

Kristen M. Martinenza, P.E., CFM, Chief  
Risk Analysis Branch  
FEMA Region IV  
3005 Chamblee-Tucker Road  
Atlanta, Georgia 30309  
770-220-3174  
Kristen.Martinenza@fema.dhs.gov

**Subject: Palm Beach County Request for Independent Scientific Resolution Panel (ISRP)**

Ms. Martinenza:

Palm Beach County (PBC) appreciates the effort required to update the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRMs). PBC filed the Appeal of Preliminary FIRMs and Flood Insurance Study for PBC Florida in July of 2021. At this time, we do not believe that the FEMA Resolution letter (dated January 3, 2023) sufficiently addressed the technical modeling issues that PBC documented and provided to your team. Given the complexity of the modeling issues identified, that the considerable previous correspondence has not persuaded FEMA that the modeling requires correction, and the 30-day time limit, an acceptable resolution will not be feasible through the submittal of additional comments. PBC appreciates that FEMA informed PBC of the option of a review by an Independent Scientific Resolution Panel (ISRP). Based on PBC concerns, we are requesting an ISRP; the required form is attached. PBC's objective is to have FIRMs based on modeling and analysis that has congruent results, as well as clear, complete, and concise documentation. While, PBC expected changes in the Base Flood Elevations (BFEs), the magnitude and inconsistencies of the proposed BFEs are concerning and will be difficult to explain and defend. BFE increases of this magnitude will affect numerous PBC's citizens in unincorporated and incorporated PBC. Coherent BFEs conveyed through concise documentation will facilitate the understanding and proactive use of the FIRMs by the citizens of PBC.

PBC identified multiple modeling issues that are resulting in anomalously high BFEs and incongruent BFEs. We include three examples in this letter. The W.F. Baird & Associates (Baird) Modeling Support for Appeal of FEMA Flood Maps letter dated January 30, 2023 provides a summary of the substantive modeling issues identified in the appeal. The appendices include a list of PBC's appeal submittals. Figures 1 and 2 show examples where the proposed BFEs are 2 to 4 feet higher than the existing BFE. Figure 3 shows how the BFEs are 1) not consistently higher near the inlets, as would be expected from storm surge, 2) the rise of the BFEs at the inlets are not similar even though the inlets have similar capacity, and 3) the BFE are not consistent (dropping and rising). There are likely multiple modeling issues that have interacted/compounded to result in the anomalous results. PBC's coastal engineering consultant (W.F. Baird & Associates) expended considerable effort in trying to identify the causes of the anomalous BFE and provide a "corrected" model. Due to the complexity of the problem, limited time, and limited resources to explore the modeling issues, Baird was unable to provide examples of fully "corrected" modeling runs and the resulting updated FIRMs. While it would have been preferable for FEMA and PBC if "corrected" modeling and FIRMs were achieved, it is PBC's opinion that with the complex modeling issues identified, that providing a "corrected" model should not be a requirement for justifying that the model requires additional work.

PBC hopes to work in a collaborative process with FEMA and the ISRP to efficiently and effectively identify the technical information that the ISRP will need to thoroughly evaluate the modeling issues. With the complexity of the modeling issues, PBC requests a full day introduction and scoping meeting with the FEMA Staff/Consultant and the ISRP. At this meeting, it is requested that FEMA provide a description of the work in PBC; provide a timeline of the project; answer whether new analysis performed as a follow up to previously identified issues are allowed to be submitted to the ISRP; communicate the change threshold that would trigger remodeling; and explain the number and type of modeling run examples that would be required to validate the need for updating of the current model and proposed FIRMs. The outcome of this initial meeting would be an understanding of the information that the ISRP needs, and a reasonable schedule associated with the development of new data, processing and summarizing of new and existing data. Once the ISRP has received and reviewed the required information, PBC requests a workshop with the FEMA Staff/Consultants and the ISRP to resolve/identify remaining details.

Thank you for your time and attention to this important issue that impact the citizens of Palm Beach County. Please feel free to contact me with any questions at 561-355-3600 or [plinton@pbcgov.org](mailto:plinton@pbcgov.org).

Sincerely,



Paul F. Linton, PE, Water Resources Manager  
Palm Beach County

Attachments:

APPENDIX A - Scientific Resolution Panel Request Form

APPENDIX B - List of Appeal Documents Previous Provided by Palm Beach County

APPENDIX C – W.F. Baird & Associated Modeling Support for Appeal of FEMA Flood Maps

Copies

Verdenia Baker/Palm Beach County

Michael .Taylor/AECOM (FEMA Mapping Partner) [Michael.Taylor@aecom.com](mailto:Michael.Taylor@aecom.com)

Adam Clinch/AECOM (FEMA Mapping Partner) [Adam.Clinch@aecom.com](mailto:Adam.Clinch@aecom.com)

Patrick Rutter/Palm Beach County

Todd J. Bonlarron/Palm Beach County

Doug Wise/Palm Beach County

Kenneth Todd/Palm Beach County

Gordon Thomson/J.W. Baird & Associates (PBC Consultant) [gthomson@baird.com](mailto:gthomson@baird.com)



Figure 1 - Proposed Base Floor Elevation in Larger Font (Existing Base Floor Elevation in Small Font)

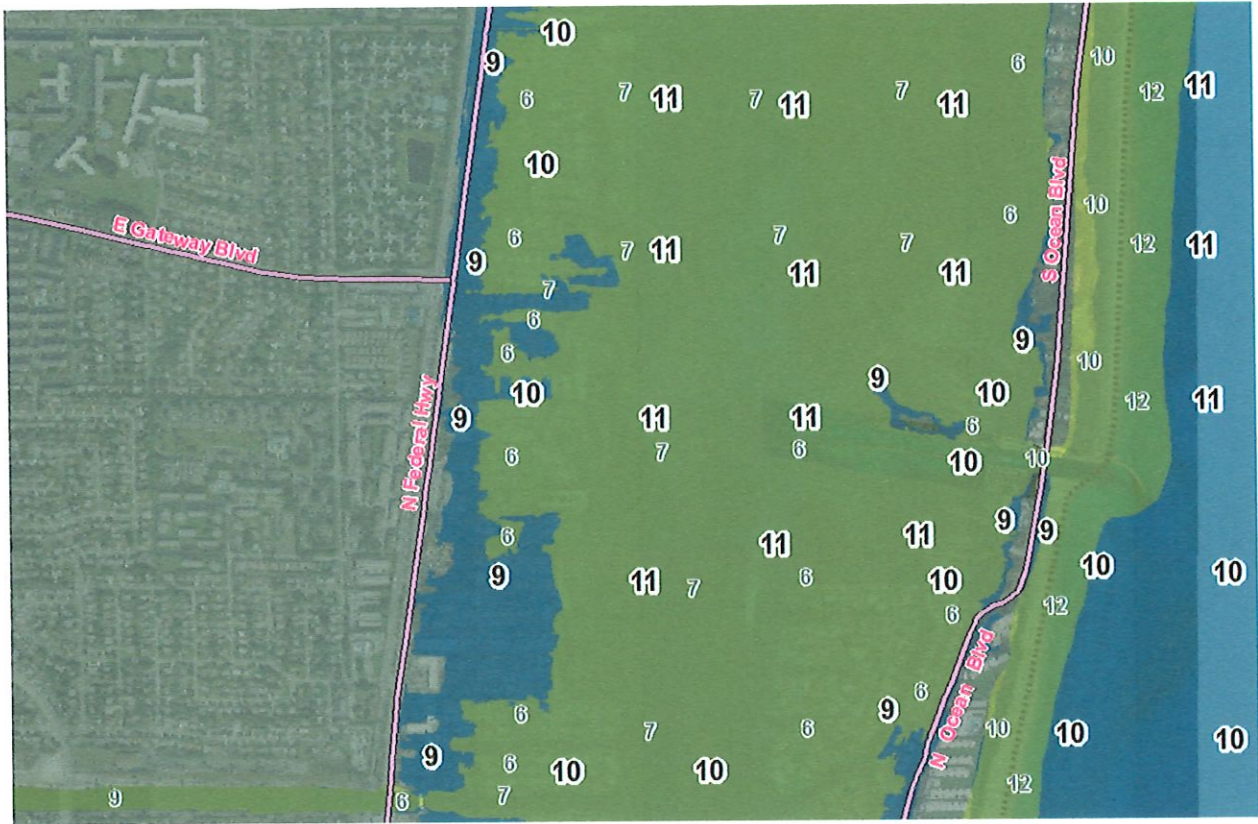


Figure 2 - Proposed Base Flow Elevation in Larger Font (Existing Base Floor Elevation in Small Font)

