

Collier County Comprehensive Watershed Improvement Plan

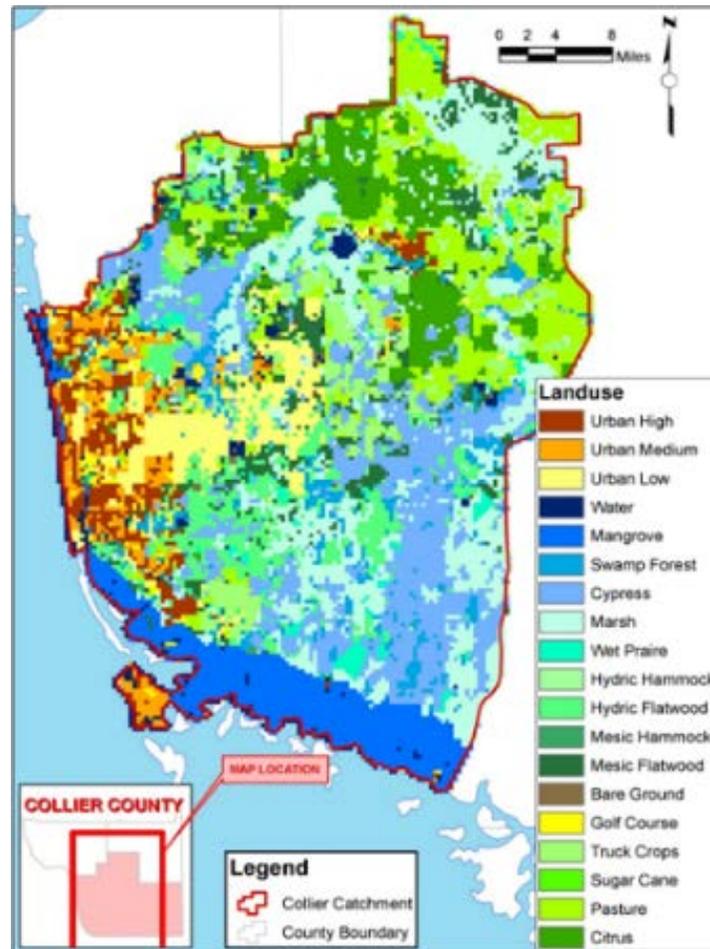


Project boundaries - Collier County in Southwest Florida



From Atkins (2011)

Wide variety of land uses within Collier County



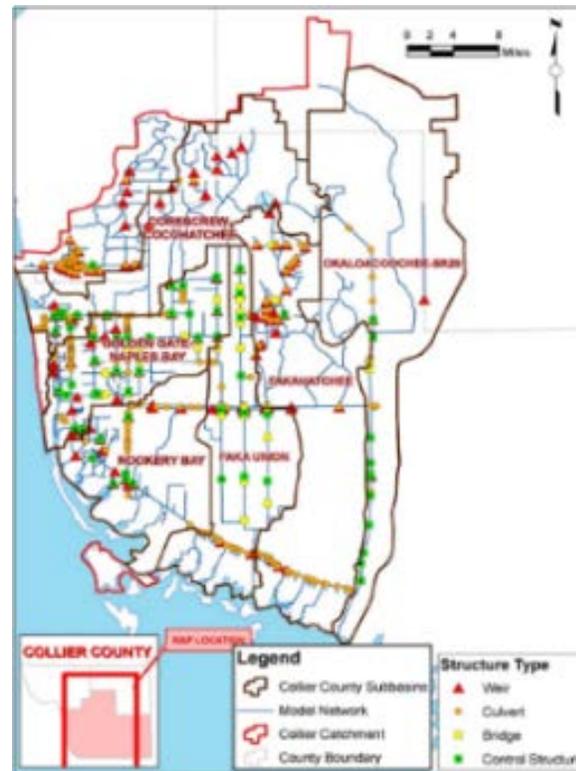
From Atkins (2011)

Highly altered watersheds

Extensive canal network

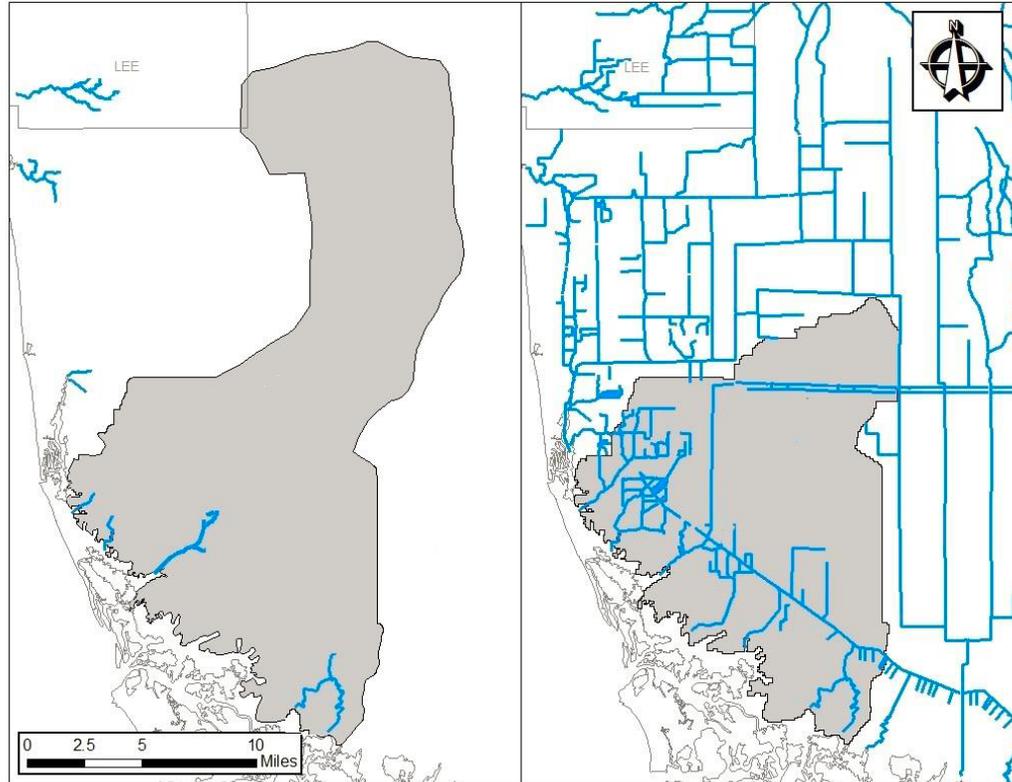


Numerous water control structures



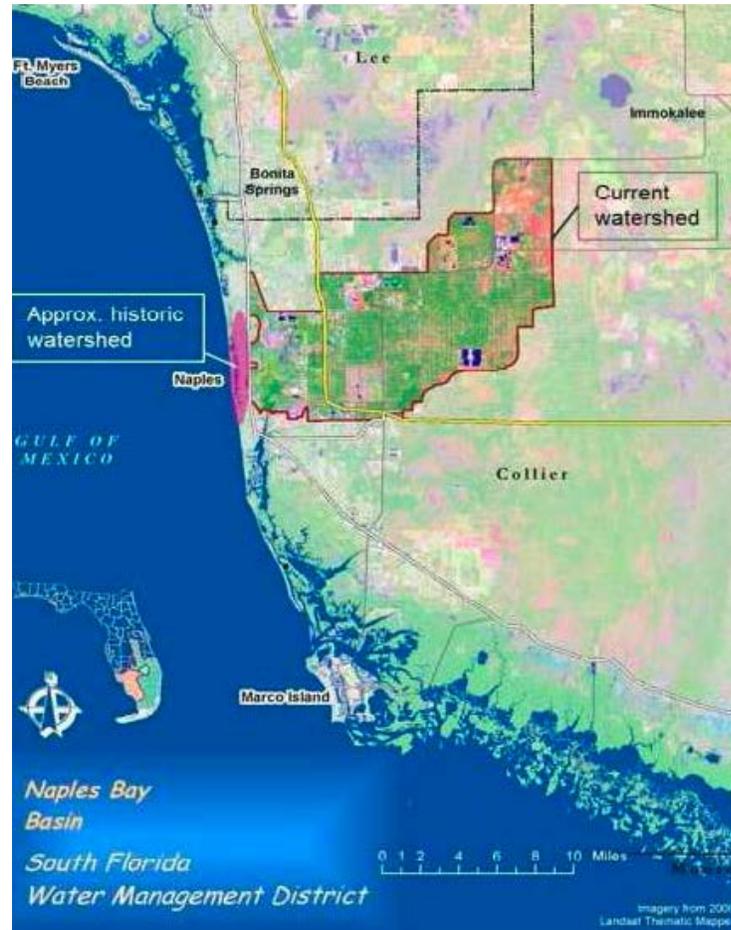
From Atkins (2011)

Rookery Bay's watershed highly modified, and reduced by ca. 80 sq. miles



From Interflow Engineering Inc. and Taylor Engineering (2014)

Naples Bay's watershed highly modified, and increased by ca. 100 square miles



From Cardno (2015)

Consensus on impacts to watersheds and coastal waters from altered hydrology

- ▶ Impacts to ecology of Naples Bay
 - ▶ (e.g., SFWMD 2007, Atkins 2011, Cardno 2015, etc.)
- ▶ Impacts to ecology of Rookery Bay watershed
 - ▶ (e.g., Parsons, 2006, SFWMD and USACE 2010, Atkins 2011, RBNERR 2012, etc.)
- ▶ Impacts to ecology of Rookery Bay
 - ▶ (e.g., Shirley et al. 2004, 2005, Rubec et al. 2006, Atkins 2011, etc.)

So, how about retrofitting watersheds?

- ▶ Diversion of flows from Golden Gate Canal to Henderson Creek - conceived in many water management plans since 1980
 - ▶ Golden Gate Water Management Plan (Johnson Engineering for SFWMD-BCB, 1980)
 - ▶ Big Cypress Basin Water Management Plan, 1998
 - ▶ SWIM Plan for Naples Bay (SFWMD 2007)
 - ▶ Collier County Watershed Management Plan (Atkins 2011)
 - ▶ Naples Bay Water Quality and Biological Analysis Project (Cardno 2015)

However...

