Pedestrian Feasibility Studies

City of DeBary
East Highbanks Road
Sidewalk Feasibility Study

LTG Job No.: 3903.08

Prepared For

Prepared By:

Lassiter Transportation Group, Inc.
Engineering and Planning

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Revised March 2017

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1. EXECUTIVE SUMMARY

The River to Sea Transportation Planning Organization (R2CTPO) provides support to its member communities by conducting bicycle and pedestrian feasibility studies for projects with applications for funding through the priority project selection process. The City of DeBary has applied for a Pedestrian Feasibility Study along the East Highbanks Road (R2CTPO SCHL-2016-047R). The original application is included as Appendix A.

The purpose of this study is to assess the feasibility for a newly constructed five-foot sidewalk along the north side of East Highbanks Road in the City of DeBary. The specific segment has been selected by City Staff as high-priority due to location, existing pedestrian patterns, to enhance safety and ultimately address the existing sidewalk gap. The proposed sidewalk is to extend from Simcoe Street to Enterprise Road (approximately 3,600 ft.), with the complete study area extending from Lucerne Drive to Enterprise Road (approximately 4,185 ft.). Three crosswalk locations were also investigated as part of the feasibility study.

A site visit was conducted along the study area segment on Thursday, December 8, 2016 which included the City of DeBary, the Florida Department of Transportation (FDOT), and Lassiter Transportation Group, Inc. (LTG) staff. The site visit consisted of driving and walking the study area to evaluate potential constraints within the apparent right-of-way. To aid in identifying the apparent right-of-way, the following items were reviewed prior to the site visit: Volusia County right-of-way maps for Enterprise Road at East Highbanks Road, Volusia County property appraiser's website, Volusia County Geographical Information Systems (GIS) files, and aerial maps. Right-of-way material is included as Appendix B. Based on the information contained in these documents, previous studies, and field review, the following bullet points summarize the results of this sidewalk feasibility study.

- The study area segment is located within an urbanized area.
- The minimum amount of right-of-way at a given point along the study area is 66 ft. near Enterprise Road.
- The majority of the proposed sidewalk is 5-ft. wide and extends approximately 3,250 ft. A 6-ft. wide section of sidewalk is also included and extends approximately 350 ft. from Toronto Street to the Volusia County Learning Center driveway.
- The proposed sidewalk will connect to existing sidewalks at each end of the study area and to the sidewalk on the south side of Highbanks Road to provide improved connectivity to the surrounding community. Crosswalk pavement markings, detectable warnings and advanced pedestrian signage was used to enhance pedestrian safety at intersections within the study area.
- All the proposed sidewalk alignments are to be placed as close to the apparent right-of-way line as possible, with a minimum of 1 ft. offset.
- The sidewalk alignment shall adjust to avoid existing utility poles located within the apparent right-of-way.

- Where feasible, the proposed sidewalk is to mimic the existing roadway grades and alignment.

- Additional lighting fixtures have been recommended at proposed crosswalk locations for added pedestrian safety.

- There are four total proposed crosswalks within the study area and are located at Simcoe Street, Woodbound Lane and Toronto Street (one stretches across Highbanks Road, the other crosses Toronto Street). Two options have been provided for the Highbanks Road crosswalk treatment near the Volusia County Learning Center/ Toronto Street.

- No improvements to the existing sidewalk that runs along the south side of Highbanks Road have been included in the study except for adding ADA ramps at the proposed crosswalk locations.

Based on results of this Sidewalk Gap Feasibility Study the proposed sidewalk along the segment was estimated to be $538,800.00. The proposed sidewalk will enhance pedestrian connectivity to the surrounding community, provide safe crossing opportunities, and ultimately address the existing gap issue in the overall sidewalk network. By the year 2020, the estimated construction cost for those recommended improvements is expected to increase to $583,520.00. No physical barriers or impediments were identified that would make construction of the sidewalk not possible. Therefore, construction is considered feasible assuming funding becomes available.

2. INTRODUCTION

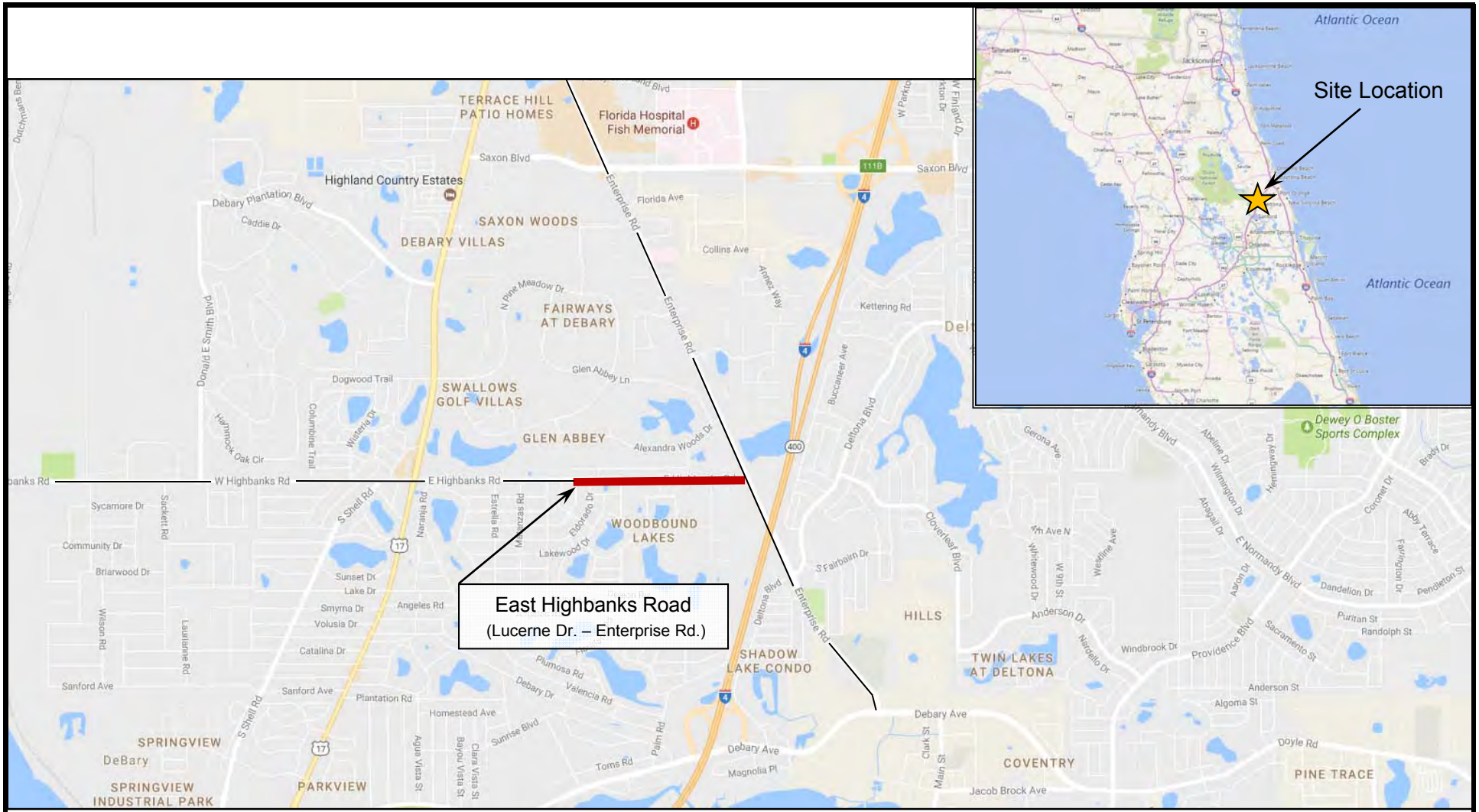
Lassiter Transportation Group, Inc. (LTG) has been retained by the River to Sea Transportation Planning Organization (R2CTPO) to prepare a sidewalk feasibility study along the north side of East Highbanks Road, from Simcoe Street to Enterprise Road, located within the City of DeBary. The City of DeBary submitted an application requesting a feasibility study dated May 7 of 2014 (see Appendix A). This sidewalk safety and connectivity project includes the construction of a new sidewalk to fill gaps within the existing pedestrian network, and three crosswalks to provide access from one side of Highbanks Road to the other. The study area extends from Lucerne Drive to Enterprise Road; however, the proposed sidewalk will end on the east side of Simcoe Street where it ties into the existing sidewalk network. The proposed crosswalk locations, identified by the minor side street, are provided below:

1. Simcoe Street
2. Woodbound Lane
3. Toronto Street (2 locations)

The study area segment of East Highbanks Road is within proximity to community assets and provides direct access to such establishments. Community developments within 1-mile of the study area include the following:

- Bill Keller Park, City of DeBary Parks & Recreation
- Reading Edge Academy
- Volusia County Learning Center
- The River City Church, First Presbyterian Church
- Glen Abbey Golf Club
- DeBary Commons Shopping Plaza
- Orange City Collison, Inc.
- Residential Building Supply

This report summarizes LTG's investigation into the physical feasibility for sidewalk construction, recommendations for improvement and an estimated probable cost for such improvements, as requested by the City of DeBary. Figure 1 shows the general location of the study area segment in relation to the surrounding roadway network.



RIVER TO SEA TPO
Transportation Planning Organization
VISION - PLAN - IMPLEMENT

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Sidewalk Feasibility Study
City of DeBary, FL

Site Location Map

Project No.: 3903.08

Figure: 1

Lassiter Transportation Group, Inc.
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The following information outlines the supporting policies found in the City's Comprehensive Plan and Development Code of Ordinances:

Chapter 2, The Vision of the City of DeBary:
The City of DeBary is a safe and active community that provides cultural, educational and recreational opportunities for all. The City envisions land development patterns and a transportation system that encourages healthy and active living; promotes transportation options; increases community safety; reduces environmental impact; mitigates climate change; and supports greater community identity. DeBary's progressive and proactive government continuously strives to be responsive to the needs and aspirations of its people. – *City of DeBary Comprehensive Plan, 2012, pg. 9*

Sect.4-82 - Streets:

(7) Pedestrian Crosswalks. Pedestrian crosswalk signing and marking, where used, shall be in accordance with the USDOT Manual on Uniform Traffic Control Devices. – *Land Development Code or Ordinances, City of DeBary*

Sect.4-90 - Sidewalks:

(A) Pedestrian Access. Neighborhood and community commercial facilities shall have an efficient and direct pedestrian way connection to the residential areas the facilities are intended to serve. The design of local commercial facilities shall allow pedestrians direct access from adjacent neighborhood areas, with due consideration to the elimination of points of conflict between pedestrians and vehicles.

(B) Sidewalks General. Paved sidewalks, a minimum of five feet in width, shall be installed on both sides of all local streets within a new development. – *Land Development Code or Ordinances, City of DeBary*

As part of this study, the City held a public information meeting on January 11, 2017 and presented the conceptual plan included here. No comments are objections were received as a result of that meeting.

3. PURPOSE AND OBJECTIVES

The purpose of this project is to conduct a study that will assess the feasibility for construction of a five-foot wide sidewalk along the northern side of Highbanks Road located in the City of DeBary. The study area segment is approximately 0.79 miles/4,185 ft. in length from Lucerne Drive to Enterprise Road. The proposed sidewalk is approximately 0.68 miles/3,600 ft. in total length and is to extend from the east side of Simcoe Street to the west side of Enterprise Road. The western boundary, or beginning of the proposed sidewalk, will connect to the existing sidewalk along the east side of Simcoe Street. A crosswalk at this location will also be included in the overall improvement. Additionally, crosswalks located at Woodbound Lane and Toronto Street are also included. The proposed sidewalk will connect to the existing sidewalk network along Enterprise Road in the northwest quadrant of the Highbanks Road intersection. A newly constructed sidewalk at this location will enhance pedestrian safety and connectivity to the surrounding community as well as encourage pedestrian travel between residential neighborhoods, educational facilities and local businesses.

This study evaluates existing conditions and proposes recommendations for construction of the desired sidewalk. The recommended conceptual alignment for the segment is presented in this report. A cost estimate for the recommended alignment is included in this report with sufficient supporting detail provided in **Chapter 8: Engineer's Opinion of Probable Cost**. The cost estimate is provided to assist the R2CTPO and the City of DeBary in the budgeting and planning of this project. For the purposes of data collection, concept development, corridor evaluation, and cost estimation, field visits and record research with the City and Volusia County were conducted by LTG staff.

4. STUDY METHODOLOGY

The following tasks were completed per the project scope to provide an informed feasibility report in accordance with R2CTPO policies, procedures, and rules. In addition, the tasks will meet the procedures currently used by FDOT District 5 to evaluate transportation (SU funded), bicycle and pedestrian corridor projects.

- A project scope meeting was held with R2CTPO, The City of DeBary, Volusia County, FDOT, and LTG staff on Thursday, October 27, 2016. The purpose of the meeting was to discuss the scope of the project and to obtain any relevant project information from the stakeholders.

- Data collection for the project consisted of obtaining copies of planning, land use, and engineering information, including the following:

    a. FDOT/Volusia County right-of-way maps (show 66 ft. of right-of-way near Enterprise Road).

    b. Volusia County Property Appraiser's parcel maps were downloaded to delineate the area right-of-way boundaries to check for consistency with records and field observations. Fence locations, drainage structures and minimal utility information is also identified where applicable. The right-of-way boundaries shown on Figures 2A-2E are approximate. No right-of-way purchase requirements were identified. However, it is recommended that a right-of-way survey be conducted during the design phase.

    c. County of Volusia LiDAR

    d. USGS Soil Maps and data show several different soil types within the study area.

    e. Data also consisted of referencing readily available information from a variety of sources, including: The R2CTPO, The City of DeBary, and Volusia County.

- A site visit along the study area segment was conducted on Thursday, December 8, 2016 and included The City of DeBary, FDOT and LTG Staff. The meeting provided an opportunity for stakeholders to gain familiarity with the study area and to discuss site specific challenges that may affect feasibility. Photographs, measurements, and field

notes were collected to document any potential obstructions/obstacles specific to the study area.

- A Concept plan was developed based on the results of the three previous tasks and applicable design criteria. The concept plan is based on design criteria for pedestrian facilities contained in the FDOT Design Standards, Plans Preparation Manual, Manual on Uniform Minimum Standards for Design, Construction, and Maintenance (the Florida Greenbook), and the maintaining agency standards.

- An Engineer's Opinion of Probable Costs (EOPC) for construction was prepared based on the conceptual design to construct the sidewalk within the existing right-of-way limits. The EOPC was prepared based on FDOT historical cost data.

5. EXSITING CONDITIONS

The East Highbanks Road study area is located within the City of DeBary and maintained by City staff. The study area segment is approximately 0.79 miles, or 4,185 ft., in length and extends eastbound from Lucerne Drive (Station 11+38) to Enterprise Road (Station 52+52). Please note that the proposed sidewalk begins on the eastern side of Simcoe Street, approximately 610 feet east of Lucerne Drive (Station 16+68). East Highbanks Road provides connectivity to US 17/Charles Richard Beall Boulevard to the west, and Enterprise Road to the east. The roadway segment also provides primary access to residential neighborhoods, local community businesses, and educational facilities. A description of the existing conditions is provided below. Detailed graphics and photographs are included on Figures 2A – 2E.

The section of East Highbanks Road within the study area is classified as a two-lane undivided urban minor collector with exclusive left and right-turn lanes and a posted speed limit of 40 miles per hour (mph). Travel lane widths are typically 12 ft. throughout the study area. There is an existing five-foot sidewalk that runs along the south side of the roadway, and is aligned at the back of the right-of-way. Roadway grades fluctuate along the segment that create gentle vertical curves at each end of the study area, and a small rolling hill near The River City church driveway (Station 26+00). Based on contour mapping data obtained from the Volusia County Property Appraiser, the crown of a vertical curve is located at Simcoe Street and gradually transitions to a flat section of roadway between Toronto Street (Station 38+35) and Cunningham Road (Station 44+00). The roadway grade then increases slightly to match the existing grade along Enterprise Road. Roadway grades vary from nearly flat to a maximum of 2.75%.

From Simcoe Street to Toronto Street, residential property boundaries are identified by private fences that appear to align at the back of the right-of-way. However, the fence line and width of right-of-way varies along the segment. While open areas are present throughout this section, heavy natural vegetation/brush is scattered along the fence line. Additionally, Fiber Optic Cable (FOC) markers and fire hydrants were identified along the right-of-way line.

Open drainage features are primarily present along the segment, with curb and gutter sections located between Toronto Street and Enterprise Road. Type -C ditch bottom inlets were identified near Simcoe Street indicating a small drainage system exists along the northern side of Highbanks Road. The drainage system extends approximately 475 feet (from Station 15+89 to Station 20+63) along Highbanks Road and outfalls into a nearby wetland area on the south side of the segment. The drainage system also includes a narrow ditch located approximately 3 ft. from the edge of pavement and extends the length of the system. Two utility poles are located within the right-of-way from Simcoe Street to Toronto Street (at Station 26+27 and Station 36+45) and include two or more guy wires. Electrical span wire connects these poles to an existing over-head utility system that runs along the south side of Highbanks Road.

Image 1: ***Residential Fencing and vegetation along North side of Highbanks Road***

East of Toronto Street. there are fire suppression and water supply back flow preventers within the right-of-way (at Station 39+83) that are located directly adjacent to the Volusia County Learning Center property boundary. Roadside curb and gutter are present through this section. The drainage system also includes a concrete flume approximately 9 ft. in length that provides outfall from the roadway.

