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SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Managing High Water and the 8.5 Square Mile Area

WATER RESOURCES ACCOUNTABILITY AND COLLABORATION PUBLIC FORUM

December 3, 2020

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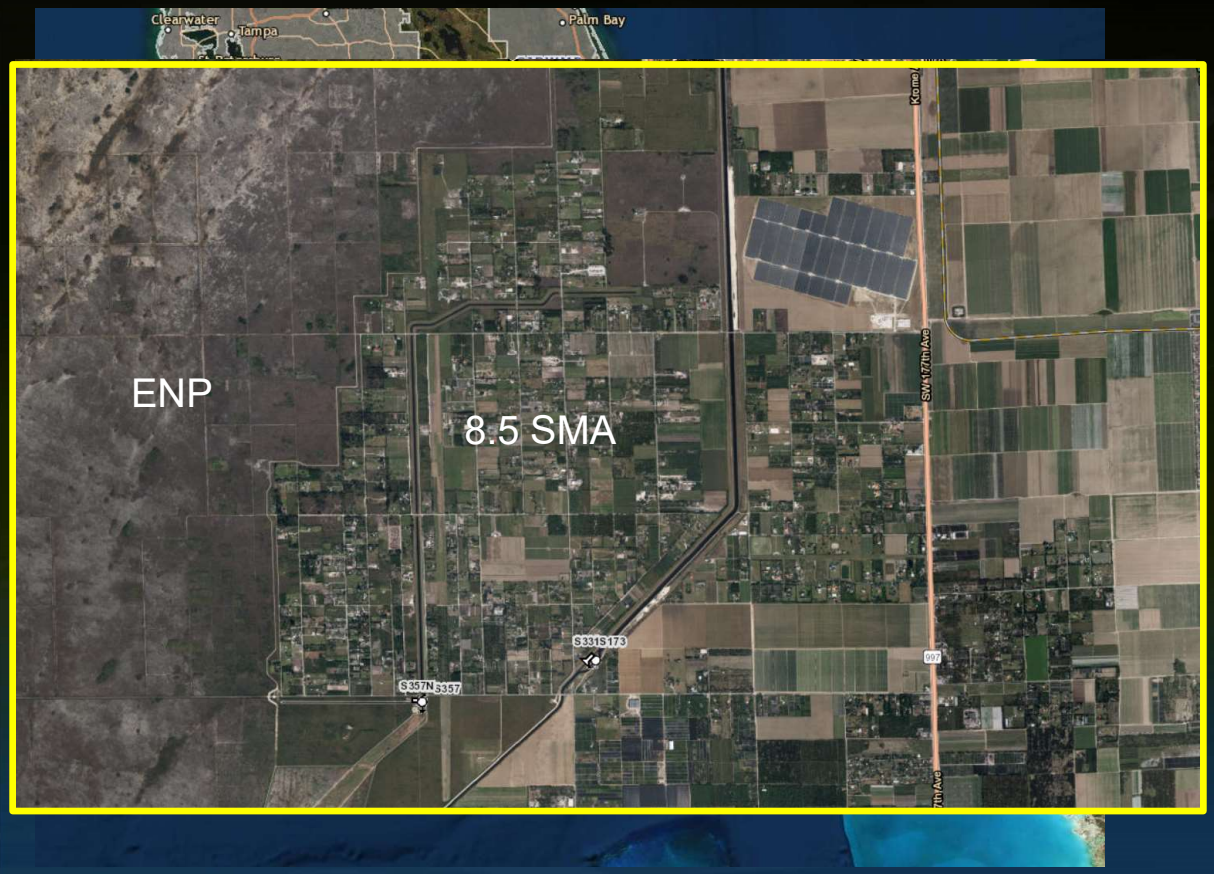
a. Background and History



- The 8.5 Square Mile Area (8.5 SMA) or Las Palmas Community is a developed (residential/ agricultural) area adjacent to the Everglades National Park (ENP)
- It is located west of the L31N Canal and Levee, part of the South Dade Conveyance System
- It is located within Miami Dade County's designated East Everglades Management Area

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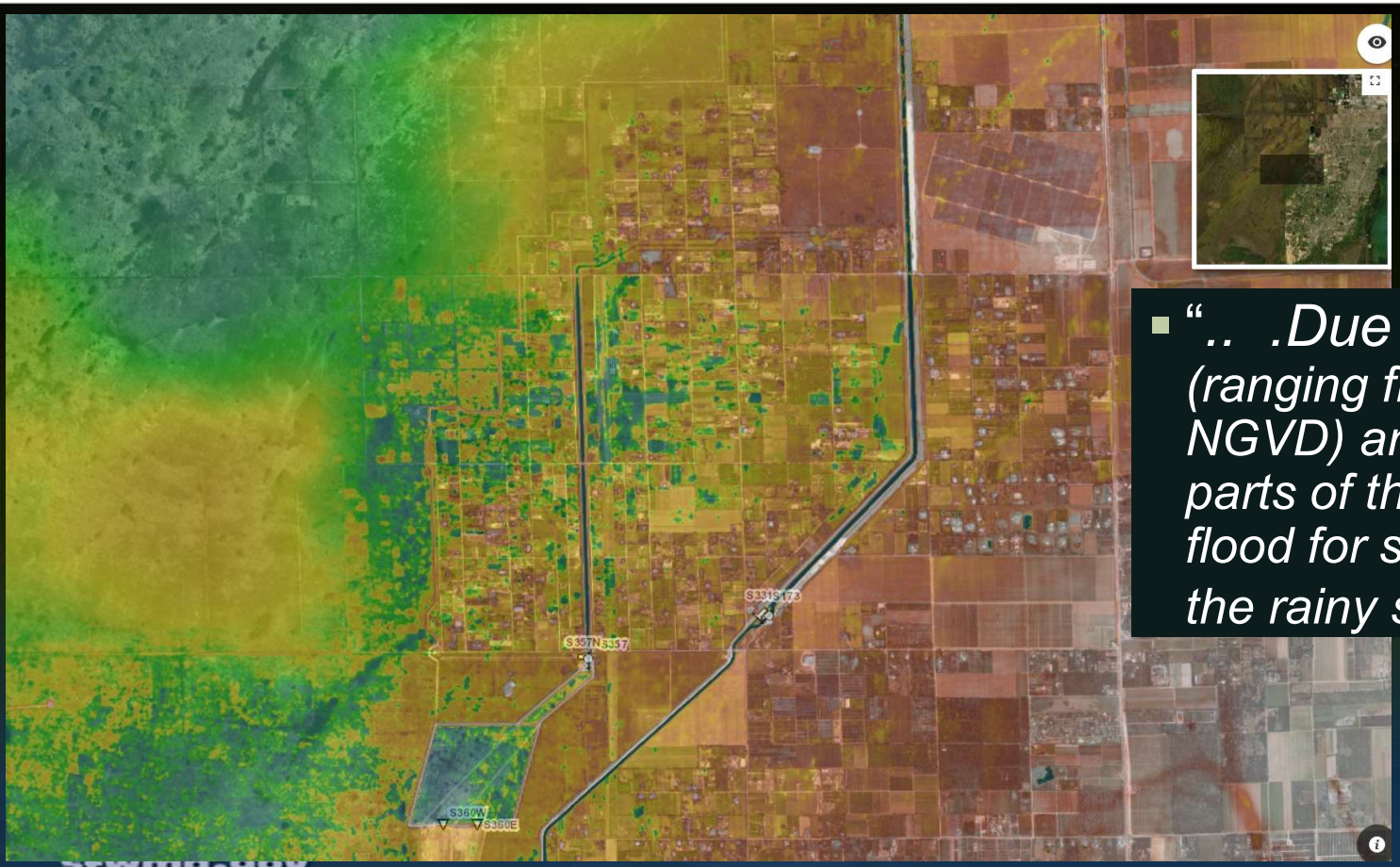
Pre 1983



- ".. .*Due to its low topography (ranging from 5.0 to 8.5 feet NGVD) and lack of drainage, parts of the 8.5 SMA frequently flood for several months during the rainy season …*"

Quote from CRS Report for Congress, Everglades Restoration: Modified Water Deliveries Project, 2005

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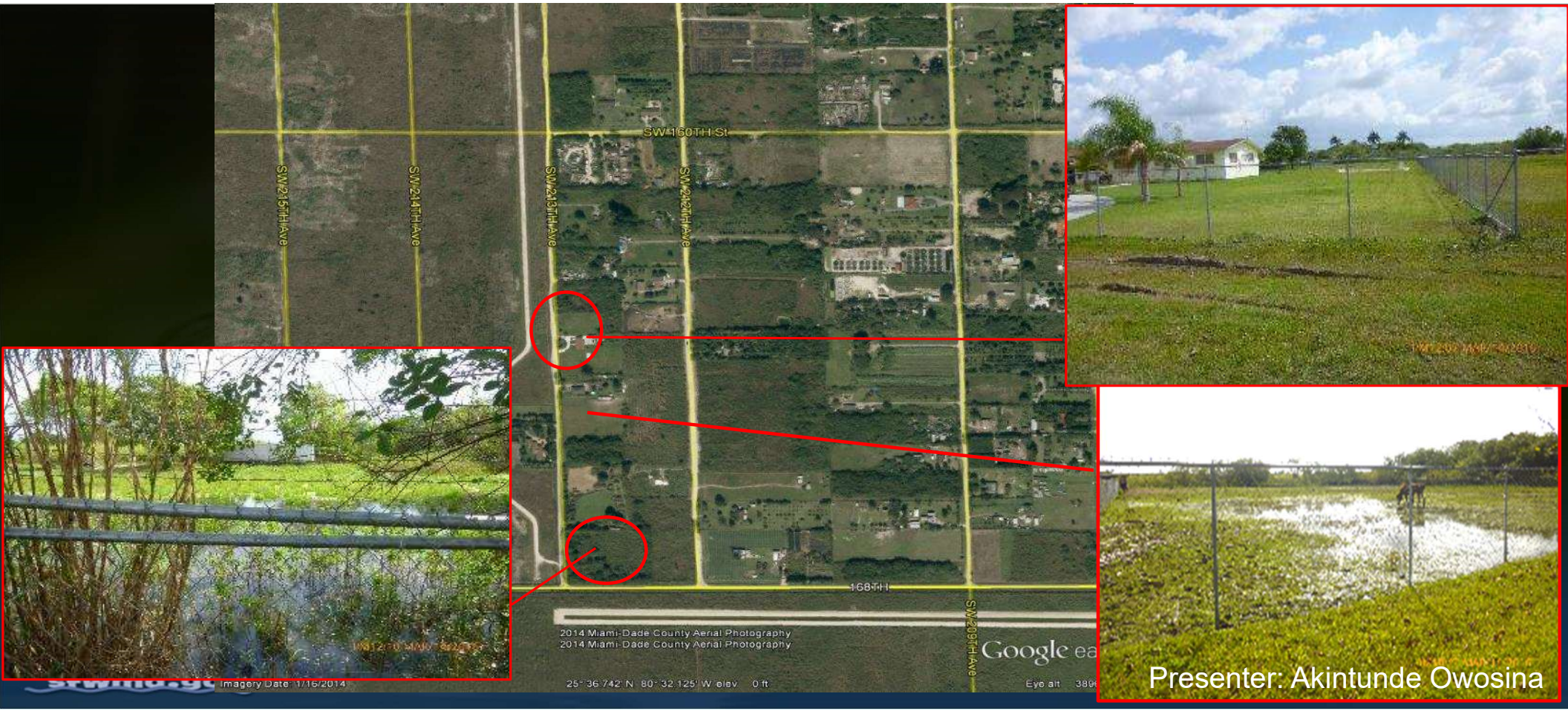
Poor Drainage



Expansion of ENP boundaries

- Everglades National Park Protection and Expansion Act of 1989 resulted in a eastwards shift of the park boundary
- The park expansion triggered a number of important activities including the Modified Water Deliveries project (authorized as part of the act) to improve water deliveries to the New ENP and to the extent possible restore natural hydrological conditions within the park
- "*The ACT also instructed the Secretary of the US Army Corps of Engineers (USACE) to determine if the proposed restoration of flows would adversely impact the 8.5 SMA and, if so, to construct a flood protection system for the developed portion of 8.5 SMA.*"

Miami Dade Wetland Advisory Task Force Final Report

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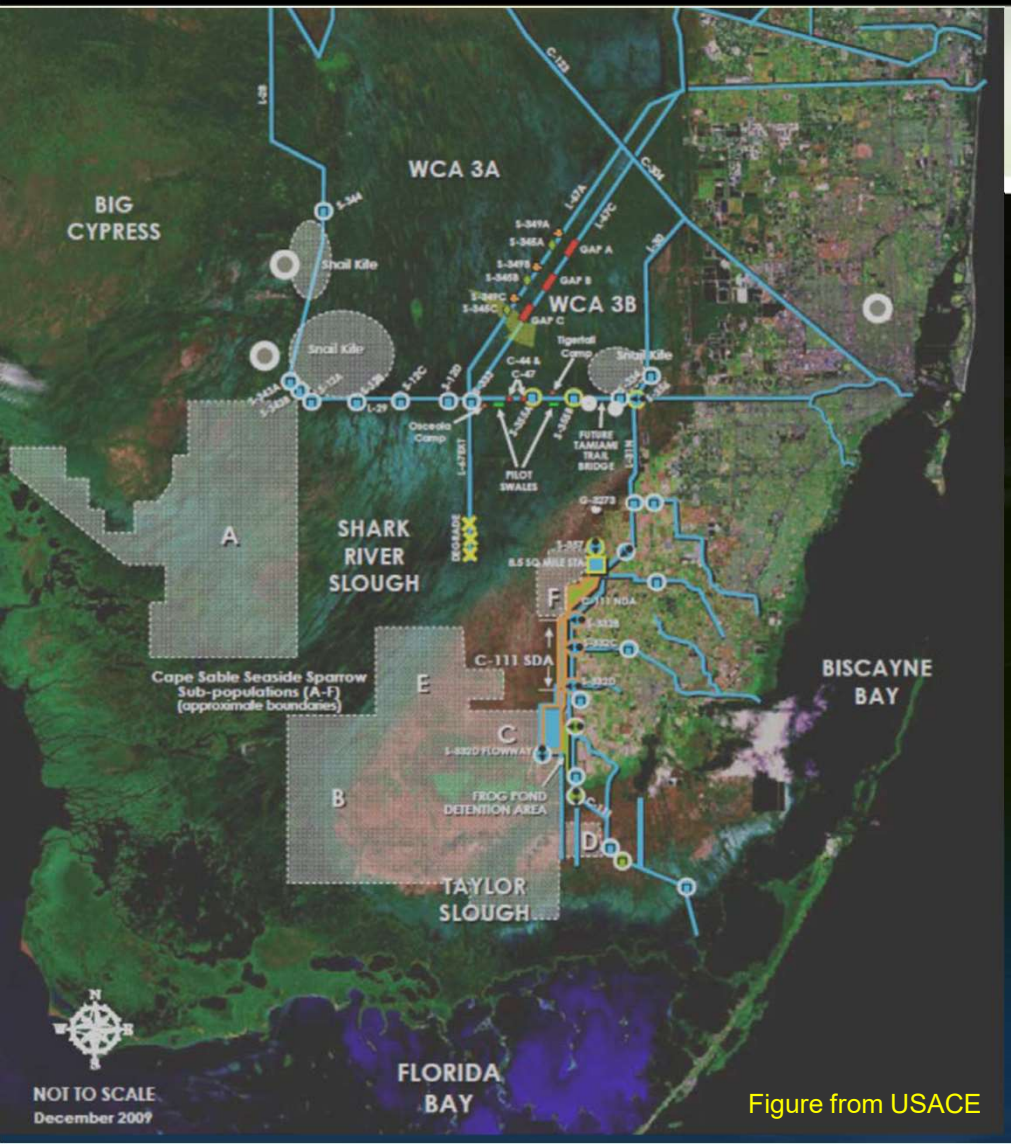

Figure from USACE

Modified Water Deliveries

- Conveyance and seepage control features
- Modifications to Tamiami Trail
- Flood mitigation for the developed East Everglades Area (8.5 SMA)
- Development of Operations Plan

Note: Some unconstructed conveyance and seepage control features removed in 2017
Corps published Environmental Assessment (EA) and Finding of No Significant Impact (FONSI) in 2017

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Modified Water Deliveries – 8.5 SMA Flood Mitigation

- Flood mitigation plan (1992 General Design Report and EIS for Modified Water Deliveries to Everglades National Park)
- Initial plan in 1992 which was " *.. Deemed "unworkable" by the superintendent of Everglades National Park*".
- State East Everglades 8.5 Square Mile Area Study Committee (1994) – was one of the considerations in a governing board 1998 vote to acquire all parcels in the 8.5 SMA
- "*The Corps began to devise a new plan for Mod Waters and the 8.5 SMA in 1999, which considered several alternative plans, including the complete buyout of the 8.5 SMA*." The new plan, Alternative 6D, had a mix of acquisition and structural features.
- Alternative 6D provides flood mitigation for 8.5 SMA. While the area will still see flooding, it will be no worse than it was before MWD.