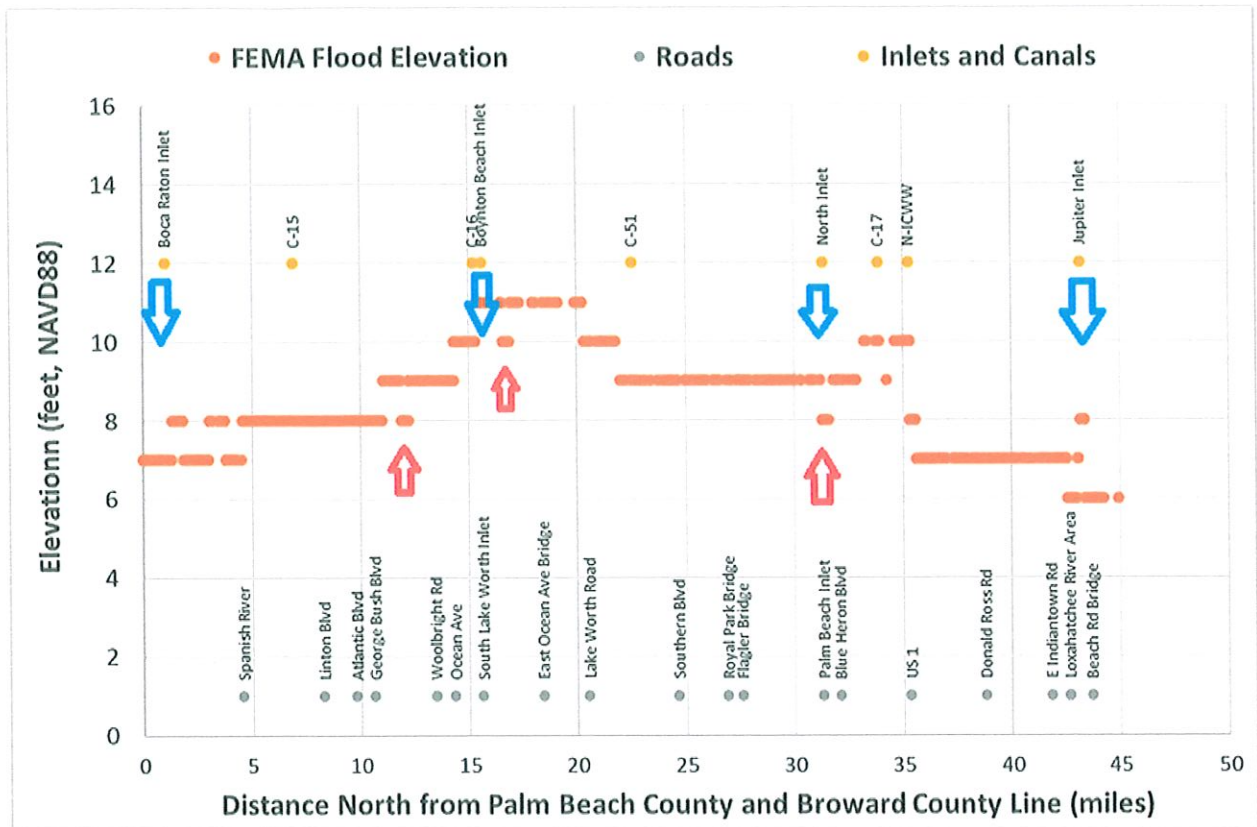


Figure 3 – Anomalous BFE Water Levels in Lake Worth Lagoon and Intracoastal Waterway

APPENDIX A – Scientific Resolution Panel Request Form

## Scientific Resolution Panel Request Form

*This form is to be completed by each, if applicable, the community's Chief Executive Officer (CEO) or the authorized representative of the community for which the appeal or comment is being filed.*

Date: January 31, 2023

Name of Community: Palm Beach County

County and State of Community: Palm Beach County Ms. Verdenia C. Baker County Administrator

Name of Community CEO or authorized representative:

Mailing Street Address: 301 North Olive Avenue

City: West Palm Beach State: Florida Zip: 33401

Phone Number (Work): 561 355-2738

Phone Number (Cell): 561 346-1901

Email Address: VBaker@pbcgov.org

Does the data submitted constitute an appeal? (Y/N) Y comment

If yes does the submitted data satisfy the data requirements outlined in 44 CFR Section 67.6 (b) of the National Flood Insurance Program (NFIP) regulations and demonstrate that FEMA's proposed flood hazard determinations (proposed flood hazard determinations may include the addition or modifications of Base Flood Elevations (BFEs), base flood depths, Special Flood Hazard Area (SFHA) or zone designations, or regulatory floodways) are:

(1) technically incorrect due to a mathematical or measurement error or changed physical conditions?

X (2) technically incorrect due to error in application of hydrologic, hydraulic or other methods or use of inferior data in applying such methods?

X (3) scientifically incorrect?

If an oral presentation to the SRP is necessary to support this appeal or comment, please justify here.

An oral presentation is necessary due to the complexity of the modeling issue identified, the need and benefits in identify what analysis, evaluation, modeling examples are needed to provide the Scientific Resolution Panel sufficient information to determine definitively whether the modeling requires correction.

## Community Commitment and Certification

The community certifies that:

1. The data provided for SRP review was entirely submitted to FEMA during the 90-day appeal period?  
YX  N
2. No additional data has been submitted for this or any other appeal or comment for SRP consideration? YX  N
3. There may be no submission of any other appeals and comments not consolidated with this submission? YX  N

## Location of Contested Flood Elevations

4. *Identify the specific river reaches or coastal transects challenged by the data.*

The entire Lake Worth Lagoon has anomalously high/inconsistent Base Flood Elevations (BFE). The BFE should be the highest near the inlets. The BFE is anomalously high and inconsistent in Lake Worth Lagoon. The BFE do not rise near the Jupiter Inlet, Port of Palm Beach Inlet, and Boca Raton Inlet. There are anomalous water draw downs and inconsistencies at the inlets. The area and issues are described further in Appendix B of the transmittal letter and in the previous appeal submittals which are listed in Appendix C.

---

---

5. *Please identify areas of expertise the community believes are pertinent for representation on the SRP.*

PBC requests that the SRP contain experts in storm surge modeling, wave modeling, and hydrodynamics. The SRP representatives should have experience with AdCirc and other numerical models that address tropical storm events and storm surge.

---

---

---

6. **Description of information to be submitted by the community indicating that the flood hazard data proposed by FEMA are scientifically or technically incorrect:**

*Please include on a separate page labeled "Attachment A: Summary of Appeal or Comment Information" a summary of the specific technical issues, errors in FEMA's data, or different technical processes submitted to contest the flood hazard determination data proposed by FEMA.*

7. **Acceptance by community of terms and conditions for the initiation of an SRP:**

*To initiate the SRP process, the community's CEO or authorized representative must accept the following terms and conditions on behalf of the community and individuals whose appeals or comments are consolidated with this submission.*

- a) The community understands that the recommendations of the Panel will be binding on all appellants and not subject to further judicial review unless the FEMA Administrator chooses not to enforce the Panel recommendation because FEMA determines that implementation would pose a significant threat due to failure to identify a substantial risk of flood hazards or violate applicable law.



