Governing Board Workshop

June 10, 2009

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Phase I Planning Update

sfwmd.gov/riverofgrass

Planning Process

- Where We Have Been and Where We Are Headed
  - ✓ Development of Vision and Goal Statements
  - ✓ Development of Problems, Objectives, and Constraints
  - ✓ Development of Tools (including modeling and maps)
  - ✓ Development of Team Configurations
  - Evaluation of Stakeholder Team Configurations (You are here)
  - Evaluation of Relationships, Tradeoffs, Other Considerations
  - Discuss Viable Concepts/Features and Common Elements
  - Discuss Concepts for more Detailed Analysis
  - Utilize Analysis to Support Decision Making for Concepts in Phase II Planning

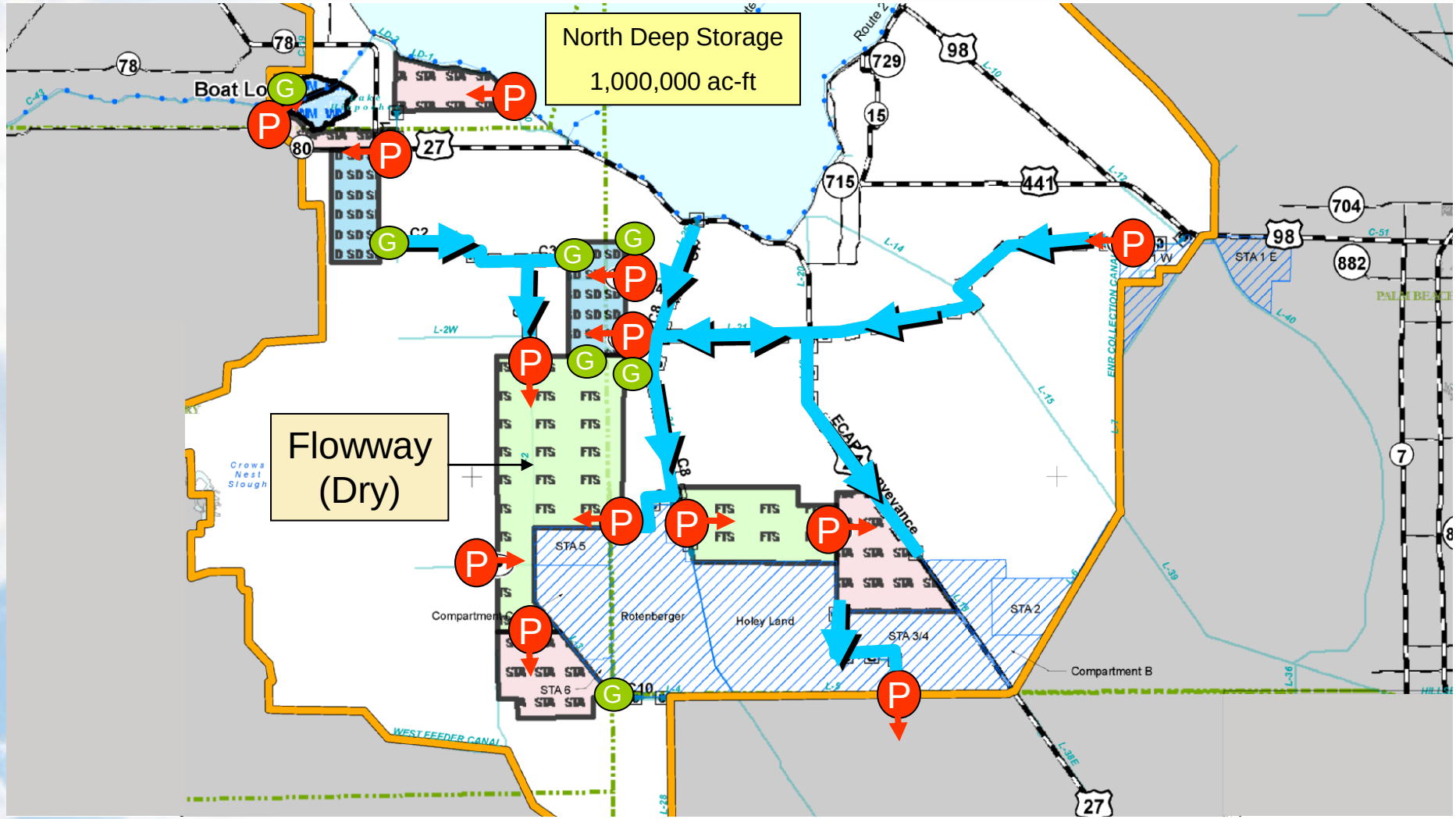
Stakeholder Configurations

Configuration Titles/Abbreviations

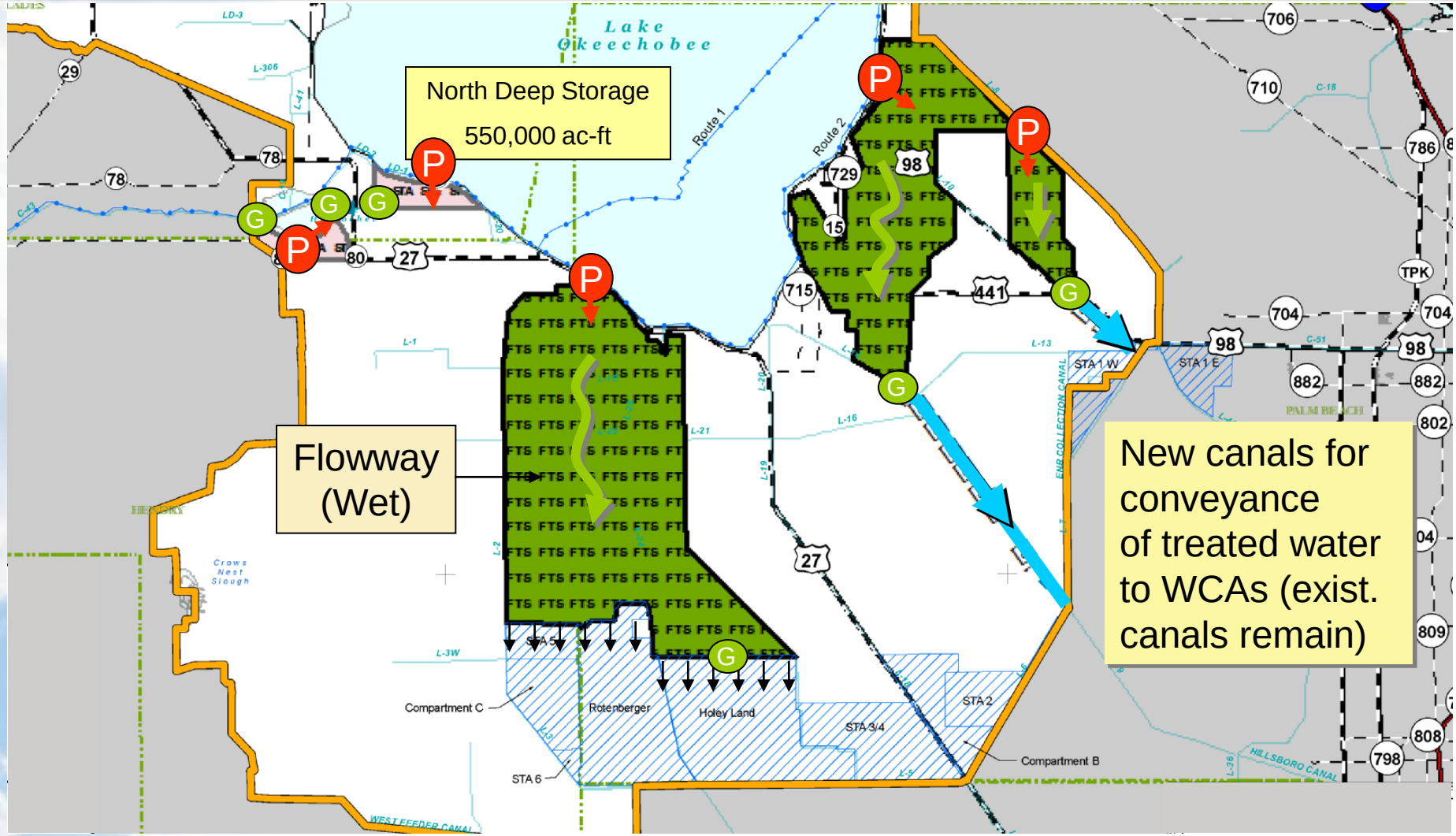
Estuary Driven Everglades Restoration	EDER
Everglades River of Grass Northern Expansion	ERNE
Chain of Lakes	CL
Florida Crystals	FC
Restoration Plus Employment	RPE
Marshall Plan Element 6	MP6
Performance	P
Performance – Cost Plan	PCP
Reservoir Within Lake Okeechobee	RWL

