2017 SAME Jacksonville Post - Joint Engineer Training Symposium (JETS)
Presentation August 30, 2017

Stormwater & Wastewater Management – Meeting Rising Expectations (Part II)

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Presentation Outline

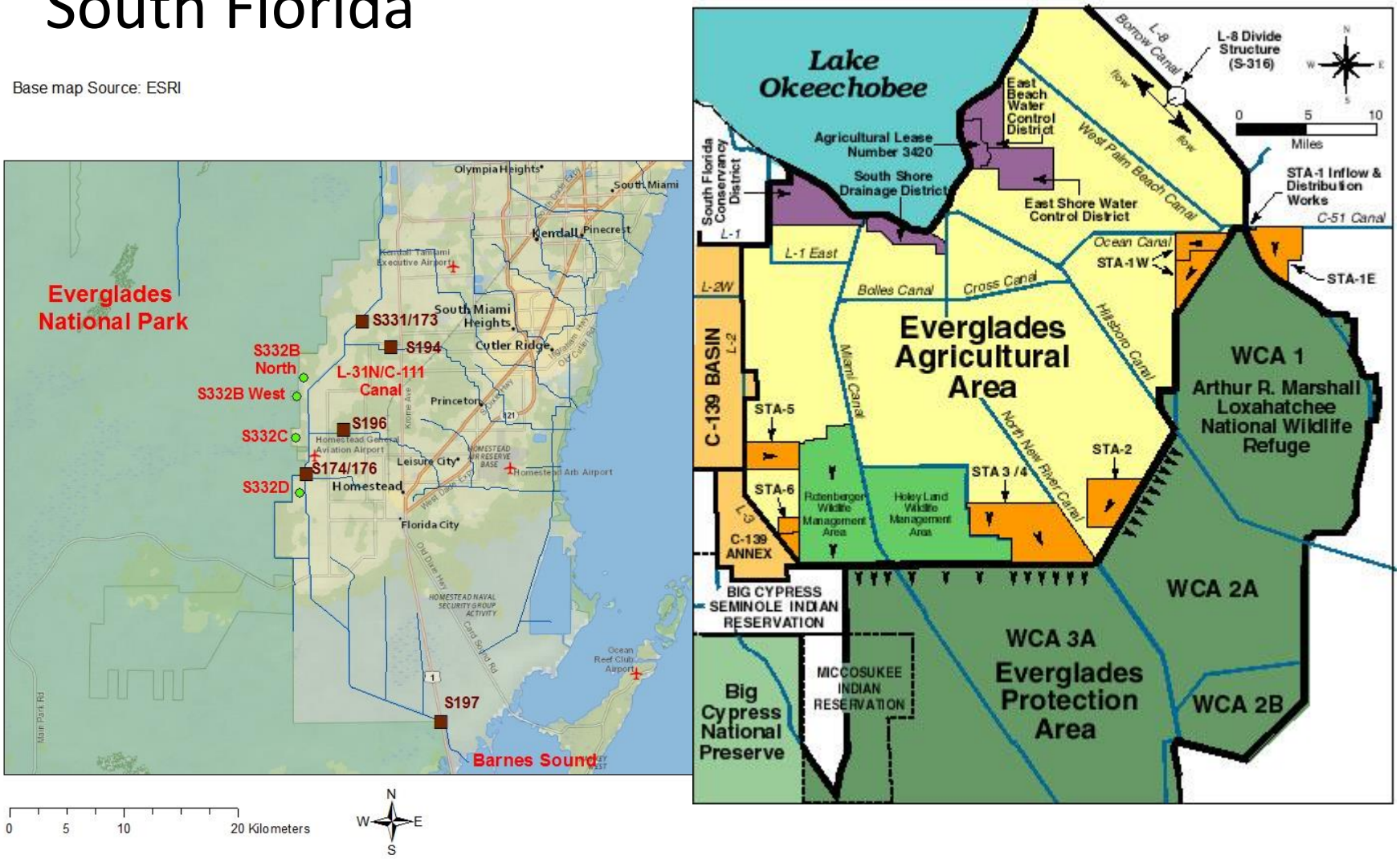
- Discuss Example Projects Location and Study Area.
- General discussion of “green methods” of managing nutrient disposal.
- Discuss Water Farm Project.
- Discuss Blue Head Ranch Project.
- Summary and Future Direction.

“Green” Nutrient Removal

- Many technologies being looked at around the globe.
- For this presentation, we will discuss:
  - Artificial Recharge;
  - Stormwater Treatment Areas;

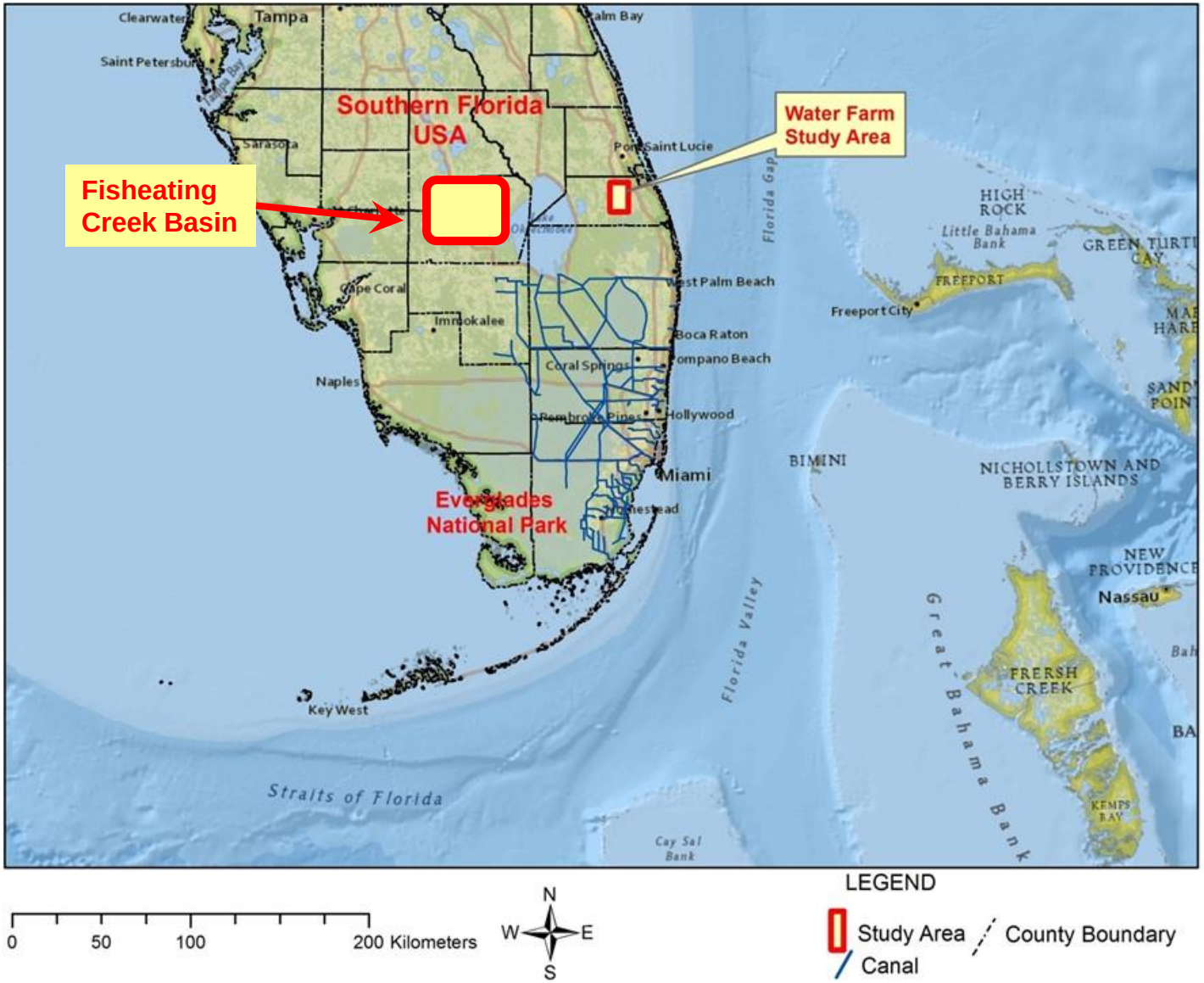
Examples

- C-111 Project in South Florida and ECP in South Florida



Base map Source: ESRI

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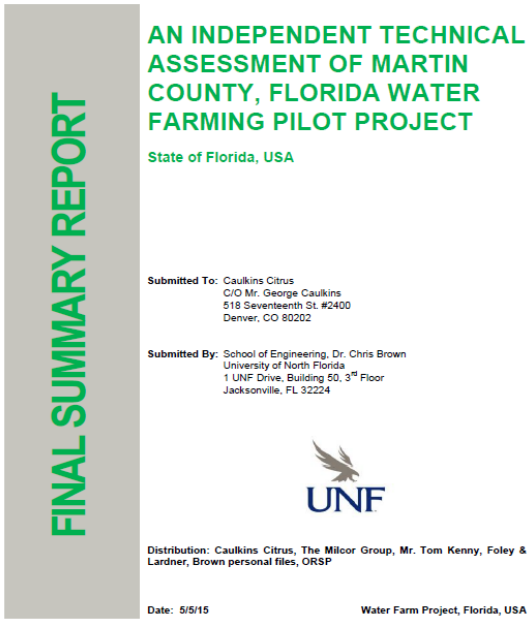


