Inundation Modeling and Mapping for Shadow Run Dam at Lake Grady, Riverview, Hillsborough County, Florida

Florida Department of Environmental Protection, Florida Dam Safety Program, Division of Water Resource Management

NID ID: FL00176 Shadow Run Dam, Riverview, Hillsborough County, Florida

Project No.BS135

REVISED FINAL

CGI Project No. 2001.01

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06/30/2022

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Prepared for

Florida Department of Environmental Protection, Florida Dam Safety Program, Division of Water Resource Management

NID ID: FL00176 Shadow Run Dam, Riverview, Hillsborough County, Florida

Professional Services Contract No. BS135

06/30/2022

prepared by

COMAK Group, Inc

in association with

Mott MacDonald Florida, LLC

REVISED FINAL

2022

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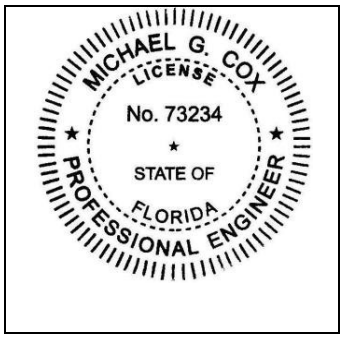
CERTIFICATION
FLORIDA PROFESSIONAL ENGINEER

The engineering services addressed herein, as defined in Section 471.005(6), F.S., have been performed by and under the responsible charge of the professional engineer named below. These engineering services are based upon the named professional engineer's knowledge, information, and belief, and in accordance with commonly accepted procedures consistent with applicable standards of practice. This certification is not a guaranty or warranty, either expressed or implied.

Comak Group, Inc.
Florida Board of Professional Engineers Registry No. 32224

Principal Engineer



Michael G. Cox

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1.0 GENERAL INFORMATION

1.1 Project Location

Shadow Run Dam at Lake Grady, NID ID: FL00176, is in west central Hillsborough County, within the municipal limits of Riverview, Florida, approximately 20 miles southeast of downtown Tampa. It is owned and operated by Shadow Run Dam Corporation, Inc, Riverview, FL. The dam is situated at approximate Latitude 27.8377^0 North, and Longitude 82.2731^0 West. Shadow Run Dam is located on Shadow Run Boulevard and is approximately 1.4 miles south of the Bell Creek crossing of Boyettte Road, which is about 2.9 miles to the east of US Highway 301 S in Riverview, Hillsborough County. The dam impounds Bell Creek and Pelleham Branch which flows through Shadow Run Dam lake outlet works and which is part of the Alafia River Basin. See project vicinity map on Page 5. The project location map for Shadow Run Dam is shown on Figure 1 in Appendix A.

1.2 Purpose

1) Provide FDEP and the dam owner, with inundation mapping and modeling in the project vicinity and downstream locations, which have or may have collectively the potential for loss of life and loss of property in the event of a dam failure.

2) Conduct hydrologic and hydraulic analysis of the dam for the 100-year, ½ PMP and PMP storm events, for no dam break condition, and prepare matching inundation maps based on the results.

3) Prepare customized inundation maps based on the modeling results for the dam site, under no dam break condition.

The FDEP has executed a work delivery order with Mott MacDonald to provide the services in the SOW outlined in Contract No: BS-135.Task Assignment No. 13.

1.3 Background Data Information

Background information for this project was obtained from a review of historic record files obtained from the FDEP, University of South Florida, Shadow Run Dam Corporation, Inc., and Esri.

The following maps and aerial imagery were obtained:

- High resolution 0.24 m or 9.4-in Bing Aerial Imagery (1.54 m or 5-foot horizontal accuracy) available on ArcGIS Pro (dated 1/18/2016 and supplied by the State of Florida to Esri et al.[1]).

[1] Esri, Digital Globe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, Aero GRID, IGN, and the GIS User Community

The following digital elevation data were obtained:

- LIDAR Datasets horizontal resolution 1 m or 3.28-foot (+/- 30.8 cm or 12.12-inches at 95% confidence level), vertical accuracy (+/- 9.6 cm or 3.8-inches at 95% confidence level), and
- National Elevation Dataset (NED) l/9 arc second Digital Elevation Model (DEM).

1.4 Project Datum

The project maps and elevation data are based on the horizontal coordinate system NAD 1983 2011 UTM Zone 16N projection. Contours on the USGS Quadrangle Maps, Lidar data, and Digital Elevation Model (DEM, used within the project are referenced to the North American Vertical Datum of 1988 (NAVD88).

Pertinent topographic surveying data and bathymetric data were obtained from detailed field methods conducted in January through March 2022. The DEM data developed for Shadow Run Dam at Lake Grady was merged with the detailed Bathymetry data obtained in the field in March 2022 to create a seamless DEM/ BEM referenced to NAVD88 vertical datum elevation. Benchmarks at Shadow Run Dam were used by field surveying conducted in March 2022 to verify and ground truth the DEM / BEM data. An overhead close-up view of Shadow Run Dam Spillway Outlet Works Control Structure at Lake Grady is included as Figure 1a.

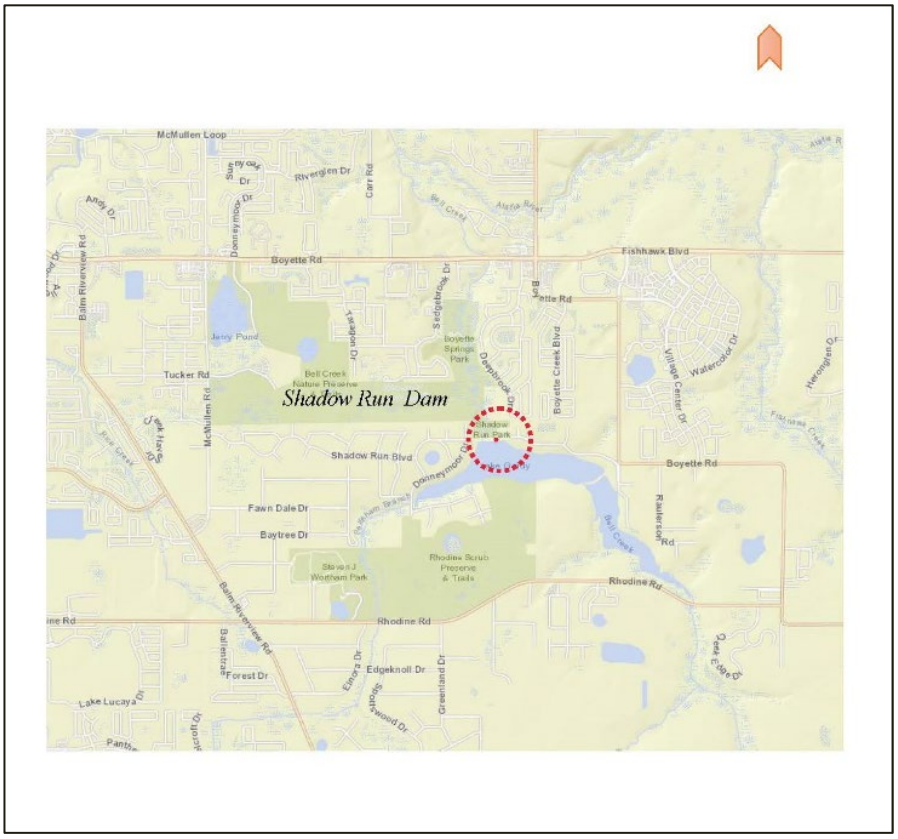
1.5 Project Description

NID ID: FL 00176. Shadow Run Dam is a rolled earth fill dam approximately 30 feet high and approximately 1015 feet long. The dam forms a 120-acre impoundment with 750-acre feet of storage at normal pool level and has a pool surface area of approximately 275 acres with a storage volume of 3119 - acre feet at the top of dam embankment crest at Shadow Run Blvd. An 8ft wide paved curvilinear concrete walkway runs along the crest of the dam which is about 30 feet wide. The water level in the lake pool is controlled by a winged shaped drop inlet concrete overflow spillway having weir elevations at varying levels, discharging into a 4-barrel concrete culvert outlet conduit; two(2) sized at 13ft wide by 8.3ft high and two (2) sized at 12 ft wide by 8.3ft high. The profile of the top of the impoundment varies and follows the concrete walkway elevations along Shadow Run Blvd which vary from a low of 44.3ft to a high of 45.9 ft. The average low point elevation is approximately 44.5 feet. The dam was originally constructed around 1969 to create a recreational lake and consisted of an earthen embankment built across Bell Creek and Pelleham Branch.

Based on its storage capacity and height, the Shadow Run Dam is in the category of an "Intermediate" dam. The dam is listed in the NID as a **Significant Hazard** Potential Classification impoundment, indicating that "failure or mis-operation results in no probable loss of human life, but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns." The dam hazard potential classification is based on

"Federal Guidelines for Dam Safety: Hazard Potential Classification System for Dams" published by the Federal Emergency Management Agency (FEMA)[2]. Refer to the project Vicinity Figure below which illustrates the dam and its surrounding neighborhood. It is noted that no inspection report documenting the Significant Hazard Potential Classification for Shadow Run Dam at Lake Grady was available at the time of this study. The Project Location Map, Figure 1, is shown with an Aerial background setting in Appendix A.

The dam upstream and downstream embankment slopes are each 2.5:1 (horizontal to vertical). The principal spillway is a winged shaped drop inlet concrete overflow spillway having three(3) Weir control elevations at varying levels, and referred to as Low- Level Weir, Mid-Level Weir and High-Level Weir, all discharging into the 4-barrel concrete culvert outlet conduit. The Low-Level Weir crest is 4 feet wide at elevation 34.61ft, which serves to maintain the Normal pool at Elevation 35.11. The Mid-Level Weir has a total length of 204 feet at crest elevation of 35.61 ft and the High-Level Weir has a length of 57feet at a crest elevation 40.61ft. The spillway outlet works is equipped with a Draw Down drain gate which is a 72-inch diameter gate valve with stem and invert at elevation 25.11 ft, allowing a maximum lake pool drawdown of approximately ten feet. The discharge barrel consists of a 105-foot long four (4) barrel concrete conduits with outlet elevation at approximately 22.61 ft. The 4-barrel culvert discharges to a concrete apron approximately 40feet long, with end of apron at elevation 22.41ft.



Project Vicinity Figure – Shadow Run Dam, Riverview, Hillsborough County, FL

[2] FEMA- Federal Guidelines for Dam Safety: Hazard Potential Classification System for Dams, January 2004.

Refer to Figure 1a. which is a close-up overhead view of the dam embankment at the principal Spillway Drop Inlet Outlet Works Control Structure location.

The dam consists of a typical NRCS grassed - lined embankment with a 3-Teir Weir pool level control concrete drop inlet with no defined approach channel and Bell Creek as the defined exit channel. The dam was originally constructed in 1969 without any emergency spillway. Reportedly, in 1983 the upstream side of the dam failed and in 1987 slope problems were encountered due to surface erosion and dam seepage. Subsequently, the dam was repaired, and the current outlet works structure constructed in October 1997. The entire dam embankment crest would function as the emergency overflow spillway if an extreme flood event such as the Probable Maximum Flood (PMF), were to occur.

Figure 1a. Overhead View – Shadow Run Dam Outlet Works, Riverview, Hillsborough County, FL

2.0 ENGINEERING ANALYSES

2.1 Hydrology

The delineation of the drainage basin contributing runoff to Shadow Run Dam at the Lake Grady impoundment and the downstream Bell Creek sub-area to the mouth of Bell Creek at the confluence with Alafia River , was performed utilizing ArcGIS Pro's hydrological tools and DEM data obtained from the University of South Florida GIS data files. The contributory Bell Creek drainage area to Shadow Run Dam at Lake Grady is approximately 17.43 mi^2 (or11,155.2 acres). The contributing Bell Creek sub-area from Shadow Run Dam outflow downstream to the Bell Creek Mouth at the confluence with Alafia River , which is the downstream study limit, is 2.52 mi^2 (or 1,612.8 acres) thereby resulting in a total Shadow Run Dam / Bell Creek system catchment area of 19.95 mi^2 or 12,768 acres. The mainstem and upstream Alafia River catchment drainage area above the confluence with Bell Creek mouth, has a combined drainage area of approximately 370 mi^2 and is not included in the hydrologic model analysis, because this catchment area is about 18 times as large as the project drainage area, and reportedly, based on historic events the Alafia River flood peak arrives at the Bell Creek Mouth confluence some 24-36 hours after the peak flows from the Shadow Run Dam at Lake Grady system has receded.

The USACE HEC-HMS model was used to analyze the Shadow Run Dam at Lake Grady impoundment drainage system. HEC-HMS is a hydrologic simulation software developed by the Hydrologic Engineering Center of U.S. Army Corps of Engineers (USACE). The model determined the runoff volume entering the Shadow Run Dam at Lake Grady impoundment system, the discharges from the dam structures and the maximum water level in Lake Grady resulting from the 100-year, ½ PMP and PMP storm events.

2.1.1 Model Setup

The NRCS Curve Number (CN) Method was used in HEC-HMS to develop the runoff hydrographs for the study area. By examination of the catchment land cover and historic data from prior studies, a CN of 78 was used for the Shadow Run Dam at Lake Grady sub-area, and a CN value of 80 was used for the downstream Bell Creek sub-area. The 100-year 24-hour rainfall depth is11.1 inches and was taken from the NOAA Atlas 14. The PMP 24-hour value is 47.1 inches and was obtained from Hydrometeorological Report (HMR) 51 rainfall maps. The NRCS Type III (Type II Modified) temporal distribution was used to simulate the rainfall depths in the runoff models. The HEC-HMS was used in conjunction with HEC-RAS for the lake impoundments to account for stream storage.

Table 1 summarizes the model results for Shadow Run Dam at Lake Grady and the downstream Bell Creek drainage sub catchment area. Figure 2 in Appendix A shows the delineation of the contributory Bell Creek drainage area to Shadow Run Dam at Lake Grady and the downstream Bell Creek subbasin to Bell Creek mouth at the Confluence with Alafia River. Figure 3 is a schematic of the HEC-HMS hydrologic model network developed and used. The model schematic is as Figure 3 in Appendix A. Table 1 summarizes the Runoff Paek Flow for the Shadow Run Dam

Table 1. Shadow Run Dam At Lake Grady - Drainage Basin Runoff Peak Flow Summary - HEC HMS

Points of Interest (POI)	Drainage Area (mi2)	CN	Peak Inflow 100 -yr (CFS)	Peak Inflow ½ PMP (CFS)	Peak Inflow PMP (CFS)
Shadow Run Dam / Shadow Run Blvd			0	0	1458
POI 01 -Shadow Run Dam At Lake Grady Inlet	17.43 (11155.2 ac)	78	4946.0	13917.8	25119.0
POI 02 - Shadow Run Dam At Lake Grady Outlet-d/s toe	17.43 (11155.2 ac)	N/a	4485.0	13290.0	24846.7
POI 03 - Boyette Rd over Bell Creek	19.1 (1068.8 ac)	N/a	5142.0	15874.0	31272.0
POI 04 – Bell Creek Outlet	19.95 (12768 ac)	80	5148.0	15881.0	31268.0

2.2 Hydraulics

2.2.1 HEC-RAS Model Introduction

The HEC-RAS model was used in the analysis of the Shadow Run Dam at Lake Grady impoundment system on Bell Creek and its downstream riverine flood floodplain. HEC-RAS is a hydraulics simulation software developed by the Hydrologic Engineering Center of U.S. Army Corps of Engineers (USACE). It is a steady and unsteady hydrodynamic analysis model based on the solution of Saint Venant Equation using an implicit finite difference method. The HEC-RAS system includes river analysis components for one- and two-dimensional steady and unsteady flow simulation and is applicable in situations where the water surface profile is rapidly varied, such as hydraulic jumps, hydraulics of bridges, as well as dam break and levee breach analysis.

2.2.2 Model Setup

In this model application, the **2D HEC-RAS** model based on available 3.28 ft x 3.28ft terrain data was used for the Bell Creek Shadow Run Dam at Lake Grady impoundment system. HEC-RAS has the capability to provide 1D riverine, detailed 2D channel and floodplain, and hybrid of 1D channel flow with 2D floodplain flow areas simulation modules. The HEC-RAS 2D simulation was used and provides a more realistic depiction of flow throughout a system than a 1D model for the case where flood wave may 'spread' significantly and for urbanized areas, as well as wide floodplains.

Also, the RAS- Mapper in the HEC-RAS 2D module was used to post-process the simulation results and generate inundation maps and graphs.

2.2.3 Simulation Domains

Figure 2 in Appendix A shows the Bell Creek contributory drainage catchment area to Shadow Run Dam and the downstream Bell Creek sub-watershed catchment area. The hydrologic analysis described in Section 2.1 utilized the HEC-HMS model to simulate the runoff inflow to the dam's system. The Shadow Run Dam is listed in the Federal National Inventory of Dams (NID No:00176) as a **Significant Hazard Potential** dam. Typically, the hazard potential classification of a dam is used to select the extreme hydrologic failure event. The PMF is the flood that may be expected from the most severe combination of critical meteorological and hydrologic conditions that are possible in the study area drainage basin. According to FEMA guidance, High Hazard Potential dams are typically evaluated using a full PMF, and Significant and Low-Hazard Potential dams are evaluated on a percentage of the PMF or some more frequent storm event, such as the 100-yr (one percent annual chance exceedance) storm event. The project scope of services requires that the Shadow Run Dam be evaluated for both the PMP and ½ PMP storms as well as the 100-year storm event. Due to the potential for the capacity of the dam to be exceeded during events more frequent than the PMP storm, the 100-year 24-hour storm (11.1 inches), and the half Probable Maximum Precipitation (1/2 PMP) storm (23.55 inches) were analyzed in addition to the PMP (47.1 inches) event. Reservoir flood routing analysis as well as channel flood routing analysis were conducted for the selected downstream points of interest. These flood routing results were then used in HEC-RAS 2D model to perform the **no dam break** flood flow and overtopping analysis, for the selected extreme storm events.

Two (2) 2D simulation domains, which include Shadow Run Dam at Lake Grady as well as the downstream Bell Creek floodplain contributing areas, were established in the HEC-RAS model. The potential inundated areas downstream extend from Lake Grady spillway outflow through the Bell Creek subarea floodplain and crossing under Boyette Road Bridge to Bell Creek Mouth at the confluence with Alafia River. The model domain schematic map is illustrated on Figure 4 in Appendix A. It is noted that where the capacity of the dam was exceeded and overtopped during the PMP extreme storm event, the dam was considered as overtopping without embankment failure, i.e., the no dam break condition.

2.2.4 Boundary Conditions, Hydraulic Structures and Modeling Analysis Coefficients

For the model domains considered, selected types of boundary conditions were used in HEC-RAS 2D model setup, which are depicted by the red checkered lines on Figure 4. Inflow boundary conditions were used in the water storage domain around the Shadow Run Dam impoundment at Lake Grady. The outflows coming from the principal spillway and discharge barrels, and dam crest overtopping were combined and identified as the lake outflow boundary, which connects to the inflow boundary of the downstream Bell Creek floodplain. To capture the flooding impact from the contributing Bell Creek sub-area downstream of the Shadow Run Dam, a floodplain boundary was applied. For the study limit at the confluence with Alafia River, the 100yr flood water surface elevation established in prior studies was used as the downstream boundary condition, in lieu of the Bell Creek mouth normal depth water surface elevation.

Table 2 summarizes the elevation - area and storage data developed for the dam at Lake Grady.

Table 2. Shadow Run Dam at Lake Grady, Elevation-Area- Storage - Discharge Summary

Elevation (ft)	Surface Area (ac)	Storage Volume (ac-ft)	Drawdown Outlet 72"dia. Discharge (cfs)	Drop Inlet Low Weir L=4ft Discharge (cfs)	Drop Inlet Mid Weir L=204ft Discharge (cfs)	Drop Inlet High Weir L=57ft Discharge (cfs)	Dam Crest, L =1015ft Discharge (cfs)	Total Discharge (cfs)	Description
16.43	0.000	0	0	0	0	0	0	0	Lake Bottom (Low Point)
20.00	0.871	1.23	0	0	0	0	0	0	Lake Bottom Average
25.10	8.604	12.22	0	0	0	0	0	0	Drawdown Outlet Invert
29.00	60.404	149.17	0	0	0	0	0	0	Intermediate Stage
33.00	109.717	508.77	304	0	0	0	0	0	Intermediate Stage
34.61	115.927	656.18	347.09	0.00	0	0	0	347.09	Low Weir Crest El
35.11	119.897	750.43	360.19	4.71	0	0	0	364.90	Normal Pool El
35.61	141.134	958.08	372.83	13.32	0.00	0	0	386.15	Mid-Level Weir Crest
36.00	160.082	1056.80	385.06	24.47	241.35	0	0	650.88	Intermediate Stage
38.00	198.294	1418.88	430.51	87.22	2698.41	0	0	3216.14	Intermediate Stage
39.00	218.578	1628.64	451.53	127.15	4469.92	0	0	5048.60	Intermediate Stage
40.00	227.905	1844.79	471.60	171.81	6516.54	0	0	7159.95	Intermediate Stage
40.61	239.321	1989.86	481.33	195.76	7632.25	0.00	0	8309.34	High Level Weir Crest
41.00	246.619	2082.61	490.86	220.74	8805.26	67.11	0	9583.97	Intermediate Stage
42.00	256.397	2326.54	509.39	273.59	11312.75	348.70	0	12095.73	Intermediate Stage
43.00	270.341	2591.62	527.27	330.09	14021.36	750.29	0	15629.01	Intermediate Stage
44.00	272.514	2855.14	544.56	390.02	16917.12	1242.86	0	19094.56	Intermediate Stage
44.50	273.601	2986.90	553.00	421.22	18431.55	1518.48	0.00	20924.25	Top of Dam Overflow El 44.5 (Avg) L=1050ft
45.00	274.687	3118.66	561.30	453.20	19987.99	1811.93	897.14	22814.42	
46.00	276.860	3382.18	577.64	519.45	23226.00	2448.36	4661.70	31433.15	

It is noted that for Shadow Run Dam/Lake Grady impoundment the available top of embankment / roadway profile data within the LiDAR DEM at the dam was confirmed by field survey measurements conducted in March 2022 and supplemented by Lake Bathymetry Elevation data (BEM) obtained in March 2022 and merged with the DEM data to form a seamless DEM/BEM data base, which was utilized in the hydraulic models. All ground elevations refer to NAVD 1988 datum and were cross checked with established Benchmarks at Shadow Run Blvd. All 2D domain and internal boundaries are shown in Figure 4 in Appendix A.

2.2.5 No Dam Break Simulation Scenarios

In the model study, three (3) scenarios were required to be evaluated in the hydraulic analysis. They are:

- No dam break and uncontrolled flow through outlet works spillway and low-level outlet based on routing analysis for 100-year 24-hour storm
- No dam break and uncontrolled flow through outlet works spillway and low-level outlet based on routing analysis for ½ Probable Maximum Precipitation (PMP) 24-hour storm.
- No dam break and uncontrolled flow through outlet works spillway and low-level outlet based on routing analysis for the Probable Maximum Precipitation (PMP) 24-hour storm.

The simulation scenario matrix and overtopping conditions status for Shadow Run Dam at Lake Grady is listed in Table 3 below.

It is noted that for the scenarios evaluated, the following assumptions were made:

- **the impoundment at Shadow Run Dam / Lake Grady will not experience overtopping failure.**
- **the 72-inch (6ft) diameter sluice gate drawdown outlet valve remained in its open position during all the storm event cases simulated with an invert elevation at 25.1ft NAVD 88.**

Table 3. Flood Simulation Scenarios

Dam ID: FL00176 Shadow Run Damat Lake Grady	Case Name	Peak El. (ft NAVD88)	Overtopping Condition
1	100-year Storm - No Break	42.1	No Overtopping
2	½ PMP Storm - No Break	44.4	No Overtopping
3	PMP Storm - No Break	45.2	Overtopping (Crest El. 44.5ft)

3.0 POINTS OF INTEREST AND CROSS SECTIONS

3.1 Points of Interest and Cross Sections

Points of Interest (POI) were identified at the dam and at downstream locations along the stream corridor, based on review of aerial photography, flood maps, field reconnaissance and hydrologic analysis. Four POIs were carefully chosen and are illustrated on Figure 5 in Appendix A. Shadow Run Dam at Lake Grady representative photographs and top of dam cross sections at selected POIs are shown on Figure 6; and the Boyette Road crossing over Bell Creek representative Photos and road profile from east to west is shown on Figure 7. The cross sections and top of road low point elevations were obtained from the LiDAR/ DEM surface data supplemented by field survey conducted in March 2022.

