

HOUSTON SHIP CHANNEL EXPANSION

Project 11

Western Dredging Association — Webinar

January 14, 2021



PORT HOUSTON™

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Presenters & Topics



PORT HOUSTON™



Charlie Jenkins
Port Houston &
Project 11 Importance



Captain J.J. Plunkett
Houston Pilots
Perspective



Dana Cheney
Joint Venture
Segments 1-2 Design



Neil McLellan
HDR Engineering
Segments 3-4 Design

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Port Houston: Who We Are



PORT HOUSTON™

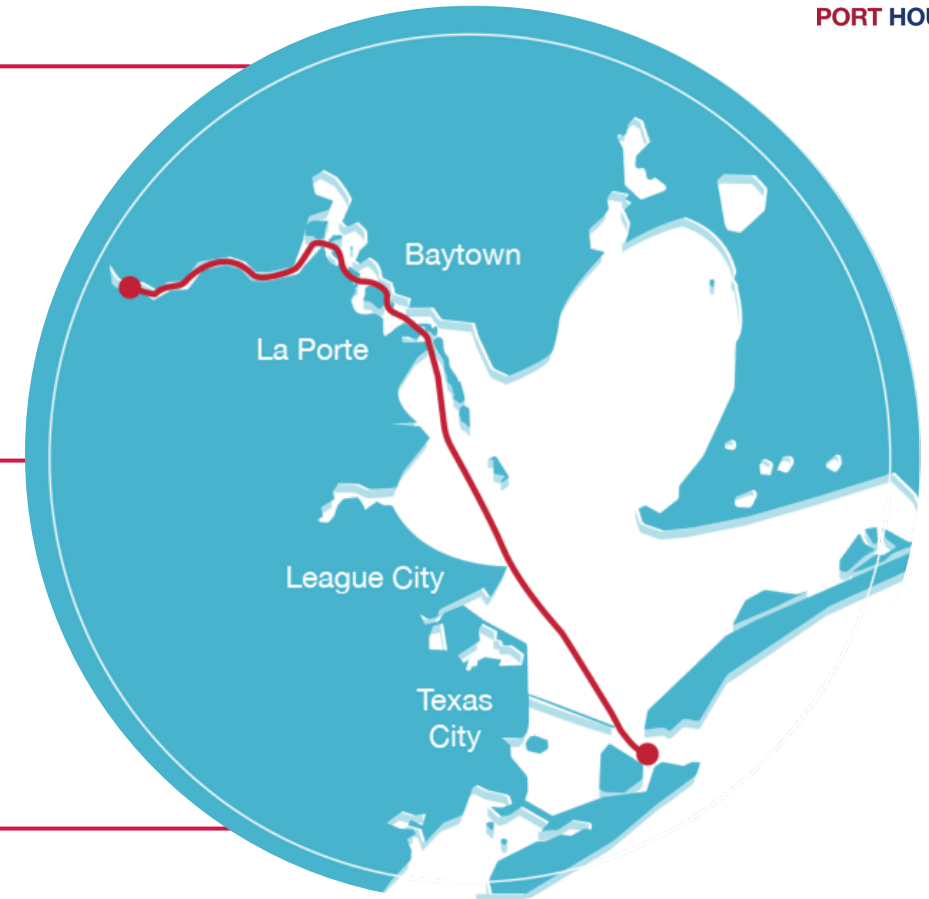
We manage eight public terminals — including two container terminals



As the **non-federal sponsor of the Houston Ship Channel**, the nation's busiest waterway, we support the nearly 200 facilities along it



We help facilitate vital commerce through the port that keeps local, state, and national economy moving



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History



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1911

Harris County Houston Ship Channel Navigation District



1925

US Army Corps of Engineers dredges channel to 30 feet



2005 Project 10 completed



To better serve manufacturing industries, the channel is deepened to 45 feet and widened to 530 feet through Galveston Bay, plus environmental restoration projects are constructed with dredged material.

1914 Project 6 completed

The port officially opens to deep-draft vessels



1935 Project 7 completed

Refining facilities drive the need to expand, this time to 400 feet wide



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Houston Ship Channel Impact



1.35 Million
Jobs in Texas



3.2 Million
Jobs Nationwide



\$339 Billion
Economic Impact
in Texas



\$802 Billion
Economic Impact
Across the U.S.

**PORT
FACTS**

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The Energy Capital of the World



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- The Houston Ship Channel has the largest **petrochemical** complex in the U.S.
- Houston also has the largest **energy pipeline and storage** network in the U.S.
- **500 million barrels** of liquid storage along the HSC
- A total of **69% of cargo** on Houston Ship Channel is liquid bulk



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By the Numbers



U.S. Port by Foreign Waterborne Tonnage
– 169.9M Tons

The U.S. Coastal and Inland Navigation System

2019 Transportation Facts & Information



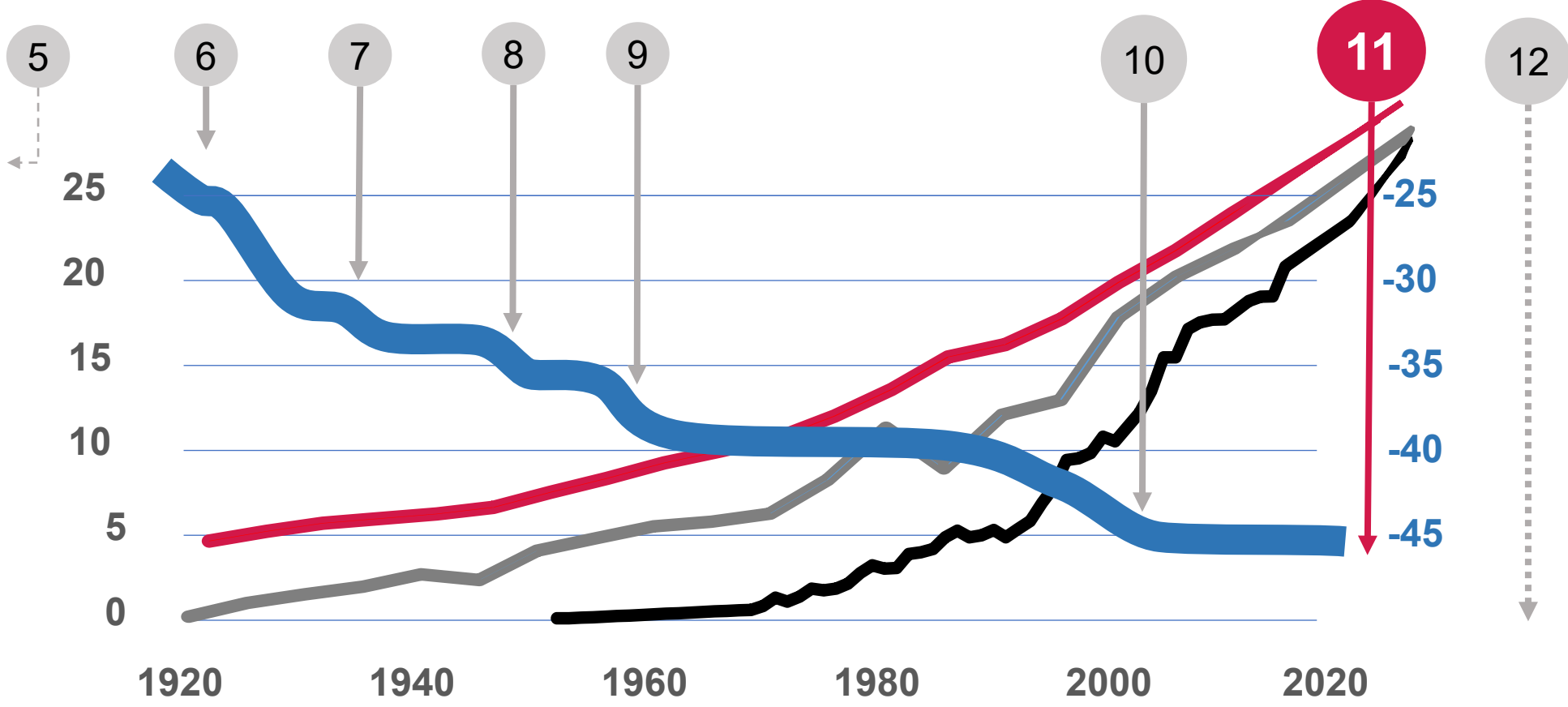
Navigation and Civil Works
Decision Support Center
U.S. Army Corps of Engineers

Leading U.S. Ports in 2019
(Millions of Short Tons and Percent Change¹ from 2018)

| Rank | Type ³ | Port | Domestic | | Foreign | | Total ² | |
|------|-------------------|----------------------------------|----------|-------|---------|-------|--------------------|-------|
| | | | Tons | % | Tons | % | Tons | % |
| 1 | C | Houston Port Authority, TX | 75.2 | -3.4 | 209.8 | 9.8 | 284.9 | 6.0 |
| 2 | C | South Louisiana, LA, Port of | 122.3 | -8.7 | 115.6 | -18.3 | 238.0 | -13.6 |
| 3 | C | New York, NY & NJ | 45.3 | -2.8 | 91.3 | -2.5 | 136.6 | -2.6 |
| 4 | C | Corpus Christi, TX | 25.8 | 6.4 | 85.4 | 23.4 | 111.2 | 19.0 |
| 5 | C | Beaumont, TX | 36.9 | -3.9 | 64.2 | 3.8 | 101.1 | 0.8 |
| 6 | C | New Orleans, LA | 48.2 | -2.7 | 44.0 | 0.4 | 92.2 | -1.2 |
| 7 | C | Port of Long Beach, CA | 9.5 | -8.1 | 71.2 | -6.6 | 80.7 | -6.8 |
| 8 | C | Port of Greater Baton Rouge, LA | 43.4 | -8.0 | 30.0 | -14.4 | 73.4 | -10.7 |
| 9 | C | Port of Los Angeles, CA | 6.8 | -15.3 | 56.3 | -6.0 | 63.0 | -7.1 |
| 10 | C | Virginia, VA, Port of | 4.5 | -0.9 | 57.2 | -14.9 | 61.7 | -14.0 |
| 11 | C | Lake Charles Harbor District, LA | 31.8 | 0.0 | 26.3 | 0.0 | 58.0 | 0.0 |
| 12 | C | Mobile, AL | 19.7 | -10.9 | 37.2 | 1.9 | 56.9 | -3.0 |
| 13 | C | Plaquemines Port District, LA | 29.0 | -6.9 | 23.8 | -7.5 | 52.8 | -7.2 |
| 14 | C | Baltimore, MD | 6.6 | -9.1 | 37.6 | 0.3 | 44.2 | -1.2 |
| 15 | C | Port of Savannah, GA | 0.9 | -18.4 | 41.0 | 2.2 | 41.9 | 1.6 |
| 16 | C | Texas City, TX | 16.7 | 0.0 | 24.6 | 0.0 | 41.3 | 0.0 |
| 17 | I | Huntington-Tristate, KY, OH, WV | 36.8 | 7.4 | ** | 0.0 | 36.8 | 7.4 |
| 18 | I | Cincinnati-Northern KY, Ports of | 36.6 | -5.1 | ** | 0.0 | 36.6 | -5.1 |
| 19 | C | Port Arthur, TX | 11.3 | 3.7 | 22.7 | -21.8 | 33.9 | -14.8 |
| 20 | L | Duluth-Superior, MN and WI | 26.4 | -1.5 | 7.4 | -11.6 | 33.7 | -3.9 |
| 21 | I | St. Louis, MO and IL | 31.3 | -16.5 | ** | 0.0 | 31.3 | -16.5 |
| 22 | C | Tampa Port Authority, FL | 18.1 | -3.6 | 11.9 | -2.5 | 30.0 | -3.2 |
| 23 | C | Port Freeport, TX | 3.9 | -14.8 | 26.0 | 24.3 | 29.8 | 17.3 |
| 24 | C | Richmond, CA | 7.3 | -17.8 | 21.2 | 15.2 | 28.5 | 4.5 |
| 25 | C | Jackson County Port, MS | 8.8 | -10.1 | 17.0 | -3.0 | 25.8 | -5.5 |
| 26 | C | Valdez, AK | 24.3 | -5.1 | 0.9 | 268.5 | 25.2 | -2.4 |
| 27 | C | Port of Charleston, SC | 2.0 | -2.2 | 22.6 | -0.8 | 24.6 | -0.9 |
| 28 | C | Port Everglades, FL | 13.4 | 0.3 | 10.6 | -9.2 | 24.0 | -4.1 |
| 29 | C | Seattle, WA | 5.3 | -5.4 | 17.7 | -13.4 | 23.0 | -11.7 |
| 30 | I | Pittsburgh, PA Port of | 21.8 | 1.0 | ** | 0.0 | 21.8 | 1.0 |
| 31 | C | Tacoma, WA | 4.3 | 33.8 | 17.2 | -12.4 | 21.5 | -5.9 |
| 32 | C | Port of Portland, OR | 7.1 | -5.8 | 12.2 | -22.0 | 19.4 | -16.7 |
| 33 | C | Port of Oakland, CA | 1.8 | 0.0 | 17.6 | 0.0 | 19.3 | 0.0 |
| 34 | C | Paulsboro, NJ | 6.7 | 43.4 | 11.7 | 2.4 | 18.4 | 14.2 |
| 35 | C | Jacksonville, FL | 7.7 | -6.8 | 10.0 | 3.0 | 17.7 | -1.5 |
| 36 | C | Port of Kalama, WA | 1.7 | 59.5 | 15.4 | 4.1 | 17.0 | 7.8 |
| 37 | L | Two Harbors, MN | 13.4 | 0.1 | 3.5 | -8.2 | 16.9 | -1.7 |
| 38 | C | Marcus Hook, PA | 8.6 | 22.7 | 8.1 | 56.0 | 16.7 | 36.8 |
| 39 | C | Philadelphia Regional Port, PA | 7.1 | -32.5 | 9.2 | -42.9 | 16.3 | -38.8 |
| 40 | C | Boston, MA | 5.1 | -1.1 | 10.9 | -1.1 | 16.0 | -1.1 |
| 41 | C | Honolulu, O'ahu, HI | 12.8 | -7.2 | 1.6 | 10.8 | 14.3 | -5.5 |
| 42 | L | Detroit-Wayne County Port, MI | 10.3 | -10.8 | 3.0 | -8.6 | 13.3 | -10.3 |
| 43 | L | Indiana Harbor, IN | 12.2 | 3.7 | ** | -73.6 | 12.2 | 2.5 |
| 44 | I | Mid-America Port Commission | 12.0 | 0.0 | ** | 0.0 | 12.0 | 0.0 |
| 45 | L | Cleveland-Cuyahoga Port, OH | 10.1 | 0.2 | 1.8 | 5.2 | 11.9 | 0.9 |
| 46 | C | Port of Vancouver USA, WA | 2.2 | 71.5 | 8.8 | -5.1 | 11.0 | 4.1 |
| 47 | C | Galveston, TX | 4.9 | 11.3 | 6.1 | 28.6 | 11.0 | 20.3 |
| 48 | C | San Juan, PR | 4.9 | -0.2 | 5.5 | -19.2 | 10.4 | -11.3 |
| 49 | L | Illinois International Port, IL | 8.4 | -44.8 | 1.7 | -1.8 | 10.0 | -40.5 |
| 50 | C | Port of Longview, WA | 1.1 | -7.3 | 8.5 | -31.8 | 9.7 | -29.6 |

Continued on the next panel

Current Effort: Project 11



— Texas Population, Millions (left axis)
 — Container TEU's x 100,000's (left Axis)
— Total POH Cargo x 10 Millions (left axis)
 — Ship Channel Depth, feet (right axis)

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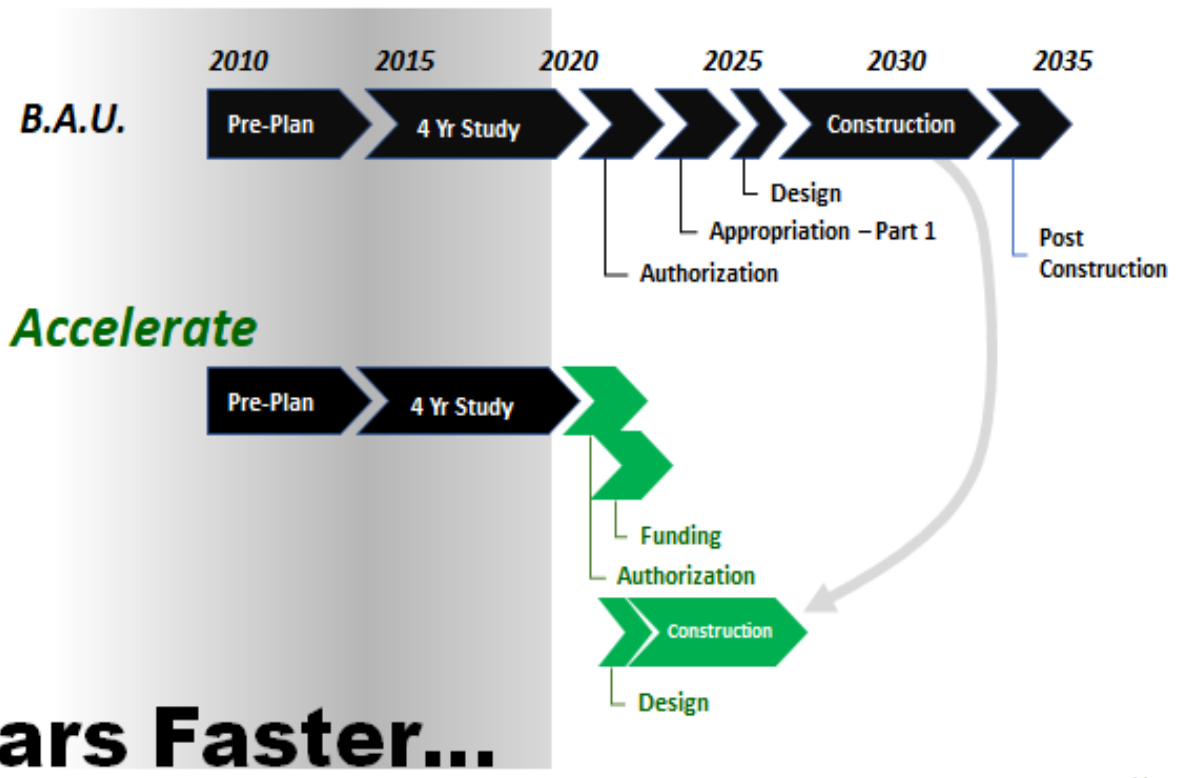
Needed now...Why Wait...?



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- **USACE Feasibility Report shows the project's National Economic Development benefits to be \$80.3 M/yr**
 - \$80.3M x 4 years faster - \$321M in additional project benefits
 - Plus, interest savings during construction of \$23M
 - Total \$344M additional NED Benefits
- **Industry has pledged to contribute 50/50 with Port Houston to accelerate the project**
 - $\$960\text{M}/2 = \$480/4$ year acceleration = \$120M per year or \$10M per month
 - Does not include their profit....

Why Wait...?