Project Location Map

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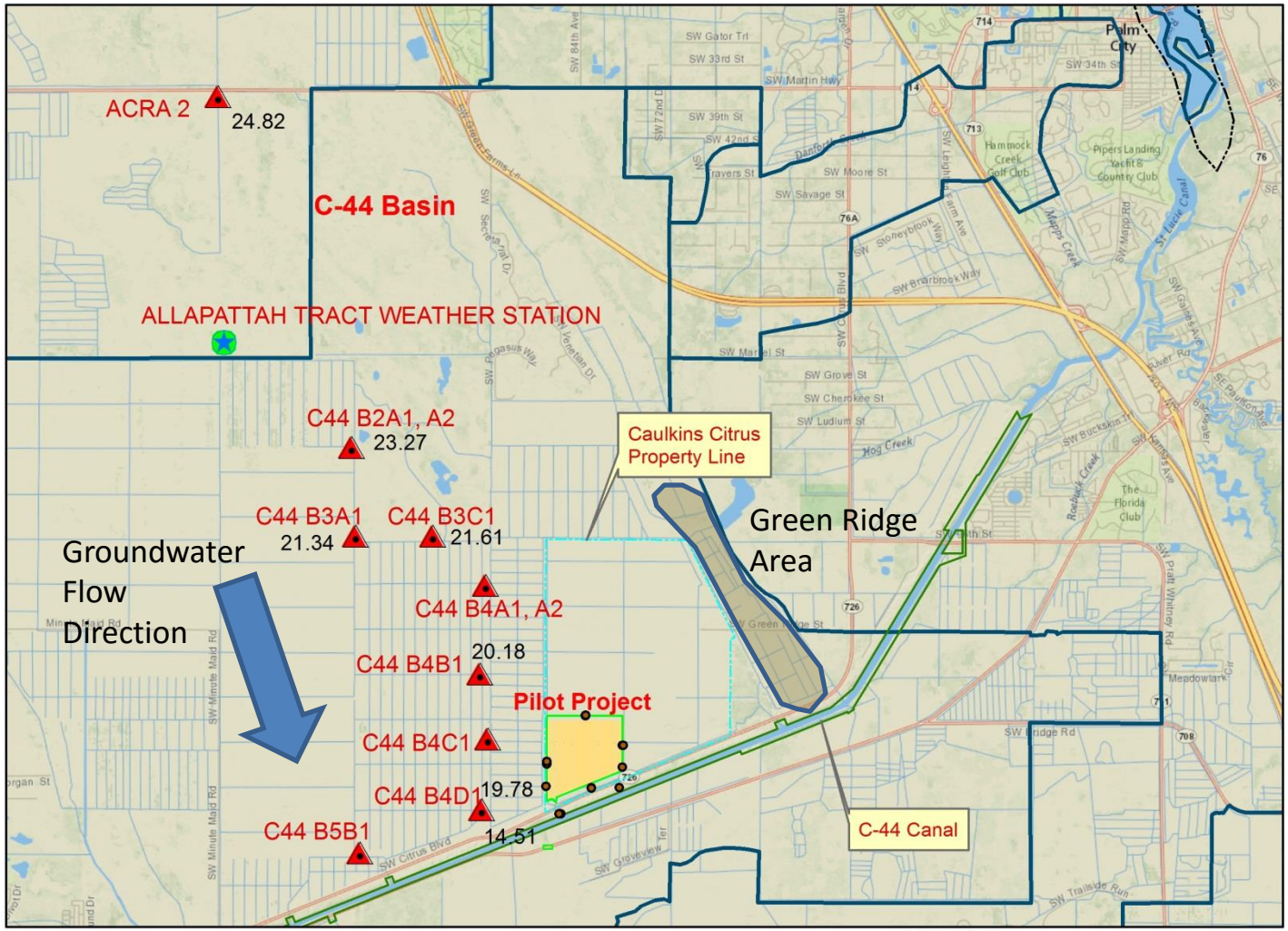
Water Farm

- The so-called “Water Farm” is essentially a large artificial recharge project;
- 418 acre pilot project constructed in 2013;
- Monitoring and assessment for 2 years; and,
- Success ! – being expanded now.



Base map Source: ESRI

Background Groundwater Levels 11/17/2014 (NGVD 1929, feet)

