

# Canal Navigation Maintenance Program Update

Town Commission Workshop

June 17, 2024



# History of the Program

- Initial 5YR costs to dredge all canals to their originally permitted dredge depth and width
  - Approximately - \$16,800,000
  - Pay as you go
  - Includes ad valorem millage and non-ad valorem assessments

## Feedback #1

- Look for ways to reduce costs



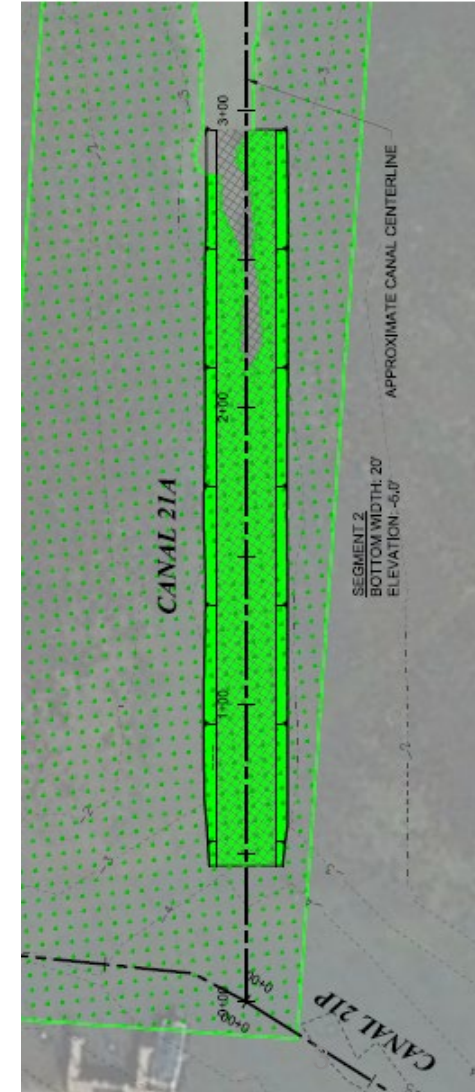


# Previous Direction

## Steps needed to advance plan

1. Resurvey
2. Staff and consultants to revise program concept and funding approach
  - A. Refine cost estimates through additional analysis
  - B. Provide options of cost with reduced effort options
  - C. Prioritize efforts throughout program time
3. Possibility of moving forward with Red (General Benefit) Canals
  - A. Establish a millage to continue to develop Seagrass Mitigation Area (4-acres)
  - B. Could be used for critical General Benefit Channel (Red) dredging
4. Present updated data and options to Commission
  - A. If approved, conduct community outreach – “Citizen feedback!”
  - B. Present outcomes of community outreach to Commission
5. *Move forward with revised program and funding*

Refine \$





# Project Objectives

- Understand the current condition of the Town's waterways
  - Hydrographic survey and volume calculations
  - Seagrass checks
  - Navigability assessment
- Re-evaluate cost for the canal maintenance program
  - Bring 2017 estimate forward to 2024 dollars
  - Perform a new OPCC
  - Optimize and Strategize



# Order of Brief

1. Condition Assessment
2. Updating to 2024 Condition
3. New programmatic tools
4. Advancing the program
5. Summary and Results
6. Next Steps



TOWN OF LONGBOAT KEY

# Our New Consultants



FIRST LINE  
COASTAL

## **Mark Stroik**

Founding partner and Project  
Manager



## **Jake Pierson**

Founding partner and project  
engineer



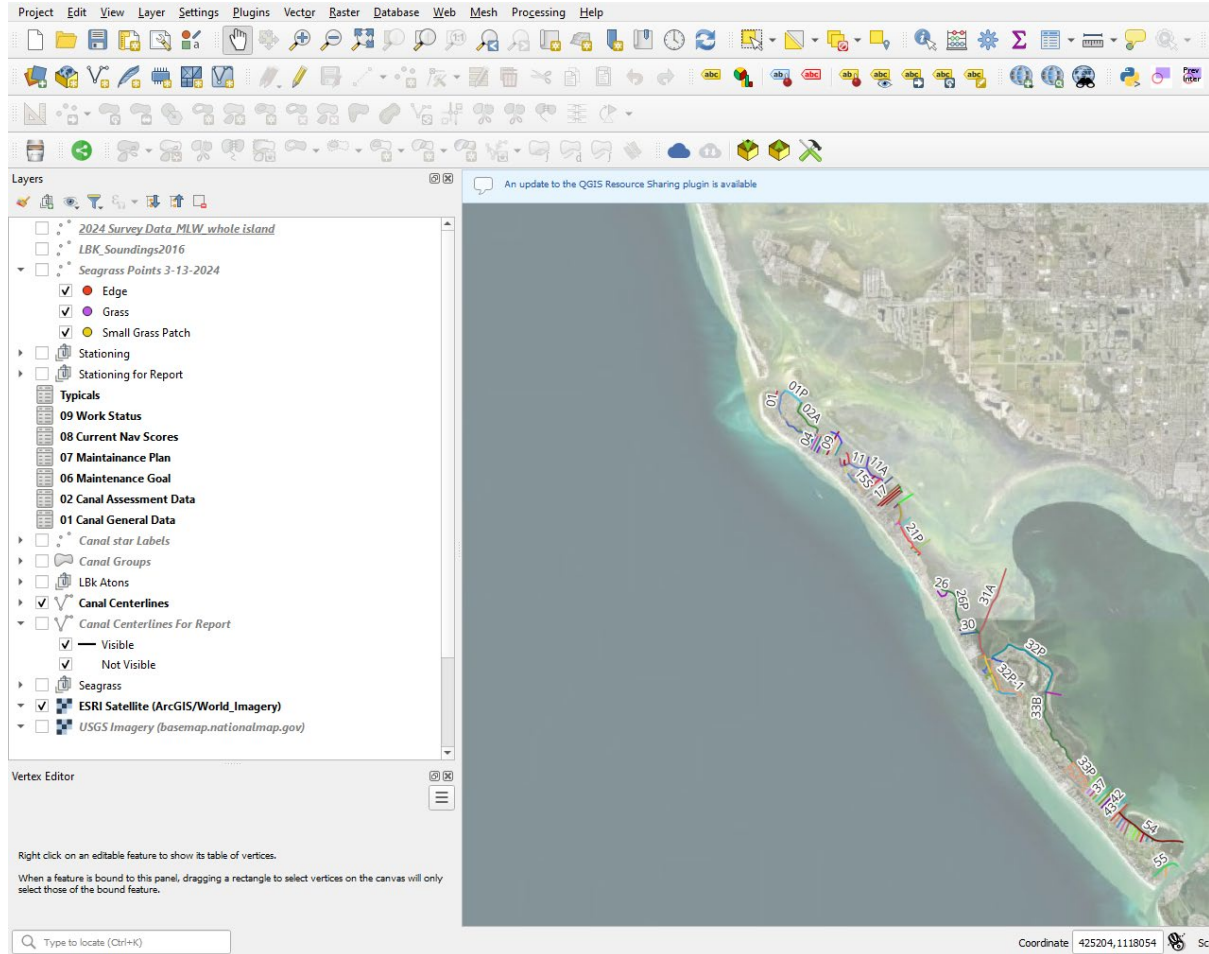


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# 2024 Conditions Assessment



# Bringing Previous Work Forward



- Recent Survey efforts:
  - 2017 – Cross-section survey of 16 canals
  - 2024 – Investigatory
- Seagrass Investigation
  - 11 of 16 canals affected
  - 4.81 acres of mapped seagrass
- Channel Design History
  - 96 Waterways
  - 72 have permit history / design
  - 24 have no permit history



