Florida Shore and Beach Preservation Association

59th Annual Conference

September 15, 2016

Naples, Florida

Using Port Everglades Inlet to Examine and Challenge the State's Efforts to Manage Florida's Inlets

Christopher G. Creed, P.E., D. CE
Olsen Associates, Inc.

Nicole S. Sharp, P.E.
Broward County, FL

Inlet Management in Florida

In 1986…

- the Florida Legislature formally recognized that while Florida's improved inlets must be maintained for commercial and recreational navigation…

- …inlets interrupt the longshore transport of sand and contribute significantly to beach erosion on adjacent shorelines.

- Legislation was passed to implement inlet improvements that would reduce beach erosion around the State.

BROWARD COUNTY FLORIDA

olsen associates, inc. Coastal Engineering

1986 Statutory Provisions

Section 161.142 – Declaration of public policy relating to improved navigation inlets

- Legislature recognizes that inlets alter the natural drift of beach-quality sand resources
- all construction and maintenance dredging of beach-quality sand should be placed on the downdrift beaches
- on an average annual basis, a quantity of sand should be placed on the downdrift beaches equal to the natural net annual longshore sediment transport

BROWARD COUNTY FLORIDA

olsen associates, inc. Coastal Engineering

1986 Statutory Provisions

Section 161.161 – Procedure for approval of projects

- the Department shall evaluate each improved, modified, or altered inlet and determine whether the inlet is a significant cause of beach erosion
- [Inlet Management Plans (IMPs) shall be adopted and] the plans shall include:
  - the extent to which the inlet causes beach erosion,
  - recommendations to mitigate the erosive impact of the inlet,
  - cost estimates necessary to take inlet corrective measures,
  - recommendations regarding cost sharing among the beneficiaries of the inlet

BROWARD COUNTY FLORIDA

olsen associates, inc. Coastal Engineering

Ref: Ralph Clark, P.E., FDEP

2008 Assessment of Inlet Management

- had been almost 8 years since an IMP had been adopted
- many of the Plans were only partially implemented, and in a number of cases very minimal inlet sand bypassing was occurring
- during the previous 8 years, only 7%, on average, of the total fixed capital outlay for statewide beach management was utilized for inlet sand bypassing / inlet management projects
  - **Evaluated with beach projects**
  - **Reduced Incentives to pursue inlet activities**

BROWARD COUNTY FLORIDA

olsen associates, inc. Coastal Engineering

2008 Assessment of Inlet Management

Legislature realized…

- …the continued loss of sand from beaches to inlets and associated continued to contribute to beach erosion, and
- …the limited success over the last two decades to fully develop and implement inlet management projects.

…concluded it was time to recommit and further emphasize Florida's beach management efforts at its inlets.

BROWARD COUNTY FLORIDA

olsen associates, inc. Coastal Engineering

2008 Inlet Management Legislation

Policy Focus…redirect and recommit the state's beach management efforts to address beach erosion caused by Florida's inlets

Recognizing…

- the need for maintaining navigation inlets,
- inlets interrupt or alter the natural drift of beach-quality sand,
- the public interest in replicating the natural flow of sand at inlets,
- the public interest for government at all levels to undertake reasonable efforts to maximize sand bypassing at inlets,
- the benefit of balanced inlet sediment budgets to shoreline erosion and beach projects.

BROWARD COUNTY FLORIDA

olsen associates, inc. Coastal Engineering

Planning…

- Studies, projects, and activities must be supported by approved IMPs.

Priorities…

- Studies, Projects, and Activities to Improve Inlets
  - Inlet sand bypassing
  - Modifications to channel dredging
  - Jetty redesign,
  - Jetty repair,
  - Beach disposal
  - IMPs

- To maximize benefits of available funding, the most beneficial actions shall be identified by ranking criteria

BROWARD COUNTY FLORIDA

olsen associates, inc. Coastal Engineering

Ranking Criteria…

- the annual quantity of sand reaching the inlet
- the severity of the erosion caused by the inlet
- the anticipated success of the proposed project in reinstating the natural flow of sand and addressing the sand deficit
- the degree to which existing bypassing activities would benefit from modest cost-effective improvements
- commitment from local government(s) to cost-share in the project and future maintenance
- previous completion and adequacy of an inlet management plan or study, and
- the degree to which the project may enhance the longevity of proximate beach nourishment project

BROWARD COUNTY FLORIDA

olsen associates, inc. Coastal Engineering

Ranking Criteria…

- the annual quantity of sand reaching the inlet
- the severity of the erosion caused by the inlet
- the anticipated success of the proposed project in reinstating the natural flow of sand and addressing the sand deficit
- the degree to which existing bypassing activities would benefit from modest cost-effective improvements
- commitment from local government(s) to cost-share in the project and future maintenance
- previous completion and adequacy of an inlet management plan or study, and
- the degree to which the project may enhance the longevity of proximate beach nourishment project

BROWARD COUNTY FLORIDA

olsen associates, inc. Coastal Engineering

Funding…

- Provide 75% of costs from legislative appropriations for inlet management activities

Annual Project List…

- Develop list of studies, projects, and activities, for 10 separate inlets
- 10 percent of the annual legislative beach management appropriation shall be made available to the three highest ranking inlets

BROWARD COUNTY FLORIDA

olsen associates, inc. Coastal Engineering

Inlet of the Year

Each year, the Legislature shall designate an Inlet of the Year from the top three projects on the priority list.

The department will subsequently notify the Legislature of the extent of intended success achieved in fast-tracking *design and project implementation* for the inlet of the year.

BROWARD COUNTY FLORIDA

olsen associates, inc. Coastal Engineering

Criteria for Evaluating Inlet Ranking
(Rule - F.A.C. 62B-36.006(2))

The biggest players…

- Sand Reaching the Inlet (10)
- Balancing the Budget (20)
- Cost-Effectiveness (10)
- Enhanced Longevity (3)
- Enhanced Project Performance (5)
- IMP (5)
- Updated IMP (5)
- New IMP (15)

BROWARD COUNTY FLORIDA

olsen associates, inc. Coastal Engineering

Ranking Results Over Past 4 Years

Rank	2014-15		2015-16		2016-17		2017-18 (draft)	
1	Port Canaveral	60.0	Port Canaveral	62.0	Port Canaveral	62.0	Lake Worth Inlet	57.0
2	Lake Worth Inlet	56.0	Lake Worth Inlet	55.0	Lake Worth Inlet	57.0	Port Canaveral	56.1
3	St. Lucie Inlet	51.2	Longboat Pass	54.8	St. Lucie Inlet	53.6	St. Lucie Inlet	55.8
4	East Pass	48.9	St. Lucie Inlet	53.6	Port Everglades	50.3	Port Everglades	50.0
5	St. Andrews Inlet	45.5	Ft. Pierce Inlet	45.39	Ponce de Leon Inlet	46.1	Ponce de Leon Inlet	47.0
6	S. Lake Worth Inlet	45.2	S. Lake Worth Inlet	45.38	S. Lake Worth Inlet	45.38	S. Lake Worth Inlet	45.6
7	Sebastian Inlet	42.9	Port Everglades Entrance	43.5	Blind Pass (Lee)	40.9	Pass-a-Grille	39.7
8	Longboat Pass	41.2	Boca Raton Inlet	39.4	Pass-a-Grille	39.3	Boca Raton Inlet	38.4
9	Boca Raton Inlet	31.4	Sebastian Inlet	38.4	Boca Raton Inlet	37.8	Bakers Haulover	36.4
10	Venice Inlet	26.1	Venice Inlet	30.1	Longboat Pass	36.6	Longboat Pass	35.0

BROWARD COUNTY FLORIDA

olsen associates, inc. Coastal Engineering

Projects in Top 3 for Past 4 Years

Rank	2014-15		2015-16		2016-17		2017-18 (draft)	
1	Port Canaveral	60.0	Port Canaveral	62.0	Port Canaveral	62.0	Lake Worth Inlet	57.0
2	Lake Worth Inlet	56.0	Lake Worth Inlet	55.0	Lake Worth Inlet	57.0	Port Canaveral	56.1
3	St. Lucie Inlet	51.2	Longboat Pass	54.8	St. Lucie Inlet	53.6	St. Lucie Inlet	55.8
4	East Pass	48.9	St. Lucie Inlet	53.6	Port Everglades	50.3	Port Everglades	50.0
5	St. Andrews Inlet	45.5	Ft. Pierce Inlet	45.39	Ponce de Leon Inlet	46.1	Ponce de Leon Inlet	47.0
6	S. Lake Worth Inlet	45.2	S. Lake Worth Inlet	45.38	S. Lake Worth Inlet	45.38	S. Lake Worth Inlet	45.6
7	Sebastian Inlet	42.9	Port Everglades	43.5	Blind Pass (Lee)	40.9	Pass-a-Grille	38.4
8	Longboat Pass	41.2	Boca Raton Inlet	39.4	Pass-a-Grille	39.3	Boca Raton Inlet	35.0
9	Boca Raton Inlet	31.4	Sebastian Inlet	38.4	Boca Raton Inlet	37.8	Bakers Haulover	33.3
10	Venice Inlet	26.1	Venice Inlet	30.1	Longboat Pass	36.6	Longboat Pass	31.1