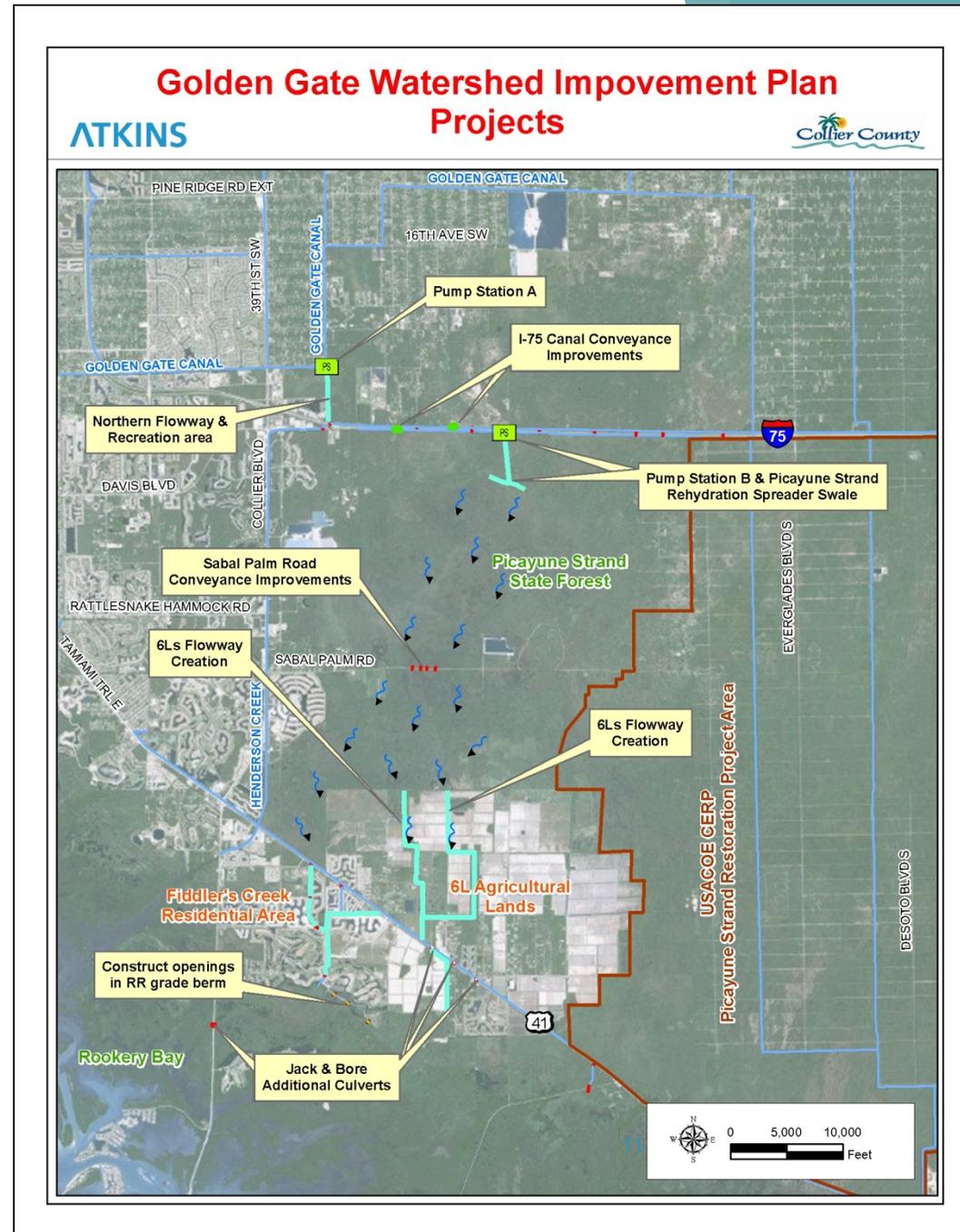
- ▶ While Rookery Bay as a whole has a wet weather inflow deficit, that is not the case for Henderson Creek (Interflow Engineering Inc. and Taylor Engineering, Inc. 2014)
- ▶ Water quality in Golden Gate Canal (GGC) while better than most of other tributaries to Naples Bay, has elevated nitrogen and phosphorous compared to Rookery Bay's watershed
- ▶ Upstream water use by public and private water supplies, including water reservation for PSRP Federal project, limits the amount of water that can be removed from GGC
- ▶ Smaller project than those previously envisioned but and more significant in terms of water quality, rehydration and habitat restoration
- ▶ A Naples Bay water bypass via Henderson Creek would not rehydrate the Picayune Strand State Forest or provide wet weather flows to Six L's or Rookery Bay or water quality enhancements for the diverted water.

Proposed project

- ▶ Diversion of inflows out of GGC when sufficient water available (June - October) so that no impacts to upstream water users
- ▶ Diversion into historic flowway to south
- ▶ Spreader canal to increase area of Rookery Bay's watershed to receive inflows
- ▶ Protective of adding too much inflows to the Rookery Bay watershed
- ▶ Avoids impacts to the Picayune Strand Restoration Project (PSRP)
- ▶ Consistent with Latest Management Plan for Picayune Strand State Forest

Projects by Area

- ▶ Project components are based on previous study concepts
- ▶ Components have been tailored to meet project-specific goals
- ▶ Projects have been (and are still being) vetted in terms of feasibility and permitability.
- ▶ Projects have been (and are still being) coordinated with local agencies, NGOs and other interested parties
- ▶ Projects are consistent with the RESTORE Comprehensive Management Plan



Project constraints

- ▶ Flows diverted only when critical water levels reached in GGC
- ▶ Maximum diversion of 100 cfs (daily average)
 - ▶ Equal to ca. 65 mgd
 - ▶ Estimated to lose 50% via losses to infiltration, evapotranspiration and storage
 - ▶ Inflow to Rookery Bay no more than 50 cfs
 - ▶ Fits within model estimates of wet season inflow deficits for Rookery Bay and hydro-periods of south Belle Meade wetlands

Operation schedule

- ▶ Based on observed flows and gate levels in the Golden Gate Canal from January 1, 2009 to January 1, 2014
- ▶ Diversions could occur on approximately 11% of days
- ▶ Those 11% of days represent approximately 45% of the total inflows to Naples Bay
- ▶ On days when pumping occurs, diverts approximately 15% of flows from Naples Bay

Year	Number of Pumping Days
2009	27
2010	36
2011	19
2012	22
2013	90
2014	46
Average	40

Estimating benefits

▶ Naples Bay

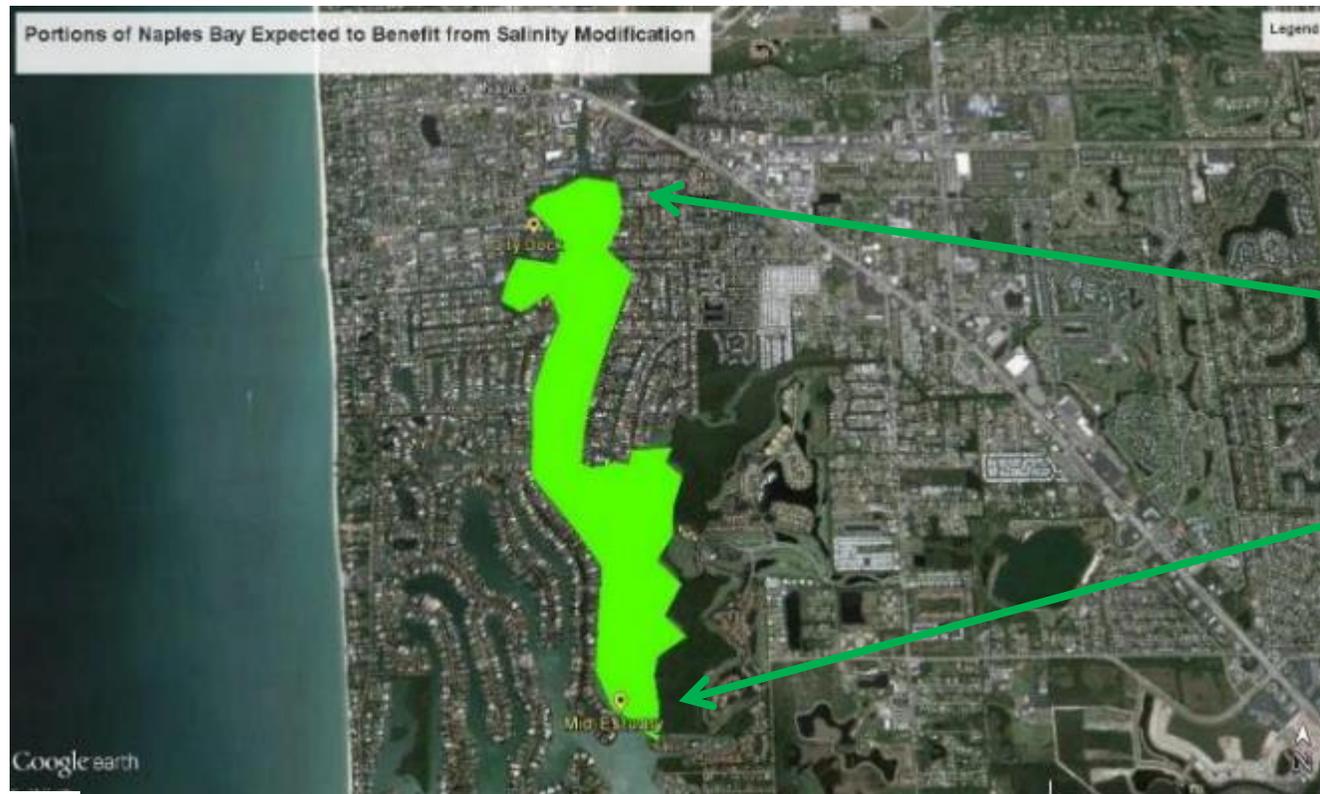
- ▶ Expected benefits to salinity regimes allowing positive conditions for habitat development
- ▶ Expected benefits associated with nutrient load reductions
- ▶ Turbidity reductions

▶ Picayune Strand State Forest/Rookery Bay

- ▶ Improve water depth and hydro-periods to impacted wetlands, without altering species composition
- ▶ Benefit to ca. 10,000 acres of mostly cypress and hydric flatwoods
- ▶ Improve freshwater inflows from forest to Rookery Bay
- ▶ Sufficient combination of water storage and sheetflow that water quality expected to approximate that of current watershed

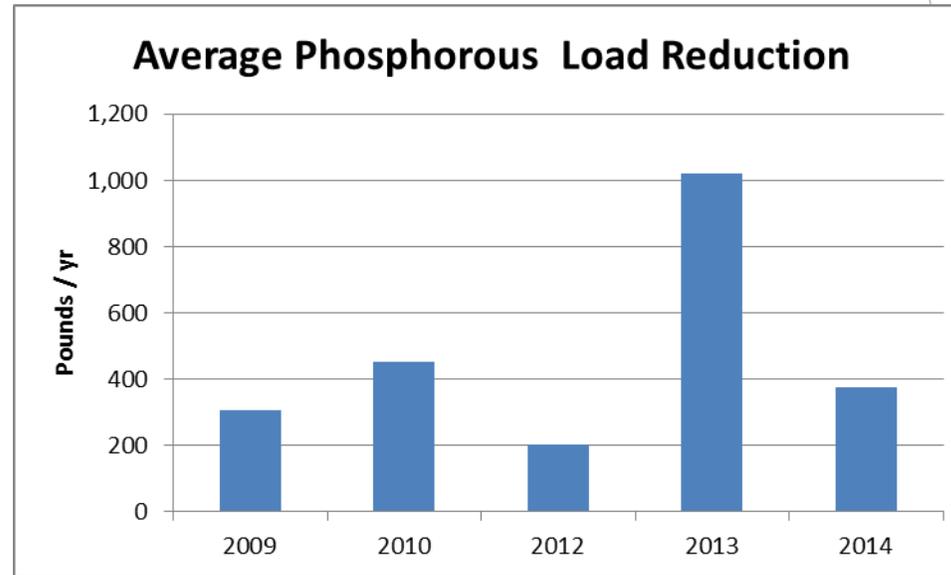
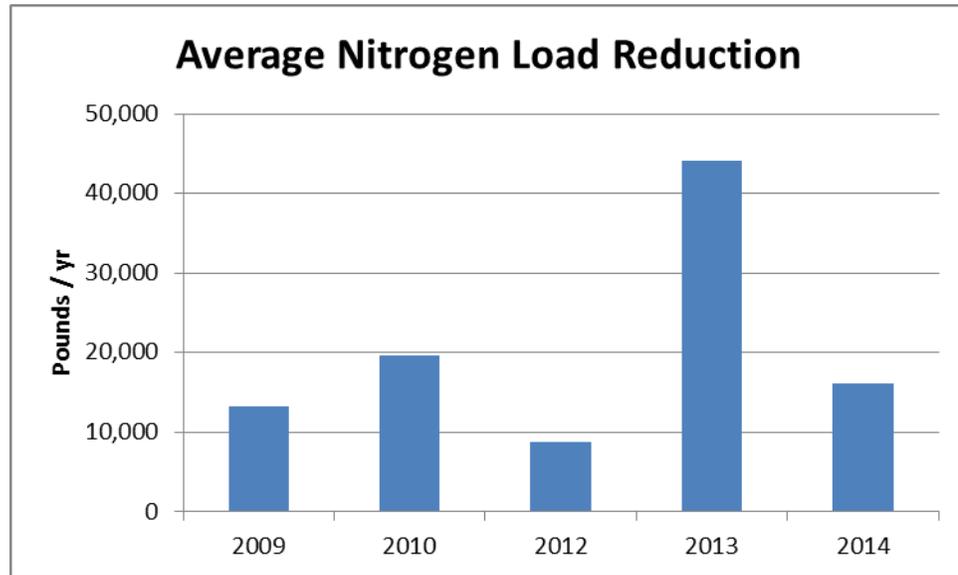
Naples Bay - area will likely benefit ca. 400 acres

