State of Louisiana
Coastal Protection and Restoration Authority

2022 Operations, Maintenance, and Monitoring Report

for

West Bay Sediment Diversion (MR-0003)

State Project Number MR-03
Priority Project List 1

November, 2022
Plaquemines Parish

Prepared by:

Dr. Theryn Henkel
Coastal Resources Scientist, CPRA
New Orleans Field Office
CERM, Suite 309
2045 Lakeshore Dr.
New Orleans, LA 70122

Suggested Citation:

Henkel, T. 2022*. 2022 Operations, Maintenance, and Monitoring Report for West Bay Sediment Diversion (MR-0003),* Coastal Protection and Restoration Authority of Louisiana, New Orleans, Louisiana. 73pp.

Table of Contents

Table of Figures

Table of Tables

Preface

The 2022 Operations, Maintenance and Monitoring (OM&M) report is a second in a series of reports. The first report, entitled "*2016 Operations, Maintenance, and Monitoring Report for West Bay Sediment Diversion (MR-03)*" included data collected through 2015 (Plitsch 2017). This current report includes all of the data from the previous report with the addition of data collected from 2016 through 2021.

I. Introduction

The West Bay Sediment Diversion (MR-0003) project was approved on the Coastal Wetlands Planning, Protection, and Restoration Act (CWPPRA) 1st Priority Project List. The project is located on the west bank of the Mississippi River in Plaquemines Parish, Louisiana (**Figure 1**). The project features include a crevasse on the right descending bank of the main Mississippi River channel, at river mile 4.7 above Head of Passes (AHP), and a number of beneficial-use areas of dredge material. The project outfall area is a large, shallow, open-ended inter-distributary basin, situated between the main river channel to the east, Grand Pass to the west, and Zinzin Bay to the south. The project area is composed of fresh and intermediate marsh, tidal flats, and open water, totaling 12,294 acres (4,975 ha). Construction of the diversion channel began in September 2003 and was completed in November 2003. The West Bay Sediment Diversion is an uncontrolled diversion with a designed capacity of 50,000 cubic feet per second (cfs) at the 50 percent duration stage of the Mississippi River. The West Bay Sediment Diversion project area is located on the abandoned West Bay Complex sub-delta of the larger Mississippi River Delta (MRD).

Coast-wide subsidence, at an average rate of 9 mm/yr, with higher rates in the Bird's Foot Delta (Nienhuis et al. 2017), and sediment deprivation are natural characteristics of abandoned deltas (Coleman and Gagliano 1964, Kolb and Van Lopik 1965, Niell and Deegan 1986, Wells and Coleman 1987, Coleman 1988, Penland et al. 1990) and are the main factors influencing land loss in the MRD. A study of an artificial crevasse in the eastern MRD noted that approximately one quarter of the pond bottom elevation gain from sediment accretion is lost because of shallow subsidence (Marin 1996). Anthropogenic causes of land loss, such as leveeing, canal dredging, saltwater intrusion, gas and oil exploration and withdrawal, as well as natural processes such as eustatic sea level rise and erosion, have contributed to wetland deterioration.

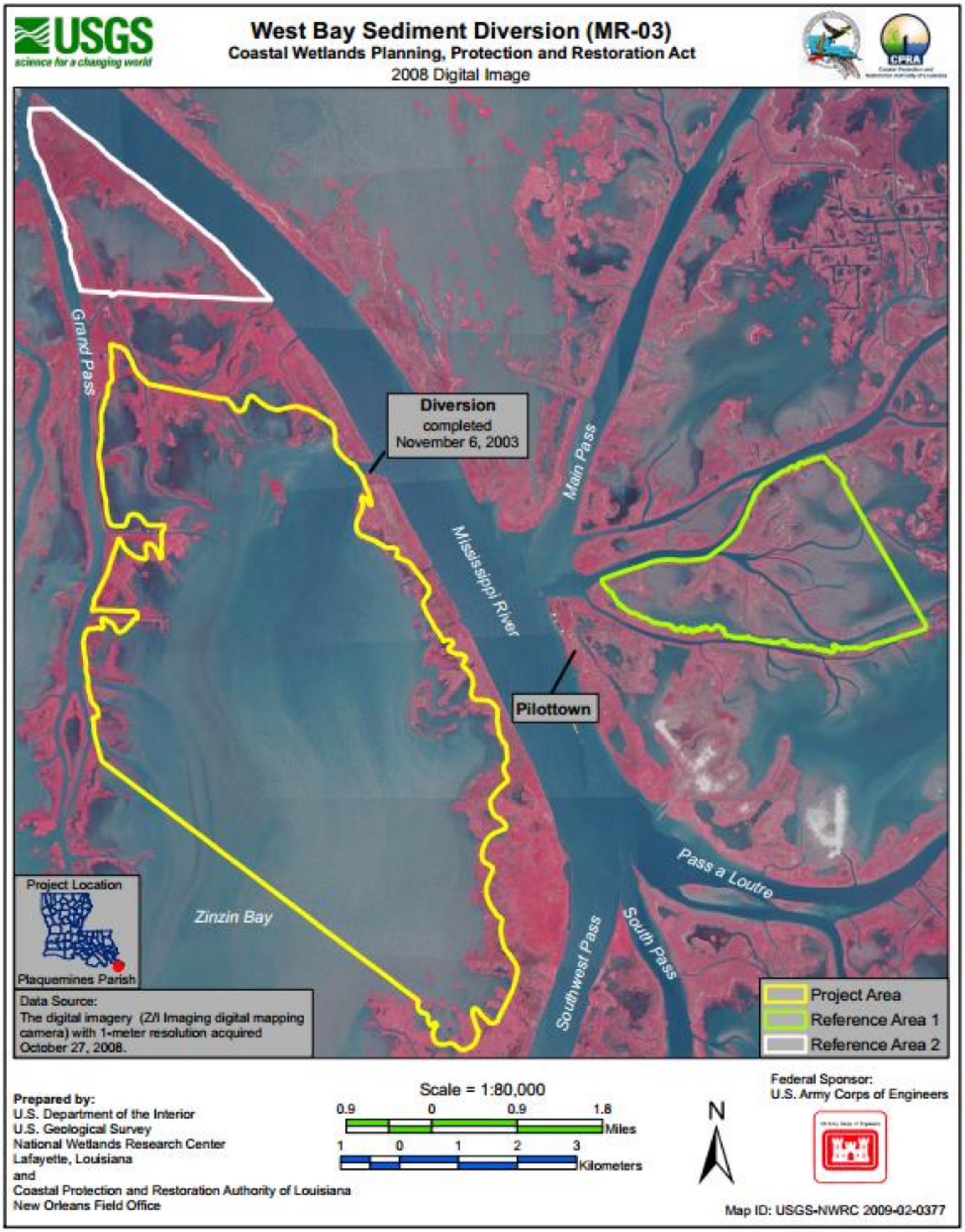


Figure 1: West Bay Sediment Diversion (MR-0003) project and reference areas.

The major process that forms subaerial land in the lower MRD is the formation of sub-deltas and crevasse-splays. Sub-deltas are "scaled down" versions of the major deltaic cycle, both in size and time (Coleman and Gagliano 1964, Wells and Coleman 1987). Sub-deltas consist of relatively large receiving bays that have aerial extents of 75,000 – 100,000 acres (30,000 – 40,000 ha) and depths of 30 - 50 ft. (10 - 15 m) (Coleman and Gagliano 1964). Sub-deltas go through two stages, progressive and transgressive, during their typical life span (Scruton 1960) of 115 to 175 years (Wells and Coleman 1987). The progressive stage begins with the formation of a crevasse along a distributary's levee. Once a crevasse occurs, a "splay" develops within the receiving bay as sediments accrete near the mouth of the crevasse (Boyer et al. 1997). After major channels have formed, rapid subaerial growth ensues. This newly formed land provides substrate for the rapid colonization of emergent vegetation, which stabilizes sediment and increases the rate of accretion (White 1993). As more channels develop by bifurcation, the rate of progradation decreases. Near the end of the progressive stage, the older parts of the sub-delta enter the transgressive stage (Scruton 1960). As interdistributary areas become cut off from sedimentation by natural levees and infilling of the main channel, subsidence due to compaction from dewatering causes ponding (Scruton 1960, Coleman and Gagliano 1964, Morgan 1973). Thus, the sub-delta subsides from the inside out.

The benefits of creating artificial crevasses on the MRD became evident in the 1980's as both a cost effective and highly successful means of creating new wetlands. The Louisiana Department of Natural Resources (LDNR) constructed three crevasses in 1986 that produced over 657 acres (266 ha) of emergent marsh from 1986 to 1991, and four crevasses in that produced over 400 acres (162 ha) of emergent marsh from 1990 to 1993 (LDNR 1993, Trepagnier 1994). Thirteen crevasses included in the LDNR Small Sediment Diversions (MR-0001) project cumulatively produced 313 acres (127 ha) of emergent marsh between 1986 and 1993. Land growth rates ranged from 28 to 103 acres (11.3 to 41.7 ha) per crevasse for the older crevasses (4 to 10 years old) and 0.5 to 12 acres (0.2 to 4.9 ha) for the younger crevasses (0 to 2 years old) (Kelley 1996). All of these constructed crevasses had a mean monthly discharge rate of less than 4,000 cfs.

The purpose of the West Bay Sediment Diversion (MR-0003) project is to promote the formation of emergent marsh through construction of a crevasse and the placement of dredge material. Trepagnier (1994) suggested the idea that "the most successful crevasse would probably be one that discharges from a large pass into a large, open-ended receiving basin that allows the water to flow efficiently through the system". Open systems allow for rapid subaerial creation, thus making them mature more quickly and allow for colonization of native vegetation. The location of the West Bay Sediment Diversion (MR-0003) project receiving basin, along with the shallow depth and open-ended configuration, could maximize the potential for emergent marsh creation. In the specific case of the MR-0003 project, it appeared over time that the system was perhaps too open and land building did not occur at expected scales. Modification to the project receiving bay enhanced deposition and therefore land building. These modifications will be discussed later in the document.

a. Project Features

The West Bay Sediment Diversion project includes a conveyance channel constructed to act as an uncontrolled diversion of water and sediment from the Mississippi River. The diversion was designed to be sediment rich, with the angle, depth, and site location of the diversion chosen to optimize the concentration of bed material per unit volume of water diverted. Prior to construction of the diversion channel, a 10 in. pipeline located in the outfall channel pathway was relocated for safety reasons. The sediment diversion channel was constructed at a 120-degree angle from the downstream direction, in two phases: 1) construction of an interim diversion channel to accommodate a discharge of 20,000 cfs, and 2) modification of the interim diversion channel design to accommodate full-scale diversion of 50,000 cfs at the 50 percent duration stage of the Mississippi River. The United States Army Corps of Engineers (USACE) Operations Division implemented this enlargement upon completion of intensive monitoring of diversion characteristics.

The USACE has developed multiple action strategies to address the trigger points that will be monitored. Primary trigger conditions included scour hole depth limits of -40 ft within 3,000 ft of the navigation channel centerline, enlargement of the diversion channel to convey more than 30% of the river flow at the point of diversion, and/or the deposition of more than 50,000 yd^3 of induced shoal material per day in the navigation channel below the diversion. If any of these trigger conditions developed, the USACE would employ a two-step process to respond and alleviate the problems. First, the mobilization of a dredging operation to mine material from the anchorage area and pump it into the diversion channel. These dredging operations would help maintain control of the diversion channel, and keep the navigation channel open and safe to navigation by encouraging material to fall out in the anchorage area instead of the channel. Second, following the passage of high water, a rock sill in the diversion mouth from bank to bank would permanently fix the dimensions of the channel and prevent future threats to safe navigation in the river.

Two reference areas were selected in order to compare project-induced changes in land and water areas (**Figure 1**). Vegetation and elevation surveys were not conducted in the reference areas. The first reference area (Ref 1), Brant Bayou, is east of the project area just inside Cubit's Gap. This natural crevasse was formed in 1978 and is used as a "with project" target reference area for making comparisons. The second reference area (Ref 2) is used as a "without" project reference area, and is located north of the project area (**Figure 1**). It is situated between the Mississippi River to the East, Grand Pass to the West and a pipeline canal to the South, but does not receive direct riverine input. Since these reference areas are also used to evaluate other similar projects in the Mississippi River Delta area, funding for aerial photography acquisition and analysis for these reference areas comes from the monitoring budgets of other Mississippi River Delta projects.

It was difficult to find reference areas with identical characteristics and influences as the project area. The reference areas chosen have the following limitations: 1) whereas dredge material will be placed in the project area, none will be placed in either reference area, 2) neither reference area is subjected to the open Gulf of Mexico or its wave energies, 3) both reference areas are smaller in size, and 4) Brant Pass has a smaller parent pass.

II. Maintenance Activity

Due to the lack of structural components associated with the West Bay Sediment Diversion, there are no maintenance inspections required for this project.

III. Operation Activity

There is no operation plan for the project, the West Bay Sediment Diversion is an uncontrolled crevasse. However, the USACE collects discharge data with an Acoustic Doppler Current Profiler (ADCP) upstream, downstream, and within the diversion channel (including bifurcations when formed). Flow data has been collected since 2004. This data was collected approximately monthly and data from 2004 through 2021 are included in this section. Flow rates are largely dependent upon river flow with some influence from meteorological events (fronts, precipitation, winds, etc.) and tidal exchange. Measured discharges range from -20,500 cfs (reverse flow into the river, October 2012) to a max of 68,100 cfs (May 2011, river was at flood stage, Bonnet Carré Spillway was open), with a mean discharge of 29,261 cfs ± 15,706 and a median discharge of 26,992 cfs over the 18 years of the project (**Figure 2**). It appears that flow through the diversion at a given river stage has been relatively stable over time, since 2006 (**Figure 3**). For 2004 and 2005, flow through the diversion was lower when compared to a similar river stage after 2005. This indicates that the channel cross-sectional area increased early on in the project life and then stabilized over time. As discussed in a later section, the channel has changed shape over time, but perhaps the over-all cross sectional area has not substantially changed. This is further shown when the flow through West Bay is correlated with the flow in the Mississippi River just upstream of the diversion. When the 2004 and 2005 data are included, the relationship results in a r^2 of 0.68, and when those data are removed, the correlation improves to an r^2 of 0.8.

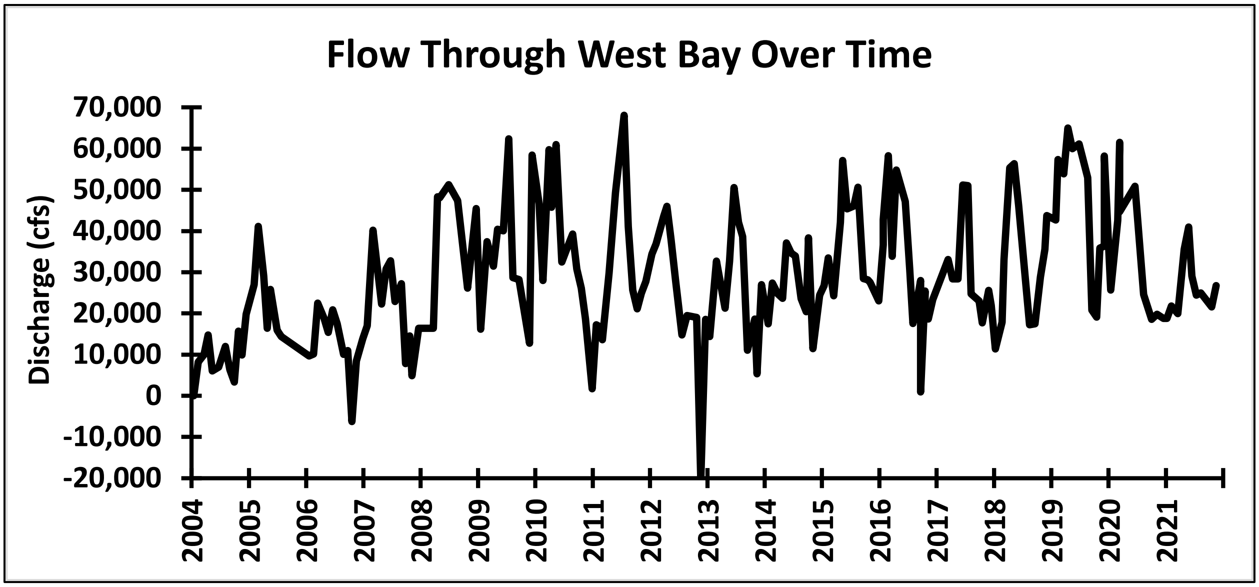


Figure 2: Flow over time through the West Bay Diversion.

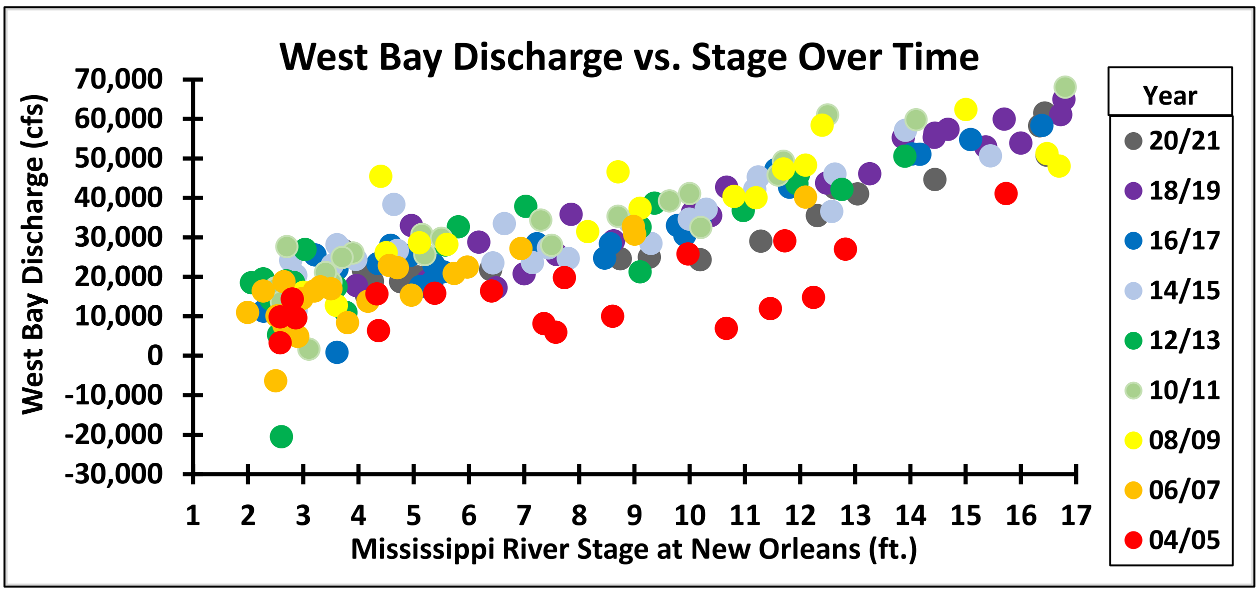


Figure 3: Discharge through the West Bay Diversion versus river stage. Note that in early years (red), the discharge is lower for a given stage than later years.

IV. Monitoring Activity

This OM&M report includes data collected from November 2003 through December 2021. Monitoring efforts for the West Bay Sediment Diversion project focus on evaluating project effects on land/water ratios, bathymetry/topography, and emergent vegetation (LDNR 2003). Analysis of land/water ratios in the project and reference areas are used to determine the effects of the constructed crevasse and beneficial use of dredge material on the acreage of subaerial land. Periodic elevation surveys of the receiving bay are performed to monitor project effects on the vertical elevation of the marsh, channel formation and infilling or erosion of the open water areas. Surveys of emergent vegetation within the crevasse receiving bay help determine if the project is effectively creating marsh substrate for colonizing vegetation.

a. Monitoring Goals

The objective of the West Bay Sediment Diversion project is to promote the formation of emergent marsh through construction of a crevasse and the placement of dredge material.

The following monitoring goals contribute to the evaluation of the above objective:

1. Determine the effects of the project on land/water ratios in the project area.
2. Determine the changes in the mean elevation within the crevasse receiving bay.
3. Determine the effects of the project on emergent vegetation within the crevasse receiving bay.

b. Monitoring Elements

i. Beneficial Use of Dredge Material

The beneficial use of dredge material (BUDM) in not an official monitoring element in the monitoring plan, however, it will be described in a separate section under monitoring because it is an important part of the project and affects all the other monitoring elements described below. The BUDM affects the land/water analysis, elevations surveys and vegetation surveys, since it adds land and elevation to the project area and in some cases is placed over existing vegetation plots. The USACE keeps track of annual volumes placed and provides location shapefiles. These data are what will be described and presented in that section.

ii. Land-Water Analysis

Land-water analysis of aerial photography is used in conjunction with topographic surveys of the project area to evaluate land creation and maintenance within the basin. Land to water ratios within the project area were analyzed by the USGS Wetland and Aquatic Research Center (WARC) using 1-m resolution aerial photography (Z/I Imaging digital mapping camera) collected through the CRMS program. To evaluate land/water ratios in the receiving bay, near-vertical, color-infrared aerial photography (1:24,000 scale) was obtained prior to construction in 2002, and in post-construction years 2008, 2014 and 2021. The photography was georectified using standard operating procedures (Steyer et al. 1995, revised 2000), in which all areas characterized by emergent vegetation, wetland forest, scrub-shrub, or upland are classified as land, while open water, aquatic beds, and non-vegetated mudflats are classified as water.

iii. Elevation (Topographic and Bathymetric Surveys)

Elevation surveys were conducted once pre-construction (2003, receiving bay only) and in 2009, 2011, 2015, and 2020 (receiving bay and crevasse channel). Similar survey plans were used for each survey, however, elevation transects were modified as needed, as field conditions shifted. The elevation data was collected via a contract with Morris P. Hebert, Inc (MPH).

The elevation survey focused on three areas: The receiving bay, receiving bay islands and the channel/crevasse. To document changes in the mean sediment elevation within the receiving bay, elevation transect lines were established across the crevasse receiving bay (**Figure 4**). Seventeen (17) transects were surveyed in a northwest to southeast direction across the receiving bay. The lines were spaced approximately 1,000 ft. (305 m) apart for the first 5,000 ft. (1525) from the mouth of the diversion, then at 1,500 ft. (457 m) intervals to the southern project boundary. The southernmost survey line was taken along this southern project boundary alignment. Elevation data was recorded at 200 ft. (61 m) intervals along the transects and where the elevation interval was more than 0.3 ft. (0.9 m). The receiving bay island elevation survey focused on islands that were created as part of the early BUDM process (**Figure 4**). Transects were established at varying intervals dependent on the size of the island, but generally vary between 200 ft. (61 m) and 500 ft. (153 m), with points along each transect taken every 25 ft. (7.6 m).

A more detailed survey of the main crevasse channel was conducted in order to detect change over time in channel dimensions (**Figure 5**). Fifteen (15) transects were surveyed across the crevasse channel at approximately 200 ft. (61m) intervals with elevations being recorded at 10 ft. (3 m) intervals. Additionally, a high concentration of elevation points were collected in the main channel in order better detect changes in channel dimensions.

For all of the surveys, MPH delivered point data, as well as cross-section drawings showing changes in transect dimensions over time. The cross section of all crevasse channel and receiving bay transects, from all survey years, are presented in **Appendices 1 and 2**, respectively.

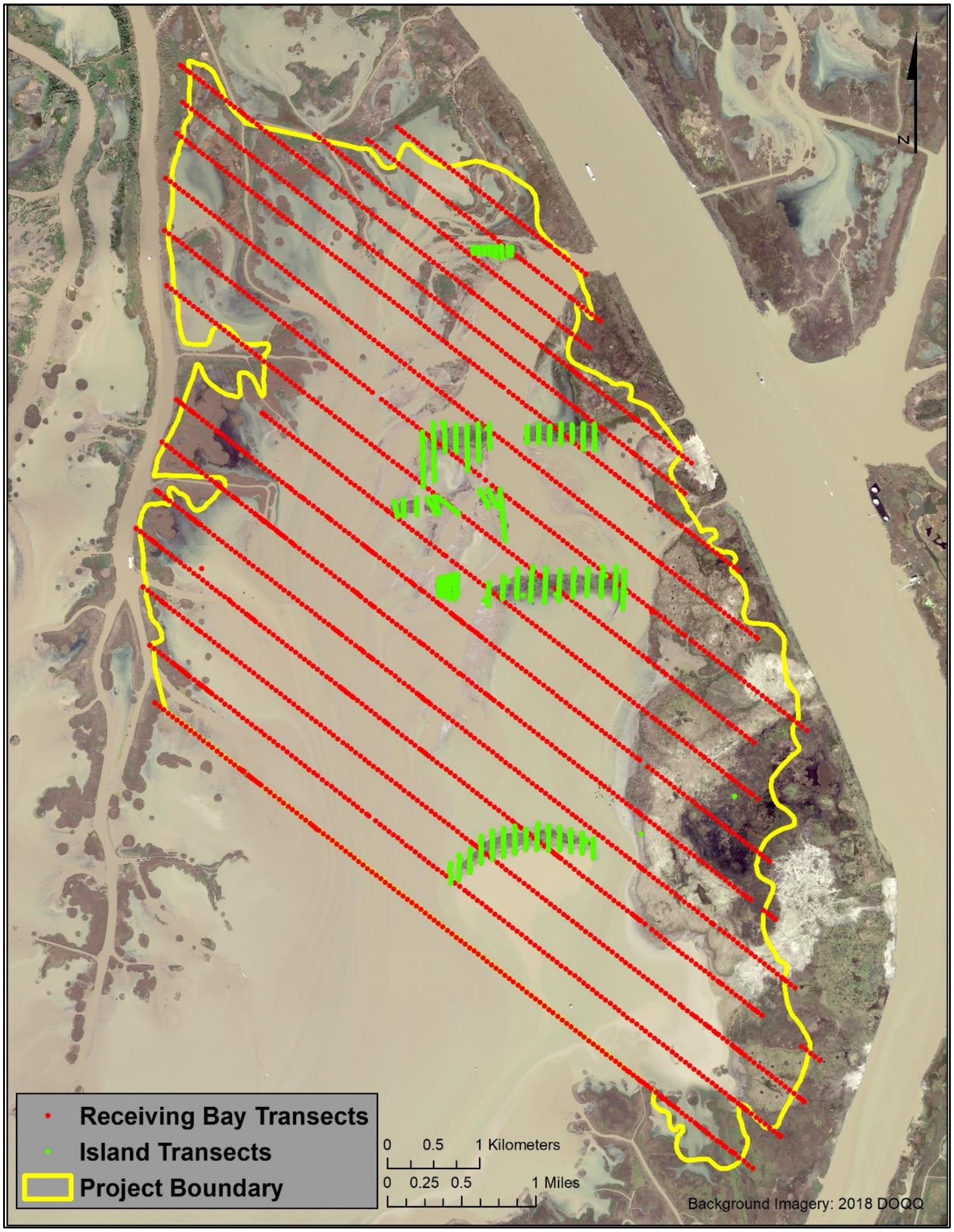


Figure 4: Location of receiving bay elevation survey transects and island survey transects. The figure shows the location of the 2020 transects, but surveys in other years followed a similar layout.

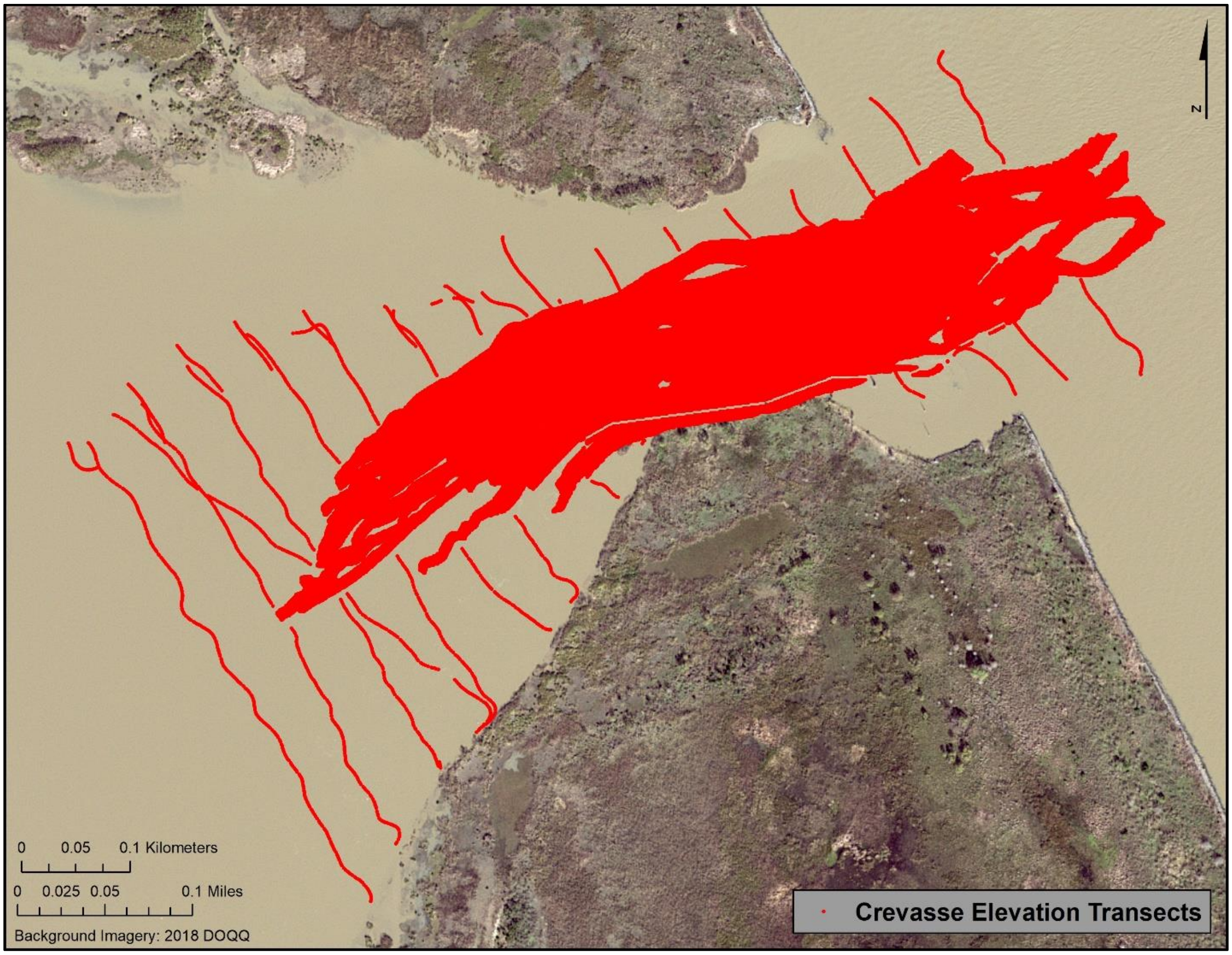


Figure 5: Elevation survey transects and additional points in the crevasse channel for the West Bay Sediment Diversion project. The figure shows the location of the 2020 data points, but surveys in other years followed a similar layout.

