From: (b)(6)
To:
Subject: Fw: Draft_Minutes-Mobile_Harbor_GRR_IPR_28_November_17.docx
Date: Friday, December 1, 2017 9:02:55 AM
Attachments: Draft_Minutes-Mobile_Harbor_GRR_IPR_28_November_17.docx

---

Sent from my BlackBerry 10 smartphone.
Original Message
From: (b)(6)
Sent: Thursday, November 30, 2017 3:04 PM
To: (b)(6)
(b)(6)
Subject: Draft_Minutes-Mobile_Harbor_GRR_IPR_28_November_17.docx

All: Before I forward to the larger district team, please review the attached DRAFT minutes from IPR#3 and let me know if you have any comments by COB tomorrow.

(b)(6)

Pages 2 through 11 redacted for the following reasons:
- -
(b)(5)

From:	(b)(6)
To:	
Subject:	Econ Slide.pptx
Date:	Monday, December 4, 2017 2:17:00 PM
Attachments:	Econ Slide.pptx

From:
To: (b)(6)
Cc:
Subject: FW: I"m forwarding this from the ACCP mailbox FW: [EXTERNAL] Dauphin Island
Date: Monday, December 4, 2017 9:55:00 AM
Attachments: DI Letter Dec 2017.pdf

(b)(6) : Thank you.

(b)(6) : Please file this accordingly. I have placed it in my file was well.

(b)(6)

-----Original Message-----
From: (b)(6)
Sent: Monday, December 04, 2017 9:17 AM
To: (b)(6)
(b)(6)
Cc: (b)(6)
Subject: I'm forwarding this from the ACCP mailbox FW: [EXTERNAL] Dauphin Island

(b)(6)

From: (b)(6)
Sent: Sunday, December 03, 2017 10:20 PM
To: Mobile Harbor GRR <MobileHarborGRR@usace.army.mil>; ACCP <ACCP@usace.army.mil>
Subject: [EXTERNAL] Dauphin Island


(b)(6)

District Engineer

US Army Corps of Engineers

ATTN: PD-F PO Box 2288

Mobile AL, 36628

Sent via email: MobileHarborGRR@usace.army.mil, accp@usace.army.mil

Dear District Engineer,

I am writing again regarding the ongoing erosion crisis facing Dauphin Island, AL. We have owned a home there for sixteen years.

Dauphin Island is an important protector and barrier for Alabama's western coastal shoreline. Over the sixteen years we have lived there we have lost over 100 feet of beach due to erosion. This erosion is due to Corps' of Engineers maintenance dredging of the Mobile Harbor Outer Bar Chanel.

We understand that this channel maintenance must take place. What we and concerned members of the Dauphin Island community think is that there needs deposition of dredged sand so it replenishes the beaches of the island. Further, there needs to be a dialogue with those directly affected by dredging.

Further erosion of the island has dire consequences for the island, the biodiversity, and the Alabama shoreline.

Please consider the requests, previously submitted, to change dredging and sand disposal practices.

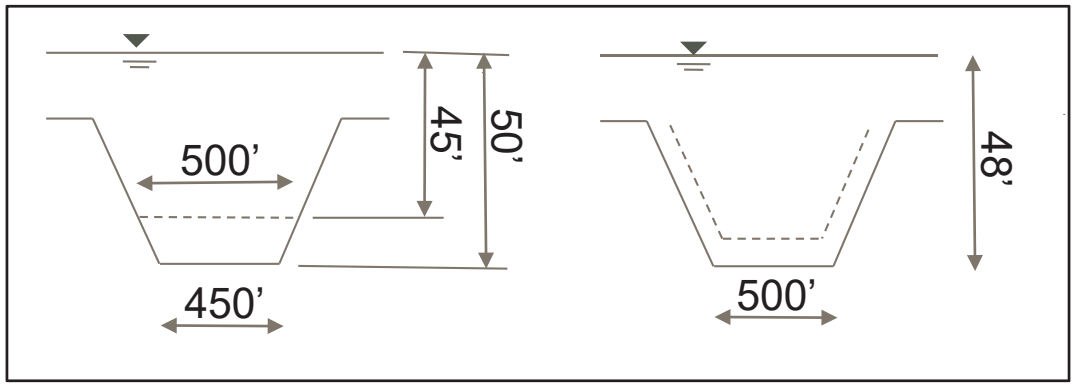
Thank you for your consideration.

Sincerely,

MOBILE HARBOR GRR
PRELIMINARY NET BENEFITS AND BCR

Mobile Harbor Alternatives Matrix						
Net Benefits						
	45'	47'	48'	49'	50'	51'
Deepening Only	NA	$17.1M	$26.8M	$36.5M	$44.5M	49.7M
50' widening for 4 miles						
50' widening for 5 miles			$ (2,100)	$ (41,000)	$ (74,300)	
50' widening for 5 miles (parameter change)*			$114,000	$75,000	$42,000	
100' widening for 3 miles	$265,000	$ 148,000	$ 89,000	$ 16,000	$ (77,000)	
100' widening for 4 miles						
100' widening for 5 miles	$700	$ (169,900)	$ (257,000)	$ (387,600)	$ (481,600)	

Highlighted yellow alternatives were modeled in HarborSym. Other net Benefits estimated using widening benefits modeled at 50 foot depth.



US Army Corps of Engineers

U.S.ARMY

From:
To: (b)(6)

Subject: RE: Mobile Harbor GRR Widener Selection
Date: Monday, December 4, 2017 4:20:00 PM
Attachments: Econ Slide.pptx
3308_001.pdf

All: The attached slide includes the narrowed alternatives per today's discussion. Also attached is the ship simulation report.

(b)(6)

-----Original Appointment-----
From: (b)(6)
Sent: Monday, December 04, 2017 11:25 AM
To: (b)(6)
(b)(6)
Cc: (b)(6)
Subject: Mobile Harbor GRR Widener Selection
When: Monday, December 04, 2017 2:30 PM-3:00 PM (UTC-06:00) Central Time (US & Canada).
Where: MsCIP Conference Room

All: Please plan on attending a brief discussion on the widener selection for the Mobile Harbor GRR today at 1430hrs in the MsCIP Conference Room. Will provide an updated economics table prior to the meeting.

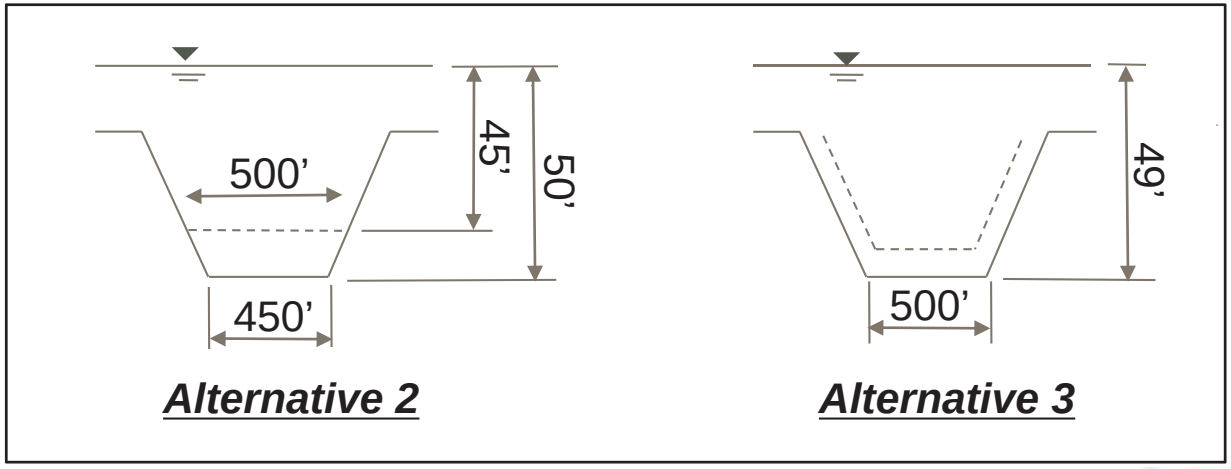
(b)(6)

MOBILE HARBOR GRR
PRELIMINARY NET BENEFITS

Mobile Harbor Alternatives Matrix						
Net Benefits						
	45'	47'	48'	49'	50'	51'
Alternative 1 - Deepening Only	NA	$17.1M	$26.8M	$36.5M	$44.5M	49.7M
Alternative 2* - 50' widening for 5 miles						
Alternative 3 - 100' widening for 3 miles	$265,000	$ 148,000	$ 89,000	$ 16,000	$ (77,000)	

***Assumes additional benefits for larger vessels to pass that draft at 45' or less**

Note: Highlighted yellow alternatives were modeled in HarborSym. Other net Benefits estimated using widening benefits modeled at 50 foot depth.



Alternative 2 ***Alternative 3***

US Army Corps of Engineers

U.S.ARMY

DEPARTMENT OF THE ARMY
ENGINEER RESEARCH AND DEVELOPMENT CENTER, CORPS OF ENGINEERS
COASTAL AND HYDRAULICS LABORATORY
WATERWAYS EXPERIMENT STATION, 3909 HALLS FERRY ROAD
VICKSBURG, MISSISSIPPI 39180-6199

REPLY TO
ATTENTION OF

CEERD-HNN

2 October 2017

MEMORANDUM FOR Commander, U.S. Army Corps of Engineers, Mobile District (CESAM-EN-HH/Ms. Elizabeth Godsey), P.O. Box 2288, Mobile, AL 36628-0001

SUBJECT: Mobile Bay Deepening and Widening Feasibility Ship Simulation Study Data Report

1. Enclosed is the Mobile Bay Deepening and Widening Feasibility Ship Simulation Study (FLSSP) Data Report.

2. The purpose of the FLSSP was to test varying channel widths for the two-way traffic area in the lower Mobile Bay Channel, to test a bend easing, and to determine the feasibility of only deepening the Little Sand Island turning basin. Enclosed is a synopsis of the testing performed from 23-26 May 2017 as well as trackplots and runsheets (Appendix A) and pilot questionnaires (Appendix B). The results from this FLSSP should be used to drive a more comprehensive ship simulation study performed during the Preconstruction, Engineering, and Design (PED) portion of the project.

3. If you have any questions, please contact Ms. Morgan Johnston at (601) 634-2365 or Mr. Tim Shelton, Chief, Navigation Branch, at (601) 634-2304.

Encl

FOR JOSÉ E. SÁNCHEZ, PE, SES
Director

ERDC/CHL

Engineer Research and Development Center
Coastal and Hydraulics Laboratory

US Army Corps of Engineers®
Engineer Research and Development Center

Data Report *Mobile Bay Deepening and Widening Feasibility Ship Simulation Study*

Morgan Johnston

August 2017

Mobile Bay Deepening and Widening
Feasibility Ship Simulation Study
Data Report

1. Introduction

The U.S. Army Engineer Research and Development Center (ERDC) assisted the U.S. Army Corps of Engineers District, Mobile (CESAM) in screening proposed deepening and widening alternatives in Mobile Bay by completing a Feasibility Level Screening Simulation Program (FLSSP). The two areas of interest for the study included a turning basin near Little Sand Island and an area which included a bend easing connected to a two-way traffic area in the lower part of Mobile Bay. These areas of interest are shown in Figure 1.

Figure 1. Areas of interest for Mobile Bay FLSSP

2. Proposed Alternatives Tested

For all proposed simulations, the depth was deepened from 45-ft (47-ft at entrance channel) to 51-ft (53-ft at entrance channel). Two different widths were screened for the passing area (500-ft and 550-ft). Each passing lane width spanned approximately 5 miles. All proposed passing lane testing included bend easing on the inside at buoys 18 and 21. The width increases of the bends were approximately 185-ft at buoy 18 and 50-ft at buoy 21. The proposed bend easing is shown in Figure 2. The passing lane begins immediately north of buoy 22 as shown in Figure 2. The Little Sand Island Turning Basin was deepened to 51-ft for proposed testing. The design vessel chosen for the study by the district was a containership (1100-ft x 158-ft x 48-ft). As this ship was not in ERDC's ship library, replacement ships had to be chosen for testing. For passing, the *MSC Daniella 2* (1200-ft x 159-ft x 50-ft) was chosen as a replacement ship to closely match beam, which is vital to passing. There were also a variety of passing scenarios tested that did not include the design vessel, but were of economic interest to the district. For the turning basin, the *Humber Bridge* (1102-ft x 150-ft x 46-ft) was chosen as a replacement ship to match length, which is essential to turning.

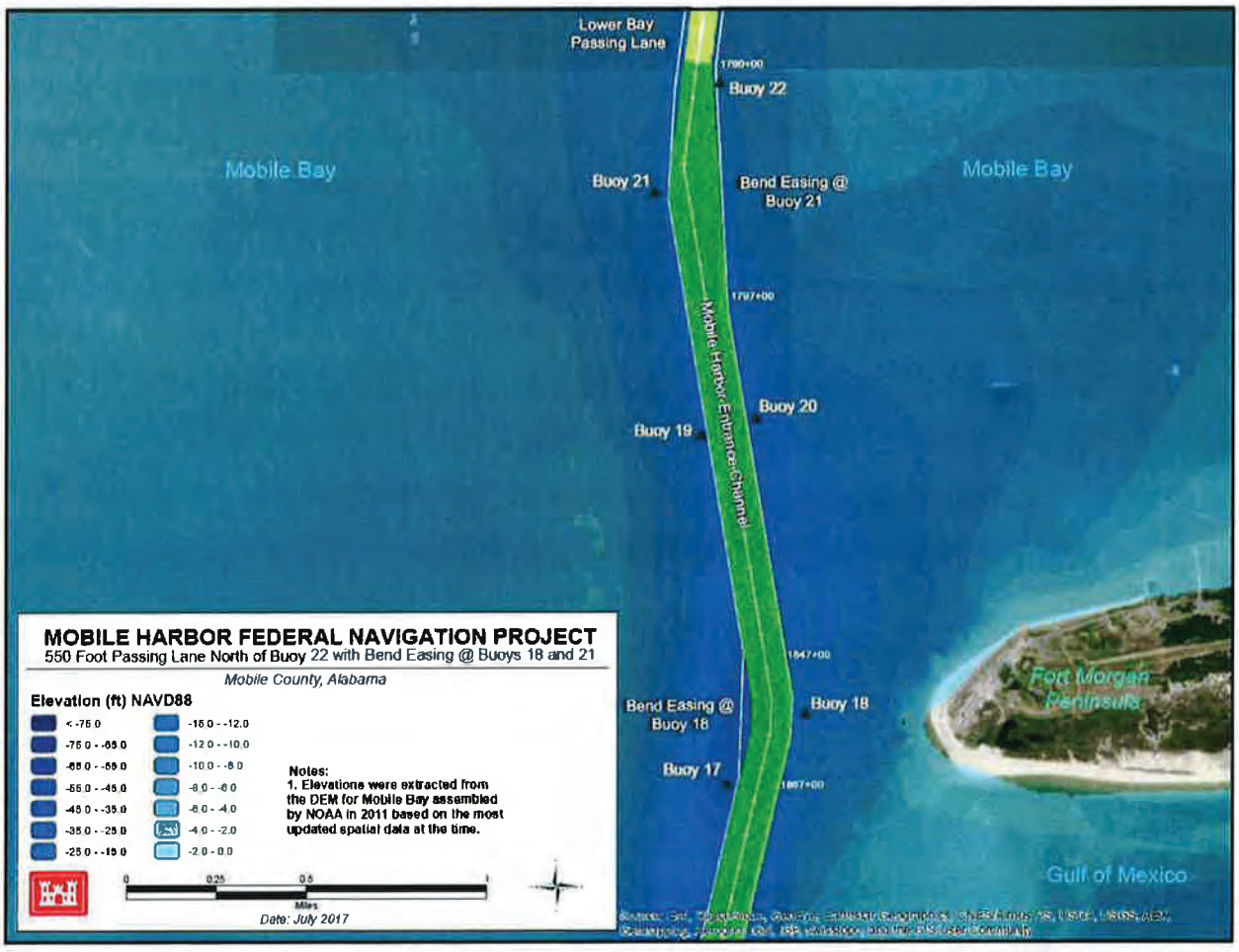


Figure 2. Proposed bend easing

3. Purpose

The purpose of a FLSSP is to screen proposed alternatives using lower resolution databases to limit monetary and time commitments while still providing vital insight of the proposed alternatives moving forward. The lower resolution databases are quicker and less costly to develop and easier to quickly manipulate during the course of testing. This method allows for discussion after the completion of each simulated run, necessary modifications to be implemented, and then the same simulations re-run. By allowing for quick manipulation, the suggested adjustments can be made during the testing week and then tested with the same group of pilots. Conclusions drawn from actual data should be limited due to the use of these lower resolution databases. Data processing is limited to trackplots and run sheets shown in Appendix A. One of the most vital aspects of a FLSSP is providing the means to conduct expert elicitations. The collaboration of all parties occurred throughout the testing week as well as the final group discussion at the conclusion of the testing.

4. Participants

The FLSSP included representatives from ERDC, CESAM, and Mobile Bar Pilots. The individuals listed below were present for the entirety of the testing week, 23-26 May 2017.

ERDC: Morgan Johnston, Keith Martin, Mary Claire Allison, Mario Sanchez, and Dennis Webb, P.E. (former ERDC employee under contract to CHL)

CESAM: Elizabeth Godsey, P.E.

Mobile Bar Pilots: Capt. Chris Brock and Capt. Curtis Wilson

5. Database Development

Due to this study falling under the guidelines of a FLSSP, model development was completed with fairly low resolution.

a. Simulated ships were limited to ships in ERDC's ship library. Ships used during simulations are shown in Table 1 below.

b. Since the development of the exact design ships was not able to be contracted due to time constraints, the ships used from ERDC's ship library had drafts which were unrealistic for the proposed deepening. Tide had to be added to compensate for the extra draft on the *MSC Daniella 2* and *MT Brittania* during testing and when using the *Sovereign Maersk* during validation.

c. Wind conditions were set at run time.

d. Visual scenes were developed using the high level of detail necessary for the more in-depth Preconstruction Engineering and Design (PED) phase of the project. The visual database should be able to be used with minimal adjustments during PED.

e. Currents were developed for the existing channel and the 550-ft proposed channel. During testing of the 500-ft channel, the currents developed for the 550-ft channel were used. This approach was acceptable based off this being a FLSSP and pilots' comments of minimal difference occurring between existing and proposed currents felt during passing. The dominant force felt during passing was ship-to-ship interaction.

f. Ebb currents used for the proposed turning basin included an increased Mobile River flow to create a similar vessel response expected during existing ebb tide.

g. A constant depth of 51-ft was set for the testing of the extended turning basin.

Table 1. Ships used in simulations

Model Name	Vessel Name	LOA (ft)	Beam (ft)	Draft (ft)	Area Tested
CNTNR28L	*Sovereign Maersk*	1138.5	140.4	47.6	Passing, bends, and validation of turning basin
CNTNR40	*MSC Daniella 2*	1201.1	158.8	49.9	Passing, bends, and turning basin
CNTNR20L	*KMSS Dainty*	964.9	105.7	41.0	Validation only, replaced by *Zim Piraeus* for testing of passing
CNTNR44	*Zim Piraeus*	964.9	105.6	43.0	Passing and bends
CNTNR33L	*Humber Bridge*	1102.4	150.3	46.2	Passing, bends, and turning basin
VLCC15L	*MT Brittania*	859.6	137.8	49.2	Passing and bends
TANK10L	*MT Danita II*	750.0	105.8	45.9	Used only as docked vessel near turning basin

6. Validation

Validation for the passing lane occurred on Tuesday, 23 May 2017. Validation started with passing scenarios using the *KMSS Dainty*; however it quickly became clear that the pilots felt that the ship was not experiencing enough response from the banks. The *KMSS Dainty* was replaced with the *Zim Piraeus* which had similar dimensions and has called to port before. This replacement allowed for a much more accurate vessel response from the banks which is vital when testing passing scenarios; however it did come with a slight increase in draft. Once this ship was replaced, pilots felt the appropriate bank effects, including the expected shear off the bank toward the middle of the channel. Pilots expressed that wind, ship-to-ship reaction, ship responses, and currents all felt appropriate for the existing conditions.

Validation of the turning basin occurred during Tuesday, 23 May and Wednesday, 24 May 2017. On Tuesday, it quickly became evident that the currents created for the existing conditions in the turning basin were not sufficient. During turning, these large vessels block most of the channel that conveys the flow of the Mobile River causing the currents and force on the vessel to greatly intensify. An example of this turning vessel which blocks river flow is shown in Figure 3 below. The simulator operates using a pre-

calculated current field. Real-time recalculation of currents to account for ship blockage is beyond the ability of present day ship simulation modeling. The decision was made to improve the effect felt by these turning ships by simply increasing the magnitude of the currents. On Wednesday, a new ebb current was developed which increased the original Mobile River flow used to create the ebb currents by 75%. The pilots found this increased current to be a much more accurate representation of what they experience in existing conditions. The same +75% river flow was then developed for the deepening alternative which was used for the rest of the proposed turning basin testing.

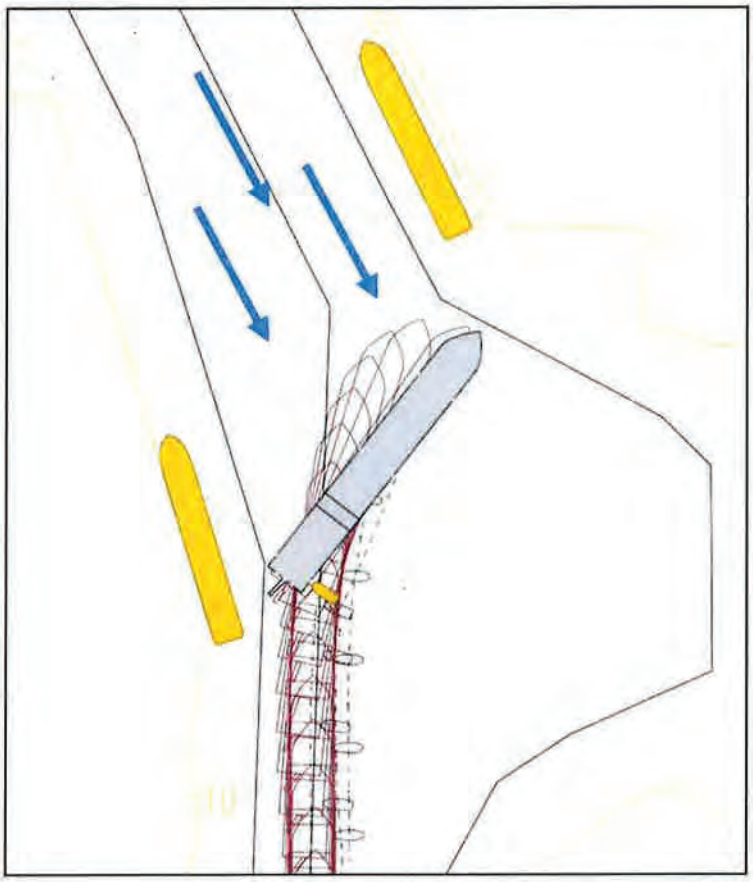


Figure 3. Turning vessel which dams majority of the river flow heading south

7. Passing Lane Testing

Passing lane and bend easing testing began on Wednesday morning. The first run was in the 550-ft channel passing the *MSC Daniella 2* and *Zim Piraeus* using the currents developed for the 550-ft channel. Pilots stated they did not feel much of a difference between the existing currents and the currents developed for the 550-ft channel. This is due to the dominant force of ship-to-ship reaction felt during passing. Due to the minimal difference felt and this being a FLSSP, the currents developed for the 550-ft channel were used for both the 500-ft and 550-ft channels for the remainder of the simulations.

The inbound vessel has a more difficult transit when passing as this ship must navigate through the bends in the lower part of Mobile Bay, and then set up to pass an outbound

vessel. For screening purposes, the more challenging ship typically headed inbound to test the worst case scenario. This more difficult ship was usually selected as the longer ship or the *MT Brittania* as loaded tankers do not steer as easily as containerships. After the first run, the starting positions of the ships were shifted to allow for the inbound ship to completely navigate the bends and then pass the outbound ship.

Table 2 shows the passing lane simulations which were run over the course of the testing week. Twelve passing lane/bend easing runs were simulated with varying passing combinations. It should be noted that drafts were not able to be manipulated to realistically simulate certain passing scenarios. During PED, vessels which have the appropriate loaded and unloaded drafts should be developed. Most runs simulated used flood current with a 20 knot southeasterly wind. Pilots stated this was a critical condition with the ebb current and a 20 knot northern wind being a secondary concern. Run 10 used the existing flood current and a 20 knot eastern wind to test cross-currents felt along the transit. Existing flood currents with an easterly wind were used for this simulation as the proposed channel modification had not been developed with this wind condition.

Table 2. Passing simulations completed

Run #	Passing Lane Width (ft)	Inbound Ship (ft)	Outbound Ship (ft)	Combined Dimensions (ft)	Current	Wind
1	550	*MSC Daniella 2* (1200 x 159)	*Zim Piraeus* (965 x 106)	2165 x 266	Alt Flood	20 SE
3	500	*MSC Daniella 2* (1200 x 159)	*Zim Piraeus* (965 x 106)	2165 x 266	Alt Flood	20 SE
4	500	*MT Brittania* (860 x 138)	*Zim Piraeus* (965 x 106)	1825 x 244	Alt Flood	20 SE
5	500	*MT Brittania* (860 x 138)	*Zim Piraeus* (965 x 106)	1825 x 244	Alt Flood	20 SE
6	500	*Humber Bridge* (1102 x 150)	*Zim Piraeus* (965 x 106)	2067 x 256	Alt Flood	20 SE
7	500	*Humber Bridge* (1102 x 150)	*Zim Piraeus* (965 x 106)	2067 x 256	Alt Ebb	20 N
8	500	*MSC Daniella 2* (1200 x 159)	*MT Brittania* (860 x 138)	2060 x 297	Alt Ebb	20 N
9	500	*Sovereign Maersk* (1140 x 140)	*Sovereign Maersk* (1140 x 140)	2280 x 280	Alt Ebb	20 N
10	500	*MSC Daniella 2* (1200 x 159)	*Sovereign Maersk* (1140 x 140)	2340 x 299	Existing Flood	20 E
23	550	*MT Brittania* (860 x 138)	*MSC Daniella 2* (1200 x 159)	2060 x 297	Alt Flood	20 SE
24	550	*MSC Daniella 2* (1200 x 159)	*Sovereign Maersk* (1140 x 140)	2340 x 299	Alt Flood	20 SE
29	500	*Sovereign Maersk* (1140 x 140)	*Sovereign Maersk* (1140 x 140)	2280 x 280	Alt Flood	20 SE

8. Bend Easing Testing

While simulations that tested only the bend easings were not performed, the entire bend easing was tested during all passing scenario runs after the first run by the inbound vessel. Figure 4 shows the effect the bend easing had on the transit of the inbound vessel. Figure 4 compares the *MT Brittania* trackplots for Run 4 and Run 23. In Run 4, the vessel did not utilize the given bend easing and shows a trackplot that would be similar to a vessel transit in the existing conditions. The bend easing was likely not utilized due to pilots becoming acquainted with the new bend easing and being the initial tanker run. In this simulation, the vessel experienced a much harder turn which pushed it out of the east side of the channel. Run 23 shows better utilization of the bend easing. In this simulation, the same vessel was able to use the bend easing to maintain its course in the center of the channel.

Pilots stated that the bend easing was extremely beneficial in passing scenarios. The extra room at buoy 18 and 21 allowed for the inbound vessel to prepare earlier to pass the outbound vessel which is vital when passing. Pilots suggested that the bend be eased further on the outside of the bend near buoy 21 as to provide extra room for inbound vessels utilizing this segment of the bend.

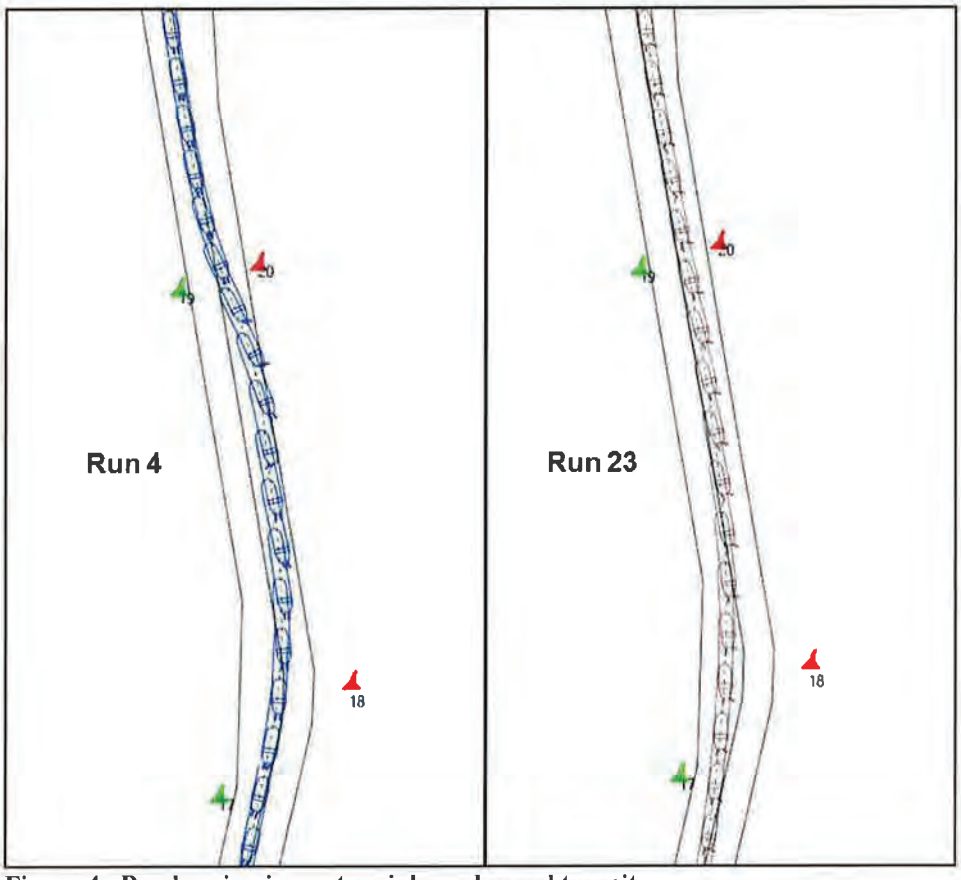


Figure 4. Bend easing impact on inbound vessel transit

9. One-way existing channel with *MSC Daniella 2*

The existing channel with no bend easing or passing lanes added was tested using the *MSC Daniella 2* inbound with flood current and a 20 knot southeasterly wind in Run 26. During this simulation, the vessel clipped the channel near buoy 17 and had to use several hard over rudder commands to traverse the existing channel. However, these navigational difficulties likely occurred due to the lack of bend easing and not the channel width. The pilot who completed this simulation said the width of the existing channel felt adequate. The existing channel width should be sufficient for a vessel with similar dimensions of the *MSC Daniella 2* if the bend easing is implemented.

10. Turning Basin Testing

Turning Basin testing began on Thursday morning as the proposed ebb current had to be updated to include an increase river flow to mimic the vessel response felt during turning with strong ebb currents. The proposed testing utilized the deepened channel, the increased river flow ebb current, and a 20 knot wind from the north. Pilots stated that this was by far the hardest condition typically navigated. They were confident if they were able to turn a vessel with the ebb current and north wind, then they would be able to turn the vessel in other conditions.

For all turning basin simulations, cranes were placed at the southern container terminal berth to act as a visual que for the pilots. For most simulations, a docked tanker (750-ft x 106-ft) was placed at the southern berth of the container terminal and at the Pinto terminal. The placement and size of these ships is typical of docked ships expected to be seen by pilots.

Table 3 shows the different turning basin simulations which were ran over the course of the testing week. Runs 13-16 tested the *Humber Bridge* turning and then going towards the dock and the *Humber Bridge* pulling off the dock and then turning. Two tugs were used for these first simulations as this is what is typically available to the pilots in current conditions. In the simulations that pulled the vessel off the dock (Runs 15 and 16), both pilots went outside of the federal channel and had to rely on the container terminal berthing area to complete the turn. In the simulations testing the vessel docking (Runs 13, 14, and 19), the vessel barely stayed within the federal limits (roughly averaged 21-ft from stern of turning vessel to the federal channel limit near the berthing area) and had about 150-ft of clearance from the docked vessel at the container terminal.

Pilots were very uncomfortable with these turning scenarios. To use the turning basin inbound for existing conditions in ebb tide, pilots position the stern of the turning ship as close to the dock or docked vessel as possible. This maneuver often requires the vessel to go outside of the federal channel and rely on the container terminal berthing area. Once the vessel is perpendicular with the ebb current, tugs are positioned on the stern. These tugs attempt to hold the stern in place while the bow of the vessel falls to the south due to the strong ebb current. Due to the docked vessel at the southern berth of the container terminal, pilots had to go further east into the turning basin which they avoid in existing conditions. The further east the vessel commits into the turning basin,

the greater the risk of the bow of the vessel clipping the southern edge of the turning basin in the vicinity of Little Sand Island. A more easterly approach also forces the pilot to rely on engines working full astern to pull out of the turning basin. This leaves the pilots without a safety factor. With engines pulling full astern and tugs working at full power, there is no room for error or engine failure. Due to this added risk, pilots were uncomfortable with the maneuver necessary to turn this larger vessel with a docked vessel.

For Runs 17 and 18, the *MSC Daniella 2* was tested going to the dock with three tugs by both pilots. Both of these runs were unsuccessful. The 1200-ft length of the *MSC Daniella 2* was not feasible for the deepened only turning basin with a docked vessel at the southern berth. For Runs 19 and 20, the *Humber Bridge* was tested going to the dock with an extra 60 ton tug. The pilots did not find that this extra tug had much of an effect on the turning maneuver; however, pilots stated that if this sized vessel were to come to port, they would complete the turn with three tugs. Therefore, the rest of the simulations were completed using three tugs. Run 20 was completed in the deepened only turning basin, but with an aggressive easterly approach that would not be attempted in existing conditions. This run allowed the team to visualize the maneuver and dimensions necessary for more utilization of the eastern portion of the turning basin. Modifications were made for subsequent simulations to eliminate the concern of the falling bow clipping the southern edge of the turning basin.

For Runs 21-22, 25-28, and 30-32, a flat bottom of constant depth 51-ft was used for the entire database. A flat bottom of constant depth allows for the vessel to leave the channel boundaries without stopping the simulation. This provides insight into what may be necessary as a channel improvement. This assumption is appropriate for a FLSSP and is consistent with assumptions used in previous FLSSP studies. For Runs 21 and 22, a flat bottom was used; however the Electronic Chart Display and Information System (ECDIS) maintained the existing turning basin lines. Pilots expressed interest in adding an extension to the turning basin lines in the ECDIS to better visualize the room available. For Runs 25 and after, a new file was created on the ECDIS with a 100-ft extension on the southern edge of the turning basin. This 100-ft extension of the turning basin can be seen in Figure 5. In Run 31, a *Humber Bridge* was turned with a docked *MSC Daniella 2* in the southern berth of the container terminal to visually represent further expansion of the container terminal.

Of the nine simulations completed with a flat bottom, only one simulation went outside of the federal channel near the container terminal berthing area, Run 28. In Run 28, there was no docked vessel at the southern berth so the turning vessel utilized part of the berthing area to complete the turn. The average distance from the federal channel limit near the southern berth to the turning *Humber Bridge* for all of the flat bottom simulations (Runs 21-22, 25-28, and 30-32) was about 183-ft. The average distance from the federal channel limit near the southern berth to the turning *Humber Bridge* for the deepened only turning basin simulations (Runs 13-16, and 19) was about 11-ft.

Pilots thought overall the extension of the turning basin greatly assisted in the safety of completing the turn with the *Humber Bridge* by allowing for more room for the falling

bow. However, even with the extension, pilots still had to use more of the engine's power than they would typically be comfortable with. While the extension of the turning basin increased the room for error during the turn for this larger vessel, further improvements may be required. Turning basin testing should be revisited during PED as testing was limited, utilized a flat bottom instead of actual bathymetry, operated with a replacement design vessel, and used currents developed for the deepened only turning basin. After the previous simplifications are addressed, PED testing can be completed to further test turning basin modification.

Table 3. Turning basin simulations completed

Run #	Plan	Vessel (ft)	To dock/ Off dock	Docked Vessel (south berth, Pinto terminal)	Tugs (tons)	Pilot
13	P1	*Humber Bridge* (1102 x 150)	To dock	Tank10L, Tank10L	50 and 60	Brock
14	P1	*Humber Bridge* (1102 x 150)	To dock	Tank10L, Tank10L	50 and 60	Wilson
15	P1	*Humber Bridge* (1102 x 150)	Off dock	Tank10L, Tank10L	50 and 60	Brock
16	P1	*Humber Bridge* (1102 x 150)	Off dock	Tank10L, Tank10L	50 and 60	Wilson
17	P1	*MSC Daniella 2* (1200 x 159)	To dock	Tank10L, Tank10L	50, 60, and 60	Brock
18	P1	*MSC Daniella 2* (1200 x 159)	To dock	Tank10L, Tank10L	50, 60, and 60	Wilson
19	P1	*Humber Bridge* (1102 x 150)	To dock	Tank10L, Tank10L	50, 60, and 60	Brock
20	P1	*Humber Bridge* (1102 x 150)	To dock	Tank10L, Tank10L	50, 60, and 60	Wilson
21	P2	*Humber Bridge* (1102 x 150)	To dock	Tank10L, Tank10L	50, 60, and 60	Brock
22	P2	*Humber Bridge* (1102 x 150)	To dock	Tank10L, Tank10L	50, 60, and 60	Wilson
25	P2	*Humber Bridge* (1102 x 150)	To dock	Tank10L, Tank10L	50, 60, and 60	Wilson
26	P2	*Humber Bridge* (1102 x 150)	Off dock	Tank10L, Tank10L	50, 60, and 60	Brock
27	P2	*Humber Bridge* (1102 x 150)	To dock	None, Tank10L	50, 60, and 60	Brock
28	P2	*Humber Bridge* (1102 x 150)	Off dock	None, Tank10L	50, 60, and 60	Wilson
30	P2	*Humber Bridge* (1102 x 150)	To dock	Tank10L, Tank10L	50, 60, and 60	Brock
31	P2	*Humber Bridge* (1102 x 150)	To dock	Tank10L, *MSC Daniella 2*	50, 60, and 60	Wilson
32	P2	*Humber Bridge* (1102 x 150)	Off dock	Tank10L, Tank10L	50, 60, and 60	Wilson

*All runs used the increased river flow ebb current for the deepened alternative and a 20 knot northern wind
**P1 is a deepened only turning basin (51-ft) , P2 is deepened using a flat bottom depth of 51-ft

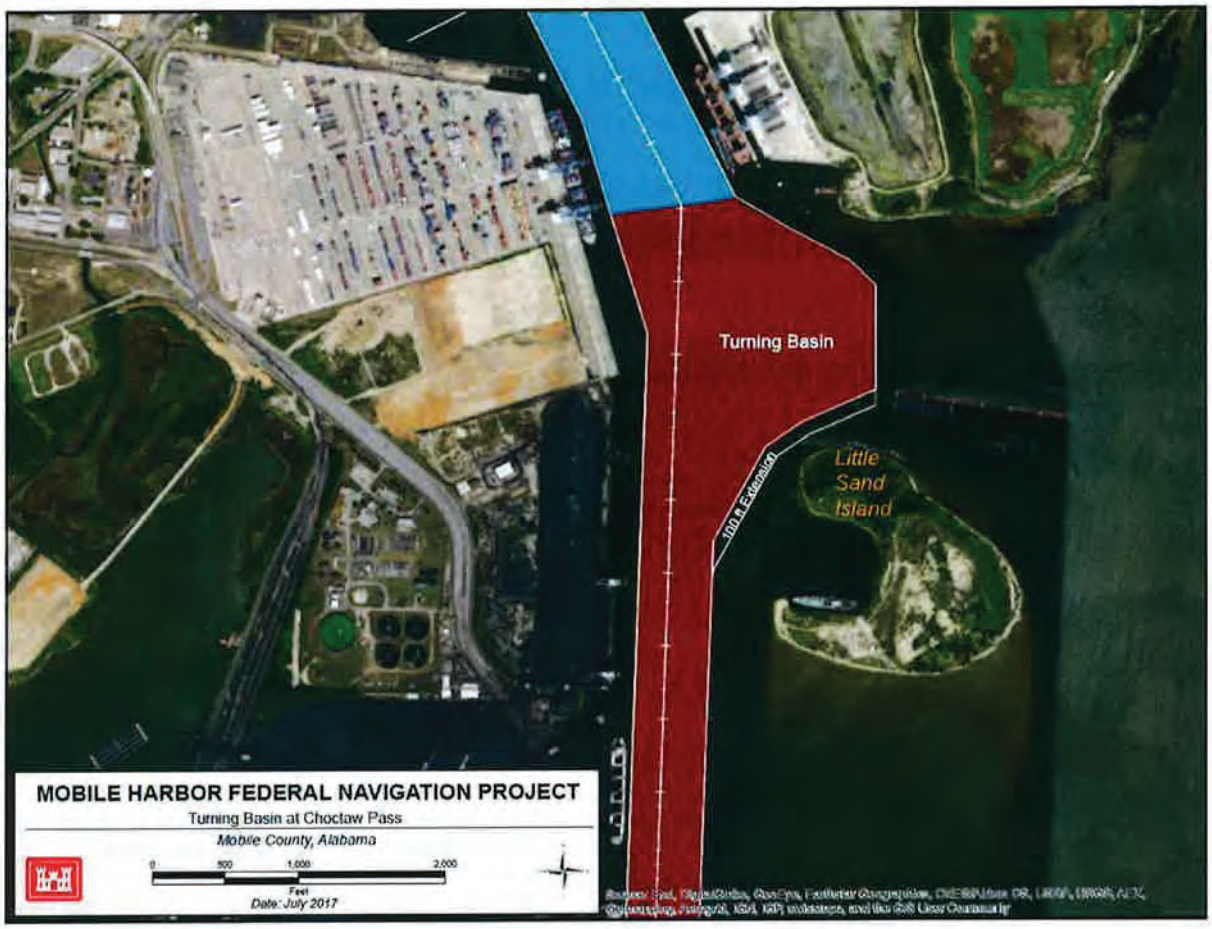


Figure 5. Turning basin extension

11. TSP Channel

The following aspects of the study were determined based upon the final FLSSP discussion on Friday afternoon, observations throughout the testing week, and the final pilot surveys (shown in Appendix B):

a. The 500-ft channel was deemed acceptable for a variety of passing scenarios:

   (1) *Zim Piraeus* (965-ft x 106-ft) and *Zim Piraeus* (965-ft x 106-ft)

   (2) *Zim Piraeus* (965-ft x 106-ft) and *MT Brittania* (860-ft x 138-ft)*

b. The 550-ft channel was deemed acceptable for a variety of passing scenarios:

   (1) *Zim Piraeus* (965-ft x 106-ft) and *Zim Piraeus* (965-ft x 106-ft)

   (2) *Zim Piraeus* (965-ft x 106-ft) and *MT Brittania* (860-ft x 138-ft)

   (3) *Sovereign Maersk* (1140-ft x 140-ft) and *Sovereign Maersk* (1140-ft x 140-ft)

(4) *Sovereign Maersk* (1140-ft x 140-ft) and *Zim Piraeus* (965-ft x 106-ft)

(5) *MSC Daniella 2* (1200-ft x 159-ft) and *MT Brittania* (860-ft x 138-ft)*

(6) *Sovereign Maersk* (1140-ft x 140-ft) and *MT Brittania* (860-ft x 138-ft)*

*It should be noted that pilots believe draft restrictions in both the 500-ft and 550-ft passing lanes will be enforced for passing scenarios using tankers.

c. The bend easing was found to greatly influence the ease in which passing could be completed. If further modifications to ease the bend even more were possible, the passing lane may be able to be shortened slightly.

The biggest interest for further softening of the bends was near buoy 21 on the west side of the channel.

d. While testing was completed using a 5 mile passing lane, it is likely that the full 5 mile length may not be necessary.

Most likely the passing lane length will fall in-between 3 and 5 miles.

e. The turning basin should be modified for the design vessel to safely and confidently use the turning basin. This will be required when a docked vessel is present at the container terminal. Further testing should be completed for this modification, but it is likely that a minimum of a 100-ft addition will be necessary on the southern edge of the turning basin.

If the turning basin is enlarged, it is possible that only two tugs would be necessary to complete the turn using ships similar in size to the *Humber Bridge* (1102-ft x 150-ft).

During a follow-up call with Capt. Brock on 27 May 2017, the following passing situations were discussed:

a. *Sovereign Maersk* (1140-ft x 140-ft) and *Zim Piraeus* (965-ft x 106-ft) would be feasible with draft restrictions in the 500-ft channel.

b. Humber Bridge (1102-ft x 150-ft) and *Zim Piraeus* (965-ft x 106-ft) in the 500-ft channel would be feasible with environmental and draft restrictions.

c. *MT Brittania* (860-ft x 138-ft) and *MT Brittania* (860-ft x 138-ft) in 550-ft channel

Although not simulated, Capt. Brock believed this scenario would be possible with draft restrictions.

Mobile Bay Feasibility Simulations – Passing Lane / Bend Ease

Run #: 1 Date: 5/24/17

Pilot:

1. Captain Chris Brock — Inbound ✓ Outbound ___ Buoy Start 17 Bridge B
2. Captain Curtis Wilson — Inbound ___ Outbound ✓ Buoy Start 31 Bridge A

Out 31
In 17

Wind: 20 KNT E W SE Other: ___

Currents: Flood(E wind) Flood(W wind) Flood(SE wind) Ebb(E wind) Ebb(W wind) Other: ___

Tide added: None +0.7m (Daniella 2 or MT Brittania) Other: ___

Plan: P0 (Existing) P1(500ft) P2(550ft)

Vessel:

Pilot #	Model Name	Ship Name	LOA (ft)	Beam (ft)	Draft (ft)	LOA (m)	Beam (m)	Draft (m)
	CNTNR28L	Sovereign Maersk (SovMae)	1138.5	140.4	47.6	347.0	42.8	14.5
1	CNTNR40	MSC Daniella 2 (Dan2)	1201.1	158.8	49.9	366.1	48.4	15.2
2	CNTNR44	Zim Piraeus (Zim)	964.9	105.6	43.0	294.1	32.2	13.1
	CNTNR33L	Humber Bridge (HumB)	1102.4	150.3	46.2	336.0	45.8	14.1
	VLCC15L	MT Brittania (MTBrit)	859.6	137.8	49.2	262.0	42.0	15.0
	TANK23	Eagle Kanger (EagleK)	799.9	137.8	40.0	243.8	42.0	12.2

Naming convention - Plan_Area_IShipInbound_OShipoutbound_Currents_Wind_Repetition
(Ex:P0_PassingLane_IZim_ODan2_Flood_20E_1)

Filename: P2-PassingLane-OZim-IDan2-Flood-20SE-1

Comments:

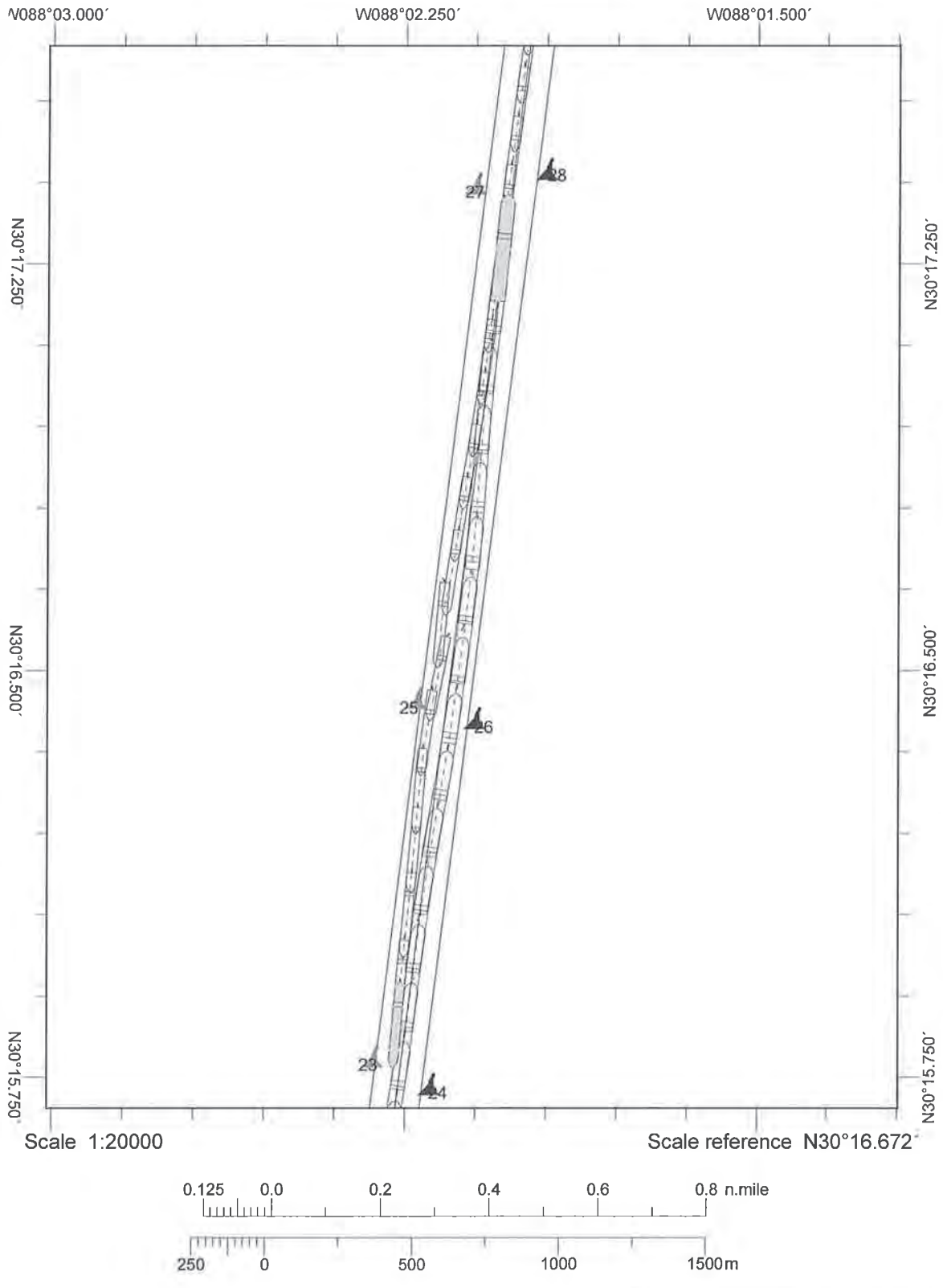
* Alt 1 Flood

- Ships handled Realistic
- More time to recover once passing was completed

02:09
02:26

Record File 02:02

Appendix A



Line sample period (s)	30
Course marker every	00:30
Heading marker period (s)	30
Shape outline every	00:30

Mobile Bay Feasibility Simulations – Passing Lane / Bend Ease

Run #: 2

Date: 5/24/2017

Pilot:

1. Captain Chris Brock — Inbound ✓ Outbound ___ Buoy Start 15 Bridge B
2. Captain Curtis Wilson — Inbound ___ Outbound ✓ Buoy Start 33 Bridge A

Wind: (20 KNT) E W (SE) Other: _____

Currents: Flood(E wind) Flood(W wind) (Flood(SE wind)) Ebb(E wind) Ebb(W wind) Other: _____

Tide added: None (+0.7m (Daniella 2 or MT Brittania)) Other: _____

Plan: P0 (Existing) (P1(500ft)) P2(550ft)

Vessel:

Pilot #	Model Name	Ship Name	LOA (ft)	Beam (ft)	Draft (ft)	LOA (m)	Beam (m)	Draft (m)
	CNTNR28L	Sovereign Maersk (SovMae)	1138.5	140.4	47.6	347.0	42.8	14.5
1	CNTNR40	MSC Daniella 2 (Dan2)	1201.1	158.8	49.9	366.1	48.4	15.2
2	CNTNR44	Zim Piraeus (Zim)	964.9	105.6	43.0	294.1	32.2	13.1
	CNTNR33L	Humber Bridge (HumB)	1102.4	150.3	46.2	336.0	45.8	14.1
	VLCC15L	MT Brittania (MTBrit)	859.6	137.8	49.2	262.0	42.0	15.0
	TANK23	Eagle Kanger (EagleK)	799.9	137.8	40.0	243.8	42.0	12.2

Naming convention - Plan_Area_IShipInbound_OShipoutbound_Currents_Wind_Repetition
(Ex:P0_PassingLane_IZim_ODan2_Flood_20E_1)

Filename: P1_PASSING LANE_O'ZIM_IDAN2_FLOOD_20SE-2

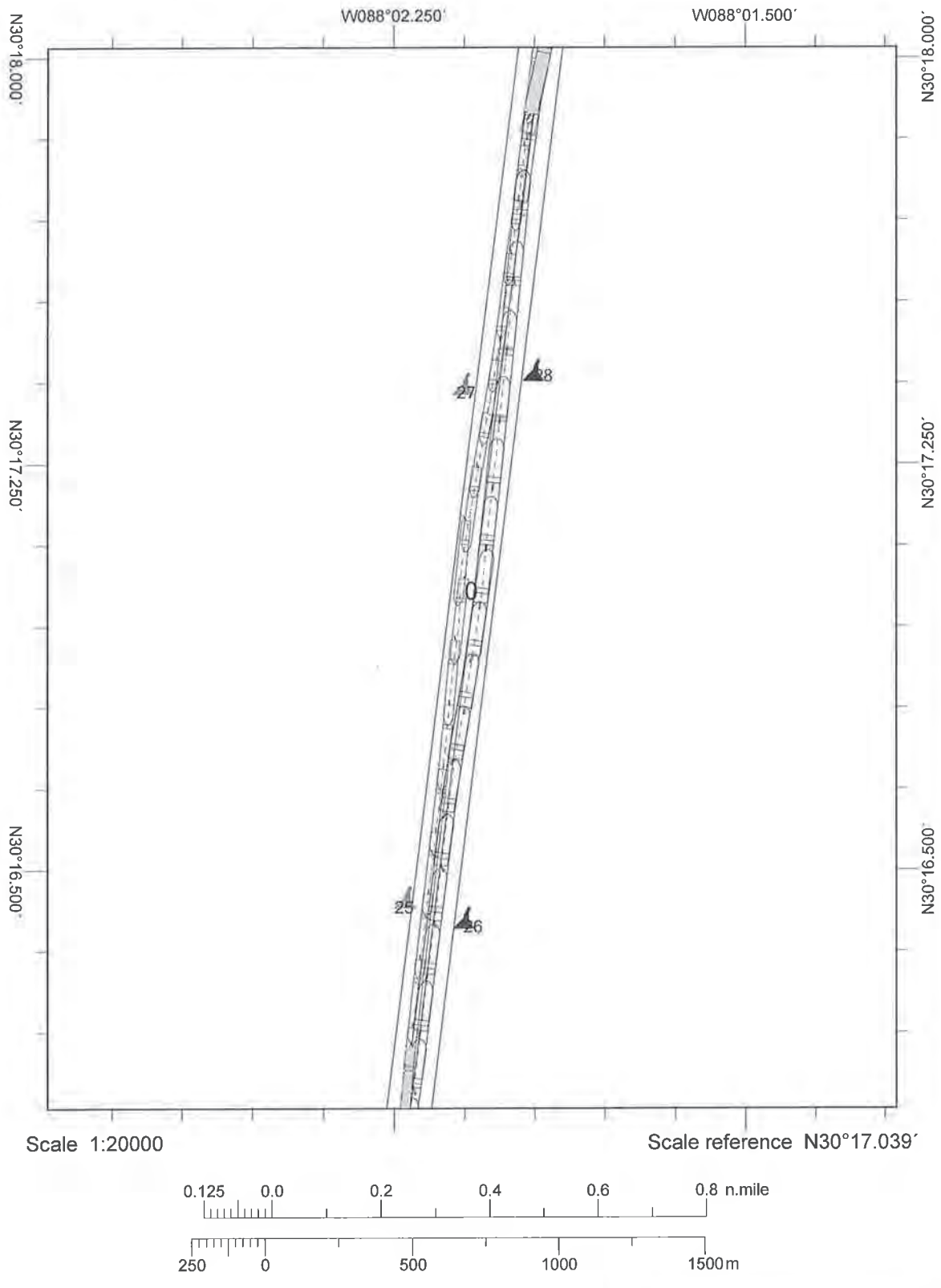
Comments:

* ALT 1 FLOOD

03:04

DAN 2 GROUNDED AROUND G-21
DOING ALMOST 16 KT.