BROWARD COUNTY FLORIDA

olsen associates, inc. Coastal Engineering

Project Activity

Rank	2014-15		2015-16		2016-17		2017-18 (draft)	
1	**Port Canaveral**	Feasibility Study/Design	**Port Canaveral**	Design/ Construction	**Port Canaveral**	Design/ Construction/ Monitoring	**Lake Worth Inlet**	Monitoring
2	**Lake Worth Inlet**	Monitoring	**Lake Worth Inlet**	Monitoring	**Lake Worth Inlet**	Monitoring	**Port Canaveral**	Monitoring
3	**St. Lucie Inlet**	Construction/ Monitoring	**Longboat Pass**	Design/ Construction	**St. Lucie Inlet**	Construction/ Monitoring	**St. Lucie Inlet**	Construction/ Monitoring
4	**East Pass**	Construction	**St. Lucie Inlet**	Construction	**Port Everglades**	Design/ Construction	**Port Everglades**	Construction
5	**St. Andrews Inlet**	Design/ Construction	**Ft. Pierce Inlet**	Design	**Ponce de Leon Inlet**	Feasibility Study	**Ponce de Leon Inlet**	Feasibility Study
6	**S. Lake Worth Inlet**	Construction/ Monitoring	**S. Lake Worth Inlet**	Monitoring	**S. Lake Worth Inlet**	Monitoring	**S. Lake Worth Inlet**	Monitoring
7	**Sebastian Inlet**	Monitoring	**Port Everglades**	Construction	**Blind Pass (Lee)**	Feasibility Study	**Pass-a-Grille**	Feasibility Study
8	**Longboat Pass**	Design/ Construction	**Boca Raton Inlet**	Construction/ Monitoring	**Pass-a-Grille**	Feasibility Study	**Boca Raton Inlet**	Construction/ Monitoring
9	**Boca Raton Inlet**	Design/ Construction	**Sebastian Inlet**	Monitoring	**Boca Raton Inlet**	Construction/ Monitoring	**Bakers Haulover**	Feasibility Study
10	**Venice Inlet**	Construction	**Venice Inlet**	Construction	**Longboat Pass**	Feasibility Study/ Monitoring	**Longboat Pass**	Feasibility Study/ Monitoring

BROWARD COUNTY FLORIDA

olsen associates, inc. Coastal Engineering

Over Past 4 years…

- Only four inlet projects have ranked in the top three.
- Three of the same projects have ranked in the top three at least three out of the four years.
- There is consistently a top three project requesting funding for monitoring only.
- There are many projects seeking construction for inlet improvements and/or New IMPs have not (or cannot rank) in the top three.

BROWARD COUNTY FLORIDA

olsen associates, inc. Coastal Engineering

Criteria for Evaluating Inlet Ranking

Rewards

Sand Reaching the Inlet (10)
Balancing the Budget (existing condition) (20)
Total (30)

Incentives

Cost-Effectiveness (10)
Enhanced Longevity (3)
Enhanced Project Performance (5)
Total (18)

- Net advantage is for existing projects in areas of the State with high sand transport rates

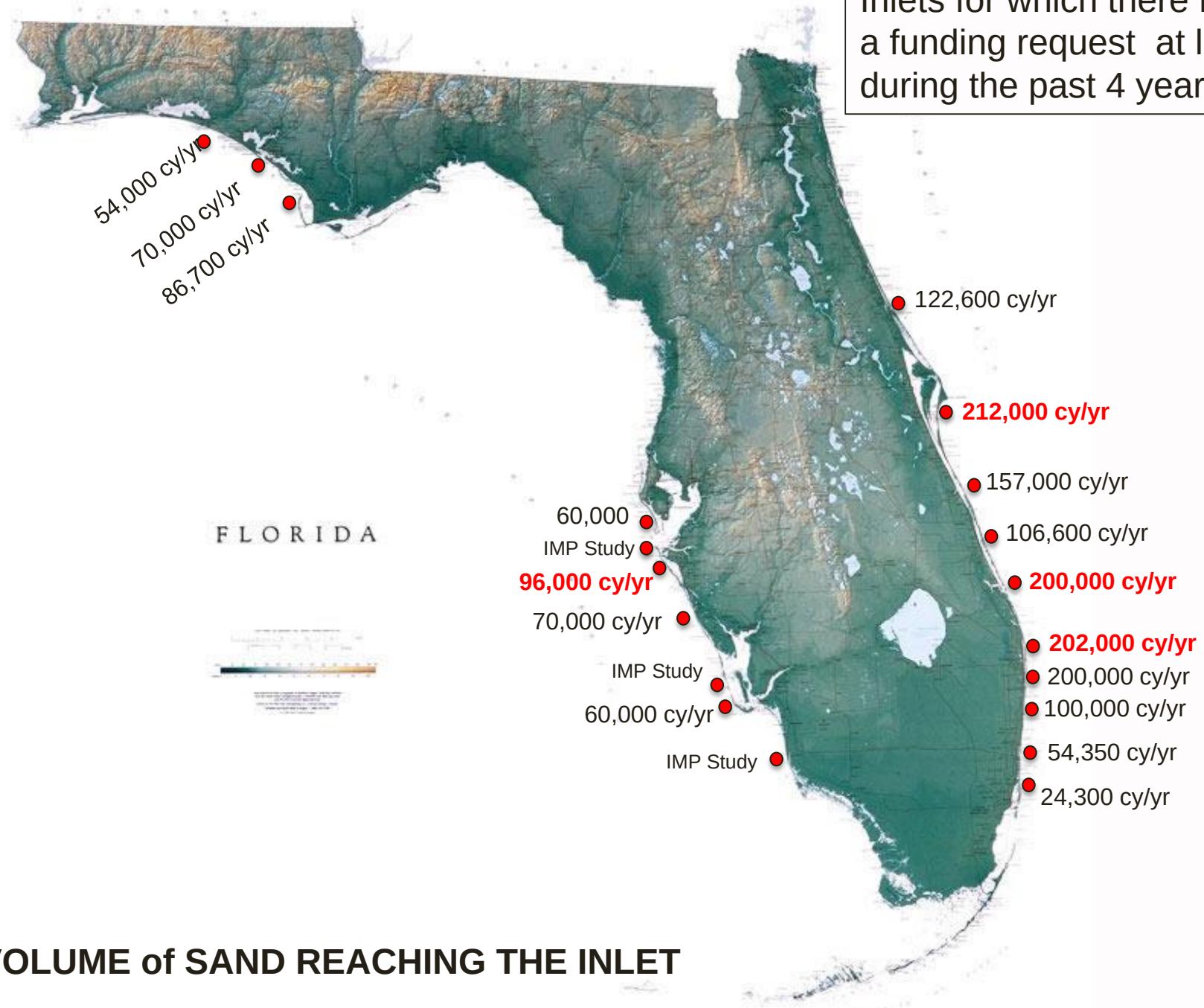
BROWARD COUNTY FLORIDA

olsen associates, inc. Coastal Engineering

Inlets for which there has been a funding request at least once during the past 4 years.

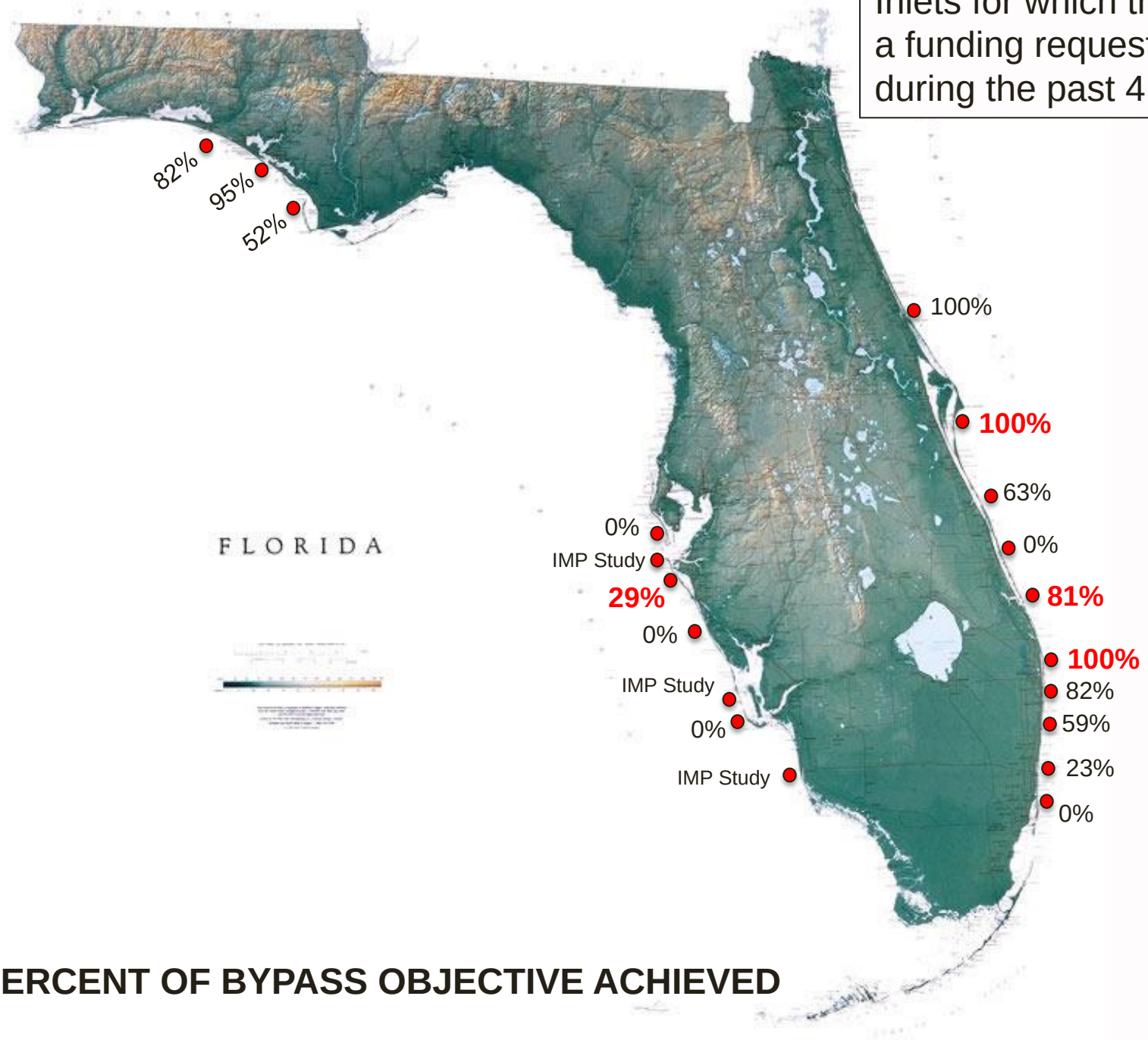
Inlets for which there has been a funding request at least once during the past 4 years.

Inlets for which there has been a funding request at least once during the past 4 years.



VOLUME of SAND REACHING THE INLET

Inlets for which there has been a funding request at least once during the past 4 years.



