POND SITING REPORT

Florida Department of Transportation

District One

SR 45 (US 41) at Bonita Beach Road Project Development and Environment (PD&E) Study

Limits of Project: US 41 and Bonita Beach Road

Lee County, Florida

Financial Management Number: 444321-1-22-01

Federal Aid Project Number: D123-081-B

ETDM Number: 6291

Date: February 2024

The environmental review, consultation, and other actions required by applicable federal environmental laws for this project are being, or have been, carried out by the Florida Department of Transportation (FDOT) pursuant to 23 U.S.C. § 327 and a Memorandum of Understanding dated May 26, 2022 and executed by the Federal Highway Administration and FDOT.

PROFESSIONAL ENGINEER CERTIFICATION

POND SITING REPORT

Project: SR 45 **(**US 41) at Bonita Beach Road Project Development and Environment (PD&E) Study

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This Pond Siting Report contains engineering information that fulfills the purpose and need for the SR 45 (US 41) at Bonita Beach Road Project Development and Environment (PD&E) Study in Lee County, Florida. I acknowledge that the procedures and references used to develop the results contained in this report are standard to the professional practice of transportation engineering as applied through professional judgment and experience.

I hereby certify that I am a registered professional engineer in the State of Florida practicing with Inwood Consulting Engineers, and that I have prepared or approved the evaluation, findings, opinions, conclusions or technical advice for this project.

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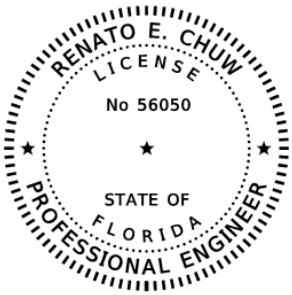

This item has been digitally signed and sealed by Renato Chuw, PE on the date adjacent to the seal.
Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.

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Executive Summary

The SR 45 (US 41) at Bonita Beach Road Project Development and Environment (PD&E) Study evaluated capacity, safety, and multi-modal improvements at the US 41 and Bonita Beach Road intersection, in the City of Bonita Springs, Florida. The proposed improvements will modify the signalized configuration of the US 41 and Bonita Beach Road intersection to be a partial displaced left turn (PDLT), with the northbound and southbound left turn movements to crossover and be located outside of the opposing traffic flow. This configuration will allow the northbound and southbound left turning movements to operate in the same signal phase or simultaneously as the northbound and southbound through movements. To accommodate the partial displaced left turn configuration and facilitate the relocation of northbound and southbound turning vehicles, two new signalized "crossover" intersections will be added along US 41 approximately 675' south and 460' north of Bonita Beach Road. The southbound and eastbound left turn movements are proposed to have three lanes each, and the eastbound and westbound right turn movements are proposed to have two lanes each. Intersection improvements will also be supported by an enhanced Northwest Quadrant Roadway and a new Northeast Quadrant Roadway.

The purpose of this Pond Siting Report is to discuss, analyze, and identify the stormwater management plan for the proposed roadway improvements based on environmental, hydrological, hydraulic, and economic factors. Stormwater management for water quality treatment and runoff attenuation will be provided using wet detention ponds, dry retention ponds, and dry linear swales. The drainage and stormwater facilities will comply with the standards set forth by the South Florida Water Management District (SFWMD) and Florida Department of Transportation.

Pond sites have been identified along the project limits. The analysis estimates right-of-way needs using both a volumetric analysis which accounts for water quality treatment and water quantity attenuation. The total pond cost estimate found in this report is a budget tool used to estimate total acquisition costs associated with each pond site and to budget the appropriate funds for acquisition. The findings and evaluations of the environmental (wetlands, species, contamination), archeological/historical and total costs and rankings for each pond site alternative can be found in the **Pond Alternatives Evaluation Matrix** in **Appendix E** of this report.

Please note that the pond site's volumetric analysis were performed with preliminary data, reasonable engineering judgment, and assumptions. Pond sites and configurations may change during final design as more detailed information on Seasonal High-Water Table (SHWT), wetland hydrologic information (as applicable), and a final roadway design profile become available. Please refer to **Table 1-1** for a **Summary of Stormwater Pond Sites**.

Table 1-1: Summary of Recommended Stormwater Pond Sites

Basin	Recommended Preferred Pond Alternative	Pond Access Easement Area (ac)	Pond Right-of-Way Area (ac)	Total Required Right-of-Way Area (ac)	Total Pond Cost ($)
Windsor/NW Quadrant Roadway	Designed by City of Bonita Springs				
Basin East	Pond East Alt. 1	0.00	0.00	0.00	$170,963
Basin West	No proposed changes to basin areas from Pre to Post				
Basin North	Pond West	0.00	0.41	0.41	$2,097,708
	Pond North	0.00	17.34	3.67	$6,402,432
			Totals:	**4.08**	$8,671,103

1.0 Project Overview

Initiated in November 2019, this Project Development and Environment (PD&E) Study has been conducted to assess various intersection alternatives for US 41 at CR 865/Bonita Beach Road. This Preliminary Engineering Report (PER) documents the project's purpose and need, the alternatives developed, the process of selecting the preferred alternative, and presents the preliminary design analysis for the preferred alternative. CR 865 will be referred to as Bonita Beach Road throughout the remainder of this report.

1.1 Project Description

The US 41 at Bonita Beach Road Project Development and Environment (PD&E) Study evaluated capacity, safety, and multi-modal improvements at the US 41 and Bonita Beach Road intersection, in the City of Bonita Springs, Florida. The study area limits extend along US 41 from Foley Road to just south of the Imperial River bridge, a distance of approximately 0.9 miles. Additionally, the study area extends along Bonita Beach Road from Windsor Road to Spanish Wells Boulevard, a distance of approximately 0.8 miles.

US 41 is a north-south principal arterial roadway running parallel to Interstate 75 (I-75) and facilitates movement of regional and local traffic (including truck traffic) along Florida's west coast. Bonita Beach Road is an east-west minor arterial roadway providing a connection to I-75 and is one of two east-west connections between the Lee County mainland and coastal communities and barrier island tourist destinations and beaches to the west. US 41 is a state roadway maintained by the Florida Department of Transportation (FDOT) District 1, while Bonita Beach Road is maintained by the Lee County. Both US 41 and Bonita Beach Road are designated as emergency evacuation routes.

US 41 within the project limits is a six-lane divided roadway with 5' on-street bicycle lanes and 5' sidewalks on both sides of the roadway. Bonita Beach Road is a four lane divided roadway with 5' sidewalks on both sides but no on-street bicycle facilities.

The US 41 at Bonita Beach Road intersection of is currently a signalized intersection with two exclusive left turn lanes and an exclusive right turn lane in each approach. Aside from the main intersection, there is currently one other signalized intersection along US 41 at the Center of Bonita Springs (Tuffy Auto/Advanced Auto Parts). There are three additional signalized intersections along Bonita Beach Road at the Center of Bonita Springs, Arroyal Road, and Spanish Wells Boulevard.

The existing US 41 and Bonita Beach Road intersection has two high volume left turn movements, those being eastbound to northbound and southbound to eastbound. To partially address these heavy movements, the City of Bonita Springs conducted the "Network Enhancement Alignment Study – Quadrant Plan" in May 2017. From this, the City will be designing and building a two-lane quadrant roadway connecting Bonita Beach Road at Windsor Road to US 41 at the Center of Bonita Springs. This Northwest Quadrant Roadway is currently in design by the City and anticipated to be built ahead of the US 41 and Bonita Beach Road intersection improvements.

The proposed improvements will modify the signalized configuration of the US 41 and Bonita Beach Road intersection to be a partial displaced left turn (PDLT), with the northbound and southbound left turn movements to crossover and be located outside of the opposing traffic flow. This configuration will allow the northbound and southbound left turning movements to operate in the same signal phase or simultaneously as the northbound and southbound through movements. To accommodate the partial displaced left turn configuration and facilitate the relocation of northbound and southbound turning vehicles, two new signalized "crossover" intersections will be added along US 41 approximately 675' south and 460' north of Bonita Beach Road. The southbound and eastbound left turn movements are proposed to have three lanes each, and the eastbound and westbound right turn movements are proposed to have two lanes each.

As noted above, a Northwest Quadrant Roadway is being constructed by the City of Bonita Springs. As part of the PD&E study's proposed improvements, the US 41 and the Center of Bonita Springs intersection is proposed to be changed from a standard signalized intersection to a "thru-cut" intersection. A thru-cut intersection restricts through movements from the minor street typically due to operational and/or geometric conditions. In this case, the west leg is being widened from two lanes to five lanes (four eastbound approach lanes and one westbound receiving lane) and the east leg is being widened from two lanes to four lanes (two westbound approach lanes and two eastbound receiving lanes). This creates skew issues for any east/west through movements and creates operational constraints that are alleviated by the thru-cut intersection configuration. Tying into the new east leg is a Northeast Quadrant Roadway proposed between US 41 and Arroyal Road, northeast of the US 41 and Bonita Beach Road intersection. This will be a new three-lane roadway with two lanes eastbound and one lane westbound.

Along US 41 in the northbound direction, a 6' sidewalk is proposed from Foley Road to Springs Plaza (Sta. 232+50) and a 12' shared-use path is proposed from Springs Plaza to just north of the Imperial River Boat Ramp (Sta. 271+00). In the southbound direction, a 12' shared-use path is proposed from just north of the Imperial River Boat Ramp (Sta. 271+00) to Bonita Funeral Home (Sta. 231+00) and a 6' sidewalk is proposed from Bonita Funeral Home to Foley Road. Along both sides of Bonita Beach Road, the sidewalks will be widened to 12' shared-use paths from the Center of Bonita Springs to Arroyal Road. Signalized marked crosswalks will be maintained on every leg of the PDLT, including the channelized right turn lanes. Signalized marked crosswalks will also be provided on every leg of each signalized intersection along US 41 and Bonita Beach Road within the study area. The project location is shown in **Figure 1** and the study area is shown in **Figure 2**.

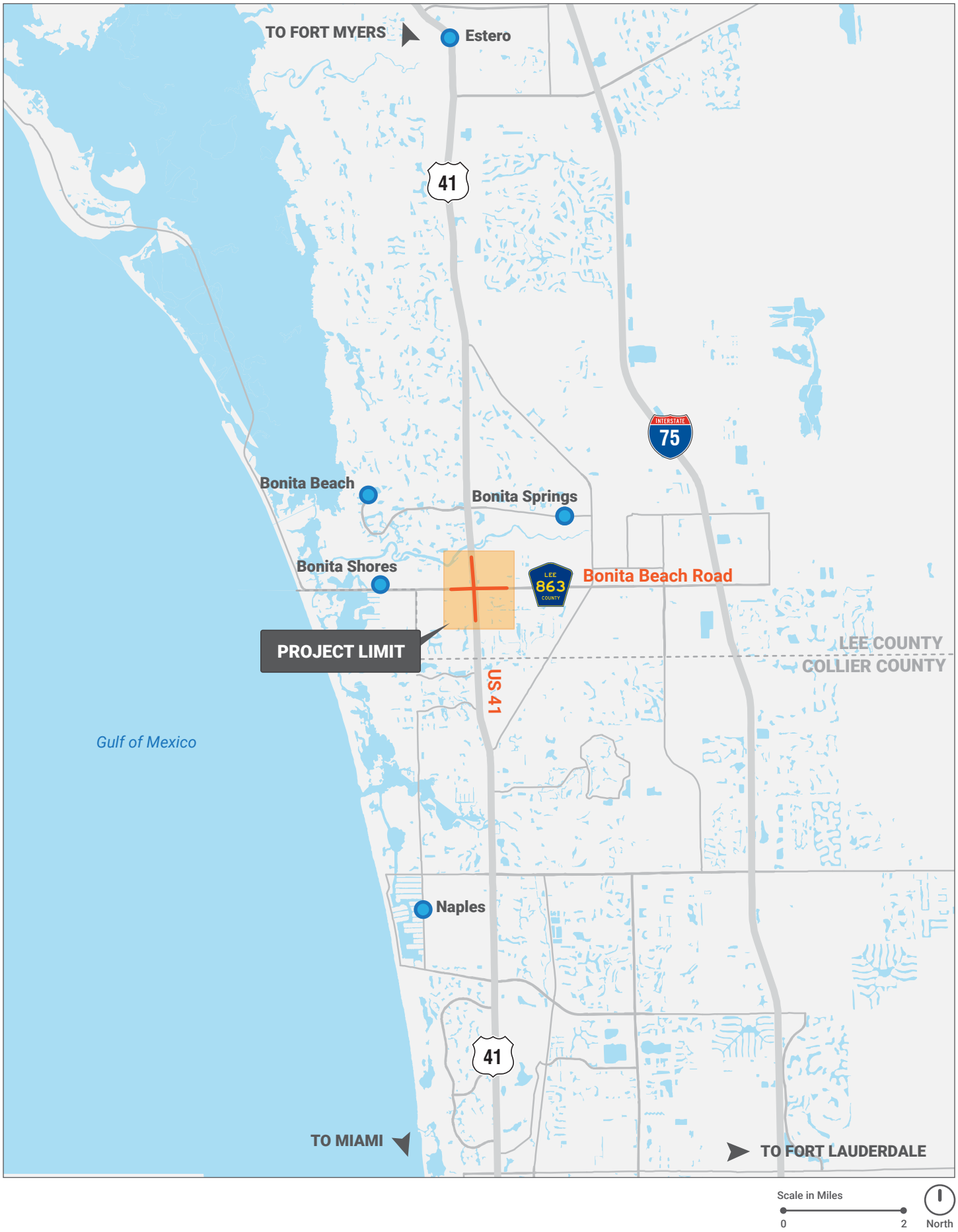


Figure 1 | Project Location

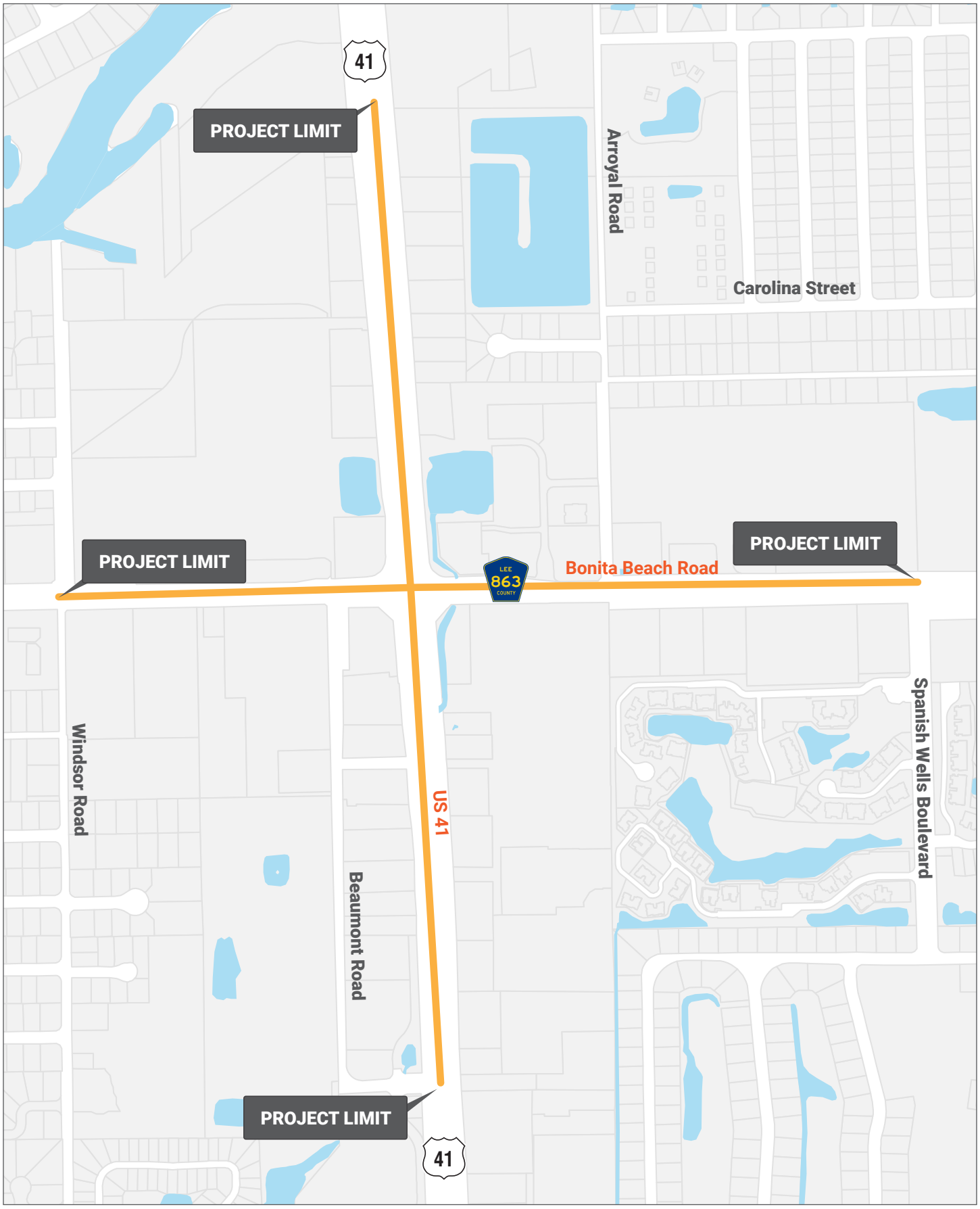


Figure 2 | Study Area

1.2 Project Purpose and Need

The purpose of this project is to address the deficient operational capacity of the US 41 and Bonita Beach Road intersection to relieve existing congestion and accommodate projected future traffic demand. The project's secondary goals are to 1) Enhance regional and local mobility; 2) Enhance safety conditions; and 3) Improve multi-modal access. The need for these improvements is described in this section.

1.2.1 Transportation Demand/Capacity

The US 41 at Bonita Beach Road intersection experiences chronic congestion. As population and employment growth are expected to continue within this area of Lee County, the intersection's congestion is anticipated to increase. Based on 2019 traffic counts taken, the existing Annual Average Daily Traffic (AADT) ranges from 39,000 to 53,000 along US 41 and was 30,000 along Bonita Beach Road. Based on future growth projections to a 2050 design year, the AADTs are forecast to range from 60,000 to 78,000 along US 41. The future 2050 AADT forecast along Bonita Beach Road is 39,000.

The existing (2019) mid-day traffic analysis for the US 41 at Bonita Beach Road intersection shows that six of the 12 movements operate at Level of Service (LOS) of F, with one of those being overcapacity (volume-to-capacity >1.0). The existing (2019) PM traffic analysis for the intersection shows that seven of the 12 movements operate at Level of Service (LOS) of F, with two of those being overcapacity. In the future 2050 condition, the no-build intersection operates at LOS F with an overall average vehicle delay between 85 and 92 seconds. While there are a similar number of LOS F movements between the existing and future no-build, latent demand is expected to increase by nearly 30 percent. The future no-build intersection is serving approximately the same amount of traffic volume as the existing condition but with the increased volumes, there are more vehicles in the overall network not being served.

1.2.2 Safety

Crash records were obtained for both US 41 and Bonita Beach Road within the study area, as described below:

US 41 from Foley Road (MP 0.540) to the Imperial River bridge (MP 1.482); and

Bonita Beach Road from 400' west of Windsor Road to 450' east of Spanish Wells Boulevard.

Crash data was obtained for the most recent five-year period on record (2018 through 2022). The crash data was obtained from the University of Florida's Signal Four (S4) Analytics crash database for US 41 and Bonita Beach Road. The safety analysis was performed for the most recent five years of crash data (January 1, 2018 – December 31, 2022). Supplemental crash data from previous years (2014 to 2017) and January 1, 2023 to June 30, 2023 were also analyzed to verify crash trends and patterns.

Figure 3 displays a summary of crash frequency by year along with the respective severities from 2014 to 2022. There was an increase in crashes between 2014 and 2017, but there has been a decrease in crashes between 2017 and 2019 before an approximate 30 percent drop in crashes due to the COVID-19 pandemic in 2020. The number

of crashes have stayed relatively constant in 2021 and 2022. There were 163 crashes per year on average between 2014 to 2017. However, there were 146 crashes per year on average in the study area between 2018 to 2022, not including 2020 (a 10 percent decrease). The fatal crash in 2019 involved a vehicle striking a pedestrian on US 41 just south of Bonita Beach Road, and the fatal crash in 2021 involved an angle crash at the intersection of US 41 at Foley Road/Shanna Lane.

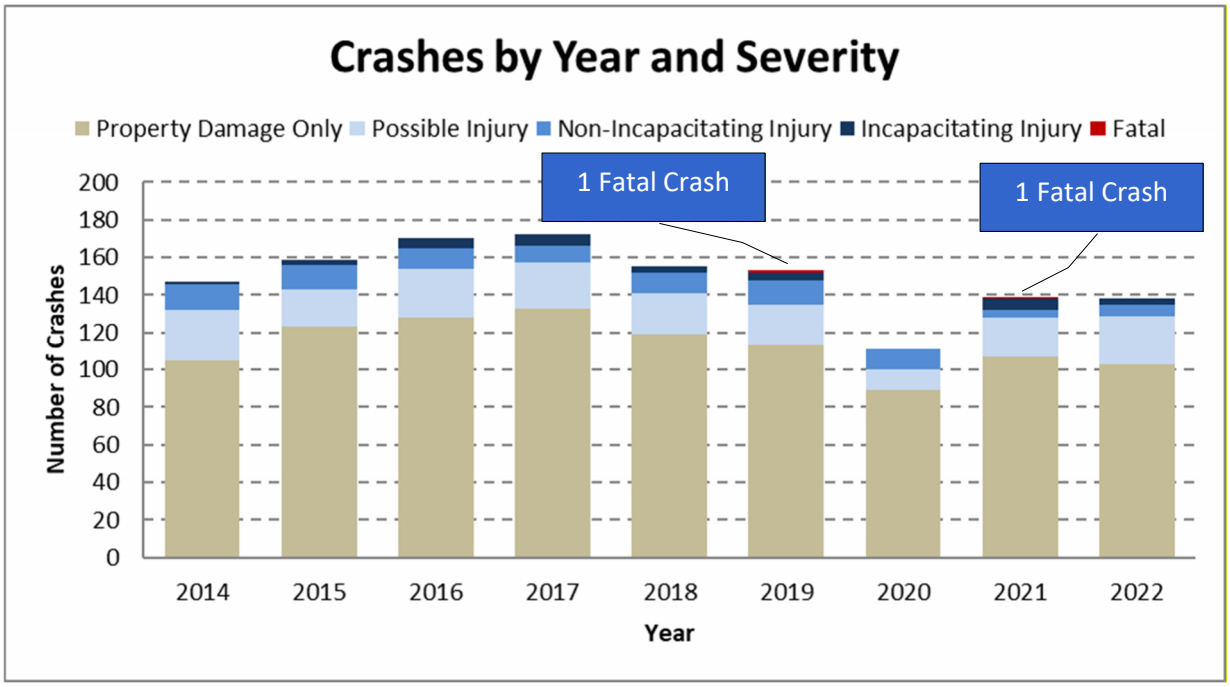


Figure 3: Crashes per Year (Entire Study Area)

Forty three percent of the total study area crashes were located within the intersection influence area of US 41 and Bonita Beach Road. Figure 4 displays a summary of crash frequency by year along with the respective severities from 2018 to 2022. There was a total of 298 reported crashes during this period, 65 injury crashes (22 percent), and one fatal crash (in 2019). As displayed in Figure 4, there were an average of 60 crashes per year at the intersection.

Figure 5 displays the crashes at the intersection by type and severity for the five-year study period. The highest crash type observed was rear end, comprising 59 percent of the total crashes. Sideswipe crashes (13 percent) and left turn (8 percent) were the second and third highest crash types. These trends are consistent with the overall study area. The fatal crash in 2019 occurred when a vehicle struck a pedestrian crossing US 41.

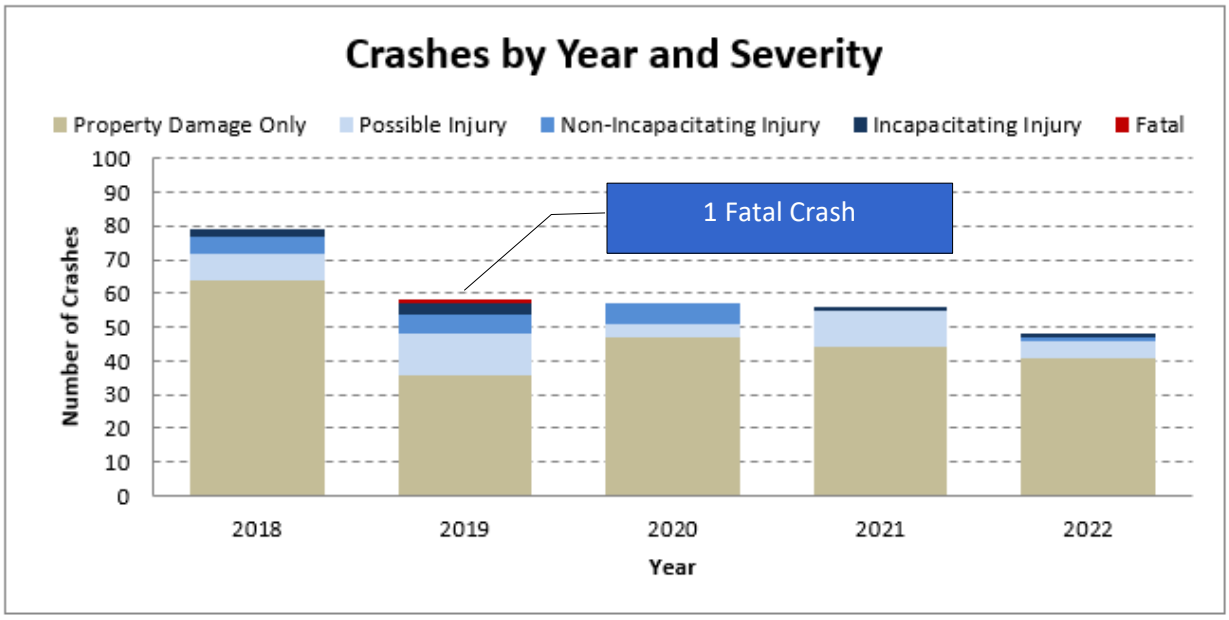


Figure 4: Crashes per Year (US 41 and Bonita Beach Road Intersection)

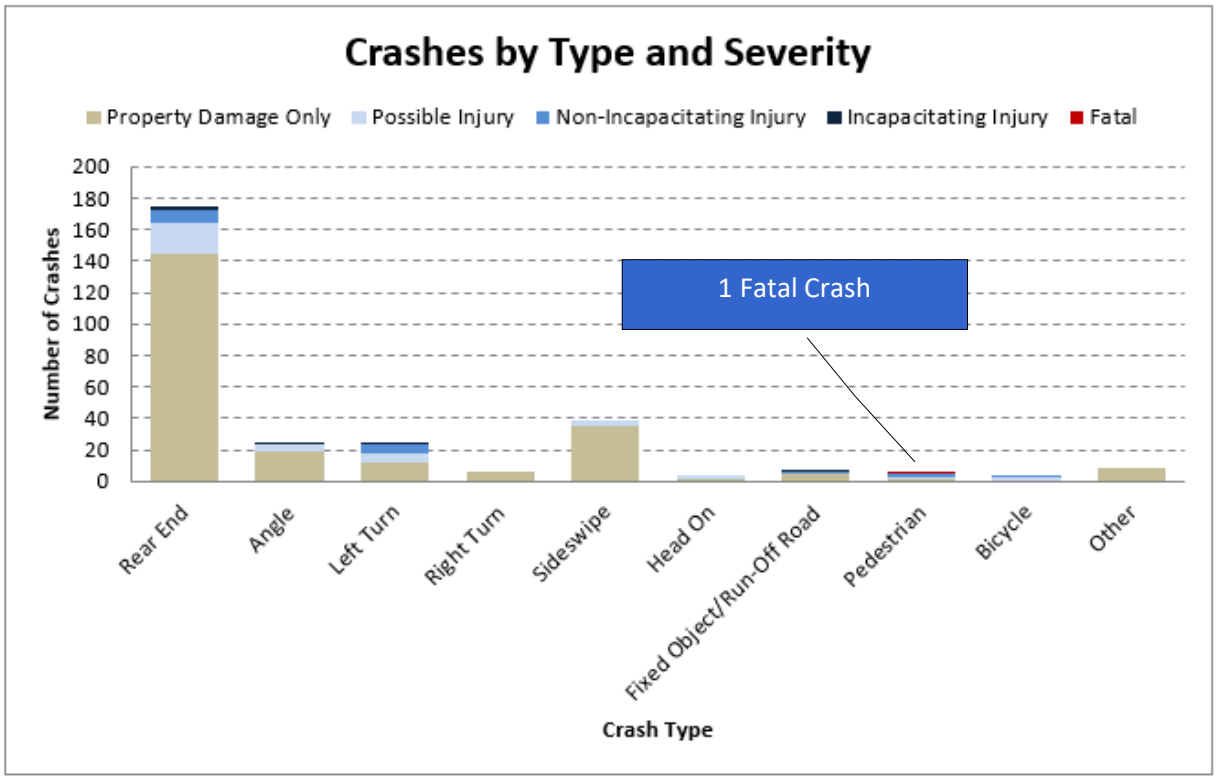


Figure 5: Crashes by Type and Severity (US 41 and Bonita Beach Road Intersection: 2018 to 2022)

A crash rate analysis was performed for the US 41 at Bonita Beach Road intersection. Note that as 2020-2022 average crash rates are not yet available, crash rate analyses were limited to 2018 and 2019 data. Based on the analysis, the study intersection experienced higher than average crash rates in both 2018 and 2019 when compared to both Statewide and Districtwide average crash rates.

US 41 and Bonita Beach Road are designated emergency evacuation routes for both the Florida Division of Emergency Management and Lee County. Providing parallel service to I-75, US 41 plays an important role in facilitating north-south traffic during incidences and emergency evacuation periods (particularly within southwest Florida). Bonita Beach Road also serves a critical role during emergency evacuation periods as it connects US 41 and I-75 (facilities of the state evacuation route network) and provides one of two connections for residents and tourists between the barrier islands/tourist destinations to the west and mainland of Lee County.

1.2.3 Modal Interrelationships

While sidewalks are present on both sides of US 41 and Bonita Beach Road, the only bicycle facilities present in the study area are 5' marked bicycle lanes along both sides of US 41. Two LeeTran bus routes (Routes 150 and 600) operate along US 41 and Bonita Beach Road. In addition to the two bus routes, LeeTran has partnered with Uber to provide ULTRA On-Demand Transit service in the Bonita Springs area. With LeeTran's ULTRA On-Demand Transit service is a deluxe mini-bus available seven days a week from 7:00 AM to 6:00 PM. ULTRA On-Demand Transit allows riders to request a ride as needed, with curb to curb service.

Due to the presence of these facilities/services and the surrounding urban environment, heavy pedestrian and bicycle traffic exists in the area (as observed during field reviews conducted for the project).

The Office of Greenways and Trails (OGT) and the Lee County Metropolitan Planning Organization (MPO) have identified trail opportunities in the vicinity of the US 41 and Bonita Beach Road study intersection. The Coastal Loop Trail is a spur loop from the Southwest Coastal Regional Trail, which is part of the larger FDOT Shared-Use Nonmotorized (SUN) Trail Program. This is a planned loop trail that begins at the Southwest Coastal Regional Trail in Bonita Springs, travels along Bonita Beach Road to the barrier islands, then travels through Fort Myers Beach and southern Fort Myers before connecting back to the Southwest Coastal Regional Trail east of US 41 in Fort Myers. Through discussions with Lee County MPO, no future funding has been dedicated for Coastal Loop Trail improvements in the vicinity of the US 41 and Bonita Beach Road intersection as per the date of this report.

1.2.4 System Linkage

US 41 serves as a critical arterial in facilitating the north-south movement of regional and local traffic (including truck traffic) as it runs parallel to I-75 along Florida's west coast. Similarly, Bonita Beach Road serves as a major east-west local roadway within Lee County, linking US 41 and I-75 and providing access (as one of two connections) between the mainland of Lee County and coastal communities/tourist destinations to the west (i.e., barrier islands and beaches).

The City of Bonita Springs performed the Network Enhancement Alignment Study, also known as the "Quadrant Plan", in May 2017. The purpose of the Quadrant Plan is to develop an expanded roadway network between

Bonita Beach Road with US 41 that improves the area's mobility, maintains a high-quality environment for the community, and minimizes impacts to the natural environment. The City is moving forward with design and construction for a northwest quadrant roadway.

1.3 Alternatives Analysis Summary

1.3.1 Prior Grade Separated Alternative

During the preliminary alternatives analysis efforts in 2020, a single point diamond interchange (SPDI) was one of two alternatives being considered (along with the PDLT). The SPDI alternative assumes the northbound and southbound through lanes on US 41 are elevated over Bonita Beach Road. Turning movements for US 41 and Bonita Beach Road occur at a single intersection underneath the US 41 overpass. To allow access to local businesses, through movements on the US 41 ramps were allowed. The US 41 overpass begins between the two access points for Springs Plaza on the south side of Bonita Beach Road and ends north of the Crown Lake Boulevard intersection to the north. Access to any minor streets along the US 41 ramps are maintained as intersections with the US 41 ramps only.

The SPDI alternative was reviewed as part of the Stage 1 Intersection Control Evaluation. During this evaluation, a new development was approved with their primary access to US 41 occurring at the Center of Bonita Springs signalized intersection via the northwest quadrant roadway. The overpass' ramps would tie-in to US 41 north of this location and convert the Center of Bonita Springs intersection into a right-in/right-out configuration. With this new development needing full access to US 41 at the Center of Bonita Springs, the SPDI alternative was removed from consideration and an enhanced at-grade traffic signal was reviewed (as discussed in the next section).

1.3.2 Intersection Alternatives

Two intersection alternatives were developed to support the US 41 at Bonita Beach Road purpose and need:

- Alternative A – Enhanced Traffic Signal (**Figure 6**)
    - Widens US 41 to eight lanes from Foley Road to the southern end of the Imperial River bridge.
    - Provides additional turn lane improvements to the existing signalized intersection.
- Alternative B – Partial Displaced Left Turn (**Figure 7**)
    - Northbound and southbound left turn movements are relocated to the outside of the opposing flow of traffic, allowing the northbound and southbound left turning movements to operate in the same signal phase as the northbound and southbound through movements.
    - Two new signalized "crossover" intersections are proposed along US 41 approximately 675' south and 460' north of Bonita Beach Road to allow left turning vehicles to cross to the other side of the opposing flow.
    - The southbound and eastbound left turn movements are proposed to have three lanes each.
    - The eastbound and westbound right turn movements are proposed to have two lanes each.

The intersection alternatives were developed using design provisions from the FDOT Design Manual (FDM). Each of the proposed intersection alternatives were applied along US 41 from Sta. 221+19 to Sta. 271+81 and along Bonita Beach Road from Sta. 254+57 to Sta. 300+33.

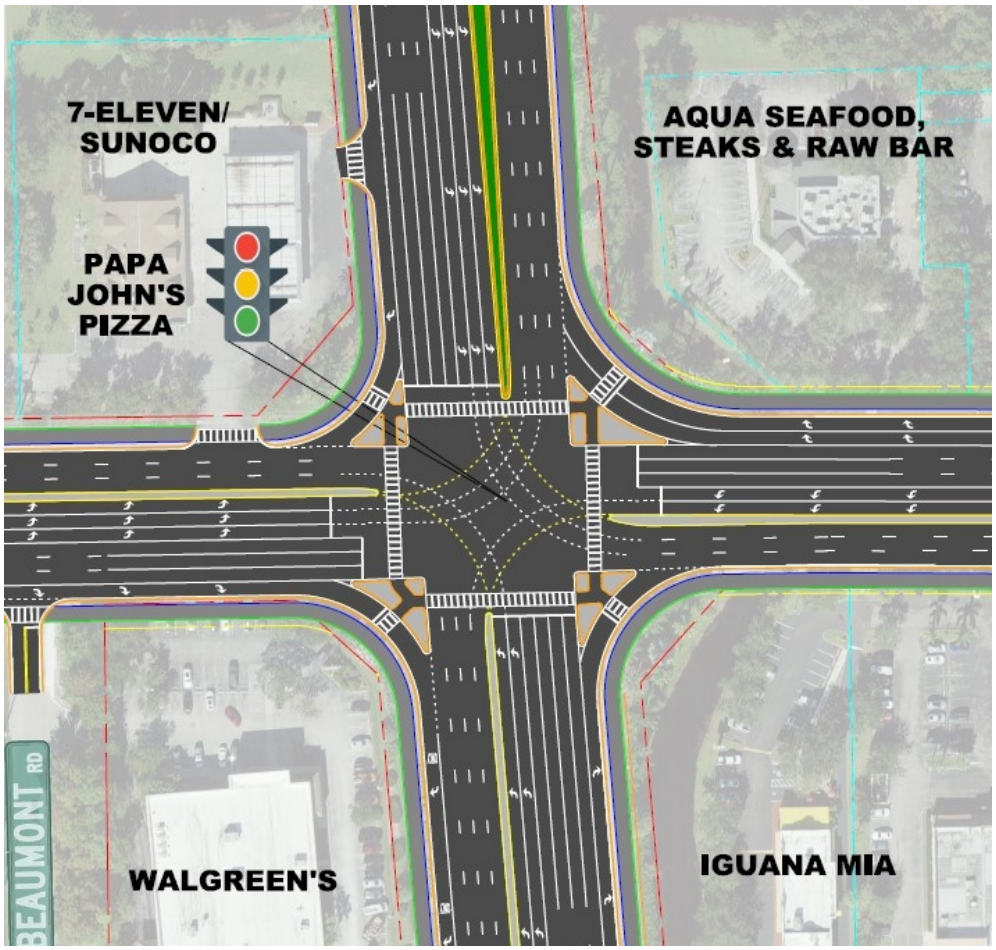


Figure 6: Alternative A – Enhanced Traffic Signal

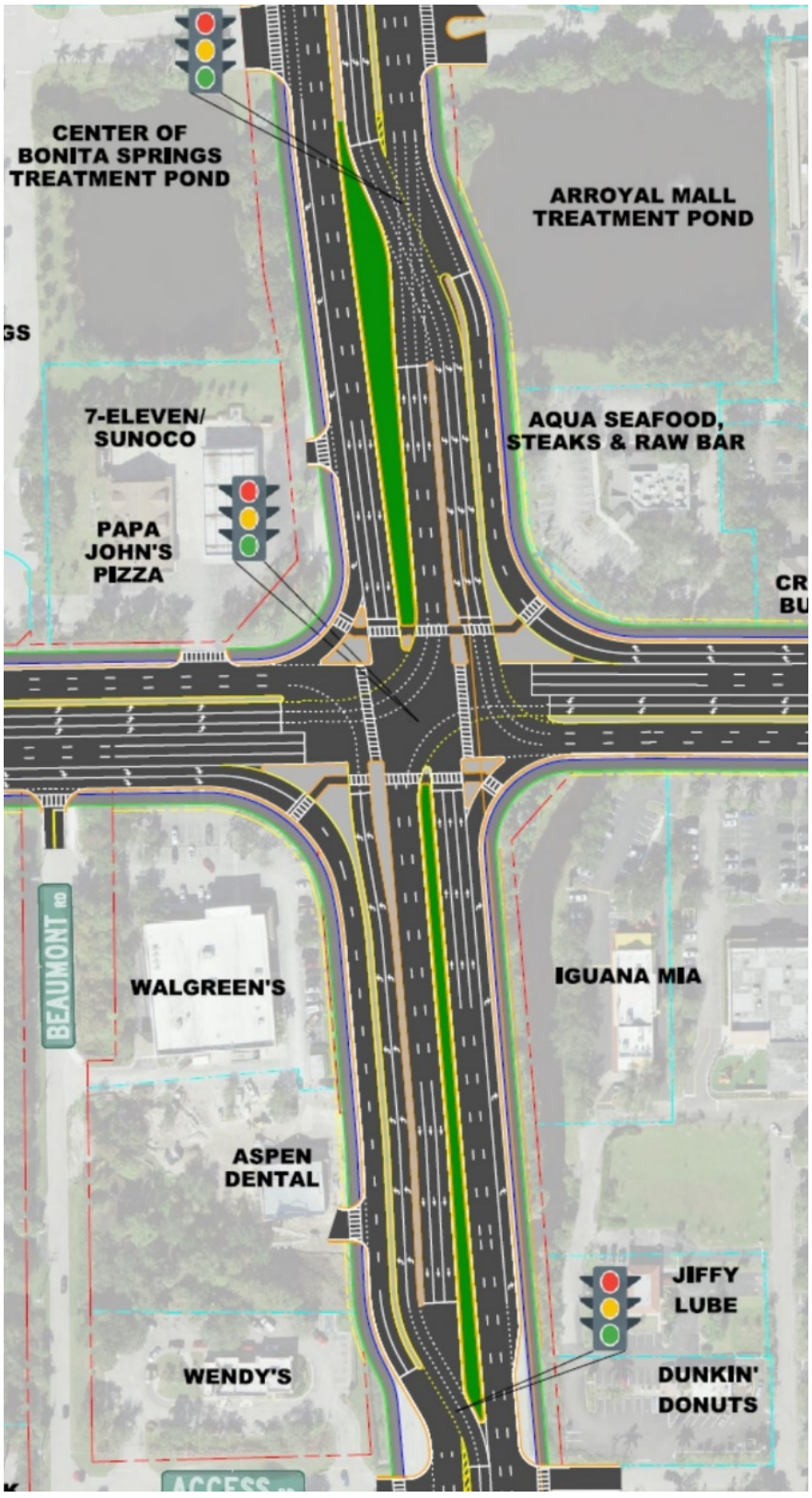


Figure 7: Alternative B – Partial Displaced Left Turn

1.3.3 Other US 41 Improvements (Outside of Main Intersection)

1.3.3.1 Alternative A – Enhanced Traffic Signal

For Alternative A, US 41 is proposed to be modified based on the following:

- Adding a fourth travel lane in each direction and reducing the lane widths to 11':
  - Additional northbound travel lane will start just north of Foley Road (Sta. 223+50) and end at the driveway for the Imperial River Boat Ramp (Sta. 270+00).
  - The additional southbound travel lane will start at Sta. 265+00 (halfway between the Imperial River Boat Ramp driveway (Sta. 270+00) and the US 41/Center of Bonita Springs intersection (Sta. 260+00)) and end at the Foley Road intersection (Sta. 222+75).
- A 12' shared-use path is proposed on both sides of US 41 in lieu of the on-street bicycle facilities:
  - In the northbound direction from Springs Plaza (Sta. 232+50) to just north of the Imperial River Boat Ramp (Sta. 271+00).
  - In the southbound direction from just north of the Imperial River Boat Ramp (Sta. 271+00) to Bonita Funeral Home (Sta. 231+00).
- A 7' on-street buffered bicycle lane is proposed on the south end of the corridor:
  - In the northbound direction from Foley Road (Sta. 222+75) to just north of Springs Plaza (Sta. 234+50).
  - In the southbound direction from Bonita Funeral Home (Sta. 231+00) to Foley Road (Sta. 222+75).
- A 6' sidewalk is proposed on the south end of the corridor:
  - In the northbound direction from Foley Road (Sta. 222+75) to Springs Plaza (Sta. 232+50).
  - In the southbound direction from Bonita Funeral Home (Sta. 231+00) to Foley Road (Sta. 222+75).