4 Years Faster...

Success Requires Partnerships and Collaboration



Industry



Community



State and Federal Agencies



Port



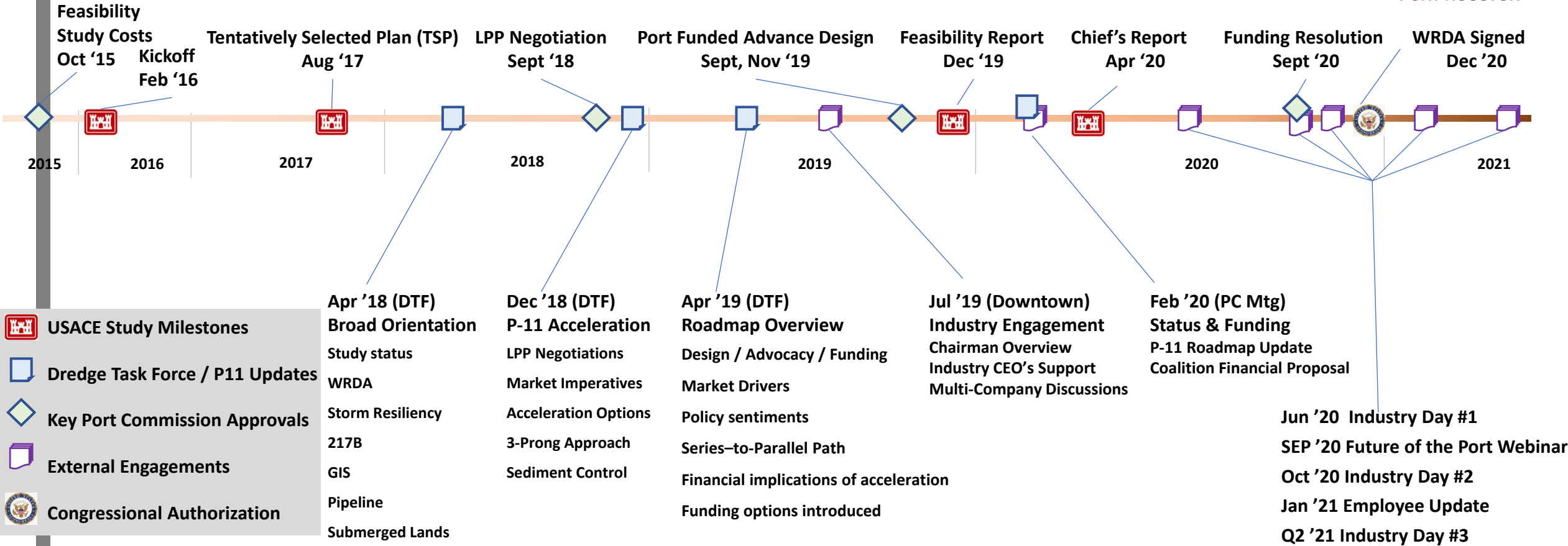
Corps

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HSC Project Overview



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- USACE Study Milestones
- Dredge Task Force / P11 Updates
- Key Port Commission Approvals
- External Engagements
- Congressional Authorization

Charting a New Course



- ERDC Service Agreement (Done)
- PED New Start Investment Decision (Done)
- 221 WIK Credit (Done)
- Project Management Plan (Done)
- Design Agreement (Done)
- PED Contributed Funds Agreement (Done)
- 95% Design, Segment 1-4 (Done)
- Construction Agreement (In Development)
- Project Partnership Agreement (In Development)
- Procurement Strategy (In Development)



Houston Ship Channel Proposed Improvements



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Bolivar Roads to Redfish

1A

- Approximately 11.5 miles in length
- Widen Channel to 700 feet
- Bend easings
- Construct bird island
- Mitigate for oyster habitat loss

Redfish to Bayport Ship Channel

1B

- Currently not in the proposed federal plan, so must be built by local interests
- Approximately 8.3 miles in length
- Widen Channel to a minimum of 700 feet
- Bend easings
- Construct marshes and three bird islands in Galveston Bay
- Mitigate for oyster habitat loss

Bayport Ship Channel to Barbours Cut

1C

- *Currently not in the proposed federal plan, so must be built by local interests*
- *Approximately 5 miles in length*
- Widen Channel to 700 feet
- Construct additional marshes
- Mitigate for oyster habitat loss

Bayport Ship Channel

2

- Approximately 4 miles in length
- Widen Channel to approximately 455 feet
- Construct three bird islands and marshes in Galveston Bay
- Mitigate for oyster habitat loss
- Modify channel entrance to reduce shoaling

Barbours Cut Ship Channel

3

- Widen Channel to approximately 455 feet
- Construct additional marshes on Atkinson Island
- Modify channel entrance

Boggy Bayou (BW 8) to Sims Bayou

4

- Widen Channel to approximately 530 feet through Greens Bayou confluence
- Deepen from existing 41 feet to 46.5 feet from Boggy Bayou to Hunting Bayou (last Turning Basin before reaching Washburn Tunnel)

Sims Bayou to IH 610

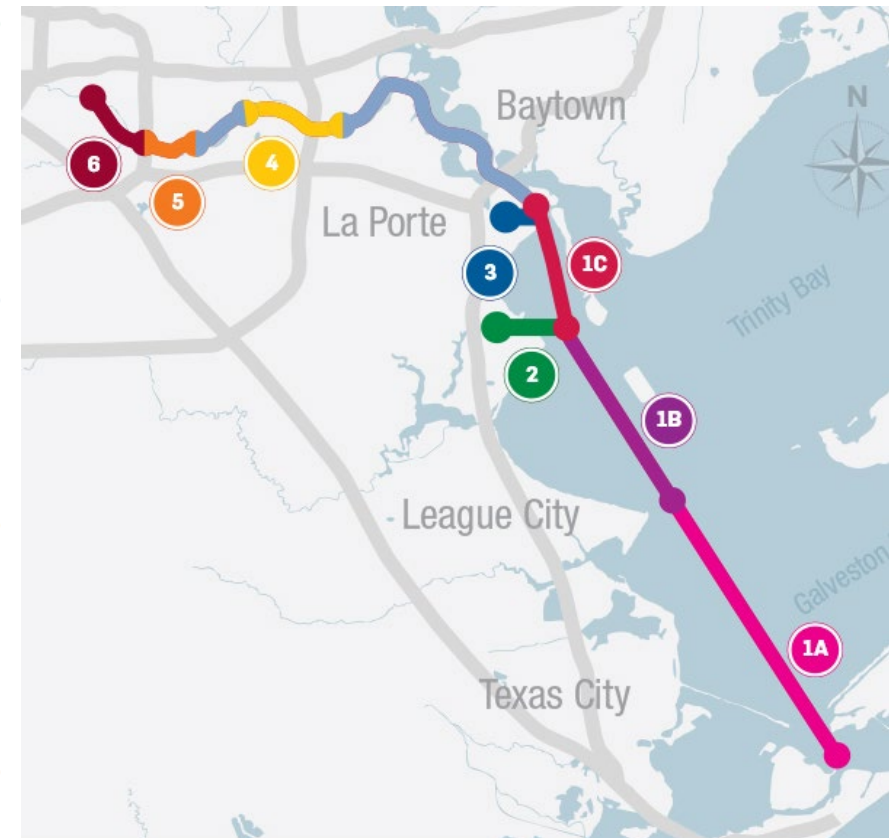
5

- Deepen from existing 37 feet to 41.5 feet

IH 610 to Turning Basin

6

- Deepen from existing 37 feet to potential 39 feet
- Increase Brady Island Turning Basin



— No improvement planned in these areas

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Houston Ship Channel

Proposed Improvements



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| | | Design Package Description | Segment | Design | Award and Construct | |
|--------------|----|---|--|--------|---------------------|-------|
| PORT HOUSTON | 1 | Bolivar Roads to Redfish Reef | • Construct Dollar Reef Oyster beds | 1A | PHA/USACE | USACE |
| | 2 | Boggy Bayou to Sims Bayou | • Prepare Beltway 8 Site | 4 | PHA | PHA |
| | 3 | Bolivar Roads to Redfish | • Dredge Houston Ship Channel to 700-ft wide and relocate barge lanes • Construct two bird islands (New Evia Island II and New Long Bird Island) | 1A | PHA | PHA |
| | 4 | Redfish | • Dredge Houston Ship Channel to 700-ft wide and relocate barge lanes • Offshore material disposal to Ocean Dredged Material Disposal Site (ODMDS) | 1A, 1B | PHA | PHA |
| | 5 | Redfish to Bayport (Beacon 76) | • Dredge Houston Ship Channel to 700-ft wide and relocate barge lanes • Dredge Bayport Ship Channel up to 455-ft wide • Construct New Bird Island Marsh complex and oyster beds | 1B, 2 | PHA | PHA |
| | 6 | Bayport (Beacon 76) to Morgans Point | • Dredge Houston Ship Channel to 700-ft wide and relocate barge lanes • Construct Marsh 11 • Enhancement of Marsh 7/8/9 and Marsh 10 | 1C | PHA | PHA |
| | 7 | Barbours Cut Ship Channel | • Dredge Barbours Cut Ship Channel up to 455-ft wide ○ Barbours Cut Flare Relief ○ Cedar Bayou Sweep ○ Spilman Island & Morgans Point Sheet Pile Wall • Place in newly constructed Marsh Cell 12 | 3 | PHA | PHA |
| | 8 | Boggy Bayou to Hunting Bayou Turning Basin | • Construct Beltway 8 and East-East Clinton placement areas | 4 | PHA | PHA |
| | 9 | | • Dredge Boggy to Greens at 46.5-ft MLLW and 530-feet and Greens to Hunting at existing federal width to 46.5-ft MLLW | 4 | PHA | PHA |
| | 10 | Sims to Turning Basin | • Prepare Glendale Placement Area | 5 | USACE | USACE |
| | 11 | | • Prepare Filterbed Placement Area | 6 | USACE | USACE |
| | 12 | | • Dredge Houston Ship Channel from 37.5 up to 41.5 ft MLLW | 5, 6 | USACE | USACE |

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USACE

Wider is more efficient and safer



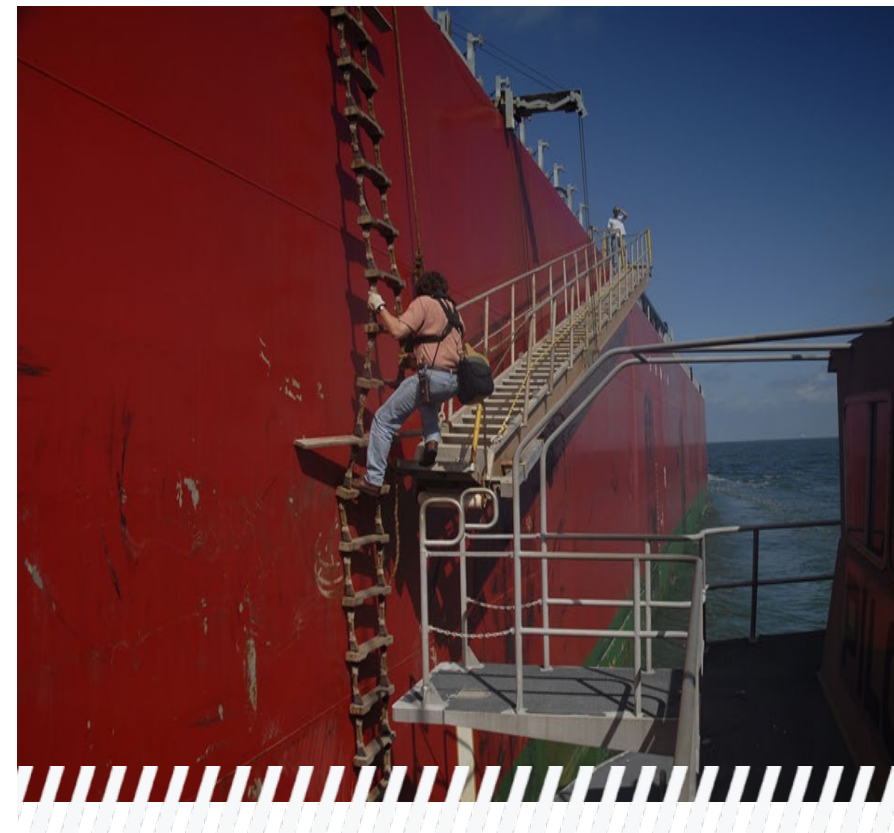
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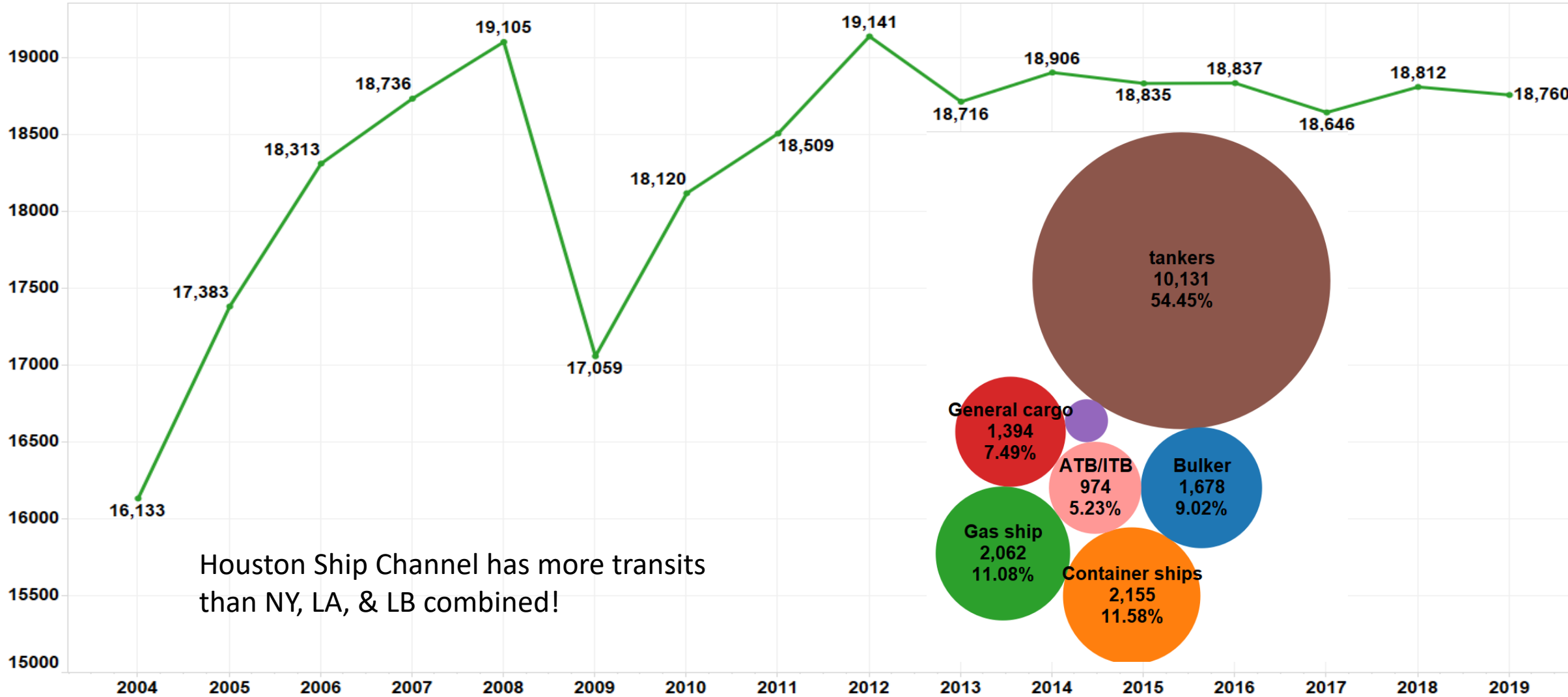
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Who are the Houston Pilots?

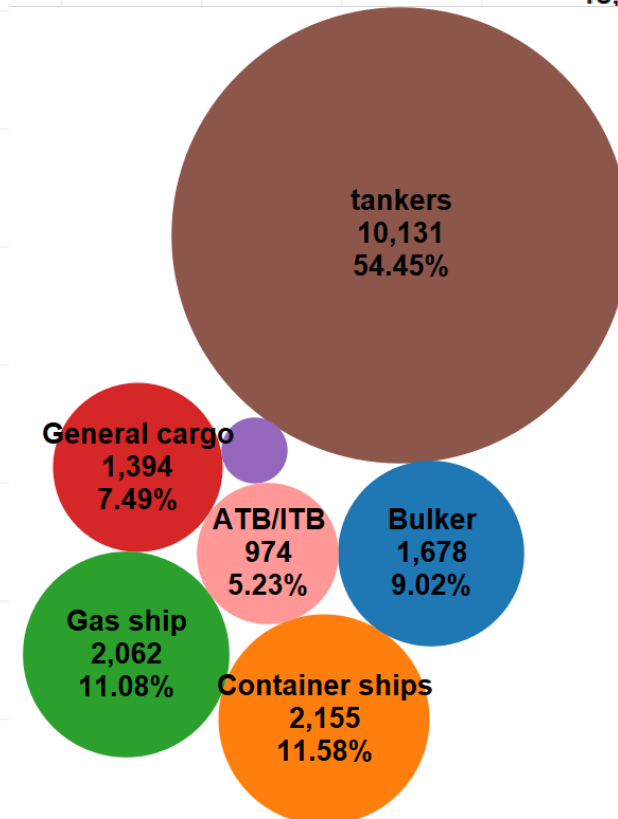
- 99 Pilots, all independent contractors while on vessels
- Membership is 50/80 mix of blue and brown water
- Master mariners with Coast Guard license and State Commission issued by the Governor of Texas
- Required by Texas State Statute to guide deep draft ships into Harris County Ports
- Governed by Pilot Board of Commissioners



Busiest Waterway in the United States!



Houston Ship Channel has more transits than NY, LA, & LB combined!







Pilot Support of Project 11

- Oct/Nov 2017: Feasibility level full mission bridge simulations
- Sept/Oct 2019: Houston Pilot sponsored full mission bridge simulations
- May/June 2020: Preconstruction engineering design level full mission bridge simulations



HP Sponsored Assessment of Channel Widening



Part 1: Background Info

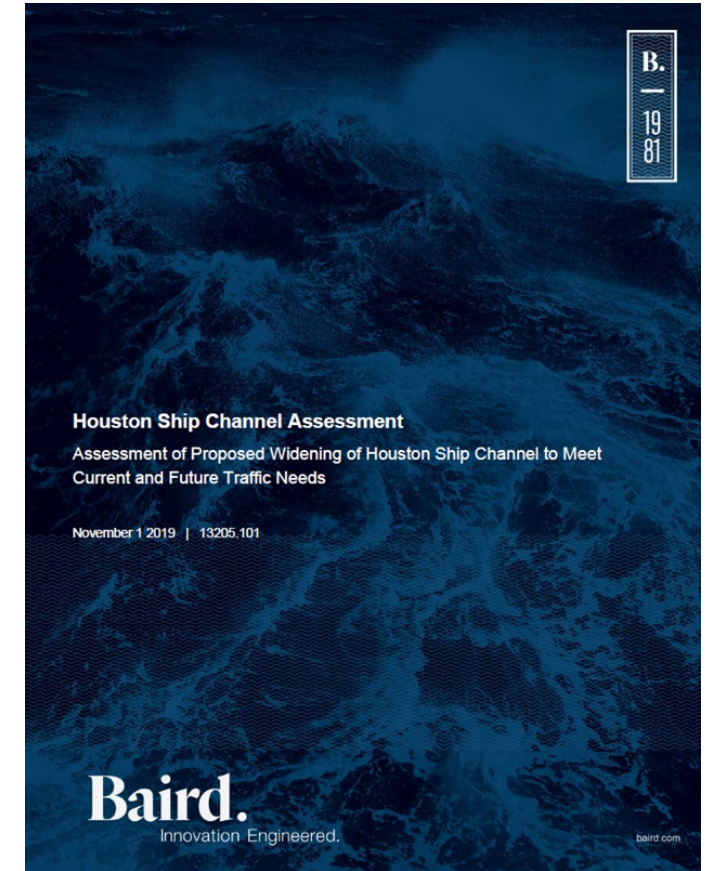
- Comparison to other ports
- Comparison to channel design standards
- Incident review

Part 2: Hazid Study

- Facilitated by PSRG & Baird Engineering
- Scope = 700 ft & 800 ft channel
- Id major accident events
- Assess risk
- Develop mitigations

