DONA BAY WATERSHED MANAGEMENT PLAN MODEL UPDATE

Sarasota County | May 2024

DONA BAY WATERSHED MANAGEMENT PLAN

MODEL UPDATE

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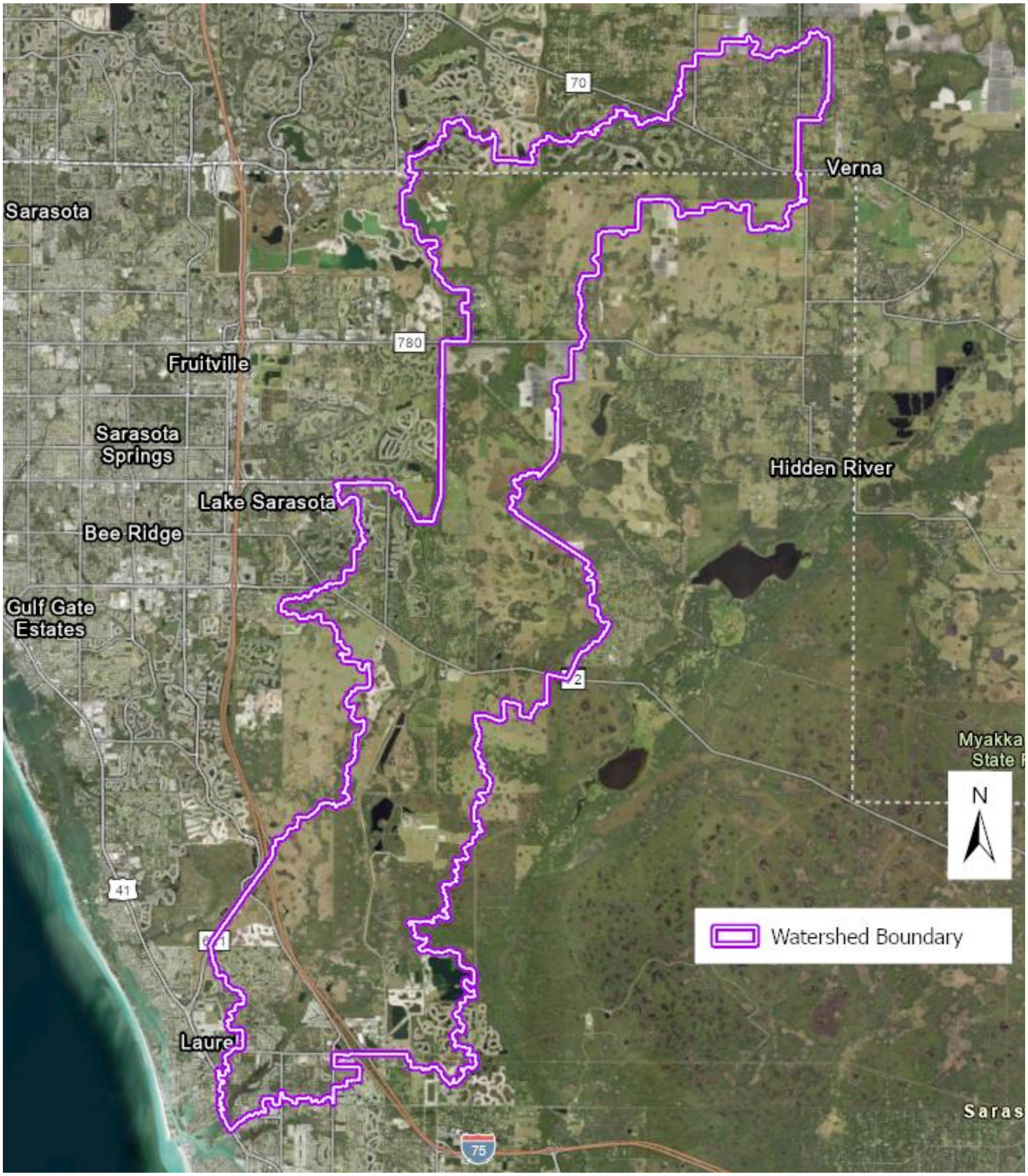
1 PURPOSE AND OBJECTIVES

Sarasota County understands the importance of maintaining up-to-date watershed-scale models for planning purposes. The County has been using the Interconnected Channel and Pond Routing software Version 3 (ICPR3) for stormwater modeling; however, Streamline Technologies, Inc. discontinued support for ICPR3 in 2016. ICPR3 has been replaced by ICPR Version 4 (ICPR4), and the County is converting its watershed models from ICPR3 to ICPR4. The County contracted Jones Edmunds to convert four watershed models from ICPR3 to ICPR4 and update the models for six watersheds under the Request for Professional Services (RPS) #202061MN of Sarasota County Contract No. 2021-268. This Technical Memorandum documents the model update for the Dona Bay Watershed Management Plan. Figure 1 illustrates the Dona Bay Watershed location.

Jones Edmunds converted the Dona Bay Watershed Model from ICPR3 to ICPR4 in prior tasks. This task consists of updating the watershed model to incorporate new developments that have occurred over the years using enhanced 2019 light detection and ranging (LiDAR) data obtained from the Southwest Florida Water Management District (SWFWMD) and addressing watershed boundary gaps and overlaps with adjacent watersheds.

Figure 1 Location Map



2 MODEL UPDATE

The previous Dona Bay Watershed Management Plan model update was completed in 2021 using the 2007 LiDAR data. For this update, the new 2019 LiDAR was used to refine the watershed boundaries, incorporate new developments, and address gaps and overlaps with adjacent watersheds. The model updates also include a quality-control check of the input parameters to ensure that the information from the previous model is reasonable.

2.1 Topographic Void Update

The 2019 LiDAR reflects the new developments that have occurred as well as the more detailed and refined surface information that results from advanced topographic data capture technologies. Jones Edmunds reviewed the SWFWMD Environmental Resource Permits (ERPs), 2019 LiDAR, and 2020 aerial imagery to identify developments that would have a significant impact on the watershed model. Some of the developments identified for updates are topographic voids in the 2019 LiDAR. Topographic voids are areas in the digital elevation model (DEM) that do not represent actual ground conditions based on aerial imagery review. After reviewing the areas of new development, we identified several topographic void areas that were large enough to cause notable inaccuracies in the model results and floodplain mapping if not addressed. We updated the DEM in these areas to reflect current conditions. Table 1 lists the developments where we conducted DEM updates.

Table 1 Topographic Void Developments

Project Name	ERP Number
LTRanch Neighborhood 1/Access Road	ERP_042124_002
Skye Ranch Neighborhood 4 North	ERP_042124_003
Skye Ranch Neighborhood 2	ERP_042124_004
Skye Ranch Neighborhood P1 Mass Grading	ERP_042124_005
Skye Ranch CP-1	ERP_042124_006
Skye Ranch Neighborhood 2	ERP_042124_007
Skye Ranch NP-1	ERP_042124_008
Skye Ranch Neighborhood 3	ERP_042124_009
Skye Ranch NP-4 Amenity	ERP_042124_010
Skye Ranch Neighborhood 2 16- and 20-foot Townhomes	ERP_042124_011
Skye Ranch Neighborhood 5	ERP_042124_012
Skye Ranch Neighborhood 4 South	ERP_042124_016
Skye Ranch Lorraine Road	ERP_042124_017
Toscana Isles	ERP_012290_019

For each area, Jones Edmunds georeferenced the applicable design drawings in a geographic information system (GIS). These drawings were used to digitize the ponds, building pads, parking lots, ditches, and other features that would assist in updating the terrain. Figure 2 illustrates the topographic features used to update the terrain for the Skye Ranch development. Figure 3 shows the before and after DEM for the Skye Ranch development.

Figure 2 Skye Ranch Development DEM Update Features

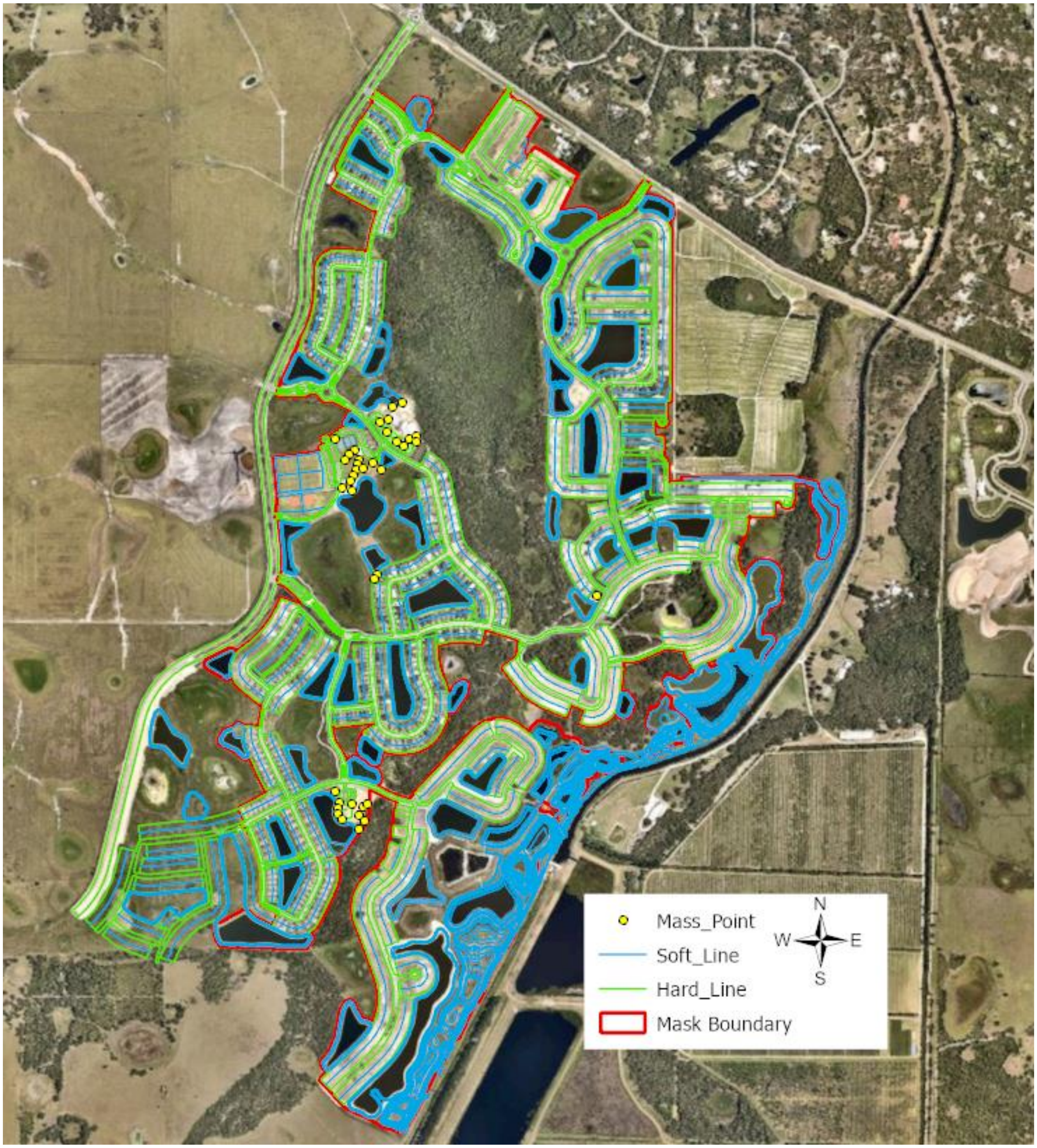
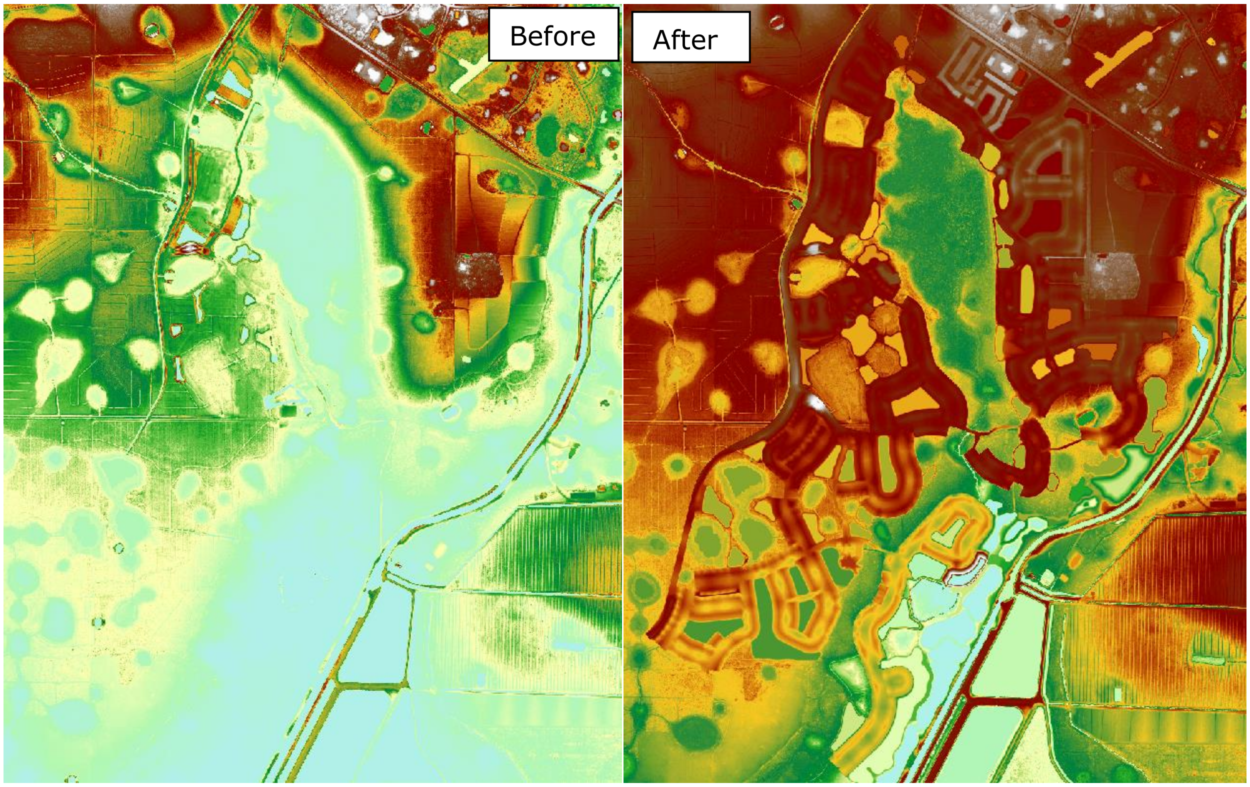


Figure 3 Skye Ranch Topographic Void DEM Comparison



The Talon preserve is a major development that is a topographic void in the 2019 DEM. Jones Edmunds did not update the terrain for this development due to significant (over 850 acres) topographic void updates already made to other areas within the watershed. Additional topographic void updates would have been beyond the scope and budget of this project. However, since the Talon Preserve development is at the boundary of the Little Sarasota Bay and Dona Bay Watersheds, incorporating the development data into the watershed model is necessary to ensure that the boundary contains the latest information. Jones Edmunds used storage from the drainage report to incorporate into the model.

2.2 New Developments Update

Several developments have occurred in the watershed since the model was last updated in 2021. Table 2 lists the developments that have significant impacts on the watershed model and were included in the model update.

