

M E M O R A N D U M

To: Howard Tipton, Town Manager
From: Charles Mopps, Assistant Public Works Director
Report date: June 7, 2024
Meeting date: June 17, 2024
Subject: Canal Navigation Maintenance Program Update

Recommended Action

Provide direction to Town Manager.

Background

Prior briefings:

At the December 11, 2023, Regular Workshop, staff provided an update regarding the Canal Navigation Maintenance Program. This update followed a Regular Meeting on November 6, 2023, and resulted in the arrangement of one-on-one meetings with Commissioners due to the complexity of the briefing and the volume of questions it generated.

At the most recent update on December 11th, staff received the following direction from the Commission:

- Resurvey Canal/Channel System
- Determine cost-reduction options
- Present updated information to the Commission.

The Town has since engaged engineering consultant First Line Coastal (First Line) to assist staff in completing the directed work. The completed work effort included a conditional resurvey, seagrass checks, and a field Canal Navigability Assessment. In this presentation, staff and the consultant will provide a brief overview of program developments before discussing the results of this reassessment. We will explain the programmatic tools developed to complete the reassessment. The resulting information has been utilized to update a strategic approach, which provides significant cost savings to the program. These cost savings will be further explained by showing how the Engineer's recommended adjustments, the use of the developed tools, and the updated survey resulted in the reduction compared to previously presented estimates. Last, a demonstration of several programmatic tools developed to assist with decision-making will be provided and how they can be used in the future.

Next Steps

The following is staff's assessment of the next step actions for continued program development:

- Synchronize dredging and seagrass mitigation projects for additional cost savings
- Develop an annual maintenance cost

- Additional programmatic advancements:
 - Conceptualize and strategic project sequencing
 - Develop dredging project number one (most needed)
 - Initiate a canal monitoring plan.

Staff Recommendation

Staff will be requesting direction from the Commission regarding:

- Adoption of the updated dredging estimates
- Finalization of the program funding assessments
- Advancement of canal assessment tools
- Progression of seagrass mitigation area planning.

