CORPUS CHRISTI SHIP CHANNEL DEEPENING PROJECT

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PORT CORPUS CHRISTI®

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Project Overview

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Project Overview

- Deepen the Entrance Channel from the Gulf of Mexico to Harbor Island
- Deepen up to -80 feet MLLW to allow fully loaded VLCCs
- Better prepare PCCA for long-term future for crude oil export
- Generate approximately 46 MCY of new work material

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Project Purpose

- **The purpose of the project** is to construct a channel with the capability to accommodate the transit of fully laden Very Large Crude Carriers (VLCCs) from multiple locations on Harbor Island into the Gulf of Mexico. Factors influencing the need for the project include:
  - Allow for more efficient movement of U.S. produced crude oil, to meet current and forecasted demand in support of national energy security and national trade objectives
  - Enhance PCCA's ability to accommodate future growth in crude oil movement
  - Construct a channel project that the PCCA can readily implement to accommodate industry needs.

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Project Priorities

- **<u>This project directly addresses the following priorities:</u>**
  - Pipelines from Eagle Ford and Permian Basins are being constructed to the Port of Corpus Christi and to Harbor Island.
  - Crude oil terminals are also being planned at Harbor Island using the Federally-authorized -54-foot deep channel that limits the ability to fully load VLCCs, decreasing efficiency by requiring reverse lightering of these vessels.
  - National energy security through the growth of U.S. crude exports.
  - Protecting national economic interests by decreasing the national trade deficit.
  - Supporting national commerce by keeping pace with existing and expanded infrastructure being modified or already under development to export crude oil.
  - Improve safety and efficiency of water-borne freight movements.

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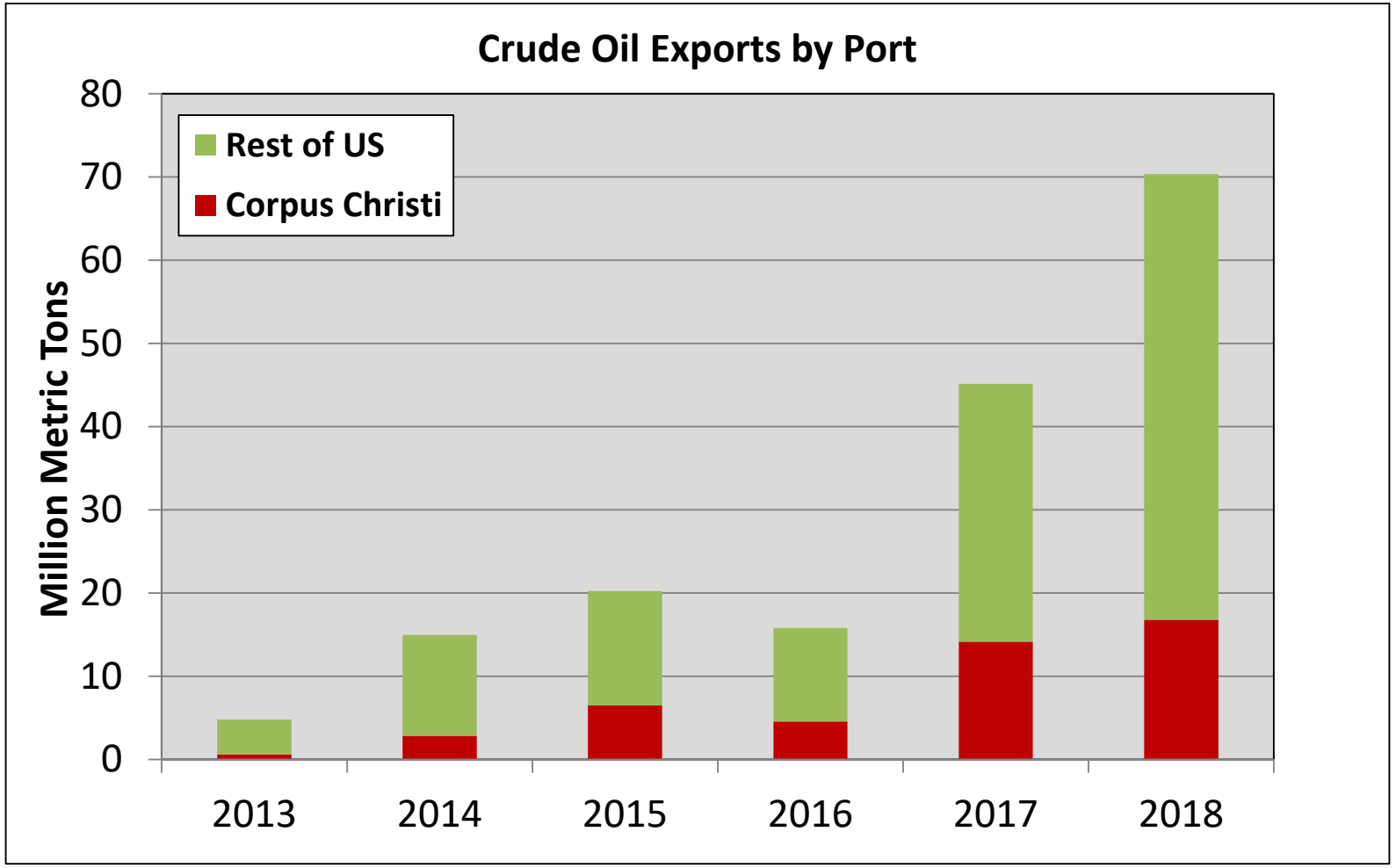