A graphic depiction of the roadway features for Alternative A is shown in **Figure 8** below.

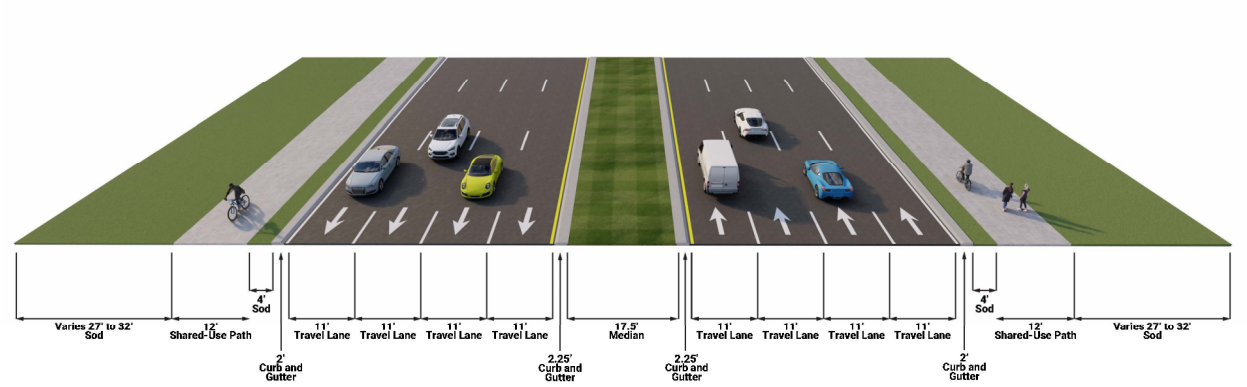


Figure 8: Alternative A US 41 Roadway Features

1.3.3.2 Alternative B – Partial Displaced Left Turn

For Alternative B, the northbound and southbound left turn movements will be relocated outside of the opposing flow of traffic. This configuration will allow the northbound and southbound left turning movements to operate in the same signal phase as the northbound and southbound through movements. To accommodate the Alternative B configuration and facilitate the relocation of northbound and southbound turning vehicles, two new signalized "crossover" intersections will be added along US 41 approximately 675' south and 460' north of Bonita Beach Road (as shown in **Figure 7**). The following features detail the improvements proposed as part of the new "crossover" intersections:

- Between Foley Road (Sta. 222+75) and southern "crossover" intersection (Sta. 239+00):
  - Three 11' northbound and southbound through lanes.
- Between southern "crossover" intersection (Sta. 239+00) and US 41 and Bonita Beach Road intersection (Sta. 246+00) (described from right side to left side across US 41 and shown in **Figure 9**):
  - Exclusive 11' northbound right turn lane.
  - Three 11' northbound and southbound through lanes.
  - Dual 11' northbound exclusive left turn lanes positioned outside of the southbound through lanes.
  - Dual 11' eastbound to southbound exclusive right turn lanes positioned outside of the northbound left turn lanes.
- Between US 41/Bonita Beach Road intersection (Sta. 246+00) and northern "crossover" intersection (Sta. 251+00) and (described from right side to left side across US 41):
  - Dual 11' westbound to northbound exclusive right turn lanes positioned outside of the southbound left turn lanes.
  - Triple 11' southbound exclusive left turn lanes positioned outside of the northbound through lanes.
  - Three 11' northbound and southbound through lanes.
  - Exclusive 11' southbound right turn lane.
- Between northern "crossover" intersection (Sta. 251+00) and US 41/Center of Bonita Springs intersection (Sta. 260+00):
  - Four 11' northbound through lanes.
  - Three 11' southbound through lanes.
- Between US 41 and Center of Bonita Springs intersection (Sta. 260+00) and the Imperial River Boat Ramp (Sta. 266+50):
  - Four 11' northbound through lanes (outside lane drops at the Imperial River Boat Ramp).
  - Three 11' southbound through lanes (a fourth "auxiliary" lane begins at Sta. 265+00 that drops into the triple southbound left turn lanes).
- A 12' shared-use path is proposed on both sides of US 41 in lieu of the on-street bicycle facilities:
  - In the northbound direction from Springs Plaza (Sta. 232+50) to just north of the Imperial River Boat Ramp (Sta. 271+00).
  - In the southbound direction from just north of the Imperial River Boat Ramp (Sta. 271+00) to just south of Access Road (Sta. 237+00).

- A 7’ on-street buffered bicycle lane is proposed on the south end of the corridor:
    - In the northbound direction from Foley Road (Sta. 222+75) to just north of Springs Plaza (Sta. 234+50).
    - In the southbound direction from just south of Access Road (Sta. 237+00) to Foley Road (Sta. 222+75).
- A 6’ sidewalk is proposed on the south end of the corridor:
    - In the northbound direction from Foley Road (Sta. 222+75) to Springs Plaza (Sta. 232+50).
    - In the southbound direction from just south of Access Road (Sta. 237+00) to Foley Road (Sta. 222+75).

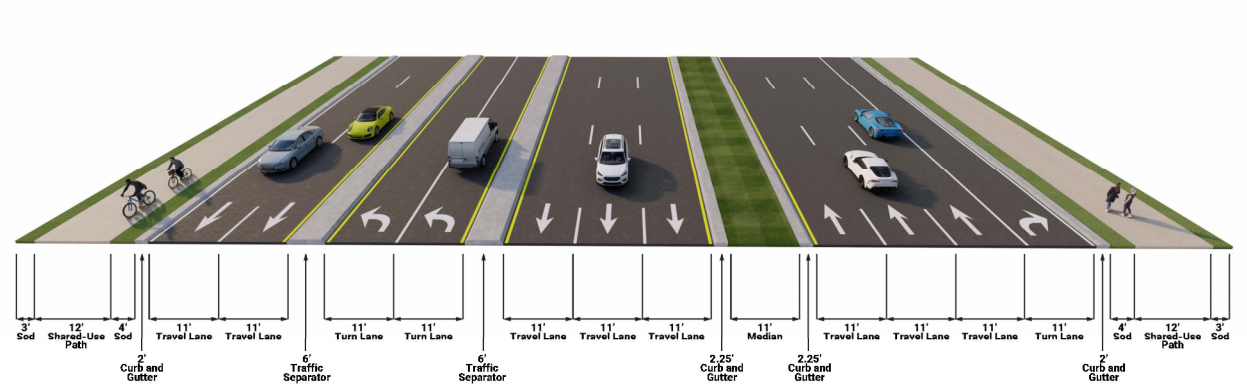


Figure 9: Alternative B US 41 Roadway Features

1.4 Description of Preferred Alternative

1.4.1 Preferred Intersection Control Alternative

The purpose of this project is to address the deficient operational capacity of the US 41 and Bonita Beach Road intersection to relieve existing congestion and accommodate projected future traffic demand. The project's secondary goals are to 1) Enhance regional and local mobility; 2) Enhance safety conditions; and 3) Improve multi-modal access.

Alternatives A (Enhanced Traffic Signal) and B (PDLT) were presented at the Alternatives Public Workshop conducted virtually on Monday April 3 and in-person on Tuesday April 4, 2023. Following the workshop, feedback was gathered from members of the public for both alternatives. The majority of public comments received expressing support for Alternative B, PDLT. Alternative B was favored as it does not add through lanes along US 41, was viewed as being more operationally efficient, and provided better pedestrian and bicyclist safety. These alternatives were also presented to the Lee County MPO on June 16, 2023 and the public support for the PDLT alternative was documented with the MPO Board.

Discussions were held with FDOT District 1 after the Alternatives Public Workshop and it was determined Alternative B – PDLT best aligns with the purpose and need of the project and was selected as the preferred alternative. The following bullets summarize how the PDLT recommendation meets the primary and secondary purpose and need goals noted above:

- Transportation Demand/Capacity
    - In the 2050 future build condition, the average network delay for vehicles traveling through the PDLT is approximately 50 percent less than the No-Build Alternative.
    - The number of vehicles served by the PDLT in 2050 is approximately 20 percent higher than the No-Build Alternative.
    - The PDLT is anticipated to improve average vehicle delay by over 45 seconds in both the 2050 mid-day and PM peak hours when compared to the No-Build Alternative.
- Safety
    - Using the predictive safety analysis methods provided in the FDOT Safety Performance for Intersection Control Evaluation (SPICE) Tool, the PDLT intersection is predicted to decrease total and fatal/injury crashes by over 10 percent vs the No-Build Alternative over the 20 year life cycle from 2030 to 2050.
    - Increase the volume of residents and tourists from coastal communities that can be evacuated during an emergency event by improving intersection operations of two major evacuation routes.
    - Enhance access to facilities of the state evacuation route network.
    - Improve response times (due to enhanced access) to emergency events and incidences.
- Modal Interrelationships
    - Sidewalks in the study area are proposed to be widened to 12' shared-use paths along both sides of US 41 and Bonita Beach Road.

  - These shared-use paths will improve pedestrian/bicycle access and circulation by modifying/limiting opportunities for conflicts between automobiles and pedestrians/bicyclists.
  - The 12' shared-use path improvements proposed as part of the PDLT would help further enhance the future vision of the Coastal Loop Trail in the study area.
  - Additional median and concrete traffic separators are included in the PDLT concept to provide pedestrian refuge areas and better facilitate non-motorist crossings.
  - The PDLT will also enhance the performance and reliability of transit service operating along US 41 and Bonita Beach Road by reducing delays at the intersection.
- System Linkage
  - Improve the viability of US 41 as a regional alternative facility to I-75 by reducing travel delay.
  - Enhance east-west access between two primary north-south transportation corridors (US 41 and I-75) as well as between the mainland of Lee County and coastal communities/tourist destinations to the west.
  - Enhance freight mobility and access within the area as US 41 is designated as regional freight mobility corridor (Tier 1 Regional Freight Corridor) in the Lee County 2045 Long Range Transportation Plan.
  - The proposed PDLT improvements will support local system linkage planning efforts by providing a Northeast Quadrant Roadway connecting US 41 to Arroyal Road.

1.4.2 Preferred Alternative Features

The following highlights the key improvement elements within the US 41 at Bonita Beach Road intersection area for Alternative B:

1.4.2.1 US 41

The proposed roadway/intersection improvements discussed in **Section 1.3.1** and **1.3.3.2** were brought forward as part of the preferred alternative design. Outside of the main US 41 and Bonita Beach Road intersection and "crossover" locations, additional intersection improvements are included as part of the preferred alternative:

- Signalization and turn lane improvements at the intersection of US 41 and Foley Road (Sta. 222+75).
- Modified "thru-cut" signalized intersection at US 41 and Center of Bonita Springs (Sta. 260+00) as shown in **Figure 10**:
  - A thru-cut intersection restricts through movements from the minor street typically due to operational and/or geometric conditions. In this case, the west leg is being widened from two lanes to five lanes (four eastbound approach lanes and one westbound receiving lane) and the east leg is being widened from two lanes to four lanes (two westbound approach lanes and two eastbound receiving lanes).
  - Dual southbound left turn lanes are also proposed in the new thru-cut configuration.

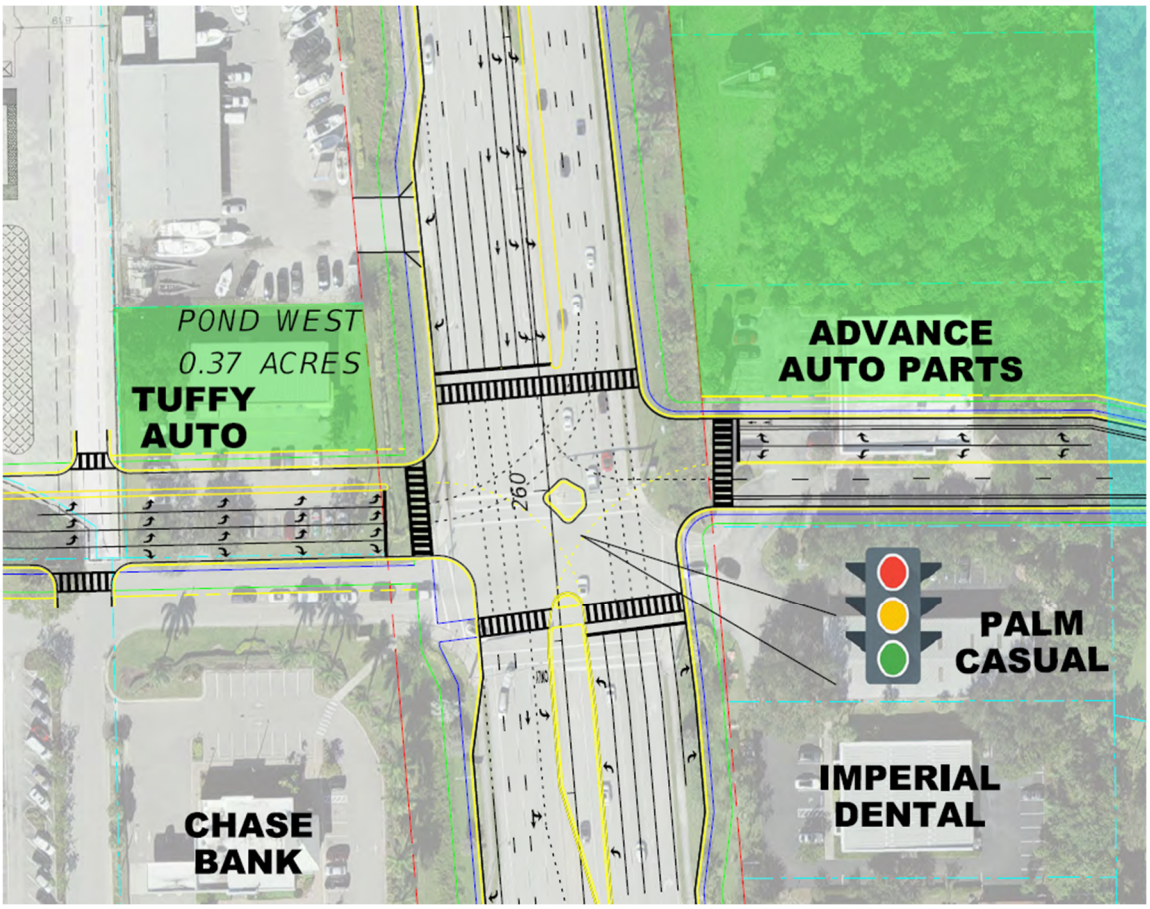


Figure 10: US 41/Center of Bonita Springs "Thru-Cut" Intersection

1.4.2.2 Bonita Beach Road

The following roadway improvements are proposed along Bonita Beach Road as part of the preferred alternative:

- Three 11' travel lanes in each direction from the Center of Bonita Springs (Sta. 266+50) to Arroyal Road (Sta. 286+25). The third eastbound through lane drops at the Spanish Wells Boulevard signal.
- Widening the sidewalk to be a 12' shared-use path on both sides from the Center of Bonita Springs (Sta. 266+50) to Arroyal Road (Sta. 286+25).

At intersections along Bonita Beach Road, the following features are included are part of the preferred alternative:

- Bonita Beach Road at Center of Bonita Springs (Sta. 266+50):
  - Develop a third 11' eastbound travel lane departing intersection.
- Bonita Beach Road at Arroyal Road (Sta. 286+25):
  - One additional 11' eastbound through lane (will be a shared through/right configuration).
  - Develop a third 11' westbound travel lane departing intersection.

- The southbound approach will be modified to include two southbound left turn lanes and one southbound shared through/right turn lane.

1.4.2.3 Quadrant Roadway System

A new Northwest Quadrant Roadway from Bonita Beach Road at Windsor Road (Bonita Beach Road Sta. 260+00) to US 41 at the Center of Bonita Springs (US 41 Sta. 260+00) will be constructed by the City of Bonita Springs before the preferred alternative is planned to be constructed at the US 41 and Bonita Beach Road intersection. The following features describe the Northwest Quadrant Roadway improvements as shown in **Figure 11**:

- Intersection of Bonita Beach Road and Windsor Road (Bonita Beach Road Sta. 260+00):
  - An eastbound displaced left turn to the Northwest Quadrant Roadway with a new crossover intersection just west of Windsor Road.
  - The southbound approach from Windsor Road will be widened to two lanes.
  - An exclusive westbound right turn lane will be added.
- Along Windsor Road:
  - Two southbound lanes and one northbound lane.
  - 6’ sidewalk on the west side and 12’ shared-use path on the east side of the roadway.
- Along New Roadway between Windsor Road and the Northwest Corner of the Center of Bonita Springs Shopping Plaza:
  - One 11’ travel lane in each direction.
  - 4’ paved shoulders in each direction.
  - 6’ sidewalk on the west side and 12’ shared-use path on the east side of the roadway.

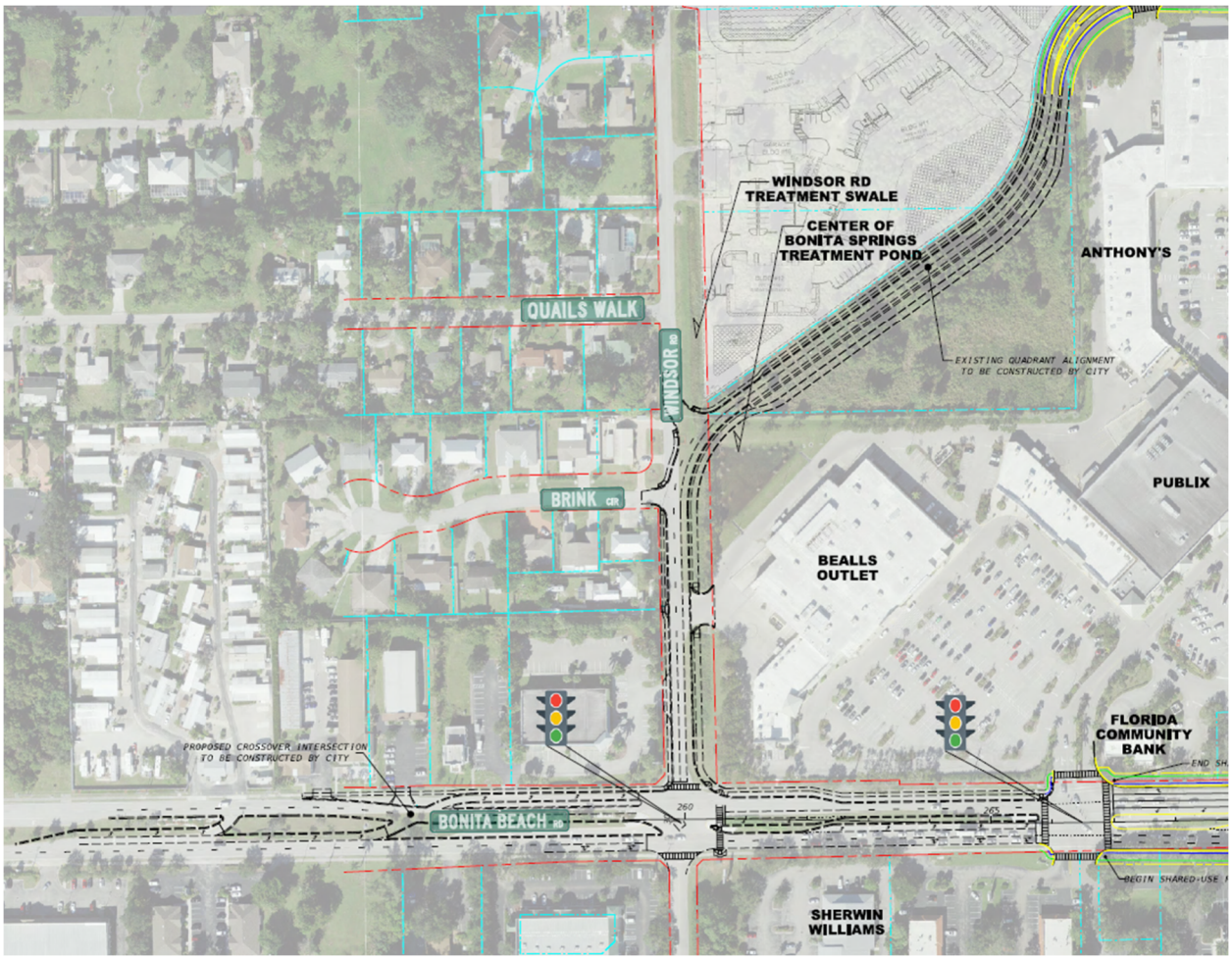


Figure 11: Northwest Quadrant Roadway – Proposed City Alignment

The design concept for the City's Northwest Quadrant Roadway ties in at the existing US 41/Center of Bonita Springs intersection and is not making any improvements to this intersection. In the future condition, this intersection will not have enough capacity to accommodate the forecasted traffic demand, necessitating additional turn lane improvements on the intersection's west leg. As part of the preferred alternative, the Northwest Quadrant Roadway is being modified from the northwest corner of the Center of Bonita Springs Shopping Plaza to US 41. These changes are described below and shown in **Figure 12**:

- Northwest Corner of the Center of Bonita Springs Shopping Plaza to US 41:
  - Roadway is widened to develop a center median with varying width.
  - One 11' travel lane in each direction.
  - 6' sidewalks on each side of the roadway.
  - 7' buffered bicycle lanes in each direction.
  - New 11' westbound left turn lane into Center of Bonita Springs behind the Old Time Pottery building.
- West Leg at US 41 Intersection:

- One 11’ eastbound right turn lane.
- Three 11’ eastbound left turn lanes.
- One 11’ westbound receiving lane.

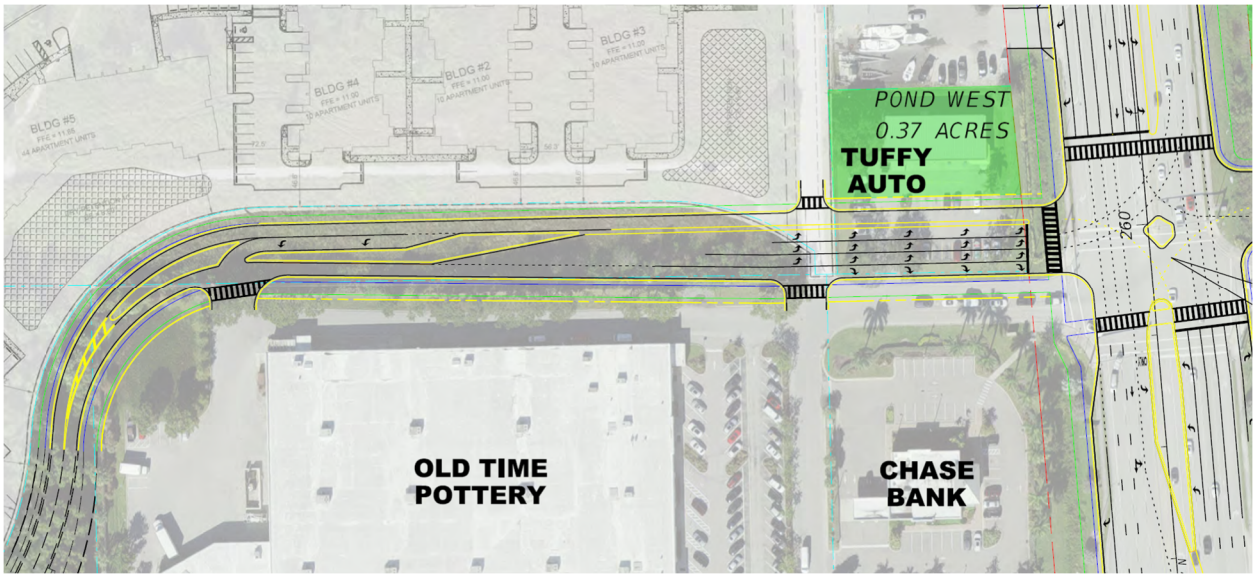


Figure 12: Northwest Quadrant Roadway – West Leg at US 41

Tying into the east leg of this intersection is a Northeast Quadrant Roadway proposed between US 41 and Arroyal Road, intersecting at Arroyal Road and Carolina Street. This will be a new three-lane roadway with two lanes eastbound and one lane westbound, as shown in **Figure 13**. The lane configuration at the US 41 intersection is discussed below:

- One 11’ westbound left turn lane.
- One 11’ westbound right turn lane.
- Two 11’ eastbound receiving lanes.

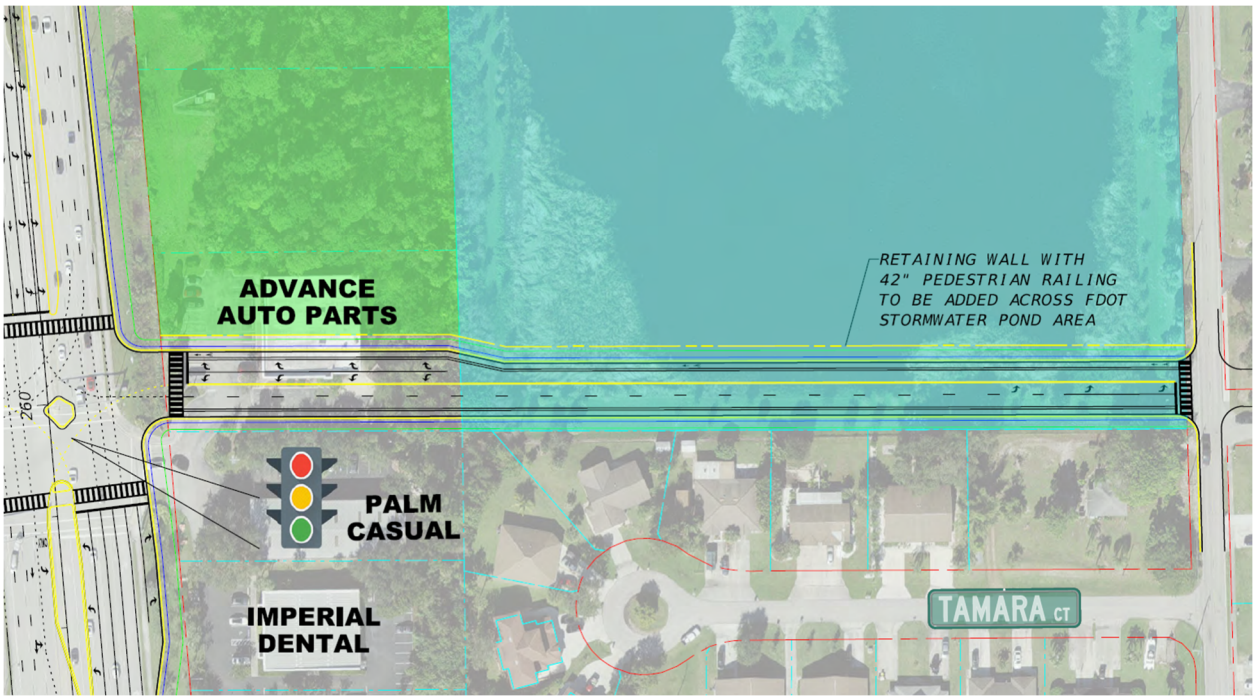


Figure 13: Northeast Quadrant Roadway – East Leg at US 41

2.0 Design Criteria

The project's stormwater management facilities' design is governed by the rules set forth by the SFWMD and FDOT. Water treatment and attenuation requirements will comply with the guidelines as defined in Chapter 62-330 of the Florida Administrative Code (F.A.C) and the Statewide Environmental Resource Permit Manual (SWERP).

Wet detention ponds, dry retention ponds, and swale systems will provide for water quality improvements as well as water quantity attenuation for the project runoff. Please refer to the sections below for the water quality, water quantity, and pond facilities configuration criterion used for the project.

2.1 SFWMD Criteria

- **Water Quality**:
  - Wet Detention: Treatment will be provided for the greater of one inch (1") of runoff over the drainage area or two and a half inches (2.5") of runoff from the net new impervious area (excluding water bodies). For conservative measures, the net new impervious area includes the proposed sidewalk and shared-use path.
    - An orifice should be set at the control elevation and sized to drawdown a maximum of one-half of the required treatment volume within 24 hours.
  - Dry Retention: Treatment will be provided for the greater of one-half inch (0.5") of runoff over the drainage area or one and a quarter inches (1.25") of runoff from the impervious area (excluding waterbodies).
    - The entire treatment volume is to be infiltrated within 72 hours after a storm event.

  The study is located in the Estero Bay Watershed within South Florida Water Management District's (SFWMD) jurisdiction. The project is just south of the Imperial River, Waterbody ID (WBID) 3258EB – Imperial River (Marine Segment), an Outstanding Florida Water (OFW) and the project's ultimate outfall. The Imperial River has a Total Maximum Daily Load (TMDL) for Dissolved Oxygen (DO) and Total Nitrogen (TN) meaning nutrient loading analysis will be required. Basins out falling to an OFW will provide an additional 50% water quality treatment volume.

- **Water Quantity**: For open basins, SFWMD requires that the post-development peak discharge shall be at or below pre-development peak discharge for the 25-year/72-hour and mean annual storms.

- **Pond Configuration**:
  - Wet Detention Ponds: The water's flow path from the inlets to the pond's outlet must be maximized to promote good mixing with no dead spots, minimize short circuiting, and maximize pollutant removal efficiency and mixing.
    - Area – 0.5 acre minimum
    - Width – 100 feet minimum for linear areas in excess of 200 feet length
    - Littoral Zone – The littoral zone shall be a portion of the wet retention/detention bodies shallower than 6 feet as measured from below the control elevation. The minimum area shall be the lesser of 20 percent of the wet retention/detention area or 2.5 percent of the total of the retention/detention area plus the basin contributing areas.

- Additional source controls, BMPs and other protective measures – Increase average wet season hydraulic residence time of wet detention ponds to at least 21 days using a maximum depth of 12 feet from the control elevation to calculate the residence time.
- Side Slopes – The pond must be designed so that the average pond side slope measured between the control elevation and two feet below the control elevation is no steeper than 1V:4H.

– Retention Ponds and Linear Swales: The effectiveness of retention facilities is controlled by two key factors: the construction procedures for the facility and the overall sequence of the site construction.

- Dry retention areas shall have mechanisms for returning the groundwater level in the area to the control elevation.
  The design of dry retention areas hall incorporate considerations for regular maintenance and vegetation harvesting procedures.

3.0 Data Collection

The design team collected and reviewed data from the following sources:

- FDOT Drainage Manual, January 2024
- FDOT Drainage Design Guide, January 2024
- Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Panel Nos. 12071C0658G, Effective Date 11/17/2022, in Lee County, Florida.
- United States Geological Survey (USGS) Quadrangle Maps
- United States Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS) Soils Survey of Lee County, Florida, 1984
- Field Reconnaissance (April 2019)
- Existing Permit Databases (SFWMD)
- 1-ft LIDAR Data Source: Lee County, 2007

4.0 Existing Drainage Conditions

4.1 Topography & Hydrologic Features

Topography throughout the project is relatively flat with a very gradual downhill slope from the study limit's southern end to the north. Roadway elevations begin at 13.0 feet and decrease to 12.0 feet. All elevations mentioned in this

4.0 Existing Drainage Conditions

4.1 Topography & Hydrologic Features

Topography throughout the project is relatively flat with a very gradual downhill slope from the study limit's southern end to the north. Roadway elevations begin at 13.0 feet and decrease to 12.0 feet. All elevations mentioned in this report are in reference to the North American Vertical Datum of 1988 (NAVD) unless otherwise stated. Where information was available only in the National Geodetic Vertical Datum of 1929 (NGVD), it was converted to NAVD using the conversion NAVD = NGVD – 1.38 feet. Please refer to the USGS Quadrangle Map, Figure 2 in Appendix A. The study is just south of the Imperial River, Waterbody ID (WBID) 3258EB – Imperial River (Marine Segment), which is an Outstanding Florida Water (OFW) and the project's ultimate outfall. There is a Total Maximum Daily Load (TMDL) for Dissolved Oxygen (DO) and Total Nitrogen (TN) for the Imperial River.

There are three existing drainage crossings within the study limits. There is a double 8' x 4' concrete box culvert (CBC) underneath US 41 south of the US 41 and Bonita Beach Road intersection which conveys a large drainage ditch from US 41's west side to the ditch along US 41's east side. There is a single 10' x 7' CBC underneath Bonita Beach Road east of the US 41 and Bonita Beach Road intersection conveying the ditch north to the Arroyal Mall Pond. There is a 24" outfall pipe crossing underneath US 41 from the Center of Bonita Springs treatment pond into the Arroyal Mall Pond. An additional crossing will be necessary underneath the proposed Northeast Quadrant Roadway to maintain conveyance of the outfall ditch from the Arroyal Mall Pond to the Imperial River.

4.2 Soils Data and Geotechnical Investigations

The soil survey of Lee County, Florida (dated 1984) published by the USDA NRCS has been reviewed within the project vicinity. USDA Soil Survey Geographic database (SSURGO) data was also obtained from NRCS to create a project limits' soils map using GIS ArcMap. The project vicinity soil survey map is illustrated in Figure 3 of Appendix A.

Table 4-1: USDA NRCS Soil Survey Information for Lee County

Soil No.	USDA Soil Name	Seasonal High Ground Water		HSG	Soil Classification		
		Depth* (feet)	Duration (months)		Depth (inches)	Unified	AASHTO
36	Immokalee Sand-Urban Land Complex, 0 to 2 Percent Slopes	0.5-1.5	Jun-Nov	B/D	0-9 9-36 36-55 55-80	SP-SM SP, SP-SM SP-SM, SM SM, SP-SM	A-2-4, A-3 A-2-4, A-3 A-3, A-2-4 A-3, A-2-4
106	Daytona Sand-Urban Land Complex, 0 to 5 Percent Slopes	3.5-5.0	Jun-Oct	A	0-5 5-36 36-47 47-80	SP-SM, SP SP, SP-SM SP-SM, SM SP, SP-SM	A-3, A-2-4 A-3 A-2-4, A-3 A-3, A-2-4
123	Myakka Fine Sand-Urban Land Complex, 0 to 2 Percent Slopes	0.5-1.5	Jun-Nov	A/D	0-6 6-20 20-36 36-80	SP-SM, SM SP-SM, SM SP-SM, SM SP-SM, SM	A-3, A-2-4 A-3, A-2-4 A-2-4, A-3 A-3, A-2-4

Soil No.	USDA Soil Name	Seasonal High Ground Water		HSG	Soil Classification		
		Depth* (feet)	Duration (months)		Depth (inches)	Unified	AASHTO
124	Myakka Fine Sand-Urban Land Complex, 0 to 1 Percent Slopes	0.0	Jul-Oct	A/D	0-5 5-25 25-39 39-80	SM, SP-SM SP-SM, SM SM SM, SP-SM	A-2-4. A-3 A-3, A-2-4 A-2-4 A-3, A-2-4
131	Pompano Fine Sand-Urban Land Complex, 0 to 2 Percent Slopes	0.3-1.5	Jul-Oct	A/D	0-4 4-80	SP-SM, SM SM, SP-SM	A-2-4, A-3 A-3, A-2-4
134	Satellite Fine Sand-Urban Land Complex, 0 to 2 Percent Slopes	1.5-3.5	Jun-Nov	A	0-3 3-65 65-80	SP-SM, SM SP-SM, SM SM, SP-SM	A-2-4, A-3 A-3, A-2-4 A-2-4, A-3
136	Valkaria Fine Sand-Urban Land Complex, 0 to 2 Percent Slopes	0.3-1.5	Jul-Oct	A/D	0-5 5-16 16-51 51-80	SM, SP-SM SM, SP-SM SM, SP-SM SM, SP-SM	A-3, A-2-4 A-3, A-2-4 A-3, A-2-4 A-3, A-2-4
145	Gator Muck, Ponded-Urban Land Complex, 0 to 1 Percent Slopes	0.0	Jun-Dec	C/D	0-18 18-36 36-55 55-80	PT CL, SC, SM SC, SC-SM, SM SP-SM, SM	A-8 A-4, A-7-6, A-6 A-4, A-2-4, A-6 A-2-4, A-3

*Seasonal High Ground Water Table: Depth is referenced below existing grade, except where indicated as "+".

The soils encountered along the project limits are mostly Hydrologic Soil Group (HSG) A/D, B/D, and C/D. Group A soils have low runoff potential and high infiltration rates even when thoroughly wetted. They consist chiefly of deep, well to excessively drained sand or gravel and have a high rate of water transmission. Group B soils have moderate infiltration rate when thoroughly wet and consist chiefly of moderately deep or deep, moderately well drained, or well drained soils that have moderately fine texture to moderately coarse texture. Group C soils have low infiltration rates when thoroughly wetted and consist chiefly of soils with a layer that impedes downward movement of water and soils with moderately fine to fine texture. Group D soils have high runoff potential. They have very low infiltration rates when thoroughly wetted and consist chiefly of clay soils with a high swelling potential, soils with a permanent high water table, soils with a claypan or clay layer at or near the surface, and shallow soils over nearly impervious material. These soils have a very low rate of water transmission. If a soil is assigned to a dual HSG, the first letter is for drained areas and the second is for un-drained areas. Soils are only assigned a dual class if they are group D in their natural condition. According to the Soil Survey, there are 8 different soil types located along the project limits within Lee County. **Table 4-1: USDA NRCS Soil Survey Information for Lee County** summarizes and lists the soil types and relevant information. The ground water depth varies from 0' to 5' along the project per the NRCS Soil Survey information.

4.2.1 Contamination Screening

Contamination screening was conducted by Tierra, Inc. As a result of the contamination screening evaluation, 4 sites have been assigned a contamination risk rating. The rating system was developed by FDOT and incorporates four levels of risk: No, Low, Medium, and High. Of the 4 sites, 2 were identified as Low Risk, 1 as Medium Risk, and 1 as High Risk.

The sites, business operations and/or facilities identified, to date, and the risk rankings given to them are preliminary. Additional information may become available or site-specific conditions may change and should be considered. For the locations rated "Low" for contamination, no further action is required. These locations have been determined not to have any contamination risk to the study area at this time. For any sites with a risk ranking of "Medium" or "High", Level II field screening should be conducted if it is determined during the project's design that construction activities could be within their vicinity. Please refer to **Appendix I - Contamination Screening Evaluation Report** for further information.

4.3 Environmental Characteristics

4.3.1 Land Use Data

A majority of the project's area is predominately developed as commercial and retail services. Please see **Figure 4** for the **Land Use Map** in **Appendix A**. The proposed improvements at the US 41 and Bonita Beach Road intersection does not alter the existing or future land uses in the area.

4.3.2 Cultural Features

A Cultural Resource Assessment Survey has been conducted by Archaeological Consultants, Inc. The Area of Potential Effects (APE) for the study was defined as the footprint of construction. Based on the analysis, it was determined that all sites have a Low probability of prehistoric archaeological resources and a Low probability of historic archaeological resources.

The archaeological survey consisted of shovel testing and field survey of the project corridor and pond footprints (i.e., the archaeological APE). A total of 35 shovel tests were excavated. All shovel tests were negative for prehistoric or historic sites. Five historical resources (8LL02983, 8LL02984, 8LL02985, 8LL02986, 8LL02987) were identified within the project vicinity. The identified historical resources have been altered, lack sufficient architectural or engineering features and were not determined to be significant features. Relevant information from the Cultural Resource Assessment Survey for this study are included in **Appendix G**.

4.3.3 Natural and Biological Features

The proposed study area was evaluated for natural and biological features and potential impacts to these features. These features and their anticipated involvement are identified in the **Natural Resources Evaluation Report**. Relevant information from the report are located in **Appendix H**.