Points of Interest and Representative Photo Summary for Shadow Run Damat Lake Grady

Points of Interest (POI)	Distance from Shadow Run Dam at lake Grady – ft	Representative Photo and Cross Section	Dam /Top of Road Low Point Elevation within DEM-ft NAVD88
POI 01 - Shadow Run dam Spillway Drop Inlet	0.0 (0.00mi)	X	Top of Dam (Crest) Low Point El.44.50
POI 02 - Shadow Run Dam Outlet	145 (0.03mi)	-------	-------
POI 03 - Boyette Road Bridge across Bell Creek	7352 (1.39 mi)	X	Westside Roadway - Low Point El. 27.83
POI 04 – Bell Creek Outlet (Mouth) at Alafia River	12,987 (2.46 mi)	-------	-------

4.0 INUNDATION MAPPING, FLOOD DEPTHS AND TRAVEL TIMES

The three hydraulic analysis scenarios identified in Section 2 for Shadow Run Dam at Lake Grady were evaluated for flood inundation **no dam break** 100-year 24-hour storm, ½ PMP storm and PMP storm event conditions. Based on the HEC-RAS 2D simulation results, the hydraulic features at selected points of interest extending downstream of Shadow Run Dam are summarized on Tables 4,5 and 6. The flood inundation extents, maximum water elevations and maximum water depths, were established for the selected extreme flood events and the resulting flood inundation mapping illustrated graphically on Figures 8 through 13, and Figure 15 through 17 using Esri Hybrid Satellite imagery as the background.

4.1 100-year Flood Routing – No Dam break

The 100-year runoff inflow flood was generated using the HEC-HMS computer Program and the resulting inflow hydrograph routed through the Shadow Run dam impoundments, using HEC-RAS two -dimensional unsteady flow routing, assuming no dam break, and downstream from the dam along Bell Creek to the Boyette Road Bridge and then through the floodplain area to Bell Creek mouth , approximately 2.5 miles downstream.

The 100- year -no dam break flood simulation analysis results are summarized on Table 4, entitled "Hydraulic Features of Shadow Run Dam system 100 Year Flood-No Dam Break" .

In summary, Shadow Run Dam at Lake Grady, owned by Shadow Run Corp Inc, possesses sufficient storage capacity to safely pass the 100 - year storm peak discharge without overtopping the dam embankment.

The flood inundation extent, maximum water surface elevations and maximum water depths are shown on Figures 8, 9 and 10, respectively.

Table 4. Hydraulic Features of Shadow Run Dam system 100 Year Flood - No Dam Break

Point of Interest (POI)	Distance from Shadow Run Dam at Lake Grady (ft)	Peak Velocity (ft/s)	Peak Flood Wave Discharge (cfs)	Peak Flood Depth (ft)	Peak Flood Stage (ft)	Peak Stage Arrival Time (since start of rainfall)	Over Topping Duration (Hr:Min: Sec)	Remarks
POI 01 - Shadow Run Dam Inlet Works Spillway Structure (Mid Pt)	0	N/A	4946.00	23.01	42.05	21:30:00	0:00:00	Top of Dam Low Point El.44.50. No Overtopping of dam
POI 02 - Shadow Run Dam Outlet (Mid Pt of apron)	145	N/A	4483.00	5.06	29. 94	21:30:00	0:00:00	Where no overtopping occurs, the peak flood stage is the upstream side embankment water level
POI 03 - Boyette Rd Bridge across Bell Creek (Mid Pt of the Upstream face)	7352	2.49	5152.30	10.80	21.80	22.30.00	0.:00:00	Westside Roadway- Low Point El. 27.83
POI 04 - Bell Creek outlet (Mouth) at Confluence with Alafia River	12987	0.41	5111.10	14.34	14.94	23:00:00	0:00:00	Bell Creek Mouth 100-yr flood El. 14.94 ft adapted from Alafia River Watershed Management Plan, Hillsborough County, 2002

4.2 ½ PMP Storm – No Dam Break

The ½ PMP inflow flood was generated using the HEC-HMS computer Program and the resulting inflow hydrograph routed through the Shadow Run Dam at Lake Grady impoundments, using HEC-RAS two -dimensional unsteady flow routing, assuming no dam break, and downstream from the dam along Bell Creek to the Boyette Road Bridge and then through the floodplain area to Bell Creek mouth , approximately 2.5 miles downstream.

The ½ PMP no dam break flood simulation analysis results are summarized on Table 5, entitled "Hydraulic Features of Shadow Run Dam system ½ PMP Flood-No Dam Break" .

In summary, Shadow Run Dam at Lake Grady , owned by Shadow Run Corp Inc, possesses sufficient storage capacity to safely pass the ½ PMP storm peak discharge without overtopping the dam embankment. The peak flood stage level is at the brim of the dam embankment, and Lake Grady is at full capacity during the ½ PMP event.

The flood inundation extent, maximum water surface elevations and maximum water depths are shown on Figures 11,12 and 13, respectively.

4.3 PMP Storm – No Dam Break

The PMP inflow flood was generated using the HEC-HMS computer Program and the resulting inflow hydrograph routed through the Shadow Run Dam at Lake Grady impoundments, using HEC-RAS two -dimensional unsteady flow routing, assuming no dam break, and downstream from the dam along Bell Creek to the Boyette Road Bridge and then through the floodplain area to Bell Creek mouth , approximately 2.5 miles downstream.

The PMP no dam break flood simulation analysis results are summarized on Table 6, entitled "Hydraulic Features of Shadow Run Dam system PMP Flood-No Dam Break" .

In summary, Shadow Run Dam at Lake Grady , owned by Shadow Run Corp Inc, does not possess sufficient storage capacity to safely pass the PMP storm peak discharge without overtopping the dam embankment. The peak flood stage level is at the brim of the dam embankment, and Lake Grady is at full capacity during the ½ PMP event.

The flood inundation extent, maximum water surface elevations and maximum water depths are shown on Figures 15,16 and 17, respectively.

Table 5. Hydraulic Features of Shadow Run Dam system 1/2 PMP Flood - No Dam Break

Point of Interest (POI)	Distance from Shadow Run Dam at Lake Grady (ft)	Peak Velocity (ft/s)	Peak Flood Wave Discharge (cfs)	Peak Flood Depth (ft)	Peak Flood Stage (ft)	Peak Stage Arrival Time (since start of rainfall)	Over Topping Duration (Hr:Min: Sec)	Remarks
POI 01 - Shadow Run Dam Inlet Works Spillway Structure (Mid Pt)	0	N/A	13917.00	25.38	44.42	18:09:00	0:00:00	Peak stage at Brim of dam. Low Point El.44.5. No Overtopping of dam.
POI 02 - Shadow Run Dam Outlet (Mid Pt of apron)	145	N/A	13917.00	9.42	34.3	18:30:00	0:00:00	Where no overtopping occurs, the peak flood stage is the upstream side embankment water level
POI 03 - Boyette Rd Bridge across Bell Creek (Mid Pt of the Upstream face)	7352	4.83	15872.00	15.90	26.90	19:30.00	0.:00:00	Westside Roadway - Low Point El. 27.83
POI 04 - Bell Creek outlet (Mouth) at Confluence with Alafia River	12987	2.13	15891.00	15.90	16.50	20:00:00	0:00:00	Modeled water surface level at Bell creek mouth.

Table 6. Hydraulic Features of Shadow Run Dam system PMP Flood - No Dam Break

Point of Interest (POI)	Distance from Shadow Run Dam at Lake Grady (ft)	Peak Velocity (ft/s)	Peak Flood Wave Discharge (cfs)	Peak Flood Depth (ft)	Peak Flood Stage (ft)	Peak Stage Arrival Time (since start of rainfall)	Over Topping Duration (Hr:Min: Sec)	Remarks
POI 01 - Shadow Run Dam Inlet Works Spillway Structure (Mid Pt)	0	N/A	26774.00	26.15	45.19	17:00:00	4:30:00	Top of Dam Low Point El.44.50. Max. 0.69 ft Overtopping of dam.
POI 02 - Shadow Run Dam Outlet (Mid Pt of apron)	145	N/A	26774.00	12.82	37.70	18:30:00	0:00:00	The peak flood stage is the upstream side embankment lake pool level.
POI 03 - Boyette Rd Bridge across Bell Creek (Mid Pt of the Upstream face)	7352	4.58	31272.00	19.20	30.20	19:30.00	0.:00:00	Westside Roadway- Low Point El. 27.83
POI 04 - Bell Creek outlet (Mouth) at Confluence with Alafia River	12987	3.24	31242.00	18.00	18.60	20:00:00	0:00:00	Modeled water surface level at Bell creek mouth.

4.4 Comparison between Different Inundation Scenarios

Based on the results of the simulation scenarios assessed, the distinct range of flooding inundation on the respective maps are compared for:

- the 100-yr versus ½ PMP event under no dam break , refer to Figure14 Appendix A
- the ½ PMP versus PMP events under no dam break , refer to Figure18 Appendix A

The extreme events 100-yr versus ½ PMP comparison results are shown on Figure 14. For the Bell Creek reach downstream of the dam, the flooding extents reveal an additional area of inundation during the ½ PMP event at the upstream west side of the Boyette Road Bridge. Refer to the Table in Section 5.2 which lists the number of homes impacted by the extreme flood events.

For the Bell Creek area upstream of the dam and adjacent to the Lake shoreline area, the inundation differential extent is comparatively small; but the ½ PMP flooding inundation extends into the upland area and impacts eleven (11) more homes than that of the 100-yr event. Refer to the Table in Section 5.2 which lists the number of homes impacted by the extreme flood events.

Figure 18 illustrates the comparative inundation extents of the ½ PMP and PMP events. For the area upstream of the dam the inundation differential is not discernible on the map. However, the number of additional homes impacted by the PMP event is six (6).

For the reach of Bell Creek downstream of the dam, the differential inundation extents are more pronounced at the Boyette bridge crossing along the west side of the roadway. Although the Bridge structure will not be overtopped during the ½ PMP event, the area adjacent to the upstream west side of the roadway would be inundated. During the PMP event the west side of the roadway approach would be inundated and impassible to vehicular traffic. This is because the west side roadway low point is approximately 2 feet lower than the bridge deck west end. The Boyette Road bridge structure and deck will not be overtopped during the PMP event, except for a small section near the west end of the bridge structure.

5.0 FLOODED PARCELS 100YR, ½ PMP AND PMP EVENTS

5.1 General

Flooded parcels resulting from the three (3) extreme event scenarios considered were identified and used to further confirm properties adjacent to Shadow Run Dam and the downstream Bell Creek system that will be impacted and may require evacuation of residents ahead of the arrival of the extreme rainfall event.

5.2 Flooded Parcels and Homes

The parcels and homes that will be inundated during the 100-year, ½ and PMP events, assuming the "no dam break" condition at Shadow Run Dam, are illustrated on Figures 19, 20 and 21, respectively.

The number of parcels with homes, adjacent to Shadow Run Dam, which are impacted during the 100 -year event and no dam break conditions, is estimated at six (6). Five(5) of the homes are situated upstream of the dam along the Bell Creek branch and one(1) home is located along the west side Pelleham Branch shore. The total number of parcels impacted is ninety-seven (97).
In addition, for the Bell Creek reach downstream of the dam, no homes are impacted adjacent to the creek for more than 2 miles downstream. The eighteen(18) homes impacted, are situated downstream of the Boyette Road crossing and in the immediate vicinity of the mouth of Bell Creek at its confluence with Alafia River, which are also influenced by the backwater elevation in the Alafia River during the flood event. Refer to Figure 22 - A1 to A4 panels. The total number of parcels impacted is one hundred and thirty-one (131).

The number of parcels with homes upstream of Shadow Run Dam along Lake Grady shoreline, which are impacted during the ½ PMP event and no dam break conditions, is estimated at seventeen (17). The total number of parcels impacted is one hundred and four (104).
It is noted that one (1) home is situated just downstream of the dam on the left bank of Bell Creek. In addition, for the Bell Creek reach downstream of the dam, twenty-six homes are impacted on the left bank just upstream of the Boyette Road crossing; and another twenty-three (23) homes in the vicinity of the confluence of Alafia River are impacted, which are also influenced by the backwater elevation in the Alafia River during the flood event. Refer to Figure 23 - A1 to A4 panels. For the Bell Creek reach downstream of the dam, the total number of homes impacted is fifty(50); and the total number of parcels impacted is one hundred and seventy-four (174).

The number of parcels with homes upstream of Shadow Run Dam along Lake Grady shoreline, which are impacted during the PMP event, and no dam break conditions, is estimated at twenty-three (23). The total number of parcels impacted is one hundred and eleven (111).
It is noted that one(1) home is situated just downstream of the dam on the left bank of Bell Creek. In addition, for the Bell Creek reach downstream of the dam, forty-seven (47) homes are impacted on the left bank in the vicinity of the Boyette Road crossing; and another thirty-seven (37) homes in the vicinity of the confluence of Alafia River are impacted, which are also influenced by the backwater elevation in the Alafia River during the flood event. Refer to Figure 24 - A1 to A4

panels. For the Bell Creek reach downstream of the dam, the total number of homes impacted is eighty-five (85) ; and the total number of parcels impacted is two hundred and ten (210).

The Table below summarizes the number of Impacted Homes and Inundated Parcels for the selected extreme flood events for areas along Bell Creek at locations Upstream and Downstream of Shadow Run Dam.

Downstream of Shadow Run Dam	Drawing No.	Inundation Event	No of Impacted Homes	No. of Impacted Parcels	Comments
√	Figure 19	100yr	18	131	See Figure 22 A1to A-4
√	Figure 20	½ PMP	50	174	See Figure 23 A1 to A-64
√	Figure 21	PMP	85	210	See Figure 24 A1 to A-4
Upstream of Shadow Run Dam	Drawing No.	Inundation Event	No. of Impacted Homes	No. of Impacted Parcels	Comments
√	Figure 19	100yr	6	97	See Figure 22 A3 to A-6
√	Figure 20	½ PMP	17	104	See Figure 23 A3 to A-6
√	Figure 21	PMP	23	111	See Figure 24 A3 to A-6

6.0 SUMMARY OF FINDINGS

Based on the hydrologic and hydraulic investigations performed for developing the Inundation Modeling and Mapping associated with extreme storm events for the Shadow Run Dam, owned and operated by Shadow Run Corp, Inc., the following findings are presented.

- Considering the three extreme event scenarios evaluated for flood inundation impacts at four (4) selected points of interest along Bell Creek at Shadow Run Dam and downstream to its mouth at Alafia River, all locations were identified as having potential flooding consequences. The three extreme event scenarios evaluated are:
    - 100-year storm – No Dam Break
    - ½ PMP storm – No Dam Break
    - PMP storm – No Dam Break

- **100 -year Shadow Run Dam -** The **no dam break 100 -year** storm event peak inflow will undergo an approximate 12 percent peak discharge flow attenuation by the lake impoundment and the routed outflow will not overtop the dam embankment crest. The peak inflow is 4946 cfs and the routed peak outflow is 4348 cfs. The corresponding flood stage is at Elevation 42.05ft , approximately 6.94feet above normal pool level at El 35.; and about 2.5 feet below the top of the dam embankment crest low point (average el. 44.5ft NAVD88). Shadow Run dam has no emergency overflow spillway and the 72 -inch diameter low level Draw Down gate valve will remain open throughout the entire storm event. The three -tier winged drop inlet spillway will safely discharge the flood flows through the 4-barrel concrete exit conduit to the outlet structure downstream apron to Bell Creek. The Shadow Run Dam flood pool will be at elevation 42.05 feet and the entire Lake Grady area will be inundated. Only six (6) parcels with homes adjacent to the Lake Grady shoreline will be affected during this event. However, ninety- seven (97) parcels along the Shadow Run shoreline will be impacted. Upstream of Shadow Run Dam, the inundation depths near the homes range from 0.1 to 5.8 feet above ground. For the reach of Bell Creek downstream of the dam, the inundation depths near the homes range from 0.2 to 6.9 feet above ground. Approximately one hundred and thirty-one (131) parcels will be impacted along the downstream reach of Bell Creek, which is also influenced by the backwater flood effects of the Alafia River at the confluence of the streams.

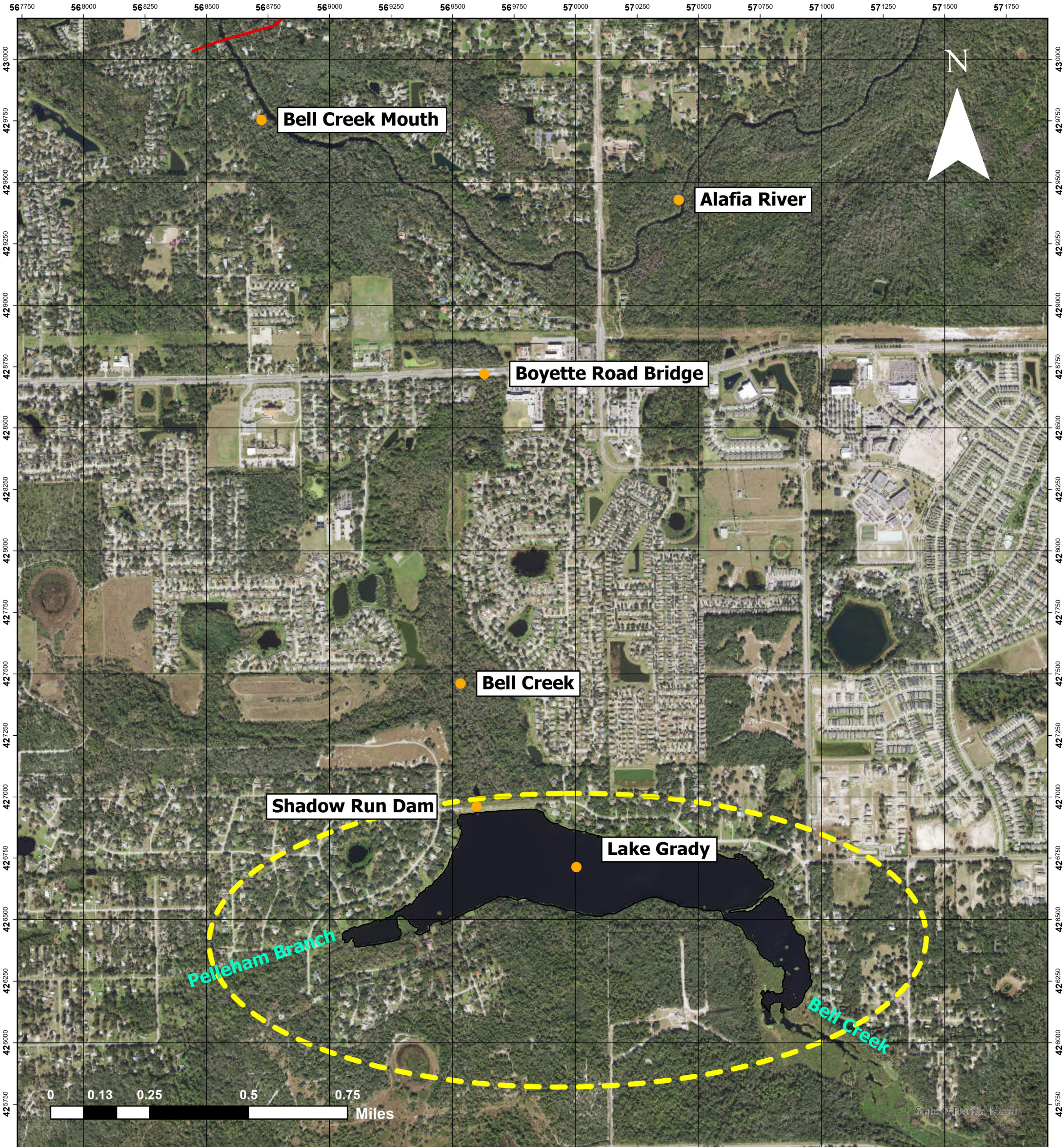
- **½ PMP Shadow Run Dam -** For the **½ PMP no dam break** condition, the routed flood flow through the Shadow Run will experience low attenuation. The peak inflow is 13,918 cfs and the routed peak outflow is 13,290 cfs, which is equivalent to a 4.9% attenuation of the peak inflow. The corresponding flood stage is at Elevation 44.4 ft approximately 0.1 feet below the dam embankment low point and approximately 9.3 feet above normal pool level. The top of the dam embankment crest will not be **overtopped** during the ½ PMP event, but the pool level will be at the brim of the embankment, indicating a full Lake Grady. The 3-tiered drop inlet spillway and 4 -barrel discharge conduit has sufficient capacity to safely pass the peak outflow downstream to Bell Creek. The Shadow Run flood pool will be at elevation 44.4 feet and the entire lake area will be inundated. Seventeen

(17) homes along the Shadow Run shoreline will be impacted, with flooding depths ranging from 0.1 to 8.2 feet above ground. One hundred and four (104) parcels will be affected upstream of the dam during this event. For the reach of Bell Creek downstream of the dam, fifty (50) homes would be inundated, with flooding depths near the homes ranging from 0.1 to 7.9 feet above ground. One hundred and seventy-four (174) parcels will be impacted along the downstream reach of Bell Creek, which is also influenced by the backwater flood effects of the Alafia River at the confluence of the streams.

- **PMP Shadow Run Dam** - For the **PMP no dam break** condition, the routed flood flow through the Shadow Run will experience low attenuation. The peak inflow is 25,119 cfs and the routed peak outflow is 24,847 cfs, which is equivalent to a 1.1% attenuation of the peak inflow. The corresponding flood stage is at Elevation 45.2 ft approximately 0.7 feet above the dam embankment low point and approximately 10.1 feet above normal pool level. The top of the dam embankment crest will be **overtopped** during the PMP event. The 3-tiered drop inlet spillway and 4 -barrel discharge conduit has sufficient capacity to safely pass 68% of the peak outflow with the remaining flow passing via pressure flow and dam overtopping flow downstream to Bell Creek. The Shadow Run flood pool will be at elevation 45.2 feet and the entire lake area will be inundated. Twenty-three (23) homes along the Shadow Run shoreline will be impacted, with flooding depths ranging from 0.1 to 9.0 feet above ground. One hundred and eleven parcels (111) will be affected upstream of the dam during this event. For the reach of Bell Creek downstream of the dam, eighty-five (85) homes would be inundated, with flooding depths near the homes ranging from 0.1 to 10.1 feet above ground. Two hundred and ten (210) parcels will be impacted along the downstream reach of Bell Creek, which is also influenced by the backwater flood effects of the Alafia River at the confluence of the streams.

7.0 APPENDIX A – FIGURES

Figure 1 to Figure 24



Project

Inundation Modeling and Mapping for Shadow Run Dam

Project Location- Shadow Run Dam at Lake Grady, Riverview, Hillsborough County, FL

Date	**Drawn**	**Scale**
06.14.22	TC/MC	1:15,000

Spatial Reference

Name: Albers Conical Equal Area
[Florida Geographic Data Library]

Drawing Ref:

Figure 1

Legend

- Study limit
- Received shoreline
- Lake Grady location

Notes

Florida Department of Environmental Protection

Division of Water Resource Management

Comak Group, Inc

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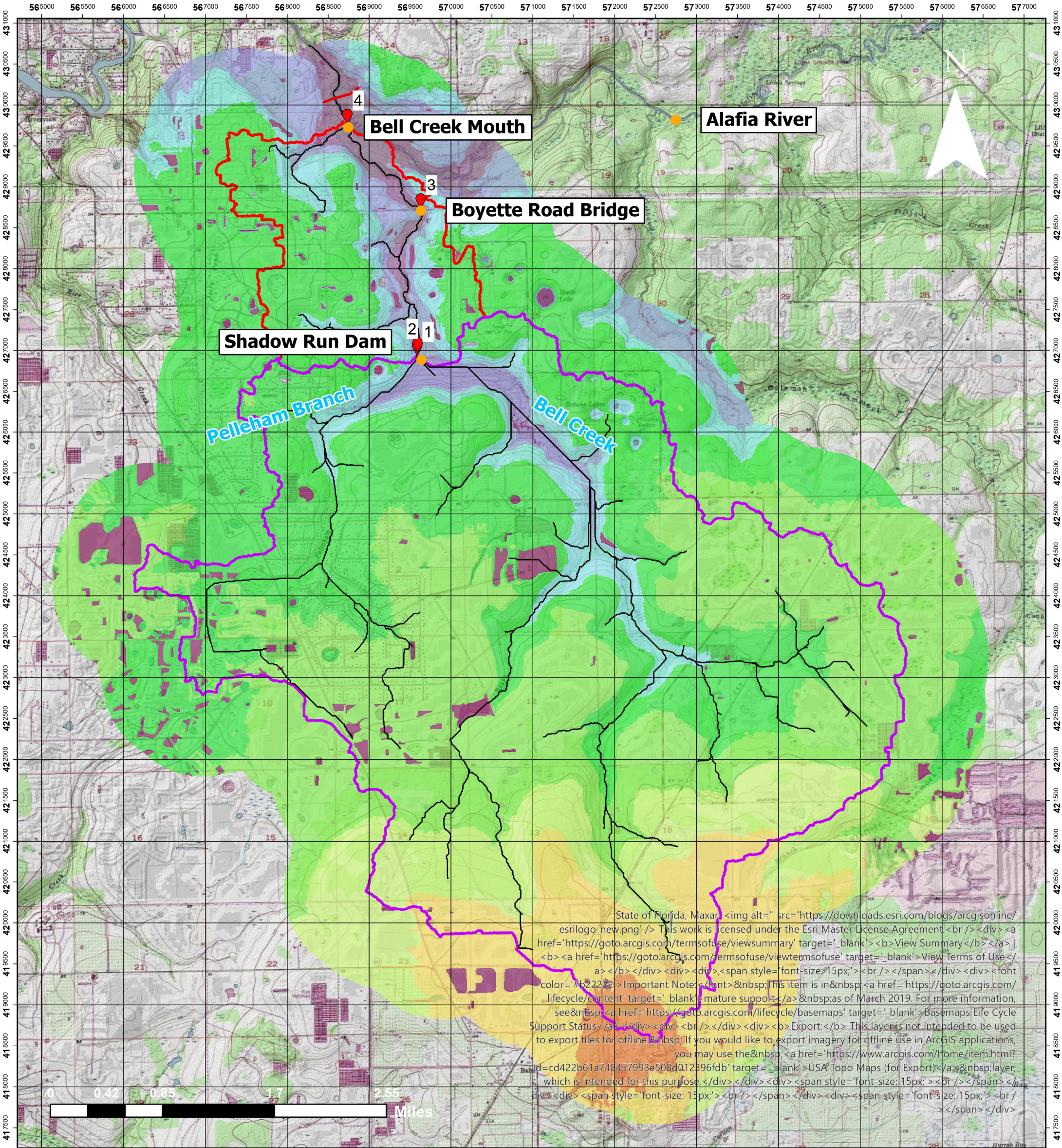

State of Florida, Maxar, This work is licensed under the Esri Master License Agreement.
 View Summary | View Terms of Use
 Important Note: This item is in mature support as of March 2019. For more information, see Basemaps Life Cycle Support Status
 Export: This layer is not intended to be used to export tiles for offline. If you would like to export imagery for offline use in ArcGIS applications, you may use the USA Topo Maps (for Export) layer, which is intended for this purpose.

