Evacuation Planning Assessment for the US 1 and SW 344 Street Intersection Area

Draft Report

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June 2012

The preparation of this report has been financed in part from the U.S. Department of Transportation (USDOT) through the Federal Highway Administration (FHWA) and/or the Federal Transit Administration (FTA), the State Planning and Research Program (Section 505 of Title 23, U.S. Code) and Miami-Dade County, Florida. The contents of this report do not necessarily reflect the official views or policy of the U.S. Department of Transportation.

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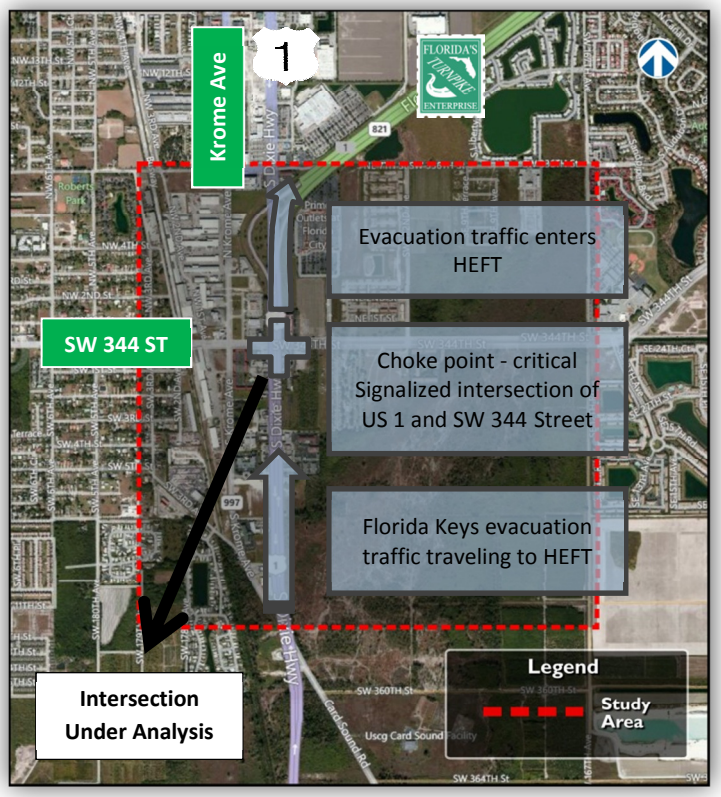
1.0 INTRODUCTION

The Florida Keys (Monroe County) is composed of a chain of small islands which is a popular tourist destination and home to over 73,000 residents according to the 2010 Census figures. These chain of islands are connected by one roadway, the Overseas Highway (US 1) beginning from Key West (Mile Marker [MM] 0) to the end of the Upper Keys (MM 112.5).

In order to reach the Florida mainland, vehicles must travel along US 1 toward Florida City, FL to reach the final mile marker and end of the Overseas Highway – MM 127.5 – which is located at the junction of US 1 and the Homestead Extension of Florida's Turnpike/SR 821 (HEFT). Even though vehicles may choose to travel along the scenic Card Sound Road from the Upper Keys to reach the Florida mainland, the vehicles must merge onto US 1 at the northern end of Card Sound Road and then travel north for about 1 mile to reach MM 127.5. Along this 1 mile stretch vehicles travel on a three-lane roadway with curb and gutter on either side. It should be noted that the Florida Department of Transportation (FDOT) recently constructed an auxiliary lane in the northbound direction along this segment of US 1 changing the cross-section of the roadway to a three-lane urban typical section.

During a major hurricane event such as a Category 3, 4, or 5 storm, the over 73,000 residents and tourists must be evacuated within a 24-hour timeframe along the Monroe County evacuation route in order to reach the official designated shelter of the Florida Keys – Florida International University (FIU). This evacuation route mainly consists of evacuees traveling northbound along US 1/Overseas Highway, entering the HEFT northbound on-ramp at approximately MM 127.5, and travelling north along the HEFT to reach the designated shelter. Along this evacuation route between the Upper Keys and the HEFT northbound on-ramp, the signalized intersection of US 1 and SW 344 Street (just before MM 127.5) acts as a critical location for evacuation events. Depending on

Figure 1 – Study Intersection



the amount of vehicles and timing of evacuee travel, this intersection can act as a traffic choke point during evacuation events.

In June 2011, FDOT updated a Traffic Management Plan to be utilized during Florida Keys evacuation events for the intersection of US 1 and SW 344 Street and the surrounding area. The plan consists of five phases to be implemented based on the determination of field personnel observing traffic flow conditions during the evacuation process. The plan requires the use of significant manpower (State and County Emergency personnel and Florida Highway Patrol) and equipment (barricades and signs) for implementation of the phases. While this plan does relieve more traffic than allowing for normal traffic operations at the intersection of US 1 and SW 344 Street, the plan is based on a reactive approach rather than a proactive approach to traffic management. In other words, congestion builds up and delays increase before conditions are improved based on the time it takes to implement the phases of the plan.

1.1 Study Purpose

The purpose of this project is to assess the existing conditions and propose permanent operational and capacity improvements to the intersection of US 1 and SW 344 Street and the surrounding area to accommodate future demand especially during Florida Keys evacuation event. The study achieves the following:

- ✓ Documents the established coordination activities between the County and State Emergency Management Agencies.
- ✓ Analyzes and summarizes some of the previous evacuation planning efforts in the area
- ✓ Reviews programmed transportation improvements in the area;
- ✓ Assesses the existing geometric configuration of the subject intersection and area;
- ✓ Identifies alternatives for potential permanent improvements to the subject intersection;
- ✓ Analyzes alternatives against the current evacuation traffic management plan through traffic simulation; and,
- ✓ Recommends a final alternative which includes planning-level cost estimates, right-of-way considerations, and additional improvements for the HEFT.

2.0 BACKGROUND RESEARCH

This section summarizes the findings of the evacuation related studies, documents and future plans in the area of the study intersection. Agencies contacted included Monroe County, Miami-Dade County Division of Emergency Management, the Florida Turnpike Enterprise (FTE), and FDOT. Twenty (20) documents/plans were reviewed and are presented in **Table 1**.

Table 1 – Background Research

Area/Subject	Documents/Studies/Plans
Transportation Improvements	1. Miami-Dade 2012 Transportation Improvement Program 2. Miami-Dade 2035 Long-Range Transportation Plan 3. FDOT Five-Year Work Program 4. US 1 Overseas Highway RRR Projects, 2008
Florida Keys	5. Updated Traffic Management Plan for US 1 and Palm Drive, 2011 6. Maximum Sustainable Flow Rates for Emergency Evacuation in the Florida Keys, 2010 7. Florida Keys Site-Specific Capacity Study,2010 8. FDOT Grade Separation Concept 9. Florida Keys Hurricane Evacuation Study, 2001 10. The Case of Hurricane George and the Florida Keys, 2001 11. Hurricane George Review of Evacuation Studies Utilization, 1999
Miami-Dade County	12. Miami-Dade Comprehensive Emergency Management Plan, 2008 13. Simulation and Analysis of Potential Mass Evacuation, 2007 14. District Six Comprehensive Emergency Management Plan, 2007 15. District Six Emergency Operations Plan for Hurricanes, 2006
Florida	16. One-Way Evacuation Plan, 2011 17. Florida Statewide Hurricane Evacuation/Shelter Plan, 1996
National	18. Guidelines for Hurricane Evacuation Signing and Marking, 2007 19. Before and After Hurricane Rita, 2006 20. Hurricane Floyd FEMA After Action Report, 1999

Several of the documents reviewed provided valuable information for the development of this project. The Updated Traffic Management Plan for US 1 and Palm Drive provided information about the existing traffic operations implemented during a hurricane evacuation event. The FDOT Grade Separation Concept was a planning-level conceptual improvement project along US 1 from south of SW 344 Street to the HEFT involving a grade separation of US 1 to provide enhanced levels of traffic operations. The Miami-Dade MPO study, Simulation and Analysis of Potential Mass Evacuation, recommended improvements to the area during hurricane evacuation events such as use of shoulders and Intelligent Transportation System (ITS) technologies.

2.1 Transportation Improvements

Miami-Dade 2012 Transportation Improvement Program

The current Miami-Dade Transportation Improvement Program (TIP) includes projects programmed from Fiscal Years (FY) 2011/2012 to FY 2015/2016. This 2012 TIP is a major document of the Miami-Dade MPO for the Miami Urbanized area and specifies proposed transportation improvements to be implemented in Miami-Dade County within the next five years. While most of the projects in this document are anticipated to be implemented as programmed, the projects will be periodically evaluated by the MPO as the TIP is updated or amended as necessary.

The 2012 TIP was reviewed in order to identify any capacity and operational improvements in the vicinity of the study intersection of US 1 and SW 344 Street. As such, four (4) capacity and operational improvement projects were identified from this document and are detailed in **Table 2**.

Table 2 – 2012 TIP Projects near Study Intersection

MPO Project No.	Facility	From/Location	To/Location	Type of Work
DT2496143	Krome Avenue	SW 296 Street	SW 136 Street	PD&E/EMO Study to improve traffic flow
PW000712	SW 336 Street and US 1			Traffic Signal
PW000723	SW 328 Street	SW 187 Avenue	US 1	Roadway Improvements
PW671605	SW 328 Street	US 1	SW 162 Avenue	Widening to 4 lanes

Miami-Dade 2035 Long Range Transportation Plan

The Miami-Dade 2035 Long Range Transportation Plan (LRTP) was completed in 2009 by the Miami-Dade MPO. The Miami-Dade MPO, similar to other MPOs, is required by Federal law to develop and update long range transportation plans every five years in cooperation with respective agencies that operate the County's transportation network. The 2035 LRTP was an update of the 2030 LRTP and was developed to guide transportation investments in Miami-Dade County to the Year 2035.

The 2035 LRTP Cost Feasible Plan Priority I Improvements (projects scheduled to be funded for construction by 2014were reviewed in order to identify any planned capacity improvements in the vicinity of the study intersection of US 1 and SW 344 Street. As such, three (3) planning capacity improvement projects were identified and are presented in Table 3. Although the SW 328 Street projects presented in this table are also programmed into the 2012 TIP, the FDOT recently cancelled the widening from 157th Avenue to 137th Avenue.

Table 3 – 2035 LRTP Priority I Planned Projects near Study Intersection

Facility	From/Location	To/Location	Type of Work
SR 5/US 1	Mile Marker 121.32	Mile Marker 124.18	Capacity improvement
SW 328 Street	SW 152 Avenue	SW 137 Avenue	Widening to 4 lanes
SW 328 Street	US 1	SW 162 Avenue	Widening to 4 lanes

FDOT Five-Year Work Program

The most recent FDOT Five-Year Work Program is for Fiscal Years 2012-2016. This document was reviewed for any capacity or operational improvement projects within the project area which may not have been included in the 2012 TIP. As such, four (4) projects were capacity or operational improvement projects as presented in **Table 4**.

Table 4 – FDOT Five Year Work Program projects

Item No.	Facility	From/Location	To/Location	Type of Work
405575-2	SR 997/Krome Avenue	Flagler Ave	SW 296th Street (by-pass)	PD&E/EMO Study
405575-3	SR 997/Krome Avenue	SR5 / US 1	SW 328 Street (Lucy Street)	Add lanes / reconstruct
249614-4	SR 997/Krome Avenue	SW 296 Street	SW 136 Street	PD&E/EMO Study
427369-1	SR 997/Krome Avenue	SW 296 Street	SW 232 Street	Add lanes / reconstruct

US 1 Overseas Highway RRR Projects, 2008

The US 1 Overseas Highway Restoration, Rehabilitation, and Resurfacing (RRR) projects were completed in 2011 by FDOT D6. These RRR projects focused on US 1 from Mile Marker 92 to Mile Marker 106 (approximately the northern end of Key Largo). These projects included milling and resurfacing, construction of paved inside and outside shoulders, drainage improvements, new signing and pavement markings, access modifications, and signal improvements.

As evidenced by this review, no improvements are planned for this study intersection and some of the capacity enhancements in the plans are along major evacuation routes.

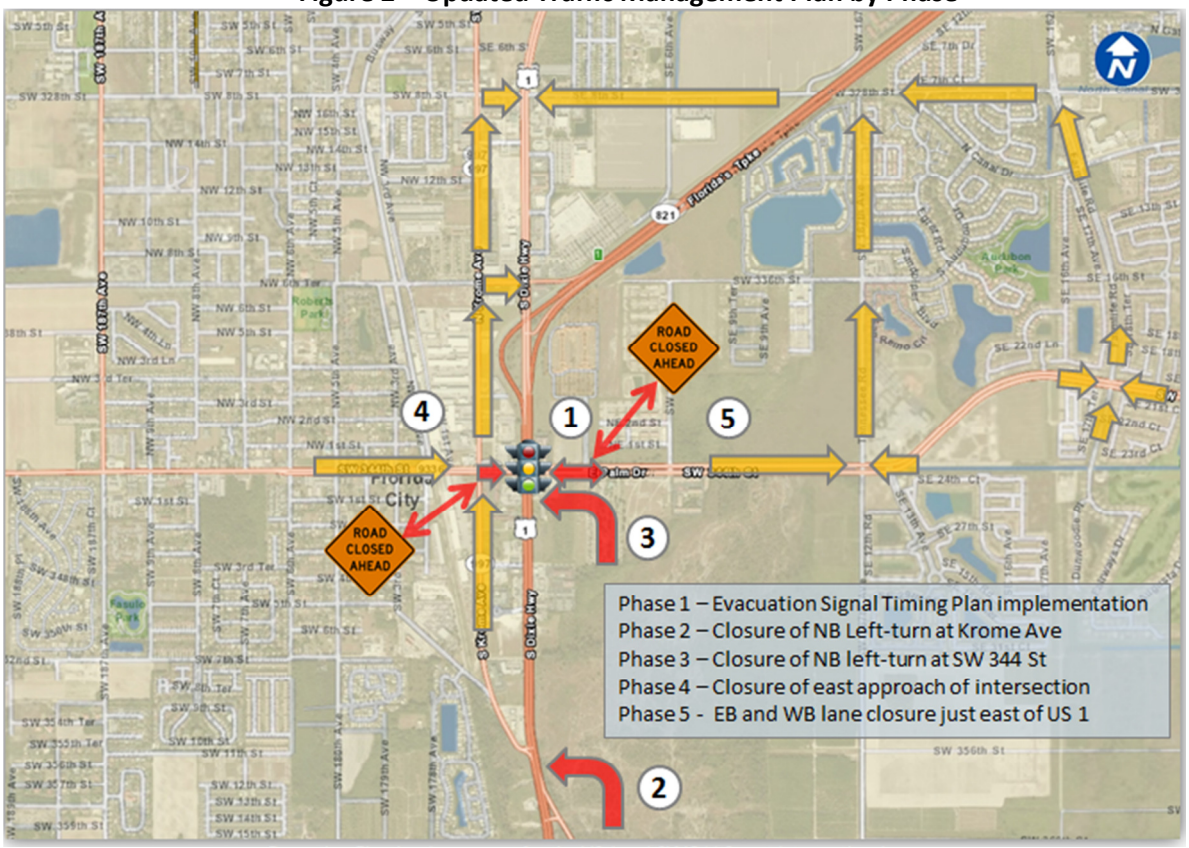
2.2 Florida Keys Studies

Updated Traffic Management Plan for US 1 and Palm Drive, 2011

The Updated Traffic Management Plan for US 1 and Palm Drive was developed in June 2011 in order to improve access to Florida's Turnpike from the Florida Keys during hurricane evacuation conditions (see **Appendix A**). The updated traffic management plan recommends five phases of implementation in order to improve access during these conditions. The following five phases were recommended from this plan (also see **Figure 2**):

1. Phase 1: activation of evacuation timing plan for US 1 and Palm Drive and monitoring of US 1 / Krome Avenue and US 1 / Palm Drive intersections.
2. Phase 2: closure of northbound left-turn lane at US 1 and Krome Avenue.
3. Phase 3: closure of northbound left-turn lane at US 1 and Palm Drive.
4. Phase 4: eliminate traffic from west approach at the US 1 and Palm Drive intersection.
5. Phase 5: eliminate traffic from the east approach at the US 1 and Palm Drive intersection.

Figure 2 – Updated Traffic Management Plan by Phase



These phases also contain other Maintenance of Traffic (MOT) implementation strategies in order to facilitate the closure of approaches and lanes. Significant manpower and equipment is needed for the implementation of this plan. These phases are implemented by field personnel observing traffic flow conditions. Therefore, this plan requires traffic congestion to build-up before measures are implemented to reduce congestion. Additionally, the final phase requires the closure of the SW 344 Street approaches. The Updated Traffic Management provides the framework for existing conditions during hurricane evacuation events. These traffic management techniques are used as a base condition for the traffic assessment analysis conducted for this study.

Maximum Traffic Flow Rates for Emergency Evacuation of Florida Keys, 2010

This technical memorandum was developed in 2010 by the FDOT D6 as part of an effort to develop a series of maximum sustainable traffic flow rates that can be used to conduct simulation modeling of US 1 within the Florida Keys during an evacuation of this area. The document states that the flow rates represent the practical rates that are likely to be realistically sustainable over an extended period (8 or more hours) of a mass evacuation. This study included the use of data collection from previous evacuations.

Based on the data collected on US 1 during recent evacuations in the Keys, evacuation flow rates collected in other locations, and the specific design, control, and land development characteristics that currently exist along US 1, the maximum sustainable evacuation traffic flow rates were calculated. The values for the maximum sustainable flow rates for hurricane evacuation along US 1 for the Upper Keys are presented in **Table 5**.

Table 5 – Maximum Sustainable Flow Rates for Hurricane Evacuation along US 1

Location Description	Maximum Sustainable Flow Rate Per Hour per Functional Evacuation Lane
Sexton Cove to Rattlesnake Key	900
Rattlesnake Key to Card Sound Road	1,200
Card Sound Road to HEFT	900

It should be noted these values represent the anticipated maximum sustainable flow rates per "functional evacuation lane," where a functional evacuation lane is defined as any through travel lane or continuous paved shoulder with a width of at least 10 feet. Since the possibility of some of the existing (and potential future) shoulder areas could be used as an additional outbound lane to carry evacuation traffic on some segments of US 1 during an emergency, these values can also be used for planning models of these temporary outbound travel areas. Prior analysis conducted by FDOT has concluded that continuous paved shoulders of ten feet or greater in width will permit traffic operations that are effectively the same as an adjacent standard travel lane during an evacuation.

Florida Keys Site Specific Capacity Study, 2010

The Florida Keys Site Specific Capacity Study was developed by the FDOT D6 to evaluate traffic conditions and roadway capacity on roadway segments in the upper Keys in Monroe County, Florida. The site-specific analyses were needed to assess traffic flow rates under a variety of conditions and to determine the appropriateness of the roadway capacity values used in the 2001 Florida Keys Hurricane Evacuation Study prepared by Miller Consulting, Inc. (aka the "Miller Study"), within the Key Largo area.

The analysis included a micro-simulation with CORSIM, a nationally-recognized tool in evaluating traffic conditions on roadway networks. The CORSIM model was coded between Mile Marker 99 and Mile Marker 107 (Key Largo). Based on this analysis, the potential capacity values anticipated during a mandatory hurricane evacuation condition in the Key Largo area is presented in **Table 6.**

Table 6 – Potential Hourly Capacity per Lane During an Evacuation Event

No Incident			With Incident		
Dry and Daylight	Rain or Night	Rain and Night	Dry and Daylight	Rain or Night	Rain and Night
1,435 vph	1,220 vph	760 vph	1,145 vph	975 vph	610 vph

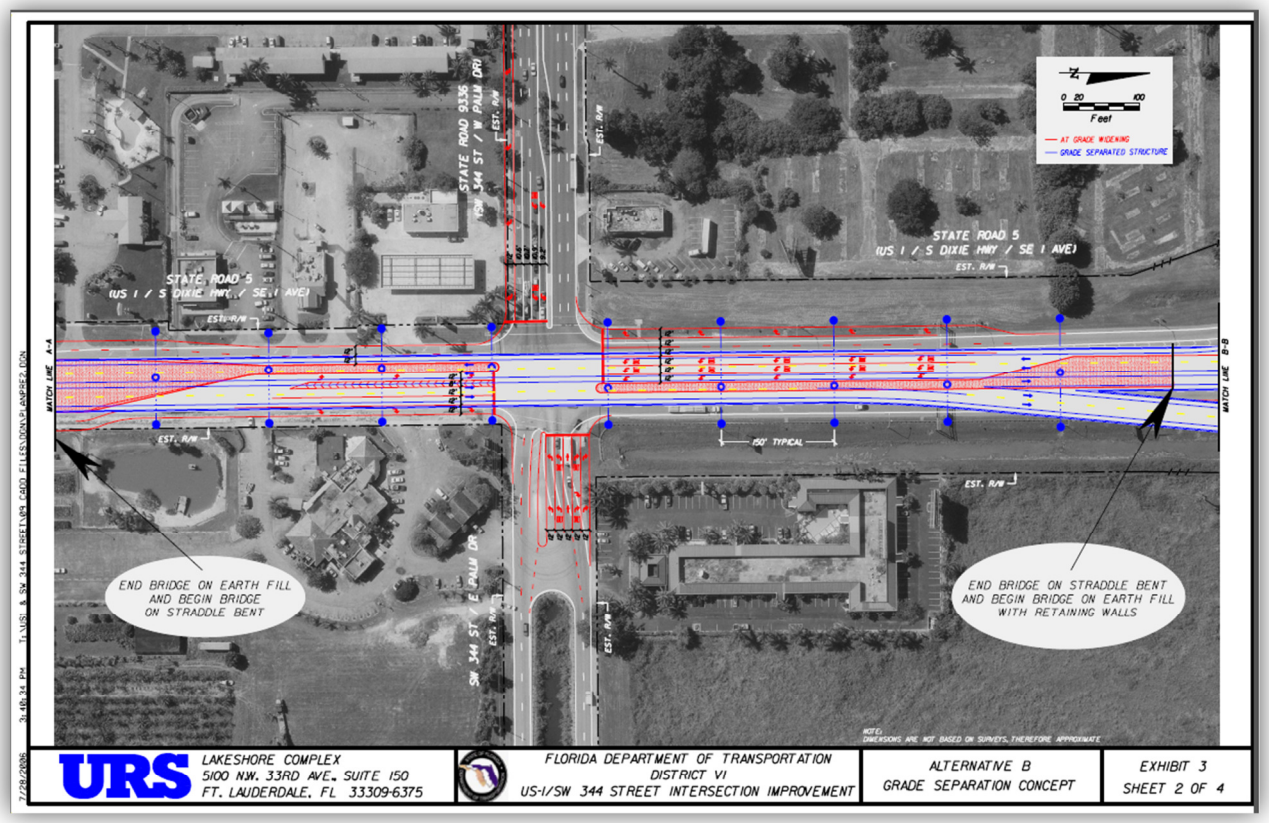
According to the study, these flow rates are consistent with evacuation traffic flow rates observed in several other evacuations, including those associated with Hurricanes Floyd in Florida and South Carolina and Hurricane Katrina in Louisiana.

However, due to the insufficient traffic data available (actual traffic volumes) during hurricane evacuations, a flow rate needed to be assumed for this study. Therefore, a maximum flow rate was developed based on the recommended Highway Capacity Manual (HCM) value for saturated conditions along urban roadways, which is approximately 1,900 vehicles per hour of green per lane (vphgpl).

FDOT Grade Separation Concept

The FDOT Grade Separation Concept was developed for the purposes of improving the hurricane evacuation traffic conditions for vehicles entering/exiting the Florida Keys along US 1 from south of SW 344 Street to the HEFT (see **Figure 3**). The concept involved a grade separated US 1 providing two-levels of traffic. The at-grade level would be widened, intersect with SW 344 Street, and provide access to the HEFT. The upper level was conceptualized on straddle bents and would provide free-flow conditions along US 1 from south of SW 344 Street to the HEFT. The project cost was estimated at approximately $50 to $60 million. The concept could enhance evacuation clearance time; however, did not move forward into design due to funding constraints.

Figure 3 – FDOT Grade Separation Concept



Florida Keys Hurricane Evacuation Study, 2001

The Florida Keys Hurricane Evacuation Study was completed by FDOT D6 in June 2001. The Florida Keys Hurricane Evacuation Study had three specific goals:

1. Develop an evacuation model that measured and analyzed the unique characteristics of the Florida Keys;
2. Determine the "clearance time" required to evacuate the Florida Keys up to Florida City based on existing US 1 and Card Sound Road conditions; and
3. Identify clearance times of various scenarios.

Several alternatives were analyzed including the following: No-Build alternative, Transportation Systems Management (TSM), FDOT proposed widening of 18-mile stretch, and a permanent improvement alternative. Based on the study recommendations, in order to reduce the clearance time associated with the hurricane evacuation of the Florida Keys, the permanent improvement alternative was recommended for implementation. The components of this improvement near the US 1 and SW 344 Street intersection area included the following:

- Construct one additional northbound lane along US 1 in Florida City;
- Provide a three-lane on-ramp from US 1 to northbound Florida's Turnpike;
- Improve shoulder width and provide safety elements along the 18-mile stretch of US 1. Improvements along the shoulder allow for them to be used as an additional lane during hurricane evacuation events. Improvements were completed as of September 2011.

The Case of Hurricane Georges and the Florida Keys, 2001

This study evaluated the return delays and evacuation order compliance from this hurricane event. Hurricane Georges made landfall near Key West moving towards the Gulf Coast on September 25, 1998. At the time of landfall, Hurricane Georges was a Category 2 storm. Aside from reentry after a hurricane evacuation event, the research focused on household response to Hurricane Georges in Monroe and Miami-Dade counties. While both counties were threatened, Monroe County experienced the worst of Hurricane Georges.

The data collection for this project included survey data collected between February 24 and March 30, 1999, using a computer assisted telephone interviewing system. For Monroe County the target was a randomly selected sample of 400 households. The survey instrument covered a wide range of evacuation and preparedness issues, both general and specific to Hurricane Georges.

According to the study survey data, a 53% of Florida Keys households evacuated for Hurricane Georges, however compliance varied significantly by geographical location. The geographic locations of the Florida Keys were Lower Keys, Middle Keys, and Upper Keys. The entire county was under mandatory evacuation although Hurricane Georges was predicted consistently to cross the Lower to Middle Keys. According to the survey, the evacuation statistics by geographical area include the following: 72% of Lower Keys residents evacuated; 58% for the Middle Keys; and, 42% for the Upper Keys. Based on these statistics it appears that the majority of Florida Key residents evacuate during a hurricane evacuation event.

Hurricane Georges Assessment, 1999

The Hurricane Georges Assessment was developed by the US Army Corp of Engineers (USACE) and the Federal Emergency Management Agency (FEMA) in 1999. The assessment reviews the hurricane evacuation study utilization and information dissemination. Hurricane Georges provided an opportunity to answer several key questions regarding these major FEMA/Corps planning efforts:

- Did local and state officials use the products produced in these major studies?
- Were study data regarding storm hazards, behavioral characteristics of the threatened population, shelter information, evacuation times, and decision-making accurate and reliable?
- Which study products were most useful and which least useful - what improvements could be made to current methodologies and products?

However this study focused mainly on the refinement of hurricane modeling techniques rather than evacuation conclusions.

2.3 Miami-Dade County Studies

Miami-Dade County Comprehensive Emergency Management Plan, 2008

The Miami-Dade County Comprehensive Emergency Management Plan (CEMP) was developed in 2008. The CEMP outlines the basic strategies, assumptions, operational goals and objectives, and mechanisms through which Miami-Dade County will mobilize resources and conduct activities to guide and support emergency management efforts through preparedness, response, recovery and mitigation. This plan focuses on the general, high-level emergency management techniques rather than focusing on evacuation routes and traffic management methods. However, the CEMP does not recommend the use of contraflow operations for any evacuation event.

Simulation and Analysis of Potential Mass Evacuation of Miami-Dade Residents, 2007

The Simulation and Analysis of Potential Mass Evacuation of Miami-Dade Residents study was developed by the Miami-Dade MPO based on a request from the Citizens Transportation Advisory Committee (CTAC). The study provided the results of a simulated mass evacuation event using the MPO regional model and identified applicable pre and post event transportation strategies that may be utilized to manage such an event should it occur in Miami-Dade County.

Although some benefits of contraflow operations were cited, the study did not replicate the hurricane evacuation modeling that can be provided by OEM&HS nor did it provide for an assessment of the manpower needed to implement contraflow operations. The study noted that contraflow operations have been previously evaluated by the FDOT and other transportation agencies and have not been recommended due to the extensive manpower required as well as the uncertainty of where the contraflow should be directed based on the changing course of hurricanes.

The study identified several strategies that can be further explored if a mass evacuation event were to occur in the County. Some of these strategies more closely related to a potential evacuation of the Florida Keys are outlined below:

- Use of road shoulders;
- Maximizing the use of Intelligent Transportation Systems (ITS) for evacuation purposes;
- Prioritize all transportation improvement projects along designated evacuation routes; and,
- Include roadway capacity enhancement projects along designated evacuation routes.

District Six Comprehensive Emergency Management Plan, 2007

The FDOT D6 Comprehensive Emergency Management Plan was developed in 2007. FDOT has four basic emergency management responsibilities:

- To address employees and places of work, in essence, continuity of Department business when work place emergencies occur;
- To respond to local emergencies that, directly or indirectly, have an impact on or disrupt the multi-modal transportation system;
- To respond when state emergencies are imminent or declared; and,
- To support mutual aid requests.

The plan identifies key departmental individuals who are responsible for accomplishing these obligations. Emergencies include work place emergencies such as airborne hazards, bombs, and tornados; local emergencies such as bridge damage or failures, terrorism, and severe weather; and state emergencies.

As defined by this plan, the section regarding Severe Weather is primarily for hurricanes. Since hurricanes can be planned for prior to landfall, they typically receive the most detail relative to other issues in this document. The plan outlines a list of techniques for preparation, response, and recovery from these events.

District Six Emergency Operations Plan for Hurricanes, 2006

The FDOT D6 Emergency Operations Plan for Hurricanes 2006 is an update of the 2003 edition. The purpose of this plan is to outline the actions and responsibilities of District personnel necessary to:

- Establish an Emergency Operations Center which will provide the focal point of communication;
- Prepare for a prompt and efficient response to emergency situations;
- Respond to emergency situations promptly and properly; and,
- Recover from emergency situations including damage assessment and assisting local entities.

The plan is a general plan for the entire District and provides a checklist format on a time-line. The time-line is based on a 72-hour period preceding landfall of a hurricane or a severe tropical storm and ends about two weeks following passage of a storm.

District Six SunGuide TMC Hurricane Response Action Plan, 2006

The FDOT D6 Sunguide Transportation Management Center (TMC) Hurricane Response Action Plan (HRAP) was developed in 2006 which identifies planning and operational strategies before, during, and after a hurricane event. This document is intended for the use of the Sunguide TMC during this hurricane event time periods.

Some of the activities which the SunGuide TMC is responsible for based on the HRAP is the following:

- Usage of Dynamic Messaging Signs (DMS) for emergency purposes based on a request by Emergency Operations Center (EOC);
- Coordination with District 4 and Turnpike TMC's;
- Road ranger coordination; and
- Traveler information (511)

2.4 State of Florida Studies

One-Way Evacuation Plan, 2011

The One-Way Evacuation Plan was developed by FTE and FDOT in 2011. The plan details the operations of contraflow travel along the Florida Turnpike from a southern point in Homestead to the City of Orlando. Therefore northbound traffic will be able to utilize both the northbound and the southbound travel lanes. According to FTE, the need for implementation of this plan has never occurred since other strategies prove more useful.

Florida Statewide Hurricane Evacuation/Shelter Plan, 1996

The Florida Statewide Hurricane Evacuation/Shelter Plan was developed by the USACE, FEMA, and Florida Department of Community Affairs (DCA) in 1996. The study included reviewing regional hurricane evacuation studies, behavioral analysis, roadway capacity data collection, statewide evacuation travel demand, and clearance time reduction analysis. Some of the outcomes from this study consist of developing strategies for clearance reduction time including enhancing directional capacity and using alternative modes of transportation.

2.5 National Studies

Guidelines for Hurricane Evacuation Signing and Marking, 2007

The Guidelines for Hurricane Evacuation Singing and Markings was developed for the Federal Highway Administration (FHWA) in 2007. The document development was based on focus group input and surveys of motorists who have recent hurricane evacuation experience, researchers developed guidelines for various hurricane evacuation signs and markings. These signs and markings include the following:

- Evaculane pavement marking,
- Contraflow crossover signs,
- Evacuation route signs,
- Evacuation route designations on overhead guide signs,
- Evaculane signing,

- Motorists service signs,
- Dynamic messaging signs.

Some examples of the potential evacuation related signs are presented in **Figure 4**.

Figure 4 – Evacuation Route Signs

The hurricane evacuation signs are utilized along the hurricane evacuation route of US 1. Additionally these are standard signs included in the Manual of Uniform Traffic Controls Devices.

Before and After Hurricane Rita, 2006

The Before and After Hurricane Rita report was developed in 2006 by the House Research Organization of the Texas House of Representatives. Hurricane Rita traveled through the Gulf of Mexico in September 2005 as a Category 5 storm and prompted millions of residents in the coastal communities, Houston area, and southeast Texas to evacuate their homes.

One significant problem with the evacuation from Hurricane Rita was the heavy backlog of traffic leading away from the coast while highway lanes heading toward the storm were empty along I-10 and I-45. Since the backlog of traffic was significant, contraflow was implemented by order of the governor. However at the time there were no plans to implement this contraflow along these highways. The contraflow required 12-hours to implement.

Subsequently, steps were taken in order to mitigate any traffic and mobility issues for any future evacuation based on the issues encountered during the Hurricane Rita evacuation. In 2005 the Office of Homeland Security identified eight evacuation routes in need of improvements. Additionally, steps have been taken to develop plans for contraflow implementation during an evacuation event in the State of Texas.

Hurricane Floyd FEMA After Action Report, 1999

The Hurricane Floyd FEMA After Action Report was developed in 1999. At the time, Hurricane Floyd, a Category 4 storm, prompted the largest evacuation in US History as 3.5 million coastal residents rushed inland. Hurricane Floyd made landfall on September 16, 1999 near Cape Fear, North Carolina. The report contains after action issues that were submitted by the Emergency Response Team staff and identifies critical issues with the potential of having an important bearing on future operations if not resolved. Some of the issues reported include complaints regarding inspectors/inspections, inadequate search capability of the National Emergency Management Information Systems (NEMIS), assignment of National Processing Service Center Liaison to the Disaster Field Office, etc.

