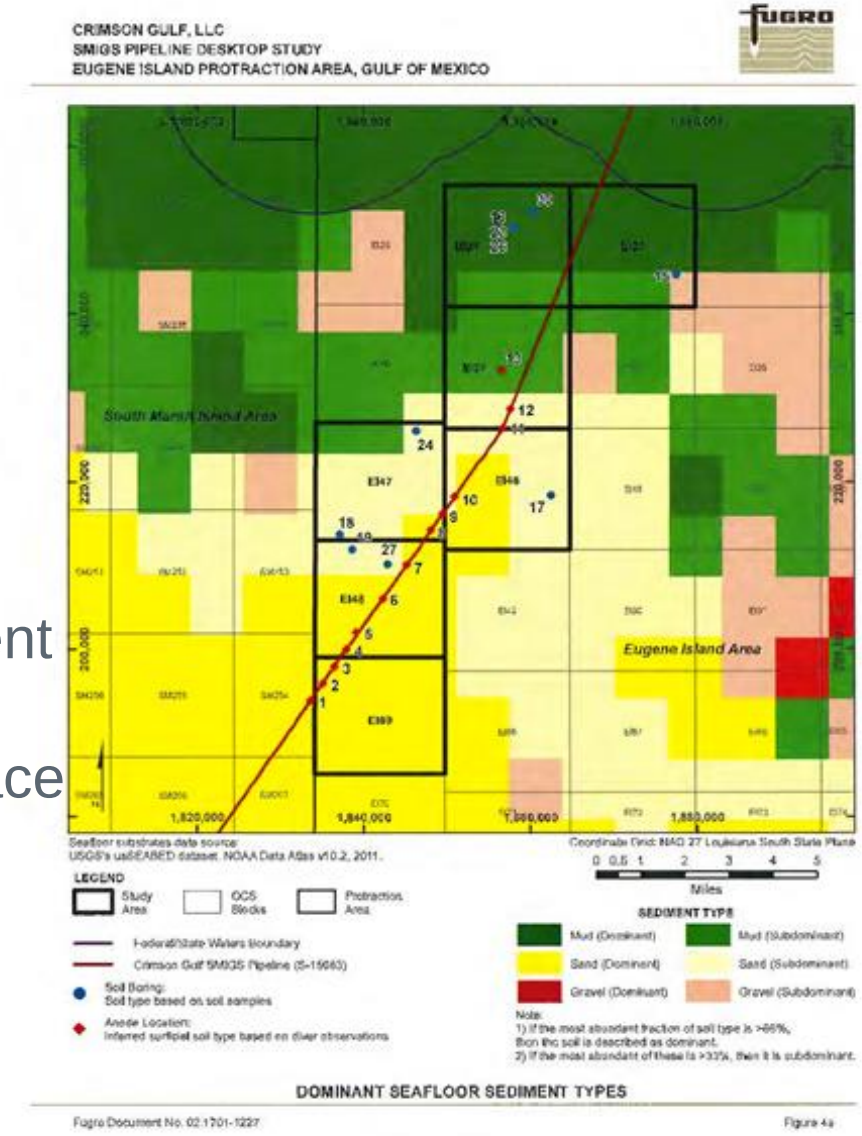
CRIMSON MIDSTREAM PSN15083 SIGNIFICANT SEDIMENT RESOURCE AREA (SSRA) COORDINATION

Eric Lyons
Engineering Manager
Crimson Midstream

Beau Suthard, PG
Client Program Manager
APTIM

INTRODUCTION

- 12” PL Seg. #15083 was flushed in 2017
- Crimson applied for a permit to abandon in place
- Abandonment in place was denied for 70,400’ of the pipeline due to the SSRA
- A desktop study was performed by a 3rd party survey company in order to show the feasibility of abandonment in place via past survey data
- Crimson met with BOEM & BSEE; abandonment in place was still denied
- This left Crimson with a significant removal cost and responsibility
- Crimson still felt strong about the initial desktop survey results prompting further investigation



INTRODUCTION

- As a part of a Net Environmental Benefits Assessment (NEBA), APTIM Environmental & Infrastructure, LLC was discovered
- APTIM had previously performed similar Geotechnical & Geophysical Data Collection for other pipeline companies in SSRAs with positive results
- APTIM was contracted to perform the same scope of work
- The study yielded 100% success allowing for abandonment in place

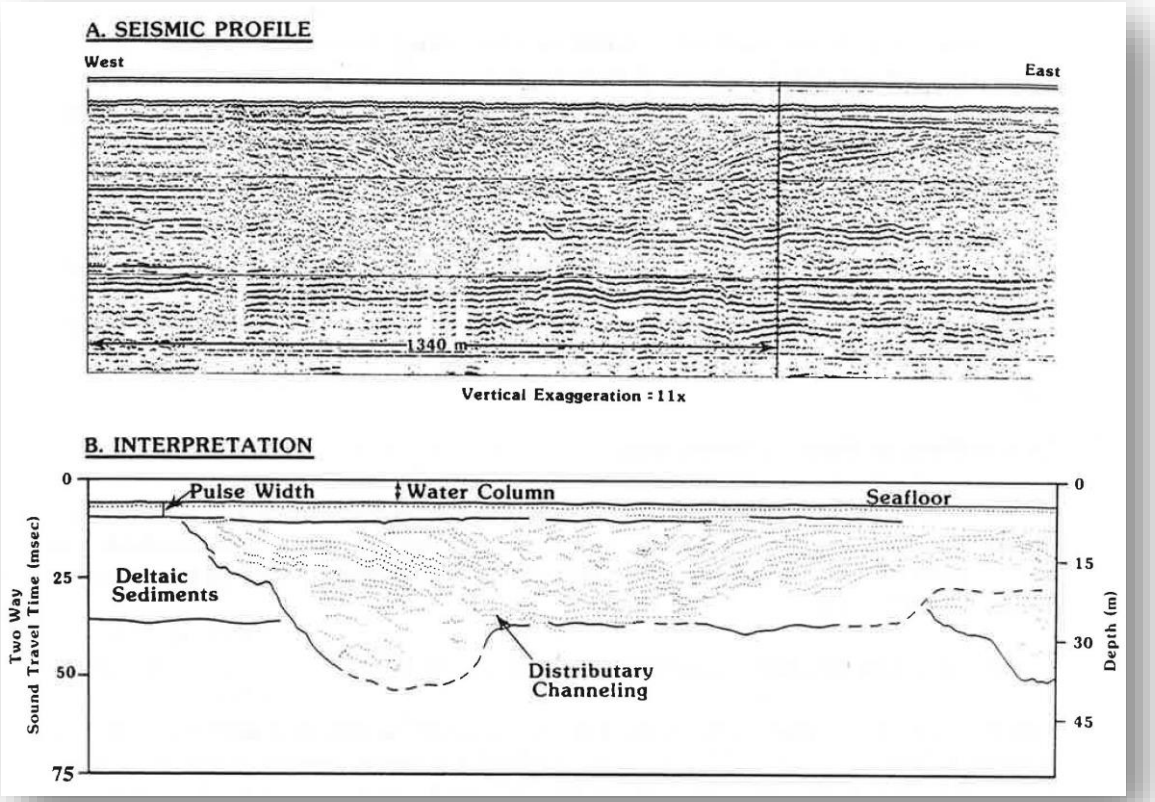
- Special thanks to Sohrab Lahooty (BSEE), Jessica Mallindine (BOEM) & Jim Bondy (DNR) & the APTIM Team