- Expectation of 20 % difference in salinity and an average salinity difference of 2 ppt or higher
- Sets the stage for future sea grass and oyster bed increases



After diversions implemented, potential locations for “jump starting” restoration via seagrass transplanting and oyster reef deployment

Naples Bay - Reductions in nutrient loads



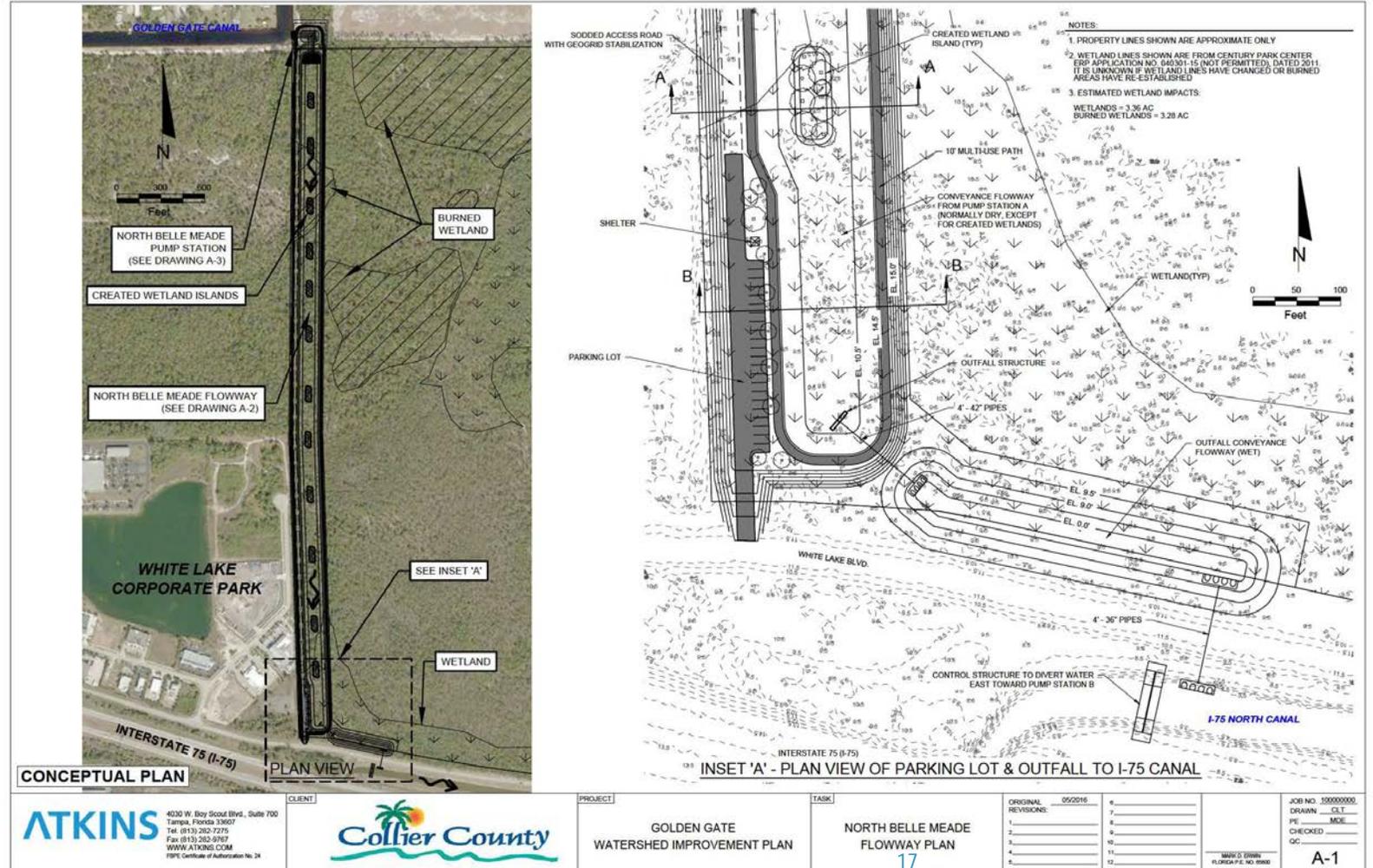
- ▶ Equivalent to 3,000 20-lb bags of lawn fertilizer (on average) per year over the previous 5 year period
- ▶ Greater benefits to water clarity than expected reduction in turbidity alone
- ▶ Likely to create conditions for enhanced coverage of seagrass in Naples Bay



Project Area A

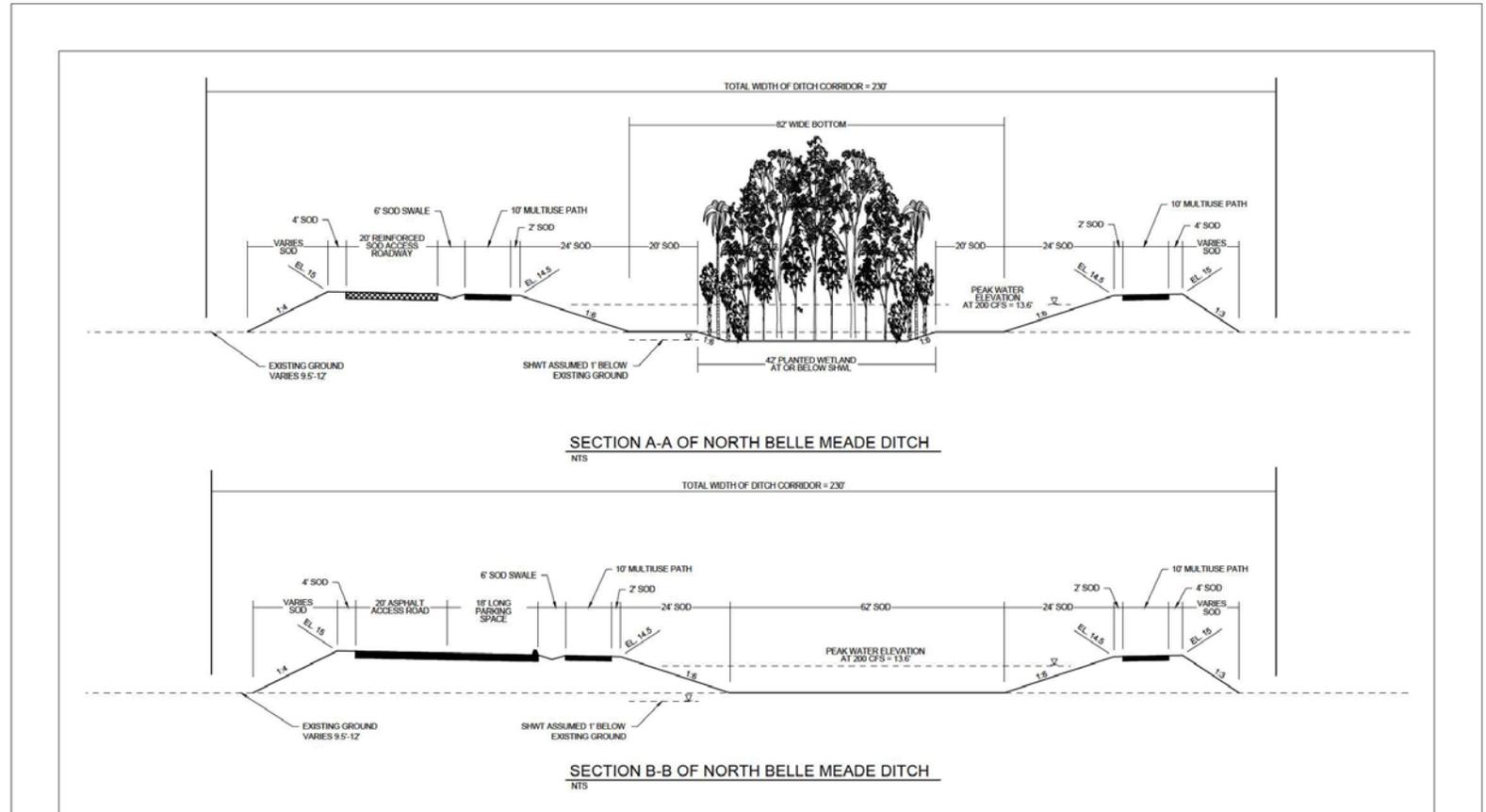
Project Components

- ▶ 5,000 foot Flowway
- ▶ Includes multi-use recreational trail
- ▶ Constructed on County property
- ▶ Outfall system under Lake Blvd. to the I-75 north canal



Project Area A

- ▶ Project Components
 - ▶ 110-foot wide flowway
 - ▶ Flowway planted with wetland islands to promote habitat and water quality improvements

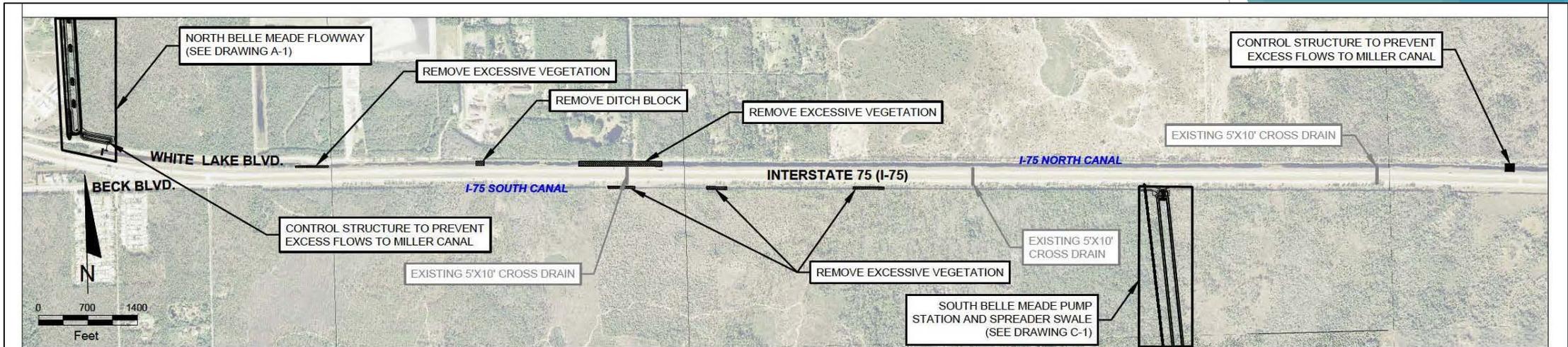


CONCEPTUAL PLAN

<p>4030 W. Boy Scout Blvd., Suite 700 Tampa, Florida 33607 Tel: (813) 292-7275 Fax: (813) 292-8767 WWW.ATKINS.COM FBC Certificate of Authorization No. 24</p>	CLIENT	<p>Collier County</p>	PROJECT	TASK	ORIGINAL	05/2016	6	JOB NO. 100000000 DRAWN: CLT PE: MDE CHECKED: OC:
	GOLDEN GATE WATERSHED IMPROVEMENT PLAN		NORTH BELLE MEADE FLOWWAY TYPICAL SECTIONS 18	1 2 3 4 5	7 8 9 10 11 12	MARK D. USING FLORIDA P.E. NO. 8998	A-2	



Project Area B



- ▶ Removal of ditch blocks and vegetation to improve conveyance

- ▶ Operational Control structures to control flows to Henderson Creek and the Miller Canal

CONCEPTUAL PLAN

ATKINS

4030 W. Boy Scout Blvd., Suite 700
Tampa, Florida 33607
Tel. (813) 282-7275
Fax (813) 282-9767
WWW.ATKINS.COM
FBPE Certificate of Authorization No. 24