RECORD FILE



Line sample period (s)	30
Course marker every	00:30
Heading marker period (s)	30
Shape outline every	00:30

Mobile Bay Feasibility Simulations – Passing Lane / Bend Ease

Run #: 4 Date: 5/24/2017

Pilot:

1. Captain Chris Brock	Inbound ✓	Outbound ___	Buoy Start 15	Bridge B
2. Captain Curtis Wilson	Inbound ___	Outbound ✓	Buoy Start 33	Bridge A

Wind: (20 KNT) E W (SE) Other: _____

Currents: Flood(E wind) Flood(W wind) (Flood(SE wind)) Ebb(E wind) Ebb(W wind) Other: _____

Tide added: None +0.7m (Daniella 2 or MT Brittania) (+ 1.2m) Other: _____

Plan: P0 (Existing) (P1(500ft)) P2(550ft)

Vessel:

Pilot #	Model Name	Ship Name	LOA (ft)	Beam (ft)	Draft (ft)	LOA (m)	Beam (m)	Draft (m)
	CNTNR28L	Sovereign Maersk (SovMae)	1138.5	140.4	47.6	347.0	42.8	14.5
	CNTNR40	MSC Daniella 2 (Dan2)	1201.1	158.8	49.9	366.1	48.4	15.2
2	CNTNR44	Zim Piraeus (Zim)	964.9	105.6	43.0	294.1	32.2	13.1
	CNTNR33L	Humber Bridge (HumB)	1102.4	150.3	46.2	336.0	45.8	14.1
1	VLCC15L	MT Brittania (MTBrit)	859.6	137.8	49.2	262.0	42.0	15.0
	TANK23	Eagle Kanger (EagleK)	799.9	137.8	40.0	243.8	42.0	12.2

Naming convention - Plan_Area_IShipInbound_OShipoutbound_Currents_Wind_Repetition
(Ex:P0_PassingLane_IZim_ODan2_Flood_20E_1)

Filename: P1_PassLan - OZim_I MT Brit_Flood-20E_1

Comments:

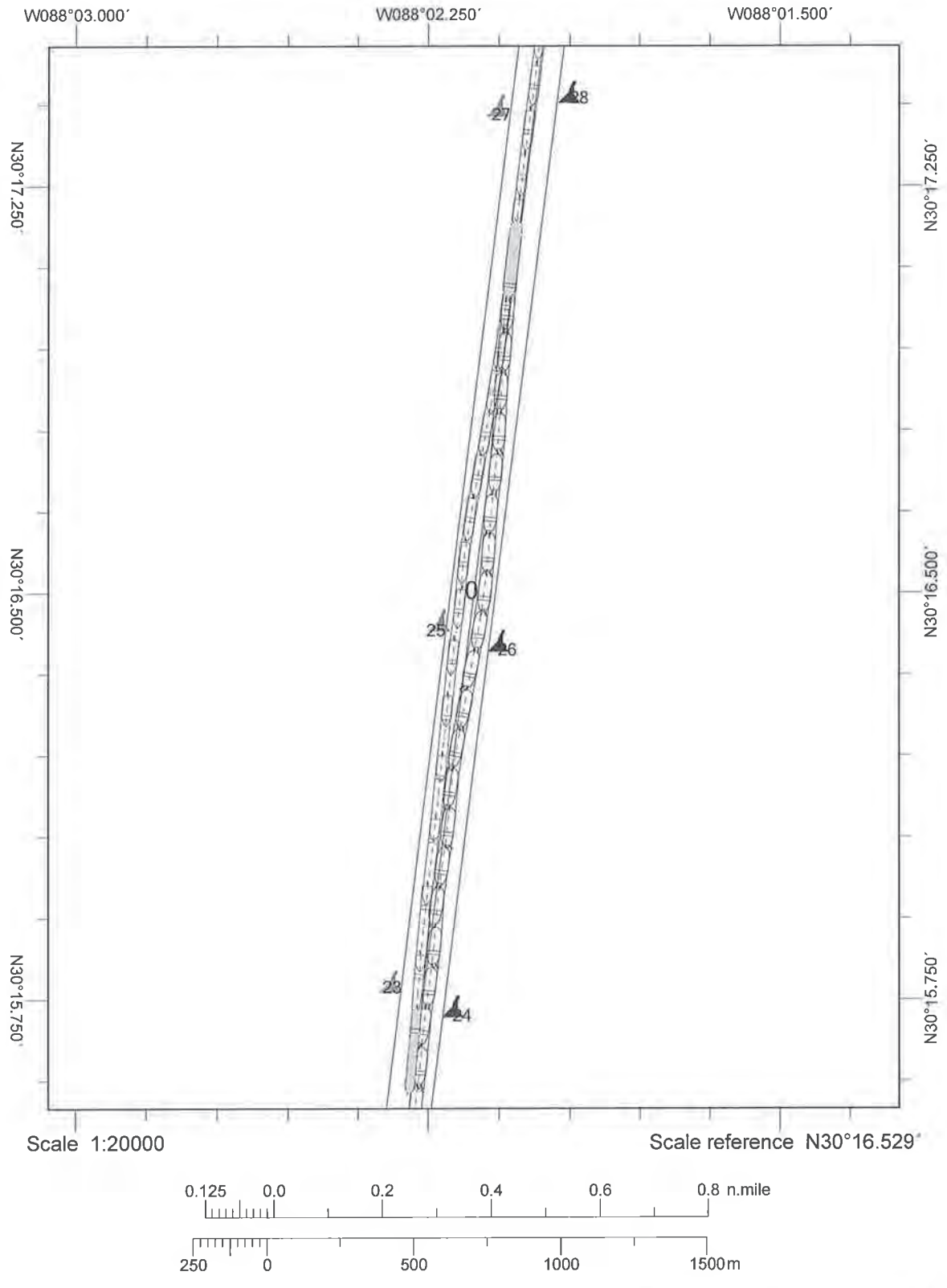
* Alt 1 Floods.

Start - 0412
End - 0440

Meeting @ 23:30

Record File 0346

Pilot observed inbound Tanker handled very sluggish, otherwise the passing was realistic



Line sample period (s)	30
Course marker every	00:30
Heading marker period (s)	30
Shape outline every	00:30

Mobile Bay Feasibility Simulations – Passing Lane / Bend Ease

Run #: 5

Date: 5/24/2017

Pilot:

1. Captain Chris Brock — Inbound ___ Outbound ✓ Buoy Start 35 Bridge B
2. Captain Curtis Wilson — Inbound ✓ Outbound ___ Buoy Start 15 Bridge A

Wind: 20 KNT E W SE Other: _____

Currents: Flood(E wind) Flood(W wind) Flood(SE wind) Ebb(E wind) Ebb(W wind) Other: _____

Tide added: None +0.7m (Daniella 2 or MT Brittania) +1.2 m Other: _____

Plan: P0 (Existing) P1(500ft) P2(550ft)

Vessel:

Pilot #	Model Name	Ship Name	LOA (ft)	Beam (ft)	Draft (ft)	LOA (m)	Beam (m)	Draft (m)
	CNTNR28L	Sovereign Maersk (SovMae)	1138.5	140.4	47.6	347.0	42.8	14.5
	CNTNR40	MSC Daniella 2 (Dan2)	1201.1	158.8	49.9	366.1	48.4	15.2
1	CNTNR44	Zim Piraeus (Zim)	964.9	105.6	43.0	294.1	32.2	13.1
	CNTNR33L	Humber Bridge (HumB)	1102.4	150.3	46.2	336.0	45.8	14.1
2	VLCC15L	MT Brittania (MTBrit)	859.6	137.8	49.2	262.0	42.0	15.0
	TANK23	Eagle Kanger (EagleK)	799.9	137.8	40.0	243.8	42.0	12.2

Naming convention - Plan_Area_IShipInbound_OShipoutbound_Currents_Wind_Repetition
(Ex:P0_PassingLane_IZim_ODan2_Flood_20E_1)

Filename: P1_PassLan_OZim_IMTBrit_Flood_20SE_2

Comments:

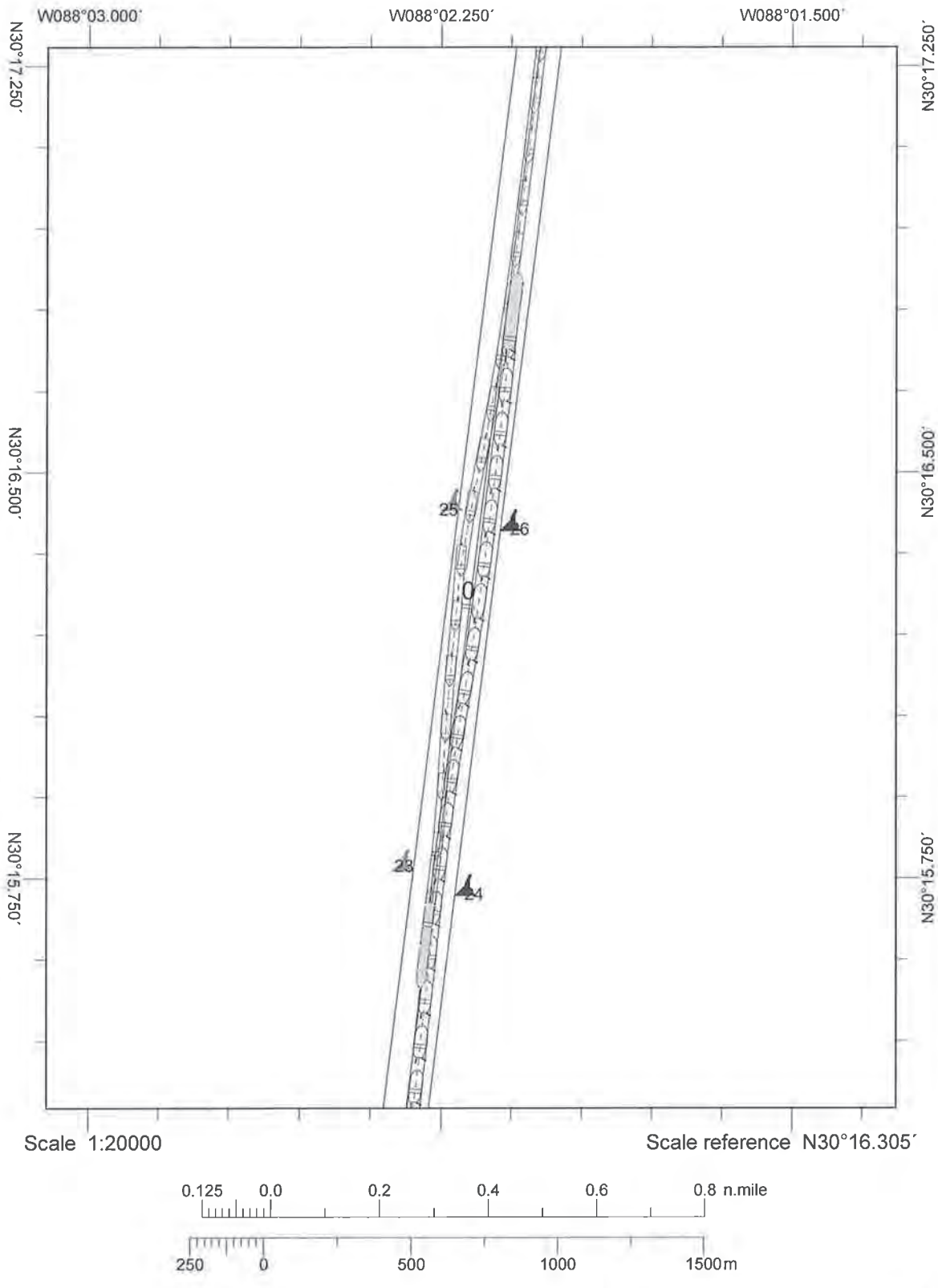
* Alt 1 Flood

START 05:00
END 05:24

Meeting @ 20:40

Record File 04:41

Bend Easings were very much an improvement, Tanker handled fine, Meeting in channel was good w/ sufficient room.



Line sample period (s)	30
Course marker every	00:30
Heading marker period (s)	30
Shape outline every	00:30

Mobile Bay Feasibility Simulations – Passing Lane / Bend Ease

Run #: 6 Date: 5/24/17

Pilot:

1. Captain Chris Brock	Inbound___	Outbound ✓	Buoy Start 33	Bridge B	OWN 2 A
2. Captain Curtis Wilson	Inbound ✓	Outbound___	Buoy Start 15	Bridge A	OWN 1 B

Bridge

Wind: (20 KNT) E W (SE) Other: _____

Currents: Flood(E wind) Flood(W wind) (Flood(SE wind)) Ebb(E wind) Ebb(W wind) Other: _____

Tide added: None +0.7m (Daniella 2 or MT Brittania) (+1.2m) Other: _____

Plan: P0 (Existing) (P1(500ft)) P2(550ft)

Vessel:

Pilot #	Model Name	Ship Name	LOA (ft)	Beam (ft)	Draft (ft)	LOA (m)	Beam (m)	Draft (m)
	CNTNR28L	Sovereign Maersk (SovMae)	1138.5	140.4	47.6	347.0	42.8	14.5
	CNTNR40	MSC Daniella 2 (Dan2)	1201.1	158.8	49.9	366.1	48.4	15.2
1	CNTNR44	Zim Piraeus (Zim)	964.9	105.6	43.0	294.1	32.2	13.1
2	CNTNR33L	Humber Bridge (HumB)	1102.4	150.3	46.2	336.0	45.8	14.1
	VLCC15L	MT Brittania (MTBrit)	859.6	137.8	49.2	262.0	42.0	15.0
	TANK23	Eagle Kanger (EagleK)	799.9	137.8	40.0	243.8	42.0	12.2

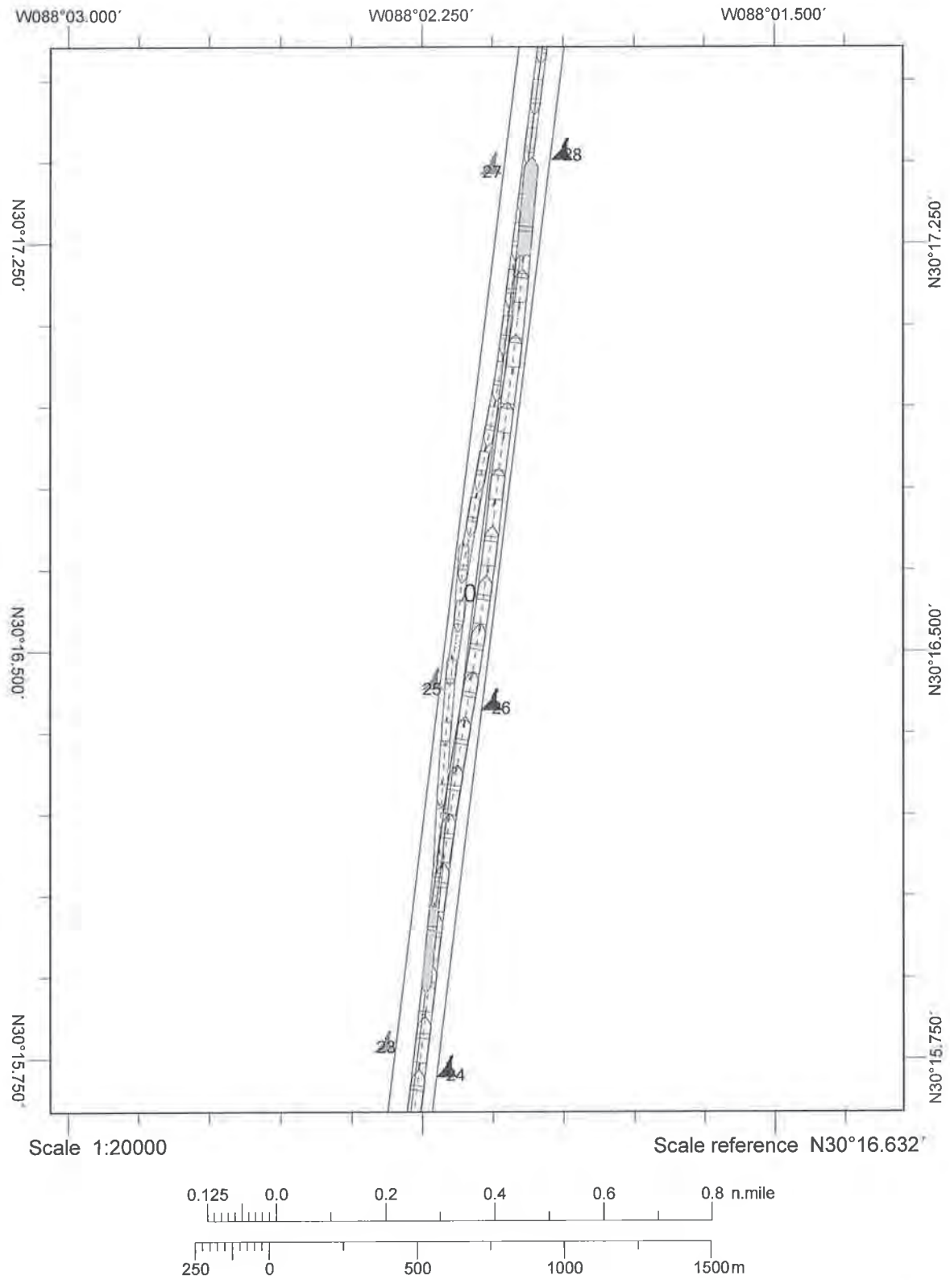
Naming convention - Plan_Area_IShipInbound_OShipoutbound_Currents_Wind_Repetition
(Ex:P0_PassingLane_IZim_ODan2_Flood_20E_1)

Filename: P1_Passinglane_ IHumB_OZim_ OHumB_ ~~IMTBrit~~ _Flood_20SE_1

Comments:

PASSING WENT WELL, AMPLE ROOM IN 500 Ft Channel

Slant - 0644
End -
Meet -



Line sample period (s)	30
Course marker every	00:30
Heading marker period (s)	30
Shape outline every	00:30

Mobile Bay Feasibility Simulations – Passing Lane / Bend Ease

Run #: 7 Date: 5/24/17

Pilot:

1. Captain Chris Brock — Inbound ___ Outbound ✓ Buoy Start 29 ~~33~~ Bridge B
2. Captain Curtis Wilson — Inbound ✓ Outbound ___ Buoy Start 15 Bridge A

Wind: (20 KNT) E W SE (N) Other: N

Currents: Flood(E wind) Flood(W wind) Flood(SE wind) Ebb(E wind) Ebb(W wind) Other: ~~Flood~~ Ebb (N wind)

Tide added: None (+0.7m (Daniella 2 or MT Brittania)) Other: ___

Plan: P0 (Existing) (P1(500ft)) P2(550ft)

Vessel:

Pilot #	Model Name	Ship Name	LOA (ft)	Beam (ft)	Draft (ft)	LOA (m)	Beam (m)	Draft (m)
	CNTNR28L	Sovereign Maersk (SovMae)	1138.5	140.4	47.6	347.0	42.8	14.5
	CNTNR40	MSC Daniella 2 (Dan2)	1201.1	158.8	49.9	366.1	48.4	15.2
1	CNTNR44	Zim Piraeus (Zim)	964.9	105.6	43.0	294.1	32.2	13.1
2	CNTNR33L	Humber Bridge (HumB)	1102.4	150.3	46.2	336.0	45.8	14.1
	VLCC15L	MT Brittania (MTBrit)	859.6	137.8	49.2	262.0	42.0	15.0
	TANK23	Eagle Kanger (EagleK)	799.9	137.8	40.0	243.8	42.0	12.2

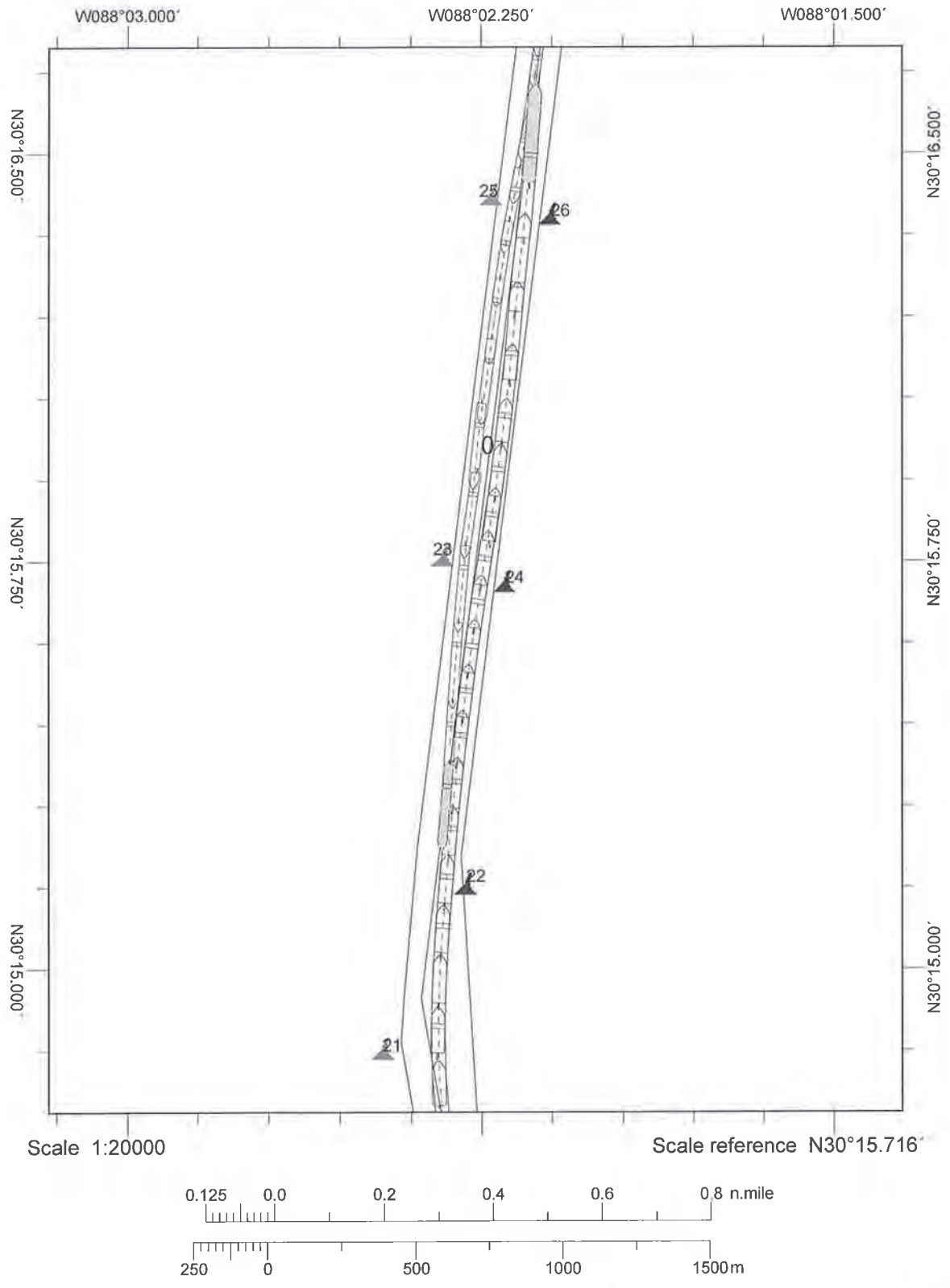
Naming convention - Plan_Area_IShipInbound_OShipoutbound_Currents_Wind_Repetition
(Ex:P0_PassingLane_IZim_ODan2_Flood_20E_1)

Filename: P1-Passinglane_IHumB_OZim_~~Flood~~ Ebb_20N_1
*file name says Flood, but Ebb was used

Comments:

Ship reaction after passing needs to be improved

Start - 709 ~~720~~
End - 737
Meet -
↑ elapsed time



Line sample period (s)	30
Course marker every	00:30
Heading marker period (s)	30
Shape outline every	00:30

Mobile Bay Feasibility Simulations – Passing Lane / Bend Ease

Run #: 8 Date: 24 May 2017

Pilot:
1. Captain Chris Brock — Inbound X — Outbound ___ — Buoy Start 15 — Bridge B
2. Captain Curtis Wilson — Inbound ___ — Outbound X — Buoy Start ~~31~~ 29 — Bridge A

Wind: (20 KNT) E W SE N Other: N

Currents: Flood(E wind) Flood(W wind) Flood(SE wind) Ebb(E wind) Ebb(W wind) Other: Ebb N

Tide added: None +~~0.7m~~ 1.2 (Daniella 2 or MT Brittania) Other: ___

Plan: P0 (Existing) (P1(500ft)) P2(550ft)

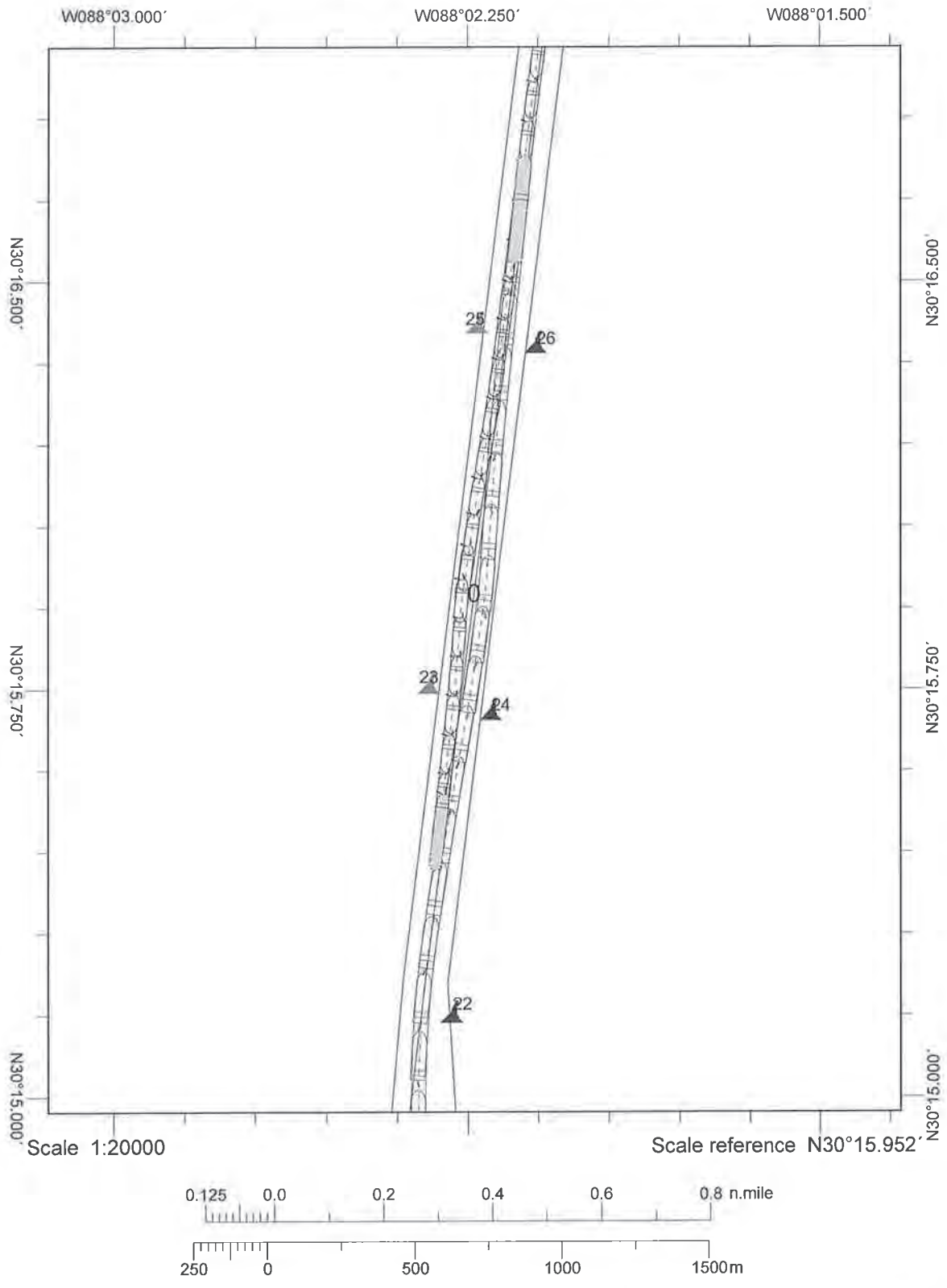
Vessel:

Pilot #	Model Name	Ship Name	LOA (ft)	Beam (ft)	Draft (ft)	LOA (m)	Beam (m)	Draft (m)
	CNTNR28L	Sovereign Maersk (SovMae)	1138.5	140.4	47.6	347.0	42.8	14.5
1 (B)	CNTNR40	MSC Daniella 2 (Dan2)	1201.1	158.8	49.9	366.1	48.4	15.2
	CNTNR44	Zim Piraeus (Zim)	964.9	105.6	43.0	294.1	32.2	13.1
	CNTNR33L	Humber Bridge (HumB)	1102.4	150.3	46.2	336.0	45.8	14.1
2 (A)	VLCC15L	MT Brittania (MTBrit)	859.6	137.8	49.2	262.0	42.0	15.0
	TANK23	Eagle Kanger (EagleK)	799.9	137.8	40.0	243.8	42.0	12.2

Naming convention - Plan_Area_IShipInbound_OShipoutbound_Currents_Wind_Repetition
(Ex:P0_PassingLane_IZim_ODan2_Flood_20E_1)

Filename: P1_PassLan_I Dan2_O MTBrit_Ebb_20N_1

Comments: Passing executed safely, combined beam approaching extreme maximum. Distance between ships very close.



Line sample period (s)	30
Course marker every	00:30
Heading marker period (s)	30
Shape outline every	00:30

Mobile Bay Feasibility Simulations – Passing Lane / Bend Ease

Run #: 9 Date: 5/24/2017

Pilot:

1. Captain Chris Brock	Inbound X	Outbound___	Buoy Start 15	Bridge B
2. Captain Curtis Wilson	Inbound___	Outbound X	Buoy Start 29	Bridge A

Wind: 20 KNT		W	SE		Other: N
Currents: Flood(E wind)	Flood(W wind)	Flood(SE wind)	Ebb(E wind)	Ebb(W wind)	Other: Ebb N
Tide added:	None	+~~0.7~~1.2m (Daniella 2 or MT Brittania)			Other:
Plan:	P0 (Existing)	P1(500ft)	P2(550ft)		

Vessel:

Pilot #	Model Name	Ship Name	LOA (ft)	Beam (ft)	Draft (ft)	LOA (m)	Beam (m)	Draft (m)
1, 2	CNTNR28L	Sovereign Maersk (SovMae)	1138.5	140.4	47.6	347.0	42.8	14.5
	CNTNR40	MSC Daniella 2 (Dan2)	1201.1	158.8	49.9	366.1	48.4	15.2
	CNTNR44	Zim Piraeus (Zim)	964.9	105.6	43.0	294.1	32.2	13.1
	CNTNR33L	Humber Bridge (HumB)	1102.4	150.3	46.2	336.0	45.8	14.1
	VLCC15L	MT Brittania (MTBrit)	859.6	137.8	49.2	262.0	42.0	15.0
	TANK23	Eagle Kanger (EagleK)	799.9	137.8	40.0	243.8	42.0	12.2

Naming convention - Plan_Area_IShipInbound_OShipoutbound_Currents_Wind_Repetition
(Ex:P0_PassingLane_IZim_ODan2_Flood_20E_1)

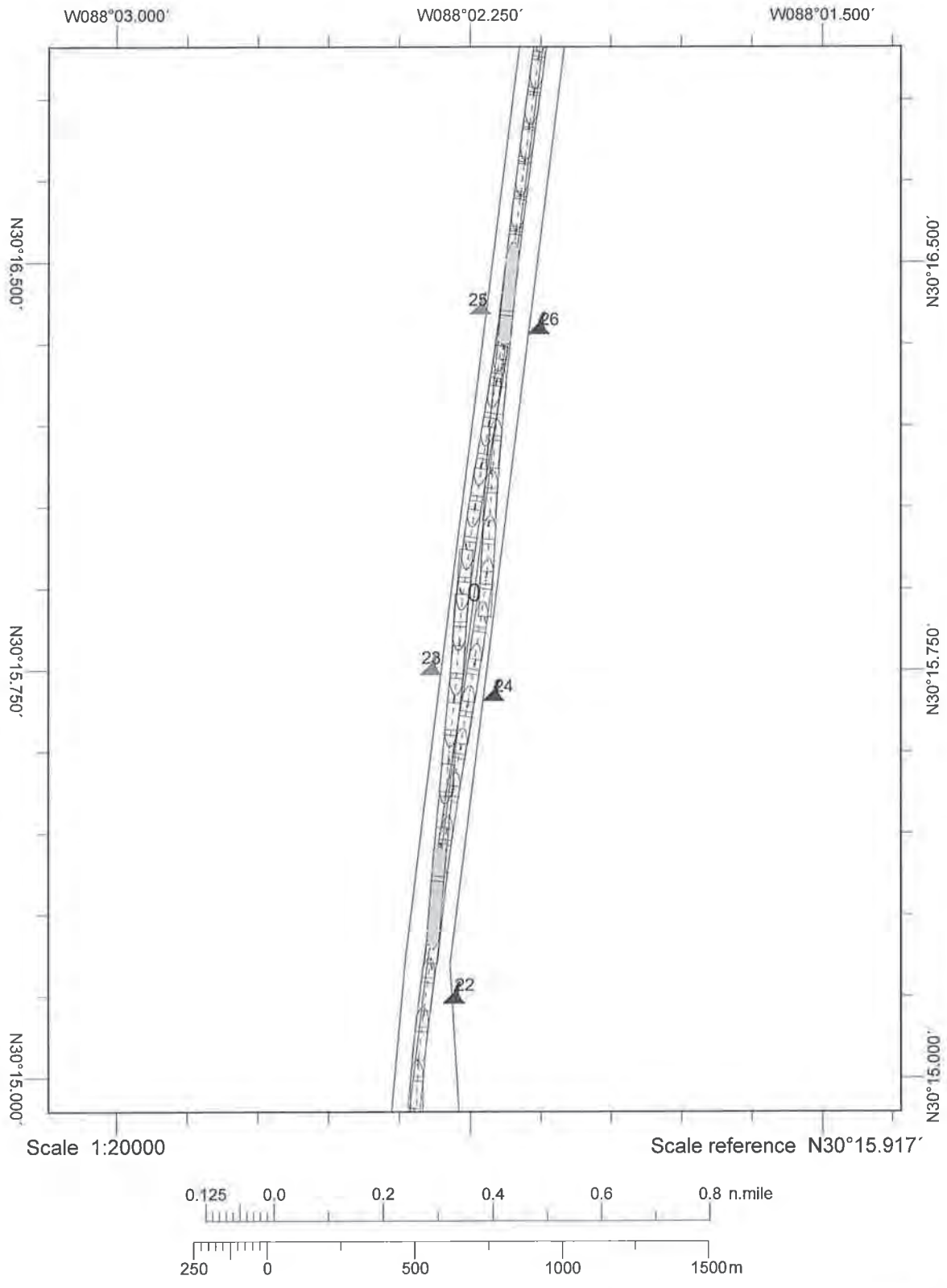
Filename: P1_PassLan_ISovMae_OSavMae..Ebb_20N_1

Comments: Passing went well, 500' channel gave sufficient room to pass safely.

Bow
107 ft

m.s
112 ft

stern
118 ft



Line sample period (s)	30
Course marker every	00:30
Heading marker period (s)	30
Shape outline every	00:30

Mobile Bay Feasibility Simulations – Passing Lane / Bend Ease

Run #: 10 Date: 5/24/2017

Pilot:

1. Captain Chris Brock	Inbound X	Outbound___	Buoy Start 15	Bridge B
2. Captain Curtis Wilson	Inbound___	Outbound X	Buoy Start 29	Bridge A

Wind: 20 KNT (E)		W	SE		Other: _____
Currents: Flood(E wind)	Flood(W wind)	Flood(SE wind)	Ebb(E wind)	Ebb(W wind)	Other: _____
Tide added:	None	~~+0.7m~~ 1.2 (Daniella 2 or MT Brittania)			Other: _____
Plan:	P0 (Existing)	P1(500ft)	P2(550ft)		

Vessel:

Pilot #	Model Name	Ship Name	LOA (ft)	Beam (ft)	Draft (ft)	LOA (m)	Beam (m)	Draft (m)
2	CNTNR28L	Sovereign Maersk (SovMae)	1138.5	140.4	47.6	347.0	42.8	14.5
1	CNTNR40	MSC Daniella 2 (Dan2)	1201.1	158.8	49.9	366.1	48.4	15.2
	CNTNR44	Zim Piraeus (Zim)	964.9	105.6	43.0	294.1	32.2	13.1
	CNTNR33L	Humber Bridge (HumB)	1102.4	150.3	46.2	336.0	45.8	14.1
	VLCC15L	MT Brittania (MTBrit)	859.6	137.8	49.2	262.0	42.0	15.0
	TANK23	Eagle Kanger (EagleK)	799.9	137.8	40.0	243.8	42.0	12.2

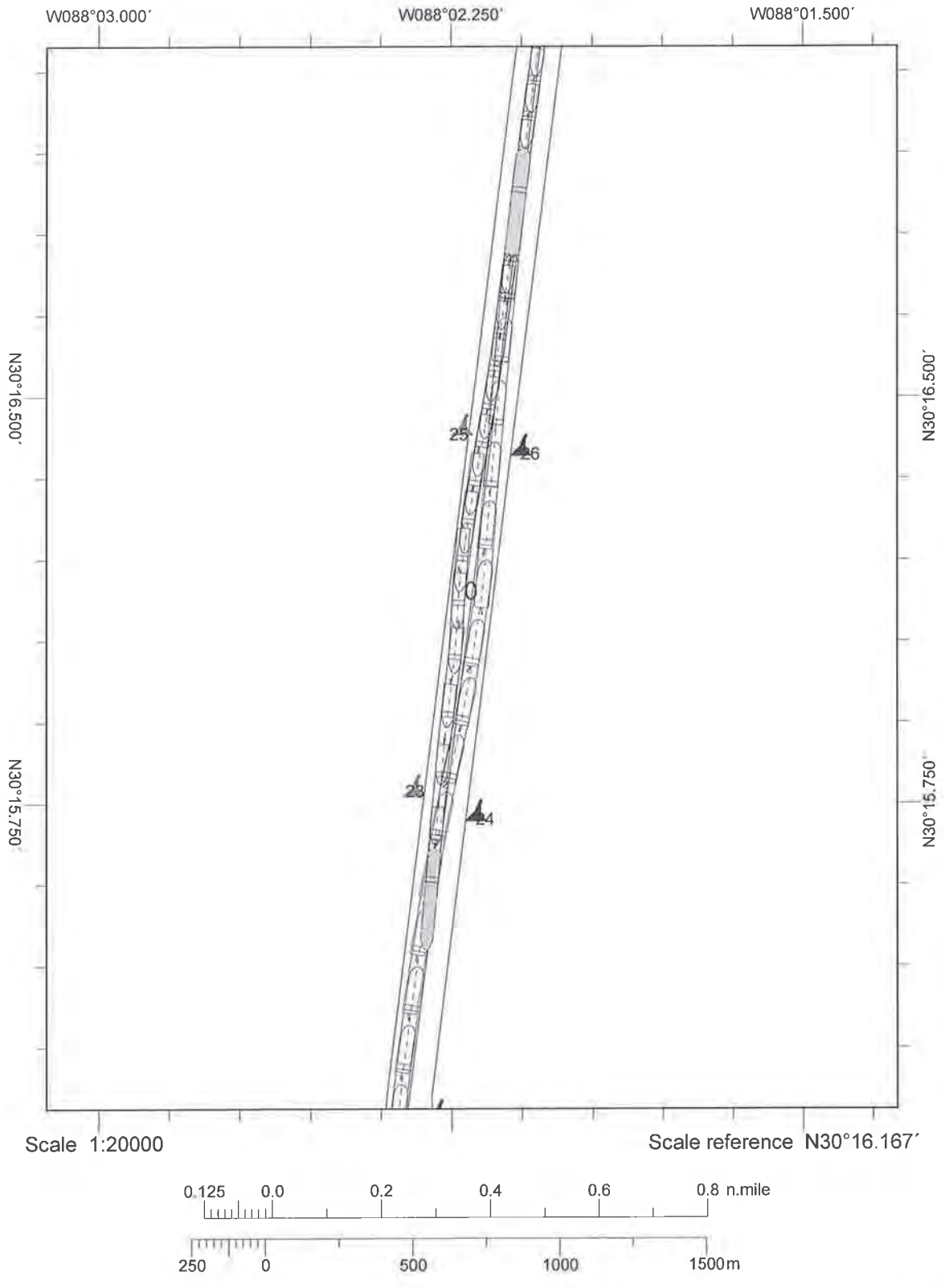
Naming convention - Plan_Area_IShipInbound_OShipoutbound_Currents_Wind_Repetition
(Ex:P0_PassingLane_IZim_ODan2_Flood_20E_1)

Filename: P1-PassLan_I Dan2_O SovMae_Flood_20E_1

Comments: EXTREMELY TIGHT. DOABLE BUT DON'T WANT TO

Bow
140 ft
Mid
114 ft
Stern
105 ft

0924



Line sample period (s)	30
Course marker every	00:30
Heading marker period (s)	30
Shape outline every	00:30

Mobile Bay Feasibility Simulations – Turning Basin

Run #: 13 Date: 5/25

Pilot:

1. Captain Chris Brock	Off Dock___	To Dock ✓	Bridge A
2. Captain Curtis Wilson	Off Dock___	To Dock___	Bridge___

Wind: 20 KNT N Other: _____

Currents: Ebb turning basin (north wind) Other: 7520

Tide added: None +0.7m (Daniella 2 or MT Britt) Other: _____

Plan: P0 (Existing) P1 or P2 (Deepened only -51 ft) Other: _____

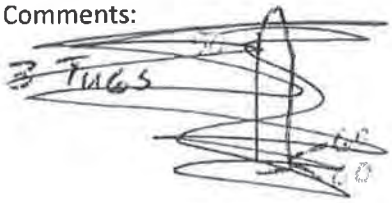
Vessel:

Pilot #	Model Name	Ship Name	LOA (ft)	Beam (ft)	Draft (ft)	LOA (m)	Beam (m)	Draft (m)
	CNTNR28L	Sovereign Maersk (SovMae)	1138.5	140.4	47.6	347.0	42.8	14.5
	CNTNR40	MSC Daniella 2 (Dan2)	1201.1	158.8	49.9	366.1	48.4	15.2
1	CNTNR33L	Humber Bridge (HumB)	1102.4	150.3	46.2	336.0	45.8	14.1
	VLCC15L	MT Brittania (MTBrit)	859.6	137.8	49.2	262.0	42.0	15.0
	CNTNR20L	KMSS Dainty (Dainty)	964.9	105.7	41.0	294.1	32.2	12.5

Naming convention - Plan_Area_Transit_Shipname_Currents_Wind_PilotName_Repetition
(Ex:P0_TurningBasin_Offdock_SovMae_Ebb_20N_CWilson_1)

Filename: P1_TurningBasin_ToDock_HumB_ebb_20N_BRock_2

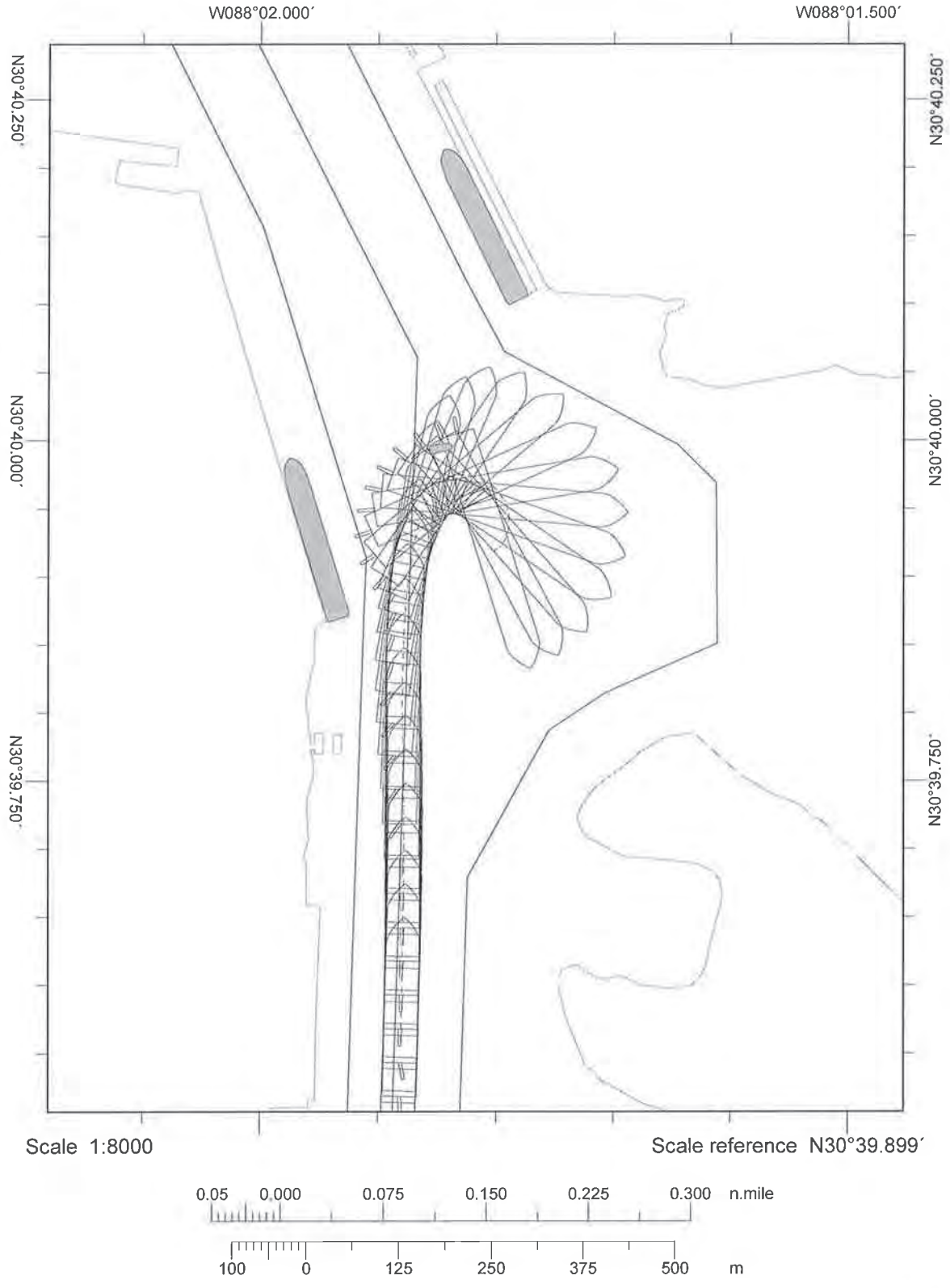
Comments:



Start 0459
Stop
End 0513

DOABLE BUT SHIP AT SOUTH BERTH MAKES YOU GO MUCH FURTHER INTO BASIN THAN ACCUSTOMED TO. FALL ROOM WITH STRONG RIVER & WIND IS CONCERN.

