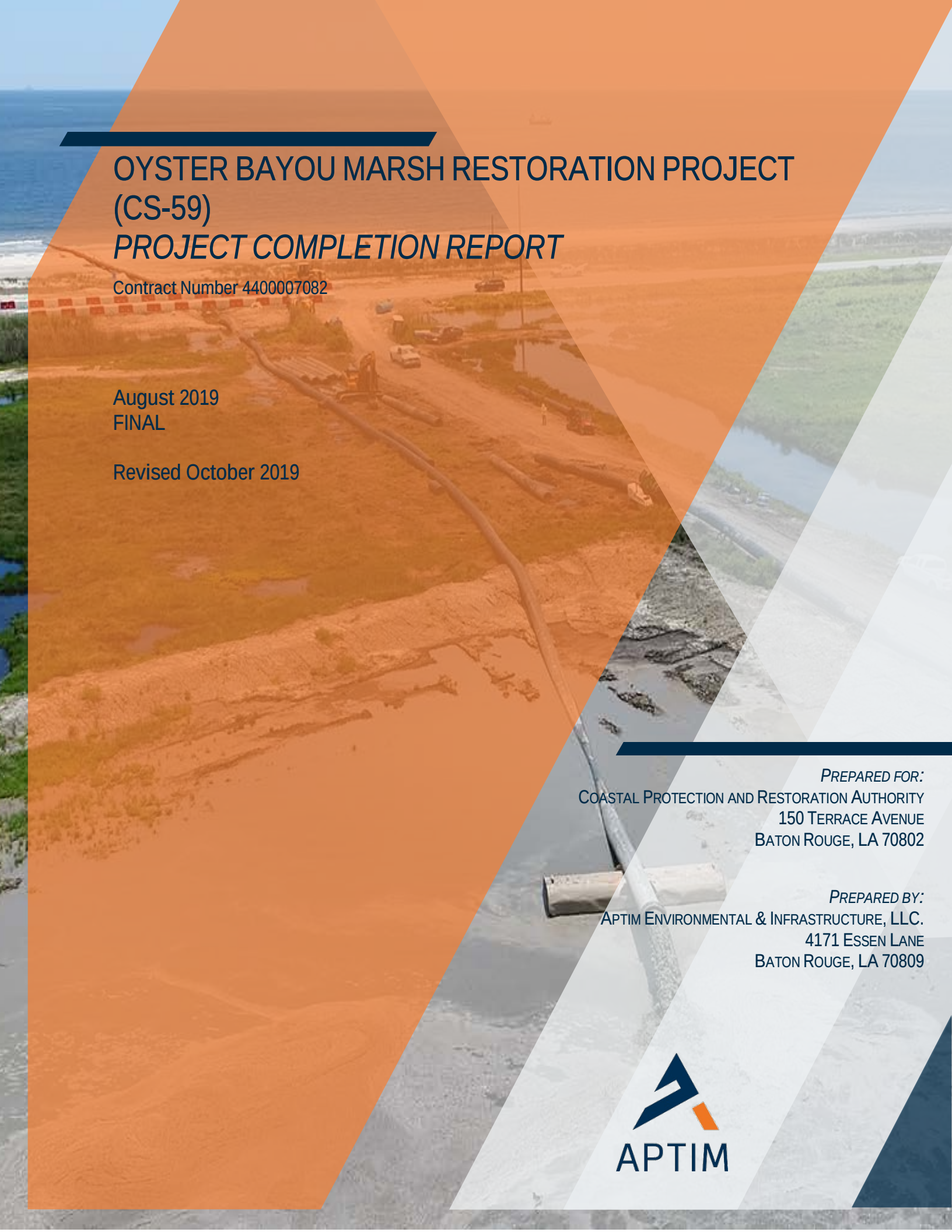

OYSTER BAYOU MARSH RESTORATION PROJECT (CS-59)

PROJECT COMPLETION REPORT

Contract Number 4400007082

August 2019
FINAL

Revised October 2019

PREPARED FOR:
COASTAL PROTECTION AND RESTORATION AUTHORITY
150 TERRACE AVENUE
BATON ROUGE, LA 70802

PREPARED BY:
APTIM ENVIRONMENTAL & INFRASTRUCTURE, LLC.
4171 ESSEN LANE
BATON ROUGE, LA 70809

APTIM

1.0 Executive Summary

This project completion report for the Oyster Bayou Marsh Restoration Project (CS-59) contains a summary of project-related information and significant events including project personnel, final as-built project features, benefited acreage, construction cost and project estimates, construction oversight costs, construction activities and change orders, pipeline and utility crossing owner information, and other significant milestone dates and comments.

The constructed acreages for the Oyster Bayou Marsh Restoration project were as follows:

1) 836 acres of confined marsh
2) 13 acres of unconfined marsh
3) 96 acres of unconfined nourishment
4) 9,000 linear feet (15.5 acres) of earthen terraces

Mobilization for the Oyster Bayou Marsh Restoration Project began in December 2016. Containment Dike construction was completed on August 11, 2017, and dredging operations commenced on June 6, 2017. A total of 4,314,929 cubic yards of marsh compatible fill material was dredged from the Gulf of Mexico borrow area and utilized to construct six (6) confined marsh creation areas (MCA 1, 2, 3, 4, 5, 5A) along with one (1) marsh nourishment area (MCA 6). Approximately 960 acres of marsh were restored and/or nourished through dredged material placement. Dredging operations were completed on September 8, 2017. In addition, a total of 9,000 linear feet of earthen terraces were constructed. Following the completion of dredging operations, the oil field road and pipeline crossing at LA 27/82 were rehabilitated via Change Order 007.
The original project goals and objectives were met or exceeded during construction. A complete summary of all construction activities is included herein.

2.0 Table of Contents

3.0 List of Figures

4.0 List of Tables

5.0 List of Appendices

Appendix A: As-Built Drawings and Bathymetries
Appendix B: Invoice Related Correspondences
Appendix C: General Correspondences
Appendix D: Change Orders
Appendix E: Field Adjustment Reports
Appendix F: Requests for Interpretation
Appendix G: WMI Daily Quality Control Reports
Appendix H: Subcontractor Daily Reports
Appendix I: Daily Bird Monitoring Reports
Appendix J: WMI Submittals
Appendix K: APTIM Daily Observation Reports
Appendix L: Construction Meeting Minutes
Appendix M: Permits, Permit Sketches, and Modifications
Appendix N: Construction Plans and Specifications
Appendix O: Settlement Plate Monitoring Data
Appendix P: Subline Profile Surveys
Appendix Q: DOTD 2059 Submittal
Appendix R: Davis Bacon Forms

6.0 Project Information and Personnel

Project Name: **Oyster Bayou Marsh Restoration Project**

State Project No. **CS-59**

Report Date: **May 22, 2019**

By: APTIM Environmental and Infrastructure: Coastal, Ports, and Marine

Project Managers/Contracting Officer

CPRA Project Manager:	Katie Freer	Tel: (225) 342-7362
CPRA Construction Project Manager:	Stan Aucoin	Tel: (337) 482-0681
CPRA Project Engineer:	Kodi Guillory, P.E.	Tel: (225) 342-5175
NOAA Project Manager:	Donna Rogers, Ph.D.	Tel: (225) 636-2095
APTIM Project Manager:	Whitney Thompson, P.E.	Tel: (225) 932-2568
APTIM Engineer of Record:	Whitney Thompson, P.E.	Tel: (225) 932-2568
APTIM Construction Observers:	Chris Paul, P.E.	Tel: (225) 932-2767
	John Darnall, E.I.	Tel: (225) 987-6879
	Greg Finch	Tel: (910) 791-9494

7.0 Project Funding and Sponsors

This project was constructed by the State of Louisiana Coastal Protection and Restoration Authority (CPRA). The National Oceanic and Atmospheric Administration (NOAA) was the Federal sponsor. Engineering and design and construction were funded by the Coastal Planning, Protection, and Restoration Act (CWPPRA). The Oyster Bayou Marsh Restoration Project (CS-59) was approved on Project Priority List 21 (PPL 21).

8.0 Location and Description of the Project

The Oyster Bayou Marsh Restoration project is located in Cameron Parish, Louisiana between Mud Lake and the Calcasieu River, north of Louisiana Highway 27/82 (LA 27/82). The project area is located approximately 3 miles east of the community of Holly Beach. The Marsh Creation Areas (MCAs) are located in the southern portion of the project area, and the earthen terraces are located in the northern portion of the project area (See As-Built Plan Sheet 6).

Altered hydrology and saltwater intrusion have contributed to land loss in the Oyster Bayou Project Area. The Calcasieu-Sabine Basin has experienced 122,000 acres of land loss since 1932. In addition to altered hydrology and saltwater intrusion, drought stress and hurricane impacts have also affected the land loss rate in the Oyster Bayou Project Area. Impacts from Hurricane Rita in 2005 and Hurricane Ike in 2008 have resulted in the coalescence of Oyster Lake with interior water bodies thus increasing wave/wake related erosion in the area. Based on data between 1984 and 2011, land loss for this area has been estimated by USGS to be -1.18% per year (NMFS, 2011).

This project is intended to reduce wave/wake erosion and reestablish saline marsh in the Oyster Bayou area by constructing earthen terraces and saline marsh within existing shallow open water. Approximately 836 acres of saline marsh were restored using nearly 4.2 million cubic yards of marsh fill material dredged from a Gulf of Mexico borrow area, and 9,000 linear feet of earthen terraces were constructed. In addition, approximately 100 acres of marsh were nourished via unconfined disposal of marsh fill material. Native vegetation may be planted after construction to stabilize the rebuilt marsh habitat.

9.0 Final As-Built Features, Boundaries, and Acreages

9.1 Marsh Construction Overview

Excavated marsh sediment volumes are detailed as follows. The Contractor, Weeks Marine, Inc. (WMI), was paid for the excavation of 4,314,929 cubic yards of marsh fill material from the Gulf of Mexico borrow area. However, the Contractor dredged below the marsh borrow area limit but within the allowance for equipment. The total volume excavated was approximately 4,351,868 cubic yards of marsh fill. Minor overdredging (1,939 cubic yards) occurred within the marsh borrow area. In addition, a total of 35,000 cubic yards was deducted from the marsh fill pay quantity to account for material placed outside of the permitted area.

Volumes of marsh fill material measured in the fill area are detailed as follows. The total volume of material measured within the constructed marsh template (+3.0 feet NAVD88), following a minimum required settlement period of 30 days, was approximately 3,820,433 cubic yards, which included refilling the primary dike fill excavation sources. The total volume placed (measured after the minimum required 30-day settlement period) including fill material above +3.0 NAVD88 and in the unconfined disposal area was approximately 4,949,462 cubic yards. Marsh fill volumes for each Marsh Creation Area were also computed and are listed in Table 1. An overview of the marsh creation areas is shown in Figure 1.

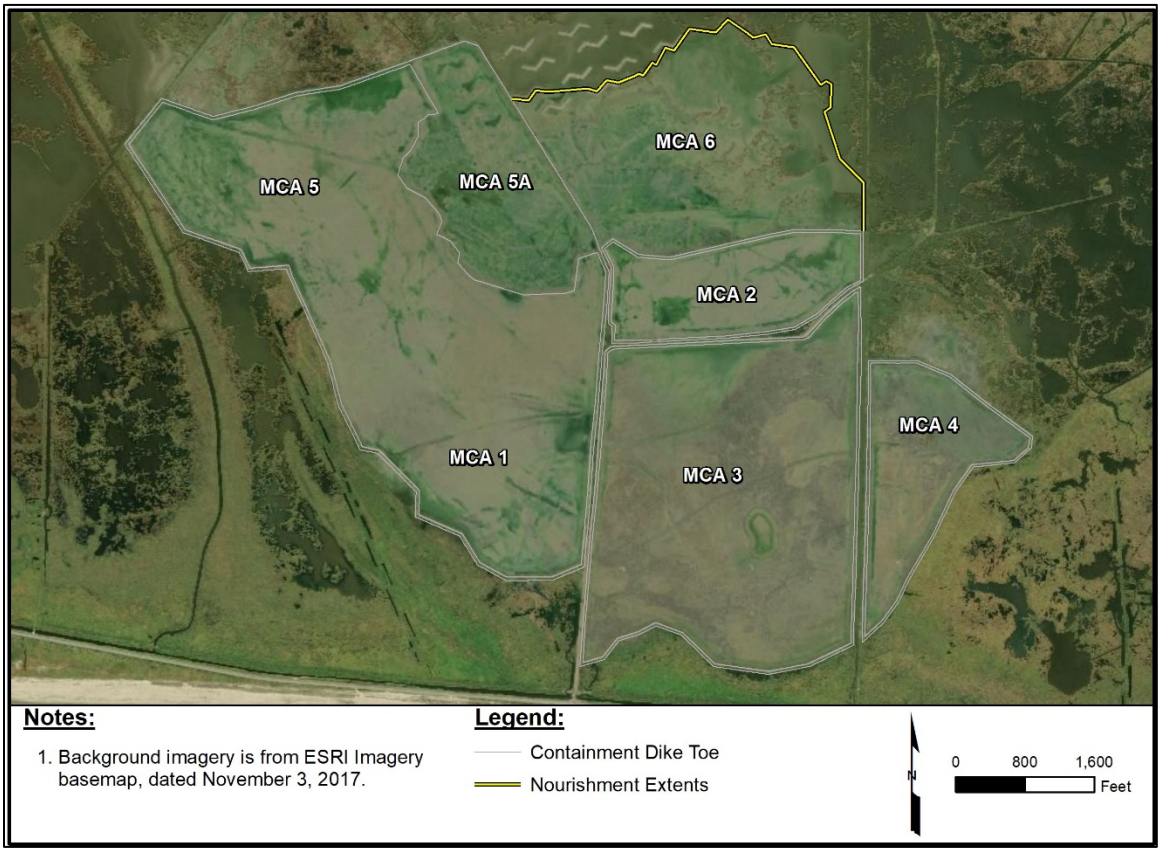

Figure 1: Overview of Marsh Creation Areas

Table 1: Marsh Creation Area As-Built Volumes

Marsh Creation Area	Area (Acres)	Volume placed to +2.5' (CY) (minimum tolerance)*	Volume Placed to +3.0' (CY)*	Total Volume Placed (CY)
MCA 1	207	771,122	922,253	1,232,363
MCA 2	68.4	259,809	303,608	364,601
MCA 3	258.5	983,648	1,112,327	1,142,987
MCA 4	71.6	213,650	233,130	236,229
MCA 5	147.3	717,016	815,347	1,071,343
MCA 5A	83.3	368,199	433,768	560,129
MCA 6 (nourishment)	103.1	---	---	341,810
TOTAL	939.2	3,313,444	3,820,433	4,949,462

*Volumes calculated based on As-Built survey data.