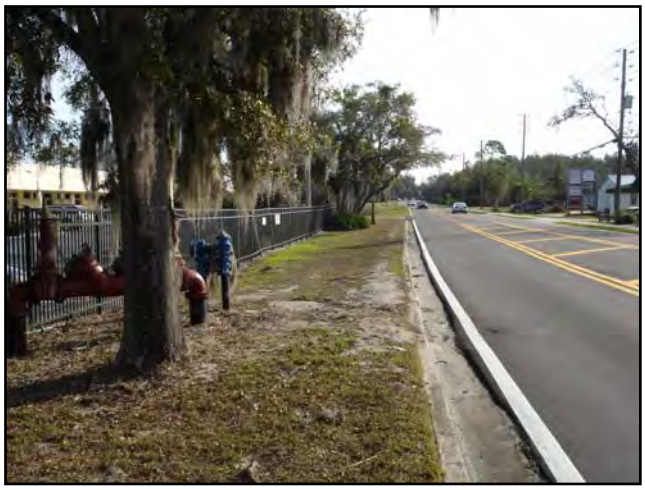


Image 2: ***Fire suppression and back flow preventers to remain, from Toronto Street to Cunningham Road.***

Multiple small/medium sized oak trees are located approximately 8 ft. from the back of curb (Station 41+52) and are to be avoided. At the northern side of the Cunningham Road intersection (Station 43+84) a PVC storm pipe extends north and south under Highbanks Road, and connects to a deep swale located in the southwest quadrant of the intersection. A deep-set water valve, located approximately 3 ft. from the edge of pavement, and abandoned gas lines are also marked at this location. However, the origin of these utilities is unknown and they should be avoided.

From Cunningham Road (Station 44+00) to approximately 200 ft. west of Enterprise Road (Station 51+00), the northern right-of-way line is directly adjacent to a Volusia County owned parcel that includes a large storm water pond. At the property boundary, an existing power pole and span wire assembly is located approximately 255 ft. east of Cunningham Road (Station

46+58). The electrical span wire connects to an existing over-head utility system that runs along the south side of Highbanks Road. The power pole assembly is anticipated to be just within the right-of-way and includes two guy wires. Two gas mains cross Highbanks Road along the eastern edge of the pond property in an easement (Station 50+89). A water valve is also located near the gas line markers and is approximately 3 ft. from the back of curb indicating that an existing water main exists along the north side of Highbanks Road. However, the City of DeBary was unable to provide the exact location; additional contact with Volusia County may be required. The small triangular parcel in the northwest quadrant of the Enterprise Road intersection is privately owned and is not anticipated to be impacted by the proposed sidewalk alignment. Based on Right-of-way maps provided by Volusia County, the apparent right-of-way along Highbanks Road near Enterprise Road is 66 feet.

Image 3: ***Unidentified utilities to be avoided. Located across from Cunningham Road.***

It should also be noted that multiple street lights are present throughout the study area that illuminate the southern side of Highbanks Road and existing sidewalk (from Station 26+27 to Station 44+50). One light fixture is in the northwest quadrant of the Simcoe Street intersection (Station ,16+20), while a continuous strand of street lights is present from the eastern River City church driveway and ends at the edge of the Woodbound Lane residential subdivision (from Station 26+27 to Station 34+56). A single street light is also located in the northwest quadrant of the Toronto Street intersection (Station 38+45), and the southeast corner of the Cunningham Road intersection (Station 44+50).

Project Soils

The U.S. Department of Agriculture's (USDA) Web Soil Survey and Volusia County Kiosk Map were used to approximate the soil quality conditions within the immediate study area. The most prominent soil qualities identified along Highbanks Road are summarized below. Appendix B provides the existing soil classification map and a description of the soil properties within the area of influence.

Paola fine sand, 0 to 8 percent slopes: Paola series type soils can be described as very deep, excessively drained and rapidly permeable soils. Typically located on nearly level to moderately steep uplands. In a representative profile the surface layer is dark gray sand approximately 3 inches thick. The subsurface is mainly light gray sand that is underlain by yellowish brown and light brown sand to 80 inches or more. Typically formed in thick deposits of marine sand.

Orsino fine sand, 0 to 5 percent slopes: Orsino soils consists of deep, moderately drained sandy soils that have formed in sandy marine or Aeolian sediments. In a representative profile the surface layer is dark gray to gray fine sand approximately 7 inches thick. The subsurface layer is mainly light gray fine sand approximately 15 inches thick.

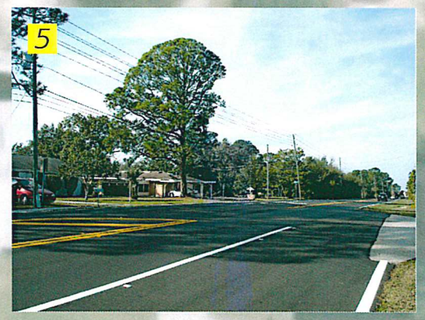
Daytona sand, 0 to 5 percent slopes: Daytona Sand with 0 to 5 percent slopes consists of moderately well drained sandy soils that are typically found on low sand hills on the lower coastal plain. The parent material typically consists of sandy marine deposits. Water movement in the most restrictive layer is high.

SIMCOE STREET

E. HIGHBANKS ROAD

LUCERNE DRIVE

ELDORADO DRIVE



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RIVER TO SEA TRANSPORTATION PLANNING ORGANIZATION

ROAD	COUNTY	PROJECT ID
HIGHBANKS	VOLUSIA	SCHL-2016-047R

FIGURE 2A

EXISTING CONDITIONS

CITY OF DEBARY - SIDEWALK FEASIBILITY STUDY

SHEET NO. 11

9 10

11 12

13 14

15 16

E. HIGHBANKS ROAD

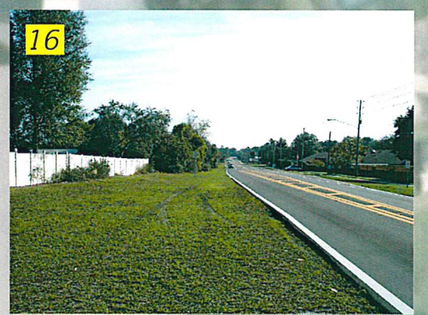

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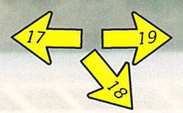
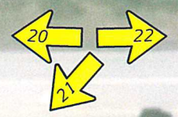
FIGURE 2B

EXISTING CONDITIONS

CITY OF DEBARY - SIDEWALK FEASIBILITY STUDY

SHEET NO. 12





E. HIGHBANKS ROAD

WOODBOUND LANE

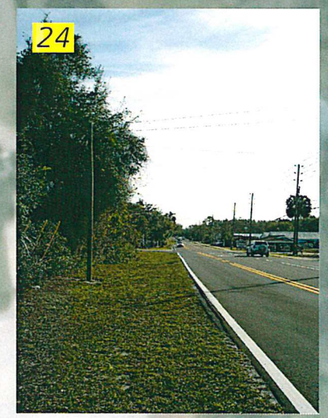


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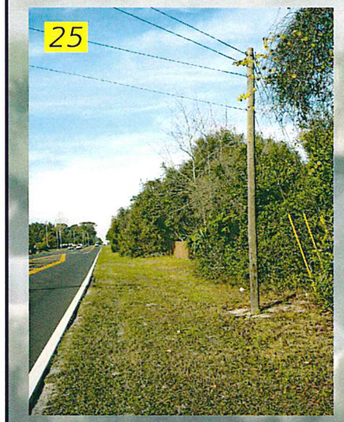
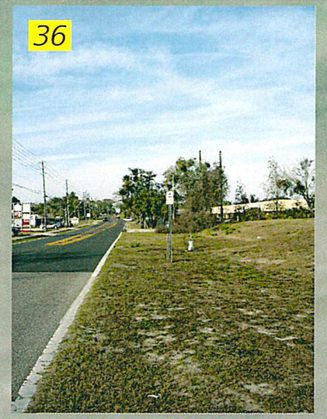
FIGURE 2C

EXISTING CONDITIONS

CITY OF DEBARY - SIDEWALK FEASIBILITY STUDY

SHEET NO. 13





TORONTO STREET

25 26 27 28 29 30 31 32 33 34 35 36

E. HIGHBANKS ROAD

PRIVATE DRIVE

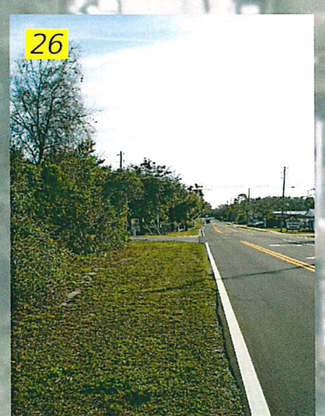


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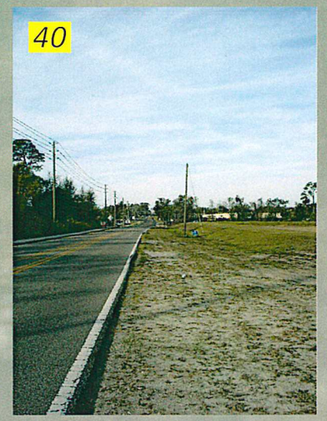
FIGURE 2D

EXISTING CONDITIONS

CITY OF DEBARY - SIDEWALK FEASIBILITY STUDY

SHEET NO. 14



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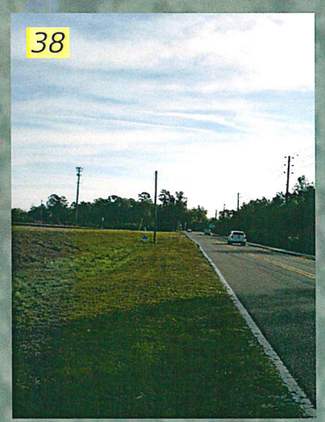
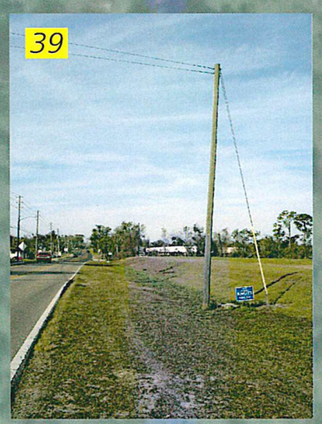
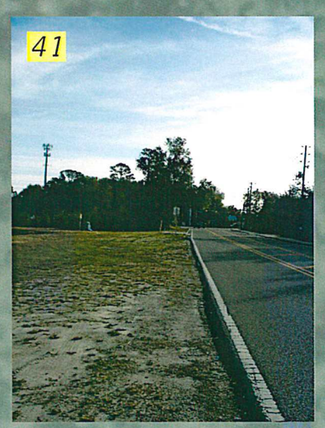
47

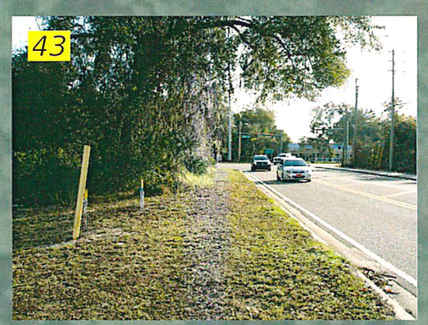
E. HIGHBANKS ROAD

ENTERPRISE ROAD









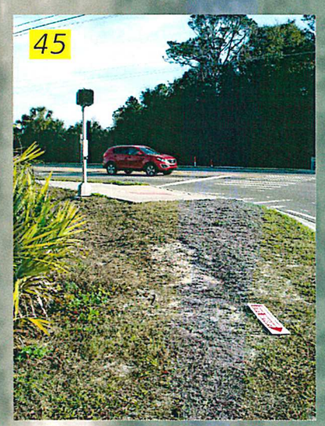


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FIGURE 2E

EXISTING CONDITIONS

CITY OF DEBARY - SIDEWALK FEASIBILITY STUDY

SHEET NO. 15

6. DESIGN CRITERIA

The concept plan included within this report was developed based on design criteria set forth and adopted by FDOT and the City of DeBary. The following publications were used to prepare the concept design, and cost estimates:

- Plans Preparation Manual (FDOT)
- Design Standards (FDOT)
- Florida Greenbook (FDOT)
- Manual on Uniform Traffic Control Devices (MUTCD)
- Volusia County Land Development Code
- City of DeBary Land Development Code
- Standard Specifications for Road and Bridge Construction (FDOT)
- Basis of Estimates (FDOT)
- FDOT Historical Unit Cost Data (dated 11/30/2016)

The following specific criteria should be used in development of the final construction plans:

Horizontal Separation
The Plans Preparation Manual (PPM) recommends that new sidewalks be placed as far from the roadway as practical in the following sequence of desirability:

1. As near the right of way line as possible
2. Outside of the clear zone
3. Five feet from the shoulder point on flush shoulders
4. At the shoulder point

The Florida Greenbook, which governs design of the non-state roadway system, recommends that pedestrian pathways be placed as far from the roadway as possible, in the following sequence of desirability:

1. Outside of the right-of-way in a separately dedicated corridor adjacent to the right-of-way
2. At or near the right-of-way
3. Outside of the minimum required clear zone
4. As far from the edge of the driving lane as practical

The PPM and Florida Greenbook criteria were selected as appropriate for design of the sidewalk. it is recommended that the proposed alignment be placed as close as possible to the right-of-way limits.

The PPM and Florida Greenbook recommend that sidewalks be transitioned toward the roadway at intersections to establish a more functional crossing location that also meets driver expectations for stop line location. The concept plan has been developed so that the proposed sidewalk intersects existing streets, driveways, and sidewalks at approximate right angles to cross in parallel movements to the adjacent roadway where applicable.

Accessibility, Slopes, and Grades

Curb ramps, maximum slopes, minimum widths, clear zones, and design treatments for the visually impaired, such as truncated domes, are design features that result in part from the Americans with Disabilities Act (ADA). These design features must be accounted for when designing new pedestrian facilities and retrofitting existing facilities. The following list of design criteria should be considered when preparing the final construction plans for the project.

1. The Florida Greenbook states that curb ramps meeting the requirements of ADA Accessibility Guidelines and the Florida Accessibility Code for Building Construction shall be constructed at crosswalks at all intersections where curbs and sidewalks are constructed to give persons with disabilities safe access.

2. In general, proper design of pedestrian crossings shall consider the following:
   a. Crossings should be placed at locations with ample sight distances.
   b. At crossings, the roadway should be free from changes in alignment or cross section.
   c. The entire length of the crosswalk shall be visible to drivers at a sufficient distance to allow a stopping maneuver.
   d. STOP lines shall be provided adjacent to all signalized crosswalks to inform drivers of the proper location to stop. The STOP line should be separated from the crosswalk and should not be closer than 4 ft.
   e. All crosswalks shall be easily identified and clearly delineated, in accordance with MUTCD (Rule 14-15.010).

3. The most important design consideration for persons with disabilities are curb ramps. Therefore, new and retrofitted streets with sidewalks should have curb ramps installed at all delineated crossings, and it is desirable to provide separate ramps for each crosswalk at intersections with perpendicular approaches. Two curb cuts at each corner with a curb separating each ramp provides a greater amount of information to visually impaired pedestrians in street crossing designs.

4. Crossings shall also meet the same grade and cross slope requirements as sidewalks where the longitudinal grade should not exceed 5% and the maximum cross slope shall be no more than 2%.

5. Marked crosswalks on an uncontrolled leg of an intersection or midblock shall be supplemented with other treatments (including beacons, curb extensions, raised medians, raised traffic islands, or enhanced overhead lighting) when any of the following conditions exist: 1) Where posted speeds are greater than 40 mph, 2) Inadequate stopping sight distance exists, such as on hills or curves, 3) Block length is shorter than 600 feet and high pedestrian volumes exist, and 4) Multiple conflict points that demand driver attention away from the crosswalk.

7. CONCEPT PLAN DEVELOPMENT

Per the City of DeBary's project funding application for this project, the sidewalk concept is to address the sidewalk gap along the north side of Highbanks Road. The proposed sidewalk will extend from the northeast quadrant of the Simcoe Street intersection to the northwest quadrant of the Enterprise Road intersection. The conceptual sidewalk design includes 5 ft., and 6 ft. sidewalk widths and four proposed crosswalk locations. The conceptual design is provided in Figures 3A-3E. The summary of the alignment is provided below.

Beginning at the western boundary of the study area, just east of Lucerne Drive, an advanced pedestrian warning sign with one flashing circular beacon is proposed (at Station 11+40) to enhance driver awareness and improve crosswalk safety throughout the segment. A second advanced pedestrian warning sign and flashing beacon is proposed directly east of the Cunningham Road intersection to alert westbound traffic of pedestrian crosswalks (at Station 44+53). As requested by City staff, the standard electric powered and solar powered options were considered as part of the feasibility study. It is recommended by LTG staff that the solar powered option be included in the design however, either system would be considered acceptable.

The first proposed 8 ft. crosswalk is to be located on the east side of Simcoe Street (at Station 16+70) to provide access to the existing southern sidewalk. A 5-ft. wide landing area is proposed on the south side of Highbanks Road and is to match the existing sidewalk. Detectable warnings and additional pedestrian crosswalk signage shall be provided. The existing light pole located in the northwest quadrant of the Simcoe Street intersection currently illuminates the street identification sign. With no other lighting structures in the immediate area, it is recommended that additional lighting be provided in the southeast quadrant of the intersection. The proposed 5 ft. sidewalk will tie into the existing north-south sidewalk along the eastern side of Simcoe Street. Due to existing damage of the sidewalk at this location, 8 ft. of the sidewalk is to be replaced to provide a smooth even surface and transition. The alignment continues parallel to Highbanks Road and placed approximately 3 ft. from the back of the apparent right-of-way. The alignment is not expected to impact the existing drainage structures directly adjacent to Highbanks Road.

