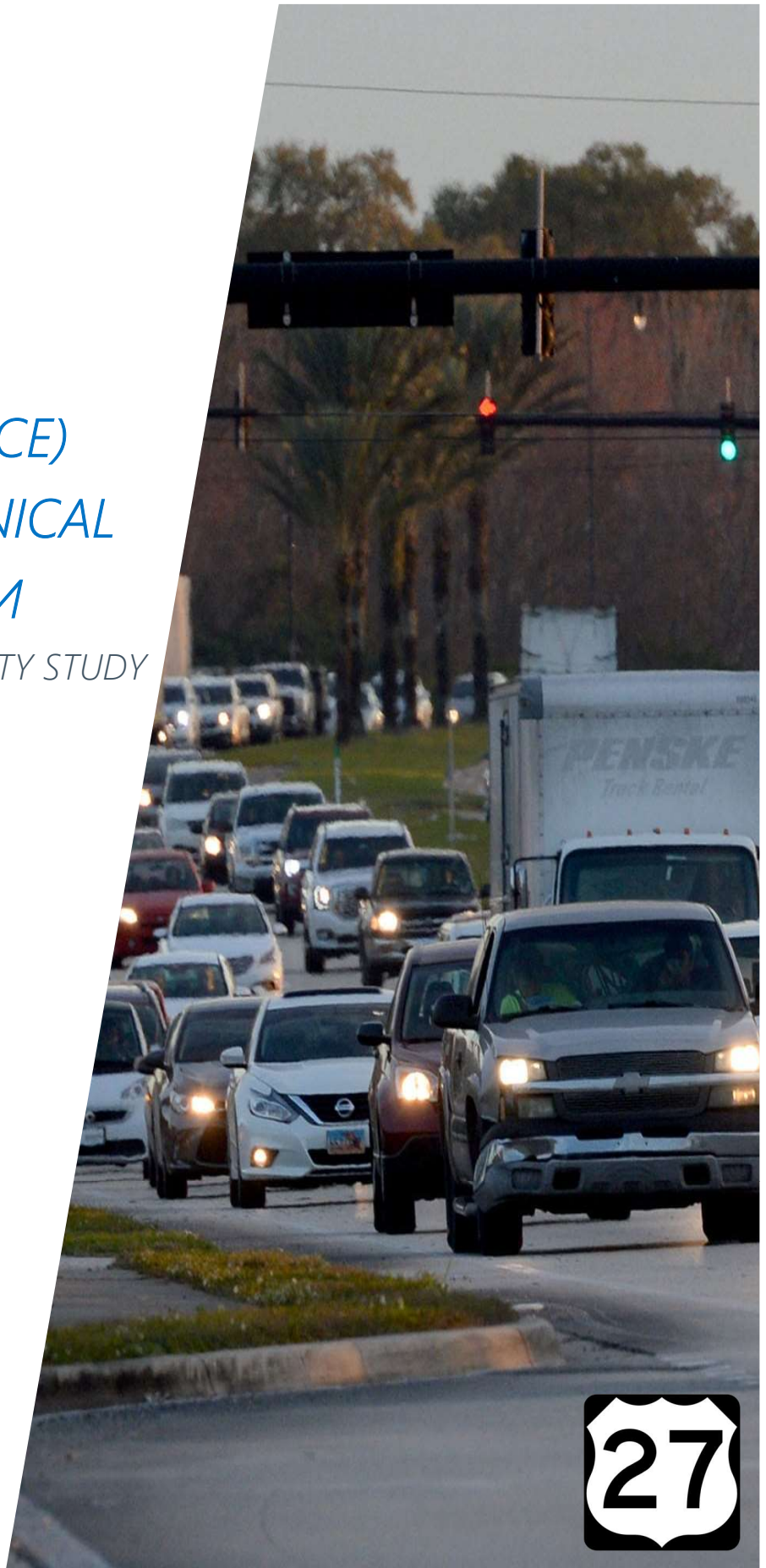


*INTERSECTION
CONTROL
EVALUATION (ICE)
STAGE 1 TECHNICAL
MEMORANDUM
NE POLK US 27 MOBILITY STUDY*

FPID #: 440320-1

OCTOBER 2021



EXECUTIVE SUMMARY

The NE Polk US 27 Mobility Study is intended to support the Florida Department of Transportation (FDOT) District One and its transportation partners in defining a multimodal program of improvement projects and strategies. The overall objective of the study is to improve the mobility, safety, and livability along the US 27 corridor. This multimodal plan will address congestion and mobility issues on US 27 by developing Context Sensitive Solutions and documenting improvement strategies.

As documented in the *NE Polk US 27 Mobility Study Future No-Build Conditions Report*, Trafficware's Synchro 10 was used to analyze each of the study intersections along the project corridor (from SR 60 to US 192) in both the 2045 No-Build condition and the 2030 No-Build condition. The assumptions for intersection configurations in these future No-Build scenarios were determined based on extensive review of all planned and programmed improvement projects for the US 27 project corridor.

Using Highway Capacity Manual (HCM) 6th Edition methodology, an overall Level of Service (LOS) for each intersection was determined. Intersections for which LOS fell below the threshold of "D" were analyzed further following the Intersection Control Evaluation (ICE) process. The ICE process was used to evaluate and compare alternative intersection configurations in 2045 (as well as 2030, where applicable). The ICE analysis consisted of Stage 1, including Capacity Analysis for Planning of Junctions (CAP-X) and Safety Performance for Intersection Control Evaluation (SPICE) analyses along with accompanying traffic analysis conducted in Synchro 10. Historical crash data was also reviewed using data from the State Safety Office GIS (SSOGIS) portal for the years 2013 – 2016 and Signal Four Analytics for the year 2017.

The Stage 1 ICE analysis documented within this memorandum identifies alternatives that are potential solutions to expected future traffic demands based on the specific characteristics of each intersection. This effort provides a head start on future projects along the US 27 corridor that may include intersection improvements. During future Stage 2 ICE analyses, the design year traffic volumes should be checked for validity based on any potential future developments, land use changes, or roadway network improvements, and adjustments should be made accordingly prior to selecting a preferred intersection alternative.

Upon review and acceptance by the District, the study team plans to incorporate the US 27 intersection analysis findings and recommendations into the final report for the NE Polk US 27 Mobility Study. Many of these recommended improvements are expected to require some right-of-way, and impacts would need to be evaluated further. Therefore, additional engineering and environmental analyses (e.g., PD&E Studies) will be necessary prior to the implementation of major intersection improvements.

All documentation and files imperative to the Stage 1 ICE analysis are included as appendices electronically. The appendices are organized first by intersection (numbered north to south) and then by file. For ease of use, the numbering of the intersection corresponds to their individual section subheading. For example, the appendices for intersection 1 (Polo Park Boulevard), found in **Section 3.1**, are as follows:

- 1-A: Traffic Data
- 1-B: Capacity Analysis for Planning of Junctions (CAP-X) Files

- 1-C: Safety Performance for Intersection Control Evaluation (SPICE) Files
- 1-D: Stage 1 ICE Form
- 1-E: Crash Data

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1.0 INTRODUCTION

The NE Polk US 27 Mobility Study is intended to support the Florida Department of Transportation (FDOT) District One and its transportation partners in defining a multimodal program of improvement projects and strategies. The overall objective of the study is to improve the mobility, safety, and livability along the US 27 corridor. This multimodal plan will address congestion and mobility issues on US 27 by developing Context Sensitive Solutions and documenting improvement strategies.

The purpose of the NE Polk US 27 Mobility Study is to engage local and regional project stakeholders to identify mobility needs and establish planning goals and values that lead to implementation of improvement strategies. Through a collaborative regional consensus process, a multimodal program of projects and strategies is being defined that will improve mobility, safety, and livability for all users. This includes an emphasis on freight. Addressing congestion and mobility issues requires context sensitive solutions that not only look at improving mobility and safety but also balance those improvements with defined community values. The study outcome will include a set of recommended multimodal strategies and improvements.

The study is being conducted in three phases:

- *Phase One: Define the Problem.* The goal of this effort was to define the problem(s) through initial stakeholder outreach, data collection, and reviews of previous studies. Existing travel demand and operations characteristics were assessed, and land use and community characteristics evaluated. A roadway safety audit was conducted, and existing or short-term issues and opportunities identified.
- *Phase Two: Define Guiding Principles.* The focus of this effort is establishing a vision for the corridor. This involves developing guiding principles and forming purpose and need statements. In addition, evaluation criteria and measures of success are being defined, and future travel demand and operations characteristics evaluated. The long-range needs are being identified in this phase.
- *Phase Three: Define and Select Alternatives.* Efforts will be centered on defining, assessing, evaluating, documenting, and preparing alternatives for implementation. This phase will identify the viable alternatives to be carried forward and determine the appropriate method for programming and implementing projects.

The *NE Polk US 27 Mobility Study Existing Conditions Report*, which documents the data collection, research, and existing conditions analysis completed for US 27 during Phase I, was published September 2019 (revised November 2019).

The *NE Polk US 27 Mobility Study Future No-Build Conditions Report*, which documents the future No-Build conditions and needs identified along US 27, was published August 2020 (revised November 2020). The study intersections were analyzed based on expected traffic conditions in future years assuming only planned/committed transportation improvements are implemented. In the year 2030, 27 of the 47 study intersections will operate below the FDOT's LOS target of "D" in the AM and/or PM peak hours. By 2045, 30 of the 47 study intersections are expected to operate below the LOS target. Multiple unsignalized

intersections will be well over capacity, experiencing excessive delays on the side street approaches in peak periods. Intersection improvements alternatives have been evaluated for each of these locations. The alternatives will be documented in an Alternatives and Strategies Summary Report.

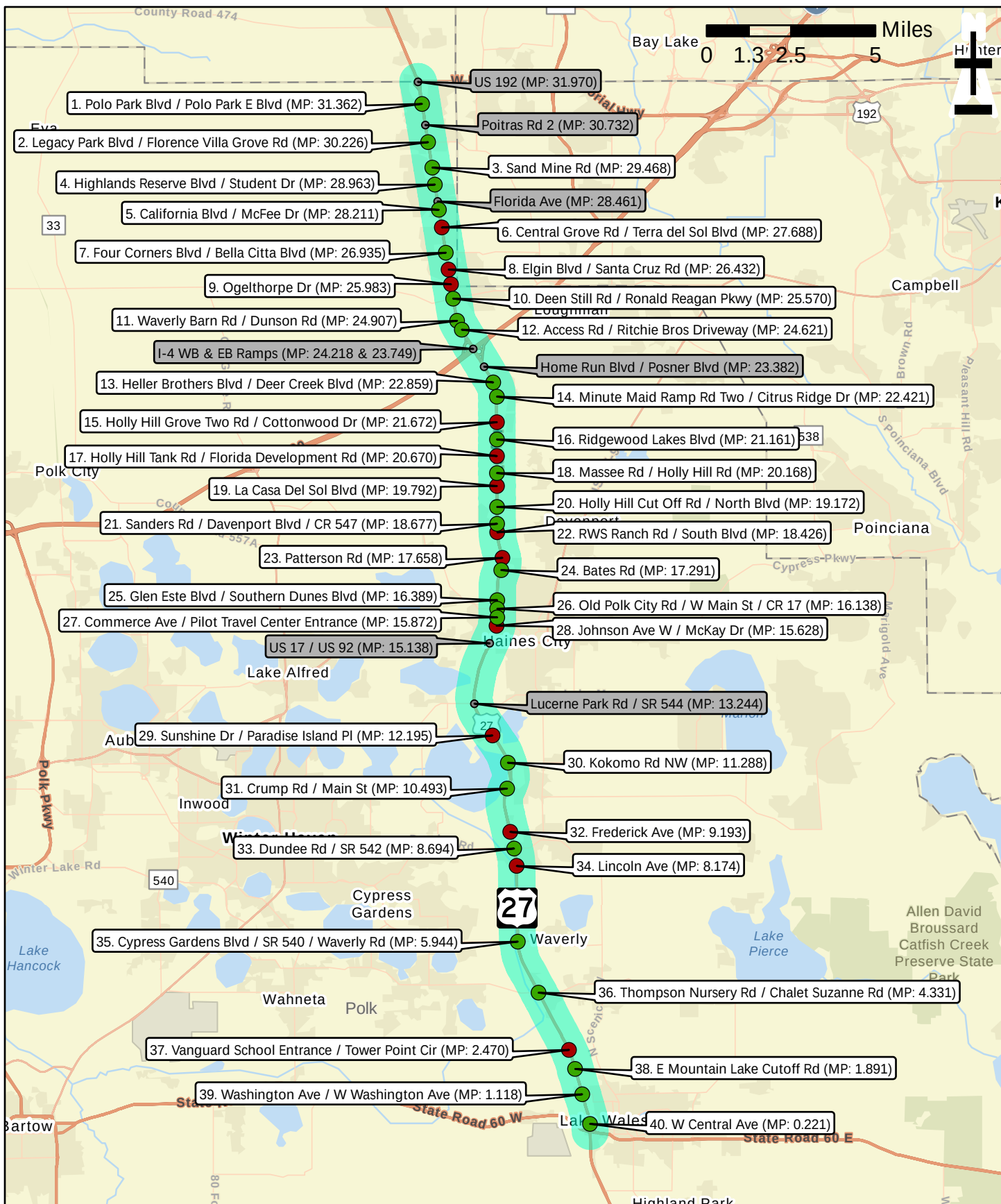
As documented in the *NE Polk US 27 Mobility Study Future No-Build Conditions Report*, Trafficware's Synchro 10 was used to analyze each of the study intersections along the project corridor (from SR 60 to US 192) in both the 2045 No-Build condition and the 2030 No-Build condition. The assumptions for intersection configurations in these future No-Build scenarios were determined based on extensive review of all planned and programmed improvement projects for the US 27 project corridor.

Using Highway Capacity Manual (HCM) 6th Edition methodology, an overall Level of Service (LOS) for each intersection was determined. Intersections for which LOS fell below the threshold of "D" were analyzed further following the Intersection Control Evaluation (ICE) process. The ICE process is used to evaluate and compare alternative intersection configurations. A Stage 1 ICE analysis has been conducted, including Capacity Analysis for Planning on Junctions (CAP-X) and SPICE analyses along with accompanying traffic analysis conducted in Synchro 10. A historical crash data review was also conducted as a part of the Stage 1 ICE. The State Safety Office GIS (SSOGIS) portal was used for analyzing 2013 – 2016 data while Signal Four Analytics was used for 2017 data.

Figure 1 on page 1-3 identifies all the intersections included in the Stage 1 ICE analysis. The following interchanges and intersections along the study corridor were not included in the ICE analysis because they will be analyzed in other studies and/or projects:

- US 27/I-4 interchange: FPID 201210-3 (Segment 5 of I-4 Beyond the Ultimate), new FPID for new ultimate interchange not available yet
- US 27 at Home Run Boulevard/Posner Boulevard intersection (part of US 27/I-4 interchange project above)
- US 27/SR 60 interchange: FPID 419243-4 (reconstruct interchange to SPUI)
- US 27 at SR 544: FPID 440273-1 (PD&E Study for SR 544 from MLK Blvd to SR 17)

This Stage 1 ICE analysis identifies alternatives that are potential solutions to expected future traffic demands at each intersection based on their specific characteristics. The intent of the Stage 1 ICE conducted in this study is not to make final determinations or recommendations for individual intersection improvement projects. Rather, it is to screen a wide range of improvement strategies to narrow down the range of solutions moving forward. This effort provides a head start on future projects along the US 27 corridor that may include intersection improvements.



Legend

- Signalized ICE Intersection (27)
- Non-ICE Intersection* (7)
- Unsignalized ICE Intersection (13)
- NE Polk US 27 Mobility Study Limits

*Non-ICE intersections were not studied as part of this project and consist of interchanges, full median openings (with some network connectivity), or signalized intersections being analyzed as part of other studies.

Figure 1
ICE Intersection Locations

2.0 ANALYSIS OVERVIEW

2.1 Interim Year (2030) Intersection Capacity Analysis and Alternatives Evaluation Process

The 2030 No-Build Synchro analysis results were reviewed to identify intersections along the study corridor that will need improvements by year 2030. Signalized study intersections that are expected to operate at an overall intersection level of service (LOS) worse than “D” were selected to be evaluated using FDOT’s CAP-X tool. A variety of traditional and reduced conflict intersection (RCI) alternatives were evaluated. The following at-grade alternative improvement configurations were considered for each study intersection:

- 1) No-Build (do nothing)
- 2) Traffic Signal (additional lanes, if applicable)
- 3) Partial Displaced Left-Turn (PDLT)
- 4) Displaced Left-Turn (DLT)
- 5) Signalized Restricted Crossing U-turn (RCUT)
- 6) Median U-turn (MUT)
- 7) Partial Median U-turn (PMUT)

Unsignalized (full median opening) study intersections that were predicted to have a minor street approach LOS worse than “D” in the 2030 No-Build scenario were also evaluated using CAP-X. The following improvement configurations were considered for each unsignalized study intersection:

- 1) No-Build (Do Nothing)
- 2) Two-Way Stop-Controlled (Directional Median Opening)
- 3) Two-Way Stop-Controlled (Closed Median/Right-In Right-Out Only)
- 4) Unsignalized Restricted Crossing U-turn (RCUT)
- 5) Traffic Signal

For each intersection alternative evaluated in CAP-X, the AM and PM volume-to-capacity (v/c) ratio results were added together to represent a combined v/c ratio (representing the overall performance) which was then compared and ranked against the other alternatives’ combined v/c ratios. The Build Alternative v/c ratios give a general and relative indication how well each alternative would operate if that configuration were constructed, based on the future year peak hour volumes. Based on the v/c ratios, each alternative was given a ranking.

Next, study intersections were grouped based on their proximity to adjacent study intersections. The purpose of doing this was to aid in selecting the most appropriate alternative that would work as part of a network of similar intersections (e.g., RCUT/Superstreet). If a study intersection had no adjacent intersections within approximately one mile, it was considered an isolated intersection and was evaluated as such, with no consideration given to functioning as a network of similar intersections. Using the groupings and the alternative intersection rankings, preferred alternatives were then selected for each study intersection. Factors such as land use, anticipated right-of-way impacts/costs, estimated construction costs and access management were also considered in determining the viability of alternatives. Overall, 32 of the 47 study intersections were studied with improvements recommended by 2030.

2.2 Design Year (2045) Intersection Capacity Analysis and Alternatives Evaluation Process

The 2045 alternatives analysis process was essentially the same process used in the 2030 alternatives analysis process, but additional intersections were analyzed in CAP-X (intersections that did not need improvements in 2030 but are predicted to need improvements by 2045). Unlike the 2030 analysis, some intersections in 2045 are predicted to operate with v/c ratios greater than 1.0 even after the construction of potential at-grade solutions. For those intersections, the following grade-separated alternatives were analyzed:

- 1) Traditional Diamond Interchange
- 2) Partial Cloverleaf (two different configurations)
- 3) Diverging Diamond Interchange (DDI)
- 4) Displaced Left-Turn Interchange (DLTI)
- 5) Single Point Urban Interchange (SPUI)

Again, the number one ranked alternative based on v/c ratios was not always the alternative that was selected as the preferred for a given location. Factors such as land use, anticipated right-of-way impacts/costs, estimated construction costs, and access management were also considered in making the recommendation. Overall, 40 of the 47 study intersections were studied with improvements recommended by 2045.

The Stage 1 ICE results are summarized in **Table 4-1** on page 4-2. Upon review and acceptance by the District, the study team plans to incorporate the US 27 intersection analysis findings and recommendations into the final report for the NE Polk US 27 Mobility Study. Many of these recommended improvements are expected to require some right-of-way, and impacts would need to be evaluated further. Therefore, additional engineering and environmental analyses (e.g., PD&E Studies) will be necessary prior to the implementation of major intersection improvements.

3.0 STAGE 1 ICE INTERSECTION SUMMARIES

The following subsections summarize the ICE analyses for each intersection studied. Documentation is included in the appendices noted for each intersection.

3.1 Polo Park Boulevard (MP: 31.362)

Background: A Stage 1 ICE analysis has been completed for the intersection of US 27 and Polo Park Boulevard in Polk County. This analysis was conducted as part of the NE Polk US 27 Mobility Study, which has the overall objective of improving the mobility, safety, and livability along the US 27 corridor. The ICE analysis is intended to support the Florida Department of Transportation (FDOT) District One and its transportation partners in identifying alternative intersection configurations for intersections projected to be over capacity in the 2045 Design Year.

The intersection is currently a four-legged signalized intersection, with US 27 as the north and south legs. Land use surrounding the intersection is a mix of residential and commercial. The posted speed limit is 55 miles per hour (mph) on US 27 (north of intersection), 55 mph on US 27 (south of intersection), 25 mph on Polo Park Boulevard (west of intersection) and 25 mph on Polo Park East Boulevard (east of intersection).

The current context classification of this intersection is C3R (Suburban Residential), and future context classification is also C3R. An eight-hour turning movement count (TMC) was conducted in December 2018. During the eight-hour TMC, 26 pedestrians and 15 cyclists were counted using the crosswalks. There are transit stops on both the northbound and southbound approaches of the intersection.

Capacity Analysis: CAP-X (Capacity Analysis for Planning of Junctions) was conducted for the years in which the No-Build configuration was determined to be failing using Synchro 10. For this intersection only 2045 AM and PM analysis was conducted as the No-Build condition operated adequately in the year 2030. 2045 volumes were developed using 2045 No-Build AADTs, selected K-factors and selected D-factors. The future year AADTs were developed by applying an annual growth rate of 2.75% to US 27 north of the intersection, 2.75% to US 27 south of the intersection, 0.5% to Polo Park Boulevard west of the intersection, and 0.5% to Polo Park East Boulevard east of the intersection. The intersection improvement alternatives evaluated were: Traffic Signal (No-Build), Full Median U-turn (MUT), Partial Median U-turn (PMUT), Signalized Restricted Crossing U-turn (RCUT), Full Displaced Left-Turn (DLT), and Partial Displaced Left-Turn (PDLT).

Safety Analysis: Crash data was reviewed for the five-year study period from 2013 through 2017. There were 79 crashes reported with annual occurrences of 13 crashes (2013), 18 (2014), 16 (2015), 20 (2016), and 12 (2017). The predominant crash type was Rear End (58%). One crash involved a pedestrian, and no crashes involved a cyclist. 35 crashes resulted in an injury and two crashes resulted in a fatality. The first fatal crash occurred in 2015 in clear weather, daylight, and dry roadway conditions. A southbound heavy truck rear ended stopped vehicles at the intersection. The passenger of the first vehicle struck was fatally wounded. The second fatal crash occurred in 2016 in clear weather, daylight, and dry roadway conditions. A southbound motorcycle was traveling too closely to the vehicle in front of it and rear ended the vehicle. The passenger of the motorcycle was fatally wounded.

Results: CAP-X results indicated a full MUT, PMUT, RCUT, full DLT and PDLT all operate better than the No-Build Traffic Signal, with v/c ratios ranging from 0.76 to 1.07 using the 2045 projected volumes. Of the alternatives analyzed, a full DLT was expected to operate with the lowest v/c ratios, ranging from 0.76 to 0.95. The No-Build scenario (Traffic Signal) was expected to operate with v/c ratios ranging from 0.94 to 1.14. The full MUT, PMUT and RCUT all had the highest multimodal score of 6.3 while the Traffic Signal and DLT alternatives had the lowest score of 4.8. The SPICE results indicate that a full MUT would have 15% fewer total crashes than the base (No-Build) Traffic Signal alternative and 30% fewer fatal/injury crashes (over 20 years). Compared to the base Traffic Signal alternative over the 20-year project life cycle, a PMUT was expected to have 7.5% fewer total crashes and 15% fewer fatal/injury crashes, a full DLT was expected to have 12% fewer total crashes and 12% fewer fatal/injury crashes, a PDLT was expected to have 6% fewer total crashes and 6% fewer fatal/injury crashes, and a signalized RCUT was expected to have 64.4% more total crashes and 13.8% more fatal/injury crashes. All four corners of the intersection are already developed so large right-of-way impacts/costs should be anticipated with any major improvements. Based on the Stage I analysis, three (3) alternatives were recommended to be carried forward into Stage II for further evaluation, as follows: Traffic Signal (No-Build), Full MUT, and Partial DLT. Analysis results and recommendations are presented in **Table 3-1**.

TABLE 3-1: US 27 & POLO PARK BOULEVARD ICE RESULTS AND RECOMMENDATIONS

US 27 & Polo Park Boulevard					
Control Strategy Evaluated	AM Peak V/C	PM Peak V/C	Multimodal Score	SPICE Ranking	Recommended to be evaluated in Stage II ICE?
Traffic Signal (No-Build)	1.14	0.94	4.8	3	Yes
Full DLT	0.95	0.76	4.8	2	No
PDLT	0.98	0.78	4.8	2	Yes
Full MUT	1.04	0.88	6.3	1	Yes
PMUT	1.07	0.88	6.3	1	No
Signalized RCUT	0.95	0.81	6.3	4	No

Appendix 1-A: Traffic Data

Appendix 1-B: Capacity Analysis for Planning of Junctions (CAP-X) Files

Appendix 1-C: Safety Performance for Intersection Control Evaluation (SPICE) Files

Appendix 1-D: Stage 1 ICE Form

Appendix 1-E: Crash Data

3.2 Florence Villa Grove Road (MP: 30.226)

Background: A Stage 1 ICE analysis has been completed for the intersection of US 27 and Florence Villa Grove Road in Polk County. This analysis was conducted as part of the NE Polk US 27 Mobility Study, which has the overall objective of improving the mobility, safety, and livability along the US 27 corridor.

The intersection is currently a four-legged signalized intersection, with US 27 as the north and south legs. This is a residential area with primarily residential communities on all four corners of the intersection. The posted speed limit is 55 mph on US 27 (north of intersection), 55 mph on US 27 (south of intersection), 30

mph on Legacy Park Boulevard (west of intersection) and 30 mph on Florence Villa Grove Road (east of intersection).

The current context classification of this intersection is C3R, and future context classification is also C3R. An eight-hour turning movement count (TMC) was conducted in December 2018. No cyclists or pedestrians were counted during the TMC.

Capacity Analysis: CAP-X was conducted for the years in which the No-Build configuration was determined to be failing using Synchro 10. For this intersection both 2030 AM/PM and 2045 AM/PM analysis were conducted. 2030 and 2045 volumes were developed using 2030 and 2045 No-Build AADTs, selected K-factors and selected D-factors. The future year AADTs were developed by applying an annual growth rate of 2.75% to US 27 north of the intersection, 2.75% to US 27 south of the intersection, 0.5% to Legacy Park Boulevard west of the intersection, and 3.00% to Florence Villa Grove Road east of the intersection. The intersection configurations evaluated were: Traffic Signal (No-Build), Full Median U-turn (MUT), Partial Median U-turn (PMUT), Signalized Restricted Crossing U-turn (RCUT), Full Displaced Left-Turn (DLT), Partial Displaced Left-Turn (PDLT), and a Modified Traffic Signal.

Safety Analysis: Crash data was reviewed for the five-year study period from 2013 through 2017. There were 69 crashes reported with annual occurrences of 8 crashes (2013), 13 (2014), 15 (2015), 16 (2016), and 17 (2017). The predominant crash type was Rear End (62%). No crashes involved a cyclist or pedestrian. 36 crashes resulted in an injury and no crashes resulted in a fatality.

Results: CAP-X results indicated a full MUT, PMUT, RCUT, full DLT, PDLT and Modified Traffic Signal all operate better than the No-Build Traffic Signal, with v/c ratios ranging from 0.55 to 1.20 using the 2030 and 2045 projected volumes. Of the alternatives analyzed, a full DLT was expected to operate with the lowest v/c ratios, ranging from 0.55 to 0.87. A Traffic Signal (No-Build scenario) was expected to operate with v/c ratios ranging from 0.92 to 1.45. The full MUT, PMUT and RCUT all had the highest multimodal score of 6.3 while the Traffic Signal and DLT alternatives had the lowest score of 4.8. The SPICE results indicate that a full MUT would have 15% fewer total crashes than the base (No-Build) Traffic Signal alternative and 30% fewer fatal/injury crashes (over 20 years). Compared to the base Traffic Signal alternative over the 20-year project life cycle, a PMUT was expected to have 7.5% fewer total crashes and 15% fewer fatal/injury crashes, a full DLT was expected to have 12% fewer total crashes and 12% fewer fatal/injury crashes, a PDLT was expected to have 6% fewer total crashes and 6% fewer fatal/injury crashes, a signalized RCUT was expected to have 92.1% more total crashes and 55.4% more fatal/injury crashes, and a Modified Traffic signal was expected to have the same number of total and fatal/injury crashes. Drainage ponds exist in the northeast and northwest corners of the intersection, but the southeast and southwest corners are mostly vacant. Although a full DLT provides the best traffic operations, minimal right-of-way impacts to the side streets were preferred and was therefore eliminated. Based on the Stage I analysis, four (4) alternatives were recommended to be carried forward into Stage II for further evaluation, as follows: Traffic Signal (No-Build), Partial MUT, Partial DLT, and Modified Traffic Signal. Analysis results and recommendations are presented in **Table 3-2**.

TABLE 3-2: US 27 & FLORENCE VILLA GROVE ROAD ICE RESULTS AND RECOMMENDATIONS

US 27 & Florence Villa Grove Road					
Control Strategy Evaluated	AM Peak V/C	PM Peak V/C	Multimodal Score	SPICE Ranking	Recommended to be evaluated in Stage II ICE?
Traffic Signal (No-Build)	1.35	1.45	4.8	3	Yes
Full DLT	0.78	0.87	4.8	2	No
PDLT	0.84	0.96	4.8	2	Yes
Full MUT	0.91	1.02	6.3	1	No
PMUT	0.91	0.99	6.3	1	Yes
Signalized RCUT	0.98	1.01	6.3	5	No
Modified Traffic Signal	1.11	1.20	4.8	3	Yes

Appendix 2-A: Traffic Data

Appendix 2-B: Capacity Analysis for Planning of Junctions (CAP-X) Files

Appendix 2-C: Safety Performance for Intersection Control Evaluation (SPICE) Files

Appendix 2-D: Stage 1 ICE Form

Appendix 2-E: Crash Data

3.3 Sand Mine Road (MP: 29.468)

Background: A Stage 1 ICE analysis has been completed for the intersection of US 27 and Sand Mine Road in Polk County. This analysis was conducted as part of the NE Polk US 27 Mobility Study, which has the overall objective of improving the mobility, safety, and livability along the US 27 corridor.