Estuary Driven Everglades Restoration - EDER

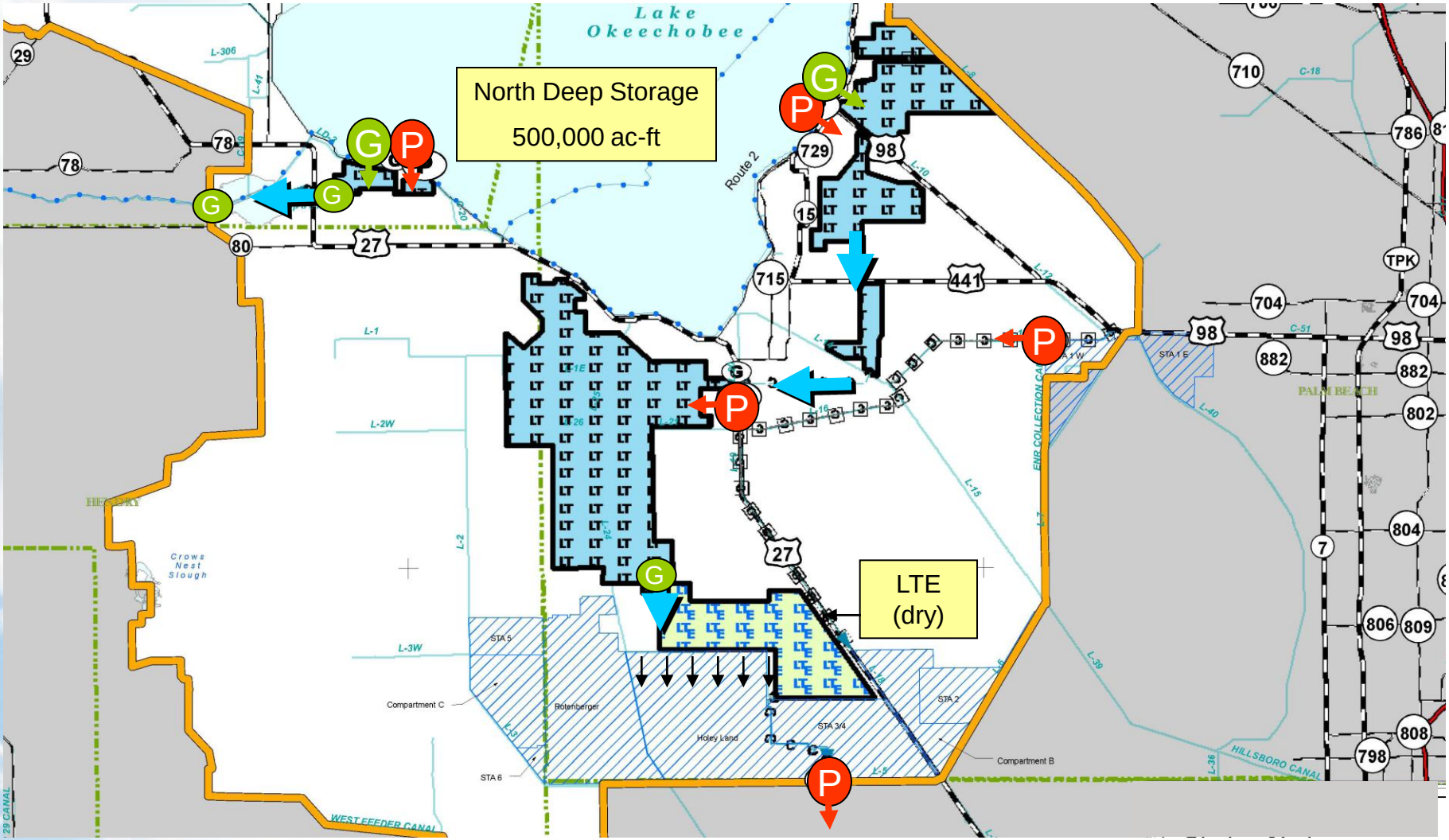
Conceptual Configuration



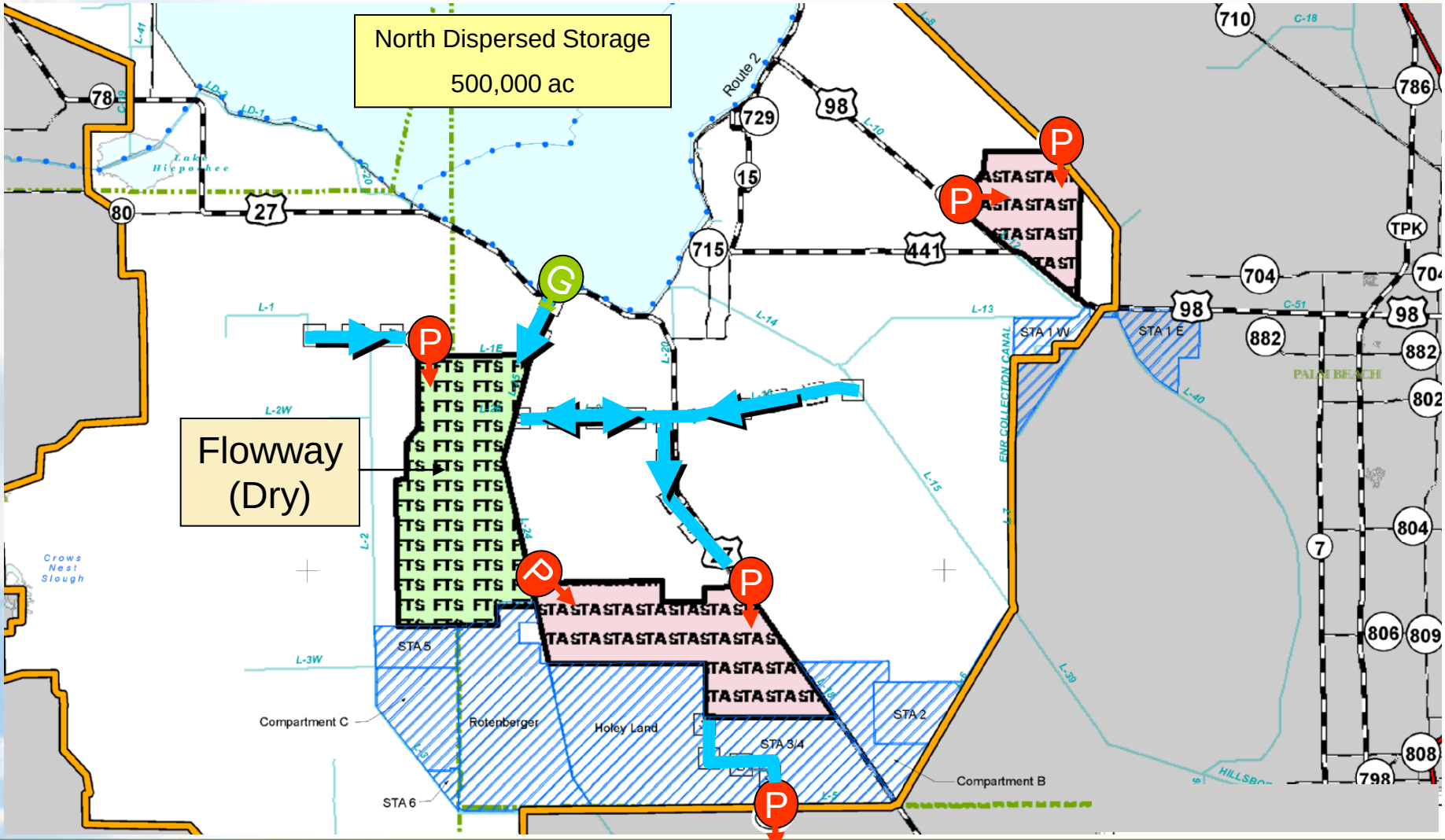
Everglades River of Grass Northern Expansion - ERNE
Conceptual Configuration