Summaries of the pit-to-fill ratio (Table 2) and pit-to-pay ratio (Table 3) for each of the borrow areas are shown below.

Table 2: Borrow Area Pit-to-Fill Ratios

Borrow Area	Volume Excavated (cy)	Volume Placed (cy)	Pit-to-Fill Ratio
Gulf of Mexico Marsh Borrow Area	4,314,929 (without overdredging quantity)	4,949,462	0.87

There was a difference between the cut volume (measured within the borrow area) and the fill volume measured in place. The difference was approximately 634,533 cubic yards. This difference resulted in a cut to fill ratio of 0.87.

Table 3: Borrow Area Pit-to-Pay Ratios

Borrow Area	Volume Excavated (cy)	Pay Volume (cy)	Pit-to-Pay Ratio
Gulf of Mexico Marsh Borrow Area	4,316,868	4,314,929	1.00

Marsh acreages and the linear footage of constructed terraces were computed to quantify project benefits. The outer extents of the constructed toe of the primary dike and the construction template were used to quantify the project benefits. The centerline of the constructed earthen terraces was measured to determine the length of the terrace. In addition, limits of the unconfined fill placed between MCA 2 and the terrace fields were determined via aerial photography (drone footage) and as-built survey data collected by WMI. Approximately 836.1 acres of confined marsh and 103.1 acres of unconfined marsh existed within the project area immediately following construction. In addition, a total of approximately 9,000 linear feet of earthen terraces were constructed.

Constructed Acres: **836 acres of marsh**
13 acres of created marsh (unconfined)
96 acres of unconfined nourishment
9,000 linear feet (15.5 acres) of constructed earthen terraces

9.2 Waterline Relocation

In order to place the sediment pipeline from the Gulf of Mexico borrow area to the fill area, the pipeline had to be placed under Highway LA27/82. Therefore, an existing waterline had to be relocated. The existing waterline ran parallel to LA 27/82 at a depth of approximately five feet below grade. Water service was able to be maintained throughout the relocation work through the use of two (2) tapping sleeves. One (1) twelve inch (12") HDPE line was installed according to the lines and grades shown in the project Plans and Specifications. Following installation, the new line was chlorinated, flushed, and tested. The tapping sleeves were used to redirect the flow of water to the new waterline. Details of the waterline relocation are provided in Section 14.5. Figure 2 shows the waterline relocation.

Figure 2: Waterline Relocation – View of the Trench Box and HDPE Pipe During the Waterline Relocation

9.3 Permanent Concrete Casing Pipe

Following the waterline relocation, a permanent concrete casing pipe was installed beneath LA 27/82. The casing pipe was installed via open highway cut methods. Figure 3 and Figure 4 show

the temporary sediment pipeline and concrete casing pipe. Figure 5 shows the completed asphalt patch following the highway rehabilitation.

Figure 3: Concrete Casing Pipe Installation (Eastbound Lane on 5/16/2017)

Figure 4: View of the temporary sediment pipeline installation within the concrete casing pipe

Figure 5: Completed Highway Crossing Following the Highway Rehabilitation (9/24/2018)

9.4 Marsh Creation and Nourishment Areas

Marsh fill material was placed within five (5) marsh creation areas constructed with primary containment dikes north of LA 27/82. Marsh fill was also placed via unconfined disposal north of MCA 2 and south of the terrace fields (Area 6). The marsh creation areas were constructed with a minimum target elevation of +2.5 feet (NAVD88). The maximum width of the constructed marsh platform was 5,635 feet, which occurred within MCA 1 and MCA 5A between Station 18+50 and Station 75+00.

Figure 6: Aerial of Completed Marsh Creation Areas

9.5 Earthen Terraces

A total of twenty (20) earthen terraces were constructed north of MCA 6 and to the east of MCA 1/5. Approximately 9,000 linear feet (15.5 acres) of earthen terraces were constructed to an elevation of +3.5 feet NAVD88 utilizing in-situ soils for construction. Due to the timing of the terrace construction and project expansion, four of the terraces (3.1 acres) were constructed within MCA 5A, and marsh fill was subsequently pumped around these terraces. Figure 7 shows a portion of the constructed terrace field. Earthen terraces were constructed to an elevation of +3.5 feet NAVD88 with a crest width of approximately 15.0 feet and side slopes of 1V:5H. In-situ material was excavated with a minimum 20.0 foot bench width from the terraces. The borrow source was excavated to an approximate depth of -10.4 feet NAVD88 and had a bottom width of approximately 10.0 feet. Side slopes of the borrow area were designed at a 1V:2H slope. Table 4 summarizes the cut and fill volumes required to construct the terraces.

Table 4: Earthen Terraces Cut to Fill Ratios

Earthen Terraces	Volume Excavated (cy)	Volume Placed (cy)	Pit-to-Fill Ratio
Total Earthen Terraces	99,929	90,446	1.10

Figure 7: Constructed Terrace Field

9.6 Settlement Plates

A total of seven (7) settlement plates were installed to quantify the settlement and consolidation of the placed material on top of existing sediments. Six (6) plates were installed within the marsh footprint, and one (1) plate was installed along the centerline of the primary containment dike. One (1) settlement plate originally installed in MCA 1 was disturbed due to construction activities and was relocated to MCA 5A prior to the placement of fill material. All of the plates were installed during construction but prior to the placement of fill material. All settlement plates were surveyed after construction.

9.7 Additional Project Features

Additional construction features included 11,637 linear feet of trenasses as well as 2,769 linear feet of secondary containment dikes. The secondary containment dikes along with natural containment were utilized to construct three (3) ponds within MCA 1 and MCA 3.

9.8 As-built Drawings

The as-built drawings are included in Appendix A. These drawings detail the elevation and location of the placed marsh fill and terrace construction, post-construction condition of the borrow area, the location of the installed settlement plates, and the elevation and location of the waterline relocation and the installed casing pipe.

10.0 Constructed Elevations

Marsh restoration projects are constructed to nourish existing marsh or create new marsh within shallow, open water areas. Marsh Creation Areas 1-5A were designated as marsh creation areas. The total acreage of marsh creation within these areas was 836.1 acres. Marsh nourishment areas on this project include the unconfined disposal area (MCA 6). A total of 103.1 acres of marsh was nourished on this project. Constructed elevations within the marsh creation and nourishment areas were also computed.

Marsh created or nourished was divided into the following elevation categories; marsh constructed below +2.5' NAVD88, marsh constructed between +2.5' and +3.0' NAVD88, and marsh created above +3.0' NAVD88. The construction template (including containment dikes and marsh) defined the horizontal limits. The post-construction survey data was utilized to define the topography and hydrography of the project area. The acreages were delineated and summarized for each elevation Range (Table 5). Figure 8 shows a Plan View of the constructed elevations.

Table 5: Elevations of Acreages Constructed

Constructed Elevation Range	Acres Constructed Within Range
> +3.0'	561.2
+2.5' to +3.0'	237.5
< +2.5'	140.5
Total:	939.2

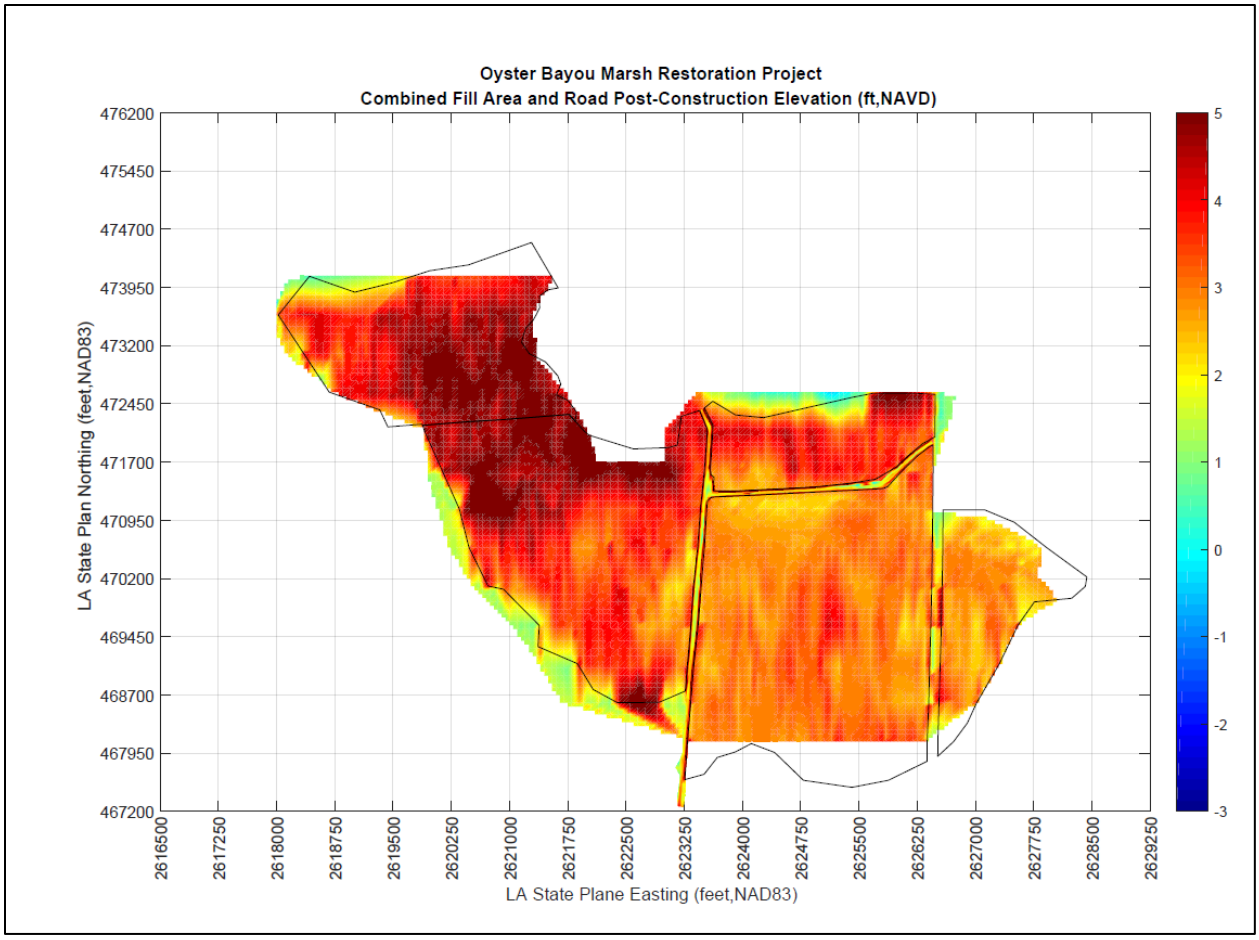

Figure 8: Plan View of Elevations Constructed within MCA 1- 5A.

11.0 Key Project Cost Elements

Table 6 below summarizes the key costs incurred during construction (including construction oversight and contract administration) and engineering and design.

Table 6: Key Project Cost Elements

Project Element	Project Cost Estimate	Cost Incurred as of Construction Completion
Construction Base Bid	$20,835,085.49	$19,108,688.00
Construction Cost (including CO's)		$23,529,720.66
APTIM Engineering & Design Contracted Total*	$480,269.90	$471,905.51
Observation / Contract Administration Contracted Total	$619,638.06	$612,986.50
Total	$29,931,150.00	$33,954,020.74

*Fill area design surveys, vibracore collection, and inland geotechnical investigation performed by others.