Table 2 Significant Developments in the Dona Bay Watershed

Project Name	ERP Plans
Clark Oaks Subdivision	ERP_042686_000
LTRanch Neighborhood 1/Access Road	ERP_042124_002
Skye Ranch Neighborhood 4 North	ERP_042124_003
Skye Ranch Neighborhood 2	ERP_042124_004
Skye Ranch Neighborhood P1 Mass Grading	ERP_042124_005
Skye Ranch CP-1	ERP_042124_006
Skye Ranch Neighborhood 2	ERP_042124_007

Project Name	ERP Plans
Skye Ranch NP-1	ERP_042124_008
Skye Ranch Neighborhood 3	ERP_042124_009
Skye Ranch NP-4 Amenity	ERP_042124_010
Skye Ranch Neighborhood 2 16- and 20foot Townhomes	ERP_042124_011
Skye Ranch Neighborhood 5	ERP_042124_012
Skye Ranch Neighborhood 4 South	ERP_042124_016
Skye Ranch Lorraine Road	ERP_042124_017
Toscana Isles	ERP_012290_019
Windwood	ERP_026207_000
Villages of Milano	ERP_041590_003
Talon Preserve 6A	ERP_043530_004
Talon Preserve 6B	ERP_043530_005
Amenity Center at Talon Preserve	ERP_043530_007
Lauren Road and Knight Trail Road	ERP_012149_048

Jones Edmunds reviewed the development plans and compared the design elevations and topographic data to the LiDAR data. Each development was reviewed for:

- Drainage patterns and catchment delineations.
- Hydraulically significant structures.
- Elevations and profiles.
- Topography.
- Initial stages.

Based on our review, we re-delineated the model catchments, incorporated new or revised hydraulic structures, and parameterized the watershed model according to the design data. In areas adjacent to the new developments, we updated curve numbers (CNs), impervious areas, times-of-concentration (Tc), storage, overland weirs, and cross-sections.

In addition to new developments, Jones Edmunds reviewed the Dona Bay Restoration project as-builts and incorporated new hydraulic structures (notably the re-designed Albritton Control Structure) from the plans. We also updated the initial stages within the Cow Pen Slough's channel system. We parameterized the conveyance system and operable structures in the model to simulate wet-season operating conditions. We obtained the wet-season operating conditions from the associated drainage report and verified them with the Public Works Standard Operating Procedure (SOP) document. We modeled the Albritton Control Structure using weirs and pipes as opposed to drop structures. The most upstream weirs include a Top Clip Operating Table, which represents the operable gates. The top clip depth was set to 0 since the gate would be fully open during the wet season. The pipes represent the box culverts within the structure, and the downstream weirs have a Bottom Clip Operating Table that represents the stop log control downstream of the structure. For the 100-year storm event, the bottom clip depth was set to 0 to simulate no stop logs in place. We chose this configuration because of the likelihood that County maintenance staff would preemptively open the system before an eminent storm event as an emergency operation that is outside normal procedures. The assumption is that a storm of that magnitude would likely have some warning before the event and the stop log removal could be accomplished beforehand. We also modified the Kings Gate control structure further downstream to be completely open, as this would also need to be accomplished concurrently to not overwhelm that structure.

Table 3 compares the model input data of the previous version of the model (existing model) and the updated version of the model.

Table 3 Comparison of Existing and Updated Model Elements

Model Element	Existing Model (count)	Updated Model (count)
Catchment	1,934	2,006
Node	2,158	2,304
Drop Structure	304	343
Pipe	724	802
Channel	472	469
Weir	3,427	3,441
Rating Curve	20	20
Watershed Area	47,893.59 acres	48,307.73 acres

2.3 Watershed Boundary Update

Since the previous update of the Dona Bay Watershed Management Plan, updates to other adjacent watershed models in the County have occurred. Surrounding watersheds that have been updated include Cooper Creek, Phillippi Creek, Little Sarasota Bay, Lyons Bay, Roberts Bay, Lemon Bay, and Lower Myakka. These updates required that the boundaries along the Dona Bay Watershed also be updated to be consistent with the adjacent watersheds to represent the interflow between the areas more accurately. Jones Edmunds revised the Dona Bay Watershed boundary catchments to be consistent with the new LiDAR and the surrounding watersheds. The revisions included updating the storage, CNs, and Tc characteristics of the newly revised catchments.

Jones Edmunds also ensured that the hydraulic connections were consistent between the watershed models (i.e., a conduit leaving one watershed is connected to the appropriate node of the adjacent watershed and that the parameter data are identical).

2.4 Quality Assurance/Quality Control

Jones Edmunds develops watershed models using defined procedures for quality assurance. Many tasks associated with model development and/or model conversion are captured in our SOPs to ensure consistency and accuracy. We also have many tools to aid in quality control of watershed products, including tools for parameterization, automated checks of model inputs, and floodplain delineation tools that meet Federal Emergency Management Agency (FEMA) standards for floodplain mapping.

Jones Edmunds performed a quality-control check of the input parameters to ensure that the information from the previous model was accurately represented. While checking the model inputs for reasonableness, we identified and corrected several issues in the previous model. These issues included:

- The maximum area in the stage-storage data exceeded the basin area.
- The modeled acreage does not match the acreage derived from the GIS data.

3 VERIFICATION

After updating the Dona Bay Watershed model, Jones Edmunds conducted model calibration and verification. The goal of calibration/verification is to ensure that the model accurately reflects observed conditions of historical storm events and can be reliably used to predict system performance under design storm conditions. The purpose of the model calibration process is to modify the model input parameters (generally coefficients) within an acceptable engineering range until the model results best match the actual recorded data. The model verification simulation verifies that the model "setup" matches the recorded data (hydrograph) for a separate storm event. An ideal verification event would have a different depth and/or duration than the calibration storm event. A model is considered calibrated and verified when the same model setup produces results that reasonably match both storm events in terms of peak, timing, and volume. Once the model's validity is confirmed, the model can be relied on as a tool to develop accurate flood risk data, analyze the flood protection level-of-service (FPLOS), and analyze proposed conditions. The following subsections document the model calibration/verification approach and results for the updated ICPR4 Dona Bay Watershed model.

3.1 MODEL CALIBRATION AND VERIFICATION APPROACH

The Dona Bay model was previously verified during model updates in 2016. The task in this Contract was to validate the previous calibration and verification efforts or update the calibration by adjusting the model hydraulic parameters, if required, to ensure that the model simulates the system hydrologic and hydraulic responses after conducting the model updates.

Jones Edmunds' approach assumed that the model input parameters (in particular, the Manning's n values) were largely accurate and that this effort was primarily conducted to identify any model updates that could change the model simulation performance or potential model inaccuracies and/or calibrate any locations/tributaries in the model that were not previously calibrated. No rating curve (flow) data are available for any of the water-level gauge locations, which limited our ability to calibrate the model along channel reaches. Because of these aspects, no large-scale changes were made to the Manning's n values unless clearly required. However, several gauges are available with recorded water elevations, which we used to compare to the model results. Section 3.5.3 discusses the specifics regarding the actual model parameter adjustments.

3.2 HISTORICAL STORM EVENT(S) SELECTION

Selecting the historical storm events to be used for the calibration and verification considered several factors:

- Magnitude of the storm events(s).
- Availability of rainfall and water-level data.
- Antecedent moisture conditions (AMC).
- Recency of the storm event.
- Temporally isolated rainfall.
- Needs from adjacent watersheds for boundary conditions.

We considered all of the previously noted items to determine the most appropriate storm events to use for the Dona Bay Watershed, although the most important considerations are the first two, i.e., event magnitude and data availability. We used these two factors to initially filter the gauge data. We graphed and reviewed the water-level data for the period of record for the highest peak stages at each gauge. We reviewed the rainfall data associated with those events having the highest peaks to determine the time of year, temporal distribution, and magnitude of the rainfall data. We used this information to determine if the rainfall data were appropriate for model calibration/verification. The remaining factors were considered with emphasis given to more recent events.

Based on the data, Hurricane Ian in September 2022 and Tropical Storm (TS) Eta in November 2020 were the most suitable storm events for the Dona Bay Watershed calibration and verification. However, because watershed models are being updated and calibrated across the entire County, the selection of calibration/verification events across all watersheds was considered prudent. To do this, we coordinated with Collective Water Resources (who is conducting the calibration/verification for half of the County) and performed a cursory review of the gauge and rainfall data for the other half of the County watersheds. Based on these efforts, both consultants determined that these two events could be used to calibrate and verify model results for all County watersheds.

3.3 Available Gauge Data

During the calibration process, Jones Edmunds assessed the suitability and reliability of gauge data for making model parameter changes. The selected storm events were thoroughly reviewed for usability, and data that were deemed unsuitable or unreliable were generally disregarded. In one case, a correction factor was applied.

3.3.1 Recorded Water-Level Data

The Sarasota County Automated Rainfall Monitoring System (ARMS) program is equipped with a network of remote monitoring stations throughout the County that record rainfall and water-level information. Four gauging stations are within the Dona Bay Watershed. Table 4 summarizes the ARMS gauge sites with the suitability of their usage for the verification process. Figure 4 shows the locations of the ARMS gauge sites.

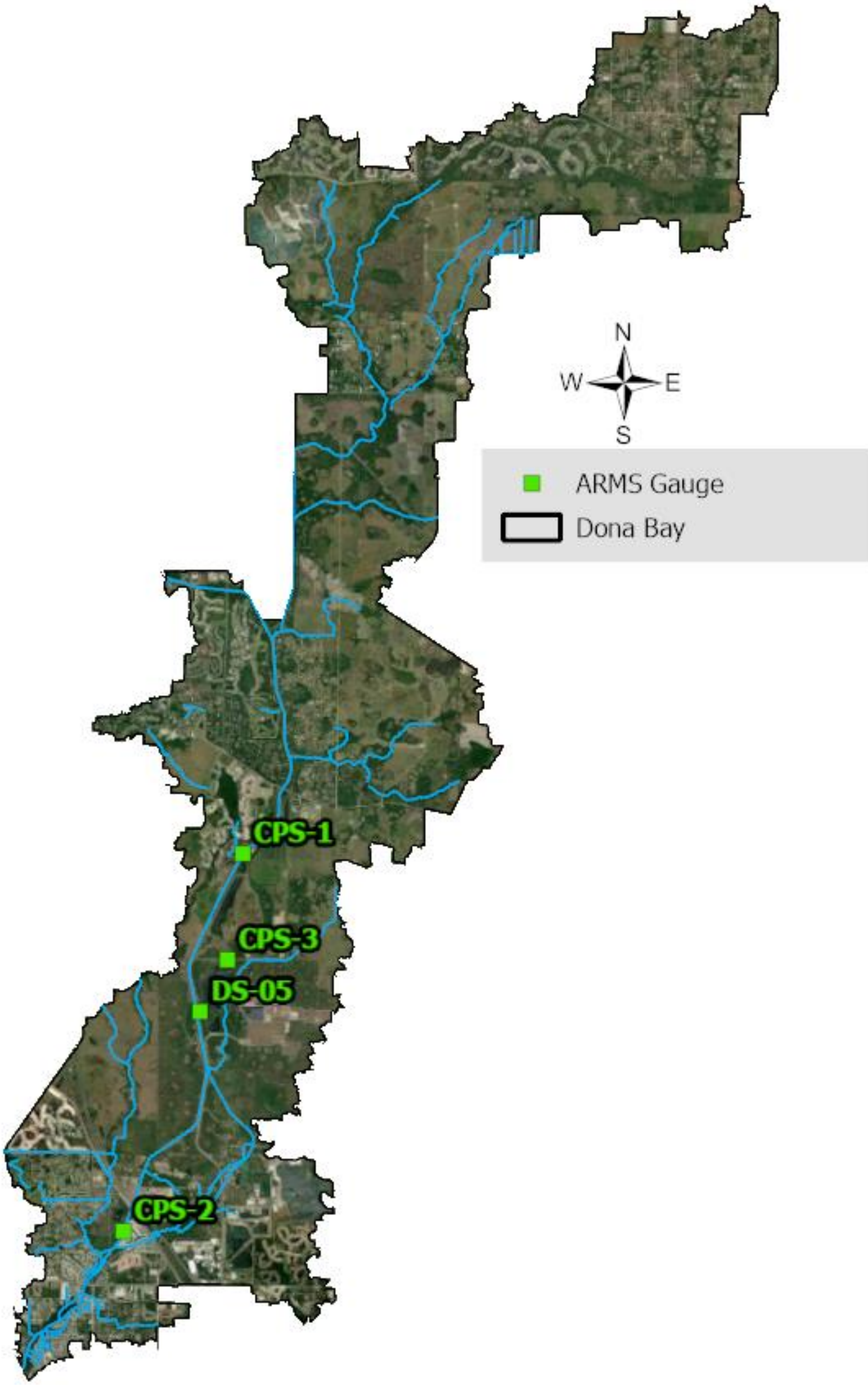
Table 4 Sarasota County ARMS Gauges – Dona Bay Watershed

Station Name	Data Usable for Model Calibration (Ian)	Data Usable for Model Verification (Eta)
CPS-1 Clark Road Battery	Yes	Yes
CPS-2 Kings Gate Battery	Yes*	Yes*
CPS-3 CS-03	Yes	Yes
DS-05	No**	Yes

*Gauge correction factor applied.

