



2021 Upper East Coast Water Supply Plan Update

Welcome

2021 UEC Technical Methods Workshop

July 16, 2021

Workshop Agenda

- Welcome and Introduction – Tom Colios, Section Leader
- East Coast Floridan Model – Rob Earle, Lead Modeler
 - Model overview
 - Model updates since 2014
 - UEC planning model scenarios and results
 - Modeling conclusions
- Public Comments and Questions
- Next Steps – Nancy Demonstranti, UEC Plan Manager

Introduction

- Water supply plans
 - Road map to meet future demands while protecting water resources and natural systems
 - Planning-level analysis to determine water supply availability
 - Summary of modeling results
- Regional groundwater models
 - Regional evaluation of groundwater resources
 - Specific to an area and aquifer system
 - Used for determining regional trends, not for local analysis
 - Separate technical document for detailed model updates, calibration, and results



East Coast Floridan Modeling to Support the 2021 Upper East Coast Water Supply Plan Update

Fort Pierce, FL

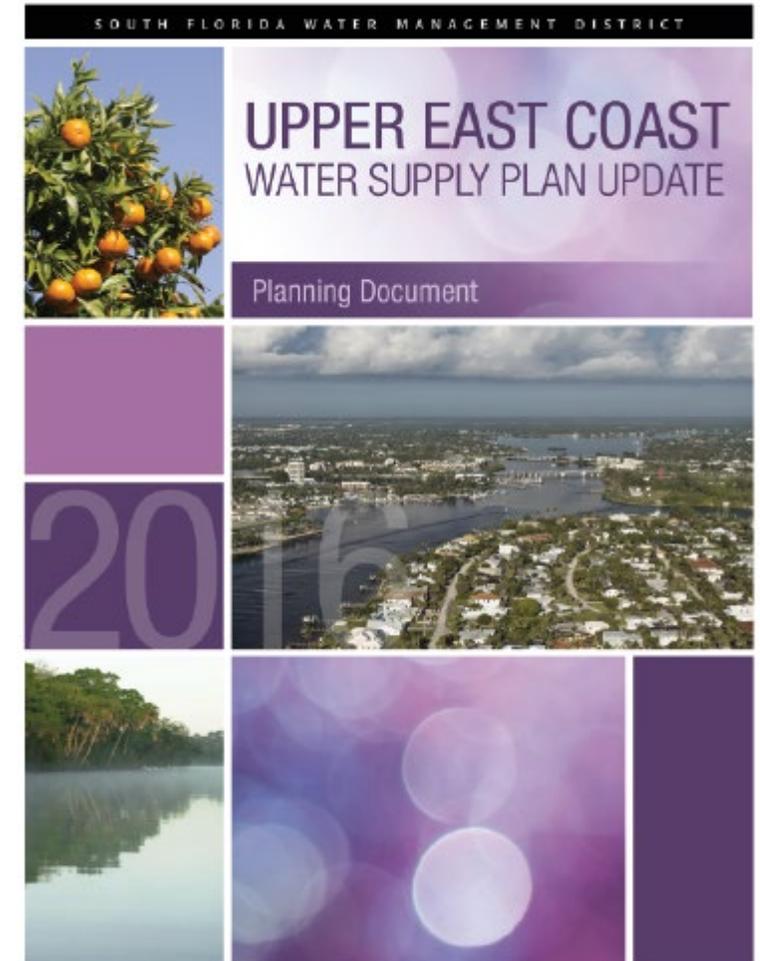
Rob Earle

Lead Modeler, Groundwater Modeling Unit, Water Supply Bureau
South Florida Water Management District

2016 Upper East Coast Water Supply Plan Update

Future Direction

- The surficial aquifer system (SAS) use is limited
 - Increases in water use expected to be supported by the Floridan aquifer system (FAS)
 - Brackish water from the FAS can serve as a supplemental agricultural water source
- Maintain wells critical to long-term monitoring and modeling
- New Avon Park permeable zone wellfields should have greater spacing and lower per-well capacity





East Coast Floridan Model Re-Calibration and Application to the Upper East Coast

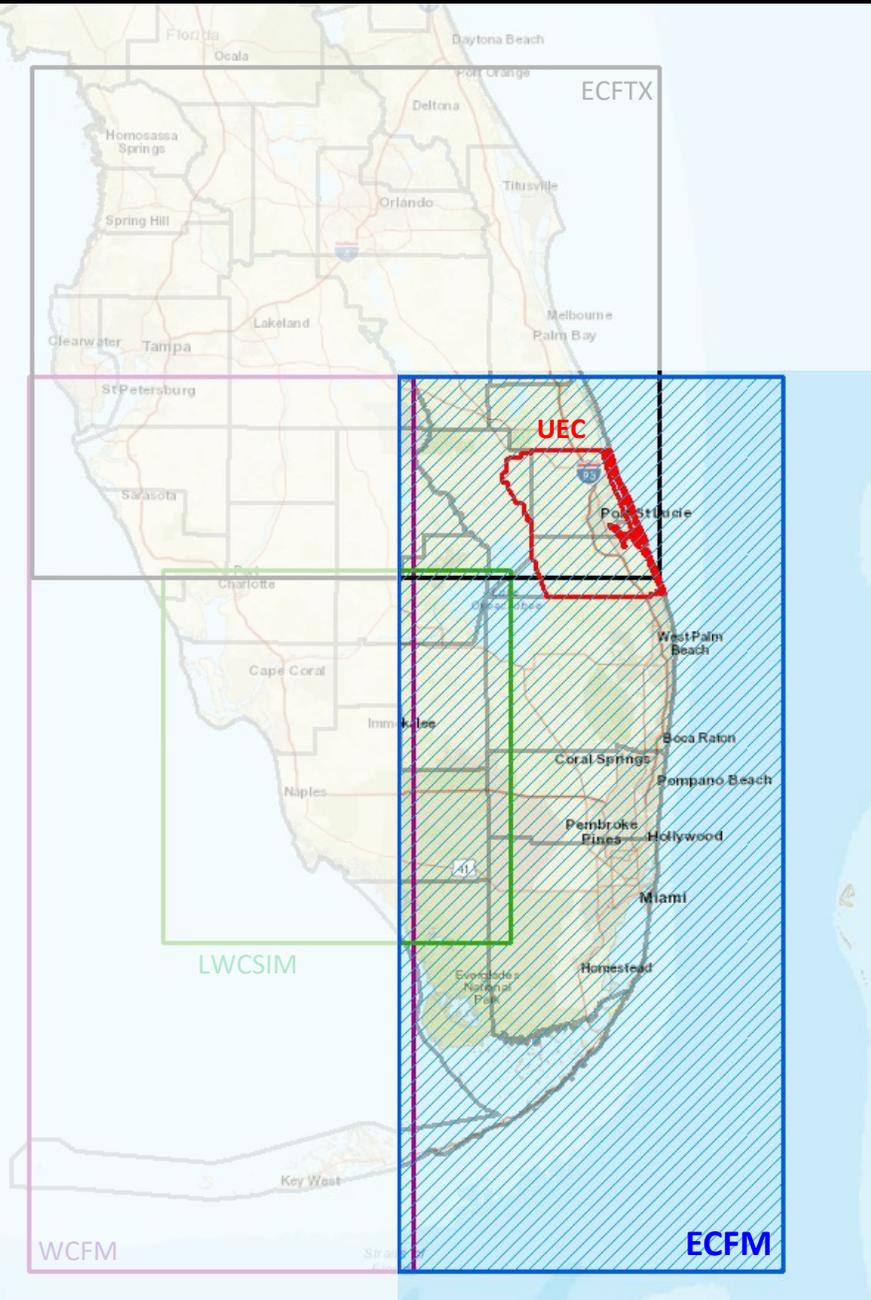
Presentation Overview

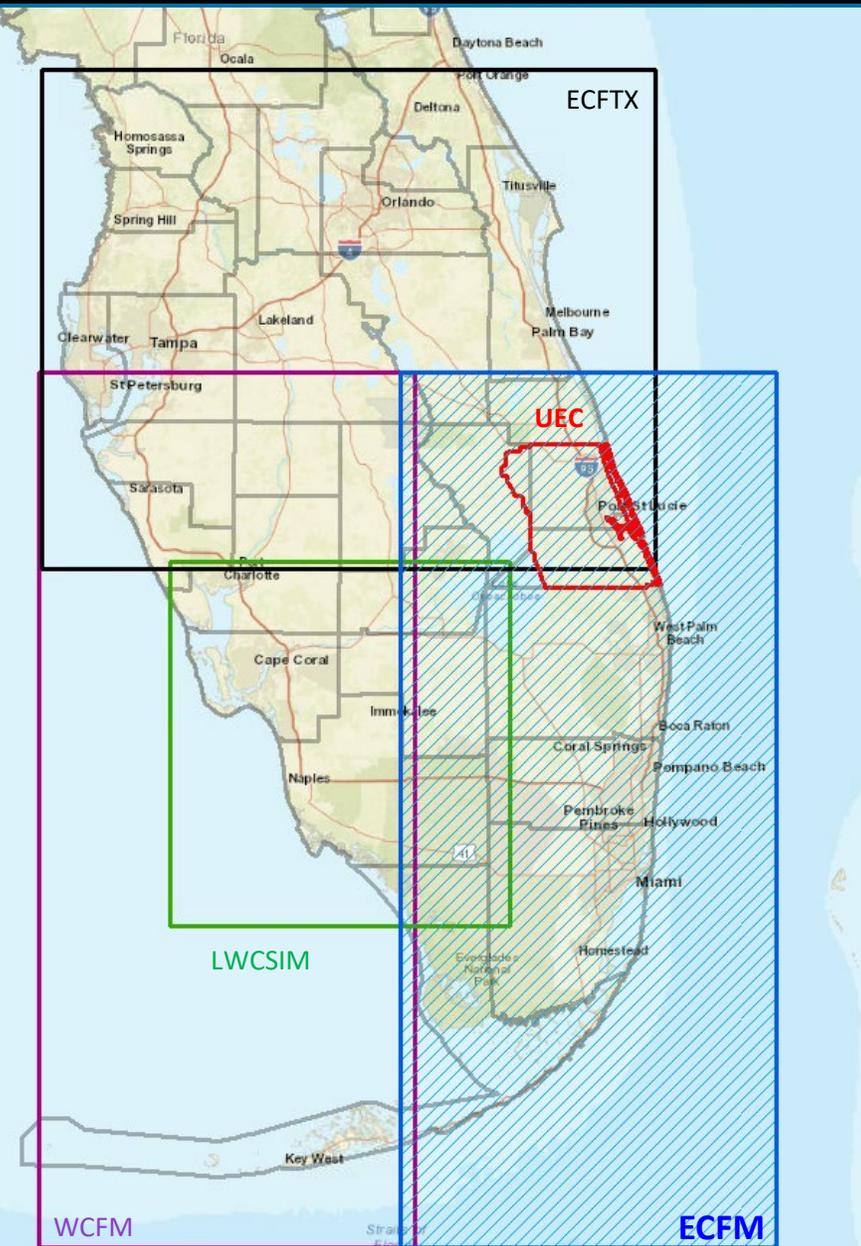
- East Coast Floridan Model overview
- East Coast Floridan Model re-calibration
- Application to Upper East Coast planning scenarios
- Upper East Coast planning scenario results

East Coast Floridan Model

Boundaries

- Brevard County (north)
- Florida Keys/Florida Straits (south)
- Atlantic Ocean (east)
- West Coast Floridan Model (west)





East Coast Floridan Model

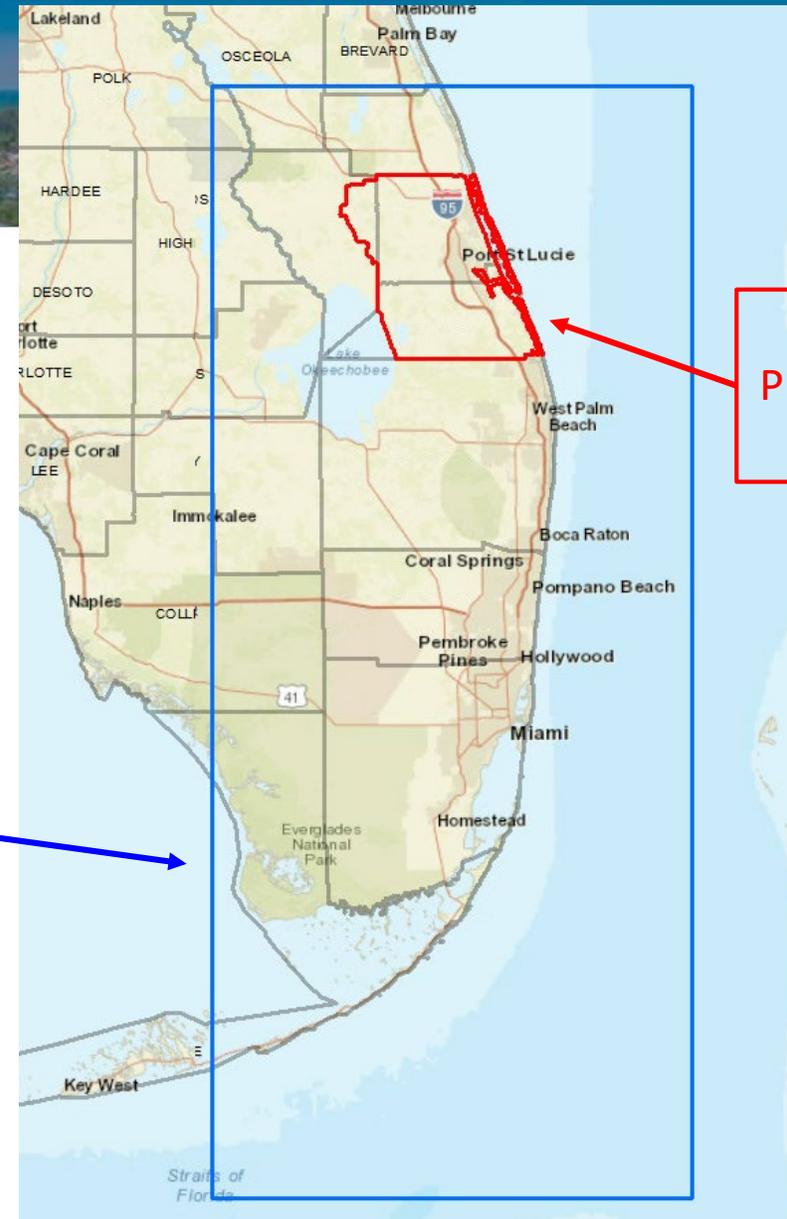
- Northwestern portion of model domain overlaps the East-Central Florida Transient Expanded (ECFTX) Model
- Western portion of model domain slightly overlaps the West Coast Floridan Model

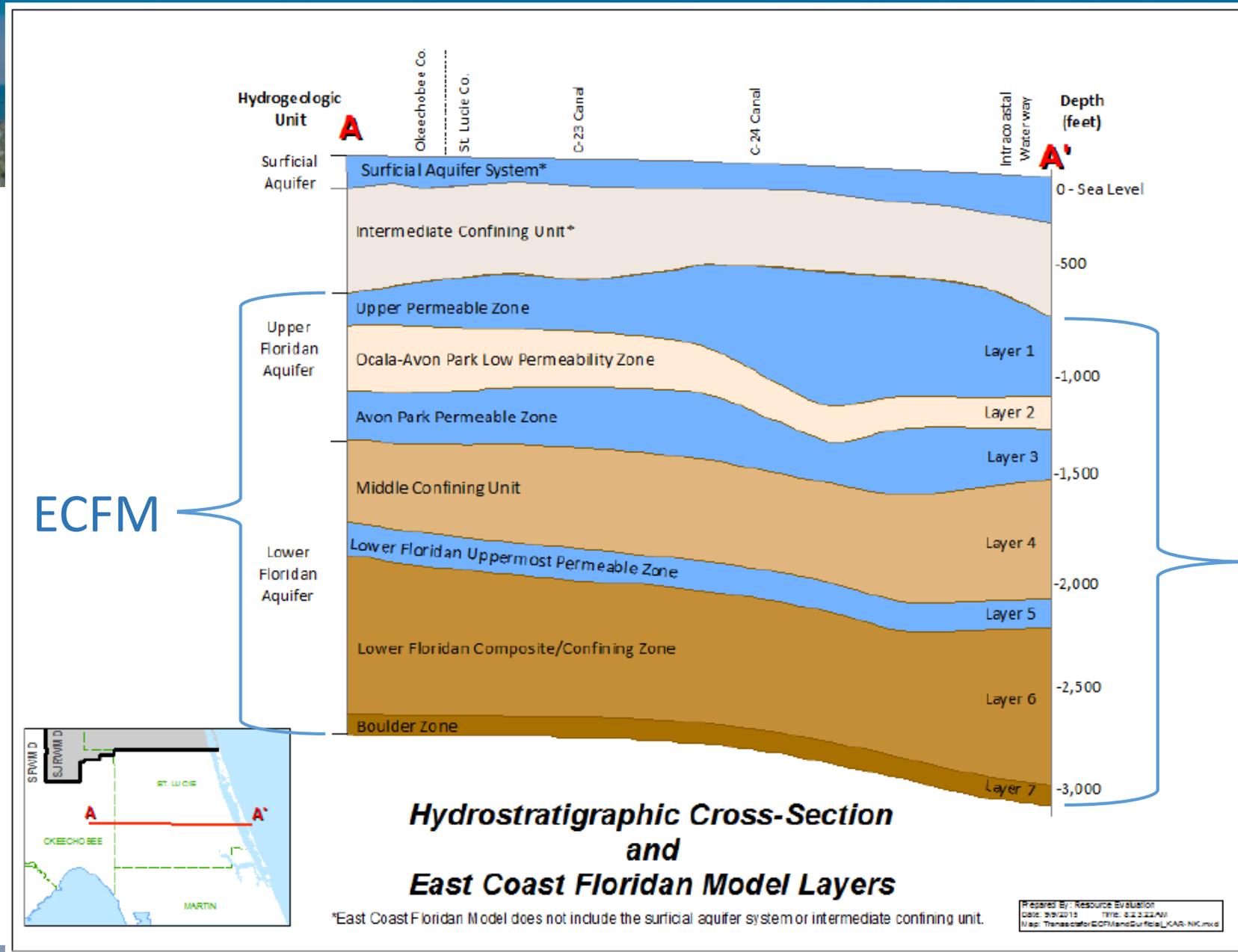
East Coast Floridan Model

- MODFLOW-SEAWAT Model (USGS 2012)
- Calibration period: 1989-2012
- 288 monthly simulation (stress) periods (288 ÷ 12 = 24 years)
- Cell size: 2,400 ft × 2,400 ft
- 7 model layers, including:
 - Layer 1: Upper Floridan aquifer
 - Layer 3: Avon Park permeable zone
- Calibrated to water levels and water quality (TDS concentration [mg/L])

ECFM
Domain

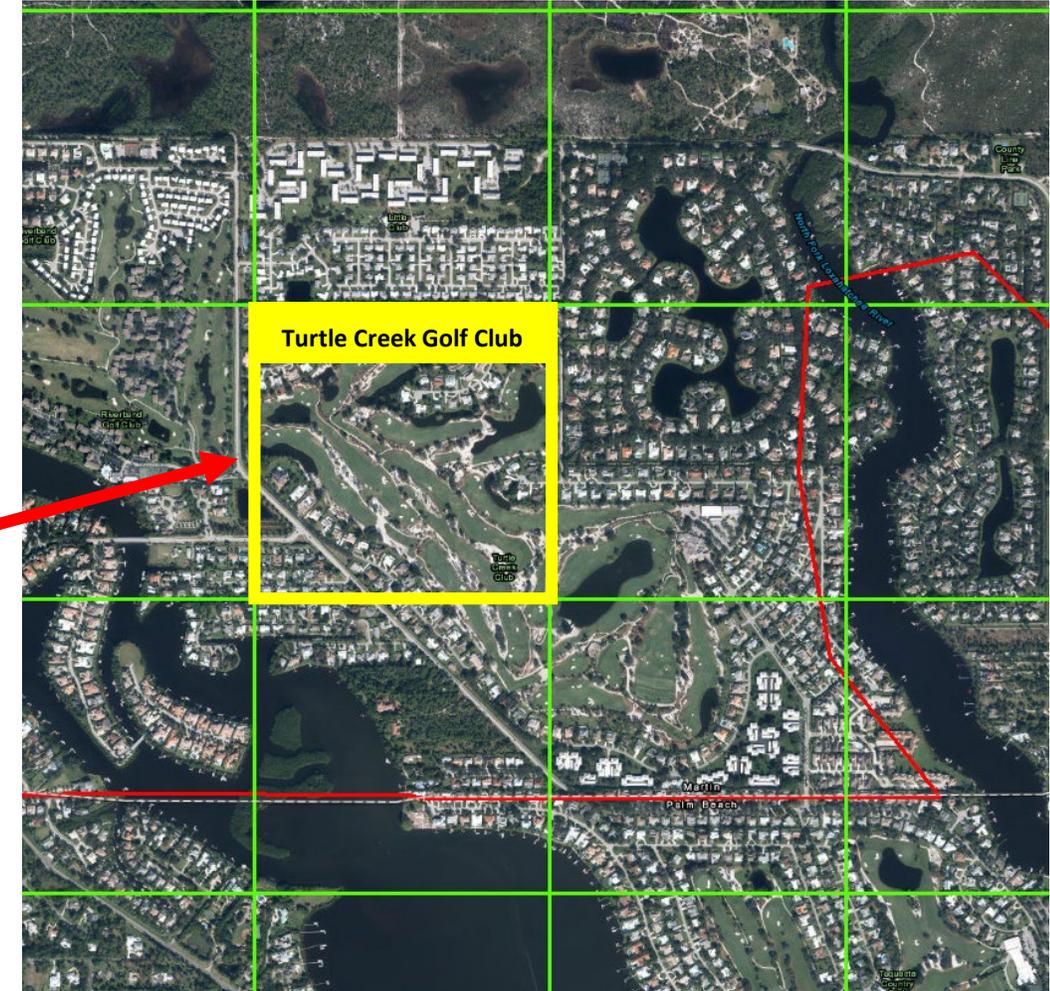
UEC
Planning
Area





Considerations for Large Regional Models

- MODFLOW-SEAWAT: block-centered, finite-difference, cellular
- Heads and concentrations for each stress period are determined at each model cell
- Each ECFM model cell measures 2,400 ft × 2,400 ft in area
(132 acres)
- Regional trends and differences; local can be deceiving





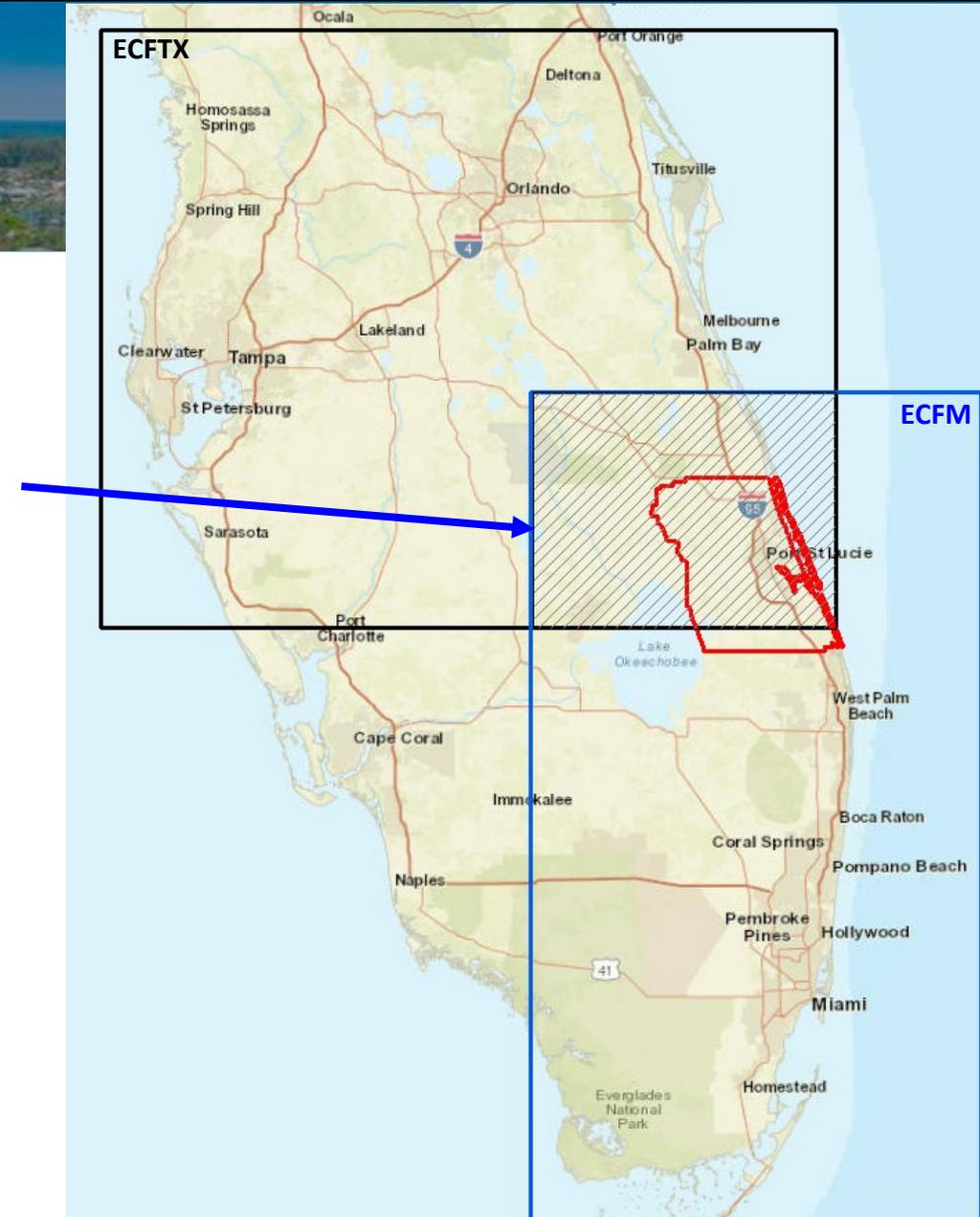
Calibration Update and Comparison (2014 ECFM vs. 2021 ECFM)