Table 7: Items of Work Construction, Final Quantities, and Monetary Amounts

Item	Description	Bid Quantity	Unit	Construction Estimate Unit Price	Construction Estimate Amount	Bid Unit Price	Bid Amount	Final Quantity	Final Amount	% Over/Under
1	Mobilization and Demobilization	1	LS	$3,410,000.00	$3,410,000.00	$3,875,000.00	$3,875,000.00	1	$3,875,000.00	13.6%
2	Pre-Construction Surveys	1	LS	$180,000.00	$180,000.00	$300,000.00	$300,000.00	1	$300,000.00	66.7%
3	As-Built Surveys	1	LS	$180,000.00	$180,000.00	$100,000.00	$100,000.00	1	$100,000.00	-44.4%
4	Hydraulic Dredging - Marsh Creation	3,481,700	CY	$4.51	$15,702,467.00	$3.65	$12,708,205.00	3,390,300	$12,374,595.00	-21.2%
5	Primary Containment Dikes	45,041	LF	$13.00	$585,533.00	$20.00	$900,820.00	52,084	$1,041,680.00	77.9%
6	Secondary Pond Containment	2,543	LF	$8.00	$20,344.00	$10.00	$25,430.00	2,769	$27,690.00	36.1%
7	Trenasses	9,491	LF	$4.50	$42,709.50	$3.00	$28,473.00	11,637	$34,911.00	-18.3%
8	Earthen Terraces	17,550	LF	$26.00	$456,300.00	$35.00	$614,250.00	9,000	$315,000.00	-31.0%
9	Settlement Plates	7	EACH	$3,500.00	$24,500.00	$3,500.00	$24,500.00	7	$24,500.00	0.0%
10	Temporary Waterline Bypass	1	LS	$30,000.00	$30,000.00	$50,000.00	$50,000.00	0	$0.00	-100.0%
11	Waterline Relocation	1	LS	$35,000.00	$35,000.00	$85,000.00	$85,000.00	1	$85,000.00	142.9%
12	Traffic Control	1	LS	$14,700.00	$14,700.00	$175,000.00	$175,000.00	1	$175,000.00	1090.5%
13	Highway Crossing Mobilization	1	LS	$100,000.00	$100,000.00	$30,000.00	$30,000.00	1	$30,000.00	-70.0%
14	Highway Embankment (DOTD 203-03-00100)	270	CY	$20.00	$5,400.00	$100.00	$27,000.00	102	$10,200.00	88.9%
15	Highway Excavation (DOTD 203-01-00100)	470	CY	$13.00	$6,110.00	$40.00	$18,800.00	199	$7,960.00	30.3%
16	Geotextile Fabric (DOTD 203-08-00100)	63	SY	$10.00	$630.00	$40.00	$2,520.00	116	$4,640.00	636.5%
17	Pavement Patching 12 Inch Thick (DOTD 510-01-00100)	63	SY	$203.00	$12,789.00	$300.00	$18,900.00	51	$15,300.00	19.6%
18	Bedding Material (DOTD 726-01-00100)	11	CY	$50.00	$550.00	$225.00	$2,475.00	11	$2,475.00	350.0%
19	Concrete Drain Pipe (51" O.D. Concrete Pipe) (DOTD 701-01-N)	43	LF	$193.18	$8,306.74	$1,000.00	$43,000.00	43	$43,000.00	417.7%
20	Flowable Fill (DOTD 710-01-00100)	115	CY	$148.75	$17,106.25	$225.00	$25,875.00	115	$25,875.00	51.3%
21	Plastic Pavement Markings (Solid Line) (4" Width)(DOTD 732-02-00100)	80	LF	$5.00	$400.00	$30.00	$2,400.00	80	$2,400.00	500.0%
22	Plastic Pavement Markings (Broken Line) (4" Width)(DOTD 732-03-00100)	40	LF	$5.00	$200.00	$20.00	$800.00	40	$800.00	300.0%
23	Raised Pavement Markers (DOTD 731-02-00100)	4	EACH	$10.00	$40.00	$60.00	$240.00	4	$240.00	500.0%
24	Casing Pipe Cap	2	EACH	$1,000.00	$2,000.00	$25,000.00	$50,000.00	2	$50,000.00	500.0%
	Subtotal of Bid Items				**$20,835,085.49**		**$19,108,688.00**		**$18,546,266.00**	
	Change Order #1									
5	Primary Containment Dikes	-958	LF	---	---	$20.00	-$19,160.00			
6	Secondary Pond Containment	179	LF	---	---	$10.00	$1,790.00			
	Subtotal with Change Order #1						**$19,091,318.00**			
	Change Order #2									
25	Bird Abatement	167	DAY	---	---	$700.55	$116,991.85			
	Subtotal with Change Order #2						**$19,208,309.85**			
	Change Order #3									
4	Hydraulic Dredging - Marsh Creation	870,425	CY	---	---	$3.65	$3,177,051.25			
5	Primary Containment Dikes	5,179	LF	---	---	$20.00	$103,580.00			
6	Secondary Pond Containment	243	LF	---	---	$10.00	$2,430.00			
7	Trenasses	1,326	LF	---	---	$3.00	$3,978.00			
8	Earthen Terraces	-8,550	LF	---	---	$35.00	-$299,250.00			
26	Hydraulic Dredging - Marsh Creation	386,975	CY	---	---	$4.15	$1,605,946.25			
	Subtotal with Change Order #3						**$23,802,045.35**			
	Change Order #4									
5	Primary Containment Dikes	2955	LF	**---**	**---**	$20.00	$59,100.00			
7	Trenasses	1,964	LF	**---**	**---**	$3.00	$5,892.00			
16	Geotextile Fabric (DOTD 203-08-00100)	53	SY	**---**	**---**	$40.00	$2,120.00			

27	Spoil Bank Primary Containment Dike	2,640	LS	---	---	$17.50	$46,200.00		
	Subtotal with Change Order #4						**$23,915,357.35**		
	Change Order #6								
25b	Bird Abatement ATV Mobilization	1	LS	---	---	$389.33	$389.33		
25c	Bird Abatement 2018	108	DAY	---	---	$749.80	$80,978.40		
	Subtotal with Change Order #6						**$23,996,725.08**		
	Change Order #7								
4	Hydraulic Dredging - Marsh Creation	-37,196	CY	---	---	$3.65	-$135,765.40		
5	Primary Containment Dikes	-133	LF	---	---	$20.00	-$2,660.00		
6	Secondary Pond Containment	-196	LF	---	---	$10.00	-$1,958.60		
7	Trenasses	-1,144	LF	---	---	$3.00	-$3,433.38		
10	Temporary Waterline Bypass	-1	LS	---	---	$50,000.00	-$50,000.00		
14	Highway Embankment (DOTD 203-03-00100)	-168	CY	---	---	$100.00	-$16,790.00		
15	Highway Excavation (DOTD 203-01-00100)	-271	CY	---	---	$40.00	-$10,834.40		
17	Pavement Patching 12 Inch Thick (DOTD 510-01-00100)	-12	SY	---	---	$300.00	-$3,744.00		
26	Hydraulic Dredging - Marsh Creation	-386,975	CY	---	---	$4.15	-$1,605,946.25		
27	Spoil Bank Primary Containment Dike	-78	LF	---	---	$17.50	-$1,365.00		
28	Highway Rehabilitation Mobilization/Demobilization	1	LS	---	---	$22,822.86	$22,822.86		
29	Asphalt Concrete (2" Thick) (DOTD 502-03-00100)	184	SY	---	---	$160.07	$29,452.88		
30	Milling Asphalt Pavement (DOTD 509-01-00100)	184	SY	---	---	$40.64	$7,477.76		
31	Plastic Pavement Striping (Solid Line) (4" Width) (DOTD 732-02-00100)	260	LF	---	---	$3.75	$975.00		
32	Plastic Pavement Striping (Broken Line) (4" Width) (DOTD 732-03-00100)	130	LF	---	---	$3.75	$487.50		
33	Reflectorized Raised Pavement Markers (DOTD 731-02-00100)	10	EACH	---	---	$26.89	$268.90		
34	Oil Field Road Rehabilitation Mobilization/Demobilization	1	LS	---	---	$31,264.19	$31,264.19		
35	Drainage Excavation (DOTD 203-02-00200)	12,500	LF	---	---	$6.00	$75,000.00		
36	Embankment/Excavation (DOTD 203-03-00100)	1,788	CY	---	---	$58.78	$105,098.64		
37	Geotextile Fabric (DOTD 203-08-00100)	28,275	SY	---	---	$1.56	$44,109.00		
38	Class II Base Course (12" Thick) DOTD 302-01-00100) 610 Crushed Concrete	4,161	CY	---	---	$158.06	$657,687.66		
39	Aggregate Surface Course (DOTD 401-01-00100)	2,058	CY	---	---	$133.65	$275,051.70		
40	Cross Drain Pipe (CMP) (12") (Sta. E0+00)	48	LF	---	---	$90.04	$4,321.92		
41	Cross Drain Pipe (CMP) (18") (Sta. N14+00)	32	LF	---	---	$106.30	$3,401.60		
42	Cross Drain Pipe (CMP) (18") (Sta. E31+09)	32	LF	---	---	$106.30	$3,401.60		
43	Road Surveys	1	LS	---	---	$57,526.12	$57,526.12		
44	Turf Reinforcement Mats	133	SY	---	---	$8.75	$1,163.75		
45	TRM Installation Twist Pins (5 Per 2 Square Yards)	333	EACH	---	---	$0.38	$126.54		
	Subtotal with Change Order #7						**$23,483,865.67**		
	Change Order #10								
29	Asphalt Concrete (2" Thick) (DOTD 502-03-00100)	-6.67	SY	---	---	$160.07	-$1,067.67		
30	Milling Asphalt Pavement (DOTD 509-01-00100)	-6.67	SY	---	---	$40.64	-$271.07		
35	Drainage Excavation (DOTD 203-02-00200)	-604.00	LF	---	---	$6.00	-$3,624.00		
36	Embankment/Excavation (DOTD 203-03-00100)	1,243.24	CY	---	---	$58.78	$73,077.65		
37	Geotextile Fabric (DOTD 203-08-00100)	-2,627.22	SY	---	---	$1.56	-$4,098.46		
38	Class II Base Course (12" Thick) DOTD 302-01-00100) 610 Crushed Concrete	-807.42	CY	---	---	$158.06	-$127,620.81		
39	Aggregate Surface Course (DOTD 401-01-00100)	819.00	CY	---	---	$133.65	$109,459.35		
	Subtotal with Change Order #10						$23,529,720.66		
	Subtotal of Change Orders						**$4,421,032.66**		
	Total Cost				**$20,835,085.49**		**$23,529,720.66**		

13.0 Construction and Construction Oversight

13.1 Construction

Prime Construction Contractor	Weeks Marine, Inc.
Subcontractor (Pre-Construction Survey)	HydroTerra Technologies, Inc.
Subcontractor (Post-Construction Survey)	HydroTerra Technologies, Inc.
Subcontractor (Roadway Crossing)	Cycle Construction
Subcontractor (Roadway Crossing)	Tarpan Construction
Subcontractor (Asphalt Paving)	RC Paving
Subcontractor (Waterline Relocation)	Blake D. Hines, Inc.
Subcontractor (Primary Dike Construction)	Wilco Marsh Buggies & Draglines, Inc.
Original Construction Contract	$19,108,688.00
Change Orders	$4,421,032.66
Final Construction Contract	$23,529,720.66

13.2 Oversight and Administration for Construction

Construction Oversight	APTIM
Final Contracted Amount	$612,986.50

13.3 Major Equipment Used

Weeks Marine, Inc.
- 30” Cutterhead Dredge “E.W. Ellefsen”
- Quarters Barge
- Tug Boats
- 1 Crew Boat
- 1 Crane Barge
- 2 Anchor Barges
- 1 Survey Vessel
- 1 D-6 Bulldozer
- 2 Marsh Buggies
- 1 Front End Loader
- 1 CAT Excavator
- 1 Skid Steer
- 2 Airboats
- 1 Electronic Y-Valve

Wilco Marsh Buggies & Draglines, Inc.
- 4 Long Reach Marsh Buggies

Tarpan Construction
- 1 CAT Excavator
- 1 Skid Steer
- 1 Mini-hoe Excavator

1 Trench Box

RC Paving
- 1 Skid Steer
- 1 3-Ton Vibratory Roller
- 1 10-Ton Vibratory Roller
- 1 Asphalt Paver

Blake D. Hines, Inc.
- 1 Skid Steer
- 1 CAT Excavator

14.0 Construction Sequence

14.1 Pre-Construction Survey (November 1, 2016 – May 23, 2017)

HydroTerra Technologies, a subcontractor for Weeks Marine, surveyed the project area prior to construction. A total of 19 marsh lines and 18 terrace field lines were surveyed prior to construction between November 4, 2016 and May 23, 2017. The marsh lines were spaced 500 feet apart along the baseline. The marsh lines extended 100 feet outward from primary containment dike template. The terrace field lines were located north of the fill areas and were spaced 500 feet apart. The pre-construction survey data was used by the Engineer to update the construction plans and prepare the final cross-sections. HydroTerra Technologies also conducted magnetometer surveys of the fill areas, borrow area, terrace fields, and conveyance corridor prior to construction between November 4, 2016 and May 23, 2017.

Hydrographic surveys of the Gulf of Mexico marsh borrow area and conveyance corridor were also conducted. These surveys were conducted concurrently with construction of the primary containment dikes and prior to the borrow area being dredged. The pre-construction surveys for the borrow area and conveyance corridor were conducted from April 24, 2017 to April 27, 2017. The surveys were collected on a north-south and east-west grid pattern with 50-foot spacing between lines and extended a minimum of 100 feet from the edge of the borrow area.

Pre-construction surveys of the LA 27/82 highway crossing were also conducted prior to construction on November 10, 2016 and on April 12, 2017. The pre-construction survey data was used by the Engineer to update the construction plans and prepare final cross sections for the roadway crossing.

14.2 Primary Containment Dike Construction (December 30, 2016 – August 11, 2017)

Wilco Marsh Buggies and Draglines, Inc, a subcontractor for Weeks Marine, constructed the primary containment dikes throughout the marsh creation area. The containment dikes were utilized to contain marsh fill material in six (6) marsh creation areas (MCA 1 through MCA 5A). Containment dike construction commenced on December 30th, 2016. The dikes were constructed to an average elevation of +4.0 feet NAVD88 with a crest width of approximately 5.0 feet and side slopes of 1V:4H. The dikes were constructed in several lifts, with some areas requiring up to four (4) lifts of material placement. Material used to construct containment was excavated from within the marsh creation areas so that it would be refilled during construction.