Chain of Lakes - CL
Conceptual Configuration

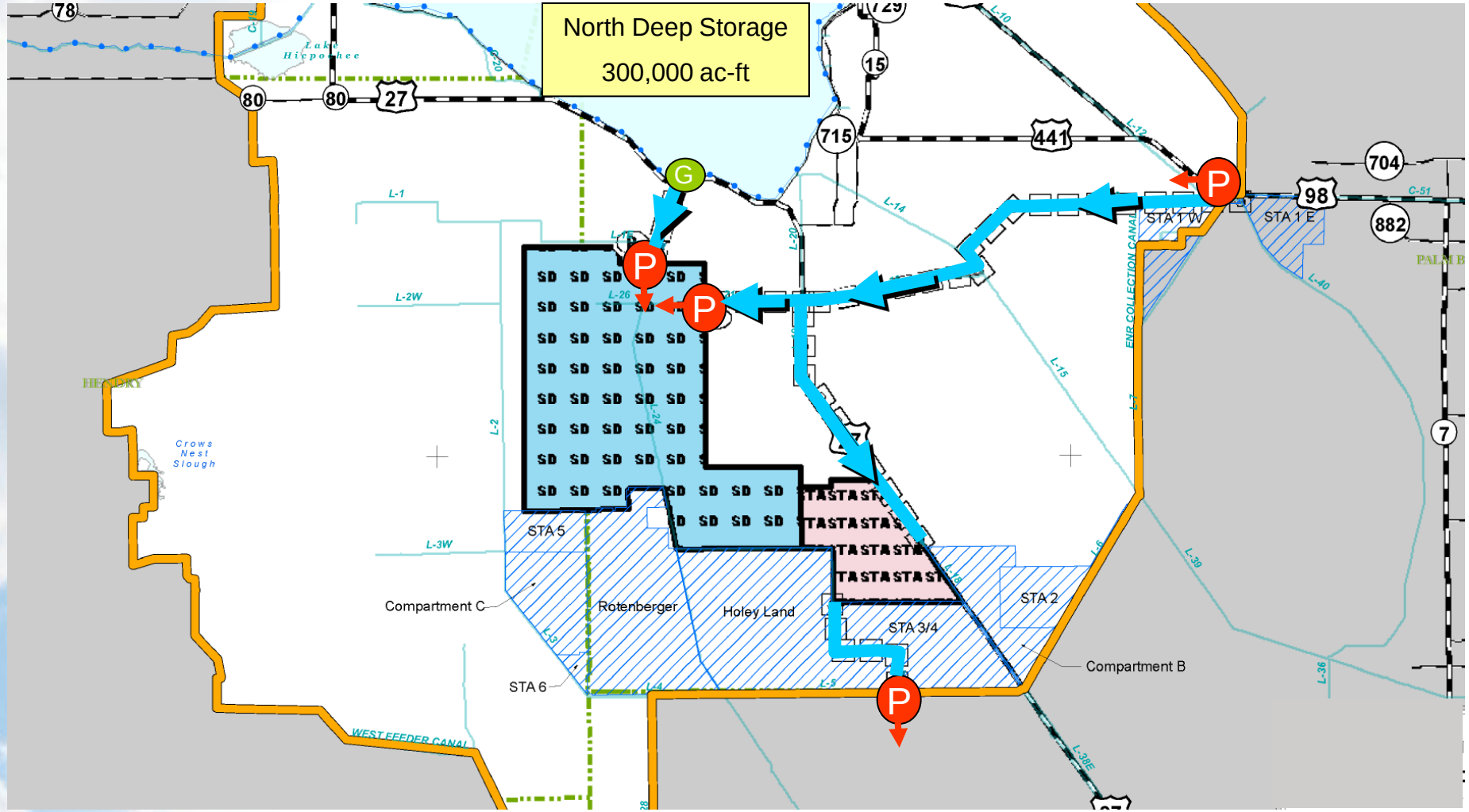


Florida Crystals - FC
Conceptual Configuration



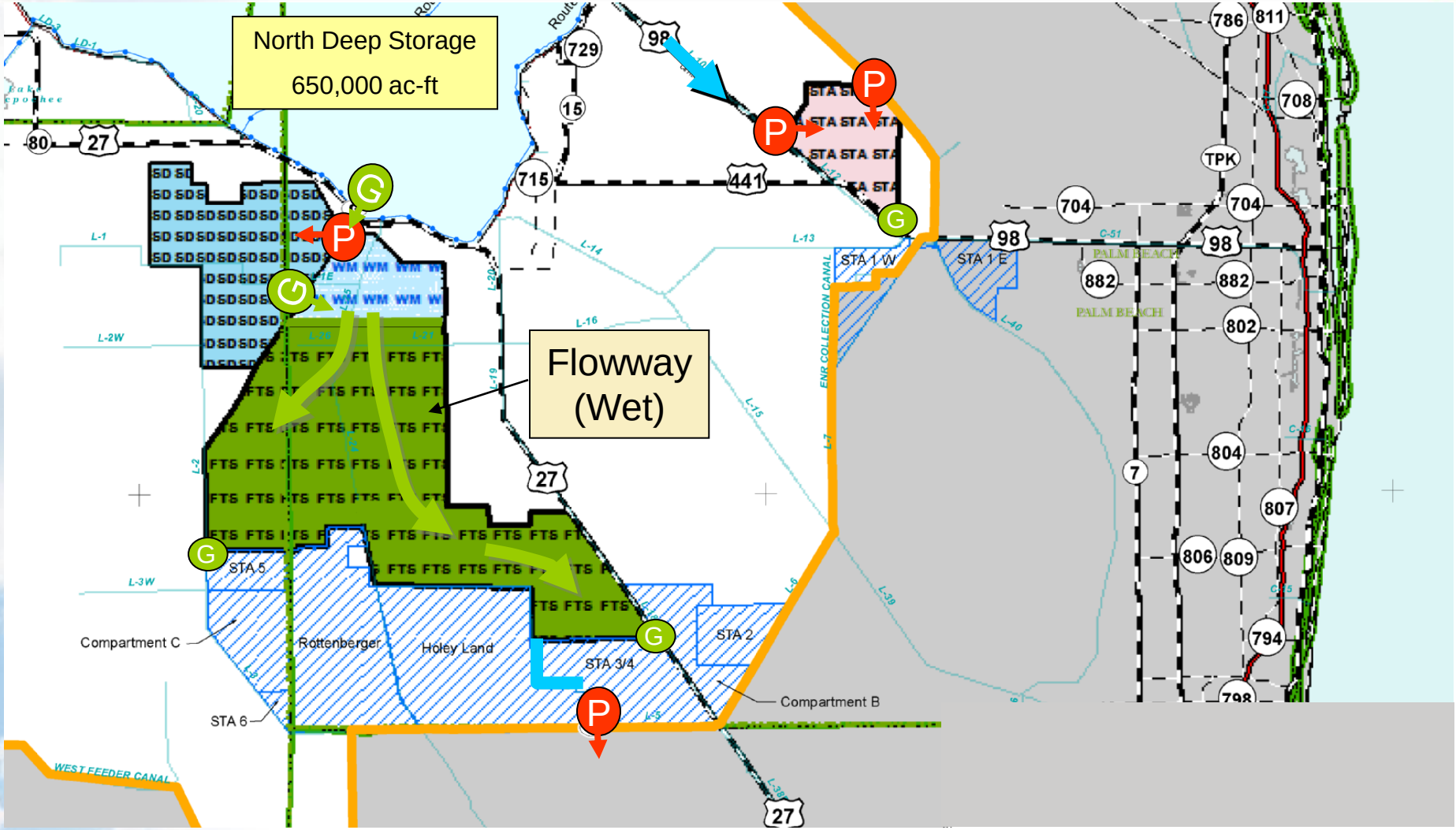
Restoration Plus Employment - RPE

Conceptual Configuration

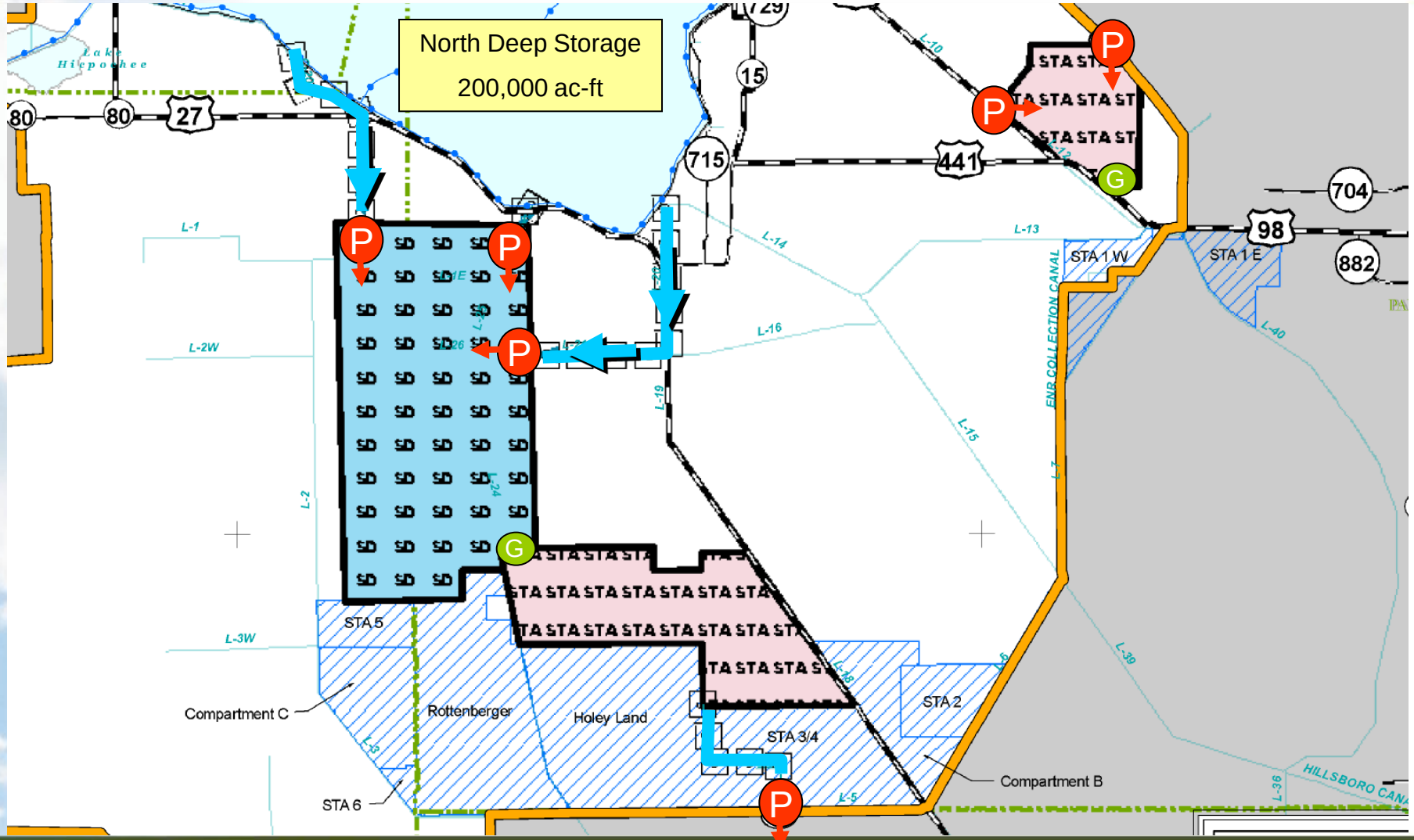


Marshall Plan Element 6 – MP6

Conceptual Configuration

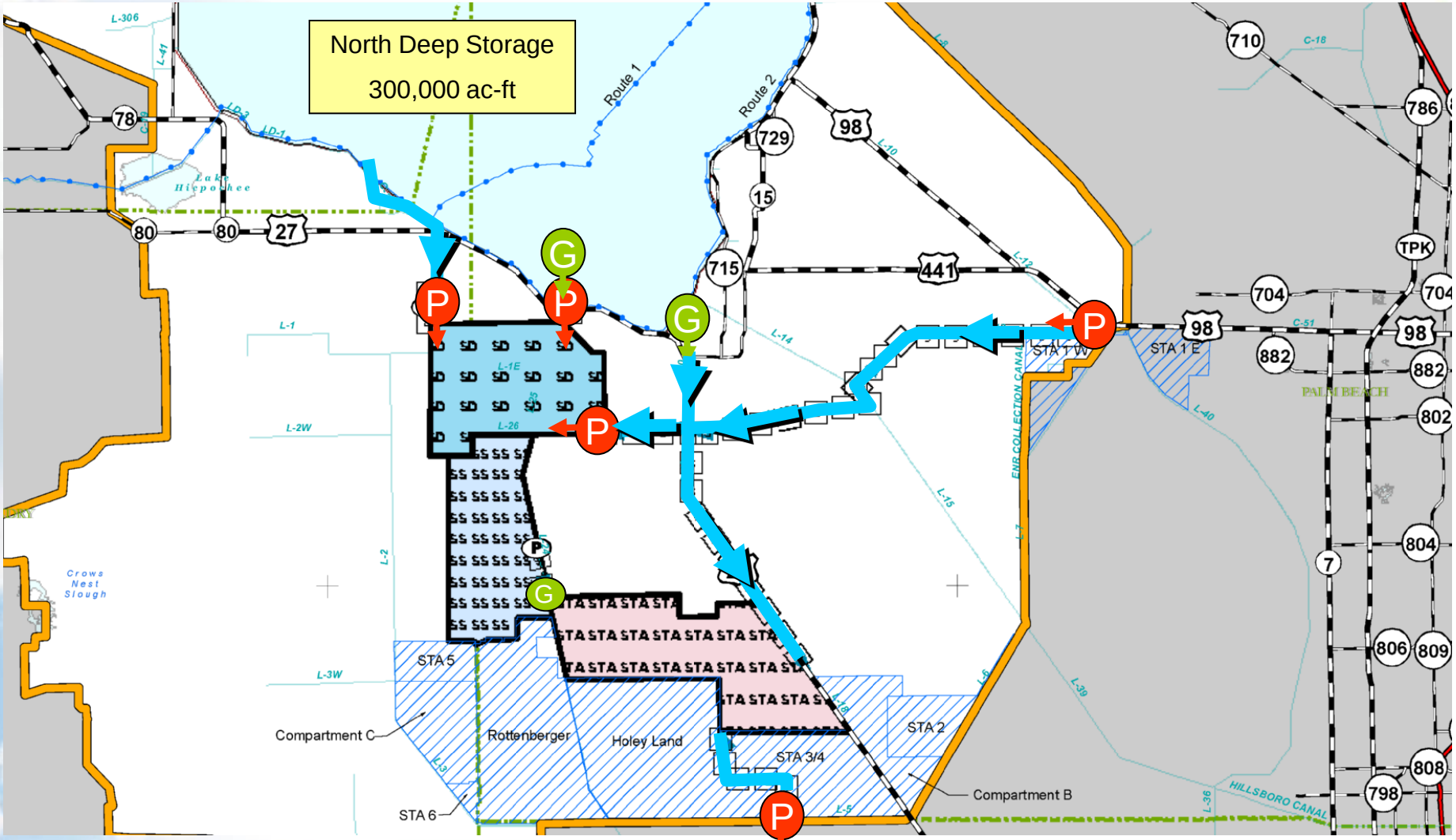


Performance - P
Conceptual Configuration



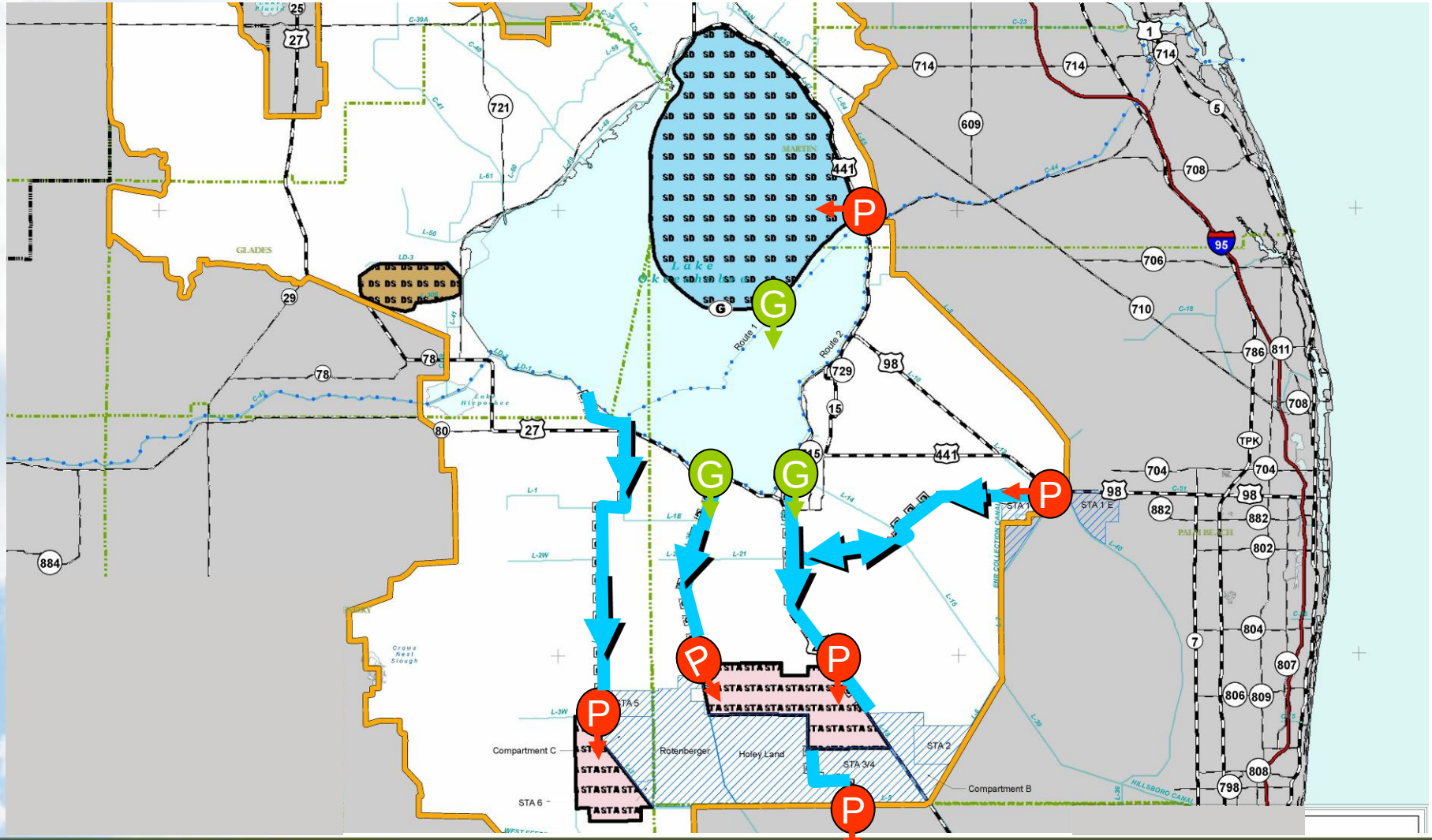
Performance Cost Plan - PCP

Conceptual Configuration



Reservoir Within Lake Okeechobee - RWL

Conceptual Configuration



Benefits Summary

Water Quality Evaluation Overview

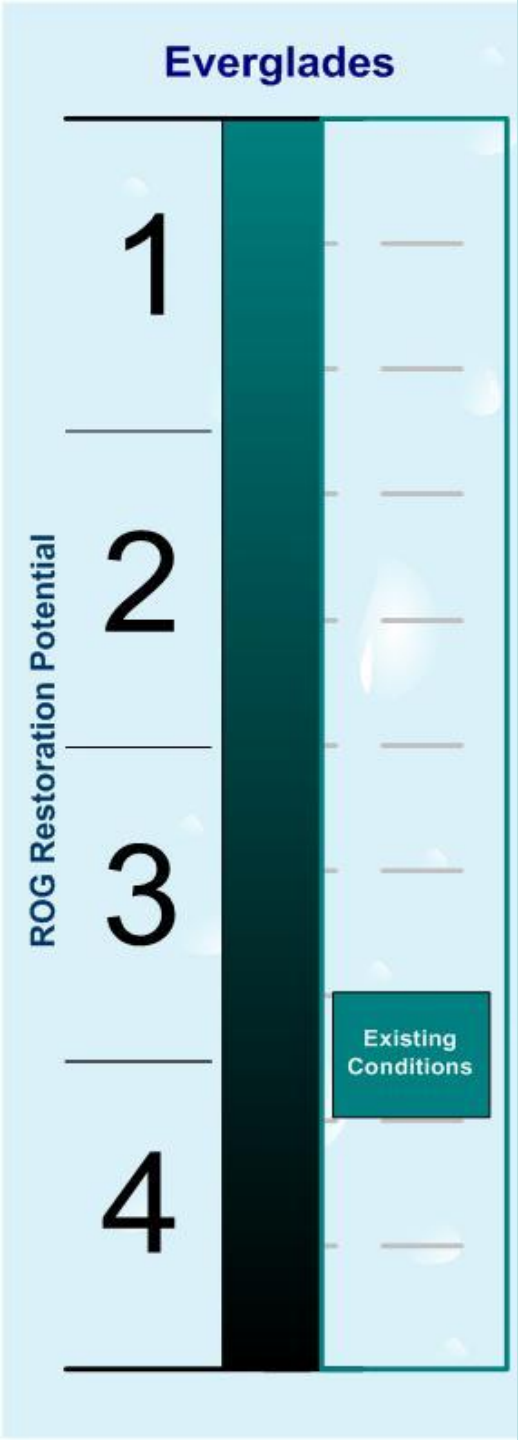
- Steady State Design Model (Kadlec and Knight 1996)
  - Strength - Simpler approach than dynamic model (e.g., DMSTA); efficiently evaluates long-term average performance of large number of alternatives identified in Phase I Planning
  - Weakness – forecasting short-term dynamic treatment performance and long-term performance of high hydraulic pulses
  - Previously focused on treatment in reservoirs and STAs; Updated to evaluate treatment potential of other features
    - Flow-ways
    - Shallow storage areas
    - Wetlands – Managed Aquatic Plant Systems
    - Lake Technology Ecosloughs
    - Lake Technology Ecoreservoirs
  - Phase 1 Planning study will be followed by more detailed water quality analyses

Water Quality Evaluation

- Each configuration made assumptions regarding the necessary treatment capacity provided
  - Wet vs. dry condition assumptions
- Analysis focused on identifying treatment capacity needed to meet water quality needs
- Four (4) configurations require additional treatment capacity (CL, ERNE, MP6, RPE)
  - Performance and/or costs for these configurations will need to be adjusted

Hydrologic Evaluation

- Criteria was developed by District scientists and engineers to evaluate ecological performance of the various configurations using the output of the RESOPS hydrologic model
  - Based on specific ecological responses to variations in hydrology
  - Relates to specific species viability & sustainability
- 4 levels of ecological health were identified for each of the performance measures associated with the major system components
  - Also included assessment of water supply in the Lake Okeechobee Service Area