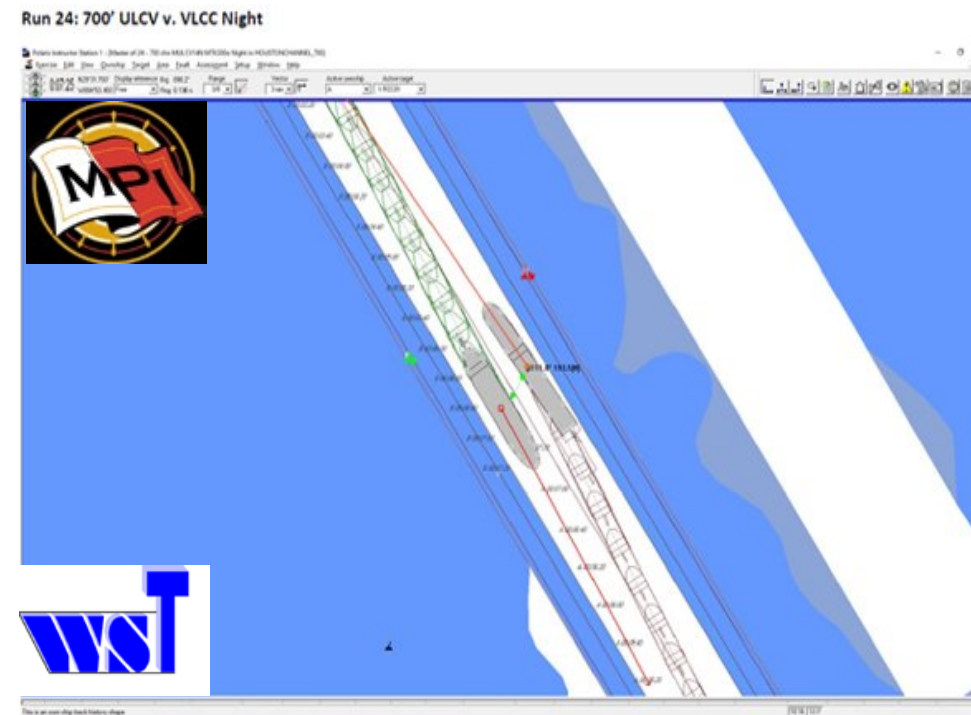
Part 3: Full Mission Bridge Sims

- Ship model vetting & design
- 20 exploratory runs
- 36 double encounter runs
- Qualitative & quantitative outputs



Full Mission Bridge Simulations Overview

- Objective: Evaluate the differences in safely navigating the 700 ft and 800 ft channel variants
- 3 Design vessels:
 - ULCV – 1200 ft x 158 ft x 45 ft
 - VLCC – 1088 ft x 200 ft
 - Suezmax – 900 ft x 164 ft
 - Channel variants: 700 ft vs 800 ft wide mid bay reach
- Night & day runs
- Up to 20 kts of adverse wind & 1.0 kt of current
- 20 exploratory runs (eval various meeting situations, traffic density, wind & current conditions)
- 36 comparative runs with double encounters



Assessment Key Findings

- HSC is narrowest waterway (relative to vessel beam) of major US ports & has the highest level of vessel traffic
- Bank suction forces are the primary hazard on HSC
- In comparing 2 channel widths, ship to ship distances remain constant, but wider channel allows for greater ship to bank distances.
- Most important safety metric was recovery angle and distance from the ship's stern quarter to the bank

Figure 4: Two vessels at the onset of a meet

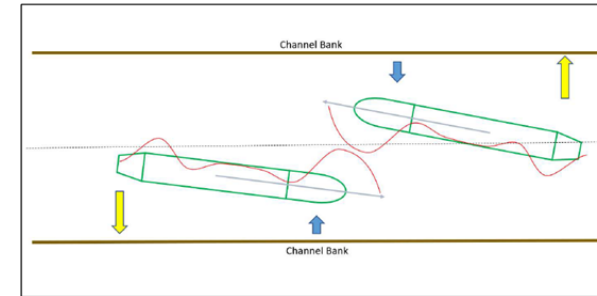


Figure 5: Two vessels parallel during a meet

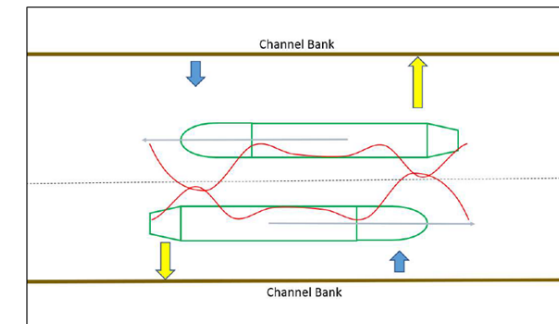
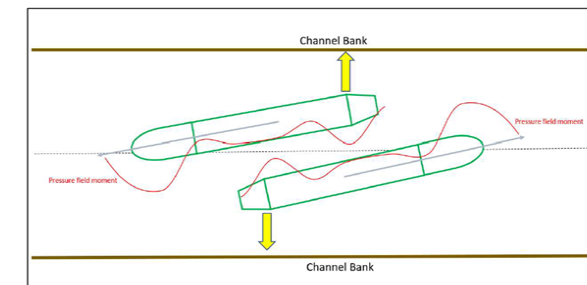


Figure 6: Two vessels returning to track after a meet



Improved channel "value proposition" to stakeholders



- Increase combined beam meeting rule from 310 to 340 ft
- Move daylight restriction from Bolivar Roads to Morgans Point
- Container vessels over 1,000 ft LOA will move 24 hours a day.



Houston Ship Channel Mainstem, Galveston Bay & Bayport Ship Channel



Houston Ship Channel Mainstem, Galveston Bay

Widen existing 530-foot-wide by 46-foot MLLW deep channel to a 700-foot-wide channel with relocation of the 230-foot wide by 13-foot MLLW deep barge lanes from Bolivar Roads to Morgans Point on both sides of the channel.

Bayport Ship Channel

Widen the existing 350/400-foot-wide by 46-foot MLLW deep channel to a uniform 455-foot-wide channel all to the north.

- All dredged materials with construction capability will be used beneficially for oyster reef, bird island, and marsh creation
- Dredging contracts to achieve the improvements to Segments 1 & 2 are currently planned under 4 contracts (Contracts 3, 4, 5, and 6)
- Dredging options include a combination of hydraulic pipeline, mechanical scow, and hopper dredging
- Depending on timing of Port Procurement and USACE O&M, maintenance dredging of some or part of Segments 1 & 2 will occur during the construction timeline via hopper dredging to be placed in the ODMDS

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Houston Ship Channel Mainstem, Galveston Bay & Bayport Ship Channel



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| Project | Stationing | | | Design Width | Design Depth | Side Slopes | Dredge Volume (CY) | | | Total Volume |
|-----------------|---|-------------------------|-------------|--------------|--------------|----------------|--------------------|---------|-----------|--------------|
| | Station Begin | Station End | Length (LF) | (ft.) | (ft. MLLW) | (H:V) | RD | AM | OD | (CY) |
| C90-D13-P11-003 | BRC STA 2+607.32 | HSC STA 98+000 | 42,976 | 700 | 48 | 3:1 | 1,353,000 | - | 391,000 | 1,744,000 |
| C90-D13-P11-004 | HSC STA 98+000 | HSC STA 78+000 | 20,000 | 700 | 48 | 3:1 | 1,256,000 | - | 280,000 | 1,536,000 |
| | HSC STA 78+000 | HSC STA 57+000 | 21,000 | 700 | 48 | 4:1 | 3,278,000 | - | 280,000 | 3,558,000 |
| | HSC STA 57+000 | HSC RED SIDE STA 47+000 | 10,000 | 700 | 40 | 4:1 | 568,000 | - | - | 568,000 |
| | HSC STA 57+000 | HSC GRN SIDE STA 45+000 | 12,000 | 700 | 30 | 4:1 | 267,000 | - | - | 267,000 |
| C90-D13-P11-005 | HSC STA 57+000 | HSC STA 56+000 | 1,000 | 700 | 48 | 4:1 | 6,090,000 | - | 555,000 | 6,645,000 |
| | HSC STA 56+000 | HSC STA 31+059.92 | 24,940 | 700 | 48 | 3:1 | | | | |
| | HSC STA 31+059.92 | HSC STA 15+500 | 15,560 | 700 | 48.5 | 3:1 | | | | |
| | BSC STA 42+07.80 | BSC STA 222+75.87 | 18,068 | 455 | 48.5 | 3:1 | 1,940,000 | 11,000 | 102,000 | 2,053,000 |
| | BSC STA 48+19.51 | BSC STA 60+00 | 1,440 | 81-231 | 48.5 | 2.5:1 | 380,000 | - | 16,000 | 396,000 |
| | BSC STA 110+00 | BSC STA 122+31.79 | 1,232 | 231 | 48.5 | 2.5:1 | 264,000 | - | 19,000 | 283,000 |
| | BSC STA 211+56.66 | BSC STA 238+37.31 | 2,681 | Flare Varies | 48.5 | 3:01 | 65,000 | 128,000 | 66,000 | 259,000 |
| C90-D13-P11-006 | HSC STA 15+500 | HSC STA -0+003.94 | 20,004 | 700 | 48.5 | 3:1 | 2,845,000 | - | 205,000 | 3,050,000 |
| | HSC STA -0+003.94 = HSC BAYOU STA 00+00 | HSC BAYOU STA 27+48.18 | 2,748 | 700-530 | 48.5 | 3:1 | 191,000 | - | 13,000 | 204,000 |
| | | | | | | Volume Totals: | 18,497,000 | 139,000 | 1,927,000 | 20,563,000 |

RD = Required Depth

AM = Advanced Maintenance

OD = Over Depth

Houston Ship Channel Mainstem, Galveston Bay & Bayport Ship Channel



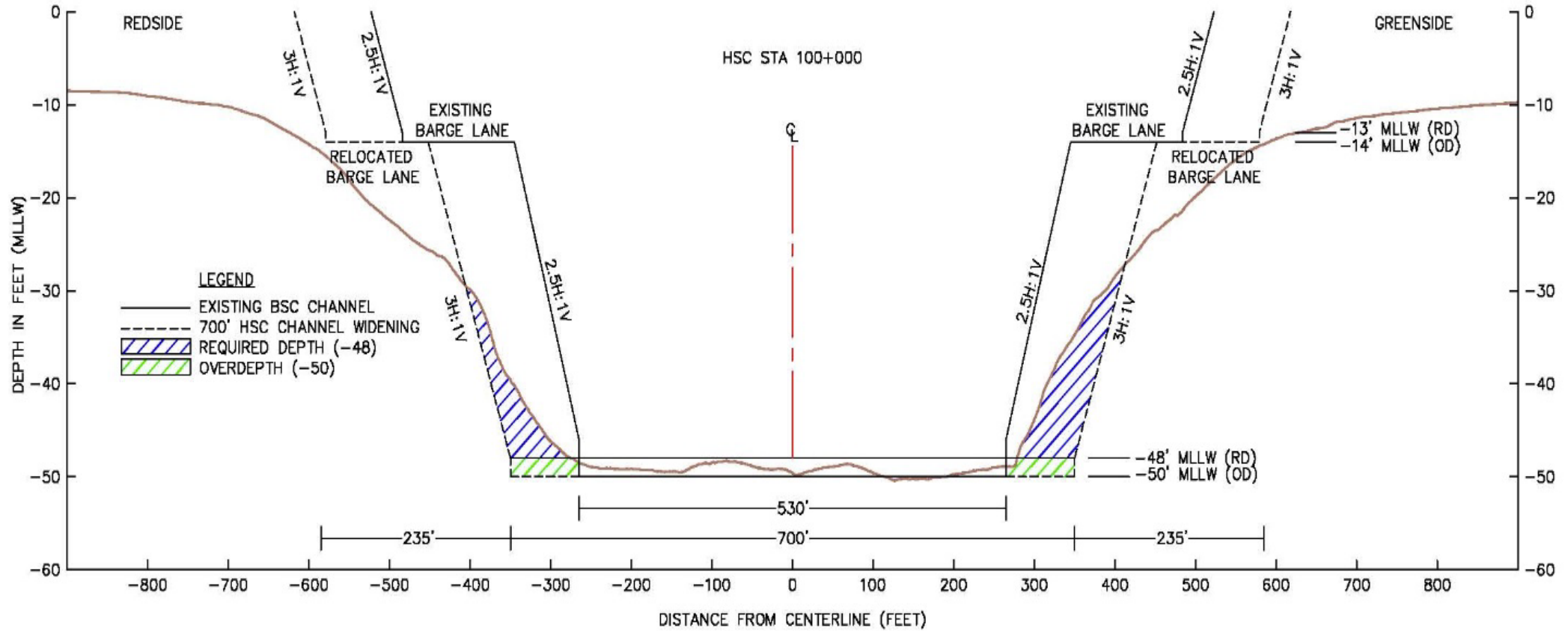
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| Project Number | Project Name | Dredging | Existing PA | New PA |
|-----------------|--|--|-------------------------------------|--|
| C90-D13-P11-003 | Bolivar Roads to Redfish HSC Station 138+369 to HSC Station 98+000 | Widen existing 530-FT HSC to 700-FT from approximate Station 138+369 to 98+000 | | New Long Bird Island |
| C90-D13-P11-004 | Redfish to South Boaters Cut HSC Station 98+000 to HSC Station 45+000 | Widen existing 530-FT HSC to 700-FT from approximate Station 98+000 – 45+000 | ODMDS | |
| C90-D13-P11-005 | South Boaters Cut to Bayport (Beacon 76) HSC Station 57+000 to 15+500 & Bayport Ship Channel Station 238+37.21 to 42+07.80 | Widen existing 530-FT HSC to 700-FT from approximate Station 57+000 – 15+500 Widen existing 4,000-FT BSC Flare to align with 700-FT HSC widening from approximate HSC Station 26+750 to 28+605.05 Widen existing 350/400-FT existing BSC to 455-FT from approximate Station 42+07.80 to 222+75.87 Dredging of BSC Dock 7 (BSC Station 45+59.70 to 60+00) and Dock 1 (BSC Station 110+00 to 122+31.79) | | Bird Island Marsh San Leon Oyster Mitigation Dollar Reef Oyster Mitigation |
| C90-D13-P11-006 | Bayport (Beacon 76) to Morgan's Point HSC Station 15+500 to HSC Station -0+003.94 | Widen existing 530-FT HSC to 700-FT from approximate Station 15+500 to -0+003.94 and HSC Bayou Station 00+00 to 27+48.18 | Dike Rehabilitation of M7/8/9 & M10 | M11 |

Houston Ship Channel, Typical Cross-Section



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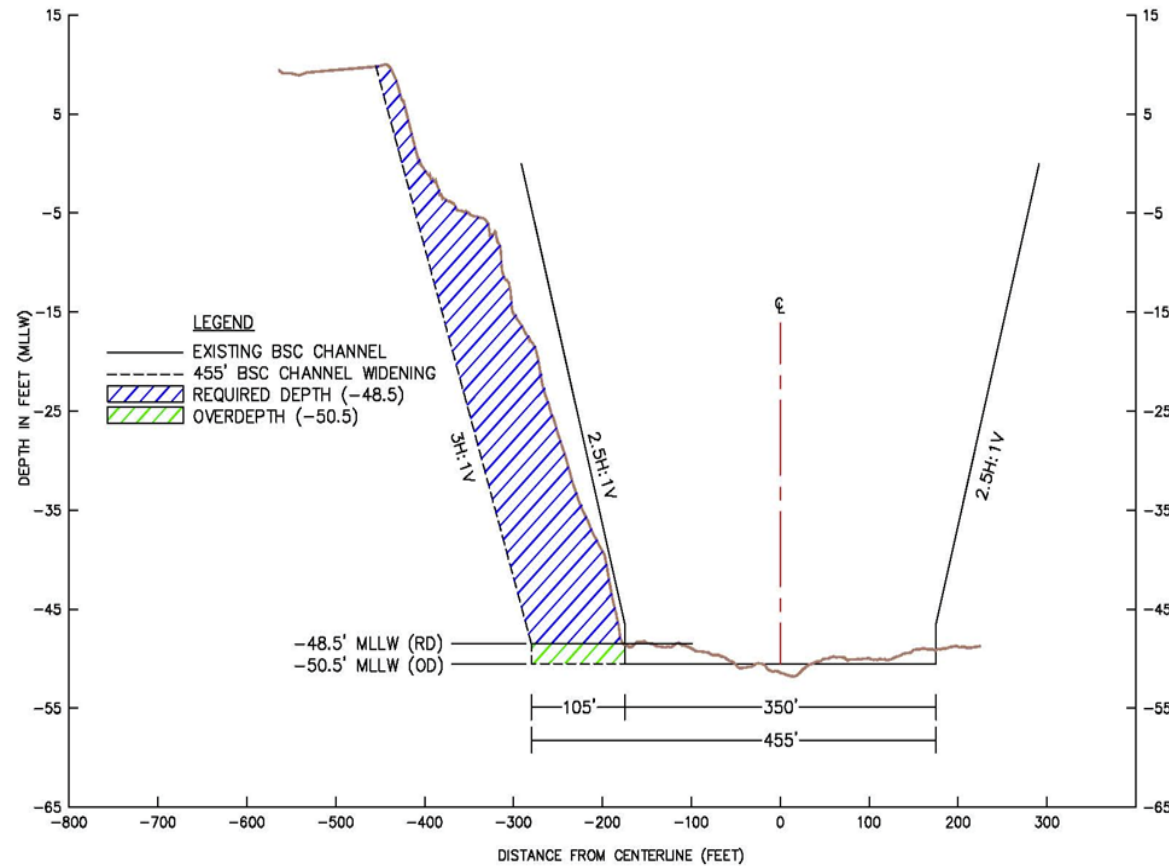


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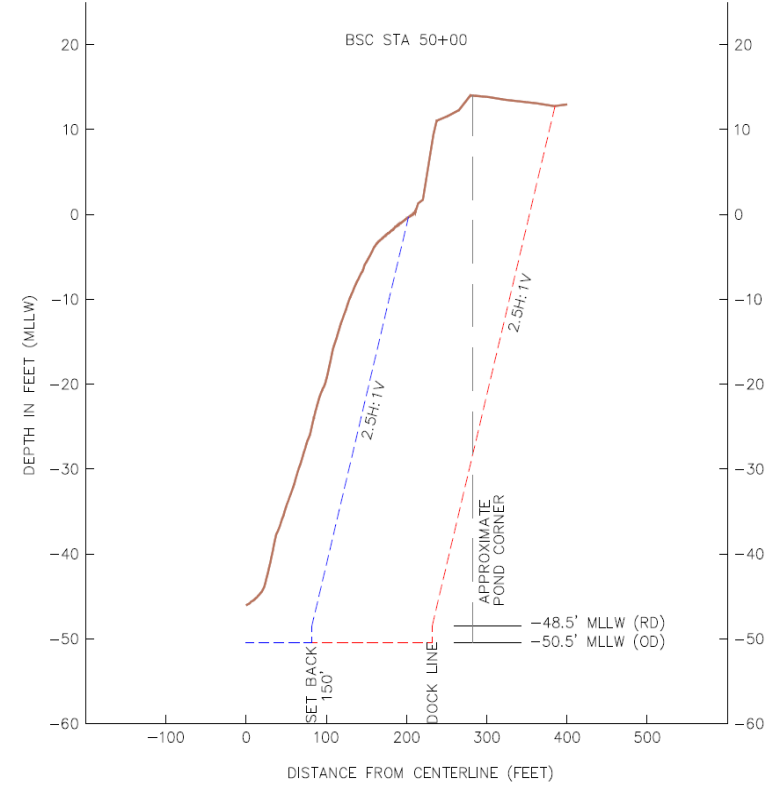
Bayport Ship Channel Widening, Typical Cross-Section



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BSC Typical Channel template