An existing fire hydrant located directly adjacent to the back of the right-of-way (at Station 23+88) shall be avoided. The proposed sidewalk alignment gently meanders around the fire hydrant, keeping a clearance of 2 feet, and continues parallel along the right-of-way for approximately 150 feet. The alignment meanders around two existing utility pole-guy wire assemblies and shifts back north to continue parallel along the apparent right-of-way until reaching Toronto Street. At Station 30+90, an additional 5 ft. sidewalk aligns perpendicular to the main sidewalk to provide access to the Woodbound Lane intersection. An 8-ft. crosswalk is also proposed along the western side of Woodbound Lane and is to include detectable warnings and multi-panel pedestrian signage for both directions of vehicular travel. A 5-ft. wide section of sidewalk is proposed in the southwest quadrant of the intersection and shall tie into the existing sidewalk network along the south side of Highbanks Road. Multiple light poles located on the south side of Highbanks Road are within the immediate area of the proposed pedestrian crossing. However, the north side of the crosswalk does not appear to have sufficient lighting during night-time hours. Additional street lighting is recommended at this location to enhance the visibility of pedestrians and improve the overall safety of the crosswalk.

A 6-ft. sidewalk is proposed from Toronto Street to the Volusia Learning Center Driveway and is to be located at the back of the existing curb. The last two proposed crosswalks are to be located at or near the Toronto Street intersection to enhance connectivity to the existing sidewalk network. An 8-ft. east-west crosswalk, curb ramp and detectable warnings are recommended for the Toronto Street crossing. Two alternative locations are suggested to provide access to the existing southern sidewalk. The Option A crosswalk alignment is slightly skewed and is located directly east of the Toronto Street intersection. Option A was developed to keep all crosswalks at identified intersections. Option B, located approximately 100 ft. east of Toronto Street, is perpendicular to the vehicular travel lanes, however this would be considered a mid-block crossing due to existing driveway connections and roadway geometry. Both options would include receiving sidewalks on the south side of Highbanks Road, detectable warnings and pedestrian signage for both directions of vehicular travel. Due to the existing curb & gutter drainage system along this section of Highbanks Road, curb ramps are required for access to the proposed sidewalk. Minimal clearing and grubbing is expected as adjacent utilities and multiple tree/landscaping areas are to remain. Additional modifications include matching the grade of the existing valve boxes, removal of rebar lift rings on both valve boxes, and adding tubular delineators in-line with existing pad locks. The delineators are recommended to shield the locks and to warn pedestrians of the potential trip hazard. However, modifications to the hatch/box covers may be required and shall be determined during final design. Additionally, a closed flume inlet and handrail is proposed to by-pass the existing roadside flume.

Even though existing street lighting is provided in the immediate area, additional lighting is recommended to enhance pedestrian visibility. Location of such lighting varies upon the selected crosswalk option (see Figure 3D, page 23). Based on safety standards against mid-block crossings, Option A is the recommended location for the crosswalk because it is located at the intersection. It should be noted that due to the skewed nature of the proposed crosswalk alignment, the curb ramps and detectable warnings will require special attention during the design phase to accommodate such alignment.

The proposed 6 ft. sidewalk alignment shifts slightly from the back of curb to remain perpendicular to the Volusia County Learning Center driveway (at Station 42+00). Both sidewalk approaches at this location do not require the need for curb ramps or detectable warnings. The proposed 5 ft. sidewalk alignment shifts north to align 1 ft. from the back of the apparent right-of-way proceeding east. The alignment continues parallel to Highbanks Road and passes by the existing water valve and unidentified utilities. The alignment meanders around the existing utility pole assembly for approximately 75 ft. before returning to the back of right-of-way. The existing water main and gas lines are not expected to be impacted by the proposed 5 ft. sidewalk. As the proposed sidewalk reaches Enterprise Road, the alignment follows the existing roadway geometry and ties into the existing sidewalk in the northwest quadrant of the intersection, at the east end of the study area, to complete the sidewalk network. The proposed sidewalk concept is shown in Figures 3A – 3E.

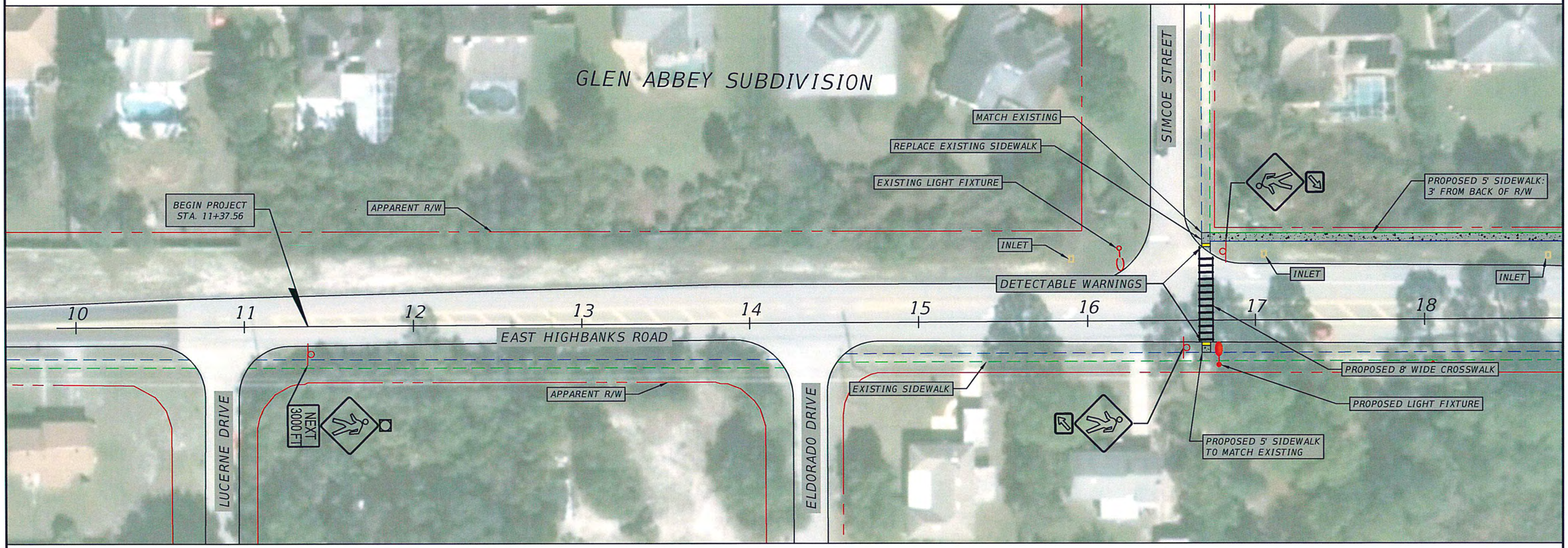
Due to anticipated vegetation impacts from Sta. 29+00 to Sta. 36+50, The City has requested flexibility in the final alignment through this section. The alternative alignment is to be placed outside of the existing vegetation line, approximately 8 ft. – 13 ft. from the back of the right-of-way for an option that includes minimal clearing and grubbing. The secondary alignment is anticipated to avoid existing utility poles and drainage structures as identified in the first alternative. The final alignment is to be determined at the time of final design. A summary of the vegetation impacts and graphics of the proposed alignments are included in Appendix D.

LEGEND

- APPARENT R/W
- EXISTING EDGE OF PAVEMENT
- PROPOSED FRONT OF SIDEWALK
- PROPOSED BACK OF SIDEWALK
- EXISTING FRONT OF SIDEWALK
- EXISTING BACK OF SIDEWALK
- PROPOSED 2' DETECTABLE WARNING
- EXISTING UTILITY POLE
- EXISTING DRAINAGE STRUCTURE
- CONCRETE STRAIN POLE
- FIRE HYDRANT
- EXISTING LIGHT FIXTURE
- PROPOSED LIGHT FIXTURE

-N-

GRAPHIC SCALE
0 15 30 60
1" = 60'
SCALE



POSTED SPEED LIMIT: 40 MPH
FOR VEGETATION IMPACTS SEE APPENDIX D

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION
1/11/17 3/21/17	CONCEPTUAL DRAFT - V2 (KLD) SIDEWALK CONCEPT - FINAL (KLD)		

Lassiter Transportation Group, Inc.
Engineering and Planning
MARK NEIMAN
P.E. No. 44077
1450 W. GRANADA BOULEVARD SUITE 2
ORMOND BEACH, FLORIDA 32174
PH: 386.257.2571 FAX: 386.257.6996
COE NO. 9227

RIVER TO SEA TRANSPORTATION PLANNING ORGANIZATION

ROAD	COUNTY	PROJECT ID
HIGHBANKS	VOLUSIA	SCHL-2016-047R

FIGURE 3A

SIDEWALK CONCEPT

CITY OF DEBARY - SIDEWALK FEASIBILITY STUDY

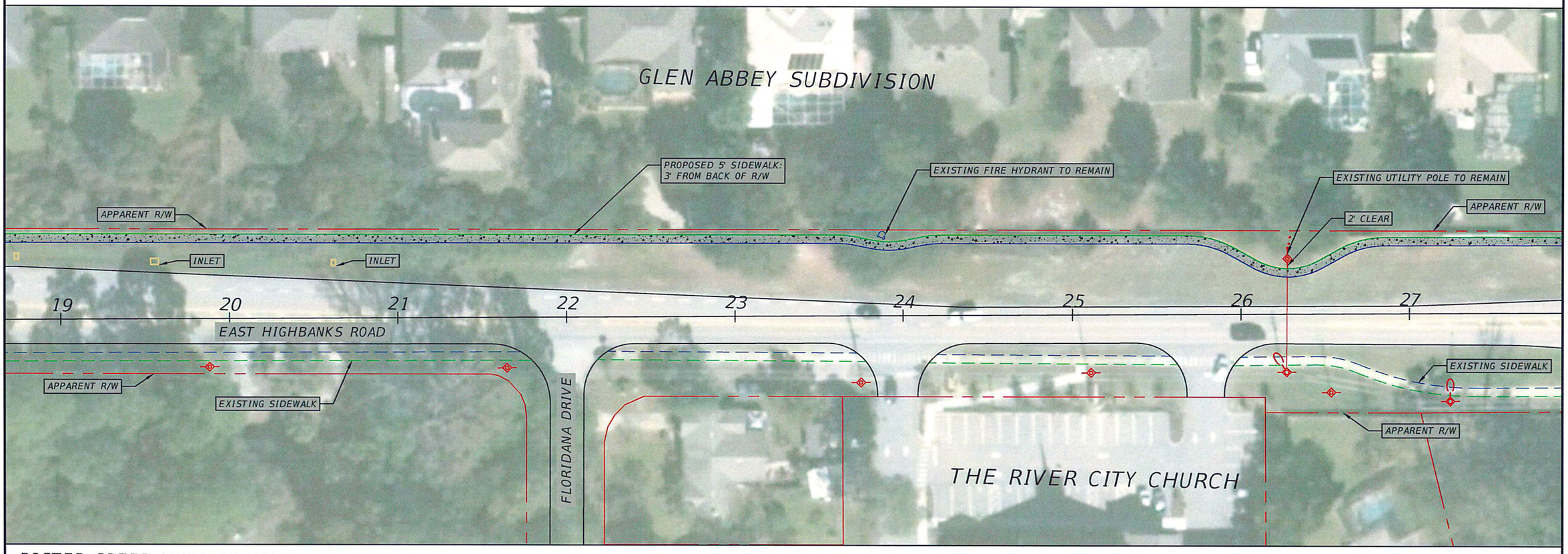
SHEET NO. 20

LEGEND

- APPARENT R/W
- EXISTING EDGE OF PAVEMENT
- PROPOSED FRONT OF SIDEWALK
- PROPOSED BACK OF SIDEWALK
- EXISTING FRONT OF SIDEWALK
- EXISTING BACK OF SIDEWALK
- PROPOSED 2' DETECTABLE WARNING
- EXISTING UTILITY POLE
- EXISTING DRAINAGE STRUCTURE
- CONCRETE STRAIN POLE
- FIRE HYDRANT
- EXISTING LIGHT FIXTURE
- PROPOSED LIGHT FIXTURE

-N-

GRAPHIC SCALE
0 15 30 60
1" = 60'
SCALE



POSTED SPEED LIMIT: 40 MPH
FOR VEGETATION IMPACTS SEE APPENDIX D

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION
1/11/17 3/21/17	CONCEPTUAL DRAFT - V2 (KLD) SIDEWALK CONCEPT - FINAL (KLD)		

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RIVER TO SEA TRANSPORTATION PLANNING ORGANIZATION

ROAD	COUNTY	PROJECT ID
HIGHBANKS	VOLUSIA	SCHL-2016-047R

FIGURE 3B

SIDEWALK CONCEPT

CITY OF DEBARY - SIDEWALK FEASIBILITY STUDY

SHEET NO. 21

LEGEND

- APPARENT R/W
- EXISTING EDGE OF PAVEMENT
- PROPOSED FRONT OF SIDEWALK
- PROPOSED BACK OF SIDEWALK
- EXISTING FRONT OF SIDEWALK
- EXISTING BACK OF SIDEWALK
- PROPOSED 2' DETECTABLE WARNING
- EXISTING UTILITY POLE
- EXISTING DRAINAGE STRUCTURE
- CONCRETE STRAIN POLE
- FIRE HYDRANT
- EXISTING LIGHT FIXTURE
- PROPOSED LIGHT FIXTURE

-N-

GRAPHIC SCALE

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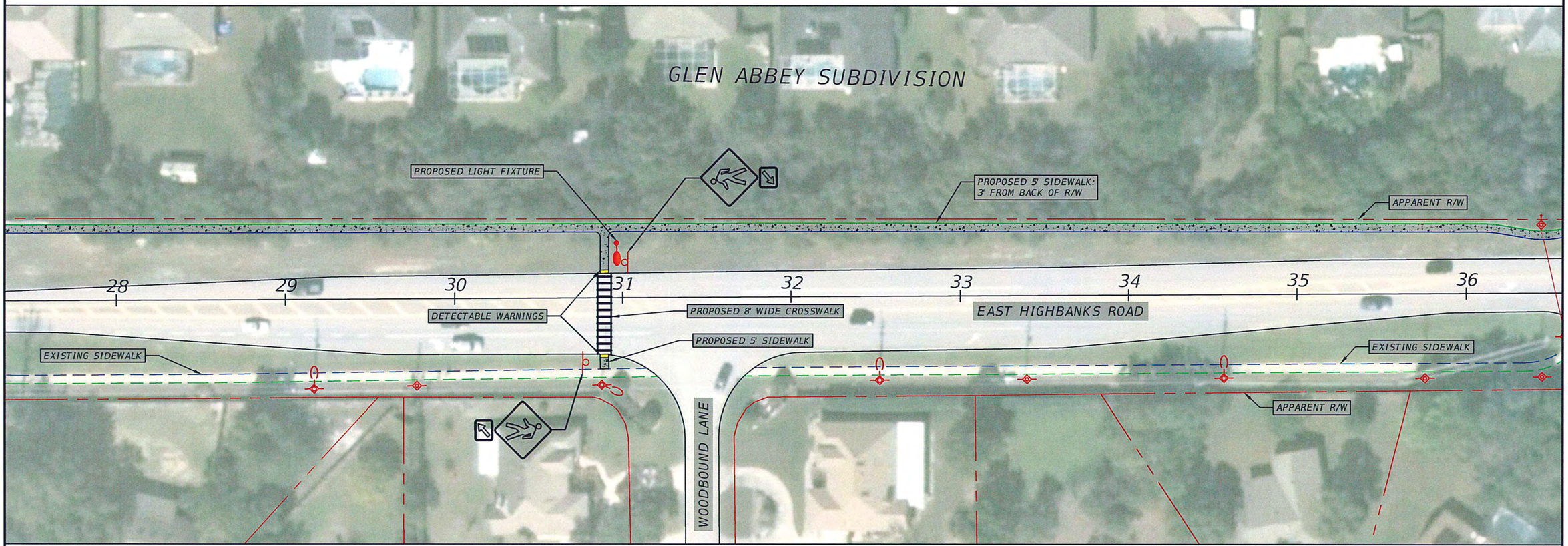
1" = 60'
SCALE



POSTED SPEED LIMIT: 40 MPH
FOR VEGETATION IMPACTS SEE APPENDIX D

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION
1/11/17 3/21/17	CONCEPTUAL DRAFT - V2 (KLD) SIDEWALK CONCEPT - FINAL (KLD)		

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RIVER TO SEA TRANSPORTATION PLANNING ORGANIZATION

ROAD	COUNTY	PROJECT ID
HIGHBANKS	VOLUSIA	SCHL-2016-047R

FIGURE 3C

SIDEWALK CONCEPT

CITY OF DEBARY - SIDEWALK FEASIBILITY STUDY

SHEET NO. 22

LEGEND

- APPARENT R/W
- EXISTING EDGE OF PAVEMENT
- PROPOSED FRONT OF SIDEWALK
- PROPOSED BACK OF SIDEWALK
- EXISTING FRONT OF SIDEWALK
- EXISTING BACK OF SIDEWALK
- PROPOSED 2' DETECTABLE WARNING
- EXISTING UTILITY POLE
- EXISTING DRAINAGE STRUCTURE
- CONCRETE STRAIN POLE
- FIRE HYDRANT
- EXISTING LIGHT FIXTURE
- PROPOSED LIGHT FIXTURE