The project corridor was evaluated for the presence of potentially occurring protected species. A total of 34 protected species were identified as having potential to occur within the study area. The proposed ponds are anticipated to have "**no effect**" or "**may affect, but is not likely to adversely affect.**"

The study area's wetlands and other surface waters (OSW) with potential to be affected by the proposed project were identified. A wetland assessment was performed for these wetlands and other surface waters in accordance with the Uniform Mitigation Assessment Method (UMAM) as described in Chapter 62-345, FAC to determine the functional value provided by the wetlands and other surface waters. The UMAM is the state-wide methodology for determining the functional value provided by wetlands and other surface waters and the amount of mitigation required to offset adverse impacts to those areas for regulatory permits. The impacted OSWs are considered

upland cut components of the existing manmade drainage system; and therefore, these OSWs were not included in the wetland assessment as mitigation is not anticipated. Based on the wetland assessment, the preferred alternative has approximately **3.21 acres of direct impacts to wetlands** and **0.81 acres of direct impacts to other surface waters**. Unavoidable impacts to wetlands will be mitigated to achieve no net loss of wetland function.

4.4 Floodplains/Floodways

The Federal Emergency Management Agency (FEMA) flood insurance rate map (FIRM) for Lee County (Map No. 12071C0658G) dated November 17, 2022 indicates Zone AE floodplains (Flood El. 9.0 and 10.0 feet NAVD) are within the study area. The floodplain area within the study limits is tidally influenced and per SFWMD coordination will not require compensation for anticipated impacts. The Imperial River is considered a regulatory FEMA floodway; however, the proposed improvements considered for this study will not impact the roadway or bridge at the river. Additional information regarding floodplains will be documented in this study's Location Hydraulics Report. Initial coordination with the City of Bonita Springs indicated a flooding concern at the homes and road systems west of Beaumont Road and upstream of the double 8' x 4' CBC under US 41. Preliminary calculations, provided in the Location Hydraulics Report**,** indicate that the concrete box culvert extension will not adversely impact the stages within the ditch upstream. It is anticipated that the flooding concerns are due to issues outside of the study limits, which will need to be verified and coordinated with the City of Bonita Springs during final design.

4.5 Existing Drainage Permits

US 41 and Bonita Beach Road both collect stormwater runoff in roadway curb and gutters before conveying the runoff via closed storm sewer systems to nearby permitted stormwater treatment facilities. The surrounding commercial developments at the intersection of US 41 and Bonita Beach Road also have their own stormwater treatment facilities treating onsite runoff before discharging offsite. Many of these permitted facilities discharge to the large ditch along US 41's east side conveying the runoff to the Imperial River. The sections below briefly describe the permitted condition and the proposed improvement's impacts. Documents from select permits the study could significantly impact or were used for drainage structure data collection can be found in **Appendix F – Existing Permits**.

4.5.1 Permit No. 36-02988-P:

This permit is for the surface water management system for a 3.10-mile segment of US 41 from CR 887 (Old US 41 Road) to north of Bonita Beach Road. The permitted project's north basin is within the study limits. Treatment and attenuation are provided in a permitted FDOT pond (Pond North) located east of US 41 just south of the Imperial River. Pond North discharges to a swale adjacent to US 41, outfalling to the Imperial River.

4.5.2 Permit No. 36-00317-S:

This permit is for the water management system serving the residential and commercial land along US 41 and Bonita Beach Road's southwest corner. Treatment is provided within a series of swales and dry treatment ponds prior to discharging into the large ditch running along US 41 at the US 41 and Bonita Beach Road intersection's southeast corner.

4.5.3 Permit No. 36-02746-S

This permit is for the Walgreens property treatment at the US 41 and Bonita Beach Road intersection's southwest corner. Treatment is provided by a dry retention swale at the property's southwest corner before discharging to a large ditch. This discharge joins a ditch flowing underneath US 41 via a concrete box culvert and then north towards the Imperial River.

4.5.4 Permit No. 36-00718-S

This permit is for the surface water management of the commercial development at the US 41 and Bonita Beach Road intersection's northwest corner. The site's treatment is provided by a wet detention pond on the property's east side discharging under US 41 to the Arroyal Mall Pond. Additional treatment is provided by a dry retention pond at the property's northwest side discharging to the Windsor Road treatment swale.

4.5.5 Permit No. 36-00863-S

This permit is for the commercial site at the US 41 and Bonita Beach Road intersection's northeast corner. The pond adjacent to US 41 at the property's west side provides treatment and attenuation for onsite runoff as well as accepting and routing runoff from regional drainage areas totaling approximately 393.5 acres. The areas routed through the pond are listed below and are conveyed to the pond through outfall pipes and by the large ditch running through the study area:

Onsite Area – 18.1 acres

Permit No. 36-00317-S Springs Plaza – 24.8 acres

Permit No. 36-00718-S Center of Bonita Springs – 32.0 acres

Permit No. GP 87-20 Bonita Beach Boulevard – 18.6 acres

Permit No. 36-00854-S Woods Edge DRI – 119.5 acres

Undeveloped off-site area – 180.5 acres. The pond discharges north through a weir into a ditch system leading to the Imperial River.

4.5.6 Permit No. 36-03971-P

This permit is for the treatment swale running along Windsor Road**.** Stormwater runoff is collected via sheet flow and closed storm sewer systems discharging into a series of swales. There is a control structure at Windsor Road's north end outfalling into the Imperial River.

4.5.7 Permit No. 36-07247-P

This permit is for the Angler's Paradise surface water management system located north of the Northwest Quadrant Roadway. Stormwater runoff is collected and conveyed to both dry and wet pretreatment systems prior to discharging into a wet detention system via control structure. The system will provide treatment and attenuation for the development prior to ultimately outfalling into the Imperial River.

4.6 Existing Drainage Basins

There are currently four (4) existing drainage basins within the project limits. Existing basin limits were determined by reviewing permitted plans and available LIDAR data to identify the most probable drainage patterns and outfall locations. Refer to **Appendix B – Basin Maps** for basin locations. The sections below describe the basin limits and characteristics.

4.6.1 Windsor Road/Northwest Quadrant Basin

The Windsor Road Swale Basin and Northwest Quadrant Roadway Basin begins at the study area's western limit along Bonita Beach Road, approximately 1100 feet west of Windsor Road and continues west towards the intersection of US 41. The basin includes the Northwest Quadrant Roadway, which will be designed by others. Runoff from Bonita Beach Road is collected in curb and gutter inlets and conveyed to the Windsor Road swale before discharging to the Imperial River. The swale is permitted under Permit No. 36-03971-P. This basin is considered an open basin.

4.6.2 Basin West

Basin West encompasses the area along Bonita Beach Road between the limits of the Windsor Road Swale Basin and the US 41 intersection. Bonita Beach Road runoff is collected in curb and gutter inlets and conveyed to a ditch heading south along Beaumont Road conveying stormwater south to the ditch system crossing underneath US 41 and Bonita Beach Road eventually flowing to the Arroyal Mall Pond. This basin is considered an open basin and the ultimate outfall is the Imperial River.

4.6.3 Basin East

Basin East begins at the US 41 and Bonita Beach Road intersection and continues east to Spanish Wells Blvd. Stormwater runoff from Bonita Beach Road and a portion of the intersection is collected within curb and gutter inlets and discharged directly to the concrete box culvert underneath Bonita Beach Road just east of the intersection, which conveys the ditch north to the Arroyal Mall Pond. This basin is considered an open basin with the Arroyal Mall Pond ultimately outfalling to the Imperial River via an outfall ditch to the north.

4.6.4 Basin North

Basin North is currently permitted under SFWMD Permit No. 36-02988-P. This permit is for the surface water management system for a 3.10-mile segment of US 41 from CR 887 (Old US 41 Road) to north of Bonita Beach Road. Treatment and attenuation are provided in a permitted FDOT pond (Pond North) located east of US 41 just south of the Imperial River. US 41'stormwater runoff is collected within curb and gutter inlets and conveyed to the pond via a closed stormsewer system. This basin is considered an open basin with Pond North ultimately discharging to the Imperial River.

5.0 Proposed Drainage Conditions

The project limit's stormwater runoff will be collected and conveyed via curb and gutter to each basin's recommended pond alternative. The various pond alternatives consist of dry retention ponds, wet detention ponds, and dry linear swales. The ponds will discharge at or near the same locations carrying the roadway runoff in the existing condition, or directly into ditches where appropriate. The proposed ponds have been sized to achieve the required water quality treatment and water quantity attenuation and serve as a budget tool for the project's right-of-way estimation.

5.1 Proposed Basins

There are four (4) proposed drainage basins within the project limits. The onsite roadway basin areas draining to the ponds were determined to be the areas within the proposed right-of-way limits. Please see the basin descriptions below for more information. The outfall locations in the proposed condition are the same as the existing condition. Attenuation in the proposed ponds is provided in all basins. Please refer to the Basin Maps in **Appendix B** for the pond locations. **Table 5-1: Summary of Proposed Drainage Basins** provides a summary of the proposed basins.

Table 5-1: Summary of Proposed Drainage Basins

Basin Name	Location	Basin Area	Remarks
Windsor/NW Quadrant Basin	See Basin Map	8.19 acres	Includes NW Quadrant Roadway
Basin West		2.90 acres	
Basin East		8.88 acres	
Basin North		57.95 acres	Includes NE Quadrant Roadway and portion of intersections at US 41 and NW Quadrant Roadway

Note: Please see Basin Maps located in Appendix B

5.2 Methodology of Pond Determination

5.2.1 General Process

The pond sizing analysis assumes that all ponds will be designed using the appropriate criteria for wet detention or dry retention based on the best available water table data and other proposed site conditions. The ponds were sized assuming offsite runoff would bypass the pond site alternative toward its historical path. Our preliminary investigation indicates the proposed expansion of Pond North will impact the outfall ditch for the Arroyal Mall Pond. The proposed Pond North area allocates for a bypass ditch within to allow regrading this ditch. The report focuses on the preliminary estimate of required pond volumes necessary for each roadway drainage basin. A 20% upsize in the required pond right-of-way area has been applied for all the ponds to account for preliminary parameters such as the estimated average wet seasonal water elevations, ground elevations and potential natural contouring of the ponds. The ponds were sized to accommodate the increased impervious areas within each basin.

The potential pond site locations were selected by considering existing stormwater features, proximity to the outfall location, estimated average wet seasonal water elevations, soil types, land use, and aesthetic features.

There are several existing ponds within the project limits permitted to treat the existing project roadway. Where viable these ponds will be utilized and expanded to continue to provide treatment for the project. Additionally, the Northwest Quadrant Roadway's initial phase will be designed by the City of Bonita Springs and treatment and attenuation will be provided. Please see the correspondence section for meeting minutes for the coordination meetings held with the City. The other pond alternative sites are vacant parcels or remnant parcel areas impacted by the roadway improvements or quadrant roadways. It is not anticipated that any of the pond site alternatives will alter existing or future land uses of surrounding properties or significantly impact existing landscapes.

The following parameters were considered in determining the size and location of the potential pond sites:

- Hydrologic and hydraulic factors such as existing ground elevations, soil types, estimated average wet seasonal water elevations (AWSWE) stormwater conveyance feasibility, allowable hydraulics grade line (HGL), and local discharge criteria (see below);
- Environmental resource impacts including wetlands and threatened or endangered species;
- Floodplain Impacts;
- Major utility conflict potential;
- Parcel descriptions and land usage;
- Impacts to cultural resources;
- Impacts to contamination sites;

5.2.2 Nutrient Loading Analysis

The project traverses Waterbody ID (WBID) 3258EB – Imperial River, which is impaired for nutrients and has adopted a TMDL for DO an TN and is an OFW. Nutrient loading analysis has been performed for the study's proposed ponds to show there will be no adverse effects to the downstream waters. All analysis was performed using BMPTRAINS 2020 software, developed by the University of Central Florida Stormwater Management Academy. Analysis results are included in **Appendix D – Nutrient Loading Analysis** and summarized below in **Table 5-2**. Basin North's existing condition nutrient loading was conducted analyzing the permitted condition routed through the existing FDOT Pond as well as the additional basin area currently untreated that will be a part of the post condition basin area. In the post condition the nutrient loading was routed for the proposed Basin North. However, a portion of the proposed basin was routed to Pond West for pre-treatment in order to meet the project's nutrient loading requirements. All of the recommended pond sites showed a reduction in Phosphorus and Nitrogen loading when compared with pre-development conditions. Therefore, this project meets requirements for both Phosphorus and Nitrogen removal.

Table 5-2: Summary of Nutrient Removal

Basin	Pre-Development Nitrogen Loading (kg/yr)	Post-Development Nitrogen Loading (kg/yr)	Pre-Development Phosphorus Loading (kg/yr)	Post-Development Phosphorus Loading (kg/yr)	Nitrogen Removal Met?
NW Quadrant	Designed by Others				
Basin West	No change from Pre-Condition to Post Condition				
Basin East	37.70	31.33	5.10	4.24	YES
Basin North	88.80	85.02	4.33	4.27	YES
Total	**126.50**	**116.35**	**9.43**	**8.51**	**YES**

5.3 Stormwater Pond Evaluation

The following sections detail each proposed basin and the relevant pond site alternatives. The full Pond Site Evaluation Matrix is available in **Appendix E**. Please note, the preferred pond site alternative for each basin was selected based on the lowest estimated total cost including the cost of right-of-way acquisition, construction, potential remediation of contaminated soil, and wetland mitigation unless otherwise noted in the Pond Site Evaluation Matrix.

5.3.1 Windsor Road/Northwest Quadrant Basin

A portion of Bonita Beach Road west of US 41 and the Northwest Quadrant Roadway are being designed under a separate project led by the City of Bonita Springs. The City project's basin begins at the study area's western limits along Bonita Beach Road, approximately 1100 feet west of Windsor Road and continues east towards the intersection at US 41 to the Center of Bonita Springs' access and includes the Northwest Quadrant Roadway. Bonita Beach Road runoff will be collected in Bonita Beach Road's curb and gutter inlets and the Northwest Quadrant Roadway's shallow swales. Stormwater runoff will be conveyed to a proposed stormwater pond southeast of the quadrant roadway, which will ultimately outfall to the Imperial River. Coordination with the City determined the pond would not be able to accommodate the additional improvements associated with the US 41 at Bonita Beach Road intersection or this project's Northwest Quadrant Roadway. Therefore, Basin West's limits not treated within the City's proposed pond will be accounted within the improvements and expansion of the existing FDOT North Pond. Pond West will provide pre-treatment for the improvements proposed to the study's Northwest Quadrant Roadway. Please see **Appendix J – Correspondence** for meeting minutes of the coordination with the City of Bonita Springs. All calculations and parameters for Pond West are located in **Appendix C – Pond Design Calculations**.

5.3.1.1 Pond West

Pond West will serve as pre-treatment for the improvements to Basin North. Portions of the Northwest Quadrant Roadway improvements proposed by this study and to Basin North will be routed to Pond West to assist meeting nutrient loading requirements. Pond West is located west of US 41 at approximately station 261+00 (LT.). Please see **Appendix B – Basin Maps** for reference. This pond site sits within one (1) parcel (33-47-25-B3-00260.0020),

which is impacted by the proposed quadrant roadway. The pond does not have impacts to other surface waters (OSW) or wetlands. There are no impacts to floodplains. According to the Lee County Soil Survey, Pond West consists of Immokalee Sand (#36, HSG B/D). According to LIDAR and existing permit data obtained for this pond site, the existing ground is at approximately 9.00 feet NAVD. With the data compiled from roadway soil borings, available permits, and soil information, it was determined the pond will be a dry pond with the pond bottom set at elevation 6.00 feet. The pond will encompass the total 0.41 acres of the impacted parcel's remnant area.

5.3.2 Basin West

Basin West will maintain the same limit as the existing condition. The basin's eastern limit at the US 41 and Bonita Beach Road intersection will shift slightly west to reduce the proposed basin limits to maintain the same basin area as the existing condition (larger basin width due to the proposed R/W). Stormwater runoff from Basin West will maintain the existing outfall to Beaumont Drive's ditch to the south. Additional proposed areas will be collected within US 41's stormsewer system and conveyed and accounted for within the proposed Pond North expansion as part of Basin North. This basin is considered an open basin and the ultimate outfall is the Imperial River.

5.3.3 Basin East

Basin East maintains the existing basin limits, beginning at the US 41 and Bonita Beach Road Intersection and continuing east to Spanish Wells Blvd. Bonita Beach Road's stormwater runoff and a portion of the intersection will be collected within curb and gutter inlets and conveyed to a stormwater treatment facility prior to being discharged to the concrete box culvert underneath Bonita Beach Road, flowing to the Arroyal Mall Pond. This basin is considered an open basin with the Arroyal Mall Pond ultimately outfalling to the Imperial River via an outfall ditch to the north. There are two (2) alternatives for this basin. A dry retention swale and an offsite dry retention pond are being considered. The alternatives are discussed in the following sections. All calculations and parameters for each alternative are located in **Appendix C – Pond Design Calculations**. The recommended preferred alternative for this basin is Pond East Alt. 1, the dry retention swale.

5.3.3.1 Pond East Alternative 1

Pond East Alt. 1 is a proposed swale that will serve as the treatment and attenuation for Basin East. Alt. 1 is located south of Bonita Beach Road from approximately station 286+50 (RT.) to station 293+10. Please see **Appendix B – Basin Maps** for reference. The swale sits within the existing roadway right-of-way. The swale does not have impacts to other surface waters (OSW) or wetlands. There are no impacts to floodplains. The swale is within the limits of a High-Risk contamination site due to the proximity of a former gas station location. However, due to the proposed swale being shallow and the former site now occupied by a bank, it is not anticipated to require remedial efforts for contamination. According to the Lee County Soil Survey, the dry retention swale consists of Pompano Fine Sane (#131, HSG A/D). According to LIDAR data obtained for this site and existing permit data, the existing ground is at approximately 12.50 feet NAVD. With the data compiled from roadway soil borings, available permits, and soil information, it was determined the swale bottom will be at 10.00 feet NAVD. Preliminary sizing calculations indicate the right-of-way can accommodate a 30-foot wide swale and requires a length of approximately 660 feet. The swale will outfall to the concrete box culvert underneath Bonita Beach Road at the same location as the existing condition's basin outfall. This is the preferred alternative for this basin.

5.3.3.2 Pond East Alternative 2

Pond East Alt. 2 will serve as the treatment and attenuation pond for Basin East. Pond East Alt. 2 is located south of Bonita Beach Road at approximately station 293+40 (RT.). This pond site sits within one (1) parcel (03-48-25-B1-00001.0120). The pond does not have impacts to other surface waters (OSW) or wetlands. There are no impacts to floodplains. According to the Lee County Soil Survey, the dry retention pond consists of Pompano Fine Sand (#131, HSG A/D). According to LIDAR and existing permit data obtained for this pond site, the existing ground elevation is at approximately 14.00 feet NAVD. With the data compiled from roadway soil borings, available permits, and soil information, it was determined that Pond East Alt. 2 will be a dry pond with the pond bottom set at elevation 11.00 feet. Preliminary pond sizing calculations indicate that this pond requires 0.83 acres of area. This pond will outfall to the concrete box culvert underneath Bonita Beach Road at the same location as the existing condition's basin outfall.

5.3.4 Basin North

Basin North is currently permitted under SFWMD Permit No. 36-02988-P. This permit is for US 41's surface water management system from CR 887 (Old US 41 Road) to north of Bonita Beach Road. In the proposed condition, the basin limits will be expanded at the Bonita Beach Road and the Northwest Quadrant Roadway intersections to treat and attenuate the additional areas not accounted within the City's northwest quadrant pond. The basin's treatment and attenuation is provided in an existing FDOT pond, Pond North. The pond has been analyzed to be expanded to provide additional treatment and attenuation volume needed for the proposed improvements. Stormwater runoff from US 41 will be collected within curb and gutter inlets and conveyed to the pond via a closed stormsewer system as is done in the existing condition. This basin is considered an open basin with Pond North ultimately discharging to the Imperial River. Modifications to the FDOT Pond North are discussed in the section below and all calculations and parameters are located in **Appendix C – Pond Design Calculations**.

5.3.4.1 Pond North

Pond North will serve as Basin North's primary treatment and attenuation pond. Pond North is located east of US 41. The pond's southern end will be impacted by the proposed quadrant roadway. The pond will be expanded to the west into Parcel 33-47-25-B3-00260.002A, which is also impacted by the proposed Northeast Quadrant Roadway, and into Parcels 33-47-25-B3-00260.0010, 33-47-25-B3-00257.0010 and 33-47-25-B3-00257.0030. According to the Lee County Soil Survey, the expanded pond area consists of Pompano Fine Sane (#131, HSG A/D) and Immokalee Sand (#36, HSG B/D). According to LIDAR data obtained for this pond site, the existing ground is at approximately 7.00 feet NAVD. Pond North is a wet detention pond with a control elevation of 3.60 feet NAVD. Preliminary pond sizing calculations indicate that this pond will need to be expanded approximately 3.67 acres. This pond will maintain the existing Imperial River outfall.

5.3.5 Arroyal Mall Pond Impacts

The proposed US 41 and Bonita Beach Road intersection improvements will have impacts to the existing Arroyal Mall Pond, privately owned and permitted under SFWMD Permit No. 36-00863-S. The large ditch running adjacent to US 41 from the concrete box culvert crossing at Bonita Beach Road north to the Arroyal Mall Pond will be enclosed to accommodate the addition of the PDLT. Volumetric impacts to the Arroyal Mall Pond from the addition of the PDLT are anticipated to be approximately 0.25 ac-ft. These impacts can be offset by re-grading the

southern and western pond berms, which will provide approximately 0.33 ac-ft of added volume. Additionally, portions of runoff currently directly discharging to the large ditch in the existing condition will be treated and attenuated in the east basin and proposed stormwater management facility and offset impacts to the Arroyal Mall Pond. During the project's design, the concrete box culvert enclosure and Arroyal Mall Pond grading will be required to be sized and routed as to not cause any adverse impacts or increases to the upstream stages within the ditch or Arroyal Mall Pond. Additionally, the proposed improvements and required drainage easements to perform work within the Arroyal Mall Pond will need to be coordinated during the project's design phase.

5.3.6 Floodplain Compensation

One Floodplain Impact Area (FIA) has been identified within the project limits, located at the northern end of the corridor. The FIA includes floodplains associated with the Imperial River, which range from elevation 9.0 to 10.0 feet NAVD. The Imperial River at the project location is tidal and coordination with SFWMD determined compensation would not be required for impacts within the tidal floodplain area. Additional information regarding floodplain impacts is located in the Location Hydraulics Report.

6.0 Environmental Look Arounds (ELAs)

Environmental Look Arounds (ELAs) provide a unique opportunity to team up with regional stakeholders to explore watershed wide stormwater needs and alternative permitting approaches for the project. Areas of potential cooperation are documented in this report for future follow up as the design moves forward.

Due to the majority of the project corridor being developed there were limited opportunities for shared use or joint use facilities. The existing Arroyal Mall pond accepts regional stormwater runoff from 393.5 acres of the surrounding area. As discussed in Section 5.3.5, minor impacts are anticipated to the pond area from the proposed improvements. However, the pond can be regraded within the parcel to make up for the lost volume and maintain functionality.

Discussion of ELA opportunities were held with the City of Bonita Springs discussing the shared use of the pond providing treatment and attenuation for the Northwest Quadrant Roadway. It was determined there was no additional capacity available within the pond to accommodate improvements along US 41 or Bonita Beach Road. A City of Bonita Springs meeting summary can be found in **Appendix J – Correspondence**.

7.0 Conclusions and Recommendations

Potential ponds have been sized and located along this PD&E study's project limits. The analysis estimates right-of-way needs using a volumetric analysis, accounting for water quality treatment and water quantity attenuation. Please note that the estimated right-of-way areas for the ponds were based on pond sizes determined from preliminary data calculations, reasonable engineering judgment, and assumptions. Pond sizes and configurations may change during final design as more detailed information on SHWT, wetland normal pool elevation, final roadway profile design, etc. become available. Please refer to **Table 7-1** for **Preferred Stormwater Pond Requirements**.

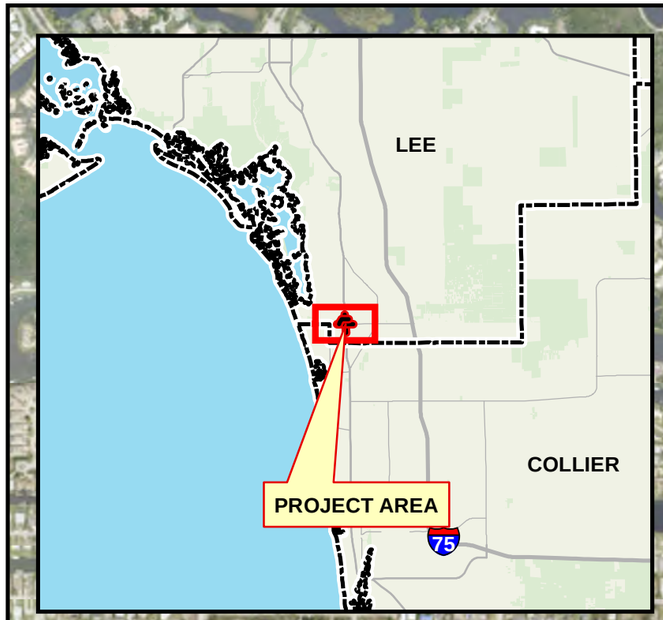
Table 7-1: Preferred Stormwater Pond Requirements

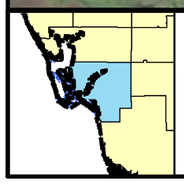
Basin	From Station*	To Station*	Recommended Pond	Required Treatment + Attenuation (ac-ft)	Provided Treatment + Attenuation (ac-ft)	Basin Area (Acres)	Pond Area (Acres)
Windsor/NW Quadrant Basin	249+00 (BBR)	266+25 (BBR)	Designed by City of Bonita Springs Project				
Basin East	280+75 (BBR)	300+50 (BBR)	Pond East Alt. 1	0.15	0.17	8.88	0.45
Basin West	266+25(BBR)	274+15 (BBR)	No proposed changes to basin areas from pre to post				
Basin North	183+65 (US 41)	277+00 (US 41)	Pond West	16.40	0.23	57.95	0.41
			Pond North		16.44		17.34

* Please see **Appendix B – Basin Maps** for stationing reference.

APPENDIX A

Exhibits





FDOT

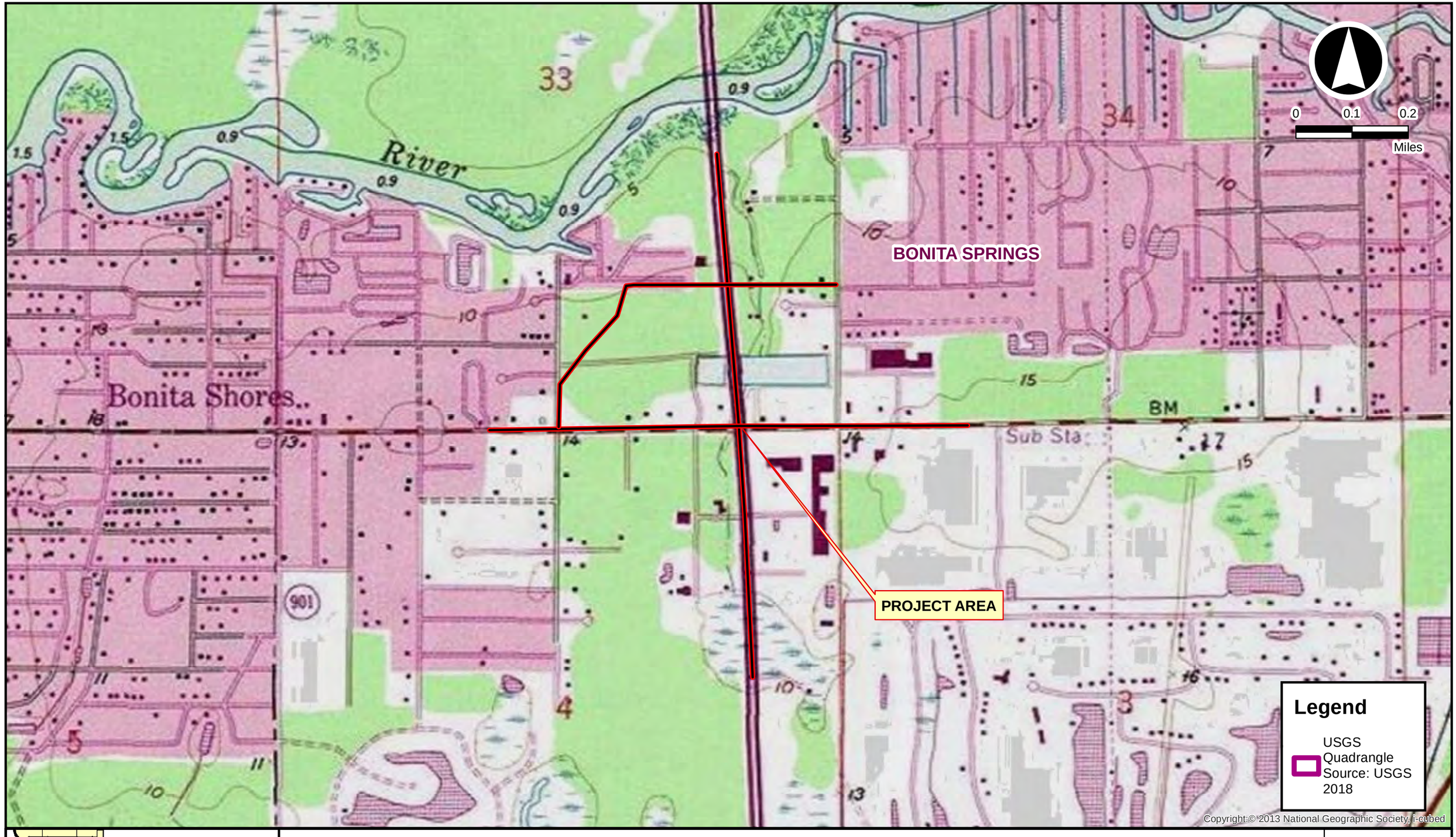
US 41 at CR 865 (Bonita Beach Road)

Project Development and Environment (PD&E) Study
Lee County, FL

Financial Project ID: 444321-1-22-01

PROJECT LOCATION MAP

Figure
1



FDOT

US 41 at CR 865 (Bonita Beach Road)

Project Development and Environment (PD&E) Study
Lee County, FL

Financial Project ID: 444321-1-22-01

USGS QUADRANGLE MAP

Figure

2

Lee County Soil Descriptions

10: POMPANO FINE SAND, 0 TO 2 PERCENT SLOPES

24: KESSON FINE SAND, TIDAL, 0 TO 1 PERCENT SLOPES

36: IMMOKALEE SAND-URBAN LAND COMPLEX, 0 TO 2 PERCENT SLOPES

53: MYAKKA FINE SAND, FREQUENTLY PONDED, 0 TO 1 PERCENT SLOPES

59: URBAN LAND, 0 TO 2 PERCENT SLOPES

99: WATER

100: WATERS OF THE GULF OF MEXICO

106: DAYTONA SAND-URBAN LAND COMPLEX, 0 TO 5 PERCENT SLOPES

123: MYAKKA FINE SAND-URBAN LAND COMPLEX, 0 TO 2 PERCENT SLOPES

124: MYAKKA FINE SAND, PONDED-URBAN LAND COMPLEX, 0 TO 1 PERCENT SLOPES

131: POMPANO FINE SAND-URBAN LAND COMPEX, 0 TO 2 PERCENT SLOPES

134: SATELLITE FINE SAND-URBAN LAND COMPLEX, 0 TO 2 PERCENT SLOPES

136: VALKARIA FINE SAND-URBAN LAND COMPLEX, 0 TO 2 PERCENT SLOPES

138: WABASSO SAND, LIMESTONE SUBSTRATUM-URBAN LAND COMPLEX, 0 TO 2 PERCENT SLOPES

145: GATOR MUCK, PONDED-URBAN LAND COMPLEX, 0 TO 1 PERCENT SLOPES

0 0.1 0.2 Miles

Soil Group

- A
- A/D
- B/D
- C/D
- Water
- Urban Land

Legend

- Project Limits
- Streets

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

US 41 to CR 865 (Bonita Beach Road)

Project Development and Environment (PD&E) Study
Lee County, FL

Financial Project ID: 444321-1-22-01

NRCS SOILS MAP

Figure 3

Lee County Land Use

Urban and Built Up

- 1210: Fixed Single Family Units
- 1320: Mobile Home Units
- 1330: Multiple Dwelling Units, Low Rise
- 1400: Commercial and Services
- 1410: Retail Sales and Services (not used in map)
- 1490: Commercial and Services Under Construction
- 1700: Institutional
- 1820: Golf Course
- 1850: Parks and Zoos
- 1900: Open Land
- 3100: Open Land

Upland Forests

- 4130: Sand Pine
- 4340: Hardwood-Conifer Mixed

Water

- 5100: Streams and Waterways
- 5110: Natural River, Stream, Waterway
- 5120: Channelized Waterways, Canals
- 5300: Reservoirs

Wetlands

- 6120: Mangrove Swamp
- 6170: Mixed Wetland Hardwoods
- 6250: Wet Pinelands Hydric Pine
- 6300: Wetland Forested Mixed
- 6420: Saltwater Marshes / Halophytic Herbaceous Prairie

Transportation, Communication, and Utilities

- 8140: Roads and Highways

0 0.1 0.2 Miles

Legend

- Project Limits
- Streets

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

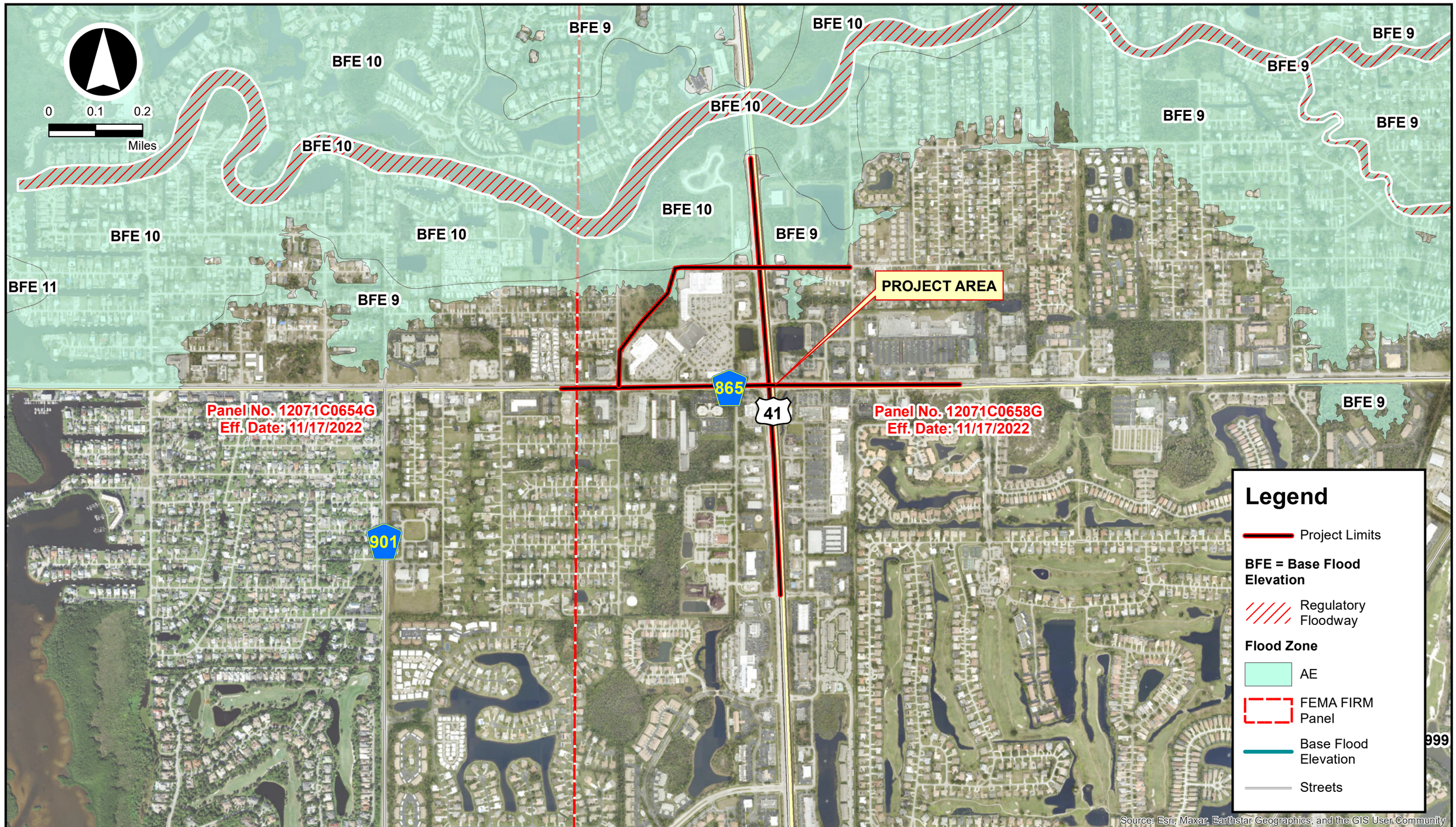
US 41 at CR 865 (Bonita Beach Road)

Project Development and Environment (PD&E) Study
Lee County, FL

Financial Project ID: 444321-1-22-0

LAND USE MAP

Figure 4



FDOT

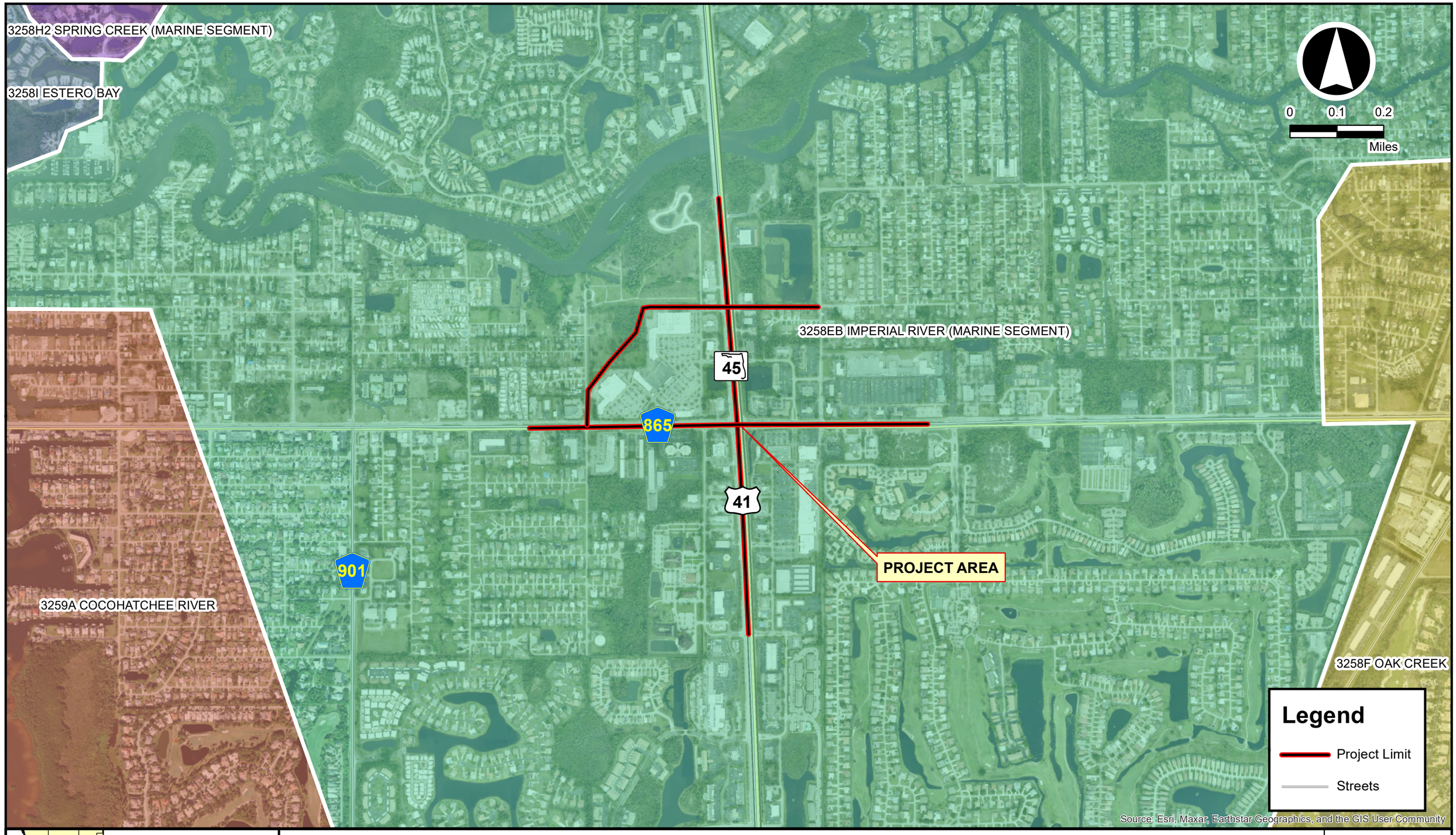
US 41 at CR 865 (Bonita Beach Road)

Project Development and Environment (PD&E) Study
Lee County, FL

Financial Project ID: 444321-1-22-01

FEMA FLOODPLAINS MAP

Figure
6



US 41 at CR 865 (Bonita Beach Road)

Project Development and Environment (PD&E) Study
Lee County, FL

Financial Project ID: 444321-1-22-01

WBID MAP

Figure
7

APPENDIX B

Basin Maps

IMPERIAL RIVER

IMPERIAL RIVER

EXISTING FDOT POND NORTH (14.79 AC)

TAMARA CT

SOMERSET LN

CAROLINA ST

US 41

QUAILS WALK RD

WINDSOR RD

BRINK CIR

PUBLIX

CENTER OF BONITA SPRINGS TREATMENT POND

24" RCP

NW QUADRANT POND DESIGNED BY CITY OF BONITA SPRINGS

ARROYAL MALL POND

CROWN LAKE BLVD

CROWN LAKE CT

ARROYAL RD

BONITA BEACH RD

BONITA BEACH RD

BONITA BEACH RD

10' X 7' CONCRETE BOX CULVERT

DOUBLE 8' X 4' CONCRETE BOX CULVERT

BEAUMONT RD

ACCESS RD

US 41

SPANISH WELLS BLVD

N

0 100 500

Feet

LEGEND

- WINDSOR ROAD SWALE/NORTHWEST QUADRANT ROADWAY BASIN (8.19 ac)
- BASIN WEST (2.90 AC)
- PERMITTED BASIN NORTH (54.61 AC)
- BASIN EAST (8.88 AC)
- CROSS DRAIN
- FEMA FLOODPLAIN (ZONE AE)
- OFFSITE DRAINAGE AREA
- PROPOSED RIGHT-OF-WAY

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
US 41	LEE	444321-1-22-01

EXISTING BASIN MAP

SHEET NO.