Quotes from CRS Report for Congress, Everglades Restoration: Modified Water Deliveries Project, 2005

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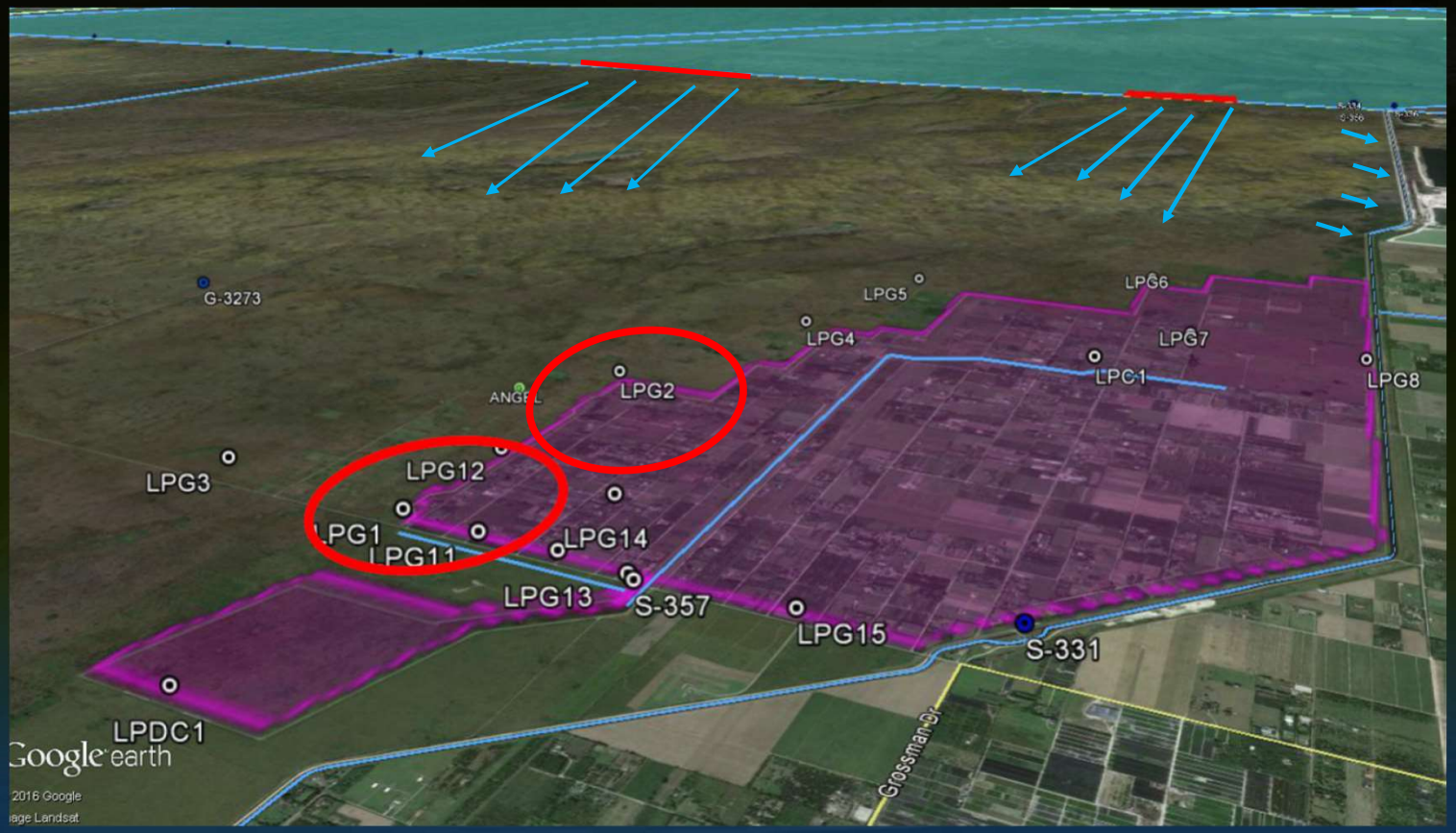
Modified Water Deliveries Project – Alternative 6D Seepage Management Features for 8.5 SMA



- L-357W – Levee separating the 8.5 SMA from ENP
- C-357 – Seepage collection canal inside the 8.5 SMA to capture and discharge seepage flows
- C-358 – Additional seepage canal south and west of the 8.5 SMA to capture seepage
- S-357N – Structure connecting C-358 to C-357
- S-357 – Pump station for moving recovered seepage into the 8.5 SMA Detention Cell
- 8.5 SMA Detention Cell – Detention area that discharges to the C-111 South Dade North Detention Area

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Tracking Restoration Flow to Shark River Slough

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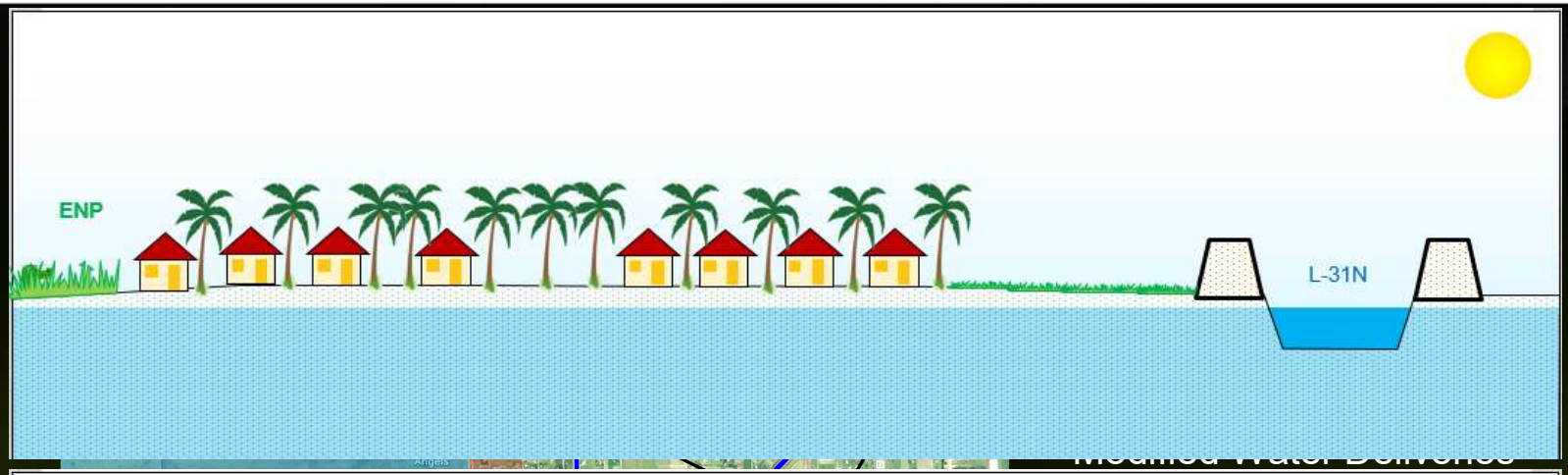
Providing Context – How is it Impacted



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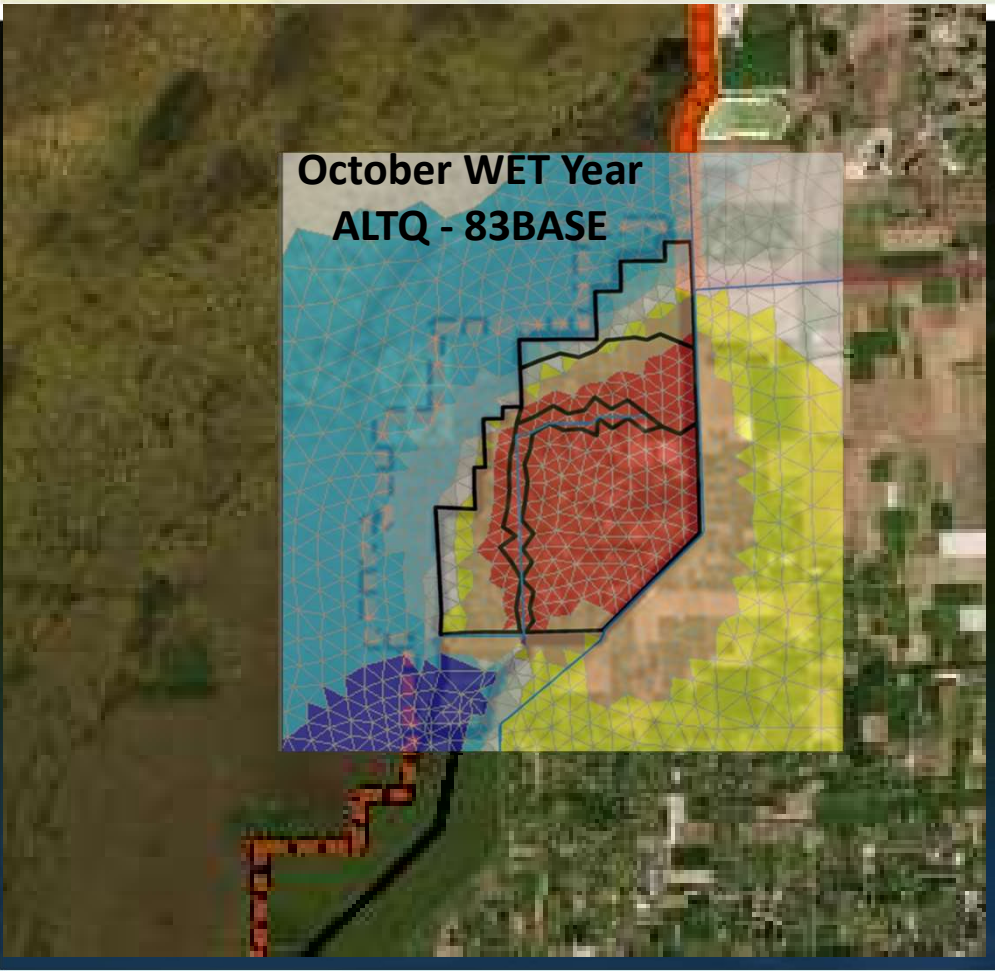
Combined Operating Plan (COP) Operations and Performance at 8.5 SMA



To operate the current system

- COP compared flooding metrics in 8.5 SMA between current conditions and conditions prior to implementation of MWD (1983)
- Looked at conditions in a wet, average or dry year

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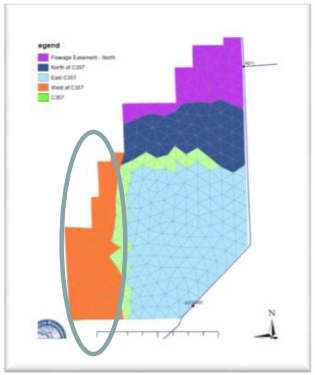
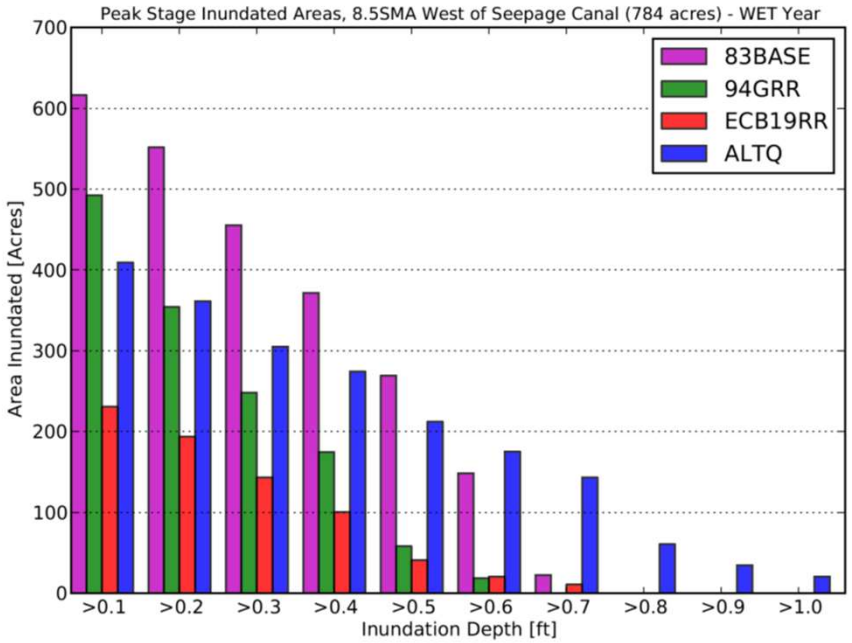
Combined Operating Plan (COP) Operations and Performance Summary

8.5 SMA Area Inundated Area West of Seepage Canal WET WATER YEAR (May05 – Apr06)





- COP able to achieve goal of additional flows to NESRS without making 8.5 SMA flooding worse at a regional scale
- At a sub-regional scale, some areas got wetter with hydroperiod restoration while some got better
- With improved operations metrics looking at overland water were mostly satisfied however water table remained higher in some areas suggesting reduced groundwater storage
- Important note, COP evaluation was for L-29 elevation up to 8.3 feet NGVD raised to 8.5 feet NGVD up to 90 days per water year
- With full restoration and L-29 at 9.7 feet NGVD the considerations for 8.5 SMA will very likely become limiting

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What is the current Issue

- Modwaters is done and working and allows L-29 canal to be raised up to 8.5 for up to 90 days sending more water than ever before to NERSR
- Why further action is needed
  1. The current operations relies on a combination of structural elements and operational accommodation, lowering flow into NESRS at times when flooding exceeds a predetermined threshold in 8.5 SMA.
  2. This throttling of flows out of the S333 and across Tamiami Trail due to flooding risk in 8.5 SMA often coincides with high water in WCAs and limits our ability to manage flooding in the WCAs, especially WCA3A.
  3. COP addressed the flood mitigation issues for L-29 at elevation 8.5 ft NGVD for some of the time, full restoration following the Tamiami Trail next steps will allow L-29 to be taken as high as 9.7 ft NGVD, conditions under which the mitigations features are expected to be less effective and become limiting

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The Challenge and Opportunity

- Is there a project or course of action that can ensure that during periods of high-water emergency in the WCAs, flows can continue in to NESRS furthering restoration while still providing flood mitigation for 8.5 SMA
- Can that project or course of action be integrated into a long-term seepage management/ flood mitigation strategy to ensure that as the Tamiami Trail Next Steps and CERP features can increase L-29 levels, while 8.5 SMA meets its flood mitigation objective and will not limit flows into NESRS

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Evaluation of Seepage Collection Canal and Curtain Wall as Part of the Strategy for Addressing Seepage Induced Flooding in 8.5 SMA

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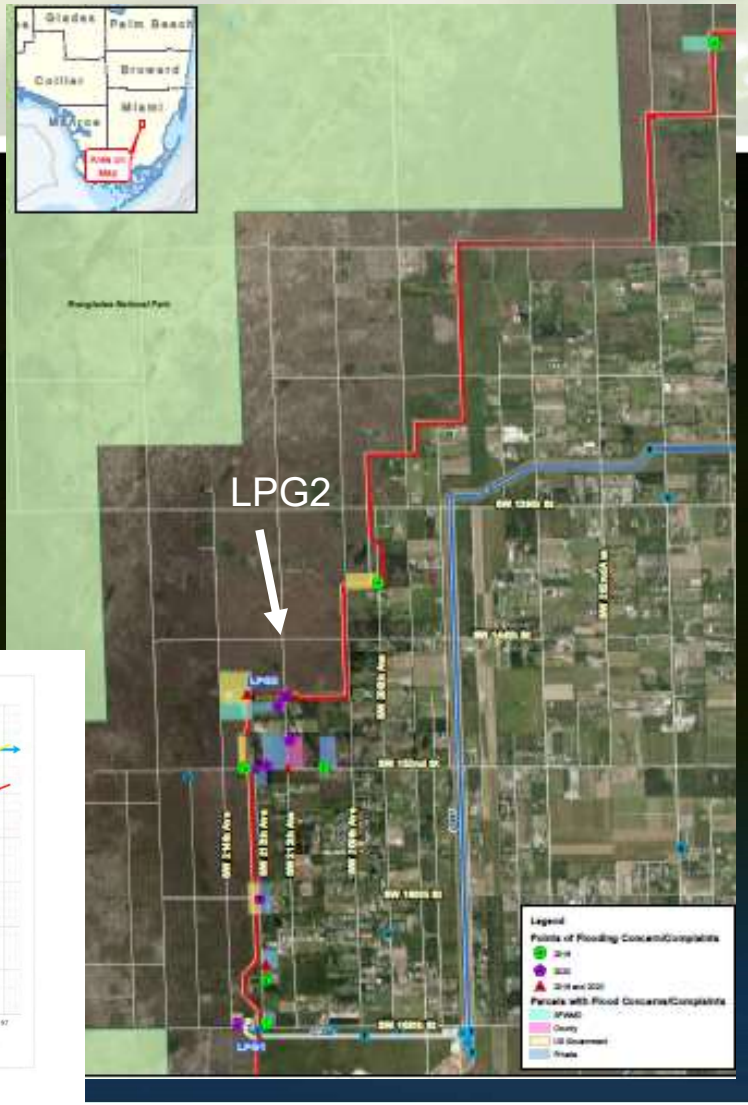
8.5 SMA Challenges

- Despite completion and operation of MWD project, flood water conditions in portions of the 8.5 SMA persist and represent a challenge to sending flows from WCA 3A to ENP.
- These challenges not only impact local hydrology but also regional operations, such as the opportunity to make releases from WCA3A during high water conditions
- Staff was directed to evaluate options, structural and non-structural



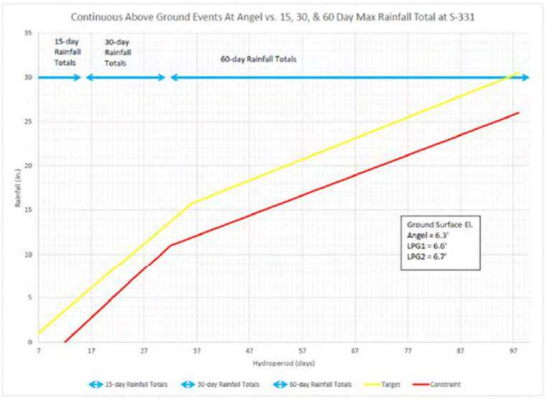


Figure 7-11. 8.5 SMA Hydroperiod Target and Constraint

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Outline of Presentation

- Non-Structural Option
- Structural Options
  - Seepage Collection Canals (with and without pump)
  - Curtain Wall
  - Curtain Wall, Canal, and Pump Station
- Comparison of alternative options
- Summary of results
- Cost estimates

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2b. Nonstructural Opportunities and Challenges

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Non-structural Option: Acquisition

Acquisition Process Willing Seller

- Identify target properties
- Complete title work
- Contact Property owner inquire as to interest in selling property
- Negotiate right of entry to conduct appraisal, environmental and cultural resource assessments.
- Negotiate Purchase and Sales Agreement.
- Obtain Governing Board Approval
- Close purchase

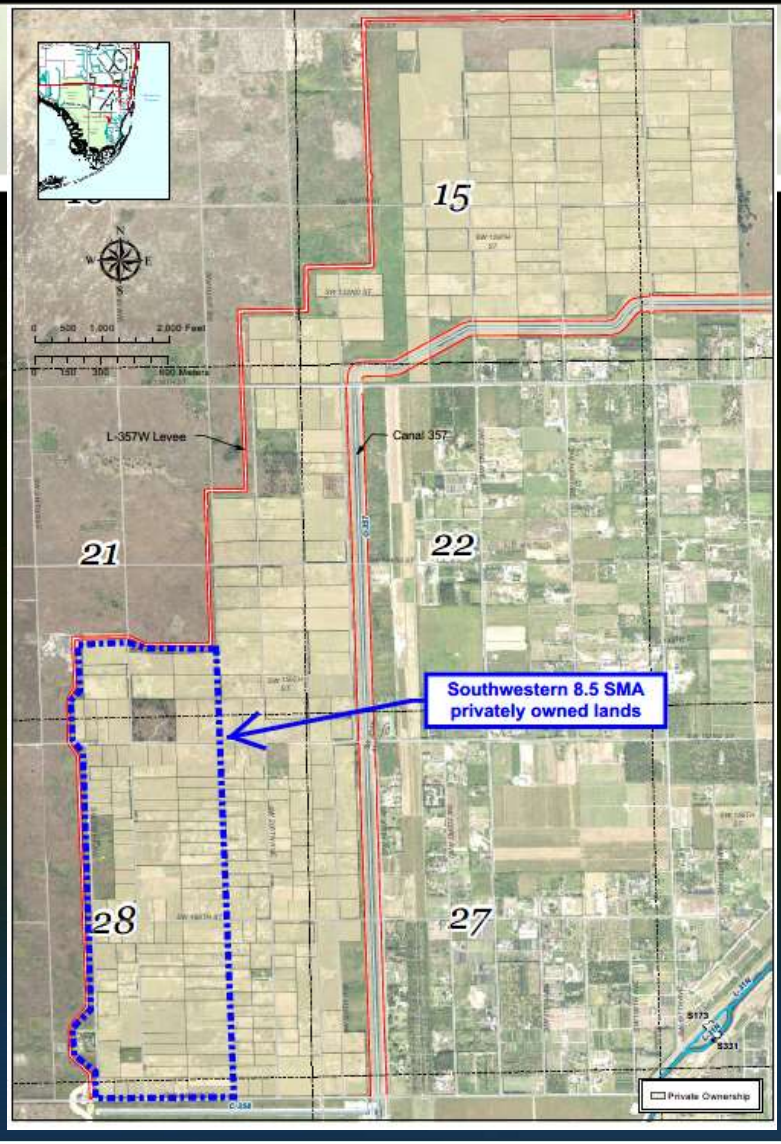
Non-structural Option: Acquisition

Willing Seller Process Experience

- 66% acquired on a willing seller basis
- Acquired at 190% of Appraised value
  - Inclusive of Attorney fees and costs
- 15 months to acquire all willing seller interests