  - Levels span from fully restored to non-functional ecosystem conditions
    - Identifies conditions that indicate whether the ecosystem component is improving, static or deteriorating



•1

- Water moves as unobstructed sheetflow over full width of remaining landscape
- Long term average water depths match pre-drainage depths
- Depths and flows vary according to pre-drainage linkage to weather variation
- Depths and flows sustain peat processes and in turn sustain shapes, elevations, and vegetation of ridges and tree islands
- Populations of large multi-year fish persist; wading bird prey base present
- Flows into Florida Bay continue through most of the year, preventing hyper-salinity and sustaining diverse submerged aquatic vegetation, fish and shrimp

•2

- Ecologically sub-optimal condition, but sustainable
- Hydrology cannot restore landscape to optimal condition, but can sustain in Condition 2
- Everglades ecology is very sensitive to hydrologic change - modest hydrologic improvements can tip ecological conditions from 2 to 1

•3

- “Tipping point:” landscape on degrading ecological trajectory toward Condition 4
- Ecologically, very different from Condition 2 because of downward trajectory
- Everglades ecology is very sensitive to hydrologic change - modest hydrologic improvements can tip ecological conditions from 3 to 2

•4

- Sloughs are dry (water depths zero) for more than four months of the year
- Flows zero for more than six months of the year; annual flows to FL Bay near zero
- Multi-year large fish populations eliminated; small fish populations greatly reduced
- Wading bird prey base essentially eliminated
- Widespread oxidation and/or burning of peat
- Elevations of ridges and tree islands reduced to level of sloughs (landscape flattened)
- Water lilies gone; sloughs invaded by sawgrass / dryland species; tree islands gone.

ROG Restoration Potential	Caloosahatchee Estuary	St. Lucie Estuary	LOSA Demand	Lake Okeechobee	Everglades
1	CL, EDER, MP6, P, PCP, RPE and RWL	CL, EDER, MP6, P, PCP, RPE and RWL			EDER, P and RPE
2	ERNE and FC Existing Conditions	ERNE and FC	All Configurations	FC Existing Conditions	CL, MP6 and PCP
3		Existing Conditions	Existing Conditions	CL, EDER, ERNE, MP6, P, PCP and RPE, RWL	ERNE, FC and RWL Existing Conditions
4					

Summary of Planning Level Cost Estimates & Sugar Cane Productivity for Team Configurations

