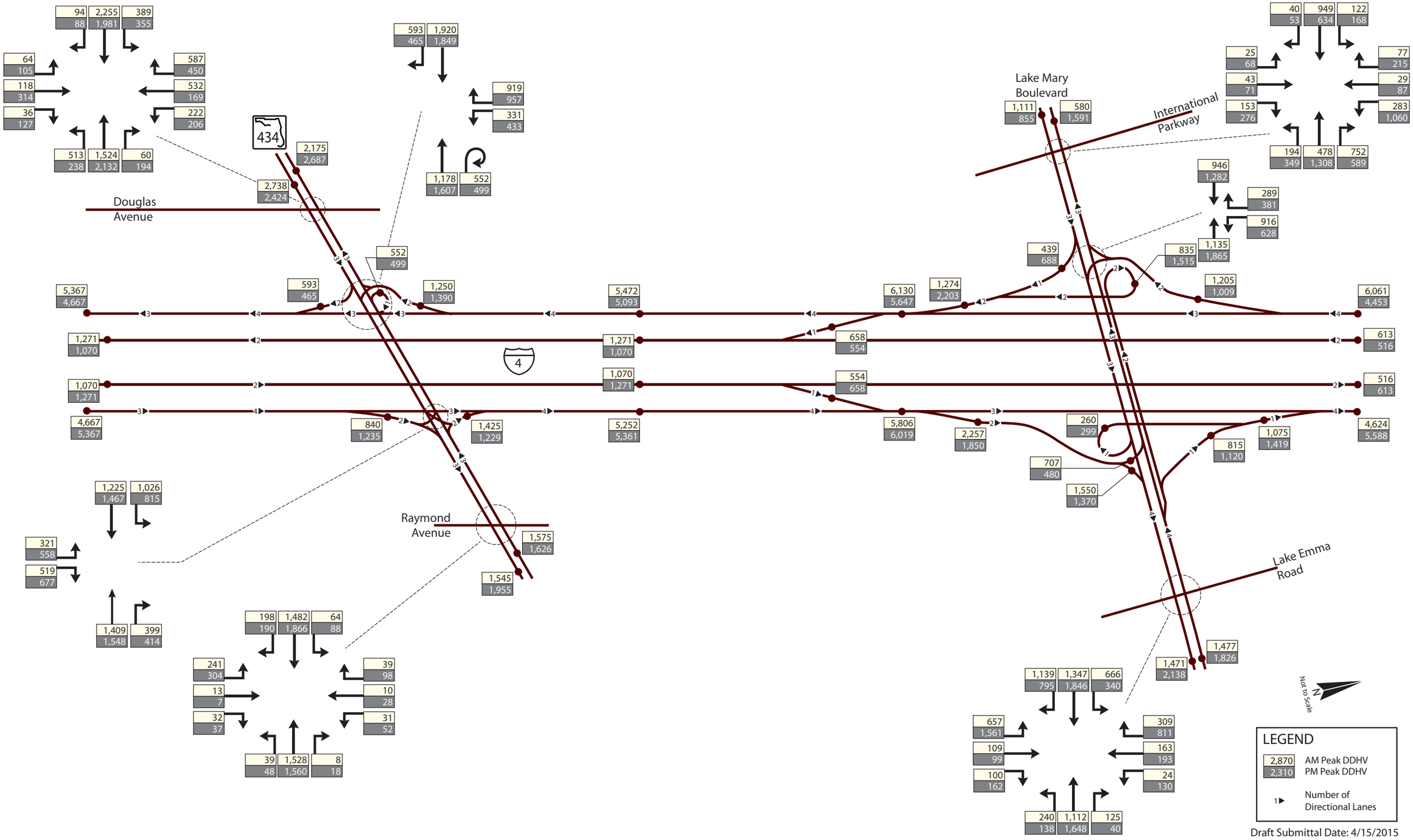

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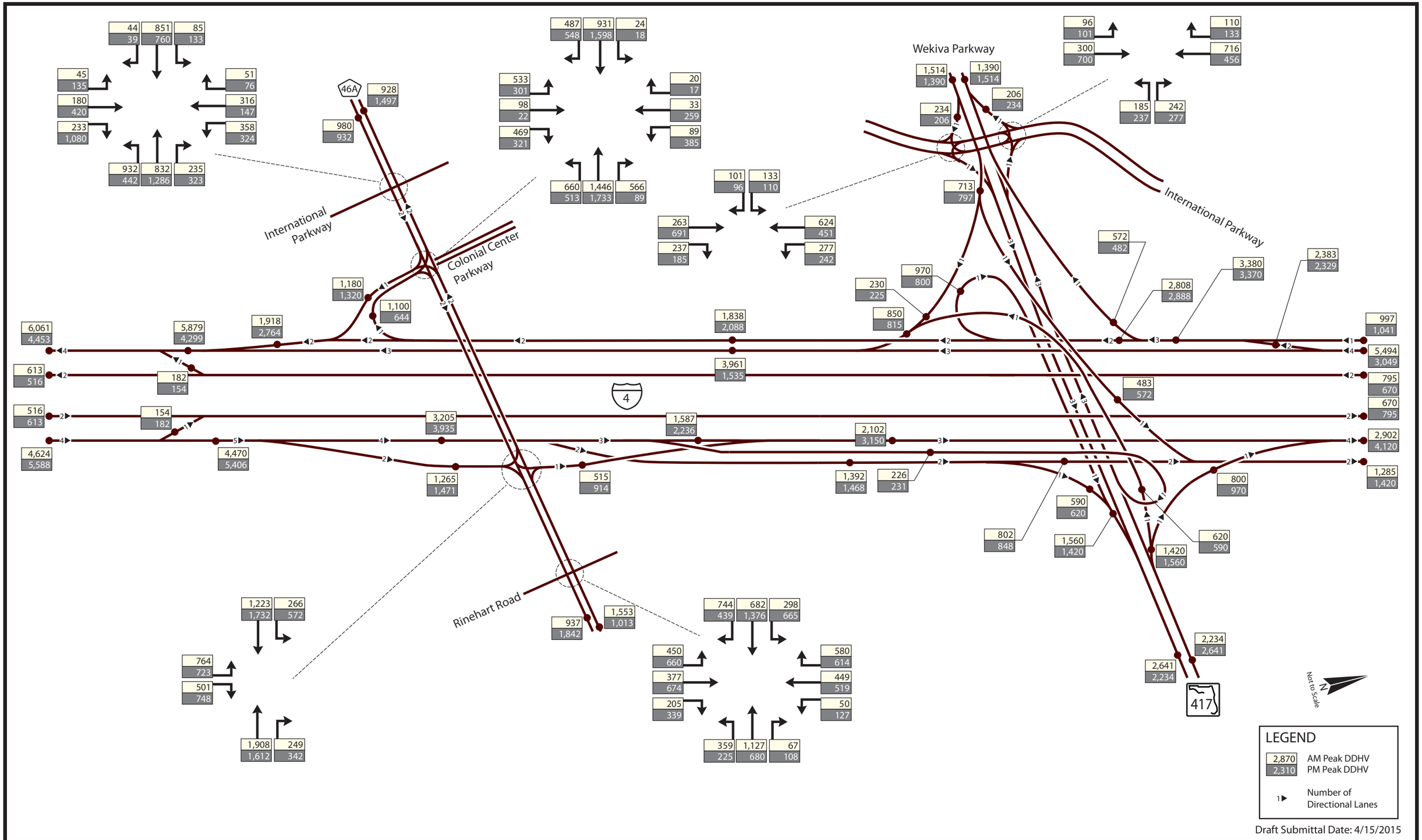

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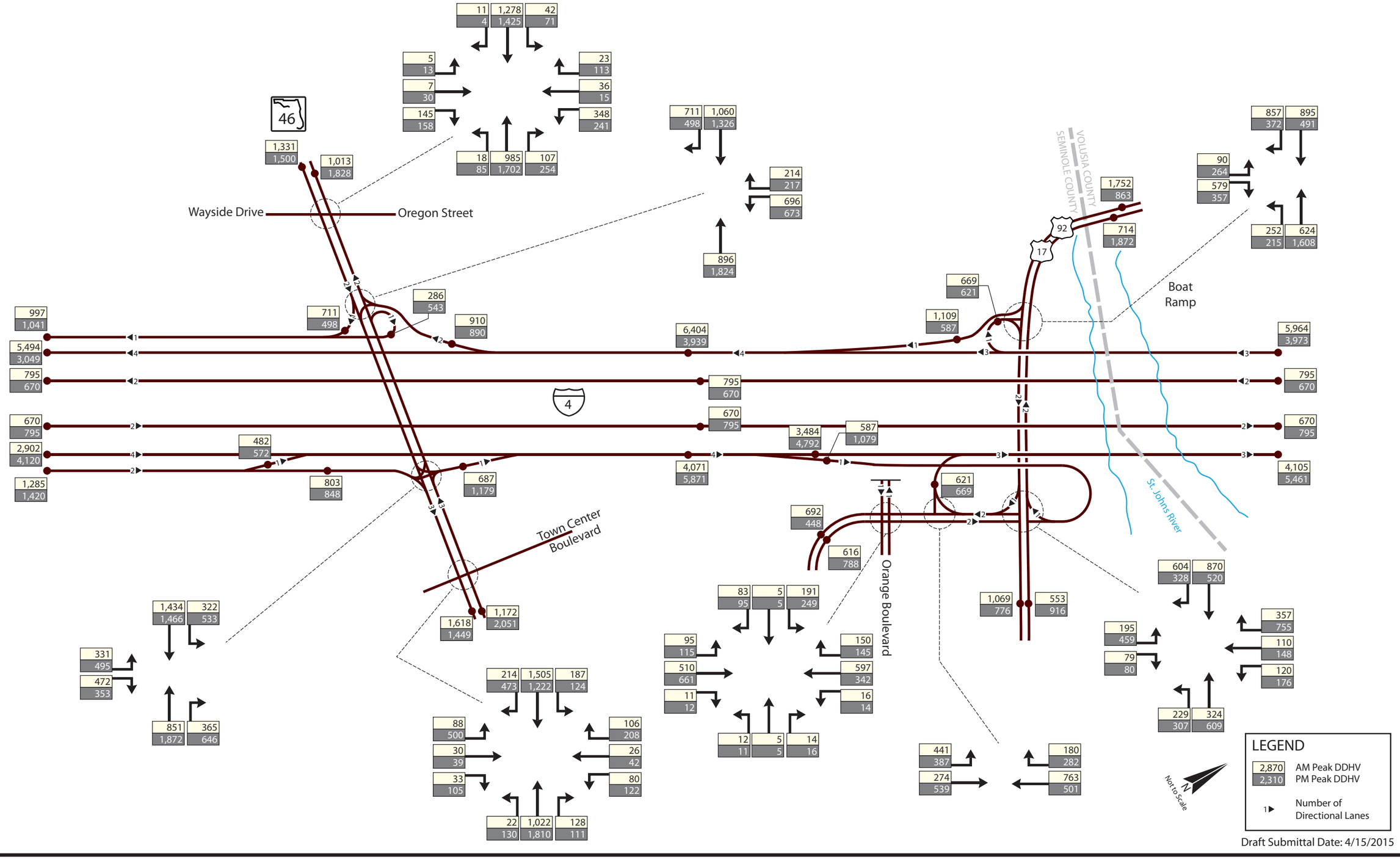

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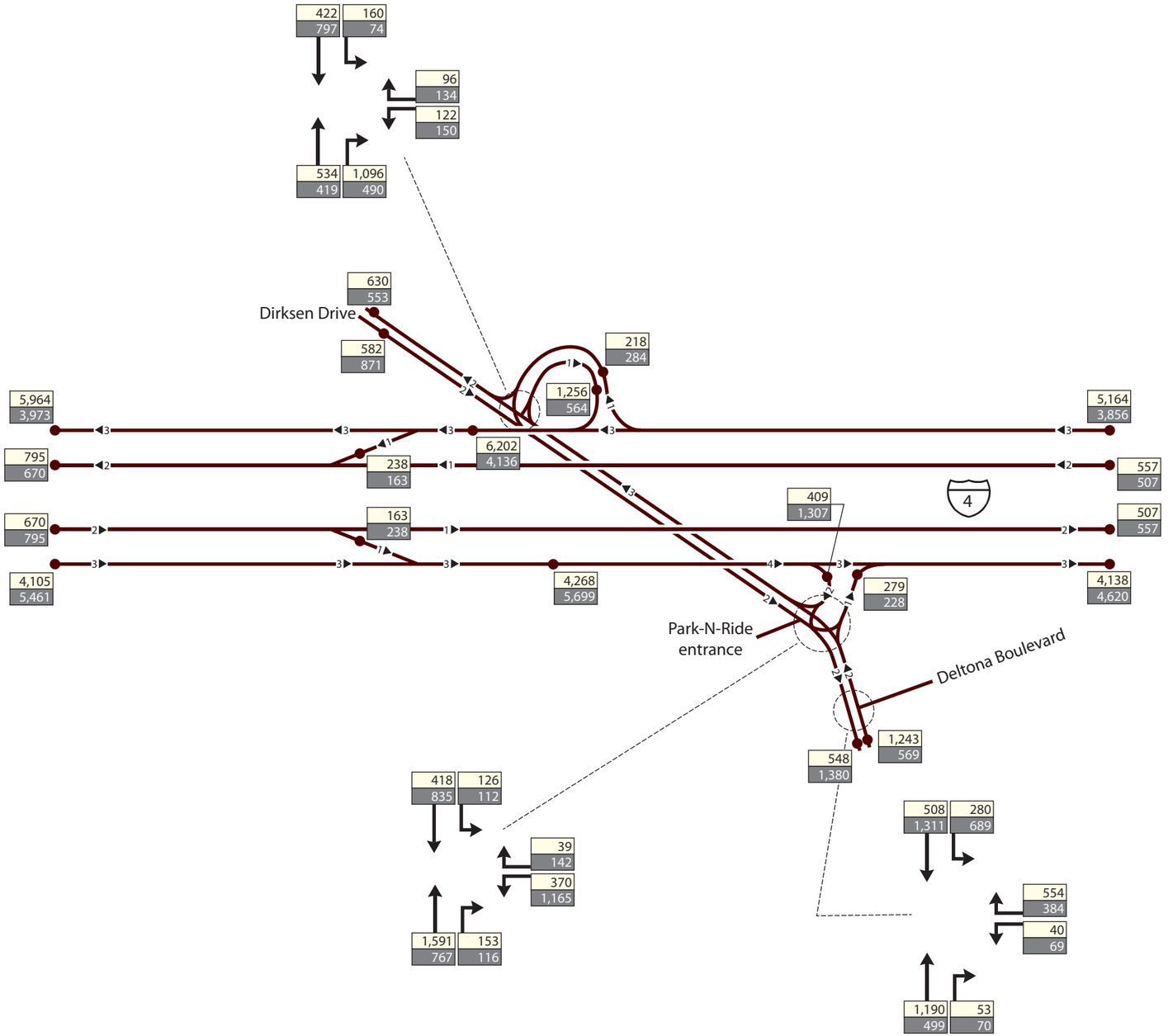

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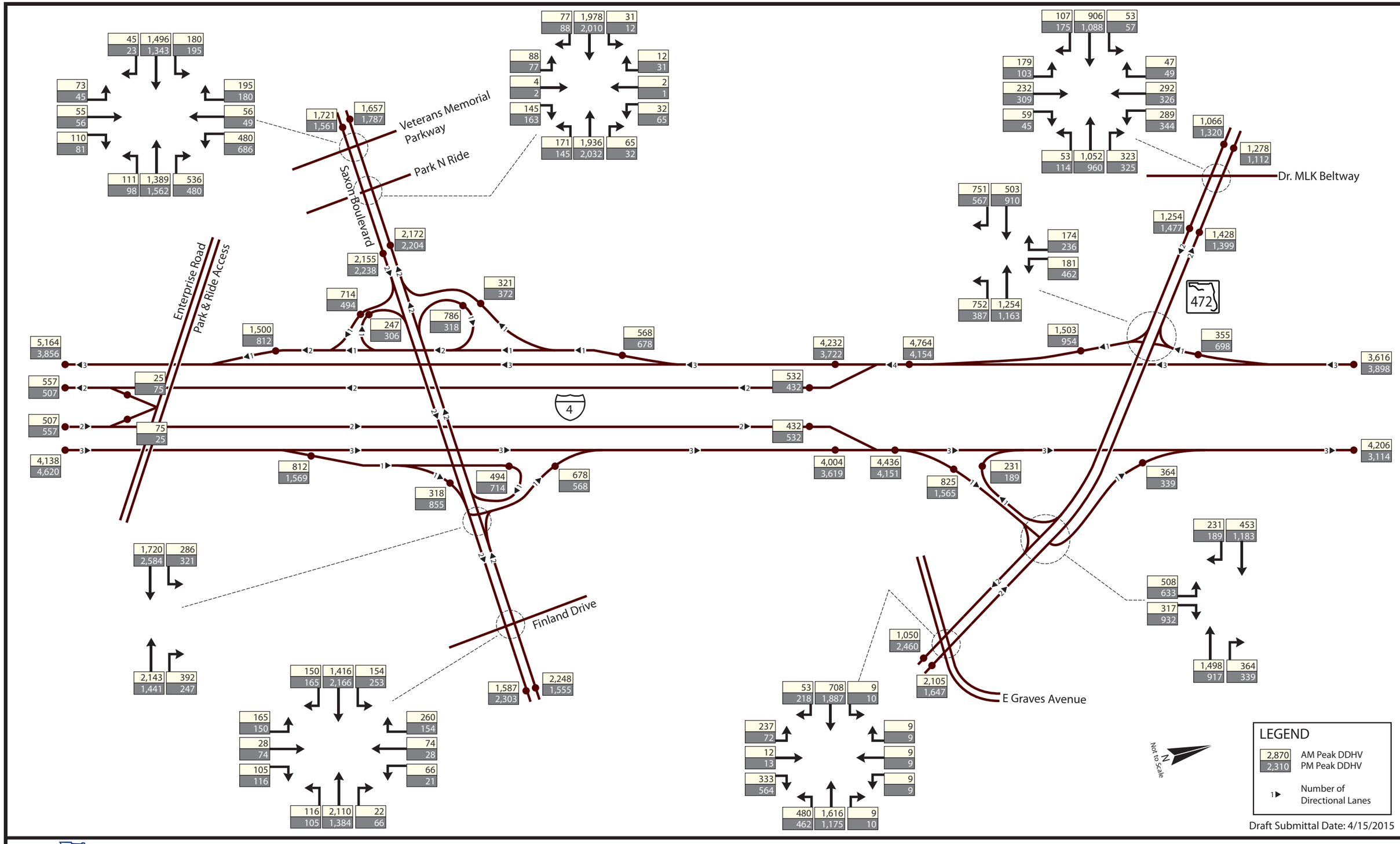

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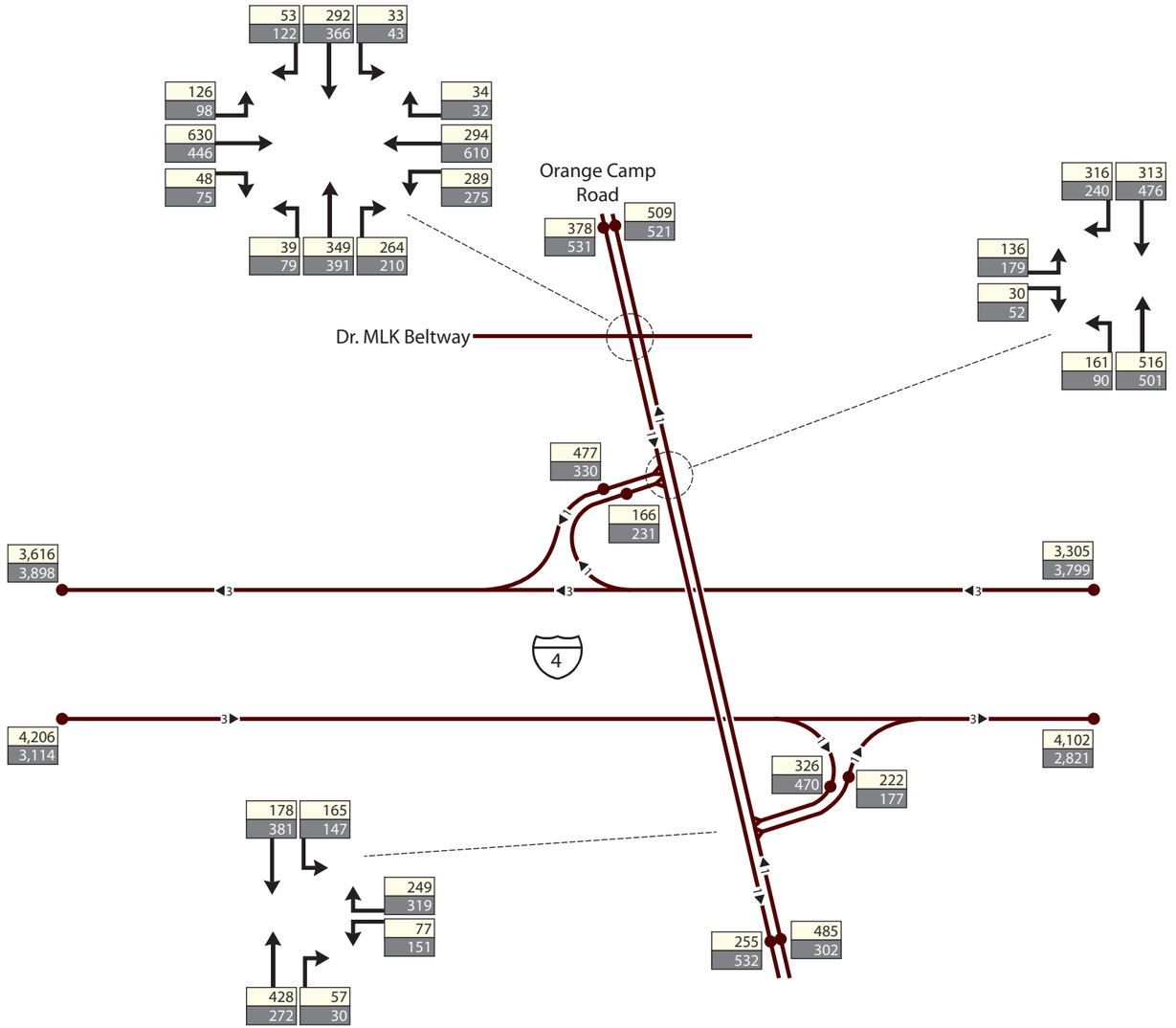


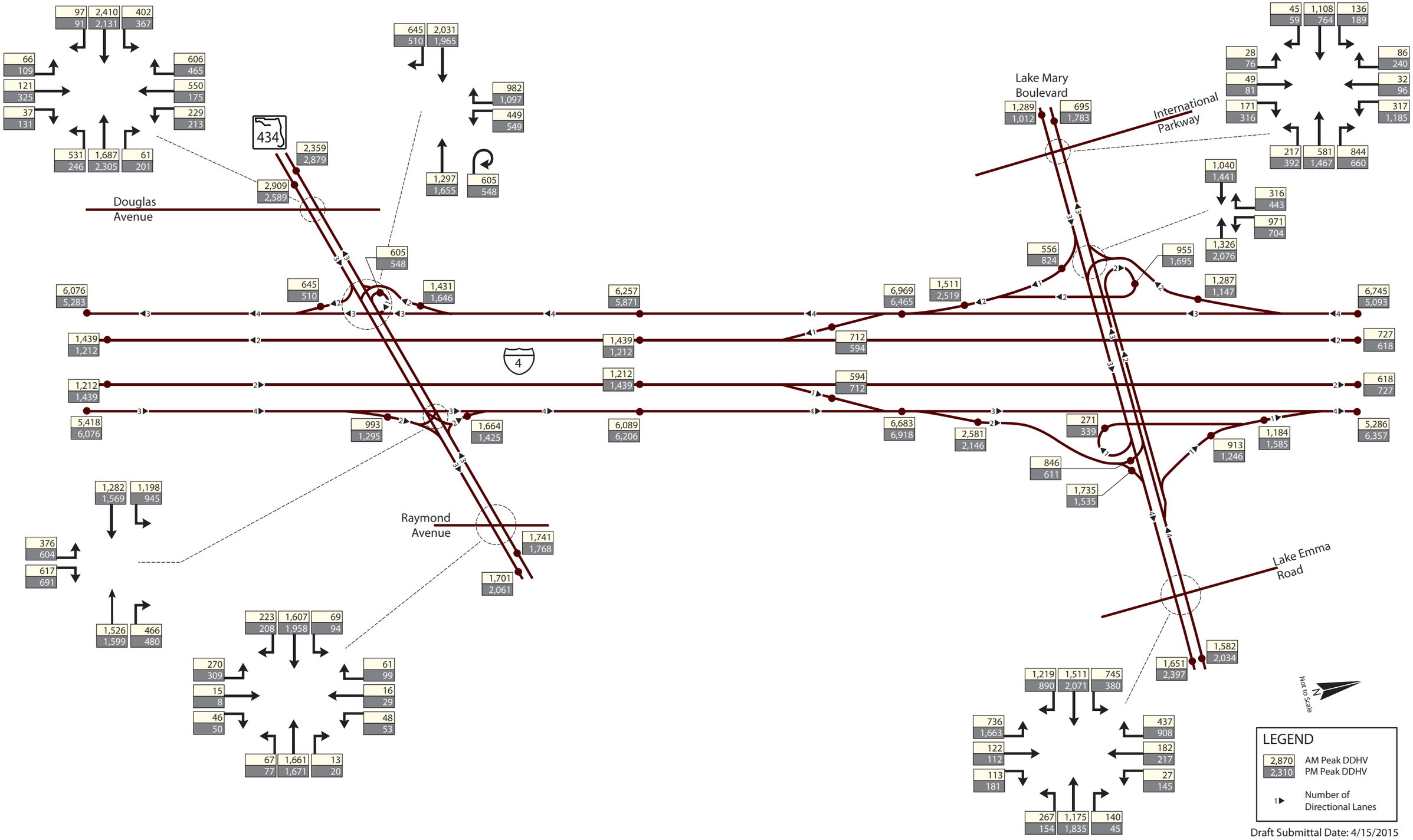
Not to Scale

LEGEND

2,870 AM Peak DDHV
2,310 PM Peak DDHV

1▶ Number of Directional Lanes

Draft Submittal Date: 4/15/2015



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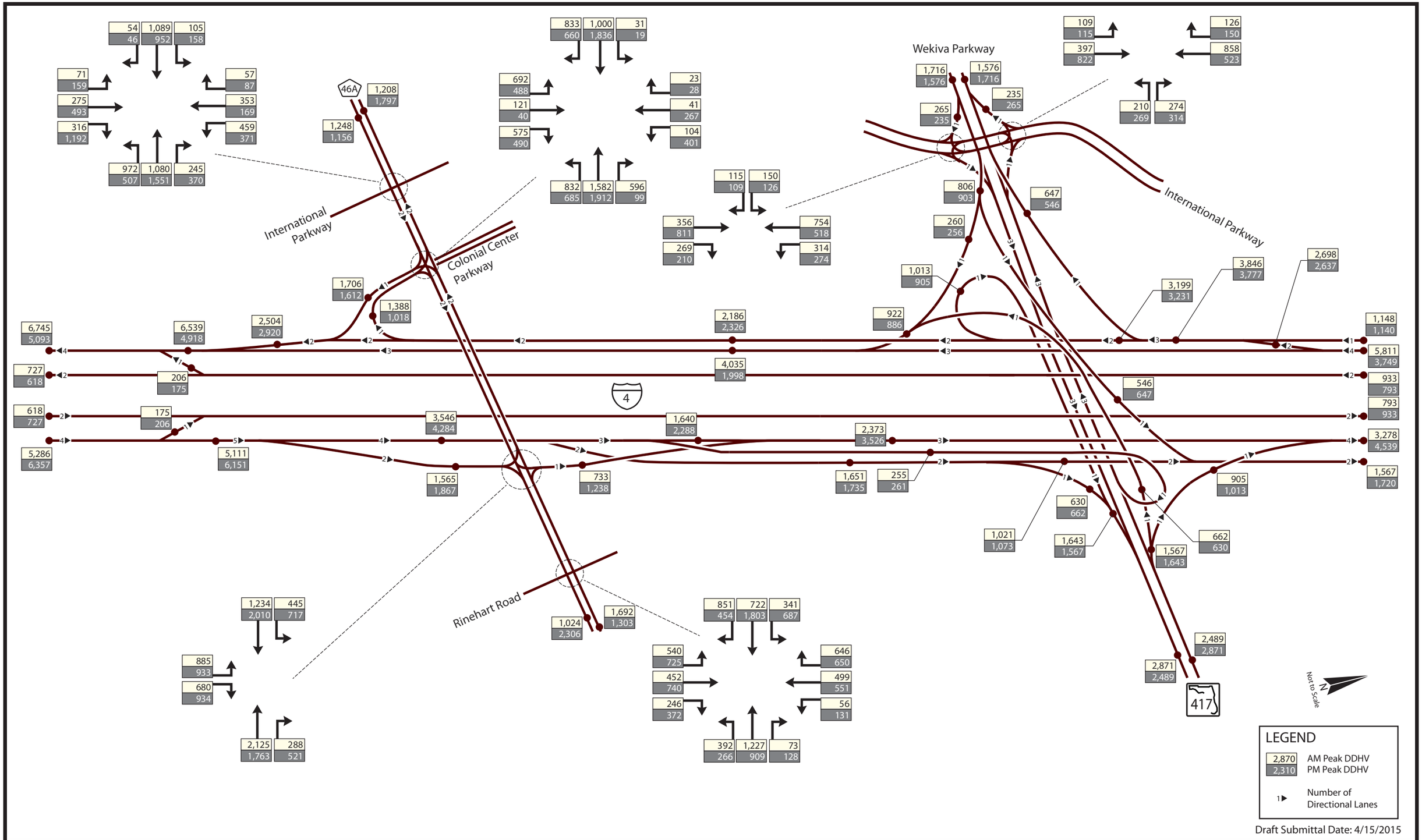

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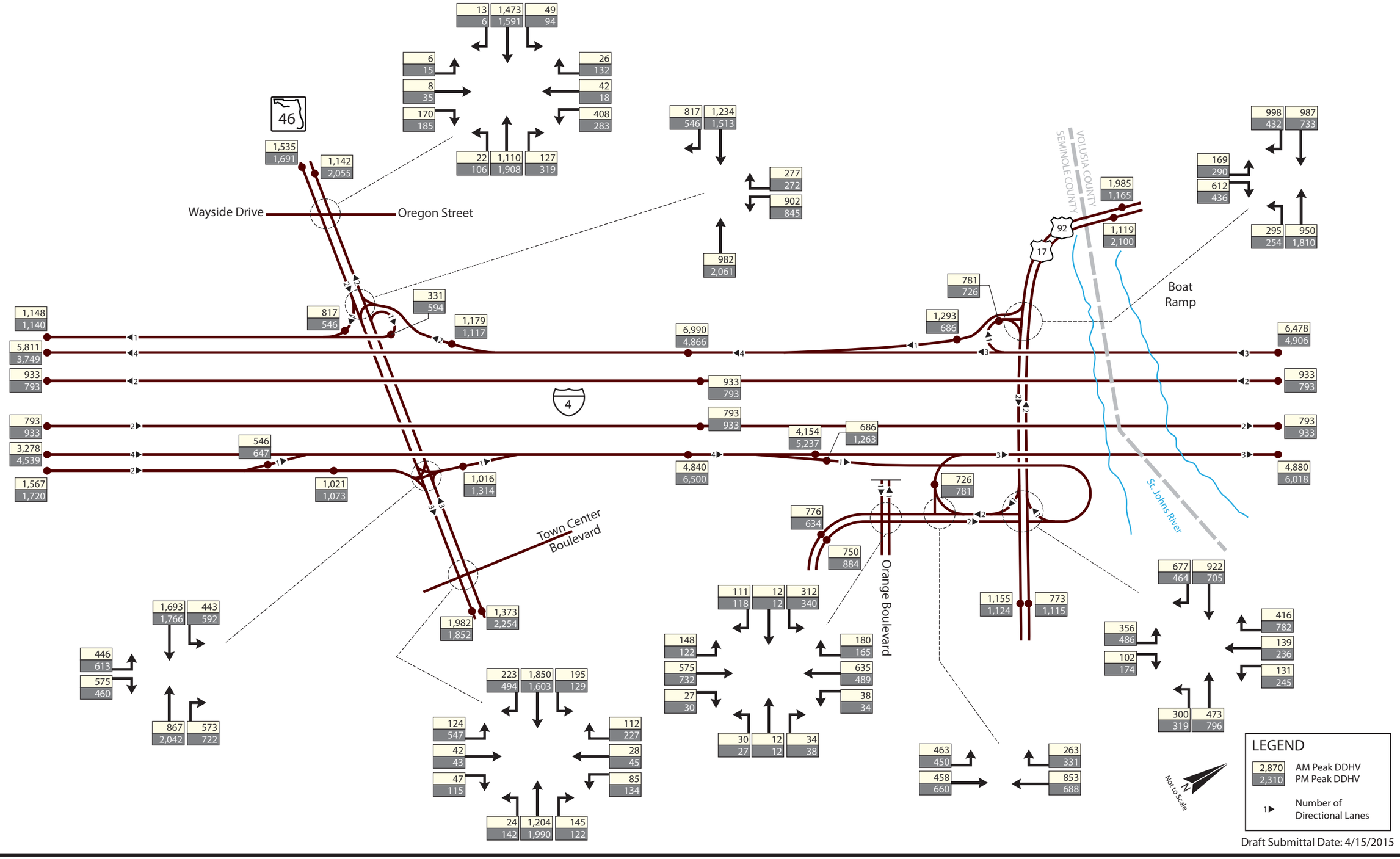

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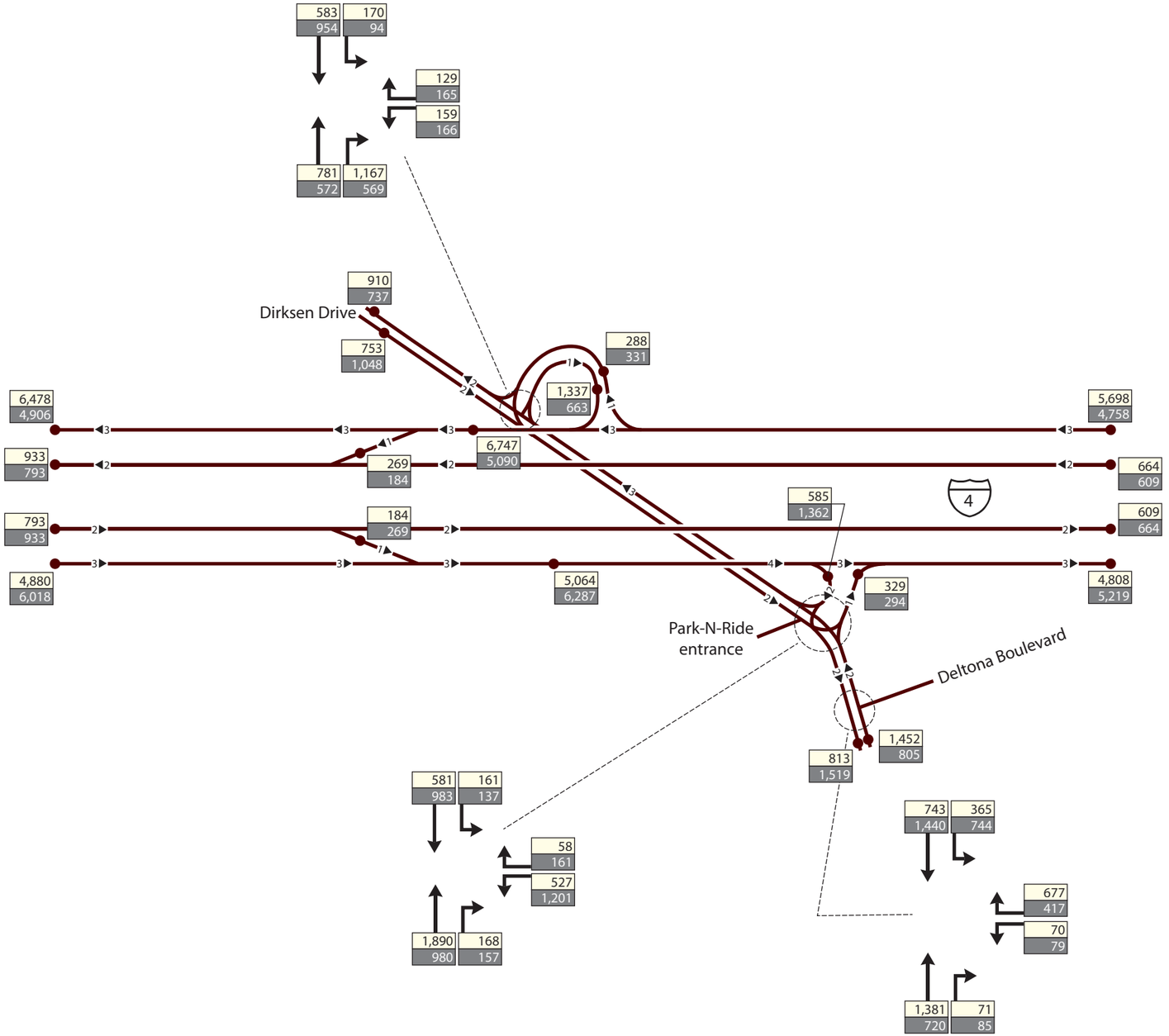

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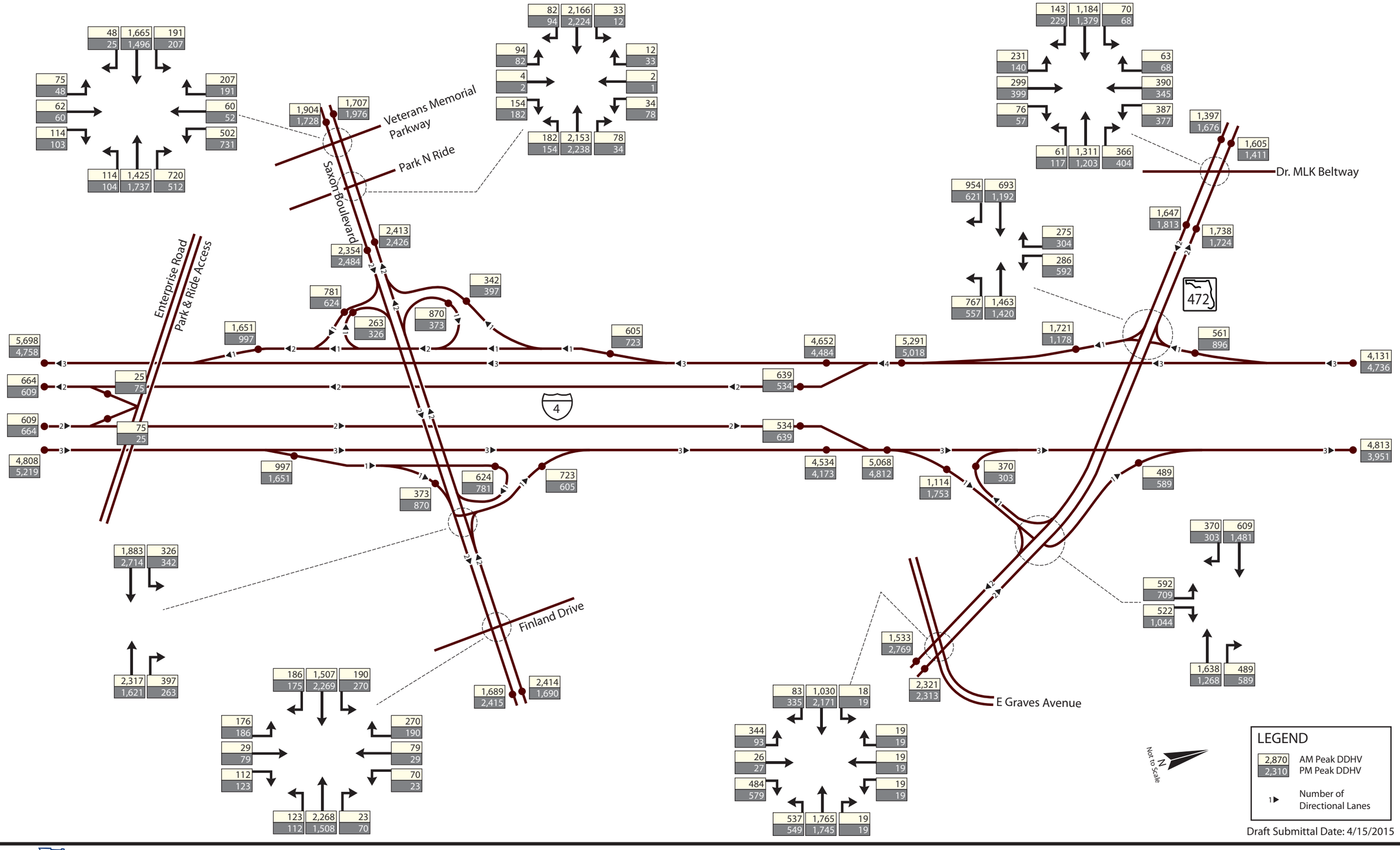