Elevation data were processed and analyzed using the same methodology for both the receiving bay and crevasse channel. All of the analysis was conducted in ArcMap 10.5.1. The data were delivered from MPH in .csv form with the gps location of each point and the elevation, reported in a variety of geoids and both feet and meter units. The point data were brought into ArcMap and converted into point shapefiles for each year. In order to create an elevation surface for visualization, the "Topo to Raster" tool was used to interpolate the elevation point data into an elevation surface. This tool allows for interpolation to a boundary, and the same boundary was used for all years. The interpolated elevation surface could then by colorized by elevation interval to allow for comparison across years. In order to analyze the elevation data for changes in elevation and volume, using the 3D Analyst extension, the point shapefiles were converted to a triangulated irregular network (TIN) using the "create TIN" tool. The TIN was then modified using the "edit TIN" tool to a common boundary (across surveys) so that direct comparisons could be made among the different survey years. The TIN was then converted to a raster for analysis using the "TIN to Raster" tool, with the cell size set to 30 for each survey date to allow for direct comparison.

To compare across survey dates two tools were used to calculate differences in elevation and volume. To detect differences in elevation, the "Minus" tool was used, which results in a surface indicating places where the elevation increased or decreased between surveys, and the magnitude of change. To calculate volume change, the "Cut Fill" tool was used, which results in a calculation of what volume of sediment was gained or lost between survey dates and a surface which shows where the gains and losses occurred.

iv. Vegetation

West Bay vegetation data was collected in 2015, 2018, and 2021 at 19 vegetation plots (**Figure 6**). Vegetation plots were established on newly formed land and on islands created by dredge placement. Vegetation data was collected within the project area to assess the colonization and transition of vegetation on the forming marsh platform, to compare the vegetation in the created marsh to local, natural marsh, and to gauge the quality and stability of the vegetative community. Plant species composition, percent cover, and relative abundance were evaluated to document vegetation on newly created land in the receiving bay. Marsh vegetation was sampled at 2-m x 2-m plots using a modified Braun-Blanquet sampling method (Mueller-Dombois and Ellenberg 1974, Folse et al. 2020). Vegetation was collected using the Coastwide Reference Monitoring System (CRMS) methodology (Folse et al. 2020), to allow for direct comparison to this extensive monitoring network. Vegetation plots could be added in the future as more land forms.

Herbaceous marsh vegetation data were analyzed in a variety of ways. Percent cover (actual plot cover, always less than 100%), species richness, total percent cover (added cover of all species, can be more than 100%), percent herbaceous cover, percent shrub cover, percent tree cover, Shannon Diversity Index (Shannon 1948), and floristic quality index (FQI) (Cretini et al. 2012) were all analyzed by marsh plot and year using ANOVA in RStudio (RStudioTeam 2016). The vegetation data from MR-0003 were compared to the nearby CRMS 2608 vegetation data (**Figure 6**). These data were compared by the same factors listed above by year and by location (CRMS vs West Bay). Data from the same years (2015, 2018, and 2021) were used for the comparison (CRMS collects data annually, but only data from the relevant years were analyzed). Lastly, in order to compare community composition, non-metric multidimensional scaling (NMDS) was performed using RStudio with the Vegan Package. All NMDS analyses were performed using Bray-Curtis distances and two axes. Data from each location for the three data collection years were used in the NMDS analysis.

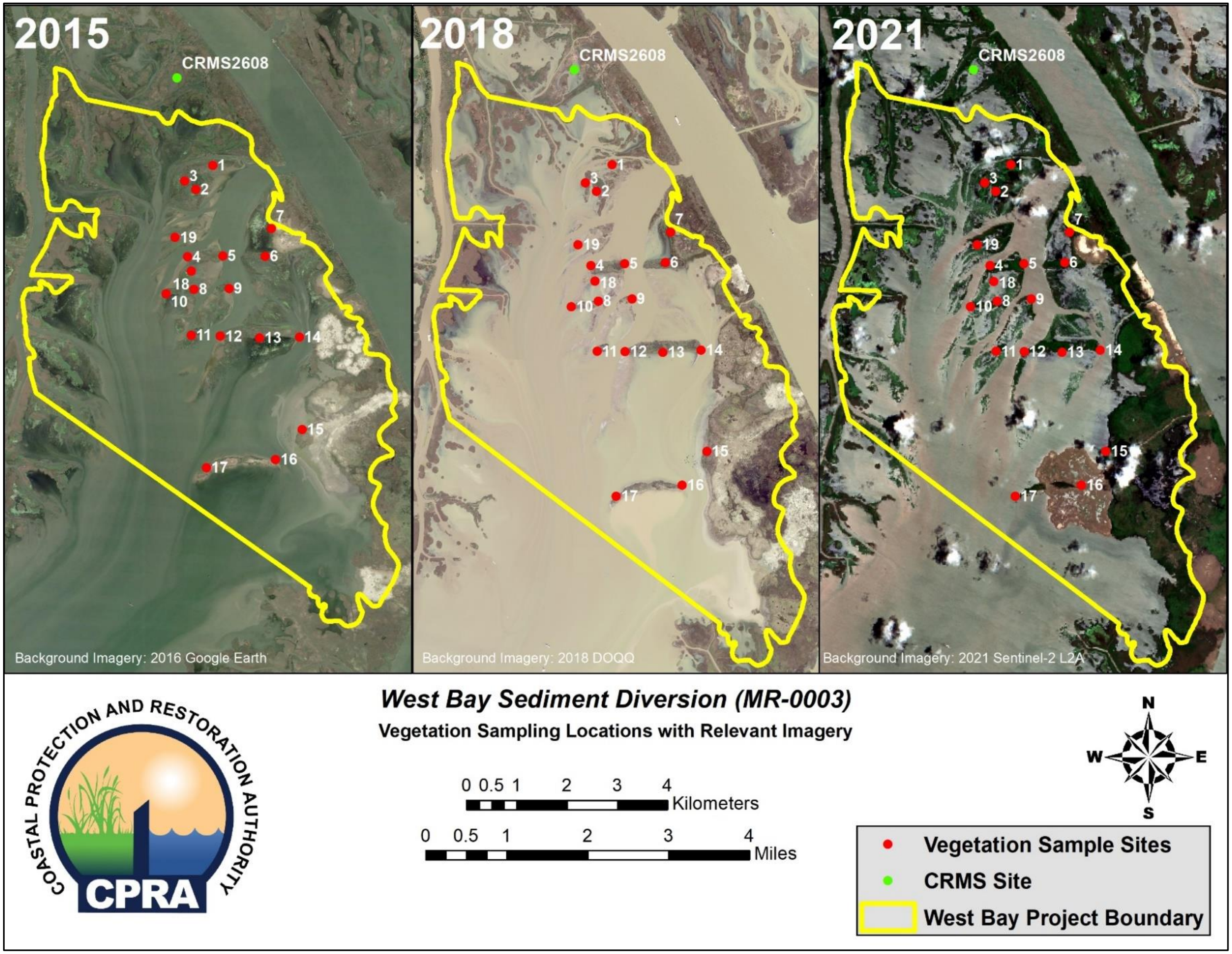


Figure 6: Location of vegetation plots in the West Bay Sediment Diversion project area. Plot locations are show in different years, with different background imagery to highlight changes.

C. Monitoring Results and Discussion

Results and discussion for the various monitoring elements are presented below.

i. Beneficial Use of Dredged Material Areas

Dredge material from project construction and Mississippi River maintenance has been placed in the West Bay receiving bay throughout the project life. Between 2010 and 2015, the dredge was used to create sediment retention enhancement devices (SREDs) which were small islands constructed in the receiving bay, perpendicular to flow, in order to slow the flow, enhance sediment deposition, and increase the rate of land building (**Figure 7**). Before the SREDs were built, there was little land building in West Bay (it was filling in and shallowing, but no sub-aerial land had appeared), because much of the sediment by-passed the bay and flowed into the open water to the south. Dredge placement throughout the project life mostly occurred on the eastern edge of the project, near the Mississippi River (**Figure 7**).

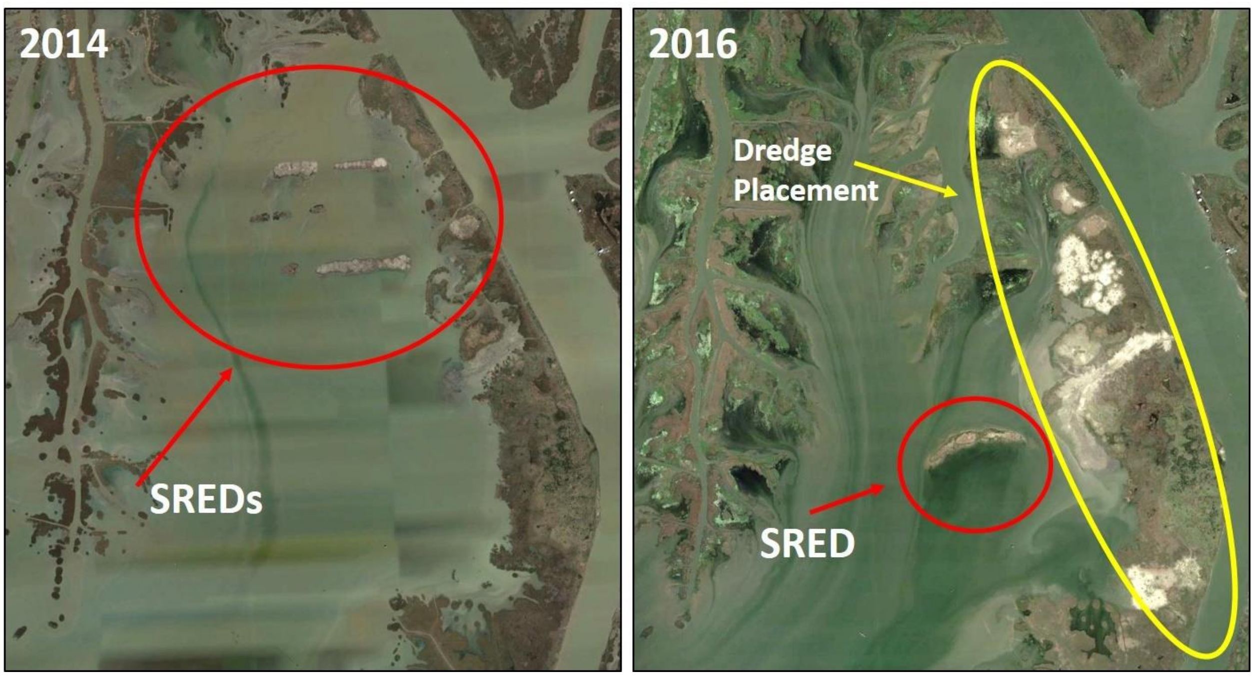


Figure 7: Beneficial use of dredge material from the Mississippi River was used to construct sediment retention enhancement devices (SREDs) in the receiving bay to enhance sediment deposition and land building (left). Dredge material has also been deposited along the eastern edge of the project area throughout the project life (right).

Dredge material has been placed in the project area since 2003 with a total of 56,567,957 yd^3 (43,279,326 m^3) placed through 2021 (**Table 1**). Dredge spoil areas were placed along the eastern boundary of the project, often straddling the official project boundary (**Figure 8**). Dredge placement has overlapped in some areas over time. In total, dredge has been placed in 47 separate areas over the project life. The total area of dredge placement over the project life is 3,680 acres (14.9 km^2) both inside and in the vicinity of the official project boundary (**Figure 9**). However, it is important to note that placed sediments, especially those placed more towards the middle of the receiving bay, are subject to reworking by diversion flows, especially during high river years. The West Bay diversion area is dynamic and subject to a variety of forcings including flow, cold-fronts, tidal exchange, hurricanes, etc. It is important to remember that these dredged sediments become part of the system and do not always remain, *in toto*, where placed. Dredge material also compacts after placed, so the volume that was documented as dredged and placed decreases over time. This is important because the documented dredge volume can be subtracted from the sediment volume gained between elevation survey years to determine the rate of natural sediment deposition. But that calculation would be conservative as the volume of placed dredge material may compact, erode, or re-deposit somewhere else. Because the dredge material is often placed straddling the project line, and to date, elevation surveys have stopped at the project line, it is difficult to differentiate between sediment that was naturally deposited versus placed sediment when calculating sediment volume gains over time (volume changes are presented in the elevation section). In the future, elevation surveys will extend all the way to the river in order to be able to make this differentiation, but again, the calculation would be conservative based on the discussion above. Due to the size of the project area, sediment deposition, erosion, and movement patterns are dynamic and difficult to wholly account. However, the project demonstrates the synergies between Louisiana's working coast and restoration projects as the placed sediment enhances natural processes.

Table 1: Volume of beneficial use sediment placed in each year and the approximate acres created.

Year	Yd^3 Placed	M^3 Placed	Acres Created*
2003	1,394,047	1,065,825	155
2006	1,989,689	1,521,226	175
2009	1,989,041	1,520,731	140
2012	1,172,049	896,096	93
2013	3,543,541	2,709,231	195
2015	11,317,159	8,652,589	670
2016	3,953,262	3,022,486	847
2017	8,486,780	6,488,609	484
2018	3,870,831	2,989,463	205
2019	1,882,900	1,439,580	328
2020	2,705,153	2,068,238	211
2021	14,263,505	10,905,252	980
Total	**56,567,957**	**43,279,326**	

* Approximation; acres created is not additive because dredge placement areas overlapped

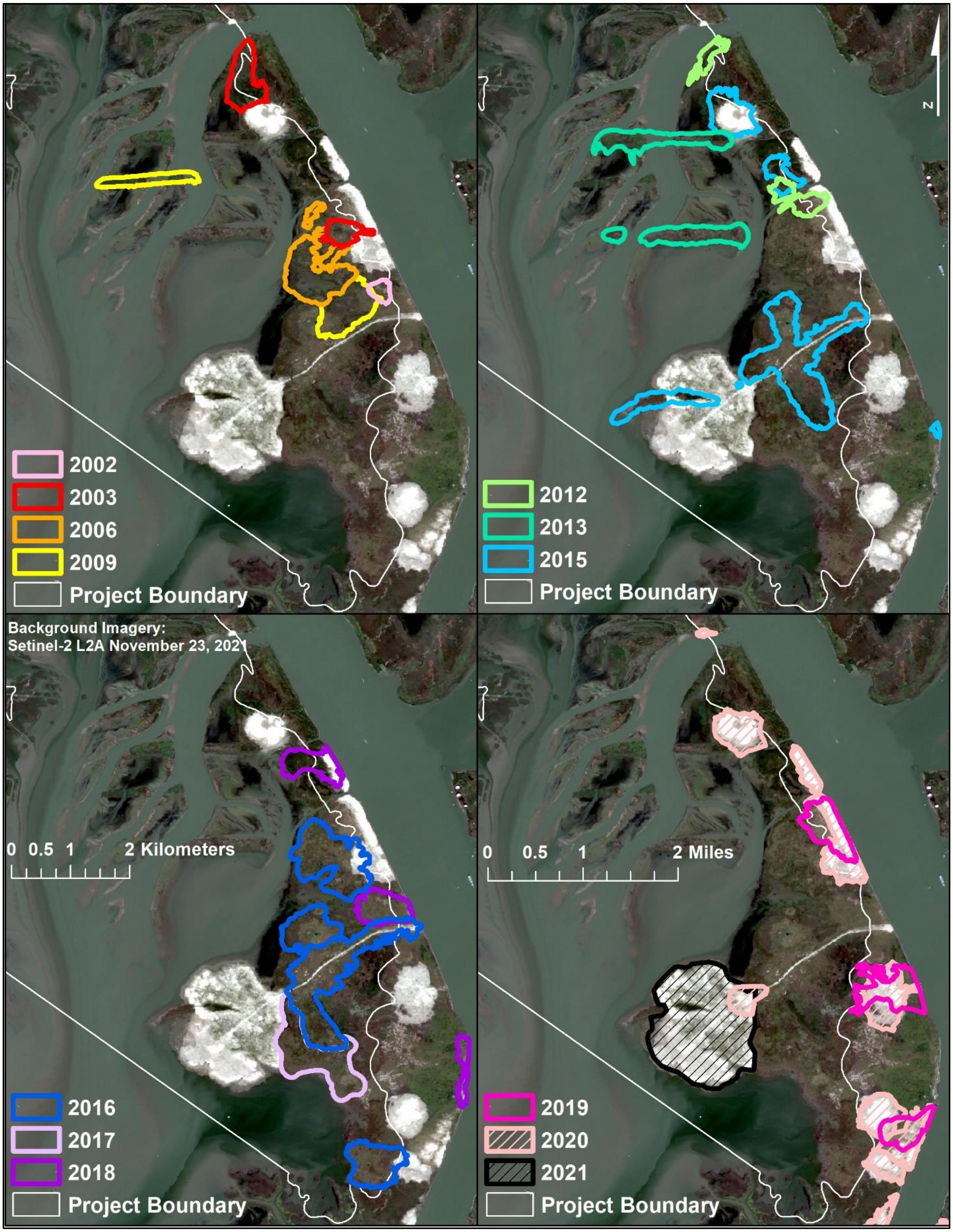


Figure 8: Dredge placement areas by year.

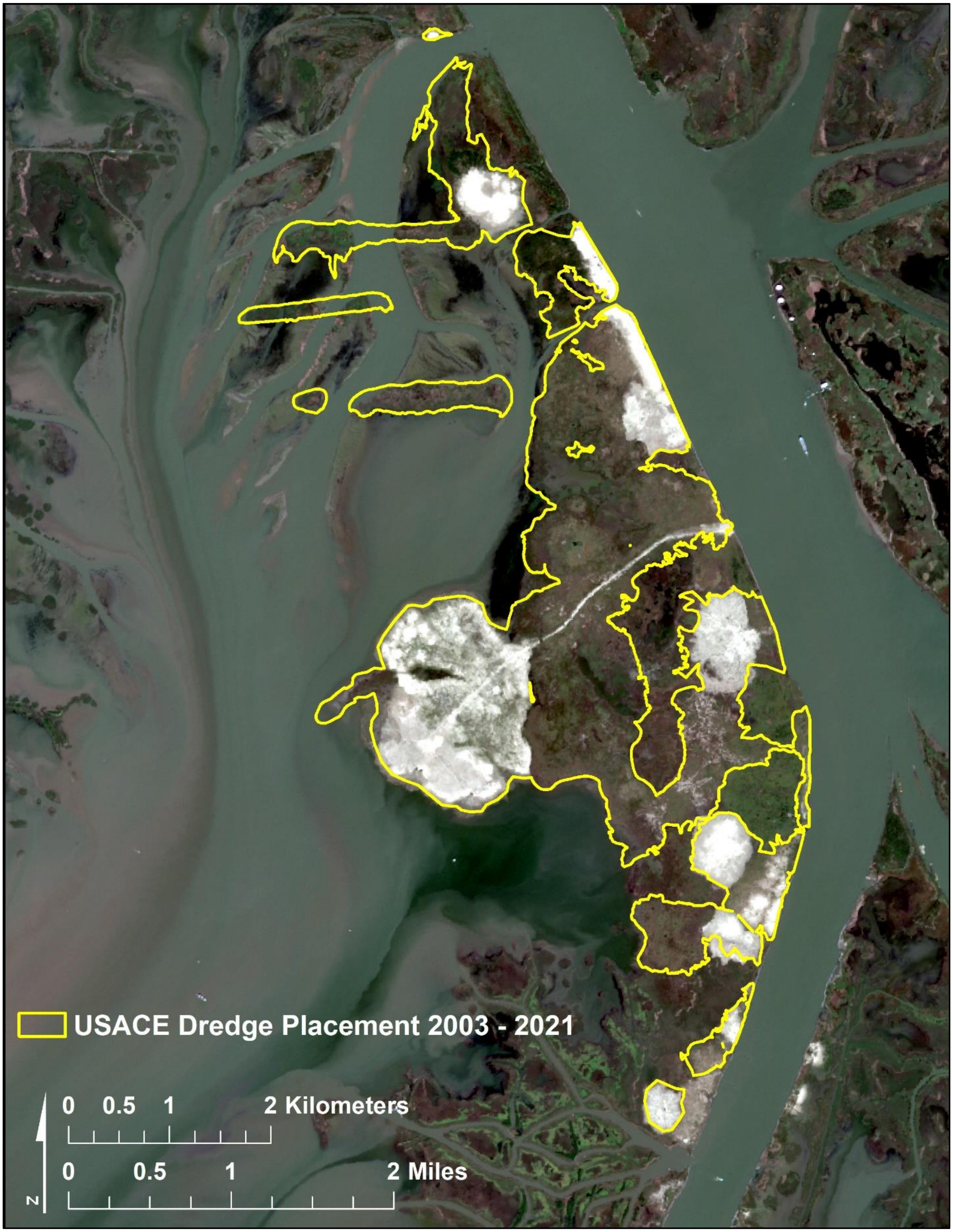


Figure 9: All areas of dredge placement merged, highlighting that there are some areas of natural land building (Background imagery is Sentinel-2 LA November 23, 2022).

ii. Land/Water Analysis

Land/water change analysis was conducted for 2002 (pre-project), 2008 (project year 5), 2014 (project year 11), and 2021 (project year 18) for the project area and both reference areas.

Reference Area 1

Reference Area 1 features a crevasse and a delta complex in the formation stage and is therefore similar to the West Bay Sediment Diversion except that it exists on a much smaller scale. Due to the smaller scale, faster land growth rates would be expected when compared to the project in the near term, but rates would be expected to decrease in a shorter time span than at the project.

Reference area 1 experienced land gain over time with land increasing from 21% of the area (499 acres) in 2002 to 39% of the area (921 acres) in 2021 (**Table 2, Figures 10, 11, 12, and 13**). The land area has increased by 88.3 % from 2002 through 2021 (**Table 3**). The rate of land gain has decreased over time with 30.2 acres/year gained from 2002 to 2008, 24 acres/year from 2008 to 2014 and 13.9 acres/year from 2014 to 2021.

Reference Area 2

Reference Area 2 is not connected to the river, experiencing sediment starvation, a similar process experienced across coastal Louisiana. Reference area 2 experienced land loss over time with land decreasing from 58% of the area (861 acres) in 2002 to 48% of the area (711 acres) in 2021 (**Table 2, Figures 10, 11, 12, and 13**). The land area has decreased by 17.4 % from 2002 through 2021 (**Table 3**). The rate of land loss had increased over time with 2.8 acres/year lost from 2002 to 2008, 5.0 acres/year from 2008 to 2014 and 14.7 acres per year from 2014 to 2021.

Project Area Receiving Bay

Land gain in the receiving area is a result of the combination of beneficially placed material and naturally deposited sediment (as described above). It is clear that natural land building is occurring, but differentiating between naturally deposited and placed sediment, as it relates to the existence of sub-aerial land, is not possible, as both naturally deposited and placed sediments are reworked as conditions in the project area change (e.g. high flow vs low flow). Therefore results below represent land gain from all sources and no attempt will be made to differentiate between them.

The project area experienced land gain over time with land increasing from 9% of the area (1,110 acres) in 2002 to 30% of the area (3,741 acres) in 2021 (**Table 2, Figures 10, 11, 12, and 13**). The land area has increased by 237% from 2002 through 2021 (**Table 3**). The rate of land gain decreased in early years with 63.8 acres/year gained from 2002 to 2008, 29 acres/year from 2008 to 2014. From 2014 to 2021 the rate of land gain increased to 296 acres/year. This is due to the natural development of emergent wetlands and extensive dredge placement during this period. Overall, the project gained 138.5 acres/year from 2002 through 2021.

Table 2: Land area over time in the West Bay receiving bay and the two reference areas.

	Receiving Bay			Reference Area 1			Reference Area 2		
	Land (Acres	Water (Acres)	% Land	Land (Acres	Water (Acres)	% Land	Land (Acres	Water (Acres)	% Land
2002	1,110	11,186	9%	499	1,853	21%	861	627	58%
2008	1,493	10,803	12%	680	1,662	29%	844	644	57%
2014	1,667	10,628	14%	824	1,516	35%	814	673	55%
2021	3,741	8,553	30%	921	1,420	39%	711	775	48%

Table 3: Land area change rate over time in the West Bay receiving bay and the reference areas.

	Project Area			Reference Area 1			Reference Area 2		
Years	Change (acres)	% Change	Change Rate (acres/yr)	Change (acres)	% Change	Change Rate (acres/yr)	Change (acres)	% Change	Change Rate (acres/yr)
2002 - 2008	383	34.5%	63.8	191	39.1%	31.8	-17	-2.0%	-2.8
2008 - 2014	174	11.7%	29.0	144	21.2%	24.0	-30	-3.6%	-5.0
2014 - 2021	2,074	124.4%	296.3	97	11.8%	13.9	-103	-12.6%	-14.7
2002 - 2021	**2,631**	**237.0%**	**138.5**	**432**	**88.3%**	**22.7**	**-150**	**-17.4%**	**-7.9**

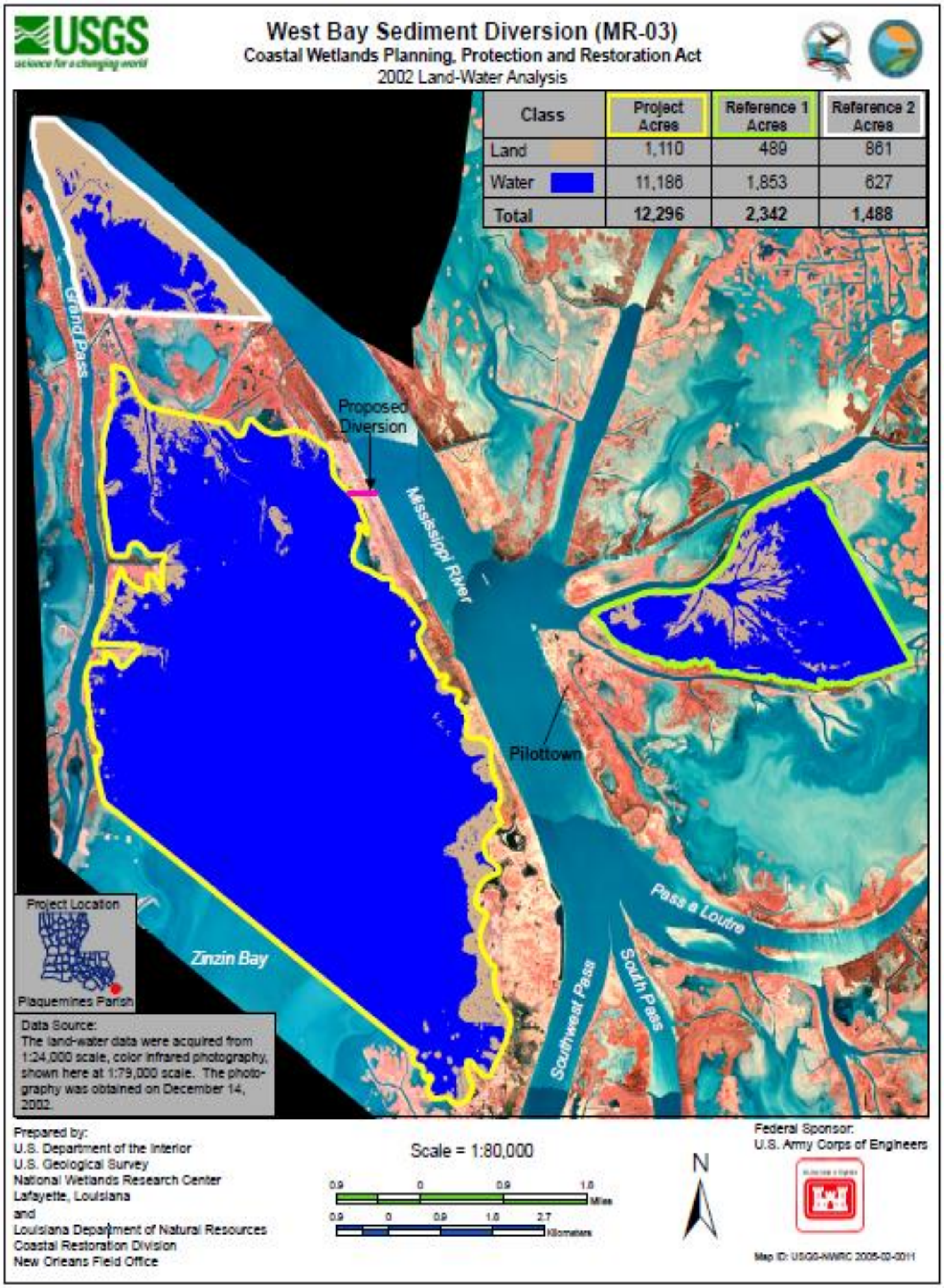


Figure 10: Pre-project (2002) land/water analysis results for the West Bay receiving bay and the two reference areas.