SCOPE OF WORK

- Total of 16377 pipelines in the GOM
- Total of 588 Significant Sediment Resource Areas (SSRA) in GOM (2019)
- BOEM determining removal needs for abandoned/inactive pipelines
- Crimson assess removal needs for portions of PSN15083 crossing SSRA
  - Phase I Desktop Study: feasibility of abandoning asset in place
  - Phase II Geophysical and Geotechnical Data Collection: determine if sections of assets can be abandoned in place

DESKTOP STUDY

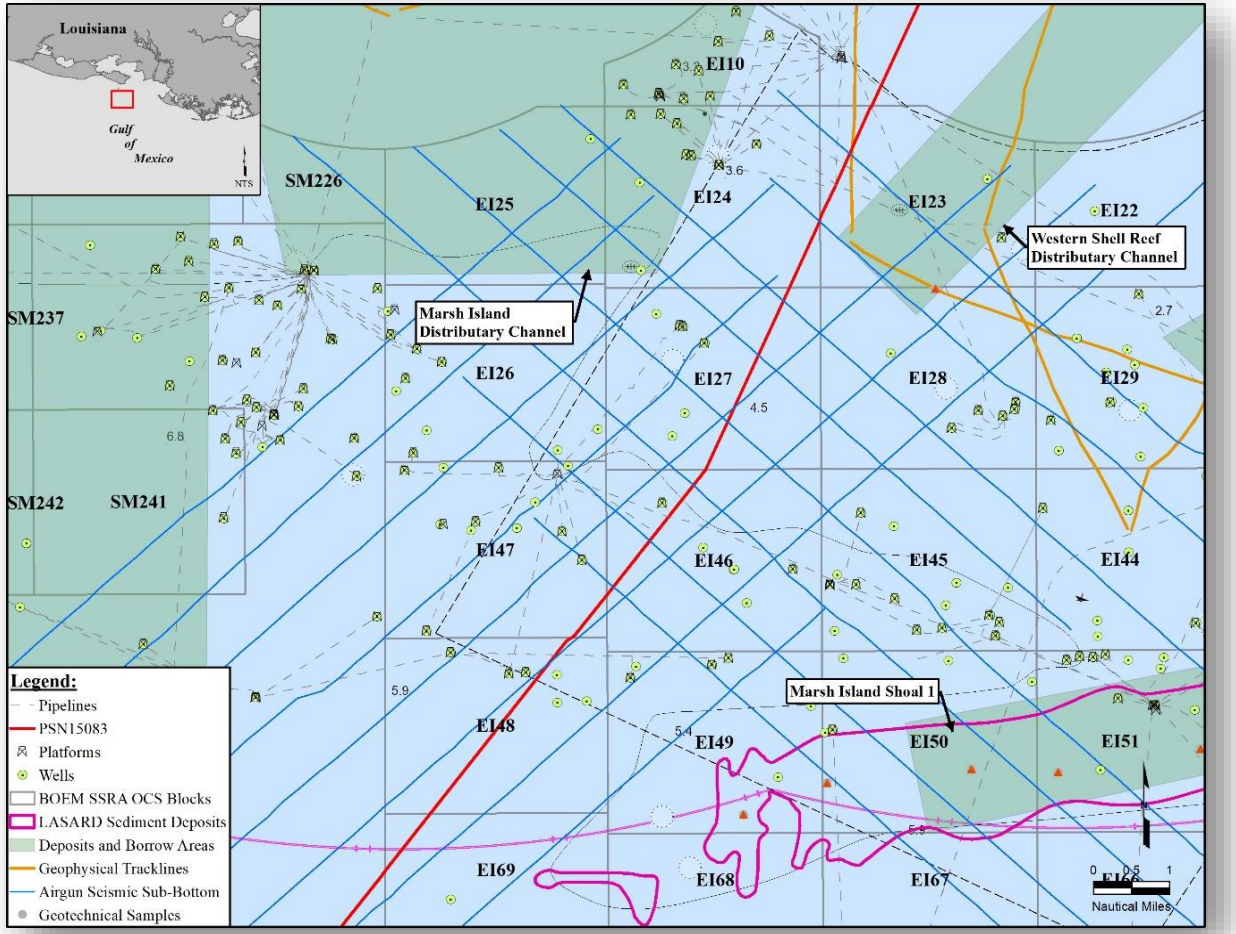
- Assess the geologic baseline near PSN15083
- Delineate any potential areas of sand (shoals)
- Incised paleochannels and buried paleochannels
  - > Cultural Resource
  - > Sand resource
- Buried paleochannels
  - > Formed by sea level fluctuations during sea level rise/fall in Quaternary



From: Suter, J. P., Penland, S., Ramsey, K. E., 1991, Nearshore Sand Resources off the Mississippi River Delta Plain: Marsh Island to Sandy Point, Louisiana Geological Survey, Coastal Geology Technical Report No. 8. Baton Rouge Louisiana.

GEOLOGIC SETTING

- Wisconsinan glacial period (75,000 to 11,000 BP)
  - Delta progradation
    - Fluvial systems incised into continental shelf
  - Infilled with sand from delta during sea level rise
  - Relic sand deposits (modern shoals)
- Nearshore distributary channel complexes
  - Marsh Island Distributary Channel (MIDC)
  - Western Shell Reef Distributary Channel (WSRDC)
- Inner Shelf Shoal
  - Marsh Island Shoal 1 (MIS1)



SAND DEPOSIT CHARACTERIZATION

Marsh Island Distributary Channel

- Size: 37,100 acres
- Average thickness: 98ft
- Overburden: 6-10ft
- Composite: 64% sand
- Volume: 974,400,000 cubic yards

Western Shell Reef Distributary Channel

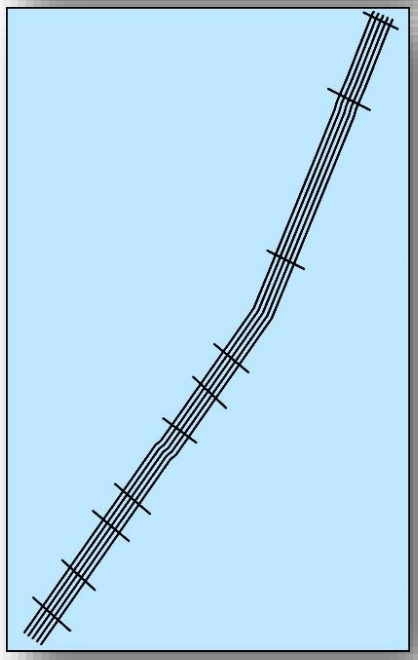
- Size: 7,000 acres
- Average thickness: 30ft
- Overburden: 6-10ft
- Composite: 90-98% sand
- Volume: 98,000,000 cubic yards