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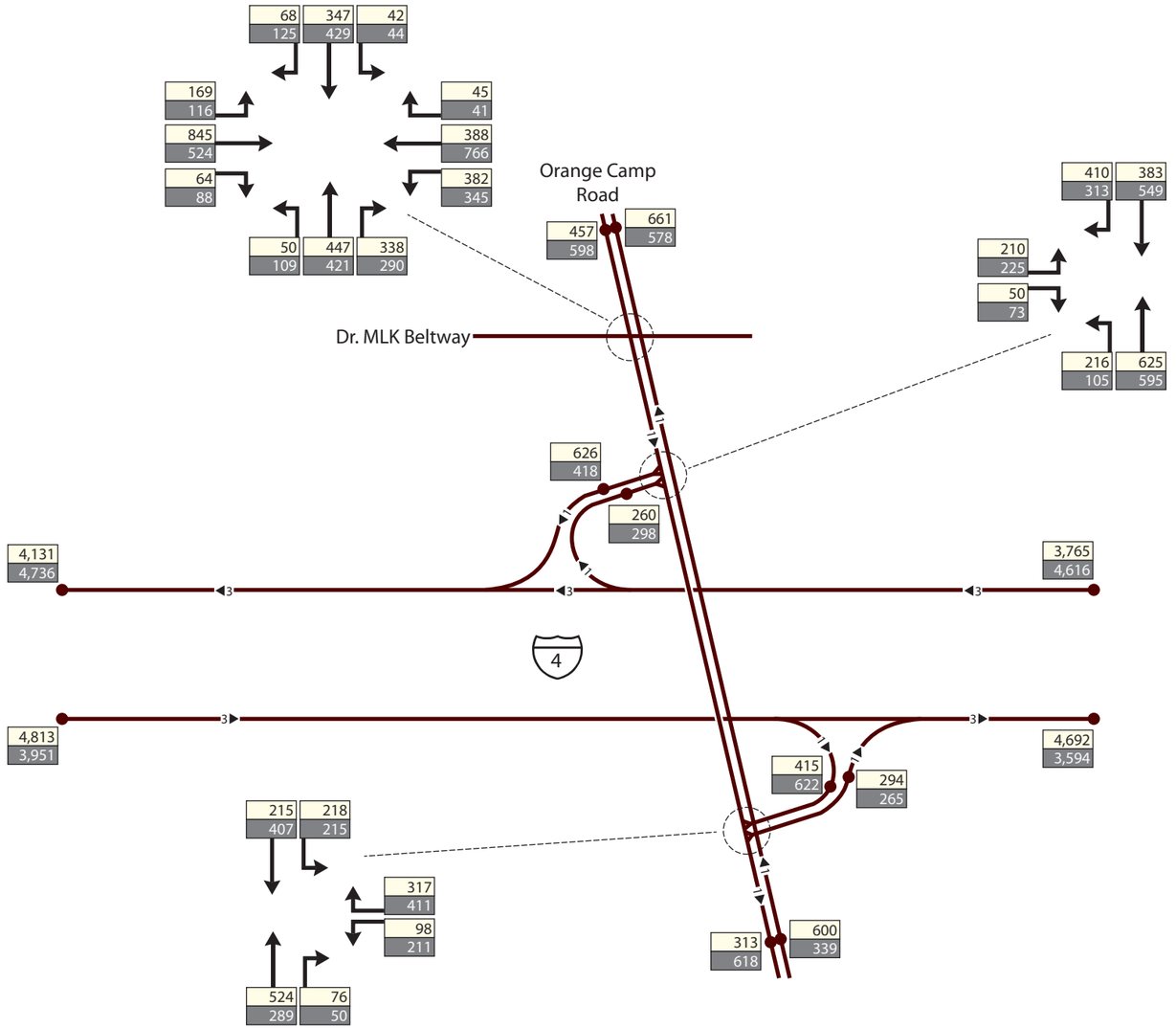


Not to Scale

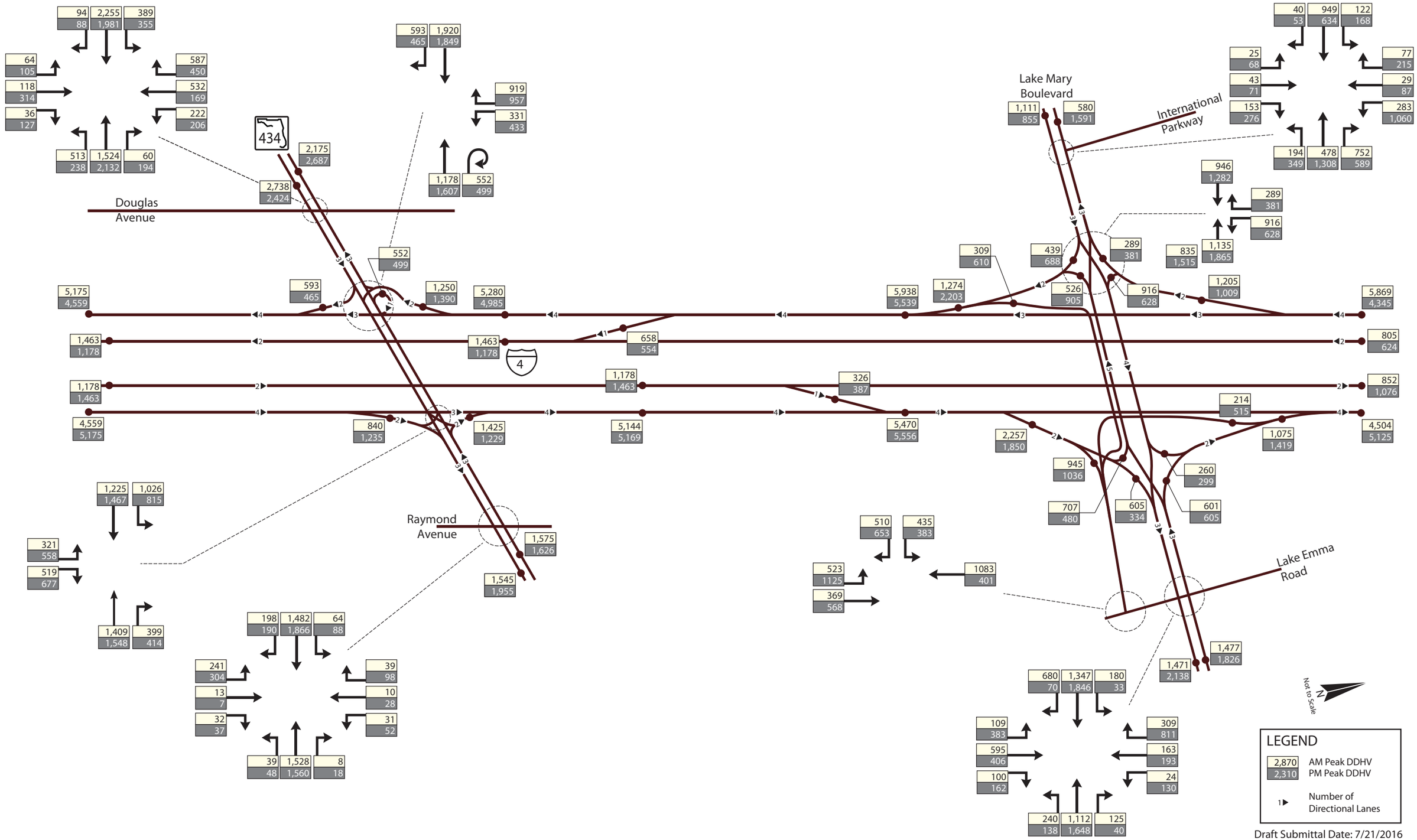
LEGEND

2,870 / 2,310	AM Peak DDHV / PM Peak DDHV
1▶	Number of Directional Lanes

Draft Submittal Date: 4/15/2015

5.4. Modified Build – Traffic Volumes

The lane configurations of I-4 and arterials intersecting the freeway within the study area are similar for both the Original and Modified Build alternatives. However, some interchange configurations and access point locations changed in the Modified Build alternative. Traffic volumes developed for the Original Build Alternative (as discussed previously) were used to determine the traffic volumes for the Modified Build Alternative. The Original Build traffic volumes were redistributed (according to the Modified Build concepts for both interchange and freeway) to establish traffic volumes for the Modified Build alternative. The 2020, 2030, and 2040 peak hour volumes for the North Section (Modified Build) are illustrated in **Figure 18** through **Figure 20**, respectively.



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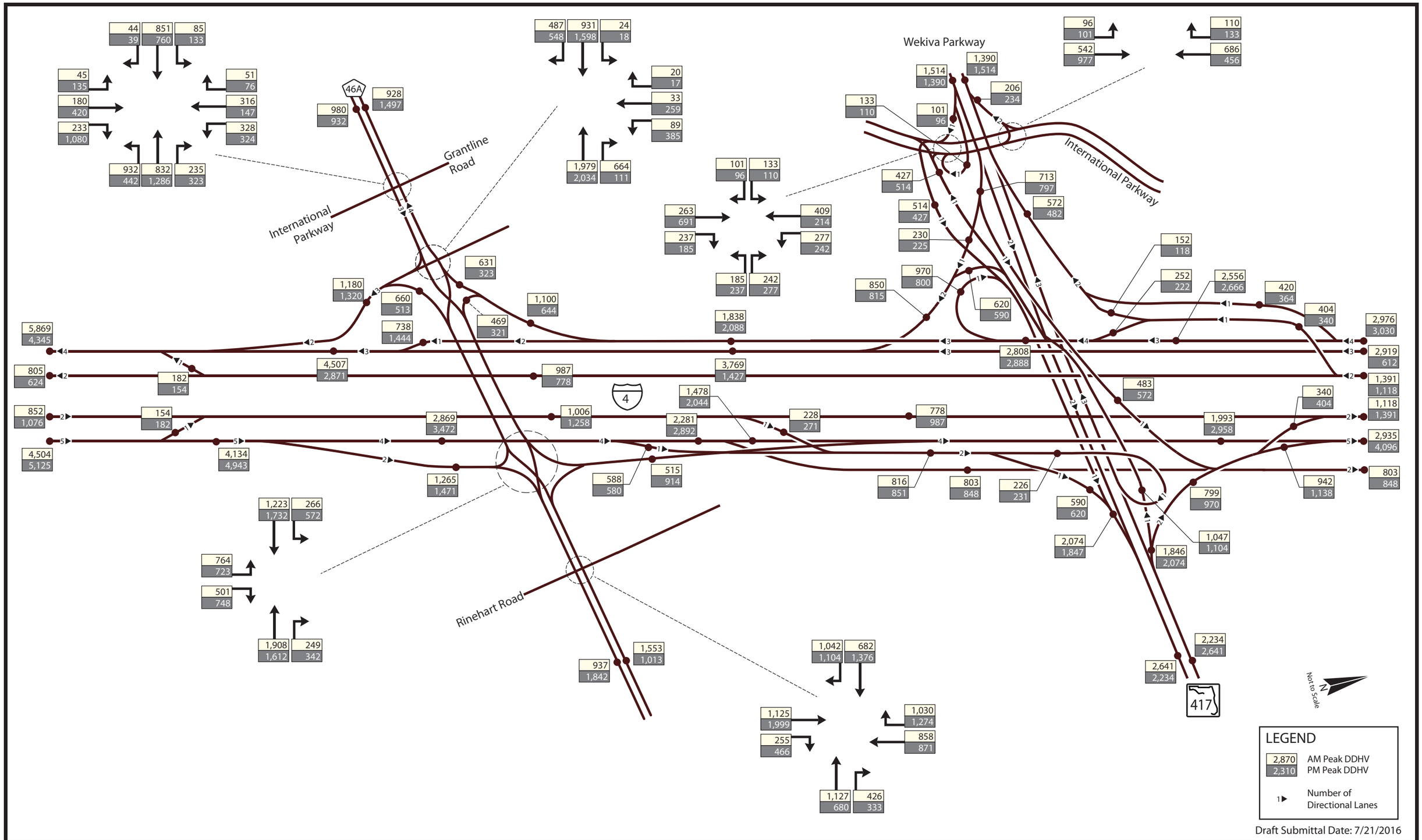

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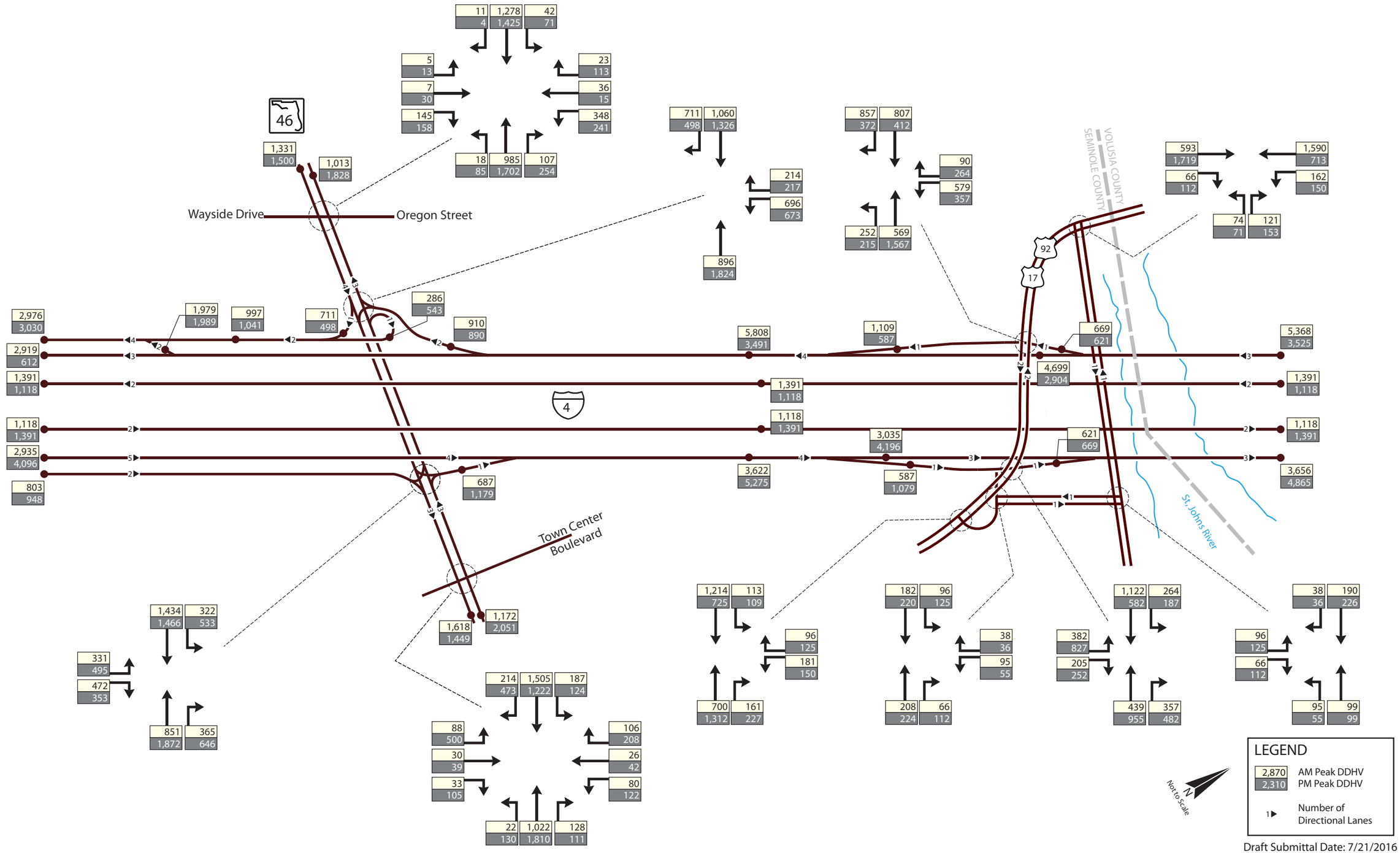

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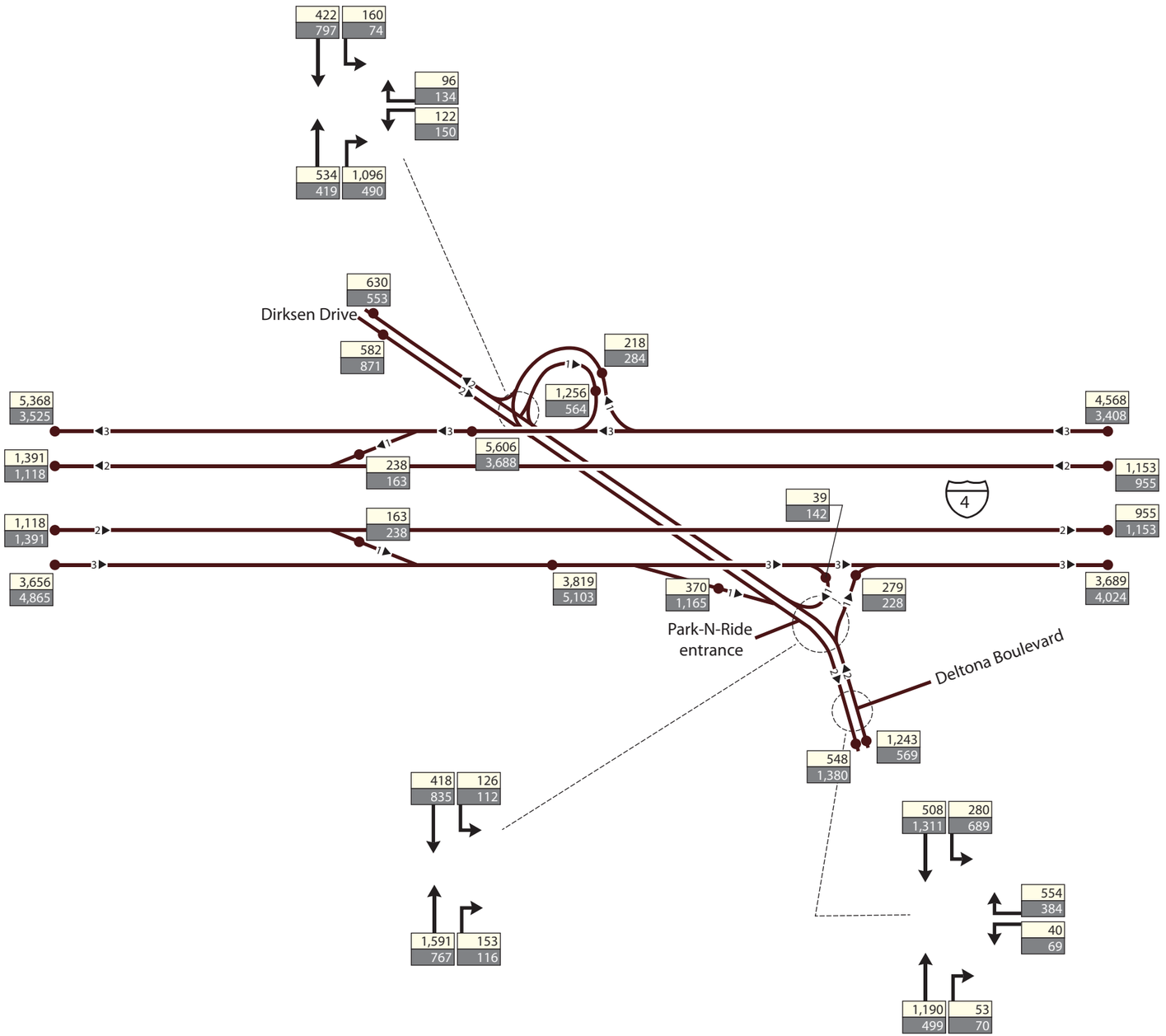

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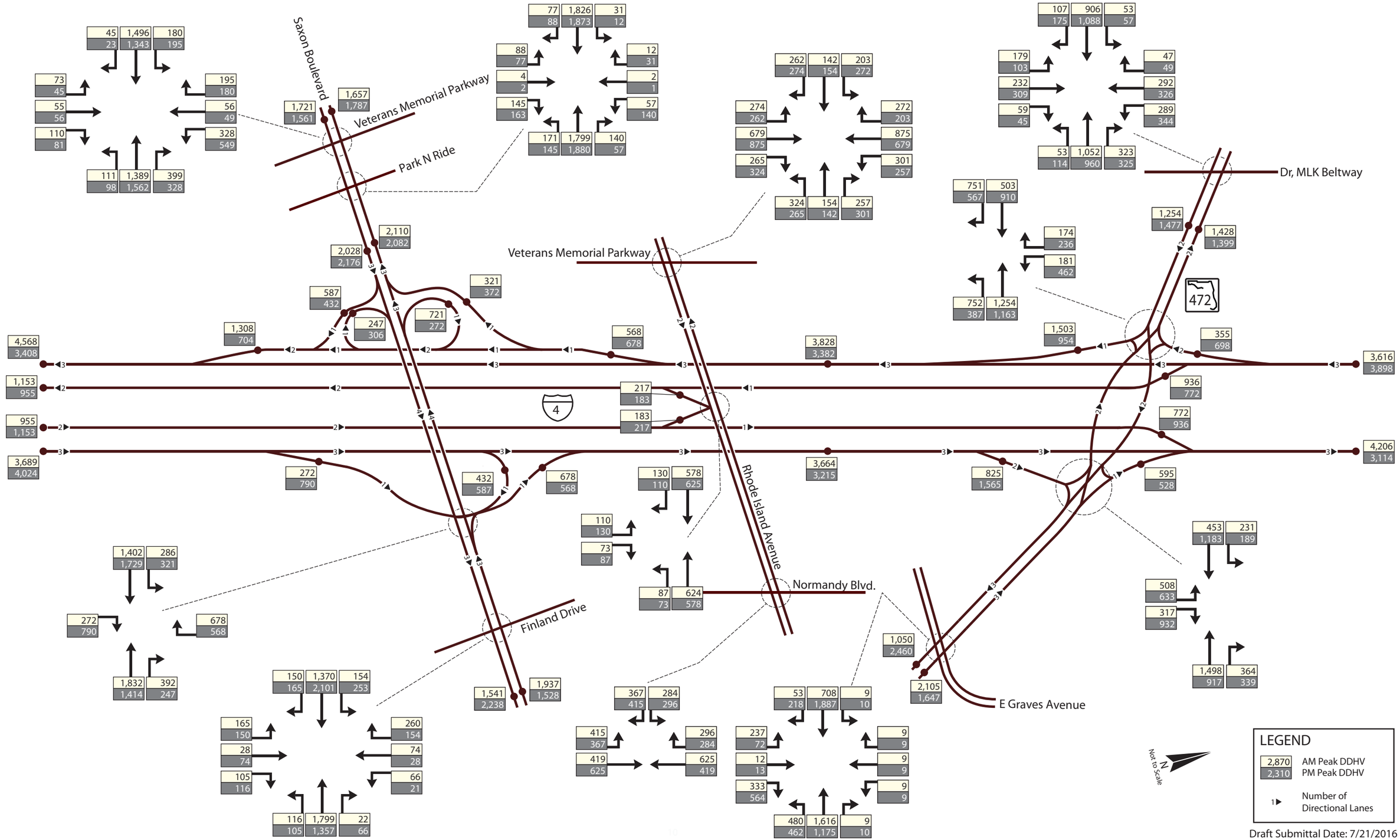
LEGEND

2,870 / 2,310	AM Peak DDHV / PM Peak DDHV
1 ▶	Number of Directional Lanes

Draft Submittal Date: 7/21/2016



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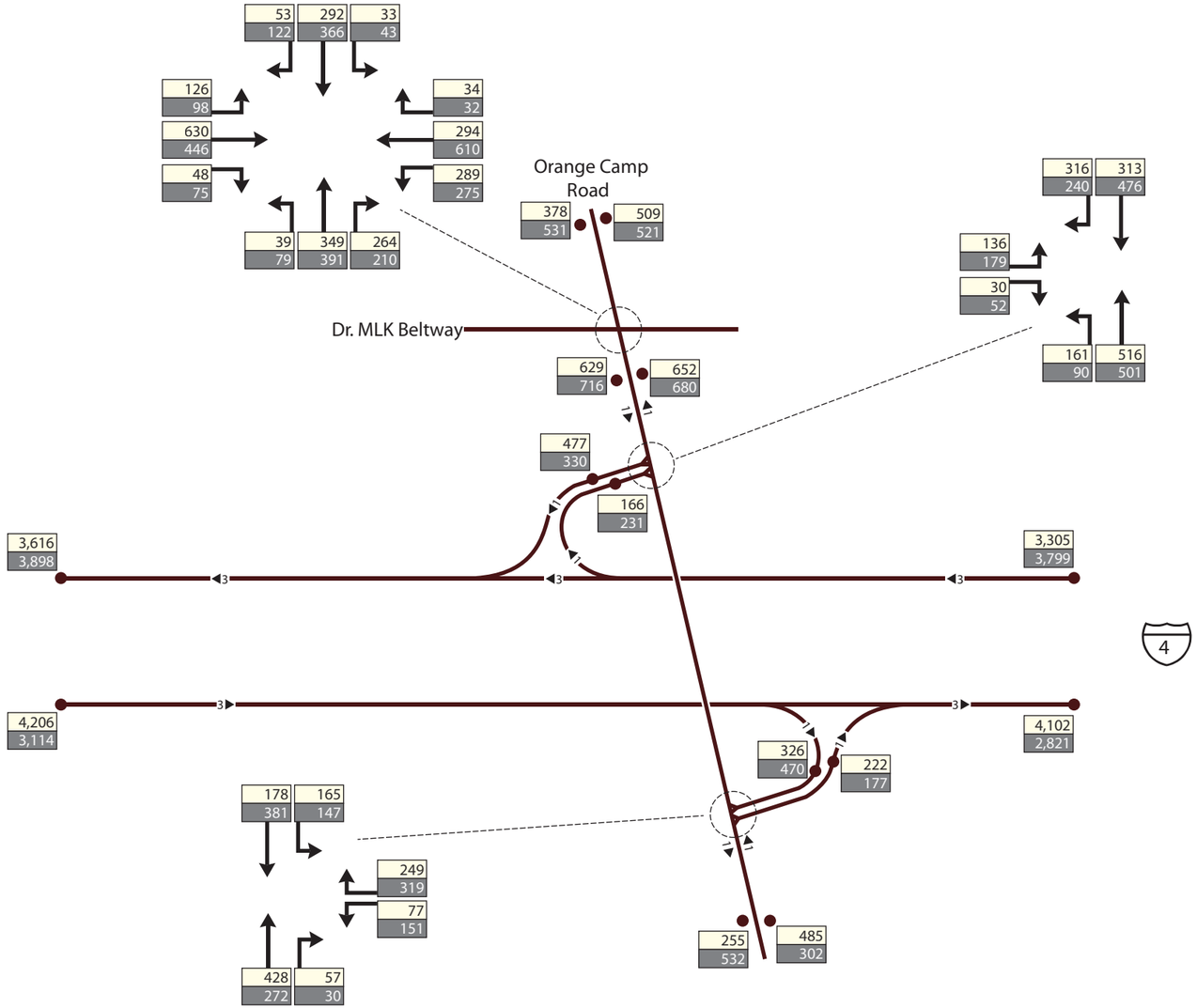

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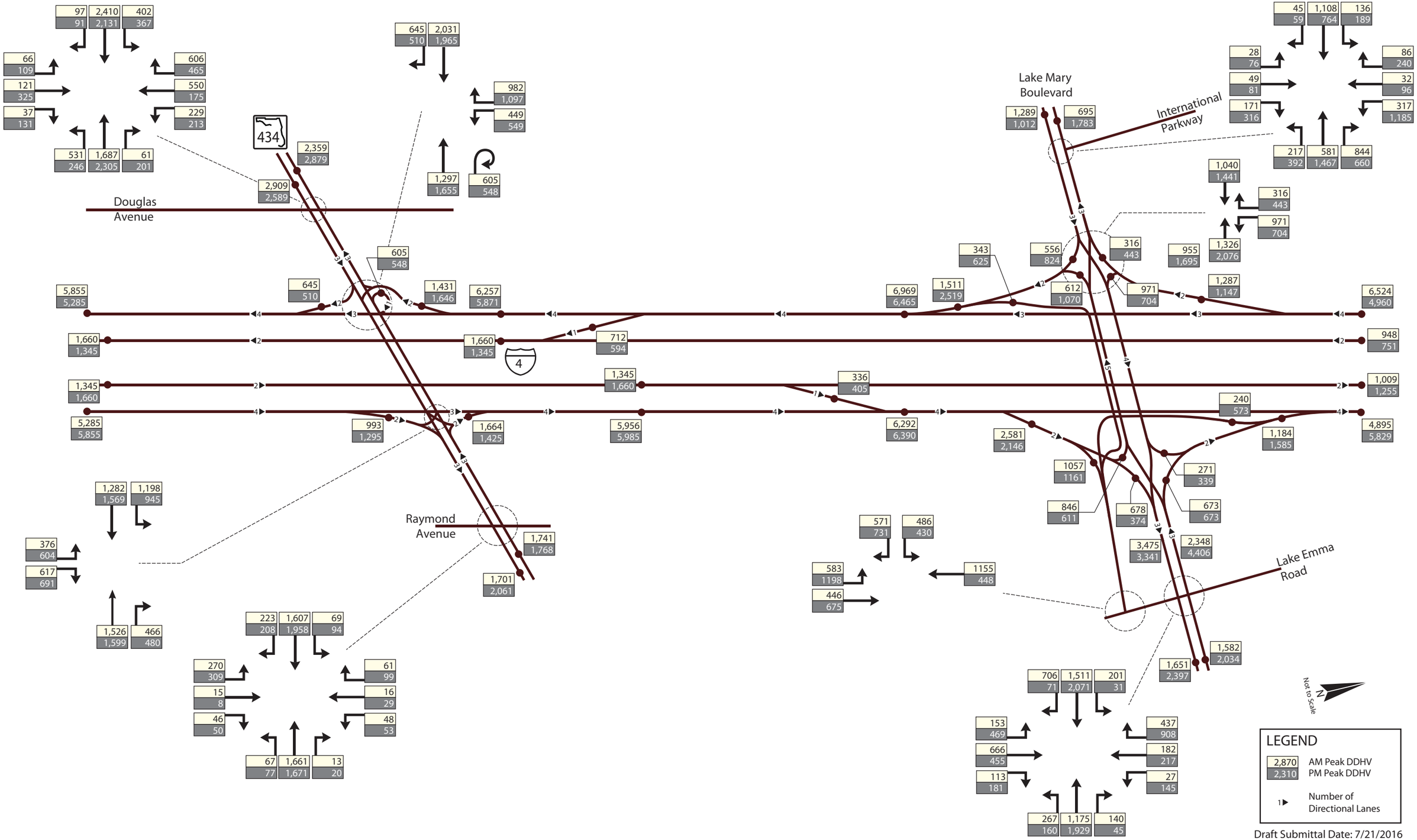
LEGEND

2,870 / 2,310	AM Peak DDHV / PM Peak DDHV
1▶	Number of Directional Lanes

Draft Submittal Date: 7/21/2016



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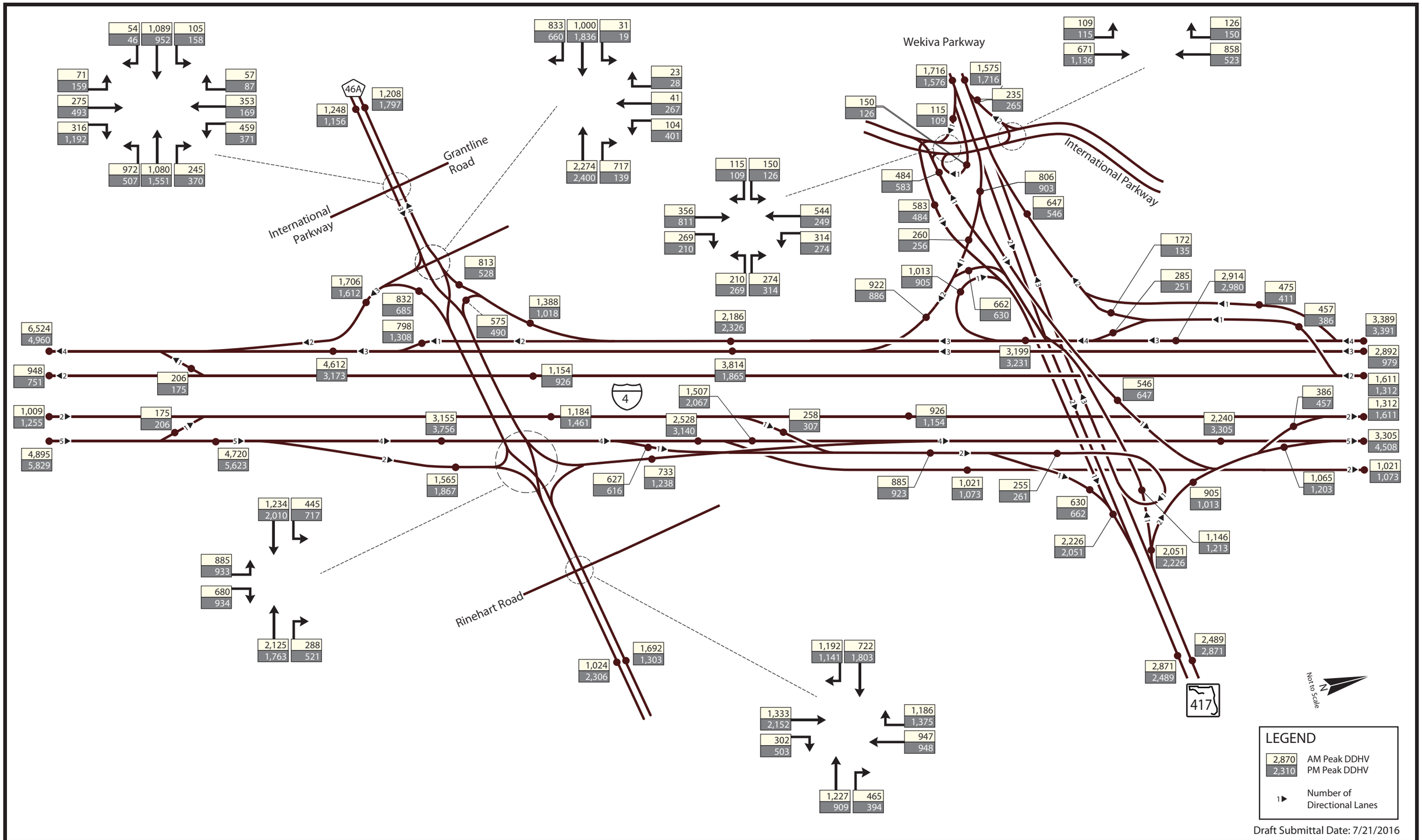

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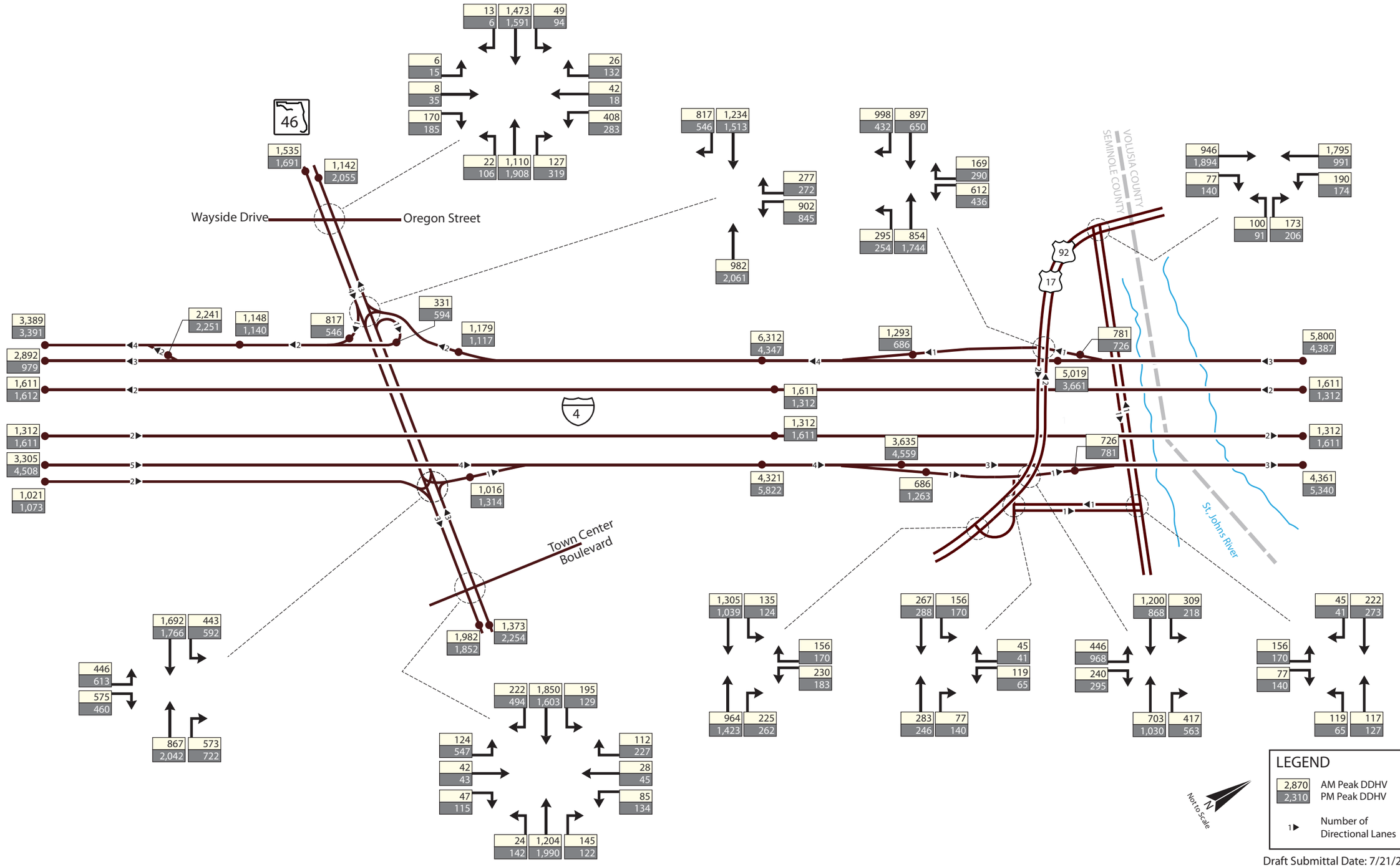