Update to the East Coast Floridan Model

- Modified the hydrostratigraphy (model layers) to be consistent with the East-Central Florida Transient Expanded (ECFTX) Model
- Incorporated new hydrogeologic information (hydraulic conductivity) into the model from six new sites
- Re-calibrated the model to meet calibration criteria

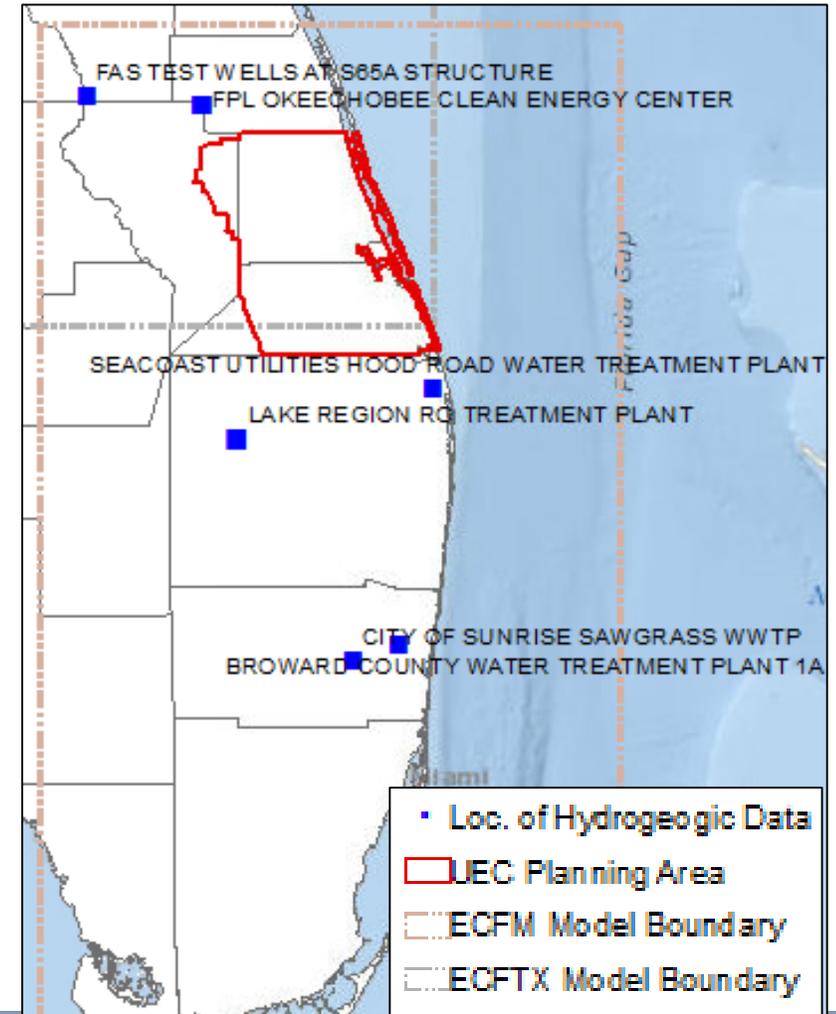
Updates to the East Coast Floridan Model

- Hydrostratigraphy (model layer elevation) data from the ECFTX Model was used in the area that overlaps the ECFM domain
- Within the overlapped area, ECFTX well data points were provided:
 - UFA top: 446 data points
 - UFA bottom: 38 data points
 - APPZ top: 37 data points
 - APPZ bottom: 22 data points



Updates to the East Coast Floridan Model

- Incorporated new hydrogeologic information
- New hydraulic conductivity was incorporated in localized areas in both the UFA and APPZ
 - Upper Floridan aquifer (UFA)
 - Okeechobee Clean Energy Center
 - Broward County Water Treatment Plant 1A
 - Lake Region Reverse Osmosis Treatment Plant
 - Avon Park permeable zone (APPZ)
 - S-65A structure at Kissimmee River Basin
 - Okeechobee Clean Energy Center
 - City of Sunrise Wastewater Treatment Facility
 - Seacoast Utility Authority



Water Level Calibration Criteria

(from 2014 ECFM – recommended by the peer-review panel)

- Water level calibration criteria, by aquifer (UFA, APPZ, LFA):
 - Percent of simulated heads within ± 2.0 ft of observed heads $\geq 80\%$
 - Percent of simulated heads within ± 4.0 ft of observed heads $\geq 90\%$
 - Mean absolute error (MAE): < 2.0 ft
 - 80% of wells in an aquifer with MAE < 2.0 ft
 - Percentage of stations where $\geq 80\%$ of the simulated heads are within ± 2.0 ft of the observed heads $\geq 80\%$

Comparison of Water Level Calibration (2021 vs. 2014)

Current Version 2021 ECFM

Aquifer	No. of Well Sites	No. of Records	% of Records Outside ± 2.0 ft Interval	% of Records Outside ± 4.0 ft Interval	% of Sites with <2 ft MAE (Goal: 80%)	% of Sites within ± 2 ft Interval (Goal: 80%)
Upper Floridan aquifer	110	6,521	16%	2%	90%	75%
Avon Park permeable zone	27	1,835	10%	0%	96%	81%
Lower Floridan aquifer	6	502	15%	1%	83%	83%

SMMS Version* 2014 ECFM

Aquifer	No. of Well Sites	No. of Records	% of Records Outside ± 2.0 ft Interval	% of Records Outside ± 4.0 ft Interval	% of Sites with <2 ft MAE (Goal: 80%)	% of Sites within ± 2 ft Interval (Goal: 80%)
Upper Floridan aquifer	110	6521	18%	2%	87%	61%
Avon Park permeable zone	27	1835	13%	1%	93%	59%
Lower Floridan aquifer	6	502	5%	1%	75%	75%

MAE = mean absolute error

Water Quality Calibration Criteria

(from 2014 ECFM – recommended by the peer-review panel)

Calibration Target

For at least 80% of the monitoring wells, the model will simulate TDS within the error band:

	Fresh to Brackish Water		Moderately Saline	Saline Water
Observed total dissolved solids (mg/L)	0 – 4,000	4,000 – 10,000	10,000 – 18,000	>18,000
Calibration error band (mg/L)	±500	±750	±3,000	±4,000

Definition

A “calibrated well” is a well for which the model simulates TDS within the error band

Comparison of Water Quality Calibration (2021 vs. 2014)

- Percentage of data points (records) outside the desirable interval should be 20% or less

Current Version 2021 ECFM

Aquifer	Desirable Interval Criteria (\pm mg/L)	No. of Well Sites	No. of Records	% of Records Outside Desirable Interval	% of Sites Within Desirable Interval
UFA	500 – 750	102	5028	11%	90%
APPZ	500 – 4,000	63	4298	33%	71%
LFA	3,000 – 4,000	43	4165	23%	84%

- Percentage of sites within the desirable interval should be 80% or greater

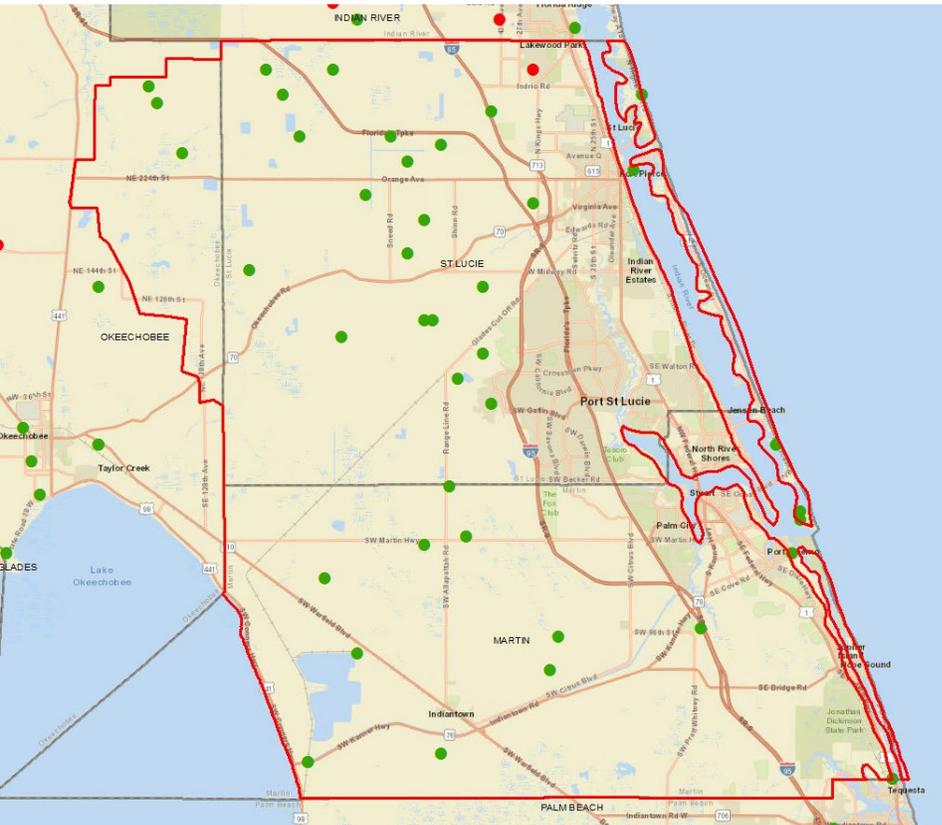
SMMS Version* 2014 ECFM

Aquifer	Desirable Interval Criteria (\pm mg/L)	No. of Well Sites	No. of Records	% of Records Outside Desirable Interval	% of Sites Within Desirable Interval
UFA	500 - 750	102	5028	10%	90%
APPZ	500 - 4000	63	4298	38%	65%
LFA	3000 - 4000	43	4165	25%	86%

An aerial photograph of a coastal resort area. In the foreground, there is a sandy beach and a small pier extending into the turquoise water. Behind the beach, there are several large, multi-story buildings with balconies, surrounded by green lawns and palm trees. In the background, more buildings and a large body of water are visible under a clear blue sky.

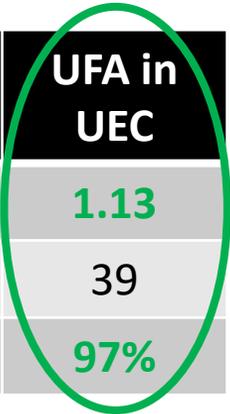
2021 East Coast Floridan Model Re-Calibration Summary

Water Level Calibration – Upper Floridan Aquifer



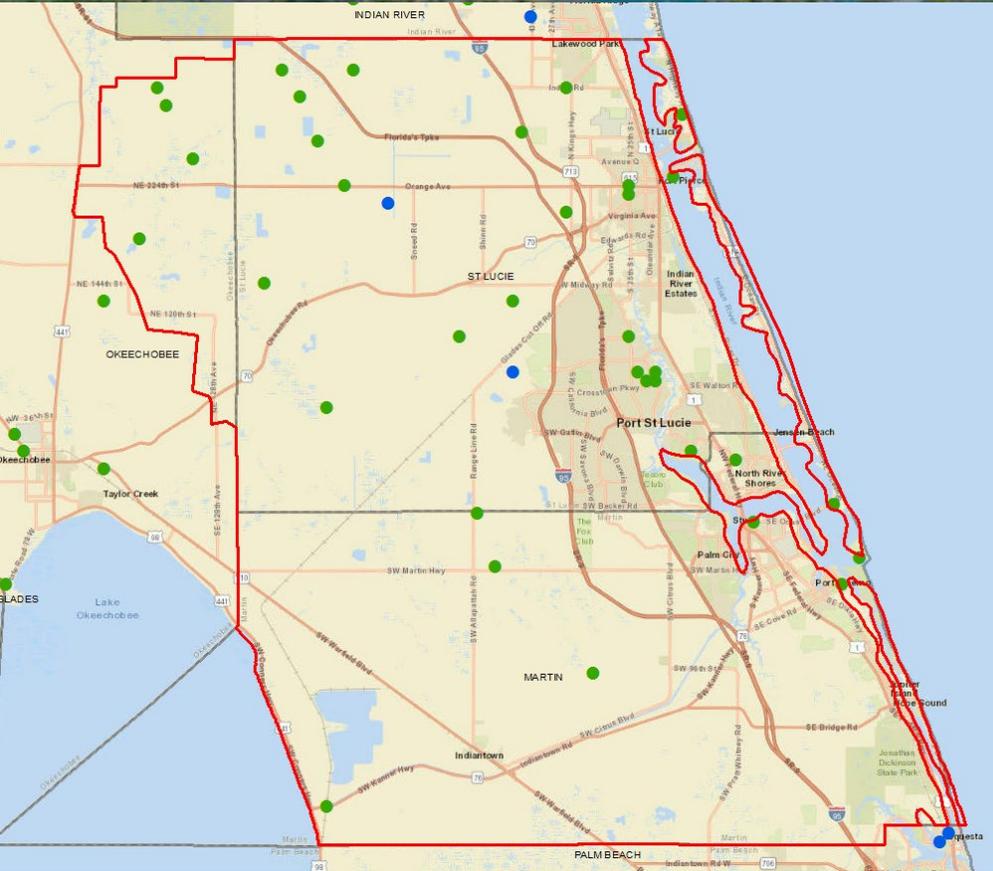
39 out of 110 (35%) ECFM – UFA water level calibration targets inside the UEC Planning Area

	Criterion	All Layers	UFA in ECFM	UFA in UEC
Mean absolute error (MAE)	<2.0 ft	1.21	1.25	1.13
Number of wells		143	110	39
% of wells with MAE <2.0 ft	>80%	92%	90%	97%



Note: Wells depicted in **green** meet calibration criteria
 Wells depicted in **red** do not meet calibration criteria

Water Quality Calibration – Upper Floridan Aquifer

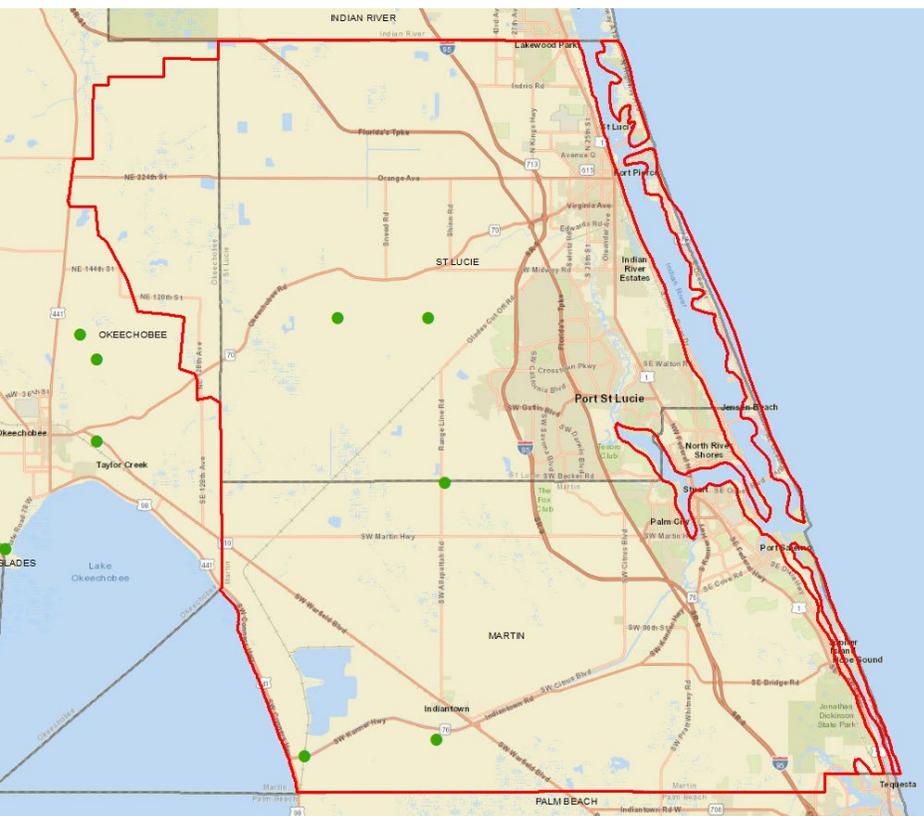


37 out of 102 (36%) ECFM – UFA water quality calibration targets inside the UEC Planning Area

	Criterion	All Layers	UFA in ECFM	UFA in UEC
Number of wells		208	102	37
Number of wells meeting calibration		175	92	35
Percentage of calibrated wells	80%	84%	90%	95%

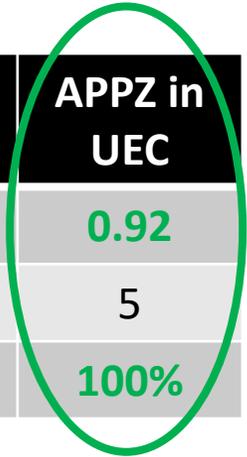
Note: Wells depicted in **green** meet calibration criteria
 Wells depicted in **blue** do not meet calibration criteria

Water Level Calibration – Avon Park Permeable Zone



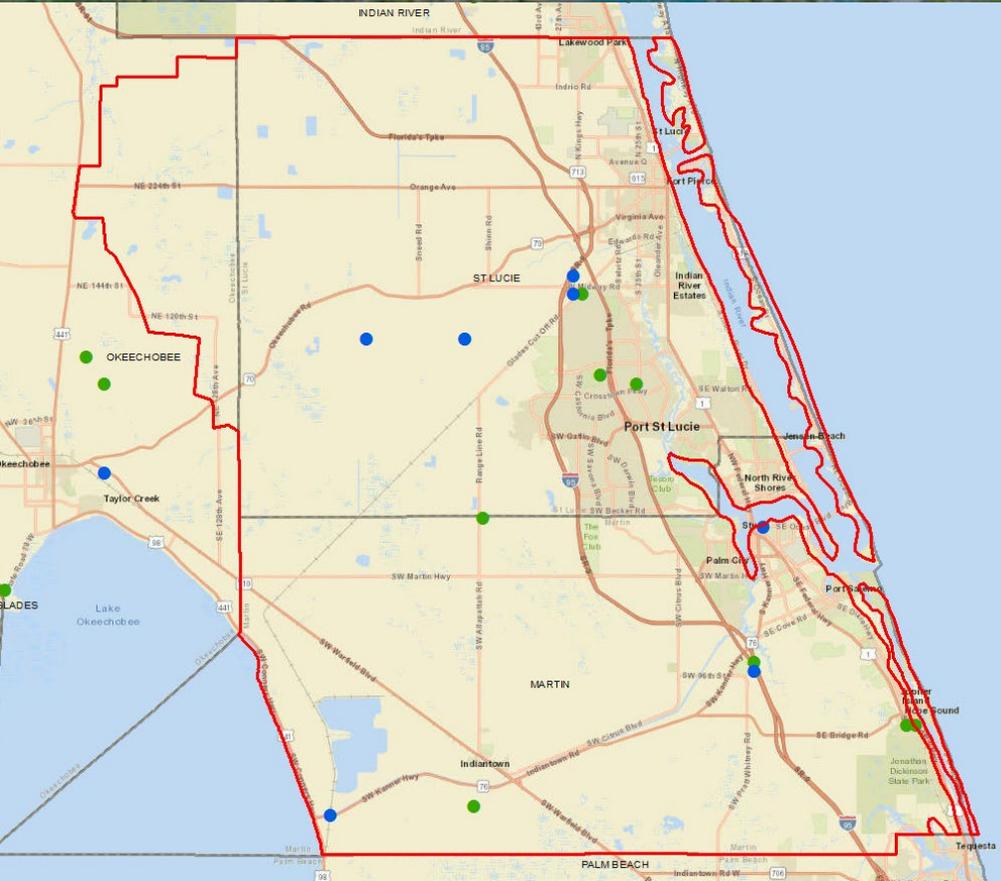
5 out of 27 (19%) ECFM – APPZ water level calibration targets inside the UEC Planning Area

	Criterion	All Layers	APPZ in ECFM	APPZ in UEC
Mean absolute error (MAE)	<2.0 ft	1.21	1.04	0.92
Number of wells		143	27	5
% of wells with MAE <2.0 ft	>80%	92%	96%	100%



Note: Wells depicted in green meet calibration criteria

Water Quality Calibration – Avon Park Permeable Zone

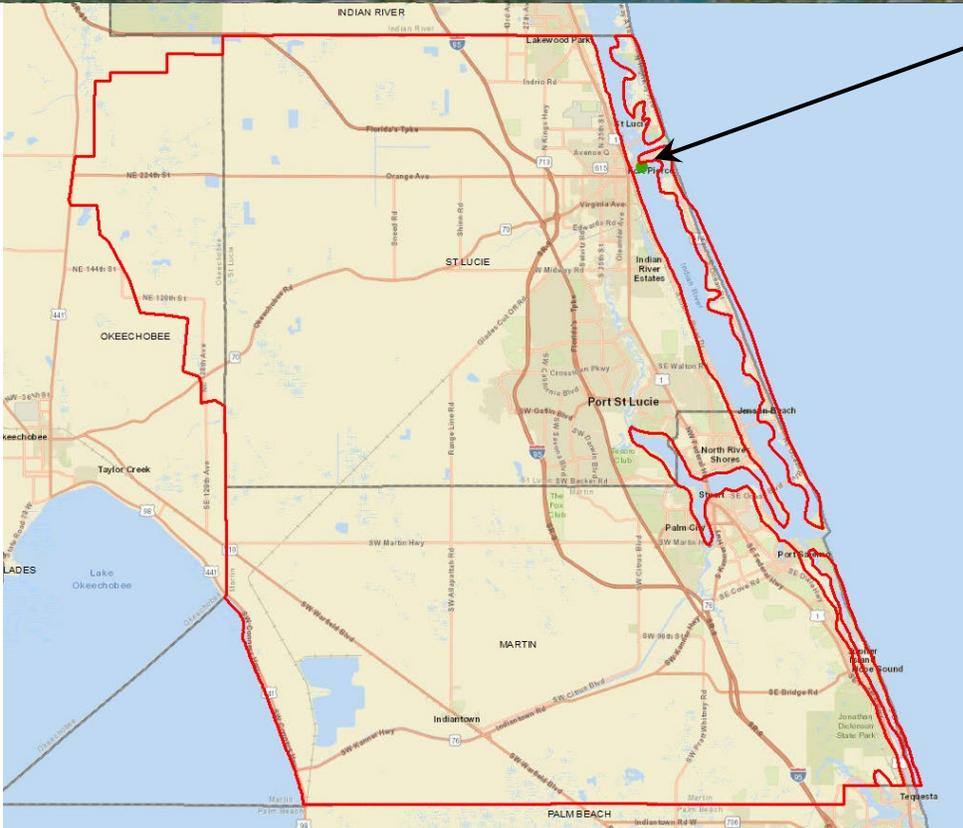


15 out of 63 (24%) ECFM – APPZ water quality calibration targets inside the UEC Planning Area

	Criterion	All Layers	APPZ in ECFM	APPZ in UEC
Number of wells		208	63	15
Number of wells meeting calibration		175	46	8
Percentage of calibrated wells	80%	84%	71%	53%

Note: Wells depicted in **green** meet calibration criteria
 Wells depicted in **blue** do not meet calibration criteria

Water Level Calibration – Lower Floridan Aquifer

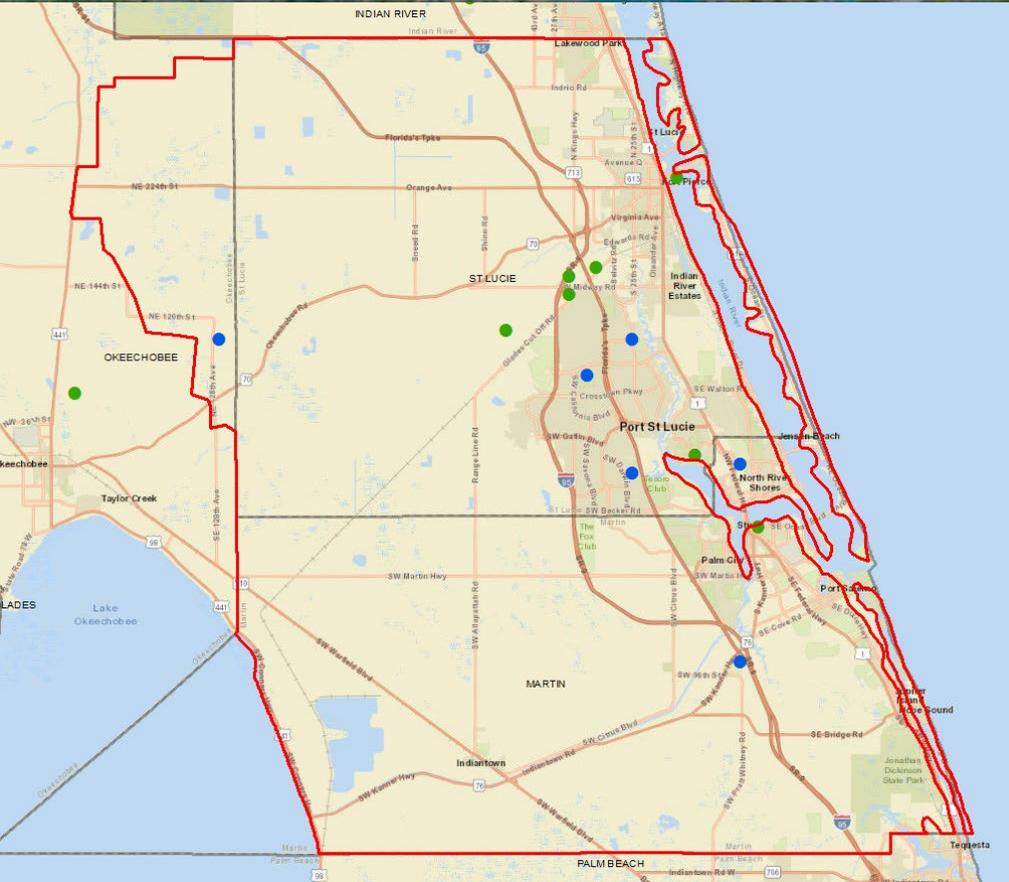


There is only one ECFM – LFA water level calibration target inside the UEC Planning Area

	Criterion	All Layers	LFA in ECFM	LFA in UEC
Mean absolute error (MAE)	<2.0 ft	1.21	1.16	0.85
Number of wells		143	6	1
% of wells with MAE <2.0 ft	>80%	92%	83%	100%

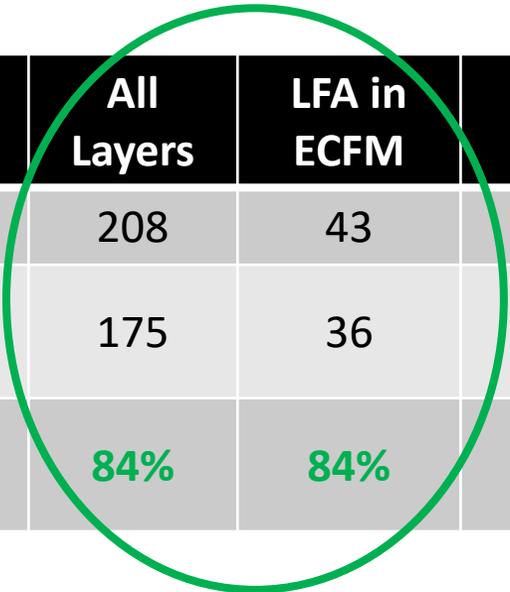
Note: Well depicted in green meets calibration criteria

Water Quality Calibration – Lower Floridan Aquifer



12 out of 43 (27%) ECFM – LFA water quality calibration targets inside the UEC Planning Area

	Criterion	All Layers	LFA in ECFM	LFA in UEC
Number of wells		208	43	13
Number of wells meeting calibration		175	36	7
Percentage of calibrated wells	80%	84%	84%	54%



Note: Wells depicted in **green** meet calibration criteria
 Wells depicted in **blue** do not meet calibration criteria

An aerial photograph of a coastal resort area. In the foreground, there is a sandy beach and a swimming pool with a thatched roof. Behind the pool are several large, multi-story buildings with balconies. The background shows a dense residential area and the ocean under a clear blue sky.