Project

Inundation Modeling and Mapping for Shadow Run Dam

Shadow Run Dam at Lake Grady – Drainage Catchment Areas

Date	Drawn	Scale
06.14.22	TC/MC	1:45,000

Spatial Reference

Name: Albers Conical Equal Area
[Florida Geographic Data Library]

Drawing Ref:

Figure 2

Legend

- Flood modeling points of interest
- Study limit
- Modeled flow routing (0.090 sq miles contributing area threshold)

Lake Grady watershed area at Carrow Road (19.95 sq miles)

- Bell Creek D/S Subarea (2.52 sq miles)
- Lake Grady Subarea (17.43 sq miles)

Lake Grady watershed (feet)

- -0.999 - 0
- 0.1 to 20.0
- 20.1 to 40.0
- 40.1 to 60.0
- 60.1 to 80.0
- 80.1 to 100.0
- 100.1 to 120.0
- 120.1 to 140.0
- 140.1 to 160.0
- 160.1 to 165.0

Notes

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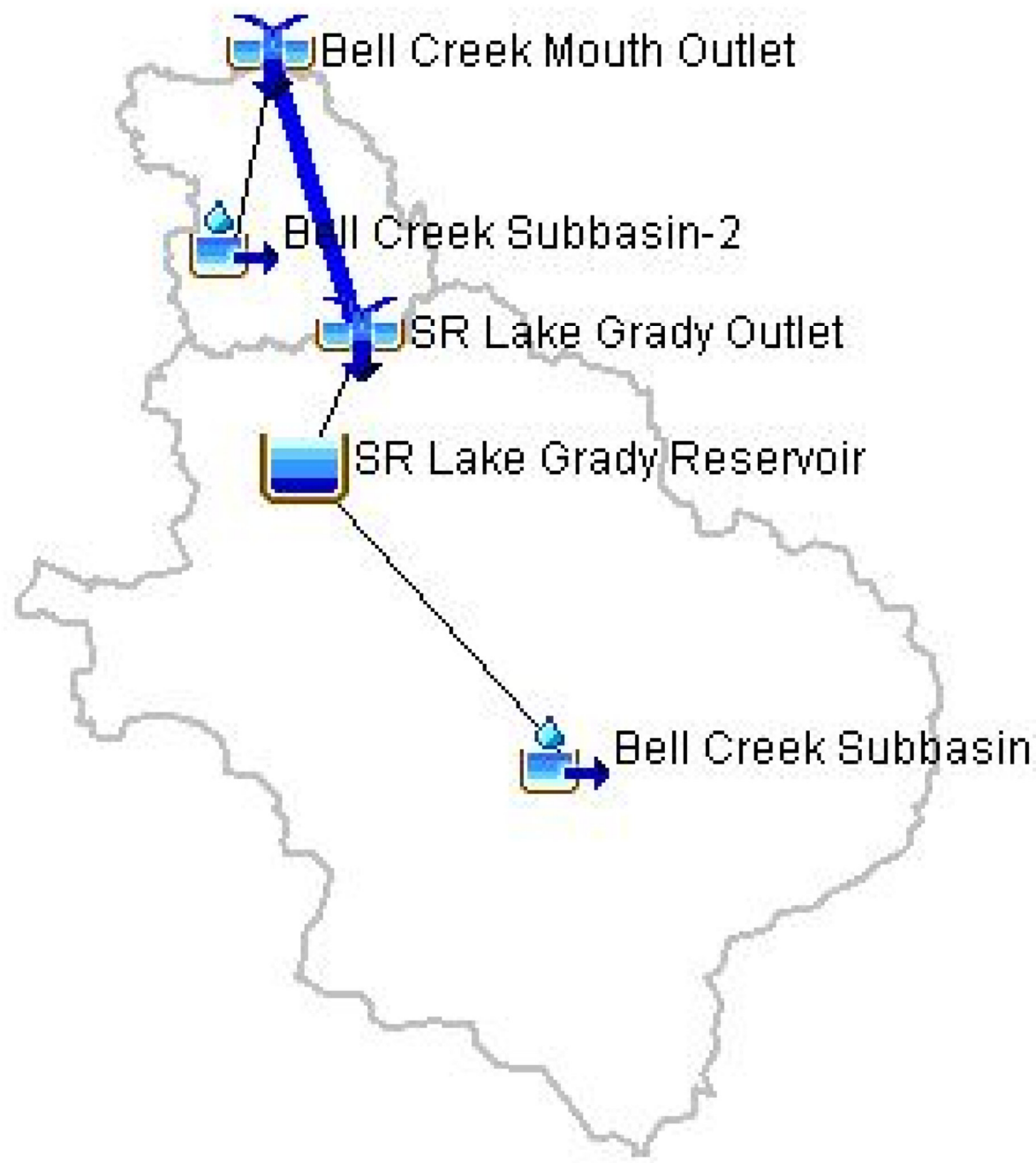

Project

Inundation Modeling and Mapping for Shadow Run Dam

Shadow Run Dam at Lake Grady – HEC-HMS Model Network Schematic

Date	**Drawn**	**Scale**
06.15.22	TC/MC	N/A

Legend

Spatial Reference
N/A

Drawing Ref:
Figure 3

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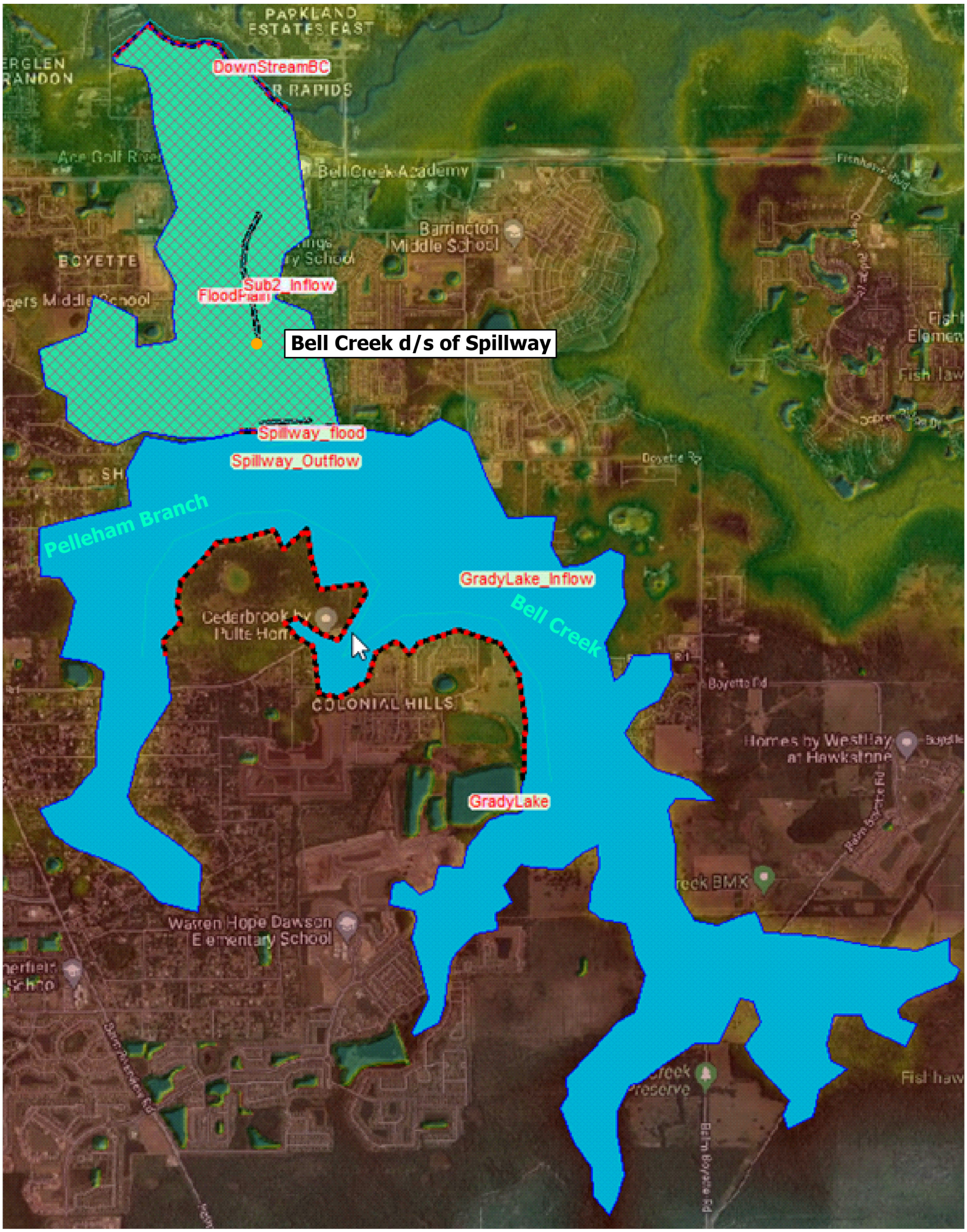
Notes

1) Model Schematic Drawing - not to scale



Project

Inundation Modeling and Mapping for Shadow Run Dam

Shadow Run Dam at Lake Grady – Schematic of HEC-RAS model set up

Date	Drawn	Scale
06.14.22	TC/MC	N/A

Legend

- Model boundary condition divide
- Simulation domain - Bell Creek Floodplain
- Typical simulation domain - Shadow Run Dam Floodplain

Spatial Reference
N/A

Drawing Ref:
Figure 4

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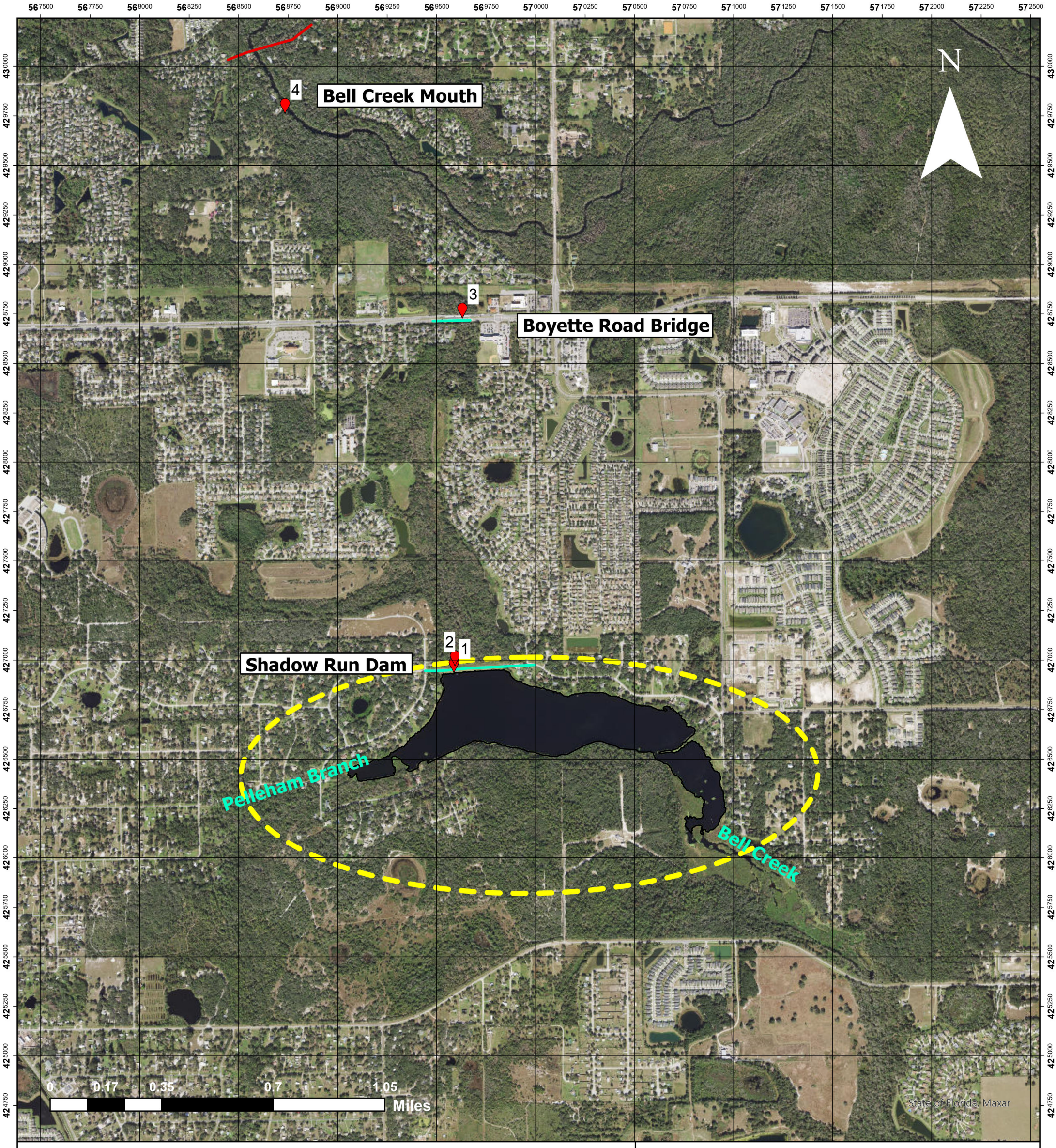
Notes

1) Model Schematic Drawing - not to scale



Project

Inundation Modeling and Mapping for Shadow Run Dam

Shadow Run Dam Location, Points of Interest and Cross Sections

Date	Drawn	Scale
06.14.22	TC/MC	1:18,500

Spatial Reference

Name: Albers Conical Equal Area
[Florida Geographic Data Library]

Drawing Ref:

Figure 5

Legend

- Flood modeling points of interest
- Study limit
- Cross section lines
- Lake Grady location
- Received shoreline

Notes

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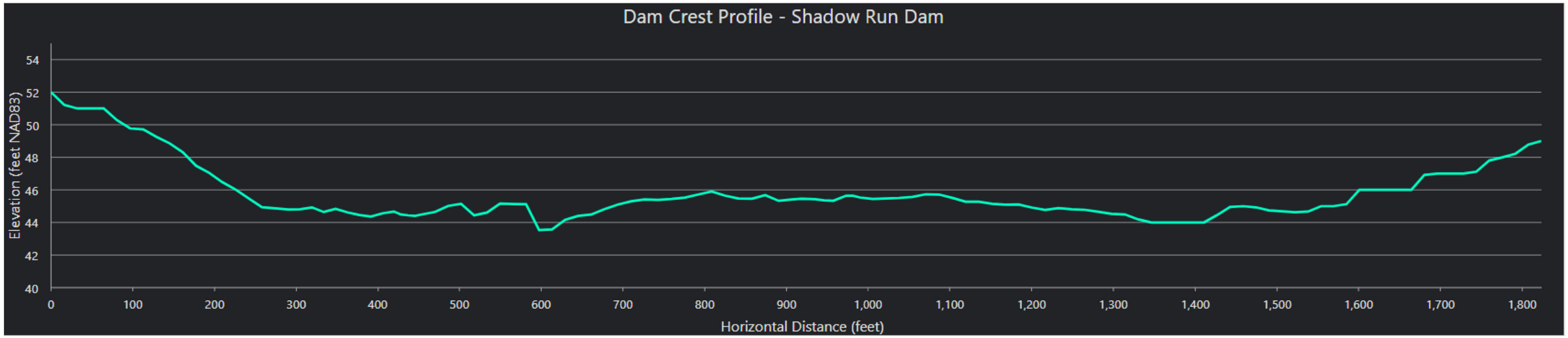

Project

Dam Break Inundation Mapping – Shadow Run Dam

Date	Drawn	Scale
06.15.22	TC/MC	N/A

Shadow Run Dam Representative Photos and Top of Dam Cross section

Shadow Run Dam, Riverview, Hillsborough County, FL

Spatial Reference

N/A

Drawing Ref:

Figure 6

Legend

Notes

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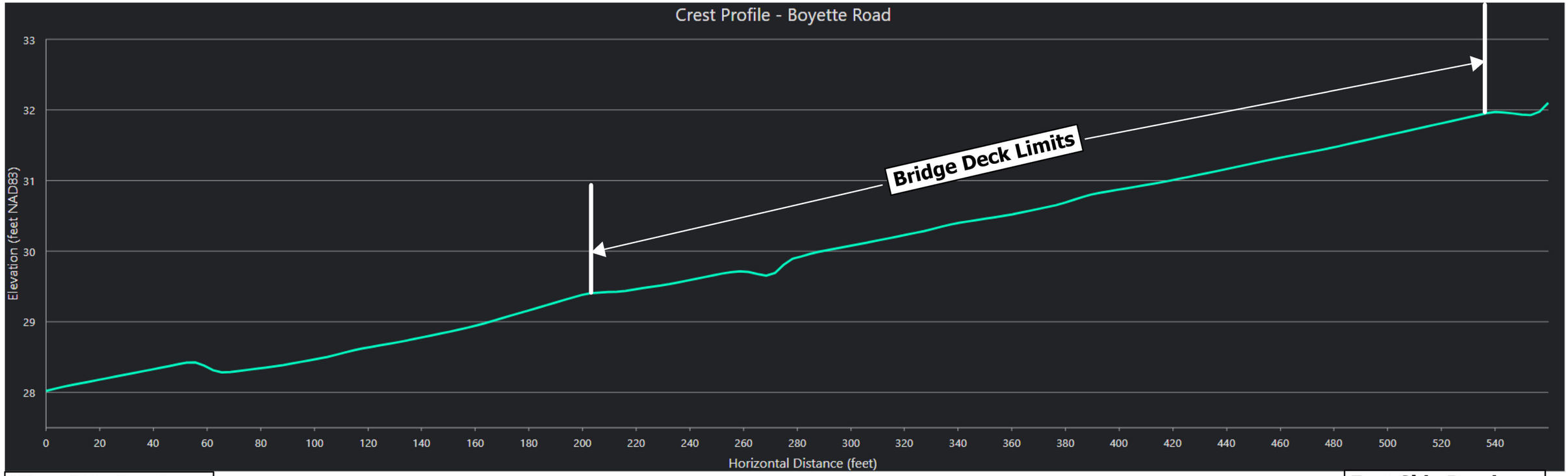
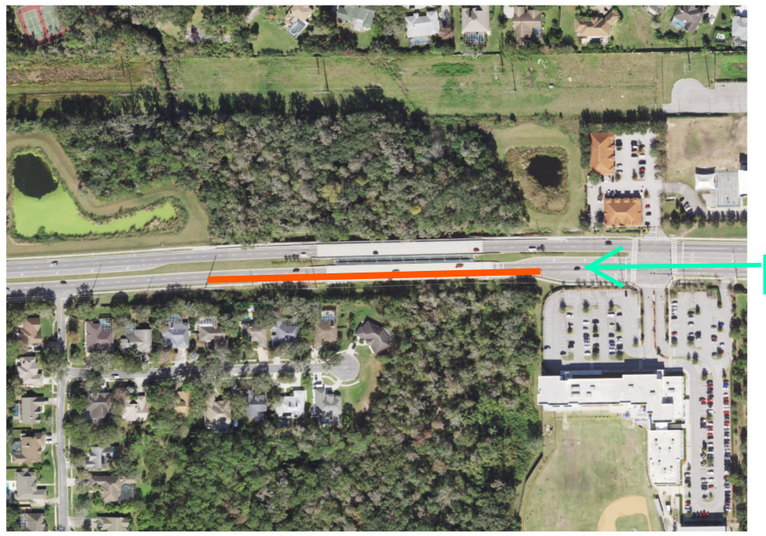


West Side Roadway

East Side Roadway



Project

Dam Break Inundation Mapping – Shadow Run Dam

Date	Drawn	Scale
06.15.22	TC/MC	N/A

Boyette Road Representative Photos and Cross section

Shadow Run Dam, Riverview, Hillsborough County, FL

Spatial Reference

N/A

Drawing Ref:

Figure 7

Legend

Notes

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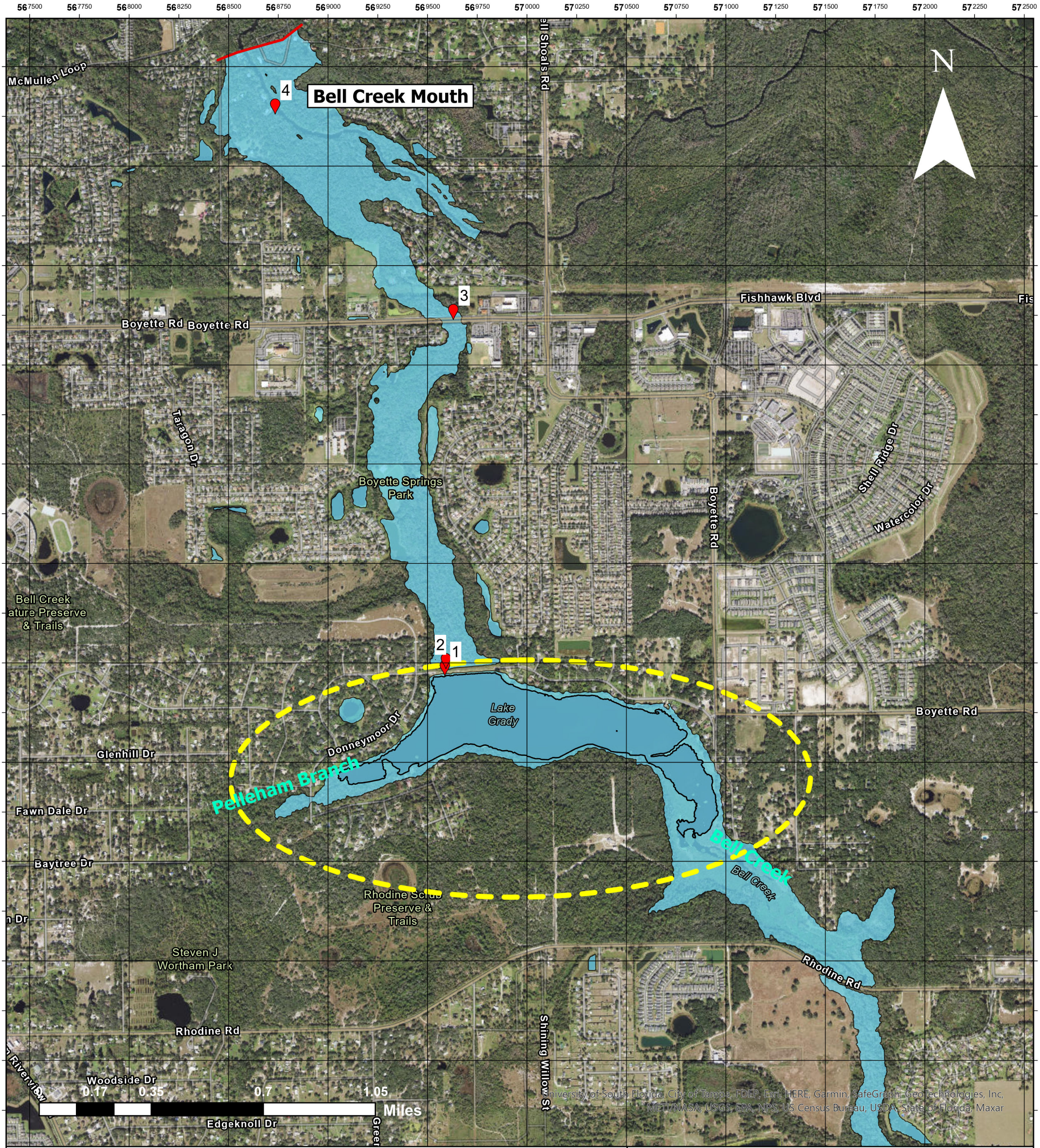

Project

Inundation Modeling and Mapping for Shadow Run Dam

100-Year Flood Inundation Extent - No Dam Break

Date	Drawn	Scale
06.14.22	TC/MC	1:18,500

Legend

- Flood modeling points of interest
- Study limit
- Lake Grady location
- Received shoreline
- Shadow Run Dam 100-year storm (no dam break)