- b) The community has read the FEMA prepared Guidance Memorandum titled "implementing the Scientific Resolution Panel Process" and agrees to work with the National Institute of Building Sciences (NIBS) in the timely completion of the SRP review, including timely selection of panel members and participation in additional review procedures if requested.
- c) The community agrees that no contact will be made with the Panel members except as expressly requested by NIBS before, during or after the SRP review is undertaken.
- d) The community agrees that they have read and signed the "Community Submittal Agreement."

Ms. Verdenia C. Baker County Administrator  
Signing as Authorized Representative

\_\_\_\_\_  
Name and Title of Community CEO or Authorized Representative

*Verdenia C. Baker*

*1/31/2023*

\_\_\_\_\_  
Signature of Community CEO or Authorized Representative

\_\_\_\_\_  
Date

###

APPENDIX B - List of Appeal Documents Previous Provided by Palm Beach County

W.F. Baird & Associates, 2020. Review and Evaluation of FEMA's Coastal Flood Risk Study: Topographic Elevation Data Technical Memorandum. W.F Baird & Associates, Boca Raton, FL.

W.F. Baird & Associates, 2020. Review and Evaluation of FEMA's Coastal Flood Risk Study: Data and Documents Review Technical Memorandum. W.F Baird & Associates, Boca Raton, FL.

W.F. Baird & Associates, 2020. Review and Evaluation of FEMA's Coastal Flood Risk Study: Storm Surge, Wave Model and Flood Map Evaluation. W.F Baird & Associates, Boca Raton, FL.

APPENDIX C – W.F. Baird & Associated Modeling Support for Appeal of FEMA Flood Maps

Mr. Paul Linton, PE  
Water Resource Manager | Palm Beach County  
Department of Environmental Resource Management  
301 North Olive Avenue, 11th Floor  
Palm Beach, FL 33401

via email to [PLinton@pbcgov.org](mailto:PLinton@pbcgov.org)

January 30, 2023

Dear Paul,

**Reference # P13134.202.P2.Rev0**

## **RE: MODELING SUPPORT FOR APPEAL OF FEMA FLOOD MAPS**

Baird supported Palm Beach County (PBC) in an initial review and appeal of FEMA's proposed flood maps for coastal Palm Beach County. Baird identified several issues with FEMA's development of the flood maps and PBC submitted an appeal on July 9, 2021. FEMA responded to this appeal on January 3, 2023.

FEMA revised the Flood Insurance Rate Maps (FIRMs) to incorporate more recent topographic data (2016/2017 PBC LiDAR). They indicated that zone adjustments were made to nine preliminary FIRMs resulting in an expansion of the Shaded X area. However, they did not make any adjustments to overland modeling.

FEMA effectively dismissed issues identified with the modeling itself stating that, "the PBC submittal did not demonstrate how the alternative analyses would impact preliminary modeling or mapping." Per FEMA guidelines, the impetus is on the County (and thus Baird) to provide revised model results that FEMA can directly apply to create revised maps. While we pointed out what we consider to be significant issues with the model, we acknowledge that we did not provide an updated model where we reran the 395 synthetic storms showing a difference in Still Water Elevations (SWEL).

FEMA has effectively provided two options:

1. PBC can accept FEMA's response by not responding by the February 2 deadline (or submit a letter officially waiving any further intended action) to FEMA's January 3 letter. FEMA will then finalize the FIRM and FIS reports and issue a Letter of Final Determination leading to adoption of the new FIRMs.
2. PBC can request a Scientific Resolution Panel (SRP) to review technical details of the appeal.

We recommend that PBC requests an SRP because while we could not improve the model in the 3 month appeal window, the issues identified indicate that, in our opinion, the model is drastically overestimating storm surge within the Lake Worth Lagoon. Examining the lower frequency storms, which drive the 100-year flood elevation, FEMA's model does not correlate with water elevation measurements collected over the last 37 years throughout Lake Worth Lagoon. This letter outlines the areas that we would encourage the SRP to review along with comparing to measured data.

### Wind and Pressure Grid Field

FEMA acknowledges that there is a difference in the wind and pressure field grid between the northern and southern sections of PBC. During our review we determined that the highest 1% still water elevations (SWEL) reported by FEMA in Palm Beach County were found to occur within the portions of the Lake Worth Lagoon near Boynton Inlet that were located in the area with a coarser grid. A review of FEMA's modeling data for the synthetic storms indicated that Storm 21 produced one of the highest modeled water surface elevations (WSE) within this portion of the lagoon. The insufficient wind and pressure fields grid resolution over most of Palm Beach County limits the SWAN+ADCIRC model's ability to accurately simulate storm surges for storms making landfall north of and near the boundary of the regional grid.

We applied a finer grid resolution and ran the model for the three synthetic storm events that resulted in the highest SWEL. We found that this discrepancy could result in a difference of up to 2.5 meters (8 feet). We acknowledge that we did not rerun all 395 storms. This was because we did not have time within the appeal window. Regardless, FEMA dismissed this difference because Compass could not replicate our results.

However, measured water levels collected over the last 37 years throughout Lake Worth Lagoon do not support the storm surge levels that FEMA is claiming.

### Model Setup

PBC outlined several concerns with the model setup within the original appeal. We are going to focus on the ones that in our opinion could have the greatest impact on the modeled SWEL.

### Restricted Water Level Gradient

FEMA acknowledges that the elemental slope limiter (ESL) was applied to 376 out of 392 storms. In their response, they state that this has been applied to several previous studies. This does not mean that it has been correctly applied in this case. In FEMA's response, they also indicate that, "this parameter is a reasonable way to dampen localized instabilities near canal banks". However, the area over which this was applied does not match this description. The ESL has been applied to two areas, the first over 3.5 miles long and 1,800 feet wide and a second that is 1.75 miles long and up to 4,700 feet wide.

When this delimiter is removed, the north end of Lake Worth Lagoon almost runs dry under some of the most severe storm events. This suggests that there are underlying issues with respect to the friction factors being applied. Unfortunately, we did not have the time to determine the root cause requiring the ESL to be applied. Thus, we request that the Scientific Resolution Panel review the application of the ESL.

It should be reinforced that applying the ESL to address model instabilities without understanding the root cause has real world implications. These areas are coincident with a significant number of properties that are being switched from an X zone to an AE zone. The sections with ESL being applied have never approached the existing BFE, much less the 2-foot to 4-foot increases being proposed under the new FIRMs.

### Local Numerical Instabilities at Palm Beach Inlets

There is a 20-foot drop in the water level within Boynton Inlet from approximately +10 feet, NAVD88 to -10 feet, NAVD88 before it increases by 14 feet to +2 feet, NAVD88 elevation offshore! The drop occurs over 400 feet and the rise occurs over 100 feet (Figure 1). This is clearly not hydrodynamically possible.