Attachments

PowerPoint Presentation

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



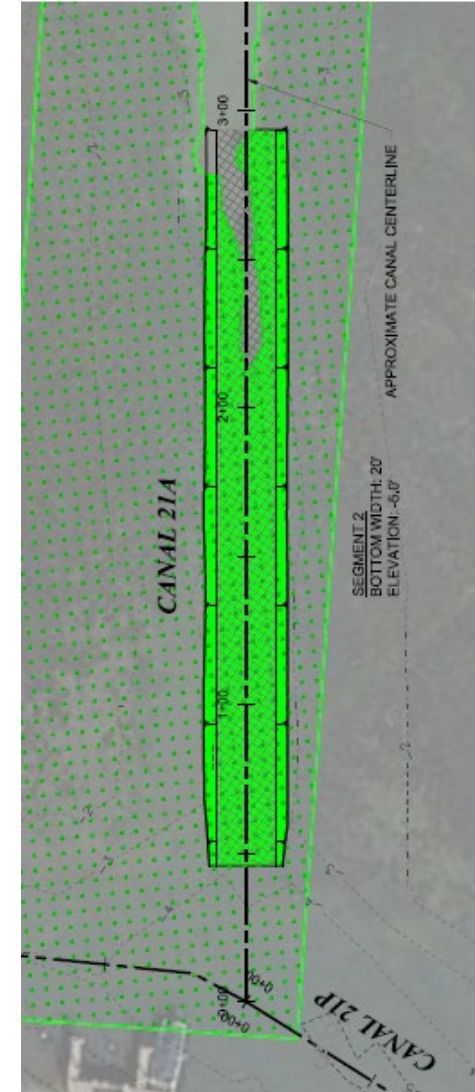


Previous Direction

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



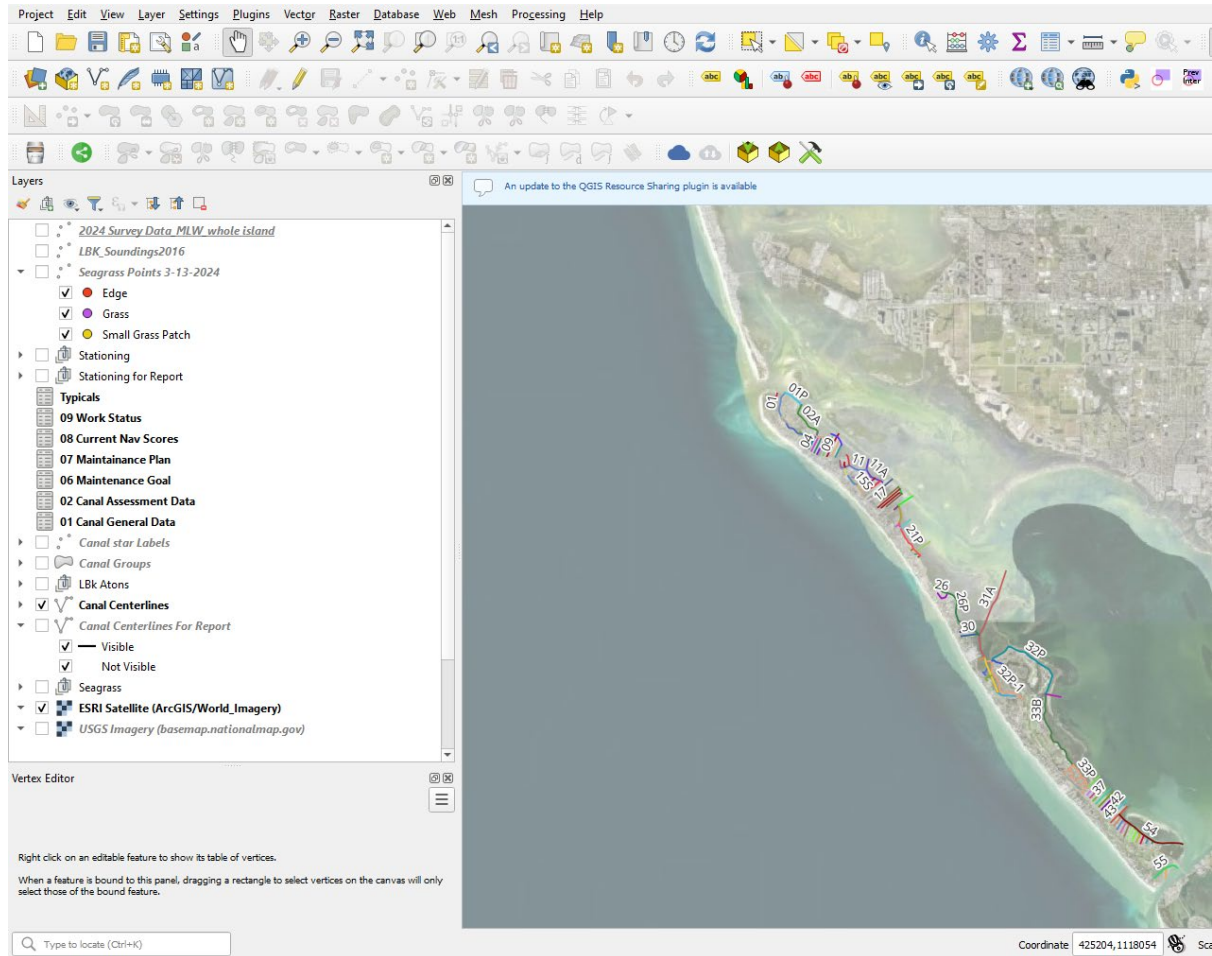


TOWN OF LONGBOAT KEY

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



TOWN OF LONGBOAT KEY

Maintenance Requirements

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

Critical Assumptions

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

Required Mitigation

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



TOWN OF LONGBOAT KEY

Island Wide Investigatory Survey





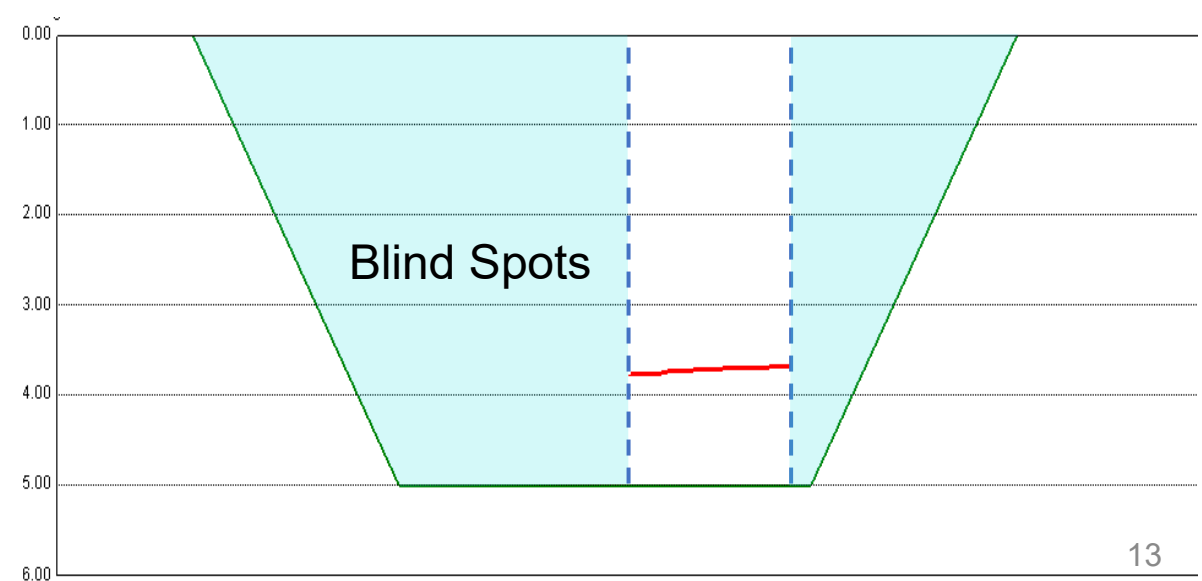
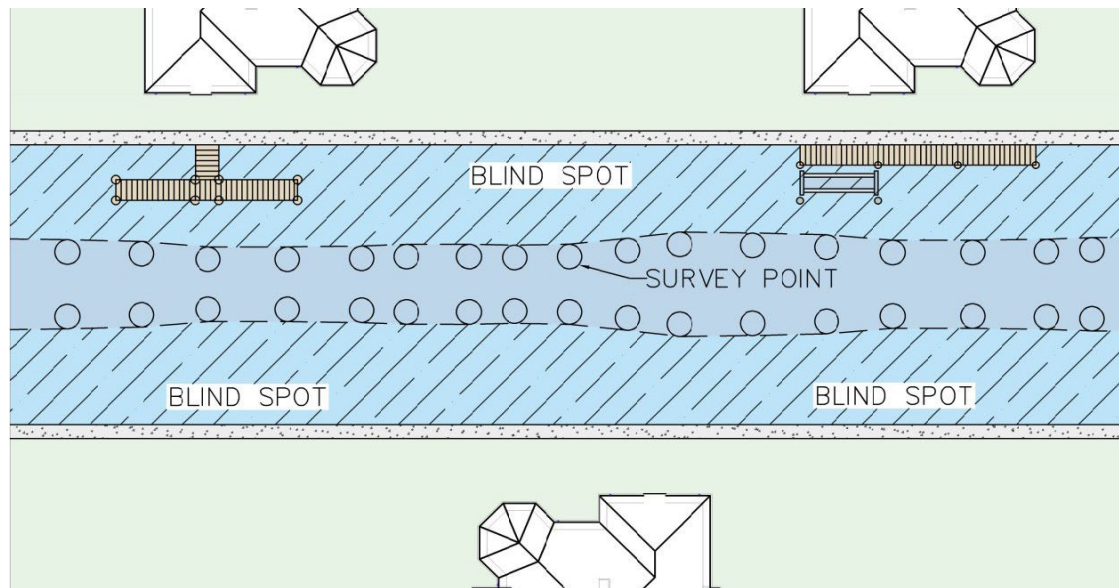
Survey Type – Investigatory Profiles