*Source: U.S. Census USA Trade Data (through October 2018)

Alternative Analysis

- **<u>Screening Criteria Identified:</u>**
  - Increase export efficiency
  - Ability to serve multiple tenants
  - Ability to accommodate future growth
  - Environmental impacts
  - Risk, safety and security
  - Ability to contribute to Beneficial Use

Alternative Analysis

- **Alternatives Screened:**
  - Alternative A – No action
  - Alternative B – Channel Deepening Project
  - Alternative C – Offshore SPM
  - Alternative D – Offshore Platform

Design Vessels

- 99th Percentile VLCC
  - LOA: 1116 feet
  - Beam: 197 feet
  - Draft: 70.2 feet (WTI)
- Maximum drafts assume a cargo of low density WTI crude oil (API=40) for VLCCs

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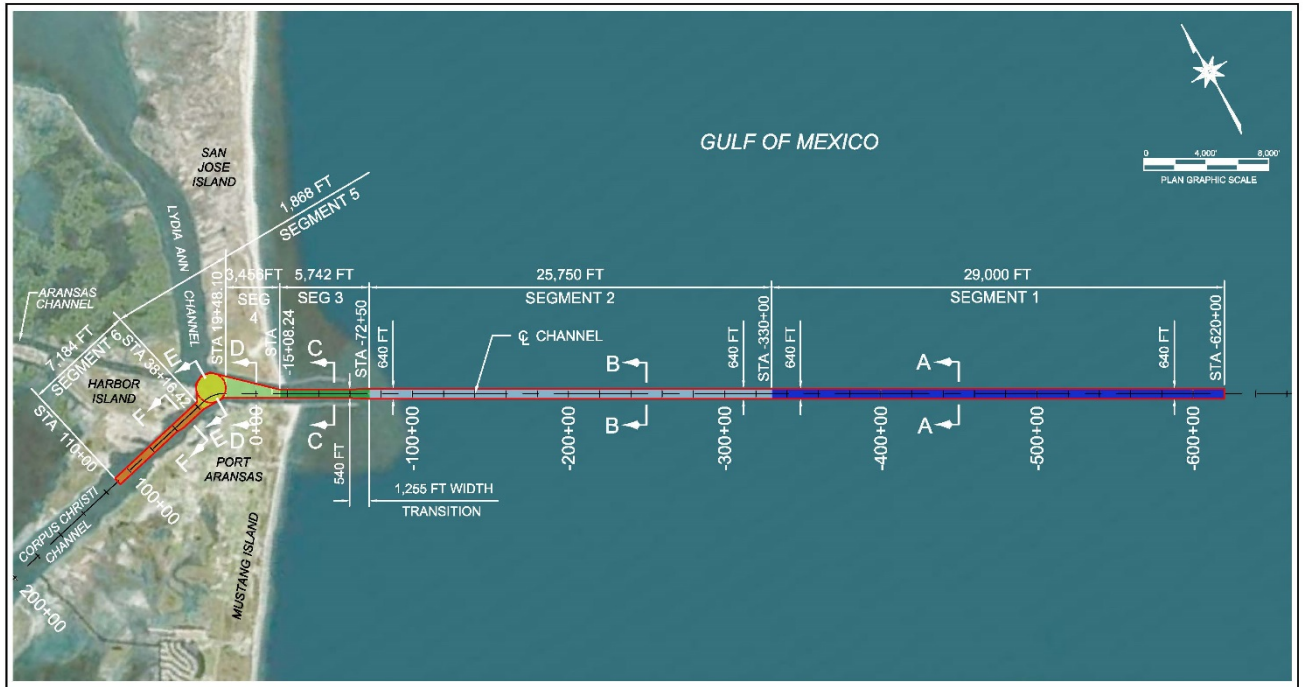
Channel Segments



DREDGING PLAN

SCALE: 1" = 8000'

SEGMENT	STATIONING (@ CHANNEL CL) FROM	TO	*DEPTH (FT BELOW MLLW)	DESCRIPTION	PLAN VIEW LEGEND
1	STA -620+00	STA -330+00	-77.0	*Outer Channel*	
2	STA -330+00	STA -72+50	-77.0	*Approach Channel*	
3	STA -72+50	STA -15+08.24	-75.0	*Jetties to Harbor Island Transition Flare*	
4	STA -15+08.24	STA 19+48.10	-75.0	*Harbor Island Transition Flare*	
5	STA 19+48.10	STA 38+16.42	-75.0	*Harbor Island Junction*	
6	STA 38+16.42	STA 110+00	-75.0	*Corpus Christi Channel*	

* DESIGN DEPTH SHOWN. DOES NOT INCLUDE 2.0 FT ADVANCED MAINTENANCE DREDGING OR 2.0 FT ALLOWABLE OVER DREDGE.