The intersection is currently a four-legged signalized intersection, with US 27 as the north and south legs. This area is primarily commercial with businesses on the northwest and southeast corners of the intersection. Sand Mine Road services a sand/gravel quarry/supplier to the west and Citrus Ridge Academy K-8 school to the east. The posted speed limit is 55 mph on US 27 (north of intersection), 55 mph on US 27 (south of intersection), 40 mph on Sand Mine Road (west of intersection) and is not posted on Sand Mine Road (east of intersection). Citrus Ridge Academy school is on the eastern segment of Sand Mine Road while a mine/quarry is on the western segment of Sand Mine Road.

The current context classification of this intersection is C3R, and future context classification is also C3R. An eight-hour turning movement count (TMC) was conducted in December 2018. During the eight-hour TMC, 45 pedestrians and 20 cyclists were counted using the crosswalks. There is a transit stop on the northbound approach of the intersection.

Capacity Analysis: CAP-X was conducted for the years in which the No-Build configuration was determined to be failing using Synchro 10. For this intersection both 2030 AM/PM and 2045 AM/PM analysis were conducted. 2030 and 2045 volumes were developed using 2030 and 2045 No-Build AADTs, selected K-factors and selected D-factors. The future year AADTs were developed by applying an annual growth rate of 2.75% to US 27 north of the intersection, 2.75% to US 27 south of the intersection, 1.00% to Sand Mine Road west of the intersection, and 3.00% to Sand Mine Road east of the intersection. The

intersection configurations evaluated were: Traffic Signal (No-Build), Full Median U-turn (MUT), Partial Median U-turn (PMUT), Signalized Restricted Crossing U-turn (RCUT), Full Displaced Left-Turn (DLT), Partial Displaced Left-Turn (PDLT), SW Quadrant Roadway, and a Modified Traffic Signal.

Safety Analysis: Crash data was reviewed for the five-year study period from 2013 through 2017. There were 90 crashes reported with annual occurrences of 13 crashes (2013), 18 (2014), 19 (2015), 16 (2016), and 24 (2017). The predominant crash type was Rear End (58%). No crashes involved a cyclist or pedestrian. 38 crashes resulted in an injury and one crash resulted in a fatality. The fatal crash occurred in 2015 in clear weather, dark – not lighted conditions, and dry roadway conditions. A northbound motorcycle failed to come to a stop at a red light at the intersection and rear ended a stopped vehicle. The driver of the motorcycle was totally ejected and was fatally wounded.

Results: CAP-X results indicated a full MUT, PMUT, RCUT, full DLT, PDLT, SW Quadrant and Modified Traffic Signal all operate better than the No-Build Traffic Signal, with v/c ratios ranging from 0.59 to 1.25 using the 2030 and 2045 projected volumes. Of the alternatives analyzed, a full DLT was expected to operate with the lowest v/c ratios, ranging from 0.59 to 0.88. A Traffic Signal (No-Build scenario) was expected to operate with v/c ratios ranging from 0.87 to 1.37. The full MUT, PMUT and RCUT all had the highest multimodal score of 6.3 while the Traffic Signal and DLT alternatives had a score of 4.8 and the SW Quadrant had a score of 4.4. The SPICE results indicate that a full MUT would have 15% fewer total crashes than the base (No-Build) Traffic Signal alternative and 30% fewer fatal/injury crashes (over 20 years). Compared to the base Traffic Signal alternative over the 20-year project life cycle, a PMUT was expected to have 7.5% fewer total crashes and 15% fewer fatal/injury crashes, a full DLT was expected to have 12% fewer total crashes and 12% fewer fatal/injury crashes, a PDLT was expected to have 6% fewer total crashes and 6% fewer fatal/injury crashes, a signalized RCUT was expected to have 88.6% more total crashes and 49.8% more fatal/injury crashes, and a Modified Traffic signal was expected to have the same number of total and fatal/injury crashes. A SW Quadrant intersection could not be analyzed in SPICE. Both the northeast and southwest corners of the intersection are mostly vacant. A SW Quadrant provides one of the best operations overall but would need to be new construction as there is no existing roadway to be used. Based on the Stage I analysis, four (4) alternatives were recommended to be carried forward into Stage II for further evaluation, as follows: Traffic Signal (No-Build), Full DLT, Partial DLT, and SW Quadrant Roadway. Analysis results and recommendations are presented in **Table 3-3**.

TABLE 3-3: US 27 & SAND MINE RD ICE RESULTS AND RECOMMENDATIONS

US 27 & Sand Mine Road					
Control Strategy Evaluated	AM Peak V/C	PM Peak V/C	Multimodal Score	SPICE Ranking	Recommended to be evaluated in Stage II ICE?
Traffic Signal (No-Build)	1.37	1.17	4.8	3	Yes
Full DLT	0.88	0.82	4.8	2	Yes
PDLT	0.98	0.89	4.8	2	Yes
Full MUT	1.04	0.91	6.3	1	No
PMUT	1.15	1.03	6.3	1	No
Signalized RCUT	0.95	0.82	6.3	5	No
SW Quadrant Roadway	0.85	0.85	4.4	-	Yes
Modified Traffic Signal	1.25	1.13	4.8	3	No

Appendix 3-A: Traffic Data

Appendix 3-B: Capacity Analysis for Planning of Junctions (CAP-X) Files

Appendix 3-C: Safety Performance for Intersection Control Evaluation (SPICE) Files

Appendix 3-D: Stage 1 ICE Form

Appendix 3-E: Crash Data

3.4 Student Drive/Highlands Reserve Boulevard (MP: 28.963)

Background: A Stage 1 ICE analysis has been completed for the intersection of US 27 and Student Drive/Highland Reserve Boulevard in Polk County. This analysis was conducted as part of the NE Polk US 27 Mobility Study, which has the overall objective of improving the mobility, safety, and livability along the US 27 corridor.

The intersection is currently a four-legged signalized intersection, with US 27 as the north and south legs. This area is primarily residential. Highlands Reserve Boulevard feeds into residential communities on the northwest and southwest corners of the intersection. There is another residential community that is on the southeast corner of the intersection. The northeast corner is developing into commercial properties. The posted speed limit is 55 mph on US 27 (north of intersection), 55 mph on US 27 (south of intersection), no posted speed on Highland Reserve Boulevard (west of intersection) and 30 mph on Student Drive (east of intersection).

The current context classification of this intersection is C3R, and future context classification is also C3R. An eight-hour turning movement count (TMC) was conducted in December 2018. During the eight-hour TMC, 42 pedestrians, 24 cyclists and 2 golf carts were counted using the crosswalks.

Capacity Analysis: CAP-X (Capacity Analysis for Planning of Junctions) was conducted for the years in which the No-Build configuration was determined to be failing using Synchro 10. For this intersection both 2030 AM/PM and 2045 AM/PM analysis were conducted. 2030 and 2045 volumes were developed using 2030 and 2045 No-Build AADTs, selected K-factors and selected D-factors. The future year AADTs were developed by applying an annual growth rate of 2.75% to US 27 north of the intersection, 2.75% to

US 27 south of the intersection, 0.5% to Highlands Reserve Boulevard west of the intersection, and 3.00% to Student Drive east of the intersection. The intersection configurations evaluated were: Traffic Signal (No-Build), Full Median U-turn (MUT), Partial Median U-turn (PMUT), Signalized Restricted Crossing U-turn (RCUT), Full Displaced Left-Turn (DLT), and Partial Displaced Left-Turn (PDLT).

Safety Analysis: Crash data was reviewed for the five-year study period from 2013 through 2017. There were 28 crashes reported with annual occurrences of 3 crashes (2013), 7 (2014), 4 (2015), 7 (2016), and 7 (2017). The predominant crash type was Rear End (39%). No crashes involved a cyclist or pedestrian. 11 crashes resulted in an injury and no crashes resulted in a fatality.

Results: CAP-X results indicated a full MUT, PMUT, RCUT, full DLT, and PDLT all operate better than the No-Build Traffic Signal, with v/c ratios ranging from 0.55 to 0.94 using the 2030 and 2045 projected volumes. Of the alternatives analyzed, a full DLT was expected to operate with the lowest v/c ratios, ranging from 0.55 to 0.86. A Traffic Signal (No-Build scenario) was expected to operate with v/c ratios ranging from 0.69 to 1.09. The full MUT, PMUT and RCUT all had the highest multimodal score of 6.3 while the Traffic Signal and DLT alternatives had the lowest score of 4.8. The SPICE results indicate that a full MUT would have 15% fewer total crashes than the base (No-Build) Traffic Signal alternative and 30% fewer fatal/injury crashes (over 20 years). Compared to the base Traffic Signal alternative over the 20-year project life cycle, a PMUT was expected to have 7.5% fewer total crashes and 15% fewer fatal/injury crashes, a full DLT was expected to have 12% fewer total crashes and 12% fewer fatal/injury crashes, a PDLT was expected to have 6% fewer total crashes and 6% fewer fatal/injury crashes, and a signalized RCUT was expected to have 49.4% more total crashes but 6.0% fewer fatal/injury crashes. All four corners of the intersection are already developed or are under development so right-of-way impacts on the side street are discouraged. For this reason, a full DLT was eliminated. Based on the Stage I analysis, four (4) alternatives were recommended to be carried forward into Stage II for further evaluation, as follows: Traffic Signal (No-Build), Full MUT, Partial MUT and Partial DLT. Analysis results and recommendations are presented in **Table 3-4**.

TABLE 3-4: US 27 & STUDENT DRIVE/HIGHLAND RESERVE BOULEVARD ICE RESULTS AND RECOMMENDATIONS

US 27 & Student Drive/Highland Reserve Boulevard					
Control Strategy Evaluated	AM Peak V/C	PM Peak V/C	Multimodal Score	SPICE Ranking	Recommended to be evaluated in Stage II ICE?
Traffic Signal (No-Build)	1.09	0.93	4.8	4	Yes
Full DLT	0.86	0.75	4.8	2	No
PDLT	0.86	0.77	4.8	2	Yes
Full MUT	0.94	0.84	6.3	1	Yes
PMUT	0.90	0.83	6.3	1	Yes
Signalized RCUT	0.86	0.79	6.3	3	No

Appendix 4-A: Traffic Data

Appendix 4-B: Capacity Analysis for Planning of Junctions (CAP-X) Files

Appendix 4-C: Safety Performance for Intersection Control Evaluation (SPICE) Files

Appendix 4-D: Stage 1 ICE Form

Appendix 4-E: Crash Data

3.5 McFee Drive/California Boulevard (MP: 28.211)

Background: A Stage 1 ICE analysis has been completed for the intersection of US 27 and McFee Drive/California Boulevard in Polk County. This analysis was conducted as part of the NE Polk US 27 Mobility Study, which has the overall objective of improving the mobility, safety, and livability along the US 27 corridor.

The intersection is currently a four-legged signalized intersection, with US 27 as the north and south legs. This area has residential communities on all four corners of the intersection and commercial businesses in the northwest quadrant of the intersection. The posted speed limit is 55 mph on US 27 (north of intersection), 55 mph on US 27 (south of intersection), 25 mph on California Boulevard (west of intersection) and is not posted on McFee Drive (east of intersection).

The current context classification of this intersection is C3R, and future context classification is also C3R. An eight-hour turning movement count (TMC) was conducted in December 2018. During the eight-hour TMC, 34 pedestrians and 7 cyclists were counted using the crosswalks. There are transit stops on both the northbound and southbound approaches of the intersection.

Capacity Analysis: CAP-X was conducted for the years in which the No-Build configuration was determined to be failing using Synchro 10. For this intersection only 2045 AM and PM analysis was conducted as the No-Build condition operated adequately in the year 2030. 2045 volumes were developed using 2045 No-Build AADTs, selected K-factors and selected D-factors. The future year AADTs were developed by applying an annual growth rate of 2.75% to US 27 north of the intersection, 2.75% to US 27 south of the intersection, 0.5% to California Boulevard west of the intersection, and 0.5% to McFee Drive east of the intersection. The intersection configurations evaluated were: Traffic Signal (No-Build), Full Median U-turn (MUT), Partial Median U-turn (PMUT), Signalized Restricted Crossing U-turn (RCUT), Full Displaced Left-Turn (DLT), Partial Displaced Left-Turn (PDLT), and a Modified Traffic Signal.

Safety Analysis: Crash data was reviewed for the five-year study period from 2013 through 2017. There were 47 crashes reported with annual occurrences of 6 crashes (2013), 7 (2014), 14 (2015), 9 (2016), and 11 (2017). The predominant crash types were Rear End and Angle (both 34% each). No crashes involved a cyclist or pedestrian. 32 crashes resulted in an injury and 2 crashes resulted in a fatality. The first fatal crash occurred in 2014 in clear weather, daylight, and dry roadway conditions. This crash occurred prior to signalization at the intersection. A westbound vehicle failed to yield the right-of-way to southbound traffic and crossed into the path of a southbound motorcycle. The motorcycle struck the westbound vehicle at an angle, ejecting the driver of the motorcycle totally, fatally wounding them. The second fatal crash occurred in 2017 in clear weather, daylight, and dry roadway conditions. A northbound through vehicle failed to yield right-of-way to southbound left-turning traffic and struck a southbound vehicle attempting a left-turn. The passenger of the northbound vehicle was fatally wounded.

Results: CAP-X results indicated a full MUT, PMUT, RCUT, full DLT, PDLT and Modified Traffic Signal all operate better than the No-Build Traffic Signal, with v/c ratios ranging from 0.7 to 0.92 using the 2045 projected volumes. Of the alternatives analyzed, a full DLT was expected to operate with the lowest v/c ratios, ranging from 0.7 to 0.74. The No-Build scenario (Traffic Signal) was expected to operate with v/c ratios ranging from 0.92 to 0.95. The full MUT, PMUT and RCUT all had the highest multimodal score of 6.3 while the Traffic Signal and DLT alternatives had the lowest score of 4.8. The SPICE results indicate that a full MUT would have 15% fewer total crashes than the base (No-Build) Traffic Signal alternative and 30% fewer fatal/injury crashes (over 20 years). Compared to the base Traffic Signal alternative over the 20-year project life cycle, a PMUT was expected to have 7.5% fewer total crashes and 15% fewer fatal/injury crashes, a full DLT was expected to have 12% fewer total crashes and 12% fewer fatal/injury crashes, a PDLT was expected to have 6% fewer total crashes and 6% fewer fatal/injury crashes, a signalized RCUT was expected to have 52.0% more total crashes but 2.7% fewer fatal/injury crashes, and a Modified Traffic Signal was expected to have the same number of total and fatal/injury crashes. All four corners of the intersection are already developed so right-of-way impacts on the side street are discouraged. Based on the Stage I analysis, four (4) alternatives were recommended to be carried forward into Stage II for further evaluation, as follows: Traffic Signal (No-Build), Full MUT, Partial MUT and Partial DLT. Analysis results and recommendations are presented in **Table 3-5**.

TABLE 3-5: US 27 & MCFEE DRIVE/CALIFORNIA BOULEVARD ICE RESULTS AND RECOMMENDATIONS

US 27 & McFee Drive/California Boulevard					
Control Strategy Evaluated	AM Peak V/C	PM Peak V/C	Multimodal Score	SPICE Ranking	Recommended to be evaluated in Stage II ICE?
Traffic Signal (No-Build)	0.95	0.92	4.8	4	Yes
Full DLT	0.70	0.74	4.8	2	No
PDLT	0.72	0.74	4.8	2	Yes
Full MUT	0.78	0.81	6.3	1	Yes
PMUT	0.81	0.78	6.3	1	Yes
Signalized RCUT	0.75	0.74	6.3	3	No
Modified Traffic Signal	0.85	0.92	4.8	4	No

Appendix 5-A: Traffic Data

Appendix 5-B: Capacity Analysis for Planning of Junctions (CAP-X) Files

Appendix 5-C: Safety Performance for Intersection Control Evaluation (SPICE) Files

Appendix 5-D: Stage 1 ICE Form

Appendix 5-E: Crash Data

3.6 Terra del Sol Boulevard/Central Grove Road (MP: 27.688)

Background: A Stage 1 ICE analysis has been completed for the intersection of US 27 and Terra del Sol Boulevard/Central Grove Road in Polk County. This analysis was conducted as part of the NE Polk US 27

Mobility Study, which has the overall objective of improving the mobility, safety, and livability along the US 27 corridor.

The intersection is currently a four-legged unsignalized intersection, with US 27 as the north and south legs. A Signal Warrant Analysis (SWA) was completed in June 2021 and revealed that signalization of the intersection is warranted. This SWA is included in the Traffic Data Appendix of this intersection. This is a residential area with the southeast side of the intersection still being under construction. The land on the northern and southern sides of Terra del Sol Boulevard is either in preparation for construction or contains newly constructed homes. The posted speed limit is 60 mph on US 27 (north of intersection), 60 mph on US 27 (south of intersection), 30 mph on Central Grove Road (west of intersection) and 30 mph on Terra del Sol Boulevard (east of intersection).

The current context classification of this intersection is C3R, and future context classification is also C3R. An eight-hour turning movement count (TMC) was conducted in December 2018. During the eight-hour TMC, 9 pedestrians and one cyclist were counted using the crosswalks.

Capacity Analysis: CAP-X was conducted for the years in which the No-Build configuration was determined to be failing using Synchro 10. For this intersection both 2030 AM/PM and 2045 AM/PM analysis were conducted. 2030 and 2045 volumes were developed using 2030 and 2045 No-Build AADTs, selected K-factors and selected D-factors. The future year AADTs were developed by applying an annual growth rate of 2.75% to US 27 north of the intersection, 2.75% to US 27 south of the intersection, 2.00% to Central Grove Road west of the intersection, and 5.00% to Terra del sol Boulevard east of the intersection. Since the intersection meets signal warrants, the intersection configurations evaluated were: Traffic Signal (No-Build), Full Displaced Left-Turn, Partial Displaced Left-Turn, Full Median U-turn, Partial Median U-turn, and Signalized Restricted Crossing U-turn.

Safety Analysis: Crash data was reviewed for the five-year study period from 2013 through 2017. There were 20 crashes reported with annual occurrences of 1 crash (2013), 4 (2014), 6 (2015), 4 (2016), and 5 (2017). The predominant crash type was Rear End (30%). No crashes involved a cyclist or pedestrian. Eight crashes resulted in an injury and no crashes resulted in a fatality.

Results: CAP-X results indicated a Full DLT, PDLT, Full MUT, PMUT and RCUT all operate better than the No-Build Traffic Signal, with v/c ratios ranging from 0.50 to 0.85 using the 2030 and 2045 projected volumes. Of the alternatives analyzed, a Full DLT was expected to operate with the lowest v/c ratios, ranging from 0.50 to 0.80. A Traffic Signal (No-Build scenario) was expected to operate with v/c ratios ranging from 0.64 to 0.99. The MUT and RCUT alternatives had the highest multimodal score of 6.3, and the Traffic Signal and DLT alternatives had a score of 4.8. The SPICE results indicate that a full MUT would have 15% fewer total crashes than the base (No-Build) Traffic Signal alternative and 30% fewer fatal/injury crashes (over 20 years). Compared to the base Traffic Signal alternative over the 20-year project life cycle, a PMUT was expected to have 7.5% fewer total crashes and 15% fewer fatal/injury crashes, a full DLT was expected to have 12% fewer total crashes and 12% fewer fatal/injury crashes, a PDLT was expected to have 6% fewer total crashes and 6% fewer fatal/injury crashes, and a signalized RCUT was expected to have 46.5% more total crashes but 9.7% fewer fatal/injury crashes. As mentioned previously, residential

development continues on the east side of the intersection, so right-of-way impacts are discouraged there. Based on the Stage I analysis, three (3) alternatives were recommended to be carried forward into Stage II for further evaluation, as follows: Traffic Signal (No-Build), Partial DLT and Partial MUT. Analysis results and recommendations are presented in **Table 3-6**.

TABLE 3-6: US 27 & TERRA DEL SOL BOULEVARD/CENTRAL GROVE ROAD ICE RESULTS AND RECOMMENDATIONS

US 27 & Terra del Sol Boulevard/Central Grove Road					
Control Strategy Evaluated	AM Peak V/C	PM Peak V/C	Multimodal Score	SPICE Ranking	Recommended to be evaluated in Stage II ICE?
Traffic Signal (No-Build)	1.03	0.78	4.8	4	Yes
Full DLT	0.80	0.71	4.8	2	No
PDLT	0.82	0.73	4.8	2	Yes
Full MUT	0.85	0.75	6.3	1	No
PMUT	0.83	0.74	6.3	1	Yes
Signalized RCUT	0.84	0.74	6.3	3	No

Appendix 6-A: Traffic Data

Appendix 6-B: Capacity Analysis for Planning of Junctions (CAP-X) Files

Appendix 6-C: Safety Performance for Intersection Control Evaluation (SPICE) Files

Appendix 6-D: Stage 1 ICE Form

Appendix 6-E: Crash Data

3.7 Four Corners Boulevard/Bella Citta Boulevard (MP: 26.935)

Background: A Stage 1 ICE analysis has been completed for the intersection of US 27 and Four Corners Boulevard/Bella Citta Boulevard in Polk County. This analysis was conducted as part of the NE Polk US 27 Mobility Study, which has the overall objective of improving the mobility, safety, and livability along the US 27 corridor.

The intersection is currently a four-legged signalized intersection, with US 27 as the north and south legs. This is a residential area with the side east of the intersection still being under construction. The land on the northern and southern sides of Bella Citta Boulevard is in preparation for construction. The posted speed limit is 60 mph on US 27 (north of intersection), 60 mph on US 27 (south of intersection), 25 mph on Four Corners Boulevard (west of intersection) and 40 mph on Bella Citta Boulevard (east of intersection).

The current context classification of this intersection is C2 (Rural), and future context classification is C3C (Suburban Commercial). An eight-hour turning movement count (TMC) was conducted in December 2018. During the eight-hour TMC, 24 pedestrians, 11 cyclists and 1 golf cart were counted using the crosswalks.

Capacity Analysis: CAP-X was conducted for the years in which the No-Build configuration was determined to be failing using Synchro 10. For this intersection both 2030 AM/PM and 2045 AM/PM

analysis were conducted. 2030 and 2045 volumes were developed using 2030 and 2045 No-Build AADTs, selected K-factors and selected D-factors. The future year AADTs were developed by applying an annual growth rate of 2.75% to US 27 north of the intersection, 4.00% to US 27 south of the intersection, 1.00% to Four Corners Boulevard west of the intersection, and 5.00% to Bella Citta Boulevard east of the intersection. The intersection configurations evaluated were: Traffic Signal (No-Build), Full Median U-turn (MUT), Partial Median U-turn (PMUT), Signalized Restricted Crossing U-turn (RCUT), Full Displaced Left-Turn (DLT), Partial Displaced Left-Turn (PDLT), NE Quadrant Roadway, Modified Traffic Signal, and a hybrid SB PDLT/NB PMUT.

Safety Analysis: Crash data was reviewed for the five-year study period from 2013 through 2017. There were 65 crashes reported with annual occurrences of 13 crashes (2013), 14 (2014), 23 (2015), 11 (2016), and 4 (2017). The predominant crash type was Angle (55%). No crashes involved a cyclist or pedestrian. 36 crashes resulted in an injury and no crashes resulted in a fatality.

Results: CAP-X results indicated a full MUT, PMUT, RCUT, full DLT, PDLT, NE Quadrant, Modified Traffic Signal, and hybrid SB PDLT/NB PMUT all operate better than the No-Build Traffic Signal, with v/c ratios ranging from 0.54 to 1.22 using the 2030 and 2045 projected volumes. Of the alternatives analyzed, a full DLT was expected to operate with the lowest v/c ratios, ranging from 0.54 to 0.94. A Traffic Signal (No-Build scenario) was expected to operate with v/c ratios ranging from 0.77 to 1.29. The full MUT, PMUT and RCUT all had the highest multimodal score of 6.3, the hybrid SB PDLT/NB PMUT had a score of 5.6, the Traffic Signal and DLT alternatives had a score of 4.8 and the NE Quadrant had a score of 4.4. The SPICE results indicate that a full MUT would have 15% fewer total crashes than the base (No-Build) Traffic Signal alternative and 30% fewer fatal/injury crashes (over 20 years). Compared to the base Traffic Signal alternative over the 20-year project life cycle, a PMUT was expected to have 7.5% fewer total crashes and 15% fewer fatal/injury crashes, a full DLT was expected to have 12% fewer total crashes and 12% fewer fatal/injury crashes, a PDLT was expected to have 6% fewer total crashes and 6% fewer fatal/injury crashes, a signalized RCUT was expected to have 91.3% more total crashes and 54% more fatal/injury crashes, a hybrid SB PDLT/NB PMUT was expected to have 13.5% fewer total crashes and 21% fewer fatal/injury crashes, and a Modified Traffic Signal was expected to have the same number of total and fatal/injury crashes. A NE Quadrant intersection could not be analyzed in SPICE. Both the northwest and southeast corners of the intersection are mostly vacant while the northeast corner is still under development. A NE Quadrant provides one of the best operations overall but would require a connecting roadway construction at the intersection of US 27 and Calabay Parc Boulevard. Based on the Stage I analysis, four (4) alternatives were recommended to be carried forward into Stage II for further evaluation, as follows: Traffic Signal (No-Build), Partial DLT, NE Quadrant Roadway, and hybrid SB PDLT/NB PMUT. Analysis results and recommendations are presented in **Table 3-7**.

TABLE 3-7: US 27 & FOUR CORNERS BOULEVARD/BELLA CITTA BOULEVARD ICE RESULTS AND RECOMMENDATIONS

US 27 & Four Corners Boulevard/Bella Citta Boulevard					
Control Strategy Evaluated	AM Peak V/C	PM Peak V/C	Multimodal Score	SPICE Ranking	Recommended to be evaluated in Stage II ICE?
Traffic Signal (No-Build)	1.29	1.12	4.8	4	Yes
Full DLT	0.94	0.78	4.8	3	No
PDLT	0.94	0.78	4.8	3	Yes
Full MUT	1.13	1.22	6.3	1	No
PMUT	1.09	1.10	6.3	1	No
Signalized RCUT	0.94	0.89	6.3	6	No
NE Quadrant Roadway	0.87	0.81	4.4	-	Yes
Modified Traffic Signal	1.22	1.12	4.8	4	No
PDLT/PMUT Hybrid*	0.94/1.09	0.78/1.10	5.6	2	Yes

*PDLT/PMUT v/c ratios, respectively

Appendix 7-A: Traffic Data

Appendix 7-B: Capacity Analysis for Planning of Junctions (CAP-X) Files

Appendix 7-C: Safety Performance for Intersection Control Evaluation (SPICE) Files

Appendix 7-D: Stage 1 ICE Form

Appendix 7-E: Crash Data

3.8 Elgin Boulevard/Santa Cruz Road (MP: 26.432)

Background: A Stage 1 ICE analysis has been completed for the intersection of US 27 and Elgin Boulevard/Santa Cruz Road in Polk County. This analysis was conducted as part of the NE Polk US 27 Mobility Study, which has the overall objective of improving the mobility, safety, and livability along the US 27 corridor.

The intersection is currently a four-legged unsignalized intersection, with US 27 as the north and south legs. This is a residential area where Elgin Boulevard and Santa Cruz Road feed into larger residential communities. The posted speed limit is 60 mph on US 27 (north of intersection), 60 mph on US 27 (south of intersection), 25 mph on Elgin Boulevard (west of intersection) and not posted on Santa Cruz Road (east of intersection).

The current context classification of this intersection is C2 (Rural), and future context classification is C3C. An eight-hour turning movement count (TMC) was conducted in December 2018. During the eight-hour TMC, 22 pedestrians and 6 cyclists were counted using the crosswalks.

Capacity Analysis: CAP-X was conducted for the years in which the No-Build configuration was determined to be failing using Synchro 10. For this intersection both 2030 AM/PM and 2045 AM/PM analysis were conducted. 2030 and 2045 volumes were developed using 2030 and 2045 No-Build AADTs, selected K-factors and selected D-factors. The future year AADTs were developed by applying an annual

growth rate of 4.00% to US 27 north of the intersection, 4.00% to US 27 south of the intersection, 0.5% to Elgin Boulevard west of the intersection, and 0.5% to Santa Cruz Road east of the intersection. The intersection configurations evaluated were: Two-Way Stop Controlled (TWSC) Full Median Opening (No-Build), Traffic Signal, Unsignalized Restricted Crossing U-turn (RCUT), TWSC Closed Median, and TWSC Directional Median Opening,

Safety Analysis: Crash data was reviewed for the five-year study period from 2013 through 2017. There were 6 crashes reported with annual occurrences of 3 crashes (2013), 1 (2014), 1 (2015), 0 (2016), and 1 (2017). The predominant crash type was Sideswipe (50%). No crashes involved a cyclist or pedestrian. Two crashes resulted in an injury and no crashes resulted in a fatality.