-N-

GRAPHIC SCALE
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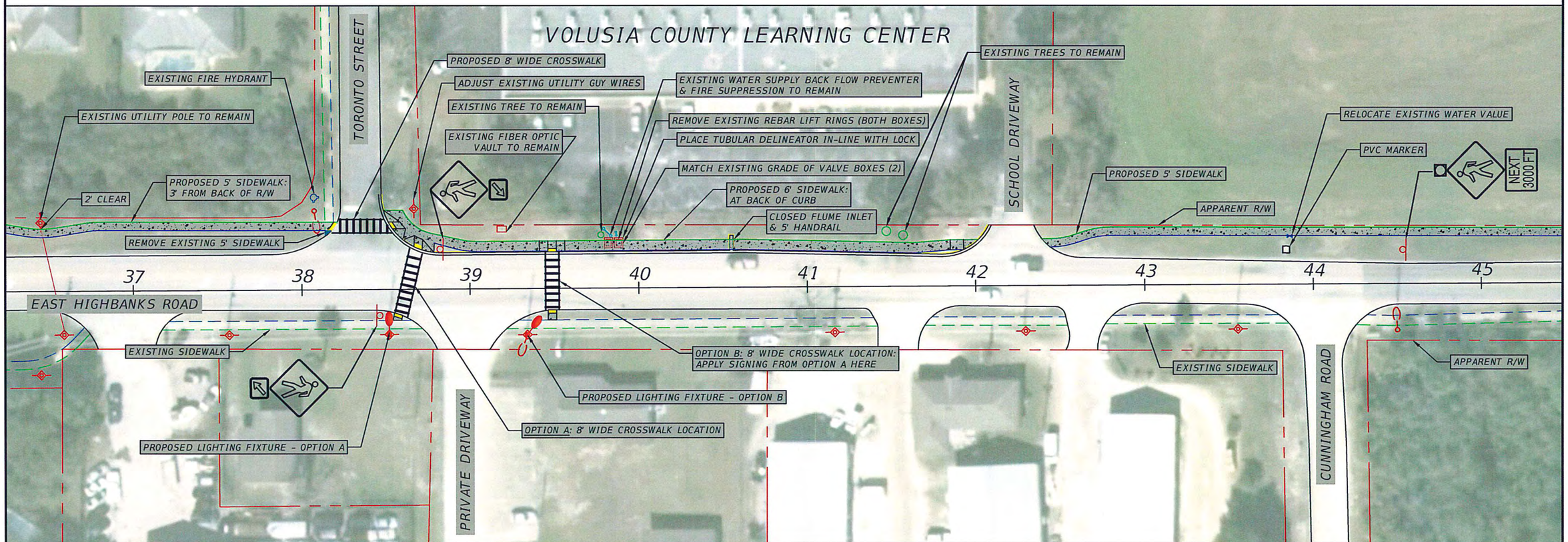
1" = 60' SCALE



POSTED SPEED LIMIT: 40 MPH
FOR VEGETATION IMPACTS SEE APPENDIX D

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION
1/11/17	CONCEPTUAL DRAFT - V2 (KLD)		
3/21/17	SIDEWALK CONCEPT - FINAL (KLD)		

Lassiter Transportation Group, Inc.
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COE NO. 9227

RIVER TO SEA TRANSPORTATION PLANNING ORGANIZATION

ROAD	COUNTY	PROJECT ID
HIGHBANKS	VOLUSIA	SCHL-2016-047R

FIGURE 3D

SIDEWALK CONCEPT

CITY OF DEBARY - SIDEWALK FEASIBILITY STUDY

SHEET NO. 23

LEGEND

- APPARENT R/W
- EXISTING EDGE OF PAVEMENT
- PROPOSED FRONT OF SIDEWALK
- PROPOSED BACK OF SIDEWALK
- EXISTING FRONT OF SIDEWALK
- EXISTING BACK OF SIDEWALK
- PROPOSED 2' DETECTABLE WARNING
- EXISTING UTILITY POLE
- EXISTING DRAINAGE STRUCTURE
- CONCRETE STRAIN POLE
- FIRE HYDRANT
- EXISTING LIGHT FIXTURE
- PROPOSED LIGHT FIXTURE

-N-

GRAPHIC SCALE
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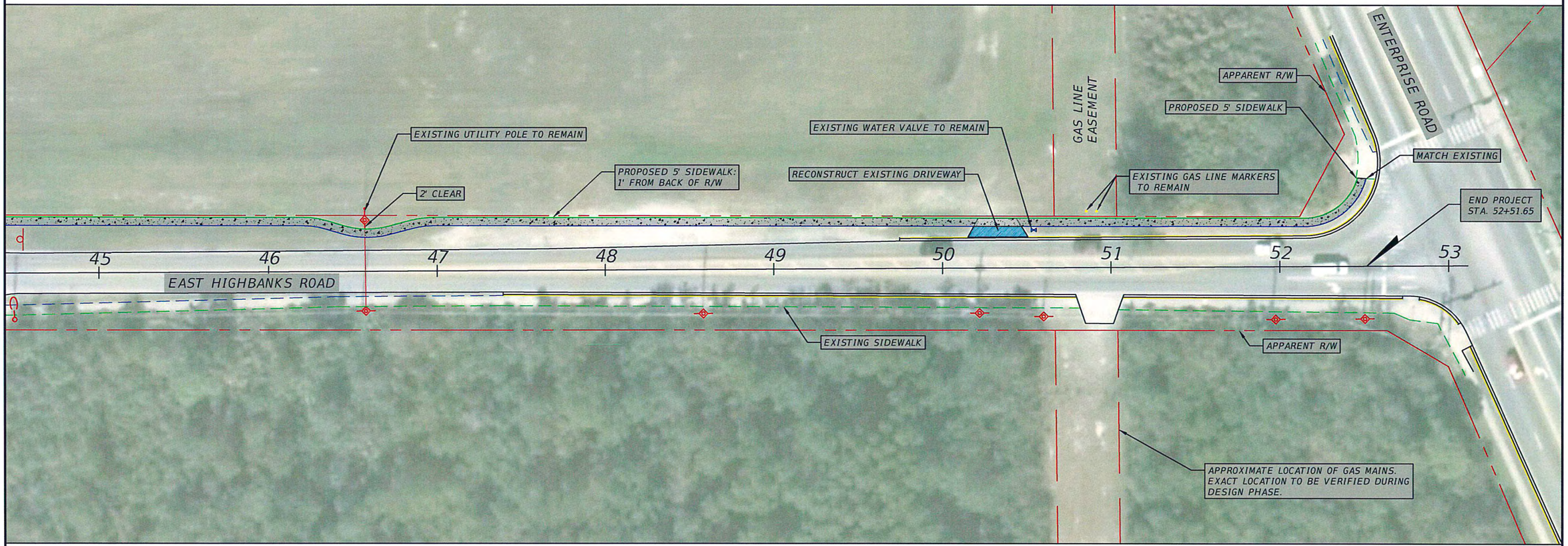
1" = 60' SCALE



POSTED SPEED LIMIT: 40 MPH
FOR VEGETATION IMPACTS SEE APPENDIX D

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION
1/11/17 3/21/17	CONCEPTUAL DRAFT - V2 (KLD) SIDEWALK CONCEPT - FINAL (KLD)		

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RIVER TO SEA TRANSPORTATION PLANNING ORGANIZATION

ROAD	COUNTY	PROJECT ID
HIGHBANKS	VOLUSIA	SCHL-2016-047R

FIGURE 3E

SIDEWALK CONCEPT

CITY OF DEBARY - SIDEWALK FEASIBILITY STUDY

SHEET NO. 24

8. ENGINEER'S OPINION OF PROBABLE COST (EOPC)

Table 1 provides the preliminary estimate of probable cost for the design and construction of the proposed sidewalk with the recommended lighting option. The cost associated with each light pole has been increased to include lighting conductors, electrical service wire, electrical power service, pull boxes, conduit (directional bore), and a pole-cable distribution system. The solar powered sign beacons have been compared to the standard electrically powered devices to show the variation in cost associated with each option. Additional cost was added to the overall construction cost for the electrically powered sign beacons to account for electrical service wire, power service, conduit and pull boxes. Assuming 250 ft. of conduit (directional bore), 250 ft. of electrical service wire and 2 pull boxes, the power hook-up cost applied to each electrical beacon resulted in $9,850.00. The cost comparison between each option is provided below.

- Electrically Powered Sign Beacons (Pay Item No. 700-12-11) = $24,600.00
- Solar Powered Sign Beacons (Pay Item No. 700-12-21) = $10,047.96

It is recommended that the solar powered beacons be implemented in the sidewalk design. Solar powered beacons offer an energy efficient option that reduces possible utility conflicts, has no dependence on power supply, provides a cheaper construction cost, and acquires no monthly cost for operation. Please note that the estimated probable cost comparison provided above only includes the flashing beacon, additional cost is required for sign panels (see Table 1). These cost estimates are to be considered an opinion of probable cost based solely on the results of this feasibility study. The pay item number and unit of measure are based on the Florida Department of Transportation (FDOT) Basis of Estimates (BOE) Manual. The unit prices are based on historical average costs for each pay item as provided by FDOT. Some unit prices may have been adjusted due to the small nature of the project or the lack of sufficient historical cost data. No right-of-way acquisition fees have been developed for purposes of this study as no additional right-of-way was determined necessary. Based upon findings in the feasibility study, the estimated probable cost, with the lighting option and using electrically powered sign beacons is $538,800.00.

To adjust for potential future increases in the project's cost estimate, an annual inflationary factor was applied. The FDOT provides annual inflation factors for roadway construction costs which may be used as a guideline for this sidewalk project. The 2016 cost estimate provided herein may be adjusted by the FDOT inflationary factors (included in Appendix E) for the next three years (2018, 2019, and 2020) as follows:

- Total preliminary future cost for the sidewalk gap improvement:
    - $553,348.00, $569,973.00 and $583,520.00 respectively.

Table 1
Engineer's Opinion of Probable Cost
City of DeBary, Sidewalk Feasibility Study

PAY ITEM NUMBER	PAY ITEM DESCRIPTION	TOTAL QTY	UNIT MEASURE	UNIT PRICE	TOTAL PRICE
101-1	MOBILIZATION	1	LS	$33,780.60	$33,780.60
102-1	MAINTENANCE OF TRAFFIC	1	LS	$44,061.65	$44,061.65
				Sidewalk Mobilization and Maintenance of Traffic:	**$77,842.24**
110-1-1	CLEARING AND GRUBBING	0.7	AC	$16,734.60	$11,064.20
110-4	REMOVAL OF EXISTING CONCRETE PAVEMENT	7	SY	$20.29	$146.55
120-1	REGULAR EXCAVATION	453	CY	$15.17	$6,872.41
425-1-910	INLETS, CLOSED FLUME	1	EA	$5,211.61	$5,211.61
425-6	VALVE BOXES, ADJUST (MODIFY)	2	EA	$596.63	$1,193.26
515-1-2	PIPE HANDRAIL - GUIDERAIL, ALUMINUM	5	LF	$53.39	$266.94
522-1	CONCRETE SIDEWALK AND DRIVEWAYS 4" THICK	2,025	SY	$92.50	$187,304.40
522-2	CONCRETE SIDEWALK AND DRIVEWAYS 6" THICK	38	SY	$94.37	$3,606.95
527-2	DETECTABLE WARNINGS	80	SF	$34.54	$2,762.88
570-1-2	PERFORMANCE TURF, SOD	1,200	SY	$2.46	$2,952.00
639-1-121	ELECTRICAL POWER SERVICE, F&I, UG, FUR BY POWER	1	AS	$5,144.40	$5,144.40
639-2-1	ELECTRICAL SERVICE WIRE, F&I	250	LF	$5.63	$1,407.00
700-1-11	SINGLE POST SIGN, F&I GROUND MOUNT, UP TO 12 SF	8	AS	$364.15	$2,913.22
700-12-21	SIGN BEACON, F&I GROUND MOUNT - SOLAR POWERED, ONE BEACON	2	AS	$6,028.78	$12,057.55
705-11-1	DELINEATOR, FLEXIBLE TUBULAR	2	EA	$88.80	$177.60
711-11-123	THERMOPLASTIC, STANDARD, WHITE, SOLID, 12"	345	LF	$2.88	$993.60
711-11-125	THERMOPLASTIC, STANDARD, WHITE, SOLID, 24"	337	LF	$6.58	$2,216.11
715-4-121**	LIGHT POLE COMPLETE, F&I, WS 130, 40 FT	3	EA	$15,817.87	$47,453.62
				Sidewalk Subtotal:	**$293,744.31**
				Total Construction Subtotal:	**$371,586.55**
N/A	PRELIMINARY ENGINEERING & SURVEY	1	LS	35%	$130,055.29
N/A	CEI	1	LS	10%	$37,158.65
				Grand Total:	**$538,800.49**

FDOT Inflation Adjusted Estimate	Inflation Factor	PDC Multiplier	Adjusted Cost Estimate
Year 1 Inflation-Adjusted Estimate (2018)	2.70%	1.027	**$553,348.11**
Year 2 Inflation-Adjusted Estimate (2019)	2.80%	1.056	**$568,973.32**
Year 3 Inflation-Adjusted Estimate (2020)	2.60%	1.083	**$583,520.93**

**** UNIT PRICE INCLUDES THE FOLLOWING:**

PAY ITEM	DESCRIPTION
715-1-11	LIGHTING CONDUCTORS (3 @ 250')
635-2-11	PULL & SPLICE BOX (3)
630-2-12	CONDUIT (DIRECTIONAL BORE @ 250')
715-5-001	POLE CABLE DISTRIBUTION SYSTEM

9. CONCLUSION

The purpose of this study was to evaluate the feasibility of constructing a new sidewalk along the north side of Highbanks Road within the City of DeBary. The proposed sidewalk will enhance current connectivity within the immediate area and help address sidewalk gaps in the existing pedestrian network. The total length of proposed sidewalk within the study area is approximately 0.68 miles, or 3,600 ft., in length. Based upon findings in this report, the 5 ft. and 6 ft. proposed sidewalks are physically feasible for construction. The total engineer's probable cost estimate is approximately $538,800.00 in present day value. The cost includes design, construction and inspection for completion.

10. DATA COLLECTION REFERENCES

- FDOT Right-of-Way Maps
- Volusia County GIS
- Volusia County Property Appraiser
- River to Sea TPO
- FDOT Design Standards (2016)
- FDOT Plans Preparation Manual (2017)
- FDOT Basis of Estimates (2016)
- FDOT Florida Greenbook (2013)
- FDOT Long Range Estimates
- Google Earth
- Manual on Uniform Traffic Control Devices (2009)
- City of DeBary Comprehensive Plan
- City of DeBary Land Development Code
- United Stated Geological Survey
- American Associated of State Highway and Transportation Officials Greenbook

APPENDIX A

APPLICATION

2014 Application for Project Prioritization – FEASIBILITY STUDY

XU Bicycle/Pedestrian Projects

Project Title: *Highbanks Road Sidewalk Gap*

Applicant (project sponsor): *City of DeBary* **Date:** *May 7, 2014*

Contact Person: *Rebecca Hammock* **Job Title:** *Planning Administrator*

Address: *16 Colomba Road, DeBary, FL 32713*

Phone: *386-668-2040 x 317* **FAX:** *386-668-3523*

E-mail: *rhammock@debary.org*

Governmental entity with maintenance responsibility for roadway facility on which proposed project is located: *City of DeBary*
[If not the same as Applicant, attach letter of support for proposed project from the responsible entity. This letter of support must include a statement describing the responsible entity's expectations for maintenance of the proposed improvements, i.e., what the applicant's responsibility will be.]

Priority of this proposed project relative to other applications submitted by the Applicant: *Second (2nd)*

Project Description: *Study being requested to analyze the feasibility of constructing approximately 1000 feet of 5' (minimum)sidewalk on the north side of Highbanks Road to fill in a sidwalk gap between Simcoe Steet and Enterprise Road.*

Project Location (include project length and termini, if appropriate, and attach location map)**:** *Approximately 1000' on the north side of Highbanks Road from Simcoe Street to Enterprise Road. Please see the attached location map.*

Project Eligibility for XU Funds *(check the appropriate box):*

- ☒ the proposed improvement is located on the Federal-aid system;
- ☐ the proposed improvement is **not** located on the Federal-aid system, but qualifies as a type of improvement identified in 23 U.S.C. §133 that is not restricted to the Federal-aid system.

Project Purpose and Need Statement:

In the space provided below, describe the purpose and need for this proposed project. It is very important that the Purpose and Need Statement is clear and complete. It will be the principle consideration in ranking the project application for a feasibility study. It must convince the public and decision-makers that the expenditure of funds is necessary and worthwhile and that the priority the project is being given relative to other needed transportation projects is warranted. The Purpose and Need Statement will also help to define the scope for the feasibility study, the consideration of alternatives (if appropriate), and project design.