RF 0453



Line sample period (s)	30
Course marker every	00:30
Heading marker period (s)	30
Shape outline every	00:30

Mobile Bay Feasibility Simulations – Turning Basin

Run #: 14 Date: 5/25/2017

Pilot:

1. Captain Chris Brock	Off Dock___	To Dock___	Bridge___
2. Captain Curtis Wilson	Off Dock___	To Dock X	Bridge B

Wind: 20 KNT (N) Other: _____

Currents: Ebb turning basin (north wind) Other: 75%

Tide added: (None) +0.7m (Daniella 2 or MT Britt) Other: _____

Plan: P0 (Existing) (P1 or P2 (Deepened only -51 ft) Other: _____

Vessel:

Pilot #	Model Name	Ship Name	LOA (ft)	Beam (ft)	Draft (ft)	LOA (m)	Beam (m)	Draft (m)
	CNTNR28L	Sovereign Maersk (SovMae)	1138.5	140.4	47.6	347.0	42.8	14.5
	CNTNR40	MSC Daniella 2 (Dan2)	1201.1	158.8	49.9	366.1	48.4	15.2
2	CNTNR33L	Humber Bridge (HumB)	1102.4	150.3	46.2	336.0	45.8	14.1
	VLCC15L	MT Brittania (MTBrit)	859.6	137.8	49.2	262.0	42.0	15.0
	CNTNR20L	KMSS Dainty (Dainty)	964.9	105.7	41.0	294.1	32.2	12.5

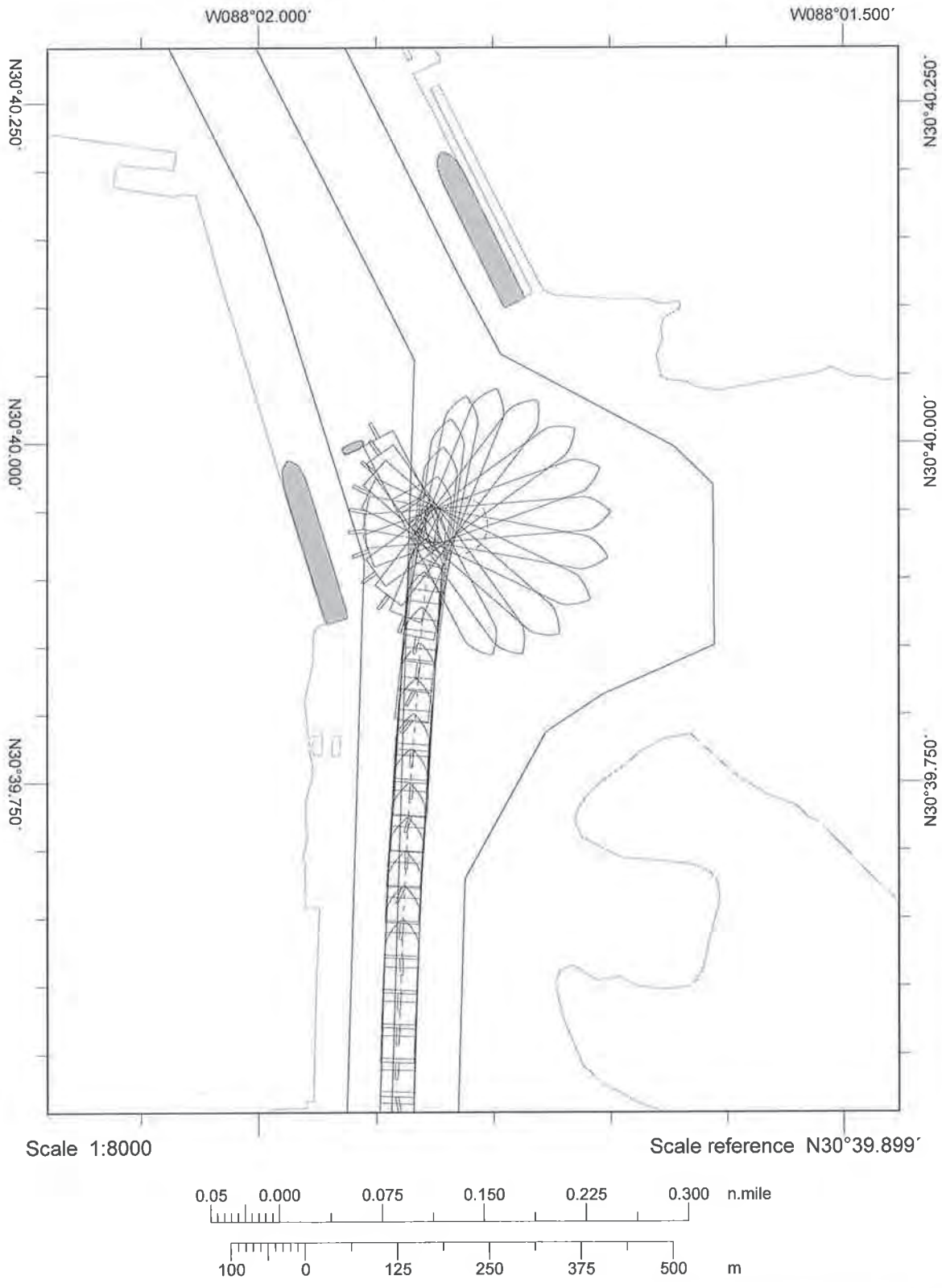
Naming convention - Plan_Area_Transit_Shipname_Currents_Wind_PilotName_Repetition
(Ex:P0_TurningBasin_Offdock_SovMae_Ebb_20N_CWilson_1)

Filename: P1-Turning Basin_To Dock_HumB_Ebb_20N_Wilson_2

Comments:

~~[illegible]~~

This size vessel requires a very aggressive maneuver to get in proper position to turn with given environmentals. Turn executed effectively, but in manner + with speed that isn't practical in reality.



Line sample period (s)	30
Course marker every	00:30
Heading marker period (s)	30
Shape outline every	00:30

Mobile Bay Feasibility Simulations – Turning Basin

Run #: 15 Date: 5/25/17

Pilot:

1. Captain Chris Brock	Off Dock ✓	To Dock___	Bridge A
2. Captain Curtis Wilson	Off Dock___	To Dock___	Bridge___

Wind: (20 KNT N) Other: _____

Currents: (Ebb turning basin (north wind)) Other: 75%

Tide added: ✓ None (+0.7m (Daniella 2 or MT Britt)) Other: [redacted]

Plan: P0 (Existing) (P1 or P2 (Deepened only -51 ft)) Other: _____

Vessel:

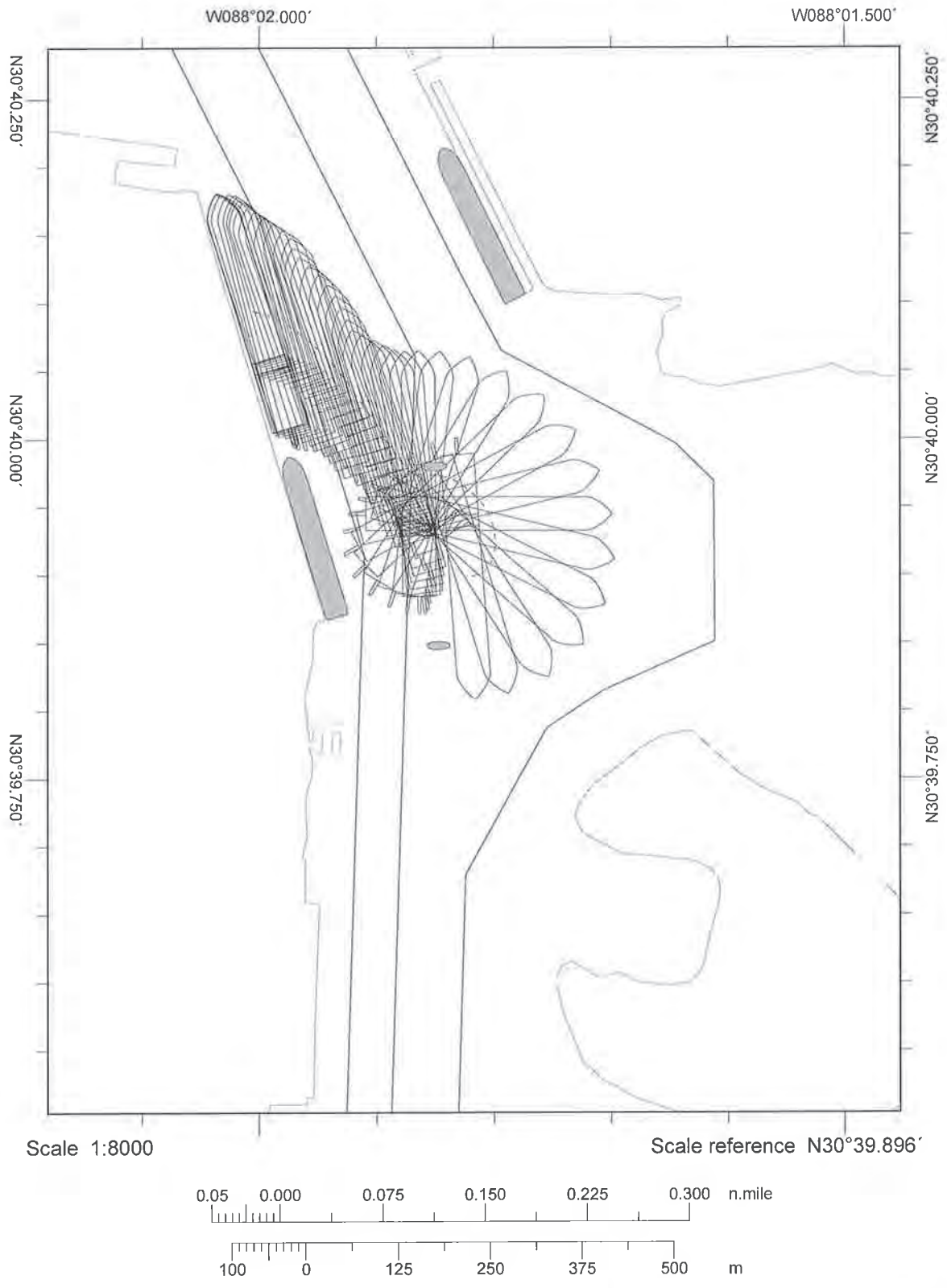
Pilot #	Model Name	Ship Name	LOA (ft)	Beam (ft)	Draft (ft)	LOA (m)	Beam (m)	Draft (m)
	CNTNR28L	Sovereign Maersk (SovMae)	1138.5	140.4	47.6	347.0	42.8	14.5
	CNTNR40	MSC Daniella 2 (Dan2)	1201.1	158.8	49.9	366.1	48.4	15.2
1	CNTNR33L	Humber Bridge (HumB)	1102.4	150.3	46.2	336.0	45.8	14.1
	VLCC15L	MT Brittania (MTBrit)	859.6	137.8	49.2	262.0	42.0	15.0
	CNTNR20L	KMSS Dainty (Dainty)	964.9	105.7	41.0	294.1	32.2	12.5

Naming convention - Plan_Area_Transit_Shipname_Currents_Wind_PilotName_Repetition
(Ex:P0_TurningBasin_Offdock_SovMae_Ebb_20N_CWilson_1)

Filename: P1_TurningBasin_Offdock_HumB_Ebb_20N_BrockL1

Comments: STERN TUG WAS ABLE TO HOLD BUT NOT LIFT. FALLING DOWN ON ISLAND IS STILL CONCERN

Reads File 0708



Line sample period (s)	30
Course marker every	00:30
Heading marker period (s)	30
Shape outline every	00:30

Mobile Bay Feasibility Simulations – Turning Basin

Run #: 16 Date: 5/25/17

Pilot:

1. Captain Chris Brock	Off Dock___	To Dock___	Bridge___
2. Captain Curtis Wilson	Off Dock✓	To Dock___	Bridge B

Wind: 20 KNT N Other: _____

Currents: Ebb turning basin (north wind) Other: 75%

Tide added: ~~None~~ +0.7 since dock +0.7m (Daniella 2 or MT Britt) Other: _____

Plan: P0 (Existing) P1 or P2 (Deepened only -51 ft) Other: _____

Vessel:

Pilot #	Model Name	Ship Name	LOA (ft)	Beam (ft)	Draft (ft)	LOA (m)	Beam (m)	Draft (m)
	CNTNR28L	Sovereign Maersk (SovMae)	1138.5	140.4	47.6	347.0	42.8	14.5
	CNTNR40	MSC Daniella 2 (Dan2)	1201.1	158.8	49.9	366.1	48.4	15.2
2	CNTNR33L	Humber Bridge (HumB)	1102.4	150.3	46.2	336.0	45.8	14.1
	VLCC15L	MT Brittania (MTBrit)	859.6	137.8	49.2	262.0	42.0	15.0
	CNTNR20L	KMSS Dainty (Dainty)	964.9	105.7	41.0	294.1	32.2	12.5

Naming convention - Plan_Area_Transit_Shipname_Currents_Wind_PilotName_Repetition
(Ex:P0_TurningBasin_Offdock_SovMae_Ebb_20N_CWilson_1)

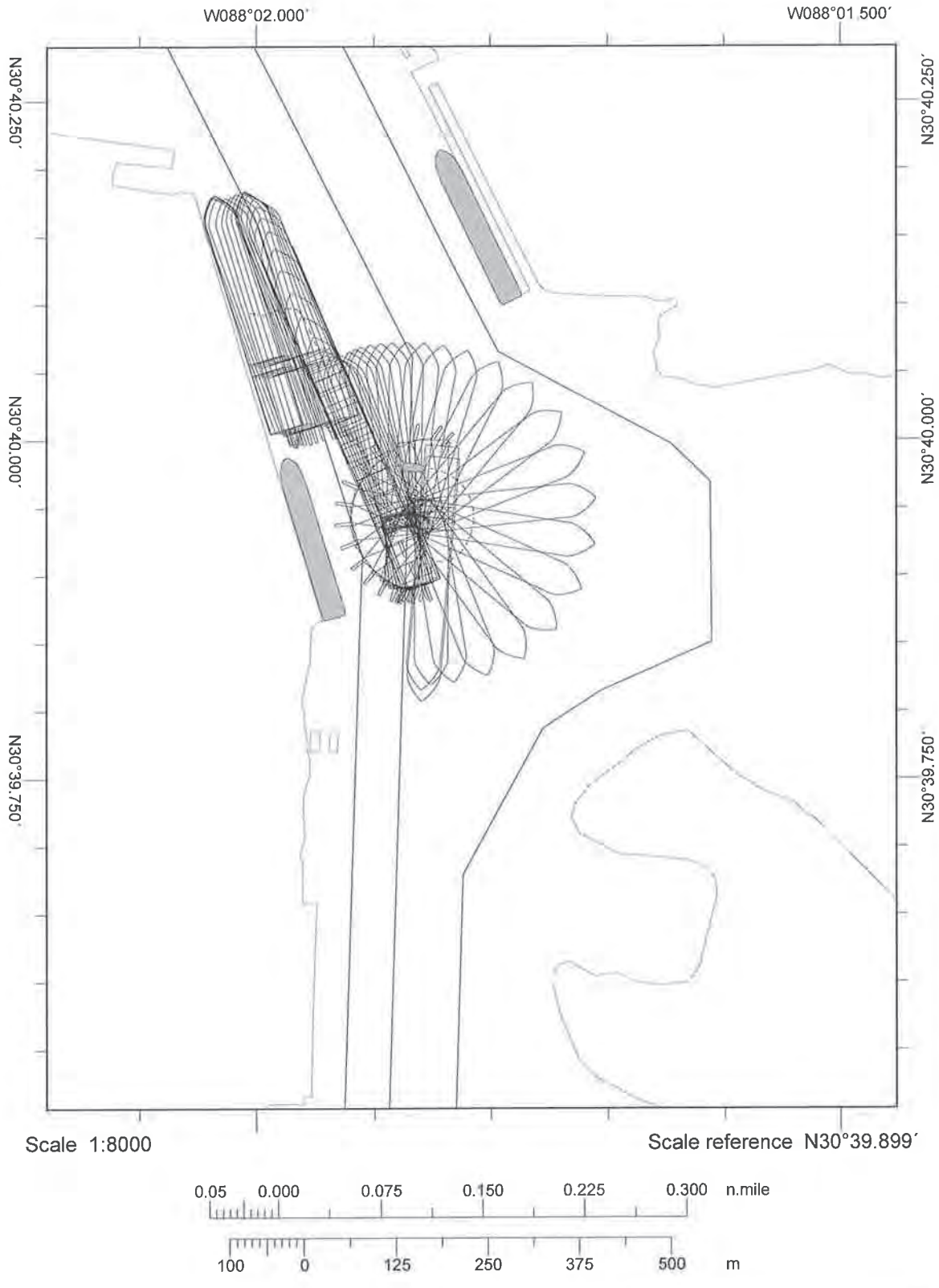
Filename: P1_TurningBasin_Offdock_HumB_Ebb_20N_Wilson_1

Start: 0705

Comments:

Stern outside Channel
~120 ft Stern to docked ship

Ship handled well, current effected ship dramatically, bow Falling onto Little Sand Island greatest concern. No room to Fall South. unless perfect position + speed.



Line sample period (s)	30
Course marker every	00:30
Heading marker period (s)	30
Shape outline every	00:30

Mobile Bay Feasibility Simulations – Turning Basin

Run #: 17 Date: 25 MAY

Pilot:

1. Captain Chris Brock	Off Dock___	To Dock✓	Bridge A
2. Captain Curtis Wilson	Off Dock___	To Dock___	Bridge___

Wind: 20 KNT N Other: _____

Currents: Ebb turning basin (north wind) Other: 75 %

Tide added: None +0.7m (Daniella 2 or MT Britt) Other: _____

Plan: P0 (Existing) P1 or P2 (Deepened only -51 ft) Other: _____

Vessel:

Pilot #	Model Name	Ship Name	LOA (ft)	Beam (ft)	Draft (ft)	LOA (m)	Beam (m)	Draft (m)
	CNTNR28L	Sovereign Maersk (SovMae)	1138.5	140.4	47.6	347.0	42.8	14.5
1	CNTNR40	MSC Daniella 2 (Dan2)	1201.1	158.8	49.9	366.1	48.4	15.2
	CNTNR33L	Humber Bridge (HumB)	1102.4	150.3	46.2	336.0	45.8	14.1
	VLCC15L	MT Brittania (MTBrit)	859.6	137.8	49.2	262.0	42.0	15.0
	CNTNR20L	KMSS Dainty (Dainty)	964.9	105.7	41.0	294.1	32.2	12.5

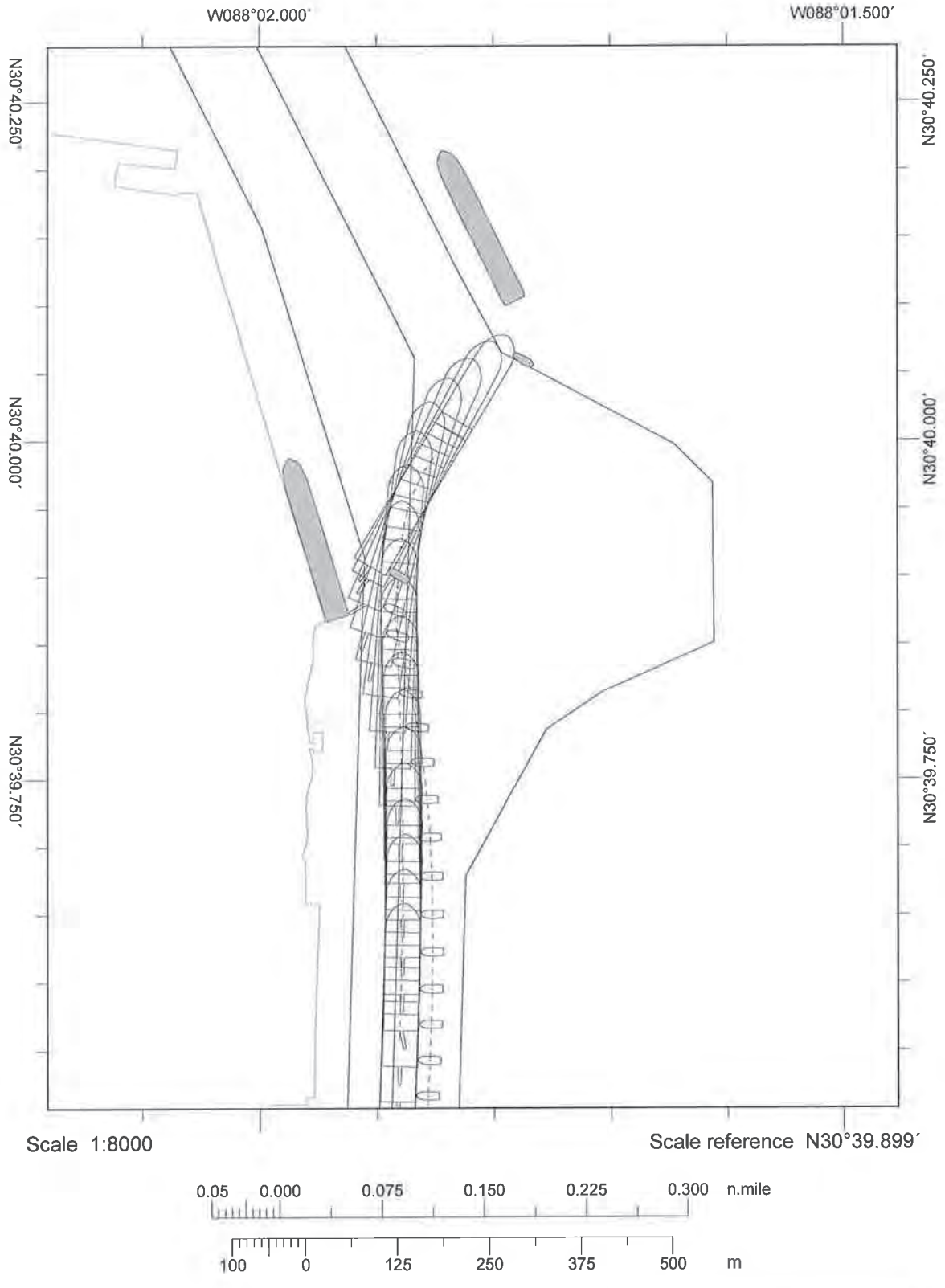
Naming convention - Plan_Area_Transit_Shipname_Currents_Wind_PilotName_Repetition
(Ex:P0_TurningBasin_Offdock_SovMae_Ebb_20N_CWilson_1)

Filename: P1_TurningBasin_Todock_DAN2_ebb_20N_Brock_1

Comments: 3 Tugs

RF 0753

Grounded



Line sample period (s)	30
Course marker every	00:30
Heading marker period (s)	30
Shape outline every	00:30

Mobile Bay Feasibility Simulations – Turning Basin

Run #: 18 Date: _____

Pilot:

1. Captain Chris Brock	Off Dock___	To Dock___	Bridge___
2. Captain Curtis Wilson	Off Dock___	To Dock ✓	Bridge B

Wind: (20 KNT N) Other: _____

Currents: (Ebb turning basin (north wind)) Other: 75%

Tide added: None (+1m) +0.7m (Daniella 2 or MT Britt) Other: _____

Plan: P0 (Existing) (P1 or P2 (Deepened only -51 ft)) Other: _____

Vessel:

Pilot #	Model Name	Ship Name	LOA (ft)	Beam (ft)	Draft (ft)	LOA (m)	Beam (m)	Draft (m)
	CNTNR28L	Sovereign Maersk (SovMae)	1138.5	140.4	47.6	347.0	42.8	14.5
2	CNTNR40	MSC Daniella 2 (Dan2)	1201.1	158.8	49.9	366.1	48.4	15.2
	CNTNR33L	Humber Bridge (HumB)	1102.4	150.3	46.2	336.0	45.8	14.1
	VLCC15L	MT Brittania (MTBrit)	859.6	137.8	49.2	262.0	42.0	15.0
	CNTNR20L	KMSS Dainty (Dainty)	964.9	105.7	41.0	294.1	32.2	12.5

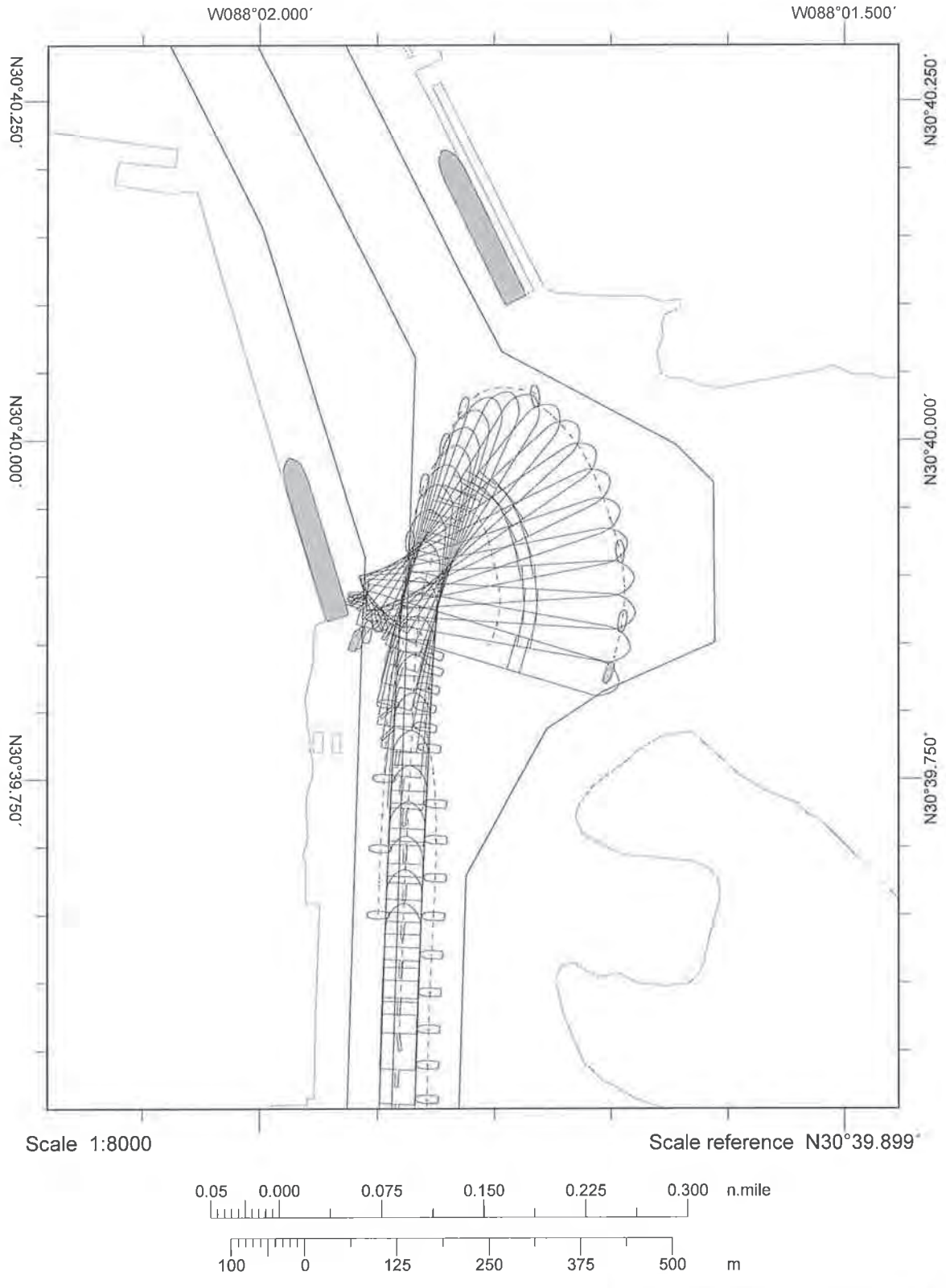
0749

Naming convention - Plan_Area_Transit_Shipname_Currents_Wind_PilotName_Repetition
(Ex:P0_TurningBasin_Offdock_SovMae_Ebb_20N_CWilson_1)

Filename: P1_TurningBasin_Todock_Dan2_Ebb_20N_CWilson_1

Comments: 2
3 tugs, 5t Qtr ~~stern~~ port bow
~100ft Stern to docked vessel, stern outside channel
Grounded on Southern end

Turn is not feasible in these environmental conditions, if two tugs cannot pick up the stern. Ship falls too far bodily to South, No room for bow on island.



Line sample period (s)	30
Course marker every	00:30
Heading marker period (s)	30
Shape outline every	00:30

Mobile Bay Feasibility Simulations – Turning Basin

Run #: 19 Date: 25 May

Pilot:

1. Captain Chris Brock	Off Dock___	To Dock X	Bridge A
2. Captain Curtis Wilson	Off Dock___	To Dock___	Bridge___

Wind:	20 KNT	N	Other:_____
Currents:	Ebb turning basin (north wind)		Other: 75%
Tide added:	None	+0.7m (Daniella 2 or MT Britt)	Other:_____
Plan:	P0 (Existing)	P1 or P2 (Deepened only -51 ft)	Other:_____

Vessel:

Pilot #	Model Name	Ship Name	LOA (ft)	Beam (ft)	Draft (ft)	LOA (m)	Beam (m)	Draft (m)
	CNTNR28L	Sovereign Maersk (SovMae)	1138.5	140.4	47.6	347.0	42.8	14.5
	CNTNR40	MSC Daniella 2 (Dan2)	1201.1	158.8	49.9	366.1	48.4	15.2
1	CNTNR33L	Humber Bridge (HumB)	1102.4	150.3	46.2	336.0	45.8	14.1
	VLCC15L	MT Brittania (MTBrit)	859.6	137.8	49.2	262.0	42.0	15.0
	CNTNR20L	KMSS Dainty (Dainty)	964.9	105.7	41.0	294.1	32.2	12.5

Naming convention - Plan_Area_Transit_Shipname_Currents_Wind_PilotName_Repetition
(Ex:P0_TurningBasin_Offdock_SovMae_Ebb_20N_CWilson_1)

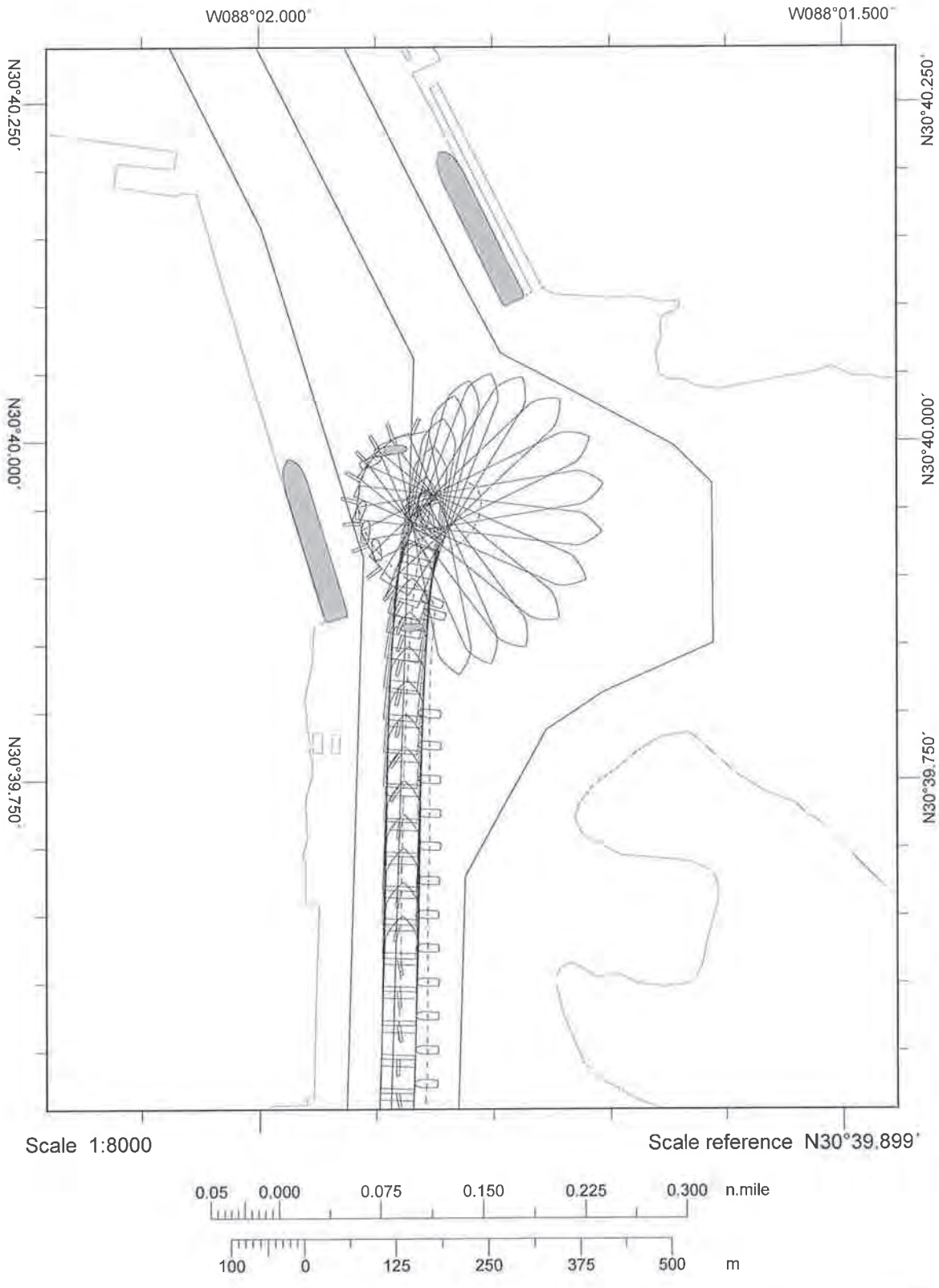
Filename: P1_TurningBasin_ToDock_HumB_Ebb_20N_Brock_3

Comments:

3 Tugs

RF 0834

Speed of turn with 3 tugs was not much different than with 2. I used furthest most edge of basin to north to start turn. Putting bow too far in basin to east is worrisome in fact that you may not get ship out of the basin before hitting up on island.



Line sample period (s)	30
Course marker every	00:30
Heading marker period (s)	30
Shape outline every	00:30

Mobile Bay Feasibility Simulations – Turning Basin

Run #: 20 Date: _____

Pilot:

1. Captain Chris Brock	Off Dock___	To Dock___	Bridge___
2. Captain Curtis Wilson	Off Dock___	To Dock ✓	Bridge B

Wind: 20 KNT N Other: _____

Currents: Ebb turning basin (north wind) Other: 75°

Tide added: None +0.7m (Daniella 2 or MT Britt) Other: _____

Plan: P0 (Existing) P1 or P2 (Deepened only -51 ft) Other: _____

Vessel:

Pilot #	Model Name	Ship Name	LOA (ft)	Beam (ft)	Draft (ft)	LOA (m)	Beam (m)	Draft (m)
	CNTNR28L	Sovereign Maersk (SovMae)	1138.5	140.4	47.6	347.0	42.8	14.5
	CNTNR40	MSC Daniella 2 (Dan2)	1201.1	158.8	49.9	366.1	48.4	15.2
2	CNTNR33L	Humber Bridge (HumB)	1102.4	150.3	46.2	336.0	45.8	14.1
	VLCC15L	MT Brittania (MTBrit)	859.6	137.8	49.2	262.0	42.0	15.0
	CNTNR20L	KMSS Dainty (Dainty)	964.9	105.7	41.0	294.1	32.2	12.5

Naming convention - Plan_Area_Transit_Shipname_Currents_Wind_PilotName_Repetition
(Ex:P0_TurningBasin_Offdock_SovMae_Ebb_20N_CWilson_1)

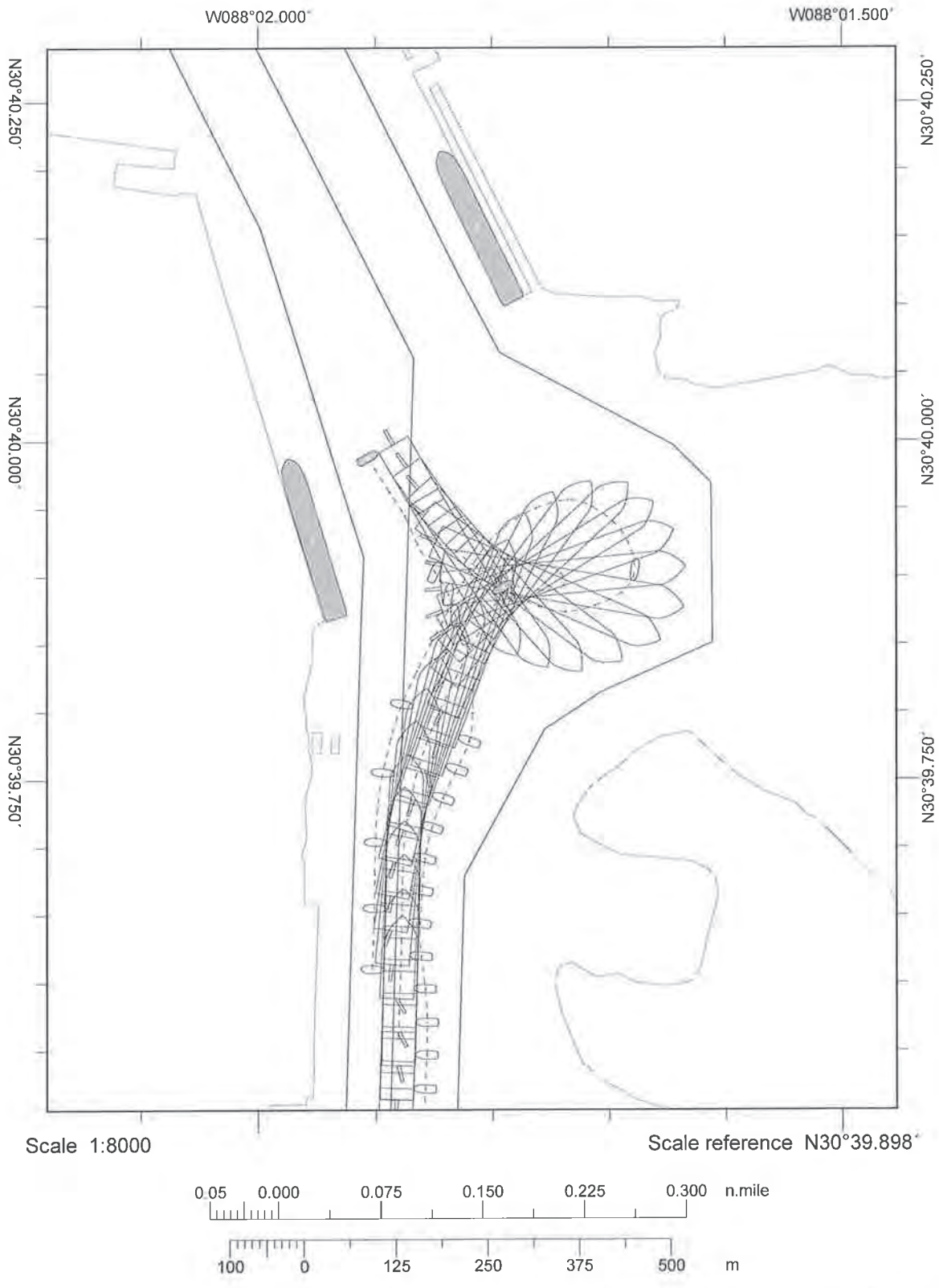
830

Filename: P1_TurningBasin_Todock_Humb_Ebb_20N_Wilson_3

Comments:

3 tugs, 50 ton Pt Bow, 260 ton Stb Qtr

Deliberate attempt to commit bow as far east into basin as possible ~~without~~ + back ship out with strong environmental conditions. Executed on simulator with very aggressive operation. Very unrealistic due to excessive speed + reliability on tug / ship's engine perfect operation. Extreme East side of basin unusable in these environmental conditions.



Line sample period (s)	30
Course marker every	00:30
Heading marker period (s)	30
Shape outline every	00:30

Mobile Bay Feasibility Simulations – Turning Basin

Run #: 21 Date: _____

Pilot:

1. Captain Chris Brock	Off Dock___	To Dock ✓	Bridge A
2. Captain Curtis Wilson	Off Dock___	To Dock___	Bridge___

Wind: 20 KNT N Other: _____

Currents: Ebb turning basin (north wind) Other: _____

Tide added: None +0.7m (Daniella 2 or MT Britt) Other: FLAT BOTTOM

Plan: P0 (Existing) P1 or P2 (Deepened only -51 ft) Other: _____

Vessel:

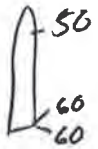
Pilot #	Model Name	Ship Name	LOA (ft)	Beam (ft)	Draft (ft)	LOA (m)	Beam (m)	Draft (m)
	CNTNR28L	Sovereign Maersk (SovMae)	1138.5	140.4	47.6	347.0	42.8	14.5
	CNTNR40	MSC Daniella 2 (Dan2)	1201.1	158.8	49.9	366.1	48.4	15.2
	CNTNR33L	Humber Bridge (HumB)	1102.4	150.3	46.2	336.0	45.8	14.1
	VLCC15L	MT Brittania (MTBrit)	859.6	137.8	49.2	262.0	42.0	15.0
	CNTNR20L	KMSS Dainty (Dainty)	964.9	105.7	41.0	294.1	32.2	12.5

Naming convention - Plan_Area_Transit_Shipname_Currents_Wind_PilotName_Repetition
(Ex:P0_TurningBasin_Offdock_SovMae_Ebb_20N_CWilson_1)

Filename: P1_TurningBasin_Todock_HumB_ebb_20N_Brock_FB

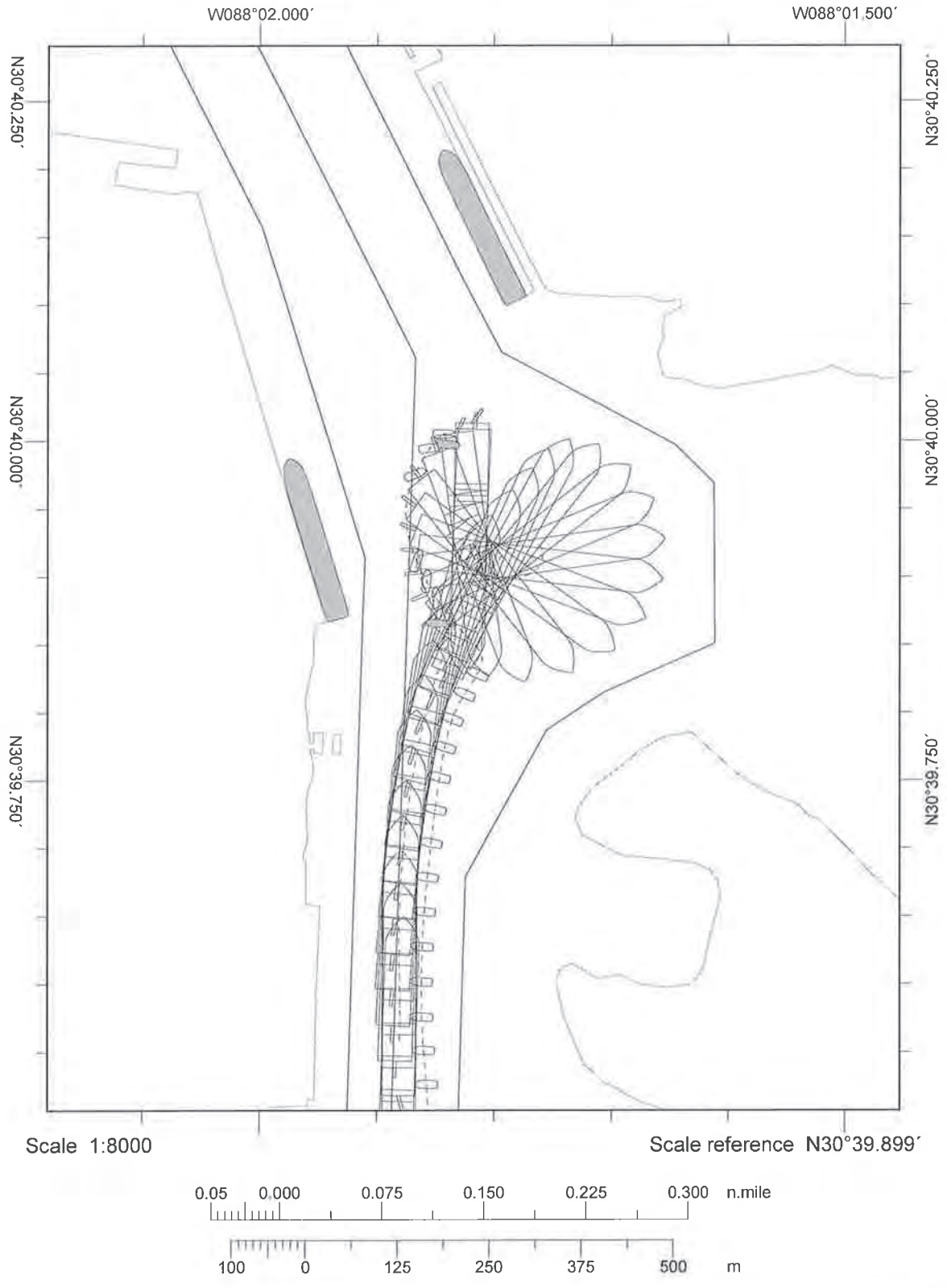
Comments:

3 Tugs



RF 0857

BACKING FULL FOR BOW TO CLEAR ISLAND. GROUNDING IS CONCERN WITH STRONG CURRENT AND WIND CLEARANCE IS UNSAFE IN MY OPINION



Line sample period (s)	30
Course marker every	00:30
Heading marker period (s)	30
Shape outline every	00:30

Mobile Bay Feasibility Simulations – Turning Basin

Run #: 22 Date: 25 May 2017

Pilot:

1. Captain Chris Brock	Off Dock___	To Dock #	Bridge___
2. Captain Curtis Wilson	Off Dock___	To Dock √	Bridge B

Wind: 20 KNT N Other: _____

Currents: Ebb turning basin (north wind) Other: _____

Tide added: None +0.7m (Daniella 2 or MT Britt) Other: Flat bottom

Plan: P0 (Existing) P1 or P2 (Deepened only -51 ft) Other: _____

Vessel:

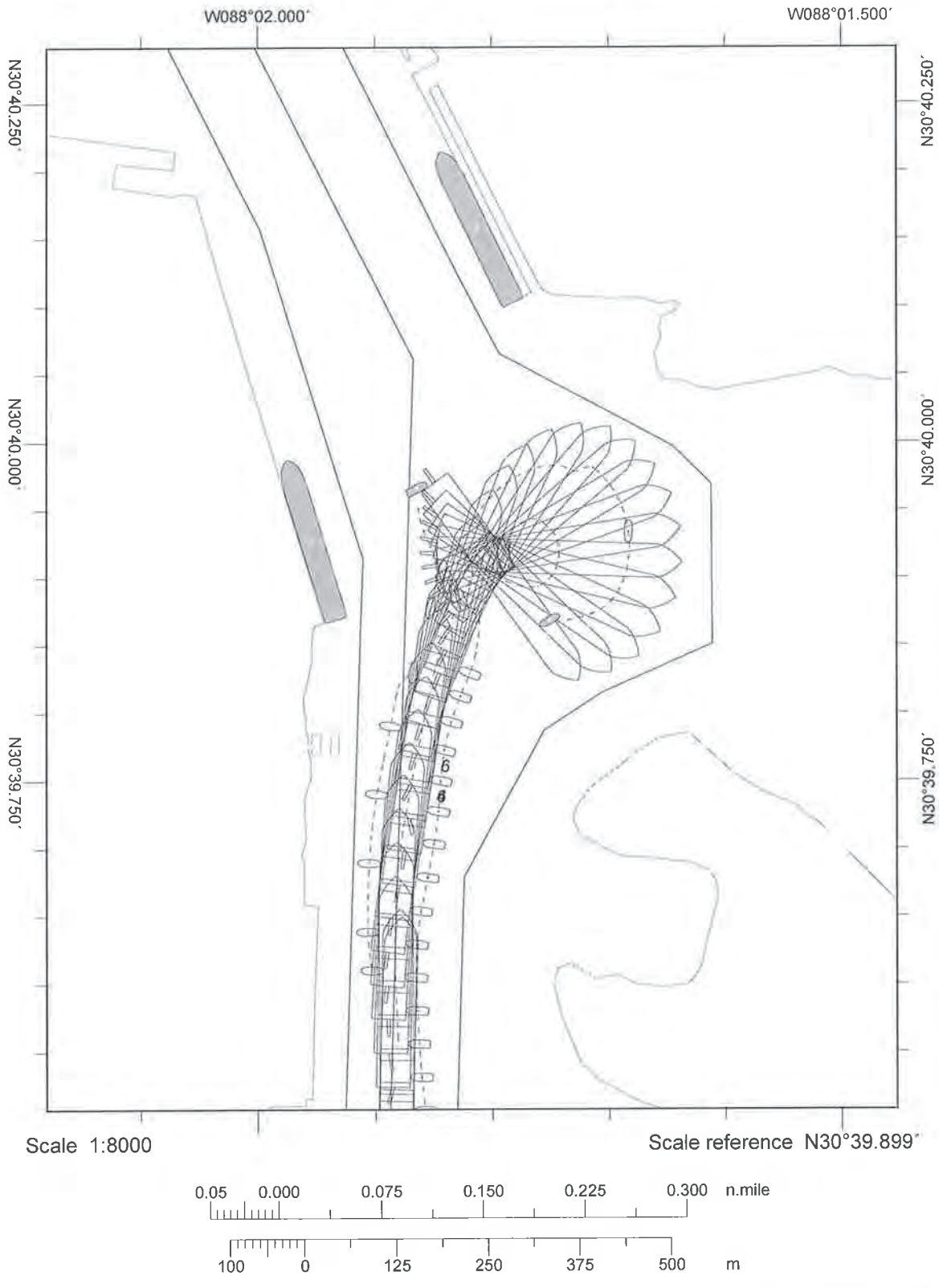
Pilot #	Model Name	Ship Name	LOA (ft)	Beam (ft)	Draft (ft)	LOA (m)	Beam (m)	Draft (m)
	CNTNR28L	Sovereign Maersk (SovMae)	1138.5	140.4	47.6	347.0	42.8	14.5
	CNTNR40	MSC Daniella 2 (Dan2)	1201.1	158.8	49.9	366.1	48.4	15.2
2	CNTNR33L	Humber Bridge (HumB)	1102.4	150.3	46.2	336.0	45.8	14.1
	VLCC15L	MT Brittania (MTBrit)	859.6	137.8	49.2	262.0	42.0	15.0
	CNTNR20L	KMSS Dainty (Dainty)	964.9	105.7	41.0	294.1	32.2	12.5

Naming convention - Plan_Area_Transit_Shipname_Currents_Wind_PilotName_Repetition
(Ex:P0_TurningBasin_Offdock_SovMae_Ebb_20N_CWilson_1)

Filename: P1_TurningBasin_Todock_HumB_ebb_20N_Wilson_flat-bottom

Comments: 3 tugs and flat bottom, 51 ft

Executed turn using as much basin area as possible. Maneuver went well, but conclusion is that the execution of this turn is unrealistic due to absolute commitment into the basin with no emergency recourse. Doable on simulator, would never attempt with this ship in reality.