PERCENT OF BYPASS OBJECTIVE ACHIEVED

Criteria for Evaluating Inlet Ranking

Rewards

IMP (5)

Updated IMP (5)

Total (10)

Incentives

New IMP (15)

Total (15)

- Net advantage is to “new studies”, but only by 5 points
- If new studies are for inlets with low transport rates and no existing infrastructure…no opportunity to score high enough to qualify for funding assistance

BROWARD COUNTY FLORIDA

olsen associates, inc. Coastal Engineering

Issues…

- List of highest ranking inlets has become more or less stagnant, year to year…
  - Transport rate to the inlet and existing inlet efficiency are heavily weighted ranking criteria
  - Many inlets are submitting requests each year regardless of activity
  - In most cases, inlets that rank lower require infrastructure improvements to improve efficiency to improve scoring
- There are many inlet projects with significant long-term benefits that have low chance of qualifying for funding assistance using current ranking approach

BROWARD COUNTY FLORIDA

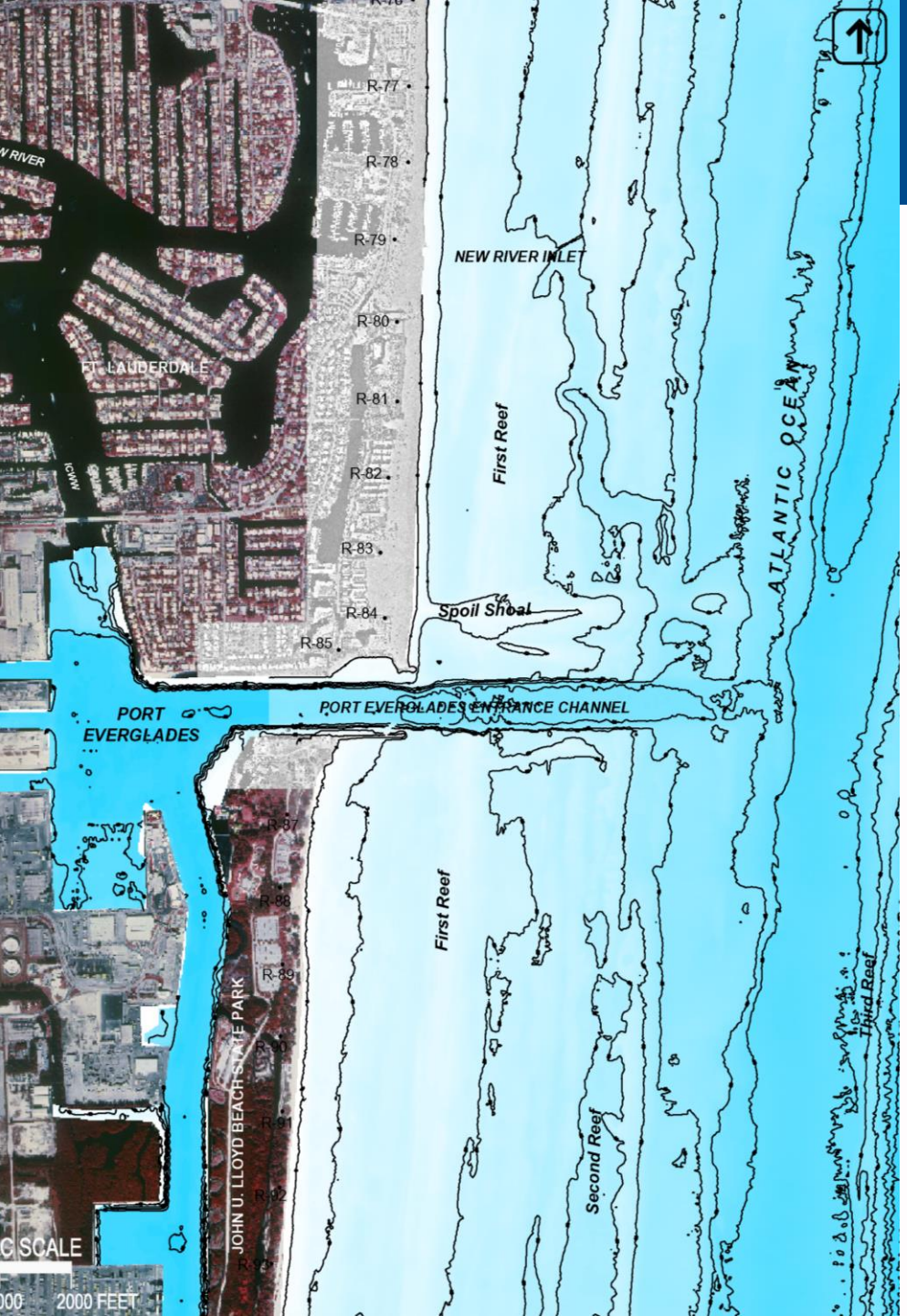
olsen associates, inc. Coastal Engineering

Issues…

- Relatively low consideration for IMP development
- No consideration for benefit of activity
  - construction vs. monitoring
- Funds that ultimately reach the inlet projects continue to be very limited

BROWARD COUNTY FLORIDA

olsen associates, inc. Coastal Engineering

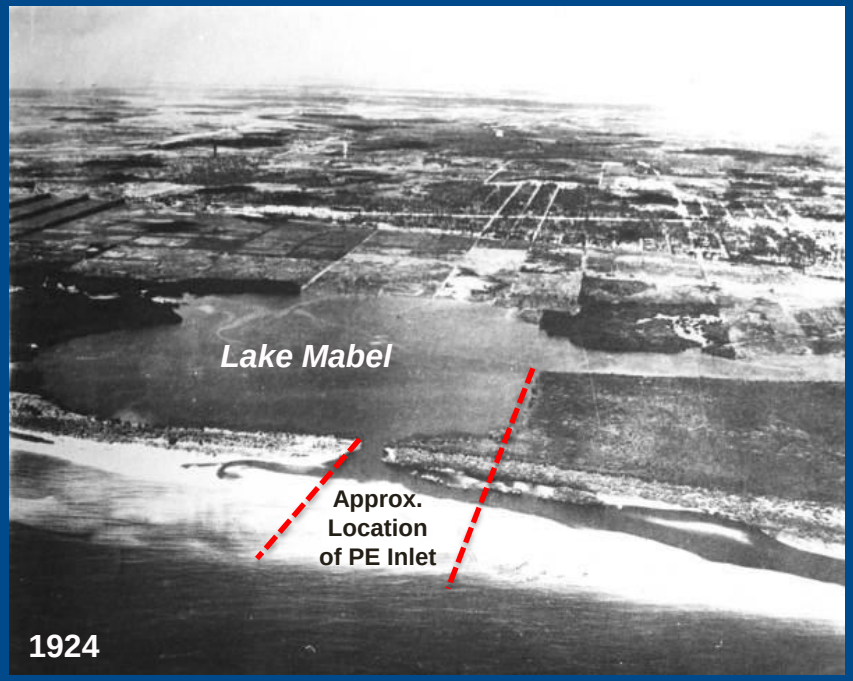


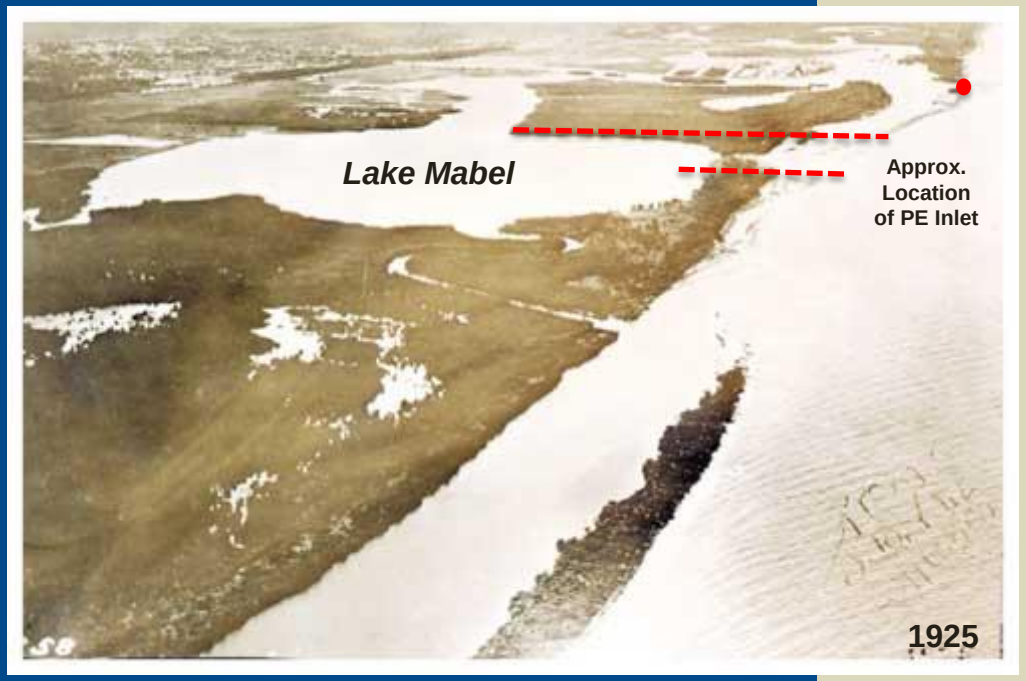
PORT EVERGLADES INLET

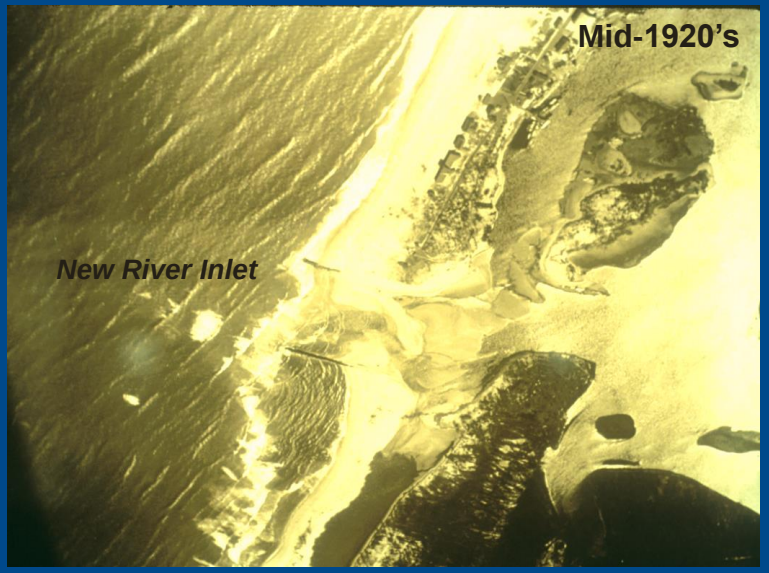
- Inlet established in 1926-28
- Federal Navigation Project 1930
- Major Expansions in 1962 and 1980
- No Natural or Artificial Sand Bypassing
- ***Complete*** Barrier to Littoral Drift
- Highly Accretional North Shoreline
- Consistent Channel Shoaling
- Chronically Erosion South Shoreline
- No known future local sand sources for Segment III