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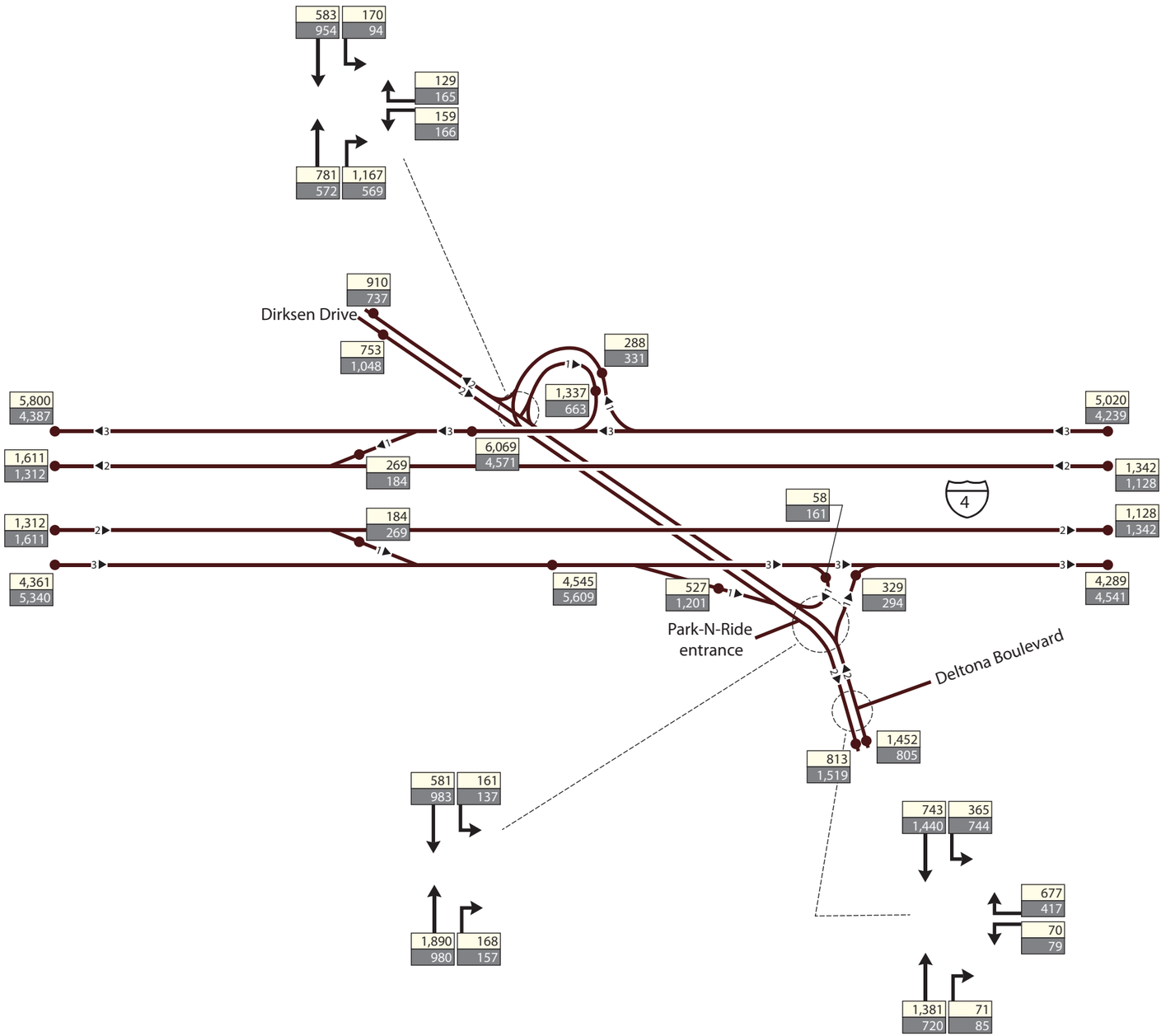
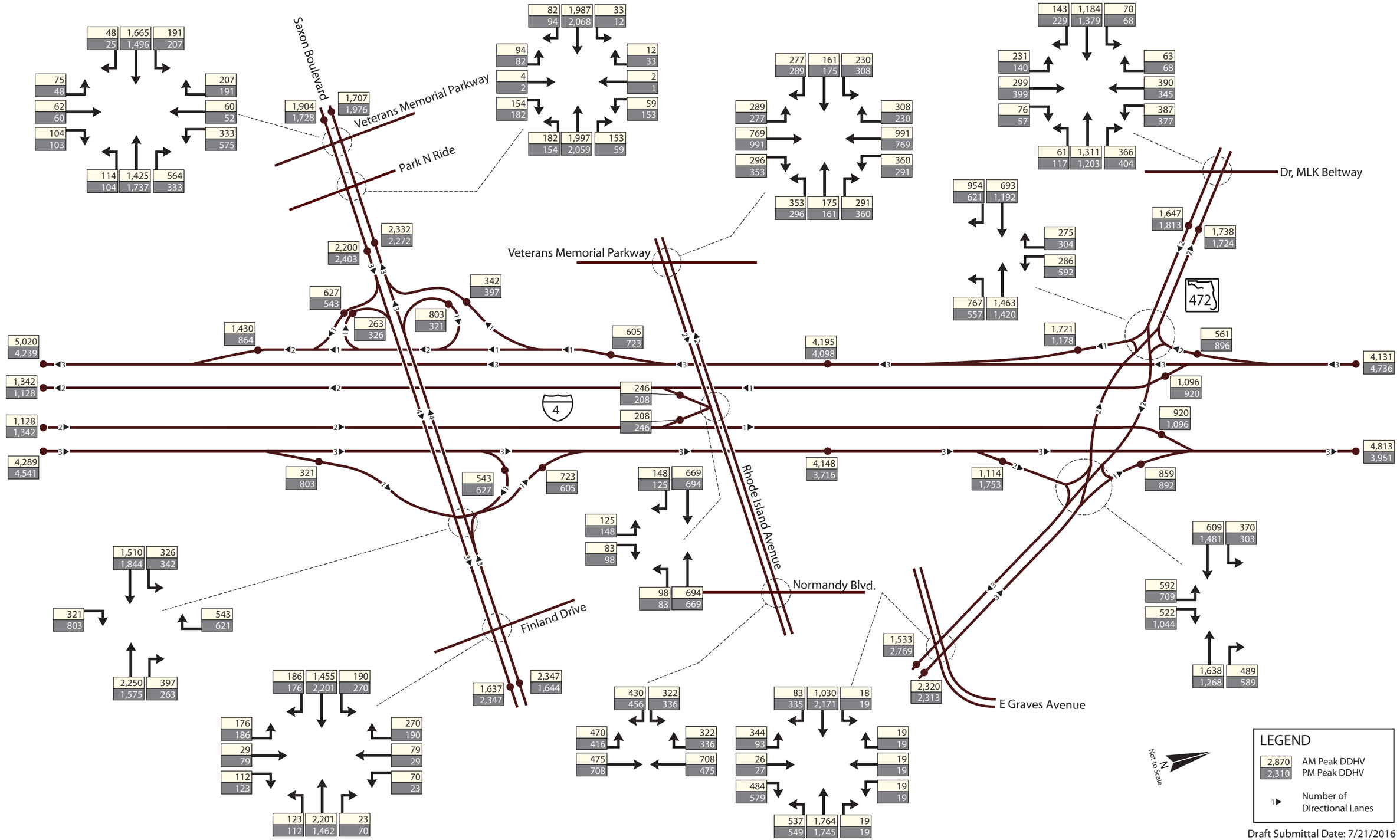


Draft Submittal Date: 7/21/2016

North Section - 2030 Modified Build - Directional Design Hour Traffic Volumes

FIGURE 19 Sheet 4 of 6



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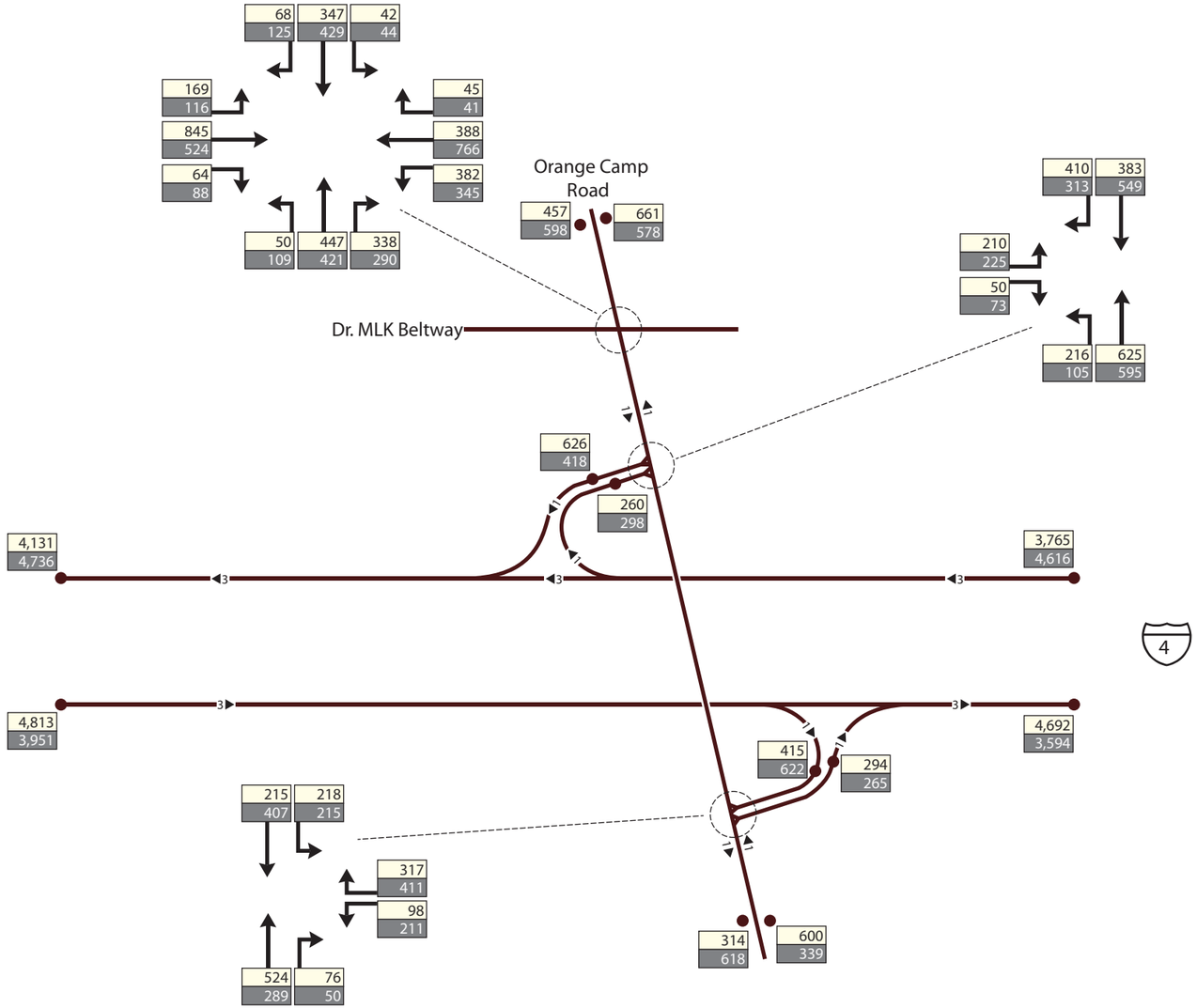


Not to scale

LEGEND

2,870 AM Peak DDHV
2,310 PM Peak DDHV

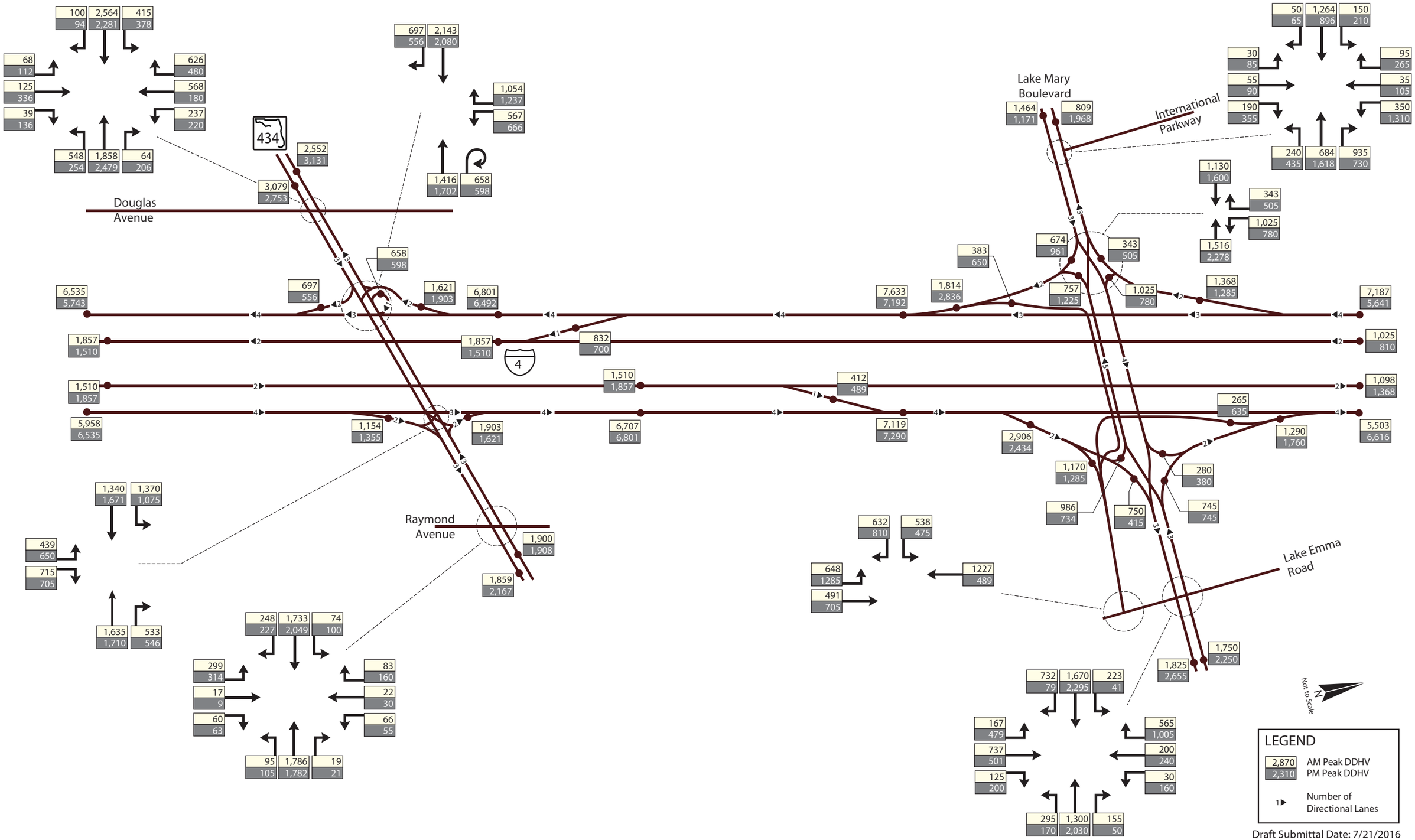
1▶ Number of Directional Lanes

Draft Submittal Date: 7/21/2016

FDOT I-4 SAMR Update Design Traffic

North Section - 2030 Modified Build - Directional Design Hour Traffic Volumes

FIGURE 19 Sheet 6 of 6



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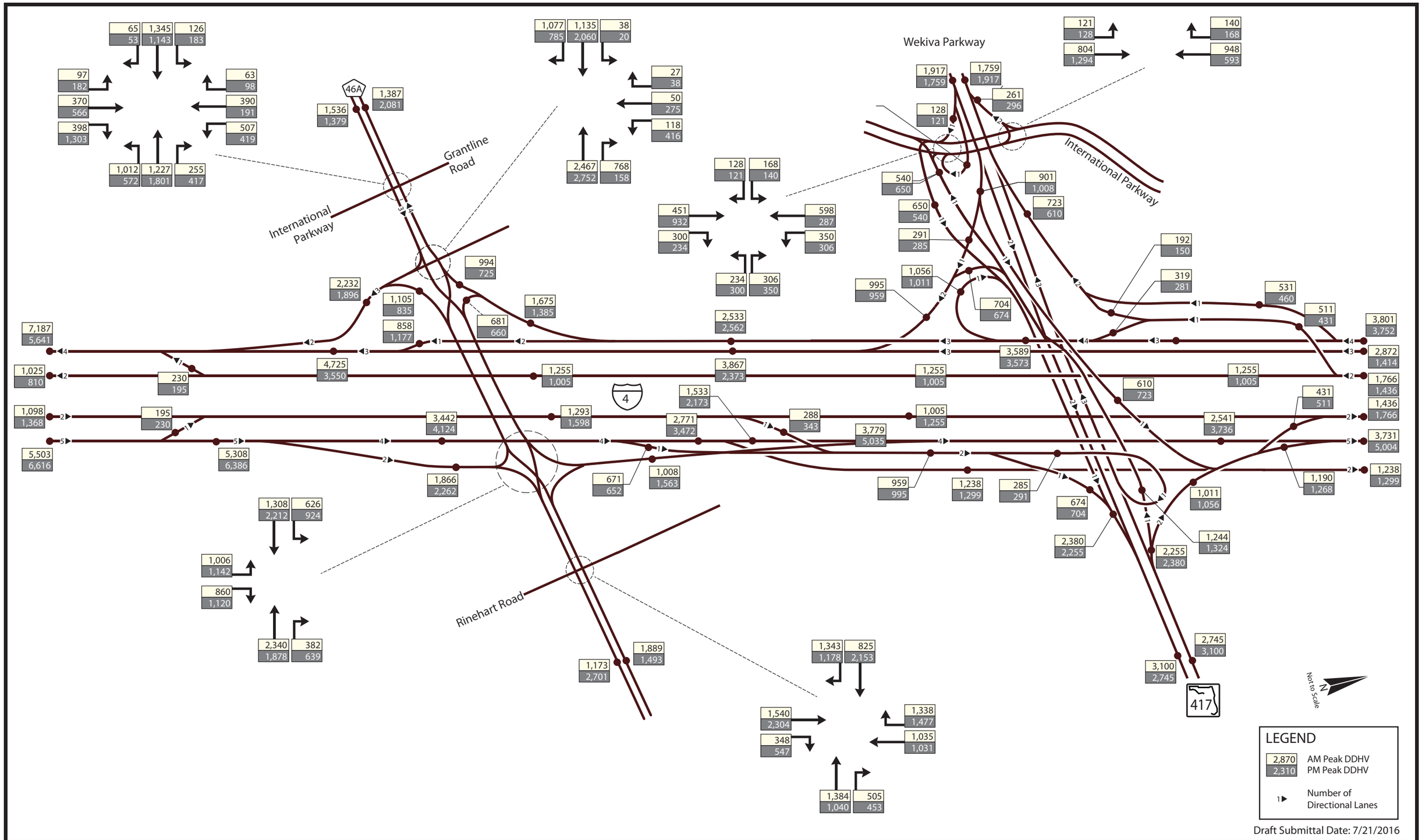

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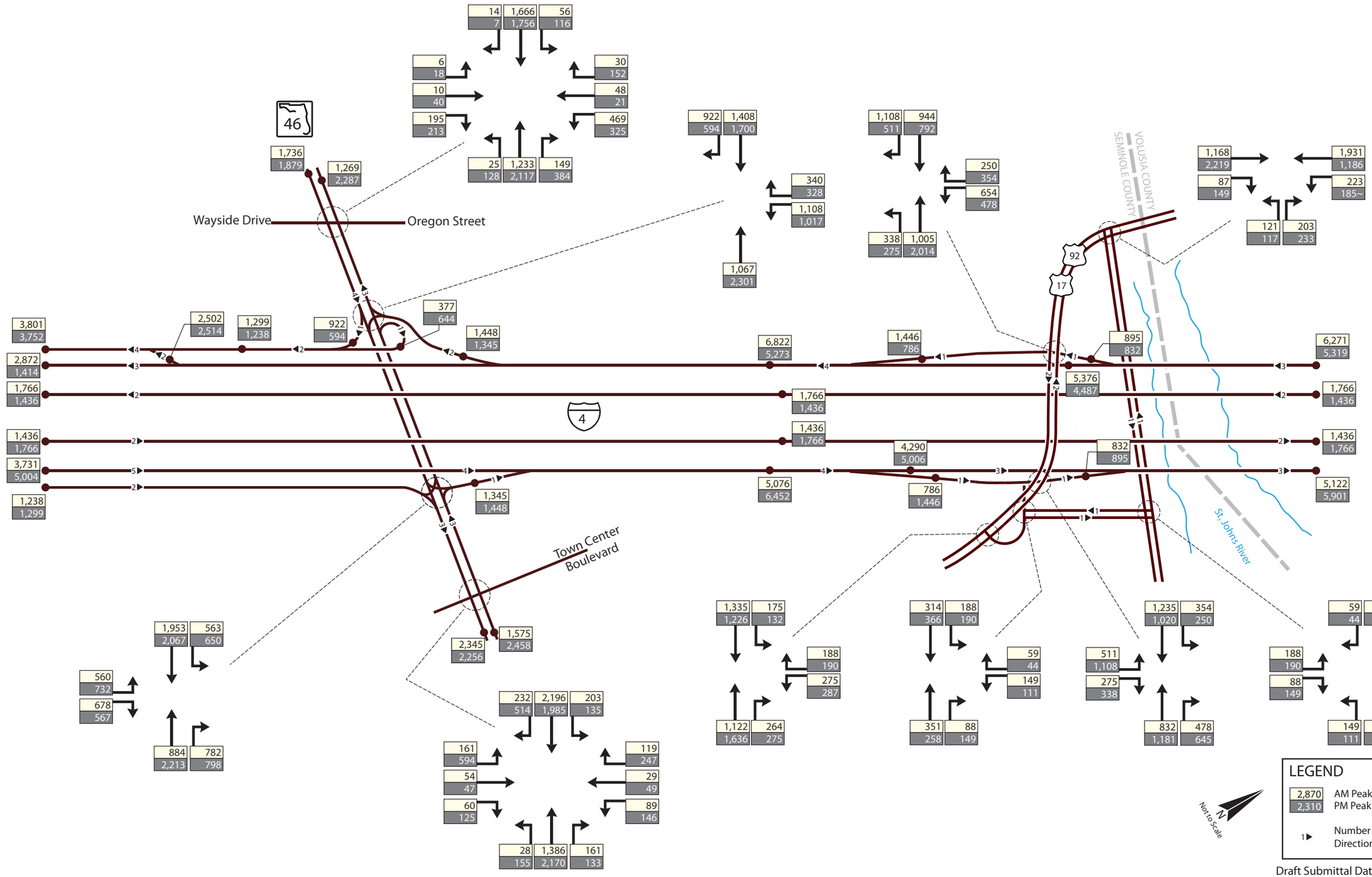

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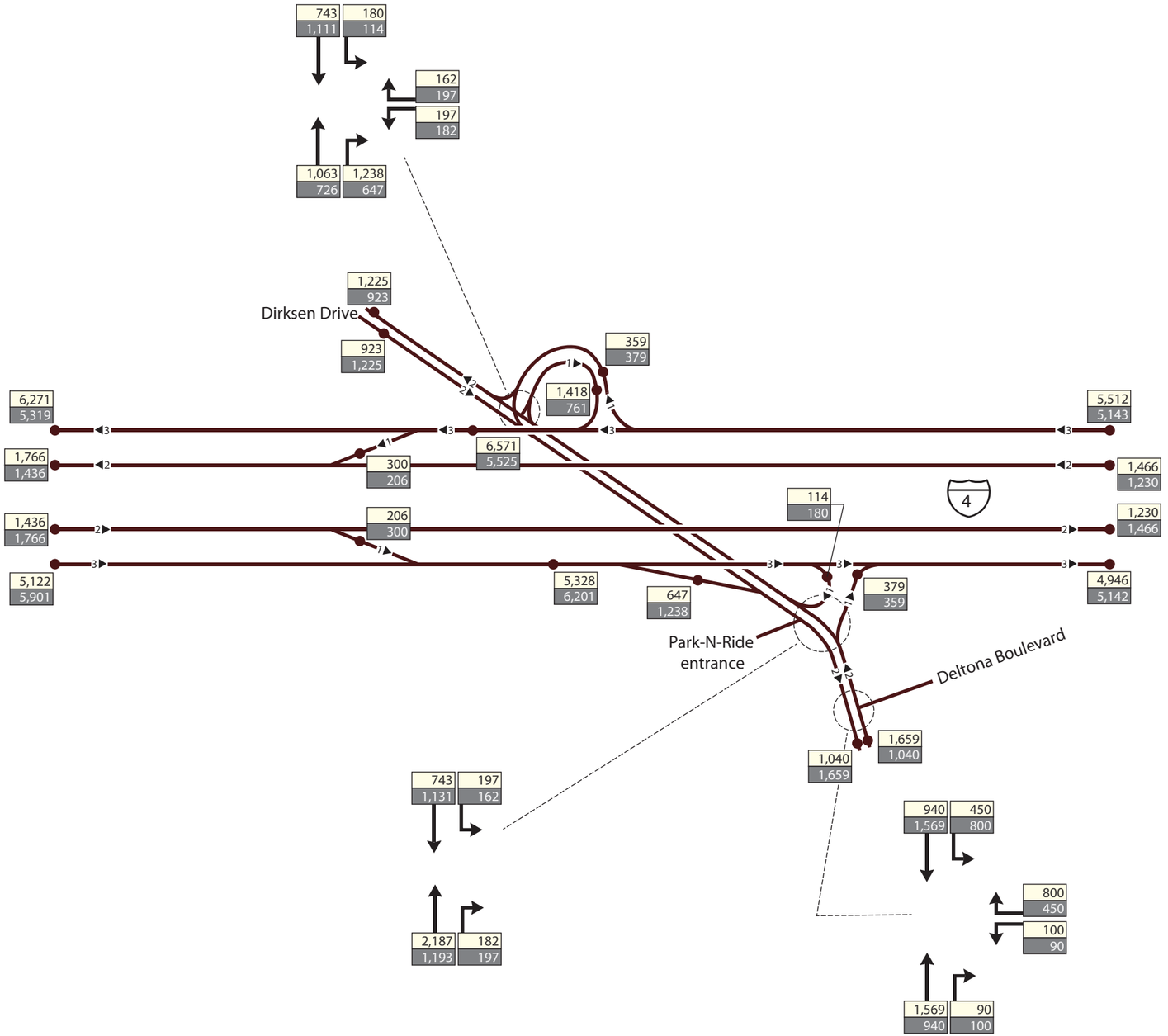
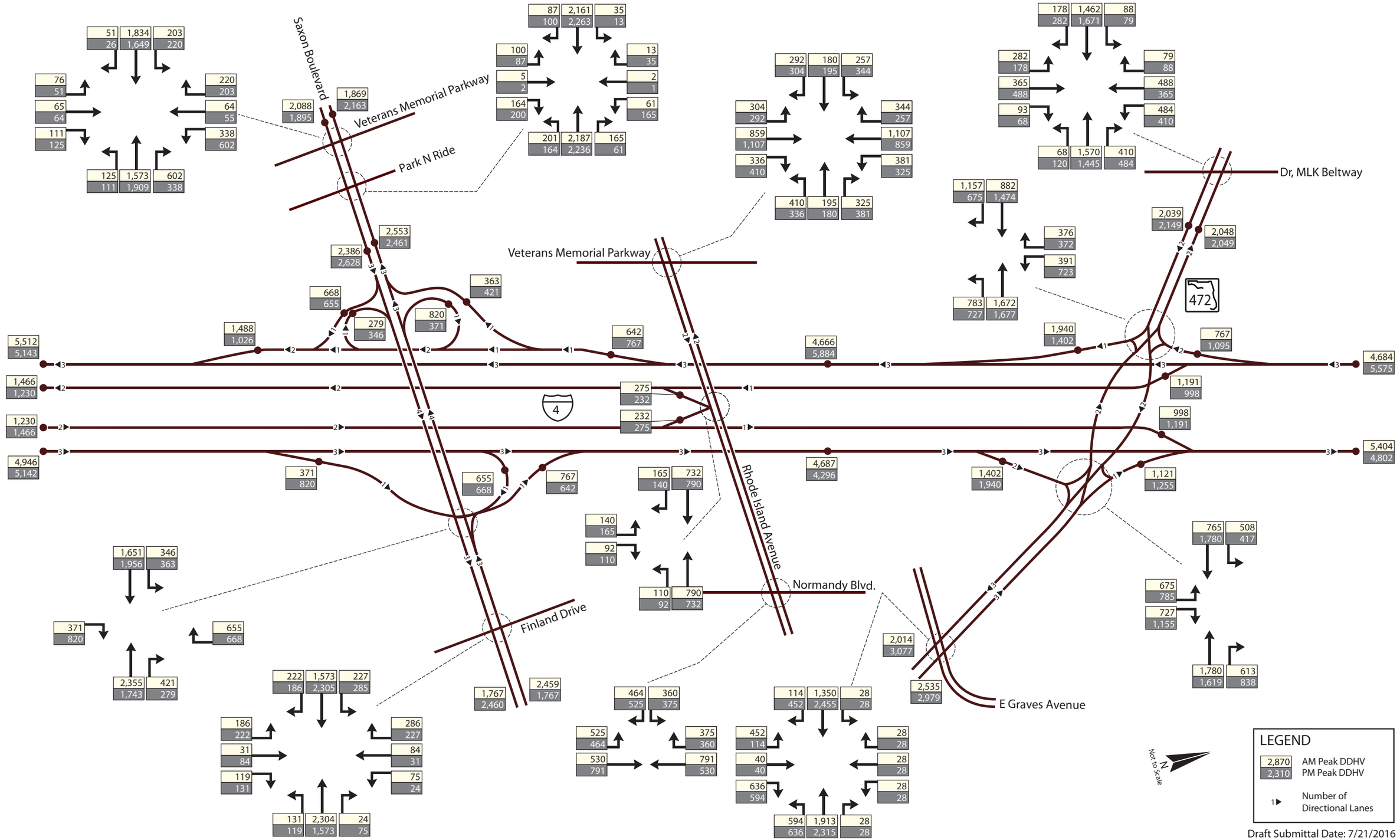


Draft Submittal Date: 7/21/2016

FDOT I-4 SAMR Update Design Traffic

North Section - 2040 Modified Build - Directional Design Hour Traffic Volumes

FIGURE 20 Sheet 4 of 6



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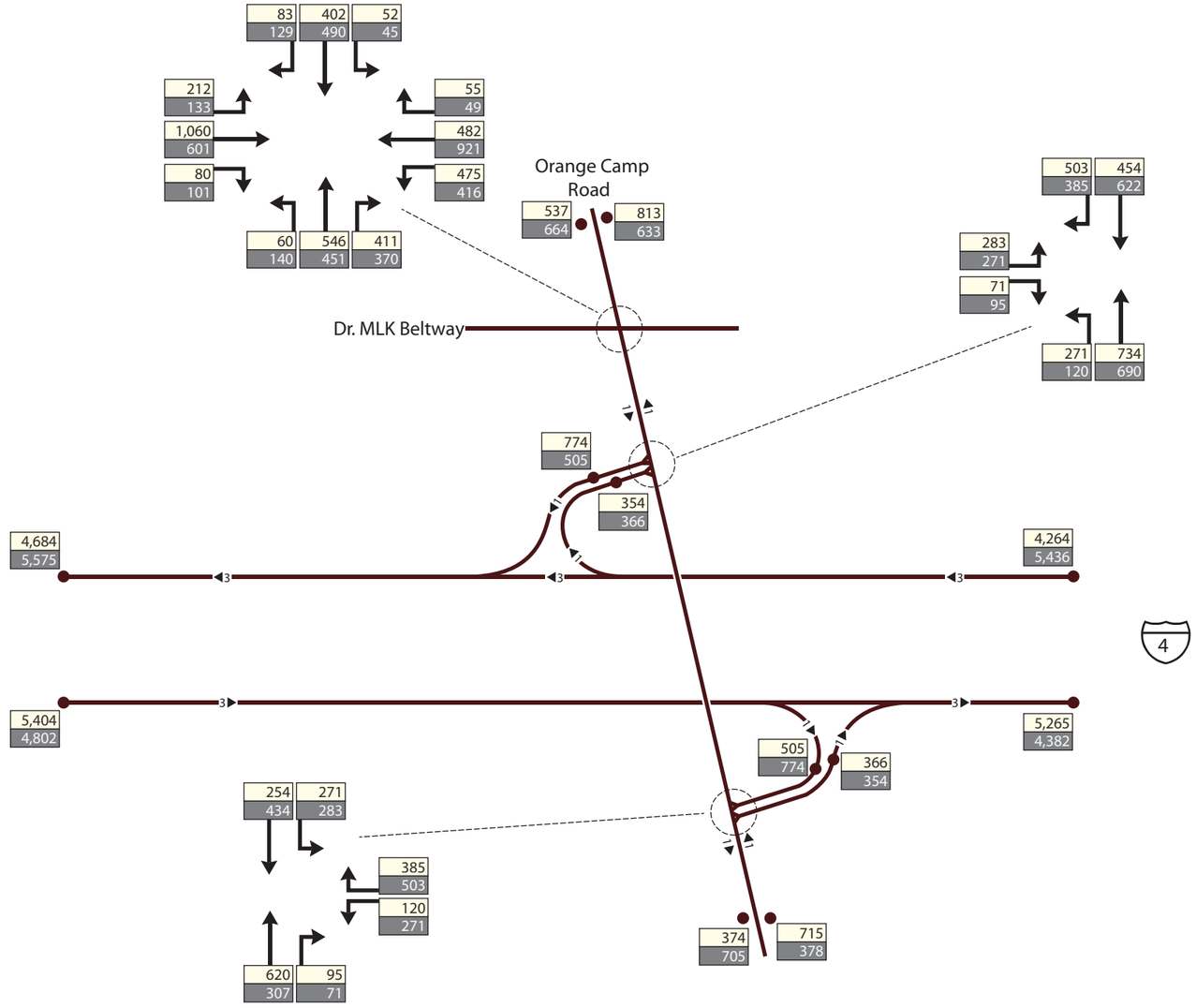


Draft Submittal Date: 7/21/2016

6. FUTURE CONDITIONS ALTERNATIVES ANALYSIS – NORTH SECTION

This section documents the future conditions analysis along the I-4 corridor's North Section.

6.1. Transportation Network

The Original Build and Modified Build networks were analyzed in the future conditions. As discussed previously, the Modified Build modifies the Original Build's two HOV (High Occupancy Vehicle) lanes in the median, one in each direction, to four express lanes, two in each direction. The express lanes will be separated from the general use travel lanes by two shoulders with a barrier wall between the shoulders. Typical sections for the Original Build mainline and Modified Build mainline are provided in **Figure 21** and **Figure 22**, respectively. A side-by-side concept comparison of the Original Build and Modified Build freeway networks and interchange configurations is illustrated in **Figure 23**.

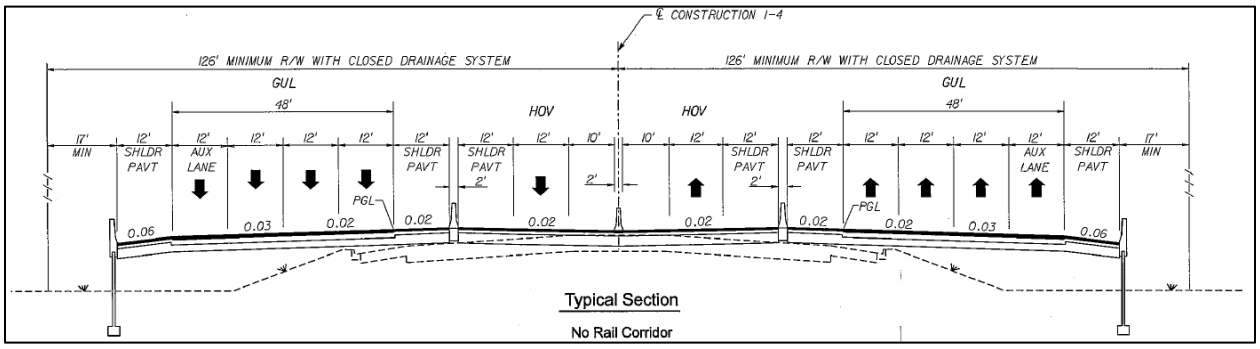


Figure 21 Original Build Typical Section (North Section)

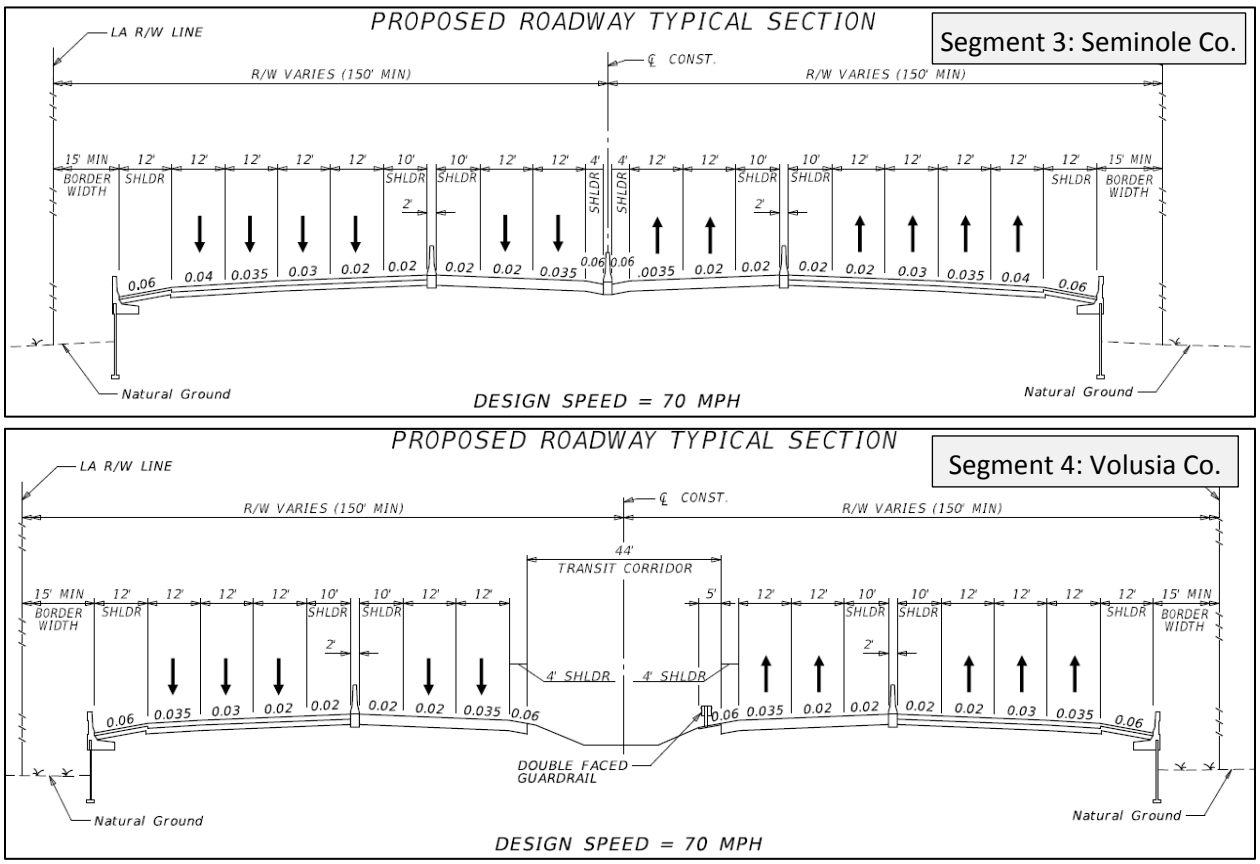
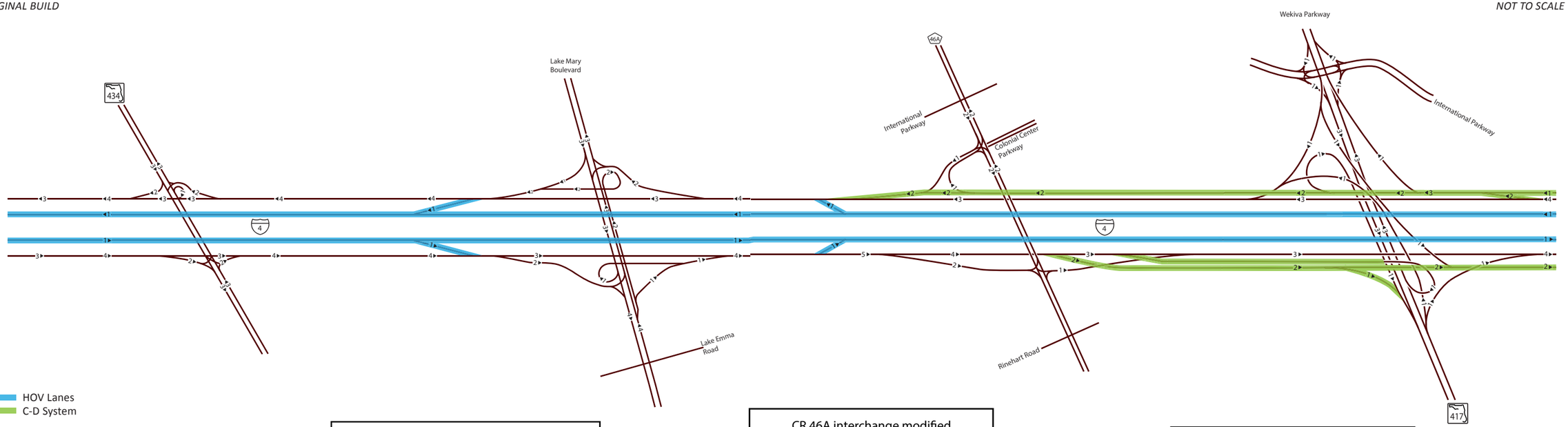