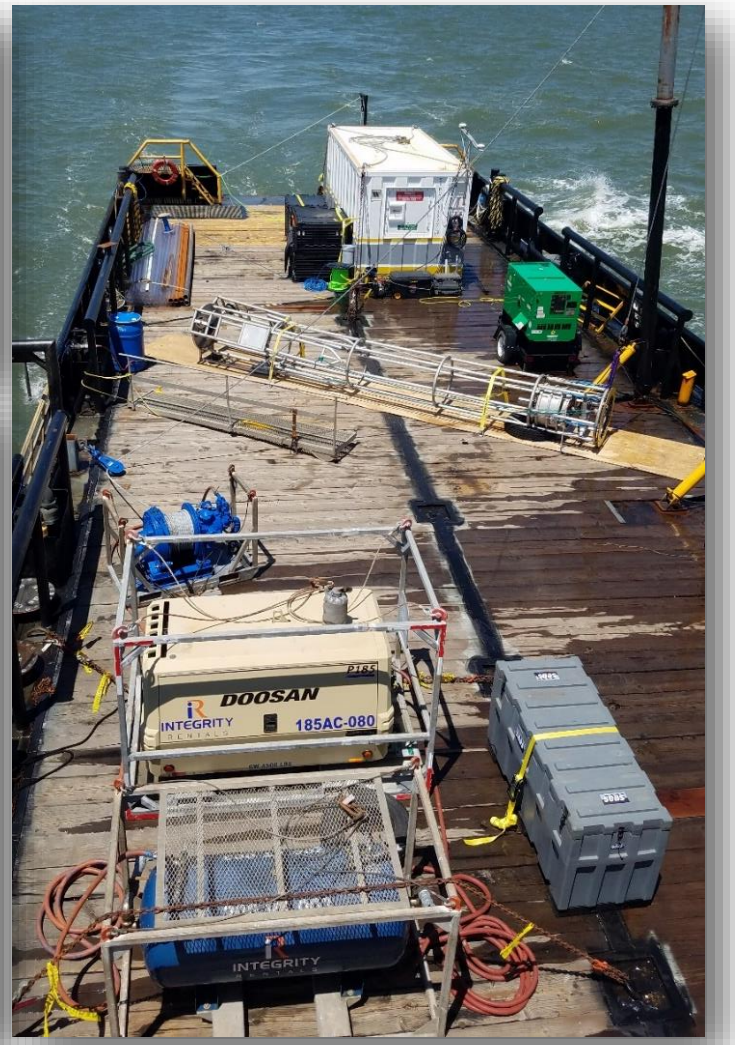
Marsh Island Shoal 1

- Size: 6,400 acres
- Average thickness: 5ft
- Overburden: 3ft
- Composite: 90-96% sand
- Volume: 51,000,000 cubic yards

GEOPHYSICAL DATA COLLECTION

- Geophysical survey operations: July 26, 2019 and July 28, 2019
  - Chirp Sub-bottom: EdgeTech 3200 512i
  - Sidescan Sonar: Klein 3900 (445/900 kHz)
  - Magnetometer: Geometrics 882
  - Single Beam: Teledyne Hydrotrac II
- Main line 50ft off pipeline
- Two additional lines 500ft and 1000ft either side
  - 88 nm
- 10 vibracore locations picked in real time
- Cultural Resource Clearance

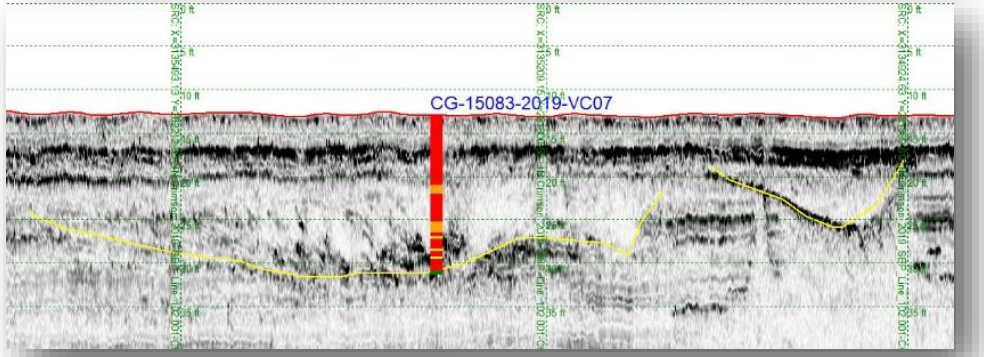


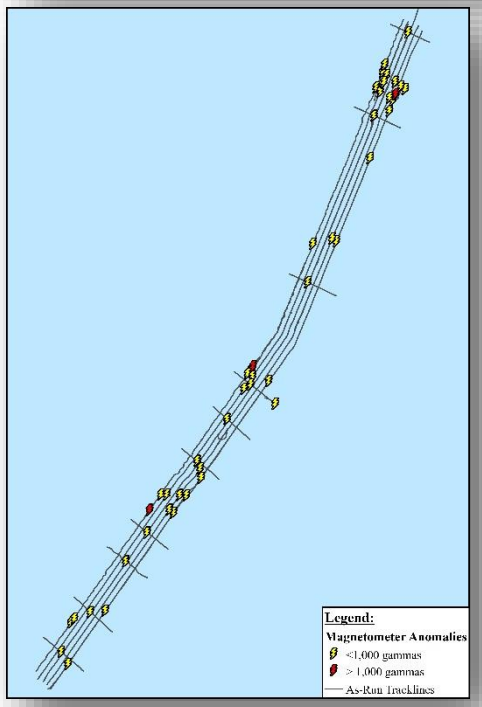


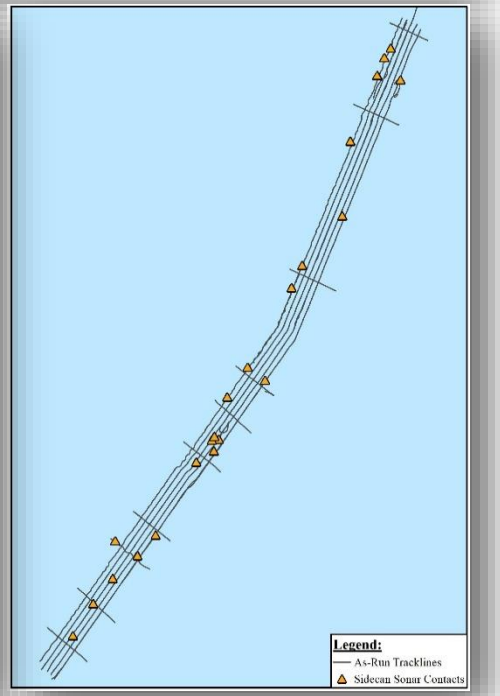
Crimson Midstream, LLC 811

GEOPHYSICAL DATA PROCESSING

- Chirp Sub-bottom
  - > Digitization of sand shoals, paleochannels, geohazards
  - > Sand thickness (isopach)
  - > Surficial Mixed Clay (isopach)
- Sidescan sonar
  - > Delineation of surface features, types, characteristics and surface hazards/debris
- Magnetometer
  - > Identify magnetic anomalies
- Single Beam
  - > Bathymetric surface along pipeline