# Bringing Previous Work Forward

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## Maintenance Requirements

- 127,000 CY
- 96 waterways
- \$12.0M dredging cost

## Required Mitigation

- 1 of 16 canals affected
- 0.21 Acres of habitat loss
- \$1.0M mitigation cost

## Critical Assumptions

- Waterway status
- Design parameters
- Dredge volume
- Dredging cost



# Updating to 2024

1. Updating Survey
2. Canal Navigation Assessment Development
3. Seagrass Encroachment Check
4. Navigability Assessment

# 1. Updating Survey

2. Canal Navigation Assessment Development
  3. Navigability Assessment
  4. Seagrass Encroachment Check



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# Island Wide Investigatory Survey





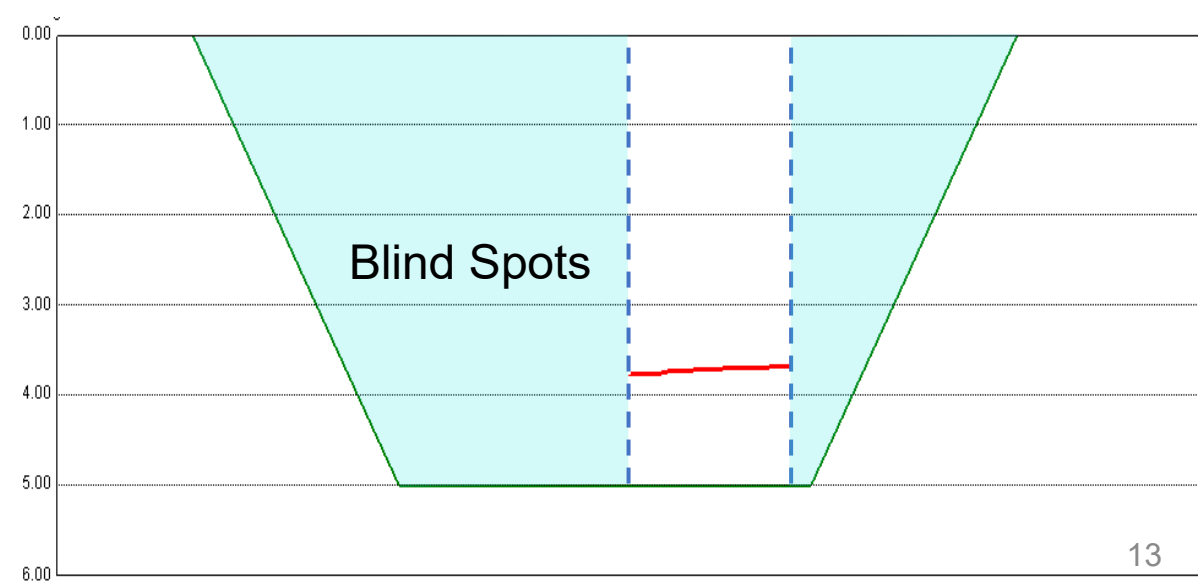
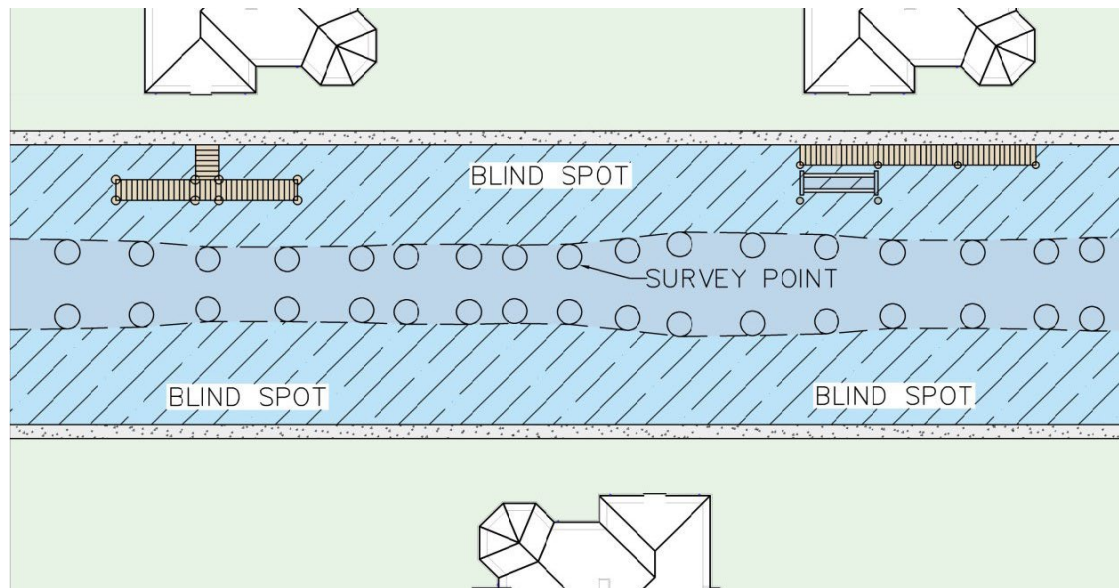
# Survey Type – Investigatory Profiles

## Purpose

- Fast & economical
- Centerline snapshot
- ID target areas
- General idea

## Limitations

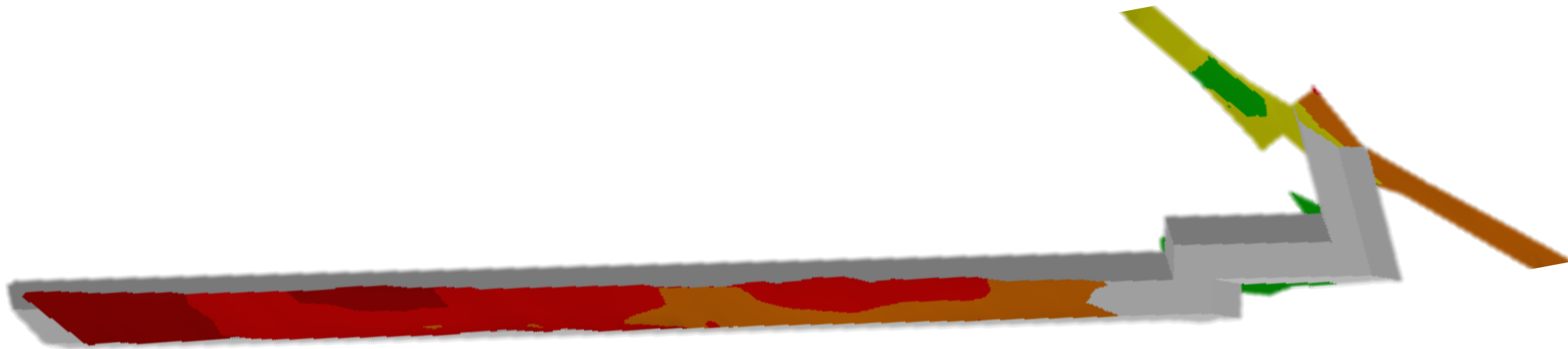
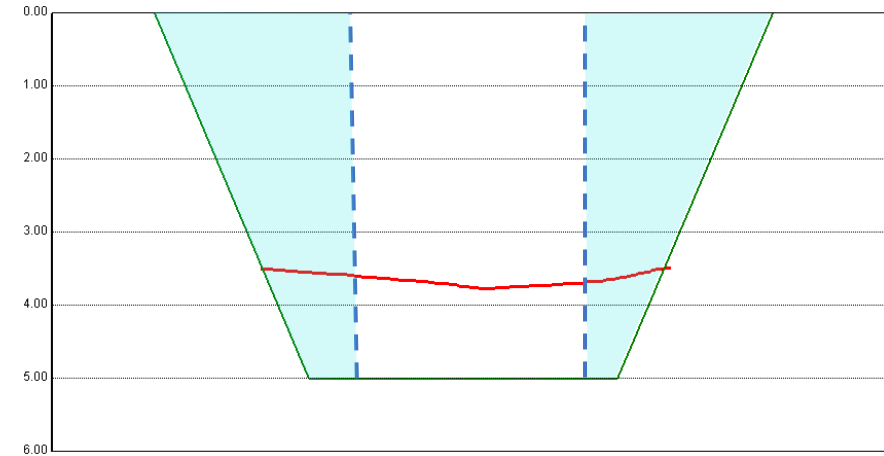
- Extremely accurate for coverage areas only
- Assumptions must be made
- Volumes are influenced by assumptions





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# Brief look at data



1. Updating Survey

## 2. Canal Navigation Assessment Development

3. Navigability Assessment

4. Seagrass Encroachment Check



# Defining Navigability

Objective: Determine existing level of service for each waterway for a particular class of vessel.