CLIENT



PROJECT

GOLDEN GATE
WATERSHED IMPROVEMENT PLAN

TASK

INTERSTATE 75 (I-75)
CANAL PLAN

ORIGINAL REVISIONS: 05/2016

1		6	
2		7	
3		8	
4		9	
5		10	
		11	
		12	

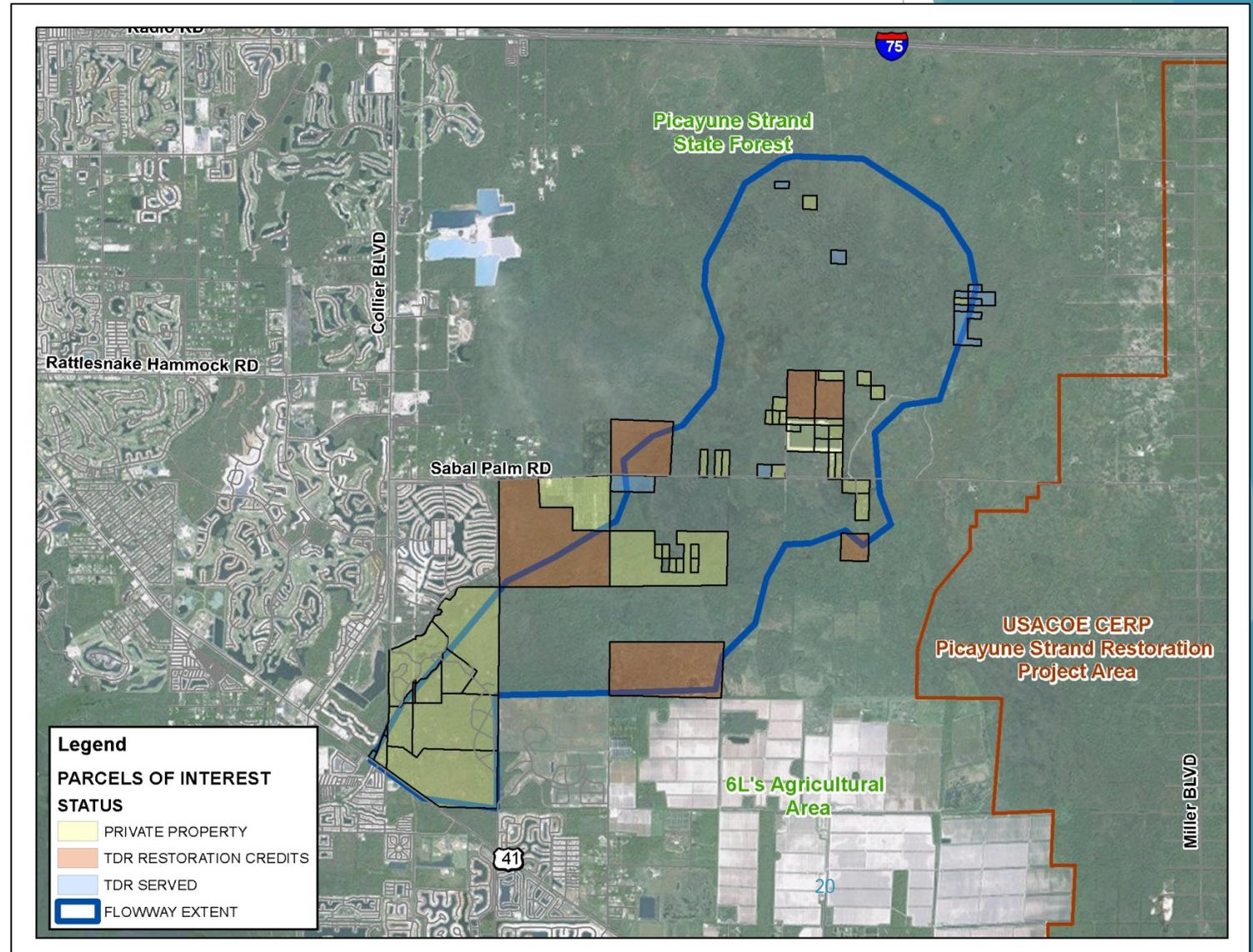
MARK D. ERWIN
FLORIDA P.E. NO. 65500

JOB NO. 100000000
DRAWN CLT
PE MDE
CHECKED
QC

B-1

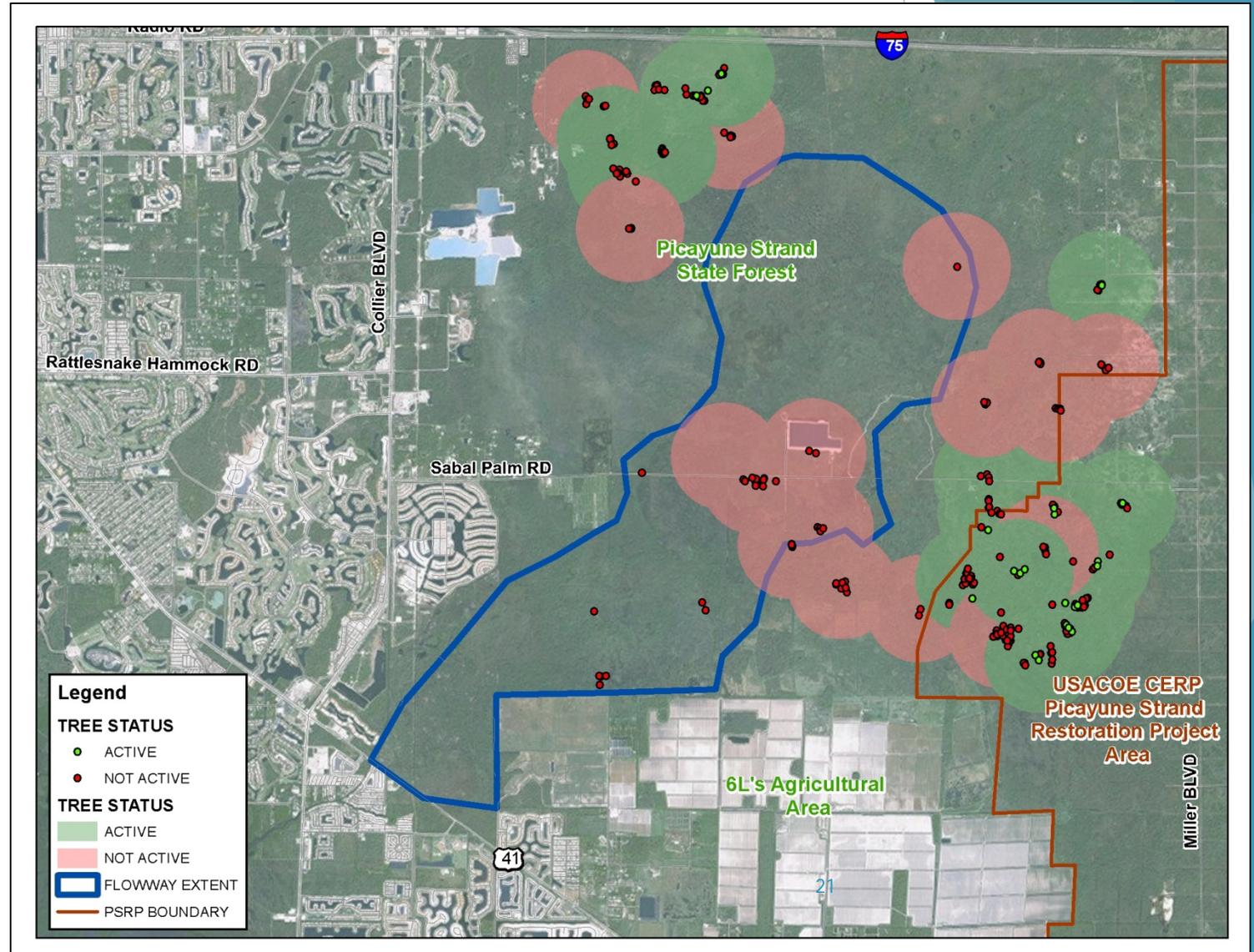
Rehydration Area - PSSF/South Belle Meade

- ▶ Most of project area (10,000 ac.) is publically owned with approx 55 private parcels
- ▶ Most of the project area lies within the “sending” lands
- ▶ Need to address the development rights for 46 privately-owned parcels
- ▶ 16 are already in the TDR program
- ▶ Parcels in the far south are either being developed or are designated wetlands



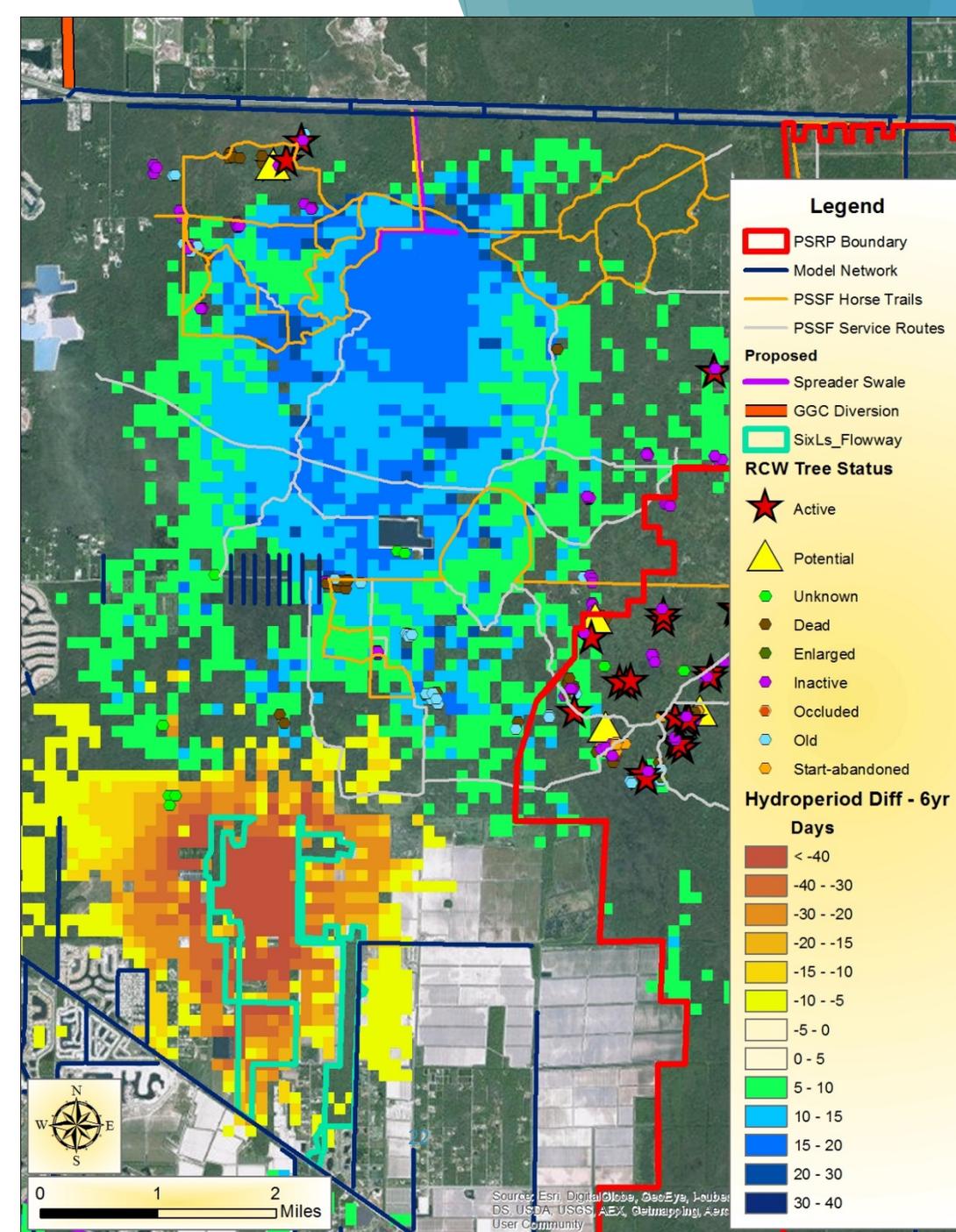
PSSF/South Belle Meade Concerns

- ▶ No impact to RCW population - Federally endangered species
- ▶ Project flowway cannot impact RCW current or expansion area habitat
- ▶ No degradation to mesic or hydric flatwoods
- ▶ No functional decrease in recreational features or roads; no permanent earthen features
- ▶ Monitoring and adaptability
- ▶ Invasive species mgt
- ▶ No impacts to Federal project