Corpus Christi Ship Channel Deepening Project
Individual Permit Application SWG-2019-00067

Preferred Channel Alternative

County: Aransas and Nueces
Application By: Port of Corpus Christi Authority

State: Texas
Date: May 2019

Proposed Channel Segment Depth and Width Compared to -54 ft Project

Description	Channel Segments			
	Segment 1 Outer Approach	Segment 2 Inner Approach	Segment 3 Between Jetties	Through Harbor Island
Authorized 54 ft. Depth/ Proposed Channel Depth MLLW (ft.)	56/77	56/77	54/75	54/75
Authorized 54 ft. Width/ Proposed Channel Width (ft.)	700/640	700/640	600/540	Varies/ Varies

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Preferred Channel Dimensions

Channel Segment	Width (ft.)	Side Slopes (H:V)
Outer/ Approach	640	10:1
Jetties to Harbor Island	540	3:1

Segment	Stationing		Design Depth *	Description	Dredge Volume
	Station Begin	Station End	(ft. MLLW)		(CY)
1	-620+00	-330+00	-77	Outer Channel	9,617,390
2	-330+00	-72+50	-77	Approach Channel	20,308,762
3	-72+50	-15+08.24	-75	Jetties to Harbor Island Transition Flare	2,105,041
4	-15+08.24	19+48.10	-75	Harbor Island Transition Flare	2,851,897
5	19+48.10	38+16.42	-75	Harbor Island MB	2,951,614
6	38+16.42	110+00	-75	Corpus Christi Channel	4,020,764
				Total Dredge Volume:	**41,855,468**

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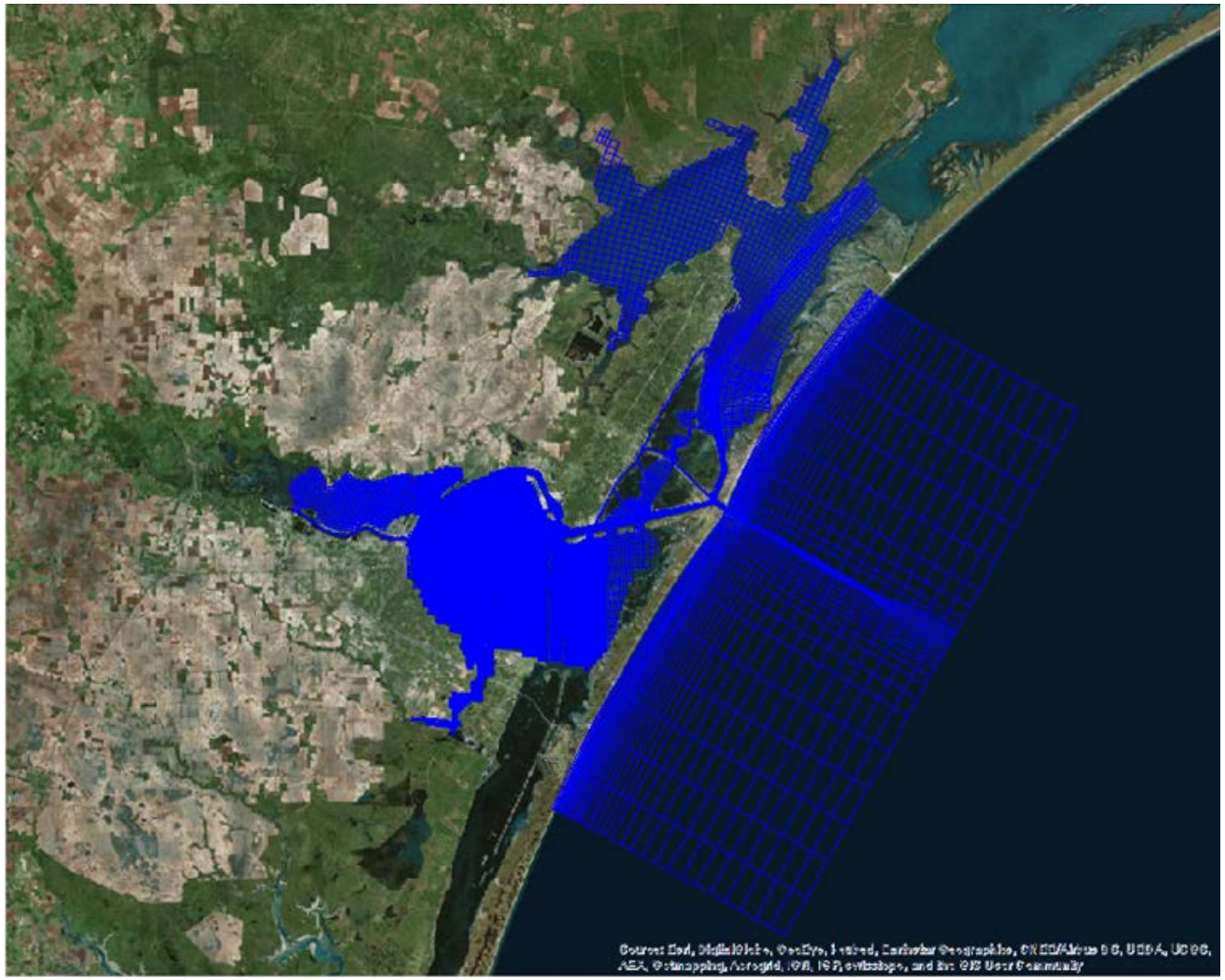
Modeling Completed to Date