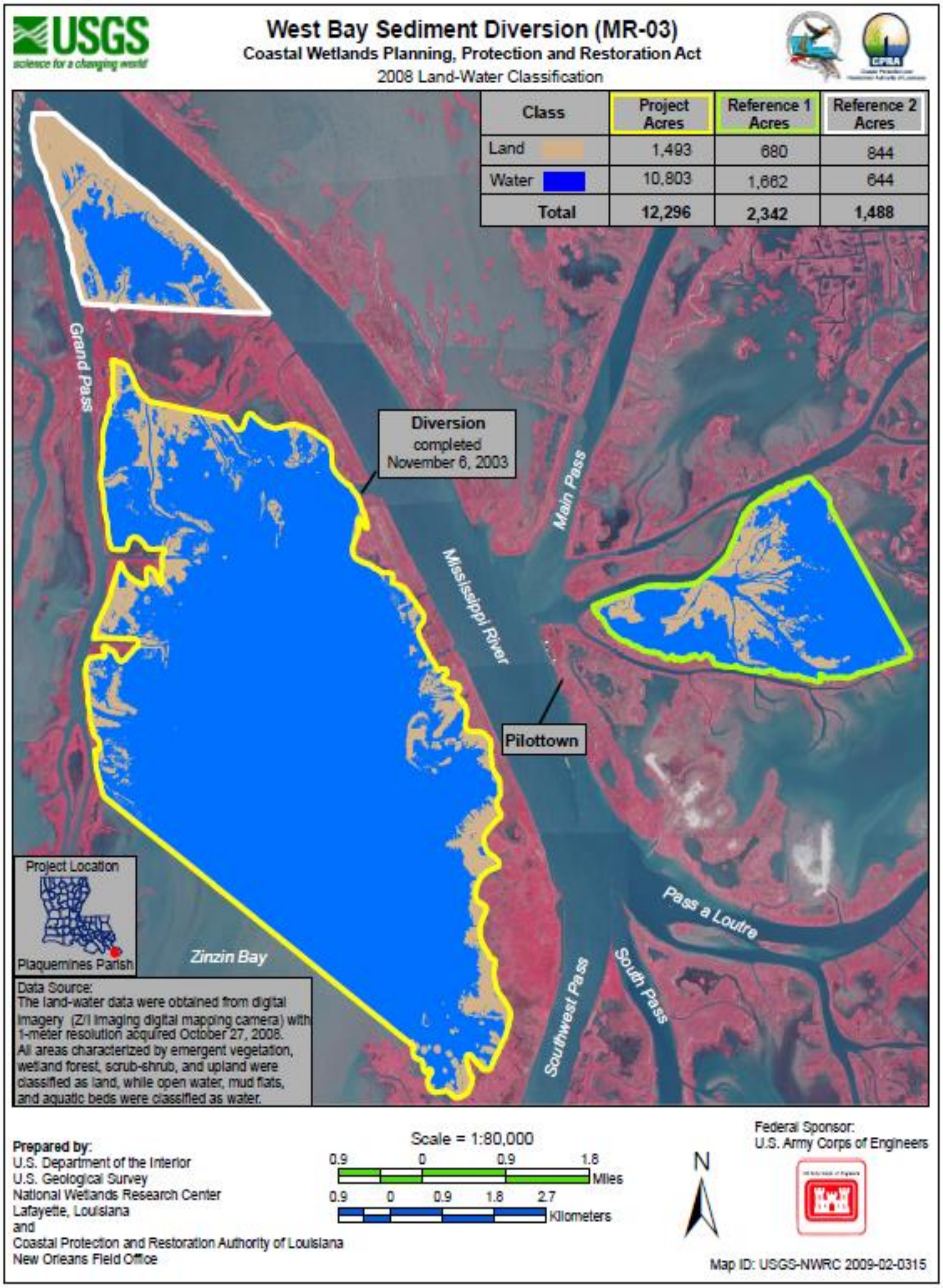


Figure 11: Project year 5 (2008) land/water analysis results in the West Bay receiving area and the two reference areas.

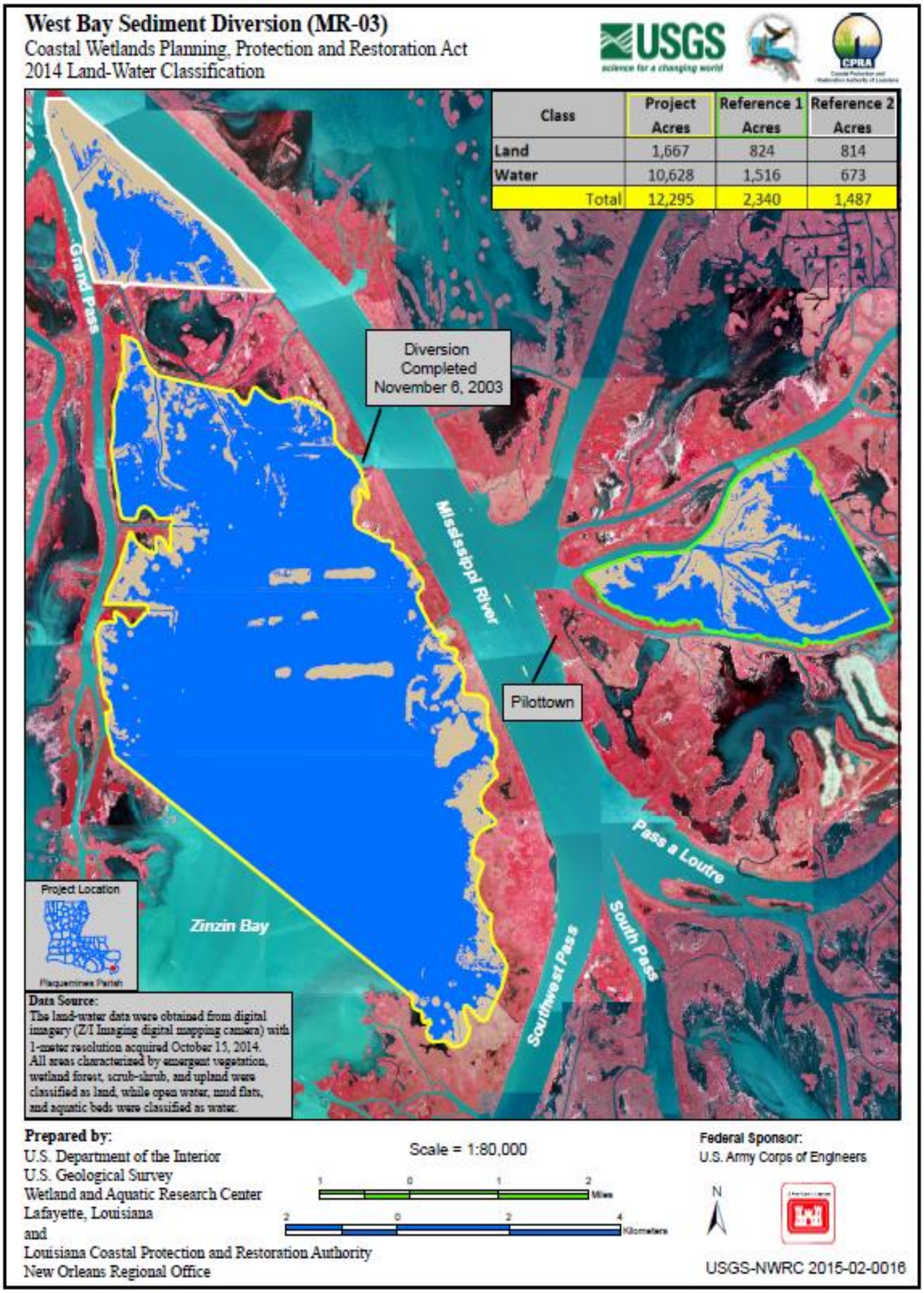


Figure 12: Project year 11 (2014) land/water analysis results for the West Bay receiving bay and the two reference areas.

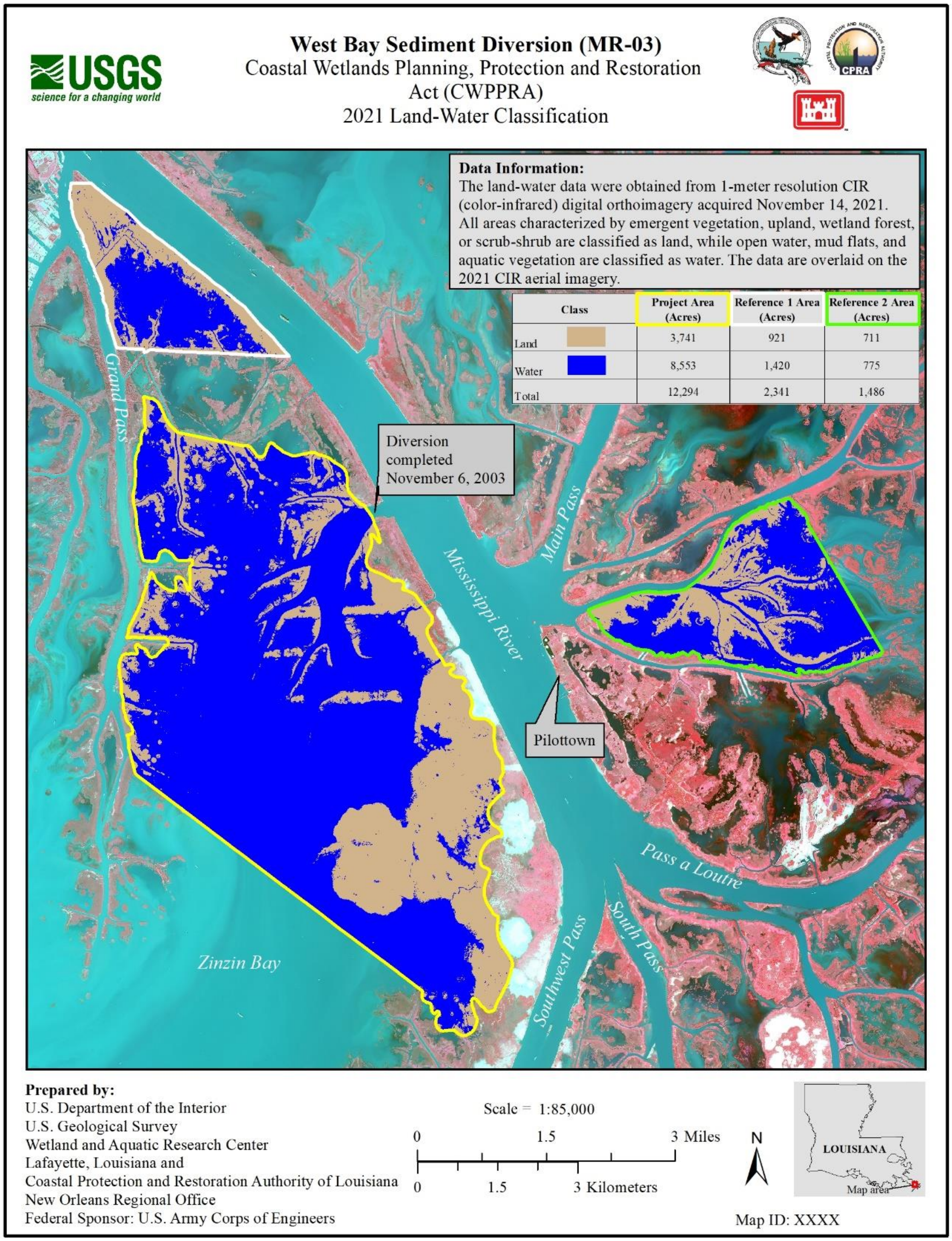


Figure 13: Project year 18 (2021) land/water analysis results for the West Bay receiving area and the two reference areas.

The project area is building land, both through natural processes as well as through beneficial placement of dredge material. The land/water analysis also provides evidence of the value of a river connection for land building and sustaining. The project area and reference area 1, which are connected to the river, both experienced land gain throughout 18 years of analysis, while reference area 2, which lacks the river connection, experienced consistent loss. The most recent period of analysis (2014 – 2021) shows evidence of natural land building which was mostly not present in previous analyses. The most recent period was marked by numerous flood years on the Mississippi River, with both high discharge, but also prolonged flood stage, especially in 2019. These flood events could enhance land building by inserting sediment into the project area but could also erode land due to the high energy environment. The project area is dynamic and delta building processes are ongoing.

iii. Elevation (Topographic and Bathymetric Surveys)

This section will focus on data from 2011 to 2020, but will include some reporting of earlier data.

Crevasse Channel

Since 2011, the crevasse channel has shallowed, elongated, and migrated towards the southern shore (**Figure 14**). In 2011, the deepest point in the channel was -95 ft., in 2015 it was -90 ft., and in 2020 it was -79 ft. The channel appears to elongate on the bay side, with deepening away from the scour hole. Further evidence of the shallowing and southern migration can be seen in the cross sections of elevation transects (**Figure 15**). An example of one cross section is shown in Figure 15, but all cross sections can be viewed in **Appendix 1**.

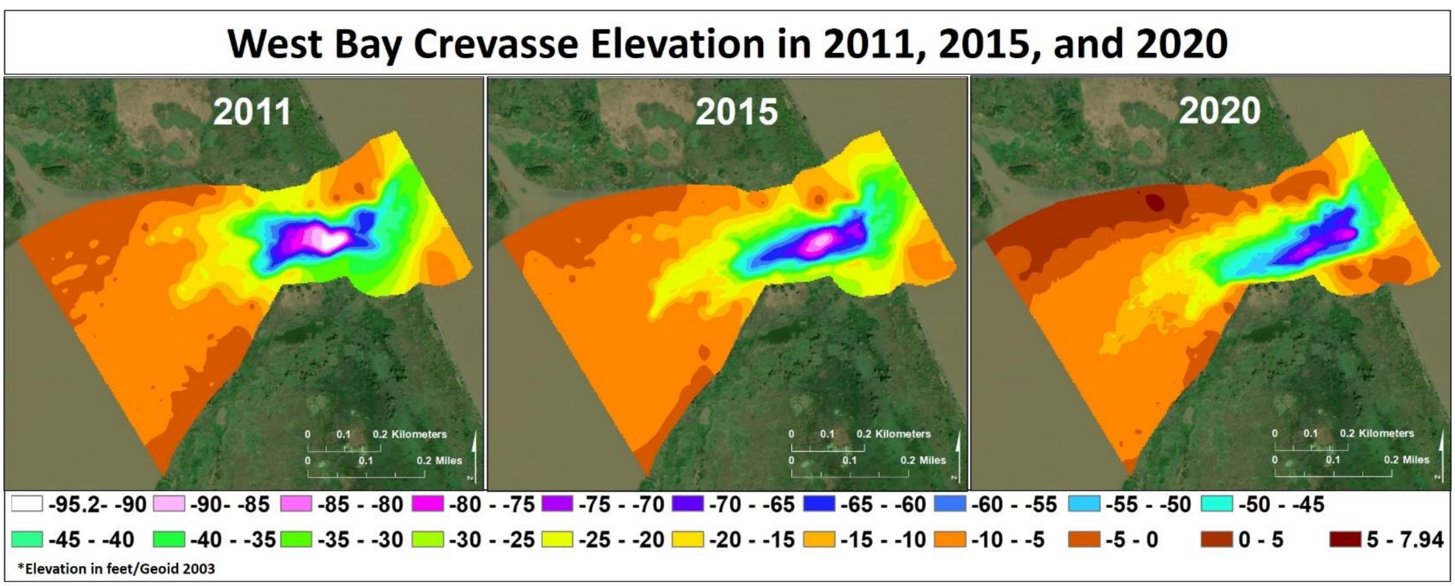


Figure 14: Elevation interpolations showing the changing West Bay channel dimensions from 2011 to 2020. Note that it appears the channel became shallower, longer, and migrated south over this time period.

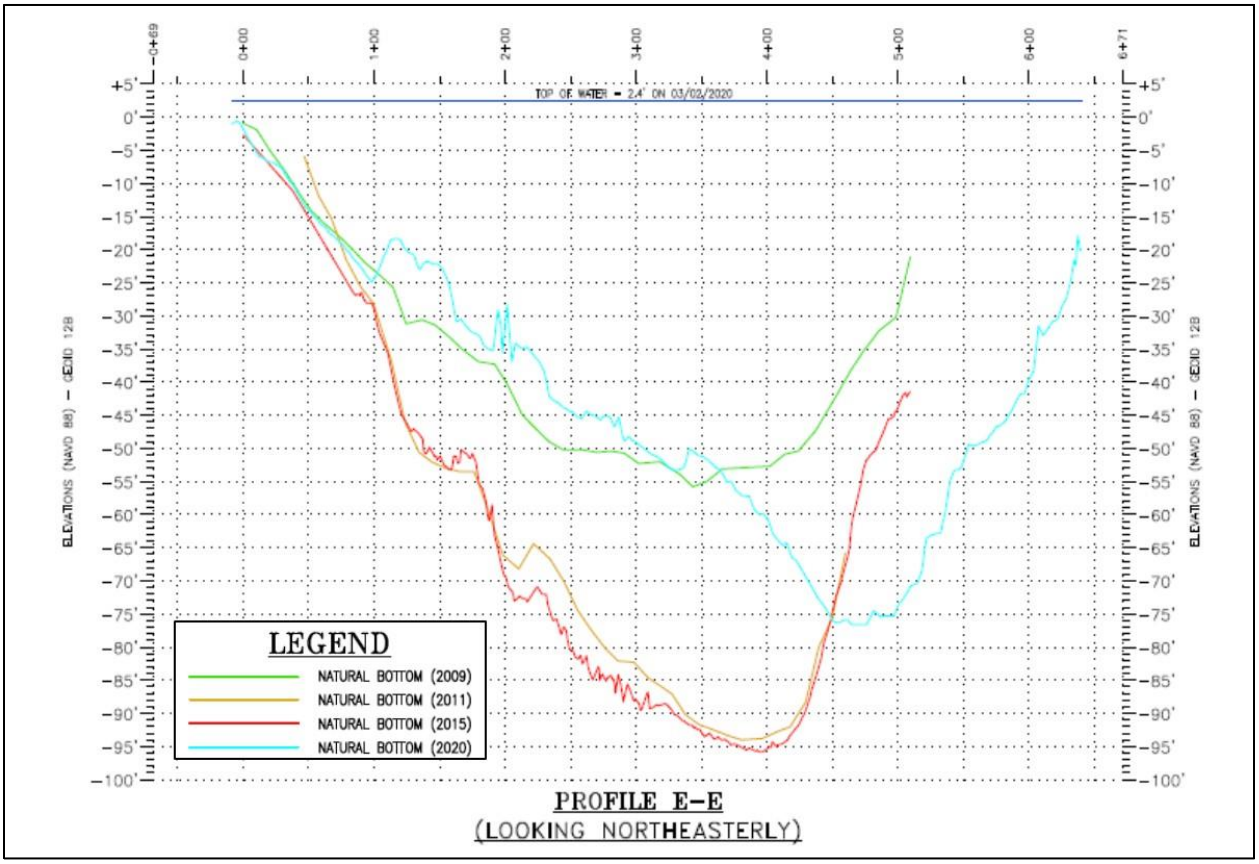


Figure 15: Example of one cross section in the West Bay channel showing the shallowing and southerly migration of the main channel (cyan line). All cross sections can be viewed in Appendix 1.

From 2015 to 2020, the channel area gained 242,950 yd^3 (185,750 m^3) of sediment and lost 190,880 yd^3 (145,940 m^3) for a net gain of 52,073 yd^3 (39,813 m^3) or 10,415 yd^3 per year (7,960 m^3) (**Figure 16; left panel**). The channel area is not expected to experience significant deposition since it is an area of high, concentrated flow. The cut fill analysis also shows what was mentioned above, with deposition on the northern side of the channel, erosion on the southern end as it migrated south, and erosion into the bay side as the channel elongates. During this same time period, the area gained 33 ft. (10 m) in elevation as the channel filled in to the north and lost 35 ft. (10.7 m) in elevation as the channel scoured to the south (**Figure 16; right panel**). This trend remained when looking at the longer term changes from 2011 to 2020. During this time period, the channel area gained 488,180 yd^3 (373,240 m^3) of sediment and lost 272,160 yd^3 (208,080 m^3) with a net gain of 216,020 yd^3 (165,160 m^3) or 24,000 yd^3 per year (18,350 m^3) **(Figure 17; left panel**). During this same time period, parts of the channel gained 56 ft. (17.1 m) in elevation and lost 38 ft. (11.6 m) in elevation (**Figure 17; right panel**). The deposition and scour were in the same pattern described above.

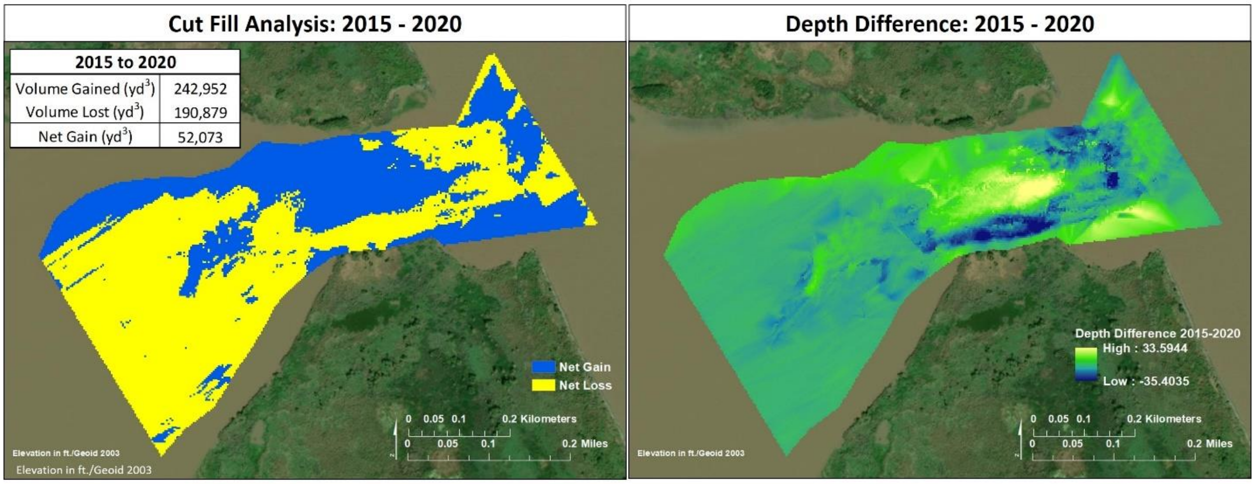


Figure 16: Results of the cut fill and elevation difference analysis in the channel area of the West Bay Sediment Diversion from 2015 to 2020.

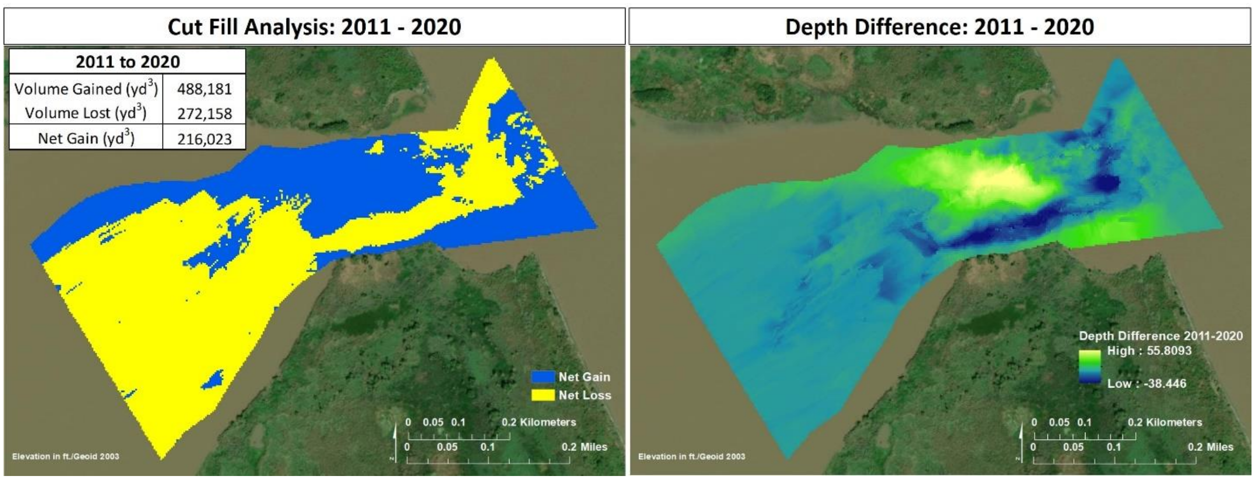


Figure 17: Results of the cut fill and elevation difference analysis in the channel area of the West Bay Sediment Diversion from 2011 to 2020.

Receiving Bay

All of the following descriptions and analysis of elevation and volume change include naturally deposited sediment and dredge placed sediment. As described in the "Beneficial Use" section, there is currently no accurate way to differentiate between these two sources due to the fact that dredge placement straddles the project boundary, over time dredge has been placed in an overlapping pattern, and the elevation survey did not extend to the Mississippi River bank. The survey will be extended in the future to allow for a conservative estimate of natural vs dredge placed land building.

From 2011 to 2020, the receiving bay has become shallower, with a deeper channel developing down the middle (**Figures 18 and 19**). Mean elevation of the entire project area (including the crevasse) in 2011 was -2.6 ft. ± 2.7 (-0.8 m ± 0.82) with a maximum height of 3.2 ft. (0.97 m) and a minimum depth of -95.2 ft. (29 m). In 2015 mean elevation was -1.4 ft. ± 2.7 (-0.43 m ± 0.82), with a maximum height of 4.6 ft. (1.4 m) and a minimum depth of -88.0 ft. (-26.8 m). In 2020 the mean elevation was -0.9 ft. ± 3.1 (-0.27 m ± 0.94), with a maximum height of 7.9 ft. (2.4 m) and a minimum depth of -78.4 ft. (23.9 m). The elevation data was analyzed by area by elevation interval from 2003 through 2020 (**Figure 20**). In general, there is a pattern of erosion in the early years of the project (2003 – 2011) and then a pattern of deposition in the later years (2011 - 2020). While dredge placement has directly caused shallowing in some areas, it is clear the areas where no dredge placement has occurred have also shallowed, indicating a combination of natural and anthropogenic deposition. It is also important to consider the pattern of river flow into the basin. The latest interval, 2015-2020, was marked by numerous high river years that required multiple Bonnet Carré Spillway openings, including an approximately six-month flood stage in 2020. While there was a flood in 2011, earlier intervals did not experience the same river energy as this most recent interval.

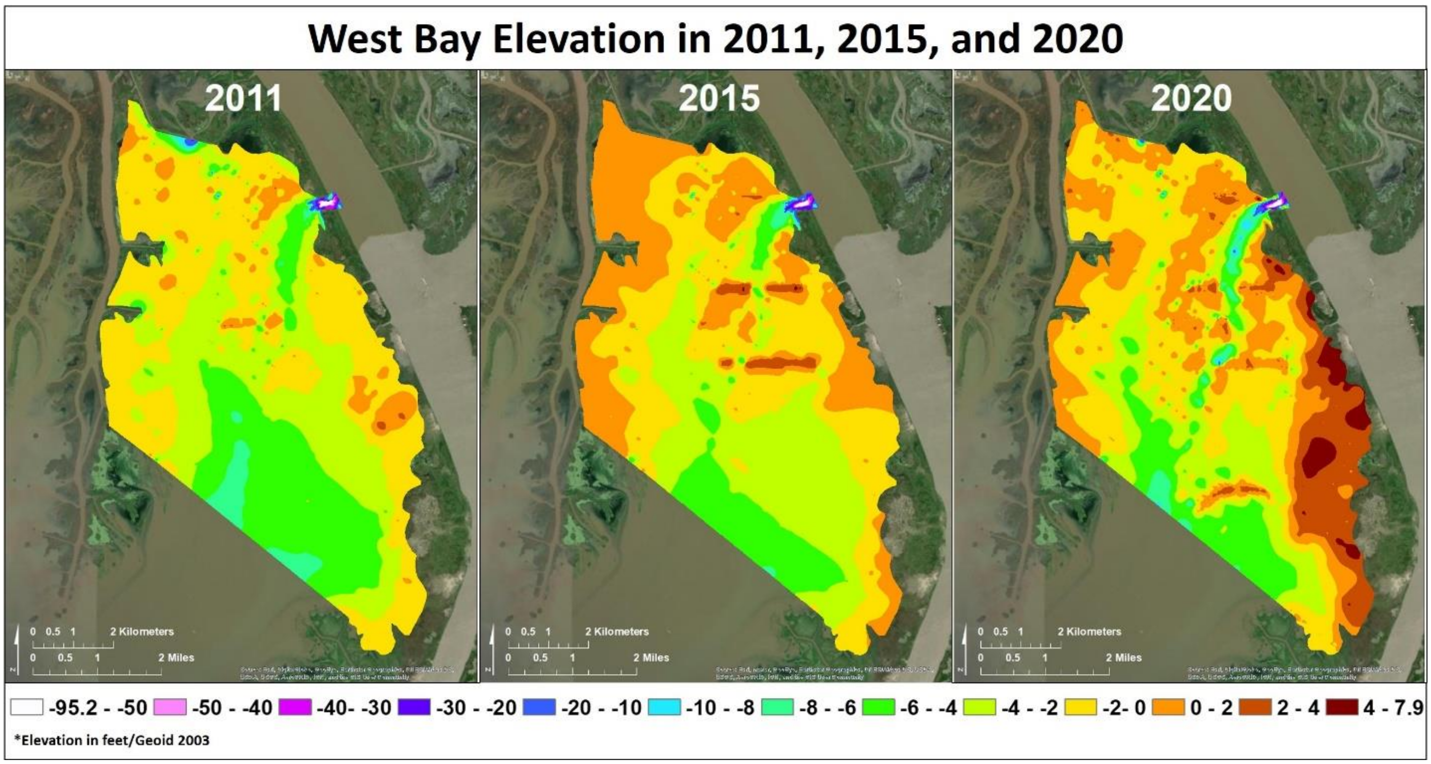


Figure 18: Interpolated surface elevation based on data collected in 2011, 2015, and 2020 in the West Bay project area.