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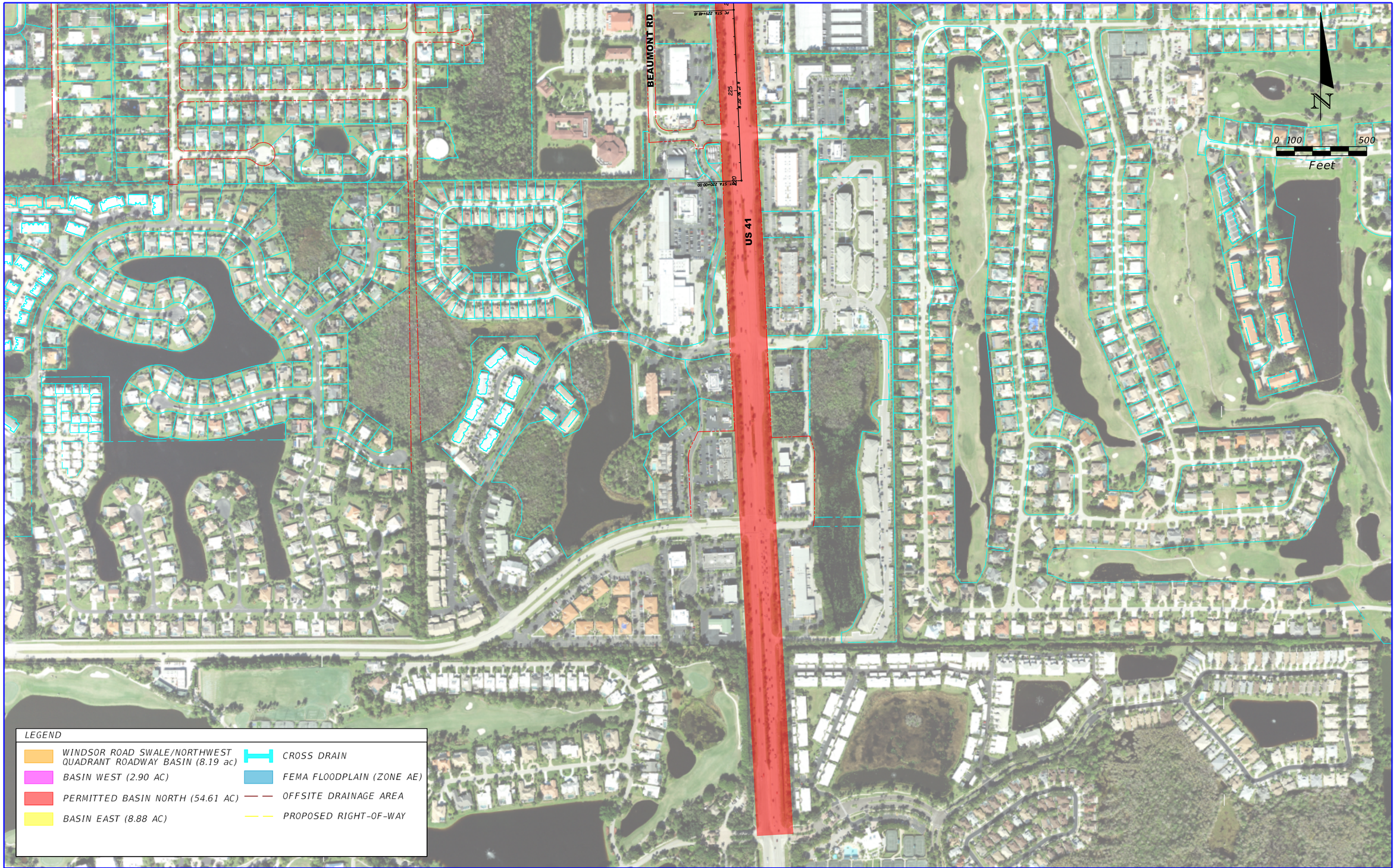

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
US 41	LEE	444321-1-22-01

EXISTING BASIN MAP

SHEET NO.

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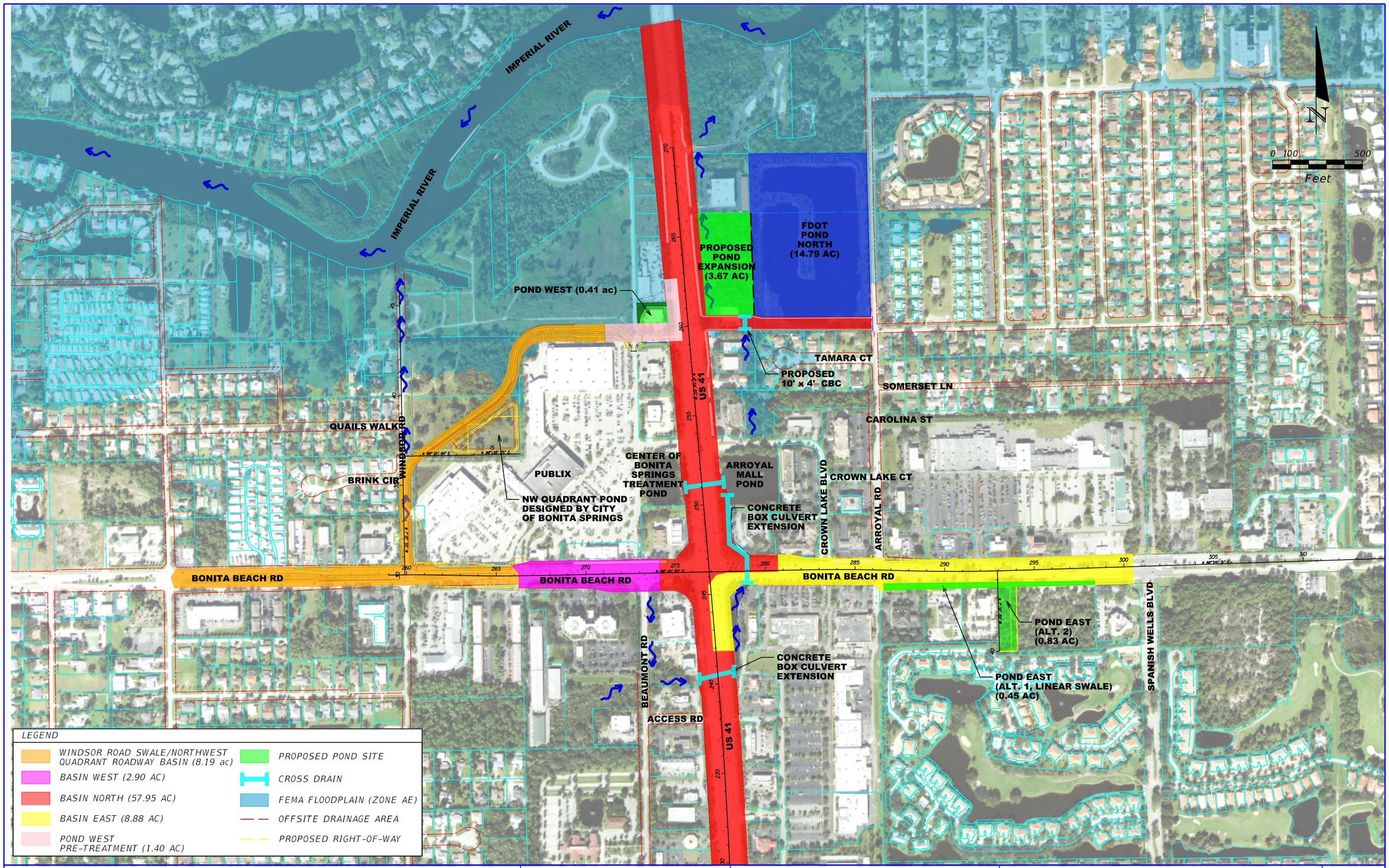

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
US 41	LEE	444321-1-22-01

PROPOSED BASIN MAP

SHEET NO.

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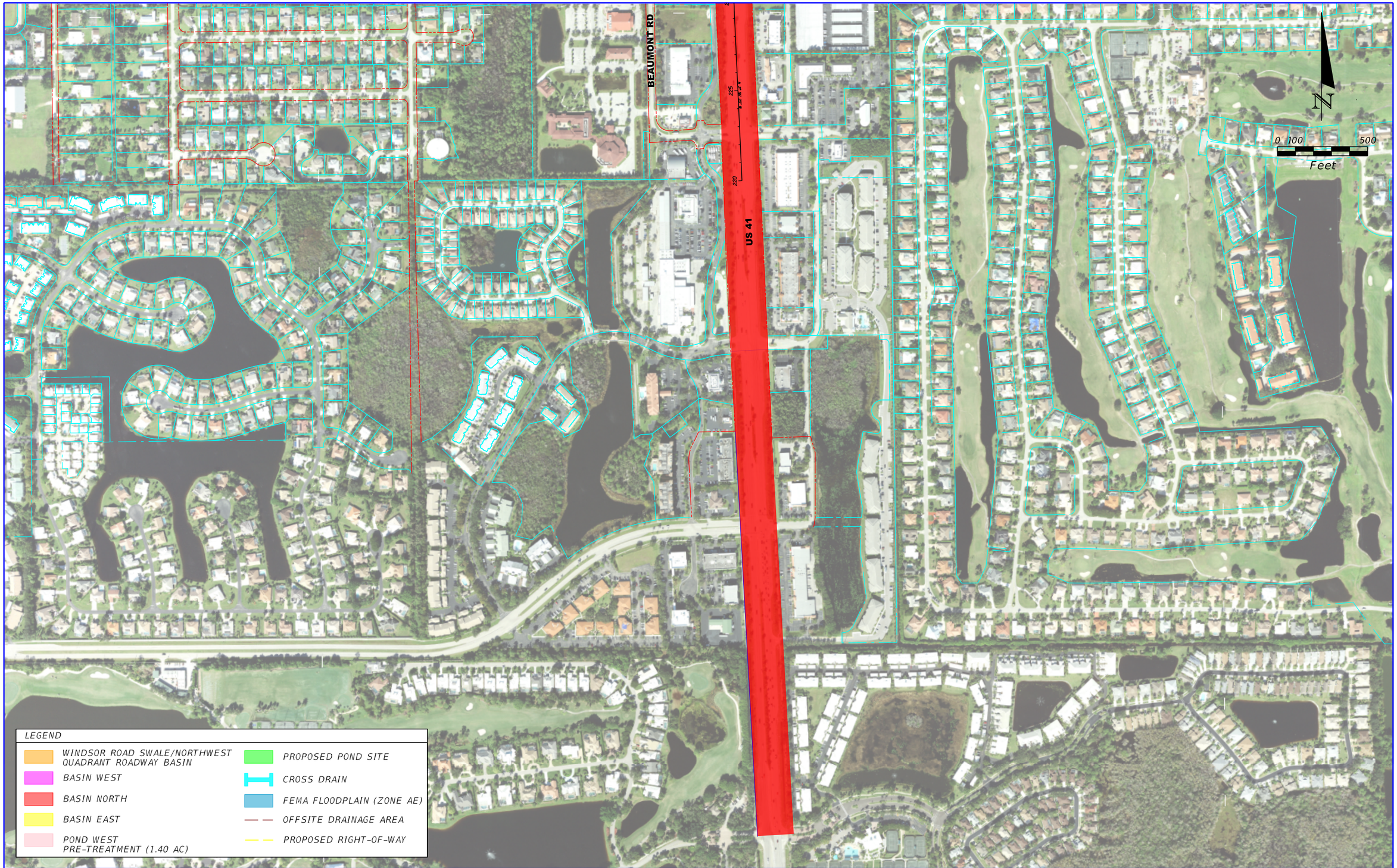

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
US 41	LEE	444321-1-22-01

PROPOSED BASIN MAP

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APPENDIX C

Pond Design Calculations

3000 Dovera Drive, Suite 200, Oviedo, FL 32765
(407) 971-8850 (phone)
(407) 971-8955 (fax)

Made by: ZKE
Checked by: REC

DATE: November 28, 2023
Job Number: KIT-008-01

PROJECT : **US 41 at CR 865 (Bonita Beach Road) PD&E Study**
BASIN NAME : **Basin East**
POND NAME : **Alternative 1 (Swale)**

Station Limits: From: 280+75
To: 300+50

EXISTING CONDITION

Roadway Area:

Areas Measured in Microstation

Impervious Roadway Area: 6.51 ac
Pervious Roadway Area: 2.37 ac
Total Roadway Area: 8.88 ac

Pond Area: Pervious Pond Area = 0.33 ac

Total Area:
Impervious Area: **6.51 ac**
Pervious Area: **2.37 ac**
Total Area: **8.88 ac**

Curve Number:

Land Use Description	Soil Group	CN	Area	CN*Area
Impervious areas; Streets & roads	D	98	6.51 ac	638.0
Open Space (lawns, parks, golf courses, cemeteries,	D	84	2.37 ac	199.1
		Total:	8.88 ac	837.1

CN = Total CN*Area / Total Area = **94.3**

Runoff:

		SFWMD (25yr/72hr)	FDOT (5yr/24hr)
Soil Capacity (S) = $\frac{1000}{CN} - 10$ = **0.61 in**	Precipitation (P) =	11.20 in	6.01 in
Runoff (Q) = $\frac{(P - 0.2S)^2}{(P + 0.8S)}$	Runoff (Q) =	**10.50 in**	**5.34 in**

3000 Dovera Drive, Suite 200, Oviedo, FL 32765
(407) 971-8850 (phone)
(407) 971-8955 (fax)

Made by: ZKE
Checked by: REC

DATE: November 28, 2023
Job Number: KIT-008-01

PROJECT : **US 41 at CR 865 (Bonita Beach Road) PD&E Study**
BASIN NAME : **Basin East**
POND NAME : **Alternative 1 (Swale)**

Station Limits: From: 280+75
To: 300+50

PROPOSED CONDITION

Roadway Area:

Basin Area
Areas measured from Microstation

Impervious Roadway Area:	7.01 ac
Pervious Roadway Area:	1.87 ac
Total Roadway Area:	8.88 ac

Pond Area:

Pervious Pond Area :	0.33 ac	Dry Pond
Water Surface Area:	0.00 ac	
Total Pond Area:	0.33 ac	

Total Area:

Impervious Area:	**7.01 ac**
Pervious Area:	**1.87 ac**
Water Surface Area:	**0.00 ac**
Total Area:	**8.88 ac**

Curve Number:

Land Use Description	Soil Group	CN	Area	CN*Area
Impervious areas; Streets & roads	D	98	7.01 ac	686.5
Proposed Ponds (Water Surface)	D	100	0.00 ac	0.0
Open Space (lawns, parks, golf courses, cemeteries,	D	84	1.87 ac	157.4
				0.0
		Total:	8.88 ac	843.9

CN = Total CN*Area / Total Area = **95.0**

Runoff:

	SFWMD (25yr/72hr)	FDOT (5yr/24hr)
Soil Capacity (S) = $\frac{1000}{CN} - 10$ = 0.52 in		
Precipitation (P) =	11.20 in	6.01 in
Runoff (Q) = $\frac{(P - 0.2S)^2}{(P + 0.8S)}$	**10.60 in**	**5.43 in**

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DATE: November 28, 2023
Job Number: KIT-008-01

PROJECT : **US 41 at CR 865 (Bonita Beach Road) PD&E Study**
BASIN NAME : **Basin East**
POND NAME : **Alternative 1 (Swale)**

POND SIZING

Required Treatment Volume (TV)

Selection criteria

Permitting Agency	**SFWMD**
StormW.Mgmt.	**Dry Retention**
Online/Offline	**Online**
OFW	**Yes**
Open/Closed Basin	**Open**

Dry Retention	**1.25 in**	x Net New Imp. Areas =	0.05 ac-ft
	0.50 in	x Total Basin Area =	

Imp. Area (Prop.) - Imp. Area (Exist)	0.50

Treatment V_{req} = Largest of Trt. Vol. =	**0.05 ac-ft**
OFW Requirement, add 0.5 inches more TV	**0.08 ac-ft**

Note: Stormwater treatment provided for improvements to the existing basin. Existing Basin outfalls to Arroyal Mall Pond.

Required Attenuation Volume:

Total Runoff (ac-ft)

	SFWMD (25yr/72hr)	FDOT (5yr/24hr)
Q_{pre} =	7.77 ac-ft	3.95 ac-ft
Q_{post} =	7.84 ac-ft	4.02 ac-ft
ΔQ =	**0.07 ac-ft**	**0.07 ac-ft**

Attenuation V_{req} = 0.07 ac-ft (use largest value)

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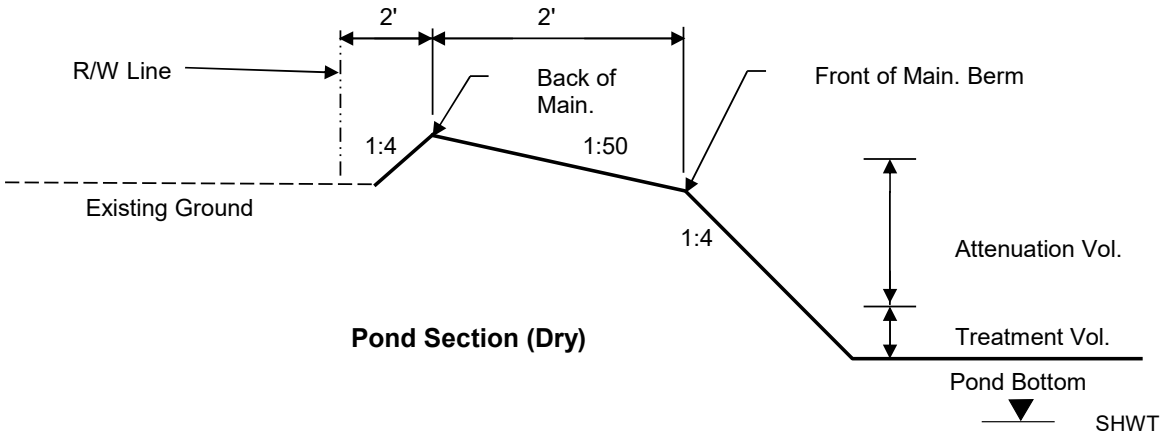
PROJECT : **US 41 at CR 865 (Bonita Beach Road) PD&E Study**
BASIN NAME : **Basin East**
POND NAME : **Alternative 1 (Swale)**

Maintenance Area Width =	2.0 ft	@ 1:50	Existing Ground Elevation =	12.50
Pond Tie-In Width =	1.8 ft	@ 1:4	Normal Water Elevation =	7.80
Maximum Storage Depth (**SD**) =	1.25 ft	with 1.0 ft freeboard	Lowest EOP Elevation =	13.00

Hydraulic Grade Line (HGL) check

HGL Slope =	0.100%	Use 0.05% for very flat terrain to 0.1% for flat terrain
Distance from Pond to Lowest EOP =	100 ft	
Estimated Energy Losses =	0.1 ft	
HGL Clearance =	1.0 ft	Use 1.0 foot as a standard HGL clearance (no junction losses)
Estimated Storm Sewer Tailwater EL =	11.9 ft	



Pond Section (Dry)

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DATE: November 28, 2023
Job Number: KIT-008-01

PROJECT : **US 41 at CR 865 (Bonita Beach Road) PD&E Study**
BASIN NAME : **Basin East**
POND NAME : **Alternative 1 (Swale)**

Pond Stage / Storage Calculations

ELEVATION	DESCRIPTION	AREA	DIMENSIONS		STORAGE
			LENGTH	WIDTH	
12.50	Pond R/W	0.38 ac	550.0 ft	30.0 ft	
12.04	Back of Main. Berm	0.33 ac	546.3 ft	26.3 ft	0.36 ac-ft
12.02		0.30 ac	544.3 ft	24.3 ft	0.36 ac-ft
12.00	Front of Main. Berm	0.28 ac	542.3 ft	22.3 ft	0.35 ac-ft
11.25	Provided Treat.Vol.+Att.Vol	0.20 ac	536.3 ft	16.3 ft	0.17 ac-ft
11.15	Req'd Treat.Vol+Att. Vol	0.19 ac	535.5 ft	15.5 ft	0.15 ac-ft
11.10	Estimated Storm Sewer TW	0.19 ac	535.1 ft	15.1 ft	0.14 ac-ft
10.70	Top of Treatment Vol.	0.15 ac	531.9 ft	11.9 ft	0.08 ac-ft
10.00	Pond Bottom	0.08 ac	526.3 ft	6.3 ft	0.00 ac-ft

Required Treatment+Attenuation Vol.= 0.15 ac-ft
Required Treatment+Attenuation Stage= 11.15 ft

Provided Treatment+Attenuation Vol.= 0.17 ac-ft
Provided Treatment+Attenuation Stage= 11.25 ft

Estimated Treat. Vol.+Storm Sewer Att.= 0.14 ac-ft
Estimated Storm Sewer TW EL.= 11.10 ft

HGL requirements met

PROPOSED POND R/W (Safety Factor of 20%) = 0.45 ac

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Job Number: KIT-008-01

PROJECT : **US 41 at CR 865 (Bonita Beach Road) PD&E Study**
BASIN NAME : **Basin East**
POND NAME : **Alternative 2**

Station Limits: From: 280+75
To: 300+50

EXISTING CONDITION

Roadway Area:

Basin Area
Areasa measured from Microstation

Impervious Roadway Area: 6.51 ac
Pervious Roadway Area: 2.37 ac
Total Roadway Area: 8.88 ac

Pond Area: Pervious Pond Area = 0.69 ac

Total Area:
Impervious Area: **6.51 ac**
Pervious Area: **3.06 ac**
Total Area: **9.57 ac**

Curve Number:

Land Use Description	Soil Group	CN	Area	CN*Area
Impervious areas; Streets & roads	D	98	6.51 ac	638.0
Open Space (lawns, parks, golf courses, cemeteries,	D	84	3.06 ac	256.9
		Total:	9.57 ac	894.9

CN = Total CN*Area / Total Area = **93.5**

Runoff:

		SFWMD (25yr/72hr)	FDOT (5yr/24hr)
Soil Capacity (S) = $\frac{1000}{CN} - 10$ = **0.69 in**	Precipitation (P) =	11.20 in	6.01 in
Runoff (Q) = $\frac{(P - 0.2S)^2}{(P + 0.8S)}$	Runoff (Q) =	**10.41 in**	**5.25 in**

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Job Number: KIT-008-01

PROJECT : **US 41 at CR 865 (Bonita Beach Road) PD&E Study**
BASIN NAME : **Basin East**
POND NAME : **Alternative 2**

Station Limits: From: 280+75
To: 300+50

PROPOSED CONDITION

Roadway Area:

Basin Area
Areasa measured from Microstation

Impervious Roadway Area: 7.01 ac
Pervious Roadway Area: 1.87 ac
Total Roadway Area: 8.88 ac

Pond Area:

Pervious Pond Area : 0.69 ac Dry Pond
Water Surface Area: 0.00 ac
Total Pond Area: 0.69 ac

Total Area:

Impervious Area: **7.01 ac**
Pervious Area: **2.56 ac**
Water Surface Area: **0.00 ac**
Total Area: **9.57 ac**

Curve Number:

Land Use Description	Soil Group	CN	Area	CN*Area
Impervious areas; Streets & roads	D	98	7.01 ac	686.5
Open Space (lawns, parks, golf courses, cemeteries,	D	84	2.56 ac	215.3
		Total:	9.57 ac	901.8

CN = Total CN*Area / Total Area = **94.3**

Runoff:

	SFWMD (25yr/72hr)	FDOT (5yr/24hr)
Precipitation (P) =	11.20 in	6.01 in
Runoff (Q) =	**10.50 in**	**5.34 in**

Soil Capacity (S) = $\frac{1000}{CN} - 10$ = 0.61 in

Runoff (Q) = $\frac{(P - 0.2S)^2}{(P + 0.8S)}$

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PROJECT : **US 41 at CR 865 (Bonita Beach Road) PD&E Study**
BASIN NAME : **Basin East**
POND NAME : **Alternative 2**

POND SIZING

Required Treatment Volume (TV)

Selection criteria

Permitting Agency	**SFWMD**
StormW.Mgmt.	**Dry Retention**
Online/Offline	**Online**
OFW	**Yes**
Open/Closed Basin	**Open**

Dry Retention	**1.25 in**	x Net New Imp. Areas = 0.05 ac-ft

Net New Impervious Area	
Imp. Area (Prop.) - Imp. Area (Exist)	0.50 ac

Treatment V_{req} = Largest of Trt. Vol. = **0.05 ac-ft**
OFW Requirement, provide 50% more TV = **0.08 ac-ft**

Note: Stormwater treatment provided for improvements to the existing basin. Existing Basin outfalls to Arroyal Mall Pond.

Required Attenuation Volume:

Total Runoff (ac-ft)

	SFWMD (25yr/72hr)	**FDOT (5yr/24hr)**
Q_{pre} =	8.30 ac-ft	4.19 ac-ft
Q_{post} =	8.37 ac-ft	4.25 ac-ft
ΔQ =	**0.07 ac-ft**	**0.07 ac-ft**

Attenuation V_{req} = 0.07 ac-ft (use largest value)

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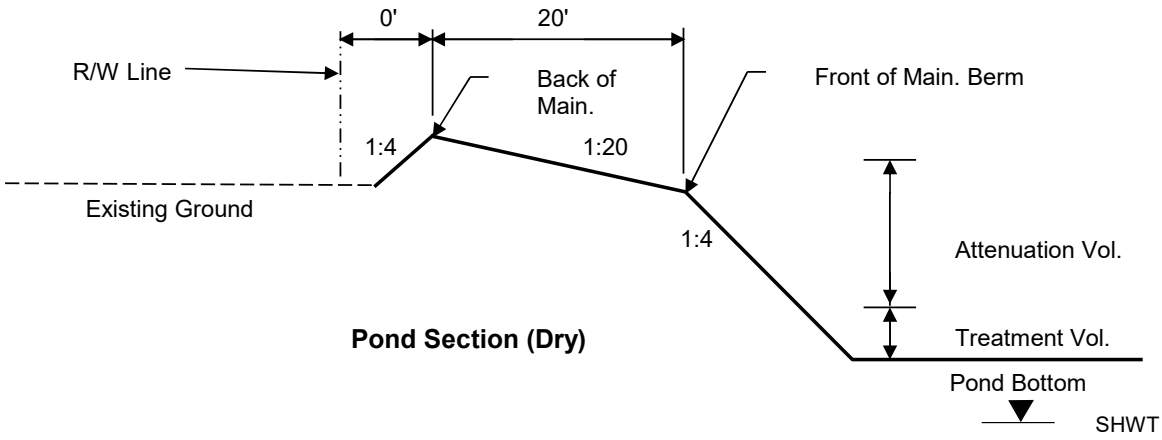
PROJECT : **US 41 at CR 865 (Bonita Beach Road) PD&E Study**
BASIN NAME : **Basin East**
POND NAME : **Alternative 2**

Maintenance Area Width =	20.0 ft	@ 1:20	Existing Ground Elevation =	14.00
Pond Tie-In Width =	0.0 ft	@ 1:4	Normal Water Elevation =	7.80
Maximum Storage Depth (**SD**) =	1.00 ft	with 1.0 ft freeboard	Lowest EOP Elevation =	13.00

Hydraulic Grade Line (HGL) check

HGL Slope =	0.100%	Use 0.05% for very flat terrain to 0.1% for flat terrain
Distance from Pond to Lowest EOP =	200 ft	
Estimated Energy Losses =	0.2 ft	
HGL Clearance =	1.0 ft	Use 1.0 foot as a standard HGL clearance (no junction losses)
Estimated Storm Sewer Tailwater EL =	11.8 ft	



Pond Section (Dry)

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DATE: November 28, 2023
Job Number: KIT-008-01

PROJECT : **US 41 at CR 865 (Bonita Beach Road) PD&E Study**
BASIN NAME : **Basin East**
POND NAME : **Alternative 2**

Pond Stage / Storage Calculations

ELEVATION	DESCRIPTION	AREA	DIMENSIONS		STORAGE
			LENGTH	WIDTH	
14.00	Pond R/W	0.69 ac	300.0 ft	100.0 ft	
14.00	Back of Main. Berm	0.69 ac	300.0 ft	100.0 ft	1.07 ac-ft
13.50		0.51 ac	280.0 ft	80.0 ft	0.77 ac-ft
13.00	Front of Main. Berm	0.36 ac	260.0 ft	60.0 ft	0.55 ac-ft
12.00	Provided Treat.Vol.+Att.Vol	0.27 ac	248.0 ft	48.0 ft	0.23 ac-ft
11.67	Req'd Treat.Vol+Att. Vol	0.25 ac	244.0 ft	44.0 ft	0.15 ac-ft
11.65	Estimated Storm Sewer TW	0.25 ac	243.8 ft	43.8 ft	0.14 ac-ft
11.40	Top of Treatment Vol.	0.23 ac	240.8 ft	40.8 ft	0.08 ac-ft
11.00	Pond Bottom	0.20 ac	236.0 ft	36.0 ft	0.00 ac-ft

Required Treatment+Attenuation Vol.= 0.15 ac-ft
Required Treatment+Attenuation Stage= 11.67 ft

Provided Treatment+Attenuation Vol.= 0.23 ac-ft
Provided Treatment+Attenuation Stage= 12.00 ft

Estimated Treat. Vol.+Storm Sewer Att.= 0.14 ac-ft
Estimated Storm Sewer TW EL.= 11.65 ft

HGL requirements met

PROPOSED POND R/W (Safety Factor of 20%) = 0.83 ac

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Job Number: KIT-008-01

PROJECT : **US 41 at CR 865 (Bonita Beach Road) PD&E Study**
BASIN NAME : **Basin North**
POND NAME : **Pond North**

Station Limits: From: 183+65
To: 277+00

EXISTING CONDITION

Roadway Area:

Basin Area
Areas Measured from Existing Permit Data and Microstation

Impervious Roadway Area: 34.12 ac
Pervious Roadway Area: 20.49 ac
Total Roadway Area: 54.61 ac

Pond Area:

Pervious Pond Area = 7.94 ac
Water Surface Area: 10.52 ac
Total Pond Area: 18.46 ac

Total Area:

Impervious Area: **34.12 ac**
Pervious Area: **28.43 ac**
Total Area: **73.07 ac**

Curve Number:

Land Use Description	Soil Group	CN	Area	CN*Area
Impervious areas; Streets & roads	D	98	34.12 ac	3343.8
Open Space (lawns, parks, golf courses, cemeteries,	D	84	24.76 ac	2079.8
Proposed Ponds (Water Surface)	D	100	10.52 ac	1052.0
Woods & Wetlands Combination	D	97	3.67 ac	356.0
		Total:	73.07 ac	6831.6

CN = Total CN*Area / Total Area = **93.5**

Runoff:

		SFWMD (25yr/72hr)	FDOT (5yr/24hr)
Soil Capacity (S) = $\frac{1000}{CN} - 10$ =	**0.70 in**	Precipitation (P) =	11.20 in	6.01 in
Runoff (Q) = $\frac{(P - 0.2S)^2}{(P + 0.8S)}$		Runoff (Q) =	**10.41 in**	**5.25 in**

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Job Number: KIT-008-01

PROJECT : **US 41 at CR 865 (Bonita Beach Road) PD&E Study**
BASIN NAME : **Basin North**
POND NAME : **Pond North**

Station Limits: From: 183+65
To: 277+00

PROPOSED CONDITION

Roadway Area:

Basin Area
Areas measured from Microstation

Impervious Roadway Area:	44.97 ac
Pervious Roadway Area:	12.98 ac
Total Roadway Area:	57.95 ac

Pond Area:

Pervious Pond Area :	4.96 ac	
Water Surface Area:	12.38 ac	Wet Pond
Total Pond Area:	17.34 ac	

Total Area:

Impervious Area:	**44.97 ac**
Pervious Area:	**17.94 ac**
Water Surface Area:	**12.38 ac**
Total Area:	**75.29 ac**

Curve Number:

Land Use Description	Soil Group	CN	Area	CN*Area
Impervious areas; Streets & roads	D	98	44.97 ac	4407.1
Proposed Ponds (Water Surface)	D	100	12.38 ac	1238.0
Open Space (lawns, parks, golf courses, cemeteries,	D	80	17.94 ac	1435.2
				0.0
		Total:	75.29 ac	7080.3

CN = Total CN*Area / Total Area = **94.0**

Runoff:

		SFWMD (25yr/72hr)	FDOT (5yr/24hr)
Soil Capacity (S) = $\frac{1000}{CN} - 10$ =	0.63 in	Precipitation (P) =	11.20 in	6.01 in
Runoff (Q) = $\frac{(P - 0.2S)^2}{(P + 0.8S)}$		Runoff (Q) =	**10.47 in**	**5.31 in**

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PROJECT : **US 41 at CR 865 (Bonita Beach Road) PD&E Study**
BASIN NAME : **Basin North**
POND NAME : **Pond North**

POND SIZING

Required Treatment Volume (TV)

Selection criteria

Permitting Agency	**SFWMD**
StormW.Mgmt.	**Wet Detention**
Online/Offline	**Online**
OFW	**Yes**
Open/Closed Basin	**Open**

Wet Detention	**2.50 in**	x Impervious Areas =	9.37 ac-ft
	1.00 in	x Total Basin Area =	6.27 ac-ft

Treatment V_{req} = Largest of Trt. Vol. =	**9.37 ac-ft**
OFW Requirement, provide 50% more TV =	**14.05 ac-ft**

Required Attenuation Volume:

Total Runoff (ac-ft)

	SFWMD	**Storm Sewer Design**
Q_{pre} =	63.36 ac-ft	31.96 ac-ft
Q_{post} =	65.71 ac-ft	33.32 ac-ft
ΔQ =	**2.35 ac-ft**	**1.36 ac-ft**

Attenuation V_{req} = 2.35 ac-ft (use largest value)

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PROJECT : **US 41 at CR 865 (Bonita Beach Road) PD&E Study**
BASIN NAME : **Basin North**
POND NAME : **Pond North**

Maintenance Area Width =	20.0 ft	@ 1:12	Existing Ground Elevation =	7.00
Pond Tie-In Width =	1.0 ft	@ 1:2	Normal Water Elevation =	3.60
Maximum Storage Depth (**SD**) =	1.30 ft	with 1.0 ft freeboard	Lowest EOP Elevation =	13.00

Hydraulic Grade Line (HGL) check

HGL Slope =	0.100%	Use 0.05% for very flat terrain to 0.1% for flat terrain
Distance from Pond to Lowest EOP =	1000 ft	
Estimated Energy Losses =	1.0 ft	
HGL Clearance =	1.0 ft	Use 1.0 foot as a standard HGL clearance (no junction losses)
Estimated Storm Sewer Tailwater EL =	11.0 ft	

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PROJECT : **US 41 at CR 865 (Bonita Beach Road) PD&E Study**
BASIN NAME : **Basin North**
POND NAME : **Pond North**

Pond Stage / Storage Calculations

ELEVATION	DESCRIPTION	AREA	Areas Measured in Microstation		STORAGE
7.00	Pond R/W	17.34 ac			
7.50	Back of Main. Berm	15.55 ac			52.67 ac-ft
6.70		14.44 ac			40.68 ac-ft
5.90	Front of Main. Berm	13.33 ac			29.57 ac-ft
4.90	Provided Treat.Vol.+Att.Vol	12.92 ac			16.44 ac-ft
4.90	Req'd Treat.Vol+Att. Vol	12.92 ac			16.44 ac-ft
4.82	Estimated Storm Sewer TW	12.88 ac			15.45 ac-ft
4.71	Top of Treatment Vol.	12.84 ac			14.05 ac-ft
3.60	Normal Water Level	12.38 ac			0.00 ac-ft
2.79		11.15 ac			
-2.95	Pond Bottom	9.44 ac			

Required Treatment+Attenuation Vol.= 16.40 ac-ft
Required Treatment+Attenuation Stage= 4.90 ft

Provided Treatment+Attenuation Vol.= 16.44 ac-ft
Provided Treatment+Attenuation Stage= 4.90 ft

Estimated Treat. Vol.+Storm Sewer Att.= 15.42 ac-ft
Estimated Storm Sewer TW EL.= 4.82 ft

HGL requirements met

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DATE: November 28, 2023
Job Number: KIT-008-01

PROJECT : **US 41 at CR 865 (Bonita Beach Road) PD&E Study**
BASIN NAME : **Basin North**
POND NAME : **Pond West (Pre-Treatment)**

Station Limits: From: 183+65
To: 277+00

PROPOSED CONDITION

Roadway Area:

Basin Area
Accounts for Area from Basin North routed to Pre-Treatment for Nutrient Loading analysis. Does not account for attenuation for the basin. Total basin area shown in Basin North Calculations for attenuation.