Purpose

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

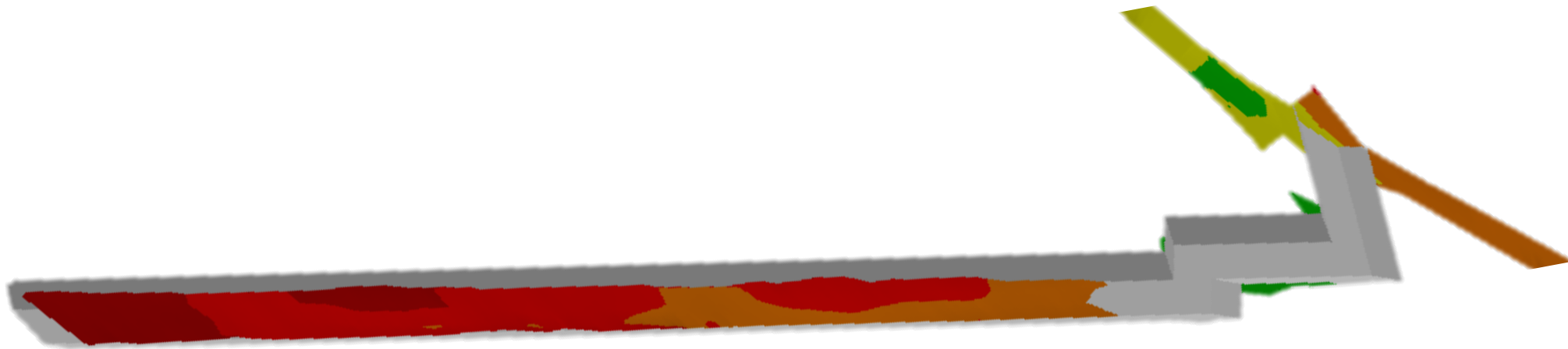
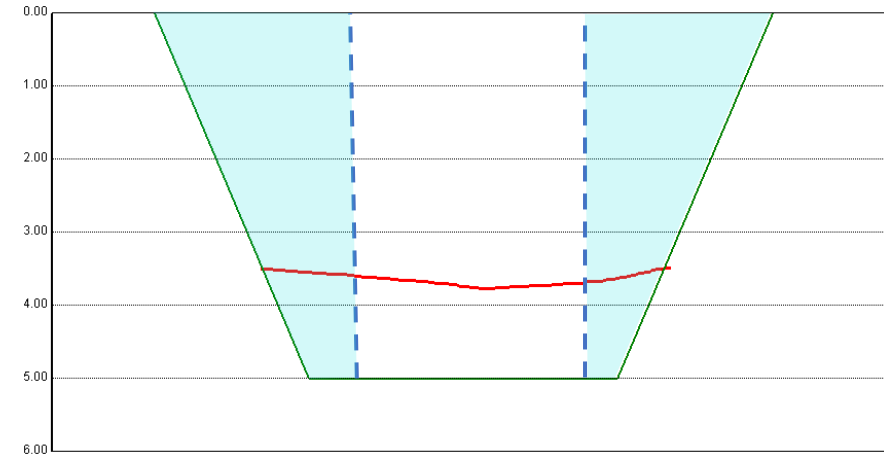
Limitations

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





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

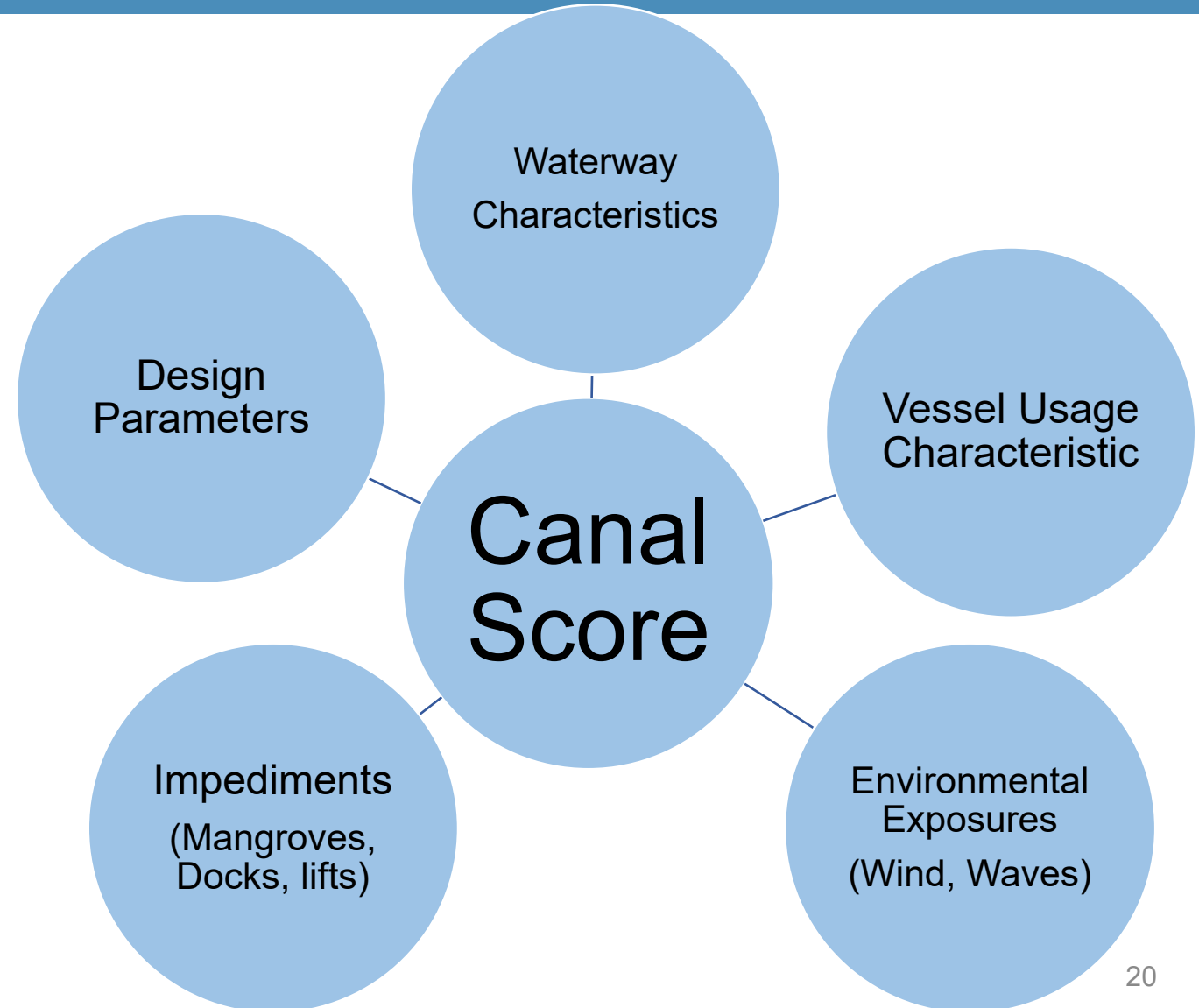




Canal Scoring and Grading

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.