The purpose is analogous to the problem. It should focus on particular issues regarding the transportation

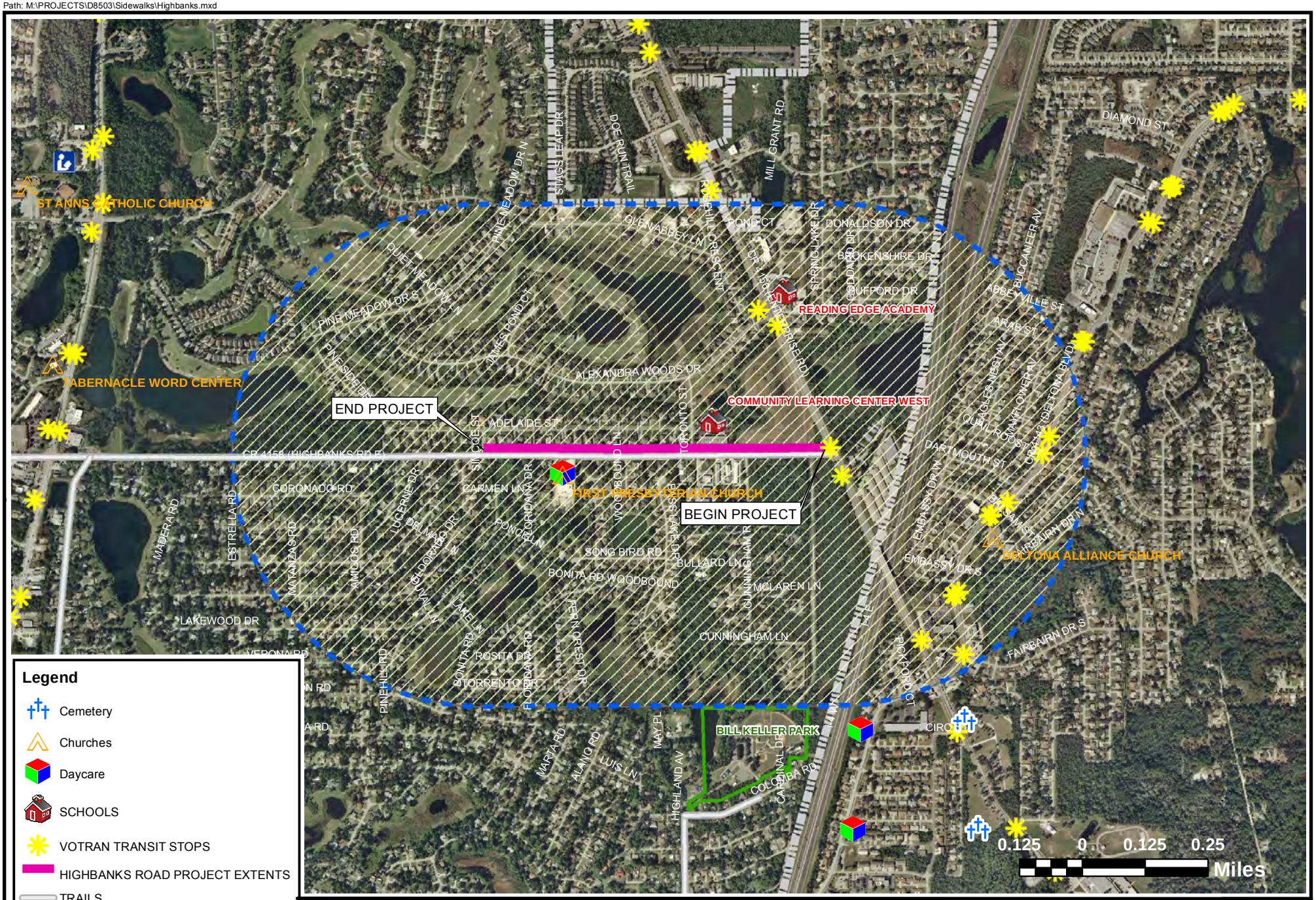
system (e.g., Proximity to Community Assets (Criterion #1), Connectivity (Criterion #2), Safety (Criterion #3) and Public Support/Special Considerations (Criterion #4)). Other important issues to be addressed by the project should be identified as ancillary benefits. The purpose should be stated in one or two sentences as the positive outcome that is expected. For example, "The purpose is to provide a connection between a park and a school." It should avoid stating a solution as a purpose, such as: "The purpose of the project is to add a sidewalk." It should be stated broadly enough so that no valid solutions will be dismissed prematurely.

The need should establish the evidence that the problem exists, or will exist if anticipated conditions are realized. It should support the assertion made in the Purpose Statement. For example, if the Purpose Statement is based on safety improvements, the Need Statement should support the assertion that there is or will be a safety problem to be corrected. When applying for a feasibility study, you should support your Need Statement with the best available evidence. However, you will not be expected to undertake new studies.

Commentary: *There is a gap in sidewalk connectivity on the north side of Highbanks Road. The proposed feasibility study would analyze the installation of a sidewalk on the north side of Highbanks from Enterprise to Simcoe Street at the entrance to Glen Abbey to connect to the existing sidewalk on Enterprise Road. The new sidewalk would help connect pedestrians to bus stops on Enterprise Rd as well as other facilities such as the Volusia County Education Center. The sidewalk would create a pedestrian loop for DeBary residents and in particular the residents of Glen Abbey. There is an existing sidewalk on the south side of Highbanks. Please see the attached location map.*

The Highbanks Road Sidewalk feasibility study is needed to analyze road crossings, utilities (above and below ground), trees in the corridor and cost.

Path: M:\PROJECTS\D8503\Sidewalks\Highbanks.mxd



HIGHBANKS ROAD SIDEWALK

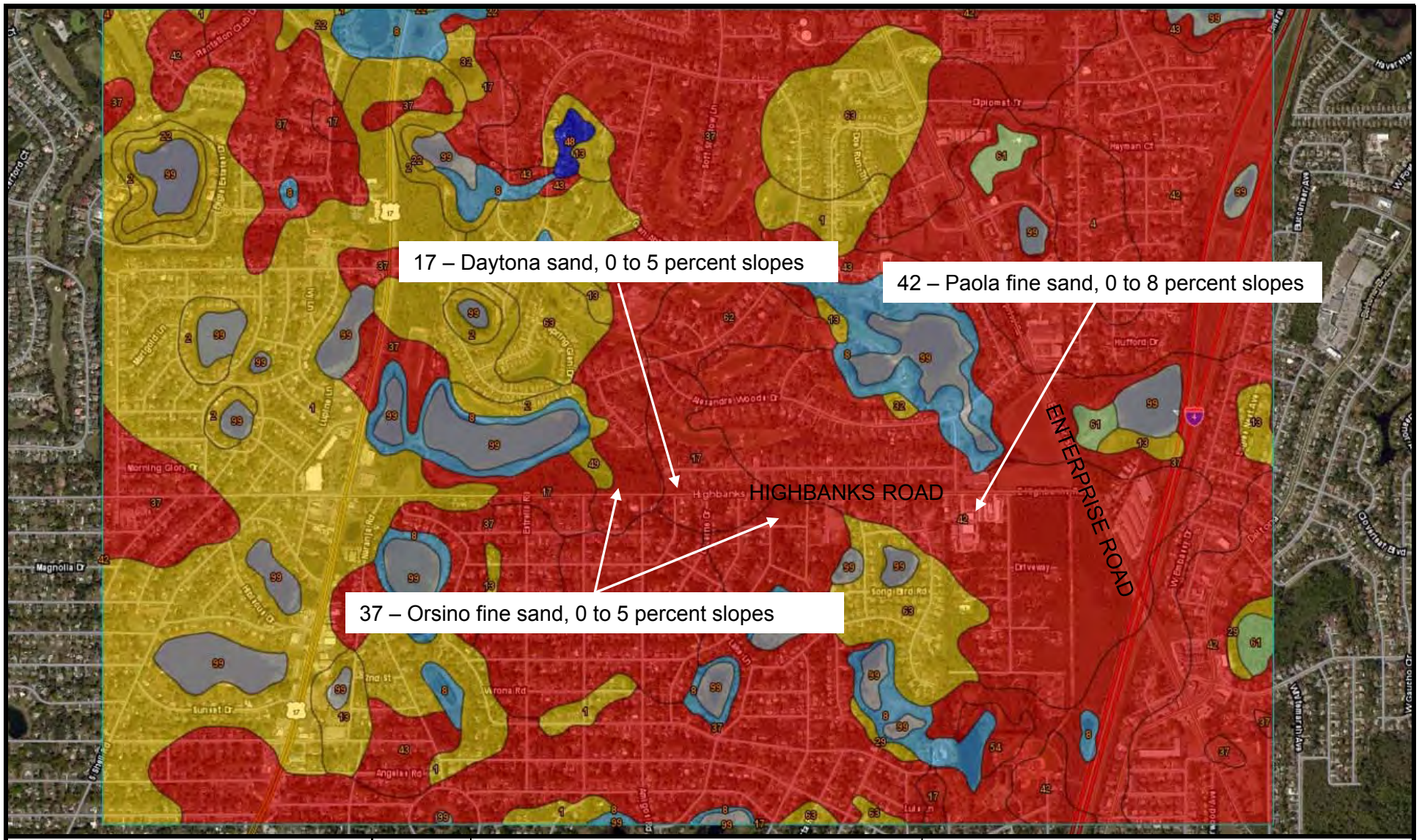
NORTHSIDE OF ROAD FROM ENTERPRISE RD. TO SIMCOE STREET

SECTIONS 25, 26, 35, 36, TOWNSHIP 18 W, RANGE 30 SOUTH
CITY OF DEBARY, VOLUSIA COUNTY, FLORIDA

EXHIBIT 1

APPENDIX B

SOIL CLASSIFICATION



RIVER TO SEA TPO
Transportation Planning Organization
VISION - PLAN - IMPLEMENT

N

NTS

Soil Map

E. Highbanks Road

Lassiter Transportation Group, Inc.
Engineering and Planning

Project No.:3903.08

Appendix B

1450 W. Granada Blvd, Suite 2 – Ormond Beach, Florida 32174
Telephone: 386.257.2571 Fax: 386.257.6996 EB# 0009227

Engineering Properties

This table gives the engineering classifications and the range of engineering properties for the layers of each soil in the survey area.

Hydrologic soil group is a group of soils having similar runoff potential under similar storm and cover conditions. The criteria for determining Hydrologic soil group is found in the National Engineering Handbook, Chapter 7 issued May 2007(http://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=17757.wba). Listing HSGs by soil map unit component and not by soil series is a new concept for the engineers. Past engineering references contained lists of HSGs by soil series. Soil series are continually being defined and redefined, and the list of soil series names changes so frequently as to make the task of maintaining a single national list virtually impossible. Therefore, the criteria is now used to calculate the HSG using the component soil properties and no such national series lists will be maintained. All such references are obsolete and their use should be discontinued. Soil properties that influence runoff potential are those that influence the minimum rate of infiltration for a bare soil after prolonged wetting and when not frozen. These properties are depth to a seasonal high water table, saturated hydraulic conductivity after prolonged wetting, and depth to a layer with a very slow water transmission rate. Changes in soil properties caused by land management or climate changes also cause the hydrologic soil group to change. The influence of ground cover is treated independently. There are four hydrologic soil groups, A, B, C, and D, and three dual groups, A/D, B/D, and C/D. In the dual groups, the first letter is for drained areas and the second letter is for undrained areas.

The four hydrologic soil groups are described in the following paragraphs:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Depth to the upper and lower boundaries of each layer is indicated.

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is 15 percent or more, an appropriate modifier is added, for example, "gravelly."

Classification of the soils is determined according to the Unified soil classification system (ASTM, 2005) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO, 2004).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to particle-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of particle-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Percentage of rock fragments larger than 10 inches in diameter and 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage. Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field. Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination. Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

References:

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Report—Engineering Properties

Absence of an entry indicates that the data were not estimated. The asterisk '*' denotes the representative texture; other possible textures follow the dash. The criteria for determining the hydrologic soil group for individual soil components is found in the National Engineering Handbook, Chapter 7 issued May 2007(http://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=17757.wba). Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

Engineering Properties–Volusia County, Florida														
Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*
1—Apopka fine sand, 0 to 5 percent slopes														
Apopka	85	A	0-6	Fine sand	SP, SP-SM	A-3	0- 0- 0	0- 0- 0	100-100-100	100-100-100	85-93-100	3- 7- 10	0-7 -14	NP
			6-62	Fine sand	SP, SP-SM	A-3	0- 0- 0	0- 0- 0	100-100-100	100-100-100	85-93-100	3- 7- 10	0-7 -14	NP
			62-80	Sandy loam, sandy clay loam	SC, SC-SM	A-2-4, A-2-6, A-4, A-6	0- 0- 0	0- 0- 0	98-99-100	95-98-100	60-80-100	20-30-40	20-30 -40	4-12-20
2—Apopka fine sand, 5 to 12 percent slopes														
Apopka	85	A	0-4	Fine sand	SP, SP-SM	A-3	0- 0- 0	0- 0- 0	100-100-100	100-100-100	85-93-100	3- 7- 10	0-7 -14	NP
			4-44	Fine sand	SP, SP-SM	A-3	0- 0- 0	0- 0- 0	100-100-100	100-100-100	85-93-100	3- 7- 10	0-7 -14	NP
			44-80	Sandy clay loam, sandy loam	SC, SC-SM	A-2-4, A-2-6, A-4, A-6	0- 0- 0	0- 0- 0	98-99-100	95-98-100	60-80-100	20-30-40	20-30 -40	4-12-20

Engineering Properties–Volusia County, Florida														
Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*
4—Astatula fine sand, 0 to 8 percent slopes														
Astatula	85	A	0-2	Fine sand	SP, SP-SM	A-3	0- 0- 0	0- 0- 0	100-100 -100	100-100 -100	75-87-99	1- 4- 7	0-7 -14	NP
			2-95	Fine sand	SP, SP-SM	A-3	0- 0- 0	0- 0- 0	100-100 -100	100-100 -100	75-87-99	1- 4- 7	0-7 -14	NP
8—Basinger fine sand, depressional, 0 to 1 percent slopes														
Basinger, depressional	90	A/D	0-5	Fine sand	SP-SM	A-2-4	0- 0- 0	0- 0- 0	100-100 -100	100-100 -100	85-93-98	7-12- 18	0-0 -33	NP-0 -1
			5-14	Fine sand	SP-SM	A-3	0- 0- 0	0- 0- 0	100-100 -100	100-100 -100	86-94-99	4- 9- 15	0-0 -16	NP-0 -1
			14-36	Fine sand	SP-SM	A-3	0- 0- 0	0- 0- 0	100-100 -100	100-100 -100	86-94-99	6-10- 17	0-0 -22	NP-0 -3
			36-80	Fine sand	SP-SM	A-3	0- 0- 0	0- 0- 0	100-100 -100	100-100 -100	87-94-98	4- 8- 13	0-0 -14	NP
13—Cassia fine sand, 0 to 2 percent slopes														
Cassia	80	A/D	0-5	Fine sand	SP-SM, SM	A-3, A-2-4	0- 0- 0	0- 0- 0	100-100 -100	100-100 -100	90-94-100	8-10- 15	0-0 -23	NP-0 -1
			5-26	Fine sand	SP-SM, SM	A-2-4, A-3	0- 0- 0	0- 0- 0	100-100 -100	100-100 -100	89-94-100	7- 9- 14	0-0 -14	NP
			26-42	Loamy sand, sand, fine sand	SP-SM, SM, SC-SM	A-2-4	0- 0- 0	0- 0- 0	100-100 -100	100-100 -100	89-95-100	11-13-20	0-23 -32	NP-4 -6
			42-80	Sand, fine sand	SP-SM, SM	A-2-4, A-3	0- 0- 0	0- 0- 0	100-100 -100	100-100 -100	88-94-100	9-11- 16	0-0 -17	NP-0 -2

Engineering Properties–Volusia County, Florida														
Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*
17—Daytona sand, 0 to 5 percent slopes														
Daytona	85	A	0-5	Sand	SP, SP-SM	A-3	0- 0- 0	0- 0- 0	100-100-100	100-100-100	70-83-95	2- 6- 10	0-7 -14	NP
			5-36	Sand	SP, SP-SM	A-3	0- 0- 0	0- 0- 0	100-100-100	100-100-100	70-83-95	2- 6- 10	0-7 -14	NP
			36-47	Sand, fine sand, coarse sand	SP-SM	A-2-4, A-3	0- 0- 0	0- 0- 0	100-100-100	100-100-100	70-83-95	5- 9- 12	0-7 -14	NP
			47-80	Sand, fine sand, coarse sand	SP, SP-SM	A-3	0- 0- 0	0- 0- 0	100-100-100	100-100-100	70-83-95	4- 7- 10	0-7 -14	NP
22—Electra fine sand, 0 to 5 percent slopes														
Electra	75	A	0-2	Fine sand	SP, SP-SM	A-3	0- 0- 0	0- 0- 0	100-100-100	95-98-100	75-87-99	3- 7- 10	0-7 -14	NP
			2-35	Sand, fine sand	SP, SP-SM	A-3	0- 0- 0	0- 0- 0	100-100-100	95-98-100	75-87-99	3- 7- 10	0-7 -14	NP
			35-52	Sand, fine sand, loamy sand	SM, SP-SM	A-2-4, A-3	0- 0- 0	0- 0- 0	100-100-100	100-100-100	80-90-99	8-12- 15	0-7 -14	NP
			52-57	Sand, fine sand	SP, SP-SM	A-3	0- 0- 0	0- 0- 0	100-100-100	95-98-100	75-87-99	3- 7- 10	0-7 -14	NP
			57-70	Sandy clay loam, sandy clay, fine sandy loam	SC, SC-SM	A-2, A-4, A-6	0- 0- 0	0- 0- 0	100-100-100	100-100-100	80-90-99	20-36-45	20-30 -40	4-12-20