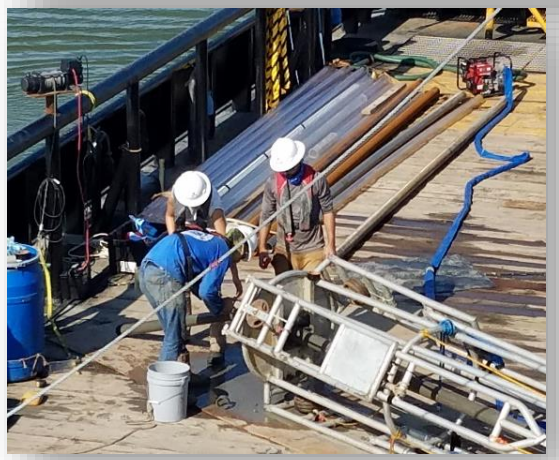




Crimson Midstream, LLC 811

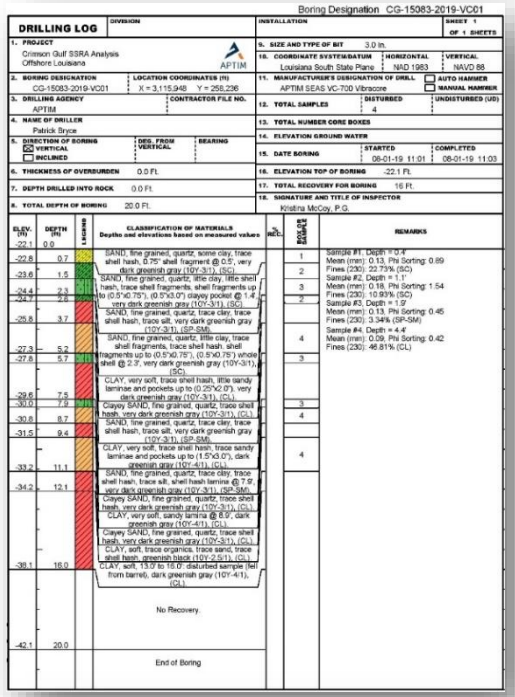
GEOTECHNICAL DATA COLLECTION

- Geotechnical survey operations August 1, 2019 and August 2, 2019
- VC-700 Vibracore System
  - Electric vibracore
  - 20 ft sediment sample
  - 600-2200 rpm
- Collection of 10 vibracores



GEOTECHNICAL DATA PROCESSING

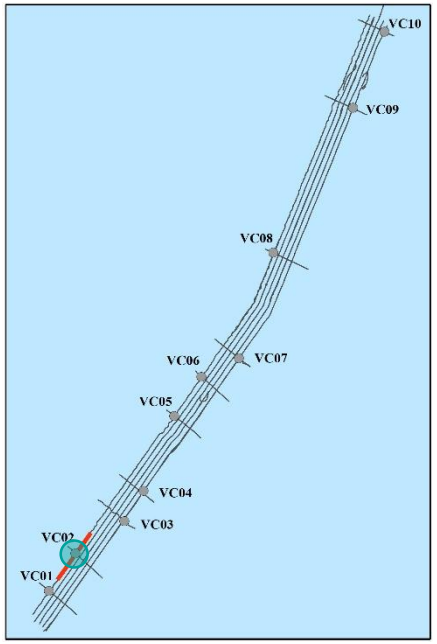
- APTIM's accredited laboratory
- Vibracores were split, photographed, logged and sampled
  - > Layer thickness, color, texture, composition and grain size (clay, sit, sand, gravel, shells)
- Entered into gINT
  - > Mean, median grain size, sorting, silt/clay content (moment method)
- Vibracores color coded based on grain size (Facies)
  - > Plotted on chirp sub-bottom data
    - Red – clay, shelly clay, and clayey silt
    - Orange – sandy clay, silty clay, silt, and clayey sand;
    - Yellow – mixed quality sandy silts or silty sands
    - Green – good quality sandy material

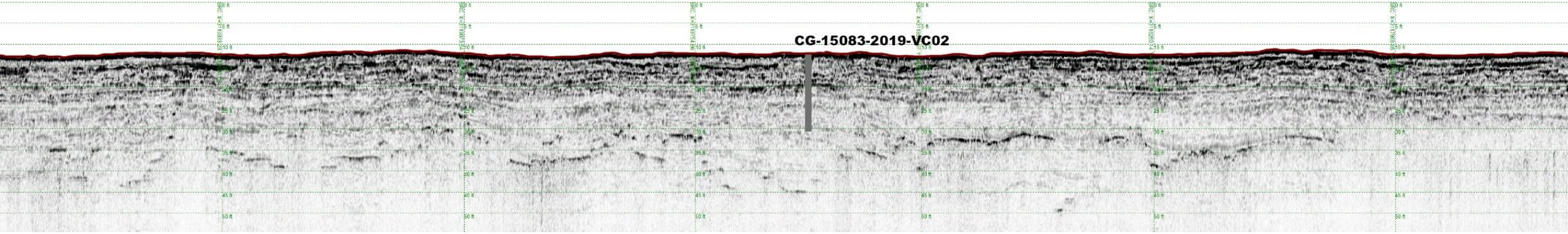


Sieve Number	Size (phi)	Size (mm)	Wentworth Scale	
3/4	-4.25	19.00	Pebble	Gravel
5/8	-4.00	16.00		
7/16	-3.50	11.20		
5/16	-3.00	8.00		
3 ½	-2.50	5.60		
4	-2.25	4.75		
5	-2.00	4.00		
7	-1.50	2.80	Granule	
10	-1.00	2.00		
14	-0.50	1.40	Very Coarse Sand	Sand
18	0.00	1.00		
25	0.50	0.71	Coarse Sand	
35	1.00	0.50		
45	1.50	0.36	Medium Sand	
60	2.00	0.25		
80	2.50	0.18	Fine Sand	
120	3.00	0.13		
170	3.50	0.09	Very Fine Sand	
200	3.75	0.08		
230	4.00	0.06		