Results: CAP-X results indicated a Traffic Signal, RCUT, TWSC Closed Median, and TWSC Directional Median all operate better than the No-Build TWSC Full Median Opening, with v/c ratios ranging from 0.55 to 40.04 using the 2030 and 2045 projected volumes. Of the alternatives analyzed, a Traffic Signal was expected to operate with the lowest v/c ratios, ranging from 0.58 to 0.88. A TWSC Full Median Opening (No-Build scenario) was expected to operate with negative v/c ratios. These extreme v/c ratios were caused by near zero capacity on the side streets. The Traffic Signal had the highest multimodal score of 4.8, unsignalized RCUT had a score of 4.4 and all the TWSC alternatives had a score of 3.7. The SPICE results indicate that an unsignalized RCUT would have 28.6% fewer total crashes than the base (No-Build) TWSC Full Median Opening alternative and 64.9% fewer fatal/injury crashes (over 20 years). Compared to the base TWSC Full Median Opening alternative over the 20-year project life cycle, a Traffic Signal was expected to have 77.2% more total crashes and 10.7% more fatal/injury crashes, and all other TWSC alternatives are expected to have the same number of total and fatal/injury crashes. Qualitatively, a closed median is expected to be safer than a directional median opening, which is expected to be safer than a full median opening. There are residential communities on all four corners as well as noise walls on the northeast and southeast corners. Based on the Stage I analysis, four (4) alternatives were recommended to be carried forward into Stage II for further evaluation, as follows: TWSC Full Median Opening (No-Build), Traffic Signal, Unsignalized RCUT, TWSC Closed Median. Analysis results and recommendations are presented in **Table 3-8**.

TABLE 3-8: US 27 & ELGIN BOULEVARD/SANTA CRUZ ROAD ICE RESULTS AND RECOMMENDATIONS

US 27 & Elgin Boulevard/Santa Cruz Road					
Control Strategy Evaluated	AM Peak V/C	PM Peak V/C	Multimodal Score	SPICE Ranking	Recommended to be evaluated in Stage II ICE?
Traffic Signal	0.84	0.88	4.8	5	Yes
TWSC Full Median Opening (No-Build)	-191886.10	-3235.70	3.7	2	Yes
TWSC Closed Median	2.14	1.43	3.7	2	Yes
TWSC Directional Median Opening	2.10	4.32	3.7	2	No
Unsignalized RCUT	40.04	28.92	4.4	1	Yes

Appendix 8-A: Traffic Data

Appendix 8-B: Capacity Analysis for Planning of Junctions (CAP-X) Files

Appendix 8-C: Safety Performance for Intersection Control Evaluation (SPICE) Files

Appendix 8-D: Stage 1 ICE Form

Appendix 8-E: Crash Data

3.9 Ogelthorpe Drive (MP: 25.983)

Background: A Stage 1 ICE analysis has been completed for the intersection of US 27 and Ogelthorpe Drive in Polk County. This analysis was conducted as part of the NE Polk US 27 Mobility Study, which has the overall objective of improving the mobility, safety, and livability along the US 27 corridor.

The intersection is currently a three-legged unsignalized intersection, with US 27 as the north and south legs. Ogelthorpe Drive is the entrance to Laurel Estates in which homes were constructed from 2017 to 2019. The posted speed limit is 60 mph on US 27 (north of intersection), 60 mph on US 27 (south of intersection), and 25 mph on Ogelthorpe Drive (west of intersection).

The current context classification of this intersection is C2 (Rural), and future context classification is C3C. An eight-hour turning movement count (TMC) was conducted in December 2018. During the eight-hour TMC, 7 pedestrians and two cyclists were counted using the crosswalk.

Capacity Analysis: CAP-X was conducted for the years in which the No-Build configuration was determined to be failing using Synchro 10. For this intersection both 2030 AM/PM and 2045 AM/PM analysis were conducted. 2030 and 2045 volumes were developed using 2030 and 2045 No-Build AADTs, selected K-factors and selected D-factors. The future year AADTs were developed by applying an annual growth rate of 4.00% to US 27 north of the intersection, 4.00% to US 27 south of the intersection, and 2.00% to Ogelthorpe Drive west of the intersection. The intersection configurations evaluated were: Two-Way Stop Controlled (TWSC) Full Median Opening (No-Build), Traffic Signal, Unsignalized Restricted Crossing U-turn (RCUT), TWSC Closed Median, and TWSC Directional Median Opening.

Safety Analysis: Crash data was reviewed for the five-year study period from 2013 through 2017. There were two crashes reported with annual occurrences of 0 crashes (2013), 1 (2014), 1 (2015), 0 (2016), and 0 (2017). One crash was a fixed object collision and the other was a non-collision crash. Neither crash involved a pedestrian or cyclist. One of the crashes resulted in an injury and no crashes resulted in a fatality.

Results: CAP-X results indicated a Traffic Signal, RCUT, TWSC Closed Median, and TWSC Directional Median all operate better than the No-Build TWSC Full Median Opening, with v/c ratios ranging from 0.46 to 51.43 using the 2030 and 2045 projected volumes. Of the alternatives analyzed, a Traffic Signal was expected to operate with the lowest v/c ratios, ranging from 0.56 to 0.86. A TWSC Full Median Opening (No-Build scenario) was expected to operate with negative v/c ratios. These extreme v/c ratios were caused by near zero capacity on the side streets. The Traffic Signal had the highest multimodal score of 4.8, unsignalized RCUT had a score of 4.4 and all the TWSC alternatives had a score of 3.7. The SPICE results indicate that an unsignalized RCUT would have 4.3% fewer total crashes than the base (No-Build)

TWSC Full Median Opening alternative and 6.0% fewer fatal/injury crashes (over 20 years). Compared to the base TWSC Full Median Opening alternative over the 20-year project life cycle, the Traffic Signal was expected to have 26.2% fewer total crashes but 41.0% more fatal/injury crashes, and all other TWSC alternatives are expected to have the same number of total and fatal/injury crashes. Qualitatively, a closed median is expected to be safer than a directional median opening, which is expected to be safer than a full median opening. The Laurel Estates development has recently been finished on the western side of the intersection. Based on the Stage I analysis, four (4) alternatives were recommended to be carried forward into Stage II for further evaluation, as follows: TWSC Full Median Opening (No-Build), Traffic Signal, Unsignalized RCUT, TWSC Closed Median. Analysis results and recommendations are presented in **Table 3-9**.

TABLE 3-9: US 27 & OGELTHORPE DRIVE ICE RESULTS AND RECOMMENDATIONS

US 27 & Ogelthorpe Drive					
Control Strategy Evaluated	AM Peak V/C	PM Peak V/C	Multimodal Score	SPICE Ranking	Recommended to be evaluated in Stage II ICE?
Traffic Signal	0.83	0.86	4.8	5	Yes
TWSC Full Median Opening (No-Build)	-759.20	-24.90	3.7	2	Yes
TWSC Closed Median	2.46	1.25	3.7	2	Yes
TWSC Directional Median Opening	2.97	7.11	3.7	2	No
Unsignalized RCUT	51.43	23.52	4.4	1	Yes

Appendix 9-A: Traffic Data

Appendix 9-B: Capacity Analysis for Planning of Junctions (CAP-X) Files

Appendix 9-C: Safety Performance for Intersection Control Evaluation (SPICE) Files

Appendix 9-D: Stage 1 ICE Form

Appendix 9-E: Crash Data

3.10 Deen Still Road/Ronald Reagan Parkway (MP: 25.570)

Background: A Stage 1 ICE analysis has been completed for the intersection of US 27 and Deen Still Road/Ronald Reagan Parkway in Polk County. This analysis was conducted as part of the NE Polk US 27 Mobility Study, which has the overall objective of improving the mobility, safety, and livability along the US 27 corridor.

The intersection is currently a four-legged signalized intersection, with US 27 as the north and south legs. This area has some commercial businesses, a pharmacy in the northeast corner and a gas station in the southeast corner. There are residential communities on the northern and southern sides of Ronald Reagan Pkwy. West of the intersection are major business warehouses. The posted speed limit is 60 mph on US 27 (north of intersection), 55 mph on US 27 (south of intersection), 40 mph on Deen Still Road (west of intersection) and 45 mph on Ronald Reagan Parkway (east of intersection).

The current context classification of this intersection is C2 (Rural), and future context classification is C3C. An eight-hour turning movement count (TMC) was conducted in December 2018. During the eight-hour TMC, 12 pedestrians and 11 cyclists were counted using the crosswalks.

Capacity Analysis: CAP-X was conducted for the years in which the No-Build configuration was determined to be failing using Synchro 10. For this intersection both 2030 AM/PM and 2045 AM/PM analysis were conducted. 2030 and 2045 volumes were developed using 2030 and 2045 No-Build AADTs, selected K-factors and selected D-factors. The future year AADTs were developed by applying an annual growth rate of 4.00% to US 27 north of the intersection, 4.00% to US 27 south of the intersection, 1.00% to Deen Still Road west of the intersection, and 4.00% to Ronald Reagan Parkway east of the intersection. The intersection configurations evaluated were: Traffic Signal (No-Build), Full Median U-turn (MUT), Partial Median U-turn (PMUT), Signalized Restricted Crossing U-turn (RCUT), Full Displaced Left-Turn (DLT), Partial Displaced Left-Turn (PDLT), Modified Traffic Signal, and a hybrid SB PDLT/NB PMUT.

Safety Analysis: Crash data was reviewed for the five-year study period from 2013 through 2017. There were 81 crashes reported with annual occurrences of 12 crashes (2013), 17 (2014), 19 (2015), 14 (2016), and 19 (2017). The predominant crash type was Rear End (64%). One crash involved a pedestrian, but no crashes involved a cyclist. 36 crashes resulted in an injury and no crashes resulted in a fatality.

Results: CAP-X results indicated a full MUT, PMUT, RCUT, full DLT, PDLT, and hybrid SB PDLT/NB PMUT all operate better than the No-Build Traffic Signal, with v/c ratios ranging from 0.52 to 1.08 using the 2030 and 2045 projected volumes. Of the alternatives analyzed, a full DLT was expected to operate with the lowest v/c ratios, ranging from 0.52 to 0.82. A Traffic Signal (No-Build scenario) was expected to operate with v/c ratios ranging from 0.84 to 1.32. The full MUT, PMUT and RCUT all had the highest multimodal score of 6.3, the hybrid SB PDLT/NB PMUT had a score of 5.6, and the Traffic Signal and DLT alternatives had a score of 4.8. The SPICE results indicate that a full MUT would have 15% fewer total crashes than the base (No-Build) Traffic Signal alternative and 30% fewer fatal/injury crashes (over 20 years). Compared to the base Traffic Signal alternative over the 20-year project life cycle, a PMUT was expected to have 7.5% fewer total crashes and 15% fewer fatal/injury crashes, a full DLT was expected to have 12% fewer total crashes and 12% fewer fatal/injury crashes, a PDLT was expected to have 6% fewer total crashes and 6% fewer fatal/injury crashes, a signalized RCUT was expected to have 120.3% more total crashes and 102% more fatal/injury crashes, a hybrid SB PDLT/NB PMUT was expected to have 13.5% fewer total crashes and 21% fewer fatal/injury crashes, and the Modified Traffic Signal was expected to have the same number of total and fatal/injury crashes. All four corners of the intersection are either developed or under development. Alternatives minimizing the impacts to the side streets were preferred. Based on the Stage I analysis, four (4) alternatives were recommended to be carried forward into Stage II for further evaluation, as follows: Traffic Signal (No-Build), Partial MUT, Partial DLT, and hybrid SB PDLT/NB PMUT. Analysis results and recommendations are presented in **Table 3-10**.

TABLE 3-10: US 27 & DEEN STILL ROAD/RONALD REAGAN PARKWAY ICE RESULTS AND RECOMMENDATIONS

US 27 & Deen Still Road/Ronald Reagan Parkway					
Control Strategy Evaluated	AM Peak V/C	PM Peak V/C	Multimodal Score	SPICE Ranking	Recommended to be evaluated in Stage II ICE?
Traffic Signal (No-Build)	1.31	1.32	4.8	4	Yes
Full DLT	0.81	0.82	4.8	3	No
PDLT	0.91	0.87	4.8	3	Yes
Full MUT	1.07	1.04	6.3	1	No
PMUT	1.06	1.00	6.3	1	Yes
Signalized RCUT	1.08	1.08	6.3	6	No
Modified Traffic Signal	1.31	1.32	4.8	4	No
PDLT/PMUT Hybrid*	0.91/1.06	0.87/0.95	5.6	2	Yes

*PDLT/PMUT v/c ratios, respectively

Appendix 10-A: Traffic Data

Appendix 10-B: Capacity Analysis for Planning of Junctions (CAP-X) Files

Appendix 10-C: Safety Performance for Intersection Control Evaluation (SPICE) Files

Appendix 10-D: Stage 1 ICE Form

Appendix 10-E: Crash Data

3.11 Waverly Barn Road (MP: 24.907)

Background: A Stage 1 ICE analysis has been completed for the intersection of US 27 and Waverly Barn Road in Polk County. This analysis was conducted as part of the NE Polk US 27 Mobility Study, which has the overall objective of improving the mobility, safety, and livability along the US 27 corridor.

The intersection is currently a four-legged signalized intersection, with US 27 as the north and south legs. Land use in the immediate vicinity of the intersection is primarily commercial, with developed parcels present in all four quadrants. The posted speed limit is 55 mph on US 27 (north of intersection), 55 mph on US 27 (south of intersection), 30 mph on Waverly Barn Road (west of intersection) and 30 mph on Dunson Road (east of intersection).

The current context classification of this intersection C2 (Rural) and future context classification is C3C. A four-hour turning movement count (TMC) was conducted April 2016. During the four-hour TMC, one (1) pedestrian and two (2) cyclists were counted.

Capacity Analysis: CAP-X was conducted for the years in which the No-Build configuration was determined to be failing using Synchro 10. For this intersection both 2030 AM/PM and 2045 AM/PM analyses were conducted. 2030 and 2045 volumes were developed using 2030 and 2045 No-Build AADTs, selected K-factors and selected D-factors. The future year AADTs were developed by applying an annual growth rate of 4% to US 27 north and south of the intersection, 1% to Waverly Road west of the intersection, and 1% to Dunson Road east of the intersection. The intersection configurations evaluated

were: Traffic Signal (No-Build), Full Median U-turn (MUT), Partial Median U-turn (PMUT), Signalized Restricted Crossing U-turn (RCUT), Full Displaced Left-Turn (DLT), Partial Displaced Left-Turn (PDLT), NE Quadrant Roadway, and Modified Traffic Signal.

Safety Analysis: Crash data was reviewed for the five-year study period from 2013 through 2017. There were 39 crashes reported with annual occurrences of 10 crashes (2013), 6 (2014), 4 (2015), 12 (2016), and 7 (2017). The predominant crash type was Rear End (54%). One crash involved a pedestrian, and none involved cyclists. 15 crashes resulted in an injury and no crashes resulted in a fatality.

Results: CAP-X results indicate that a partial MUT, full MUT, partial DLT, full DLT, signalized RCUT, NE Quadrant roadway, and Modified Traffic Signal all operate better than the No-Build Traffic Signal, with v/c ratios ranging 0.54 to 1.36 using the 2030 and 2045 projected volumes. Of the alternatives analyzed, a Partial DLT is expected to operate with the lowest v/c ratios, ranging from 0.54 to 1.05. The No-Build scenario (Traffic Signal) is expected to operate with v/c ratios ranging 0.72 to 1.45. The Partial DLT, No-Build (Traffic Signal) and Modified Traffic Signal all have the highest multimodal score of 4.8 while the signalized RCUT and full MUT have the lowest score of 6.3. The SPICE results indicate that a full MUT would have 15% fewer total crashes than the base Traffic Signal alternative and 30% fewer fatal/injury crashes (over 20 years). Compared to the base Traffic Signal alternative over the 20-year project life cycle, a partial MUT was expected to have 7.5% fewer total crashes and 15% fewer fatal/injury crashes, a signalized RCUT was expected to have 54.28% fewer total crashes and 0.38% fewer fatal/injury crashes, a full DLT was expected to have 12% fewer total crashes and 12% fewer fatal/injury crashes, a partial DLT was expected to have 6% fewer total crashes and 6% fewer fatal/injury crashes, and the Modified Traffic Signal was expected to have the same number of total crashes and fatal/injury crashes as the No-Build scenario. SPICE cannot be conducted on a quadrant intersection. All four corners of the intersection are partially or completely developed, so large right-of-way impacts/costs should be anticipated with any major improvements. Based on the Stage I analysis, three (3) alternatives were recommended to be carried forward into Stage II for further evaluation, as follows: Traffic Signal (No-Build), Partial DLT and NE Quadrant Roadway. Analysis results and recommendations are presented in **Table 3-11**.

TABLE 3-11: US 27 & WAVERLY BARN ROAD ICE RESULTS AND RECOMMENDATIONS

US 27 & Waverly Barn Road					
Control Strategy Evaluated	AM Peak V/C	PM Peak V/C	Multimodal Score	SPICE Ranking	Recommended to be evaluated in Stage II ICE?
Traffic Signal (No-Build)	1.45	1.14	4.8	4	Yes
Full DLT	1.05	0.87	4.8	2	No
PDLT	1.05	0.87	4.8	2	Yes
Full MUT	1.03	0.91	6.3	1	No
PMUT	1.04	0.98	6.3	1	No
Signalized RCUT	1.05	0.87	6.3	3	No
NE Quadrant Roadway	0.95	0.95	4.4	-	Yes
Modified Traffic Signal	1.36	1.09	4.8	4	No

Appendix 11-A: Traffic Data

Appendix 11-B: Capacity Analysis for Planning of Junctions (CAP-X) Files

Appendix 11-C: Safety Performance for Intersection Control Evaluation (SPICE) Files

Appendix 11-D: Stage 1 ICE Form

Appendix 11-E: Crash Data

3.12 Access Road (MP: 24.621)

Background: A Stage 1 ICE analysis has been completed for the intersection of US 27 and Access Road in Polk County. This analysis was conducted as part of the NE Polk US 27 Mobility Study, which has the overall objective of improving the mobility, safety, and livability along the US 27 corridor.

The intersection is currently a four-legged signalized intersection, with US 27 as the north and south legs. There is some commercial development near the intersection; however, the northeast and northwest quadrants are vacant. Access Road services several distribution centers and a few fast-food restaurants on the west side and services Ritchie Bros Auctioneers on the eastern side. Large vehicles (semi-trucks) frequently use both sides of Access Road. The posted speed limit is 45 mph on US 27 (north of intersection), 45 mph on US 27 (south of intersection), 35 mph on Access Road (west of intersection) and 25 mph on Ritchie Brothers Driveway (east of intersection).

The current context classification of this intersection is C2 (Rural) and future context classification C3C (Suburban Commercial). A four-hour turning movement count (TMC) was conducted in May 2018. During the four-hour TMC, three (3) pedestrians and three (3) cyclists were counted using the crosswalks.

Capacity Analysis: CAP-X was conducted for the years in which the No-Build configuration was determined to be failing using Synchro 10. For this intersection only 2045 AM and PM analysis was conducted as the No-Build condition operated adequately in 2030. 2045 volumes were developed using 2045 No-Build AADTs, selected K-factors and selected D-factors. The future year AADTs were developed by applying an annual growth rate of 4% to US 27 and south of the intersection, 5% to Access Road west of the intersection, and 1% to Ritchie Brothers Driveway east of the intersection. The intersection configurations evaluated were: Traffic Signal, Full Median U-turn (MUT), Partial Median U-turn (PMUT), signalized Restricted Crossing U-turn (RCUT), Full Displaced Left-Turn (DLT), Partial Displaced Left-Turn (PDLT), and a Modified Traffic Signal.

Safety Analysis: Crash data was reviewed for the five-year study period from 2013 through 2017. There were 16 crashes reported with annual occurrences of 5 crashes (2013), 3 (2014), 3 (2015), 4 (2016), and 1 (2017). The predominant crash type was Rear End (37.5%). None of the crashes involved a pedestrian or cyclist. Eleven (11) crashes resulted in an injury and none of the crashes resulted in a fatality.

Results: CAP-X results indicated a full MUT, PMUT, signalized RCUT, full DLT, PDLT, and Modified Traffic Signal all operate better than the No-Build Traffic Signal, with v/c ratios ranging from 0.83 to 1.20 using the 2045 projected volumes. Of the alternatives analyzed, a full DLT was expected to operate with the lowest v/c ratios, ranging from 0.83 to 0.9. A Traffic Signal (No-Build scenario) was expected to operate with v/c ratios ranging from 1.07 to 1.27. The full MUT, PMUT, and RCUT all had the highest multimodal

score of 6.3 while the Traffic Signal, full DLT, PDLT, and Modified Traffic Signal had the lowest score of 4.8. The SPICE results indicate that a MUT would have 15% fewer total crashes than the base (No-Build) Traffic Signal alternative and 30% fewer fatal/injury crashes (over 20 years). Compared to the base (No-Build) Traffic Signal alternative over the 20-year project life cycle, a partial MUT was expected to have 7.5% fewer total crashes and 15% fewer fatal/injury crashes; a full DLT was expected to have 12% fewer total crashes and 12% fewer fatal/injury crashes; a partial DLT was expected to have 6% fewer total crashes and 6% fewer fatal/injury crashes; a signalized RCUT was expected to have 381.8% more total crashes and 96.4% more fatal/injury crashes; and the Modified Traffic Signal was expected to have the same number of total crashes and fatal/injury crashes. Due to the absence of structures in the immediate vicinity of the intersection, right-of-way impacts/costs should be relatively minor with any major improvements. However, due to the alignment of Access Road as it runs directly west of the intersection south of the intersection, any changes to the southwest quadrant of the intersection are expected to result in major right-of-way impacts/costs. Based on the Stage I analysis, two (2) alternatives were recommended to be carried forward into Stage II for further evaluation, as follows: No-Build (Traffic Signal) and Partial DLT (PDLT). Analysis results and recommendations are presented in **Table 3-12**.

TABLE 3-12: US 27 & ACCESS ROAD ICE RESULTS AND RECOMMENDATIONS

US 27 & Access Road					
Control Strategy Evaluated	AM Peak V/C	PM Peak V/C	Multimodal Score	SPICE Ranking	Recommended to be evaluated in Stage II ICE?
Traffic Signal (No-Build)	1.07	1.27	4.8	3	Yes
Full DLT	0.83	0.90	4.8	2	No
PDLT	0.86	0.90	4.8	2	Yes
Full MUT	0.99	0.97	6.3	1	No
PMUT	1.03	1.20	6.3	1	No
Signalized RCUT	0.94	0.98	6.3	5	No
Modified Traffic Signal	1.07	1.14	4.8	3	No

Appendix 12-A: Traffic Data

Appendix 12-B: Capacity Analysis for Planning of Junctions (CAP-X) Files

Appendix 12-C: Safety Performance for Intersection Control Evaluation (SPICE) Files

Appendix 12-D: Stage 1 ICE Form

Appendix 12-E: Crash Data

3.13 Heller Brothers Boulevard/Deer Creek Boulevard (MP: 22.859)

Background: A Stage 1 ICE analysis has been completed for the intersection of US 27 and Heller Brothers Boulevard/Deer Creek Boulevard in Polk County. This analysis was conducted as part of the NE Polk US 27 Mobility Study, which has the overall objective of improving the mobility, safety, and livability along the US 27 corridor.

The intersection is currently a four-legged signalized intersection (signalized in 2015), with US 27 as the north and south legs. Land use immediately adjacent to the intersection is primarily commercial; the

northeast and southeast corners of the intersection contain developed parcels, and the northwest and southwest parcels are vacant. East of the intersection, there are strip malls and access to the Deer Park RV and Gold Resort. Heller Brothers Boulevard to the west of the intersection provides access to large residential communities as well as Ernie Caldwell Boulevard. The posted speed limit is 45 mph on US 27 (north and south of intersection), 30 mph on Heller Brothers Boulevard (west of intersection) and 30 mph on Deer Creek Boulevard (east of intersection).

The current context classification of this intersection is C2 (Rural) and future context classification C3C. An eight-hour turning movement count was conducted in March 2016. One (1) pedestrian and four (4) cyclists were observed during the count.

Capacity Analysis: CAP-X was conducted for the years in which the No-Build configuration was determined to be failing using Synchro 10. For this intersection both 2030 AM/PM and 2045 AM/PM analyses were conducted. 2030 and 2045 volumes were developed using 2030 and 2045 No-Build AADTs, selected K-factors, and selected D-factors. The future year AADTs were developed by applying an annual growth rate of 2% to US 27 north of the intersection, 2% to US 27 south of the intersection, 3% to Heller Brothers Boulevard west of the intersection, and 0.5% to Deer Creek Boulevard east of the intersection. The at-grade intersection configurations evaluated were: Traffic Signal (No-Build), Full Median U-turn (MUT), Partial Median U-turn (PMUT), Signalized Restricted Crossing U-turn (RCUT), Full Displaced Left-Turn (DLT), Partial Displaced Left-Turn (PDLT), SW Quadrant Roadway, and Modified Traffic Signal. The grade-separated intersection configurations evaluated were: Diamond Interchange, two Partial Cloverleafs (Parclo A & Parclo B), Displaced Left-Turn Interchange (DLT I), Diverging Diamond Interchange (DDI), and Single Point Urban Interchange (SPUI). All grade-separated interchanges were oriented east-west.

Safety Analysis: Crash data was reviewed for the five-year study period from 2013 through 2017. There were 55 crashes reported with annual occurrences of 5 crashes (2013), 8 (2014), 14 (2015), 9 (2016), and 19 (2017). It should be noted that crash analysis years covered both an unsignalized configuration (2013-2015) and a signalized configuration (2016-2017) as a signal was installed in late 2015. The predominant crash type was Rear End (45.5%). None of the crashes involved a pedestrian or cyclist. 26 crashes resulted in an injury; none of the crashes resulted in a fatality.

Results: CAP-X results indicated that all alternatives operate better than the No-Build Traffic Signal, with at-grade v/c ratios ranging from 0.66 to 1.35 using the 2030 and 2045 projected volumes and grade-separated v/c ratios ranging from 0.06 to 0.16 using the 2045 projected volumes (grade-separated alternatives were not analyzed in year 2030).

Of the alternatives analyzed, a DLT Interchange was expected to operate with the lowest v/c ratios, ranging from 0.06 to 0.12 using the 2045 projected volumes. A Traffic Signal (No-Build scenario) was expected to operate with v/c ratios ranging from 0.86 to 1.53 using the 2030 and 2045 projected volumes. The DDI alternative had the highest multimodal score of 6.7 while the Parclo alternatives had the lowest score of 3.0.

The at-grade alternatives were evaluated in SPICE. The SPICE results indicate that a full MUT would have 15% fewer total crashes than the base Traffic Signal alternative and 30% fewer fatal/injury crashes (over 20 years). Compared to the base Traffic Signal alternative over the 20-year project life cycle, a partial MUT was expected to have 7.5% fewer total crashes and 15% fewer fatal/injury crashes; a full DLT was expected to have 12% fewer total crashes and 12% fewer fatal/injury crashes; a partial DLT was expected to have 6% fewer total crashes and 6% fewer fatal/injury crashes; a signalized RCUT was expected to have 395% more total crashes and 75% more fatal/injury crashes; and the Modified Traffic Signal was expected to have the same number of total and fatal/injury crashes. Due to the development of parcels in the northeast and southeast quadrants, any major improvement on the east side of US 27 would likely result in right-of-way impacts/costs. Based on the Stage I analysis, five (5) alternatives were recommended to be carried forward into Stage II for further evaluation, as follows: Traffic Signal (No-Build), full MUT, PDLT, Diamond Interchange, and a SPUI. Analysis results and recommendations are presented in **Table 3-13**.

TABLE 3-13: US 27 & HELLER BROTHERS BOULEVARD/DEER CREEK BOULEVARD ICE RESULTS AND RECOMMENDATIONS

US 27 & Heller Brothers Boulevard/Deer Creek Boulevard					
Control Strategy Evaluated	AM Peak V/C	PM Peak V/C	Multimodal Score	SPICE Ranking	Recommended to be evaluated in Stage II ICE?
Traffic Signal (No-Build)	1.53	1.21	4.8	3	Yes
Full DLT	1.25	0.94	4.8	2	No
PDLT	1.33	1.03	4.8	2	Yes
Full MUT	1.30	0.97	6.3	1	Yes
PMUT	1.35	1.07	6.3	1	No
Signalized RCUT	1.23	0.94	6.3	5	No
SW Quadrant Roadway	1.34	1.05	4.4	-	No
Modified Traffic Signal	1.53	1.21	4.8	3	No
Traditional Diamond	0.09	0.16	4.8	-	Yes
Partial Cloverleaf A	0.06	0.13	3.0	-	No
Partial Cloverleaf B	0.08	0.13	3.0	-	No
DLT Interchange	0.06	0.12	4.8	-	No
DDI	0.06	0.13	6.7	-	No
SPUI	0.07	0.14	4.8	-	Yes

Appendix 13-A: Traffic Data

Appendix 13-B: Capacity Analysis for Planning of Junctions (CAP-X) Files

Appendix 13-C: Safety Performance for Intersection Control Evaluation (SPICE) Files

Appendix 13-D: Stage 1 ICE Form

Appendix 13-E: Crash Data

3.14 Minute Maid Ramp Road 2 (MP: 22.421)

Background: A Stage 1 ICE analysis has been completed for the intersection of US 27 and Minute Maid Ramp Road 2/Citrus Ridge Drive in Polk County. This analysis was conducted as part of the NE Polk US 27 Mobility Study, which has the overall objective of improving the mobility, safety, and livability along the US 27 corridor.

The intersection is currently a four-legged signalized intersection, with US 27 as the north and south legs. Land use in the immediate vicinity of the intersection is primarily commercial, but there are empty parcels in three of the four quadrants. The posted speed limit is 55 mph on US 27 (north and south of intersection), 40 mph on Minute Maid Ramp Road 2 (west of intersection) and 35 mph on Citrus Ridge Drive (east of intersection).

The current context classification of this intersection is C2 (Rural), and future context classification is C3C (Suburban Commercial). An eight-hour turning movement count was conducted in March 2016. Nine (9) pedestrians and one (1) cyclist were observed during the count.