Engineering Properties–Volusia County, Florida														
Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*
29—Immokalee sand														
Immokalee, non-hydric	65	B/D	0-10	Sand	SP, SP-SM	A-3	0- 0- 0	0- 0- 0	100-100-100	100-100-100	70-85-100	2- 6- 10	0-7 -14	NP
			10-34	Fine sand, sand	SP, SP-SM	A-3	0- 0- 0	0- 0- 0	100-100-100	100-100-100	70-85-100	2- 6- 10	0-7 -14	NP
			34-43	Fine sand, sand	SM, SP-SM	A-2-4, A-3	0- 0- 0	0- 0- 0	100-100-100	100-100-100	70-85-100	5-13- 21	0-7 -14	NP
			43-85	Fine sand, sand	SP, SP-SM	A-3	0- 0- 0	0- 0- 0	100-100-100	100-100-100	70-85-100	2- 6- 10	0-7 -14	NP
Immokalee, hydric	10	B/D	0-10	Sand	SP, SP-SM	A-3	0- 0- 0	0- 0- 0	100-100-100	100-100-100	70-85-100	2- 6- 10	0-7 -14	NP
			10-34	Fine sand, sand	SP, SP-SM	A-3	0- 0- 0	0- 0- 0	100-100-100	100-100-100	70-85-100	2- 6- 10	0-7 -14	NP
			34-43	Fine sand, sand	SM, SP-SM	A-2-4, A-3	0- 0- 0	0- 0- 0	100-100-100	100-100-100	70-85-100	5-13- 21	0-7 -14	NP
			43-85	Fine sand, sand	SP, SP-SM	A-3	0- 0- 0	0- 0- 0	100-100-100	100-100-100	70-85-100	2- 6- 10	0-7 -14	NP

Engineering Properties–Volusia County, Florida														
Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*
32—Myakka-Myakka, wet, fine sands, 0 to 2 percent slopes														
Myakka	75	A/D	0-6	Fine sand	SM, SP-SM	A-3, A-2-4	0- 0- 0	0- 0- 0	100-100 -100	100-100 -100	86-93-100	7- 9- 16	0-0 -19	NP-0 -1
			6-20	Fine sand, sand	SM, SP-SM	A-3, A-2-4	0- 0- 0	0- 0- 0	100-100 -100	100-100 -100	88-94-100	6- 8- 15	0-0 -14	NP
			20-36	Loamy fine sand, sand, fine sand	SM, SP-SM	A-3, A-2-4	0- 0- 0	0- 0- 0	100-100 -100	100-100 -100	86-94-100	8-12- 20	0-27 -37	NP-1 -4
			36-80	Sand, fine sand	SM, SP-SM	A-3, A-2-4	0- 0- 0	0- 0- 0	100-100 -100	100-100 -100	84-91-99	7-10- 19	0-0 -18	NP-0 -2
Myakka, wet	15	A/D	0-6	Fine sand	SM, SP-SM	A-3, A-2-4	0- 0- 0	0- 0- 0	100-100 -100	100-100 -100	86-93-100	7- 9- 16	0-0 -19	NP-0 -1
			6-20	Fine sand, sand	SM, SP-SM	A-3, A-2-4	0- 0- 0	0- 0- 0	100-100 -100	100-100 -100	88-94-100	6- 8- 15	0-0 -14	NP
			20-36	Loamy fine sand, sand, fine sand	SM, SP-SM	A-3, A-2-4	0- 0- 0	0- 0- 0	100-100 -100	100-100 -100	86-94-100	8-12- 20	0-27 -37	NP-1 -4
			36-80	Sand, fine sand	SM, SP-SM	A-3, A-2-4	0- 0- 0	0- 0- 0	100-100 -100	100-100 -100	84-91-99	7-10- 19	0-0 -18	NP-0 -2
37—Orsino fine sand, 0 to 5 percent slopes														
Orsino	80	A	0-6	Fine sand	SP	A-3	0- 0- 0	0- 0- 0	100-100 -100	100-100 -100	88-94-100	1- 2- 3	0-7 -14	NP
			6-30	Fine sand	SP	A-3	0- 0- 0	0- 0- 0	100-100 -100	100-100 -100	88-94-100	1- 2- 3	0-7 -14	NP
			30-80	Sand, fine sand	SP, SP-SM	A-3	0- 0- 0	0- 0- 0	100-100 -100	100-100 -100	88-94-100	2- 5- 7	0-7 -14	NP

Engineering Properties–Volusia County, Florida														
Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*
42—Paola fine sand, 0 to 8 percent slopes														
Paola	85	A	0-6	Fine sand	SP-SM, SM	A-2-4, A-3	0- 0- 0	0- 0- 0	100-100 -100	100-100 -100	86-94-99	6-10- 15	0-0 -14	NP
			6-26	Fine sand, sand	SP-SM, SM	A-2-4, A-3	0- 0- 0	0- 0- 0	100-100 -100	100-100 -100	86-94-99	6-10- 15	0-0 -14	NP
			26-80	Sand, fine sand	SP-SM, SM	A-2-4, A-3	0- 0- 0	0- 0- 0	100-100 -100	100-100 -100	86-94-99	6-10- 15	0-0 -14	NP
43—Paola fine sand, 8 to 17 percent slopes														
Paola	85	A	0-5	Fine sand	SP	A-3	0- 0- 0	0- 0- 0	100-100 -100	100-100 -100	85-93-100	1- 2- 2	0-7 -14	NP
			5-25	Fine sand, sand	SP	A-3	0- 0- 0	0- 0- 0	100-100 -100	100-100 -100	85-93-100	1- 2- 2	0-7 -14	NP
			25-80	Sand, fine sand	SP	A-3	0- 0- 0	0- 0- 0	100-100 -100	100-100 -100	80-90-100	1- 3- 4	0-7 -14	NP
48—Placid fine sand, frequently ponded, 0 to 1 percent slopes														
Placid	80	A/D	0-24	Fine sand	SP-SM, SM	A-2-4, A-3, A-2-5	0- 0- 0	0- 0- 0	100-100 -100	100-100 -100	89-95-100	10-13-19	0-29 -41	NP-3 -4
			24-80	Fine sand, sand	SP-SM, SC-SM	A-3, A-2-4	0- 0- 0	0- 0- 0	100-100 -100	100-100 -100	88-94-100	9-11- 18	0-0 -20	NP-0 -4

Engineering Properties–Volusia County, Florida														
Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*
49—Pomona fine sand														
Pomona, non-hydric	70	A/D	0-5	Fine sand	SP, SP-SM	A-2-4, A-3	0- 0- 0	0- 0- 0	100-100 -100	100-100 -100	85-93-100	2- 7- 12	0-7 -14	NP
			5-18	Sand, fine sand	SP, SP-SM	A-2-4, A-3	0- 0- 0	0- 0- 0	100-100 -100	100-100 -100	85-93-100	2- 7- 12	0-7 -14	NP
			18-45	Sand, fine sand	SM, SP-SM	A-2-4, A-3	0- 0- 0	0- 0- 0	100-100 -100	100-100 -100	85-93-100	5-10- 15	0-7 -14	NP
			45-50	Sand, fine sand	SP, SP-SM	A-2-4, A-3	0- 0- 0	0- 0- 0	100-100 -100	100-100 -100	85-93-100	2- 7- 12	0-7 -14	NP
			50-60	Fine sandy loam, sandy clay loam	SC, SC-SM, SM	A-2, A-4, A-6	0- 0- 0	0- 0- 0	100-100 -100	95-98-100	85-93-100	25-34- 50	0-20 -40	NP-8 -16
			60-70	Fine sandy loam, sandy clay loam	SC, SC-SM, SM	A-2, A-4, A-6	0- 0- 0	0- 0- 0	100-100 -100	95-98-100	85-93-100	25-34- 50	0-20 -40	NP-8 -16
Pomona, hydric	10	A/D	0-5	Fine sand	SP, SP-SM	A-2-4, A-3	0- 0- 0	0- 0- 0	100-100 -100	100-100 -100	85-93-100	2- 7- 12	0-7 -14	NP
			5-18	Sand, fine sand	SP, SP-SM	A-2-4, A-3	0- 0- 0	0- 0- 0	100-100 -100	100-100 -100	85-93-100	2- 7- 12	0-7 -14	NP
			18-45	Sand, fine sand	SM, SP-SM	A-2-4, A-3	0- 0- 0	0- 0- 0	100-100 -100	100-100 -100	85-93-100	5-10- 15	0-7 -14	NP
			45-50	Sand, fine sand	SP, SP-SM	A-2-4, A-3	0- 0- 0	0- 0- 0	100-100 -100	100-100 -100	85-93-100	2- 7- 12	0-7 -14	NP
			50-60	Fine sandy loam, sandy clay loam	SC, SC-SM, SM	A-2, A-4, A-6	0- 0- 0	0- 0- 0	100-100 -100	95-98-100	85-93-100	25-34- 50	0-20 -40	NP-8 -16
			60-70	Fine sandy loam, sandy clay loam	SC, SC-SM, SM	A-2, A-4, A-6	0- 0- 0	0- 0- 0	100-100 -100	95-98-100	85-93-100	25-34- 50	0-20 -40	NP-8 -16
54—Quartzipsamments, gently sloping														
Quartzipsamments	100	A	0-80	Fine sand	SP, SP-SM	A-3	0- 0- 0	0- 0- 0	100-100 -100	100-100 -100	85-93-100	2- 6- 10	0-7 -14	NP

Engineering Properties–Volusia County, Florida														
Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*
61—St. Johns fine sand														
St. johns, hydric	60	B/D	0-10	Fine sand	SP, SP-SM	A-3	0- 0- 0	0- 0- 0	100-100-100	100-100-100	75-85-95	3- 7- 10	0-7 -14	NP
			10-26	Sand, fine sand	SP, SP-SM	A-3	0- 0- 0	0- 0- 0	100-100-100	100-100-100	85-90-95	3- 7- 10	0-7 -14	NP
			26-43	Sand, fine sand, loamy fine sand	SM, SP-SM	A-2-4, A-3	0- 0- 0	0- 0- 0	100-100-100	100-100-100	85-90-95	5-13- 20	0-7 -14	NP
			43-60	Sand, fine sand	SP, SP-SM	A-3	0- 0- 0	0- 0- 0	100-100-100	100-100-100	80-85-90	2- 6- 10	0-7 -14	NP
St. johns, non-hydric	20	B/D	0-10	Fine sand	SP, SP-SM	A-3	0- 0- 0	0- 0- 0	100-100-100	100-100-100	75-85-95	3- 7- 10	0-7 -14	NP
			10-26	Sand, fine sand	SP, SP-SM	A-3	0- 0- 0	0- 0- 0	100-100-100	100-100-100	85-90-95	3- 7- 10	0-7 -14	NP
			26-43	Sand, fine sand, loamy fine sand	SM, SP-SM	A-2-4, A-3	0- 0- 0	0- 0- 0	100-100-100	100-100-100	85-90-95	5-13- 20	0-7 -14	NP
			43-60	Sand, fine sand	SP, SP-SM	A-3	0- 0- 0	0- 0- 0	100-100-100	100-100-100	80-85-90	2- 6- 10	0-7 -14	NP
62—St. Lucie fine sand, 0 to 8 percent slopes														
St. lucie	75	A	0-3	Fine sand	SP	A-3	0- 0- 0	0- 0- 0	100-100-100	90-95-100	80-90-99	1- 3- 4	0-7 -14	NP
			3-80	Sand, fine sand	SP	A-3	0- 0- 0	0- 0- 0	100-100-100	90-95-100	80-90-99	1- 3- 4	0-7 -14	NP

Engineering Properties–Volusia County, Florida														
Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*
63—Tavares fine sand, 0 to 5 percent slopes														
Tavares	90	A	0-6	Fine sand	SP-SM, SP	A-3	0- 0- 0	0- 0- 0	100-100 -100	100-100 -100	87-95-100	4- 5- 8	0-0 -14	NP
			6-80	Sand, fine sand	SP-SM, SP	A-2-4, A-3	0- 0- 0	0- 0- 0	100-100 -100	100-100 -100	82-95-100	4- 6- 12	0-0 -14	NP

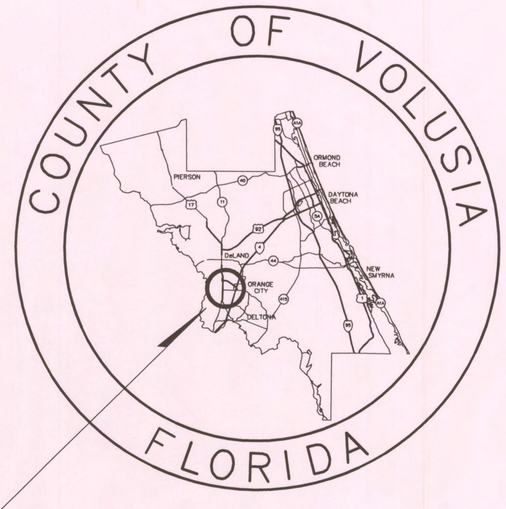
Data Source Information

Soil Survey Area: Volusia County, Florida
Survey Area Data: Version 15, Sep 20, 2016

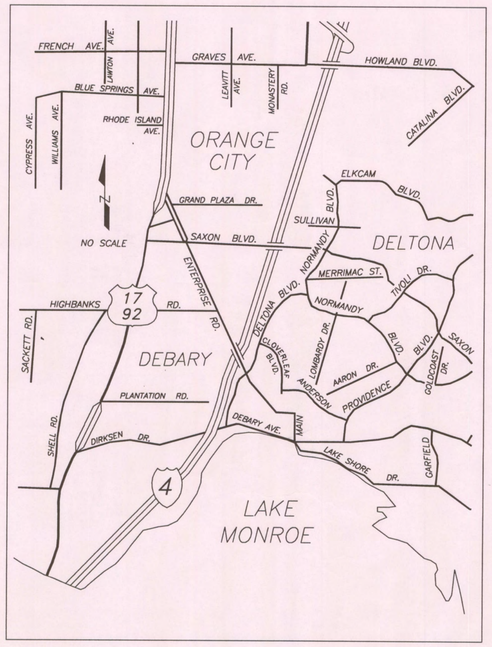
APPENDIX C

RIGHT-OF-WAY MAPS/ AS-BUILTS

COUNTY OF VOLUSIA
STATE OF FLORIDA
ENTERPRISE ROAD
RIGHT OF WAY MAP
HIGHBANKS ROAD TO SAXON BOULEVARD
PROJECT #4362



PROJECT LOCATION



LENGTH OF PROJECT = 1.58± MILES

CERTIFICATE OF APPROVAL BY THE COUNTY COUNCIL OF VOLUSIA COUNTY, FLORIDA

THIS IS TO CERTIFY, That on _____ the foregoing map was approved by the County Council of Volusia County, Florida.

_____
Chairman of the County Council of Volusia County County Seal

Attest: _____
County Manager of Volusia County and Ex-officio Clerk

CERTIFICATE OF CLERK

I HEREBY CERTIFY, That I have examined the foregoing map and find that it complies in form with all the requirements of Chapter 95.361, Florida Statutes, and was filed for record on _____at_____ RECORDED IN RIGHT OF WAY BOOK _____ PAGE _____

_____
Clerk of the Circuit Court
in and for Volusia County, Florida

This Amended Right of Way Map replaces and supersedes that Right of Way Map recorded in Volusia County Right of Way Map Book 2, Pages 67-71.

Note: Sheets 4 & 5 revised 1/16/02.

LEGEND & ABBREVIATIONS

STA = STATION CONC. = CONCRETE PVMT. = PAVEMENT P/L = PROPERTY LINE ° = DEGREES PC = POINT OF CURVATURE PT = POINT OF TANGENCY
F.M. = FIELD MEASURED C. = CALCULATED P. = PLAT SEC. = SECTION T = TOWNSHIP R = RANGE ' = MINUTES & FEET " = SECONDS
I.P. = IRON PIPE R/W = RIGHT OF WAY R = RADIUS C/L = CENTERLINE FND. = FOUND PROP. = PROPOSED ELEV. = ELEVATIONS
R.&C. = ROD AND CAP P.O.C. = POINT OF COMMENCEMENT T = TANGENT P.O.B. = POINT OF BEGINNING C.M. = CONCRETE MONUMENT L = ARC LENGTH
= GUY POLE = CONCRETE MONUMENT = ROD & CAP = UTILITY POLE = BENCHMARK △ = CENTRAL ANGLE = IRON PIPE

COUNTY OF VOLUSIA
PUBLIC WORKS SERVICE CENTER
ENGINEERING SERVICE GROUP/SURVEY SECTION
123 W. INDIANA AVE. DELAND, FL. 32720
TELEPHONE 1-904-736-5967 FAX 1-904-822-5736

	NAME	DATE
CADD	GS	1/02
CHECKED	HTA	1/02
FIELD BOOK # 501,502,503		
DATE OF SURVEY: 3/14/00		

PLOT DATE: 4/11/02
SCALE: NO SCALE
PROJECT # 4362

SURVEYORS CERTIFICATE:
NOT VALID WITHOUT THE ORIGINAL RAISED SEAL OF A FLORIDA LICENSED SURVEYOR AND MAPPER
Hugh Terry Appleby Jr. 1:20th 2002
HUGH TERRY APPLEBY R.L.S. #3310

ENTERPRISE ROAD

TYPE OF SURVEY
BOUNDARY __ RIGHT OF WAY _X_ SPECIFIC PURPOSE __
TOPOGRAPHIC __ SKETCH OF DESCRIPTION __ DESIGN __

DRAWING # R/W 4362
SHEET # 1 OF 5

SURVEY NOTES:

1. TYPE OF SURVEY: RIGHT OF WAY.
2. BEARINGS BASED ON AN INVERSE BETWEEN DEPARTMENT OF TRANSPORTATION MONUMENTS 14-71-A23 & 14-71-A24 AS BEING N 19°29'52" E (GRID NORTH).
3. SURVEY BASELINE SHOWN IS APPROXIMATE CENTERLINE OF MONUMENTED RIGHT OF WAY. UNABLE TO RECOVER EXACT CENTERLINE OF OLD DESIGNATED STATE ROAD, CENTERLINE OF PAVEMENT VARIES.
4. FOUND DEPARTMENT OF TRANSPORTATION MONUMENTATION DOES NOT MATCH D.O.T. RIGHT OF WAY MAP.
5. SHEETS 4 & 5 REVISED 1/16/02.