W088°02.000´
W088°01.500´
N30°40.250´
N30°40.000´
N30°39.750´
Scale 1:8000
Scale reference N30°39.899´
0.05 0.000 0.075 0.150 0.225 0.300 n.mile
100 0 125 250 375 500 m
Line sample period (s) 30
Course marker every 00:30
Heading marker period (s) 30
Shape outline every 00:30

Mobile Bay Feasibility Simulations – Passing Lane / Bend Ease

Run #: 23 Date: 25 May

Pilot:
1. Captain Chris Brock — Inbound ___ Outbound O Buoy Start 29 Bridge A
2. Captain Curtis Wilson — Inbound I Outbound ___ Buoy Start ~~27~~ 15 Bridge B

Wind: (20 KNT) E W (SE) Other: _____

Currents: Flood(E wind) Flood(W wind) (Flood(SE wind)) Ebb(E wind) Ebb(W wind) Other: _____

Tide added: None +0.7m (Daniella 2 or MT Brittania) Other: 1.2 m

Plan: P0 (Existing) P1(500ft) (P2(550ft))

Vessel:

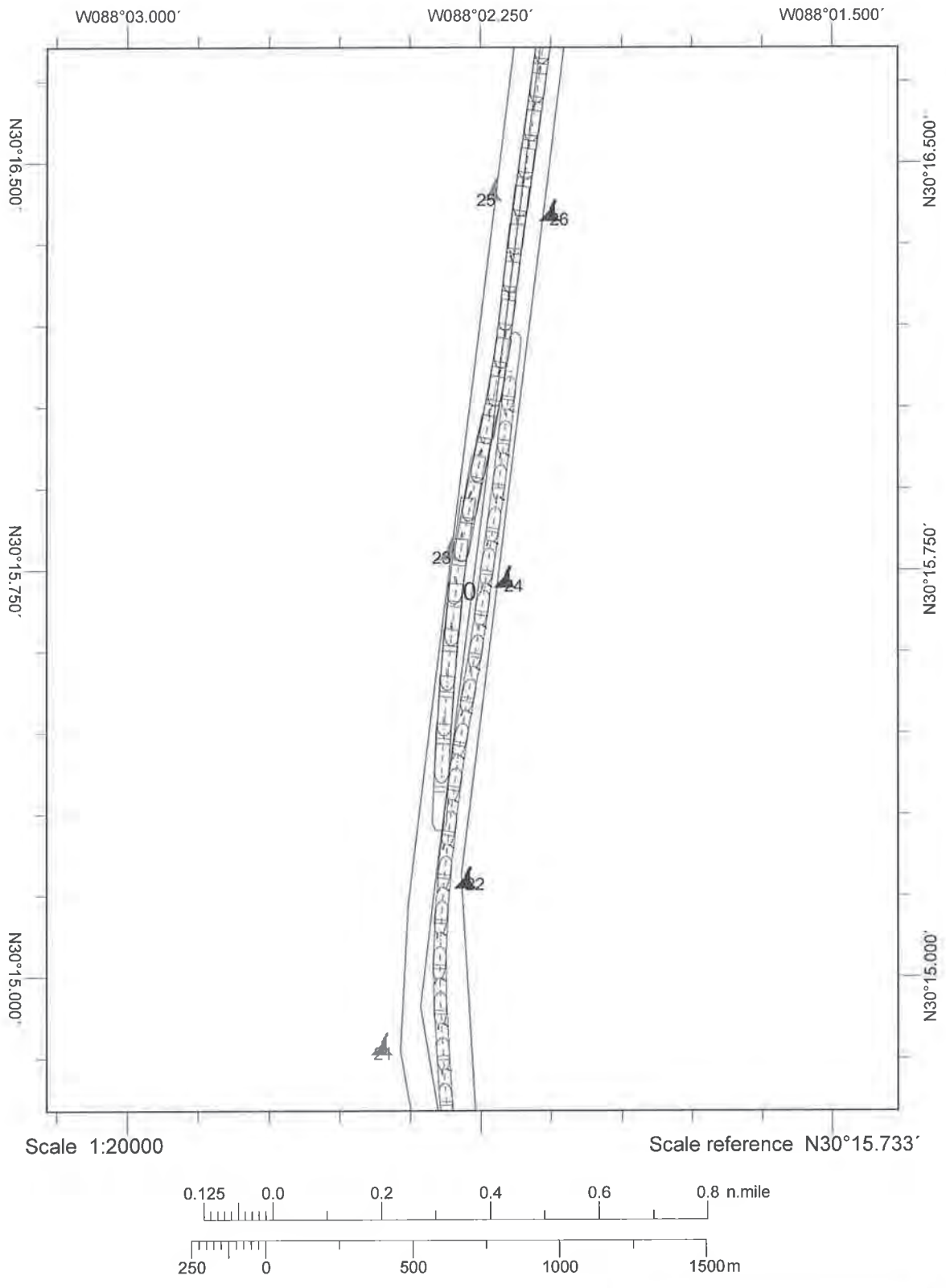
Pilot #	Model Name	Ship Name	LOA (ft)	Beam (ft)	Draft (ft)	LOA (m)	Beam (m)	Draft (m)
	CNTNR28L	Sovereign Maersk (SovMae)	1138.5	140.4	47.6	347.0	42.8	14.5
	CNTNR40	MSC Daniella 2 (Dan2) O	1201.1	158.8	49.9	366.1	48.4	15.2
	CNTNR44	Zim Piraeus (Zim)	964.9	105.6	43.0	294.1	32.2	13.1
	CNTNR33L	Humber Bridge (HumB)	1102.4	150.3	46.2	336.0	45.8	14.1
	VLCC15L	MT Brittania (MTBrit) I	859.6	137.8	49.2	262.0	42.0	15.0
	TANK23	Eagle Kanger (EagleK)	799.9	137.8	40.0	243.8	42.0	12.2

Naming convention - Plan_Area_IShipInbound_OShipoutbound_Currents_Wind_Repetition
(Ex:P0_PassingLane_IZim_ODan2_Flood_20E_1)

Filename: P2_PassLan_ODan2_IMTBrit_Flood_20SE_1

Comments: 550' channel was comfortable to pass in. Adequate room b/t vessels while also not feeling too much bank effect.

RF 10:05



Line sample period (s)	30
Course marker every	00:30
Heading marker period (s)	30
Shape outline every	00:30

Mobile Bay Feasibility Simulations – Passing Lane / Bend Ease

Run #: 24 Date: 25 MAY

Pilot:

1. Captain Chris Brock — Inbound ___ Outbound ✓ Buoy Start 29 Bridge A
2. Captain Curtis Wilson — Inbound ✓ Outbound ___ Buoy Start 15 Bridge B

Wind: (20 KNT) E W (SE) Other: _____

Currents: Flood(E wind) Flood(W wind) (Flood(SE wind)) Ebb(E wind) Ebb(W wind) Other: _____

Tide added: None (1.2 +0.7m (Daniella 2 or MT Brittania)) Other: _____

Plan: P0 (Existing) P1(500ft) (P2(550ft))

Vessel:

Pilot #	Model Name	Ship Name	LOA (ft)	Beam (ft)	Draft (ft)	LOA (m)	Beam (m)	Draft (m)
1	CNTNR28L	Sovereign Maersk (SovMae)	1138.5	140.4	47.6	347.0	42.8	14.5
2	CNTNR40	MSC Daniella 2 (Dan2)	1201.1	158.8	49.9	366.1	48.4	15.2
	CNTNR44	Zim Piraeus (Zim)	964.9	105.6	43.0	294.1	32.2	13.1
	CNTNR33L	Humber Bridge (HumB)	1102.4	150.3	46.2	336.0	45.8	14.1
	VLCC15L	MT Brittania (MTBrit)	859.6	137.8	49.2	262.0	42.0	15.0
	TANK23	Eagle Kanger (EagleK)	799.9	137.8	40.0	243.8	42.0	12.2

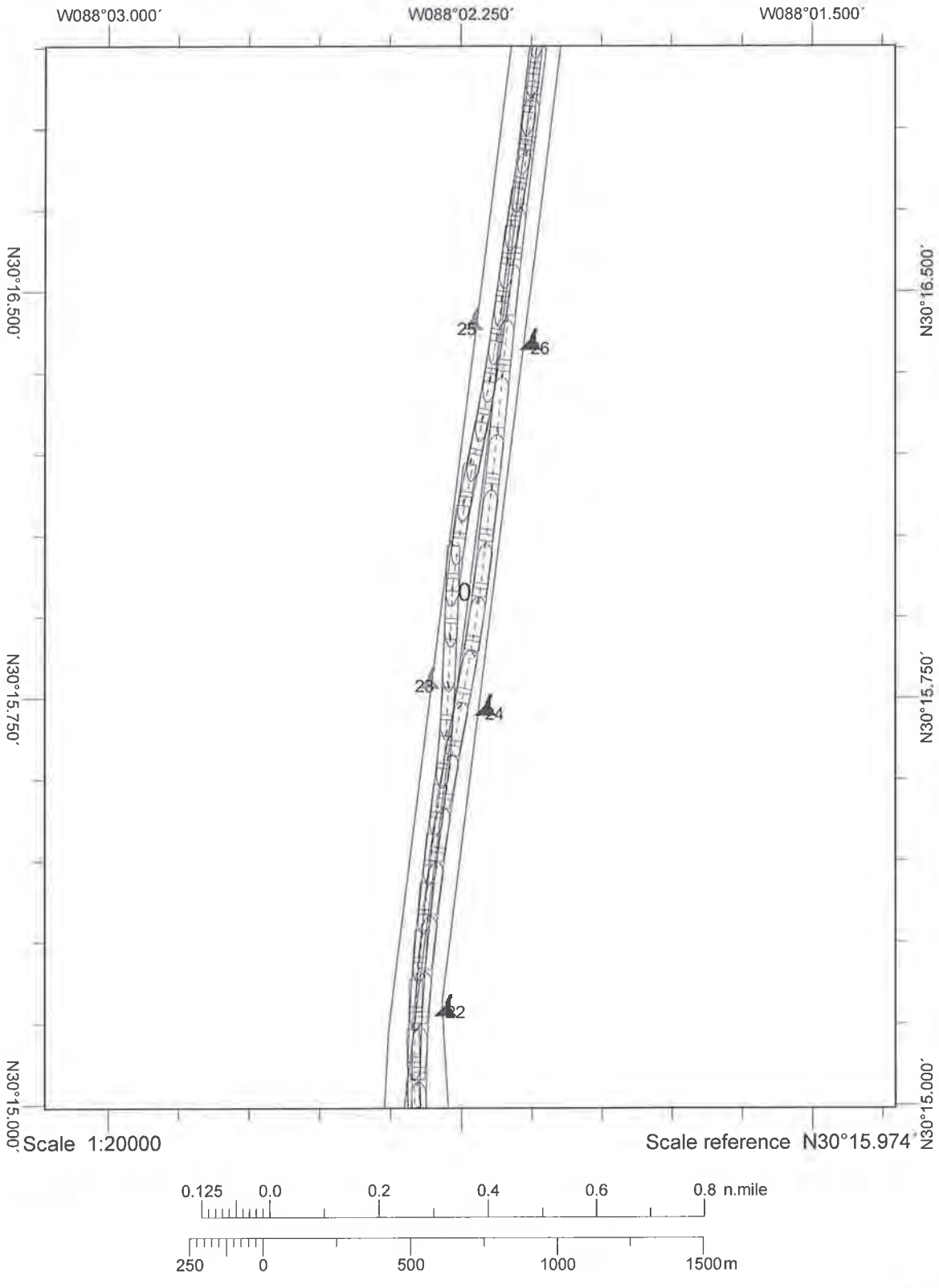
Naming convention - Plan_Area_IShipInbound_OShipoutbound_Currents_Wind_Repetition
(Ex:P0_PassingLane_IZim_ODan2_Flood_20E_1)

Filename: P2_PassingLane_OSovMae_IDan2_Flood_20SE_1

Comments: 160' between ships during passing

550' channel was needed, inbound ship very sluggish response, outbound vessel needed extra width to clear safely. 500' channel would have been very tight.

1039



Line sample period (s)	30
Course marker every	00:30
Heading marker period (s)	30
Shape outline every	00:30

Mobile Bay Feasibility Simulations – Turning Basin

Run #: 25 Date: 26 MAY

Pilot:

1. Captain Chris Brock	Off Dock___	To Dock___	Bridge___
2. Captain Curtis Wilson	Off Dock___	To Dock✓	Bridge B

Wind: (20 KNT N) Other:_____

Currents: (Ebb turning basin (north wind)) Other: 75%

Tide added: (None) +0.7m (Daniella 2 or MT Britt) Other:_____

Plan: P0 (Existing) (P1 or P2 (Deepened only -51 ft)) Other: Flat Bottom w/ increased TB deminsion

Vessel:

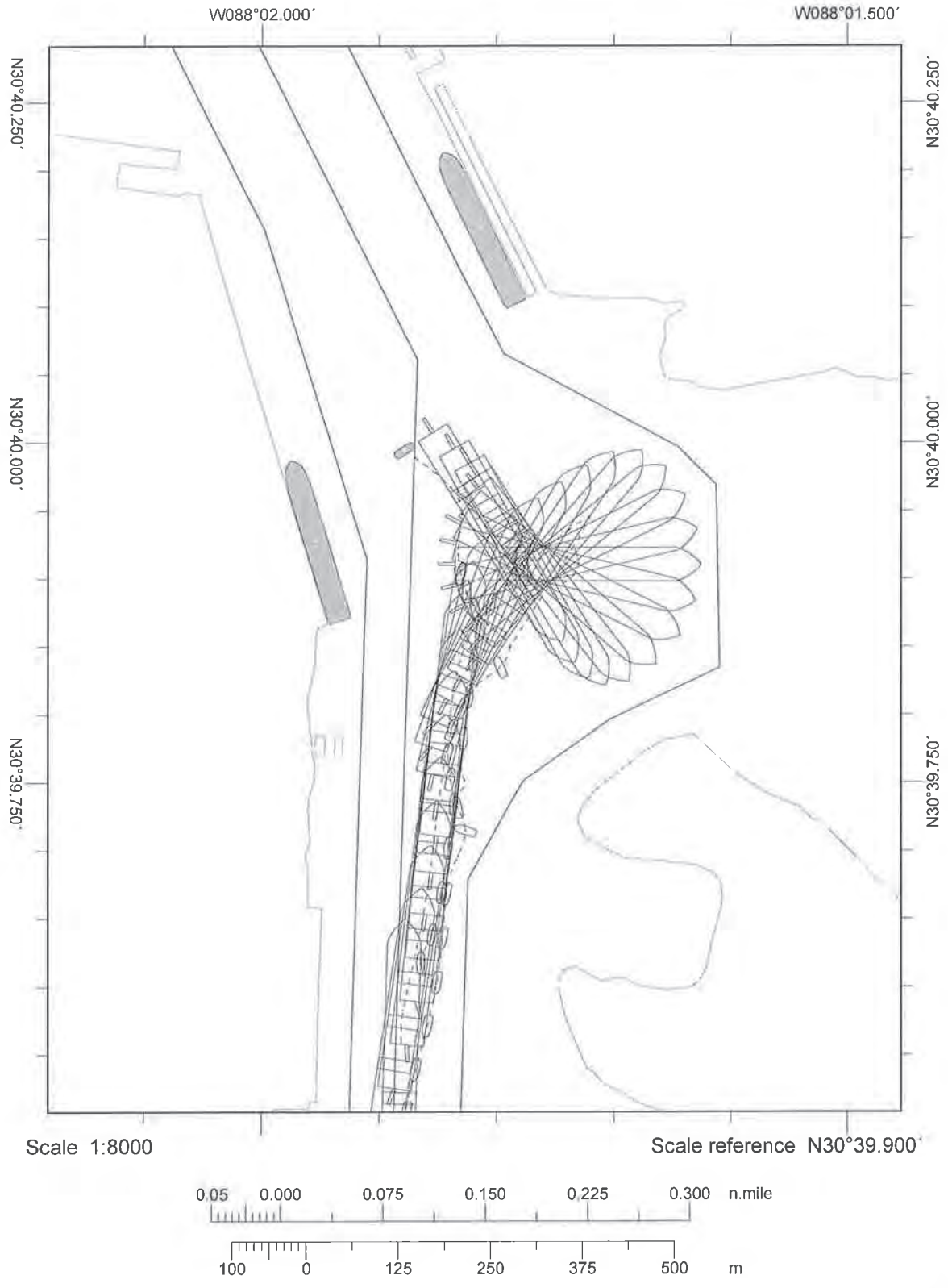
Pilot #	Model Name	Ship Name	LOA (ft)	Beam (ft)	Draft (ft)	LOA (m)	Beam (m)	Draft (m)
	CNTNR28L	Sovereign Maersk (SovMae)	1138.5	140.4	47.6	347.0	42.8	14.5
	CNTNR40	MSC Daniella 2 (Dan2)	1201.1	158.8	49.9	366.1	48.4	15.2
2	CNTNR33L	Humber Bridge (HumB)	1102.4	150.3	46.2	336.0	45.8	14.1
	VLCC15L	MT Brittania (MTBrit)	859.6	137.8	49.2	262.0	42.0	15.0
	CNTNR20L	KMSS Dainty (Dainty)	964.9	105.7	41.0	294.1	32.2	12.5

Naming convention - Plan_Area_Transit_Shipname_Currents_Wind_PilotName_Repetition
(Ex:P0_TurningBasin_Offdock_SovMae_Ebb_20N_CWilson_1)

Filename: P2_TurningBasin_Todock_~~Humberbridge~~ HumB_Ebb_20N_Wilson_1

Comments: Bow

Pilot ship deep into turn basin. Approached with bow high to North. Had to use both tug boats on quarter Full ahead + continuously backed ship between slow + half astern. Relying on the ships engine working astern that long greatly increases risk as bow drops south to Little Sand Island.



Line sample period (s)	30
Course marker every	00:30
Heading marker period (s)	30
Shape outline every	00:30

Mobile Bay Feasibility Simulations – Passing Lane / Bend Ease

Run #: 26 Date: 26 May 2017

Pilot:

1. Captain Chris Brock	Inbound 2	Outbound___	Buoy Start___	Bridge___	
2. Captain Curtis Wilson	Inbound ✓	Outbound___	Buoy Start___	Bridge 3	

Wind: (20 KNT)	E	W	(SE)		Other:_____
Currents: Flood(E wind)	Flood(W wind)	(Flood(SE wind))	Ebb(E wind)	Ebb(W wind)	Other:_____
Tide added:	None	+0.7m (Daniella 2 or MT Brittania)			Other: 2m
Plan:	(P0 (Existing))	P1(500ft)	P2(550ft)		

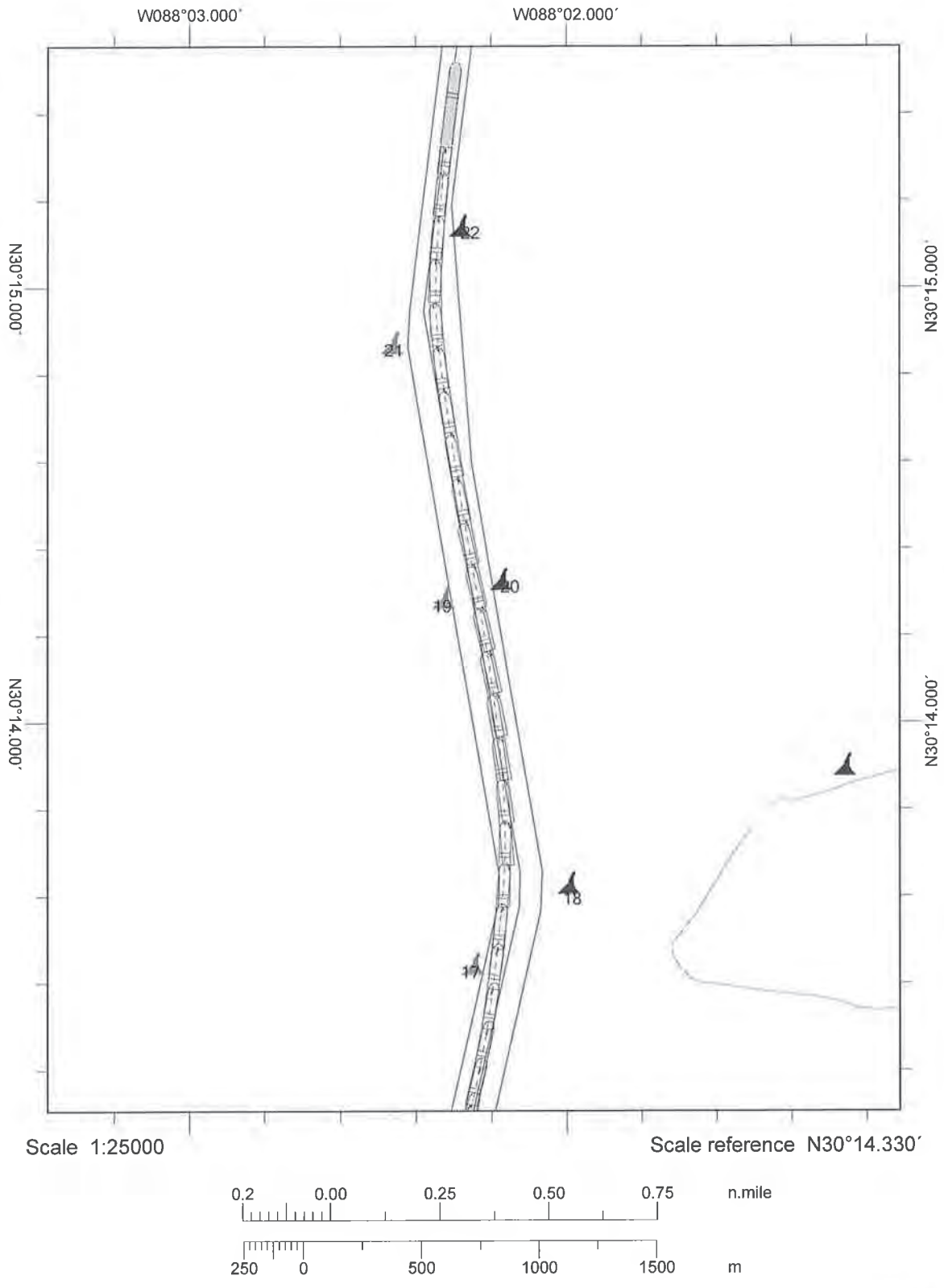
Vessel:

Pilot #	Model Name	Ship Name	LOA (ft)	Beam (ft)	Draft (ft)	LOA (m)	Beam (m)	Draft (m)
	CNTNR28L	Sovereign Maersk (SovMae)	1138.5	140.4	47.6	347.0	42.8	14.5
2	CNTNR40	MSC Daniella 2 (Dan2)	1201.1	158.8	49.9	366.1	48.4	15.2
	CNTNR44	Zim Piraeus (Zim)	964.9	105.6	43.0	294.1	32.2	13.1
3	CNTNR33L	Humber Bridge (HumB)	1102.4	150.3	46.2	336.0	45.8	14.1
	VLCC15L	MT Brittania (MTBrit)	859.6	137.8	49.2	262.0	42.0	15.0
	TANK23	Eagle Kanger (EagleK)	799.9	137.8	40.0	243.8	42.0	12.2

Naming convention - Plan_Area_IShipInbound_OShipoutbound_Currents_Wind_Repetition
(Ex:P0_PassingLane_IZim_ODan2_Flood_20E_1)

Filename: P0_OneWay_IDan2_Flood_20SE_CWilson_1

Comments: Very large ship with sluggish steering. Required hard over rudder several times, especially making bend into 400' channel. Pretty narrow.



Line sample period (s)	30
Course marker every	00:30
Heading marker period (s)	30
Shape outline every	00:30

Mobile Bay Feasibility Simulations – Turning Basin

Run #: 26 Date: 26 MAY

Pilot:
1. Captain Chris Brock Off Dock ✓ To Dock___ Bridge A
2. Captain Curtis Wilson Off Dock___ To Dock___ Bridge___

Wind: (20 KNT N) Other: _____

Currents: (Ebb turning basin (north wind)) Other: 75%

Tide added: (None) +0.7m (Daniella 2 or MT Britt) Other: _____

Plan: P0 (Existing) (P1 or P2 (Deepened only -51 ft)) Other: Flatbottom, new turning basin lines

Vessel:

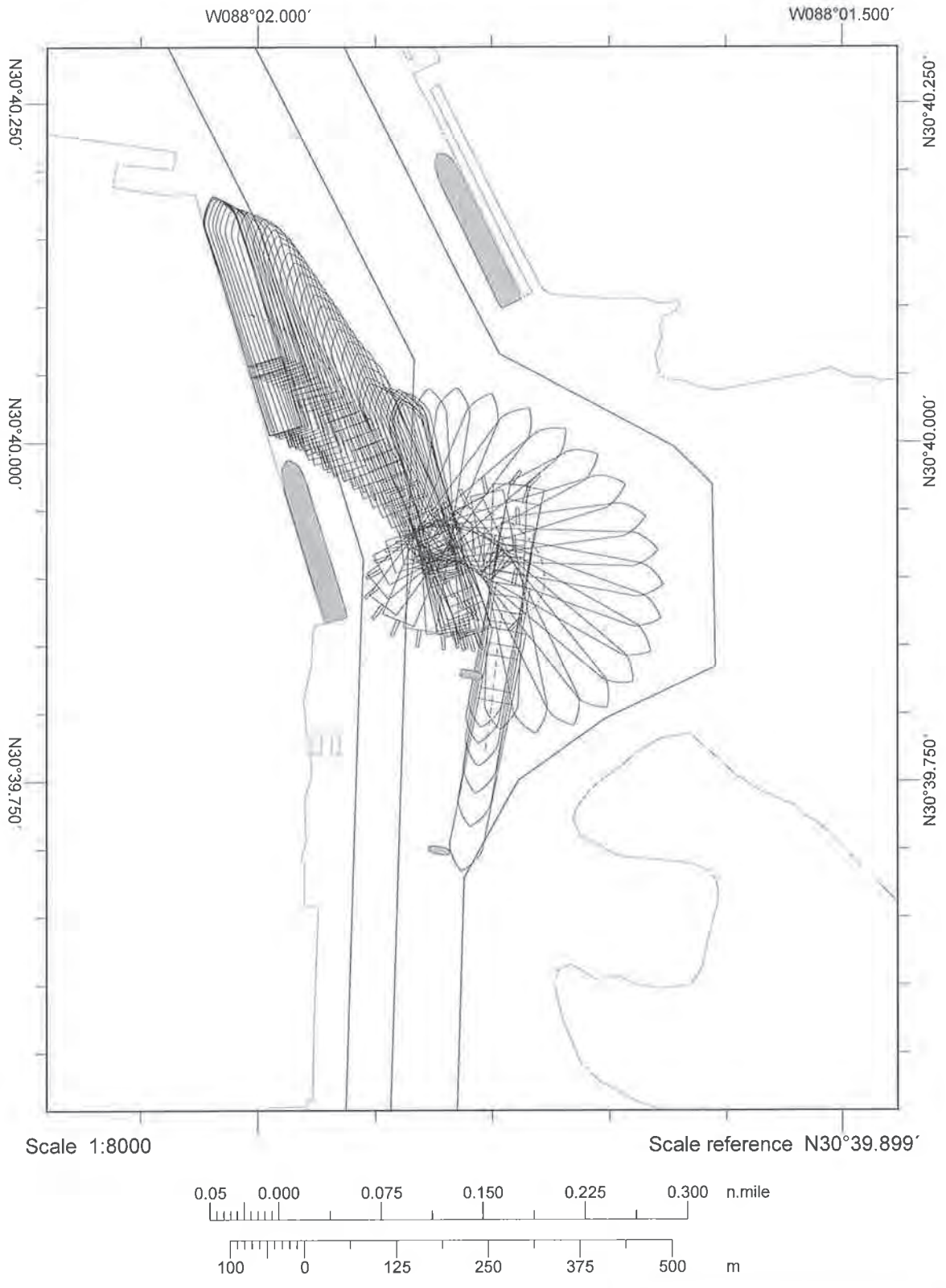
Pilot #	Model Name	Ship Name	LOA (ft)	Beam (ft)	Draft (ft)	LOA (m)	Beam (m)	Draft (m)
	CNTNR28L	Sovereign Maersk (SovMae)	1138.5	140.4	47.6	347.0	42.8	14.5
	CNTNR40	MSC Daniella 2 (Dan2)	1201.1	158.8	49.9	366.1	48.4	15.2
1	CNTNR33L	Humber Bridge (HumB)	1102.4	150.3	46.2	336.0	45.8	14.1
	VLCC15L	MT Brittania (MTBrit)	859.6	137.8	49.2	262.0	42.0	15.0
	CNTNR20L	KMSS Dainty (Dainty)	964.9	105.7	41.0	294.1	32.2	12.5

Naming convention - Plan_Area_Transit_Shipname_Currents_Wind_PilotName_Repetition
(Ex:P0_TurningBasin_Offdock_SovMae_Ebb_20N_CWilson_1)

Filename: P2_TurningBasin_offdock_Humb_Ebb_20N_Brock_1

Comments: WAS ABLE TO GIVE MYSELF SAFE CLEARANCE ON SHIP AT SOUTH BERTH WITH POST PANAMAX (RF 0153) CRANES OUTREACHED. STILL ISSUE OF GETTING DEEP INTO BASIN IS HAVING TO BACK FULL ON THE SHIP TO TRY AND MAINTAIN MIDDLE AND NOT GROUND ON THE ISLAND.

* within 39 ft of new turning basin lines.



Line sample period (s)	30
Course marker every	00:30
Heading marker period (s)	30
Shape outline every	00:30

Mobile Bay Feasibility Simulations – Turning Basin

Run #: 27 Date: 26 May 2017

Pilot:
1. Captain Chris Brock Off Dock___ To Dock X Bridge A
2. Captain Curtis Wilson Off Dock___ To Dock___ Bridge___

Wind: (20 KNT) (N) Other:_____

Currents: (Ebb) turning basin (north wind) Other:_____

Tide added: None +0.7m (Daniella 2 or MT Britt) Other: Flat Bottom 15.5m

Plan: P0 (Existing) P1 or (P2) (Deepened only -51 ft) Other:_____

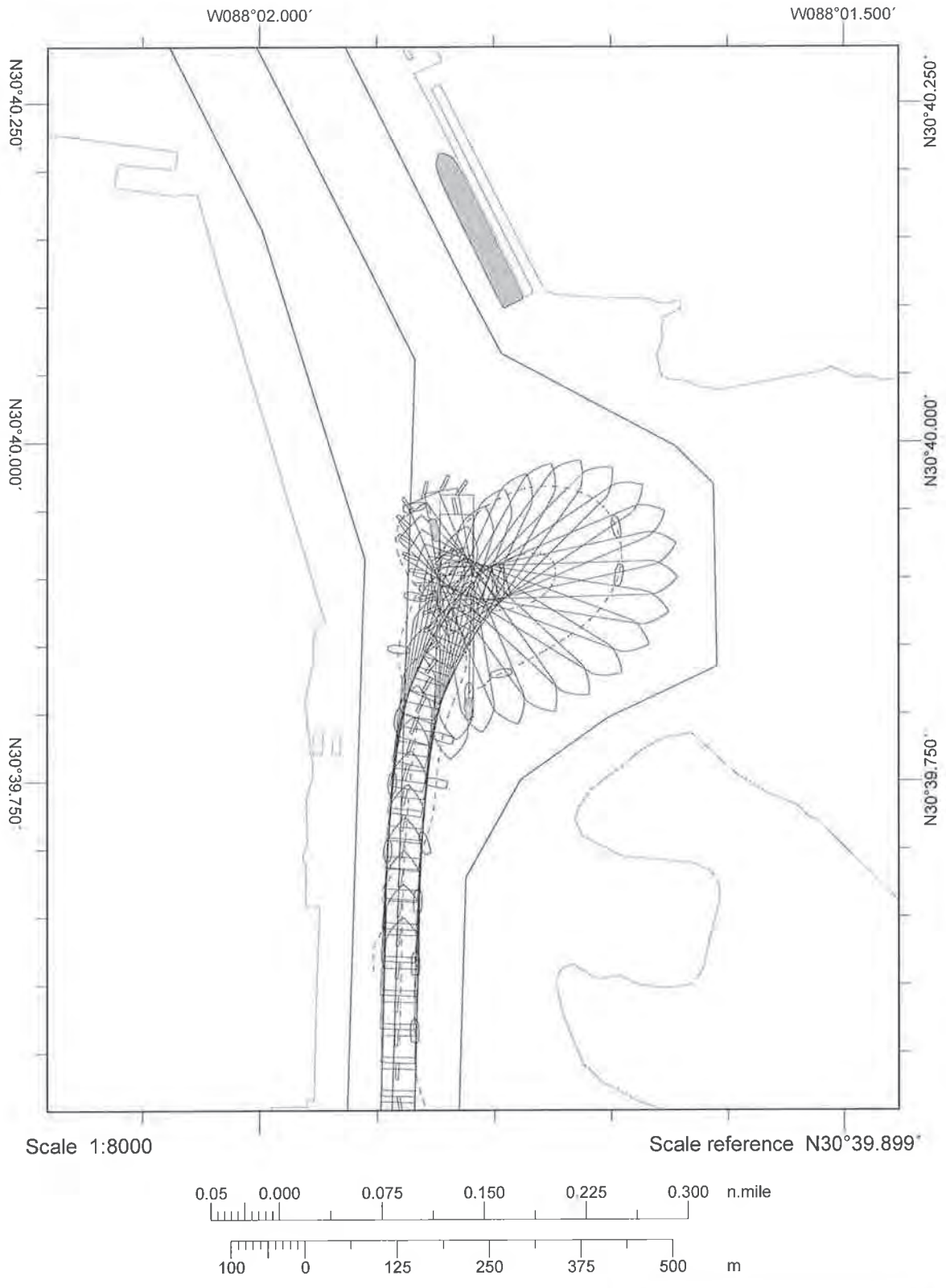
Vessel:

Pilot #	Model Name	Ship Name	LOA (ft)	Beam (ft)	Draft (ft)	LOA (m)	Beam (m)	Draft (m)
	CNTNR28L	Sovereign Maersk (SovMae)	1138.5	140.4	47.6	347.0	42.8	14.5
	CNTNR40	MSC Daniella 2 (Dan2)	1201.1	158.8	49.9	366.1	48.4	15.2
	CNTNR33L	Humber Bridge (HumB)	1102.4	150.3	46.2	336.0	45.8	14.1
	VLCC15L	MT Brittania (MTBrit)	859.6	137.8	49.2	262.0	42.0	15.0
	CNTNR20L	KMSS Dainty (Dainty)	964.9	105.7	41.0	294.1	32.2	12.5

Naming convention - Plan_Area_Transit_Shipname_Currents_Wind_PilotName_Repetition
(Ex:P0_TurningBasin_Offdock_SovMae_Ebb_20N_CWilson_1)

Filename: P2_TurningBasin_ToDock_HumB_Ebb_20N_CBrock_2

Comments:
Extended turning basin
WAS ABLE TO GIVE PLENTY OF CLEARANCE OFF CONTAINER TERMINAL. ACTUALLY USED FEDERAL BASIN. WITH THESE CONDITIONS I'M STILL HAVING TO BACK SHIP FULL TO STAY OFF OF SAND ISLAND.



Line sample period (s)	30
Course marker every	00:30
Heading marker period (s)	30
Shape outline every	00:30

Mobile Bay Feasibility Simulations – Turning Basin

Run #: 28 Date: 26 May 2017

Pilot:

1. Captain Chris Brock	Off Dock___	To Dock___	Bridge___
2. Captain Curtis Wilson	Off Dock ✓	To Dock___	Bridge B

Wind:	20 KNT	N	Other: _____
Currents:	Ebb turning basin (north wind)		Other: +75%
Tide added:	None	+0.7m (Daniella 2 or MT Britt)	Other: flat-bottom
Plan:	P0 (Existing)	P1 or P2 (Deepened only -51 ft)	Other: _____

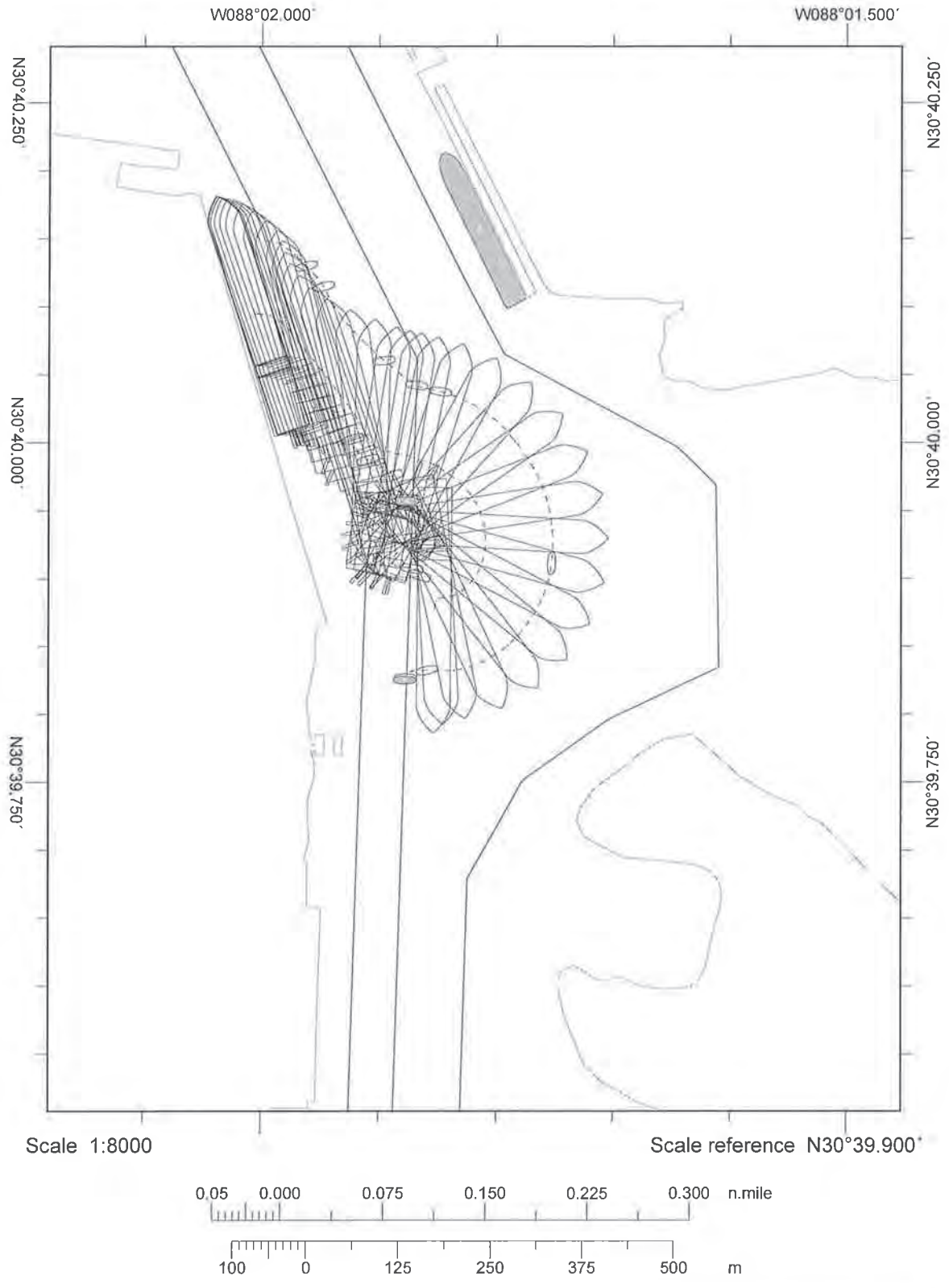
Vessel:

Pilot #	Model Name	Ship Name	LOA (ft)	Beam (ft)	Draft (ft)	LOA (m)	Beam (m)	Draft (m)
	CNTNR28L	Sovereign Maersk (SovMae)	1138.5	140.4	47.6	347.0	42.8	14.5
	CNTNR40	MSC Daniella 2 (Dan2)	1201.1	158.8	49.9	366.1	48.4	15.2
2	CNTNR33L	Humber Bridge (HumB)	1102.4	150.3	46.2	336.0	45.8	14.1
	VLCC15L	MT Brittania (MTBrit)	859.6	137.8	49.2	262.0	42.0	15.0
	CNTNR20L	KMSS Dainty (Dainty)	964.9	105.7	41.0	294.1	32.2	12.5

Naming convention - Plan_Area_Transit_Shipname_Currents_Wind_PilotName_Repetition
(Ex:P0_TurningBasin_Offdock_SovMae_Ebb_20N_CWilson_1)

Filename: P2_TurningBasin_OffDock_HumB_Ebb_20N_CWilson_1

Comments:



Line sample period (s)	30
Course marker every	00:30
Heading marker period (s)	30
Shape outline every	00:30

Mobile Bay Feasibility Simulations – Passing Lane / Bend Ease

Run #: 29 Date: 26 May 2017

Pilot:
1. Captain Chris Brock — Inbound ~~X~~ Outbound X — Buoy Start 15 — Bridge A
2. Captain Curtis Wilson — Inbound X — Outbound ~~X~~ — Buoy Start 29 — Bridge B

Wind: 20 KNT E W (SE) Other: _____

Currents: Flood(E wind) Flood(W wind) Flood(SE wind) Ebb(E wind) Ebb(W wind) Other: _____

Tide added: ~~None~~ +0.7m (Daniella 2 or MT Brittania) Other: _____

Plan: P0 (Existing) P1(500ft) P2(550ft)

Vessel:

Pilot #	Model Name	Ship Name	LOA (ft)	Beam (ft)	Draft (ft)	LOA (m)	Beam (m)	Draft (m)
1, 2	CNTNR28L	Sovereign Maersk (SovMae)	1138.5	140.4	47.6	347.0	42.8	14.5
	CNTNR40	MSC Daniella 2 (Dan2)	1201.1	158.8	49.9	366.1	48.4	15.2
	CNTNR44	Zim Piraeus (Zim)	964.9	105.6	43.0	294.1	32.2	13.1
	CNTNR33L	Humber Bridge (HumB)	1102.4	150.3	46.2	336.0	45.8	14.1
	VLCC15L	MT Brittania (MTBrit)	859.6	137.8	49.2	262.0	42.0	15.0
	TANK23	Eagle Kanger (EagleK)	799.9	137.8	40.0	243.8	42.0	12.2

Naming convention - Plan_Area_IShipInbound_OShipoutbound_Currents_Wind_Repetition
(Ex:P0_PassingLane_IZim_ODan2_Flood_20E_1)

Filename: P1_PassLan_I SovMae_O SovMae_Flood_20SE_1

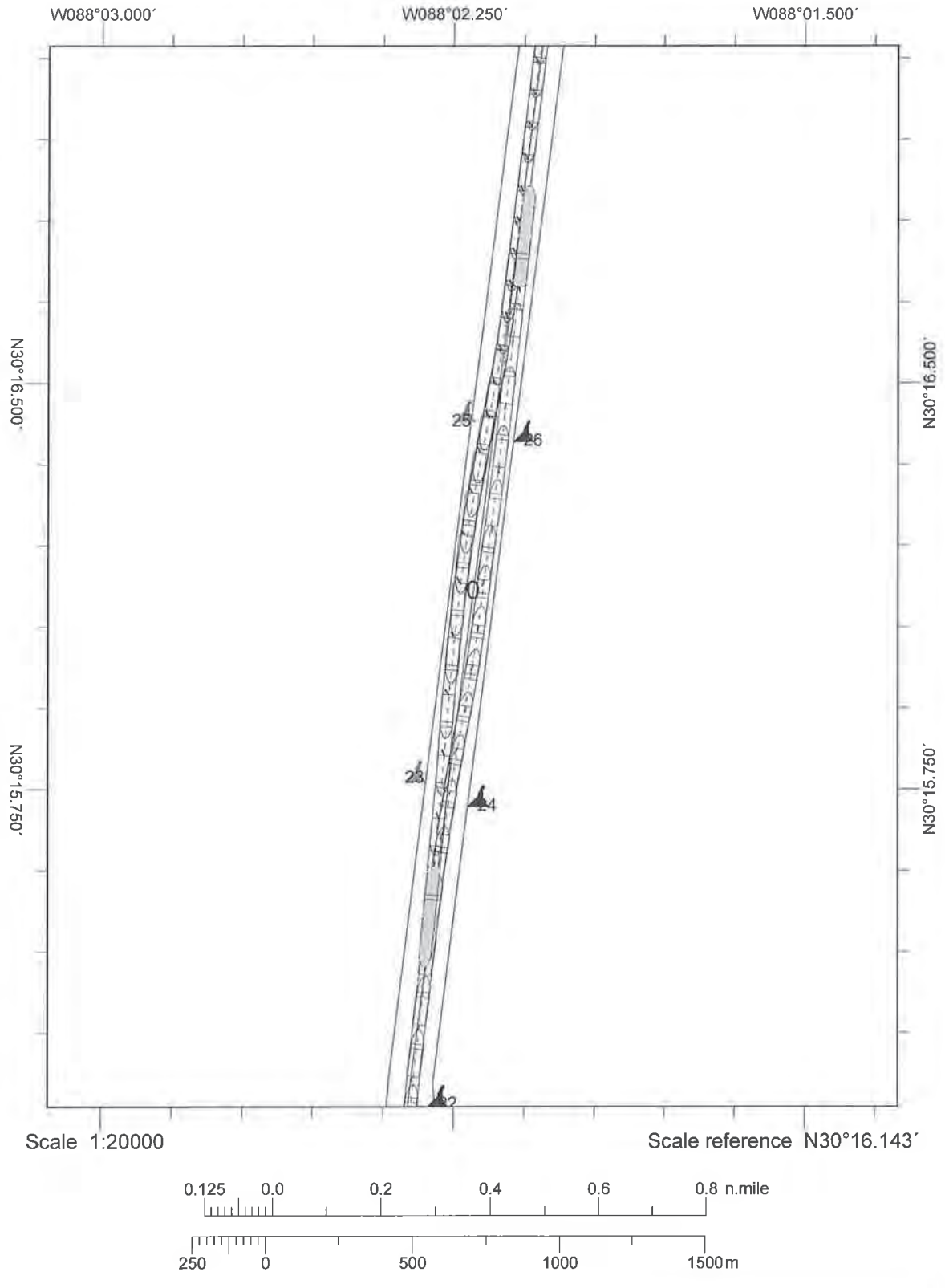
Bow 140

Comments: Passing distance in this channel w/ 2 ships this size is Fairly tight. Even at low speeds ~~[illegible]~~ there is substantial bank effect felt due to the proximity.

Mid 130

Stern 120

TOO CLOSE PASSING. LOW SPEED PASSING AND SHIP STILL GOT CRAZY WHEN WE PASSED WAS CONCERNED WITH TOUCHING BANK WHEN TRYING TO GET BACK IN MIDDLE AFTER PASSING



Line sample period (s)	30
Course marker every	00:30
Heading marker period (s)	30
Shape outline every	00:30

Mobile Bay Feasibility Simulations – Turning Basin

Run #: 30

Date: 26 May 2017

Pilot:

1. Captain Chris Brock	Off Dock___	To Dock X	Bridge A
2. Captain Curtis Wilson	Off Dock___	To Dock___	Bridge___

Wind: 20 KNT (N) Other: _____

Currents: Ebb turning basin (north wind) Other: _____

Tide added: None (0.7m) (Daniella 2 or MT Britt) Other: _____

Plan: P0 (Existing) P1 or (P2) (Deepened only -51 ft) Other: _____

Vessel:

Pilot #	Model Name	Ship Name	LOA (ft)	Beam (ft)	Draft (ft)	LOA (m)	Beam (m)	Draft (m)
	CNTNR28L	Sovereign Maersk (SovMae)	1138.5	140.4	47.6	347.0	42.8	14.5
	CNTNR40	MSC Daniella 2 (Dan2)	1201.1	158.8	49.9	366.1	48.4	15.2
1	CNTNR33L	Humber Bridge (HumB)	1102.4	150.3	46.2	336.0	45.8	14.1
	VLCC15L	MT Brittania (MTBrit)	859.6	137.8	49.2	262.0	42.0	15.0
	CNTNR20L	KMSS Dainty (Dainty)	964.9	105.7	41.0	294.1	32.2	12.5

Naming convention - Plan_Area_Transit_Shipname_Currents_Wind_PilotName_Repetition
(Ex:P0_TurningBasin_Offdock_SovMae_Ebb_20N_CWilson_1)

Filename: P2_TurningBasin_ToDock_HumB_Ebb_20N_CBrock_3

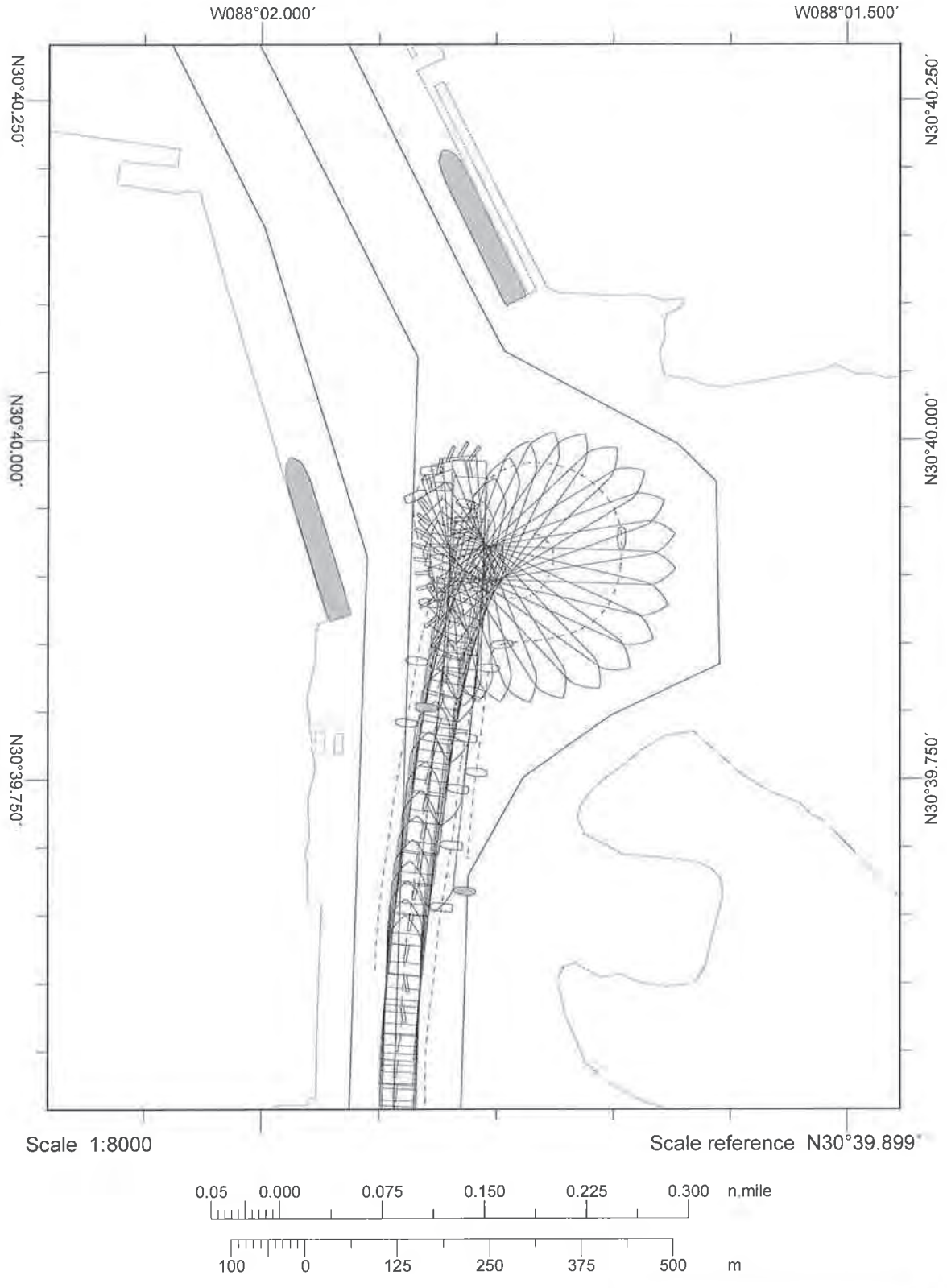
North Boundary
143

Southe
125

Comments:

Tank 10L berthed at Southern Tip
Extended Basin

SAFE ROOM ALL AROUND, STILL TAKING A LOT TO GET SHIP OUT OF BASIN ONCE YOU COMMITT



Line sample period (s)	30
Course marker every	00:30
Heading marker period (s)	30
Shape outline every	00:30

Mobile Bay Feasibility Simulations – Turning Basin

Run #: 31

Date: 26 May 2017

Pilot:

1. Captain Chris Brock	Off Dock___	To Dock___	Bridge___
2. Captain Curtis Wilson	Off Dock___	To Dock ✓	Bridge B

Wind: 20 KNT N

Other: _____

Currents: Ebb turning basin (north wind)

Other: +75%

Tide added: None +0.7m (Daniella 2 or MT Britt)

Other: flat-bottom

Plan: P0 (Existing) P1 or P2 (Deepened only -51 ft)

Other: _____

Vessel:

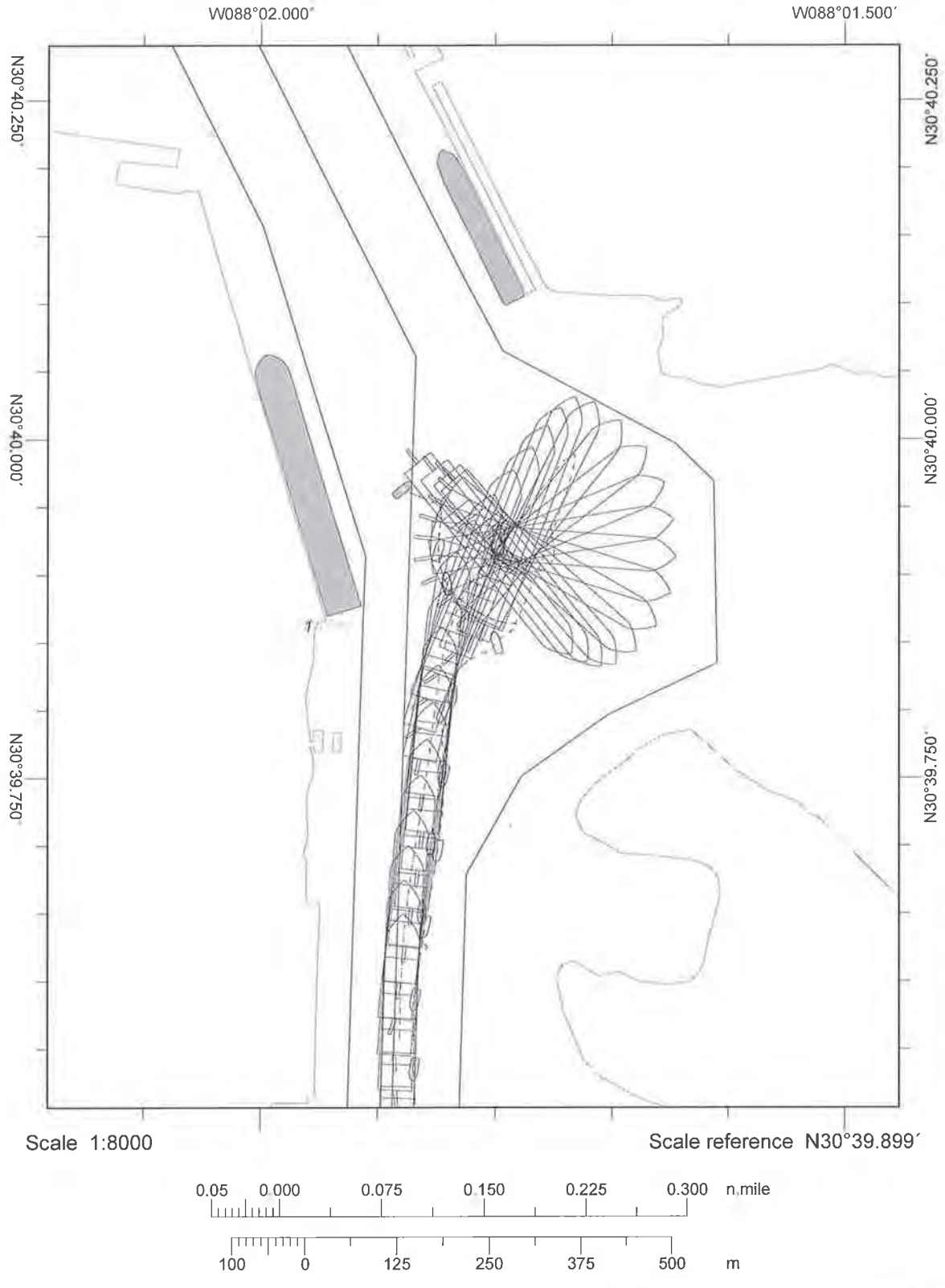
Pilot #	Model Name	Ship Name	LOA (ft)	Beam (ft)	Draft (ft)	LOA (m)	Beam (m)	Draft (m)
	CNTNR28L	Sovereign Maersk (SovMae)	1138.5	140.4	47.6	347.0	42.8	14.5
	CNTNR40	MSC Daniella 2 (Dan2)	1201.1	158.8	49.9	366.1	48.4	15.2
2	CNTNR33L	Humber Bridge (HumB)	1102.4	150.3	46.2	336.0	45.8	14.1
	VLCC15L	MT Brittania (MTBrit)	859.6	137.8	49.2	262.0	42.0	15.0
	CNTNR20L	KMSS Dainty (Dainty)	964.9	105.7	41.0	294.1	32.2	12.5

Naming convention - Plan_Area_Transit_Shipname_Currents_Wind_PilotName_Repetition
(Ex:P0_TurningBasin_Offdock_SovMae_Ebb_20N_CWilson_1)

Filename: P2_TurningBasin_ToDock_HumB_Ebb_20N_CWilson_2

Comments: Changed berthed ship at proposed container terminal ↑ to Daniella 2 expansion

Got bow to extreme North edge of basin. Had to use both tugs Full ahead on stern to execute turn + not fall too far south. Being that far north helped bow from getting too close to L.S.I. but Far From realistic



Line sample period (s)	30
Course marker every	00:30
Heading marker period (s)	30
Shape outline every	00:30

Mobile Bay Feasibility Simulations – Turning Basin

Run #: 32 Date: 26 May 2017

Pilot:

1. Captain Chris Brock	Off Dock___	To Dock___	Bridge___
2. Captain Curtis Wilson	Off Dock✓	To Dock___	Bridge B

Wind: 20 KNT N Other: _____

Currents: Ebb turning basin (north wind) Other: _____

Tide added: None +0.7m (Daniella 2 or MT Britt) Other: flat bottom

Plan: P0 (Existing) P1 or P2 (Deepened only -51 ft) Other: _____

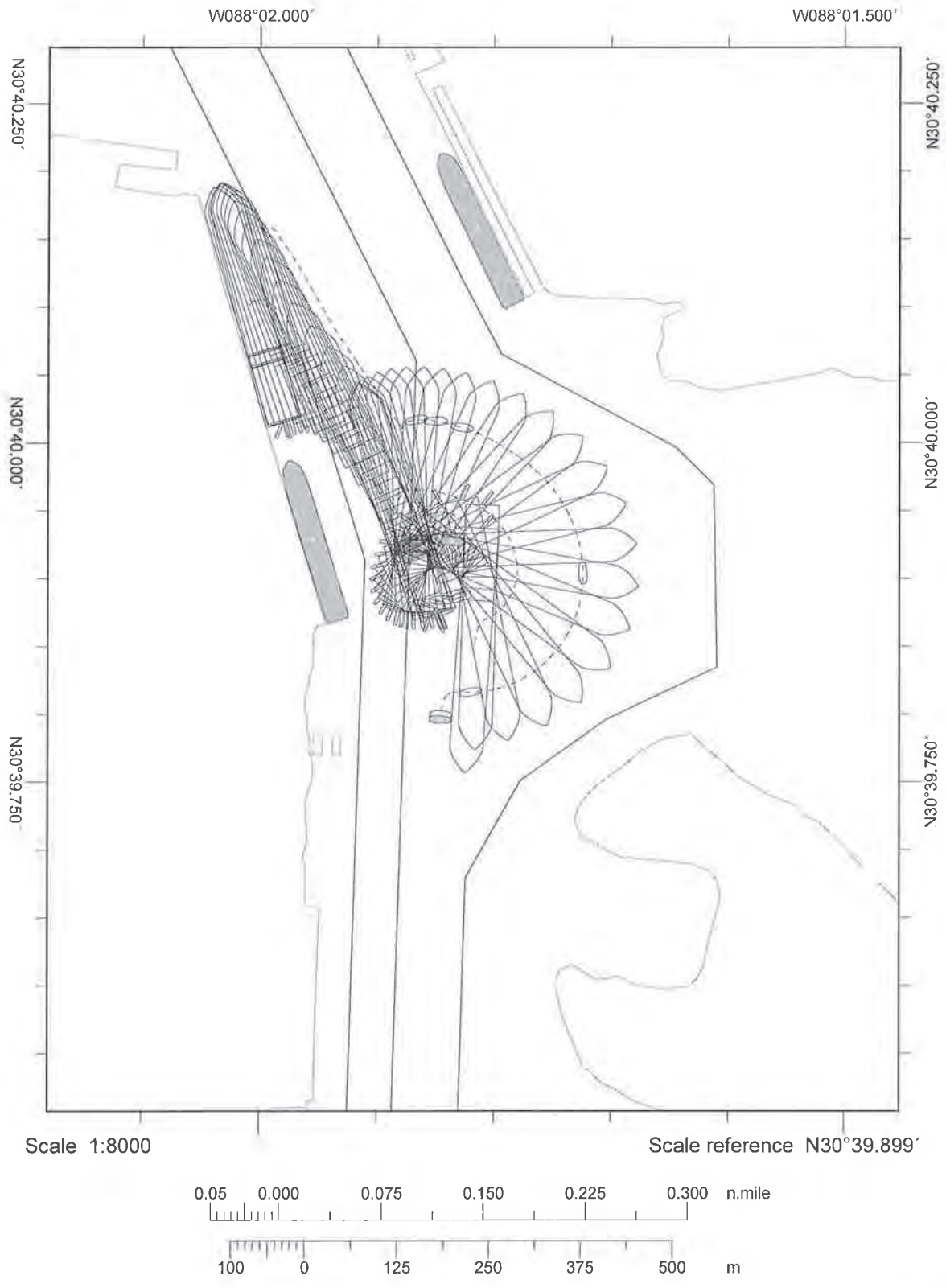
Vessel:

Pilot #	Model Name	Ship Name	LOA (ft)	Beam (ft)	Draft (ft)	LOA (m)	Beam (m)	Draft (m)
	CNTNR28L	Sovereign Maersk (SovMae)	1138.5	140.4	47.6	347.0	42.8	14.5
	CNTNR40	MSC Daniella 2 (Dan2)	1201.1	158.8	49.9	366.1	48.4	15.2
2	CNTNR33L	Humber Bridge (HumB)	1102.4	150.3	46.2	336.0	45.8	14.1
	VLCC15L	MT Brittania (MTBrit)	859.6	137.8	49.2	262.0	42.0	15.0
	CNTNR20L	KMSS Dainty (Dainty)	964.9	105.7	41.0	294.1	32.2	12.5

Naming convention - Plan_Area_Transit_Shipname_Currents_Wind_PilotName_Repetition
(Ex:P0_TurningBasin_Offdock_SovMae_Ebb_20N_CWilson_1)

Filename: P2_TurningBasin_OffDock_HumB_Ebb_20N_CWilson_3

Comments: Turning with ship @ south dock requires movement to the EAST. While turning, ship engine working at least half astern to check headway.



Line sample period (s)	30
Course marker every	00:30
Heading marker period (s)	30
Shape outline every	00:30

Mobile Bay Feasibility Level Simulation Study – Final Questionnaire

Name: Chris Brock

Screening of the proposed deepening and widening for a passing area and the proposed deepening of the turning basin in Mobile Bay was conducted at ERDC's Ship/Tow Simulator (STS) 23-26 May 2017. The purpose was to provide a preliminary evaluation of proposed deepening and widening in lower Bay passing area (550ft x 53/51ft or 500ft by 53/51ft) and deepening of the turning basin near Little Sand Island (51ft). The channel extents agreed upon at the end of this week will be used for the remainder of the Feasibility Study. Additional and final simulation will be conducted during the PED portion of the study to address any additional concerns raised between Feasibility and PED.

1. As a Feasibility Level simulation, several assumptions were made to reduce the overall time and cost of the project compared to a full ship simulation study.
    a. Were the environment conditions (wind and current combinations) reasonable?

YES. PRETTY REALISTIC

    b. Screening for the project only lasted about a week. This is about one third of the simulation testing typically done for final channel design. Do you think the number of pilots participating and time spent testing was adequate for a Feasibility Level study?

FOR FINAL DESIGN I WOULD WANT MORE PILOTS ATTENDING. PRELIMINARY TESTING TWO WAS SUFFICIENT

    c. The Corps of Engineers were represented by ERDC and Mobile District. Pilots were represented by the Mobile Bar Pilots. Do you think additional parties should've been represented during this testing effort? THE STATE PORT AUTHORITY

Note: Captain Brock contacted ERDC after testing that he wished to add the Mobile Container Terminal as a party that should be represented as well.

d. Please comment on the response of the vessels models, both ships and tugs.

MOST SEEMED TRUE TO LIFE

e. How were the other aspects of the simulation?

GOOD

2. Did you consider the 5 mile, 500ft , 53/51ft channel adequate for passing in the following situations:
   a. Zim Piraeus (964.9 x 105.6 x 43.0) and MSC Daniella 2 (1200.1 x 158.8 x 49.9)
   b. Zim Piraeus (964.9 x 105.6 x 43.0) and the MT Brittania (859.6 x 137.8 x 49.2)
   c. Zim Piraeus (964.9 x 105.6 x 43.0) and the Humber Bridge (1102 x 150 x 46.2)
   d. Sovereign Maersk (1138.5 x 140.4 x 47.6) and the Sovereign Maersk (1138.5 x 140.4 x 47.6)

   Why or why not?

a) DOABLE BUT DON'T ADVISE. DEPENDS ON ENVIRONMENTALS AND combined DRAFTS

b) YES

c) DOABLE BUT DON'T ADVISE. RECOVERY ROOM MINIMAL

d) NO. NOT ENOUGH TIME TO RECOVER ONCE PASSED FOR FEAR OF TOUCHING BANK

3. Did you consider the 5 mile, 550ft , 53/51ft channel adequate for passing in the following situations:
   a. MSC Daniella 2 (1200.1 x 158.8 x 49.9) and the Sovereign Maersk (1138.5 x 140.4 x 47.6)
   b. Sovereign Maersk (1138.5 x 140.4 x 47.6) and the Sovereign Maersk (1138.5 x 140.4 x 47.6)*
   c. MSC Daniella 2 (1200.1 x 158.8 x 49.9) and the MT Brittania (859.6 x 137.8 x 49.2)

   Why or why not?

   *Note: The Sovereign Maersk passing the Sovereign Maersk was not tested in the 550ft channel. Based on passing in the 500ft channel, do you believe the 550ft channel would be adequate?

a) DOABLE BUT DON'T ADVISE. TIGHT RECOVERY TIME

b) YES

c) YES WITH DRAFT RESTRICTIONS

4. Based upon the simulator runs, what possible limits or restrictions MIGHT be considered by the Mobile Bar Pilots for two way traffic in the passing zone?

For the 500 ft wide channel:

- COMBINED length
- COMBINED DRAFT

For the 550 ft wide channel:

- Combined length
- Combined draft

5. Please comment on the proposed 3 mile length for the passing lanes.

- TIMING IS CRITICAL
- BEND BASING @ 22 WOULD HELP INBOUND LINE UP TO MEET the outbound
- transition ZONE isn't beneficial as ~~far as~~ timing for passing goes
- 5 miles GIVES both vessels time to slow DOWN AND position themselves for ~~passing~~

6. Did the bend easings improve the setup for meeting of the large vessels in the passing lane?

BEND EASING AT 21/22 ESPECIALLY IF IT CAN BE DONE ON GREEN SIDE (WEST) WOULD BE BENEFICIAL

7. Was the deepened turning basin (51ft) adequate (please include comments concerning docked ships) for turning the following vessels:
   a. MSC Daniella 2 (1200.1 x 158.8 x 49.9)
   b. Humber Bridge (1102 x 150 x 46.2)

   Why or why not?

a) DEPTH DIDN'T HELP SPEED OF TURN / NO

b) DEPTH DIDN'T HELP SPEED OF TURN / NO

8. Did the expansion of turning basin tested improve the turning maneuver for the Humber Bridge? Why or why not?

YES. IT GAVE ME ADEQUATE ROOM TO SWING OFF VESSEL BERTHED AT SOUTH END OF CONTAINER TERMINAL AND STILL ENOUGH ROOM TO FALL AND RECOVER

Note: Captain Brock contacted ERDC after testing that he wanted to clarify that he believed a minimum 100-ft addition would be needed on the southern edge of the turning basin.

9. Do you consider the existing channel adequate for the MSC Daniella 2 (1200.1 x 158.8 x 49.9) in one way traffic?

CHANNEL YES

TURNING BASIN WOULD BE EXTREMELY TIGHT

10. Were simulations representative of real life piloting operations?

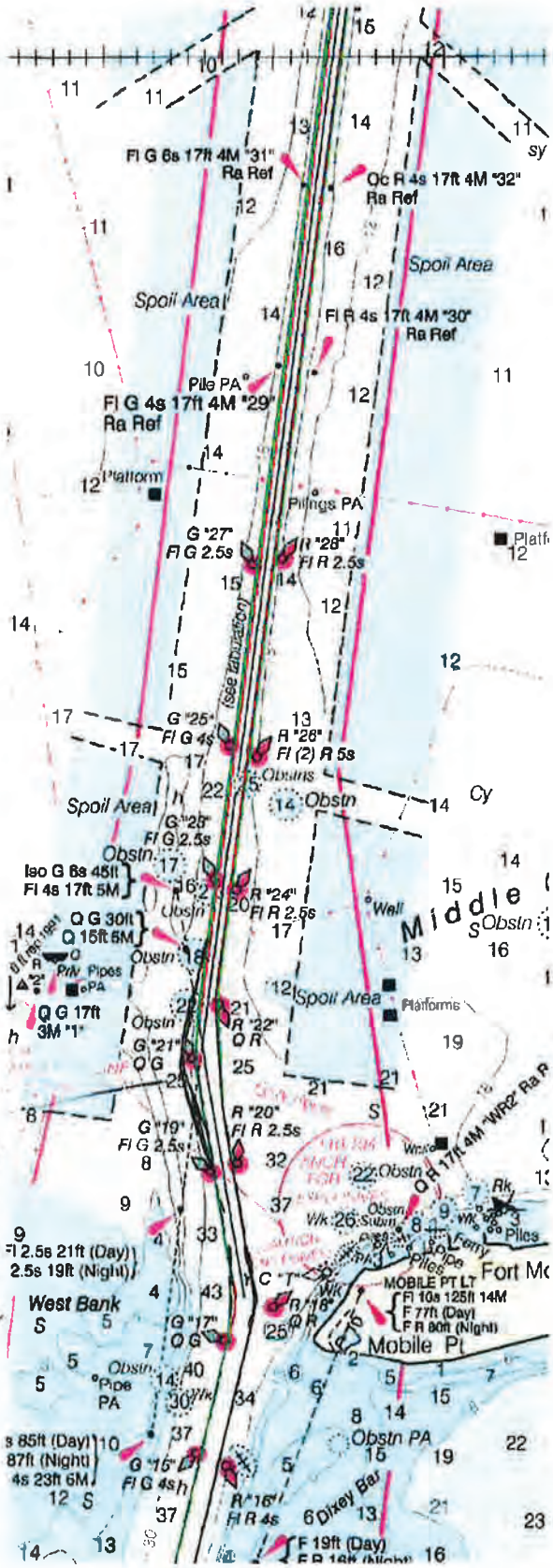
YES. VERY GOOD

11. Are there any aspects of the project that were not adequately addressed by USACE and should be updated going forward?

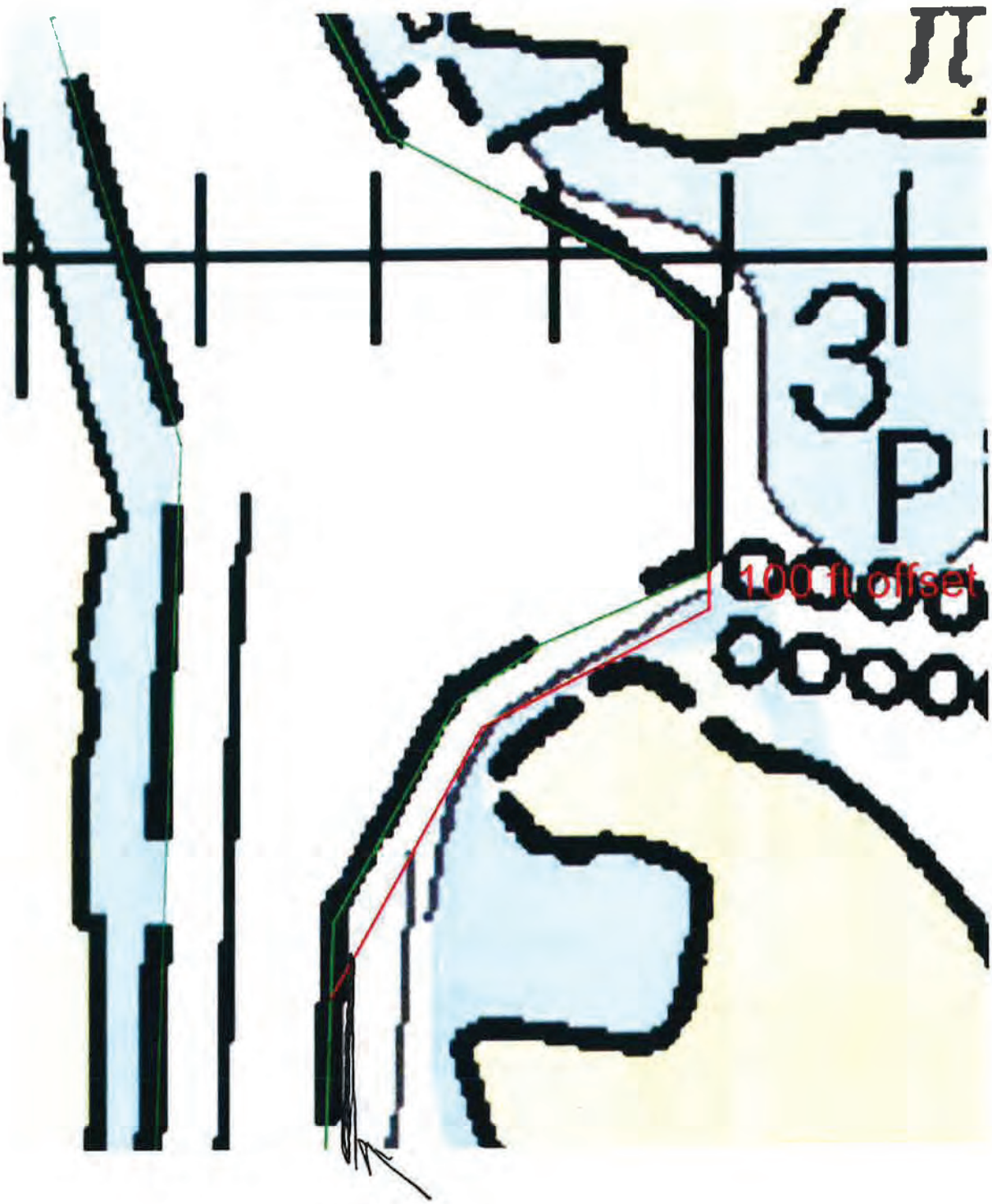
NO

11. Any additional comments?

VERY THOROUGH



WOULD HELP COME OUT OF TURN & LING UP QUICKER



STILL WOULD ENTERTAIN WIDENER OFF MCDUFFIE. SHIP SIZE HAS INCREASED SINCE last WIDENER WAS DONE. EVEN AT EXTREMELY SLOW SPEEDS PULLING SHIPS OFF DOCK IS HUGE CONCERN. ESPECIALLY WITH NEWER CLASS CONTAINER VESSELS

Mobile Bay Feasibility Level Simulation Study – Final Questionnaire

Name: Curtis Wilson

Screening of the proposed deepening and widening for a passing area and the proposed deepening of the turning basin in Mobile Bay was conducted at ERDC's Ship/Tow Simulator (STS) 23-26 May 2017. The purpose was to provide a preliminary evaluation of proposed deepening and widening in lower Bay passing area (550ft x 53/51ft or 500ft by 53/51ft) and deepening of the turning basin near Little Sand Island (51ft). The channel extents agreed upon at the end of this week will be used for the remainder of the Feasibility Study. Additional and final simulation will be conducted during the PED portion of the study to address any additional concerns raised between Feasibility and PED.

1. As a Feasibility Level simulation, several assumptions were made to reduce the overall time and cost of the project compared to a full ship simulation study.
   a. Were the environment conditions (wind and current combinations) reasonable?

      Yes, both in turning basin & South end of bay.

   b. Screening for the project only lasted about a week. This is about one third of the simulation testing typically done for final channel design. Do you think the number of pilots participating and time spent testing was adequate for a Feasibility Level study?

      Two pilots were adequate, more participating pilots would have been optimal.

   c. The Corps of Engineers were represented by ERDC and Mobile District. Pilots were represented by the Mobile Bar Pilots. Do you think additional parties should've been represented during this testing effort?

      Port of Mobile representation to answer questions about possible Future operations would have been helpful

d. Please comment on the response of the vessels models, both ships and tugs.

Ship + tug simulation was certainly adequate.

e. How were the other aspects of the simulation?

Landmarks, Aids to navigation, + environmentals were realistic.

2. Did you consider the 5 mile, 500ft , 53/51ft channel adequate for passing in the following situations:
   a. Zim Piraeus (964.9 x 105.6 x 43.0) and MSC Daniella 2 (1200.1 x 158.8 x 49.9)
   b. Zim Piraeus (964.9 x 105.6 x 43.0) and the MT Brittania (859.6 x 137.8 x 49.2)
   c. Zim Piraeus (964.9 x 105.6 x 43.0) and the Humber Bridge (1102 x 150 x 46.2)
   d. Sovereign Maersk (1138.5 x 140.4 x 47.6) and the Sovereign Maersk (1138.5 x 140.4 x 47.6)

   Why or why not?

a) No, Daniella did not handle adequately to provide enough room for other ship.

b) yes, contingent on drafts. Room felt adequate.

c) [redacted] was Doable, severe bank effect makes it hard to advise.

d) No, too much bank effect.

3. Did you consider the 5 mile, 550ft , 53/51ft channel adequate for passing in the following situations:
   a. MSC Daniella 2 (1200.1 x 158.8 x 49.9) and the Sovereign Maersk (1138.5 x 140.4 x 47.6)
   b. Sovereign Maersk (1138.5 x 140.4 x 47.6) and the Sovereign Maersk (1138.5 x 140.4 x 47.6)*
   c. MSC Daniella 2 (1200.1 x 158.8 x 49.9) and the MT Brittania (859.6 x 137.8 x 49.2)

   Why or why not?

   *Note: The Sovereign Maersk passing the Sovereign Maersk was not tested in the 550ft channel. Based on passing in the 500ft channel, do you believe the 550ft channel would be adequate?

a) No, Daniella responds too poorly to meet other ship.

b) yes, ample room between ships

c) yes, but with lighter draft on tanker.

4. Based upon the simulator runs, what possible limits or restrictions MIGHT be considered by the Mobile Bar Pilots for two way traffic in the passing zone?

For the 500 ft wide channel:

Current rules dictating combined length/draft restrictions.

For the 550 ft wide channel:

See above.

5. Please comment on the proposed 3 mile length for the passing lanes.

3 miles would potentially not be adequate for a passing lane length. Ships of this size & speed (maneuverable) would need more flexibility & distance to guarantee an effective passing arrangement.

5 miles more practical.

6. Did the bend easings improve the setup for meeting of the large vessels in the passing lane?

yes, substantially.

7. Was the deepened turning basin (51ft) adequate (please include comments concerning docked ships) for turning the following vessels:
   a. MSC Daniella 2 (1200.1 x 158.8 x 49.9)
   b. Humber Bridge (1102 x 150 x 46.2)

   Why or why not?

a) No, depth not a factor. That size ship in extreme environmentals needs bigger basin.

b) yes, 1,102' turned ok okay.

8. Did the expansion of turning basin tested improve the turning maneuver for the Humber Bridge? Why or why not?

yes, especially with a ship docked at South End of Container terminal. A ship this length requires the bow to be in East side of basin, but MUST have room to fall. Expansion of basin helped

9. Do you consider the existing channel adequate for the MSC Daniella 2 (1200.1 x 158.8 x 49.9) in one way traffic? Yes. Turning basin possibly an issue.

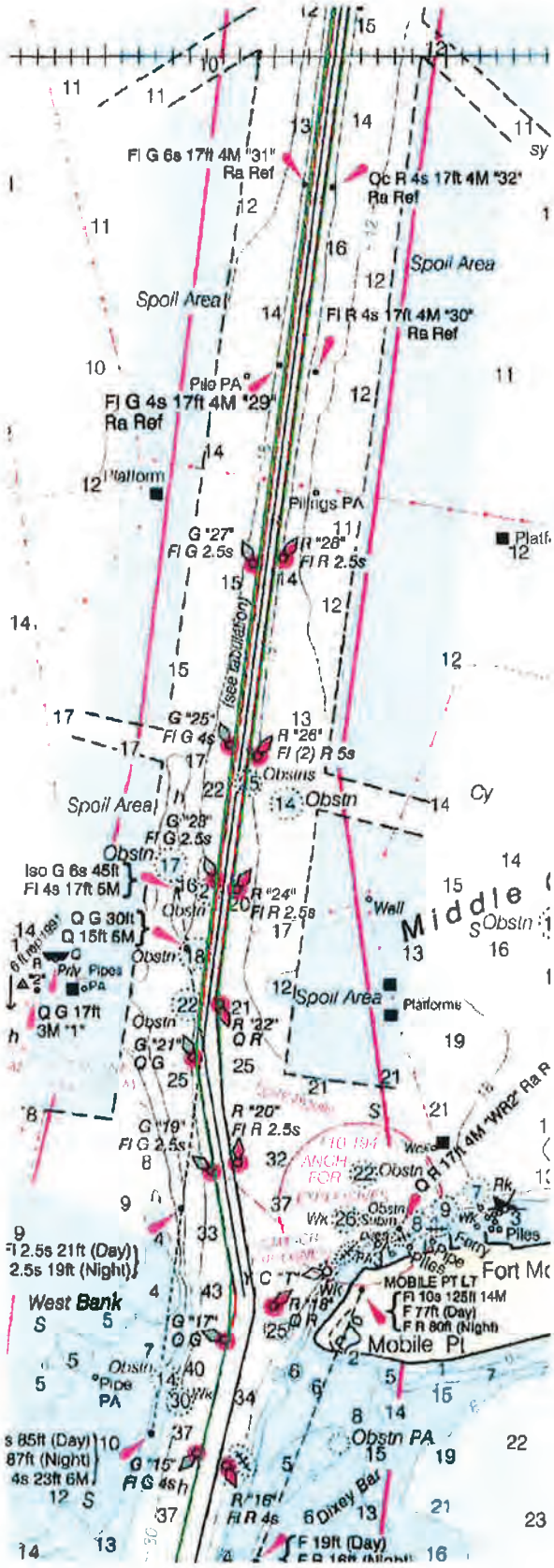
10. Were simulations representative of real life piloting operations?

Yes.

11. Are there any aspects of the project that were not adequately addressed by USACE and should be updated going forward? No.

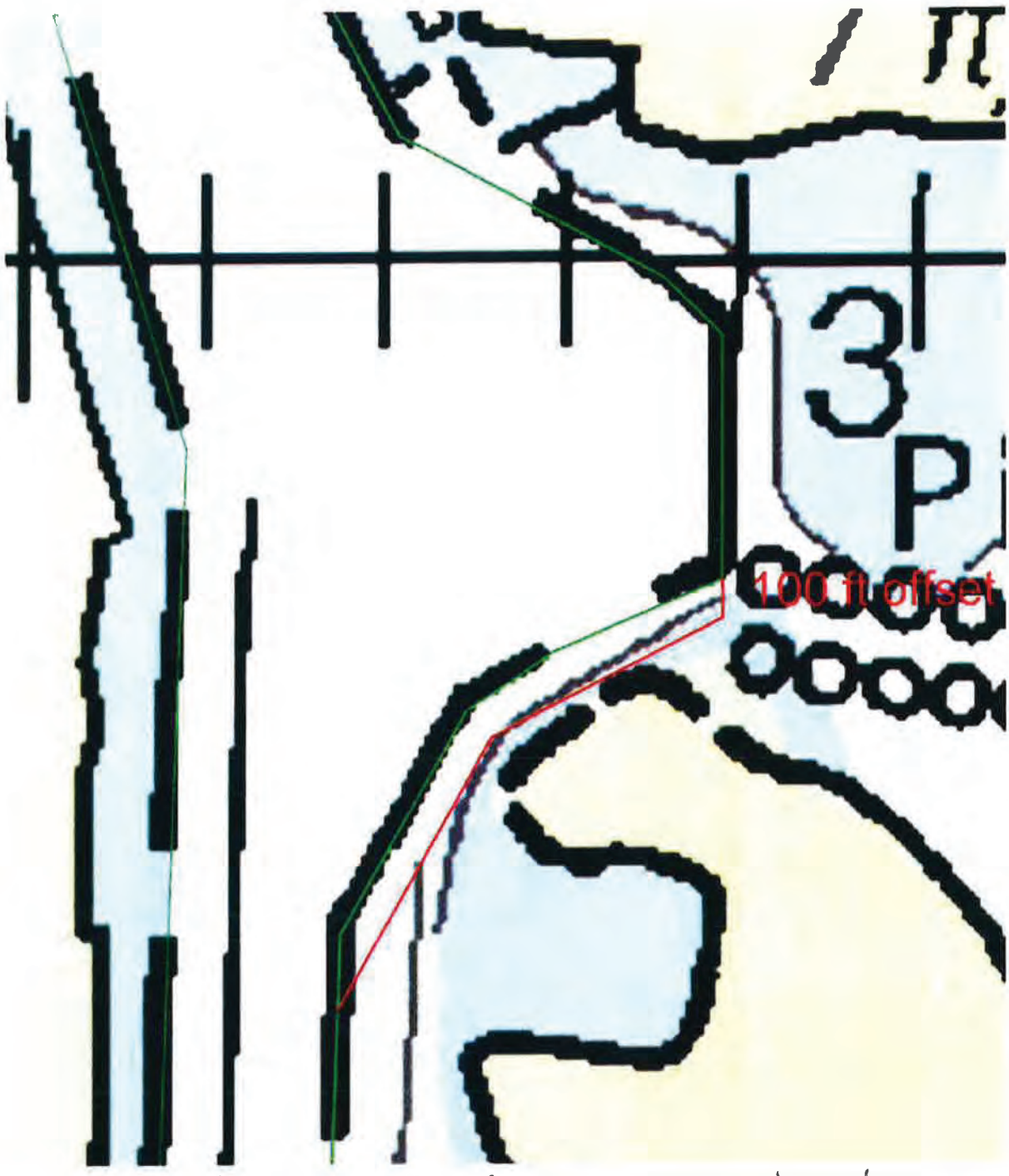
11. Any additional comments?

Good operation of equipment from staff. Good Exercise.



Bend Easings are a substantial improvement.

Any Additional room on West side of channel near #21 would be a great improvement.



The ships tested on simulator demand an aggressive approach into basin + execution of turn. (in standard Environmentals). Committing to the East side of basin requires extremely close proximity to North + South boundaries. It is not feasible to turn an 1,100' ship that deep in basin without more room for bow to fall South, if another ship docked @ South end of Container Terminal.

From: (b)(6)
To:
Subject: FW: Mobile Harbor GRR Widener Selection
Date: Tuesday, December 5, 2017 7:23:00 AM

Call me when you get a moment. Have question about cost for Mobile Harbor.

(b)(6)

-----Original Message-----
From (b)(6)
Sent: Monday, December 04, 2017 4:20 PM
To: (b)(6)

(b)(6)

Subject: RE: Mobile Harbor GRR Widener Selection

All: The attached slide includes the narrowed alternatives per today's discussion. Also attached is the ship simulation report.

(b)(6)

-----Original Appointment-----
From: (b)(6)
Sent: Monday, December 04, 2017 11:25 AM
To (b)(6)

(b)(6)

(b)(6)

Cc: (b)(6)
Subject: Mobile Harbor GRR Widener Selection
When: Monday, December 04, 2017 2:30 PM-3:00 PM (UTC-06:00) Central Time (US & Canada).
Where: MsCIP Conference Room

All: Please plan on attending a brief discussion on the widener selection for the Mobile Harbor GRR today at 1430hrs in the MsCIP Conference Room. Will provide an updated economics table prior to the meeting.

(b)(6)

From: (b)(6)
To:
Subject: RE: Contract Language
Date: Tuesday, December 5, 2017 1:36:00 PM

Looks perfect!

-----Original Message-----
From: (b)(6)
Sent: Tuesday, December 05, 2017 1:01 PM
To: (b)(6)
Subject: Contract Language

How do you think this sounds?

This task order will be supporting efforts required for the Mobile Harbor GRR and Mobile Harbor and Pascagoula Harbors O&M to meet environmental compliance for open water placement of dredged material from these projects. The Corps is obligated under the Marine Protection, Research and Sanctuaries Act of 1972 (MPRSA) to demonstrate that the disposal or beneficial placement of dredged material satisfies the open water disposal criteria and that such actions would not result in any significant adverse effects on human health or welfare, including municipal or private water supplies, recreation and commercial fishing, plankton, fish, shellfish, and wildlife. Results from the proposed sediment testing is also necessary to obtain project state water quality certifications required under Section 401 of the Clean Water Act. In addition, any sediment placed within State and Federal waters must be in compliance with applicable Toxic Effluent Standards under Section 307 of the Clean Water Act. The sediment testing to be completed under this task order will conduct rigorous chemical analyses to test for the presence various contaminants to show that the material dredged from these projects are in compliance with the laws cited above and falls under the intent of the contract to provide environmental support to military, civil, and Federal Agencies.

From: (b)(6)
To:
Subject: RE: Mobile Harbor GRR Widener Selection
Date: Tuesday, December 5, 2017 7:21:00 AM

Call me when you have a moment. I would like to have preliminary discussion with (b)(6) today.

(b)(6)

-----Original Message-----
From (b)(6)
Sent: Monday, December 04, 2017 7:52 PM
To: (b)(6)
Subject: RE: Mobile Harbor GRR Widener Selection

(b)(6) - still needs work. Let's talk tomorrow before your meeting with the port. Thanks.
(b)(6)

From: (b)(6)
Date: December 4, 2017 at 4:22:18 PM CST
To: (b)(6)

(b)(6)

Subject: RE: Mobile Harbor GRR Widener Selection

All: The attached slide includes the narrowed alternatives per today's discussion. Also attached is the ship simulation report.

(b)(6)

(b)(6)

-----Original Appointment-----
From (b)(6)
Sent: Monday, December 04, 2017 11:25 AM
To: (b)(6)
(b)(6)
Cc: (b)(6)
Subject: Mobile Harbor GRR Widener Selection
When: Monday, December 04, 2017 2:30 PM-3:00 PM (UTC-06:00) Central Time (US & Canada).
Where: MsCIP Conference Room

All: Please plan on attending a brief discussion on the widener selection for the Mobile Harbor GRR today at 1430hrs in the MsCIP Conference Room. Will provide an updated economics table prior to the meeting.

(b)(6)

From: (b)(6)
To:
Subject: FW: W9127818F0026-P00001 CONTRACT NO. W91278-16-D-0072 Mobile Harbor GRR and Integrated SEIS, Mobile, AL
Date: Wednesday, December 6, 2017 7:06:00 AM
Attachments: W9127818F0026-P00001__MOD.pdf

(b)(6) Please call me when you have a moment.

(b)(6)

-----Original Message-----
From: (b)(6)
Sent: Tuesday, December 05, 2017 11:39 AM
To:
Cc: (b)(6)

(b)(6)

Subject: W9127818F0026-P00001 CONTRACT NO. W91278-16-D-0072 Mobile Harbor GRR and Integrated SEIS, Mobile, AL

Copy of mod exercising Option 1 is attached FYI.

(b)(6)

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. CONTRACT ID CODE	PAGE OF PAGES
J	1 | 3

2. AMENDMENT/MODIFICATION NO.	3. EFFECTIVE DATE	4. REQUISITION/PURCHASE REQ. NO.	5. PROJECT NO.(If applicable)
P00001	05-Dec-2017	W31XNJ72990681	

6. ISSUED BY	CODE	7. ADMINISTERED BY (If other than item 6)	CODE
ENDIST MOBILE CONTRACTING DIVISION 109 ST JOSEPH ST MOBILE AL 36602	W91278	See Item 6	

8. NAME AND ADDRESS OF CONTRACTOR (No., Street, County, State and Zip Code)		
AECOM TECHNICAL SERVICES, INC. BILL CLENDENIN 300 S GRAND AVE STE 1100 LOS ANGELES CA 90071-3173		9A. AMENDMENT OF SOLICITATION NO.
		9B. DATED (SEE ITEM 11)
	X	10A. MOD. OF CONTRACT/ORDER NO. W9127818F0026
	X	10B. DATED (SEE ITEM 13) 03-Nov-2017
CODE 4L767	FACILITY CODE	

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offer ☐ is extended, ☐ is not extended.

Offer must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended by one of the following methods: (a) By completing Items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA (If required)

See Schedule

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

☐ A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.

☐ B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(B).

☐ C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:

X D. OTHER (Specify type of modification and authority)
52.217-7 OPTION FOR INCREASED QUANTITY--SEPARATELY PRICED LINE ITEM

E. IMPORTANT: Contractor ☒ is not, ☐ is required to sign this document and return _____ copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)
Modification Control Number: k5ctcrch18286

TASK ORDER FOR ENVIRONMENTAL PLANNING AND DESIGN SERVICES AND PUBLIC INVOLVEMENT SUPPORT FOR THE MOBILE HARBOR GRR AND INTEGRATED SEIS MOBILE HARBOR, ALABAMA IS MODIFIED TO EXERCISE BID OPTION 1:

IN CONSIDERATION OF A MODIFICATION AGREED TO HEREIN AS COMPLETE EQUITABLE ADJUSTMENT FOR THE ABOVE CHANGES, THE CONTRACTOR HEREBY RELEASES THE GOVERNMENT FROM ANY AND ALL LIABILITY UNDER THIS MODIFICATION FOR FURTHER EQUITABLE ADJUSTMENTS ATTRIBUTAL TO SUCH FACTORS OR CIRCUMSTANCES GIVING RISE TO THE PROPOSAL FOR ADJUSTMENT.

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)		16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print) KYLE M RODGERS / CONTRACTING OFFICER TEL: 251-690-3356 EMAIL: Kyle.M.Rodgers@usace.army.mil	
15B. CONTRACTOR/OFFEROR _____ (Signature of person authorized to sign)	15C. DATE SIGNED	16B. UNITED STATES OF AMERICA BY Kyle M. Rodgers (Signature of Contracting Officer)	16C. DATE SIGNED 05-Dec-2017

SECTION SF 30 BLOCK 14 CONTINUATION PAGE

SECTION DD 1155 - PURCHASE ORDER/DELIVERY ORDERS

SUMMARY OF CHANGES

SECTION DD 1155 - PURCHASE ORDER/DELIVERY ORDERS

The total cost of this contract was increased by $253,192.83 from $152,345.25 to $405,538.08.

CLIN 0003

The option status has changed from Option to Option Exercised.

The following Delivery Schedule item for CLIN 0003 has been changed from:

DELIVERY DATE	QUANTITY	SHIP TO ADDRESS	DODAAC / CAGE
POP 03-NOV-2017 TO 03-MAR-2018	N/A	ENGINEERING DIVISION LORETTA TANNER P O BOX 2288 109 ST. JOSEPH STREET MOBILE AL 36628 251-690-2692 FOB: Destination	W31XNJ

To:

DELIVERY DATE	QUANTITY	SHIP TO ADDRESS	DODAAC / CAGE
POP 05-DEC-2017 TO 31-DEC-2019	N/A	ENGINEERING DIVISION LORETTA TANNER P O BOX 2288 109 ST. JOSEPH STREET MOBILE AL 36628 251-690-2692 FOB: Destination	W31XNJ

Accounting and Appropriation

Summary for the Payment Office

As a result of this modification, the total funded amount for this document was increased by $253,192.83 from $152,345.25 to $405,538.08.

CLIN 0003:

AC: 096 NA X 2018 3121 000 0000 CCS: 116 K5 2018 08 2446 076126 96015 3200 5F3119 (CIN W31XNJ729906810003) was increased by $253,192.83 from $0.00 to $253,192.83

The contract ACRN AC has been added.
The CIN W31XNJ729906810003 has been added.

(End of Summary of Changes)

From:	(b)(6)
To:	
Subject:	Need Updates...
Date:	Wednesday, December 6, 2017 7:04:00 AM
Attachments:	Econ Slide.xlsx

(b)(6): Can you guys fill in the yellow highlighted boxes in the attached table today?

Mobile Harbor GRR Preliminary Project Cost Estimate ($M)					
	Depth				
	45'	47'	48'	49'	50'
Alternative 1 - Deepening Only	$27.90	$190.70	$267.70	$343.30	$425.80
Alternative 2 - 100' widening for 3 miles	(b)(5)				
Alternative 3 - 100' widening for 5 miles	$34.10	$204.90	$285.20	$364.70	$450.50

Mobile Harbor GRR Alternatives Matrix					
	Net Benefits				
	45'	47'	48'	49'	50'
Alternative 1 - Deepening Only	NA	**$17.1M**	**$26.8M**	**$36.5M**	**$44.5M**
Alternative 2 - 100' widening for 3 miles	**$265,000**	**$148,000**	**$89,000**	**$16,000**	(b)(5)
Alternative 3 - 100' widening for 5 miles				(b)(5)	

51'	52'
$553.10	$711.60
(b)(5)	
$581.30	$741.50

51'	52'
(b)(5)	

From:
To: (b)(6)

Subject: December 08 Focus Group Meeting
Date: Wednesday, December 6, 2017 3:56:00 PM
Attachments: focus group 08 Dec 017 DRAFT.PPTX

All,
Attached is a DRAFT of the proposed slides for Friday's Focus Group meeting. I just made minor edits to the previous focus group slides. Please let me know if you have any comments.

(b)(6)

-----Original Message-----
From: (b)(6)
Sent: Monday, December 04, 2017 10:37 AM
To (b)(6)
(b)(6)
Cc: (b)(6)
(b)(6)
Subject: RE: [EXTERNAL] Re: December 8 is our date

I think we can keep with the same format. Background:

(b)(6) Bon Secour Fisheries is a processor and wholesale distributor that has deep history – operational since 1896. They also fish commercially for shrimp. They purchase oysters from state-certified producers and then process. Their distribution is fish, oysters, shrimp, and crab and specialty items. Also in attendance may be (b)(6) (b)(6) Aquila Seafood) – mostly royal red shrimp, but also sells other seafood – not sure this (b)(6) family is related to (b)(6) t Bon Secour, but perhaps (b)(6) can expand. There may also be in attendance (b)(6) (Billy's Seafood). His family has a retail and wholesale seafood company - both fish and shellfish. (b)(6) may also be there (Carson & Company Seafood) both fishes and sells to the institutional food market. The both fish and process shrimp, including farm raised.

(b)(6) is checking to see if we are going to get cultivated oyster interest at this meeting.

(b)(6)

(b)(6)

From: (b)(6)
Sent: Monday, December 04, 2017 8:56 AM
To: (b)(6)
Cc: (b)(6)
(b)(6)
Subject: Re: [EXTERNAL] Re: December 8 is our date

(b)(6)
I plan to visit the meeting location today and provide feedback on any special instructions. Lunch before the meeting sounds great. (b)(6) will need to give you guidance on presentation.
Looking forward to seeing you all on Friday.
Have a wonderful day!

(b)(6)

Sent from my iPhone

> On Dec 4, 2017, at 8:50 AM, (b)(6)
(b)(6) wrote:
>
>(b)(6),
> We're assuming we'll do a basic slide presentation like last time. Let me know if you guys are thinking anything different. Also, do you guys want to meet for lunch over in the Bon Secour area before the meeting?
>
>
>
>
>
>
>
>
>
>
>
>
>
> -----Original Message-----
> From: (b)(6)
(b)(6)
> Sent: Thursday, November 30, 2017 8:29 PM
> To:
> Cc: (b)(6)
(b)(6)
> Subject: [EXTERNAL] Re: December 8 is our date
>
> All,
>
> Yes , Fishermen 's Baptist Church at 2:00. I plan to check out the meeting room while working in Bon Secour

next week and will forward any special instructions on to all. Tomorrow I will ask the community leaders to begin reaching out to your target audience with the meeting arrangements.
>
> Looking forward to seeing you all there.
>
> (b)(6)
>
> Sent from my iPhone
>
> On Nov 30, 2017, at 5:44 PM, (b)(6) wrote:
>
>
>
> (b)(6) (b)(6), the Corps' project manager, is in copy. The preference is Friday, December 8th at 2:00 pm. You indicated in an earlier email that you have a room at the Fishermen's Baptist Church, located at 17101 River Rd, Bon Secour, AL 36511, reserved. Please confirm this is the location. I unfortunately cannot make this meeting, but (b)(6) can attend from our shop. You will recall meeting him at the Lighthouse meeting.
>
>
>
> (b)(6): Let's get it scheduled. Sorry I cannot be there, but I am obligated elsewhere. Judy
>
>
>
> (b)(6)
>
>
>
> From: (b)(6)
> (b)(6)
> Sent: Thursday, November 30, 2017 10:59 AM
> To: (b)(6)
> Subject: December 8 is our date
>
>
>
> (b)(6)
> I will firm up the time once I discuss with group to determine the best time for our target audience to gather. The window I am looking at is between the hours of 2 and 6. Please advise if COE has a preference.
>
> I turned the server issue over to the IT guys, (b)(6) (aspa) and (b)(6) (adph).
> Have a great day!
>
> (b)(6)
>
> Sent from my iPhone
>
> Confidentiality Notice - This e-Mail message, including any attachments, is for the sole use of the intended recipient(s) and may contain confidential or privileged information. If this message concerns a lawsuit, it may be considered a privileged communication. Any unauthorized review, use, disclosure, or distribution is prohibited. If you are not the intended recipient, please contact the sender by reply e-mail and destroy all copies of the original

message.
>
>
>
>
>
>
> Confidentiality Notice - This e-Mail message, including any attachments, is for the sole use of the intended recipient(s) and may contain confidential or privileged information. If this message concerns a lawsuit, it may be considered a privileged communication. Any unauthorized review, use, disclosure, or distribution is prohibited. If you are not the intended recipient, please contact the sender by reply e-mail and destroy all copies of the original message.
>
>

Confidentiality Notice - This e-Mail message, including any attachments, is for the sole use of the intended recipient(s) and may contain confidential or privileged information. If this message concerns a lawsuit, it may be considered a privileged communication. Any unauthorized review, use, disclosure, or distribution is prohibited. If you are not the intended recipient, please contact the sender by reply e-mail and destroy all copies of the original message.

Pages 5 through 13 redacted for the following reasons:
- -
(b)(5)

From:
To: (b)(6)

Subject: Mobile Harbor GRR Eastern Shore Seafood Focus Group 08 Dec 017 - final minutes
Date: Monday, December 11, 2017 9:42:00 AM
Attachments: focus group 08 Dec 017 DRAFT.pptx
IMG_20171211_093609.jpg

All: Attached are the slides presented and sign-in sheet for last week's Eastern Shore Seafood Focus Group Meeting held at the Fisherman Baptist Church. Draft minutes are as follows (please let me know if you have comments or additional notes):
1.) (b)(6) presented the information provided in the attached slides.
2.) Comment: There is an oyster reef to the east of the channel near Gaillard Island that is in the vicinity of the formerly shell mined area proposed for disposal. Oyster bottoms provide good habitat for Sheepshead. Will we impact that area? Response: We will be using hydrodynamic and sediment transport modeling to determine the movement of sediment placed in the shell mined area. Material will be placed in "thin" 1-2' lifts. Furthermore, we do not plan to place material on oyster-bottoms. The shell mined area proposed for placement is a dead zone with a very "fluidized" mud bottom.
3.) Comment: How deep is the formerly shell mined area and is it still used by the shrimpers? Response: It is about 10-12' in depth. It is not shrimped to our knowledge, but we will need to follow-up on that.
4.) Comment: All oyster reefs on the eastern side of the bay are essentially gone.
5.) (b)(6) asked if anyone has ideas of other ways to beneficially use the material to please let us know.
6.) (b)(6) asked that those in attendance please spread the word that we will have a follow-on public meeting February 20 and to please encourage others to attend.
7.) Corps provided handouts of the ways to contact us and wrapped up meeting.

-----Original Message-----
From: (b)(6)
Sent: Friday, December 08, 2017 8:43 AM
To: (b)(6)
Subject: focus group 08 Dec 017 DRAFT.pptx

US Army Corps of Engineers

MOBILE HARBOR PROJECT

U.S.ARMY

- **Project authorized in the Water Resources Development Act of 1986 in accordance with the 1981 Chief's Report.**
- **Full-Service Seaport -- 10th Largest in the United States - Balanced Trade (Strong Export Market)**
  - ✓ 58M tons handled port-wide. ASPA terminals represent 25 - 29M tons annually
- **Port of Mobile has sustained growth in steel, petroleum and containerized cargoes**
  - ✓ Record 2016 19% growth in containerized cargo – automotive, aviation, forest products, chemicals, poultry
  - ✓ Now ranked No. 2 steel port in the United States
  - ✓ 10 New Ocean Carriers Added Service into Mobile in 2016-2017
- **The Port of Mobile Drives the Regional Economy**
  - ✓ Alabama State Port Authority terminals alone generate 124,328 jobs and $19.4B in total economic value
  - ✓ Private Petroleum / Petroleum Products terminals alone generate 5,220 jobs and $687M in economic value
- **Modernizing Mobile Harbor is Necessary Because**
  - ✓ 2/3's of the Port of Mobile's vessel traffic is restricted or delayed.
  - ✓ Larger Ships Now Transit North American Trade Lanes
  - ✓ Channel Deficiencies and Vessel Transit Inefficiencies Directly Impact Shipper Costs and Competitiveness
  - ✓ Mobile's Port-side Infrastructure Investments have met Shipper Needs ($500+ Million Invested) - Channel Investment Necessary to Leverage Non-federal Sponsor investment and Regional Growth


INTERMODAL CONTAINER FACILITY


MCDUFFIE COAL TERMINAL

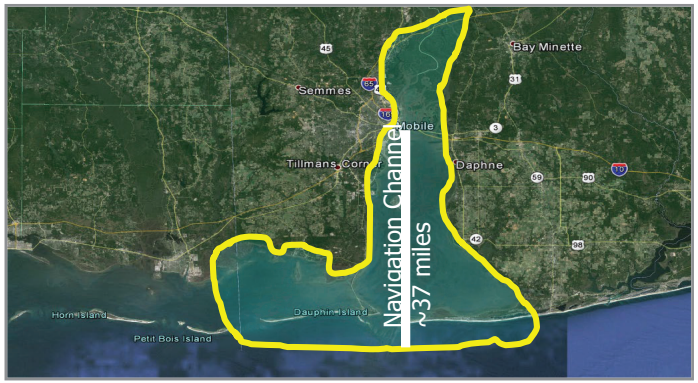
US Army Corps of Engineers

MOBILE HARBOR PROJECT

U.S.ARMY

Mobile Bay and Watershed

- *The Mobile Bay Watershed is the 6th largest river basin in the United States with five rivers forming the 2nd largest delta in the US, and the 4th largest watershed based on drainage area* (Mobile, Tensaw, Blakeley, Spanish, and Apalachee). Environmentally and economically important because of the exceptional biological diversity and productivity which provides habitat for various invertebrates, fishes, waterfowl, migrant birds, as well as, other game and non-game species.
- *Mobile Delta is one of the most diverse ecosystems in the US* with 3 types of wetland habitats, extensive seagrasses, 200+ species of fish, major shellfish communities, and 300+ species of birds and reptiles. The Delta is one of the most important and valuable natural resources in the US.
- *Alabama Seafood Industry Economic Impact.* Commercial species harvests provide a valuable source of revenue for the state contributing approximately $461M in revenue annually and 10,000 jobs. The most common commercial species obtained from Alabama waters are shrimp, blue crabs, oysters, and numerous species of fish.
- *Coastal tourism and recreation provide local economic benefits including* boating, fishing, swimming, and sight seeing. Saltwater species provide the vast majority of fish caught recreationally in the Mobile Bay system.
- *Cultural Resources.* The Mobile area is rich in both pre-historic and historic cultural resources.