## Functions

- Transiting
- Meeting/Overtaking
- Maneuvering & Docking

## Utilization

- Shallow draft
- Bay boat
- Offshore vessel

## Factors

- Controlling draft
- Controlling width
- Impediments
- Environmental exposures



Center Console  
Length – 24 ft  
Beam – 8 ft 3 in  
Draft – 2 ft 8 in  
Power – Single 250 hp



1. Updating Survey
2. Canal Navigation Assessment Development
- 3. Navigability Assessment**
4. Seagrass Encroachment Check



# Canal Field Assessment



3/12

**Canal 33** Group: 5 Funding Category: Blue/Green/R  
 Subdivision: BAY ISLES UNIT 01 / COUNTRY CLUB SHORES UNIT 5 SEC 4  
 Cross Streets: Harbor Cove Cir / Putter Ln

Permit Depth: -5 MLW Permit Width: 40 FT Mapped Seagrass:

**Utilization**

Primary Use  
 Mooring/Dockage  Recreation  Transit  Other [ ]

Density of Water Access  0%  30%  60%  90%

Avg Vessel Beam  <7 ft  7 - 10 ft  10+ ft

Avg Vessel Draft  <2 ft  2 - 4 ft  4+ ft

**Structures**

Adjacent Features

Bank [ / ] Seawall [ % ] Riprap [ % ] Mangrove/Veg [ % ] Open Water [ % ] Shoal [ % ]  
 Bank [ S ] Seawall [ 100% ] Riprap [ % ] Mangrove/Veg [ % ] Open Water [ % ] Shoal [ % ]

Damaged Structure  Yes  No

Impediment  Shoal  Seagrass  Dock/Lift  Oyster  Overgrowth  Revetment

**Navigation**

Notable Exposure  Wind  Current  Wave  Obstacle  Note:

	Navigability (Apparent Utilization)		
	Transiting	Meeting/ Overtaking	Maneuvering/ Docking
Unrestricted			
As-expected	✓	✓	✓
Local Knowledge Required			
Conditionally Restricted			
Not Navigable			

Marker Density  None  Adequate  Dense

Marked Channel  As Permitted  Not as Permitted

Channel Orientation  Preferred Alignment  Requires Adjustment

**Notes/ Recommendation**

split bend on map  
 sea grass along North: 90%



# Scoring Classifications

- A – Unrestricted
- B – As Expected
- C – Local Knowledge
- D – Conditionally Restricted
- F – Not Navigable

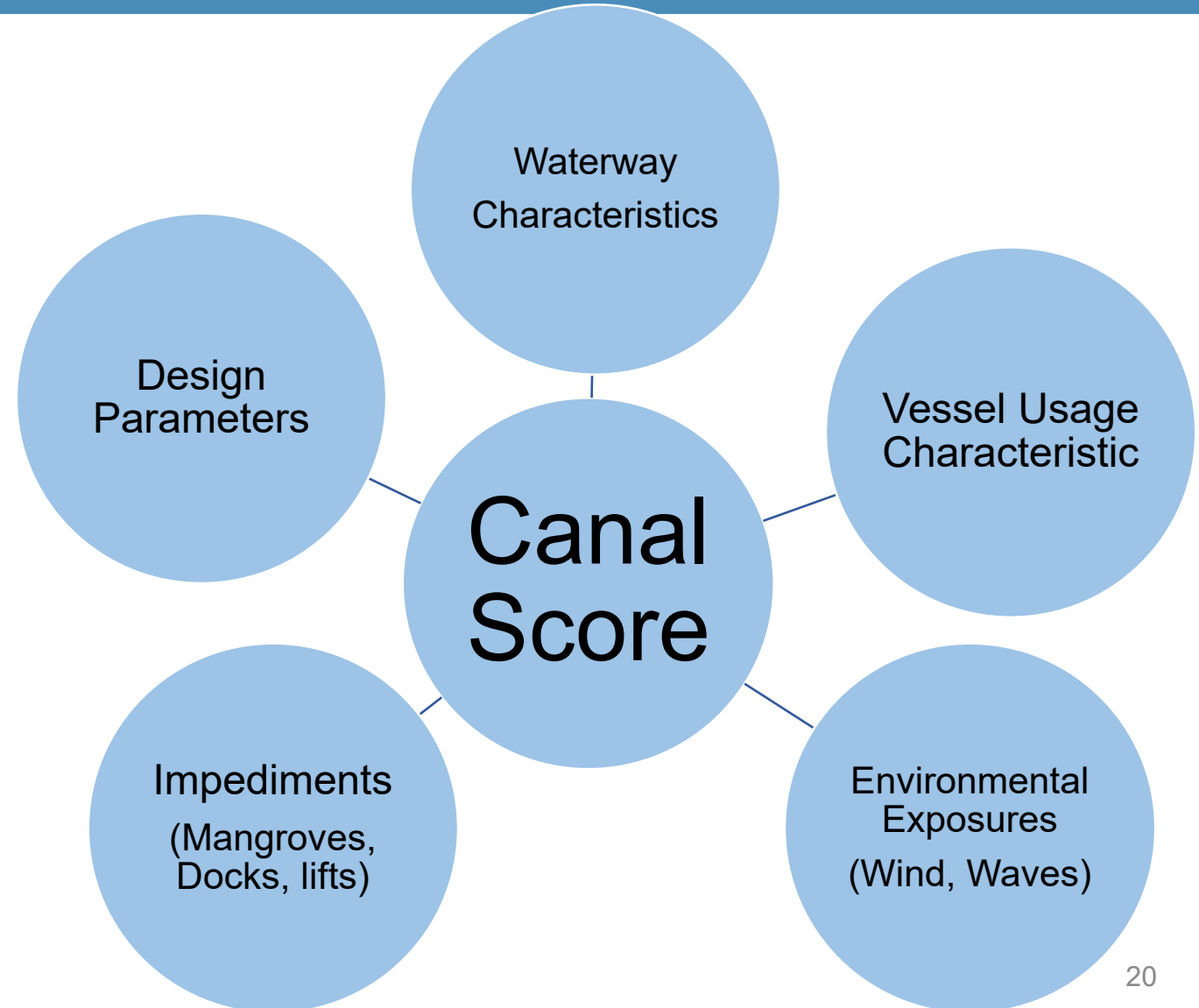




# Canal Scoring and Grading

## Scoring Process

- Factors
- Level of service
- Objective vs subjective
- Fixed parameters
- Variable parameters





# The different scores explained

Current score – Current score based on current conditions and historic design.

Max score with Current Design – Best possible score based on historic/permitted design parameters.

Max score with Maintenance Plan – Best possible score after recommended maintenance is completed.