Figure 22 Modified Build Typical Section (North Section)

ORIGINAL BUILD

NOT TO SCALE

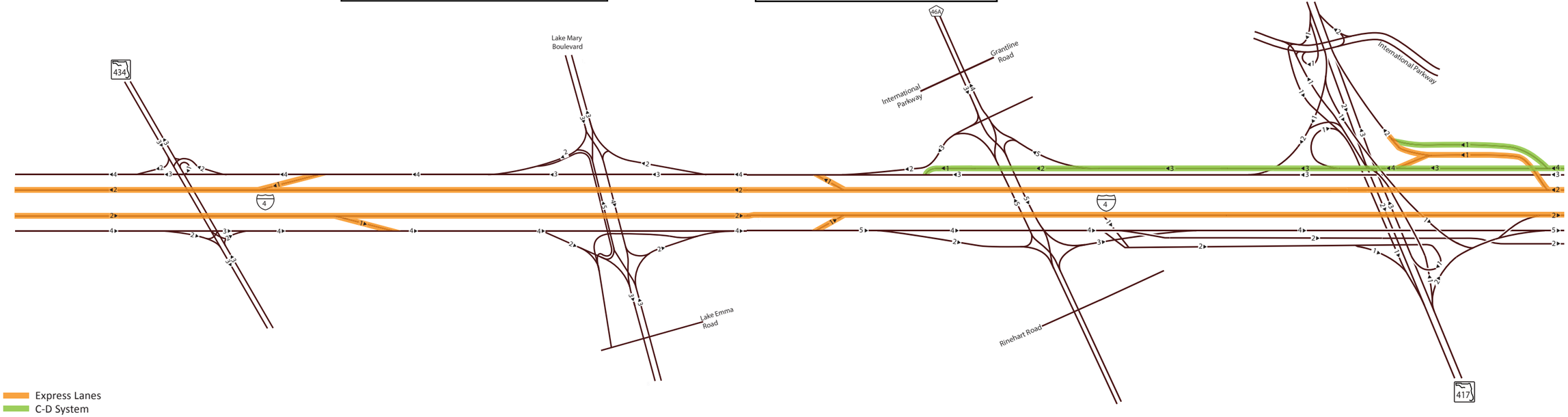


Lake Mary Blvd interchange modified to Diverging Diamond interchange with the addition of ramp access at Lake Emma Rd

CR 46A interchange modified to Diverging Diamond interchange with corridor and intersection improvements at Rinehart Rd

Express lane connections were added to the SR 417 interchange

MODIFIED BUILD



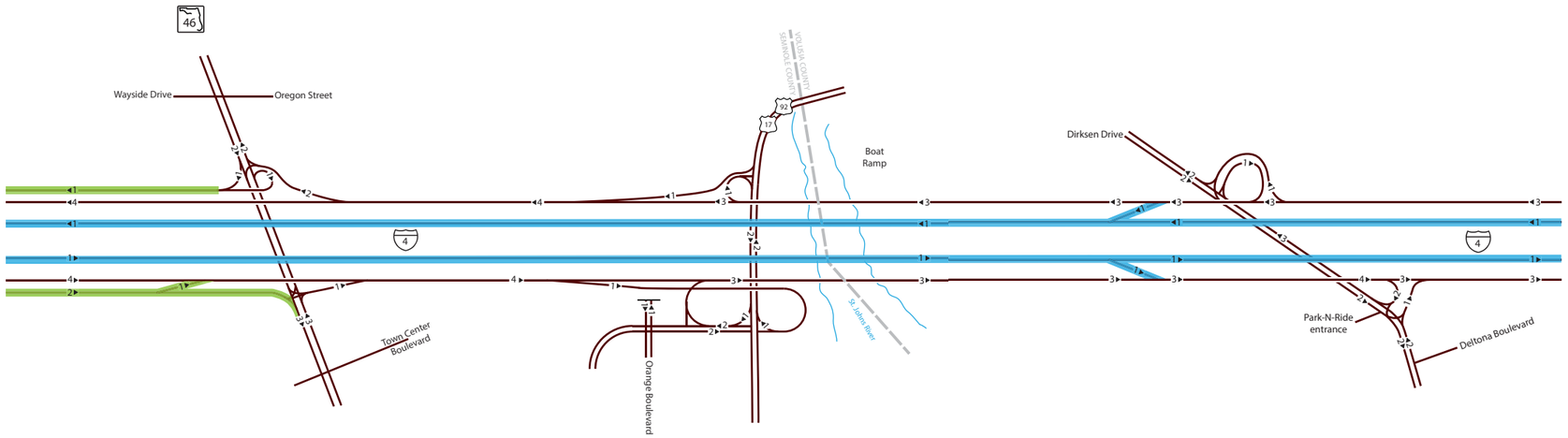
Date: 8.26.2016

I-4 SAMR Re-Evaluation

Figure 23 (1 of 3) - Original and Modified Build Transportation Networks (North Section)

ORIGINAL BUILD

NOT TO SCALE

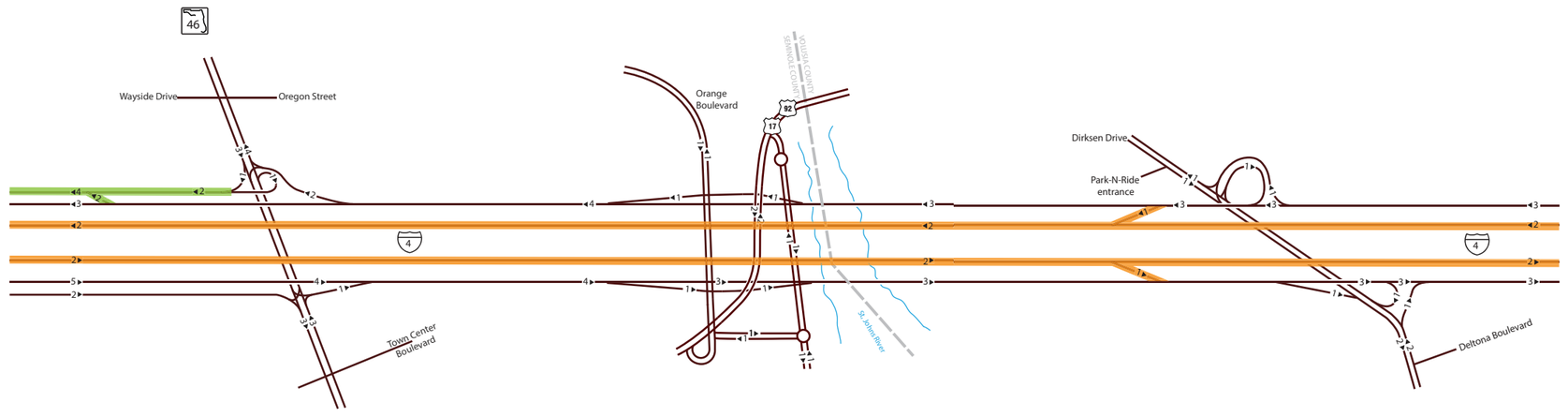


HOV Lanes
C-D System

US 17-92 interchange modified to full access dimaond interchange

Dirksen Drive interchange modified to add an Eastbound-to-Eastbound ramp.

MODIFIED BUILD



Express Lanes
C-D System

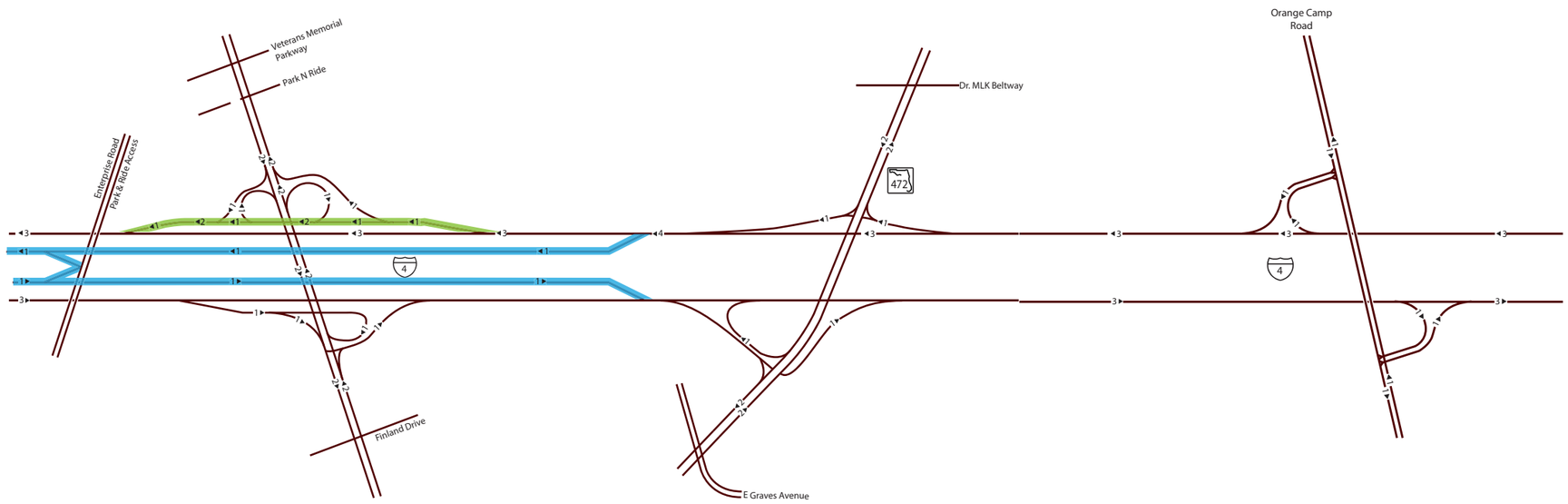
Date: 8.26.2016

I-4 SAMR Re-Evaluation

Figure 23 (2 of 3) - Original and Modified Build Transportation Networks (North Section)

ORIGINAL BUILD

NOT TO SCALE



HOV Lanes
C-D System

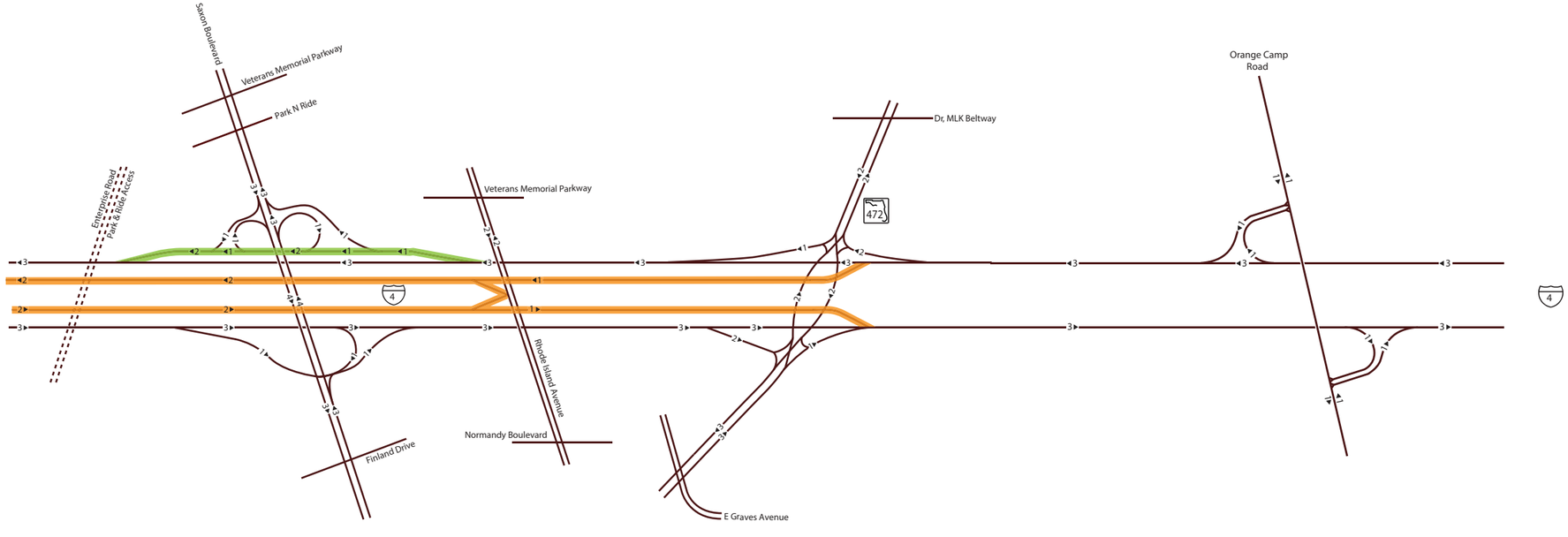
HOV access at Enterprise Rd replaced with Express Lane access to Rhode Island Ave

Saxon Blvd widened to six lanes through the interchange area

SR 472 interchange modified to Diverging Diamond interchange, with Express Lane access relocated east of SR 472

Orange Camp Rd ramp intersections were signalized in the modified build

MODIFIED BUILD



Express Lanes
C-D System

Date: 8.26.2016

I-4 SAMR Re-Evaluation

Figure 23 (3 of 3) - Original and Modified Build Transportation Networks (North Section)

Design concepts for the Modified Build interchanges are included in **Appendix E**. In addition to express lanes, the Modified Build includes improvements to the following interchanges:

- Lake Mary Boulevard: the interchange configuration was modified to a Diverging Diamond Interchange (DDI), and ramp spurs will connect to a new intersection at Lake Emma Road south of Lake Mary Boulevard.
- CR 46A: the interchange configuration was modified to a DDI with CR 46A widened to six lanes and additional intersection improvements at Rinehart Road.
- SR 417 / Wekiva Parkway: Express Lane access connections were added to the SR 417 / Wekiva Parkway interchange to provide managed lane system connectivity.
- US 17-92: the interchange configuration was modified to a full access diamond interchange.
- Dirksen Drive: the interchange was modified to add an eastbound-to-eastbound ramp
- Saxon Boulevard: the cross-street arterial will be widened through the interchange.
- Rhode Island Avenue: the Original Build HOV-only access at Enterprise Road was relocated to be an Express Lane-only access at Rhode Island Avenue.
- SR 472: the interchange configuration was modified to a DDI, and the Express Lane terminals were shifted east of SR 472.

6.2. Interchange Alternatives Analysis

The Modified Build alternative configuration was selected through analyses of alternatives at various interchanges throughout the North Section. Some alternatives were removed from consideration due to roadway geometric design constraints or other critical evaluation criteria and no further traffic analysis was completed. Peak hour operational analysis of intersections/interchanges was completed using Synchro or VISSIM software. The following section summarizes the alternatives analyses, and additional information on the selection of preferred alternatives is included in the Preliminary Engineering Reports conducted as part of the PD&E Study.

6.2.1. Lake Mary Boulevard

Six alternatives were considered for the traffic operational analysis of the Lake Mary Boulevard interchange:

- Alternative 1 - No-Build;
- Alternative 2 - Single Point Urban Interchange (SPUI);
- Alternative 3 - Grade separated DDI (GS DDI);
- Alternative 4 - No-Build + Pedestrian Overpass across I-4 with additional free northbound right lane at I-4 EB Ramps intersection and exclusive 2nd eastbound right lane at Lake Emma Road intersection;
- Alternative 5 – DDI with existing intersection geometry at Lake Mary Boulevard and Lake Emma Road intersection; and
- Alternative 6 - DDI with additional ramp intersection on Lake Emma Road.

During the development of interchange alternatives, Alternative 3 (GSDDI) was eliminated due to geometric constraints, cost and pedestrian access issues; therefore, operational analysis was not evaluated for this alternative.

Based on the intersection, network-wide, and queuing results provided in the Lake Mary Boulevard Interchange Alternatives Evaluation in **Appendix A**, it was determined that Alternative 4 performed better than Alternative 1 and Alternative 2. However, adjacent intersections on Lake Emma Road and International Parkway were operating poorly in all the evaluated alternatives. The analysis of the I-4/Lake Mary Boulevard interchange concepts showed a need to either add capacity to the closely spaced Lake Mary Boulevard/Lake Emma Road signalized intersection or decrease the volume of vehicles using the intersection. Without implementing changes to the interchange and to the interchange area, vehicle queuing from the Lake Emma Road intersection would negatively impact the I-4/Lake Mary Boulevard interchange and the interchange ramps would experience significant queueing and delays.

When alternatives to add capacity at the Lake Mary Boulevard/Lake Emma Road signalized intersection were discussed with the local jurisdictions, opposition to the significant right of way and business impacts that would be caused by expanding the intersection were expressed. Therefore, an alternative that provides additional connections to the roadway system in order to reduce the number of vehicles traveling through the I-4/Lake Mary Boulevard ramp junction intersections was created.

After reviewing the results of the analysis of Alternative 4 the decision was made to re-evaluate the area due to the impacts the poor operations of the Lake Mary Boulevard/Lake Emma Road intersection would have on the I-4/Lake Mary Boulevard interchange. The following additional alternatives were developed:

- Alternative 5: DDI with existing intersection geometry at Lake Mary Boulevard and Lake Emma Road intersection. This alternative was developed to test interchange operations without providing an additional connection to Lake Emma Road.
- Alternative 6: DDI with additional ramp intersection on Lake Emma Road. This alternative was developed to provide an alternative connection that would reduce the amount of vehicles utilizing the I-4/Lake Mary Boulevard interchange ramp terminals while not creating any new access points on I-4.

A detailed peak-hour operational analysis was conducted for Alternatives 4 through 6 using the microsimulation software VISSIM version 5.4. The results of the analysis and a comparison between the Alternatives are provided in the Lake Mary Boulevard Interchange Alternatives Evaluation in **Appendix A**. Alternative 6 was selected as the preferred alternative.

6.2.2. CR 46A

Three interchange concepts were evaluated for the CR 46A interchange. Alternative 1, shown in Sheets 52-56 of the Segment 3 Concept Plans in **Appendix E**, maintains the existing interchange in the current configuration. The existing 2-lane eastbound exit ramp and the existing 1-lane eastbound on ramp will continue to connect to the general use lanes. I-4 westbound will have a C-D system that will connect to CR 46A via a single off lane ramp. Likewise, a single lane on ramp will connect CR 46A to the westbound I-4 C-D system. The westbound C-D lanes will connect to the I-4 general use lanes west of CR 46A. An additional lane will be added in each direction along CR 46A from International Parkway to Rinehart Road. The design speed for CR 46A will be maintained at 45 mph. The intersection at the I-4

eastbound off ramp will be modified to separate the outside right turn lane from the inside right turn lane with the use of a channelizing island. The purpose of the separation is to maintain the flow of vehicles from the I-4 eastbound off ramp onto CR 46A, similar to the configuration of the I-4 eastbound off ramp at Lake Mary Boulevard. The intersection of CR 46A at Colonial Center Parkway, which serves I-4 westbound entry and exit traffic, will be modified to include six lanes along CR 46A (three lanes in each direction between International Parkway and Rinehart Road). The CR 46A through lanes are 11-feet wide in order to minimize right-of-way impacts to the adjacent businesses. The current channelizing island for the right turn lane from eastbound CR 46A to westbound I-4 will need to be modified to fit the new CR 46A geometry by decreasing the radius of the bypass lane and decreasing the size of the channelizing island. The CR 46A overpass will be modified by widening the bridge to accommodate the additional lanes. Additional right-of-way will not be required along CR 46A.

Alternative 2, shown in Sheets 57-62 of the Segment 3 Concept Plans in **Appendix E**, modifies the existing interchange design by adding Displaced Left Turns (DLTs) or Continuous Flow Intersections (CFIs) and the use of a reverse jug handle to improve the traffic flow along CR 46A and to decrease the potential for queue formation along the ramps extending to the I-4 mainline. The two-lane exit ramp from I-4 eastbound will increase to five lanes as it approaches CR 46A. This ramp will provide access to CR 46A via dual left and dual right turn lanes. One through lane will continue straight onto a new, three lane quadrant road that connects to Rinehart Road or to the I-4 eastbound general use lanes. A new single lane off ramp will connect the westbound C-D roadway via three right turn lanes to westbound CR 46A and by a single left turn lane directed to the quadrant road/Rinehart Road. The existing single lane I-4 westbound loop off ramp will become a two-lane loop ramp that provides access from the westbound C-D system to eastbound CR 46A. The outer connector ramp of the new loop ramp will accommodate westbound I-4 entering vehicles from the westbound CR 46A dual left lanes at the west end of the bridge. The intersection of CR 46A and Rinehart Road will be modified to eliminate left turns from CR 46A to improve traffic flow. Westbound CR 46A to southbound Rinehart Road traffic will continue straight through the intersection and then turn right onto the new quadrant roadway that connects back to Rinehart Road. Eastbound CR 46A to northbound Rinehart Road traffic will turn left at the intersection at the west end of the CR 46A bridge. Traffic will then proceed along a roadway similar to a displaced left turn and turn onto the quadrant roadway. The quadrant roadway will intersect Rinehart Road approximately 1,020 feet north of CR 46A at the existing roadway on the south side of Sanford Infiniti, forming the west leg of a new four-way intersection. The quadrant roadway will also provide access to eastbound I-4 with a new ramp that will connect to the general use lanes. The new intersection at the west end of the CR 46A bridge will accommodate westbound I-4 to westbound CR 46A, westbound I-4 to Rinehart Road, the displaced left turns from westbound CR 46A and Colonial Center Parkway and the displaced left turns from eastbound CR 46A and I-4 eastbound. The intersection will also serve as the connection for the westbound I-4 loop off ramp to eastbound CR 46A. The south leg of the CR 46A will no longer accommodate entry onto I-4 westbound from westbound CR 46A. This movement will take place at a displaced left turn at the new westbound off ramp terminal. The eastbound CR 46A to westbound I-4 on ramp will be modified to a two-lane free-flow right turn to increase capacity. Additional right-of-way will be required for this alternative at several locations including along CR 46A, Colonial Center Parkway and the I-4 westbound off ramp.

Alternative 3, shown in Sheets 63-69 of the Segment 3 Concept Plans in **Appendix E**, proposes a Diverging Diamond Interchange (DDI). The proposed I-4 exit ramp movements will be signalized and provide triple lefts and triple right turn lanes onto CR 46A. This design changes the signal operations at the eastbound ramp terminal from a three-phase to two-phase cycle, as the left turn movements from the crossroad to the on ramp are now free flow movements. CR 46A will be widened to three through lanes in each direction between International Parkway and east of Rinehart Road and bike lanes have been provided along CR 46A through the interchange. To the west of the interchange, modifications include elimination of the westbound dual left lanes at CR 46A and Colonial Center Parkway; I-4 westbound will be accessed by the westbound lanes of the DDI. To the east of the interchange, modifications include elimination of eastbound and westbound left turn lanes at the intersection of CR 46A and Rinehart Road. Eastbound traffic on CR 46A destined to the north will have the option to go straight through and make a U-turn on CR 46A to return to the intersection and make a right turn onto northbound Rinehart Road. The other option for eastbound traffic is to turn right onto Rinehart Road and make a U-turn at a new, proposed median opening south of the intersection. Westbound traffic destined to the south would have to turn right onto Rinehart Road and access the existing median opening which will be modified to accommodate U-turns for a larger design vehicle. This alternative will require additional right-of-way at several locations including along CR 46A, Colonial Center Parkway and the I-4 westbound off ramp.

The build alternative identified in the original PD&E study/FEIS for the CR 46A interchange proposed modifying the full access diamond with loop ramp for the I-4 westbound to CR 46A movements to allow for the continuation of the westbound C-D ramp from SR 46 and providing a 2-lane eastbound off ramp. West of the interchange, the C-D ramp would merge with the I-4 westbound on ramp from CR 46A.

A separate AM and PM peak hour intersection analysis for the study area intersections was completed in VISSIM for the study intersections along CR 46A; the intersection delay and LOS summary is shown in **Table 17**. Network-wide performance was also evaluated for all the alternatives; the results are summarized in **Table 18**. Based on the intersection operational analyses and network wide performance parameters, Alternatives 2 and 3 provide similar operational benefits when compared to the No-Build Alternative. It was determined that Alternative 2 was flawed due to the creation of a weave section and the mixing of I-4 ramp traffic and non-Interstate traffic that would occur in the northeast quadrant of the interchange (see Sheet 62, Appendix E). It was also noted that the geometry of the crossover movements associated with the CFI may be difficult for oversized vehicles (such as WB-67) to navigate (see Sheet 59, Appendix E) and that the local governments did not support the CFI configuration. Alternative 3 was selected as the recommended alternative.

Table 17 CR 46A Peak Hour Node Evaluation Comparison

CR 46A Intersection with	No-Build		Alternative 1 (CR 46A 6-lane)		Alternative 2 (CFI)		Alternative 3 (DDI)		No-Build		Alternative 1 (CR 46A 6-lane)		Alternative 2 (CFI)		Alternative 3 (DDI)	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
	AM Peak								PM Peak							
International Pkwy.	167.6	F	158.6	F	63.9	E	58.7	E	230.5	F	212.5	F	48.1	D	61.3	E
I-4 WB On Ramp	85.9	F	80.9	F	10.0	A	11.8	B	99.9	F	134.0	F	18.3	B	18.5	B
I-4 WB Off Ramp							24.6	C							27.8	C
CR 46A Crossover	N/A		N/A		17.8	B	N/A		N/A		N/A		29.8	C	-	-
I-4 EB Off Ramp	90.6	F	104.6	F	23.2	C	47.8	D	108.6	F	145.7	F	29.7	C	40.7	D
Rinehart Rd.	203.3	F	152.2	F	29.3	C	42.8	D	166.9	F	205.4	F	32.0	C	35.3	D
Rinehart Rd./ NB U-turn	N/A		N/A		13.3	B	45.2	D	N/A		N/A		15.4	B	20.7	C
Rinehart Rd./ SB U-turn	N/A		N/A		N/A		13.7	B	N/A		N/A		N/A		22.7	C

Note: Average delay reported in seconds per vehicle

Table 18 CR 46A Interchange Alternatives – Network Performance Comparison

Performance Parameter	No-Build	Alt. 1	Alt. 1 Improvement	Alt. 2	Alt. 2 Improvement	Alt. 3	Alt. 3 Improvement
I-4 & CR 46A - AM Peak							
Total Travel Time (hr)	1070	1094	-2%	561	47.6%	721	32.6%
Total Delay Time (hr)	858	864	-1%	277	67.7%	451	47.4%
Average Delay Time (sec/veh)	319	283	11%	82	74.3%	137	57.1%
Latent Delay Time (hr)	312	183	41%	0	100.0%	22	92.9%
Number of Arrived Vehicles	8514	9721	-14%	11573	35.9%	10982	-29.0%
Latent Vehicles	2656	1519	43%	0	100.0%	262	90.1%
Total Delay + Latent Delay (hr)	1170	1047	11%	277	76.3%	473	59.6%
I-4 & CR 46A - PM Peak							
Total Travel Time (hr)	1089	1193	-10%	668	38.7%	778	28.6%
Total Delay Time (hr)	892	981	-10%	349	60.9%	449	49.7%
Average Delay Time (sec/veh)	338	349	-3%	91	73.1%	118	65.1%
Latent Delay Time (hr)	582	490	16%	0	100.0%	31	94.7%
Number of Active Vehicles	1110	1245	-12%	643	42.1%	689	37.9%
Number of Arrived Vehicles	8377	8875	-6%	13188	57.4%	13001	-55.2%
Latent Vehicles	5047	4179	17%	4	99.9%	242	95.2%
Total Delay + Latent Delay (hr)	1474	1471	0%	349	76.3%	480	67.4%

6.2.1. Wekiva Parkway / SR 417

The Wekiva Parkway interchange will be constructed under the Wekiva Parkway Design-Build project that is currently under development and construction (FDOT FPN 240200-4). The interchange will be built to accommodate the express lanes along I-4 with minimal reconstruction during the Beyond the Ultimate construction. Four interchange concepts were developed for the SR 417/Wekiva Parkway interchange as part of the I-4 BtU project to facilitate coordination between the I-4 BtU improvements and the Wekiva Parkway project. The four interchange concepts are discussed in the following paragraphs; concept plans for the interchange are provided only for the recommended alternative.

Alternative 1 accommodates the additional lanes that will be needed with the construction of the Wekiva Parkway. The proposed improvements for this interchange are being coordinated with the Wekiva Parkway project. The existing interchange connects I-4 to SR 417 and International Parkway. The new SR 417/Wekiva Parkway and I-4 interchange will be a partial cloverleaf interchange. Direct connections to and from Wekiva Parkway/SR 417 will be provided to and from both the I-4 general use lanes and the express lanes. Eastbound Wekiva Parkway will have a single lane ramp which will provide access to the I-4 westbound general use lanes, the westbound express lanes, the eastbound general use lanes and the eastbound express lanes. The eastbound I-4 express lanes will have a ramp that braids over eastbound I-4 general use lanes and ties into the 2-lane off ramp for the eastbound general use lanes. The 2-lane eastbound general use lane exit ramp will provide single lane access to SR 417 southbound and westbound Wekiva Parkway. Northbound SR 417 will have a two-lane off ramp which will split and provide access to the eastbound express lanes, eastbound general use lanes, westbound express lanes and westbound general use lanes. The westbound I-4 express lanes will have a single lane ramp that braids over westbound I-4 general use lanes and will split to provide access to westbound Wekiva Parkway and southbound SR 417 via the westbound collector distributor lanes. The westbound general use lanes will have access to westbound Wekiva Parkway and southbound SR 417 via the collector/ distributor lanes adjacent to westbound I-4. Additional right-of-way requirements for the Wekiva Parkway interchange will be purchased under the Wekiva Parkway Project.

Alternative 2 is the most radical design and costs more than the other three concepts evaluated. The eastbound express lane has a single left sided ramp that will combine with the westbound express lane ramp and braid over the westbound express lanes, the westbound general use lanes, and the C-D road between CR 46A and the Wekiva Parkway. The eastbound express lane splits where one lane goes to SR 417 southbound and the other goes to Wekiva Parkway westbound. I-4 eastbound general use will have a two-lane exit that will split into two separate exits: the left split will be the start of a C-D system that will end at SR 46. The right lane will split again and the left ramp will go to SR 417 southbound and the right ramp will go to Wekiva Parkway westbound. Northbound SR 417 will be a three lane exit: one lane will taper off on the left, go under the eastbound C-D system, eastbound I-4 general use and express lanes, and will ramp up and merge into the eastbound express lanes between the eastbound and westbound express lanes. The other 3 lanes on the ramp will split and the right lane will merge into eastbound I-4 general use. The two other lanes will travel under the eastbound C-D system, eastbound I-4 general use and express lanes. It will split and the left lane will ramp up and merge into westbound I-4 express lanes in between the eastbound and westbound express lanes. The right lane will merge into the westbound C-D system between Wekiva Parkway and SR 46. The exit ramp for the westbound

I-4 express lanes will braid over the westbound general use lanes and the westbound C-D system. The single lane ramp will turn into three lanes where the right lane will split off and merge with the westbound general use off ramp and will eventually split to go to southbound SR 417 and westbound Wekiva Parkway. The two left lanes will split: the right lane will merge with the two-lane ramp created from the express lane and general use lane exits. The left lane will continue straight and will merge with the two lanes that diverged off of the general use exit ramp. From here the express exit ramp, general use exit ramp, and SR 46 on ramp will combine into a C-D system allowing access to southbound SR 417, CR 46A, and westbound I-4 general use. The two-lane exit ramp off of the westbound general use lanes will travel under the SR 46 on ramp. One lane will taper off to the right and merge with the westbound express lane exit ramp while two lanes will continue straight and combine with the other westbound express off ramp and the SR 46 on ramp to form a C-D system between CR 46A and SR 46. Eastbound Wekiva Parkway has a single lane exit ramp that splits. The right lane braids over the westbound C-D system, westbound general use lanes, and westbound express lanes. It ramps down and merges into the westbound express lanes from the left. The left lane splits again with the right lane merging into the westbound C-D system. The left lane splits and the left split travels under westbound I-4 and ramps up and merges into the eastbound express lanes. The right split travels under I-4 and merges with the eastbound C-D system.

Alternative 3 is the preferred alternative due to its lowest cost and impacts. The eastbound express exit ramp goes under the eastbound general use lanes and merges with the single lane off ramp from the general use lanes. From there, the two-lane ramp splits: right lane goes to southbound SR 417 and left lane goes to westbound Wekiva Parkway via a proposed loop ramp. Northbound SR 417 has a two-lane exit ramp that will provide two lanes to merge into the eastbound I-4 general use lanes and will have one lane taper off and braid over northbound and southbound SR 417 and then contraflow between the SR 417 southbound ramp and southbound SR 417 lanes. This single lane ramp will provide access to International Parkway and to I-4 westbound general use lanes. The single lane ramp from southbound SR 417 will merge with the two-lane ramp from northbound SR 417 to form a three-lane ramp. The left lane of the ramp will braid over the eastbound general use lanes and merge into the eastbound express lanes. The other two lanes will merge into the eastbound general use lanes. The westbound express lane exit will travel under the westbound general use lanes and the westbound C-D system. The ramp will split: the right split will combine with the exit ramp off of the C-D system and merge into westbound Wekiva Parkway and the left split will merge into the westbound C-D system and will provide access to southbound SR 417 via the existing loop ramp, to CR 46A or to the westbound general use lanes. There is a one lane exit ramp off of eastbound Wekiva Parkway that will split. The right split will merge with the contraflow ramp from northbound SR 417 and will merge into the westbound general use lanes. The left split will ramp up and braid over eastbound and westbound Wekiva Parkway. Then it will ramp under and across the I-4 lanes before merging with the two-lane ramp from northbound SR 417. From here the left lane will ramp off and braid over the eastbound general use lanes and merge into the eastbound express. The other two lanes will merge into the eastbound general use lanes.

Alternative 4 is nearly identical to the third except for the Wekiva Parkway/SR 417 mainline configuration. Northbound SR 417 crosses over southbound SR 417 at the Town Center Blvd bridges allowing a left-handed exit ramp onto International Parkway and westbound I-4 general use lanes.

Wekiva Parkway eastbound will cross over the westbound lanes at the International Parkway bridges. A left-hand exit will split off of the westbound lanes and merge with the two-lane ramp from northbound SR 417 to eastbound I-4. The remaining two lanes of the eastbound Wekiva Parkway turn into southbound SR 417 and crosses back under northbound SR 417 to the original configuration at the Town Center Blvd bridges. SR 417/Wekiva Parkway is shown as a grade-separated diverging diamond.

The build alternative identified in the original PD&E study/FEIS for the SR 417 (Central Florida GreeneWay) interchange proposed modifying ramp junctions to and from I-4 to connect to the reconstructed freeway. The I-4 westbound to SR 417 ramp junction would be moved east to approximately 2,100 feet west of SR 46. This ramp would merge with the SR 46 to SR 417/I-4 C-D ramp and form a three-lane facility adjacent to I-4.

6.2.2. SR 46

Two interchange concepts were evaluated for the SR 46 interchange. Alternative 1, shown in Sheets 70-73 of the Segment 3 Concept Plans in **Appendix E**, will leave the existing interchange as it is with widening of eastbound SR 46 for an additional left turn lane from eastbound SR 46 to eastbound I-4. The existing 2-lane eastbound C-D road between CR 46A and SR 46 will be removed. A new 2-lane exit ramp will be added for I-4 eastbound general use traffic to SR 46. The 1-lane eastbound on ramp will connect to the I-4 eastbound general use lanes. The SR 46 and I-4 eastbound ramp connection intersection will be changed so that there are two left turn lanes from SR 46 eastbound onto I-4 eastbound; three through lanes will remain along SR 46 eastbound. The westbound I-4 general use will have a 2-lane exit ramp connecting to SR 46 around the outside of the loop ramp on the northwest quadrant. The 1-lane SR 46 westbound loop on ramp will connect to the I-4 westbound C-D road. No additional right-of-way will be required for this concept.

Alternative 2, shown in Sheets 74-77 of the Segment 3 Concept Plans in **Appendix E**, is similar to Alternative 1, but has an additional off ramp that connects the I-4 eastbound off ramp to Towne Road. This additional off ramp provides access to Towne Center Boulevard without using SR 46. The connection for the new ramp will be a new roundabout intersection that connects to South Oregon Avenue and Towne Road. The existing access on the local roads will be maintained. Additional right-of-way will be required along North Towne Road and the existing right-of-way will need to be converted to limited access right-of-way.

The build alternative identified in the original PD&E study/FEIS for the SR 46 interchange proposed maintaining the full access diamond with I-4 eastbound to SR 46 movement provided via a C-D ramp that exits just east of CR 46A. Proposed modifications would add a loop ramp for SR 46 westbound to I-4 westbound; this loop ramp would begin the westbound C-D roadway that would serve the SR 46, SR 417 and CR 46A interchanges and realigning Oregon Street in the northwest quadrant.

Review of the three alternatives was conducted for SR 46 interchange for the analysis year 2040. Based on the operational analysis, Alternative 2 provides better operational performance among the alternatives. The results of the peak hour intersection operational analyses for SR 46 are summarized in **Table 19**.

Table 19 Average Delay and LOS – SR 46 Intersections

Intersection	MOEs	No-Build	Alt. 1	Alt. 2	No-Build	Alt. 1	Alt. 2
		AM Peak Hour			PM Peak Hour		
SR 46 & Wayside Drive/Oregon Street	Delay	15.1	14.8	14.8	21.6	20.4	18.2
	LOS	B	B	B	C	C	B
SR 46 & I-4 WB Ramps	Delay	13.8	14.0	13.8	13.6	13.2	13.5
	LOS	B	B	B	B	B	B
SR 46 & I-4 EB Ramps	Delay	38.1	22.6	21.9	43.3	21.7	20.9
	LOS	D	C	C	D	C	C
SR 46 & Towne Center Boulevard/Hickman Drive	Delay	27.2	26.2	28.1	26.6	25.0	26.5
	LOS	C	C	C	C	C	C
Notes: Delay – Average delay (sec/veh), MOEs = Measures of Effectiveness							

6.2.3. US 17-92

Eight interchange concepts were evaluated for the US 17-92 interchange. The eight concepts include:

- Partial cloverleaf;
- Diamond interchange;
- Single point urban interchange;
- Diamond interchange that keeps the existing loop ramp;
- Single point urban interchange that modifies southbound US 17-92 to directly align with Monroe Road;
- Partial cloverleaf interchange that modifies US 17-92 to align with Monroe Road;
- Grade separated diverging diamond interchange (GSDDI); and
- Tight urban diamond interchange (TUDI) that realigns US 17-92 to align with Monroe Road.

The current configuration of the US 17-92 interchange was built in accordance with the approved concept from the original FEIS from 2002 Alternative concepts were developed for this interchange because the existing interchange has been shown to cause exiting traffic to back up onto I-4.

Alternative 1, shown in Sheets 78-81 of the Segment 3 Concept Plans in **Appendix E**, keeps the same overall existing geometry of the ramps and alignment of US 17-92. The single lane I-4 eastbound exit ramp will remain in place and be widened to allow for two lanes of traffic. The single lane I-4 eastbound on ramp will continue to connect to the general use lanes. The westbound I-4 off ramp will remain a single lane loop off ramp, but the channelizing island at the intersection with southbound US 17-92 will be removed. The single lane I-4 westbound on ramp will remain a single lane ramp and a new channelizing island will be constructed for the southbound US 17-92 traffic to improve the safety and geometry at this intersection. The southbound US 17-92 traffic will no longer have a dedicated turn lane for traffic turning south onto Monroe Road; instead traffic will have to turn at the intersection of US 17-92 and the I-4 eastbound off ramp. Dual left turn lanes will be added for the northbound US 17-92 traffic turning left onto Monroe Road.