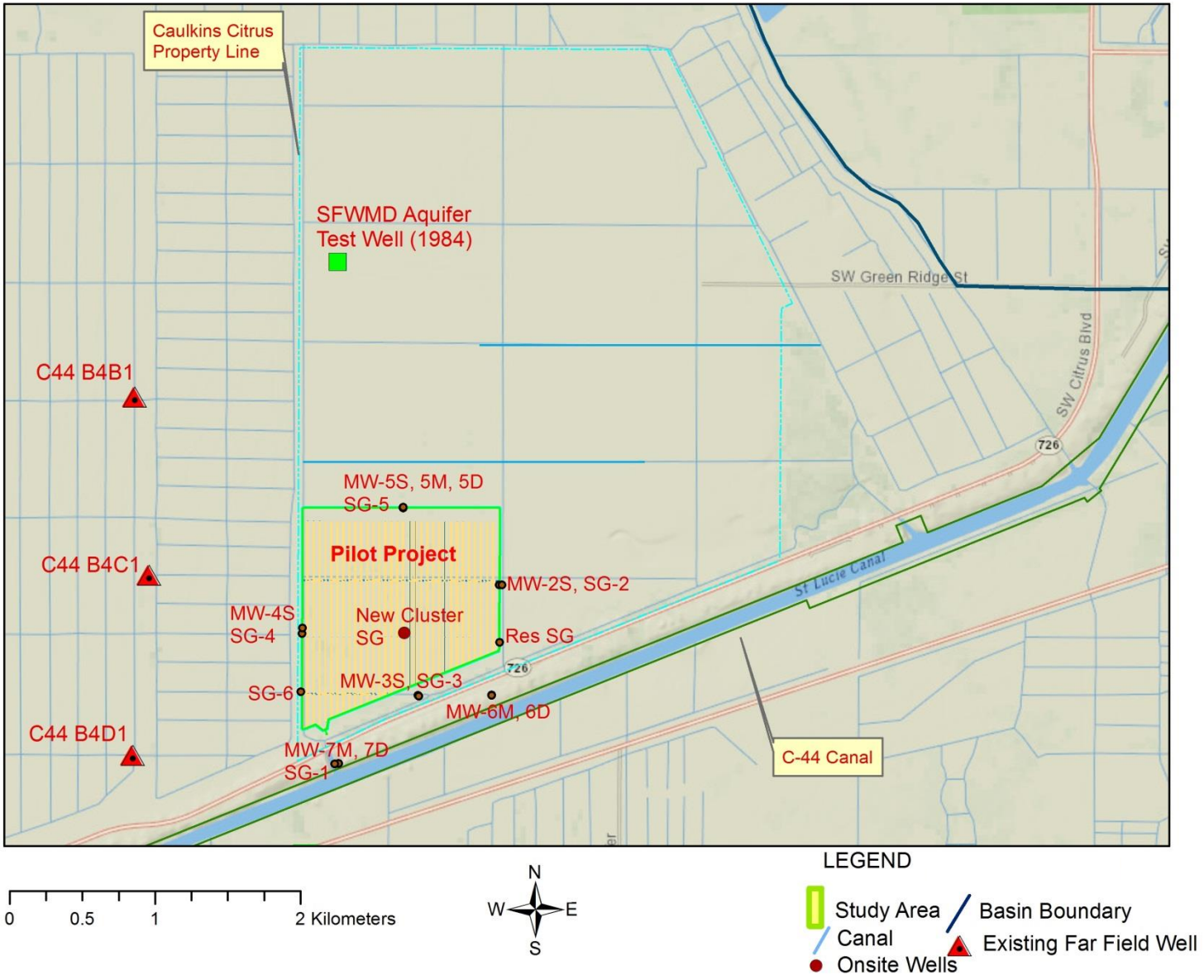


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Key Instrumentation

Base map Source: ESRI

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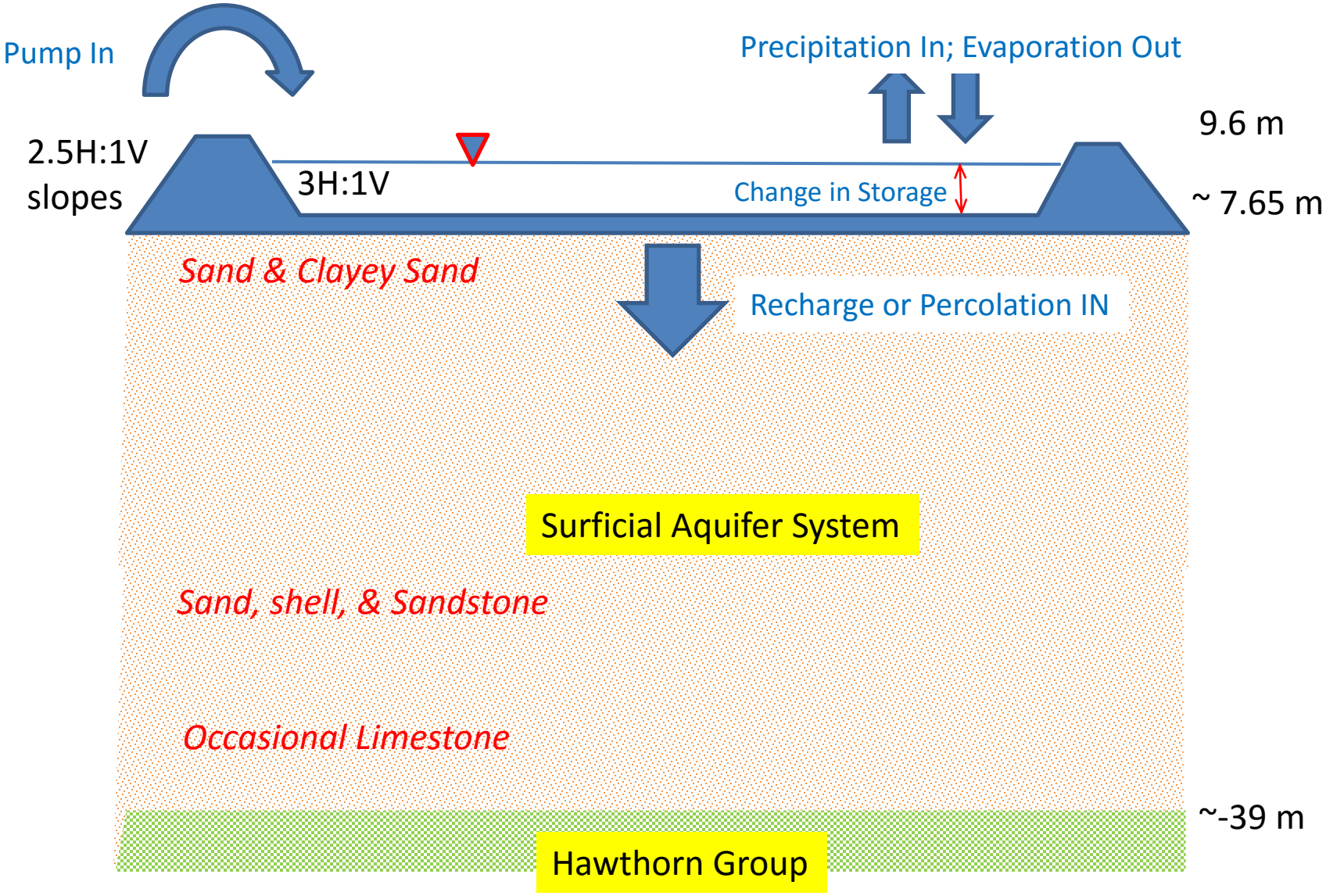
Detailed Site Map