The scope of work for primary containment dike construction was expanded via Change Orders 001, 003, and 004. These change orders realigned the primary containment dikes and added containment for Marsh Creation Areas 5 and 5A. An additional pay item for Spoil Bank Primary Containment Dikes was added via Change Order 004 as existing spoil banks were able to be enhanced to be utilized for the containment of marsh fill material. These containment dikes were constructed along an existing spoil bank on the eastern side of Marsh Creation Area 5A. An

additional pay item was included for Spoil Bank Primary Containment Dikes as a smaller volume of material was required, so a lower unit price was warranted.

Containment dike construction began in Marsh Creation Areas 3 and 4 and progressed north and eastward into Marsh Creation Areas 1 and 2. Containment dikes were constructed for Marsh Creation Areas 5 and 5A last. Primary containment dike (and spoil bank primary containment dike) construction was completed on August 11, 2017. Weeks Marine crews maintained the containment dikes throughout construction. The total length of the constructed primary dike was approximately 52,084 linear feet. The total length of the constructed spoil bank primary dike was approximately 2,562 linear feet.

14.3 Trenasse and Secondary Pond Containment Construction (January 25, 2017 to August 10, 2017)

Wilco Marsh Buggies and Draglines, Inc, constructed the trenasses and secondary pond containment throughout the project area. This work was conducted concurrently with primary containment dike and earthen terrace construction. Trenasses were designed to facilitate intertidal flow following construction to enhance the creation of functional marsh habitat. The secondary pond containment was constructed to facilitate the formation of ponds in Marsh Creation Areas 1 and 3. Trenasse and pond containment construction commenced on January 25, 2017. The secondary pond containment was constructed to an elevation of +2.5 feet NAVD88 with a crest width of approximately 5.0 feet and side slopes of 1V:4H. Trenasses were excavated to an elevation of -2.5 feet NAVD88 with a bottom width of approximately 2.0 feet and side slopes of 1V:2H. Excavated material from the trenasse construction was sidecast within the marsh fill template. The fill sources for the secondary containment were filled by marsh material during construction. Trenasses were also filled with marsh material and were designed to settle differentially, allowing intertidal flow.

The scope of work for trenasse and secondary pond containment was modified via Change Orders 001, 003, and 004. Work on these items were completed on August 10, 2017. The total length of secondary pond containment constructed was 2,769 linear feet. The total length of trenasses constructed was 11,637 linear feet.

14.4 Earthen Terrace Construction (June 15, 2017 to July 27, 2017)

Wilco Marsh Buggies and Draglines, Inc, constructed the earthen terraces on the north end of the project area. This work was conducted concurrently with primary containment dike, secondary pond containment, and trenasse construction. Earthen terraces were designed to mitigate wave/wake erosion in the project area. Earthen terrace construction commenced on June 15, 2017. The scope of work for earthen terrace construction was reduced via Change Order 003, which included an expansion area (Marsh Creation Area 5) within the northwestern terrace field. The total number of terraces to be constructed was reduced from 39 to 20. Earthen terrace construction was completed on July 27, 2017. The total length of earthen terraces constructed was approximately 9,000 linear feet. Four of the terraces were already constructed in MCA 5A prior to the change order going into effect.

14.5 Waterline Relocation (May 2, 2017 – May 12, 2017)

Blake D. Hines, a subcontractor for Cycle Construction and Tarpan Construction, relocated the waterline. The existing waterline parallel to LA 27/82 was lowered to facilitate the placement of the permanent casing pipe beneath LA 27/82, which was installed to allow for placement of the sediment pipeline. Work on the waterline relocation commenced on May 2, 2017. Blake D. Hines crews began by excavating the eastern and western bell joints of the existing PVC waterline. After these joints were located, two tapping sleeves were installed. By connecting hot tap sleeves, the temporary bypass waterline was unnecessary.

Following this work, the new HDPE waterline was installed between the two joints via jack and bore methods. The new waterline was connected to the tapping sleeves and chlorinated. Water samples were then collected from the newly installed line. Once samples had been approved by the Department of Health and Hospitals, the new waterline was put into use, and the old PVC waterline was removed.

14.6 Highway Crossing/Casing Pipe Installation (May 13, 2017 to May 23, 2017)

Tarpan Construction, a subcontractor for Weeks Marine, constructed the highway crossing and casing pipe installation. The highway crossing/casing pipe installation was conducted in three (3) phases. Work commenced on the highway crossing on May 13, 2017.

Phase One (1) of the highway crossing commenced on May 13, 2017 with the eastbound lane of LA 27/82. Tarpan crews installed Triton barriers to protect the work zone from the traveling public. Temporary traffic control signs and flaggers were utilized throughout construction of the highway crossing to direct traffic. Once temporary traffic control measures were in place, Tarpan crews excavated the southern side of the highway (eastbound lane) to a depth 6 inches below the casing pipe design depth. Following excavation, a trench box was installed, and bedding material and the casing pipe were installed within the trench. Once all connections of the casing pipe had been sealed, the trench was backfilled with flowable fill. Once the flowable fill had cured, R.C. Paving crews installed a full depth asphalt pavement patch. The eastbound lane was reopened upon completion.

Following the completion of the eastbound lane, Phase Two (2) of the highway crossing work commenced. Traffic control measures were switched from the eastbound lane to the westbound lane closure. Again, temporary traffic control measures and flaggers were employed throughout the highway crossing work. Tarpan crews excavated the northern side of the highway (westbound lane) to a depth 6 inches below the casing pipe design depth. Following excavation, a trench box was installed and bedding material and the casing pipe were installed within the trench. Once all connections of the casing pipe had been sealed, the trench was backfilled with flowable fill. Once the flowable fill had cured, R.C. Paving crews installed a full depth asphalt pavement patch.

Phase Three (3) of the highway crossing consisted of shifting traffic control measures to allow traffic flow in both directions. During Phase 3, the temporary sediment pipeline was installed within the permanent concrete casing pipe (See Section 14.7). The concrete casing pipe installation

and highway crossing work was completed on May 23, 2017. A total of 43 linear feet of concrete casing pipe was installed beneath LA 27/82.

14.7 Temporary Sediment Pipeline Installation (May 21, 2017 to June 6, 2017)

Weeks Marine crews constructed the temporary sediment pipeline within the concrete casing pipe beginning on May 21, 2017. The temporary sediment pipeline was connected to steel pipeline from the Gulf of Mexico borrow area to the project site. Connections at the LA 27/82 crossing were welded and connected to a float hose pipe crossing the drainage canal to the north of the roadway. Remaining sediment pipeline consisted of HDPE pipe that was fused at the project site.

A total of 33,500 linear feet of sediment pipeline was installed to reach Marsh Creation Area 5 (furthest pumping extent). All connections to the fill areas had been completed by June 6, 2017.

14.8 Tropical Storm Cindy and Hurricane Harvey Impacts

Tropical Storm Cindy made landfall near the project area on June 22, 2017. Passage of the tropical storm resulted in flooding throughout the project site and prevented access to the project site for several days. WMI also demobilized the dredge in anticipation of Tropical Storm Cindy. The resulting delay from demobilization and remobilization as well as site inaccessibility was three (3) days. No damage was incurred by project features during this storm event. Work on the project site resumed on June 25, 2017.

Hurricane Harvey made landfall in east Texas on August 25, 2017. Passage of the hurricane resulted in flooding throughout the project site and prevented access to the project site for several days. WMI also demobilized the dredge in anticipation of Hurricane Harvey. The resulting delay from demobilization and remobilization as well as site inaccessibility was eight (8) days. No damage was incurred by project features during this storm event. Work on the project site resumed on September 1, 2017.

14.9 Marsh Creation (June 6, 2017 – September 8, 2017)

Dredging operations commenced on June 6, 2017 following the completion of the temporary sediment pipeline installation. WMI crews began marsh creation operations by pumping marsh fill material into the southwestern corner of MCA 3. Weir boxes were installed in the northeastern corner of MCA 3 to facilitate dewatering of the marsh fill material. Figure 9 shows WMI crews pumping marsh fill material into MCA 3 at the beginning of the project.

Figure 9: Aerial of WMI Placing Marsh Fill Within MCA 3

WMI crews continued to pump marsh fill material into MCA 3 up to an elevation ranging from +2.5' to 3.5' NAVD88. As marsh fill material approached the weir boxes in the northeast corner of MCA 3, boards were added in an effort to prevent marsh fill material from exiting into the adjacent canal running between MCA 3 and 4. Following the 30-day settlement period, marsh fill elevations within MCA 3 ranged between +2.1' NAVD88 to 3.4' NAVD88.

Once fill operations were completed in MCA 3, the discharge outfall was relocated to MCA 4. Weir boxes were installed in the northern boundary of MCA 4 to facilitate the dewatering of marsh fill material. WMI crews continued marsh fill placement until marsh fill elevations had reached an approximate elevation of +3.0' NAVD88. Following the 30-day settlement period, marsh fill elevations within MCA 4 ranged between +2.1' NAVD88 to 3.4' NAVD88.

After placement of fill material within MCA 3 and 4, as-built surveys showed that the marsh fill material appeared to be bulking. A cut to fill ratio of approximately 0.8 was calculated for these two fill areas towards the end of filling operations within MCA 3 and 4. Change Order 003 was issued to take advantage of a bid underrun and increase project benefits by adding an additional marsh creation area (MCA 5).

Following the completion of fill operations in MCA 3 and MCA 4, WMI relocated the discharge outfall to the southeastern corner of MCA 1. Fill operations were slowed in MCA 1 due to existing vegetation within the fill template. Weir boxes were installed in the northwestern side of MCA 5 to dewater the MCA 1 and MCA 5 fill areas.

WMI crews installed a Y-Valve in the pipe to MCA 1 to allow material to be placed within MCA 2 and MCA 1 simultaneously. Two (2) sets of weir boxes were installed within MCA 2 to dewater the marsh creation area.

As fill operations continued within MCA 1/5 and MCA 2, it was estimated that the total quantity of marsh fill available may not reach the contract quantity due to material bulking. Change Order 004 added an additional marsh creation area (MCA 5A) to alleviate these concerns. The construction of MCA 5A required that additional containment dikes be constructed. MCA 5A also required several containment dikes to be removed from the northeastern side of MCA 1/5. Volume calculation methodology with respect to bulking is further discussed in Section 15.

During dredging operations within MCA 1/5 and MCA 5A, a breach in the containment dike was observed. The breach occurred overnight and was repaired in the morning. Material was observed north and west of the marsh fill template in MCA 5.

Once fill operations were completed within MCA 1/5 and MCA 2, fill operations resumed within MCA 5A. Material was placed via the use of a low-level notch within the eastern containment dike of MCA 5A. Unconfined fill within the area east of MCA 5A (MCA 6) was allowed during this time. As-Built elevations within MCA 1/5, 2, and 5A ranged from 2.5' to 4.5' NAVD88.

WMI ceased dredging operations on September 8, 2017. A summary of marsh fill dredging operations is provided in Table 8.

Table 8: Summary of Marsh Creation Dredging Operations

Location	Start Date	End Date	Total Elapsed Time to Fill Marsh Cell (Days)	WMI Reported Excavated Quantity (CY)*
MCA 1/5	7/10/2017	9/8/2017	60	1,988,234
MCA 2	7/22/2017	8/11/2017	20	433,031
MCA 3	6/6/2017	7/9/2017	33	1,032,944
MCA 4	7/2/2017	7/9/2017	7	309,886
MCA 5A	8/13/2017	9/5/207	23	382,473

*WMI did not separate fill quantities on days when material was placed within multiple fill cells. A 50/50 split of reported volume is assumed within this table. The quantities provided by WMI are production estimates and not reflective of in-situ conditions of the borrow area post-construction.

Production rates were estimated based on the total construction time from the start and end dates of marsh construction, including any delays experienced. The gross production rate based on the total volume of material placed was estimated at 31,477 cubic yards per day (inclusive of downtime). The average production rate while operational was approximately 68,901 cubic yards per day. The maximum production rate was approximately 98,927 cubic yards on June 27, 2017.

Delays were estimated based on the total marsh construction time. Operational, mechanical, booster pump, and weather delays accounted for 54% of the construction time.

14.10 Settlement Plate Installation (June 5, 2017 – August 12, 2017)

A total of 7 settlement plates were installed to monitor the post-construction settlement of the marsh fill areas and consolidation of the placed fill material. Six (6) plates were installed within the marsh footprint, and one (1) plate was installed along the centerline of the primary containment dike. The settlement plates consisted of a 4-foot by 4-foot by ¼-inch steel plate with a three-inch galvanized capped riser pipe welded to the center of the plate. The settlement plates were installed such that the top of the riser pipe was between 3 and 7 feet above the designed grade. The installed settlement plate locations are shown in Table 9. The settlement plate shown on the Plans at Station 60+00, Range 32+20 within the marsh fill template was relocated to Station 35+80, Range 23+85 (see Field Adjustment Report 005 and Request for Interpretation 013).

Table 9: Settlement Plate Locations

Settlement Plate Locations				
Designed		Installed		Location
Station	Range	Station	Range	
38+88	44+99	38+40	45+00	MCA 1 - Marsh
60+00	32+20	60+00	32+10	MCA 1 – Marsh*
45+00	07+43	45+00	7+45	MCA 2 - Marsh
55+00	11+76	55+00	11+80	MCA 3 - Marsh
70+00	06+75	70+00	06+05	MCA 3 - Marsh
55+00	-18+88	55+00	-19+90	MCA 4 - Marsh
70+00	-19+07	70+00	-19+10	MCA 4 - Dike
35+85	23+84	35+80	23+85	MCA 5A – Marsh*

*The settlement plate (SP-2) installed within MCA 1 was displaced due to construction activities. It was relocated to MCA 5A.