Alternative 2, shown in Sheets 82-86 of the Segment 3 Concept Plans in **Appendix E**, changes the existing geometry of the ramps and the alignment of US 17-92. The interchange is changed to a diamond interchange with US 17-92 shifting further to the south and remaining an underpass, but requiring a new bridge to be built. The existing alignment of US 17-92 is changed at the St. John's River Bridge with the curve being moved to the south of its current location. Part of the existing US 17-92 bridge over Lake Monroe would need to be removed from the point of curve to the south and rebuilt to continue straight with four lanes further south. A curve would then be constructed to redirect the roadway back to the east under I-4, approximately halfway between the current underpass and the existing Orange Boulevard underpass. An access road will be added to the west of I-4 to maintain access to Lake Monroe Wayside Park. Beyond the interchange, US 17-92 will continue to the east and a new intersection with Monroe Road will be made, eliminating the roadway further to the north. US 17-92 will then curve back to the north and transition from a four-lane roadway to a two-lane roadway. The current entrance to the Central Florida Zoo & Botanical Gardens will be shifted further to the south with a new intersection being built for access. The design speed for the realignment of 17/92 is 60 mph. The current interchange ramps will be modified where possible or eliminated altogether and the I-4 St. John's River Bridge will need to be widened to accommodate the new ramps. The existing one lane I-4 eastbound off ramp will need to be widened and the vertical alignment may need to be changed to align with the US 17-92 underpass. A new single lane on-ramp will be added for the eastbound lanes. Additional single lane on ramps and off ramps will be added to the westbound lanes. Additional right-of-way will need to be purchased in order to build this alternative.

Alternative 3, shown in Sheets 87-91 of the Segment 3 Concept Plans in **Appendix E**, is a single point urban interchange design which will have the same geometric characteristics as Alternative 2 with the exception of the interchange design. The alignment of US 17-92 for Alternative 3 will be the same as the new alignment in Alternative 2. The changes to I-4 would also be the same with the exception of the new overpass bridge being larger for Alternative 3. The I-4 overpass bridge will need to be lengthened to accommodate extra space needed for the left turn lanes of the single point urban interchange. The same additional right-of-way will need to be purchased in order to build this alternative as in Alternative 2.

Alternative 4, shown in Sheets 92-96 of the Segment 3 Concept Plans in **Appendix E**, is also a diamond interchange with a realignment of US 17-92 similar to Alternative 2. The exception is that the current loop ramp from the I-4 eastbound off ramp is kept and extended back to the new Monroe Road and US 17-92 intersection. This extension can be accomplished using the existing Monroe Road lanes to direct traffic back to the intersection. The other exception is that the current I-4 eastbound on ramp will be reused for access from US 17-92 to I-4 eastbound. Thus, the eastbound I-4 St. John's River Bridge may only need minimal adjustments to accommodate the new ramp. The same additional right-of-way will need to be purchased in order to build this alternate as in Alternative 2.

Alternative 5, shown in Sheets 97-101 of the Segment 3 Concept Plans in **Appendix E**, is a single point urban interchange similar to Alternative 3, but with a realignment of US 17-92 to connect directly into Monroe Road. The old section of 17-92 along Lake Monroe will become a low speed, scenic road and will connect to US 17-92 via a T intersection. The new US 17-92 will terminate at SR 46 to the south. There is one at grade rail road crossing that will need to be reconstructed due to the realignment of

Monroe Road, also known as the new US 17-92. A traffic operational analysis was conducted for this alternative, and the majority of the traffic through the interchange is coming from the north, via US 17-92 and from the south via Monroe Road. It is also desired by the local agency to make the old section of US 17-92 a lower speed scenic roadway. Additional right-of-way will need to be purchased in order to build this alternative.

Alternative 6, shown in Sheets 102-109 of the Segment 3 Concept Plans in **Appendix E**, is a partial cloverleaf interchange that realigns US 17-92 to connect with Monroe Road similar to Alternative 5. Alternative 6 proposes a grade separation at the Monroe Road and SunRail crossing. This grade separation will improve traffic flow and safety in the area. The existing grade crossing will remain only to provide a connection between Monroe Road and the existing US 17-92 portion that goes to downtown Sanford, Florida. The traffic volumes will be reduced along the existing Monroe Road alignment resulting in the SunRail grade crossing on Monroe Road having less of an impact on the overall operations of this interchange. The existing westbound single lane loop off ramp and on ramp will connect to the general use lanes. The existing eastbound single lane off ramp and partial loop on ramp will also connect to the general use lanes. The eastbound off ramp and on ramp will be realigned to use School Street and the connection will be at the existing School Street/Monroe Road intersection. A new roundabout will be added to connect Orange Boulevard and School Street to the east of the new US 17-92 and existing Monroe Road alignments. Additional right-of-way will be require to build the new loop ramps, US 17-92 alignment, and roundabout as well as purchasing new limited access right-of-way between the eastbound ramps. Residential relocations will be required to build this alternative.

Alternative 7, shown in Sheets 110-116 of the Segment 3 Concept Plans in **Appendix E**, is a Grade Separated Diverging Diamond Interchange (GSDDI) which realigns the existing US 17-92 to align with Monroe Road similar to Alternative 5. The existing US 17-92 roadway that travels to downtown Sanford will remain and be renamed, but will tee into the new US 17-92 alignment. The new alignment of US 17-92 will provide grade separation between US 17-92 and SunRail. The existing at grade crossing of Monroe Road and SunRail will be eliminated in this alternative. A new roundabout will be added to connect Orange Boulevard and School Street to the east of the new US 17-92 and existing Monroe Road alignments. Due to the constraint of not being able to reconstruct the I-4 bridge over the St. Johns River, this alternative is not feasible to build. Additional right-of-way will be required to construct the new roundabout and new 17/92 alignment.

Alternative 8, shown in Sheets 117-123 of the Segment 3 Concept Plans in **Appendix E**, is a Tight Urban Diamond Interchange (TUDI) that realigns US 17-92 to directly align with Monroe Road. The existing US 17-92 roadway that travels to downtown Sanford, Florida will be renamed and will remain, but will tee into the new US 17-92 alignment, west of I-4. Two single-lane roundabouts are proposed at the location of the existing US 17-92 ramp terminals east and west of I-4 with this alternative. The new alignment of US 17-92 will provide grade separation between US 17-92 and SunRail. The existing at grade crossing of Monroe Road and SunRail will remain in this alternative; however Monroe Road will be a two-lane roadway north of Orange Boulevard instead of the current four-lane section, reducing the rail crossing width. A new road will be added to connect Orange Boulevard and School Street to the east of the new US 17-92 and existing Monroe Road alignments. The existing westbound single lane off ramp and on ramp will connect to the general use lanes. The existing eastbound single lane off

ramp and on ramp will also connect to the general use lanes. Additional right-of-way will be required to construct the new extension of Orange Blvd to Monroe Rd and the new 17/92 alignment.

Alternatives 2 through 8 for the US 17-92 interchange involve reconstruction of the US 17-92 bridge over the St. Johns River, as shown in the Segment 3 Concept Plans in **Appendix E**. The US 17-92 bridge is in superelevation. During design, survey will be required to determine the exact limits of deck replacement, in order to obtain the correct cross slope for the horizontal geometry.

The build alternative identified in the original PD&E study/FEIS for the US 17-92 interchange proposed maintaining the full access partial cloverleaf design with all movements occurring at US 17-92 as they are today, instead of being split between US 17-92 and Orange Boulevard.

Alternatives 1 through 4 maintain current US 17-92 alignment. Alternatives 5 through 8 consider realignment of US 17-92 to connect directly into Monroe Road. With the realignment of US 17-92, the old section of 17-92 along Lake Monroe will become a low speed, scenic road and will connect to US 17-92 via a T intersection. The new US 17-92 will terminate at SR 46 to the south.

With the programmed designation change of US 17-92 (to Monroe Road), alternatives that maintain existing US 17-92 alignment (Alternatives 2 through 4) were not considered further in the operational analysis. Alternative 1, the No-Build Alternative, was evaluated only for comparison purposes. The following alternatives were considered for the US 17-92 interchange evaluation:

- Alternative 1 (No-Build)
- Alternative 5 – Single Point Urban Interchange (SPUI)
- Alternative 6 – Partial cloverleaf
- Alternative 7 - Grade Separated Diverging Diamond Interchange (GSDDI)
- Alternative 8 - Tight Urban Diamond Interchange (TUDI)

Review of four alternatives in addition to No-Build and Original Build was conducted for the US 17-92 interchange for the analysis year 2040. Based on the operational analysis, the results indicate that alternatives 6, 7 and 8 perform better than the No-Build. The results of the network wide performance for US 17-92 are summarized in **Table 20**. Alternative 8 was selected as the recommended alternative based upon other factors such as costs, ROW, and environmental considerations.

Table 20 US 17-92 Interchange Alternatives – Network Performance Comparison

Performance Parameter	Alternative 1 (No-Build)	Alt. 5 (SpUI)	Alt. 5 (SPUI) Improvement	Alt. 6 (Parclo)	Alt. 6 (Parclo) Improvement	Alt. 7 (GSDDI)	Alt. 7 (GSDDI) Improvement	Alt. 8 (TUDI)	Alt. 8 (TUDI) Improvement
I-4 & US 17-92 - AM Peak									
Total Travel Time (hr)	409	512	-25%	327	20%	292	29%	286	30%
Total Delay Time (hr)	198	331	-67%	92	54%	75	62%	78	61%
Average Delay Time (sec/veh)	118	163	-38%	53	55%	43	64%	45	62%
Latent Delay Time (hr)	24	290	-1108%	3	88%	0	100%	0	100%
Number of Arrived Vehicles	5,635	6,767	20%	5,970	6%	5,982	6%	5,988	6%
Latent Vehicles	186	2557	-1275%	8	96%	1	99%	1	99%
Total Delay + Latent Delay (hr)	222	621	-180%	95	57%	75	66%	78	65%
I-4 & US 17-92 - PM Peak									
Total Travel Time (hr)	396	491	-24%	327	17%	302	24%	304	23%
Total Delay Time (hr)	185	294	-59%	92	50%	85	54%	96	48%
Average Delay Time (sec/veh)	113	134	-19%	53	53%	49	57%	55	51%
Latent Delay Time (hr)	41	247	-502%	3	93%	0	100%	0	100%
Number of Active Vehicles	5,545	7411	-34%	5970	8%	5971	8%	5955	7%
Number of Arrived Vehicles	328	2161	-559%	8	98%	1	100%	1	100%
Latent Vehicles	226	541	-139%	95	58%	85	62%	96	58%
Total Delay + Latent Delay (hr)	396	491	-24%	327	17%	302	24%	304	23%

6.2.4. Dirksen Drive

Two alternatives were considered for the Dirksen Drive/Debary Avenue interchange. Alternative 1 would leave the overall existing horizontal geometry as it is, in a partial cloverleaf configuration with loop ramps in the northwest and northeast quadrants. The existing 1-lane I-4 eastbound exit ramp will continue to connect to the I-4 general use lanes. The existing 1-lane eastbound on-ramp will continue to connect to the I-4 general use lanes. The existing 1-lane I-4 westbound exit ramp will continue to connect to the I-4 general use lanes. The existing 1-lane westbound on-ramp will continue to connect to the I-4 general use lanes. The proposed concept plans for Dirksen Drive/Debary Avenue include changing the vertical geometry by lowering the height of the interstate over the roadway because there is no longer a railroad corridor along the roadway and the additional height is no longer needed. This alternative requires reconstruction of the bridge carrying Dirksen Drive/Debary Avenue over I-4. No additional right-of-way will need to be purchased to construct this alternative.

Alternative 2 would maintain the existing I-4 westbound on and off-ramps as they are today. The I-4 eastbound on ramp would also be maintained as it is today. The I-4 eastbound loop off-ramp would be modified such that motorists can only turn right at the ramp terminus and head westbound on Dirksen Drive. A new 1-lane exit ramp is proposed in the southeast quadrant which will provide access to eastbound Dirksen Drive from the I-4 eastbound general use lanes. This alternative will impact the park and ride lot that is currently located just east of the interchange. A new park and ride lot is proposed on a vacant parcel located on the west side of the interchange. The vertical geometry will be adjusted similar to Alternative 1. Additional right-of-way will need to be purchased to construct this alternative.

The build alternative identified in the original PD&E study/FEIS (*I-4 PD&E Study – Section 2, Final Environmental Impact Statement FEIS, August 2002*) for the Dirksen Drive/Debary Avenue interchange proposed maintaining the existing interchange concept with widening of the I-4 eastbound exit ramp to two lanes.

Two alternatives were considered for the Dirksen Drive interchange traffic operations evaluation:

- Alternative 1 (No-Build) - Existing + Four lanes on Dirksen Drive, west of the interchange
- Alternative 2 – Free Flow Ramp at I-4 eastbound ramp terminus. This alternative includes the following additional improvements at the adjacent intersections:
    - a free flow right lane onto the westbound on-ramp (requires 2 receiving lanes before merging to 1 in order to maintain free flow movement with opposing eastbound lefts) with a 3rd continuous westbound lane between the ramp terminals,
    - dual eastbound left turns at the Deltona Boulevard intersection and
    - dual southbound right turn lanes on Deltona Boulevard.

Review of the two alternatives was conducted for the Dirksen Drive interchange for the analysis year 2040. Based on the operational analysis, Alternative 2 provides better operational performance, ultimately improving mobility throughout the Dirksen Drive corridor. The results of the peak hour intersection operational analyses for Dirksen Drive are summarized in **Table 21**.

Table 21 Average Delay and LOS – Dirksen Drive Intersections

	Alt 1 (No Build) AM		Alternative 2 AM	
Intersection	Delay	LOS	Delay	LOS
I-4 WB Ramps/Dirksen Drive	14.0	B	13.1	B
I-4 EB Ramps/Dirksen Drive	36.1	D	2.8	A
Delton Boulevard/Dirksen Drive	140.3	F	19.3	B
	Alt 1 (No Build) PM		**Alternative 2 PM**	
Intersection	Delay	LOS	Delay	LOS
I-4 WB Ramps/Dirksen Drive	14.5	B	10.7	B
I-4 EB Ramps/Dirksen Drive	60.6	E	2.3	A
Delton Boulevard /Dirksen Drive	86.2	F	18.2	B

6.2.5. Saxon Boulevard

Two interchange concepts and three roadway widening alignment alternatives were evaluated for Saxon Boulevard. Alternative 1 would leave the overall existing geometry as it is, in a partial cloverleaf configuration with loop ramps in the northwest, northeast and southwest quadrants. The existing single lane off-ramp from eastbound I-4 to eastbound Saxon Boulevard will continue to connect to the general use lanes and will be extended along Saxon Boulevard to Finland Drive in order to provide a greater weaving distance for traffic exiting the interstate. The lane will become an exclusive right turn lane at the intersection of Saxon Boulevard and Finland Drive. The existing single lane off-ramp from eastbound I-4 to westbound Saxon Boulevard will continue to connect to the general use lanes. The existing single lane I-4 eastbound on-ramp will continue to connect to the general use lanes. The existing I-4 westbound C-D road will continue to have the same configuration and connect the I-4 westbound general use lanes to the C-D road. The C-D road will continue to provide access to the single lane westbound Saxon Boulevard outer connector off-ramp, the single lane westbound Saxon Boulevard inner loop on-ramp, the single lane eastbound Saxon Boulevard inner loop off-ramp and the single lane eastbound Saxon Boulevard to I-4 westbound outer connector on-ramp. The C-D road will connect back to the I-4 general use lanes with a two lane on-ramp. Pedestrian access will continue to be maintained on both sides of the Saxon Boulevard Bridge. Additional right-of-way will need to be purchased to construct this alternative. The additional right-of-way will be needed at the I-4 eastbound off-ramp to eastbound Saxon Boulevard extension.

Alternative 2 would change the configuration of the interchange to a single point diamond interchange (SPDI). The SPDI design would provide access from I-4 to Saxon Boulevard at a single intersection. A new single lane off-ramp and a new single lane on-ramp will be constructed at the I-4 eastbound general use lanes. A new single lane off-ramp and a new 2-lane on-ramp will be constructed at the I-4 westbound general use lanes. The C-D road will not be necessary and will be eliminated at this interchange. Saxon Boulevard will be widened through the interchange to match the proposed section of Saxon Boulevard to the west of I-4 that is currently under construction. Pedestrian access will be maintained on both sides of Saxon Boulevard. No additional right-of-way will need to be purchased to construct this alternative.

Alternative 3 would include the interchange improvements as described in Alternative 1, and will widen Saxon Boulevard from four through lanes to six through lanes from the park and ride lot, west of I-4 to Normandy Boulevard, east of I-4. The alignment of the roadway would be shifted to the north by 12 feet, or one lane width. The original southern edge of the roadway would remain the same and the northern edge of the roadway will move by 24 feet. The center turn lane will be eliminated and a traffic separator will be placed in the roadway to restrict left turn movements.

The PD&E Preliminary Engineering Report discusses in more detail the changes in access management along Saxon Boulevard. Additional right-of-way will be needed on the north and south sides of the roadway to accommodate the additional roadway width to the north and the additional pond sites on both the north and south sides of the roadway.

Alternative 4 is similar to Alternative 3 except that the widening of Saxon Boulevard would occur on both sides of the roadway. One additional lane would be added to each side of the roadway and proposed ponds will be located along both sides of the roadway. The alignment of Saxon Boulevard would remain unchanged. Additional right-of-way will be needed on the north and south sides of the roadway to accommodate the additional roadway width and proposed pond sites. Alternative 4 also incorporates the changes to the existing interchange as described in Alternative 1.

Alternative 5 is similar to Alternative 3 except that the widening of the roadway would occur on the south side of the roadway. The original northern edge of the roadway would remain the same and the southern edge of the roadway will move by 24 feet, while the ponds will be added to the southern side of the roadway. Additional right-of-way will be needed only on the south side of Saxon Boulevard to accommodate the additional roadway width and proposed pond sites. Alternatives 3, 4, and 5 will maintain the existing pedestrian access along both sides of the roadway.

Alternative 6 is similar to Alternative 5 with the widening of the roadway occurring on the south side of the road. The existing loop ramps and outer connector ramps in the northwest and southwest quadrants will remain providing connections to and from the I-4 westbound general use lanes. The existing single-lane eastbound off ramp in the southeast quadrant and I-4 eastbound loop off ramp in the northeast quadrant will be modified due to proposed ponds in both quadrants. Both eastbound ramps are single-lane off ramps that will flare to two lanes and align at a single signalized intersection with Saxon Boulevard. The free-flow right turn from the I-4 eastbound loop ramp will be eliminated. Additional right-of-way will be needed in the southeast quadrant for the new off ramp and floodplain compensation pond, along the south side of Saxon Boulevard to accommodate the additional roadway width and along the north side for proposed ponds. Alternatives 3, 4, 5 and 6 will also maintain the existing pedestrian access along both sides of the roadway.

The build alternative identified in the original PD&E study/FEIS (*I-4 PD&E Study – Section 2, Final Environmental Impact Statement FEIS, August 2002*) for the Saxon Boulevard interchange proposed maintaining the existing full access partial cloverleaf interchange concept with minor ramp gore modifications and reconstruction to consolidate the two I-4 eastbound exit ramps to a single off-ramp.

Six alternatives were considered for the Saxon Boulevard interchange traffic operations evaluation:

- Alternative 1 – No-Build
- Alternative 2 – Single Point Diamond Interchange
- Alternative 3 – Saxon Boulevard six lane Widening (Left alignment)
- Alternative 4 – Saxon Boulevard six lane Widening (Center alignment)
- Alternative 5 – Saxon Boulevard six lane Widening (Right alignment)
- Alternative 6 – Saxon Boulevard six lane Widening (Right alignment w/I4 EB off-ramps to Saxon Boulevard aligned)

Alternative 3, 4 and 5 are geometric variations of the same alternative; therefore, for the purpose of operational analysis, these alternatives were treated as one.

Peak-hour intersection analysis was conducted for the PM peak hour as this dictates operational conditions at the interchange. Intersection Delay and LOS was determined for the Saxon Boulevard interchange and adjacent intersections for the analysis year 2040. Based on the operational analyses, Alternatives 3, 4, 5 and 6 perform better than the No-Build Alternative. However, Alternative 6 provides additional safety benefits, as it brings ramp movements from I-4 to east and west of Saxon Boulevard to a signal control and ultimately avoids weaving between I-4 eastbound off-ramp to Saxon Boulevard westbound and Saxon Boulevard westbound to I-4 westbound on ramp movements. The results of the peak hour intersection operational analyses for Saxon Boulevard are summarized in **Table 22**.

Table 22 Average Delay and LOS – Saxon Boulevard Intersections

PM Peak Hour Analysis	Alt. 1		Alt. 2		Alt. 3/4/5		Alt. 6	
Saxon Boulevard Intersection with	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
Veterans Memorial Parkway	94.2	F	-	-	95.0	F	99.6	F
Park and Ride Lot	17.5	B	-	-	16.2	B	18.6	B
I-4 EB Ramps	7.1	A	271	F	6.8	A	19.1	B
Finland Drive	125.1	F	-	-	27.9	C	28.9	C
Normandy Boulevard	92.7	F	-	-	39.4	D	40.2	D

6.2.6. Rhode Island Avenue

An extension to Rhode Island Avenue is being proposed as part of the SR 400 (I-4) PD&E reevaluation project. The limits of improvement are from the existing east terminus of Rhode Island Avenue at Veterans Memorial Parkway in Orange City, extending eastward approximately 1¼ miles to Normandy Boulevard in Deltona. The current proposed extension follows the same alignment proposed in plans that were previously completed by Volusia County in 2009. The County has purchased right-of-way for the previously proposed alignment; any additional parcels will be acquired under the I-4 Beyond the Ultimate project. The proposed Rhode Island Avenue typical section consists of a four-lane urban roadway divided by a 22-foot landscape median, with two 12-foot travel lanes and a 4-foot bike lane in each direction. Eight-foot wide sidewalks, which will be separated from the bike lane by a landscape buffer, will be provided on both sides of the roadway. The Rhode Island Avenue extension and

interchange improvements are intended to increase connectivity in this region by providing access between I-4 and US 17-92 (S. Volusia Avenue) to the west and Normandy Boulevard to the east.

A direct connect interchange is proposed at I-4 which will provide direct access from the I-4 eastbound express lanes to Rhode Island Avenue and from Rhode Island Avenue to the I-4 westbound express lanes. Direct access to the express lanes will be provided from a single intersection on the Rhode Island Avenue Bridge. A single lane off-ramp will connect the I-4 eastbound express lanes to Rhode Island Avenue and a single lane on-ramp will provide direct access from Rhode Island Avenue to the I-4 westbound express lanes. A new park and ride facility will be added along Normandy Boulevard to the south of Rhode Island Avenue. To date, Volusia County has purchased 74% of the parcels required to accommodate the future roadway and interchange. The remaining 26% of the parcels still need to be purchased in order to build the roadway. Additional right-of-way will also need to be purchased along Normandy Boulevard to accommodate the additional lanes needed for turning movements.

6.2.7. SR 472

Five interchange concepts were evaluated for the SR 472 interchange. Alternative 1 is a partial cloverleaf interchange with loop ramps in the northwest and southeast quadrants. The existing single lane I-4 eastbound off-ramp will continue to connect from the I-4 general use lanes to SR 472. The existing single lane loop on-ramp will continue to connect eastbound SR 472 to the I-4 eastbound general use lanes. The existing single lane on-ramp will continue to connect westbound SR 472 to the I-4 eastbound general use lanes. A new single lane off-ramp will be constructed to provide access from the I-4 westbound general use lanes to SR 472. A new single lane loop on-ramp will be constructed to provide access from westbound SR 472 to the I-4 westbound general use lanes. A new single lane ramp will be constructed to provide access from SR 472 eastbound to the I-4 westbound general use lanes. Pedestrian access will be maintained along the northern side of SR 472 and an additional sidewalk will be added to the south side of the eastbound bridge. Additional right-of-way will need to be purchased in order to construct the new loop on-ramp and the new off-ramp to/from the I-4 westbound general use lanes. Additional right-of-way will also be needed to build the new on-ramp from westbound SR 472 to the I-4 eastbound general use lanes.

Alternative 2 involves changing the configuration of the interchange to a SPDI which incorporates all of the ramp movements into a single intersection. This results in a larger structure to accommodate the interchange but reduces the number of signalized intersections for the interchange. The SPDI will eliminate the two signalized intersections on SR 472 and consolidate them into a single intersection on a newly constructed SR 472 bridge over I-4. A new 2-lane off-ramp and a new single lane on-ramp will be constructed at the I-4 eastbound general use lanes. A new 2-lane off-ramp and a new single lane on-ramp will be constructed at the I-4 westbound general use lanes. The roadway along SR 472 will be modified to allow for new turn lanes onto the ramps and the existing two bridges will be removed and replaced with a single bridge. Pedestrian access will be maintained along the north side of SR 472 only. Additional right-of-way will need to be purchased in order to construct the new on-ramp from SR 472 to the general use lanes and the new off-ramp from the I-4 westbound general use lanes to SR 472.

Alternative 3 leaves the interchange as it is but adds a second left turn lane along SR 472 for westbound traffic turning onto the on-ramp to the I-4 westbound general use lanes. The existing single

lane off-ramp from I-4 eastbound to SR 472 will continue to connect to the general use lanes. The existing single lane loop on-ramp from SR 472 eastbound to I-4 eastbound will continue to connect to the general use lanes. The existing single lane on-ramp from SR 472 westbound to I-4 eastbound will continue to connect to the general use lanes. The existing single lane off-ramp from I-4 westbound to SR 472 will continue to connect to the general use lanes. The existing single lane on-ramp from SR 472 eastbound to I-4 westbound will continue to connect to the general use lanes. Additional right-of-way will need to be purchased in order to construct this alternative. The additional right-of-way is required to accommodate the on-ramp from westbound SR 472 to the I-4 eastbound general use lanes and for the off-ramp from the I-4 westbound general use lanes to SR 472.

Alternative 4 is a SPDI similar to Alternative 2 but incorporates dedicated U-turn lanes along SR 472. The existing left turn and through movements are proposed to be eliminated from northbound Kentucky Avenue at SR 472 and southbound Graves Avenue at SR 472. In order to better accommodate the heavier volumes at these intersections, the left turn and through movement phases have been removed from the signal cycles resulting in more green time for the other heavier movements. Northbound traffic from Kentucky Avenue will be restricted to right turn only onto eastbound SR 472 and southbound traffic from Graves Avenue will be restricted to right turn only onto westbound SR 472. The U-turn lanes are proposed along SR 472 to accommodate the left/through movements eliminated from the signals; the U-turn traffic will be yield-controlled. An additional southbound auxiliary lane will be added along SR 472 from the interchange to Graves Avenue. Additional right-of-way will be required for this interchange.

Alternative 5 is a diverging diamond interchange (DDI). A DDI is designed so that each direction of the crossing roadway traffic is split and then crosses over itself. The traffic will temporarily drive on the left hand side of the roadway and then cross back over on the other side of the interchange. In order to avoid wrong way movements through this type of interchange, the opposite directions of the roadway are intersected at an angle that is large enough to appear to the driver as if they are making a through movement and that the other side of the roadway is an intersecting street. This design changes the terminals of the interchange from three phase cycles to two phase cycles as the left turn movements from the roadway are now free flow movements. For this interchange, the I-4 off-ramp movements are signalized due to high volumes and short weaving distance available. The right turn movements onto I-4 are also signal controlled due to the high volume of left hand movements and short merging distances available. Bike lanes have been provided along SR 472 through the interchange. Improvements to the Kentucky Avenue and Graves Avenue intersections with SR 472 are also incorporated into this alternative. The improvements to the intersections are in the form of additional turn lanes and additional through lanes at the intersections to improve traffic flow. Dual left turn lanes as well as two through lanes will be provided for all legs of the SR 472 and Kentucky Avenue intersection. A right turn lane will be added, providing dual right lanes from northbound Kentucky Avenue onto eastbound SR 472. A dedicated right turn lane will be added at eastbound SR 472 to southbound Graves Avenue and an additional left turn lane, resulting in dual left lanes, will be provided for westbound SR 472 to southbound Graves Avenue traffic. Additional right-of-way will be required along Graves Avenue, Kentucky Avenue, SR 472 and along I-4 for this interchange concept.

The build alternative identified in the original PD&E study/FEIS (*I-4 PD&E Study – Section 2, Final Environmental Impact Statement FEIS, August 2002*) for the SR 472 Boulevard interchange proposed maintaining the existing interchange concept with minor modifications to the ramp gore areas on I-4 and addition of dual left turn lanes for the SR 472 westbound to I-4 westbound entrance ramp.

Six alternatives were considered for the SR 472 interchange traffic operations evaluation:

- No-Build Alternative
- Alternative 1 – Loop Ramp
- Alternative 2 – Single Point Diamond Interchange (SPDI)
- Alternative 3 – Westbound Double Left Turns
- Alternative 4 – Single Point Diamond Interchange (SPDI) with U-turns
- Alternative 5 – Diverging Diamond Interchange (DDI)

Peak hour operational analysis using VISSIM (ver. 5.4) microsimulation software was completed along the SR 472 corridor. The results of the No-Build operational analysis indicated that the interchange was failing at the adjacent intersections beyond the ramp terminals, therefore Alternatives 1 and 3, which do not significantly alter geometry at the interchange, were removed from further consideration. Additionally, FDOT has indicated a preference to avoid U-turns on State roads; therefore Alternative 4 was also dismissed. Interchange operations analyses for Alternatives 2 and 5, in addition to the No-Build Alternative was completed; the results are summarized in **Table 23**. Based on the results of the traffic operational analyses, both the SPDI and DDI interchange alternatives provide improved performance over the No-Build alternative, with the DDI providing enhanced operations during the AM Peak Hour.

Table 23 Average Delay and LOS – SR 472 Intersections

SR 472 Intersection with	No-Build		Alt. 2		Alt. 5	
	Delay	LOS	Delay	LOS	Delay	LOS
AM Peak Hour						
MLK Jr. Beltway/N. Kentucky Ave.	173.1	F	46.3	D	39.3	D
I-4 WB Ramps	36.4	D	29.9	C	16.0	B
I-4 EB Ramps	15.4	B	29.9	C	16.8	B
Graves Avenue	82.8	F	35.6	D	35.2	D
PM Peak Hour						
MLK Jr. Beltway/N. Kentucky Ave.	284.6	F	42.9	D	39.9	D
I-4 WB Ramps	168.0	D	31.6	C	23.3	C
I-4 EB Ramps	158.5	B	31.6	C	21.7	C
Graves Avenue	61.8	F	39.5	D	36.9	D

7. FUTURE CONDITIONS OPERATIONS ANALYSIS – NORTH SECTION

This section documents the future conditions operations analysis along the I-4 corridor's North Section and compares operations of the Modified Build alternative against the Original Build alternative.

7.1. Analysis Approach

As previously discussed in Section 3.4.2, Highway Capacity Analysis was conducted for the interim analysis years 2020 and 2030. For comparison purposes, Highway Capacity Analysis was also conducted for the design year 2040. Per the MLOU, microsimulation analysis (VISSIM) was conducted for the design year (2040). The future conditions analyses utilized the forecast volumes presented in Section 5.

7.2. Highway Capacity Analysis

Basic freeway segments, ramp merge and diverge areas, and weaving sections were analyzed utilizing HCS 2010. Intersections within the study area were analyzed using Synchro 8, implementing the procedures of HCM 2010. The results of the analyses are illustrated in **Figure 24** through **Figure 29**, and detailed tables and analysis output are provided in **Appendix I**.

7.2.1. Basic Freeway Analysis

Basic freeway segments include the portions of freeway where flow is not influenced by the diverging, merging, or weaving associated with ramp/freeway connections. Basic freeway segments have been analyzed for the Original Build Alternative and Modified Build Alternative utilizing the HCS 2010 freeway module. Due to limitations of HCS 2010 software to analyze basic freeway segments less than two lanes, equations and exhibits from HCM 2010 Chapter 11 were used to analyze the Original Build HOV facility. The Modified Build improves freeway operations compared to the Original Build, with all freeway segments in the North Section operating at LOS D or better through 2040. The express lanes are expected to operate at LOS B or better through 2040.

7.2.2. Ramp Merge and Diverge Analysis

Ramp merge and diverge are defined as segments in which two or more traffic streams combine to form a single traffic stream (merge) or a single traffic stream divided to form two or more separate traffic streams (diverge). Ramp merge and diverge areas have been analyzed for Original Build Alternative and Modified Build Alternative utilizing the HCS 2010 ramp module. Due to limitations of HCS 2010 software to analyze ramp junctions with freeway segments having less than two lanes, the Original Build HOV ramp junctions were analyzed using equations and exhibits from Chapter 13 of the HCM 2010. The Modified Build improves freeway ramp merge and diverge operations compared to the Original Build, with all freeway ramps operating at LOS D or better through 2040. The express lane ramps are expected to operate at LOS B or better through 2040.

7.2.3. Weaving Analysis

Weaving segments are defined as the segments where two or more traffic streams traveling in the same direction cross paths without the aid of traffic control devices. All weaving segments have been analyzed for the Original Build Alternative and the Modified Build Alternative utilizing the HCS 2010 weaving module. The Modified Build reduces the number of weave sections (from seven to five) and

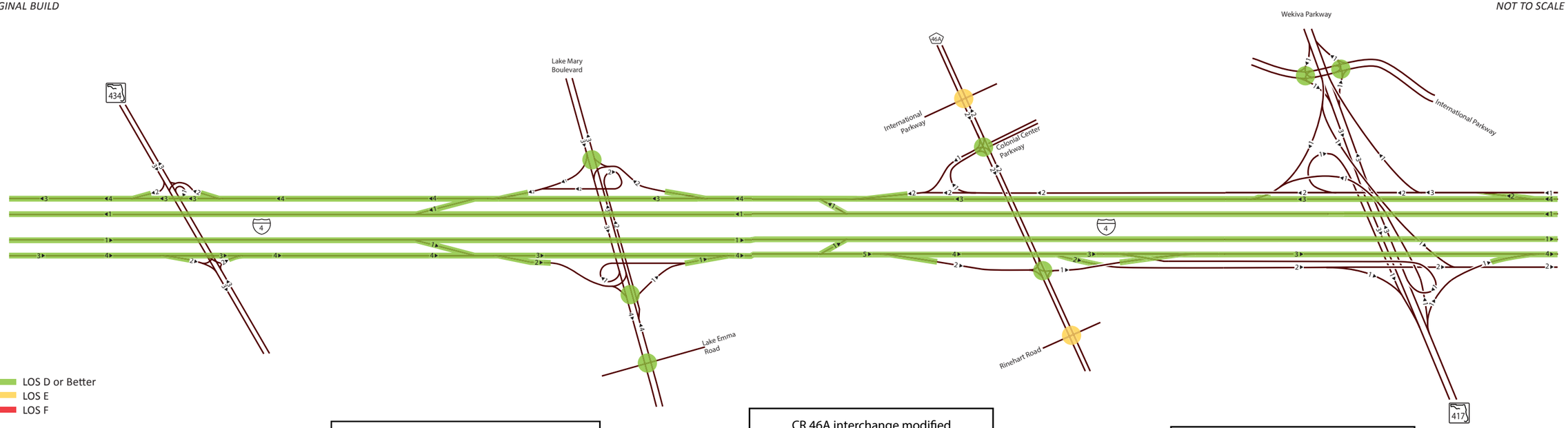
improves freeway weaving operations compared to the Original Build, with all weaving sections in the North section operating at LOS E or better through 2040.

7.2.4. Intersection Analysis

AM and PM peak hour intersection analyses were conducted for the Original and Modified Build Alternatives using Synchro 8. The Modified Build improves intersection operations compared to the Original Build, with all but one of the intersections in the North section operating at LOS E or better through 2040, and most operating at LOS D or better (27 of 34 intersections analyzed). The one exception is the new intersection at Veterans Memorial Parkway and Rhode Island Avenue, which is projected to operate at LOS F. The intersection is located approximately 5,500 feet from the express lane interchange ramps, and the queue is not project to exceed 800 feet. Therefore, operations at the signal will not impact freeway operations. This was also confirmed in the VISSIM analysis.

ORIGINAL BUILD

NOT TO SCALE

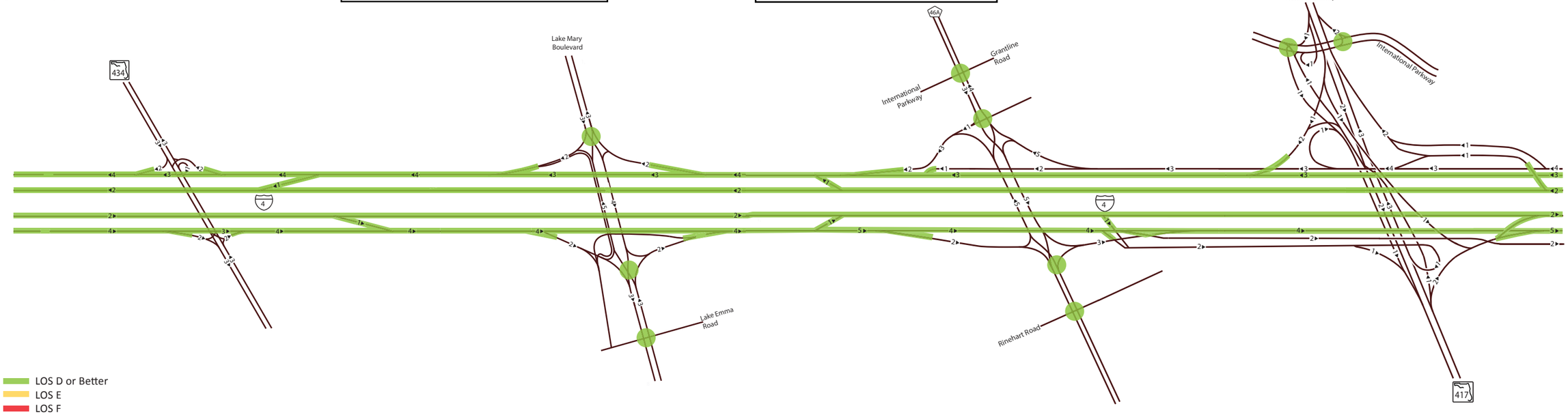


Lake Mary Blvd interchange modified to Diverging Diamond interchange with the addition of ramp access at Lake Emma Rd

CR 46A interchange modified to Diverging Diamond interchange with corridor and intersection improvements at Rinehart Rd

Express lane connections were added to the SR 417 interchange

MODIFIED BUILD



Date: 8.26.2016

I-4 SAMR Re-Evaluation

Figure 24 (1 of 3)
2020 AM Peak Hour Operations (North Section)

ORIGINAL BUILD

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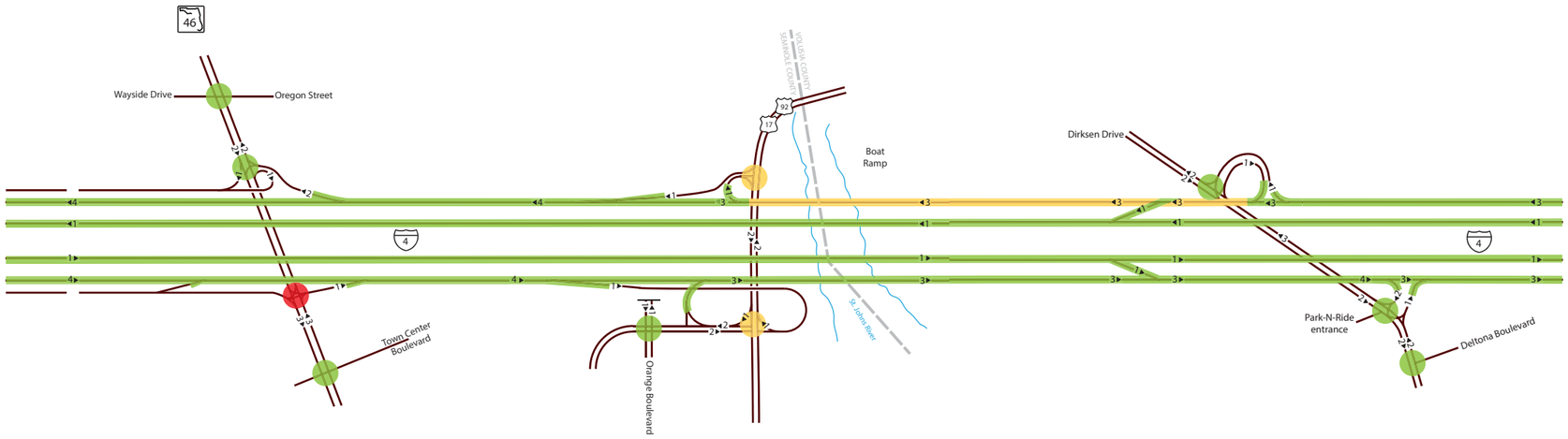
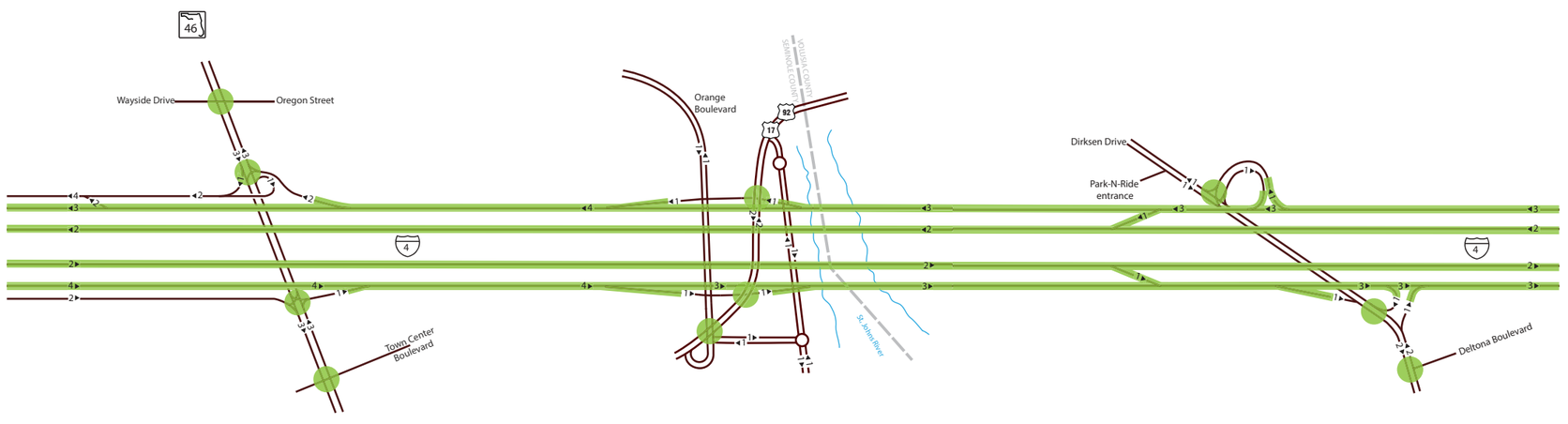


LOS D or Better
LOS E
LOS F

US 17-92 interchange modified to full access dimaond interchange

Dirksen Drive interchange modified to add an Eastbound-to-Eastbound ramp.