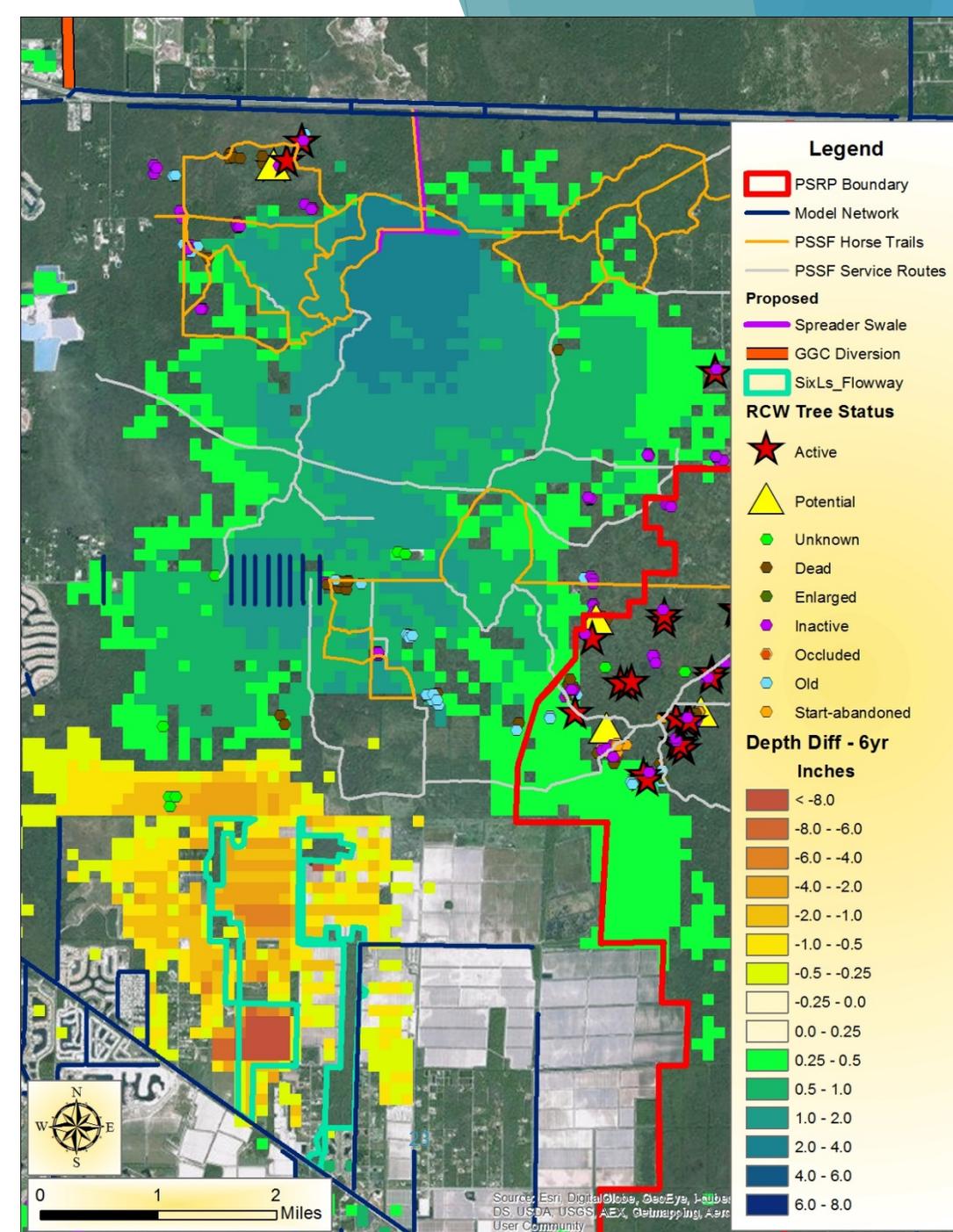
Preliminary Model Results - Hydroperiod (2009 - 2014)

- ▶ Largest hydroperiod increases in the center of forest near the spreader (cypress)
- ▶ Minimal impacts outside of forest
- ▶ No impacts to RCW habitat
- ▶ Minimal changes to vegetative communities
- ▶ PSRP hydraulic gradient from pumping will prevent flows from PSRP area
- ▶ Reductions in Six L's will be resolved with control structures



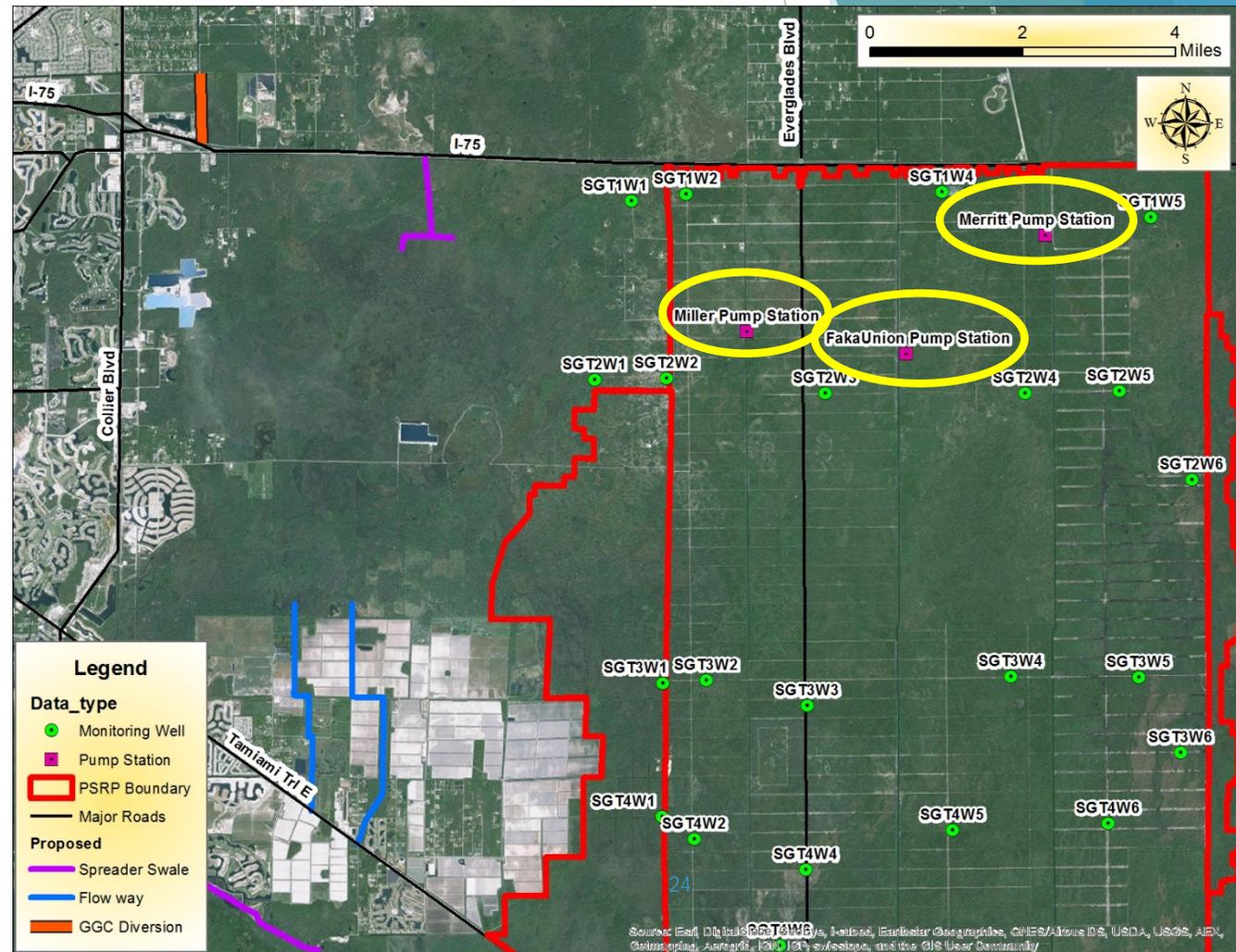
Preliminary Model Results- Average Depths (2009 - 2014)

- ▶ Largest average depth increases in the center of forest near the spreader (cypress wetland)
- ▶ Average depth increases are less than 1-inch in Hydric and Mesic Flatwood areas
- ▶ Minimal impacts outside of forest
- ▶ No impacts to RCW habitat
- ▶ Minimal changes to vegetation communities
- ▶ Reductions in Six L's will be resolved with control structures
- ▶ PSRP hydraulic gradient from pumping will prevent flows from PSRP area