Non-structural Option: Acquisition

- Willing Seller program
- Can be scaled up or down
- 119 properties shown including 18 homes
- Property Appraiser “Market” Value $12.4 Million
- Purchase values will likely be significantly greater than the “Market” Value



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2c. Evaluation of Seepage Management Options for the Western Limits of 8.5 SMA

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Structural and Operations Options

- COP confirmed that the western-most portion of the 8.5 SMA is most vulnerable to seepage impacts from the ENP
- Two recent projects in the region, Modified Water Deliveries and the Miami Dade Limestone Products Association seepage wall projects, evaluated and demonstrated effective seepage management concepts
- The data acquired as part of the ongoing curtain wall study authorized by SFWMD GB present an opportunity to re-examine these concepts and their potential to help mitigate flooding in western 8.5 SMA
    1. A second seepage collection canal
    2. A curtain wall
    3. A combination of both

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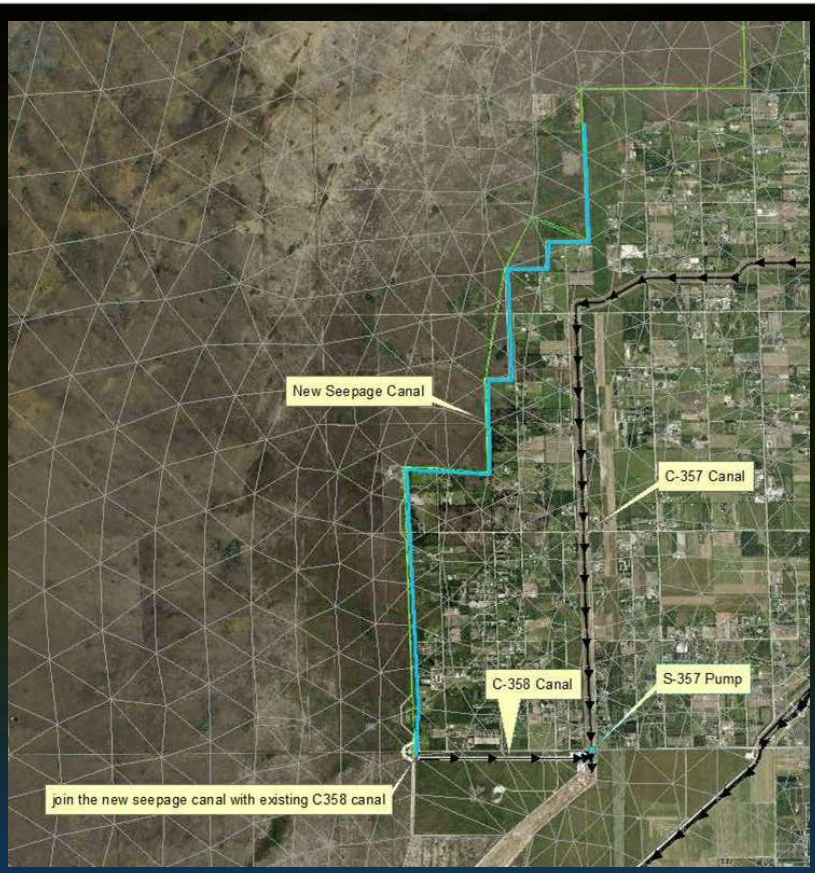
Seepage Collection Canal Concept

- Add a canal, smaller in size than the C-357, along the western perimeter of the 8.5 SMA
- While east west canals connecting to C-357 were considered they were not evaluated due to land/easement concerns
- Various canal lengths were tested to identify the shortest length capable achieving flood mitigation without over draining the area
- Connections to the existing flood mitigation system is through the C-358 Canal
- An open connection was considered but a pumped outfall was found to offer higher operational flexibility to limit impacts



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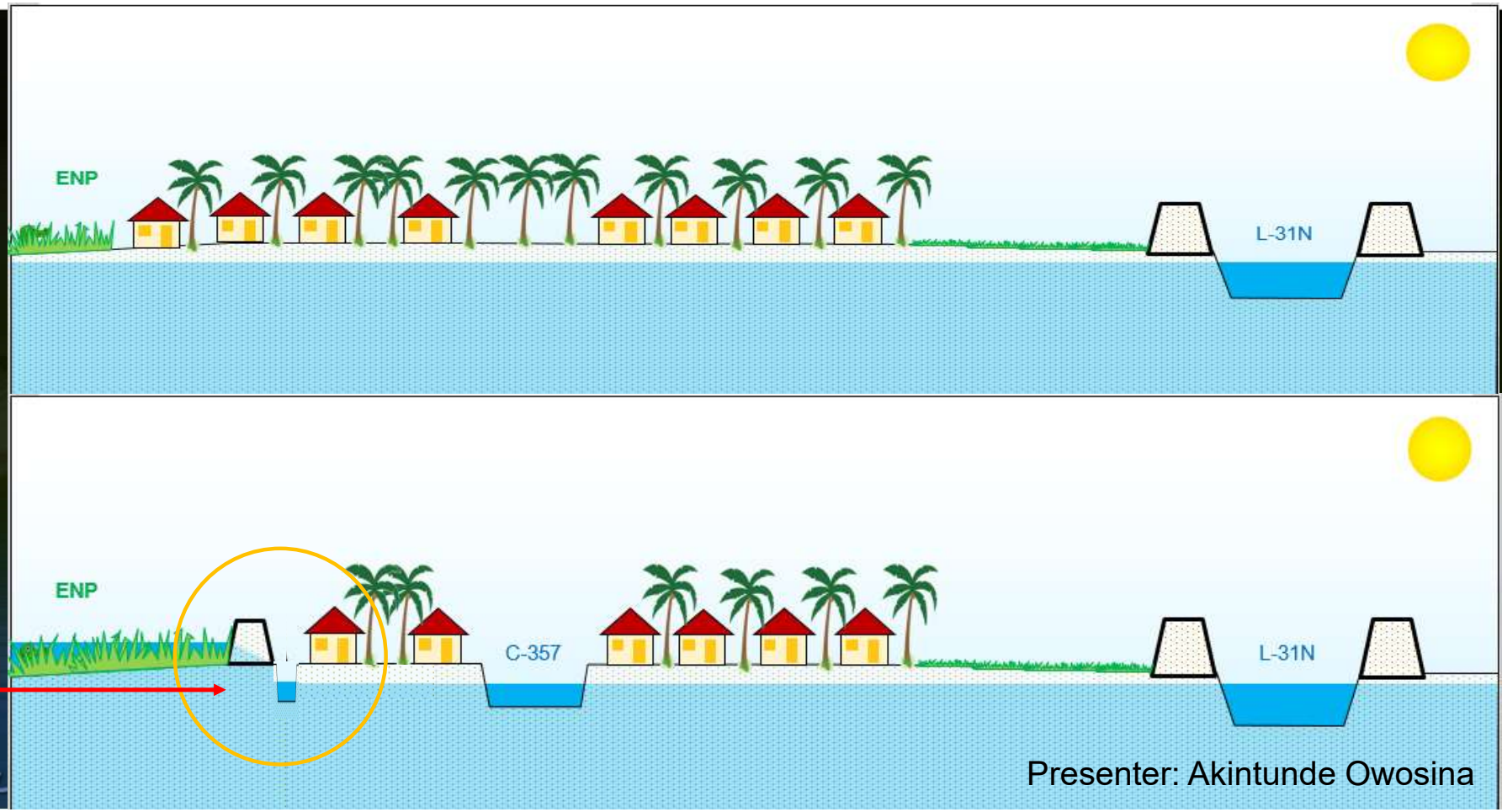
Effect of Seepage Collector Canal Concept

Before

After

New feature



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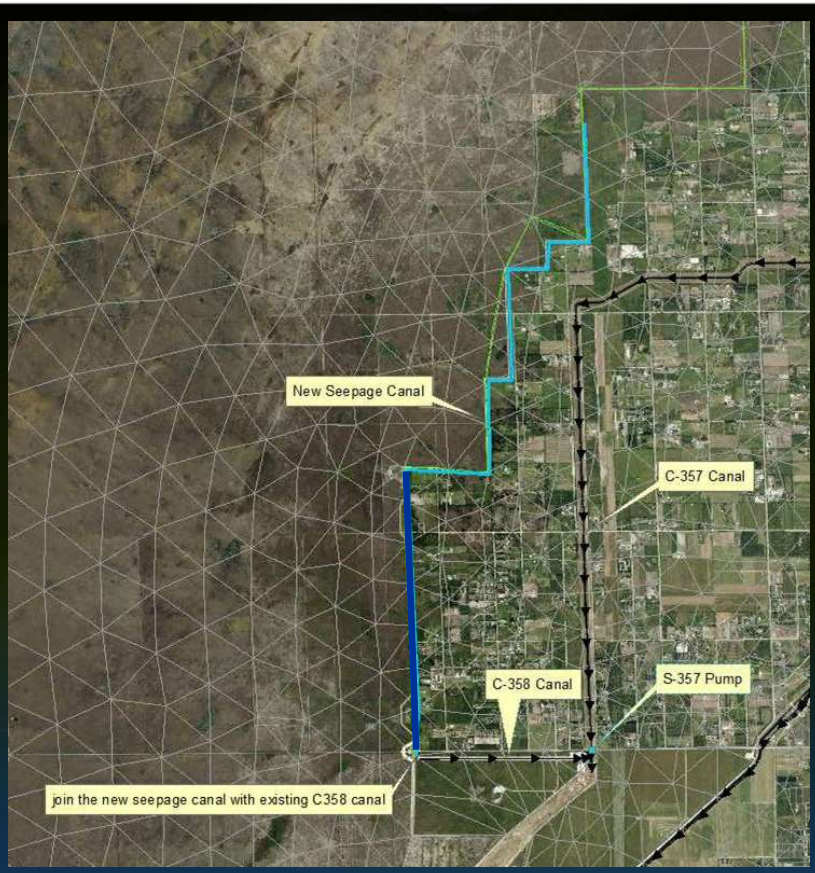
Seepage Collection Canal Evaluation Approach

- Explored a seepage collection canal concept (shown to the right)
- Hydraulic analysis was performed to confirm the canal could convey sufficient volume of seepage
- Analysis focused on COP operations of the existing infrastructure (i.e., S-357 pump)
- Improved operations may be necessary to maximize benefit of this feature



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Seepage Collection Canal Scenarios

- Various canal lengths and/or supplemental pumps were analyzed
  - A preferred canal alignment (**ALT1**) was modeled.
  - A 125 cfs pump station was added to become (**ALT3R**)
- The ALT1 and ALT3R performed similarly to options with longer canal lengths by improving conditions near LPG2.
- As with other canal options, both show some simulated impacts in ENP and the northern portion of the 8.5 SMA
- Two minor refinements to S-357 operations were tested which addressed some, but not all simulated impacts. **ALT1O** (lower triggering conditions for S-357) and **ALT3O** (use of northern gauges to trigger S-357)

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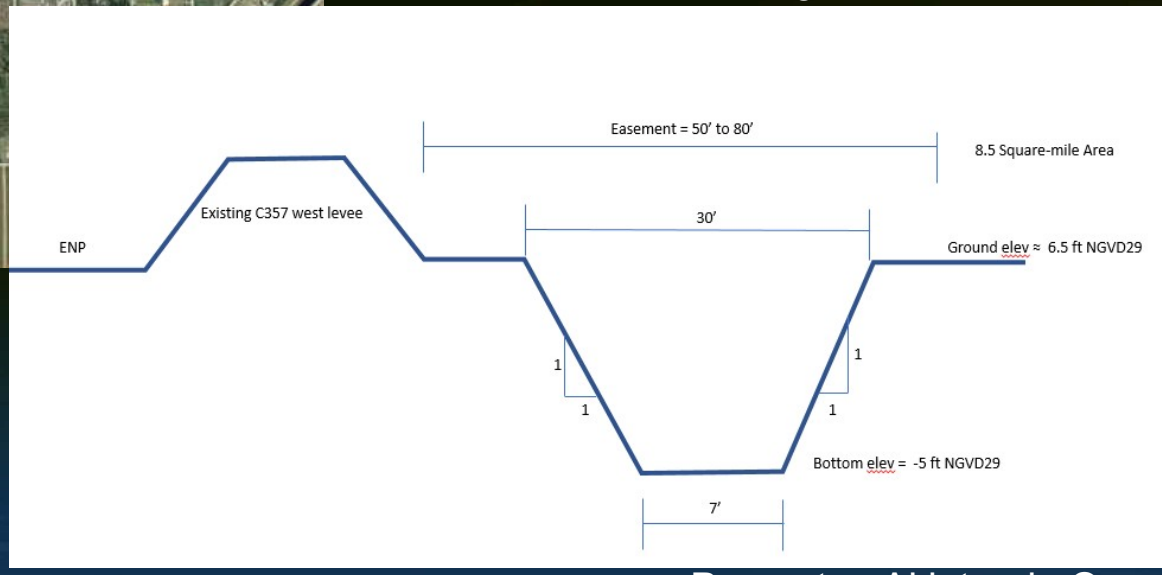
Selected Scenario

A short canal reach (approximately 7200feet) with a pumped discharge showed great promise

Assumed Canal Cross Section Similar to existing C-358 Canal



Preliminary siting assessment indicates a 50' to 80' easement east of the 8.5SMA L-357W levee which could accommodate a 30' top-width canal

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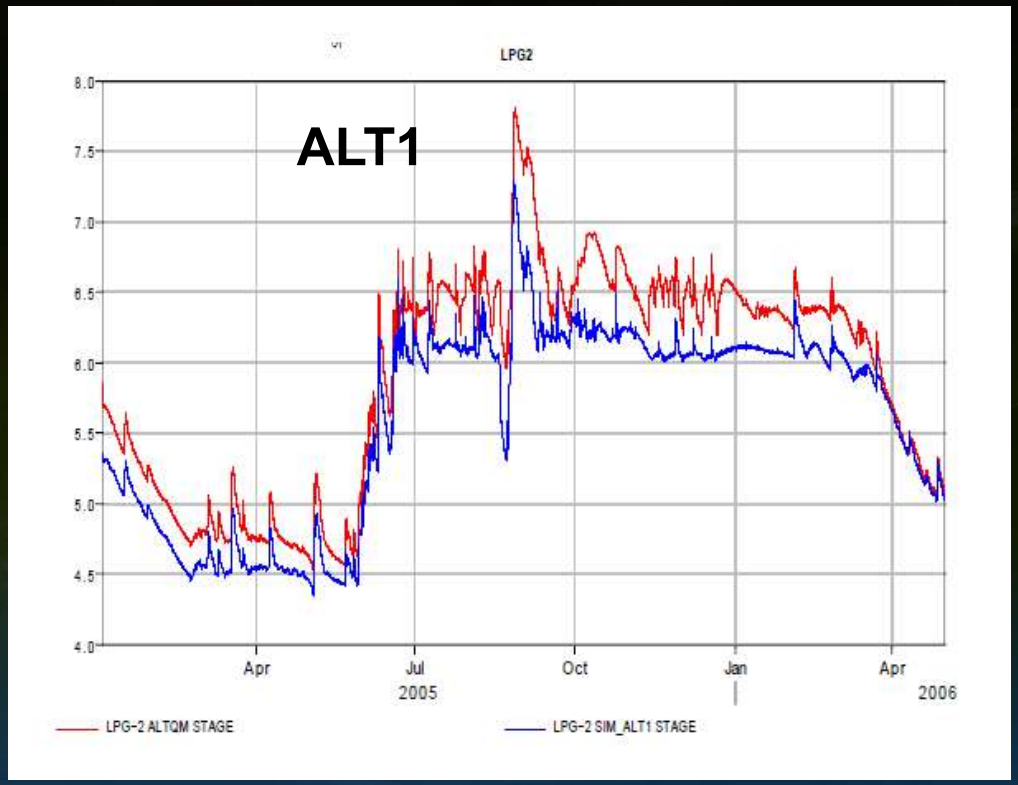
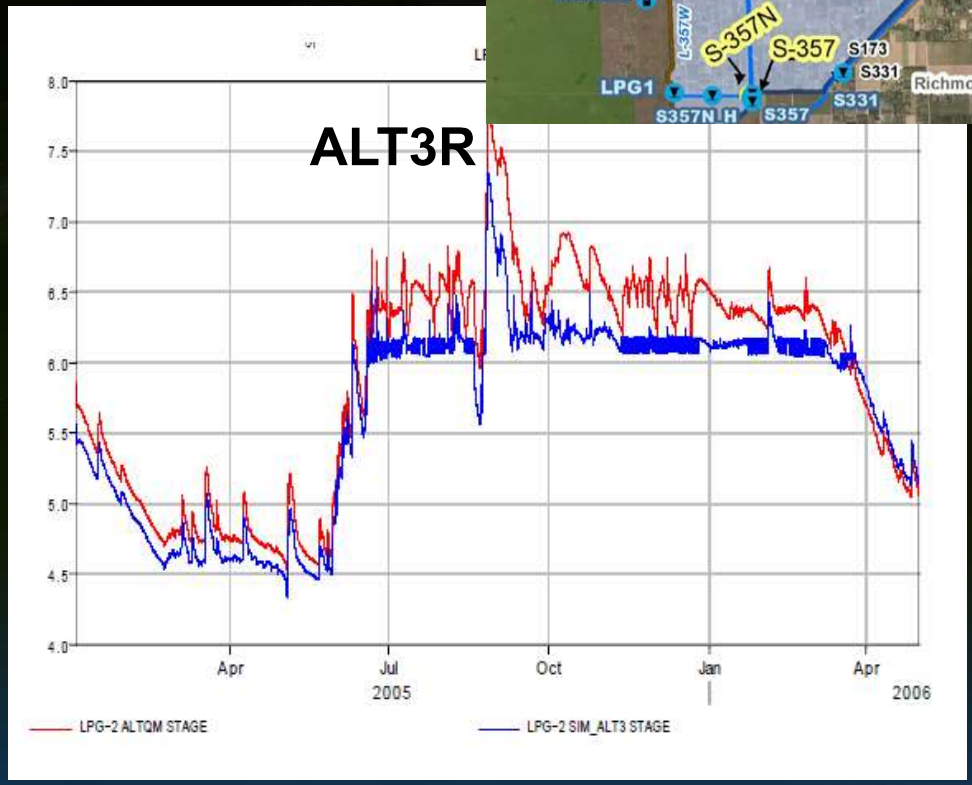
Seepage Collection Canal Lowers Peak Stages Near LPG2