Model Application: Upper East Coast Planning Scenarios

Upper East Coast Planning Scenarios

➤ 2019 Base Condition

- Public Supply, Power Generation, Landscape/Recreational, and Commercial/Industrial/Institutional demands from historical 2019 pumpage data
- Agricultural demands estimated based on AFSIRS (simulates irrigation demands)

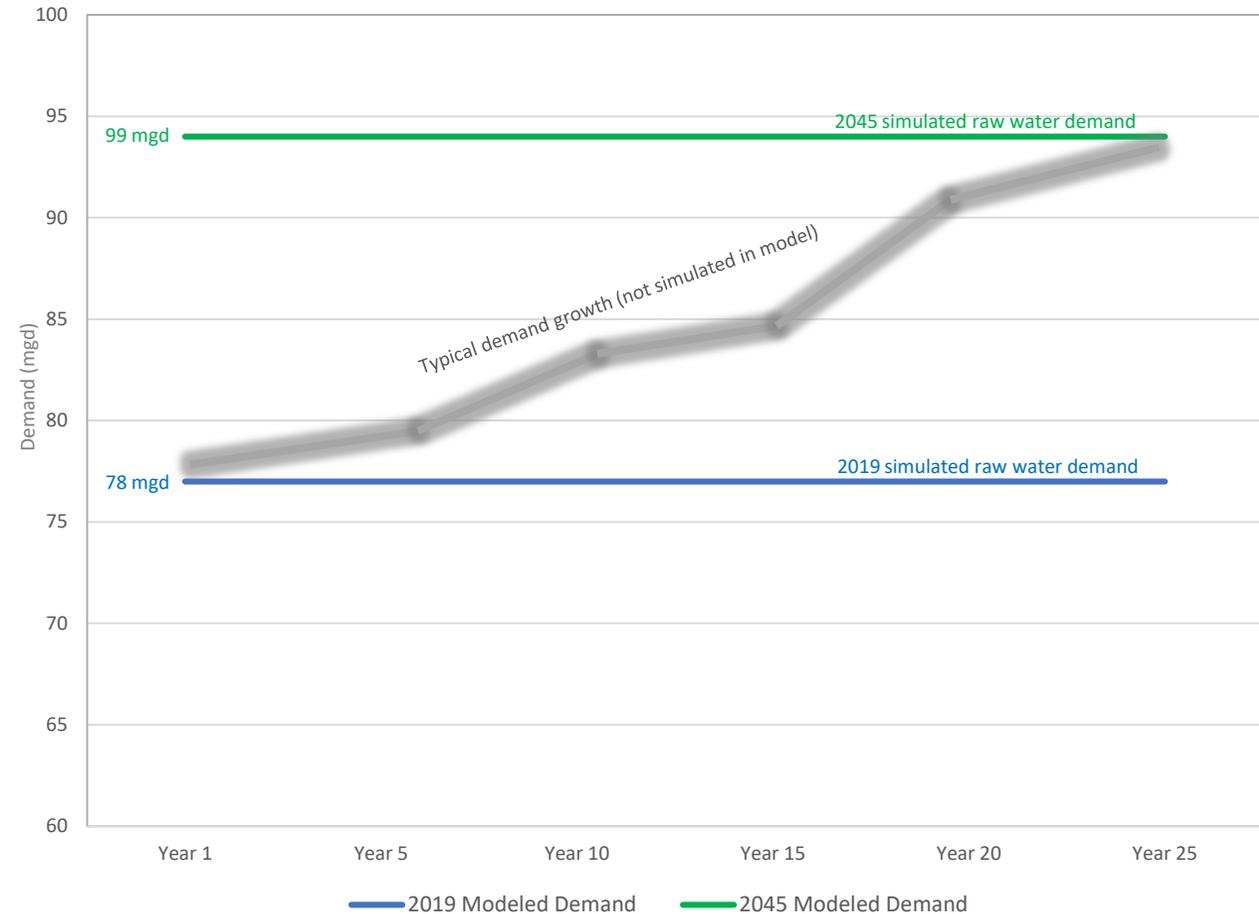
➤ 2045 Future Condition

- Public Supply, Power Generation, and Commercial/Industrial/Institutional demands based on future population growth rate
- Agricultural demands based on future land use (FSAID 2019*) and AFSIRS
- Landscape/Recreational demands based on 2045 planning projections

➤ Differences in water levels and water quality (TDS) between 2019 and 2045 in the UFA and APPZ (model layers 1 and 3)

Limitations in Simulating Demands

- Each simulation is 24 years
 - Same as calibration period
- Model does not simulate annual demand growth
- Simulated demands are “instant on”
- Raw water demand shown for all use types
- Results from the 2045 simulation are considered conservative



Regional Model Limitations

- Large model cell size (2,400 ft × 2,400 ft)
 - Cannot accurately simulate local drawdowns
- Regional model may not capture local heterogeneity in the FAS and the response at individual wells
- Regional model results should be used as an overall planning tool; results should not be considered absolute

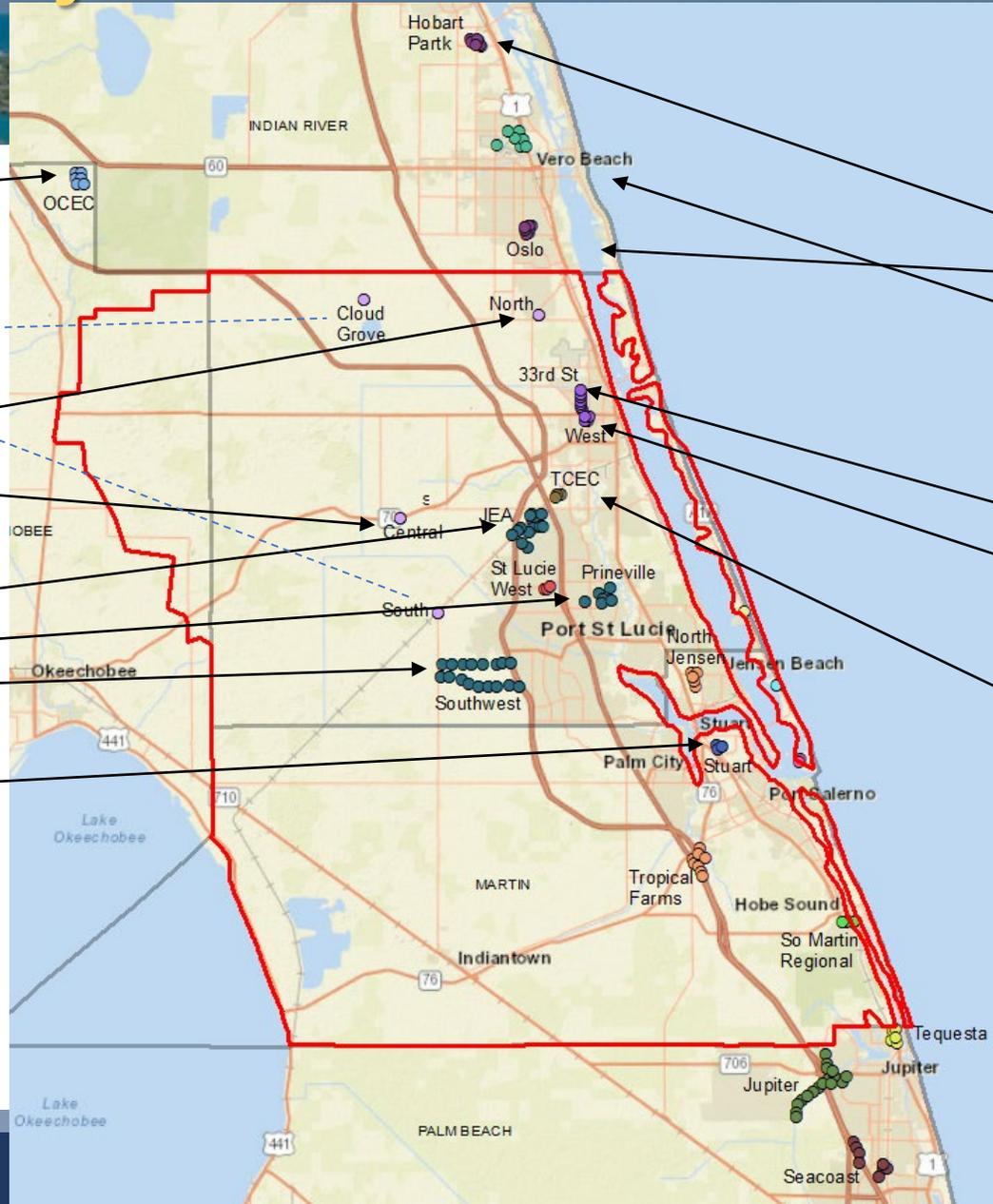
Floridan Aquifer Demands in the Upper East Coast Planning Area

Water Use Category	2019 (mgd)	2045 (mgd)	Difference (mgd)
Agriculture	37.87	31.45	-6.42
Commercial/Industrial/Institutional	0.18	0.18	0.00
Landscape/Recreational	2.74	4.20	1.46
Power Generation	1.45	3.34	1.89
Public Supply	36.18	59.74	23.56
Total	78.42	98.91	20.49

Differences in PS Demands in the UEC Planning Area

Permit Number	Utility	Allocation (mgd)	2019 (mgd)	2045 (mgd)	Difference (mgd)
Martin County					
43-00053-W	Stuart, City of	3.67	0.00	2.62	2.62
43-00066-W	South Martin Regional Utility	2.50	1.78	2.43	0.65
43-00102-W	Martin County Utilities (Consolidated System)	15.09	9.98	10.63	0.65
43-00146-W	Sailfish Point Utility Corporation	0.22	0.21	0.22	0.01
St. Lucie County					
56-00085-W	Fort Pierce Utilities Authority	13.13	3.42	5.85	2.43
56-00142-W	Port St. Lucie Utility Systems Department, City of	30	18.33	30.08	11.75
56-00406-W	St. Lucie County Utilities	6.65	0.00	5.40	5.40
56-00614-W	St. Lucie West Services District	3.10	2.20	2.23	0.03

2045 Projected Demands at FAS Wellfields



Okeechobee Clean Energy Center (PG)

- 1.37 mgd increase UFA
- 2.07 mgd increase APPZ

St. Lucie County Utilities

- 5.4 mgd increase
 - No pumping in 2019
 - 4 mgd from North in 2045
 - 1.4 mgd from Central in 2045
 - UFA only

Port St. Lucie Utility Systems Dept.

- JEA: 0.94 mgd decrease
- Prineville: 0.27 mgd decrease
- Southwest: 12.96 mgd increase
 - 3.53 mgd from UFA, 9.43 mgd from APPZ

City of Stuart

- 2.62 mgd increase
 - No pumping in 2019
 - Mostly APPZ in 2045 (2.6 mgd APPZ, 0.02 mgd UFA)

Hobart & Oslo

- 1.93 mgd increase Hobart
- 0.7 mgd decrease Oslo
- UFA only

City of Vero Beach

- 1.67 mgd increase, UFA only

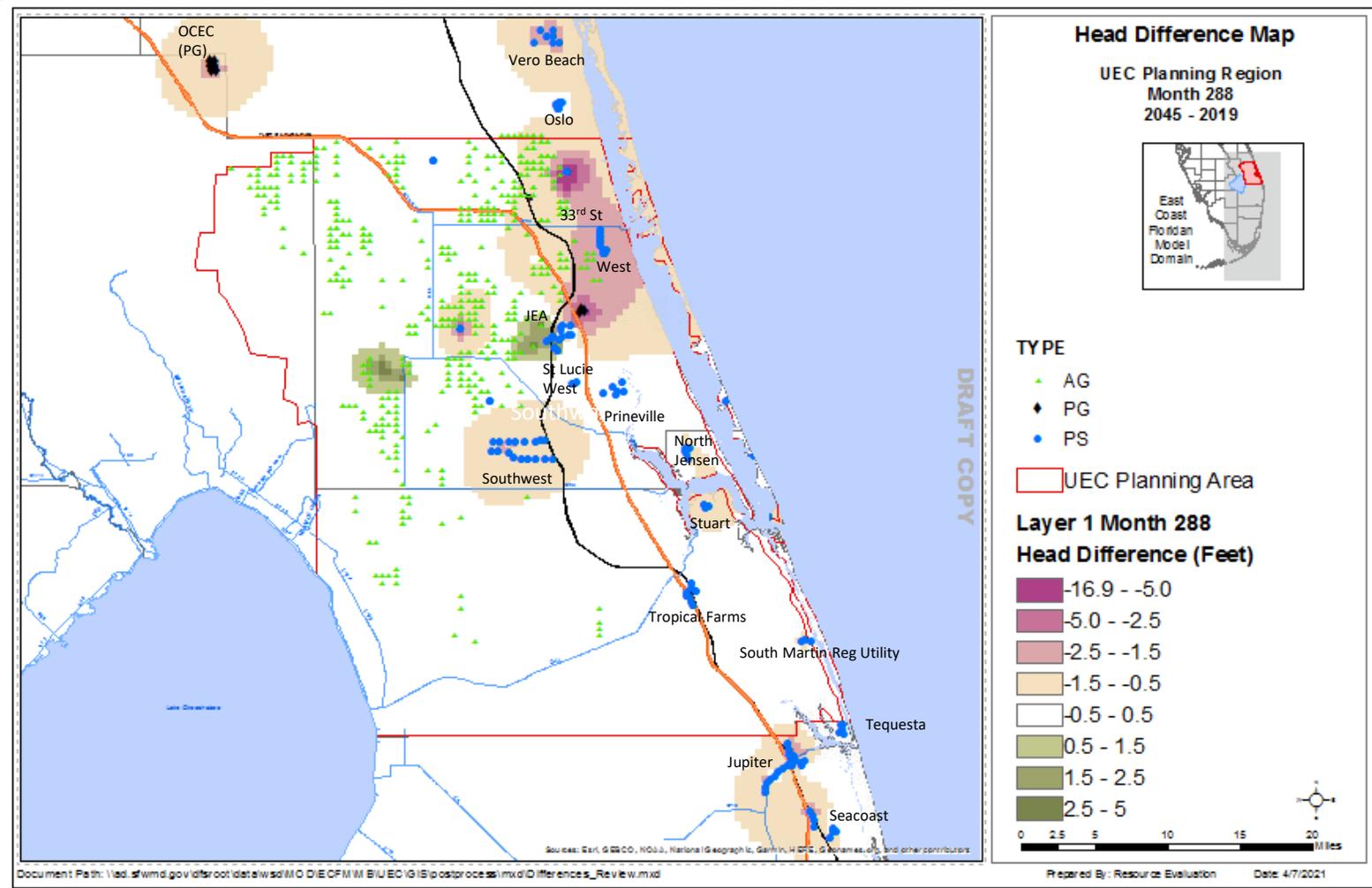
Fort Pierce Utilities Authority

- 2.43 mgd increase
 - 33rd St. UFA increase = 1.17 mgd
 - 33rd St. APPZ increase = 0.28 mgd
 - West UFA increase = 0.94 mgd
 - West APPZ increase = 0.05 mgd

Treasure Coast Energy Center (PG)

- 1.89 mgd increase, UFA only

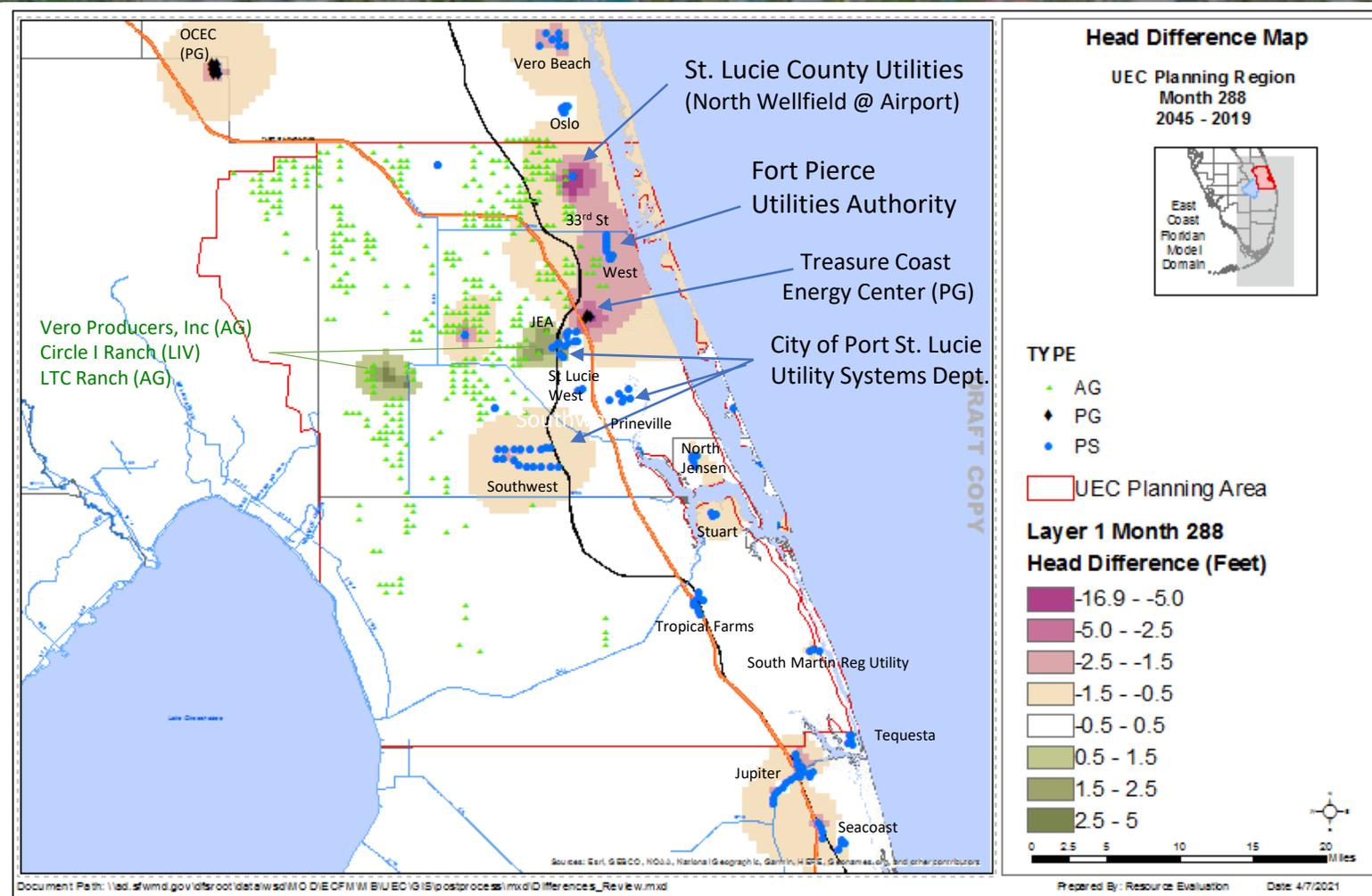
How to Read the Results



➤ Legend

- Month 288: Last month in planning scenario model runs
- Type:
 - ▲ AG = Agriculture
 - ◆ PG = Power Generation
 - PS = Public Supply
- Well symbols
- Layer (1 or 3)
- Planning area boundary
- Head difference in feet
 - 2045 head minus 2019 head

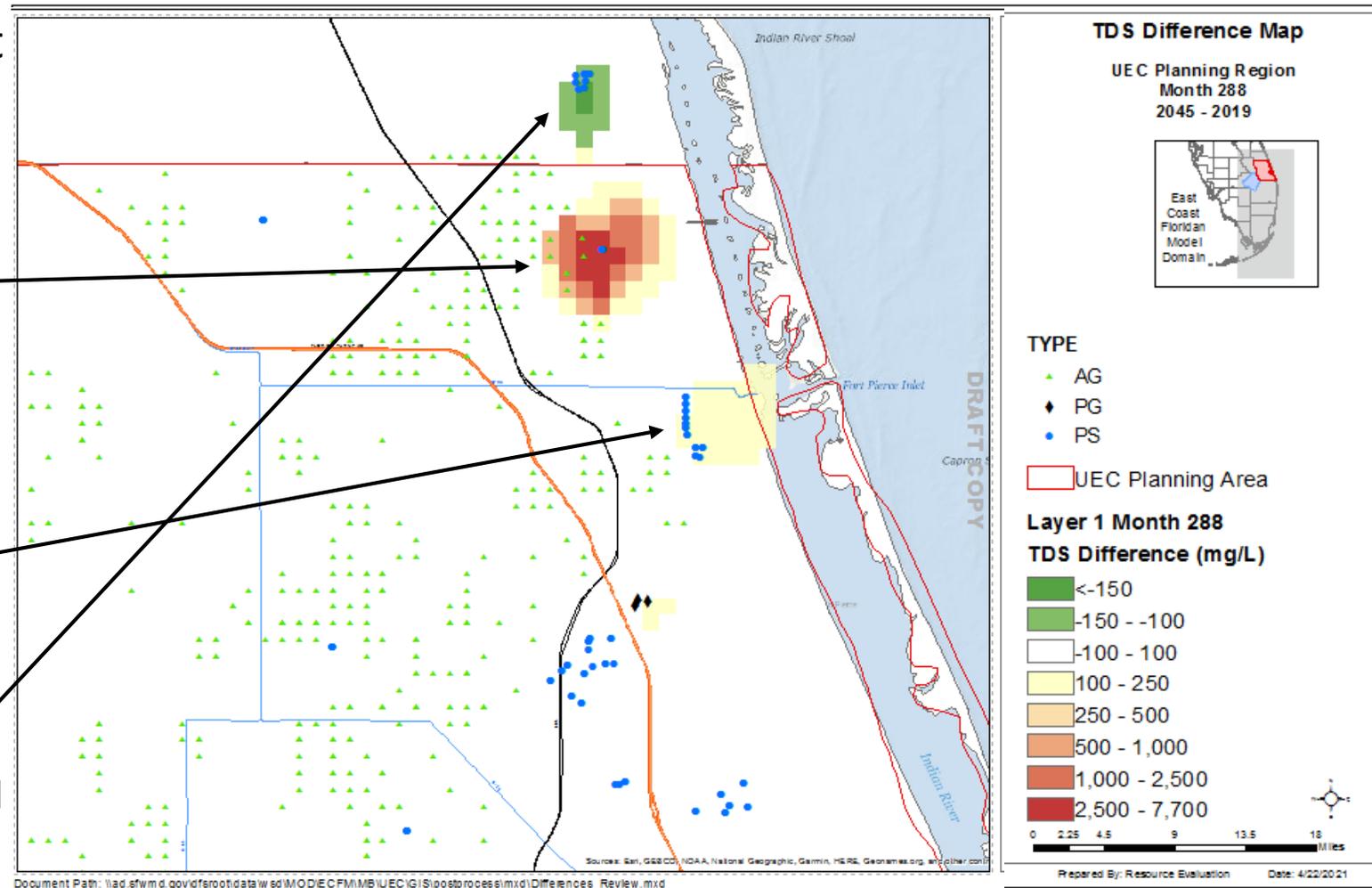
Upper Floridan Aquifer Water Level Difference (2045 - 2019)



- ~17 ft of drawdown at St. Lucie County Utilities (North Wellfield)
 - No FAS demand in 2019
 - 4 mgd in 2045
- ~6.5 ft of additional drawdown at Treasure Coast Energy Center Power Generation wells
 - 1.9 mgd increase
- Up to 3 ft of rebound at City of Port St. Lucie (JEA Wellfield)
 - 0.42 mgd decrease
 - Agricultural demand decreases may contribute