MODIFIED BUILD



LOS D or Better
LOS E
LOS F

Date: 8.26.2016

I-4 SAMR Re-Evaluation

Figure 24 (2 of 3)
2020 AM Peak Hour Operations (North Section)

ORIGINAL BUILD

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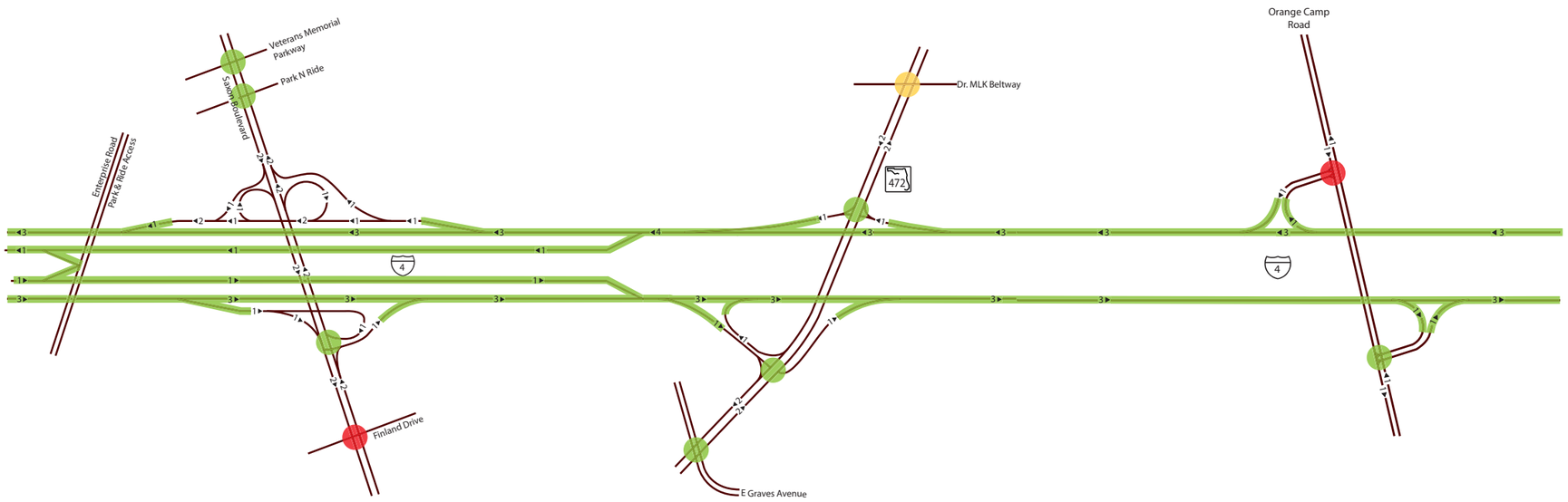


LOS D or Better
LOS E
LOS F

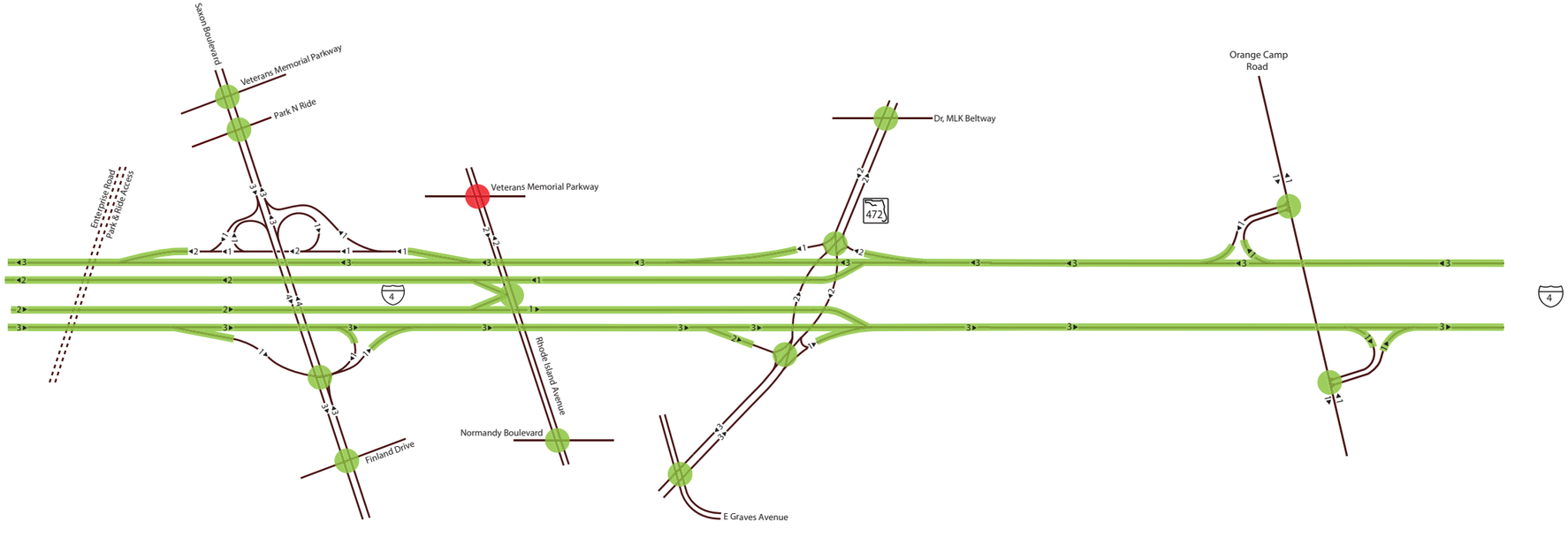
HOV access at Enterprise Rd replaced with Express Lane access to Rhode Island Ave

Saxon Blvd widened to six lanes through the interchange area

SR 472 interchange modified to Diverging Diamond interchange, with Express Lane access relocated east of SR 472

Orange Camp Rd ramp intersections were signalized in the modified build

MODIFIED BUILD



LOS D or Better
LOS E
LOS F

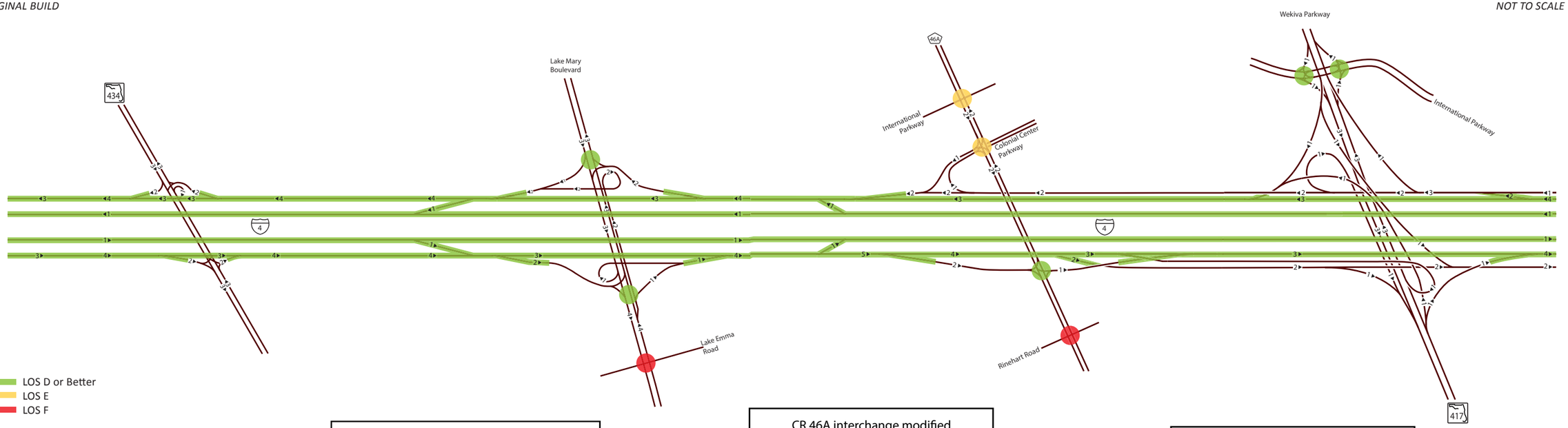
Date: 8.26.2016

I-4 SAMR Re-Evaluation

Figure 24 (3 of 3)
2020 AM Peak Hour Operations (North Section)

ORIGINAL BUILD

NOT TO SCALE



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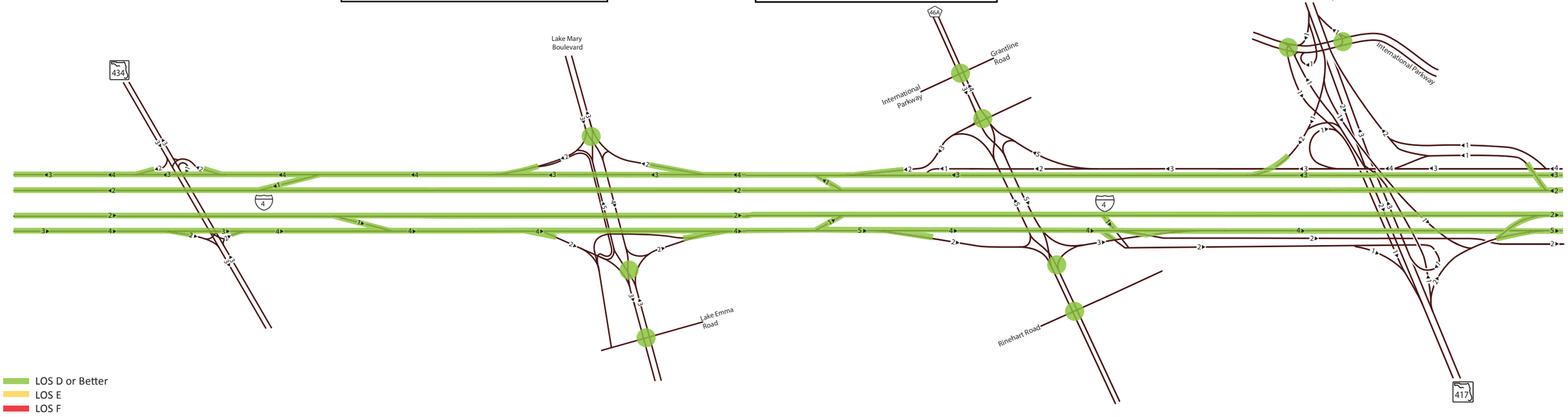
CR 46A interchange modified to Diverging Diamond interchange with corridor and intersection improvements at Rinehart Rd

Express lane connections were added to the SR 417 interchange

MODIFIED BUILD



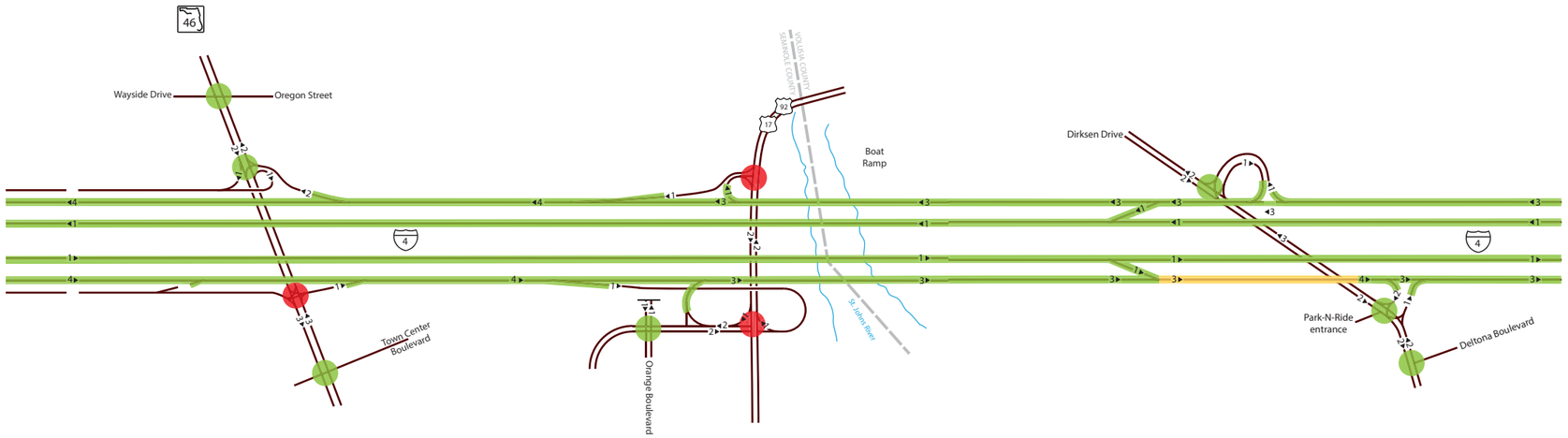
Date: 8.26.2016

I-4 SAMR Re-Evaluation

Figure 25 (1 of 3)
2020 PM Peak Hour Operations (North Section)

ORIGINAL BUILD

NOT TO SCALE

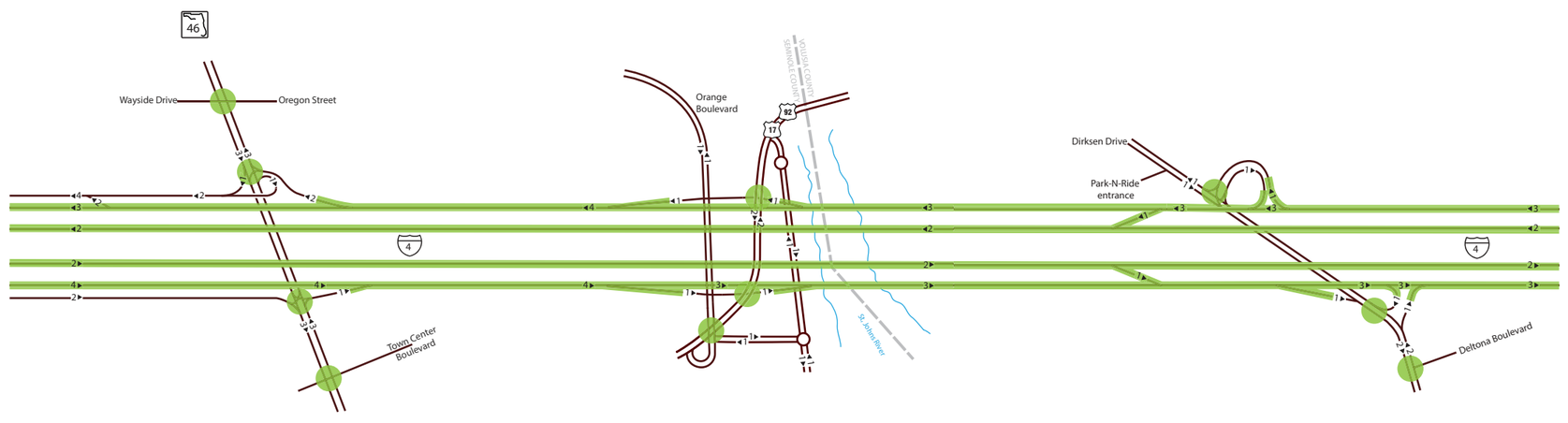


LOS D or Better
LOS E
LOS F

US 17-92 interchange modified to full access dimaond interchange

Dirksen Drive interchange modified to add an Eastbound-to-Eastbound ramp.

MODIFIED BUILD



LOS D or Better
LOS E
LOS F

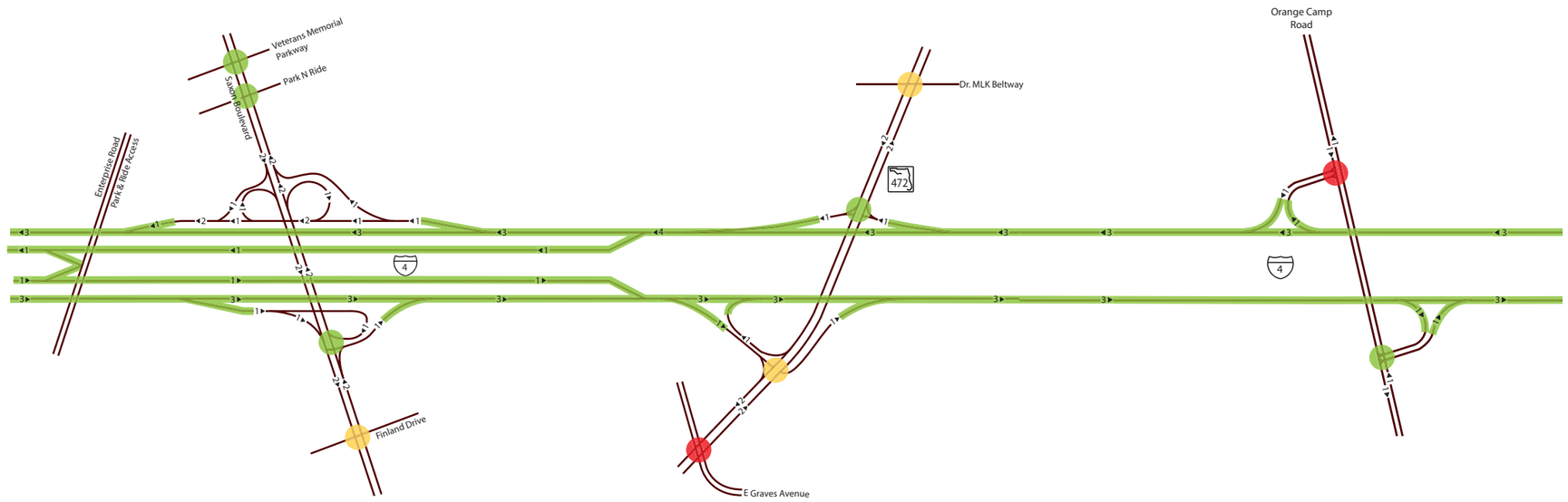
Date: 8.26.2016

I-4 SAMR Re-Evaluation

Figure 25 (2 of 3)
2020 PM Peak Hour Operations (North Section)

ORIGINAL BUILD

NOT TO SCALE



LOS D or Better
LOS E
LOS F

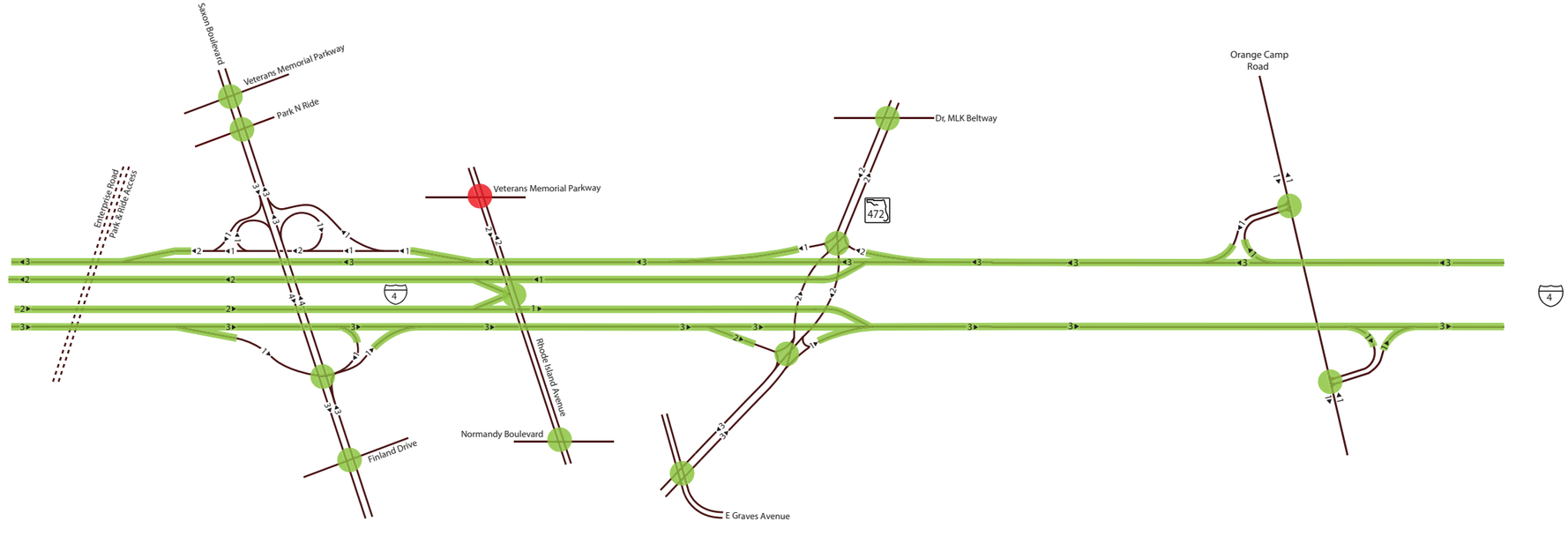
HOV access at Enterprise Rd replaced with Express Lane access to Rhode Island Ave

Saxon Blvd widened to six lanes through the interchange area

SR 472 interchange modified to Diverging Diamond interchange, with Express Lane access relocated east of SR 472

Orange Camp Rd ramp intersections were signalized in the modified build

MODIFIED BUILD



LOS D or Better
LOS E
LOS F

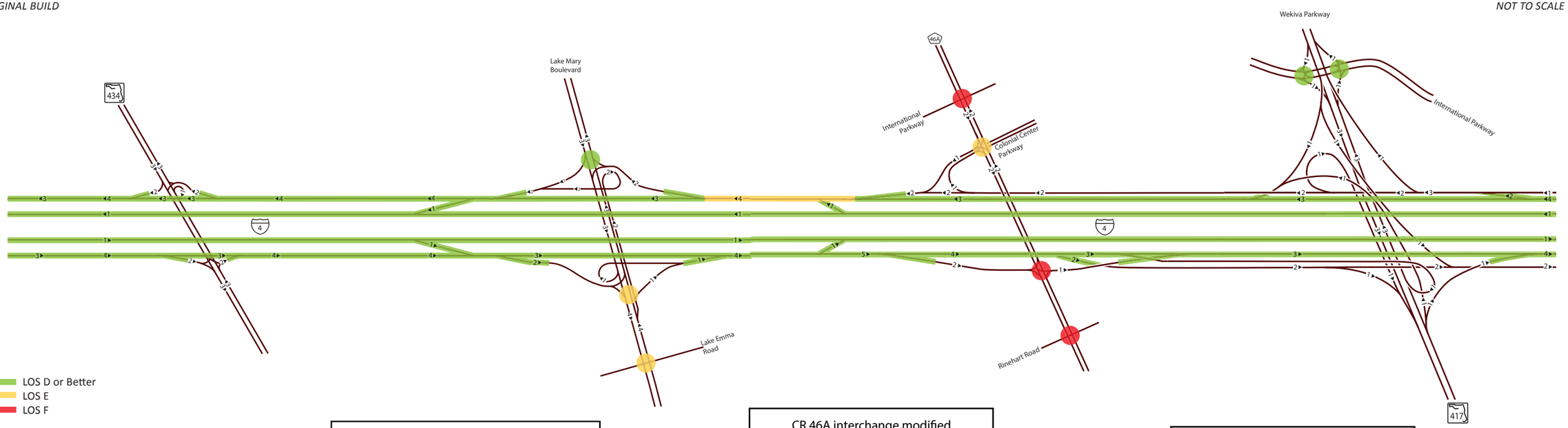
Date: 8.26.2016

I-4 SAMR Re-Evaluation

Figure 25 (3 of 3)
2020 PM Peak Hour Operations (North Section)

ORIGINAL BUILD

NOT TO SCALE



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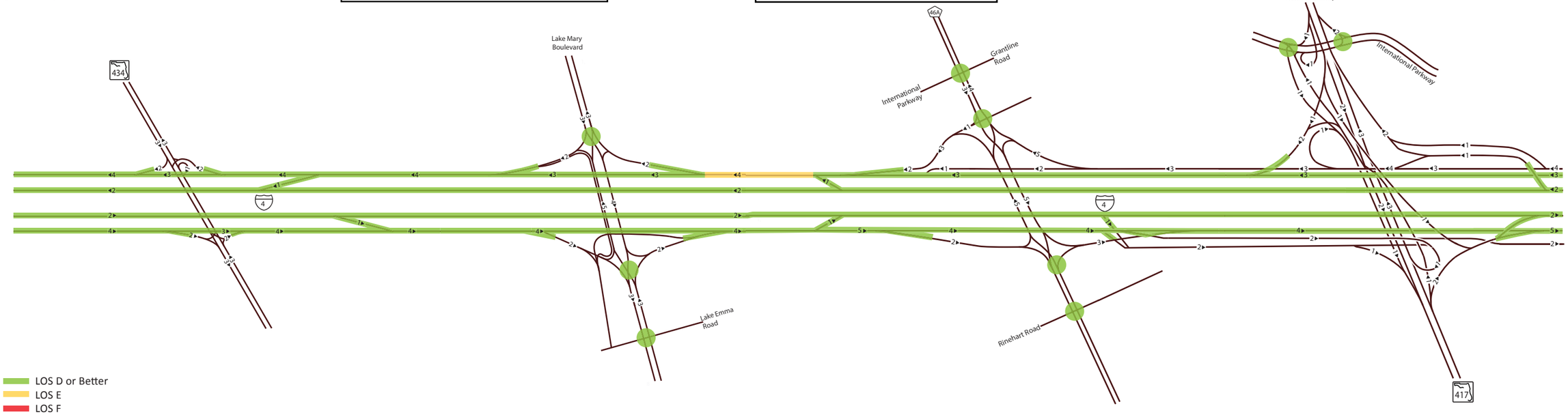
Express lane connections were added to the SR 417 interchange

MODIFIED BUILD



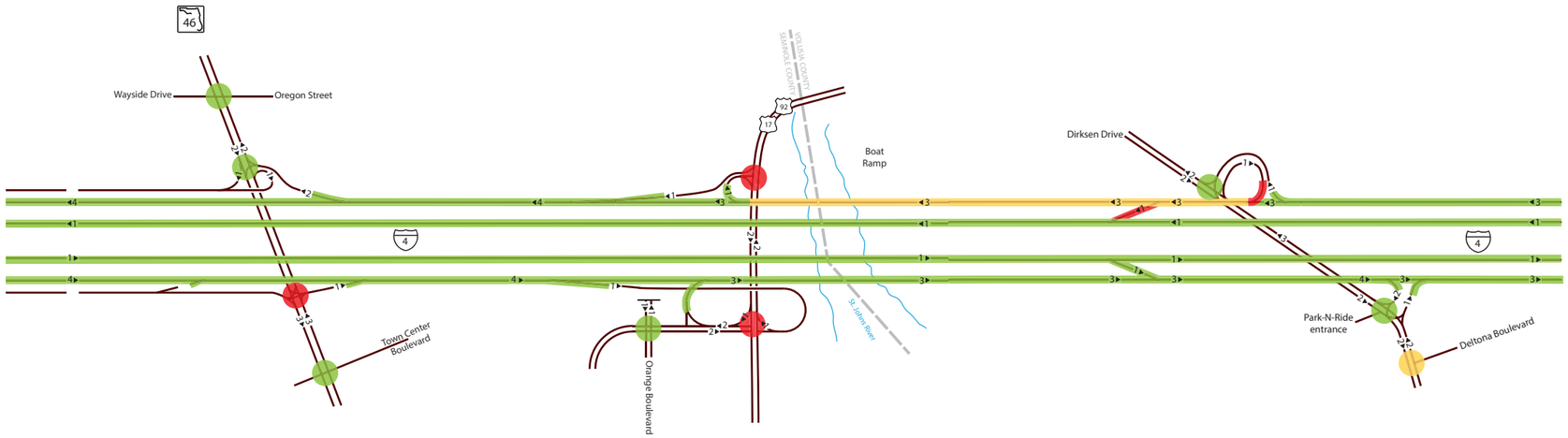
Date: 8.26.2016

I-4 SAMR Re-Evaluation

Figure 26 (1 of 3)
2030 AM Peak Hour Operations (North Section)

ORIGINAL BUILD

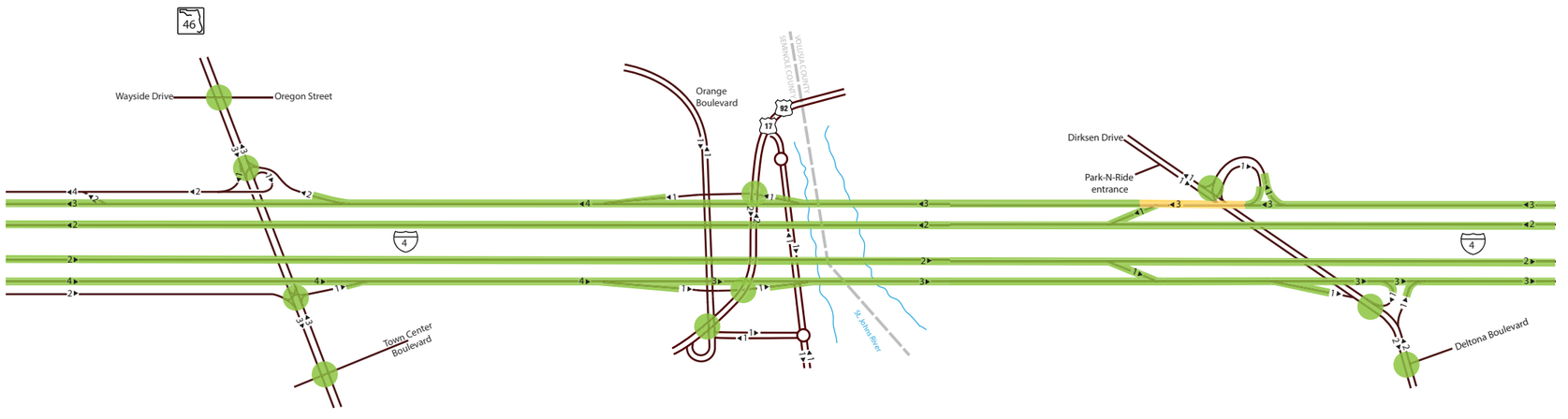
NOT TO SCALE



US 17-92 interchange modified to full access dimaond interchange

Dirksen Drive interchange modified to add an Eastbound-to-Eastbound ramp.

MODIFIED BUILD



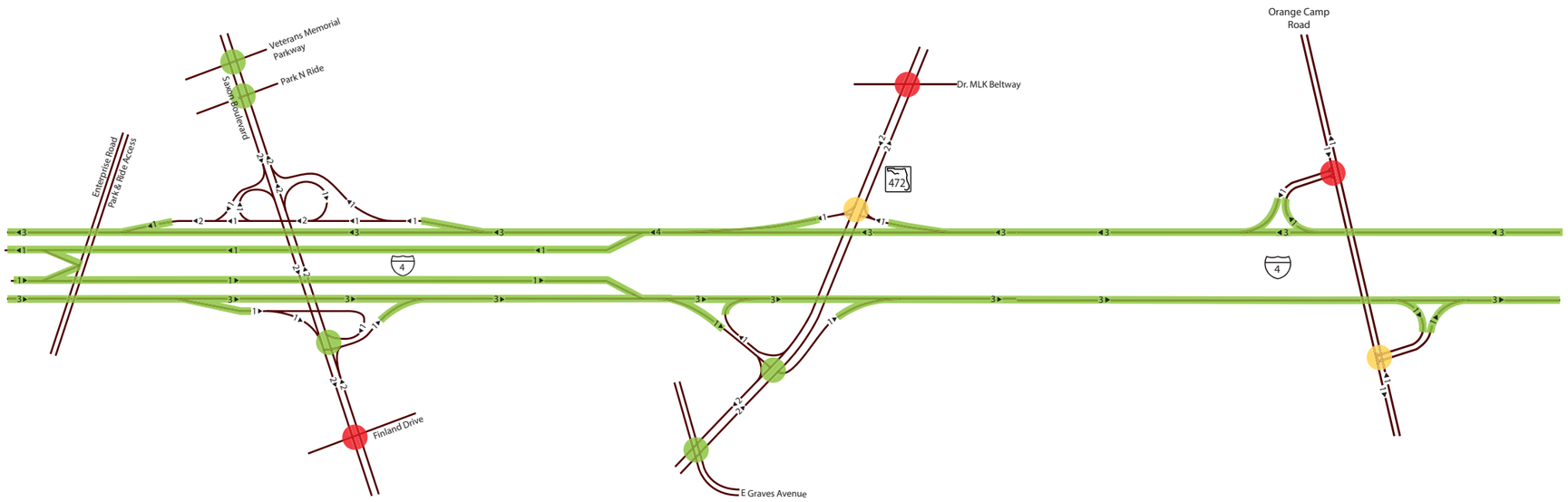
Date: 8.26.2016

I-4 SAMR Re-Evaluation

Figure 26 (2 of 3)
2030 AM Peak Hour Operations (North Section)

ORIGINAL BUILD

NOT TO SCALE



LOS D or Better
LOS E
LOS F

HOV access at Enterprise Rd replaced with Express Lane access to Rhode Island Ave

Saxon Blvd widened to six lanes through the interchange area

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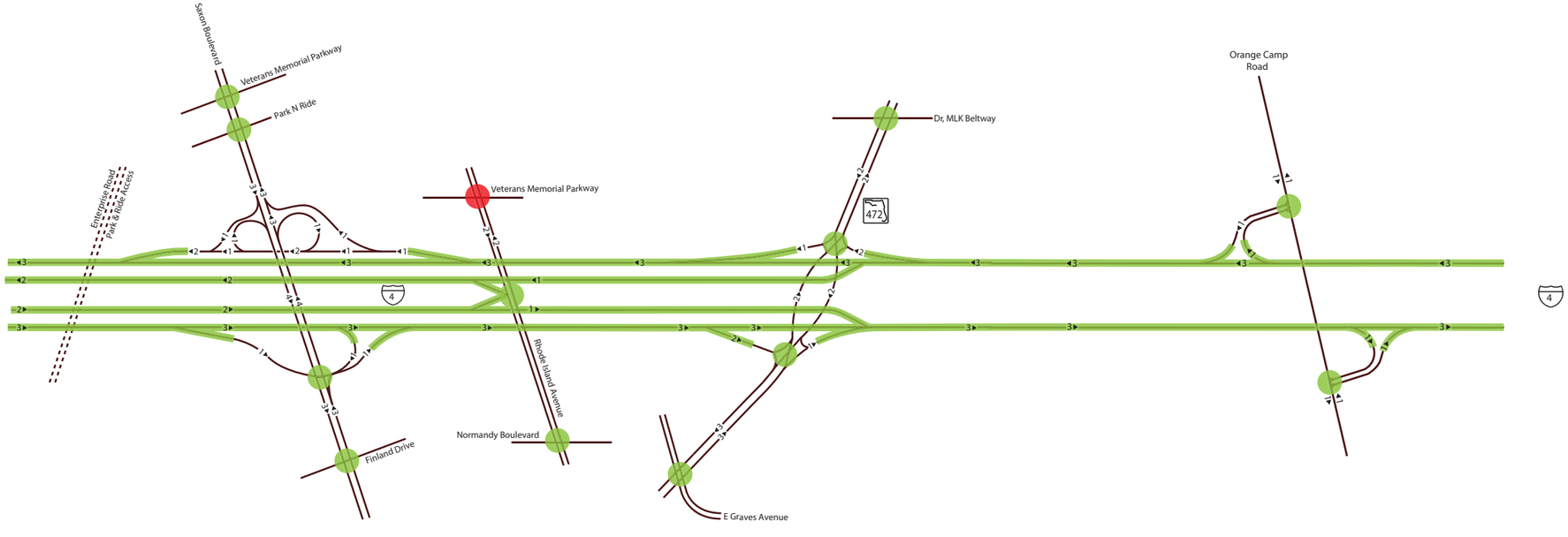
Orange Camp Rd ramp intersections were signalized in the modified build

MODIFIED BUILD



LOS D or Better
LOS E
LOS F

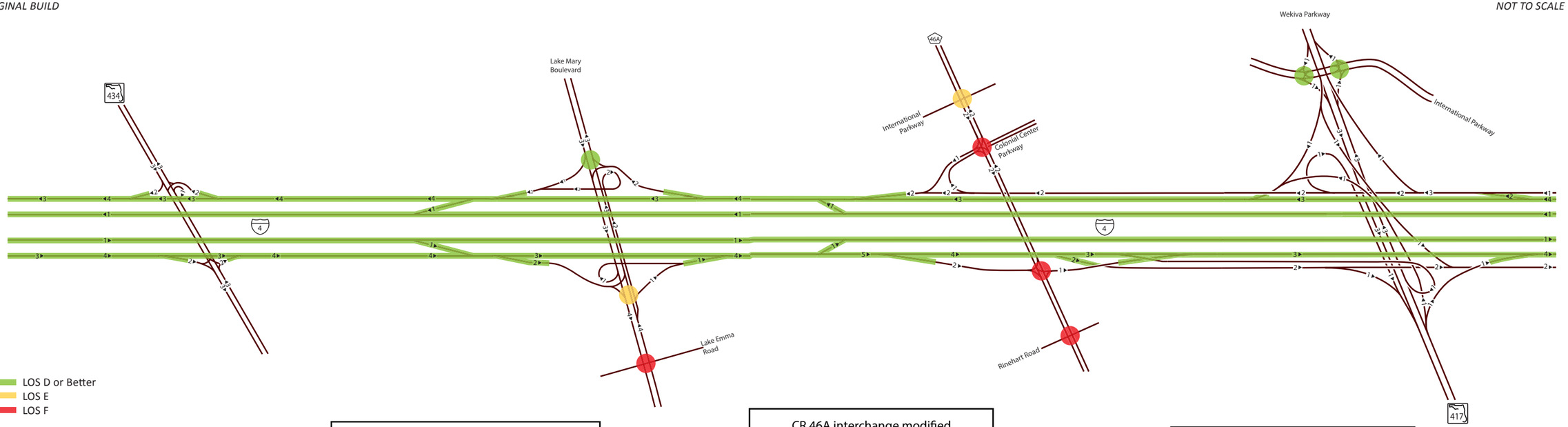
Date: 8.26.2016

I-4 SAMR Re-Evaluation

Figure 26 (3 of 3)
2030 AM Peak Hour Operations (North Section)