**Error in the observed stage recording.

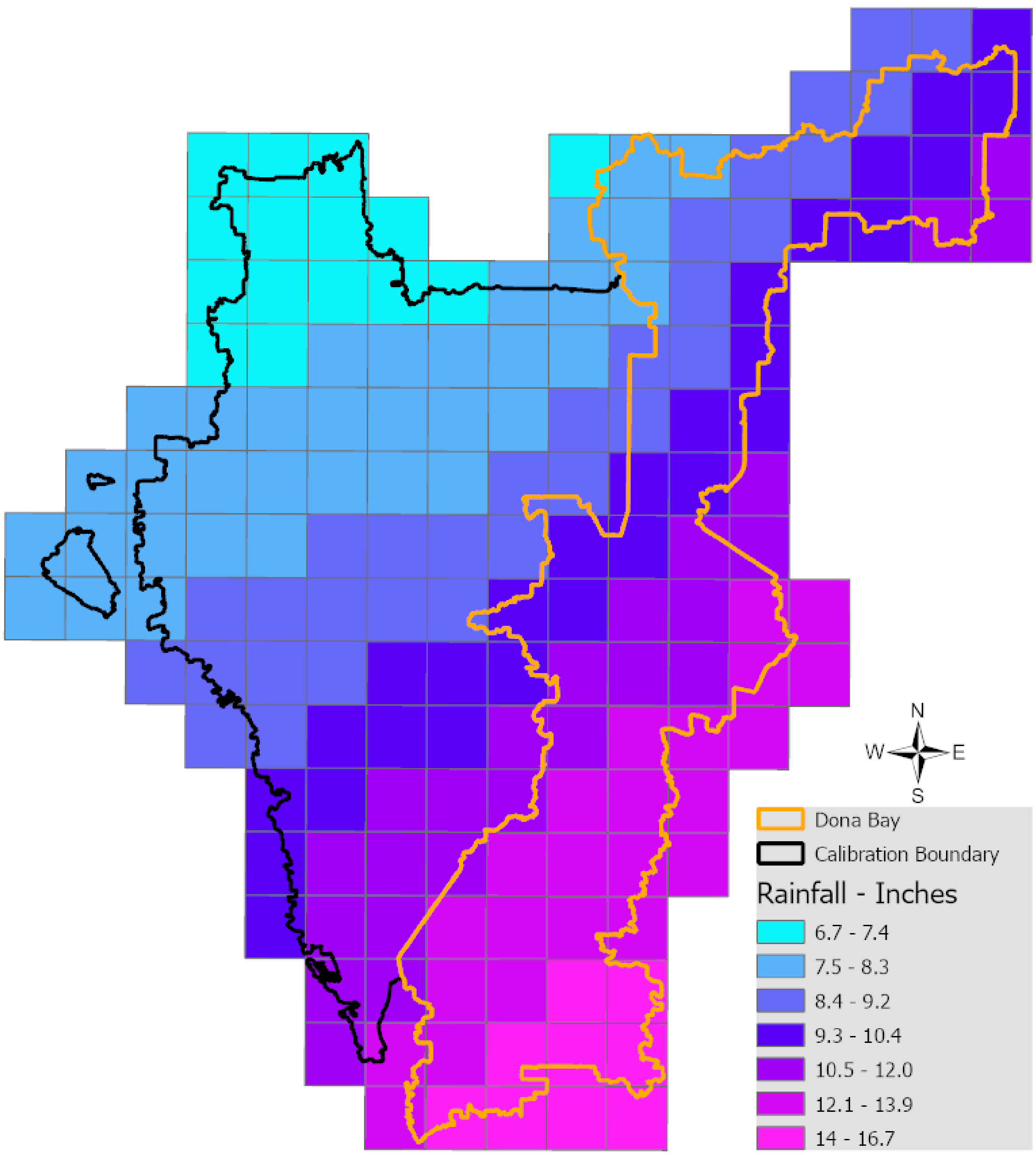
Figure 4 Sarasota County ARMS Gauge Locations – Dona Bay Watershed



3.3.2 RAINFALL DATA

Jones Edmunds obtained the Next Generation Weather Radar (NEXRAD) rainfall data from SWFWMD. The data are quantified through a 2-kilometer (km) grid with each cell containing rainfall-depth distributions at 15-minute intervals. The rainfall distribution grid was intersected with the model subbasins, and each subbasin received the rainfall distribution (and depth) for the grid cell that contained the centroid of the subbasin polygon. Figure 5 depicts the NEXRAD grid cells used for Dona Bay and the surrounding watersheds, showing the range of rainfall depth totals for cells used in the model calibration event. NEXRAD rainfall totals were also compared to the ARMS-recorded rainfall data totals to verify the accuracy of the NEXRAD data. Overall, the data compared within reasonable limits with no discrepancies to warrant any rainfall data changes.

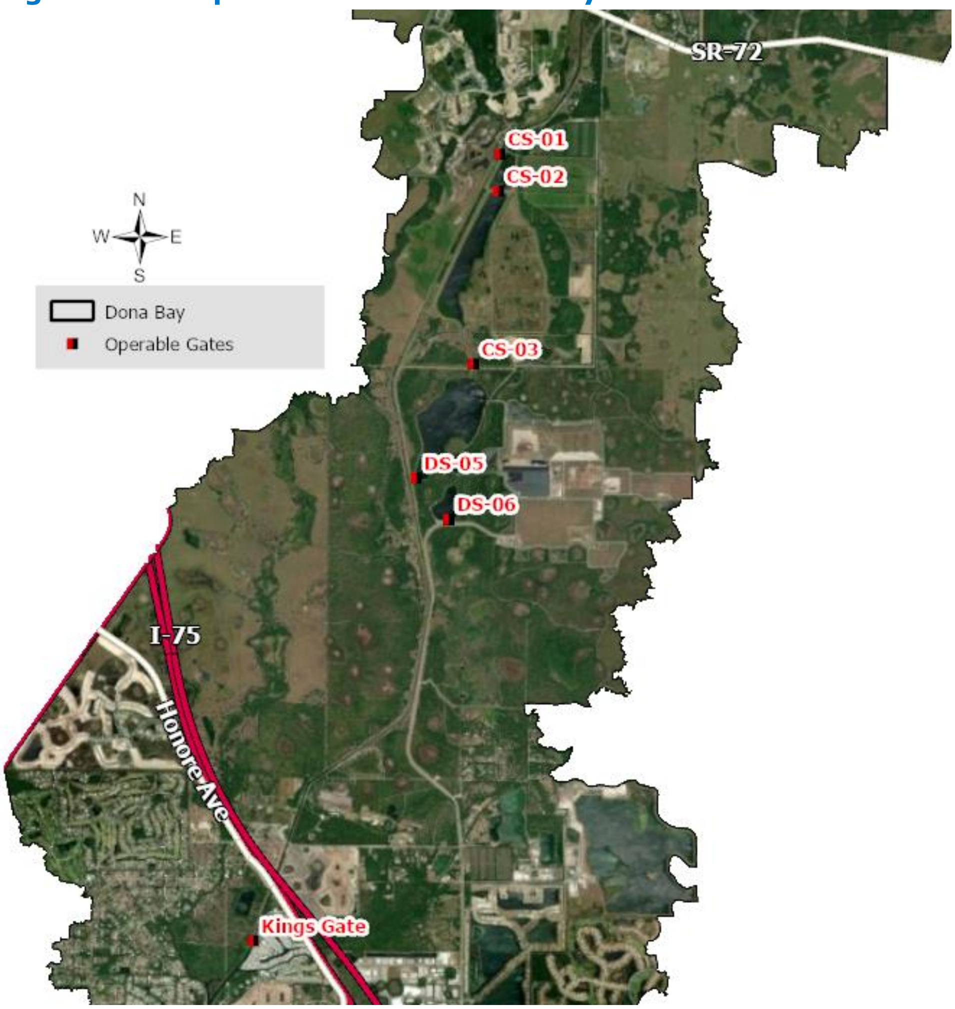
Figure 5 Hurricane Ian Modeled Calibration Rainfall Totals



3.4 Structure Operations

The Dona Bay Watershed contains six operable water-control structures within its drainage area. All operable structures are part of the Dona Bay Restoration Project except for the Kings Gate weir. The Dona Bay Restoration Project was designed to reduce freshwater flows to the downstream estuary, enhance the level of flood protection, and improve water quality, wetland rehydration, and conveyances to Salt Creek. The system diverts flow from Cow Pen Slough through a treatment train system consisting of the North Pinelands stormwater management facility, the Central Pinelands stormwater management facility, and a wetland rehydration area. The operable gates control the stages and outflows from each treatment facility. Figure 6 illustrates these structure locations.

Figure 6 Operable Gates – Dona Bay Watershed



The structures have an SOP for the wet and dry seasons. The general operation rules are described in Sarasota County's *Standard Operating Procedures* and in *Maintenance Guidelines for Dona Bay Water Quality Project Phase I* (Kimley-Horn and Associates, Inc., 2014). The structure operations for the calibration and verification simulations were simulated using the wet-season SOPs. Table 5 shows the wet-season structures operation table from the Kimley-Horn operation manual.

Table 5 Wet-Season Structures Operation

Table 5.3.1 Wet Season Conditions (June 1st, October 31st)			
Structure Name	Control Elevation	Gate/Weir Position	Comment
CS-01	17.0	Open	Stop logs inserted to El. 17.0 Bottom of gate at EL. 23.5
W-01	14.0	Open	Fixed at El. 14.0
CS-02	14.0	Open	All Stop logs removed
CS-03	14.0	Open	Gates open, El. 14.0 to El. 18.0
DS-05	15.5	Open	Stop logs removed to El. 15.5
DS-06	15.5	Open	All stop logs removed

3.5 Model Calibration

After updating the Dona Bay Watershed model with new developments, Jones Edmunds simulated a real storm to compare the model-predicted results with known water-level observations at the four gauges in the watershed. We compared the model results to the gauge data and reviewed/adjusted the appropriate model parameters to obtain a reasonable stage hydrograph match for the Hurricane Ian storm event. The following subsections describe the model calibration details.

3.5.1 Calibration Storm – Hurricane Ian

Hurricane Ian was a Category 4 storm that made landfall just south of Punta Gorda, Florida, at 4:30 PM, September 28, 2022. In addition to Category 4 winds, it also brought heavy rain. Rainfall depths in Sarasota County ranged from approximately 17 inches in the Dona Bay Watershed to approximately 7 inches to the north. Figure 5 shows the rainfall depths across the calibration model boundary. Advantages of using this event for calibration include:

1. **Recent Storm:** This event occurred recently and reflects current land use conditions.
2. **Regional Storm:** This event was regional in nature; therefore, the entire watershed contributed to the observed flows.
3. **Uniform AMC:** This event began with uniform soil moisture conditions across the watershed.

3.5.2 Calibration Storm – Event-Specific Model Input Data

To perform a calibration event, specific model input data must be reviewed to determine if modifications need to be made that differ from the standard design storm model setup. These typically include boundary conditions, initial conditions (initial stages and/or flows), and sometimes the soil AMC. In this case, structure operations for this event were also considered. The Dona Bay Watershed model was combined with Little Sarasota Bay, Coastal Fringe Roberts Bay North, and Coastal Fringe Little Sarasota Bay to minimize the uncertainties in boundary conditions. The tidal boundary condition, which is represented as a constant elevation of 1.42 feet North American Vertical Datum of 1988 (NAVD88) in the design models, was replaced with the observed water level at Venice Inlet at Crow's Nest Marina. Flow exchanges from Dona Bay to Upper Myakka, Lower Myakka, and Roberts Bay do not impact results at the calibration gauges and are considered negligible.

Initial conditions in the system were left the same as the design events except for the areas surrounding the gauges; these were adjusted to match the gauge data before Hurricane Ian to the extent practicable. Lastly, based on our review of the rainfall data preceding the Hurricane Ian event, the soil conditions appear suitable for conducting model simulations with CNs for an AMC II condition.

3.5.3 Parameter Adjustments

This task was to verify and/or adjust the model parameters to provide the best reasonable match between simulated and measured stages. After the initial model run, the model peak stages showed notable differences of varying degrees near some of the gauges. We updated the model schematic and parameters in the Dona Bay Restoration Area in accordance with as-built plans data. Various model input data were meticulously reviewed, including structure operations before and during the storm. We also reviewed the Manning's n values along Cow Pen Slough from CS-01 to the Kings Gate structure and noticed that Manning's n values were unusually low for a natural channel. The Manning's n values along this channel segment were modified based on recently taken field and aerial photography.

3.5.4 Calibration Results

Figures 7 through 9 present stage hydrographs for the gauge locations with viable data (three of the four gauges; refer to Table 4). The figures show that model calibration stage hydrographs match reasonably well with the recorded data in terms of peak stages, particularly at gauge CPS-1. However, the model recession limb in each comparison contains a consistent disparity. Although simulated peak stages match fairly well, the differences during the model recession prompted us to contact the County Stormwater Operations Department to verify the explicit operation of the structures and any other information we could obtain regarding the Hurricane Ian event.

The Operations staff told us that detailed structure operations were not available for the Hurricane Ian event. However, we did discover that a flow blockage occurred at Clark Road that was not cleared until a month after the storm had passed. This could be why the recession limb on the observed stage hydrographs stays elevated for so long. We also reviewed the verification results, which do not show a prolonged stage recession (discussed more in subsequent sections). We determined that the disparities in the calibration hydrographs were attributed to abnormal structure operations or flow blockage. Based on these reasons, no additional changes were made to the calibration model.