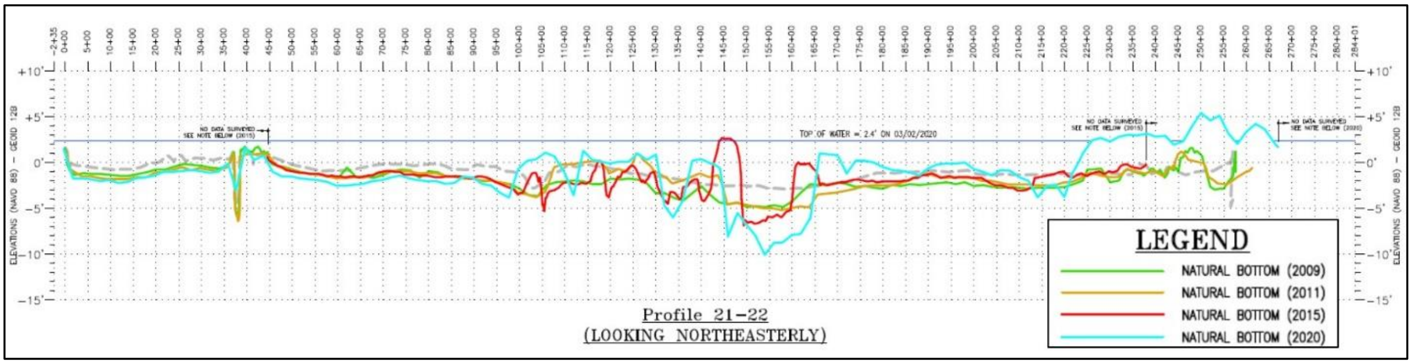


Figure 19: Elevation cross section across the West Bay receiving bay. Note enlargement of a main channel that is developing down the middle of the area (cyan line). This is an example of one cross-section. All cross-sections from the receiving bay can be found in Appendix B.

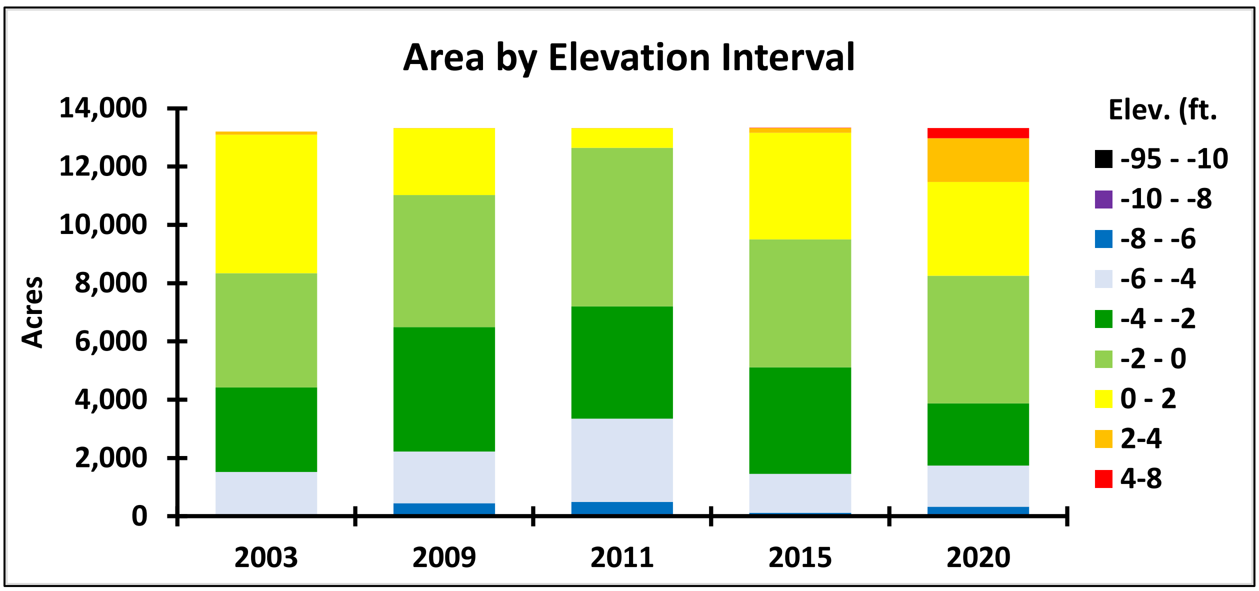


Figure 20: Area by elevation interval for the West Bay project area for 2003 (pre-project), 2009, 2011, 2015, and 2020.

During the first time interval, from project inception through 2009, the West Bay receiving area had a net loss in sediment, losing approximately 2.5 million yd^3 (1.9 million m^3) per year (**Table 4**). The rate of land gain from 2009 to 2011 was 783,000 yd^3 (598,647 m^3) per year, which increased to 4.3 million yd^3 (3.2 million m^3) per year from 2011 to 2015, and then decreased to 1.6 million yd^3 (1.2 million m^3) per year from 2015 to 2020. These increases in sediment volume include both naturally and anthropogenically deposited sediments. The interval with the highest rate was from 2011-2015. This time period did not include any high river (the high river occurred before the 2011 survey so would be part of the 2009 to 2011 interval) and 2015 was the year with the most beneficial placement of dredge material out of any year (excluding 2021 which was placed after the 2020 survey). Although volume placed through the BUDM program is known, these sediments compact and/or erode once placed, so the volume of placed sediments decrease over time. Therefore, if the elevation survey is conducted shortly after placement, it is likely that some volume loss between time intervals is due to compaction.

Table 4: Volume of gain and loss, and rate of change at the West Bay Sediment Diversion.

Years	Gain (yd^3)	Gain Rate (yd^3/year)	Loss (yd^3)	Loss Rate (yd^3/year)	Change (yd^3)	Change Rate (yd^3/year)
2003-2009	3,476,559	579,426	18,290,140	3,048,357	-14,813,581	-2,468,930
2009-2011	7,837,426	3,918,713	6,270,171	3,135,086	1,567,255	783,628
2011-2015	17,979,825	4,494,956	744,477	186,119	17,235,348	4,308,837
2015-2020	17,049,218	3,409,844	9,200,597	1,840,119	7,848,621	1,569,724
2003-2020	**46,343,028**	**2,726,060**	**34,505,385**	**2,029,729**	**11,837,643**	**696,332**

Between 2003 and 2009, the survey area experienced a loss of approximately 14.8 million yd^3 (11.3 million m^3) (Barras et al. 2009). Change analyses between the 2009 and 2011 surveys indicated a net gain of approximately 1.5 million yd^3 (1.2 million m^3) (USACE 2012). Elevation analyses for 2011 through 2015 were performed by the USACE Mobile District's Spatial Analysis Center (USACE 2016). From 2011 to 2015, cut/fill analysis showed a net increase of 17,979,827 yd^3 (13,746,564 m^3) in the receiving area **(Figure 21; left panel**) with a max elevation difference of 15.4 ft. (4.7 m) and a minimum difference of -5.9 ft. (-1.8 m) (**Figure 21; right panel**). Most of the receiving area experienced a net gain except near where the channel enters the bay. This was also the same area where the largest elevation decrease was experienced. The greatest increase in elevation was from the placement of dredge material to construct the SRED islands.

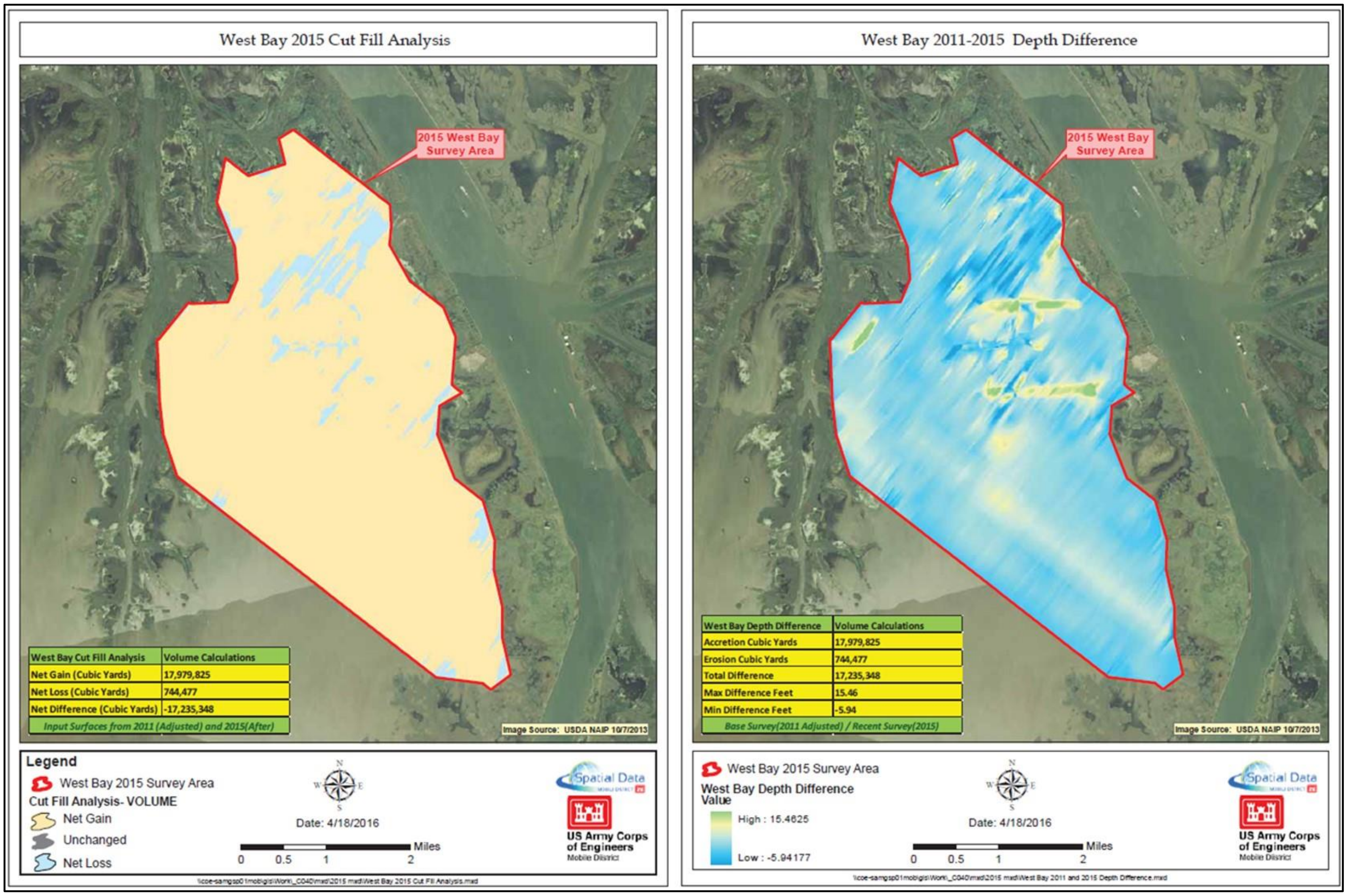


Figure 21: Results of the cut/fill analysis (left panel) and elevation difference analysis (right panel) from 2011 to 2015. Analysis conducted by the USACE (USACE 2016).

From 2015 to 2020, the project area had a net gain of 7,818,620 yd^3 (**Figure 22; left panel**) with a maximum elevation difference of 15.7 ft. (4.8 m) and a minimum difference of -24.0 ft. (-7.3 m) (**Figure 22; right panel**). There was a net loss of sediment in the northern and northwestern part of the receiving bay, perhaps a result of the numerous high river events experienced during this time period. Much of the volume gained is on the eastern side of the project, mostly due to dredge placement. However, there was volume gained in the middle of the receiving area where no dredge was placed during this time period. The highest elevation gained was along the eastern side of the project due to dredge placement. The elevation loss appears to be down the middle of the project area as a deeper, main channel develops (see cross-sections in **Appendix 2**).

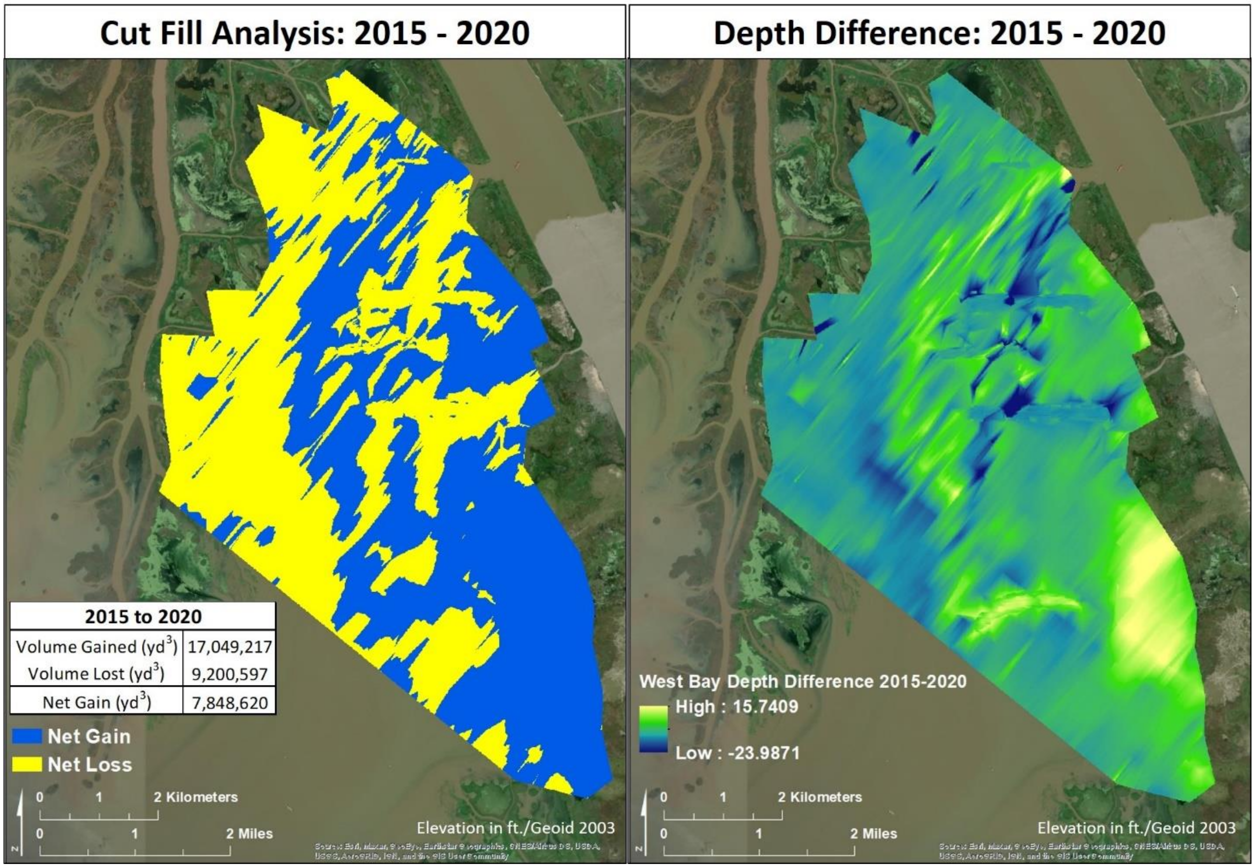


Figure 22: Results of the cut/fill (left panel) and the elevation difference (right panel) analysis for 2015 through 2020 in the West Bay receiving area.

The sedimentary processes in the West Bay receiving area remain dynamic with cycles of deposition and erosion. The area is subject to forcings that erode, deposit and rework sediment such as high river events, hurricanes, and cold fronts. However, with the (presumed) high mineral content of the deposited and placed sediment, there are places where land has developed and persisted throughout the project life. The West Bay Sediment Diversion project is an excellent example of the potential synergies between coastal restoration and routine maintenance dredging with strategically placed dredge material enhancing natural sediment deposition. Historically, river maintenance dredge sediment would be sent down the river and out of the Mississippi River Delta system, bypassing sediment starved wetlands. The BUDM program has pivoted this practice to using those sediments where needed.

iv. Vegetation

Vegetation data were analyzed by year and station as described in the methods section. Percent tree cover, percent shrub cover, and Shannon's Diversity Index were not significantly different by year or station (the interaction of station and year could not be investigated because there was no replication at that level). Tree cover and shrub cover were significantly different by station but those results were most likely skewed because there was tree cover at only one of the stations in two of the three years and there was shrub cover at only 2 stations in 2015 and 2018 and one station in 2021. Therefore, the significant difference by station was driven by highly skewed data. Percent cover, total percent cover (addition of all individual species cover, can be over 100%) and percent herbaceous cover (shrub and tree cover excluded) were significantly different by year (p=0.003, p=0.019, and p<0.001, respectively) but not by plot. All three parameters followed the same pattern with cover increasing slightly from 2015 to 2018, then decreased substantially in 2021, with an increase in standard deviation (indicating a wide range of percent cover) in 2021. Percent cover was 73% ± 23 in 2015, increased to 76% ± 35 in 2018 and then decreased substantially in 2021 to 32% ± 43. Total percent cover was 97% ± 40 cover in 2015, 108% ± 64 in 2018, and 53% ± 72 in 2021. Percent herbaceous cover was 71%± 23 in 2015, 74% ± 35 in 2018, and 29% ± 39 in 2021. Some of the plots that were on land in 2018 had converted back to open water in 2021 (but were full of submerged aquatic vegetation (SAV)), and therefore had zero cover while some of the plots that remained on land were thriving and had high percent cover. Species richness was also significantly different by year (p=0.028) and followed a similar pattern to percent cover with a mean 4.0 ± 2.9 species per plot in 2015, 5.1 ± 3.9 species in 2018, and 2.1 ± 3.3 species in 2021. Lastly, the floristic quality index (FQI) was significantly different by year (p<0.001), with an FQI of 33.4 ± 16.9 in 2015, 32.5 ± 18.7 in 2018, and 13.0 ± 17.9 in 2021 (**Figure 23**). Note that while FQI decreased over time, substantially in 2021, none of the FQI scores are very high and are well below the ideal range of 70-100 for active deltaic plain (Cretini et al. 2011). In 2015 the species with the highest mean percent cover was *Zizania aquatica* (annual wild rice) at 15.5% ± 26.5, followed by the vine *Vigna luteola* (hairypod cowpea) at 11.6% ± 24.9 (**Figure 23**). In 2018, the species with the highest mean percent cover was *Phragmites australis* (common reed) at 17.6% ± 35.6, followed by *Polygonum punctatum* (dotted smartweed) at 11.5% ± 24.4 (**Figure 23**). In 2021, the species with the highest mean percent cover was *Colocasia esculenta* (coco yam) at 7.4% ± 24.2. followed by *Nelumbo lutea* (American lotus) at 6.6% ± 20.5, *P. australis* at 6.6% ± 17.3, and *Salix nigra* (black willow) at 6.1% ± 18.6 (**Figure 23**).

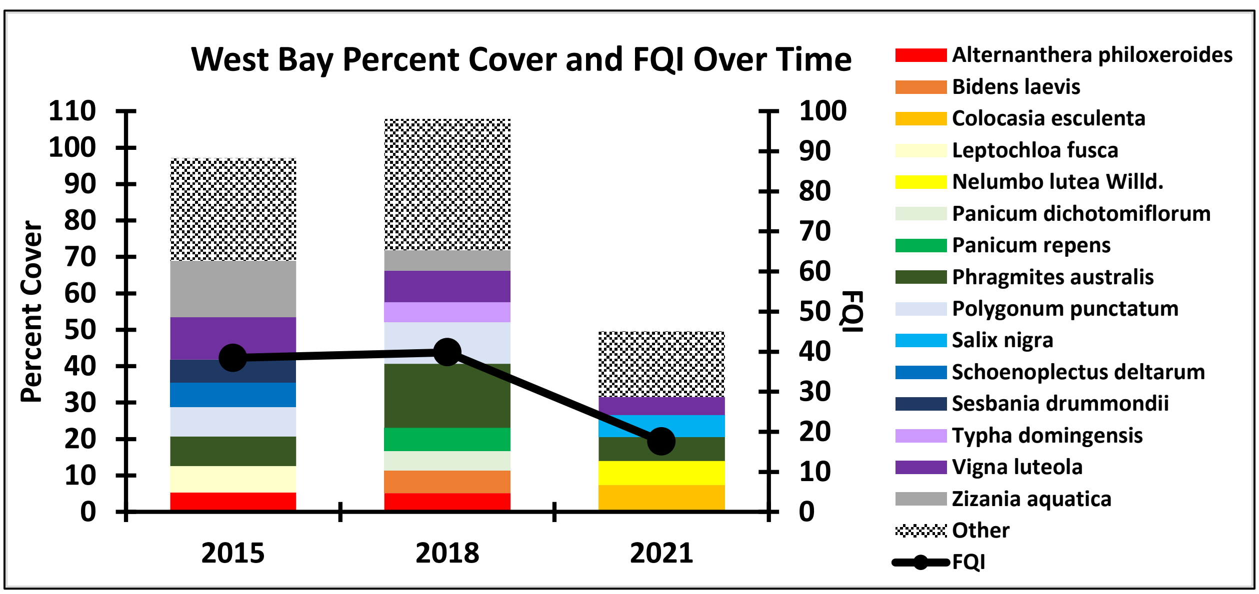


Figure 23: Floristic quality index (FQI) and species composition over time at the West Bay Sediment Diversion.

When vegetation data from West Bay was compared to CRMS 2608, the results were similar to those described above. For most of the parameters, there was no significant difference by location (West Bay vs CRMS) but there was a significant difference by year. The significant difference by year was driven by the low percent cover and species richness found at West Bay in 2021, as described above. See **Table 5** below for means and standard deviation of a variety of parameters. Notice that numbers are similar across locations in 2015 and 2018, but different in 2021. Therefore, the two locations do not seem to be actually different by most parameters and 2021 is anomalous year at the West Bay project, or the two locations are beginning to diverge over time. To support the hypothesis that the two locations are similar in species composition, the NMDS analysis did not converge and therefore found no significant difference between any of the locations and years. The analysis was conducted with all species included, with species with less than 1% cover eliminated and species with less than 5% cover eliminated, and none of the iterations converged on a significant solution.

Table 5: Mean and standard deviation of a variety of vegetation parameters at the West Bay Sediment Diversion and CRMS 2608 over time.

	West Bay						CRMS 2608					
	2015		2018		2021		2015		2018		2021	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
% Cover	73	23	76	35	32	43	80	42	72	13	68	26
Total % Cover	97	40	108	64	54	72	92	50	91	23	83	33
% Herbaceous Cover	74	23	74	35	29	39	80	42	72	13	68	26
Species Richness	4.0	2.9	5.1	3.9	2.1	3.3	4.4	3.6	5.2	2.2	4.7	1.6
Floristic Quality Index	33.4	16.9	32.5	18.7	13.0	17.9	28.2	16.8	33.2	15.2	35.9	17.1

Overall, the vegetation in the West Bay Sediment Diversion project area is very dynamic, changing over time, and varying spatially at any given time. During all three vegetation surveys there was a variety of habitats present from open water, SAV dominated, monoculture of different plant species, fresh to intermediate mixed marsh vegetation and black willow forest (**Figure 24**). Individual plots looked vastly different over time with some developing into solid marsh and others reverting to open water (**Figure 25**). The decrease in vegetative cover in some of the plots in 2021 could be the result of the prolonged high river in both 2019 and 2020 that triggered Bonnet Carré Spillway openings, which could have reworked and eroded sediments and caused prolonged marsh inundation in receiving area during the sustained period of high flow. The vegetation in the West Bay receiving area seems to be evolving and changing over time and does not show any sign of reaching equilibrium soon. However, some areas have stabilized and have consistent vegetative cover that, in some cases, has developed into a woody habitat with shrubs and black willow. While the individual vegetation plots are shifting over time (**Figure 25**) the plant community as a whole is rich with plant life and creates a variety of habitats from shallow open water, to SAV, to emergent marsh, to scrub/shrub to small forest (**Figure 26**).

Figure 24: There are a variety of vegetative cover types found in the West Bay receiving area including: a) open water, b) *Phragmites australis* or roseau cane dominated, c) *Nelumbo lutea* or American lotus dominated, d) newly deposited dredge fill with minimal cover, e) developing woody habitat, and f) SAV dominated.

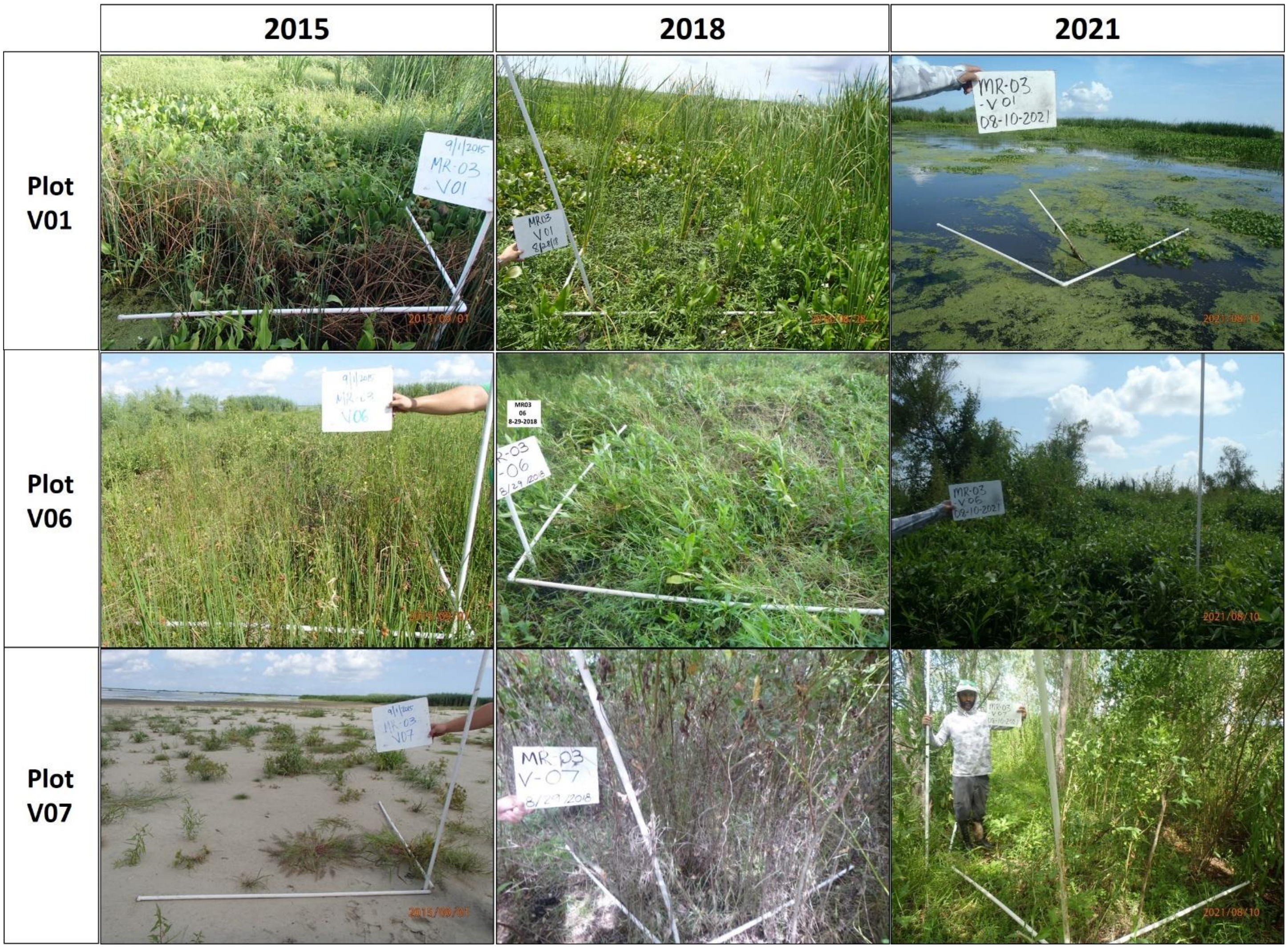


Figure 25: Example of changing vegetation plots over time, transitioning from emergent vegetation to open water (top row), from emergent vegetation to a shrub community (middle row) and going from newly deposited dredge to a nascent forest community (bottom row).

Figure 26: Photo from the West Bay receiving area showing the open water and SAV habitats in the foreground, emergent marsh in the middle, and forest in the background on the left side of the photo.

V. Conclusions

a. Project Effectiveness

The project goals are to increase land to water ratio, increase mean elevation within the receiving bay, and determine the emergent vegetation dynamics in the receiving bay. The West Bay Sediment Diversion is effectively making progress towards these goals. Due to the various beneficial use events and natural deposition, land to water ratios have increased with the addition of strategically placed material, and those sites are vegetating naturally immediately following placement, which helps sustain the newly built land areas. Strategic placement of material is also likely aiding in sediment retention in the basin by slowing and altering the path of the flow through the area, increasing the opportunity for suspended sediments to settle out of the water column, and be captured in the system. The mean elevation within the receiving bay has also increased, and this increasing trend is expected to continue in the near-term as more areas fill in and become sub-aerial. It would be expected that an equilibrium in land to water ratio and elevation would be reached at some point, but it does not seem to have occurred in the first 18 years of the project life in this dynamic system.