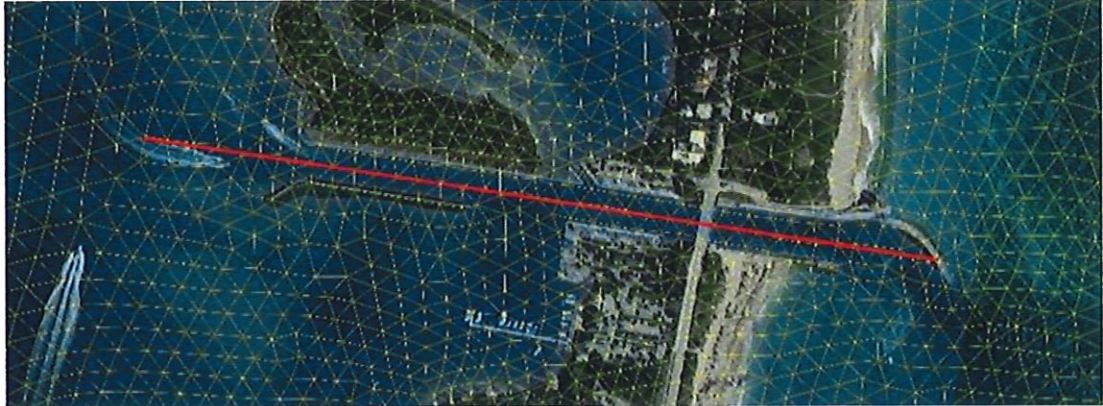
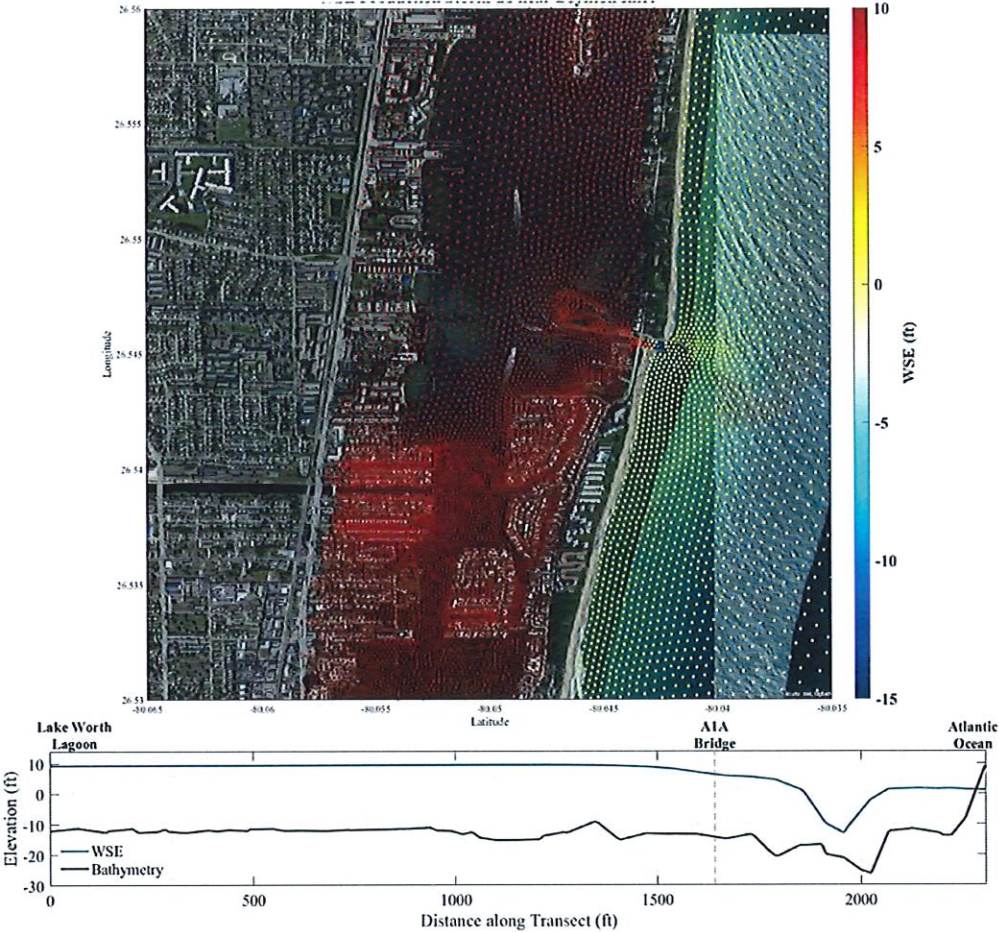


Figure 1: Water Surface Elevation – Boynton Inlet – Synthetic Storm #21

During the synthetic storm (#21) that produced the highest WSE within this area of the lagoon, FEMA's model did not allow water to flow out through the inlet. This created unrealistic WSE changes in the inlet thereby affecting WSE within the lagoon as the storm passed to the north. Initially, Baird revised the model grid to include additional nodes across the inlet because it was surmised that the wetting/drying of nodes within the

SWAN+ADCIRC model combined with insufficient mesh resolution could have contributed to the unrealistic WSE changes. While we were unsuccessful in resolving this issue in the time we had available, we recommend that a water balance box model be considered to better understand how the model is predicting water inflows into the lagoon.

FEMA's response was that they had, "reviewed the information provided and found that the preliminary mesh grid resolution at this site is reasonable based on the scope and large modeling scale of this project." They followed that saying that, "These results are located in the inlet and not over a developed area of interest for purposes of flood mapping. QA/QC of the maximum water levels produced in the vicinity of Boynton Inlet did not identify spatial gradients."

It is irrelevant whether the "preliminary grid resolution is reasonable" or whether there are "spatial gradients" if the model results are unreasonable and based on questionable hydrodynamics within the model. The BFEs in the lagoon area around Boynton Inlet are significantly higher (+11 feet, NAVD88) than the BFE's around the other inlets (+7 feet NAVD88 at Boca Raton Inlet, +8/+9 feet, NAVD88 at Palm Beach Inlet, and +6/+8 feet, NAVD88 at Jupiter Inlet). There is no statistical basis or geographic basis (variation in offshore bathymetry) for these differences whereas there is a clear issue with the hydrodynamics within the FEMA model.

Again, we think it is unreasonable to impose higher BFEs and revised flood zones on residents due to model results with questionable hydrodynamics, especially given that the model results do not match measured water levels over the last 37 years and general observations extending well before then.

#### **Quality Assurance/ Quality Control at Local Level**

PBC pointed out that FEMA only performed a sensitivity analysis of mesh or nodal attributes at a regional scale, not a local scale. FEMA responded that they included, "included a "Detailed Check" of output data. This review includes contour plots of data results at a higher resolution in order to identify any gradients or anomalous values at a higher level of detail."

This implies that they examined the contours for anomalies but may not have considered whether the overall assessment was accurate.

#### **Model Run for Tide Effects**

FEMA dismissed PBC's comment about the use of the hot-start to combine tidal runs saying that, "Tidal variations were reviewed as part of the QA/QC process and errors were not identified based on the methodology applied". They further state that this was applied on other FEMA models.

Again, application of this process does not imply that it worked correctly for the SFLSSS study, especially given the anomalies observed at the inlets, which appear to be driving very high storm surge values around the inlets, and in particular Boynton Inlet.

#### **Validation Storms**

Validation of the model was based on five historical hurricanes; Betsy (1965), David (1979), Andrew (1992), Georges (1998), and Wilma (2005). Hurricane Wilma had a west to east track, which is not conducive to creating storm surge. Furthermore, it exited the County at the northern county line. Hurricane David made landfall farther north than either Frances or Jeanne and had a northwesterly track. The other three storms all passed well south of Palm Beach County, with Hurricane Andrew being the most northerly track of those three, and still passed south of Miami.

FEMA stated that, "Regarding the validation storms, the PBC submittal identified Hurricane Frances and Hurricane Jeanne as more suitable validation storms, however these storms made landfall north of Palm Beach County. These storms were used to validate ECCFL because of their landfall location. The damage due to storm surge and waves was found to be higher in areas north of Palm Beach County."

But Hurricane David made landfall farther north in Martin County than either Hurricanes Frances or Jeanne. Furthermore, both Frances and Jeanne had a more westerly track, as opposed to David's northwesterly track. Lastly, measured storm surge data is available for both Frances and Jeanne. There are fewer measured water elevation points available for Hurricane David. Specifically, Hurricane David was calibrated based on one measured water location in Palm Beach County, two in Miami-Dade County and one at Key West.

As outlined in the original appeal documentation, FEMA's model over predicted the storm surge from Hurricane Wilma by up to 1.8 feet.

Interestingly, the updated FEMA maps for the vicinity of St. Lucie Inlet, where both Frances and Jeanne made landfall, show BFEs of +7/+8 feet NAVD88. This compares to a tide gauge at Steele Point (located inside the St. Lucie Estuary) that measured +3.8 feet NAVD88 for Hurricane Frances and +4.0 feet, NAVD88 for Hurricane Jeanne. Hurricane Frances was relatively slow moving (5 mph forward speed) when it made landfall with an 80-mile wide eye and 90 mph maximum wind speed on September 5, 2004. Hurricane Jeanne made landfall in almost the identical spot three weeks later on September 26 with sustained wind speeds of 105 mph.