BROWARD COUNTY FLORIDA

olsen associates, inc. Coastal Engineering







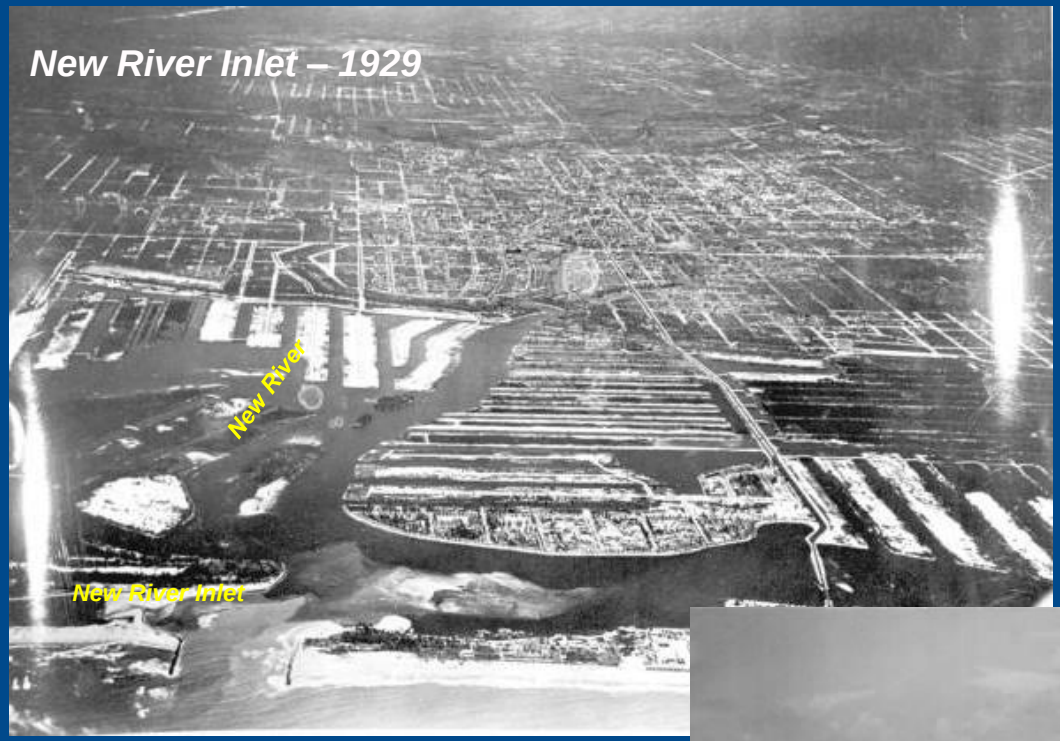
BROWARD COUNTY FLORIDA

olsen associates, inc.
Coastal Engineering

Port Everglades Dredging – Circa 1928

BROWARD COUNTY FLORIDA

olsen associates, inc. Coastal Engineering



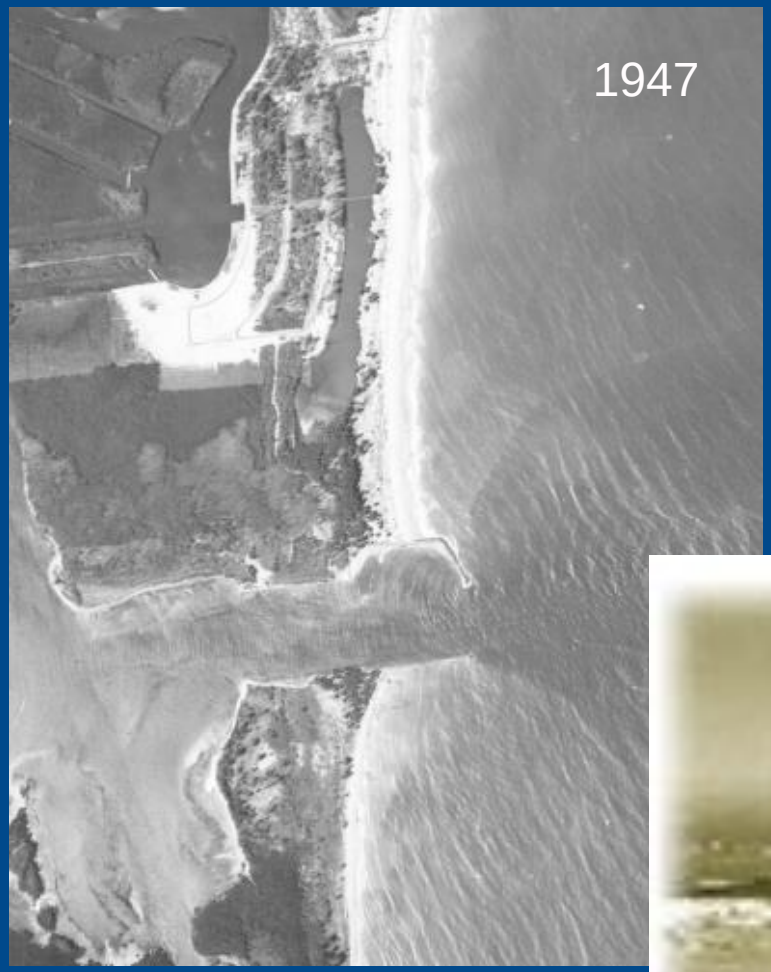
First impacts at New River Inlet

BROWARD COUNTY FLORIDA

olsen associates, inc. Coastal Engineering

BROWARD COUNTY FLORIDA

olsen associates, inc.
Coastal Engineering



Circa 1950s

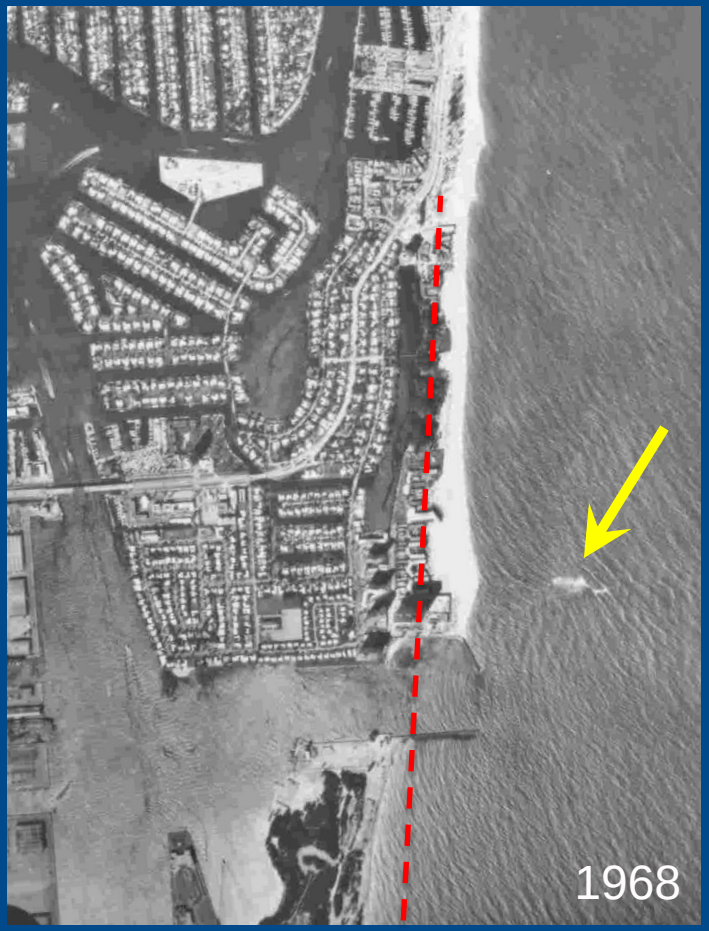
BROWARD COUNTY FLORIDA

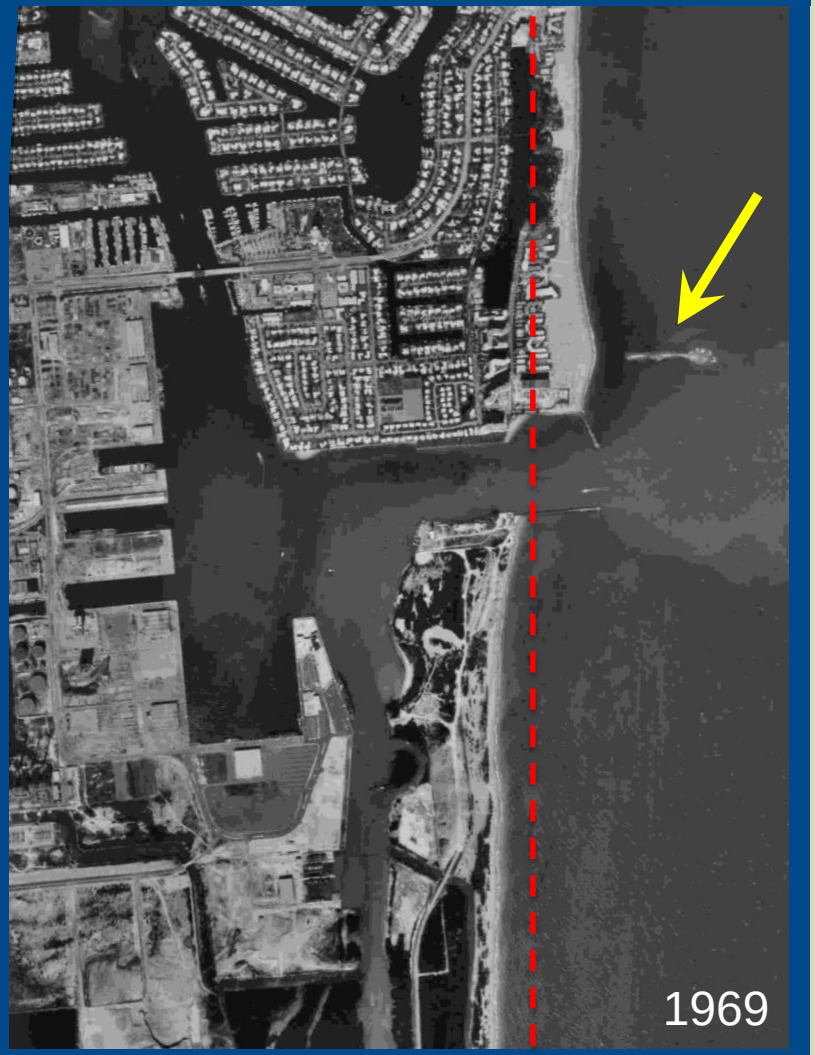
olsen associates, inc. Coastal Engineering