The Red trace (ALTQm) represents COP performance

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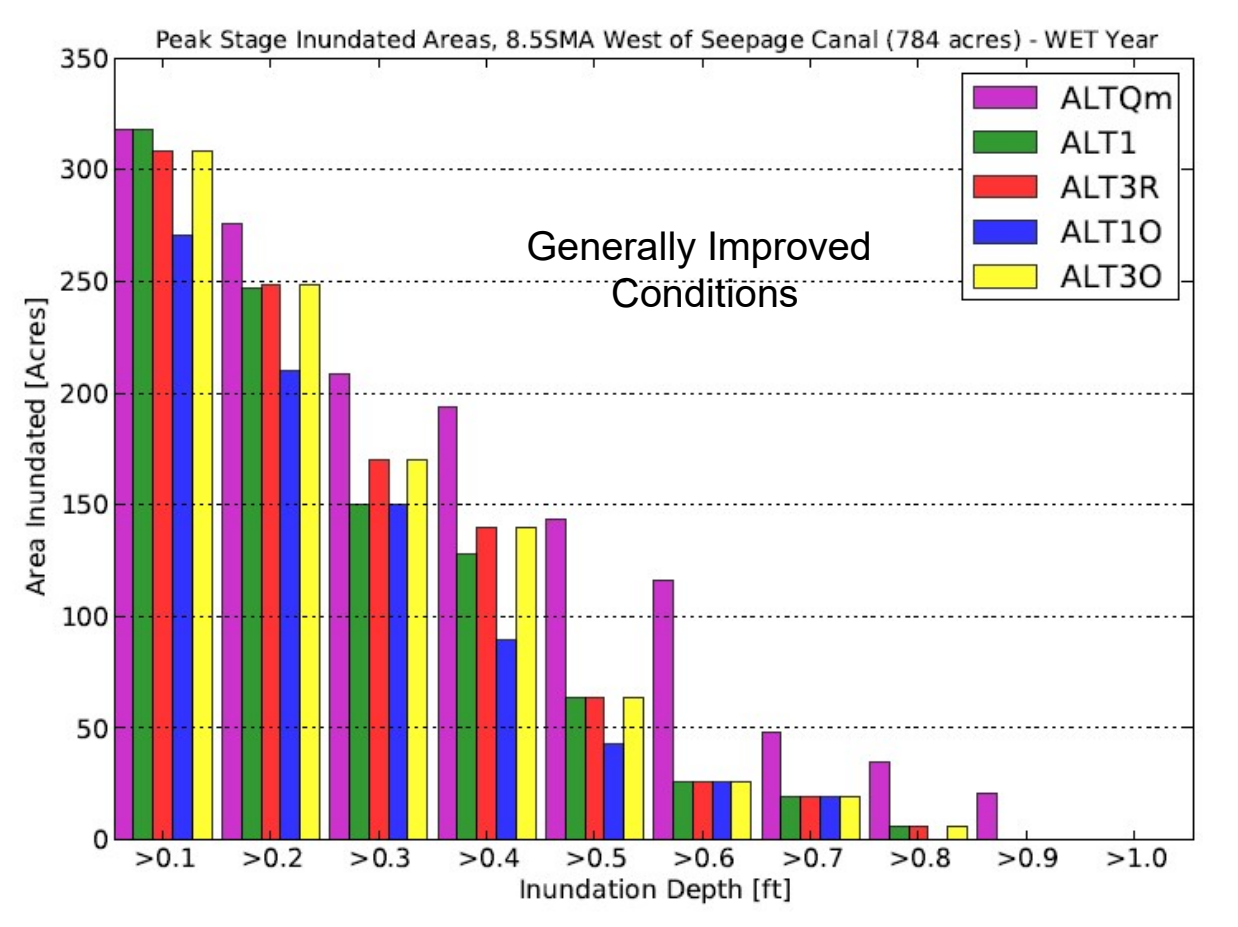

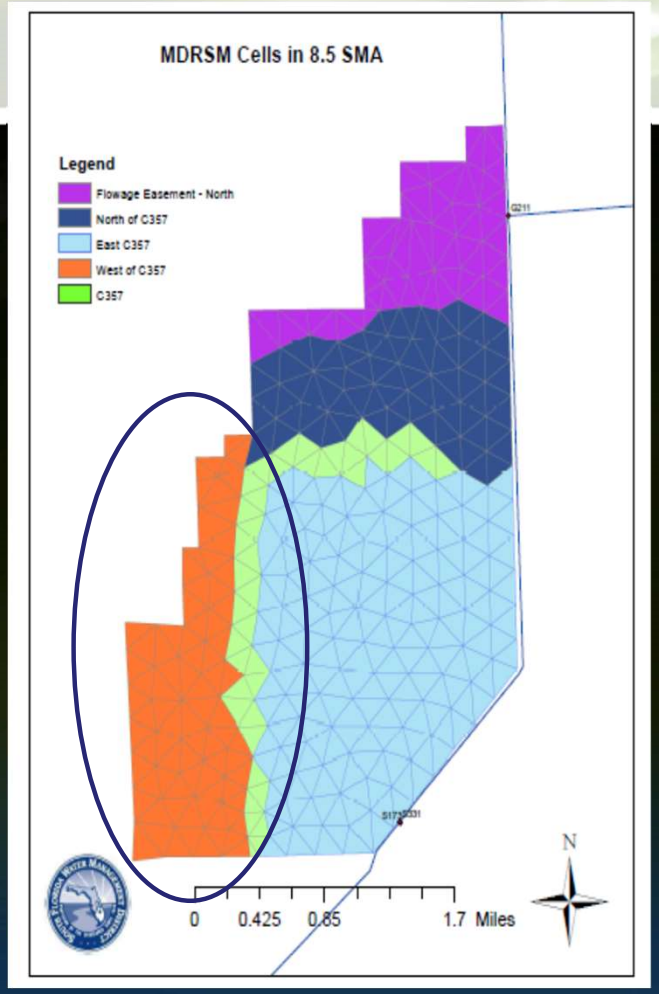

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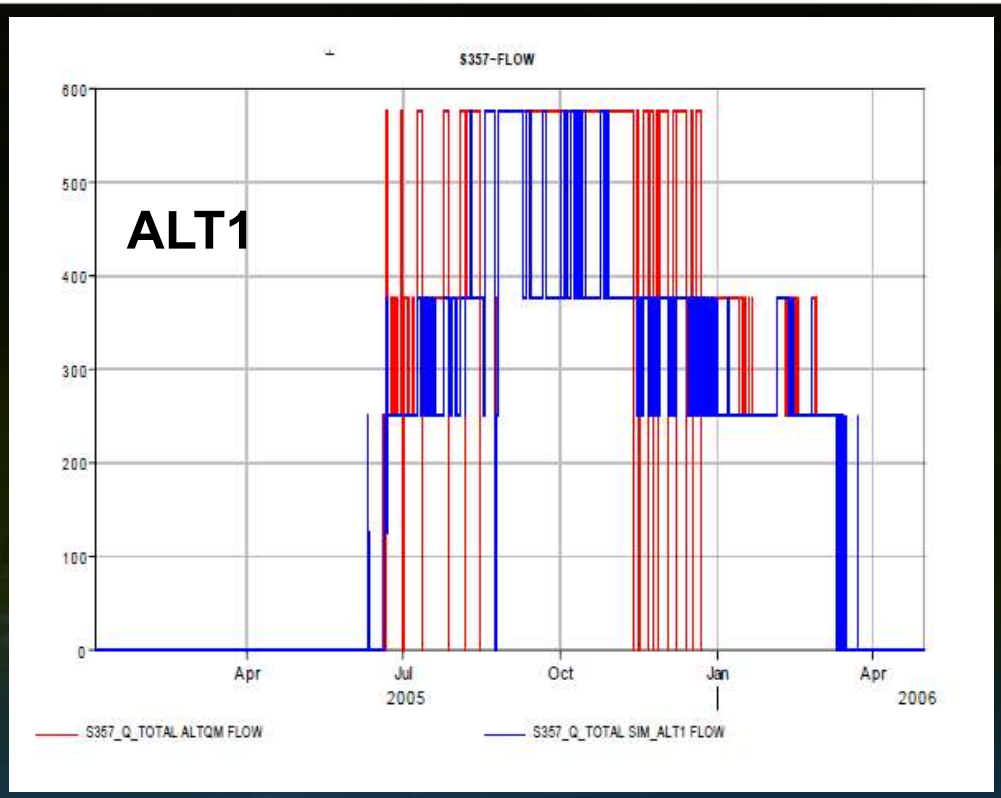
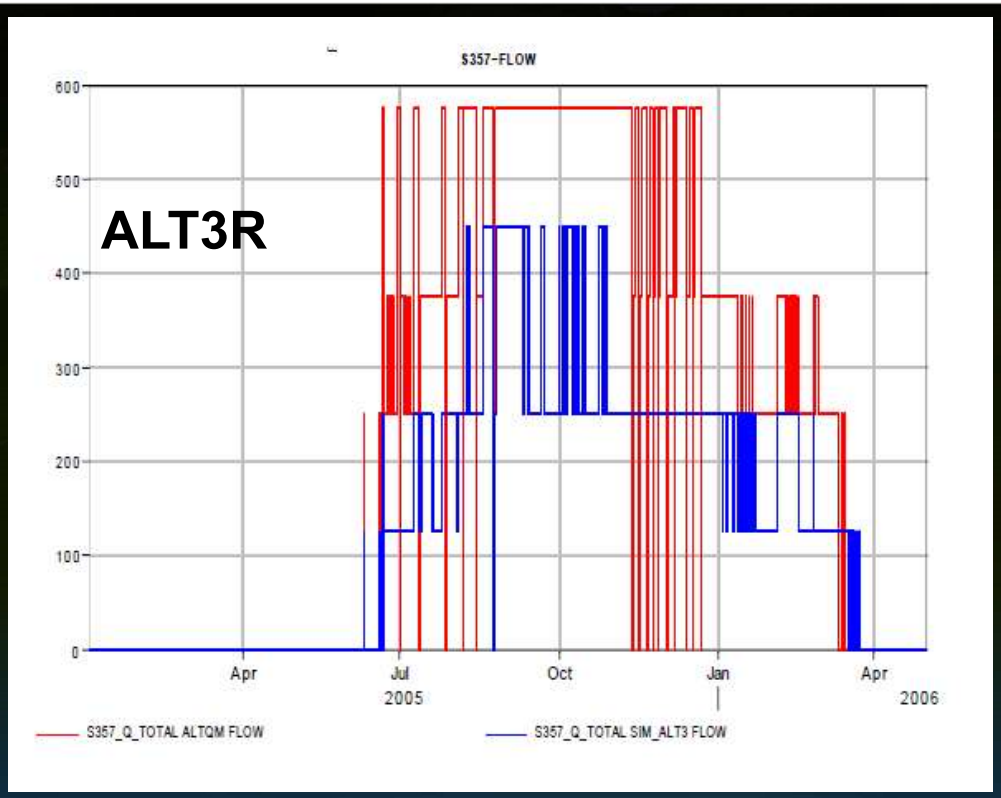
S-357 Pumps Less Frequently





The Red trace (ALTQm) represents COP performance

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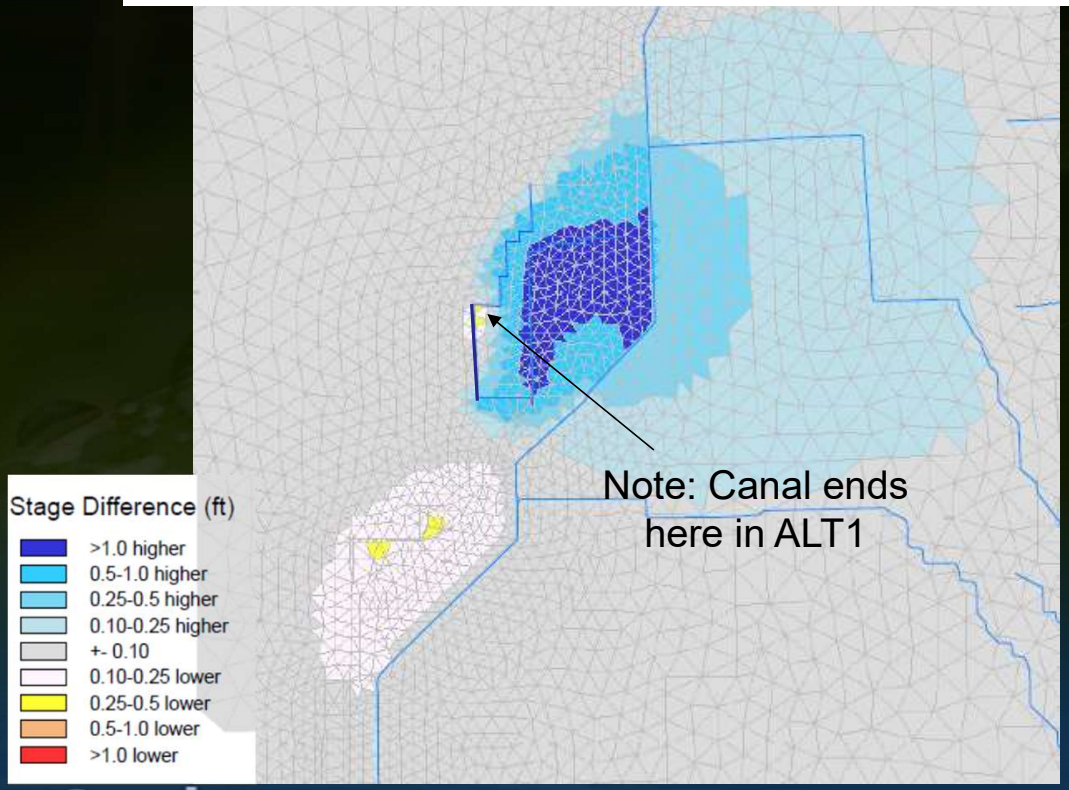
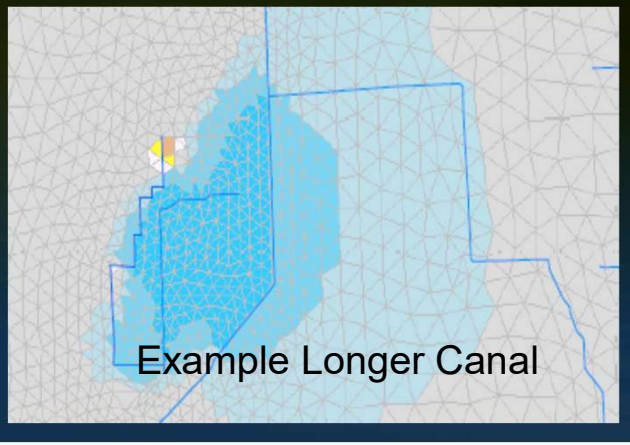
Area Influenced by S-357 Canal

Wet October Stage Difference

October 2005



Alternatives illustrate the potential to reduce groundwater drawdown in the area influenced by the existing seepage canal (using current S-357 operations) causing a wetter 8.5 SMA and a drier C111 north detention area; performance trend are similar with the addition of a pump and / or longer perimeter canal.



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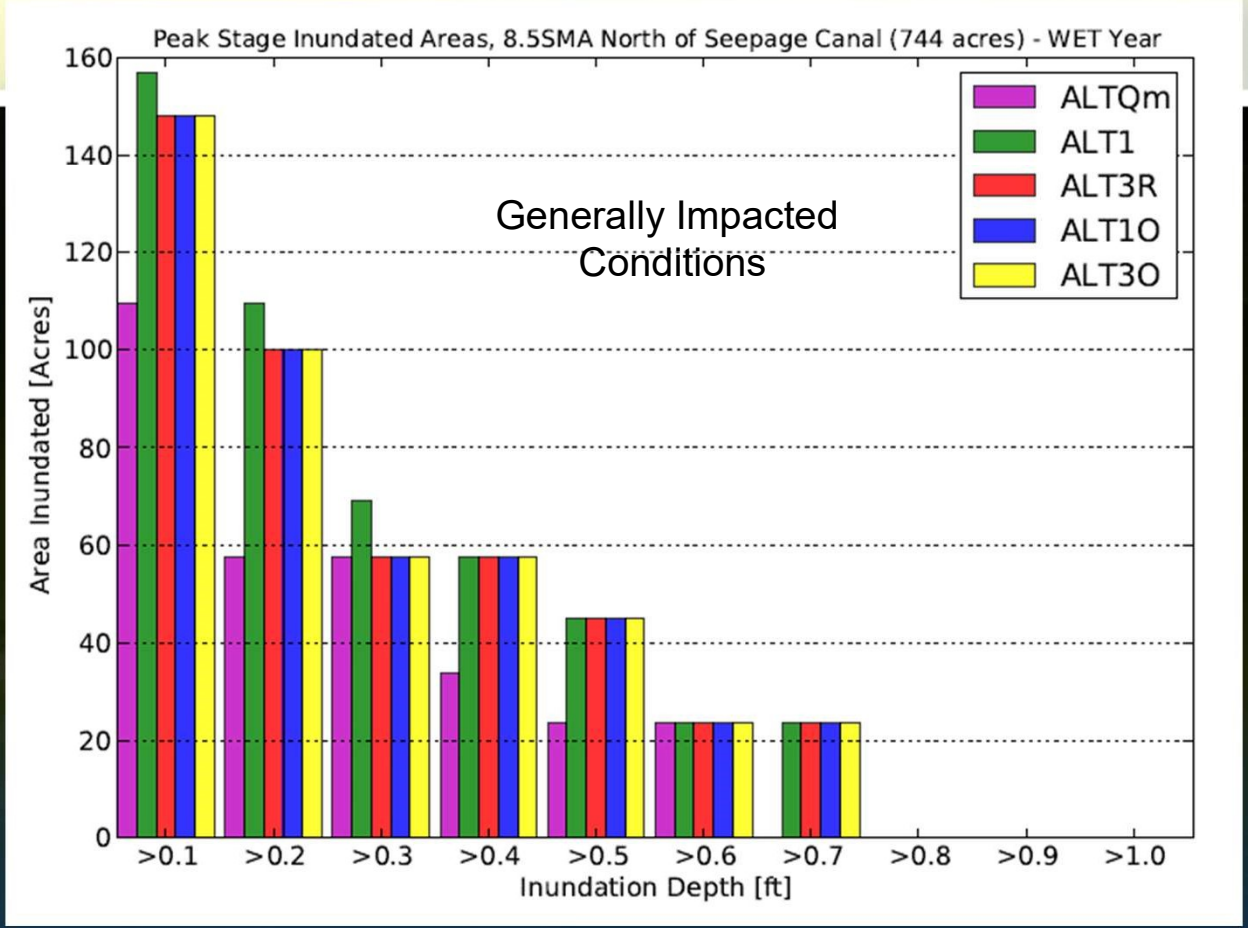