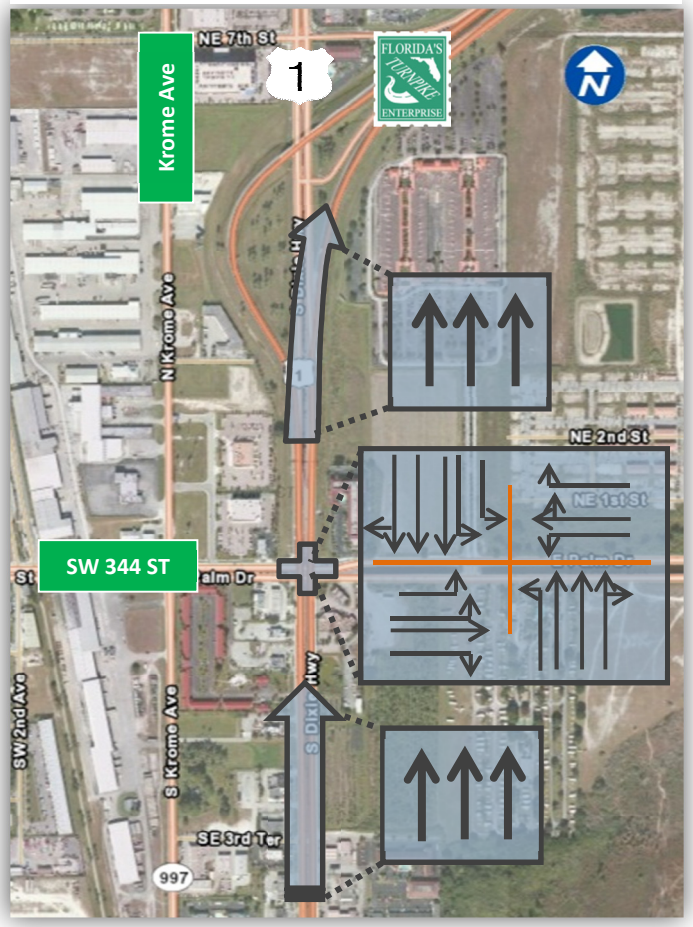
These studies provided information in regards to hurricane evacuation procedures. However, based on the review of these reports, the ones that provided the most practical information where those reports specific to the Florida Keys. These documents provided the information necessary to proceed to the next step of this project – development of alternatives.

3.0 ALTERNATIVE CONCEPT DEVELOPMENT

The alternatives developed for this project were based on reviewing the existing geometric configuration along US 1, potential right-of-way constraints, alternative project costs, and coordination with the various agencies involved with the project such as FDOT, FTE, and Miami-Dade Public Works. For a project to be implemented under current financial constraints, right-of-way and construction costs are the most valuable attributes in determining project benefits. The steps for the development of the concepts included the following:

1. Review of existing geometry (see **Figure 5**);
2. Development of 8 conceptual alternatives;
3. Comparing planning-level costs, right-of-way constraints, and potential benefits;
4. Narrowing study alternatives to 3 to advance into traffic assessment;
5. Coordination with various agencies; and,
6. Recommendation of final alternative

Figure 5 – Existing Geometric Configuration



3.1 Existing Geometry

The existing geometric features along US 1 from Card Sound Road to about SW 344 Street include a divided, 5-lane roadway (three northbound and two southbound) with curb and gutter on either side of the northbound travel lanes and a swale on the right side of the southbound travel lanes (see **Figure 5**). From about SW 344 Street to the HEFT, US 1 is a divided, 6-lane roadway with swale on the right side of both travel ways. At the intersection of US 1 and SW 344 Street, the northbound approach has one exclusive left-turn lane and three thru lanes including one shared thru-right lane.

3.2 Concept Alternatives

After a review of the existing geometric configuration and the right-of-way along US 1, 8 concept alternatives were developed (see **Appendix B**).

These alternatives were conceptualized by overlaying 8 potential alignments on an aerial. Preliminary costs and potential right-of-way impacts were assessed based on these concepts. Some of the 8 alternative concepts have sub-alternatives with minor variations. The 8 concept alternatives are presented in **Table 7**.

The alternatives included geometric features such as single point interchanges, diamond interchanges, partial interchanges, indirect left-turns, and direct flyovers. Other features include alternatives where US 1 has free-flow traffic operations over SW 344 Street.

Table 7 –Conceptual Alternatives

Alternative	
1	Single point urban interchange with US 1 over Palm Drive
2	Single point urban interchange with Palm Drive Over US 1
3	Diamond interchange with US 1 over Palm Drive
4A	Diamond interchange with Palm Drive over US 1
4B	Diamond interchange with Palm Drive over US 1 and Krome Avenue
5	Partial single point interchange (US 1 northbound over Palm Drive)
6	Partial diamond interchange (US 1 northbound over Palm Drive)
7	Indirect lefts or New Jersey jug handle
8A	US 1 northbound direct flyover to the HEFT northbound
8B	US 1 northbound single lane direct flyover to the HEFT northbound
8C	US 1 northbound single lane direct flyover to the HEFT northbound and 8 feet shift to the west
8D	US 1 northbound single lane direct flyover to the HEFT northbound with minimum ROW impacts

The preliminary cost estimate, right-of-way impact/relocations, and potential improvements to the intersection traffic flow were analyzed for each of the alternatives and are presented in **Table 8**. The construction and right-of-way costs were developed based on preliminary costs used in previously approved projects. It should be noted that this is a sketch-level planning analysis and additional engineering and environmental analysis are needed to fully evaluate operations, safety, environmental, and planning considerations associated with each alternative.

Table 8 –Preliminary Analysis

Alternative		Potential for Increased Traffic Flow Rates	Right of Way Impacts and Relocations	Total Costs[1]
1	Single Point US 1 Over SW 344 Street	High	20 parcels 8 relocations	$45,000,000
2	Single Point SW 344 Street Over US 1	Medium	25 parcels 5 relocations	$ 30,000,000
3	Diamond US 1 Over SW 344 Street	High	16 parcels 6 relocations	$ 35,000,000
4A	Diamond SW 344 Street Over US 1	Medium	24 parcels 5 relocations	$ 25,000,000
4B	Diamond SW 344 Street Over US 1 and Krome Avenue	Medium	24 parcels 5 relocations	$ 32,000,000
5	Partial Single Point US 1 Over SW 344 Street	Medium	5 parcels no relocations	$ 29,000,000
6	Partial Diamond US 1 Over SW 344 Street	Medium	5 parcels no relocations	$ 23,000,000
7	Indirect Lefts on US 1 and SW 344 Street	Low	5 parcels no relocations	$ 22,000,000
8A	Direct Flyover US 1 to HEFT Northbound	High	2 parcels no relocations	$ 14,000,000
8B	Direct Flyover US 1 to HEFT Northbound with single lane flyover	High	2 parcels no relocations	$ 12,000,000
8C	Direct Flyover US 1 to HEFT Northbound with single lane flyover and 8-ft shift to west	High	1 parcels no relocations	$ 19,000,000
8D	Direct Flyover US 1 to HEFT Northbound with single lane flyover with additional shift to west	High	1 parcel no relocations	$ 18,000,000

[1] Total Costs includes right-of-way and construction costs.

All of the alternatives have the opportunity to enhance traffic flow rates through the study intersection thereby also benefitting any potential evacuation conditions. However, some of the alternatives may require additional traffic operations management during hurricane events to allow for free-flow of US 1, such as the SW 344 Street over US 1 alternatives and the Indirect Lefts alternative. All of the alternatives conceptualized would have impacts to right-of-way. The alternative with the least impact to right of way is Alternative 8D. The project costs, which include potential right-of-way acquisition and construction costs, ranged from $12 million for Alternative 8B to $45 million for Alternative 1.

Right-of-way costs are planning level estimates and would require further evaluation in a future project study.

3.3 Selected Alternatives For Further Traffic Analysis

The eight concept alternatives were presented to the Miami-Dade MPO Transportation Planning Technical Advisory Committee (TPTAC) on April 4, 2012 (See **Appendix C**). This meeting was composed of representatives from various agencies including Miami-Dade County, FDOT, MDX, and the FTE. As a result of meeting discussion between participants, and based on the MPO recommendations, three of the eight alternatives were selected to undergo further analysis. Overall, positive feedback was received from these recommended alternatives. It should be noted that after the TPTAC presentation, the Miami-Dade County Public Works Department provided comments to the MPO. These comments are addressed in **Appendix D**.

The three alternatives identified for further analysis were Alternative 3, 4B, and 8A from **Table 8**. For ease of recognizing the geometric differences the Alternatives were renamed to US-1 Overpass, SW 344 Street Overpass, and Northbound HEFT Ramp Extension, respectively. These alternatives will be referenced by these names throughout the rest of the document. More detailed information on the 3 concept alternatives is provided on **Table 9**.

Table 9 –Alternatives Advanced for Traffic Analysis

Alternative		Description	Advantages	Disadvantages
	Existing Conditions (See **Figure 5**)	• US 1 and SW 344 Street is a signalized at-grade intersection with no free flow movements • NB US 1 provides three through lanes from Card Sound Road to HEFT interchange • NB US 1 is two-lanes north of NB HEFT ramps • HEFT connection to US 1 is north of SW 344 Street • NB HEFT ramp from northbound US 1 is two-lanes	• No cost	• Does not provide any enhancements to potential hurricane evacuation conditions
3	US 1 Overpass (see **Figure 6**)	• NB/SB through movements on US 1 will be free-flow over SW 344 Street • Access to/from SW 344 Street will be provided via one-lane ramps from/to US 1 • SW 344 Street will be signalized east and west of US 1 overpass to provide access with ramps to/from US 1 • Vehicles traveling NB on US 1 south of SW 344 Street will be provided access to the NB HEFT via an elevated two-lane ramp south of SW 344 Street • Vehicles accessing NB US 1 via SW 344 Street will be provided access to the NB HEFT via a new one-lane ramp at the current SB US 1 to NB HEFT ramp location • NB US 1 will remain two-lanes north of NB HEFT ramps • SB HEFT ramp will be shifted west and elevated to provide connection with the grade separated SB US 1, it will not have access to SW 344 Street	• Potential enhancement of evacuation clearance time for NB direction • Traffic operation will also improve for the SB direction	• Highest total cost due to right-of –way acquisition and construction of bridge • SB HEFT does not provide access to SW 344 Street • Additional signal at SW 344 Street
4B	**SW 344 Street Overpass (see Figure 7)**	• EB/WB through movements on SW 344 Street will be free-flow over US 1 • Access to/from US 1 will be provided via one-lane ramps from/to SW 344 Street • US 1 will be signalized north and south of SW 344 Street overpass to provide access with ramps to/from SW 344 Street • NB HEFT connection from NB US 1 will remain a two-lane ramp north of SW 344 Street • NB US 1 will remain two-lanes north of NB HEFT ramps • Krome Avenue will need to be constructed over SW 344 Street and will not provide access to/from SW 344 Street	• Potential improvements to local non-evacuation traffic conditions	• Highest impact to parcels and relocations • It will still require a traffic management plan for the free-flow of US 1 during hurricane evacuation conditions • Additional signal on US 1 • Krome Avenue does not provide access to/from SW 344 Street
8A	Northbound HEFT Ramp Extension (see **Figure 8**)	• Vehicles traveling NB on US 1 south of SW 344 Street will be provided access to the NB HEFT via an fly-over two-lane ramp • US 1 would remain at-grade with SW 344 Street • NB US 1 will remain two-lanes north of NB HEFT ramps • Vehicles accessing NB US 1 via SW 344 Street will be provided access to the NB HEFT via a new one-lane ramp at the current SB US 1 to NB HEFT ramp location	• Potential enhancement of evacuation clearance time • Lowest total construction cost • Least impact to parcels and relocations • Reduction of NB through traffic at the intersection of US 1 and SW 344 Street due to NB HEFT fly-over bypassing intersection	• Reduction of NB US 1 lanes south of SW 344 Street • No added improvements to SB HEFT traffic

Figure 6 – US 1 Overpass Alternative

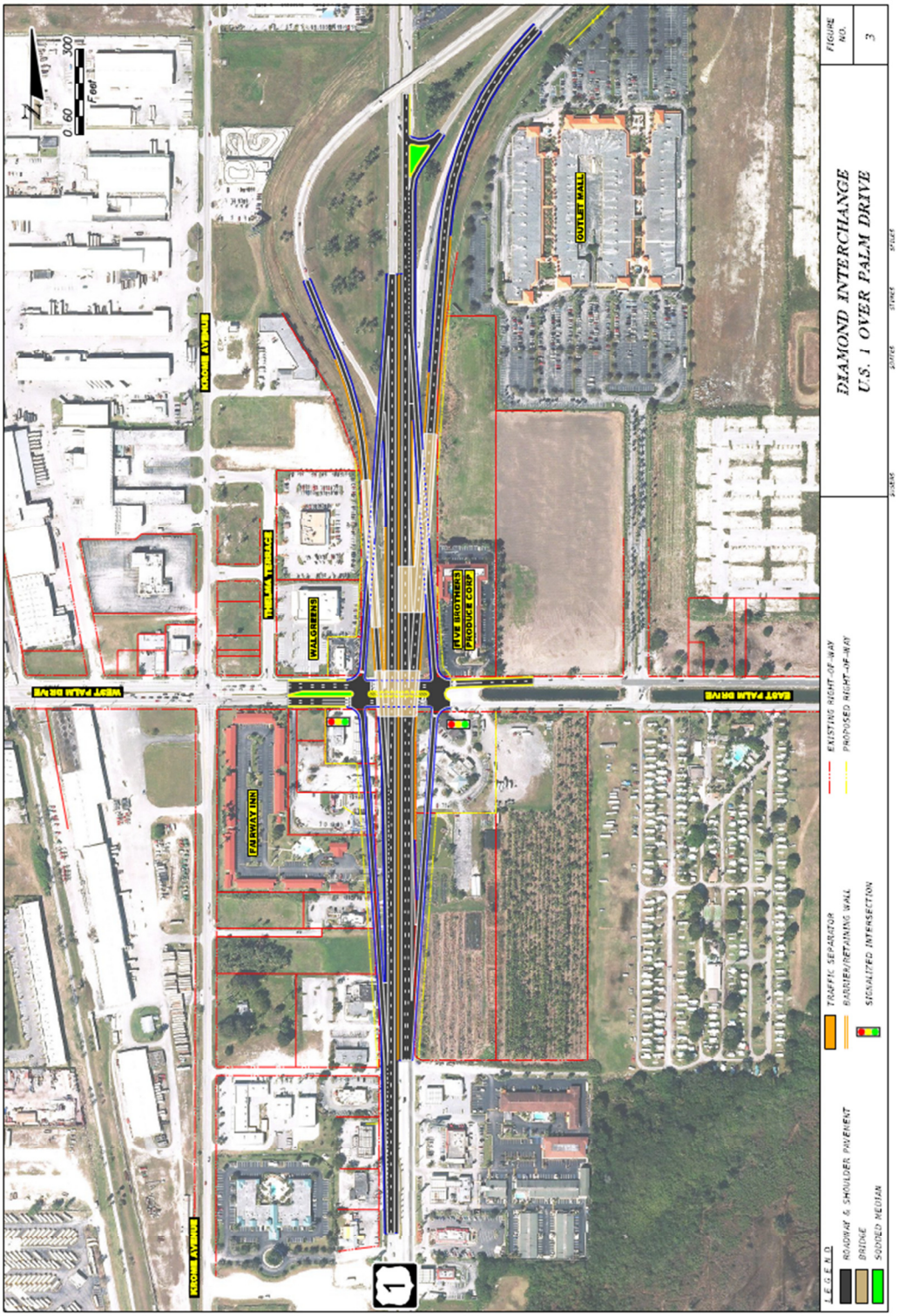


Figure 7 – SW 344 Street Overpass

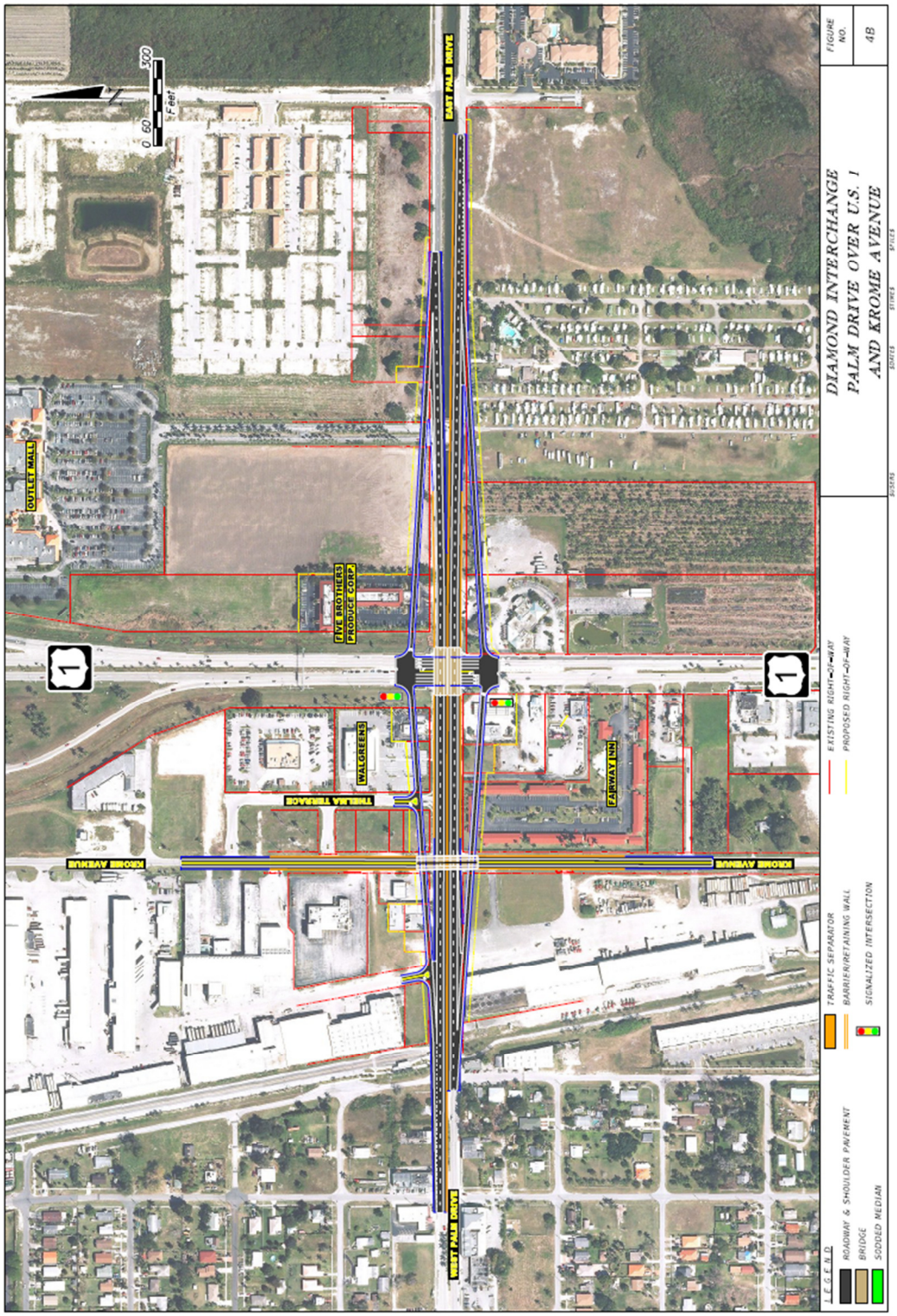
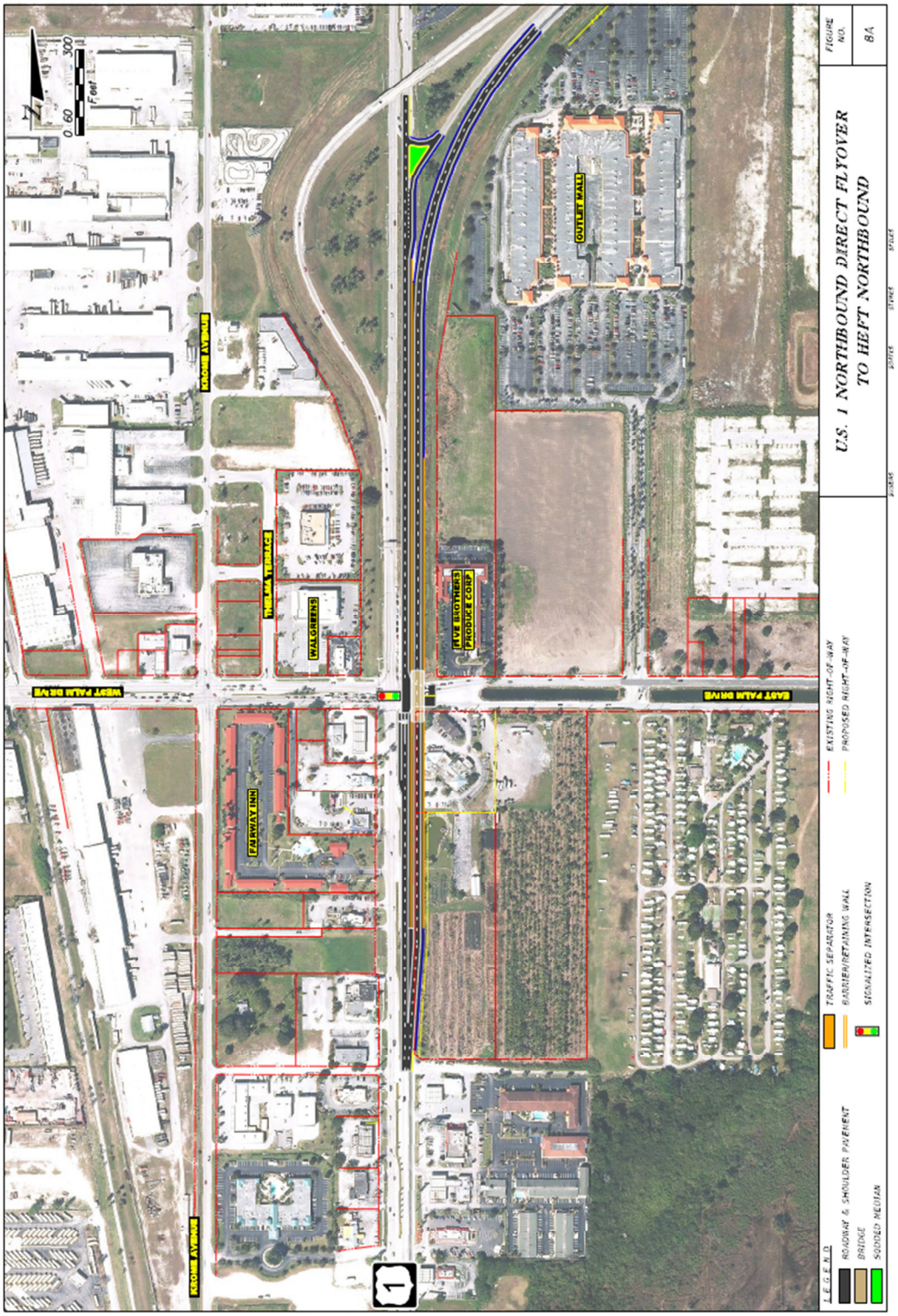


Figure 8 – Northbound HEFT Ramp Extension



Aside from the differences in geometric configuration, these alternatives offer other distinct benefits, such as:

- The US 1 Overpass alternative allows potential improvements to the traffic conditions for both the northbound and southbound movements during hurricane evacuations. However this alternative has the highest cost due to the right-of-way acquisition and construction cost associated with the bridge.
- The SW 344 Street Overpass alternative allows for free-flow traffic conditions for SW 344 Street movements which would potentially improve local non-evacuation traffic conditions. However, this alternative would require a traffic management plan and personnel to allow free-flow traffic conditions along US 1 during an evacuation. Conceptually, the traffic management plan for this alternative would be less intense than the existing traffic management plan currently used by FDOT.
- The Northbound HEFT Ramp Extension alternative provides free-flow traffic conditions for the northbound movement which is the most critical traffic movement during a Florida Keys hurricane evacuation event. In order to accommodate the two-lane fly-over northbound ramp to the HEFT, this alternative would require modifying the number of northbound lanes along US 1 from three to two. However, traffic conditions along southbound US 1 will remain the same. It should be mentioned that although this alternative considers reducing the number of northbound US 1 lanes south of SW 344 Street, there will not be significant impacts to the traffic operations on US 1. It is expected that the current traffic that goes through the intersection of US 1 and SW 344 Street destined to the HEFT will use the proposed fly-over ramp and by-pass the intersection. Therefore, traffic operations on US 1 should remain the same.

4.0 TRAFFIC ANALYSIS

The purpose of the traffic analysis conducted for the intersection of US 1 & SW 344th Street was to evaluate the impacts that the recently completed improvements along the 18-mile stretch of SR 5/US 1 might have on traffic operations during evacuation conditions along the northbound direction of SR 5/US 1 segment north of Card Sound Road.

In addition to the roadway improvements implemented as part of the 18-mile stretch project, FDOT also completed improvements along the northbound direction of SR 5/US 1 between the intersection of Card Sound Road and the HEFT interchange which included the construction of an additional northbound lane along SR 5/US 1 and implementation of sidewalks on the east side of the roadway.

One of the MPO study analysis goals is to assess whether the increase in capacity due to recent improvements (18-mile stretch improvements and northbound improvements north of Card Sound Road) further impacts the operations and ability for increased traffic flows through the intersection of SR 5/US 1 & SW 344th Street. As the only signalized intersection located on SR 5/US 1 north of Card Sound Road, this intersection could potentially interfere with hurricane evacuation conditions by metering the traffic that passes through this intersection.

As mentioned previously, the Traffic Management Plan for SR 5/US 1 at SW 344th Street (Palm Drive) is to be implemented in case of hurricane evacuation conditions and it consists of five phases. The first phase consists of activating the hurricane timing plan for intersection of SR 5/US 1 and SW 344th Street which, provides 75% more green time to the northbound direction (more green time than during normal peak periods). The last phase of the Traffic Management Plan considers the complete closure of the eastbound/westbound approaches of the intersection of SR 5/US 1 and SW 344th Street (if field personnel deem it necessary) in order to provide free-flow conditions for the traffic traveling northbound. It needs to be emphasized the closure of the eastbound-westbound approaches of this intersection will only take place if field personnel deem it essential to keep the northbound traffic flowing efficiently. Otherwise, this signal will operate under a hurricane evacuation timing plan to be activated by Miami-Dade County Signals and Signs Division after being notified by the Monroe County Emergency Management Office.

The traffic analysis was performed in three stages. The first stage evaluated existing traffic flow conditions along SR 5/US 1 between Card Sound Road and the northbound ramp to the HEFT, assuming traffic characteristics during a holiday (worst-case scenario for SR 5/ US 1northbound direction). The second stage considered traffic flow conditions during hurricane evacuation. For the hurricane evacuation condition a Base Scenario (current geometric conditions) and three proposed alternatives were evaluated. The third phase consisted of identifying potential improvements to the HEFT segment

(north of the interchange with SR 5/US 1) that might allow a more efficient permanent traffic flow that would be especially beneficial during hurricane evacuations.

Since the segment along SR 5/US 1 from Card Sound Road to the northbound HEFT ramp is expected to operate under free-flow conditions (no signal at the intersection of SR 5/US 1 and SW 344th Street) during the worst-case scenario for hurricane evacuation of the Florida Keys, the traffic analysis conducted for this study would be based on the worst-case scenario. Therefore, the CORSIM simulation model developed to replicate current traffic flow conditions during hurricane evacuation, does not consider a signal at the intersection of SR 5/US 1 and SW 344th Street.

All the traffic analyses conducted for this study were performed using CORSIM 6.2. Due to the stochastic nature of CORSIM, it is necessary to run CORSIM multiple times to gain an accurate reflection of the performance of the scenario being studied. Therefore ten (10) runs were conducted for each traffic analysis scenario to evaluate the performance of each alternative. CORSIM output results are included in **Appendix E**.

As indicated previously, this is a preliminary planning-level traffic analysis conducted in order to evaluate the impact on the northbound direction of SR 5/US 1 during hurricane evacuation conditions. Due to the planning-level characteristic of this analysis, traffic data collection was very limited and several assumptions were made throughout the study. These assumptions will be described further in this report.

4.1 Existing Conditions Analysis

Traffic Data Collection/Traffic Flow Characteristics

Traffic data collection consisted of information from the 2010 FDOT Florida Traffic Information DVD. And traffic counts collected in the field during May 28th, 2012 (Memorial Day). Data from three permanent traffic monitoring sites were obtained as indicated on **Table 10.**

Table 10 – Information from 2010 FDOT Florida Traffic Information DVD

Traffic Count Station ID	Traffic Count Station Location	AADT (vpd)		Truck Factor	
870543	SR 5/US 1 – 2,500' south of Palm Drive (SW 344th Street)	NB SB Total	12,500 10,500 23,500	Daily Peak Hour	12.62% 6.31%
870544	SR 5/US 1 – 100' north of Lucy Street (SW 328th Street)	NB SB Total	14,000 13,500 27,500	Daily Peak Hour	6.92% 3.46%
872263	HEFT northbound ramp from US 1	NB	17,400	Daily Peak Hour	5.69% 2.85%

In addition, a plot of the hourly volumes vs. time of day was developed for stations 870543 and 870544 (located along SR 5/US 1) using data from the Synopsis Report included in the 2010 FDOT Florida Traffic Information DVD. Unfortunately, no Synopsis Report was available for station 872263 (located on the HEFT NB Ramp from SR 5/US1). **Figure 9** and **Figure 10** show the plots previously mentioned for stations 87054 and 870544, respectively.

As observed from these graphs, the two-way traffic along SR 5/US 1 south and north of SW 344th Street experiences the highest two-way hourly volume during the PM peak hour. Approximately, 1,600 vph and 2,200 vhp were reported for both locations during the afternoon peak. It is noticeable that the northbound direction is the one with the highest contribution to the two-way traffic volumes. South of SW 344th Street approximately 1,000 vph were reported and north of SW 328th Street 1,200 vph were counted.

Figure 9 – SR 5/US 1 south of SW 344th Street - Hourly Volume vs. Time Day Graph

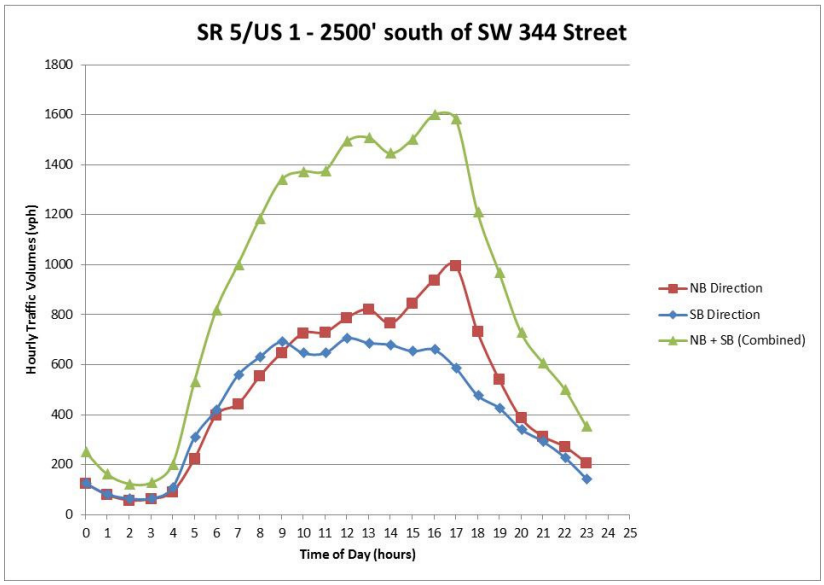
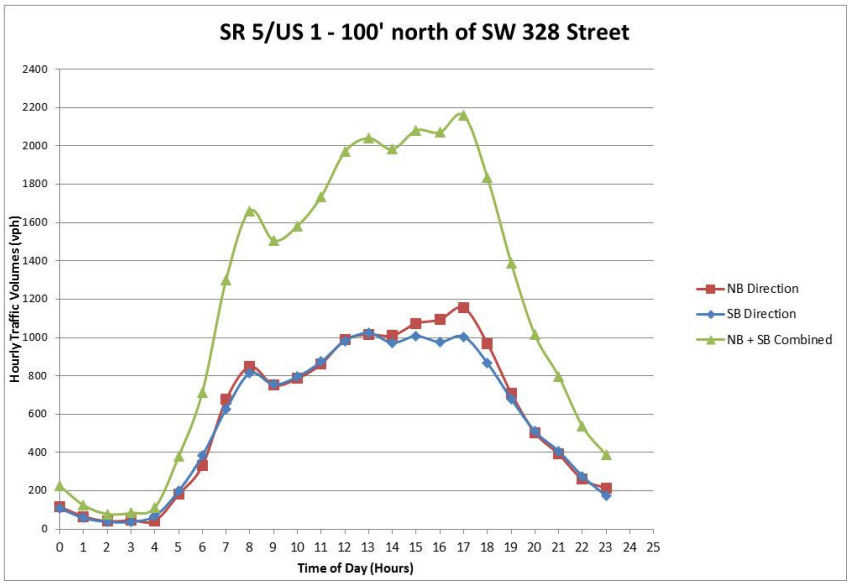


Figure 10 – SR 5/US 1 north SW 328th Street - Hourly Volume vs. Time Day Graph



Data was also collected during a holiday to analyze holiday travel conditions (included in **Appendix F**). Traffic turning movement counts were collected during Memorial Day (May 28th, 2012) as follows:

- From 8:00 AM to 10:00 AM
- From 2:00 PM to 7:00 PM

In addition, twenty-four hour approach counts were also collected at this intersection during May 28th, 2012.

Figure 11 shows the plot of time of day vs. hourly traffic volumes at all of the approaches of the intersection of SR 5/US 1 and SW 344th Street. As indicated, the peak hour along the SR 5/US 1 northbound direction occurs between 6:00 PM and 7:00 PM. In addition, the southbound direction only experiences one peak period during a holiday and it occurs between 11:00 AM and 12:00 PM. The eastbound and westbound approaches along SW 344th Street experience the highest peak between 3:00 PM and 4:00 PM and between 5:00 PM and 6:00 PM, respectively.

Based on the results from the field counts and in correlation with the analyzed data from FDOT traffic count stations 870543 and 870544, it was determined that the northbound direction experiences its peak period during the afternoon hours. Therefore, existing conditions analysis was performed for the PM peak hour only.

Figure 12 shows the summarized data for the turning movement counts collected during May 28th, 2012. The peak volumes were determined to occur between 6:00 PM to 7:00 PM.