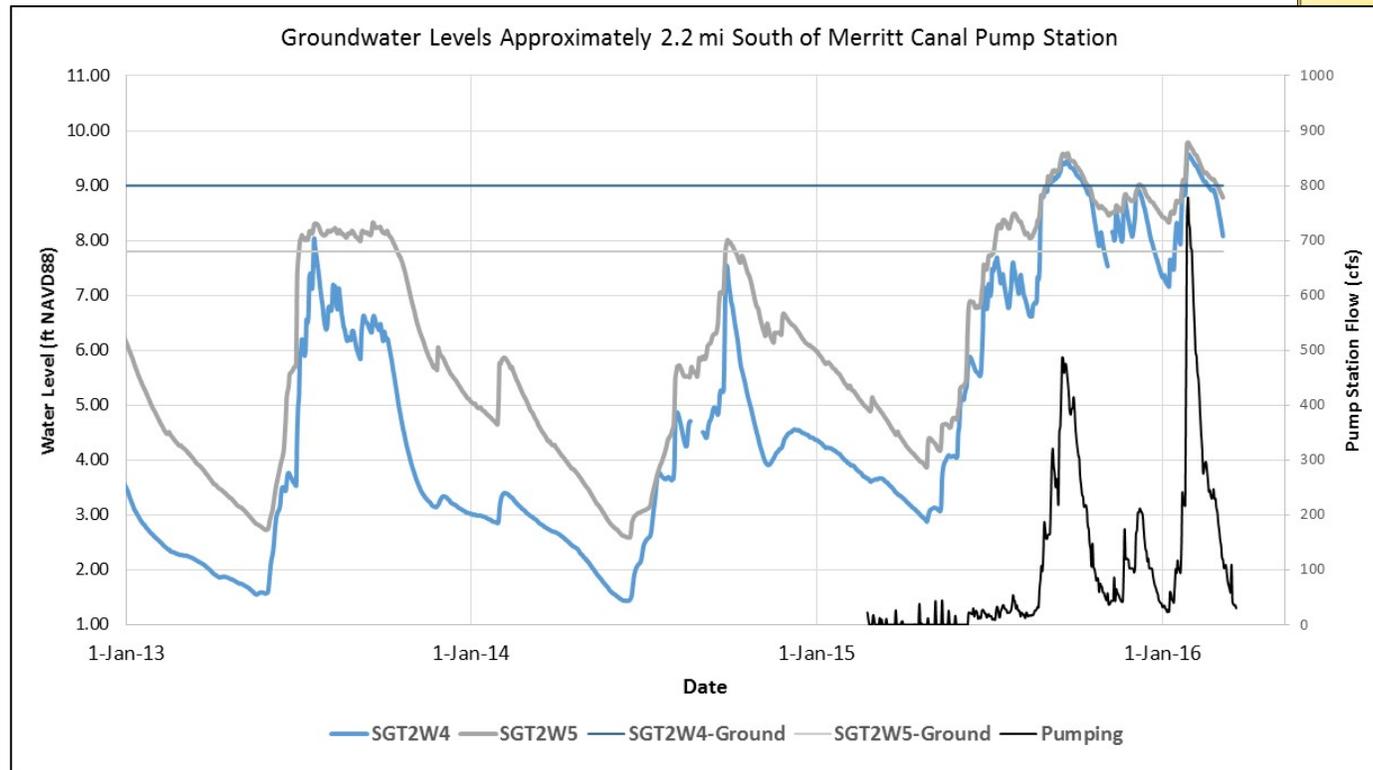


Potential Effects of PSRP east of Six L's

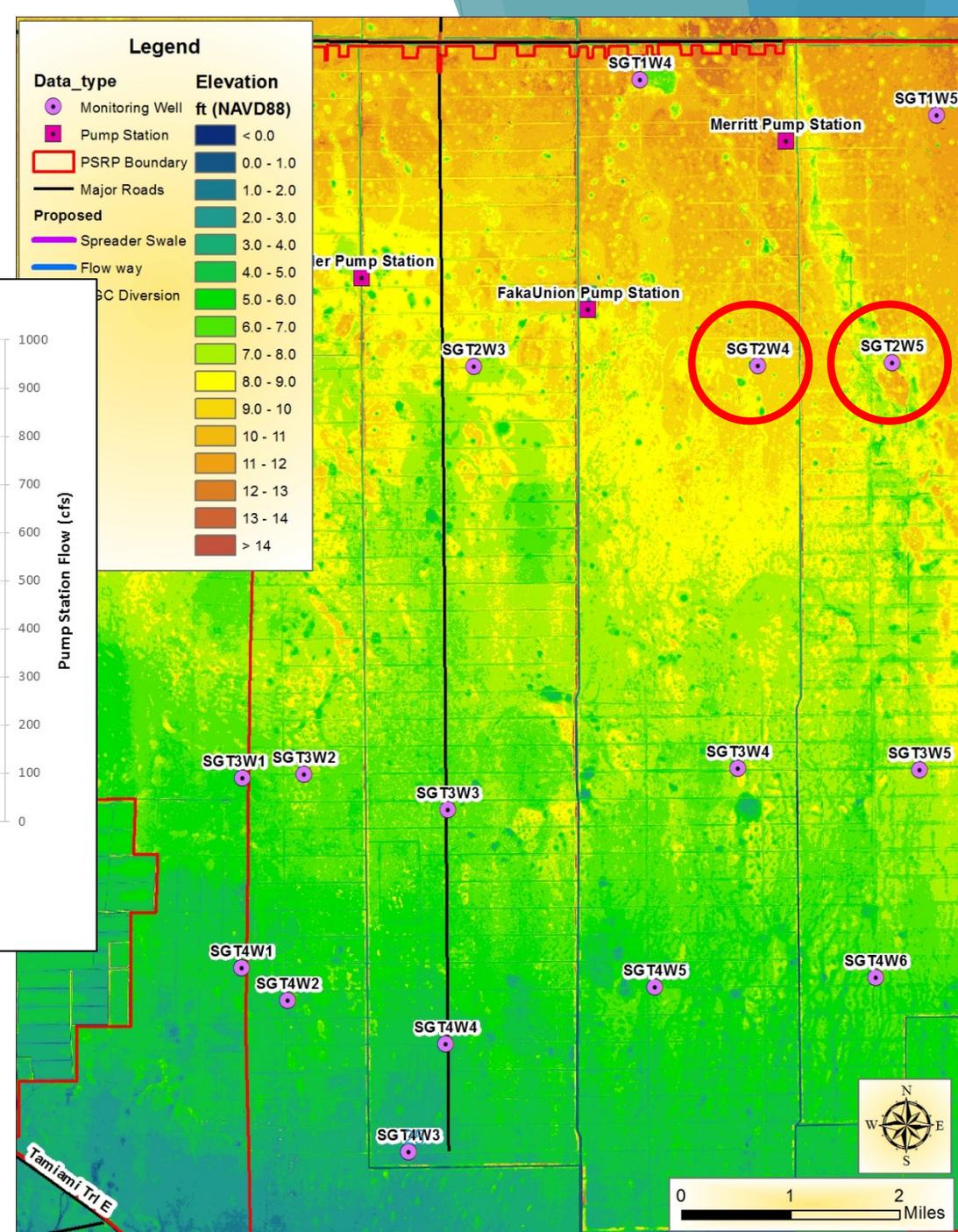
- ▶ Merritt Pump station (810 cfs) - activated in 2015
- ▶ Miller Pump station (1250 cfs) - estimated to open in 2020
- ▶ FakaUnion Pump station (2650 cfs) - estimated to open in 2020



Effects of PSRP on groundwater levels east of Six L's

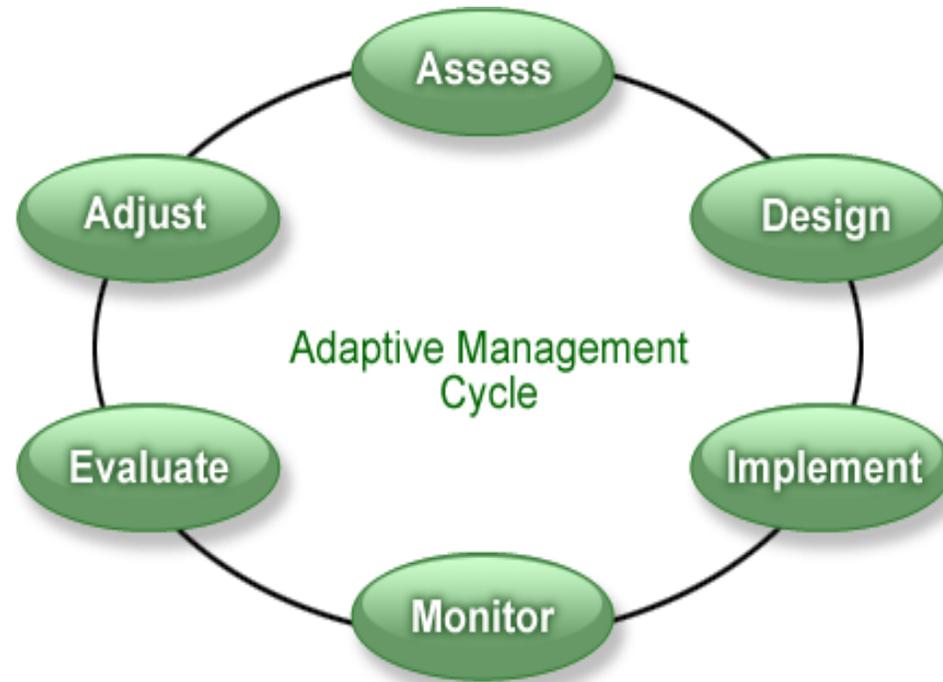


► Hydraulic gradient from PSRP pumping will prevent our flows from going to the PSRP



Preventing impacts to ecology and hydrology

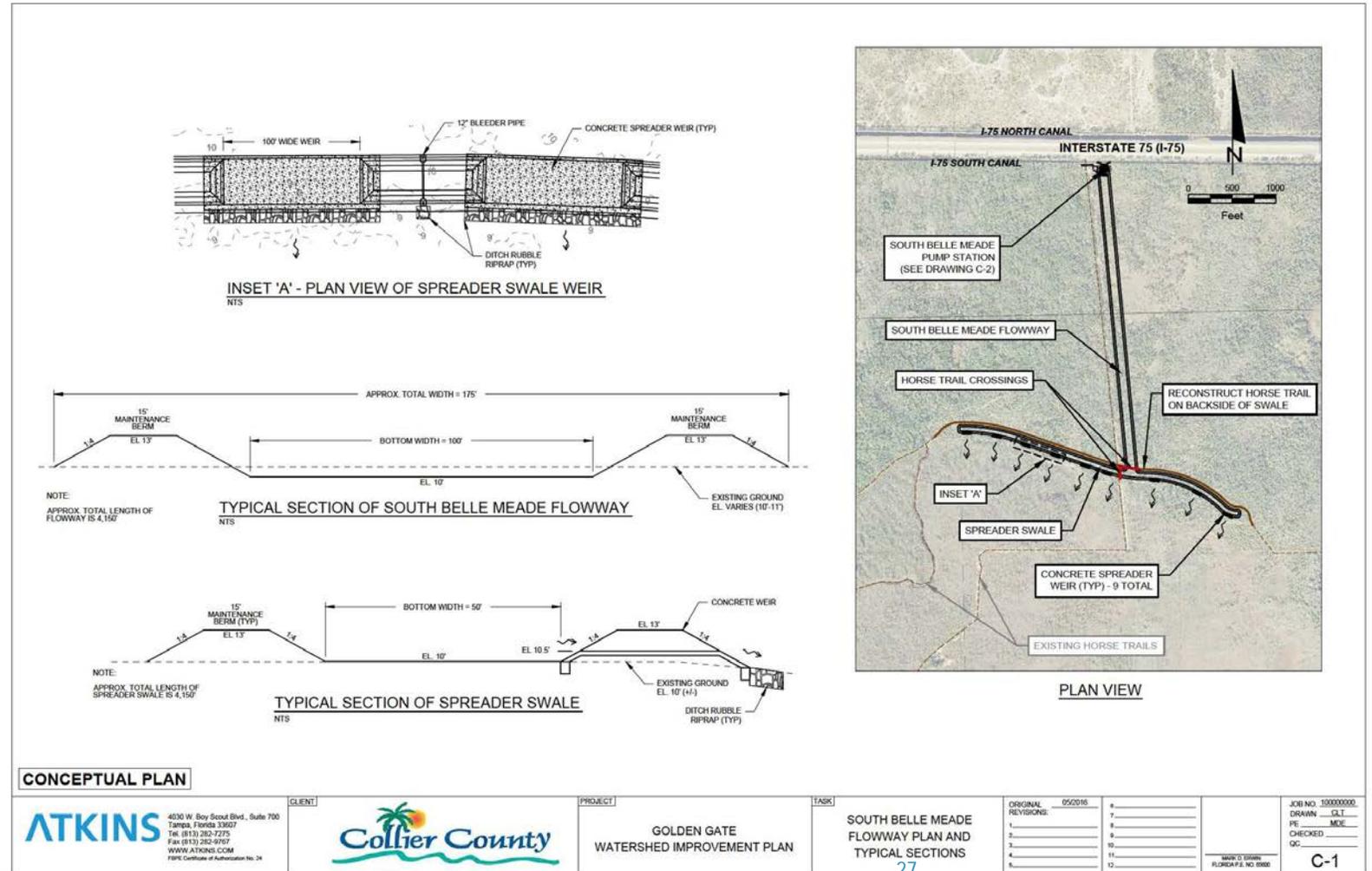
- ▶ Adaptive management approach
- ▶ Hydrologic, wetland and Habitat monitoring
- ▶ System will be flexible
- ▶ Diverted flows can be decreased if needed or system capacity could be increased