Capacity Analysis: CAP-X was conducted for the years in which the No-Build configuration was determined to be failing using Synchro 10. For this intersection both 2030 AM/PM and 2045 AM/PM analyses were conducted. 2030 and 2045 volumes were developed using 2030 and 2045 No-Build AADTs, selected K-factors and selected D-factors. The future year AADTs were developed by applying an annual growth rate of 2% to US 27 north and south of the intersection, 3% to Minute Maid Ramp Road 2 west of the intersection, and 3% to Citrus Ridge Drive east of the intersection. The intersection configurations evaluated were: Traffic Signal, Full Median U-turn (MUT), Partial Median U-turn (PMUT), Signalized Restricted Crossing U-turn (RCUT), Full Displaced Left-Turn (DLT), Partial Displaced Left-Turn (PDLT), NE Quadrant Roadway, and Modified Traffic Signal.

Safety Analysis: Crash data was reviewed for the five-year study period from 2013 through 2017. There were 53 crashes reported with annual occurrences of 5 crashes (2013), 3 (2014), 14 (2015), 21 (2016), and 10 (2017). The predominant crash type was Rear End (52.8%). None of the crashes involved a cyclist or pedestrian. 24 crashes resulted in an injury and one (1) crash resulted in a fatality. The fatal crash occurred in 2015 in clear weather, daylight, and dry roadway conditions. A southbound vehicle approached the rear of another southbound vehicle and struck it at a high rate of speed, after which it left the roadway and overturned. The driver of the first vehicle was fatally wounded; the driver and passenger of the struck vehicle were unharmed.

Results: CAP-X results indicated a DLT, PDLT, MUT, PMUT, signalized RCUT, NE Quadrant, and Modified Traffic Signal all operate better than the No-Build Traffic Signal, with v/c ratios ranging 0.64 to 1.40 using the 2030 and 2045 projected volumes. Of the alternatives analyzed, a full DLT was expected to operate with the lowest v/c ratios, ranging from 0.64 to 1.11. A Traffic Signal (No-Build scenario) was expected to operate with v/c ratios ranging from 0.81 to 1.45. The MUT, PMUT, and signalized RCUT all had the highest multimodal score of 6.3, while the NE Quadrant Roadway alternative had the lowest score of 4.4. The SPICE results indicate that a MUT would have 15% fewer total crashes than the base (No-Build) Traffic Signal and 30% fewer fatal/injury crashes (over 20 years). Compared to the base Traffic Signal over the 20-

year project life cycle, a PMUT was expected to have 7.5% fewer total crashes and 15% fewer fatal/injury crashes; a DLT was expected to have 12% fewer total crashes and 12% fewer fatal/injury crashes; a PDLT was expected to have 6% fewer total crashes and 6% fewer fatal/injury crashes; a signalized RCUT was expected to have 72.5% more total and 22.7% more fatal/injury crashes; and the Modified Traffic Signal was expected to have the same number of total crashes fatal/injury crashes. Based on the Stage I analysis, four (4) alternatives were recommended to be carried forward into Stage II for further evaluation, as follows: Traffic Signal (No-Build), Full MUT, Partial DLT, and NE Quadrant. Analysis results and recommendations are presented in **Table 3-14**.

TABLE 3-14: US 27 & MINUTE MAID RAMP ROAD 2 ICE RESULTS AND RECOMMENDATIONS

US 27 & Minute Maid Ramp Road 2					
Control Strategy Evaluated	AM Peak V/C	PM Peak V/C	Multimodal Score	SPICE Ranking	Recommended to be evaluated in Stage II ICE?
Traffic Signal (No-Build)	1.45	1.13	4.8	3	Yes
Full DLT	1.11	0.89	4.8	2	No
PDLT	1.15	0.90	4.8	2	Yes
Full MUT	1.16	0.97	6.3	1	Yes
PMUT	1.40	1.04	6.3	1	No
Signalized RCUT	1.19	0.93	6.3	5	No
NE Quadrant Roadway	1.21	0.94	4.4	-	Yes
Modified Traffic Signal	1.40	1.13	4.8	3	No

Appendix 14-A: Traffic Data

Appendix 14-B: Capacity Analysis for Planning of Junctions (CAP-X) Files

Appendix 14-C: Safety Performance for Intersection Control Evaluation (SPICE) Files

Appendix 14-D: Stage 1 ICE Form

Appendix 14-E: Crash Data

3.15 Cottonwood Road (MP: 21.672)

Background: A Stage 1 ICE analysis has been completed for the intersection of US 27 and Cottonwood Road/Holly Hill Grove Road 2 in Polk County. This analysis was conducted as part of the NE Polk US 27 Mobility Study, which has the overall objective of improving the mobility, safety, and livability along the US 27 corridor.

The intersection, a four-legged intersection with US 27 as the north and south legs, was analyzed as a two-way stop-controlled intersection but has an emergency signal with a fire station just to the east. Land use in the immediate vicinity of the intersection is mixed with commercial, agricultural, and vacant land. The posted speed limit is 60 mph on US 27 (north and south of intersection), 30 mph on Holly Hill Grove Road 2 (west of intersection) and 25 mph on Cottonwood Road (east of intersection). A fire station, Polk County Fire Rescue Station 38, is present on the north side of Cottonwood Road approximately 1,000 feet of the intersection.

The current context classification of this intersection is C2 (Rural), and future context classification is C3C. An eight-hour turning movement count (TMC) was conducted in December 2018. During the eight-hour TMC, two (2) pedestrians and one (1) cyclist were counted traversing the intersection.

Capacity Analysis: CAP-X was conducted for the years in which the No-Build configuration was determined to be failing using Synchro 10. For this intersection both 2030 AM/PM and 2045 AM/PM analyses were conducted. 2030 and 2045 volumes were developed using 2030 and 2045 No-Build AADTs, selected K-factors and selected D-factors. The future year AADTs were developed by applying an annual growth rate of 2% to US 27 north and south of the intersection, 3% to Holly Hill Grove Road 2 west of the intersection, and 0.5% to Cottonwood Road east of the intersection. The intersection configurations evaluated were: Two-Way Stop Controlled (TWSC) Full Median Opening (No-Build), Traffic Signal, Partial Median U-turn (PMUT), Unsignalized Restricted Crossing U-turn (RCUT), TWSC Closed Median, and TWSC Directional Median Opening.

Safety Analysis: Crash data was reviewed for the five-year study period from 2013 through 2017. There were 28 crashes reported with annual occurrences of 6 crashes (2013), 7 (2014), 7 (2015), 5 (2016), and 3 (2017). The predominant crash type was Rear End (35.7%). One crash involved a pedestrian and none of the crashes involved a cyclist. 13 crashes resulted in an injury and 1 crash resulted in a fatality. The fatal crash occurred in 2015 in clear weather, dark (not lighted), and dry roadway conditions. A pedestrian was standing in the left turn lane from southbound US 27 onto Cottonwood Road, attempting to find and retrieve a cell phone. The roadway area was dimly lit, and the pedestrian was not visible to vehicular traffic. Four vehicles struck the pedestrian as a result; the pedestrian was declared deceased at the scene.

Results: CAP-X results indicated a Traffic Signal, TWSC Closed Median, and TWSC Directional Median all operate better than the No-Build TWSC Full Median Opening, with v/c ratios ranging from 0.82 to over 100 using the 2030 and 2045 projected volumes. Of the alternatives analyzed, a Traffic Signal was expected to operate with the lowest v/c ratios, ranging from 0.82 to 1.26. A TWSC Full Median Opening (No-Build scenario) was expected to operate with v/c ratios over 100. These extreme v/c ratios were caused by near zero intersection capacity from the side streets. The partial MUT had the highest multimodal score of 6.3, the Traffic Signal had a multimodal score of 4.8, the unsignalized RCUT had a multimodal score of 4.4, and all TWSC alternatives had a multimodal score of 3.7. The SPICE results indicate that an unsignalized RCUT would have 3.8% fewer total crashes than the base (No-Build) TWSC Full Median Opening alternative and 68.3% fewer fatal/injury crashes (over 20 years). Compared to the base TWSC Full Median Opening alternative over the 20-year project life cycle, a Traffic Signal was expected to have 96.8% more total crashes and 12.3% more fatal/injury crashes; a full MUT was expected to have 67.2% more total crashes and 21.4% more fatal/injury crashes; a partial MUT was expected to have 33.6% more total crashes and 10.7% more fatal/injury crashes; all other TWSC alternatives are expected to have the same number of total and fatal/injury crashes. Due to commercial development on the east side of US 27, right-of-way impacts are discouraged there. Based on the Stage I analysis, three (3) alternatives were recommended to be carried forward into Stage II for further evaluation, as follows: TWSC Full Median Opening, Traffic Signal, and Partial MUT. Analysis results and recommendations are presented in **Table 3-15**.

TABLE 3-15: US 27 & COTTONWOOD ROAD ICE RESULTS AND RECOMMENDATIONS

US 27 & Cottonwood Road					
Control Strategy Evaluated	AM Peak V/C	PM Peak V/C	Multimodal Score	SPICE Ranking	Recommended to be evaluated in Stage II ICE?
PMUT	1.09	0.96	6.3	2	Yes
Traffic Signal	1.26	1.10	4.8	6	Yes
TWSC Full Median Opening (No-Build)	3810.31	2055.91	3.7	3	Yes
TWSC Closed Median	11.90	2.70	3.7	3	No
TWSC Directional Median Opening	19.41	9.86	3.7	3	No
Unsignalized RCUT	1028.31	86.47	4.4	1	No

Appendix 15-A: Traffic Data

Appendix 15-B: Capacity Analysis for Planning of Junctions (CAP-X) Files

Appendix 15-C: Safety Performance for Intersection Control Evaluation (SPICE) Files

Appendix 15-D: Stage 1 ICE Form

Appendix 15-E: Crash Data

3.16 Ridgewood Lakes Boulevard (MP: 21.161)

Background: A Stage 1 ICE analysis has been completed for the intersection of US 27 and Ridgewood Lakes Boulevard in Polk County. This analysis was conducted as part of the NE Polk US 27 Mobility Study, which has the overall objective of improving the mobility, safety, and livability along the US 27 corridor.

The intersection is currently a three-legged signalized intersection, with US 27 as the north and south legs. Land use surrounding the intersection is mostly commercial or vacant. The posted speed limit is 60 mph on US 27 (north and south of intersection) and 25 mph on Ridgewood Lakes Boulevard (east of intersection).

The current context classification of this intersection is C2 (Rural), and future context classification is C3C. An eight-hour turning movement count (TMC) was conducted in November 2018. No pedestrian or cyclist crossings were recorded in the TMC.

Capacity Analysis: CAP-X was conducted for the years in which the No-Build configuration was determined to be failing using Synchro 10. For this intersection only 2045 AM and PM analysis was conducted as the No-Build condition operated adequately in 2030. 2045 volumes were developed using 2045 No-Build AADTs, selected K-factors and selected D-factors. The future year AADTs were developed by applying an annual growth rate of 2% to US 27 north and south of the intersection and 3% to Ridgewood Lakes Boulevard east of the intersection. The intersection configurations evaluated were: Traffic Signal (No-Build), Partial Median U-turn (PMUT), Partial Displaced Left-Turn (PDLT), Continuous Green Tee, and signalized Restricted Crossing U-turn (RCUT).

Safety Analysis: Crash data was reviewed for the five-year study period from 2013 through 2017. There were 81 crashes reported with annual occurrences of 11 crashes (2013), 25 (2014), 14 (2015), 14 (2016), and 17 (2017). The predominant crash type was Rear End (47%). None of the crashes involved a cyclist or pedestrian. 40 crashes resulted in an injury; none of the crashes resulted in a fatality.

Results: CAP-X results indicated a PMUT, signalized RCUT, PDLT, and Continuous Green Tee all operate better than the No-Build (Traffic Signal), with v/c ratios ranging from 0.93 to 1.19 using the 2045 projected volumes. Of the alternatives analyzed, a PDLT was expected to operate with the lowest v/c ratios, ranging from 0.93 to 1.13. A Traffic Signal (No-Build scenario) was expected to operate with v/c ratios ranging from 1.12 to 1.32. The PMUT and signalized RCUT had the highest multimodal score of 3.0, the Traffic Signal and PDLT had multimodal scores of 4.8, and the Continuous Green Tee had a score of 3.0. The SPICE results indicate that a PMUT would have 7.5% fewer total crashes than the base (no-build) Traffic Signal and 15% fewer fatal/injury crashes (over 20 years). Compared to the base Traffic Signal over the 20-year project life cycle, a PDLT was expected to have 6% fewer total crashes and 6% fewer fatal/injury crashes, a Continuous Green Tee was expected to have 4% fewer total crashes and 15% fewer fatal/injury crashes, and a signalized RCUT was expected to have 650% more total crashes and 235.8% more fatal/injury crashes. Based on the Stage I analysis, four (4) alternatives were recommended to be carried forward into Stage II for further evaluation, as follows: Traffic Signal (No-Build), Partial MUT, Partial DLT, and Continuous Green Tee. Analysis results and recommendations are presented in **Table 3-16**.

TABLE 3-16: US 27 & RIDGEWOOD LAKES BOULEVARD ICE RESULTS AND RECOMMENDATIONS

US 27 & Ridgewood Lakes Boulevard					
Control Strategy Evaluated	AM Peak V/C	PM Peak V/C	Multimodal Score	SPICE Ranking	Recommended to be evaluated in Stage II ICE?
Traffic Signal (No-Build)	1.32	1.12	4.8	4	Yes
PDLT	1.13	0.93	4.8	3	Yes
PMUT	1.19	0.99	6.3	1	Yes
Signalized RCUT	1.12	0.96	6.3	4	No
Continuous Green Tee	1.16	1.00	3.0	2	Yes

Appendix 16-A: Traffic Data

Appendix 16-B: Capacity Analysis for Planning of Junctions (CAP-X) Files

Appendix 16-C: Safety Performance for Intersection Control Evaluation (SPICE) Files

Appendix 16-D: Stage 1 ICE Form

Appendix 16-E: Crash Data

3.17 Holly Hill Tank Road/Florida Development Road (MP: 20.670)

Background: A Stage 1 ICE analysis has been completed for the intersection of US 27 and Holly Hill Tank Road/Florida Development Road in Polk County. This analysis was conducted as part of the NE Polk US 27 Mobility Study, which has the overall objective of improving the mobility, safety, and livability along the US 27 corridor.

The intersection is currently a four-legged unsignalized intersection, with US 27 as the north and south legs. The area surrounding the intersection is mostly vacant. The posted speed limit is 60 mph on US 27 (north and south of intersection), 25 mph on Holly Hill Tank Road (west of intersection) and 30 mph on Florida Development Road (east of intersection).

The current context classification of this intersection is C2 (Rural) and future context classification C3C. AN eight-hour turning movement count (TMC) was conducted in November 2018. Three (3) pedestrians and zero cyclists were observed during the TMC.

Capacity Analysis: CAP-X was conducted for the years in which the No-Build configuration was determined to be failing using Synchro 10. For this intersection both 2030 AM/PM and 2045 AM/PM analyses were conducted. 2030 and 2045 volumes were developed using 2030 and 2045 No-Build AADTs, selected K-factors and selected D-factors. The future year AADTs were developed by applying an annual growth rate of 2% to US 27 north and south of the intersection, 3% to Holly Hill Tank Road west of the intersection, and 1% to Florida Development Road east of the intersection. The intersection configurations evaluated were: Two-Way Stop Controlled (TWSC) Full Median Opening (No-Build), Traffic Signal, Unsignalized Restricted Crossing U-turn (RCUT), TWSC Closed Median, and TWSC Directional Median Opening.

Safety Analysis: Crash data was reviewed for the five-year study period from 2013 through 2017. There were eight (8) crashes reported with annual occurrences of 0 crashes (2013), 0 (2014), 5 (2015), 0 (2016), and 3 (2017). The predominant crash type was Rear End (50%). None of the crashes involved a cyclist or pedestrian. Four (4) crashes resulted in an injury and no crashes resulted in a fatality.

Results: CAP-X results indicated that a Traffic Signal, unsignalized RCUT, TWSC Closed Median, and TWSC Directional Median all operate better than the No-Build TWSC Full Median Opening, with v/c ratios ranging from 0.76 to over 100 using the 2030 and 2045 projected volumes. Of the alternatives analyzed, a Traffic Signal was expected to operate with the lowest v/c ratios, ranging from 0.76 to 1.19. A TWSC Full Median Opening (No-Build scenario) was expected to operate with v/c ratios ranging from 1.87 to over 100. The extremely high v/c ratios present in some scenarios were caused by near zero throughput/capacity from the side streets. The Traffic Signal had the highest multimodal score of 4.8, the unsignalized RCUT had a multimodal score of 4.4, and all the TWSC alternatives had a multimodal score of 3.7. The SPICE results indicate that an unsignalized RCUT would have 5.65% fewer total crashes than the base (No-Build) TWSC Full Median Opening alternative and 64% fewer fatal/injury crashes (over 20 years). Compared to the base TWSC Full Median Opening alternative over the 20-year project life cycle, a Traffic Signal was expected to have 103.6% more total crashes and 20.6% fewer fatal/injury crashes, and all other TWSC alternatives were expected to have the same number of total fatal/injury crashes. As the area surrounding the intersection is mostly vacant, right-of-way impacts/costs are not expected to be a major concern. Based on the Stage I analysis, four (4) alternatives were recommended to be carried forward into Stage II for further evaluation, as follows: TWSC Full Median Opening (No-Build), Traffic Signal, Unsignalized RCUT, TWSC Closed Median. Analysis results and recommendations are presented in **Table 3-17**.

TABLE 3-17: US 27 & HOLLY HILL TANK ROAD ICE RESULTS AND RECOMMENDATIONS

US 27 & Holly Hill Tank Road					
Control Strategy Evaluated	AM Peak V/C	PM Peak V/C	Multimodal Score	SPICE Ranking	Recommended to be evaluated in Stage II ICE?
Traffic Signal	1.19	1.03	4.8	5	Yes
TWSC Full Median Opening (No-Build)	15698.34	4113.95	3.7	2	Yes
TWSC Closed Median	6.55	2.46	3.7	2	Yes
TWSC Directional Median Opening	22.36	10.34	3.7	2	No
Unsignalized RCUT	493.70	88.92	4.4	1	Yes

Appendix 17-A: Traffic Data

Appendix 17-B: Capacity Analysis for Planning of Junctions (CAP-X) Files

Appendix 17-C: Safety Performance for Intersection Control Evaluation (SPICE) Files

Appendix 17-D: Stage 1 ICE Form

Appendix 17-E: Crash Data

3.18 Massee Road/Holly Hill Road (MP: 20.168)

Background: A Stage 1 ICE analysis has been completed for the intersection of US 27 and Massee Road/Holly Hill Road in Polk County. This analysis was conducted as part of the NE Polk US 27 Mobility Study, which has the overall objective of improving the mobility, safety, and livability along the US 27 corridor.

The intersection is currently a four-legged signalized intersection, with US 27 as the north and south legs. The land around the intersection is developed, consisting primarily of commercial land uses. AdventHealth Heart of Florida (a hospital) is in the northwest quadrant of the intersection. The posted speed limit is 55 mph on US 27 (north and south of intersection), 40 mph on Massee Road (west of intersection) and 40 mph on Holly Hill Road (east of intersection).

The current context classification of this intersection is C2 (Rural), and future context classification is C3C. An eight-hour turning movement count was conducted in March 2016. Ten (10) pedestrians and no cyclists were counted.

Capacity Analysis: CAP-X was conducted for the years in which the No-Build configuration was determined to be failing using Synchro 10. For this intersection both 2030 AM/PM and 2045 AM/PM analyses were conducted. 2030 and 2045 volumes were developed using 2030 and 2045 No-Build AADTs, selected K-factors and selected D-factors. The future year AADTs were developed by applying an annual growth rate of 2% to US 27 north and south of the intersection, 3% to Massee Road west of the intersection, and 3% to Holly Hill Road east of the intersection. The intersection configurations evaluated were: Traffic Signal (No-Build), Full Median U-turn (MUT), Partial Median U-turn (PMUT), Signalized

Restricted Crossing U-turn (RCUT), Full Displaced Left-Turn (DLT), Partial Displaced Left-Turn (PDLT), NE Quadrant Roadway, Modified Traffic Signal, and a hybrid SB PDLT/NB PMUT.

Safety Analysis: Crash data was reviewed for the five-year study period from 2013 through 2017. There were 125 crashes reported with annual occurrences of 14 crashes (2013), 28 (2014), 25 (2015), 27 (2016), and 31 (2017). The predominant crash type was Rear End (63%). None of the crashes involved a cyclist or pedestrian. 50 crashes resulted in an injury and none of the crashes resulted in a fatality.

Results: CAP-X results indicated that a Full MUT, PMUT, signalized RCUT, Full DLT, PDLT, NE Quadrant Roadway, hybrid SB PDLT/NB PMUT, and Modified Traffic Signal all operate better than the No-Build Traffic Signal, with v/c ratios ranging from 0.67 to 1.33 using the 2030 and 2045 projected volumes. Of the alternatives analyzed, a full DLT was expected to operate with the lowest v/c ratios, ranging from 0.67 to 1.02. A Traffic Signal (No-Build scenario) was expected to operate with v/c ratios ranging from 1.02 to 1.68. The Full MUT, PMUT, and signalized RCUT all had the highest multimodal score of 6.3; the hybrid SB PDLT/NB PMUT had a score of 5.6; the full DLT, PDLT, and both Traffic Signal alternatives (No-Build and alternate) had a score of 4.8, and the NE Quadrant Roadway alternative had a multimodal score of 4.4. The SPICE results indicate that a MUT would have 15% fewer total crashes than the base (No-Build) Traffic Signal and 30% fewer fatal/injury crashes (over 20 years). Compared to the base Traffic Signal over the 20-year project life cycle, a PMUT was expected to have 7.5% fewer total crashes and 15% fewer fatal/injury crashes, a DLT was expected to have 12% fewer total crashes and 12% fewer fatal/injury crashes, a PDLT was expected to have 6% fewer total crashes and 6% fewer fatal/injury crashes, a signalized RCUT was expected to have 83.2% more total crashes and 39.1% more fatal/injury crashes, and an Modified Traffic Signal was expected to have the same number of total and fatal/injury crashes. While there is still vacant space within the right-of-way, all four corners of the intersection are already developed, so right-of-way impacts/costs may result from some potential improvements. Based on the Stage I analysis, five (5) alternatives were recommended to be carried forward into Stage II for further evaluation, as follows: Traffic Signal (No-Build), Full MUT, Partial DLT, Modified Traffic Signal, and hybrid SB PDLT/NB PMUT. Analysis results and recommendations are presented in **Table 3-18**.

TABLE 3-18: US 27 & MASSEE ROAD/HOLLY HILL ROAD ICE RESULTS AND RECOMMENDATIONS

US 27 & Massee Road/Holly Hill Road					
Control Strategy Evaluated	AM Peak V/C	PM Peak V/C	Multimodal Score	SPICE Ranking	Recommended to be evaluated in Stage II ICE?
Traffic Signal (No-Build)	1.68	1.40	4.8	4	Yes
Full DLT	1.02	0.83	4.8	3	No
PDLT	1.07	0.90	4.8	3	Yes
Full MUT	1.10	1.01	6.3	1	Yes
PMUT	1.17	1.04	6.3	1	No
Signalized RCUT	1.11	0.97	6.3	6	No
NE Quadrant Roadway	1.32	1.01	4.4	-	No
Modified Traffic Signal	1.33	1.09	4.8	4	Yes
PDLT/PMUT Hybrid*	1.07/1.17	0.90/1.04	5.6	2	Yes

*PDLT/PMUT v/c ratios, respectively

Appendix 18-A: Traffic Data

Appendix 18-B: Capacity Analysis for Planning of Junctions (CAP-X) Files

Appendix 18-C: Safety Performance for Intersection Control Evaluation (SPICE) Files

Appendix 18-D: Stage 1 ICE Form

Appendix 18-E: Crash Data

3.19 La Casa Del Sol Boulevard (MP: 19.792)

Background: A Stage 1 ICE analysis has been completed for the intersection of US 27 and La Casa Del Sol Boulevard in Polk County. This analysis was conducted as part of the NE Polk US 27 Mobility Study, which has the overall objective of improving the mobility, safety, and livability along the US 27 corridor.

The intersection is currently a three-legged unsignalized intersection, with US 27 as the north and south legs. The land use immediately adjacent to the intersection consists of agricultural (to the east) and residential (to the west). The posted speed limit is 55 mph on US 27 (north and south of intersection) and 25 mph on La Casa Del Sol Boulevard (west of intersection).

The current context classification of this intersection is C2 (Rural), and future context classification is C3C. An eight-hour turning movement count (TMC) was conducted in November 2018. Three (3) pedestrians and one (1) cyclist were observed during the count.

Capacity Analysis: CAP-X was conducted for the years in which the No-Build configuration was determined to be failing using Synchro 10. For this intersection both 2030 AM/PM and 2045 AM/PM analyses were conducted. 2030 and 2045 volumes were developed using 2030 and 2045 No-Build AADTs, selected K-factors and selected D-factors. The future year AADTs were developed by applying an annual growth rate of 2% to US 27 north and south of the intersection and 0.5% to La Casa Del Sol Boulevard west of the intersection. The intersection configurations evaluated were: Two-Way Stop Controlled (TWSC)

Full Median Opening (No-Build), Traffic Signal, Unsignalized Restricted Crossing U-turn (RCUT), Continuous Green Tee, TWSC Closed Median, and TWSC Directional Opening.

Safety Analysis: Crash data was reviewed for the five-year study period from 2013 through 2017. There were four (4) crashes reported with annual occurrences of 0 crashes (2013), 2 (2014), 0 (2015), 1 (2016), and 1 (2017). The crash types were Rear End, Sideswipe, Off road, and Pedestrian. None of the crashes involved a cyclist. One (1) crash resulted in an injury and one (1) of the crashes resulted in a fatality. The fatal crash occurred in 2016 in clear weather, dark (lighted), and dry roadway conditions. A pedestrian was attempting a westbound crossing on the southern leg of the intersection and violated the right-of-way of southbound traffic. The pedestrian was not visible to vehicular traffic and was struck by a southbound vehicle. The pedestrian was declared deceased at the scene.

Results: CAP-X results indicated a Traffic Signal, Continuous Green Tee, TWSC Closed Median, and TWSC Directional Opening all operate better than the No-Build TWSC Full Median Opening, with v/c ratios ranging from 0.59 to 21.07 using the 2030 and 2045 projected volumes. Of the alternatives analyzed, a Continuous Green Tee was expected to operate with the lowest v/c ratios, ranging from 0.62 to 0.81 using 2045 projected volumes. A TWSC Full Median Opening (No-Build scenario) was expected to operate with v/c ratios ranging from 19.10 to over 100. The high v/c ratio was caused by near zero capacity for the side street approach. The Traffic Signal had the highest multimodal score of 4.8; the unsignalized RCUT had a score of 4.4; all the TWSC alternatives had scores of 3.7; and the continuous green tee had a multimodal score of 3.0. The SPICE results indicate that a TWSC Directional Opening and TWSC Closed Median would have the same number of total and fatal/injury crashes than the base (No-Build) TWSC Full Median Opening alternative (over 20-years). Compared to the base TWSC Full Median Opening alternative over the 20-year project life cycle, a Traffic Signal was expected to have 9.7% fewer total crashes and 75.53% more crashes, a Continuous Green Tee was expected to have 13.3% fewer total crashes and 49.20% more fatal/injury crashes, and an unsignalized RCUT was expected to have 18.9% more total crashes and 16.3% more fatal/injury crashes. Based on the Stage I analysis, five (5) alternatives were recommended to be carried forward into Stage II for further evaluation, as follows: TWSC Full Median Opening (No-Build), Traffic Signal, Continuous Green Tee, TWSC Closed Median, and Unsignalized RCUT. Analysis results and recommendations are presented in **Table 3-19**.

TABLE 3-19: US 27 & LA CASA DEL SOL BOULEVARD ICE RESULTS AND RECOMMENDATIONS

US 27 & La Casa Del Sol Boulevard					
Control Strategy Evaluated	AM Peak V/C	PM Peak V/C	Multimodal Score	SPICE Ranking	Recommended to be evaluated in Stage II ICE?
Traffic Signal	1.05	0.90	4.8	6	Yes
Continuous Green Tee	0.62	0.81	3.0	5	Yes
TWSC Full Median Opening (No-Build)	1992.50	-1390.00	3.7	1	Yes
TWSC Closed Median	0.90	0.78	3.7	1	Yes
TWSC Directional Median Opening	0.90	1.42	3.7	1	No
Unsignalized RCUT	5.77	21.07	4.4	4	Yes

Appendix 19-A: Traffic Data

Appendix 19-B: Capacity Analysis for Planning of Junctions (CAP-X) Files

Appendix 19-C: Safety Performance for Intersection Control Evaluation (SPICE) Files

Appendix 19-D: Stage 1 ICE Form

Appendix 19-E: Crash Data

3.20 Holly Hill Cutoff Road/North Boulevard W (MP: 19.172)

Background: A Stage 1 ICE analysis has been completed for the intersection of US 27 and Holly Hill Cutoff Road/North Boulevard W in Polk County. This analysis was conducted as part of the NE Polk US 27 Mobility Study, which has the overall objective of improving the mobility, safety, and livability along the US 27 corridor.

While the intersection is currently a four-legged unsignalized intersection, it passed a Signal Warrant Analysis (SWA) in 2018 and thus was evaluated as a signalized intersection in the No-Build condition, with US 27 as the north and south legs. The SWA is included in the Traffic Data Appendix of this intersection. The signalization lets for construction in September 2021. There is a residential area west of the intersection, but the land uses in the immediate vicinity of the intersection are commercial, agricultural, and vacant. Holly Hill Cutoff Road provides access to primarily residential land use to the west as does North Boulevard W to the east. North Boulevard W provides connectivity to Lee Jackson Highway/CR 547 to the east. The posted speed limit is 55 mph on US 27 (north and south of intersection), 30 mph on Holly Hill Cutoff Road (west of intersection) and 30 mph on North Boulevard W (east of intersection). Davenport Fire Station 2 was recently constructed on North Boulevard W, east of the study intersection.