Figure 11 – Time of Day vs. Hourly Volumes at SR 5/US 1 and SW 344th Street Intersection Approaches

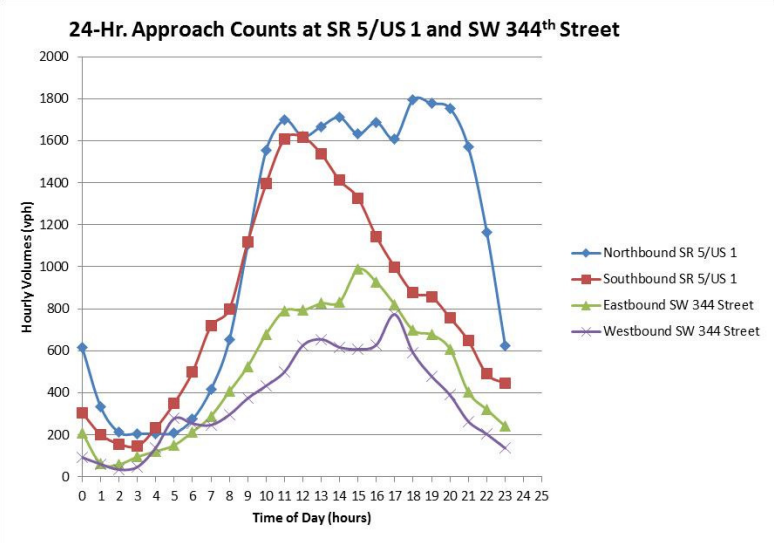
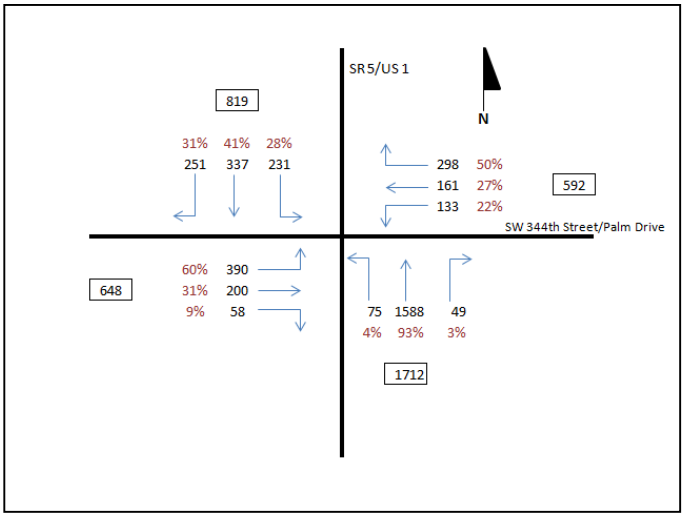
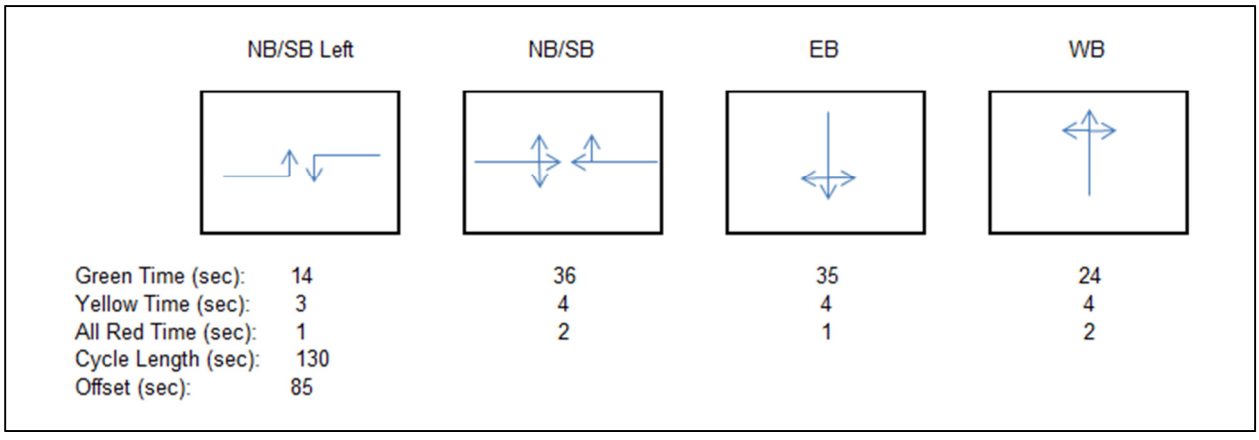


Figure 12– SR 5/US 1 & SW 344th Street Intersection PM Peak Turning Movements



A CORSIM simulation file was developed for the PM peak hour. Geometric configuration for the roadway network was obtained from aerial images. Traffic volumes shown on **Figure 12** were used as entry volumes when coding the model. In addition, traffic signal timing was obtained from the Miami-Dade County Advanced Traffic Management System (ATMS) website and it is shown on **Figure 13**.

Figure 13 – SR 5/US 1 & SW 344th Street Intersection Signal Timing for Weekdays between 6:00 to 7:00 PM



In addition, the percentage of traffic heading to the HEFT and the percentage of traffic continuing traveling northbound on US 1 was estimated using the data from FDOT traffic count station 870544 (north of the HEFT) and the turning movement counts collected in the field. This percentage split resulted in a value of approximately 60 percent of the vehicles continuing on northbound on SR 5/US 1 and 40 percent taking the HEFT northbound ramp.

Existing Conditions Analysis Results

Two scenarios were evaluated for existing conditions. One scenario did not include truck percentages on the network and the second scenario estimated a seven percent truck factor (based on the peak hour truck factor obtained from FDOT traffic count station 870543). **Tables 11** and **Table 12** show the results for the intersection analysis performed using CORSIM models with and without truck traffic considered in the simulation. Results of the analysis showed that the intersection of SR 5/US 1 and SW 344th Street currently operated at Level of Service (LOS) E, with the northbound approach operating at LOS F and the rest of the approaches at LOS D. The level of service was estimated using criteria for signalized intersections listed in the 2000 Highway Capacity Manual (HCM).

Table 11 – SR 5/US 1 & SW 344th Street Intersection Analysis Results (7% Truck Factor)

Approaches	Field Counts (vph)	Processed Volumes (vph)	Processed Average Speed (mph)	Processed Average Delay (sec/veh)	Approach Level of Service
Northbound	1,712	1,676	5.10	160.00	F
Southbound	819	821	7.42	43.55	D
Eastbound	648	644	7.56	35.96	D
Westbound	592	587	9.29	39.53	D
Overall Intersection Delay (sec/veh)	NA	NA	NA	94.48	E

Table 12 – SR 5/US 1 & SW 344th Street Intersection Analysis Results (No Truck Factor)

Approaches	Field Counts (vph)	Processed Volumes (vph)	Processed Average Speed (mph)	Processed Average Delay (sec/veh)	Approach Level of Service
Northbound	1,712	1,684	6.56	114.00	F
Southbound	819	816	7.39	36.73	D
Eastbound	648	647	7.63	35.62	D
Westbound	592	580	9.37	39.26	D
Overall Intersection Delay (sec/veh)	NA	NA	NA	72.02	E

By comparing processed Measures of Effectiveness (MOEs) for the two scenarios analyzed it can be observed that the impact of the percentage of trucks on the traffic stream is not very significant. The most noticeable difference is found when comparing the average delay of the northbound and southbound approaches. For the northbound approach the delay is approximately 40 percent higher when the truck factor is considered in the simulation. For the southbound approach the increase in delay is approximately 20 percent. Overall, the average delay seems to be proportional to the total number of vehicles (cars and trucks) per approach; however, the difference is not as significant with the others MOEs.

As listed in **Table 13,** the MOE results of the CORSIM simulation model on the two-lane segment north of SR 5/US 1 indicates no impact to LOS by the percentage of trucks traveling along this segment. In addition, based on the simulation results, this segment of the HEFT is operating at a satisfactory level of service.

Table 13 – HEFT Ramp (north of US 1) Analysis Results

Existing Conditions Scenarios	Estimated Volume (vhp)	Processed Volume (vph)	Processed Average Density (veh/lane-mile)	Processed Average Speed (mph)	Level of Service (LOS)
Seven Percent Truck Factor	910	890	7.23	61.63	A
No Truck Factor	910	882	7.14	61.76	A

4.2 Hurricane Evacuation Conditions Analysis

As mentioned in Section 3.0 of this report, several concept alternatives for improving the northbound traffic flow through the intersection of SR 5/US 1 and SW 344th Street were developed. However, only three alternatives were selected for further analysis.

It has to be mentioned that the purpose of all of the alternatives was to identify permanent improvements for the intersection of SR 5/US 1 and SW 344th Street that would allow not only a more efficient northbound traffic flow during hurricane evacuation; but also, during regular week days and weekends.

In order to evaluate and compare the traffic operations of the three alternatives, CORSIM simulation models were developed. The proposed alternatives were compared against a Base Scenario so a total of four simulation models were developed.

The traffic analysis conducted for this study was based on the following assumptions:

- The northbound traffic volume traveling along SR 5/US 1 between Card Sound Road and the northbound ramp to the HEFT was estimated using the base saturation flow rate recommended in the HCM 2000. This base saturation flow rate estimates a value of approximately 1,900 pc/h/l. This actually represents the theoretical capacity of one lane for an arterial roadway. A total of 5,700 vph were coded into the simulation model (three lanes), this represents the worst-case scenario for this segment of SR 5/US 1 which the maximum volume that is currently experiencing volumes of approximately 1,800 vph (during a holiday). In other words, the traffic demand used in this analysis is greater than that presented in the 2010 Florida Keys Site Specific Capacity Study and the actual traffic volumes currently traveling along this section of SR 5/US 1. However, this was agreed to as the worst case scenario for analysis purposes only.
- One hundred percent of the northbound traffic would evacuate the Florida Keys via the two-lane northbound ramp to the HEFT.
- The five phases of the Traffic Management Plan for the intersection of SR 5/US 1 and SW 344th Street were fully implemented. Therefore, SR 5/US 1 was assumed to be operating under free-flow conditions for the Base Scenario.
- Southbound traffic along SR 5/US 1 was not considered. It was assumed that during evacuation conditions a minimal number of vehicles are expected to travel to the Florida's Keys.
- Traffic Signal Timing and Phasing do not represent current actual field data. Tentative signal timing and plan were developed using Synchro and some adjustments made when coded into CORSIM.
- Turning Movement counts from and to SW 344th Street were estimated using the assumption that the capacity of a one-lane ramp (future ramp to serve the traffic entering SR 5/US 1 north of SW 344th Street) is approximately 700 vph. In addition, it was assumed that out of the 700

vph that the ramp could carry 50 percent will come from SW 344th Street eastbound and 50 percent will come from SW 344th Street westbound. These volumes were compared to the volumes collected in the field and appeared reasonable to use for this study purpose.

Similar to existing conditions, CORSIM models were run a total of 10 times and then MOEs such as processed volumes, average delay, average speeds and average densities were calculated for each particular alternative. **Table 14** and **Table 15** summarize the results of the CORSIM simulation analysis for different alternatives evaluated. It has to be mentioned that the levels of service listed in **Table 14** and in **Table 15** were estimated using average delay and density as the MOEs, based on the criteria outlined in the HCM 2000 for signalized intersections and basic freeway segments, respectively.

As indicated in **Table 14,** the two alternatives that provide more efficient traffic flow along SR 5/US 1 northbound direction at the intersection of SW 344th Street are the US 1 Overpass and the Northbound HEFT Ramp Extension. The advantage of these two alternatives over the SW 344th Street Overpass alternative is that the majority of vehicles traveling in the northbound direction have the option of traveling at free-flow conditions.

In the case of the SR 5/US 1 Overpass, vehicles along the northbound direction travel at free-flow condition, since there is no signal at the intersection with SW 344th Street.

Table 14 – CORSIM Simulation Results for Northbound SR 5/US 1 south of SW 344th Street

Alternative	Theoretical Volumes (vph)	Processed Average Volumes (vph)	Processed Average Speed (mph)	Processed Average Delay (sec/veh)	Level of Service (LOS)
Base Scenario	5,700	5,348	19	92	F
US 1 Overpass	5,700	5,389[1]	21	39	D
SW 344 Street Overpass	5,700	4,484[2]	9	123	F
Northbound HEFT Ramp Extension	5,700	5,346[3]	19	44	D

[1] Processed volume south of the off-ramp to SW 344th Street

[2] Processed volume south of SW 344th Street

[3] Processed volume south of the ramp to northbound HEFT

Table 15 – CORSIM Simulation Results for Northbound HEFT Ramp (2-lane section)

Alternative[1]	Theoretical Volumes (vph)	Processed Average Volumes (vph)	Processed Average Speed (mph)	Processed Average Density (veh/mi/ln)	Level of Service (LOS)
Base Scenario	5,700	5,327	26	73	F
US 1 Overpass	5,700	5,300	41	65	F
SW 344 Street Overpass	5,700	4,429	54	41	E
Northbound HEFT Ramp Extension	5,700	5,303	43	62	F

In the case of the Northbound HEFT Ramp Extension the majority of the northbound demand will experience free-flow conditions in the vicinity of the intersection with SW 344th Street, as the ramp runs parallel to SR 5/US 1 and it will be grade separated at SW 344th Street. Therefore, the delay (listed on Table 14) for this alternative represents the delay of the vehicles continuing northbound on SR 5/US 1.

For the case of the SW 344th Street Overpass, this alternative offers no benefit to SR 5/US 1 given that the intersection will still be signalized in order to give access to and from SW 344th Street. This alternative actually considers the implementation of two traffic signals along SR 5/US 1 northbound traffic resulting in higher delays than the Base Scenario. In addition, as traffic gets metered by the signals along SR 5/US 1, the entire demand is not able to reach the ramp to northbound HEFT. Therefore, the processed volumes in this segment of the network are lower.

Northbound HEFT Ramp Extension Alternative More Detailed Analysis

Since the Northbound HEFT Ramp Extension alternative provides benefits to the northbound traffic while minimizing right-of-way impacts and an estimated low cost, this alternative was selected for further traffic analysis. The analysis consisted of coding the existing volumes collected in the field into a CORSIM simulation model in order to evaluate traffic operations using the roadway geometry proposed for the Northbound HEFT Ramp Extension Alternative.

As indicated in Table 16 the Northbound HEFT Ramp Extension Alternative results in lower delays for the northbound approach at the intersection of SR 5/US 1 and SW 344th Street. The reduction in delay is of approximately 47 percent. The delay for the other approaches of the intersection remains fairly constant. The overall intersection delay decreases by approximately 38 percent.

It appears that vehicles in the northbound direction actually experience even lower delay given that 40 percent of vehicles (approximately 685 vph) travel along the Northbound HEFT Ramp Extension. These vehicles traveling on the ramp experienced zero delay.

The reduction in delay for these 685 vehicles is not accounted for in the results shown on **Table 16**.

Table 16 – CORSIM Simulation Results Existing Conditions vs. Northbound HEFT Ramp Extension

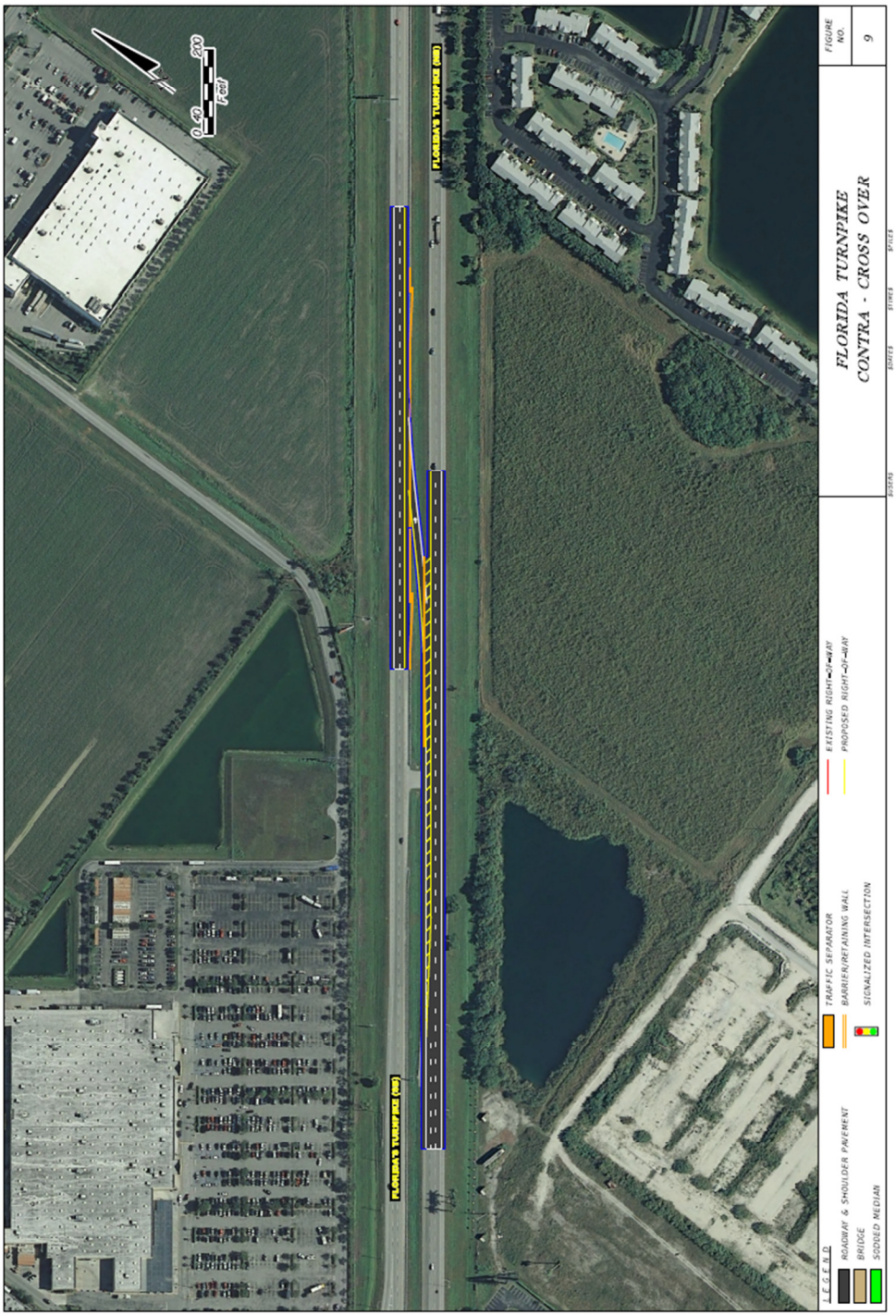
Intersection Approaches	Existing Conditions					Northbound HEFT Ramp Extension				
	Field Count (vph)	Processed Average Volumes (vph)	Processed Average Speed (mph)	Processed Average Delay (sec/veh)	Level of Service (LOS)	Field Count (vph)	Processed Average Volumes (vph)	Processed Average Speed (mph)	Processed Average Delay (sec/veh)	Level of Service (LOS)
Northbound Approach	1,712	1,698	8	90	F	1,028	1,080	12	47	D
Southbound Approach	819	826	8	34	C	819	827	8	35	C
Eastbound Approach	648	650	11	30	C	648	651	11	30	C
Westbound Approach	592	584	14	22	C	592	583	14	22	C
Overall Average Intersection Delay (sec/veh)				56.85	E				35.45	D

4.3 Additional HEFT Improvements

During the simulation analysis conducted for the Base Scenario as well as for the three proposed alternatives (during hurricane evacuation conditions), it was observed that as the SR 5/US 1 northbound traffic flow is improved at the 344th Street intersection, a bottleneck starts forming at the location of the northbound HEFT ramp. This bottleneck is actually more significant north of the location where the southbound SR 5/US 1 to northbound HEFT and the northbound SR 5/US 1 to northbound HEFT ramps merge (the cross section of the ramp goes from a three-lane to two lanes). Therefore, additional improvements were preliminarily conceptualized and coded into the CORSIM network to compare the Base Scenario and the Northbound HEFT Ramp Extension alternative.

The improvements included recommendations to allow traffic to travel on the shoulder of the two-lane cross-section of the HEFT (for a total of three lanes) north of the US 1 interchange. In addition, a crossover within the HEFT median to feed the northbound inside lane into one of the southbound HEFT lanes (inside lane would operate under contraflow conditions) was developed for analysis purposes only. For this improvement to occur, the on-ramp from US 1 southbound to HEFT northbound would need to be closed during hurricane evacuation conditions. During regular conditions, this HEFT crossover would be gated at both ends. Only during a hurricane event, and if deemed necessary, would the gates be opened. **Figure 14** depicts the HEFT crossover improvement scenario approximately half-a-mile north of the US 1 and SW 344th Street intersection.

Figure 14 – HEFT Crossover Detail



CORSIM models, with the shoulder and crossover improvements, were run for the Base Scenario and the Northbound HEFT Ramp. Based on the results from the CORSIM outputs presented in **Table 17** and **Table 18**, the average processed volumes, average delay and average speeds improve when compared to the scenario with no additional improvements.

The additional cost associated with this crossover is approximately $600,000.

Table 17 – CORSIM Simulation Results Northbound US 1 Segment South of SW 344 Street

Alternative	With Additional HEFT Improvements			Without HEFT Improvements		
	Processed Average Volume (vph)	Processed Average Delay (sec/veh)	Average Processed Speed (mph)	Processed Average Volume (vph)	Processed Average Delay (sec/veh)	Average Processed Speed (mph)
Base Scenario	5,700	16	36	5,348	92	19
Northbound HEFT Ramp Extension	5,699	8	36	5,346	44	19

Table 18 – CORSIM Simulation Results North of the Northbound HEFT Ramp

Alternative	With Additional HEFT Improvements					Without Additional HEFT Improvements	
	Average Processed Volumes (vph)		Total Processed Volumes (vph)[2]	Average Processed Speed (mph)		Total Processed Volumes (vph)[2]	Average Processed Speed (sec/veh)
	NB Ramp	NB Crossover		NB Ramp	NB Crossover		
Base Scenario	4,282	1,413	5,695	53	40	5,327	26
Northbound HEFT Ramp Extension	4,276	1,419	5,695	53	39	5,303	43

A second TPTAC presentation was held on June 6, 2012 to present the preliminary traffic analysis results. This meeting was attended by representatives from various agencies including Miami-Dade County, FDOT, and FTE. The traffic analysis results of the base scenario and the three concept alternatives and the additional traffic analysis performed with the shoulder and crossover improvements were presented (See **Appendix C**). At this meeting, FTE expressed concern with the implementation of a crossover condition since all previous studies have indicated that contraflow operations are generally not recommended during evacuation conditions and previous evacuations have not required this type of improvement. However, the use of shoulder operations for improved traffic flow was deemed acceptable. FTE also mentioned that shoulder lane travel is occasionally

implemented along the HEFT during special events at the Homestead-Miami Speedway. Although the discussion at TPTAC focused on the crossover and shoulder improvements, the recommended improvement for this study remains the Northbound HEFT Ramp Extension due to the improved traffic flow conditions indicated in Table 16 and its cost and impact. More detailed evaluation of the study area is recommended to determine potential improvements for all approaches of the HEFT in relation to 344 street and US 1.

5.0 CONCLUSION

During a major hurricane event, such as a Category 3, 4, or 5 storm, over 73,000 residents and tourists must be evacuated within a 24-hour timeframe along the Monroe County evacuation route in order to reach the official designated shelter of the Florida Keys – Florida International University. Along this evacuation route between the Upper Keys and the HEFT northbound on-ramp, the signalized intersection of US 1 and SW 344 Street acts as a critical location for evacuation events given that it could interfere with the evacuation traffic flow of the Florida Keys.

Although the FDOT has a Traffic Management Plan to be utilized during Florida Keys evacuation events for the intersection of US 1 and SW 344 Street and the surrounding area, the purpose of this study is to implement more permanent and efficient solutions to accommodate the vehicular demands of the Florida Keys during an evacuation event.

As presented in the previous sections, eight concept alternatives were developed taking into consideration existing geometric configuration and the right-of-way along US 1. From these eight concept alternatives, three alternatives were selected with the consultation on the Miami-Dade MPO and the TPTAC for further traffic operation analysis. The three alternatives selected for further review are listed below:

1. US 1 Overpass
2. SW 344 Street Overpass
3. Northbound HEFT Ramp Extension

The traffic analysis for the Northbound HEFT Ramp Extension alternative provides more favorable results compared to the existing traffic management plan (base scenario). Additionally, this alternative had the lowest costs among alternatives (costs ranges approximately from $10 to $20 million) and the least right-of-way impacts. However, by implementing more efficient traffic operations through the intersection of US 1 and SW 344 Street, a traffic bottleneck could potentially shift to the HEFT. Therefore, additional improvements were analyzed which included allowing traffic to travel on the shoulder of the two-lane section of the HEFT and to provide a crossover within the HEFT's median to feed the northbound inside lane into the inside southbound HEFT lanes during hurricane evacuation conditions. Traffic analysis revealed that by implementing these improvements on the Northbound HEFT Ramp Extension alternative during hurricane evacuation, the traffic conditions on the HEFT mainline and on US 1 would improve. These improvements, except for shoulder operations, would add infrastructure and manpower costs to the recommended alternative. Therefore, the recommended alternative is implementation the Northbound HEFT Ramp Extension since it will benefit the LOS for the northbound approach and the overall intersection during weekend/holiday conditions. Impacts to the HEFT and to US 1 as a result of this alternative should be evaluated in a future Project Development and

Environment Study (PDE) to be jointly sponsored by FDOT and FTE since their jurisdictions overlap at this location. The PDE study would be able to analyze all conditions in all directions for the study area and would be more comprehensive than the analysis conducted for this study. This study could also analyze any crossover type improvements along the HEFT for hurricane evacuation purposes. Funding should be identified jointly by FTE and FDOT for a PDE study in the future update to the MPO Long Range Transportation Plan.

Analysis results were presented to the Miami-Dade MPO Transportation Planning Council (TPC) on July 9, 2012.

APPENDIX A

Updated Traffic Management Plan for US 1 and SW 344 Street, 2011

Updated Traffic Management Plan for US 1 at Palm Dr in Florida City (For Implementation during Florida Keys Hurricane Evacuation) June 22, 2011

In order to improve access to Florida's Turnpike from the Florida Keys during hurricane evacuation conditions, a traffic management plan consisting of five phases is recommended for the intersection of US 1 and Palm Drive (SW 344th Street) and at the south terminus of Florida's Turnpike. One or multiple phases of the traffic management plan should be implemented in the field in order to provide the maximum increase in capacity to US 1 south of Florida's Turnpike. The phase(s) that should be implemented in the field should be determined by the personnel assigned to implement these options in the field depending on the observed traffic flow conditions during the evacuation process. The traffic management plan is described below and is graphically illustrated in Figures 1 through 5b.

Phase 1: Activation of Evacuation Timing Plan for US 1 and Palm Drive and Monitoring of US 1/Krome Avenue and US 1/Palm Drive Intersections

The signalized intersection of US 1 and Palm Drive has a special timing plan for hurricane evacuation purposes. However, the subject timing plan is only implemented when there is a hurricane evacuation order for South Miami-Dade County or if the hurricane timing plan is specially requested by an emergency management official. Since the subject traffic signal is located in Miami-Dade County, the hurricane evacuation timing plan is not automatically implemented during an evacuation order for Monroe County. Therefore, during any evacuation order given to residents or visitors of the Florida Keys, the Monroe County Emergency Management Office should notify Miami-Dade County Signals and Signs Division to activate the hurricane evacuation timing plan for the intersection of US 1 and Palm Drive. With the subject timing plan in place, the northbound lanes of US 1 have almost 75% more green time than during normal peak periods (the equivalent of 75% increase in capacity).

Figure 1 illustrates the activation of the evacuation timing plan for the intersection of US 1 and Palm Drive.

Additionally, either through video surveillance cameras or traffic control personnel, the northbound left-turn movement at the US 1/Krome Avenue intersection should be monitored during hurricane evacuation conditions. Given the difficulty in accurately predicting the amount of northbound left-turning vehicles that could potentially occur at the US 1/Krome Avenue intersection, the operating conditions of the subject movement shall be monitored. If at any moment during the hurricane evacuation phase of the Florida Keys, the left-turn queues at this intersection spill onto the inside (left-most) through lane of US 1, causing a blockage to the evacuating traffic flow, Phase 2 should

be implemented. Figure 2 illustrates the potential blockage conditions that could occur at the intersection of US 1 and Krome Avenue.

Through the presence of police personnel, the northbound left-turn movement at the US 1/Palm Drive intersection should be monitored during hurricane evacuation conditions. Given the difficulty in accurately predicting the amount of northbound left-turning vehicles that could potentially occur at the US 1/SW 344th Street intersection, the operating conditions of the subject left-turn movement shall be monitored. If at any moment during the hurricane evacuation phase of the Florida Keys, the left-turn queues at this intersection spill onto the inside (left-most) through lane of US 1, causing a blockage to the evacuating traffic flow, Phase 3 should be implemented. Figure 3 illustrates the potential blockage conditions that could occur at the intersection of US 1 and SW 344th Street (Palm Drive).

Phase 2: Closure of Northbound Left-Turn Lane at US 1 and Krome Avenue

Based on the results of Phase 1, close the northbound left-turn lane at the intersection of US 1 and Krome Avenue. All traffic wishing to access Krome Avenue can do so via the signalized intersection of US 1 and SW 344th Street (Palm Drive) or through one of the many east-west roadways located off of US 1 within the City of Homestead.

Figure 2 presents the required MOT plan to close the subject left-turn lane.

Phase 3: Closure of Northbound Left-Turn Lane at US 1 and Palm Drive

Based on the results of Phase 1, close the northbound left-turn lane at the intersection of US 1 and SW 344th Street (Palm Drive). All traffic wishing to head west on SW 344th Street can use existing alternative routes through one of the many east-west roadways located off of US 1 within the City of Homestead.

Figure 3 presents the required MOT plan to close the subject left-turn lane.

Phase 4: Eliminate Traffic from West Approach at the US 1/Palm Drive Intersection

Given the recent widening of the northbound lanes of US 1between Card Sound Road and SW 344th Street (Palm Drive) by FDOT, this phase will likely not be required. However, given the unpredictability nature of traffic flow conditions that may occur during hurricane evacuation conditions, this phase should be ready for implemented by police officers/traffic control personnel assigned to Florida City. This hurricane evacuation improvement phase is described below:

The majority of the traffic that arrives from the west via Palm Drive to US 1 turns left (heading north). Therefore, all eastbound traffic should be re-routed to the northbound lanes of Krome Avenue (complete closure of the eastbound lanes on Palm Drive between Krome Avenue and US 1 is recommended). Once on Krome Avenue, the re-routed

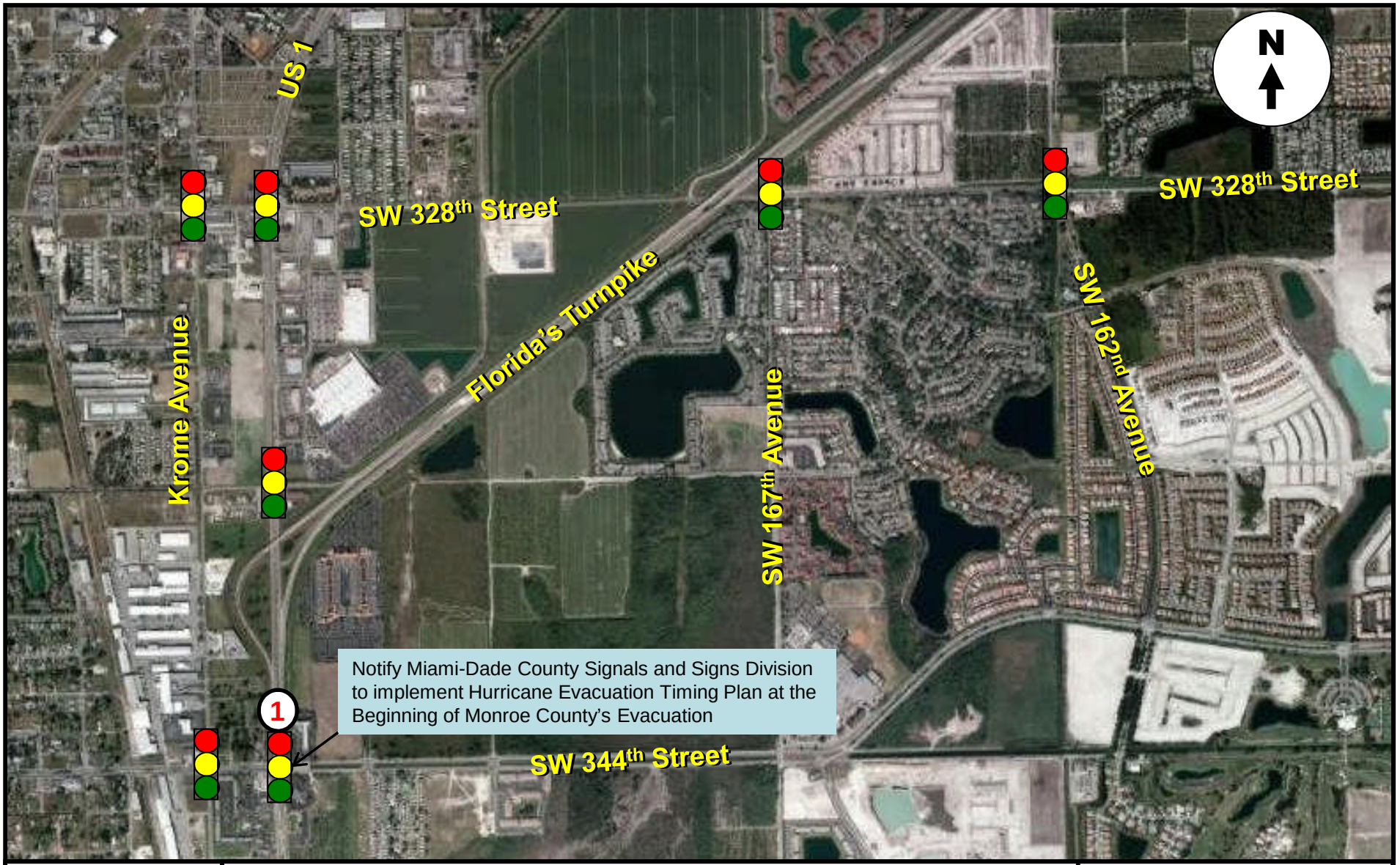
vehicles have access to US 1 via SW 336th Street and through SW 328th Street. Due to the large amount of traffic that could potentially be re-routed to Krome Avenue, police officers should be placed at the intersections of US 1/SW 336th Street and US 1/SW 328th Street in order to ensure that both intersections operate efficiently during the evacuation period.

By eliminating all eastbound traffic approaching the US 1/Palm Drive intersection, the eastbound signal phase will not be activated and therefore, the unused green time reserved for the eastbound phase will be automatically transferred (by the signal controller) to the northbound lanes of US 1 which will benefit the evacuating vehicles arriving from Monroe County. Figure 4 graphically depicts the road closure location and the re-routing traffic plan. The information shown in Figure 4 is for presentation purposes only (does not constitute a detailed traffic re-routing plan). Additional signs will be required in order to effectively implement the proposed road closure and re-routing plan shown in Figure 4.