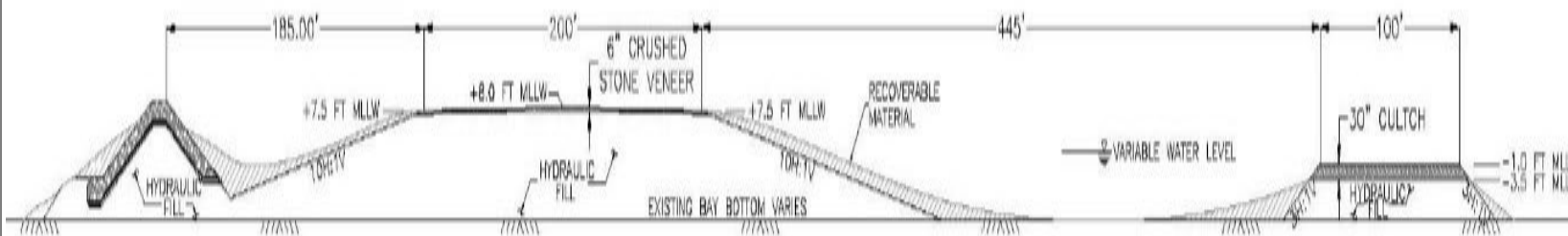
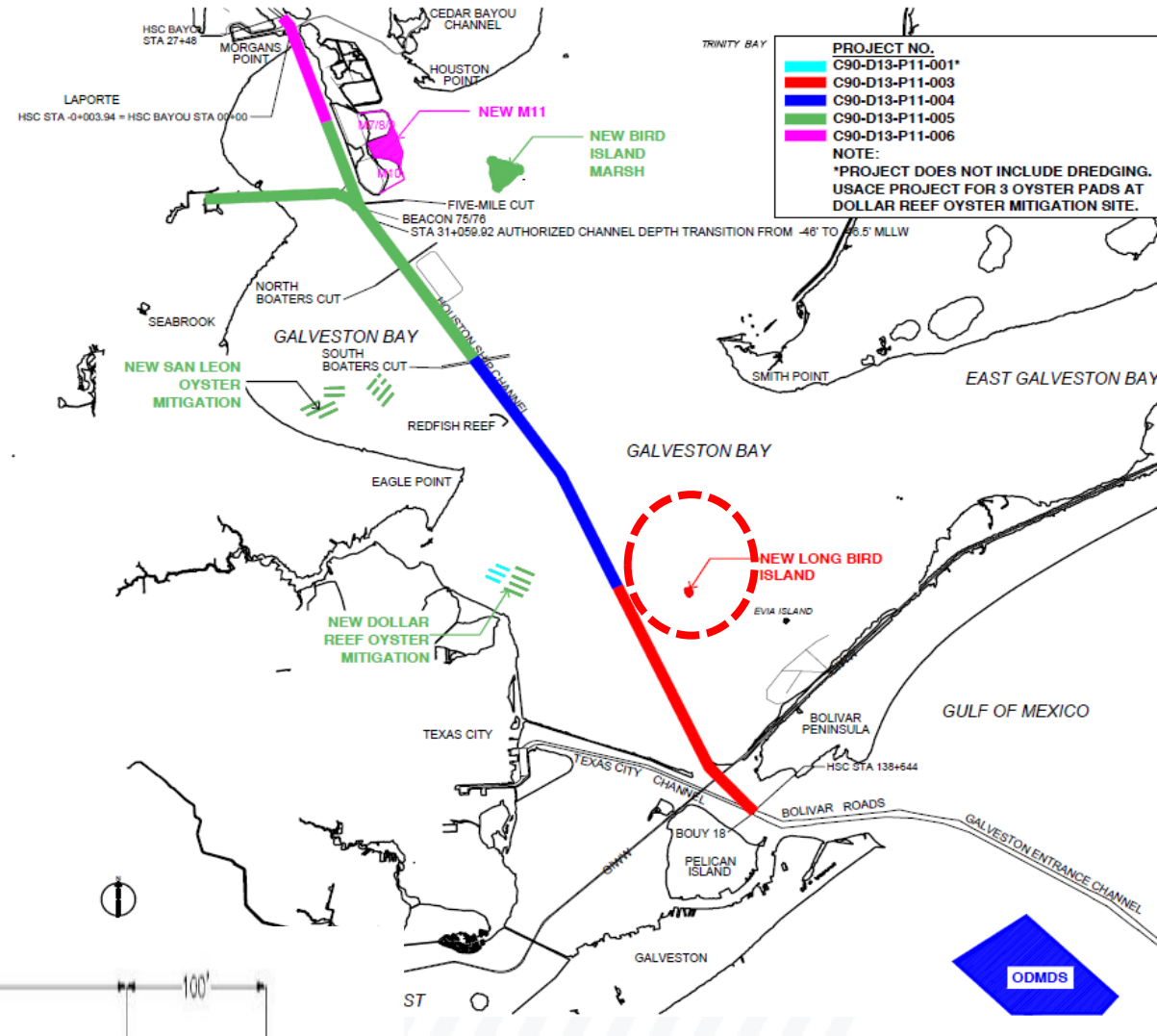


Typical Section of BSC Dock 7 Revised

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Bolivar Roads to Redfish

- Excavate 1.7 MCY of dredged material
- Shoreline protection
 - 31,000 tons of material for armor stone
 - 5,000 tons of blanket stone
- New Long Bird Island Construction
- Oyster Mitigation
 - 18,500 tons of crushed limestone



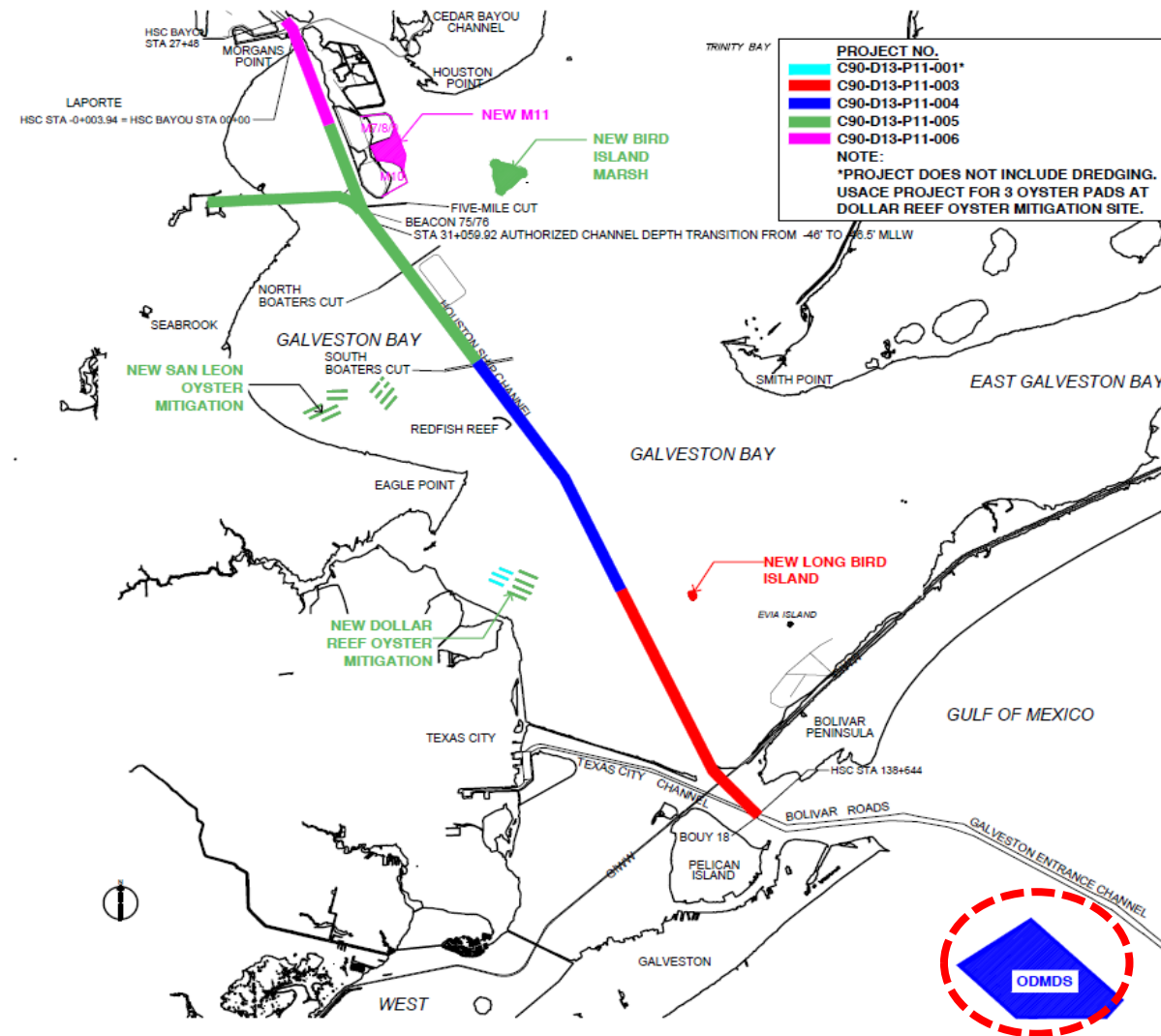
Long Bird Island Typical Section

Redfish

- Full widening template to be dredged and placed at ODMDS from HSC Station 100-000 to 57+000
- Added stripping of material from HSC Station 57+000 to 47+000 to -40 ft MLLW on Red side to ODMDS
- Added stripping of material from HSC Station 57+000 to 45+000 to -30 ft MLLW on Green side to ODMDS



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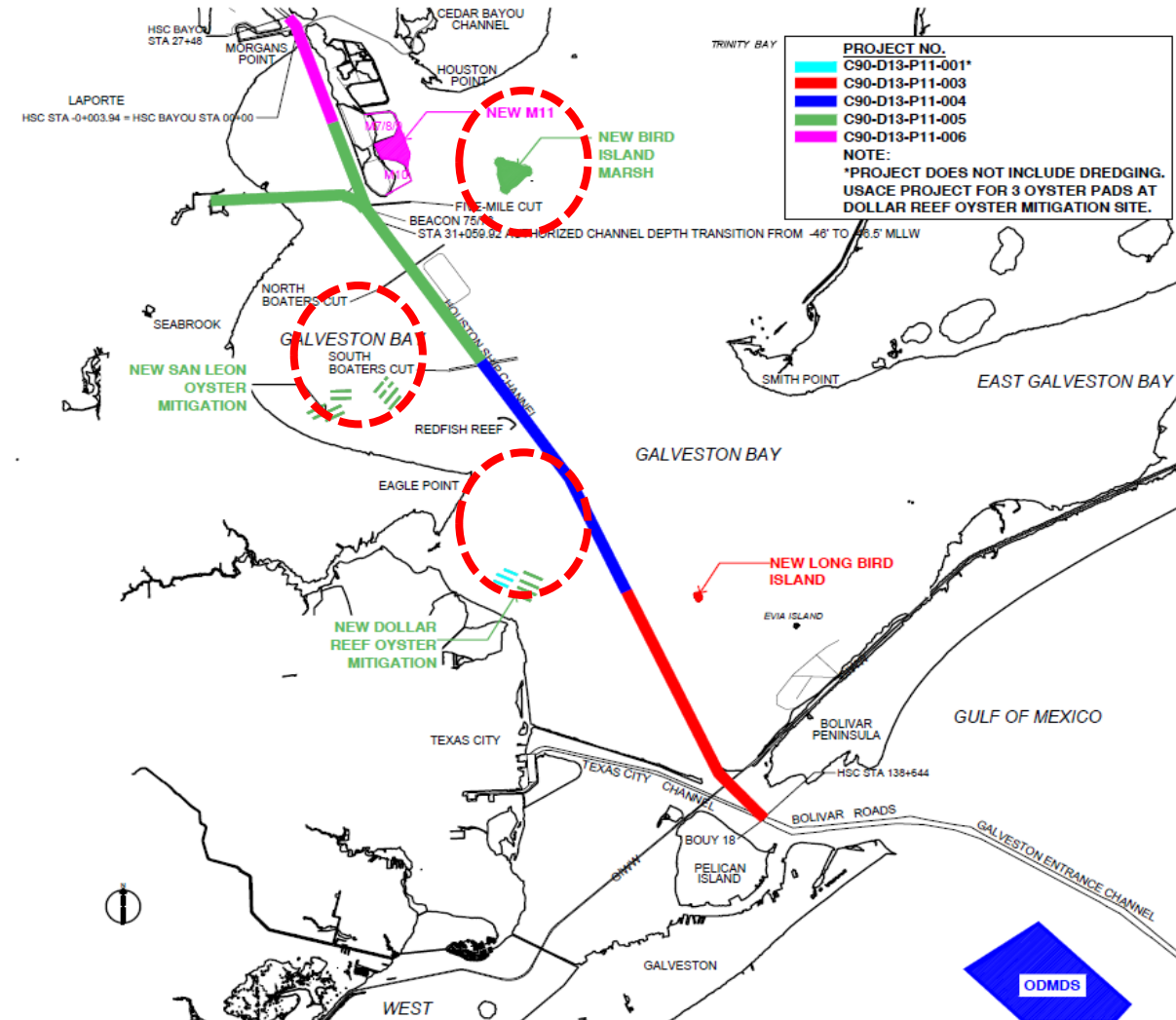


Redfish to Bayport Ship Channel



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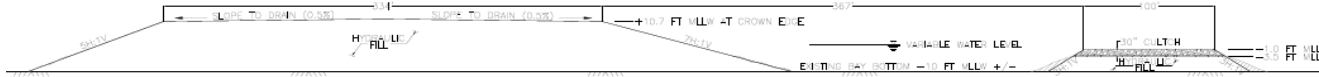
- Excavate 9.6 MCY (6.6 MCY HSC, 3.0 MCY BSC) of dredged material
- Dredge for BSC docks 1 and 7
- Remove and replace shore protection on north side of the BSC
- Construct 240-acre Marsh/Bird Island Complex at Bird Island Marsh (BIM) and oyster reef mitigation pads at Dollar Reef and San Leon
 - 126,000 tons of armor stone for BIM
 - 18,000 tons of bedding stone for BIM
 - 93,000 tons of cultch for oyster wave trips at BIM
 - 425,000 tons of crushed limestone for construction of 20 oyster mitigation pads



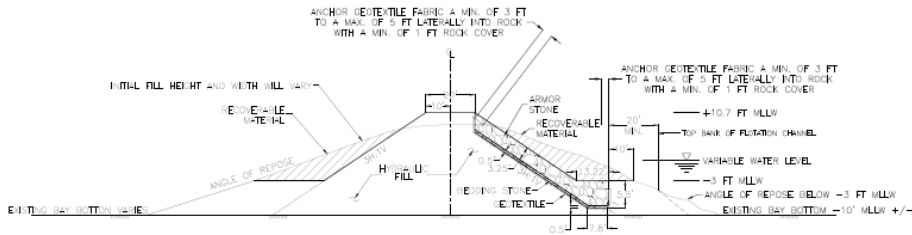
Redfish to Bayport Ship Channel, Continued



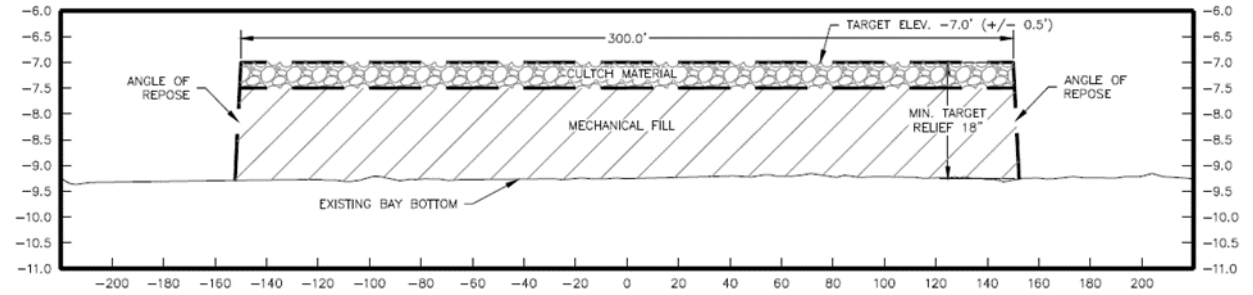
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Bird Island Marsh Island and Wave Trip Typical Section



Bird Island Marsh Dike Typical Section



Mechanical Fill Oyster Pad Typical Section

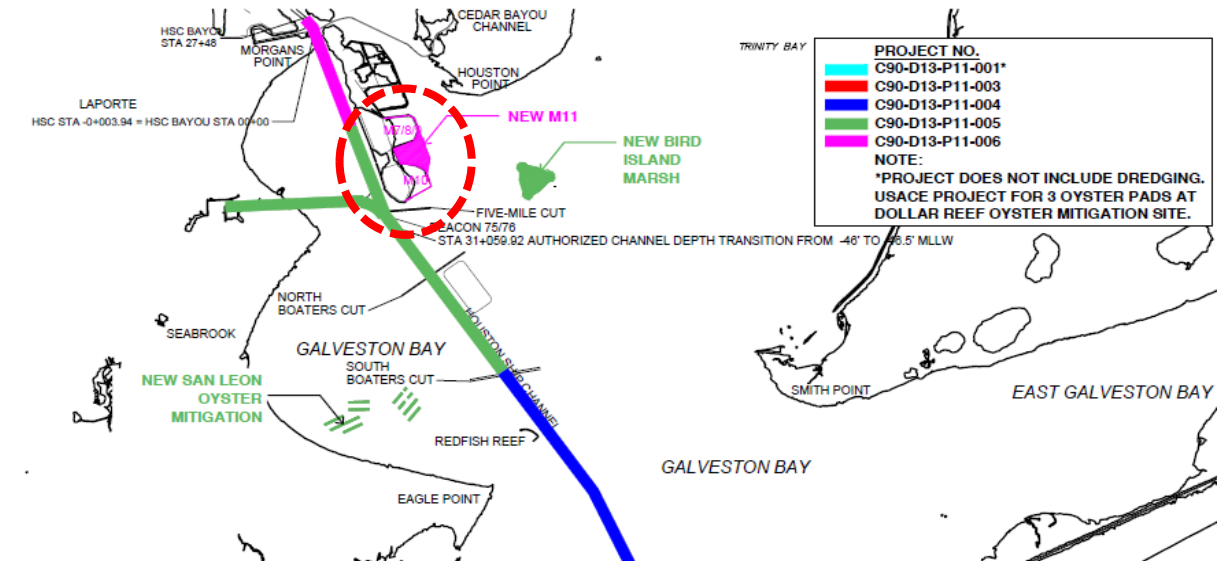


Typical Shore Protection Section at Bird Island Marsh

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Bayport Ship Channel to Morgan's Point

- Channel widening from 530 to 700 feet wide (hydraulic dredging)
- Relocate barge lanes (HSC)
 - Excavate 3.3 MCY of dredged material
- Construct of M11 and repair of existing perimeter dikes at M10 and M7/8/9
 - 133,000 tons of Armor Stone for M7/8/9, M10, and M11
 - 24,000 tons of Blanket stone for M7/8/9, M10, and M11



Challenges

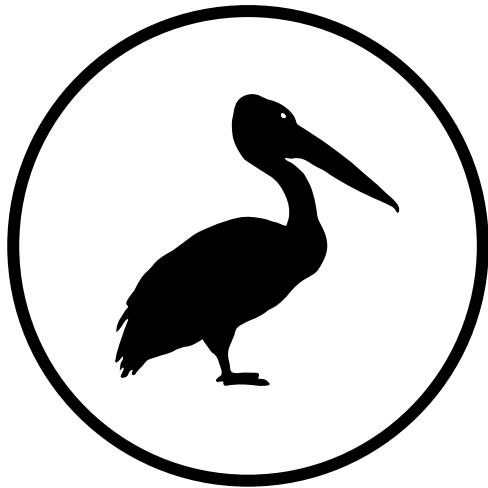


- **Compressed field work, design, procurement and construction schedules.**
- Procurement and management of construction to **maintain 5-mile rule** between dredging operations and managing multiple contracts and contractors at the same time
- **Determining the effectiveness of some of the unique project aspects**, such as the oyster wave trips as design guidance in the engineering manuals and methods have not been updated for Beneficial Use.
- **Balancing immediate cost savings versus long term costs and outward forecasting of changes**, particularly for bulkhead design, pipeline relocations, and shore protection
- Managing multiple **environmental challenges** such as changing of air and water quality rules as well as updates to considerations for endangered species
- **Coordination of disciplines and partnerships** between multiple design teams, experts, agencies, stakeholders, and channel users to find a common ground where the economy, commerce, engineering, and the environment can provide benefit simultaneously.