Circa 1960s

BROWARD COUNTY FLORIDA

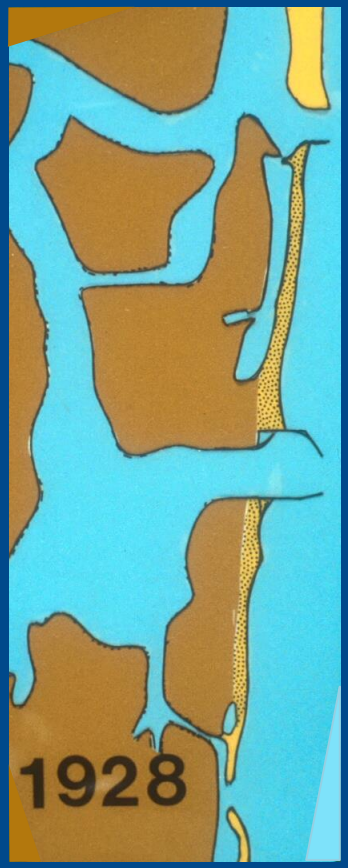
olsen associates, inc. Coastal Engineering





BROWARD COUNTY FLORIDA

olsen associates, inc.
Coastal Engineering



New River Inlet

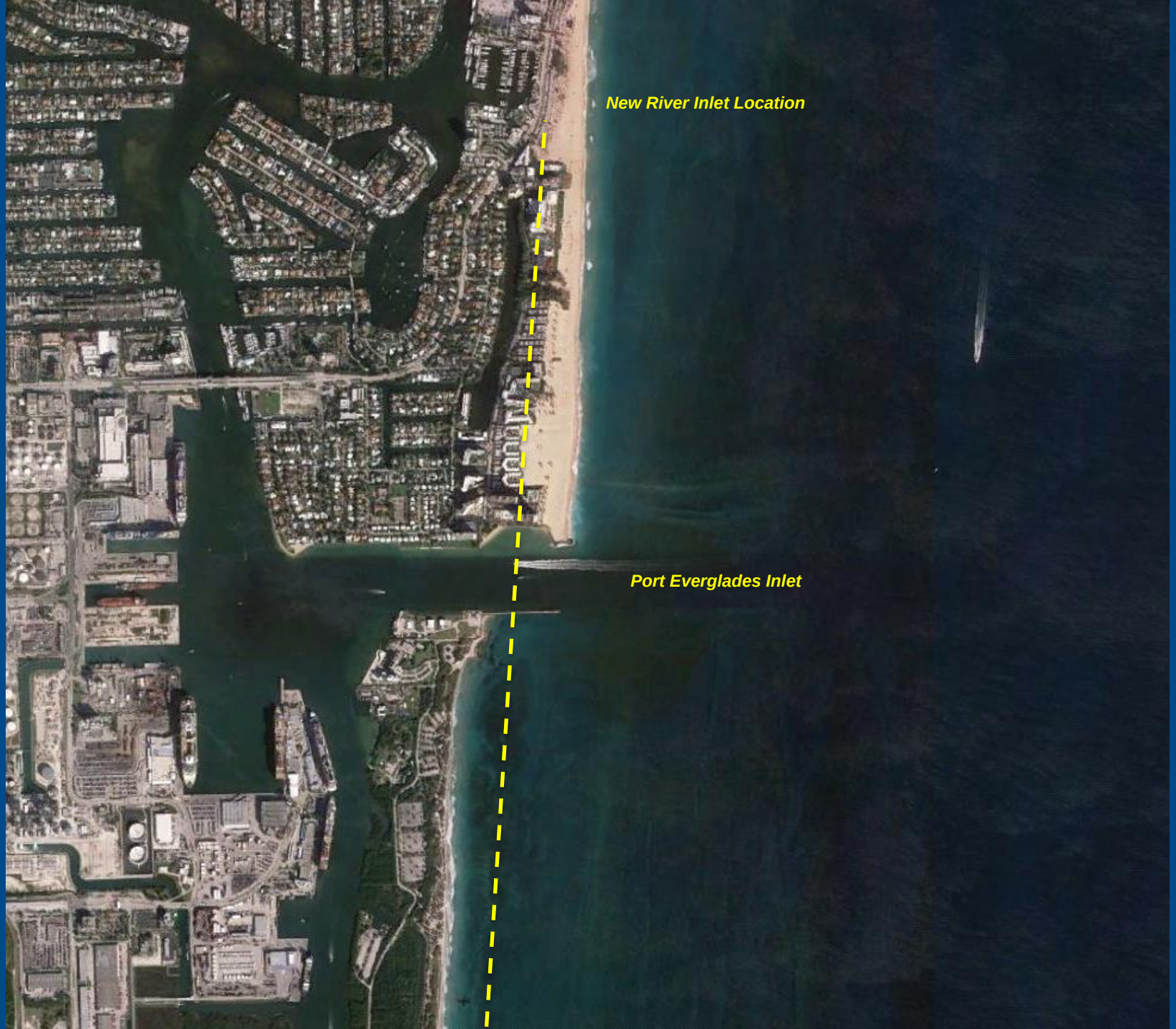
PE Inlet

New River Inlet

PE Inlet

olsen associates, inc. Coastal Engineering

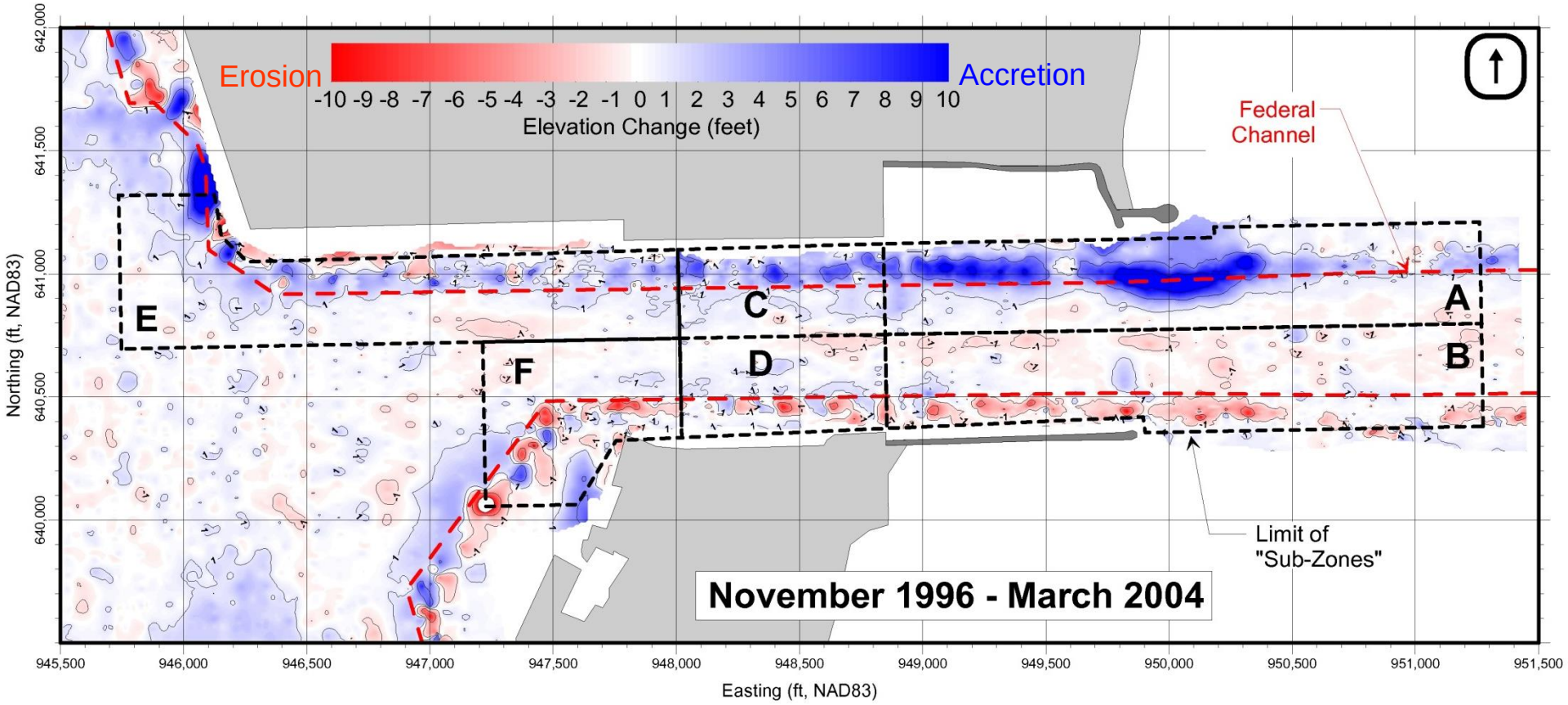
BROWARD COUNTY FLORIDA



BROWARD COUNTY FLORIDA

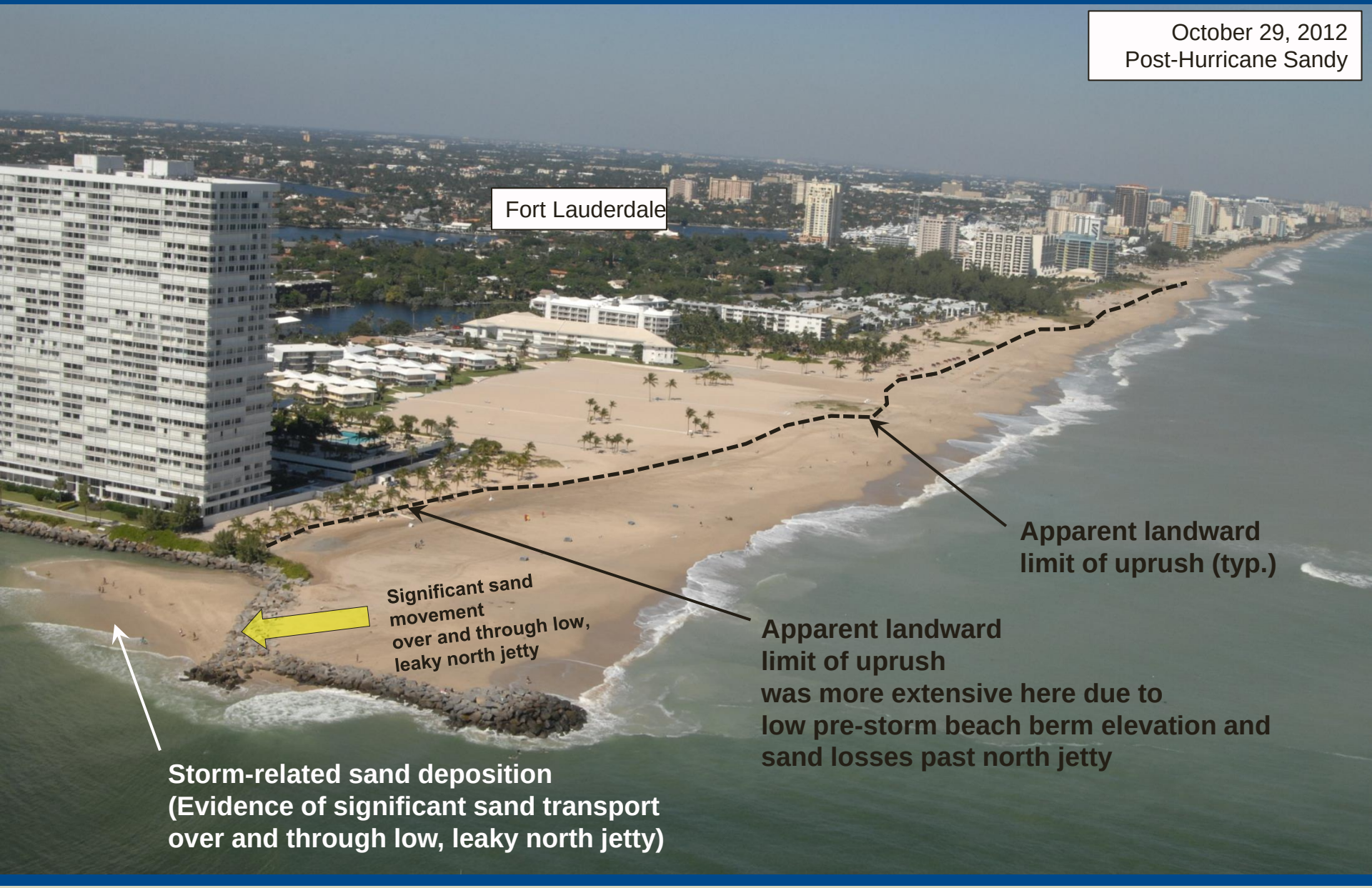
olsen associates, inc.
Coastal Engineering

CURRENT ISSUES: DOWNDRIFT EROSION



CURRENT ISSUES: INLET SHOALING

(Sand Transport Over, Through, and Around North Jetty)



CURRENT ISSUES: STORM EVENTS

PREVIOUS EFFORTS TO ADDRESS DOWNDRIFT EROSION

Year	Project	Location	Sand Quantity (cy)	Project Length (miles)	Sponsor	Total Cost ($M)	Federal Share ($M)	State Share ($M)	County Share ($M)	City Share ($M)
1971	Hallandale	R124-R128	360,000	0.8	Broward	$ 0.78	$ -	$ 0.59	$ 0.15	$ 0.04
1976/77	John U. Lloyd Beach SP	South Jetty to R93	1,090,000	1.5	Broward	$ 2.96	$ 1.97	$ 0.84	$ 0.15	---
1979	Hollywood/Hallandale	R101-R128	2,000,000	5.2	Broward	$ 7.83	$ 3.33	$ 2.82	$ 0.88	$ 0.80
1989	John U. Lloyd Beach SP	South Jetty to R93	604,000	1.6	Broward	$ 5.68	$ 3.97	$ 1.71	---	---
1991	Hollywood/Hallandale	R101-R128	1,100,000	5.2	Broward	$ 9.47	$ 4.17	$ 3.88	$ 1.07	$ 0.35
2001	Hollywood (Diplomat)	R121-R123	25,000	0.5	Hollywood	$ 1.00	$ -	$ -	$ -	$ 1.00
2005/06	Hollywood/Hallandale	R99-R128	1,300,000	6.8	Broward	$ 44.50	$ 26.00	$ 10.10	$ 6.30	$ 2.10