Crimson Midstream, LLC 811

LINE 100 – CG-15083-2019-VC02





CG-15083-2019-VC02

Boring Designation CG-15083-2019-VC02

DRILLING LOG | DIVISION | INSTALLATION | SHEET 1 OF 1 SHEETS

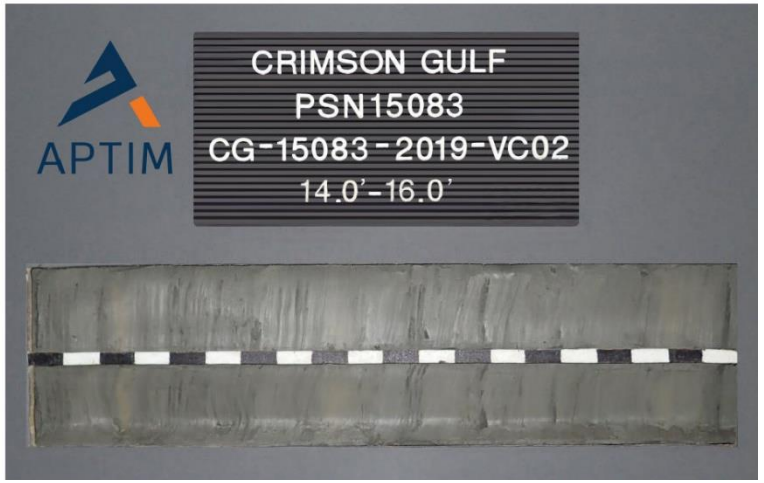
1. PROJECT: Crimson Gulf SSRA Analysis, Offshore Louisiana (APTIM)
2. BORING DESIGNATION: CG-15083-2019-VC02 | LOCATION COORDINATES (ft): X = 3,118,650 Y = 262,065
3. DRILLING AGENCY: APTIM | CONTRACTOR FILE NO.:
4. NAME OF DRILLER: Francis Stankiewicz
5. DIRECTION OF BORING: ☒ VERTICAL ☐ INCLINED | DEG. FROM VERTICAL: | BEARING:
6. THICKNESS OF OVERBURDEN: 0.0 Ft.
7. DEPTH DRILLED INTO ROCK: 0.0 Ft.
8. TOTAL DEPTH OF BORING: 20.0 Ft.
9. SIZE AND TYPE OF BIT: 3.0 In.
10. COORDINATE SYSTEM/DATUM: Louisiana South State Plane | HORIZONTAL: NAD 1983 | VERTICAL: NAVD 88
11. MANUFACTURER'S DESIGNATION OF DRILL: APTIM SEAS VC-700 Vibracore | ☐ AUTO HAMMER ☐ MANUAL HAMMER
12. TOTAL SAMPLES: DISTURBED 3 | UNDISTURBED (UD):
13. TOTAL NUMBER CORE BOXES:
14. ELEVATION GROUND WATER:
15. DATE BORING: STARTED 08-01-19 12:32 | COMPLETED 08-01-19 12:33
16. ELEVATION TOP OF BORING: -23.1 Ft.
17. TOTAL RECOVERY FOR BORING: 18.8 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR: Kristina McCoy, P.G.

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Depths and elevations based on measured values)	% REC.	BOX OR SAMPLE	REMARKS
-23.1	0.0					
-24.1	1.0		Clayey SAND, fine grained, quartz, trace shell hash, very dark greenish gray (10Y-3/1), (CL).		1	Sample #1, Depth = 0.5' Mean (mm): 0.12, Phi Sorting: 0.81 Fines (230): 47.06% (CL)
-25.0	1.9		SAND, fine grained, quartz, little clay, trace shell hash, 2.0" little shell hash pocket @ 1.8', very dark greenish gray (10Y-3/1), (SC).		2	Sample #2, Depth = 1.4' Mean (mm): 0.11, Phi Sorting: 0.41 Fines (230): 10.77% (SC)
-26.0	2.9		Clayey SAND, fine grained, quartz, trace shell hash, very dark greenish gray (10Y-3/1), (CL).		1	
-26.4	3.3		SAND, fine grained, quartz, little clay, trace shell hash, very dark greenish gray (10Y-3/1), (SC).		2	
-27.1	4.0		Clayey SAND, fine grained, quartz, trace shell hash, very dark greenish gray (10Y-3/1), (CL).		1	
-28.0	4.9		Clayey SAND, fine grained, quartz, trace shell hash, 1.0" shell fragment @ 4.5', very dark greenish gray (10Y-3/1), (CL).		3	Sample #3, Depth = 4.4' Mean (mm): 0.08, Phi Sorting: 0.42 Fines (230): 37.79% (CL)
-29.7	6.6		CLAY, very soft, trace shell hash, little sandy laminae and pockets up to (1.5"x3.0"), dark greenish gray (10Y-4/1), (CL).		2	
-30.2	7.1		SAND, fine grained, quartz, little clay, trace shell hash, very dark greenish gray (10Y-3/1), (SC).		1	
-32.5	9.4		Clayey SAND, fine grained, quartz, trace shell hash, (1.0"x1.75") whole shell @ 7.6', very dark greenish gray (10Y-3/1), (CL).			
			CLAY, soft, trace organics, trace sandy laminae and pockets up to (0.25"x2.0"), dark greenish gray (10Y-4/1), (CL).			
-40.3	17.2					
-41.9	18.8		Clayey SAND, fine grained, quartz, clay decreases with depth, very dark greenish gray (10Y-3/1), (CL).		1	
-43.1	20.0		No Recovery.			
			End of Boring			

Sand
Mixed quality sandy silts or silty sands
Sandy clay, silty clay, silt, and clayey sand
Clay, shelly clay, clayey silt

Crimson Midstream, LLC 811

CG-15083-2019-VC02



Boring Designation CG-15083-2019-VC02

DRILLING LOG | DIVISION | INSTALLATION | SHEET 1 OF 1 SHEETS

1. PROJECT: Crimson Gulf SSRA Analysis, Offshore Louisiana (APTIM)
2. BORING DESIGNATION: CG-15083-2019-VC02 | LOCATION COORDINATES (ft): X = 3,118,650 Y = 262,065
3. DRILLING AGENCY: APTIM | CONTRACTOR FILE NO.:
4. NAME OF DRILLER: Francis Stankiewicz
5. DIRECTION OF BORING: ☒ VERTICAL ☐ INCLINED | DEG. FROM VERTICAL: | BEARING:
6. THICKNESS OF OVERBURDEN: 0.0 Ft.
7. DEPTH DRILLED INTO ROCK: 0.0 Ft.
8. TOTAL DEPTH OF BORING: 20.0 Ft.
9. SIZE AND TYPE OF BIT: 3.0 In.
10. COORDINATE SYSTEM/DATUM: Louisiana South State Plane | HORIZONTAL: NAD 1983 | VERTICAL: NAVD 88
11. MANUFACTURER'S DESIGNATION OF DRILL: APTIM SEAS VC-700 Vibracore | ☐ AUTO HAMMER ☐ MANUAL HAMMER
12. TOTAL SAMPLES: | DISTURBED: 3 | UNDISTURBED (UD):
13. TOTAL NUMBER CORE BOXES:
14. ELEVATION GROUND WATER:
15. DATE BORING: STARTED 08-01-19 12:32 | COMPLETED 08-01-19 12:33
16. ELEVATION TOP OF BORING: -23.1 Ft.
17. TOTAL RECOVERY FOR BORING: 18.8 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR: Kristina McCoy, P.G.