Environment



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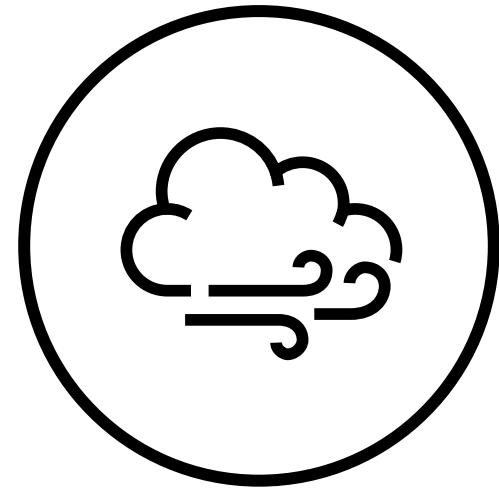
Bird Islands



Oyster Reefs



Marsh



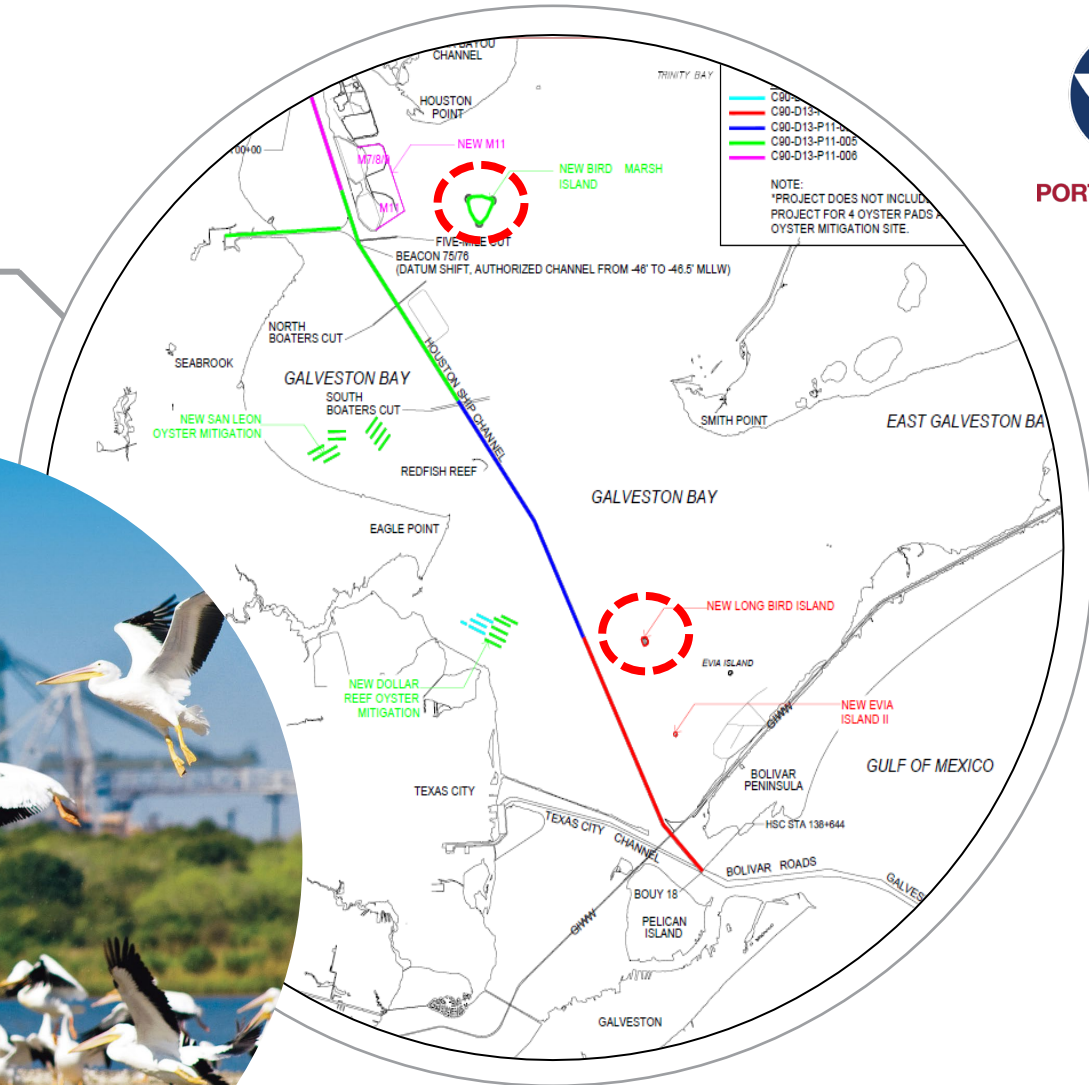
Air Quality



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Bird Islands

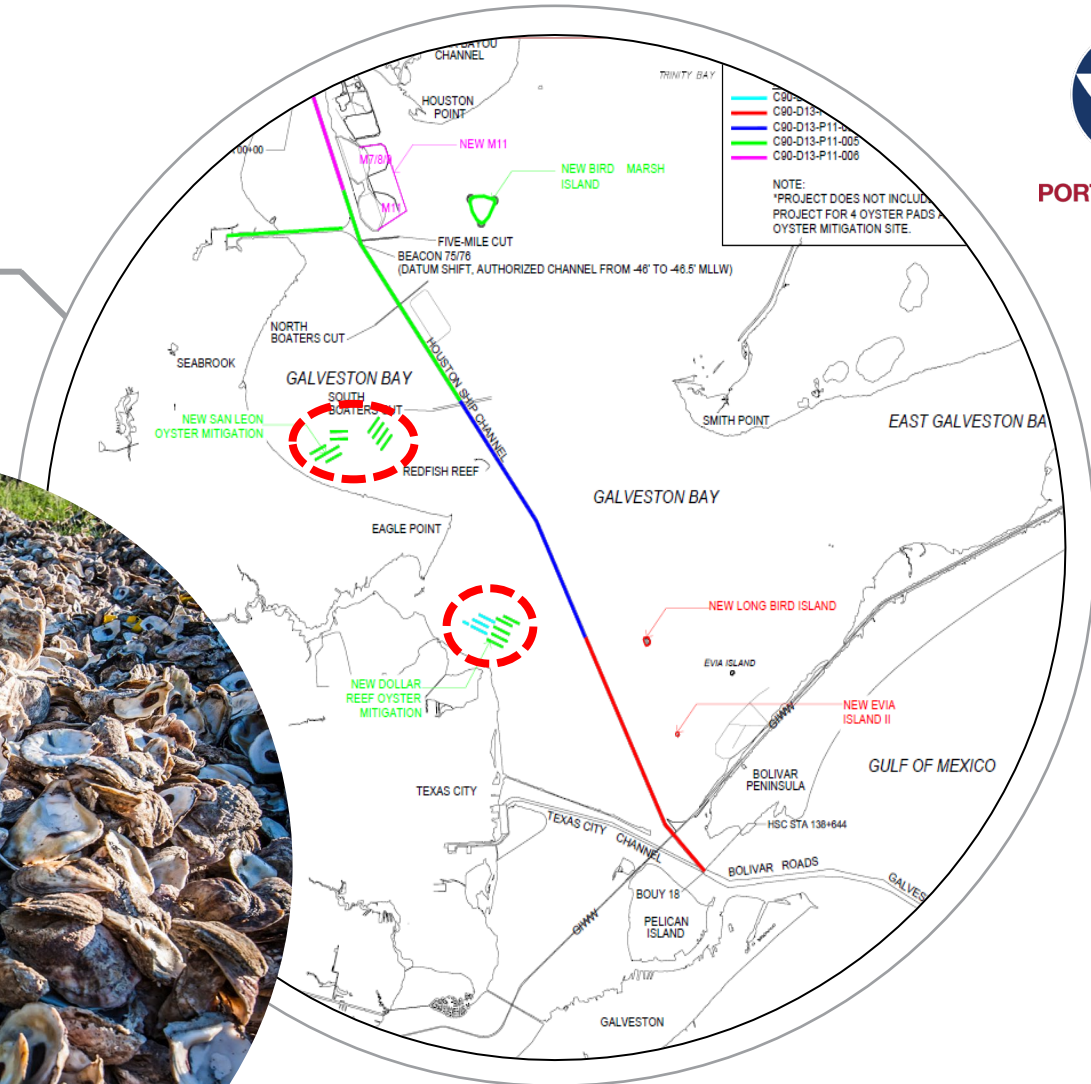
- Four new bird islands:
 - New Bird Island (3) Marsh Complex
 - New Long Bird Island



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Oyster Reefs

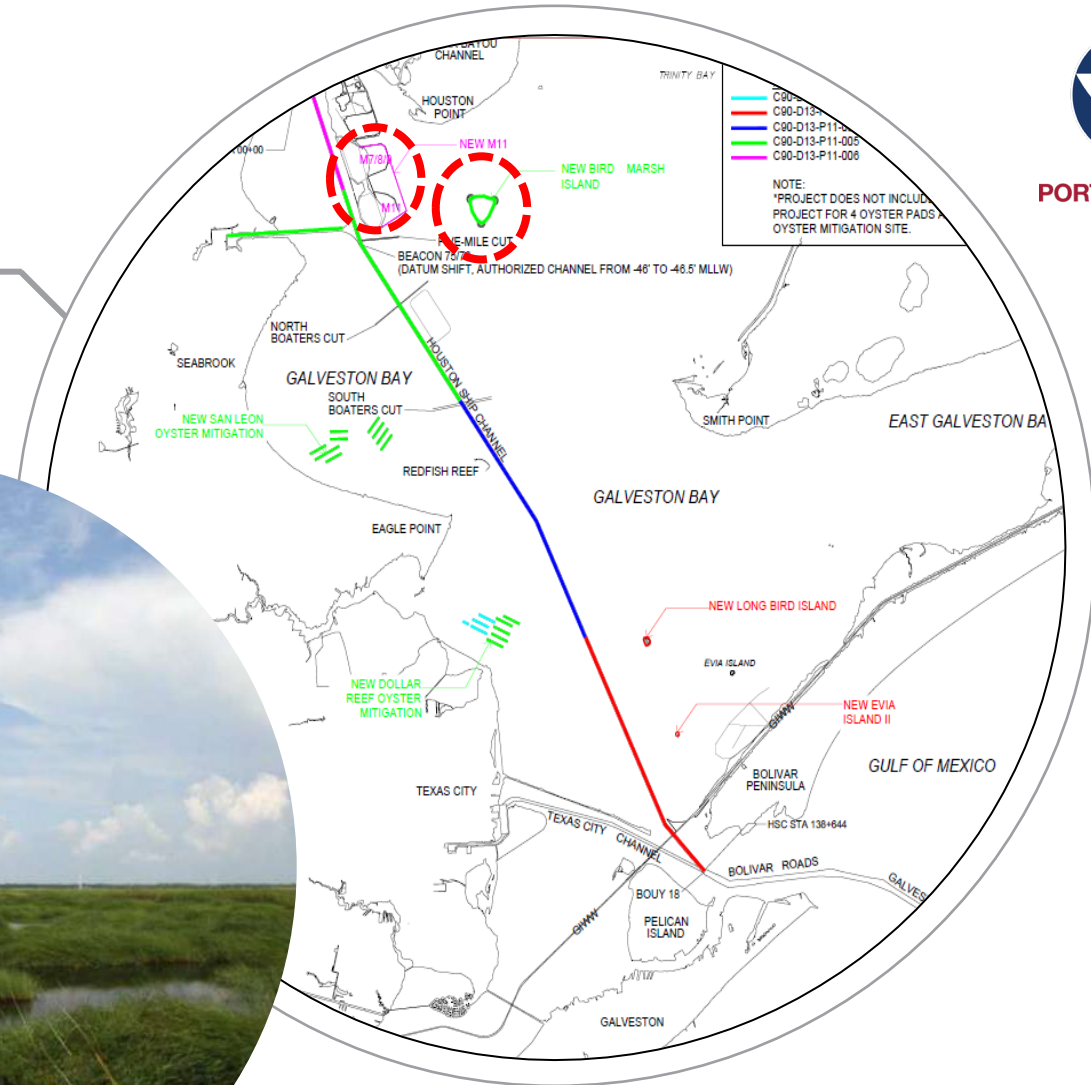
- Up to 350 acres of replacement oyster reef pads
- Two new Oyster Reef Areas:
 - San Leon Reef
 - Dollar Reef



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Marsh

- Provide wetlands and shallow open-water habitat
- New Marsh Area
 - New Bird Island Marsh Complex
 - M11
 - M12



Air Quality

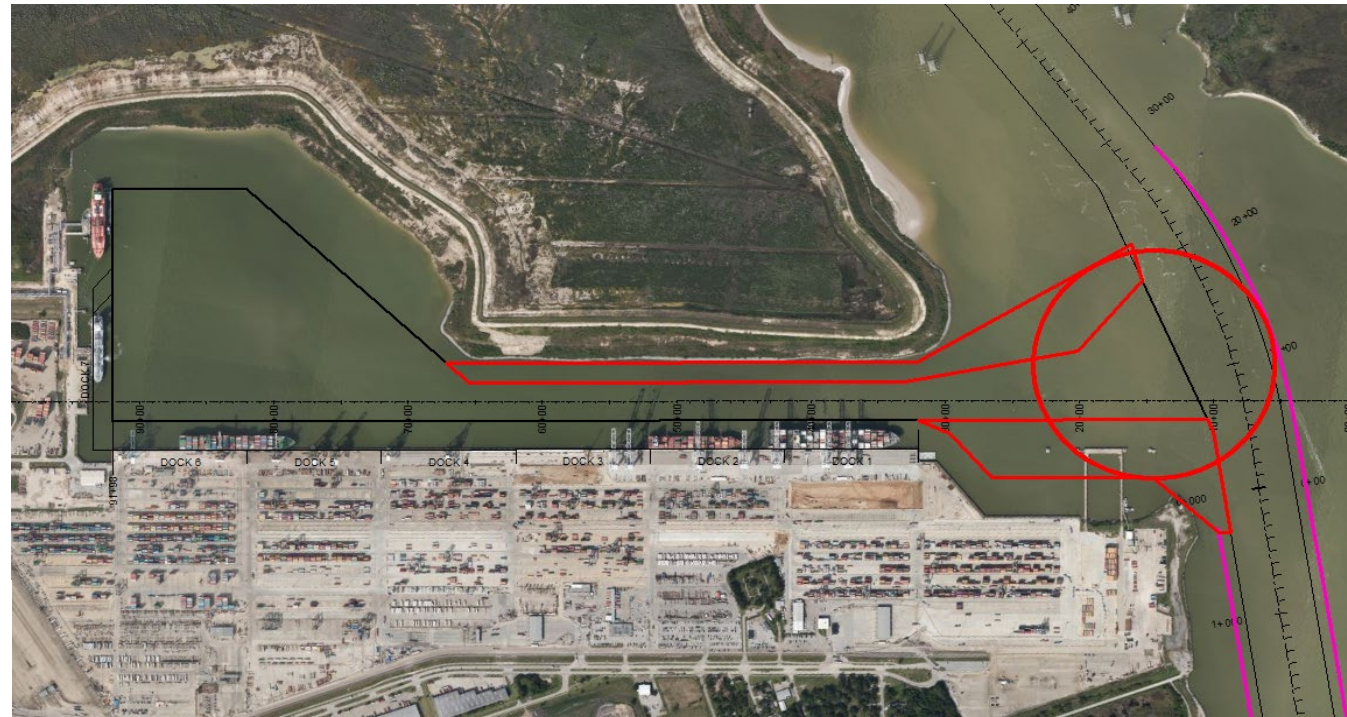
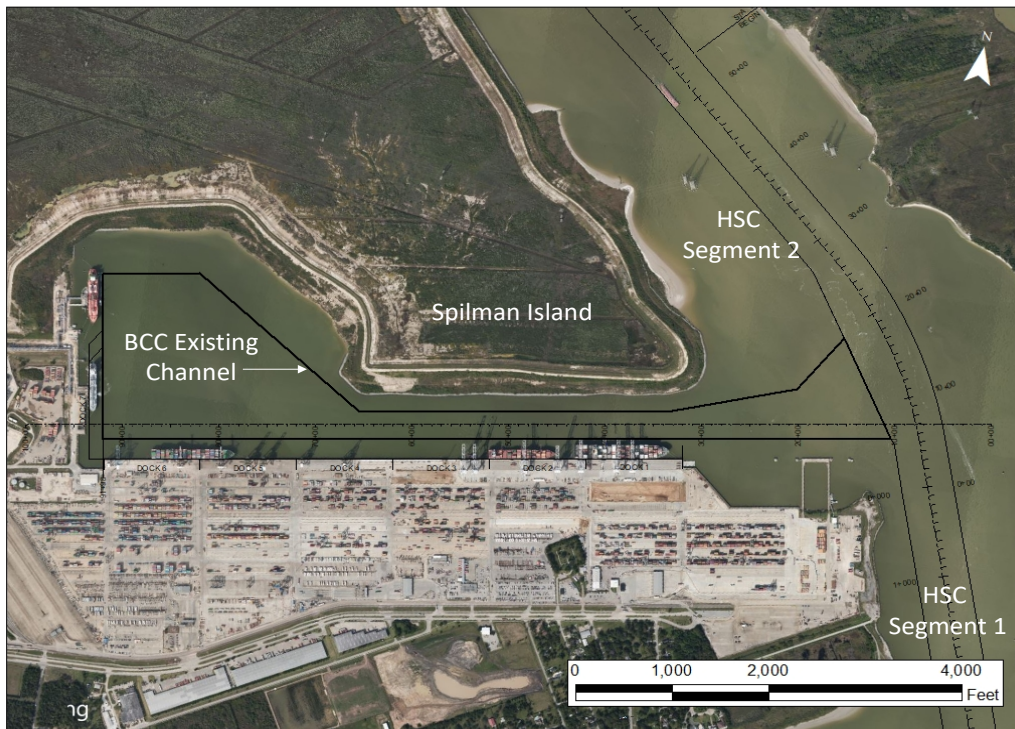
- Initial 3% reduction of NOx from vessel emissions
- Wider, deeper safer channel results in fewer transits, shorter wait times, and decreased turn-around distance
- Over the next 11 years – after project implementation – expect to incrementally reduce air emissions by 7% annually



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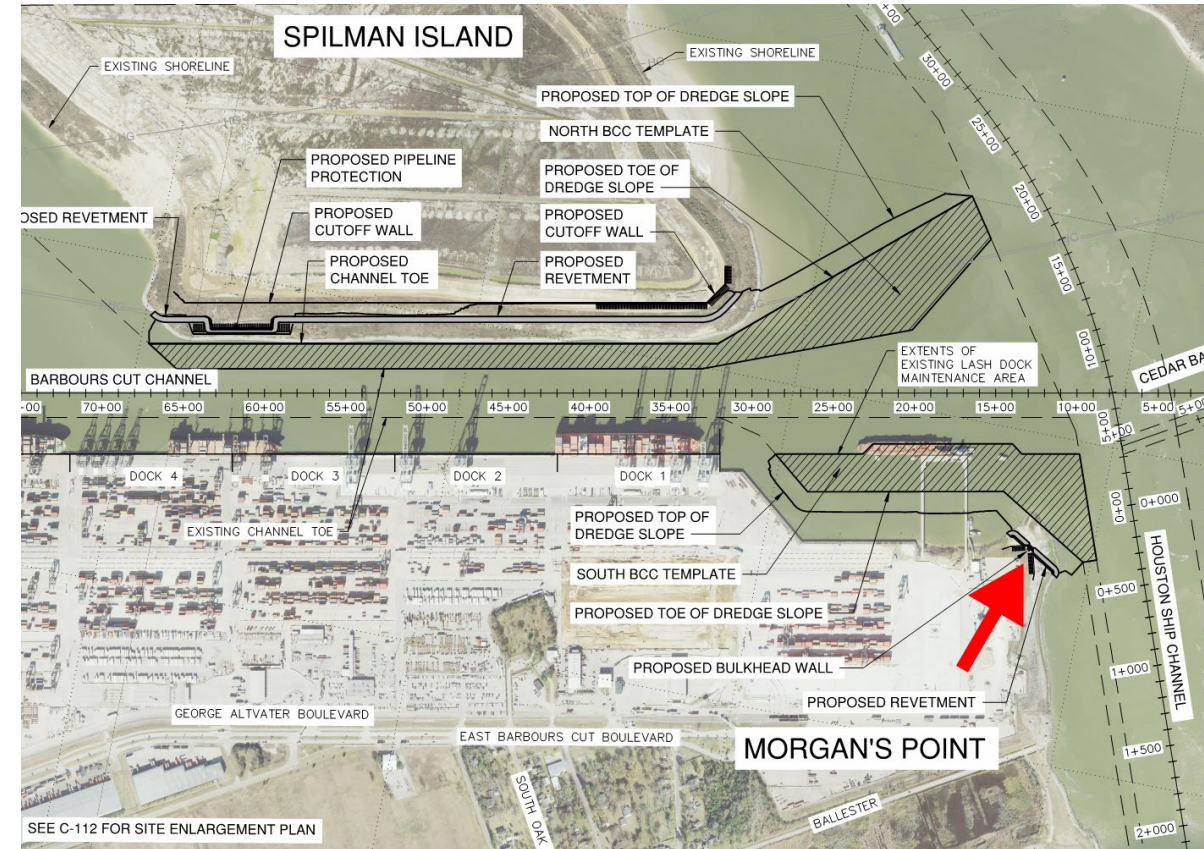
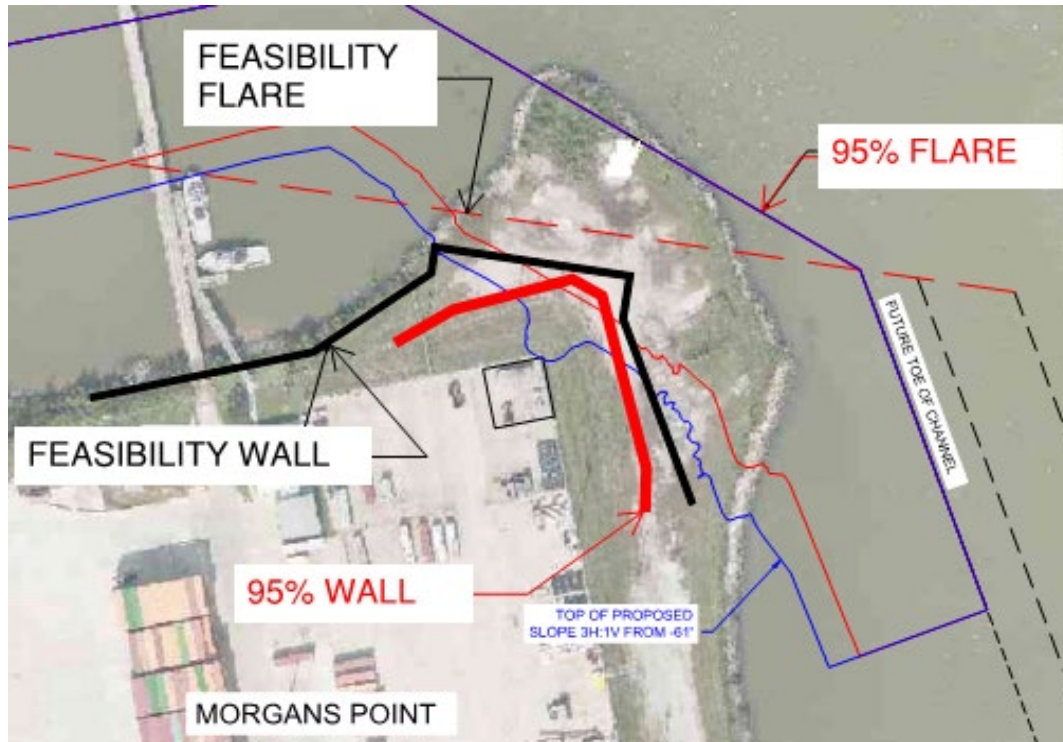
Barbours Cut Ship Channel