	John U. Lloyd Beach SP*	South Jetty to R92	550,000							
2012	Southern Hollywood	R119 - R124	80,000	0.75	Hollywood	$ 3.50	$ -	$ -	$ -	$ 3.50
2013	John U. Lloyd (Beach Disposal)*	R87-R90	116,000	0.75	Broward	$ 2.50	$ 1.50	$ -	$ 1.00	$ -
Total			**7,225,000**			**$ 78.22**	**$ 40.94**	**$ 19.94**	**$ 9.55**	**$ 7.79**

* 40,000 cy (2005/06) and 116,000 cy (2013) of sand were dredged from the inlet channel and placed on the JUL Beach SP shoreline.

98% of the sand came from remote sources (offshore and upland)

BROWARD COUNTY FLORIDA

olsen associates, inc. Coastal Engineering

- Shoreline immediately downdrift of Port Everglades is most erosional of all those along Broward County

- Annual sand demand…
  - 40-50k cy/yr (Park)
  - 130k cy/yr (Segment III)

- Economically accessible offshore sand resources are essentially depleted

- Known future sand resources include sand bypass at Port Everglades and upland only

1963: USACE Countywide Beach Erosion Study

1985: Alternative Sand Source Study

1988: Reconnaissance-Level Sand Bypass Study

1994: State-sponsored Inlet Management Plan (IMP)

1997: Economic Update to Inlet Management Plan

1999: State adopts Inlet Management Plan

2004: Detailed Sand Bypassing Feasibility Study

2007: Feasibility Study Addendum (Design Revision/Evaluation)

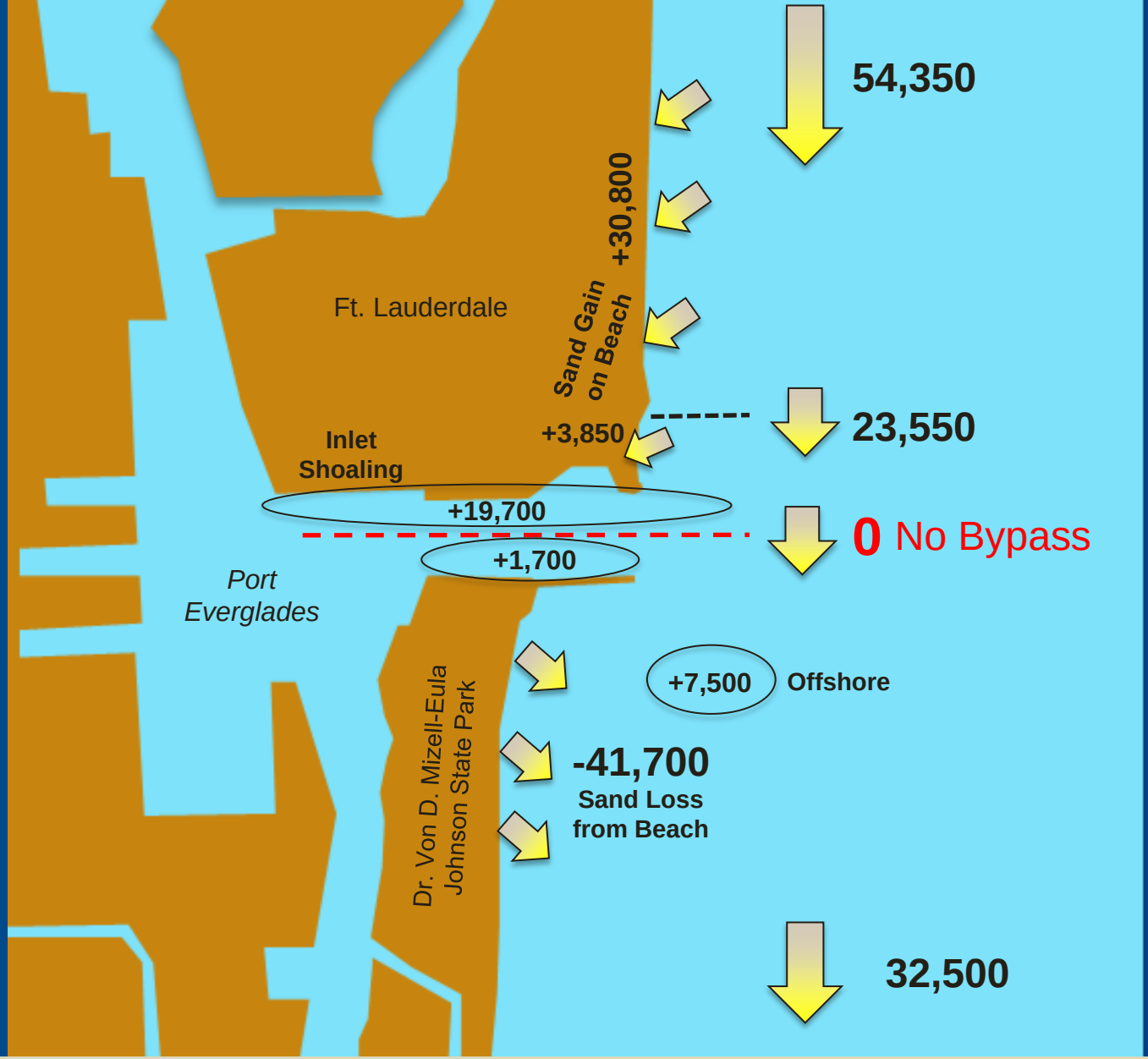
2008-12: Initial Permit Application/State and Federal Coordination
(Const. approach that included blasting met significant local opposition)