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# Canal Example – Good Condition

## Canal 33

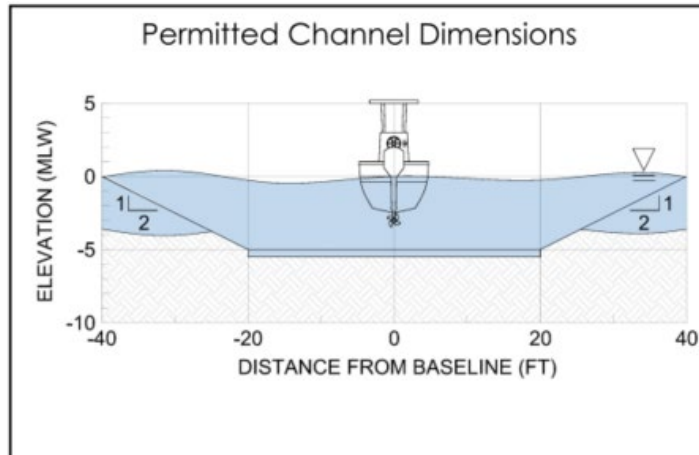
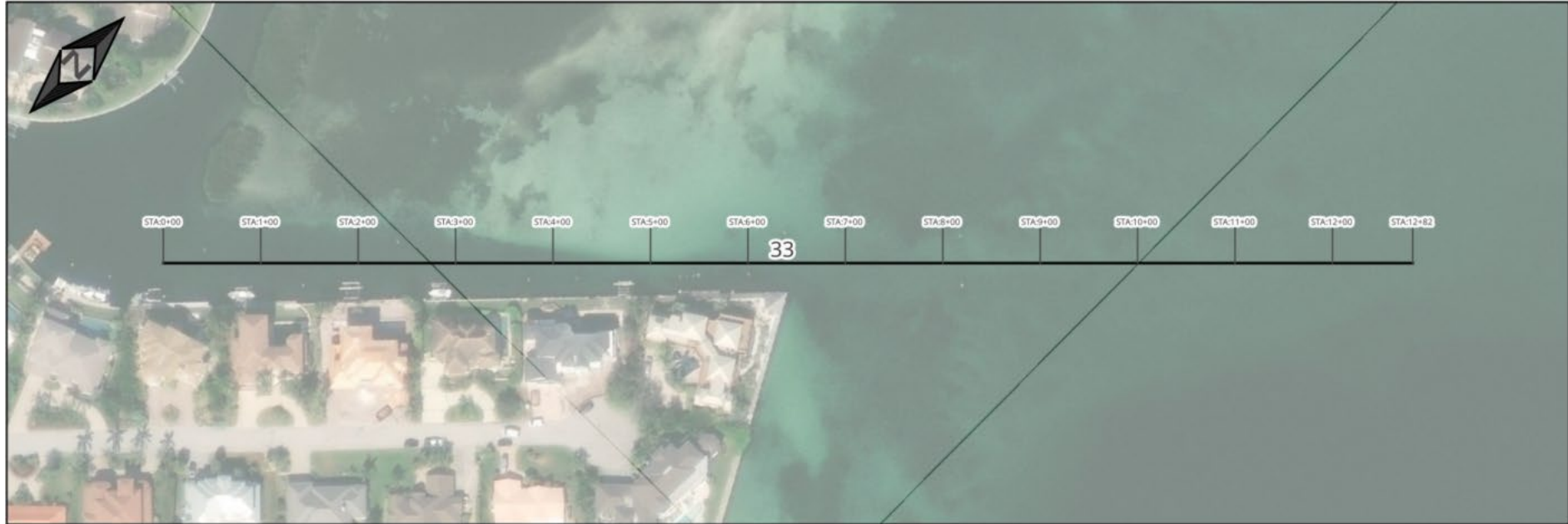


Current Score: B-

Max Score with Current Design Score: A



# Canal 33 – Overview



360 Video

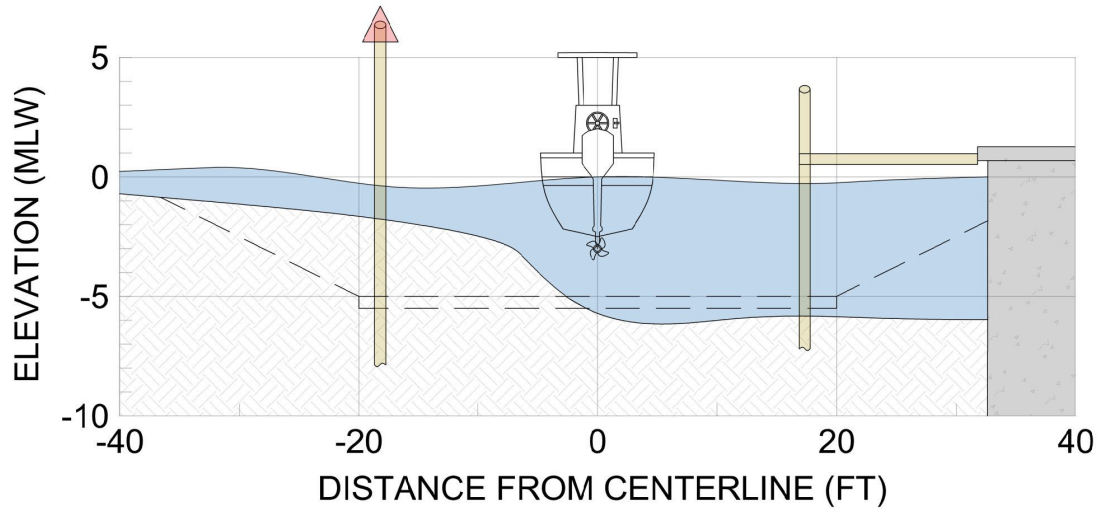




# Canal 33 – Current survey data

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Conceptualized Cross-section