- Tide and Velocity
- Salinity
- Shoaling
- Vessel Wake
- ODMDS Capacity

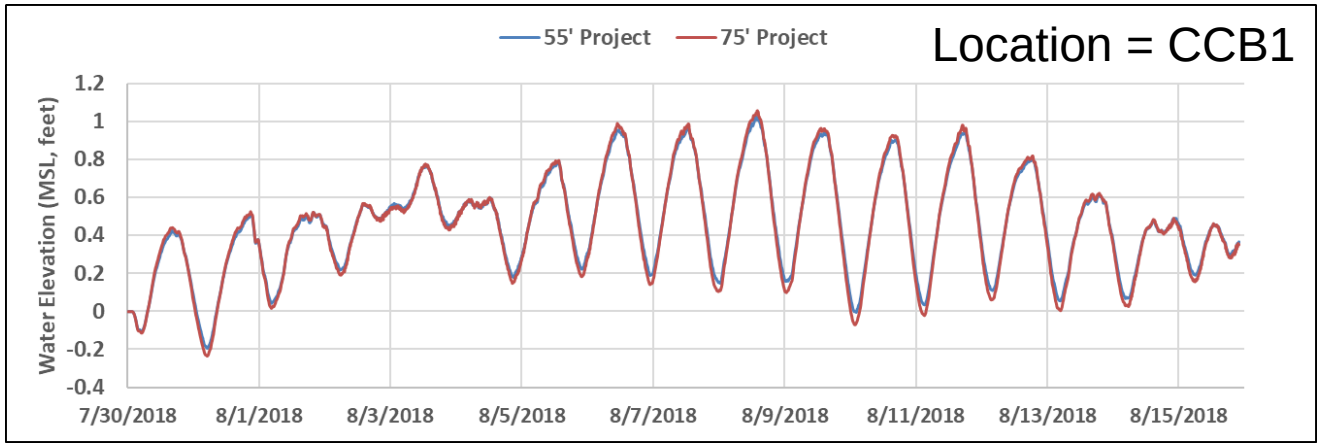
Tidal and Velocity Modeling



With Project Tidal Range Change

Change in Average of All Tides

Location	CCSCIP Spring Tide Range (ft)	CDP Spring Tide Range (ft)	Change (ft)
Corpus Christi Bay	0.62	0.67	0.05
Nueces Bay	0.68	0.74	0.06
Redfish Bay	0.66	0.74	0.08
Aransas Bay	0.47	0.5	0.03
Copano Bay	0.35	0.38	0.03



These changes are:

- **<1 in.**
- **very small**
- **negligible**

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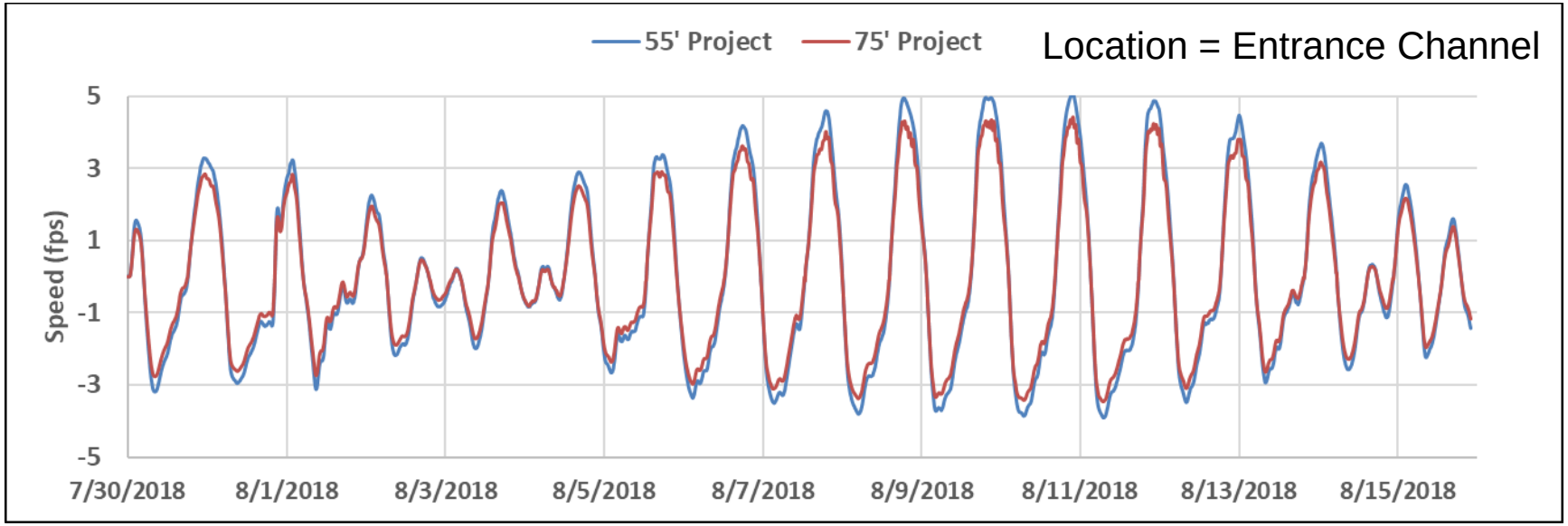
Project Velocity Change