Our concerns with model validation were presented in the original appeal document. Unfortunately, we could not obtain sufficient data to run Hurricanes Frances and Jeanne within the 3-month appeal timeline and thus FEMA dismissed this important element of the model application. This appears to have resulted in the model being accepted and suggesting storm surge levels of +10 feet, NAVD88 even though Category 1 and Category 3 landfalling hurricanes did not result in storm surges exceeding 5.5 feet, NAVD88 along a stretch of coast just 15 miles north of PBC.

#### **SWEL Transition Areas and Adjustments**

FEMA acknowledged that storm surge at the northern end of Palm Beach County in the South Florida Study was higher than the storm surge at the southern end of Martin County as developed in the East Coast Central Florida (ECCFL) study (2014). The 1% SWEL for the SFL study were higher by "1.7 feet along the open coast, 2.0 feet in the Intracoastal Waterway, and 2.0 to 4.2 feet up the Loxahatchee and North Fork Loxahatchee Rivers." FEMA also excluded exiting storms (storm tracks going west to east) from the ECCFL study citing that "exiting storms have a minimal effect on the low-frequency water levels" and "the presence of other uncertainties which influence the modeling results to a larger degree." FEMA reported that the influence of west coast (exiting) storms on the SFL study was 0.25 feet (3 times greater than the ECCFL study) but opted to include them regardless.

FEMA identified a transition area and applied adjustments lowering the 1% SWEL within the northern 5 miles of the County to join the studies. However, they included much larger transition zones at the boundaries of other studies, such as the 25-mile transition zone between the ECCFL study and the Georgia-Northeast Florida (GANEFL) study. This was not discussed at all in FEMA's response.

#### **Transect Based Erosion Analysis**

PBC raised concerns with five transects in the original appeal (Transects 136, 137, 138, 147 and 158). FEMA's response only referenced Transects 137 and 138. FEMA also stated that, "Although the dune geometry is likely contributing to the inland VE zone in the lagoon, this mapped area does not appear to impact habitable structures. The PBC submittal is correct that there may be other reasonable choices for selection of the dune reservoir that would trigger a different erosion geometry, however additional modeling, mapping and justification would need to have been provided... to support a mapping change."



Again, we recognize that FEMA requires that the appellant perform this effort. However, there are several properties where the FEMA flood zone is being proposed to be changed from an X zone to a VE zone and FEMA has acknowledged that an alternate assessment should be applied.

### Summary

We think that the FEMA model is over estimating SWEL. We are specifically concerned with proposed elevations around the Boynton Inlet area where the model output is contradicted by over 37 years of measured data. FEMA has acknowledged some of these issues but has required PBC to reperform the analysis. We think that some of these issues, and specifically the drainage issue through Boynton Inlet may require an extensive effort to address. We recommend that the County request that a Scientific Resolution Panel review the concerns we have identified with the model. In our opinion, the FEMA model is over-estimating the water level and PBC residents will bear the impact of a flawed model.

Kind regards,

**Gordon Thomson, PE, D.CE** | Vice President  
Baird & Associates  
E: [gthomson@baird.com](mailto:gthomson@baird.com)  
M: 561-400-7820

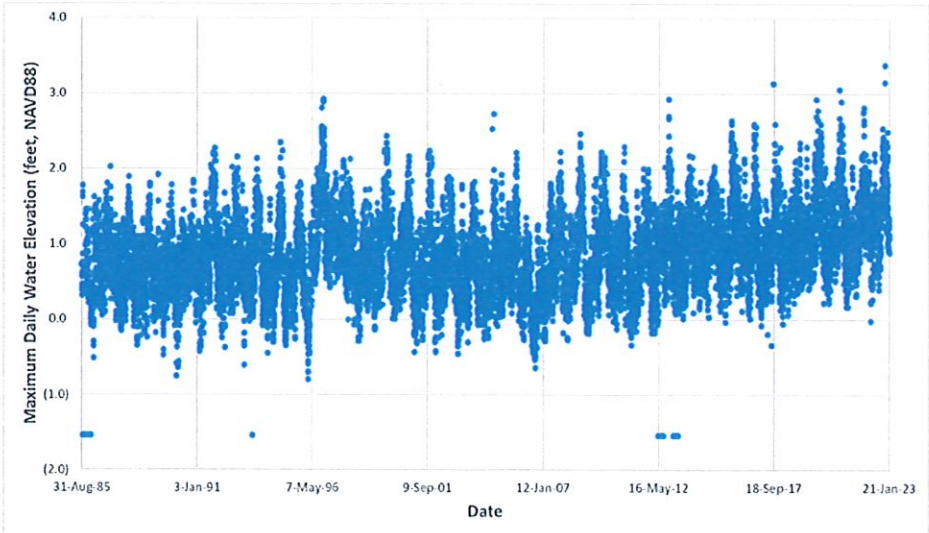
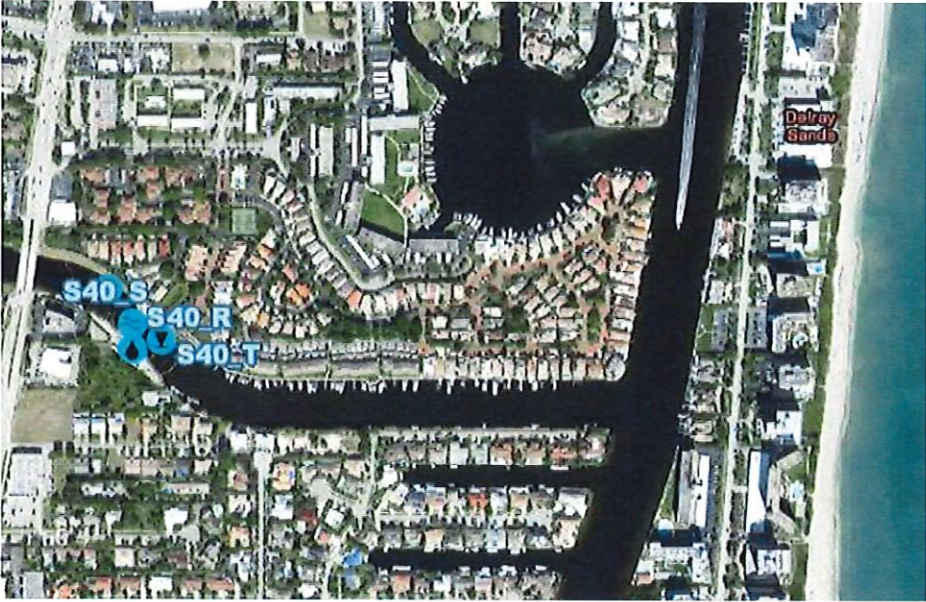
Cc: Doug Wise, PE (PBC)  
Onur Kurum (Baird)

**Data from South Florida Water Management District**

DBHYDRO (Link to [SFWMD Environmental Monitoring](#))

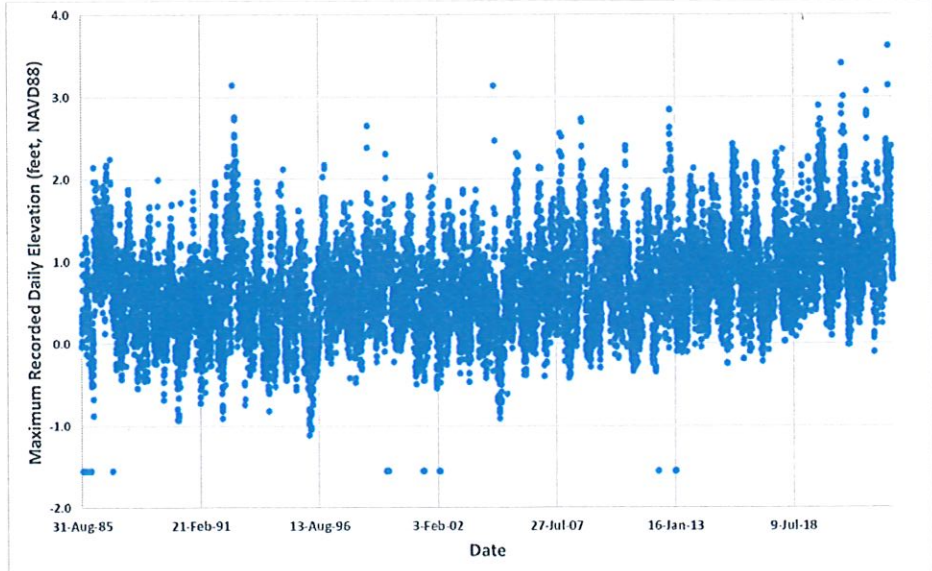
Station S40\_T  
 Description: S-40 Spillway On Canal C-15 At Tidewater (Tailwater)  
 Latitude: 26° 25' 16.9" Longitude: 80° 04' 19.4"  
 Data Time Period: August 31, 1985 to January 26, 2023 (37.4 years)  
 Data available: Daily maximum, mean and minimum water level; 5 minute average water levels