Studies suggest that crevasses tend to experience a timeframe of initial scour prior to the depositional period (Cahoon et al. 2011). The West Bay Sediment Diversion has experienced a similar cycle, and has entered the phase of deposition (Yuill et al. 2016). One study found that the majority of sediment transported through the West Bay diversion crevasse was retained in the receiving area, including some deposition occurring seaward of the project boundary (Kolker et al. 2012). Furthermore, the study found that a high river event in 2011 had a large impact, resulting in the emergence of many subaerial islands at low water level. This occurrence is reflected in the 2011 survey data, and highlights the impact and importance of seasonal high water events in the development and maintenance of land in crevasse deltas. However, the prolonged high river events of 2016, 2018, 2019, and 2020, may have altered some of these processes with scour in some locations and the development of a more dominant channel down the middle of the bay. It is important to remember that data is not collected outside of the project area, and therefore it is difficult to determine what is occurring outside of its boundaries, especially to the south in the open bay. This area could be shallowing over time, but is not captured in current analysis. Delta building processes are ongoing in the project area, with land to water ratios increasing overtime.

Volumetric analyses derived from elevation data indicate that the West Bay project area is infilling but at different rates over time. The early period, from 2003 to 2009, was marked by elevation loss and a decrease in sediment volume, or an overall erosional environment, which was confirmed by other studies of the area (Yuill et al. 2016). This is to be expected with the introduction of new flow into the system, with a deeper basin and more head potential from the river. Additionally, Hurricane Katrina affected the area in 2005, which caused land loss in many nearby marshes and associated storm surge could have caused erosion in the shallowing bay (Andrus 2007). Over time, the West Bay receiving area became depositional, which was enhanced by the placement of SREDS. There has been a net gain in sediment since 2009, however the rate of gain has fluctuated over time. Periods with high river events tend to have less annual average gain than period without these major events. The periods of 2009 to 2011 (which included the 2011 flood) and 2015 to 2020 (which included the 2016, 2018, 2019, and 2020 floods) had a lower rate of sediment volume accumulation than the period of 2011 to 2015, which had no river floods. The dredging volumes placed during these periods were highest (annual mean) during the latest period, therefore the differences in sediment volume during various periods cannot only be attributed to dredge placement activity. There also seemed to be a trend up until 2015 of sediment preferentially depositing down the western side of the bay (Allison et al. 2017), which seemed to erode to some degree during the most recent period (**Figures 18, 21, and 22**). The dynamic flows of the Mississippi River appear to have a large role in determining depositional and erosional patterns at the West Bay project over time. However, the West Bay receiving area is currently a net-depositional environment.

The crevasse channel development displayed an initial period of scouring and self-optimization, followed by filling in of some areas of the crevasse along with of the greater basin area. These changes are consistent with early crevasse evolutionary phases, and indicate that the crevasse channel may be self-optimizing (Yuill et al. 2016). The channel displayed deepening between 2009 and 2011, remained somewhat stable from 2011 to 2015 and then shallowed and migrated south between 2015 and 2020. In addition, it appears as if the main channel is elongating into the bay over time. The channel at its narrowest point has increased in width from approximately 155 meters (510 ft.) to 220 meters (720 ft.) from 2004 to 2021. As with the receiving bay, the periods of substantial change in the channel morphology were marked by Mississippi River flood events. Average flow has not substantially increased in over a decade, which would indicate that although the main channel shape as changed, the cross-sectional area, which plays a part in determining flow, has not changed significantly.

The vegetative community in the West Bay project area is consistent with typical fresh and intermediate marsh species composition. Vegetation location is dynamic and shifts with the shifting land masses in the project area. New land, either naturally deposited or dredge placed is colonized by plants and then can shift, build or erode away over time. A few of the SREDs that were placed were cut through as a main channel develops down the middle of the receiving bay. There are a variety of habitats present in the West Bay receiving area (**Figures 25 and 26**), including shallow open water, SAV, emergent marsh, and forest. This variety in habitats allows for a variety of fauna to use and live in the project area. It is important to note that, while land building is important and one of the project goals, there are hundreds of acres of important habitat in the shallow water environment, which were also created by this project.

The West Bay diversion project has overall been successful. It is building land and creating extensive wildlife habitat, compared to the open bay prior to project construction. The project did not build land as quickly or extensively as initially predicted, but this has improved understanding of diversions as a whole. The benefit of the synergy of the BUDM and project flows cannot be overstated. Placed dredge material enhanced land building processes and provides additional sediment in the system that can then be reworked. The West Bay diversion has served as an important analog that was studied in order to model and design the proposed Mid-Barataria and Mid-Breton sediment diversion projects that area a cornerstone of the CPRA's restoration program (CPRA 2017). The West Bay diversion has not reached equilibrium, and further land building and habitat creation would be expected into the future. The project has performed and maintained under a variety of extreme weather conditions including hurricane storm surge in multiple years, Mississippi River floods, and strong cold fronts that can impact the open bay system.

b. Recommendations

Recommendations for the project in the future include:

1. Extend the project life for 20 more years under the CWPPRA program. The West Bay diversion project will reach the end of its 20-year project life in 2023. Because the receiving area has not reached equilibrium and the land-building processes are still dynamic, 20 more years of

monitoring, will be beneficial in understanding the impacts of this important project. Because there is no O&M associated with the project outside of the monthly flow data collection, the 20-year life extension would be mostly to be to continue executing the monitoring activities outlined in this report which include periodic elevation, land/water, and vegetation data collection and analysis.

2. For future elevation surveys, extend the survey past the project boundary on the east side, and proceed all the way to the Mississippi River bank. This would allow for a calculation of volume of sediment that is naturally deposited versus dredged placed over time. Due to the current elevation survey boundary cutting through dredge placement polygons and that dredge placement polygons overlap over time, this difference cannot currently be calculated.

3. While it is necessary to set a project boundary for budgeting, etc., there is currently little to no understanding of how the West Bay Diversion impacts areas south of the current boundary. Since water and sediment flow through and out of the project area, there is a possibility that shallowing is occurring south of the project, especially as the West Bay waters combine with flow from Grand Pass and an unnamed cut off of Southwest Pass. It would be beneficial to do some monitoring and investigation south of the official project boundary to truly understand the full extent of project influence, benefits, and impacts.

c. Lessons Learned

Lessons learned from the West Bay Diversion include:

1. The West Bay Diversion demonstrates that it takes significant time to fill in a large receiving bay such as the West Bay Basin, though strategically placed dredge material has accelerated this process. Consideration and understanding of these factors can aid in improved design and expectations of future diversions and crevasses.

2. Using dredge material to enhance land building by placing SREDs to slow down and deflect flow is an effective technique that could be applied to existing and future areas where there is flowing water.

VI. References

Allison, M. A., B. T. Yuill, E. A. Meselhe, J. K. Marsh, A. S. Kolker, and A. D. Ameen. 2017. Observational and numerical particle tracking to examine sediment dynamics in a Mississippi River delta diversion. Estuarine Coastal and Shelf Science **194**:97-108.

Andrus, T. M. 2007. Sediment flux and fate in the Mississippi River Diversion at West Bay: Observation study. M.S. Thesis, Louisiana State University, Baton Rouge, LA. 242 pp.

Barras, J. A., W. C. Padgett, and C. B. Sanders. 2009. Aerial and Bathymetric Spatial Change Analysis of the West Bay Sediment Diversion Receiving Area, Louisiana for U.S. Army Engineer District, New Orleans (MVN) Report US Army Corps of Engineers. 39 pp.

Boyer, M. E., J. O. Harris, and R. E. Turner. 1997. Constructed crevasses and land gain in the Mississippi River delta. Restoration Ecology **5**:85-92.

Cahoon, D. R., D. A. White, and J. C. Lynch. 2011. Sediment infilling and wetland formation dynamics in an active crevasse splay of the Mississippi River delta. Geomorphology **131**:57-68.

Coleman, J. M. 1988. Dynamic changes and processes in the Mississippi River Delta. Geological Society of America Bulletin **100**:999-1015.

Coleman, J. M., and S. M. Gagliano. 1964. Cyclic sedimentation in the Mississippi River deltaic plain. Transactions of the Gulf Coast Association of Geological Sciences **14**:67-80.

CPRA. 2017. Louisiana's Comprehensive Master Plan for a Sustainable Coast. Coastal Protection and Restoration Authority, Baton Rouge, New Orleans Louisiana, 184 p. http://coastal.la.gov/our-plan/2017-coastal-master-plan/.

Cretini, K. F., J. M. Visser, K. W. Krauss, and G. D. Steyer. 2011. CRMS vegetation analytical team framework—Methods for collection, development, and use of vegetation response variables: U.S. Geological Survey Open-File Report 2011–1097, 60 p, https://pubs.usgs.gov/of/2011/1097/.

Cretini, K. F., J. M. Visser, K. W. Krauss, and G. D. Steyer. 2012. Development and use of a floristic quality index for coastal Louisiana marshes. Environmental Monitoring and Assessment **184**:2389-2403.

Folse, T. M., T. E. McGinnis, L. A. Sharp, J. L. West, M. K. Hymel, J. P. Troutman, D. Weifenbach, W. M. Boshart, L. B. Rodrigue, D. C. Richardi, W. B. Wood, C. M. Miller, E. M. Robinson, A. M. Freeman, C. L. Stagg, B. R. Couvillion, and H. J. Beck. 2020. A standard operating procedures manual for the Coastwide Reference Monitoring System- Wetlands and the system-wide assessment and monitoring program: Methods for site establishment, data collection, and quality assurance/quality control. Louisiana Coastal Protection and Restoration Authority. Baton Rouge, LA, 252 pp.

Kelley, S. 1996. Small Sediment Diversions (MR-01). Progress Report No. 2. Louisiana Department of Natural Resources. Baton Rouge, Louisiana. 12pp.

Kolb, C. R., and J. R. Van Lopik. 1965. Depositional environments of Mississippi River deltaic plain; Southeastern Louisiana. Bulletin of the American Association of Petroleum Geologists **49**:1755.

Kolker, A. S., M. D. Miner, and H. D. Weathers. 2012. Depositional dynamics in a river diversion receiving basin: The case of the West Bay Mississippi River diversion. Estuarine, Coastal and Shelf Science **106**:1-12.

LDNR. 1993. Accretion and hydrologic analyses of three existing crevasse splay marsh creation projects at the Mississippi delta. Louisiana Department of Natural Resources. Final report to U.S. EPA Region VI, Grant No. X-006587-01-0. Baton Rouge, Louisiana. 28pp, plus appendices.

LDNR. 2003. Monitoring plan for the West Bay Sediment Diversion. Louisiana Department of Natural Resources, Coastal Restoration Division. Baton Rouge, LA. 11pp.

Marin, P. E. 1996. A study of sedimentation in an artificially crevassed pond on Delta National Wildlife Refuge, Louisiana. Thesis. University of Southwestern Louisiana, Lafayette, Louisiana.

Morgan, J. P. 1973. Impact of subsidence and erosion on Louisiana coastal marshes and estuaries. *In* R.H. Chabreck, Proceedings of the Coastal Marsh and Estuary Management Symposium. L.S.U., Baton Rouge, Louisiana. P. 217-233.

Mueller-Dombois, D., and H. Ellenberg. 1974. Aims and methods of vegetation ecology. John Wiley and Sons, Inc. New York.

Niell, C., and H. H. Deegan. 1986. The effect of Mississippi River delta lobe development on the habitat composition and diversity of Louisiana coastal wetlands. American Midland Naturalist **116**:296-303.

Nienhuis, J. H., T. E. Tornqvist, K. L. Jankowski, A. M. Fernandes, and M. E. Keogh. 2017. A new subsidence map for coastal Louisiana. GSA Today **27**:58-59.

Penland, S., H. H. Roberts, S. J. Williams, A. H. Sallenger Jr., D. R. Cahoon, D. W. Davis, and C. G. Groat. 1990. Coastal land loss in Louisiana. Gulf Coast Association of Geological Societies Transactions **40**:685-699.

Plitsch, E. 2017. 2016 Operations, Maintenance, and Monitoring Report for West Bay Sediment Diversion (MR-03). Coastal Protection and Restoration Authority of Louisiana, New Orleans, Louisiana. 29pp. https://cims.coastal.louisiana.gov/RecordDetail.aspx?Root=0&sid=21342.

RStudioTeam. 2016. RStudio: Integrated Development for R. RStudio, Inc., Boston, MA http://www.rstudio.com/.

Scruton, P. C. 1960. Delta building and the deltaic sequence.*in* F. P. Shepard, F. B. Phlegar, and T. H. Van Andel, editors. Recent Sediments, Northwest Gulf of Mexico. American Association of Petroleum Geologists.

Shannon, C. E. 1948. A mathematical theory of communication. The Bell System Technical Journal **27**:379-423.

Steyer, G. F., R. C. Raynie, D. L. Steller, D. Fuller, and E. Swenson. 1995, revised 2000. Quality management plan for Coastal Wetlands Planning, Protection, and Restoration Act monitoring program. Open-file report no. 95-01. Louisiana Department of Natural Resources, Coastal Restoration Division, Baton Rouge, LA. 97 pp. plus appendices.

Trepagnier, C. M. 1994. Near coastal waters pilot project: Crevasse splay portion. Final report to U.S. EPA Region VI, Grant No. X-006518-01-2. Louisiana Department of Natural Resources, Coastal Restoration Division. Baton Rouge, Louisiana. 37pp, plus appendices.

USACE. 2012. West Bay 2011 depth analysis process report. Report to USACE New Orleans District from USACE Mobile District Spatial Data Branch (OP-J).

USACE. 2016. West Bay 2015 depth analysis process report. United States Army Corps of Engineers. Report to USACE New Orleans District from USACE Mobile District Spatial Data Branch (OP-J). 23 pp.

Wells, J. T., and J. M. Coleman. 1987. Wetland loss and the subdelta life-cycle. Estuarine Coastal and Shelf Science **25**:111-125.

White, D. A. 1993. Vascular plant community-development on mudflats in the Mississippi River Delta, Louisiana, USA. Aquatic Botany **45**:171-194.

Yuill, B. T., A. K. Khadka, J. Pereira, M. A. Allison, and E. A. Meselhe. 2016. Morphodynamics of the erosional phase of crevasse-splay evolution and implications for river sediment diversion function. Geomorphology **259**:12-29.

Appendix 1:
Cross sections of the West Bay Sediment Diversion Channel Over Time

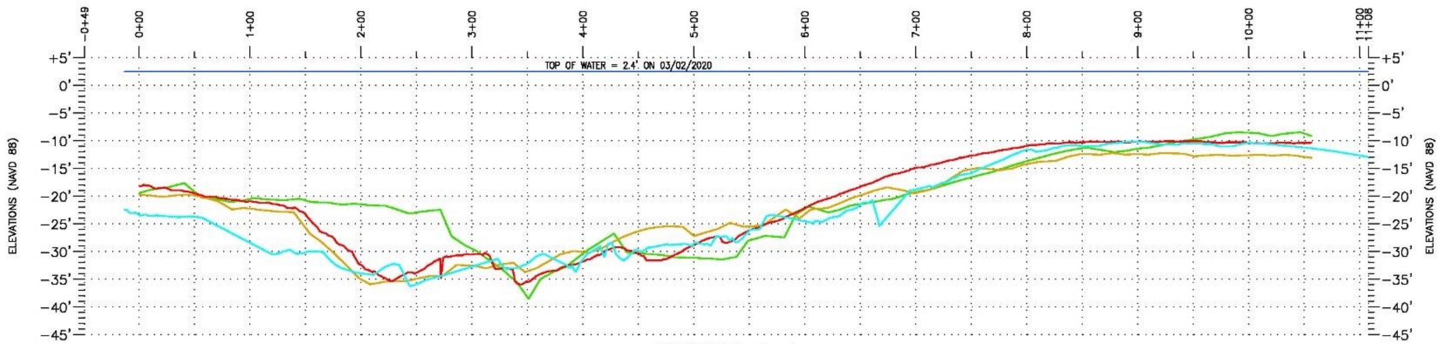
Morris P. Hebert, Inc.
SURVEYING • ENGINEERING • ENVIRONMENTAL • GIS
P.O. BOX 3106 * 116 VENTURE BLVD. * HOUMA, LOUISIANA 70361 * (985) 879-2731
HOUMA, LA * HOUSTON, TX * SAN ANTONIO, TX * MIDLAND, TX
TEXAS SURVEY FIRM REGISTRATION NUMBER: 10193786 (HOUMA OFFICE)

OFFICE OF COASTAL PROTECTION & RESTORATION AUTHORITY OF LOUISIANA

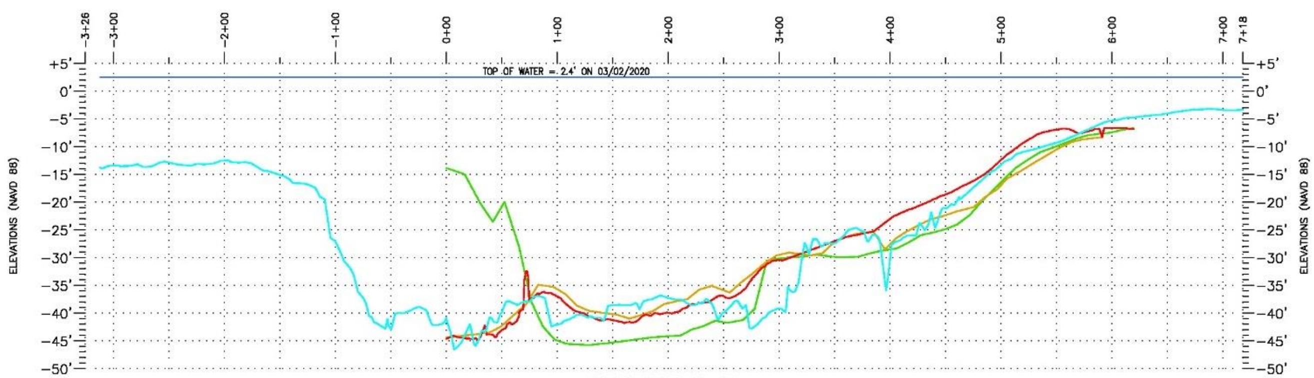
OVERVIEW CREVASSE PROFILES
CREVASSE SURVEY
WEST BAY SEDIMENT DIVERSION PROJECT (MR-0003)
PLAQUEMINES PARISH, LOUISIANA

DRAWN BY:	TPC	SHEET:	1 OF 20
CHKD./APPD. BY: JCM		SCALE:	AS SHOWN
UPDATED BY:		DATE:	06/05/2020
DATA BASE:	13000-06	JOB NO.	13000-06
MPH CAD FILE: 13000-06 – CREVASSE – PROFILE.DWG			

P:\01-Survey_Projects\State of Louisiana\13000-06 – West Bay\CAD Files\00 – Prelim\01 – Crevasse\13000-06 – CREVASSE – profile.dwg PLOT DATE: 6/11/20 2:11:43pm



PROFILE A–A
(LOOKING NORTHEASTERLY)



PROFILE B–B
(LOOKING NORTHEASTERLY)

SCALE
HORIZONTAL: 1"=100'
VERTICAL: 1"=20'

LEGEND

- NATURAL BOTTOM (2009)
- NATURAL BOTTOM (2011)
- NATURAL BOTTOM (2015)
- NATURAL BOTTOM (2020)

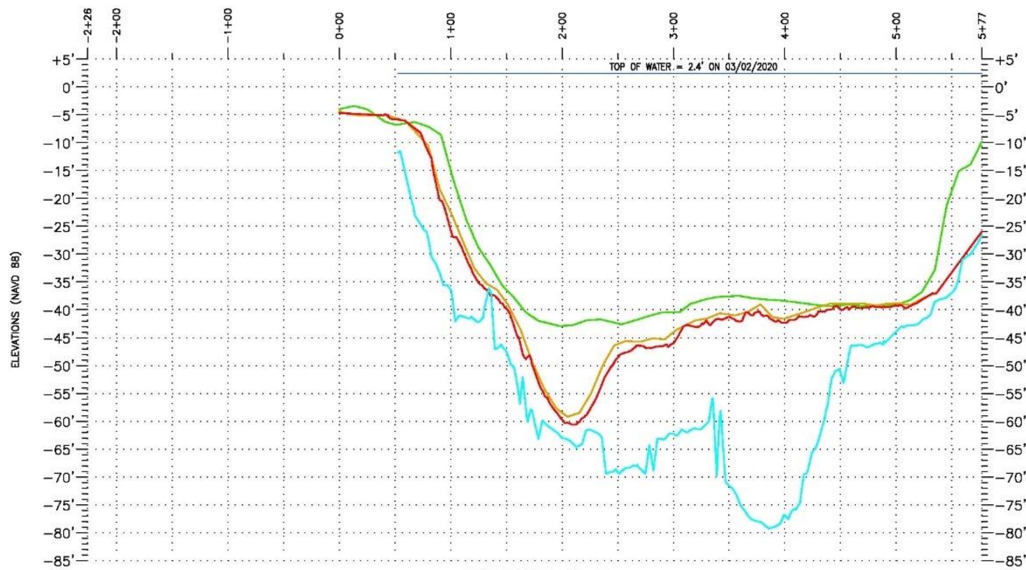
mph Morris P. Hebert, Inc.
SURVEYING • ENGINEERING • ENVIRONMENTAL • GIS
P.O. BOX 3106 * 116 VENTURE BLVD. * HOUMA, LOUISIANA 70361 * (985) 879-2731
HOUMA, LA. * HOUSTON, TX. * SAN ANTONIO, TX. * MIDLAND, TX.
TEXAS SURVEY FIRM REGISTRATION NUMBER 10193786 (HOUMA OFFICE)

OFFICE OF COASTAL PROTECTION & RESTORATION AUTHORITY OF LOUISIANA

CREVASSE PROFILES – NORTHWESTERLY TO SOUTHEASTERLY
PROFILES A–A & B–B
WEST BAY SEDIMENT DIVERSION PROJECT (MR–0003)
PLAQUEMINES PARISH, LOUISIANA

DRAWN BY:	TPC	SHEET:	2 OF 20
CHKD./APPD. BY: JCM		SCALE:	SHOWN
UPDATED BY:		DATE:	06/05/2020
DATA BASE:	13000–06	JOB NO.	13000–06
MPH CAD FILE: 13000–06 – CREVASSE – PROFILE.DWG			

P:\01–Survey_Projects\State of Louisiana\13000–06 – West Bay\CAD Files\00 – Prelim\01 – Crevasse\13000–06 – CREVASSE – profile.dwg PLOT DATE: 6/10/20 10:10:40am



PROFILE C–C
(LOOKING NORTHEASTERLY)

LEGEND

- NATURAL BOTTOM (2009)
- NATURAL BOTTOM (2011)
- NATURAL BOTTOM (2015)
- NATURAL BOTTOM (2020)

SCALE
HORIZONTAL: 1"=100'
VERTICAL: 1"=20'

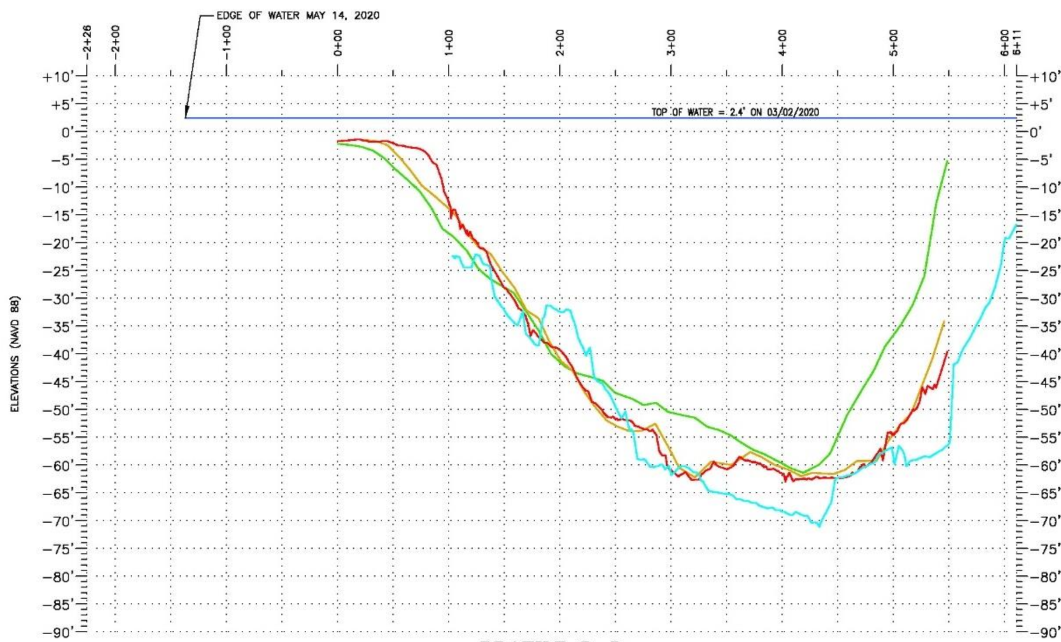
mph Morris P. Hebert, Inc.
SURVEYING • ENGINEERING • ENVIRONMENTAL • GIS
P.O. BOX 3106 * 116 VENTURE BLVD. * HOUMA, LOUISIANA 70361 * (985) 879-2731
HOUMA, LA. * HOUSTON, TX. * SAN ANTONIO, TX. * MIDLAND, TX.
TEXAS SURVEY FIRM REGISTRATION NUMBER: 10193786 (HOUMA OFFICE)

OFFICE OF COASTAL PROTECTION & RESTORATION AUTHORITY OF LOUISIANA

CREVASSE PROFILES – NORTHWESTERLY TO SOUTHEASTERLY
PROFILE C–C
WEST BAY SEDIMENT DIVERSION PROJECT (MR–0003)
PLAQUEMINES PARISH, LOUISIANA

DRAWN BY:	TPC	SHEET:	3 OF 20
CHKD./APPD. BY: JCM		SCALE:	SHOWN
UPDATED BY:		DATE:	06/05/2020
DATA BASE:	13000–06	JOB NO.	13000–06
MPH CAD FILE: 13000–06 – CREVASSE – PROFILE.DWG			

P:\01–Survey_Projects\State of Louisiana\13000–06 – West Bay\CAD Files\00 – Prelim\01 – Crevasse\13000–06 – CREVASSE – profile.dwg PLOT DATE: 6/10/20 9:45:54am



PROFILE D–D
(LOOKING NORTHEASTERLY)

LEGEND

- NATURAL BOTTOM (2009)
- NATURAL BOTTOM (2011)
- NATURAL BOTTOM (2015)
- NATURAL BOTTOM (2020)

SCALE
HORIZONTAL: 1"=100'
VERTICAL: 1"=20'

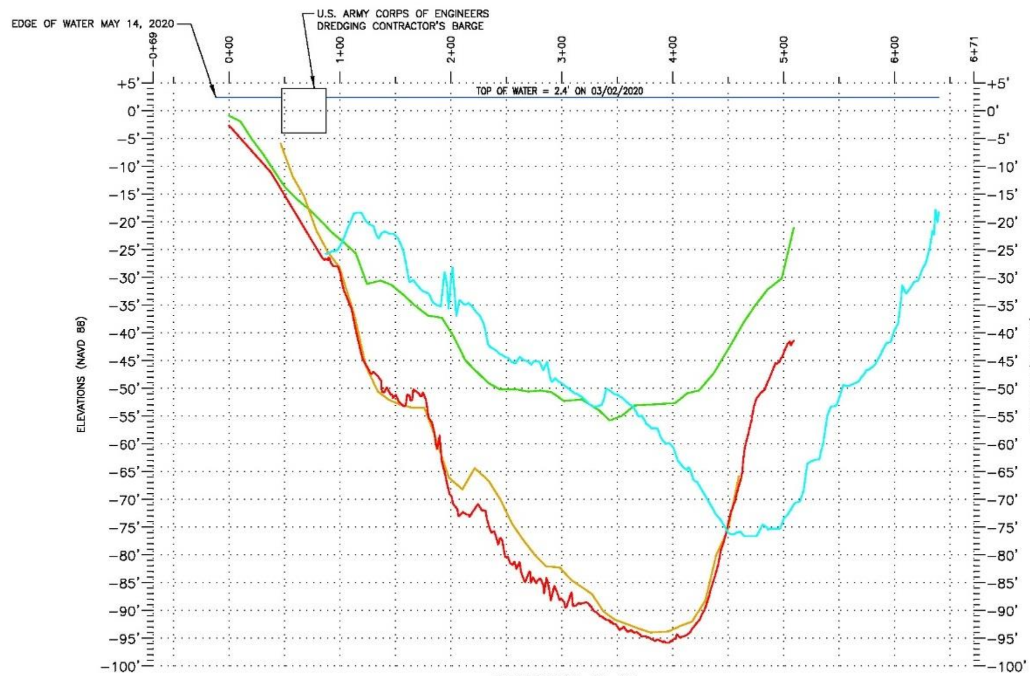
Morris P. Hebert, Inc.
SURVEYING • ENGINEERING • ENVIRONMENTAL • GIS
P.O. BOX 3106 * 116 VENTURE BLVD. * HOUMA, LOUISIANA 70361 * (985) 879-2731
HOUMA, LA. * HOUSTON, TX. * SAN ANTONIO, TX. * MIDLAND, TX.
TEXAS SURVEY FIRM REGISTRATION NUMBER 10193786 (HOUMA OFFICE)

OFFICE OF COASTAL PROTECTION & RESTORATION AUTHORITY OF LOUISIANA

CREVASSE PROFILES – NORTHWESTERLY TO SOUTHEASTERLY
PROFILE D–D
WEST BAY SEDIMENT DIVERSION PROJECT (MR-0003)
PLAQUEMINES PARISH, LOUISIANA

DRAWN BY:	TPC	SHEET:	4 OF 20
CHKD./APPD. BY: JCM		SCALE:	SHOWN
UPDATED BY:		DATE:	06/05/2020
DATA BASE:	13000-06	JOB NO.	13000-06
MPH CAD FILE: 13000-06 – CREVASSE – PROFILE.DWG			

P:\01-Survey_Projects\State of Louisiana\13000-06 – West Bay\CAD Files\00 – Prelim\01 – Crevasse\13000-06 – CREVASSE – profile.dwg PLOT DATE: 6/11/20 4:34:53pm