TOWN OF LONGBOAT KEY

Canal Example – Good Condition

Canal 33

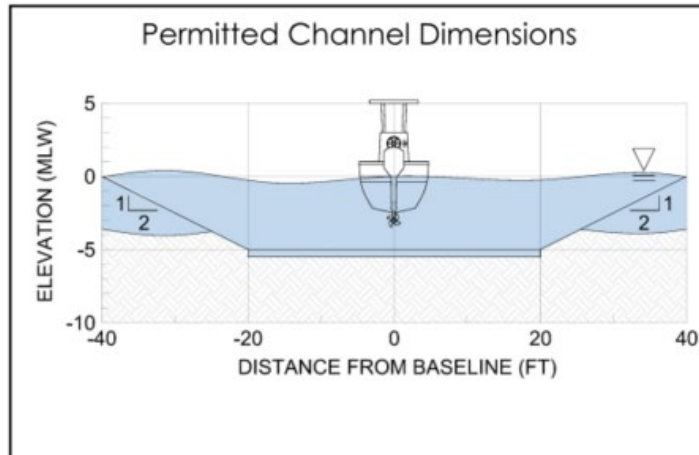
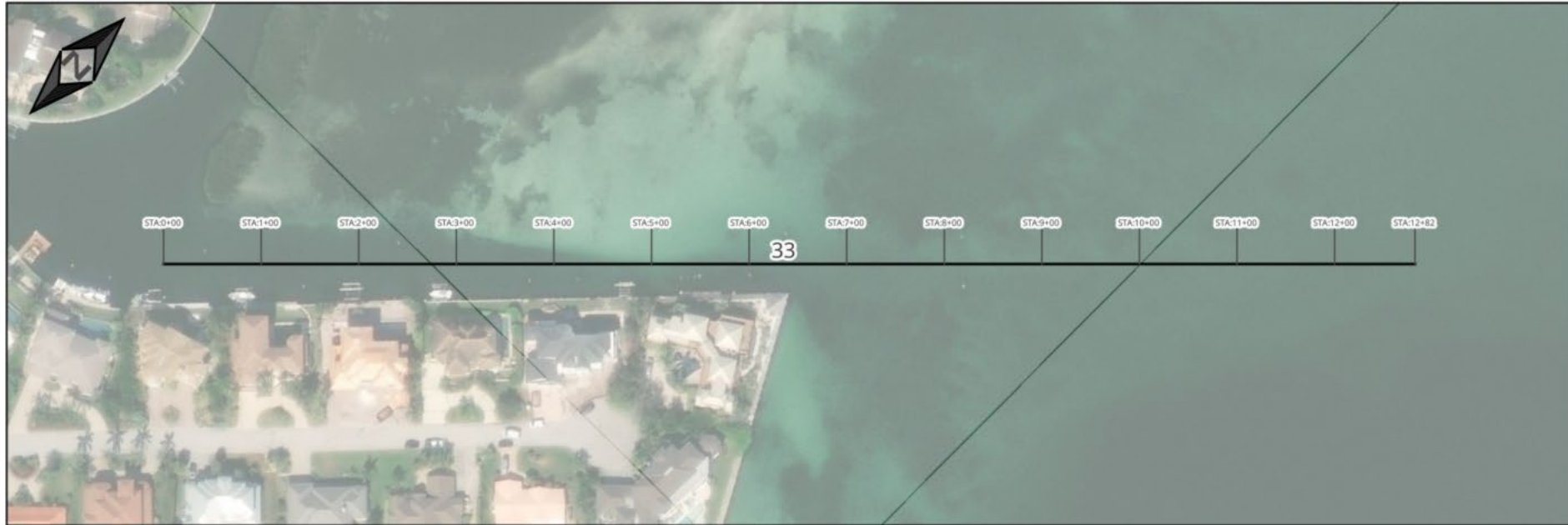


Current Score: B-

Max Score with Current Design Score: A



Canal 33 – Overview



360 Video

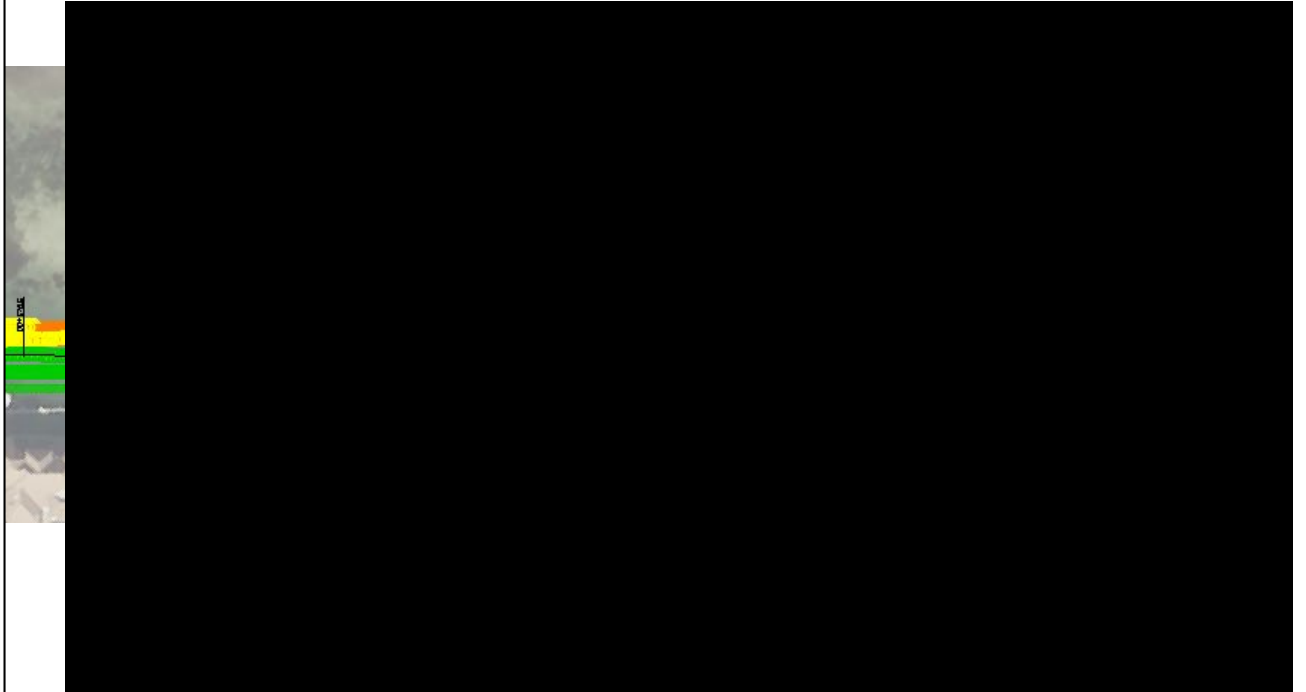
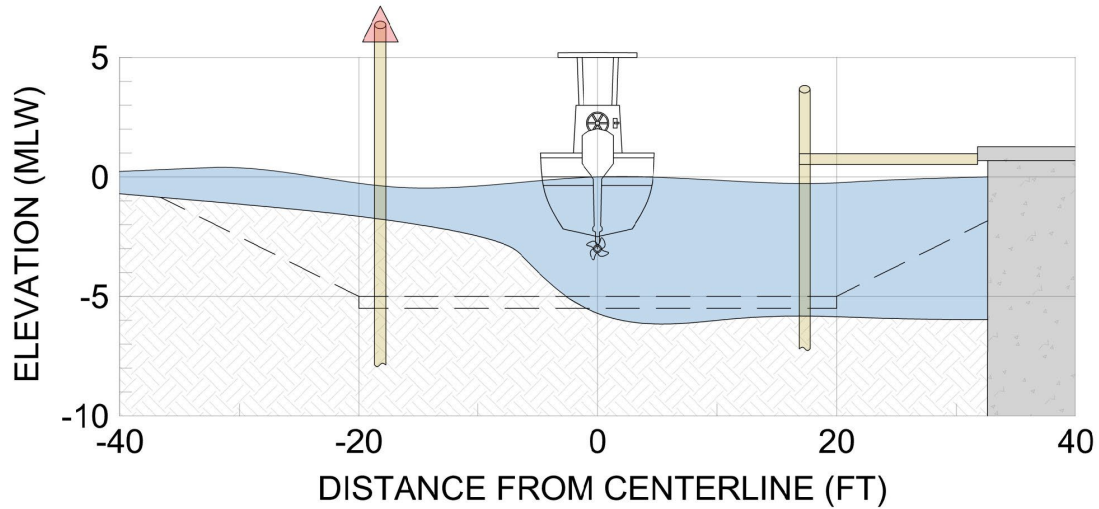