2013-16: Redesign, Permitting and Detailed design and Section 408 Coordination

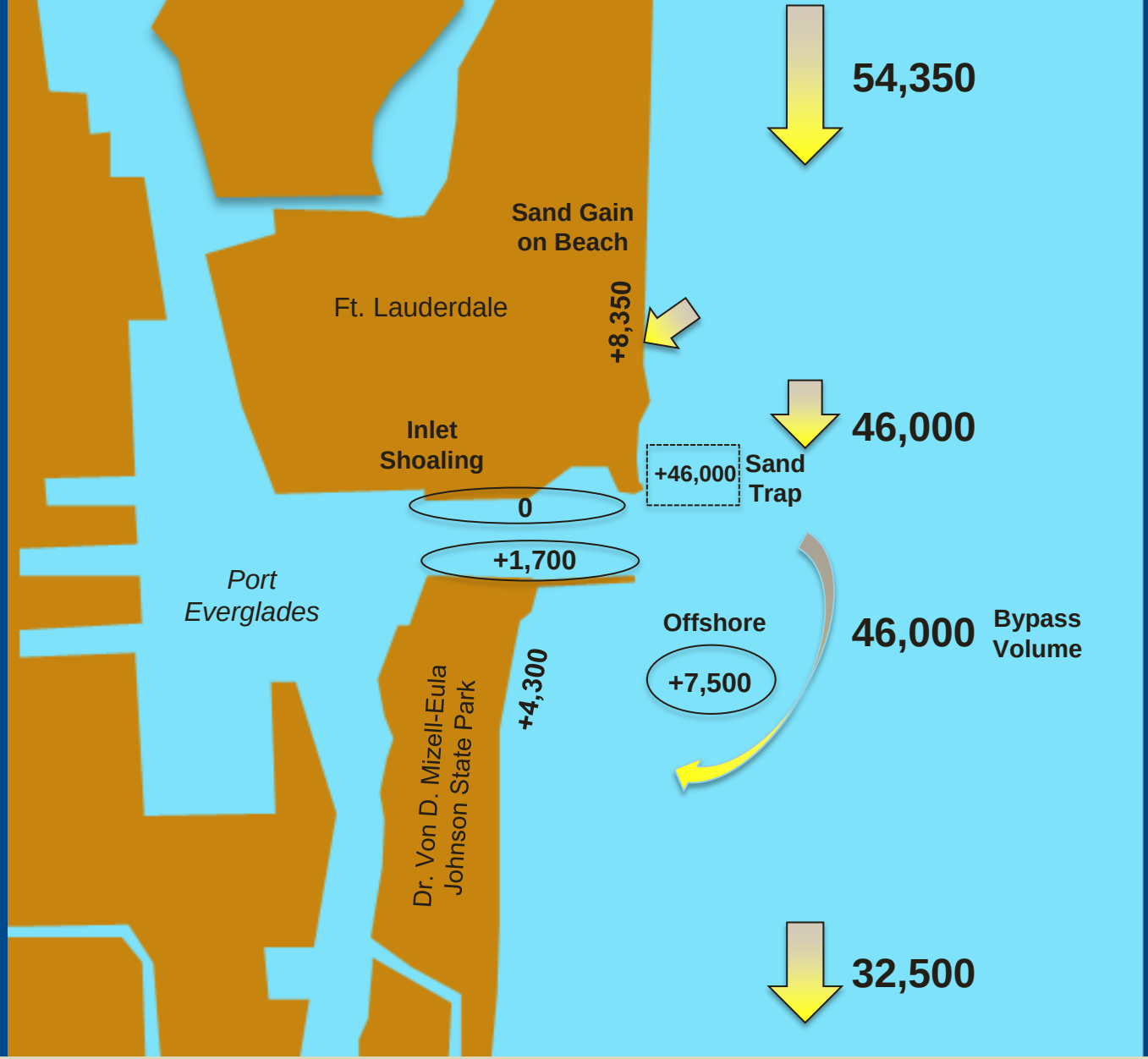
2017: Construction (planned)

2020: First sand bypass event (planned)