Changes at Entrance Channel

	CCSCIP	CDP	Change	%
Peak Velocity (fps)	5.04	4.42	-0.62	-12%
*Average Velocity (fps)	1.98	1.71	-0.27	-14%
*Average of hourly velocities over 14 day simulation				



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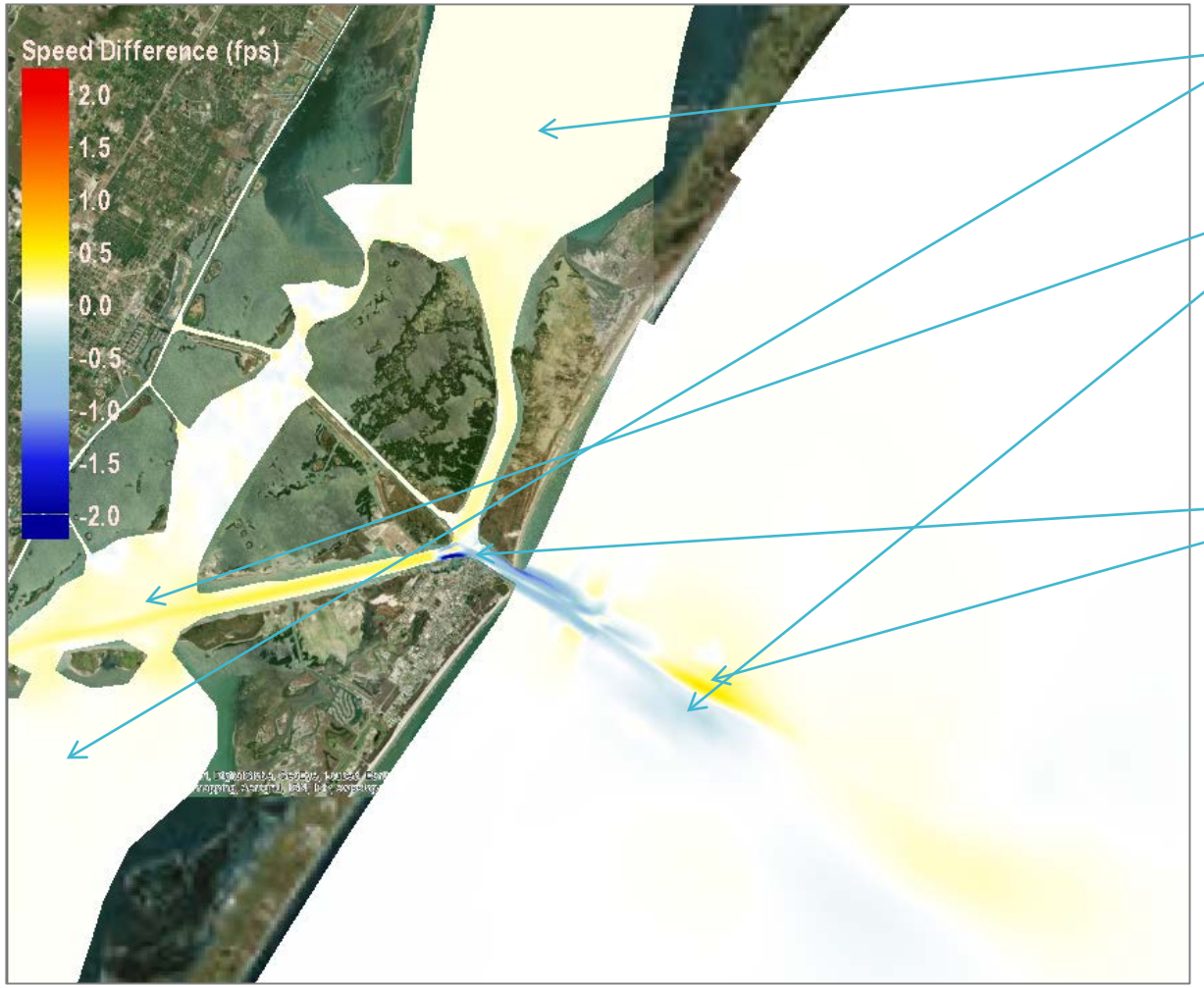
With Project Tidal Maximum Velocity Change
(CDP versus CCSCIP Project)



- Most area is 0 or near-zero change
- Most in-channel change 0.01-0.1 fps increase/decrease
- Some very localized changes between 0.5-0.7 fps increase/decrease
- These are minor & relatively negligible to erosion & sediment transport