14.11 Containment Dike Gapping and Degrading

Following the completion of marsh fill operations, WMI and Wilco crews degraded the primary containment dikes in all locations except for areas adjacent to the Oil Field Road. Excess material was placed within the boundaries of the containment dike fill source. Weir boxes were also removed from the containment dikes at this time. Construction crews also worked to gap the primary containment dikes in strategic locations in order to facilitate intertidal flow within the marsh creation areas. A total of 48 locations along the 5 marsh creation areas were chosen for gapping below the degraded elevation. The locations chosen were adjacent to nearby tidal creeks or waterbodies or in the gaps where the weir box locations were positioned during marsh fill operations. Gapping and the degradation of the containment dikes commenced on September 26, 2017 and was completed on October 19, 2017. Containment dike gapping locations are shown in **Figure 10**.

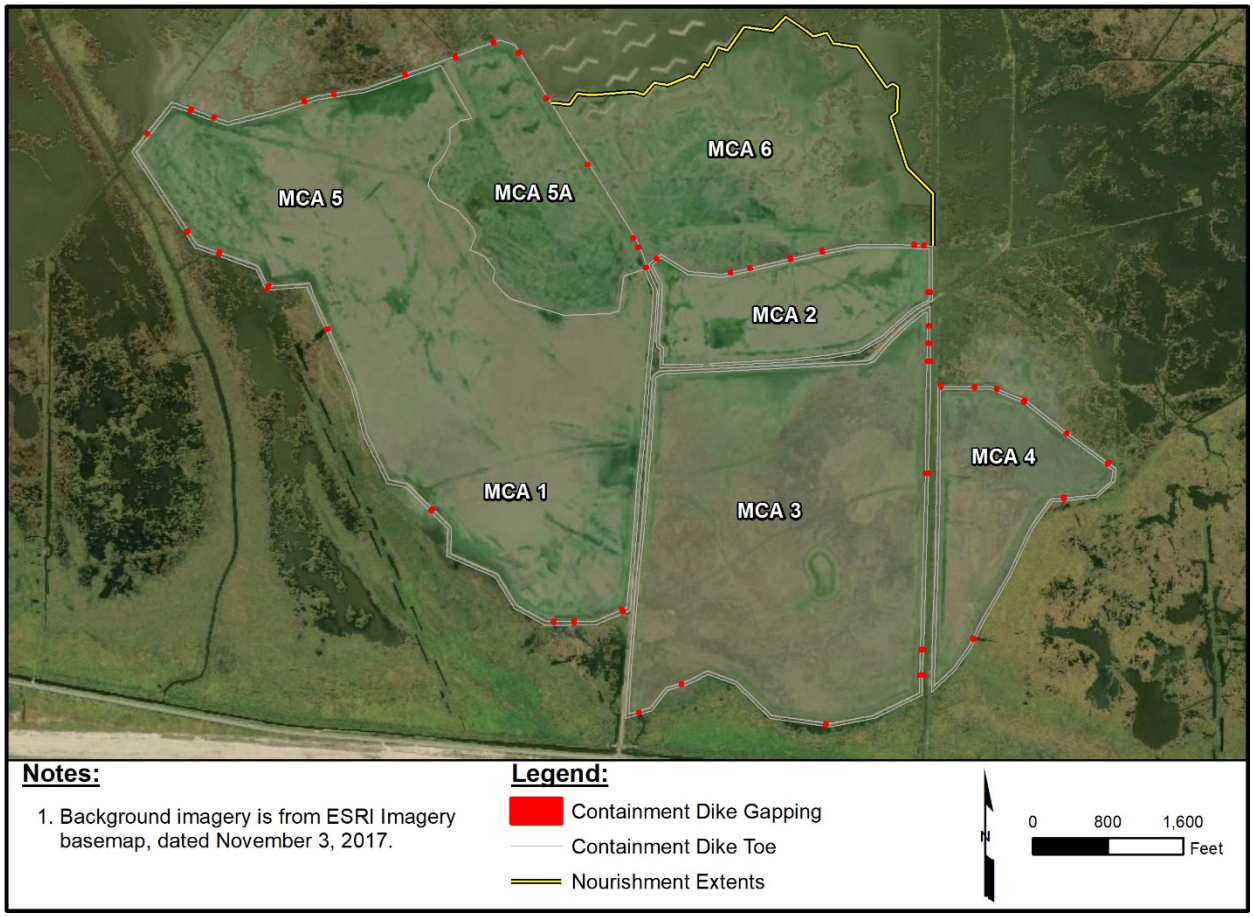

Figure 10: Containment Dike Gapping Locations

14.12 As-Built Surveys

HydroTerra Technologies and Weeks Marine conducted as-built surveys of completed project features throughout construction. As-Built features surveyed included the primary containment dikes, secondary containment dikes, trenasses, earthen terraces, marsh creation areas, the borrow area, highway crossing (including the waterline relocation), and the conveyance corridor. In addition, following the rehabilitation of the Oil Field Road, as-built surveys were conducted of the roadway. Dates of as-built surveys conducted ranged from April 7, 2017 to January 25, 2019. A summary of as-built survey data collection is provided in Table 10.

The as-built bathymetric survey of the borrow area was performed by Hydroterra Technologies, LLC. on October 9, 10, and 11, 2017 using an R2 Sonic multibeam system 400 kHz. Survey data acquisition was performed using RTK poling methods. The survey covered all sections within the borrow area limits. In addition, Hydroterra conducted bathymetric surveys of the conveyance corridor on October 13, 2017 with an Odom Mark III 200 kHZ transducer. All survey data was collected within the corridor alignment.

Table 10: Summary of As-Built Surveys

Location	Date of Survey Completion	Location	Date of Survey Completion
Borrow Area (Multibeam)	10/11/2017	Marsh Fill – MCA 5A	10/10/2017
Conveyance Corridor	10/13/2017	Terrace Field	7/31/2017
Highway Crossing	10/05/2017	Primary Containment	8/14/2017
Marsh Fill - MCA 1/5	9/25/2017	Secondary Containment	4/7/2017
Marsh Fill - MCA 2	9/12/2017	Trenasses	8/13/2017
Marsh Fill – MCA 3	8/23/2017	Oil Field Road	01/25/2019
Marsh Fill – MCA 4	8/23/2017	Marsh Fill – MCA 6	10/10/2017

Weeks Marine survey crews collected final as-built data on the highway crossing on October 5, 2017. Survey data acquisition was performed using RTK poling methods. The data was reviewed and approved by Hydroterra. The WMI survey data showed the position of the waterline relocation as well as the permanent casing pipe and the final elevation of the roadway patch constructed at the highway crossing.

Weeks Marine survey crews collected final as-built data of the marsh fill elevations from MCA 1 to MCA 5A. Surveys were conducted between August 23, 2017 and October 10, 2017 following the required 30-day settlement period for each marsh creation fill cell. Survey data acquisition was performed using RTK poling methods. The data was reviewed and approved by Hydroterra. Hydroterra conducted as-built surveys of the earthen terraces from July 25, 2017 to August 2, 2017. Survey data acquisition was performed using RTK poling methods.

As-Built surveys of the primary and secondary containment dikes and trenasses were conducted throughout construction by Weeks Marine. Survey data acquisition was performed using RTK poling methods.

Hydroterra conducted the final as-built surveys of the Oil Field Road on January 25, 2019. Survey data acquisition was performed using RTK poling methods on each layer of the constructed roadway.

14.13 LA 27/82 Pavement Restoration (September 24, 2018 – October 3, 2018)

Change Order 007 was issued on July 27, 2018 to rehabilitate the Oil Field Road and restore a dip observed at the highway crossing pavement patch. RC Paving, a subcontractor of WMI and Tarpan, constructed a fifty-six (56) foot mill and overlay of the highway crossing beginning on September 24, 2018 at the request of DOTD.

RC Paving began pavement restoration operations by milling asphalt pavement in the eastbound lane of LA 27/82. Flaggers were utilized during milling operations to maintain traffic in the westbound lane. Warning signs were also installed ahead of construction operations by Tarpan construction. The milling machine worked from Station 0+22 to Station 0+78 in the eastbound lane and removed the top two (2) inches of in-situ asphalt pavement. Following milling operations

in the eastbound lane, the eastbound lane was reopened, the westbound lane was closed, and the top two (2) inches of asphalt were milled from the surface from Station 0+78 to Station 0+22. Once both lanes had been milled, RC Paving cleaned the roadway surface and applied asphalt tack coat to the surface of the roadway. RC Paving crews utilized one (1) paver to place a two inch (2") asphalt overlay from Station 0+22 to Station 0+78 in the eastbound lane. RC Paving then paved the westbound lane. A total of 177 square yards of asphalt pavement were rehabilitated. Crews placed temporary pavement markings at the highway crossing until striping operations could begin.

Southwest Striping, a subcontractor of WMI and Tarpan, conducted striping operations on October 3, 2018. A total of 260 linear feet of solid striping and 130 linear feet of broken (centerline) striping were installed. In addition, ten (10) raised pavement markers were installed.

14.14 Oil Field Road Rehabilitation (August 18, 2018 to January 25, 2019)

Tarpan Construction, a subcontractor for WMI, constructed the 6,615 linear foot rehabilitation of Oil Field Road commencing on August 18, 2018. Change Order 007 was issued on July 27, 2018 to authorize work to repair Oil Field Road to useful service. The scope of work included installing drainage adjacent to the road and constructing Oil Field Road to a top elevation +4.0' NAVD88.

Prior to commencing the roadway rehabilitation, Tarpan crews constructed V-ditches along the length of the north/south and east/west roadway. V-ditches were constructed with a 4.5' top width and 1.5(H):1(V) side slopes. The V-ditches were designed with a longitude slope such that the ditches drained to the south and to the west of Oil Field Road. All material excavated from the V-ditches was sidecast within adjacent marsh creation areas. To facilitate the drainage of Oil Field Road, three (3) cross drains were installed, one (1) along the north/south roadway and two (2) along the east/west roadway. Turf reinforcement mats were also installed within the V-ditches in areas adjacent to pipeline crossings to improve the stability of the ditches in these locations.

Tarpan began the roadway rehabilitation by grading existing material and then placed embankment material on the north/south roadway. Geotextile fabric was placed on the existing graded surface prior to the installation of embankment material. Embankment material was placed with a target elevation of +2.5 feet NAVD88. Compaction testing was conducting every 1,000 feet along the installed embankment layer. All tests yielded passing test results. As-built surveys showed the elevation of the embankment layer ranged from +2.4 feet to +2.6 feet NAVD88.

Following the installation of embankment material, Tarpan crews installed a one (1) foot thick layer of Class II Base Course utilizing Number 57 BAH Limestone. An additional layer of geotextile fabric was installed on the surface of the embankment layer prior to the installation of base course. The base course layer was constructed with a target elevation of +3.5 feet NAVD88 and side slopes of 1.5(H):1(V). Compaction testing was conducted every 1,000 feet along the installed base course layer. All tests either yielded initial passing test results, or sections were re-compacted until suitable results were achieved. As-built surveys showed that the base course top elevation varied between +3.4 and +3.6 feet NAVD88.

To complete the roadway restoration, Tarpan crews installed a six inch (6”) layer of aggregate surface course. The surface course layer was constructed with 610 Crushed Concrete. The surface course layer was constructed to a target elevation of +4.0 feet NAVD88 and had side slopes of 1.5(H):1(V). The minimum top width constructed was 10 feet across. Compaction testing was conducted every 1,000 feet along the installed surface course layer. All tests either yielded initial passing test results, or sections were re-compacted until suitable results were achieved. As-built surveys showed that the surface course top elevation varied between +3.9 and +4.1 feet NAVD88.

Tarpan crews achieved substantial completion of the Oil Field Road rehabilitation on January 23, 2019. Tarpan completed field related punch list items on January 25, 2019.

15.0 Problems Encountered / Lessons Learned

15.1 Marsh Fill Material Estimation

Less marsh fill material was required to construct the project than estimated in the project design, which resulted in an underrun of the contract quantity. This is believed to be primarily related to marsh fill volume calculation methodology and the way it accounted for void ratio and fill material bulking. The method of calculating marsh fill volumes has evolved over time. Historically, the typical marsh fill volume calculation methodology included calculating the in-place volume and adding an estimated loss factor. In more recent projects, CPRA has begun to develop an improved method of accounting for the increase in void ratio after dredging, such that the volume required could be estimated to reflect the void ratio after returning to the in-situ value.

The Oyster Bayou design effort used the older methodology and did not account for the void ratio after dredging; instead, an anticipated loss factor was applied in addition to the estimated in-place volume. Following this older method, the loss factor was estimated during design to be 1.3 to 1. During and immediately following Oyster Bayou project construction, an observed cut to fill ratio of less than 1 to 1 was determined based on the dredge and fill calculations. The Oyster Bayou contract payed for fill material by the cut volume, so the very low cut to fill ratio observed during and soon after construction meant the pay volume was less than the observed fill volume and thus less than the estimated bid volume.

Several factors may contribute to bulking rates, such as sediment composition and/or construction means and methods. The use of instrumented settlement plates to measure fill consolidation during construction and dewatering will provide additional data to aid in estimating bid volumes more accurately on future projects. In addition, CPRA may consider implementing more robust pipeline and dewatering management specifications to lower loss factors on future projects that may be related to construction practices.