The current context classification of this intersection is C2 (Rural) and future context classification C3C. An eight-hour turning movement count (TMC) was conducted in November 2018. Three (3) pedestrians and no cyclists were observed during the count.

Capacity Analysis: CAP-X was conducted for the years in which the No-Build configuration was determined to be failing using Synchro 10. For this intersection both 2030 AM/PM and 2045 AM/PM

analyses were conducted. 2030 and 2045 volumes were developed using 2030 and 2045 No-Build AADTs, selected K-factors and selected D-factors. The future year AADTs were developed by applying an annual growth rate of 2% to US 27 north and south of the intersection, 1% to Holly Hill Cutoff Road west of the intersection, and 3% to North Boulevard W east of the intersection. The intersection configurations evaluated were: Traffic Signal (No-Build), Full Median U-turn (MUT), Partial Median U-turn (PMUT), Signalized Restricted Crossing U-turn (RCUT), Full Displaced Left-Turn (DLT), Partial Displaced Left-Turn (PDLT), and a Modified Traffic Signal.

Safety Analysis: Crash data was reviewed for the five-year study period from 2013 through 2017. There were 47 crashes reported with annual occurrences of 5 crashes (2013), 7 (2014), 12(2015), 16 (2016), and 7 (2017). The predominant crash type was Angle (32%). None of the crashes involved a pedestrian or cyclist. 14 crashes resulted in an injury and none of the crashes resulted in a fatality.

Results: CAP-X results indicated a Full MUT, PMUT, signalized RCUT, Full DLT, PDLT, and Modified Traffic Signal all operate better than the No-Build Traffic Signal, with v/c ratios ranging from 0.6 to 1.21 using the 2030 and 2045 projected volumes. Of the alternatives analyzed, a PDLT and full DLT were both expected to operate with the lowest v/c ratios, ranging from 0.6 to 0.97. A Traffic Signal (No-Build scenario) was expected to operate with v/c ratios ranging from 0.79 to 1.23. The MUT, PMUT, and signalized RCUT all had the highest multimodal score of 6.3, and the DLT, PDLT, Traffic Signal, and Modified Traffic Signal all had a multimodal score of 4.8. The SPICE results indicate that a MUT would have 15% fewer total crashes than the base (No-Build) Traffic Signal and 30% fewer fatal/injury crashes (over 20 years). Compared to the Traffic Signal over the 20-year project life cycle, a PMUT was expected to have 7.5% fewer total crashes and 15% fewer fatal/injury crashes; a DLT was expected to have 12% fewer total crashes and 12% fewer fatal/injury crashes; a PDLT was expected to have 6% fewer total crashes and 6% fewer fatal/injury crashes; a signalized RCUT was expected to have 48.6% more total crashes and 8.3% fewer fatal/injury crashes; and the Modified Traffic Signal alternative was expected to have the same number of total and fatal/injury crashes. As mentioned previously the land to the east of the intersection is developed with commercial property, so right-of-way impacts should be discouraged there. However, the land immediately west of the intersection consists of agricultural and vacant land uses; therefore, right-of-way impacts to the west would likely be less impactful. Based on the Stage I analysis, three (3) alternatives were recommended to be carried forward into Stage II for further evaluation, as follows: Traffic Signal (No-Build), Partial MUT, and Partial DLT. Analysis results and recommendations are presented in **Table 3-20**.

TABLE 3-20: US 27 & HOLLY HILL CUTOFF ROAD ICE RESULTS AND RECOMMENDATIONS

US 27 & Holly Hill Cutoff Road					
Control Strategy Evaluated	AM Peak V/C	PM Peak V/C	Multimodal Score	SPICE Ranking	Recommended to be evaluated in Stage II ICE?
Traffic Signal (No-Build)	1.23	1.02	4.8	4	Yes
Full DLT	0.97	0.78	4.8	2	No
PDLT	0.97	0.78	4.8	2	Yes
Full MUT	1.10	0.85	6.3	1	No
PMUT	1.03	0.87	6.3	1	Yes
Signalized RCUT	1.00	0.81	6.3	3	No
Modified Traffic Signal	1.21	0.95	4.8	4	No

Appendix 20-A: Traffic Data

Appendix 20-B: Capacity Analysis for Planning of Junctions (CAP-X) Files

Appendix 20-C: Safety Performance for Intersection Control Evaluation (SPICE) Files

Appendix 20-D: Stage 1 ICE Form

Appendix 20-E: Crash Data

3.21 Sanders Road/Davenport Boulevard (MP: 18.677)

Background: A Stage 1 ICE analysis has been completed for the intersection of US 27 and CR 547/Davenport Boulevard/Sanders Road in Polk County. This analysis was conducted as part of the NE Polk US 27 Mobility Study, which has the overall objective of improving the mobility, safety, and livability along the US 27 corridor.

The intersection is currently a four-legged signalized intersection, with US 27 as the north and south legs. The surrounding area is rural, with some residential land uses east and west of the intersection. There are gas stations on the southeast and northeast corners of the intersection, with vacant land on the northwest and southwest corners. The posted speed limit is 55 mph on US 27 (north and south of intersection), 30 mph on Sanders Road (west of intersection) and 45 mph on Davenport Boulevard (east of intersection).

The current context classification of this intersection is C3C, and future context classification is C3C. An eight-hour turning movement count (TMC) was conducted in March 2016. A total of four (4) pedestrians and one (1) cyclist were observed during the count.

Capacity Analysis: CAP-X was conducted for the years in which the No-Build configuration was determined to be failing using Synchro 10. For this intersection both 2030 AM/PM and 2045 AM/PM analyses were conducted. 2030 and 2045 volumes were developed using 2030 and 2045 No-Build AADTs, selected K-factors and selected D-factors. The future year AADTs were developed by applying an annual growth rate of 2% to US 27 north and south of the intersection, 0.5% to Sanders Road west of the intersection, and 3% to Davenport Boulevard east of the intersection. The at-grade intersection configurations evaluated were: Traffic Signal, Full Median U-turn (MUT), Partial Median U-turn (PMUT), signalized Restricted Crossing U-turn (RCUT), Full Displaced Left-Turn (DLT), Partial Displaced Left-Turn

(PDLT), NE Quadrant Roadway, hybrid SB PDLT/NB PMUT, and Modified Traffic Signal. The grade-separated intersection configurations evaluated were: a Diamond Interchange, two Partial Cloverleafs (Parclo A & Parclo B), Displaced Left-Turn Interchange (DLT I), Diverging Diamond Interchange (DDI), and Single Point Urban Interchange (SPUI). All grade-separated alternatives were oriented east-west.

Safety Analysis: Crash data was reviewed for the five-year study period from 2013 through 2017. There were 136 crashes reported with annual occurrences of 10 crashes (2013), 25 (2014), 26 (2015), 23 (2016), and 52 (2017). The noticeable increase in crashes from 2016 to 2017 could potentially be attributed to the construction of the RaceTrac gas station/convenience store in the northeast quadrant. The predominant crash type was Rear End (50%). One crash involved a cyclist, and no crashes involved a pedestrian. 51 crashes resulted in an injury and one (1) crash resulted in a fatality. Initial crash data collection revealed no fatal crashes at this intersection; however, upon review of the fatal crash reports at South Boulevard, it was determined that one of the fatal crashes was incorrectly coded and actually occurred at CR 547/Davenport Boulevard/Sanders Road.

The sole fatal crash occurred in 2015 in clear weather, daylight, and dry roadway conditions. A vehicle was exiting the 7-Eleven in the northbound direction, turning left onto Davenport Boulevard as another vehicle, facing west, was waiting to turn left into the 7-Eleven. The driver of the first vehicle failed to see an eastbound motorcycle and pulled out in front of it, striking it and redirecting it into the second (stopped) vehicle. After colliding with both vehicles, the operator of the motorcycle was ejected and was fatally wounded.

Results: CAP-X results indicated that all alternatives operate better than the No-Build Traffic Signal, with at-grade v/c ratios ranging from 0.67 to 1.25 using the 2030 and 2045 projected volumes and grade-separated v/c ratios ranging from 0.26 to 0.58 using the 2045 projected volumes (grade-separated alternatives were not analyzed in year 2030).

Of the alternatives analyzed, Parclo A and Parclo B were expected to operate with the lowest v/c ratios, ranging from 0.26 to 0.33 using the 2045 projected volumes. A Traffic Signal (No-Build scenario) was expected to operate with v/c ratios ranging from 1.03 to 1.76 using the 2030 and 2045 projected volumes. The DDI had the highest multimodal score of 6.7 while the Parclo alternatives had the lowest multimodal scores of 3.0.

The at-grade alternatives were evaluated in SPICE. The SPICE results indicate that a Full MUT would have 15% fewer total crashes than the base (No-Build) Traffic Signal and 30% fewer fatal/injury crashes (over 20 years). Compared to the base Traffic Signal over the 20-year project life cycle, a PMUT was expected to have 7.5% fewer total crashes and 15% fewer fatal/injury crashes, a Full DLT was expected to have 13.3% fewer total crashes and 12% fewer fatal/injury crashes, a hybrid SB PDLT/NB PMUT was expected to have 13% fewer total crashes and 21% fewer fatal/injury crashes, a DLT was expected to have 12% fewer total crashes and 12% fewer fatal/injury crashes, a PDLT was expected to have 6% fewer total crashes and 6% fewer fatal/injury crashes, and a signalized RCUT was expected to have 99.9% more total crashes and 65.7% more fatal/injury crashes. As previously discussed, there are commercial properties present in the quadrants east of the intersections, so right-of-way takes to the east should be minimized if possible. The

land west of the intersection is vacant, so any right-of-way impacts would likely be less impactful. Based on the Stage I analysis, five (5) alternatives were recommended to be carried forward into Stage II for further evaluation, as follows: Traffic Signal (No-Build), Full DLT, hybrid SB PDLT/NB PMUT, Diamond Interchange, and SPUI. Analysis results and recommendations are presented in **Table 3-21**.

TABLE 3-21: US 27 & SANDERS ROAD/DAVENPORT BOULEVARD ICE RESULTS AND RECOMMENDATIONS

US 27 & Sanders Road/Davenport Boulevard					
Control Strategy Evaluated	AM Peak V/C	PM Peak V/C	Multimodal Score	SPICE Ranking	Recommended to be evaluated in Stage II ICE?
Traffic Signal (No-Build)	1.76	1.44	4.8	4	Yes
Full DLT	1.12	0.94	4.8	3	Yes
PDLT	1.22	1.00	4.8	3	No
Full MUT	1.25	1.06	6.3	1	No
PMUT	1.22	1.09	6.3	1	No
Signalized RCUT	1.14	0.95	6.3	6	No
NE Quadrant Roadway	1.23	1.05	4.4	-	No
Modified Traffic Signal	1.58	1.44	4.8	4	No
PDLT/PMUT Hybrid*	0.94/1.09	0.78/1.10	5.6	2	Yes
Traditional Diamond	0.48	0.58	4.8	-	Yes
Partial Cloverleaf A	0.26	0.33	3.0	-	No
Partial Cloverleaf B	0.32	0.27	3.0	-	No
DLT Interchange	0.42	0.53	4.8	-	No
DDI	0.42	0.53	6.7	-	No
SPUI	0.44	0.56	4.8	-	Yes

*PDLT/PMUT v/c ratios, respectively

Appendix 21-A: Traffic Data

Appendix 21-B: Capacity Analysis for Planning of Junctions (CAP-X) Files

Appendix 21-C: Safety Performance for Intersection Control Evaluation (SPICE) Files

Appendix 21-D: Stage 1 ICE Form

Appendix 21-E: Crash Data

3.22 South Boulevard (MP: 18.426)

Background: A Stage 1 ICE analysis has been completed for the intersection of US 27 and South Boulevard in Polk County. This analysis was conducted as part of the NE Polk US 27 Mobility Study, which has the overall objective of improving the mobility, safety, and livability along the US 27 corridor.

The intersection is currently a four-legged unsignalized intersection, with US 27 as the north and south legs. There is undeveloped property in the northwest and southeast corners of the study intersection. However, commercial and retail land uses are present in the northeast and southwest quadrants. South

Boulevard east of US 27 provides connectivity to residential developments and a high school. The posted speed limit is 55 mph on US 27 (north and south of the intersection), and 30 mph on South Boulevard east and west of US-27. There are no designated bike lanes near the intersection on US 27 or South Boulevard. Sidewalk is present along South Boulevard east of US 27, but not on US 27.

The current and future context classification of this intersection is C3C – Suburban Commercial. An eight-hour turning movement count (TMC) was conducted in November 2018. Of the two pedestrians recorded at the intersection, one crossed the north leg while the other crossed the east leg. No other bike or pedestrian activity was noted in this area. There are no transit stops at the intersection.

Capacity Analysis: CAP-X was conducted for the years in which the No-Build configuration was determined to be failing using Synchro 10. For this intersection both 2030 AM/PM and 2045 AM/PM analysis were conducted. 2030 and 2045 volumes were developed using 2030 and 2045 No-Build AADTs, selected K-factors and selected D-factors. The future year AADTs were developed by applying an annual growth rate of 2% to US 27 north and south of the intersection, and 3% to South Boulevard east of the intersection and 0.5% west of the intersection. The intersection configurations evaluated were: Two-Way Stop Controlled (TWSC) Full Median Opening (No-Build), Traffic Signal, Unsignalized Restricted Crossing U-turn (RCUT), Full Median U-turn (MUT), TWSC Closed Median, and TWSC Directional Opening. The Full MUT was evaluated at this unsignalized intersection as it may meet signal warrants.

Safety Analysis: Crash data was reviewed for the five-year study period from 2013 through 2017. There were 45 crashes reported with annual occurrences of 8 crashes (2013), 9 (2014), 8 (2015), 16 (2016), and 4 (2017). The predominant crash type was Rear End (28%). No bicycle or pedestrian crashes were reported during the five-year study period. Thirteen (13) crashes resulted in an injury and two fatal crashes were initially reported. The first fatal crash occurred in 2015 and was an angle crash that involved an eastbound vehicle and a northbound vehicle in daylight, clear weather, and dry pavement conditions. The eastbound driver attempted to complete a left turn from South Boulevard but violated the right-of-way of the northbound traveling vehicle.

A second fatal crash was initially reported at this intersection. However, upon review of the fatal crash reports, it was determined that this second fatal crash was incorrectly coded and actually occurred at CR 547/Davenport Boulevard/Sanders Road. This fatal crash is discussed in the CR 547/Davenport Boulevard/Sanders Road section.

Results: CAP-X results indicated a Two-Way Stop Controlled, Traffic Signal (Directional Opening), Two-Way Stop Controlled (Closed Median), Unsignalized Restricted Crossing U-turn (RCUT) and Full Median U-turn (MUT) all operate better than the No-Build TWSC Full Median Opening with v/c ratios ranging from 0.70 to 666.42 using the 2030 and 2045 projected volumes. Of the alternatives analyzed, a MUT was expected to operate with the lowest v/c ratios, ranging from 0.70 to 1.04. A TWSC Full Median Opening (No-Build scenario) was expected to operate with v/c ratios over 100. These extreme v/c ratios were caused by near zero capacity on the side streets. The Full MUT had the highest multimodal score of 6.3, traffic signal had a score of 4.8, unsignalized RCUT had a score of 4.4 and all the TWSC alternatives had a score of 3.7.

The SPICE results indicate that an unsignalized RCUT would have 12% fewer total crashes than the base (No-Build) TWSC Full Median Opening alternative and 75% fewer fatal/injury crashes (over 20 years). Compared to the base TWSC Full Median Opening alternative over the 20-year project life cycle, a Traffic Signal was expected to have 77% more total crashes but 3% fewer fatal/injury crashes, a full MUT was expected to have 51% more total crashes but 32% fewer fatal/injury crashes, and all other TWSC alternatives are expected to have the same number of total and fatal/injury crashes. Qualitatively, a closed median is expected to be safer than a directional median opening, which is expected to be safer than a full median opening.

Right-of-way impacts/costs for each alternative evaluated are anticipated to be minimal. The Unsignalized RCUT and full MUT may require some right-of-way if new U-turn bulb outs were to be constructed. Based on the Stage I analysis, five (5) alternatives were recommended to be carried forward into Stage II for further evaluation, as follows: TWSC Full Median Opening (No-Build), Traffic Signal, Unsignalized RCUT, full MUT and TWSC Closed Median. Analysis results and recommendations are presented in **Table 3-22**.

TABLE 3-22: US 27 & SOUTH BOULEVARD ICE RESULTS AND RECOMMENDATIONS

US 27 & South Boulevard					
Control Strategy Evaluated	AM Peak V/C	PM Peak V/C	Multimodal Score	SPICE Ranking	Recommended to be evaluated in Stage II ICE?
Full MUT	1.04	0.97	6.3	2	Yes
Traffic Signal	1.29	1.13	4.8	3	Yes
TWSC Full Median Opening (No-Build)	-101153.00	9442.08	3.7	4	Yes
TWSC Closed Median	13.49	6.98	3.7	4	Yes
TWSC Directional Median Opening	54.04	17.62	3.7	4	No
Unsignalized RCUT	666.42	187.96	4.4	1	Yes

Appendix 22-A: Traffic Data

Appendix 22-B: Capacity Analysis for Planning of Junctions (CAP-X) Files

Appendix 22-C: Safety Performance for Intersection Control Evaluation (SPICE) Files

Appendix 22-D: Stage 1 ICE Form

Appendix 22-E: Crash Data

3.23 Section 7 Airport Road/Parson Road/Patterson Road (MP: 17.658)

Background: A Stage 1 ICE analysis has been completed for the intersection of US 27 and Patterson Road / Section 7 Airport Road / Parson Road in Polk County. This analysis was conducted as part of the NE Polk US 27 Mobility Study, which has the overall objective of improving the mobility, safety, and livability along the US 27 corridor.

The intersection is currently a four-legged unsignalized intersection, with US 27 as the north and south legs. Along the west side of the intersection the land use is primarily agricultural, while on the east side

consists of some commercial/retail uses and residential developments. The posted speed limit is 55 mph on US 27 north and south of the intersection, and 40 mph on Patterson Road / Section 7 Airport Road / Parson Road east of the intersection.

The current and future context classification of this intersection is C3C – Suburban Commercial. An eight-hour turning movement count (TMC) was conducted in November 2018. During the traffic count, only one pedestrian was recorded. There are no transit stops at the intersection.

Capacity Analysis: CAP-X was conducted for the years in which the No-Build configuration was determined to be failing using Synchro 10. For this intersection both 2030 AM/PM and 2045 AM/PM analysis were conducted. 2030 and 2045 volumes were developed using 2030 and 2045 No-Build AADTs, selected K-factors and selected D-factors. The future year AADTs were developed by applying an annual growth rate of 2% to US 27 north and south of the intersection, 0.5% to Patterson Road / Section 7 Airport Road / Parson Road west of the intersection and 3% east of the intersection. The intersection configurations evaluated were: Two-Way Stop Controlled (TWSC) Full Median Opening (No-Build), Traffic Signal, Unsignalized Restricted Crossing U-turn (RCUT), TWSC Closed Median, and TWSC Directional Opening.

Safety Analysis: Crash data was reviewed for the five-year study period from 2013 through 2017. There were 26 crashes reported with annual occurrences of 2 crashes (2013), 8 (2014), 7 (2015), 8 (2016), and 1 (2017). The predominant crash type was Angle (30%) followed by Rear End (23%). No bicycle or pedestrian crashes were reported during the 5-year analysis period. Ten (10) crashes resulted in an injury and 1 crash resulted in a fatality. The fatal crash occurred in 2016 in clear weather, daylight, and dry roadway conditions. A northbound traveling motorcycle impacted a westbound passenger car attempting to complete a left turn onto southbound US-27. The motorcyclist was fatally wounded.

Results: CAP-X results indicated a Traffic Signal, Unsignalized Restricted Crossing U-turn (RCUT), Two-Way Stop Controlled (Directional Median Opening), and Two-Way Stop Controlled (Close Median) all operate better than the No-Build TWSC Full Median Opening, with v/c ratios ranging from 0.76 to 469.28 using the 2030 and 2045 projected volumes. Of the alternatives analyzed, a Traffic Signal was expected to operate with the lowest v/c ratios, ranging from 0.76 to 1.13. A Two-Way Stop Controlled configuration (No-Build scenario) was expected to operate with v/c ratios over 100 or even negative. These extreme v/c ratios were caused by near zero capacity on the side streets. The Traffic Signal had the highest multimodal score of 4.8, unsignalized RCUT had a score of 4.4 and all the TWSC alternatives had a score of 3.7.

The SPICE results indicate that an unsignalized RCUT would have 11% fewer total crashes than the base (No-Build) TWSC Full Median Opening alternative and 78% fewer fatal/injury crashes (over 20 years). Compared to the base TWSC Full Median Opening alternative over the 20-year project life cycle, a Traffic Signal was expected to have 85% more total crashes but 22% more fatal/injury crashes, and all other TWSC alternatives are expected to have the same number of total and fatal/injury crashes. Qualitatively, a closed median is expected to be safer than a directional median opening, which is expected to be safer than a full median opening.

Right-of-way impacts/costs for each alternative evaluated are anticipated to be minimal. The Unsignalized RCUT may require some right-of-way if new U-turn bulb outs were to be constructed. Based on the Stage I analysis, four (4) alternatives were recommended to be carried forward into Stage II for further evaluation, as follows: TWSC Full Median Opening (No-Build), Traffic Signal, Unsignalized RCUT, and TWSC Closed Median. Analysis results and recommendations are presented in **Table 3-23**.

TABLE 3-23: US 27 & SECTION 7 AIRPORT ROAD/PARSON ROAD/PATTERSON ROAD ICE RESULTS AND RECOMMENDATIONS

US 27 & Section 7 Airport Road/Parson Road/Patterson Road					
Control Strategy Evaluated	AM Peak V/C	PM Peak V/C	Multimodal Score	SPICE Ranking	Recommended to be evaluated in Stage II ICE?
Traffic Signal	1.13	1.05	4.8	3	Yes
TWSC Full Median Opening (No-Build)	-432.00	-595.00	3.7	2	Yes
TWSC Closed Median	9.65	5.32	3.7	2	Yes
TWSC Directional Median Opening	44.43	28.80	3.7	2	No
Unsignalized RCUT	469.28	111.32	4.4	1	Yes

Appendix 23-A: Traffic Data

Appendix 23-B: Capacity Analysis for Planning of Junctions (CAP-X) Files

Appendix 23-C: Safety Performance for Intersection Control Evaluation (SPICE) Files

Appendix 23-D: Stage 1 ICE Form

Appendix 23-E: Crash Data

3.24 Bates Road (MP: 17.291)

Background: A Stage 1 ICE analysis has been completed for the intersection of US 27 and Bates Road in Polk County. This analysis was conducted as part of the NE Polk US 27 Mobility Study, which has the overall objective of improving the mobility, safety, and livability along the US 27 corridor.

The intersection is currently a four-legged signalized intersection with US 27 as the north and south legs. Land uses east of the intersection are generally a mixture of commercial and residential. Immediately west of the intersection is commercial and agricultural uses. The posted speed limit is 55 mph on US 27 north and south of intersection), and 40 mph on Bates Road east of intersection. Bates Road west of the intersection functions as a driveway to an automobile dealership.

The current and future context classification of this intersection is C3C – Suburban Commercial. An eight-hour turning movement count (TMC) was conducted in March 2016. A count of bicycle and pedestrian activity was not available at this location. There are no transit stops at this intersection.

Capacity Analysis: CAP-X was conducted for the years in which the No-Build configuration was determined to be failing using Synchro 10. For this intersection both 2030 AM/PM and 2045 AM/PM

analysis were conducted. 2030 and 2045 volumes were developed using 2030 and 2045 No-Build AADTs, selected K-factors and selected D-factors. The future year AADTs were developed by applying an annual growth rate of 2% to US 27 north of the intersection, 2.75% to US 27 south of the intersection, 3% to Bates Road west of the intersection and 2% east of the intersection. The at-grade intersection configurations evaluated were Traffic Signal (No-Build), Signalized Restricted Crossing U-turn (RCUT), Full Displaced Left-Turn (DLT), Partial Displaced Left-Turn (PDLT), Full Median U-Turn (MUT), Partial Median U-Turn (PMUT), a hybrid SB PDLT/NB PMUT, and Modified Traffic Signal. The grade-separated intersection configurations evaluated were: Displaced Left-Turn Interchange (DLT I), Single Point Urban Interchange (SPUI), Diverging Diamond Interchange (DDI), and a Diamond Interchange.

Safety Analysis: Crash data was reviewed for the five-year study period from 2013 through 2017. There were 97 crashes reported with annual occurrences of 30 crashes (2013), 14 (2014), 23 (2015), 28 (2016), and 2 (2017). The predominant crash type was Rear End (63%). No bicycle or pedestrian crashes were reported during the five-year study period. Thirty-two (32) crashes resulted in an injury and 1 crash resulted in a fatality. The fatal crash occurred in 2017 and was a rear-end crash that involved two northbound vehicles in dark (with streetlight), clear weather, and dry pavement conditions. The driver of the following vehicle was traveling faster than the lead vehicle, which resulted in a collision that was ultimately fatal for the motorist of the following vehicle.

Results: CAP-X results indicated that all alternatives operate better than the No-Build Traffic Signal, with at-grade v/c ratios ranging from 0.71 to 1.27 using the 2030 and 2045 projected volumes and grade-separated v/c ratios ranging from 0.39 to 0.66 using the 2045 projected volumes (grade-separated alternatives were not analyzed in year 2030).

Of the alternatives analyzed, a DLT Interchange was expected to operate with the lowest v/c ratios, ranging from 0.39 to 0.54. A Traffic Signal (No Build scenario) was expected to operate with v/c ratios ranging from 1.11 to 1.50.

A DDI had the highest multimodal score (6.7). These were followed by the full MUT, PMUT, and RCUT configurations (multimodal score of 6.3), and the hybrid SB PDLT/NB PMUT configuration (multimodal score of 5.6). The alternatives with the lowest multimodal score of 4.8 are full DLT, PDLT, Traffic Signal, DLT Interchange, SPUI, and Diamond Interchange.

The at-grade alternatives were evaluated in SPICE. The SPICE results indicate that a Full MUT would have 15% fewer total crashes than the base (No-Build) Traffic Signal and 30% fewer fatal/injury crashes (over 20 years). Compared to the base Traffic Signal over the 20-year project life cycle, a PMUT was expected to have 7.5% fewer total crashes and 15% fewer fatal/injury crashes, a Full DLT was expected to have 12% fewer total crashes and 12% fewer fatal/injury crashes, a hybrid SB PDLT/NB PMUT was expected to have 13% fewer total crashes and 21% fewer fatal/injury crashes, a DLT was expected to have 12% fewer total crashes and 12% fewer fatal/injury crashes, a PDLT was expected to have 6% fewer total crashes and 6% fewer fatal/injury crashes, and a signalized RCUT was expected to have 188% more total crashes and 143% more fatal/injury crashes. Right-of-way impacts/costs for each alternative evaluated are anticipated to be minimal, although some configurations may require refinements to avoid impacting the west approach

that functions as a driveway to an existing automobile dealership. It is noted that some right-of-way may be necessary if large U-turn bulb outs were to be constructed. Based on the Stage I analysis, five (5) alternatives were recommended to be advanced into Stage II for further evaluation, as follows: Traffic Signal (No-Build), Partial Displaced Left-Turn (PDLT), Partial Median U-Turn (PMUT), hybrid SB PDLT/NB PMUT, and a Diamond Interchange. Analysis results and recommendations are presented in **Table 3-24**.

TABLE 3-24: US 27 & BATES ROAD ICE RESULTS AND RECOMMENDATIONS

US 27 & Bates Road					
Control Strategy Evaluated	AM Peak V/C	PM Peak V/C	Multimodal Score	SPICE Ranking	Recommended to be evaluated in Stage II ICE?
Traffic Signal (No-Build)	1.50	1.48	4.8	4	Yes
Full DLT	0.99	0.89	4.8	3	No
PDLT	1.02	0.91	4.8	3	Yes
Full MUT	1.13	1.01	6.3	1	No
PMUT	1.12	0.99	6.3	1	Yes
Signalized RCUT	1.14	1.05	6.3	5	No
Modified Traffic Signal	1.27	1.23	4.8	4	No
PDLT/PMUT Hybrid*	1.02/1.12	0.91/0.99	5.6	2	Yes
Traditional Diamond	0.61	0.66	4.8	-	Yes
DLT Interchange	0.39	0.54	4.8	-	No
DDI	0.52	0.60	6.7	-	No
SPUI	0.42	0.57	4.8	-	No

*PDLT/PMUT v/c ratios, respectively

Appendix 24-A: Traffic Data

Appendix 24-B: Capacity Analysis for Planning of Junctions (CAP-X) Files

Appendix 24-C: Safety Performance for Intersection Control Evaluation (SPICE) Files

Appendix 24-D: Stage 1 ICE Form

Appendix 24-E: Crash Data

3.25 Glen Este Boulevard/Southern Dunes (MP: 16.389)

Background: A Stage 1 ICE analysis has been completed for the intersection of US 27 and Glen Este Boulevard / Southern Dunes in Polk County. This analysis was conducted as part of the NE Polk US 27 Mobility Study, which has the overall objective of improving the mobility, safety, and livability along the US 27 corridor.