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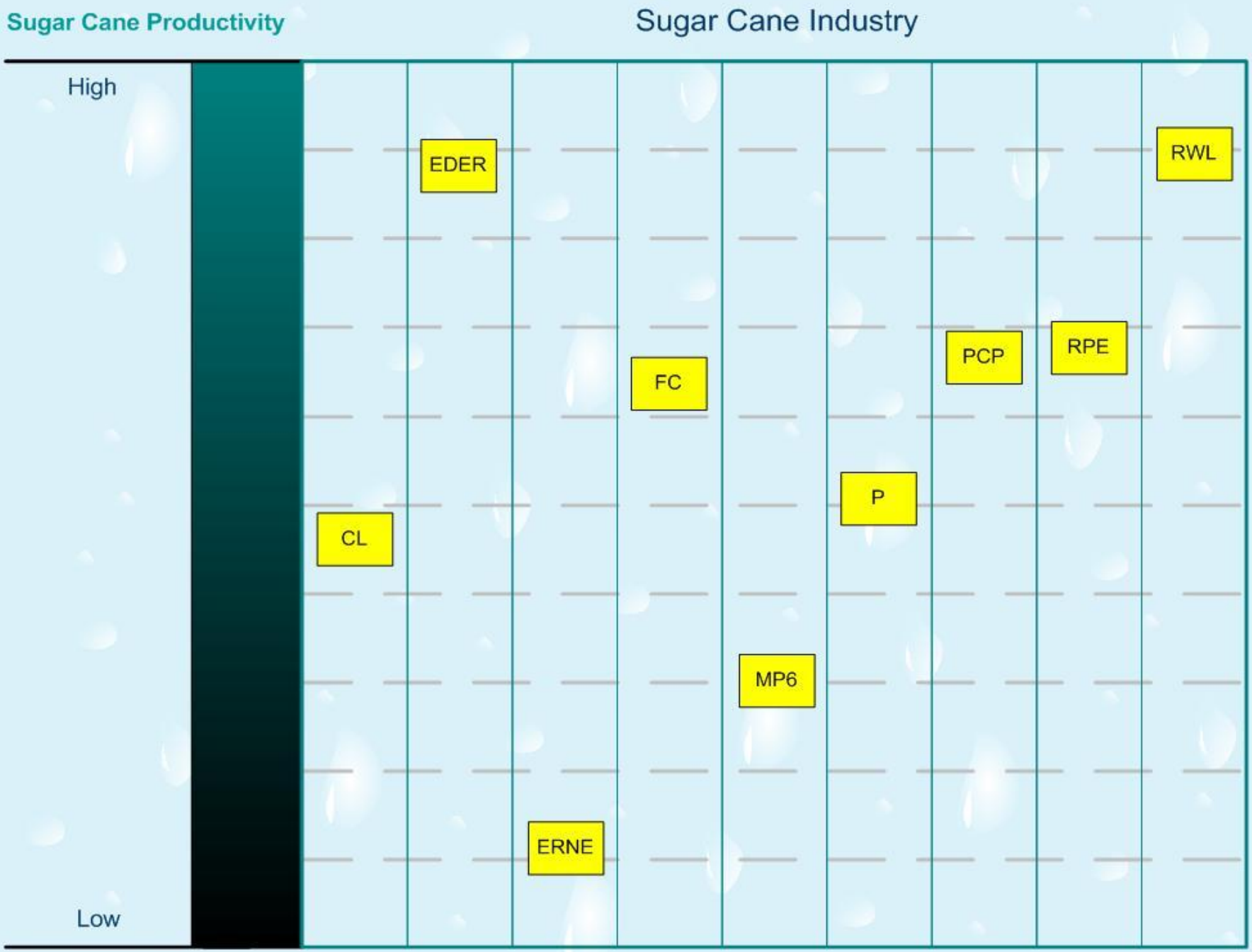

Sugar Cane Productivity
Sugar Cane Industry
High
Low
EDER
RWL
PCP
RPE
FC
P
CL
MP6
ERNE

System-Wide Approach

Program Overlap

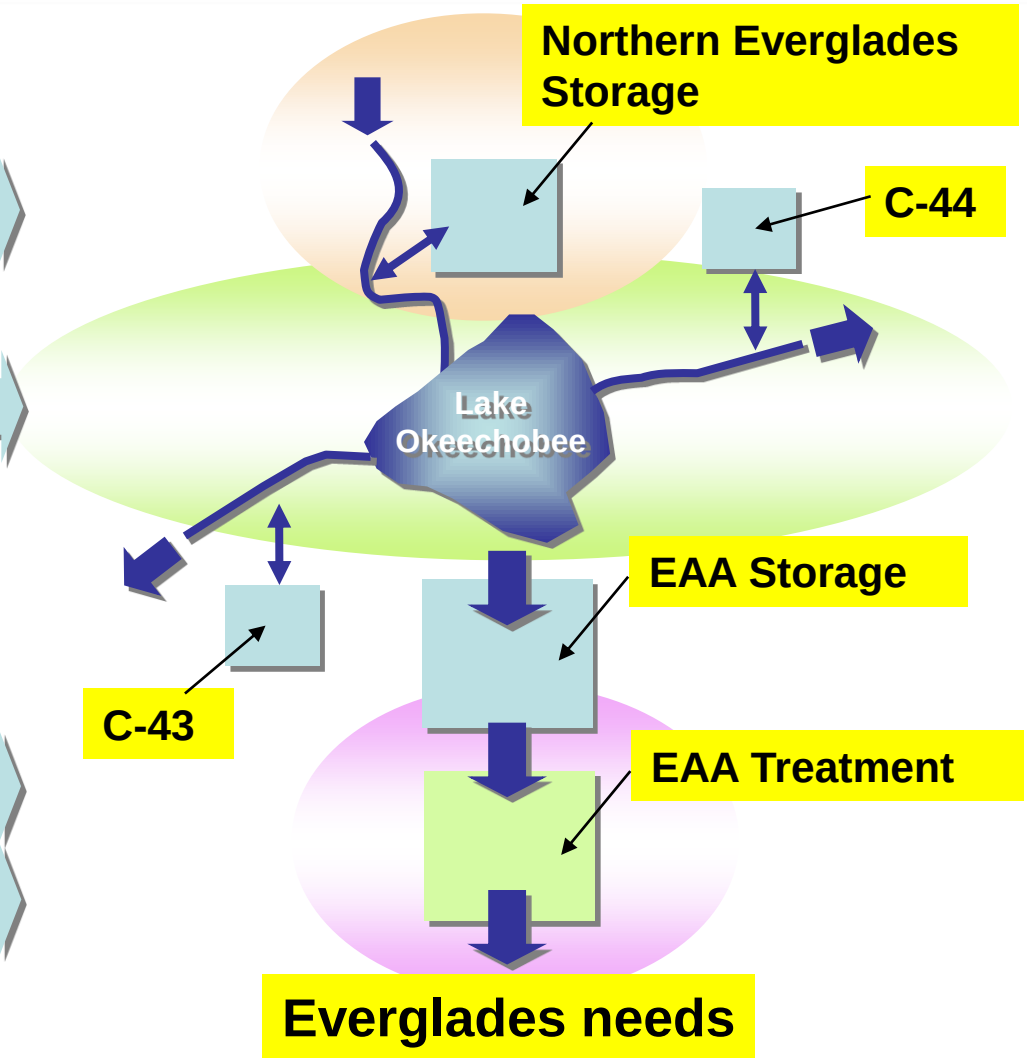
Lake Okeechobee Technical Plan

River Watershed Protection Plans

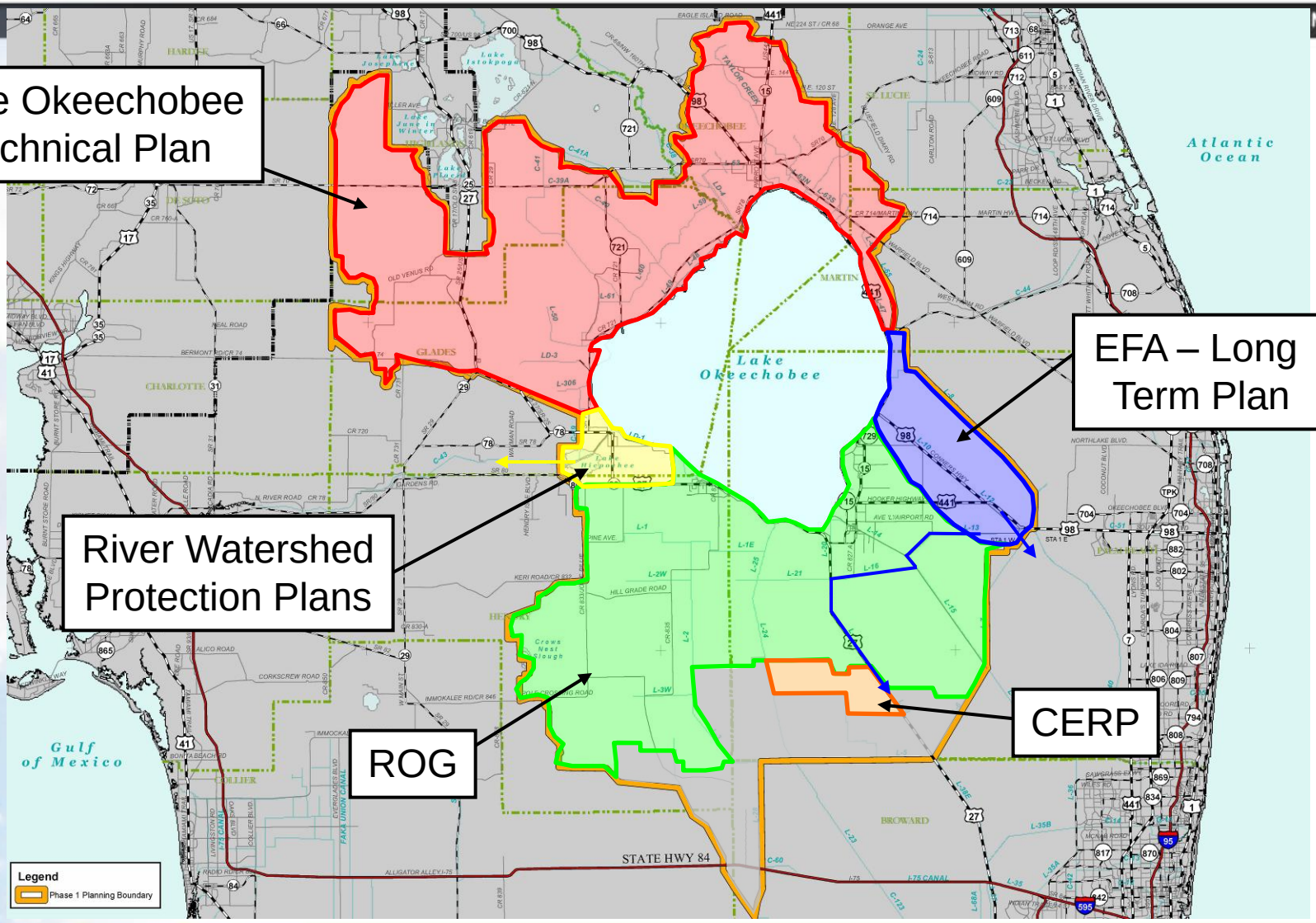
ROG

CERP

EFA -Long Term Plan



Program Areas



Summary of All Configurations

Estimates Include Remediation, Real Estate, Construction Costs, and 20 Years of Payment for Dispersed Storage

Funding Category Note: Estimates do not include design, permitting, engineering during construction and construction management costs.