# Canal Example – Poor Condition

## Canal 16

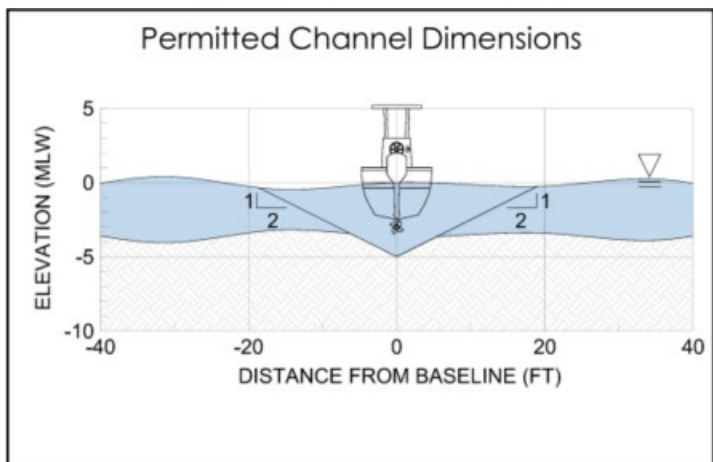


Current Score: D-

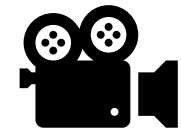
Max Score with Current Design Score: C+



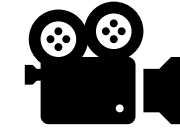
# Canal 16 – Overview



360 Video  
– Part 1



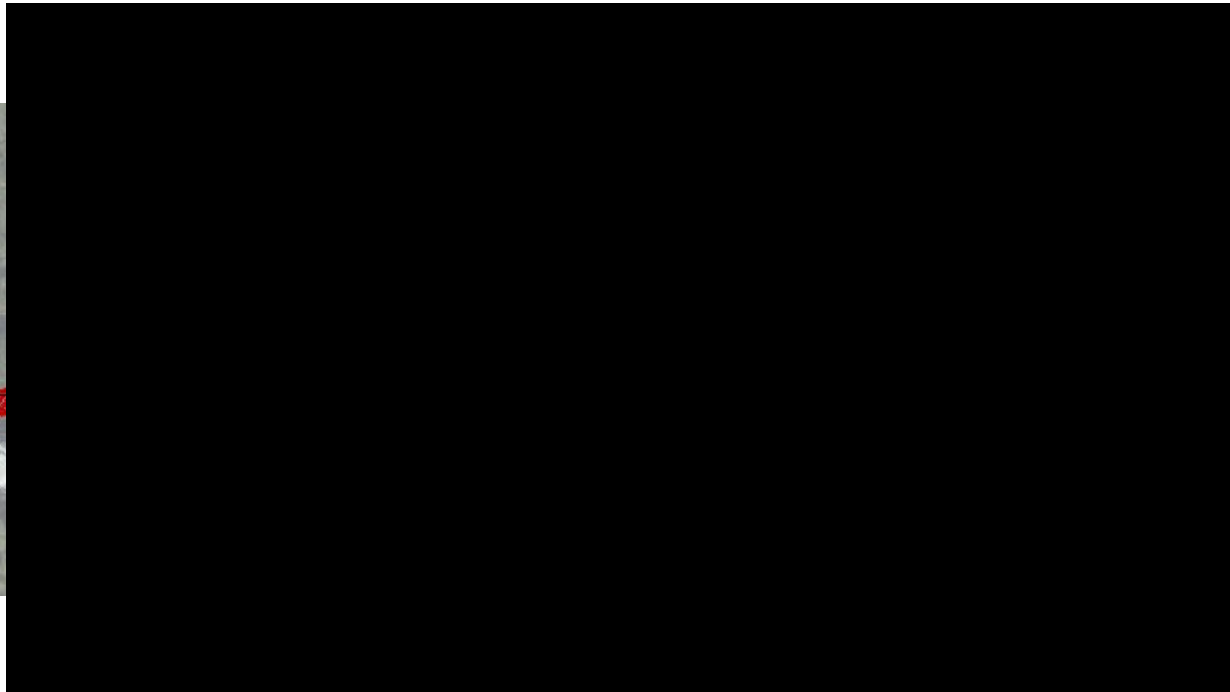
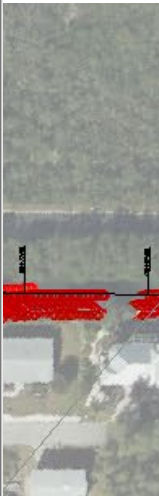
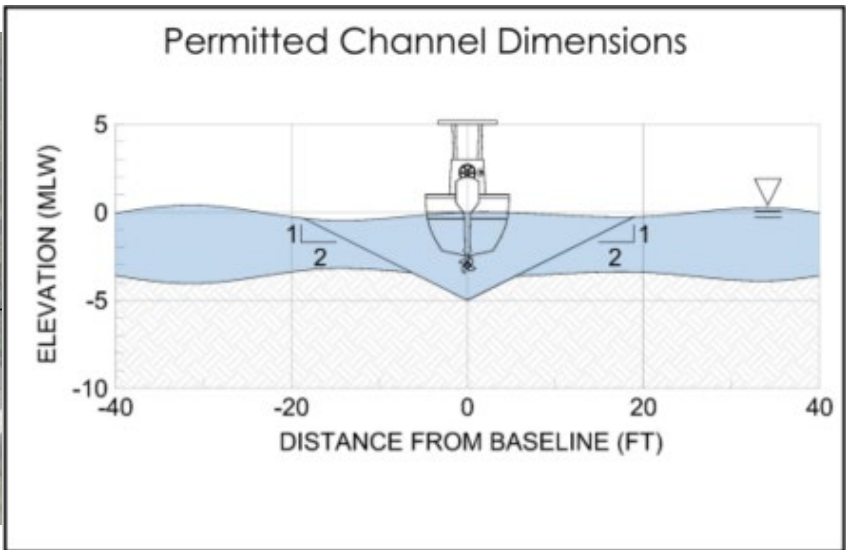
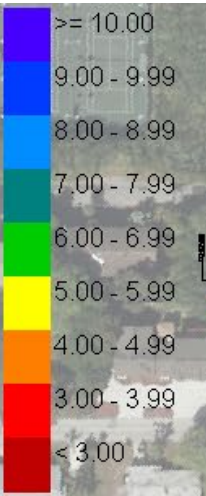
360 Video  
– Part 2





# Canal 16 – Current survey data


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# Canal Sheet Tool

**Canal**  
**33**



Canal Group: 5      Subdivision: BAY ISLES UNIT 01 / COUNTRY CLUB SHORES UNIT 5 SEC 4

Funding Category: Green/Red      Cross Streets: Harbor Cove Cir / Puffer Ln

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**Existing Conditions:**

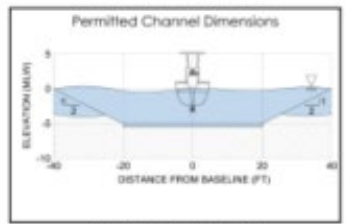
Primary Usage: Mooring/Dockage, Transit	Avg Vessel Beam: 7 - 10 ft
Density of Water Access: 60%	Avg Vessel Draft: 2 - 4 ft
Noted Damage to Structures: No	Mapped Seagrass: None Mapped
Notable Exposures: Waves, Wind	
Impediments: None	

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**Design Parameters**

**Existing Permit Info**

Permit Depth: -5 MLW  
 Permit Width: 40 FT  
 Placement Area:  
 Existing Permits: SB-01637883-001  
 Permit Expiration: 3/30/2005  
 Length of Canal: 1282 ft



Permitted Channel Dimensions

ELEVATION (MLW)

DISTANCE FROM BASELINE (FT)

Last Maintained: xx-xx-xxxx

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**Navigation Score**

Canal Nav Score Max with Current Design <b>A</b>	Current Score <b>B-</b>
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Transiting: C - local knowledge  
 Meeting/Overtaking: B - As expected  
 Maneuvering/docking: B - As expected  
 Marker Density: Dense

Notes: split 33 at 33P and make west end 33-5. Seagrass observed on the north toe

**Survey Info**

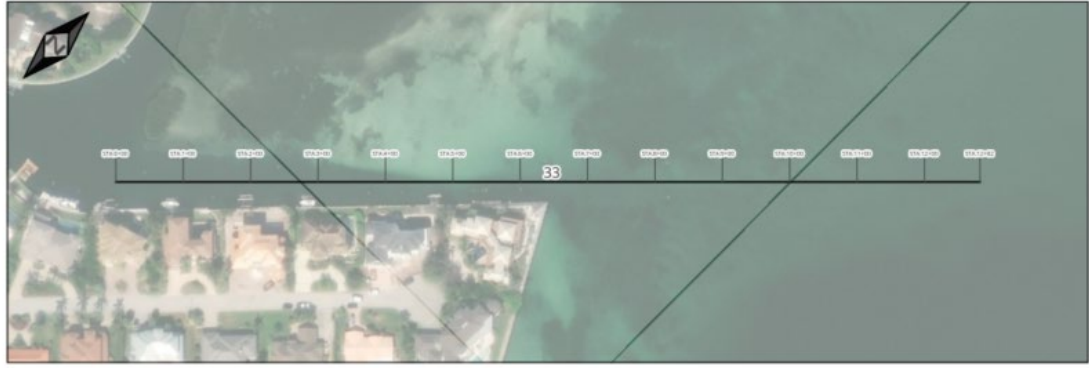
Survey Date	Volume	Survey Type
Mar 2024	134 cy	SB Profile
2019	732 cy	Est. from OPCC (Taylor)

\*Volume presented represents total volume to permitted design. If no permitted design exists, volumes are based on maintenance plan below.