Impervious Roadway Area:	1.25 ac
Pervious Roadway Area:	0.15 ac
Total Roadway Area:	1.40 ac

Pond Area:

Pervious Pond Area :	0.32 ac	Dry Pond
Water Surface Area:	0.00 ac	
Total Pond Area:	0.32 ac	

Total Area:

Impervious Area:	**1.25 ac**
Pervious Area:	**0.47 ac**
Water Surface Area:	**0.00 ac**
Total Area:	**1.72 ac**

Curve Number:

Land Use Description	Soil Group	CN	Area	CN*Area
Impervious areas; Streets & roads	D	98	1.25 ac	122.5
Open Space (lawns, parks, golf courses, cemeteries,	D	80	0.00 ac	0.0
Open Space (lawns, parks, golf courses, cemeteries,	D	80	0.47 ac	37.3
				0.0
		Total:	1.72 ac	159.8

CN = Total CN*Area / Total Area = **93.1**

Runoff:

	SFWMD (25yr/72hr)	FDOT (5yr/24hr)
Soil Capacity (S) = $\frac{1000}{CN} - 10$ = 0.74 in		
Precipitation (P) =	11.20 in	6.01 in
Runoff (Q) = $\frac{(P - 0.2S)^2}{(P + 0.8S)}$	**10.36 in**	**5.21 in**

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Job Number: KIT-008-01

PROJECT : **US 41 at CR 865 (Bonita Beach Road) PD&E Study**
BASIN NAME : **Basin North**
POND NAME : **Pond West (Pre-Treatment)**

POND SIZING

Required Treatment Volume (TV)

Selection criteria

Permitting Agency	**SFWMD**
StormW.Mgmt.	**Dry Retention**
Online/Offline	**Online**
OFW	**Yes**
Open/Closed Basin	**Open**

Dry Retention	**1.25 in**	x Impervious Areas =	0.13 ac-ft
	0.50 in	x Total Basin Area =	0.07 ac-ft

Treatment V_{req} = Largest of Trt. Vol. =	**0.13 ac-ft**
OFW Requirement, add 0.5 inches more TV	**0.20 ac-ft**

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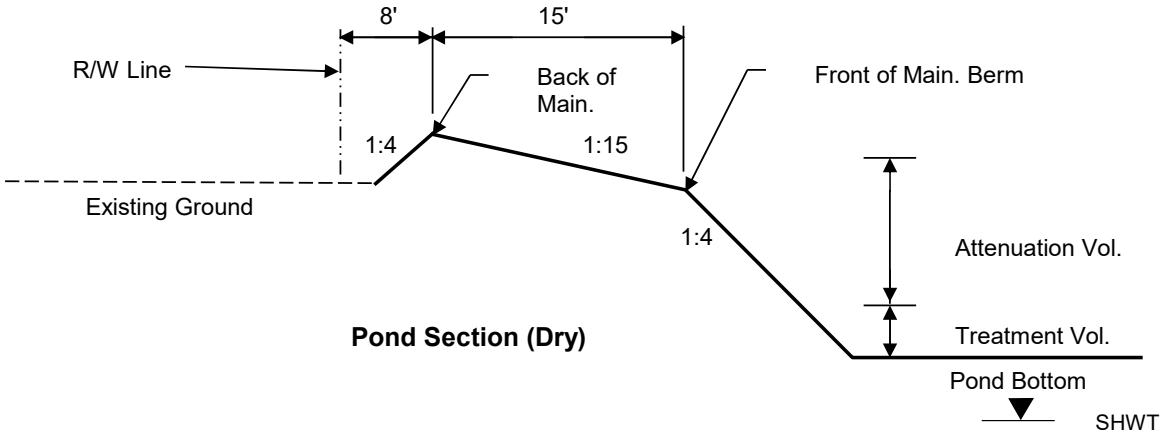
PROJECT : **US 41 at CR 865 (Bonita Beach Road) PD&E Study**
BASIN NAME : **Basin North**
POND NAME : **Pond West (Pre-Treatment)**

Maintenance Area Width =	15.0 ft	@ 1:15	Existing Ground Elevation =	9.00
Pond Tie-In Width =	8.0 ft	@ 1:4	Normal Water Elevation =	4.00
Maximum Storage Depth (**SD**) =	6.00 ft	with 1.0 ft freeboard	Lowest EOP Elevation =	10.00

Hydraulic Grade Line (HGL) check

HGL Slope =	0.100%	Use 0.05% for very flat terrain to 0.1% for flat terrain
Distance from Pond to Lowest EOP =	200 ft	
Estimated Energy Losses =	0.2 ft	
HGL Clearance =	1.0 ft	Use 1.0 foot as a standard HGL clearance (no junction losses)
Estimated Storm Sewer Tailwater EL =	8.8 ft	



Pond Section (Dry)

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Job Number: KIT-008-01

PROJECT : **US 41 at CR 865 (Bonita Beach Road) PD&E Study**
BASIN NAME : **Basin North**
POND NAME : **Pond West (Pre-Treatment)**

Pond Stage / Storage Calculations

ELEVATION	DESCRIPTION	AREA	DIMENSIONS		STORAGE
			LENGTH	WIDTH	
9.00	Pond R/W	0.41 ac	155.0 ft	115.0 ft	
11.00	Back of Main. Berm	0.32 ac	139.0 ft	99.0 ft	0.62 ac-ft
10.50		0.24 ac	124.0 ft	84.0 ft	0.48 ac-ft
10.00	Front of Main. Berm	0.17 ac	109.0 ft	69.0 ft	0.38 ac-ft
9.00	Provided Treat.Vol.+Att.Vol	0.13 ac	97.0 ft	57.0 ft	0.23 ac-ft
8.80	Req'd Treat.Vol+Att. Vol	0.12 ac	94.6 ft	54.6 ft	0.21 ac-ft
8.80	Estimated Storm Sewer TW	0.12 ac	94.6 ft	54.6 ft	0.21 ac-ft
8.80	Top of Treatment Vol.	0.12 ac	94.6 ft	54.6 ft	0.21 ac-ft
6.00	Pond Bottom	0.03 ac	61.0 ft	21.0 ft	0.00 ac-ft

Required Treatment+Attenuation Vol.= 0.20 ac-ft
Required Treatment+Attenuation Stage= 8.80 ft

Provided Treatment+Attenuation Vol.= 0.23 ac-ft
Provided Treatment+Attenuation Stage= 9.00 ft

Estimated Treat. Vol.+Storm Sewer Att.= 0.20 ac-ft
Estimated Storm Sewer TW EL.= 8.80 ft

HGL requirements met

APPENDIX D

Nutrient Loading Analysis (BMPTRAINS)

Complete Report (not including cost) Ver 4.3.5

Project: US 41
Date: 11/28/2023 11:20:06 AM

Site and Catchment Information

Analysis: Net Improvement

Catchment Name	East
Rainfall Zone	Florida Zone 1
Annual Mean Rainfall	52.50
Pre-Condition Landuse Information	
Landuse	User Defined Values
Area (acres)	8.88
Rational Coefficient (0-1)	0.68
Non DCIA Curve Number	84.00
DCIA Percent (0-100)	73.31
Nitrogen EMC (mg/l)	1.160
Phosphorus EMC (mg/l)	0.157
Runoff Volume (ac-ft/yr)	26.358
Groundwater N (kg/yr)	0.000
Groundwater P (kg/yr)	0.000
Nitrogen Loading (kg/yr)	37.699
Phosphorus Loading (kg/yr)	5.102
Post-Condition Landuse Information	
Landuse	User Defined Values
Area (acres)	8.88
Rational Coefficient (0-1)	0.71
Non DCIA Curve Number	84.00
DCIA Percent (0-100)	78.89
Wet Pond Area (ac)	0.00
Nitrogen EMC (mg/l)	1.160
Phosphorus EMC (mg/l)	0.157
Runoff Volume (ac-ft/yr)	27.755
Groundwater N (kg/yr)	0.000
Groundwater P (kg/yr)	0.000
Nitrogen Loading (kg/yr)	39.697
Phosphorus Loading (kg/yr)	5.373

Catchment Number: 1 Name: East

Project: US 41
Date: 11/28/2023

Retention Design

Retention Depth (in)	0.210
Retention Volume (ac-ft)	0.155

Watershed Characteristics

Catchment Area (acres)	8.88
Contributing Area (acres)	8.880
Non-DCIA Curve Number	84.00
DCIA Percent	78.89
Rainfall Zone	Florida Zone 1
Rainfall (in)	52.50

Surface Water Discharge

Required TN Treatment Efficiency (%)	5
Provided TN Treatment Efficiency (%)	21
Required TP Treatment Efficiency (%)	5
Provided TP Treatment Efficiency (%)	21

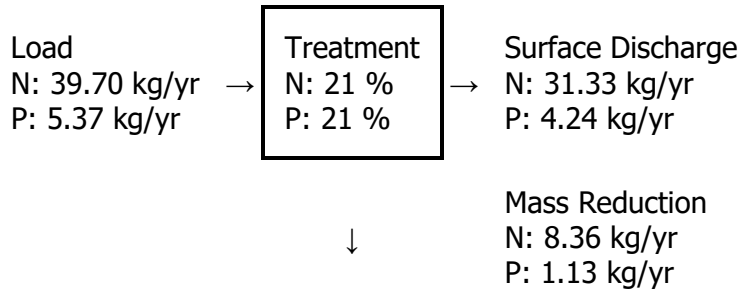
Media Mix Information

Type of Media Mix	Not Specified
Media N Reduction (%)	
Media P Reduction (%)	

Groundwater Discharge (Stand-Alone)

Treatment Rate (MG/yr)	0.000
TN Mass Load (kg/yr)	8.364
TN Concentration (mg/L)	0.000
TP Mass Load (kg/yr)	1.132
TP Concentration (mg/L)	0.000

Load Diagram for Retention (stand-alone)



Summary Treatment Report Version: 4.3.5

Project: US 41
Analysis Type: Net Improvement Date:11/28/2023
BMP Types:
Catchment 1 - (East) Retention
Based on % removal values to the nearest percent

Routing Summary
Catchment 1 Routed to Outlet

Total nitrogen target removal met? **Yes**
Total phosphorus target removal met? **Yes**

Summary Report
Nitrogen

Surface Water Discharge

Total N pre load	37.7 kg/yr	
Total N post load	39.7 kg/yr	
Target N load reduction	5 %	
Target N discharge load	37.7 kg/yr	
Percent N load reduction	21 %	
Provided N discharge load	31.33 kg/yr	69.09 lb/yr
Provided N load removed	8.36 kg/yr	18.44 lb/yr

Phosphorus

Surface Water Discharge

Total P pre load	5.102 kg/yr	
Total P post load	5.373 kg/yr	
Target P load reduction	5 %	
Target P discharge load	5.102 kg/yr	
Percent P load reduction	21 %	
Provided P discharge load	4.241 kg/yr	9.35 lb/yr
Provided P load removed	1.132 kg/yr	2.496 lb/yr

Inwood Consulting Engineers, Inc.						
	PROJECT TITLE:	US 41 at CR 865 (Bonita Beach Road) PD&E Study				
	PROJECT NUMBER:	KIT-008-01				
	BASIN NAME:	Basin North	MADE BY:	TDO	DATE:	11/28/2023
	POND NAME:	Pond North	CHECKED BY:	REC	DATE:	11/28/2023

Permanent Pool Calculations

Basin Characteristics

Land Use	Area (ac)	CN	Product
Roadway Paved Area	34.12	98.00	3343.76
Roadway Pervious Area	20.49	80.00	1639.20
Pond Pervious Area	4.27	80.00	341.60
Pond Area at NWL	10.52	100.00	1052.00
Total	**69.40**		6376.56

% DCIA = **49.16** %
Non DCIA CN = **80**
Composite C = **0.51**
Annual Rainfall (P) = **52.5** **in**

Meteorlogical Zone : **1**

Stage Storage Calc.

ELEV. (ft)		AREA (ac)	AVG AREA (ac)	Delta D (ft)	Delta storage (ac-ft)	Sum Storage (ac-ft)
3.60	(NWL)	10.52				50.83
			10.14	0.81	8.21	
2.79		9.75				42.62
			7.43	5.74	42.62	
-2.95	Bottom	5.10				

Permanent Pool Volume Provided = **50.83** **ac-ft**

Mean Depth = Permanent Pool Volume / Area at NWL = **4.83** **ft**

Complete Report (not including cost) Ver 4.3.5

Project: US 41
Date: 11/28/2023 2:44:43 PM

Site and Catchment Information

Analysis: Net Improvement

Catchment Name	North-South (Permitted)	North-South (Unpermitted)
Rainfall Zone	Florida Zone 1	Florida Zone 1
Annual Mean Rainfall	52.50	52.50
Exist-Condition Landuse Information		
Landuse	User Defined Values	Undeveloped - Wet Flatwoods: TN=1.213 TP=0.021
Area (acres)	69.40	3.67
Rational Coefficient (0-1)	0.52	0.60
Non DCIA Curve Number	84.00	97.00
DCIA Percent (0-100)	49.16	0.00
Wet Pond Area (ac)	10.52	0.00
Nitrogen EMC (mg/l)	1.160	1.213
Phosphorus EMC (mg/l)	0.157	0.021
Runoff Volume (ac-ft/yr)	134.911	9.580
Groundwater N (kg/yr)	0.000	0.000
Groundwater P (kg/yr)	0.000	0.000
Nitrogen Loading (kg/yr)	192.961	14.328
Phosphorus Loading (kg/yr)	26.116	0.248

Catchment Number: 1 Name: North-South (Permitted)

Project: US 41
Date: 11/28/2023

Wet Detention with Littoral Shelf Design

Permanent Pool Volume (ac-ft)	50.830
Permanent Pool Volume (ac-ft) for 31 days residence	11.458
Annual Residence Time (days)	138
Littoral Zone Efficiency Credit	33
Wetland Efficiency Credit	

Watershed Characteristics

Catchment Area (acres)	69.40
Contributing Area (acres)	58.880
Non-DCIA Curve Number	84.00
DCIA Percent	49.16
Rainfall Zone	Florida Zone 1
Rainfall (in)	52.50

Surface Water Discharge

Required TN Treatment Efficiency (%)	100
Provided TN Treatment Efficiency (%)	61
Required TP Treatment Efficiency (%)	100
Provided TP Treatment Efficiency (%)	84

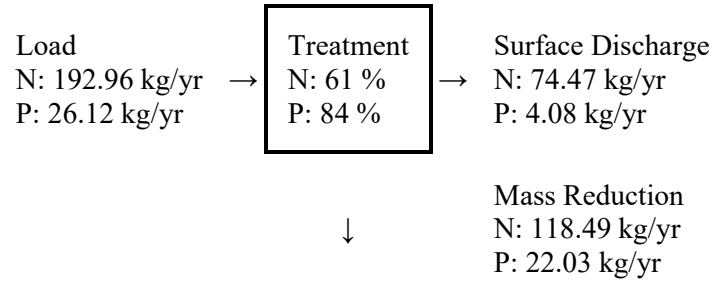
Media Mix Information

Type of Media Mix	Not Specified
Media N Reduction (%)	
Media P Reduction (%)	

Groundwater Discharge (Stand-Alone)

Treatment Rate (MG/yr)	0.000
TN Mass Load (kg/yr)	0.000
TN Concentration (mg/L)	0.000
TP Mass Load (kg/yr)	0.000
TP Concentration (mg/L)	0.000

Load Diagram for Wet Detention with Littoral Shelf (stand-alone)



Catchment Number: 2 Name: North-South (Unpermitted)

Project: US 41
Date: 11/28/2023

None Design

Watershed Characteristics

Catchment Area (acres)	3.67
Contributing Area (acres)	3.670
Non-DCIA Curve Number	97.00
DCIA Percent	0.00
Rainfall Zone	Florida Zone 1
Rainfall (in)	52.50

Surface Water Discharge

Required TN Treatment Efficiency (%)	5
Provided TN Treatment Efficiency (%)	
Required TP Treatment Efficiency (%)	
Provided TP Treatment Efficiency (%)	

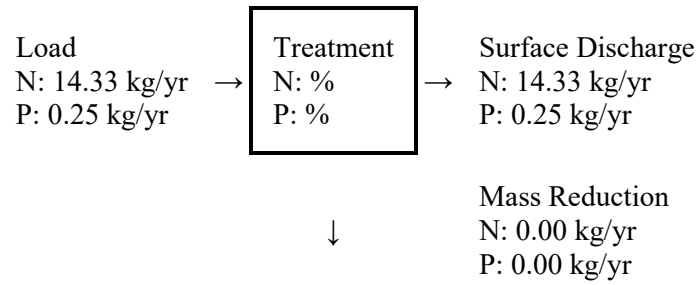
Media Mix Information

Type of Media Mix	Not Specified
Media N Reduction (%)	0.000
Media P Reduction (%)	0.000

Groundwater Discharge (Stand-Alone)

Treatment Rate (MG/yr)	0.000
TN Mass Load (kg/yr)	0.000
TN Concentration (mg/L)	0.000
TP Mass Load (kg/yr)	0.000
TP Concentration (mg/L)	0.000

Load Diagram for None (stand-alone)



Summary Treatment Report Version: 4.3.5

Project: US 41

Analysis Type: Net Improvement
BMP Types: Date:11/28/2023

Catchment 1 - (North-South (Permitted)) Wet Detention with Littoral Shelf

Catchment 2 - (North-South (Unpermitted)) None

Routing Summary
Catchment 1 Routed to Outlet
Catchment 2 Routed to Outlet

Based on % removal values to the nearest percent

Total nitrogen target removal met? **No**
Total phosphorus target removal met? **No**

Summary Report
Nitrogen

Surface Water Discharge

Total N pre load	13.64 kg/yr	
Total N post load	207.29 kg/yr	
Target N load reduction	93 %	
Target N discharge load	13.64 kg/yr	
Percent N load reduction	57 %	
Provided N discharge load	88.8 kg/yr	195.8 lb/yr
Provided N load removed	118.49 kg/yr	261.28 lb/yr

Phosphorus

Surface Water Discharge

Total P pre load	.319 kg/yr	
Total P post load	26.364 kg/yr	
Target P load reduction	99 %	
Target P discharge load	.319 kg/yr	
Percent P load reduction	84 %	
Provided P discharge load	4.331 kg/yr	9.55 lb/yr
Provided P load removed	22.034 kg/yr	48.584 lb/yr

Inwood Consulting Engineers, Inc.						
	PROJECT TITLE:	US 41 at CR 865 (Bonita Beach Road) PD&E Study				
	PROJECT NUMBER:	KIT-008-01				
	BASIN NAME:	Basin North	MADE BY:	TDO	DATE:	11/28/2023
	POND NAME:	Pond North	CHECKED BY:	REC	DATE:	11/28/2023

Permanent Pool Calculations

Basin Characteristics

Land Use	Area (ac)	CN	Product
Roadway Paved Area	43.72	98.00	4284.56
Roadway Pervious Area	14.62	80.00	1169.60
Pond Pervious Area	3.17	80.00	253.60
Pond Area at NWL	12.38	100.00	1238.00
Total	**73.89**		6945.76

% DCIA = **59.17** %
Non DCIA CN = **80**
Composite C = **0.57**
Annual Rainfall (P) = **52.5** **in**

Meteorlogical Zone : **1**

Stage Storage Calc.

ELEV. (ft)		AREA (ac)	AVG AREA (ac)	Delta D (ft)	Delta storage (ac-ft)	Sum Storage (ac-ft)
3.60	(NWL)	12.38				68.62
			11.77	0.81	9.53	
2.79		11.15				59.09
			10.30	5.74	59.09	
-2.95	Bottom	9.44				

Permanent Pool Volume Provided = **68.62** **ac-ft**

Mean Depth = Permanent Pool Volume / Area at NWL = **5.54** **ft**

Complete Report (not including cost) Ver 4.3.5

Project: US 41
Date: 11/28/2023 9:39:20 AM

Site and Catchment Information

Analysis: Net Improvement

Catchment Name	North-South
Rainfall Zone	Florida Zone 1
Annual Mean Rainfall	52.50

Post-Condition Landuse Information

Landuse	User Defined Values
Area (acres)	73.89
Rational Coefficient (0-1)	0.57
Non DCIA Curve Number	80.00
DCIA Percent (0-100)	59.17
Wet Pond Area (ac)	12.38
Nitrogen EMC (mg/l)	1.160
Phosphorus EMC (mg/l)	0.157
Runoff Volume (ac-ft/yr)	152.948
Groundwater N (kg/yr)	0.000
Groundwater P (kg/yr)	0.000
Nitrogen Loading (kg/yr)	218.759
Phosphorus Loading (kg/yr)	29.608

Note: 1.40 acres of North Basin routed to Pond West for Pre-Treatment. Calculations shown below.

Catchment Number: 1 Name: North-South

Project: US 41
Date: 11/28/2023

Wet Detention with Littoral Shelf Design

Permanent Pool Volume (ac-ft)	68.620
Permanent Pool Volume (ac-ft) for 31 days residence	12.990
Annual Residence Time (days)	164
Littoral Zone Efficiency Credit	34
Wetland Efficiency Credit	

Watershed Characteristics

Catchment Area (acres)	73.89
Contributing Area (acres)	61.510
Non-DCIA Curve Number	80.00
DCIA Percent	59.17
Rainfall Zone	Florida Zone 1
Rainfall (in)	52.50

Surface Water Discharge

Required TN Treatment Efficiency (%)	100
Provided TN Treatment Efficiency (%)	62
Required TP Treatment Efficiency (%)	100
Provided TP Treatment Efficiency (%)	86

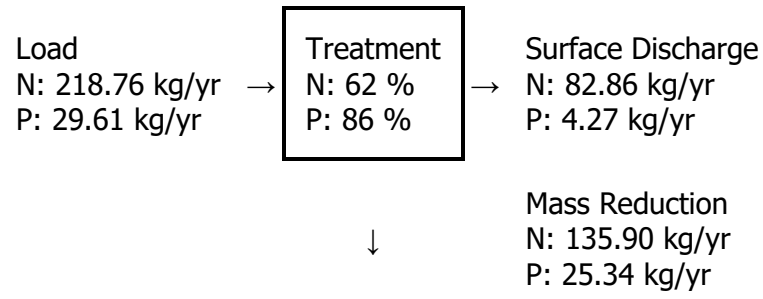
Media Mix Information

Type of Media Mix	Not Specified
Media N Reduction (%)	
Media P Reduction (%)	

Groundwater Discharge (Stand-Alone)

Treatment Rate (MG/yr)	0.000
TN Mass Load (kg/yr)	0.000
TN Concentration (mg/L)	0.000
TP Mass Load (kg/yr)	0.000
TP Concentration (mg/L)	0.000

Load Diagram for Wet Detention with Littoral Shelf (stand-alone)



Summary Treatment Report Version: 4.3.5

Project: US 41

Analysis Type: Net Improvement Date:11/28/2023

BMP Types:

Catchment 1 - (North-South) Wet Detention with Littoral Shelf
Based on % removal values to the nearest percent

Routing Summary
Catchment 1 Routed to Outlet

Total nitrogen target removal met? **No**
Total phosphorus target removal met? **No**

Summary Report
Nitrogen

Surface Water Discharge

Total N pre load	kg/yr	
Total N post load	218.76 kg/yr	
Target N load reduction	100 %	
Target N discharge load	kg/yr	
Percent N load reduction	62 %	
Provided N discharge load	82.86 kg/yr	182.71 lb/yr
Provided N load removed	135.9 kg/yr	299.66 lb/yr

Phosphorus

Surface Water Discharge

Total P pre load	kg/yr	
Total P post load	29.608 kg/yr	
Target P load reduction	100 %	
Target P discharge load	kg/yr	
Percent P load reduction	86 %	
Provided P discharge load	4.269 kg/yr	9.41 lb/yr
Provided P load removed	25.339 kg/yr	55.872 lb/yr

Complete Report (not including cost) Ver 4.3.5

Project: US 41
Date: 11/28/2023 9:42:26 AM

Site and Catchment Information

Analysis: Net Improvement

Catchment Name	North-South
Rainfall Zone	Florida Zone 1
Annual Mean Rainfall	52.50

Post-Condition Landuse Information

Landuse	User Defined Values
Area (acres)	1.40
Rational Coefficient (0-1)	0.66
Non DCIA Curve Number	80.00
DCIA Percent (0-100)	72.85
Wet Pond Area (ac)	0.00
Nitrogen EMC (mg/l)	1.160
Phosphorus EMC (mg/l)	0.157
Runoff Volume (ac-ft/yr)	4.061
Groundwater N (kg/yr)	0.000
Groundwater P (kg/yr)	0.000
Nitrogen Loading (kg/yr)	5.808
Phosphorus Loading (kg/yr)	0.786

Catchment Number: 1 Name: North-South

Project: US 41
Date: 11/28/2023

Wet Detention with Littoral Shelf Design

Permanent Pool Volume (ac-ft)	68.620
Permanent Pool Volume (ac-ft) for 31 days residence	0.345
Annual Residence Time (days)	6168
Littoral Zone Efficiency Credit	34
Wetland Efficiency Credit	

Watershed Characteristics

Catchment Area (acres)	1.40
Contributing Area (acres)	1.400
Non-DCIA Curve Number	80.00
DCIA Percent	72.85
Rainfall Zone	Florida Zone 1
Rainfall (in)	52.50

Surface Water Discharge

Required TN Treatment Efficiency (%)	100
Provided TN Treatment Efficiency (%)	63
Required TP Treatment Efficiency (%)	100
Provided TP Treatment Efficiency (%)	99

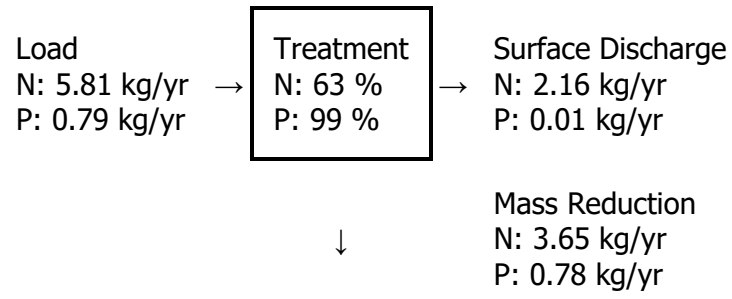
Media Mix Information

Type of Media Mix	Not Specified
Media N Reduction (%)	
Media P Reduction (%)	

Groundwater Discharge (Stand-Alone)

Treatment Rate (MG/yr)	0.000
TN Mass Load (kg/yr)	0.000
TN Concentration (mg/L)	0.000
TP Mass Load (kg/yr)	0.000
TP Concentration (mg/L)	0.000

Load Diagram for Wet Detention with Littoral Shelf (stand-alone)



Summary Treatment Report Version: 4.3.5

Project: US 41

Analysis Type: Net Improvement Date:11/28/2023

BMP Types:

Catchment 1 - (North-South) Wet Detention with Littoral Shelf
Based on % removal values to the nearest percent

Routing Summary
Catchment 1 Routed to Outlet

Total nitrogen target removal met? **No**
Total phosphorus target removal met? **Yes**

Summary Report
Nitrogen

Surface Water Discharge

Total N pre load	kg/yr	
Total N post load	5.81 kg/yr	
Target N load reduction	100 %	
Target N discharge load	kg/yr	
Percent N load reduction	63 %	
Provided N discharge load	2.16 kg/yr	4.76 lb/yr
Provided N load removed	3.65 kg/yr	8.05 lb/yr

Phosphorus

Surface Water Discharge

Total P pre load	kg/yr	
Total P post load	.786 kg/yr	
Target P load reduction	100 %	
Target P discharge load	kg/yr	
Percent P load reduction	100 %	
Provided P discharge load	kg/yr	lb/yr
Provided P load removed	.786 kg/yr	1.733 lb/yr

APPENDIX E

Pond Alternatives Evaluation Matrix

Inwood consulting engineers
3000 Dovera Drive, Suite 200, Oviedo FL32765
(407) 971-8850 phone (407) 971-8955 fax

US 41 at CR 865 (Bonita Beach Rd) PD&E STUDY

BASIN EAST ALTERNATIVE POND SITES

ENGINEERING DATA & ANALYSIS

Alternatives	Location	Existing Ground Elevation (ft)	Pond Type	Soil Names & Hydrologic Groups	Estimated SHWT Elevation (ft)	Lowest Edge of Existing Roadway (ft)	Distance From Lowest Edge of Proposed Roadway (ft)	Estimated Allowable $DHW_{25yr/72hr}$ (ft)	Estimated Allowable Treatment & Attenuation Depth (ft)	Outfall Location	Roadway Drainage Area Excluding Pond (ac)	Required Treatment & Attenuation Volume (ac-ft)	Required Pond Access Area (ac)	Required Pond Area (ac)	Required Pond Area Including Access (ac)
Pond East Alt. 1 (Swale)	Sta. 286+50 (Rt.) to 298+40 (Rt.) Within Roadway R/W	12.50	Dry Retention	Pompano fine sand-Urban land complex (A/D)	7.80	13.00	100	11.25	1.25	Imperial River	8.88	0.15	0.00	Within Roadway R/W	0.00
Pond East Alt.2	Sta. 293+40 (Rt.) Parcel No. 03-48-25-B1-00001.0120	14.00	Dry Retention	Pompano fine sand-Urban land complex (A/D)	7.80	13.00	200	12.00	1.00	Imperial River	8.88	0.15	0.00	0.83	0.83

IMPACT & COST ANALYSIS

Alternatives	Pond Floodplain Impacts (ac-ft)	FEMA Floodzone	Arch. / Historical Impact Potential	Wetland Impacts (ac)	Environmental Impact Risk	Threatened or Endangered Species Impacts	Hazardous Materials & Contamination Potential	Major Utility Conflict Potential (Y/N)	Existing Land Use	Future Land Use	Total Area of Parcels (Including Non-Impacted Area) (ac)	Total Pond Costs	Rankings
Pond East Alt. 1 (Swale)	0.00	X	Low	0.00	Low	Wood stork, Eastern black rail, Eastern indigo snake	High	N	Institutional (FLUCFCS 170)	Sub-outlying Urban	N/A	$170,963	1
Pond East Alt.2	0.00	X	Low	0.00	Low	Wood stork, Eastern black rail, Eastern indigo snake	Low	N	Institutional, Sand Pine (FLUCFCS 170, 413)	Sub-outlying Urban	4.69	$1,431,531	2

Note:

The cost evaluation for the stormwater management facility alternatives in this report include stormwater management facility construction costs, costs associated with wetland impacts, potential remediation of contaminated sites, and parcel acquisition costs. The stormwater management facility construction costs include cost of installed drainage structures, drainage pipes and outfalls, clearing and grubbing, earthwork excavation and grading, berm construction, erosion protection, fencing, access accommodations, sodding and any potential impermeable liners. The associated parcel acquisition cost for each alternative evaluated include the estimated cost of land and any impacted improvements, administrative costs and legal fees.

The potential occurrence of any listed species within each proposed pond site was valued as low, medium, or high based on FLUCFCS type, FNAI reports, and data gathered during field reviews. A determination of low was given for areas that are developed and exhibited minimal to no available habitat for listed species. A determination of medium was given for areas where suitable habitat was identified within one quarter mile of the pond site, or suboptimal habitat was observed within the pond site. A determination of high was given for direct observations of listed species, or areas with greater than one mile of contiguous suitable habitat.

3000 Dovera Drive, Suite 200, Oviedo FL32765
(407) 971-8850 phone (407) 971-8955 fax

US 41 at CR 865 (Bonita Beach Rd) PD&E STUDY

BASIN NORTH ALTERNATIVE POND SITES

ENGINEERING DATA & ANALYSIS

Alternatives	Location	Existing Ground Elevation (ft)	Pond Type	Soil Names & Hydrologic Groups	Estimated SHWT Elevation (ft)	Lowest Edge of Existing Roadway (ft)	Distance From Lowest Edge of Proposed Roadway (ft)	Estimated Allowable $DHW_{25yr/72hr}$ (ft)	Estimated Allowable Treatment & Attenuation Depth (ft)	Outfall Location	Roadway Drainage Area (ac)	Required Treatment & Attenuation Volume (ac-ft)	Required Pond Access Area (ac)	Required Pond Area (ac)	Required Pond Area Including Access (ac)
Pond North Expansion	Sta. 263+00 (Rt.) Parcel No. 33-47-25-B3-00260.002A, 33-47-25-B3-00260.0010, 33-47-25-B3-00257.0010, 33-47-25-B3-00257.0030	7.00	Wet Detention	Pompano fine sand-Urban land complex (A/D)	3.60	13.00	1000	4.90	1.30	Imperial River	57.95	16.40	0.00	3.67	3.67

IMPACT & COST ANALYSIS

Alternatives	Pond Floodplain Impacts (ac-ft)	FEMA Floodzone	Arch. / Historical Impact Potential	Wetland Impacts (ac)	Environmental Impact Risk	Threatened or Endangered Species Impacts	Hazardous Materials & Contamination Potential	Major Utility Conflict Potential (Y/N)	Existing Land Use	Future Land Use	Total Area of Parcels (Including Non-Impacted Area) (ac)	Total Pond Costs	Rankings
Pond North Expansion	0.00	AE	Low	3.23	Low	Wood stork, Eastern black rail, Eastern indigo snake	Low	N	Commercial and Services Under Construction (FLUCFCS 149)	Sub-outlying Urban	4.20	$6,402,432	1

Note:

The cost evaluation for the stormwater management facility alternatives in this report include stormwater management facility construction costs, costs associated with wetland impacts, potential remediation of contaminated sites, and parcel acquisition costs. The stormwater management facility construction costs include cost of installed drainage structures, drainage pipes and outfalls, clearing and grubbing, earthwork excavation and grading, berm construction, erosion protection, fencing, access accommodations, sodding and any potential impermeable liners. The associated parcel acquisition cost for each alternative evaluated include the estimated cost of land and any impacted improvements, administrative costs and legal fees.

The potential occurrence of any listed species within each proposed pond site was valued as low, medium, or high based on FLUCFCS type, FNAI reports, and data gathered during field reviews and species-specific surveys. A determination of low was given for areas that exhibited minimal to no available habitat for listed species. A determination of medium was given for areas where suitable habitat was identified within one quarter mile of the pond site, or suboptimal habitat was observed within the pond site. A determination of high was given for direct observations of listed species, or areas with greater than one mile of contiguous suitable habitat.

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US 41 at CR 865 (Bonita Beach Rd) PD&E STUDY

BASIN NORTH ALTERNATIVE POND SITES

ENGINEERING DATA & ANALYSIS

Alternatives	Location	Existing Ground Elevation (ft)	Pond Type	Soil Names & Hydrologic Groups	Estimated SHWT Elevation (ft)	Lowest Edge of Existing Roadway (ft)	Distance From Lowest Edge of Proposed Roadway (ft)	Estimated Allowable $DHW_{25yr/24hr}$ (ft)	Estimated Allowable Treatment & Attenuation Depth (ft)	Outfall Location	Roadway Drainage Area (ac)	Required Treatment & Attenuation Volume (ac-ft)	Required Pond Access Area (ac)	Required Pond Area (ac)	Required Pond Area Including Access (ac)
Pond West	Sta. 261+00 (Lt.) Parcel No. 33-47-25-B3-00260.0020	9.00	Dry Retention	Immokalee sand-Urban land complex (B/D)	4.00	10.00	200	9.00	3.00	Imperial River	1.40	0.20	0.00	0.49	0.49

IMPACT & COST ANALYSIS

Alternatives	Pond Floodplain Impacts (ac-ft)	FEMA Floodzone	Arch. / Historical Impact Potential	Wetland Impacts (ac)	Environmental Impact Risk	Threatened or Endangered Species Impacts	Hazardous Materials & Contamination Potential	Major Utility Conflict Potential (Y/N)	Existing Land Use	Future Land Use	Total Area of Parcels (Including Non-Impacted Area) (ac)	Total Pond Costs	Rankings
Pond West	0.08	AE	Low	0.00	Low	Wood stork, Eastern black rail, Eastern indigo snake	Medium	N	Commercial and Services, Reservoirs (FLUCFCS 140, 530)	Sub-outlying Urban	0.63	$2,097,708	1

Note:

The cost evaluation for the stormwater management facility alternatives in this report include stormwater management facility construction costs, costs associated with wetland impacts, potential remediation of contaminated sites, and parcel acquisition costs. The stormwater management facility construction costs include cost of installed drainage structures, drainage pipes and outfalls, clearing and grubbing, earthwork excavation and grading, berm construction, erosion protection, fencing, access accommodations, sodding and any potential impermeable liners. The associated parcel acquisition cost for each alternative evaluated include the estimated cost of land and any impacted improvements, administrative costs and legal fees.

The potential occurrence of any listed species within each proposed pond site was valued as low, medium, or high based on FLUCFCS type, FNAI reports, and data gathered during field reviews and species-specific surveys. A determination of low was given for areas that exhibited minimal to no available habitat for listed species. A determination of medium was given for areas where suitable habitat was identified within one quarter mile of the pond site, or suboptimal habitat was observed within the pond site. A determination of high was given for direct observations of listed species, or areas with greater than one mile of contiguous suitable habitat.

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Made by: FJM
Checked by: REC

DATE: November 29, 2023
Job Number: KIT-008-01

PROJECT : **US 41 at CR 865 (Bonita Beach Road) PD&E Study**
BASIN NAME : **Basin East**
POND NAME : **Alternative 1 (Swale)**

CONSTRUCTION COSTS

Dry Linear Swale

	ELEVATION	AREA	FILL		EXCAVATION	
			HEIGHT	VOLUME	HEIGHT	VOLUME
EXISTING GROUND (POND R/W)	12.50 ft	0.38 ac	0.46 ft	0 cy	0.46 ft	263 cy
BACK OF BERM	12.04 ft	0.33 ac	0.04 ft	0 cy	0.04 ft	20 cy
FRONT OF BERM	12.00 ft	0.28 ac	2.00 ft	0 cy	2.00 ft	581 cy
SLOPE BREAK	10.00 ft	0.08 ac	0.00 ft	0 cy	0.00 ft	0 cy
POND BOTTOM	10.00 ft	0.08 ac				
			TOTAL:	**0 cy**	**TOTAL:**	**600 cy**

EARTHWORK

	VOLUME	UNIT COST
POND FILL :	0 cy	$20.81
POND EXCAVATION:	600 cy	$12.08
TOTAL COST:		**$7,253.8**

CLEARING AND GRUBBING

POND R/W AREA :	0.38 ac
COST PER ACRE :	$44,734.48
TOTAL COST :	**$16,999.10**

POND SOD QUANTITIES

POND R/W AREA :	0.38 ac
POND WATER AREA :	0.00 ac
TOTAL POND SOD AREA :	0.38 ac
COST PER SY :	$4.40
TOTAL COST :	**$8,092.48**

MAINTENANCE

20 YEAR LIFE CYCLE	20
COST PER YEAR :	$3,000.00
TOTAL COST :	**$60,000.00**

PIPE QUANTITIES (includes both inflow and outfall pipes)

Length		
Inflow	**Outfall**	**Total**
100 ft	200 ft	300 ft
UNIT COST - PIPE (30") (RCP):		$262.06
TOTAL COST:		**$78,618.0**

Note: Unit Costs based on 12 Month Moving Statewide Averages

TOTAL CONSTRUCTION COST: $170,963.41

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Made by: FJM
Checked by: REC

DATE: November 29, 2023
Job Number: KIT-008-01

PROJECT : **US 41 at CR 865 (Bonita Beach Road) PD&E Study**
BASIN NAME : **Basin East**
POND NAME : **Alternative 2**

CONSTRUCTION COSTS

Dry Treatment Pond

	ELEVATION	AREA	FILL		EXCAVATION	
			HEIGHT	VOLUME	HEIGHT	VOLUME
EXISTING GROUND (POND R/W)	14.00 ft	0.69 ac	0.00 ft	#VALUE!	0.00 ft	0 cy
BACK OF BERM	14.00 ft	0.69 ac	1.00 ft	0 cy	1.00 ft	847 cy
FRONT OF BERM	13.00 ft	0.36 ac	2.00 ft	0 cy	2.00 ft	903 cy
SLOPE BREAK	11.00 ft	0.20 ac	0.00 ft	0 cy	0.00 ft	0 cy
POND BOTTOM	11.00 ft	0.20 ac	**TOTAL:**	**0 cy**	**TOTAL:**	**1750 cy**

EARTHWORK

	VOLUME	UNIT COST
POND FILL :	0 cy	$20.81
POND EXCAVATION:	1750 cy	$12.08
TOTAL COST:		**$21,145.6**

CLEARING AND GRUBBING

POND R/W AREA :	0.69 ac
COST PER ACRE :	$44,734.48
TOTAL COST :	**$30,866.79**

POND SOD QUANTITIES

POND R/W AREA :	0.69 ac
POND WATER AREA :	0.00 ac
TOTAL POND SOD AREA :	0.69 ac
COST PER SY :	$4.40
TOTAL COST :	**$14,694.24**

MAINTENANCE

20 YEAR LIFE CYCLE	20
COST PER YEAR :	$3,000.00
TOTAL COST :	**$60,000.00**

PIPE QUANTITIES (includes both inflow and outfall pipes)

Length		
Inflow	Outfall	Total
200 ft	200 ft	400 ft
UNIT COST - PIPE (30") (RCP):		$262.06
TOTAL COST:		**$104,824.0**

Note: Unit Costs based on 12 Month Moving Statewide Averages

TOTAL CONSTRUCTION COST: $231,530.67

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Made by: FJM
Checked by: REC

DATE: November 29, 2023
Job Number: KIT-008-01

PROJECT : **US 41 at CR 865 (Bonita Beach Road) PD&E Study**
BASIN NAME : **Basin North**
POND NAME : **Pond North Expansion**

CONSTRUCTION COSTS

Wet Treatment Pond

	ELEVATION	AREA	FILL		EXCAVATION	
			HEIGHT	VOLUME	HEIGHT	VOLUME
EXISTING GROUND (POND R/W)	7.00 ft	3.67 ac	0.50 ft	234 cy	0.50 ft	0 cy
BACK OF BERM	7.50 ft	3.09 ac	0.50 ft	52 cy	0.50 ft	0 cy
EXISTING GROUND (INSIDE POND)	7.00 ft	2.96 ac	1.10 ft	0 cy	1.10 ft	4996 cy
FRONT OF BERM	5.90 ft	2.67 ac	3.11 ft	0 cy	3.11 ft	12293 cy
SLOPE BREAK	2.79 ft	2.23 ac	5.74 ft	0 cy	5.74 ft	15558 cy
POND BOTTOM	-2.95 ft	1.13 ac	**TOTAL:**	**52 cy**	**TOTAL:**	**32846 cy**

EARTHWORK

	VOLUME	UNIT COST
POND FILL :	52 cy	$20.81
POND EXCAVATION:	32846 cy	$12.08
TOTAL COST:		**$397,872.9**

CLEARING AND GRUBBING

POND R/W AREA :	3.67 ac
COST PER ACRE :	$44,734.48
TOTAL COST :	**$164,175.54**

POND SOD QUANTITIES

POND R/W AREA :	3.67 ac
POND WATER AREA :	0.57 ac
TOTAL POND SOD AREA :	3.10 ac
COST PER SY :	$4.40
TOTAL COST :	**$65,911.69**

MAINTENANCE

20 YEAR LIFE CYCLE	20
COST PER YEAR :	$3,000.00
TOTAL COST :	**$60,000.00**

PIPE QUANTITIES (includes both inflow and outfall pipes)

Length		
Inflow	**Outfall**	**Total**
1000 ft	200 ft	1200 ft
UNIT COST - PIPE (30") (RCP):		$262.06
TOTAL COST:		**$314,472.0**

Note: Unit Costs based on 12 Month Moving Statewide Averages

TOTAL CONSTRUCTION COST: $1,002,432.17

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Made by: FJM
Checked by: REC

DATE: November 29, 2023
Job Number: KIT-008-01

PROJECT : **US 41 at CR 865 (Bonita Beach Road) PD&E Study**
BASIN NAME : **Basin North**
POND NAME : **Pond West (Pre-Treatment)**

CONSTRUCTION COSTS

Dry Pre-Treatment Pond

	ELEVATION	AREA	FILL		EXCAVATION	
			HEIGHT	VOLUME	HEIGHT	VOLUME
EXISTING GROUND (POND R/W)	9.00 ft	0.34 ac	2.00 ft	129 cy	2.00 ft	0 cy
BACK OF BERM	11.00 ft	0.26 ac	1.00 ft	105 cy	1.00 ft	0 cy
FRONT OF BERM	10.00 ft	0.13 ac	1.00 ft	242 cy	1.00 ft	0 cy
EXISTING GROUND (INSIDE POND)	9.00 ft	0.09 ac	3.00 ft	0 cy	3.00 ft	266 cy
SLOPE BREAK	6.00 ft	0.02 ac	0.00 ft	0 cy	0.00 ft	0 cy
POND BOTTOM	6.00 ft	0.02 ac	**TOTAL:**	**347 cy**	**TOTAL:**	**266 cy**

EARTHWORK

	VOLUME	UNIT COST
POND FILL :	347 cy	$20.81
POND EXCAVATION:	266 cy	$12.08
TOTAL COST:		**$10,434.0**

CLEARING AND GRUBBING

POND R/W AREA :	0.34 ac
COST PER ACRE :	$44,734.48
TOTAL COST :	**$15,209.72**

POND SOD QUANTITIES

POND R/W AREA :	0.34 ac
POND WATER AREA :	0.00 ac
TOTAL POND SOD AREA :	0.34 ac
COST PER SY :	$4.40
TOTAL COST :	**$7,240.64**

MAINTENANCE

20 YEAR LIFE CYCLE	20
COST PER YEAR :	$3,000.00
TOTAL COST :	**$60,000.00**

PIPE QUANTITIES (includes both inflow and outfall pipes)

Length		
Inflow	**Outfall**	**Total**
200 ft	200 ft	400 ft
UNIT COST - PIPE (30") (RCP):		$262.06
TOTAL COST:		**$104,824.0**

Note: Unit Costs based on 12 Month Moving Statewide Averages

TOTAL CONSTRUCTION COST: $197,708.35

APPENDIX F

Existing Permits

Last Date For Agency Action: June 13, 2002

INDIVIDUAL ENVIRONMENTAL RESOURCE PERMIT STAFF REPORT

Project Name: State Road 45 (Us 41)

Permit No.: 36-02988-P

Application No.: 011107-6

Application Type: Environmental Resource (Construction/Operation Modification)

Location: Lee County, S4,9,18/T48S/R25E
Location: Collier County, S33/T47S/R25E

Permittee : Florida Department Of Transportation

Operating Entity : Florida Department Of Transportation

Project Area: 82.4 acres

Project Land Use: Highway

Drainage Basin: NORTH COASTAL

Receiving Body: Cocohatchee & Imperial Rivers

Special Drainage District: A

DRAFT
Subject to Governing
Board Approval

Total Acres Wetland Onsite:	7.40	
Total Acres Wetland Preserved Onsite:	.52	
Total Acres Impacted Onsite :	6.88	
Offsite Mitigation Credits-Mit.Bank:	3.00	Out For Bid Per Fdot Sb 1986

Conservation Easement To District : No
Sovereign Submerged Lands: No

PROJECT PURPOSE:

Modification of an Environmental Resource Permit to authorize construction and operation of a surface water management system to serve an 82.4 acre highway project known as State Road 45 (US 41) from north of CR 887 to north of Bonita Beach Road.