Canal 33 – Current survey data

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Conceptualized Cross-section





Canal Example – Poor Condition

Canal 16

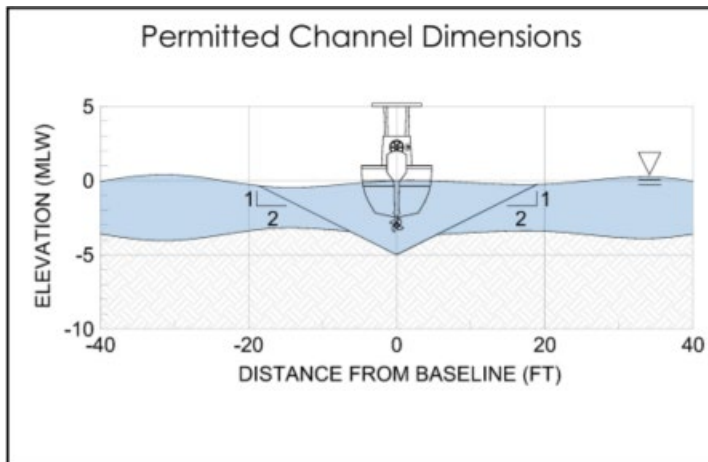


Current Score: D-

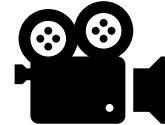
Max Score with Current Design Score: C+



Canal 16 – Overview



360 Video
– Part 1



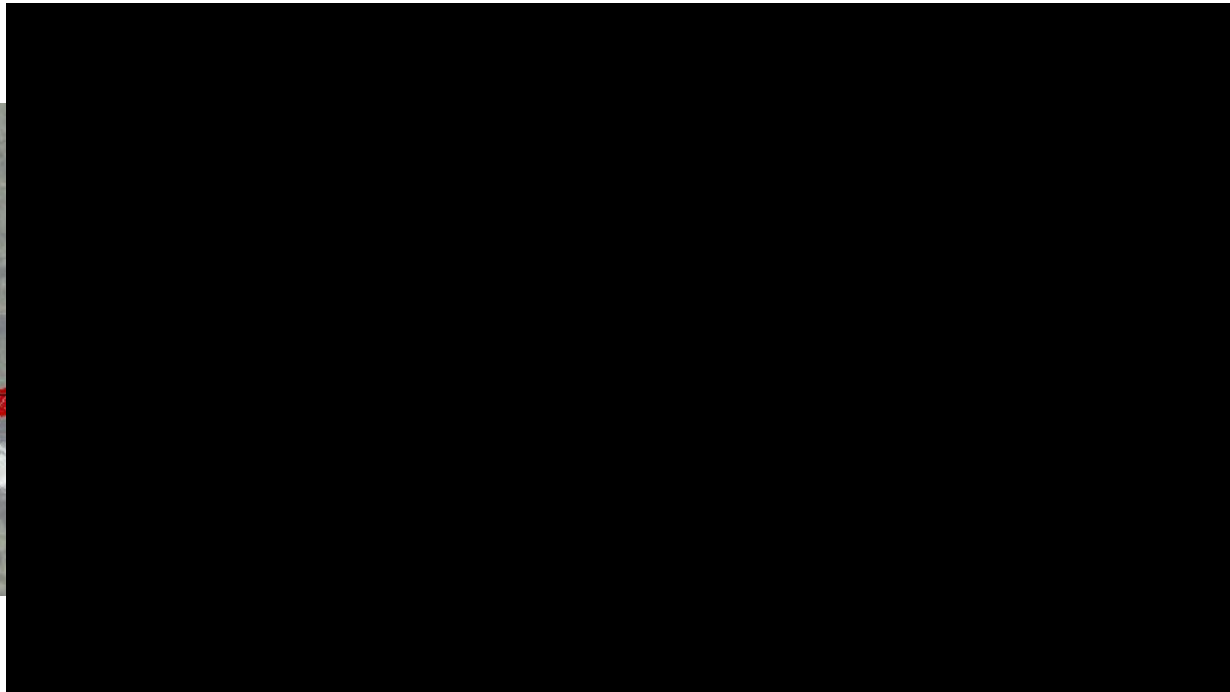
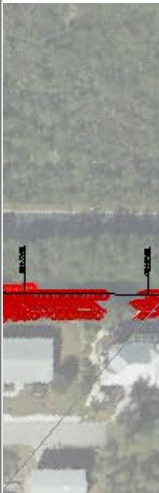
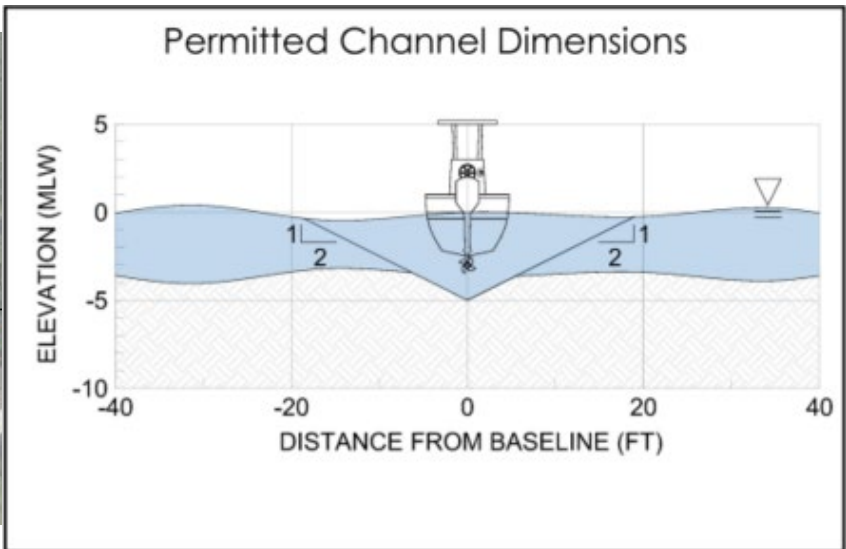
360 Video
– Part 2