PROFILE E–E
(LOOKING NORTHEASTERLY)

LEGEND

- NATURAL BOTTOM (2009)
- NATURAL BOTTOM (2011)
- NATURAL BOTTOM (2015)
- NATURAL BOTTOM (2020)

SCALE
HORIZONTAL: 1"=100'
VERTICAL: 1"=20'

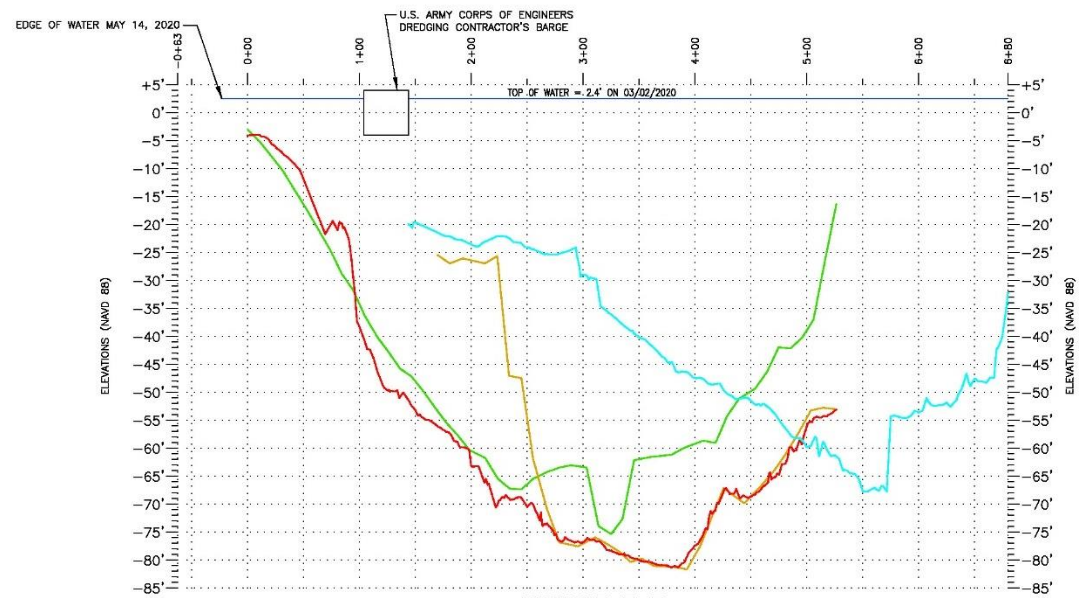
Morris P. Hebert, Inc.
SURVEYING • ENGINEERING • ENVIRONMENTAL • GIS
P.O. BOX 3106 * 116 VENTURE BLVD. * HOUMA, LOUISIANA 70361 * (985) 879-2731
HOUMA, LA. * HOUSTON, TX. * SAN ANTONIO, TX. * MIDLAND, TX.
TEXAS SURVEY FIRM REGISTRATION NUMBER: 10193788 (HOUMA OFFICE)

OFFICE OF COASTAL PROTECTION & RESTORATION AUTHORITY OF LOUISIANA

CREVASSE PROFILES – NORTHWESTERLY TO SOUTHEASTERLY
PROFILE E–E
WEST BAY SEDIMENT DIVERSION PROJECT (MR-0003)
PLAQUEMINES PARISH, LOUISIANA

DRAWN BY:	TPC	SHEET:	5 OF 20
CHKD./APPD. BY:	JCM	SCALE:	SHOWN
UPDATED BY:		DATE:	06/05/2020
DATA BASE:	13000-06	JOB NO.	13000-06
MPH CAD FILE: 13000-06 – CREVASSE – PROFILE.DWG			

P:\01-Survey_Projects\State of Louisiana\13000-06 – West Bay\CAD Files\00 – Prelim\01 – Crevasse\13000-06 – CREVASSE – profile.dwg PLOT DATE: 6/11/20 4:39:09pm



PROFILE F–F
(LOOKING NORTHEASTERLY)

LEGEND
- NATURAL BOTTOM (2009)
- NATURAL BOTTOM (2011)
- NATURAL BOTTOM (2015)
- NATURAL BOTTOM (2020)

SCALE
HORIZONTAL: 1"=100'
VERTICAL: 1"=20'

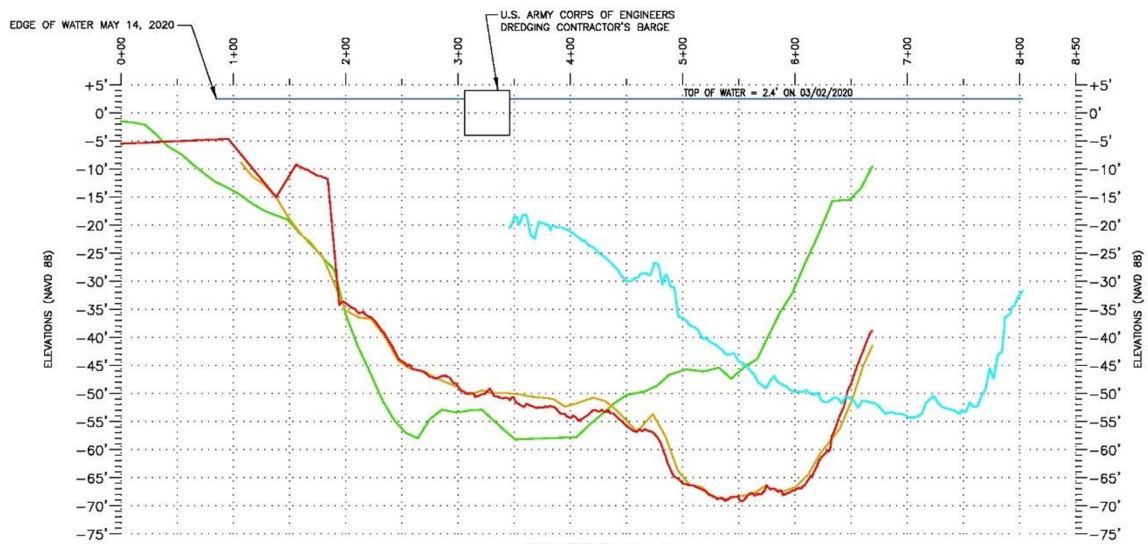
Morris P. Hebert, Inc.
SURVEYING • ENGINEERING • ENVIRONMENTAL • GIS
P.O. BOX 3106 * 116 VENTURE BLVD. * HOUMA, LOUISIANA 70361 * (985) 879-2731
HOUMA, LA. * HOUSTON, TX. * SAN ANTONIO, TX. * MIDLAND, TX.
TEXAS SURVEY FIRM REGISTRATION NUMBER: 10193786 (HOUMA OFFICE)

OFFICE OF COASTAL PROTECTION & RESTORATION AUTHORITY OF LOUISIANA

CREVASSE PROFILES – NORTHWESTERLY TO SOUTHEASTERLY
PROFILE F–F
WEST BAY SEDIMENT DIVERSION PROJECT (MR–0003)
PLAQUEMINES PARISH, LOUISIANA

DRAWN BY:	TPC	SHEET:	6 OF 20
CHKD./APPD. BY: JCM		SCALE:	SHOWN
UPDATED BY:		DATE:	06/05/2020
DATA BASE:	13000–06	JOB NO.	13000–06
MPH CAD FILE: 13000–06 – CREVASSE – PROFILE.DWG			

P:\01–Survey_Projects\State of Louisiana\13000–06 – West Bay\CAD Files\00 – Prelim\01 – Crevasse\13000–06 – CREVASSE – profile.dwg PLOT DATE: 6/11/20 4:40:54pm



PROFILE G–G
(LOOKING NORTHEASTERLY)

LEGEND

- NATURAL BOTTOM (2009)
- NATURAL BOTTOM (2011)
- NATURAL BOTTOM (2015)
- NATURAL BOTTOM (2020)

SCALE

HORIZONTAL: 1"=100'
VERTICAL: 1"=20'

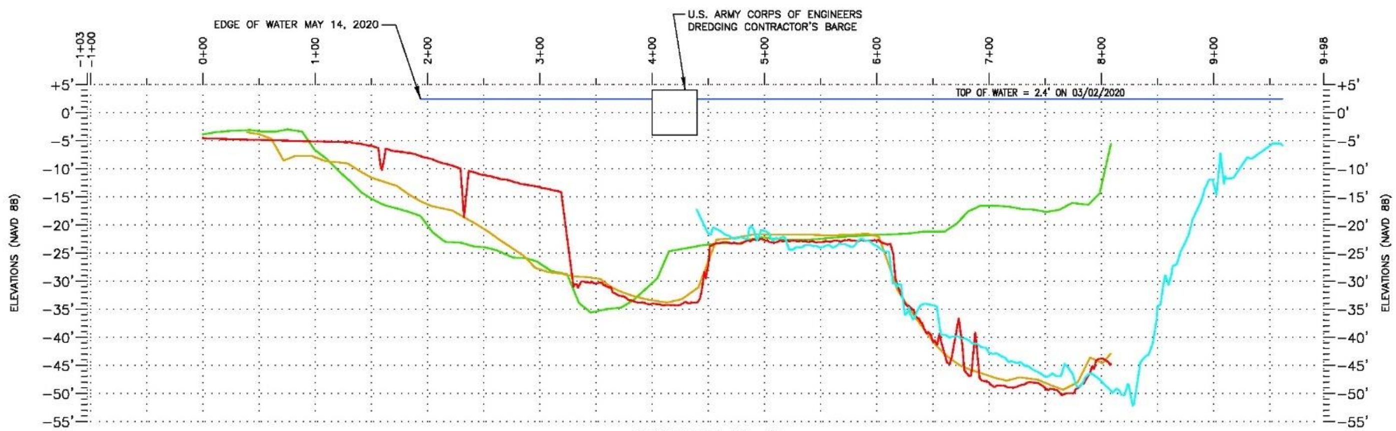
Morris P. Hebert, Inc.
SURVEYING • ENGINEERING • ENVIRONMENTAL • GIS
P.O. BOX 3106 * 116 VENTURE BLVD. * HOUMA, LOUISIANA 70361 * (985) 879-2731
HOUMA, LA. * HOUSTON, TX. * SAN ANTONIO, TX. * MIDLAND, TX.
TEXAS SURVEY FIRM REGISTRATION NUMBER 10193786 (HOUMA OFFICE)

OFFICE OF COASTAL PROTECTION & RESTORATION AUTHORITY OF LOUISIANA

CREVASSE PROFILES – NORTHWESTERLY TO SOUTHEASTERLY
PROFILE G–G
WEST BAY SEDIMENT DIVERSION PROJECT (MR–0003)
PLAQUEMINES PARISH, LOUISIANA

DRAWN BY:	TPC	SHEET:	7 OF 20
CHKD./APPD. BY:	JCM	SCALE:	SHOWN
UPDATED BY:		DATE:	06/05/2020
DATA BASE:	13000–06	JOB NO.	13000–06
MPH CAD FILE: 13000–06 – CREVASSE – PROFILE.DWG			

P:\01–Survey_Projects\State of Louisiana\13000–06 – West Bay\CAD Files\00 – Prelim\01 – Crevasse\13000–06 – CREVASSE – profile.dwg PLOT DATE: 6/11/20 4:44:11pm



PROFILE H–H
(LOOKING NORTHEASTERLY)

LEGEND

- NATURAL BOTTOM (2009)
- NATURAL BOTTOM (2011)
- NATURAL BOTTOM (2015)
- NATURAL BOTTOM (2020)

SCALE
HORIZONTAL: 1"=100'
VERTICAL: 1"=20'

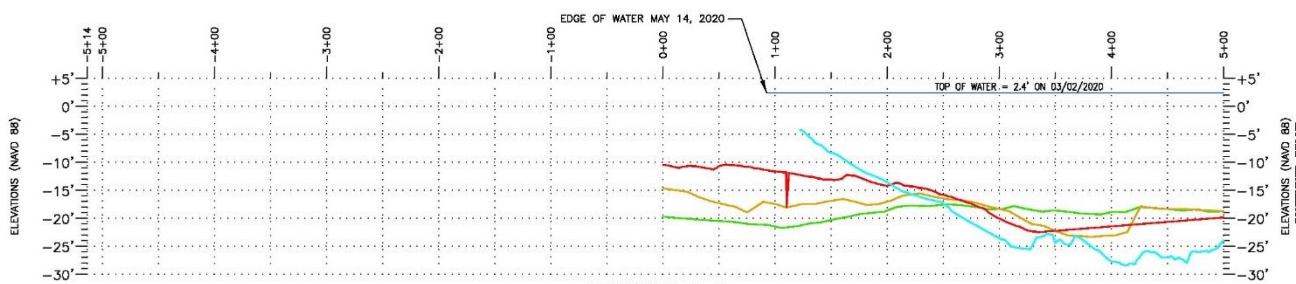
mph Morris P. Hebert, Inc.
SURVEYING • ENGINEERING • ENVIRONMENTAL • GIS
P.O. BOX 3106 * 118 VENTURE BLVD. * HOUMA, LOUISIANA 70361 * (985) 879-2731
HOUMA, LA. * HOUSTON, TX. * SAN ANTONIO, TX. * MIDLAND, TX.
TEXAS SURVEY FIRM REGISTRATION NUMBER: 10193786 (HOUMA OFFICE)

OFFICE OF COASTAL PROTECTION & RESTORATION AUTHORITY OF LOUISIANA

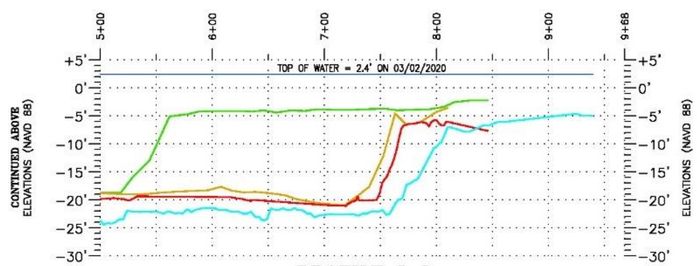
CREVASSE PROFILES – NORTHWESTERLY TO SOUTHEASTERLY
PROFILE H–H
WEST BAY SEDIMENT DIVERSION PROJECT (MR–0003)
PLAQUEMINES PARISH, LOUISIANA

DRAWN BY:	TPC	SHEET:	8 OF 20
CHKD./APPD. BY: JCM		SCALE:	SHOWN
UPDATED BY:		DATE:	06/05/2020
DATA BASE:	13000–06	JOB NO.	13000–06
MPH CAD FILE: 13000–06 – CREVASSE – PROFILE.DWG			

P:\01–Survey_Projects\State of Louisiana\13000–06 – West Bay\CAD Files\00 – Prelim\01 – Crevasse\13000–06 – CREVASSE – profile.dwg PLOT DATE: 6/11/20 4:46:19pm



PROFILE I–I
(LOOKING NORTHEASTERLY)



PROFILE I–I
(LOOKING NORTHEASTERLY)

LEGEND

- NATURAL BOTTOM (2009)
- NATURAL BOTTOM (2011)
- NATURAL BOTTOM (2015)
- NATURAL BOTTOM (2020)

SCALE
HORIZONTAL: 1"=100'
VERTICAL: 1"=20'

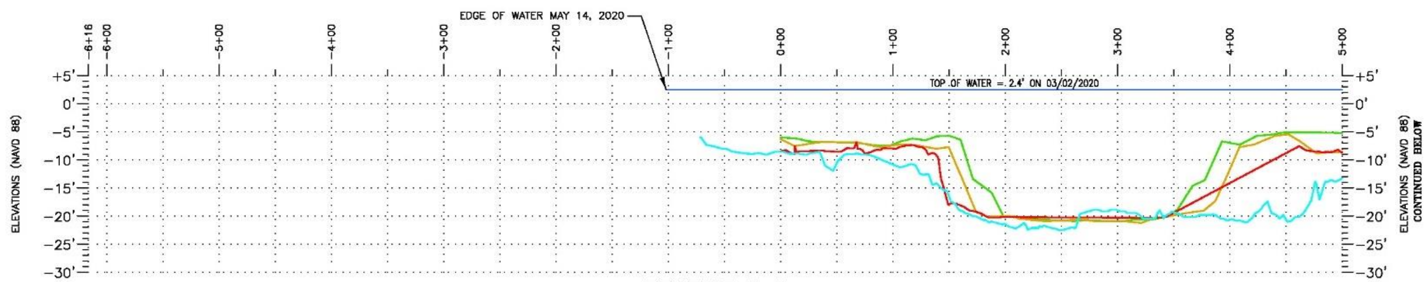
Morris P. Hebert, Inc.
SURVEYING • ENGINEERING • ENVIRONMENTAL • GIS
P.O. BOX 3106 * 116 VENTURE BLVD. * HOUMA, LOUISIANA 70361 * (985) 879-2731
HOUMA, LA. * HOUSTON, TX. * SAN ANTONIO, TX. * MIDLAND, TX.
TEXAS SURVEY FIRM REGISTRATION NUMBER: 10193786 (HOUMA OFFICE)

OFFICE OF COASTAL PROTECTION & RESTORATION AUTHORITY OF LOUISIANA

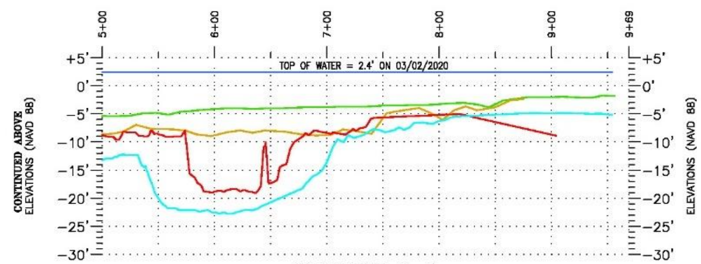
CREVASSE PROFILES – NORTHWESTERLY TO SOUTHEASTERLY
PROFILE I–I
WEST BAY SEDIMENT DIVERSION PROJECT (MR-0003)
PLAQUEMINES PARISH, LOUISIANA

DRAWN BY:	TPC	SHEET:	9 OF 20
CHKD./APPD. BY: JCM		SCALE:	SHOWN
UPDATED BY:		DATE:	06/05/2020
DATA BASE:	13000-06	JOB NO.	13000-06
MPH CAD FILE: 13000-06 – CREVASSE – PROFILE.DWG			

P:\01-Survey_Projects\State of Louisiana\13000-06 – West Bay\CAD Files\00 – Prelim\01 – Crevasse\13000-06 – CREVASSE – profile.dwg PLOT DATE: 6/11/20 1:56:23pm



PROFILE J–J
(LOOKING NORTHEASTERLY)



PROFILE J–J
(LOOKING NORTHEASTERLY)

LEGEND

- NATURAL BOTTOM (2009)
- NATURAL BOTTOM (2011)
- NATURAL BOTTOM (2015)
- NATURAL BOTTOM (2020)

SCALE
HORIZONTAL: 1"=100'
VERTICAL: 1"=20'

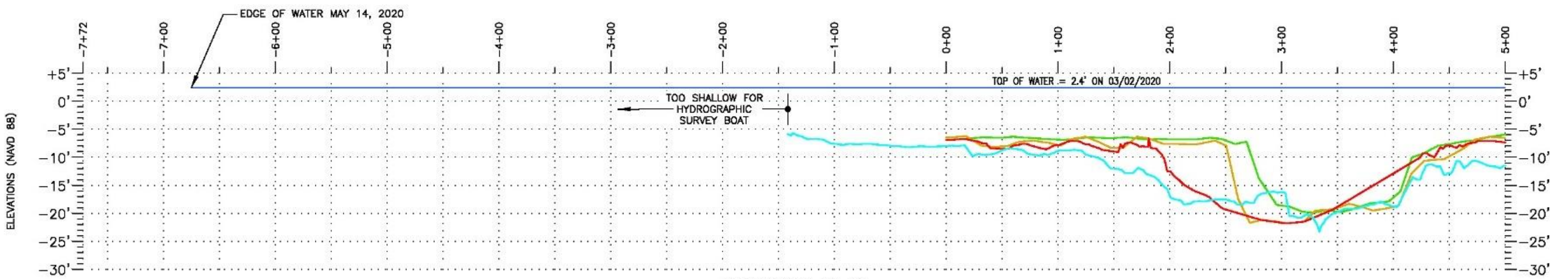
mph Morris P. Hebert, Inc.
SURVEYING • ENGINEERING • ENVIRONMENTAL • GIS
P.O. BOX 3106 * 116 VENTURE BLVD. * HOUMA, LOUISIANA 70361 * (985) 879-2731
HOUMA, LA. * HOUSTON, TX. * SAN ANTONIO, TX. * MIDLAND, TX.
TEXAS SURVEY FIRM REGISTRATION NUMBER: 10193786 (HOUMA OFFICE)

OFFICE OF COASTAL PROTECTION & RESTORATION AUTHORITY OF LOUISIANA

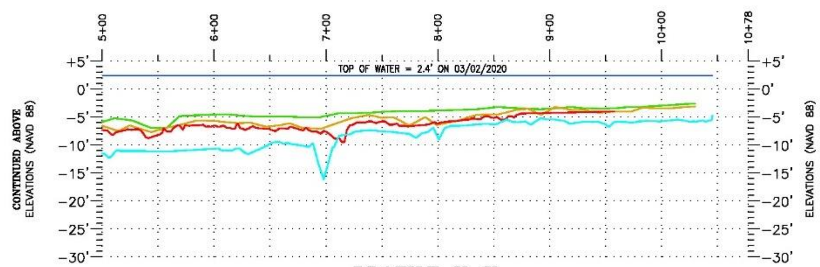
CREVASSE PROFILES – NORTHWESTERLY TO SOUTHEASTERLY
PROFILE J–J
WEST BAY SEDIMENT DIVERSION PROJECT (MR–0003)
PLAQUEMINES PARISH, LOUISIANA

DRAWN BY:	TPC	SHEET:	10 OF 20
CHKD./APPD. BY: JCM		SCALE:	SHOWN
UPDATED BY:		DATE:	06/05/2020
DATA BASE:	13000–06	JOB NO.	13000–06
MPH CAD FILE: 13000–06 – CREVASSE – PROFILE.DWG			

P:\01–Survey_Projects\State of Louisiana\13000–06 – West Bay\CAD Files\00 – Prelim\01 – Crevasse\13000–06 – CREVASSE – profile.dwg PLOT DATE: 6/11/20 1:59:22pm



PROFILE K–K
(LOOKING NORTHEASTERLY)



PROFILE K–K
(LOOKING NORTHEASTERLY)

LEGEND

- NATURAL BOTTOM (2009)
- NATURAL BOTTOM (2011)
- NATURAL BOTTOM (2015)
- NATURAL BOTTOM (2020)

SCALE
HORIZONTAL: 1"=100'
VERTICAL: 1"=20'

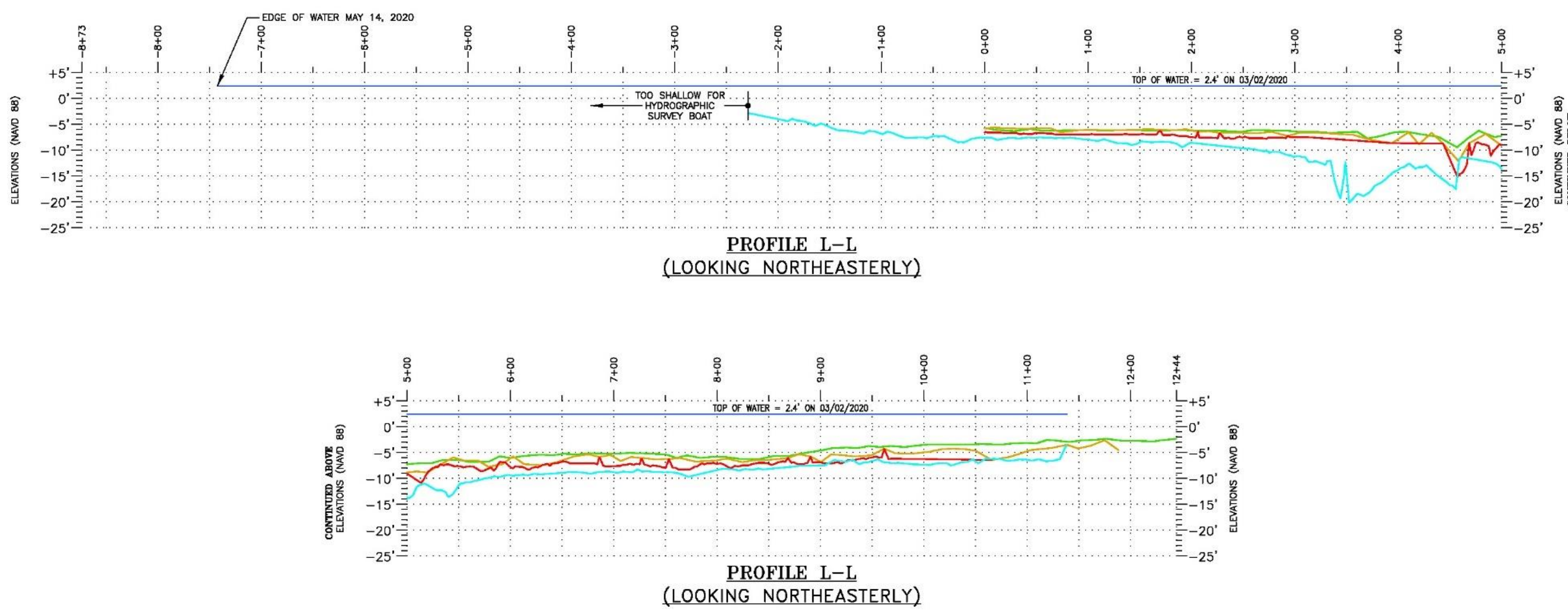
mph Morris P. Hebert, Inc.
SURVEYING • ENGINEERING • ENVIRONMENTAL • GIS
P.O. BOX 3106 * 118 VENTURE BLVD. * HOUMA, LOUISIANA 70361 * (985) 879-2731
HOUMA, LA. * HOUSTON, TX. * SAN ANTONIO, TX. * MIDLAND, TX.
TEXAS SURVEY FIRM REGISTRATION NUMBER: 10193786 (HOUMA OFFICE)

OFFICE OF COASTAL PROTECTION & RESTORATION AUTHORITY OF LOUISIANA

CREVASSE PROFILES – NORTHWESTERLY TO SOUTHEASTERLY
PROFILE K–K
WEST BAY SEDIMENT DIVERSION PROJECT (MR–0003)
PLAQUEMINES PARISH, LOUISIANA

DRAWN BY:	TPC	SHEET:	11 OF 20
CHKD./APPD. BY: JCM		SCALE:	SHOWN
UPDATED BY:		DATE:	06/05/2020
DATA BASE:	13000–06	JOB NO.	13000–06
MPH CAD FILE: 13000–06 – CREVASSE – PROFILE.DWG			

P:\01–Survey_Projects\State of Louisiana\13000–06 – West Bay\CAD Files\00 – Prelim\01 – Crevasse\13000–06 – CREVASSE – profile.dwg PLOT DATE: 6/11/20 2:25:44pm



PROFILE L–L
(LOOKING NORTHEASTERLY)

PROFILE L–L
(LOOKING NORTHEASTERLY)

LEGEND

- NATURAL BOTTOM (2009)
- NATURAL BOTTOM (2011)
- NATURAL BOTTOM (2015)
- NATURAL BOTTOM (2020)

SCALE
HORIZONTAL: 1"=100'
VERTICAL: 1"=20'

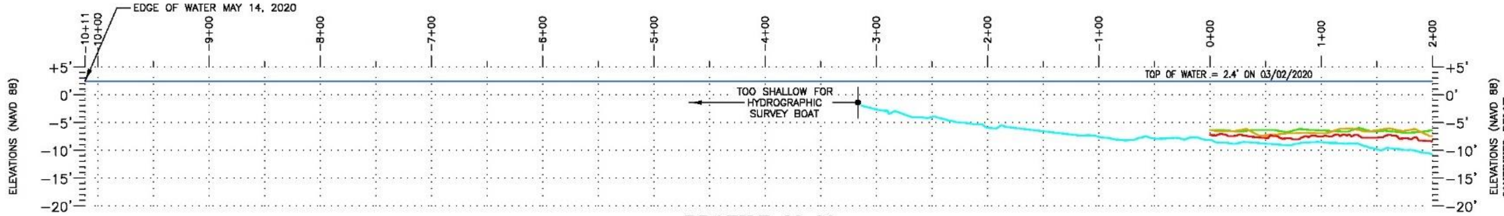
Morris P. Hebert, Inc.
SURVEYING • ENGINEERING • ENVIRONMENTAL • GIS
P.O. BOX 3106 * 116 VENTURE BLVD. * HOUMA, LOUISIANA 70361 * (985) 879-2731
HOUMA, LA. * HOUSTON, TX. * SAN ANTONIO, TX. * MIDLAND, TX.
TEXAS SURVEY FIRM REGISTRATION NUMBER: 10193786 (HOUMA OFFICE)

OFFICE OF COASTAL PROTECTION & RESTORATION AUTHORITY OF LOUISIANA

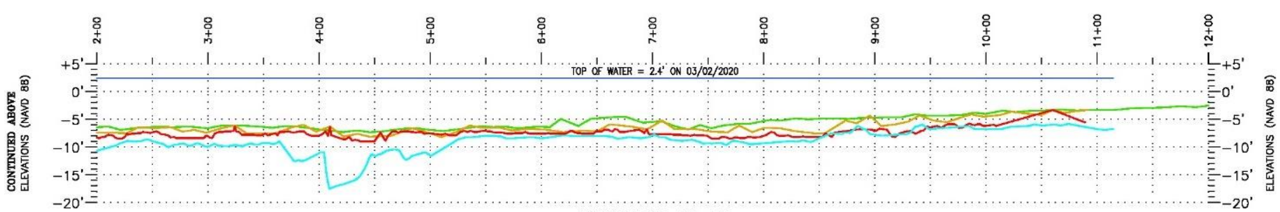
CREVASSE PROFILES – NORTHWESTERLY TO SOUTHEASTERLY
PROFILE L–L
WEST BAY SEDIMENT DIVERSION PROJECT (MR-0003)
PLAQUEMINES PARISH, LOUISIANA