Date	Maximum Daily Water Elevation (ft, NAVD88)
9-Nov-22	3.38
10-Nov-22	3.15
10-Sep-17	3.14
21-Sep-20	3.06
16-Nov-96	2.93
28-Oct-12	2.93
3-Sep-19	2.93
19-Oct-20	2.90
15-Nov-96	2.89
8-Nov-21	2.82
13-Oct-96	2.81
1-Oct-19	2.78
5-Nov-21	2.76
6-Nov-21	2.76
25-Sep-04	2.73
29-Oct-12	2.70
2-Sep-19	2.70
22-Sep-20	2.68
27-Oct-12	2.67
2-Oct-19	2.65
9-Nov-21	2.65
29-Sep-15	2.64
30-Sep-15	2.60
17-Oct-16	2.60
5-Oct-17	2.60
18-Nov-19	2.60
18-Oct-20	2.60
7-Nov-21	2.60
18-Oct-16	2.58
20-Oct-20	2.58
9-Nov-20	2.57
14-Oct-96	2.56



Station S41\_T  
 Description: S-41 Spillway On Canal C-16 At Tidewater (Tailwater)  
 Latitude: 26° 32' 20.4" Longitude: 80° 03' 20.6"  
 Data Time Period: August 31, 1985 to January 26, 2023 (37.4 years)  
 Data available: Daily maximum, mean and minimum water level; 5 minute average water levels

Date	Maximum Daily Water Elevation (ft, NAVD88)
9-Nov-22	3.62
21-Sep-20	3.41
24-Aug-92	3.15
4-Sep-04	3.14
10-Nov-22	3.14
8-Nov-21	3.07
19-Oct-20	3.01
3-Sep-19	2.90
22-Sep-20	2.89
28-Oct-12	2.85
7-Nov-21	2.83
5-Nov-21	2.80
20-Sep-20	2.79
6-Nov-21	2.79
9-Nov-21	2.77
27-Sep-92	2.76
24-Sep-08	2.74
28-Sep-92	2.73
1-Oct-19	2.73
25-Sep-08	2.70
5-Nov-98	2.65
2-Sep-19	2.65
17-Oct-20	2.64
27-Oct-12	2.63
18-Nov-19	2.59
18-Oct-20	2.58
2-Oct-19	2.57
23-Sep-20	2.57
1-Oct-07	2.56
8-Nov-20	2.56
1-Oct-92	2.55
29-Oct-12	2.55



Station S155\_R

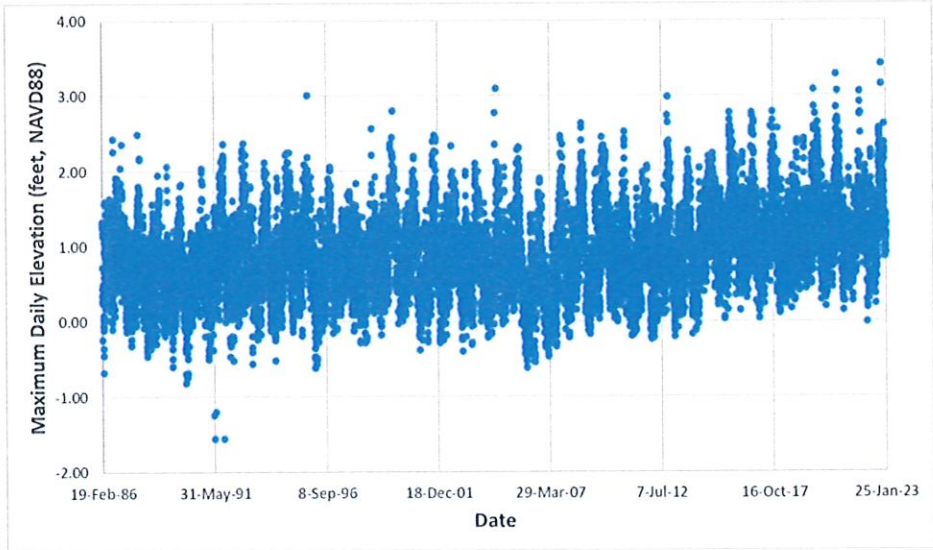
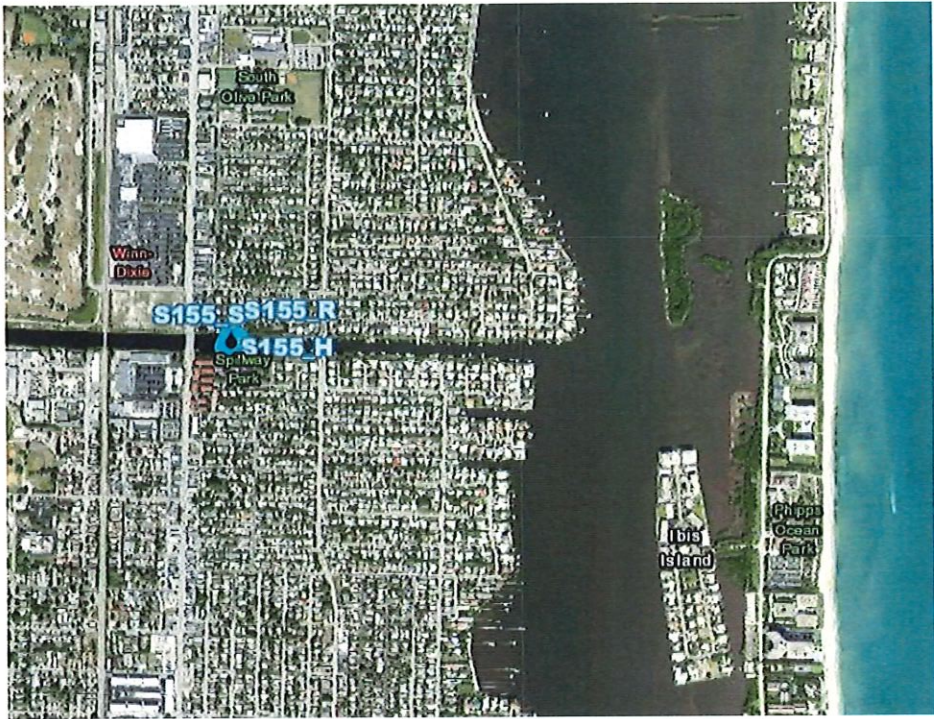
Description: S-155 Spillway On W.P.B. Canal At U.S. 1 (Tailwater)

Latitude: 26° 38' 41.3" Longitude: 80° 03' 17.7"

Data Time Period: February 19, 1986 to January 26, 2023 (36.9 years)

Data available: Daily maximum, mean and minimum water level; 5 minute average water levels