PE SAND BYPASS TIMELINE

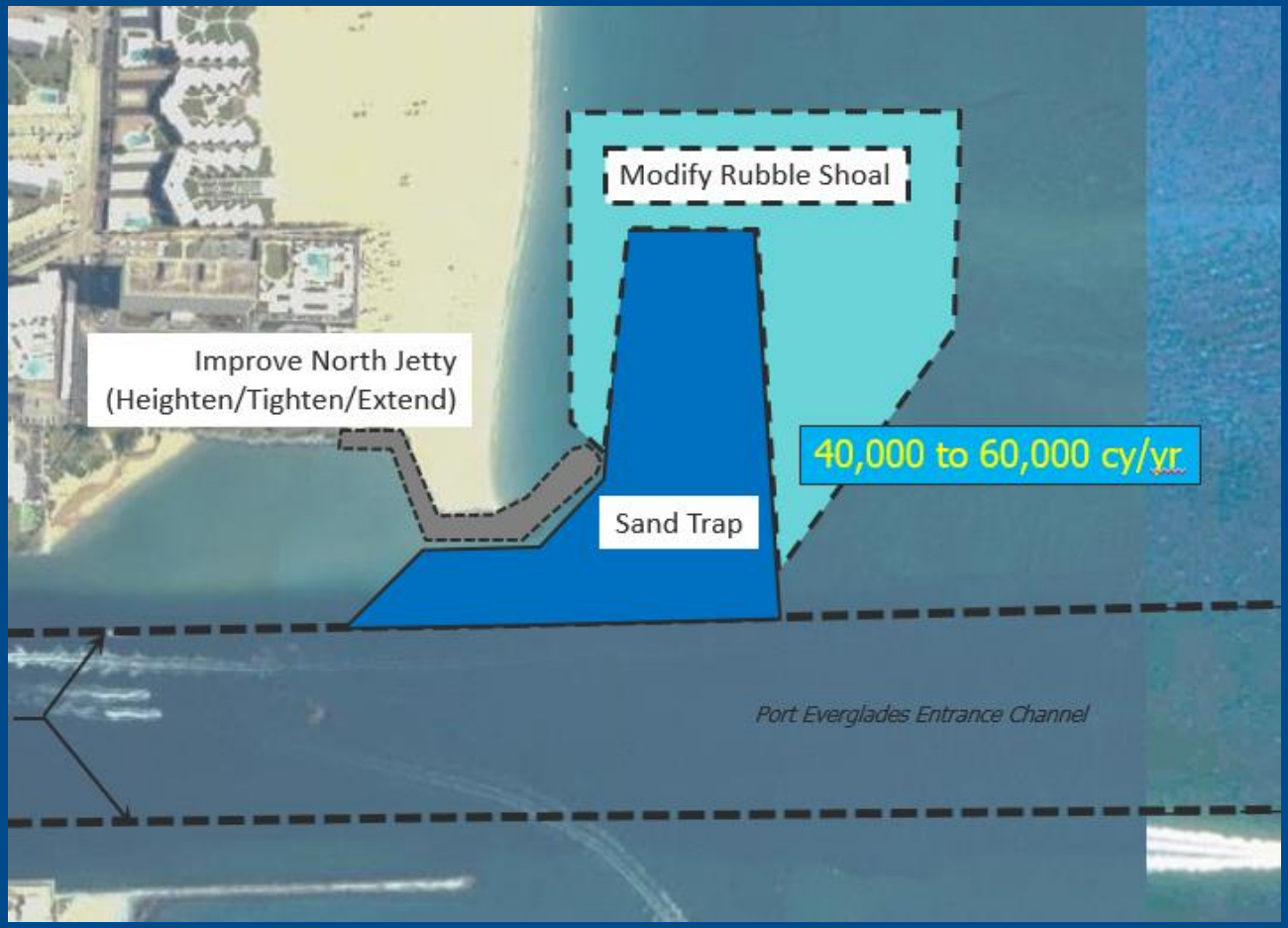


EXISTING SEDIMENT BUDGET

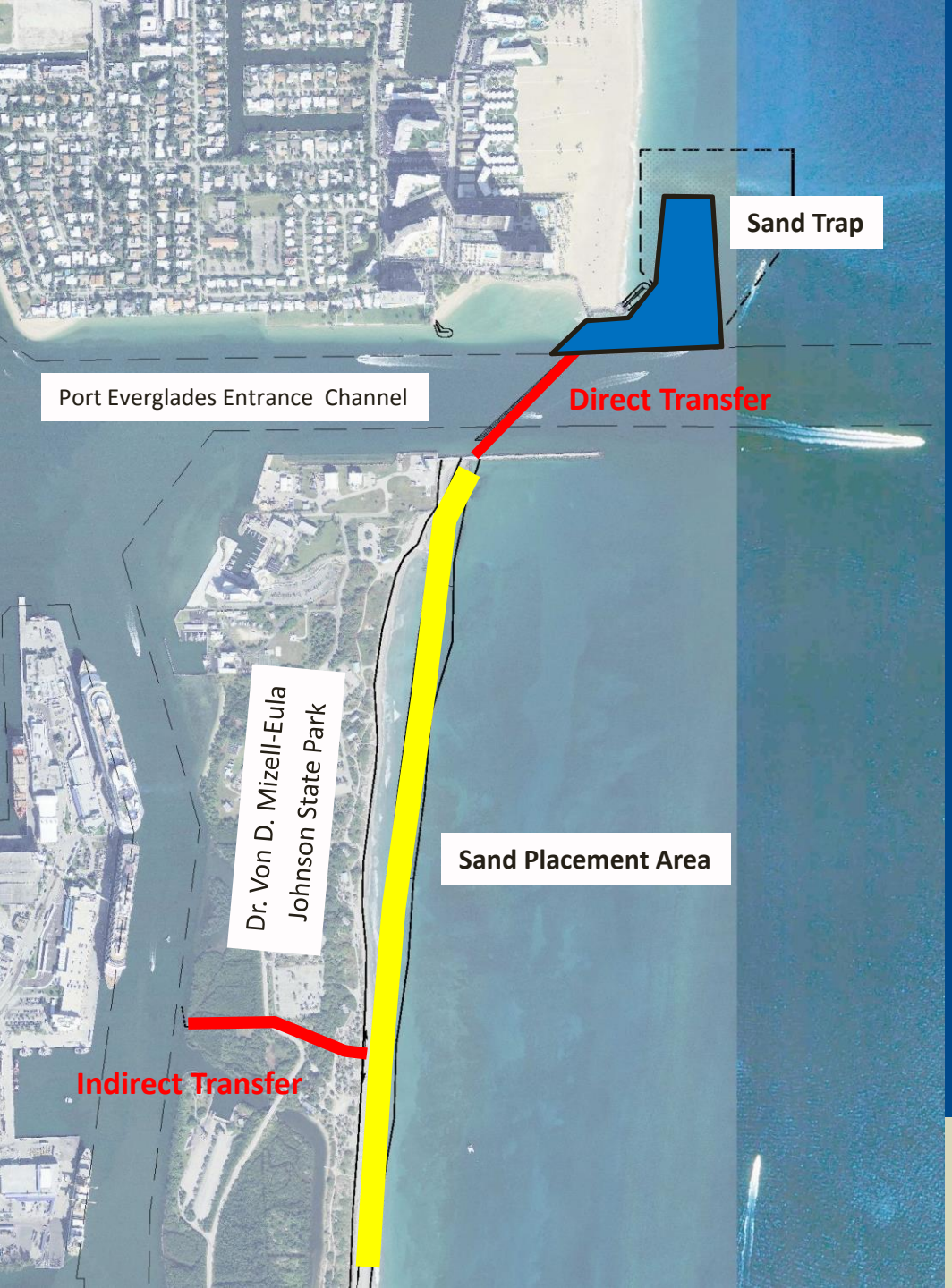


PROPOSED SEDIMENT BUDGET

INITIAL PROJECT PLAN OVERVIEW



Construct sand trap and other ancillary improvements on north side of inlet



PROJECT PLAN OVERVIEW

AFTER CONSTRUCTION

- Sand trap will collect sand between maintenance events

FUTURE MAINTENANCE

- Remove sand from sand trap and transfer to JUL Beach SP Shoreline every 2 to 4 years

BROWARD COUNTY FLORIDA

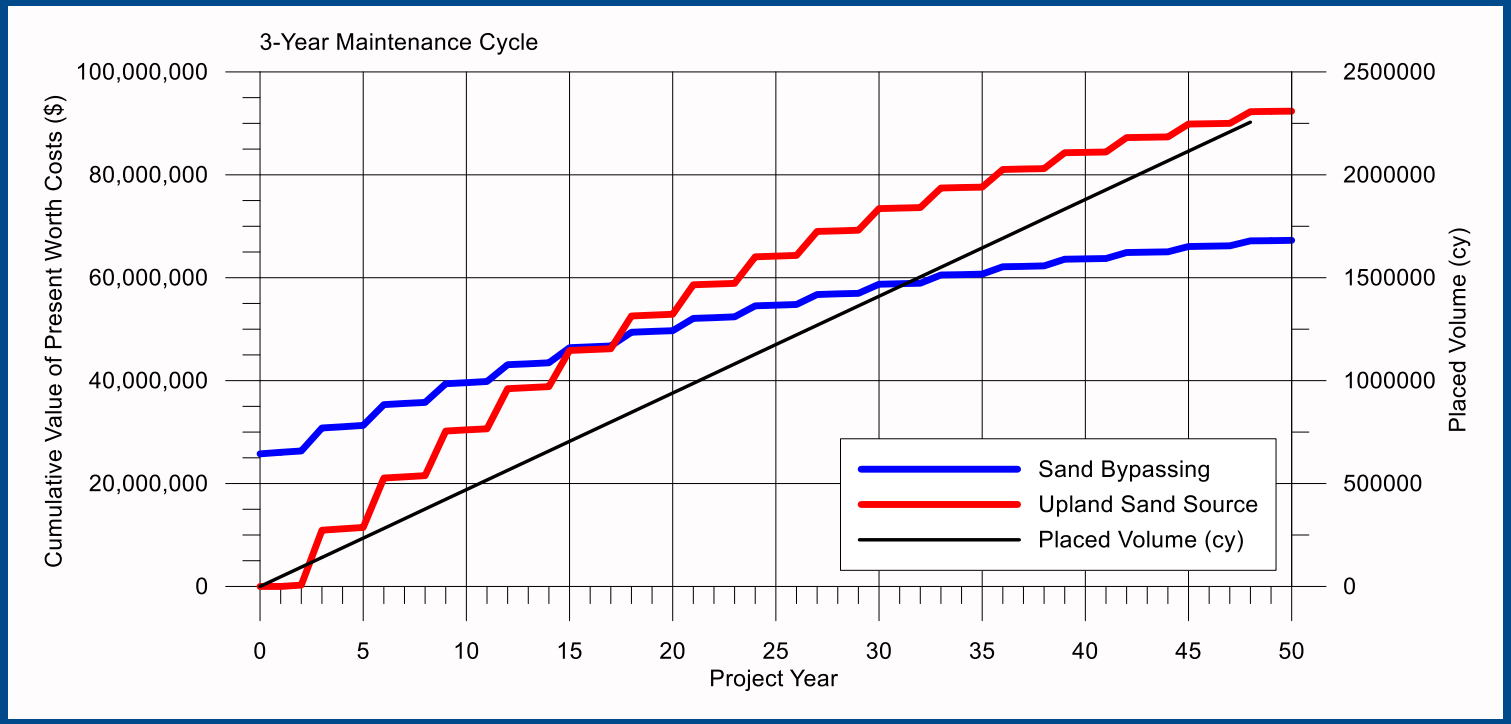
olsen associates, inc. Coastal Engineering


Sand Trap
Port Everglades Entrance Channel
Port Everglades
Dr. Von D. Mizell-Eula Johnson State Park
Mangroves
Cross Island Pipeline
Mangroves
Dredge Mooring and Pumpout in Port Everglades

- Aims to restore littoral drift to southern Broward County shoreline
- Reduce the need for nourishment along the Segment III shoreline (Port Everglades to Miami-Dade County Line),
- Expected to produce between 30 and 50 percent of the annual sand need south of the inlet, and
- Reduce/eliminate problematic sand shoaling of Federal navigation channel at Port Everglades Entrance
- Contains all components key to vital to a successful regional sediment management system

Project Cost Benefits

- Upland Sand -> ~$70/cy
- Sand Bypassing
  - Initial investment ~$25.7M ; Maintenance Cost ~$28/cy



- Reduction in cost to future Segment III projects

BROWARD COUNTY FLORIDA

olsen associates, inc. Coastal Engineering

Port Everglades Sand Bypass…

- Is an economically feasible project with long-term benefits to Broward County and the State of Florida
- Is a central element to the County's inlet and beach management program
- Is a designated Adaptation Action Area
  - Recognized as a key project to regional resiliency in a region facing possible dramatic consequences from sea level rise
  - Should be prioritized within the funding process for infrastructure needs and adaptation planning
- Compliments Regional Sediment Management (RSM) approach being undertaken by Corps

BROWARD COUNTY FLORIDA

olsen associates, inc. Coastal Engineering

Questions…

- What impacts PE Sand Bypass ranking most…
  - Located in area of the State with relatively low sand transport rate
  - No reliable sand bypass program
- What was intent of the 1986/2008 legislation…?
  - Offer incentives to Improve inlets state-wide to reduce beach erosion
- What is current condition of program…?
  - Limited funding
  - Limited benefit to new projects/efforts
  - Rewards outweigh Incentives

BROWARD COUNTY FLORIDA

olsen associates, inc. Coastal Engineering

Future Inlet Management Considerations…?

- Consider revisiting Statute and/or Rule
- Do not limit the number of inlets on the list that qualify for funding
- Balance the consideration of incentives and rewards
  - Example: public access for beach management funding
- Economic benefit of effective inlet management, not just quantified as reduced erosion
  - Emphasis on cost-effectiveness / Value of Sand
- Emphasize Activity
  - Higher emphasis should be placed on actual improvements to inlets
  - Will make inlet list more appealing to Legislature

BROWARD COUNTY FLORIDA

olsen associates, inc. Coastal Engineering

Future Inlet Management Considerations…?

- Seek to increase funding for inlet improvements
- Reserve 75% cost-sharing for improvement incentives (i.e., IMPs, capital expenses that result in inlet improvements with measureable benefits (i.e., incentives!)
- Continue to recognize all aspects and specific benefits of inlet management vs. beach projects, but consider…
  - 50% cost-sharing for sand bypass events (same as beach nourishment)
  - 50% cost-sharing for monitoring, design, permitting, etc.
- **Focus on Incentives**
- **Seek to increase funding for inlet improvements**

BROWARD COUNTY FLORIDA

olsen associates, inc. Coastal Engineering

Florida Shore and Beach Preservation Association

59th Annual Conference

September 15, 2016

Naples, Florida

Using Port Everglades Inlet to Examine and Challenge the State's Efforts to Manage Florida's Inlets

Christopher G. Creed, P.E., D. CE
Olsen Associates, Inc.

Nicole S. Sharp, P.E.
Broward County, FL