LEGEND & ABBREVIATIONS

C.M. = CONCRETE MONUMENT; VOL. CO. = VOLUSIA COUNTY; D.O.T. = DEPARTMENT OF TRANSPORTION; WV = WATER VALVE; WM = WATER METER
STA = STATION; CONC. = CONCRETE; PVMT. = PAVEMENT; P/L = PROPERTY LINE; ° = DEGREES; PC = POINT OF CURVATURE; PT = POINT OF TANGENCY
F.M. = FIELD MEASURED; C. = CALCULATED; P. = PLAT; SEC. = SECTION; T = TOWNSHIP; R = RANGE; D. = DEED; " = SECONDS
I.P. = IRON PIPE; R/W = RIGHT OF WAY; R = RADIUS; C/L = CENTERLINE; FND. = FOUND; PROP. = PROPOSED; ELEV. = ELEVATIONS
R.&C. = ROD AND CAP; P.O.C. = POINT OF COMMENCEMENT; T = TANGENT; P.O.B. = POINT OF BEGINNING; ' = MINUTES & FEET; L = ARC LENGTH
= NAIL; = CONCRETE MONUMENT; = ROD & CAP; = UTILITY POLE; = DISK (D.O.T.); △ = CENTRAL ANGLE; o = IRON PIPE

COUNTY OF VOLUSIA · FLORIDA

COUNTY OF VOLUSIA
PUBLIC WORKS SERVICE CENTER
ENGINEERING SERVICE GROUP/SURVEY SECTION
123 W. INDIANA AVE. DELAND, FL. 32720
TELEPHONE 1-904-736-5967 FAX 1-904-822-5736

	NAME	DATE
CADD	GS	12/00
CHECKED	HTA	12/00

DATE OF SURVEY: 3/14/00
FIELD BOOK # 501, 502, 503
PLOT DATE: 4/11/02
SCALE: 1"=100'
PROJECT # 4362

SURVEYORS CERTIFICATE:
NOT VALID WITHOUT THE ORIGINAL RAISED SEAL OF A FLORIDA LICENSED SURVEYOR AND MAPPER
HUGH TERRY APPLEBY R.L.S. #3310

EXISTING & PROPOSED RIGHT OF WAY
ENTERPRISE ROAD
HIGHBANKS ROAD TO SAXON BOULEVARD

TYPE OF SURVEY
BOUNDARY __ RIGHT OF WAY X SPECIFIC PURPOSE __
TOPOGRAPHIC __ SKETCH OF DESCRIPTION __ DESIGN __

DRAWING # R/W 4362
SHEET # 2 OF 5

EXISTING & PROPOSED RIGHT OF WAY
ENTERPRISE ROAD
HIGHBANKS ROAD TO SAXON BOULEVARD

GRID

SWALLOWS EAST
M.B. 43 PG. 110

COUNTY OF VOLUSIA RETENTION AREA
O.R. 4371 PGS. 3447–3459
8026-00-00-0161

Parcel 4

HIGHBANKS RD.

ALEXANDRA WOODS DR.

GLEN ABBEY LANE

KELLER CT.

POND CT.

FOX RIDGE CT.

ENTERPRISE RD.

SURVEY BASELINE

EXISTING R/W LINE

PROPOSED R/W LINE

W. EDGE PVMT.

FND. R&C NO I.D.
S.W. CORNER
SEC. 25–18–30

FND. C.M. #2299 N.W. COR.
E. 1/2 S.E. 1/4 SEC. 26–18–30

FND. NAIL #3473
STA. 100+00.00 SURVEY B/L
BEGIN PROJECT #4362

FND. C.M. #3473
N.W. COR. OF S.W. 1/4
S.W. 1/4 SEC. 25–18–30

FND. R&C #2564

FND. C.M. #3282
E. 1/4 CORNER
SEC. 26–18–30

FLORIDA POWER CORP. EASEMENT
(SEE DETAIL RIGHT)

FLORIDA POWER CORP. EASEMENT
PER O.R. 1031 PG. 255

FLORIDA POWER & LIGHT ACCESS ESMT.

50' R/W ESMT.
O.R. 3403 PG. 1854

ACQUIRED PER O.R.
O.R. 4691, PG. 2578

ACQUIRED PER O.R.
4631, PG. 3905

5' FLORIDA POWER ESMT.
O.R. 2438 PG. 0448

R/W ESMT. PER
O.R. 2438 PG. 0448

E. LINE 30' INGRESS/EGRESS
R/W ESMT. PER O.R. 2756 PG. 1074

30' INGRESS/EGRESS

CONCRETE PARKING

20' DRAINAGE EASEMENT

EASEMENTS PER O.R. 309, PG 22 & O.R. 1203, PG. 20

TIES TO EAST LINE SEC. 26 AT ENTERPRISE RD. (NO SCALE)

B/L SURVEY STA. 106+74.64

C/L ENTERPRISE RD. N 24°17'18" W

EMMA FORD
O.R. 2042 PG. 1751
8025-00-00-0060

JOHN & LINDA ANDERSON
O.R. 3848 PG. 0660
8025-00-00-0050

HARTY LAND DEVELOPMENT
O.R. 4355 PG. 0179
8025-00-00-0054

ANN MARSHALL TRUST
RANDALL MARSHALL TRUSTEE
O.R. 4276 PG. 3452
8025-00-00-0057

JOSEPH & JOAN CHINELLI
O.R. 2896 PG. 1830
8025-00-00-0053

EUGENE HENRY
O.R. 3421 PG. 0205
8025-00-00-0055

ALBERT & JANETTE PELL
O.R. 3711 PG. 1232
8025-00-00-0051

ALFREDA WALICKI & DONNA SEIGLER
O.R. 4142 PG. 4825
8026-00-00-0021

ED & PAULA PALMATEER
O.R. 2659 PG. 0009
8026-00-00-0029

JOSEPH DIGERLANDO
O.R. 2987 PG. 0164
8026-00-00-0023

HOWARD & BETTY FRANCIS
O.R. 3907 PG. 2935
8026-00-00-0027

MILDRED PIPER
O.R. 2792 PG. 1372
8026-00-00-0025

MILDRED PIPER
O.R. 2760 PG. 1886
8026-00-00-0024

RICHARD BEAUREGARD
O.R. 2858 PG. 0417
8026-00-00-002A

MORTGAGE MANAGEMENT
O.R. 3997 PG. 2646
8026-00-00-001A

SUMMERHAVEN PHASE 1
M.B. 39 PG. 41

105+00 · 110+00 · 115+00 · 120+00 · 125+00 · 130+00

Δ = 90° R = 25.00'

Δ = 23°57'48" R = 112.29' L = 46.96'

Δ = 76°51'14" R = 180.00' L = 241.44'

Δ = 11°30'21" R = 180.00' L = 36.15'

1" = 50'

LEGEND & ABBREVIATIONS

C.M. = CONCRETE MONUMENT · VOL. CO. = VOLUSIA COUNTY · C.M.P. = CORRUGATED METAL PIPE · P.R.M. = PERMANENT REFERENCE MONUMENT
STA = STATION · CONC. = CONCRETE · PVMT. = PAVEMENT · P/L = PROPERTY LINE · ° = DEGREES · PC = POINT OF CURVATURE · PT = POINT OF TANGENCY
F.M. = FIELD MEASURED · C. = CALCULATED · P. = PLAT · SEC. = SECTION · T = TOWNSHIP · R = RANGE · N = NORTH · " = SECONDS
I.P. = IRON PIPE · R/W = RIGHT OF WAY · R = RADIUS · C/L = CENTERLINE · FND. = FOUND · PROP. = PROPOSED · ELEV. = ELEVATIONS
R.&C. = ROD AND CAP · P.O.C. = POINT OF COMMENCEMENT · T = TANGENT · P.O.B. = POINT OF BEGINNING · ' = MINUTES & FEET · L = ARC LENGTH
○ = NAIL · ⊡ = CONCRETE MONUMENT · ◉ = ROD & CAP · P.C.P. = PERMANENT CONTROL POINT · D. = DEED · Δ = CENTRAL ANGLE · O = IRON PIPE

COUNTY OF VOLUSIA
PUBLIC WORKS SERVICE CENTER
ENGINEERING SERVICE GROUP/SURVEY SECTION
123 W. INDIANA AVE. DELAND, FL. 32720
TELEPHONE 1-904-736-5967 FAX 1-904-822-5736

	NAME	DATE
CADD	GS	12/00
CHECKED	HTA	12/00
DATE OF SURVEY: 3/14/00		
FIELD BOOK # 501,502,503		

PLOT DATE: 4/11/02
SCALE: 1"=100'
PROJECT # 4362

SURVEYORS CERTIFICATE:
NOT VALID WITHOUT THE ORIGINAL RAISED SEAL OF A FLORIDA LICENSED SURVEYOR AND MAPPER

HUGH TERRY APPLEBY R.L.S. #3310

TYPE OF SURVEY
BOUNDARY __ · RIGHT OF WAY X · SPECIFIC PURPOSE __
TOPOGRAPHIC __ · SKETCH OF DESCRIPTION __ · DESIGN __

DRAWING # R/W 4362
SHEET # 3 OF 5

APPENDIX D

VEGETATION IMPACT SUMMARY

LEGEND

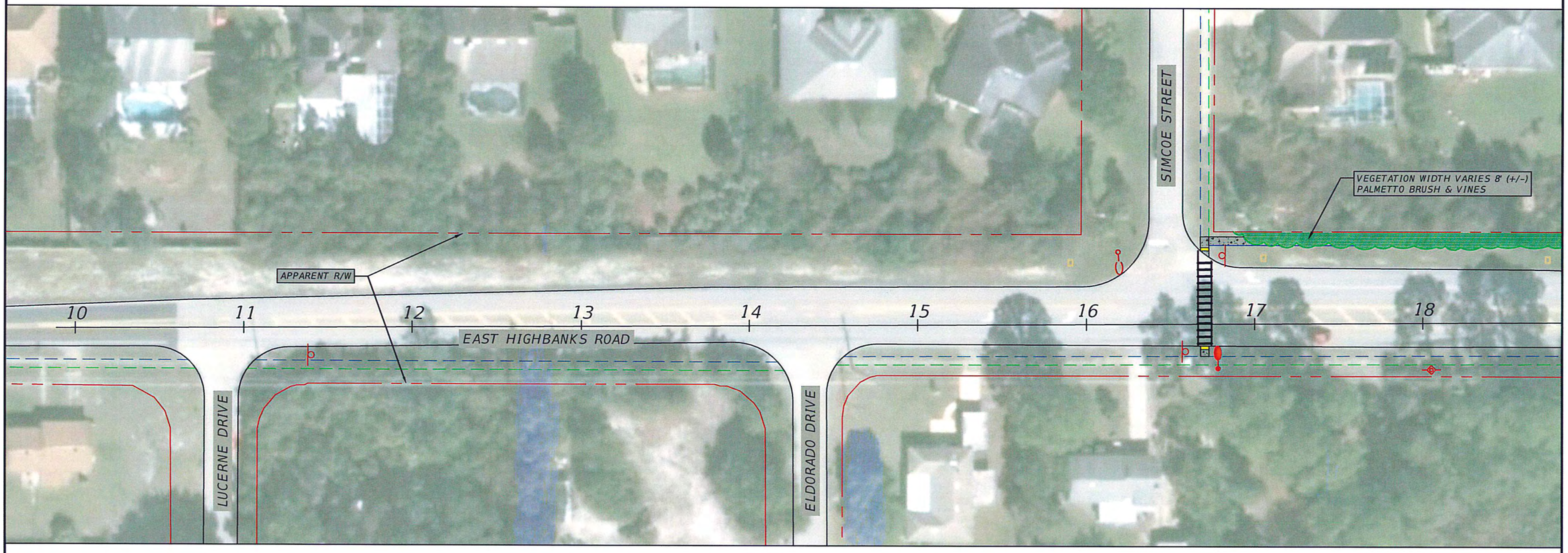
- APPARENT R/W
- EXISTING EDGE OF PAVEMENT
- PROPOSED FRONT OF SIDEWALK
- PROPOSED BACK OF SIDEWALK
- EXISTING FRONT OF SIDEWALK
- EXISTING BACK OF SIDEWALK
- PROPOSED 2' DETECTABLE WARNING
- EXISTING UTILITY POLE
- EXISTING DRAINAGE STRUCTURE
- SAWCUT
- CONCRETE STRAIN POLE
- PEDESTRIAN SIGNAL
- CONTROLLER CABINET

VEGETATION IMPACT SUMMARY

LIMITS		VEGETATION IMPACTS (SF)	
FROM	TO	ALT. A	ALT. B
STA. 17+00	STA. 21+80	4,200	4,200
STA. 23+60	STA. 24+50	570	0
STA. 29+50	STA. 33+00	4,615	325
STA. 33+00	STA. 36+50	2,265	380
STA. 36+50	STA. 38+00	900	900
TOTAL SF:		**12,550**	**5,805**

-N-

GRAPHIC SCALE
0 15 30 60
1" = 60'
SCALE



REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

Lassiter Transportation Group, Inc.
Engineering and Planning
MARK NEIMAN
P.E. No. 44077
1450 W. GRANADA BOULEVARD SUITE 2
ORMOND BEACH, FLORIDA 32174
PH: 386.257.2571 FAX: 386.257.6996
COE NO. 9227

RIVER TO SEA TRANSPORTATION PLANNING ORGANIZATION

ROAD	COUNTY	PROJECT ID
HIGHBANKS	VOLUSIA	SCHL-2016-047R

APPENDIX D

ESTIMATED VEGETATION IMPACTS

CITY OF DEBARY - SIDEWALK FEASIBILITY STUDY

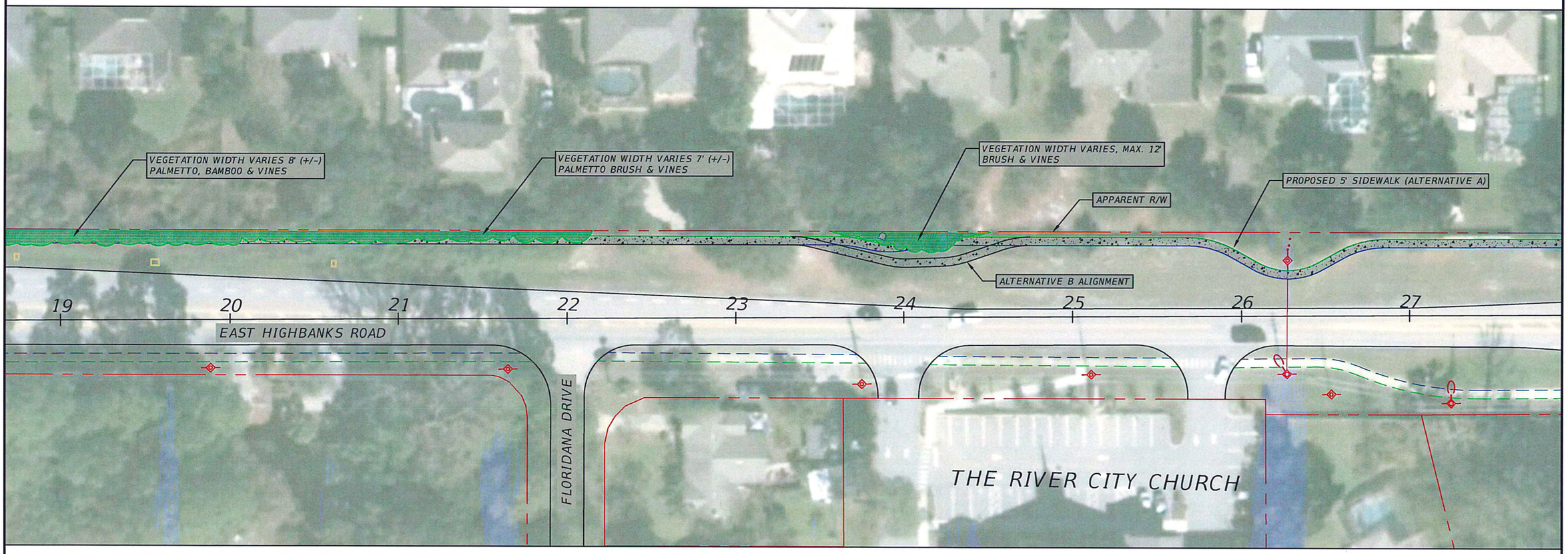
SHEET NO. 1

LEGEND

- APPARENT R/W
- EXISTING EDGE OF PAVEMENT
- PROPOSED FRONT OF SIDEWALK
- PROPOSED BACK OF SIDEWALK
- EXISTING FRONT OF SIDEWALK
- EXISTING BACK OF SIDEWALK
- PROPOSED 2' DETECTABLE WARNING
- EXISTING UTILITY POLE
- EXISTING DRAINAGE STRUCTURE
- SAWCUT
- CONCRETE STRAIN POLE
- PEDESTRIAN SIGNAL
- CONTROLLER CABINET