ORIGINAL BUILD

NOT TO SCALE



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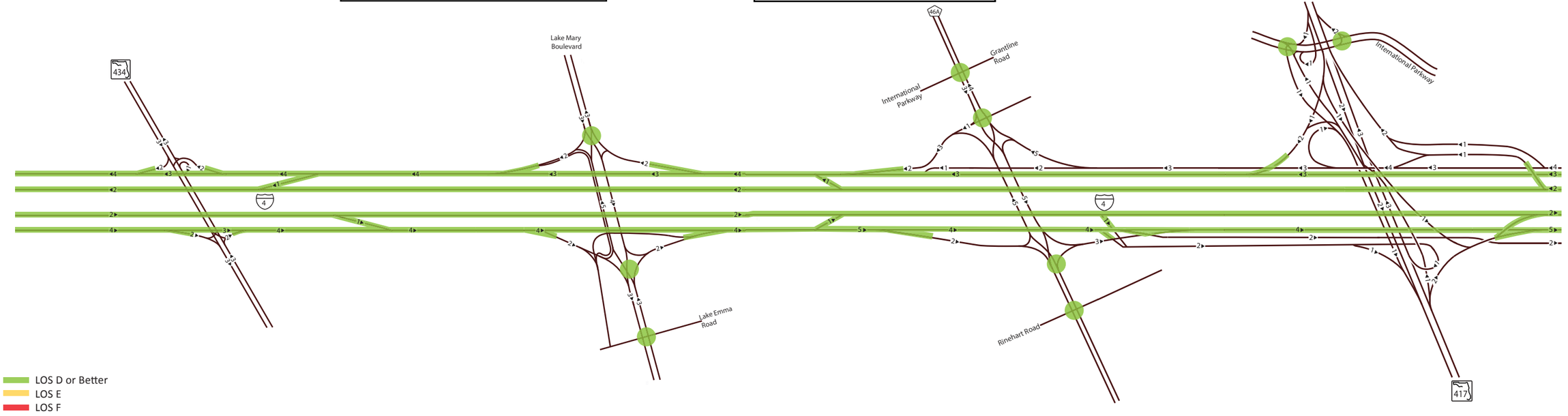
CR 46A interchange modified to Diverging Diamond interchange with corridor and intersection improvements at Rinehart Rd

Express lane connections were added to the SR 417 interchange

MODIFIED BUILD



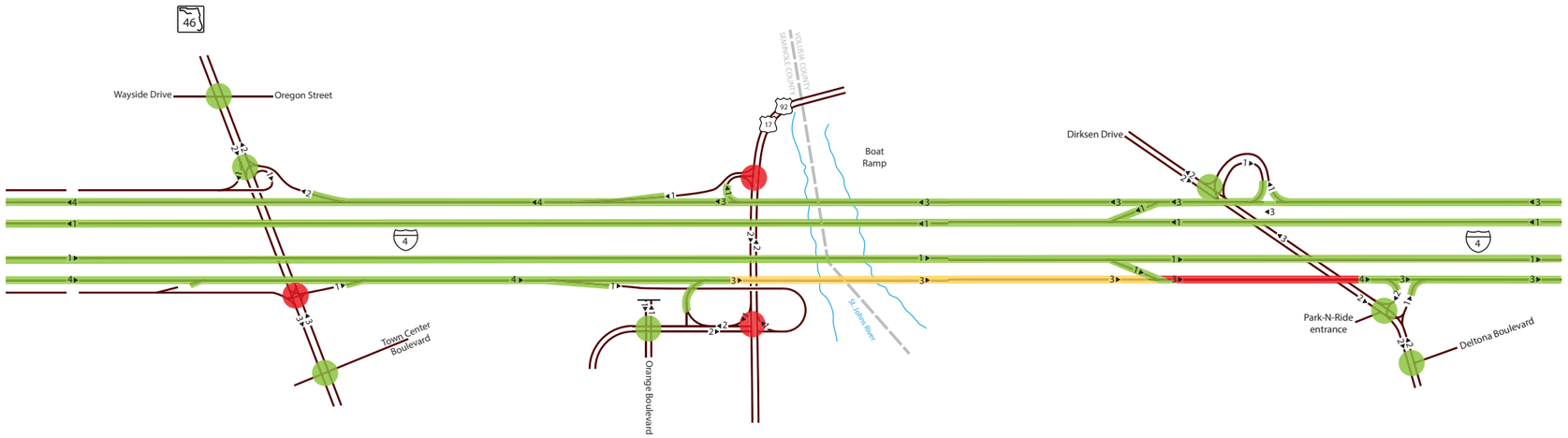
Date: 8.26.2016

I-4 SAMR Re-Evaluation

Figure 27 (1 of 3)
2030 PM Peak Hour Operations (North Section)

ORIGINAL BUILD

NOT TO SCALE

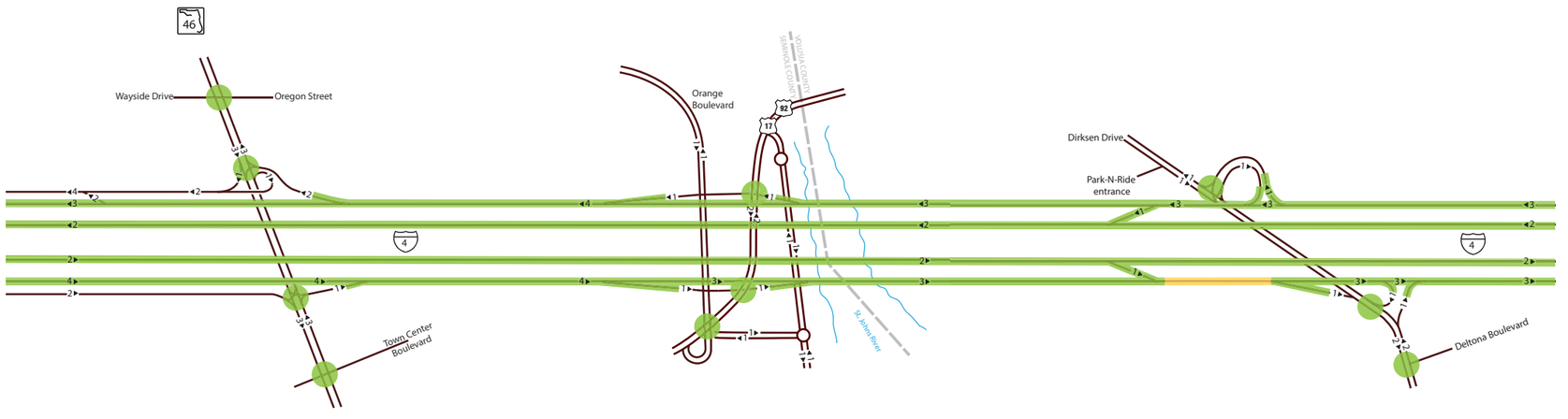


LOS D or Better
LOS E
LOS F

US 17-92 interchange modified to full access dimaond interchange

Dirksen Drive interchange modified to add an Eastbound-to-Eastbound ramp.

MODIFIED BUILD



LOS D or Better
LOS E
LOS F

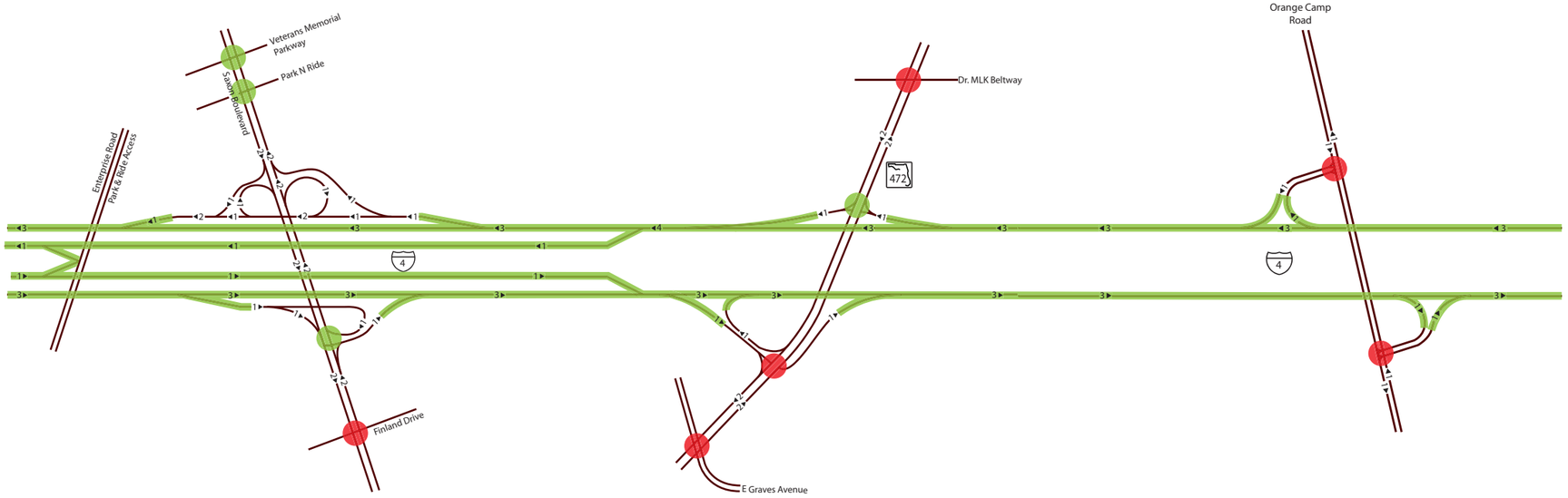
Date: 8.26.2016

I-4 SAMR Re-Evaluation

Figure 27 (2 of 3)
2030 PM Peak Hour Operations (North Section)

ORIGINAL BUILD

NOT TO SCALE



LOS D or Better
LOS E
LOS F

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Saxon Blvd widened to six lanes through the interchange area

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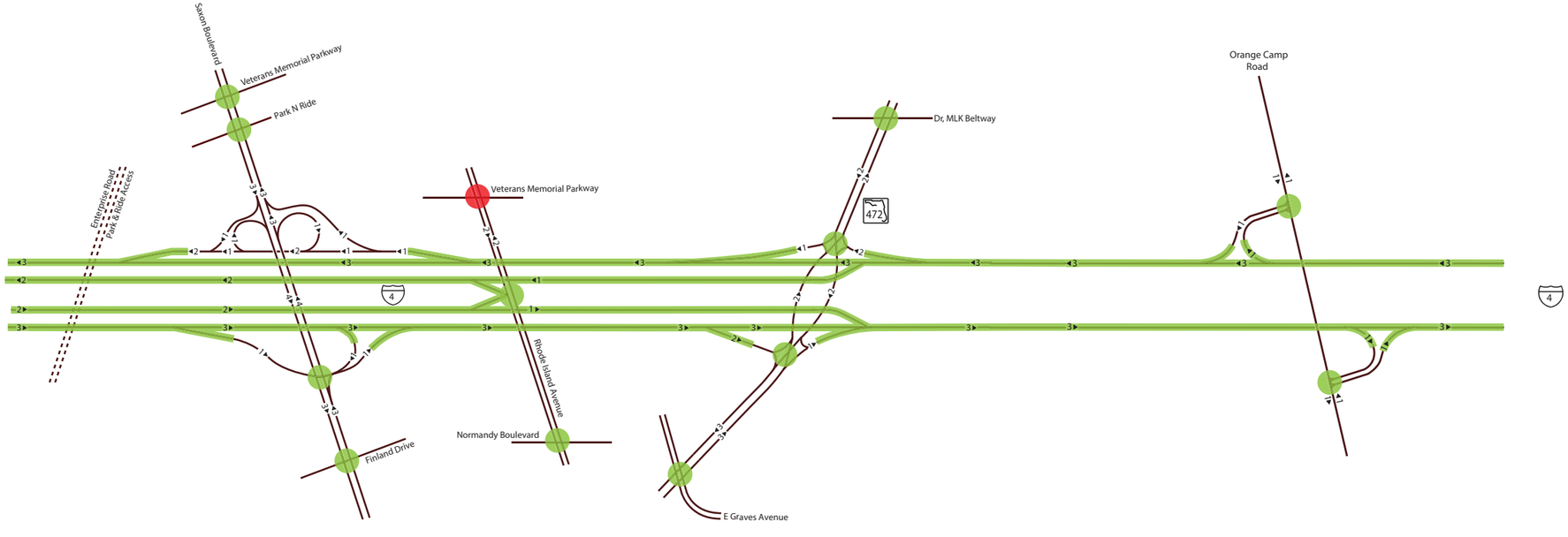
Orange Camp Rd ramp intersections were signalized in the modified build

MODIFIED BUILD



LOS D or Better
LOS E
LOS F

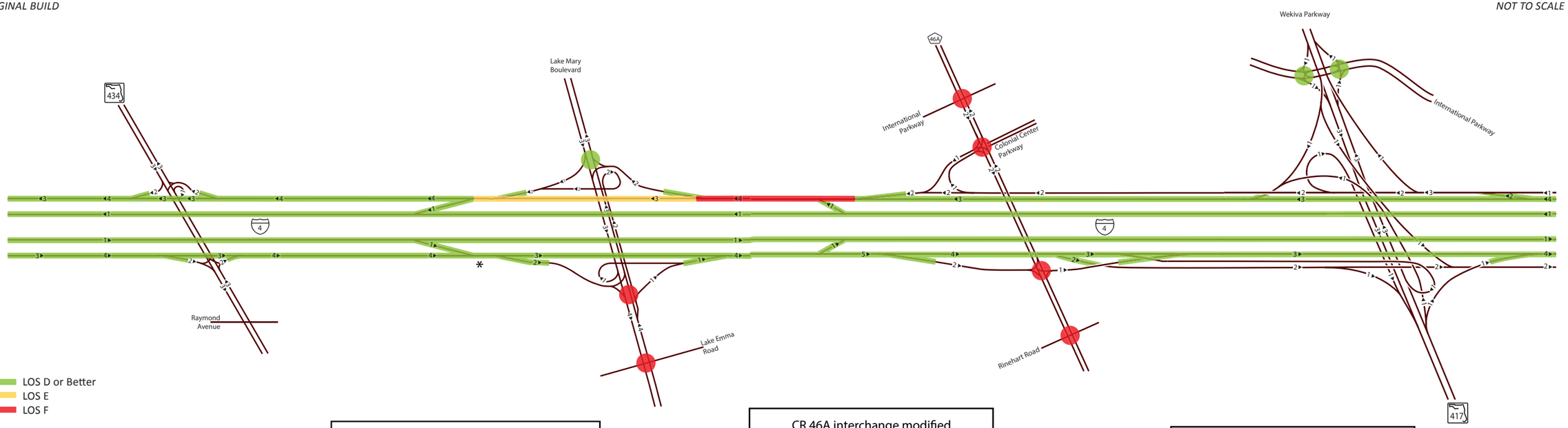
Date: 8.26.2016

I-4 SAMR Re-Evaluation

Figure 27 (3 of 3)
2030 PM Peak Hour Operations (North Section)

ORIGINAL BUILD

NOT TO SCALE



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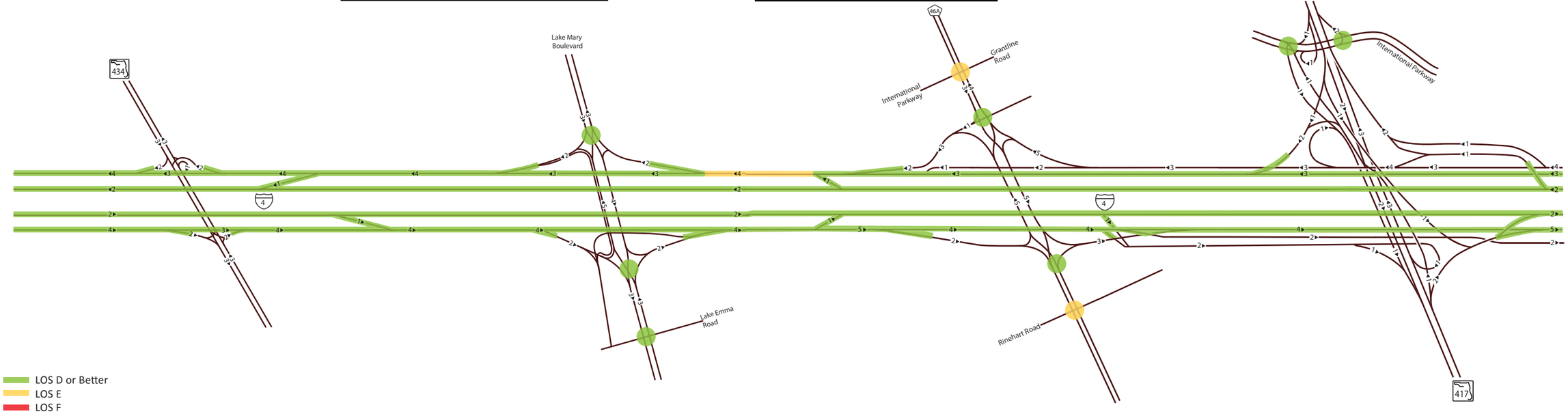
CR 46A interchange modified to Diverging Diamond interchange with corridor and intersection improvements at Rinehart Rd

Express lane connections were added to the SR 417 interchange

MODIFIED BUILD



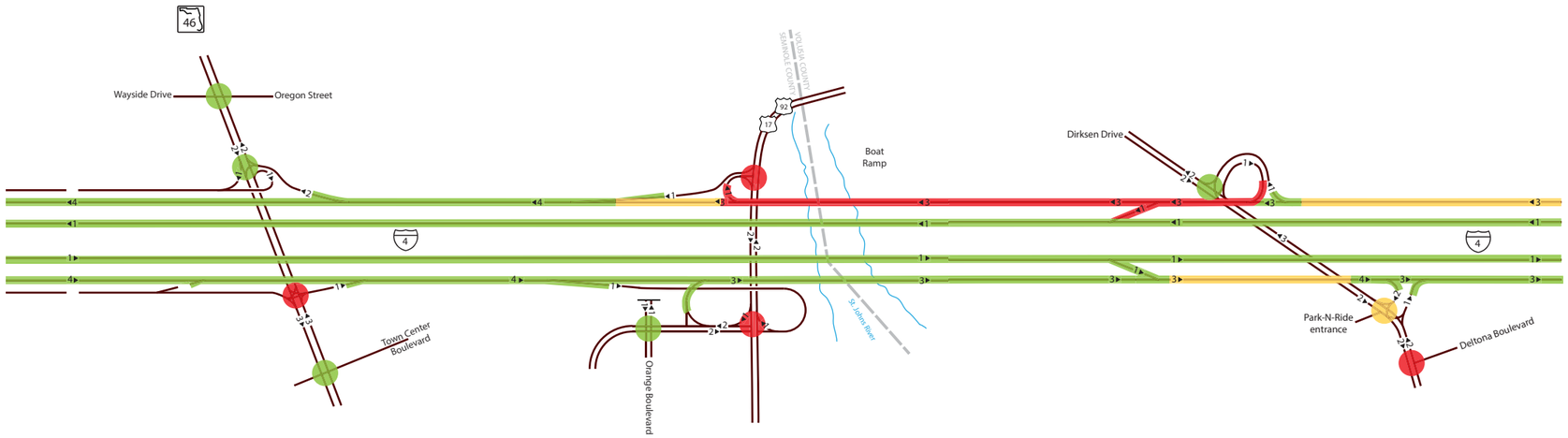
Date: 8.26.2016

I-4 SAMR Re-Evaluation

Figure 28 (1 of 3)
2040 AM Peak Hour Operations (North Section)

ORIGINAL BUILD

NOT TO SCALE

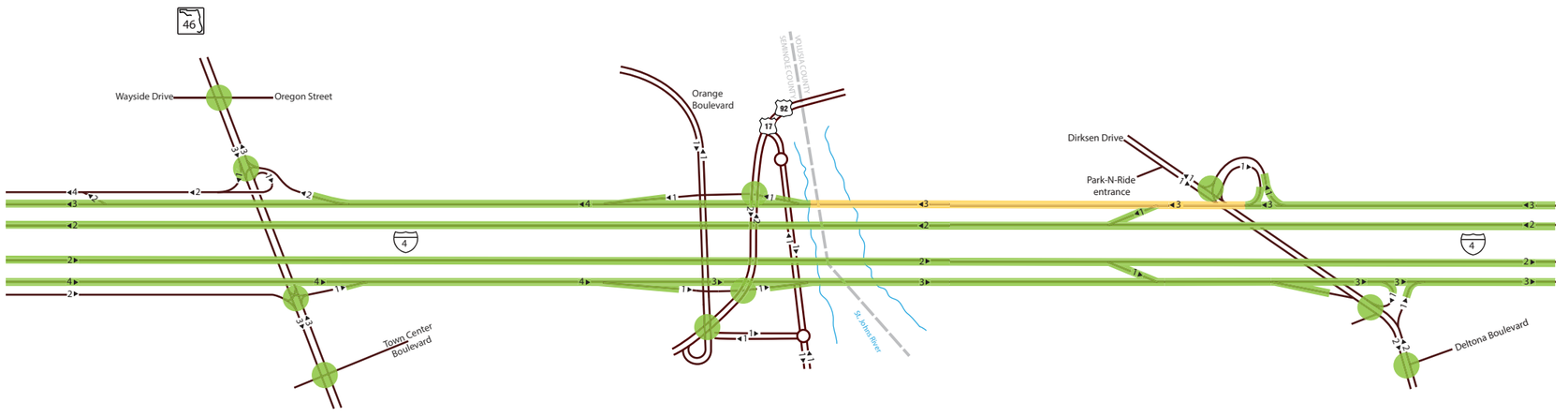


LOS D or Better
LOS E
LOS F

US 17-92 interchange modified to full access dimaond interchange

Dirksen Drive interchange modified to add an Eastbound-to-Eastbound ramp.

MODIFIED BUILD



LOS D or Better
LOS E
LOS F

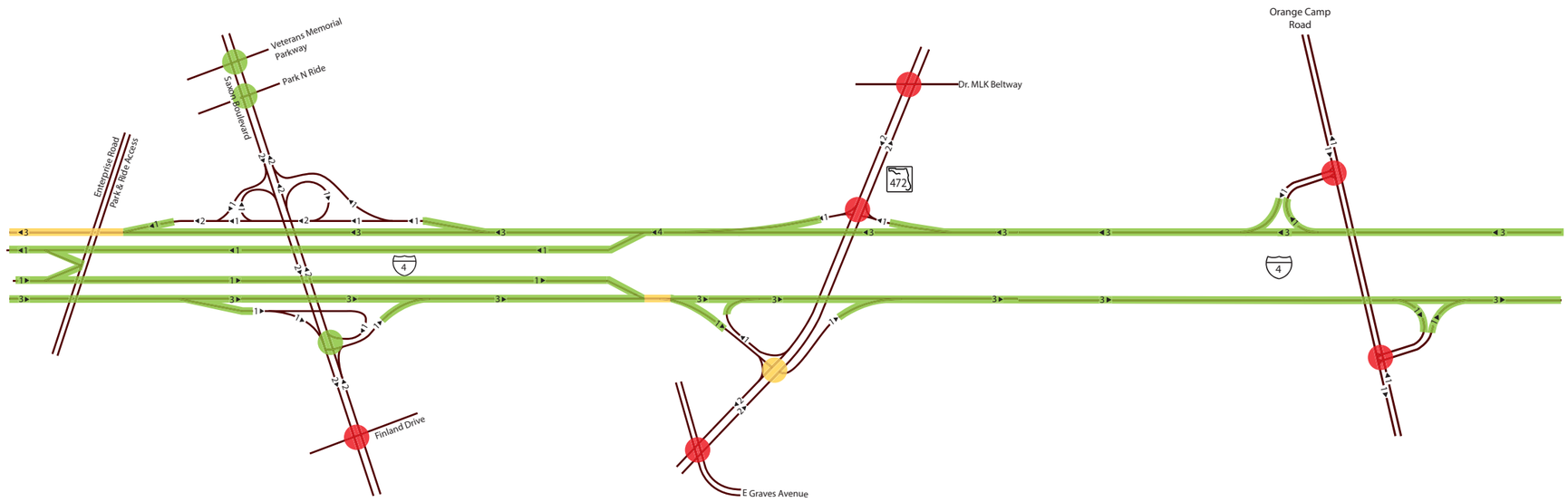
Date: 8.26.2016

I-4 SAMR Re-Evaluation

Figure 28 (2 of 3)
2040 AM Peak Hour Operations (North Section)

ORIGINAL BUILD

NOT TO SCALE



LOS D or Better
LOS E
LOS F

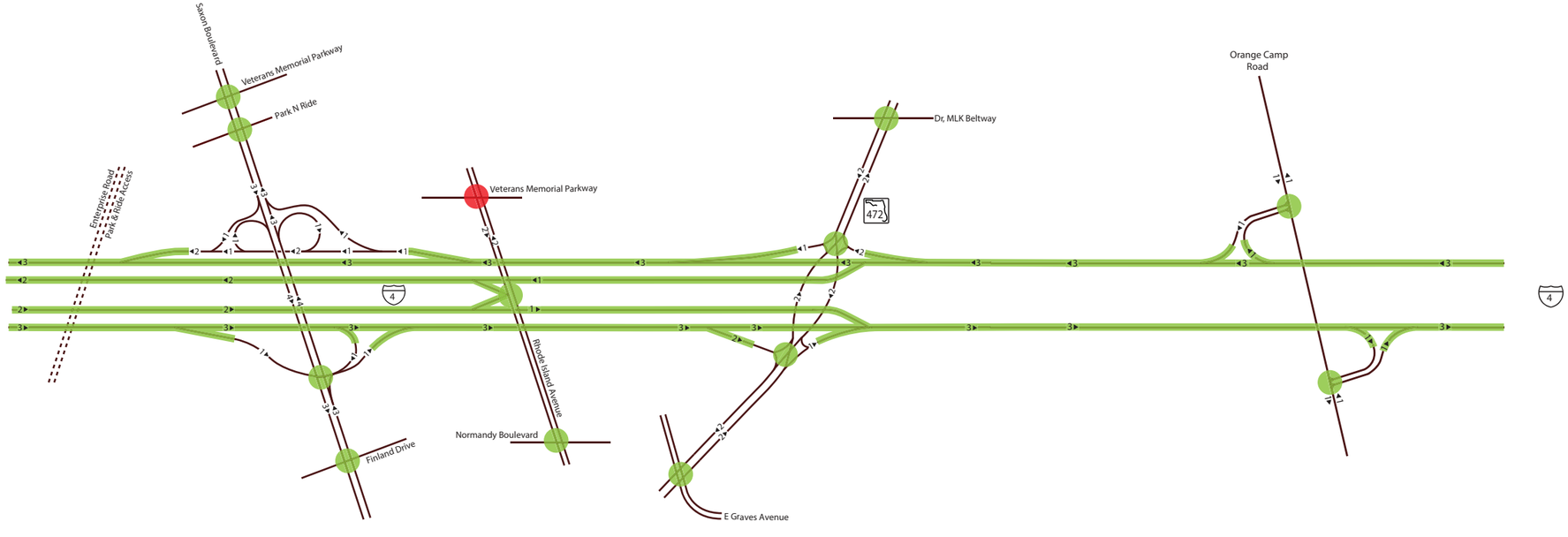
HOV access at Enterprise Rd replaced with Express Lane access to Rhode Island Ave

Saxon Blvd widened to six lanes through the interchange area

SR 472 interchange modified to Diverging Diamond interchange, with Express Lane access relocated east of SR 472

Orange Camp Rd ramp intersections were signalized in the modified build

MODIFIED BUILD



LOS D or Better
LOS E
LOS F

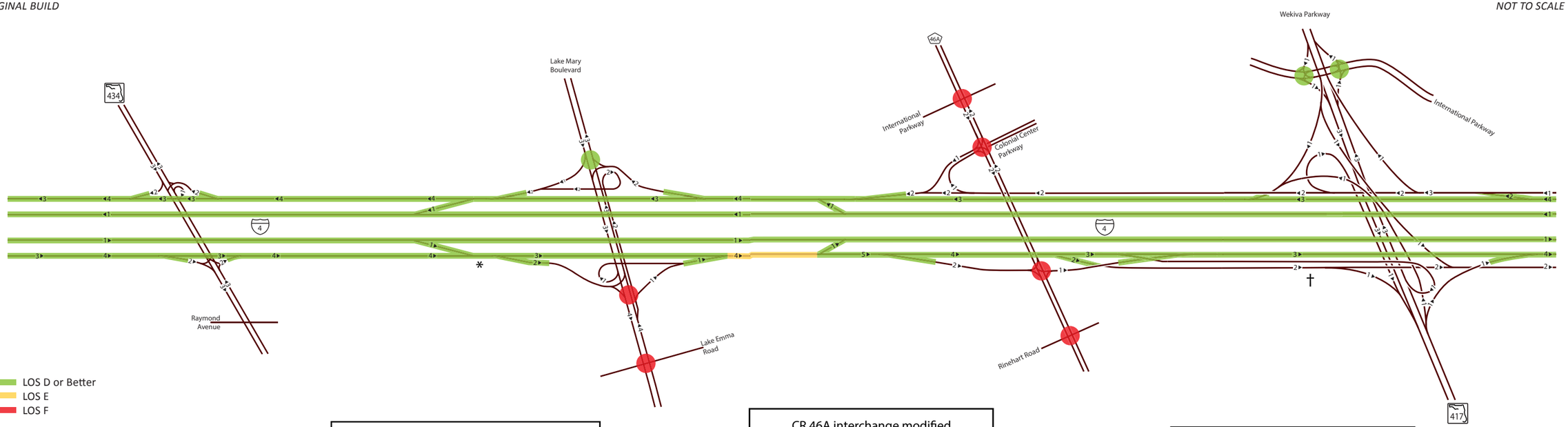
Date: 8.26.2016

I-4 SAMR Re-Evaluation

Figure 28 (3 of 3)
2040 AM Peak Hour Operations (North Section)

ORIGINAL BUILD

NOT TO SCALE

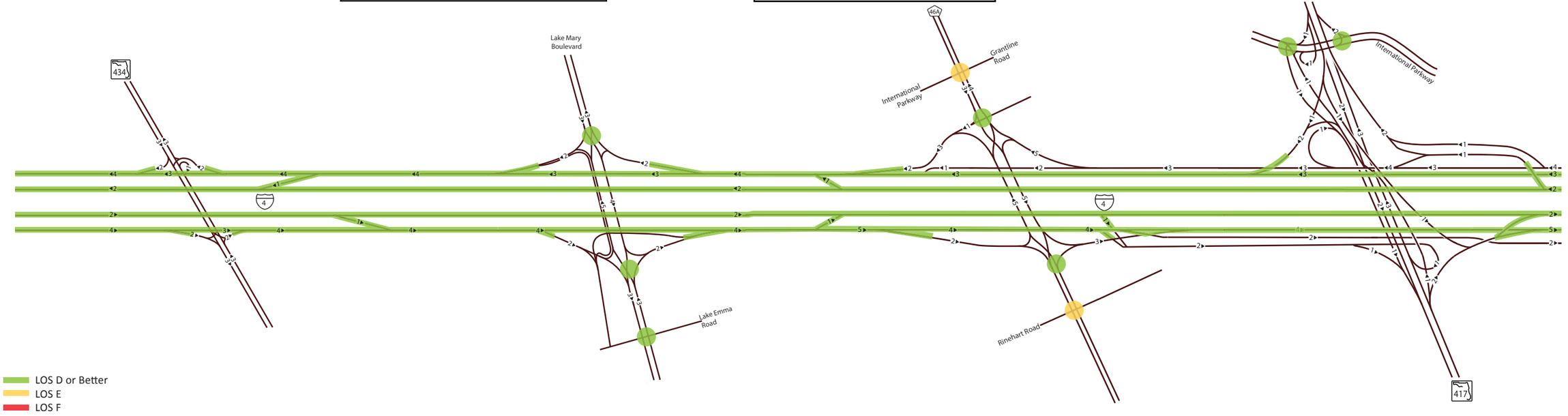


Lake Mary Blvd interchange modified to Diverging Diamond interchange with the addition of ramp access at Lake Emma Rd

CR 46A interchange modified to Diverging Diamond interchange with corridor and intersection improvements at Rinehart Rd

Express lane connections were added to the SR 417 interchange

MODIFIED BUILD



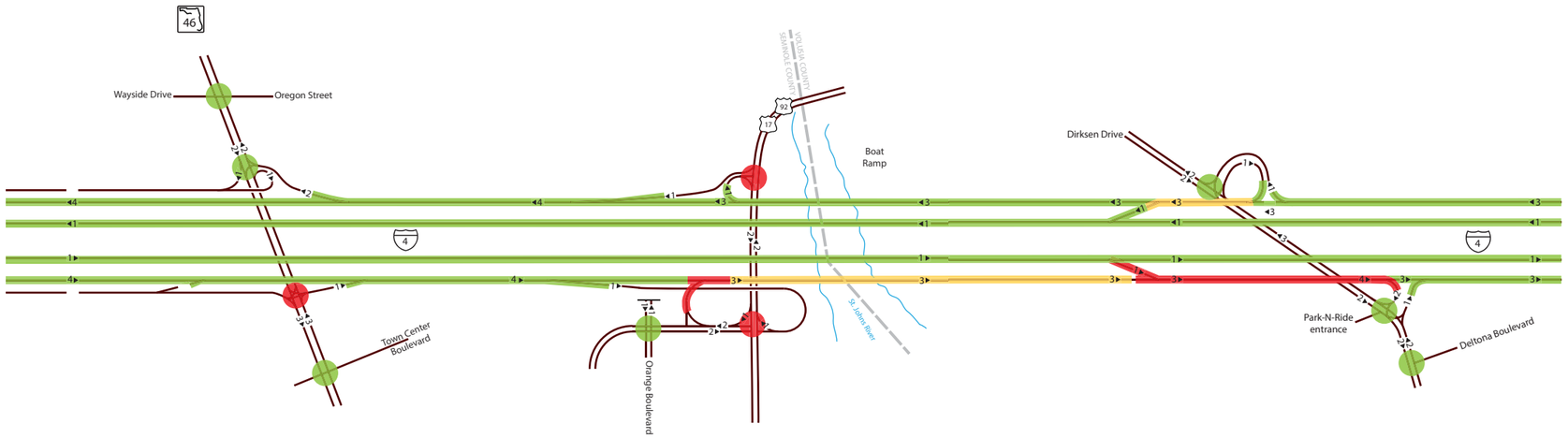
Date: 8.26.2016

I-4 SAMR Re-Evaluation

Figure 29 (1 of 3)
2040 PM Peak Hour Operations (North Section)

ORIGINAL BUILD

NOT TO SCALE

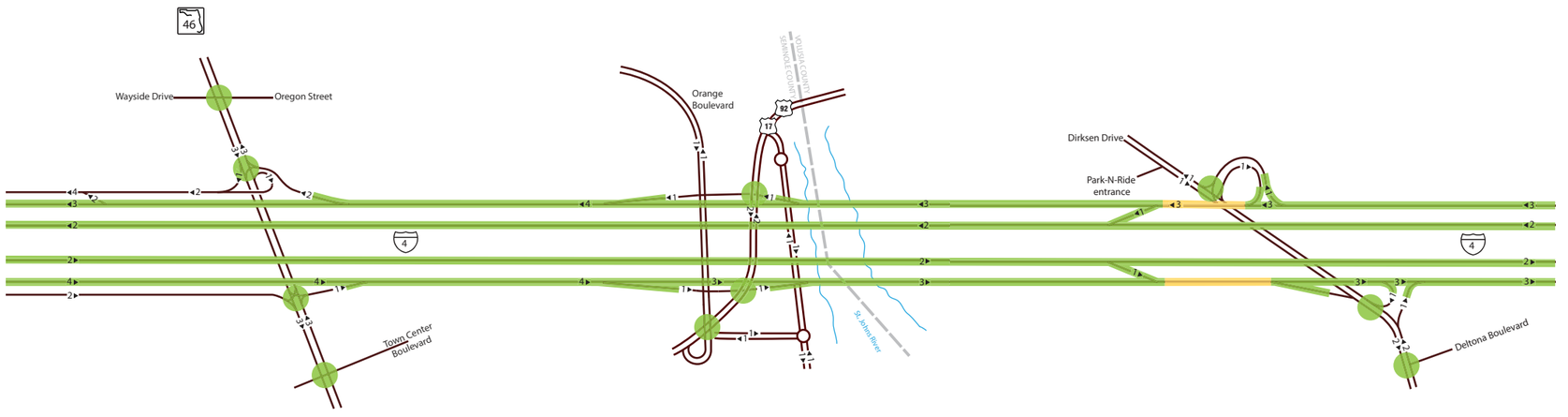


LOS D or Better
LOS E
LOS F

US 17-92 interchange modified to full access dimaond interchange

Dirksen Drive interchange modified to add an Eastbound-to-Eastbound ramp.

MODIFIED BUILD



LOS D or Better
LOS E
LOS F

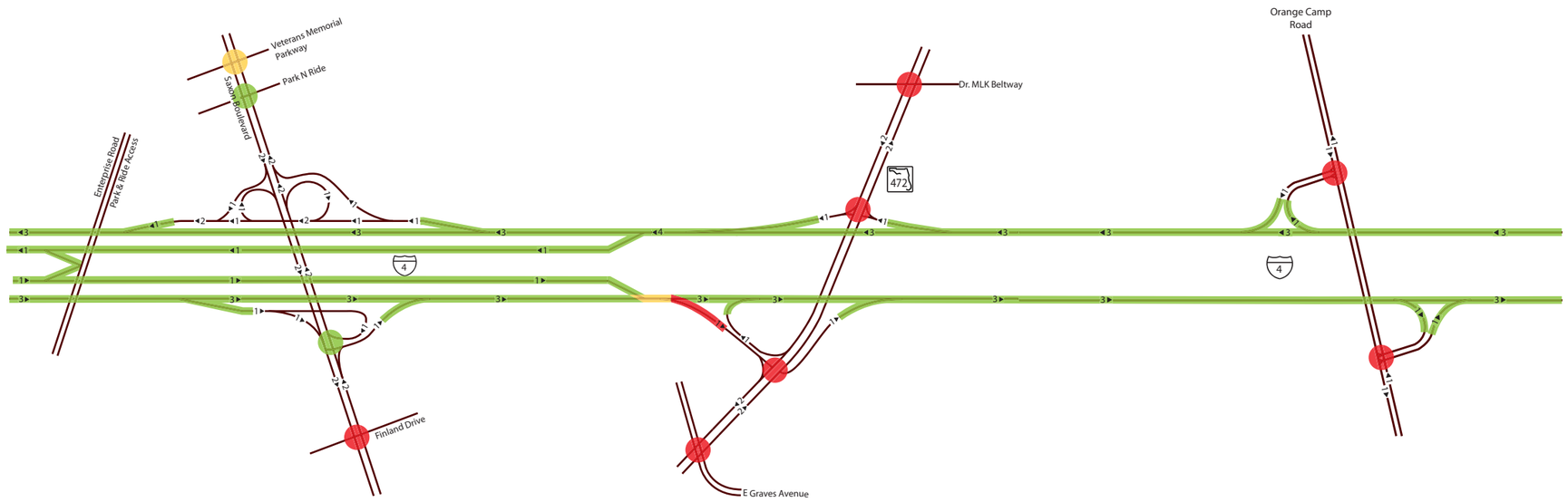
Date: 8.26.2016

I-4 SAMR Re-Evaluation

Figure 29 (2 of 3)
2040 PM Peak Hour Operations (North Section)

ORIGINAL BUILD

NOT TO SCALE



LOS D or Better
LOS E
LOS F

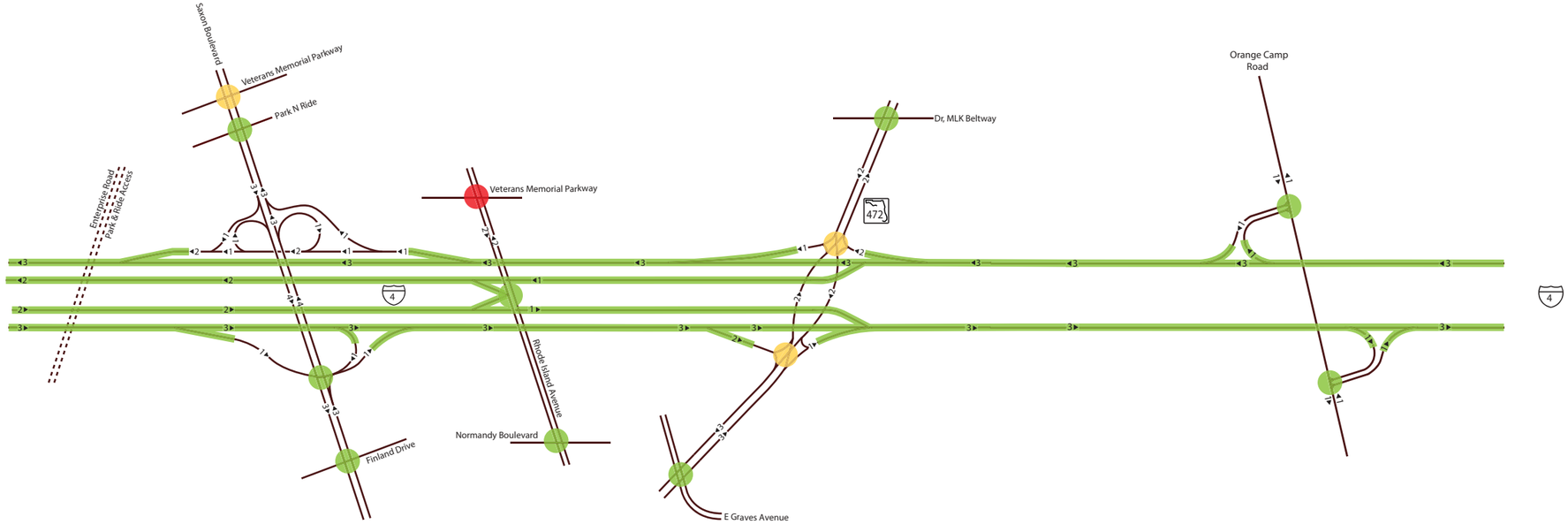
HOV access at Enterprise Rd replaced with Express Lane access to Rhode Island Ave

Saxon Blvd widened to six lanes through the interchange area

SR 472 interchange modified to Diverging Diamond interchange, with Express Lane access relocated east of SR 472

Orange Camp Rd ramp intersections were signalized in the modified build

MODIFIED BUILD



LOS D or Better
LOS E
LOS F

Date: 8.26.2016

FDOT

I-4 SAMR Re-Evaluation

Figure 29 (3 of 3)
2040 PM Peak Hour Operations (North Section)

7.2.5. Queuing Analysis

A queuing analysis was conducted to evaluate whether intersection performance at the off-ramp terminals will interact with mainline traffic. **Table 24** and **Table 25** summarize the queuing analysis of the off-ramp critical movements at the ramp terminal intersections for the Original Build and Modified Build Alternatives, respectively. Ramp lengths (feet) and 95th percentile queue lengths (feet) were compared, and insufficient storage approaches are highlighted in the tables below.