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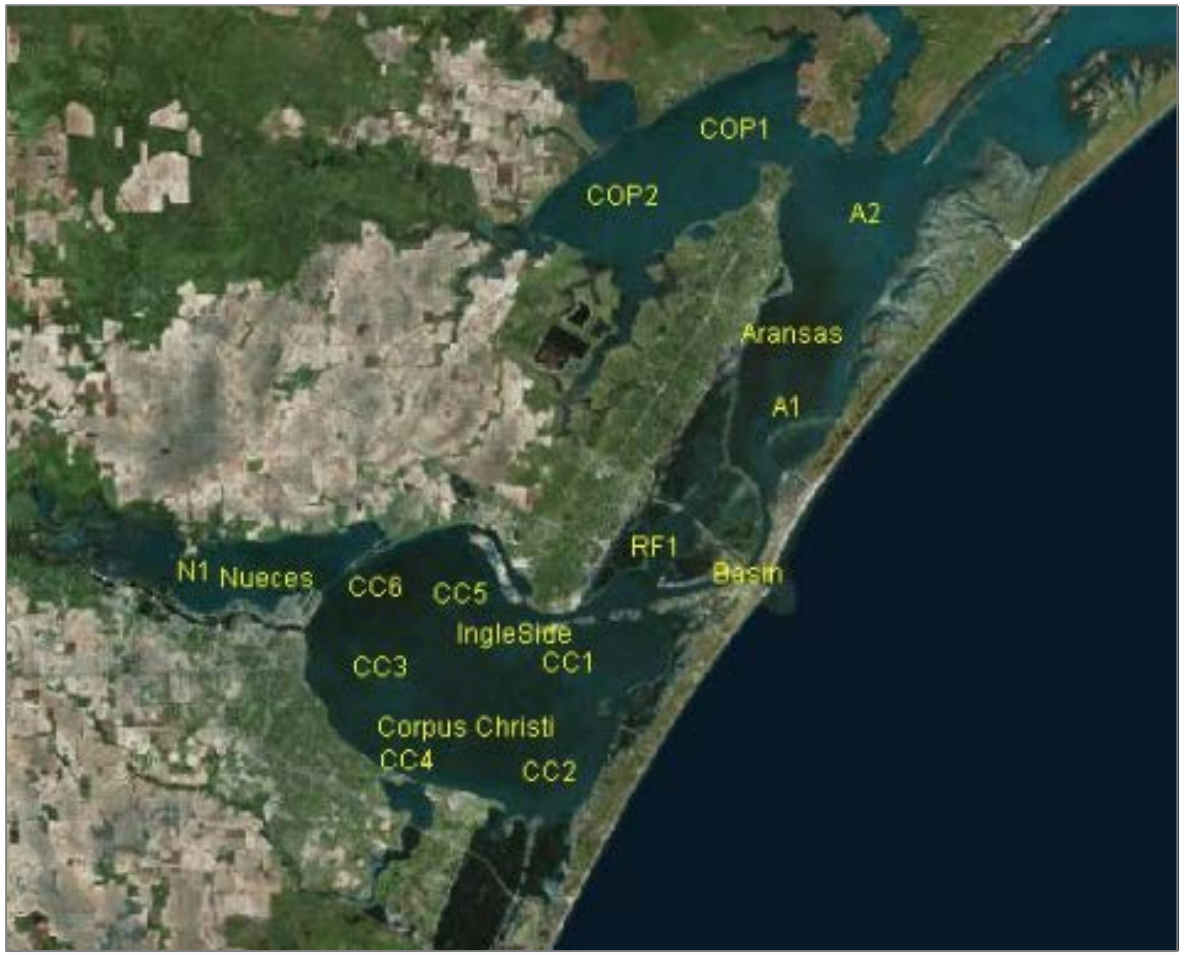
Salinity Modeling Results