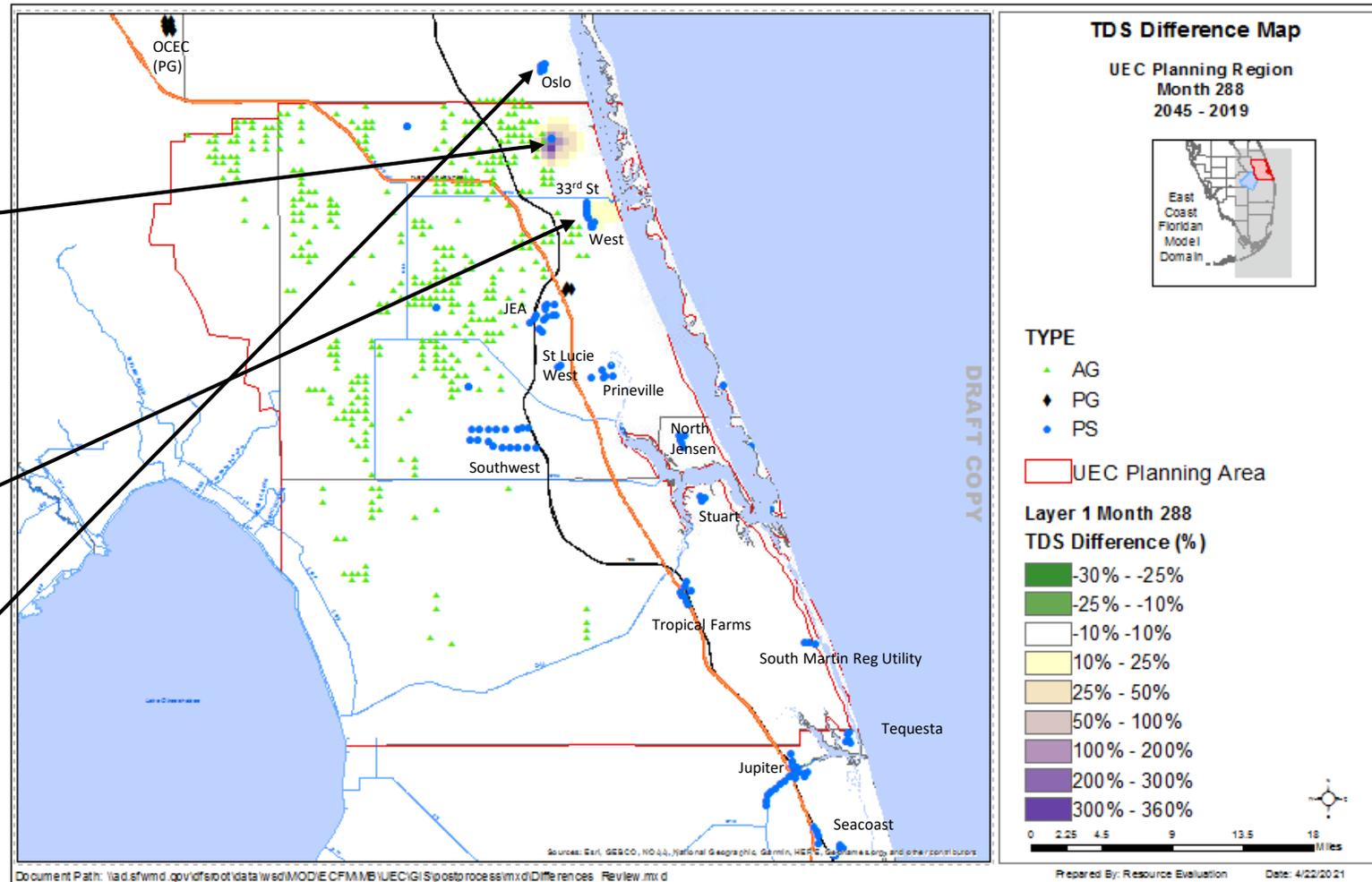
Upper Floridan Aquifer Water Quality Difference (2045 – 2019)

- TDS differences of <100 mg/L in most of the area
- Increase in TDS at St. Lucie County Utilities (North Wellfield):
 - Increase in demands 0 to 4 mgd
 - TDS increase as high as 4,800 mg/L
- Slight increase in TDS at Fort Pierce Utilities Authority
 - 33rd St. demand increase from 1.64 to 2.81 mgd
 - West demand increase from 1.32 to 2.26 mgd
- Slight decrease in TDS at Oslo Water Treatment Plant
 - Demand decreases from 6.28 to 5.58 mgd



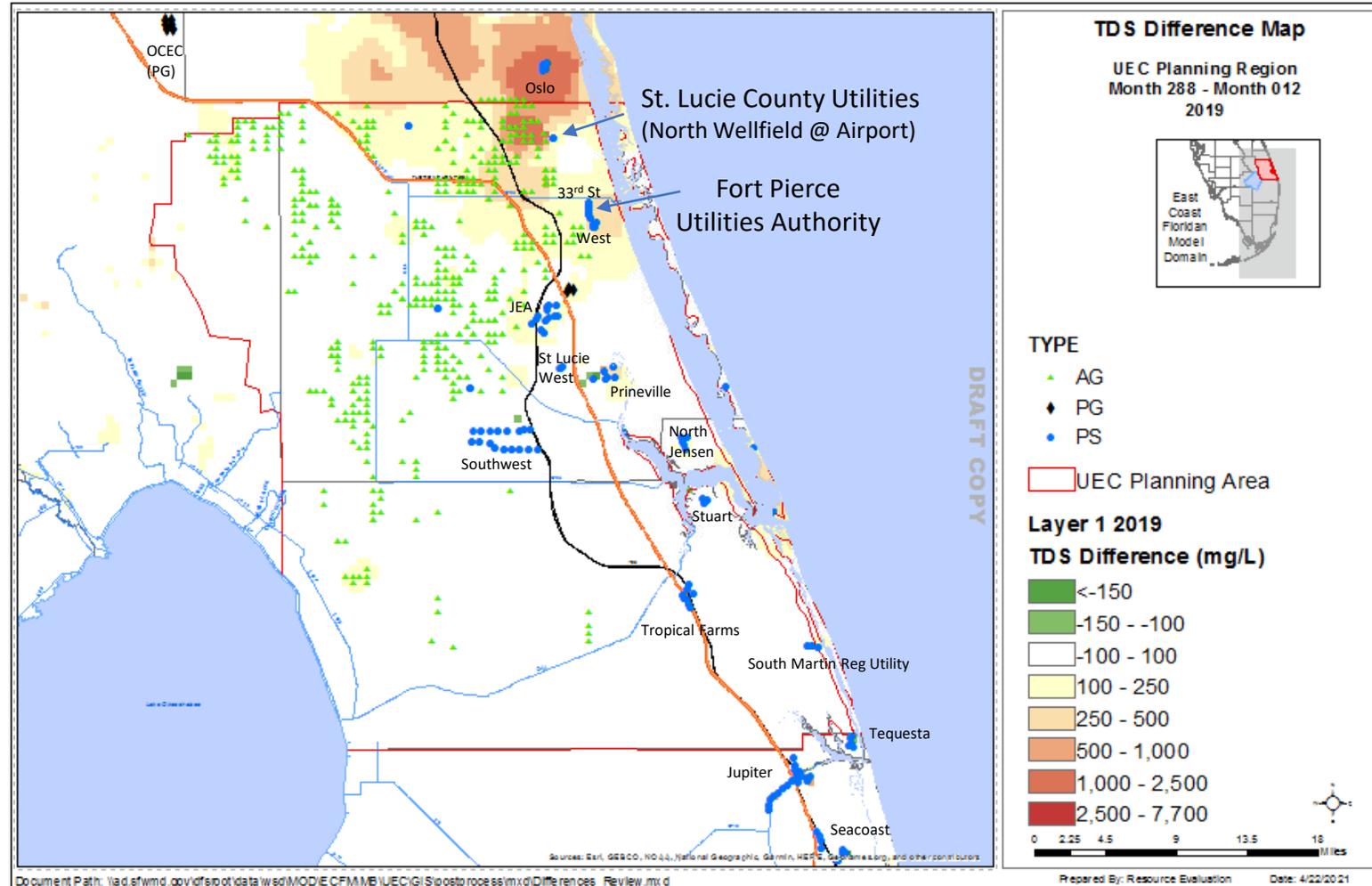
Upper Floridan Aquifer Water Quality % Difference (2045 – 2019)

- TDS % differences of <10% in most of the area
- Increase in TDS at St. Lucie County Utilities (North Wellfield) ~360%:
 - Increase in demands = 4 mgd
- Slight increase in TDS at Fort Pierce Utilities Authority ~14%
 - 33rd St. demand increase from 1.64 to 2.81 mgd
 - West demand increase from 1.32 to 2.26 mgd
- Slight decrease in TDS at Oslo Water Treatment Plant ~3%
 - Demand decreases from 6.28 to 5.58 mgd



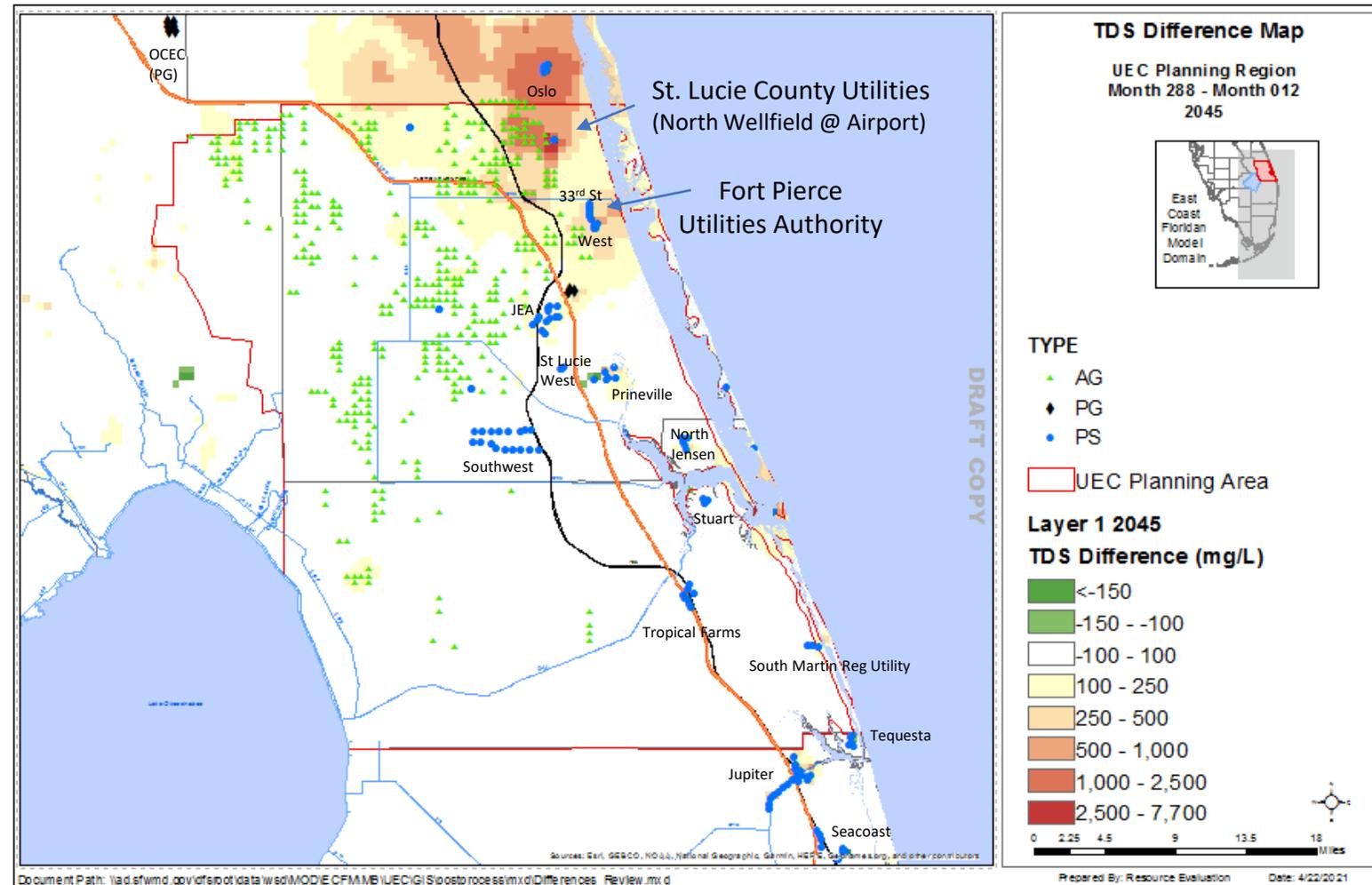
Upper Floridan Aquifer Water Quality Difference

- Difference in TDS concentrations within the ECFM **2019** scenario model run (Year 1 to 24)
- Highest TDS increase within UEC Planning Area is near St. Lucie County Utilities (North Wellfield at Airport)
 - 2,100 mg/L
 - *No pumping in 2019 at North Wellfield*
 - *Increase likely due to Oslo WTP and AG demands in 2019*



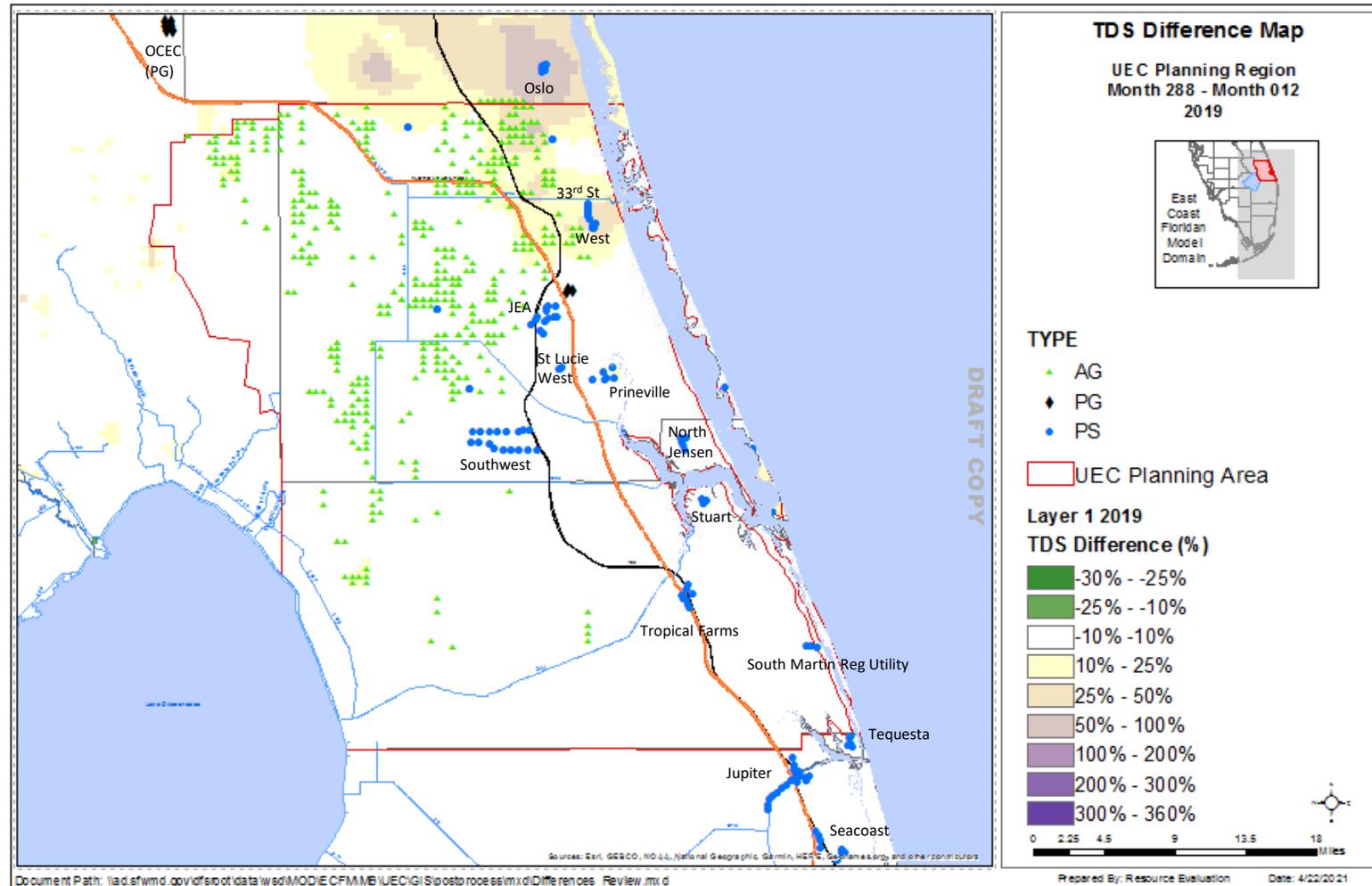
Upper Floridan Aquifer Water Quality Difference

- Difference in TDS concentrations within the ECFM **2045** scenario model run (Year 1 to 24)
- Highest TDS increase within UEC Planning Area is at St. Lucie County (North Wellfield at Airport)
 - 4,600 mg/L
 - *North Wellfield demand = 4 mgd in 2045*



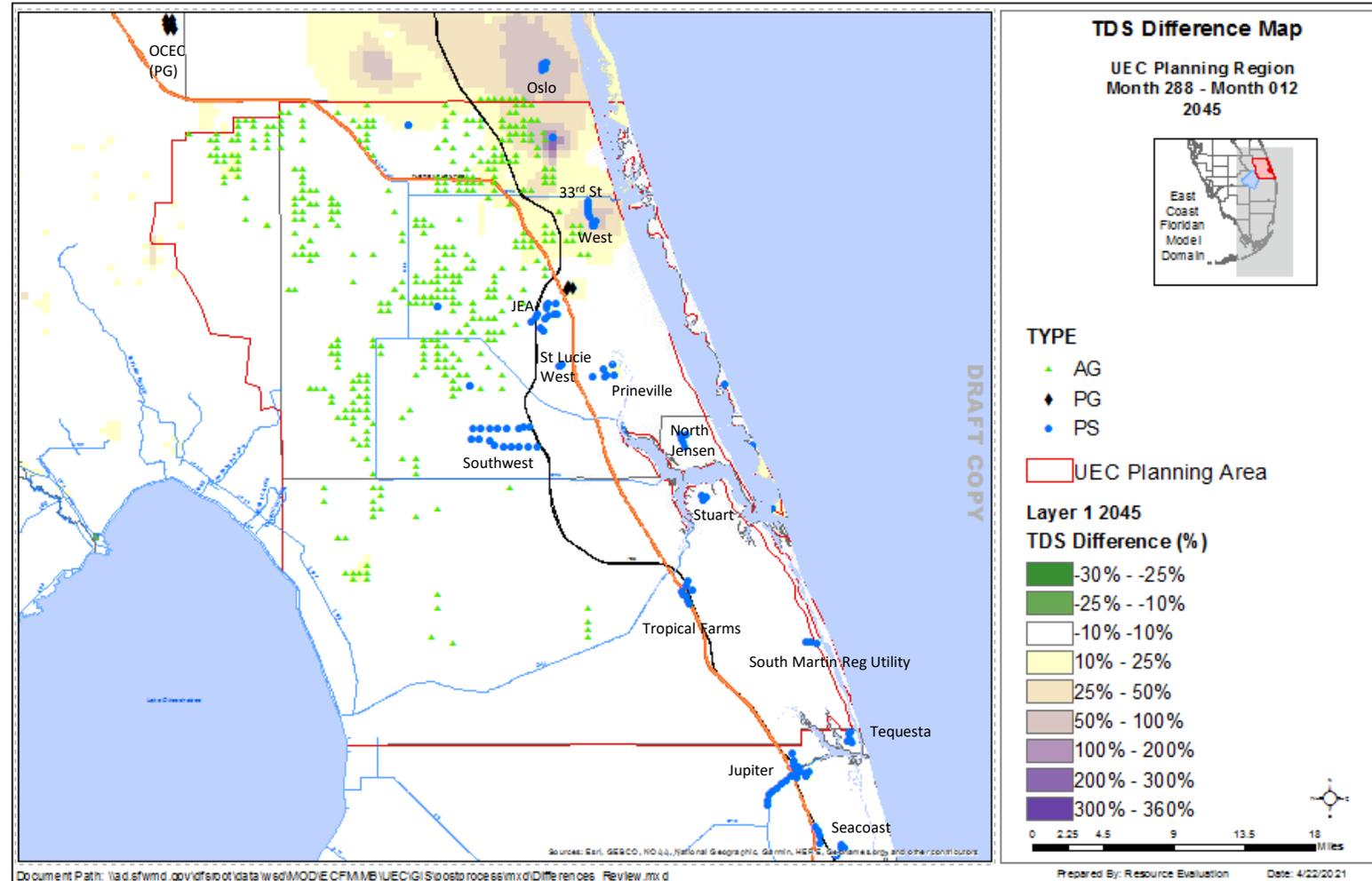
Upper Floridan Aquifer Water Quality Difference

- % difference in TDS concentrations within the ECFM **2019** scenario model run (Year 1 to 24)
- Highest TDS % increase within UEC Planning Area is near St. Lucie County Utilities (North Wellfield at Airport): **53%**
 - *No pumping in 2019 at North Wellfield*
 - *Increase likely due to Oslo WTP and AG demands in 2019*

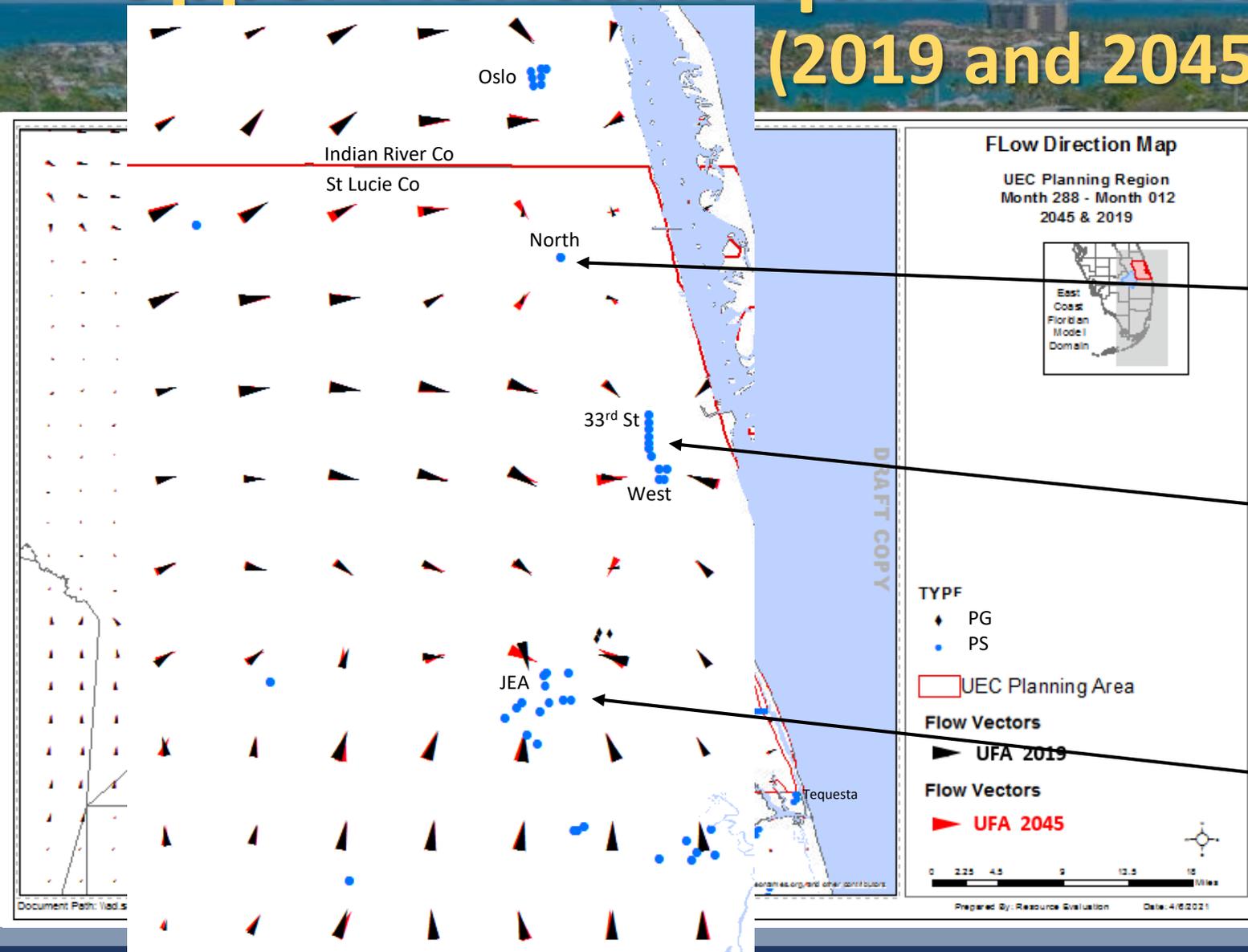


Upper Floridan Aquifer Water Quality Difference

- % difference in TDS concentrations within the ECFM **2045** scenario model run (Year 1 to 24)
- Highest TDS % increase within UEC Planning Area is at St. Lucie County Utilities (North Wellfield at Airport): **291%**
 - *North Wellfield demand = 4 mgd in 2045*



Upper Floridan Aquifer Horizontal Flow Vectors (2019 and 2045)