Phase 5: Eliminate Traffic from East Approach at the US 1/Palm Dr. Intersection

Similar to the preceding hurricane evacuation improvement plan, this phase will likely not be required. However, given the unpredictability nature of traffic flow conditions that may occur during hurricane evacuation conditions, this phase should be ready for implemented by police officers/traffic control personnel assigned to Florida City. This hurricane evacuation improvement phase is described below:

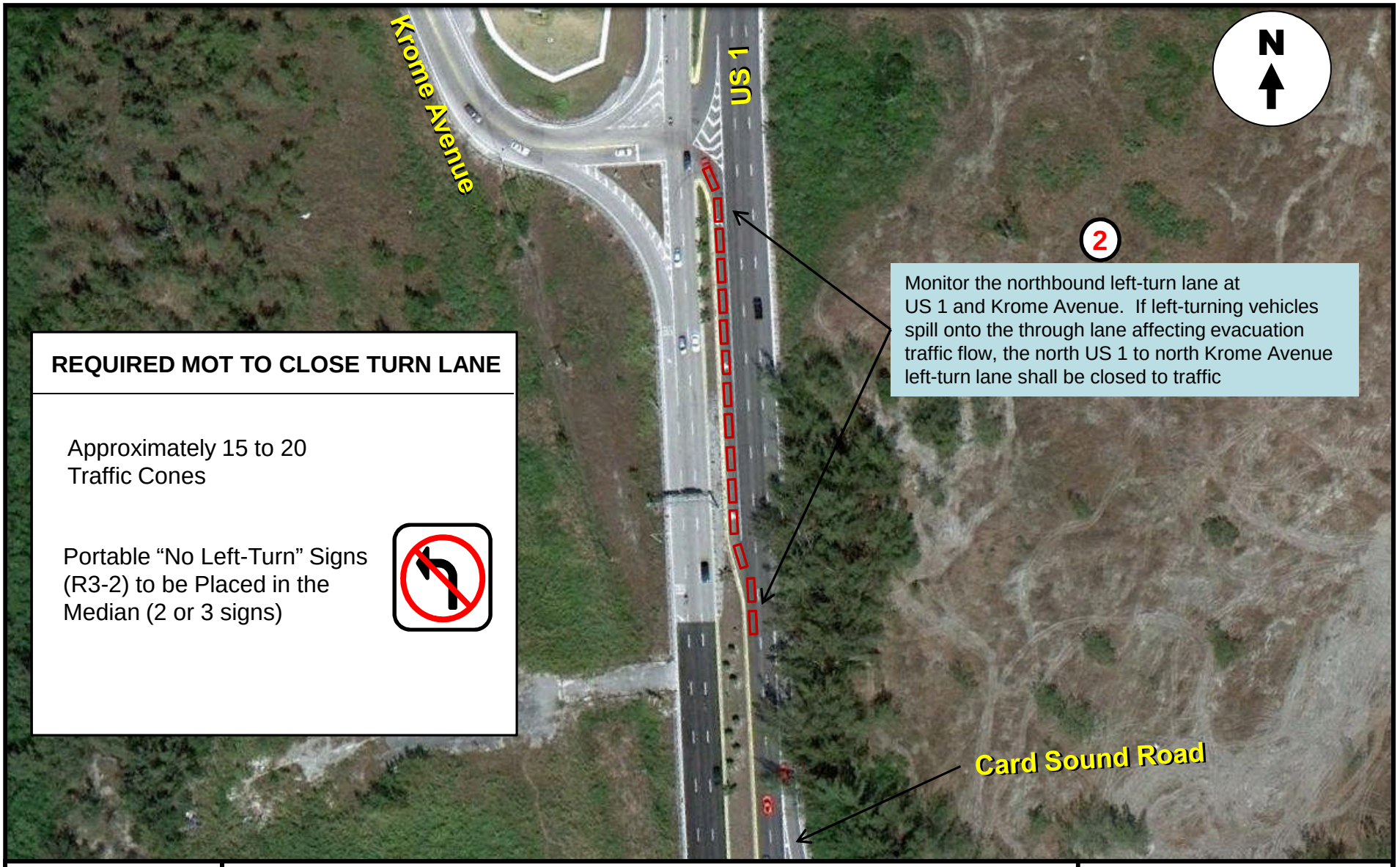
The eastbound and westbound lanes of Palm Drive, just east of US 1, should be closed to traffic. By closing the east leg of the US 1/Palm Drive intersection, the westbound signal phase will not be activated and therefore, the unused green time reserved for the westbound phase will be automatically transferred (by the signal controller) to the northbound lanes of US 1 which will benefit the evacuating vehicles arriving from Monroe County. Figures 5 and 5b show the road closure location and the re-routing traffic plan. The information shown in Figures 5 and 5b is for presentation purposes only (does not constitute a detailed traffic re-routing plan). Additional signs will be required in order to effectively implement the proposed road closure and re-routing plan depicted in these figures.



Traf Tech
ENGINEERING, INC.

Activate Evacuation Timing Plan at the US 1/Palm Drive Signalized Intersection

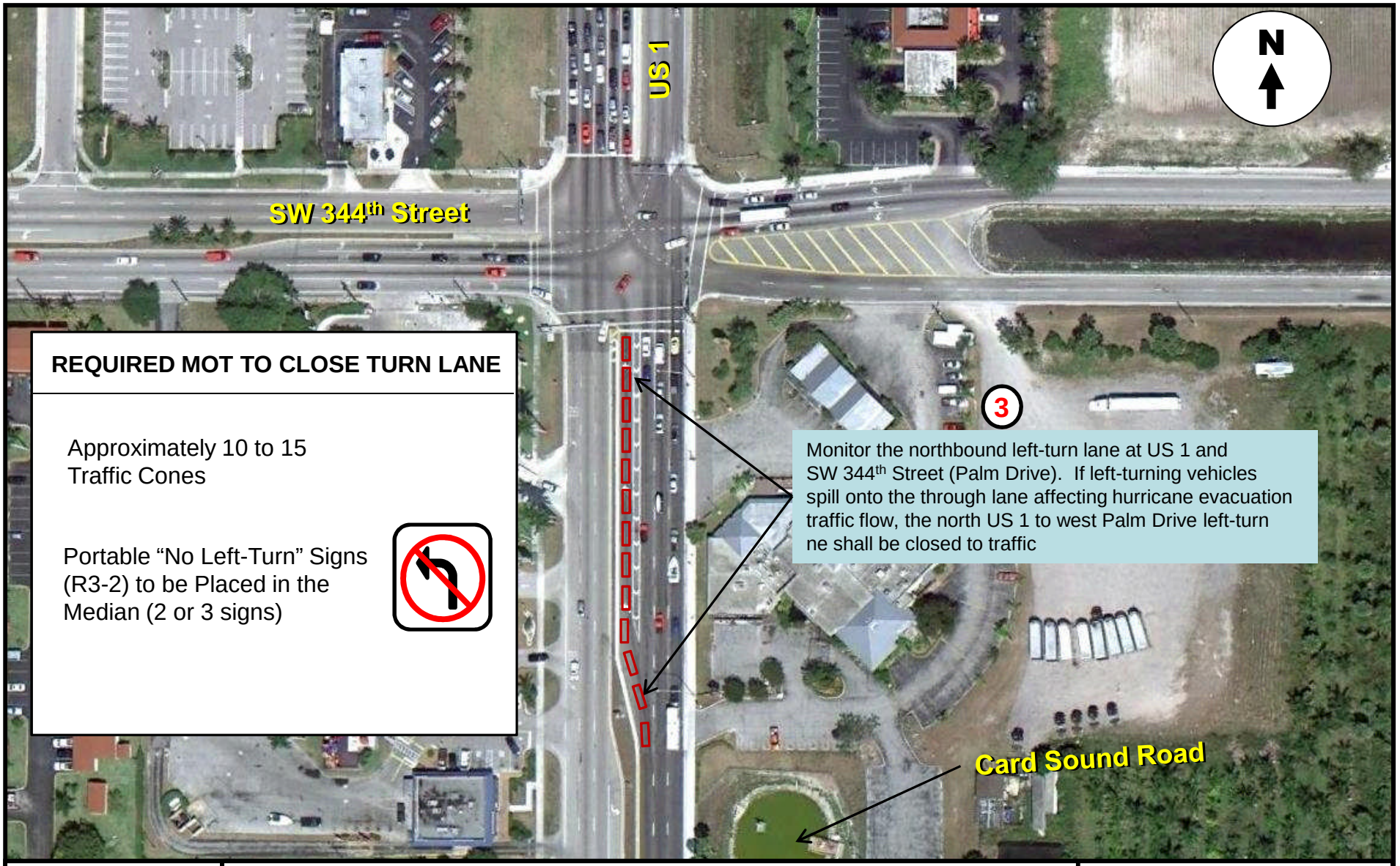
FIGURE 1
Florida City
Miami-Dade County, Florida



Traf Tech
ENGINEERING, INC.

Monitor North US-1 to North Krome Avenue Left-Turn Lane

FIGURE 2
Florida City
Miami-Dade County, Florida



Traf Tech
ENGINEERING, INC.

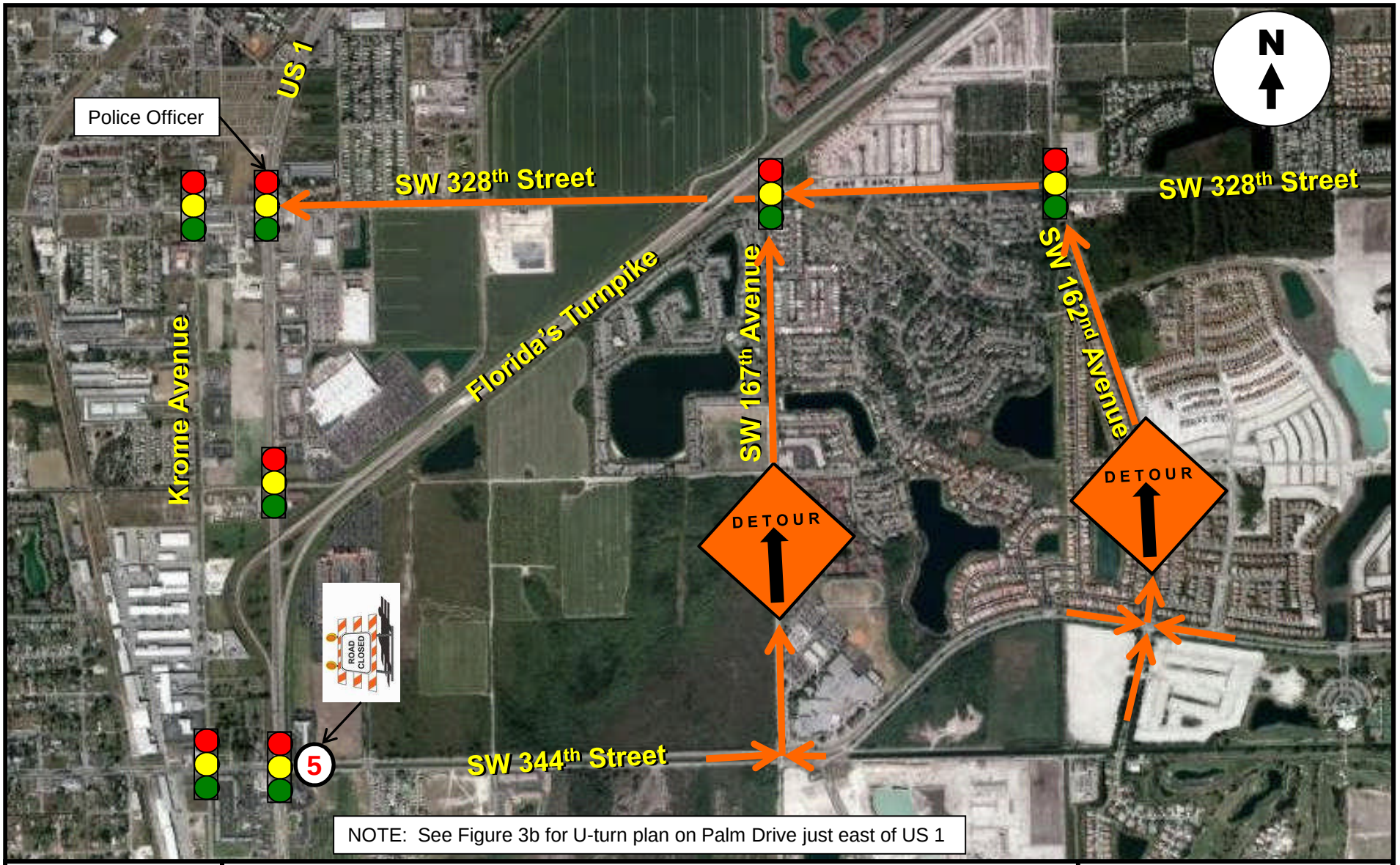
Monitor North US-1 to West Palm Drive Left-Turn Lane

FIGURE 3
Florida City
Miami-Dade County, Florida

Traf Tech
ENGINEERING, INC.

Eliminate Traffic from West Approach at the US 1/Palm Drive Intersection

FIGURE 4
Florida City
Miami-Dade County, Florida

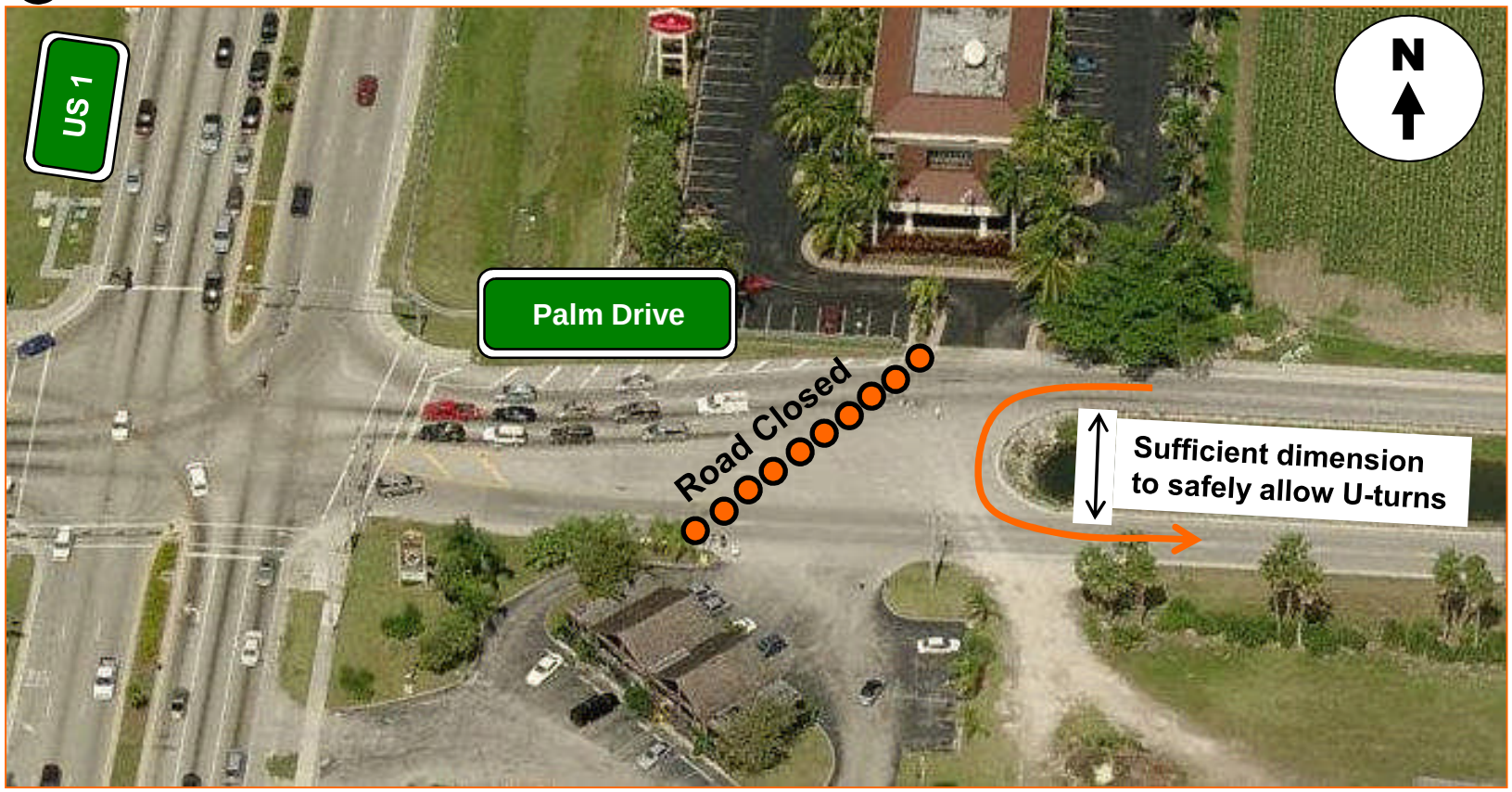


Traf Tech
ENGINEERING, INC.

Eliminate Traffic from East Approach at the US 1/Palm Drive Intersection

FIGURE 5
Florida City
Miami-Dade County, Florida

5



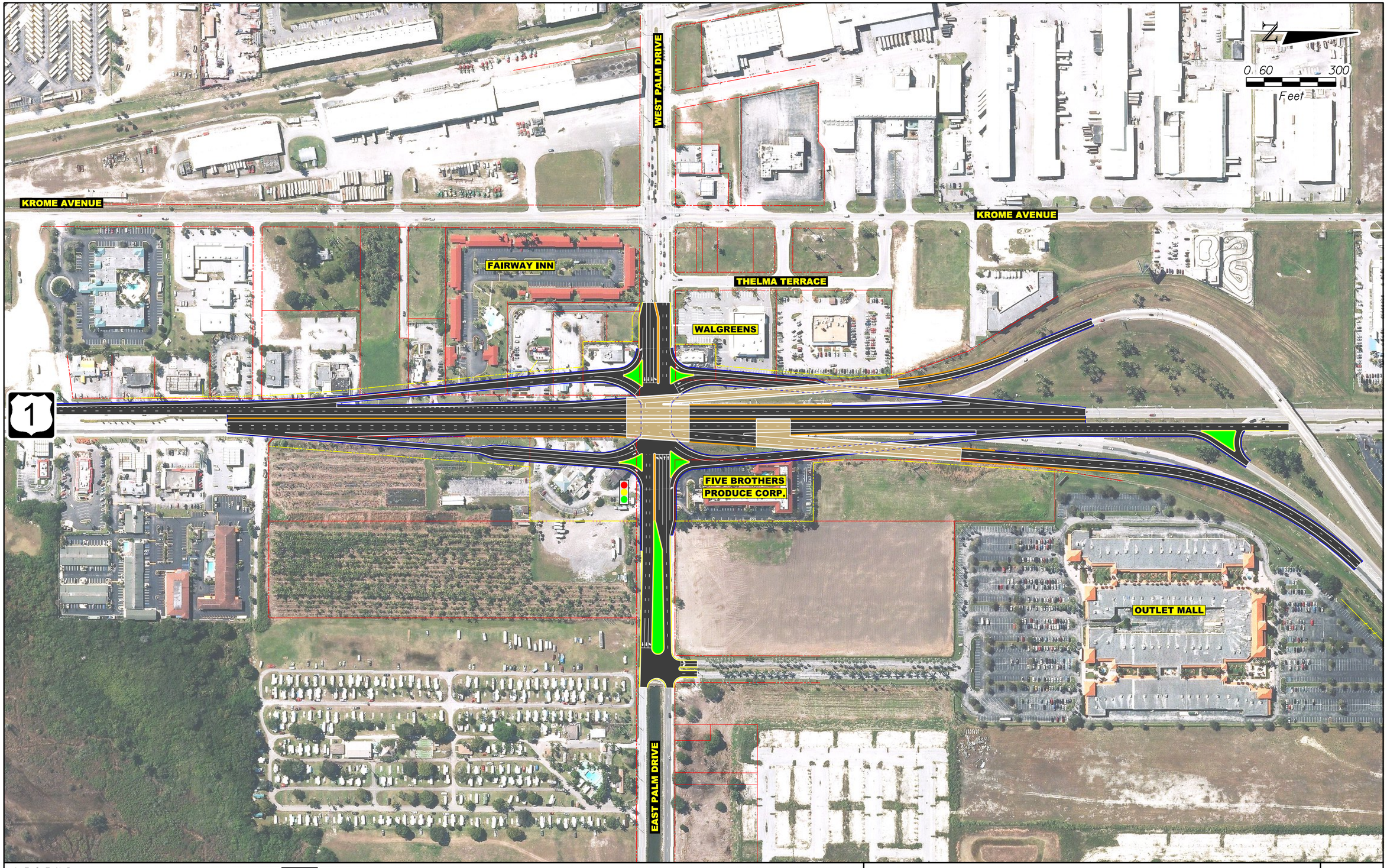
Traf Tech
ENGINEERING, INC.

Eliminate Traffic from East Approach at the US 1/Palm Drive Intersection

FIGURE 5b
Florida City
Miami-Dade County, Florida

APPENDIX B

Concept Alternatives



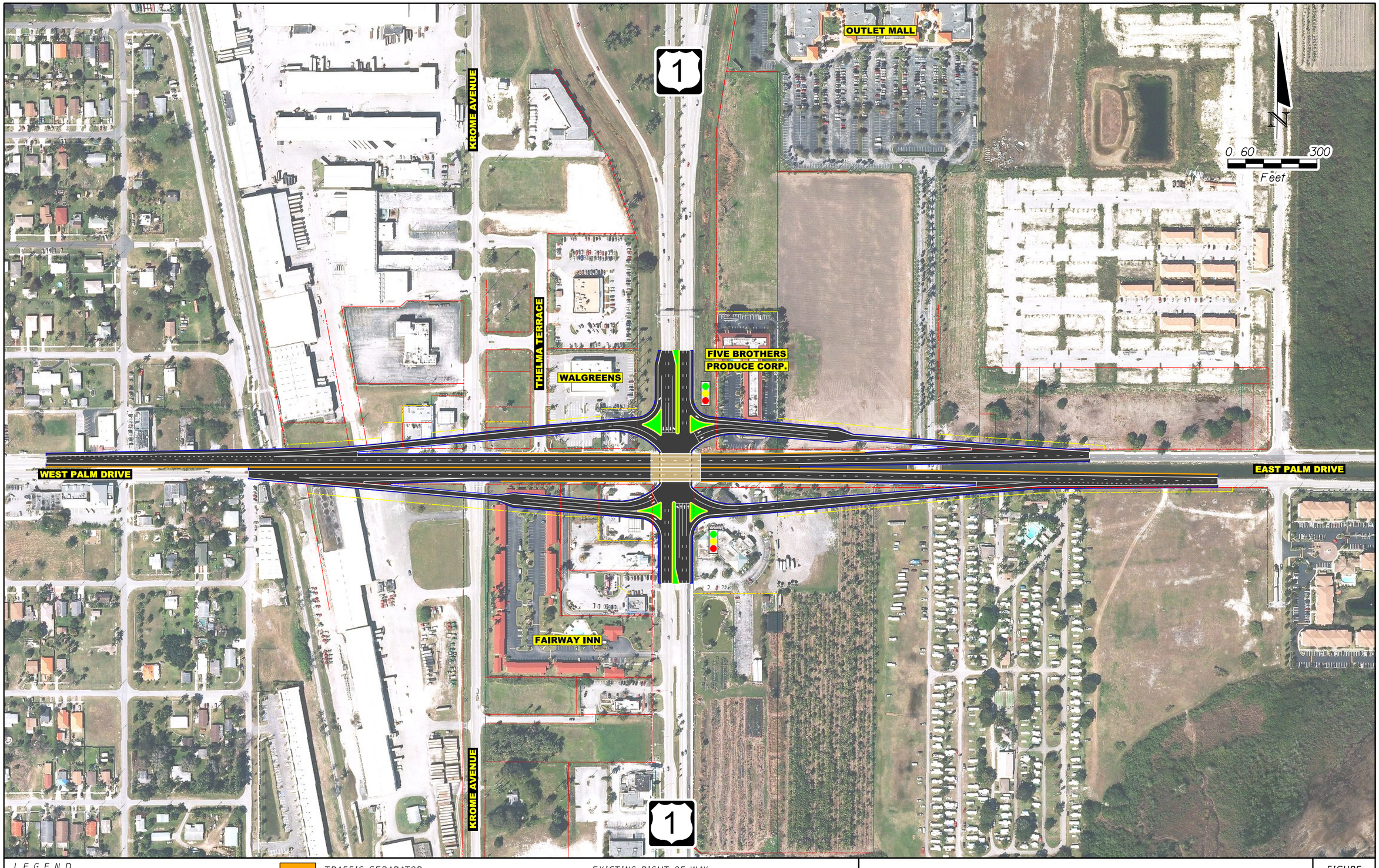
LEGEND

- ROADWAY & SHOULDER PAVEMENT
- BRIDGE
- SODDED MEDIAN
- TRAFFIC SEPARATOR
- BARRIER/RETAINING WALL
- SIGNALIZED INTERSECTION
- EXISTING RIGHT-OF-WAY
- PROPOSED RIGHT-OF-WAY

SINGLE POINT URBAN INTERCHANGE
U.S. 1 OVER PALM DRIVE

FIGURE NO. 1

$USERS $DATE$ $TIME$ $FILE$



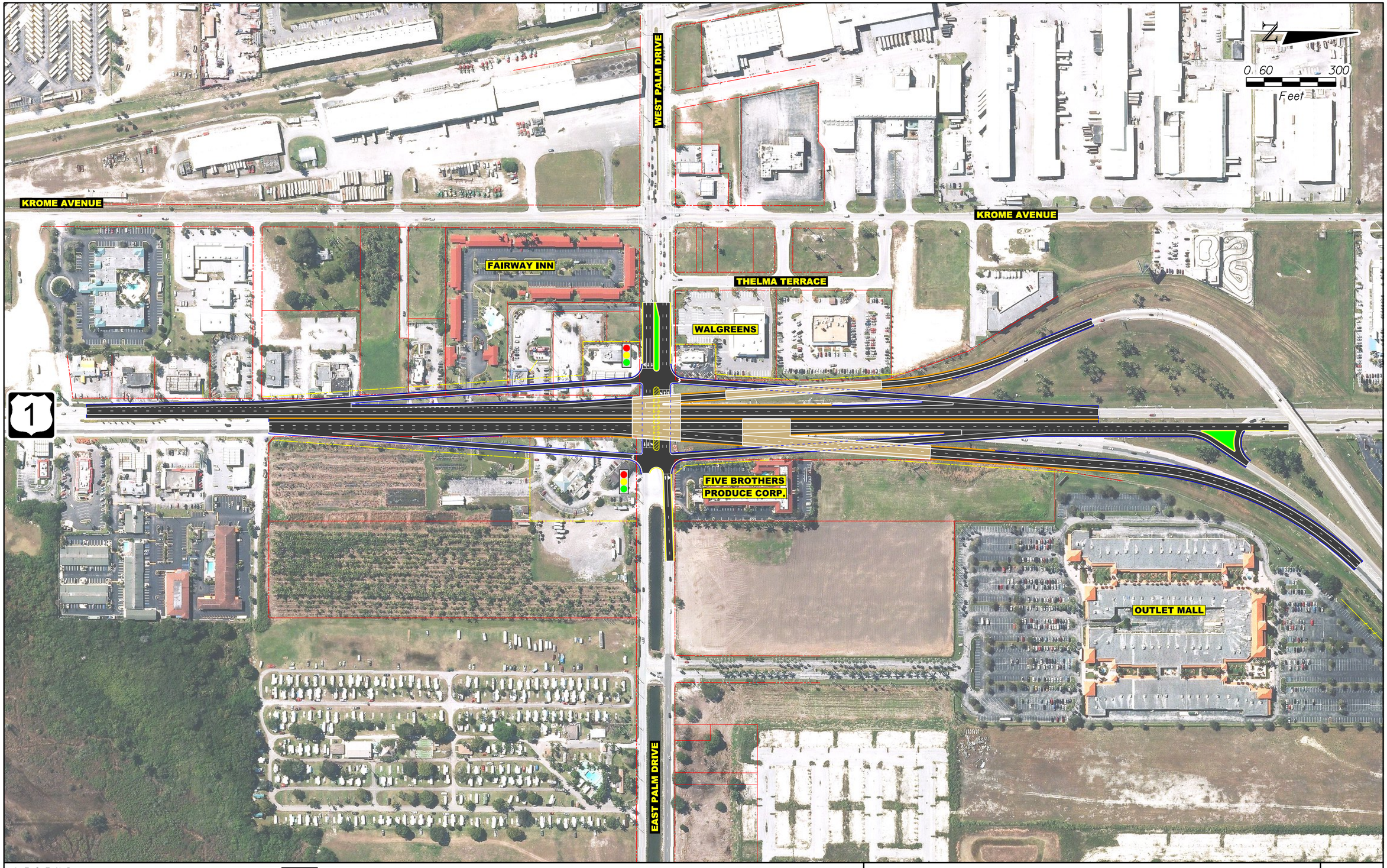
LEGEND

- ROADWAY & SHOULDER PAVEMENT
- BRIDGE
- SODDED MEDIAN
- TRAFFIC SEPARATOR
- BARRIER/RETAINING WALL
- SIGNALIZED INTERSECTION
- EXISTING RIGHT-OF-WAY
- PROPOSED RIGHT-OF-WAY

SINGLE POINT URBAN INTERCHANGE
PALM DRIVE OVER U.S. 1

FIGURE NO. 2

$USERS $DATES $TIMES $FILES



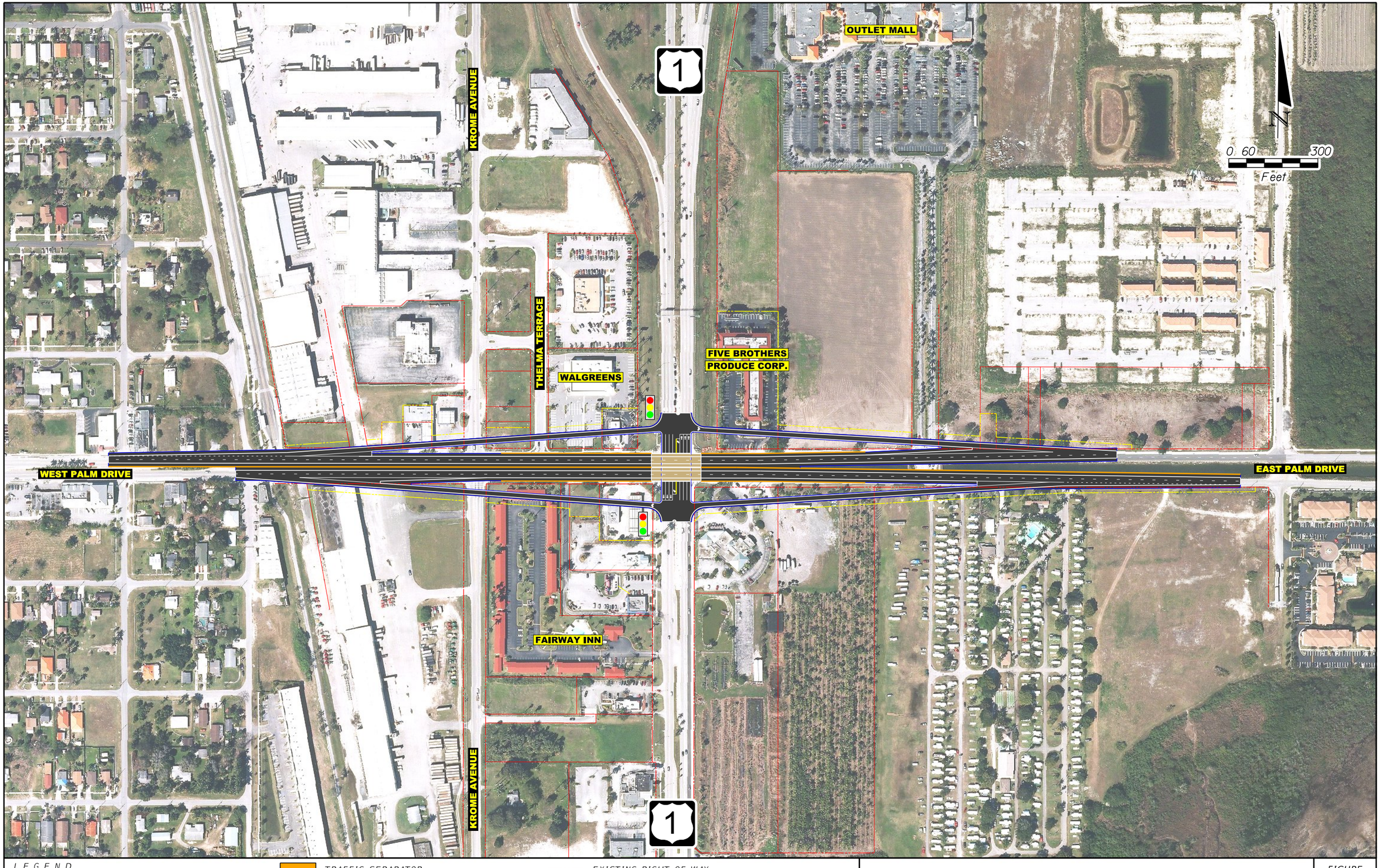
LEGEND

- ROADWAY & SHOULDER PAVEMENT
- BRIDGE
- SODDED MEDIAN
- TRAFFIC SEPARATOR
- BARRIER/RETAINING WALL
- SIGNALIZED INTERSECTION
- EXISTING RIGHT-OF-WAY
- PROPOSED RIGHT-OF-WAY

DIAMOND INTERCHANGE
U.S. 1 OVER PALM DRIVE

FIGURE NO. 3

$USERS $DATE$ $TIME$ $FILE$



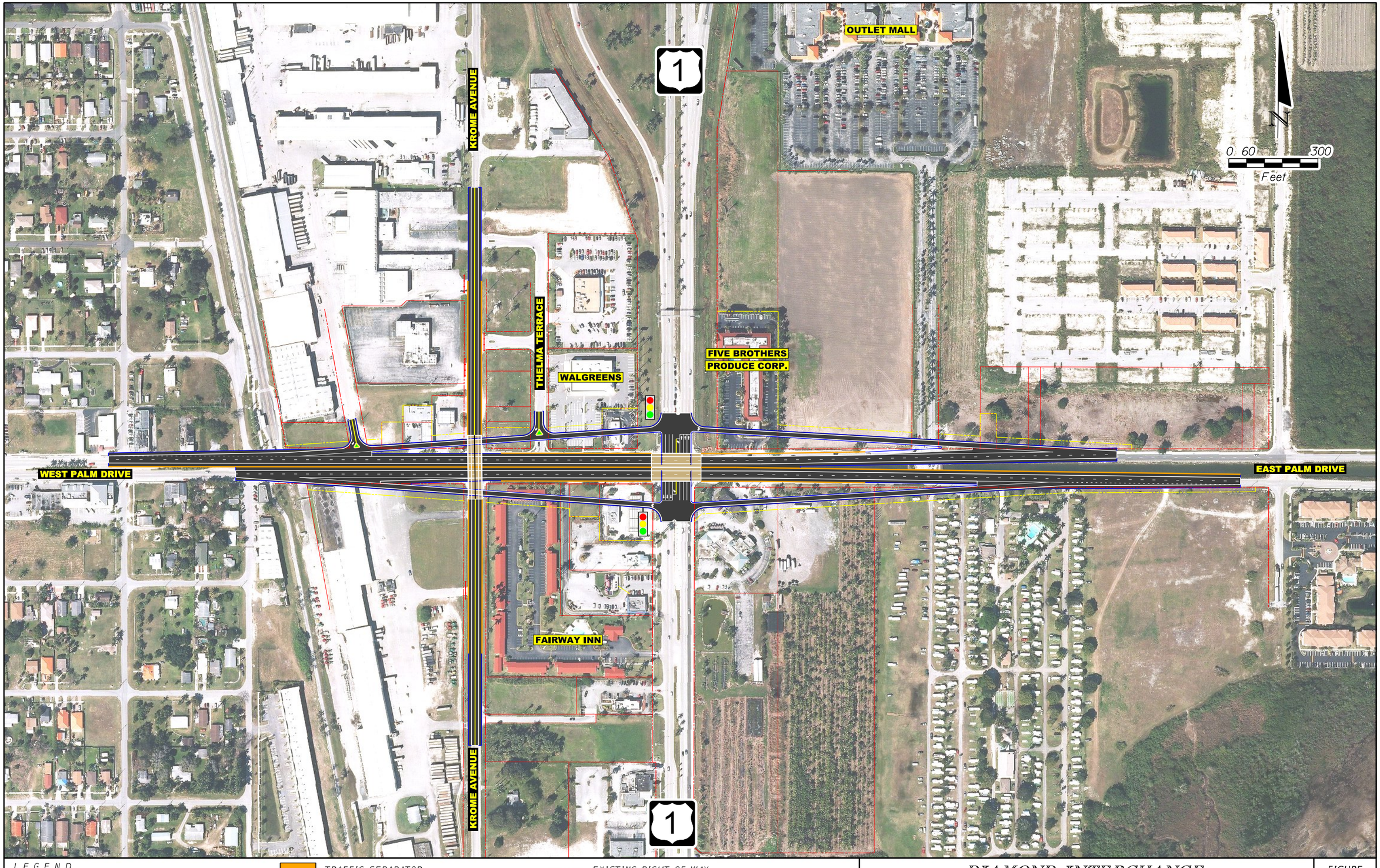
LEGEND

- ROADWAY & SHOULDER PAVEMENT
- BRIDGE
- SODDED MEDIAN
- TRAFFIC SEPARATOR
- BARRIER/RETAINING WALL
- SIGNALIZED INTERSECTION
- EXISTING RIGHT-OF-WAY
- PROPOSED RIGHT-OF-WAY

DIAMOND INTERCHANGE
PALM DRIVE OVER U.S. 1

FIGURE NO. 4A

$USERS $DATES $TIMES $FILES



LEGEND

- ROADWAY & SHOULDER PAVEMENT
- BRIDGE
- SODDED MEDIAN
- TRAFFIC SEPARATOR
- BARRIER/RETAINING WALL
- SIGNALIZED INTERSECTION
- EXISTING RIGHT-OF-WAY
- PROPOSED RIGHT-OF-WAY

DIAMOND INTERCHANGE PALM DRIVE OVER U.S. 1 AND KROME AVENUE

FIGURE NO.