Generalized Cross-Section & Water Budget Components

W

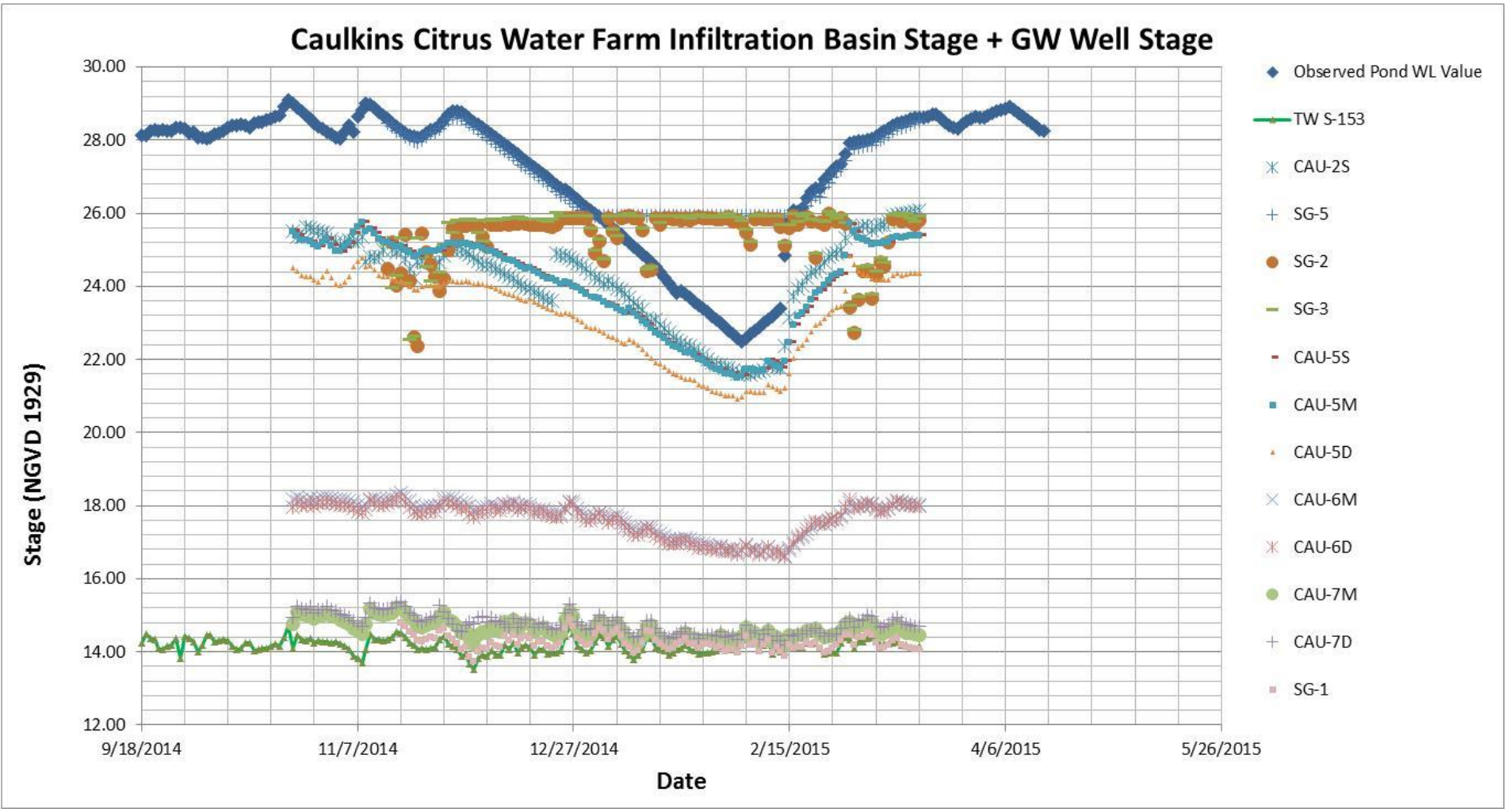
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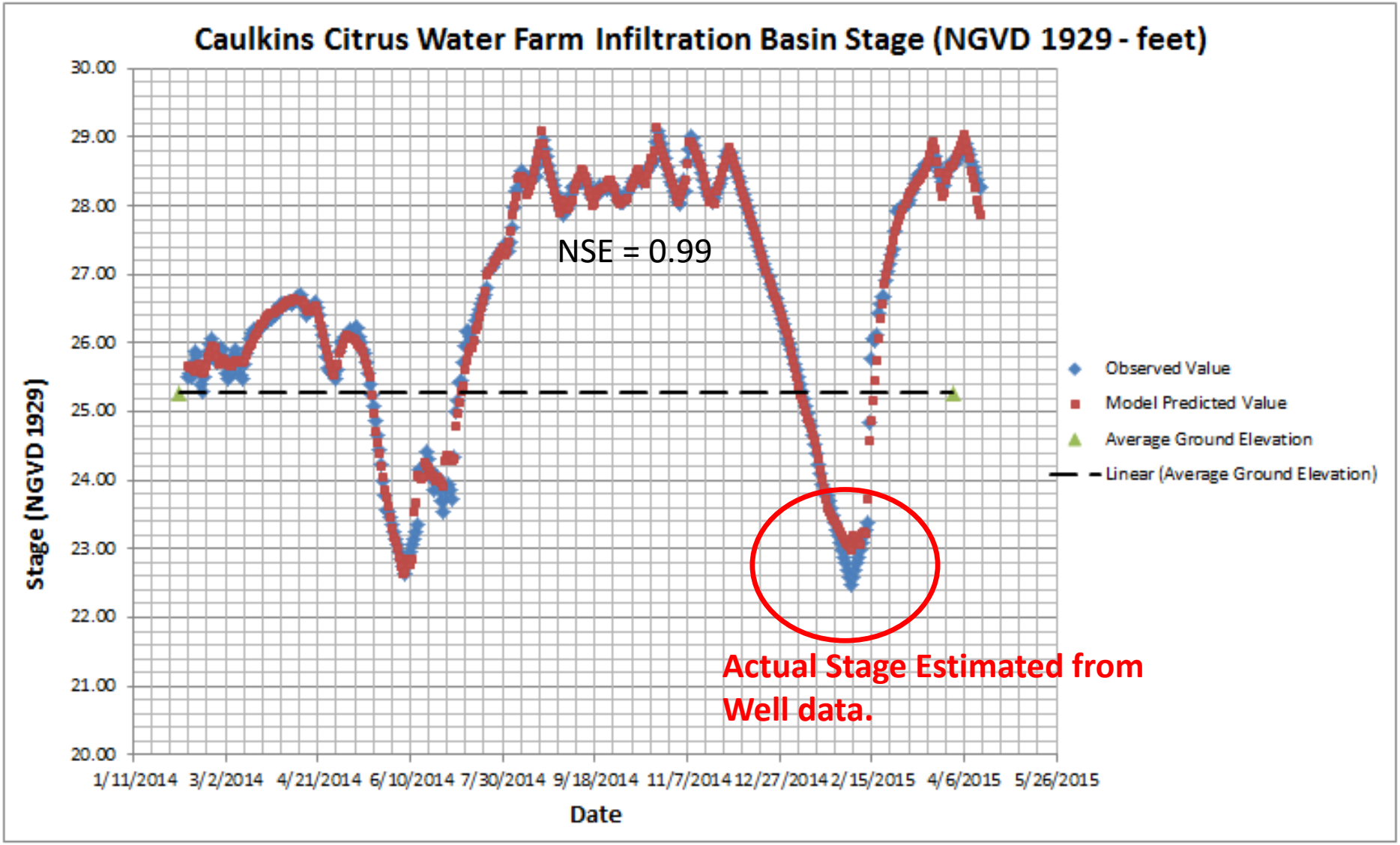


Not to Perfect Scale

Note: Elevations reference NGVD 1929 meters



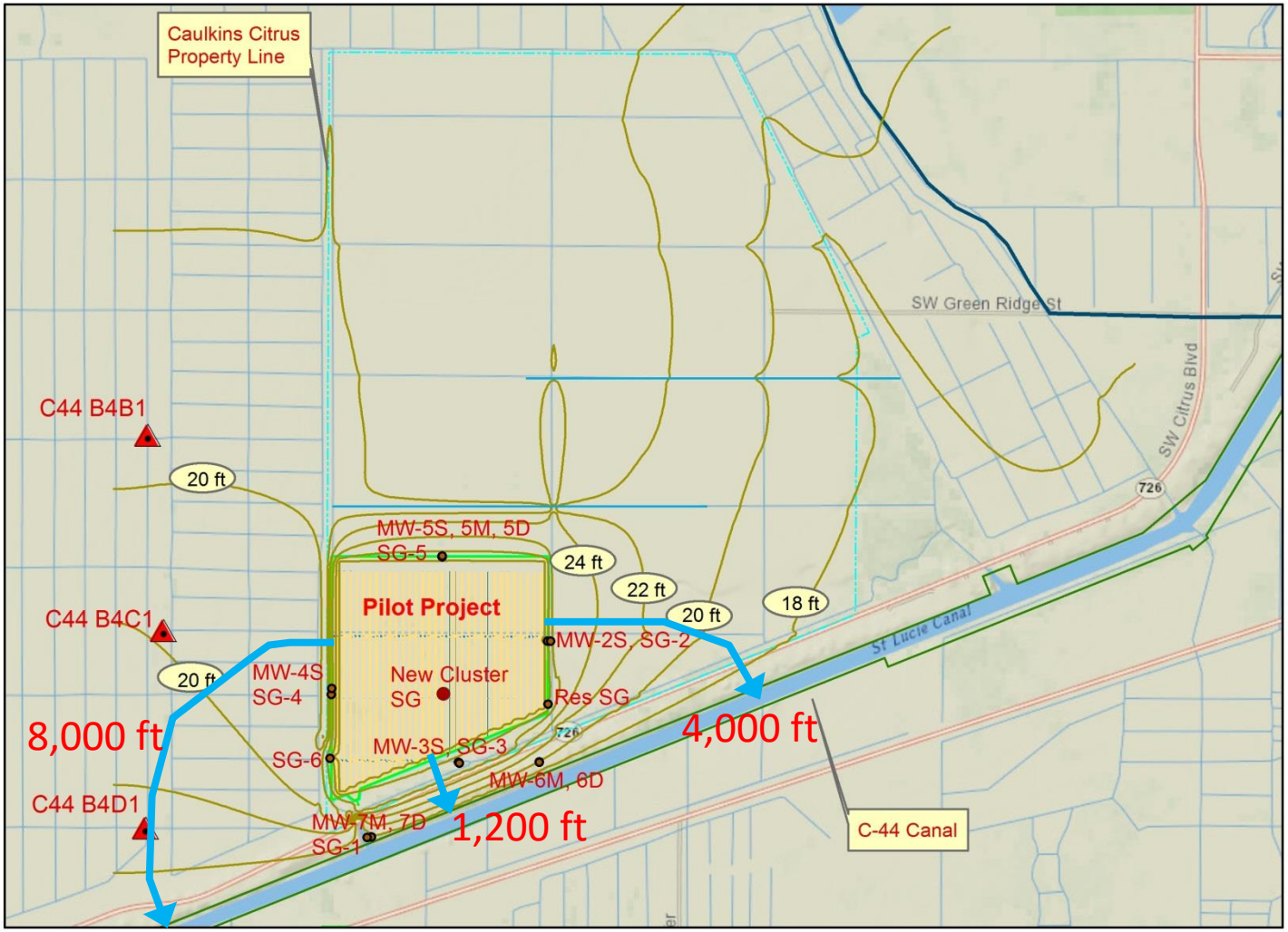
Water Farm Observation Well Data and C-44 Canal Stages



Comparison of Excel "Solver" Model Vs. Observed Stage for Excel Water Budget Model

Base map Source: ESRI

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Calibrated Water Levels & Flow Path Distances