Figure 7 Calibration Stage Hydrograph Comparison – CPS-1 at Clark Road Battery

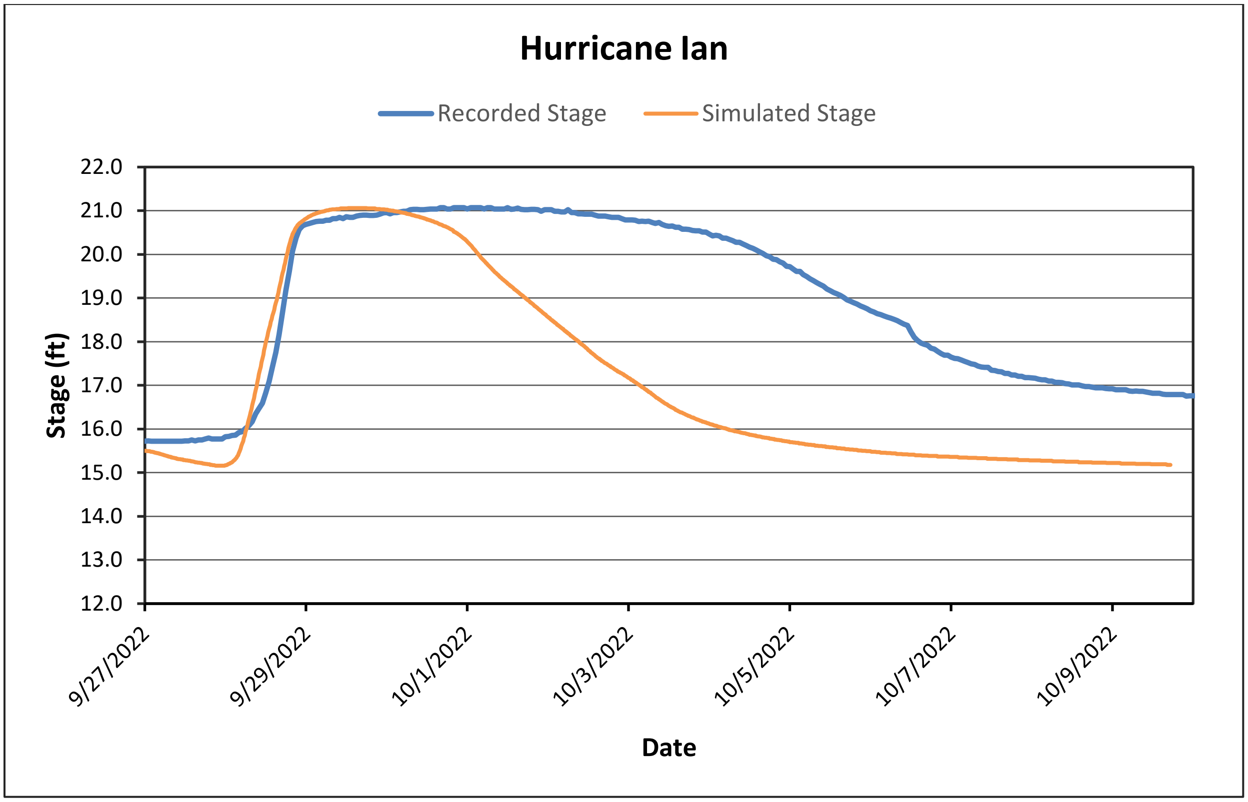


Figure 8 Calibration Stage Hydrograph Comparison at CPS-3 at CS-03

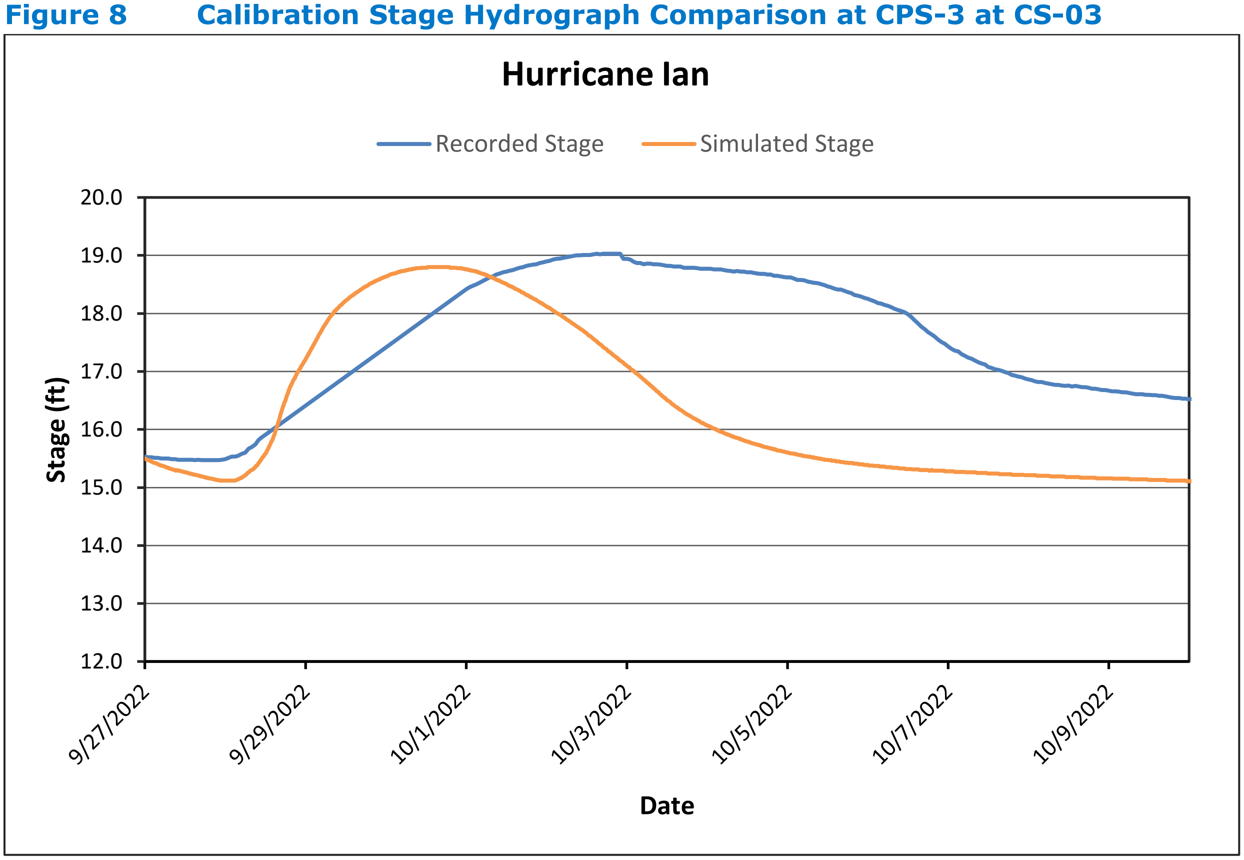
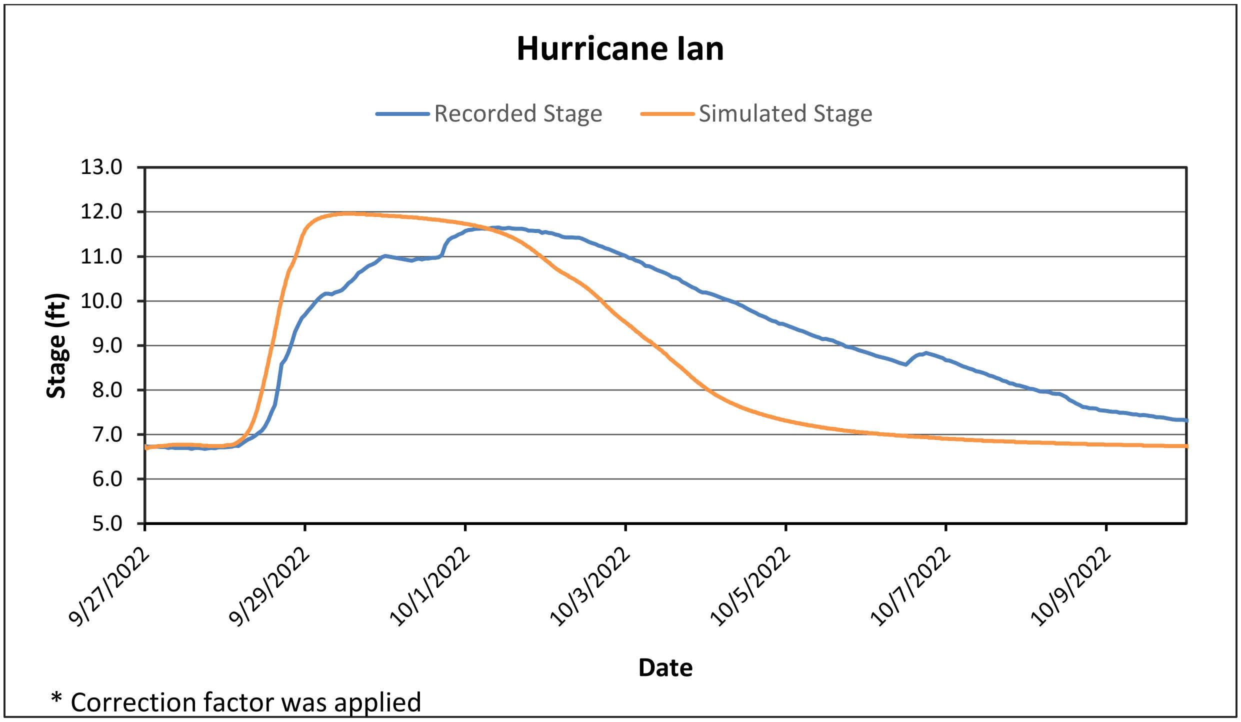


Figure 9 Calibration Stage Hydrograph Comparison at CPS-2 Kings Gate



The observed stage at Kings Gate was given a correction factor based on a field visit of the gauge. When we visited the gauge, the ARMS system recorded the stage at elevation 6.6 feet NAVD88. However, we measured the depth of water over the weir at 2 inches with the model weir elevation at 5.92 feet NAVD88. Therefore, the recorded stage was recording higher than the observed stage by approximately 0.5 foot.

Table 6 summarizes the modeled peak stages compared to the simulated peak stages. DS-05 is not shown due to an error in the recorded data. The average peak stage difference is 0.18 foot (absolute value), which is within an acceptable range.

Table 6 Observed Stages Compared to Simulated Peak Stages – Hurricane Ian Calibration Event

ARMS Gauge	Observed Peak Stage (feet NAVD88)	Simulated Stage (feet NAVD88)	Difference (foot)
CPS-1 Clark Road Battery	21.07	21.06	-0.01
CPS-3 CS-03	19.03	18.8	-0.23
CPS-2 Kings Gate Battery	11.65*	11.96	0.31

*Gauge correction factor applied.

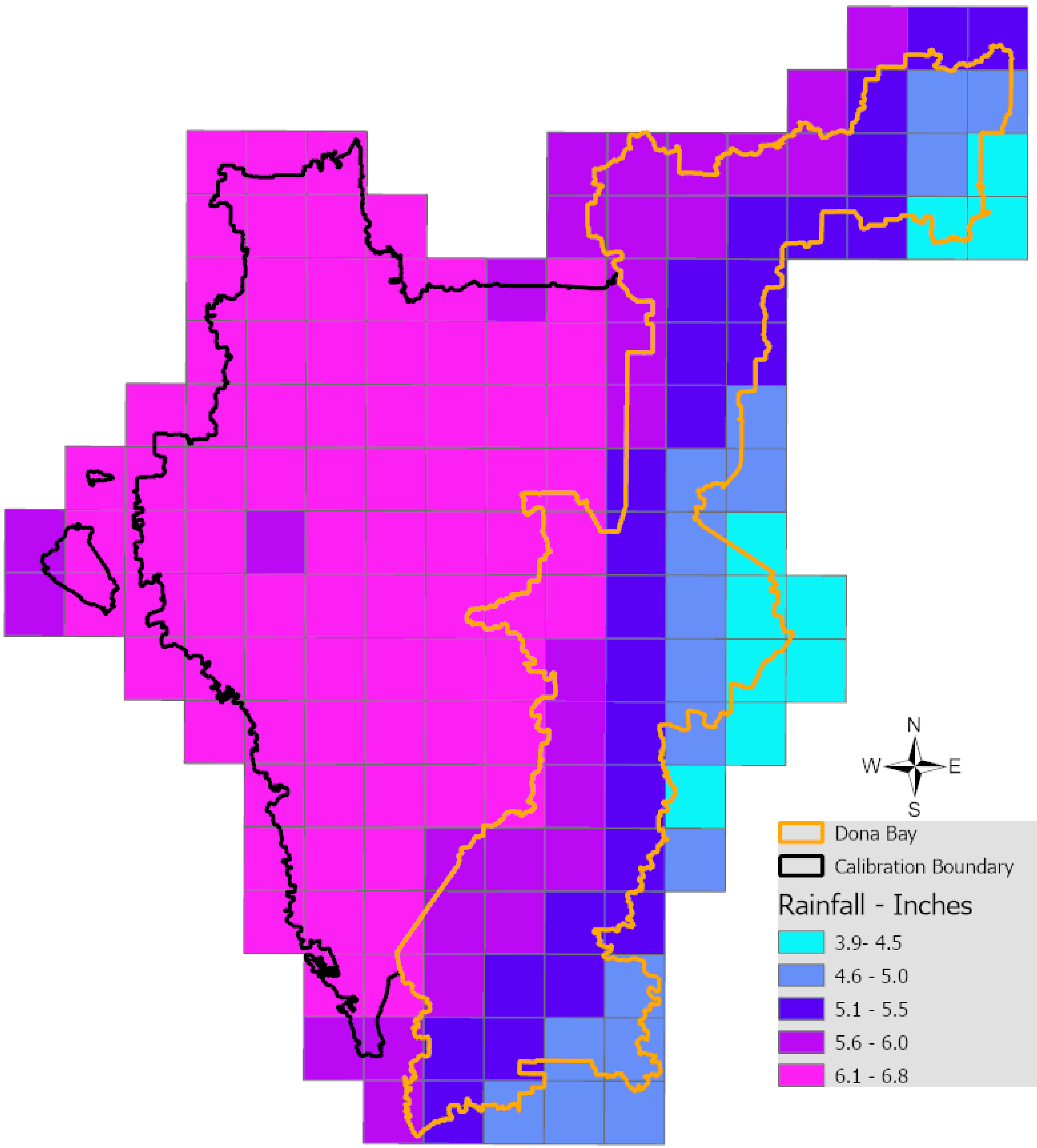
3.6 Model Verification

After calibration, Jones Edmunds verified the model by simulating a second real storm to provide confidence that the calibrated model adequately simulates the watershed hydrologic and hydraulic responses to a separate and different storm. We selected TS Eta.

3.6.1 VERIFICATION STORM – TS ETA

TS Eta began to impact southwest Florida on November 8, 2020. Although much of the rainfall occurred on November 11, the model was simulated from November 10 through November 21. During this period, rainfall ranged from 4 to 7 inches across all of the Dona Bay Watershed. Figure 10 shows the model verification event rainfall depths for the entire combined model, including the Dona Bay Watershed. As with the calibration storm, NEXRAD rainfall distributions were applied to each basin based on the intersection of the subbasin's centroid with the NEXRAD grid cells.

Figure 10 Rainfall Verification Map – TS Eta Rainfall Totals



3.6.2 Verification Storm – Event-Specific Model Input Data

As with the calibration event, Jones Edmunds reviewed specific model input data to determine if modifications were needed that differed from the standard design storm model setup, including boundary conditions, initial conditions (initial stages and/or flows), and soil AMC. We set up the model boundary conditions identical to the calibration event. Our approach to setting up the initial conditions in the system was also the same as the calibration event.

The big difference in the model input data setup for the verification event was the soil conditions. Because the event was in November, careful review of the rainfall data preceding the TS Eta event was necessary since the event occurred outside the Florida "wet" season. Our review of the 5-day period preceding November 11 revealed a that an average of 0.38 inch of rain fell across the Dona Bay Watershed. Table 7 shows that the AMC is determined by the previous 5-day rainfall total based on accepted Soil Conservation Service (SCS) methodology.

Table 7 SCS Runoff Guide for Determination of AMC

AMC	Total 5-Day Antecedent Rainfall (inches)	
	Dormant Season (November through May)	Growing Season (June through October)
I	< 0.5	< 1.4
II	0.5 to 1.1	1.4 to 2.1
III	> 1.1	> 2.1

Source: Technical Publication No. 85-5, *A Guide to SCS Runoff Procedures* (Suphunvorranop, 1985).

Based on the rainfall data and the criteria above, the proper AMC to use for the TS Eta verification event is AMC I. Jones Edmunds used the widely accepted SCS method for modifying CNs from AMC II to AMC I and used this to update the model input.

We simulated the model using AMC I and AMC II CNs to allow for a thorough review of the verification model considering that AMC I CNs are not frequently used. We conducted the AMC II simulation first, which initially showed over-predicted stages; however, we reviewed the hydrologic conditions leading up to the verification event and determined that the AMC built into the standard CNs that we used were too high for this event period, so we simulated the model using AMC I as well.

3.6.3 Verification Results

Figures 11 through 15 present stage hydrograph comparisons for the gauge locations with viable data (Table 4). Although verification event data were available for the DS-05 gauge, these data were missing from the calibration period. The model verification figures show that the model stage hydrographs match reasonably well in peak stage and timing with the recorded gauge data for the AMC I model simulation. Figure 11 shows that the elevation at CPS-1 drops sharply from 18.12 to 17.28 feet between 3 PM and 6 PM on November 12, 2020. We contacted the Stormwater Operations Department staff to confirm the operation schedule and were told that the stop logs were removed at this time; however, no work order was in the system for confirmation. This removal would explain the sharp drop in the observed stage at the CPS-1 gauge and correspondingly explain the second peak at the

Kings Gate gauge shown in Figure 14. Figure 15 shows the timing correlation from the stop log being removed at CPS-1, which likely impacted the second peak of the observed data at Kings Gate.