-N-

GRAPHIC SCALE
0 15 30 60
1" = 60'
SCALE



REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

Lassiter Transportation Group, Inc.
Engineering and Planning
MARK NEIMAN
P.E. No. 44077
1450 W. GRANADA BOULEVARD SUITE 2
ORMOND BEACH, FLORIDA 32174
PH: 386.257.2571 FAX: 386.257.6996
COE NO. 9227

RIVER TO SEA TRANSPORTATION PLANNING ORGANIZATION

ROAD	COUNTY	PROJECT ID
HIGHBANKS	VOLUSIA	SCHL-2016-047R

APPENDIX D

ESTIMATED VEGETATION IMPACTS

CITY OF DEBARY - SIDEWALK FEASIBILITY STUDY

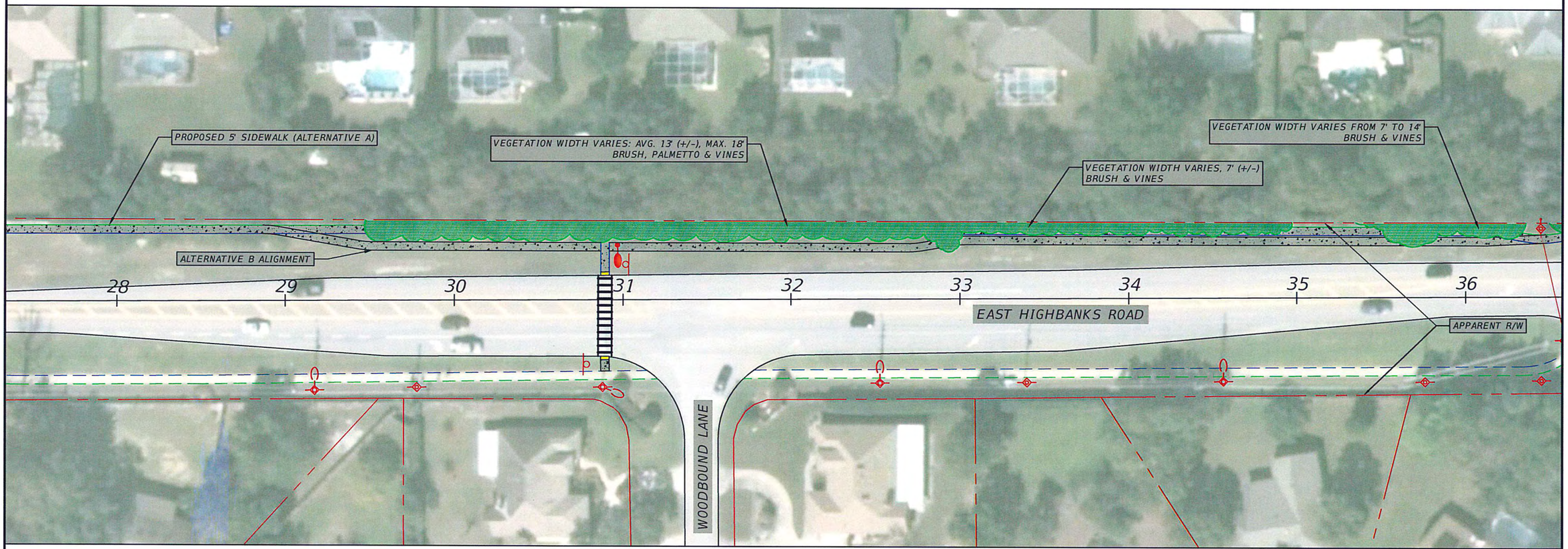
SHEET NO. 2

LEGEND

- APPARENT R/W
- EXISTING EDGE OF PAVEMENT
- PROPOSED FRONT OF SIDEWALK
- PROPOSED BACK OF SIDEWALK
- EXISTING FRONT OF SIDEWALK
- EXISTING BACK OF SIDEWALK
- PROPOSED 2' DETECTABLE WARNING
- EXISTING UTILITY POLE
- EXISTING DRAINAGE STRUCTURE
- SAWCUT
- CONCRETE STRAIN POLE
- PEDESTRIAN SIGNAL
- CONTROLLER CABINET

-N-

GRAPHIC SCALE
0 15 30 60
1" = 60'
SCALE



REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

Lassiter Transportation Group, Inc.
Engineering and Planning
MARK NEIMAN
P.E. No. 44077
1450 W. GRANADA BOULEVARD SUITE 2
ORMOND BEACH, FLORIDA 32174
PH: 386.257.2571 FAX: 386.257.6996
COE NO. 9227

RIVER TO SEA TRANSPORTATION PLANNING ORGANIZATION

ROAD	COUNTY	PROJECT ID
HIGHBANKS	VOLUSIA	SCHL-2016-047R

APPENDIX D

ESTIMATED VEGETATION IMPACTS

CITY OF DEBARY - SIDEWALK FEASIBILITY STUDY

SHEET NO. 3

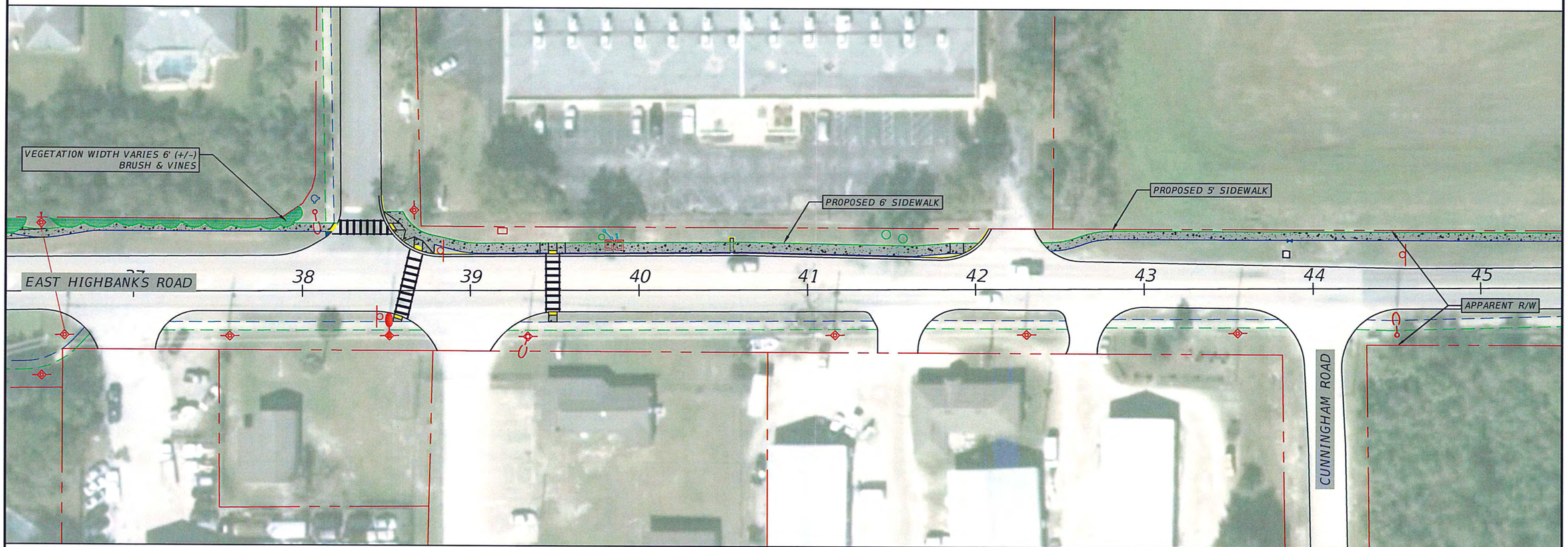
LEGEND

- APPARENT R/W
- EXISTING EDGE OF PAVEMENT
- PROPOSED FRONT OF SIDEWALK
- PROPOSED BACK OF SIDEWALK
- EXISTING FRONT OF SIDEWALK
- EXISTING BACK OF SIDEWALK
- PROPOSED 2' DETECTABLE WARNING
- EXISTING UTILITY POLE
- EXISTING DRAINAGE STRUCTURE
- SAWCUT
- CONCRETE STRAIN POLE
- PEDESTRIAN SIGNAL
- CONTROLLER CABINET

-N-

GRAPHIC SCALE
0 15 30 60
1" = 60'
SCALE

NOTE:
NO IMPACTS NOTED BEYOND STA. 38+00



REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

Lassiter Transportation Group, Inc.
Engineering and Planning
MARK NEIMAN
P.E. No. 44077
1450 W. GRANADA BOULEVARD SUITE 2
ORMOND BEACH, FLORIDA 32174
PH: 386.257.2571 FAX: 386.257.6996
COE NO. 9227

RIVER TO SEA TRANSPORTATION PLANNING ORGANIZATION

ROAD	COUNTY	PROJECT ID
HIGHBANKS	VOLUSIA	SCHL-2016-047R

APPENDIX D
ESTIMATED VEGETATION IMPACTS
CITY OF DEBARY - SIDEWALK FEASIBILITY STUDY

SHEET NO. 4

APPENDIX E

FDOT INFLATION FACTORS

Inflation Factors

This *"Transportation Costs"* report is one of a series of reports issued by the Office of Policy Planning. It provides information on inflation factors and other indices that may be used to convert Present Day Costs (PDC) to Year Of Expenditure costs (YOE) or vice versa. This report is updated annually when the factors are posted within the FDOT Work Program Instructions.

Please note that the methodology for Inflationary adjustments relating to specific transportation projects should be addressed with the district office where the project will be located. For general use or non-specific areas, the guidelines provided herein may be used for inflationary adjustments.

Construction Cost Inflation Factors

The table on the next page includes the inflation factors and present day cost (PDC) multipliers that are applied to the Department's Work Program for highway construction costs expressed in Fiscal Year 2017 dollars.

Other Transportation Cost Inflation Factors

Other indices may be used to adjust project costs for other transportation modes or non-construction components of costs. Examples are as follows:

The Consumer Price Index (CPI, also retail price index) is a weighted average of prices of a specified set of products and services purchased by wage earners in urban areas. As such, it provides one measure of inflation. The CPI is a fixed quantity price index and a reasonable cost-of-living index.

The Employment Cost Index (ECI) is based on the National Compensation Survey. It measures quarterly changes in compensation costs, which include wages, salaries, and other employer costs for civilian workers (nonfarm private industry and state and local government).

The monthly series, Producer Price Index for Other Non-residential Construction, is available from the Bureau of Labor Statistics (BLS). It is not exclusively a highway construction index, but it is the best available national estimate of changes in highway costs from month to month.

Work Program
Highway Construction Cost Inflation Factors

Fiscal Year	Inflation Factor	PDC Multiplier
2017	Base	1.000
2018	2.7%	1.027
2019	2.8%	1.056
2020	2.6%	1.083
2021	2.5%	1.110
2022	2.7%	1.140
2023	2.8%	1.172
2024	2.9%	1.206
2025	3.0%	1.242
2026	3.1%	1.281
2027	3.2%	1.322
2028	3.3%	1.365
2029	3.3%	1.410
2030	3.3%	1.457
2031	3.3%	1.505
2032	3.3%	1.555
2033	3.3%	1.606
2034	3.3%	1.659
2035	3.3%	1714
2036	3.3%	1.770
2037	3.3%	1.829
Source: Office of Work Program and Budget, (Fiscal Year 2017 is July 1, 2016 to June 30, 2017)		

Advisory Inflation Factors For Previous Years

Another *"Transportation Costs"* report covers highway construction cost inflation for previous years. "*Advisory Inflation Factors For Previous Years (1987-2015)* provides Present Day Cost (PDC) multipliers that enable project cost estimates from previous years to be updated to FY 2015. This report is updated about once a year. For the table and text providing this information, please go to http://www.dot.state.fl.us/planning/policy/costs/RetroCostInflation.pdf.

APPENDIX F

RESPONSE TO AGENCY COMMENTS

Lassiter Transportation Group, Inc.
Engineering and Planning

Ref: 3903.08

March 21st, 2017

Stephan C. Harris
River to Sea Transportation Planning Organization
2570 W. International Speedway Blvd.
Suite 100
Daytona Beach, FL 32114

Re: City of DeBary, Highbanks Road: Sidewalk Feasibility Study – Response to Comments (R2CTPO SCHL-2016-047R)

Dear Mr. Harris:

Lassiter Transportation Group, Inc. (LTG) has prepared a Feasibility Study for a 5-ft. sidewalk along Highbanks Road located in the City of DeBary. We are in receipt of Florida Department of Transportation (FDOT) and City comments that have been provided below followed by our response in **bold** typeface. The comments are in order by when they were received.

FDOT Comments, dated February 9th, 2017:

1.) FDOT Comment: Engineer's Opinion of Probable Cost: Why is 6" concrete specified for the sidewalk? Typically, 4" concrete is used unless the sidewalk is exposed to vehicular traffic.

Response: **6" thick sidewalk was originally proposed due to the close proximity of the sidewalk to the edge of the roadway and long term maintenance. However, it is understood that the department will only permit 6" sidewalk for driveways or vehicle crossings. The sidewalk has been revised to propose 4" sidewalk except at driveway crossings. Please refer to the revised study attached.**

2.) FDOT Comment: Sta. 17+00: Will drop off protection (i.e. hand rail) be needed between the sidewalk and the existing inlet? The inlet top appears to be at a much lower elevation than where the sidewalk will be placed.

Response: **5' of railing has been added at the back of curb.**

3.) FDOT Comment: Sta. 38+60: Will the tree need to be removed to adjust the guy wires? It appears that the guy wires are impacted by the tree. Was this included in the cost estimate?

Response: **Even though the guy wires pass through the existing tree at the location identified, removal of the tree isn't anticipated. All trees within the immediate study area are to be preserved where possible. Therefore, no tree removal was included in the cost.**

4.) FDOT Comment: Sta. 39+90: The electrical box has rebar loops that will need to be removed if they are to remain in place. There is also a box with a pad lock that will need to be relocated or removed.

Response: **A valve box modification pay item has been added to the probable cost estimate for removal of the existing rebar lift rings and has been called out on the plan sheet. Based on our field information it appears that the minimum ADA point clearance of 48" is available between the pad locks and back of curb. It is recommended that**

tubular markers be placed in-line of the pad lock locations to shield locks and to warn pedestrians of the potential trip hazard. However, modification of the hatch/box cover may be required and shall be determined during final design.

5.) FDOT Comment: Sta. 42+50 to 47+50: It appears that the projected sidewalk is positioned at the bottom of the road side swale. Will the sidewalk impact the existing drainage pattern? If so, how will the drainage be handled?

Response: **The back slope of the pond berm creates a swale like condition, however there does not appear to be a defined drainage system in this area. It is anticipated that the designer will place the sidewalk as shown and slope back to the roadway to recreate the swale like condition adjacent to the new sidewalk.**

6.) FDOT Comment: Sta. 50+25: Will the concrete driveway be reconstructed for ADA compliant cross slope? Was this included in the cost estimate?

Response: **The back of the driveway is to be removed and replaced with ADA compliant sidewalk. The driveway will then be reconstructed for proper slope requirements. 6" thick sidewalk is proposed at this location. The cost for this improvement has been included in the total cost provided in Table 1 of the feasibility study.**

DeBary Comments, Received

1.) City Comment: Page 6 & 36. Is the ROW survey included in the E.O.C? Can the expense of the survey and preliminary engineering be separated?

Response: **Yes, the survey is included under the preliminary engineering unit cost. Typically, we estimate 20% of the total construction cost for engineering purposes. In this case we added an extra 10% for a more inclusive engineering survey to identify right-of-way boundaries.**

2.) City Comment: Page 7. Will the grading allow for all ADA compliance? Page 17. #4 provides that longitude grade not exceed 5%. Is it anticipated that the 2.75 roadway grade is longitudinal and not cross slope? Please verify.

Response: **The 2.75% described on page 7 refers to the longitudinal slope of the existing roadway. The sidewalk is expected to match the existing roadway grade.**

3.) City Comment: Overall. Add a statement of vegetation removal required and to what extent anticipated.
   a) Add sidewalk location options based upon limiting vegetation removal
   b) Provide a graphic depicting all vegetation impacted along ROW (1 page).

Response: **A statement has been included in the Concept Plan Development section of the report to allow for sidewalk alignment flexibility as it pertains to vegetation impacts. An additional graphic depicting the alternate sidewalk alignment, and estimated areas of impact has been added as an Appendix to the revised feasibility study (Appendix D).**

4.) City Comment: Option A, crosswalk is closer to light fixture. Would light fixture move with Option B?

Response: **Additional lighting at the Option B crosswalk would also be recommended. However, due to the existing light fixture located within the immediate area, a luminaire and bracket should be considered for attachment to the existing pole. If the existing pole is unable to support the added load, a complete pole will be required. The note pertaining to the Option B crosswalk, located on Figure 3D (sheet 23), has been revised to include Option A lighting.**

If you have questions or comments, feel free to call me at (386) 257-2571.

Sincerely,

LASSITER TRANSPORTATION GROUP, INC.

Mark P. Neiman, PE
Senior Project Manager