The intersection is currently a four-legged signalized intersection with US 27 as the north and south legs. Multiple commercial properties are located in all four quadrants of the intersection. A Walmart is located in the northeast corner and other major commercial generators are nearby. Southern Dunes Boulevard east of US 27 is a 4-lane road that provides access to commercial properties and a gated residential community. Glen Este Boulevard west of US 27 also provides access to commercial properties and a

residential mobile home community. The posted speed limit is 55 mph on US 27 north of intersection and 45 mph south of the intersection. Along Glen Estes Boulevard, the posted speed limit is 25 mph east and west of US-27.

The current and future context classification of this intersection is C3C-Suburban Commercial. An eight-hour turning movement count (TMC) was conducted in November 2018. Bicycle and pedestrian activity were observed across all 4 legs of the intersection, with 5 or more individuals crossing the west and north legs of the intersection. There are crosswalks, sidewalks, and 5-ft unmarked bike lanes on the north and south approaches. Transit stops are located immediately north of the intersection in the northbound and southbound directions of travel.

Capacity Analysis: CAP-X was conducted for the years in which the No-Build configuration was determined to be failing using Synchro 10. For this intersection both 2030 AM/PM and 2045 AM/PM analysis were conducted. 2030 and 2045 volumes were developed using 2030 and 2045 No-Build AADTs, selected K-factors and selected D-factors. The future year AADTs were developed by applying an annual growth rate of 2.75% to US 27 north and south of the intersection, while a growth rate of 0.5% was applied to Glen Estes Boulevard/Southern Dunes Boulevard east and west of the intersection. The intersection configurations evaluated were Traffic Signal (No-Build), Full Median U-turn (Full MUT), Partial Median U-turn (PMUT), Full Displaced Left Turn (Full DLT), Partial Displaced Left Turn (PDLT), Signalized Restricted Crossing U-turn (RCUT), and a Modified Traffic Signal.

Safety Analysis: Crash data was reviewed for the five-year study period from 2013 through 2017. There were 70 crashes reported with annual occurrences of 7 crashes (2013), 15 (2014), 21 (2015), 25 (2016), and 2 (2017). The predominant crash type was Rear End (67%). There was only one reported crash involving a cyclist, and no reported crashes with pedestrians. Twenty-five (25) crashes resulted in an injury and no fatal crashes were reported.

Results: CAP-X results indicated a Modified Traffic Signal, Full Median U-Turn (Full MUT), Partial Median U-turn (PMUT), Full Displaced Left Turn (Full DLT), Partial Displaced Left Turn (PDLT), and Signalized Restricted Crossing U-turn (RCUT). all operate better than the No-Build Traffic Signal with v/c ratios ranging from 0.65 to 1.20 using the 2030 and 2045 projected volumes.

Of the alternatives analyzed, a Full DLT was expected to operate with the lowest v/c ratios, ranging from 0.65 to 0.96 using the 2030 and 2045 projected volumes. A Traffic Signal (No Build scenario) was expected to operate with v/c ratios ranging from 0.84 to 1.30. Full MUT, PMUT, and RCUT received the highest multimodal score reported (6.3), while Full DLT, PDLT and Traffic Signal control configurations received the lowest multimodal score (4.8).

The SPICE results indicate that a Full MUT would have 15% fewer total crashes than the base (No-Build) Traffic Signal and 30% fewer fatal/injury crashes (over 20 years). Compared to the base Traffic Signal over the 20-year project life cycle, a PMUT was expected to have 7.5% fewer total crashes and 15% fewer fatal/injury crashes, a Full DLT was expected to have 12% fewer total crashes and 12% fewer fatal/injury crashes, a DLT was expected to have 12% fewer total crashes and 12% fewer fatal/injury crashes, a PDLT

was expected to have 6% fewer total crashes and 6% fewer fatal/injury crashes, and a signalized RCUT was expected to have 596% more total crashes and 171% more fatal/injury crashes.

All four corners of the intersection contain some development so large right-of-way impacts/costs should be anticipated with any major improvements. Based on the Stage I analysis, three (3) alternatives were recommended to be carried forward into Stage II for further evaluation, as follows: Traffic Signal (No-Build), Full Displaced Left-Turn, and Partial Displaced Left-Turn. Analysis results and recommendations are presented in **Table 3-25**.

TABLE 3-25: US 27 & GLEN ESTE BOULEVARD/SOUTHERN DUNES ICE RESULTS AND RECOMMENDATIONS

US 27 & Glen Este Boulevard/Southern Dunes					
Control Strategy Evaluated	AM Peak V/C	PM Peak V/C	Multimodal Score	SPICE Ranking	Recommended to be evaluated in Stage II ICE?
Traffic Signal (No-Build)	1.30	1.23	4.8	3	Yes
Full DLT	0.96	0.92	4.8	2	Yes
PDLT	0.99	0.96	4.8	2	Yes
Full MUT	1.03	1.00	6.3	1	No
PMUT	1.06	0.99	6.3	1	No
Signalized RCUT	0.99	0.97	6.3	5	No
Modified Traffic Signal	1.20	1.17	4.8	3	No

Appendix 25-A: Traffic Data

Appendix 25-B: Capacity Analysis for Planning of Junctions (CAP-X) Files

Appendix 25-C: Safety Performance for Intersection Control Evaluation (SPICE) Files

Appendix 25-D: Stage 1 ICE Form

Appendix 25-E: Crash Data

3.26 CR 17/Old Polk City Road (MP: 16.138)

Background: A Stage 1 ICE analysis has been completed for the intersection of US 27 and CR 17 / Old Polk City Road in Polk County. This analysis was conducted as part of the NE Polk US 27 Mobility Study, which has the overall objective of improving the mobility, safety, and livability along the US 27 corridor.

The intersection is currently a four-legged signalized intersection, with US 27 as the north and south legs. The land uses surrounding this intersection are primarily commercial in each of the four quadrants. CR 17 / Old Polk City Road provides connectivity to residential communities further the east and west. The posted speed limit is 45 mph on US 27 north and south of the intersection. The posted speed limit on CR 17 / Old Polk City Road is 35 mph immediately east and west of intersection.

The current and future context classification of this intersection is C3C-Suburban Commercial. An eight-hour turning movement count (TMC) was conducted in March 2016. There are crosswalks on all four approaches and bus-stops located on the westbound approach (east leg), approximately 300 feet from

the intersection. During the 8-hour turning movement count, there was fewer than 10 observed pedestrians for all approaches of the intersection. Bicycle activity was observed with less intensity (fewer than 5 cyclists) in each approach except the eastbound approach.

Capacity Analysis: CAP-X was conducted for the years in which the No-Build configuration was determined to be failing using Synchro 10. For this intersection both 2030 AM/PM and 2045 AM/PM analysis were conducted. 2030 and 2045 volumes were developed using 2030 and 2045 No-Build AADTs, selected K-factors and selected D-factors. The future year AADTs were developed by applying an annual growth rate of 2.75% to US 27 north and south of the intersection, while a growth rate of 2% and 0.5% was applied to CR 17 / Old Polk City Road west and east of the intersection, respectively. The at-grade intersection configurations evaluated were: Traffic Signal (No-Build), Full Median U-turn (MUT), Partial Median U-turn (PMUT), Signalized Restricted Crossing U-turn (RCUT), Full Displaced Left-Turn (DLT), Partial Displaced Left-Turn (PDLT), a hybrid SB PDLT/NB PMUT, NE Quadrant Roadway, and Modified Traffic Signal. The grade-separated intersection configurations evaluated were: Diamond Interchange, Diverging Diamond Interchange (DDI), Partial Cloverleaf A, Partial Cloverleaf B, Displaced Left-Turn Interchange (DLT I), and Single Point Urban Interchange (SPUI).

Safety Analysis: Crash data was reviewed for the five-year study period from 2013 through 2017. There were 128 crashes reported with annual occurrences of 26 crashes (2013), 22 (2014), 32 (2015), 47 (2016), and 1 (2017). The predominant crash type was Rear End (53%). No pedestrian or bicycle crashes were reported during the 5-year analysis period. Thirty-five (35) crashes resulted in an injury and no fatal crashes were reported.

Results: CAP-X results indicated that all alternatives operate better than the No-Build Traffic Signal with at-grade v/c ratios ranging from 0.73 to 1.49 using the 2030 and 2045 projected volumes and grade-separated v/c ratios ranging from 0.35 to 0.91 using the 2045 projected volumes (grade-separated alternatives were not analyzed in year 2030).

Of the alternatives analyzed, a Partial Cloverleaf B was expected to operate with the lowest v/c ratios, ranging from 0.35 to 0.39. A Traffic Signal (No Build scenario) was expected to operate with v/c ratios ranging from 1.10 to 1.60. A DDI received the highest multimodal score reported (6.7), while Full MUT, PMUT, and RCUT received the next highest multimodal score reported (6.3). The Partial Cloverleaf A and Partial Cloverleaf B configurations received the lowest multimodal score (3.0).

The at-grade alternatives were evaluated in SPICE. The SPICE results indicate that a full MUT would have 15% fewer total crashes than the base Traffic Signal alternative and 30% fewer fatal/injury crashes (over 20 years). Compared to the base Traffic Signal alternative over the 20-year project life cycle, a partial MUT was expected to have 7.5% fewer total crashes and 15% fewer fatal/injury crashes; a full DLT was expected to have 12% fewer total crashes and 12% fewer fatal/injury crashes; a partial DLT was expected to have 6% fewer total crashes and 6% fewer fatal/injury crashes; a signalized RCUT was expected to have 480% more total crashes and 151% more fatal/injury crashes; and the Modified Traffic Signal was expected to have the same number of total and fatal/injury crashes as the No-Build scenario. SPICE cannot be conducted on a quadrant intersection. All four quadrants of the intersection are developed. Therefore, it is anticipated

that right-of-way impacts/costs would coincide with any major intersection improvements. Based on the Stage I analysis, five (5) alternatives were recommended to be carried forward into Stage II for further evaluation, as follows: Traffic Signal (No-Build), Full Displaced Left-Turn (DLT), hybrid SB PDLT/NB PMUT, DDI, and SPUI. Analysis results and recommendations are presented in **Table 3-26**.

TABLE 3-26: US 27 & CR 17/OLD POLK CITY ROAD ICE RESULTS AND RECOMMENDATIONS

US 27 & CR 17/Old Polk City Road					
Control Strategy Evaluated	AM Peak V/C	PM Peak V/C	Multimodal Score	SPICE Ranking	Recommended to be evaluated in Stage II ICE?
Traffic Signal (No-Build)	1.60	1.56	4.8	4	Yes
Full DLT	1.07	1.09	4.8	3	Yes
PDLT	1.07	1.09	4.8	3	No
Full MUT	1.12	1.05	6.3	1	No
PMUT	1.20	1.14	6.3	1	No
Signalized RCUT	1.10	1.09	6.3	5	No
NE Quadrant Roadway	1.27	1.23	4.4	-	No
Modified Traffic Signal	1.47	1.49	4.8	4	No
PDLT/PMUT Hybrid*	1.07/1.20	1.09/1.14	5.6	2	Yes
Traditional Diamond	0.81	0.91	4.8	-	No
Partial Cloverleaf A	0.46	0.48	3.0	-	No
Partial Cloverleaf B	0.39	0.35	3.0	-	No
DLT Interchange	0.51	0.59	4.8	-	No
DDI	0.68	0.68	4.8	-	Yes
SPUI	0.54	0.62	4.8	-	Yes

*PDLT/PMUT v/c ratios, respectively

Appendix 26-A: Traffic Data

Appendix 26-B: Capacity Analysis for Planning of Junctions (CAP-X) Files

Appendix 26-C: Safety Performance for Intersection Control Evaluation (SPICE) Files

Appendix 26-D: Stage 1 ICE Form

Appendix 26-E: Crash Data

3.27 Commerce Avenue/Pilot Entrance (MP: 15.872)

Background: A Stage 1 ICE analysis has been completed for the intersection of US 27 and Commerce Avenue / Pilot Entrance in Polk County. This analysis was conducted as part of the NE Polk US 27 Mobility Study, which has the overall objective of improving the mobility, safety, and livability along the US 27 corridor.

The intersection is currently a four-legged signalized intersection with US 27 as the north and south legs. The immediate land uses in the area are commercial. The east leg provides direct access to a Pilot gas station that is also a travel center with semi-truck parking and restaurants. The northwest quadrant

contains automotive businesses, while the southwest quadrant includes a restaurant and other commercial uses. Commerce Avenue provides connectivity to residential dwelling units to the west.

The posted speed limit is 45 mph on US 27 north and south of the intersection). The posted speed limit on Commerce Avenue / Pilot Entrance west of the intersection is 25 mph. The east approach of the intersection operates as a driveway to commercial developments immediately adjacent to the corridor.

The current and future context classification of this intersection is C3C-Suburban Commercial. An eight-hour turning movement count (TMC) was conducted in November 2018. There are pedestrian crosswalks on all four approaches, although bike lanes are not present. During the 8-hour turning movement count, less than 5 pedestrians and cyclists were observed traveling through the study intersection.

Capacity Analysis: CAP-X was conducted for the years in which the No-Build configuration was determined to be failing using Synchro 10. For this intersection both 2030 AM/PM and 2045 AM/PM analysis were conducted. 2030 and 2045 volumes were developed using 2030 and 2045 No-Build AADTs, selected K-factors and selected D-factors. The future year AADTs were developed by applying an annual growth rate of 2.75% to US 27 north and south of the intersection, while 0.5% was applied to Commerce Avenue / Pilot Entrance east and west of US-27. The intersection configurations evaluated were: Traffic Signal (No-Build), Full Median U-turn (MUT), Partial Median U-turn (PMUT), Signalized Restricted Crossing U-turn (RCUT), SW Quadrant Roadway, Full Displaced Left-Turn (DLT), Partial Displaced Left-Turn (PDLT), and a Modified Traffic Signal.

Safety Analysis: Crash data was reviewed for the five-year study period from 2013 through 2017. There were 61 crashes reported with annual occurrences of 18 crashes (2013), 24 (2014), 30 (2015), 26 (2016), and 1 (2017). The predominant crash type was Rear End (61%). No pedestrian or bicycle crashes were reported during the 5-year period. Seventeen (17) crashes resulted in an injury and no fatal crashes were reported between 2013 and 2017.

Results: CAP-X results indicated a Modified Traffic Signal, Full Median U-turn (MUT), Partial Median U-turn (PMUT), Signalized Restricted Crossing U-turn (RCUT), SW Quadrant Roadway, Full Displaced Left-Turn (DLT), and Partial Displaced Left-Turn (PDLT) all operate better than the No-Build Traffic Signal with v/c ratios ranging from 0.61 to 1.15 using the 2030 and 2045 projected volumes.

Of the alternatives analyzed, a Full Displaced Left-Turn (DLT) configuration was expected to operate with the lowest v/c ratios, ranging from 0.61 to 0.94. A Traffic Signal (No Build scenario) was expected to operate with v/c ratios ranging from 0.77 to 1.17. Full Displaced Left-Turn (DLT), Partial Displaced Left-Turn (PDLT), and Signalized Restricted Crossing U-turn (RCUT) received the highest multimodal score reported (6.3), while the SW Quadrant Roadway alternative received the lowest multimodal score (4.4).

The SPICE results indicate that a full MUT would have 15% fewer total crashes than the base Traffic Signal alternative and 30% fewer fatal/injury crashes (over 20 years). Compared to the base Traffic Signal alternative over the 20-year project life cycle, a partial MUT was expected to have 7.5% fewer total crashes and 15% fewer fatal/injury crashes; a full DLT was expected to have 12% fewer total crashes and 12%

fewer fatal/injury crashes; a partial DLT was expected to have 6% fewer total crashes and 6% fewer fatal/injury crashes; a signalized RCUT was expected to have 381% more total crashes and 74% more fatal/injury crashes; and the Modified Traffic Signal was expected to have the same number of total and fatal/injury crashes as the No-Build scenario. SPICE cannot be conducted on a quadrant intersection. All four corners of the intersection contain some development so right-of-way impacts/costs should be anticipated with any major intersection improvements. Based on the Stage I analysis, four (4) alternatives were recommended to be carried forward into Stage II for further evaluation, as follows: Traffic Signal (No-Build), Full Median U-turn (MUT), Partial Median U-turn (PMUT) and Partial Displaced Left-Turn (PDLT). Analysis results and recommendations are presented in **Table 3-27**.

TABLE 3-27: US 27 & COMMERCE AVENUE/PILOT ENTRANCE ICE RESULTS AND RECOMMENDATIONS

US 27 & Commerce Avenue/Pilot Entrance					
Control Strategy Evaluated	AM Peak V/C	PM Peak V/C	Multimodal Score	SPICE Ranking	Recommended to be evaluated in Stage II ICE?
Traffic Signal (No-Build)	1.17	1.16	4.8	3	Yes
Full DLT	0.94	0.89	4.8	2	No
PDLT	0.97	0.92	4.8	2	Yes
Full MUT	0.98	0.99	6.3	1	Yes
PMUT	0.99	0.99	6.3	1	Yes
Signalized RCUT	0.95	0.95	6.3	5	No
SW Quadrant Roadway	1.00	0.96	4.4	-	No
Modified Traffic Signal	1.15	1.11	4.8	3	No

Appendix 27-A: Traffic Data

Appendix 27-B: Capacity Analysis for Planning of Junctions (CAP-X) Files

Appendix 27-C: Safety Performance for Intersection Control Evaluation (SPICE) Files

Appendix 27-D: Stage 1 ICE Form

Appendix 27-E: Crash Data

3.28 W Johnson Avenue (MP: 15.628)

Background: A Stage 1 ICE analysis has been completed for the intersection of US 27 and West Johnson Avenue / Officer Horner Memorial Lane in Polk County. This analysis was conducted as part of the NE Polk US 27 Mobility Study, which has the overall objective of improving the mobility, safety, and livability along the US 27 corridor.

The intersection is currently a four-legged unsignalized intersection with US 27 as the north and south legs. The Haines City Police Department is situated immediately northwest of the intersection, a commercial freight truck business is in the northeast quadrant, while commercial land uses are present in the southeast corner. The property located in the southwest quadrant is currently vacant. The posted speed limit on US 27 north and south of the intersection is 45 mph. The posted speed limit on West

Johnson Avenue / Officer Horner Memorial Lane east and west of the intersection is 25 mph, as this minor street functions as a local facility for a limited amount of development.

The current and future context classification of this intersection is C3C-Suburban Commercial. An eight-hour turning movement count (TMC) was conducted in November 2018. Neither crosswalks nor bicycle lanes are present in any of the four approaches of the intersection. Turning movement counts revealed minor (fewer than 5) pedestrian and cyclist activity along the east and west legs. Similarly, fewer than 5 cyclists were observed traveling along the north and south legs. No transit stops are located near this intersection.

Capacity Analysis: CAP-X was conducted for the years in which the No-Build configuration was determined to be failing using Synchro 10. For this intersection both 2030 AM/PM and 2045 AM/PM analysis were conducted. 2030 and 2045 volumes were developed using 2030 and 2045 No-Build AADTs, selected K-factors and selected D-factors. The future year AADTs were developed by applying an annual growth rate of 2.75% to US 27 north and south of the intersection, while a 1% growth rate was applied to volumes on West Johnson Avenue east and west of the US-27 corridor. The intersection configurations evaluated were: TWSC Full Median Opening (No-Build), Traffic Signal, Unsignalized RCUT, Full Median Crossing U-turn (MUT) and TWSC Closed Median. The Full MUT was evaluated at this unsignalized intersection as it may meet signal warrants.

Safety Analysis: Crash data was reviewed for the five-year study period from 2013 through 2017. There were 27 crashes reported with annual occurrences of 3 crashes (2013), 0 (2014), 12 (2015), 11 (2016), and 1 (2017). The predominant crash types were Rear End and Angle (each at 25%). No pedestrian or bicycle crashes were reported during the 5-year period. Six (6) crashes resulted in an injury and 1 fatal crash was reported. The fatal crash occurred in 2016 and was classified as an Other (Fixed Object) crash that involved a southbound traveling vehicle. It occurred in daylight, clear weather, and dry pavement conditions. The southbound driver's vehicle left the travel way and impacted a fixed object (street light pole) located in the southwest corner of the intersection.

Results: CAP-X results indicated a Traffic Signal, Unsignalized Restricted Crossing U-turn (RCUT), Full Median Crossing U-turn (MUT) and Two-Way Stop Controlled (Closed Median) all operate better than the No-Build TWSC Full Median Opening with v/c ratios ranging from 0.64 to 278.57 using the 2030 and 2045 projected volumes. Of the alternatives analyzed, a Full MUT was expected to operate with the lowest v/c ratios, ranging from 0.64 to 0.97. A TWSC Full Median Opening (No-Build scenario) was expected to operate with v/c ratios over 100. These extreme v/c ratios were caused by near zero capacity on the side streets. The full MUT had the highest multimodal score of 6.3, traffic signal had a score of 4.8, unsignalized RCUT had a score of 4.4 and all the TWSC alternatives had a score of 3.7.

The SPICE results indicate that an unsignalized RCUT would have 81% more total crashes than the base (No-Build) TWSC Full Median Opening alternative but 32% fewer fatal/injury crashes (over 20 years). Compared to the base TWSC Full Median Opening alternative over the 20-year project life cycle, a Traffic Signal was expected to have 34% more total crashes and 48% more fatal/injury crashes, a full MUT was expected to have 15% more total crashes and 4% more fatal/injury crashes, and all other TWSC

alternatives are expected to have the same number of total and fatal/injury crashes. Qualitatively, a closed median is expected to be safer than a directional median opening, which is expected to be safer than a full median opening.

Right-of-way impacts/costs for each alternative evaluated are anticipated to be minimal. The Unsignalized RCUT and full MUT may require some right-of-way if new U-turn bulb outs were to be constructed. Based on the Stage I analysis, five (5) alternatives were recommended to be carried forward into Stage II for further evaluation, as follows: TWSC Full Median Opening (No-Build), Traffic Signal, Unsignalized RCUT, full MUT and TWSC Closed Median. Analysis results and recommendations are presented in **Table 3-28**.

TABLE 3-28: US 27 & W JOHNSON AVENUE ICE RESULTS AND RECOMMENDATIONS

US 27 & W Johnson Avenue					
Control Strategy Evaluated	AM Peak V/C	PM Peak V/C	Multimodal Score	SPICE Ranking	Recommended to be evaluated in Stage II ICE?
Full MUT	0.97	0.87	6.3	3	Yes
Traffic Signal	1.15	1.04	4.8	4	Yes
TWSC Full Median Opening (No-Build)	723.56	782.50	3.7	2	Yes
TWSC Closed Median	4.65	2.35	3.7	2	Yes
Unsignalized RCUT	278.57	75.67	4.4	1	Yes

Appendix 28-A: Traffic Data

Appendix 28-B: Capacity Analysis for Planning of Junctions (CAP-X) Files

Appendix 28-C: Safety Performance for Intersection Control Evaluation (SPICE) Files

Appendix 28-D: Stage 1 ICE Form

Appendix 28-E: Crash Data

3.29 Paradise Island Place/Sunshine Drive (MP: 12.195)

Background: A Stage 1 ICE analysis has been completed for the intersection of US 27 and Paradise Island Place / Sunshine Drive in Polk County. This analysis was conducted as part of the NE Polk US 27 Mobility Study, which has the overall objective of improving the mobility, safety, and livability along the US 27 corridor.

The intersection is currently a four-legged unsignalized intersection with US 27 as the north and south legs. This land uses adjacent to it are primarily agricultural or residential. Paradise Island RV Park is located east of US 27 and Lake Region Village is located on the west side of the corridor. It is noted that a convenience store with several fueling positions is situated in the southeast corner of the study intersection.

This intersection provides direct connectivity to residential communities a straddling US-27 on the east and west sides. The posted speed limit is 60 mph on US 27 north and south of the study intersection. The

speed limit on Paradise Island Place / Sunshine Drive is 25 mph east and west of US-27 as both approaches function as the primary driveway access to residential communities.

The current context classification of this intersection is C2 Rural while the future context classification is C3C-Suburban Commercial. An eight-hour turning movement count (TMC) was conducted in November 2018. There are no crosswalks or bicycle lanes installed along any of the approaches. Traffic counts did not record any pedestrian or bicycle activity. There are no transit stops at the intersection.

Capacity Analysis: CAP-X was conducted for the years in which the No-Build configuration was determined to be failing using Synchro 10. For this intersection both 2030 AM/PM and 2045 AM/PM analysis were conducted. 2030 and 2045 volumes were developed using 2030 and 2045 No-Build AADTs, selected K-factors and selected D-factors. The future year AADTs were developed by applying an annual growth rate of 2.75% to US 27 north and south of the intersection, while a growth rate of 0.5% was applied to Paradise Island Place / Sunshine Drive east and west of US 27. The intersection configurations evaluated were: TWSC Full Median Opening (No-Build), Traffic Signal, Unsignalized RCUT, and TWSC Closed Median.

Safety Analysis: Crash data was reviewed for the five-year study period from 2013 through 2017. There were 14 crashes reported with annual occurrences of 3 crashes (2013), 2 (2014), 4 (2015), 4 (2016), and 1 (2017). The predominant crash type was Rear End (28%) followed by Other (21%). No bicycle or pedestrian crashes were reported during the five-year study period. Eight (8) crashes resulted in an injury and 1 crash was recorded with a fatality. The fatal crash occurred in 2017 and was a left-turn crash that involved a northbound left-turning vehicle and a southbound motorcyclist. The collision occurred in dusk, clear weather, and dry pavement conditions. The northbound driver attempted to complete a left turn onto Sunshine Drive but was struck by the southbound vehicle on the passenger side.

Results: CAP-X results indicated a Traffic Signal, Unsignalized Restricted Crossing U-turn (RCUT), and Two-Way Stop Controlled (Closed Median) all operate better than the No-Build TWSC Full Median Opening with v/c ratios ranging from 0.43 to 22.22 using the 2030 and 2045 projected volumes. Of the alternatives analyzed, a Traffic Signal was expected to operate with the lowest v/c ratios, ranging from 0.56 to 0.81. A Two-Way Stop Controlled (No-Build) scenario was expected to operate with v/c ratios over 100 or even negative. These extreme v/c ratios were caused by near zero capacity on the side streets. The Traffic Signal had the highest multimodal score of 4.8, unsignalized RCUT had a score of 4.4 and all the TWSC alternatives had a score of 3.7.

The SPICE results indicate that an unsignalized RCUT would have 33% fewer total crashes than the base (No-Build) TWSC Full Median Opening alternative and 63% fewer fatal/injury crashes (over 20 years). Compared to the base TWSC Full Median Opening alternative over the 20-year project life cycle, a Traffic Signal was expected to have 71% more total crashes and 10% more fatal/injury crashes, and all other TWSC alternatives are expected to have the same number of total and fatal/injury crashes. Qualitatively, a closed median is expected to be safer than a directional median opening, which is expected to be safer than a full median opening.

Right-of-way impacts/costs for each alternative evaluated are anticipated to be minimal. The Unsignalized RCUT may require some right-of-way if new U-turn bulb outs were to be constructed. Based on the Stage I analysis, four (4) alternatives were recommended to be carried forward into Stage II for further evaluation, as follows: TWSC Full Median Opening (No-Build), Traffic Signal, Unsignalized RCUT, and TWSC Closed Median. Analysis results and recommendations are presented in **Table 3-29**.

TABLE 3-29: US 27 & PARADISE ISLAND PLACE/SUNSHINE DRIVE ICE RESULTS AND RECOMMENDATIONS

US 27 & Paradise Island Place/Sunshine Drive					
Control Strategy Evaluated	AM Peak V/C	PM Peak V/C	Multimodal Score	SPICE Ranking	Recommended to be evaluated in Stage II ICE?
Traffic Signal	0.81	0.78	4.8	3	Yes
TWSC Full Median Opening (No-Build)	120853.44	8052.08	3.7	2	Yes
TWSC Closed Median	1.10	1.05	3.7	2	Yes
Unsignalized RCUT	22.22	15.16	4.4	1	Yes

Appendix 29-A: Traffic Data

Appendix 29-B: Capacity Analysis for Planning of Junctions (CAP-X) Files

Appendix 29-C: Safety Performance for Intersection Control Evaluation (SPICE) Files

Appendix 29-D: Stage 1 ICE Form

Appendix 29-E: Crash Data

3.30 Kokomo Road (MP: 11.288)

Background: A Stage 1 ICE analysis has been completed for the intersection of US 27 and Kokomo Road in Polk County. This analysis was conducted as part of the NE Polk US 27 Mobility Study, which has the overall objective of improving the mobility, safety, and livability along the US 27 corridor.

The tee intersection is currently a three-legged unsignalized intersection with US 27 as the north and south legs, and Kokomo Road as the east leg. It is, however, planned to be signalized in the near future. The signalization project has a project letting date of July 2023. The primary land use near the intersection is agricultural as much of the area is rural. There is a mixture of commercial uses in the northeast and northwest quadrants of the intersection. Kokomo Road represents an important link to FL-17 for drivers traveling on US-27. The posted speed limit is 60 mph on US 27 north and south of intersection, and 55 mph on Kokomo Road east of intersection.

The current context classification of this intersection is C2 Rural and future context classification is C3C-Suburban Commercial. An eight-hour turning movement count (TMC) was conducted in November 2018. There are no crosswalks or bicycle lanes provided on any of the approaches. During the 8-hour turning movement count, there was no recorded pedestrian or cyclist activity. Further, there are no transit stops at the intersection.

Capacity Analysis: CAP-X was conducted for the years in which the No-Build configuration was determined to be failing using Synchro 10. For this intersection only 2045 AM and PM analysis was conducted as the No-Build condition operated adequately in 2030. 2045 volumes were developed using 2045 No-Build AADTs, selected K-factors and selected D-factors. The future year AADTs were developed by applying an annual growth rate of 2.75% to US 27 north and south of the intersection, and 4% to Kokomo Road east of the intersection. The intersection configurations evaluated were: Traffic Signal (No-Build), Signalized Restricted Crossing U-turn (RCUT), Continuous Green Tee, NE Quadrant Roadway, and Modified Traffic Signal.