4B

$USERS $DATES $TIMES $FILES

KROME AVENUE

WEST PALM DRIVE

KROME AVENUE

FAIRWAY INN

THELMA TERRACE

WALGREENS

1

FIVE BROTHERS
PRODUCE CORP.

OUTLET MALL

EAST PALM DRIVE

N

0 60 300

Feet

LEGEND

ROADWAY & SHOULDER PAVEMENT

BRIDGE

SODDED MEDIAN

TRAFFIC SEPARATOR

BARRIER/RETAINING WALL

SIGNALIZED INTERSECTION

EXISTING RIGHT-OF-WAY

PROPOSED RIGHT-OF-WAY

PARTIAL SINGLE POINT INTERCHANGE
U.S. 1 NORTHBOUND OVER PALM DRIVE

FIGURE NO.

5

$USERS $DATE$ $TIME$ $FILE$

KROME AVENUE

WEST PALM DRIVE

KROME AVENUE

FAIRWAY INN

THELMA TERRACE

WALGREENS

1

FIVE BROTHERS
PRODUCE CORP.

PRODUCE CORP.

OUTLET MALL

EAST PALM DRIVE

N

0 60 300

Feet

LEGEND

ROADWAY & SHOULDER PAVEMENT

BRIDGE

SODDENED MEDIAN

TRAFFIC SEPARATOR

BARRIER/RETAINING WALL

SIGNALIZED INTERSECTION

EXISTING RIGHT-OF-WAY

PROPOSED RIGHT-OF-WAY

PARTIAL DIAMOND INTERCHANGE
U.S. 1 NORTHBOUND OVER PALM DRIVE

FIGURE NO.

6

$USERS $DATES $TIMES $FILES

KROME AVENUE

WEST PALM DRIVE

FAIRWAY INN

THELMA TERRACE

KROME AVENUE

WALGREENS

1

FIVE BROTHERS PRODUCE CORP.

OUTLET MALL

EAST PALM DRIVE

N

0 60 300

Feet

LEGEND

ROADWAY & SHOULDER PAVEMENT

BRIDGE

SODDED MEDIAN

TRAFFIC SEPARATOR

BARRIER/RETAINING WALL

SIGNALIZED INTERSECTION

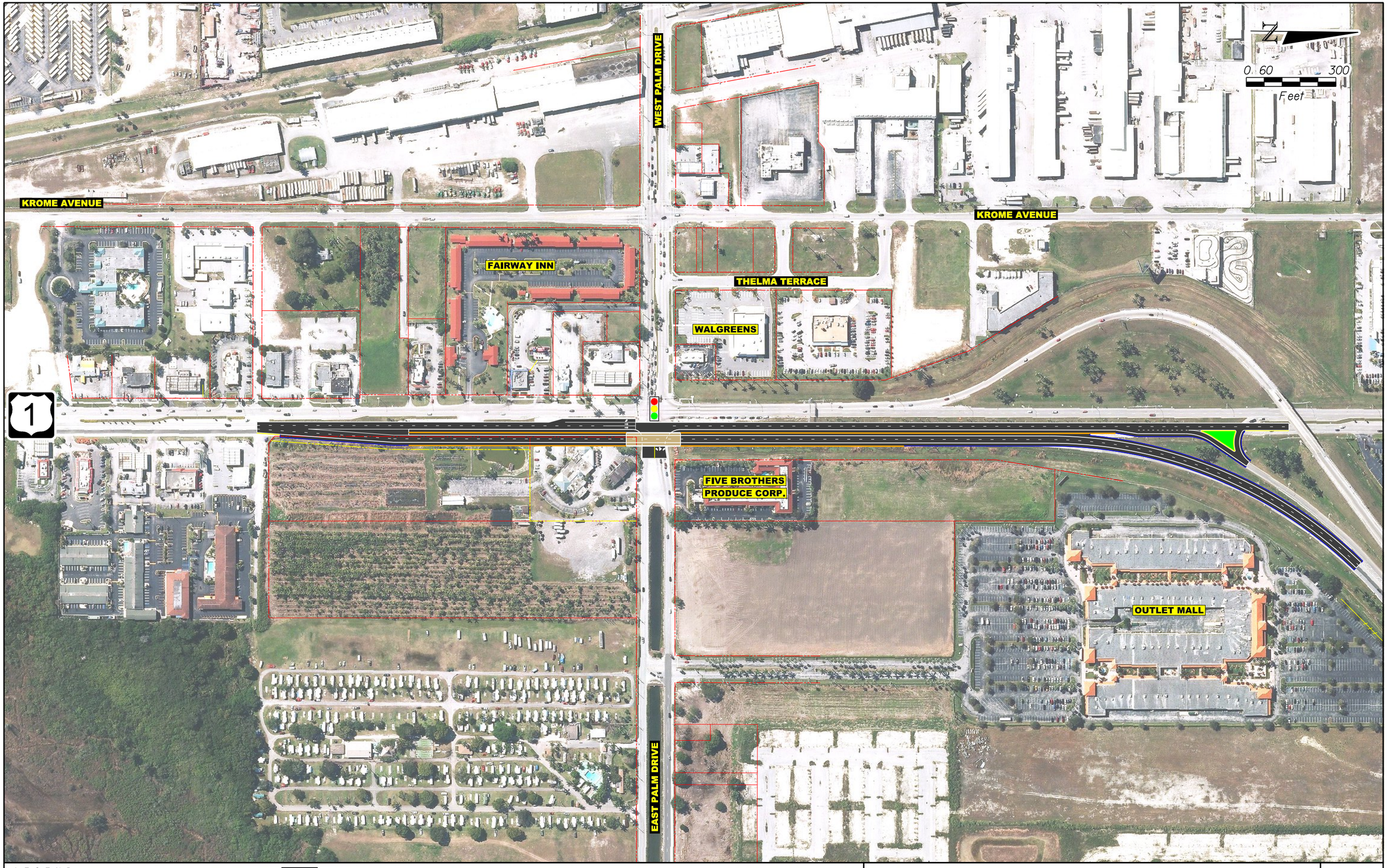
EXISTING RIGHT-OF-WAY

PROPOSED RIGHT-OF-WAY

INDIRECT LEFTS (NEW JERSEY JUG HANDLE) ALONG U.S. 1

FIGURE NO. 7

$USERS $DATES $TIMES $FILES



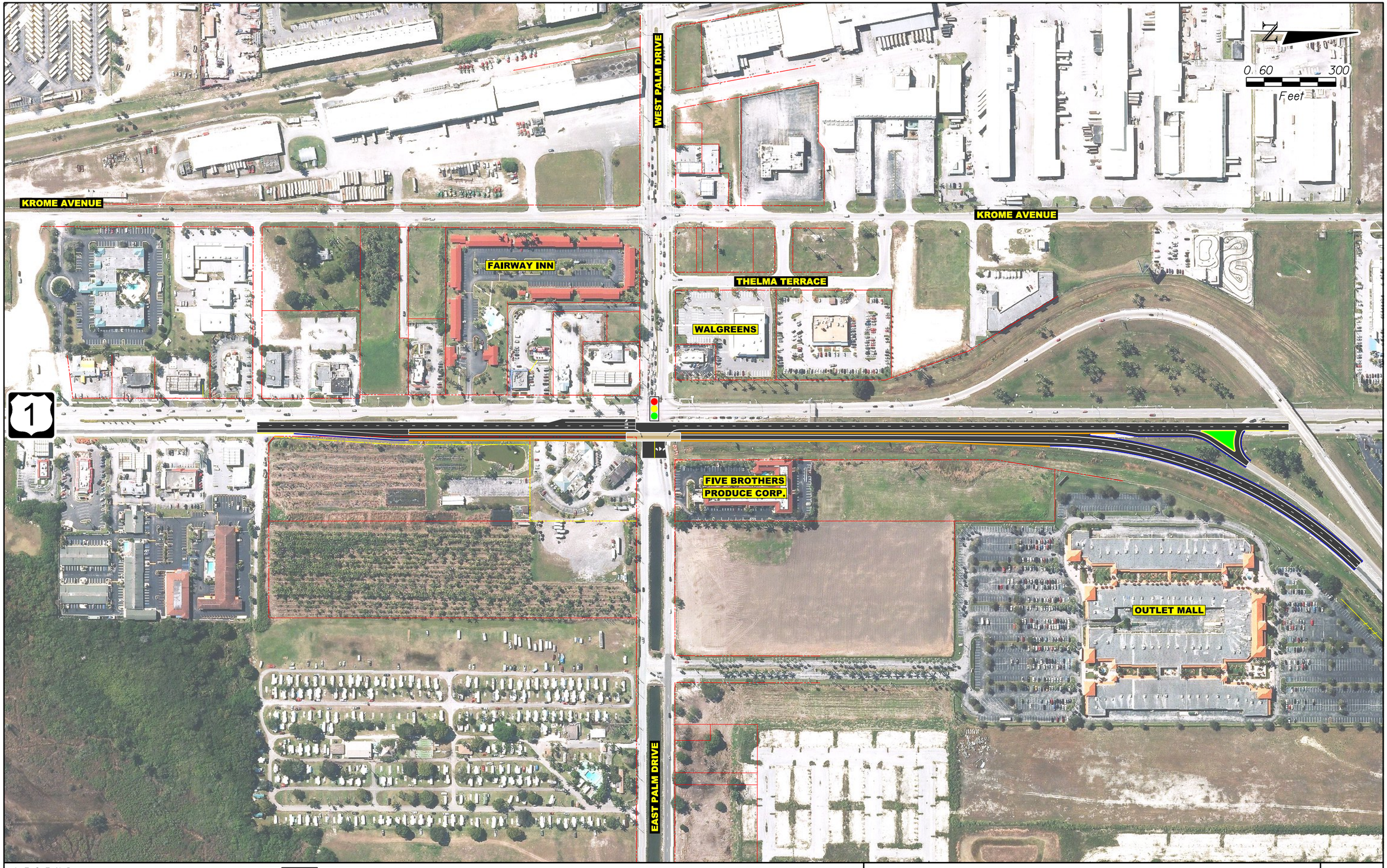
LEGEND

- ROADWAY & SHOULDER PAVEMENT
- BRIDGE
- SODDED MEDIAN
- TRAFFIC SEPARATOR
- BARRIER/RETAINING WALL
- SIGNALIZED INTERSECTION
- EXISTING RIGHT-OF-WAY
- PROPOSED RIGHT-OF-WAY

U.S. 1 NORTHBOUND DIRECT FLYOVER TO HEFT NORTHBOUND

FIGURE NO. 8A

$USERS $DATE$ $TIME$ $FILE$



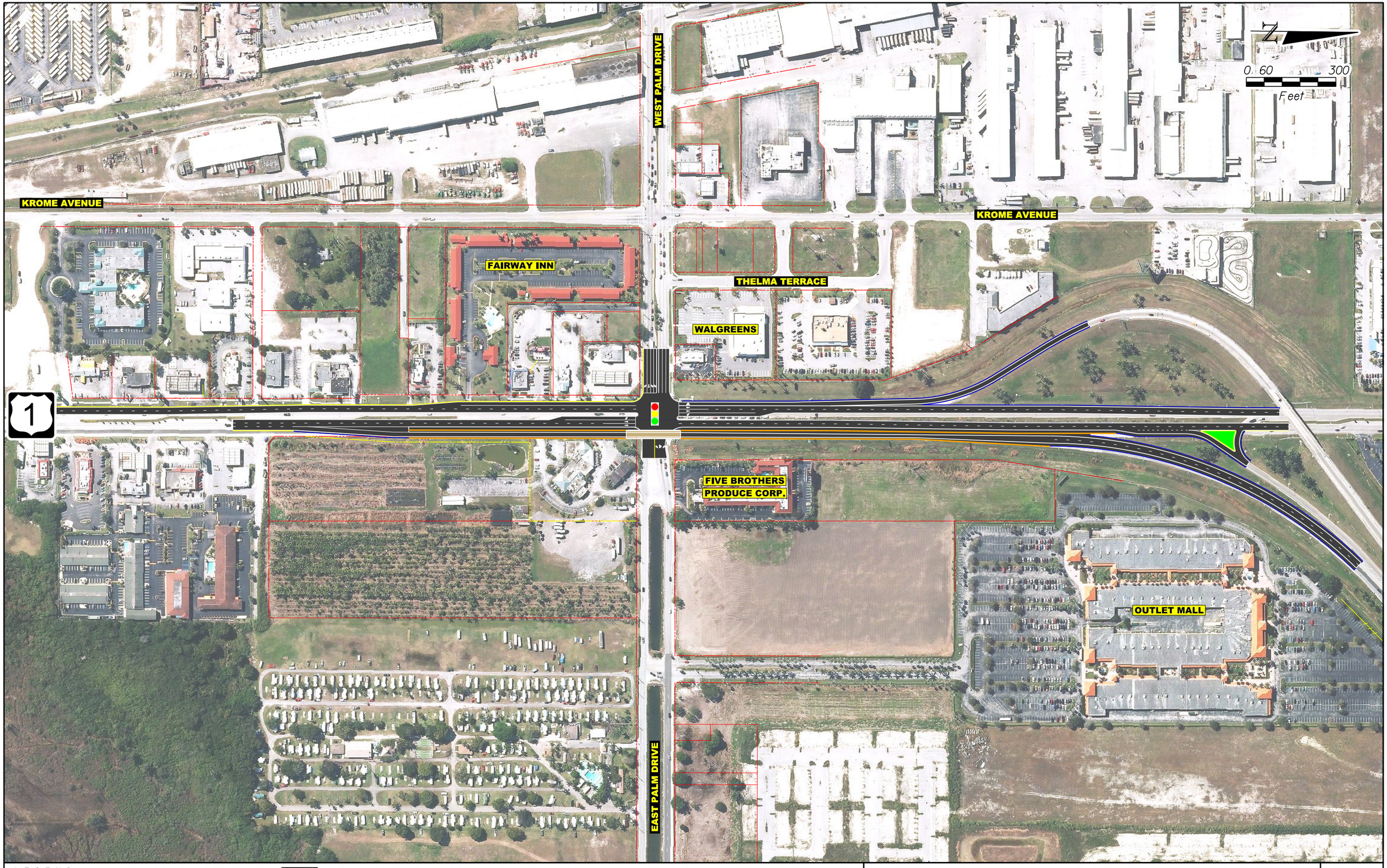
LEGEND

- ROADWAY & SHOULDER PAVEMENT
- BRIDGE
- SODDED MEDIAN
- TRAFFIC SEPARATOR
- BARRIER/RETAINING WALL
- SIGNALIZED INTERSECTION
- EXISTING RIGHT-OF-WAY
- PROPOSED RIGHT-OF-WAY

U.S. 1 NORTHBOUND SINGLE LANE DIRECT FLYOVER TO HEFT NORTHBOUND

FIGURE NO. 8B

$USERS $DATE$ $TIME$ $FILE$



LEGEND

- ROADWAY & SHOULDER PAVEMENT
- BRIDGE
- SODDED MEDIAN
- TRAFFIC SEPARATOR
- BARRIER/RETAINING WALL
- SIGNALIZED INTERSECTION
- EXISTING RIGHT-OF-WAY
- PROPOSED RIGHT-OF-WAY

U.S. 1 NORTHBOUND SINGLE LANE DIRECT FLYOVER TO HEFT NORTHBOUND AND 8-FT SHIFT TO WEST

FIGURE NO. 8C

$USERS $DATES $TIMES $FILES

KROME AVENUE

WEST PALM DRIVE

KROME AVENUE

FAIRWAY INN

THELMA TERRACE

WALGREENS

1

FIVE BROTHERS PRODUCE CORP.

PRODUCE CORP.

OUTLET MALL

EAST PALM DRIVE

N

0 60 300

Feet

LEGEND

ROADWAY & SHOULDER PAVEMENT

BRIDGE

SODDED MEDIAN

TRAFFIC SEPARATOR

BARRIER/RETAINING WALL

SIGNALIZED INTERSECTION

EXISTING RIGHT-OF-WAY

PROPOSED RIGHT-OF-WAY

U.S. 1 NORTHBOUND SINGLE LANE DIRECT FLYOVER TO HEFT NORTHBOUND WITH MINIMUM RIGHT OF WAY IMPACTS

FIGURE NO.

8D

$USERS $DATES $TIMES $FILES

APPENDIX C

TPTAC Presentations

April 4, 2012 TPTAC Presentation

Evacuation Planning Assessment for the
US-1 and SW 344th Street Intersection Area

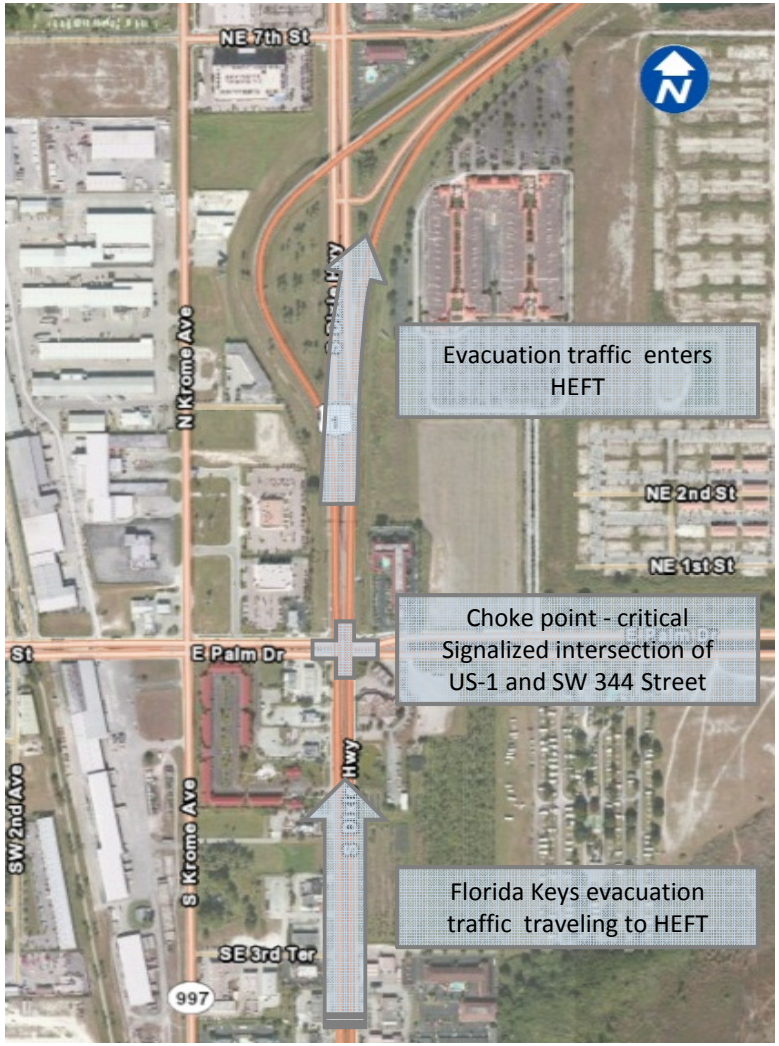
Transportation Planning Technical Advisory Committee

April 4, 2012

HNTB

Study Purpose

- Evacuation traffic from the Florida Keys travels to the HEFT along US-1
- US-1/344th street is only signalized intersection along evacuation route north of the Florida Keys
- Improvements made to US-1 south of this intersection to increase capacity that benefits evacuation
- Study purpose is to assess potential improvements to the US-1/344th street intersection
- Improve evacuation clearance times at the intersection



Responsibilities

Miami-Dade MPO

- Project Management

TPTAC

- Serves as Study Advisory Committee

Key Stakeholders

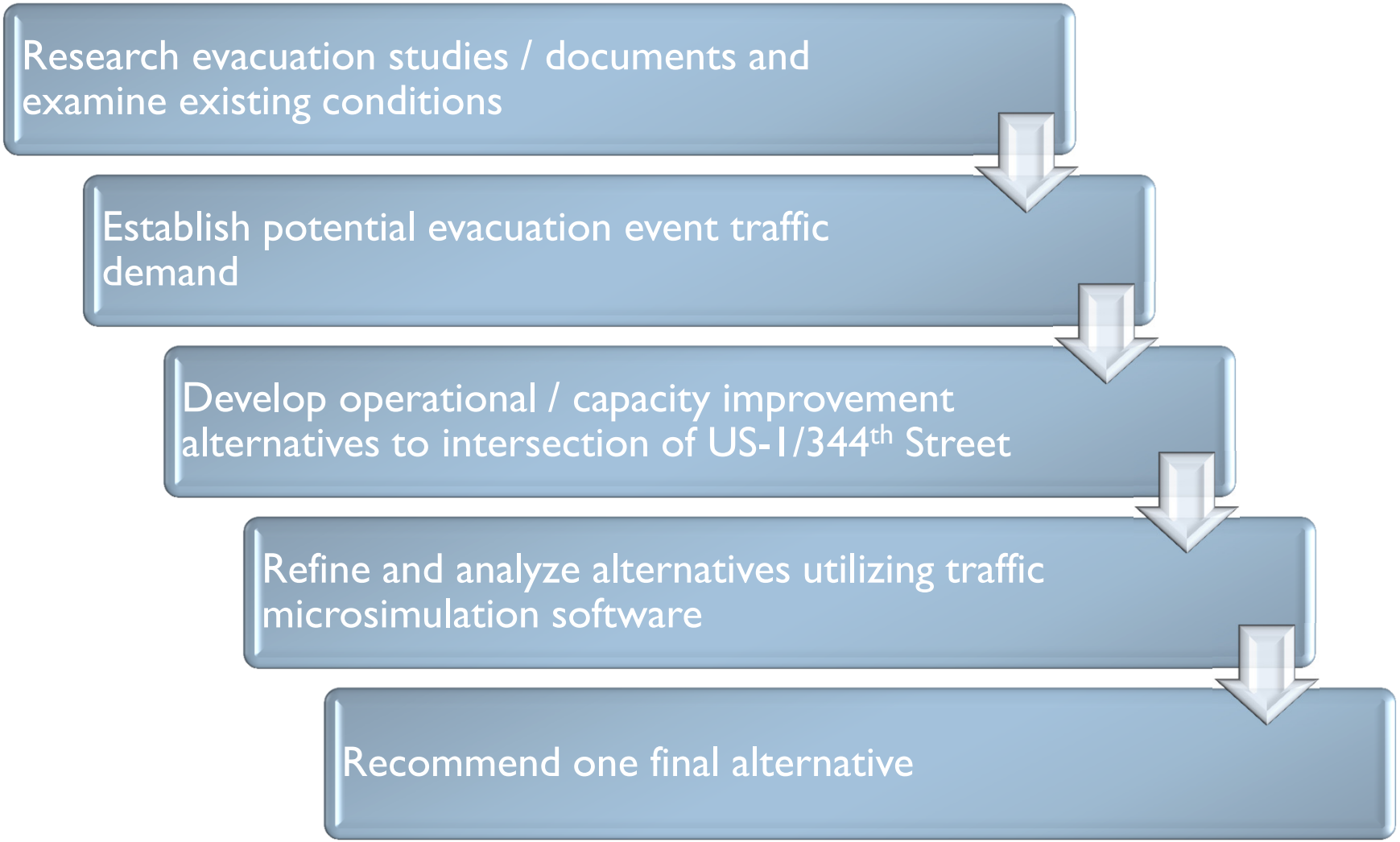
- Miami-Dade Public Works and Waste Management
- Miami-Dade Division of Emergency Management
- FDOT
- Florida Turnpike Enterprise (FTE)
- Monroe County Emergency Management

Project Schedule

Completed within 6 months – June 2012

Task No.:	Task Description	February				March				April					May				June			
		6	13	20	27	5	12	19	26	2	9	16	23	30	7	14	21	28	4	11	18	25
	Notice to Proceed (received on Monday, February 6, 2012)	★																				
1	**Study Coordination**																					
	MPO Committees																					
	Miami-Dade Division of Emergency Management																					
	FDOT Emergency Management																					
	FTE Emergency Management																					
2	Traffic Data and Demand Estimations																					
3	**Evacuations Conditions Assessment - Traffic**																					
4	Alternative Development																					
5	**Final Report**																					

Project Methodology



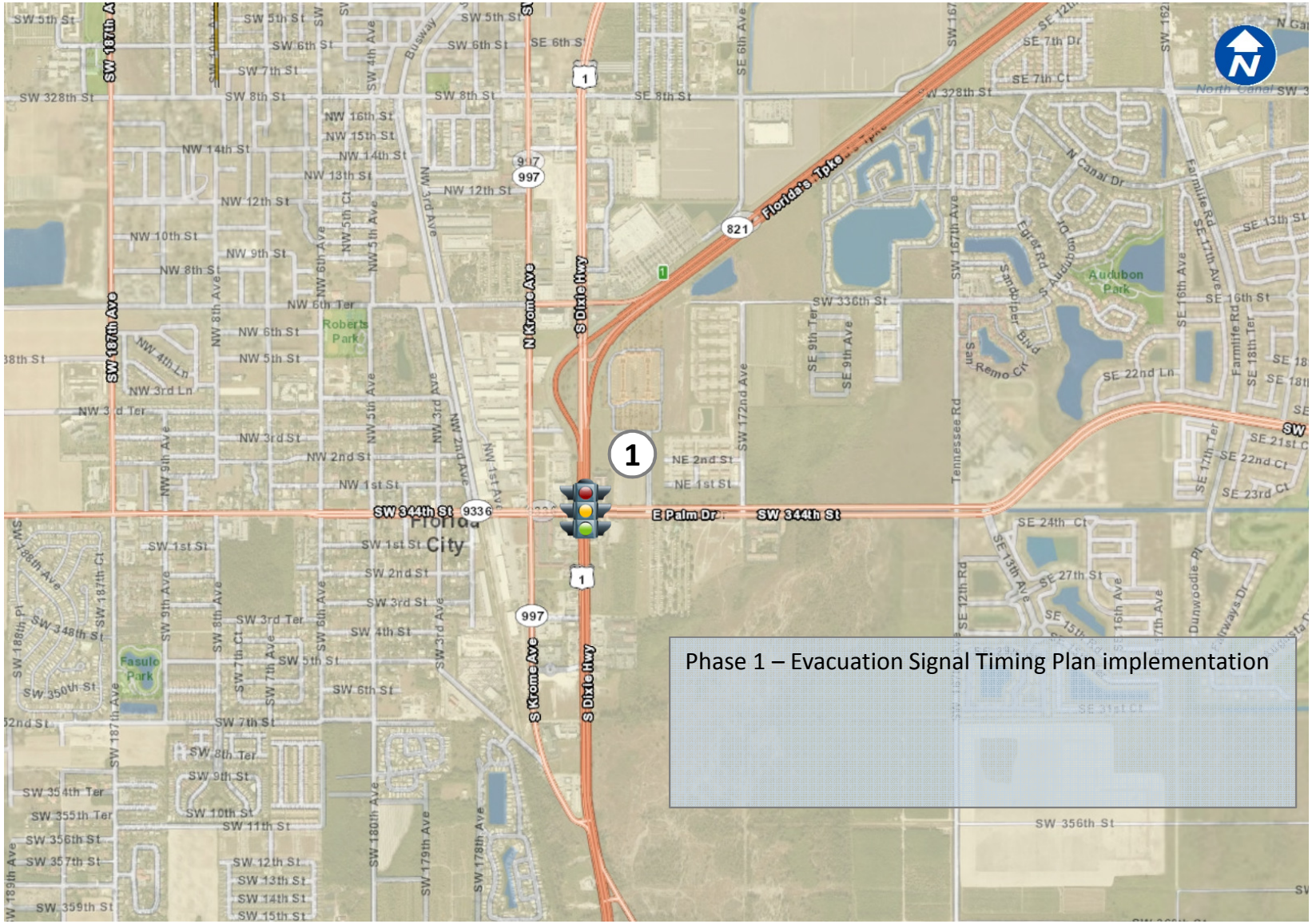
Completed Related Studies

- Updated Traffic Management Plan for US-1 and SW 344th Street (Palm Drive), 2011
- FDOT District 6, Maximum Sustainable Flow Rates for Emergency Evacuation of Florida Keys, 2010
- Miami-Dade Comprehensive Emergency Management Plan, 2008
- FDOT District 6, Comprehensive Emergency Management Plan, 2007
- FTE One-Way Plan, 2011

Traffic Management Plan for US-1 and SW 344th Street

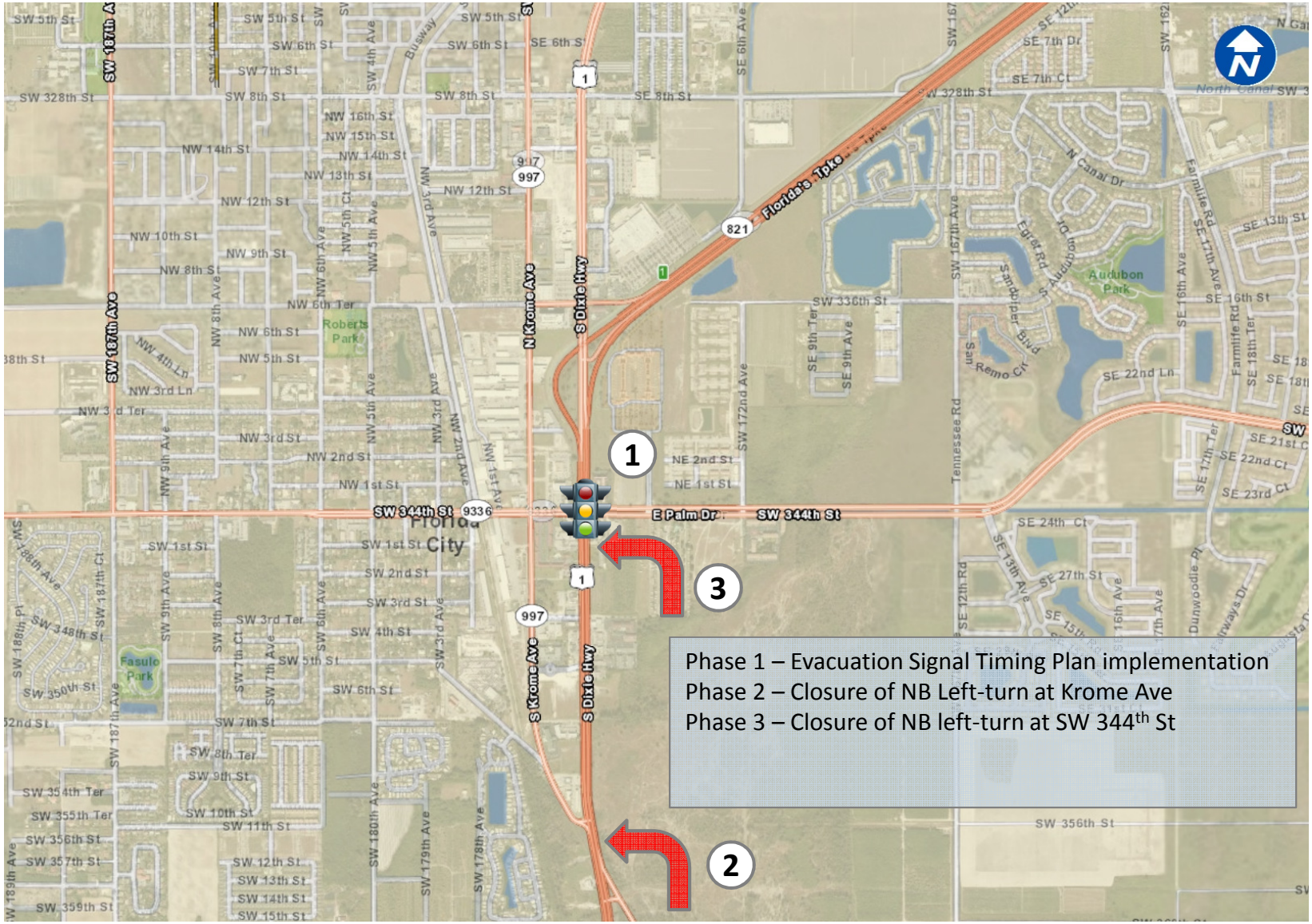
- Developed by FDOT District 6 to better manage the evacuation traffic from the Florida Keys.
- Five (5) phase implementation plan during evacuation events