DRAWN BY:	TPC	SHEET:	12 OF 20
CHKD./APPD. BY: JCM		SCALE:	SHOWN
UPDATED BY:		DATE:	06/05/2020
DATA BASE:	13000-06	JOB NO.	13000-06
MPH CAD FILE: 13000-06 – CREVASSE – PROFILE.DWG			

P:\01-Survey_Projects\State of Louisiana\13000-06 – West Bay\CAD Files\00 – Prelim\01 – Crevasse\13000-06 – CREVASSE – profile.dwg PLOT DATE: 6/11/20 2:27:38pm



PROFILE M–M
(LOOKING NORTHEASTERLY)



PROFILE M–M
(LOOKING NORTHEASTERLY)

LEGEND

- NATURAL BOTTOM (2009)
- NATURAL BOTTOM (2011)
- NATURAL BOTTOM (2015)
- NATURAL BOTTOM (2020)

SCALE
HORIZONTAL: 1"=100'
VERTICAL: 1"=20'

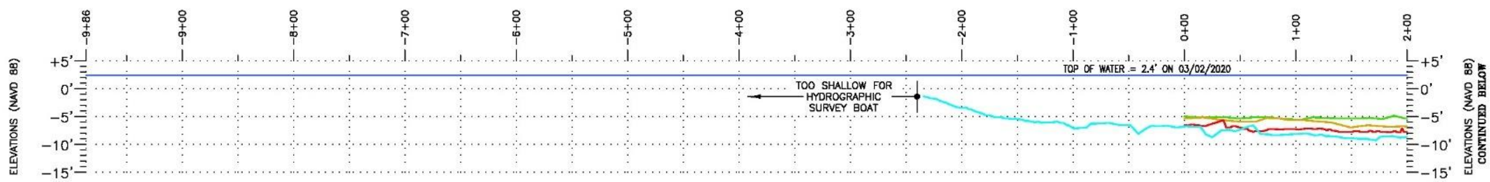
mph Morris P. Hebert, Inc.
SURVEYING • ENGINEERING • ENVIRONMENTAL • GIS
P.O. BOX 3106 * 116 VENTURE BLVD. * HOUMA, LOUISIANA 70361 * (985) 879-2731
HOUMA, LA. * HOUSTON, TX. * SAN ANTONIO, TX. * MIDLAND, TX.
TEXAS SURVEY FIRM REGISTRATION NUMBER: 10193786 (HOUMA OFFICE)

OFFICE OF COASTAL PROTECTION & RESTORATION AUTHORITY OF LOUISIANA

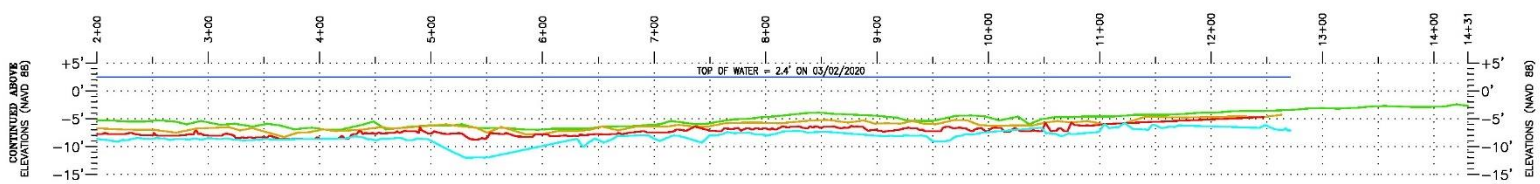
CREVASSE PROFILES – NORTHWESTERLY TO SOUTHEASTERLY
PROFILE M–M
WEST BAY SEDIMENT DIVERSION PROJECT (MR–0003)
PLAQUEMINES PARISH, LOUISIANA

DRAWN BY:	TPC	SHEET:	13 OF 20
CHKD./APPD. BY: JCM		SCALE:	SHOWN
UPDATED BY:		DATE:	06/05/2020
DATA BASE:	13000–06	JOB NO.	13000–06
MPH CAD FILE: 13000–06 – CREVASSE – PROFILE.DWG			

P:\01–Survey_Projects\State of Louisiana\13000–06 – West Bay\CAD Files\00 – Prelim\01 – Crevasse\13000–06 – CREVASSE – profile.dwg PLOT DATE: 6/11/20 2:32:59pm



PROFILE N-N
(LOOKING NORTHEASTERLY)



PROFILE N-N
(LOOKING NORTHEASTERLY)

LEGEND

- NATURAL BOTTOM (2009)
- NATURAL BOTTOM (2011)
- NATURAL BOTTOM (2015)
- NATURAL BOTTOM (2020)

SCALE
HORIZONTAL: 1"=100'
VERTICAL: 1"=20'

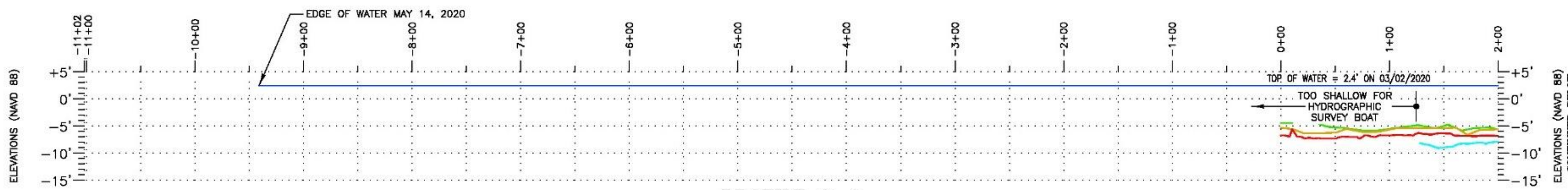
Morris P. Hebert, Inc.
SURVEYING • ENGINEERING • ENVIRONMENTAL • GIS
P.O. BOX 3106 * 116 VENTURE BLVD. * HOUMA, LOUISIANA 70361 * (985) 879-2731
HOUMA, LA. * HOUSTON, TX. * SAN ANTONIO, TX. * MIDLAND, TX.
TEXAS SURVEY FIRM REGISTRATION NUMBER: 10193788 (HOUMA OFFICE)

OFFICE OF COASTAL PROTECTION & RESTORATION AUTHORITY OF LOUISIANA

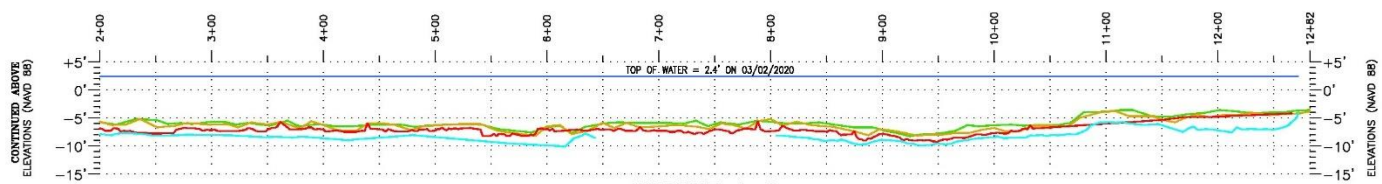
CREVASSE PROFILES – NORTHWESTERLY TO SOUTHEASTERLY
PROFILE N-N
WEST BAY SEDIMENT DIVERSION PROJECT (MR-0003)
PLAQUEMINES PARISH, LOUISIANA

DRAWN BY:	TPC	SHEET:	14 OF 20
CHKD./APPD. BY: JCM		SCALE:	SHOWN
UPDATED BY:		DATE:	06/05/2020
DATA BASE:	13000-06	JOB NO.	13000-06
MPH CAD FILE: 13000-06 – CREVASSE – PROFILE.DWG			

P:\01-Survey_Projects\State of Louisiana\13000-06 – West Bay\CAD Files\00 – Prelim\01 – Crevasse\13000-06 – CREVASSE – profile.dwg PLOT DATE: 6/11/20 2:36:00pm



PROFILE 0–0
(LOOKING NORTHEASTERLY)



PROFILE 0–0
(LOOKING NORTHEASTERLY)

LEGEND

- NATURAL BOTTOM (2009)
- NATURAL BOTTOM (2011)
- NATURAL BOTTOM (2015)
- NATURAL BOTTOM (2020)

SCALE
HORIZONTAL: 1"=100'
VERTICAL: 1"=20'

Morris P. Hebert, Inc.
SURVEYING • ENGINEERING • ENVIRONMENTAL • GIS
P.O. BOX 3106 * 116 VENTURE BLVD. * HOUMA, LOUISIANA 70361 * (985) 879-2731
HOUMA, LA. * HOUSTON, TX. * SAN ANTONIO, TX. * MIDLAND, TX.
TEXAS SURVEY FIRM REGISTRATION NUMBER: 10193786 (HOUMA OFFICE)

OFFICE OF COASTAL PROTECTION & RESTORATION AUTHORITY OF LOUISIANA

CREVASSE PROFILES – NORTHWESTERLY TO SOUTHEASTERLY
PROFILE 0–0
WEST BAY SEDIMENT DIVERSION PROJECT (MR-0003)
PLAQUEMINES PARISH, LOUISIANA

DRAWN BY:	TPC	SHEET:	15 OF 20
CHKD./APPD. BY:	JCM	SCALE:	SHOWN
UPDATED BY:		DATE:	06/05/2020
DATA BASE:	13000-06	JOB NO.	13000-06
MPH CAD FILE: 13000-06 – CREVASSE – PROFILE.DWG			

P:\01-Survey_Projects\State of Louisiana\13000-06 – West Bay\CAD Files\00 – Prelim\01 – Crevasse\13000-06 – CREVASSE – profile.dwg PLOT DATE: 6/11/20 2:39:34pm

Appendix 2:
Cross Sections of the West Bay Sediment Diversion Receiving Area

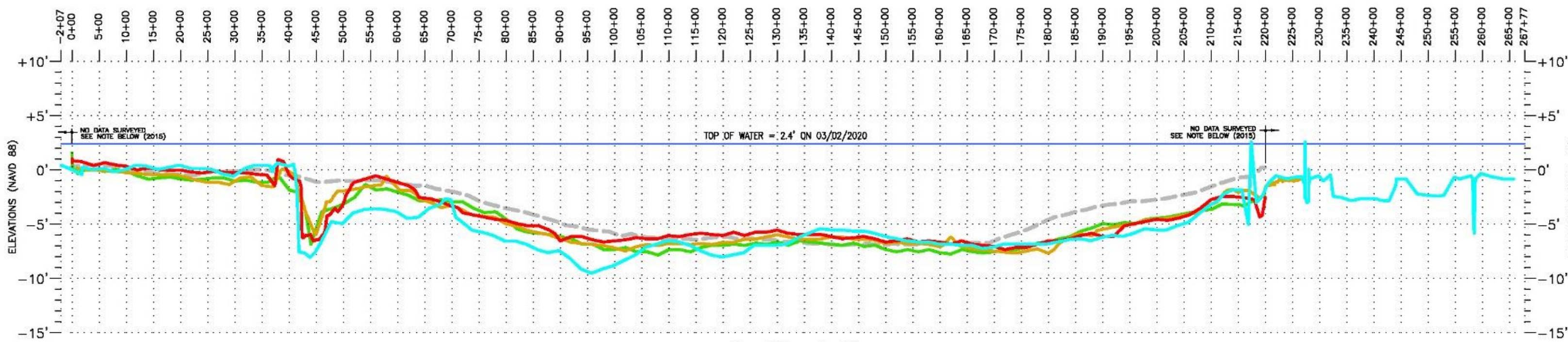
Morris P. Hebert, Inc.
SURVEYING • ENGINEERING • ENVIRONMENTAL • GIS
P.O. BOX 3106 * 116 VENTURE BLVD. * HOUMA, LOUISIANA 70361 * (985) 879-2731
HOUMA, LA. * HOUSTON, TX. * SAN ANTONIO, TX. * MIDLAND, TX.
TEXAS SURVEY FIRM REGISTRATION NUMBER: 10193786 (HOUMA OFFICE)

OFFICE OF COASTAL PROTECTION & RESTORATION AUTHORITY OF LOUISIANA

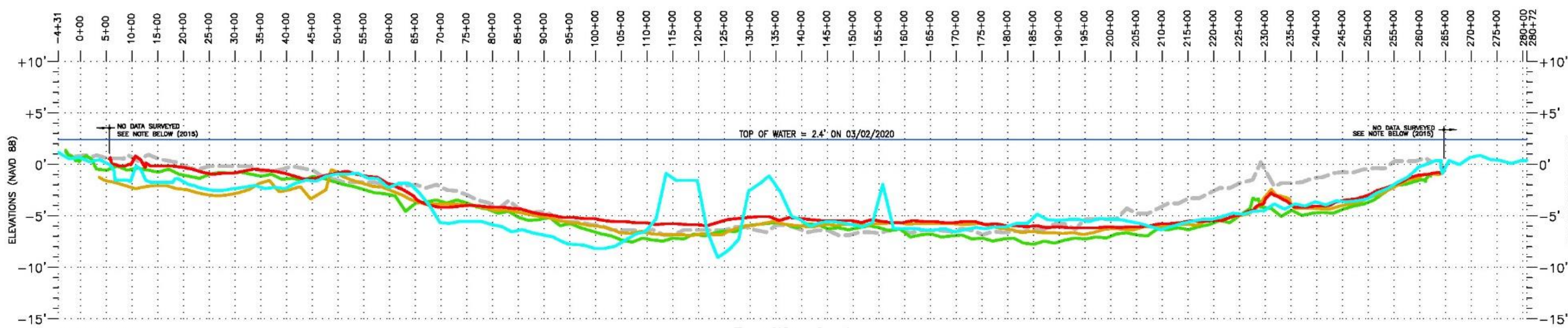
OVERVIEW WEST BAY PROFILES
RECEIVING BAY SURVEY
WEST BAY SEDIMENT DIVERSION PROJECT (MR-0003)
PLAQUEMINES PARISH, LOUISIANA

DRAWN BY:	TPC	SHEET:	1 OF 11
CHKD./APPD. BY: JCM		SCALE:	AS SHOWN
UPDATED BY:		DATE:	06/05/2020
DATA BASE:	13000-06	JOB NO.	13000-06
MPH CAD FILE: 13000-06_RB01A0.DWG			

P:\01-Survey_Projects\State of Louisiana\13000-06 - West Bay\CAD Files\00 - Prelim\02 - Receiving Bay\13000-06_RB01a0.dwg PLOT DATE: 6/11/20 11:53:33am



Profile 1-2
(LOOKING NORTHEASTERLY)



Profile 3-4
(LOOKING NORTHEASTERLY)

LEGEND

- NATURAL BOTTOM (2003)
- NATURAL BOTTOM (2009)
- NATURAL BOTTOM (2011)
- NATURAL BOTTOM (2015)
- NATURAL BOTTOM (2020)
- TOP OF WATER = 2.4' ON 03/02/2020

NOTE

NO DATA SURVEYED – ROSEAU'S TOO THICK TO RUN TRANSECT WITHOUT CUTTING

SCALE

HORIZONTAL: 1"=2000'
VERTICAL: 1"=10'

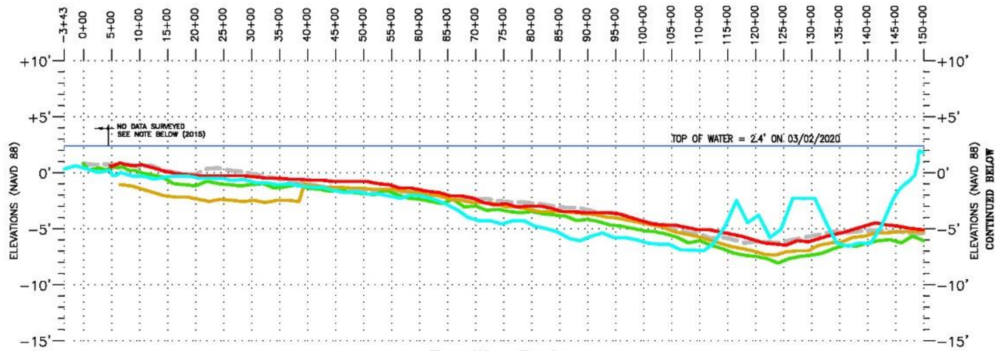
mph Morris P. Hebert, Inc.
SURVEYING • ENGINEERING • ENVIRONMENTAL • GIS
P.O. BOX 3106 * 116 VENTURE BLVD. * HOUMA, LOUISIANA 70361 * (985) 879-2731
HOUMA, LA. * HOUSTON, TX. * SAN ANTONIO, TX. * MIDLAND, TX.
TEXAS SURVEY FIRM REGISTRATION NUMBER: 10193786 (HOUMA OFFICE)

OFFICE OF COASTAL PROTECTION & RESTORATION AUTHORITY OF LOUISIANA

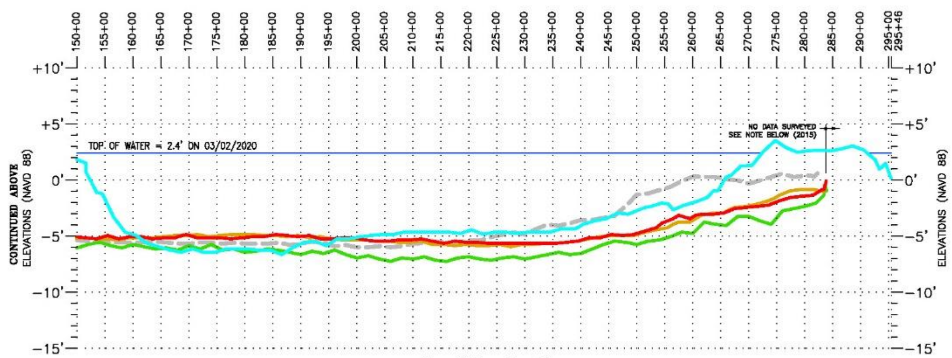
PROFILES 1-2 & 3-4
WEST BAY PROFILES – NORTHWESTERLY TO SOUTHEASTERLY
WEST BAY SEDIMENT DIVERSION PROJECT (MR-0003)
PLAQUEMINES PARISH, LOUISIANA

DRAWN BY:	TPC	SHEET:	2 OF 11
CHKD./APPD. BY: JCM		SCALE:	AS SHOWN
UPDATED BY:		DATE:	06/05/2020
DATA BASE:	13000-06	JOB NO.	13000-06
MPH CAD FILE: 13000-06_RB01A0 – PROFILES.DWG			

P:\01-Survey_Projects\State of Louisiana\13000-06 – West Bay\CAD Files\00 – Prelim\02 – Receiving Bay\13000-06_RB01a0 – Profiles.dwg PLOT DATE: 6/10/20 3:24:05pm



Profile 5-6
(LOOKING NORTHEASTERLY)



Profile 5-6
(LOOKING NORTHEASTERLY)

SCALE
HORIZONTAL: 1"=2000'
VERTICAL: 1"=10'

LEGEND
- NATURAL BOTTOM (2003)
- NATURAL BOTTOM (2009)
- NATURAL BOTTOM (2011)
- NATURAL BOTTOM (2015)
- NATURAL BOTTOM (2020)
- TOP OF WATER = 2.4' ON 03/02/2020

NOTE
NO DATA SURVEYED – ROSEAU'S TOO THICK TO RUN TRANSECT WITHOUT CUTTING

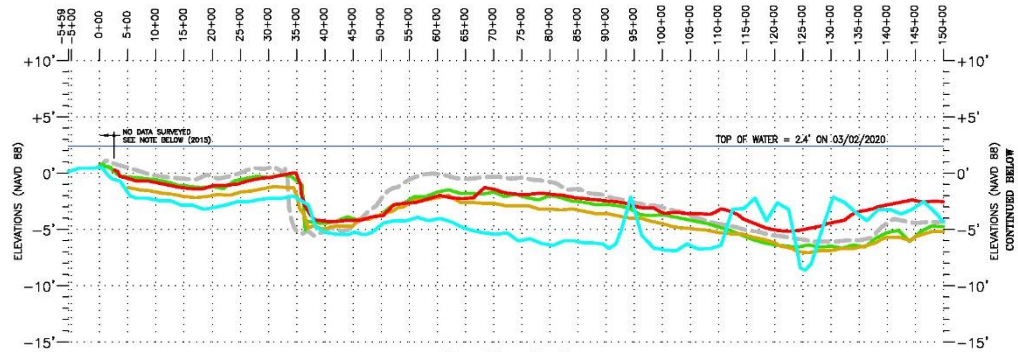
Morris P. Hebert, Inc.
SURVEYING • ENGINEERING • ENVIRONMENTAL • GIS
P.O. BOX 3106 * 116 VENTURE BLVD. * HOUMA, LOUISIANA 70361 * (985) 879-2731
HOUMA, LA. * HOUSTON, TX. * SAN ANTONIO, TX. * MIDLAND, TX.
TEXAS SURVEY FIRM REGISTRATION NUMBER: 10193786 (HOUMA OFFICE)

OFFICE OF COASTAL PROTECTION & RESTORATION AUTHORITY OF LOUISIANA

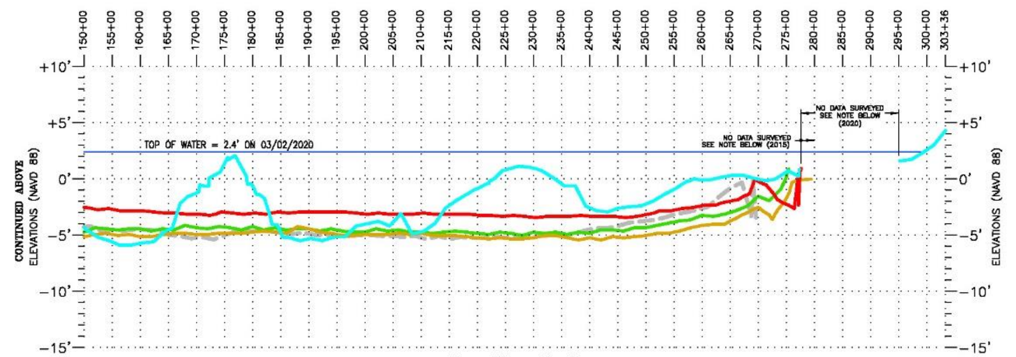
PROFILE 5-6
WEST BAY PROFILES – NORTHWESTERLY TO SOUTHEASTERLY
WEST BAY SEDIMENT DIVERSION PROJECT (MR-0003)
PLAQUEMINES PARISH, LOUISIANA

DRAWN BY:	TPC	SHEET:	3 OF 11
CHKD./APPD. BY: JCM		SCALE:	AS SHOWN
UPDATED BY:		DATE:	06/05/2020
DATA BASE:	13000-06	JOB NO.	13000-06
MPH CAD FILE: 13000-06_RB01A0 – PROFILES.DWG			

P:\01-Survey_Projects\State of Louisiana\13000-06 – West Bay\CAD Files\00 – Prelim\02 – Receiving Bay\13000-06_RB01a0 – Profiles.dwg PLOT DATE: 6/10/20 3:25:20pm



Profile 7–8
(LOOKING NORTHEASTERLY)



Profile 7–8
(LOOKING NORTHEASTERLY)

SCALE
HORIZONTAL: 1"=2000'
VERTICAL: 1"=10'

LEGEND
- NATURAL BOTTOM (2003)
- NATURAL BOTTOM (2009)
- NATURAL BOTTOM (2011)
- NATURAL BOTTOM (2015)
- NATURAL BOTTOM (2020)
- TOP OF WATER = 2.4' ON 03/02/2020

NOTE
NO DATA SURVEYED – ROSEAU'S TOO THICK TO RUN TRANSECT WITHOUT CUTTING

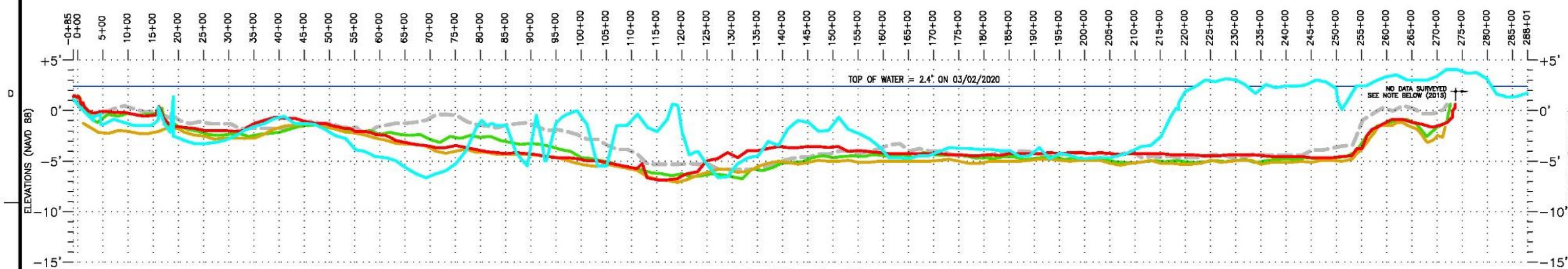
Morris P. Hebert, Inc.
SURVEYING • ENGINEERING • ENVIRONMENTAL • GIS
P.O. BOX 3106 * 116 VENTURE BLVD. * HOUMA, LOUISIANA 70361 * (985) 879-2731
HOUMA, LA. * HOUSTON, TX. * SAN ANTONIO, TX. * MIDLAND, TX.
TEXAS SURVEY FIRM REGISTRATION NUMBER: 10193786 (HOUMA OFFICE)

OFFICE OF COASTAL PROTECTION & RESTORATION AUTHORITY OF LOUISIANA

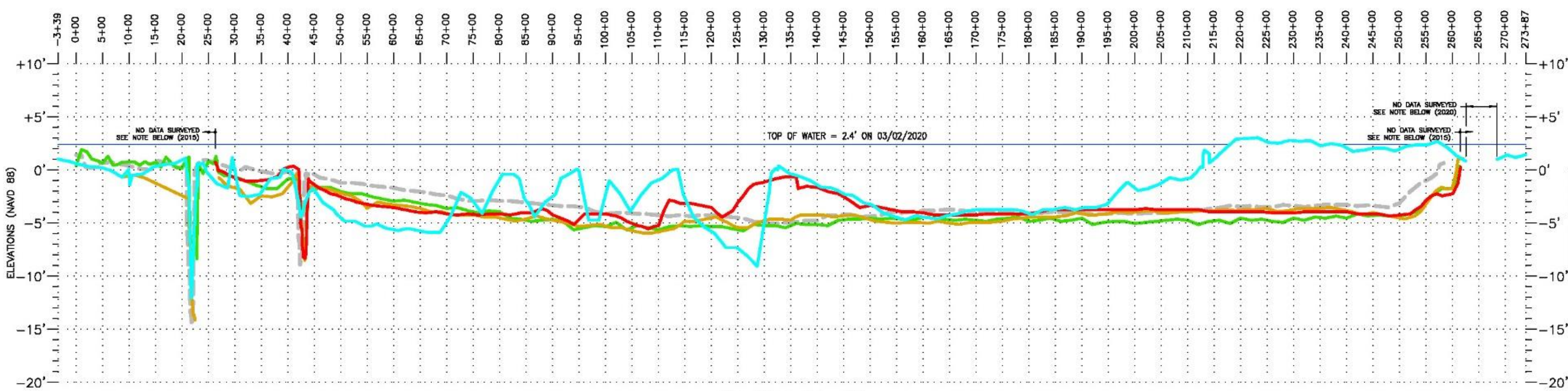
PROFILE 7–8
WEST BAY PROFILES – NORTHWESTERLY TO SOUTHEASTERLY
WEST BAY SEDIMENT DIVERSION PROJECT (MR-0003)
PLAQUEMINES PARISH, LOUISIANA

DRAWN BY:	TPC	SHEET:	4 OF 11
CHKD./APPD. BY: JCM		SCALE:	AS SHOWN
UPDATED BY:		DATE:	06/05/2020
DATA BASE:	13000-06	JOB NO.	13000-06
MPH CAD FILE: 13000-06_RB01A0 – PROFILES.DWG			

P:\01-Survey_Projects\State of Louisiana\13000-06 – West Bay\CAD Files\00 – Prelim\02 – Receiving Bay\13000-06_RB01a0 – Profiles.dwg PLOT DATE: 6/10/20 3:26:44pm



Profile 9–10
(LOOKING NORTHEASTERLY)



Profile 11–12
(LOOKING NORTHEASTERLY)

LEGEND

- NATURAL BOTTOM (2003)
- NATURAL BOTTOM (2009)
- NATURAL BOTTOM (2011)
- NATURAL BOTTOM (2015)
- NATURAL BOTTOM (2020)
- TOP OF WATER = 2.4' ON 03/02/2020

NOTE

NO DATA SURVEYED – ROSEAU'S TOO THICK TO RUN TRANSECT WITHOUT CUTTING

SCALE

HORIZONTAL: 1"=2000'
VERTICAL: 1"=10'