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Depths and elevations based on measured values)	% REC.	BOX OR SAMPLE	REMARKS
-23.1	0.0					
-24.1	1.0		Clayey SAND, fine grained, quartz, trace shell hash, very dark greenish gray (10Y-3/1), (CL).		1	Sample #1, Depth = 0.5' Mean (mm): 0.12, Phi Sorting: 0.81 Fines (230): 47.06% (CL)
-25.0	1.9		SAND, fine grained, quartz, little clay, trace shell hash, 2.0" little shell hash pocket @ 1.8', very dark greenish gray (10Y-3/1), (SC).		2	Sample #2, Depth = 1.4' Mean (mm): 0.11, Phi Sorting: 0.41 Fines (230): 10.77% (SC)
-26.0	2.9		Clayey SAND, fine grained, quartz, trace shell hash, very dark greenish gray (10Y-3/1), (CL).		1	
-26.4	3.3		SAND, fine grained, quartz, little clay, trace shell hash, very dark greenish gray (10Y-3/1), (SC).		2	
-27.1	4.0		Clayey SAND, fine grained, quartz, trace shell hash, very dark greenish gray (10Y-3/1), (CL).		1	
-28.0	4.9		Clayey SAND, fine grained, quartz, trace shell hash, 1.0" shell fragment @ 4.5', very dark greenish gray (10Y-3/1), (CL).		3	Sample #3, Depth = 4.4' Mean (mm): 0.08, Phi Sorting: 0.42 Fines (230): 37.79% (CL)
-29.7	6.6		CLAY, very soft, trace shell hash, little sandy laminae and pockets up to (1.5"x3.0"), dark greenish gray (10Y-4/1), (CL).		2	
-30.2	7.1		SAND, fine grained, quartz, little clay, trace shell hash, very dark greenish gray (10Y-3/1), (SC).		1	
-32.5	9.4		Clayey SAND, fine grained, quartz, trace shell hash, (1.0"x1.75") whole shell @ 7.6', very dark greenish gray (10Y-3/1), (CL).			
-40.3	17.2		CLAY, soft, trace organics, trace sandy laminae and pockets up to (0.25"x2.0"), dark greenish gray (10Y-4/1), (CL).			
-41.9	18.8		Clayey SAND, fine grained, quartz, clay decreases with depth, very dark greenish gray (10Y-3/1), (CL).		1	
-43.1	20.0		No Recovery.			
			End of Boring			

Sand
Mixed quality sandy silts or silty sands
Sandy clay, silty clay, silt, and clayey sand
Clay, shelly clay, clayey silt

Crimson Midstream, LLC 811

CG-15083-2019-VC02

Boring Designation CG-15083-2019-VC02

DRILLING LOG | DIVISION | INSTALLATION | SHEET 1 OF 1 SHEETS

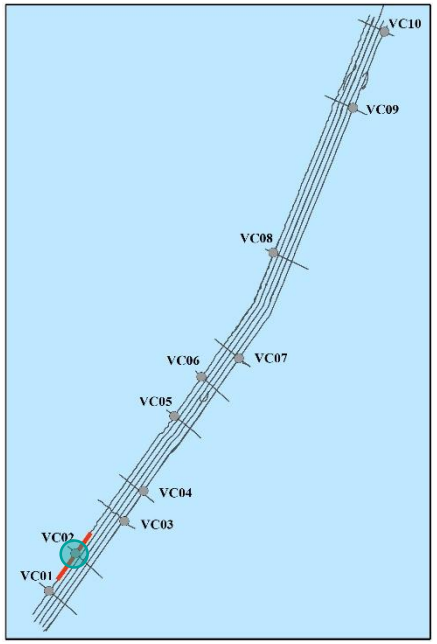
1. PROJECT: Crimson Gulf SSRA Analysis, Offshore Louisiana (APTIM)
2. BORING DESIGNATION: CG-15083-2019-VC02 | LOCATION COORDINATES (ft): X = 3,118,650 Y = 262,065
3. DRILLING AGENCY: APTIM | CONTRACTOR FILE NO.:
4. NAME OF DRILLER: Francis Stankiewicz
5. DIRECTION OF BORING: ☒ VERTICAL ☐ INCLINED | DEG. FROM VERTICAL: | BEARING:
6. THICKNESS OF OVERBURDEN: 0.0 Ft.
7. DEPTH DRILLED INTO ROCK: 0.0 Ft.
8. TOTAL DEPTH OF BORING: 20.0 Ft.
9. SIZE AND TYPE OF BIT: 3.0 In.
10. COORDINATE SYSTEM/DATUM: Louisiana South State Plane | HORIZONTAL: NAD 1983 | VERTICAL: NAVD 88
11. MANUFACTURER'S DESIGNATION OF DRILL: APTIM SEAS VC-700 Vibracore | ☐ AUTO HAMMER ☐ MANUAL HAMMER
12. TOTAL SAMPLES: | DISTURBED: 3 | UNDISTURBED (UD):
13. TOTAL NUMBER CORE BOXES:
14. ELEVATION GROUND WATER:
15. DATE BORING: STARTED 08-01-19 12:32 | COMPLETED 08-01-19 12:33
16. ELEVATION TOP OF BORING: -23.1 Ft.
17. TOTAL RECOVERY FOR BORING: 18.8 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR: Kristina McCoy, P.G.

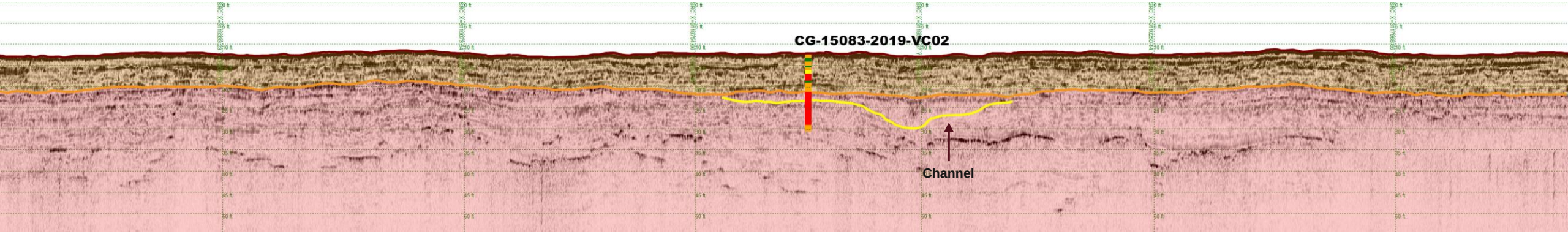
ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Depths and elevations based on measured values)	% REC.	BOX OR SAMPLE	REMARKS
-23.1	0.0					
-24.1	1.0		Clayey SAND, fine grained, quartz, trace shell hash, very dark greenish gray (10Y-3/1), (CL).		1	Sample #1, Depth = 0.5' Mean (mm): 0.12, Phi Sorting: 0.81 Fines (230): 47.06% (CL)
-25.0	1.9		SAND, fine grained, quartz, little clay, trace shell hash, 2.0" little shell hash pocket @ 1.8', very dark greenish gray (10Y-3/1), (SC).		2	Sample #2, Depth = 1.4' Mean (mm): 0.11, Phi Sorting: 0.41 Fines (230): 10.77% (SC)
-26.0	2.9		Clayey SAND, fine grained, quartz, trace shell hash, very dark greenish gray (10Y-3/1), (CL).		1	
-26.4	3.3				2	
-27.1	4.0		SAND, fine grained, quartz, little clay, trace shell hash, very dark greenish gray (10Y-3/1), (SC).		1	
-28.0	4.9		Clayey SAND, fine grained, quartz, trace shell hash, very dark greenish gray (10Y-3/1), (CL).		3	Sample #3, Depth = 4.4' Mean (mm): 0.08, Phi Sorting: 0.42 Fines (230): 37.79% (CL)
-29.7	6.6		Clayey SAND, fine grained, quartz, trace shell hash, 1.0" shell fragment @ 4.5', very dark greenish gray (10Y-3/1), (CL).			
-30.2	7.1		CLAY, very soft, trace shell hash, little sandy laminae and pockets up to (1.5"x3.0"), dark greenish gray (10Y-4/1), (CL).		2	
-32.5	9.4		SAND, fine grained, quartz, little clay, trace shell hash, very dark greenish gray (10Y-3/1), (SC).		1	
			Clayey SAND, fine grained, quartz, trace shell hash, (1.0"x1.75") whole shell @ 7.6', very dark greenish gray (10Y-3/1), (CL).			
-40.3	17.2		CLAY, soft, trace organics, trace sandy laminae and pockets up to (0.25"x2.0"), dark greenish gray (10Y-4/1), (CL).			
-41.9	18.8		Clayey SAND, fine grained, quartz, clay decreases with depth, very dark greenish gray (10Y-3/1), (CL).		1	
-43.1	20.0		No Recovery.			
			End of Boring			