Existing Traffic Management Plan

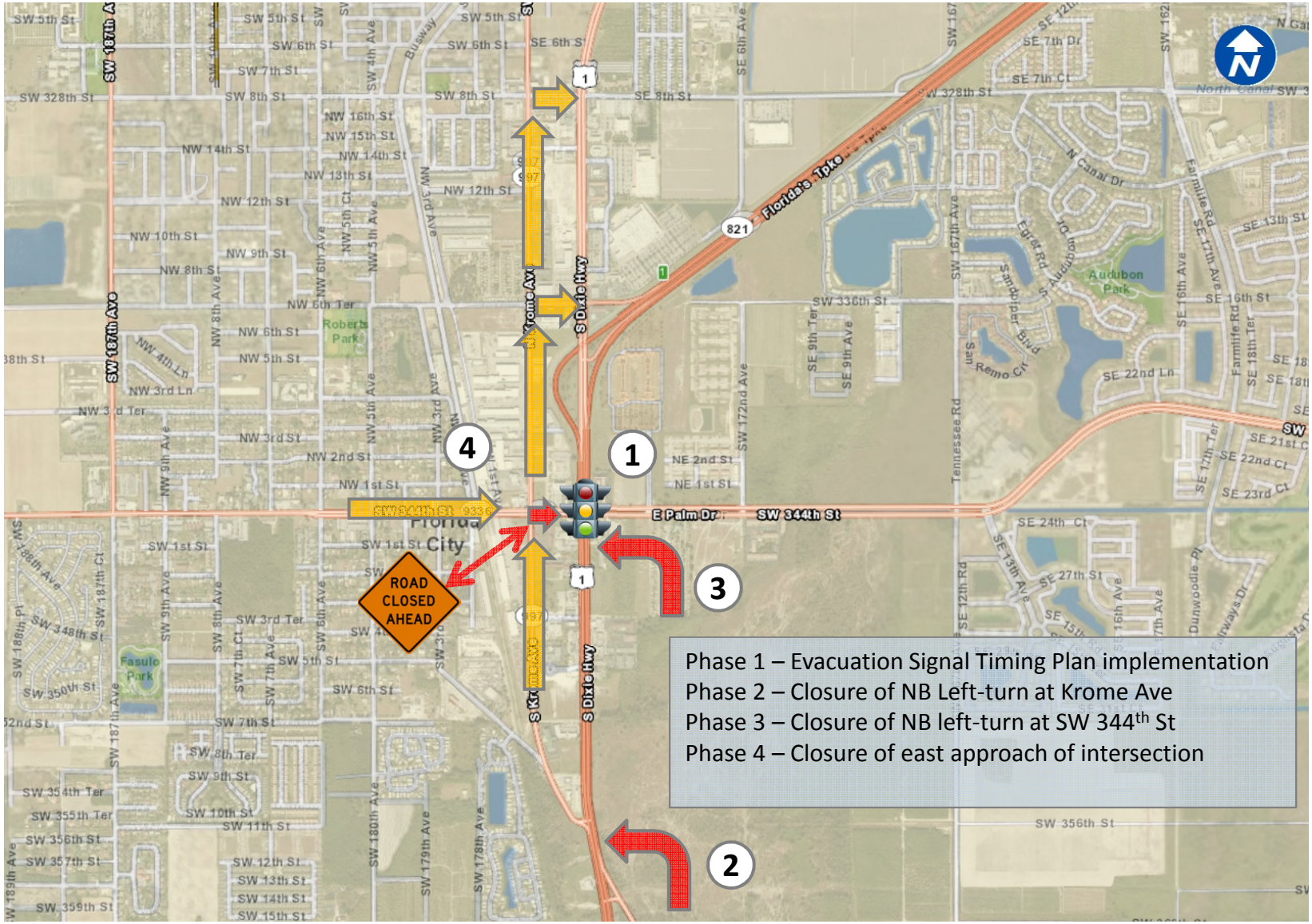


Existing Traffic Management Plan

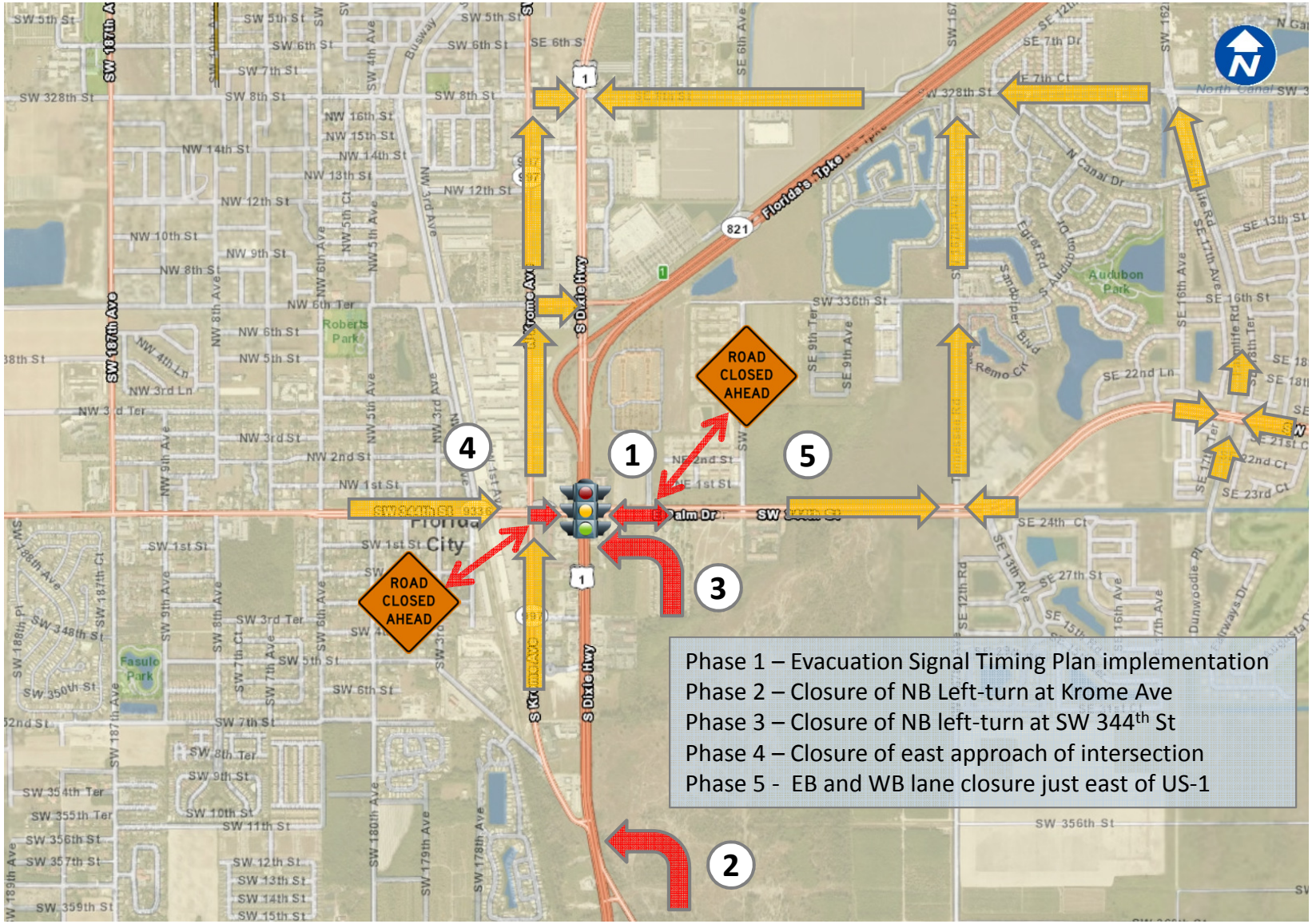
Existing Traffic Management Plan



Existing Traffic Management Plan



Existing Traffic Management Plan



Conceptual Alternatives

8 Concepts

- Qualitatively assessed potential improvements to evacuation clearance times
- Determined potential right-of-way impacts and/or relocations
- Preliminary cost of these alternatives ranged from $10 to $40 million
- Includes single point interchanges, diamond interchanges, partial interchanges, New Jersey jug handle, and flyovers
- Based on the conceptual analysis of evacuation clearance times, right-of-way impacts, and costs, the alternatives were narrowed down to 3

3 Conceptual Alternatives recommended for further analysis

- Refinement of alternatives underway
- Focus on minimizing impacts to right-of-way and relocation
- Alternatives include:
  - **US-1 Northbound Overpass**
  - **344th Street Overpass**
  - **Northbound HEFT Ramp Extension**

US-1 Northbound Overpass

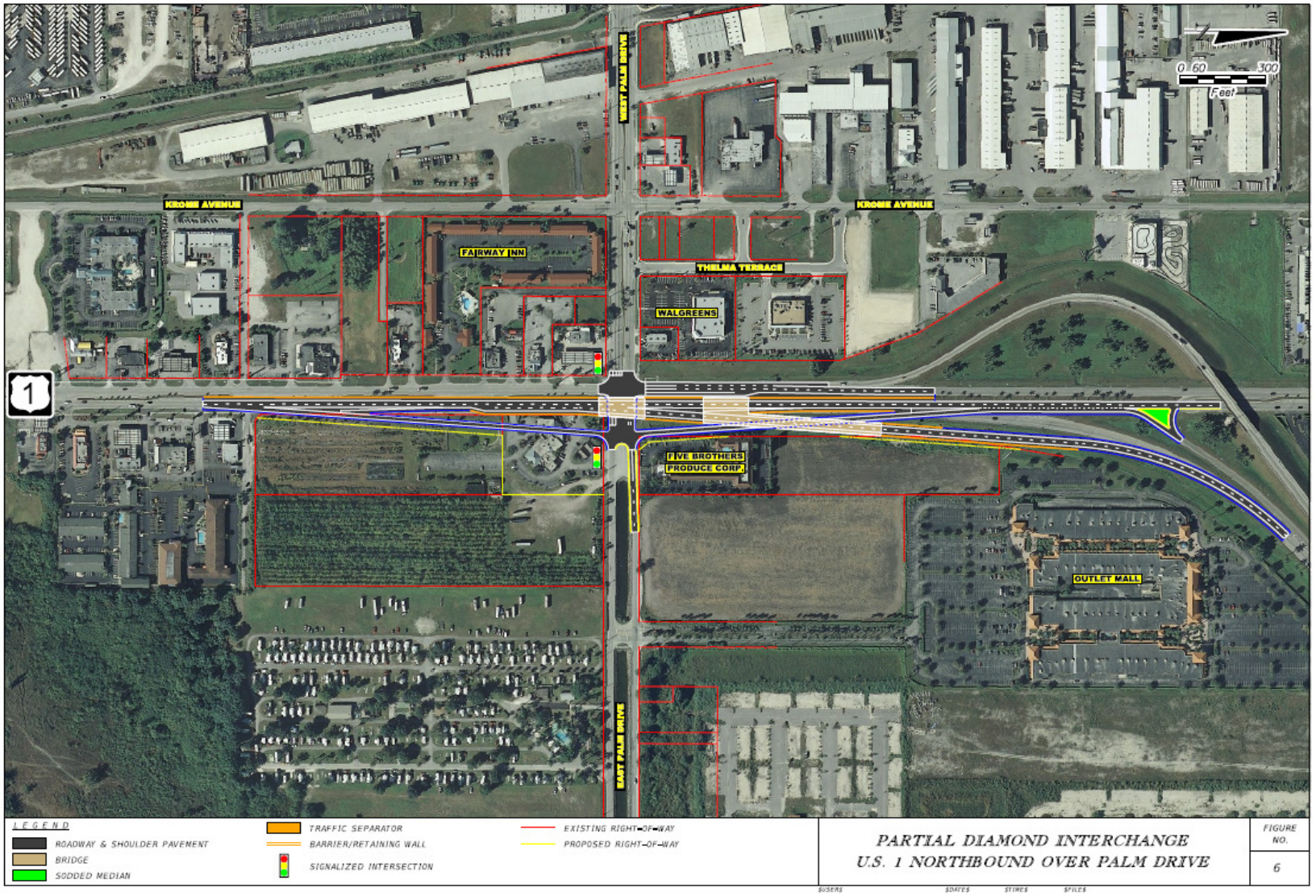
Description

- US-1 northbound lanes constructed over SW 344th Street
- US-1 northbound to HEFT on-ramp modifications including new bridge
- Potential for single-point or diamond type interchange with SW 344th Street
- Additional signal for diamond interchange with SW 344th Street
- Modified signal for single-point interchange with SW 344th Street
- Requires right-of-way acquisition and potential for relocations

Preliminary Estimate

- $15 to $30 million including potential right-of-way costs

US-1 Northbound Overpass



344th Street Overpass

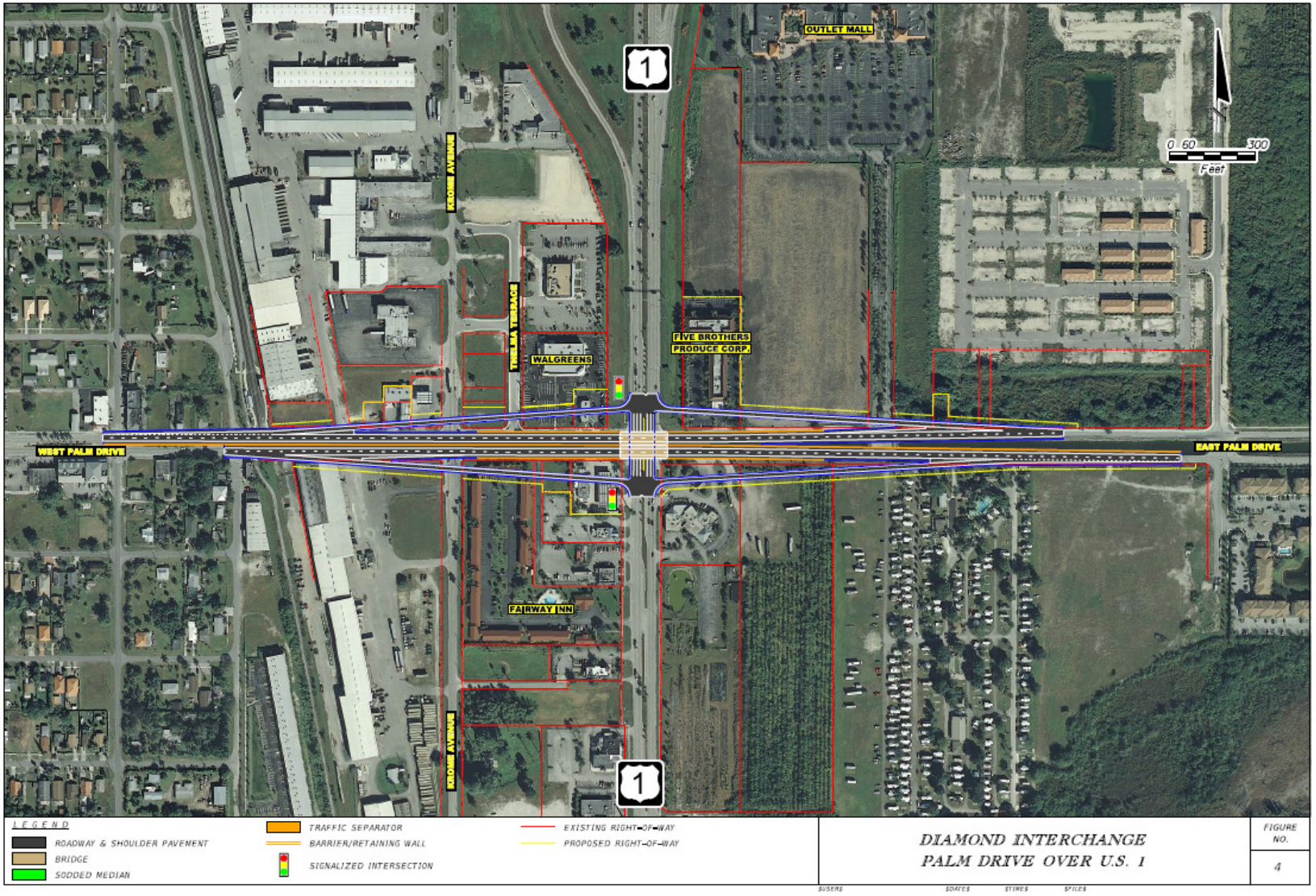
Description

- SW 344th Street constructed over US-1
- Potential for single-point or diamond type interchange with US-1
- Additional signal for diamond interchange with US-1
- Signal modifications for single point interchange with US-1
- Require right-of-way acquisition and potential for relocations

Preliminary Estimate

- $20 to $30 million including potential right-of-way costs

344th Street Overpass



Northbound HEFT Ramp Extension

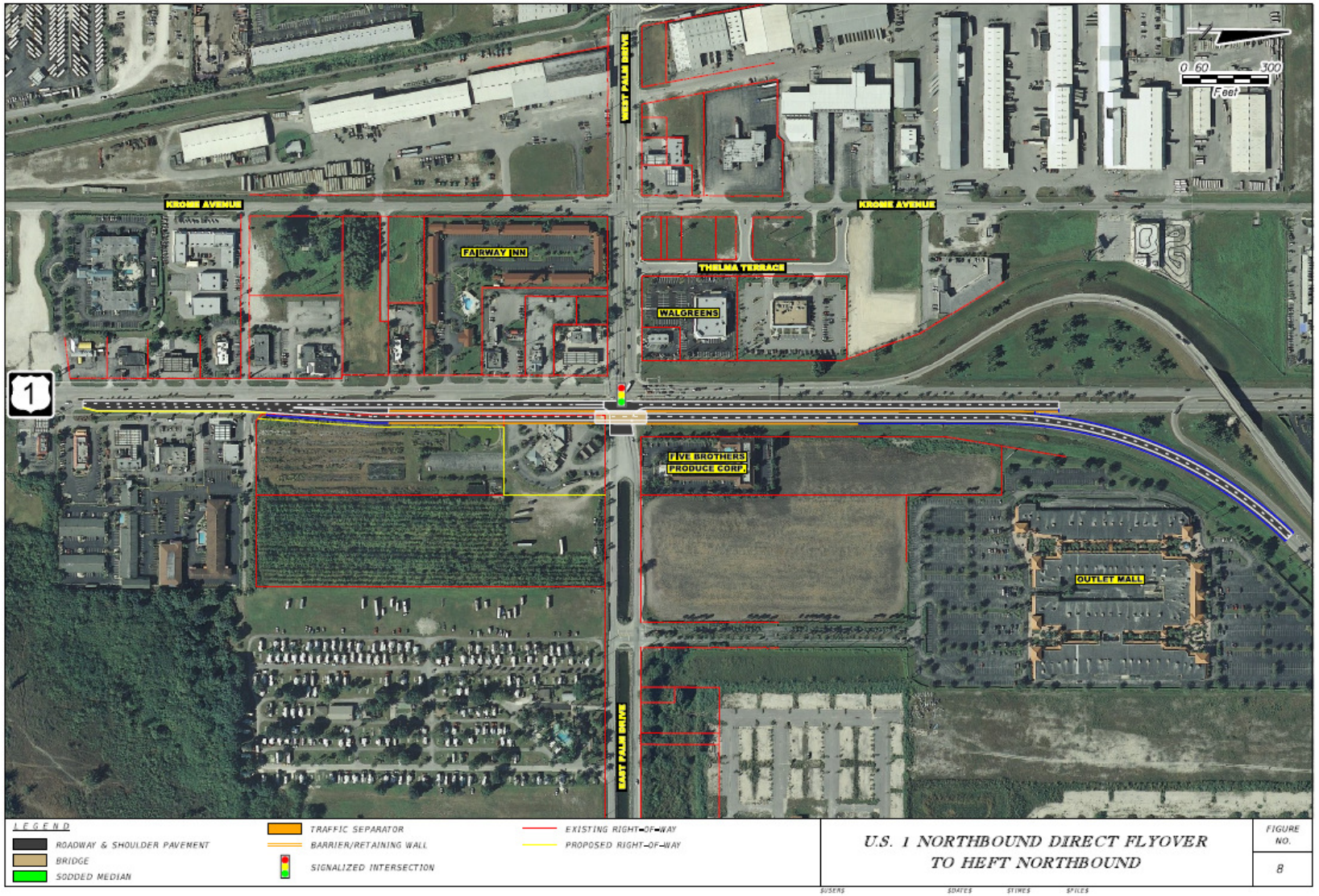
Description

- Extension of HEFT on-ramp for US-1 northbound to just south of SW 344th Street
- US-1 northbound would remain two-lanes after on-ramp
- Signal modifications to the US-1 and SW 344th Street intersection
- Requires right-of-way acquisition and potential for relocation
- Potential on-ramp extension from the inside northbound lanes of US-1 being analyzed

Preliminary Estimate

- $12 to $15 million including potential right-of-way costs
- The inside lane modification concept will reduce right-of-way costs but increase structural costs

Northbound HEFT Ramp Extension



Next Steps

1. Refinement/modification of the 3 alternatives
2. Traffic analysis of 3 alternatives and existing traffic management plan
3. Analysis of potential right-of-way and relocation impacts
4. Refine cost estimates
5. Study Advisory Committee (TPTAC) meeting in June 2012
6. Coordinate results with key stakeholders
7. Select final alternative
8. Present final results to TPC by summer 2012

June 6, 2012 TPTAC Presentation

Evacuation Planning Assessment for the US-1 and SW 344th Street Intersection Area

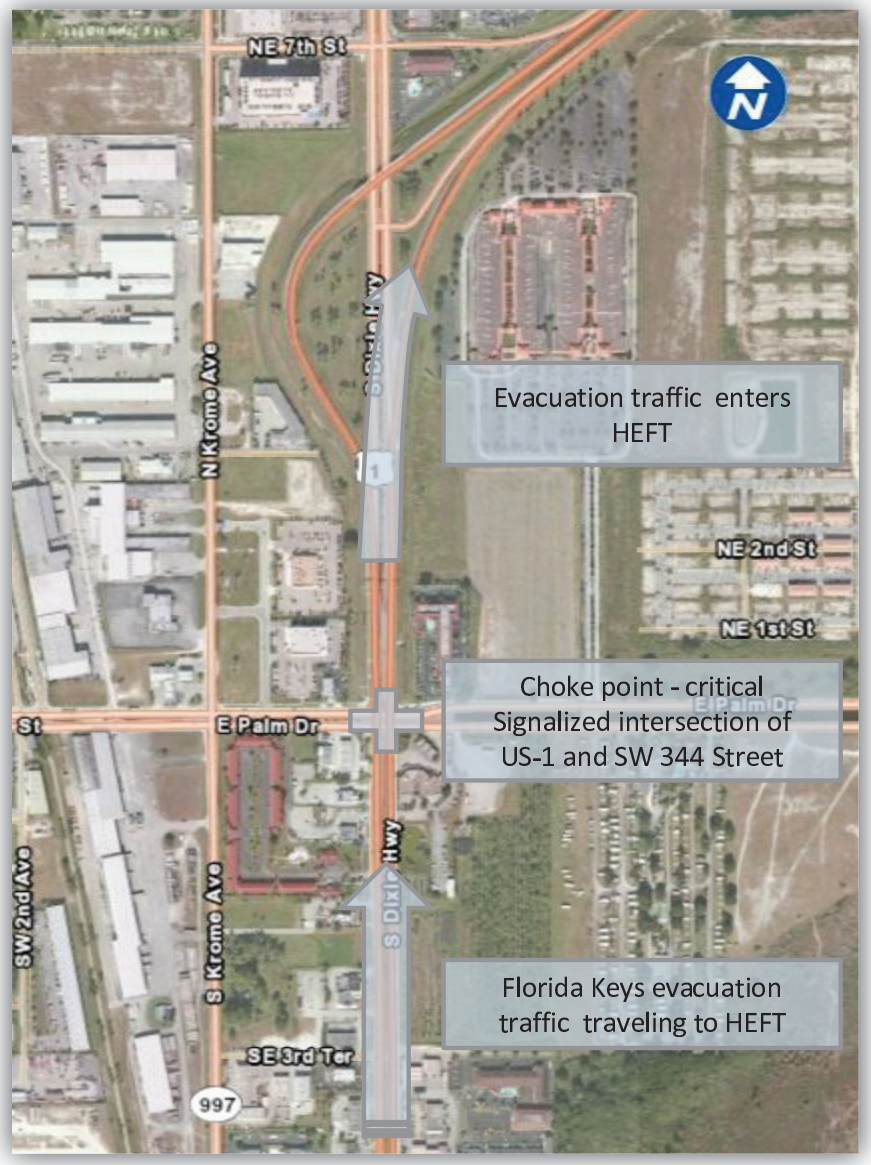
Transportation Planning Technical Advisory Committee

June 6, 2012

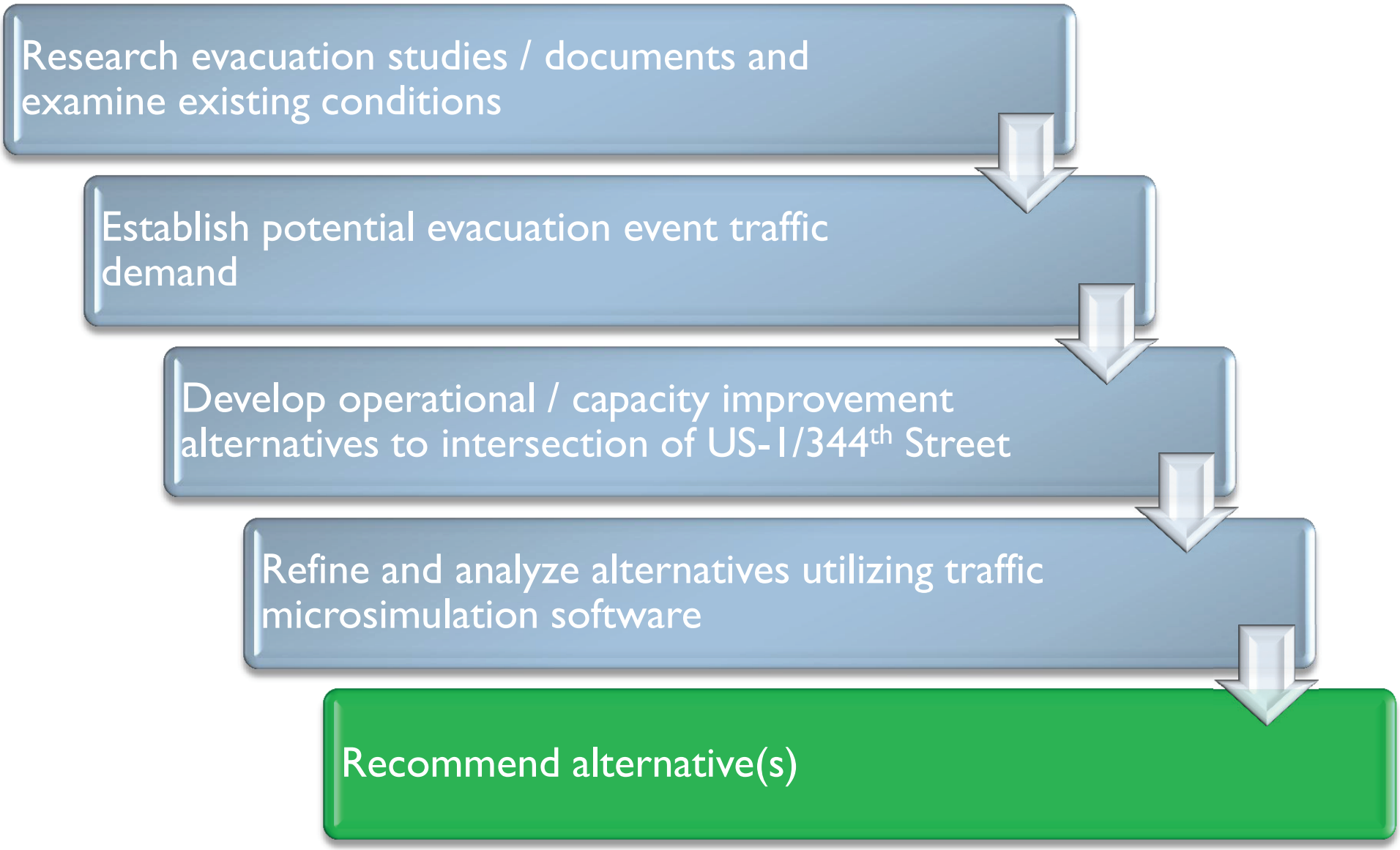
HNTB

Study Purpose

- Evacuation traffic from the Florida Keys travels to the HEFT along US-1
- US-1/344th street is only signalized intersection along evacuation route north of the Florida Keys to the HEFT
- Assess potential improvements to the US-1/344th street intersection
- Improve evacuation clearance times at the intersection



Project Methodology



Alternatives Developed

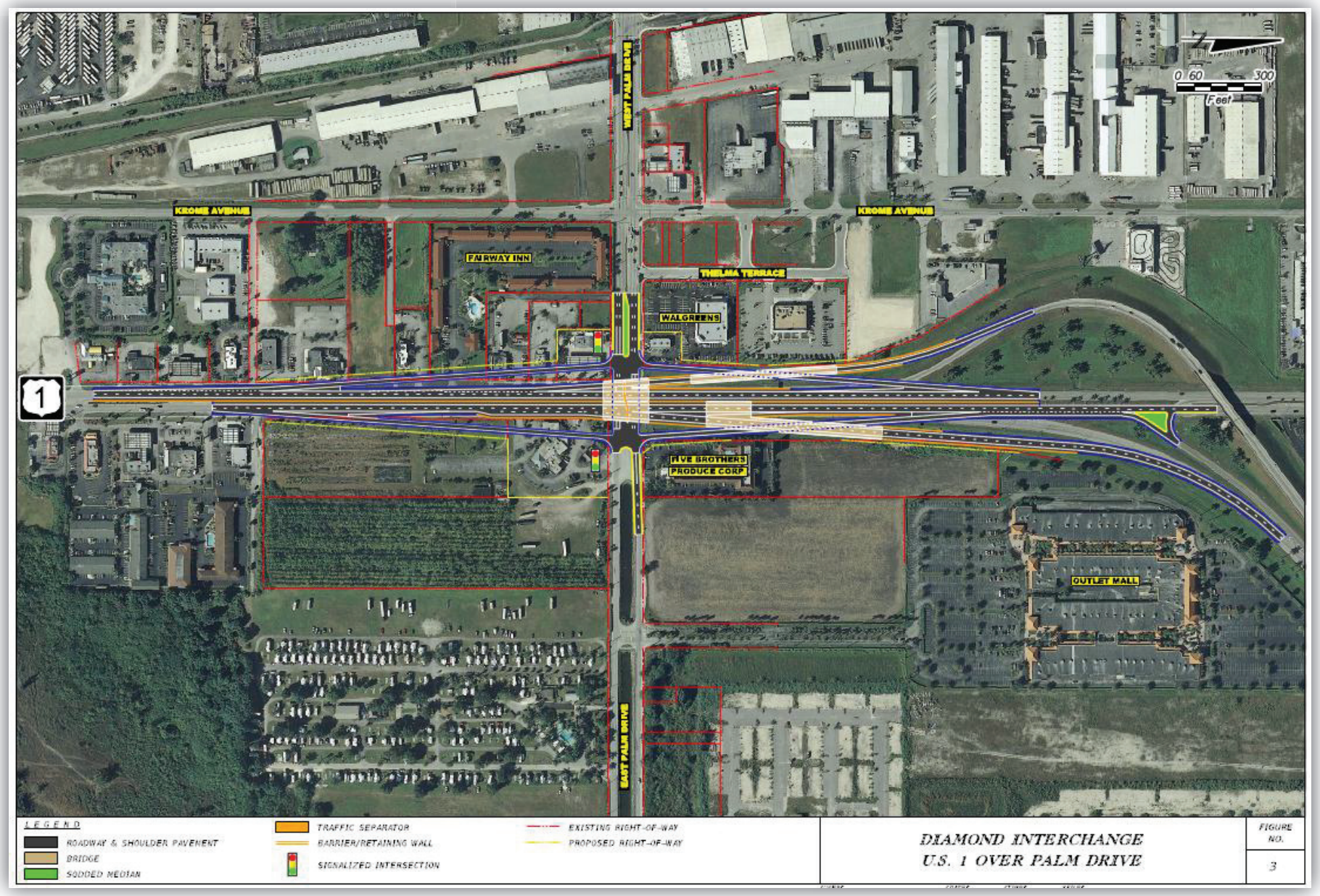
3 Alternatives Developed for Analysis

- Alternatives were developed to enhance evacuation clearance times
- Focused on minimizing impacts to right-of-way and relocation
- Conceptual capital cost developed for alternatives
  - Costs included right-of-way and construction costs

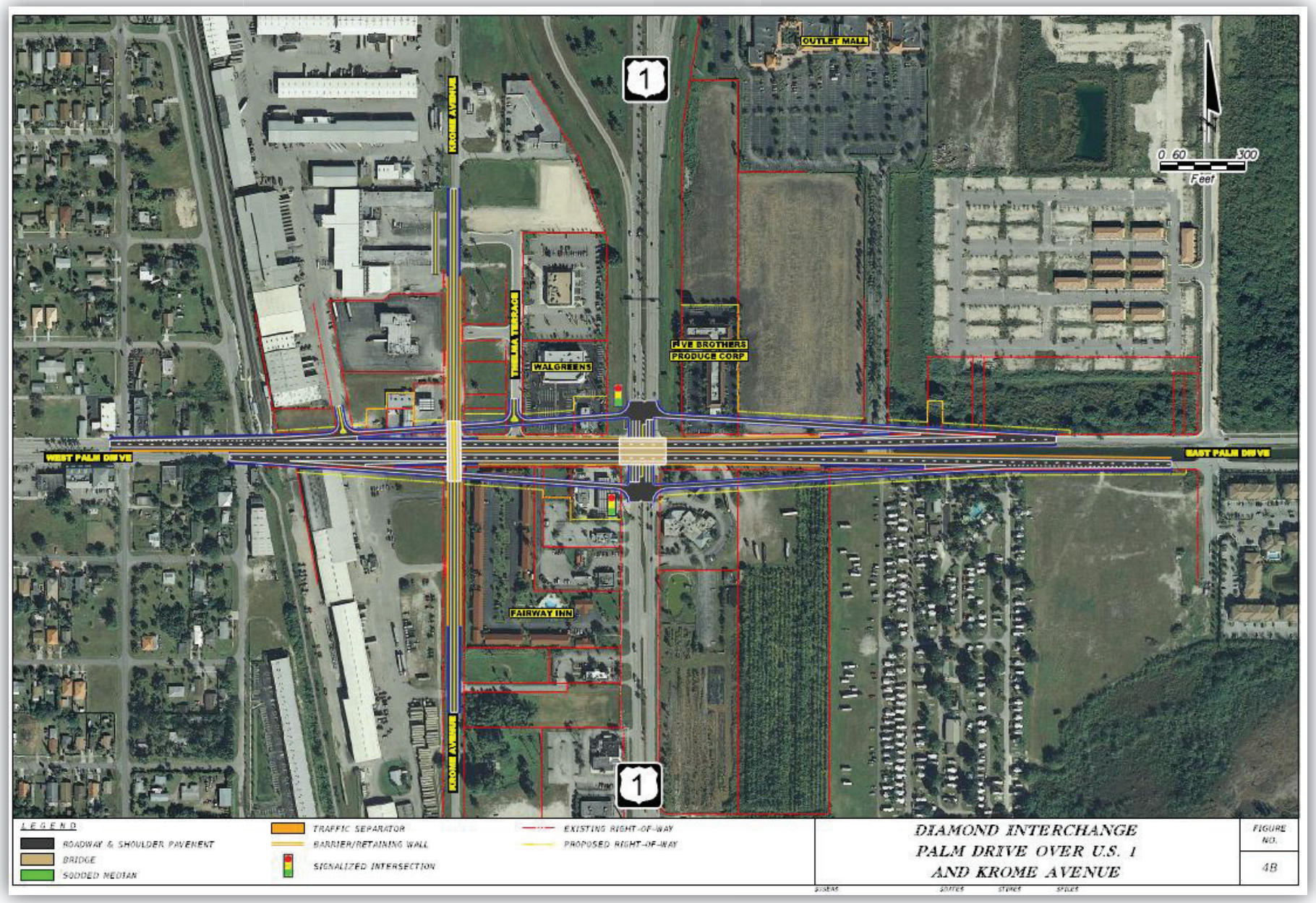
Alternatives Presented at April 4 TPTAC:

- US-1 Overpass (approx. $25 to $35 million)
- SW 344th Street Overpass (approx. $20 to $30 million)
- Northbound HEFT Ramp Extension (approx. $10 to $20 million)

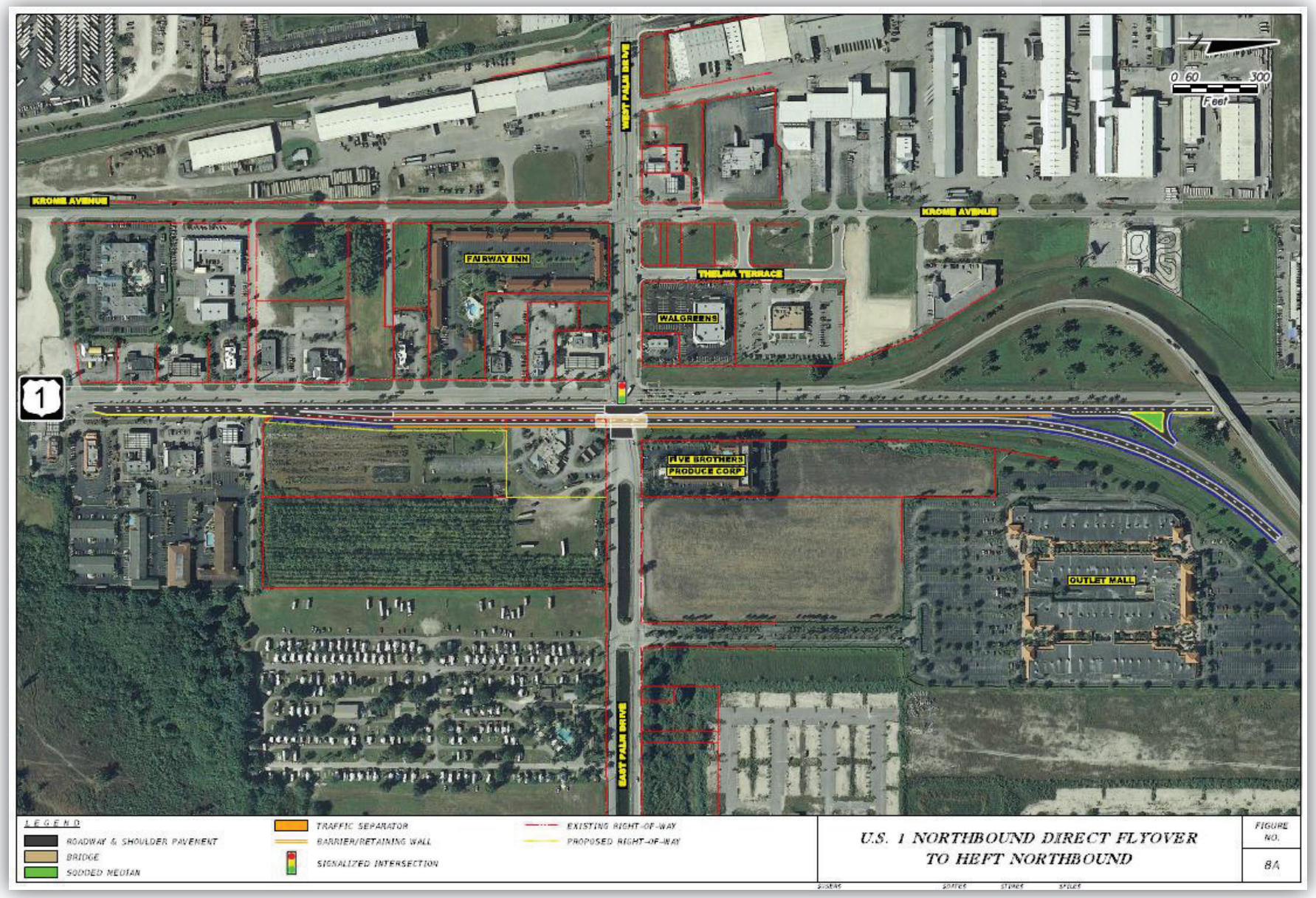
US-1 Overpass



SW 344th Street Overpass



Northbound HEFT Ramp Extension



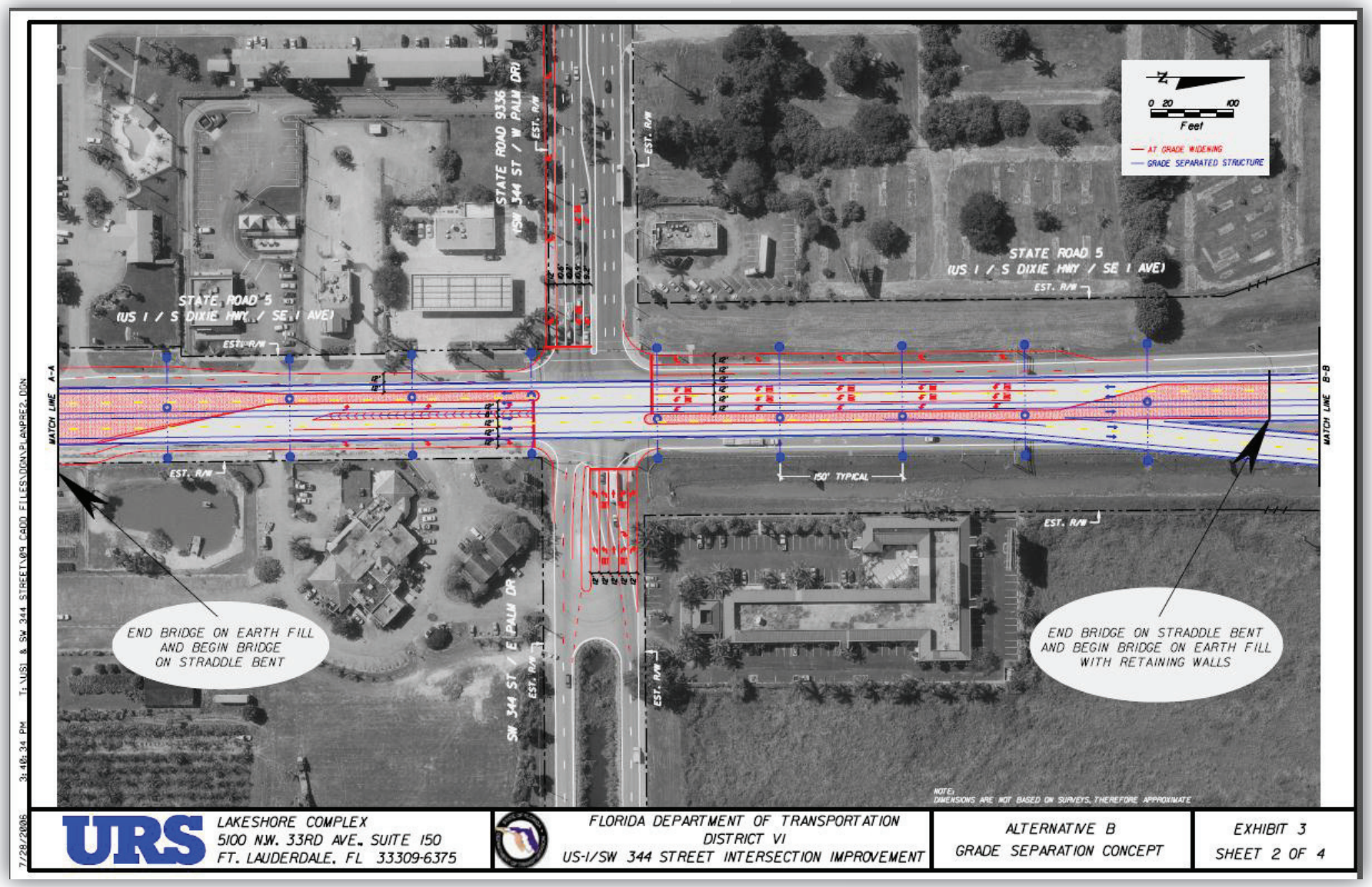
Previous Study Concept

Meeting with FDOT on Grade Separation Concept Along US-1

- Limits of project from south of SW 344th Street to the HEFT
- Physical characteristics included the following:
  - Overpass on straddle bents to allow traffic to travel underneath bridge and access the full US -1/ SW 344 St intersection
  - Widening of US -1 on ground level
  - Segmental bridge for ramps to/from HEFT
- Could enhanced evacuation clearance time

Concept did not move forward due to economic downturn

Previous Study Concept



CORSIM Analysis

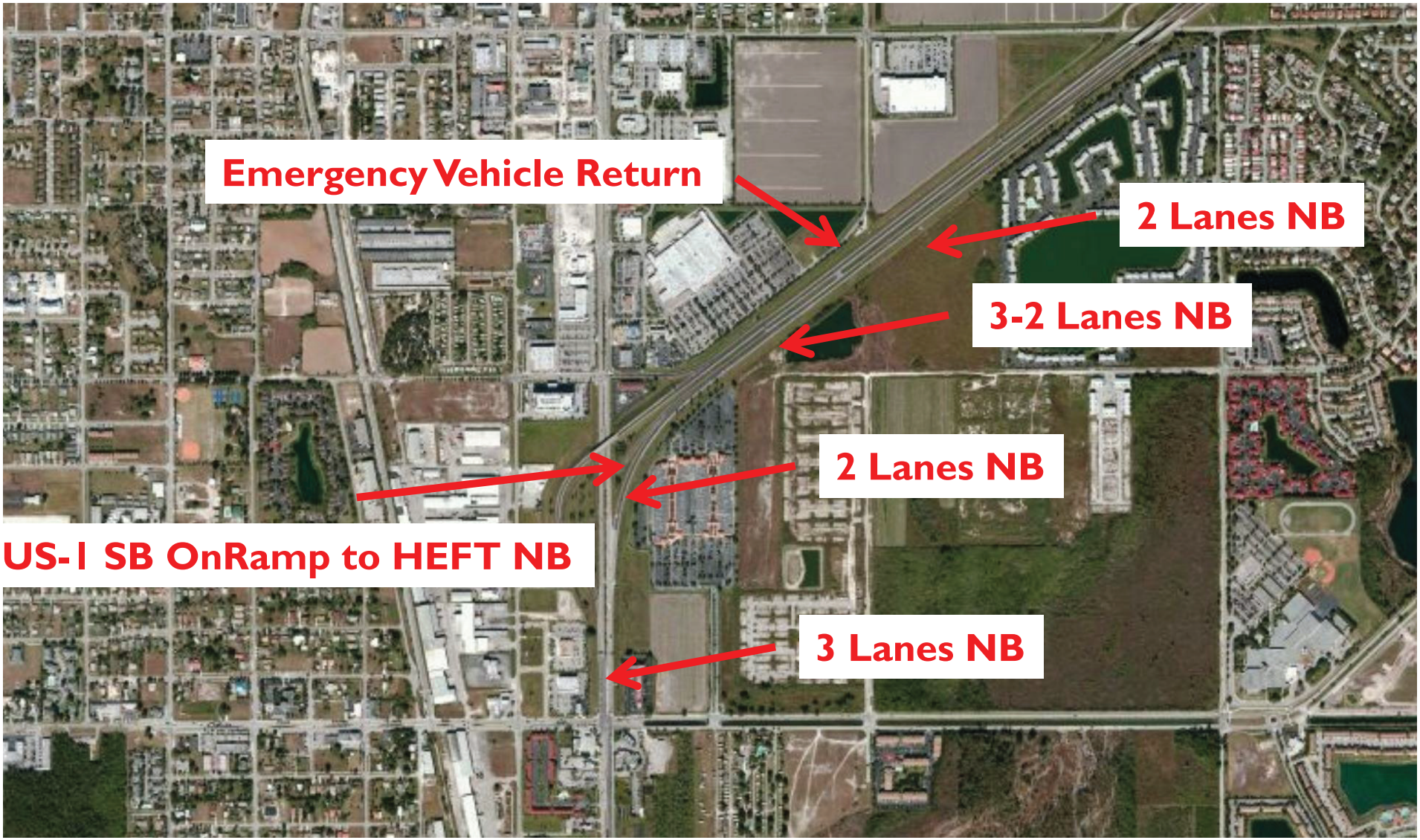
Traffic demand set at capacity to simulate potential evacuation scenario

8 Scenarios were analyzed with CORSIM Traffic Microsimulation Software:

- Base scenario (Existing Emergency Evacuation Traffic Management Plan)
- Developed Alternatives:
  - US-1 Overpass
  - SW 344th Street
  - Northbound HEFT Ramp Extension
- Base scenario and Northbound HEFT Ramp Extension with HEFT Improvements:
  - HEFT median crossover
  - Shoulder travel on the 2 lane ramp section of HEFT (a total of 3 lanes)
- Holiday Traffic Scenarios
  - Existing intersection geometry
  - Northbound HEFT Ramp Extension

Traffic Results: Average of 10 CORSIM runs for each alternative

US-1 at HEFT – Existing Conditions



Base Scenario and 3 Developed Alternatives Analysis

CORSIM Results

Level of Service (LOS) results obtained for two segments:

- US-1 Northbound (south of the HEFT)
- HEFT (from 3 to 2 lane section)

US-1 Overpass and **Northbound HEFT Ramp Extension** were the two best alternatives

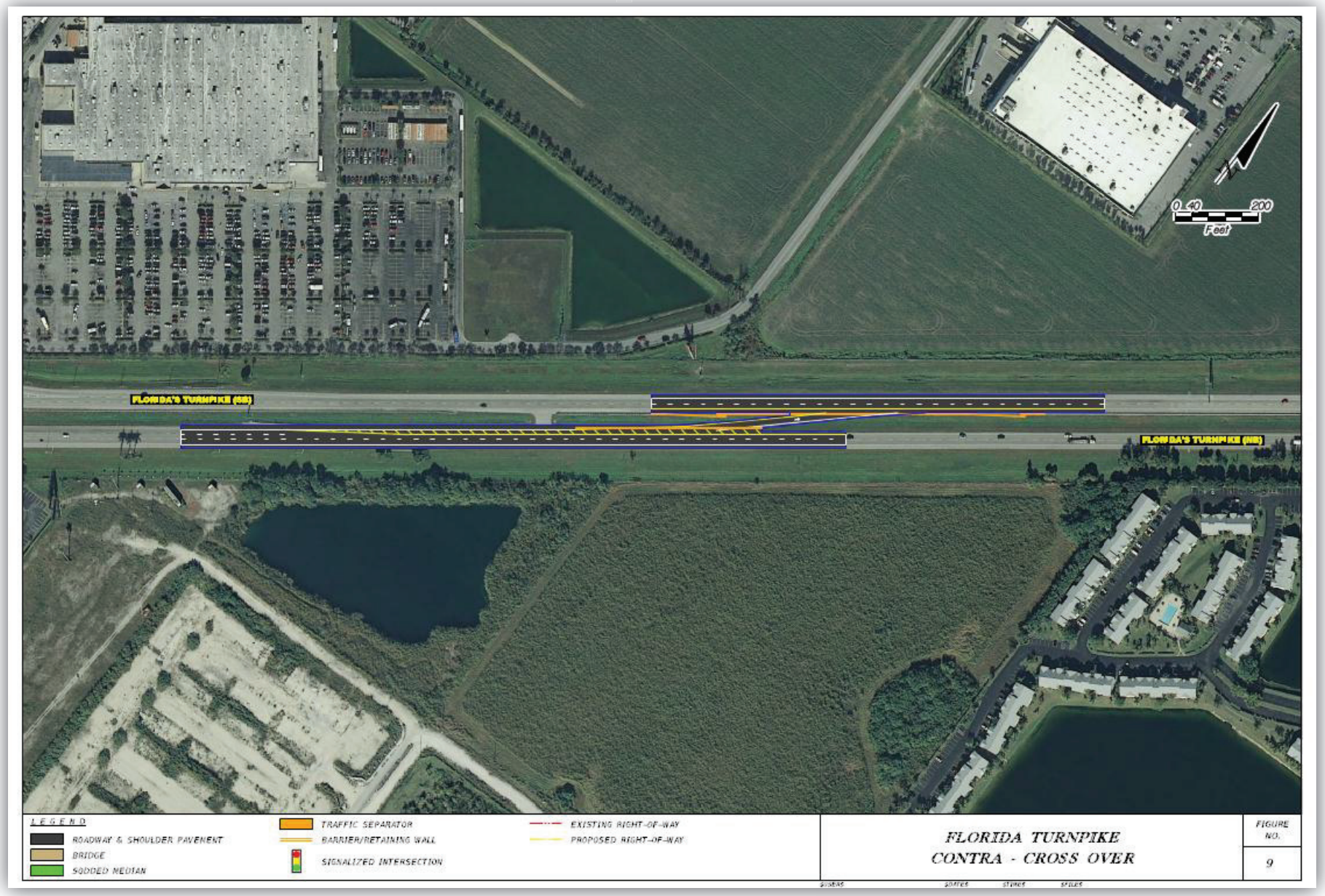
Alternative	US-1 Northbound (south of HEFT)	HEFT (from 3 to 2 lane section)
Base Scenario	F	F
US-1 Overpass	D	F
SW 344th Street Overpass	F	E
Northbound HEFT Ramp Extension	D	F

HEFT Improvements

Proposed Improvements for HEFT Evacuation access during contraflow operations

- Use shoulder to provide a third lane on the Northbound HEFT Ramp Extension
- On-ramp from US-1 Southbound to HEFT northbound will be closed
- Crossover lane connecting Northbound HEFT to Southbound HEFT to allow third Northbound lane to feed inside Southbound HEFT

HEFT Improvements



HEFT Improvements Analysis

Level of Service (LOS) results obtained for two segments:

- US-1 Northbound (south of the HEFT)
- HEFT (from 3 to 2 lane section)

Based on CORSIM results, both additional features to the Northbound HEFT Ramp Extension alternative would improve traffic conditions for the HEFT mainline

Level of Service Results

Alternative	US-1 Northbound (south of HEFT)	HEFT (from 3 to 2 lane section)
Base Evacuation Scenario with crossover lane and third lane on northbound HEFT Ramp Extension	B	E
Northbound HEFT Ramp Extension with crossover lane and third lane on northbound HEFT Ramp Extension	A	E

Weekend/Holiday Traffic Analysis

Input from Miami-Dade County Public Works

Purpose

- To analyze the intersection with and without the Northbound HEFT Ramp Extension alternative during weekend/holiday traffic conditions

Data Collection

- Turning movement counts were collected on Memorial Day – May 28, 2012
- 8 hours turning movement counts collected (8:00 AM to 11:00 AM and 2:00 PM to 7:00 PM)

Traffic Counts

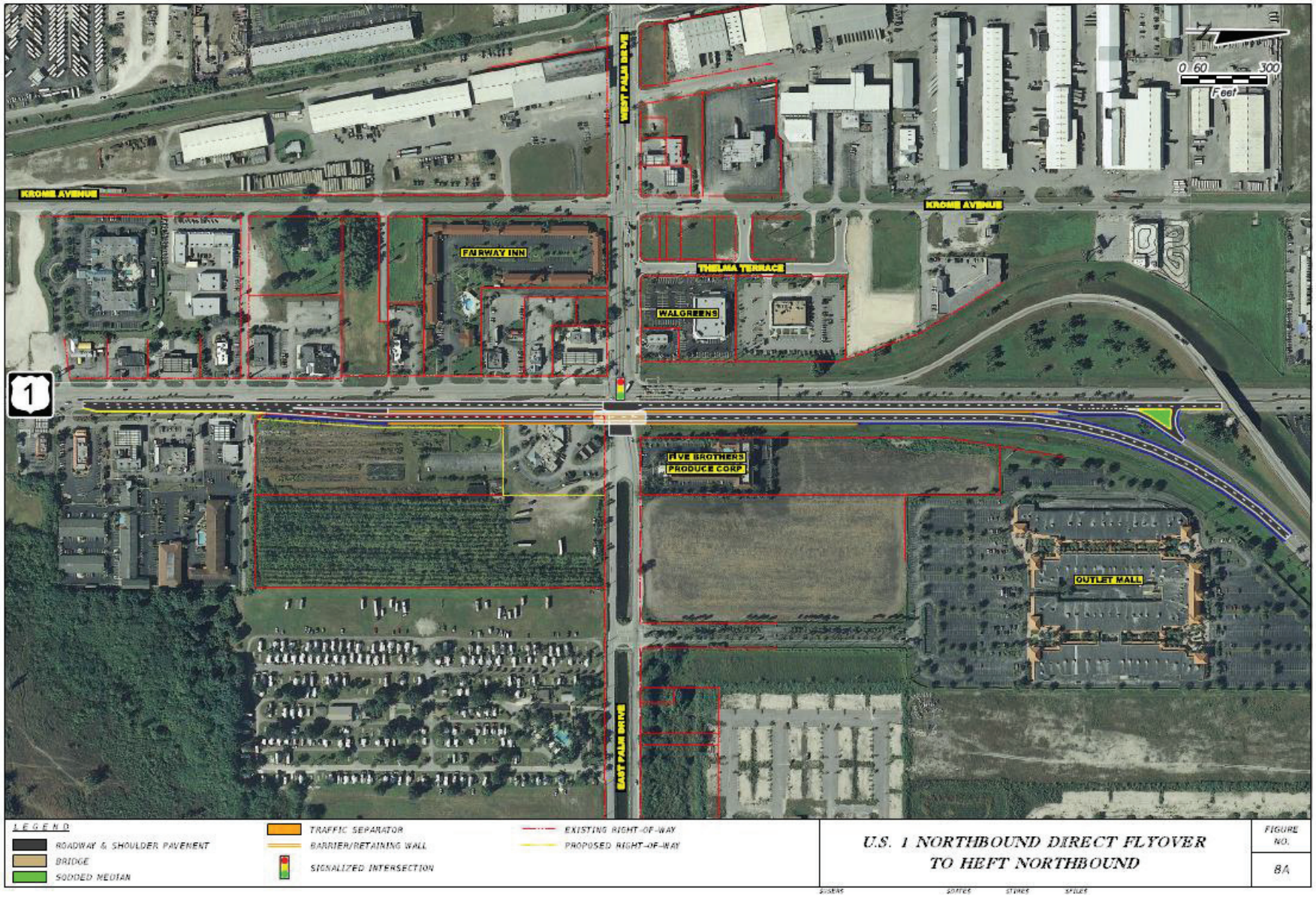
- Holiday Peak Hour Northbound approach at US-1 occurs from 6:00 PM to 7:00PM
- Memorial Day Northbound peak hour has 1,700 vehicles traveling Northbound on US-1
- Traffic model capacity to simulate potential evacuation scenario has 5,700 vehicles traveling Northbound on US-1

Recommended Alternative

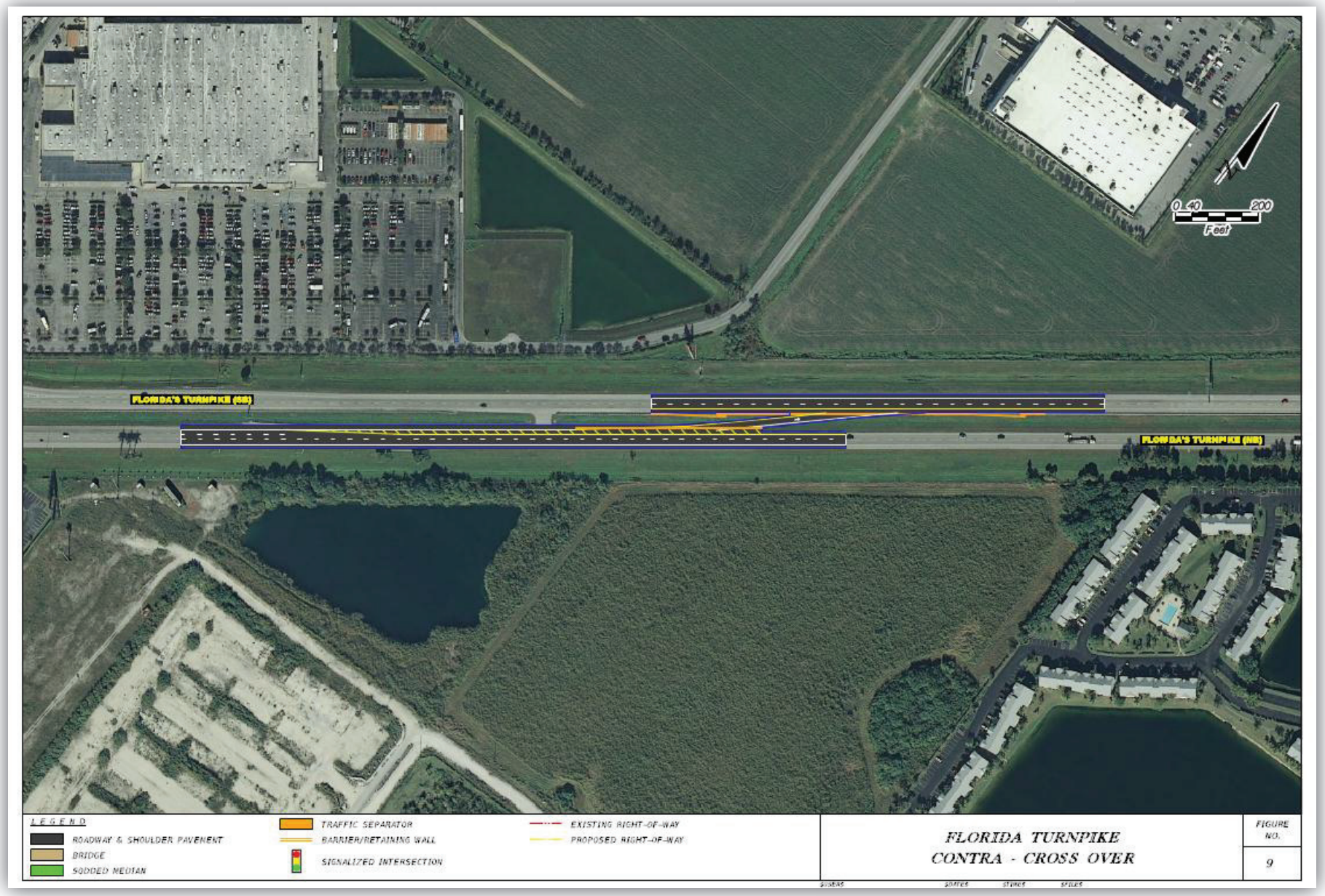
Northbound HEFT Ramp Extension

- Two-lane flyover ramp over SW 344th Street to the HEFT Northbound on-ramp
- Traffic analysis produced favorable results compared to existing traffic management plan
- Lowest costs among alternatives - costs ranged approximately from $10 to $20 million

Recommended Alternative



Recommended HEFT Improvements



Next Steps

- Finalize CORSIM analysis of holiday traffic conditions with and without Northbound HEFT Ramp Extension
- Present final results to TPC by summer 2012

APPENDIX D

Miami-Dade County Public Works Department
Comments

Below are the responses addressing the comments provided by the Miami-Dade County Public Works Department Traffic Engineering Division on May 7, 2012 regarding the Miami-Dade Metropolitan Planning Organization (MPO) project - Evacuation Planning Assessment for US 1 and SW 344 Street Area. These comments were received after the projects first meeting with the Miami-Dade MPO Transportation Planning Technical Advisory Committee (TPTAC) on April 4, 2012.

No.	Comments	Responses
1)	If there is any preliminary study that analyzed the possibility of using the reversible lanes for the US-1 during evacuation, then an alternative may be developed using such operation.	Based on the history of the Miami-Dade MPO, no such study has been performed. But due to the complexity involved with such an operation, this alternative utilizing contra flow operations along US 1 should be considered as a stand-alone study. Safety and manpower would be the number one concern for such an operation.
2)	An emergency northbound on-ramp at SW 328 Street may be considered to further disperse northbound local traffic accessing the HEFT considering potential evacuating traffic demand.	The feasibility of constructing an interchange at this location with HEFT was already being reviewed as a PD&E study funded by a private developer. However, this PD&E was put on hold due to funding constraints.
3)	If ROW allows Alternative 3 can be evaluated with the modification of northbound widening at surface level. Additional alternative can be investigated with minor geometric improvements at the intersection to improve existing operational plan.	The right-of-way along the corridor is constrained. Additionally the purpose of this alternative is to analyze the potential of free-flow operations along US 1 over SW 344 Street. There are other alternatives which analyze geometric improvements to the intersection.
4)	Existing operation at the subject intersection may be further improved by reducing movements conflicting with northbound evacuating movements along US 1.	The current traffic management plan to be utilized during Florida Keys evacuation events, allows for free-flow operations along US 1 at SW 344 Street. However, this plan is reactive and is implemented by field personnel. The focus of this project is to implement permanent solutions. However, the traffic analysis for this project includes a comparison of 3 advanced alternatives and the current traffic management plan.

APPENDIX E

CORSIM Output Results

Existing Conditions (7% Truck Factor)
Average of 10 CORSIM RUNS (NETSIM)

Up Node	Down Node	Travel Distance Total	Trips	Move Time Total	Delay Travel Total	Travel Time Total	Move Time Per Travel Time Ratio	Travel Time Per Distance	Delay Travel Per Distance	Travel Time Per Vehicle	Delay Travel Per Vehicle	Delay Control Per Vehicle	Delay Queue Per Vehicle	Delay Stop Per Vehicle	Stopped Vehicles Percent	Volume	Speed Average
16	27	9.1625	220.9	18.3245	0.7571	19.0816	0.9606	2.0828	0.0015	5.1563	0.2125	0	0	0	0	883.6	28.8143
5	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	31	33.3608	331.1	44.4811	3.0539	47.5349	0.9362	1.4246	0.0016	8.5742	0.5645	0	0	0	0	1324.4	42.1229
30	11	4.7587	126.9	7.0979	0.3204	7.4183	0.9567	1.5592	0.0012	3.5041	0.1544	0	0	0	0	507.6	38.4886
33	14	5.9108	113.9	8.8161	0.6291	9.4449	0.9349	1.596	0.0017	4.9439	0.3384	0	0	0	0	455.6	37.6092
12	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	16	12.4674	220.9	24.9349	1.2834	26.2184	0.9512	2.103	0.0015	7.0902	0.3603	0	0	0	0	883.6	28.5369
24	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	26	44.5467	328.5	59.3954	4.6513	64.0467	0.9277	1.4376	0.0018	11.6064	0.8606	0	0	0	0	1314	41.7488
32	23	107.3405	419.2	143.1208	1241.3293	1384.45	0.1131	12.8919	0.1925	179.5246	160.2947	127.9996	115.936	108.5832	99.9043	1676.8	5.0977
30	23	15.2347	161.2	22.7232	98.1473	120.8699	0.1881	7.9335	0.1073	44.3557	35.9635	33.9009	32.0222	31.6133	75.4981	644.8	7.5669
33	23	14.9025	146.8	22.2272	74.2076	96.435	0.2309	6.4707	0.083	39.5289	30.5623	26.1514	24.7867	24.2525	81.3967	587.2	9.2906
26	24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	13	53.5383	328.7	71.3843	10.8491	82.2334	0.8684	1.5358	0.0034	14.8411	1.9967	0	0	0.0237	0	1314.8	39.0768
3	32	176.9668	425.3	235.2128	8.8722	244.0849	0.9686	1.3795	0.0008	33.7844	1.2268	0	0	0.3822	4.0987	1701.2	43.7277
15	9	14.718	221.4	29.436	1.1638	30.6001	0.9621	2.0792	0.0013	8.2358	0.3309	0	0	0	0	885.6	28.8627
13	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	15	16.4667	221.8	32.9336	3.1832	36.1166	0.912	2.1932	0.0031	9.7024	0.8658	0	0	0	0	887.2	27.358
34	4	64.0857	550.2	85.4476	123.829	209.2767	0.4109	3.263	0.0322	22.5666	13.423	0	0	0.4111	6.3706	2200.8	18.5013
27	7001	6.0384	221.4	10.4188	0.9079	11.3267	0.9202	1.8756	0.0025	3.0635	0.2484	0	0	0	0	885.6	32.0012
25	7002	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	7003	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	34	50.2932	559.1	67.0574	34.1992	101.2567	0.6625	2.0131	0.0113	10.8406	3.6664	0	0	0.1222	0.0545	2236.4	29.8079
23	32	33.2665	130.4	66.5331	6.962	73.4949	0.9062	2.2076	0.0036	33.6293	3.1572	0	0	0.1497	0	521.6	27.1861
32	3	54.4673	130.9	108.9345	6.4054	115.34	0.945	2.1169	0.0018	51.1255	2.8915	0	0	0	0	523.6	28.3484
11	30	6.037	161	5.5001	0	5.5001	1	0.911	0	2.0496	0	0	0	0	0	644	65.8739
23	30	11.107	127	16.5662	6.2639	22.8299	0.7262	2.0546	0.0095	10.7448	2.955	0	0	0.218	0	508	29.216
14	33	7.628	147	8.8933	0	8.8933	1	1.1658	0	3.6299	0	0	0	0	0	588	51.4696
23	33	11.4553	114.3	17.0859	4.8308	21.9167	0.7795	1.9139	0.0069	11.4262	2.5467	0	0	0.1144	0	457.2	31.3538
4	34	23.7263	203.7	31.6352	4.6832	36.3182	0.871	1.5308	0.0031	10.6289	1.3851	0	0	0	0	814.8	39.1987
34	23	18.7025	205.3	24.9367	126.5831	151.52	0.1649	8.0991	0.1126	43.5583	36.3444	31.7971	30.2357	29.7061	77.227	821.2	7.4268
31	26	20.4439	202.9	37.8601	0	37.8601	1	1.852	0	11.1418	0.005	0	0	0	0	811.6	32.4023
26	13	27.6773	204.1	55.3541	1.0639	56.4183	0.9813	2.0385	0.0006	16.4686	0.3214	0	0	0	0	816.4	29.4372
13	4	33.2924	204.4	66.5848	3.3069	69.8918	0.9527	2.0992	0.0016	20.2736	0.9792	0	0	0	0	817.6	28.5822

Existing Conditions (7% Truck Factor)
Average of 10 CORSIM RUNS (FRESIM)

LI	K	VEHI IN	CLES OUT	LANE CHNG	CURR CONT	AVG CONT	VEH-MILES	VEH-MIN	TOTAL TIME	MOVE TIME	DELAY TIME	M/T	TOTAL	DELAY	VOLUME VEH/LN/HR	DENSITY VEH/LN-MIL	SPEED MILE/HR
20	22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	28	221.3	221.9	24	2.5	2.7752	38.8002	41.6278	11.2649	10.5	0.7649	0.9321	1.0728	0.0728	318.4852	5.6951	55.9289
28	17	221.9	223.3	5	0.5	1.2193	18.7854	18.2874	4.9228	4.668	0.2548	0.948	0.9735	0.0505	445.786	7.2328	61.6365
6	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	1	221.4	221.3	15.9	0.7	0.5784	6.5003	8.6736	2.3503	2.114	0.2366	0.8993	1.3343	0.1343	442.8641	9.8488	44.9673
7001	10	221.4	221.4	21	1.1	0.7088	6.6417	10.632	2.5288	2.106	0.4228	0.833	1.6009	0.2676	504.5672	13.4621	37.4817
7002	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7003	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Existing Conditions (No Truck Factor)
Average of 10 CORSIM RUNS (NETSIM)