Figure 11 Verification Stage Hydrograph Comparison – CPS-1 Clark Road Battery

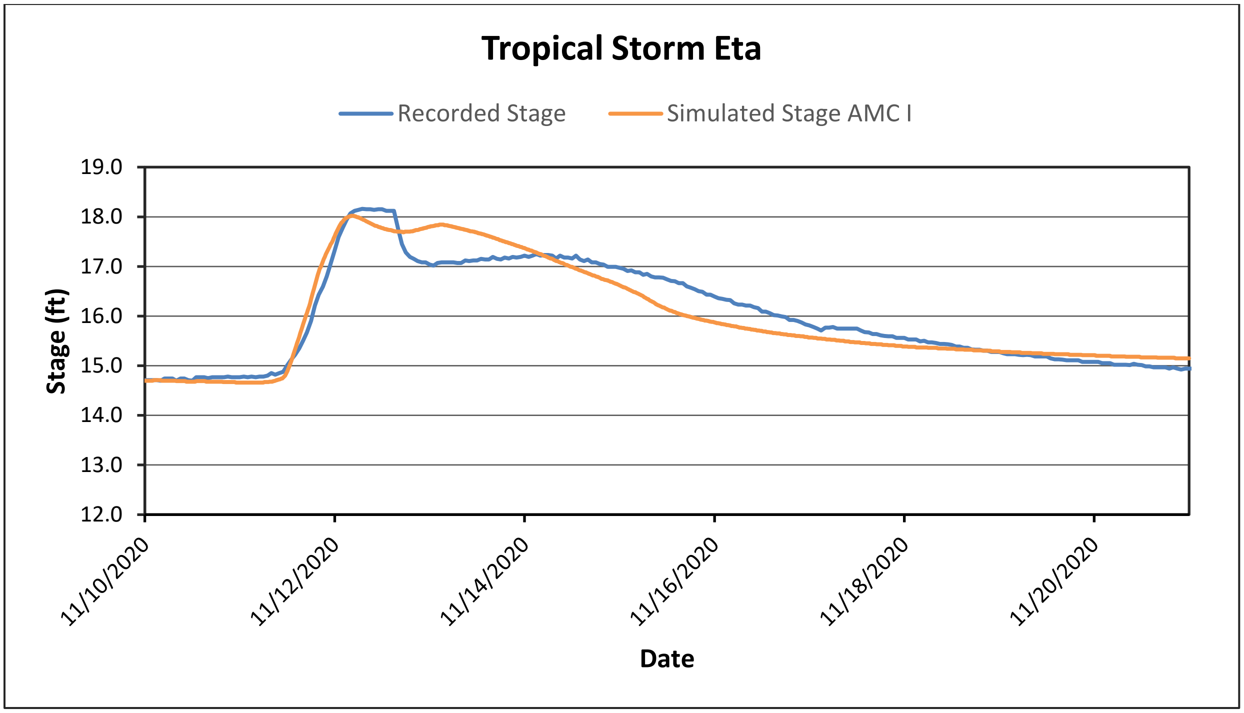


Figure 12 Verification Stage Hydrograph Comparison – CPS-3 at CS-03

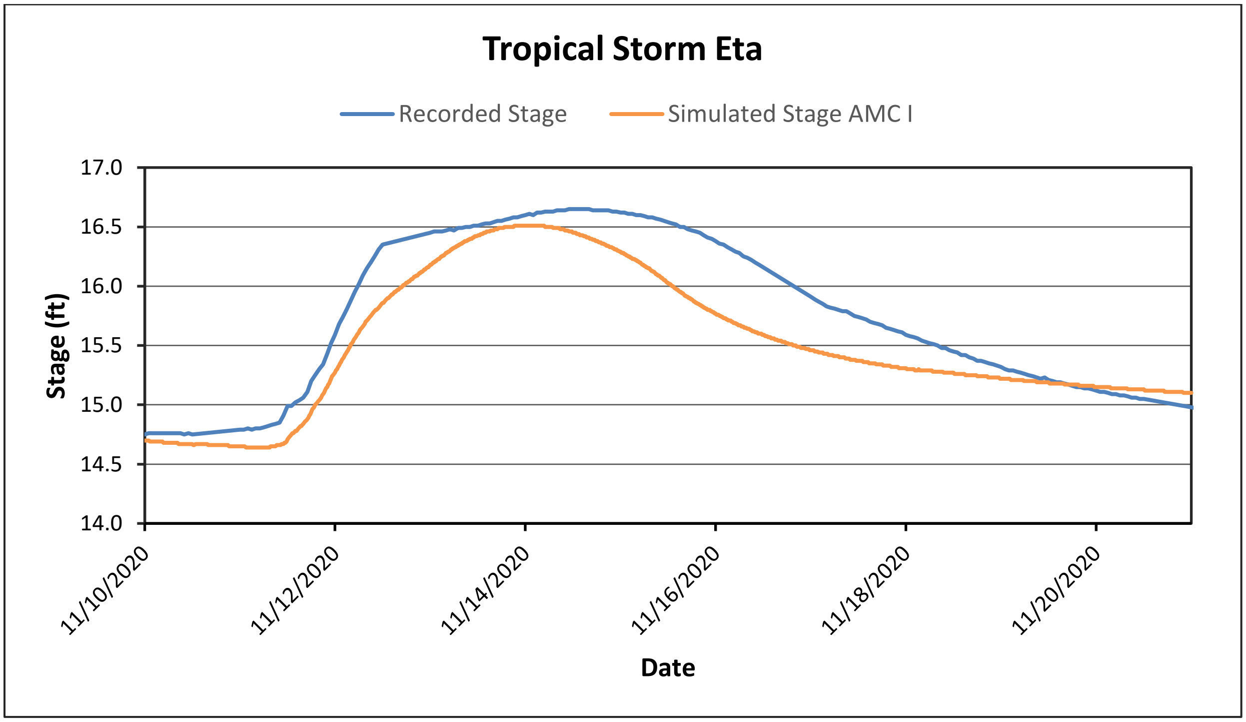


Figure 13 Verification Stage Hydrograph Comparison – DS-05

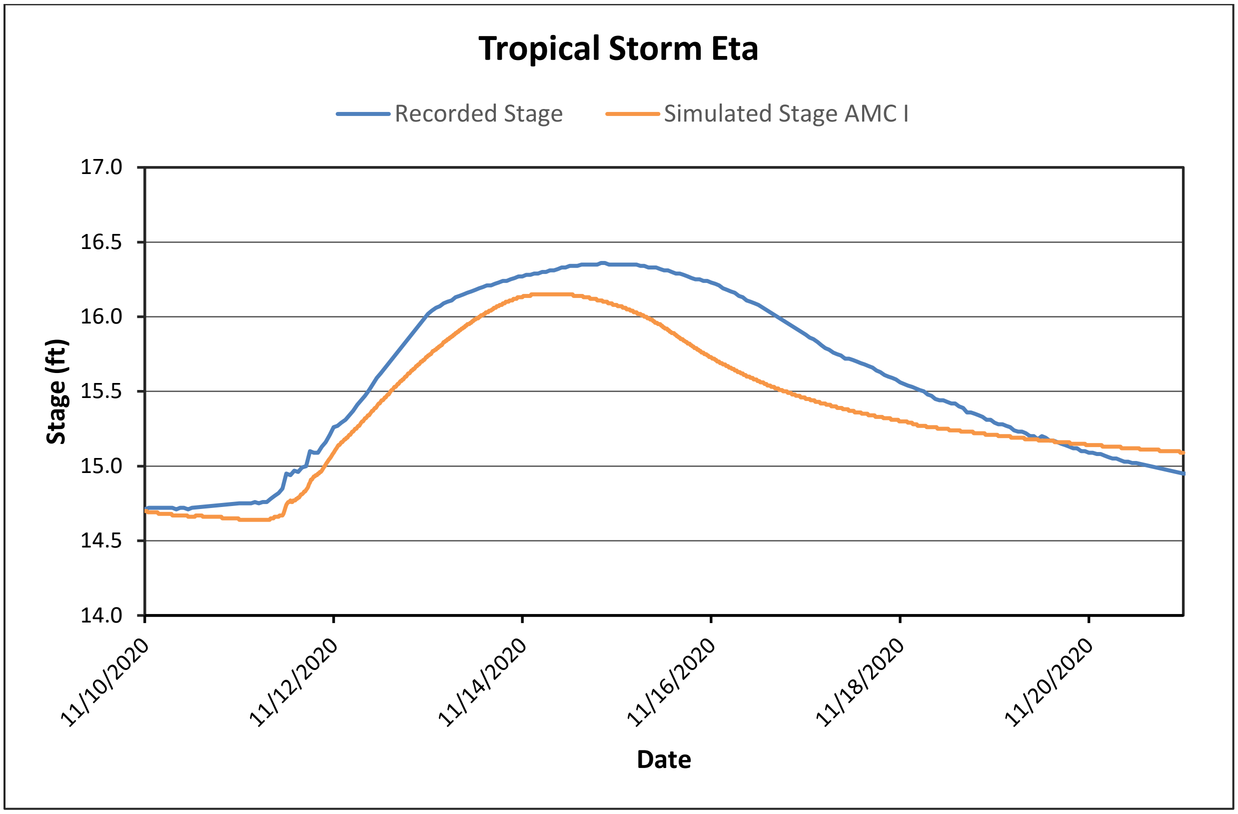


Figure 14 Verification Stage Hydrograph Comparison – CPS-2 Kings Gate

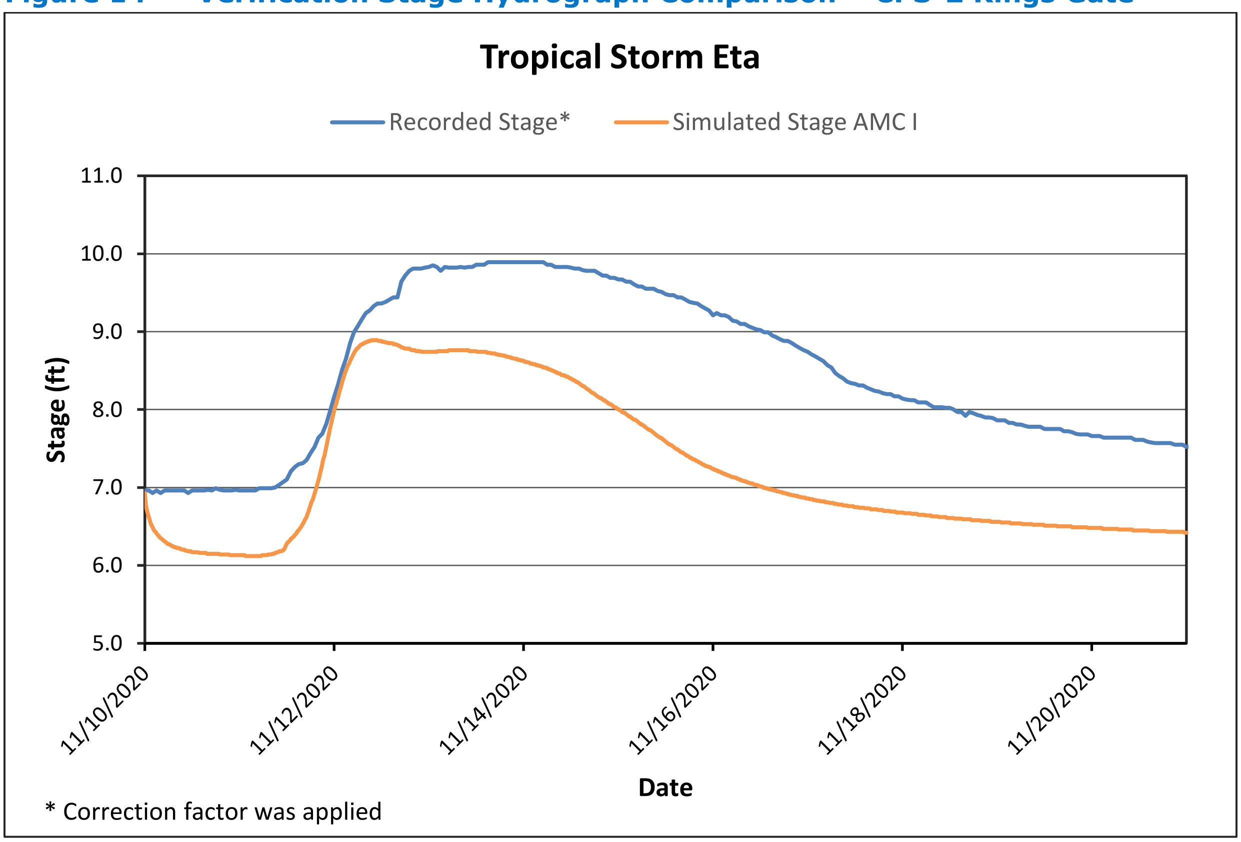


Figure 15 Verification Stage Hydrograph Comparison – CPS-1 and CPS-2

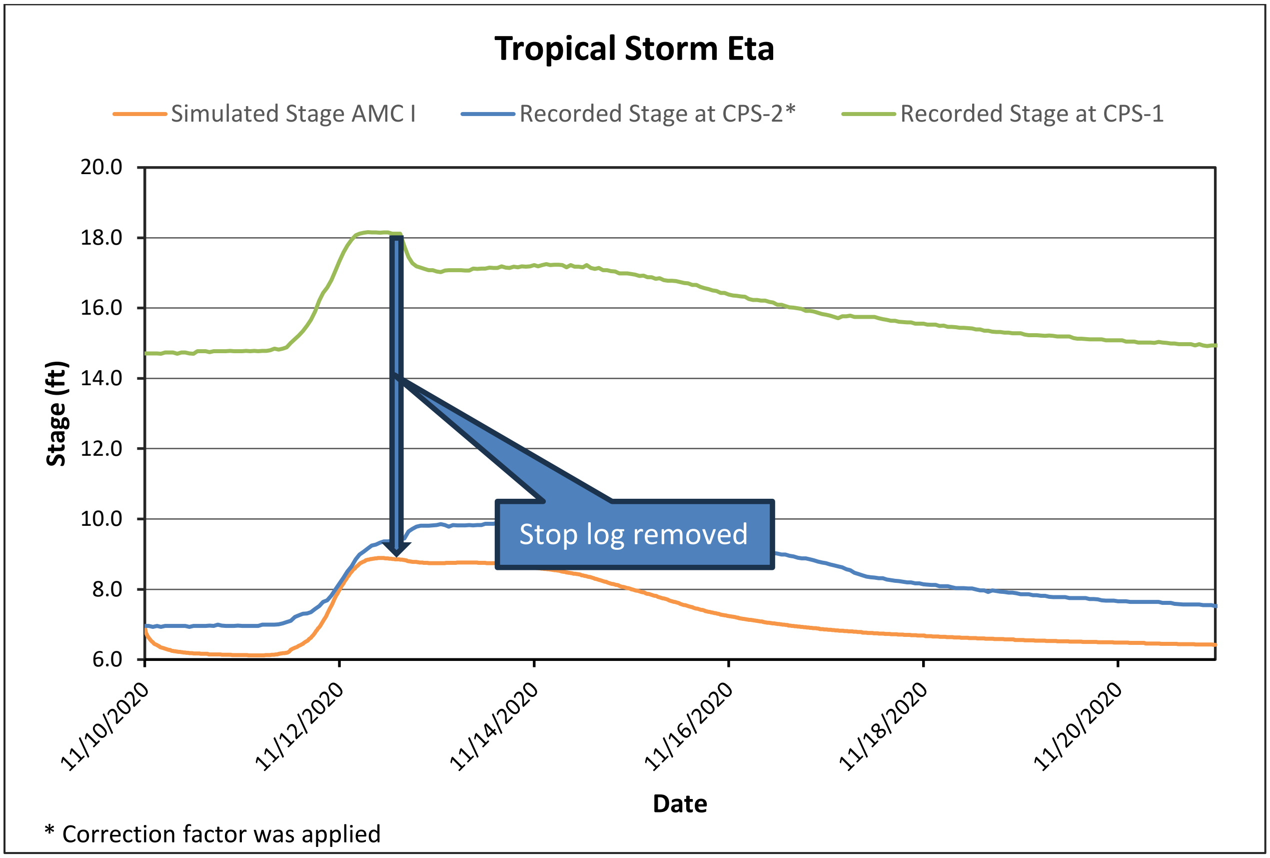


Table 8 summarizes the recorded gauge peak stages compared to the model-simulated peak stages. The maximum peak stage difference is -1.0 foot. This difference is likely due to the stop log that was removed. The average peak stage difference is 0.33 foot. These peak stage comparisons, in conjunction with the gauge data hydrograph comparisons, demonstrate satisfactory calibration/verification results.