PROJECT EVALUATION:

PROJECT SITE DESCRIPTION:

The site is a 2.8 mile, linear, north-south, state highway corridor for State Road 45 (US 41) from northern Collier County to southern Lee County. A location map is included as Exhibit 1.

The existing roadway is in a 200' wide right-of-way, and is typically a four lane divided highway with intersections, connecting roads and driveways, turn lanes and shoulders. There are existing cross drains in consideration of the ambient drainage patterns from east to west.

Existing drainage in the southern area and northern area of the existing highway drains into adjacent ditches and eventually reaches the Cocohatchee River and Imperial River, respectively. Both of these waterways are classified as Outstanding Florida Waters. The existing roadside ditches provide some water quality treatment.

The linear parcel is surrounded by agricultural lands, large vacant parcels, developments of regional impacts, and developments such as business parks, churches, and retail establishments. The existing road right-of-way is cleared and mowed regularly. The pond site is approximately 700 feet south of the Imperial River and is set back 300 feet from US 41. Arroyal Road borders the site to the east and a residential subdivision is located to the south.

All wetlands onsite total 7.4 acres. Wetlands 8 and 9 are within the Collier County right-of-way (South Basin), and Wetlands 4, 5, 6, and 7 are within Lee County right-of-way (North Basin). Wetland 7 is a disturbed freshwater marsh. The other wetlands consist of Brazilian pepper. All the wetlands within the project site extend offsite. Other Surface Waters within the right-of-way and on the pond site total 4. 79 acres and are designated as ditches and roadside swales.

Wetlands 1, 2, 3, and 10 are associated with the pond site. A melaleuca forest dominates the central portion of the site with royal fern as the ground cover. A mesic oak area is located in the southern end of the parcel and is predominantly laurel oak and live oaks. Herbaceous species consists of swamp fern, wild coffee, and greenbriar. A mixed hardwood community is located in the southwest corner and is dominated by slash pine, swamp bay, Carolina willow, cabbage palm and melaleuca; buttonbush and swamp fern make up the ground cover. The Other Surface Waters are located north and west of the site and are characterized as ditches.

PROJECT BACKGROUND:

State Road 45 (US 41) is a primary north-south travel corridor through Southwest Florida, including Collier and Lee counties. The sections of the roadway within this permit application were constructed circa 1970's without the benefit of current day surface water management features.

Permit Number 36-02988-P and subsequent modifications were authorized for the widening of S.R. 45.

The plans and design calculations are in the Metric system. Some parameters relating to this Environmental Resource Permit application have English units in parenthesis following the Metric units. All values in this Staff Report have been converted to English units and some rounding of numbers was required.

PROPOSED PROJECT:

The Florida Department of Transportation proposes to widen the existing four lane State Road 45 (US 41) to six lanes. This application includes two sections of highway. The section in Collier County is identified as financial project ID 195406-1-52-01. The section in Le unty is identified as financial project ID

The Collier County section begins just north of CR 887 and ends at the County line between Collier and Lee counties. The Lee County section begins at the county line and extends north to north of Bonita Beach Road. The total distance for the two sections is approximately 2.6 miles. Construction will take place within the existing 200' wide right-of-way: No additional lands are being purchased for the roadway.

The surface water management system is divided into two main areas, Basin South and Basin North.

Basin South extends from the southern limits of the project northward to Sterling Oaks Boulevard. The typical section for Basin South is considered a suburban section with three travel lanes in each direction separated by a raised median with curbs and gutters. The outside of the travel lanes are flanked by shoulders, drainage ditches, and concrete sidewalks. Surface water management for Basin South is comprised of three subbasins (A, B, and C) employing dry detention in the roadside ditch system. South A and South B use the ditches on both sides of the road, South C uses the ditch on the left side of the roadway, for dry detention. Surface water runoff from the project proceeds by sheetflow, or by drainage structures and culverts into the dry detention areas. Ditch blocks with "V" notch bleeders are provided for each of the three subbasins. Basin South discharges to a canal that flows west through Tarpon Cove residential development and then south along the west side of Wiggins Lakes development to the Cocohatchee River. The Cocohatchee River is classified as Outstanding Florida Waters and an additional 50% water quality volume is provided to meet anti-degradation requirements for an OFW.

Basin North begins at Sterling Oaks Boulevard and extends northward to north of Bonita Beach Road. The south end of Basin North shares the suburban section of Basin South. The typical section for most of Basin North is an urban section with three travel lanes in each direction divided by a raised median and having curbs and gutters on each side. Concrete sidewalks are provided on both sides of the roadway. Surface water runoff from the project, as well as runoff from the roadway north of this section, proceeds by sheetflow into the drainage structures and culverts and is directed north to the wet detention lake. This lake, called Pond North, has a control structure which discharges through culverts into the roadside swale of the highway. The discharge is conveyed north in the swale system and discharges to the Imperial River. The Imperial River is classified as Outstanding Florida Waters and an additional 50% water quality volume is provided to meet anti-degradation requirements for an OFW.

Cross drains, provided in the circa 1970's construction to carry the ambient east to west drainage patterns across the highway, are being plugged as part of this project. The applicant has determined that adjacent development, which has taken place subsequent to highway construction, has prevented the historic flows from reaching the highway and the cross drains are no longer required.

LAND USE:

Other acreage is comprised of 4.79 ac. of Other Surface Waters, and 7.4 ac. of wetlands.

Construction:
Project:

	Total Project	
Impervious	42.20	acres
Other	12.19	acres
Pervious	28.01	acres
Total:	**82.40**	

WATER QUANTITY :

Discharge Rate :

Computations were made for the discharge rates based on the pre-project condition, and the post-project condition A comparison of the pre and post conditions indicates that the project provides attenuation of the design storm discharges.

Basin	Allow Disch (cfs)	Method Of Determination	Peak Disch (cfs)	Peak Stage (ft, NGVD)
South A	17.62	Pre Vs Post	14.4	10.1
South B	8.44	Pre Vs Post	6.9	10.9
South C	10.64	Pre Vs Post	8.7	10
North	58.3	Pre Vs Post	41	7

Control Elevation :

Basin	Area (Acres)	Ctrl Elev (ft, NGVD)	WSWT Ctrl Elev (ft, NGVD)	Method Of Determination
South A	7.81	7.9	7.90	Surrounding Projects
South B	3.86	8.9	8.90	Surrounding Projects
South C	4.74	7.9	7.90	Surrounding Projects
North	34.12	4.8	4.80	Surrounding Projects

Receiving Body :

Basin	Str.#	Receiving Body
South A	540	Cocohatchee River via roadside swales
South B	542	Cocohatchee River via roadside swales
South C	541	Cocohatchee River via roadside swales
North	O S-1	Imperial River via roadside swale

Major Structures:

Bleeders:

Basin	Str#	Count	Type	Width	Length	Dia.	Invert Angle	Invert Elev. (ft, NGVD)
North	O S-1	1	V-Notch				60 deg.	4.8
South A	540	1	V-Notch				20 deg.	7.9
South B	542	1	V-Notch				20 deg.	8.9
South C	541	1	V-Notch				20 deg.	7.9

Culverts:

Basin	Str#	Count	Type	Width	Length	Dia.
North	O S-1	1	Reinforced Concrete Pipe		595'	4'
South A	540	1	Reinforced Concrete Pipe		45'	2'
South C	541	1	Reinforced Concrete Pipe		48'	2'

Weirs:

Basin	Str#	Count	Type	Width	Height	Length	Dia.	Elev. (ft, NGVD)
North	O S-1	1	Rectangular Notch	3.6'	1.6'			5.74 (crest)
North	O S-1	2	Rectangular Notch	2.6'	1.6'			5.74 (crest)

WATER QUALITY :

Water quality for Basin South is predicated on 2.5" of runoff over the new impervious area plus an additional 50% volume to meet the anti-degradation requirements for an OFW, the Cocohatchee River. Tho total of water quality provided for the three subbasins, A, B, and C is 1.42 ac.ft. compared with an overall required volume of 1.44 ac.ft.

Water quality for Basin North is met by wet detention in the lake just south of the Imperial River, on the east side of SR 45. The lake provides a water quality volume of 10.78 ac.ft. compared with 10.66 ac.ft. required, based on 2.5" of runoff over the impervious area, plus an additional 50% volume to meet the anti-degradation requirements for an OFW, the Imperial River.

Detention areas B and C have shortfalls in the volume required, however these amounts are compensated for in area A, and the overall water quality volume provided is greater than the volume required.

Basin	Treatment Method		Vol Req.d (ac-ft)	Vol Prov'd (ac-ft)
South A	Treatment	Dry Detention	.68	.84
South B	Treatment	Dry Detention	.36	.28
South C	Treatment	Dry Detention	.4	.3
North	Treatment	Wet Detention	10.66	10.78

WETLANDS:

Wetland Description:

There are 7.4 acres of wetlands or portions of wetlands within the proposed road right-of-way and pond site. Wetlands 4, 5, 6, and 7 are within the road right-of-way. Wetland 7 is a disturbed freshwater marsh. The other wetlands consist of Brazilian pepper. All the wetlands within the project site extend offsite. There are roadside ditches along the alignment that are classified as Other Surface Waters.

Wetlands 1, 2, 3, and 10 are associated with the pond site. A melaleuca forest dominates the central portion of the site with royal fern as the ground cover. A mesic oak area is located in the southern end of the parcel and is predominantly laurel oak and live oaks. Herbaceous species consists of swamp fern, wild coffee, and greenbriar. A mixed hardwood community is located in the southwest corner and is dominated by slash pine, swamp bay, Carolina willow, cabbage palm and melaleuca; buttonbush and swamp fern make up the ground cover. The Other Surface Waters are located north and west of the site and are characterized as ditches.

Wetland Impacts:

The US 41 corridor is one of the principle north/south urban arterial highways. The road widening is proposed in order to meet the long range transportation needs in accordance with County plans.

The US 41 proposed project contains approximately 4.79 acres of OSW and 7.40 acres of wetlands. Except for Wetland 4, all wetlands within the proposed right-of-way and pond site will be impacted as a result of the proposed road construction. Wetland 4 connects the US 41 ditch to wetlands west of Beaumont Road and conveys flows to the west. The majority of the wetland impacts for this project will occur at the proposed pond site south of the Imperial River; approximately 4.8 acres of melaleuca and approximately 1.6 acres of mixed wetland hardwoods will be impacted. Also, approximately 0.4 acres of

Water Quality Matrix
US 41 Collier and Lee Counties
FPID: 195736-1-52-01
FPID: 195406-52-01

Sub-Basin	Begin Station	End Station	Drainage Area (acres)	Required Treatment Volume (ac-ft)	Treatment Volume Provided (ac-ft)	Additional Treatment Provided (ac-ft)	Design Control Elevation (ft)	Dry Detention Bottom EL (ft)	Wet Detention Dimensions (ft x ft)	Control Structure Bleeder EL (ft)
Basin South										
A	38+75 RT 43+25 LT	47+00 RT 47+00 LT	7.81	0.68	0.84	+0.16	7.87	8.86	N/A	8.86
B	47+00 RT 47+00 LT	51+30 RT 48+50 LT	3.85	0.36	0.28	-0.08	8.86	9.84	N/A	9.84
C	39+00 RT	47+75 LT	4.74	0.40	0.30	-0.10	7.87	8.86	N/A	8.86
		Total:	16.40	1.44	1.41	-0.03				
Basin North										
1	51+30 RT 47+75 LT	87+75 RT 84+75 LT	54.61	6.83	10.78	+3.95	4.76	N/A	895 x 550	4.76
Pond		Pond North	13.74	None	None	None				
		Total:	68.35	6.83	10.78	+3.95				

FORT MYERS SERVICE CENTER
APR 10 2002
FDOT/REVISED SUBMITTAL

APPLICATION NUMBER
01102-5

Design by: ASL
Date: 6/19/00
Project #: 100318.07 0011

Checked by:
Date:

Pond Stage - Area (metric)

Stage (m)	Area (m2)	Incremental Volume (m3)	Volume (m3)
1.45	42558		0
2.15	46096	31029	31029
2.65	52260	24589	55618

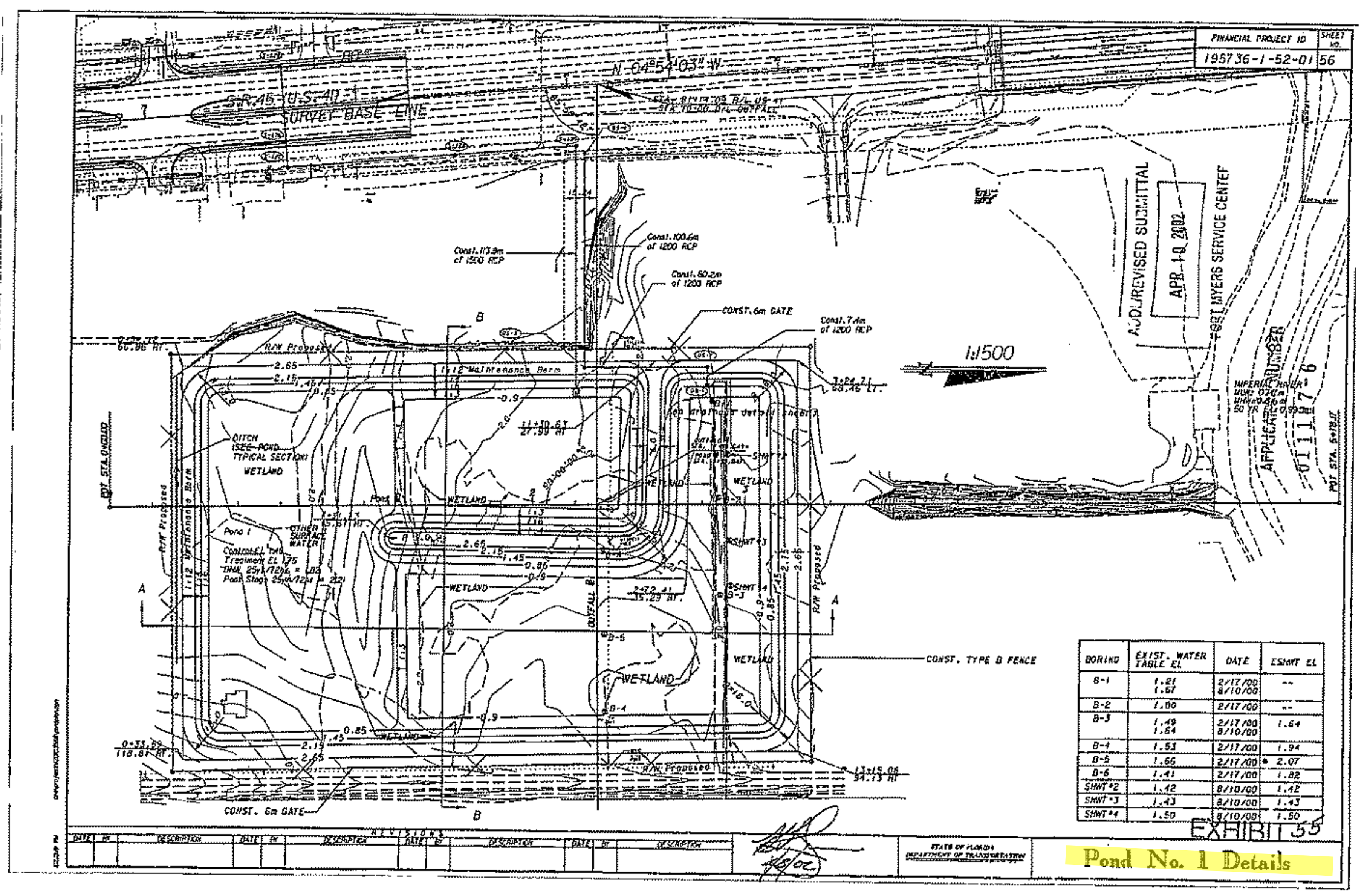
Treatment Volume Required= 13149 m3
Treatment Weir Elevation= 1.75 m
Treatment Volume Provided= 13298 m3

Pond Stage - Area (English)

Stage (ft)	Area (acres)	Incremental Volume (ac-ft)	Volume (ac-ft)
4.8	10.52		0.00
7.1	11.39	25.16	25.16
8.7	12.91	19.94	45.09

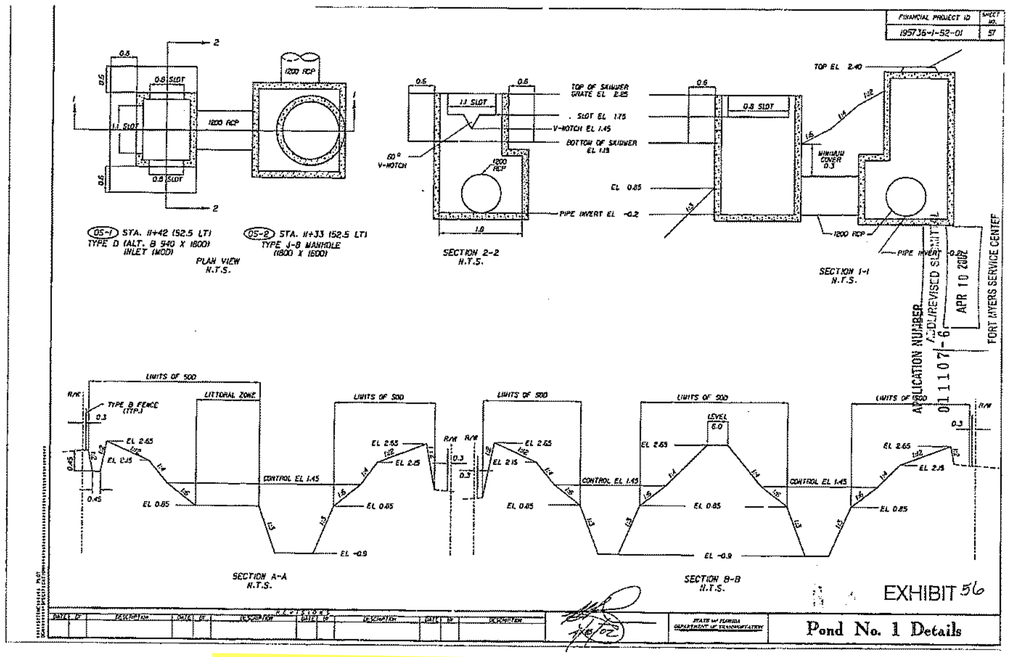
Treatment Volume Required= **10.66 ac-ft**
Treatment Weir Elevation= 5.74 ft
Treatment Volume Provided= 10.78 ac-ft

Area of Littoral Shelf = 14021 m2 3.46 ac
33 % of control area



BORING	EXIST. WATER TABLE EL	DATE	ESHWT EL
B-1	1.21 1.67	2/17/00 8/10/00	--
B-2	1.00	2/17/00	--
B-3	1.49 1.64	2/17/00 8/10/00	1.64
B-4	1.53	2/17/00	1.94
B-5	1.66	2/17/00	* 2.07
B-6	1.41	2/17/00	1.82
SHWT #2	1.42	8/10/00	1.42
SHWT #3	1.43	8/10/00	1.43
SHWT #4	1.50	8/10/00	1.50

Pond No. 1 Details


FINANCIAL PROJECT ID
195736-1-52-01
SHEET NO.
57
PLAN VIEW
N.T.S.
SECTION 2-2
N.T.S.
SECTION 1-1
N.T.S.
SECTION A-A
N.T.S.
SECTION B-B
N.T.S.
APPLICATION NUMBER
011107-6
APR 10 2008
FORT MYERS SERVICE CENTER
EXHIBIT 56
Pond No. 1 Details

GENERAL PERMIT DUE BY:
JULY 1, 1988

SURFACE WATER MANAGEMENT STAFF REVIEW SUMMARY

APPLICATION NO.: 11047-B

PROJECT NAME: Arroyal Mall

LOCATION: Lee County S33/T47S/R25E

APPLICANTS NAME AND ADDRESS: Captain Investments, Inc.
1645 Warden Avenue, Suite 305
Scarborough, Ontario Canada M1R 5B3

OWNER: Captain Investments, Inc.

DEVELOPER: Captain Investments, Inc.

ENGINEER: Hole, Montes & Associates, Inc.

REVIEWER RATING OF PROJECT DESIGN

1. Suitability of land for proposed use	GOOD	(FAIR)	POOR	NOT APPLICABLE
2. Water quantity impacts	GOOD	(FAIR)	POOR	NOT APPLICABLE
3. Water quality impacts	(GOOD)	FAIR	POOR	NOT APPLICABLE
4. Environmental impacts	GOOD	FAIR	POOR	(NOT SIGNIFICANT)
5. Water conservation	(GOOD)	FAIR	POOR	NOT APPLICABLE
6. Flood protection	(GOOD)	FAIR	POOR	NOT APPLICABLE
7. Relief from rainstorm inconvenience	(GOOD)	FAIR	POOR	NOT APPLICABLE
8. System maintainability	(GOOD)	FAIR	POOR	NOT APPLICABLE
9. Overall use of land with respect to water resource	(GOOD)	FAIR	POOR	NOT APPLICABLE
10. Water management system with respect to feasible alternatives	GOOD	(FAIR)	POOR	NOT APPLICABLE

SURFACE WATER MANAGEMENT EVALUATION

APPLICATION NUMBER 11047-B DATE: May 2, 1988

PROJECT NAME: Arroyal Mall

LOCATION: Lee COUNTY

SECTION 33, TOWNSHIP 47 SOUTH, RANGE 25 EAST

PROJECT AREA 18.1 ACRES DRAINAGE AREA 393.5 ACRES *

* Several permitted projects and other off-site areas currently drain through this site and will continue to do so after development (see Exhibit 2).

FACILITIES:

1. EXISTING: This 18.1 acre site lies within a 415.0 acre sub-basin of the Imperial River watershed. The site contains a 5.0 acre inactive borrow pit. The following off-site areas currently drain through this site (see Exhibit 2):

Name	Permit No.	Area	
Sunshine Superex	36-00203-S	21.5	acres
Springs Plaza	36-00317-S	24.8	acres
Center of Bonita Springs	36-00718-S	32.0	acres
Bonita Beach Boulevard	GP 87-20	18.6	acres
Woods Edge DRI	36-00854-S	119.5	acres
Undeveloped Off-site	----	180.5	acres

Runoff from these areas enters this site from the east, the west and the south and exits (along with the site's own runoff) through an existing ditch which conveys the flow north to the Imperial River.

2. PROPOSED: A General Permit is requested for an 18.1 acre commercial park consisting of six lots and a 1.9 acre lake. The proposed drainage design will accept runoff from all of the off-site areas that currently drain through the site (415.0 acres) with the exception of Sunshine Superex (21.5 acres) which will be routed around the project via an interceptor swale (see Exhibits 3 & 4).

Runoff from this project and 375.4 acres of off-site lands (for a total of 393.5 acres) will be directed via inlets, culverts and swales into the 1.9 acre lake. Runoff from each commercial lot will be routed through dry pretreatment areas prior to entering the lake (see Special Condition No. 9). Discharge from the lake will be directed through a control structure consisting of 1-15.5' wide weir with a crest at elevation 8.0' NGVD and 1-20 degree V-notch bleeder with an invert at elevation 7.0' NGVD discharging to the Imperial River via an existing ditch. The applicant's engineer has reasonably demonstrated that the existing ditch has the capacity to handle more than the anticipated peak runoff and that downstream impacts will not occur as a result of development.

DRAINAGE BASIN Imperial River RECEIVING BODY Imperial River

RUN OFF FORMULA PRE vs. POST ALLOWABLE DISCHARGE 85 CFS *

* This figure reflects the 373.5 acre drainage basin. The actual allowable discharge for this 18.1 acre site is 2 cfs.

REQUIRED DETENTION 2.0 AC-FT
DETENTION METHOD Lake
DETENTION PROVIDED 2.0 AC-FT

FLOOD PROTECTION		
LOCAL ROAD CRITERIA	5	YEAR, 24 HOUR STORM
FLOOD CONTOUR	9.2	FEET NGVD
MINIMUM ROAD GRADE	10.0	FEET NGVD
BASIN DESIGN FREQUENCY	25	YEAR, 72 HOUR STORM
FLOOD CONTOUR	9.8	FEET NGVD
DESIGN DISCHARGE	85	CFS
100 YEAR FLOOD		
FLOOD CONTOUR	11.0	FEET NGVD
MINIMUM FLOOR ELEVATION	12.0	FEET NGVD
FIA FLOOD ELEVATION	12.0	FEET NGVD

WATER QUALITY

A. ADVERSE IMPACTS EXPECTED: NO

B. BEST MANAGEMENT PRACTICES UTILIZED: Detention provided in excess of the first inch over the project site.

ENVIRONMENTAL

A. SIGNIFICANT ADVERSE IMPACTS EXPECTED: NO

B. COMMENTS: The project site contains pine flatwoods, cleared and improved lands, a borrow lake, oak hammocks and a wetland area (0.6 acres). This system contains a marsh and hydric hammocks. This area is located immediately to the north with eventual outfall to the Imperial River. The submitted information indicated that a wildlife survey was performed on this site. This survey located approximately six active gopher tortoise burrows within uplands areas on-site.

The project as proposed includes the construction of water management facilities to serve a commercial development. The existing wetlands and some adjacent upland areas will be incorporated into the water management system. A portion of the existing borrow lake will be filled. The gopher tortoises are to be relocated in accordance with the FGFWFC requirements.

Adverse environmental impacts are not anticipated as a result of the construction and operation of the water management facilities.

LAND USE

PRESENT ZONING Commercial Planned Development, ALLOWED DENSITY N/A DU/A

PROPOSED USE Commercial Park, PROPOSED DENSITY N/A DU/A

COMPATIBLE: YES

POTABLE WATER: Bonita Springs Water System, Inc.

PERMITTED ALLOCATION	3.0986	MGD
PRESENT WITHDRAWAL	1.5973	MGD
PROJECTED DEMAND	0.0330	MGD

WASTEWATER TREATMENT: Environmental Systems, Inc. (see Additional Comments)

ADDITIONAL COMMENTS: Wastewater treatment will be temporarily provided by on-site drainfields (if necessary) until the construction of Environmental Systems' wastewater treatment plant is completed.

APPLICABLE LAND AREA

	Project	Phase Construction
Total	18.1 acres;	18.1 acres
Water Management	1.9 acres;	1.9 acres
Impervious	11.6 acres;	11.6 acres
Commercial	100,000 sq ft;	100,000 sq ft

Location: This site is located in the northeast corner of the intersection of Bonita Beach Boulevard (CR 865) and U.S. 41.

County: Lee

Special District: None

SFWMD Basin: Imperial River

Operation Entity: Property Owners Association

The Staff recommends that the following be issued:

__X__General Permit

_____Construction and Operation Permit

_____Construction Permit

_____Operation Permit

_____Letter of Conceptual Approval

_____Right-of-Way Occupancy Permit

	APPLICATION REVIEWER:	SUPERVISOR/CHECKER:
TECHNICAL:	J. Hiscock	E. Yaun
WATER QUALITY:	J. Hiscock	S. Anderson
ENVIRONMENTAL:	R. Boylan	C. Padera

APPROVED:

DIVISION DIRECTOR: _____ DATE: 3/17/88

for James T. Show, P.E.
Water Management Division
Resource Control Department

Subject to the following 12 Standard Limiting and 9 Special Conditions (for conceptual approvals only, these conditions as a minimum will apply to subsequent construction permitting).

LIMITING CONDITIONS

1. THE PERMITTEE SHALL PROSECUTE THE WORK AUTHORIZED IN A MANNER SO AS TO MINIMIZE ANY ADVERSE IMPACT OF THE WORKS ON FISH, WILDLIFE, NATURAL ENVIRONMENTAL VALUES, AND WATER QUALITY. THE PERMITTEE SHALL INSTITUTE NECESSARY MEASURES DURING THE CONSTRUCTION PERIOD, INCLUDING FULL COMPACTION OF ANY FILL MATERIAL PLACED AROUND NEWLY INSTALLED STRUCTURES, TO REDUCE EROSION, TURBIDITY, NUTRIENT LOADING AND SEDIMENTATION IN THE RECEIVING WATERS.

2. WATER QUALITY DATA FOR THE WATER DISCHARGED FROM THE PERMITTEE'S PROPERTY OR INTO SURFACE WATERS OF THE STATE SHALL BE SUBMITTED TO THE DISTRICT AS REQUIRED. PARAMETERS TO BE MONITORED MAY INCLUDE THOSE LISTED IN CHAPTER 17-3. IF WATER QUALITY DATA IS REQUIRED, THE PERMITTEE SHALL PROVIDE DATA AS REQUIRED, ON VOLUMES OF WATER DISCHARGED, INCLUDING TOTAL VOLUME DISCHARGED DURING THE DAYS OF SAMPLING AND TOTAL MONTHLY DISCHARGES FROM THE PROPERTY OR INTO SURFACE WATERS OF THE STATE.

3. THE PERMITTEE SHALL COMPLY WITH ALL APPLICABLE LOCAL SUBDIVISION REGULATIONS AND OTHER LOCAL REQUIREMENTS. IN ADDITION THE PERMITTEE SHALL OBTAIN ALL NECESSARY FEDERAL, STATE, LOCAL AND SPECIAL DISTRICT AUTHORIZATIONS PRIOR TO THE START OF ANY CONSTRUCTION OR ALTERATION OF WORKS AUTHORIZED BY THIS PERMIT.

4. THE OPERATION PHASE OF THIS PERMIT SHALL NOT BECOME EFFECTIVE UNTIL A FLORIDA REGISTERED PROFESSIONAL ENGINEER CERTIFIES THAT ALL FACILITIES HAVE BEEN CONSTRUCTED IN ACCORDANCE WITH THE DESIGN APPROVED BY THE DISTRICT. WITHIN 30 DAYS AFTER COMPLETION OF CONSTRUCTION OF THE SURFACE WATER MANAGEMENT SYSTEM, THE PERMITTEE SHALL SUBMIT THE CERTIFICATION AND NOTIFY THE DISTRICT THAT THE FACILITIES ARE READY FOR INSPECTION AND APPROVAL. UPON APPROVAL OF THE COMPLETED SURFACE WATER MANAGEMENT SYSTEM, THE PERMITTEE SHALL REQUEST TRANSFER OF THE PERMIT TO THE RESPONSIBLE ENTITY APPROVED BY THE DISTRICT.

5. ALL ROADS SHALL BE SET AT OR ABOVE ELEVATIONS REQUIRED BY THE APPLICABLE LOCAL GOVERNMENT FLOOD CRITERIA.

6. ALL BUILDING FLOORS SHALL BE SET AT OR ABOVE ELEVATIONS ACCEPTABLE TO THE APPLICABLE LOCAL GOVERNMENT.

7. OFF-SITE DISCHARGES DURING CONSTRUCTION AND DEVELOPMENT SHALL BE MADE ONLY THROUGH THE FACILITIES AUTHORIZED BY THIS PERMIT. NO ROADWAY OR BUILDING CONSTRUCTION SHALL COMMENCE ON-SITE UNTIL COMPLETION OF THE PERMITTED DISCHARGE STRUCTURE AND DETENTION AREAS. WATER DISCHARGED FROM THE PROJECT SHALL BE THROUGH STRUCTURES HAVING A MECHANISM SUITABLE FOR REGULATING UPSTREAM WATER STAGES. STAGES MAY BE SUBJECT TO OPERATING SCHEDULES SATISFACTORY TO THE DISTRICT.

8. NO CONSTRUCTION AUTHORIZED HEREIN SHALL COMMENCE UNTIL A RESPONSIBLE ENTITY ACCEPTABLE TO THE DISTRICT HAS BEEN ESTABLISHED AND HAS AGREED TO OPERATE AND MAINTAIN THE SYSTEM. THE ENTITY MUST BE PROVIDED WITH SUFFICIENT OWNERSHIP SO THAT IT HAS CONTROL OVER ALL WATER MANAGEMENT FACILITIES AUTHORIZED HEREIN. UPON RECEIPT OF WRITTEN EVIDENCE OF THE SATISFACTION OF THIS CONDITION, THE DISTRICT WILL ISSUE AN AUTHORIZATION TO COMMENCE CONSTRUCTION.

9. THE PERMIT DOES NOT CONVEY TO THE PERMITTEE ANY PROPERTY RIGHT NOR ANY RIGHTS OR PRIVILEGES OTHER THAN THOSE SPECIFIED IN THE PERMIT AND CHAPTER 40E-4, FAC.

10. THE PERMITTEE SHALL HOLD AND SAVE THE DISTRICT HARMLESS FROM ANY AND ALL DAMAGES, CLAIMS, OR LIABILITIES WHICH MAY ARISE BY REASON OF THE CONSTRUCTION, OPERATION, MAINTENANCE OR USE OF ANY FACILITY AUTHORIZED BY THE PERMIT.

11. THIS PERMIT IS ISSUED BASED ON THE APPLICANT'S SUBMITTED INFORMATION WHICH REASONABLY DEMONSTRATES THAT ADVERSE OFF-SITE WATER RESOURCE RELATED IMPACTS WILL NOT BE CAUSED BY THE COMPLETED PERMIT ACTIVITY. IT IS ALSO THE RESPONSIBILITY OF THE PERMITTEE TO INSURE THAT ADVERSE OFF-SITE WATER RESOURCE RELATED IMPACTS DO NOT OCCUR DURING CONSTRUCTION.

12. PRIOR TO DEWATERING, PLANS SHALL BE SUBMITTED TO THE DISTRICT FOR APPROVAL. INFORMATION SHALL INCLUDE AS A MINIMUM: PUMP SIZES, LOCATIONS AND HOURS OF OPERATION FOR EACH PUMP. IF OFF-SITE DISCHARGE IS PROPOSED, OR OFF-SITE ADVERSE IMPACTS ARE EVIDENT, AN INDIVIDUAL WATER USE PERMIT MAY BE REQUIRED. THE PERMITTEE IS CAUTIONED THAT SEVERAL MONTHS MAY BE REQUIRED FOR CONSIDERATION OF THE WATER USE PERMIT APPLICATION.

SPECIAL CONDITIONS

1. MINIMUM BUILDING FLOOR ELEVATION 12.0 FEET NGVD.

2. MINIMUM ROAD CROWN ELEVATION 10.0 FEET NGVD.

3. DISCHARGE FACILITIES:

   DESCRIPTION: 1-15.5' WIDE WEIR WITH A CREST AT ELEVATION 8.0' NGVD AND 1-20 DEGREE V-NOTCH BLEEDER WITH AN INVERT AT ELEVATION 7.0' NGVD.

   RECEIVING WATER: IMPERIAL RIVER VIA AN EXISTING DITCH.

   CONTROL ELEVATION: 7.0 FEET NGVD.

4. THE PERMITTEE SHALL BE RESPONSIBLE FOR THE CORRECTION OF ANY WATER QUALITY, EROSION, OR SHOALING PROBLEMS THAT RESULT FROM THE CONSTRUCTION OR OPERATION OF THE SURFACE WATER MANAGEMENT SYSTEM.

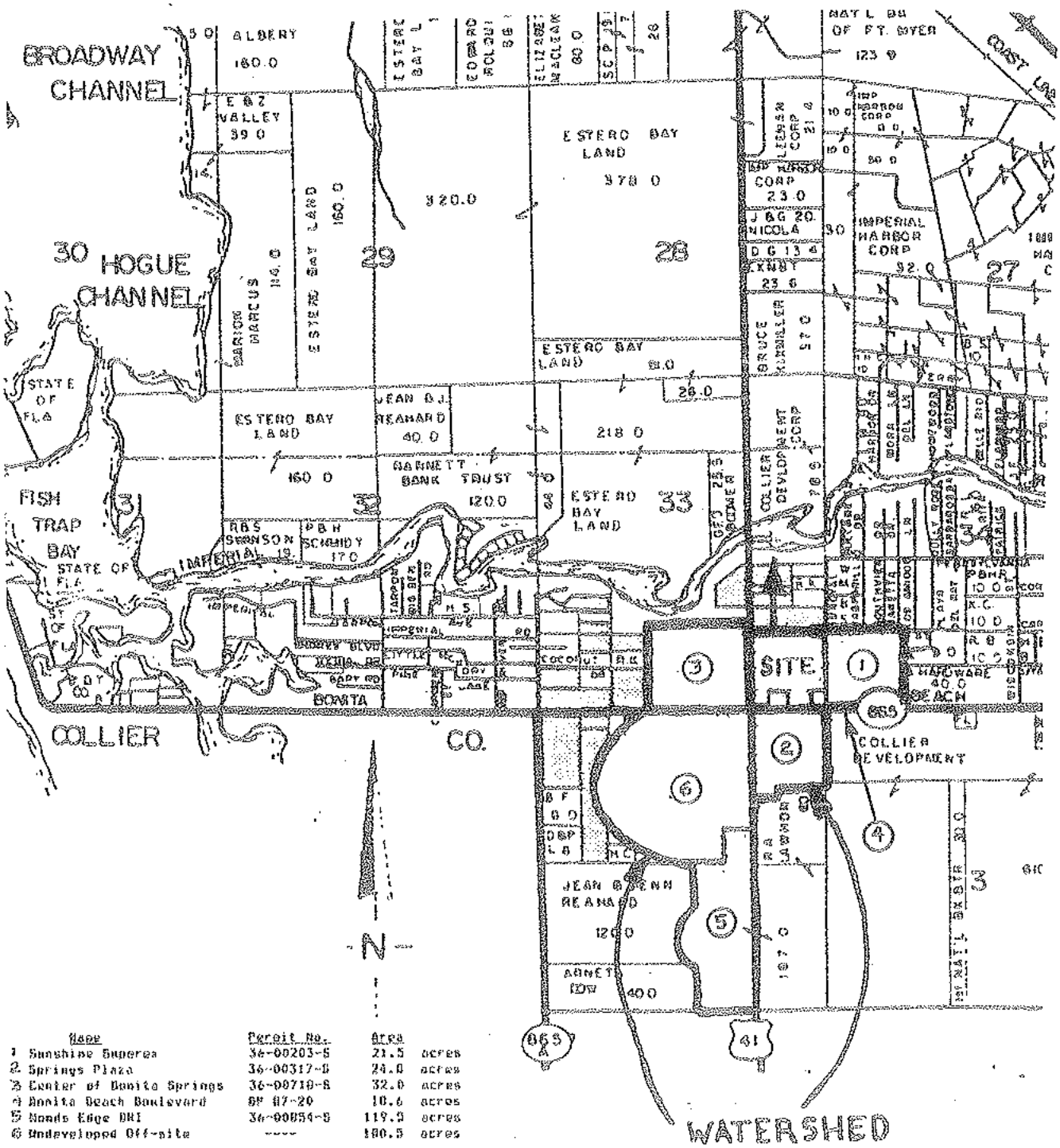
5. MEASURES SHALL BE TAKEN DURING CONSTRUCTION TO INSURE THAT SEDIMENTATION AND/OR TURBIDITY PROBLEMS ARE NOT CREATED IN THE RECEIVING WATER.

6. THE DISTRICT RESERVES THE RIGHT TO REQUIRE THAT WATER QUALITY TREATMENT METHODS BE INCORPORATED INTO THE DRAINAGE SYSTEM IF SUCH MEASURES ARE SHOWN TO BE NECESSARY.