Canal 16 – Current survey data


TOWN OF LONGBOAT KEY





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 Cr / Puffer Ln

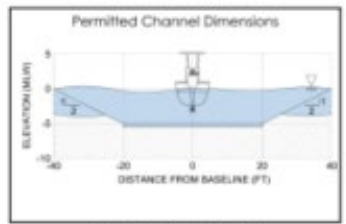
Existing Conditions:

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



Permitted Channel Dimensions

ELEVATION (MLW)

DISTANCE FROM BASELINE (FT)

Last Maintained: xx-xx-xxxx

Navigation Score

Canal Nav. Score	Current Score
Max with Current Design	Current Score
A	B-

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

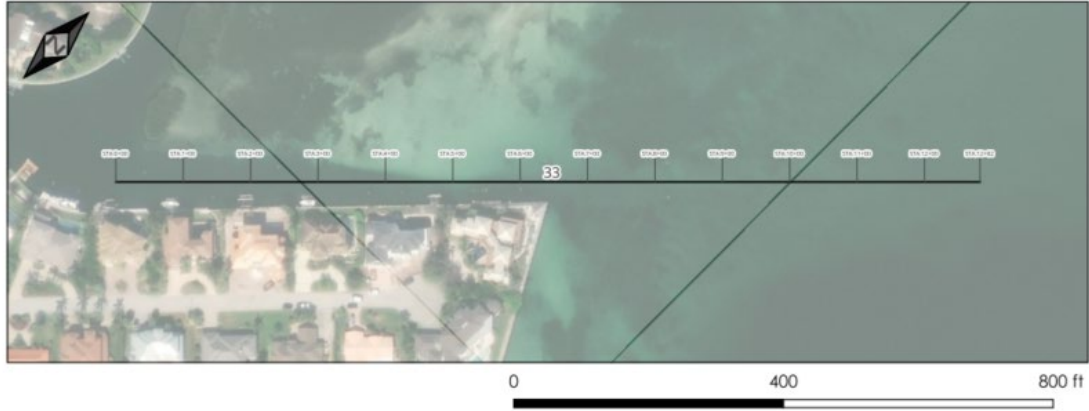
Survey Date	Volume	Survey Type
Mar 2024	134 cy	SB Profile
2019	732 cy	Est. from OPCC (Taylor)

*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 Completed

B- → A

Work Status

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

Anticipated Completion: TBD

Notes:

Maintenance Goal

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



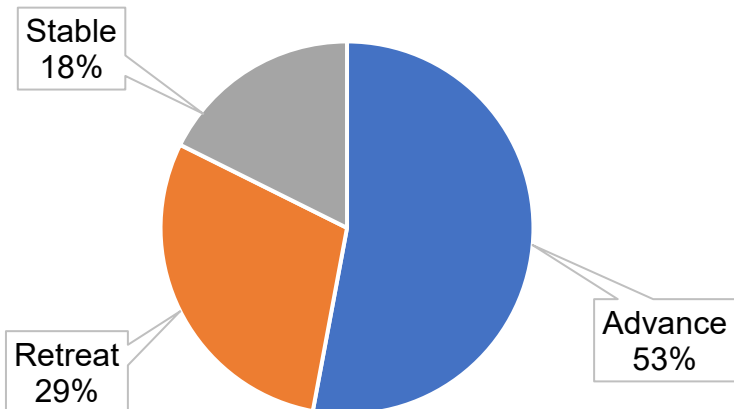
Seagrass Encroachment Check 2024

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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