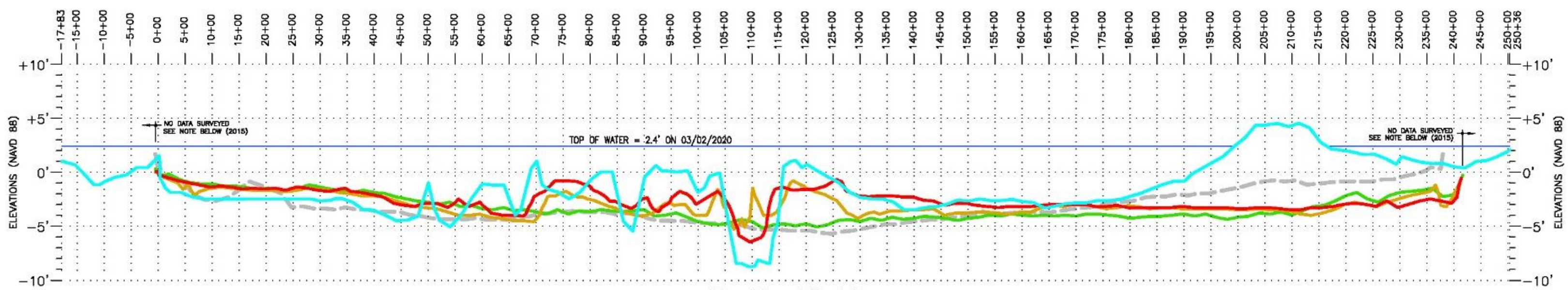
Morris P. Hebert, Inc.
SURVEYING • ENGINEERING • ENVIRONMENTAL • GIS
P.O. BOX 3106 * 116 VENTURE BLVD. * HOUMA, LOUISIANA 70361 * (985) 879-2731
HOUMA, LA. * HOUSTON, TX. * SAN ANTONIO, TX. * MIDLAND, TX.
TEXAS SURVEY FIRM REGISTRATION NUMBER: 10193786 (HOUMA OFFICE)

OFFICE OF COASTAL PROTECTION & RESTORATION AUTHORITY OF LOUISIANA

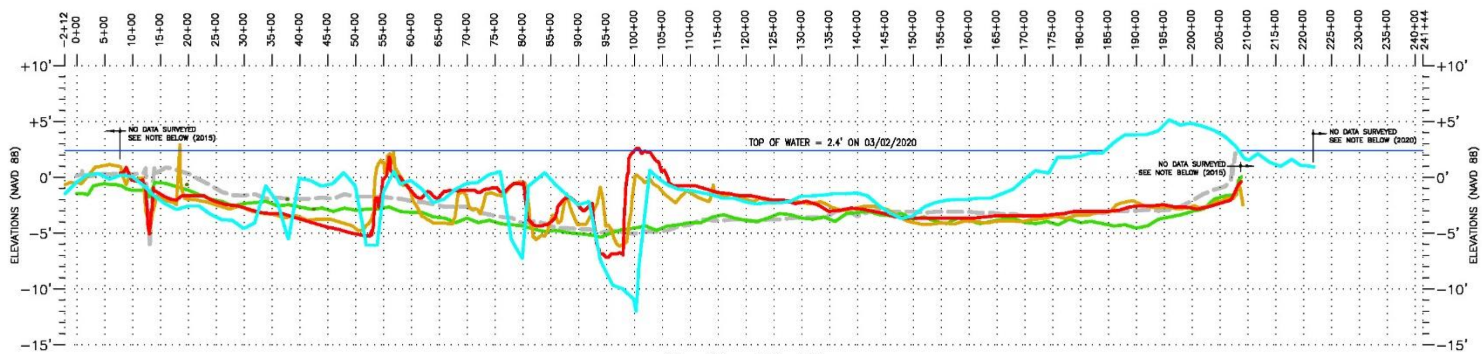
PROFILES 9–10 & 11–12
WEST BAY PROFILES – NORTHWESTERLY TO SOUTHEASTERLY
WEST BAY SEDIMENT DIVERSION PROJECT (MR-0003)
PLAQUEMINES PARISH, LOUISIANA

DRAWN BY:	TPC	SHEET:	5 OF 11
CHKD./APPD. BY:	JCM	SCALE:	AS SHOWN
UPDATED BY:		DATE:	06/05/2020
DATA BASE:	13000-06	JOB NO.	13000-06
MPH CAD FILE: 13000-06_RB01A0 – PROFILES.DWG			

P:\01–Survey_Projects\State of Louisiana\13000-06 – West Bay\CAD Files\00 – Prelim\02 – Receiving Bay\13000-06_RB01a0 – Profiles.dwg PLOT DATE: 6/10/20 3:28:09pm



Profile 13–14
(LOOKING NORTHEASTERLY)



Profile 15–16
(LOOKING NORTHEASTERLY)

LEGEND

- NATURAL BOTTOM (2003)
- NATURAL BOTTOM (2009)
- NATURAL BOTTOM (2011)
- NATURAL BOTTOM (2015)
- NATURAL BOTTOM (2020)
- TOP OF WATER = 2.4' ON 03/02/2020

NOTE

NO DATA SURVEYED – ROSEAU'S TOO THICK TO RUN TRANSECT WITHOUT CUTTING

SCALE

HORIZONTAL: 1"=2000'
VERTICAL: 1"=10'

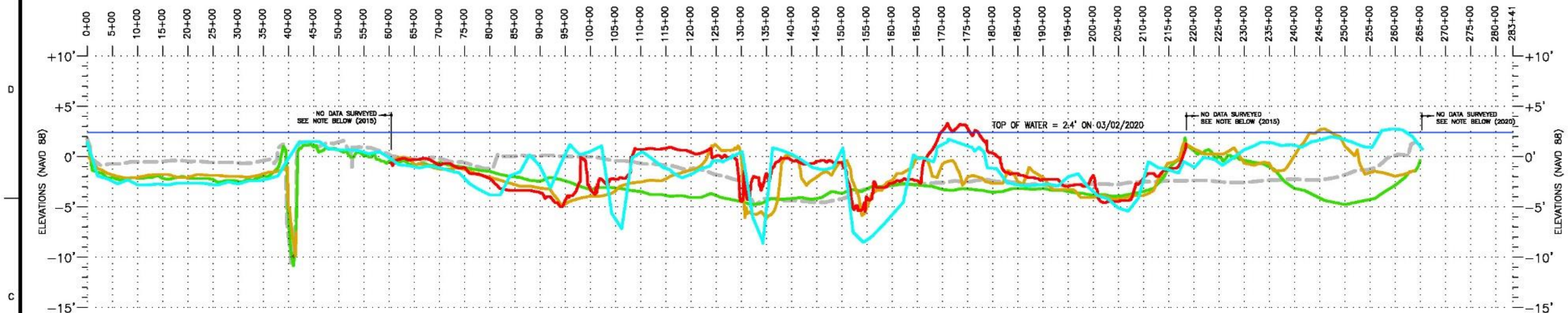
mph Morris P. Hebert, Inc.
SURVEYING • ENGINEERING • ENVIRONMENTAL • GIS
P.O. BOX 3106 * 116 VENTURE BLVD. * HOUMA, LOUISIANA 70361 * (985) 879-2731
HOUMA, LA. * HOUSTON, TX. * SAN ANTONIO, TX. * MIDLAND, TX.
TEXAS SURVEY FIRM REGISTRATION NUMBER: 10193786 (HOUMA OFFICE)

OFFICE OF COASTAL PROTECTION & RESTORATION AUTHORITY OF LOUISIANA

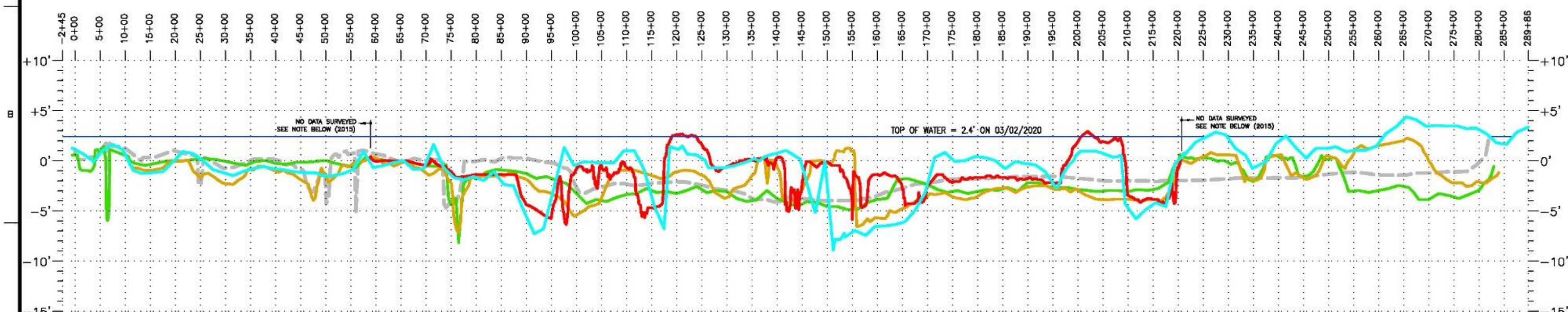
PROFILES 13–14 & 15–16
WEST BAY PROFILES – NORTHWESTERLY TO SOUTHEASTERLY
WEST BAY SEDIMENT DIVERSION PROJECT (MR-0003)
PLAQUEMINES PARISH, LOUISIANA

DRAWN BY:	TPC	SHEET:	6 OF 11
CHKD./APPD. BY: JCM		SCALE:	AS SHOWN
UPDATED BY:		DATE:	06/05/2020
DATA BASE:	13000-06	JOB NO.	13000-06
MPH CAD FILE: 13000-06_RB01A0 – PROFILES.DWG			

P:\01-Survey_Projects\State of Louisiana\13000-06 – West Bay\CAD Files\00 – Prelim\02 – Receiving Bay\13000-06_RB01a0 – Profiles.dwg PLOT DATE: 6/10/20 3:29:28pm



Profile 17–18
(LOOKING NORTHEASTERLY)



Profile 19–20
(LOOKING NORTHEASTERLY)

LEGEND

- NATURAL BOTTOM (2003)
- NATURAL BOTTOM (2009)
- NATURAL BOTTOM (2011)
- NATURAL BOTTOM (2015)
- NATURAL BOTTOM (2020)
- TOP OF WATER = 2.4' ON 03/02/2020

NOTE

NO DATA SURVEYED – ROSEAU'S TOO THICK TO RUN TRANSECT WITHOUT CUTTING

SCALE

HORIZONTAL: 1"=2000'
VERTICAL: 1"=10'

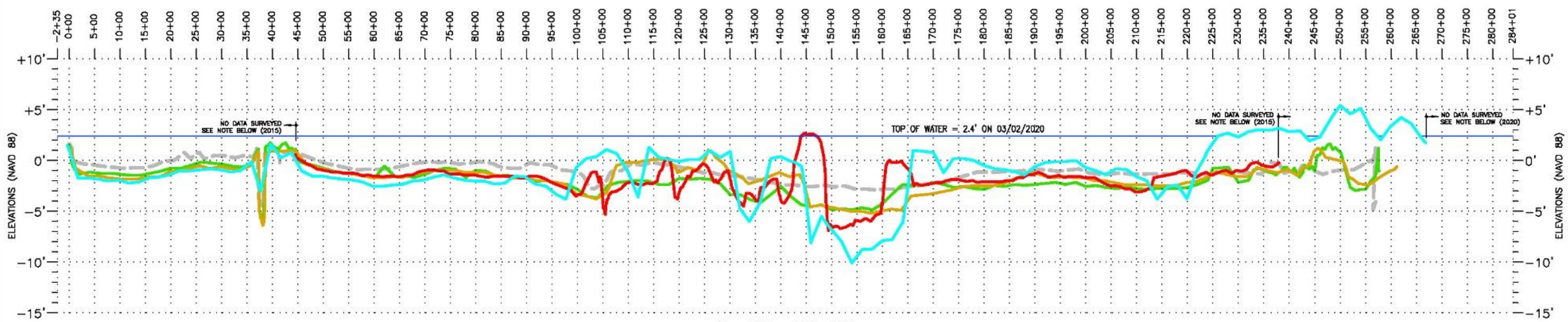
Morris P. Hebert, Inc.
SURVEYING • ENGINEERING • ENVIRONMENTAL • GIS
P.O. BOX 3106 * 118 VENTURE BLVD. * HOUMA, LOUISIANA 70361 * (985) 879-2731
HOUMA, LA. * HOUSTON, TX. * SAN ANTONIO, TX. * MIDLAND, TX.
TEXAS SURVEY FIRM REGISTRATION NUMBER: 10193786 (HOUMA OFFICE)

OFFICE OF COASTAL PROTECTION & RESTORATION AUTHORITY OF LOUISIANA

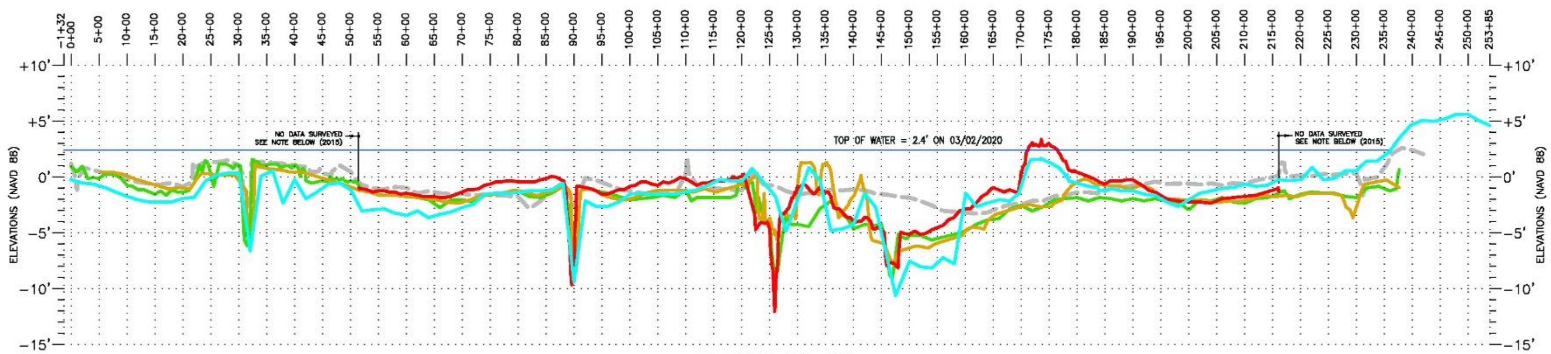
PROFILES 17–18 & 19–20
WEST BAY PROFILES – NORTHWESTERLY TO SOUTHEASTERLY
WEST BAY SEDIMENT DIVERSION PROJECT (MR-0003)
PLAQUEMINES PARISH, LOUISIANA

DRAWN BY:	TPC	SHEET:	7 OF 11
CHKD./APPD. BY: JCM		SCALE:	AS SHOWN
UPDATED BY:		DATE:	06/05/2020
DATA BASE:	13000-06	JOB NO.	13000-06
MPH CAD FILE: 13000-06_RB01A0 – PROFILES.DWG			

P:\01-Survey_Projects\State of Louisiana\13000-06 – West Bay\CAD Files\00 – Prelim\02 – Receiving Bay\13000-06_RB01a0 – Profiles.dwg PLOT DATE: 6/10/20 3:33:05pm



Profile 21-22
(LOOKING NORTHEASTERLY)



Profile 23-24
(LOOKING NORTHEASTERLY)

LEGEND

- NATURAL BOTTOM (2003)
- NATURAL BOTTOM (2009)
- NATURAL BOTTOM (2011)
- NATURAL BOTTOM (2015)
- NATURAL BOTTOM (2020)
- TOP OF WATER = 2.4' ON 03/02/2020

NOTE

NO DATA SURVEYED - ROSEAU'S TOO THICK TO RUN TRANSECT WITHOUT CUTTING

SCALE

HORIZONTAL: 1"=2000'
VERTICAL: 1"=10'

NOTE

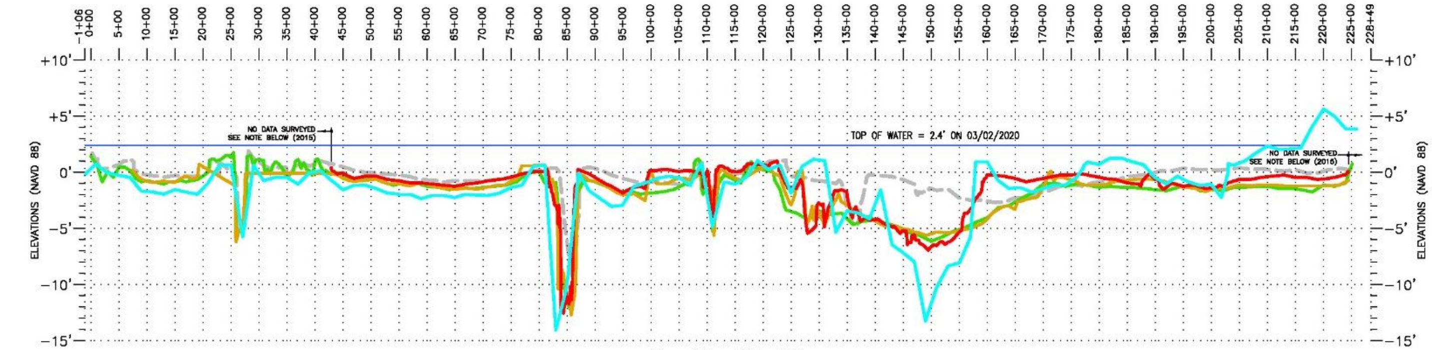
Morris P. Hebert, Inc.
SURVEYING • ENGINEERING • ENVIRONMENTAL • GIS
P.O. BOX 3106 * 116 VENTURE BLVD. * HOUMA, LOUISIANA 70361 * (985) 879-2731
HOUMA, LA. * HOUSTON, TX. * SAN ANTONIO, TX. * MIDLAND, TX.
TEXAS SURVEY FIRM REGISTRATION NUMBER: 10193786 (HOUMA OFFICE)

OFFICE OF COASTAL PROTECTION & RESTORATION AUTHORITY OF LOUISIANA

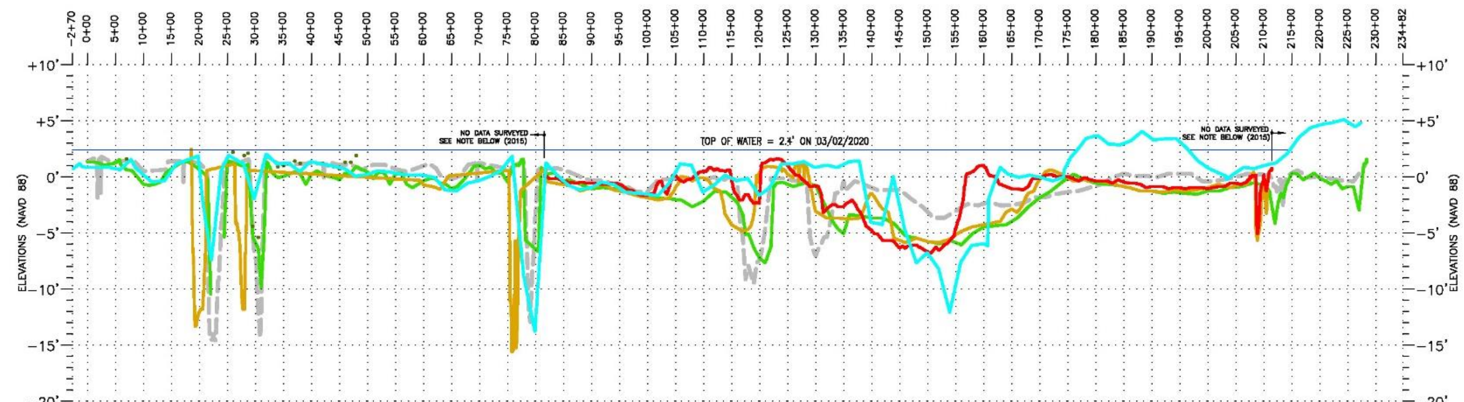
PROFILES 21-22 & 23-24
WEST BAY PROFILES - NORTHWESTERLY TO SOUTHEASTERLY
WEST BAY SEDIMENT DIVERSION PROJECT (MR-0003)
PLAQUEMINES PARISH, LOUISIANA

DRAWN BY:	TPC	SHEET:	8 OF 11
CHKD./APPD. BY: JCM		SCALE:	AS SHOWN
UPDATED BY:		DATE:	06/05/2020
DATA BASE:	13000-06	JOB NO.	13000-06
MPH CAD FILE: 13000-06_RB01A0 - PROFILES.DWG			

P:\01-Survey_Projects\State of Louisiana\13000-06 - West Bay\CAD Files\00 - Prelim\02 - Receiving Bay\13000-06_RB01a0 - Profiles.dwg PLOT DATE: 6/10/20 3:34:19pm



Profile 25-26
(LOOKING NORTHEASTERLY)



Profile 27-28
(LOOKING NORTHEASTERLY)

LEGEND

- NATURAL BOTTOM (2003)
- NATURAL BOTTOM (2009)
- NATURAL BOTTOM (2011)
- NATURAL BOTTOM (2015)
- NATURAL BOTTOM (2020)
- TOP OF WATER = 2.4' ON 03/02/2020

NOTE

NO DATA SURVEYED – ROSEAU'S TOO THICK TO RUN TRANSECT WITHOUT CUTTING

SCALE

HORIZONTAL: 1"=2000'
VERTICAL: 1"=10'

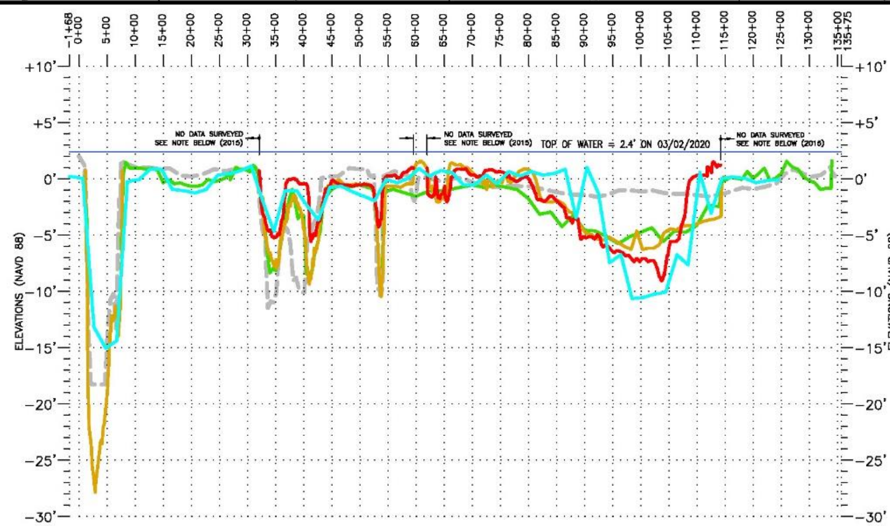
Morris P. Hebert, Inc.
SURVEYING • ENGINEERING • ENVIRONMENTAL • GIS
P.O. BOX 3106 * 116 VENTURE BLVD. * HOUMA, LOUISIANA 70361 * (985) 879-2731
HOUMA, LA. * HOUSTON, TX. * SAN ANTONIO, TX. * MIDLAND, TX.
TEXAS SURVEY FIRM REGISTRATION NUMBER: 10193786 (HOUMA OFFICE)

OFFICE OF COASTAL PROTECTION & RESTORATION AUTHORITY OF LOUISIANA

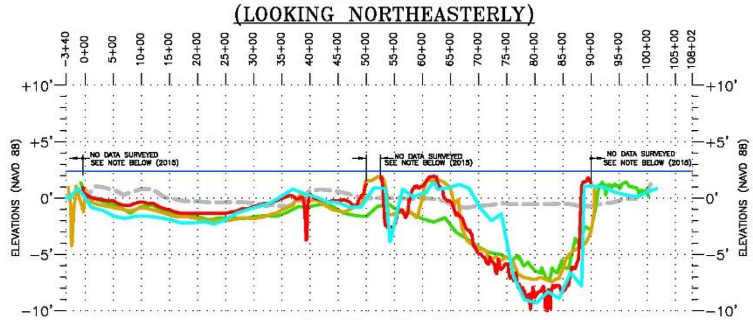
PROFILES 25-26 & 27-28
WEST BAY PROFILES – NORTHWESTERLY TO SOUTHEASTERLY
WEST BAY SEDIMENT DIVERSION PROJECT (MR-0003)
PLAQUEMINES PARISH, LOUISIANA

DRAWN BY:	TPC	SHEET:	9 OF 11
CHKD./APPD. BY: JCM		SCALE:	AS SHOWN
UPDATED BY:		DATE:	06/05/2020
DATA BASE:	13000-06	JOB NO.	13000-06
MPH CAD FILE: 13000-06_RB01A0 – PROFILES.DWG			

P:\01-Survey_Projects\State of Louisiana\13000-06 – West Bay\CAD Files\00 – Prelim\02 – Receiving Bay\13000-06_RB01o0 – Profiles.dwg PLOT DATE: 6/10/20 3:36:34pm



Profile 29-30
(LOOKING NORTHEASTERLY)



Profile 31-32
(LOOKING NORTHEASTERLY)

SCALE
HORIZONTAL: 1"=2000'
VERTICAL: 1"=10'

LEGEND
- NATURAL BOTTOM (2003)
- NATURAL BOTTOM (2009)
- NATURAL BOTTOM (2011)
- NATURAL BOTTOM (2015)
- NATURAL BOTTOM (2020)
- TOP OF WATER = 2.4' ON 03/02/2020

NOTE
NO DATA SURVEYED - ROSEAU'S TOO THICK TO RUN TRANSECT WITHOUT CUTTING

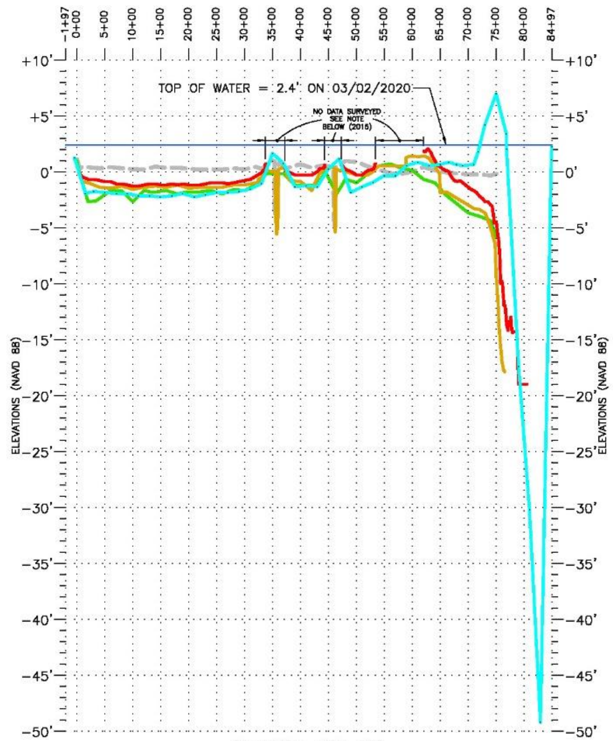
Morris P. Hebert, Inc.
SURVEYING • ENGINEERING • ENVIRONMENTAL • GIS
P.O. BOX 3106 * 116 VENTURE BLVD. * HOUMA, LOUISIANA 70361 * (985) 879-2731
HOUMA, LA. * HOUSTON, TX. * SAN ANTONIO, TX. * MIDLAND, TX.
TEXAS SURVEY FIRM REGISTRATION NUMBER: 10193786 (HOUMA OFFICE)

OFFICE OF COASTAL PROTECTION & RESTORATION AUTHORITY OF LOUISIANA

PROFILES 29-30 & 31-32
WEST BAY PROFILES - NORTHWESTERLY TO SOUTHEASTERLY
WEST BAY SEDIMENT DIVERSION PROJECT (MR-0003)
PLAQUEMINES PARISH, LOUISIANA

DRAWN BY:	TPC	SHEET:	10 OF 11
CHKD./APPD. BY: JCM		SCALE:	AS SHOWN
UPDATED BY:		DATE:	06/05/2020
DATA BASE:	13000-06	JOB NO.	13000-06
MPH CAD FILE: 13000-06_RB01A0 - PROFILES.DWG			

P:\01-Survey_Projects\State of Louisiana\13000-06 - West Bay\CAD Files\00 - Prelim\02 - Receiving Bay\13000-06_RB01a0 - Profiles.dwg PLOT DATE: 6/10/20 3:38:34pm



Profile 33-34
(LOOKING NORTHEASTERLY)

SCALE
HORIZONTAL: 1"=2000'
VERTICAL: 1"=10'

LEGEND
- NATURAL BOTTOM (2003)
- NATURAL BOTTOM (2009)
- NATURAL BOTTOM (2011)
- NATURAL BOTTOM (2015)
- NATURAL BOTTOM (2020)
- TOP OF WATER = 2.4' ON 03/02/2020

NOTE
NO DATA SURVEYED – ROSEAU'S TOO THICK TO RUN TRANSECT WITHOUT CUTTING

Morris P. Hebert, Inc.
SURVEYING • ENGINEERING • ENVIRONMENTAL • GIS
P.O. BOX 3106 * 118 VENTURE BLVD. * HOUMA, LOUISIANA 70361 * (985) 879-2731
HOUMA, LA. * HOUSTON, TX. * SAN ANTONIO, TX. * MIDLAND, TX.
TEXAS SURVEY FIRM REGISTRATION NUMBER: 10193786 (HOUMA OFFICE)

OFFICE OF COASTAL PROTECTION & RESTORATION AUTHORITY OF LOUISIANA

PROFILE 33-34
WEST BAY PROFILES – NORTHWESTERLY TO SOUTHEASTERLY
WEST BAY SEDIMENT DIVERSION PROJECT (MR-0003)
PLAQUEMINES PARISH, LOUISIANA

DRAWN BY:	TPC	SHEET:	11 OF 11
CHKD./APPD. BY: JCM		SCALE:	AS SHOWN
UPDATED BY:		DATE:	06/05/2020
DATA BASE:	13000-06	JOB NO.	13000-06
MPH CAD FILE: 13000-06_RB01A0 – PROFILES.DWG			

P:\01-Survey_Projects\State of Louisiana\13000-06 – West Bay\CAD Files\00 – Prelim\02 – Receiving Bay\13000-06_RB01a0 – Profiles.dwg PLOT DATE: 6/10/20 3:39:45pm