15.2 Grade Stake Design

In an effort to monitor the marsh fill elevations during construction, the contractor installed PVC grade stakes throughout the fill areas that were marked with various elevations for visual checks during construction. While these grade stakes were installed utilizing RTK survey practices, the action of fill material placement disturbed many of the grade stakes from their intended positions during construction operations. Surveyors were on-site to reset grade stakes, but many of the stakes were disturbed regularly and required frequent resetting. The use of grade stakes to monitor fill elevations may be more effective if the stakes can be set to a level at which fill operations would not disturb the stakes. However, this level of effort may not be necessary if surveyors are available on-site. For example, the contractor typically had surveyors on-site on a daily basis and preferred spot-checking fill elevations each day by using RTK instead of resetting each grade stake. In the future, allowing the use of RTK technology for direct verification in combination with, or eventually in place of, grade stakes may provide more flexibility and efficiency for fill monitoring.

15.3 Weir Box Management

Marsh fill material was observed passing through, and occasionally over, weir box dewatering structures at various times during construction. These observations were communicated with the contractor site crew at times when they appeared to be having difficultly managing the high slurry operations in the constructed marsh. While the construction specifications required that dewatering structures be able to be shut off completely, and that these structures shall be monitored regularly, there were many times that full containment was unachievable. In future projects, a weir box monitoring plan should be required of the contractor as part of the pre-construction submittals for implementation during construction. Turbidity curtains should also be considered as a requirement to minimize losses outside of the marsh boundary in the event of an overtopping or ineffective weir box.

15.4 Bird Abatement Plan

Bird abatement was not required in the original contract as it is not typical for marsh creation projects; however, the sediment pipeline for Oyster Bayou crossed a newly nourished section of Gulf beach (Cameron Parish Shoreline Protection Project). This beach nourishment created optimal nesting habitat for migratory birds, which created the need for abatement measures. Future projects should review the latest year's bird survey data prior to advertisement to determine whether bird abatement and monitoring is required. Nesting birds were also observed on some sections of primary containment dike within the marsh creation area. Bird abatement planning should be evaluated for implementation on case by case basis with future restoration projects that have similar potential for bird presence.

15.5 Open Roadway Cut

The permanent casing pipe beneath LA 27/82 was installed to facilitate placement of the temporary sediment pipeline. This casing pipe will be left in place for use on future projects that may utilize Gulf of Mexico borrow material. As waterlines and fiber optic lines were located near the highway, jack and bore and microtunneling construction methods were unable to be implemented. Open roadway cut installation methods and phased construction (maintaining traffic via the LA 27/82 hurricane evacuation route) were successful. However, an overlay was requested by DOTD after construction was completed following settlement of the pavement patch after the roadway construction work was completed. Construction methods appeared to follow DOTD methods, and the settlement was attributed to natural processes. Future projects requiring this type of operation should be monitored for unpredictable conditions and potential settlement following completion. CPRA may also want to consider an additional cost contingency in the project budget in the event this unexpected site condition or other similar unforeseen circumstances occur on future projects.

15.6 Protection of Existing Infrastructure

Existing infrastructure within and adjacent to the proposed project area should be evaluated in the pre-construction phase for proactive measures of protection to be implemented during construction. For example, proposed fill elevations, dewatering methods, etc., may be included in this evaluation for potential effects to nearby structures such as roads, oil and gas infrastructure,

and landowner structures. Additional information and suggestions specifically encountered during the Oyster Bayou project are provided below.

The marsh creation areas at Oyster Bayou were originally designed to be constructed to a +2.5' NAVD88 elevation. Design surveys of the oil field road captured elevations close to or below +2.5' NAVD88. However, the original design survey did not fully capture the road as the survey plan was established to focus on the marsh fill areas. To more thoroughly evaluate potential effects of projects on existing adjacent infrastructure, detailed surveys should extend to capture these existing nearby features that could have more significant implications during construction.

During construction operations, the marsh fill areas were filled to an elevation greater than that shown on the construction plans, which was above the adjacent road and contributed to areas of water ponding and impoundment after heavy rain events. In addition, construction of containment above the elevation of the road would have likely contributed to these issues temporarily. In the future, preventative measures such as constructing drainage prior to constructing marsh, installing temporary pumps, and developing an existing road erosion control plan should be evaluated during design to preserve the condition of the road during construction to the greatest extent practicable. Likewise, additional specifications regarding the contractor's use of existing roads and related infrastructure could be more preventative on future projects, such as limiting heavy equipment as deemed appropriate based on pre-construction site conditions. In summary, in planning and the early phases of design, construction near existing roads or other infrastructure should be thoroughly assessed for potential conflicts in function.

15.7 Marsh Fill Elevation Post-Construction Monitoring

The target marsh fill elevation for Oyster Bayou was adjusted between the final design phase and the development of the construction package. This contractual change increased the allowable pay elevation by +0.5 ft to provide additional assurance that the final settled elevation of the constructed marsh would meet the overall design intent. To aid in this type of decision making on future projects, data from this project and others should continue to be evaluated through post-construction monitoring. Such monitoring data will greatly assist in evaluating the performance of past projects to improve future designs and assess potential effects on other aspects of the project.

16.0 Construction Change Orders

16.1 Change Order 001 – February 24, 2017

Change Order 001 was implemented to realign the primary containment dike in MCA 2 to avoid various dike centerline obstructions in the southeastern corner of MCA 2. A 91 linear foot gap was also constructed in the primary containment dike of MCA 2 at the northern side of the existing wooden bridge culvert to prevent overflow of marsh fill material onto the Oil Field Road. Change Order 001 also was implemented to realign the secondary pond containment within MCA 1 to avoid the adjacent existing Targa pipeline. Additional secondary pond containment was also added in areas with insufficient natural containment.

- The Primary Containment Dike (Bid Item No. 5) length was decreased from 45,041 linear feet to 44,083 linear feet to account for the realignment near the adjacent Targa well station and to leave a gap near the existing wooden bridge. The decrease in quantity resulted in a project cost decrease of $19,160.00.
- The Secondary Pond Containment (Bid Item No. 6) length was increased from 2,543 linear feet to 2,722 linear feet to realign the containment and construct additional containment where natural containment was insufficient to contain marsh fill. The increase in quantity resulted in a project cost increase of $1,790.00.

The change order resulted in a net project cost decrease of $17,370.00. The change order did not result in an increase in contract time.

16.2 Change Order 002 – March 31, 2017

Change Order 002 was implemented to include an additional bid item (Bid Item No. 25) for bird abatement. Change Order 002 implemented bird abatement measures to discourage nesting near the pipeline corridor in the beach area. The change order resulted in a net project cost increase of $116,991.85 to allow for the payment of the additional line item associated with bird abatement measures in nesting season from April 1st to September 15th (167 days). One (1) additional line item was included in this change order. The change order did not result in an increase of contract time.

16.3 Change Order 003 – May 17, 2017

Change Order 003 was implemented to include a project expansion area (MCA 5). The implementation of Change Order 003 included revisions to quantities of hydraulic dredging – marsh creation, primary containment dikes, trenasses, and earthen terraces. In addition, Change Order 003 included an additional quantity of secondary pond containment to close a gap in natural containment in the northwestern pond in MCA 1.

- The Hydraulic Dredging – Marsh Creation (Bid Item No. 4) volume was increased from 3,481,700 cubic yards to 4,352,125 cubic yards to account for the project expansion area. The increase in volume resulted in a project cost increase of $3,177,051.25.

- The Primary Containment Dike (Bid Item No. 5) length was increased from 44,083 linear feet to 49,262 linear feet to account for the project expansion area. The increase in length resulted in a project cost increase of $103,580.00.
- The Secondary Pond Containment (Bid Item No. 6) length was increased from 2,722 linear feet to 2,965 linear feet to account for a gap in containment on the northwestern pond in MCA 1. The increase in length resulted in a project cost increase of $2,430.00.
- The Trenasse (Bid Item No. 7) length was increased from 9,491 linear feet to 10,817 linear feet to account for the new trenasse to be constructed within the expansion area. The increase in length resulted in a project cost increase of $3,978.00.
- The Earthen Terrace (Bid Item No. 8) length was decreased from 17,550 linear feet to 9,000 linear feet to account for the expansion area to be constructed within the terrace fields. The decrease in length resulted in a project cost decrease of $299,250.00.
- The Hydraulic Dredging – Marsh Creation (Bid Item No. 26) volume was added to the contract to account for any marsh fill volume placed on-site 25% over the original contract quantity, which necessitated a new negotiated unit rate per the specifications. The addition of Bid Item No. 26 resulted in a project cost increase of $1,605,946.25.

Change Order 003 resulted in a net project cost increase of $4,593,735.50. The change order resulted in a contract time increase of ninety (90) days to account for expansion area construction, which extended the project completion date from September 26, 2017 to December 25, 2017.

16.4 Change Order 004 – August 7, 2017

Change Order 004 was implemented to address a potential underrun and to include a new expansion area (MCA 5A). The implementation of Change Order 004 included revisions to quantities of primary containment dikes and trenasses and included an additional bid item for Spoil Bank Primary Containment Dikes (Bid Item No. 27). Change Order 004 also added additional quantity of geotextile fabric to account for material used during the casing pipe installation.

- The Primary Containment Dike (Bid Item No. 5) length was increased from 49,262 linear feet to 52,217 linear feet to account for the expansion area. The increase in length resulted in a project cost increase of $59,100.00.
- The Trenasse (Bid Item No. 7) length was increased from 10,817 linear feet to 12,781 linear feet to account for a new trenasse through the expansion area. The increase in length resulted in a net project cost increase of $5,892.00.
- The Geotextile Fabric (DOTD 203-08-00100) (Bid Item No. 16) quantity was increased from 63 square yards to 116 square yards to reflect as-built quantities during the casing pipe installation. The increase in quantity resulted in a project cost increase of $2,120.00.
- The Spoil Bank Primary Containment Dike (Bid Item No. 27) line item was added to the contract to account for containment dikes constructed adjacent to the existing spoil bank. A total of 2,640 linear feet of spoil bank primary containment dikes were added to the contract. The addition of Bid Item No. 27 resulted in a project cost increase of $46,200.00.

Change Order 004 resulted in a net project cost increase of $113,312.00. The change order did not result in an increase in contract time.

16.5 Change Order 005 – December 8, 2017

Change Order 005 was implemented to allow additional contract time to design the oil field road rehabilitation. The change order resulted in a contract time increase of forty-two (42) days to account for the design of oil field road, which extended the project completion date from December 25, 2017 to February 5, 2018.

16.6 Change Order 006 – May 29, 2018

Change Order 006 was implemented to include Bid Items 25b and 25c. The Bid Items were added as WMI would be responsible for implementing the CS-59 Bird Abatement Plan during the remaining oil field road restoration work as nesting birds were observed within the project limits.

- The Bird Abatement ATV Mobilization/Demobilization (Bid Item 25b) line item was added via Change Order 006. The contract value of Bid Item 25b was $389.33.
- The Bird Abatement 2018 (Bid Item 25c) line item was added via Change Order 006. The contract value of Bid Item 25c was $749.80 per day for a total contract increase of $80,978.40.

Change Order 006 resulted in a net project cost increase of $81,367.33. The change order resulted in a contract time increase of two hundred and twenty-one (221) days to account for the 2018 bird nesting season, which extended the project completion date from February 5, 2018 to September 15, 2018.

16.7 Change Order 007 – July 26, 2018

Change Order 007 was implemented to address the deteriorating condition of Oil Field Road and return it to useful service. Change Order 007 also addresses a dip that formed in the pavement of the highway crossing due to settlement over time. Change Order 007 included additional contract bid items for highway rehabilitation mobilization/demobilization, superpave asphaltic concrete, cold planing asphaltic pavement, plastic pavement markings (solid and broken line), and raised pavement markers to address the pavement restoration. Change Order 007 also included additional contract bid items for Oil Field Road rehabilitation mobilization/demobilization, drainage excavation, embankment/excavation, geotextile fabric, Class II base course, aggregate surface course, cross drain pipes, and road surveys to address the oil field road rehabilitation. Change Order 007 also reduced original contract quantities that were not achieved during construction. Decreased items included Bid Items 4, 5, 6, 7, 10, 14, 15, 17, 26, and 27.

- The Hydraulic Dredging – Marsh Creation (Bid Item No. 4) line item quantity was reduced from 4,352,125 cubic yards to 4,314,929 cubic yards. The reduction in quantity resulted in a project cost decrease of $135,765.40.
- The Primary Containment Dike (Bid Item No. 5) line item quantity was reduced from 52,217 linear feet to 52,084 linear feet. The reduction in quantity resulted in a project cost decrease of $2,660.00.