- Widen Channel by 155 ft to 455 ft width
 - 2.8 million yds
- 1800 ft turning Basin at Flare
- Shoreline stabilization



Barbours Cut Ship Channel

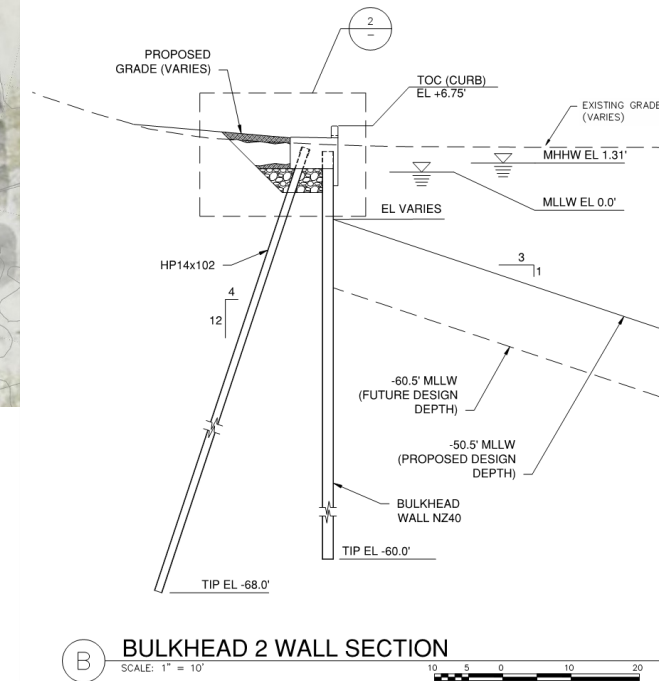
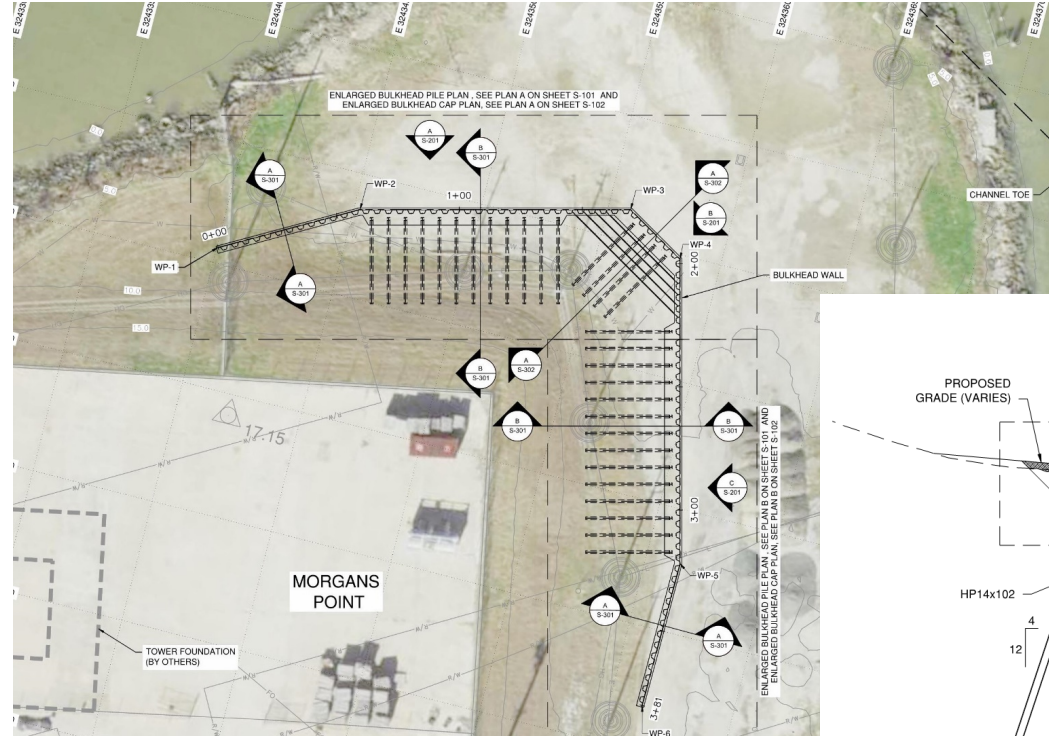
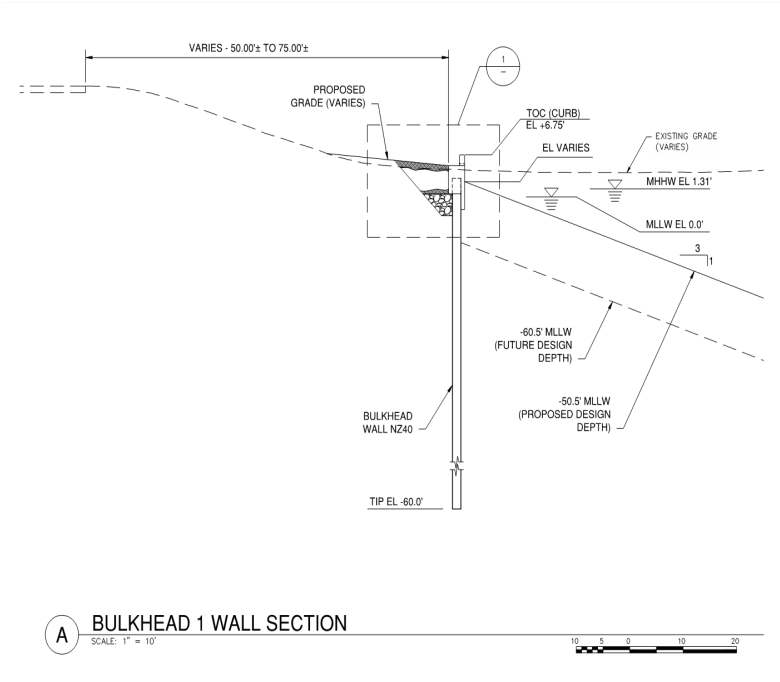
- Morgan's Point Shoreline Stabilization Optimization
- Reduce cost without impacting Navigation



Barbours Cut Ship Channel



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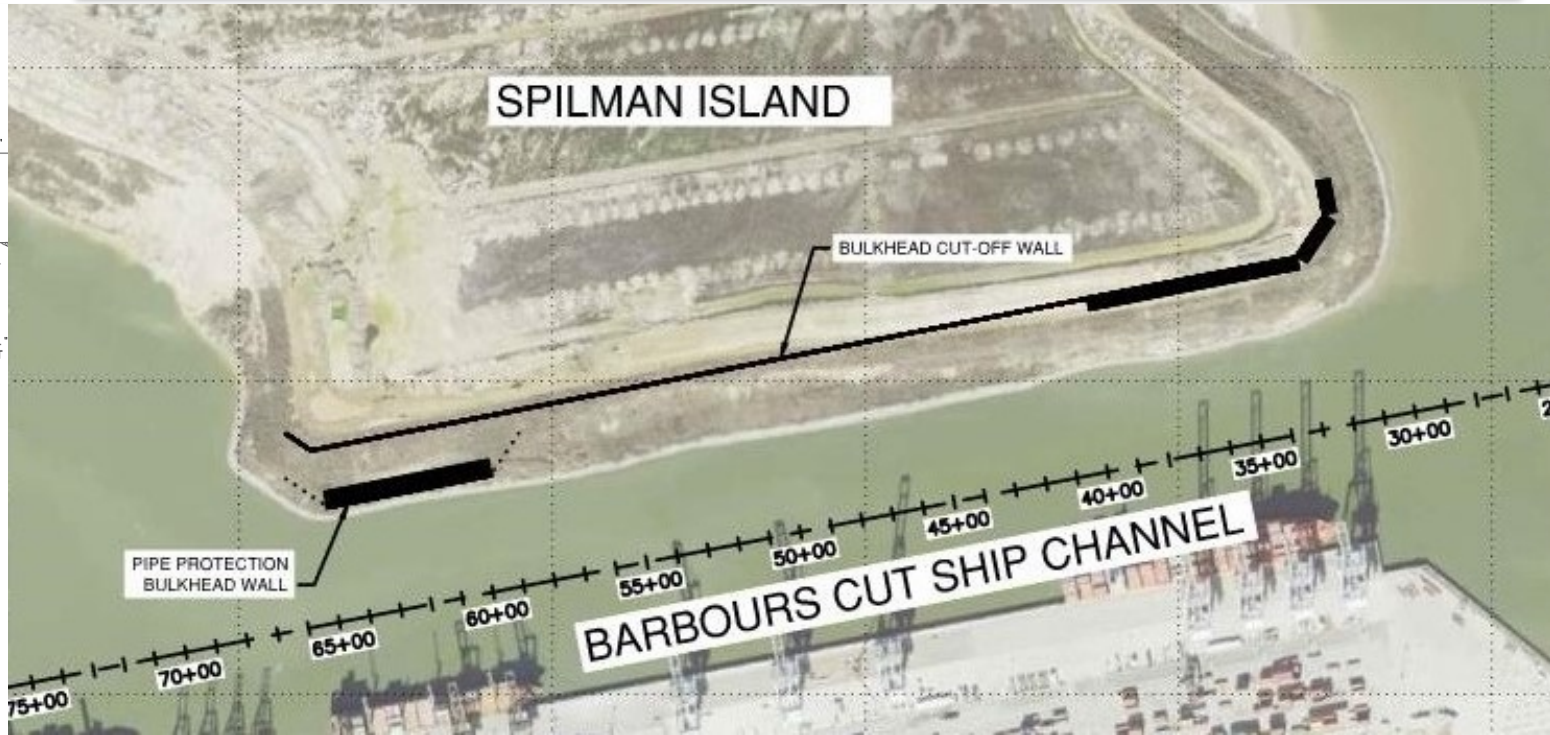
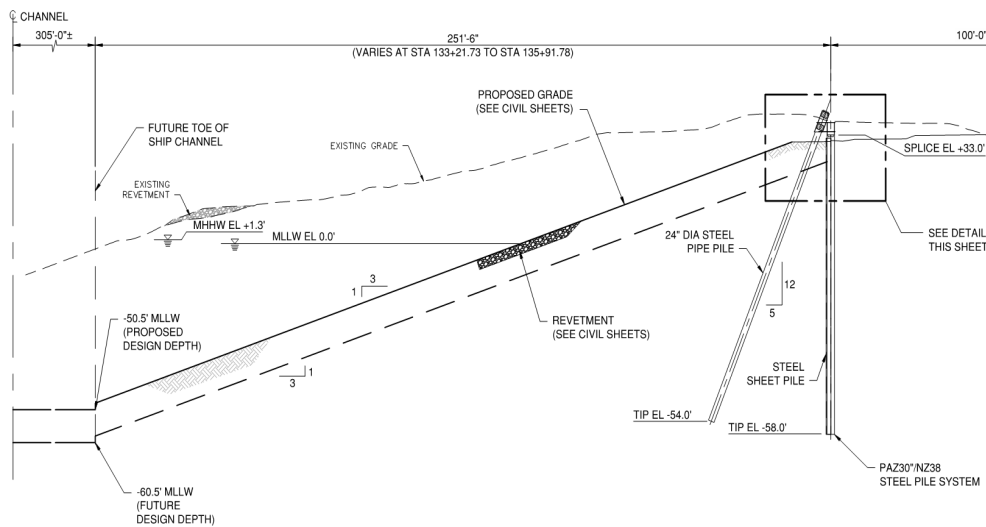
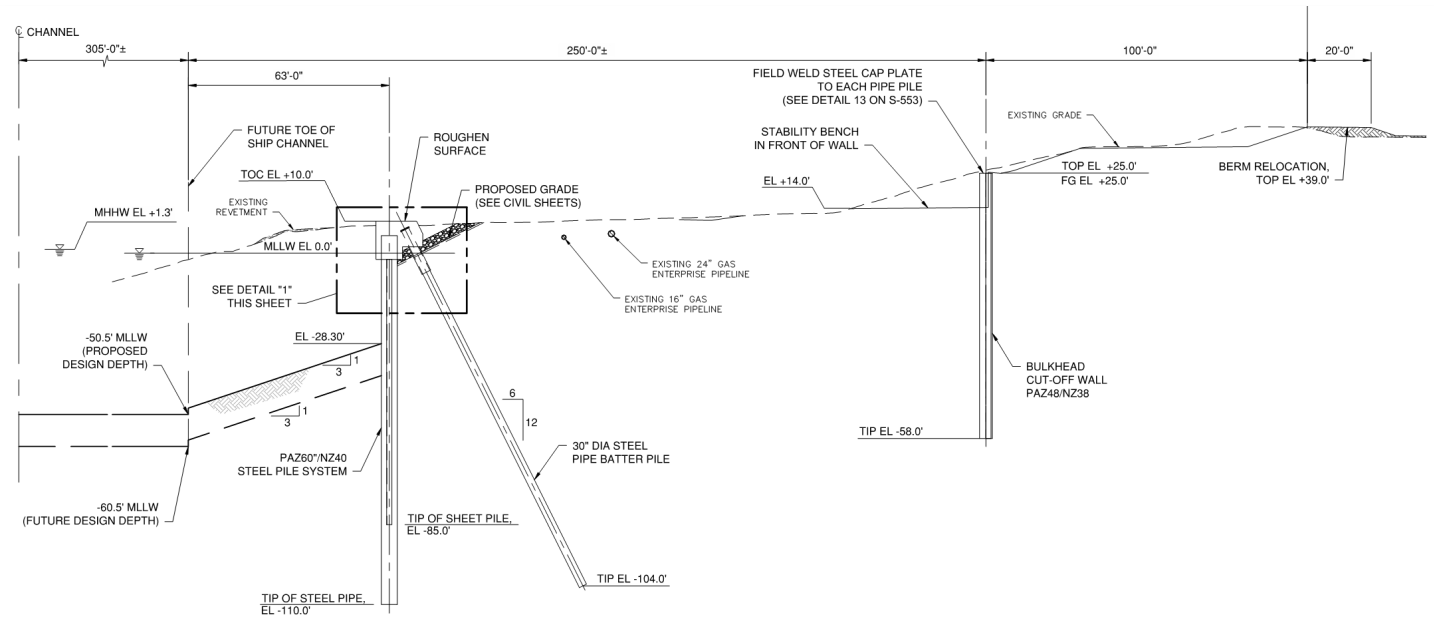
Morgans Point Bulkhead

- Successfully reduced size and cost
- Two typical wall sections

Barbours Cut Ship Channel

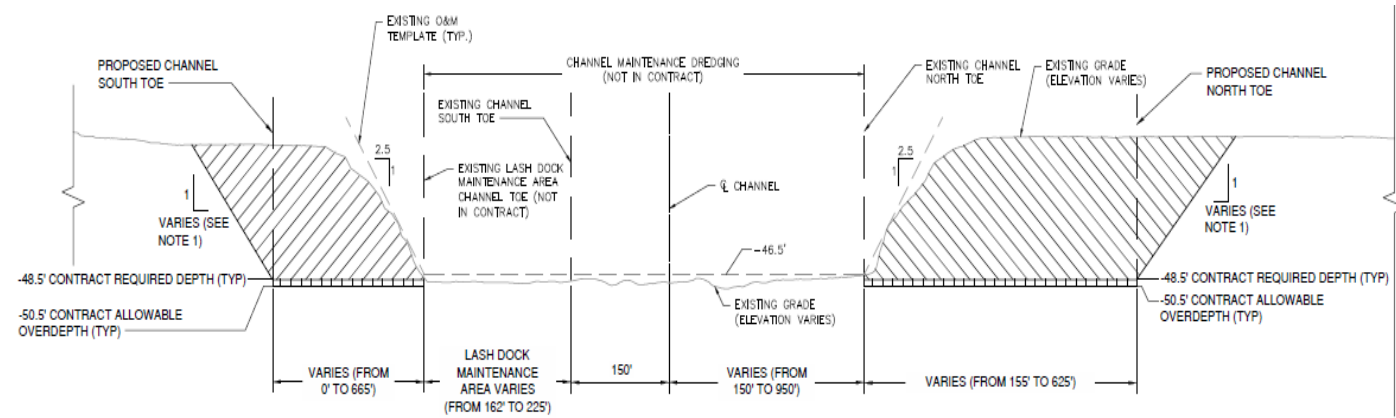
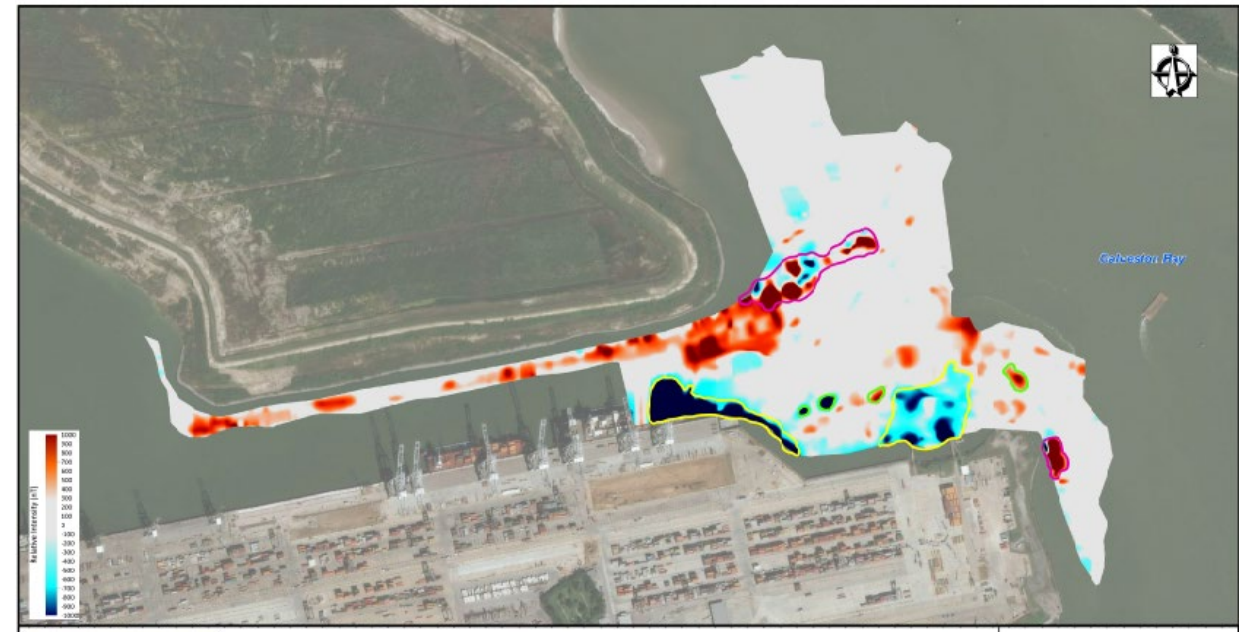
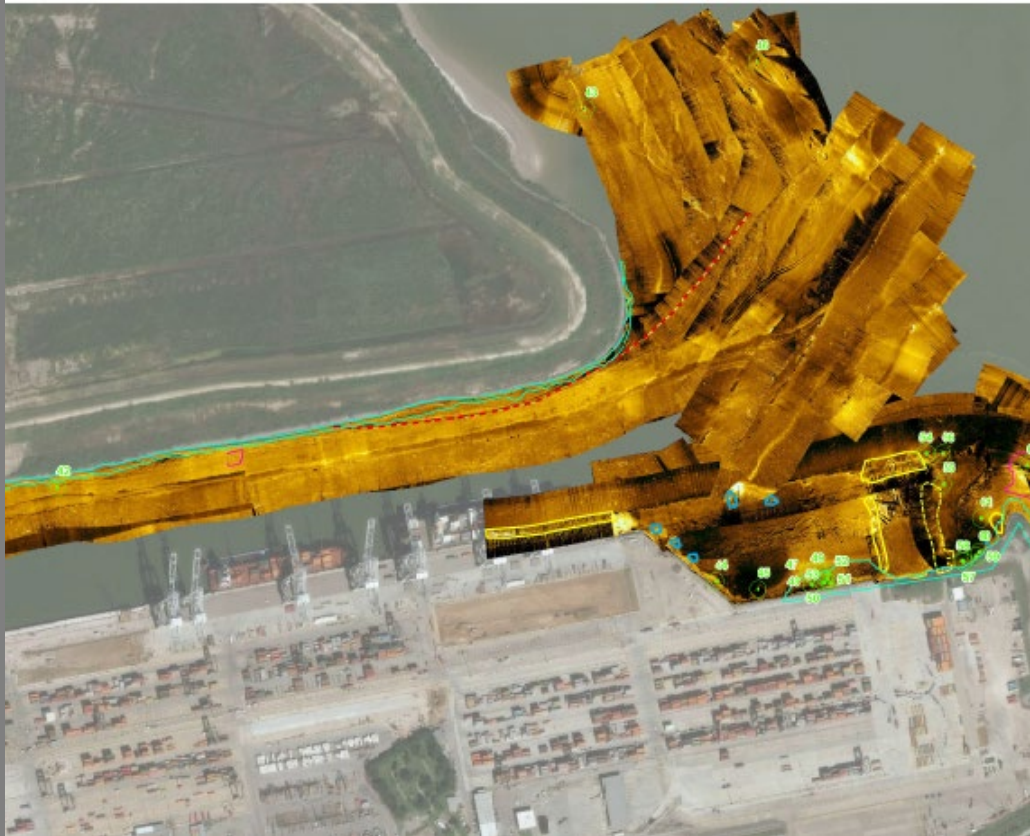
Spilman Island