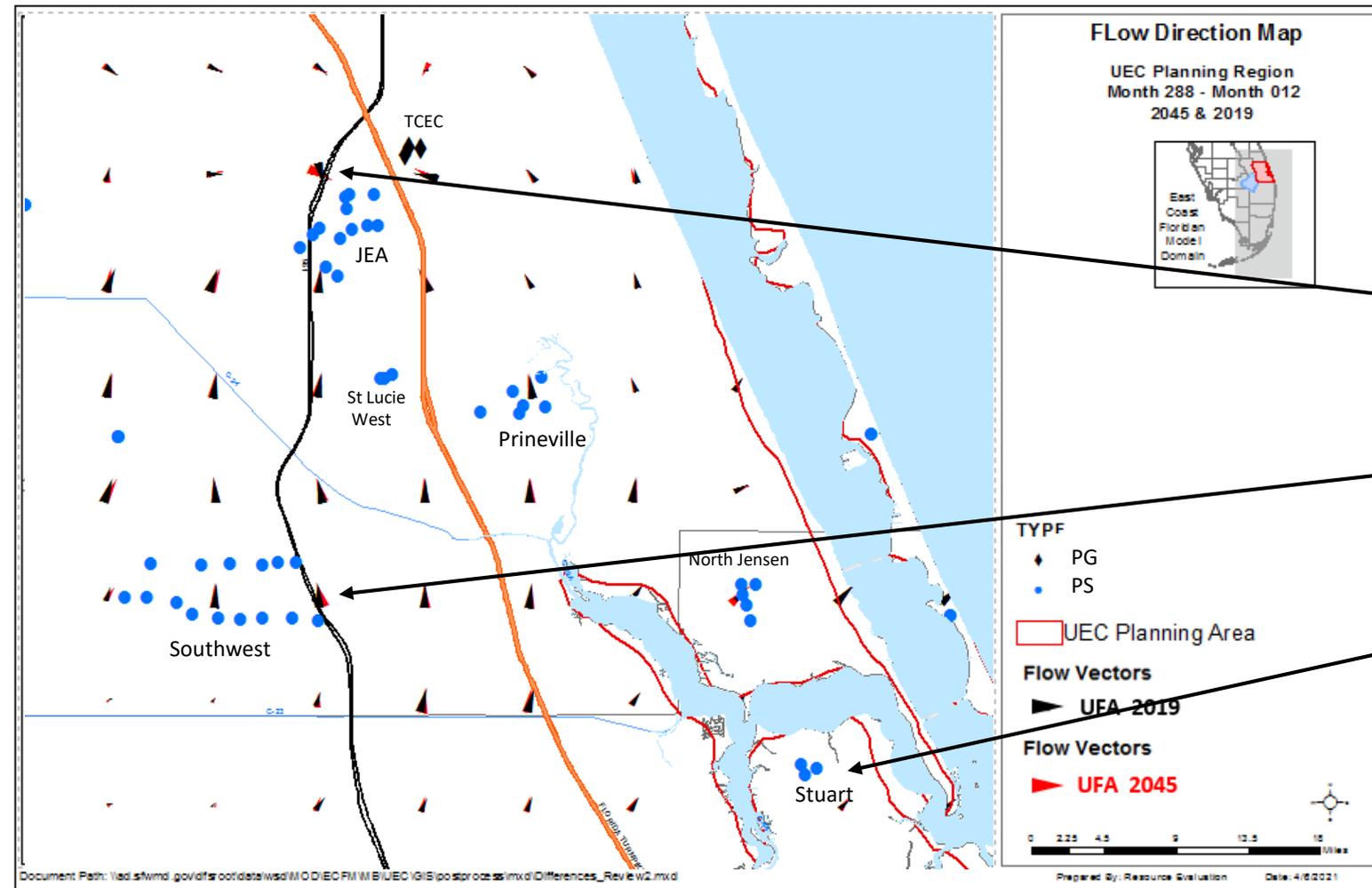


- Differences in flow direction and magnitude can be seen at:
 - St. Lucie County Utilities (North Wellfield)
 - Increase in horizontal flow from the western area
 - Demand increases from 0 to 4 mgd
 - Fort Pierce Utilities Authority
 - Increase in horizontal flow from the western area
 - Lateral saltwater intrusion
 - 33rd St. demand increases from 1.64 to 2.81 mgd
 - West demand increases from 1.32 to 2.26 mgd
 - City of Port St. Lucie Utility Systems Department (JEA Wellfield)
 - Change in horizontal flow from the surrounding area
 - Slight demand decrease of 0.4 mgd

Vectors represent horizontal flow averaged over 25 model cells

Upper Floridan Aquifer Horizontal Flow Vectors (2019 and 2045)

Oslo

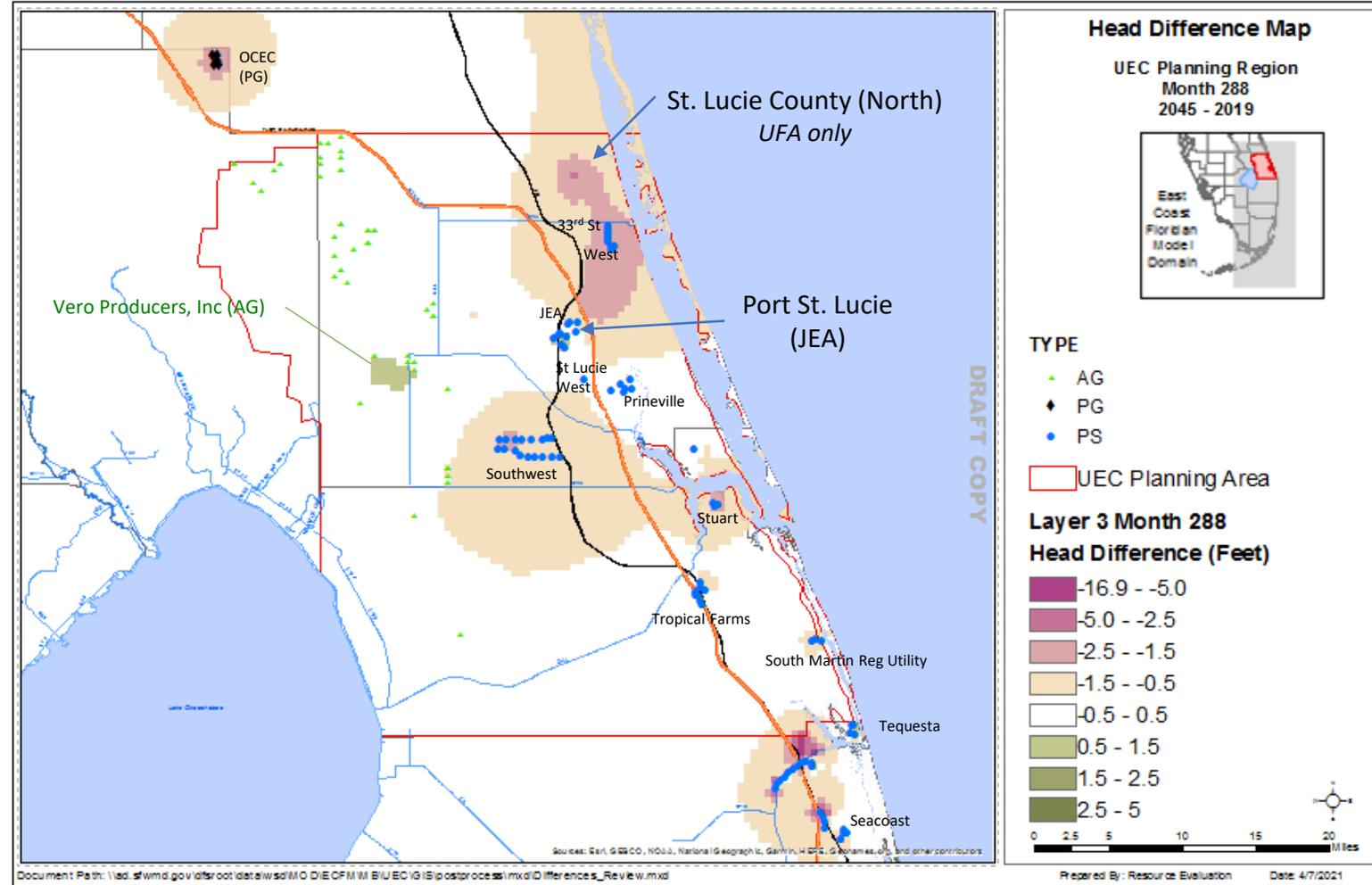


➤ Differences in flow direction and magnitude can be seen at:

- City of Port St. Lucie Utility Systems Department (JEA Wellfield)
 - Change in horizontal flow from the surrounding area
 - Slight demand decrease of 0.4 mgd
- City of Port St. Lucie Utility Systems Department (Southwest Wellfield)
 - Slight change in horizontal flow
 - UFA demand increase of 3.53 mgd
- City of Stuart
 - No noticeable change in UFA flow

Vectors represent horizontal flow averaged over 25 model cells

Avon Park Permeable Zone Water Level Difference (2045 – 2019)



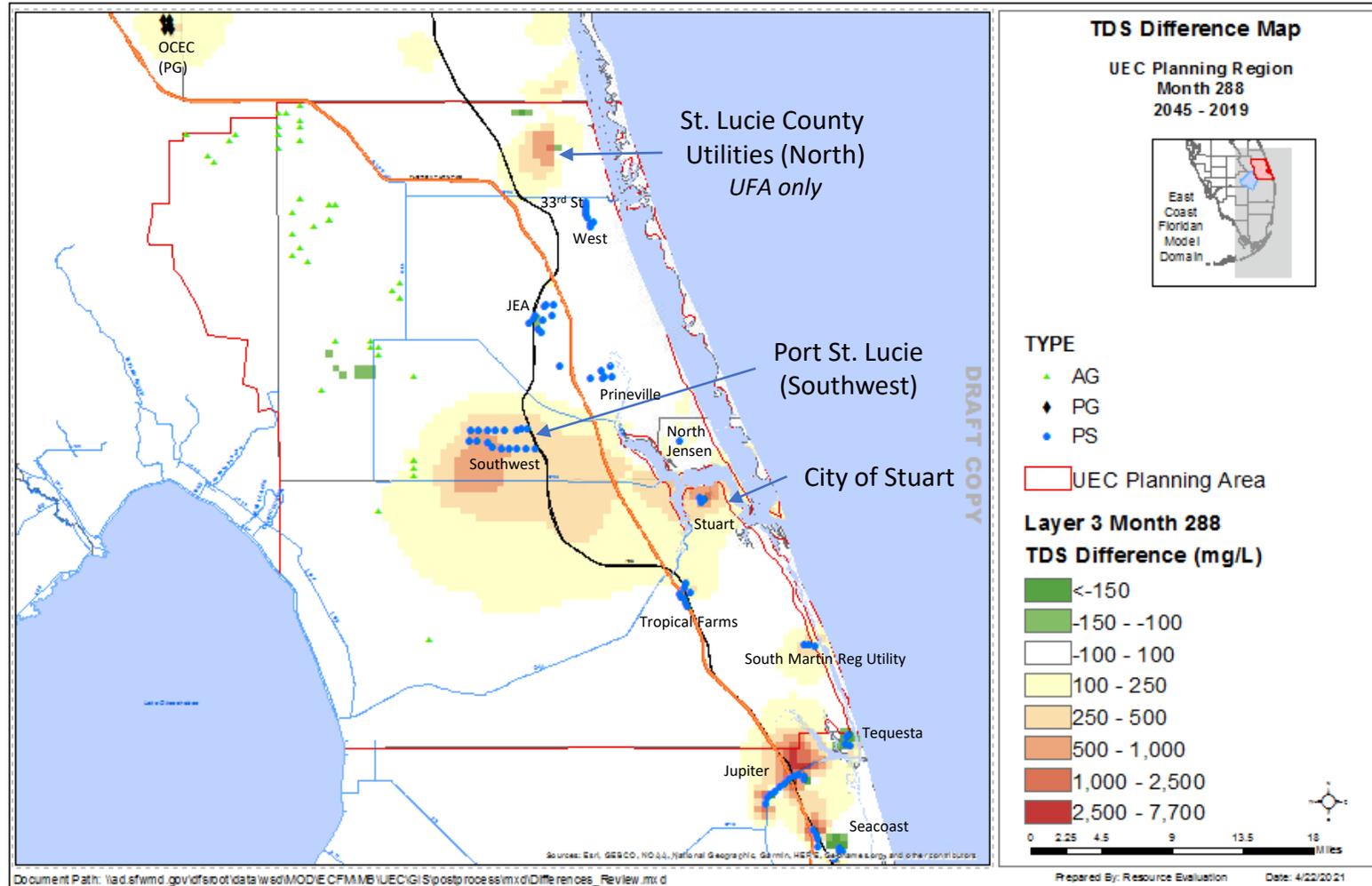
- Up to 3 ft of drawdown at St. Lucie County Utilities (North Wellfield)
 - 4 mgd UFA demand
- Approximately 2 ft of rebound at City of Port St. Lucie Utility Systems Department (JEA Wellfield)
 - 0.52 mgd decrease
- Approximately 1 ft of rebound in western St. Lucie County due to agricultural demand reduction

Avon Park Permeable Zone Water Quality Difference (2045 – 2019)

- St. Lucie County Utilities (North Wellfield)
 - No wells in the APPZ
 - TDS increases as high as 1,000 mg/L

- City of Port St. Lucie Utility Systems Department (Southwest Wellfield)
 - Increase in TDS as high as 700 mg/L
 - 2019 demand = 0 mgd
 - 2045 demand = 9.43 mgd

- City of Stuart
 - Increase in TDS as high as 1,040 mg/L
 - 2.6 mgd APPZ demand in 2045



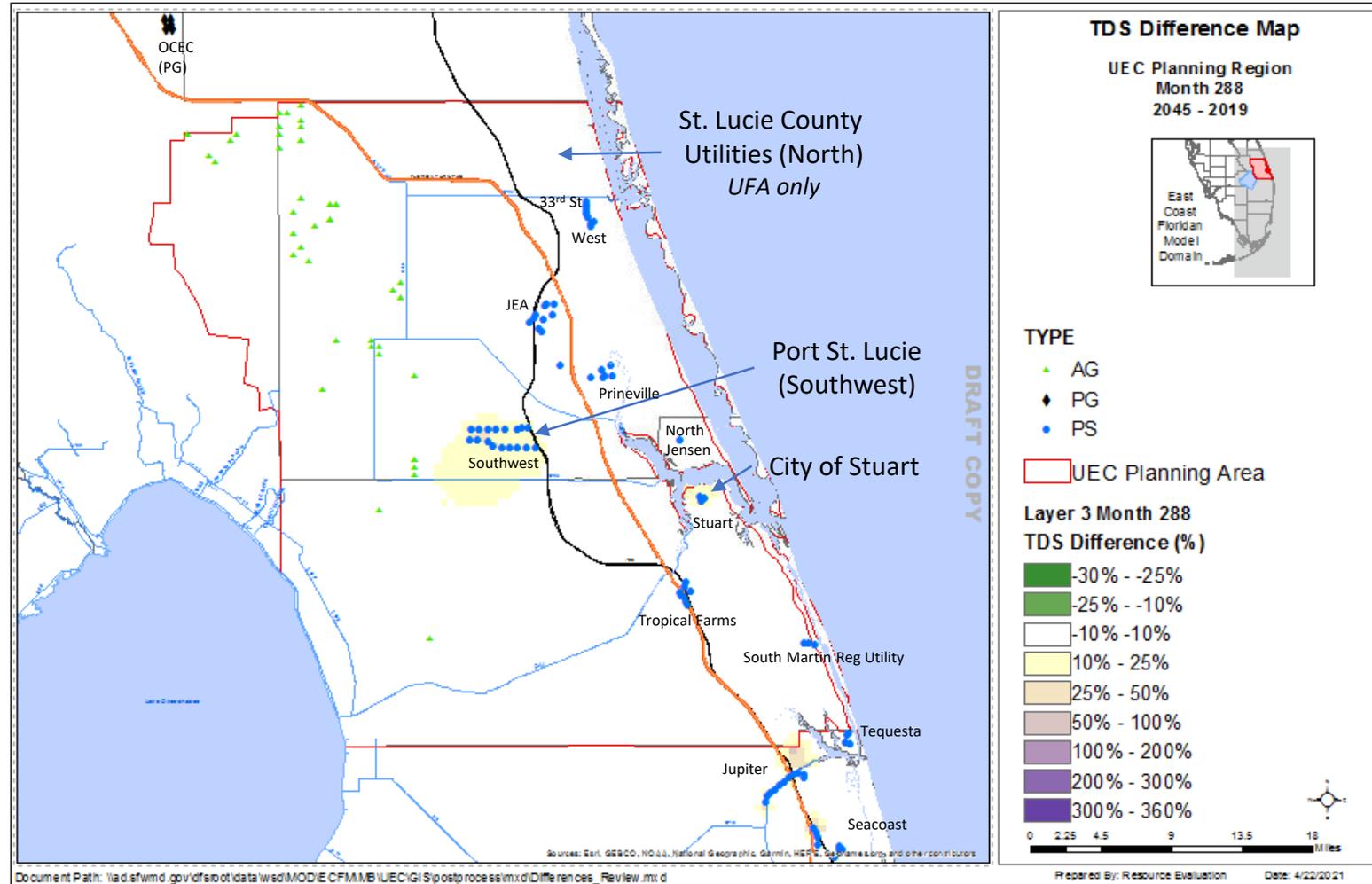
Avon Park Permeable Zone

Water Quality % Difference (2045 – 2019)

- St. Lucie County Utilities (North Wellfield)
 - No wells in the APPZ
 - TDS increases ~5%

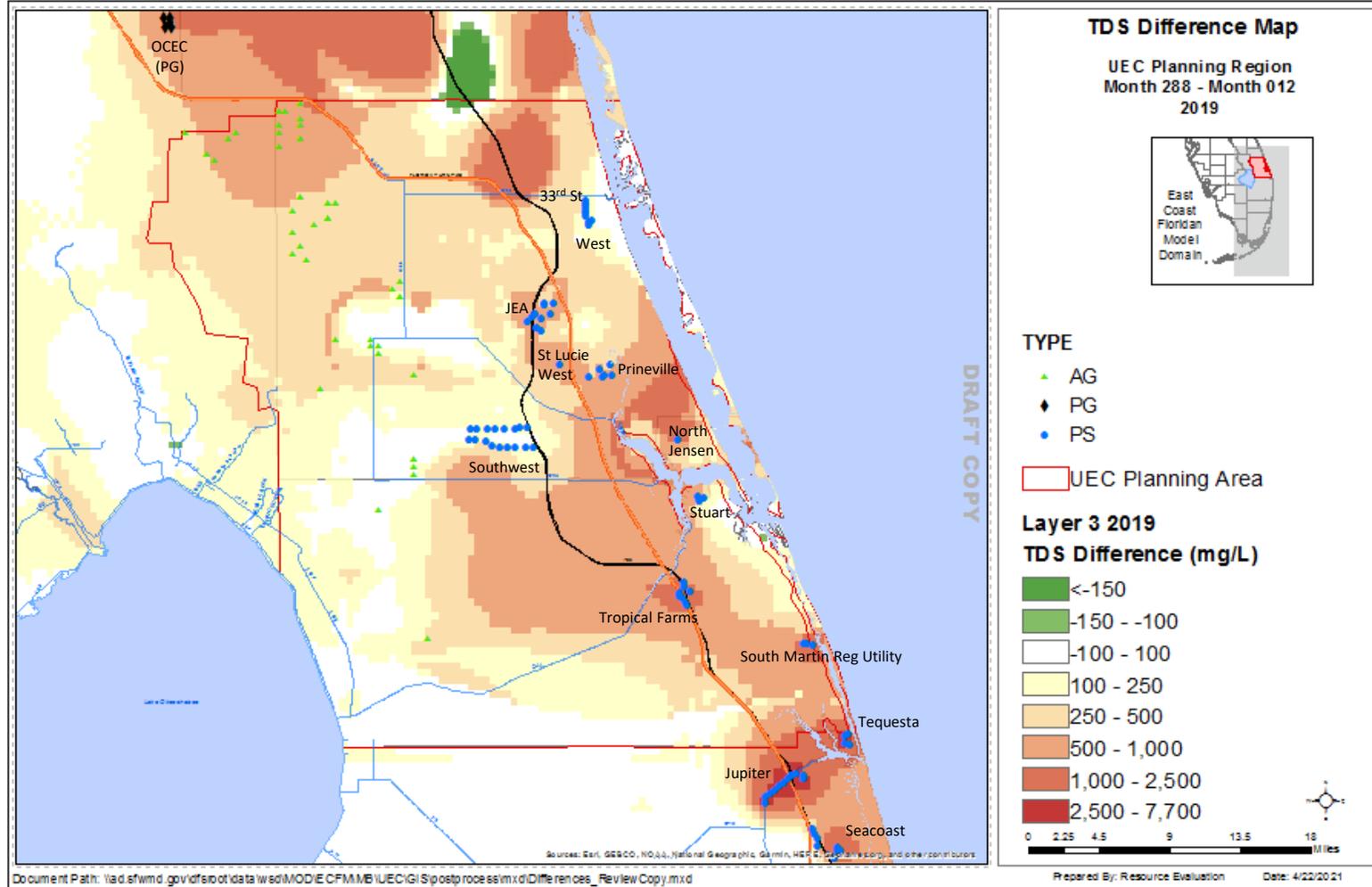
- City of Port St. Lucie Utility Systems Department (Southwest Wellfield)
 - Increase in TDS ~30%
 - 2019 demand = 0 mgd
 - 2045 demand = 9.43 mgd

- City of Stuart
 - Increase in TDS ~21%
 - 2.6 mgd APPZ demand in 2045



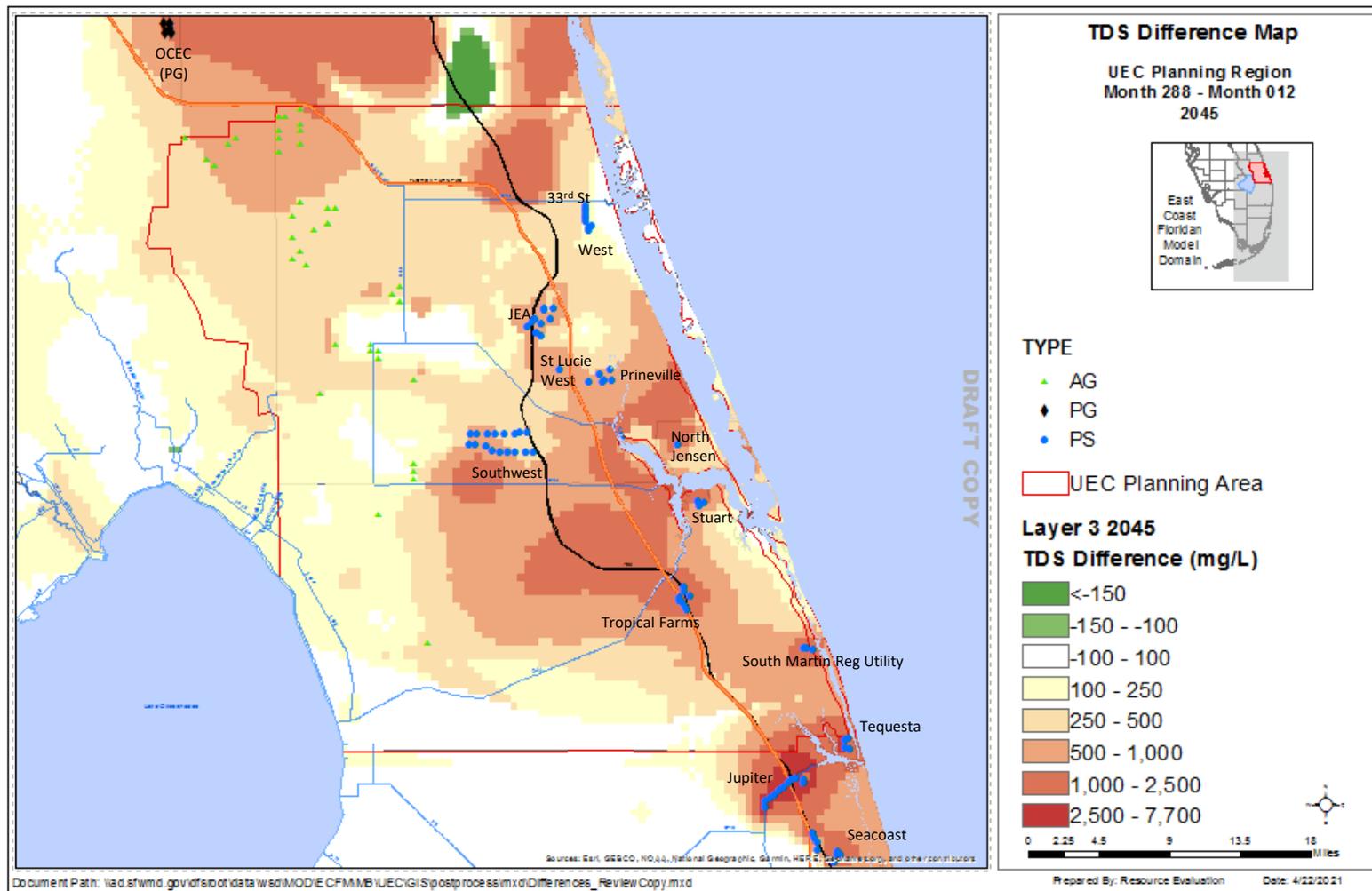
Avon Park Permeable Zone Water Quality Difference in 2019

➤ Difference in TDS concentrations within the ECFM **2019** scenario model run (Year 1 to 24)



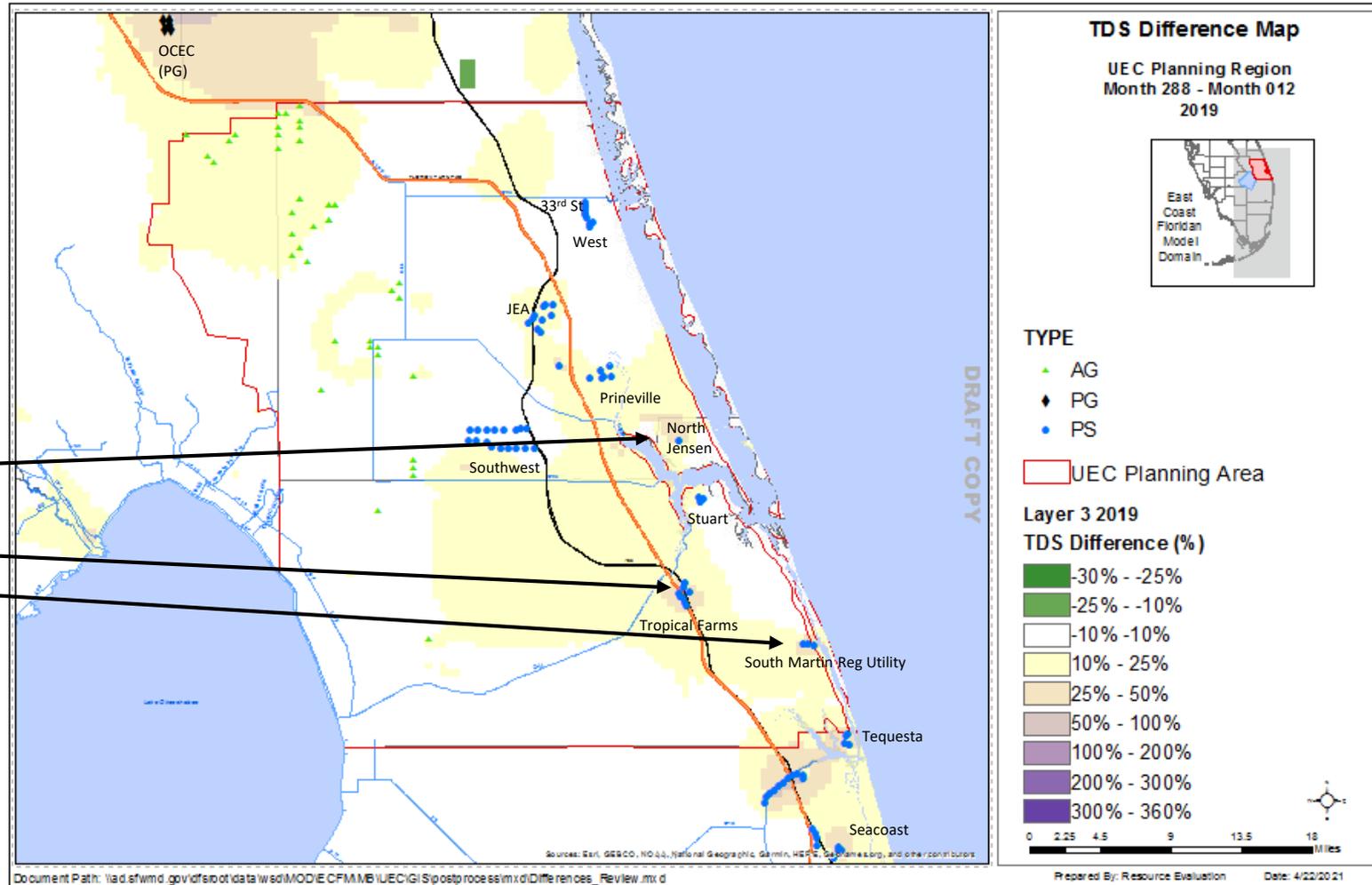
Avon Park Permeable Zone Water Quality Difference in 2045