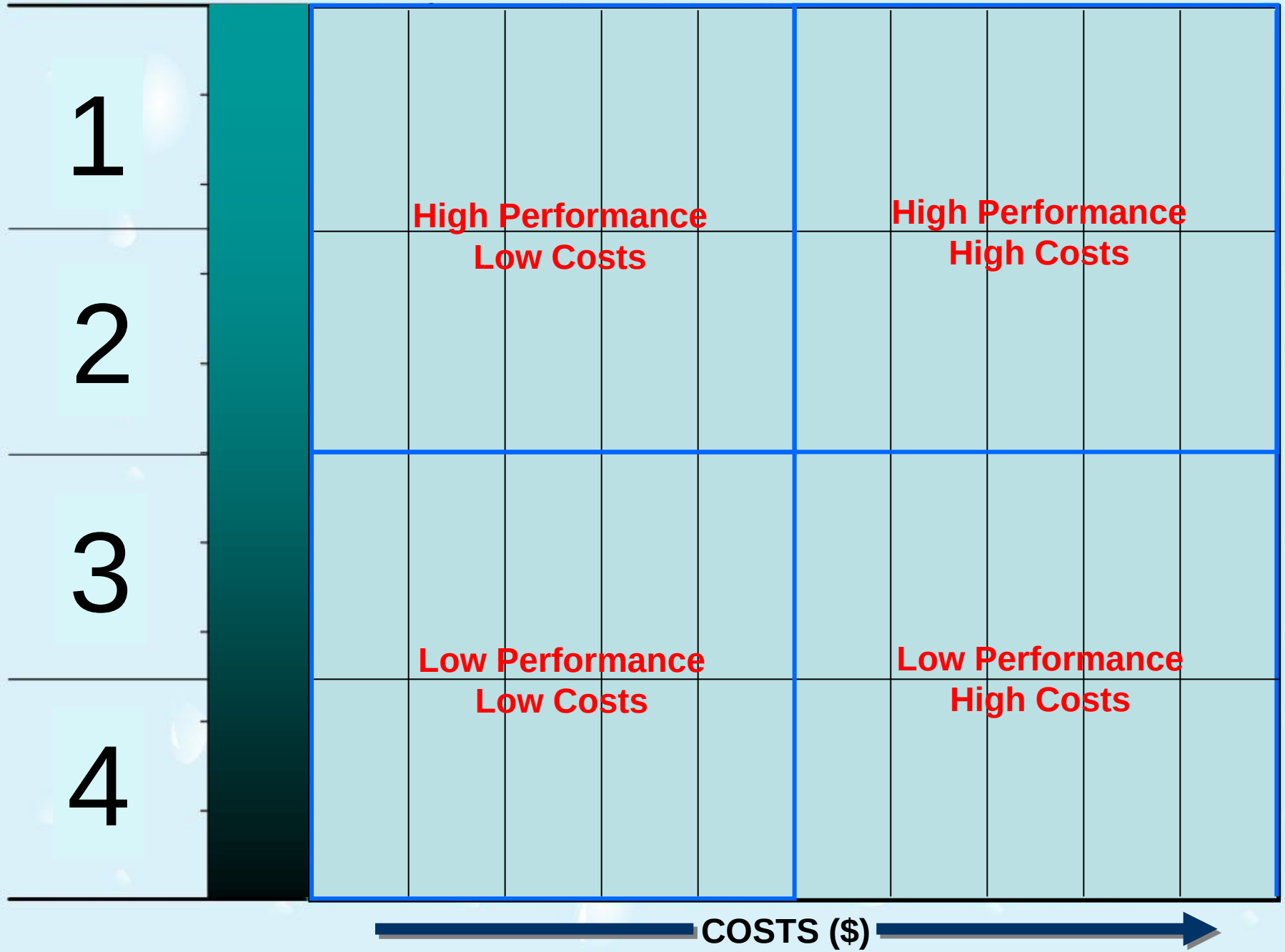
	LOTP*	RWPP*	LTP*	CERP*	ROG
Configuration Name					
Florida Crystals (FC)**	$1,335,000,000	$0	$958,898,867	$1,648,247,443	$924,668,481
Performance-Cost Plan (PCP)	$2,135,341,696	$0	$260,000,000	$1,432,029,069	$5,789,174,252
Reservoir Within Lake Okeechobee (RWLO)*	$7,007,672,785	$0	$260,000,000	$1,901,863,860	$746,749,296
Restoration Plus Employment (RPE)	$2,135,341,696	$0	$260,000,000	$2,268,205,688	$5,253,588,230
Marshall Plan Element 6 (MP)	$4,771,279,739	$0	$958,898,867	$128,129,538	$6,434,379,939
Everglades River of Grass Northern Expansion (ERNE)	$4,000,712,335	$405,979,459	$0	$663,016,104	$7,254,651,674
Performance (P)	$1,406,480,686	$0	$958,898,867	$1,432,029,069	$8,850,112,866
Estuary Driven Everglades Restoration (EDER)	$7,570,012,103	$120,437,352	$260,000,000	$1,517,183,061	$6,254,251,935
Chain of Lakes (CL)	$11,634,991,947	$2,309,168,822	$260,000,000	$1,603,216,111	$11,776,765,166

* These costs do not reflect the potential for any offsets that might occur to other programs as a result of implementing River of Grass features. For example, ROG may present the opportunity to reduce the number of ASR wells proposed under CERP, but these costs do not capture that potential difference in total restoration costs. These costs also do not reflect total program costs for these categories.