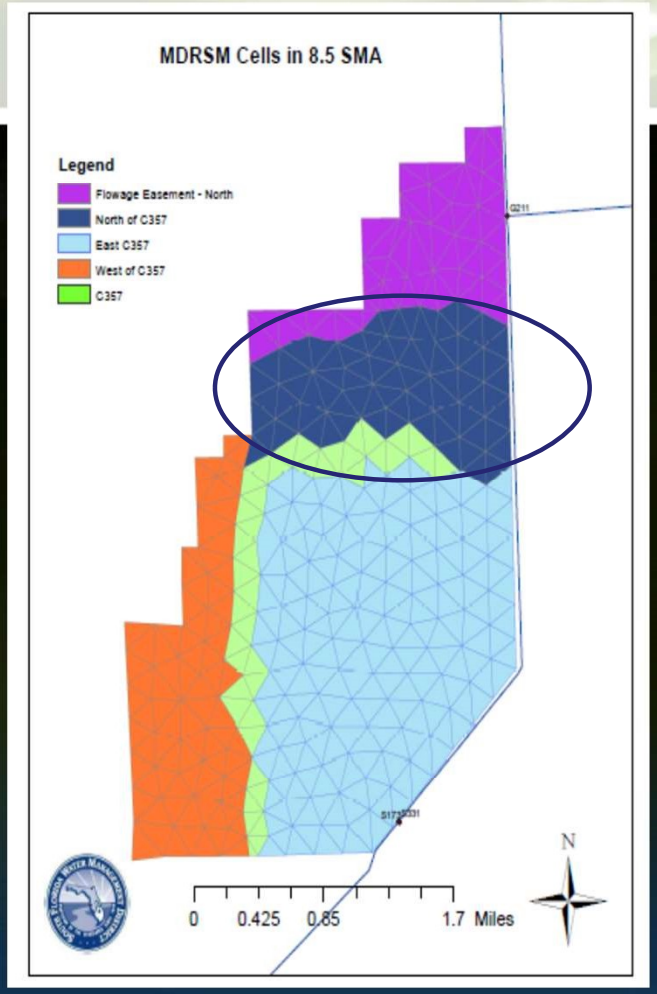

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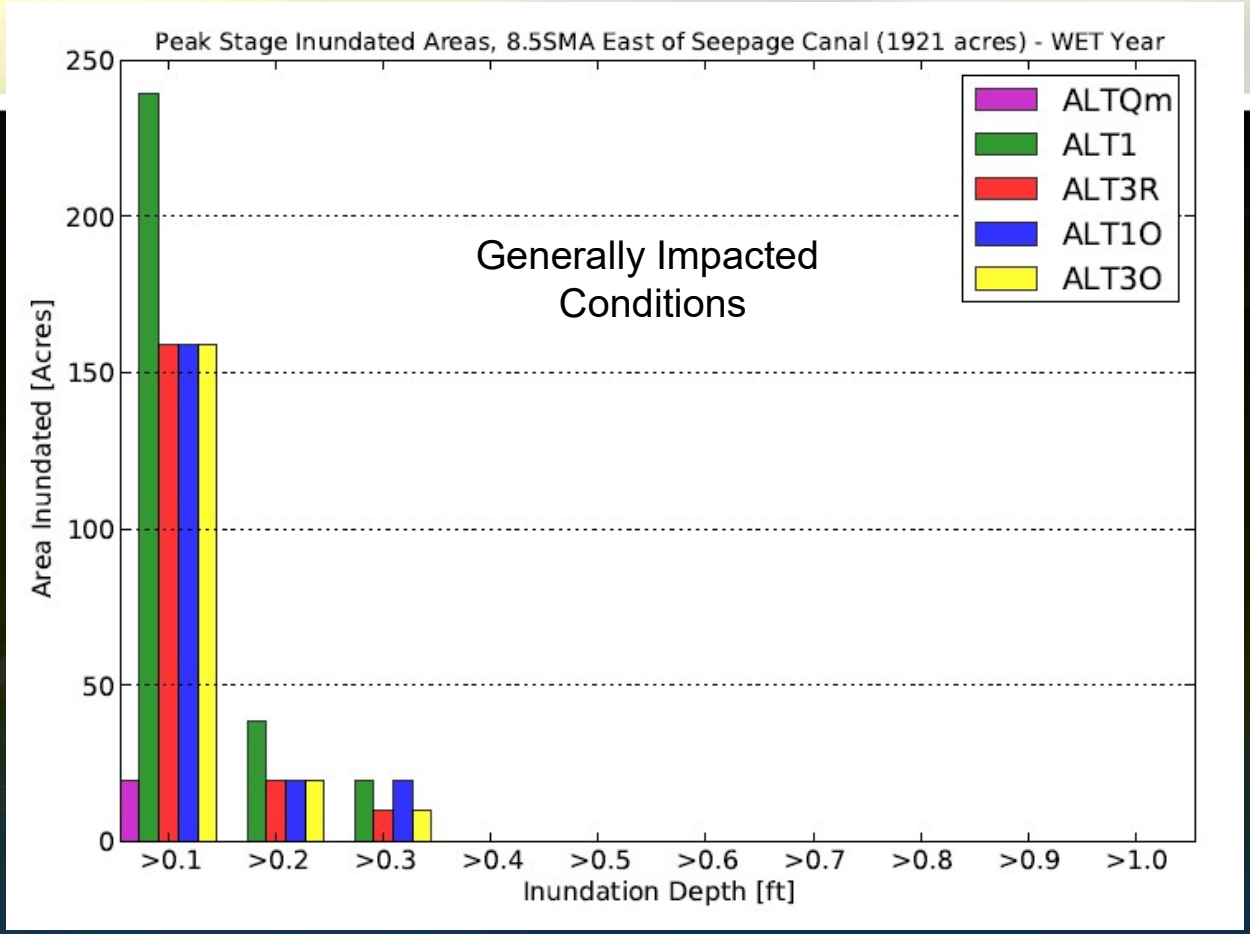

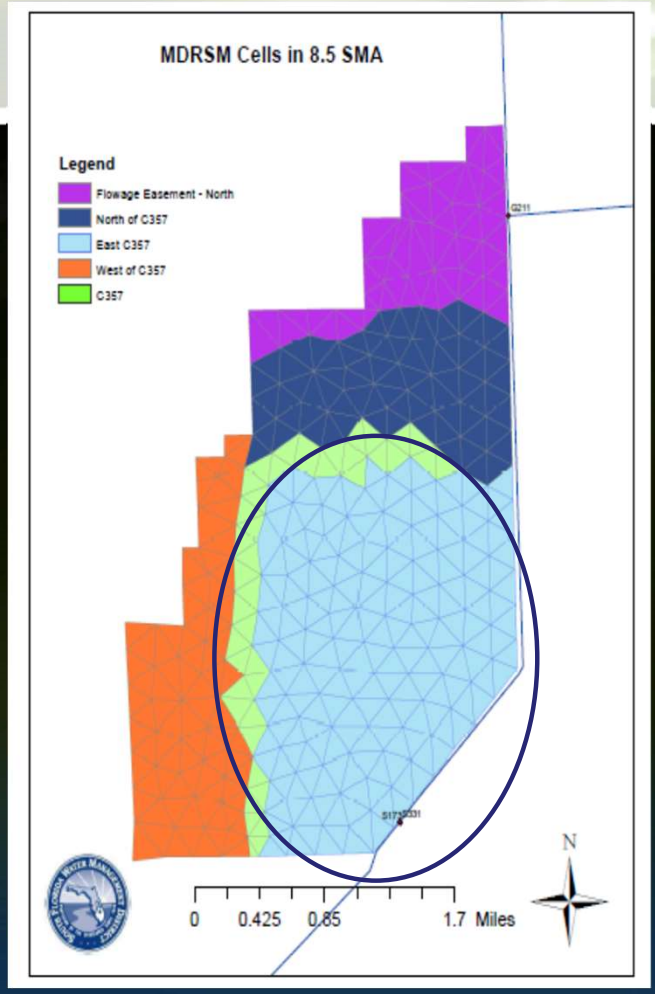

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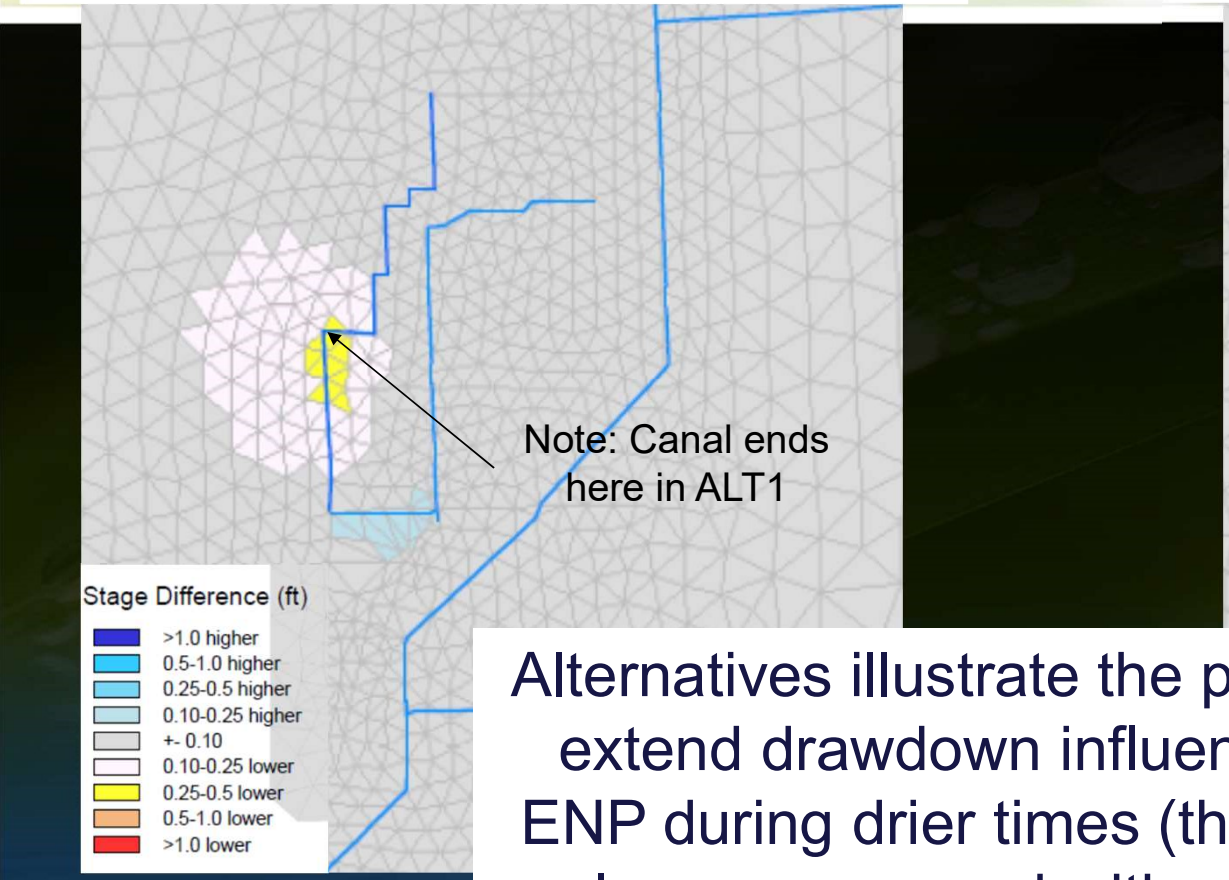
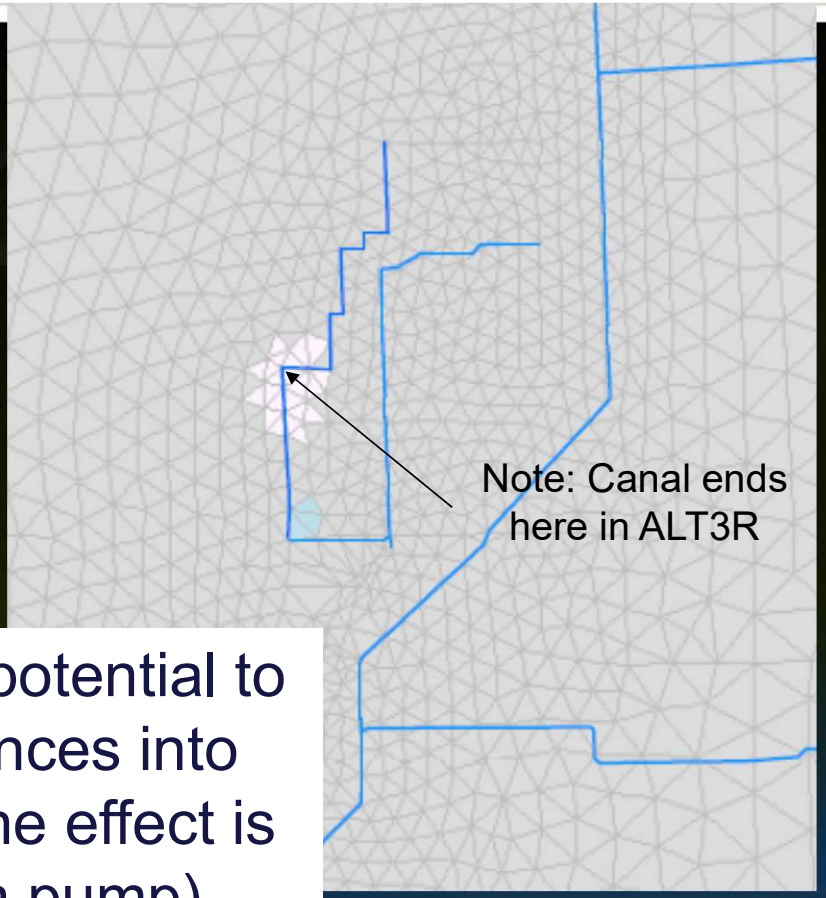
Wet April Stage Difference
April 2006



Wet April Stage Difference
April 2006



Alternatives illustrate the potential to extend drawdown influences into ENP during drier times (the effect is less pronounced with a pump)

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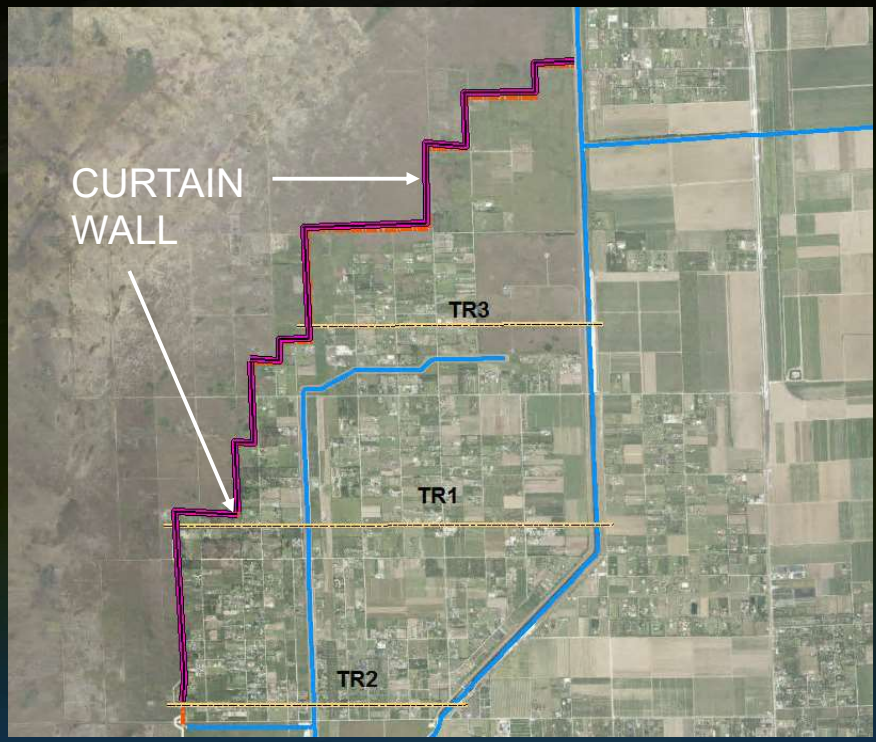
Summary: Seepage Collection Canal Results

- The addition of a seepage collection canal within the eastern easement of the existing 8.5 SMA L-357W levee was evaluated
- A wide range of canal configurations were examined (including with and without supplemental pumps).
- Performance trends were similar:
  - Lower water levels adjacent to the new canal and LPG2
  - Higher water levels adjacent to the existing seepage canal (C-357)
  - Without operation refinement, the potential for undesirable drawdown in ENP marsh (both adjacent to the new canal and downstream in the C-111 north detention area) relative to current conditions is possible
- Initial exploration of S-357 operational refinements found few significant differences from operating per COP

Curtain Wall Concept

- Placement of a semi permeable material such as bentonite slurry in the path of seepage flows, slowing down or reducing the rate of seepage or forcing a longer seepage path
- Currently being explored as part of a comprehensive seepage management strategy in the region
- Two recent examples of successful implementation in the region
- Can be completely relatively quickly within existing right of way



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Characteristics of Curtain Walls

- Passive groundwater management solution that is not operated (cannot be switched on and off)
- Non-selective in function in that it blocks flows in both directions
- Effective solution to provide flood protection that works well in conjunction with existing pumped seepage canals like the C-357 and S-357 in 8.5 SMA
- Little to no maintenance cost post construction

Photos from Bill Baker's Presentation on the MDPLA Seepage Project

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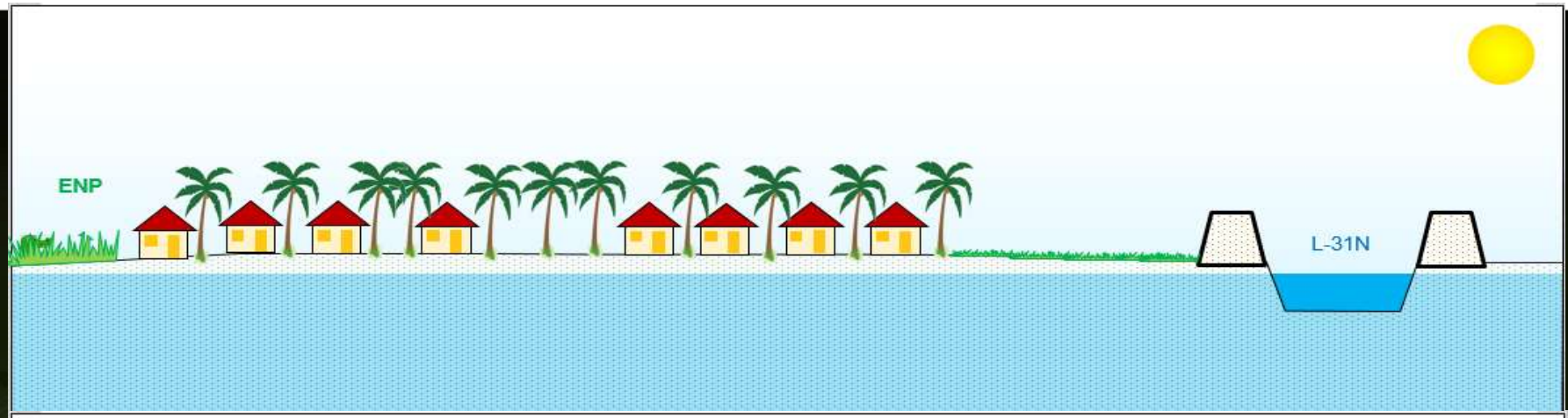
Effect of Curtain Wall