7. OPERATION OF THE SURFACE WATER MANAGEMENT SYSTEM SHALL BE THE RESPONSIBILITY OF A PROPERTY OWNERS ASSOCIATION.

8. PRIOR TO THE INITIATION OF ANY WITHDRAWAL OF WATER (IRRIGATION, DEWATERING, PUBLIC WATER SUPPLY, ETC.), IT WILL BE NECESSARY TO APPLY FOR A WATER USE PERMIT. THE PERMITTEE IS CAUTIONED THAT A MINIMUM OF 90 DAYS IS REQUIRED FOR CONSIDERATION OF THE WATER USE PERMIT APPLICATION. THE PERMITTEE IS CAUTIONED THAT THE ISSUANCE OF A SURFACE WATER MANAGEMENT PERMIT SHALL NOT BE CONSTRUED TO BE A GUARANTEE THAT WATER WILL BE AVAILABLE.

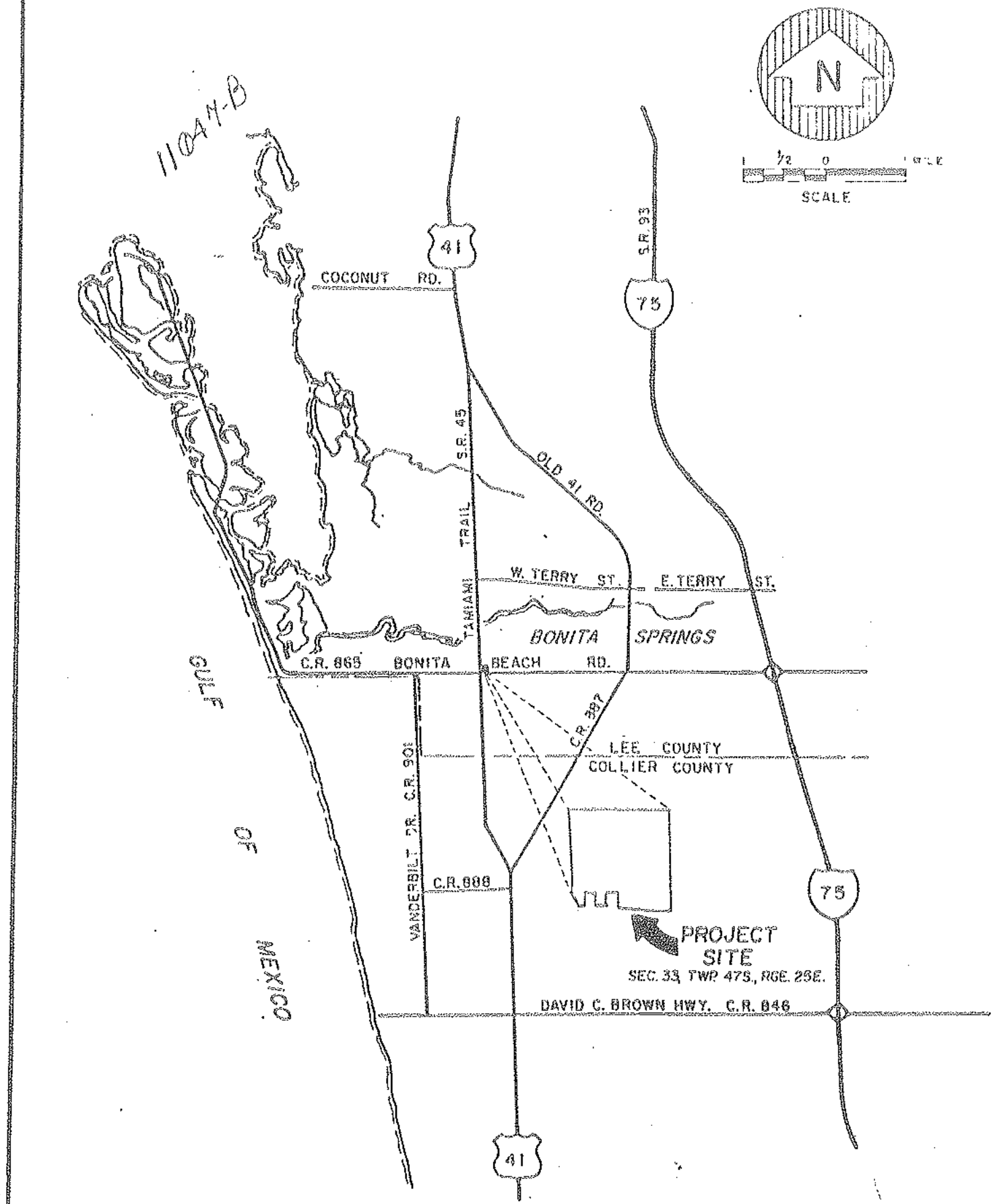
9. PRIOR TO THE COMMENCEMENT OF CONSTRUCTION OF FUTURE PHASES, PAVING, GRADING, AND DRAINAGE PLANS SHALL BE SUBMITTED TO THE DISTRICT FOR REVIEW AND APPROVAL. EACH COMMERCIAL TRACT SHALL PROVIDE ONE HALF INCH OF DRY PRETREATMENT AND SHALL NOT EXCEED 85 PERCENT OF IMPERVIOUS AREA WITHOUT PROVIDING ADDITIONAL WATER MANAGEMENT TO COMPENSATE.



Name	Permit No.	Area
1 Sunshine Squares	36-00203-S	21.5 acres
2 Springs Plaza	36-00317-S	24.0 acres
3 Center of Bonita Springs	36-00710-S	32.0 acres
4 Bonita Beach Boulevard	BP #7-20	10.6 acres
5 Woods Edge DRI	36-00054-S	119.9 acres
6 Undeveloped Off-site	-----	180.5 acres

LOCATION MAP

EXHIBIT 2



LOCATION MAP

EXHIBIT

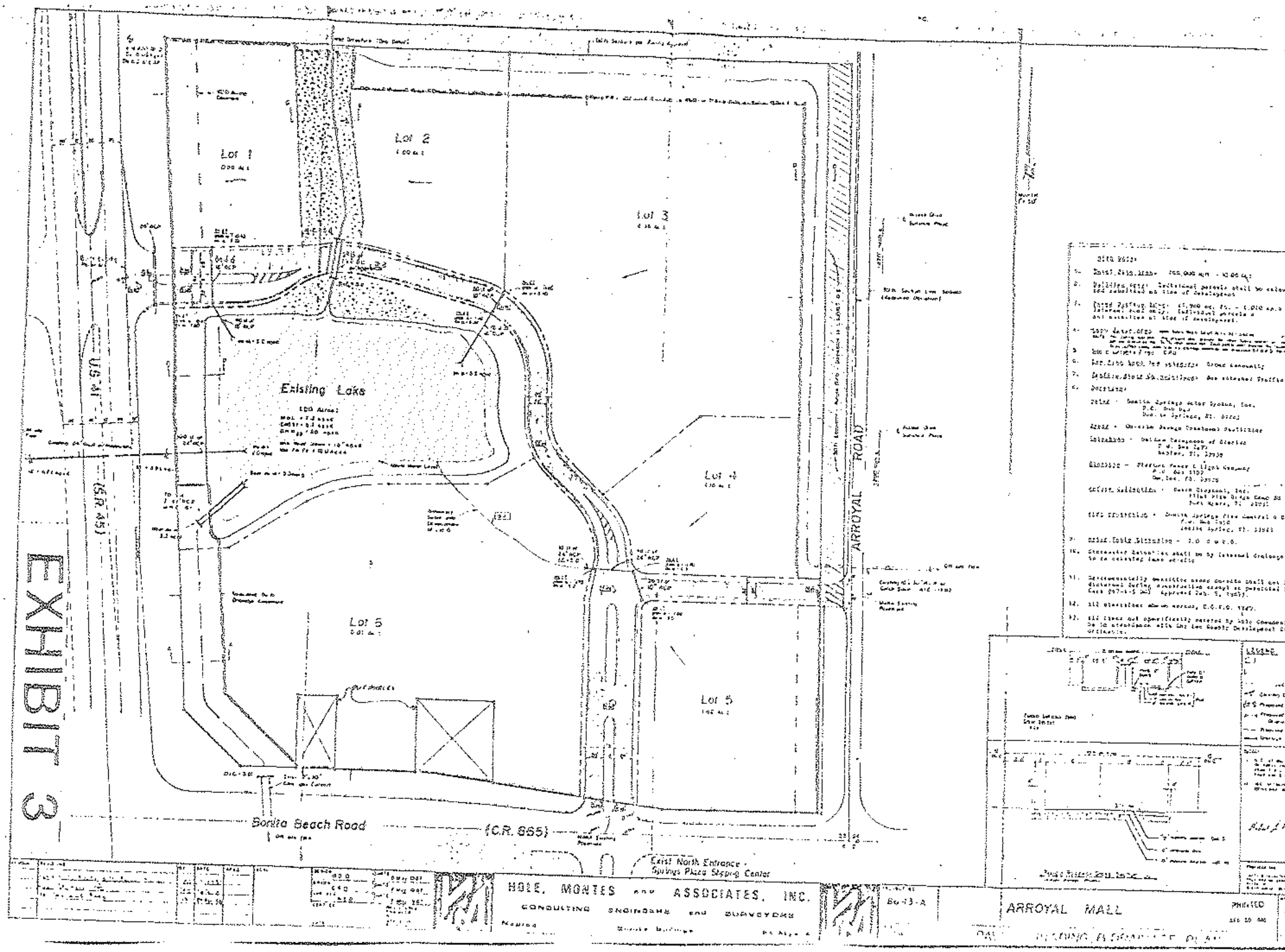
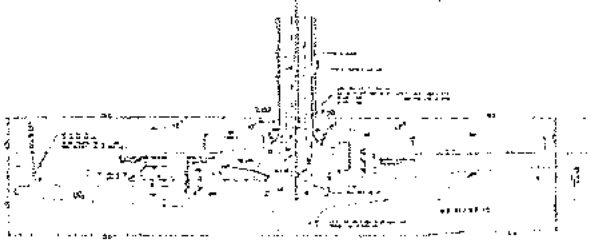
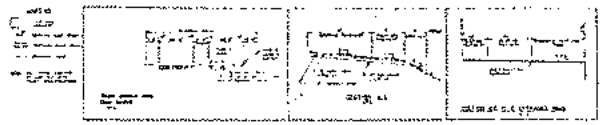
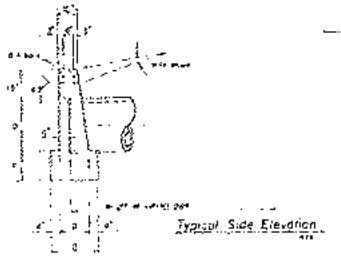


EXHIBIT 3
Lot 1
Lot 2
Lot 3
Lot 4
Lot 5
Lot 5
Existing Lakes
ARROYAL ROAD
Bonita Beach Road (C.R. 865)
US 41 (SR 45)
Exist North Entrance - Bonita Plaza Shopping Center
HOLE, MONTES and ASSOCIATES, INC.
CONSULTING ENGINEERS AND SURVEYORS
ARROYAL MALL

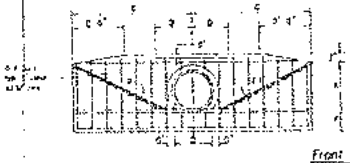
EXHIBIT A



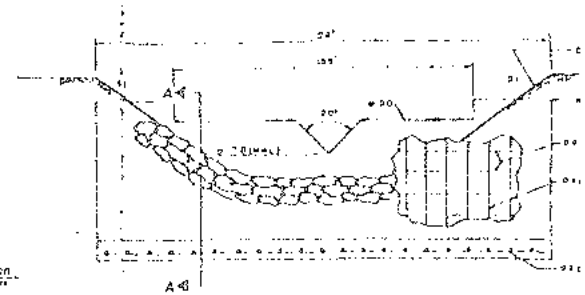




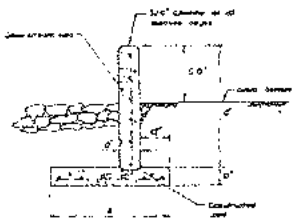
Typical Side Elevation



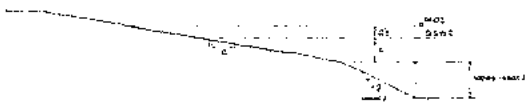
Front Elevation - Single Pipe



Weir Structure



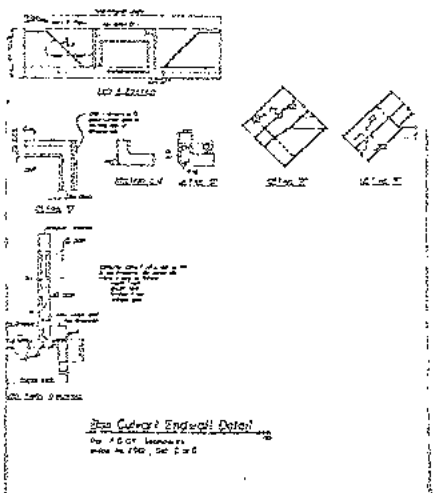
Section A-A - Weir Structure



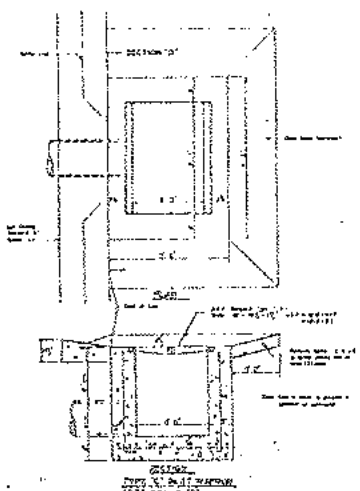
Typical Lake Section

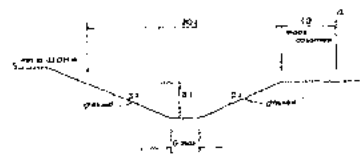
Standard Headwall Structure :

D (pipe size)	A	B	C	E	F	G
12"	1'-0"	1'-0"	0'-9"	1'-10"	1'-2"	0'-8"
18"	2'-0"	1'-0"	0'-9"	1'-10"	1'-2"	0'-8"
24"	2'-6"	1'-0"	0'-9"	1'-10"	1'-2"	0'-8"
30"	3'-0"	1'-6"	0'-9"	2'-1"	1'-4"	0'-9"
36"	3'-6"	1'-6"	0'-9"	2'-1"	1'-4"	0'-9"
42"	4'-0"	1'-6"	0'-9"	2'-1"	1'-4"	0'-9"
48"	4'-6"	2'-0"	0'-9"	2'-6"	1'-6"	0'-9"
54"	5'-0"	2'-0"	0'-9"	2'-6"	1'-6"	0'-9"

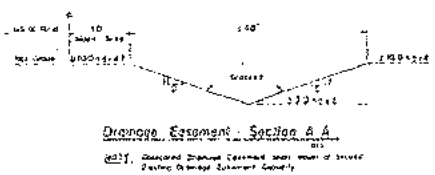


Box Culvert Endwall Detail



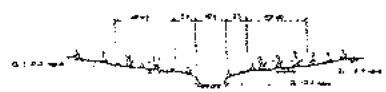


Perimeter Swale - Section D-D



Drainage Easement - Section A-A

Section B-B



Preserve Area - Section C-C

HOLE, MONTES and ASSOCIATES, INC.
CONSULTING ENGINEERS and SURVEYORS
Naples Golden Gate Ft. Myers

PROJECT NO.	86-63-A
	ARROYAL MALL
	DRAINAGE DETAILS
	PRINTED

STAFF REPORT DISTRIBUTION LIST

PROJECT Arroyal Mall APPLICATION NUMBER 11047-B

INTERNAL DISTRIBUTION

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K. Dickson
C. Drew
X M. Johnson
X V. Katilius
X S. Lamb
J. Mang
X C. McCray
P. Millar
X J. Morgan
X C. Padera
X P. Rhoads
H. Schloss
X J. Shaw
M. Slayton
X D. Slyfield
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X D. Unsell
P. Walker
T. Waterhouse
J. Wodraska
X E. Yaun
X Ft. Myers
X Inspection
Kissimmee
X Office of Counsel
X Permit File

GOVERNING BOARD MEMBERS

X Mr. Oscar M. Corbin
Mr. James F. Garner
Mr. Doran A. Jason
Mr. Arsenio Milian
Mr. Nathaniel P. Reed
Ms. Nancy H. Roen
Mr. Fritz Stein
Mr. Mike Stout
Mr. J.D. York

EXTERNAL DISTRIBUTION

X Applicant:
Captain Investments, Inc.
X Applicant's Consultant:
Hole, Montes & Associates, Inc.
X Engineer, County of:
Lee
Engineer, City of:

Local Drainage District:

DEPT. OF ENVIRONMENTAL REGULATION

X Ft. Myers
Orlando
Port St. Lucie
Tallahassee
West Palm Beach

BUILDING AND ZONING

Boca Raton
Boynton Beach
Royal Palm Beach
Tequesta
West Palm Beach

COUNTY

Broward -Director, Water Mgmt. Div.
-BCEQCB
Collier -Agricultural Agent
Dade -DERM
X Lee -Long Range Planning
X -Mosquito Control
X -E.P.S.
Martin -Attorney
-Board of County Commissioners
-Community Development Director
Palm Beach -Building Dept.
-School Brd., Plant Planning
Polk -Water Resources Dept.

OTHER

Fred Vidzes, Big Cypress Basin
Kissimmee River Coordinating Council

EXHIBIT 5

APPENDIX G

Cultural Resources Analysis

CULTURAL RESOURCE ASSESSMENT SURVEY
PROJECT DEVELOPMENT AND ENVIRONMENT (PD&E) STUDY

US 41 AT CR 865 (BONITA BEACH ROAD) INTERSECTION IMPROVEMENT
LEE COUNTY, FLORIDA

Financial Project ID No.: 444321-1-22-01
ETDM No.: 6291

Florida Department of Transportation
District One
801 North Broadway Avenue
Bartow, Florida 33830

The environmental review, consultation, and other actions required by applicable federal environmental laws for this project are being, or have been, carried out by FDOT pursuant to 23 U.S.C. § 327 and a Memorandum of Understanding dated May 26, 2022, and executed by FHWA and FDOT.

October 2023

CULTURAL RESOURCE ASSESSMENT SURVEY
PROJECT DEVELOPMENT AND ENVIRONMENT (PD&E) STUDY

US 41 AT BONITA BEACH ROAD
LEE COUNTY, FLORIDA

Financial Project ID No.: 444321-1-22-01
ETDM No.: 6291

Prepared for:

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October 2023

EXECUTIVE SUMMARY

The Florida Department of Transportation (FDOT), District One, is conducting a Project Development and Environment (PD&E) Study for US 41 at County Road (CR) 865 (Bonita Beach Road), in the City of Bonita Springs, Florida. The study area limits extend along US 41 from Foley Road to just south of the Imperial River bridge, a distance of approximately 0.9 miles. Additionally, the study area extends along CR 865 (Bonita Beach Road) from Windsor Road to Spanish Wells Boulevard, a distance of approximately 0.8 miles. The PD&E study provides information from which FDOT District One can evaluate capacity, safety, and multi-modal improvements at the US 41 and CR 865 (Bonita Beach Road) intersection. The project was evaluated through FDOT's Efficient Transportation Decision Making (ETDM) process as project No. 6291. CR 865 will be referred to as Bonita Beach Road throughout the remainder of this report. This is a federally funded project.

The purpose of this project is to address the deficient operational capacity of the US 41 and Bonita Beach Road intersection to relieve existing congestion and accommodate projected future traffic demand. The proposed improvements will modify the signalized configuration of the US 41 and Bonita Beach Road intersection to be a partial displaced left turn (PDLT), with the northbound and southbound left turn movements to crossover and be located outside of the opposing traffic flow. To accommodate the partial displaced left turn configuration and facilitate the relocation of northbound and southbound turning vehicles, two new signalized "crossover" intersections will be added along US 41. The southbound and eastbound left turn movements are proposed to have three lanes each, and the eastbound and westbound right turn movements are proposed to have two lanes each. Other improvements include a six-foot (ft) sidewalk, a 12-ft shared-use path, and signalized marked crosswalks.

In addition, the City of Bonita Springs is designing and building a two-lane quadrant roadway connecting Bonita Beach Road at Windsor Road to US 41 at the Center of Bonita Springs. This Northwest Quadrant Roadway is currently in design by the City and anticipated to be built ahead of the US 41 and Bonita Beach Road intersection improvements. The proposed improvements of the Northwest Quadrant Roadway as part of this PD&E Study includes the US 41 and the Center of Bonita Springs intersection to be changed from a standard signalized intersection to a "thru-cut" intersection. A thru-cut intersection restricts through movements from the minor street typically due to operational and/or geometric conditions. As such, the west leg is being widened from two lanes to five lanes (four eastbound approach lanes and one westbound receiving lane) and the east leg is being widened from two lanes to four lanes (two westbound approach lanes and two eastbound receiving lanes). This creates skew issues for any east/west through movements and creates operational constraints that are alleviated by the thru-cut intersection configuration. Tying into the new east leg is a Northeast Quadrant Roadway proposed between US 41 and Arroyal Road, northeast of the US 41 and Bonita Beach Road intersection. This will be a new three-lane roadway with two lanes eastbound and one lane westbound (Kittelson 2023a). See **Appendix A** for the partial displaced left turn alternative plan board.

The purpose of the Cultural Resource Assessment Survey (CRAS) was to locate and identify any archaeological sites and historic resources within the project area of potential effect (APE) and to assess their significance in terms of eligibility for listing in the National Register of Historic Places (NRHP). As defined in *36 Code of Federal Regulations [CFR] Part § 800.16(d)*, the APE is the "geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist." Based on the project type and location of the proposed work, the archaeological APE is limited to the footprint of construction. The historical/architectural APE included the footprint of construction as well as resources within

immediately adjacent parcels where proposed road widening will occur and new roadways are expected to be constructed. The archaeological and historical field surveys were completed in September 2023.

This CRAS was initiated in consideration of Section 106 of the *National Historic Preservation Act* of 1966, as amended by Public Law 89-665; the *Archaeological and Historic Preservation Act*, as amended by Public Law 93-291; Executive Order 11593; and Chapter 267, *Florida Statutes (FS)*. All work was carried out in conformity with Part 2, Chapter 8 ("Archaeological and Historical Resources") of the Florida Department of Transportation's *PD&E Manual* (FDOT 2020), and the Florida Division of Historical Resources' (FDHR) standards contained in the *Cultural Resource Management Standards and Operational Manual* (FDHR 2003), as well as with the provisions contained in the Chapter 1A-46, *Florida Administrative Code* (*FAC*). Principal Investigators meet the *Secretary of the Interior's Professional Qualification Standards* (48 FR 44716) for archaeology, history, architecture, architectural history, or historic architecture.

Archaeological background research and a review of the Florida Master Site File (FMSF) indicated that no archaeological sites are recorded within or adjacent to the APE but five sites are recorded within one mile. These consisted of various types of mounds, only one of which has been evaluated by the State Historic Preservation Officer (SHPO). A review of relevant site locational information for environmentally similar areas within Lee County and the surrounding region indicated that the APE was considered to have a low to moderate potential for archaeological sites although the ETDM report 6291 indicated a minimal impact to cultural resources. As a result of field investigation, including the excavation of 35 shovel tests, no archaeological sites were discovered.

Historic background research, including a review of the FMSF and the NRHP databases, indicated that two historic resources (8LL01426 and 8LL02543) were previously recorded within the APE. The circa (ca.) 1920 Frame Vernacular style building, located at 27750 Arroyal Road, was evaluated as ineligible for listing in the NRHP by the SHPO in 2001. Following the development of an enlarged pond site, the building was demolished and documented as such within the FMSF. Similarly, the Angler's Paradise Clubhouse (8LL02543), a ca. 1958 Masonry Vernacular style building, located at 27711 Windsor Road, was not evaluated by the SHPO for NRHP eligibility. In 2022 the FMSF was notified that the building was no longer extant. A review of relevant historic United States Geological Survey (USGS) quadrangle maps, historic aerial photographs, and the Lee County property appraiser's website data revealed the potential for five new historic resources 45 years of age or older (constructed in 1978 or earlier) within the APE (Caldwell 2023).

Historical/architectural field survey resulted in the identification and evaluation of five historic resources (8LL02983, 8LL02984, 8LL02985, 8LL02986, and 8LL02987) within the APE. These include three buildings (8LL02984, 8LL02985, and 8LL02986), constructed between ca. 1945 and 1975, one culvert (8LL02983), and one linear resource (8LL02987). The buildings consist of two Commercial style buildings (8LL02984 and 8LL02985) and one Masonry Vernacular style building (8LL02986) that have been altered, lack sufficient architectural features, and are not significant embodiments of a type, period, or method of construction. The culvert (8LL02986) was constructed in ca. 1975 and is a typical example of a common post-1945 concrete bridge/culvert found throughout Florida. The linear resource is an unnamed drainage ditch (8LL02987) that is a common example of a drainage canal found throughout Lee County and Florida and does not possess any unique engineering features. Background research did not reveal any historic associations with significant persons and/or events. Thus, these five historic resources do not appear eligible for listing in the NRHP, either individually or as a part of a historic district.

Based on the results of the background research and field investigations, no archaeological sites or historic resources that are listed, determined eligible, or that appear potentially eligible for listing in

the NRHP were located within the APE. Therefore, it is the professional opinion of ACI that the proposed undertaking will result in no historic properties affected.

Photo 5.8. Unnamed Drainage Canal (8LL02987), looking south.

8LL02987: The Unnamed Drainage Canal is located within Section 33 of Township 47 South, Range 25 East and Section 4 of Township 48S, Range 25 East (USGS 1958) (**Photo 5.8**). The segment is approximately 0.25 miles long and spans from a retention pond in the northeast quadrant of the US 41 and Bonita Beach Road intersection, under Bonita Beach Road into the southeast quadrant, and under US 41 into the southwest quadrant. The Unnamed Drainage Canal was constructed in ca. 1975 during the construction of the Bonita Bypass (US 41) which was built upon a segment of undeveloped wetlands in this location (FDOT 1975). At the widest point the canal is approximately 38 ft wide. The shallow earthen banking is covered with grass and landscaped. Overall, the linear resource is a common example of a drainage canal found throughout Lee County and Florida as a whole, lacks unique design and engineering features, and background research did not reveal any historic associations with significant persons and/or events. As a result, 8LL02987 does not appear eligible for listing in the NRHP, either individually or as part of a historic district.

5.3 Conclusions

Given the results of background research and field survey, including the excavation of 35 shovel tests, no prehistoric or historic archaeological sites were discovered. As a result of the historical/architectural field survey, five historic resources (8LL02983, 8LL02984, 8LL02985, 8LL02986, 8LL02987) were newly identified, recorded, and evaluated within the APE. Overall, the newly identified historic resources have been altered, lack sufficient architectural or engineering features, and are not significant embodiments of a type, period, or method of construction. The culvert is a typical example of a common Post-1945 concrete bridge found throughout Florida and the linear resource is a common example of a drainage canal found throughout Lee County and Florida. Thus, the resources do not appear eligible for listing in the NRHP, either individually or as a part of a historic district. Based on the results of the background research and field investigations, no archaeological sites or historic resources that are listed, determined eligible, or that appear potentially eligible for listing in the NRHP were located within the APE. Therefore, it is the professional opinion of ACI that the proposed undertaking will result in no historic properties affected.

APPENDIX H

Natural Resources Evaluation Report

NATURAL RESOURCES EVALUATION

Florida Department of Transportation

District One

US 41 Intersection Improvement Project Development and Environment (PD&E) Study

At CR 865 (Bonita Beach Road)

Lee County, Florida

Financial Management Number: 444321-1-22-01

ETDM Number: 6291

Date: October 2023

The environmental review, consultation, and other actions required by applicable federal environmental laws for this project are being, or have been, carried out by the Florida Department of Transportation (FDOT) pursuant to 23 U.S.C. § 327 and a Memorandum of Understanding dated May 26, 2022, and executed by the Federal Highway Administration and FDOT.

Table 3-1: Protected Species with Potential to Occur in the US 41 Study Area

Scientific Name	Common Name	USFWS	FWC	FDACS	Potential Occurrence
Birds					
Aphelocoma coerulescens	Florida scrub-jay	T	T		Low
Athene cunicularia floridana	Florida burrowing owl		T		Low
Calidris canutus rufa	Rufa Red Knot	T	T		Low
Egretta caerulea	Little blue heron		T		Observed
Egretta rufescens	Reddish egret		T		Moderate
Egretta tricolor	Tricolored heron		T		Observed
Grus canadensis	Florida sandhill crane		T		Moderate
Haliaeetus leucocephalus	Bald eagle	BGEMA/MBTA	M		Observed
Mycteria americana	Wood stork	T	T		High
Laterallus jamaicensis jamaicensis	Eastern black rail	T	T		Low
Platalea ajaja	Roseate Spoonbill		T		Moderate
Sternula antillarum	Least tern		T		Low
Mammals					
Eumops floridanus	Florida bonneted bat	E	E		Moderate
Perimyotis subflavus	Tricolored bat	C			Moderate
Puma concolor coryi	Florida Panther	E	E		Low
Sciurus niger avicennia	Big Cypress fox squirrel		T		Low
Trichechus manatus	West Indian manatee	T	T		No
Ursus americanus floridanus	Florida black bear		M		High
Reptiles					
Crocodylus acutus	American crocodile	T	T		No
Drymarchon couperi	Eastern indigo snake	T	T		Moderate
Gopherus polyphemus	Gopher tortoise		T		Observed
Pituophis melanoleucus mugitus	Florida pine snake		T		Moderate
Plants					
Andropogon arctatus	Pinewoods bluestem			T	Low
Calopogon multiflorus	Many-flowered grass-pink			T	Low
Chamaesyce cumulicola	Sand-dune spurge			E	Low
Deeringothamnus pulchellus	Beautiful pawpaw	E			Low
Harrisia aboriginum	Aboriginal prickly-apple	E			Low
Lechea cernua	Nodding pinweed			T	Low
Lechea divaricata	Pine pinweed			E	Low
Linum carteri var. smallii	Small's flax			E	Low
Nemastylis floridana	Celestial lily			E	Low
Nolina atopocarpa	Florida beargrass			T	Low
Pteroglossaspis ecristata	Giant orchid			T	Low
Stylisma abdita	Scrub stylisma			E	Low

E = Endangered **T** = Threatened **C** = Candidate **M** = Managed **T/S** = Threatened due to Similarity of Appearance
BGEMA = Bald and Golden Eagle Protection Act **MBTA** = Migratory Bird Treaty Act
FDACS = Florida Department of Agriculture and Consumer Services
FWC = Florida Fish and Wildlife Conservation Commission
USFWS = United States Fish and Wildlife Service

Figure 3-1: Protected Species and Habitat Map

Figure 4-1: Wetlands and Other Surface Waters Map

Table 4-1: Other Surface Waters in the US 41 Study Area

Surface Water ID	FLUCFCS Classification	NWI Classification	Description
WL 1	630	PFO4/1A	Wetland Forested Mixed
WL 2	617	PFO3/2C	Mixed Wetland Hardwoods
WL 3	612/625	PSS4A, PFO4A, PSS1/EM1R, E2SS3N	Mangrove Swamps/Hyric Pine Flatwoods
WL 4	612	E2SS3N, E2EM1P	Mangrove Swamps
SW 1	510	N/A	Streams and Waterways
SW 2	510	N/A	Streams and Waterways
SW 3	510	PUBHx	Streams and Waterways
SW 4	510	N/A	Streams and Waterways
SW 5	530	PUBHx	Reservoirs
SW 6	530	PUBHx	Reservoirs
SW 7	510	N/A	Streams and Waterways
SW 8	510	N/A	Streams and Waterways
SW 9	530	N/A	Reservoirs
SW 10	510	N/A	Streams and Waterways

4.3.1 Mangrove Swamps

FLUCFCS: 612

NWI: PSS4A, PFO4A, PSS1/EM1R, E2SS3N, E2EM1P

Wetlands: WL 3, WL 4

Mangrove swamps are communities of coastal hardwoods dominated by mangroves. These areas are found at the northern terminus of the project on both the east and west sides of US 41. Species observed in these communities include red mangrove (*Laguncularia mangle*), black mangrove (*Avicennia germinans*), white mangrove (*Laguncularia racemosa*), Brazilian pepper (*Schinus terebinthifolia*), cabbage palm (*Sabal palmetto*), and salt bush (*Baccharis halimifolia*). The proposed project will have no impacts to WL 3 and WL 4.

4.3.2 Mixed Wetland Hardwoods

FLUCFCS: 617

NWI: PFO3/2C

Wetlands: WL 2

Mixed wetland hardwood habitat is located in the northeastern quadrant of the intersection between US 41 and Bonita Beach Road, north of the proposed pond site. This habitat consists of

hardwood species with cabbage palm, slash pine (*Pinus elliotti*), Australian pine (*Casuarina equisetifolia*), and Brazilian pepper encroachment. The proposed project will have no impacts to WL 2.

4.3.3 Hydric Pine Flatwoods

FLUCFCS: 625

NWI: PSS4A, PFO4A

WL 3

Hydric Pine Flatwoods are located at the northern terminus of the project, east of US 41. This system is associated with the Imperial River and is part of WL 3. This canopy consists of slash pine and cabbage palm. Understory and groundcover species include Brazilian pepper, elderberry (*Sambucus nigra*), Carolina willow (*Salix caroliniana*), Peruvian primrose willow (*Ludwigia peruviana*), wax myrtle (*Myrica cerifera*), rush Fuirena (*Fuirena scirpoidea*), and swamp fern. No impacts to WL are anticipated as a result of the proposed project.

4.3.4 Wetland Forested Mixed

FLUCFCS: 630

NWI: PFO4/1A

Wetlands: WL 1

Wetland Forested Mixed wetlands contain communities in which neither hardwoods nor conifers achieve 66 percent canopy composition. WL 1 occurs east of US 41, and is adjacent to the western edge of the existing FDOT pond. Observed canopy vegetation includes slash pine, cabbage palm, melaleuca (*Melaleuca quinquenervia*), laurel oak (*Quercus laurifolia*), and Australian pine, earleaf acacia (*Acacia auriculiformis*). Understory and groundcover species include Brazilian pepper, Carolina willow, Peruvian primrose willow, and swamp fern (*Blechnum serrulatum*). Direct impacts to WL 1 are 3.21 acres.

4.3.5 Streams and Waterways

FLUCFCS: 510

NWI: PUBHx

Surface Waters: SW 1, SW 2, SW 3, SW 4, SW 7, SW 8, SW 10

Streams and waterways include rivers, creeks, canals, and other linear bodies of water. The surface waters within the study area consist of canals and roadside ditches. These ditches generally contain standing water during the rainy season and are shallow or dry during the dry

season. Many of these systems support hydrophytic vegetation. Typical vegetation observed in these surface waters includes duck potato (*Sagittaria latifolia*), pickerelweed (*Pontederia cordata*), frog's bit (*Limnobium spongia*), and Carolina willow (*Salix caroliniana*). The northern extent of SW 8 is wetland cut. Direct impacts resulting in 0.2 acres of impacts to the wetland cut portion of this ditch were included in the functional loss detailed in **Table 4-3** below.

4.3.6 Reservoirs

FLUCFCS 530

NWI: PUBHx N/A

Surface Waters: SW 5, SW 6, SW 9, SW 11

Reservoirs are artificial impoundments of water used for irrigation, flood control, and municipal and rural water supplies. SW 5 and SW 6 are located on either side of US 41 north of the intersection between US 41 and Bonita Beach Road. SW 9 is located within one of the proposed pond sites. These surface waters are permitted stormwater ponds. SW 9 will be expanded by the proposed project.

4.4 Wetland and Surface Water Impacts

Data collected during the literature review, previous permit history, and field survey were used to evaluate the potential adverse direct and secondary impacts of the project to wetlands and the potential cumulative impacts to those wetlands and surface waters in the project limits. Practicable measures to avoid or minimize impacts to wetlands and surface waters were considered during the US 41 Study. Any unavoidable adverse impacts will be mitigated pursuant to Section 373.4137, F.S., to satisfy all mitigation requirements of Part IV of Chapter 373, F.S., and U.S.C. §1344. **Table 4-2** details the proposed wetland and surface water impacts.

Table 4-2: Proposed Wetland and Other Surface Water Impacts

ID	FLUCFCS	Description	Type	Direct Impact (ac)
WL 1	630	Wetland Forested Mixed	Pond North	3.21
SW 1	510	Streams and Waterways	ROW	0.14
SW 3	510	Streams and Waterways	ROW	0.14
SW 4	510	Streams and Waterways	ROW	0.15
SW 6	530	Reservoirs	ROW	0.07
SW 7	510	Streams and Waterways	ROW	0.10
SW 8	510	Streams and Waterways	ROW	0.02
	510	Streams and Waterways (wetland cut ditch)	Pond North	0.02
SW 11	530	Reservoirs	ROW	0.16
			Total Proposed Impacts	4.01 acres
			Total Impacts Included in UMAM	3.23 acres

4.4.1 Direct Impacts

The Preferred Alternative will result in 3.21 acres of direct impacts to wetlands and 0.81 acres of direct impacts to other surface waters, including permitted stormwater ponds and upland cut roadside ditches. Final direct impacts will be determined during design and permitting and will be assessed accordingly.

4.4.2 Indirect Impacts

No secondary impacts are anticipated as a result of the proposed project.

4.4.3 Cumulative Impacts

Cumulative impacts can result from incremental but collectively significant impacts within the basin over time. In order to provide reasonable assurances that the project will not cause unacceptable cumulative impacts, mitigation will be provided from within the same drainage basin as the anticipated impacts or the project will utilize a regional mitigation plan pursuant to Section 373.4137, F.S.

4.5 Avoidance and Minimization

The project was designed to avoid and minimize impacts to wetlands, other surface waters, and protected species habitat to the greatest extent practicable. This was accomplished by utilizing the existing right-of-way and stormwater ponds when practicable. Complete avoidance of impacts was not feasible due to the nature of the intersection improvement project and the occurrence of wetland habitats immediately adjacent to the proposed project, including proposed pond sites.

4.6 Wetland Assessment

Wetlands and OSWs with potential to be affected by the proposed project were identified within the US 41 study area. The wetland assessment was conducted in accordance with the UMAM, as described in Chapter 62-345, F.A.C. The UMAM is the state-wide methodology for determining the functional value provided by wetlands and other surface waters and the amount of mitigation required to offset adverse impacts to those areas for regulatory permits. The impacted OSWs are considered upland cut components of the existing manmade drainage system; and therefore, these OSWs were not included in the wetland assessment as mitigation is not anticipated. The results of the UMAM assessment are provided in **Table 4-3**. UMAM summary sheets can be found in **Appendix I**. These values may be refined during the design and permitting phases of the project.

Table 4-3: Proposed Functional Loss

Wetland ID	Wetland Type	Impact Type	LLS	WE	CS	Impact Area (ac)	Functional Loss
WL 1	630	Forested	5	5	4	3.21	1.498
SW 8	510	Surface Water	3	3	3	0.02	0.006
					Total	3.23	1.504

LLS = Location and Landscape Support **WE** = Water Environment **CS** = Community Structure

4.7 Wetlands Finding

The Preferred Alternative was evaluated for impacts to wetlands in accordance with Executive Order (EO) 11990 and USDOT Order 5560.1A. The Preferred Alternative was designed to avoid impacts to wetlands and will be constructed almost entirely within the existing ROW. Due to the constraints of the corridor, unavoidable impacts associated with the location of the proposed North Pond, cannot be avoided. It has been determined that no practicable alternative to the proposed construction in wetlands exists. Any unavoidable impacts to wetlands will be mitigated to achieve no net loss of wetland function. Based upon the above considerations, it is determined that the proposed action includes all practicable measures to minimize harm to wetlands which may result from such use.

4.8 Conceptual Mitigation

Wetland impacts which will result from the construction of this project will be mitigated pursuant to Section 373.4137, F.S., to satisfy all mitigation requirements of Part IV of Chapter 373, F.S., and U.S.C. §1344. Compensatory mitigation for this project will be completed through the use of mitigation banks and any other mitigation options that satisfy state and federal requirements.

The study area is within the Estero Bay and West Collier regulatory basins. Freshwater forested credits are available from Corkscrew Regional Mitigation Bank and Little Pine Island Mitigation Bank to cover the anticipated mitigation credits needed for the proposed wetland impacts.

Section 5 Essential Fish Habitat

The National Marine Fisheries Service (NMFS) is the regulatory agency responsible for the nation's living marine resources and their habitats, including essential fish habitat (EFH). This authority is designated by the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA), as amended. The MSFCMA defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" (16 U.S.C. § 1802(10)].

6.3 Environmental Resource Permit

FDEP and Florida's five Water Management Districts implemented Chapter 62-330, F.A.C, Environmental Resource Permitting (ERP) to govern certain regulated activities, such as works in waters of the state, including wetlands, and construction of stormwater management systems. The proposed project is located within the jurisdiction of the SFWMD. The proposed project is expected to require an ERP for a stormwater management plan and impacts to wetlands and other surface waters.

6.4 Gopher Tortoise Relocation Permit

Gopher tortoises and their burrows are protected by Chapter 68A-27.003, F.A.C. A gopher tortoise relocation permit must be obtained from FWC before disturbing burrows and construction activities within 25 feet of a gopher tortoise burrow. The number of gopher tortoise burrows located within 25 feet of the project footprint will determine the type of gopher tortoise relocation permit that is needed. A 100% gopher tortoise survey will be completed during the design of the project to finalize the type of permit needed. Surveys, permitting, excavation, and relocation must be performed by an FWC Authorized Gopher Tortoise Agent.

Section 7 Conclusion

The proposed project avoids and minimizes impacts to wetlands, other surface waters, protected species, and their habitats to the greatest extent practicable. Based on existing information and both general and species-specific surveys, the Recommended Preferred Alternative will not jeopardize the continued existence of a protected species and/or result in the destruction or adverse modification of critical habitat (**Table 7-1**). However, additional coordination with wildlife agencies will be required during the design and permitting phase and additional wildlife surveys may be required prior to or during construction.