- Difference in TDS concentrations within the ECFM **2045** scenario model run (Year 1 to 24)



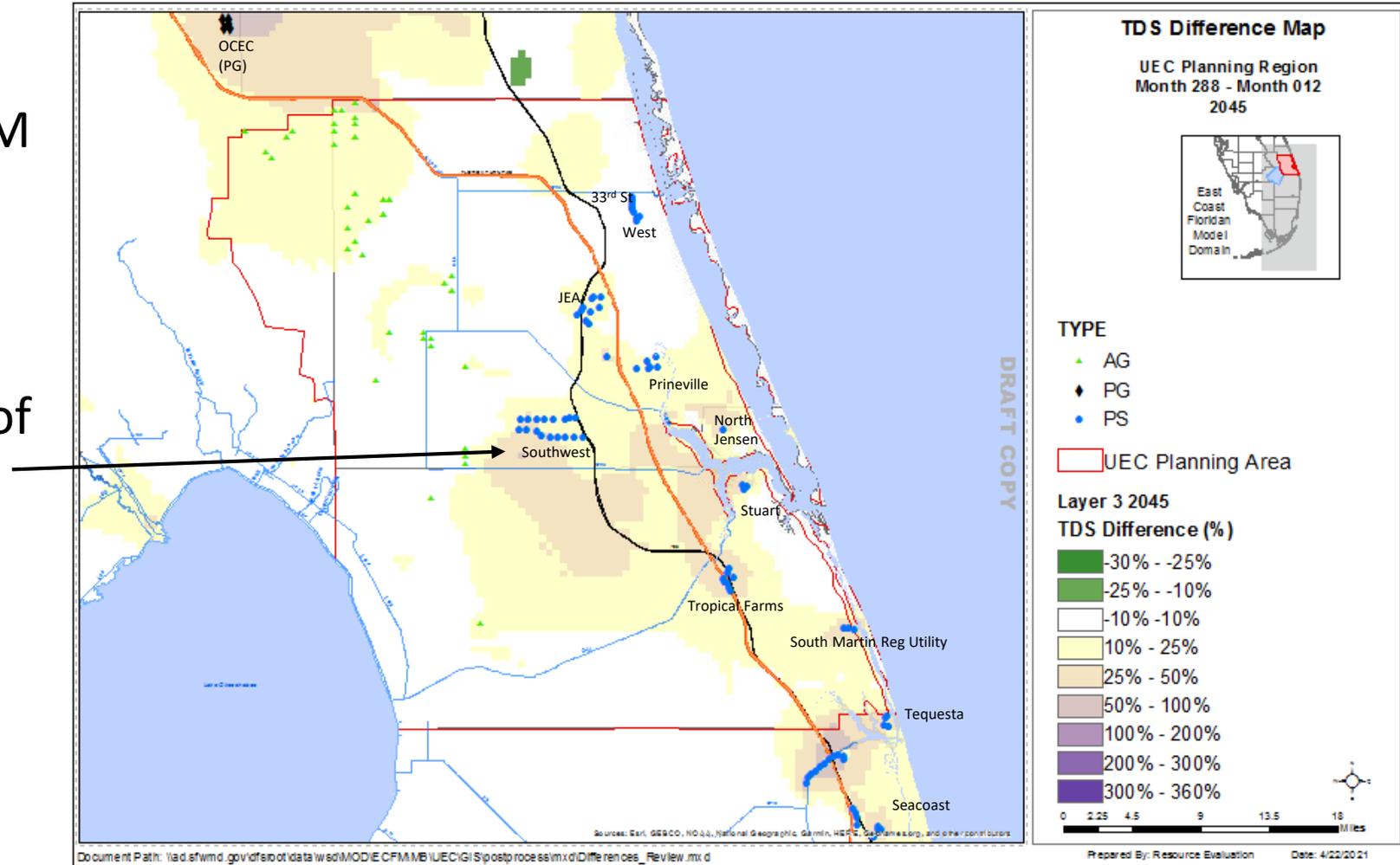
Avon Park Permeable Zone Water Quality % Difference in 2019

- % difference in TDS concentrations within the ECFM **2019** scenario model run (Year 1 to 24)
- % increase in TDS concentration within the UEC Planning Area ~30% at:
 - *North Jensen*
 - *Tropical Farms*
 - *South Martin Regional Utility*

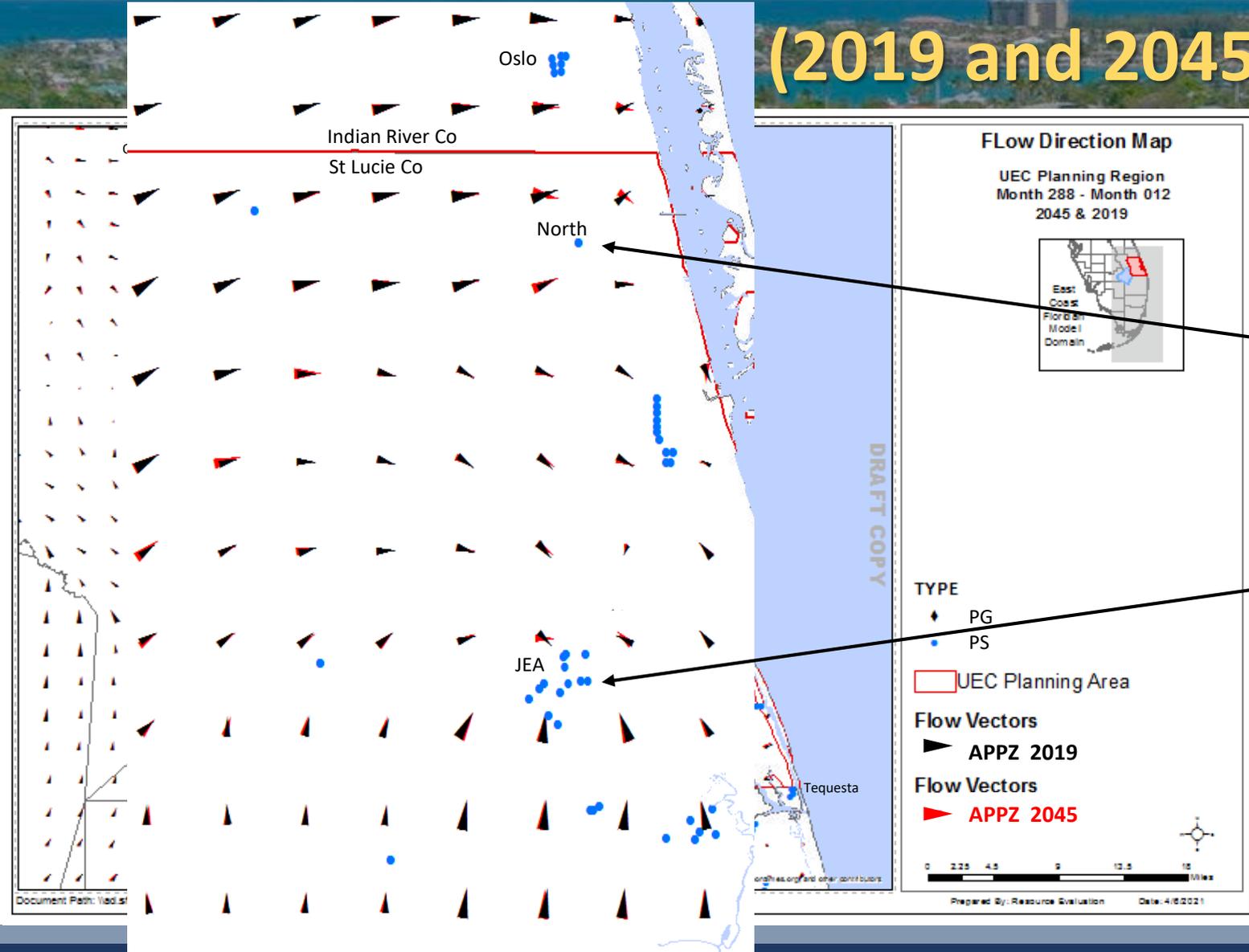


Avon Park Permeable Zone Water Quality % Difference in 2045

- % difference in TDS concentrations within the ECFM **2045** scenario model run (Year 1 to 24)
- Highest % increase in TDS concentration within the UEC Planning Area ~50% near City of Port St. Lucie's Southwest Wellfield
 - *2045 demand = 9.43 mgd*



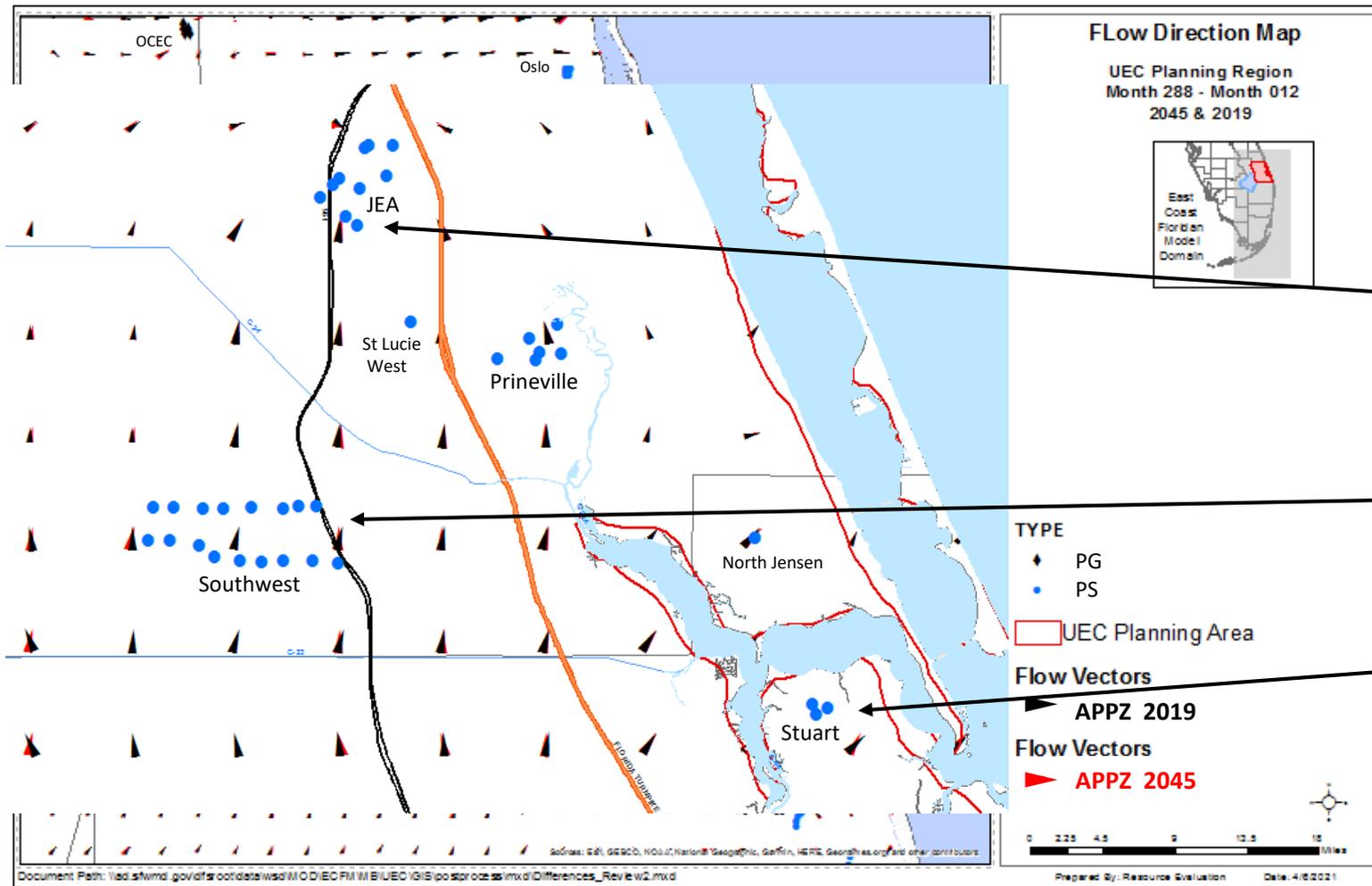
Avon Park Permeable Zone Horizontal Flow Vectors (2019 and 2045)



- Differences in flow direction and magnitude can be seen at:
 - St. Lucie County Utilities (North Wellfield – pumping from UFA)
 - Increase in horizontal flow from the western area
 - City of Port St. Lucie Utility Systems Dept. (JEA Wellfield)
 - Slight increase in horizontal flow from the surrounding area *plus slight turn away*
 - 0.5 mgd decrease in APPZ demand

Vectors represent horizontal flow averaged over 25 model cells

Avon Park Permeable Zone Horizontal Flow Vectors (2019 and 2045)



- Differences in flow direction and magnitude can be seen at:
 - City of Port St. Lucie Utility Systems Department (JEA Wellfield)
 - Slight increase in horizontal flow from the surrounding area
 - ~0.5 mgd decrease in APPZ demand
 - City of Port St. Lucie Utility Systems Department (Southwest Wellfield)
 - Only slight change in horizontal flow despite 9.43 mgd increase in APPZ demand
 - City of Stuart
 - Slight change in flow direction towards the wellfield
 - 2.6 mgd from the APPZ in 2045

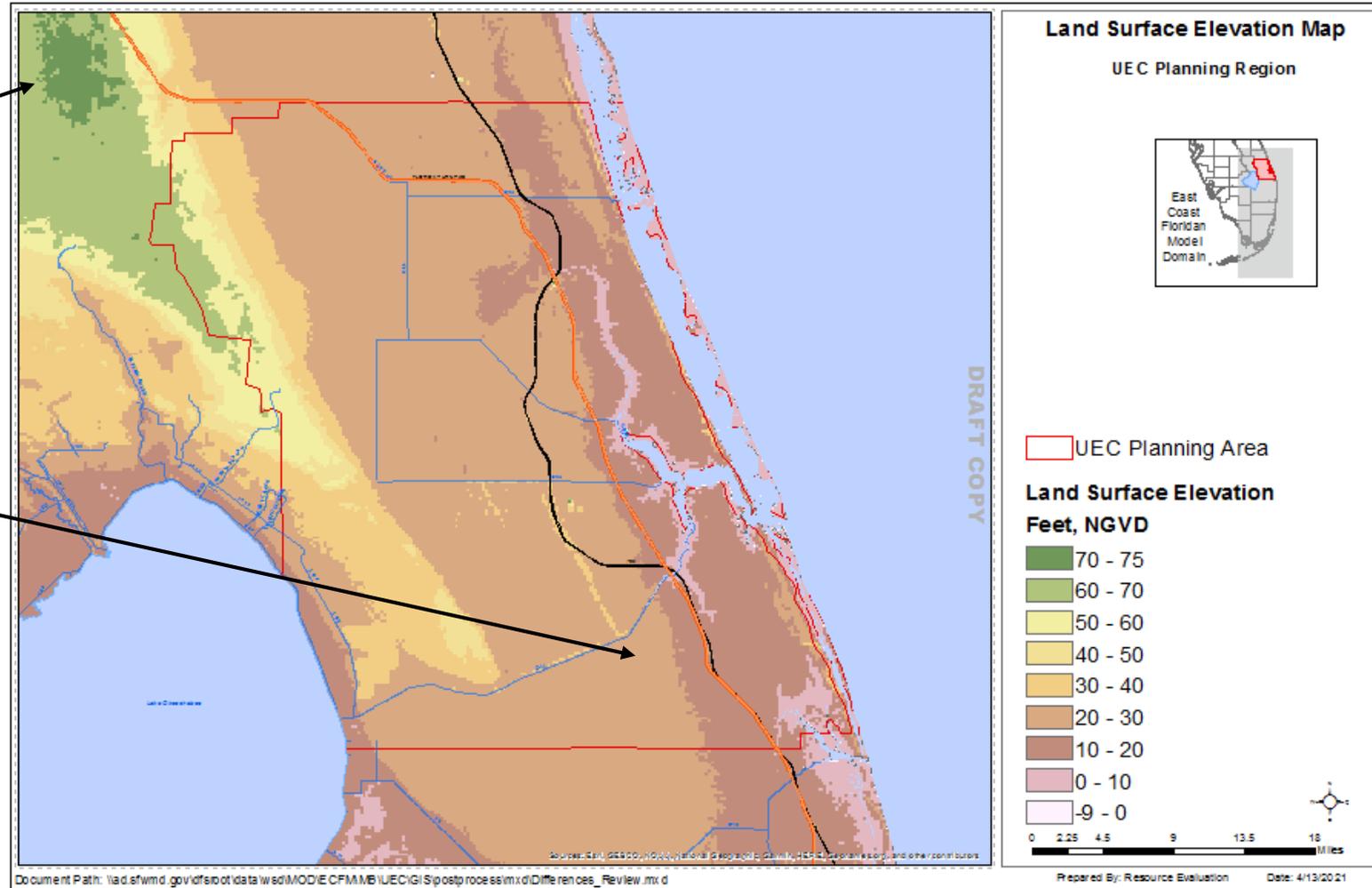
Vectors represent horizontal flow averaged over 25 model cells

An aerial photograph of a coastal resort area. In the foreground, there is a sandy beach and a small pier extending into the turquoise water. Behind the beach, several large, multi-story resort buildings with balconies are visible, interspersed with green lawns and palm trees. In the background, the ocean stretches to the horizon under a clear blue sky. The text "Artesian Head Relative to the Upper Floridan Aquifer" is overlaid in large, bold, yellow letters on a semi-transparent dark blue rectangular background.

Artesian Head Relative to the Upper Floridan Aquifer

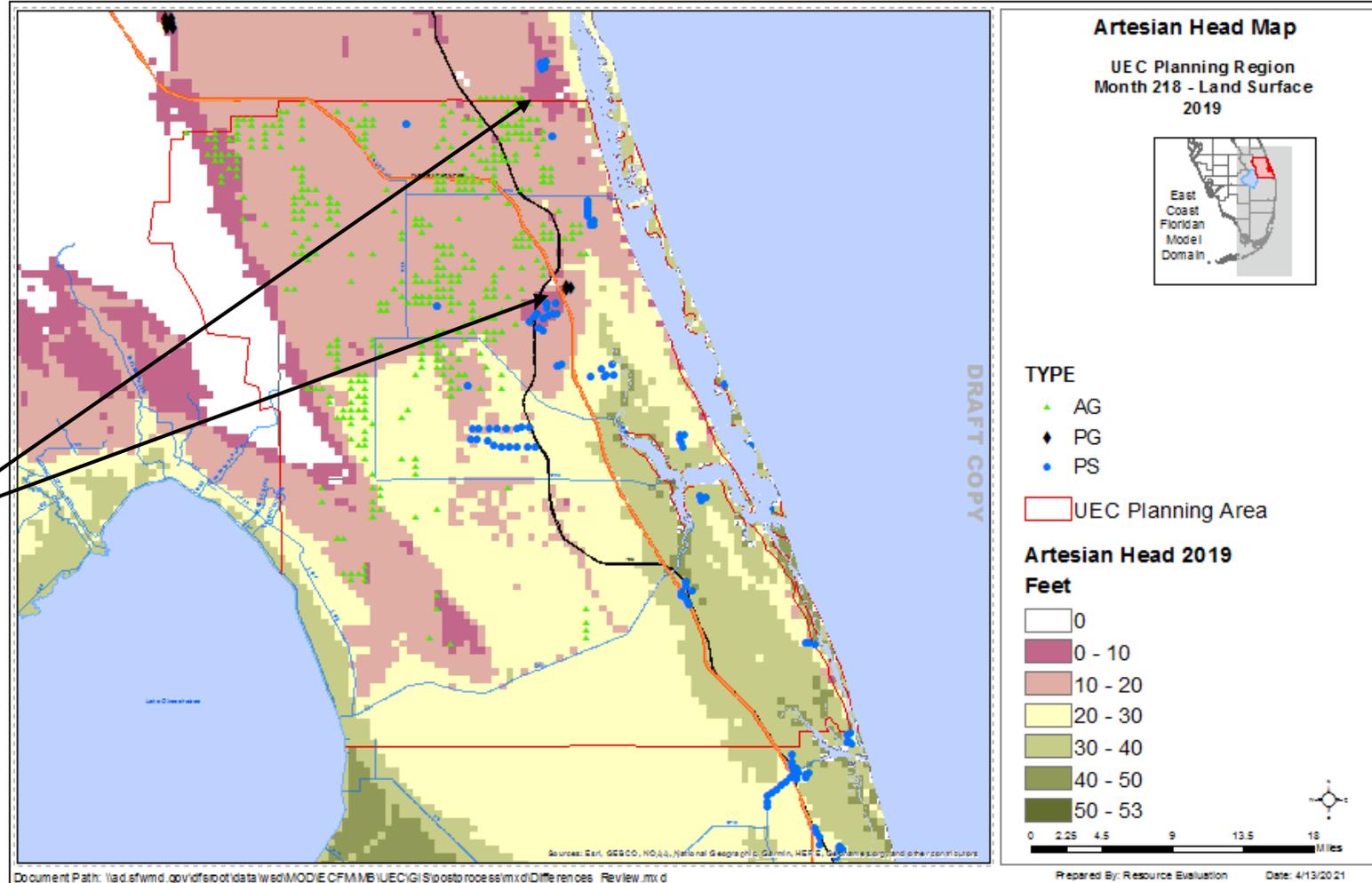
Land Surface Elevation

- Green shows ridge area with higher elevations
- Elevations decrease to the east and southeast



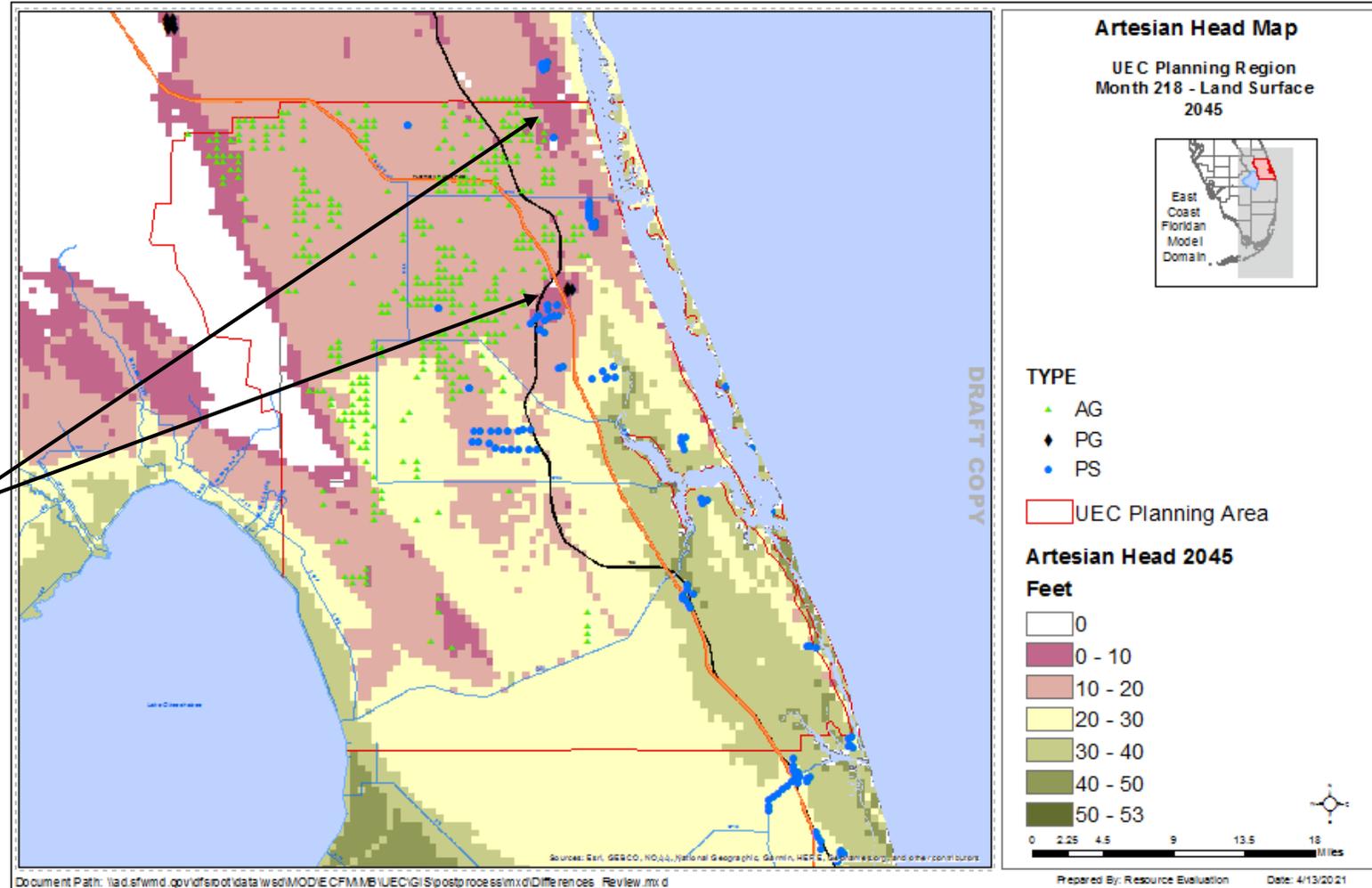
Upper Floridan Artesian Head 2019

- Simulated UFA head (month 218) minus land surface elevation
- Month 218 (February 2007) = dry month (1-in-10 drought condition)
- Lower artesian heads in areas of PS pumping