Safety Analysis: Crash data was reviewed for the five-year study period from 2013 through 2017. There were 22 crashes reported with annual occurrences of 4 crashes (2013), 4 (2014), 4 (2015), 5 (2016), and 5 (2017). The predominant crash types are Rear End and Angle, each with 36% of the occurrences. No pedestrian or bicycle crashes were reported. Nine (9) crashes resulted in an injury while no crashes resulted in a fatality.

Results: CAP-X results indicated a Modified Traffic Signal, Signalized Restricted Crossing U-turn (RCUT), Continuous Green Tee, and NE Quadrant Roadway all operate better than the No-Build Traffic Signal. Volume-to-capacity ratios ranged between 0.78 and 1.03 using the 2045 projected volumes. Of the alternatives analyzed, a Signalized Restricted Crossing U-turn (RCUT) was expected to operate with the lowest v/c ratios, ranging from 0.78 to 0.81. A Traffic Signal (No-Build scenario by 2045) was expected to operate with v/c ratios ranging from 1.07 to 1.17. A Signalized Restricted Crossing U-turn (RCUT) configuration received the highest multimodal score reported (6.3), while the Continuous Green Tee alternative received the lowest multimodal score (3.0).

The SPICE results indicate that a Continuous Green Tee alternative would have 4% fewer total crashes than the base Traffic Signal configuration and 15% fewer fatal/injury crashes (over 20 years). Compared to the base Traffic Signal, a Signalized Restricted Crossing U-turn (RCUT) was expected to have 488% more total crashes and 287% more fatal/injury crashes. The Modified Traffic Signal was expected to have the same number of total crashes and fatal/injury crashes as the No-Build scenario. SPICE cannot be conducted on a quadrant intersection.

Right-of-way impacts are generally anticipated to be minimal. However, potential improvements associated with the NE Quadrant Roadway alternative may require some right-of-way near Roberts Road northeast of the study intersection. Based on the Stage I analysis, three (3) alternatives were recommended to be carried forward into Stage II for further evaluation, as follows: Traffic Signal (No-Build), Continuous Green Tee, and NE Quadrant Roadway. Analysis results and recommendations are presented in **Table 3-30**.

TABLE 3-30: US 27 & KOKOMO ROAD ICE RESULTS AND RECOMMENDATIONS

US 27 & Kokomo Road					
Control Strategy Evaluated	AM Peak V/C	PM Peak V/C	Multimodal Score	SPICE Ranking	Recommended to be evaluated in Stage II ICE?
Traffic Signal (No-Build)	1.17	1.07	4.8	2	Yes
Signalized RCUT	0.81	0.78	6.3	4	No
NE Quadrant Roadway	0.91	0.90	4.4	-	Yes
Modified Traffic Signal	1.03	1.01	4.8	2	No
Continuous Green Tee	0.91	0.90	3.0	1	Yes

Appendix 30-A: Traffic Data

Appendix 30-B: Capacity Analysis for Planning of Junctions (CAP-X) Files

Appendix 30-C: Safety Performance for Intersection Control Evaluation (SPICE) Files

Appendix 30-D: Stage 1 ICE Form

Appendix 30-E: Crash Data

3.31 Crump Road/W Main Street (MP: 10.493)

Background: A Stage 1 ICE analysis has been completed for the intersection of US 27 and Crump Road/W Main Street in Polk County. This analysis was conducted as part of the NE Polk US 27 Mobility Study, which has the overall objective of improving the mobility, safety, and livability along the US 27 corridor.

The intersection is currently a four-legged signalized intersection, with US 27 as the north and south legs. The land use surrounding the intersection is mainly commercial. The posted speed limit is 60 mph on US 27 (north of intersection), 60 mph on US 27 (south of intersection), 35 mph on Crump Road (west of intersection) and 25 mph on W Main Street (east of intersection).

The current context classification of this intersection is C2 - Rural and future context classification is C3R - Suburban Residential. An eight-hour turning movement count (TMC) was conducted in November 2018. During the eight-hour TMC, 3 cyclists were counted using the crosswalks. There are no transit stops at the intersection.

Capacity Analysis: CAP-X was conducted for the years in which the No-Build configuration was determined to be failing using Synchro 10. For this intersection only 2045 AM and PM analysis was conducted as the No-Build condition operated adequately in the year 2030. 2045 volumes were developed using 2045 No-Build AADTs, selected K-factors and selected D-factors. The future year AADTs were developed by applying an annual growth rate of 2.75% to US 27 north of the intersection, 2.75% to US 27 south of the intersection, 1.0% to Crump Road west of the intersection, and 1.0% to W Main Street east of the intersection. The intersection configurations evaluated were: Traffic Signal (No-Build), Full Median U-turn (MUT), Partial Median U-turn (PMUT), Signalized Restricted Crossing U-turn (RCUT), Full Displaced Left-Turn (DLT), Partial Displaced Left-Turn (PDLT), and Modified Traffic Signal.

Safety Analysis: Crash data was reviewed for the five-year study period from 2013 through 2017. There were 26 crashes reported with annual occurrences of 6 crashes (2013), 7 (2014), 6 (2015), 4 (2016), and 3 (2017). The predominant crash type was Rear End (26%). No pedestrian or bicycle crashes were reported. 14 crashes resulted in an injury and 0 crashes resulted in a fatality.

Results: CAP-X results indicated a full MUT, PMUT, RCUT, full DLT, PDLT, and Modified Traffic Signal all operate better than the No-Build Traffic Signal, with v/c ratios ranging from 0.61 to 0.79 using the 2045 projected volumes. Of the alternatives analyzed, a full DLT was expected to operate with the lowest v/c ratios, ranging from 0.61 to 0.62 using the 2045 projected volumes. The No-Build scenario (Traffic Signal) was expected to operate with v/c ratios ranging from 0.78 to 0.81. The full MUT, PMUT and RCUT all had the highest multimodal score of 6.3 while the Modified Traffic Signal and DLT had the lowest score of 4.8. The SPICE results indicate that a full MUT would have 15% fewer total crashes than the base (No-Build) Traffic Signal and 30% fewer fatal/injury crashes (over 20 years). Compared to the base Traffic Signal over the 20-year project life cycle, a PMUT was expected to have 7.5% fewer total crashes and 15% fewer fatal/injury crashes, a full DLT was expected to have 12% fewer total crashes and 12% fewer fatal/injury crashes, a PDLT was expected to have 6% fewer total crashes and 6% fewer fatal/injury crashes and a signalized RCUT was expected to have 40.9% more total crashes and 14.9% more fatal/injury crashes. There are existing structures in all but the southwest quadrant. Therefore, right-of-way impacts/costs should be anticipated with a major improvement. Based on the Stage I analysis, three (3) alternatives were recommended to be carried forward into Stage II for further evaluation, as follows: Traffic Signal (No-Build), Full MUT and Partial MUT. Analysis results and recommendations are presented in **Table 3-31**.

TABLE 3-31: US 27 & CRUMP ROAD/W MAIN STREET ICE RESULTS AND RECOMMENDATIONS

US 27 & Crump Road/W Main Street					
Control Strategy Evaluated	AM Peak V/C	PM Peak V/C	Multimodal Score	SPICE Ranking	Recommended to be evaluated in Stage II ICE?
Traffic Signal (No-Build)	0.81	0.78	4.8	4	Yes
Full DLT	0.62	0.61	4.8	3	No
Full MUT	0.68	0.68	6.3	1	Yes
PMUT	0.68	0.64	6.3	1	Yes
Signalized RCUT	0.66	0.65	6.3	2	No
Modified Traffic Signal	0.79	0.77	4.8	4	No

Appendix 31-A: Traffic Data

Appendix 31-B: Capacity Analysis for Planning of Junctions (CAP-X) Files

Appendix 31-C: Safety Performance for Intersection Control Evaluation (SPICE) Files

Appendix 31-D: Stage 1 ICE Form

Appendix 31-E: Crash Data

3.32 Frederick Avenue (MP: 9.193)

Background: A Stage 1 ICE analysis has been completed for the intersection of US 27 and Frederick Avenue in Polk County. This analysis was conducted as part of the NE Polk US 27 Mobility Study, which has the overall objective of improving the mobility, safety, and livability along the US 27 corridor.

The intersection is currently a four-legged unsignalized intersection, with US 27 as the north and south legs. Land use surrounding the intersection is mainly commercial with a development in the southwest corner of the intersection. The intersection mainly provides connectivity to the town of Dundee to the east. The posted speed limit is 60 mph on US 27 (north of intersection), 60 mph on US 27 (south of intersection), 30 mph on Frederick Avenue (west of intersection) and 25 mph on Frederick Avenue (east of intersection).

The current context classification of this intersection is C3C – Suburban Commercial and future context classification is C4 – Urban General. An eight-hour turning movement count (TMC) was conducted in November 2018. During the eight-hour TMC, one pedestrian crossing and one cyclist crossing were counted. There are no transit stops at the intersection.

Capacity Analysis: CAP-X was conducted for the years in which the No-Build configuration was determined to be failing using Synchro 10. For this intersection both 2030 AM/PM and 2045 AM/PM analysis were conducted. 2030 and 2045 volumes were developed using 2030 and 2045 No-Build AADTs, selected K-factors and selected D-factors. The future year AADTs were developed by applying an annual growth rate of 2.75% to US 27 north of the intersection, 2.75% to US 27 south of the intersection, 0.5% to FairBridge Inn Express Dundee west of the intersection, and 1.0% to Frederick Avenue east of the intersection. The intersection configurations evaluated were: TWSC Full Median Opening (No-Build), Traffic Signal, Unsignalized RCUT, Full Median Crossing U-Turn and TWSC Closed Median. The Full MUT was evaluated at this unsignalized intersection as it may meet signal warrants.

Safety Analysis: Crash data was reviewed for the five-year study period from 2013 through 2017. There were 13 crashes reported with annual occurrences of 3 crashes (2013), 2 (2014), 4 (2015), 2 (2016), and 2 (2017). The predominant crash type was Rear End (46%). No pedestrian or bicycle crashes were reported. 5 crashes resulted in an injury and 0 crashes resulted in a fatality.

Results: CAP-X results indicated a Traffic Signal, Two-Way Stop Control (Closed Median), Unsignalized Restricted Crossing U-turn (RCUT) and Full Median Crossing U-turn (MUT) operate better than the No-Build TWSC Full Median Opening, with v/c ratios ranging from 0.50 to 37.73 using the 2030 and 2045 projected volumes. Of the alternatives analyzed, a Full MUT was expected to operate with the lowest v/c ratios, ranging from 0.50 to 0.79 using the 2030 and 2045 projected volumes. A TWSC Full Median Opening (No Build scenario) was expected to operate with v/c ratios over 100 or even negative. These extreme v/c ratios were caused by near zero capacity on the side streets ranging from 1.26 to 10.89. The highest multimodal score of 6.3 was the Full MUT, followed by the Traffic Signal (4.8), followed by the Unsignalized RCUT (4.4) and the TWSC – Closed Median (3.7). The SPICE results indicate that the Unsignalized RCUT would have 39% fewer total crashes than the base No-Build TWSC – Full Median Opening alternative and 69% fewer fatal/injury crashes (over 20 years). Compared to the base No-Build

TWSC – Full Median Opening alternative over the 20-year project life cycle, a Full MUT was expected to have 30% more total crashes but 33% fewer fatal/injury crashes, a Traffic Signal was expected to have 53% more total crashes and 3.7% fewer fatal/injury crashes, and the TWSC - Closed Median is expected to operate similar to the No-Build TWSC – Full Median Opening condition. Qualitatively, a closed median is expected to be safer than a directional median opening, which is expected to be safer than a full median opening. Right-of-way impacts/costs would be minimal as the quadrants are not fully developed and only the Unsignalized RCUT alternative would require major improvements. Based on the Stage I analysis, five (5) alternatives were recommended to be carried forward into Stage II for further evaluation, as follows: TWSC Full Median Opening (No-Build), Traffic Signal, Unsignalized RCUT, Full MUT and TWSC Closed Median. Analysis results and recommendations are presented in **Table 3-32**.

TABLE 3-32: US 27 & FREDERICK AVENUE ICE RESULTS AND RECOMMENDATIONS

US 27 & Frederick Avenue					
Control Strategy Evaluated	AM Peak V/C	PM Peak V/C	Multimodal Score	SPICE Ranking	Recommended to be evaluated in Stage II ICE?
Full MUT	0.79	0.70	6.3	2	Yes
Traffic Signal	0.97	0.84	4.8	3	Yes
TWSC Full Median Opening (No-Build)	-957.80	- 2597.00	3.7	4	Yes
TWSC Closed Median	2.92	1.46	3.7	4	Yes
Unsignalized RCUT	37.73	15.86	4.4	1	Yes

Appendix 32-A: Traffic Data

Appendix 32-B: Capacity Analysis for Planning of Junctions (CAP-X) Files

Appendix 32-C: Safety Performance for Intersection Control Evaluation (SPICE) Files

Appendix 32-D: Stage 1 ICE Form

Appendix 32-E: Crash Data

3.33 SR 542/Dundee Road (MP: 8.694)

Background: A Stage 1 ICE analysis has been completed for the intersection of US 27 and SR 542/Dundee Road in Polk County. This analysis was conducted as part of the NE Polk US 27 Mobility Study, which has the overall objective of improving the mobility, safety, and livability along the US 27 corridor.

The intersection is currently a four-legged signalized intersection, with US 27 as the north and south legs. The land use surrounding the intersection is primarily commercial and provides connectivity to the City of Dundee. The posted speed limit is 50 mph on US 27 (north of intersection), 50 mph on US 27 (south of intersection), 45 mph on Dundee Road (west of intersection) and 35 mph on Dundee Road (east of intersection).

The current context classification of this intersection is C3C – Suburban Commercial and future context classification is C4 – Urban General. An eight-hour turning movement count (TMC) was conducted in

March 2016. During the eight-hour TMC, ten pedestrians were counted using the crosswalks. There are no transit stops at the intersection.

Capacity Analysis: CAP-X was conducted for the years in which the No-Build configuration was determined to be failing using Synchro 10. For this intersection both 2030 AM/PM and 2045 AM/PM analysis were conducted. 2030 and 2045 volumes were developed using 2030 and 2045 No-Build AADTs, selected K-factors and selected D-factors. The future year AADTs were developed by applying an annual growth rate of 2.75% to US 27 north of the intersection, 2.75 to US 27 south of the intersection, 3.0% to Dundee Road west of the intersection, and 3.0% to Dundee Road east of the intersection. The at-grade intersection configurations evaluated were: Traffic Signal (No-Build), Signalized Restricted Crossing U-turn, Full Median U-turn (MUT), Full Displaced Left Turn (DLT), Partial Displaced Left-Turn (PDLT), and Modified Traffic Signal. The grade-separated intersection configurations evaluated were: a Diamond Interchange, two Partial Cloverleafs (Parclo A & Parclo B), Displaced Left-Turn Interchange (DLT I), Diverging Diamond Interchange (DDI), and a Single Point Urban Interchange (SPUI).

Safety Analysis: Crash data was reviewed for the five-year study period from 2013 through 2017. There were 65 crashes reported with annual occurrences of 11 crashes (2013), 16 (2014), 11 (2015), 11 (2016), and 16 (2017). The predominant crash type was Rear End (45%). One pedestrian and one bicycle crash was reported. 34 crashes resulted in an injury and one crash resulted in a fatality. The fatal crash, characterized as a rear end collision occurred in 2014 in the southbound direction under clear, nighttime, and dry pavement conditions. The driver at fault was determined to have been operating his vehicle in an unsafe and reckless manner.

Results: CAP-X results indicated all alternatives operate better than the No-Build Traffic Signal, with at-grade alternative v/c ratios ranging from 0.68 to 1.27 using the 2030 and 2045 projected volumes and grade-separated v/c ratios ranging from 0.62 to 0.97 using the 2045 projected volumes (grade-separated alternatives were not analyzed in year 2030).

Of the alternatives analyzed, a Displaced Left Turn Interchange was expected to operate with the lowest v/c ratios, ranging from 0.62 to 0.71 using the 2045 projected volumes. The No-Build Traffic Signal was expected to operate with v/c ratios ranging from 1.13 to 1.73 using 2030 and 2045 projected volumes. The DDI had the highest multimodal score of 3.3 while the Parclo alternatives had the lowest multimodal scores of 1.5.

The at-grade alternatives were evaluated in SPICE. The SPICE results indicate that a Full MUT would have 15% fewer total crashes than the base No-Build Traffic Signal alternative and 30% fewer fatal/injury crashes (over 20 years). Compared to the base No-Build Traffic Signal alternative over the 20-year project life cycle, a Full DLT was expected to have 12% fewer total crashes and 12% fewer fatal/injury crashes, a Partial DLT was expected to have 6% fewer total crashes and 6% fewer fatal/injury crashes, a Modified Traffic Signal alternative is expected to have no change in total crashes or fatal/injury crashes and a Signalized RCUT was expected to have 380% more total crashes and 138% more fatal/injury crashes. There are existing commercial structures in all four quadrants of the intersection, therefore right-of-way impacts/costs can be anticipated with major improvements especially above-grade alternatives. Based on

the Stage I analysis, three (3) alternatives were recommended to be carried forward into Stage II for further evaluation, as follows: Traffic Signal (No-Build), Full DLT, and Modified Traffic Signal. Analysis results and recommendations are presented in **Table 3-33**.

TABLE 3-33: US 27 & SR 542/DUNDEE ROAD ICE RESULTS AND RECOMMENDATIONS

US 27 & SR 542/Dundee Road					
Control Strategy Evaluated	AM Peak V/C	PM Peak V/C	Multimodal Score	SPICE Ranking	Recommended to be evaluated in Stage II ICE?
Traffic Signal (No-Build)	1.73	1.62	2.4	3	Yes
Full DLT	0.68	0.81	2.4	2	Yes
PDLT	0.86	0.97	2.4	2	No
Full MUT	0.88	0.96	3.1	1	No
Signalized RCUT	0.95	1.01	3.1	5	No
Modified Traffic Signal	1.18	1.27	2.4	3	Yes
Traditional Diamond	0.87	0.97	2.4	-	No
Partial Cloverleaf A	0.67	0.70	1.5	-	No
Partial Cloverleaf B	0.71	0.71	1.5	-	No
DLT Interchange	0.62	0.71	2.4	-	No
DDI	0.74	0.71	3.3	-	No
SPUI	0.66	0.74	2.4	-	No

Appendix 33-A: Traffic Data

Appendix 33-B: Capacity Analysis for Planning of Junctions (CAP-X) Files

Appendix 33-C: Safety Performance for Intersection Control Evaluation (SPICE) Files

Appendix 33-D: Stage 1 ICE Form

Appendix 33-E: Crash Data

3.34 Lincoln Avenue (MP: 8.174)

Background: A Stage 1 ICE analysis has been completed for the intersection of US 27 and Lincoln Avenue in Polk County. This analysis was conducted as part of the NE Polk US 27 Mobility Study, which has the overall objective of improving the mobility, safety, and livability along the US 27 corridor.

The intersection is currently a three-legged unsignalized intersection, with US 27 as the north and south legs. The land use surrounding the intersection is consists of residential with undeveloped properties nearby. The posted speed limit is 50 mph on US 27 (north of intersection), 50 mph on US 27 (south of intersection), 25 mph on Lincoln Avenue (east of intersection).

The current context classification of this intersection is C3R, and future context classification is also C4 (Urban General). An eight-hour turning movement count (TMC) was conducted in November 2018. During the eight-hour TMC, two pedestrians were counted using the crosswalk. There are no transit stops at the intersection.

Capacity Analysis: CAP-X was conducted for the years in which the No-Build configuration was determined to be failing using Synchro 10. For this intersection both 2030 AM/PM and 2045 AM/PM analysis were conducted. 2030 and 2045 volumes were developed using 2030 and 2045 No-Build AADTs, selected K-factors and selected D-factors. The future year AADTs were developed by applying an annual growth rate of 2.75% to US 27 north of the intersection, 2.75% to US 27 south of the intersection and 2.0% to Lincoln Avenue east of the intersection. The intersection configurations evaluated were: TWSC Full Median Opening (No-Build), Traffic Signal, Unsignalized RCUT, and TWSC Closed Median.

Safety Analysis: Crash data was reviewed for the five-year study period from 2013 through 2017. There were 8 crashes reported with annual occurrences of 2 crashes (2013), 0 (2014), 2 (2015), 2 (2016), and 2 (2017). The predominant crash type was Rear End (25%). No pedestrian or bicycle crashes were reported. 3 crashes resulted in an injury and zero crashes resulted in a fatality.

Results: CAP-X results indicated a Traffic Signal, TWSC Closed Median, and Unsignalized RCUT operate better than the No-Build scenario TWSC Full Median Opening with v/c ratios ranging from 0.41 to 8.09 using 2030 and 2045 projected volumes. Of the alternatives analyzed, a Traffic Signal was expected to operate with the lowest v/c ratios, ranging from 0.50 to 0.73. A TWSC Full Median Opening (No Build scenario) was expected to operate with v/c ratios over 100 or even negative. These extreme v/c ratios were caused by near zero capacity on the side streets ranging from 1.17 to 1.83. The highest multimodal score of 4.8 was the Traffic Signal, followed by the Unsignalized RCUT (4.4) and the TWSC – Closed Median (3.7). The SPICE results indicate that the TWSC – Closed Median would have the same number of total crashes than the base TWSC – Full Median Opening alternative and the same fatal/injury crashes (over 20 years). Compared to the base TWSC – Full Median Opening alternative over the 20-year project life cycle, a Traffic Signal was expected to have 40% more total crashes and 51% more fatal/injury crashes and an Unsignalized RCUT was expected to have 22% more total crashes and 29% more fatal/injury crashes. Qualitatively, a closed median is expected to be safer than a directional median opening, which is expected to be safer than a full median opening. Right-of-way impacts/costs would be minimal as the quadrants are not fully developed and only the Unsignalized RCUT alternative would require major improvements. Based on the Stage I analysis, four (4) alternatives were recommended to be carried forward into Stage II for further evaluation, as follows: TWSC Full Median Opening (No-Build), Traffic Signal, Unsignalized RCUT, and TWSC Closed Median. Analysis results and recommendations are presented in **Table 3-34**.

TABLE 3-34: US 27 & LINCOLN AVENUE ICE RESULTS AND RECOMMENDATIONS

US 27 & Lincoln Avenue					
Control Strategy Evaluated	AM Peak V/C	PM Peak V/C	Multimodal Score	SPICE Ranking	Recommended to be evaluated in Stage II ICE?
Traffic Signal	0.73	0.70	4.8	5	Yes
TWSC Full Median Opening (No-Build)	- 1574.60	-144.50	3.7	2	Yes
TWSC Closed Median	0.75	0.64	3.7	2	Yes
Unsignalized RCUT	8.09	7.36	4.4	1	Yes

Appendix 34-A: Traffic Data

Appendix 34-B: Capacity Analysis for Planning of Junctions (CAP-X) Files

Appendix 34-C: Safety Performance for Intersection Control Evaluation (SPICE) Files

Appendix 34-D: Stage 1 ICE Form

Appendix 34-E: Crash Data

3.35 SR 540/Waverly Road/Cypress Gardens Boulevard (MP: 5.944)

Background: A Stage 1 ICE analysis has been completed for the intersection of US 27 and SR 540/Waverly Road/Cypress Gardens Boulevard in Polk County. This analysis was conducted as part of the NE Polk US 27 Mobility Study, which has the overall objective of improving the mobility, safety, and livability along the US 27 corridor.

The intersection is currently a four-legged signalized intersection, with US 27 as the north and south legs. The land use of all four quadrants of the intersection is undeveloped, it provides connectivity to the City of Cypress Gardens Boulevard to the west and US 17 to the east. The posted speed limit is 60 mph on US 27 (north of intersection), 60 mph on US 27 (south of intersection), 55 mph on Cypress Gardens Boulevard (west of intersection) and 45 mph on Cypress Gardens Boulevard (east of intersection).

The current context classification of this intersection is C2 - Rural and future context classification is C3R - Suburban Residential. An eight-hour turning movement count (TMC) was conducted in March 2016. During the eight-hour TMC, zero pedestrians and cyclists were observed using the crosswalks. There are no transit stops at the intersection.

Capacity Analysis: CAP-X was conducted for the years in which the No-Build configuration was determined to be failing using Synchro 10. For this intersection both 2030 AM/PM and 2045 AM/PM analysis were conducted. 2030 and 2045 volumes were developed using 2030 and 2045 No-Build AADTs, selected K-factors and selected D-factors. The future year AADTs were developed by applying an annual growth rate of 2.75% to US 27 north of the intersection, 2.75% to US 27 south of the intersection, 2.75% to Cypress Gardens Boulevard west of the intersection, and 1.00% to Waverly Road east of the intersection. The intersection configurations evaluated were: Traffic Signal (No-Build), Full Median U-turn (MUT), Partial Median U-turn (PMUT), Signalized Restricted Crossing U-turn (RCUT), Full Displaced Left Turn (DLT), Partial Displaced Left-Turn (PDLT), hybrid NB PDLT/SB PMUT, and Modified Traffic Signal.

Safety Analysis: Crash data was reviewed for the five-year study period from 2013 through 2017. There were 109 crashes reported with annual occurrences of 22 crashes (2013), 17 (2014), 26 (2015), 19 (2016), and 25 (2017). The predominant crash type was Rear End (69%). No pedestrian or bicycle crashes were reported. 56 crashes resulted in an injury and one crash resulted in a fatality. The fatal crash is characterized as a southbound angle collision which occurred in 2014 at nighttime under clear weather and dry pavement conditions.

Results: CAP-X results indicated a Modified Traffic Signal, Full Median U-turn (MUT), Partial MUT, Signalized RCUT, Full Displaced Left Turn (DLT), Partial DLT and hybrid NB PDLT/SB PMUT all operate better than the No-Build (Traffic Signal) with v/c ratios ranging from 0.54 to 1.06 using the 2030 and 2045 projected volumes. Of the alternatives analyzed, a PDLT was expected to operate with the lowest v/c ratios, ranging from 0.54 to 0.82. A Traffic Signal (No-Build scenario) was expected to operate with v/c ratios ranging from 0.88 to 1.32. The Signalized RCUT provided the highest multimodal score of 6.6, while the Modified Traffic Signal, DLT (Full & Partial) provided a score of 4.8, the hybrid NB PDLT/SB PMUT provided a score of 4.4 and the MUT (Full & Partial) resulted in a score of 4.0. The SPICE results indicate that a Full MUT would have 15% fewer total crashes than the base Traffic Signal alternative and 30% fewer fatal/injury crashes (over 20 years). Compared to the base Traffic Signal over the 20-year project life cycle, a hybrid NB PDLT/SB PMUT was expected to have 13.5% fewer total crashes 21% fewer fatal/injury crashes, a Full DLT was expected to have 12% fewer total crashes 12% fewer fatal/injury crashes, a Partial MUT was expected to have 7.5% fewer total crashes 15% fewer fatal/injury crashes, a Partial DLT was expected to have 6% fewer total crashes 6% fewer fatal/injury crashes, a Modified Traffic Signal was expected to have the same total crashes the same fatal/injury crashes and a Signalized RCUT is expected to have 119% more total crashes and 103% more crashes. All four quadrants of the intersection are undeveloped; therefore, right-of-way impacts are not anticipated for any of the alternatives. Based on the Stage I analysis, four (4) alternatives were recommended to be carried forward into Stage II for further evaluation, as follows: Traffic Signal (No-Build), Partial DLT, Partial MUT and hybrid NB PDLT/SB PMUT. Analysis results and recommendations are presented in **Table 3-35**.

TABLE 3-35: US 27 & SR 540/WAVERLY ROAD/CYPRESS GARDENS BOULEVARD ICE RESULTS AND RECOMMENDATIONS

US 27 & SR 540/Waverly Road/Cypress Gardens Boulevard					
Control Strategy Evaluated	AM Peak V/C	PM Peak V/C	Multimodal Score	SPICE Ranking	Recommended to be evaluated in Stage II ICE?
Traffic Signal (No-Build)	1.27	1.32	4.8	4	Yes
Full DLT	0.93	1.06	4.8	3	No
PDLT	0.82	0.74	4.8	3	Yes
Full MUT	1.00	1.04	4.0	1	No
PMUT	1.02	1.04	4.0	1	Yes
Signalized RCUT	0.93	0.94	6.3	6	No
Modified Traffic Signal	1.22	1.27	4.8	4	No
PDLT/PMUT Hybrid*	0.82/1.02	0.74/1.04	4.4	2	Yes

*PDLT/PMUT v/c ratios, respectively

Appendix 35-A: Traffic Data

Appendix 35-B: Capacity Analysis for Planning of Junctions (CAP-X) Files

Appendix 35-C: Safety Performance for Intersection Control Evaluation (SPICE) Files

Appendix 35-D: Stage 1 ICE Form

Appendix 35-E: Crash Data

3.36 Thompson Nursery Road (MP: 4.331)

Background: A Stage 1 ICE analysis has been completed for the intersection of US 27 and Thompson Nursery Road/Suzanne Road in Polk County. This analysis was conducted as part of the NE Polk US 27 Mobility Study, which has the overall objective of improving the mobility, safety, and livability along the US 27 corridor.

The intersection is currently a four-legged signalized intersection, with US 27 as the north and south legs. The land uses surrounding the intersection are primarily commercial. The posted speed limit is 60 mph on US 27 (north of intersection), 60 mph on US 27 (south of intersection), 45 mph on Thompson Nursery Road (west of intersection) and 45 mph on Suzanne Road (east of intersection).

The current context classification of this intersection is C2 - Rural and future context classification is C3R - Suburban Residential. An eight-hour turning movement count (TMC) was conducted in March 2016. During the eight-hour TMC, 15 pedestrians and zero cyclists were observed using the crosswalks. There are no transit stops at the intersection.