Project Area C

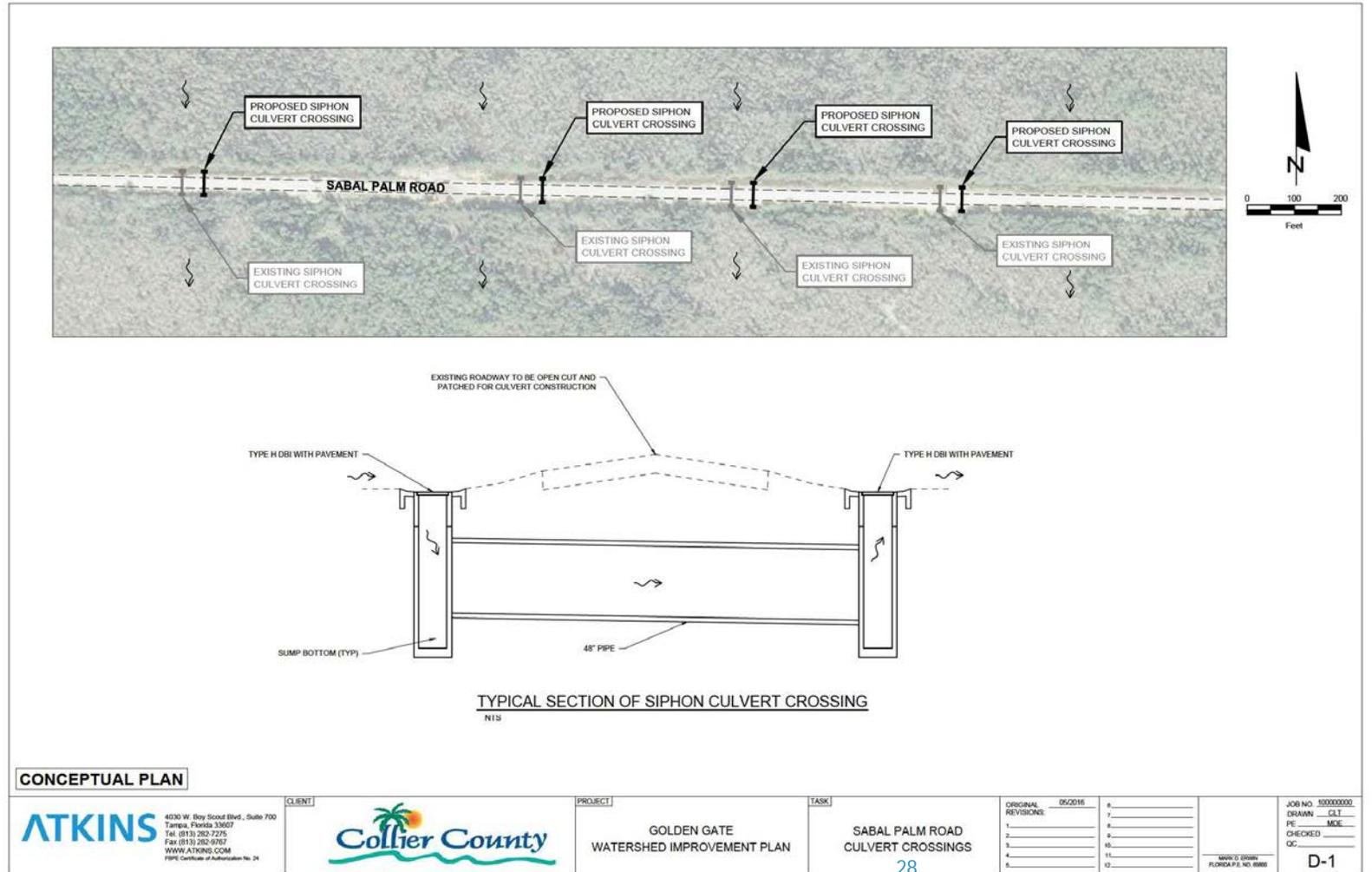
Project Components

- ▶ Conveyance flowway and spreader swale built at grade
- ▶ Flowway/spreader will be “dry” (no impacts to groundwater)
- ▶ Minimal gradient so pump head will push water
- ▶ Realigned horse trails will maintain trail connectivity



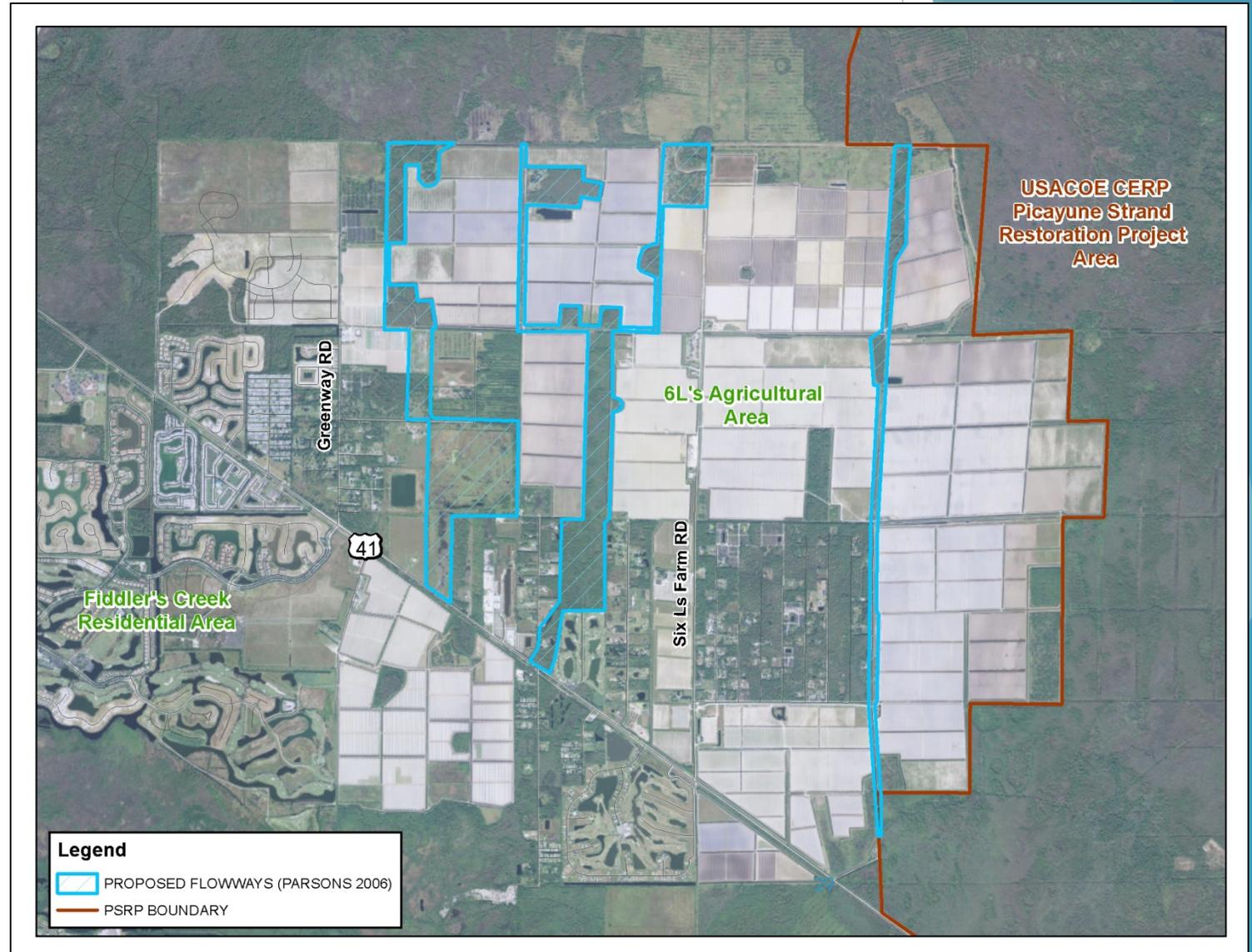
Project Area D

- ▶ Project Components
 - ▶ 4 new siphon culvert crossings to convey additional flow
 - ▶ Reconstruct road to existing conditions



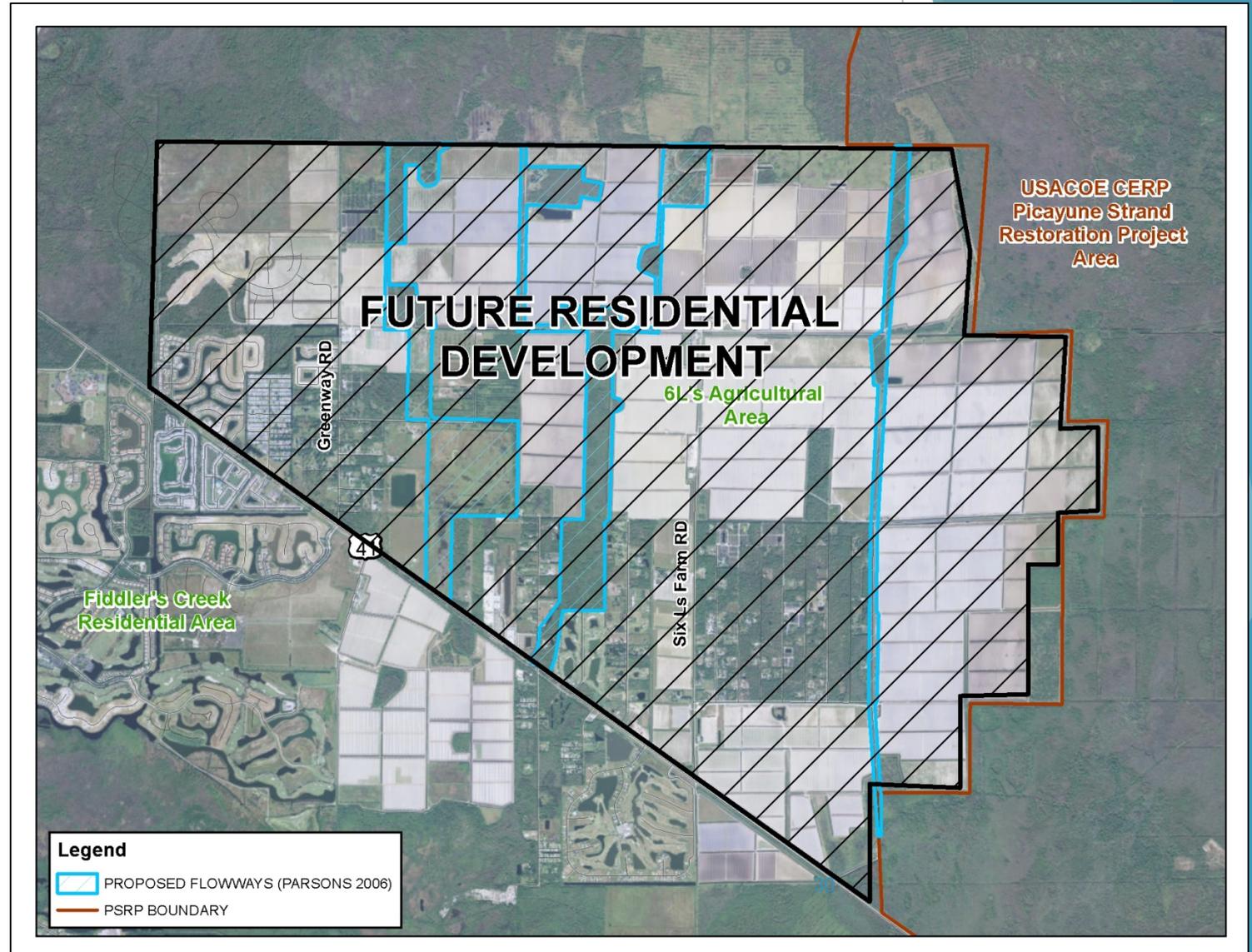
Six L's Historical Flowways

- ▶ Flowway corridors must be obtained from Six L's
- ▶ Proposed flowways from historical analysis (Parsons 2006)