Before



After

New feature

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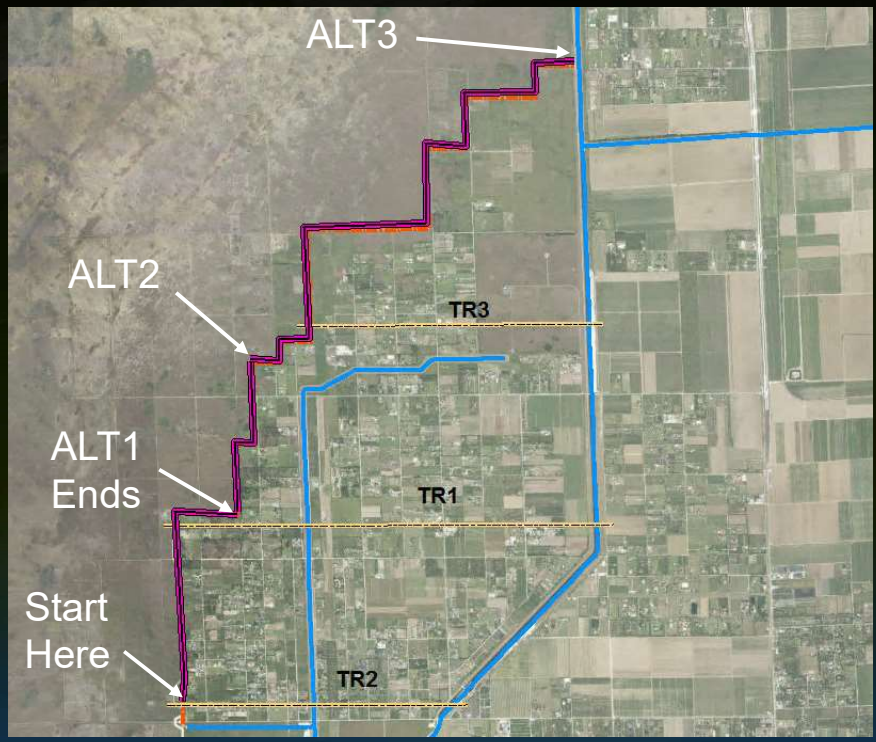
Curtain Wall Evaluation Approach

- Exploratory investigation of an 8.5 SMA curtain wall concept, was performed:
  - ALT1 = Short wall (SW Corner only)
  - ALT2 = Mid-length
  - ALT3 = Full length
- Since wall "depth" is not yet certain, a range of transmissivity reduction factors were evaluated for each wall alternative
- Data collected and being processed as part of the regional curtain wall study will help confirm depth and reduce technical uncertainties



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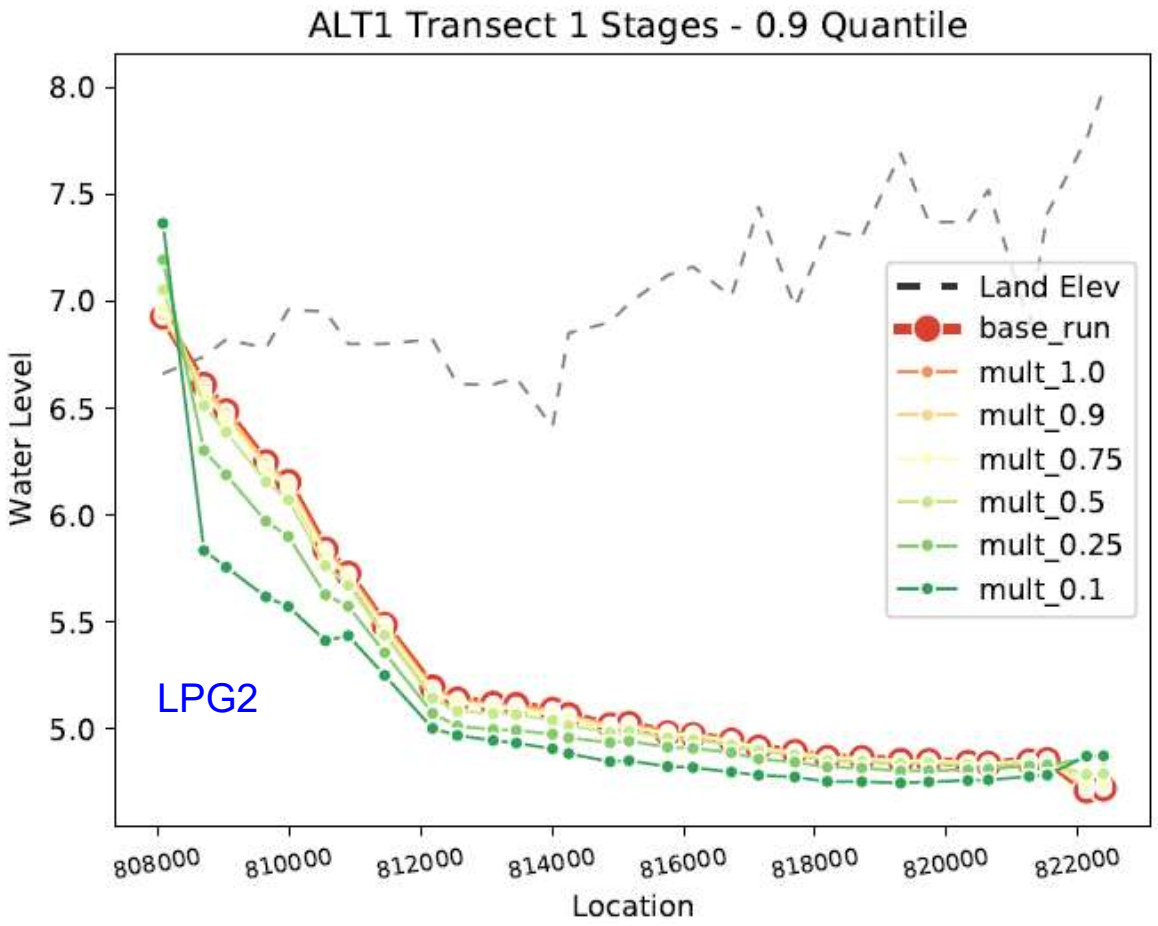

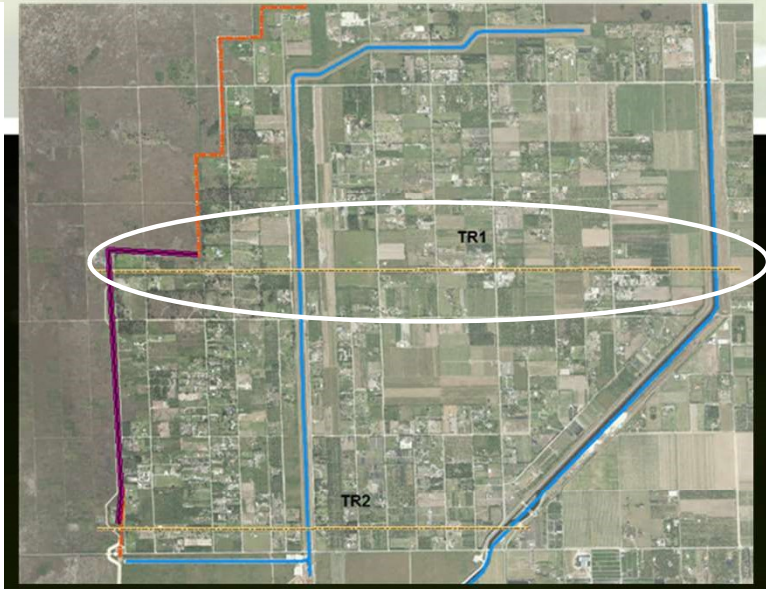

Example results for ALT1 illustrate that “deeper” walls capable of reducing transmissivity by 75-90% may be needed to achieve LPG2 water level reductions

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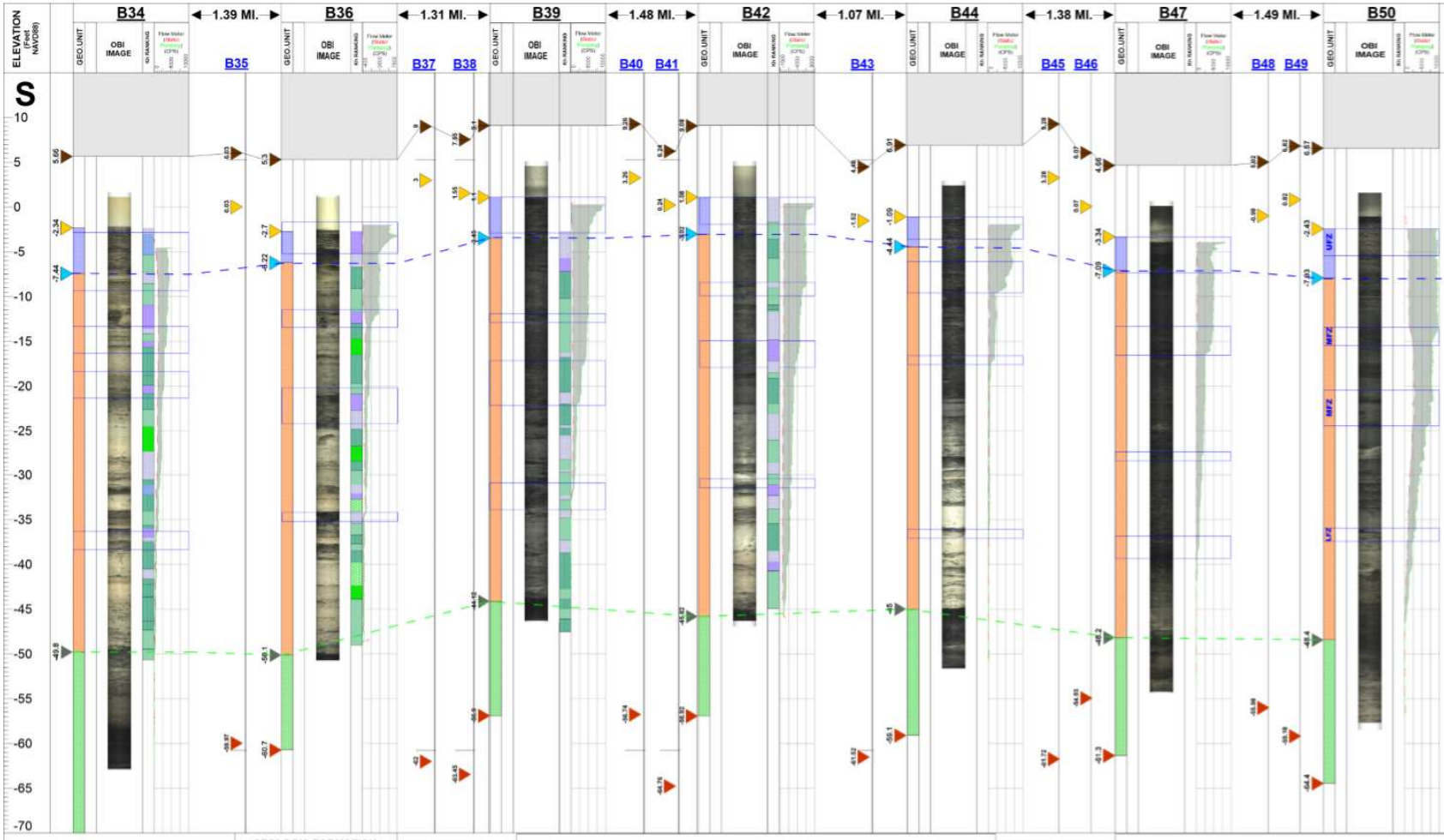
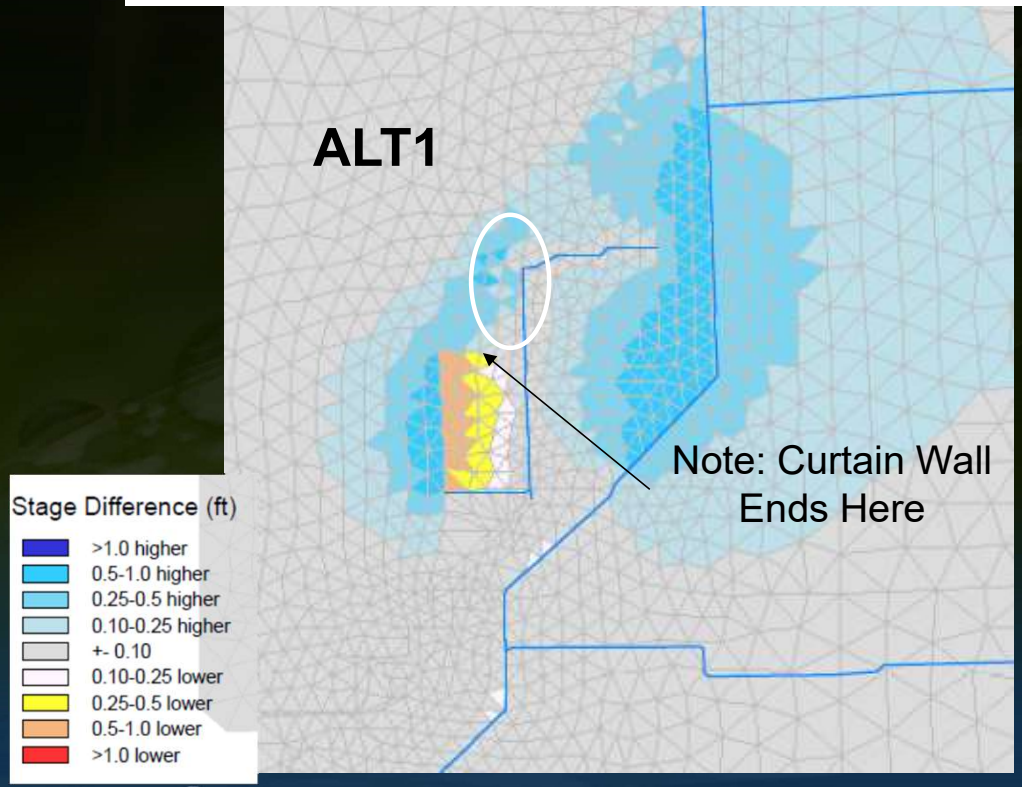


"Edge of Wall" Effects

Wet October Stage Difference

October 2005



Curtain wall implementation tends to raise upstream water levels and as such, at the edge of the wall, increased flows may be observed locally resulting in a wetting trend in areas near the "edge" (as seen in the white circle)

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Summary: Curtain Wall Results

- The addition of a curtain wall to manage seepage along the western boundary 8.5 SMA was evaluated
- Three wall configurations were examined: short, mid-length, and long. Performance trends were generally similar:
  - Lower water levels within the 8.5 SMA to the east/south of the wall alignment
  - Higher water levels adjacent to the 8.5 SMA in natural areas and ENP west / north of wall implementation (keeping restoration flows in ENP)
  - An “edge” effects (identified in previous studies) was present where the curtain wall ends reflecting increased flow due to increased gradient resulting from the wall.
- To effectively manage seepage, the design of the curtain wall must significantly reduce the transmissivity at the wall location.

Comparison of Canal and Wall Concepts

- Two reference baseline conditions:
  - 83BASE = USACE defined reference for 8.5SMA flood consideration
  - CBASE = Current Base (Combined Operations Plan)

- Compare canal, wall and a combination:
  - SCANAL = “Shortest” Canal and Pump (ALT3R)
  - SWALL = “Shortest” Wall (ALT1)
  - SWALLC = Combine “Shortest” Wall with Canal and Pump

- Other concepts may be explored in the future with subsequent modeling that incorporates improved data (e.g. hydrogeology, flexibility on land acquisition, etc...)

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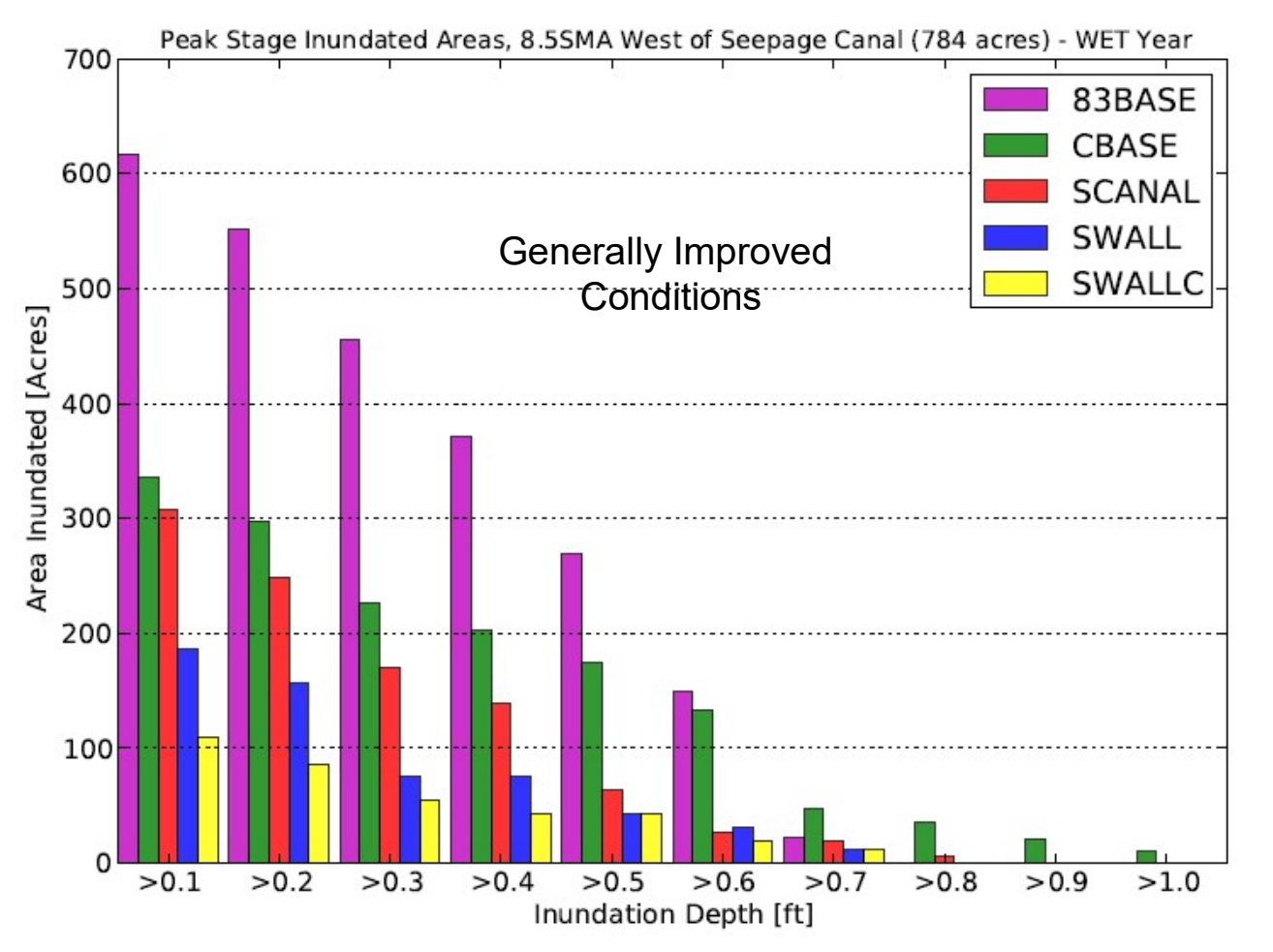