Table 8 Observed Peak Stages Compared to Simulated Peak Stages with AMC I – TS Eta Verification Event

ARMS Gauge	Observed Peak Stage (feet NAVD88)	Simulated Stage (feet NAVD88)	Difference (foot)
CPS-1 Clark Road Battery	18.16	18.02	-0.02
CPS-3 CS-03	16.65	16.51	-0.14
DS-05	16.36	16.15	-0.21
CPS-2 Kings Gate Battery	9.89*	8.89	-1**

*Correction factor was applied.

**Stop log removed from CS-01.

4 BOUNDARY CONDITIONS UPDATE

Since the model for the Dona Bay Watershed as well as the adjacent watersheds are concurrently being updated along their boundaries, it is important that the boundary conditions reflect the changes within each watershed. Historically, developing the boundary conditions is an iterative process of updating the time-stage data of adjacent watersheds until both watershed models produce consistent results. The new ICPR4 engine has improved the computation time. This improvement, along with advancements in computer hardware and memory management, made simulating countywide models feasible. Therefore, Jones Edmunds merged all the County's watershed geodatabases into one geodatabase. Figure 16 illustrates the extent of the countywide watershed model. Updates made during the merge include:

- Updating the basin delineation to eliminate gaps and overlaps.
- Renaming nodes and links to ensure no duplicates exist.
- Updating link features to ensure the polyline feature originates and terminates at nodes.
- Updating link spatial features to match the model inputs.
- Retaining the feature that has a credible source (i.e., survey, as-built, etc.) where the same feature had mismatched information.

Table 9 summarizes the hydrologic and hydraulic features within the Countywide geodatabase.

Table 9 Countywide Hydrologic and Hydraulic Features

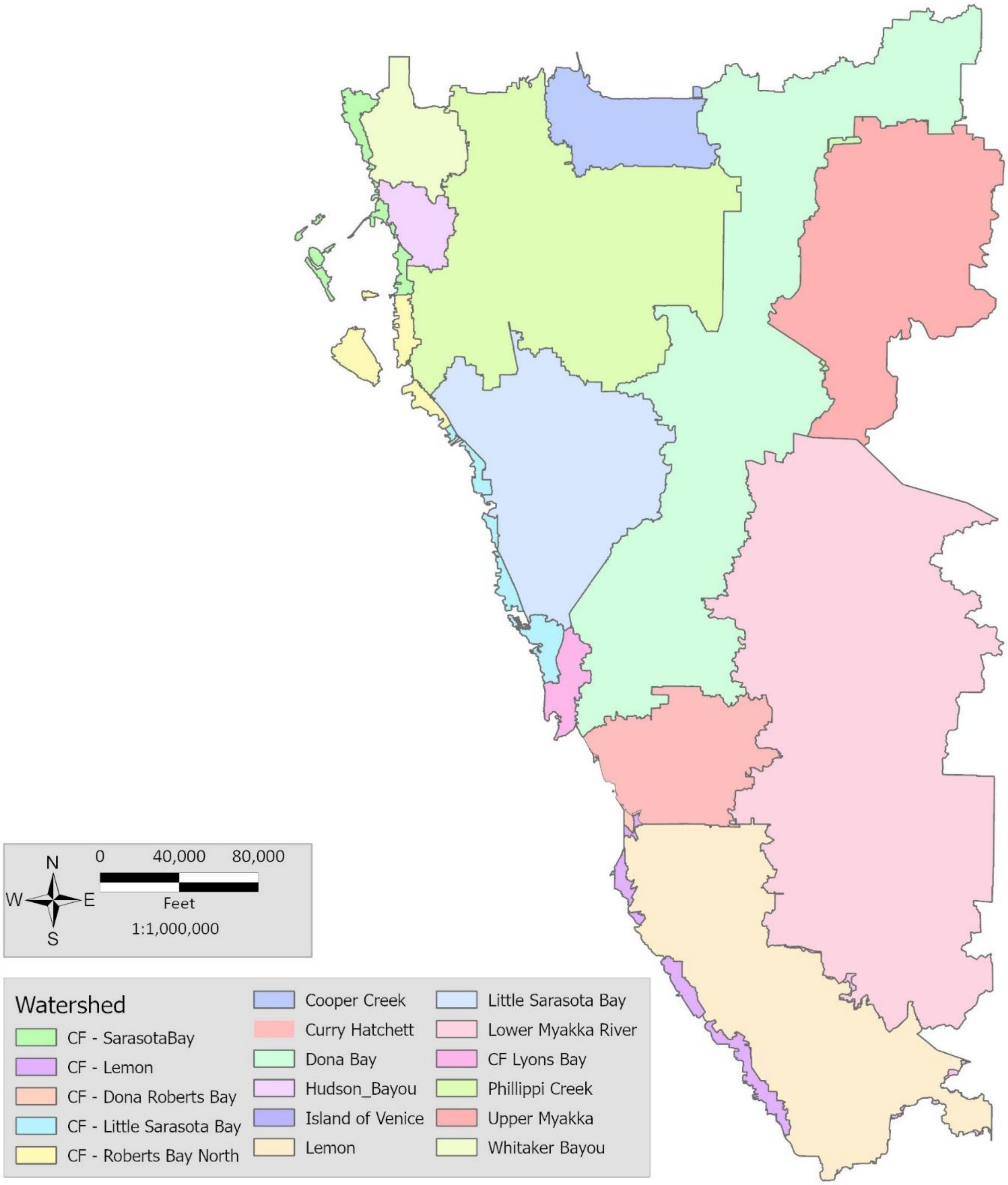
Basins	Nodes	Rating Curves	Pipes	Channels	Weirs	Drop Structures
17,320	20,083	123	9,549	3,425	26,928	3,248

Jones Edmunds created the countywide model using Streamline Technologies' toolbox to export the model data from SWFWMD's Geographic Watershed Information System (GWIS) 2.1 geodatabase and import it into the ICPR4 model. We simulated the 10-, 25-, 50-, 100-, and 500-year storm events using the SCS Type-II Florida-Modified Rainfall Distribution. Table 10 shows the rainfall depths that we derived for these storms from rainfall isohyet maps provided in SWFWMD's *Guidelines and Specifications (G&S)* (2020).

Table 10 Design Storm Rainfall Depths Using 24-Hour Duration and Type II Florida-Modified Distribution

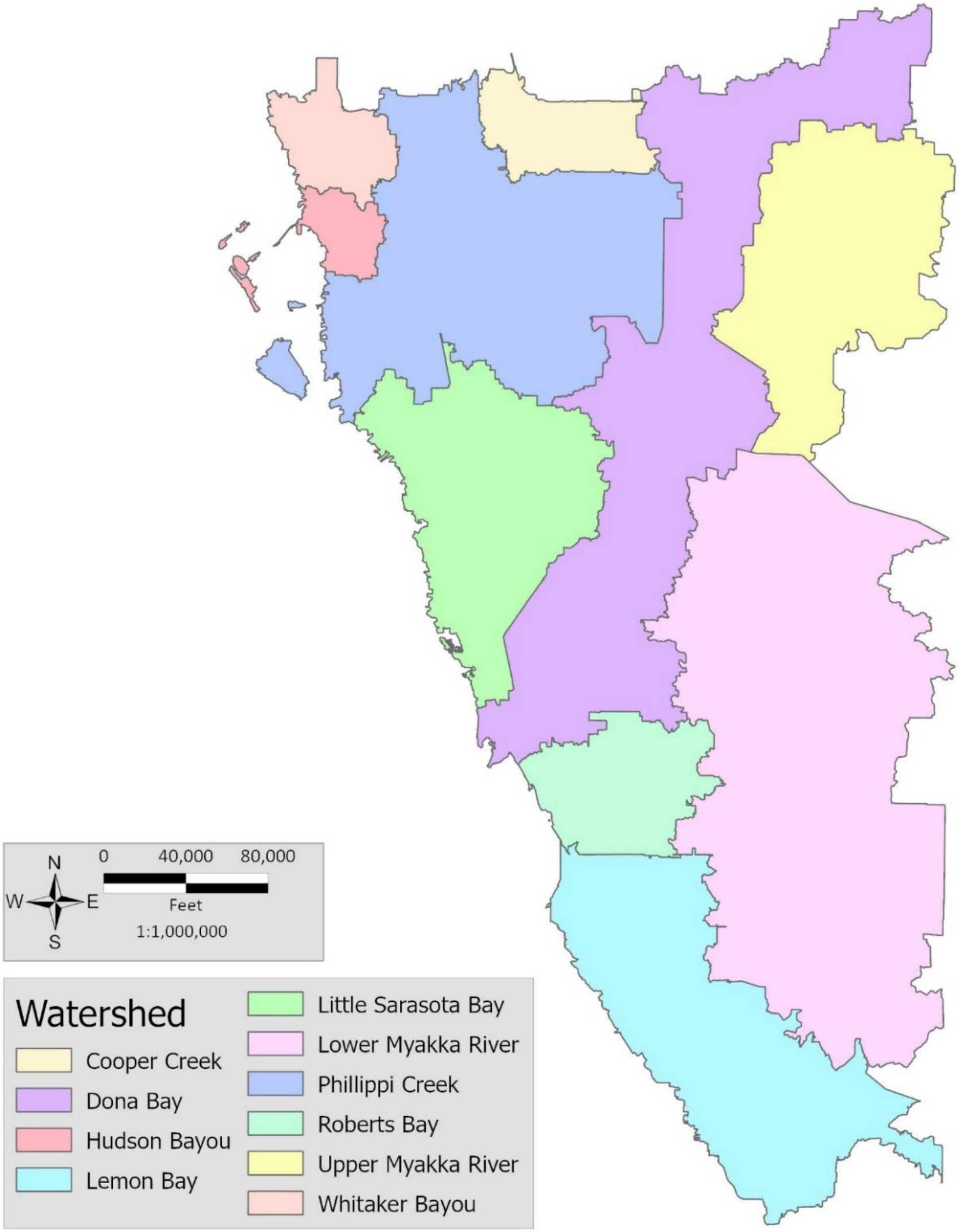
Return Frequency (years)	Rainfall Depth (inches)
10	7.0
25	8.0
50	9.0
100	10.0
500	12.4

Figure 16 Sarasota County's Watershed Model Boundaries



The County maintains 16 models; six models are coastal models that were developed with the intent to be merged with the adjacent riverine watersheds. Under the County's guidance, Jones Edmunds combined the coastal basins into the appropriate watershed. Figure 17 illustrates the resulting 10 watershed boundaries.

Figure 17 Sarasota County's Updated Watershed Boundaries



Using the countywide watershed model, Jones Edmunds extracted the Dona Bay Watershed into a separate geodatabase. We updated the boundary nodes for Dona Bay with the time-stage data from the countywide model, and we simulated the 10-, 25-, 50-, 100-, and 500-year storm events for the Dona Bay Watershed. Jones Edmunds verified that the results of the Dona Bay Watershed model were consistent with the overall countywide model.

5 FLOODPLAIN DELINEATION

Jones Edmunds developed level pool floodplains for the 100-year/24-hour design storm event. We delineated the floodplain extents using the 2019 SWFWMD enhanced ground-surface digital terrain model (DTM) and existing conditions model results. We determined the mapped floodplain water-surface elevations based on peak water-surface elevations at the model nodes.

In areas of natural land cover (e.g., forest), floodplain generation using high-resolution terrain data typically results in delineation of numerous small polygons or holes within polygons. The small polygons or holes are generated because of small variations in elevation sometimes caused by objects such as fallen trees, tree canopy, or other conditions where the DTM may not reflect the bare-earth elevation. We excluded inundated areas less than 2,500 square feet (ft^2) from the final delineations. We also filled gaps less than 2,500 ft^2 in flooded areas.

6 LEVEL OF SERVICE

The FPLOS evaluation identifies the location and severity of the flooding problems within the watershed.

6.1 FPLOS Criteria

The FPLOS designations characterize flooding due to rainfall events, and can be categorized as either meeting or not meeting the following design conditions:

- Category I – Structures. Building finished-floor elevations are at or above the 100-year/24-hour flood elevation.
- Category II – Road Access. Roads are passable during flooding. Passable is defined as roadway flooding less than 6 inches deep at the outside edge of pavement during a specific design storm. Table 11 describes the road access design storm criteria by roadway classifications.

Table 11 Category II – Road Access Design Criteria

Road Category	Storm Design
Evacuation Route	>100-Year*
Arterial	100-Year
Collector	25-Year
Neighborhood	10-Year

* For Evacuation Route, 0 inches of flooding is allowed for the 100-year storm event.

The model results do not consider potential effects from tidal surges – tidal storm-surge analysis requires a separate type of modeling and is not part of this study.

6.2 Supporting Data

Jones Edmunds evaluated stormwater FPLOS for all subbasins in Dona Bay in accordance with the methods described in Sarasota County's Unified Development Code (UDC), Appendix C14 (Sarasota County Government, 2023). The supporting data used for evaluating the FPLOS include:

- 2019 Hydro-enhanced DEM raster.
- Inundation polygons.
- Inundation depth grid for the 100-, 25-, and 10-year/24-hour design storms.
- Sarasota County building footprint polygons.
- Sarasota County Streets.
- Sarasota County 2040 Future Thoroughfare Plan Roads.
- 2022 aerial imagery.

6.3 FPLOS Methodology

The following sections describe the FPLOS evaluation methodologies for roadways and structures.

6.3.1 Structures

Jones Edmunds used the BuildingFootprints geodatabase provided by Sarasota County to identify structures with finished-floor elevations that are below the 100-year/24-hour flood elevation (i.e., FPLOS deficient). According to the metadata for the GIS features, the building footprints were derived using photogrammetry. The data were updated to include elevations. The elevation dataset was last updated in 2014. Since then, more building footprints were added to the data as recently as November 2022. However, the building footprints that were added did not have the finished floor elevations (FFE) attributed.

Jones Edmunds reviewed the available elevation data for the building footprints and found the information to be significantly inconsistent with the 2019 LiDAR. Therefore, we re-evaluated the FFE for the building footprints using the new LiDAR data to ensure more accuracy and consistency with the model information. The LiDAR was also used to parameterize the floodplain model.

New building footprints were also available that were generated from the 2019 LiDAR. The geometry of these footprints was not as refined as the previous dataset. However, they are more consistent with the new LiDAR. These footprints were used as the basis to determine the FFE from the new LiDAR and the results of the analysis were assigned to the older, but more refined, building footprints. The following steps summarize the procedures for determining the FFE for buildings.

1. Buffer the building footprints sourced from the 2019 LiDAR by 5 feet.
2. Determine the mean and maximum elevations in the buffer area.
3. Calculate the average of the mean and maximum elevations to estimate the FFE for buildings other than mobile or manufactured homes.
4. For mobile or manufactured homes, add 1 foot to estimate the FFE.
5. Assign the FFE to the more refined building footprints.

The above approach was compared with available survey data for reasonableness. FFE values were then compared to the flood-depth grid to determine whether the building meets the FPLOS conditions for Category I. Non-habitable structures were removed from the list of deficient structures.

The Dona Bay Watershed contains 83 deficient structures for the 100-year/24-hour design storm. Figure 18 and Table 12 highlight the locations of the structures within the watershed that did not meet the FPLOS conditions for Category I.