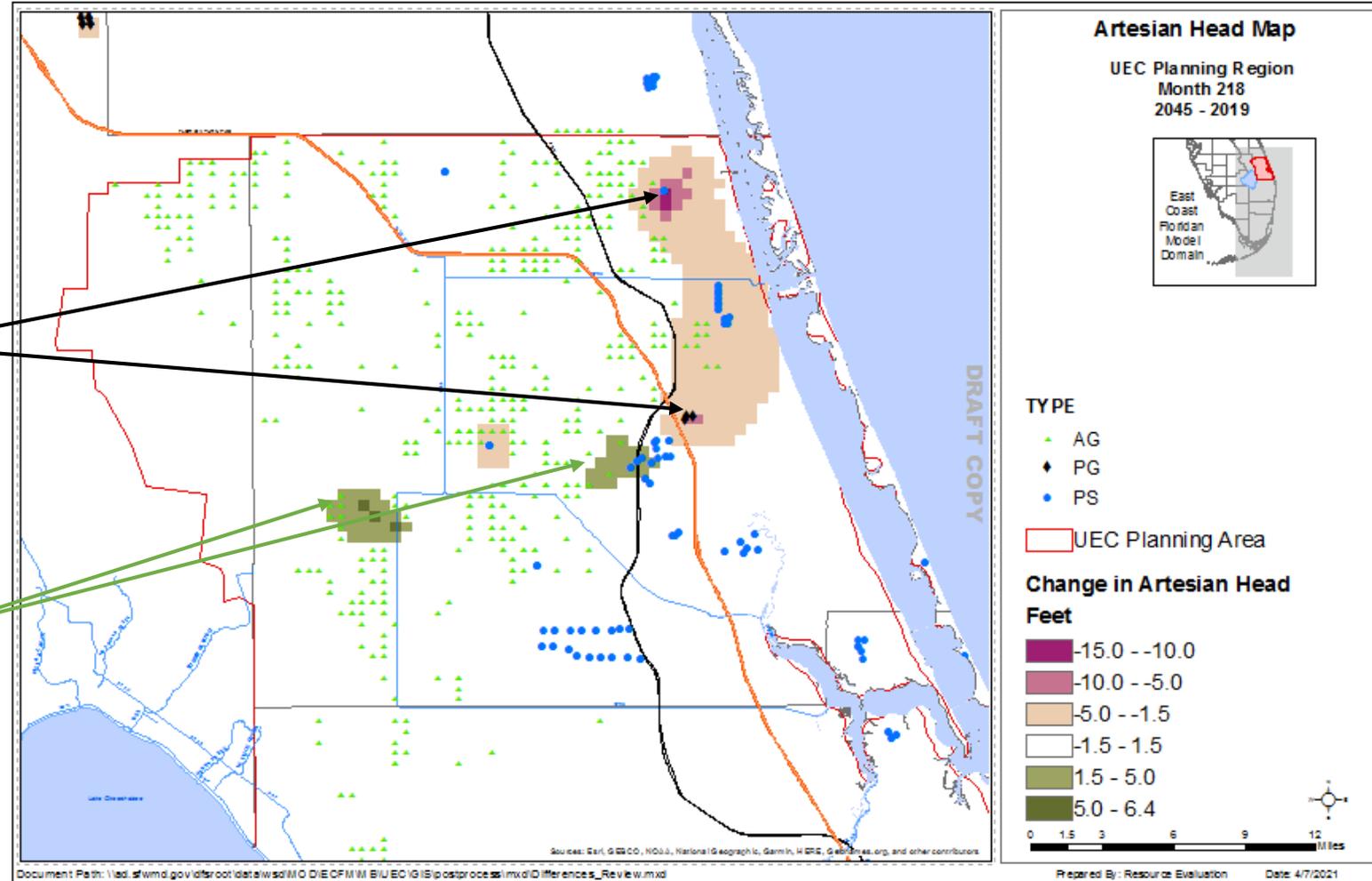
Upper Floridan Artesian Head 2045

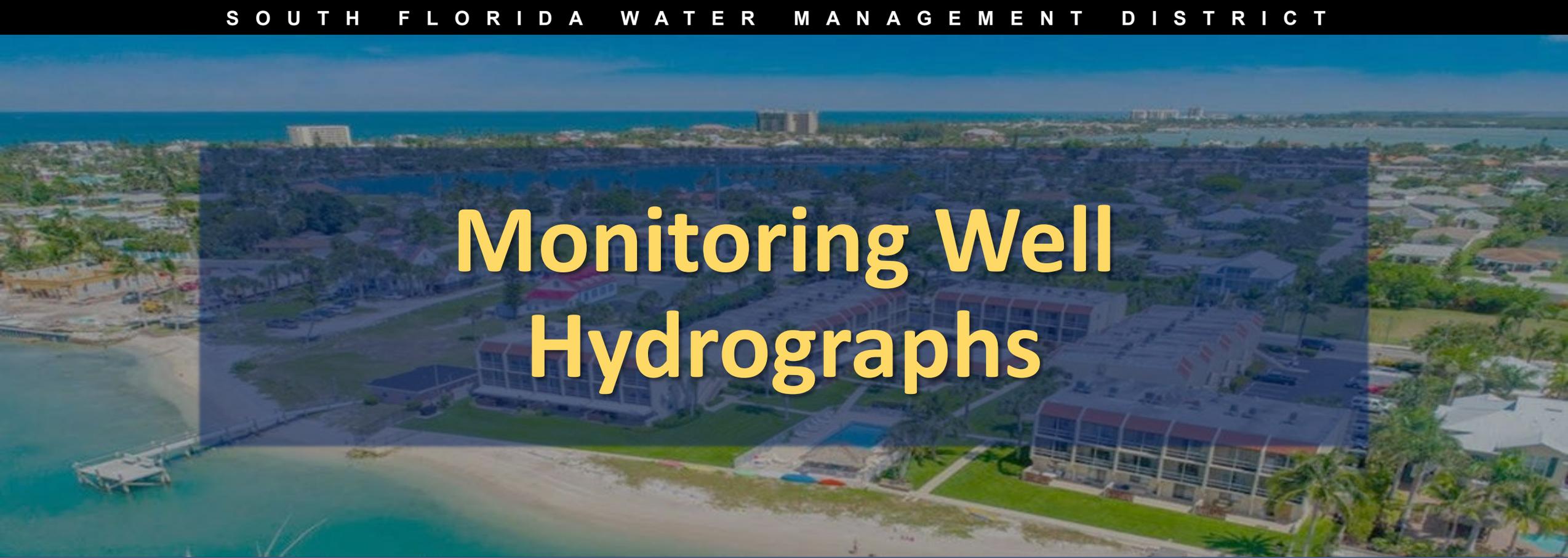
- Simulated UFA head (month 218) minus land surface elevation
- Month 218 (February 2007) = dry month (1-in-10 drought condition)
- Lower artesian heads in areas of PS/PG pumping



Change in Upper Floridan Artesian Head (2045 minus 2019)

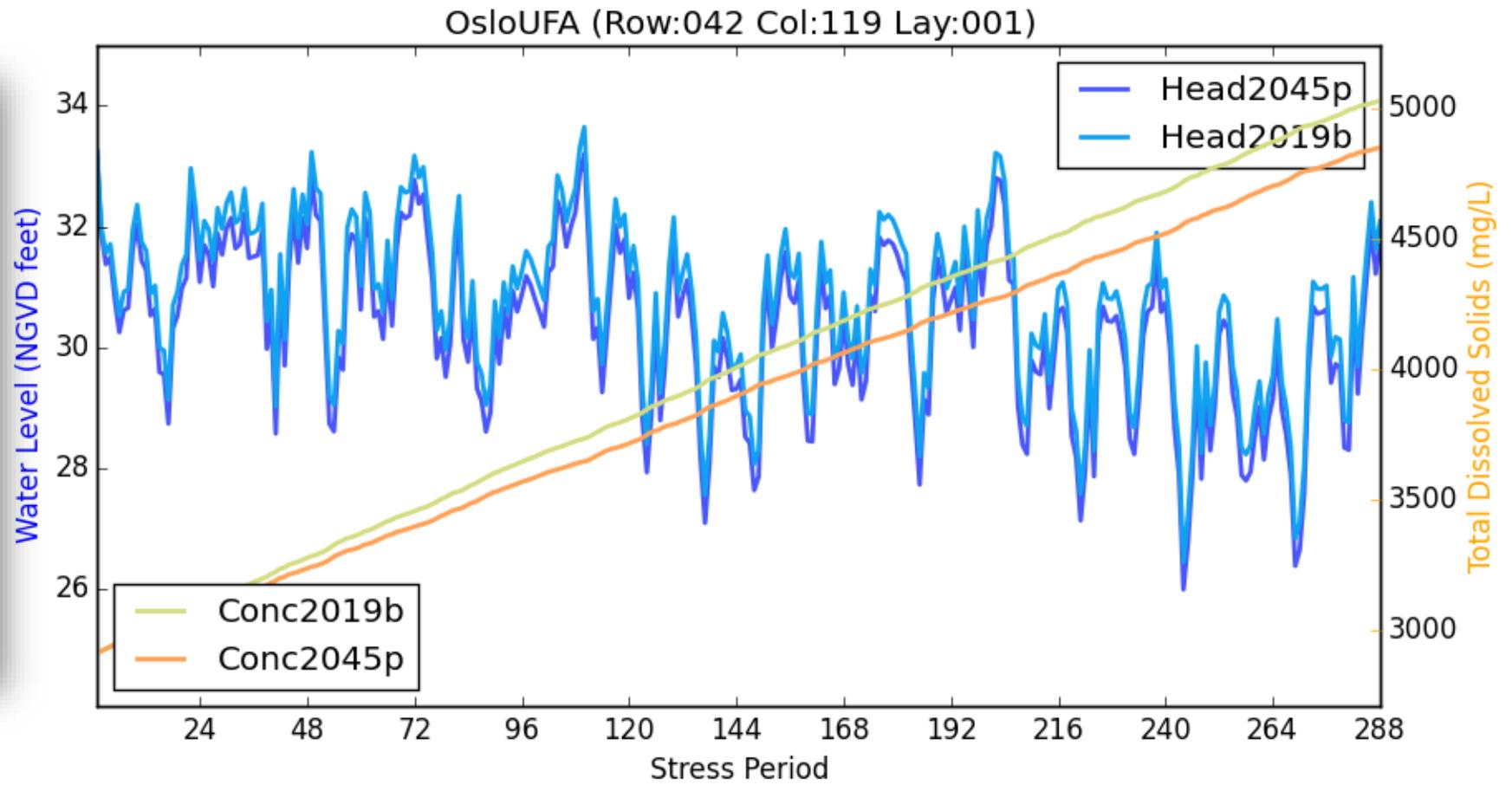
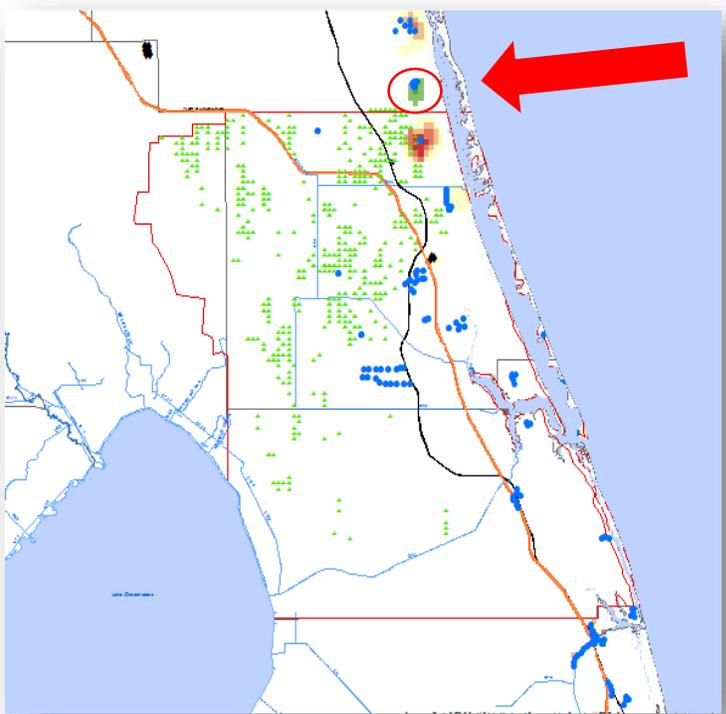
- Month 218 (February 2007) = dry month (1-in-10 drought condition)
- Significant decrease in artesian head in areas of increasing PS/PG pumping
 - NO artesian head near St. Lucie County North PS wells
- Slight increase in artesian head in areas of decreasing AG/PS pumping



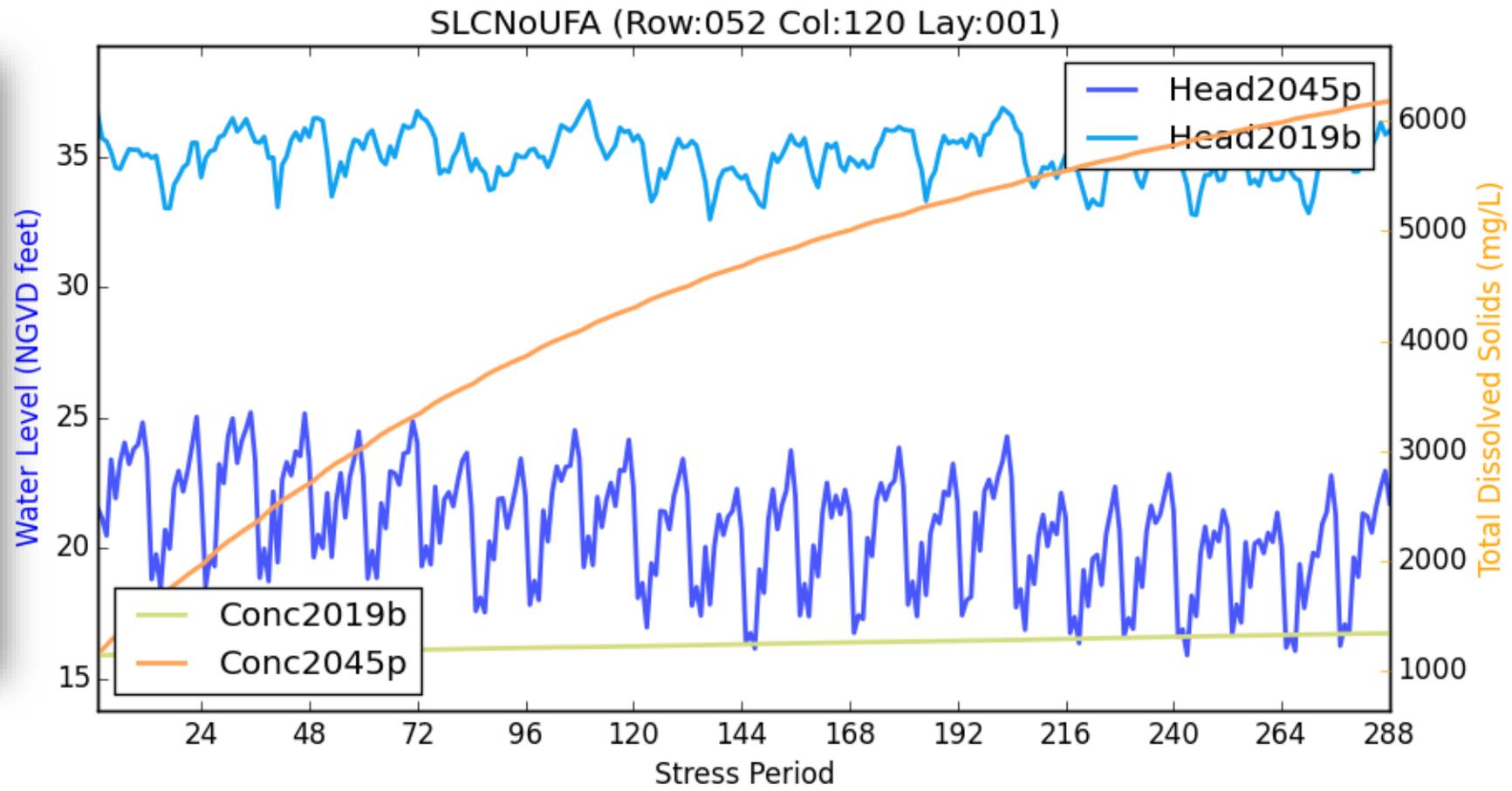
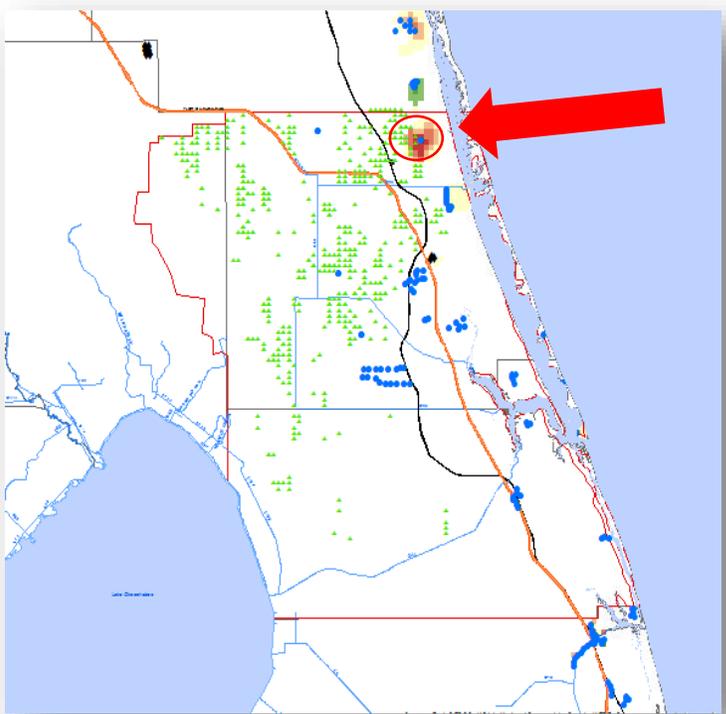


Monitoring Well Hydrographs

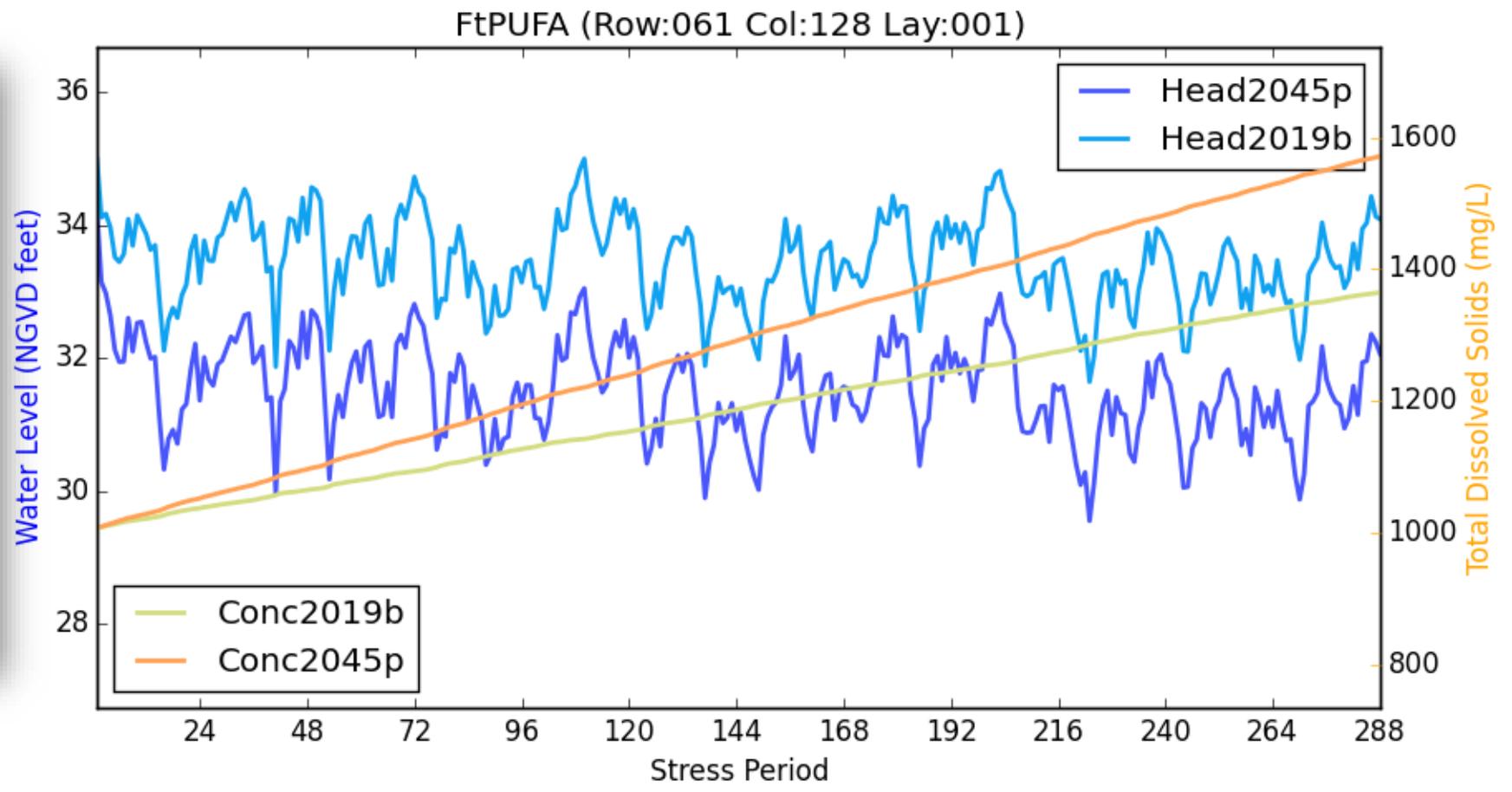
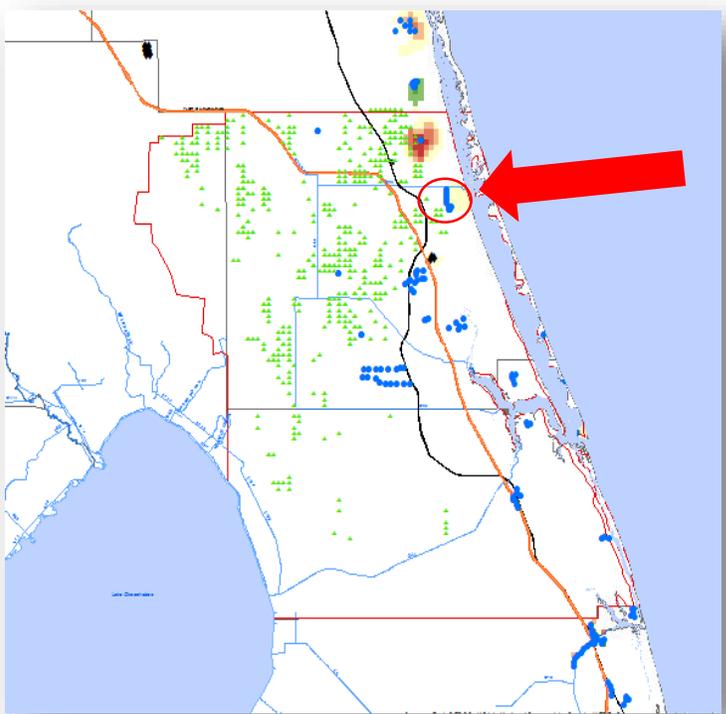
Upper Floridan Aquifer Near Oslo WTP