Limiting Depth at last Survey: -2.2 ft MLW at STA 4+40

Sheet Last Updated: 5/8/2024 by J.Peterson, First Line Coastal

**Canal 33**



**Maintenance Plan**

Maintained Width: 40 FT  
 Maintained Depth: -5 MLW  
 Monitoring Frequency: 1 Year  
 Dredging Required: Yes  
 Min Dredge Target: TBD  
 Number of Segments: 1  
 Dredge Length: TBD

Additional Work: Recommend shoal buoy until dredging can occur. Recommend marker adjustments once dredging is completed.

**Nav. Score After Maintenance**

Current **B-** → Completed **A**

**Work Status**

Designed: Yes  
 Permitted: No  
 Mitigated: Not Confirmed  
 Funded: No

Anticipated Completion: TBD

Notes:

**Maintenance Goal**

Vessel	Transiting
Length: 24 ft	A - Unrestricted
Beam: 9 ft	
Draft: 3.5 ft	
	Meeting
	A - Unrestricted
	Maneuvering
	A - Unrestricted

1. Updating Survey
2. Canal Navigation Assessment Development
3. Navigability Assessment

# 4. Seagrass Encroachment Check



# 2017 Seagrass Survey

- 11 Canals with mapped seagrass
- 4.85 acres of previously mapped grass
- Mitigation required for 0.21 acres



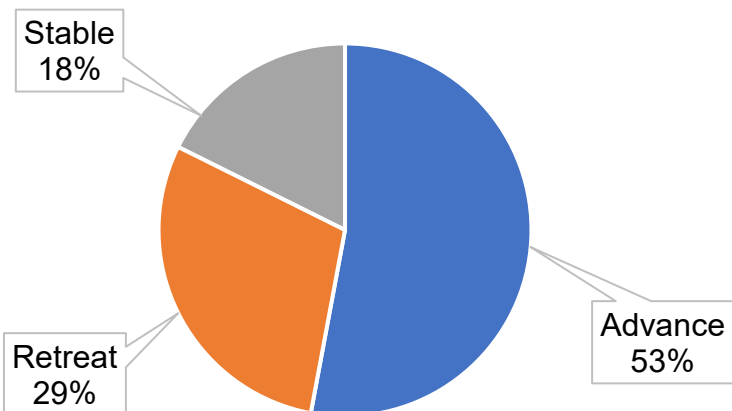
# Seagrass Encroachment Check 2024

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Objective: Roughly evaluate trends of previously mapped grasses.

- 17 out of 21 Grass beds visited
  - 9 beds advanced or expanded
  - 5 beds retreated or contracted
  - 3 beds seemed stable

Noted Seagrass Changes



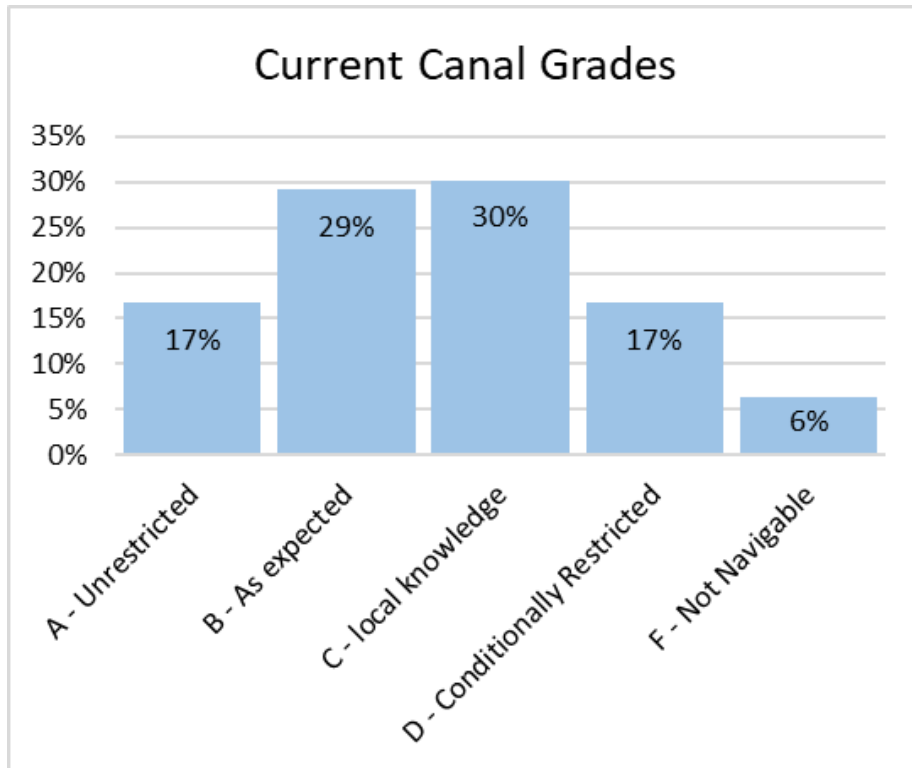
# Advancing the Program – The Next Steps



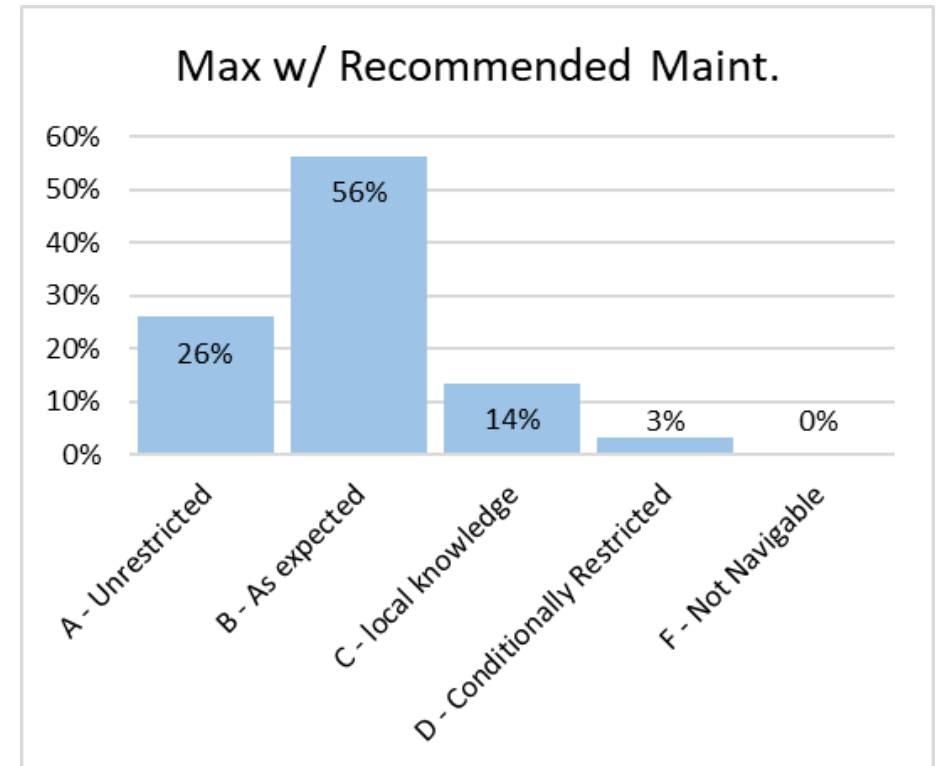


# Navigability Assessment Results

## Existing island wide conditions



## Condition after completing proposed maintenance





# Examples of Engineering Adjustments

- Centerline realignment
- Removed canals from the program \*(Next Slide)
- Combine canals for added value
- Truncated canals to remove unnecessary service areas
- Increase/decrease depth
- Increase/decrease width
- Eliminate non-productive work
- Disregard minimal material at canal terminus