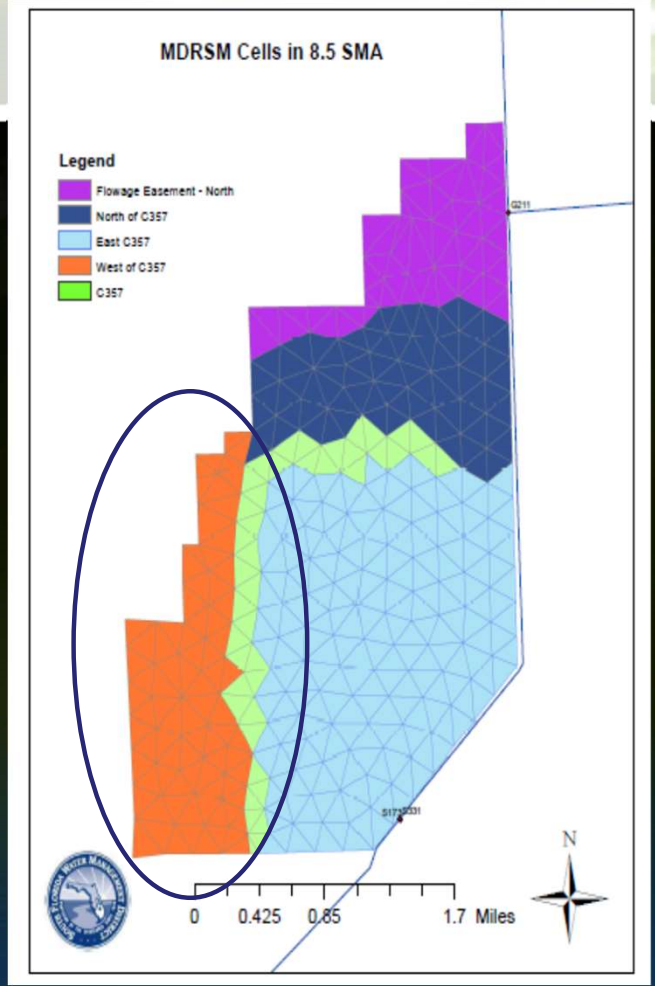

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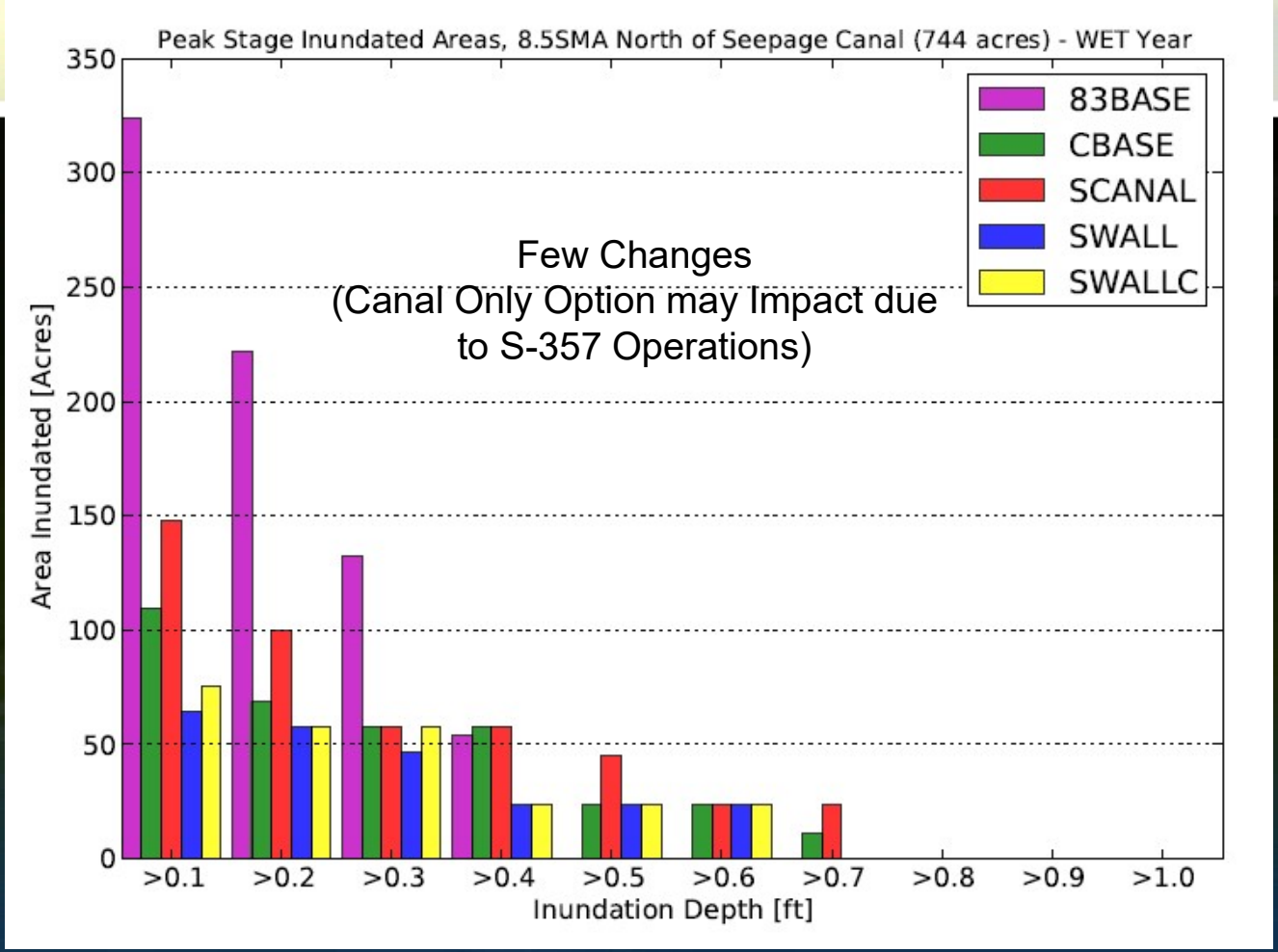

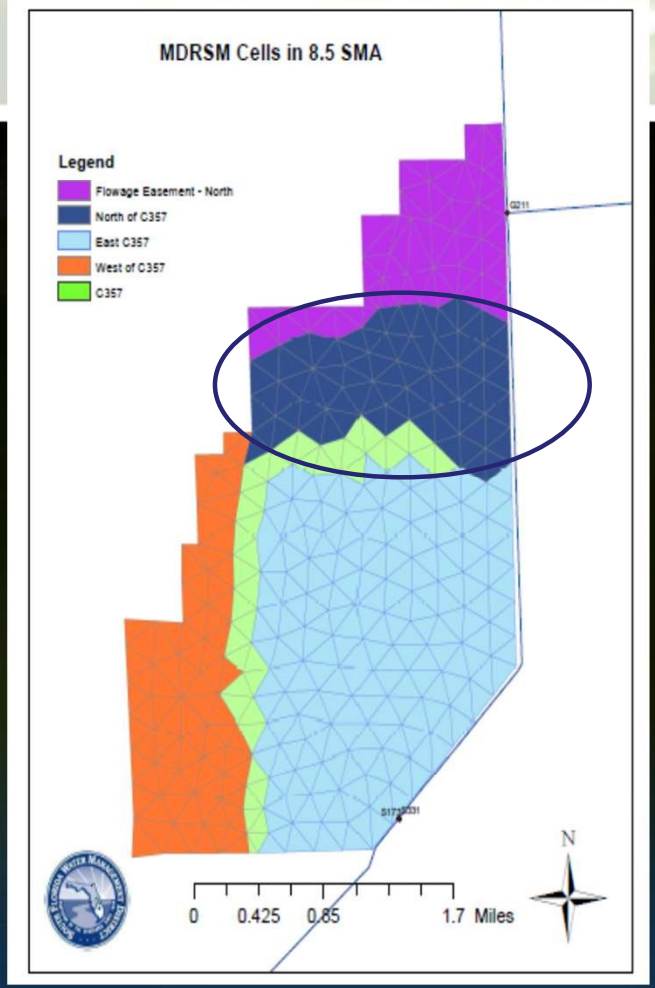

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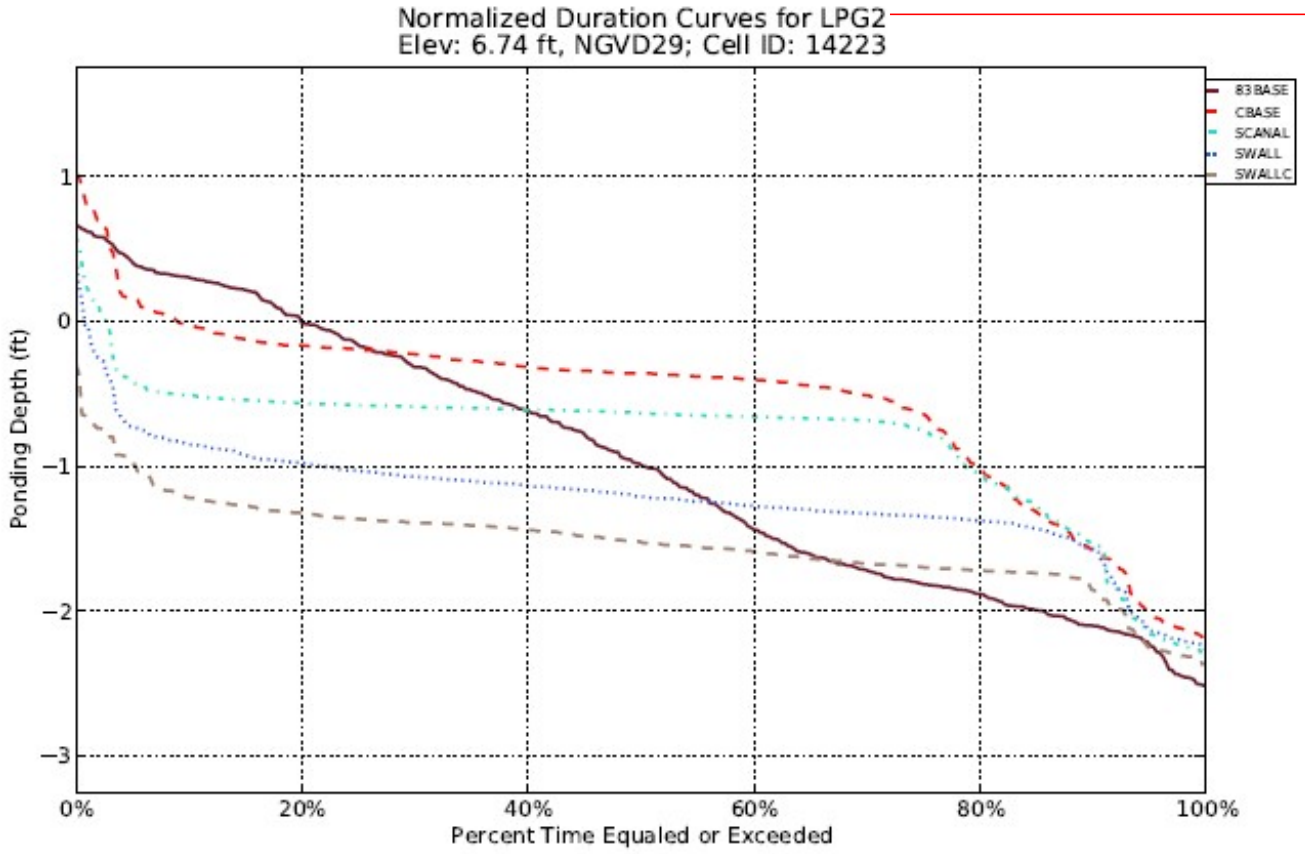

- All evaluated scenarios reduce duration of time LPG2 Cell inundated compared to 83 Base
- Groundwater however remain closer to land surface suggesting loss of soil storage
- Localized low spots within a model cell could experience inundation condition if the elevation is low enough to intercept the groundwater table

Note: Many Complaints for Areas Lower than AVG Ground Surface

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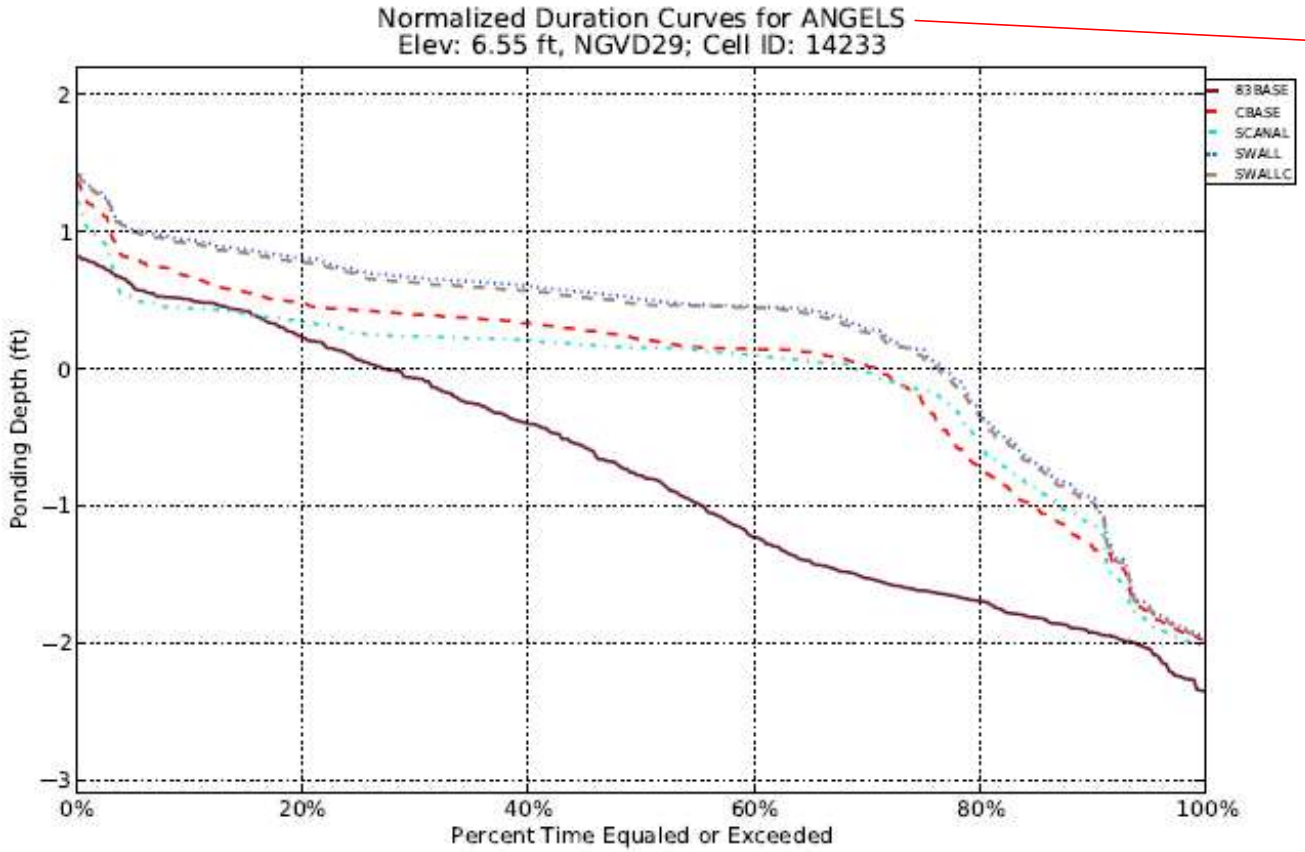

- All evaluated scenarios increased hydroperiod at the Cell representing ANGELS well compared to 83 Base
- Canal only option results in slight reduction in inundation depth compared to COP
- Curtain wall options generally show longer hydroperiod and depth of inundation