Final Results

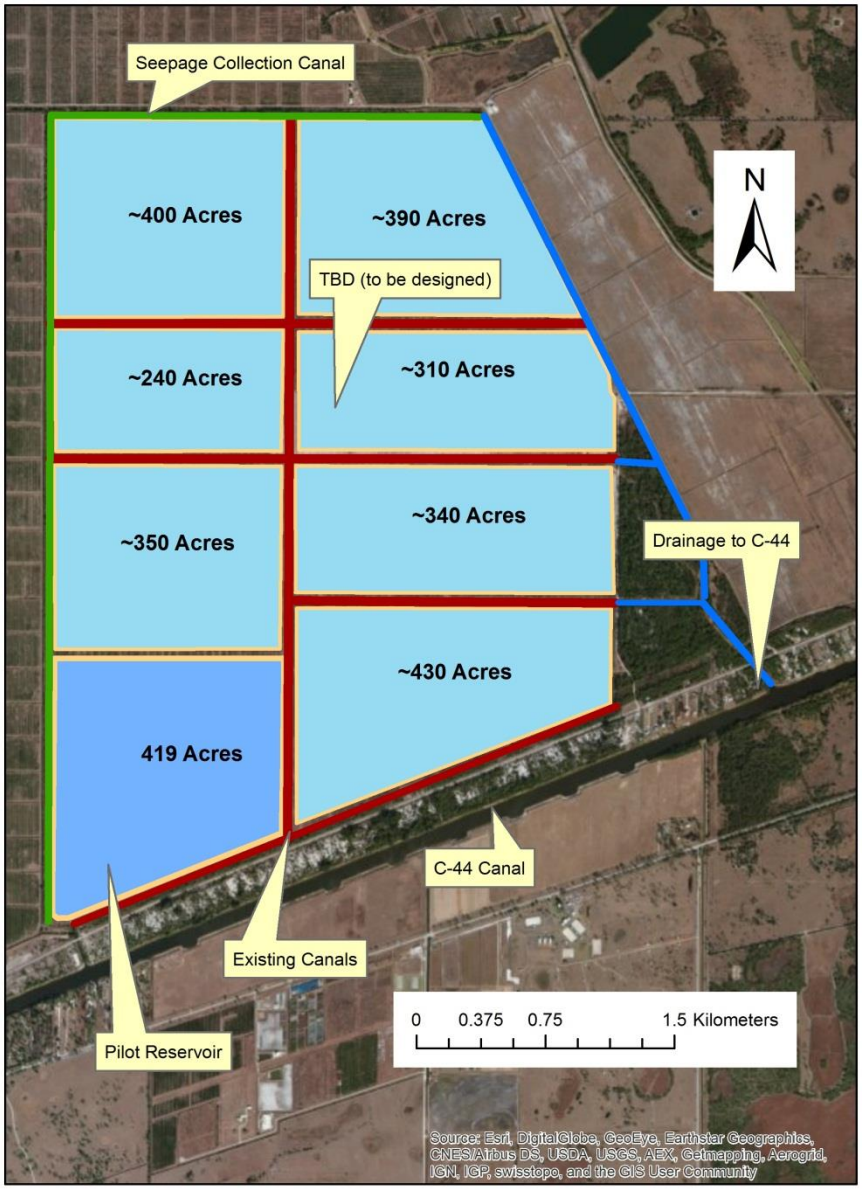
- From Feb 2014 to April 15, 2015, approximately 20,000 Ac-Ft of water stored in the basin;
- Approximately 82.3 % percolated back into Surficial Aquifer System;
- Approximately 11.4 % was evaporated or transpired; and, rest was in temporary storage.

Final Results

- Unit Cost of storage was estimated to be $37/Ac-Ft versus about $202/Ac-Ft for nearby C-44 reservoir;
- It is estimated that the basin removed about 2.66 MT of phosphorus and 13.10 MT total nitrogen;
- Value of the water quality benefit alone is estimated to be at least $900,000 versus SFWMD total investment of $1,200,000.

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Proposed Water Farm Layout



Possible Configuration for Site Expansion

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Blue Head Ranch

- Feasibility of nutrient removal projects for ranch and greater Fisheating Creek basin;
- Developed a range of alternative STA options;
- Report 2017
- Coordination with FDEP now.


FINAL SUMMARY REPORT

FEASIBILITY OF IMPLEMENTING LARGE-SCALE NUTRIENT REMOVAL/STORAGE PROJECTS ON THE BLUE HEAD RANCH PROPERTY

State of Florida, USA

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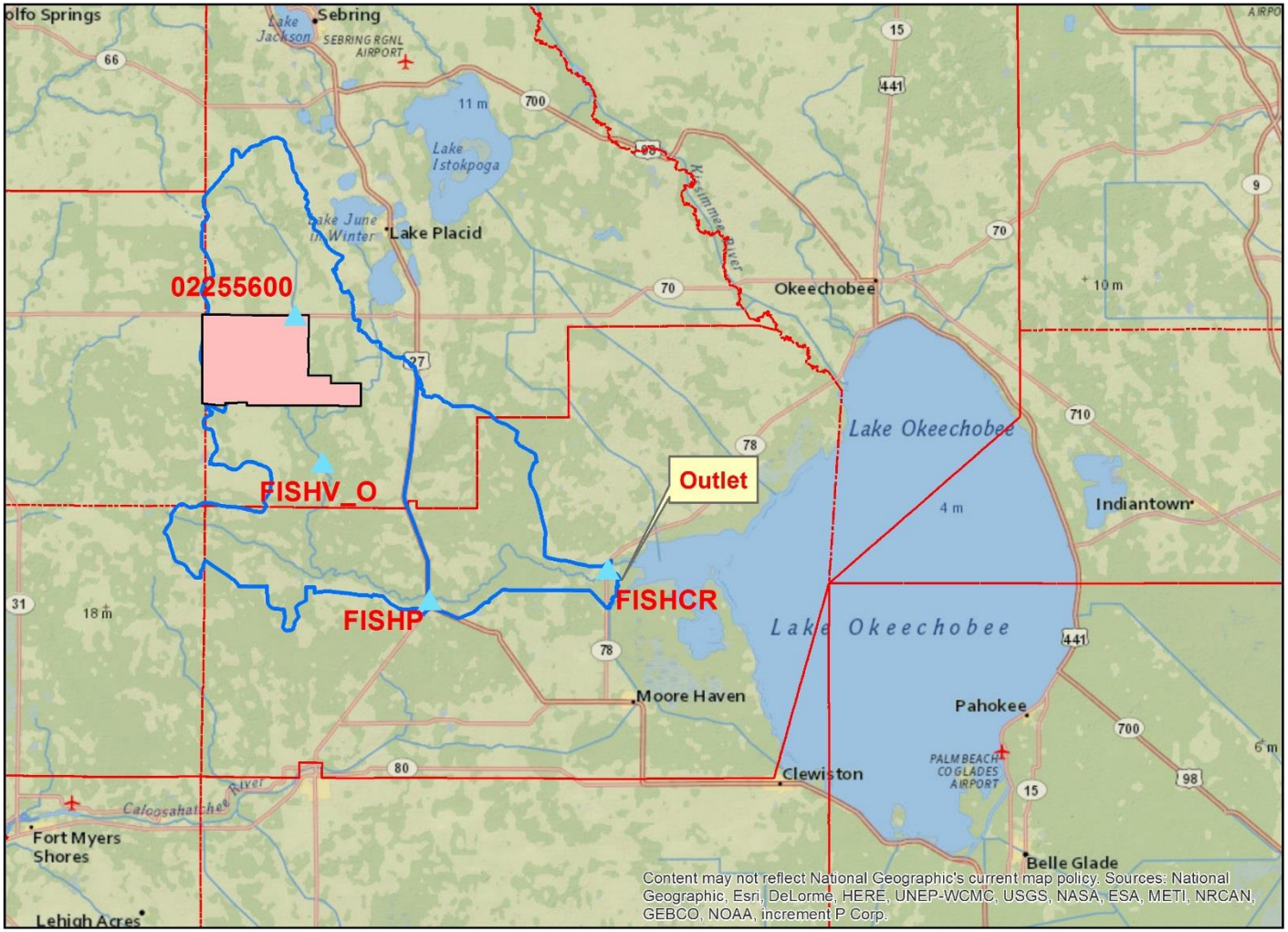
UNF