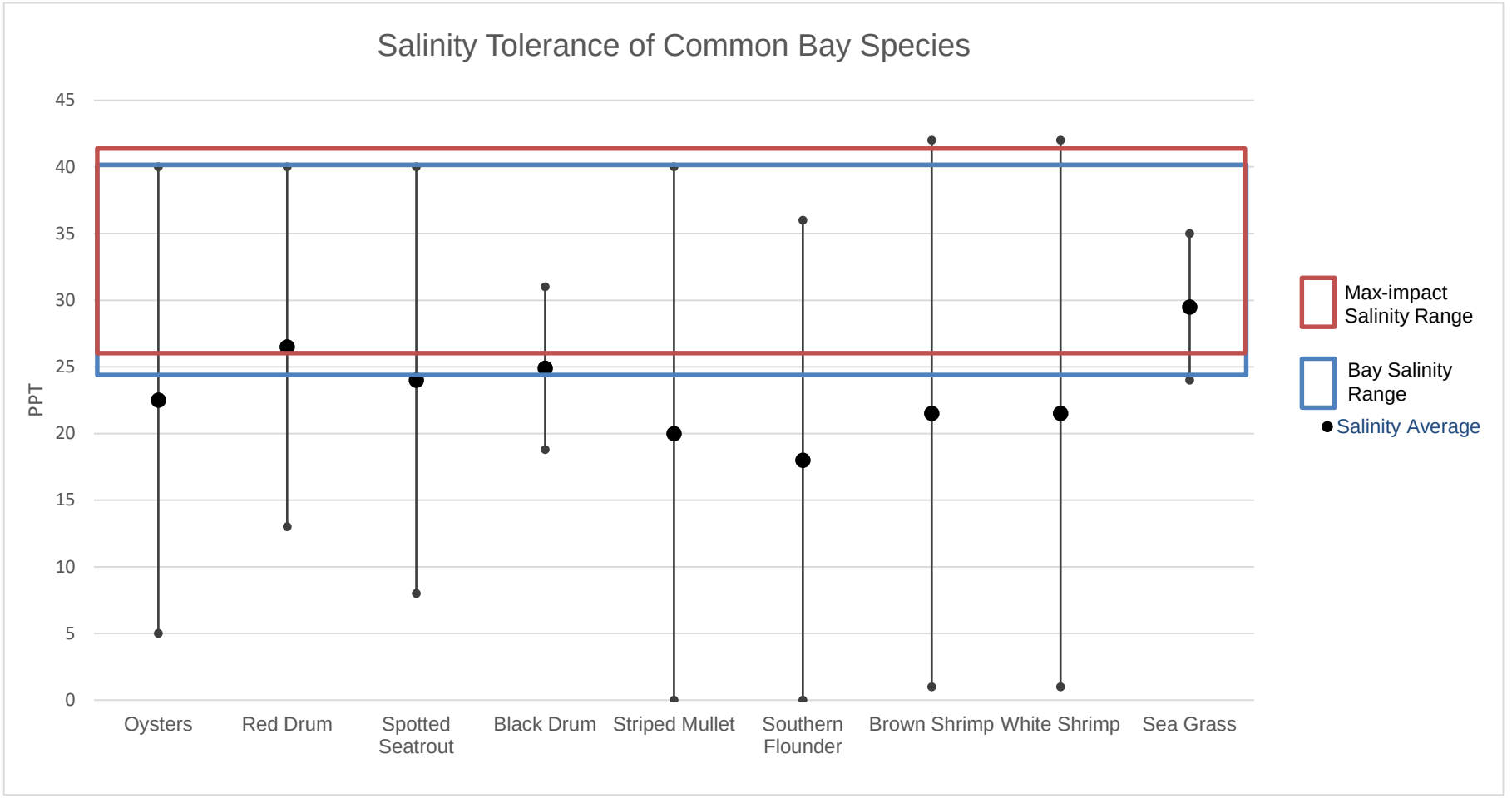
With Project Salinity Changes Calculated in the DELFT3D Model

Location	Average Increase* (ppt)	Increase In Maximum* (ppt)
CC3	0.37	0.47
Corpus Christi	0.38	0.52
CC4	0.33	0.46
CC2	0.35	0.40
N1	0.26	0.29
Nueces	0.25	0.32
CC6	0.24	0.29
CC5	0.32	0.40
Ingleside	0.32	0.47
CC1	0.36	0.53
Basin	0.05	0.06
RedFish Bay	0.21	0.09
A1	0.37	0.44
Aransas Bay	0.28	0.31
A2	0.11	0.12
COP1	0.08	0.08
COP2	0.07	0.08



*Average of all simulations in all conditions. Changes in the maximum values obtained from a selected condition run

Salinity Change in Context Using HIS Models*



*USFWS Habitat Suitability Index Models Northern Gulf of Mexico Brown Shrimp and White Shrimp

Shoaling Analysis

- Estimated using modified USACE rapid estimation techniques
- Most shoaling is still due to Gulf-related sediment (i.e. littoral)
- CCSCIP Project Shoaling (without project) = 1.08 MCY
- CDP Shoaling Incremental Increase = 399,000 CY

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Vessel Wake

- Vessel wake can be broken down into two aspects for analysis
  - Bow Waves
  - Vessel Drawdown

Vessel Wake

Location	1	2	3	4	5	6	7	8	9	10
54-ft Project Vessels	0.015	0.026	0.007	0.017	0.009	0.006	0.008	0.005	0.006	0.008
75-ft Project Vessels	0.07	0.011	0.006	0.010	0.007	0.006	0.007	0.005	0.006	0.007
Ambient	1,730	-	-	-	-	1.17	1.47	1.52	1.76	0.93

Species of Concern

Common Name	Scientific Name	Affected Habitat	Critical Habitat
Loggerhead sea turtle	Caretta caretta	Beach – summer nesting Open ocean– sargassum seaweed feeding and foraging area	Yes - outer segment of dredge channel
Green sea turtle	Chelonia mydas	Beach – summer nesting	No
Kemp's Ridley sea turtle	Lepidochelys kempii	Beach – summer nesting	No
Piping Plover	Charadrius melodus	Beach – used for roosting, feeding, and foraging from July-March	Yes – PAs SJI, SS2, & PA2
Red Knot	Calidris canutus rufa	Beach – used for roosting, feeding, and foraging from July-March	No

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Air Quality Impacts

- **Construction** – only temporary, not subject to General Conformity (we are in attainment)

- **Long-Term Operational** – reductions through enabling fully loaded VLCC use

  - Eliminate Reverse Lightering Emissions
  - Reduce number of vessels needed to carry cargo
  - Provide the efficient highway for onshore loading facilities, which would have better loading emissions controls vs offshore facilities

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Reverse Lightering Emissions Eliminated

CC Crude Lightering at Future Export Rate						
Crude oil export at assumed future rate	4	VLCCs per week				
VLCC loading based on export	208	Annual VLCCs				
	Annual Emissions (tons)					
	NO_X	VOC	CO	PM_{10}	$PM_{2.5}$	SO_X
Using per lightering event emissions	112	9,268	22	11	11	68
Using source EF (VOC)*	-	6,508	-	-	-	-