US Army Corps of Engineers

MOBILE HARBOR PROJECT ALTERNATIVES

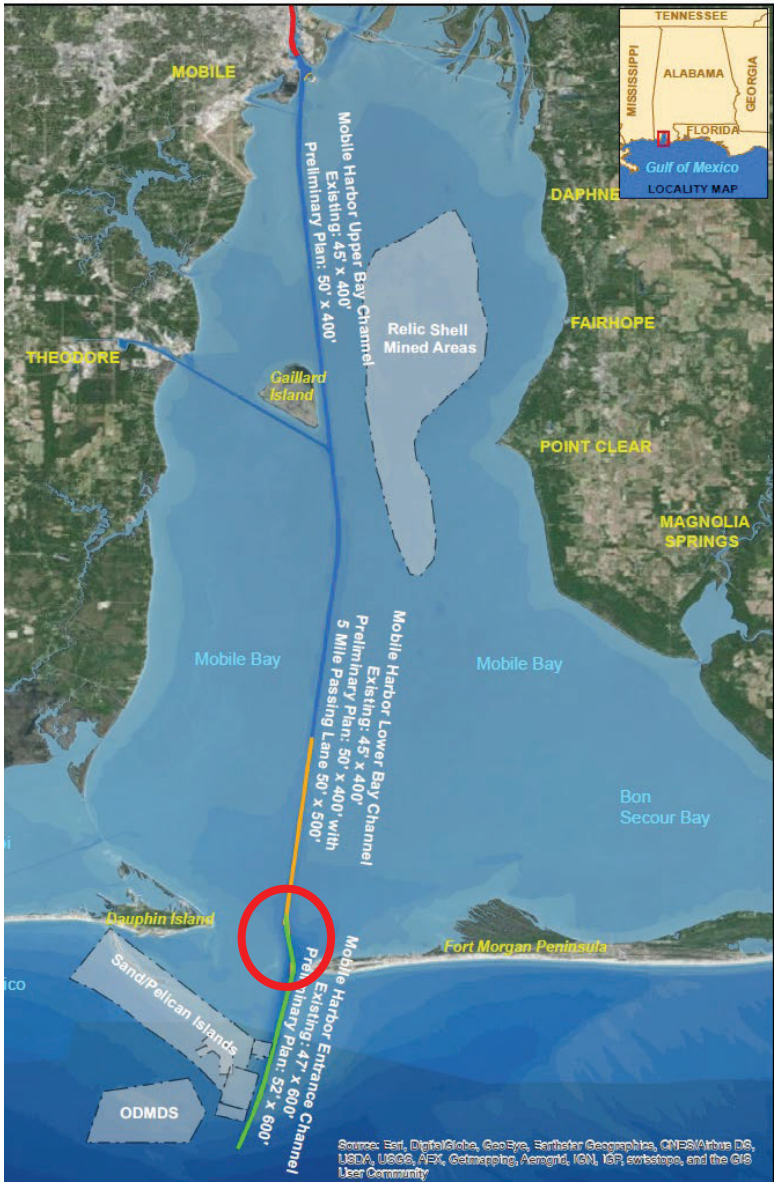
U.S.ARMY

Initial

- Deepening: 47 to 55 feet Including Turning Basin
- Bend Easing
- Widener: 100 and 150 feet 5, 10,15 miles in length

Proposed for Impact Assessment

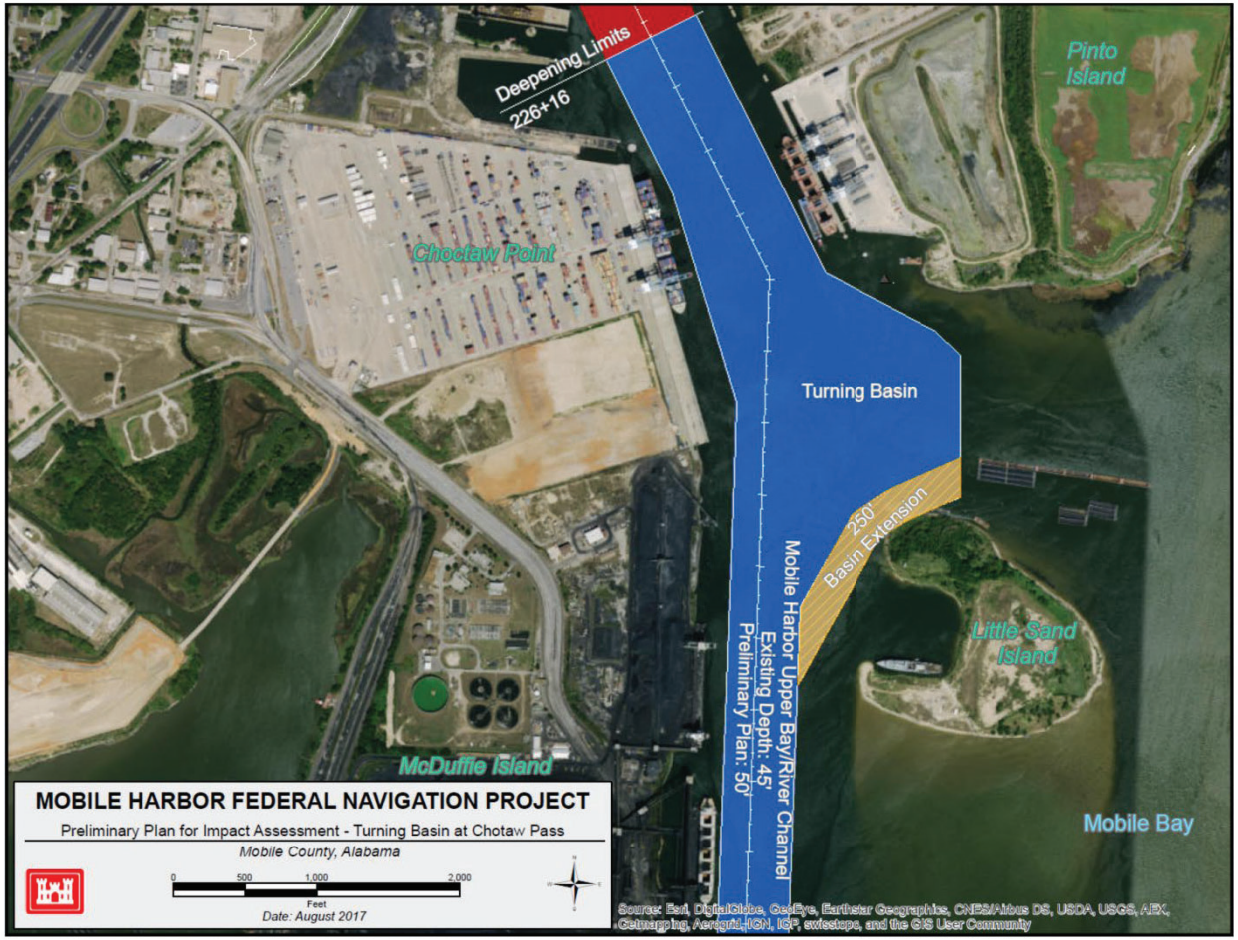
- Deepening: 50 feet Including Turning Basin
- Bend Easing
- Widener: 100 feet 5 miles in length

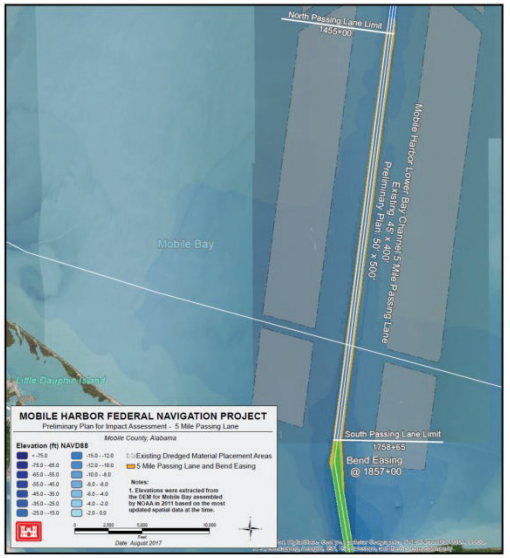


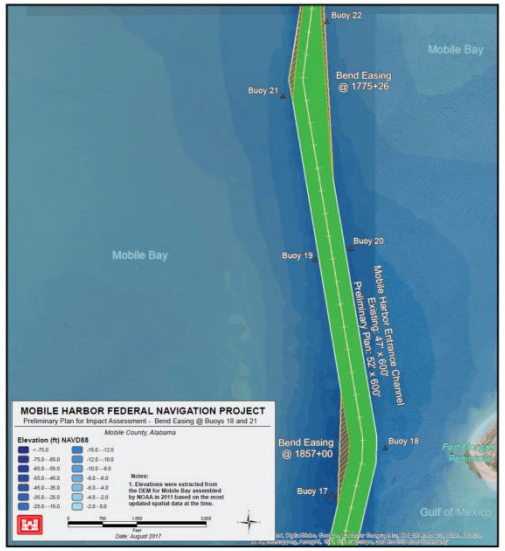
US Army Corps of Engineers®

MOBILE HARBOR PROJECT

U.S.ARMY





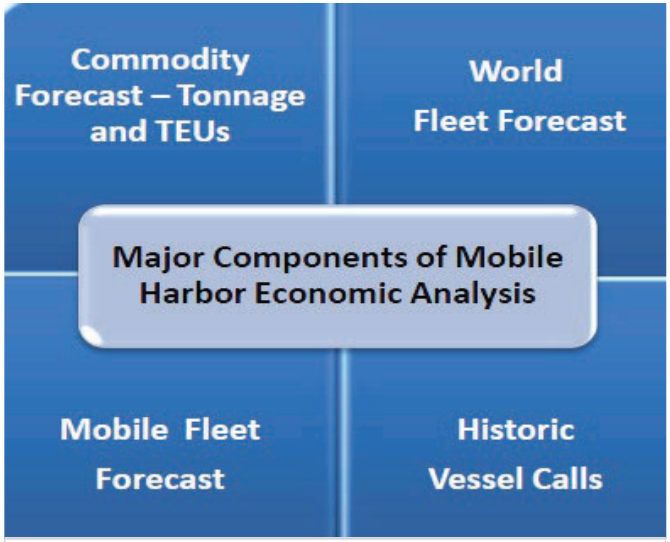


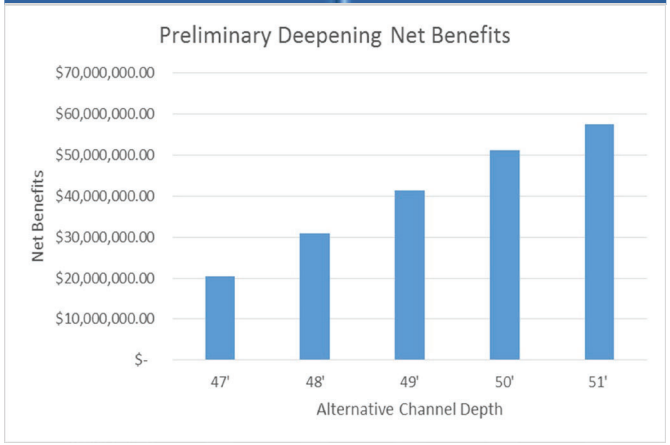
US Army Corps of Engineers

MOBILE HARBOR PROJECT

U.S.ARMY

ECONOMIC CONSIDERATIONS

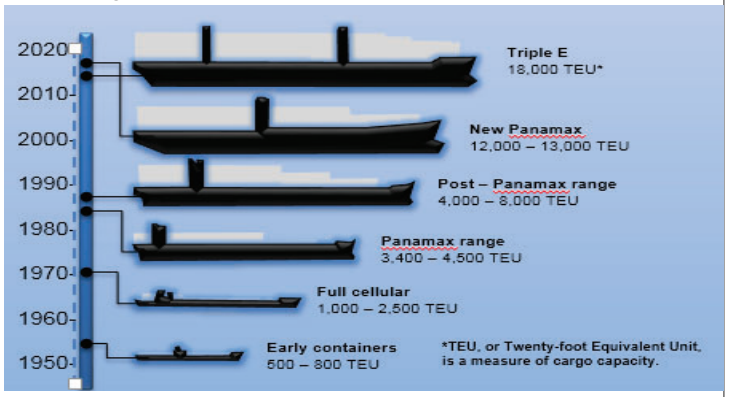




Concepts behind Mobile Harbor Economic Analysis:

- With and without the project, the same volume of cargo is assumed to move through Mobile.
- Growth is assumed only to the capacity of the facilities
- Deeper channels allow shippers to load more efficiently
- Channel widening reduces delay/waiting time to gain efficiencies
- The project benefits are reduction in transportation costs for goods (imports/exports) shipped through the Mobile Harbor with deepening/widening

Evolution of container ships
Post-Panamax ships make up 16 percent of the world's container fleet today, but carry 45 percent of the cargo. New Panamax ships will be the largest that can pass through the new locks in 2016.



US Army Corps of Engineers

MOBILE HARBOR PROJECT

U.S.ARMY

ENVIRONMENTAL CONSIDERATIONS

Fisheries Assessment

Understand relationships between salinity and fish populations to predict potential impacts. Conducted spring/summer fish sampling.

Oyster Modeling

Map existing oyster reefs and determine larvae distribution patterns throughout the Bay. Evaluate potential impacts to oysters based on the predictive water quality and hydrodynamic models.

Submerged Aquatic-Vegetation (SAV) Assessment and Mapping

Identify and map distribution of existing sea grasses to establish baseline used in determining potential impacts based on water quality model results.

Wetland Assessment and Mapping

Identify and map the distribution of existing wetland communities to understand potential impacts based on water quality model results

Benthic Community Assessment

Establish baseline conditions to analyze impacts to benthos from water-quality and saltwater intrusion based on information obtained through water-quality modeling

US Army Corps of Engineers

MOBILE HARBOR PROJECT

U.S.ARMY

ENVIRONMENTAL CONSIDERATIONS

Classify Subsurface Conditions

Compile and evaluate all existing subsurface data for the navigation channel sediments. Collect additional subsurface samples/borings to determine sediment composition and potential contamination.

Ship Wake Analysis

Estimate increases in waves and associated effects due to future ship traffic.

Sediment Transport Modeling

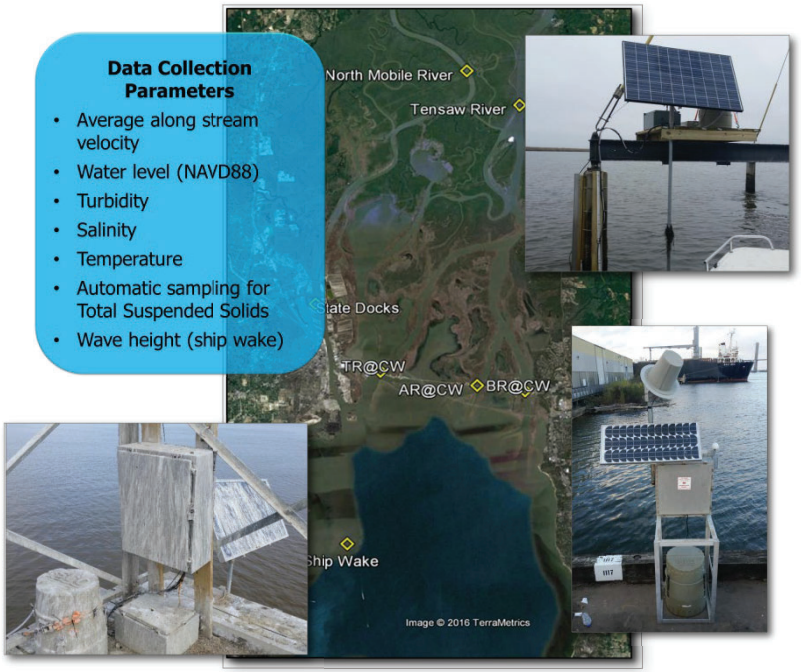
Collect baseline data and develop hydrodynamic and sediment transport models to characterize the physical conditions and sediment transport processes of the study area.

Environmental Justice Issues

Evaluate the impacts to human and social environments. This will also include impacts from air quality and noise pollution.

Cultural Resources

Evaluate potential impacts to Historic Properties in compliance with the National Historic Preservation Act.

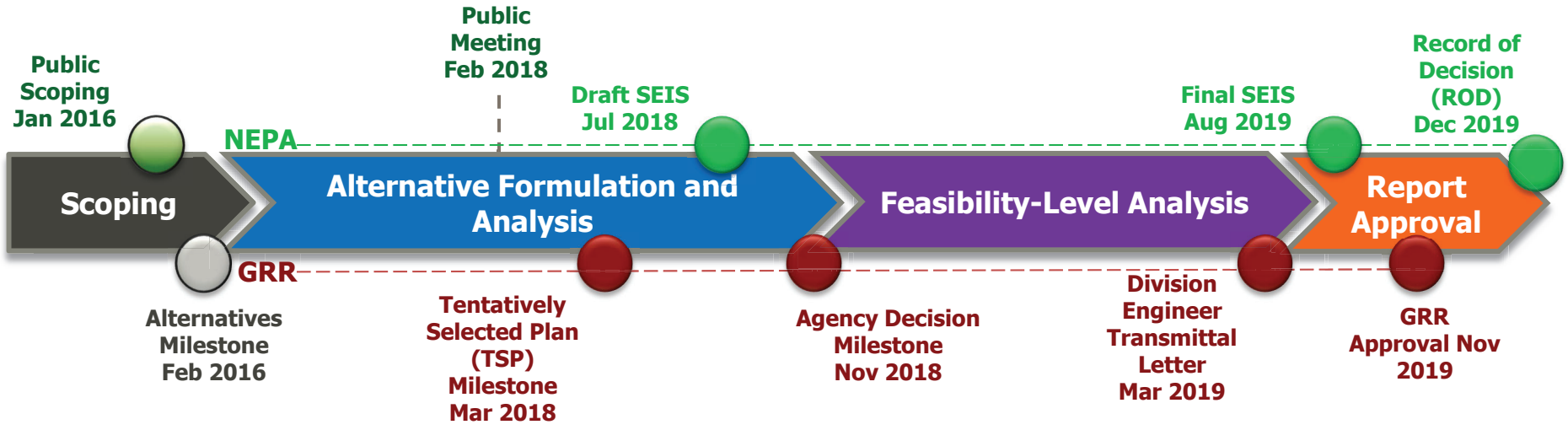


US Army Corps of Engineers

MOBILE HARBOR PROJECT

U.S.ARMY

PROJECT SCHEDULE (48 MONTHS)



US Army Corps of Engineers

MOBILE HARBOR PROJECT

U.S. ARMY

Submit Your Comments

Your input will assure that all concerns have been considered during the study. Submit your comments in any of the following ways:

Email: MobileHarborGRR@usace.army.mil

Postal Mail:

U.S. Army Corps of Engineers

ATTN: PD-F

P.O. Box 2288

Mobile, AL 36628

Stay Informed

Biweekly updates and project documents on the project website : **www.sam.usace.army.mil/Missions/Program-and-Project-Management/Civil-Projects/Mobile-Harbor-GRR/**

Sign up for the Listserve on the project website to receive a copy of the quarterly bulletin.

Follow us on...

Facebook.com/USACEMobile

Twitter.com/USACEMobile

Instagram.com/USACEMobile

Page 11 redacted for the following reason:
- -
(b)(6)

From:
To:
Cc: (b)(6)
Subject: RE: Small Business Coordination Record DD FORM 2579
Date: Monday, December 11, 2017 9:53:00 AM
Attachments: 16-R-0032 - List of Subs.docx

(b)(6) : Based on the attached listing, EA Engineering is not an approved sub for the Civil Works contract. Use of the REAT to contract with EA is the preferred path by Planning, and as Larry points out in his e-mail below, EA is a joint venture.

Please let us know if this requires further discussion.

(b)(6)

-----Original Message-----
From: (b)(6)
Sent: Wednesday, December 06, 2017 7:44 AM
To: (b)(6)
(b)(6)
Cc: (b)(6)
(b)(6)
Subject: RE: Small Business Coordination Record DD FORM 2579

Cardno will not be working on the project. EA is a separate entity under the Joint Venture and is not a sub to Cardno. Under this contract there will be no mark-up on EA, which will be an overall cost savings to us.

(b)(6)

(b)(6)

-----Original Message-----
From: (b)(6)
Sent: Tuesday, December 5, 2017 4:18 PM
To: (b)(6)
(b)(6)
(b)(6)

Cc: (b)(6)
(b)(6)
Subject: RE: Small Business Coordination Record DD FORM 2579

I do have one remaining concern, before signing the DD2579 and moving forward with the package.

It's troublesome for me when the DD2579 and email traffic say we want EA Engineering, Science, and Technology, Inc., PBC for the work, but the contract is with Cardno-EA JV. Is Cardno going to be involved with this at all? Is EA Engineering, Science, and Technology, Inc., PBC a sub under Cardno-EA, and if so, couldn't one of the Civil Works AE holders subcontract with them as well?

It seems to me that we are bypassing the more appropriate Civil Works AE IDIQs so that we can get to a specific person.

Thanks,

(b)(6)

-----Original Message-----
From: (b)(6)
Sent: Tuesday, December 05, 2017 3:00 PM
To: (b)(6)
(b)(6)
Cc: (b)(6)
(b)(6)
Subject: RE: Small Business Coordination Record DD FORM 2579

Sounds good.

(b)(6)

-----Original Message-----
From: (b)(6)
Sent: Tuesday, December 05, 2017 2:59 PM
To: (b)(6)
(b)(6)
Cc: (b)(6)
(b)(6)
Subject: RE: Small Business Coordination Record DD FORM 2579

Thanks (b)(6),

(b)(6) is going to be the COR. I already have the signed waiver memo.
(b)(6)

_____

(b)(6)

(b)(6)

-----Original Message-----
From: (b)(6)
Sent: Tuesday, December 5, 2017 2:57 PM
To: (b)(6)
(b)(6)
Cc: (b)(6)
(b)(6)
Subject: RE: Small Business Coordination Record DD FORM 2579

I have no problem with using Pool B for this work.

Who is going to be the COR for this contract?

I have a chemist who can evaluate the report when the contractor delivers it.

Please set up $5,000 for Org code

(b)(6)

(b)(6)

(b)(6)

-----Original Message-----
From: (b)(6)
Sent: Tuesday, December 05, 2017 1:44 PM
To: (b)(6)
(b)(6)
Cc: (b)(6)
Subject: RE: Small Business Coordination Record DD FORM 2579

This task order will be supporting efforts required for the Mobile Harbor GRR and Mobile Harbor and Pascagoula Harbors O&M to meet environmental compliance for open water placement of dredged material from these projects. The Corps is obligated under the Marine Protection, Research and Sanctuaries Act of 1972 (MPRSA) to demonstrate that the disposal or beneficial placement of dredged material satisfies the open water disposal criteria and that such actions would not result in any significant adverse effects on human health or welfare, including municipal or private water supplies, recreation and commercial fishing, plankton, fish, shellfish, and wildlife. Results from the proposed sediment testing is also necessary to obtain project state water quality certifications

required under Section 401 of the Clean Water Act. Furthermore, any sediment placed within State and Federal waters must be in compliance with applicable Toxic Effluent Standards under Section 307 of the Clean Water Act. The sediment testing to be completed under this task order will conduct rigorous chemical analyses to test for the presence various contaminants to show that the material dredged from these projects are in compliance with the laws cited above and is consistent with the intent of the contract to provide environmental support to military, civil, and Federal Agencies.

(b)(6)

(b)(6)

-----Original Message-----
From: (b)(6)
Sent: Tuesday, December 5, 2017 10:33 AM
To: (b)(6)
(b)(6)
Cc: (b)(6)
Subject: RE: Small Business Coordination Record DD FORM 2579

(b)(6) and (b)(6) are the PMs on this action.

-----Original Message-----
From: (b)(6)
Sent: Tuesday, December 05, 2017 10:31 AM
To: (b)(6)
(b)(6)
Cc: (b)(6)
Subject: RE: Small Business Coordination Record DD FORM 2579

16-D-0058 is Pool B, I don't think it fits there.

I also think we should be using CW AE contracts for this, more appropriate vehicle.

(b)(6)

-----Original Message-----
From: (b)(6)
Sent: Tuesday, December 05, 2017 10:27 AM
To: (b)(6)
(b)(6)
Cc: (b)(6)
Subject: RE: Small Business Coordination Record DD FORM 2579

I don't have a problem with the Scope. The REAT Pool A contract vehicle does support this type of work.

My concern is why we aren't using the CW AE contracts to do this.

(b)(6)

-----Original Message-----
From: (b)(6)
Sent: Tuesday, December 05, 2017 9:09 AM
To: (b)(6)
(b)(6)
Subject: FW: Small Business Coordination Record DD FORM 2579

(b)(6)

This is the one for Mobile/Pascagoula Harbor.

(b)(6)

-----Original Message-----
From: (b)(6)
Sent: Tuesday, December 05, 2017 9:08 AM
To: (b)(6)
Subject: FW: Small Business Coordination Record DD FORM 2579

This is the one for Mobile/Pascagoula Harbor.

(b)(6)

-----Original Message-----
From: (b)(6)
Sent: Tuesday, December 05, 2017 8:37 AM
To: (b)(6)
Subject: FW: Small Business Coordination Record DD FORM 2579

(b)(6)

For your review and signature.

(b)(6)

-----Original Message-----
From: (b)(6)
Sent: Tuesday, December 05, 2017 8:17 AM
To: (b)(6)
Subject: RE: Small Business Coordination Record DD FORM 2579

Good Morning (b)(6),

Appendix A attached. Let me know if you need anything else on this.

Thanks!

(b)(6)

_____

(b)(6)

-----Original Message-----
From: (b)(6)
Sent: Monday, December 4, 2017 6:14 PM
To: (b)(6)
Subject: Re: Small Business Coordination Record DD FORM 2579

(b)(6)

The contracting officer requires the appendix “A” with this form . Please send and I will process.

From: (b)(6)
Date: December 4, 2017 at 3:03:11 PM CST
To: (b)(6)
(b)(6)
Cc: (b)(6)
(b)(6)
Subject: Small Business Coordination Record DD FORM 2579

Good Afternoon (b)(6),

I am preparing a Task Order submittal package to conduct sediment testing work for the Mobile Harbor GRR study and for Mobile and Pascagoula Harbors. It is proposed that EA Engineering, Science, and Technology, Inc., PBC conduct the work under contract number W91278-16-D-0058 - Cardno-EA Joint Venture. Attached is the required DD FORM 2579 for you approval and signature. Once signed, would you please forward on to the next approving official. Please let me know if you have any questions or need additional information on this.

Thanks!

(b)(6)

(b)(6)

SUBJECT: W91278-16-R-0032, Indefinite Delivery Contract (IDC) for Single Award Task Order Contracts (SATOCs) for Architect and Engineering (A-E) Services TO Support the Planning and Design for the Civil Works Program, Mobile District, U.S. Army Corps of Engineers

UNRESTRICTED:

1) Amec Foster Wheeler HDR Civil Works Joint Venture
   - ✓ Amec Foster Wheeler
   - ✓ HDR
   - ✓ Singhofen & Associates
   - ✓ Olsen Associates, Inc.
   - ✓ SEARCH
   - ✓ Pickett & Associates
   - ✓ STOA Architects
   - ✓ Quest Ecology
   - ✓ Independent Drilling
   - ✓ KMEA, Inc.

2) Anchor QEA-MWH Mobile Joint Venture
   - ✓ MWH Americas, Inc.
   - ✓ Anchor QEA LLC
   - ✓ Quality Engineering Services
   - ✓ IEA, Inc.
   - ✓ Brockington and Associates, Inc.
   - ✓ Center of Planning Excellence
   - ✓ DIMCO
   - ✓ Gaea Consultants, LLC
   - ✓ MOCA Systems, Inc.
   - ✓ JAYMAC Consultants
   - ✓ Rowe Surveying and Engineering Co, Inc.
   - ✓ Southeastern Archeological Research, Inc.

3) Arcadis U.S., Inc.
   - ✓ Gulf South Research Corporation
   - ✓ Barry A. Vittor & Associates, Inc.
   - ✓ Panamerican Consultants, Inc.
   - ✓ Civil Design and Construction, Inc.
   - ✓ DR Reed & Associates, Inc.
   - ✓ Integrated Logistical Support, Inc.
   - ✓ TRAC Laboratories, Inc.
   - ✓ TestAmerican Laboratories, Inc.

4) CH2M HILL, Inc.
   - ✓ Barry Vittor and Associates
   - ✓ Brockington and Associates
   - ✓ David Miller and Associates
   - ✓ Dewberry Consultants
   - ✓ Royal Engineers & Consultants

SUBJECT: W91278-16-R-0032, Indefinite Delivery Contract (IDC) for Single Award Task Order Contracts (SATOCs) for Architect and Engineering (A-E) Services TO Support the Planning and Design for the Civil Works Program, Mobile District, U.S. Army Corps of Engineers

- ✓ Royal HaskoningDHV
- ✓ Stichting Deltares

SMALL BUSINESS:

1) Applied Coastal Research and Engineering, Inc.
   - ✓ Barry A. Vittor & Associates, Inc.
   - ✓ Gahagan & Bryant Associates, Inc.
   - ✓ CDM SMITH
   - ✓ Southeastern Archaeological Research, Inc. (SEARCH)
   - ✓ Coastal Engineering Consultants, Inc.
   - ✓ John C. Martin Associates, LLC dba Martin Associates
2) ECS-GEC JV
   - ✓ Engineering Consulting Services, Inc. (ECS)
   - ✓ G.E.C., Inc.
   - ✓ Panamerican Consultants, Inc.
   - ✓ Ramboll Environ US Corporation
   - ✓ Freese and Nichols, Inc.
   - ✓ W. F. Baird & Associates Ltd.
   - ✓ S&ME, Inc.

WOMAN OWNED SMALL BUSINESS:

1) Gaea Consultants, LLC
   - ✓ MWH Global
   - ✓ Moffatt & Nichol
   - ✓ Freese & Nichols, Inc
   - ✓ Cypress Environmental
   - ✓ Science & Engineering
   - ✓ ANAMAR
   - ✓ Environmental Consulting, Inc.
   - ✓ Earth Search, Inc.

From:
To: (b)(6)

Subject: RE: Mobile Harbor GRR - Concurrence on widener and passing rules
Date: Wednesday, December 13, 2017 2:39:00 PM

Thanks (b)(6) !

-----Original Message-----
From: (b)(6)
Sent: Wednesday, December 13, 2017 2:03 PM
To: (b)(6)
(b)(6)
Subject: RE: Mobile Harbor GRR - Concurrence on widener and passing rules

Sorry one more suggestion..... (b)(5) I would suggest (b)(5)

-----Original Message-----
From: (b)(6)
Sent: Wednesday, December 13, 2017 1:37 PM
To: (b)(6)
(b)(6)
Subject: RE: Mobile Harbor GRR - Concurrence on widener and passing rules

See attached suggestion/comments on the write up. I also have a few suggested slight revisions to the email to be clearer what we are wanting concurrence on and why. Apply how the team feels fit.

(b)(5)

Please let us know if you have any questions."

Sincerely,

(b)(6)

-----Original Message-----
From: (b)(6)
Sent: Wednesday, December 13, 2017 10:23 AM
To: (b)(6)
(b)(6)
Subject: Mobile Harbor GRR - Concurrence on widener and passing rules

Please let me know what you guys think (b)(6) asked that we cc him and let him have initial discussion with Pilots.

(b)(6)
(b)(5)

Please let us know if you have any questions.

(b)(6)

From:
To:
Cc: (b)(6)

Subject: RE: Construction Duration - Mobile Harbor GRR
Date: Thursday, December 14, 2017 4:47:00 PM

(b)(6) : I'm working on a response to Casi Callaway's question about construction duration for Mobile Harbor from yesterday's focus group meeting. I know that we previously stated it would be 6 years, but, I wanted to make sure that we provide a fully vetted response from Engineering, Operations, and Programs. I know that there are limitations on how long the equipment can stay in Mobile, impacts to construction costs, potential environmental impacts, and both federal and sponsor funding limitations.

(b)(6) stated 2-3 years in the meeting. From your perspective what is the fastest construction duration that you guys could do from the operations perspective? I'll then confirm if that works with (b)(6) and then (b)(6)

(b)(6)

-----Original Message-----
From: (b)(6)
Sent: Wednesday, November 22, 2017 7:29 AM
To:
Cc: (b)(6)

(b)(6)

Subject: RE: Construction Duration - Mobile Harbor GRR

I'm assuming this would be phased over 6 years. ...

-----Original Message-----
From: (b)(6)
Sent: Tuesday, November 21, 2017 10:20 AM
To:
Cc: (b)(6)

(b)(6)

Subject: RE: Construction Duration - Mobile Harbor GRR

Assume a 50 foot deepening with a 5 mile, 100 foot widener along with bend easing and turning basin.

(b)(6)

(b)(6)

-----Original Message-----
From: (b)(6)
Sent: Tuesday, November 21, 2017 10:18 AM
To:
Cc: (b)(6)

(b)(6)

Subject: RE: Construction Duration - Mobile Harbor GRR

For each plan or a particular plan?

-----Original Message-----
From: (b)(6)
Sent: Tuesday, November 21, 2017 8:02 AM
To:
Cc: (b)(6)

(b)(6)

Subject: Construction Duration - Mobile Harbor GRR

(b)(6)
What is the construction duration that we are using in our estimate for the Mobile Harbor GRR?

(b)(6)

From: (b)(6)
To:
Subject: FW: Mobile Harbor GRR Eastern Shore Seafood Focus Group 08 Dec 017 - final minutes
Date: Tuesday, December 19, 2017 11:32:00 AM

-----Original Message-----
From: (b)(6)
Sent: Monday, December 11, 2017 12:44 PM
To: (b)(6)
(b)(6)
Subject: [EXTERNAL] RE: Mobile Harbor GRR Eastern Shore Seafood Focus Group 08 Dec 017 - final minutes

Before you adjust the notes, let (b)(6) weigh in on this point. She may recall who raised it in the meeting or if it were something she got offline. (b)(6)

(b)(6)

-----Original Message-----
From: (b)(6)
Sent: Monday, December 11, 2017 12:42 PM
To: (b)(6)
(b)(6)
Subject: RE: Mobile Harbor GRR Eastern Shore Seafood Focus Group 08 Dec 017 - final minutes

Hey (b)(6)
Outside of the question in regards to whether they even shrimp the shell mined area, the only statement was that the dredging does not impact the shrimpers. I did not hear any specific concerns in regards to gill netting being impacted by the channel. Good comment...We'll include these notes in our record.

(b)(6)

-----Original Message-----
From (b)(6)
Sent: Monday, December 11, 2017 12:09 PM
To: (b)(6);
(b)(6)
Subject: [EXTERNAL] RE: Mobile Harbor GRR Eastern Shore Seafood Focus Group 08 Dec 017 - final minutes

(b)(6) Hi. I understood weather impacted attendance, but those who were there plan to take the info back to their stakeholders. One thing I got feedback on was net fishermen interest. I did not see them referenced in the notes other than the sheepshead comment. Can you confirm if the net fishing interest expressed concern about placement of project related material, and if so, how did the team respond to that? Or is that covered by #2 below? Judy

(b)(6)

-----Original Message-----
From: (b)(6)
Sent: Monday, December 11, 2017 9:45 AM
To: (b)(6)
(b)(6)
Subject: Mobile Harbor GRR Eastern Shore Seafood Focus Group 08 Dec 017 - final minutes

All: Attached are the slides presented and sign-in sheet for last week's Eastern Shore Seafood Focus Group Meeting held at the Fisherman Baptist Church. Draft minutes are as follows (please let me know if you have comments or additional notes):
1.) (b)(6) presented the information provided in the attached slides.
2.) Comment: There is an oyster reef to the east of the channel near Gaillard Island that is in the vicinity of the formerly shell mined area proposed for disposal. Oyster bottoms provide good habitat for Sheepshead. Will we impact that area? Response: We will be using hydrodynamic and sediment transport modeling to determine the movement of sediment placed in the shell mined area. Material will be placed in "thin" 1-2' lifts. Furthermore, we do not plan to place material on oyster-bottoms. The shell mined area proposed for placement is a dead zone with a very "fluidized" mud bottom.
3.) Comment: How deep is the formerly shell mined area and is it still used by the shrimpers? Response: It is about 10-12' in depth. It is not shrimped to our knowledge, but we will need to follow-up on that.
4.) Comment: All oyster reefs on the eastern side of the bay are essentially gone.
5.) (b)(6) asked if anyone has ideas of other ways to beneficially use the material to please let us know.
6.) (b)(6) asked that those in attendance please spread the word that we will have a follow-on public meeting February 20 and to please encourage others to attend.
7.) Corps provided handouts of the ways to contact us and wrapped up meeting.

-----Original Message-----
From: (b)(6)
Sent: Friday, December 08, 2017 8:43 AM
To: (b)(6)
Subject: focus group 08 Dec 017 DRAFT.pptx

From: (b)(6)
To:
Subject: RE: Mobile Harbor GRR Environmental Focus Group Meeting Minutes
Date: Tuesday, December 19, 2017 3:02:00 PM

Maybe, but, I really don't think we can post everything. I have a huge stack of letters with questions and comments and I'm sure (b)(6) has another stack. They will be included in the SEIS.

As far as the open house. This decision is being made above our pay grade. I hear from (b)(6) and (b)(6) that (b)(6) (b)(6) and the Colonel have weighed in that we will have town hall...let's see what happens.

(b)(6)

-----Original Message-----
From: (b)(6)
Sent: Tuesday, December 19, 2017 2:46 PM
To: (b)(6)
(b)(6)
Subject: RE: Mobile Harbor GRR Environmental Focus Group Meeting Minutes

(b)(6) and others in the past have brought up the point that they want everyone else to hear the questions they're asking and the answers. Do we post ALL the questions and comments that we get? That's one of the main reasons they want the open house style meeting. If we just post them all, maybe we can avoid the open house and still give them what they want.

-----Original Message-----
From: (b)(6)
Sent: Tuesday, December 19, 2017 2:06 PM
To: (b)(6)
(b)(6)
Subject: RE: Mobile Harbor GRR Environmental Focus Group Meeting Minutes

(b)(6) The attached Environmental Focus Group Meeting minutes incorporate everyone's comments. Please make one final check and distribute to the NGOs as a DRAFT requesting their input.

(b)(6)

(b)(6)

-----Original Message-----
From: (b)(6)
Sent: Friday, December 15, 2017 2:09 PM
To: (b)(6)
(b)(6)
Subject: Mobile Harbor GRR Environmental Focus Group Meeting Minutes

All,
Please review the attached draft minutes from the Wednesday Environmental Focus Group Meeting and let me know if you have comments or additions.

Once I receive your inputs, I will forward to the full attendee list.

(b)(6)

From:
To: (b)(6)

Subject: RE: Mobile Harbor GRR Environmental Focus Group Meeting Minutes
Date: Tuesday, December 19, 2017 2:02:00 PM
Attachments: Draft_Minutes-Mobile_Harbor_GRR_Focus Group_13_December.docx
Environmental Focus Group Attendees List 13 Dec 2017.pdf
Environmental Focus Group Slides 12-13-17.pdf

(b)(6) The attached Environmental Focus Group Meeting minutes incorporate everyone's comments. Please make one final check and distribute to the NGOs as a DRAFT requesting their input.

(b)(6)

-----Original Message-----
From: (b)(6)
Sent: Friday, December 15, 2017 2:09 PM
To: (b)(6)
(b)(6)
Subject: Mobile Harbor GRR Environmental Focus Group Meeting Minutes

All,
Please review the attached draft minutes from the Wednesday Environmental Focus Group Meeting and let me know if you have comments or additions.

Once I receive your inputs, I will forward to the full attendee list.

(b)(6)

Pages 2 through 6 redacted for the following reasons:
- -
(b)(5)

Attachment 1: Attendance Roster
*attended meeting via conference call

Name	Organization	Email Address
Dayne Cutrell*	SEN Shelby Staff - Legislative Dir.	(b)(6)
Morgan Carter*	SEN Shelby Staff – Legislative Ass.	
Jenn Armstrong*	Senate Appropriations	
Bob Harris	ASPA	
Judy Adams	ASPA	
(b)(6)	CEPOH Climate Change CECW-PC CESWD-RBT OWPR (CECW-PC) OWPR (CECW-PC/LRD) SAD RIT CESAD-PD, Director of Programs CESAD-PDP CECC-SAD CESAD-PDP CESAD-PDR CESAD-PDP CESAD-RBT CESAD-RBT CESAD-PDC	

(b)(6)	CEERD-EEW CESAM-DS CESAM-PD CESAM-OC CESAM-PD-F CESAM-PM-C CESAM-PD-EC CESAM-PM-CM CESAM-PD-FP CESAM-EN-H CESAM-EN-HH CESAM-PD-FE CESAM-PD-EC CESAM-PD-EC CESAM-EN-TS CESAM-PD-EC CESAM-PM-CP CESAM-OP-TN CESAM-DX CESAM-PD-EI
(b)(6)	

Page 9 redacted for the following reason:
- -
(b)(6)

MOBILE HARBOR GRR

With Integrated Supplemental Environmental Impact Statement

Environmental Focus Group

December 13, 2017

US Army Corps of Engineers

MOBILE HARBOR PROJECT

U.S.ARMY

- **Project authorized in the Water Resources Development Act of 1986 in accordance with the 1981 Chief's Report.**
- **Full-Service Seaport -- 10th Largest in the United States - Balanced Trade (Strong Export Market)**
  - ✓ 58M tons handled port-wide. ASPA terminals represent 25 - 29M tons annually
- **Port of Mobile has sustained growth in steel, petroleum and containerized cargoes**
  - ✓ Record 2016 19% growth in containerized cargo – automotive, aviation, forest products, chemicals, poultry
  - ✓ Now ranked No. 2 steel port in the United States
  - ✓ 10 New Ocean Carriers Added Service into Mobile in 2016-2017
- **The Port of Mobile Drives the Regional Economy**
  - ✓ Alabama State Port Authority terminals alone generate 124,328 jobs and $19.4B in total economic value
  - ✓ Private Petroleum / Petroleum Products terminals alone generate 5,220 jobs and $687M in economic value
- **Modernizing Mobile Harbor is Necessary Because**
  - ✓ 2/3's of the Port of Mobile's vessel traffic is restricted or delayed.
  - ✓ Larger Ships Now Transit North American Trade Lanes
  - ✓ Channel Deficiencies and Vessel Transit Inefficiencies Directly Impact Shipper Costs and Competitiveness
  - ✓ Mobile's Port-side Infrastructure Investments have met Shipper Needs ($500+ Million Invested) - Channel Investment Necessary to Leverage Non-federal Sponsor investment and Regional Growth

INTERMODAL CONTAINER FACILITY

MCDUFFIE COAL TERMINAL

US Army Corps of Engineers

MOBILE HARBOR PROJECT

U.S.ARMY

Mobile Bay and Watershed

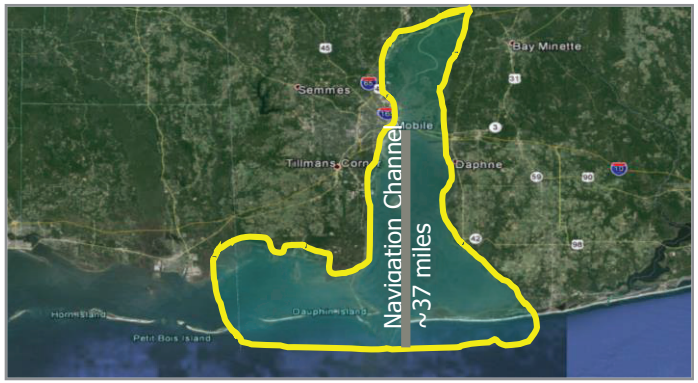
- *The Mobile Bay Watershed is the 6th largest river basin in the United States with five rivers forming the 2nd largest delta in the US, and the 4th largest watershed based on drainage area* (Mobile, Tensaw, Blakeley, Spanish, and Apalachee). Environmentally and economically important because of the exceptional biological diversity and productivity which provides habitat for various invertebrates, fishes, waterfowl, migrant birds, as well as, other game and non-game species.

- *Mobile Delta is one of the most diverse ecosystems in the US* with 3 types of wetland habitats, extensive seagrasses, 200+ species of fish, major shellfish communities, and 300+ species of birds and reptiles. The Delta is one of the most important and valuable natural resources in the US.

- *Alabama Seafood Industry Economic Impact.* Commercial species harvests provide a valuable source of revenue for the state contributing approximately $461M in revenue annually and 10,000 jobs. The most common commercial species obtained from Alabama waters are shrimp, blue crabs, oysters, and numerous species of fish.

- *Coastal tourism and recreation provide local economic benefits including* boating, fishing, swimming, and sight seeing. Saltwater species provide the vast majority of fish caught recreationally in the Mobile Bay system.

- *Cultural Resources.* The Mobile area is rich in both pre-historic and historic cultural resources.



US Army Corps of Engineers

MOBILE HARBOR PROJECT
ALTERNATIVES

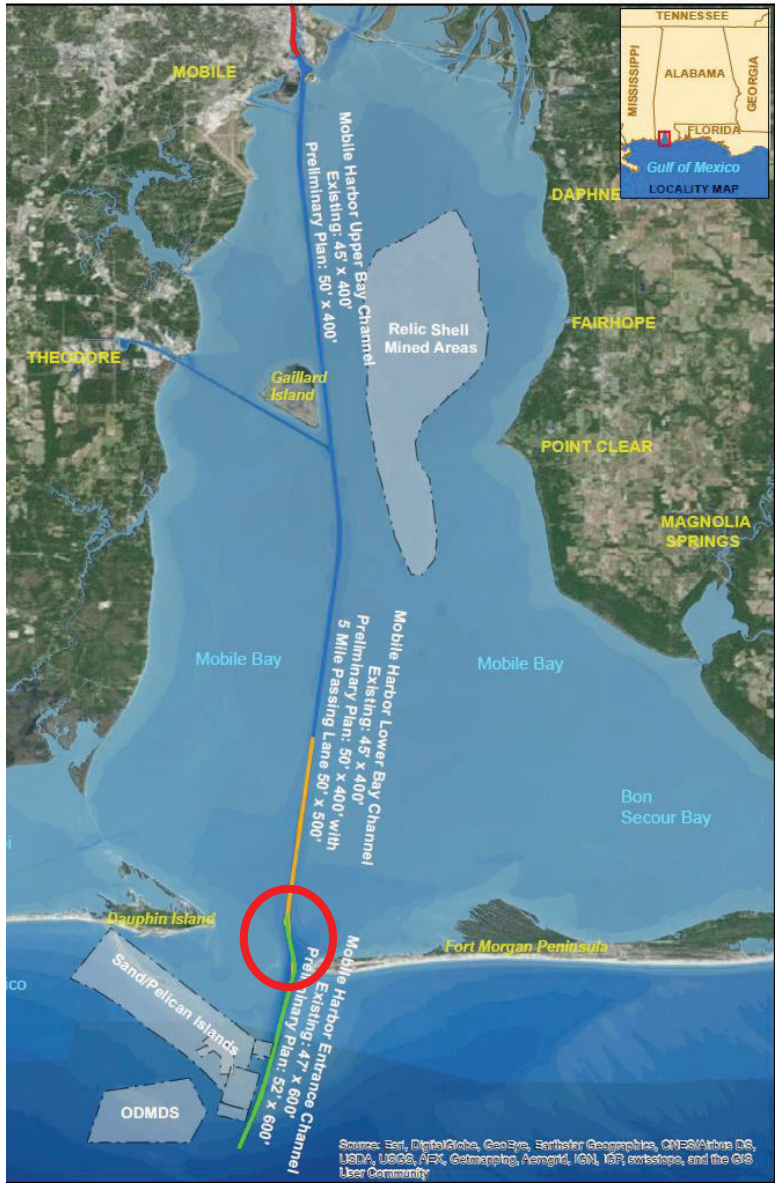
U.S.ARMY

Initial

- Deepening: 47 to 55 feet Including Turning Basin
- Bend Easing
- Widener: 100 and 150 feet 5, 10,15 miles in length

Proposed for Impact Assessment

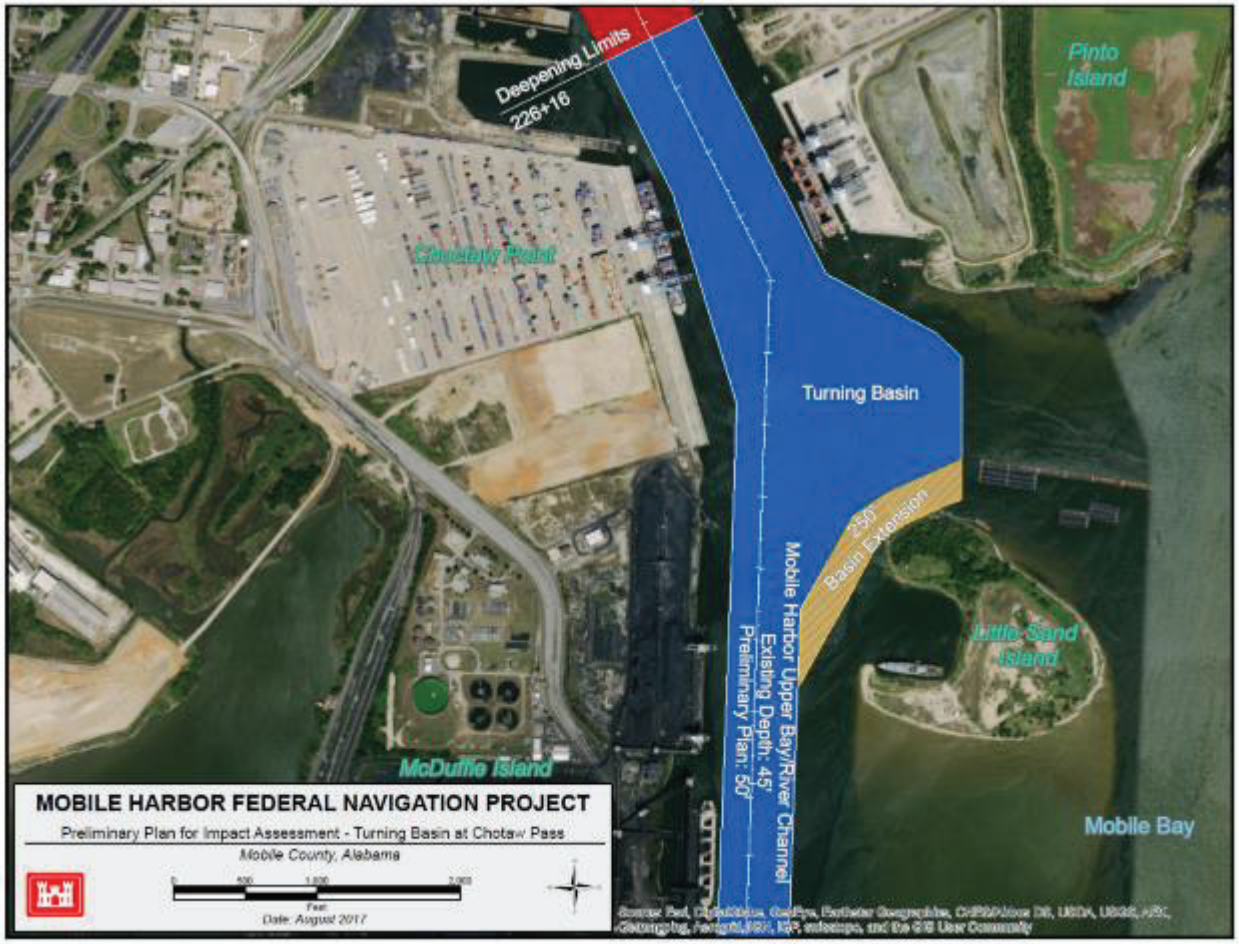
- Deepening: 50 feet Including Turning Basin
- Bend Easing
- Widener: 100 feet 5 miles in length

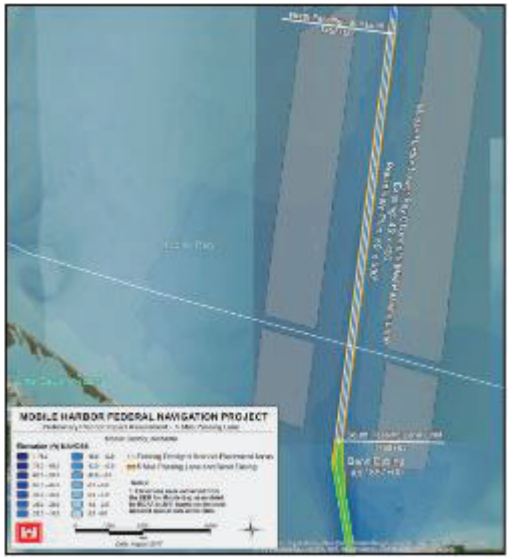


US Army Corps of Engineers

MOBILE HARBOR PROJECT

U.S.ARMY



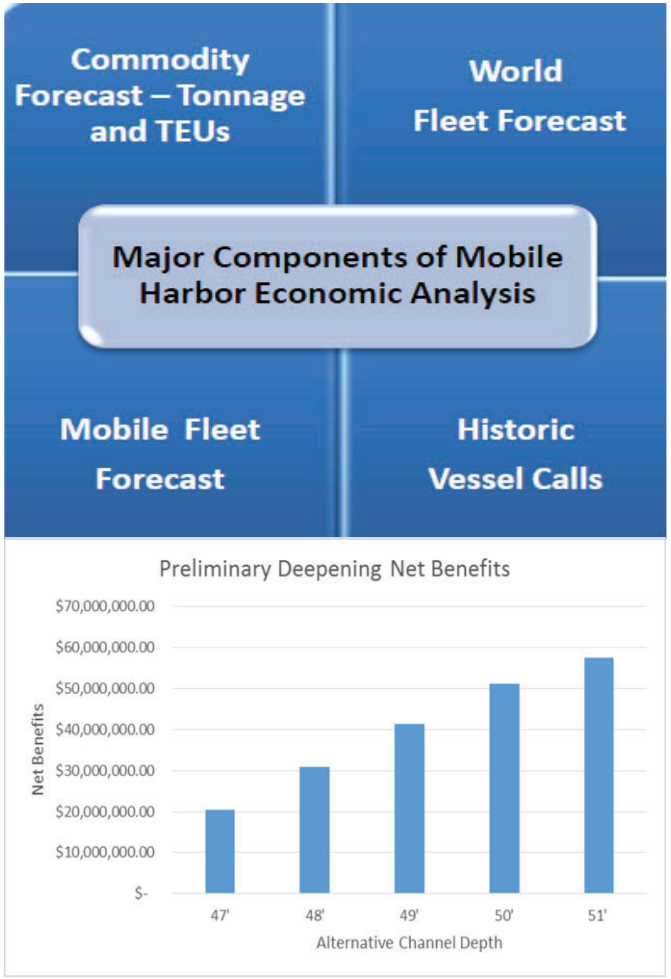


US Army Corps of Engineers

MOBILE HARBOR PROJECT

U.S.ARMY

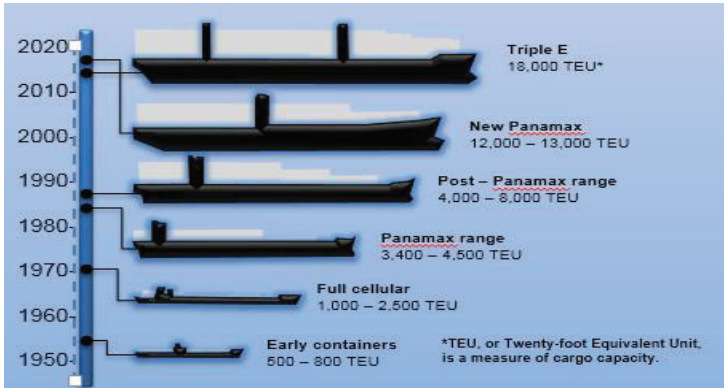
ECONOMIC CONSIDERATIONS



Concepts behind Mobile Harbor Economic Analysis:

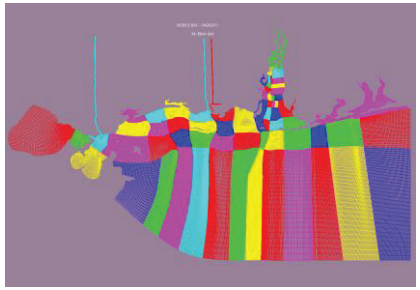
- With and without the project, the same volume of cargo is assumed to move through Mobile.
- Growth is assumed only to the capacity of the facilities
- Deeper channels allow shippers to load more efficiently
- Channel widening reduces delay/waiting time to gain efficiencies
- The project benefits are reduction in transportation costs for goods (imports/exports) shipped through the Mobile Harbor with deepening/widening

Evolution of container ships
Post-Panamax ships make up 16 percent of the world's container fleet today, but carry 45 percent of the cargo. New Panamax ships will be the largest that can pass through the new locks in 2016.