6.3.2 Roadway

Jones Edmunds determined the Roadway FPLOS by evaluating the flood depth at each segment for the different classes of roads within the study area. Sarasota County maintains a GIS road centerlines dataset called Streets, which uses the Sarasota County (SARCO) street classifications. The roads are classified according to their function. The County also maintains a Thoroughfare polyline feature class that defines Evacuation Routes and a Thoroughfare spreadsheet that contains all major road functional classes. Using the evacuation routes and the Thoroughfare spreadsheet, the Sarasota County streets were reclassified to the appropriate FPLOS roadway classifications consistent with the County's

UDC (Table 11). Table 13 describes how each street class was reclassified to be consistent with the FPLOS roadway classifications.

Figure 18 FPLOS-Deficient Structures Locations within the Watershed

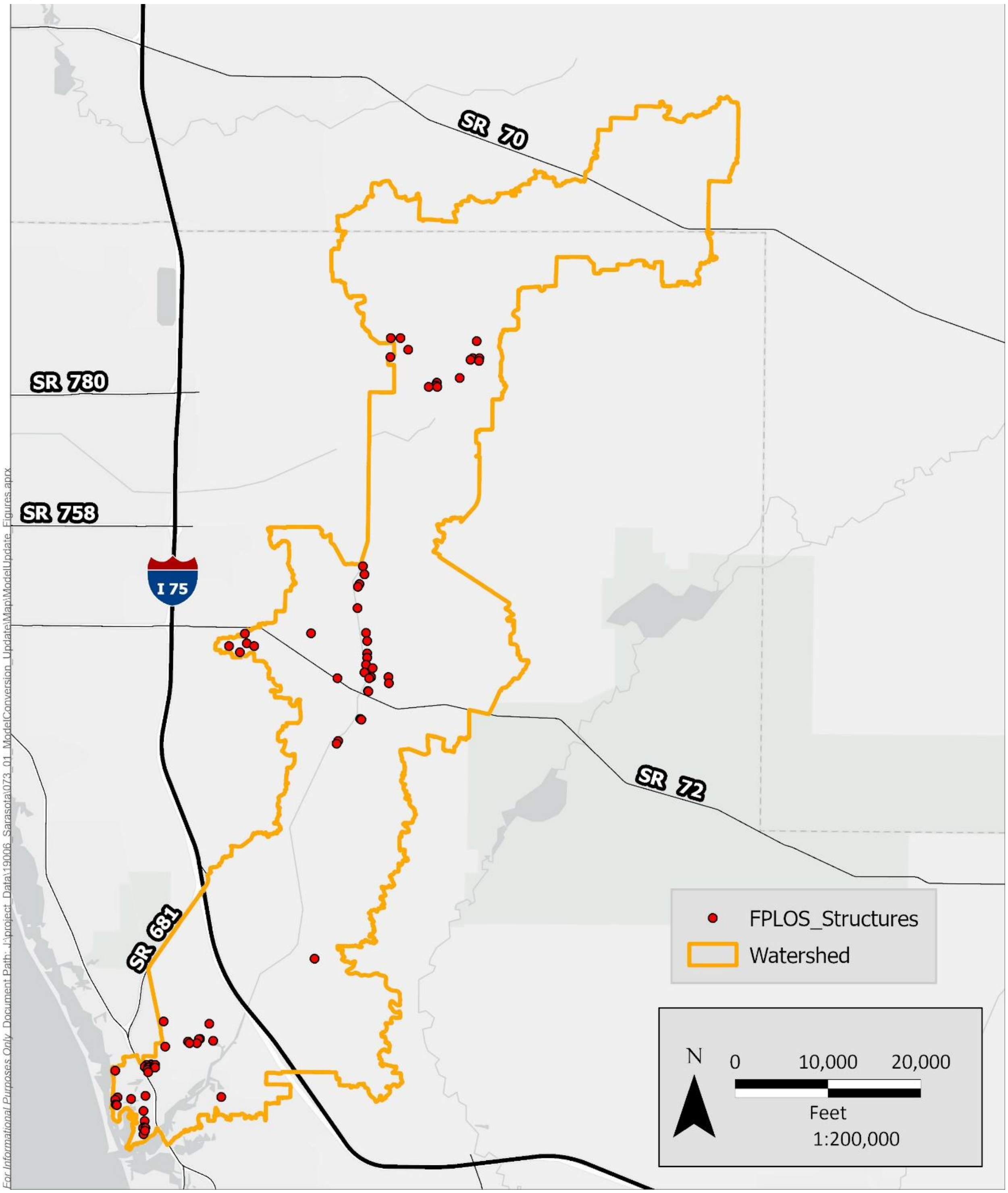


Table 12 FPLOS-Deficient Structures Data

Building Type	Address	FFE	Node	Stage 100YR	Stage 25YR	Stage 10YR
Multiple Single Fam Dwellings	1201 Sinclair Drive	41.26	099125_N	41.61	41.19	40.94
AG – Grazing Land	1200 Sinclair Drive	40.58	099125_N	41.61	41.19	40.94
Multiple Single Fam Dwellings	1101 Bern Creek Loop	46.19	099020_N	46.62	46.48	46.4
AG – Ornamentals	N/A	41.85	099315_N	42.05	41.87	41.73
Multiple Single Family Dwellings	900 Sinclair Drive	40.9	099311_N	40.9	40.86	40.83
Single Family and Other Building	11502 Celestine Pass	44.49	099266_N	44.65	44.52	44.44
Single Family Detached	2601 Bern Creek Loop	44.57	095380_N	45.3	45.19	45.11
Multiple Single Family Dwellings	11401 Celestine Pass	44.16	099266_N	44.65	44.52	44.44
Single Family Detached	2501 Bern Creek Loop	44.06	095380_N	45.3	45.19	45.11
AG – Grazing Land	1201 Cowpen Lane	40.88	099227_N	40.89	40.59	40.42
Multiple Single Family Dwellings	172 Cowpen Lane	38.28	099105_N	38.34	37.83	37.55
Single Family and Other Building	164 Cowpen Lane	37.03	099105_N	38.34	37.83	37.55
Single Family Detached	140 Cowpen Lane	37	099105_N	38.34	37.83	37.55
Multiple Single Family Dwellings	10687 Fruitville Road	38.36	099106_N	38.38	37.86	37.58
Single Family Detached	7097 Saddle Creek Lane	27.79	095180_N	27.98	27.03	26.37
Single Family Detached	7091 Saddle Creek Lane	27.63	098000_N	27.74	26.86	26.27
Single Family Detached	7071 Saddle Creek Lane	26.11	095152_N	27.28	26.61	26.14
Single Family Detached	7067 Saddle Creek Lane	25.77	095152_N	27.28	26.61	26.14
Single Family and Other Building	7234 Letitia Lane	26.11	095132_N	26.27	25.38	25.32
Single Family Detached	7318 Palomino Place	23.87	095112_N	25.06	24.13	23.98
Single Family Detached	7941 Lorraine Road	31.96	096935_N	31.99	31.51	31.25
Multiple Single Family Mixed	7341 Curlew Street	32.78	091525_N	32.92	32.65	32.45
Single Family Detached	7326 Palomino Place	24.53	095116_N	24.9	23.98	23.58
Single Family Detached	7354 Curlew Street	32.46	091486_N	32.56	32.18	32.11
Single Family Detached	7447 Hawkins Road	32.25	091483_N	32.55	32.12	32.05
Single Family Detached	7063 Hawkins Road	34.33	091496_N	34.34	34.25	34.18
Single Family Detached	7320 Hawkins Road	33.51	091441_N	33.91	33.73	33.61
Single Family and Other Building	7344 Palomino Trail	24.24	095065_N	24.61	23.78	23.38
Multiple Single Family Dwellings	7348 Palomino Trail	23.63	095065_N	24.61	23.78	23.38
Multiple Single Family Dwellings	7356 Palomino Lane	23.72	095065_N	24.61	23.78	23.38
Single Family Detached	7358 Palomino Lane	24.05	095900_N	24.58	23.79	23.09

Building Type	Address	FFE	Node	Stage 100YR	Stage 25YR	Stage 10YR
Single Family and Other Building	7501 Tortoise Way	22.85	096700_N	22.89	22.1	22.02
Single Family Detached	7853 Saddle Creek Trail	25.37	096500_N	25.39	24.98	24.47
Single Family and Other Building	7858 Saddle Creek Trail	22.87	095052_N	23.21	22.12	21.44
Single Family Detached	7860 Saddle Creek Trail	23.13	095052_N	23.21	22.12	21.44
Multiple Single Family Dwellings	7151 Rustic Acres Drive	25.34	096715_N	25.37	24.97	24.74
Single Family Detached	7855 Saddle Creek Trail	24.94	096501_N	25.38	24.98	24.47
Single Family Detached	7878 Saddle Creek Trail	22.77	095043_N	23.21	22.11	21.44
Single Family Detached	7878 Saddle Creek Trail	22.29	095043_N	23.21	22.11	21.44
AG – Grazing Land	N/A	20.92	095007_N	21.69	21.56	21.46
AG – Grazing Land	N/A	21.49	095003_N	21.51	21.08	20.83
AG – Citrus Grove	9665 State Road 72	21.24	095005_N	21.46	20.09	18.43
AG – Citrus Grove	9665 State Road 72	20.57	095005_N	21.46	20.09	18.43
Single Family Detached	8313 Lightfoot Drive	14.45	093045_N	14.86	14.81	14.77
Single Family Detached	1380 Ewing Street	5.7	094132_N	5.79	4.66	3.93
Single Family Detached	1081 Shire Street	5.39	094562_N	5.52	5.3	5.1
Single Family Detached	1051 Shire Street	5.48	094562_N	5.52	5.3	5.1
Single Family Detached	900 Shire Street	5.17	094550_N	5.53	5.31	5.11
Single Family Detached	1030 Shire Street	5.4	094550_N	5.53	5.31	5.11
Single Family Detached	950 Shire Street	5.4	094550_N	5.53	5.31	5.11
Single Family Detached	581 Palamino Circle	9.32	NK2740	9.45	8.93	8.61
Single Family Detached	122 Lakeview Drive	6.34	NK2490	6.5	5.72	5.31
Single Family Detached	112 Lakeview Drive	6.32	NK2512	6.5	6.18	6.11
Single Family Detached	1111 Sunset Avenue	5.84	NK2490	6.5	5.72	5.31
Single Family Detached	119 Laurel Road	6.35	NK2490	6.5	5.72	5.31
Office – 1 Story/Single Tenant	109 Laurel Road	6.45	NK2512	6.5	6.18	6.11
Single Family Detached	201 Laurel Road	5.43	NK2490	6.5	5.72	5.31
Single Family Detached	16 Laurel Road	5.8	NK2490	6.5	5.72	5.31
2-Family and Other Building	203 Laurel Road	6.05	NK2490	6.5	5.72	5.31
Single Family Detached	221 Laurel Road E	5.74	NK2490	6.5	5.72	5.31
Single Family Detached	18 Laurel Road	5.8	NK2490	6.5	5.72	5.31
Single Family Detached	20 Laurel Road	6	NK2490	6.5	5.72	5.31
School (Private)	101 Old Trail	5.6	NK2460	6.45	5.63	5.08
Single Family Detached	1010 Bayshore Road	5.42	NK1895	5.66	5.51	5.48
Single Family Detached	202 Mount Pleasant Road	6.22	NK2410	6.57	6.53	6.51
Multiple Single Family Dwellings	245 Avenida De La Isla	7.97	NK2010	8.07	7.75	7.53

Building Type	Address	FFE	Node	Stage 100YR	Stage 25YR	Stage 10YR
Single Family Detached	1600 Robbins Road	3.57	090030_N	3.64	3.12	2.56
Multiple Single Family Dwellings	417 Shore Road	7.65	NK1865	7.87	7.81	7.76
Single Family Detached	344 Dolphin Shores Circle	4	NK1650	4.31	4.23	4.16
Single Family Detached	406 Bayshore Road	7.65	NK1865	7.87	7.81	7.76
Single Family Detached	229 Shore T Road	5.76	NK1640	5.79	5.62	5.5
2-Family Dwelling	223 Shore T Road	5.62	NK1640	5.79	5.62	5.5
Use In Transition	216 Albee Road	6.47	NK1520	6.7	6.67	6.65
Single Family Detached	305 Palmetto Road W	6.67	NK1260	6.71	6.64	6.6
Single Family Detached	307 Pameto Road	5.28	NK1155	5.31	5.13	4.87
Single Family Detached	305 Pameto Road	4.72	NK1155	5.31	5.13	4.87
Single Family Detached	311 Pameto Road	4.75	NK1155	5.31	5.13	4.87
Multiple Single Family Mixed	301 Pameto Road	4.7	NK1155	5.31	5.13	4.87
Single Family Detached	605 Bay Point Avenue	5.74	NK1160	5.89	5.82	5.77
Single Family Detached	608 Bay Point Avenue	5.75	NK1160	5.89	5.82	5.77
Single Family Detached	303 Pine Road	5.77	NK1160	5.89	5.82	5.77
Single Family Detached	1251 Connemaral Circle	4.45	094120_N	4.68	3.87	3.46
Single Family Detached	450 Morgan Circle	10.91	NK2820	10.98	10.9	10.85

Notes: AG = Agricultural; N/A = Not Applicable.

Table 13 SARCO Street Class

SARCO Thoroughfare	FPLOS Road Class
Freeway/Expressways	Evacuation[1]
Major Arterials	Arterial or Evacuation[1]
Minor Arterials	Arterial or Evacuation[1]
Major Collectors	Collectors or Evacuation[1]
Minor Collectors	Collectors
Significant Local Roads	Neighborhood

1 If a road is designated as an evacuation route according to the County's Thoroughfare polyline feature class, it is reclassified to be an evacuation route; otherwise, it is reclassified as Arterial, Collector, or Neighborhood.

The allowable flood depth for all roadway classifications is 6 inches except for Evacuation Road. No flooding is allowed for an evacuation road. Jones Edmunds assumed that the edge-of-pavement (EOP) is 3 inches lower than the road center line (i.e., the crown of the road), which corresponds to the average roadway width of 24 feet with a 2-percent cross-slope from the crown of the road. This assumption is for the initial identification of FPLOS-deficient roadway segments.

Jones Edmunds employed GIS processing to develop the flood-depth raster to identify the portions of the road in which the EOP would be under water and above the allowable flood depth for each road classification. The duration of the flooding was calculated using the assumed EOP and model results. The deficient roadways were also visually checked for the reasonableness of results. Isolated deficient segments of streets less than 25 feet were not considered FPLOS deficient. Figures 19 and 20 show that the FPLOS-deficient roadways are concentrated in two areas. Table 14 summarizes the results from the street FPLOS evaluation by roadway class. Table 15 presents the roadway segments not meeting FPLOS design criteria. In summary, approximately 3.9 percent of evacuation routes and 0.9 percent of neighborhood roads did not meet the FPLOS conditions for Category II.