Distribution: Christian Caballero - Foley & Lardner, Brown personal files, ORSP

Date: 3/6/17 Bluehead Nutrient Removal Project, Florida, USA

Base map Source: ESRI

Blue Head Land & Cattle Company, LLC
Water Storage and Nutrient Removal Study



0 10 20 40 Kilometers

N W E S

LEGEND

County Boundary
Stream Gauge
Watershed Boundary
Bluehead Property

Figure 4
Property Location Map

Contributing to USGS 002255600

Median Q = 4.40 cfs
Mean Q = 53.07 cfs

Sub-Total = 60.35 mi²

Med Q/Area = 0.0729 cfs/mi²

Mean Q/Area = 0.8794 cfs/mi²

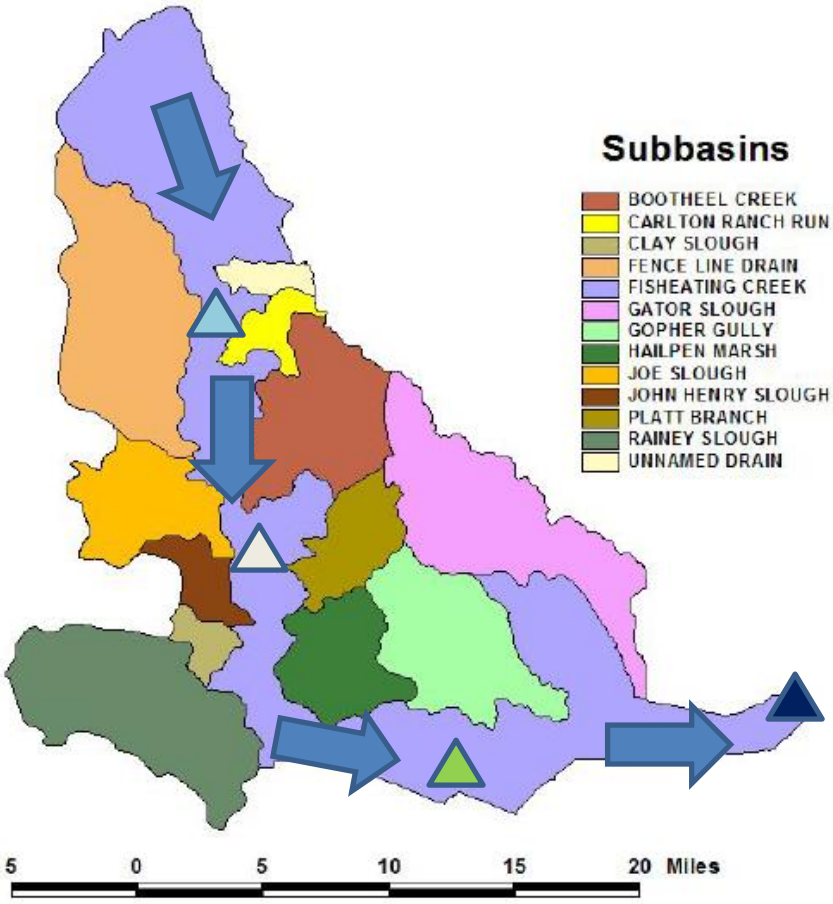
Contributing to FishV_O

Median Q = 12.60 cfs
Mean Q = 79.50 cfs

Sub-Total = 128.69 mi²

Med Q/Area = 0.0979 cfs/mi²

Mean Q/Area = 0.6178 cfs/mi²



Contributing to FishP

Median Q = 22.00 cfs
Mean Q = 121.99 cfs

Sub-Total = 122.29 mi²

Med Q/Area = 0.1799 cfs/mi²

Mean Q/Area = 0.9975 cfs/mi²

Contributing to FishCR

Median Q = 56.00 cfs
Mean Q = 116.50 cfs

Sub-Total = 132.33 mi²

Med Q/Area = 0.4232 cfs/mi²

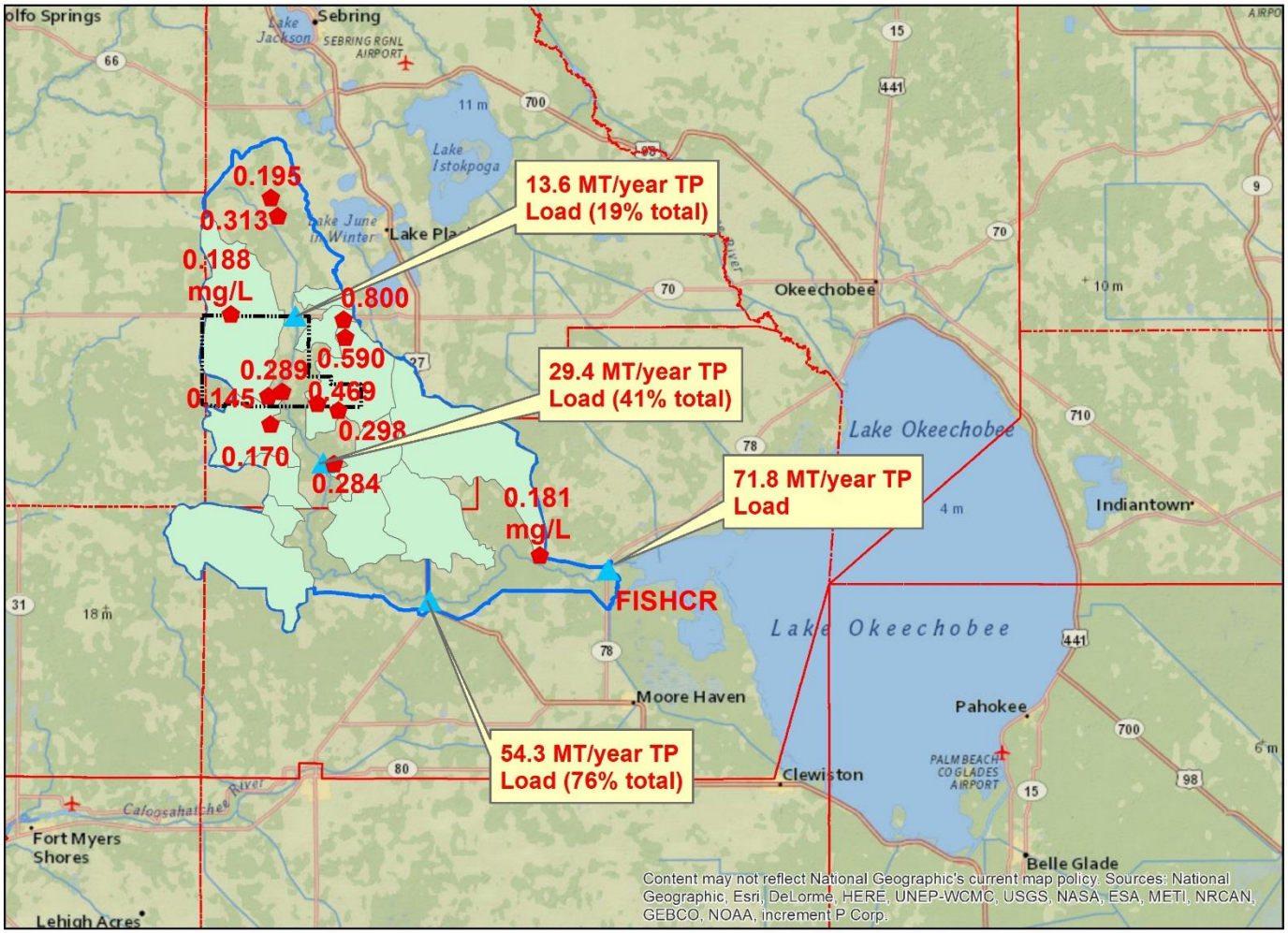
Mean Q/Area = 0.8804 cfs/mi²

Map Source: Loinaz (2005)