Spatial Reference

Name: Albers Conical Equal Area
[Florida Geographic Data Library]

Drawing Ref:

Figure 8

Notes

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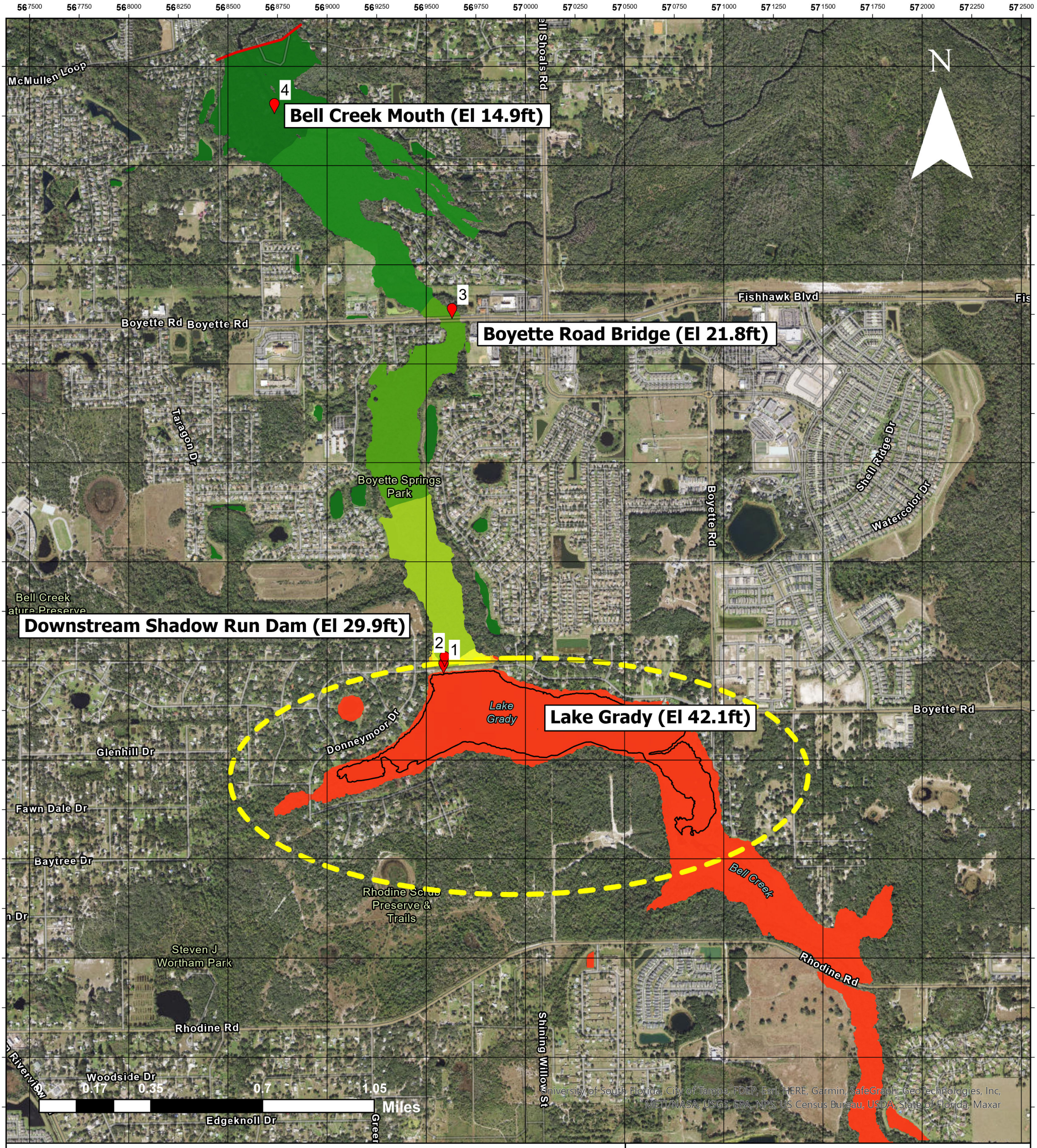

Project

Inundation Modeling and Mapping for Shadow Run Dam

100-Year Flood Inundation Maximum Water Elevations - No Dam Break

Date	Drawn	Scale
06.14.22	TC/MC	1:18,500

Spatial Reference

Name: Albers Conical Equal Area
[Florida Geographic Data Library]

Drawing Ref:

Figure 9

Legend

- Flood modeling points of interest
- Study limit
- Lake Grady location
- Received shoreline

Shadow Run Dam 100-year storm (no dam break - feet)

- 14.6 to 15.0
- 15.1 to 20.0
- 20.1 to 25.0
- 25.1 to 30.0
- 30.1 to 35.0
- 35.1 to 40.0
- 40.1 to 42.1

Notes

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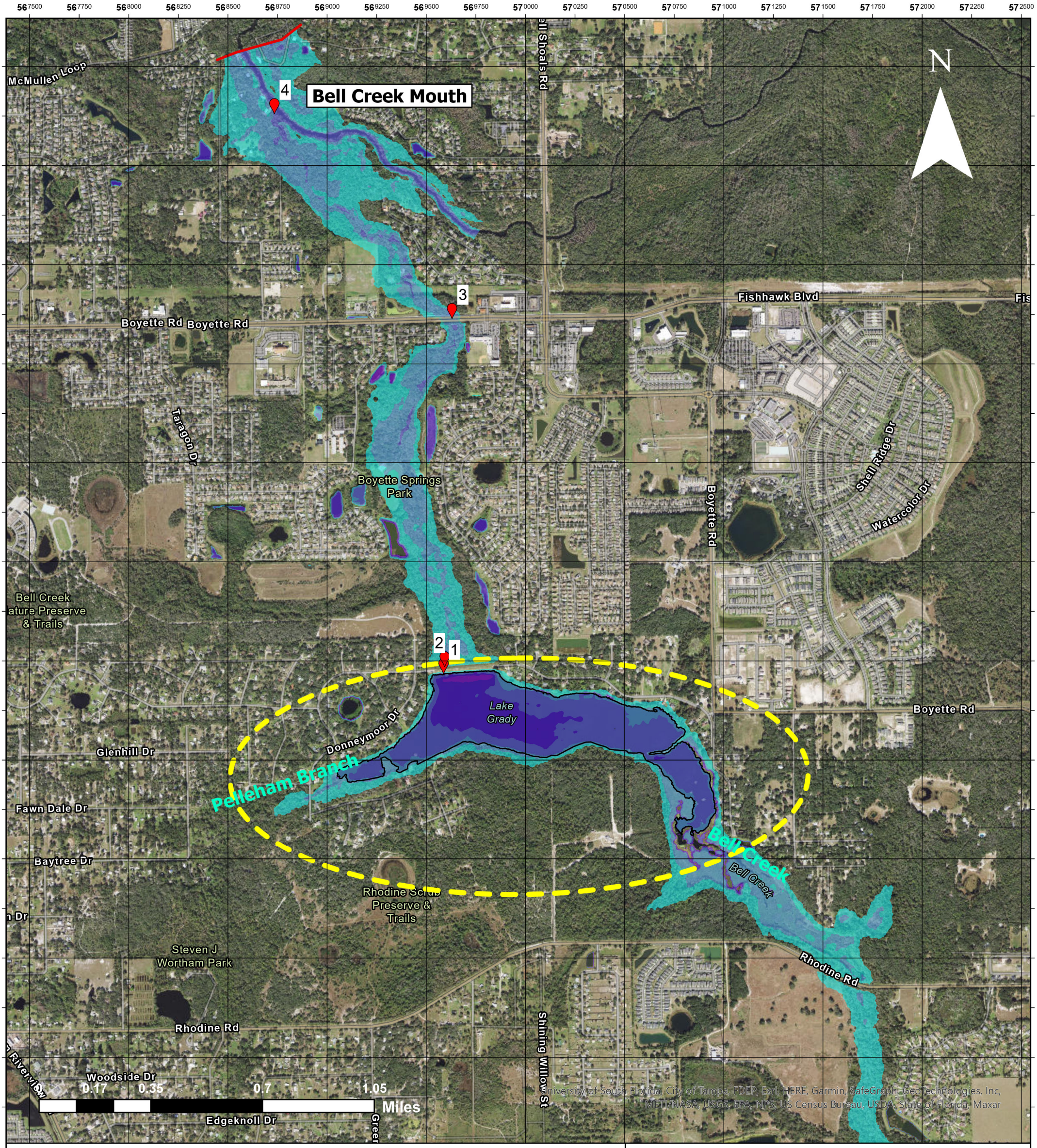

Project

Inundation Modeling and Mapping for Shadow Run Dam

100-Year Flood Inundation Maximum Water Depths - No Dam Break

Date	Drawn	Scale
06.14.22	TC/MC	1:18,500

Spatial Reference

Name: Albers Conical Equal Area
[Florida Geographic Data Library]

Drawing Ref:

Figure 10

Legend

- Flood modeling points of interest
- Study limit
- Lake Grady location
- Received shoreline

Shadow Run Dam 100-year storm (no dam break - feet)

- 0.0 to 5.0
- 5.1 to 10.0
- 10.1 to 15.0
- 15.1 to 20.0
- 20.1 to 25.0
- 25.1 to 25.3
- NoData

Notes

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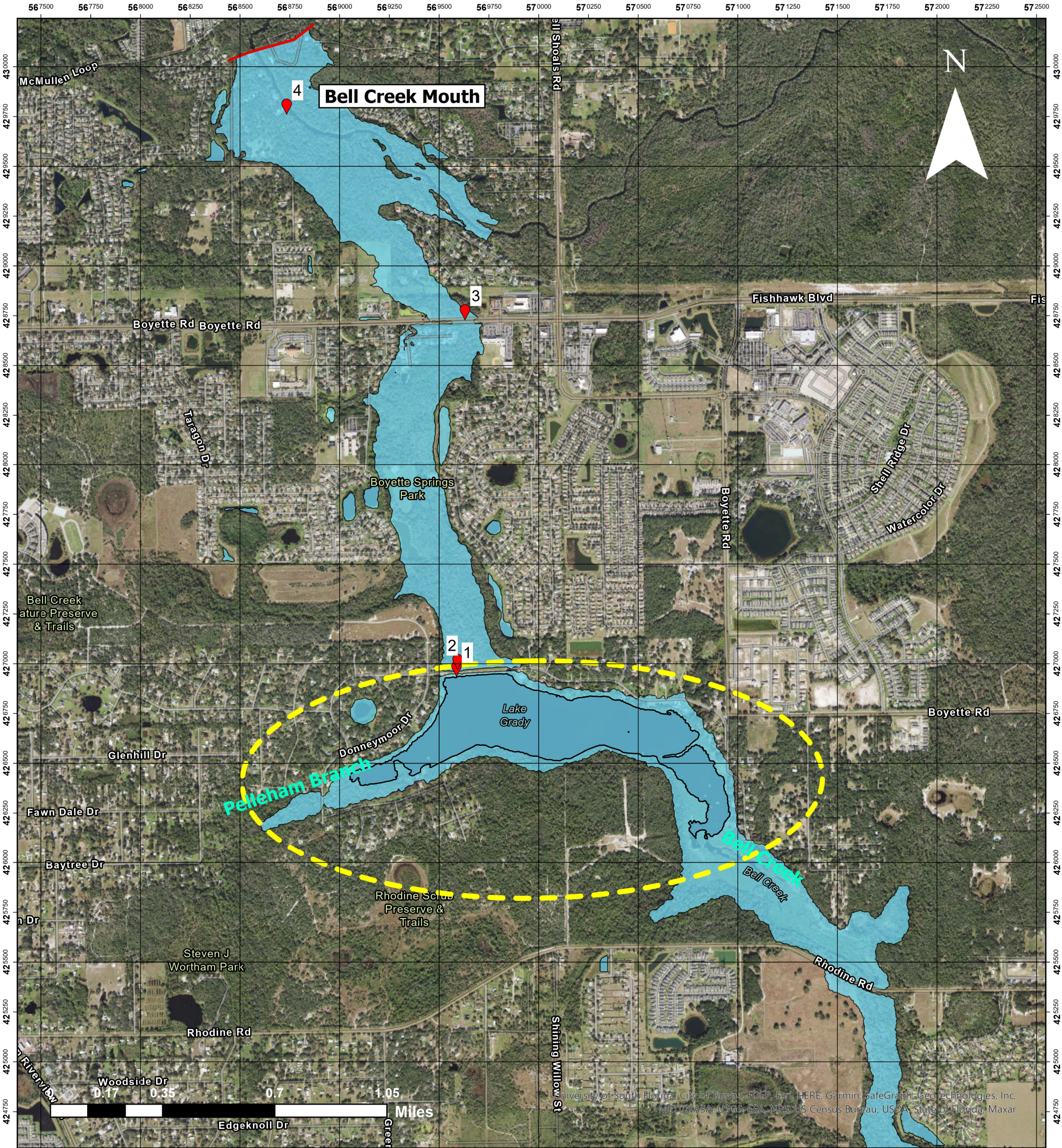

Project

Inundation Modeling and Mapping for Shadow Run Dam

½ PMP Flood Inundation Extent - No Dam Break

Date	Drawn	Scale
06.14.22	TC/MC	1:18,500

Legend

- Flood modeling points of interest
- Study limit
- Lake Grady location
- Received shoreline
- Shadow Run Dam half-PMP event (no dam break)

Spatial Reference

Name: Albers Conical Equal Area
[Florida Geographic Data Library]

Drawing Ref:

Figure 11

Notes

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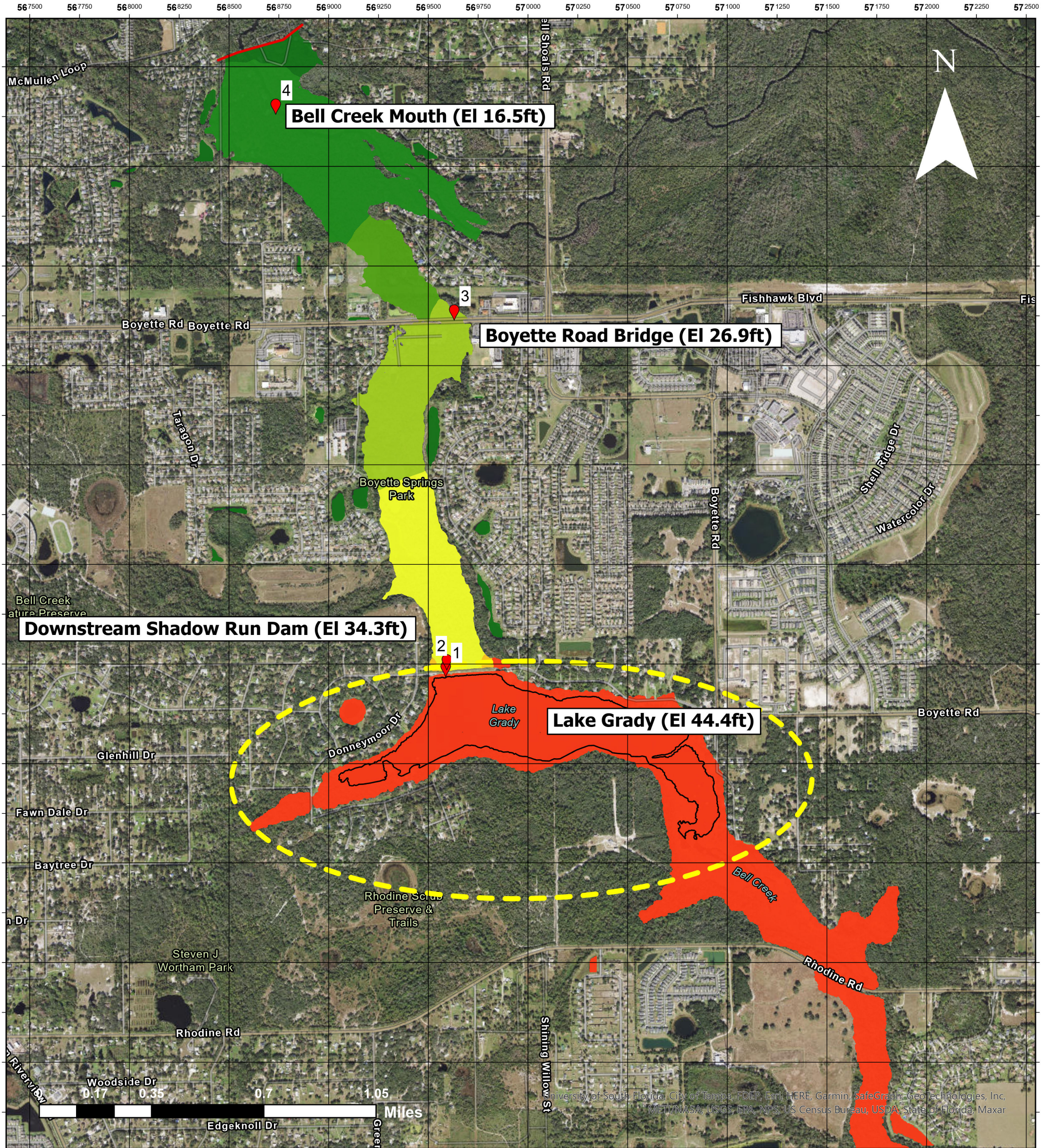

Project

Inundation Modeling and Mapping for Shadow Run Dam

½ PMP Flood Inundation Maximum Water Elevations - No Dam Break

Date	Drawn	Scale
06.14.22	TC/MC	1:18,500

Spatial Reference

Name: Albers Conical Equal Area
[Florida Geographic Data Library]

Drawing Ref:

Figure 12

Legend

- Flood modeling points of interest
- Study limit
- Lake Grady location
- Received shoreline

Shadow Run Dam half-PMP event (no dam break - feet)

- 14.6 to 15.0
- 15.1 to 20.0
- 20.1 to 25.0
- 25.1 to 30.0
- 30.1 to 35.0
- 35.1 to 40.0
- 40.1 to 44.43

Notes

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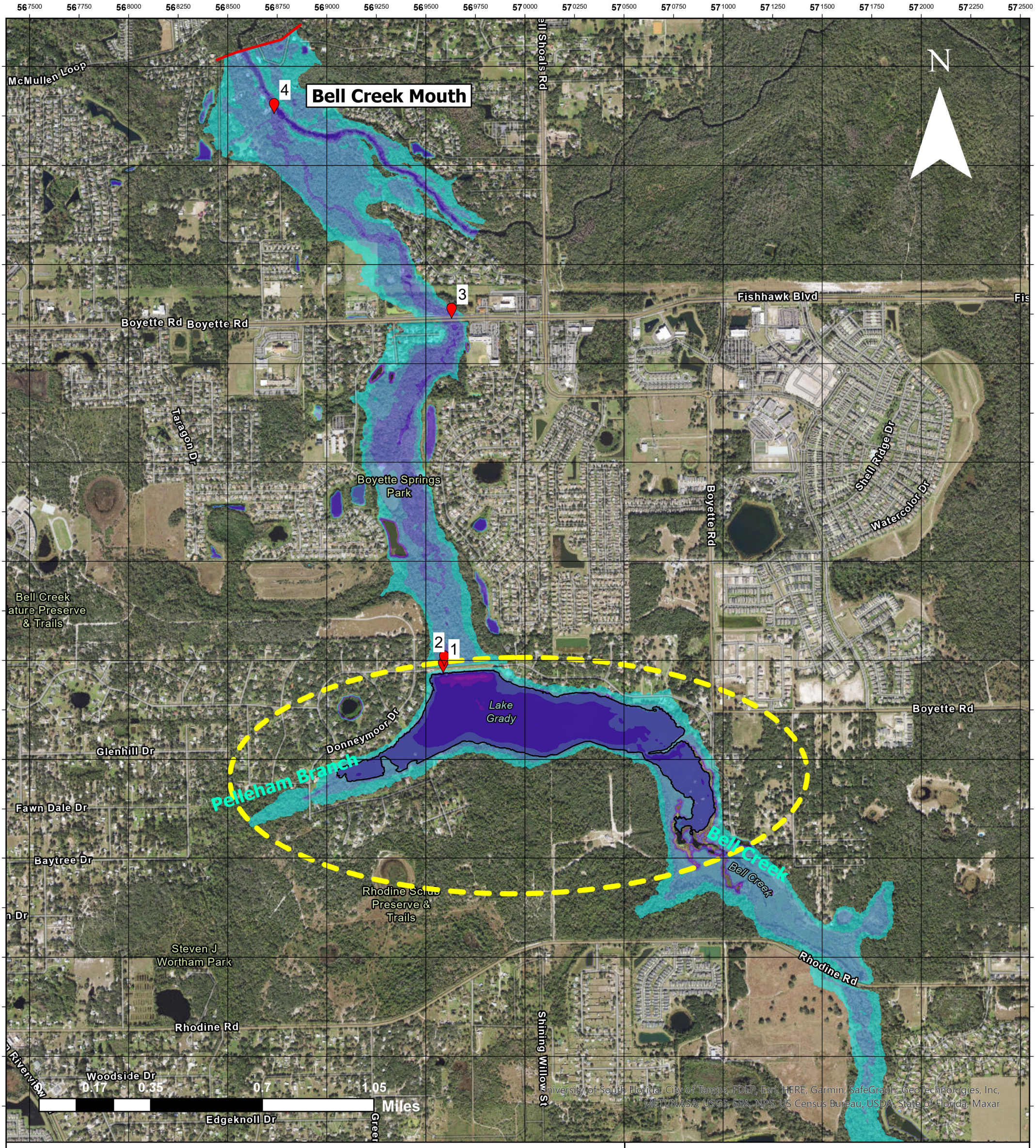

Project

Inundation Modeling and Mapping for Shadow Run Dam

½ PMP Flood Inundation Maximum Water Depths - No Dam Break

Date	Drawn	Scale
06.14.22	TC/MC	1:18,500

Spatial Reference

Name: Albers Conical Equal Area
[Florida Geographic Data Library]

Drawing Ref:

Figure 13

Legend

- Flood modeling points of interest
- Study limit
- Lake Grady location
- Received shoreline

Shadow Run Dam half-PMP event (no dam break - feet)

- 0.0 to 5.0
- 5.1 to 10.0
- 10.1 to 15.0
- 15.1 to 20.0
- 20.1 to 25.0
- 25.1 to 27.6
- NoData

Notes

Florida Department of Environmental Protection

Division of Water Resource Management

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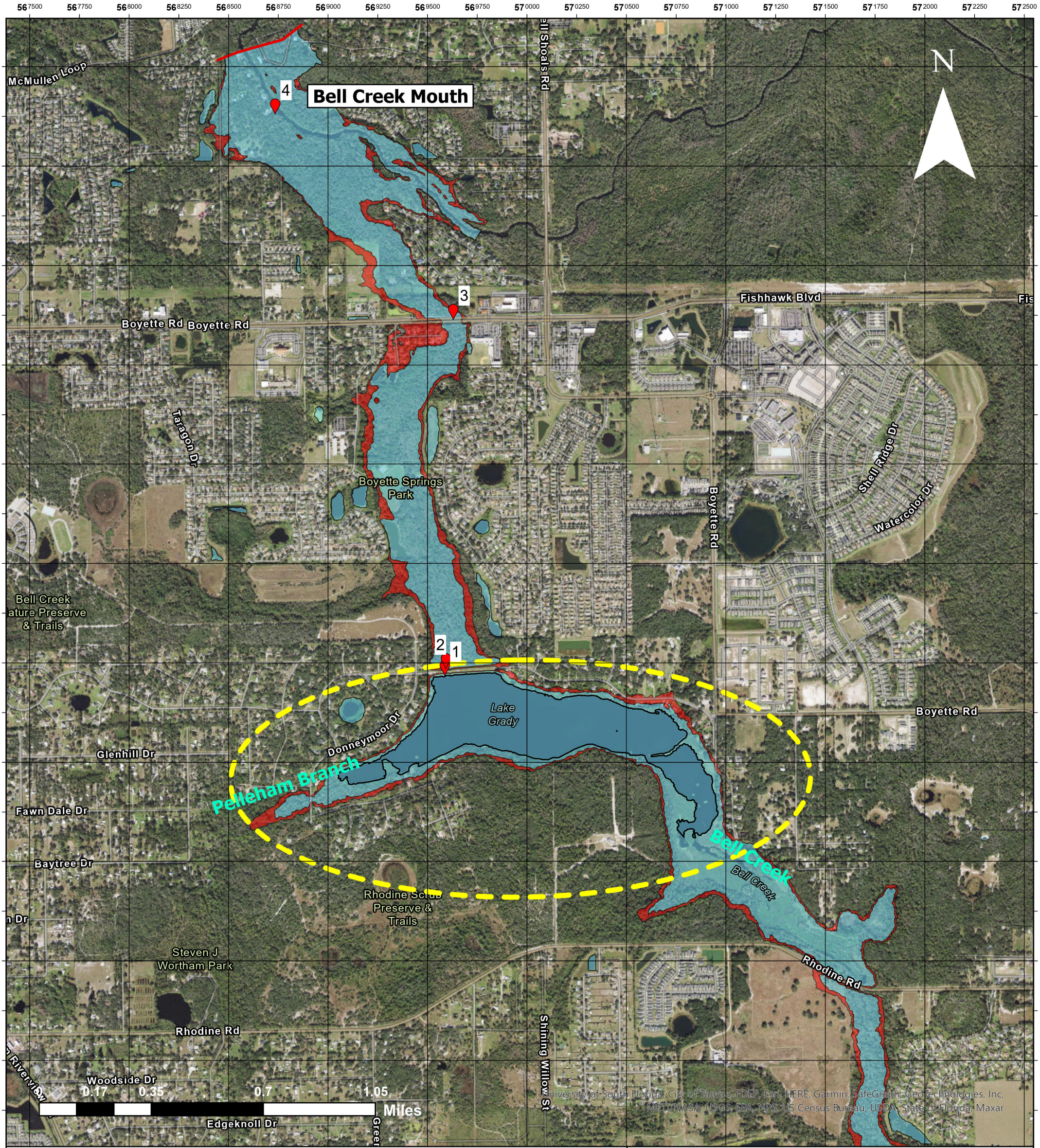