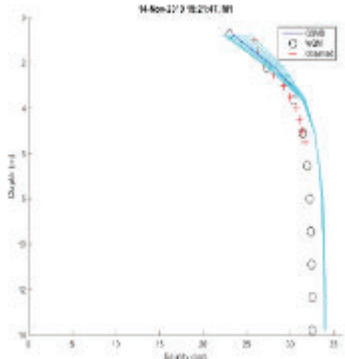


NUMERICAL MODELING - ERDC

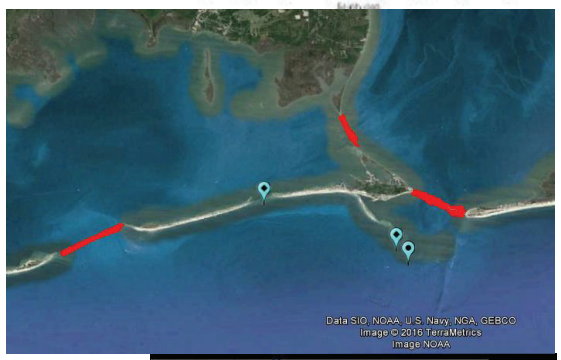
- **Hydrodynamic Modeling**
  - ✓ Simulates offshore conditions for the nearshore hydrodynamic and sediment transport modules
  - ✓ Provides wave fields to the nearshore hydrodynamic and sediment transport modules
  - ✓ Provide water levels and current velocities to the water quality, estuarine sediment transport and habitat assessment modules



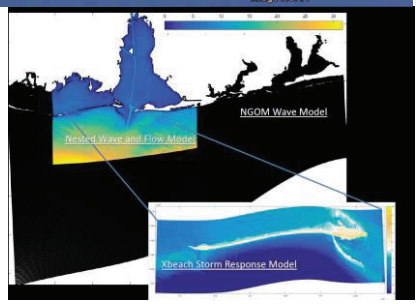
- **Water Quality Modeling**
  - ✓ Assess potential changes in water quality including flushing, salinity, dissolved oxygen, temperature, total suspended solids, nutrients and chlorophyll as a result of channel modifications.
  - ✓ Provide water quality constituents (i.e salinity, temperature, dissolved oxygen, total suspended solids, etc.) for habitat assessments.



- **Sediment Transport Modeling**
  - ✓ Estuarine sediment transport to assess relative changes in sedimentation rates as a result of channel improvements
  - ✓ Coastal nearshore sediment transport to quantify changes in sediment pathways and morphological response of the adjacent nearshore environment.

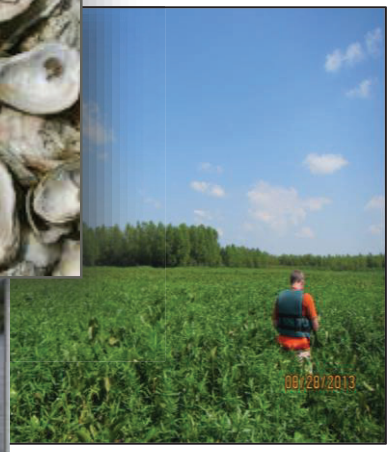


- **Ship Wake Modeling**
  - ✓ Quantify relative changes in ship wake energy from proposed channel modifications.
  - ✓ Simulated for a select number of representative vessels and speeds.



AQUATIC RESOURCES ASSESSMENTS
ERDC

- **Wetlands**
  - ✓ Field verification of existing data
  - ✓ Mapping for vegetation distributions
  - ✓ Salinity tolerances for observed species established
  - ✓ Comparing tolerances with WQ model outputs
- **Submerged Aquatic Vegetation (SAV)**
  - ✓ Field verifications of existing data sets
  - ✓ Mapping of species distributions
  - ✓ Salinity tolerances established for observed species
  - ✓ Comparing tolerances with WQ model outputs
- **Oysters**
  - ✓ Oyster reef distributions information from MRD
  - ✓ Numerical modeling to determine oyster larvae distribution mortality, and flushing
  - ✓ WQ model to determine potential impacts to larvae and existing reefs
- **Benthic Communities**
  - ✓ Spring & summer sampling of bay, transitional, & riverine
  - ✓ Sediment grain size and TOC
  - ✓ Statistical analysis and interpretation in progress
  - ✓ WQ model to determine effects on benthic communities
- **Fish**
  - ✓ Spring & summer field sampling
  - ✓ MRD coordination on approach for data collection and analysis
  - ✓ Determining relationships between salinity and fish populations
  - ✓ WQ model to determine effects to fish populations and correlation with benthics



OTHER ENVIRONMENTAL CONSIDERATIONS

- Threatened and Endangered Species
- Critical Habitats
- Essential Fish Habitat
- Cultural Resources
- Air Emissions
- Noise Pollution
- Environmental Justice
- Cumulative Impacts

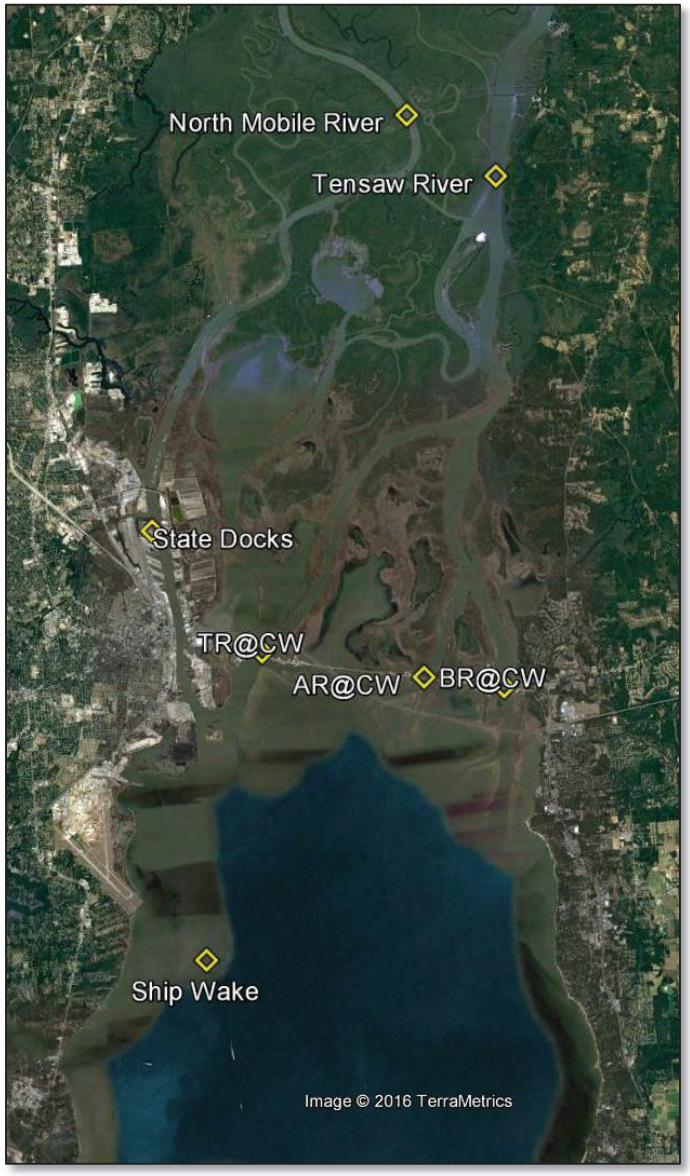
Supporting Data Collection Efforts

Acoustic Doppler Current Profile (ADCP) measurements and depth measurements at discrete locations along the rivers

Vertical profiles of temperature, turbidity, & conductivity at discrete locations

Suspended Sediment Samples at discrete locations

Model verification



US Army Corps of Engineers

MOBILE HARBOR PROJECT

U.S. ARMY

Submit Your Comments

Your input will assure that all concerns have been considered during the study. Submit your comments in any of the following ways:

Email: MobileHarborGRR@usace.army.mil

Postal Mail:

U.S. Army Corps of Engineers

ATTN: PD-F

P.O. Box 2288

Mobile, AL 36628

Stay Informed

Biweekly updates and project documents on the project website : **www.sam.usace.army.mil/Missions/Program-and-Project-Management/Civil-Projects/Mobile-Harbor-GRR/**

Sign up for the Listserve on the project website to receive a copy of the quarterly bulletin.

Follow us on...

Facebook.com/USACEMobile

Twitter.com/USACEMobile

Instagram.com/USACEMobile

From: (b)(6)
To:
Subject: FW: Recent USGS Publication on Seafloor Change around Dauphin Island from 1987 - 2015
Date: Wednesday, December 20, 2017 12:44:00 PM
Attachments: ofr20171112.pdf

-----Original Message-----
From: (b)(6)
Sent: Friday, December 15, 2017 11:15 AM
To: (b)(6)
(b)(6)
Subject: Recent USGS Publication on Seafloor Change around Dauphin Island from 1987 - 2015

Folks,

I just wanted to pass along a recent Open File Report published by the USGS on the subject topic. The 2015 data used in the analysis was the data collected as part of the ongoing NFWF Dauphin Island study.

It's a fairly quick read and you may find it interesting. It draws similar conclusions as Byrnes regarding effects to DI from our dredging/disposal.

(b)(6)

USGS
science for a changing world

Analysis of Seafloor Change around Dauphin Island, Alabama, 1987–2015

By James G. Flocks, Nancy T. DeWitt, and Chelsea A. Stalk

Open-File Report 2017–1112

U.S. Department of the Interior
U.S. Geological Survey

U.S. Department of the Interior
RYAN ZINKE, Secretary

U.S. Geological Survey
William H. Werkheiser, Acting Director

U.S. Geological Survey, Reston, Virginia: 2017

Suggested citation:
Flocks, J.G., DeWitt, N.T., and Stalk, C.A., 2017, Analysis of seafloor change around Dauphin Island, Alabama, 1987–2015: U.S. Geological Survey Open-File Report 2017–1112, 19 p., https://doi.org/10.3133/ofr20171112.

ISSN 2331-1258 (online)

Acknowledgments

This project is part of a collaborative effort between the U.S. Geological Survey (USGS), U.S. Army Corps of Engineers (USACE), and the State of Alabama, funded by the National Fish and Wildlife Foundation (NFWF) to investigate viable, sustainable restoration options that protect and restore the natural resources of Dauphin Island, Alabama. The authors would like to thank their collaborators at USACE-Mobile District, NFWF, State of Alabama, USGS Wetland and Aquatic Research Center, and the crew of the USACE S/V *Irvington*. We thank William Butler and the USACE Engineer Research and Development Center team that collected and processed the 2015 multibeam data. We would also like to thank the USGS St. Petersburg Coastal and Marine Science Center Seafloor Mapping Group (Julie Bernier, Kyle Kelso, Jake Fredericks, and Max Tuten), and Jeff Collier, Mayor of the town of Dauphin Island for their assistance. Reviews by USGS scientists Soupy Dalyander and Kathryn Smith and edits by Betsy Boynton and Marilyn Billone greatly improved this report.

Contents

Figures

Tables

Conversion Factors

International System of Units to U.S. customary units

Multiply	By	To obtain
	Length	
micron (um)	0.001	millimeter (mm)
centimeter (cm)	0.394	inch (in.)
meter (m)	3.281	foot (ft)
meter (m)	1.094	yard (yd)
kilometer (km)	0.621	mile (mi)
kilometer (km)	0.540	mile, nautical (nmi)
	Area	
square kilometer (km^2)	247.1	acre
square kilometer (km^2)	0.386	square mile (mi^2)
	Volume	
cubic meter (m^3)	1.31	cubic yard (yd^3)
cubic meter (m^3)	35.31	cubic foot (ft^3)
	Flow rate	
cubic meter per year (m^3/yr)	0.000811	acre−foot per year (acre−ft/yr)

Datum

Vertical coordinate information is referenced to the North American Vertical Datum of 1988 (NAVD 88, GEOID12A), and converted to MLLW for analysis purposes. Units of all vertical measurements are in meters.

Horizontal coordinate information is referenced in the geographic coordinates World Geodetic System of 1984 (WGS 84); however, data were projected into Universal Transverse Mercator (UTM) coordinate system for analysis purposes.

Abbreviations

DEM	digital elevation model
DGPS	Differential Global Positioning System
GMT	Generic Mapping Tools
GPS	Global Positioning System
Lidar	light and detection and ranging
MLLW	mean lower low water
NAVD	North American Vertical Datum
USGS	U.S. Geological Survey
UTM	Universal Transverse Mercator
WGS	World Geodetic System

Analysis of seafloor change around Dauphin Island, Alabama, 1987–2015

By James G. Flocks, Nancy T. DeWitt, and Chelsea A. Stalk

Introduction

Dauphin Island is a 26 km-long barrier island located southwest of Mobile Bay, Alabama, in the north-central Gulf of Mexico (fig. 1). The island contains sandy beaches, dunes, maritime forests, freshwater ponds and intertidal wetlands, providing habitat for many endangered and threatened species. Dauphin Island also provides protection for and maintains estuarine conditions within Mississippi Sound, supporting oyster habitat and seagrasses. Wetland marshes along the Alabama mainland are protected by the island from wave-induced erosion during storms approaching from the Gulf of Mexico. Over the years, the island has been eroded by storms, most recently by Hurricane Ivan (2004) and Hurricane Katrina (2005) (Ivan/Katrina), which breached the island along its narrowest extent and caused damage to infrastructure (fig. 2). Along with storms producing significant episodic change, long-term beach erosion has exposed numerous pine tree stumps in the shoreface. The stumps are remnants of past maritime forests and reflect the consistent landward retreat of the island (Parker and others, 1997).

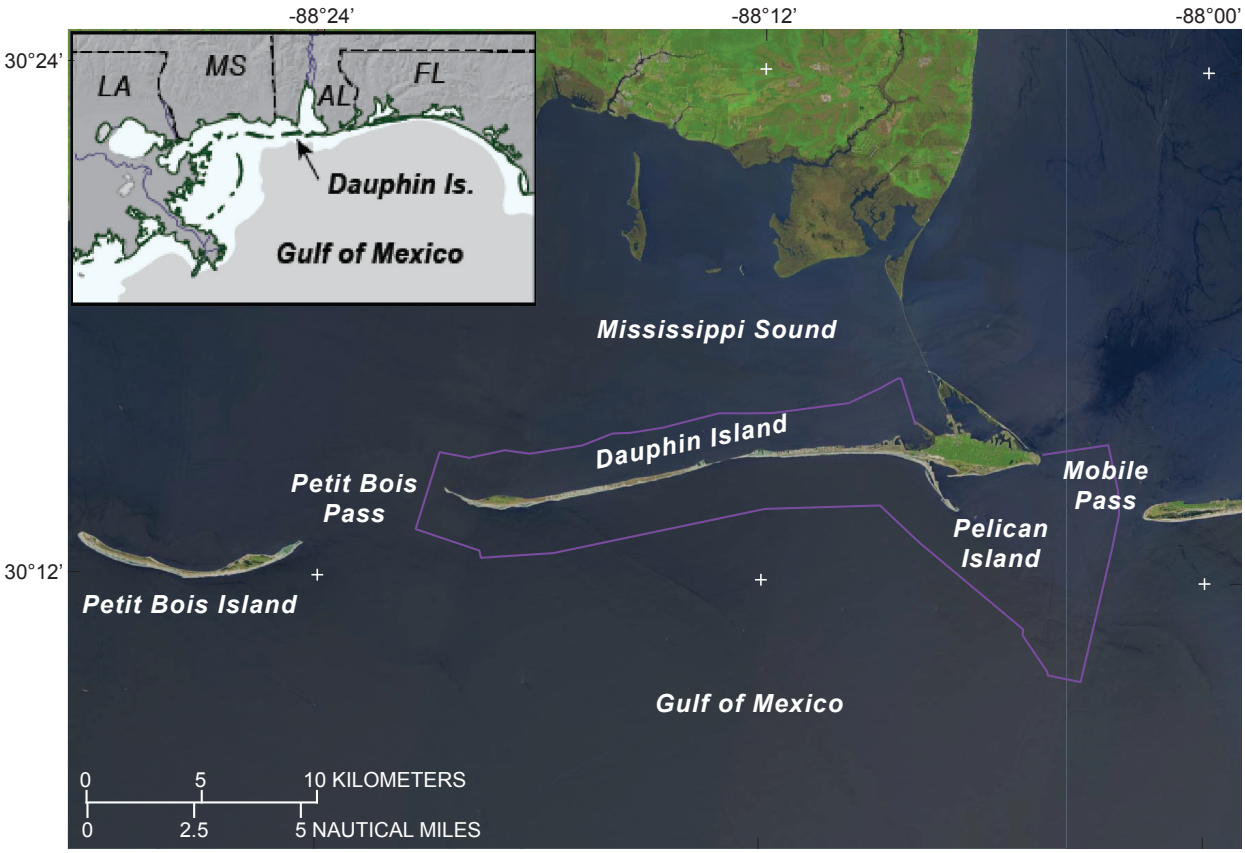


Figure 1. Maps showing the regional location of Dauphin Island (inset), and key features discussed in this study. The polygon (outlined in purple) represents the extent of the 2015 bathymetric survey. The background satellite image is from the 2014 U.S. Geological Survey Landsat 8.

Figure 2. Extensive shoreline erosion, overwash, breaching, and damage to the infrastructure at Dauphin Island during Hurricane Katrina in 2005. The view is of the central portion of the island looking west. The image was taken August 31, 2005, U.S. Geological Survey post-storm aerial oblique photography (https://coastal.er.usgs.gov/hurricanes/katrina/post-storm-photos/obliquephotos.html).

Island change has prompted the State of Alabama to evaluate restoration alternatives to increase island resilience and sustainability by protecting and preserving the natural habitat, and by understanding the processes that influence shoreline change. Under a grant from the National Fish and Wildlife Foundation (NFWF), restoration alternatives are being developed that will allow the State to make decisions on engineering and ecological restoration designs based on scientific analysis of likely outcomes and tradeoffs between impacts to stakeholder interests. Science-based assessment of the coastal zone requires accurate and up-to-date baseline data to provide a valid image of present conditions and to support modeling of coastal processes. Bathymetric elevation measurements are essential to this requirement. In August 2015, the U.S. Army Corps of Engineers (USACE) and the U.S. Geological Survey (USGS) conducted single beam and multibeam bathymetric surveys around Dauphin Island using a variety of shallow draft vessels and equipment. More than 95 square kilometers (km^2) of seafloor was imaged. The data were integrated into a seamless digital elevation model (DEM) to provide a high-resolution bathymetric map of the seafloor (fig. 3) extending 9.5 km seaward from the island's eastern end and approximately 2 km along the rest of the island on the gulf and sound sides. Water depths range from 0.3–15.0 meters (m), with depths greater than 10.0 m constrained to the Mobile ship channel on the extreme eastern flank of the coverage.

To measure seafloor change, two periods of historic hydrographic survey data were acquired from the National Oceanic and Atmospheric Administration (NOAA) National Centers for Environmental Information data archive. The two timeframes (1987–1988 and 2005–2007) were selected for their

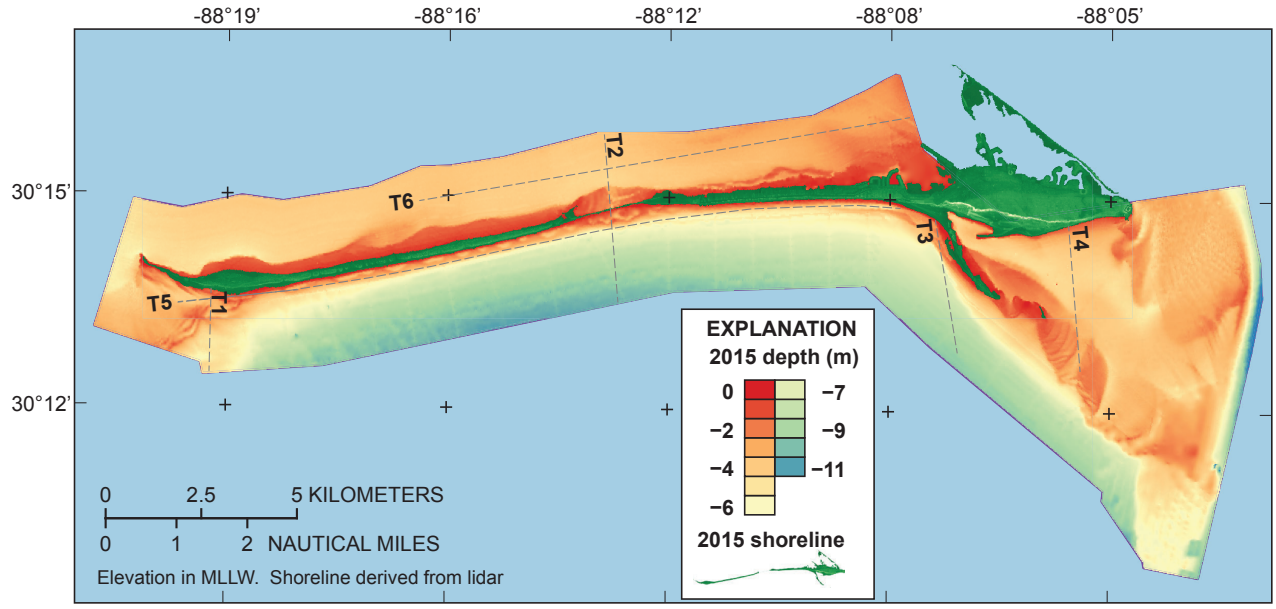


Figure 3. Digital elevation model (DEM) generated from 2015 bathymetric data. Overlain on the DEM are transect locations (T1–T6) used to represent vertical change over time.

completeness of spatial coverage and because they encompass a period of significant storm impacts to the island. These timeframes were compared to each other and with the 2015 dataset to monitor elevation gain (sediment accretion) and elevation loss (sediment erosion) over time. Sediment dynamics is by far the most significant driver of nearshore elevation change in this area. The Mississippi-Alabama inner shelf is a passive margin (Flocks and others, 2011), and other influences on elevation change (for example tectonic adjustment, Holocene subsidence, and eustatic sea-level rise) are neither significant nor variable enough over this time period to have an imprint.

Description of Study Area

Dauphin Island is typically characterized in east and west segments based on geomorphology (fig. 3). The eastern quarter of the island is up to 2 km wide with elevations that exceed 8 m. This part of the island rests on a core of hardened Pleistocene barrier ridge-deposits that became the locus of sediment deposition at the beginning of island evolution (Otvos and Giardino, 2004). In contrast, the western three quarters of the island is narrow (< 500 m) and consists of low-elevation (<4-m) sandy dunes that are subject to frequent overwash and breaching (fig. 2). In the submerged environment, seaward of the eastern end of the island is the highly dynamic Mobile Bay ebb-tidal delta, which extends approximately 10 km seaward of the island (fig. 3). On the western flank of the delta is a region of shoals and ephemeral islands that reflect the net westward transport of sand along the periphery of the ebb-tidal delta shield, driven by a prevailing southeast wave approach and tidal-flow dynamics (Byrnes and others, 2008). Pelican Island (fig. 1), also referred to as Sand Island, is a shoal that has been migrating toward and appending to Dauphin Island over the past century. (It is presently appended to Dauphin Island, adjacent to transect T3 in fig. 3.) West of these features, along the length of the island, the shoreface and inner shelf are comparatively featureless, with a gentle (0.6 degree) seaward slope. This morphology is consistent with most of the Mississippi-Alabama inner shelf at water depths less than 20 m (Flocks and others, 2011).

The western end of the island terminates at the Petit Bois Pass (fig. 1) and its ebb-tidal delta. The pass formed as a breach in the island during an unnamed hurricane in the mid-18th century (Otvos and Carter, 2013), separating Petit Bois Island from Dauphin Island (fig. 1). Since this breach, Petit Bois Island has been migrating westward, widening the pass and expanding the ebb-tidal delta deposits seaward (Flocks and others, 2015). As with the inlet at the eastern end of island, tidal dynamics control sediment transport processes within the Petit Bois Pass.

The sound side of Dauphin Island is composed of a narrow (~ 0.5 km) island platform less than 2 m deep that slopes into Mississippi Sound (fig. 3). Water depth within the sound ranges from 2.5 to 4.5 m. The Intracoastal Waterway Ship Channel passes through the sound just beyond the 2015 bathymetric coverage and is not included in this investigation. Flood-tide delta and storm overwash deposits are visible in the bathymetry at the aforementioned breach in the central part of the island (fig. 3). The breach occurred during Hurricane Ivan (2004) and was significantly widened by Hurricane Katrina the following year (fig. 2). In 2011 a rock structure was added to close the breach and, subsequently, longshore transport has begun to build out a beach in front of the structure.

Historical wave climate measured from a buoy approximately 54 km southeast of Dauphin Island (NOAA National Data Buoy Center Station 42012) indicates a predominantly southeast wave approach (Flocks and others, 2015), directing sediment transport from east to west along the island shoreface. Over the past half century, Byrnes and others (2008) estimated that approximately 4.6×10^4 cubic meters per year (m^3/yr) of sediment was transported from the Mobile ebb-tidal delta west to Dauphin Island. Over the same time period, 2.4×10^5 m^3/yr of sediment was eroded from the middle and western portion of the island (Byrnes and others, 2008). This suggests that five times the amount of sediment is eroded from the island shoreface than is delivered each year. Steady longshore sediment-transport rates and volumes are punctuated by storm impacts which rapidly erode sand from the beach and shoreface. Since 1987, 14 named storms with tropical storm strength or greater passed within 185 km (100 nautical miles) of Dauphin Island (table 1). Storm surges up to 3 m (Hurricane Ivan) caused shoreface erosion, island overwash, and breaching. Since Hurricane Katrina in 2005, only two storms have passed within 185 km of the islands (table 1), in general reflecting a period of low storm activity in the northern Gulf of Mexico in general.

Methods

A bathymetric survey was conducted in 2015 using a suite of acoustic systems and platforms; tracklines of coverage are shown in figure 4. In July 2015, the USGS collected single-beam bathymetry in the shallow waters around the island. For a complete description of the methodology used to collect these data see DeWitt and others (2017). Shallow draft vessels, including personal watercraft equipped with single-beam acoustic systems and Digital Global Positioning System (DGPS), were used to access these areas. Positioning was corrected using DGPS base stations installed over geodetic benchmarks located on the island. Variable sound velocity within the water column was corrected using periodic casts of portable sound-velocity profilers. Boat heave, pitch, and roll were compensated using an internal motion reference system, whereas the personal water craft used a very high GPS sampling rate (0.1 second) and a narrow (4 degree) transducer beam angle to compensate for motion.

In September 2015, the USACE Engineer Research and Development Center completed multibeam surveys in deeper water (up to 6-m water depth) around the Petit Bois Pass and sound-side of the island using a similar methodology (William Butler, oral comm.), while a joint USACE/USGS survey occupied the deeper waters on the gulf side of the island using the USACE survey vessel *Irvington* equipped with a multibeam system. These data, along with 2015 lidar elevations of the shoreline acquired by the USGS, were integrated to generate a DEM of the coastal zone (fig. 3).

Table 1. Tropical storms passing within 185 km (100 nm) of Dauphin Island since 1987, with major impacts highlighted. Dashed line separates the 1987–2006 and 2006–2015 time periods. Storm data extracted from the National Oceanic and Atmospheric Administration Historical Hurricane Track Tools v. 4.0 (https://coast.noaa.gov/hurricanes/).

[KM: kilometers; MB: millibars; KTS: knots; M: meters]

Name	Date	Closest distance KM	Category	Central pressure MB	Central wind speed KTS	Wind speed at Dauphin KTS	Surge at Dauphin M*
Ida	Nov 2009	8	TS	998	45	30	0.8
Claudette	Aug 2009	166	TS	1005	40	23	-
Katrina	Aug 2005	136	H3	925	107	66	2.1
Dennis	Jul 2005	135	H3	942	110	44	0.9
Cindy	Jul 2005	26	TS	995	45	44	-
Arlene	Jun 2005	74	TS	991	50	34	0.8
Ivan	Sep 2004	34	H3	946	105	79	2.9
Hanna	Sep 2002	35	TS	1003	50	36	1.1
Georges	Sep 1998	57	H2	964	90	37	1.6
Earl	Sep 1998	176	H2	988	85	45	0.3
Danny	Jul 1997	15	H1	984	70	63	1.8
Opal	Oct 1995	98	H3	940	105	53	0.8
Erin	Aug 1995	110	H2	973	85	36	-
Alberto	Jul 1994	154	TS	993	55	21	-

*Negligible or unknown surge marked as (-).

All of the bathymetric data was processed in the World Geodetic System (WGS84) with elevation control in the North American Vertical Datum NAVD88 (GEOID12A), and converted to Universal Transverse Mercator (UTM) zone 16 and mean lower low water (MLLW) for comparison with legacy bathymetric datasets. The merged DEM extends landward to include the shoreline, a zero-meter elevation contour extracted from a 2015 USGS topographic-lidar survey of Dauphin Island. Once the various datasets were merged, a 5-m running mean was applied across the data to avoid aliasing short wavelengths. The blockmean function in the Generic Mapping Tools (GMT, ver. 5) suite of data manipulation tools was used for this process. The resulting data file was then gridded to 50-m grid cells using the GMT surface algorithm with a search radius of 200 m to initialize the grid and a tension filter of 0.03 to suppress spurious oscillations. A grid mask generated from a polygon digitized around the survey area was applied to the resulting grid to exclude areas of no data using the GMT grdmask and grdmath functions (fig. 4, extent of analysis). The root-mean-square (RMS) error for the grid relative to the soundings across acquisition platforms averaged 0.022 m.

To monitor seafloor change over time, trackline data points from the 1987–1988 and 2005–2007 time periods were downloaded from the NOAA National Centers for Environmental Information website (https://maps.ngdc.noaa.gov/viewers/bathymetry/). Data coverages and identification numbers for these time periods are shown in figures 5 and 6. The data were converted from WGS84 to UTM zone 16 (meters) for volume estimations. Dauphin Island shorelines for 1987 and 2006 were digitized from Landsat satellite imagery (Guy, 2015), assigned a zero elevation, and merged with the bathymetric data. As with the recent dataset, a 5-m running mean was applied to each data merge, which were then gridded using the GMT surface algorithm at the same range and grid spacing as the 2015 DEM. The resulting DEMs are shown in figures 7 and 8. The RMS error comparing the DEM to original data

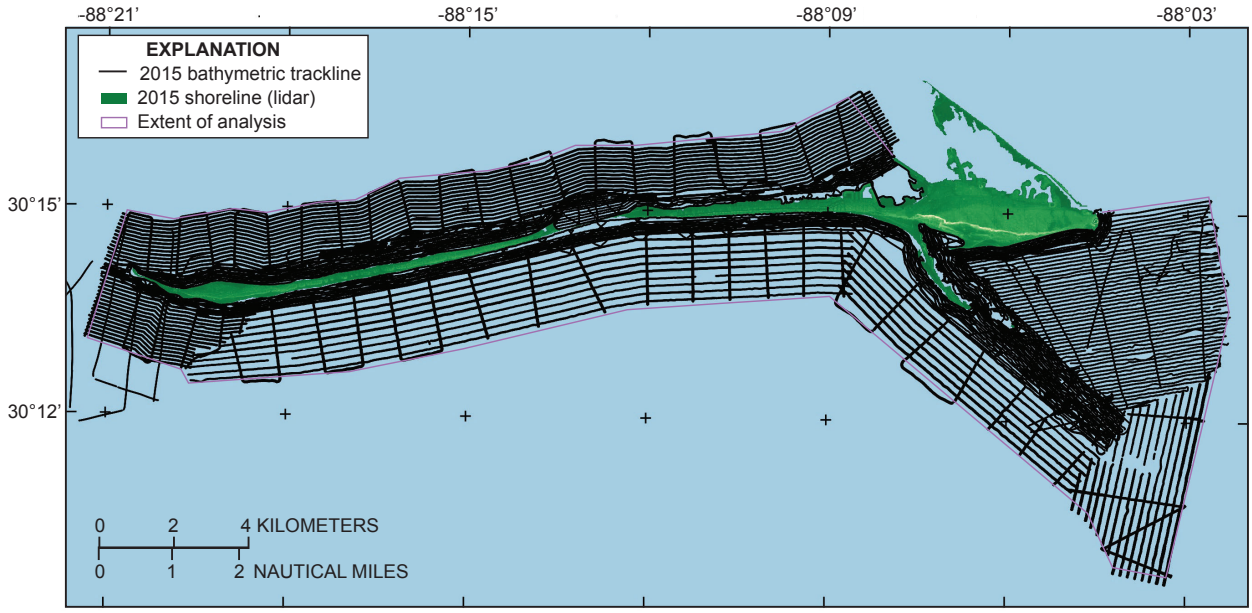


Figure 4. Trackline map showing survey extent and coverage of single beam and multibeam systems collected in July and September, 2015.

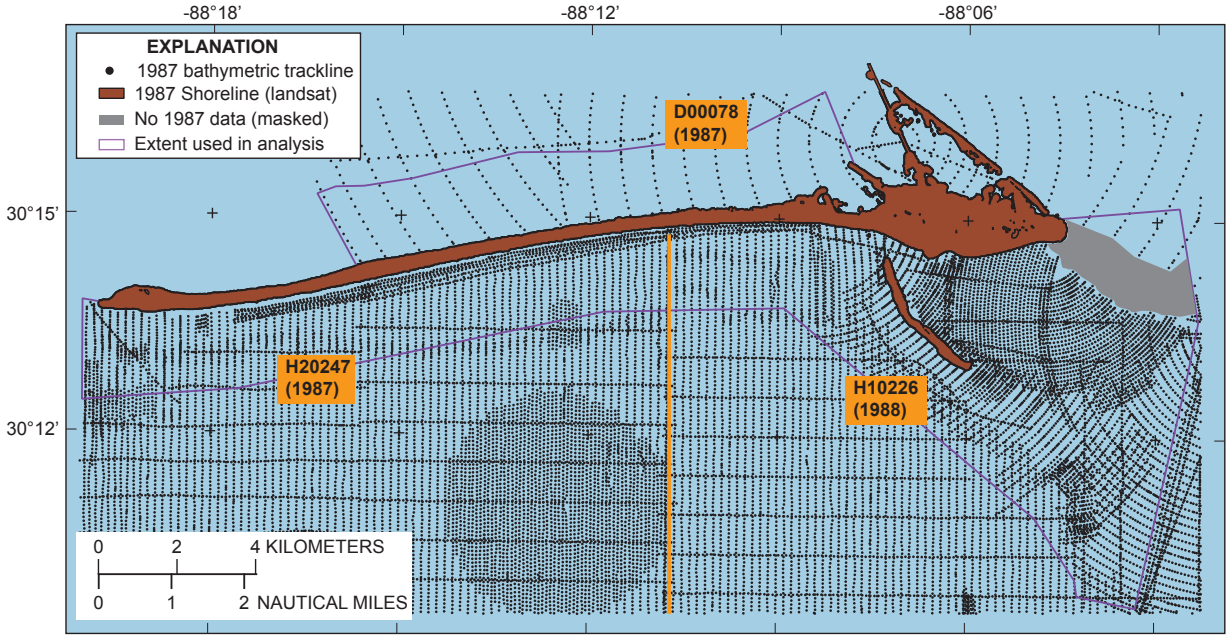


Figure 5. Trackline map showing survey extent, coverage, and survey identification from 1987–1988. National Oceanic and Atmospheric Administration hydrographic survey data (https://maps.ngdc.noaa.gov/viewers/bathymetry/).

is 0.098 m and 0.080 m for the 1987 and 2006 grids, respectively. Areas where bathymetric data were missing from the legacy datasets were masked and assigned NULL values in their respective DEMs. The DEMs were clipped to the extent of the 2015 survey, and certain areas of the legacy grids were masked because of insufficient or no data (gray background in figs. 5 and 6). Once the three DEMs were sampled to the same geographic extents and vertical datum (MLLW), the bathymetric change between each period was determined by subtracting the older period from the more recent period using the

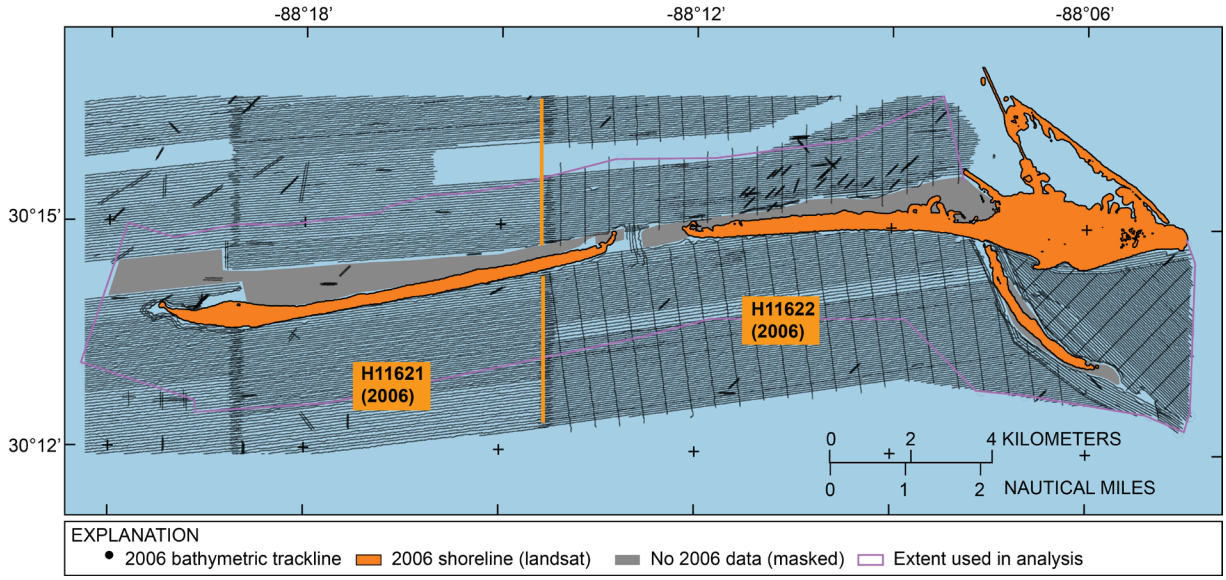


Figure 6. Trackline map showing survey extent, coverage, and survey identification from 2006. National Oceanic and Atmospheric Administration hydrographic survey data (https://maps.ngdc.noaa.gov/viewers/bathymetry/).

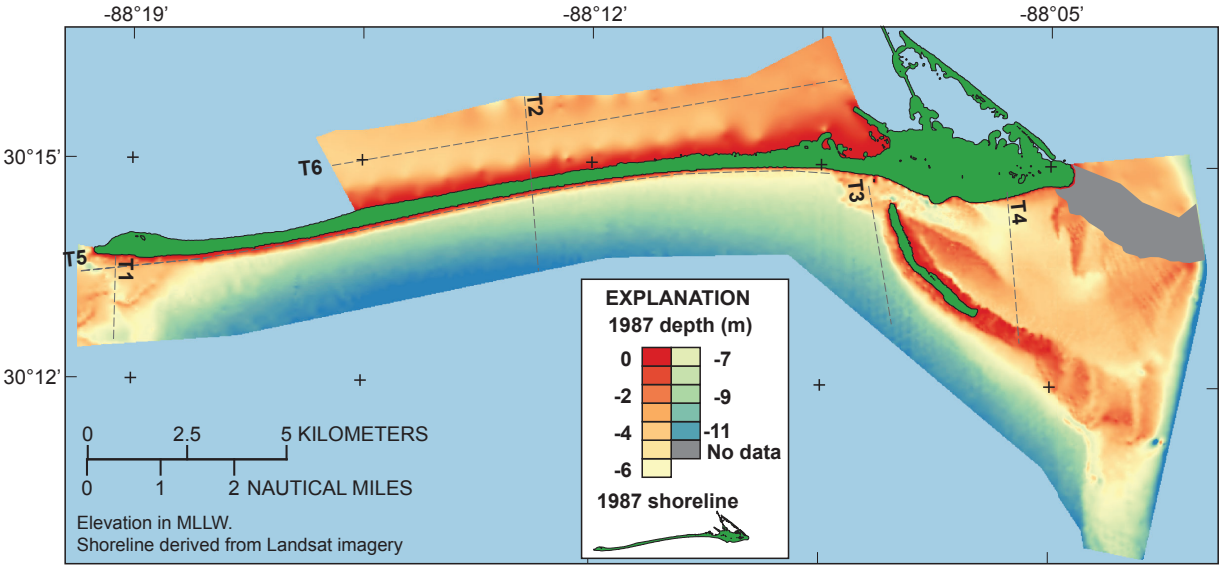


Figure 7. Digital elevation model (DEM) generated from the National Oceanic and Atmospheric Administration 1987−1988 bathymetric data. Overlain on the DEM are transect locations (T1–T6) used to represent vertical change over time.

grdmath function in GMT. This calculation provides an isopach grid of erosion (negative values) and accretion (positive values). To account for measurement uncertainty, isopach differences between –0.25 m and +0.25 m were considered within the error of analysis and set to zero (no change). The resulting time periods (2015–1987, 2006–1987, and 2015–2006) with erosion/accretion isopach maps are shown in figures 9–11. Bathymetric change between time periods can also be directly compared along two-dimensional transects (transects T1–T6 shown in figs. 3, 7, and 8) across the DEMs with stacked results in profile to show relative elevations. These profiles were restricted to the areas of common coverage across time periods and were extracted from the DEMs using the transit plug-in included with the QGIS GIS (ver. 2.18) software.

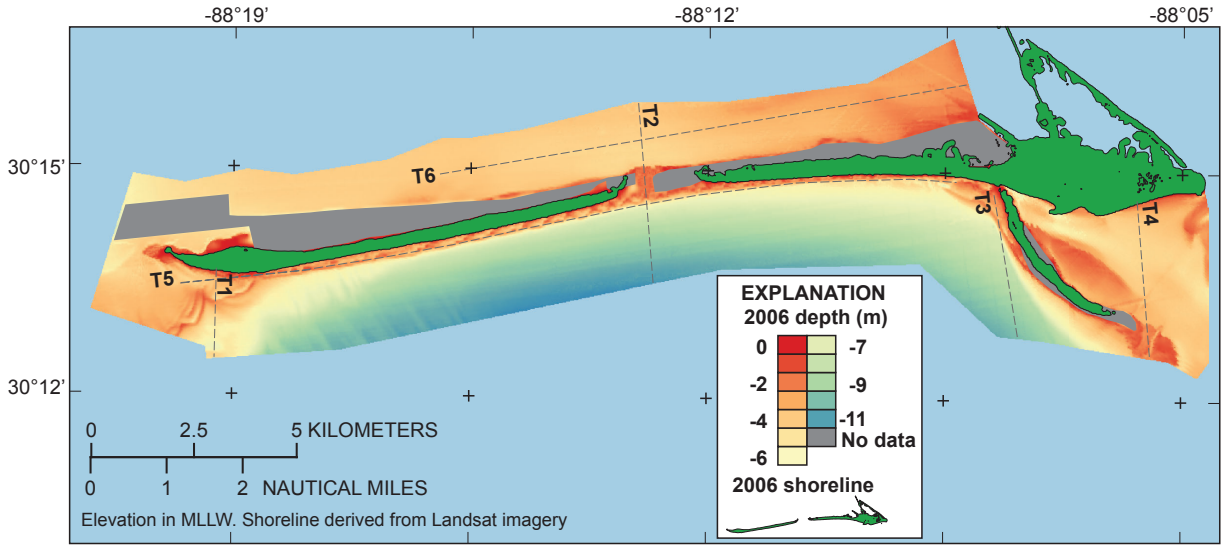


Figure 8. Digital elevation model (DEM) generated from the National Oceanic and Atmospheric Administration 2006 bathymetric data. Overlain on the DEM are transect locations (T1–T6) used to represent vertical change over time.

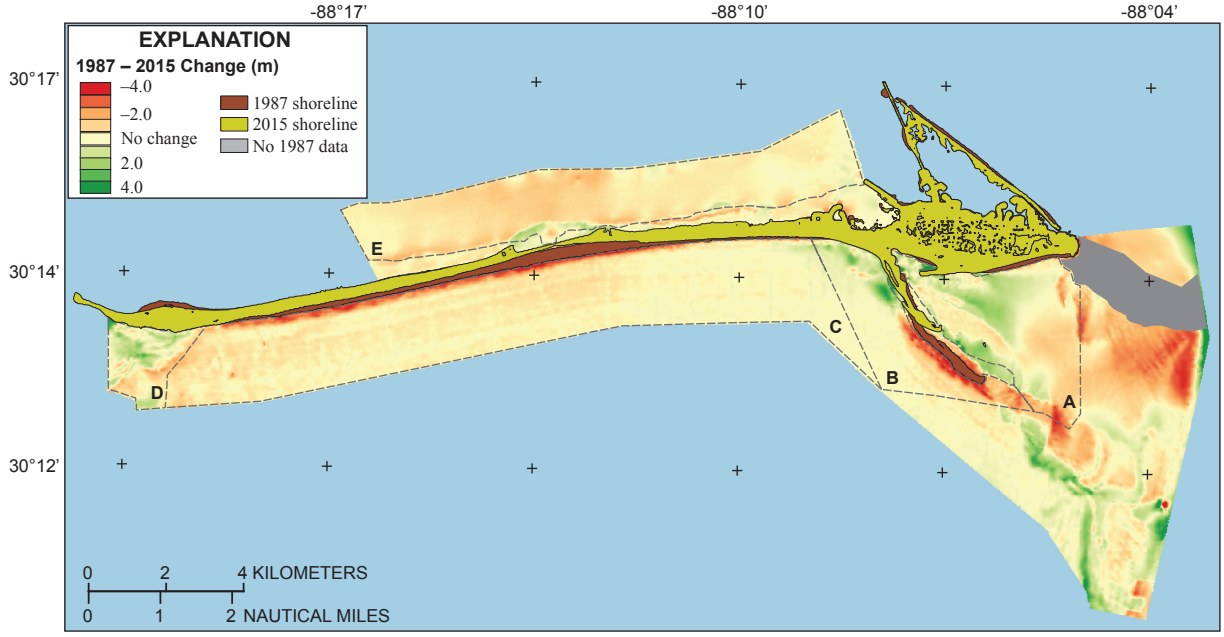


Figure 9. Map showing multidecadal elevation change determined by calculating the difference in digital elevation models (DEMs) between 1987 and 2015. The change is considered to represent accretion (positive change) and erosion (negative change) over the time period. Elevation differences within ±0.25 meter (m) are considered no change. Overlain onto the DEM are polygons (labeled A–E) that represent morphological cells from which volume change statistics are calculated (table 2).