Table 14 Roadway FPLOS Summary

FPLOS Roadway Classification	FPLOS Deficient	Linear Feet	Percent
Evacuation	No	155,823	96.1
	Yes	6,336	3.9
Arterial	No	80,263	100
	Yes	0	0
Collector	No	9,398	100
	Yes	0	0
Neighborhood	No	900,197	99.0
	Yes	8,853	1.0

Figure 19 FPLOS-Deficient Roadways – North

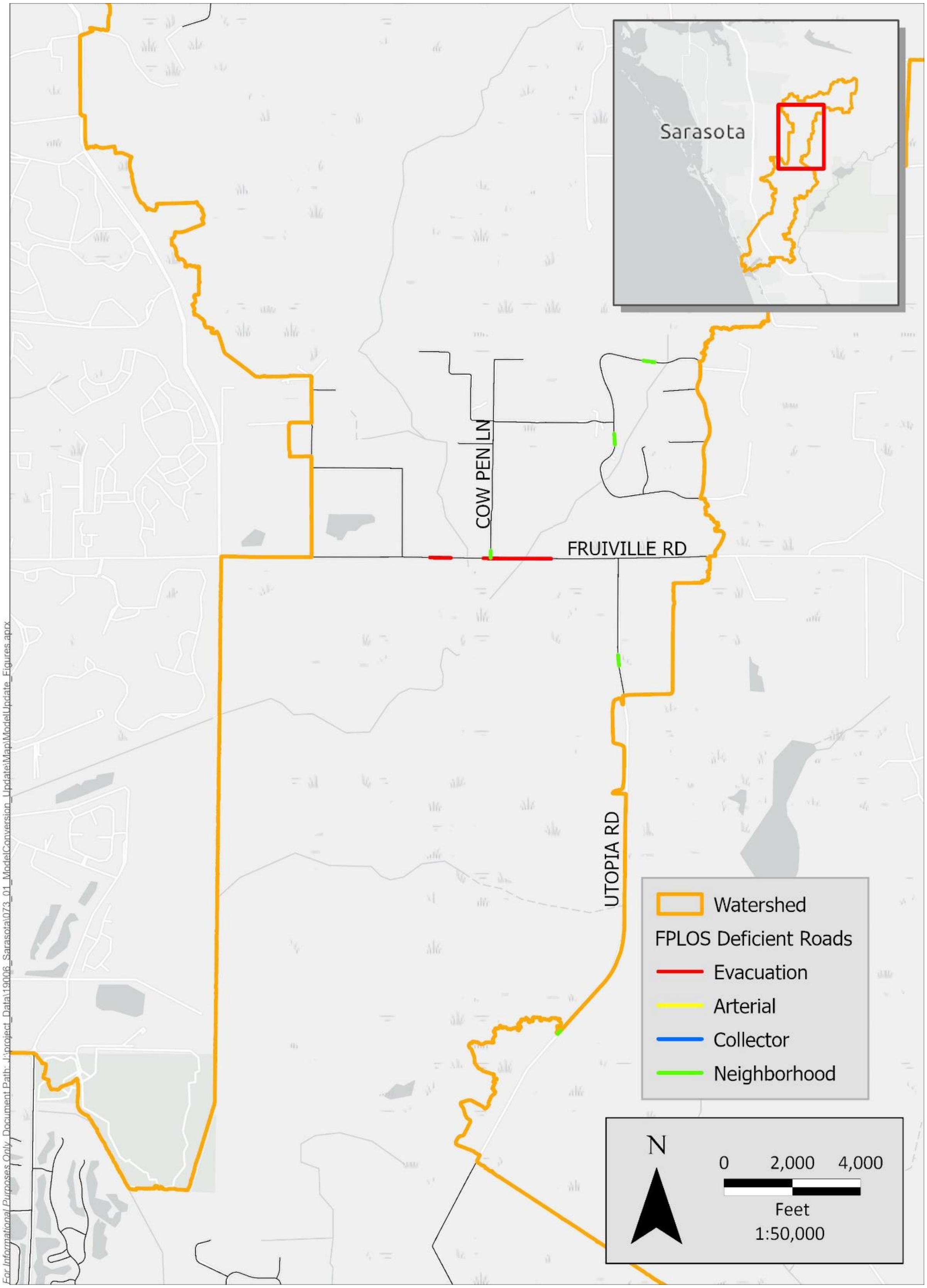


Figure 20 FPLOS-Deficient Roadways – South

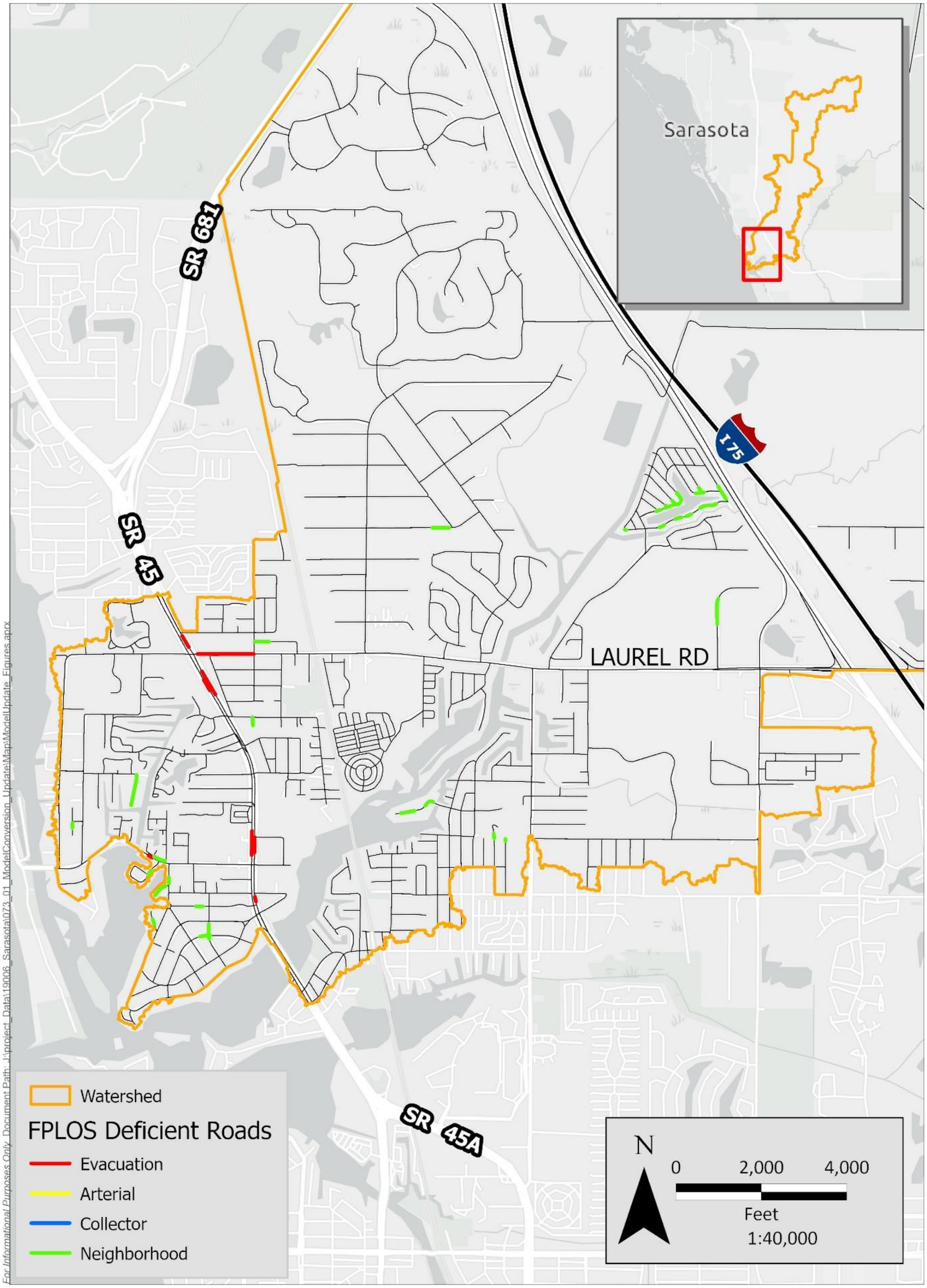


Table 15 Depth, Duration, and Extent of Roadway Not Meeting FPLOS Design Criteria

Street ID	Full Name	From Address	To Address	Road Classification	Length FT	Node	EOP	Design Storm	Flood Stage	Depth	Duration
ST_102012_000189	Laurel Road E	201	299	Evacuation	528	NK2430	4.88	100YR	6.49	1.61	10.3
ST_102012_000869	Fruitville Road	10901	12199	Evacuation	1030	095338_N	37.9	100YR	38.81	0.91	18.5
ST_102012_000896	Laurel Road E	2	98	Evacuation	501	NK2430	4.69	100YR	6.49	1.8	10.8
ST_102012_001415	Fruitville Road	10601	10899	Evacuation	156	099181_N	38	100YR	38.36	0.36	11
ST_102012_001620	N Tamiami Trail	0	0	Evacuation	309	NK2380	6.05	100YR	6.49	0.44	5.25
ST_102012_001941	N Tamiami Trail	0	0	Evacuation	181	NK2400	5.1	100YR	5.67	0.57	3.75
ST_102012_001941	N Tamiami Trail	0	0	Evacuation	454	NK2051	5.4	100YR	5.69	0.29	3
ST_102012_003890	Albee Road W	509	605	Evacuation	69	NK1375	3.78	100YR	4.08	0.3	4.25
ST_102012_022049	Laurel Road E	101	199	Evacuation	299	NK2430	5.06	100YR	6.49	1.43	9
ST_102012_026088	N Tamiami Trail	0	0	Evacuation	361	NK1751	9.44	100YR	9.81	0.37	0.5
ST_102012_026175	N Tamiami Trail	801	1099	Evacuation	294	NK2051	5.25	100YR	5.69	0.44	3.5
ST_102012_028135	N Tamiami Trail	101	225	Evacuation	491	NK1751	9.48	100YR	9.81	0.33	0.5
ST_102012_028135	N Tamiami Trail	101	225	Evacuation	79	NK1754	9.92	100YR	10.12	0.2	0.5
ST_102012_028146	S Tamiami Trail	301	361	Evacuation	123	NK1195	6.95	100YR	7.44	0.49	0.75
ST_102012_002289	Pine Road	301	399	Neighborhood	213	NK1155	3.46	10YR	4.87	1.41	1.75
ST_102012_002304	Poinsettia Road	601	699	Neighborhood	83	NK1155	3.7	10YR	4.87	1.17	1.75
ST_102012_002964	Duchess Avenue	163	175	Neighborhood	146	093028_N	7.62	10YR	8.84	1.22	38
ST_102012_003550	Avenue Of Kings	0	0	Neighborhood	55	093028_N	7.63	10YR	8.84	1.21	37.8
ST_102012_004794	Pine Cone Lane	501	599	Neighborhood	334	NK1270	2.45	10YR	3.48	1.03	1.5
ST_102012_005895	Shire Street	801	1049	Neighborhood	101	094540_N	4.13	10YR	5.1	0.97	12.5
ST_102012_005895	Shire Street	801	1049	Neighborhood	294	094564_N	4.15	10YR	5.1	0.95	13.8
ST_102012_008383	Bern Creek Loop	1000	1450	Neighborhood	337	099028_N	47.5	10YR	48.39	0.89	84
ST_102012_008743	Camelot Drive	296	297	Neighborhood	127	093028_N	7.75	10YR	8.84	1.09	34
ST_102012_008810	Camelot Drive	0	0	Neighborhood	135	093028_N	7.54	10YR	8.84	1.3	40.8
ST_102012_008904	Duchess Avenue	156	162	Neighborhood	51	093028_N	7.73	10YR	8.84	1.11	34.8
ST_102012_009539	Mango Lane	601	699	Neighborhood	193	NK2180	8.66	10YR	9.76	1.1	3.75
ST_102012_010506	Aquila Street N	101	299	Neighborhood	54	090024_N	8.74	10YR	10.39	1.65	84.8
ST_102012_010874	Poinsettia Road	501	599	Neighborhood	270	NK1155	3.21	10YR	4.87	1.66	1.75
ST_102012_011884	Avenue Of Queens	0	0	Neighborhood	116	093028_N	7.4	10YR	8.84	1.44	45

ST_102012_012578	Dolphin Shores Circle	301	399	Neighborhood	713	NK1650	2.36	10YR	4.16	1.8	3.5
ST_102012_012897	Cowpen Lane	100	1498	Neighborhood	138	099215_N	36.9	10YR	37.56	0.66	21
ST_102012_013060	Sierra Street N	101	299	Neighborhood	120	090024_N	9.25	10YR	10.39	1.14	83.3
ST_102012_013120	Pavonia Road	301	399	Neighborhood	163	NK1260	5.74	10YR	6.6	0.86	3.5
ST_102012_013158	King Arthur Drive	0	0	Neighborhood	39	093028_N	7.59	10YR	8.84	1.25	39
ST_102012_013519	Castle Drive	0	0	Neighborhood	210	093028_N	7.49	10YR	8.84	1.35	42.3
ST_102012_013696	Pine Road	201	299	Neighborhood	38	NK1155	3.73	10YR	4.87	1.14	1.75
ST_102012_013879	Palmetto Crescent	401	499	Neighborhood	129	NK1170	2.57	10YR	3.43	0.86	0.75
ST_102012_016095	Camelot Drive	309	313	Neighborhood	50	093028_N	7.82	10YR	8.84	1.02	32
ST_102012_018154	Bern Creek Loop	2100	2698	Neighborhood	40	095380_N	44.1	10YR	45.11	1.01	48
ST_102012_019325	Princess Avenue	0	0	Neighborhood	141	093028_N	7.73	10YR	8.84	1.11	34.8
ST_102012_021178	Castle Drive	0	0	Neighborhood	77	093028A_N	8.58	10YR	9.68	1.1	96.3
ST_102012_022308	Utopia Road	4201	4299	Neighborhood	129	098800_N	34.7	10YR	35.27	0.57	86.5
ST_102012_022308	Utopia Road	4201	4299	Neighborhood	299	099011_N	40.2	10YR	40.99	0.79	96.3
ST_102012_022982	Fair Winds Drive	211	212	Neighborhood	282	NK1500	3.01	10YR	3.94	0.93	2
ST_102012_024340	King Arthur Drive	85	111	Neighborhood	760	093028_N	7.6	10YR	8.84	1.24	38.5
ST_102012_025194	Astey Lane	301	399	Neighborhood	344	NK2480	4.65	10YR	6.28	1.63	17.3
ST_102012_025224	Lyons Bay Road	101	199	Neighborhood	147	NK1300	2.9	10YR	3.58	0.68	1.25
ST_102012_025501	Camelot Drive	264	273	Neighborhood	326	093028_N	7.3	10YR	8.84	1.54	48.5
ST_102012_025635	Bayview Drive	130	136	Neighborhood	128	NK1330	3.28	10YR	4.09	0.81	1
ST_102012_028059	Hillcrest Drive	800	898	Neighborhood	552	090069_N	3.64	10YR	4.66	1.02	86
ST_102012_028314	Shore T Road	201	299	Neighborhood	121	NK1640	4.75	10YR	5.5	0.75	1.25
ST_102012_031227	Twin Laurel Boulevard	1001	1199	Neighborhood	601	093075_N	11.2	10YR	12.47	1.27	28.8
ST_102012_028314	Bayview Drive	201	299	Neighborhood	121	NK1640	3.24	10YR	4.45	4.13	3.98
ST_102012_024165	Bay Point Ave	107	128	Neighborhood	93	093075_N	5.08	10YR	5.89	5.82	5.77
ST_102012_003963	Alfero Way	601	699	Neighborhood	154	092370B_N	13.1	10YR	14.06	0.96	9.25