** Includes Dispersed Storage

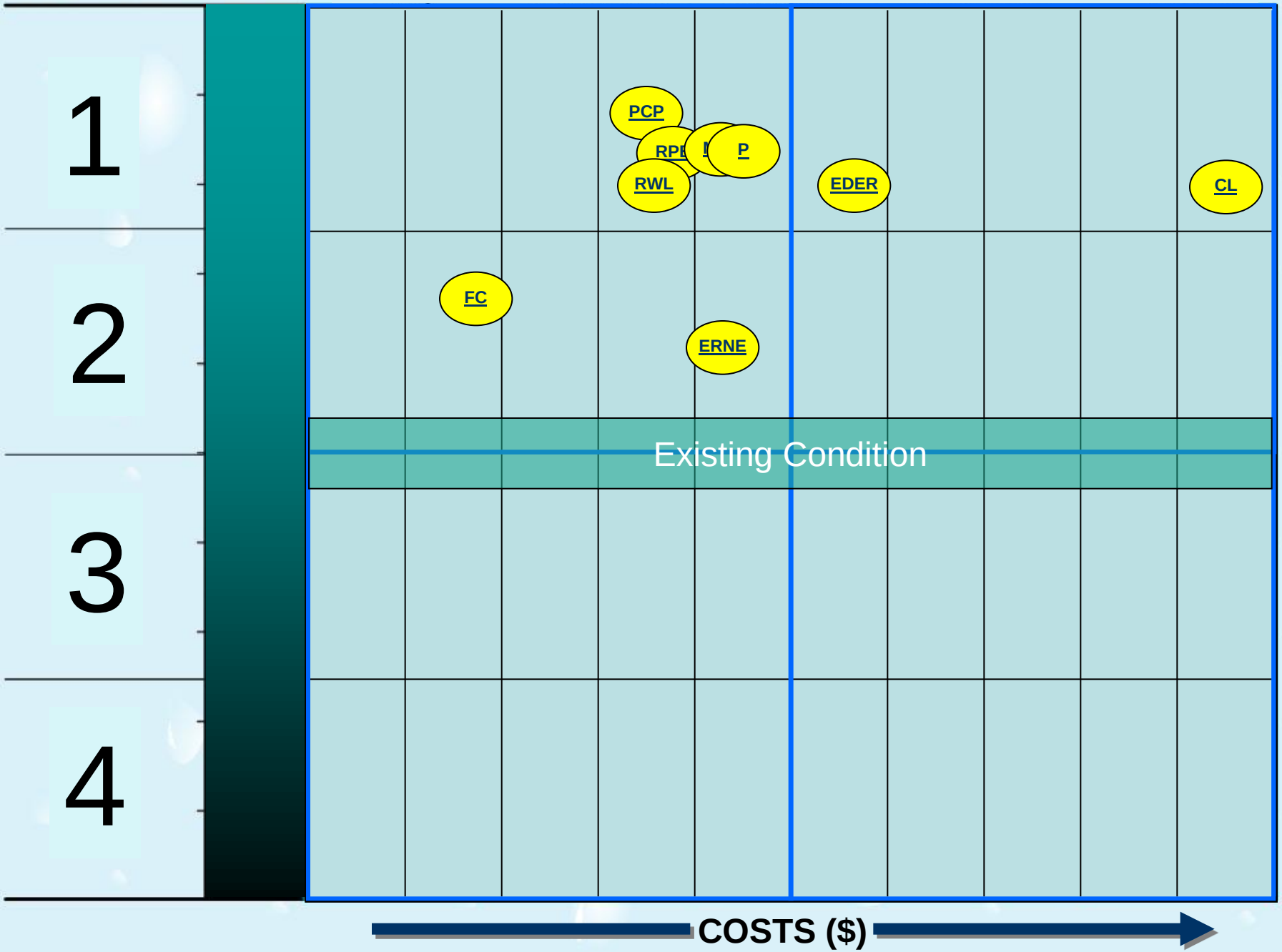
Benefit-Cost Summary

Graphic Relationships



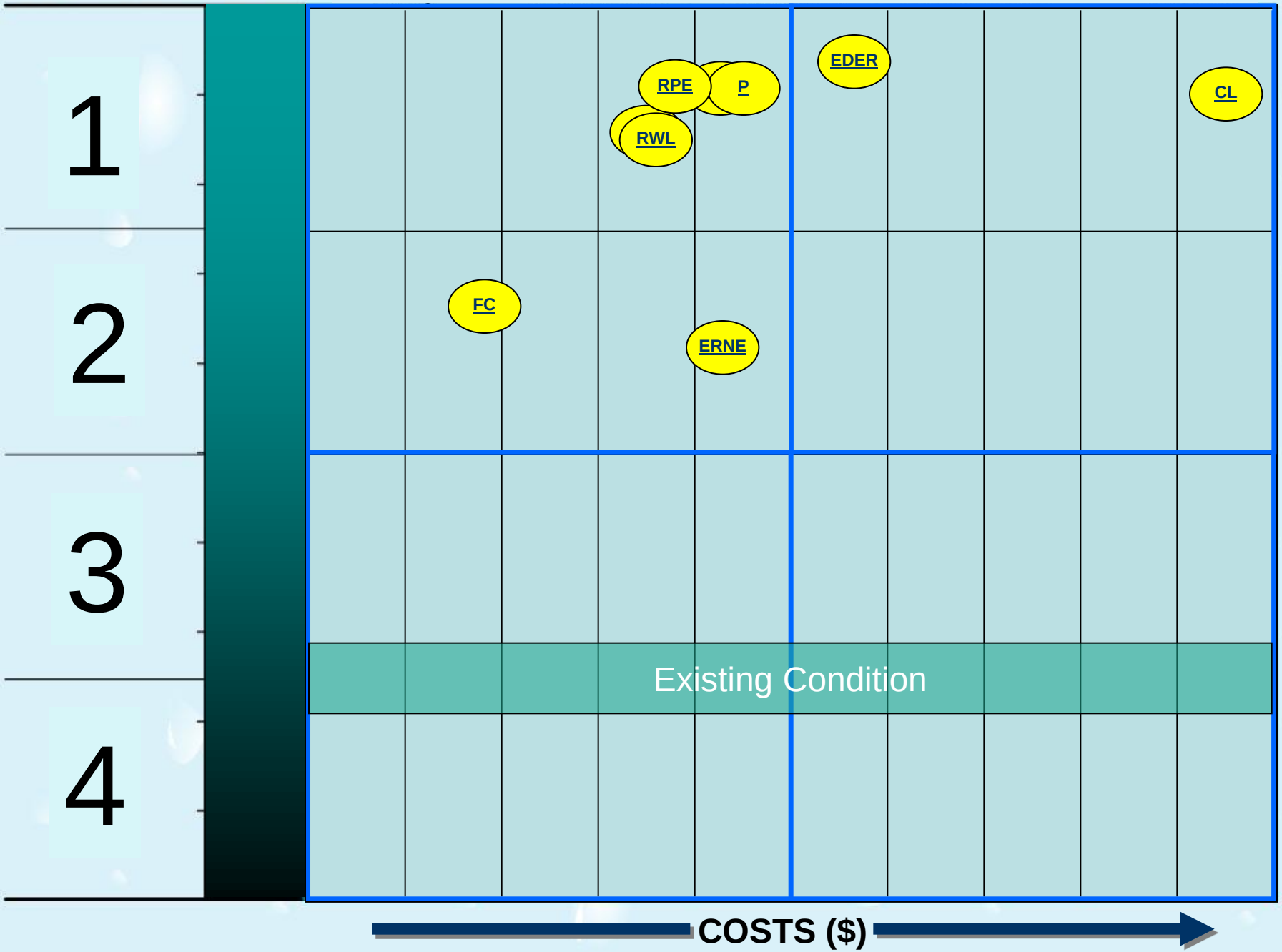
ROG Restoration Potential

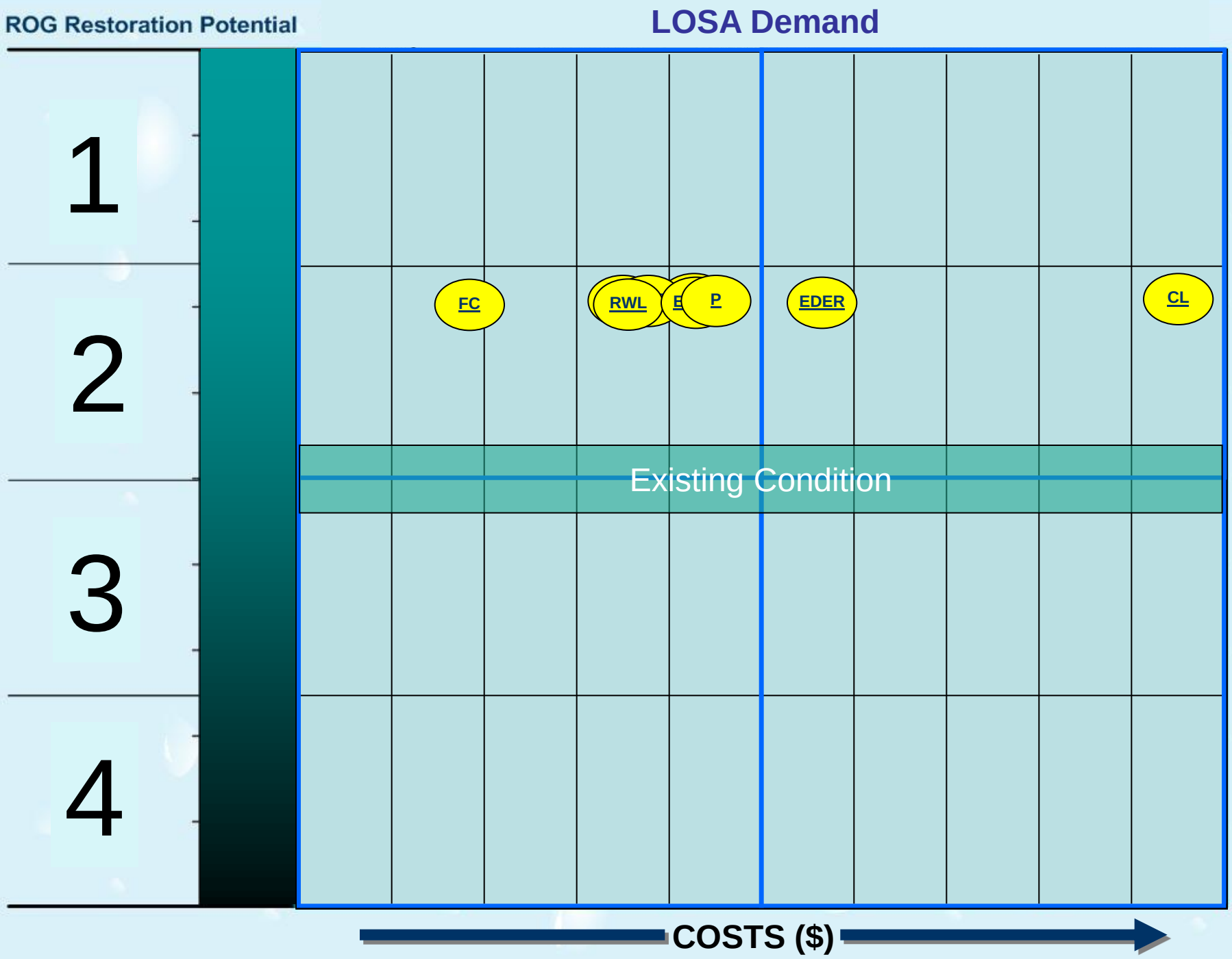
Caloosahatchee Estuary



ROG Restoration Potential

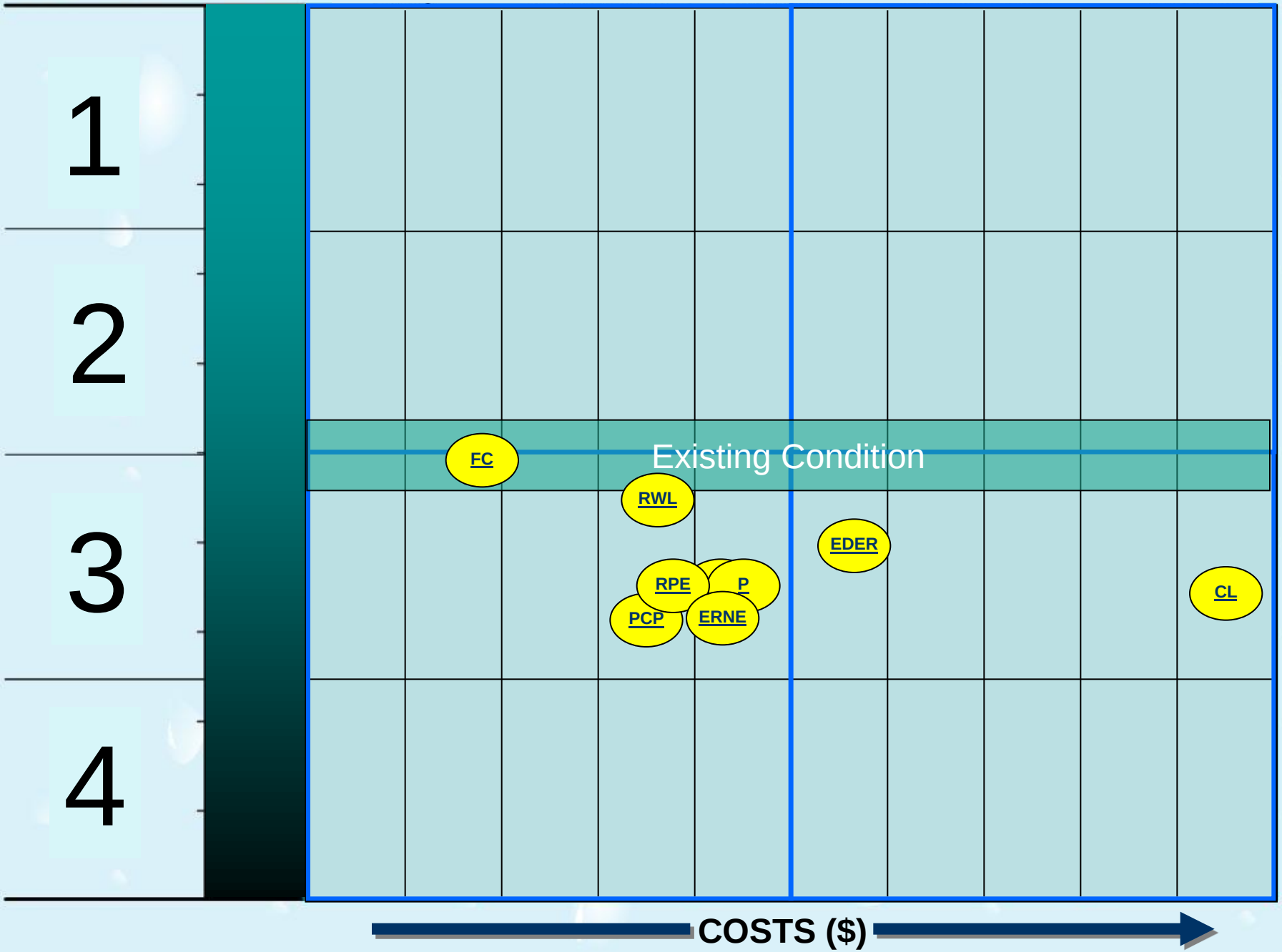
St Lucie Estuary

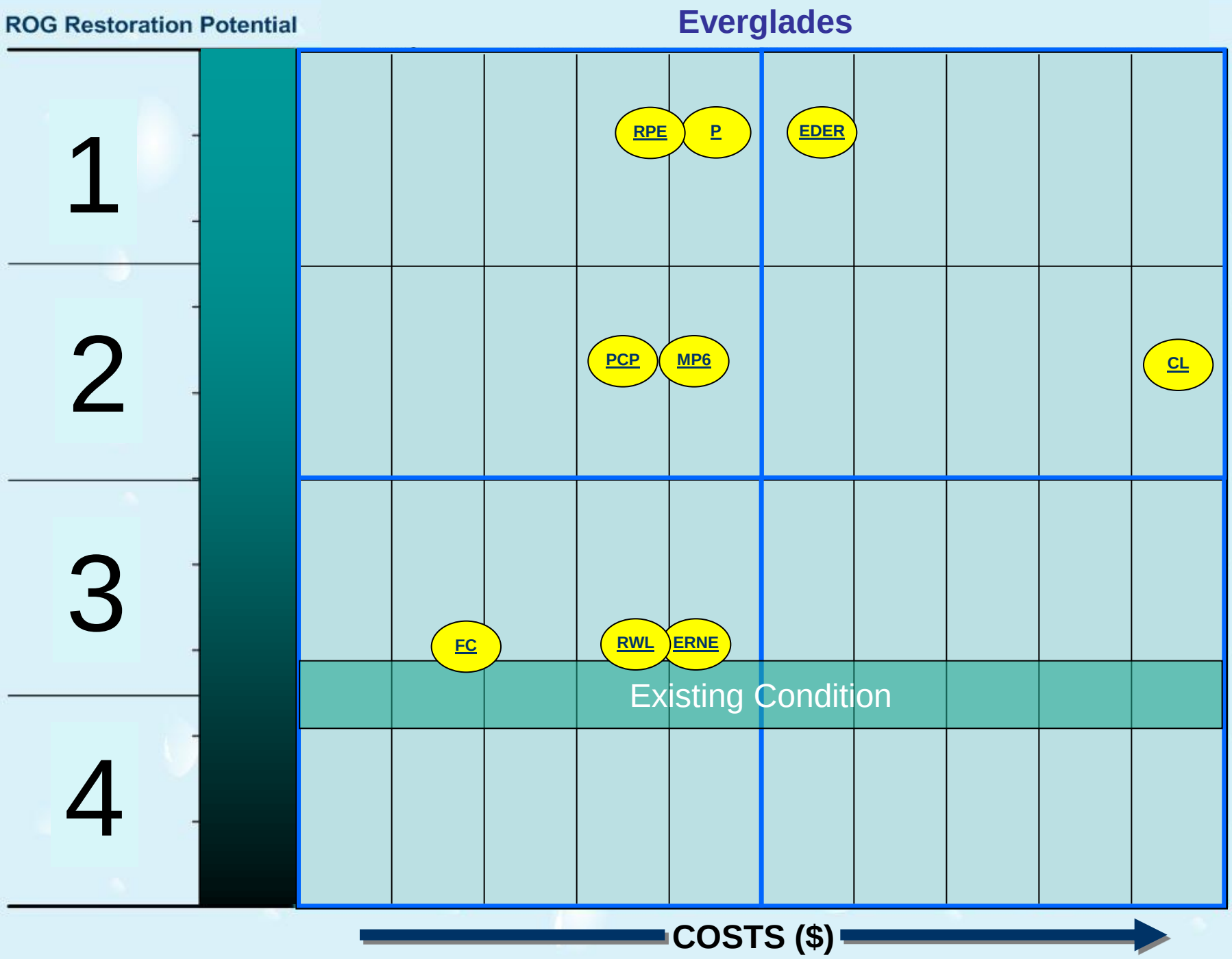



ROG Restoration Potential
LOSA Demand
1
2
3
4
FC
RWL
E
P
EDER
CL
Existing Condition
COSTS ($)