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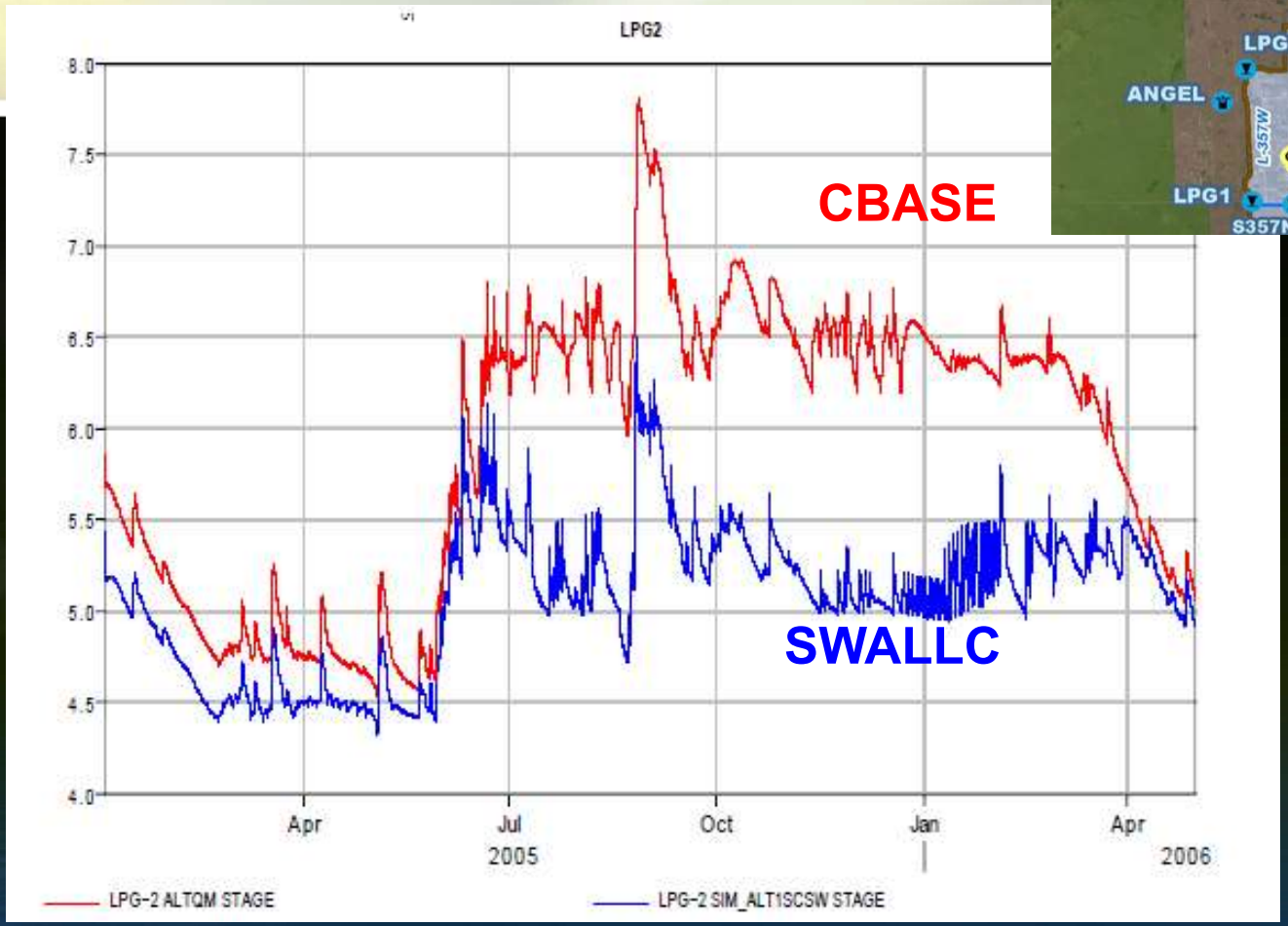
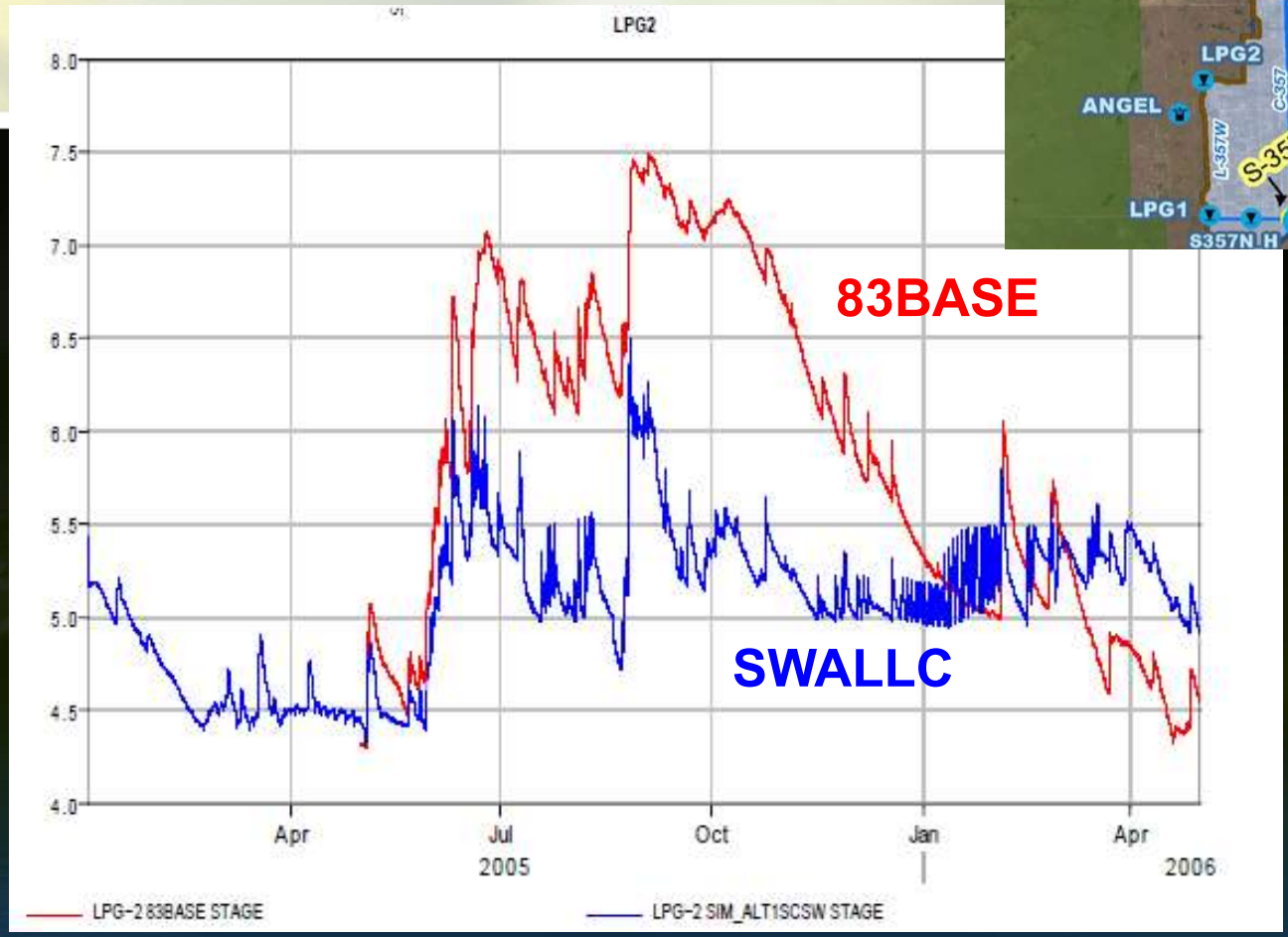


The Red trace (ALTQm) represents COP performance



The Red trace (83Base) represents pre MWD conditions
(before new deliveries to ENP through NESRS)

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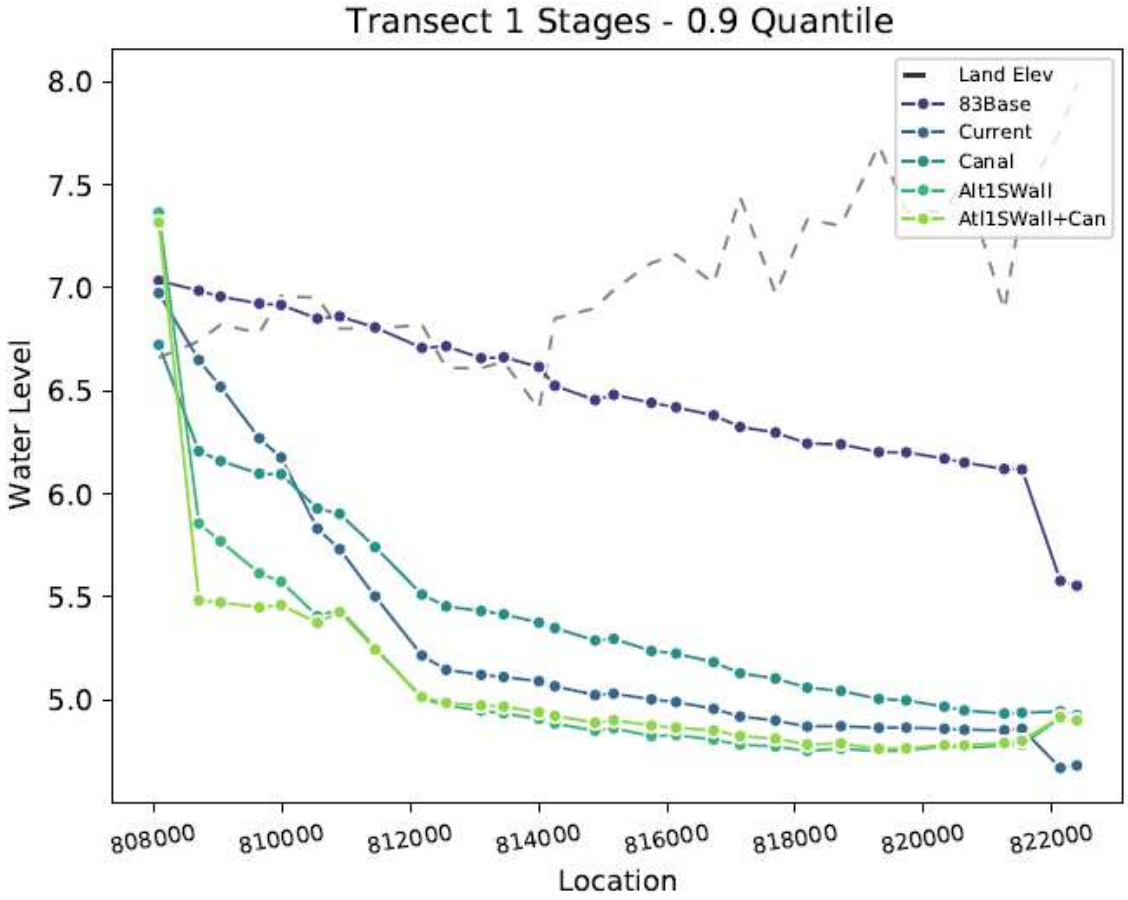
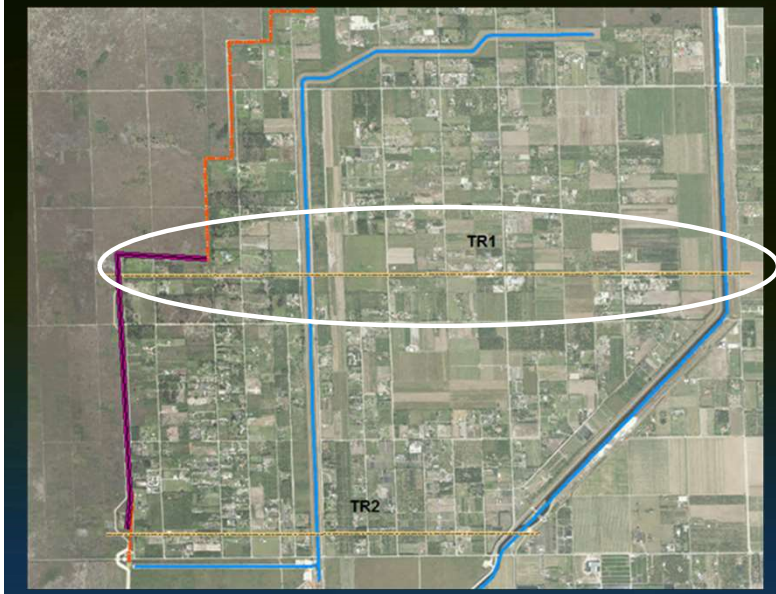


Model simulated high water stages (90th percentile wet) along Transect 1 for the base conditions and scenarios

Note depth to water table on eastern half of the transect for 83Base and CBASE



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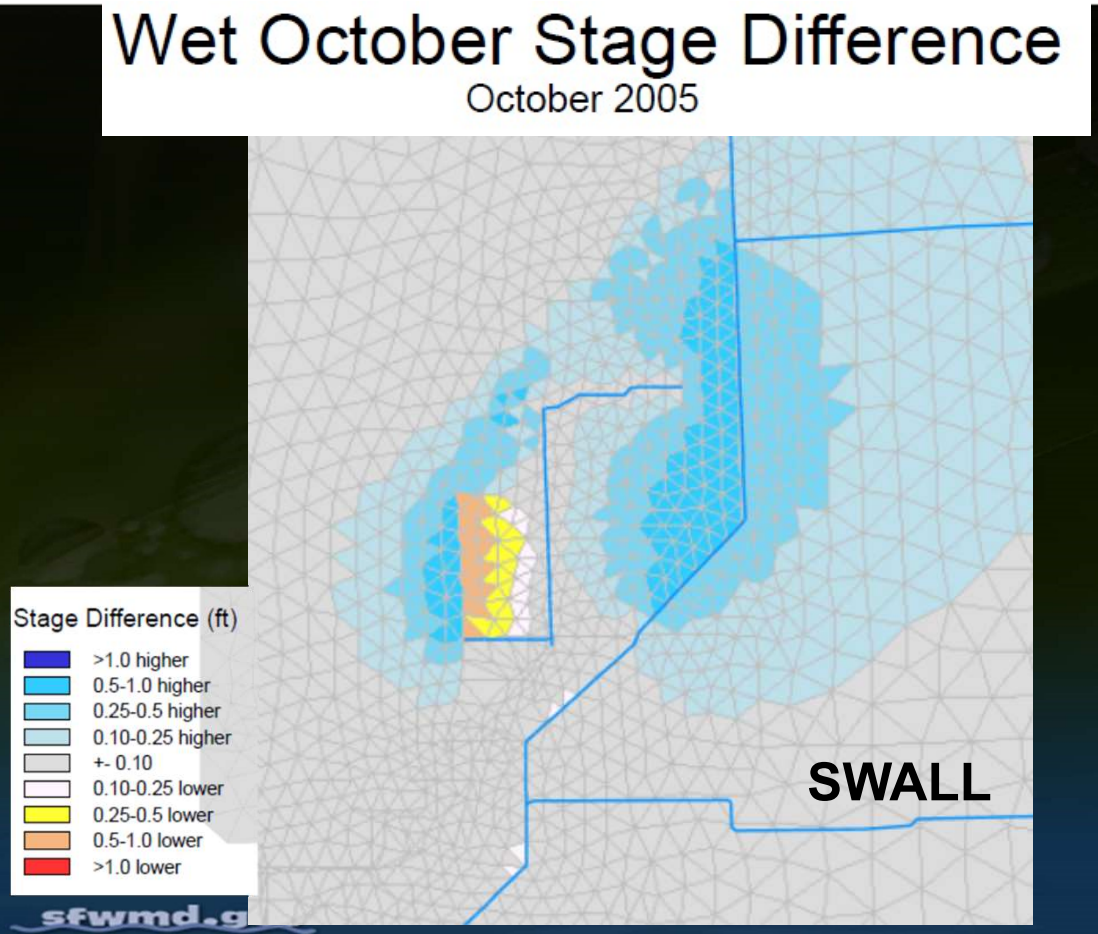
October Difference Map Compared to CBASE



Alternatives illustrate the potential to reduce groundwater levels in target 8.5 SMA areas while maintaining or increasing depths in ENP

These spatial and seasonal trends are heavily influenced by current S-357 operations and “edge of wall” effects, typically causing a wetter 8.5 SMA in areas not currently impacted

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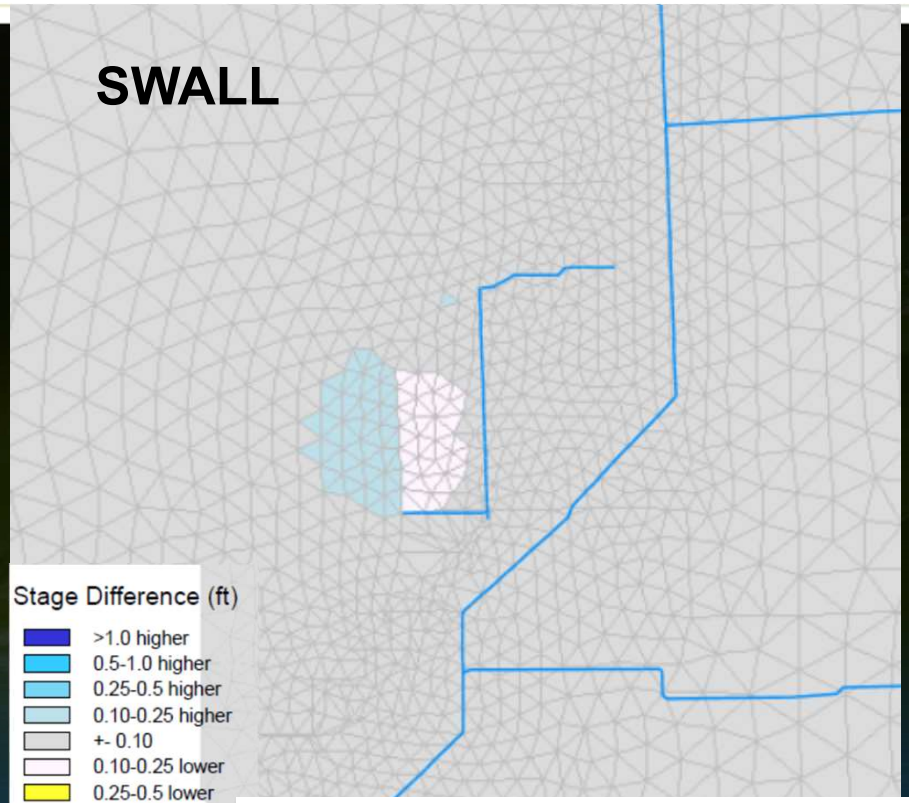
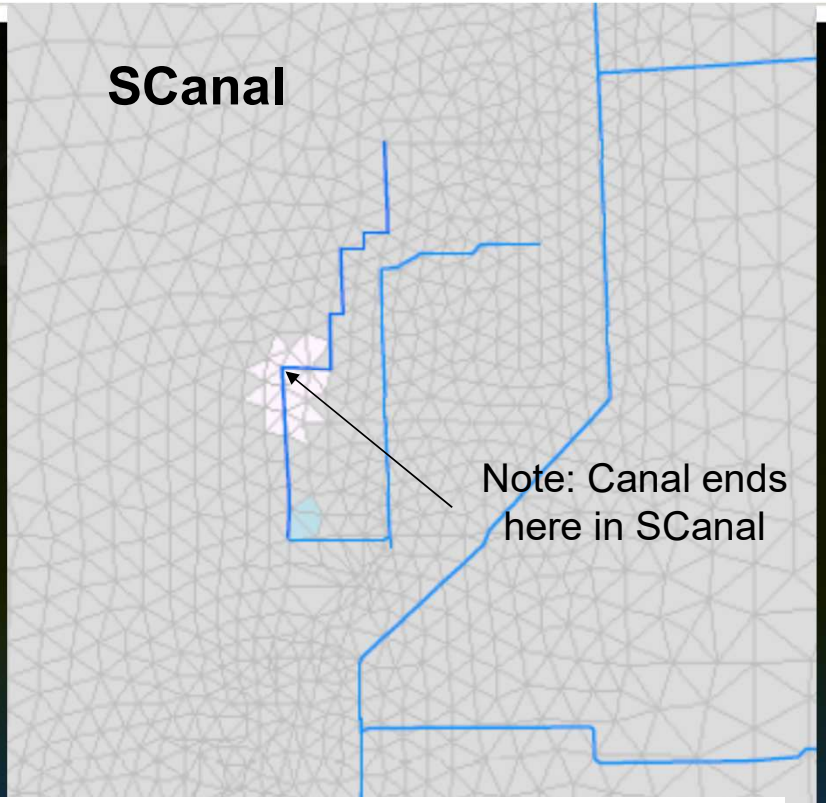
Wet April Stage Difference
April 2006

SWALL



Wet April Stage Difference
April 2006

SCanal



Canal only alternatives illustrate the potential to extend drawdown influences into ENP during drier times (the effect is less pronounced with a pump); Seepage Wall scenarios avoid this condition

sfwmd.g

Summary: Comparison of Canal and Wall Concepts

- Multiple options to improve water levels within and in the vicinity of the 8.5 SMA were evaluated
- Seepage collection canal and curtain wall options were modeled
- Evaluated scenarios successfully lower water levels in the vicinity of LPG2
- Important takeaways include:
  1. Seepage walls need to be sufficiently deep (intercepting preferred flow paths) to realize desired outcomes
  2. Canal options have the potential to create drawdowns outside 8.5 SMA footprint; operational control with pump help limit the magnitude and extent
  3. Some areas in 8.5 SMA may experience slightly wetter conditions due to reduced pumping at S-357

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Preliminary Estimated Project Costs

Land Acquisition

- 140 Parcels, 18 Homes
- Assessed = $21.4M
- Market = $95M?
- Fees(2%?)= $400K+
- Total cost = $22-100M

Note: Includes only the parcels in 1-mile western portion

Seepage Collection Canal with Pump Station

- Construction = $18M
- Design = $2.1M
- CMS/EDC = $3.6M

Total cost = $23.7M

- 15-24 Months

Note: DOES NOT INCLUDE LAND COST

Limited Curtain Wall

- Construction= $10-14M
- Design = $0.25 M
- CMS/EDC = $1.15M

Total cost = $11.4 -15.4M

- 12-18 Months

Note: DOES NOT INCLUDE LAND COST

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3. Discussion from WRAC Public Forum Participants

4. Public Comment

Want to comment?

Zoom:

- **If you're participating via Zoom – use the Raise Hand feature**

Phone:

- **If you're participating via Phone –**
  ***9 Raises Hand**
  ***6 Mutes/Unmutes**

5. Adjourn