- Shoreline Stabilization
- Pipeline Protection



Barbours Cut Ship Channel

Channel Design and Layout



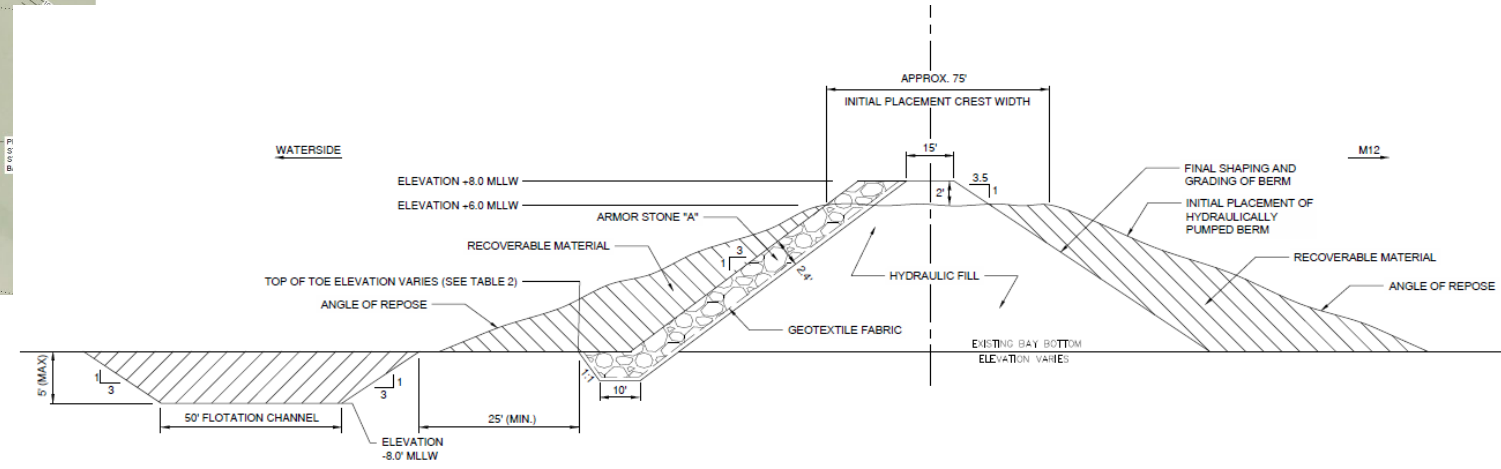
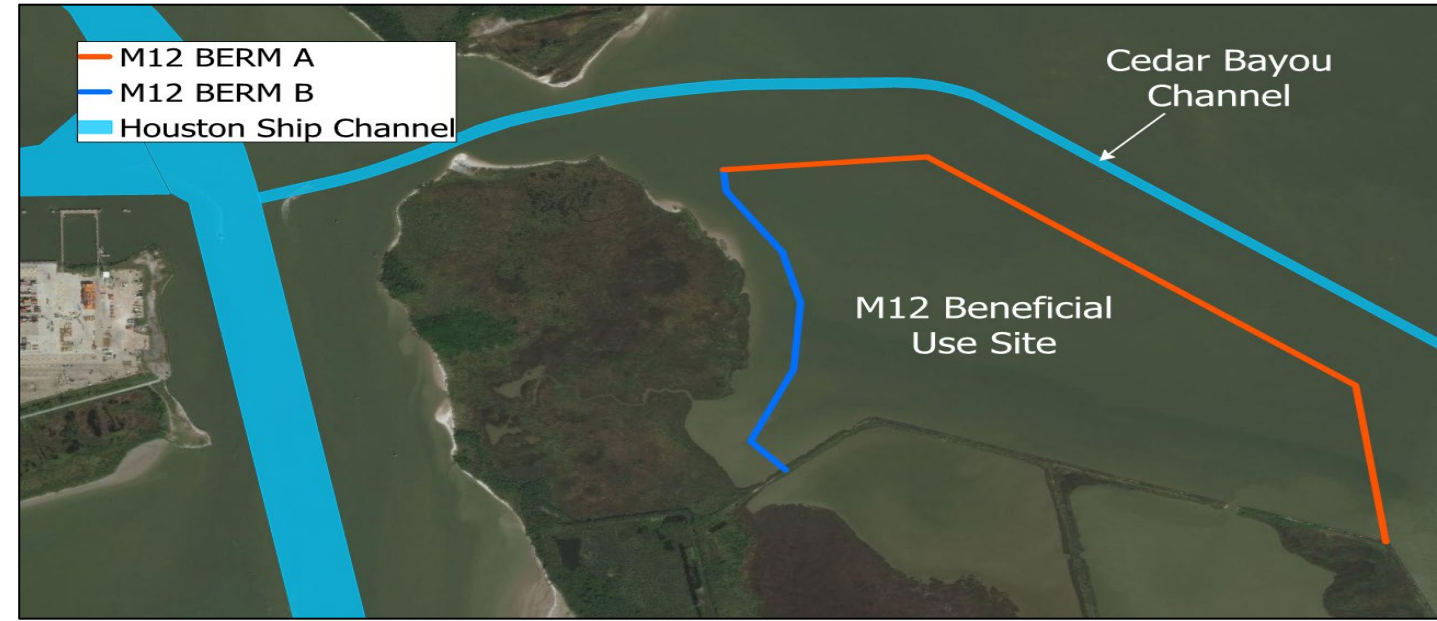
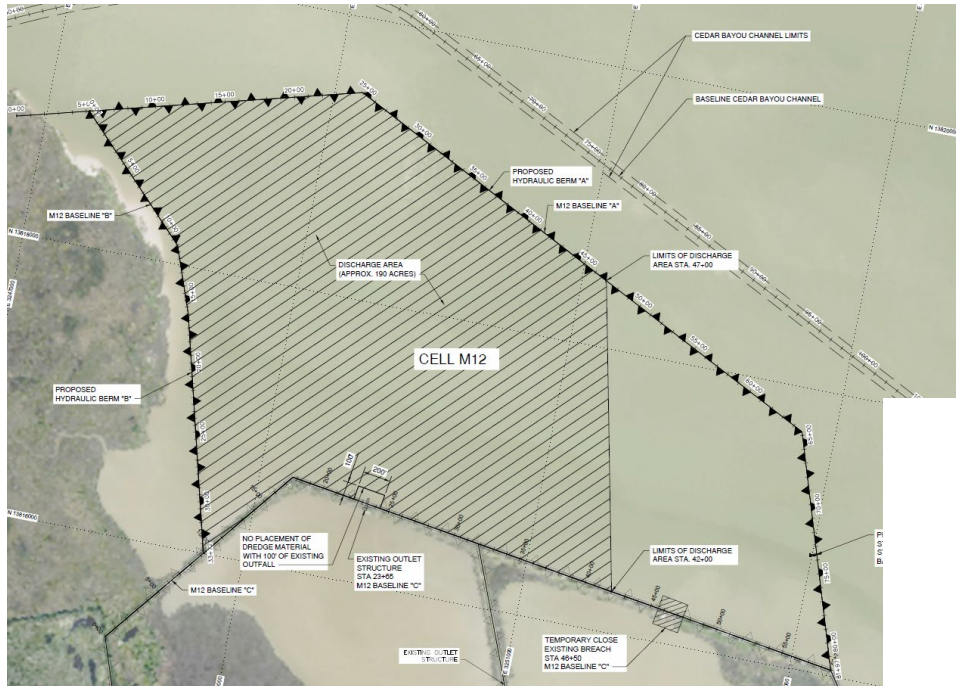
Barbours Cut Ship Channel



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Beneficial Use

- BUG Committee Coordination
- Habitat Protection/Creation



Boggy Bayou to Sims Bayou



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- Widen and deepen from Boggy Bayou to Sims Bayou to 530 ft.
- Deepen from Boggy Bayou to Hunting Bayou to 46.5 ft MLLW
- Placement Area Development

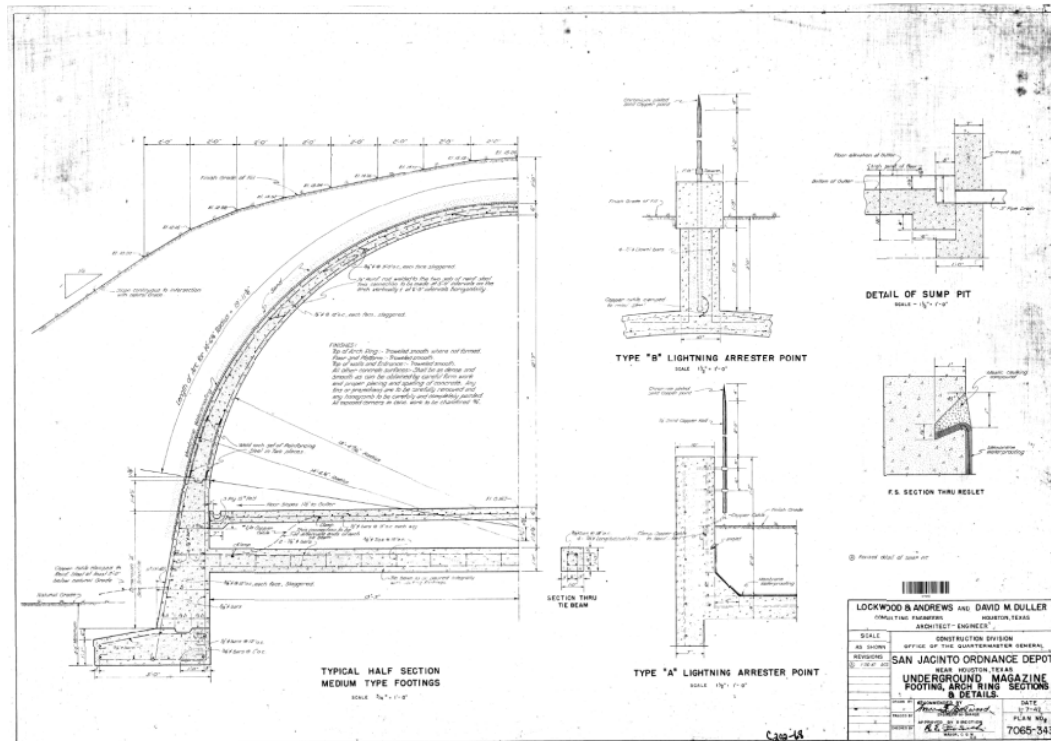


Boggy Bayou to Sims Bayou



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- BW8 Site Preparation
- Bunker Removal
- Site Clearing



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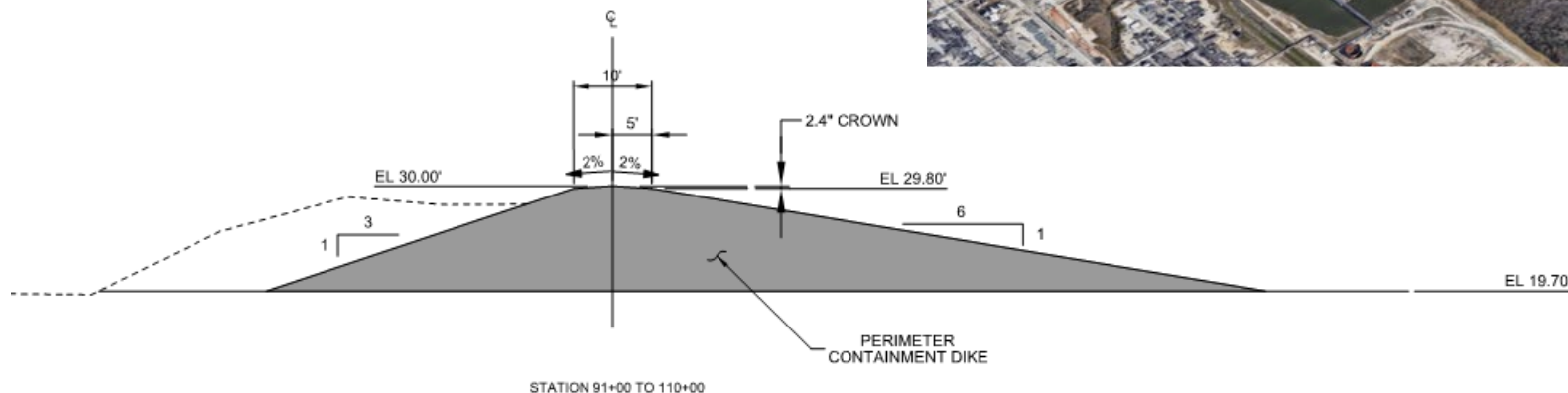
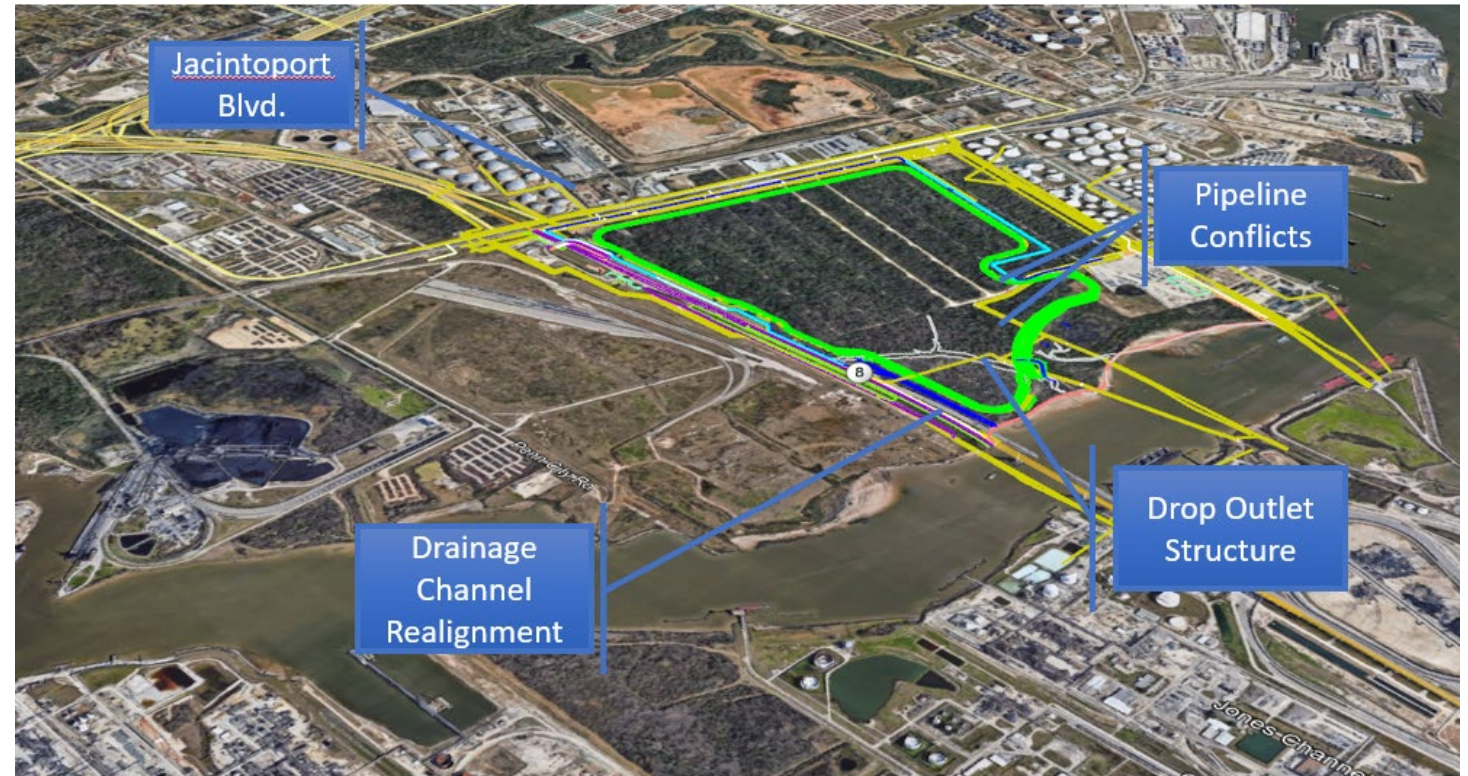
Boggy Bayou to Sims Bayou