Figure 8
Median and Mean Daily Flow per Area Values

Base map Source: ESRI

Blue Head Cattle Ranch Nutrient Removal Study



0 10 20 40 Kilometers

N W E S

LEGEND

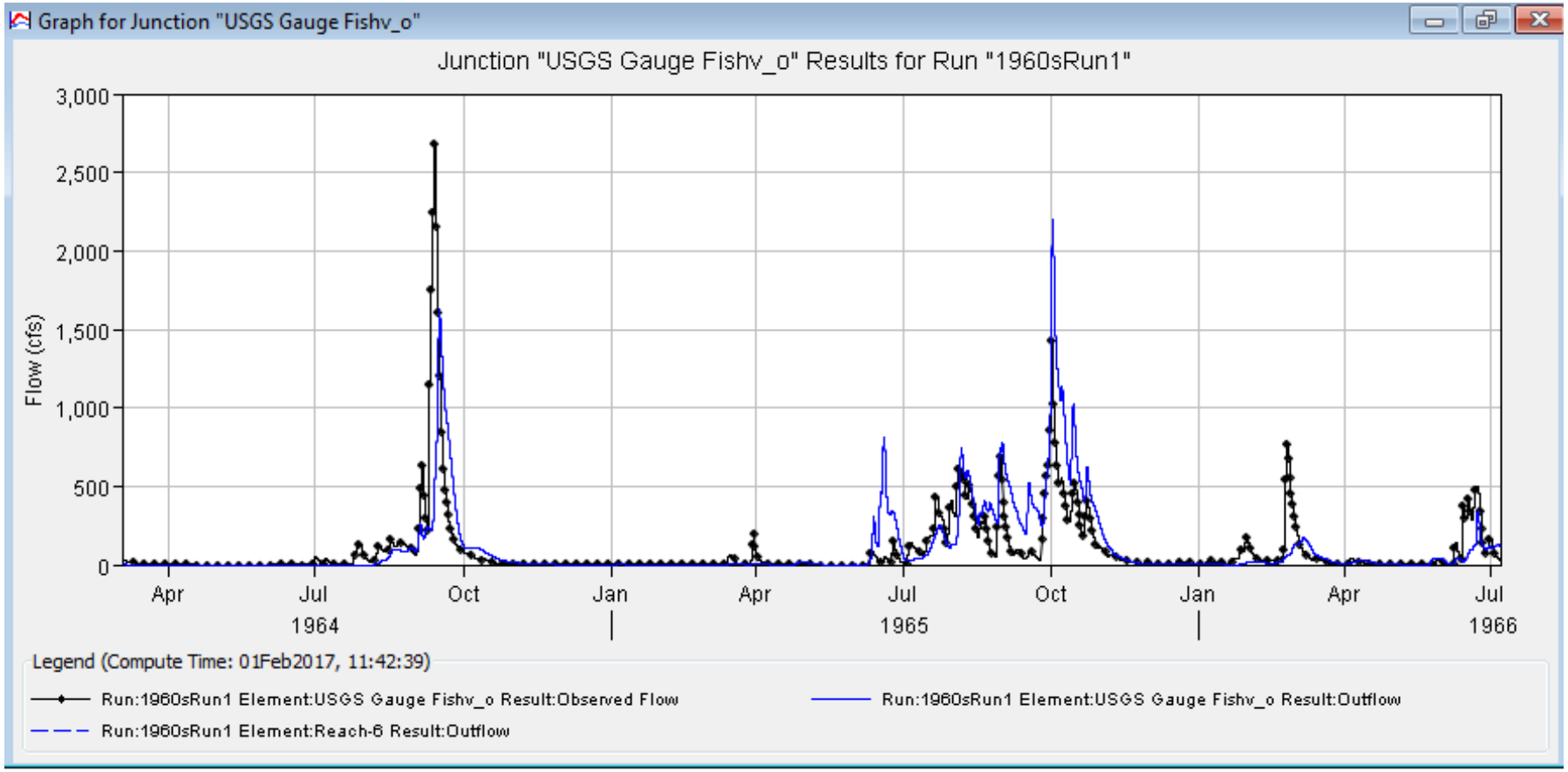
County Line

Bluehead Bny

Nutrient Sample Location - Median Total P (mg/L)