Project

Inundation Modeling and Mapping for Shadow Run Dam

Flood Inundation Comparison – 100 Year No Dam Break vs ½ PMP No Dam Break

Date	Drawn	Scale
06.14.22	TC/MC	1:18,500

Spatial Reference

Name: Albers Conical Equal Area
[Florida Geographic Data Library]

Drawing Ref:

Figure 14

Legend

- Flood modeling points of interest
- Study limit
- Lake Grady location
- Received shoreline
- Shadow Run Dam 100-year storm (no dam break)
- Shadow Run Dam half-PMP event (no dam break)

Notes

Florida Department of Environmental Protection

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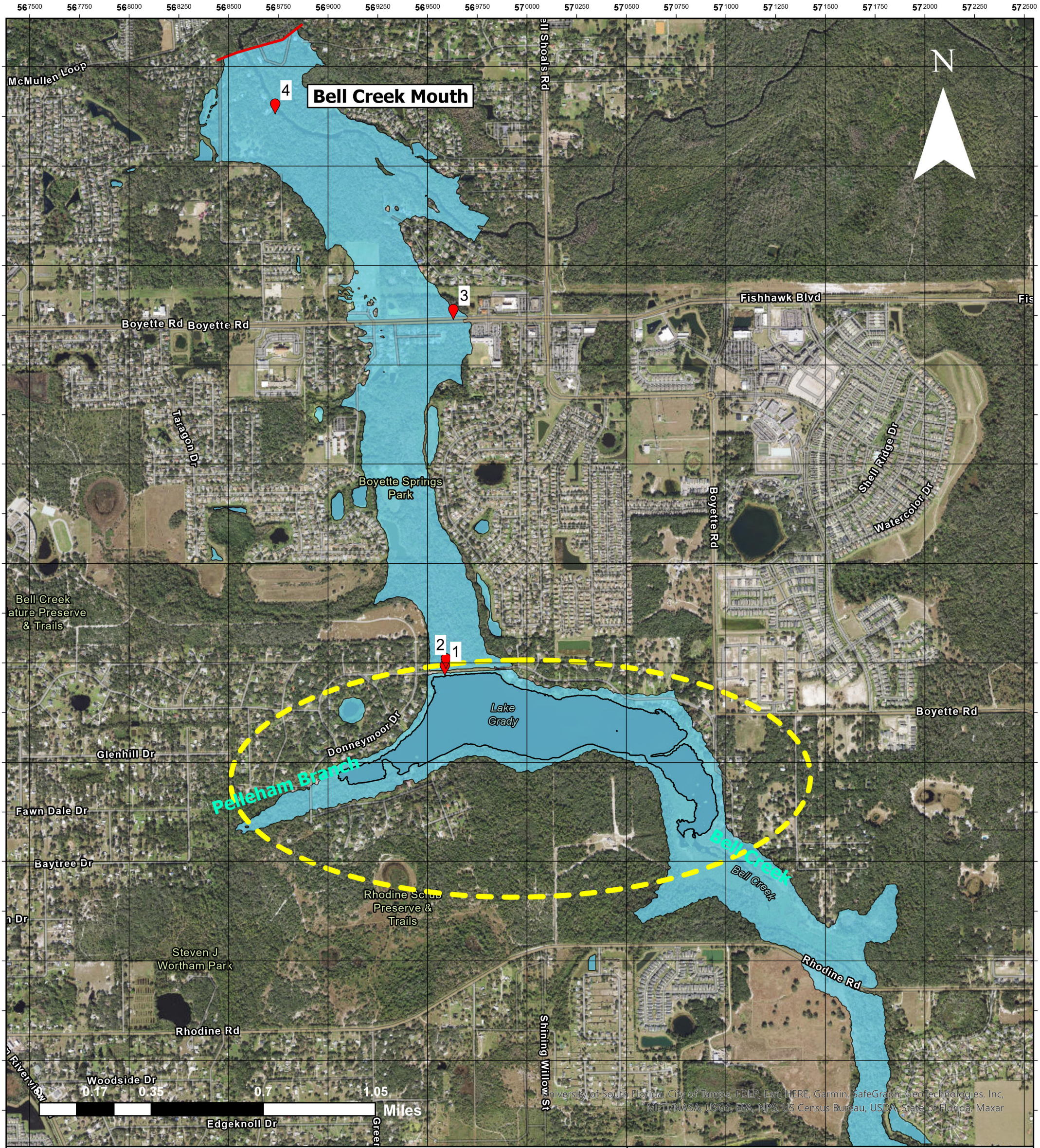

Project

Inundation Modeling and Mapping for Shadow Run Dam

PMP Flood Inundation Extent - No Dam Break

Date	Drawn	Scale
06.14.22	TC/MC	1:18,500

Legend

- Flood modeling points of interest
- Study limit
- Lake Grady location
- Received shoreline
- Shadow Run Dam PMP event (no dam break)

Spatial Reference

Name: Albers Conical Equal Area
[Florida Geographic Data Library]

Drawing Ref:

Figure 15

Notes

Florida Department of Environmental Protection

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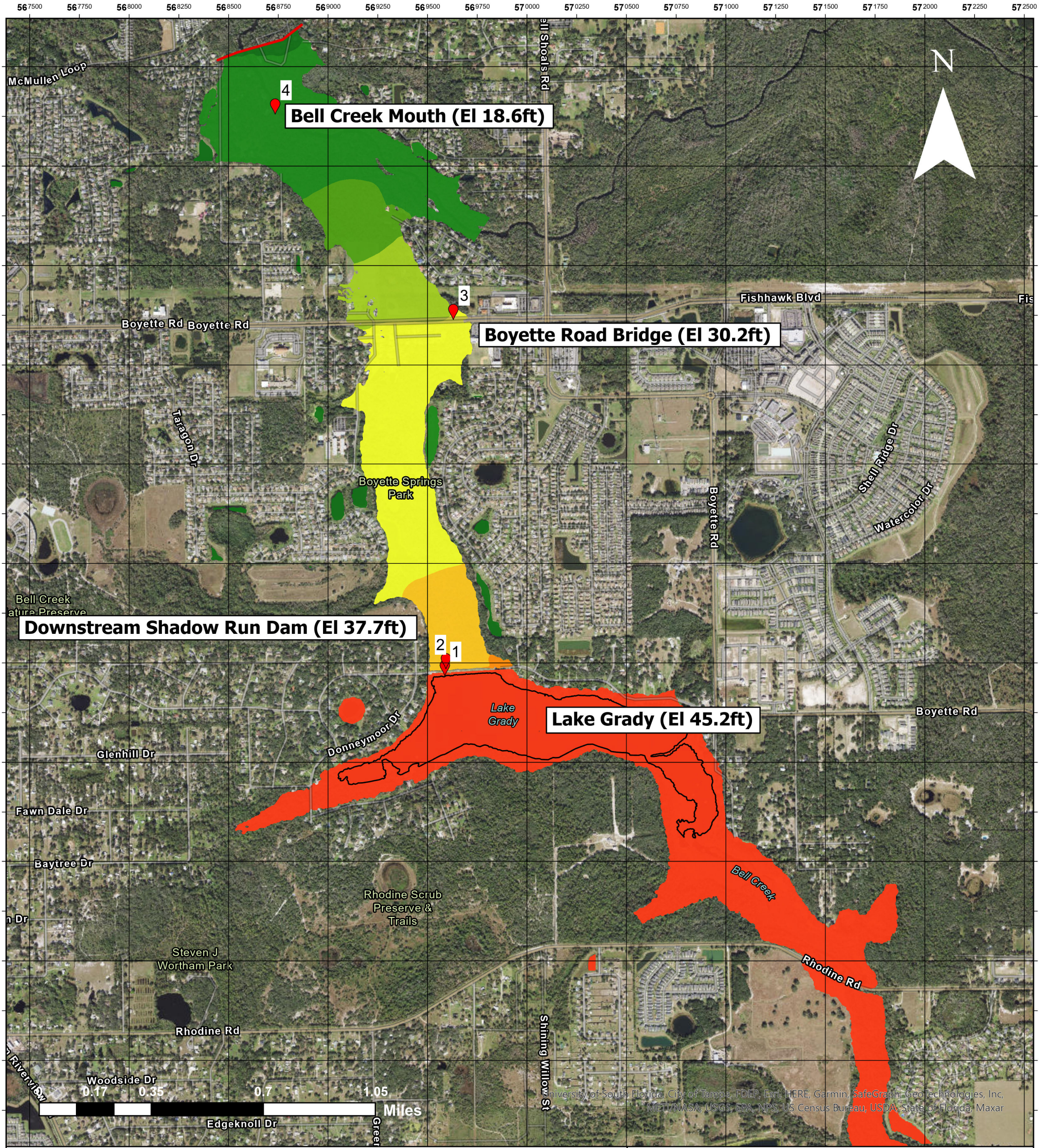

Project

Inundation Modeling and Mapping for Shadow Run Dam

PMP Flood Inundation Maximum Water Elevations - No Dam Break

Date	Drawn	Scale
06.14.22	TC/MC	1:18,500

Spatial Reference

Name: Albers Conical Equal Area
[Florida Geographic Data Library]

Drawing Ref:

Figure 16

Legend

- Flood modeling points of interest
- Study limit
- Received shoreline

Shadow Run Dam PMP event (no dam break - feet)

- 14.6 to 15.0
- 15.1 to 20.0
- 20.1 to 25.0
- 25.1 to 30.0
- 30.1 to 35.0
- 35.1 to 40.0
- 40.1 to 45.0
- 45.1 to 45.2

Notes

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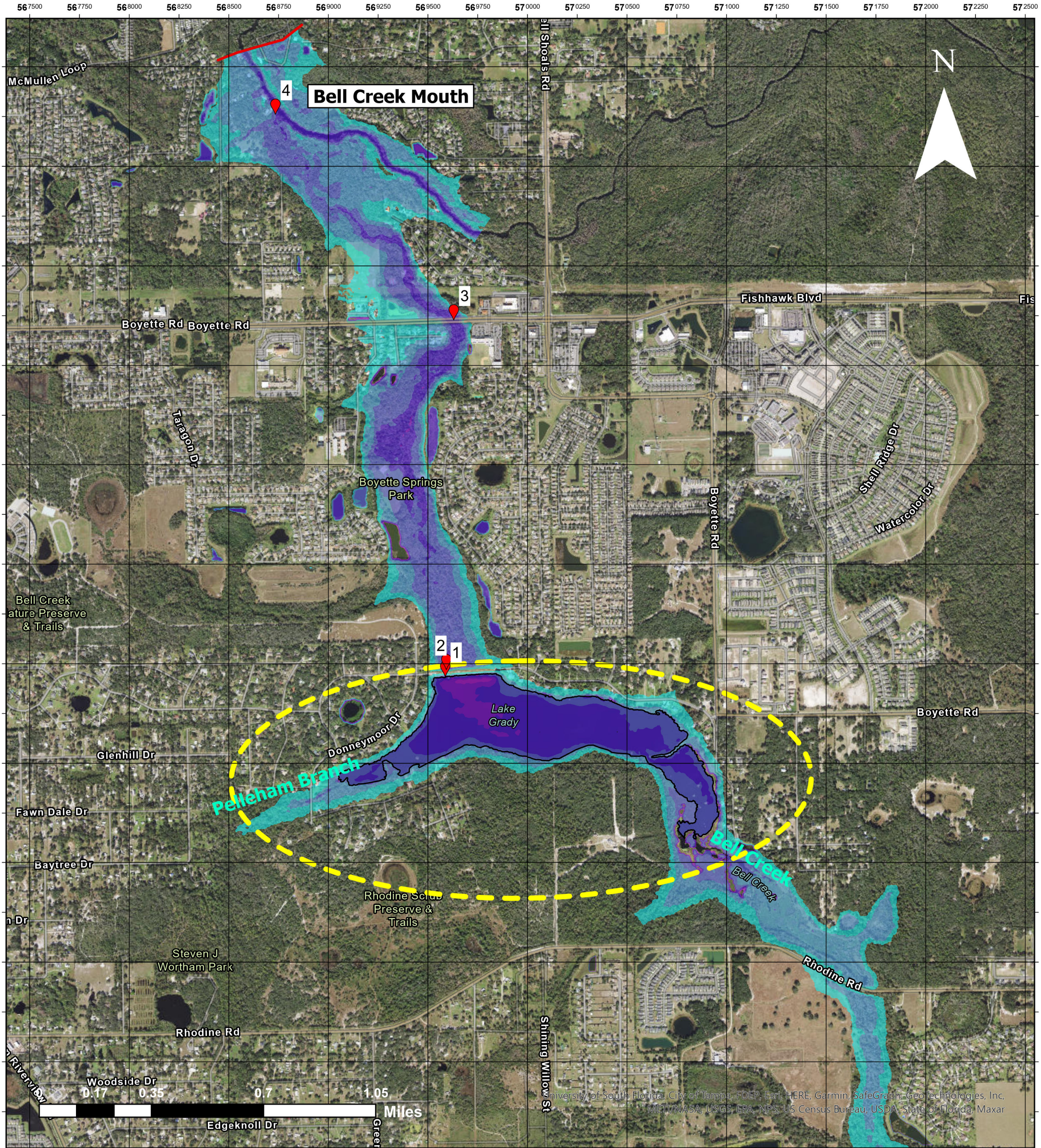

Project

Inundation Modeling and Mapping for Shadow Run Dam

PMP Flood Inundation Maximum Water Depths - No Dam Break

Date	Drawn	Scale
06.14.22	TC/MC	1:18,500

Spatial Reference

Name: Albers Conical Equal Area
[Florida Geographic Data Library]

Drawing Ref:

Figure 17

Legend

- Flood modeling points of interest
- Study limit
- Lake Grady location
- Received shoreline

Shadow Run Dam PMP event (no dam break - feet)

- 0.0 to 5.0
- 5.1 to 10.0
- 10.1 to 15.0
- 15.1 to 20.0
- 20.1 to 25.0
- 25.1 to 28.4
- NoData

Notes

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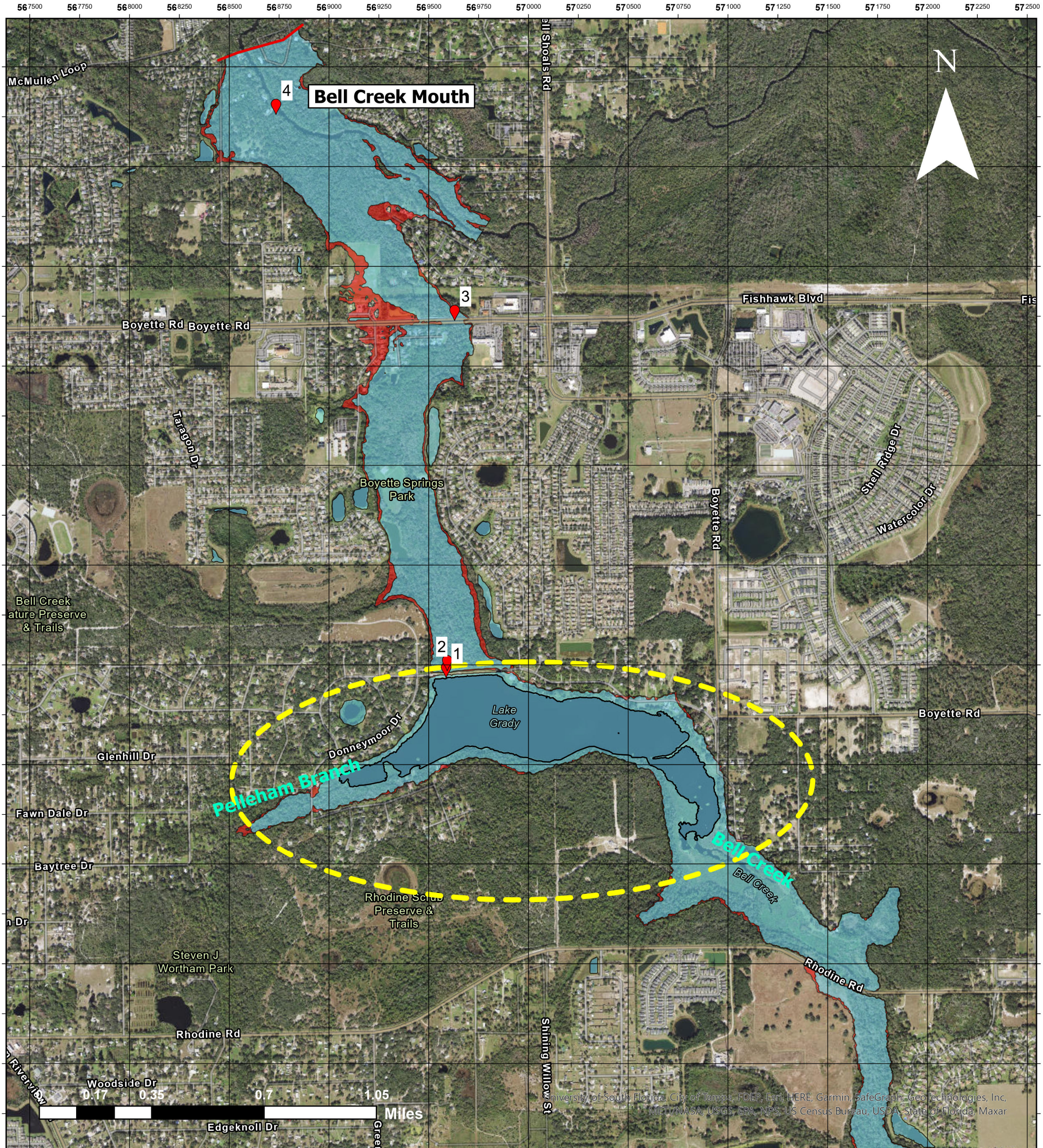

Project

Inundation Modeling and Mapping for Shadow Run Dam

Flood Inundation Comparison – ½ PMP No Dam Break vs PMP No Dam Break

Date	Drawn	Scale
06.14.22	TC/MC	1:18,500

Legend

- Flood modeling points of interest
- Study limit
- Lake Grady location
- Received shoreline
- Shadow Run Dam half-PMP event (no dam break)
- Shadow Run Dam PMP event (no dam break)

Spatial Reference

Name: Albers Conical Equal Area
[Florida Geographic Data Library]

Drawing Ref:

Figure 18

Notes

Florida Department of Environmental Protection

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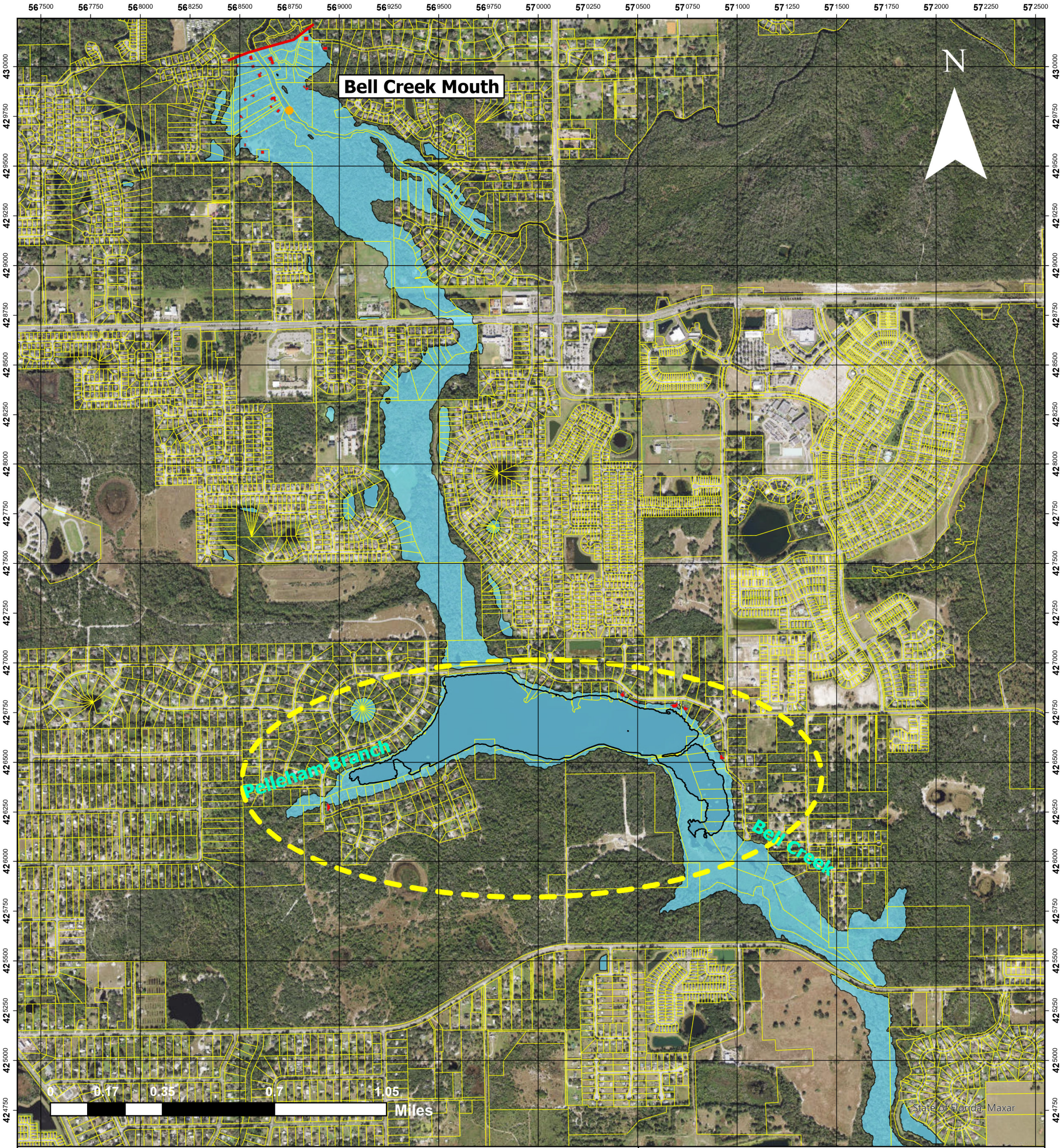

Project

Inundation Modeling and Mapping for Shadow Run Dam

Flooded Parcels During the 100 Year Event – No Dam Break

Date	Drawn	Scale
06.14.22	TC/MC	1:18,500

Spatial Reference

Name: Albers Conical Equal Area
[Florida Geographic Data Library]

Drawing Ref:

Figure 19

Legend

- Study limit
- Lake Grady location
- Received shoreline
- Inundated structures
- Hillsborough County Parcels
- Shadow Run Dam 100-year storm (no dam break)