Area and volume change between the time periods was determined using the grdvolume function in GMT, which calculates area, volume, and volume per unit area for a provided polygon within a DEM. The polygons delineate areas of interest within the study area such as geomorphic features. For this analysis, the Mobile Bay ebb-tidal shoal (A), the Pelican Island shoreface (B), the Dauphin Island gulf shoreface (C), the Petit Bois Pass tidal shoal (D), and the Dauphin Island/Mississippi Sound (E) (figs. 9–11) were selected as important geomorphic features to compare for relative change around the

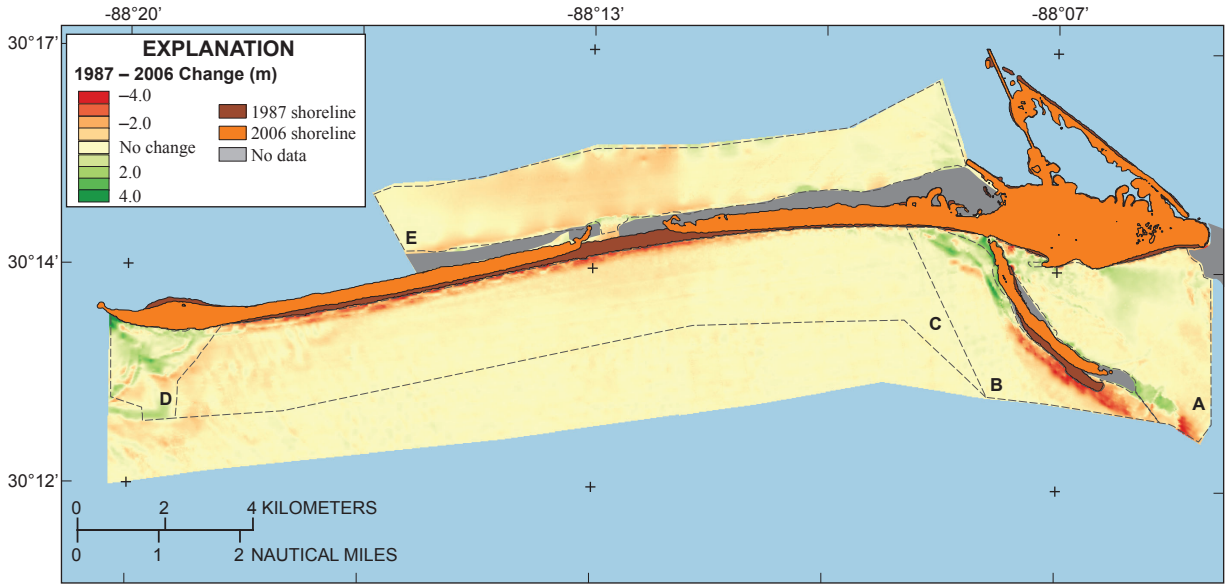


Figure 10. Map showing 19-year elevation change determined by calculating the difference in digital elevation models (DEMs) between 1987 and 2006, referred to as the stormy period. The change is considered to represent accretion (positive change) and erosion (negative change) over the time period. Elevation differences within ±0.25 meter (m) are considered no change. Overlain onto the DEM are polygons (labeled A–E) that represent morphological cells from which volume change statistics are calculated (table 2).

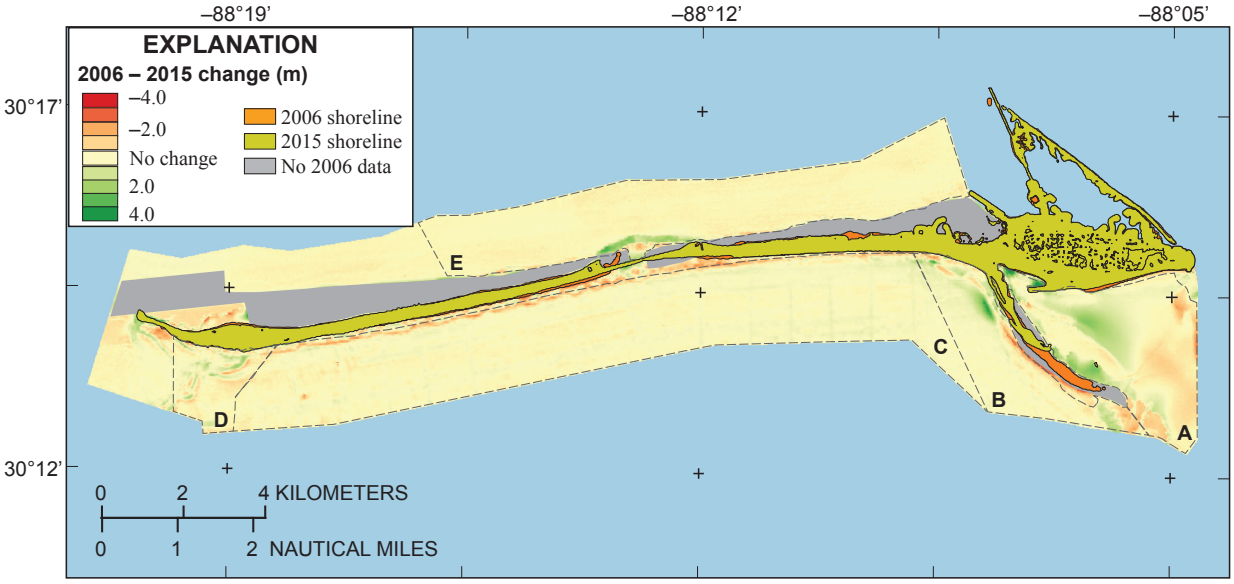


Figure 11. Map showing 9-year elevation change determined by calculating the difference in digital elevation models (DEMs) between 2006 and 2015, referred to as the non-stormy period. The change is considered to represent accretion (positive change) and erosion (negative change) over the time period. Elevation differences within ±0.25 meter (m) are considered no change. Overlain onto the DEM are polygons (labeled A–E) that represent morphological cells from which volume change statistics are calculated (table 2).

island. For effective volumetric change comparisons, only areas that contain bathymetric coverage for all three time periods were considered. The areas encompassed by the polygons are referred to as reference subsections of their respective feature.

Results and Discussion

Morphologic features seen in the three time periods and referenced in this study include the highly dynamic Mobile and Petit Bois Pass ebb-tidal deltas and Pelican Island. In contrast, the Gulf of Mexico and Mississippi Sound sides of Dauphin Island contain few morphologic features, with the gulf side seafloor sloping gently seaward and the sound side being relatively flat. Other features include the breach in the island and associated overwash deposits that are visible in the 2006 DEM (fig. 7). Storm breaching has occurred in the same general vicinity in the past (Byrnes and others, 2010), reflecting the vulnerability of narrow island width and low elevations to storm inundation.

The three time periods (1987–2015; 1987–2006; and 2006–2015) represent multi-decadal change, impact of Hurricanes Ivan/Katrina, and recovery following Hurricanes Ivan/Katrina, respectively, and will be discussed in the context of these periods and events. It should be noted that other significant storms impacted the island during the early (1987–2006) time period, such as Hurricane Danny (1997), and Hurricane Georges (1998); however, since 2006, there has been relatively few significant storm impacts to the island (table 1). Thus, the early (1987–2006) and late (2006–2015) timeframes can be considered "stormy" and "non-stormy", respectively. In the 20 years before 1987, only four tropical storms passed within 185 km (100 nm) of Dauphin Island (one of which, Hurricane Frederic, passed directly over the island as a category 4 storm). Relative to this prior two-decade period of 4 storms, the 1987–2006 timeframe (12 storms in two decades) can be considered exceptionally stormy.

The five areas of analysis (reference subsections A–E), where all three time periods contain seafloor measurements, are shown as polygons for each time period in figures 9–11. From these subsections sediment volumes were calculated and compared to assess volumetric change over time (table 2). Finally, six two-dimensional shore-perpendicular transects at various locations are compared over the three time periods to evaluate vertical change (locations shown in figs. 3, 7, and 8). The profiles will be discussed following the results of the volumetric change assessment.

Long-Term Change (1987–2015)

Over the three decades from 1987 to the present, barrier island retreat and breaching is evident in the long-term (1987–2015) comparison, as well as the occurrence of the breach in the middle of the island (fig. 9). In general, seafloor elevations around Dauphin Island have declined, with only the Mobile Bay and Petit Bois ebb-tidal delta regions producing net accretions of sediment (table 2). Mobile Bay ebb-tidal delta experienced only a slight net accretion. Sediment volumes increased 2 percent within the reference subsection (A) at a rate of 3.7×10^3 m^3/yr. This rate is relatively negligible when compared to change rates in other areas, suggesting the Mobile ebb-tidal delta cell is in equilibrium. Sediment transported westward to Pelican Island and beyond is replaced by sediment migrating from the eastern lobe of the Mobile ebb-tidal delta, which is separated from the western lobe by the Mobile Outer Bar ship channel. The ebb-tidal delta retains equilibrium despite large volumes of sediment being dredged from the ship channel and removed offshore. Byrnes and others (2008) estimate that between 1990 and 2006, 10.8×10^6 m^3 of sediment had been removed from the ship channel. Some of the historical offshore disposal areas are immediately offshore of the ebb-tidal delta and appear to be supplying sediment back to the western side of the Mobile ebb-tidal delta system (Byrnes and others, 2008).

The gulf-facing shoreface of Pelican Island has experienced the most change in elevation over the long-term time period as the island rapidly migrated landward and appended to Dauphin Island (fig. 9). The reference subsection (B) has lost 49 percent in sediment volume (table 2) as sediment moved out of the zone through shoreface erosion and sediment transport, both along the shoreline of Dauphin Island

Table 2. Accretion and erosion volumes, net change, and rates of change for reference subsections of morphological features/areas of submerged areas around Dauphin Island. (Areas are shown for each time period as lettered polygons in figures 9–11.)

[m^3 cubic meter; m^3/yr, cubic meter per year; GOM, Gulf of Mexico; MS, Mississippi Sound; ETD, ebb-tidal delta]

Time period	Interval years	Feature/area	Accretion (10^5 m^3)	Erosion (10^5 m^3)	Change (10^3 m^3)	Rate of change (10^3 m^3/yr)
1987–2015	28	Mobile ETD (A)	50.10	−49.06	103	3.69
		Pelican Is. (B)	21.53	−44.19	−2,266	−80.92
		Dauphin GOM (C)	2.06	−150.53	−14,847	−530.24
		Petit Bois (D)	18.08	−10.16	791	28.26
		Dauphin MS (E)	5.32	−115.64	−11,031	−393.97
1987–2006	19	Mobile ETD (A)	20.05	−23.49	−344	−18.11
		Pelican Is. (B)	14.00	−38.73	−2,473	−130.17
		Dauphin GOM (C)	0.77	−99.31	−9,854	−518.62
		Petit Bois (D)	18.40	−6.78	1,162	61.15
		Dauphin MS (E)	4.92	−71.13	−6,621	−348.47
2006–2015	9	Mobile ETD (A)	37.20	−28.69	851	94.56
		Pelican Is. (B)	14.41	−11.25	315	35.05
		Dauphin GOM (C)	3.92	−31.32	−2,740	−304.45
		Petit Bois (D)	4.53	−7.40	−287	−31.86
		Dauphin MS (E)	8.15	−31.15	−2,300	−255.55

and rollover into the Mobile ebb-tidal delta. As a result, it has experienced the largest loss in volume per unit area (–0.38 m) of any of the cells. The adjacent Dauphin Island cell (C) received sediment transported from Pelican Island, resulting in accretion over the long term on the east edge of the cell (fig. 9). This positive budget is offset by shoreface erosion that increases westward as the long, narrow portion of the island migrated landward from 77 m on the east end to 164 m on the west end between 1987 and 2015. At the position of the 1987 shoreline, 3–4 m of vertical elevation has been lost. The gulf-facing shoreline reference subsection (C) lost about $530x10^3$ m^3/yr (table 2), the highest rate of any cell. Most of this loss occurred along the immediate shoreline, but erosion also occurred offshore across the western half of the island (fig. 9). Much of the sediment eroded from the gulf shoreface of Dauphin Island was transported through littoral transport westward to the island's terminal spit and Petit Bois Pass ebb-tidal delta, which is reflected both by the extension of the island and accretion offshore (fig. 9). From 1987–2015, the volume in the Petit Bois Pass reference subsection (D) increased by 79 percent, or $+28.3x10^3$ m^3/yr, building shoreface shoals up to 5 m high. This influx of sediment has greatly expanded the Petit Bois Pass ebb-tidal delta over the past century through tidal-driven sediment accretion (Flocks and others, 2015).

In Mississippi Sound, the only appreciable gain of sediment in the reference subsection (E) occurred at the breach through storm overwash (fig. 9). This excludes deposition at the immediate shoreline through island migration because the reference subsection, in general, begins 200 m offshore (figs. 9–11; no 2006 data available at the shoreline). The rest of the area (E) uniformly lost 0.4 to 1.0 m in elevation at a rate of $–394x10^3$ m^3/yr. There appears to be some shoreface erosion and subsequent deposition further into the sound, which will be explored further by comparing elevation profiles later in this discussion.

Stormy Period Change (1987–2006)

During the 19-year time period ending in 2006, Dauphin Island was impacted by 12 storms, 4 of which had significant impact on the island (table 1), including the breach. Although the Mobile Bay ebb-tidal delta experienced net accretion over the long term, during this time period a net loss of sediment occurred. Over twice as much sediment was removed from the reference subsection (A) during this time period than was gained long-term (table 2), but at a relatively low rate (-18×10^3 m^3/yr) when compared to other areas around the island. Although removal of sediment from the system during storm impact is a large driver of the loss, approximately 7.0×10^5 m^3/yr of sediment was dredged from the Mobile ship channel during this time period and placed in offshore sites (USACE, 2016), likely reducing the net sediment available to migrate westward into the study area. Accretion of sediment on the western flank of the Mobile cell occurred during rollover of Pelican Island (fig. 10), noting that coverage of this change is likely incomplete given that some of this area was not captured during the 2006 survey.

Between 1987 to 2006, Pelican Island has rotated counterclockwise so that the southern tip has migrated landward approximately 350 m, and the northern tip has moved seaward about 60 m. The island had also accreted approximately 650 m towards Dauphin Island (fig. 10) at the expense of the southern end. This movement has resulted in up to 3.8 m vertical loss in the southern portion of the Pelican Island reference subsection (B) and up to 3 m vertical gain adjacent to Dauphin Island. Net change in the Pelican Island reference subsection over this time period has been a loss of 2.5×10^6 m^3, or -130×10^3 m^3/yr (table 2), as sediment has been removed from the system both through littoral transport and storm impact. Westward, along Dauphin Island, the most dramatic change was the formation of the breach, while the rest of the island experienced 1–3.25-m elevation loss at the shoreface through erosion and landward migration (50 m east end to 95 m west end). The rate of loss (5.2×10^5 m^3/yr) within the reference subsection (C) over this time period is the highest of any time period in any subsection, and is a result of littoral transport westward and wave erosion during storms. In contrast, the Petit Bois Pass ebb-tidal delta reference subsection (D) experienced a sizable gain of 6.1×10^4 m^3/yr over this time period. The amount of accretion and rate of gain, although by far the largest of any cell during any time period (table 2), is only 12 percent of the rate of loss along the adjacent gulf-facing Dauphin shoreline, suggesting episodic storm processes dominated nonstorm littoral transport along the island shoreface.

The Mississippi Sound side of Dauphin Island maintained a very high net loss rate that is very consistent with the long-term loss rate (table 2). Vertical erosion is fairly uniform throughout the subsection, the highest elevation loss (~1 m) occurs 1+ km from the breach (fig. 10). Since the 2006 bathymetric dataset does not capture the shoreface on the sound side, the elevation gain of only a portion of overwash deposit at the breach can be measured and ranges from +0.3 to +1.0 in elevation between 1987 and 2006.

Non-stormy Period Change (2006–2015)

Since 2006, only two tropical storms passed within 184 km of Dauphin Island (table 1), thus normal (for example, non-storm) littoral processes are expected to be the dominant mode of sediment transport over the past decade. The Mobile ebb-tidal delta reference subsection (A) experienced a large amount of accretion during this period and the highest rate of gain of any subsection over any time period. Deposition more than doubled what had been lost over the previous period (table 2). Most of the elevation gain occurred within the northwest part of the subsection and is likely a result of littoral sediment trapping due to the welding of Pelican Island to Dauphin Island (fig. 11). Some rollover of the southern end of Pelican Island, although reduced from the previous (stormy) time period, may also contribute to the sediment surplus.

The Pelican island reference subsection (B), which had significant erosion in the stormy time period, reversed loss and experienced almost an equal amount of accretion at a rate of $+35.1 \times 10^3$ m^3/yr (table 2). The submergence of the southern portion of Pelican Island (fig. 11) likely contributed to sediment deposition within the reference subsection, and storm-induced rollover into the Mobile ebb-tidal delta cell has been reduced. West of where Pelican and Dauphin Islands merged, the remainder of Dauphin Island continued to thin through shoreface erosion, up to 100 m on the western end. Offshore sandbars migrated landward and welded to the shoreface, reducing seafloor elevations by up to 2 m approximately 200 m offshore, and increasing elevations by 1 m at the shoreline. The storm breach at the center of the island was closed by rock during this time period (2011), and there is approximately 2 m of accretion seaward of the structure. As throughout all time periods, the gulf side of Dauphin Island continued to lose sediment, although at almost half the rate of the previous time period (table 2), reflecting reduced storm-related erosion processes acting on the system. Within the Petit Bois Pass ebb-tidal delta, linear areas of erosion adjacent to areas of deposition are consistent with westward shoal migration (fig. 11). The shoals are 100–500 m in length and up to 2 m in height (fig. 3). The terminal spit has accreted 680 m westward from its 2006 position and littoral transport has contributed up to 3.5 m in elevation along the shoreface at the westernmost tip. Although the Petit Bois Pass reference subsection (D) had accreted substantially in the previous time period, during this period the net change was negative, accumulating 25 percent less sediment than was deposited during the prior decade. This suggests that littoral transport of sediment from Dauphin Island to Petit Bois Pass during non-stormy conditions is substantially less than what is liberated and transported during stormy conditions, and not enough to maintain equilibrium at this location without episodic deposition.

Like the gulf side of Dauphin Island, the sound side experienced erosion in all periods of analysis, although substantially less loss occurred during the 2006−2015 period than during the prior period. Rate of erosion in the reference subsection (E), although negative, decreased 65 percent from the stormy period (table 2). Elevation loss across the sound side was generally a uniform 0.2–0.3 m. Prior to the breach being closed in 2011, floodtide deposits through the former inlet increased elevations by 1 m above overwash elevations approximately 300–400 m north of the structure. This is the only area in this cell that shows net accretion (fig. 11). Much of the shoreface on the sound side was not surveyed in 2006, but elevation change analysis from an area at the western tip of the island that was covered suggests erosion occurred all the way to the shoreline.

Elevation Profiles

Six transects (figs. 3, 7, and 8)—four shore perpendicular and two shore parallel—were chosen to compare elevation change across the 1987, 2006, and 2015 time periods. Transect T1 (fig. 12) is shore perpendicular and extends across the eastern margin of the Petit Bois Pass ebb-tidal delta. Sand ridges are visible as peaks in the elevation profiles, and comparison of the profiles over time show the sand ridges growing and migrating landward (fig. 12, location A). Shoreface accretion between 1987 and 2006 is reflected by the seaward migration of the profile, but this elevation gain was lost by 2015 (fig. 12, location B). Offshore, a divergence in the profiles over time represents the growth and movement of the ebb-tidal delta (fig. 12, location C).

Transect T2 (fig. 13) extends from Mississippi Sound south across the breach in the island and into the Gulf of Mexico (see figs. 3, 7, and 8 for location). Persistent erosion is seen in the loss of elevation across both the sound and the gulf (fig. 13, locations A and B), along with shoreface retreat (fig. 13, location B). The offshore and shoreface appear to have stabilized between 2006 and 2015. The island breaching between 1987 and 2006 is clearly evident, as well as the rock structure addition in 2011 (fig. 13, location C).

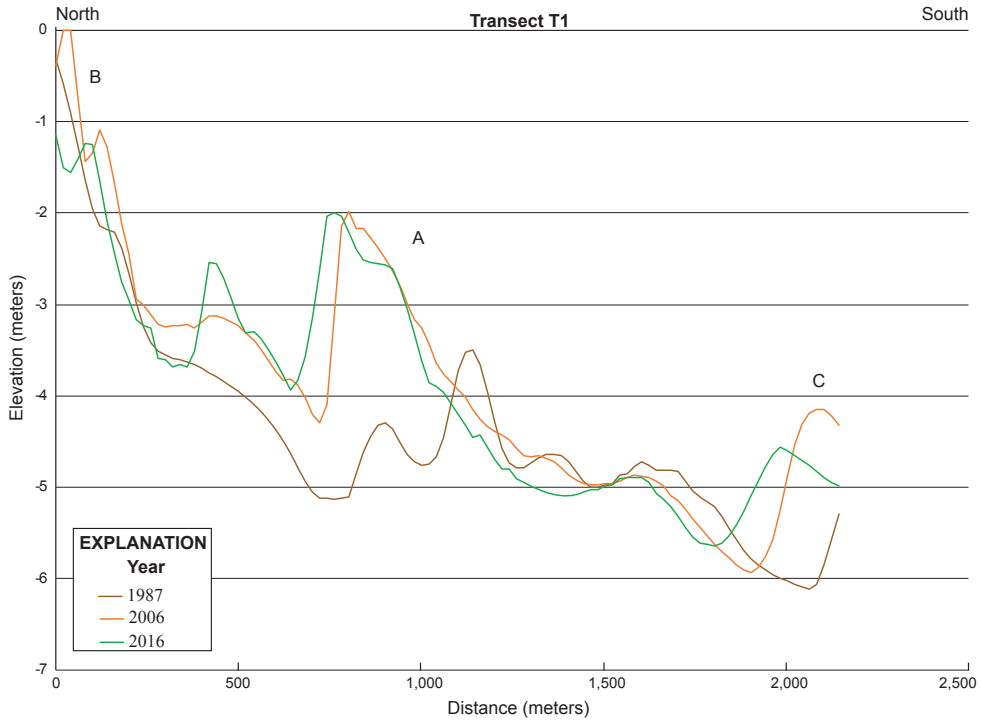


Figure 12. Elevation profiles across the Petit Bois ebb-tidal delta for the three time periods (transect T1, see figs. 3, 7, and 8 for locations). A, B, and C refer to locations discussed in the text. The vertical exaggeration is 250x.

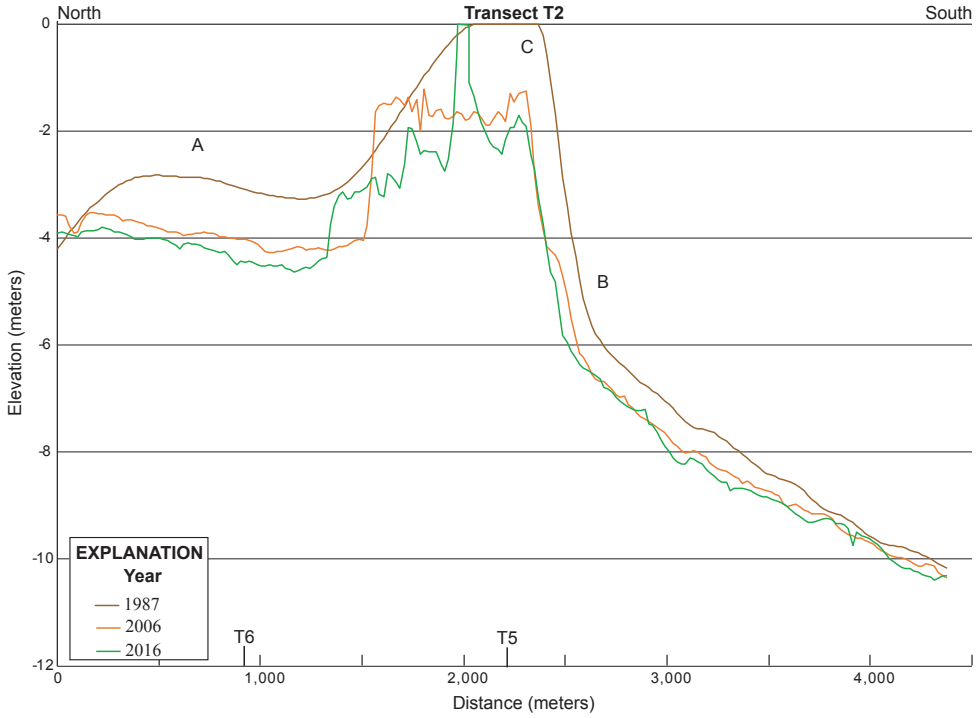


Figure 13. Elevation profiles from Mississippi Sound, across the island breach and into the Gulf of Mexico, for the three time periods (transect T2, see figs. 3, 7, and 8 for locations). Position of crossing transects (T5 and T6) are shown. A, B, and C refer to locations discussed in the text. The vertical exaggeration is 260x.

Transect T3 (fig. 14) extends seaward from the Pelican/Dauphin accretionary wedge offshore (see figs. 3, 7, and 8 for location). Sediment accretion as Pelican Island welded onto Dauphin Island is shown by up to a 3-m increase in elevation since 1987 (fig. 14, location A) and over 3 m accretion up to 1 km offshore. Beyond 1 km, the seafloor has been stable throughout the time periods.

Transect T4 (fig. 15) is shore perpendicular across the Mobile Bay ebb-tidal delta (see figs. 3, 7, and 8 for location) and reflects the dynamic morphology of this deposit. At the Dauphin Island shoreline, shoreface retreat is evident by the landward migrating profiles and loss in elevation, between 1987 and 2015 (fig. 15, location A). Immediately offshore, up to 1 m of sediment has infilled a former tidal channel present in the 1987 profile (fig. 15, location B). Erosion along the transect has occurred from 1 km to 2.7 km, with approximately 0.5-m elevation loss occurring throughout (fig. 15, location C). At the seaward extent of the transect, along the edge of the ebb-tidal delta, landward shoal migration occurred between 1987 and 2006 as Pelican Island moved northward. Since 2006, the shoal has migrated landward of the transect and has been replaced by a small tidal inlet (fig. 15, location D).

Transect T5 (fig. 16) runs shore parallel along the gulf shoreline of Dauphin Island, from the Petit Bois Pass to Pelican Island (see figs. 3, 7, and 8 for locations). High-frequency nearshore sand waves are evident in all three time periods, some over 1 m in height (fig. 16, location A). A significant amount of erosion due to landward migration of the island is evident across four-fifths of the profile, as much as 4 m (fig. 16, location A). At the Petit Bois ebb-tidal delta, sand ridge development since 1987 has occurred, along with the infilling of a tidal channel (fig. 16, location B).

Transect T6 (fig. 17) is a shore-parallel profile across Mississippi Sound (see figs. 3, 7, and 8 for location). In general, the profile records the consistent loss in elevation across the sound since 1987—up to 1.5 m of loss—and the flanks appear to be more stable than the central portion of the profile (fig. 17). No sense of sediment-transport direction can be discerned from the profiles due to lack of data in the earlier datasets at the western end of Dauphin Island.

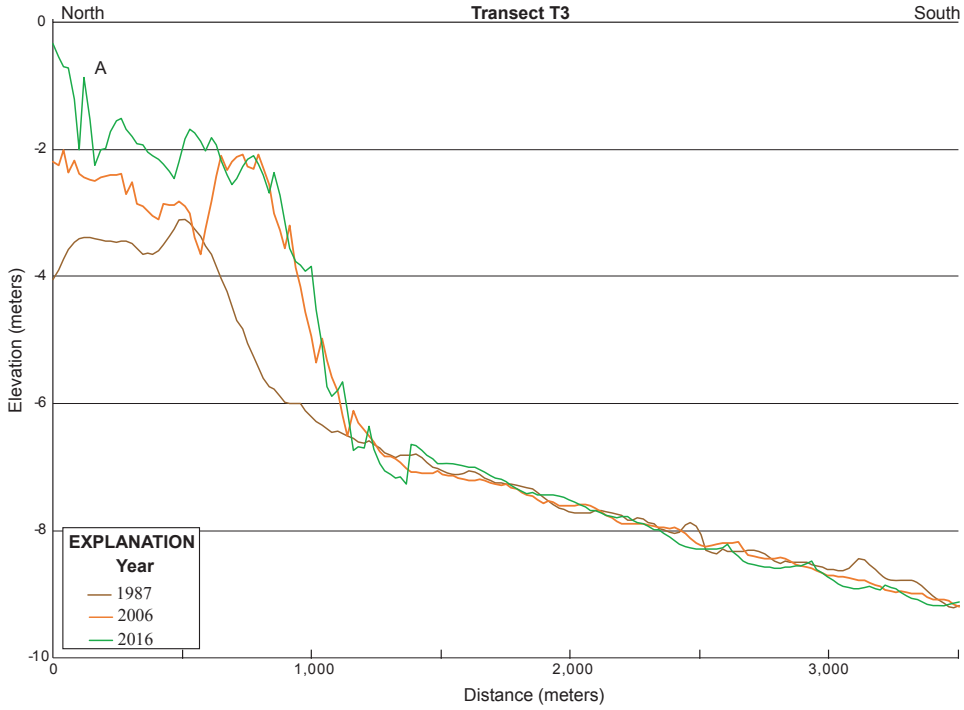


Figure 14. Elevation profiles along the gulf side of Pelican Island for the three time periods (transect T3, see figs. 3, 7, and 8 for locations). A refers to a location discussed in the text. The vertical exaggeration is 240x.

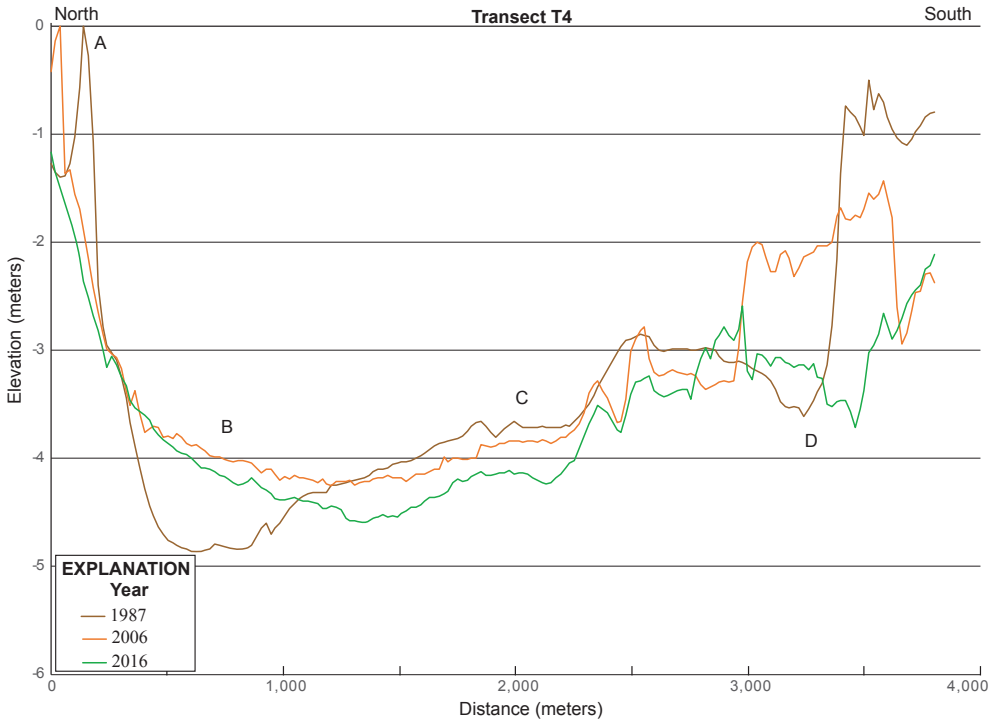


Figure 15. Elevation profiles across the Mobile ebb-tidal delta for the three time periods (transect T4, see figs. 3, 7, and 8 for locations). A, B, C, and D refer to locations discussed in the text. The vertical exaggeration is 460x.

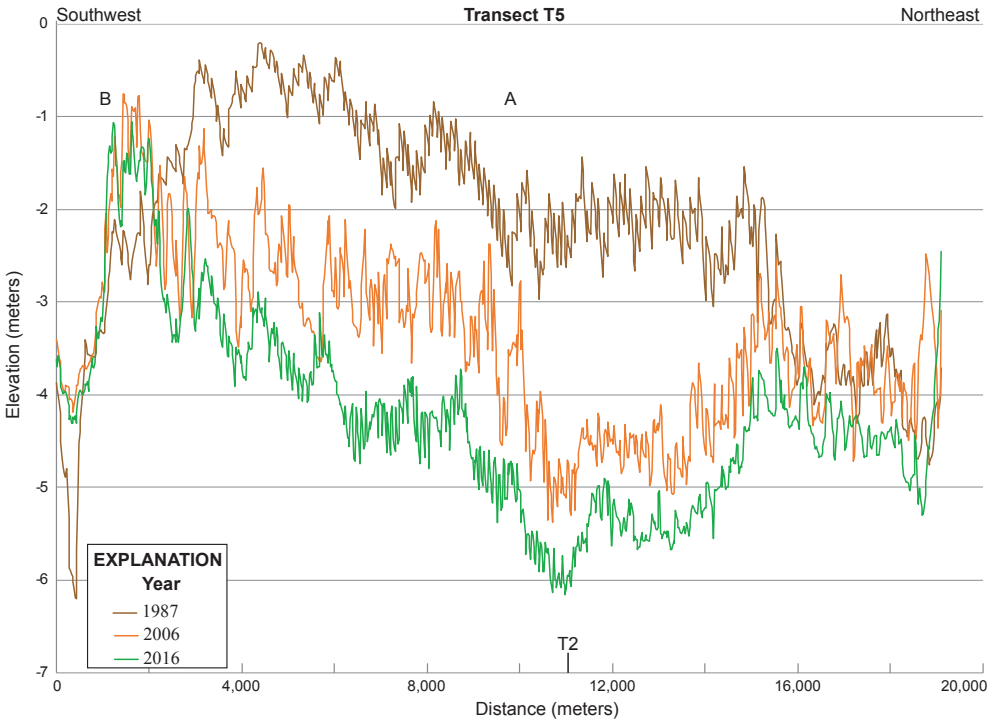


Figure 16. Elevation profiles across the gulf side of Dauphin Island for the three time periods (transect T5, see figs. 3, 7, and 8 for locations). Position of a crossing transect (T2) is shown. A and B refer to locations discussed in the text. The vertical exaggeration is 1980x.

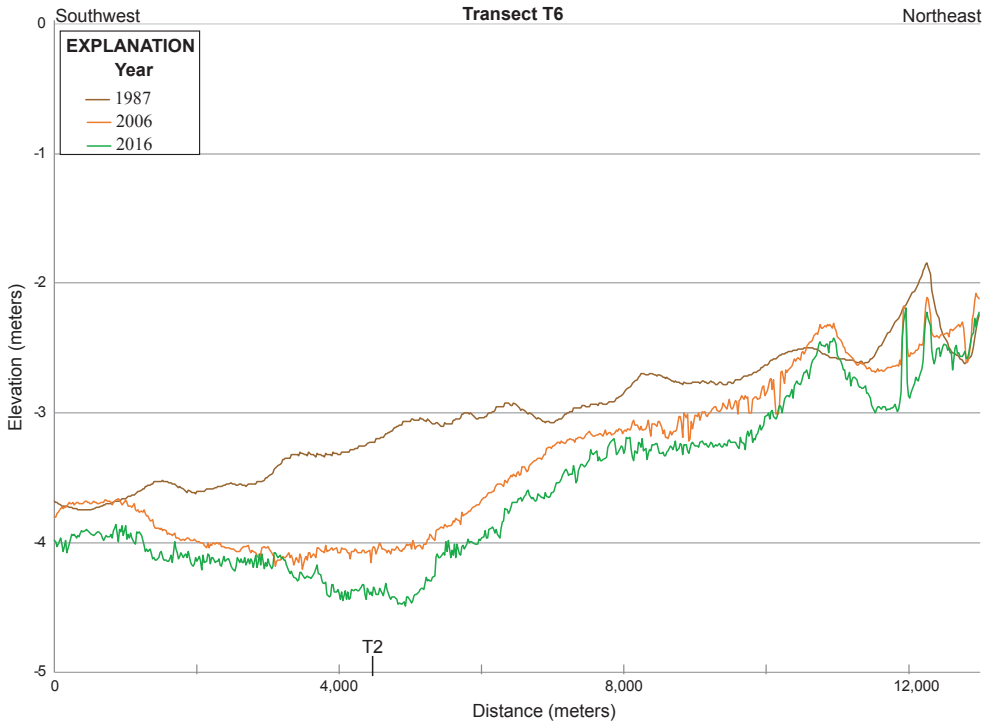


Figure 17. Elevation profiles across the sound side of Dauphin Island for the three time periods (transect T6, see figs. 3, 7, and 8 for locations). The vertical exaggeration is 1830x.

Temporal and Spatial Sediment Flux

Comparing changes in erosion rates over time (fig. 18), over the long term (1987–2015), the ebb-tidal deltas were the only features to either remain in equilibrium (Mobile ebb-tidal delta, A) or accrete (Petit Bois Pass, D). The Gulf of Mexico (C) and Mississippi Sound (E) seafloor lost sediment at relatively high rates, and Pelican Island lost sediment at a relatively low rate. Since 1987, Pelican Island has been migrating landward and rolling over through overwash into the Mobile ebb-tidal delta, producing net loss within the reference subsection (B).

During the stormy period (1987–2006), only the Petit Bois Pass reference subsection (D) experienced a positive sedimentation rate, while all other areas experienced erosion. Loss at the Mobile ebb-tidal delta (A) was relatively small and could be in part due to dredging of the Mobile Outer Bar ship channel and removal of sediment offshore. During the non-stormy period (2006–2015), the gulf (C) and sound (E) sides of Dauphin Island continued to experience overall erosion of the shoreface, at rates 41 percent and 27 percent less, respectively, than during the stormy period (fig. 18). The ebb-tidal deltas flipped their response relative to the earlier period, with the Mobile ebb-tidal delta (A) gaining sediment at a rate higher than its prior loss, and Petit Bois Pass (D) losing sediment at a relatively small rate. The Pelican Island reference subsection (B) response flipped as well, gaining sediment during the non-stormy period. In addition, Pelican Island migrated toward and welded to Dauphin Island. The southern end submerged below water level, releasing sediment to the system. This change, and the reduction in significant storm-wave events that remove sediment from the system or cause the shoal to rollover, could explain the net gain to the Pelican Island cell. By welding onto Dauphin Island, Pelican Island trapped sediment within the Mobile ebb-tidal delta cell, resulting in accretion in the western part of the system during this time period (fig. 11).

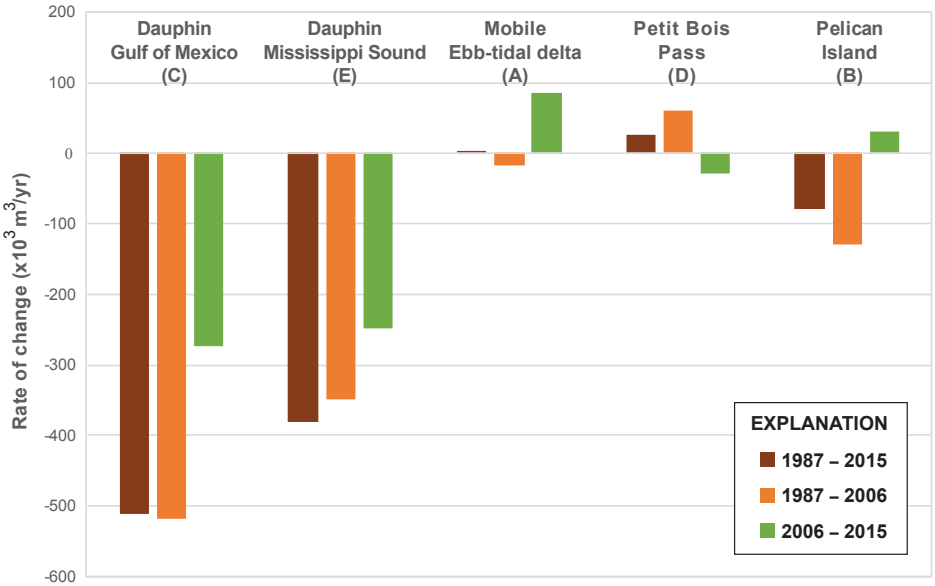


Figure 18. Rates of change (erosion/accretion over time) for the two time periods and long-term (1987–2015) for each reference subsection. See figures 9–11 for locations.

Conclusion

The seafloor around Dauphin Island is spatially and temporally dynamic, with specific areas changing elevation at different rates in response to morphology and oceanographic conditions. In general, the submerged environment can be divided into the following five geomorphologic features: two ebb-tidal deltas (Mobile Pass and Petit Bois Pass) at the inlets on either end of Dauphin Island, Pelican Island/shoal on the western flank of the Mobile ebb-tidal delta, the shoreface of Dauphin Island facing the Gulf of Mexico, and the shoreface of Dauphin Island facing Mississippi Sound. Bathymetric change within these areas was analyzed over two time periods (1987–2006 and 2006–2015) and compared to the long term (1987–2015). The first time interval (1987–2006) corresponds to a period of frequent and intense storm impacts with 12 tropical storms passing near the island, 4 of them severe (table 1). During this time, episodic erosion and rapid transport of the seafloor sediments is expected to be the dominant process affecting elevation. In contrast, only two tropical storms passed by Dauphin Island during the second time interval (2006–2015). During this period, normal east-to-west littoral sediment transport, driven by a prevailing southeast wave climate, is the main process of seafloor change.

The geomorphologic features identified in the study do respond differently over the stormy and non-stormy time periods, which can be quantified through variations in erosion and accretion rates (fig. 18). By far the most erosion, both in volume and persistence, occurs along the central and western shoreface of Dauphin Island, both on the gulf and sound sides, with reduced net erosion occurring during the nonstorm period. The ebb-tidal deltas at either end appear to be in equilibrium relative to the rest of the island. The Mobile Pass ebb-tidal delta (A) appears to be "recovering" from Hurricanes Ivan/Katrina through a net accumulation of sediment since 2006. Some of this accretion can be attributed to the welding of Pelican Island onto Dauphin Island and trapping sediment within the ebb-tidal delta that would otherwise migrate along the shoreface of Dauphin Island though a prevailing westward sediment transport. This prevailing transport supplies sediment to the Petit Bois Pass ebb-tidal delta from the Dauphin Island shoreface. Based on rates and volumes of erosion and accretion at the island shoreface

and at Petit Bois Pass, westward sediment transport appears to be more significant during storm activity than during normal littoral transport. Petit Bois Pass experienced net accretion during the stormy period and net erosion during the non-stormy period, correlating with higher erosion rates at the Dauphin Island shoreface during the stormy versus non-stormy period (fig. 18). This suggests that sediment delivery during normal littoral transport, while occurring, does not maintain (or barely maintains) equilibrium at the Petit Bois Pass. The sound side of Dauphin Island mimics the trend of the gulf side and appears to also be supplying sediment to the Petit Bois Pass ebb-tidal delta through similar processes.

References Cited

Byrnes, M.R., Griffee, S.F., and Osler, M., 2008, Evaluation of channel dredging on shoreline response at and adjacent to Mobile Pass, Alabama: Report prepared for the U.S. Army Corps of Engineers, Mobile District, 199 p., accessed March 17, 2017, at http://www.sam.usace.army.mil/Portals/46/docs/planning_environmental/acf/docs/072108-A-AQ963-014.pdf.

Byrnes, M.R., Griffee, S.F., and Osler, M., 2010, Channel dredging and geomorphic response at and adjacent to Mobile Pass, Alabama: Report prepared for the U.S. Army Corps of Engineers, Mobile District, ERDC/CHL TR-10-8, 311 p.

DeWitt, N.T., Stalk, C.A., Flocks, J.G., Bernier, J.C., Kelso, K.W., Fredericks, J.J., and Tuten, T., 2017, Single-beam bathymetry data collected in 2015 nearshore Dauphin Island, Alabama: U.S. Geological Survey data release, accessed May 30, 2017, at https://doi.org/10.5066/F7BZ648W.

Flocks, J.G., Ferina, N.F., and Kindinger, J., 2011, Recent geologic framework and geomorphology of the Mississippi-Alabama shelf, northern Gulf of Mexico, *in* Buster, N., Holmes, C., eds., Gulf of Mexico; Origins, waters and biota, 3. Geology; Texas A&M University Press, College Station, Tex., p. 475.

Flocks, J.G., Kindinger, J.L., and Kelso, K.W., 2015, Geologic control on the evolution of the inner shelf morphology offshore of the Mississippi barrier islands, northern Gulf of Mexico, USA: Continental Shelf Research, v. 101, p. 59–70.

Guy, K.K., 2015, Barrier island shorelines extracted from Landsat imagery: U.S. Geological Survey Open-File Report 2015–1179, 3 p., accessed March 17, 2017, at https://doi.org/10.3133/ofr20151179.

Otvos, E.G., and Giardino, M.P., 2004, Interlinked barrier chain and delta lobe development, northern Gulf of Mexico: Sedimentary Geology, v. 169, p. 47–73.

Parker, S.J., Davies, D.J., and Smith, W.E., 1997, Geological, economic, and environmental characterization of selected near-term leasable offshore sand deposits and competing onshore sources for beach nourishment: Geological Survey of Alabama Circular 190, 173 p.

U.S. Army Corps of Engineers (USACE), 2016, Dauphin Island Restoration Organization Memorandum for Record, accessed March 17, 2017, at http://www.dauphinislandrestoration.org/gvt/corps/2016-08-23-Corps-mtg-memo-final.pdf.

ISSN 2331-1258 (online)
https://doi.org/10.3133/ofr20171112

From: (b)(6)
To:
Subject: RE: GRR wetlands update for 12/20 meeting
Date: Wednesday, December 20, 2017 8:25:00 AM

Thanks, (b)(6). You enjoy the holidays, too!

-----Original Message-----
From: (b)(6)
Sent: Tuesday, December 19, 2017 1:37 PM
To: (b)(6)
(b)(6)
Subject: GRR wetlands update for 12/20 meeting

(b)(6) and (b)(6),
I'll be out of the office tomorrow (I suspect many will be on leave) so here is the wetlands update.
The model files for salinity data (current condition and with-project) have been converted to shape files and distributed to the aquatic resource teams. We now have the data separated into the appropriate depths (e.g., near surface depths for wetlands; near bottom for benthics) and analysis is ongoing. My understanding is that the with-sea level rise and water quality model runs are ongoing, we have not seen any of that data to date.
Thanks and enjoy the holiday.

(b)(6)

-----Original Message-----
From: (b)(6)
Sent: Monday, December 18, 2017 3:33 PM
To: (b)(6)

(b)(6)

(b)(6)

Cc: (b)(6)

(b)(6)

Subject: Mobile Harbor GRR IPR#3 - Final Meeting Minutes

All: Attached are the final minutes for the Mobile Harbor GRR IPR#3. Will coordinate with vertical team leads soon to set the January date for review of the proposed width and length of the widener.

(b)(6)

-----Original Message-----
From: (b)(6)
Sent: Thursday, December 07, 2017 3:27 PM
To: (b)(6)

(b)(6)

(b)(6)

Cc: (b)(6)

(b)(6)

Subject: Mobile Harbor GRR IPR#3 - Draft Meeting Minutes

All: Attached are the DRAFT Meeting Minutes from the Mobile Harbor GRR IPR#3 held November 28. Please provide comments back to me by COB Wednesday, December 13, 2017.

(b)(6)

-----Original Appointment-----

From: (b)(6)

Sent: Monday, October 16, 2017 1:40 PM

To: (b)(6)

(b)(6)

Cc: (b)(6)

(b)(6)

Subject: Mobile Harbor GRR IPR#3
When: Tuesday, November 28, 2017 1:30 PM-3:00 PM (UTC-06:00) Central Time (US & Canada).
Where: Mobile District Employees, Exec Conference Room

All: Due to a schedule conflict, Mobile Harbor IPR #3 time and date have been revised to Tuesday, November 28 at 1430hrs ET (1330hrs CT).

All,
Please plan on attending an In-Progress Review Meeting for the Mobile Harbor GRR, Thursday, November 30 at 1000hrs ET (0900hrs CT).

Webinar Information is as follows:
Web Meeting Address: (b)(6)
USA Toll-Free: (b)(6)
Access Code: (b)(6)
Security Code: (b)(6)

(b)(6)

From: (b)(6)
To:
Subject: Re: Mobile Harbor GRR Bi-weekly Meeting
Date: Wednesday, December 20, 2017 12:19:41 PM

Thanks (b)(6)! Merry Christmas and Happy new year! I will miss our coffee breaks.

Sent from my BlackBerry 10 smartphone.
Original Message
From: (b)(6)
Sent: Wednesday, December 20, 2017 12:06 PM
To: (b)(6)
(b)(6)
Subject: RE: Mobile Harbor GRR Bi-weekly Meeting

I will be unable to attend the meeting this afternoon and wanted to provide an update for economics. The economic vertical team had an IPR 8 December. The vertical team (b)(5)
(b)(5)
(b)(5) The forecasted tonnage and TEUs have been updated for the analysis and the updated container call list and HarborSym modeling efforts are in progress.

(b)(6)

-----Original Message-----
From: (b)(6)
Sent: Wednesday, December 20, 2017 11:24 AM
To: (b)(6)
(b)(6)
Cc: (b)(6)

(b)(6)

Subject: RE: Mobile Harbor GRR Bi-weekly Meeting

All: We will have the Mobile Harbor Meeting this afternoon. Please attend if you are able.

(b)(6)

-----Original Appointment-----
From: (b)(6)
Sent: Wednesday, February 01, 2017 12:39 PM
To: (b)(6)

(b)(6)

Cc: (b)(6)

(b)(6)

Subject: Mobile Harbor GRR Bi-weekly Meeting
When: Wednesday, December 20, 2017 2:00 PM-3:00 PM (UTC-06:00) Central Time (US & Canada).
Where: MsCIP Conference Room

For those not in the district office, call-in Information is as follows:

USA Toll-Free:
Access Code:
Security Code:

All: The Mobile Harbor GRR bi-weekly meeting has been moved to Wednesdays at 2pm, beginning February 01, 2017. Please update your calendar accordingly. The purpose of the meeting remains to provide a brief update on the project, ensure all work is being performed, and ensure that the schedule is met.

Thanks,

(b)(6)


(b)(6)

From:
To: (b)(6)

Subject: RE: Mobile Harbor GRR Environmental Focus Group Meeting Minutes
Date: Wednesday, December 20, 2017 8:39:00 AM

Good comments, (b)(6). I'm glad you and (b)(6) both caught that I included (b)(6) attendees. That could have been a disaster.

On comment 4, I believe (b)(5)

(b)(6)

-----Original Message-----
From: (b)(6)
Sent: Wednesday, December 20, 2017 8:30 AM
To: (b)(6)

(b)(6)

Subject: RE: Mobile Harbor GRR Environmental Focus Group Meeting Minutes

Sorry my late response.... (b)(6) I attached tracked changes with my comments. Also note that the attendance attachment is from the (b)(6) and not the focus group meeting.

(b)(6) I added a comment from you that I noted in the meeting. Please make sure it's correctly stated.

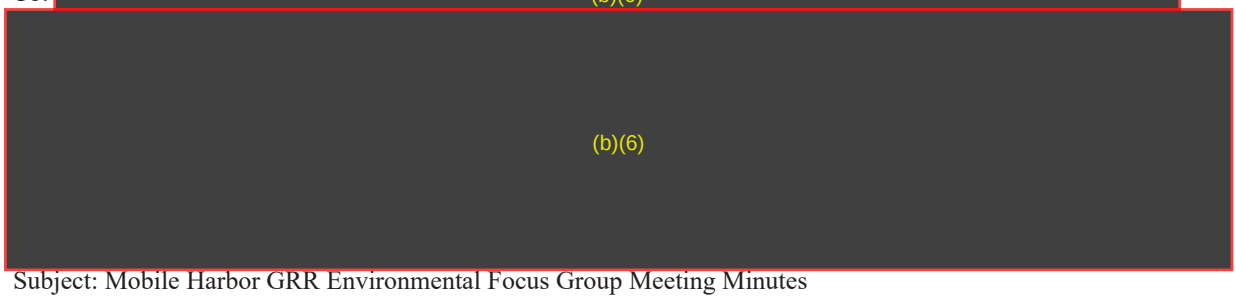
-----Original Message-----
From: (b)(6)
Sent: Tuesday, December 19, 2017 2:06 PM
To: (b)(6)

(b)(6)

Subject: RE: Mobile Harbor GRR Environmental Focus Group Meeting Minutes

(b)(6) The attached Environmental Focus Group Meeting minutes incorporate everyone's comments. Please make one final check and distribute to the NGOs as a DRAFT requesting their input.

-----Original Message-----
From: (b)(6)
Sent: Friday, December 15, 2017 2:09 PM
To: (b)(6)



Subject: Mobile Harbor GRR Environmental Focus Group Meeting Minutes

All,
Please review the attached draft minutes from the Wednesday Environmental Focus Group Meeting and let me know if you have comments or additions.

Once I receive your inputs, I will forward to the full attendee list.