** TP annual loads represent likely maximum values for the watershed

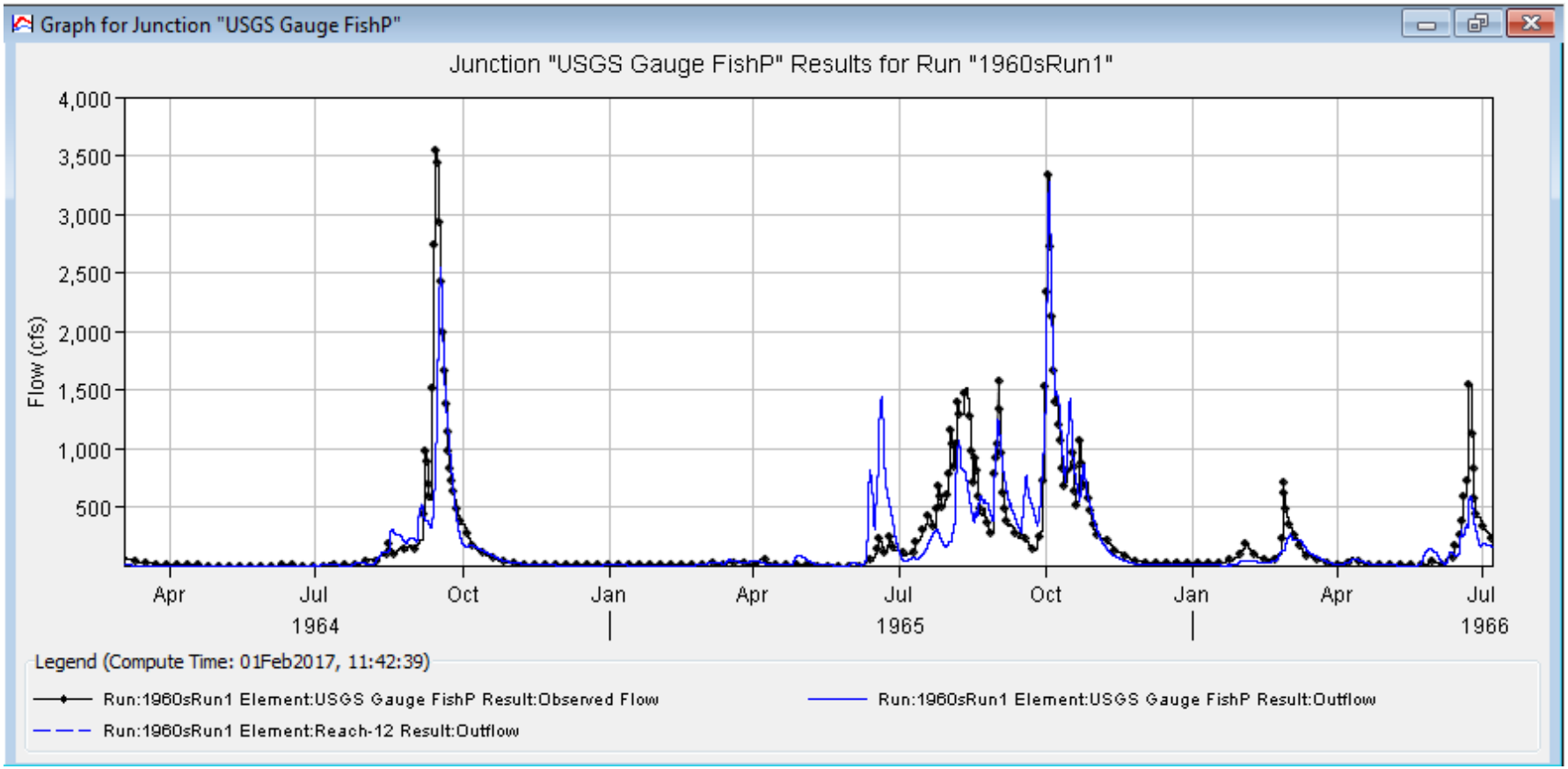
Figure 9
Key TP Water Quality Data



Calibration Results at FishV_O, Simulated Flow

Calibration Results at FishV_O, Observed Flow

Figure 10
Key Model Hydrographs

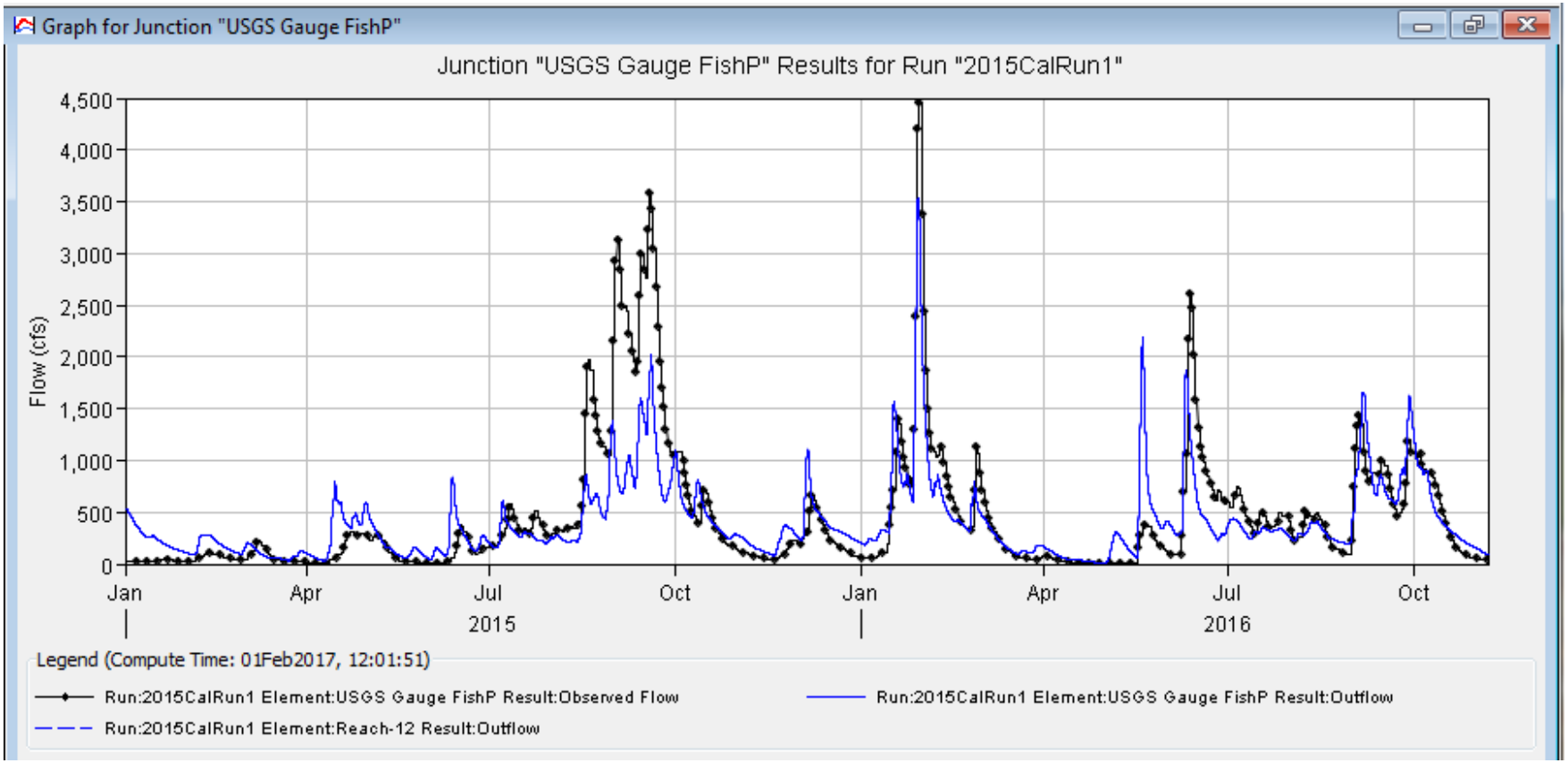


Calibration Results at FishP

Calibration Results at FishP, Simulated Flow

Calibration Results at FishP, Observed Flow

Figure 11
Key Model Hydrographs

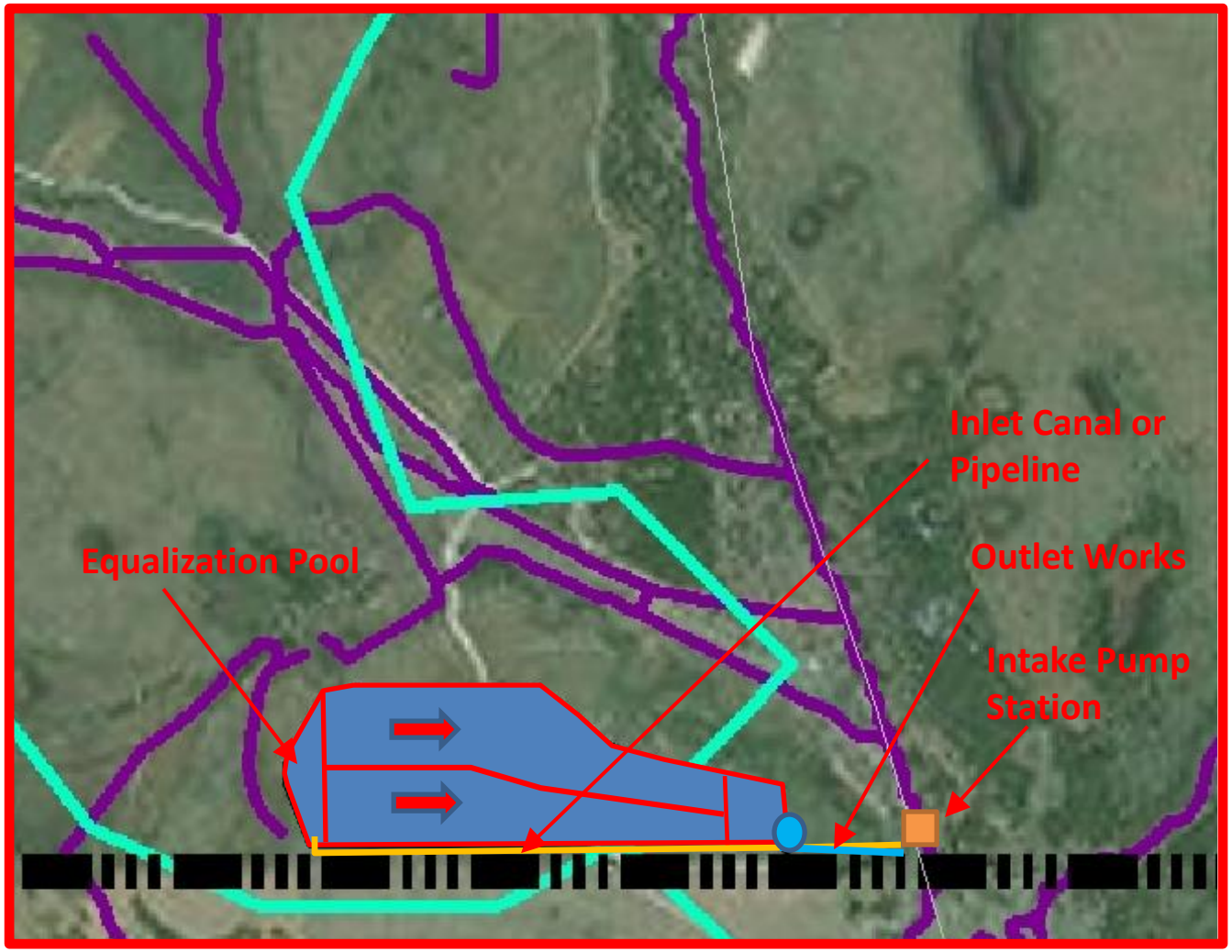


Validation Results at FishP

Validation Results at FishP, Simulated Flow

Validation Results at FishP, Observed Flow

Figure 12
Key Model Hydrographs



Proposed 125 Acre Footprint with ~ 100 Acre Treatment Area

Not to Scale

N

Alternative # 2

Map Sources: Blue Head Ranch & Cattle Company LLC

Final Results

- Four alternatives evaluated ranging from 125 to 725 acres;
- Estimated to remove from 0.53 to 4.16 MT/year TP and 3.63 to 17.83 MT/year TN;
- Unit Cost of TP water treatment was estimated to range from $173,000 to $502,000/MT;
- At the high end, the plan could alleviate up to 8.6% of the TP reduction target for Lake Okeechobee; and,
- Value of the water quality benefit alone is estimated to be as much as $2,221,351/year.

Questions

- **Thank you for the opportunity to provide this presentation.**
- **Thank you to the study sponsors (Caulkins Citrus Inc. and Blue Head Ranch).**
- **Questions ??**



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Further Information on Studies:

https://www.researchgate.net/profile/Christopher_Brown17/projects

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