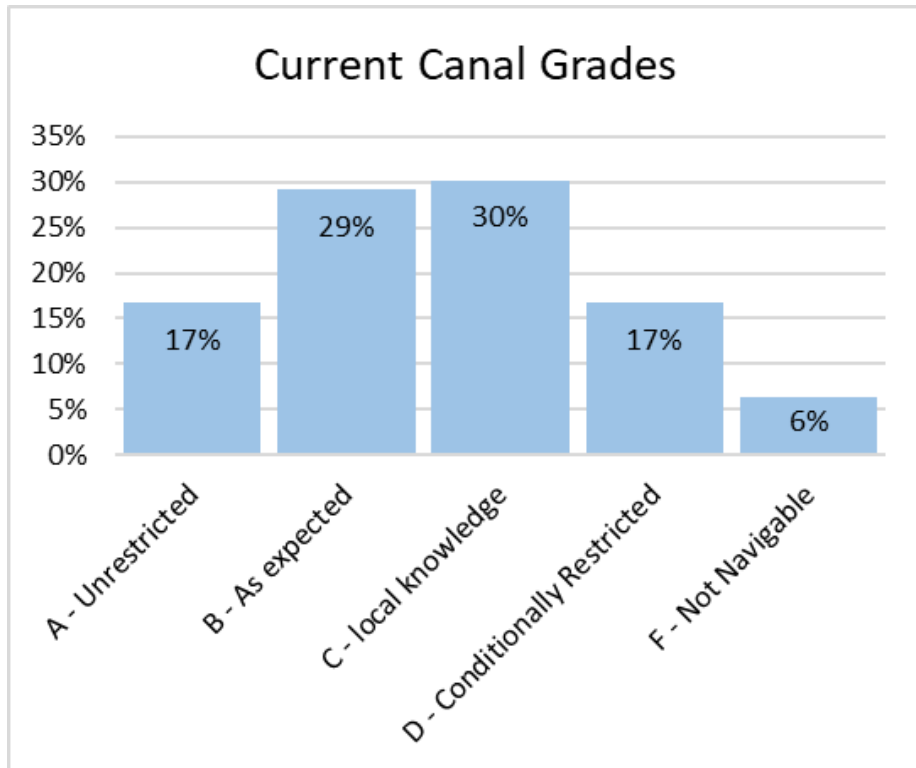


Advancing the Program – The Next Steps

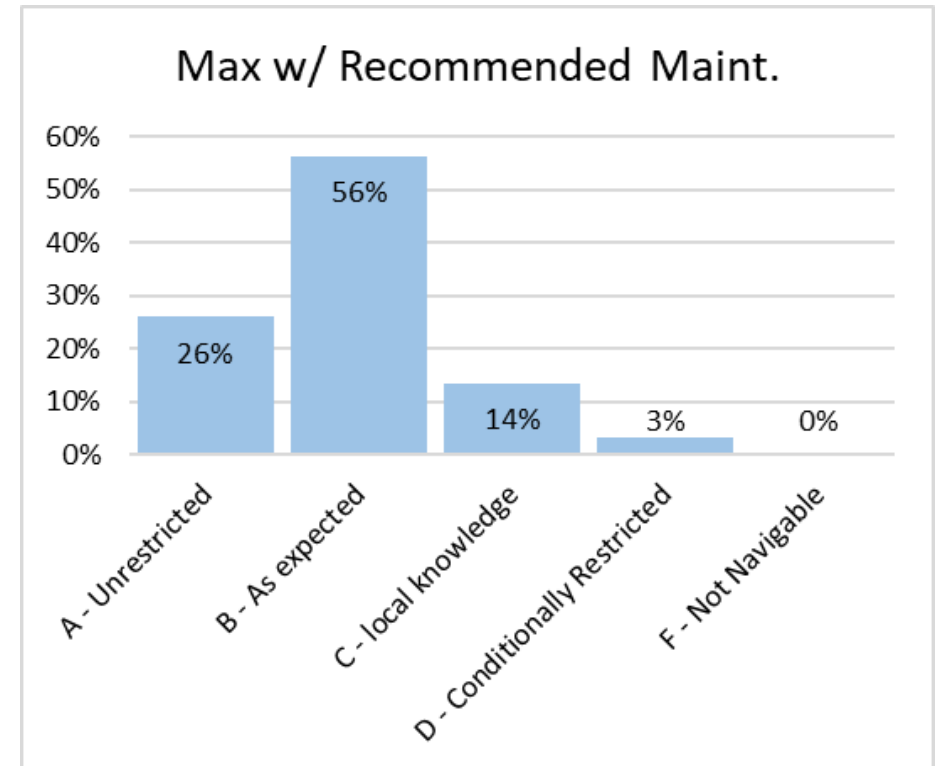


Navigability Assessment Results

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)



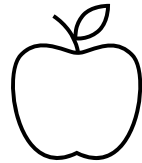
Canal Name	Change
20	Removed
20A	Removed
20P	Removed
21	Removed
27	Removed
28	Removed
33A	Removed
08	Combined
21P	Combined
26P	Combined

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)
Total Cost	\$12.03 MM
Effective Rate	\$94.83 / CY

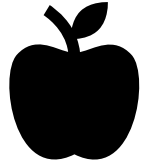


Production Model OPCC (2017 data)

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

Production Based OPCC 2017 Vs. 2024

TOWN OF LONGBOAT KEY



Production Model OPCC (2017 data)

Quantity	127,000 CY
Mobilization	\$550,000
Unit Price	\$74.25 / CY (\$54.72 – \$108.98)
Total Cost	\$9.98 MM
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)
Total Cost	\$6.15 MM
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

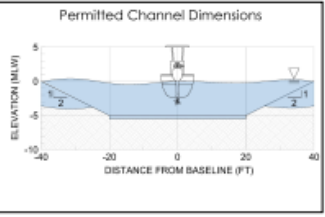
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Design Parameters

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 Length of Canal: 1282 ft



Navigation Score

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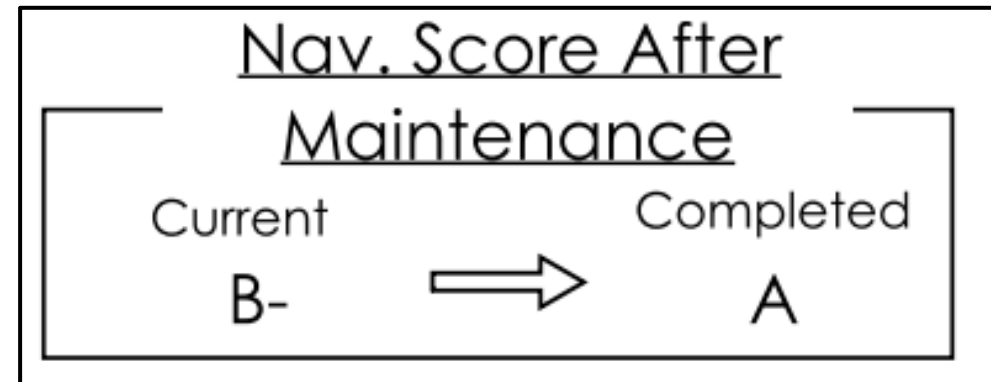
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 Limiting Depth at last Survey: -2.2 ft MLW at STA 4+40

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)

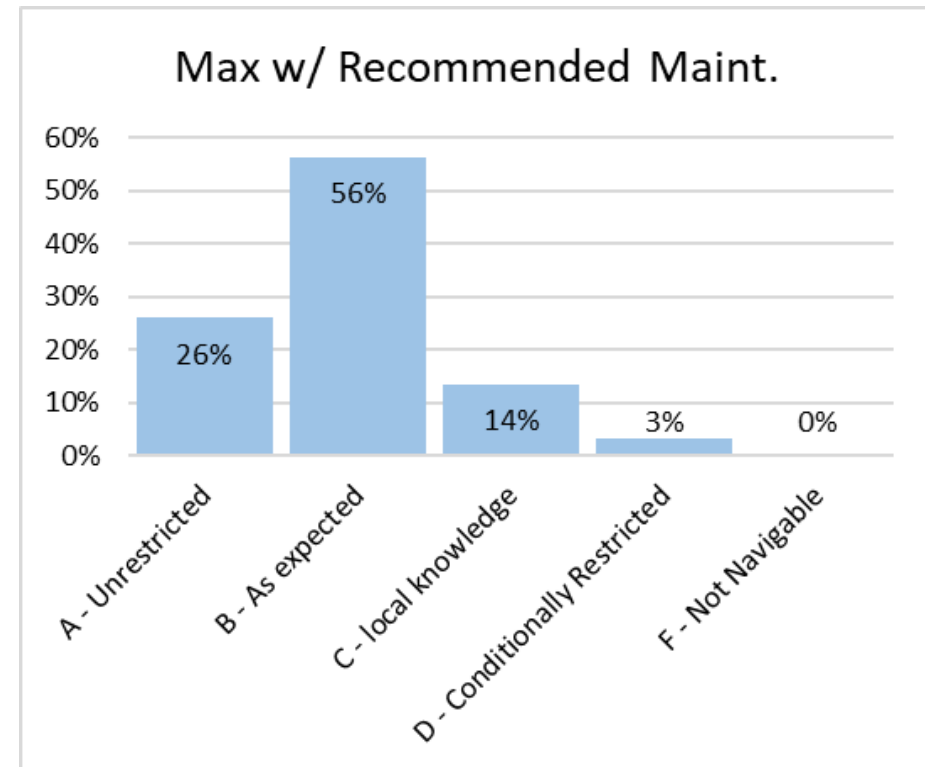




Tools Put to Work

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



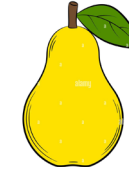


Pre-strategy vs Targeted Maintenance



Production Model OPCC (2024 data) Pre-strategy Dredging

Quantity	62,000 CY	←
Mobilization	\$490,000	
Unit Price	\$91.29 / CY (\$57.99 – \$238.36)	←
Total Cost	\$6.15 MM	
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)	←
Total Cost	\$3.68 MM	
Effective Rate	\$92.00 / CY	