- The Secondary Pond Containment (Bid Item No. 6) line item quantity was reduced from 2,965 linear feet to 2,769 linear feet. The reduction in quantity resulted in a project cost decrease of $1,958.60.
- The Trenasse (Bid Item No. 7) line item quantity was reduced from 12,781 linear feet to 11,637 linear feet. The reduction in quantity resulted in a project cost decrease of $3,433.38.
- The temporary waterline bypass (Bid Item No. 10) line item quantity was reduced from 1 to 0 as a temporary line was not used during waterline relocation. The reduction in quantity resulted in a project cost decrease of $50,000.00.
- The Highway Embankment (DOTD 203-03-00100) (Bid Item No. 14) line item quantity was reduced from 270 cubic yards to 102 cubic yards. The reduction in quantity resulted in a project cost decrease of $16,790.00.
- The Highway Excavation (DOTD 203-03-00100) (Bid Item No. 15) line item quantity was reduced from 470 cubic yards to 199 cubic yards. The reduction in quantity resulted in a project cost decrease of $10,834.40.
- The Pavement Patching 12" Thick (DOTD 510-01-00100) (Bid Item No. 17) line item quantity was reduced from 63 square yards to 51 square yards. The reduction in quantity resulted in a project cost decrease of $3,744.00.
- The Hydraulic Dredging – Marsh Creation (Bid Item No. 26) line item quantity was reduced from 386,975 cubic yards to 0.0 cubic yards. The reduction in quantity resulted in a project cost decrease of $1,605,946.25.
- The Spoil Bank Primary Containment Dike (Bid Item No. 27) line item quantity was reduced from 2,640 linear feet to 2,562 linear feet. The reduction in quantity resulted in a project cost decrease of $1,365.00.
- The Highway Rehabilitation Mobilization/Demobilization (Bid Item No. 28) line item was added to the contract. The addition of Bid Item No. 28 resulted in a project cost increase of $22,822.86.
- The Superpave Asphaltic Concrete (Bid Item No. 29) line item was added to the contract to address the pavement restoration at the highway crossing. A total of 184 square yards of superpave asphaltic concrete were added to the contract. The addition of Bid Item No. 29 resulted in a project cost increase of $29,452.88.
- The Cold Planing Asphaltic Pavement (Bid Item No. 30) line item was added to the contract to address the pavement restoration at the highway crossing. A total of 184 square yards of cold planing asphaltic pavement were added to the contract. The addition of Bid Item No. 30 resulted in a project cost increase of $7,477.76.
- The Plastic Pavement Markings (solid line) (Bid Item No. 31) line item was added to the contract to address the pavement restoration at the highway crossing. A total of 260 linear feet of plastic pavement markings (solid line) were added to the contract. The addition of Bid Item No. 31 resulted in a project cost increase of $975.00.
- The Plastic Pavement Markings (broken line) (Bid Item No. 32) line item was added to the contract to address the pavement restoration at the highway crossing. A total of 130 linear feet of plastic pavement markings (broken line) were added to the contract. The addition of Bid Item No. 32 resulted in a project cost increase of $487.50.
- The Raised Pavement Markers (Bid Item No. 33) line item was added to the contract to address the pavement restoration at the highway crossing. A total of 10 (Each) raised

pavement markers were added to the contract. The addition of Bid Item No. 33 resulted in a project cost increase of $268.90.

- The Oil Field Road Rehabilitation Mobilization/Demobilization (Bid Item No. 34) line item was added to the contract. The addition of Bid Item No. 34 resulted in a project cost increase of $31,264.19.
- The Drainage Excavation (Bid Item 35) line item was added to the contract to address the rehabilitation of the oil field road. A total of 12,500 linear feet of drainage excavation were added to the contract. The addition of Bid Item No. 35 resulted in a project cost increase of $75,000.00.
- The Embankment/Excavation (Bid Item No. 36) line item was added to the contract to address the rehabilitation of the oil field road. A total of 1,788 cubic yards of embankment/excavation were added to the contract. The addition of Bid Item No. 36 resulted in a project cost increase of $105,098.64.
- The Geotextile Fabric (Bid Item No. 37) line item was added to the contract to address the rehabilitation of the oil field road. A total of 28,275 square feet of geotextile fabric were added to the contract. The addition of Bid Item No. 37 resulted in a project cost increase of $44,109.00.
- The Class II Base Course (Bid Item No. 38) line item was added to the contract to address the rehabilitation of the oil field road. A total of 4,161 cubic yards of Class II base course were added to the contract. The addition of Bid Item No. 38 resulted in a project cost increase of $657,687.66.
- The Aggregate Surface Course (Bid Item No. 39) line item was added to the contract to address the rehabilitation of the oil field road. A total of 2,058 cubic yards of aggregate surface course were added to the contract. The addition of Bid Item No. 39 resulted in a project cost increase of $275,051.70.
- The Cross Drain Pipe (12") Sta E0+00 (Bid Item No. 40) line item was added to the contract to address the rehabilitation of the oil field road. A total of 48 linear feet of corrugated metal cross drain pipe were added to the contract. The addition of Bid Item No. 40 resulted in a project cost increase of $4,321.92.
- The Cross Drain Pipe (18") Sta N14+00 (Bid Item No. 41) line item was added to the contract to address the rehabilitation of the oil field road. A total of 32 linear feet of corrugated metal cross drain pipe were added to the contract. The addition of Bid Item No. 41 resulted in a project cost increase of $3,401.60.
- The Cross Drain Pipe (18") Sta E31+09 (Bid Item No. 42) line item was added to the contract to address the rehabilitation of the oil field road. A total of 32 linear feet of corrugated metal cross drain pipe were added to the contract. The addition of Bid Item No. 42 resulted in a project cost increase of $3,401.60.
- The Road Surveys (Bid Item No. 43) line item was added to the contract. The addition of Bid Item No. 43 resulted in a project cost increase of $57,526.12.
- The Turf Reinforcement Mats (Bid Item No. 44) (TRM) line item was added to the contract. A total of 133 square yards of turf mats were added to the contract. The addition of Bid Item No. 44 resulted in a project cost increase of $1,163.75.
- The TRM Installation Twist Pins (5 per 2 square yards) (Bid Item No. 45) line item was added to the contract. A total of 333 twist pins were added to the contract. The addition of Bid Item No. 45 resulted in a project cost increase of $126.54.

Change Order 007 resulted in a net project cost decrease of $512,859.41. The change order resulted in a contract time increase of thirty (30) days to account for roadway construction, which extended the project completion date from September 15, 2018 to October 15, 2018.

16.8 Change Order 008 – November 20, 2018

Change Order 008 was implemented to allow for a contract time extension due to weather delays incurred on the project site. Weather was unfavorable for roadway construction over the duration of the original contract time. Therefore, a contract time extension due to weather delays was requested by WMI. The change order resulted in a contract time increase of sixty (60) days to account for weather delays incurred by the contractor, which extended the project completion date from October 15, 2018 to December 14, 2018.

16.9 Change Order 009 – December 31, 2018

Change Order 009 was implemented to allow for a contract time extension due to additional weather delays incurred on the project site. Weather was unfavorable for roadway construction over the duration of the original and extended contract time. Therefore, a contract time extension due to weather delays was requested by WMI. The change order resulted in a contract time increase of thirty-eight (38) days to account for weather delays incurred by the contractor, which extended the project completion date from December 14, 2018 to January 21, 2019.

16.10 Change Order 010 – March 13, 2019

Change Order 010 was implemented to adjust the contract quantities to reflect the final as-built quantities of Oil Field Road Restoration and LA 27/82 Pavement Rehabilitation. Additional contract time was also added to account for time between the end of contract time and final site inspection on January 23, 2019.

- The Superpave Asphaltic Concrete (Bid Item No. 29) line item was reduced from 184 square yards to 177.33 square yards. The reduction in quantity of Bid Item No. 29 resulted in a project cost decrease of $1,067.67.
- The Cold Planing Asphaltic Pavement (Bid Item No. 30) line item was reduced from 184 square yards to 177.33 square yards. The reduction in quantity of Bid Item No. 30 resulted in a project cost decrease of $271.07.
- The Drainage Excavation (Bid Item 35) line item was reduced from 12,500 linear feet to 11,896 linear feet. The reduction in quantity of Bid Item No. 35 resulted in a project cost decrease of $3,624.00.
- The Embankment/Excavation (Bid Item No. 36) line item was increased from 1,788 cubic yards to 3,031.24 cubic yards. The increase in quantity of Bid Item No. 36 resulted in a project cost increase of $73,077.65
- The Geotextile Fabric (Bid Item No. 37) line item was reduced from 28,275 square yards to 25,647.78 square yards. The reduction in quantity of Bid Item No. 37 resulted in a project cost decrease of $4,098.46.

- The Class II Base Course (Bid Item No. 38) line item was reduced from 4,161 cubic yards to 3,353.58 cubic yards. The reduction in quantity of Bid Item No. 38 resulted in a project cost decrease of $127,620.81.
- The Aggregate Surface Course (Bid Item No. 39) line item was increased from 2,058 cubic yards to 2,877 cubic yards. The increase in quantity of Bid Item No. 39 resulted in a project cost increase of $109,459.35.

Change Order 010 resulted in a net project cost decrease of $45,854.99. The change order did not result in an increase in contract time.

17.0 Construction Field Adjustments

17.1 Field Adjustment Report 001 – December 12, 2016

Field Adjustment Report 001 revised Appendix XIII of the project specifications to include an additional survey monument. The use of Station F 212 was allowed for pre-construction and as-built surveys via FAR 001 as it was used in the CS-59 design survey.

17.2 Field Adjustment Report 002 – December 29, 2016

Field Adjustment 002 revised Special Provision 7 (SP-7) of the project specifications. The revisions to the specifications were added to the contract document as the Department of Energy (DOE) provided additional crossing requirements for an existing offshore pipeline after the construction specifications were finalized.

17.3 Field Adjustment Report 003 – May 24, 2017

Field Adjustment Report 003 revised Technical Specification 12 (TS-12) of the project specifications and Plan Sheet 20. FAR 003 amended the backfill material from embankment material and flowable fill to backfill material consisting solely of flowable fill. The DOTD construction engineer indicated that backfilling the casing pipe trench with flowable fill in lieu of embankment material would remove compaction and compaction testing requirements therefore simplifying the operation.

17.4 Field Adjustment Report 004 – August 8, 2017

Field Adjustment Report 004 revised the location of secondary pond containment to be constructed within MCA 1. Multiple secondary containment gaps were identified within MCA 1. Therefore, to address the gap locations, one (1) seventy-eight (78) foot gap within the northern pond and two (2) gaps (totaling ninety-one (91) linear feet) within the southern pond were designated to be filled. Natural containment (i.e. mangroves and marsh grass) that previously existed in these areas was observed to have deteriorated, necessitating this change.

17.5 Field Adjustment Report 005 – August 9, 2017

Field Adjustment Report 005 allowed for the placement of marsh fill material within MCA 5A and revised the location of a settlement plate displaced during construction. Due to a potential underrun resulting from unforeseen material properties, FAR 005 allowed for the placement of marsh fill into MCA 5A as proposed in Change Order 004. MCA 5A is located to the northeast of the existing containment of MCA 1/5. Settlement Plate SP-2 was displaced during construction activities in MCA 1. SP-2 was relocated from the marsh fill within MCA 1 to the marsh fill area within MCA 5A.

17.6 Field Adjustment Report 006 – October 30, 2017

Field Adjustment Report 006 amended SP-6.2.3 of the contract specifications. SP-6.2.3 required that the contractor provide daily progress reports following the issuance of the notice to proceed until project completion. As work was nearing completion and demobilization efforts had been suspended, it was recommended that weekly reports be issued until demobilization work resumed.

17.7 Field Adjustment Report 007 – November 29, 2017

Field Adjustment Report 007 revised the ratio of mobilization and demobilization effort described in TS-1.3 of the project specifications. The contract specifications originally required the remaining forty (40) percent of the lump sum mobilization/demobilization bid item be paid in the final payment. As additional contract work for the repair of the oil field road was anticipated to be included within this contract, this FAR allowed the release of the remaining 40% of this bid item following the acceptance of the marsh creation areas and terraces, and upon the removal of the temporary sediment pipeline.

17.8 Field Adjustment Report 008 – May 30, 2018

Field Adjustment Report 008 was issued to implement the resumption of Daily Progress Reports to be issued by the Contractor beginning May 30, 2018. FAR-006 previously suspended daily reporting due to suspension of work. However, construction activities resumed on the project site on May 30, 2018.

18.0 Requests for Interpretation

18.1 Request for Interpretation 001 – November 11, 2016

HydroTerra, a subcontractor for WMI, submitted Request for Interpretation 001 (through WMI) to request clarification regarding the conveyance corridor and the trenasse layout within Marsh Creation Area 3. The response to the RFI included a table of the conveyance corridor layout as well as an updated table of inflection points for the trenasse in MCA 3. The response also noted that there was no proposed alignment of the pipeline conveyance corridor north of LA 27/82.

18.2 Request for Interpretation 002 – November 11, 2016

Request for Interpretation 002 requested AutoCAD design files in .dwg format. Electronic copies of the AutoCAD construction plans were provided to WMI. It was noted that it is WMI's responsibility to construct the project using the data shown on the contract drawings.

18.3 Request for Interpretation 003 – December 01, 2016

HydroTerra, a subcontractor for WMI, submitted Request for Interpretation 003 (through WMI) to request clarification concerning contract drawings Sheets 3 and 6. A PDF of inflection points was provided by WMI within the RFI. The response to RFI-003 noted that reference point "A" in the RFI was updated within the table provided in RFI-001. The response further noted that reference point "B" had been eliminated and reference point "C" was changed to X: 2,622,385.7, Y: 468,593.7.

18.4 Request for Interpretation 004 – April 04, 2017

Cycle Construction, a subcontractor for WMI, submitted Request for Interpretation 004 (through WMI) to request clarification concerning contract drawings Sheets 21 and 22. Cycle Construction indicated that continuous service through the waterline was possible without constructing the temporary waterline relocation. Cycle proposed to install rotating tapping sleeves and install the HDPE pipeline at the design elevation. Cycle noted that 10" tapping sleeves would have to be permanently installed during this process. Cycle's proposed method of the waterline relocation was deemed acceptable as long as continuous service was provided and the work adhered to TS-11. It was noted that a Change Order would be required to remove Bid Item 10 – Temporary Waterline Bypass.

18.5 Request for Interpretation 005 – April 06, 2017

Cycle Construction, a subcontractor for WMI, submitted Request for Interpretation 005 (through WMI) to request clarification concerning contract drawings Sheets 23 and 24. Cycle Construction indicated that the highway crossing could be expedited by modifying the installation processes shown in Phase 1 and Phase 2. Cycle proposed to add additional length of concrete pipe on the south side of the roadway, then during Phase 2, Cycle proposed to install a temporary gravel roadway while installing the casing pipe beneath LA 27/82. The request was denied based on conversations regarding the design process.