Notes

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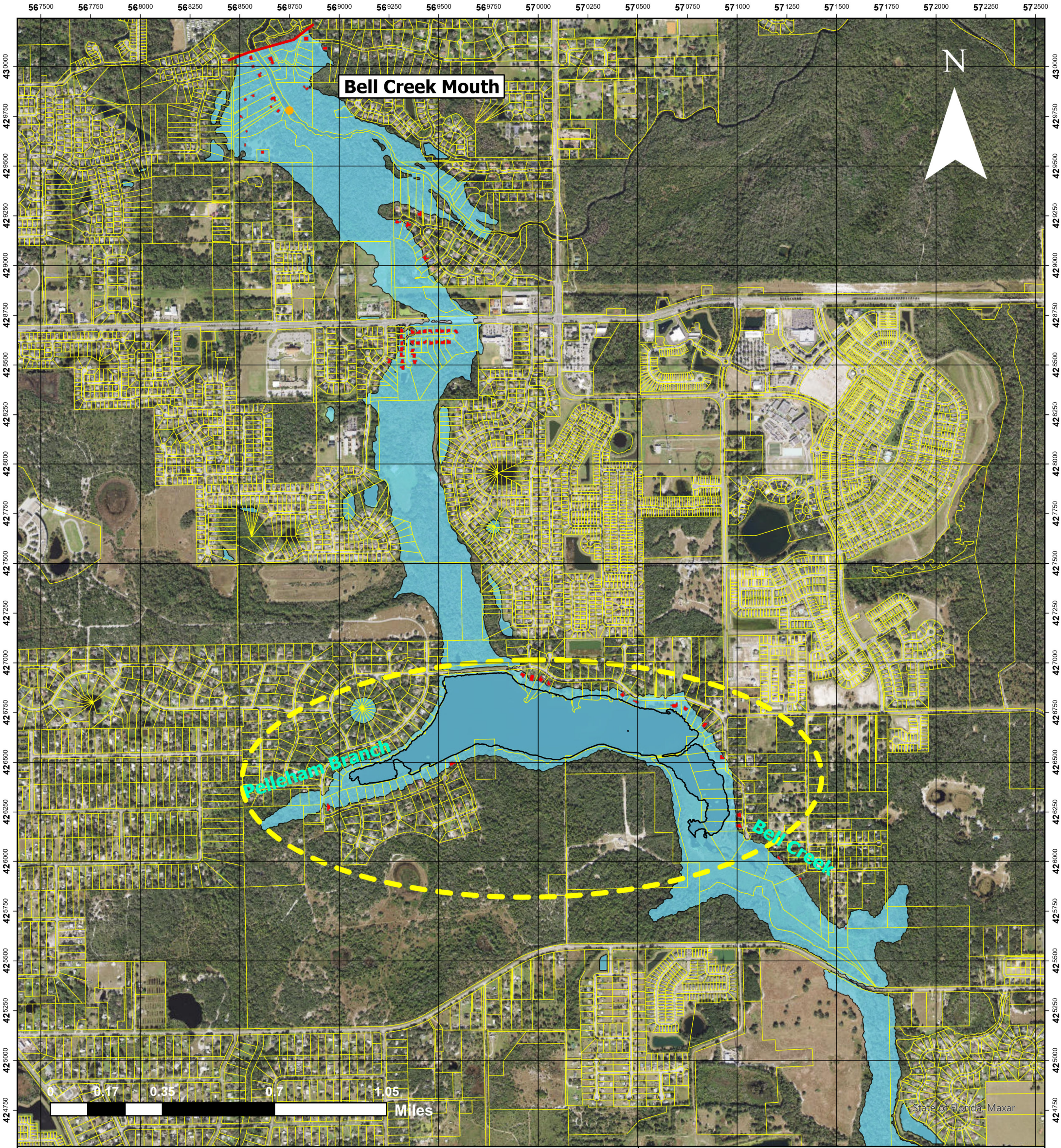

Project

Inundation Modeling and Mapping for Shadow Run Dam

Flooded Parcels During the ½ PMP Event – No Dam Break

Date	Drawn	Scale
06.14.22	TC/MC	1:18,500

Spatial Reference

Name: Albers Conical Equal Area
[Florida Geographic Data Library]

Drawing Ref:

Figure 20

Legend

- Study limit
- Lake Grady location
- Received shoreline
- Inundated structures
- Hillsborough County Parcels
- Shadow Run Dam half-PMP event (no dam break)

Notes

Florida Department of Environmental Protection

Division of Water Resource Management

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Inundation Modeling and Mapping for Shadow Run Dam

Flooded Parcels During the PMP Event – No Dam Break

Date	Drawn	Scale
06.14.22	TC/MC	1:18,500

Legend

- Study limit
- Lake Grady location
- Received shoreline
- Inundated structures
- Hillsborough County Parcels
- Shadow Run Dam PMP event (no dam break)

Spatial Reference

Name: Albers Conical Equal Area
[Florida Geographic Data Library]

Drawing Ref:

Figure 21

Notes

Florida Department of Environmental Protection

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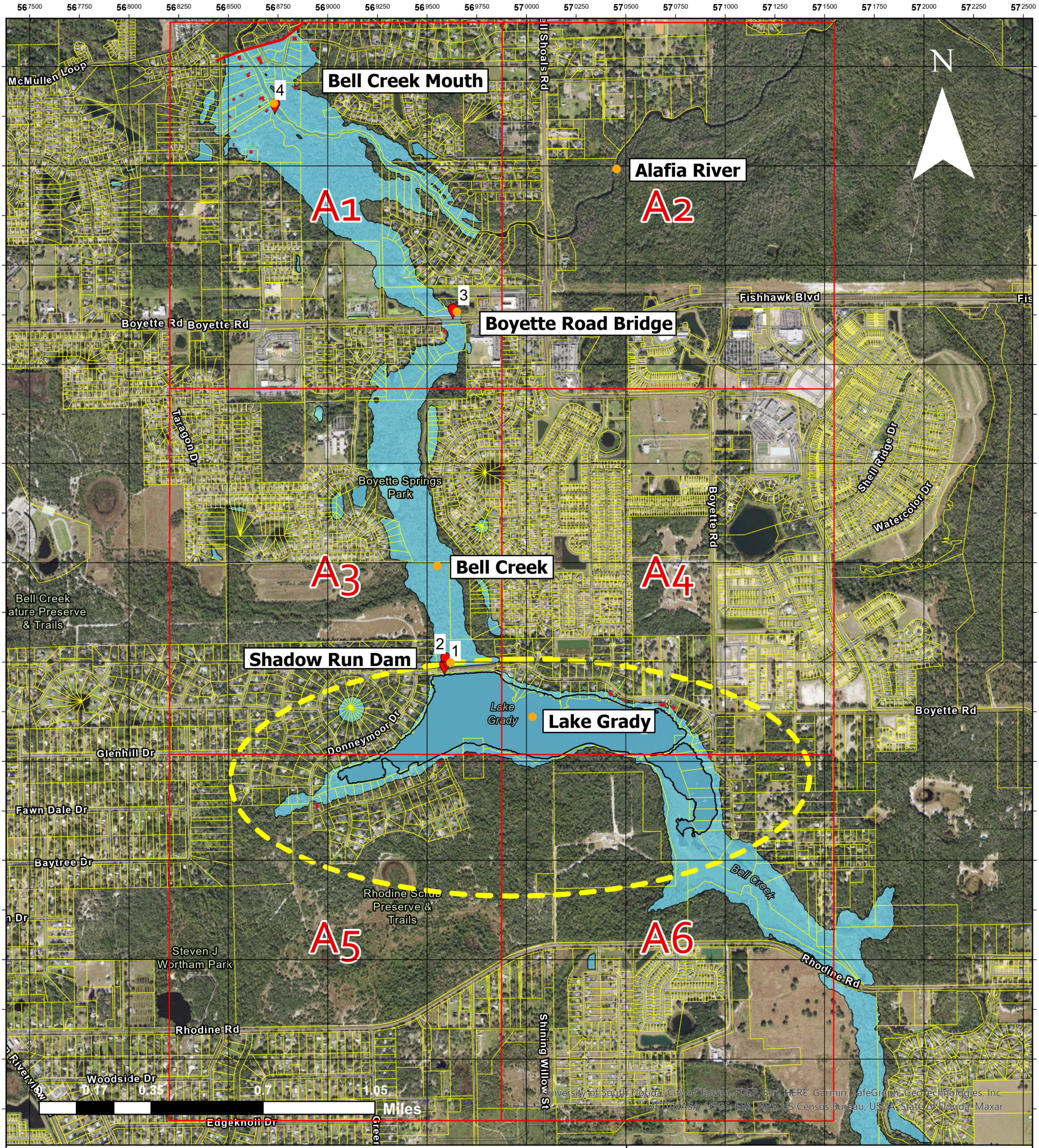

Project

Inundation Modeling and Mapping for Shadow Run Dam

Flooded parcels During 100 Year Event Near Homes – No Dam Break

Date	Drawn	Scale
06.14.22	TC/MC	1:18,500

Spatial Reference

Name: Albers Conical Equal Area
[Florida Geographic Data Library]

Drawing Ref:

Figure 22

Legend

- Flood modeling points of interest
- Study limit
- Panel Index
- Lake Grady location
- Received shoreline
- Inundated structures
- Hillsborough County Parcels
- Shadow Run Dam 100-year storm (no dam break)

Notes

Florida Department of Environmental Protection

Division of Water Resource Management

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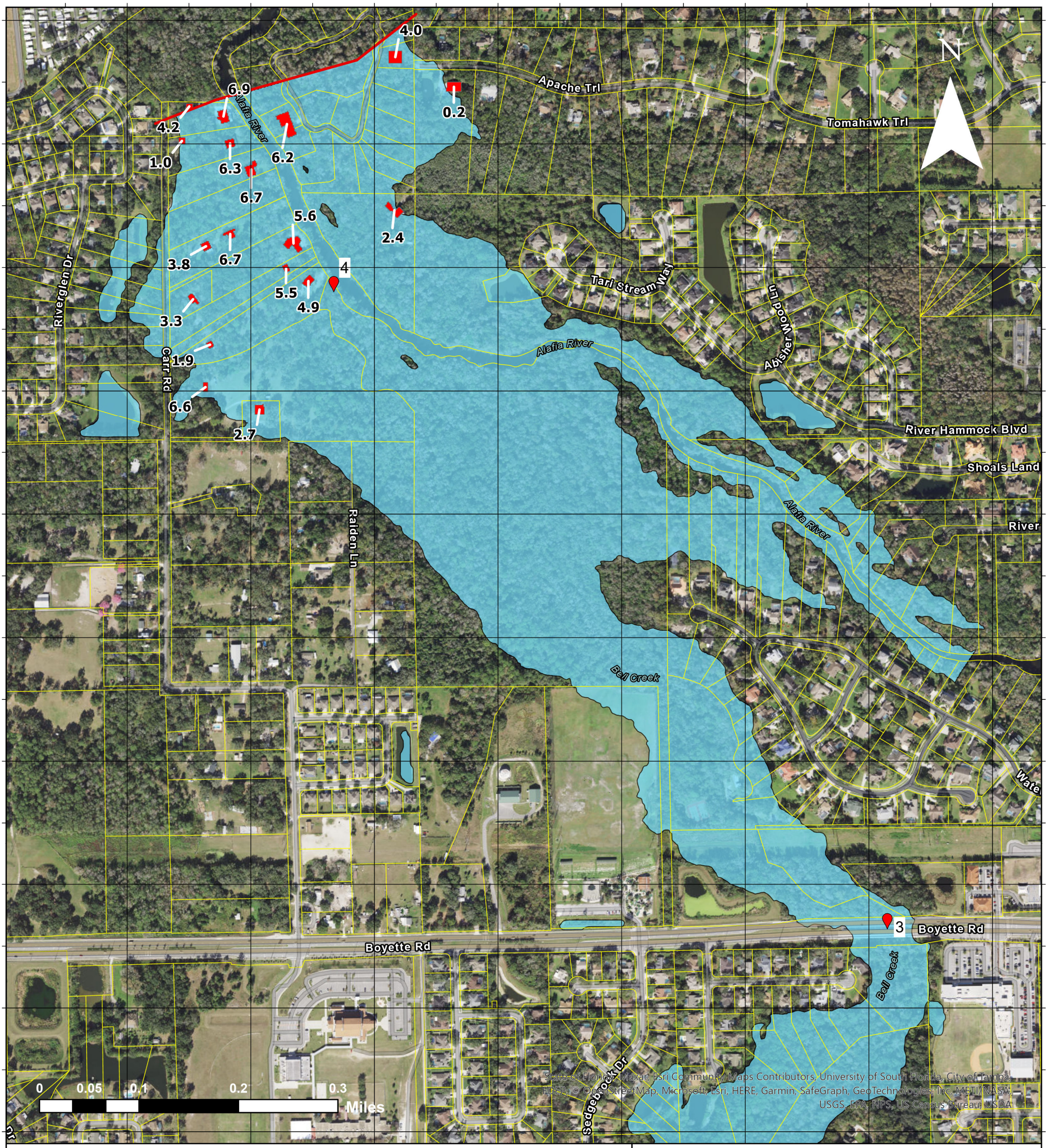

Project

Inundation Modeling and Mapping for Shadow Run Dam

Flooded parcels During 100 Year Event Near Homes – No Dam Break

Date	Drawn	Scale
06.21.22	TC/MC	1:6,000

Spatial Reference

Name: Albers Conical Equal Area
[Florida Geographic Data Library]

Drawing Ref:

Figure 22 - A1

Legend

- Flood modeling points of interest
- Study limit
- Inundated structures
- Hillsborough County Parcels
- Shadow Run Dam 100-year storm (no dam break)
- 1.5 (typical) - flood depth in feet above ground at structures.

Notes

Florida Department of Environmental Protection

Division of Water Resource Management

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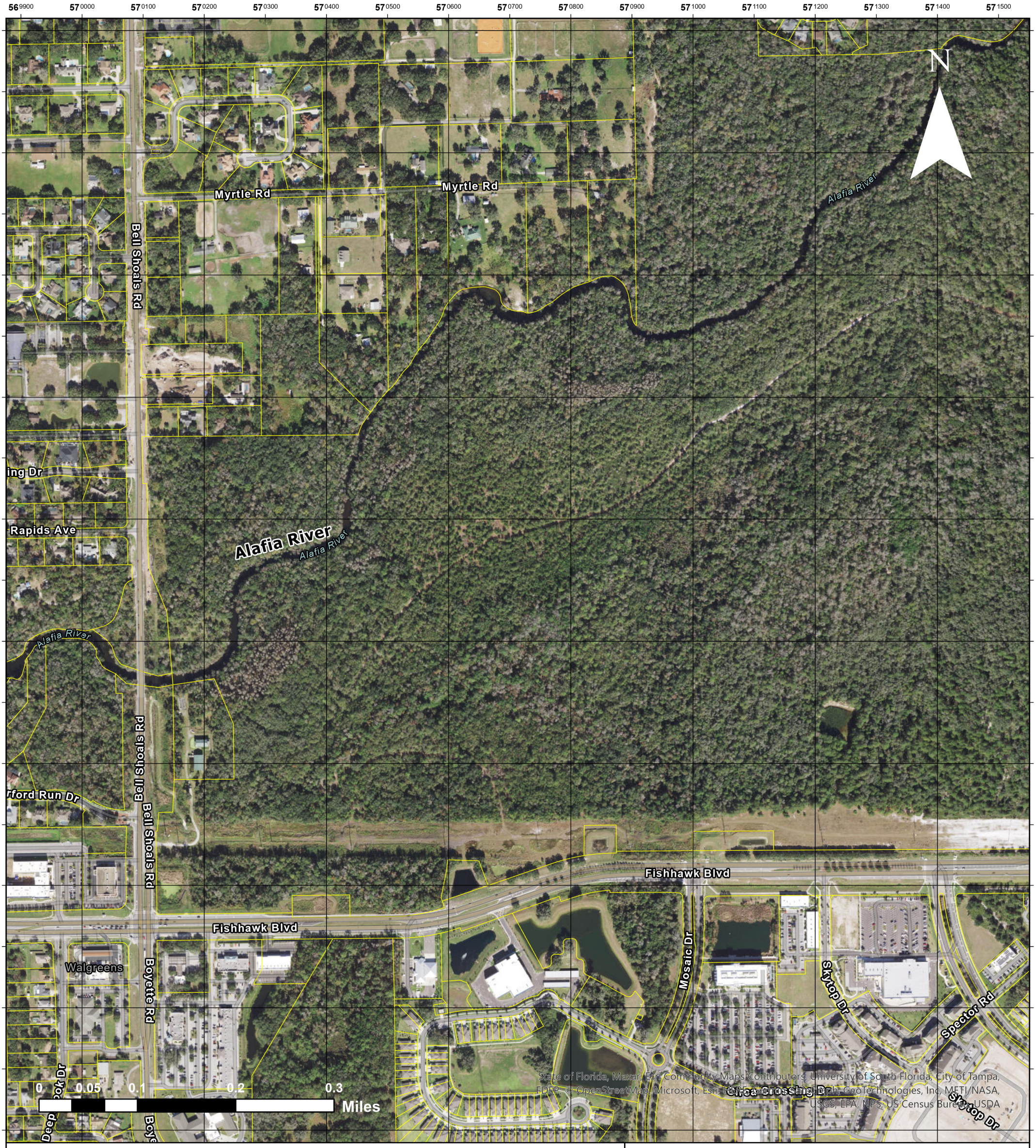

Project

Inundation Modeling and Mapping for Shadow Run Dam

Flooded parcels During 100 Year Event Near Homes – No Dam Break

Date	Drawn	Scale
06.21.22	TC/MC	1:6,000

Spatial Reference

Name: Albers Conical Equal Area
[Florida Geographic Data Library]

Drawing Ref:

Figure 22 - A2

Legend

- Hillsborough County Parcels
- 1.5 (typical) - flood depth in feet above ground at structures.

Notes

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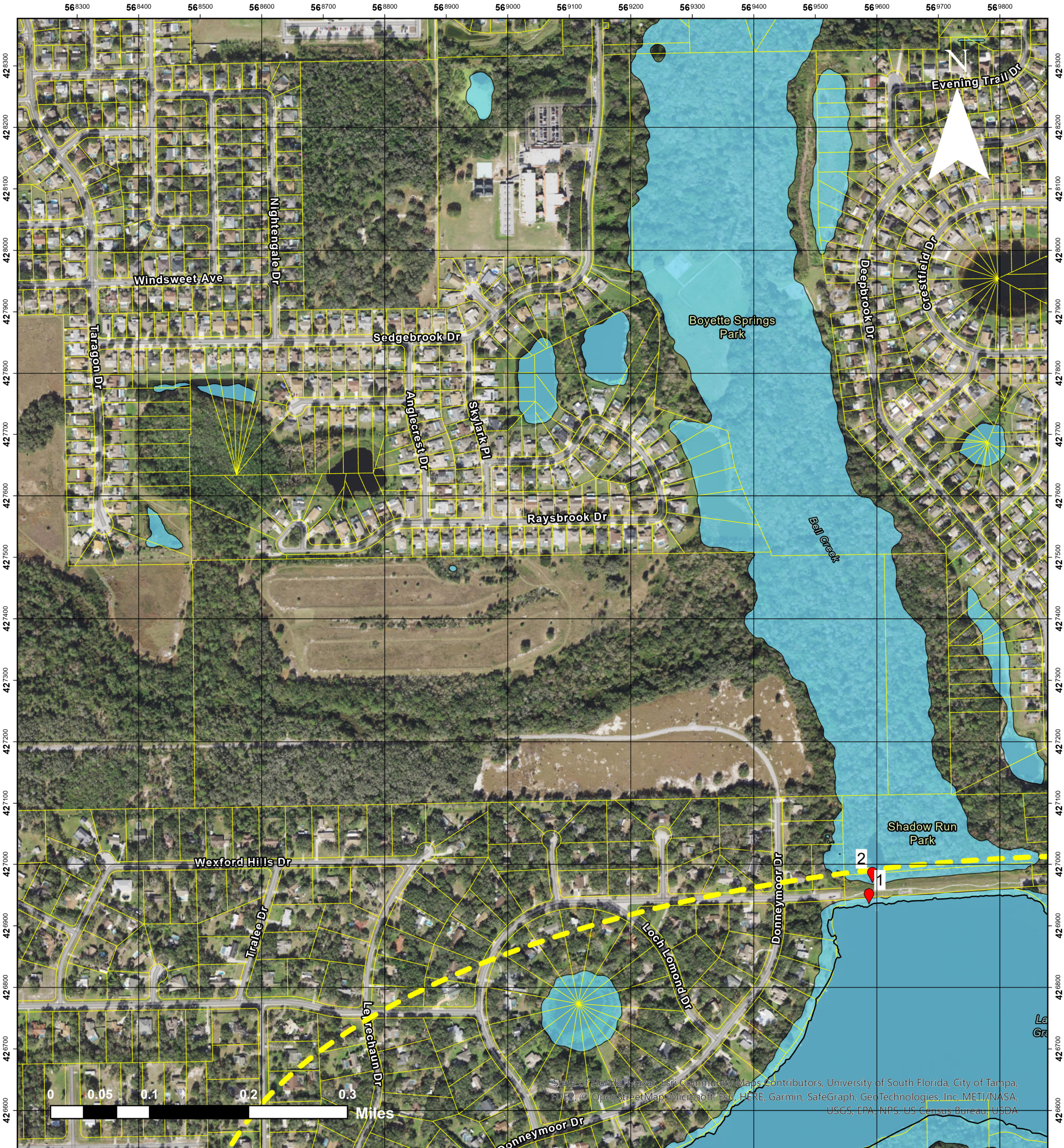

Project

Inundation Modeling and Mapping for Shadow Run Dam

Flooded parcels During 100 Year Event Near Homes – No Dam Break

Date	Drawn	Scale
06.21.22	TC/MC	1:6,000

Legend

- Flood modeling points of interest
- Lake Grady location
- Received shoreline
- Hillsborough County Parcels
- Shadow Run Dam 100-year storm (no dam break)
- 1.5 (typical) - flood depth in feet above ground at structures.

Spatial Reference

Name: Albers Conical Equal Area
[Florida Geographic Data Library]

Drawing Ref:

Figure 22 - A3

Notes

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Inundation Modeling and Mapping for Shadow Run Dam

Flooded parcels During 100 Year Event Near Homes – No Dam Break

Date	Drawn	Scale
06.21.22	TC/MC	1:6,000

Legend

- Lake Grady location
- Received shoreline
- Inundated structures
- Hillsborough County Parcels
- Shadow Run Dam 100-year storm (no dam break)
- 1.5 (typical) - flood depth in feet above ground at structures.

Spatial Reference

Name: Albers Conical Equal Area
[Florida Geographic Data Library]

Drawing Ref:

Figure 22 - A4

Notes

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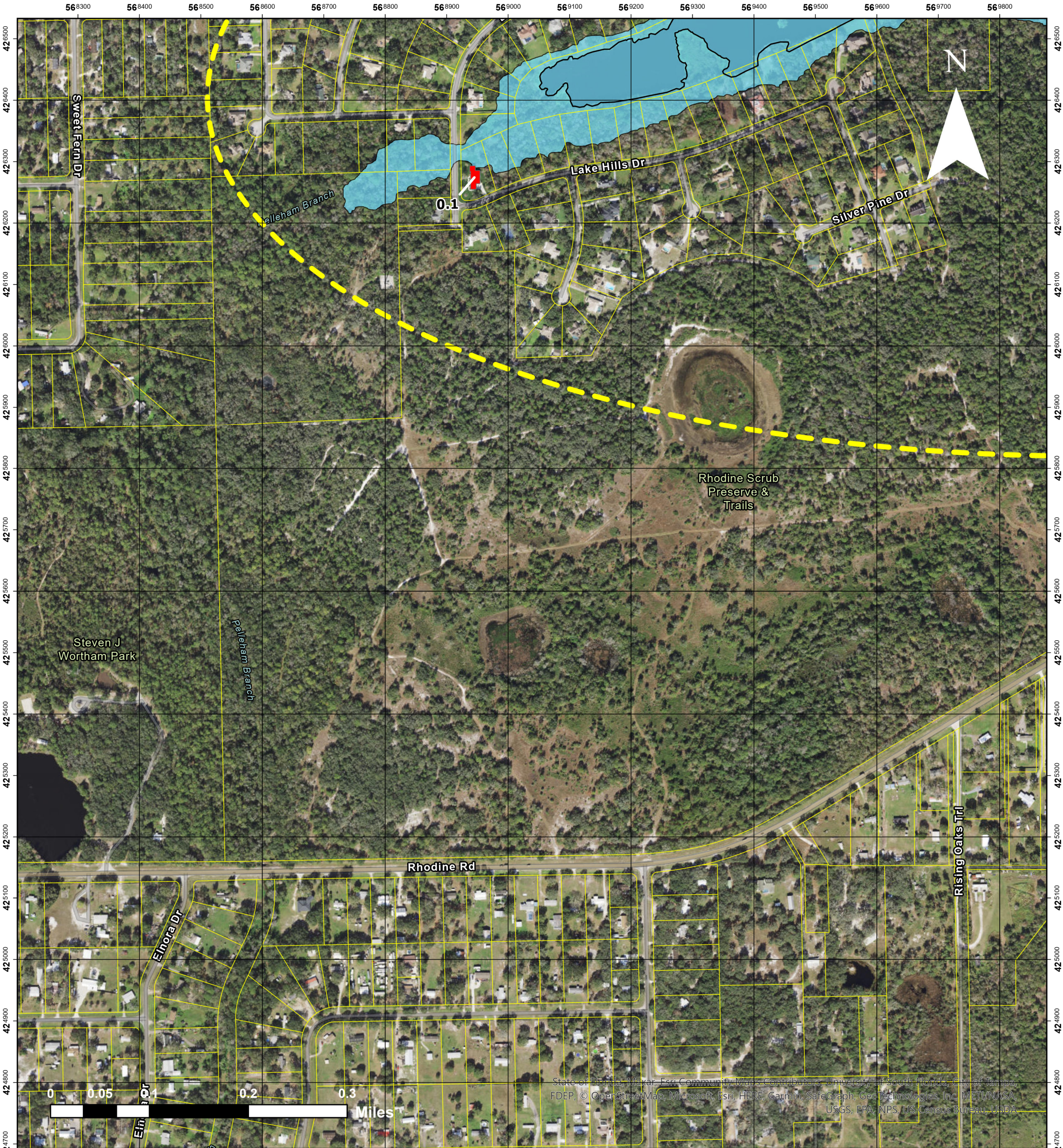

Project

Inundation Modeling and Mapping for Shadow Run Dam

Flooded parcels During 100 Year Event Near Homes – No Dam Break

Date	Drawn	Scale
06.21.22	TC/MC	1:6,000

Legend

- Lake Grady location
- Received shoreline
- Inundated structures
- Hillsborough County Parcels
- Shadow Run Dam 100-year storm (no dam break)
- 1.5 (typical) - flood depth in feet above ground at structures.