Capacity Analysis: CAP-X was conducted for the years in which the No-Build configuration was determined to be failing using Synchro 10. For this intersection both 2030 AM/PM and 2045 AM/PM analysis were conducted. 2030 and 2045 volumes were developed using 2030 and 2045 No-Build AADTs, selected K-factors and selected D-factors. The future year AADTs were developed by applying an annual growth rate of 2.75% to US 27 north of the intersection, 2.75% to US 27 south of the intersection, 4.0% to

Thompson Nursery Road west of the intersection, and 4.0% to Suzanne Road east of the intersection. The intersection configurations evaluated were: Traffic Signal (No-Build), Full Median U-turn (MUT), Partial MUT, Signalized RCUT, Full Displaced Left Turn (DLT), Partial DLT, and Modified Traffic Signal

Safety Analysis: Crash data was reviewed for the five-year study period from 2013 through 2017. There were 96 crashes reported with annual occurrences of 7 crashes (2013), 14 (2014), 21 (2015), 13 (2016), and 41 (2017). The predominant crash type was Rear End (44%). No pedestrian or bicycle crashes were reported. 27 crashes resulted in an injury, and one crash resulted in a fatality. The fatal crash is characterized as a northbound angle collision involving a northbound heavy vehicle and a southbound left passenger vehicle, which occurred in 2017 at nighttime under clear weather and dry pavement conditions.

Results: CAP-X results indicated a Modified Traffic Signal, Full MUT, Partial MUT, Signalized RCUT, Full DLT, Partial DLT all operate better than the No-Build Traffic Signal, with v/c ratios ranging from 0.50 to 1.34 using the 2030 and 2045 projected volumes. Of the alternatives analyzed, a Full DLT was expected to operate with the lowest v/c ratios, ranging from 0.50 to 0.78. A Traffic Signal (No-Build scenario) was expected to operate with v/c ratios ranging from 0.86 to 1.61. The Signalized RCUT and MUT (Full and Partial) alternatives provided the highest multimodal score results of 6.3, all other alternatives tied with a score of 4.8. The SPICE results indicate that a Full MUT would have 15% fewer total crashes than the base Traffic Signal and 30% fewer fatal/injury crashes (over 20 years). Compared to the base Traffic Signal over the 20-year project life cycle, a Full DLT was expected to have 12% fewer total crashes 12% fewer fatal/injury crashes, a Partial MUT was expected to have 7.5% fewer total crashes 15% fewer fatal/injury crashes, a Partial DLT was expected to have 6% fewer total crashes 6% fewer fatal/injury crashes, a Modified Traffic Signal was expected to have the same total and fatal/injury crashes and a Signalized RCUT is expected to have 100% more total crashes and 100% more crashes. All four quadrants of the intersection are fully developed, and right-of-way impacts/costs should be anticipated with any major improvement. Based on the Stage I analysis, four (4) alternatives were recommended to be carried forward into Stage II for further evaluation, as follows: Traffic Signal (No-Build), Full MUT, Full DLT, and Modified Traffic Signal. Analysis results and recommendations are presented in **Table 3-36**.

TABLE 3-36: US 27 & THOMPSON NURSERY ROAD ICE RESULTS AND RECOMMENDATIONS

US 27 & Thompson Nursery Road					
Control Strategy Evaluated	AM Peak V/C	PM Peak V/C	Multimodal Score	SPICE Ranking	Recommended to be evaluated in Stage II ICE?
Traffic Signal (No-Build)	1.61	1.20	4.8	3	Yes
Full DLT	0.78	0.70	4.8	2	Yes
PDLT	0.99	0.84	4.8	2	No
Full MUT	0.95	0.82	6.3	1	Yes
PMUT	1.20	1.04	6.3	1	No
Signalized RCUT	0.90	0.79	6.3	5	No
Modified Traffic Signal	1.34	1.17	4.8	3	Yes

Appendix 36-A: Traffic Data

Appendix 36-B: Capacity Analysis for Planning of Junctions (CAP-X) Files

Appendix 36-C: Safety Performance for Intersection Control Evaluation (SPICE) Files

Appendix 36-D: Stage 1 ICE Form

Appendix 36-E: Crash Data

3.37 Tower Point Entrance/Vanguard School Entrance (MP: 2.470)

analysis is intended to support the Florida Department of Transportation (FDOT) District One and its transportation partners in identifying alternative intersection configurations for intersections projected to be over capacity in the 2045 Design Year.

The intersection is currently a four-legged unsignalized intersection, with US 27 as the north and south legs. The land uses surrounding the intersection are residential and institutional. The posted speed limit is 60 mph on US 27 (north of intersection), 60 mph on US 27 (south of intersection), speed limits on Vanguard School Entrance (west of the intersection) and Tower Point Entrance (east of the intersection) are unknown.

The current context classification of this intersection is C3R - Suburban Residential and future context classification is maintains C3R - Suburban Residential. An eight-hour turning movement count (TMC) was conducted in November 2018. During the eight-hour TMC, 5 pedestrian crossings and 6 cyclists crossings were observed. Transit stops are on US-27 in the north and south legs of the intersection.

Capacity Analysis: CAP-X was conducted for the years in which the No-Build configuration was determined to be failing using Synchro 10. For this intersection both 2030 AM/PM and 2045 AM/PM analysis were conducted. 2030 and 2045 volumes were developed using 2030 and 2045 No-Build AADTs, selected K-factors and selected D-factors. The future year AADTs were developed by applying an annual growth rate of 2.75% to US 27 north of the intersection, 2.75% to US 27 south of the intersection, 0.5% to Vanguard School Entrance west of the intersection, and 0.5% to Tower Point Entrance east of the intersection. The intersection configurations evaluated were: TWSC Full Median Opening (No-Build), Traffic Signal, Unsignalized RCUT, and TWSC Closed Median.

Safety Analysis: Crash data was reviewed for the five-year study period from 2013 through 2017. There were 10 crashes reported with annual occurrences of zero crashes (2013), 3 (2014), 1 (2015), 1 (2016), and 5 (2017). The predominant crash types were Rear End and Head On (20% each). No pedestrian or bicycle crashes were reported. One (1) crash resulted in an injury and zero crashes resulted in a fatality.

Results: CAP-X results indicated a Traffic Signal and TWSC – Closed Median all operate better than the No-Build TWSC Full Median Opening, with v/c ratios ranging from 0.54 to 12.67 using 2030 and 2045 projected volumes. Of the alternatives analyzed, the Traffic Signal was expected to operate with the lowest v/c ratios, ranging from 0.54 to 0.81. A TWSC – Full Median Opening (No-Build scenario) was expected to operate with v/c ratios ranging from 1.99 to 2.40. The highest multimodal score of 4.8 was the Traffic Signal, followed by the Unsignalized RCUT (4.4) and the TWSC – Closed Median (3.7). The SPICE results indicate that an Unsignalized RCUT would have 35% fewer total crashes than the base TWSC – Full

Median Opening alternative and 63% fewer fatal/injury crashes (over 20 years). Compared to the base TWSC – Full Median Opening alternative over the 20-year project life cycle, a Traffic Signal was expected to have 70% more total crashes and 10% more fatal/injury crashes and a TWSC – Closed Median was expected to have same total crashes and the same fatal/injury crashes. Qualitatively, a closed median is expected to be safer than a directional median opening, which is expected to be safer than a full median opening. Residential development immediately east of the intersection would likely result in right-of-way impacts for major improvements. Based on the Stage I analysis, four (4) alternatives were recommended to be carried forward into Stage II for further evaluation, as follows: TWSC Full Median Opening (No-Build), Traffic Signal, Unsignalized RCUT and TWSC Closed Median. Analysis results and recommendations are presented in **Table 3-37**.

TABLE 3-37: US 27 & TOWER POINT ENTRANCE/VANGUARD SCHOOL ENTRANCE ICE RESULTS AND RECOMMENDATIONS

US 27 & Tower Point Entrance/Vanguard School Entrance					
Control Strategy Evaluated	AM Peak V/C	PM Peak V/C	Multimodal Score	SPICE Ranking	Recommended to be evaluated in Stage II ICE?
Traffic Signal	0.81	0.73	4.8	5	Yes
TWSC Full Median Opening (No-Build)	2.40	1.99	3.7	2	Yes
TWSC Closed Median	1.17	0.72	3.7	2	Yes
Unsignalized RCUT	12.67	8.27	4.4	1	Yes

Appendix 37-A: Traffic Data

Appendix 37-B: Capacity Analysis for Planning of Junctions (CAP-X) Files

Appendix 37-C: Safety Performance for Intersection Control Evaluation (SPICE) Files

Appendix 37-D: Stage 1 ICE Form

Appendix 37-E: Crash Data

3.38 Mountain Lake Cut Off Road N (MP: 1.891)

Background: A Stage 1 ICE analysis has been completed for the intersection of US 27 and Mt Lake Cut Off Road N in Polk County. This analysis was conducted as part of the NE Polk US 27 Mobility Study, which has the overall objective of improving the mobility, safety, and livability along the US 27 corridor.

The intersection is currently a three-legged signalized intersection, with US 27 as the north and south legs. The land uses surrounding the intersection are primarily commercial. The posted speed limit is 60 mph on US 27 (north of intersection), 60 mph on US 27 (south of intersection), 30 mph on Mt Lake Cut Off Road N (east of intersection), while the west side of the intersection provides access to a local business.

The current context classification of this intersection is C3R - Suburban Residential and future context classification is maintains C3R - Suburban Residential. An eight-hour turning movement count (TMC) was conducted in March 2016. During the eight-hour TMC, no pedestrian or cyclist crossings were observed. There are no transit stops at the intersection.

Capacity Analysis: CAP-X was conducted for the years in which the No-Build configuration was determined to be failing using Synchro 10. For this intersection both 2030 AM/PM and 2045 AM/PM analysis were conducted. 2030 and 2045 volumes were developed using 2030 and 2045 No-Build AADTs, selected K-factors and selected D-factors. The future year AADTs were developed by applying an annual growth rate of 2.75% to US 27 north of the intersection, 2.75% to US 27 south of the intersection, 0.5% to Mt Lake Cut Off Road N west of the intersection, and 3.0% to Mt Lake Cut Off Road N east of the intersection. The intersection configurations evaluated were: Traffic Signal (No-Build), Full Median U-turn (MUT), Partial MUT, Signalized RCUT, Full Displaced Left Turn (DLT), Partial DLT, and hybrid SB PDLT/NB PMUT.

Safety Analysis: Crash data was reviewed for the five-year study period from 2013 through 2017. There were 40 crashes reported with annual occurrences of 2 crashes (2013), 3 (2014), 6 (2015), 13 (2016), and 16 (2017). The predominant crash type was Rear End (48%). No pedestrian or bicycle crashes were reported. 21 crashes resulted in an injury and zero crashes resulted in a fatality.

Results: CAP-X results indicated a Full MUT, Partial MUT, Signalized RCUT, Full DLT, Partial DLT and hybrid SB PDLT/NB PMUT all operate better than the No-Build Traffic Signal, with v/c ratios ranging from 0.57 to 0.97 using the 2030 and 2045 projected volumes. Of the alternatives analyzed, a Full MUT was expected to operate with the lowest v/c ratios, ranging from 0.57 to 0.82. A Traffic Signal (No-Build scenario) was expected to operate with v/c ratios ranging from 0.70 to 1.06. The highest multimodal score of 9.4 were the MUT (Full & Partial) and the Signalized RCUT, the hybrid SB PDLT/NB PMUT resulted in a score of 8.3 and the DLT (Full & Partial) resulted in a score of 7.

The SPICE results indicate that a Full MUT would have 15% fewer total crashes than the base Traffic Signal and 30% fewer fatal/injury crashes (over 20 years). Compared to the base Traffic Signal over the 20-year project life cycle, a hybrid SB PDLT/NB PMUT was expected to have 13.5% fewer total crashes 21% fewer fatal/injury crashes, a Full DLT was expected to have 12% fewer total crashes 12% fewer fatal/injury crashes, a Partial MUT was expected to have 7.5% fewer total crashes 15% fewer fatal/injury crashes, a Partial DLT was expected to have 6% fewer total crashes 6% fewer fatal/injury crashes and a Signalized RCUT is expected to have 79% more total crashes and 36% more crashes. There are some commercial developments existing near the intersection; therefore, right-of-way impacts should be anticipated with any major improvements. Based on the Stage I analysis, five (5) alternatives were recommended to be carried forward into Stage II for further evaluation, as follows: Traffic Signal (No-Build), Full MUT, Partial MUT, Partial DLT, and hybrid SB PDLT/NB PMUT. Analysis results and recommendations are presented in **Table 3-38**.

TABLE 3-38: US 27 & MOUNTAIN LAKE CUT OFF ROAD N ICE RESULTS AND RECOMMENDATIONS

US 27 & Mountain Lake Cut Off Road N					
Control Strategy Evaluated	AM Peak V/C	PM Peak V/C	Multimodal Score	SPICE Ranking	Recommended to be evaluated in Stage II ICE?
Traffic Signal (No-Build)	1.03	1.06	7.2	4	Yes
Full DLT	0.87	0.92	7.2	3	No
PDLT	0.87	0.92	7.2	3	Yes
Full MUT	0.82	0.78	9.4	1	Yes
PMUT	0.97	0.86	9.4	1	Yes
Signalized RCUT	0.87	0.92	9.4	6	No
PDLT/PMUT Hybrid*	0.87/0.97	0.92/0.86	8.3	2	Yes

*PDLT/PMUT v/c ratios, respectively

Appendix 38-A: Traffic Data

Appendix 38-B: Capacity Analysis for Planning of Junctions (CAP-X) Files

Appendix 38-C: Safety Performance for Intersection Control Evaluation (SPICE) Files

Appendix 38-D: Stage 1 ICE Form

Appendix 38-E: Crash Data

3.39 Washington Avenue (MP: 1.118)

Background: A Stage 1 ICE analysis has been completed for the intersection of US 27 and Washington Avenue in Polk County. This analysis was conducted as part of the NE Polk US 27 Mobility Study, which has the overall objective of improving the mobility, safety, and livability along the US 27 corridor.

The intersection is currently a four-legged signalized intersection, with US 27 as the north and south legs. The land uses surrounding the intersection are primarily commercial. The posted speed limit is 60 mph on US 27 (north of intersection), 50 mph on US 27 (south of intersection), 30 mph on Washington Avenue (west of intersection) and 30 mph on Washington Avenue (east of intersection).

The current context classification of this intersection is C3R - Suburban Residential and future context classification is maintains C3R - Suburban Residential. An eight-hour turning movement count (TMC) was conducted in March 2016. During the eight-hour TMC, 9 pedestrians and 4 cyclists were observed using the crosswalks. There are no transit stops at the intersection.

Capacity Analysis: CAP-X was conducted for the years in which the No-Build configuration was determined to be failing using Synchro 10. For this intersection only 2045 AM and PM analysis was conducted as the No-Build condition operated adequately in 2030. 2045 volumes were developed using 2045 No-Build AADTs, selected K-factors and selected D-factors. The future year AADTs were developed by applying an annual growth rate of 2.75 to US 27 north of the intersection, 2.75% to US 27 south of the intersection, 1.0% to Washington Avenue west of the intersection, and 1.0% to Washington Avenue east of the intersection. The intersection configurations evaluated were: Traffic Signal (No-Build), Full Median

U-turn (MUT), Partial MUT, Signalized RCUT, Full Displaced Left Turn (DLT), Partial DLT, hybrid SB PDLT/NB PMUT, and a Modified Traffic Signal.

Safety Analysis: Crash data was reviewed for the five-year study period from 2013 through 2017. There were 56 crashes reported with annual occurrences of 5 crashes (2013), 8 (2014), 11 (2015), 15 (2016), and 17 (2017). The predominant crash type was Rear End (32%). Zero pedestrian crashes and one bicycle crash was reported. 28 crashes resulted in an injury and zero crashes resulted in a fatality.

Results: CAP-X results indicated a Modified Traffic Signal, Full MUT, Partial MUT, Signalized RCUT, Full DLT, Partial DLT and hybrid SB PDLT/NB PMUT all operate better than the No-Build Traffic Signal, with v/c ratios ranging from 0.63 to 0.85 using the 2045 projected volumes. Of the alternatives analyzed, a signalized RCUT was expected to operate with the lowest v/c ratios, ranging from 0.63 to 0.66. A Traffic Signal (No-Build scenario) was expected to operate with v/c ratios ranging from 0.88 to 0.89. The Signalized RCUT and MUT (Full & Partial) provided the highest multimodal scores of 6.3, while the Modified Traffic Signal and DLT (Full & Partial) provided a score of 4.8. The SPICE results indicate that a Full MUT would have 15% fewer total crashes than the base Traffic Signal and 30% fewer fatal/injury crashes (over 20 years). Compared to the base Traffic Signal over the 20-year project life cycle, a hybrid SB PDLT/NB PMUT was expected to have 13.5% fewer total crashes 21% fewer fatal/injury crashes, a Full DLT was expected to have 12% fewer total crashes 12% fewer fatal/injury crashes, a Partial MUT was expected to have 7.5% fewer total crashes 15% fewer fatal/injury crashes, a Partial DLT was expected to have 6% fewer total crashes 6% fewer fatal/injury crashes, a Modified Traffic Signal was expected to the same total and fatal/injury crashes, and a Signalized RCUT is expected to have 231% more total crashes and 28% more crashes. The area around the intersection is developed, and right-of-way impacts should be anticipated with any major improvement. Based on the Stage I analysis, four (4) alternatives were recommended to be carried forward into Stage II for further evaluation, as follows: Traffic Signal (No-Build), Partial MUT, Partial DLT, and hybrid SB PDLT/NB PMUT. Analysis results and recommendations are presented in **Table 3-39**.

TABLE 3-39: US 27 & WASHINGTON AVENUE ICE RESULTS AND RECOMMENDATIONS

US 27 & Washington Avenue					
Control Strategy Evaluated	AM Peak V/C	PM Peak V/C	Multimodal Score	SPICE Ranking	Recommended to be evaluated in Stage II ICE?
Traffic Signal (No-Build)	0.88	0.89	4.8	4	Yes
Full DLT	0.64	0.66	4.8	3	No
PDLT	0.67	0.66	4.8	3	Yes
Full MUT	0.72	0.72	6.3	1	No
PMUT	0.72	0.71	6.3	1	Yes
Signalized RCUT	0.66	0.63	6.3	6	No
Modified Traffic Signal	0.84	0.85	4.8	4	No
PDLT/PMUT Hybrid*	0.67/0.72	0.66/0.71	5.6	2	Yes

*PDLT/PMUT v/c ratios, respectively

Appendix 39-A: Traffic Data

Appendix 39-B: Capacity Analysis for Planning of Junctions (CAP-X) Files

Appendix 39-C: Safety Performance for Intersection Control Evaluation (SPICE) Files

Appendix 39-D: Stage 1 ICE Form

Appendix 39-E: Crash Data

3.40 W Central Avenue (MP: 0.221)

Background: A Stage 1 ICE analysis has been completed for the intersection of US 27 and Central Avenue in Polk County. This analysis was conducted as part of the NE Polk US 27 Mobility Study, which has the overall objective of improving the mobility, safety, and livability along the US 27 corridor.

The intersection is currently a four-legged signalized intersection, with US 27 as the north and south legs. The land uses surrounding the intersection are primarily commercial. The posted speed limit is 50 mph on US 27 (north of intersection), 50 mph on US 27 (south of intersection), 35 mph on Central Avenue (west of intersection) and 35 mph on Central Avenue (east of intersection).

The current context classification of this intersection is C3R - Suburban Residential and future context classification is maintains C3R - Suburban Residential. An eight-hour turning movement count (TMC) was conducted in November 2018. During the eight-hour TMC, 14 pedestrians and 7 cyclists were observed using the crosswalks. There is a transit stop on the westbound approach of the intersection.

Capacity Analysis: CAP-X was conducted for the years in which the No-Build configuration was determined to be failing using Synchro 10. For this intersection only 2045 AM and PM analysis was conducted as the No-Build condition operated adequately in 2030. 2045 volumes were developed using 2045 No-Build AADTs, selected K-factors and selected D-factors. The future year AADTs were developed by applying an annual growth rate of 2.75% to US 27 north of the intersection, 2.75% to US 27 south of the intersection, 3.0% to Central Avenue west of the intersection, and 3.0% to Central Avenue east of the intersection. The intersection configurations evaluated were: Traffic Signal (No-Build), Full Median U-turn (MUT), Partial MUT, Signalized RCUT, Full Displaced Left Turn (DLT), Partial DLT, hybrid SB PDLT/NB PMUT, and a Modified Traffic Signal.

Safety Analysis: Crash data was reviewed for the five-year study period from 2013 through 2017. There were 71 crashes reported with annual occurrences of 13 crashes (2013), 7 (2014), 18 (2015), 13 (2016), and 20 (2017). The predominant crash type was Rear End (47%). No pedestrian or bicycle crashes were reported. 26 crashes resulted in an injury and zero crashes resulted in a fatality.

Results: CAP-X results indicated a Modified Traffic Signal, Full MUT, Partial MUT, Signalized RCUT, Full DLT, Partial DLT and a hybrid SB PDLT/NB PMUT all operate better than the No-Build scenario Traffic Signal, with v/c ratios ranging from 0.57 to 0.85 using the 2045 projected volumes. Of the alternatives analyzed, a Full DLT was expected to operate with the lowest v/c ratios at 0.57 (AM & PM). A Traffic Signal (No-Build scenario) was expected to operate with v/c ratios ranging from 0.90 to 0.94. The Signalized RCUT and MUT (Full & Partial) provided the highest multimodal scores of 6.3, while the Modified Traffic Signal and DLT (Full & Partial) provided a score of 4.8. The SPICE results indicate that a Full MUT would

have 15% fewer total crashes than the base Traffic Signal and 30% fewer fatal/injury crashes (over 20 years). Compared to the base Traffic Signal over the 20- year project life cycle, a hybrid SB PDLT/NB PMUT was expected to have 13.5% fewer total crashes 21% fewer fatal/injury crashes, a Full DLT was expected to have 12% fewer total crashes 12% fewer fatal/injury crashes, a Partial MUT was expected to have 7.5% fewer total crashes 15% fewer fatal/injury crashes, a Partial DLT was expected to have 6% fewer total crashes 6% fewer fatal/injury crashes, a Modified Traffic Signal was expected to the same total and fatal/injury crashes, and a Signalized RCUT is expected to have 270% more total crashes and 63% more fatal/injury crashes. The area around the intersection is developed, and right-of-way impacts should be anticipated with any major improvement. Based on the Stage I analysis, five (5) alternatives were recommended to be carried forward into Stage II for further evaluation, as follows: Traffic Signal (No-Build), Partial MUT, Partial DLT, hybrid SB PDLT/NB PMUT, and a Modified Traffic Signal. Analysis results and recommendations are presented in **Table 3-40**.

TABLE 3-40: US 27 & W CENTRAL AVENUE ICE RESULTS AND RECOMMENDATIONS

US 27 & W Central Avenue					
Control Strategy Evaluated	AM Peak V/C	PM Peak V/C	Multimodal Score	SPICE Ranking	Recommended to be evaluated in Stage II ICE?
Traffic Signal (No-Build)	0.90	0.94	4.8	4	Yes
Full DLT	0.57	0.57	4.8	3	No
PDLT	0.69	0.73	4.8	3	Yes
Full MUT	0.77	0.73	6.3	1	No
PMUT	0.75	0.79	6.3	1	Yes
Signalized RCUT	0.68	0.68	6.3	6	No
Modified Traffic Signal	0.82	0.85	4.8	4	Yes
PDLT/PMUT Hybrid*	0.69/0.75	0.73/0.79	5.6	2	Yes

*PDLT/PMUT v/c ratios, respectively

Appendix 40-A: Traffic Data

Appendix 40-B: Capacity Analysis for Planning of Junctions (CAP-X) Files

Appendix 40-C: Safety Performance for Intersection Control Evaluation (SPICE) Files

Appendix 40-D: Stage 1 ICE Form

Appendix 40-E: Crash Data

4.0 OVERALL SUMMARY AND CONCLUSIONS

As described in Section 1.0 (Introduction), the existing and No-Build conditions analyses were conducted previously and documented in respective reports published in 2019 and 2020, respectively. It was following the existing and No-Build conditions analyses that operationally deficient intersections were identified for further study following the Intersection Control Evaluation (ICE) process. Intersections that operated at or above (i.e., better than) the FDOT's LOS target of "D" in the AM and PM peak hours were not included, nor were several intersections that will be improved under the scope of other ongoing projects.

Table 4-1 summarizes results of the Stage 1 ICE analysis for each of the 40 intersections identified for further study. Supporting documentation for the analysis can be found in the appendices.

TABLE 4-1: ALTERNATIVES RECOMMENDED FOR FURTHER CONSIDERATION

US 27 Intersection	Signalized Alternatives									Unsignalized Alternatives			Grade Separated Alternatives		
	Traffic Signal (No-Build)	Full DLT	PDLT	Full MUT	PMUT	Quadrant Roadway*	Modified Traffic Signal (Signalize for currently Unsignalized Ints.)	Continuous Green Tee	PDLT/PMUT Hybrid	TWSC Full Median Opening (No-Build)	TWSC Closed Median	Unsignalized RCUT	Traditional Diamond	DDI	SPUI
Polo Park Boulevard	X		X	X											
Florence Villa Grove Road	X		X		X		X								
Sand Mine Road	X	X	X			SW									
Student Drive/Highland Reserve Boulevard	X		X	X	X										
McFee Drive/California Boulevard	X		X	X	X										
Terra del Sol Boulevard/Central Grove Road	X		X		X										
Four Corners Boulevard/Bella Citta Boulevard	X		X			NE			X						
Elgin Boulevard/Santa Cruz Road							X			X	X	X			
Ogelthorpe Drive							X			X	X	X			
Deen Still Road/Ronald Reagan Parkway	X		X		X				X						
Waverly Barn Road	X		X			NE									
Access Road	X		X												
Heller Brothers Boulevard/Deer Creek Boulevard	X		X	X									X		X
Minute Maid Ramp Road 2	X		X	X		NE									
Cottonwood Road					X		X			X					
Ridgewood Lakes Boulevard	X		X		X			X							
Holly Hill Tank Road							X			X	X	X			
Massee Road/Holly Hill Road	X		X	X			X		X						
La Casa Del Sol Boulevard							X	X		X	X	X			
Holly Hill Cutoff Road	X		X		X										
Sanders Road/Davenport Boulevard	X	X							X				X		X
South Boulevard				X			X			X	X	X			
Section 7 Airport Road/Parson Road/Patterson Road							X			X	X	X			
Bates Road	X		X		X				X				X		

*The Quadrant for a "Quadrant Roadway" Intersection is indicated instead of simply marking "X".

TABLE 4-1: ALTERNATIVES RECOMMENDED FOR FURTHER CONSIDERATION (CONT'D)

US 27 Intersection	Signalized Alternatives									Unsignalized Alternatives			Grade Separated Alternatives		
	Traffic Signal (No-Build)	Full DLT	PDLT	Full MUT	PMUT	Quadrant Roadway*	Modified Traffic Signal (Signalize for currently Unsignalized Ints.)	Continuous Green Tee	PDLT/PMUT Hybrid	TWSC Full Median Opening (No-Build)	TWSC Closed Median	Unsignalized RCUT	Traditional Diamond	DDI	SPII
Glen Este Boulevard/Southern Dunes	X	X	X												
CR 17/Old Polk City Road	X	X							X					X	X
Commerce Avenue/Pilot Entrance	X		X	X	X										
W Johnson Avenue				X			X			X	X	X			
Paradise Island Place/Sunshine Drive							X			X	X	X			
Kokomo Road	X					NE		X							
Crump Road/W Main Street	X			X	X										
Frederick Avenue				X			X			X	X	X			
SR 542/Dundee Road	X	X					X								
Lincoln Avenue							X			X	X	X			
SR 540/Waverly Road/Cypress Gardens Boulevard	X		X		X				X						
Thompson Nursery Road	X	X		X			X								
Tower Point Entrance/Vanguard School Entrance							X			X	X	X			
Mountain Lake Cut Off Road N	X		X	X	X				X						
Washington Avenue	X		X		X				X						
W Central Avenue	X		X		X		X		X						

*The Quadrant for a "Quadrant Roadway" Intersection is indicated instead of simply marking "X".

5.0 NEXT STEPS

This Stage 1 ICE analysis identifies alternatives that are potential solutions to expected future traffic demands at each intersection based on their specific characteristics. This effort provides a head start on future projects along the US 27 corridor that may include intersection improvements. A Stage 2 ICE analysis should supplement the Stage 1 ICE analysis and provide even clearer and decisive guidance for future projects along US 27. During the Stage 2 ICE analysis the design year traffic volumes should be checked for validity based on any potential future developments, land use changes, or roadway network improvements, and adjustments should be made accordingly prior to selecting a preferred intersection alternative.

Upon review and acceptance by the District, the study team plans to incorporate the US 27 intersection analysis findings and recommendations into the final report for the NE Polk US 27 Mobility Study. Many of these recommended improvements are expected to require some right-of-way, and impacts would need to be evaluated further. Therefore, additional engineering and environmental analyses (e.g., PD&E Studies) will be necessary prior to the implementation of major intersection improvements.

All documentation and files imperative to the Stage 1 ICE analysis are included as appendices electronically. The appendices are organized first by intersection (numbered north to south) and then by file. For ease of use, the numbering of the intersection corresponds to their individual section subheading. For example, the appendices for intersection 1 (Polo Park Boulevard), found in **Section 3.1**, are as follows:

- 1-A: Traffic Data
- 1-B: Capacity Analysis for Planning of Junctions (CAP-X) Files
- 1-C: Safety Performance for Intersection Control Evaluation (SPICE) Files
- 1-D: Stage 1 ICE Form
- 1-E: Crash Data