Up Node	Down Node	Travel Distance Total	Trips	Move Time Total	Delay Travel Total	Travel Time Total	Move Time Per Travel Time Ratio	Travel Time Per Distance	Delay Travel Per Distance	Travel Time Per Vehicle	Delay Travel Per Vehicle	Delay Control Per Vehicle	Delay Queue Per Vehicle	Delay Stop Per Vehicle	Stopped Vehicles Percent	Volume	Speed Average
16	27	9.1207	219.9	18.2416	1.0949	19.3366	0.9435	2.1203	0.0019	5.2669	0.3063	0	0	0	0	879.6	28.3037
5	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	31	34.1166	338.6	45.4888	4.0163	49.5052	0.919	1.451	0.002	8.725	0.7158	0	0	0	0	1354.4	41.3558
30	11	4.7175	125.8	7.0362	0.3554	7.3918	0.9523	1.567	0.0013	3.5236	0.1711	0	0	0	0	503.2	38.3126
33	14	6.191	119.3	9.234	0.6711	9.9049	0.9326	1.5998	0.0019	4.9472	0.3418	0	0	0	0	477.2	37.5161
12	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	16	12.3939	219.6	24.7882	1.7952	26.5834	0.9325	2.1451	0.0024	7.2456	0.4945	0	0	0	0	878.4	27.9772
24	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	26	45.8483	338.1	61.1311	5.9705	67.1017	0.9112	1.4634	0.0021	11.8227	1.0656	0	0	0	0	1352.4	41.0042
32	23	107.8014	421	143.7354	865.2463	1008.9816	0.1457	9.3541	0.1335	134.6972	114.9642	96.4301	86.5813	82.3732	99.8085	1684	6.5635
30	23	15.2914	161.8	22.8078	97.5042	120.3117	0.1898	7.8681	0.1063	44.0103	35.6224	33.14	31.4057	31.0264	74.9743	647.2	7.6308
33	23	14.7096	144.9	21.9396	72.5321	94.4717	0.2331	6.4186	0.082	39.2586	30.3069	26.031	24.9644	24.4556	80.7345	579.6	9.3749
26	24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	13	55.1834	338.8	73.5777	10.5354	84.1133	0.875	1.524	0.0031	14.7651	1.8785	0	0	0.0141	0	1355.2	39.3735
3	32	177.0084	425.4	236.0109	3.084	239.095	0.9873	1.3507	0.0002	33.1008	0.4507	0	0	0	0	1701.6	44.4224
15	9	14.5852	219.4	29.1702	1.9399	31.1101	0.9378	2.1334	0.0022	8.4638	0.5398	0	0	0	0	877.6	28.1289
13	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	15	16.2668	219.1	32.5339	2.8611	35.395	0.9192	2.1757	0.0029	9.6449	0.7882	0	0	0	0	876.4	27.5784
34	4	65.0874	558.8	86.7832	105.905	192.6884	0.4509	2.9607	0.0271	20.5746	11.3672	0	0	0.1552	3.0759	2235.2	20.288
27	7001	5.9973	219.9	10.3482	1.0334	11.3817	0.9093	1.898	0.0028	3.1009	0.286	0	0	0	0	879.6	31.6209
25	7002	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	7003	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	34	50.1478	557.7	66.8637	31.4748	98.3383	0.68	1.961	0.0105	10.5367	3.3814	0	0	0.1191	0.0182	2230.8	30.6008
23	32	32.7895	128.6	65.5793	6.844	72.4233	0.906	2.208	0.0033	33.5282	3.1767	0	0	0.1621	0	514.4	27.178
32	3	53.5519	128.7	107.1038	6.8596	113.9633	0.9404	2.1272	0.0022	51.0277	3.1036	0	0	0	0	514.8	28.2137
11	30	6.037	161	5.5466	0	5.5466	1	0.9186	0	2.0672	0	0	0	0	0	644	65.3116
23	30	11.0216	125.8	16.4391	5.729	22.1683	0.7412	2.0121	0.0088	10.5637	2.7367	0	0	0.2342	0	503.2	29.8218
14	33	7.628	147	9.0331	0	9.0331	1	1.1841	0	3.6871	0	0	0	0	0	588	50.6764
23	33	12.0016	119.8	17.9006	4.7529	22.6533	0.7903	1.8875	0.0067	11.29	2.3857	0	0	0.0897	0	479.2	31.7921
4	34	23.8428	204.7	31.7906	4.7579	36.5483	0.8699	1.5329	0.0032	10.6628	1.396	0	0	0	0	818.8	39.1459
34	23	18.5839	204	24.7789	126.4994	151.2785	0.1644	8.1401	0.1134	43.9265	36.7318	32.2057	30.9077	30.4304	77.4793	816	7.3936
31	26	20.5146	203.6	38.295	0	38.295	1	1.8668	0	11.2294	0.0005	0	0	0	0	814.4	32.1429
26	13	27.5552	203.2	55.1102	1.7497	56.8599	0.9693	2.0635	0.0011	16.6396	0.5361	0	0	0	0	812.8	29.0791
13	4	33.1945	203.8	66.3895	3.5555	69.945	0.9492	2.1071	0.0018	20.3899	1.055	0	0	0	0	815.2	28.4777

Existing Conditions (No Truck Factor)
Average of 10 CORSIM RUNS (FRESIM)

LI	K	VEHI IN	CLES OUT	LANE CHNG	CURR CONT	AVG CONT	VEH-MILES	VEH-MIN	TOTAL TIME	MOVE TIME	DELAY TIME	M/T	TOTAL	DELAY	VOLUME VEH/LN/HR	DENSITY VEH/LN-MILE	SPEED MILE/HR
20	22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	28	220.1	220.6	24.7	2.3	2.7415	38.541	41.1228	11.2038	10.5	0.7038	0.9372	1.067	0.067	316.3554	5.6258	56.2322
28	17	220.6	220.8	4	1.1	1.2049	18.603	18.0706	4.9125	4.668	0.2447	0.9502	0.9714	0.0483	441.458	7.1471	61.7651
6	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	1	219.7	220.1	14.2	0.5	0.5726	6.4542	8.5884	2.344	2.114	0.2304	0.9018	1.3307	0.1307	439.7122	9.752	45.0879
7001	10	219.9	219.7	19.6	1.4	0.7011	6.5364	10.5156	2.5414	2.106	0.4354	0.8288	1.609	0.2755	496.5832	13.3145	37.2954
7002	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7003	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Miami-Dade MPO
Evacuation Planning Assessment
US-1 and SW 344 Street Intersection Area Study

Base Scenario - Hurricane Evacuation

US 1 NB Approach to HEFT L = 4645 ft	Entry Volume (vph)	Total Veh Discharghed (vph)	Travel Delay (sec/veh)	Avg. Queue (veh/ln)	Max Queue (veh/ln)	Avg. Speed (mph)	Travel Time (sec/veh)
Run 1	5,700	5,334	96.0616	29.5878	69	18.8423	164.645
Run 2	5,700	5,346	89.447	24.3436	59	19.7561	158.056
Run 3	5,700	5,308	100.87	30.8747	77	18.285	169.49
Run 4	5,700	5,311	90.2074	27.4111	71	19.568	158.799
Run 5	5,700	5,405	82.5384	23.6128	66	20.5537	151.282
Run 6	5,700	5,347	94.091	29.0872	66	19.0885	162.537
Run 7	5,700	5,363	90.3403	27.2694	65	19.5539	158.952
Run 8	5,700	5,390	94.1058	27.5386	77	19.0772	162.707
Run 9	5,700	5,306	94.3509	30.9606	60	19.0982	162.84
Run 10	5,700	5,367	89.4694	25.9969	75	19.6412	158.195
Average	**5,700**	**5,348**	**92**	**28**	**69**	**19**	**161**

Base Scenario - Hurricane Evacuation

HEFT 3 to 2-lane section L = 924 ft	Entry Volume (vph)	Total Veh Discharghed (vph)	Travel Delay (sec/veh)	Avg. Speed (mph)	Travel Time (sec/veh)	Density (veh/mi/ln)	LOS
Run 1	5,700	5,319	15.392	24.3318	25.892	78.5231	F
Run 2	5,700	5,324	15.3687	24.3538	25.8687	78.5205	F
Run 3	5,700	5,322	11.3942	28.7747	21.8942	66.3239	F
Run 4	5,700	5,322	12.1893	27.7663	22.6893	68.8245	F
Run 5	5,700	5,367	11.3162	28.8777	21.8162	66.7836	F
Run 6	5,700	5,318	14.2294	25.4757	24.7294	75.0414	F
Run 7	5,700	5,331	14.3853	25.3161	24.8853	75.6903	F
Run 8	5,700	5,358	12.8058	27.0319	23.3058	71.2505	F
Run 9	5,700	5,296	15.2477	24.4682	25.7477	77.6895	F
Run 10	5,700	5,310	13.8217	25.9028	24.3217	73.6747	F
Average	**5,700**	**5,327**	**14**	**26**	**24**	**73**	F

Miami-Dade MPO
Evacuation Planning Assessment
US 1 and SW 344 Street Intersection Area Study

US 1 Overpass Alternative - Hurricane Evacuation

US 1 NB Approach to HEFT L = 2194 ft	Entry Volume (vph)	Total Veh Discharghed (vph)	Avg. Delay (sec/veh)	Avg. Queue (veh/ln)	Max Queue (veh/ln)	Avg. Speed (mph)
Run 1	5,700	5,348	42.0406	15.9519	32	19.7963
Run 2	5,700	5,404	37.7922	12.7358	31	20.986
Run 3	5,700	5,442	38.4925	13.9153	36	20.7622
Run 4	5,700	5,297	40.2370	15.9831	33	20.2639
Run 5	5,700	5,484	41.3285	15.1861	33	19.9774
Run 6	5,700	5,346	43.5157	16.6208	35	19.4117
Run 7	5,700	5,355	38.8664	14.9044	38	20.703
Run 8	5,700	5,441	31.9374	9.1675	35	22.904
Run 9	5,700	5,348	40.7318	17.0033	37	20.13
Run 10	5,700	5,420	39.3267	14.6836	33	20.4976
Average	**5,700**	**5,389**	**39**	**15**	**34**	**21**

US 1 Overpass Alternative - Hurricane Evacuation

HEFT 3 to 2-lane section L = 445 ft	Entry Volume (vph)	Total Veh Discharghed (vph)	Avg. Speed (mph)	Density (veh/mi/ln)	LOS
Run 1	5,700	5,027	52.8303	47.5860	F
Run 2	5,700	5,038	52.3894	48.0656	F
Run 3	5,700	5,069	51.3005	49.4011	F
Run 4	5,700	5,006	52.8474	47.3748	F
Run 5	5,700	5,112	52.4838	48.7008	F
Run 6	5,700	5,034	53.1053	47.3729	F
Run 7	5,700	4,996	52.7887	47.3191	F
Run 8	5,700	5,128	51.4794	49.7829	F
Run 9	5,700	5,015	52.1037	48.1249	F
Run 10	5,700	5,081	52.3698	48.5274	F
Average	**5,700**	**5,051**	**52**	**48**	F

Miami-Dade MPO
Evacuation Planning Assessment
US 1 and SW 344 Street Intersection Area Study

SW 344 Street Overpass Alternative - Hurricane Evacuation

US 1 NB Approach to HEFT L = 2194 ft	Entry Volume (vph)	Total Veh Discharghed (vph)	Avg. Delay (sec/veh)	Avg. Queue (veh/ln)	Max Queue (veh/ln)	Avg. Speed (mph)
Run 1	5,700	4,552	120.51	51.1925	83	9.56947
Run 2	5,700	4,538	120.48	53.3386	81	9.58134
Run 3	5,700	4,403	123.884	55.2672	89	9.3619
Run 4	5,700	4,492	122.411	53.9103	84	9.45743
Run 5	5,700	4,520	123.661	52.0831	84	9.37237
Run 6	5,700	4,502	123.239	51.6314	82	9.39815
Run 7	5,700	4,483	124.403	52.2978	82	9.31273
Run 8	5,700	4,462	124.462	52.4600	89	9.30996
Run 9	5,700	4,391	126.365	51.0844	83	9.19339
Run 10	5,700	4,494	121.907	50.8836	83	9.47978
Average	**5,700**	**4,484**	**123**	**52**	**84**	**9**

SW 344 Street Overpass Alternative - Hurricane Evacuation

HEFT 3 to 2-lane section L = 445 ft	Entry Volume (vph)	Total Veh Discharghed (vph)	Avg. Speed (mph)	Density (veh/mi/ln)	LOS
Run 1	5,700	4,513	53.2130	42.4095	E
Run 2	5,700	4,498	54.4442	41.3041	E
Run 3	5,700	4,379	55.0541	39.7723	E
Run 4	5,700	4,425	53.8214	41.1048	E
Run 5	5,700	4,451	54.5989	40.7620	E
Run 6	5,700	4,421	53.7698	41.1306	E
Run 7	5,700	4,437	54.4142	40.7790	E
Run 8	5,700	4,411	54.8166	40.2288	E
Run 9	5,700	4,337	54.3783	39.8586	E
Run 10	5,700	4,414	54.2243	40.7084	E
Average	**5,700**	**4,429**	**54**	**41**	E

Miami-Dade MPO
Evacuation Planning Assessment
US 1 and SW 344 Street Intersection Area Study

Northbound HEFT Ramp Extension Alternative - Hurricane Evacuation

US 1 NB Approach to HEFT L = 2194 ft	Entry Volume (vph)	Total Veh Discharghed (vph)	Avg. Delay (sec/veh)	Avg. Queue (veh/ln)	Max Queue (veh/ln)	Avg. Speed (mph)
Run 1	5,700	5,327	46.0202	18.6733	46	18.7999
Run 2	5,700	5,362	42.9630	17.7761	63	19.5996
Run 3	5,700	5,339	42.8718	15.1089	46	19.5679
Run 4	5,700	5,290	46.8561	16.9694	41	18.5921
Run 5	5,700	5,358	41.7574	15.4981	46	19.9332
Run 6	5,700	5,336	45.5034	16.4672	60	18.9138
Run 7	5,700	5,425	40.3517	14.1064	45	20.2815
Run 8	5,700	5,350	46.1393	17.4794	50	18.7715
Run 9	5,700	5,267	50.4076	21.3247	46	17.7711
Run 10	5,700	5,406	39.8919	14.0511	40	20.4184
Average	**5,700**	**5,346**	**44**	**17**	**48**	**19**

Northbound HEFT Ramp Extension Alternative - Hurricane Evacuation

HEFT 3 to 2-lane section L = 445 ft	Entry Volume (vph)	Total Veh Discharghed (vph)	Avg. Speed (mph)	Density (veh/mi/ln)	LOS
Run 1	5,700	5,314	42.2657	62.8676	F
Run 2	5,700	5,296	43.6529	60.6587	F
Run 3	5,700	5,291	42.0974	62.8503	F
Run 4	5,700	5,306	42.0710	63.0545	F
Run 5	5,700	5,299	42.9425	61.6911	F
Run 6	5,700	5,258	43.1392	60.9414	F
Run 7	5,700	5,329	43.7236	60.9326	F
Run 8	5,700	5,344	43.2875	61.7240	F
Run 9	5,700	5,280	43.5504	60.6190	F
Run 10	5,700	5,311	42.6637	62.2361	F
Average	**5,700**	**5,303**	**43**	**62**	F

Miami-Dade MPO
Evacuation Planning Assessment
US-1 and SW 344 Street Intersection Area Study

Base Scenario with HEFT Mitigation

US 1 NB Approach to HEFT (L=4645 ft)	Entry Volume (vph)	Total Veh Discharghed (vph)	Avg. Delay (sec/veh)	Avg. Queue (veh/ln)	Max Queue (veh/ln)	Avg. Speed (mph)
Run 1	5,700	5,705	16.1512	0.003056	2	36.505
Run 2	5,700	5,688	16.4058	0.004444	2	36.3987
Run 3	5,700	5,705	16.7882	0.004167	2	36.2335
Run 4	5,700	5,697	16.7962	0.001944	2	36.2461
Run 5	5,700	5,702	16.0341	0.000833	1	36.5611
Run 6	5,700	5,708	16.1855	0.000278	1	36.4777
Run 7	5,700	5,694	16.6923	0.018056	5	36.2872
Run 8	5,700	5,697	16.3433	0.005833	3	36.4344
Run 9	5,700	5,697	16.1982	0.000278	1	36.4926
Run 10	5,700	5,704	16.3538	0.000556	1	36.4247
Average	**5,700**	**5,700**	**16**	**0**	**2**	**36**

Base Scenario with HEFT Mitigation

HEFT NB from 2-lane Ramp (L=445 ft)	Entry Volume (vph)	Total Veh Discharghed (vph)	Avg. Speed (mph)	Density (veh/mi/ln)	LOS
Run 1	4,275	4,291	53.3046	40.2233	E
Run 2	4,275	4,320	53.6977	40.2295	E
Run 3	4,275	4,261	53.7251	39.6488	E
Run 4	4,275	4,254	53.5484	39.7222	E
Run 5	4,275	4,243	53.3725	39.7579	E
Run 6	4,275	4,277	53.4561	39.9933	E
Run 7	4,275	4,287	53.3205	40.189	E
Run 8	4,275	4,290	53.1669	40.31	E
Run 9	4,275	4,267	53.7753	39.6521	E
Run 10	4,275	4,331	53.4071	40.5532	E
Average	**4,275**	**4,282**	**53**	**40**	E

Base Scenario with HEFT Mitigation

HEFT NB from 1-lane Crossover (L=484 ft)	Entry Volume (vph)	Total Veh Discharghed (vph)	Avg. Speed (mph)	Density (veh/mi/ln)	LOS
Run 1	1,425	1,395	39.7034	35.1393	E
Run 2	1,425	1,363	39.7423	34.2797	D
Run 3	1,425	1,438	39.6609	36.268	E
Run 4	1,425	1,424	39.624	35.8977	E
Run 5	1,425	1,460	39.7183	36.771	E
Run 6	1,425	1,432	39.6709	36.0615	E
Run 7	1,425	1,408	39.6144	35.5517	E
Run 8	1,425	1,414	39.6988	35.558	E
Run 9	1,425	1,429	39.649	36.0459	E
Run 10	1,425	1,366	39.6634	34.3615	D
Average	**1,425**	**1,413**	**40**	**36**	E

Miami-Dade MPO
Evacuation Planning Assessment
US-1 and SW 344 Street Intersection Area Study

Northbound HEFT Ramp Extension Alternative with HEFT Mitigation

US 1 NB Approach to HEFT (L=2194 ft)	Entry Volume (vph)	Total Veh Discharghed (vph)	Avg. Delay (sec/veh)	Avg. Queue (veh/ln)	Max Queue (veh/ln)	Avg. Speed (mph)
Run 1	5,700	5,706	8.11367	0	0	36.1287
Run 2	5,700	5,699	7.823	0.001944	2	36.3929
Run 3	5,700	5,700	7.89804	0.000833	1	36.315
Run 4	5,700	5,694	8.09723	0	0	36.1497
Run 5	5,700	5,694	7.81785	0.001111	1	36.4006
Run 6	5,700	5,691	7.67744	0.015	2	36.5428
Run 7	5,700	5,700	8.09504	0.000556	2	36.1416
Run 8	5,700	5,699	7.85979	0.000278	1	36.3557
Run 9	5,700	5,702	8.25471	0.004444	3	36.002
Run 10	5,700	5,703	7.78252	0	0	36.4152
Average	**5,700**	**5,699**	**8**	**0**	**1**	**36**

Northbound HEFT Ramp Extension Alternative with HEFT Mitigation

HEFT NB from Flyover (L=445 ft)	Entry Volume (vph)	Total Veh Discharghed (vph)	Avg. Speed (mph)	Density (veh/mi/ln)	LOS
Run 1	4,275	4,284	53.2252	40.2648	E
Run 2	4,275	4,260	53.5439	39.7925	E
Run 3	4,275	4,308	53.0041	40.6353	E
Run 4	4,275	4,271	53.5069	39.9093	E
Run 5	4,275	4,279	53.2771	40.1402	E
Run 6	4,275	4,230	53.2572	39.7465	E
Run 7	4,275	4,257	53.2287	39.9914	E
Run 8	4,275	4,298	53.3012	40.3256	E
Run 9	4,275	4,325	52.9826	40.8248	E
Run 10	4,275	4,244	53.467	39.6705	E
Average	**4,275**	**4,276**	**53**	**40**	E

Northbound HEFT Ramp Extension Alternative with HEFT Mitigation

HEFT NB from Crossover (L=484 ft)	Entry Volume (vph)	Total Veh Discharghed (vph)	Avg. Speed (mph)	Density (veh/mi/ln)	LOS
Run 1	1,425	1,438	39.0845	36.7786	E
Run 2	1,425	1,435	39.0756	36.706	E
Run 3	1,425	1,385	39.0208	35.4635	E
Run 4	1,425	1,410	39.0342	36.104	E
Run 5	1,425	1,419	39.0752	36.3095	E
Run 6	1,425	1,457	39.0852	37.2513	E
Run 7	1,425	1,406	39.1021	35.9996	E
Run 8	1,425	1,386	39.1815	35.3748	E
Run 9	1,425	1,402	39.222	35.7303	E
Run 10	1,425	1,447	39.1116	36.964	E
Average	**1,425**	**1,419**	**39**	**36**	E

Miami-Dade MPO
Evacuation Planning Assessment
US-1 and SW 344 Street Intersection Area Study

Existing Geometry with Holiday Volumes at US 1 and SW 344 Street

US 1 NB Approach to Palm Dr (L=1352 ft)	Entry Volume (vph)	Total Veh Discharghed (vph)	Avg. Delay (sec/veh)	Avg. Queue (veh/ln)	Max Queue (veh/ln)	Avg. Speed (mph)
Run 1	1,712	1,687	112.518	21.4353	35	6.1821
Run 2	1,712	1,705	78.9114	13.2106	30	8.34333
Run 3	1,712	1,697	95.0226	17.7269	33	7.15258
Run 4	1,712	1,699	83.6257	15.7353	31	7.94735
Run 5	1,712	1,700	99.0015	18.7997	32	6.89929
Run 6	1,712	1,692	94.0735	17.7339	33	7.1611
Run 7	1,712	1,689	83.3793	15.3933	30	7.94083
Run 8	1,712	1,693	78.9052	14.8436	30	8.32967
Run 9	1,712	1,714	90.6564	17.0253	33	7.42773
Run 10	1,712	1,703	83.4741	15.5297	29	7.97209
Average	**1,712**	**1,698**	**90**	**17**	**32**	**8**

Existing Geometry with Holiday Volumes at US 1 and SW 344 Street

US 1 SB Approach to Palm Dr (L=548 ft)	Entry Volume (vph)	Total Veh Discharghed (vph)	Avg. Delay (sec/veh)	Avg. Queue (veh/ln)	Max Queue (veh/ln)	Avg. Speed (mph)
Run 1	819	824	34.7774	2.63722	10	7.75566
Run 2	819	826	34.6149	2.79444	11	7.85962
Run 3	819	826	33.9445	2.54	10	7.91546
Run 4	819	823	34.9005	2.48972	8	7.7262
Run 5	819	828	34.5827	2.80583	10	7.71152
Run 6	819	827	34.1962	2.90694	10	7.86993
Run 7	819	825	35.7424	2.88944	10	7.54498
Run 8	819	825	32.9345	2.47861	9	8.10118
Run 9	819	824	34.0143	2.85194	9	7.92781
Run 10	819	827	30.4117	2.51917	8	8.57944
Average	**819**	**826**	**34**	**3**	**10**	**8**

Existing Geometry with Holiday Volumes at US 1 and SW 344 Street

SW 344 Street EB Approach to US 1 (L=697 ft)	Entry Volume (vph)	Total Veh Discharghed (vph)	Avg. Delay (sec/veh)	Avg. Queue (veh/ln)	Max Queue (veh/ln)	Avg. Speed (mph)
Run 1	648	652	30.2768	2.17194	7	10.5297
Run 2	648	651	30.2959	2.2725	8	10.6073
Run 3	648	650	29.0989	2.21417	7	10.8313
Run 4	648	652	29.6499	2.22389	7	10.7162
Run 5	648	650	29.9307	2.16139	7	10.6645
Run 6	648	650	31.1378	2.37944	8	10.3515
Run 7	648	651	30.504	2.24944	8	10.4961
Run 8	648	648	30.391	2.24667	7	10.5962
Run 9	648	650	29.894	2.20472	8	10.6804
Run 10	648	650	31.5069	2.29722	8	10.3066
Average	**648**	**650**	**30**	**2**	**8**	**11**

Existing Geometry with Holiday Volumes at US 1 and SW 344 Street

SW 344 Street WB Approach to US 1 (L=810 ft)	Entry Volume (vph)	Total Veh Discharghed (vph)	Avg. Delay (sec/veh)	Avg. Queue (veh/ln)	Max Queue (veh/ln)	Avg. Speed (mph)
Run 1	592	582	22.2147	1.74139	8	13.6329
Run 2	592	582	21.7042	1.83583	9	13.7766
Run 3	592	586	21.6668	1.71417	9	13.5706
Run 4	592	584	21.1635	1.56083	7	14.0321
Run 5	592	584	22.4013	1.87167	8	13.3447
Run 6	592	583	22.3065	1.64278	8	13.5854
Run 7	592	587	22.9402	1.84556	9	13.3668
Run 8	592	588	21.7556	1.70833	9	13.4483
Run 9	592	587	21.5845	1.88222	7	13.7857
Run 10	592	581	21.312	1.77528	9	13.908
Average	**592**	**584**	**22**	**2**	**8**	**14**

HCM Intersection Delay = 57 sec/veh

Miami-Dade MPO
Evacuation Planning Assessment
US-1 and SW 344 Street Intersection Area Study

NB HEFT Ramp Extension with Existing Holiday Vols at US 1 and SW 344 Street

US 1 NB Approach to Palm Dr (L=1352 ft)	Entry Volume (vph)	Total Veh Discharghed (vph)	Avg. Delay (sec/veh)	Avg. Queue (veh/ln)	Max Queue (veh/ln)	Avg. Speed (mph)
Run 1	1,077	1,098	51.0858	8.43333	21	11.129
Run 2	1,077	1,085	47.3292	7.56556	21	11.6638
Run 3	1,077	1,060	45.8092	7.11417	19	12.0064
Run 4	1,077	1,098	62.6392	10.4647	28	9.59654
Run 5	1,077	1,108	41.1129	6.76972	18	12.7824
Run 6	1,077	1,043	41.0782	6.33556	20	12.7853
Run 7	1,077	1,088	47.6847	7.66194	23	11.6191
Run 8	1,077	1,075	52.6366	8.46972	25	10.9198
Run 9	1,077	1,083	40.7809	6.48694	22	12.966
Run 10	1,077	1,063	42.5393	6.55861	18	12.6132
Average	**1,077**	**1,080**	**47**	**8**	**22**	**12**

Note: Less volume on NB approach to the intersection since traffic has already exited onto the flyover

NB HEFT Ramp Extension with Existing Holiday Vols at US 1 and SW 344 Street

US 1 SB Approach to Palm Dr (L=548 ft)	Entry Volume (vph)	Total Veh Discharghed (vph)	Avg. Delay (sec/veh)	Avg. Queue (veh/ln)	Max Queue (veh/ln)	Avg. Speed (mph)
Run 1	819	828	34.5242	2.44278	10	7.83198
Run 2	819	831	35.135	2.78194	12	7.71696
Run 3	819	825	35.4235	2.61528	12	7.69682
Run 4	819	827	34.6792	2.41889	10	7.77273
Run 5	819	828	35.552	2.70972	13	7.63992
Run 6	819	826	34.3064	2.48611	12	7.89864
Run 7	819	821	34.8988	2.57361	10	7.822
Run 8	819	831	32.6596	2.27861	12	8.14683
Run 9	819	822	35.4937	2.65833	11	7.73099
Run 10	819	827	35.6366	2.68972	10	7.68726
Average	**819**	**827**	**35**	**3**	**11**	**8**

NB HEFT Ramp Extension with Existing Holiday Vols at US 1 and SW 344 Street

SW 344 Street EB Approach to US 1 (L=697 ft)	Entry Volume (vph)	Total Veh Discharghed (vph)	Avg. Delay (sec/veh)	Avg. Queue (veh/ln)	Max Queue (veh/ln)	Avg. Speed (mph)
Run 1	648	652	31.0927	2.28472	8	10.367
Run 2	648	650	30.4537	2.24694	8	10.5541
Run 3	648	652	29.4131	2.25806	8	10.8066
Run 4	648	650	30.1948	2.20611	7	10.5816
Run 5	648	651	30.0245	2.24806	8	10.657
Run 6	648	650	29.5977	2.30278	7	10.726
Run 7	648	652	30.0822	2.18056	8	10.5993
Run 8	648	650	30.1004	2.16083	7	10.6425
Run 9	648	651	30.0501	2.19	7	10.6365
Run 10	648	650	30.2717	2.22028	8	10.5976
Average	**648**	**651**	**30**	**2**	**8**	**11**

NB HEFT Ramp Extension with Existing Holiday Vols at US 1 and SW 344 Street

SW 344 Street WB Approach to US 1 (L=810 ft)	Entry Volume (vph)	Total Veh Discharghed (vph)	Avg. Delay (sec/veh)	Avg. Queue (veh/ln)	Max Queue (veh/ln)	Avg. Speed (mph)
Run 1	592	584	22.3555	1.79167	7	13.6989
Run 2	592	582	23.3468	1.8225	9	13.4273
Run 3	592	585	21.2043	1.67778	9	13.8228
Run 4	592	581	22.5412	1.6725	7	13.5657
Run 5	592	582	23.321	1.87361	8	13.137
Run 6	592	582	22.3735	1.86083	8	13.6352
Run 7	592	583	20.7593	1.6575	8	14.0166
Run 8	592	582	20.4014	1.61917	7	14.2639
Run 9	592	589	21.261	1.64111	7	14.1942
Run 10	592	583	21.2076	1.61278	9	13.8998
Average	**592**	**583**	**22**	**2**	**8**	**14**

HCM Intersection Delay = 36 sec/veh

APPENDIX F

Holiday Turning Movement Counts

Project Name: **US 1 and SW 344 Street Evacuation Study**
HNTB Project Number: **48697**

Intersection: **US 1 / SW 344 Street**
Date of Count: **5/28/2012**
Day of Week: **Monday**
Observed by: **FTE**

Turning Movement Counts

Time Interval:		US 1 Southbound				SW 344 Street Westbound				US 1 Northbound				SW 344 Street Eastbound				Total Volume
		Left	Thru	Right	Total	Left	Thru	Right	Total	Left	Thru	Right	Total	Left	Thru	Right	Total	
8:00 AM	8:15 AM	18	119	36	173	22	28	27	77	13	92	5	110	71	16	18	105	465
8:15 AM	8:30 AM	11	119	47	177	15	28	37	80	25	130	8	163	59	16	14	89	509
8:30 AM	8:45 AM	15	106	45	166	22	19	29	70	17	125	11	153	41	17	17	75	464
8:45 AM	9:00 AM	19	125	48	192	29	24	44	97	19	151	6	176	54	7	19	80	545
9:00 AM	9:15 AM	27	130	49	206	21	36	33	90	29	190	11	230	59	26	20	105	631
9:15 AM	9:30 AM	28	141	68	237	23	26	34	83	31	176	13	220	55	21	18	94	634
9:30 AM	9:45 AM	17	164	56	237	21	31	60	112	36	215	12	263	67	28	27	122	734
9:45 AM	10:00 AM	42	194	71	307	20	24	42	86	31	243	11	285	83	42	26	151	829
10:00 AM	10:15 AM	39	170	72	281	23	34	43	100	39	269	16	324	96	24	28	148	853
10:15 AM	10:30 AM	30	189	60	279	21	25	50	96	44	291	14	349	99	32	16	147	871
10:30 AM	10:45 AM	46	229	75	350	26	35	66	127	42	320	17	379	92	23	21	136	992
10:45 AM	11:00 AM	52	221	85	358	21	30	68	119	43	361	14	418	97	44	15	156	1051
2:00 PM	2:15 PM	73	188	77	338	32	47	95	174	25	328	15	368	112	30	28	170	1050
2:15 PM	2:30 PM	68	168	80	316	21	49	61	131	33	362	10	405	119	34	28	181	1033
2:30 PM	2:45 PM	82	169	80	331	23	41	94	158	41	355	16	412	111	41	34	186	1087
2:45 PM	3:00 PM	68	163	82	313	34	38	72	144	16	348	10	374	108	66	27	201	1032
3:00 PM	3:15 PM	85	165	71	321	33	50	75	158	14	322	16	352	126	66	24	216	1047
3:15 PM	3:30 PM	78	143	70	291	23	47	84	154	19	330	14	363	151	70	30	251	1059
3:30 PM	3:45 PM	68	143	73	284	20	44	77	141	11	376	11	398	110	71	19	200	1023
3:45 PM	4:00 PM	88	148	95	331	21	55	78	154	24	334	16	374	102	86	19	207	1066
4:00 PM	4:15 PM	77	134	81	292	34	42	95	171	23	358	23	404	131	94	24	249	1116
4:15 PM	4:30 PM	65	126	85	276	36	45	87	168	21	344	24	389	104	72	21	197	1030
4:30 PM	4:45 PM	82	96	72	250	28	39	62	129	14	362	21	397	94	62	18	174	950
4:45 PM	5:00 PM	83	107	78	268	32	49	70	151	10	364	19	393	106	60	18	184	996
5:00 PM	5:15 PM	68	131	72	271	31	56	101	188	14	357	18	389	93	61	24	178	1026
5:15 PM	5:30 PM	70	108	56	234	51	71	119	241	17	305	18	340	106	51	23	180	995
5:30 PM	5:45 PM	56	99	70	225	29	38	85	152	18	345	20	383	128	53	19	200	960
5:45 PM	6:00 PM	65	81	69	215	32	53	86	171	30	345	14	389	112	63	15	190	965
6:00 PM	6:15 PM	63	79	62	204	44	38	92	174	18	387	14	419	89	50	17	156	953
6:15 PM	6:30 PM	64	76	68	208	35	47	67	149	16	357	12	385	120	49	17	186	928
6:30 PM	6:45 PM	51	95	63	209	27	34	72	133	13	428	12	453	85	56	13	154	949
6:45 PM	7:00 PM	53	87	58	198	27	42	67	136	28	416	11	455	96	45	11	152	941

Summary - Northbound Peak Hour - Turning Movement Count

Time Interval:		US 1 Southbound				SW 344 Street Westbound				US 1 Northbound				SW 344 Street Eastbound				Total Volume
		Left	Thru	Right	Total	Left	Thru	Right	Total	Left	Thru	Right	Total	Left	Thru	Right	Total	
6:00 PM	7:00 PM	231	337	251	819	133	161	298	592	75	1588	49	1712	390	200	58	648	3771
Peak Hour Factor					0.57				0.61				0.94				0.65	0.84