Date	Maximum Daily Water Elevation (ft, NAVD88)
9-Nov-22	3.42
21-Sep-20	3.28
10-Nov-22	3.15
25-Sep-04	3.10
3-Sep-19	3.08
19-Oct-20	3.06
8-Nov-21	3.05
25-Oct-95	3.01
28-Oct-12	2.98
7-Nov-21	2.91
2-Sep-19	2.85
22-Sep-20	2.84
26-Oct-99	2.80
5-Oct-17	2.78
4-Sep-04	2.77
29-Sep-15	2.77
17-Oct-16	2.77
9-Nov-21	2.77
1-Oct-19	2.76
6-Nov-21	2.76
5-Nov-21	2.75
27-Oct-12	2.74
18-Oct-16	2.73
17-Oct-20	2.70
30-Sep-15	2.68
16-Nov-16	2.67
4-Oct-17	2.67
20-Sep-20	2.66
18-Oct-20	2.66
29-Oct-12	2.64
15-Nov-16	2.64
18-Nov-19	2.64
25-Sep-08	2.63
14-Nov-16	2.63
20-Oct-20	2.63



Station S44\_T

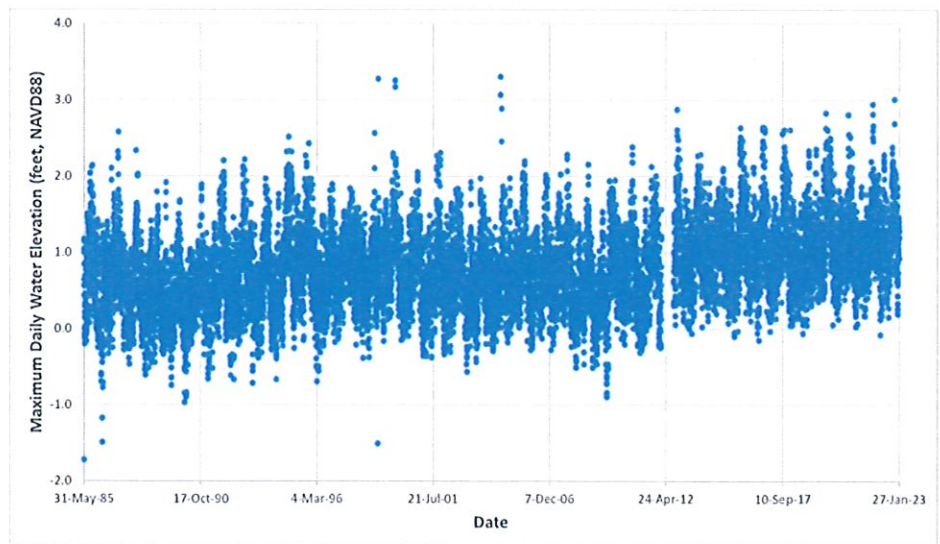
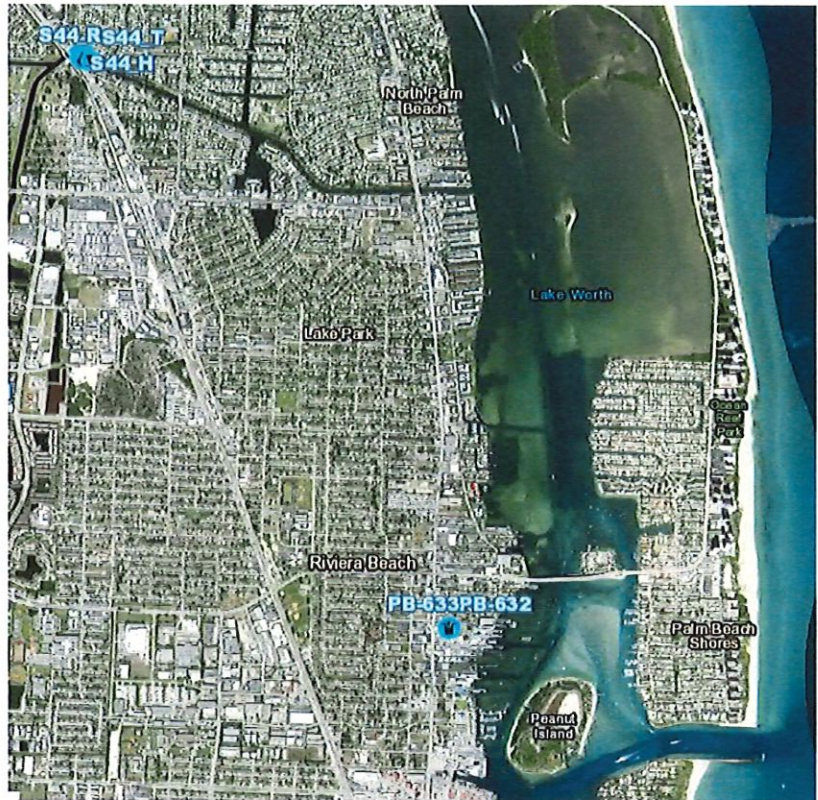
Description: S-44 Spillway On Canal C-17 At Tidewater (Tailwater)

Latitude: 26° 49' 0.8" Longitude: 80° 04' 48.4"

Data Time Period: May 31, 1985 to January 26, 2023 (37.7 years)

Data available: Daily maximum, mean and minimum water level; 5 minute average water levels

Date	Maximum Daily Water Elevation (ft, NAVD88)
5-Sep-04	3.31
2-Jan-99	3.28
16-Oct-99	3.26
15-Oct-99	3.17
4-Sep-04	3.07
10-Nov-22	3.01
8-Nov-21	2.95
26-Sep-04	2.89
28-Oct-12	2.88
3-Sep-19	2.83
7-Nov-21	2.82
21-Sep-20	2.81
9-Nov-22	2.70
9-Nov-21	2.67
18-Oct-16	2.65
29-Sep-15	2.64
14-Nov-16	2.64
2-Sep-19	2.63
15-Nov-16	2.62
27-Oct-12	2.61
17-Oct-16	2.61
5-Oct-17	2.61
3-Jan-18	2.61
1-Oct-19	2.61
6-Nov-21	2.60
1-Jan-87	2.58
16-Nov-16	2.58
5-Nov-98	2.57
10-Sep-17	2.56
22-Sep-20	2.55
29-Oct-12	2.54
15-Nov-94	2.52
30-Sep-15	2.52
19-Oct-20	2.52
5-Nov-21	2.52