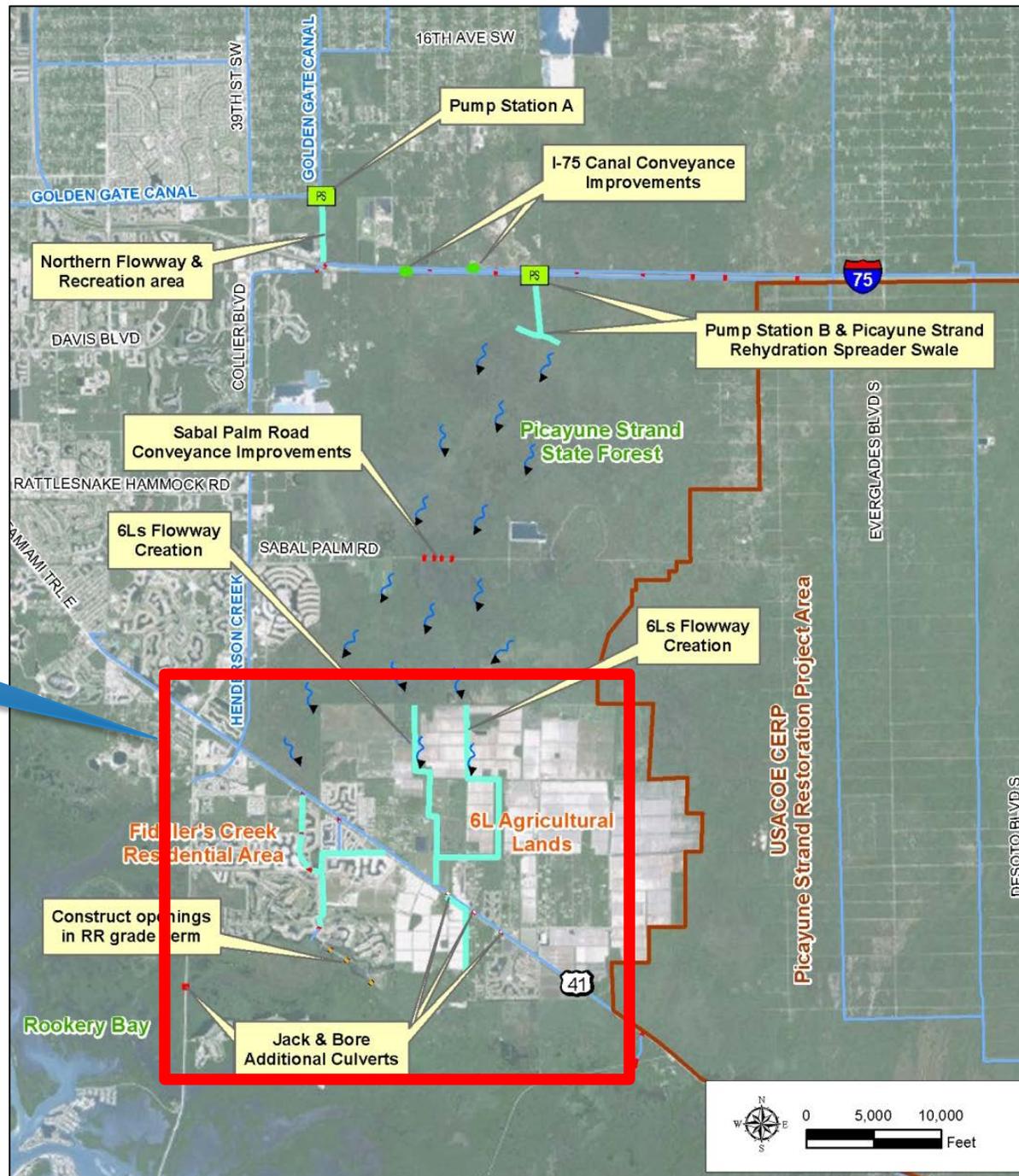


Six L's Historical Flowways

- ▶ Flowway corridors must be obtained from Six L's
- ▶ Proposed flowways from historical analysis (Parsons 2006)
- ▶ This will be coordinated with Six L's when the area transitions to residential development in the future



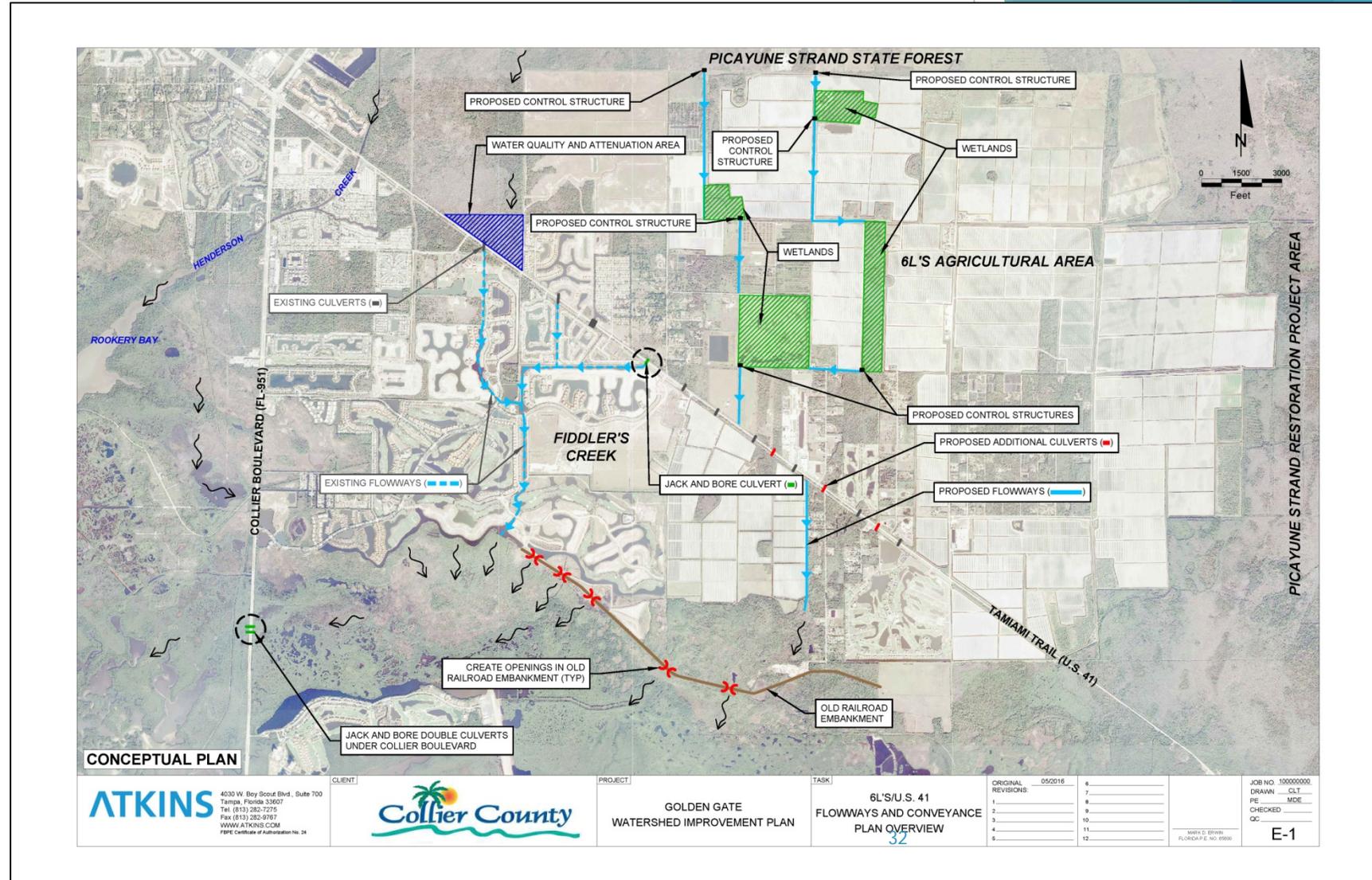
Project Area E



Project Area E

▶ Project Components

- ▶ Construct new flowways through historical flowway areas
- ▶ Construct new culvert crossings under US 41 and SR 581
- ▶ Create openings in historic RR berm
- ▶ Create water quality and attenuation area on public parcel



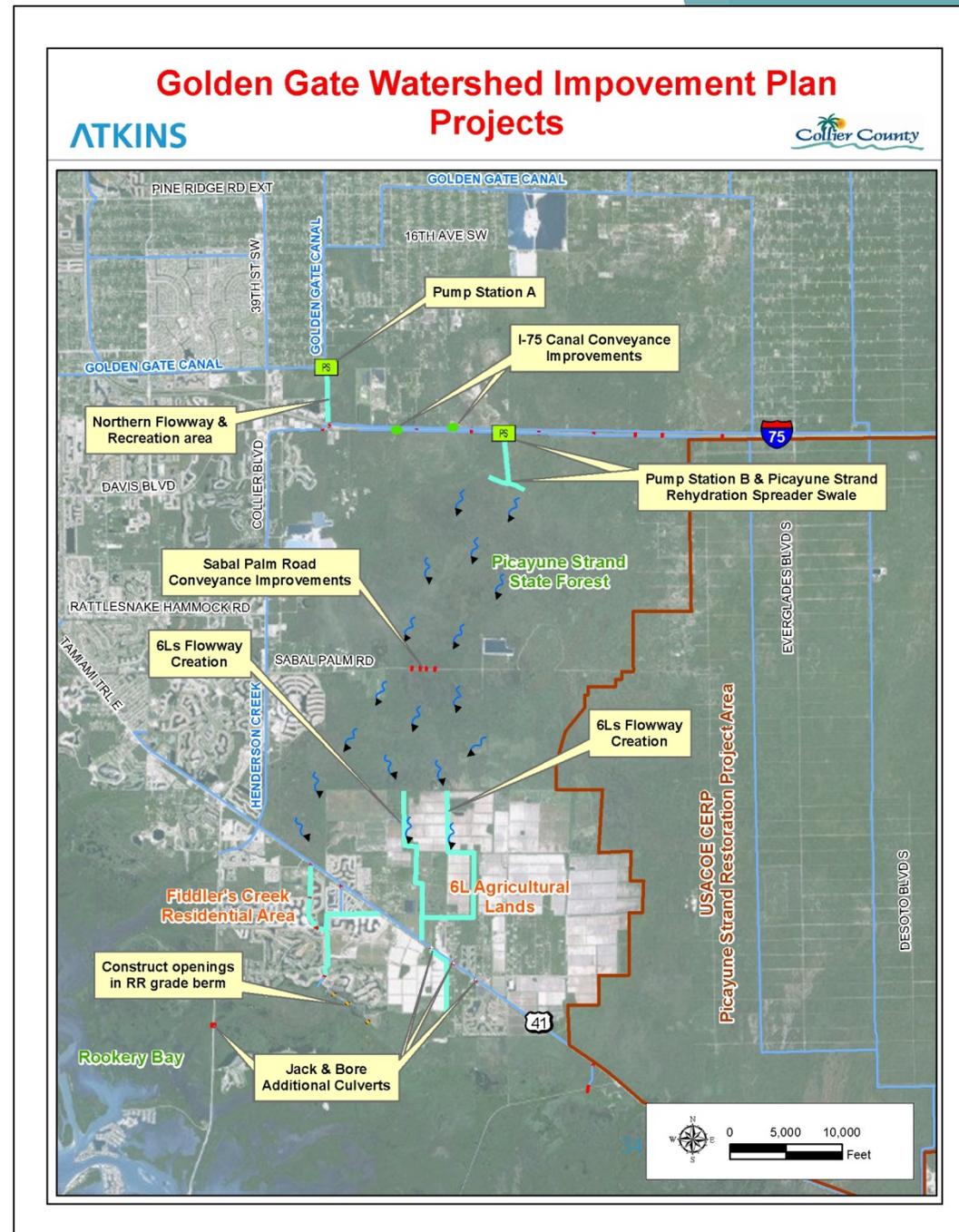


Critical issues being addressed

- ▶ **Additional Flows to Rookery Bay**
 - ▶ The additional flows from the project supplement the documented existing flow deficits
- ▶ **South Belle Meade property evaluation (TDR program)**
 - ▶ 46 private parcels need development rights evaluated
 - ▶ 16 parcels are already in the TDR program
- ▶ **Preventing impacts to ecology and hydrology**
 - ▶ No impacts to Red-Cockaded Woodpecker (RCW) habitat
 - ▶ Minimal changes to vegetation communities
 - ▶ Use an adaptive management approach
 - ▶ No additional flows to the Picayune Strand Restoration Project (east side)
 - ▶ Project pumping will reduce the probability of damaging fires in the dry season
 - ▶ Restoring hydrology will benefit vegetation: reduce palm encroachment and support historic cypress communities
 - ▶ Consistent with Latest Management Plan for Picayune Strand State Forest and addresses Forestry concerns
- ▶ **Bypassing flow through and around the Six L's Agricultural lands**
 - ▶ Historical flowways will be re-established through future modifications in the Land development code

Projects by Area

- ▶ Project components are based on previous study concepts
- ▶ Components have been tailored to meet project-specific goals
- ▶ Projects have been (and are still being) vetted in terms of feasibility and permitability.
- ▶ Projects have been (and are still being) coordinated with local agencies, NGOs and other interested parties
- ▶ Projects are consistent with the RESTORE Comprehensive Management Plan



Project Development and Estimated Cost

- ▶ Project conceptual plan set (~15% design level and includes a 25% contingency)

Project Area A (Northern Flowway)	6M
Project Area B (I-75 Canals Plan)	2M
Project Area C (South Belle Meade)	4.8M
Project Area D (Sabal Palm Rd.)	0.2M
Project Area E (Six L's/US 41 Plan)	9M
Minor projects	1M
Project Development & Design	4M
Monitoring	1M
Permitting & Mitigation	3M
<i>(Phase II) North Belle Meade Flowway</i>	
<i>Preliminary Engineering</i>	1M
<i>(Phase II) Six L's Masterplan</i>	1M

33M