Sand
Mixed quality sandy silts or silty sands
Sandy clay, silty clay, silt, and clayey sand
Clay, shelly clay, clayey silt

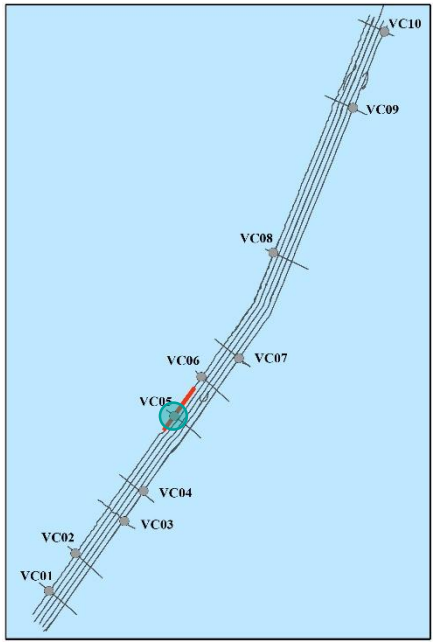
Crimson Midstream, LLC 811

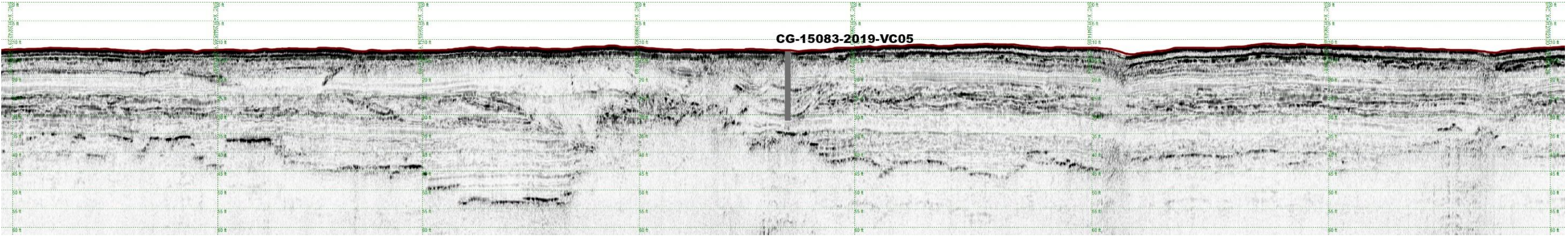
LINE 100 – CG-15083-2019-VC02





LINE 100 – CG-15083-2019-VC05





CG-15083-2019-VC05

Boring Designation CG-15083-2019-VC05

DRILLING LOG | DIVISION | INSTALLATION | SHEET 1 OF 1 SHEETS

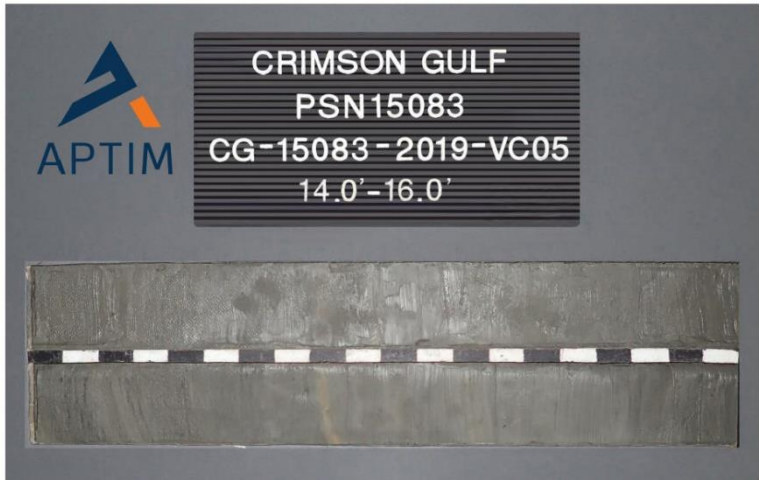
1. PROJECT: Crimson Gulf SSRA Analysis, Offshore Louisiana
2. BORING DESIGNATION: CG-15083-2019-VC05
3. DRILLING AGENCY: APTIM
4. NAME OF DRILLER: Francis Stankiewicz
5. DIRECTION OF BORING: ☒ VERTICAL ☐ INCLINED
6. THICKNESS OF OVERBURDEN: 0.0 Ft.
7. DEPTH DRILLED INTO ROCK: 0.0 Ft.
8. TOTAL DEPTH OF BORING: 20.0 Ft.
9. SIZE AND TYPE OF BIT: 3.0 In.
10. COORDINATE SYSTEM/DATUM: Louisiana South State Plane | HORIZONTAL: NAD 1983 | VERTICAL: NAVD 88
11. MANUFACTURER'S DESIGNATION OF DRILL: APTIM SEAS VC-700 Vibracore | ☐ AUTO HAMMER ☐ MANUAL HAMMER
12. TOTAL SAMPLES | DISTURBED | UNDISTURBED (UD)
13. TOTAL NUMBER CORE BOXES
14. ELEVATION GROUND WATER
15. DATE BORING: STARTED 08-01-19 15:46 | COMPLETED 08-01-19 15:47
16. ELEVATION TOP OF BORING: -23.8 Ft.
17. TOTAL RECOVERY FOR BORING: 18.8 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR: Kristina McCoy, P.G.