Station: LOX.ECO

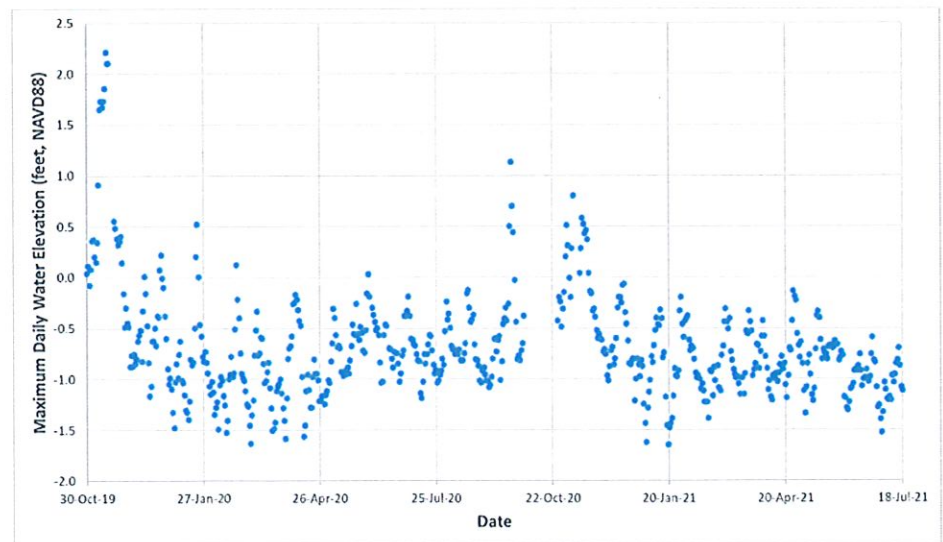
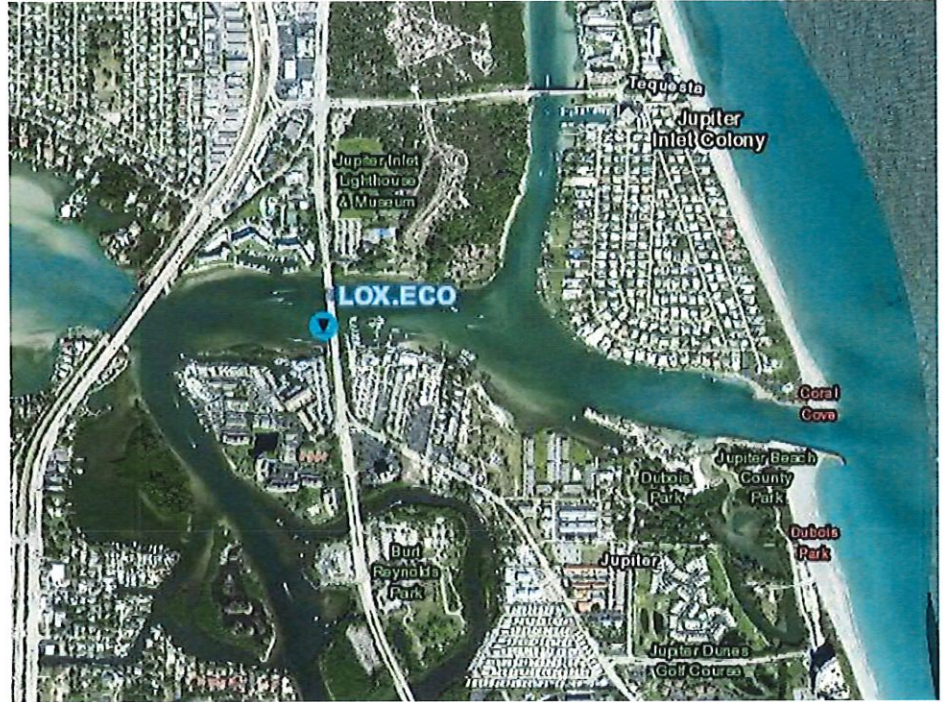
Description: Loxahatchee River At Eco Dock near Jupiter, FL

Latitude: 26° 56' 48.3" Longitude: 80° 05' 06.3"

Data Time Period: October 30, 2019 to July 19, 2021 (1.7 years)

Data available: Daily maximum, mean and minimum water level; Water temperature; Salinity; SP Conductivity

Date	Maximum Daily Water Elevation (ft, NAVD88)
14-Nov-19	2.21
21-Sep-20	1.13
8-Nov-20	0.80
23-Jan-20	0.52



Station STL\_STPT

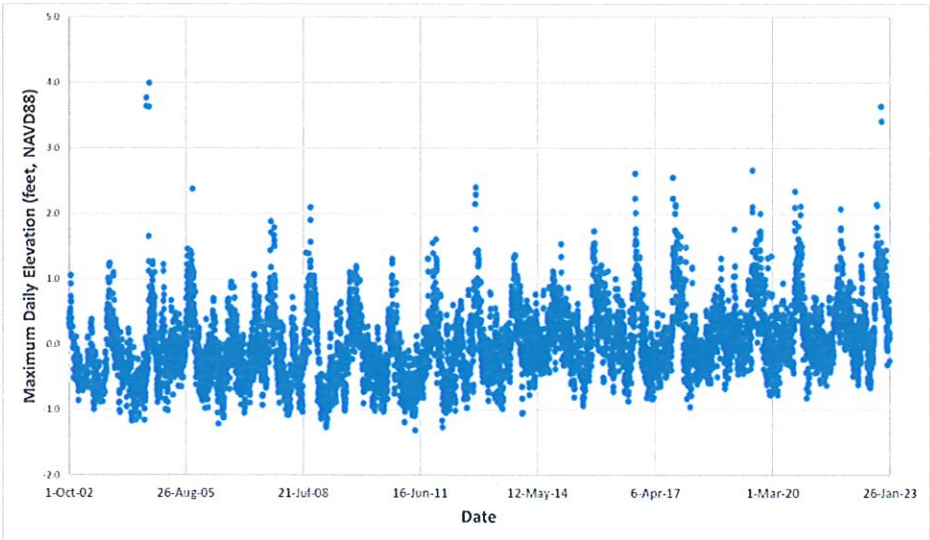
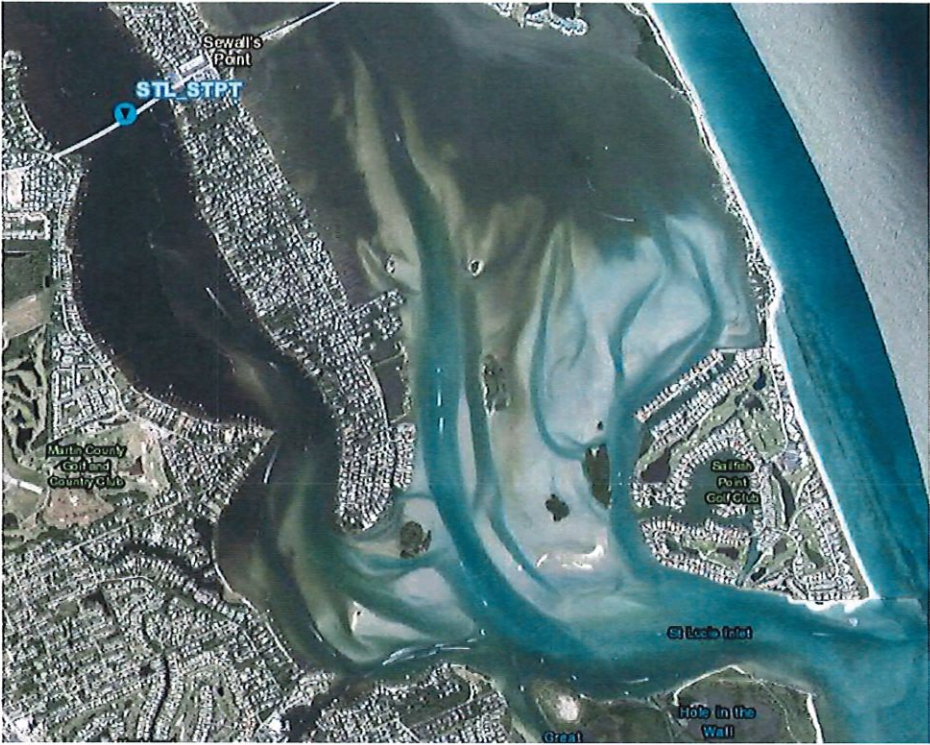
Description: St Lucie Estuary At A1a (Steele Pt) Stuart, Fl

Latitude: 27° 11' 59.2" Longitude: 80° 12' 24.2"

Data Time Period: October 1, 2002 to January 26, 2023 (20.3 years)

Data available: Daily maximum, mean and minimum water level; Water temperature; Salinity; SP Conductivity

Date	Maximum Daily Water Elevation (ft, NAVD88)
25-Sep-04	4.00
5-Sep-04	3.77
4-Sep-04	3.64
9-Nov-22	3.64
26-Sep-04	3.63
10-Nov-22	3.41
3-Sep-19	2.67
7-Oct-16	2.62
10-Sep-17	2.56
28-Oct-12	2.41
24-Oct-05	2.38
21-Sep-20	2.35
27-Oct-12	2.30
6-Oct-16	2.24
11-Sep-17	2.24
26-Oct-12	2.15
5-Oct-17	2.14
30-Sep-22	2.14
1-Oct-22	2.13
4-Oct-17	2.12
9-Nov-20	2.12
2-Sep-19	2.11
24-Sep-08	2.10
22-Sep-20	2.10
8-Nov-21	2.08
4-Sep-19	2.03
12-Oct-16	2.02
3-Oct-17	2.01
18-Nov-19	2.01
8-Nov-20	1.99
25-Sep-08	1.91
2-Oct-07	1.89
20-Sep-20	1.87
19-Oct-20	1.81
31-Oct-07	1.80



Innovation Engineered.