Spatial Reference

Name: Albers Conical Equal Area
[Florida Geographic Data Library]

Drawing Ref:

Figure 22 - A5

Notes

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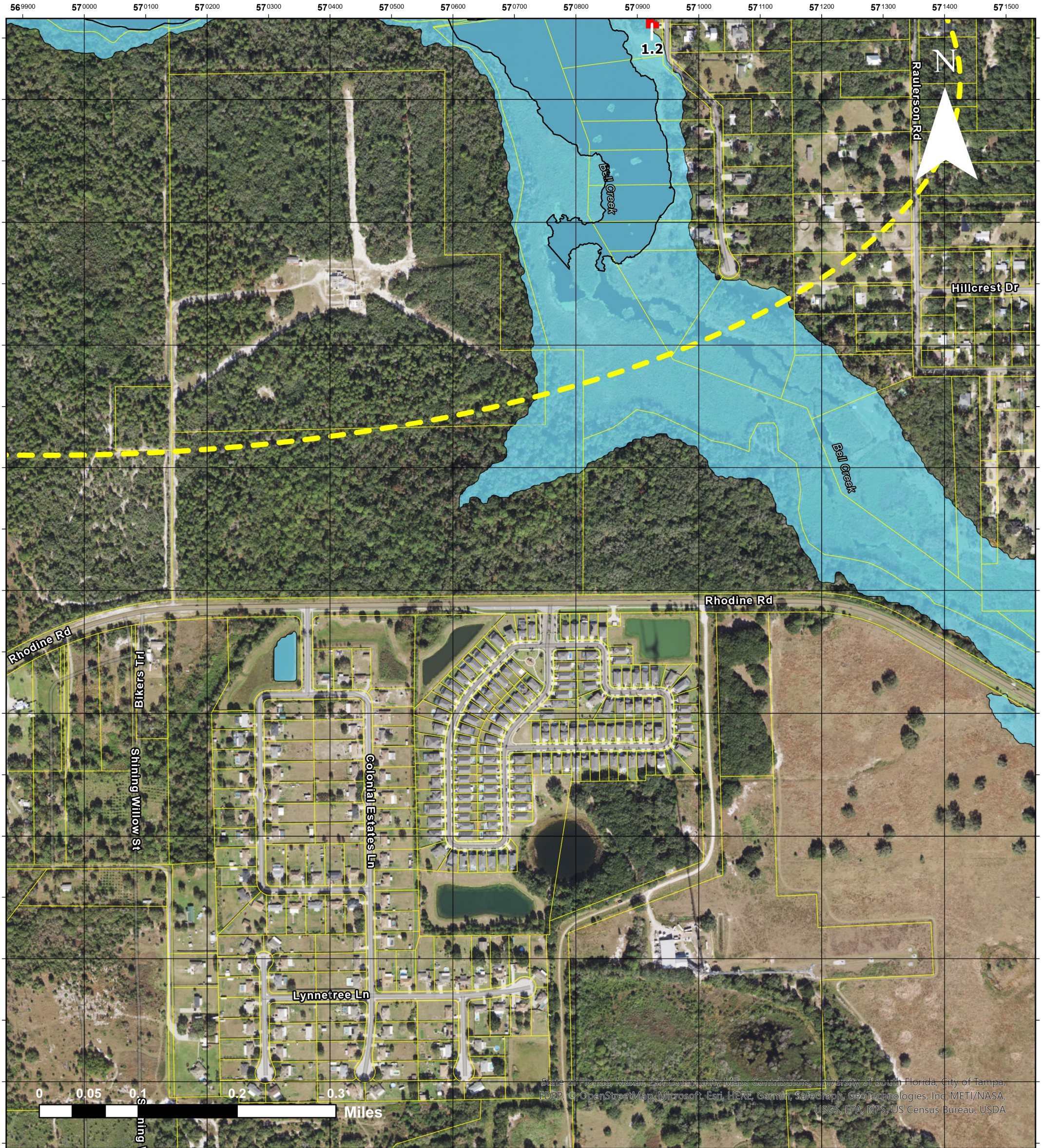

Project

Inundation Modeling and Mapping for Shadow Run Dam

Flooded parcels During 100 Year Event Near Homes – No Dam Break

Date	Drawn	Scale
06.21.22	TC/MC	1:6,000

Spatial Reference

Name: Albers Conical Equal Area
[Florida Geographic Data Library]

Drawing Ref:

Figure 22 - A6

Legend

- Lake Grady location
- Received shoreline
- Inundated structures
- Hillsborough County Parcels
- Shadow Run Dam 100-year storm (no dam break)
- 1.5 (typical) - flood depth in feet above ground at structures.

Notes

Florida Department of Environmental Protection

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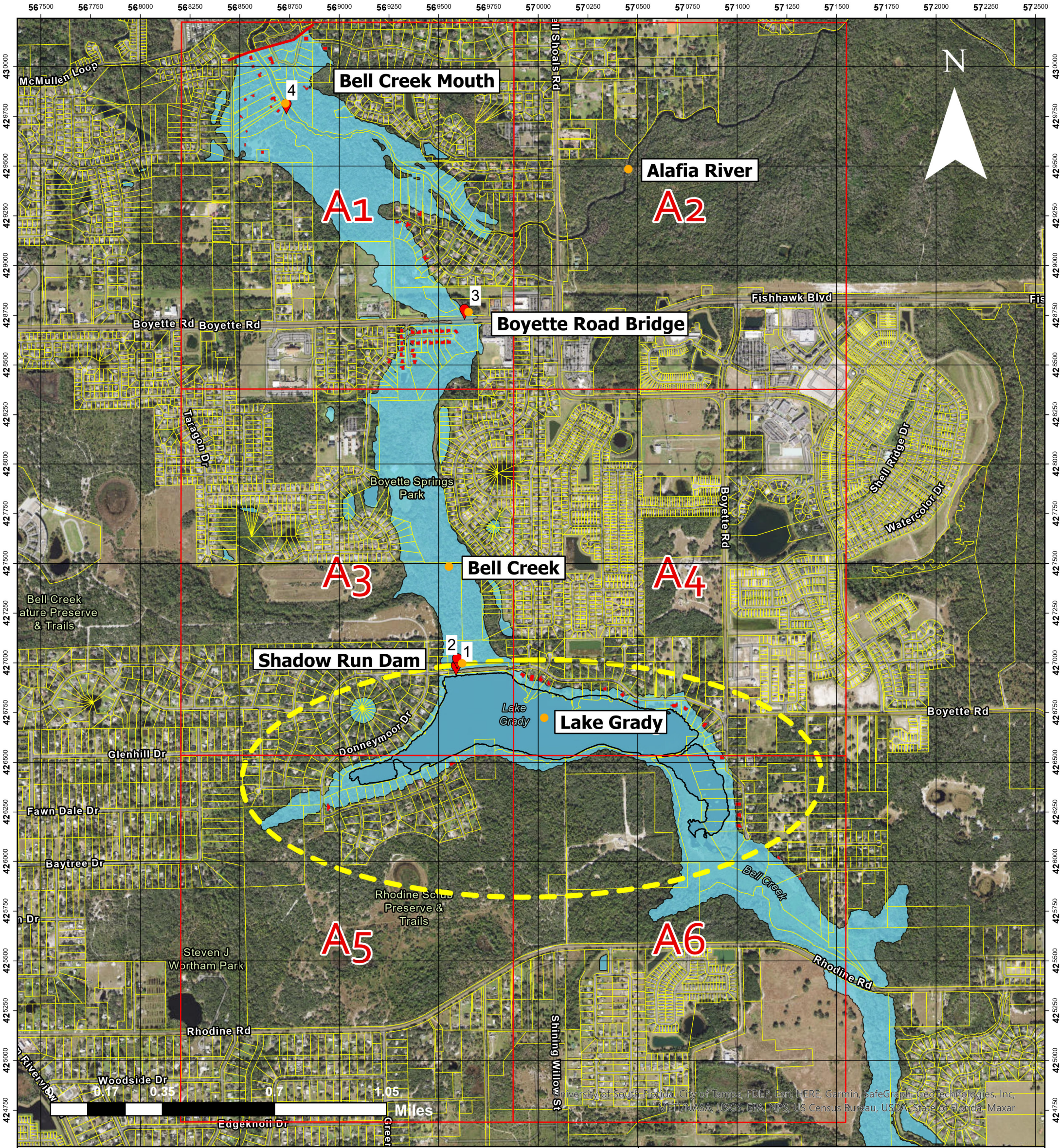

Project

Inundation Modeling and Mapping for Shadow Run Dam

Flooded parcels During ½ PMP Event Near Homes – No Dam Break

Date	Drawn	Scale
06.14.22	TC/MC	1:18,500

Spatial Reference

Name: Albers Conical Equal Area
[Florida Geographic Data Library]

Drawing Ref:

Figure 23

Legend

- Flood modeling points of interest
- Study limit
- Panel Index
- Lake Grady location
- Received shoreline
- Inundated structures
- Hillsborough County Parcels
- Shadow Run Dam half-PMP event (no dam break)

Notes

Florida Department of Environmental Protection

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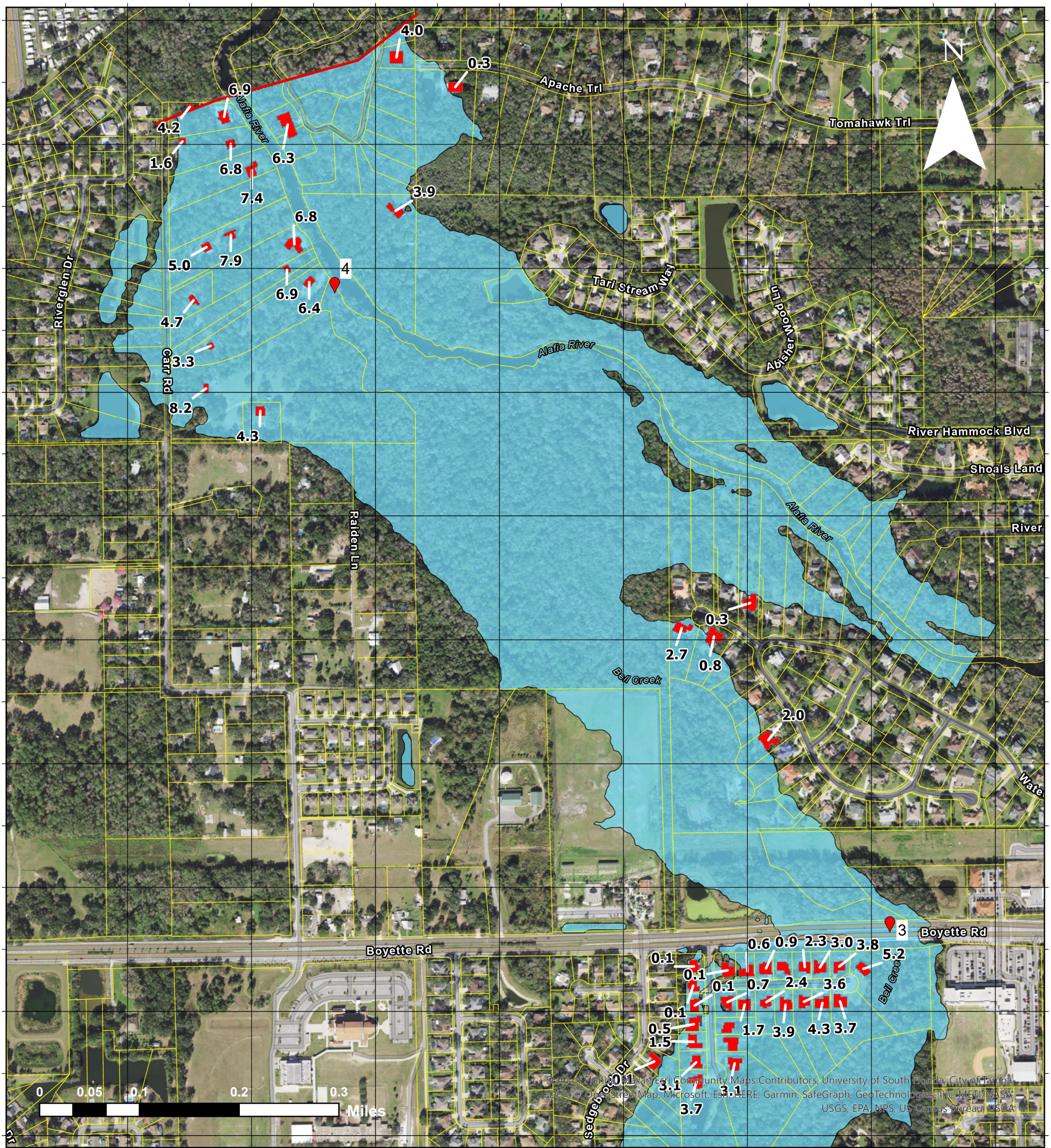

Project

Inundation Modeling and Mapping for Shadow Run Dam

Flooded parcels During ½ PMP Event Near Homes – No Dam Break

Date	Drawn	Scale
06.21.22	TC/MC	1:6,000

Spatial Reference

Name: Albers Conical Equal Area
[Florida Geographic Data Library]

Drawing Ref:

Figure 23 - A1

Legend

- Flood modeling points of interest
- Study limit
- Inundated structures
- Hillsborough County Parcels
- Shadow Run Dam half PMP event (no dam break)
- 1.5 (typical) - flood depth in feet above ground at structures.

Notes

Florida Department of Environmental Protection

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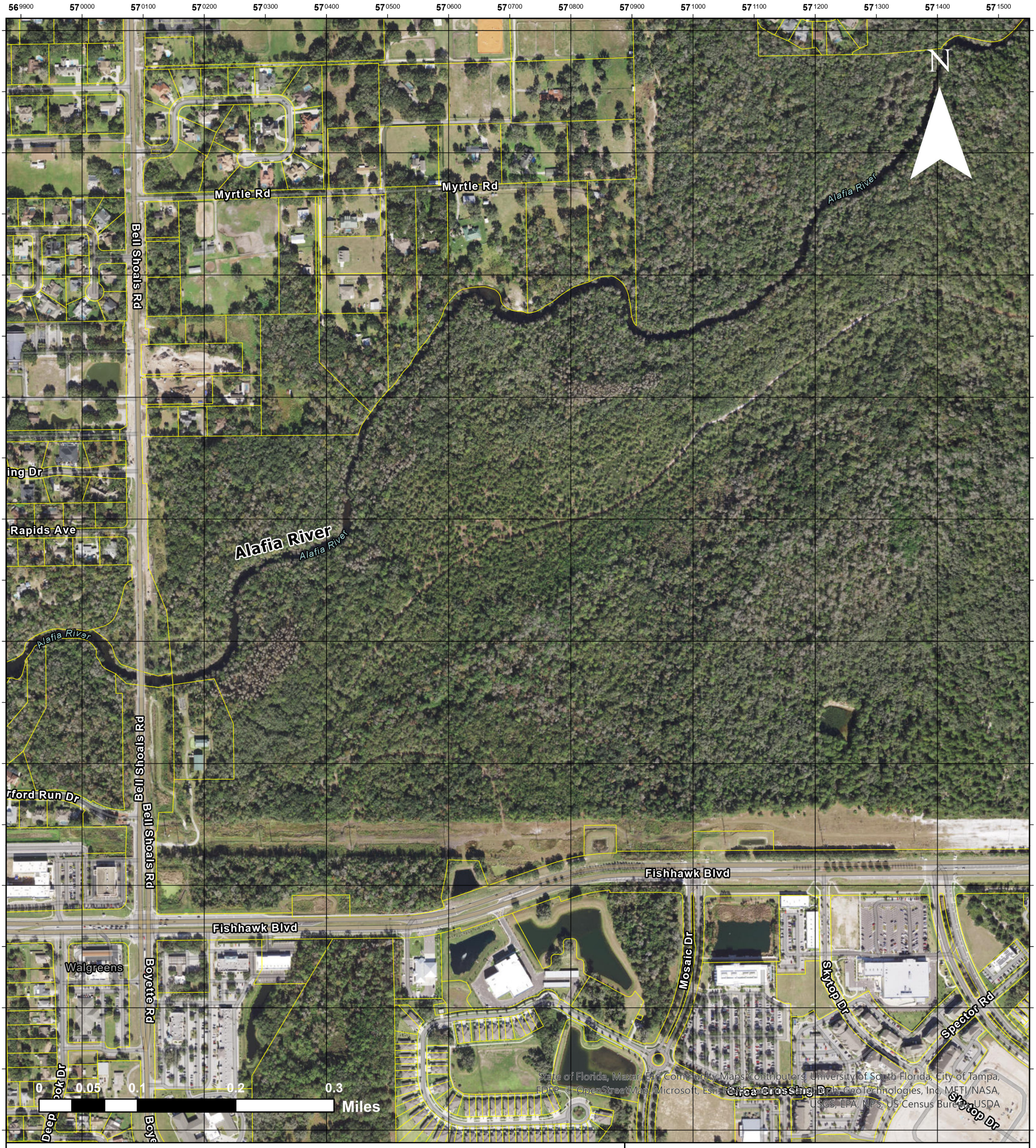

Project

Inundation Modeling and Mapping for Shadow Run Dam

Flooded parcels During ½ PMP Event Near Homes – No Dam Break

Date	Drawn	Scale
06.21.22	TC/MC	1:6,000

Spatial Reference

Name: Albers Conical Equal Area
[Florida Geographic Data Library]

Drawing Ref:

Figure 23 - A2

Legend

- Hillsborough County Parcels
- 1.5 (typical) - flood depth in feet above ground at structures.

Notes

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Project

Inundation Modeling and Mapping for Shadow Run Dam

Flooded parcels During ½ PMP Event Near Homes – No Dam Break

Date	Drawn	Scale
06.21.22	TC/MC	1:6,000

Spatial Reference

Name: Albers Conical Equal Area
[Florida Geographic Data Library]

Drawing Ref:

Figure 23 - A3

Legend

- Flood modeling points of interest
- Lake Grady location
- Received shoreline
- Inundated structures
- Hillsborough County Parcels
- Shadow Run Dam half PMP event (no dam break)
- 1.5 (typical) - flood depth in feet above ground at structures.

Notes

Florida Department of Environmental Protection

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Inundation Modeling and Mapping for Shadow Run Dam

Flooded parcels During ½ PMP Event Near Homes – No Dam Break

Date	Drawn	Scale
06.21.22	TC/MC	1:6,000

Legend

- Lake Grady location
- Received shoreline
- Inundated structures
- Hillsborough County Parcels
- Shadow Run Dam half PMP event (no dam break)
- 1.5 (typical) - flood depth in feet above ground at structures.

Spatial Reference

Name: Albers Conical Equal Area
[Florida Geographic Data Library]

Drawing Ref:

Figure 23 - A4

Notes

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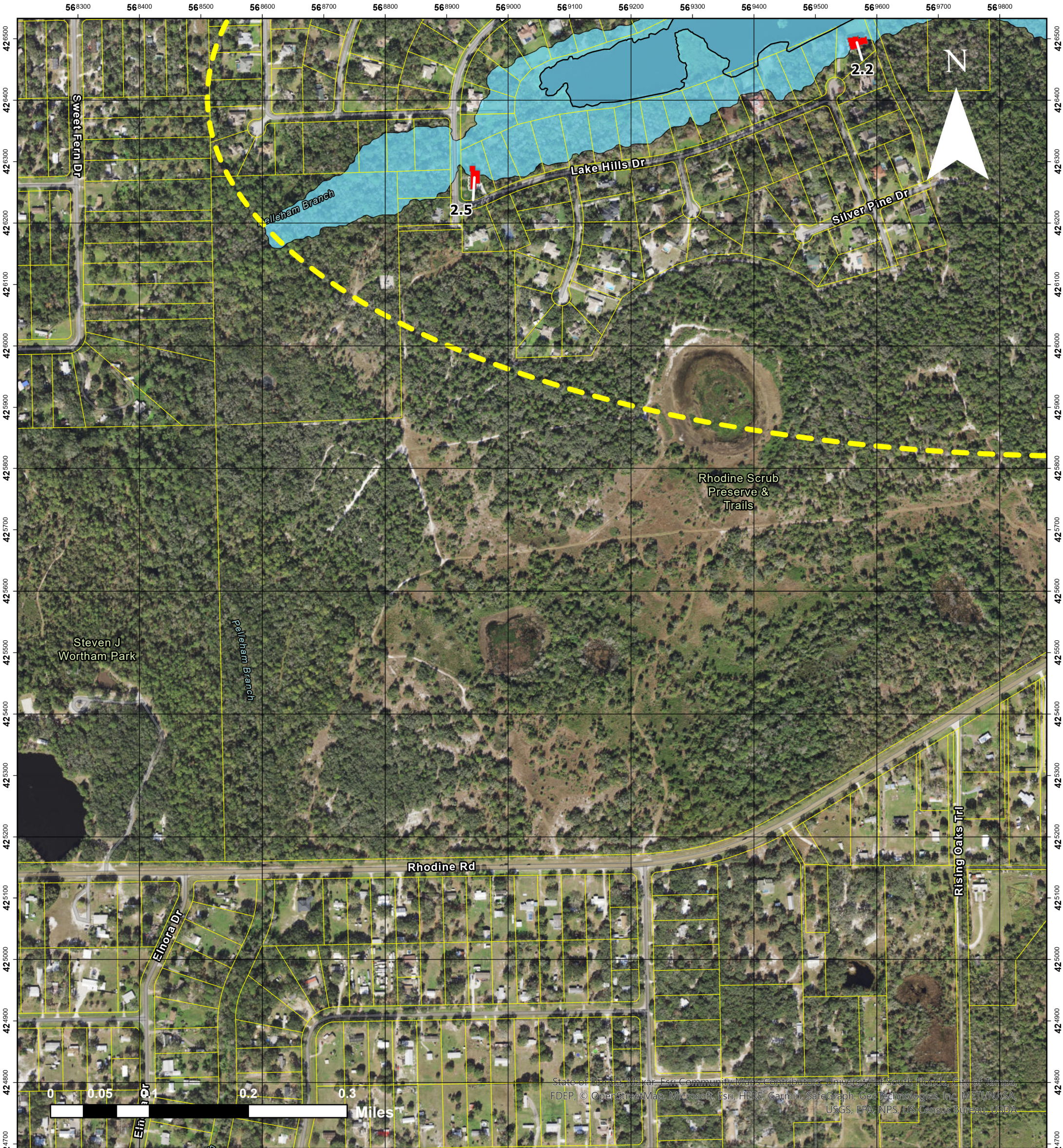

Project

Inundation Modeling and Mapping for Shadow Run Dam

Flooded parcels During ½ PMP Event Near Homes – No Dam Break

Date	Drawn	Scale
06.21.22	TC/MC	1:6,000

Legend

- Lake Grady location
- Received shoreline
- Inundated structures
- Hillsborough County Parcels
- Shadow Run Dam half PMP event (no dam break)
- 1.5 (typical) - flood depth in feet above ground at structures.