18.6 Request for Interpretation 006 – April 06, 2017

Cycle Construction, a subcontractor for WMI, submitted Request for Interpretation 006 (through WMI) to request clarification concerning project specification TS-12.4 and LA DOTD specification Section 701.8. Cycle Construction indicated that on Page 352 of DOTD's Specifications, acceptable backfill materials for backfilling pipe include select soils, granular material, flowable fill, and stone or recycled Portland cement. Cycle requested the use of stone in lieu of using flowable fill as shown on the Plans. Cycle noted that the method would require density testing. However, this method was preferable as the nearest concrete batch plant is located in nearby Westlake. Cycle also noted that the use of stone would eliminate any chance of floating the concrete casing pipe.

The response to RFI-006 cited project specification TS-12.4, which requires the use of flowable fill for backfill. The response also noted that during meetings with DOTD, DOTD requested the use of flowable fill as backfill material for the casing pipe installation. In addition, the response noted that Addendum II of the Contract Bid Documents requires that excavatable flowable fill shall be used to backfill the casing pipe installation. Therefore, Cycle's request was denied, and flowable fill was specified as the backfill material to be used per project specifications, DOTD specifications, and Addendum II of the Contract Bid Documents.

18.7 Request for Interpretation 007 – May 12, 2017

WMI submitted Request for Interpretation 007 to request the relocation of Dewatering Location 6 (DL-6) as shown on an attached AutoCAD drawing. The dewatering location was relocated to the north end of the eastern boundary of MCA 3. WMI noted that four (4) weir boxes would be placed at this location. The request was accepted.

18.8 Request for Interpretation 008 – June 12, 2017

WMI submitted Request for Interpretation 008 to request the relocation of Dewatering Location 2 (DL-2) in MCA 1/5 and Dewatering Location 4 (DL-4) in MCA 2 as shown on an attached AutoCAD drawing. WMI indicated that five (5) weir boxes would be placed in MCA 2 and four (4) weir boxes would be placed in MCA 1/5. WMI requested that the Owner void RFI-008.

18.9 Request for Interpretation 009 – June 13, 2017

WMI submitted Request for Interpretation 009 to address a discrepancy at the inflection point (PI) separating MCA 1 and MCA 5. The primary dike layout and construction in this location reflected pre-Change Order 003 conditions and did not reflect changes made in Change Order 003. The constructed PI was approximately 123 feet from the PI shown in Change Order 003. The RFI-009 response indicated that the Owner would accept the change in the primary dike at this location and noted that the open area behind the primary dike may be filled with degraded primary dike material.

18.10 Request for Interpretation 010 – July 06, 2017

WMI submitted Request for Interpretation 010 to request the relocation of the Dewatering Location in MCA 1/5 as shown on an attached AutoCAD drawing. WMI noted that after the primary dike was constructed, the Wilco foreman instructed WMI that the primary dike was difficult to build adjacent to the current dewatering location. Therefore, WMI requested to relocate the weir boxes to the northwest side of MCA 1/5 to prevent future issues with the primary dike. The request was accepted by the Owner.

18.11 Request for Interpretation 011 – August 10, 2017

WMI submitted Request for Interpretation 011 to request a relocation in the primary containment dikes on the northeastern corner of MCA 5A. WMI noted that a deep hole was present in the corner and was preventing marsh buggies from completing the primary containment dike construction. WMI submitted a CAD drawing showing the area of concern. In response to RFI-011, the Owner added two (2) inflection points to the northeastern corner of MCA 5A. The inflection points were offset one hundred (100) feet south and one hundred (100) feet west of the northeastern corner of MCA 5A as originally proposed in Change Order 004.

18.12 Request for Interpretation 012 – August 08, 2017

WMI submitted Request for Interpretation 012 to request using of a low-level weir positioned along the eastern boundary of MCA 5A. WMI indicated that the low-level weir would enable construction crews to better manage the flow of water and material within MCA 5A during dredging operations. WMI noted that the proposed low-level weir would be one hundred (100) feet long and constructed to an elevation +2.0 feet NAVD88. WMI also noted that the weir would be constructed south of the pipeline running through MCA 5A to maintain runoff within permitted areas. This RFI was voided in lieu of RFI-014.

18.13 Request for Interpretation 013 – August 8, 2017

WMI submitted Request for Interpretation 013 to request the relocation of displaced settlement plate SP-2 to a location within MCA 5A. WMI noted that the settlement plate previously installed within MCA 1 was knocked out of place by marsh buggies operating in the area. In response to RFI-013, it was noted that the coordinates for the reinstallation of the settlement plate (SP-2) was addressed within FAR-005. Coordinates for the relocated settlement plate were provided for reference within RFI-013.

18.14 Request for Interpretation 014 – August 22, 2017

WMI submitted Request for Interpretation 014 to request the relocation of the low-level weir previously installed within MCA 5A. WMI noted that the weir would be relocated approximately 1,110 feet south of its current location. WMI noted that the initial low-level weir elevation would be set at +3.0 feet NAVD88 to ensure MCA 5A will be filled to the template elevation. The relocation of the low-level weir was approved, and coordinates of the northern and southern extents of the weir to be constructed were provided by the Engineer. It was noted that WMI would be responsible for maintaining and monitoring the low-level weir at a minimum elevation of +3.0 feet

NAVD88. It was also noted that the goal is to fill MCA 5A to the target elevation of +2.5 feet NAVD88 and that the low-level weir should be adjusted accordingly.

18.15 Request for Interpretation 015 – August 22, 2017

WMI submitted Request for Interpretation 015 to request permission to construct temporary training dikes to direct unconfined fill material away from the pipeline that traverses south of the terrace field. WMI noted that coordinates of the training dike to be constructed were attached to the RFI and that these training dikes would be degraded following the completion of dredging operations. The Owner and APTIM engineers approved of the training dikes being constructed to an elevation of +3.5' NAVD88 under the premise that they would be degraded to pre-construction conditions following completion of dredging activities. It was noted that the purpose of the dikes was to direct the flow of material away from the Kinetica pipeline, and therefore, the training dikes should be constructed as needed.

18.16 Request for Interpretation 016 – August 23, 2017

WMI submitted Request for Interpretation 016 to request permission to take partial surveys of MCA 1. WMI noted that surveys would commence after the 30-day settlement period for MCA 1 (on September 12, 2017), and that acceptable survey practices would be followed in collecting the survey data. WMI noted that the remaining areas (MCA 5 and 5A) would be surveyed at a later date once dredging operations had been completed. The Owner and Engineer approved of taking the partial survey with the caveat that an observer be present for the survey. It was also noted that the fill area should comply with TS-4.12.

18.17 Request for Interpretation 017 – August 29, 2018

WMI submitted Request for Interpretation 017 to request a revision to the proposal submitted on July 17, 2018. WMI requested that the Bid Item 38 (Class II Base Course) material be changed to No. 57 BAH Crushed Limestone and that Bid Item 39 (Aggregate Surface Course) be changed to 610 Crushed Concrete. The request was accepted with the understanding the materials supplied would conform to applicable gradation tables shown in the response.

18.18 Request for Interpretation 018 – November 06, 2018

Tarpan Construction, a subcontractor for WMI, submitted Request for Interpretation 018 (through WMI) to request direction for ditching to be constructed adjacent to the Targa well station. Tarpan noted that ditching may not be required in this area as existing elevations appear to be low enough to allow for drainage. In response to RFI-018, the Owner accepted removing ditching in the area shown on the drawing attached to RFI-018.

19.0 Pipeline and Other Utility Crossings

See the construction plan Sheets 2, 5-8, 17, 20-25, and 37 for the location and description of pipelines and other utility crossings within the project footprint. Table 11 below provides contact information for the associated pipeline and utility crossing representatives. Additional pipeline owner and utility operator information is located in Appendix XII of the construction specifications.

Table 11: Pipeline and Utility Company Representatives

Company	Rep. to Contact	Phone/Email
Amoco Production Company/Oleum Operating Company	Andrew Snell	(903) 758-9896
Cameron Parish Waterworks	Mark Young	(337) 569-2110
Cameron Communications (Fiber Optic Line)	Bobby Bult	(337) 496-6530
Cheniere Creole Trail Pipeline, LP	Joey Mahmoud	(713) 375-5000
Department of Energy Pipeline	Dale Mercantel	(337) 558-3362
Kinetica Partners, LLC	Shane Lopez	(337) 485-1825
Targa Pipeline Company	Todd Morrison	(337) 569-2307

20.0 Safety and Accidents

20.1 Trench Safety Incident - May 2, 2017

During the waterline relocation, a safety incident occurred within an open trench. A worker with Blake D. Hines entered the trench prior to installing a trench box to brace the walls of the excavated area. While the crew member was cleaning off the pipe to measure the diameter, he was instructed by the subcontractor's site foreman to install a restraining joint at the existing uncovered PVC joint. During this installation, the northern face of the trench collapsed on the crew member. The crew member was removed from the trench and taken to the hospital to be assessed for any potential injuries. Following this incident, the trench was backfilled, and no further work on the waterline relocation was conducted on this day. All operations on-site were ceased until the trench safety plan was implemented on-site. It should also be noted that TS-11.7 states that trenches shall be excavated and trench boxes shall be installed to prevent failure and loss of embankment.

20.2 Man Overboard Safety Incident – August 13, 2017

A man overboard safety incident occurred on August 13, 2017 during the installation of a 720-foot section of subline. One (1) WMI crew member went overboard during the installation of the subline due to rough conditions. The incident was not reported until the following day. WMI held a safety stand down meeting on board the E.W. Ellefsen the following day and followed all necessary protocols for a man overboard incident. The crew member was taken to a nearby medical clinic to evaluate the extents of his injuries, if any. It was reported that any injuries incurred due to the man overboard incident were minor and that the crew member was released to full duty without restrictions.

20.3 Driving Safety Incident – August 14, 2017

A WMI field engineer was involved in a single vehicle crash at approximately 1 AM. The employee stated that he was returning from dinner in Lake Charles when he fell asleep at the wheel and side swiped a guard rail. The incident was reported the following morning and corrective action was taken by the WMI Site Safety and Health Officer.

21.0 Significant Construction Dates

Table 12: Significant Construction Dates

Construction Item	Date
Bid Opening	August 9, 2016
Construction Contract Awarded	August 30, 2016
Notice to Proceed	October 17, 2016
Pre-Construction Conference	October 25, 2016
Start of Primary Dike Construction	December 30, 2016
Start of Trenasse and Pond Containment Construction	January 25, 2017
DOTD Pre-Construction Conference	April 28, 2017
Start of Waterline Relocation	May 2, 2017
Completion of Waterline Relocation	May 12, 2017
Start of Casing Pipe Installation	May 13, 2017
Start of Sediment Pipeline Installation	May 21, 2017
Completion of Casing Pipe Installation	May 23, 2017
Start of Settlement Plate Installation	June 5, 2017
Completion of Sediment Pipeline Installation	June 6, 2017
Start of Marsh Creation – Hydraulic Dredging	June 6, 2017
Start of Earthen Terrace Construction	June 15, 2017
Completion of Earthen Terrace Construction	July 27, 2017
Completion of Trenasse and Pond Containment Construction	August 10, 2017
Completion of Primary Containment Dike Construction	August 11, 2017
Completion of Settlement Plate Installation	August 12, 2017
Completion of Marsh Creation – Hydraulic Dredging	September 8, 2017
Start of Oil Field Road Rehabilitation	August 18, 2018
Start of Pavement Restoration (LA 27/82)	September 24, 2018
Completion of Pavement Restoration (LA27/82)	October 3, 2018
Substantial Completion	January 23, 2019
Completion of Oil Field Road Rehabilitation	January 25, 2019
Final Acceptance	January 25, 2019

22.0 Identified Other Submittals

Appendix A	-	As-Built Drawings and Bathymetries 11x17" As-built Drawings (attached & on USB, pdf format) 8.5x11" Borrow Areas Post-Construction Bathymetries (attached & on USB, PDF format) Borrow Area Bathymetric Survey Data (on USB, ASCII format) Pre- and Post-Construction Survey Data (on USB, ASCII format)
Appendix B	-	Invoice Related Correspondence (on USB, pdf format)
Appendix C	-	General Correspondence (on USB, pdf format)
Appendix D	-	Change Orders (on USB, pdf format)
Appendix E	-	Field Adjustment Reports (on USB, pdf format)
Appendix F	-	Requests for Interpretation (on USB, pdf format)
Appendix G	-	WMI Daily Quality Control Reports (on USB, pdf format) WMI Daily Cutterhead Positioning Data (on USB, ASCII format)
Appendix H	-	Subcontractor Daily Reports (on USB, pdf format)
Appendix I	-	Daily Bird Monitoring Reports (on USB, pdf format)
Appendix J	-	WMI Submittals (on USB, pdf format)
Appendix K	-	APTIM Daily Observation Reports (on USB, pdf format)
Appendix L	-	Construction Meeting Minutes (on USB, pdf format)
Appendix M	-	Permits, Permit Sketches, and Modifications (on USB, pdf format)
Appendix N	-	Construction Plans and Specifications (on USB, pdf format)
Appendix O	-	Settlement Plate Monitoring Data (on USB, pdf format)
Appendix P	-	Subline Profile Surveys (on USB, pdf format) Subline Survey Data (on USB, ASCII format)
Appendix Q	-	DOTD 2059 Submittal (on USB, pdf format)
Appendix R	-	Davis Bacon Forms (hard copies only for confidentiality)

Report prepared by:

Chris Paul, P.E
Coastal Engineer
APTIM

John Darnall. E.I.
Coastal Engineer
APTIM

Whitney Thompson, P.E.
Engineer of Record, Reg No. 34825
APTIM