Table 7-1: Effect Determinations for Listed Species

Scientific Name	Common Name	Status	Effect Determination
Birds			
Aphelocoma coerulescens	Florida scrub-jay	FT	NO EFFECT
Athene cunicularia floridana	Florida burrowing owl	ST	NAEA
Calidris canutus rufa	Rufa Red Knot	FT	NO EFFECT
Egretta caerulea	Little blue heron	ST	NAEA
Egretta rufescens	Reddish egret	ST	NAEA
Egretta tricolor	Tricolored heron	ST	NAEA
Grus canadensis	Florida sandhill crane	ST	NAEA
Haliaeetus leucocephalus	Bald eagle	BGEMA/MBTA	--
Mycteria americana	Wood stork	FT	MANLAA
Laterallus jamaicensis jamaicensis	Eastern black rail	FT	MANLAA
Platalea ajaja	Roseate Spoonbill	ST	NAEA
Sternula antillarum	Least tern	ST	NAEA
Mammals			
Eumops floridanus	Florida bonneted bat	FE	TBD
Perimyotis subflavus	Tricolored bat	C	--
Puma concolor coryi	Florida panther	FE	NO EFFECT
Sciurus niger avicennia	Big Cypress fox squirrel	ST	NAEA
Trichechus manatus	West Indian manatee	FT	NO EFFECT
Ursus americanus floridanus	Florida black bear	M	--
Reptiles			
Crocodylus acutus	American crocodile	FT	NO EFFECT
Drymarchon couperi	Eastern indigo snake	FT	MANLAA
Gopherus polyphemus	Gopher tortoise	ST	NAEA
Pituophis melanoleucus mugitus	Florida pine snake	ST	NAEA
Plants			
Andropogon arctatus	Pinewoods bluestem	ST	NEA
Calopogon multiflorus	Many-flowered grass-pink	ST	NEA
Chamaesyce cumulicola	Sand-dune spurge	SE	NEA
Deeringothamnus pulchellus	Beautiful pawpaw	FE	NO EFFECT
Harrisia aboriginum	Aboriginal prickly-apple	FE	NO EFFECT
Lechea cernua	Nodding pinweed	ST	NEA
Lechea divaricata	Pine pinweed	SE	NEA
Linum carteri var. smallii	Small's flax	SE	NEA
Nemastylis floridana	Celestial lily	SE	NEA
Nolina atopocarpa	Florida beargrass	ST	NEA
Pteroglossaspis ecristata	Giant orchid	ST	NEA
Stylisma abdita	Scrub stylisma	SE	NEA

MANLAA = May Affect, Not Likely to Adversely Affect **NAEA** = No Adverse Effect Anticipated **NEA** = No Effect Anticipated
FE = Federally Endangered **FT** = Federally Threatened
SE = State Endangered **ST** =State Threatened **C** = Candidate **M** = Managed
BGEMA = Bald and Golden Eagle Protection Act **MBTA** = Migratory Bird Treaty Act

The proposed project will directly impact approximately 3.21 acres of wetlands, resulting in 1.504 functional loss units. During the design and permitting phase, final impacts will be calculated along with the appropriate mitigation to satisfy the requirements of 33 U.S.C. § 1344 and Part IV of Chapter 373, F.S.

APPENDIX I

Contamination Screening Evaluation Report

Contamination Technical Memorandum

US 41 and Bonita Beach Road PD&E Study

FPID No.: 444321-1-22-01

ETDM No.: 6291

Lee County, Florida

October 2023

TABLE OF CONTENTS

1.0 Project Description

The Florida Department of Transportation (FDOT) District 1 is facilitating engineering services for drainage improvements that are part of the US 41 and Bonita Beach Road PD&E Study. This report supports potential stormwater retention sites identified for study in the Pond Siting Report. Roadway improvements along the mainline are not addressed in this report and will be provided under separate cover. Drainage improvements will include expanding the existing FDOT Stormwater Pond North drainage site by acquiring three west adjoining parcels owned by the City of Bonita Springs. Drainage improvements also include the construction of Pond West within the northwest quadrant of US 41 and Bonita Beach Road intersection. Two drainage alternatives: a swale option (Pond East Alternative 1) and an offsite pond option (Pond East Alternative 2) are also included in the drainage improvement efforts. In total, four ponds have been evaluated (existing pond north is not evaluated since it has already been constructed).

The purpose of this report is to support the design and engineering study by presenting the findings of a contamination screening evaluation. This report identifies and evaluates known or potential contamination sites within or adjacent to the ponds that may affect their construction. The report also presents recommendations for supplemental assessment, when necessary. The study was performed in general accordance with Part 2, Chapter 20 of the FDOT Project Development and Environment (PD&E) Manual (July 1, 2020). The study area for the contamination screening was defined as each pond site and a search buffer that extends to ½ mile.

Based on the methodologies completed for this study, four drainage sites were evaluated and assigned risk ratings: 1 – High, 1 – Medium, 2 – Low, and 0 – No.

In accordance with the PD&E Manual, ponds rated Medium or High should be further evaluated through the completion of Level II testing. No further action is warranted for ponds that are assigned No or Low risk ratings.

2.0 Methodology

A contamination screening was conducted to identify contamination issues from properties or operations located within the study area. This evaluation consisted of the following tasks:

- Tierra drafted a Site Contamination Map (**Appendix A**) using data acquired by Environmental Data Management, Inc. (EDM) to illustrate the locations of the contamination sites with respect to the drainage sites.

- Aerial photographs were reviewed to develop a history of the previous land uses within the study area and to identify sites which may have historical uses that pose contamination concerns. Aerial photographs dated 1944, 1958, 1968, 1975, 1986, 1996, 2005, 2014, and 2020 were provided by EDM. Google Earth images dated 1999, 2003, 2006-2010, 2012-2014, 2016, 2017, and 2019-2023 were reviewed where data gaps were evident in the aerials provided by EDM. Relevant historical information is discussed in **Section 3.0**. Copies of the historical aerial photographs are presented in **Appendix B**.

- USGS topographic maps were reviewed to develop a history of the previous land uses within the study area and to identify sites which may have historical uses that pose contamination concerns. USGS topographic maps dated 1958, 1972, 1987, and 1991 were provided by EDM. Relevant historical information is discussed in **Section 3.0**. A copy of the historical topographic maps is included in **Appendix C**.

- An environmental database search using EDM was conducted on September 7, 2023, to identify sites, facilities, or listings within the study area associated with documented or suspected petroleum contamination or other hazardous materials. The EDM report is used as a preliminary screening tool to identify facilities that are registered with various county, state, and federal agencies. The regulatory review of federal and state environmental records utilizes an integrated geographic information system database. The database report provides geocoded and non-geocoded regulatory listings of interest that are identified within the study area. Each listing is located by address, facility identification number, and field verified where possible. All are reviewed for the potential of contamination to impact the project. The reviewed records include information compiled by the United States Environmental Protection Agency (EPA), the Florida Department of Environmental Protection (FDEP), and other various reporting programs. A complete list of all regulatory databases searched is included in the EDM report (**Appendix D)**. The facilities identified in the EDM report are discussed in **Section 3.0**. Each database was searched to a distance of ½ mile from the boundary of each drainage site.

- Supplemental regulatory research using the FDEP MapDirect, OCULUS, and STCM databases was performed to provide additional details about each site identified in EDM's report. Documents were reviewed to determine details such as groundwater depth and flow direction, storage tank contents, discharges, spills, contaminant concentrations, and plume locations (**Appendix E)**.

- Information found on the Lee County Property Appraiser database was reviewed for suspect contamination sites where other resources may not have provided ample information for a particular site; or to determine addresses, parcel boundaries, and other pertinent information.

- Assigned risk ratings for each contamination site after evaluating the findings produced by the previously mentioned methodologies. The rating system defined in the FDOT PD&E Manual is divided into four categories of risk which express the degree of concern for contamination problems. The four degrees of risk ratings are "No," "Low," "Medium," and "High" and are defined as follows:

  - No Risk Site: a review of available information on the property and a review of the conceptual or design plans indicates there is no potential contamination impact to the project. It is possible that contaminants have been handled on the property. However, findings indicate that contamination impacts are not expected.
  - Low Risk Site: a review of available information indicates that past or current activities on the property have an ongoing contamination issue; the site has a hazardous waste generator identification number, or the site stores, handles, or manufactures hazardous materials. However, based on the review of conceptual or design plans and/or findings from the screening process, it is not likely that there would be any contamination impacts to the project.
  - Medium Risk Site: after a review of conceptual or design plans and findings from a Level I evaluation, a potential contamination impact to the project has been identified. If there is insufficient information (such as regulatory records or site historical documents) to make a determination as to the potential for contamination impact, and there is reasonable suspicion that contamination may exist, the property should be rated at least as a "Medium." Properties used historically as gasoline stations and which have not been evaluated or assessed by regulatory agencies, sites with abandoned in place underground petroleum storage tanks, or currently operating gasoline stations should receive this Rating.
  - High Risk Site: after a review of all available information and conceptual or design plans, there is appropriate analytical data that shows contamination will substantially impact construction activities, have implications to right-of-way acquisition, or have other potential transfer of contamination related liability.

3.0 Project Impacts

Based on the research methodologies, risk ratings were assigned to four drainage sites. Table 1 provides risk ratings for each drainage site. The location of each contamination/drainage site is illustrated in **Appendix A**. Aerial photographs provided by EDM are available in **Appendix B**. Topographic maps provided by EDM are available in **Appendix C**. EDM's report is available in **Appendix D**. Supplemental files from the FDEP OCULUS database and Map Direct are available in **Appendix E**.

TABLE 1

Drainage Sites	Contaminants of Concern	Risk Rating	Comments
Pond West	Petroleum Hazardous materials	**Medium**	Aerial photographs (**Appendix B**) depicted Pond West as woods from 1944 to 1986. Development was depicted in 1996. Tuffy Tire & Auto Service was depicted from 1999 to 2023 within Pond West. Topographic maps (**Appendix C**) depicted Pond West as shaded green indicating "woods" from 1958 to 1972. A purple shaded rectangle within Pond West indicating "recent development" was depicted from 1987 to 1991. Two nearby facilities were identified as possible sources of contamination that could potentially impact the Pond West drainage site. **Tuffy Tire & Auto Service Center (Map ID 3) 27790 South Tamiami Trail, Bonita Springs, FL 34134:** Google Earth Aerial View dated 2023 identified this facility as an operational auto service center that offers alignment, exhaust, brake, and a/c services within the footprint of Pond West. This facility was not identified in EDM's report. One Aboveground Storage Tank (AST) was observed within proposed Pond West in Google Streetview Imagery dated 2019. The tank volume, and contents are unknown. AST's with a tank size of 550-gallons or more are required to be registered with the FDEP. The AST observed in the 2019 Google Earth Streetview appears to be in the range of 400 to 500-gallons in size. The AST is on a concrete pad and under an aluminum canopy. No rusting or indicators of contamination were observed in the 2019 Streetview image. Typically, auto repair facilities are Small Quantity Generators (SQGs) of hazardous waste (100-1,000 kg/month), and are considered a low risk. Seven hydraulic lifts were observed in the 2019 Streetview Imagery within Pond West. Given that the hydraulic lifts are installed within the ground, there is a possibility of encountering contamination during site demolition activities/removal of the hydraulic lifts. Other hazardous materials may be stored onsite in small quantities such as waste oil, brake fluids, and freon. **Bonita Boat Center (Map ID 4) 27760 South Tamiami Trail, Bonita Springs, FL 34134:** Google Earth Aerial View dated 2023, and Streetview Imagery dated 2019, identified this facility as an operational marine/boat dealer and service/repair center adjoining north of Pond West. This facility was not identified in EDM's report. No FDEP OCULUS regulatory files were found. No ASTs or possible fuel sources were observed at this facility. Contamination concerns are not anticipated for this facility. **Risk Rating:** Given the proposed pond site has operated as an auto repair shop with an AST and hydraulic lifts, this drainage site is assigned a risk rating of **Medium**.

TABLE 1			
Drainage Sites	**Contaminants of Concern**	**Risk Rating**	**Comments**
Pond North Expansion	Petroleum Hazardous materials	Low	Aerial photographs (**Appendix B**) depicted Pond North Expansion as woods from 1944 to 2023. One structure (**Advance Auto Parts Map ID 5**) was depicted within and adjoining the southwest corner of Pond North Expansion footprint from 1986 to 2023. Topographic maps (**Appendix C**) depicted Pond North Expansion as shaded green indicating "woods" and a solid blue line indicating "stream" from 1958 to 1991. One onsite facility was identified as a possible source of contamination that could impact the Pond North Expansion drainage site. **Advance Auto Parts (Map ID 5) 27791 South Tamiami Trail, Bonita Springs, FL 34134:** Google Earth Aerial View dated 2023 identified this facility as an operational auto parts store within and adjoining southwest of the Pond North Expansion footprint. This facility was not identified in EDM's report. Typically, retail auto parts stores are SQGs of hazardous waste (100-1,000 kg/month). These facilities store hazardous materials and petroleum products on impermeable surfaces such as concrete and are not used onsite. Therefore, auto parts facilities are typically considered a low risk. Google Earth Street View Imagery dated 2020 depicted this facility as an Advance Auto Parts retail store with no service bays and no petroleum storage tanks. Hazardous materials such as oil, brake fluids, and freon may be stored and sold onsite in small quantities. Contamination impacts are not anticipated at this facility. One offsite facility was identified as a possible source of contamination that could impact the Pond North Expansion drainage site. **Tuffy Tire & Auto Service Center (Map ID 3) 27790 South Tamiami Trail, Bonita Springs, FL 34134:** Google Earth Aerial View dated 2023 identified this facility as an operational auto service center that offers alignment, exhaust, brake, and air conditioning services. This facility was not identified in EDM's report. One AST was observed 440 feet adjacent southwest of Pond North Expansion in Google Streetview Imagery dated 2019. The tank volume, and contents are unknown. The AST is on a concrete pad and under an aluminum canopy. No rusting or indicators of contamination were observed in the 2019 Streetview image. No discharges were reported. Seven hydraulic lifts were observed 360 feet adjacent southwest in the 2019 Streetview Imagery. Other hazardous materials may be stored onsite in small quantities such as waste oil, brake fluids, and freon. However, given the separation distance of over 350 feet, contamination impacts associated with this facility are not anticipated. **Risk Rating**: Given the low risk of contamination concerns for the onsite facility (**Map ID 5**), this drainage site is assigned a risk rating of Low.

TABLE 1			
Drainage Sites	**Contaminants of Concern**	**Risk Rating**	**Comments**
Pond East (Alternative 1)	Petroleum	**High**	Aerial photographs (**Appendix B**) depicted Pond East (Alternative 1) as woods and grassy fields from 1944 to 1975. A single structure was depicted within the central area of Pond East (Alternative 1) in 1975. BP-Bonita-Oleum Corp (**Map ID 1**) retail gas station was depicted in 1986 within and adjoining southwest of Pond East (Alternative 1). **Map ID** 1 was not depicted from 1996 to 2023. The central and eastern portions of Pond East (Alternative 1) are depicted as woods from 1975 to 2023. Little to no changes were depicted from 1996 to 2023. Topographic maps (**Appendix C**) depicted Pond East (Alternative 1) as shaded beige indicating "grassy fields/developed" from 1958 to 1991. Purple shaded rectangles adjacent southwest of Pond east (Alternative 1) indicating "recent development" was depicted from 1987 to 1991. Two regulated nearby facilities were identified as possible sources for contamination that could impact Pond East (Alternative 1) drainage site. **BP-Bonita-Oleum Corp (Map ID 1) 9021 Bonita Beach Road, Bonita Springs, FL 33923-4213 Facility ID: 8520618:** EDM's report (**Appendix D**) identified this closed former retail gas station with eight former Underground Storage Tanks (USTs). Four 10,000-gallon (two unleaded gasoline, one leaded gasoline, and one diesel), three 10,152-gallon (one unleaded gasoline, one leaded gasoline, and one diesel), and one 12,000-gallon unleaded gasoline USTs previously existed at this facility. UST removal activities occurred in November 1988, and September 1994. One discharge was reported on November 17, 1994. FDEP OCULUS files (**Appendix E**) provided a Template Site Assessment Report dated January 2, 2018, stating this former facility was demolished in 1994. The former UST tank farm was located near the northeast corner of the property. A Discharge Reporting Form (DRF) was filed after elevated soil vapor readings were encountered during UST removal activities. A 1995 Site Closure Report indicated 400 tons of contaminated soil were removed from the facility for thermal treatment. Groundwater impacts were not included in the 1995 Site Closure Report. Groundwater sampling between January and March 1995 discovered exceedances in petroleum hydrocarbons and lead concentrations above their established Groundwater Cleanup Target Levels (GCTLs). Benzene was also detected above its established GCTLs in the deep well (MW-9D) which is screened from 19 to 24 feet below land surface (bls). No Remedial Action Plan (RAP) has been prepared at this facility. No other source removal activities have been reported at this site other than UST closure/removal activities. Funding was not available for this facility in 1996. No remediation activities occurred at this facility from 1996 to 2014. In 2015 funding was made available to discover the extent of the 1994 discharge. Site assessment activities resumed in 2016. Between January and November 2017, soil assessment activities occurred. Laboratory results depicted exceedances in petroleum hydrocarbons in soil borings collected between 0 and 5.5 feet bls. Between February and November 2017, eleven shallow monitoring wells (maximum depth at 12 feet bls), and three deep monitoring wells (maximum depths ranging from 25 to 30 feet bls) were installed. Laboratory results indicated exceedances in GCTLs for benzene, methyl-tert-butyl-ether (MBTE), 1-methylnaphthalene, and 2-methylnaphthalene. Laboratory results also indicated exceedances above their established Natural Attenuation Default Source Concentrations (NADCs) for naphthalene, toluene, ethylbenzene, total xylenes, and Total Recoverable Hydrocarbons (TRPHs). No exceedances in GCTLs, or NADCs were detected in any of the deeper monitoring wells. A shallow dissolved hydrocarbon map dated February 13 and December 1, 2017, depicted the extent of contamination within and adjoining southeast of the Pond East (Alternative 1). Groundwater flow was depicted cross gradient from the Pond East (Alternative 1) flowing west on February 13, 2017. Groundwater flow was depicted flowing northwest toward Pond East (Alternative 1) on August 14, 2017. Groundwater flow was also depicted flowing north towards Pond East (Alternative 1). Due to NADC exceedances in the groundwater, remediation by natural attenuation was not recommended. A Sarasota County Partial Task 1 Site Specific Health & Safety Plan letter dated August 21, 2023, indicated that the FDEP was satisfied after review of Task 1 (Health and Safety Plan) activities. No subsequent files were available. Contamination impacts at Pond East (Alternative 1) are anticipated due to unresolved contamination issues. **Sunshine Dry Cleaners (Map ID 2) 9048 Bonita Beach Road, Bonita Springs, FL 33923 Facility ID: 9801967:** The FDEP Map Direct database identified this facility as a former dry cleaner. FDEP Storage Tanks & Contamination Monitoring database stated a tetrachloroethylene AST was removed from site on an unknown date. No reported discharges are associated with this former dry cleaner facility. No regulatory information related to soil and groundwater testing is available. This former dry cleaning facility was not found in the FDEP's Dry Cleaning Solvent Cleanup Database. The former dry cleaner facility operated adjacent 450 feet northwest of Pond East (Alternative 1). Dry cleaning solvents are denser than water and tend to sink to greater depths in comparison to petroleum related contaminants. Because of this characteristic, any groundwater contamination would be found beyond the zone of construction. Contamination impacts regarding the former dry cleaner facility are not anticipated. **Risk Rating:** Given the existence of residual petroleum contamination in both the soil and shallow groundwater monitoring wells within and adjoining southwest of Pond East (Alternative 1), this drainage site is assigned a risk rating of **High.**

TABLE 1			
Drainage Sites	**Contaminants of Concern**	**Risk Rating**	**Comments**
Pond East (Alternative 2)	Petroleum	Low	Aerial photographs (**Appendix B**) depicted Pond East (Alternative 2) as woods with trails from 1944 to 2023. Topographic maps (**Appendix C**) depicted Pond East (Alternative 2) as shaded beige indicating "grassy fields/developed" from 1958 to 1991. One regulated nearby facility was identified by the EDM as a possible source for contamination that could impact Pond East (Alternative 2) drainage site. **BP-Bonita-Oleum Corp (Map ID 1) 9021 Bonita Beach Road, Bonita Springs, FL 33923-4213 Facility ID: 8520618:** EDM's report (**Appendix D**) identified this closed former retail gas station 460 feet west of Pond East (Alternative 2). Although contamination is documented on-site, a shallow dissolved hydrocarbon map dated February 13 and December 1, 2017, depicts the extent of contamination approximately 460 feet west of from Pond East (Alternative 2). Soil contamination has not been documented off-site from the former gas station. **Risk Rating:** Given a separation distance of 460 feet west of Pond East (Alternative 2) between the former retail gas station facility, and the contaminants of concern remaining confined to the former facility, this drainage site is assigned a risk rating of Low**.**

4.0 Conclusions and Recommendations

Tierra has reviewed various regulatory databases, historical aerial photographs, topographic maps, and file information to identify contamination involvement within the study area. Based on the research methodologies, risk ratings were assigned in accordance with the FDOT contamination rating system. A summary of the assigned risk ratings for each drainage site is provided below.

Table 2: Risk Rating Summary – Drainage Sites	
Risk Rating	**Number of sites**
No	0
Low	2
Medium	1
High	1

Based on the conclusions of this study and the risk ratings noted above, the following recommendations are made.

- Additional information may become available or site-specific conditions may change from the time this report was prepared and should be considered prior to acquiring ROW and/or proceeding with roadway construction. Generally, contamination reports older than one year should be updated with current information. If the design is altered or changed in any way, this report should be reviewed and modified as necessary.

- For the locations rated No or Low for contamination, no further action is required. These locations have been determined not to have any contamination risk to the study area at this time.

- One Medium rated drainage site (Pond West) was rated as such due to the proximity of an active Tuffy Tire & Auto Service Center (**Map ID 3**) identified within its footprint. The risk rating is assigned due to business operations (auto repair), in-ground hydraulic lifts, and petroleum storage. Level II testing can include hazardous material surveys, soil borings, monitoring well installation, soil and groundwater sampling, and laboratory testing. Level II testing will be performed by the Department, if this pond is selected for final design. Results of the contamination testing should be noted in the final plans so that the contractor is informed of contamination issues on the project.

- One High rated drainage site (Pond East (Alternative 1)) was rated as such due to the proximity of a former BP-Bonita-Oleum Corp (**Map ID 1**) retail gas station identified within and adjoining southwest of Pond East (Alternative 1). **Map ID 1** has documented soil and groundwater contamination within the western portion of the Pond East (Alternative 1) drainage site. No onsite remediation has occurred, and no Site Rehabilitation Completion Order has been issued. Level II testing can include hazardous material surveys, soil borings, monitoring well installation, soil and groundwater sampling, and laboratory testing. Level II testing will be performed by the Department, if this pond is selected for final design. Results of the contamination testing should be noted in the final plans so that the contractor is informed of contamination issues on the project.

- Once final design plans are available, additional review is recommended in consideration of dewatering operations that may be necessary under the *National Pollutant Discharge Elimination System Generic Permit for Stormwater Discharges from Large and Small Construction Activities*. Verification testing may be warranted for contamination issues within 500 feet of the dewatering area.

APPENDIX J

Correspondence

Meeting Minutes

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DATE: July 13, 2023

TO: **Patrick Bateman, P.E. – FDOT Project Manager**

FROM: Renato Chuw, P.E.

RE: 444321-1; US 41 at Bonita Beach Road Intersection PD&E Study – FDOT Drainage Methodology Meeting

CC: Brent Setchell (FDOT), Nicole Monies (FDOT), Jack Freeman (Kittelson), Travis Hills (Kittelson), Zach Evans (Inwood), Jason Houck (Inwood)

The meeting was held via TEAMS on July 13, 2023, at 3:00 pm and adjourned at 4:00 pm. The purpose of the meeting was to discuss the drainage approach for this PD&E Study with FDOT District Drainage and Permitting staff. A summary of the meeting discussion is below:

- Introduction of attendees started, followed by a brief overview of the project. The project is a PD&E study by FDOT District One to evaluate intersection improvement alternatives for US 41 at Bonita Beach Road (BBR) in Lee County.

- The improvements are to relieve existing congestion at the intersection and meet project travel demands in the future. Two intersection alternatives were evaluated (a signalized intersection and a partial Displaced Left Turn – DLT lane). The partial DLT alternative is the recommended preferred option and is currently under review for approval by FDOT Management. The partial DLT concept was shared in the meeting via a KMZ in Google Earth.

- In the existing condition, US 41 consists of 6 travel lanes with curb and gutter and closed drainage systems. Bonita Beach Road consists of 4 travel lanes with curb and gutter and closed drainage systems.

- The Imperial River is an Outstanding Florida Water (OFW); therefore, a 50% additional water quality treatment will be required. The WBID is also impaired for nutrients (a TMDL exists for Dissolved Oxygen and Total Nitrogen). A nutrient loading analysis will be performed.

- Stormwater runoff from US 41 is treated in an FDOT pond north and east of US 41. The six-laning for BBR was permitted in the past; however, the County withdrew plans to move forward with six-laning the road. Other permits exist for the developments surrounding the intersection.

- The NW quadrant of the intersection consists of a new roadway connection between US 41 and Bonita Beach Road via Windsor Road. The City of Bonita Springs (with RK&K as their design consultant) is designing portions of this new roadway connection with the intent that the PD&E study will widen the roadway in the future at its US 41 connection. Preliminary parcels shown as potential locations for pond sites were shared via a KMZ in Google Earth. A triangular (remnant) parcel was shown as a possible pond site for the basin for the NW quadrant roadway and BBR west of the intersection. This parcel is portrayed as this time not having plans for future development. The area to the west of the new roadway is planned for development. Coordination with RK&K is occurring to discuss if the City plans to use the triangular remnant parcel for their stormwater needs.

- Inwood indicated that a preliminary sizing on the remnant triangular parcel was able to accommodate the treatment/attenuation for the NW quadrant roadway and the net new improvements on BBR west of the intersection. FDOT asked if the City submitted a permit to SFWMD for this new roadway. Kittelson indicated that it is believed that the roadway plans are between 30% to 60% phase and that a permit hasn't been applied for yet. This will be verified with RK&K.

- There are three existing cross drains on the project. A single 10'x7' CBC under US 41 south of the intersection, a double 8'x4' CBC under BBR east of the intersection, and a single 24" RCP under US 41 north of the intersection that provides the outfall of the existing Center of Bonita Springs pond to the existing Arroyal Mall pond.

- A large canal exists east of the intersection that drains regional areas south of US 41 and surrounding developments by the intersection. The two existing box culverts convey the canal under US 41 and BBR. This canal discharges to the existing Arroyal Mall pond.

- The NE quadrant of the intersection will be improved with the DLT alternative. The improvements will have some encroachments into the Arroyal Mall pond and the existing canal. During the study, the minimization of impacts on the pond will be evaluated with the potential use of walls. The current canal will be enclosed with a box culvert along the NE quadrant segment. FDOT asked if the existing control structure of the Arroyal Mall pond would be impacted or modified. Inwood mentioned that the encroachments will slightly reduce the pond capacity, but as the study progresses and stormwater alternatives are investigated, the goal will be to maintain existing peak stages in the pond. Modifications to the existing control structure may be required.

- The outfall for the Arroyal Mall pond is north through an existing ditch between two businesses, then runs alongside the west side of the existing FDOT pond, turns west just south of The Lock Up Storage Facility and then turns north along the existing swale adjacent to US 41 and crosses under the bridge for the Imperial River Boat entrance side street, ultimately to the Imperial River (see picture below). The new roadway connection between Arroyal Road / Carolina St to US 41 will block this outfall pattern, necessitating a new cross drain underneath.

- FDOT asked if there were any existing easements for the ditch between the two businesses for the outfall of the Arroyal Mall pond. If there are no easements, we may need to consider to allow maintenance of the outfall ditch.

- The existing FDOT pond that treats US 41 contains a diversion berm. A few options were discussed to obtain more capacity in the pond to treat the improvements on US 41. One option is to eliminate the diversion berm and relocate the inflow and outflow of the ponds to keep the maximum flow path in the pond. FDOT asked if there were any uses for the diversion berm other than to maximize the flow path. Inwood indicated that the pond is fenced and does not provide any access to the public. The other option is expanding the pond to the parcel/lots adjacent west. The parcel immediately north of the Advanced Auto Parts store is owned by the City of Bonita Springs.

- FDOT indicated that the PSR evaluation matrix and cost comparison would show which option would be preferable for increasing capacity in the existing FDOT pond.

- Initial discussions with the City indicated flooding concerns at the homes west of Beaumont Rd and south of BBR. In addition, flooding concerns were brought up upstream of the double 8'x4' CBC. Improvements to the box culvert system and canal will need to consider these concerns.

- Pond Siting Report approach and methodology

    - One pond site per basin is to be evaluated. FDOT indicated that because this is a PD&E project, this approach is acceptable

    - Three basins were determined. Efforts to identify preliminary parcels for pond sites have started. Using/expanding the existing FDOT Pond and evaluating the triangular remnant parcel for the NW quadrant roadway were discussed. East of the intersection, a pond site was shown; however, Inwood indicated that it was the only parcel with no development, and further investigation is ongoing for this basin. Taking this runoff to the existing FDOT pond may be difficult since a pipe system would need to cross the canal/box culvert or be routed through local streets.

    - Will evaluate regional stormwater options (ELA/WATERSS). The Arroyal Mall pond already acts as a regional stormwater system and will remain for this study.

    - Water quality treatment will be provided for the net new impervious. Initial discussions with SFWMD during the proposal phase of the study indicated this was acceptable. This will be verified during the pre-application meeting set with SFWMD on July 26, 2023.

    - Compensating treatment will be evaluated where it is advantageous.

- Location Hydraulics Report and floodplain approach and methodology

    - A preliminary analysis of the cross drains will be performed.

    - FEMA floodplains associated with the Imperial River are located on the project. The river is tidal, and SFWMD indicated during the project proposal phase that floodplain compensation would not be required; however, this will be discussed and verified with SFWMD during the pre-application meeting on July 26, 2023.

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ACTION ITEMS:

1. FDOT TO INCLUDE PROJECT IN AGENDA FOR SFWMD JULY MEETING (**COMPLETED**)
2. SET COORDINATION MEETING WITH RK&K TO DISCUSS REMNANT PARCEL FOR STORMWATER NEEDS ON NW QUADRANT (**SET UP FOR AUGUST 3RD AT 9:00 AM**)

*****END OF MEETING*****

NOTE: THE ABOVE REFLECTS THE WRITER'S UNDERSTANDING OF THE CONTENTS OF THE MEETING. IF ANY MISINTERPRETATION OR INACCURACIES ARE INCLUDED, PLEASE CONTACT RENATO CHUW AT (407) 971-8850 OR RCHUW@INWOODINC.COM AS SOON AS POSSIBLE FOR RESOLUTION AND REVISIONS IF NECESSARY.

Meeting Minutes

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DATE: July 27, 2023

TO: **Patrick Bateman, P.E. – FDOT Project Manager**

FROM: Zach Evans, P.E.

RE: 444321-1; US 41 at Bonita Beach Road Intersection PD&E Study – SFWMD Meeting

CC: Brent Setchell (FDOT), Nicole Monies (FDOT), Patrick Bateman (FDOT), Melissa Roberts (SFWMD), Angelica Hoffert (SFWMD), Richard Batewell (SFWMD), Jack Freeman (Kittelson), Renato Chuw (Inwood), Jason Houck (Inwood), Ben Shepherd (Inwood)

FDOT's monthly pre-application meeting with SFWMD was held via TEAMS on July 26, 2023, at 10:00 am. The purpose of the meeting was to discuss the drainage criteria and approach for this PD&E Study with SFWMD staff. A summary of the meeting discussion is below:

- The meeting started with an introduction of the project team followed by a brief overview of the project. The project is a FDOT District One PD&E study to evaluate intersection improvement alternatives for US 41 at Bonita Beach Road (BBR) in Lee County.
- Two intersection alternatives were evaluated (a signalized intersection and a partial Displaced Left Turn – DLT). The partial DLT alternative is the recommended preferred option. The partial DLT concept was shared in the meeting via a KMZ in Google Earth.
- US 41 consists of 6 travel lanes with curb and gutter and closed drainage systems. Bonita Beach Road consists of 4 travel lanes with curb and gutter and 6 travel lanes from the Center of Bonita Springs entrance to Arroyal Road, and closed drainage systems.
- US 41 north and south of the intersection is treated within an FDOT pond north of the intersection located near the Imperial River east of US 41. Treatment and attenuation is provided within the pond before discharging to roadway swales, flowing to the Imperial River.
- Bonita Beach Road east of the intersection discharges directly to the concrete box culvert underneath the roadway, which flows to the Arroyal Mall Pond. The Arroyal Mall Pond is controlled by a weir structure north of Crown Lake Blvd, which outfalls to a ditch system flowing to the Imperial River.
- West of the intersection Bonita Beach Road is collected and conveyed to the Windsor Road swale, which outfalls north to the Imperial River.
- The Imperial River is the ultimate outfall for the project and is an Outstanding Florida Water (OFW); therefore, a 50% additional water quality treatment will be required. The WBID is also impaired for nutrients (a TMDL exists for Dissolved Oxygen and Total Nitrogen). A nutrient loading analysis will be performed.
- The proposed roadway improvements will include new quadrant roadways NW and NE of the intersection. The NW quadrant roadway will initially be built by the City of Bonita Springs. This project is only widening the NW quadrant's US 41 approach leg to accommodate future traffic.

- The NW quadrant roadway will provide a connection between US 41 and Bonita Beach Road via Windsor Road. The City of Bonita Springs is designing portions of this new roadway connection and a triangular pond in a remnant parcel created by the new road. Our intent is to evaluate if this pond can serve the stormwater requirements for the PD&E study.

- A large canal exists east of the intersection draining regional areas south of US 41 and surrounding developments by the intersection. The two existing box culverts convey the canal under US 41 and BBR. This canal discharges to the existing Arroyal Mall pond.

- The intersection's NE quadrant will be improved with the DLT alternative. The improvements will encroach into the Arroyal Mall pond and the existing canal. During the study, the minimization of impacts on the pond will be evaluated with the potential use of walls. The current canal will be enclosed with a box culvert along the NE quadrant segment. Inwood mentioned that the encroachments will slightly reduce the pond capacity. SFWMD indicated pre vs post conditions for the Arroyal Mall pond must be met.

- Stormwater alternatives will be investigated including: (1) evaluating if the Arroyal Mall pond can be expanded to increase capacity, (2) route stormwater from Bonita Beach Road away from the Arroyal Mall pond to other proposed stormwater treatment alternatives. Ultimately, the goal will be to maintain existing peak stages in the Arroyal Mall pond.

- SFWMD stated clear documentation of the volumetric impacts to the pond and exhibits of the drainage areas routed away from the culvert will need to be provided to ensure no negative impacts to the stormwater facility will occur.

- The existing FDOT pond that treats US 41 contains a diversion berm. Alternatives were discussed to obtain more capacity in the pond to treat the improvements on US 41. One option is to eliminate the diversion berm and relocate the inflow and outflow of the ponds to keep the maximum flow path in the pond. The other option is expanding the pond to the parcel/lots adjacent west.

- Inwood stated the approach for water quality treatment will be to provide for the net new impervious. An additional 50% treatment volume will be provided to meet OFW Criteria. Nutrient Loading analysis will be provided due to the adopted TMDL for the basin.

- The improvements associated with the PD&E study will modify both the Arroyal Mall pond and the existing FDOT US 41 permits.

- FEMA floodplains associated with the Imperial River are located on the project. The Imperial River is tidal within the project limits and Inwood asked if floodplain compensation would be required. SFWMD stated that documentation would need to be provided that this area was tidal, but compensation would not be required for floodplain impacts.

- Inwood asked if pre vs post attenuation would be required for the project due to the tidal condition of the Imperial River. SFWMD stated that the existing permit for the US 41 pond meets the pre vs post attenuation criteria and should be followed for this study. Approved discharges to the Imperial River should also be met.

*****END OF MEETING*****

NOTE: THE ABOVE REFLECTS THE WRITER'S UNDERSTANDING OF THE CONTENTS OF THE MEETING. IF ANY MISINTERPRETATION OR INACCURACIES ARE INCLUDED, PLEASE CONTACT ZACH EVANS AT (407) 971-8850 OR ZEVANS@INWOODINC.COM AS SOON AS POSSIBLE FOR RESOLUTION AND REVISIONS IF NECESSARY.

Meeting Minutes

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DATE: August 3, 2023

TO: **Patrick Bateman, P.E. – FDOT Project Manager**

FROM: Renato Chuw, P.E.

RE: 444321-1; US 41 at Bonita Beach Road Intersection PD&E Study – Coordination with City's design consultant (RK&K) regarding NW quadrant roadway and stormwater pond

CC: Brent Setchell (FDOT), Nicole Monies (FDOT), Matt Feeney (City of Bonita Springs), Joel Langaney (City of Bonita Springs), Dave Hill (Bowman), Jack Freeman (Kittelson), Joseph Baan (RK&K), Zach Evans (Inwood)

A coordination meeting with RK&K (the City of Bonita Springs' design consultant for the NW quadrant roadway connection Windsor Road at Bonita Beach Road to US 41) was held to discuss the design status of the roadway and the proposed stormwater management. In attendance were: Patrick Bateman (FDOT), Jack Freeman (Kittelson), Travis Hills (Kittelson), Joseph Baan (RK&K), and Renato Chuw (Inwood). A summary of the meeting discussion is below:

- The meeting started with introducing the project team and a brief overview of the project. Inwood indicated FDOT District One is conducting a PD&E study for the intersection of US 41 and Bonita Beach Road to evaluate intersection improvement alternatives. Kittelson is the prime consultant for the PD&E study, and Inwood is assisting in the drainage evaluation.

- This meeting aimed to inquire about the status of the City's quadrant roadway design project connecting Bonita Beach Road to US 41 via Windsor Road and behind the Center of Bonita Springs Plaza.

- RK&K mentioned that the design is moving towards 60% completion, with plans submitted to the City in October 2023. A pre application meeting with SFWMD will be held during the week of August 7 – 11 to discuss the City's project and permit requirements.

- Kittelson indicated that 30% design CADD files by RK&K were provided on March 10, 2023. Kittelson requested if updated design files for the roadway alignment can be provided to the PD&E study team. A request will be sent to RK&K.

- RK&K indicated that a CSI (Continuous Flow intersection) is proposed at Bonita Beach Road and Windsor Road intersection. This was shown in 30% plans of May 2023. RK&K mentioned that the design CADD files provided to Kittelson early in the year were likely 15% design-level files.

- Kittelson asked if the horizontal alignment of the roadway behind the Publix stayed the same as what was provided to the team earlier of has it moved. RK&K indicated that the alignment has not significantly changed at that location.

- The roadway design by the Windsor Road and Bonita Beach Road intersection was updated to minimize impacts to the existing Windsor Road swale. The goal is to maintain the swale's drainage pattern. Compensatory treatment is proposed, with minor improvements at the intersection being untreated to the existing swale. Instead, the remnant parcel will collect and treat the existing Windsor Road pavement in the proposed pond. Inwood indicated some information was obtained for the existing swale during the permit research and will share that with RK&K.

- The City is designing the pond in the remnant parcel to treat and attenuate the runoff for the NW quadrant roadway from the Bonita Beach Road intersection to just west of Tuffy Auto Center at the US 41 and NW quadrant roadway's NW corner.

- RK&K indicated that they will maximize the pond usage in the remnant parcel due to having to meet several drainage criteria and constraints, such as OFW (Imperial River), pre vs. post attenuation, and nutrient loading. The design intent is for the pond to be a dry pond to meet the nutrient loading requirements. Underdrains underneath the pond bottom are proposed to draw down the water table and maximize the storage capacity in the pond. RK&K indicated the design of the pond is still ongoing and that more design information will be available in October when plans are submitted. It was suggested to reconvene in the future to get an update on the design of the roadway and the pond.

- The PD&E study proposes to add more impervious to the quadrant roadway as it ties to US 41 and beginning at the curve alignment. RK&K indicated that it does not think the pond will have extra capacity for the additional improvements to the roadway per the study. However, RK&K indicated that if the FDOT was able to convince SFWMD that attenuation was not required when direct discharging to the tidal Imperial River, some additional capacity might be available. A possible alternative discussed for the study is to evaluate if the Tuffy Auto Center parcel at US 41's NW corner and the NW quadrant roadway would be a viable pond site location for the FDOT project since the roadway improvements will impact the parcel. Inwood indicated that would be a possibility and could be investigated further.

- RK&K indicated that a segment of the proposed roadway is a rural-type typical section to provide cost savings to the City by implementing a roadside swale for drainage conveyance instead of a close drainage system. Kittelson mentioned the PD&E study initial concept shows the roadway with curb and gutter, noting that more room will be available to expand the pond.

- RK&K mentioned their current design shows two accesses to the Center of Bonita Springs Plaza (Old Time Pottery), and that access from the new roadway to the plaza should be preserved with the PD&E concept. The proposed accesses have not yet been discussed with the shopping center.

Action Items

1. RK&K to provide latest design CADD files for the quadrant roadway
2. Inwood to share permit information for the existing Windsor Swale and Bonita Beach Road

*****END OF MEETING*****

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