Summary



Programmatic Cost Summary

TOWN OF LONGBOAT KEY

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

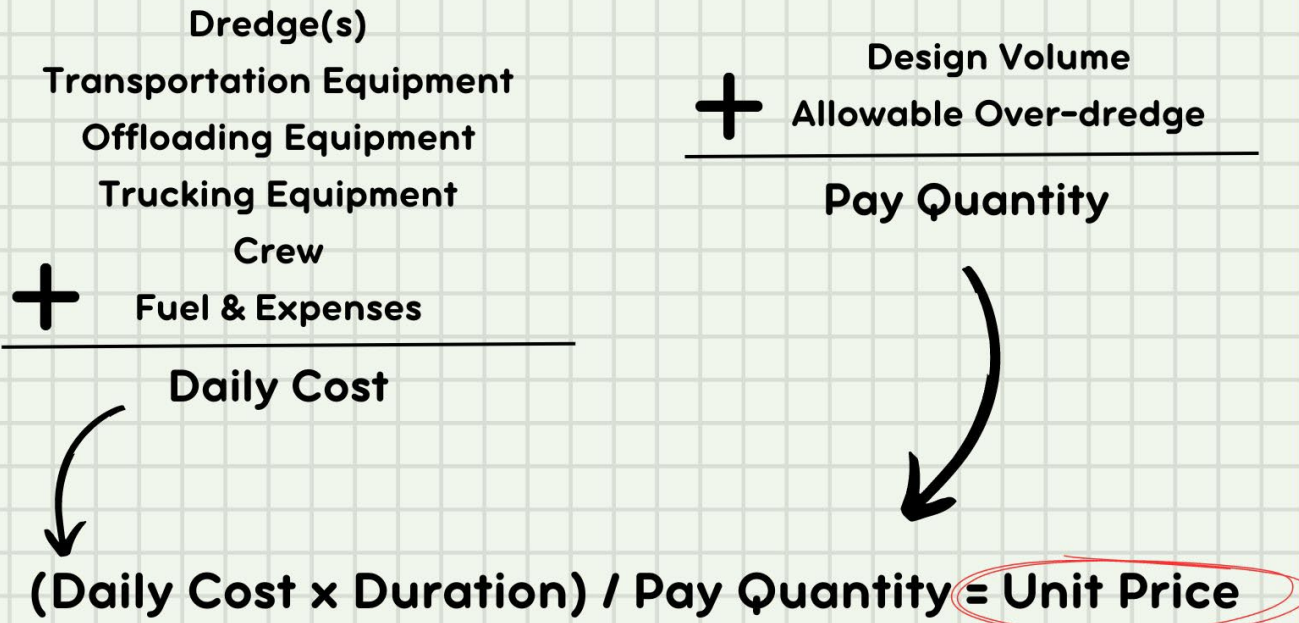


Questions?

Production Model OPCC - How It's Done

TOWN OF LONGBOAT KEY

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
Totals	\$2.05 MM	\$1.63 MM



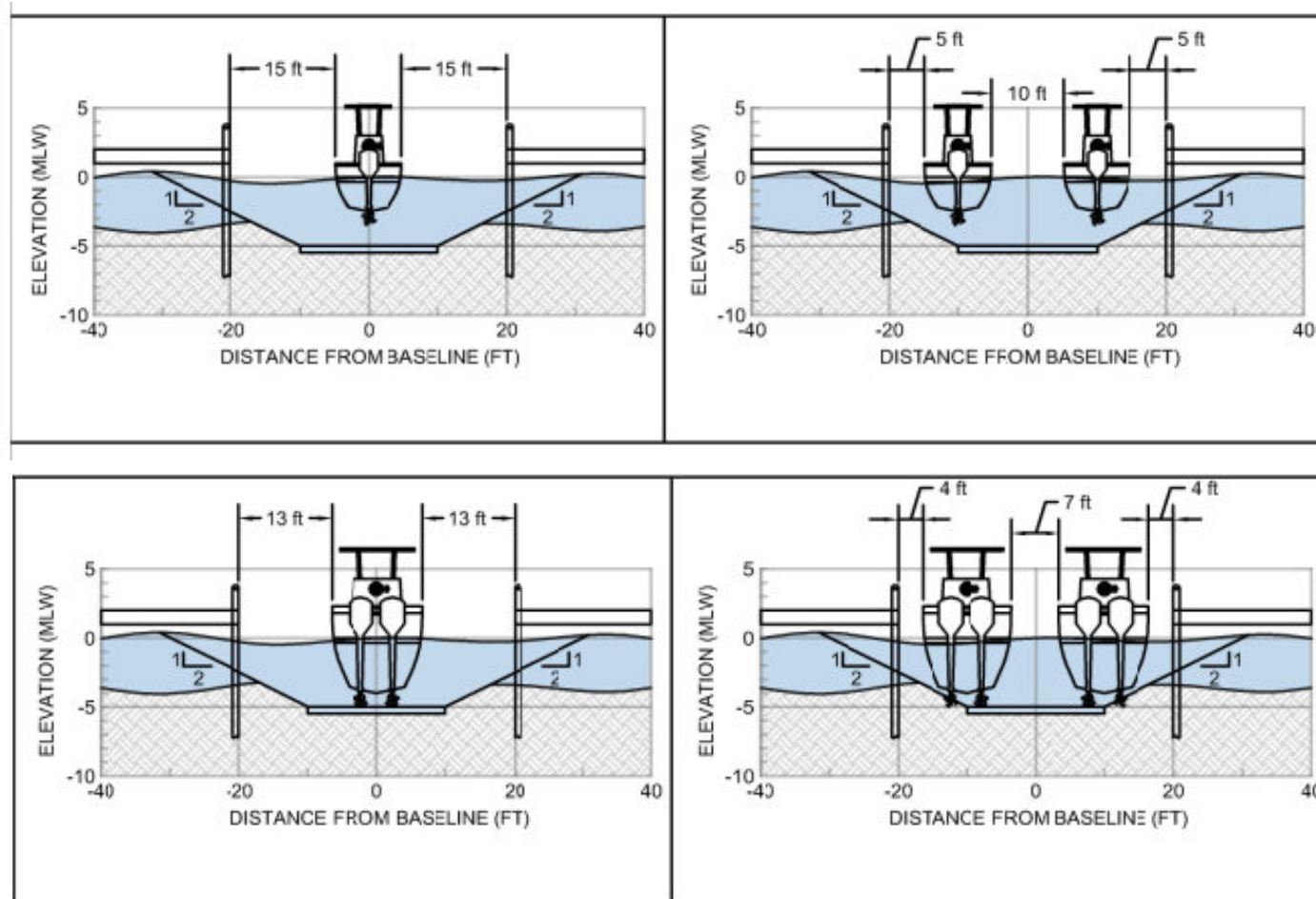
Maintenance Plan Cost Reduction Table

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.



End of Agenda Item