Spatial Reference

Name: Albers Conical Equal Area
[Florida Geographic Data Library]

Drawing Ref:

Figure 23 - A5

Notes

Florida Department of Environmental Protection

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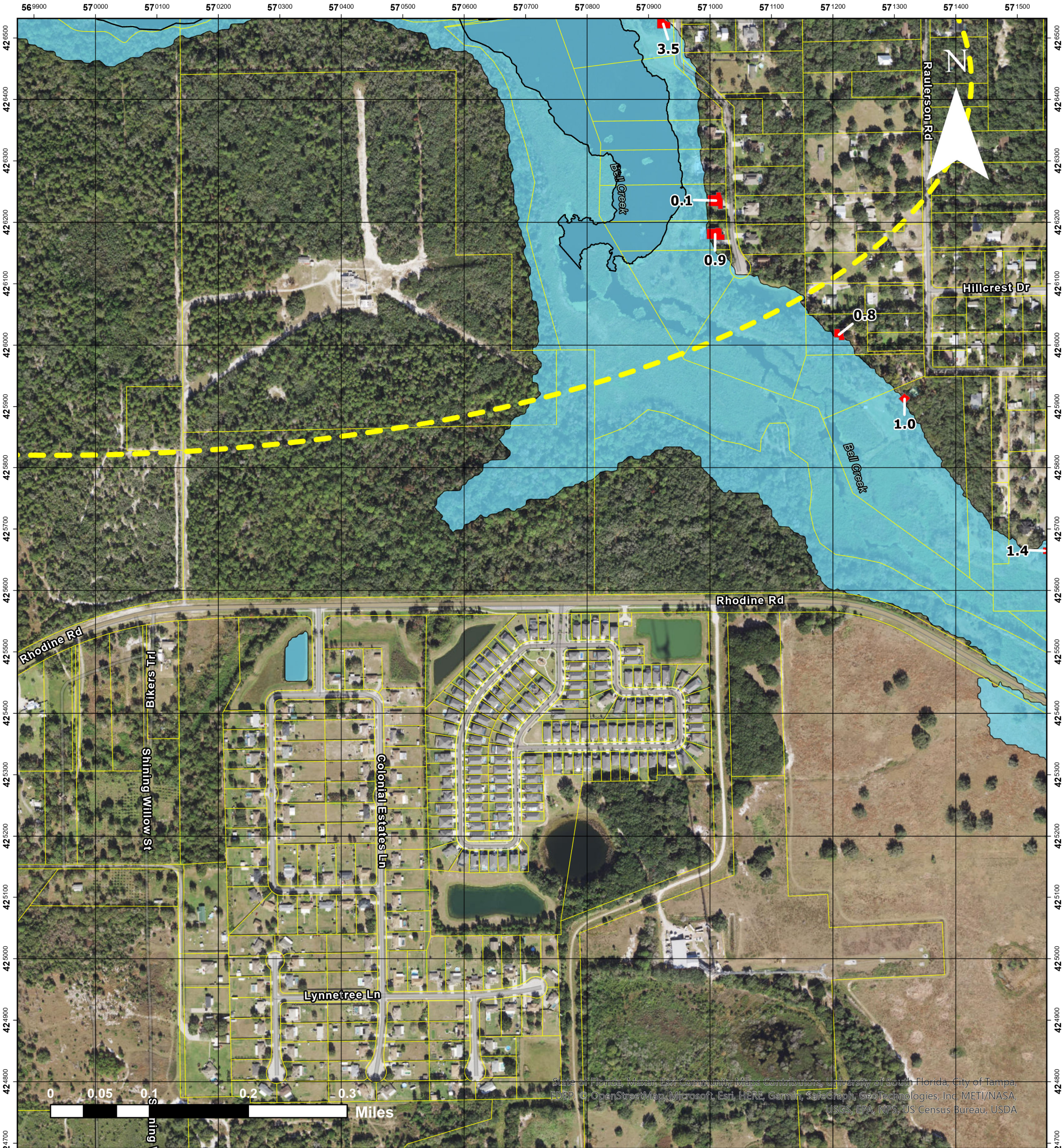

Project

Inundation Modeling and Mapping for Shadow Run Dam

Flooded parcels During ½ PMP Event Near Homes – No Dam Break

Date	Drawn	Scale
06.21.22	TC/MC	1:6,000

Spatial Reference

Name: Albers Conical Equal Area
[Florida Geographic Data Library]

Drawing Ref:

Figure 23 - A6

Legend

- Lake Grady location
- Received shoreline
- Inundated structures
- Hillsborough County Parcels
- Shadow Run Dam half PMP event (no dam break)
- 1.5 (typical) - flood depth in feet above ground at structures.

Notes

Florida Department of Environmental Protection

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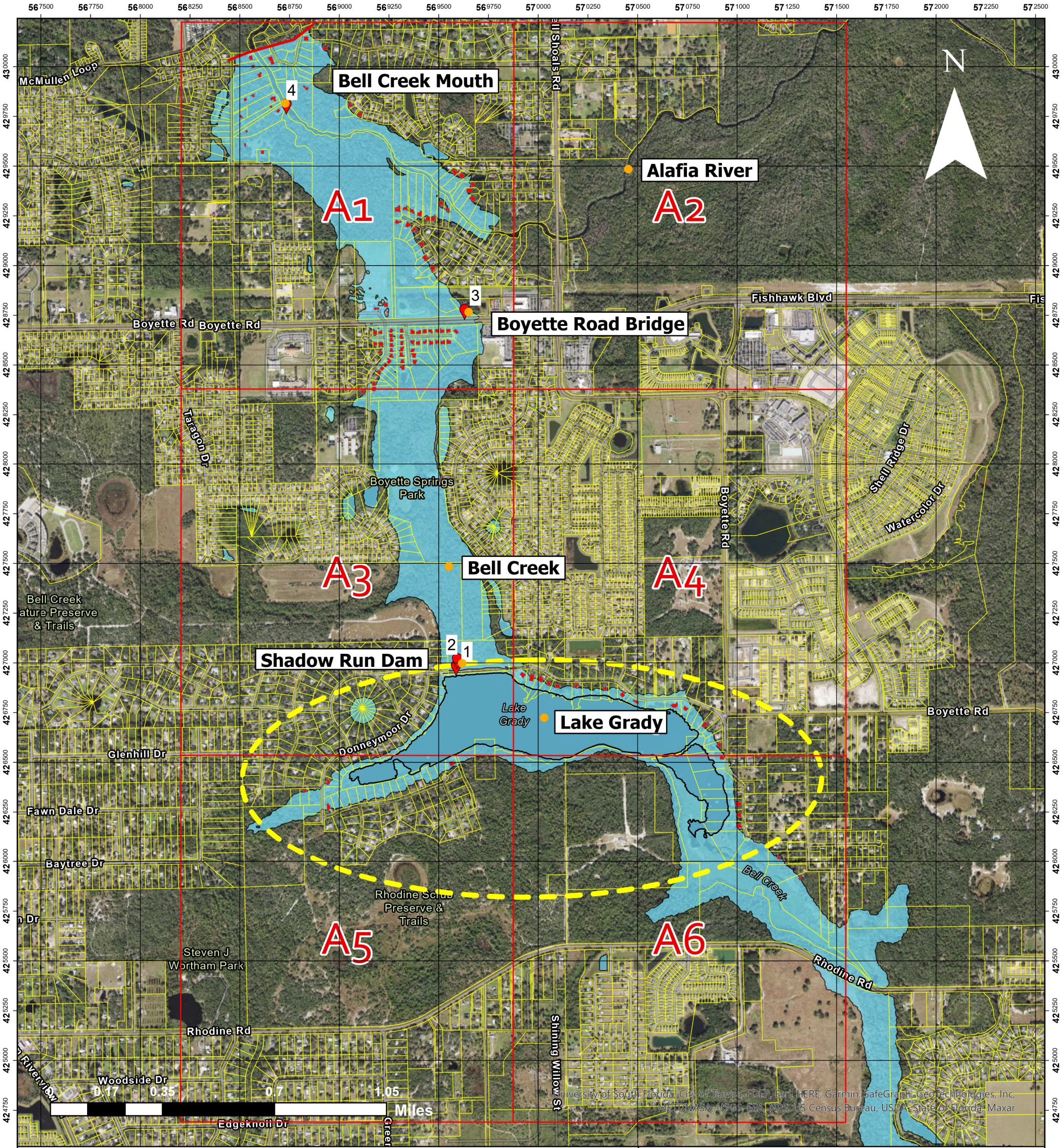

Project

Inundation Modeling and Mapping for Shadow Run Dam

Flooded Parcels During PMP Event Near Homes – No Dam Break

Date	Drawn	Scale
06.14.22	TC/MC	1:18,500

Spatial Reference

Name: Albers Conical Equal Area
[Florida Geographic Data Library]

Drawing Ref:

Figure 24

Legend

- Flood modeling points of interest
- Study limit
- Panel Index
- Lake Grady location
- Received shoreline
- Inundated structures
- Hillsborough County Parcels
- Shadow Run Dam PMP event (no dam break)

Notes

Florida Department of Environmental Protection

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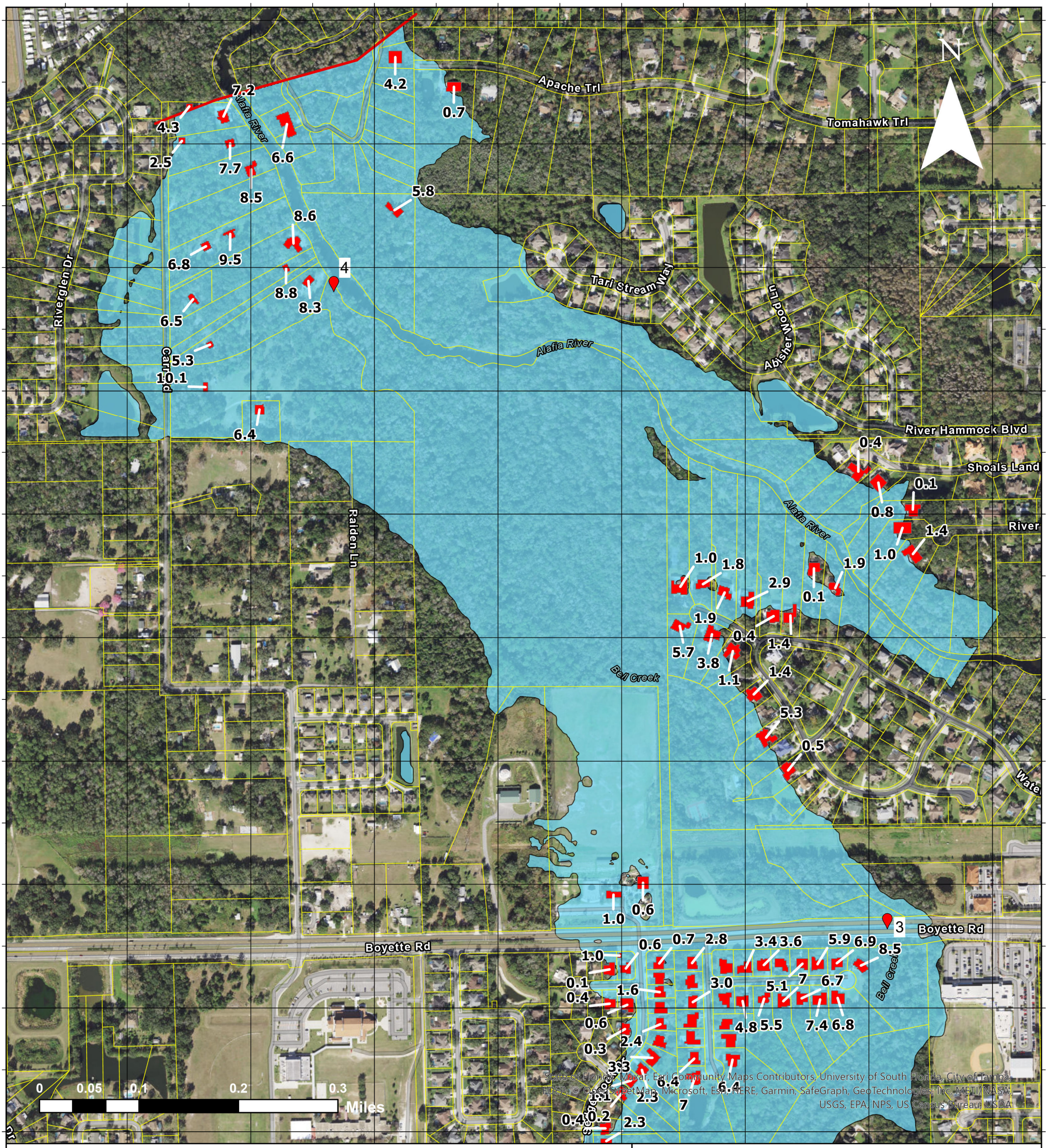

Project

Inundation Modeling and Mapping for Shadow Run Dam

Flooded Parcels During PMP Event Near Homes – No Dam Break

Date	Drawn	Scale
06.21.22	TC/MC	1:6,000

Spatial Reference

Name: Albers Conical Equal Area
[Florida Geographic Data Library]

Drawing Ref:

Figure 24 - A1

Legend

- Flood modeling points of interest
- Study limit
- Inundated structures
- Hillsborough County Parcels
- Shadow Run Dam PMP event (no dam break)
- 1.5 (typical) - flood depth in feet above ground at structures.

Notes

Florida Department of Environmental Protection

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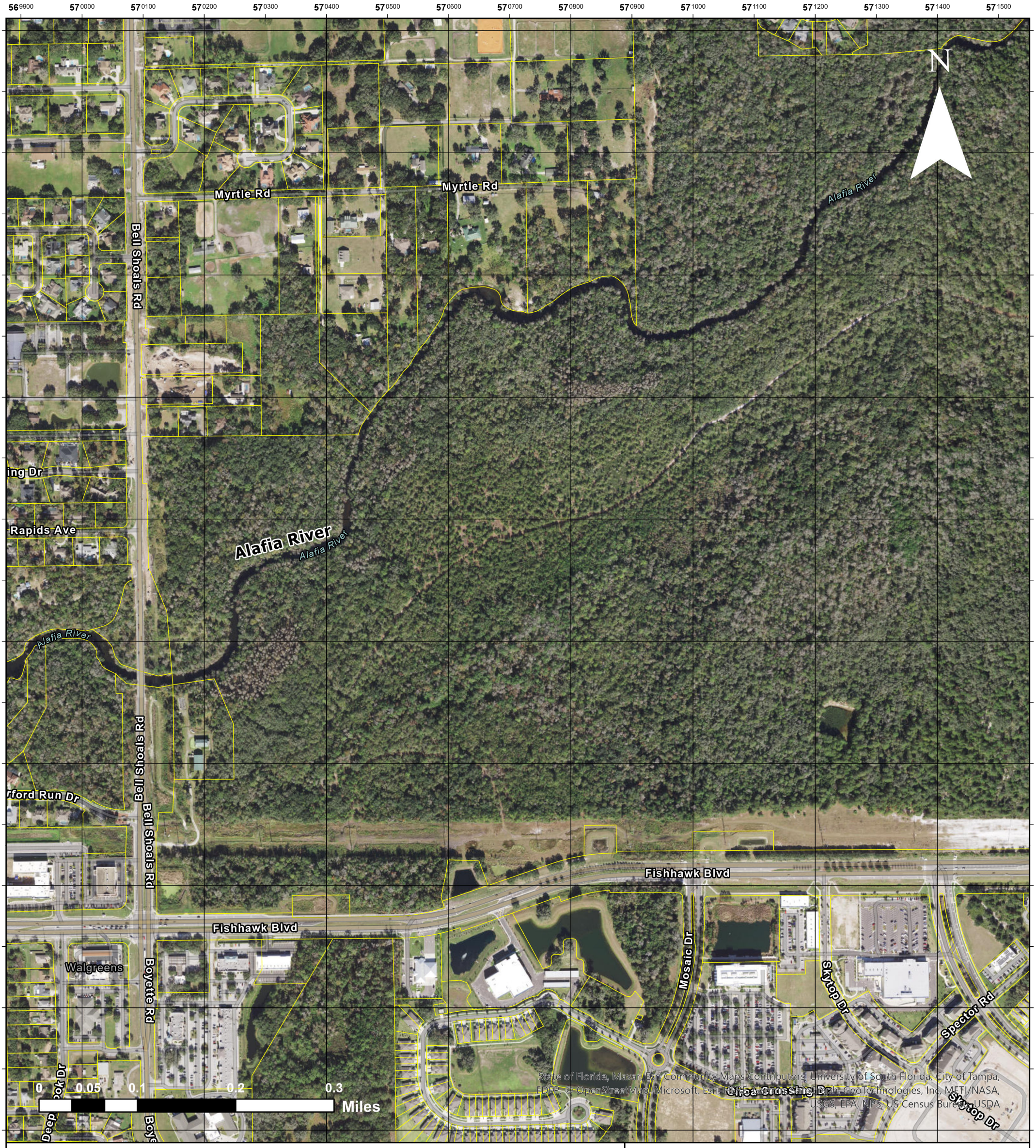

Project

Inundation Modeling and Mapping for Shadow Run Dam

Flooded Parcels During PMP Event Near Homes – No Dam Break

Date	Drawn	Scale
06.21.22	TC/MC	1:6,000

Spatial Reference

Name: Albers Conical Equal Area
[Florida Geographic Data Library]

Drawing Ref:

Figure 24 - A2

Legend

- Hillsborough County Parcels
- 1.5 (typical) - flood depth in feet above ground at structures.

Notes

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Inundation Modeling and Mapping for Shadow Run Dam

Flooded Parcels During PMP Event Near Homes – No Dam Break

Date	Drawn	Scale
06.21.22	TC/MC	1:6,000

Spatial Reference

Name: Albers Conical Equal Area
[Florida Geographic Data Library]

Drawing Ref:

Figure 24 - A3

Legend

- Flood modeling points of interest
- Lake Grady location
- Received shoreline
- Inundated structures
- Hillsborough County Parcels
- Shadow Run Dam PMP event (no dam break)
- 1.5 (typical) - flood depth in feet above ground at structures.

Notes

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Project

Inundation Modeling and Mapping for Shadow Run Dam

Flooded Parcels During PMP Event Near Homes – No Dam Break

Date	Drawn	Scale
06.21.22	TC/MC	1:6,000

Legend

- Lake Grady location
- Received shoreline
- Inundated structures
- Hillsborough County Parcels
- Shadow Run Dam PMP event (no dam break)
- 1.5 (typical) - flood depth in feet above ground at structures.

Spatial Reference

Name: Albers Conical Equal Area
[Florida Geographic Data Library]

Drawing Ref:

Figure 24 - A4

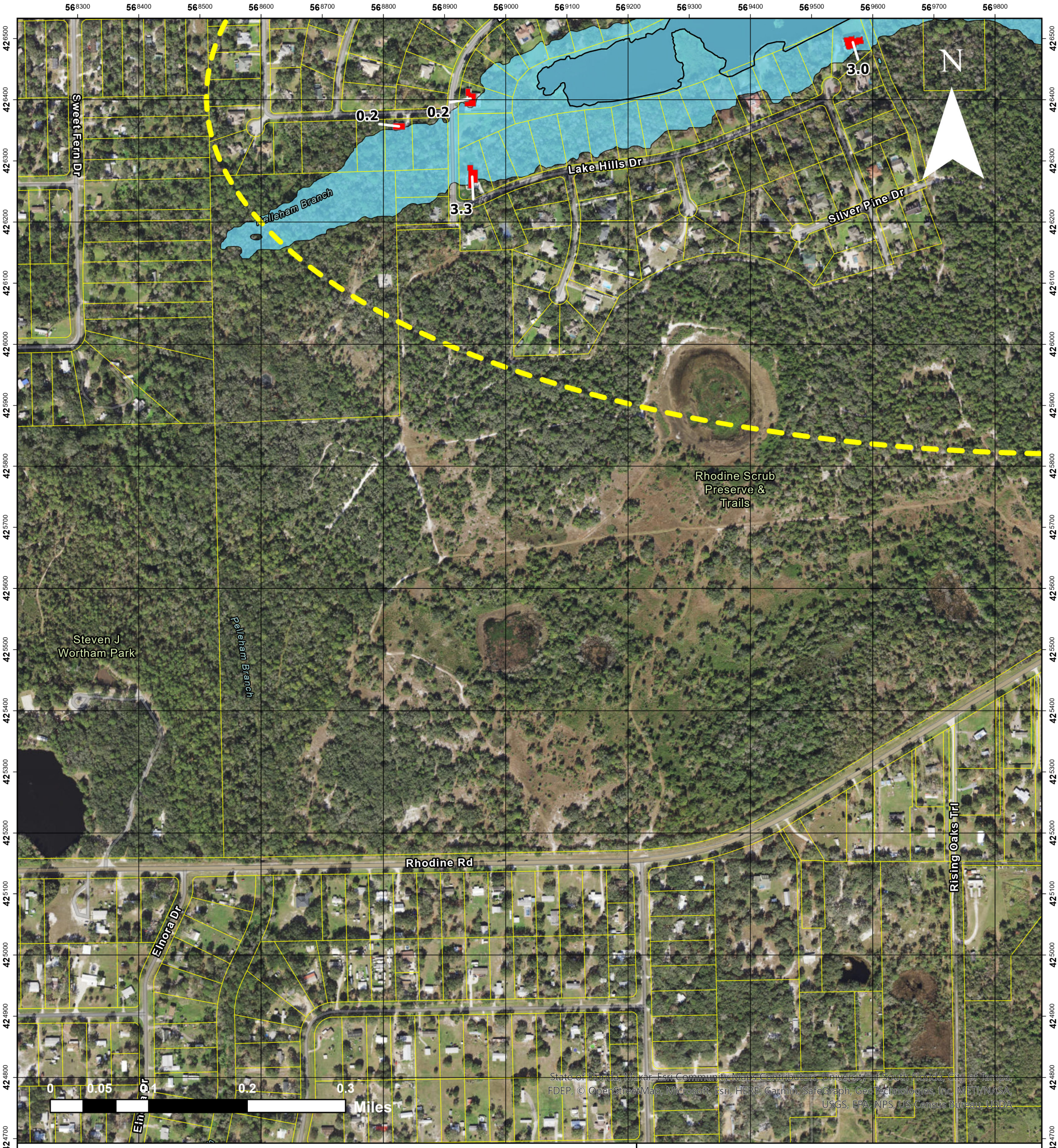
Notes

Florida Department of Environmental Protection

Division of Water Resource Management

Comak Group, Inc

MOTT MACDONALD



Project

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Flooded Parcels During PMP Event Near Homes – No Dam Break

Date	Drawn	Scale
06.21.22	TC/MC	1:6,000

Spatial Reference

Name: Albers Conical Equal Area
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Drawing Ref:

Figure 24 - A5

Legend

- Lake Grady location
- Received shoreline
- Inundated structures
- Hillsborough County Parcels
- Shadow Run Dam PMP event (no dam break)
- 1.5 (typical) - flood depth in feet above ground at structures.

Notes

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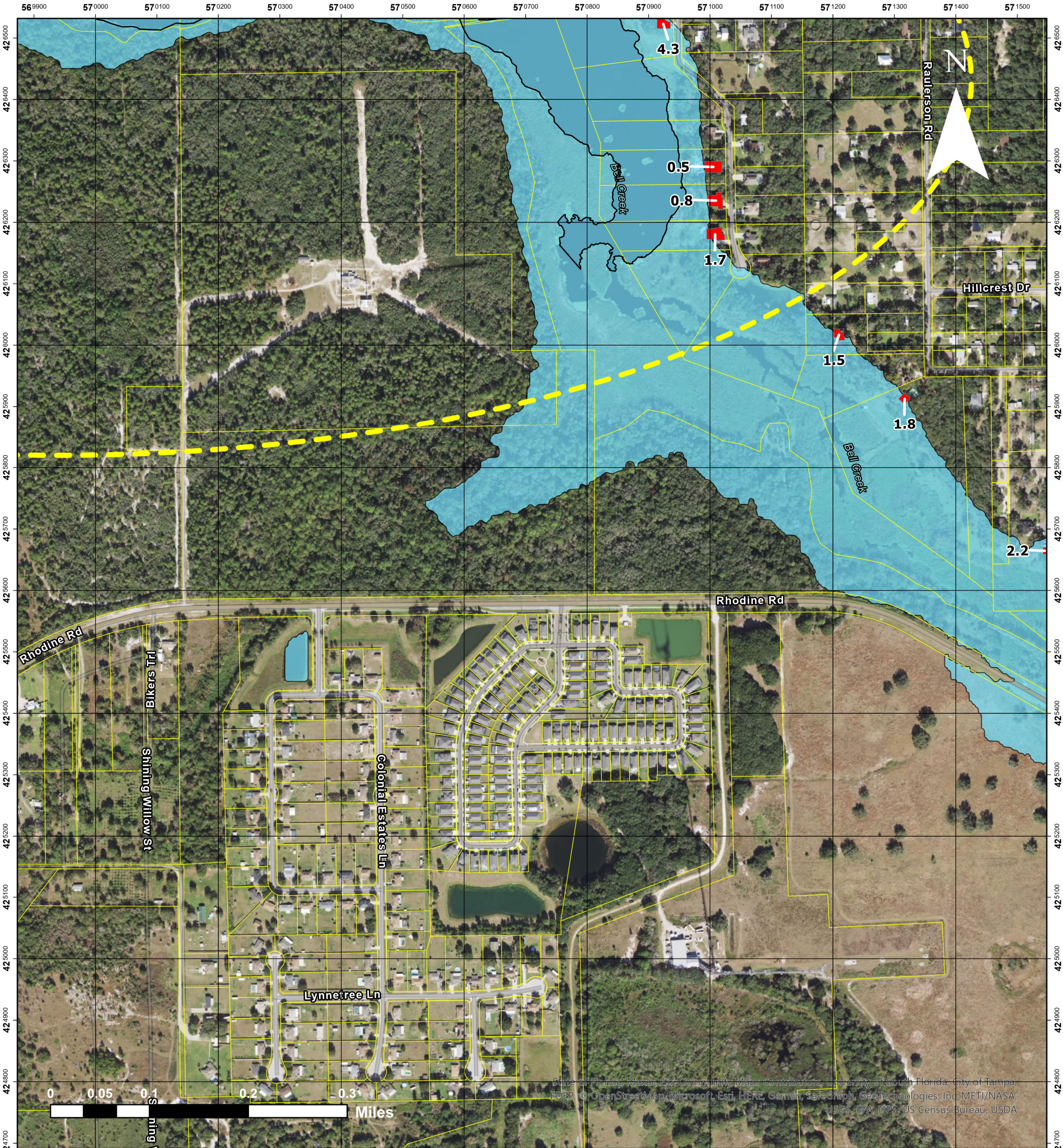

Project

Inundation Modeling and Mapping for Shadow Run Dam

Flooded Parcels During PMP Event Near Homes – No Dam Break

Date	Drawn	Scale
06.21.22	TC/MC	1:6,000

Spatial Reference

Name: Albers Conical Equal Area
[Florida Geographic Data Library]

Drawing Ref:

Figure 24 - A6

Legend

- Lake Grady location
- Received shoreline
- Inundated structures
- Hillsborough County Parcels
- Shadow Run Dam PMP event (no dam break)
- 1.5 (typical) - flood depth in feet above ground at structures.

Notes

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