# Canal Removal and Change Map (zoomed option)



Canal Name	Change
20	Removed
20A	Removed
20P	Removed
21	Removed
27	Removed
28	Removed
33A	Removed
08	Combined
21P	Combined
26P	Combined

**Canal Updates**

- Combined
- Removed
- No Change



# Construction Cost Estimates



## Simplified OPCC (2017 data)

Quantity	127,000 CY
Mobilization	\$5.28 MM
Unit Price	\$53.14/CY (\$50.12 – \$62.84)
<b>Total Cost</b>	<b>\$12.03 MM</b>
Effective Rate	\$94.83 / CY

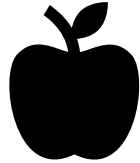


## Production Model OPCC (2017 data)

Quantity	127,000 CY
Mobilization	\$550,000
Unit Price	\$74.25 / CY (\$54.72 – \$108.98)
<b>Total Cost</b>	<b>\$9.98 MM</b>
Effective Rate	\$78.67 / CY



# Production Based OPCC 2017 Vs. 2024



## Production Model OPCC (2017 data)

Quantity	127,000 CY	
Mobilization	\$550,000	
Unit Price	\$74.25 / CY (\$54.72 – \$108.98)	
<b>Total Cost</b>	<b>\$9.98 MM</b>	
Effective Rate	\$78.67 / CY	



## Production Model OPCC (2024 data)

### Pre-strategy Dredging


Quantity	62,000 CY	
Mobilization	\$490,000	
Unit Price	\$91.29 / CY (\$57.99 – \$238.36)	
<b>Total Cost</b>	<b>\$6.15 MM</b>	
Effective Rate	\$99.01 / CY	



# Tools Put to Work

**Canal**

33



Canal Group: 5      Subdivision: BAY ISLES UNIT 01 / COUNTRY CLUB SHORES UNIT 5 SEC 4

Funding Category: Green/Red      Cross Streets: Harbor Cove Cir / Putter Ln

**Existing Conditions:**

Primary Usage: Mooring/Dockage, Transit	Avg Vessel Beam: 7 - 10 ft
Density of Water Access: 60%	Avg Vessel Draft: 2 - 4 ft
Noted Damage to Structures: No	Mapped Seagrass: None Mapped
Notable Exposures: Waves, Wind	
Impediments: None	

**Design Parameters**

**Existing Permit Info**

Permit Depth: -5 MLW

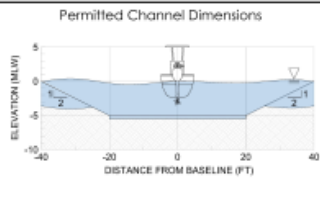
Permit Width: 40 FT

Placement Area:

Existing Permits: 58-01637883-001

Permit Expiration: 3/30/2005

Length of Canal: 1282 ft



Last Maintained: xx-xx-xxxx

**Navigation Score**

<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center;">Canal Nav Score</td> <td style="text-align: center;">Current Score</td> </tr> <tr> <td style="text-align: center;">Max with Current Design</td> <td style="text-align: center;">B-</td> </tr> <tr> <td style="text-align: center; font-size: 24pt; font-weight: bold;">A</td> <td></td> </tr> </table>	Canal Nav Score	Current Score	Max with Current Design	B-	A		<p style="text-align: center;"><b>Survey Info</b></p> <table border="1" style="width: 100%; border-collapse: collapse; font-size: 8pt;"> <thead> <tr> <th>Survey Date</th> <th>Volume</th> <th>Survey Type</th> </tr> </thead> <tbody> <tr> <td>Mar 2024</td> <td>136 cy</td> <td>SB Profile</td> </tr> <tr> <td>2019</td> <td>cy</td> <td>Est. from OPCC [Taylor]</td> </tr> </tbody> </table> <p style="font-size: 8pt;">*Volume presented represents total volume to permitted design. If no permitted design exists, volumes are based on maintenance plan below.</p> <p style="font-size: 8pt;">Limiting Depth at last Survey: -2.2 ft MLW at STA 4+40</p>	Survey Date	Volume	Survey Type	Mar 2024	136 cy	SB Profile	2019	cy	Est. from OPCC [Taylor]
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Transiting: C - local knowledge

Meeting/Overtaking: B - As expected

Maneuvering/docking: B - As expected

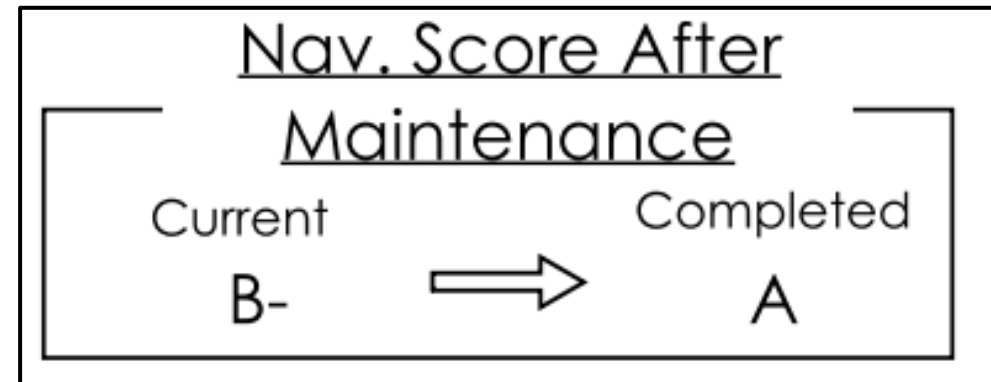
Marker Density: Dense

Notes: split 33 at 33P and make west end 33-5. Seagrass observed on the north toe

Sheet Last Updated: 5/8/2024 by J.Pierson, First Line Coastal

## Targeted Plan

- Maintain for 3.5 ft draft x 8 ft Beam
  - Minimum 4.5 ft MLW
  - Minimum width 24 ft
- Maintain permitted depth (5.0 ft MLW + 0.5 ft OD)
  - Ignore >4.75 ft MLW ←
- Maintain permitted width (40 ft with 2:1 slopes)