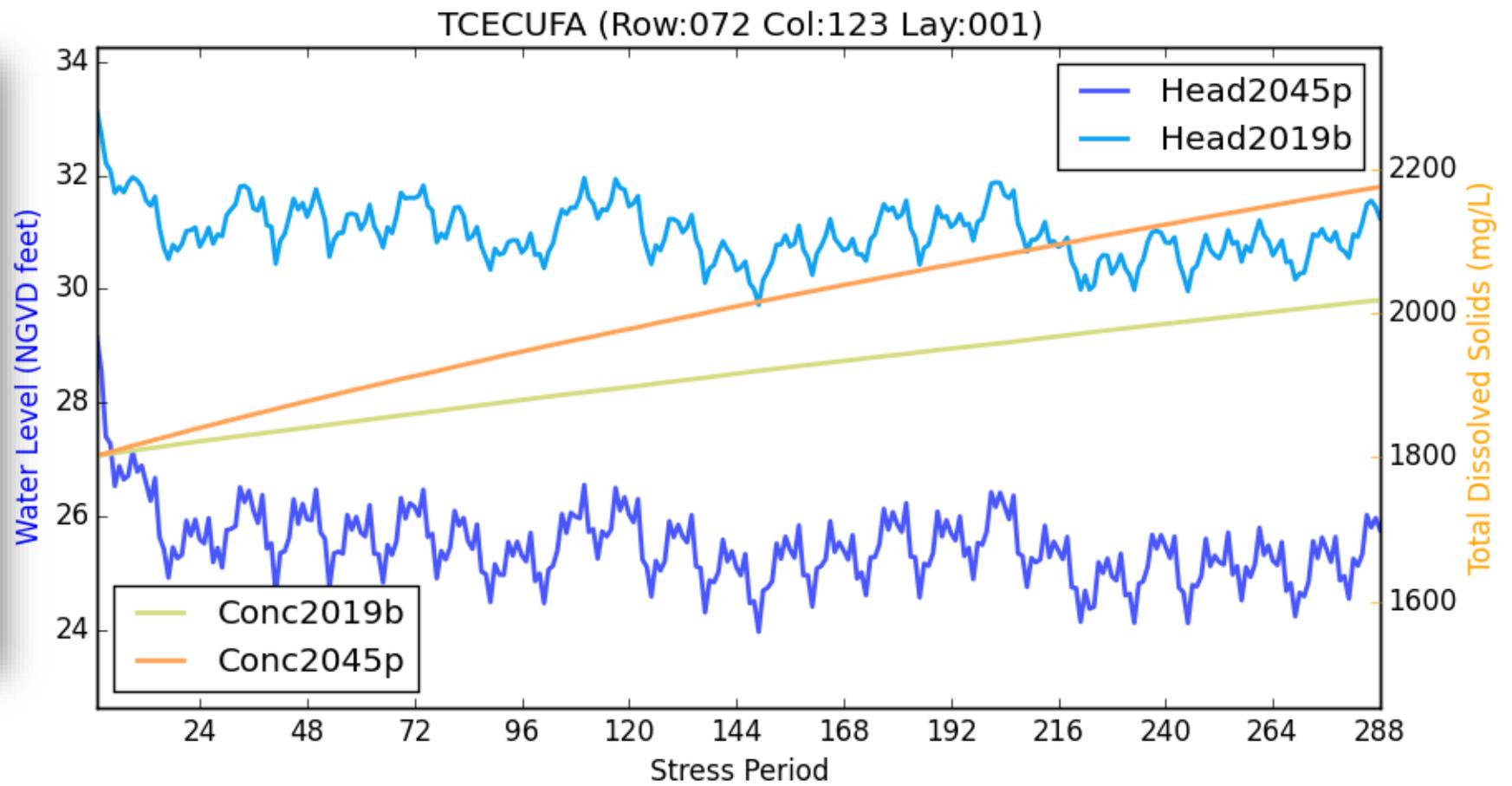
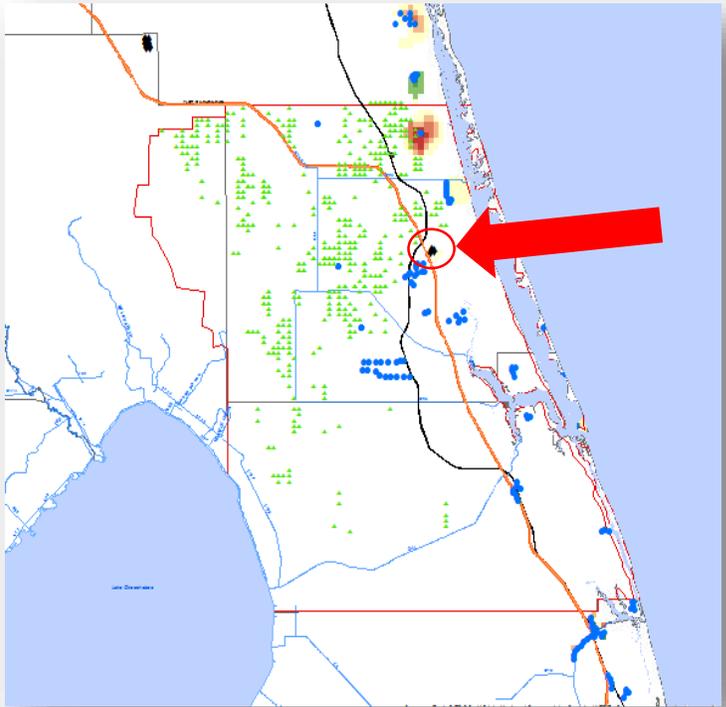
Upper Floridan Aquifer Near St. Lucie County Utilities (North Wellfield)



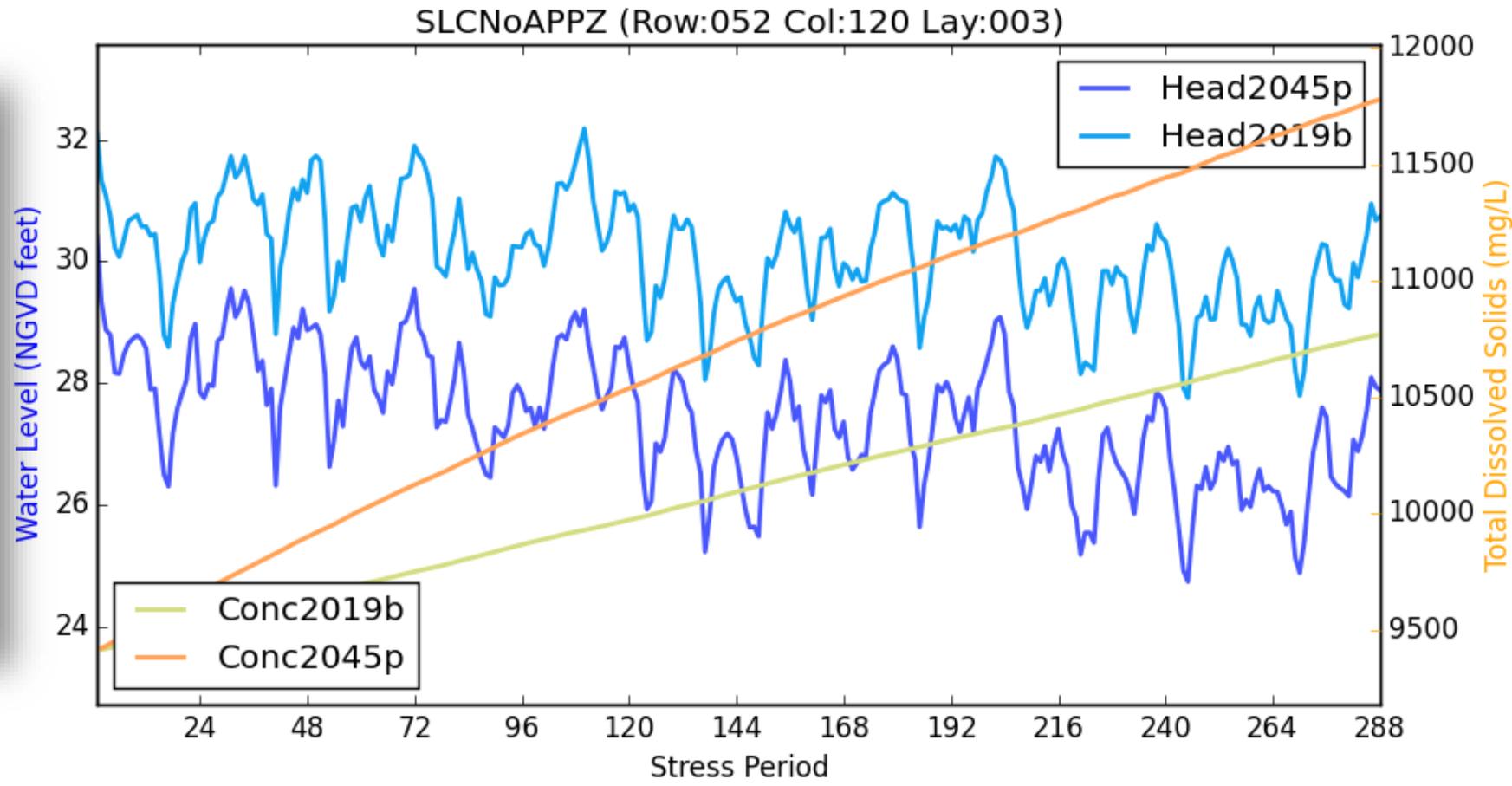
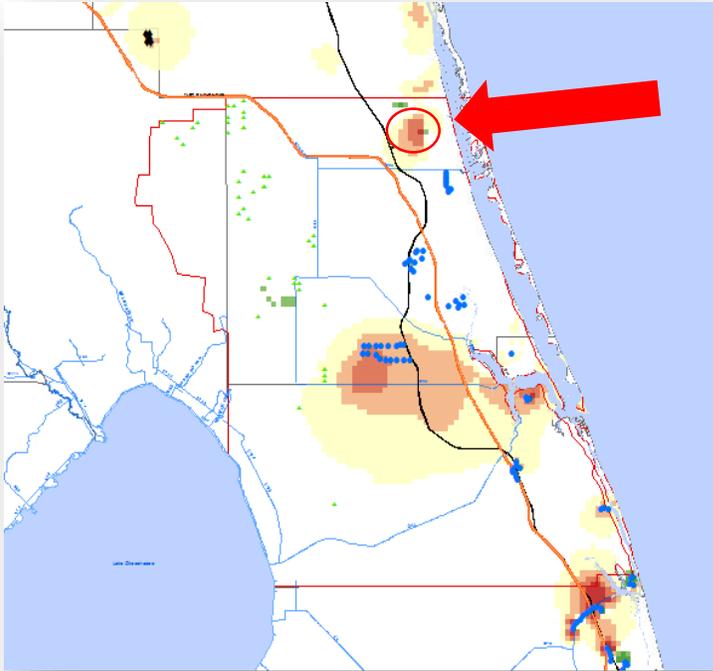
Upper Floridan Aquifer Near Fort Pierce Utilities Authority



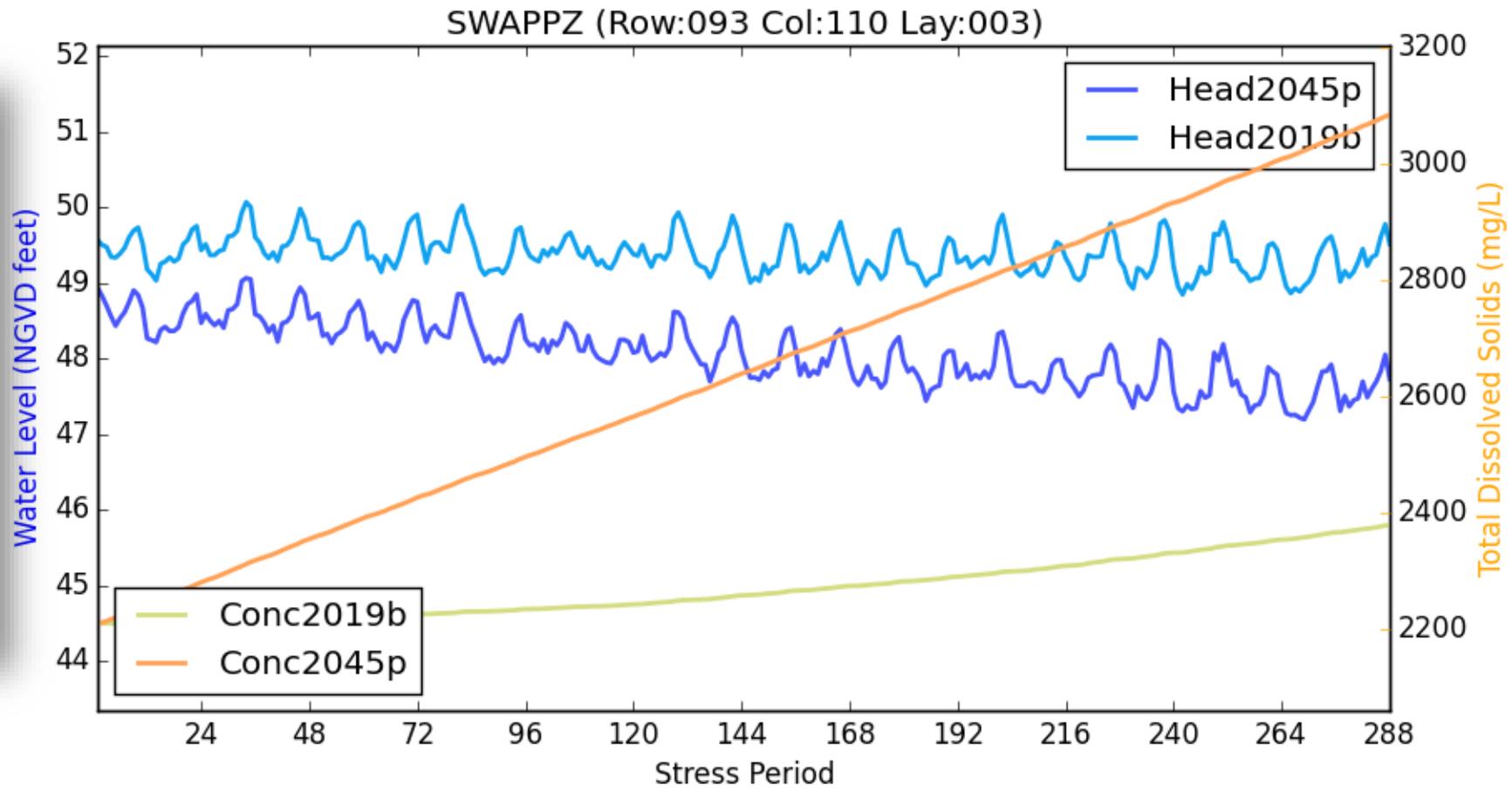
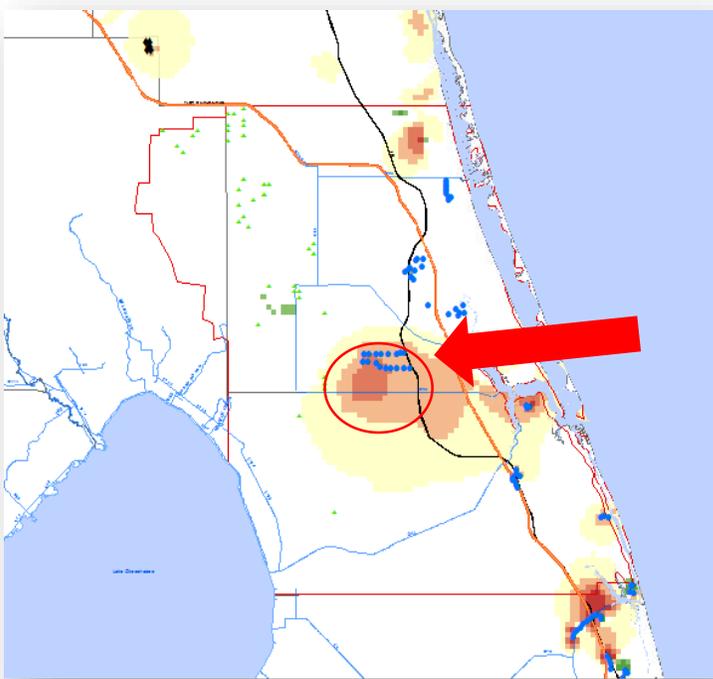
Upper Floridan Aquifer Near Treasure Coast Energy Center Power Generation Wells



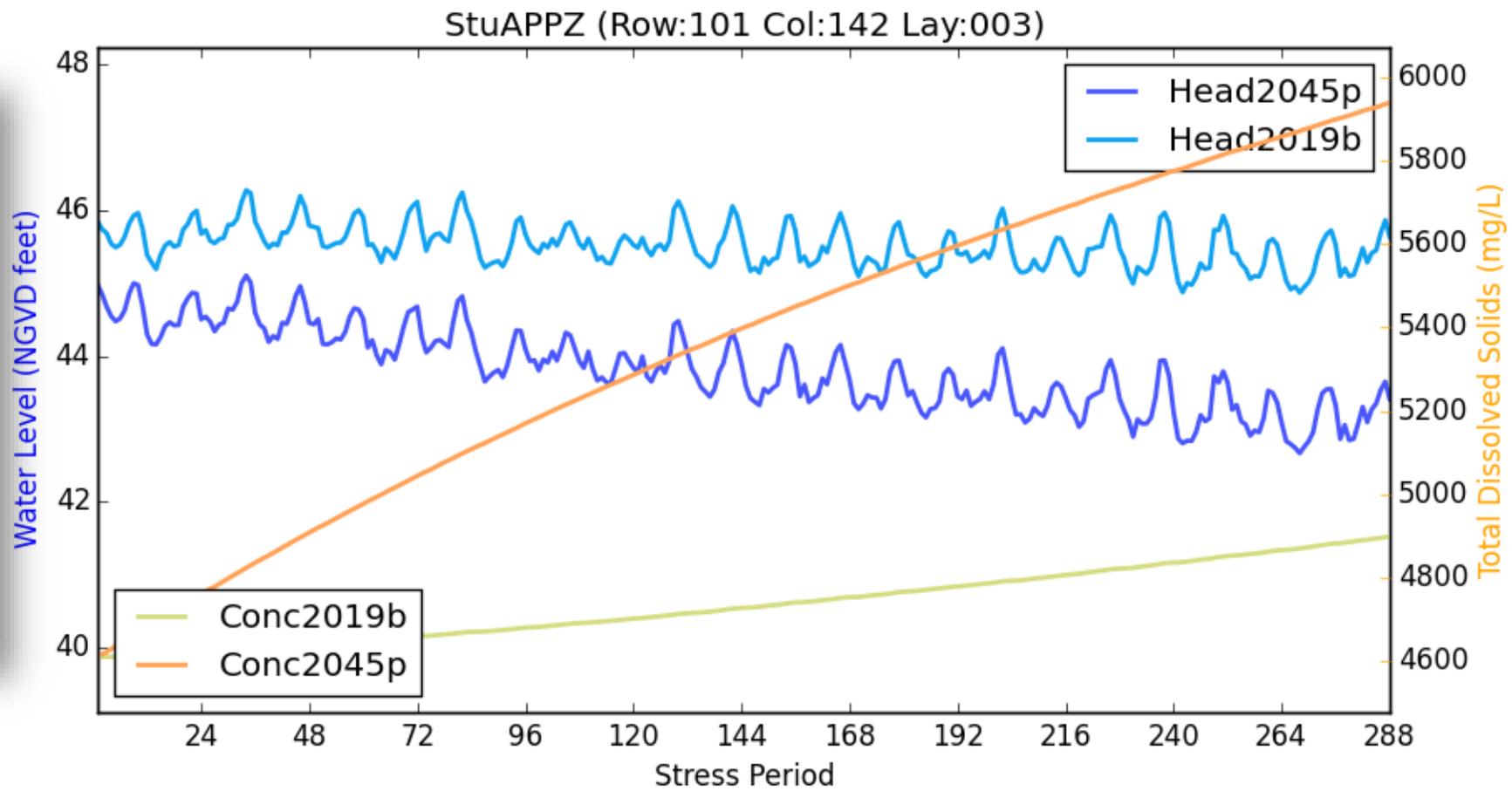
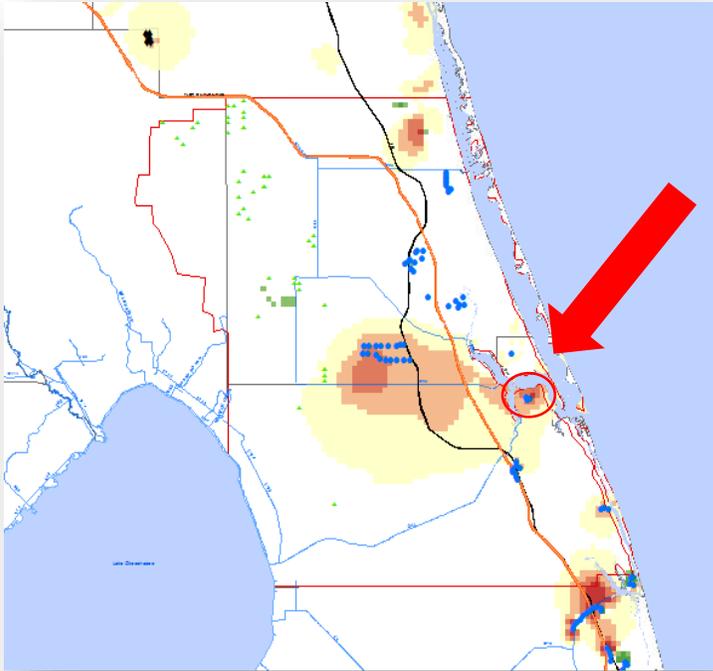
Avon Park Permeable Zone Near St. Lucie County Utilities (North Wellfield)



Avon Park Permeable Zone Near City of Port St. Lucie Utility Systems Department (Southwest Wellfield)



Avon Park Permeable Zone Near City of Stuart Wellfield



Model Conclusions

➤ Water Levels

- UFA – Except for northeastern St. Lucie County, predicted drawdown in most of the UFA are less than 2.5 ft
- APPZ – Less than 1.5 ft of drawdown predicted throughout the UEC Planning Area, except in northeastern St. Lucie County where a 3 ft decrease predicted

➤ Water Quality

- UFA – Except for northeastern St. Lucie County, predicted TDS changes in the UFA are less than 250 mg/L
- APPZ
 - Potential upward movement of APPZ water into the UFA may degrade water quality in northeastern St. Lucie County
 - 700-1,040 mg/L increase in TDS predicted at City of Port St. Lucie's Southwest Wellfield, City of Stuart, and St. Lucie County Utilities North Wellfield; less than 250 mg/L everywhere else

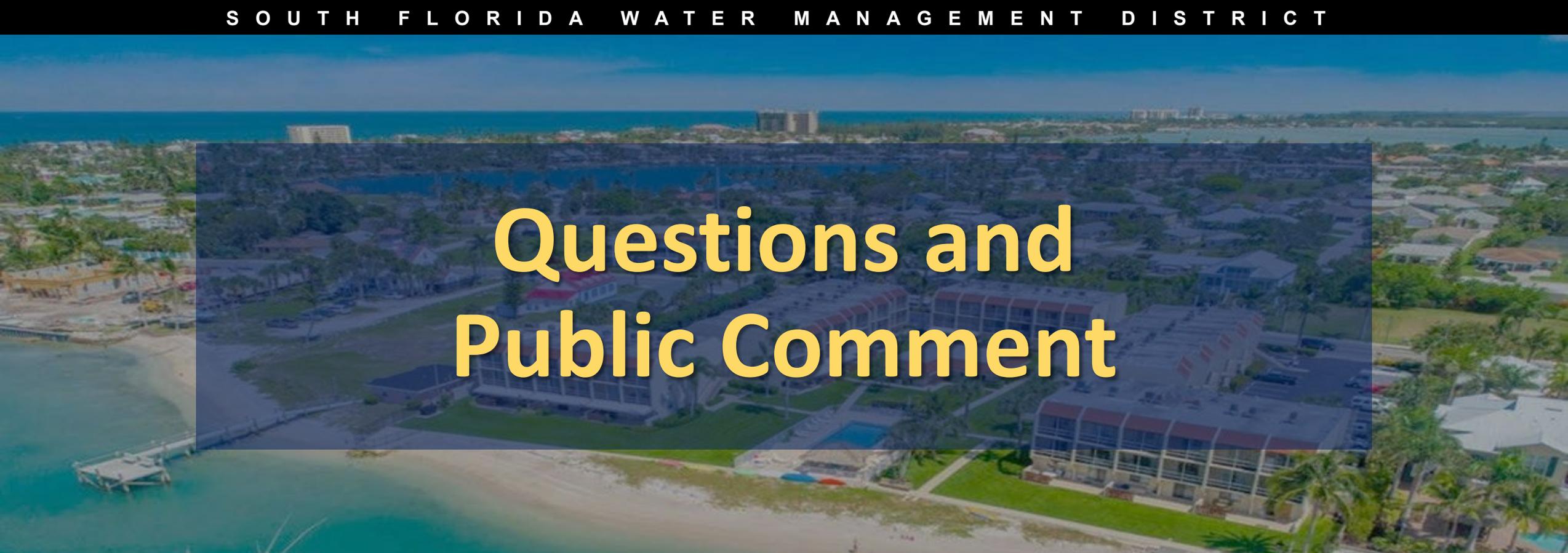
- FAS appears capable of meeting projected demands of all users through 2045 with appropriate wellfield management

Modeling Team

- Mirza Billah, Ph.D., E.I.T.
- Robert Earle
- Uditha Bandara, Ph.D., P.E.



Thank You



Questions and Public Comment

If you are participating via Zoom: Use the Raise Hand feature

If you are participating via phone: *9 raises hand, *6 mutes/unmutes

When you are called on, please state your full name and affiliation prior to providing comments and/or questions

An aerial photograph of a large residential complex, possibly a resort or apartment building, situated on a beach. The complex features several multi-story buildings with balconies, a central swimming pool, and a sandy beach area. The background shows a clear blue sky and the ocean.

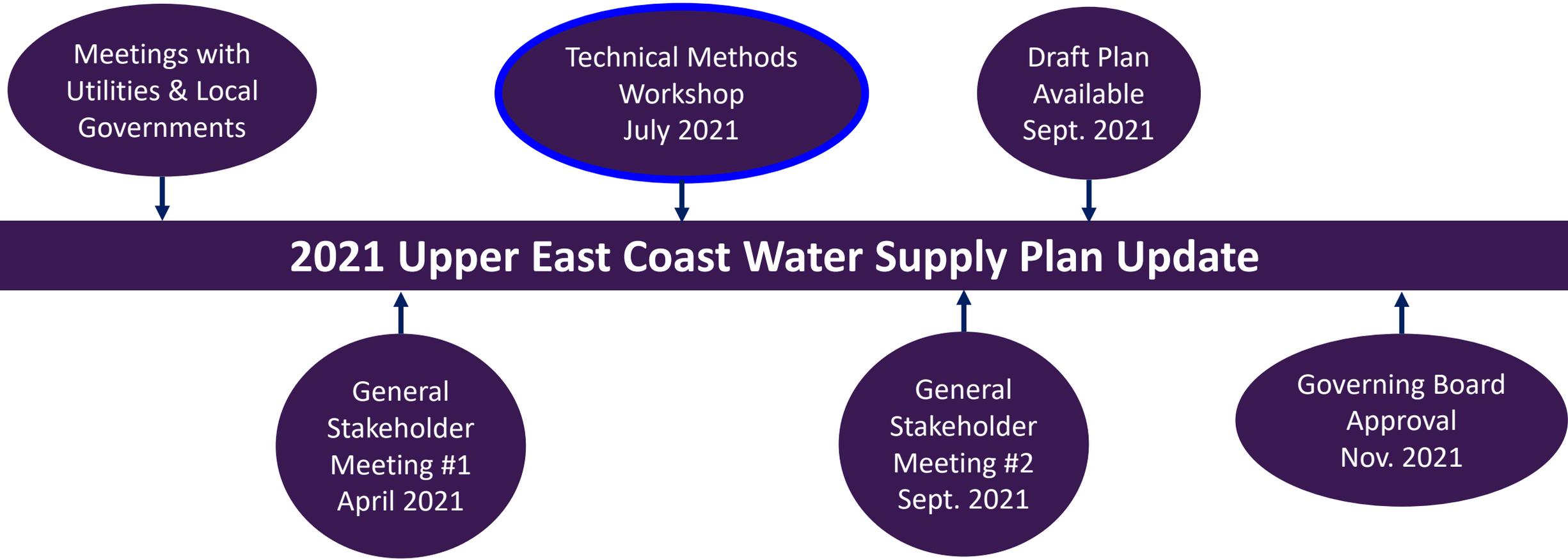
Next Steps

Nancy Demonstranti, P.G.

Upper East Coast Plan Manager

South Florida Water Management District

UEC Water Supply Plan Update Process





Thank You