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Cultural Resources Coordination

- Pre-coordination with SHPO has been initiated:
  - Brief project overview provided
  - Guidance for survey requirements
  - Official submittal the week of July 24th
- Except for one site, all wrecks are in areas that have been surveyed/reviewed previously for cultural resources

Dredged Material Placement Plan

- PCCA, USACE, and Resource Agency Participation
- Use existing PAs, existing BU sites, and existing ODMDS
- Incorporate as much BU placement as feasible
- Avoid reef, seagrass, wetlands, etc. as much as possible
- Ecosystem or habitat-oriented where feasible
- Started initial coordination for proposed BU properties and need for material:
  - Bass Family, TPWD, GLO, City of Port Aransas, City of Corpus Christi, CBI, and UTMSI

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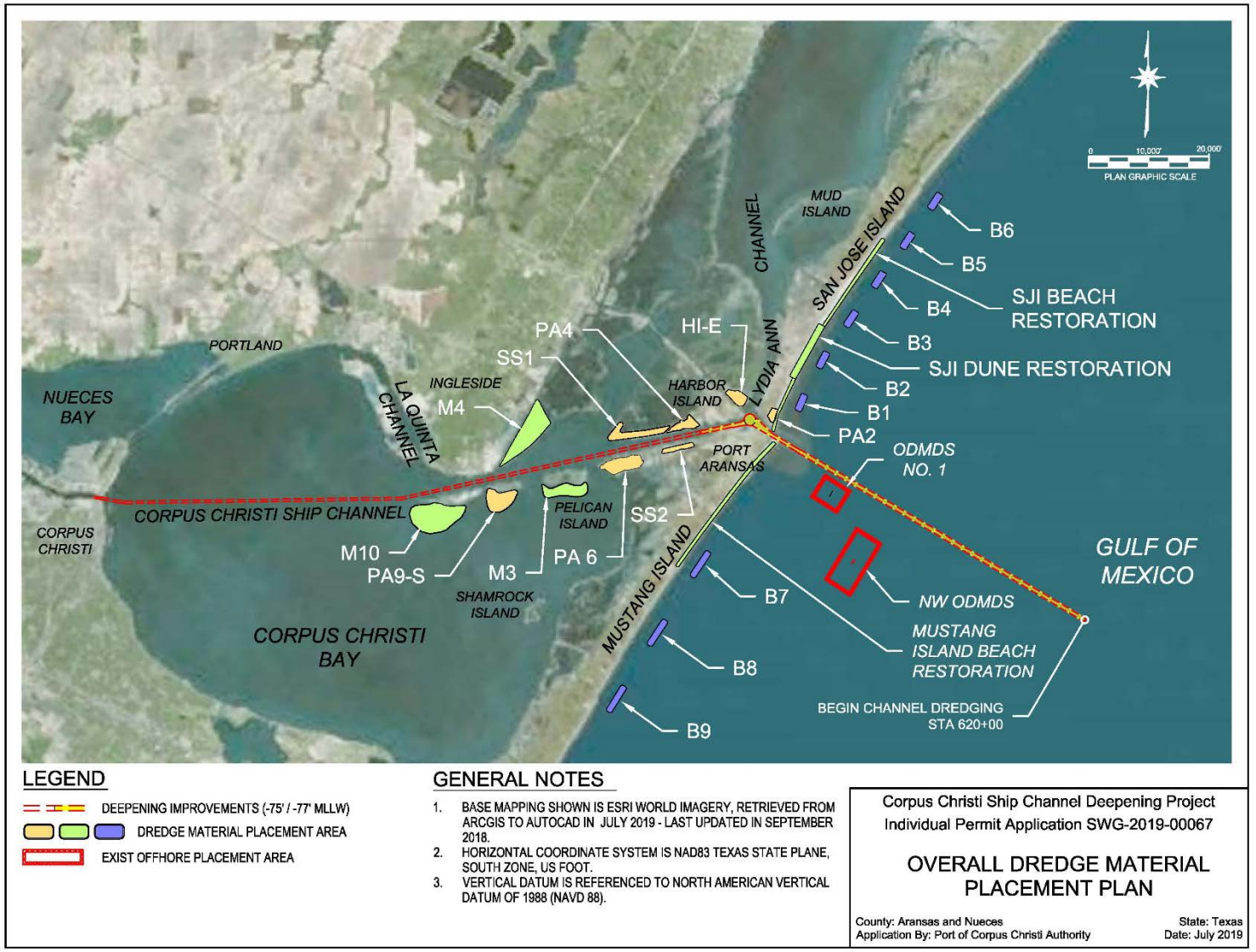
Dredged Material Placement Plan



ODMDS Capacity

- Placement in NW ODMDS (Homeport site)
- Capacity to accommodate new work material modeled using USACE MPFATE
- 13.8 MCY assumed placed in addition to CCSCIP project volume
- Mounding height below 11ft threshold in SMMP →adequate capacity

Agency Coordination and Public Outreach

- **Agency Coordination**
  - September 21, 2018 ✓
  - February 6, 2019 ✓

- **Open Houses**
  - September 27, 2018: Port Aransas ✓
  - September 28, 2018: Corpus Christi ✓

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