ROG Restoration Potential

Lake Okeechobee

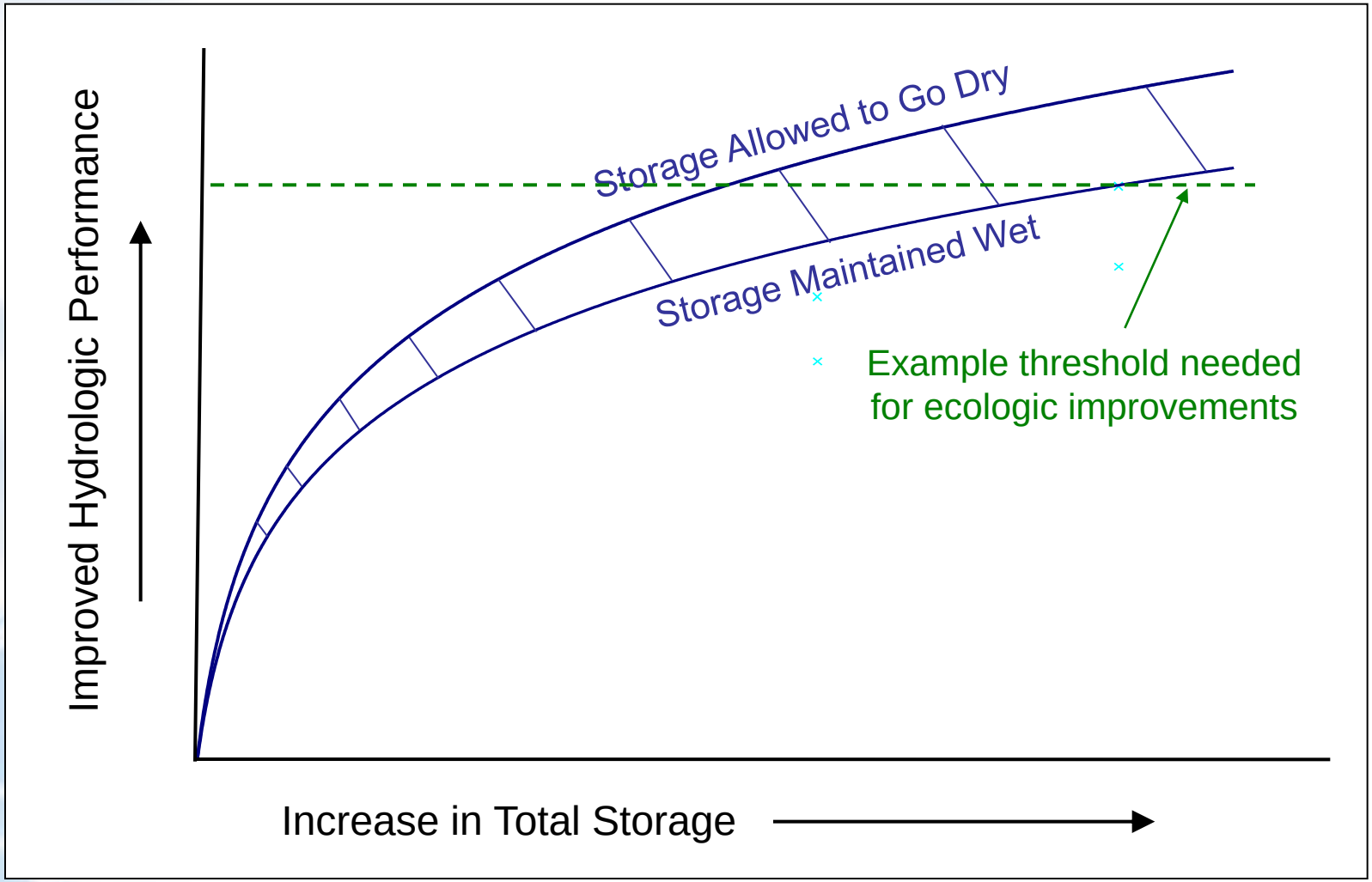



ROG Restoration Potential
Everglades
1
2
3
4
RPE
P
EDER
PCP
MP6
CL
FC
RWL
ERNE
Existing Condition
COSTS ($)

Trend Analysis of Stakeholder Configurations

- In addition to the various evaluations (benefits, cost, etc…) completed on the stakeholder configurations, additional analysis can be used to analyze trends in performance.
- This analysis can examine the configurations as a whole, or focus on individual components of the idea such as
  - Effective use of storage (North, South or total)
  - Performance of conveyance features
  - Robustness checks to examine the ability to meet differing sets of system objectives

Example Trend Analysis Graphic



Observations of Example Trend Analysis

- Allowing storage areas to go dry maximizes potential hydrologic benefit to the Lake, estuary and Everglades systems.
- Maintaining storage areas wet improves treatment potential and, in the case of shallow storage, improves hydrologic performance within the project footprint.
- There is generally a range of diminishing returns where additional increase in storage capacity does not result in large hydrologic performance improvements
- Gains in hydrologic performance beyond the point of diminishing returns may be necessary to obtain desired ecological responses

Wrap-Up/Next Meeting

Input Received at WRAC Issues Workshops and WRAC Meetings

- Positive feedback regarding the evaluation process and type of evaluation information that was presented; particularly the benefits evaluation
- Valuable ideas in the various configurations; Should be able to refine potential configurations based on combinations of the ideas identified
- Need to manage expectations
- Need to be able to manage extreme wet and dry events
- Need a better understanding of the costs and benefits of dispersed storage
- Concerns expressed by FFWCC and Audubon regarding the Reservoir within the Lake configuration
- Florida Crystals would like to use an Everglades target time series other than the Synthetic High Demand Carryover time series for operation of plan components and Lake Okeechobee

Input Received at WRAC Issues Workshops and WRAC Meetings

- Concerns that flowways may provide better benefits than this analysis indicates (increased spatial extent of wetlands, etc.)
- Concerns that the process may have an inherent bias against more natural-passive solutions
- Need to study and perhaps engage others (e.g., NAS) in studying water quality and other benefits of flowways and some of these other features for which we have limited information
- If it is critical to keep flowways/shallow storage wet in order to obtain water quality benefits, consider using ASR wells as a source of water to maintain in a wetted condition
- Would like us to also consider the following in our analysis
  - Increased spatial extent
  - Ecotourism benefits
  - Ecosystem Services Values
  - Water quality benefits of features north of the lake
  - Operations and maintenance costs- particularly pumping costs
  - Climate Change & Carbon sequestration/carbon credits

Next Meeting- Date and Location

Next WRAC Issues Workshop

June 18, 2009

SFWMD
3301 Gun Club Road
West Palm Beach, FL
10:00 a.m. – 4:00 p.m.

Phase I Planning
www.sfwmd.gov/riverofgrass

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Restoration Project Planning

On December 16, 2008, the South Florida Water Management District Governing Board voted to accept a contract with the United States Sugar Corporation to acquire more than 180,000 acres of agricultural land for Everglades restoration. This historic transaction provides water managers with the unprecedented opportunity to store and treat water on a scale never before envisioned for the benefit of America's Everglades, Lake Okeechobee and the St. Lucie and Caloosahatchee rivers and estuaries.

With full public involvement, the first phase of *River of Grass* restoration project planning is under way. Through a series of Water Resources Advisory Commission Issues Workshops, the Phase 1 planning process will determine viable configurations for constructing a managed system of water storage and treatment to support ecosystem restoration efforts.

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RELATED MATERIALS

- Public Workshops: Dates, Agendas, Presentations, Minutes
- News, Fact Sheets, Public Information
- Reservoir Sizing and Operations Screening (RESOPS) Model

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Questions

Water Quality Summary

If Wet Conditions are Maintained

Additional STA Acreage Needed for Assumed Lake Okeechobee Concentration

	40 ppb	80 ppb	100 ppb	150 ppb	200 ppb
Chain of Lakes (CL)	10,100	10,100	10,100	10,100	11,600
Estuary Driven Everglades Restoration (EDER)	0	0	0	700	2,900
Everglades ROG Northern Expansion (ERNE)	2,900	2,900	2,900	2,900	2,900
Florida Crystals (FC)	0	0	0	0	0
Marshall Plan Element 6 (MP6)	3,900	3,900	3,900	3,900	3,900
Performance (P)	0	0	0	0	0
Performance-Cost Plan (PCP)	0	0	0	800	4,400
Reservoir Within Lake Okeechobee (RWL)	0	0	0	1,600	9,400
Restoration Plus Employment (RPE)	0	2,000	3,800	7,800	11,100

Water Quality Summary

If Dry Conditions are Allowed

Additional STA Acreage Needed for Assumed Lake Okeechobee Concentration

	40 ppb	80 ppb	100 ppb	150 ppb	200 ppb
Chain of Lakes (CL)	10,700	18,000	22,600	32,000	37,200
Estuary Driven Everglades Restoration (EDER)	0	1,600	3,000	9,200	14,300
Everglades ROG Northern Expansion (ERNE)	2,900	2,900	2,900	2,900	2,900
Florida Crystals (FC)	0	0	0	0	0
Marshall Plan Element 6 (MP6)	3,900	3,900	3,900	3,900	3,900
Performance (P)	0	0	0	0	5,000
Performance-Cost Plan (PCP)	0	0	0	3,700	8,700
Reservoir Within Lake Okeechobee (RWL)	0	0	0	1,600	9,400
Restoration Plus Employment (RPE)	0	6,000	8,800	14,500	19,100