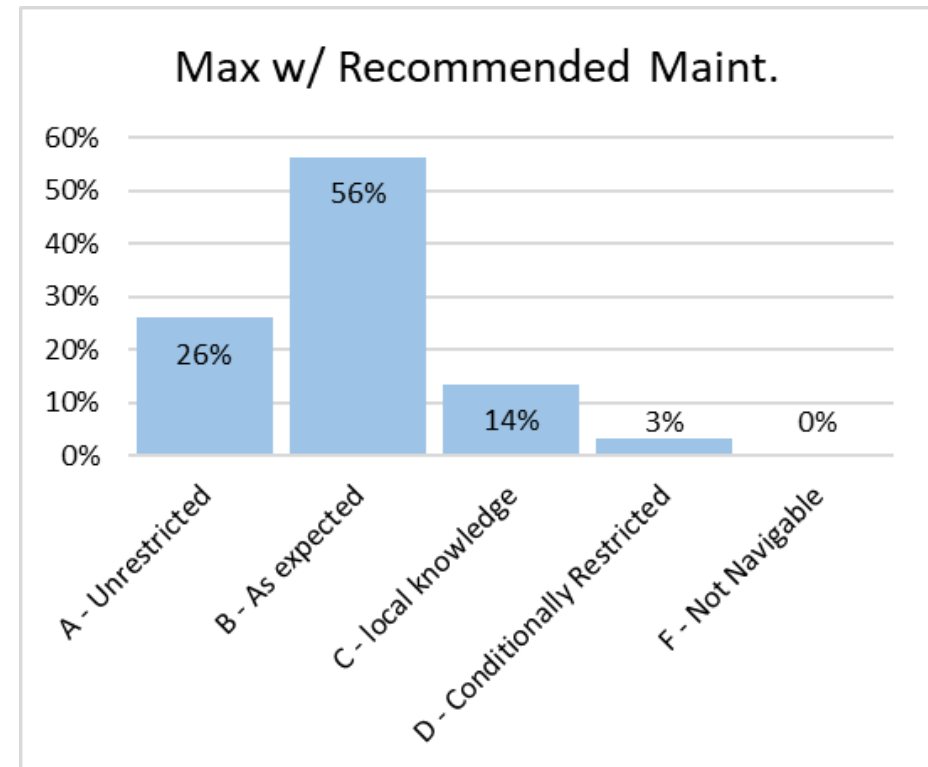




# Tools Put to Work

Modification	Number of Channels
No Dredging Required	48
Remove Channel	7
Increase Dimensions	5
Reduce Dimensions	22
Eliminate Non-Productive Dredging	71

Parameter	Pre-strategy	Targeted Maintenance
Pay Quantity	62,000cy	40,000 cy



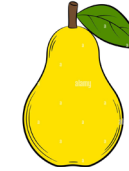


# Pre-strategy vs Targeted Maintenance



## Production Model OPCC (2024 data) Pre-strategy Dredging

Quantity	62,000 CY	←
Mobilization	\$490,000	
Unit Price	\$91.29 / CY (\$57.99 – \$238.36)	←
<b>Total Cost</b>	<b>\$6.15 MM</b>	
Effective Rate	\$99.01 / CY	



## Production Model OPCC (2024 data) Targeted Maintenance

Quantity	40,000 CY	←
Mobilization	\$330,000	
Unit Price	\$83.75 / CY (\$57.93 – \$128.23)	←
<b>Total Cost</b>	<b>\$3.68 MM</b>	
Effective Rate	\$92.00 / CY	





# Summary



# Programmatic Cost Summary

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Category	2023 Update	Advanced Update
Dredging Cost	\$ 12,030,000	\$ 3,680,000
Permit, Design, Management	\$ 1,860,000	\$ 900,000
<b>2025 Dredging Cost</b>	<b>\$ 13,890,000</b>	<b>\$ 4,580,000</b>
Mitigation Cost	\$ 1,020,000	\$ 3,600,000
Adjustment for 2028	\$ 1,890,000	\$ 1,070,000
<b>Initial Construction Estimated Cost (2028)</b>	<b>\$ 16,800,000</b>	<b>\$ 9,250,000</b>
10 yr Maintenance Cost	TBD	TBD

**Remember:**

- Volumes are rough
- Efficiencies available
- **Shoal rates TBD**
- Seagrass is changing
- Extend program to 10 yrs



Note: cost reductions for seagrass mitigation could include beneficial use of dredge material

# New Tools for the Program

- Island-wide baseline survey
- Canal sheet planning & discussion tool
- Production-based dredge estimating model
- Advanced design, ready for modifications
- Beginnings of “boat view”



# Future Project Planning

- Synchronize dredge & mitigation projects for savings
- Develop annual maintenance cost
- Advance program
  - Strategize project sequencing
  - Develop project one (most needed)
  - Initiate monitoring plan



# Guidance from Commission

- Move forward based on updated OPCC
- Work with finance to finalize assessments
- Continue development of canal assessment tools/ boat view (GIS)
- Seagrass mitigation area creation?

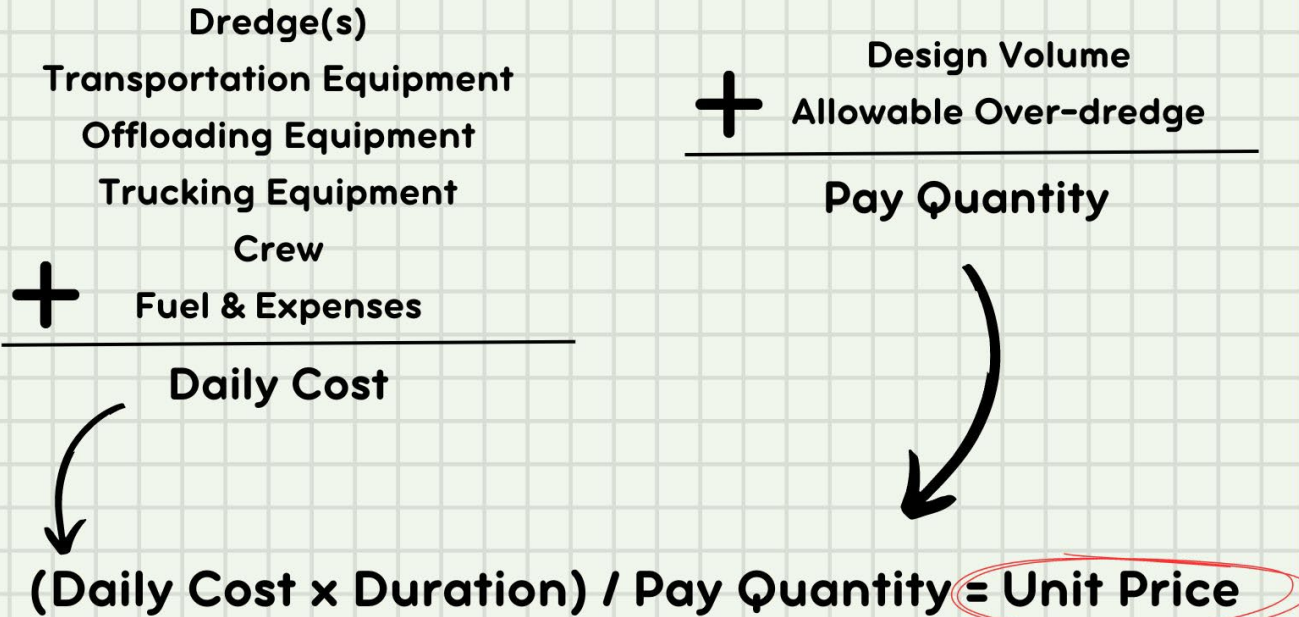


***Questions?***

# Production Model OPCC - How It's Done

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## Production Model OPCC Calculation



## Production Factors

- Dredge size
- Dredge speed
- Cut geometry
- Non-pay
- Re-dredge
- Sail speed
- Sail distance
- Positioning
- Delays
- Offload speed
- Offload capacity
- Truck loading
- Trucking distance

60 Parameters  
X 96 Waterways



# Dredge Cost by Group and Category

2025 dredge costs for Production Model OPCC (2024 data)  
Targeted Maintenance

Group	Direct Benefit (Blue)	General Benefit (Green & Red)
1	\$800,000	\$73,000
2	\$194,000	\$0
3	\$394,000	\$346,000
4	\$292,000	\$0
5	\$103,000	\$1,180,000
6	\$236,000	\$0
7	\$31,000	\$29,000
<b>Totals</b>	<b>\$2.05 MM</b>	<b>\$1.63 MM</b>





# Maintenance Plan Cost Reduction Table

Parameter	Pre - Strategy	Targeted Maintenance
Pay Quantity	199 cy	185 cy
Non-Pay	90 cy	50 cy
Total Dig	189 cy	235 cy
Effective \$/cy	\$ 100.47 / cy	\$ 87.58 / cy
Dredge Cost	\$ 19,983	\$ 16,167



# Navigability Objective

Maintain suitable navigability for a particular waterway for a particular class of vessel.