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BW 8 DMPA

- 315 acres
- 10 ft dike height
- 15,425 ft perimeter
- Pipeline coordination

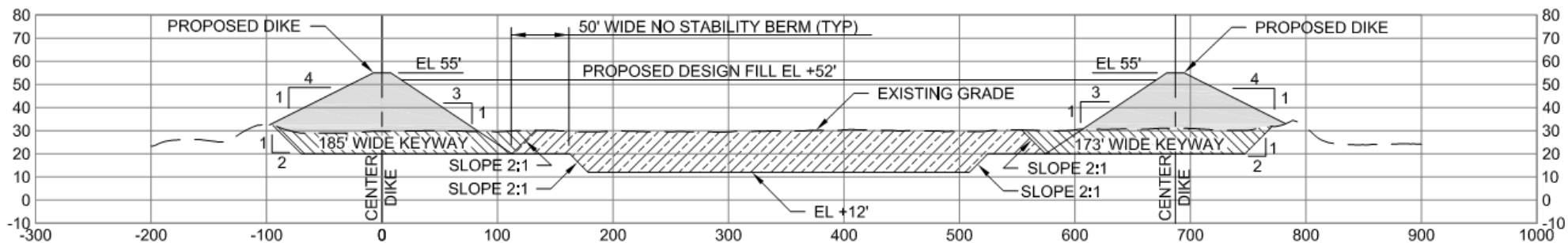
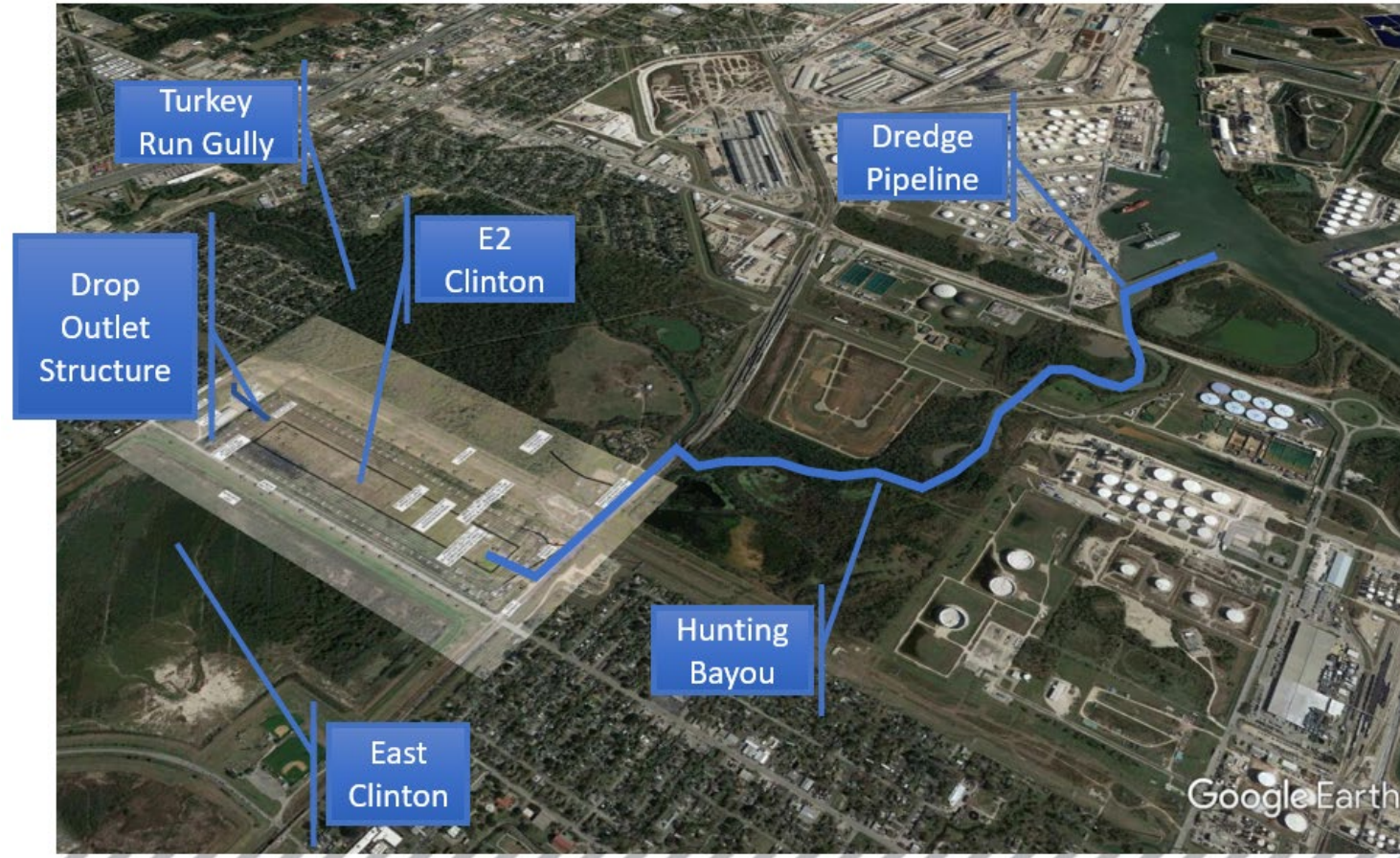


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Boggy Bayou to Sims Bayou

E2 Clinton DMPA

- 35 ft dike height
- 80 Acres
- 7,840 ft Perimeter

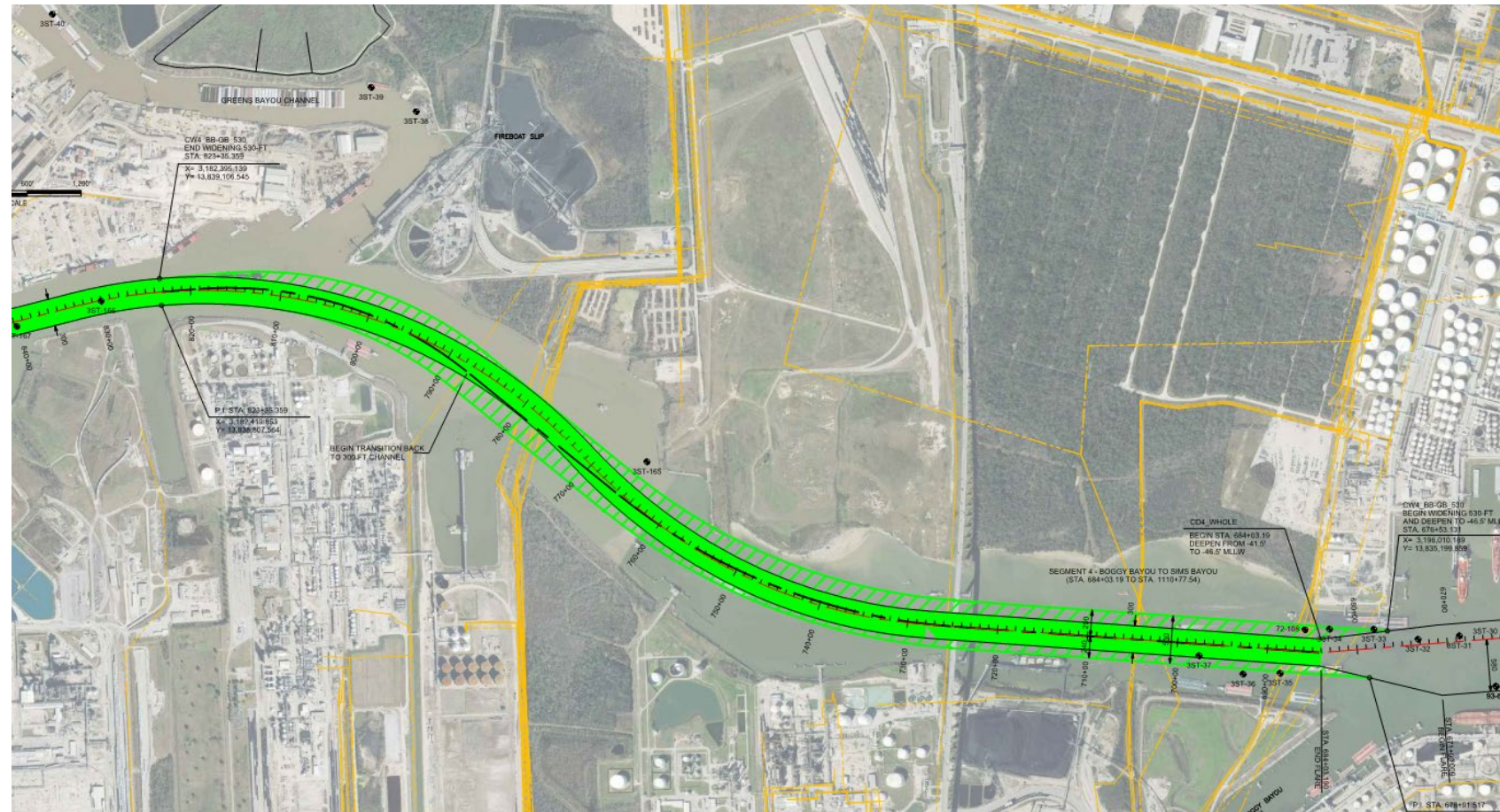


Boggy Bayou to Sims Bayou



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- Channel Layout and Design
- Coordination with Industry
- Pipelines

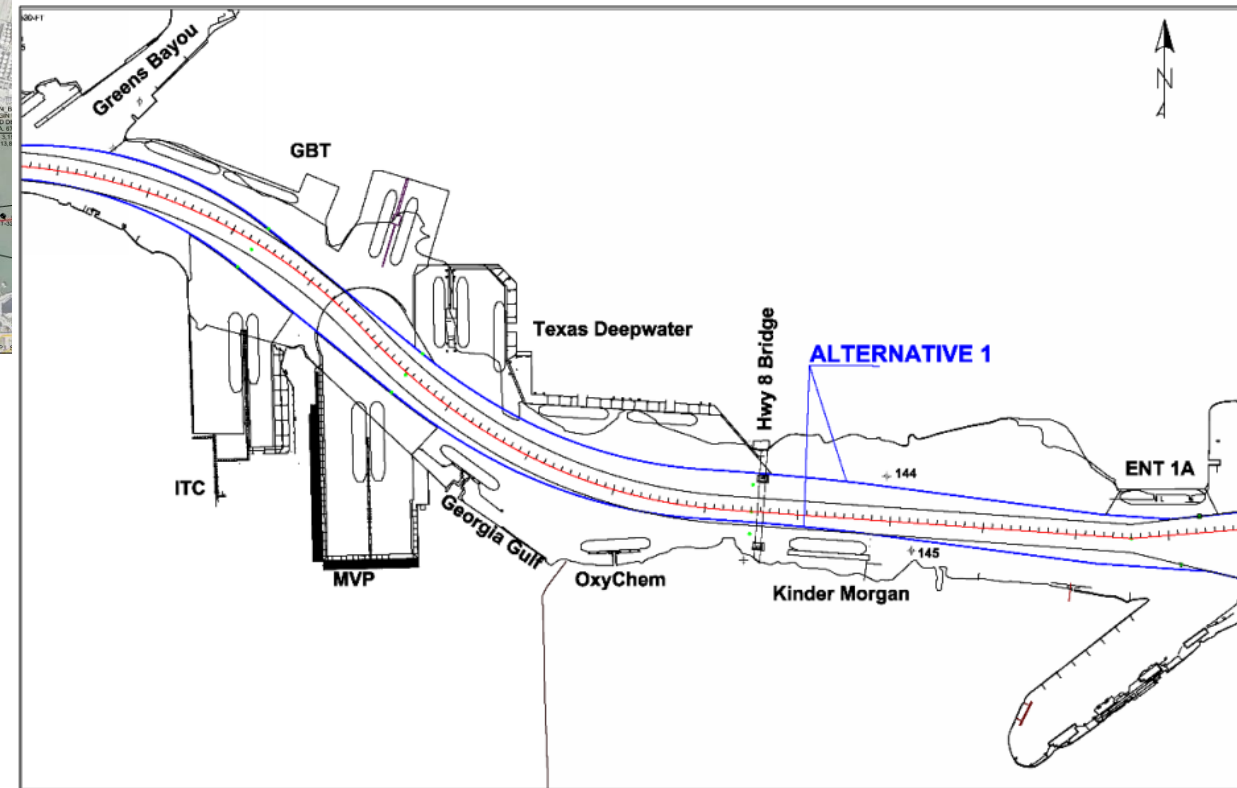
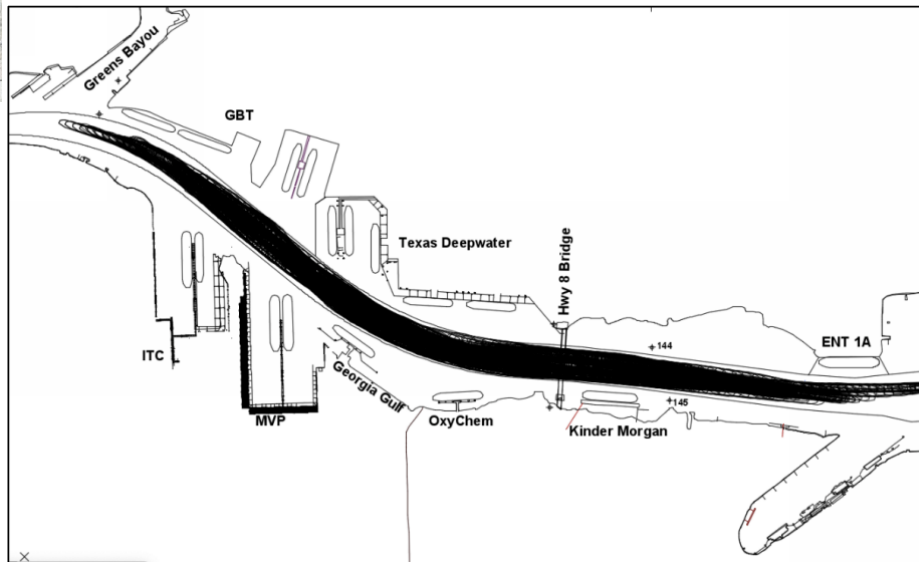
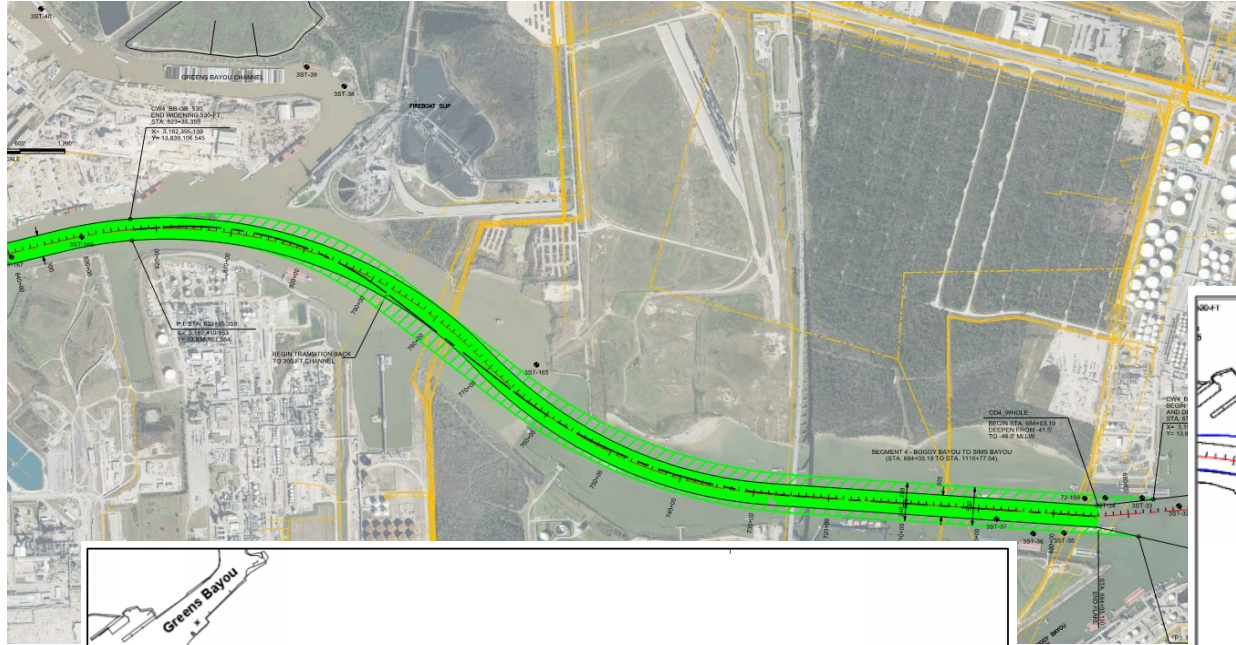


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Boggy Bayou to Sims Bayou



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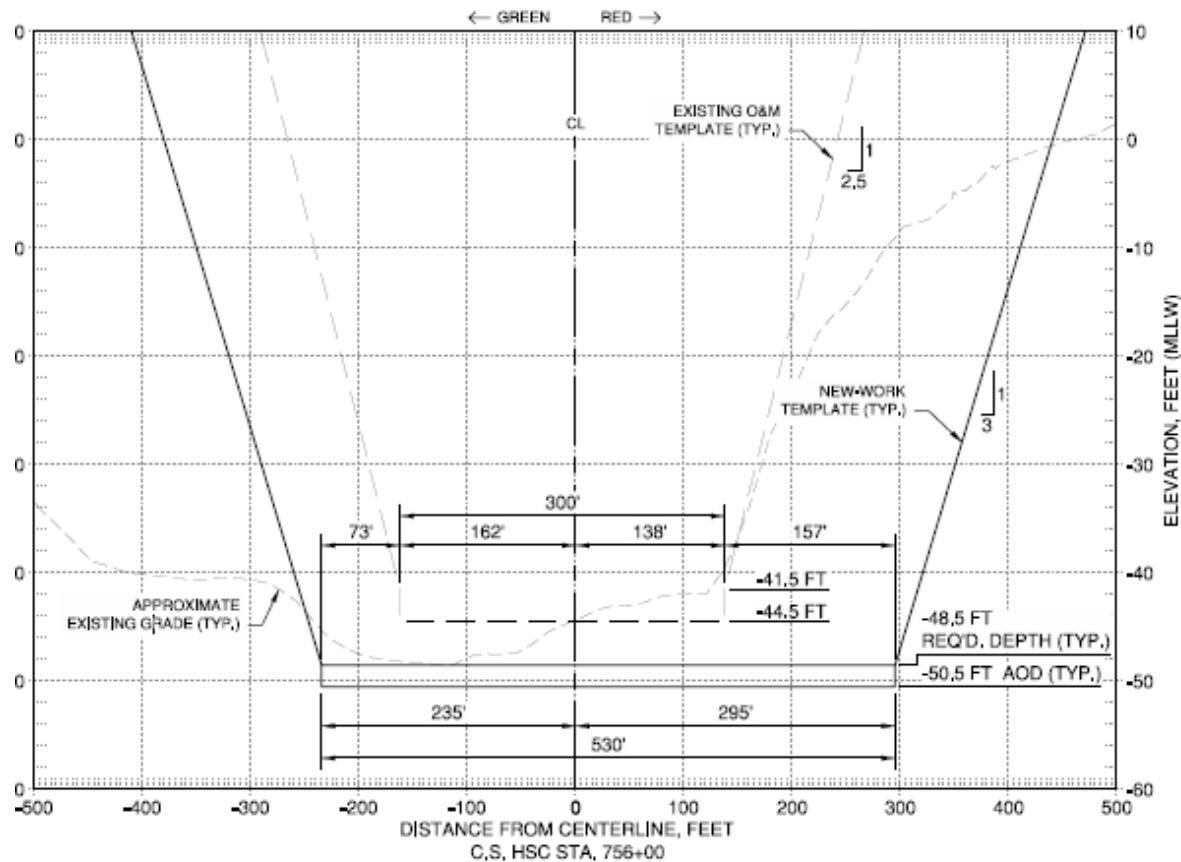


Boggy Bayou to Sims Bayou



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- Channel widening from 300 to 530 ft
- Approximately 4.2 million cubic yards
- Pipeline Relocations



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Getting it Done



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PORT HOUSTON™

The Time is Now

“The Houston Ship Channel project is needed now more than ever. Providing infrastructure to keep the flow of diverse and essential products moving, as well as building the foundation for economic opportunities in the future, is a fundamental role of Port Houston. We have gone beyond the minimum requirements of a non-federal sponsor, using our own resources to design, build and fund urgently needed components of the project.”

Port Houston
Commission
Chairman
Ric Campo

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Schedule



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Design Packages:

- Packages 1, 3-9 advertised — pending balance of risk, schedule, and cost — during the second quarter of 2021
- Package 2, advertised first quarter of 2021
- Packages 10-12 advertised in 2024 or after



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Questions?



Visit the Project 11 Webpage

<https://www.expandthehoustonsipchannel.com/>



Email the Project 11 Team

Project11@PortHouston.com



Email Houston Pilots – Captain J.J. Plunkett

Jplunkett@Houston-pilots.com