Table 24 2040 Original Build Queuing Analysis – North Section

Primary Road	Secondary Road	Ramp Length (ft)	Maximum Queue (ft)						Longer than Storage?
			AM Peak			PM Peak			
			2020	2030	2040	2020	2030	2040	
Lake Mary Blvd	EB Ramps	3,027	1,334	1,665	2,119	673	1,498	1,762	NO
	WB Ramps	2,604	503	558	650	502	669	809	NO
CR 46A	EB Ramps	2,198	638	916	1,229	742	1,046	1,369	NO
	WB Ramps	10,581	646	964	1,396	229	629	962	NO
SR 417/Wekiva Pkwy	-	-	-	-	-	-	-	-	NO
SR 46	EB Ramps	9,517	694	845	1,138	1,171	1,337	1,680	NO
	WB Ramps	1,608	440	450	615	359	427	574	NO
US 17-92	EB Ramps	4,632	585	747	836	934	1,384	1,740	NO
	WB Ramps	1,364	867	1,222	1,488	988	1,184	1,384	YES
Dirksen Dr	EB Ramps	1,447	229	416	652	775	898	1,224	NO
	WB Ramps	2,914	138	232	381	503	126	200	NO
Saxon Blvd	EB Ramps	1,381	222	321	294	327	367	204	NO
SR 472	EB Ramps	1,759	260	521	1,306	1,499	2,447	2,904	YES
	WB Ramps	839	131	555	844	181	612	878	YES
Orange Camp Rd	EB Ramps	2,269	58	119	262	110	334	636	NO
	WB Ramps	2,300	142	471	*	221	449	688	YES

Note: *Italicized font* identifies interchanges where free-flowing off-ramps are not projected to generate queues

In the Original Build Alternative, the following off-ramps are projected to experience 95th percentile queues in excess of available storage:

- US 17/92 westbound ramp in 2040 AM and PM peak hours;
- SR 472 eastbound ramp in 2030 and 2040 PM peak hours;
- SR 472 westbound ramp in the 2040 AM and PM peak hours; and
- Orange Camp Road westbound ramp in 2040 AM peak hour.

Table 25 2040 Modified Build Queuing Analysis – North Section

Primary Road	Secondary Road	Ramp Length (ft)	Maximum Queue (ft)						Longer than Storage?
			AM Peak			PM Peak			
			2020	2030	2040	2020	2030	2040	
Lake Mary Blvd	EB Ramps	3,828	215	265	321	214	203	236	NO
	WB Ramps	1,739	92	119	151	135	198	228	NO
CR 46A	EB Ramps	1,874	145	190	235	189	148	402	NO
	WB Ramps	2,083	167	246	329	48	111	179	NO
SR 417/Wekiva Pkwy	-	-	-	-	-	-	-	-	NO
SR 46	EB Ramps	5,117	227	307	378	284	382	469	NO
	WB Ramps	2,162	300	359	529	301	387	496	NO
US 17-92	EB Ramps	1,595	148	258	284	321	474	779	NO
	WB Ramps	1,741	256	427	474	212	285	571	NO
Dirksen Dr	EB Ramps	1,948	36	60	110	0	37	75	NO
	WB Ramps	2,480	161	221	281	132	196	232	NO
Saxon Blvd	-	-	-	-	-	-	-	-	NO
Rhode Island Ave	EL Ramps	830	255	285	406	347	405	469	NO
SR 472	EB Ramps	1,883	145	188	244	327	536	679	NO
	WB Ramps	1,388	0	51	131	1	61	129	NO
Orange Camp Rd	EB Ramps	2,233	109	130	149	152	195	235	NO
	WB Ramps	2,302	168	235	299	175	209	253	NO

Note: *Italicized font* identifies interchanges where free-flowing off-ramps are not projected to generate queues

With improvements at the study intersections in the Modified Build Alternative, all ramps are expected to accommodate queue sufficiently through the design year 2040. Additional details are presented within the intersection performance tables provided in **Appendix I**.

7.3. Microsimulation Analysis (2040 Conditions)

A VISSIM micro-simulation analysis was performed to evaluate the effects of the proposed improvements in the North Section study area for the design year (2040). The main advantage of this application is its ability to perform an integrated analysis taking into consideration the operation of the mainline, ramps and traffic signals and how each element interacts with each other. This effort complements the analysis conducted using the HCM method, which only allows the analysis of individual elements. This section presents the microsimulation analysis results for the 2040 projected traffic conditions for both Original Build Alternative and Modified Build Alternative.

7.3.1. Simulation Model Development

The VISSIM models for this study were developed and calibrated for AM peak hour and PM peak hour under the year 2011 traffic conditions. The calibrated existing models were used as a base to develop the design year 2040 Original Build and Modified Build models. Calibration parameters from the existing conditions VISSIM models were carried forward to the 2040 VISSIM models. The geometry of the Original Build Alternative was based on the approved I-4 SAMR in 2003. The geometry of the Modified Build Alternative was based on the I-4 Beyond the Ultimate PD&E study. The geometry of the Original-Build and the Modified Build models were constructed by tracing the roadway network over the proposed design files.

Existing signal timings were coded in the VISSIM models as a starting point and then optimized for both alternatives. Similar to existing conditions, inputs for both AM and PM peak hours were further broken down into 15-minute flow rates with a 30-minute seeding period. Twelve (12) iterations were conducted to be consistent with the existing conditions. VISUM T-Flow Fuzzy was again utilized to synthesize the Origin-Destination (OD) matrices for 2040 conditions. Existing OD matrices were utilized as seed matrices to generate ODs for 2040 conditions. The OD matrices and routes imported from the VISUM T-Flow Fuzzy process were utilized for vehicle routing in all simulation models. The routes were checked for illogical movements. Vehicle routing in the Original Build model was coded using static routes, as HOV lanes were not tolled. However, a VISSIM managed lane module was utilized for the Modified Build Alternative. The module includes managed lane facilities, pricing (toll) models and decision models. The latest "Toll Pricing Calculation model" was obtained from FDOT District Five for use in the managed lane module.

7.3.2. Network Wide Performance Results

A network performance evaluation is an important statistic as it provides the relative number of vehicles that are being served and extent of the latent demand of the North Section study area. The study area for the North Section includes I-4 from south of SR 434 to north of Orange Camp Road and arterial intersections as documented in the approved MLOU. Network wide statistics are summarized for the AM and PM peak periods in **Table 26** and **Table 27** for the North Section's Original Build and Modified Build alternatives.

Table 26 2040 AM Network Wide Performance – North Section

Parameter	Original Build	Modified Build	% Change
Total Travel Time (hr)	11,965	9,729	19%
Total Delay Time (hr)	5,337	2,417	55%
Average Delay Time (sec/veh)	258	104	60%
Latent Delay Time	1,531	585	62%
Vehicles Left the Network	60,291	73,805	22%
Latent Demand	3,469	1,263	64%

Table 27 2040 PM Network Wide Performance – North Section

Parameter	Original Build	Modified Build	% Change
Total Travel Time (hr)	11,784	9,745	17%
Total Delay Time (hr)	4,847	2,250	54%
Average Delay Time (sec/veh)	216	90	58%
Latent Delay Time	1,578	480	70%
Vehicles Left the Network	67,936	80,076	18%
Latent Demand	3,902	875	78%

The network analyses indicate the Original Build Alternative has capacity constraints; therefore, some demand cannot enter the network, resulting in latent demand and latent delay. The numbers of latent demand and latent delay are good indicators of the overall network congestion. The Modified Build

shows significantly less latent demand and latent delay compared to the Original Build, indicating less network congestion in the Modified Build Alternative.

In terms of network travel time and network delay, the Modified Build shows approximately 20 percent reduction in total travel time and 55 percent reduction in total delay time compared to the Original Build Alternative.

7.3.3. Freeway Link Evaluation Results

The VISSIM micro-simulation models were used to produce volume and speed profiles along the I-4 general purpose (GP) lanes, HOV lanes (for Original Build Alternative) and express lanes (for Modified Build Alternative) for freeway operations for both the AM and PM peak hours. Average volume and average speed profiles provide a good representation of the traffic flow along the corridor. Per the 2014 FDOT Traffic Analysis Handbook recommendation, averaging of microsimulation densities should be avoided and hence, average freeway densities are not presented. **Figure 30** through **Figure 45** depict the average speed and volumes profiles along the corridor for the Original Build and Modified Build alternatives. Average volume and average speed results are discussed in this section.

Figure 30 2040 Eastbound Average Speed AM Peak Hour – North Section Original Build

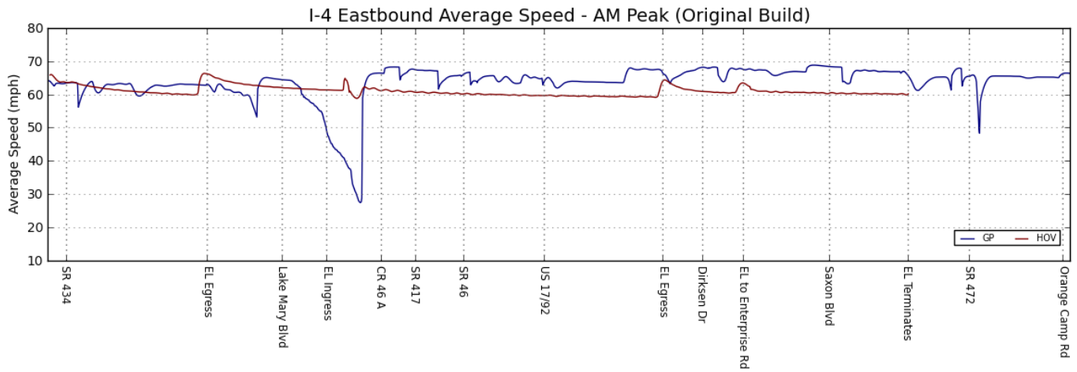


Figure 31 2040 Eastbound Average Speed AM Peak Hour – North Section Modified Build

Figure 32 2040 Eastbound Average Volume AM Peak Hour – North Section Original Build

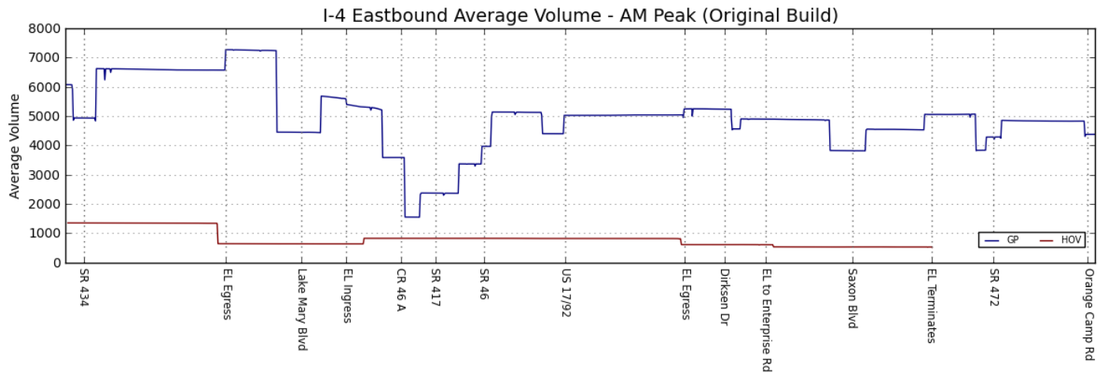


Figure 33 2040 Eastbound Average Volume AM Peak Hour – North Section Modified Build

Figure 34 2040 Westbound Average Speed AM Peak Hour – North Section Original Build

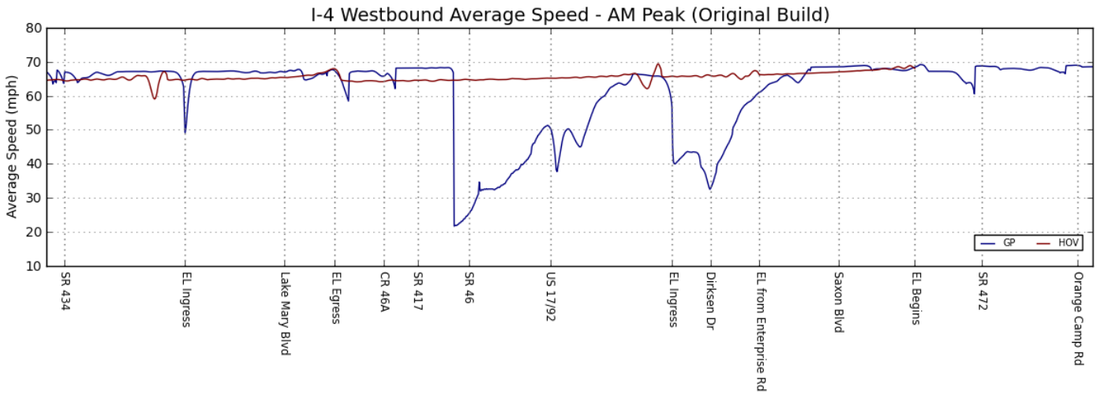


Figure 35 2040 Westbound Average Speed AM Peak Hour – North Section Modified Build

Figure 36 2040 Westbound Average Volume AM Peak Hour – North Section Original Build

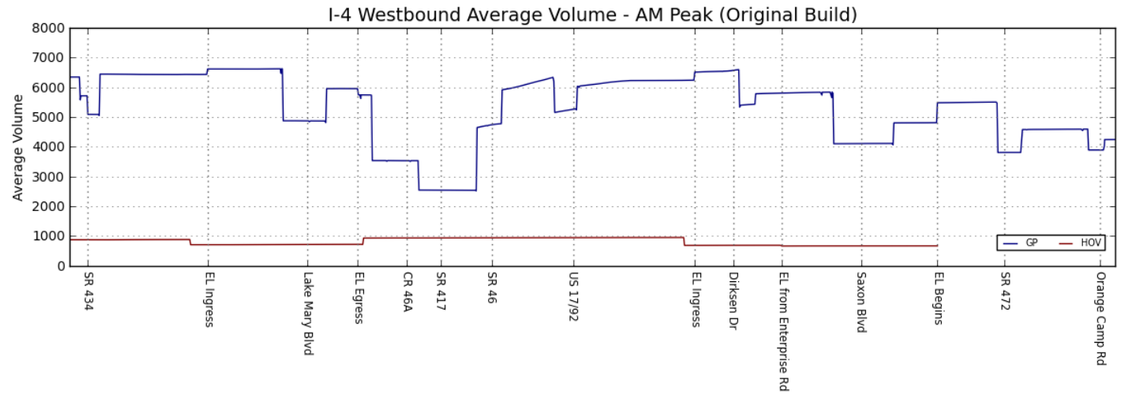


Figure 37 2040 Westbound Average Volume AM Peak Hour – North Section Modified Build

Figure 38 2040 Eastbound Average Speed PM Peak Hour – North Section Original Build

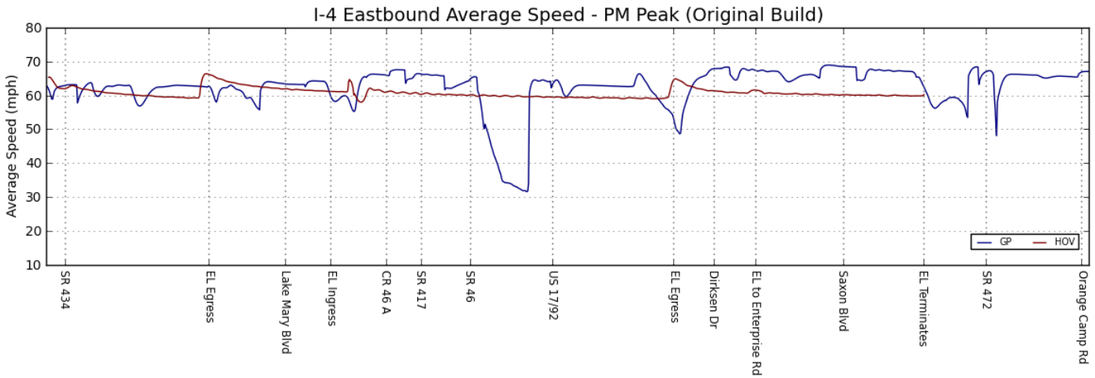


Figure 39 2040 Eastbound Average Speed PM Peak Hour – North Section Modified Build

Figure 40 2040 Eastbound Average Volume PM Peak Hour – North Section Original Build

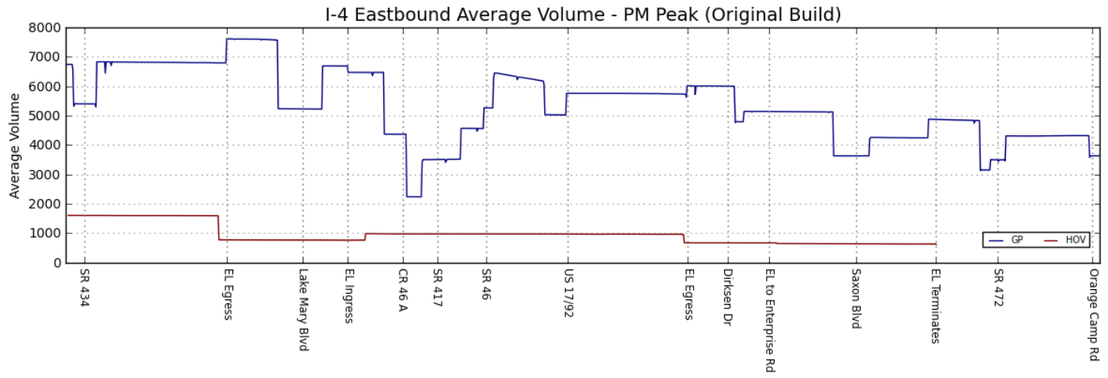


Figure 41 2040 Eastbound Average Volume PM Peak Hour – North Section Modified Build

Figure 42 2040 Westbound Average Speed PM Peak Hour – North Section Original Build

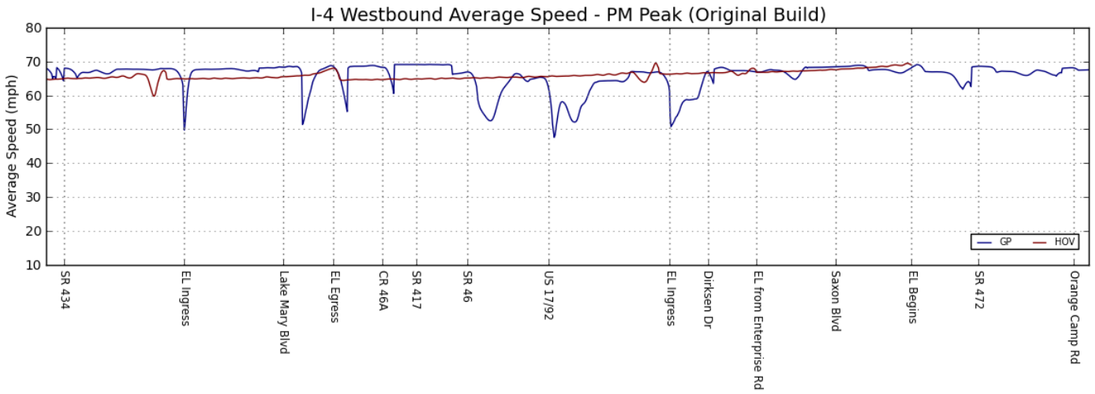


Figure 43 2040 Westbound Average Speed PM Peak Hour – North Section Modified Build

Figure 44 2040 Westbound Average Volume PM Peak Hour – North Section Original Build

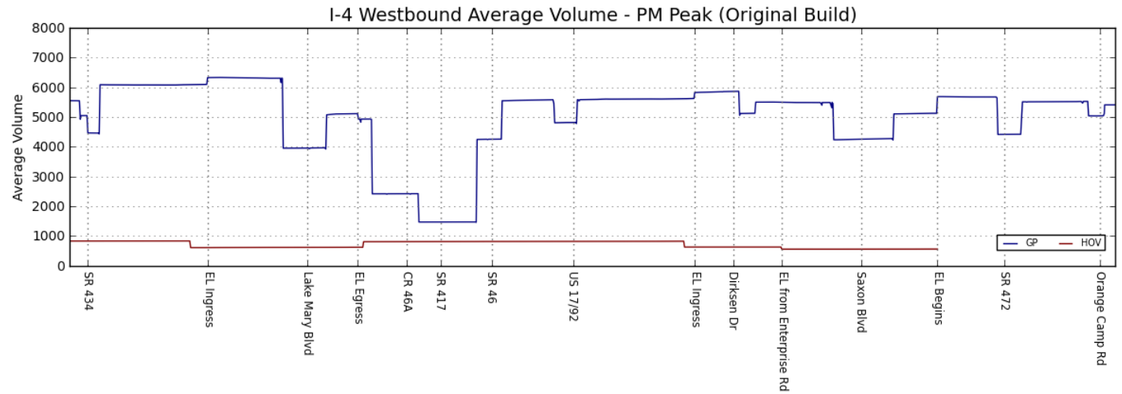


Figure 45 2040 Westbound Average Volume PM Peak Hour – North Section Modified Build

The AM peak period (eastbound and westbound) is summarized in **Figure 30** through **Figure 37**. Under the Original Build Alternative, sharp decreases in average speeds and volumes indicate eastbound traffic congestion at the CR 46A and SR 472 interchanges and westbound traffic congestion at the Dirksen Drive and SR 46 interchanges. The congestion is addressed in the Modified Build with no substantial drop in average speeds, with the exception of westbound near the Dirksen Drive interchange. The HCM analysis projected LOS E at this location in 2040 (see Figure 28). High speeds along the managed lanes (HOV or express lanes) indicate no congestion in the Original Build or Modified Build Alternatives. These findings are generally consistent with the Highway Capacity Analysis results.

The PM peak period (eastbound and westbound) is summarized in **Figure 38** through **Figure 45**. Under the Original Build Alternative, sharp decreases in average speeds and volumes indicate eastbound traffic congestion at the US 17/92 interchange. The eastbound congestion is addressed in the Modified Build with no substantial drop in average speeds at US 17/92. Downstream, a speeds decrease to the 40-mph range in advance of the Dirksen Drive interchange, where the Modified Build serves approximately 700 more vehicles in the peak hour than in the Original Build, due to latent demand. The Modified Build alternative improves the Dirksen Drive interchange by adding a new eastbound I-4 to eastbound Dirksen Drive off-ramp. The HCM analysis projected LOS E at this location in 2040 (see Figure 29). No sharp decreases in average speeds or volumes were noted in the westbound direction, and high speeds along the managed lanes (HOV or express lanes) indicate no congestion in the Original Build or Modified Build Alternatives. These findings are generally consistent with the Highway Capacity Analysis results.

7.3.4. Intersection Node Evaluation Results

The VISSIM micro-simulation models were also used to analyze the intersection delay and LOS for Original Build and Modified Build alternatives. In this analysis, the LOS is computed from the microsimulation analysis and is therefore reported as an “estimated LOS”.

Seventeen (17) intersections in the AM peak hour and 16 intersections in the PM peak hour experience excessive delay time (> 55 seconds per vehicle, LOS E or worse) in the 2040 Original Build Alternative. These operational deficiencies were examined and addressed in the Modified Build Alternative. With improvements at the study intersections, all intersections operate at LOS D or better (< 55 seconds per vehicle delay) in 2040 under the Modified Build Alternative, with the exceptions of Veterans Memorial Parkway at Rhode Island Avenue and Orange Camp Road at MLK Beltway in the AM and PM peak hours. The analysis files and summary tables are presented in greater detail in **Appendix I**.

7.4. Safety Analysis

The project team evaluated the potential entry and exit points for express lanes. Approximate locations of potential entry and exit locations, crash frequency and crash rates for the safety analysis years (2008-2012) are summarized for the North Section in **Figure 46**.

7.4.1. Preliminary Safety Evaluation of Express Lanes Entry and Exit Locations

Most of the express lanes entry and exit locations are within the low crash rate locations when compared to district averages. Based on the existing conditions crash analysis, predominant crash types are rear-end, angle and sideswipe collisions in those areas. Typically, these crash types are associated with traffic congestion. Only one potential location is located within a high crash rate area associated with congestion:

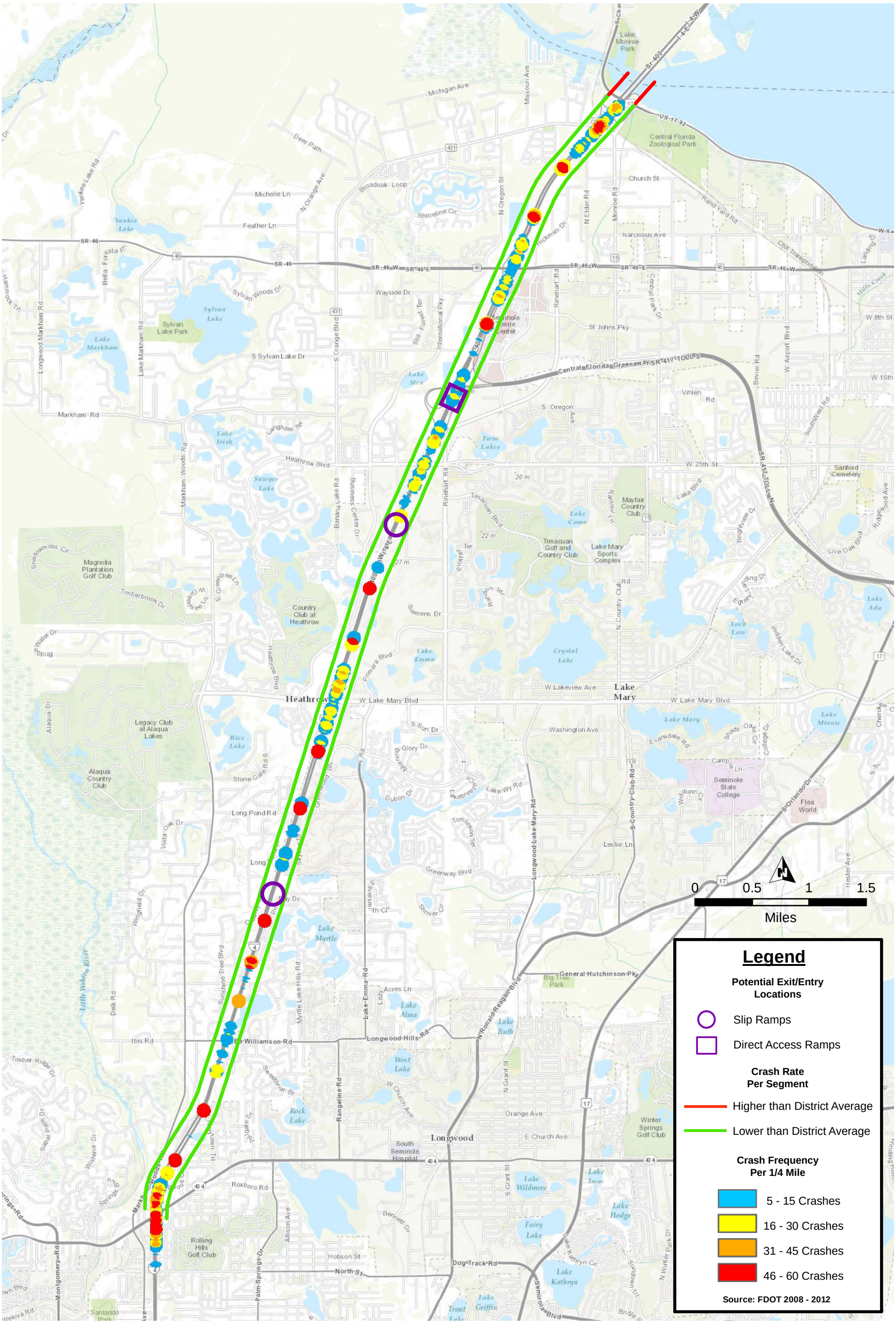
- SR 472 interchange area:
  - The crash rate is high for the I-4 eastbound segment near the SR 472 interchange.
  - Congestion is the primary cause for the high number of crash occurrences.

7.4.2. Countermeasures

The conceptual design plans for I-4 interchange improvements were developed in accordance with the FDOT's Design Standards and Plans Preparation Manual and FHWA's Policy on Geometric Design of Highways and Streets. Adherence to these standards will facilitate safe and efficient traffic operations along the corridor. As discussed in previous sections of the report, a large portion of the crashes experienced along I-4 and the arterials were associated with congested traffic conditions. In addition, it was determined that several high crash spots/segments along the corridor were concentrated at or near the interchanges. The improvements proposed will increase capacity along the mainline and at the interchanges. These capacity improvements will correspondingly improve traffic flow and reduce congestion related crashes along the corridor. The corridor level improvements expected to improve safety along the interstate mainline are as follows:

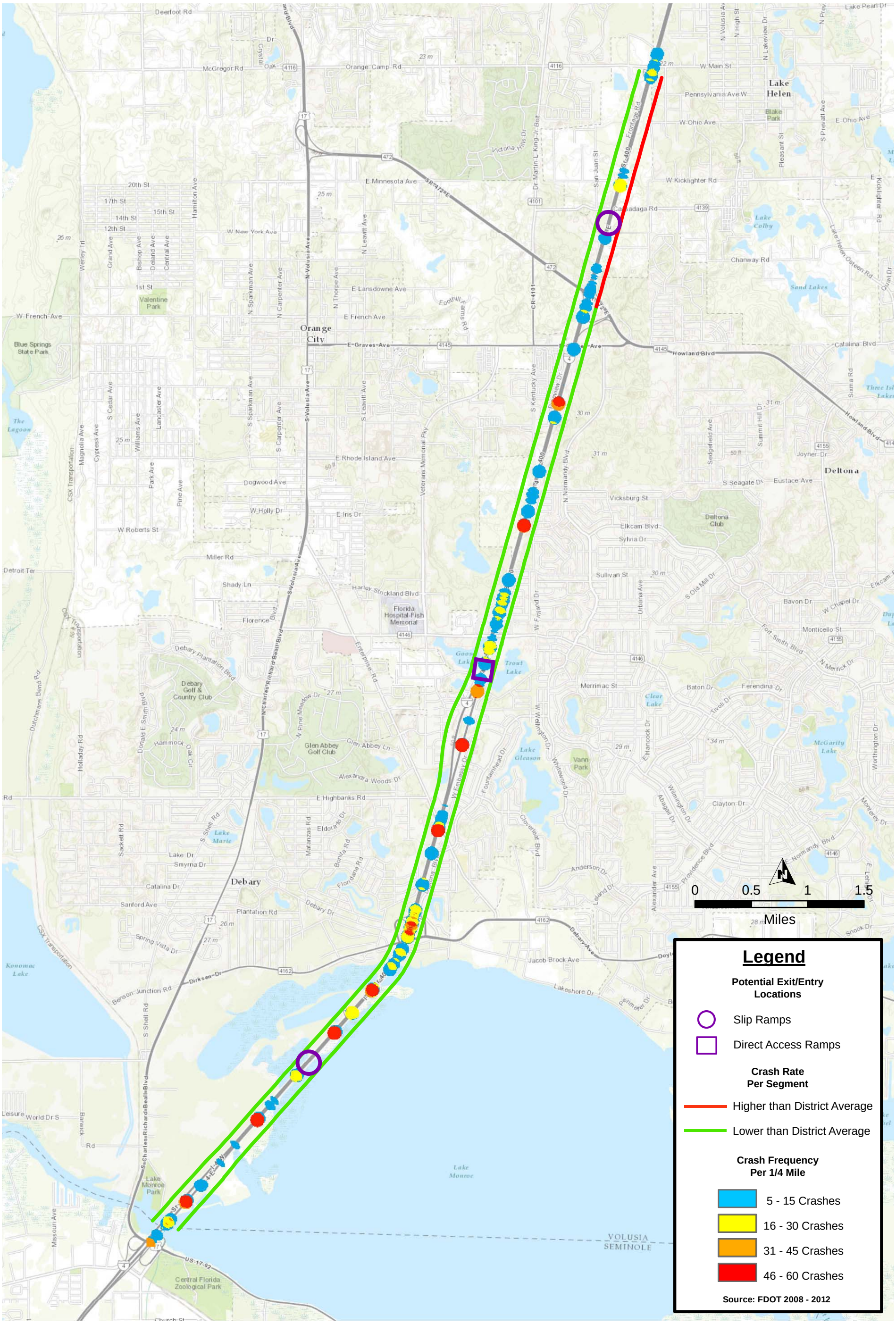
1. Improvements were considered at a systems level so congestion at one location would not adversely impact operations at another. Reduction in congestion is expected to reduce occurrences of rear end crashes.
2. Improvement to all interchanges along the corridor resulting in fewer congestion bottleneck locations. Reduction in congestion is expected to reduce occurrences of crashes.
3. Additional Advanced Signage – understanding that many in the corridor are visitors and are unfamiliar with the corridor, additional signage will be provided.

Table 28 summarizes specific countermeasures at the locations where crash rates are higher than the average FDOT District Five crash rates for similar facilities.



I-4 SAMR Re-evaluation
North Section

Figure 46 (Sheet 1 of 2)
I-4 Mainline Crash Summary
Seminole County



I-4 SAMR Re-evaluation North Section

Figure 46 (Sheet 2 of 2)
I-4 Mainline Crash Summary
Volusia County

Table 28 Potential Safety Countermeasures

Potential Crash Locations	Issue	Predominant Crash Type	Countermeasures
I-4 Mainline			
SR 472 interchange area	The crash rate is high for the I-4 eastbound segment near the SR 472 interchange.	Rear End	Improved operations along the I-4 mainline are expected to improve operations of express lane merge and diverge near SR 472 interchange area.
Arterials			
Lake Mary Blvd	The injury rates are greater than 1.0	Rear End	Intersection improvements at ramp terminals reduce congestion and occurrences of rear end crashes.
SR 46	The injury rates are greater than 1.0	Rear End	Intersection improvements at ramp terminals reduce congestion and occurrences of rear end crashes.
US 17/92	The injury rates are greater than 1.0	Rear End	The interchange configuration for US 17/92 will be modified to a Diamond configuration with better traffic operations. Improved operations in the modified interchange configuration is expected to positively impact occurrences of rear end crashes.
Dirksen Dr, Saxon Blvd and SR 472 are greater than 1.0	The injury rates are greater than 1.0	Rear End	Intersection improvements at ramp terminals reduce congestion and occurrences of rear end crashes.
Saxon Blvd and SR 472 are greater than 1.0	The injury rates are greater than 1.0	Rear End	Intersection improvements and widening of Saxon Blvd to six lanes will reduce congestion and occurrences of rear end crashes.
SR 472	The injury rates are greater than 1.0	Rear End	The interchange configuration for SR 472 will be modified to a DDI. DDI configuration reduces number of conflict points and improves traffic operations. Reduction is conflict points and congestion is expected to positively impact occurrences of rear end crashes.

8. CONCLUSION AND RECOMMENDATIONS

The purpose of the I-4 BtU project is to improve traffic operations, enhance connectivity, and improve safety on I-4 and the interchange cross-streets in the immediate vicinity of I-4. Improvements to the operation and safety of I-4 and the interchange areas will better accommodate future population increases, improve mobility and safety, and support economic growth in the region. The I-4 BtU SAMR re-evaluation is needed due to changes proposed in the Modified Build scenario as compared to the previously approved Original Build scenario. The changes include:

- A proposed change in the project typical sections: The proposed change is to the inside median of the I-4 corridor from US 27 in Polk County to SR 472 in Volusia County. The design change is to switch from HOV (High Occupancy Vehicle) lanes in the median (number of HOV lanes varied from one to two in each direction), to four express lanes, two in each direction.
- Proposed changes to interchange configurations: Several interchange configurations have been modified to better accommodate traffic volumes and improve interstate and cross-street operations.

The I-4 SAMR Re-Evaluation Study in support of the I-4 Beyond the Ultimate (BtU) PD&E study for the North Section compared the Original Build (based upon the 2003 I-4 SAMR Update) and the Modified Build Alternatives for the 2020 opening year, 2030 interim year, and 2040 design year horizons. This reevaluation also addresses the operational impacts of converting the HOV lanes to tolled express lanes. The express lanes will be separated from the general use travel lanes by two shoulders with a barrier wall between the shoulders. A variable pricing tolling plan is proposed for the express lanes. The tolls will vary by time of day and day of week to maintain acceptable levels of service in the express lanes.

Conclusions

Based upon the results of the analysis, the following conclusions were made:

- The design and operational modifications proposed in the Modified Build alternative do not degrade and generally improve the operation of the I-4 mainline, ramps, ramp junction intersections, and cross-street intersections in the North Section as compared to the Original Build scenario.
- The Express Lane system will operate at an acceptable level of service.
- Safety is expected to be improved or not degrade as compared to the Original Build scenario.

Recommendations

Based upon the findings of this study, the following recommendation was made:

- The proposed 2040 Modified Build Alternative be approved by FHWA as the Preferred Alternative concept for the North Section of I-4 BtU.

Appendix A – Lake Mary Interchange Alternative Evaluation

Appendix B – Safety Analysis Report

Appendix C – Conceptual Signing Plan

Appendix D – Long Range Transportation Plan Sheets

Appendix E – Modified Build Concepts

Appendix F – Approved Methodology Letter of Understanding

Appendix G – Existing Conditions Analysis Report

Appendix H – Traffic Volumes Development Report

Appendix I – Future Conditions Operational Analysis