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Depths and elevations based on measured values)	% REC.	BOX OR SAMPLE	REMARKS
-23.8	0.0					
-25.4	1.6		CLAY, very soft, trace shell hash, trace sandy laminae, dark greenish gray (10Y-4/1), (CL).			
-26.6	2.8		CLAY, very soft, some shell hash, trace sandy laminae, 2.25" shell fragment @ 2.3', dark greenish gray (10Y-4/1), (CL).			
-27.0	3.2		Shelly CLAY, very soft, shell components are shell hash and shell fragments up to (0.5"x0.75"), dark greenish gray (10Y-4/1), (GC).			
-28.0	4.2		CLAY, very soft, some shell hash, trace sandy laminae, dark greenish gray (10Y-4/1), (CL).			
-32.4	8.6		CLAY, very soft, trace organics, dark greenish gray (10Y-4/1), (CL).			
-37.4	13.6		Silty CLAY, soft, trace sandy laminae, dark greenish gray (10Y-4/1), (CL).			
-42.6	18.8		CLAY, soft, trace organics, trace silty laminae, Bit Sample from 18.4' to 18.8', dark greenish gray (10Y-4/1), (CL).			
-43.8	20.0		No Recovery.			
			End of Boring			

- Sand
- Mixed quality sandy silts or silty sands
- Sandy clay, silty clay, silt, and clayey sand
- Clay, shelly clay, clayey silt

Crimson Midstream, LLC 811

CG-15083-2019-VC05



Boring Designation CG-15083-2019-VC05

DRILLING LOG | DIVISION | INSTALLATION | SHEET 1 OF 1 SHEETS

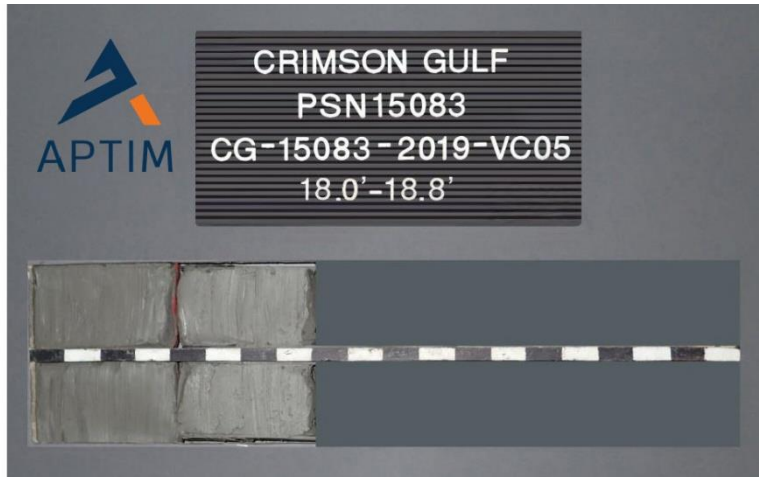
1. PROJECT: Crimson Gulf SSRA Analysis, Offshore Louisiana (APTIM)
2. BORING DESIGNATION: CG-15083-2019-VC05 | LOCATION COORDINATES (ft): X = 3,128,702 Y = 276,037
3. DRILLING AGENCY: APTIM | CONTRACTOR FILE NO.:
4. NAME OF DRILLER: Francis Stankiewicz
5. DIRECTION OF BORING: ☒ VERTICAL ☐ INCLINED | DEG. FROM VERTICAL: | BEARING:
6. THICKNESS OF OVERBURDEN: 0.0 Ft.
7. DEPTH DRILLED INTO ROCK: 0.0 Ft.
8. TOTAL DEPTH OF BORING: 20.0 Ft.
9. SIZE AND TYPE OF BIT: 3.0 In.
10. COORDINATE SYSTEM/DATUM: Louisiana South State Plane | HORIZONTAL: NAD 1983 | VERTICAL: NAVD 88
11. MANUFACTURER'S DESIGNATION OF DRILL: APTIM SEAS VC-700 Vibracore | ☐ AUTO HAMMER ☐ MANUAL HAMMER
12. TOTAL SAMPLES: | DISTURBED: | UNDISTURBED (UD):
13. TOTAL NUMBER CORE BOXES:
14. ELEVATION GROUND WATER:
15. DATE BORING: STARTED 08-01-19 15:46 | COMPLETED 08-01-19 15:47
16. ELEVATION TOP OF BORING: -23.8 Ft.
17. TOTAL RECOVERY FOR BORING: 18.8 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR: Kristina McCoy, P.G.

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Depths and elevations based on measured values)	% REC.	BOX OR SAMPLE	REMARKS
-23.8	0.0					
-25.4	1.6		CLAY, very soft, trace shell hash, trace sandy laminae, dark greenish gray (10Y-4/1), (CL).			
-26.6	2.8		CLAY, very soft, some shell hash, trace sandy laminae, 2.25" shell fragment @ 2.3', dark greenish gray (10Y-4/1), (CL).			
-27.0	3.2		Shelly CLAY, very soft, shell components are shell hash and shell fragments up to (0.5"x0.75"), dark greenish gray (10Y-4/1), (GC).			
-28.0	4.2		CLAY, very soft, some shell hash, trace sandy laminae, dark greenish gray (10Y-4/1), (CL).			
-32.4	8.6		CLAY, very soft, trace organics, dark greenish gray (10Y-4/1), (CL).			
-37.4	13.6		Silty CLAY, soft, trace sandy laminae, dark greenish gray (10Y-4/1), (CL).			
-42.6	18.8		CLAY, soft, trace organics, trace silty laminae, Bit Sample from 18.4' to 18.8', dark greenish gray (10Y-4/1), (CL).			
-43.8	20.0		No Recovery.			
			End of Boring			

- Sand
- Mixed quality sandy silts or silty sands
- Sandy clay, silty clay, silt, and clayey sand
- Clay, shelly clay, clayey silt

Crimson Midstream, LLC 811

CG-15083-2019-VC05



Boring Designation CG-15083-2019-VC05

DRILLING LOG | DIVISION | INSTALLATION | SHEET 1 OF 1 SHEETS

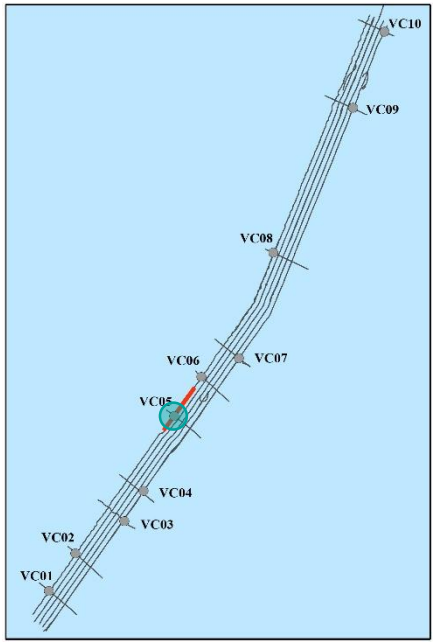
1. PROJECT: Crimson Gulf SSRA Analysis, Offshore Louisiana
2. BORING DESIGNATION: CG-15083-2019-VC05
3. DRILLING AGENCY: APTIM
4. NAME OF DRILLER: Francis Stankiewicz
5. DIRECTION OF BORING: ☒ VERTICAL ☐ INCLINED
6. THICKNESS OF OVERBURDEN: 0.0 Ft.
7. DEPTH DRILLED INTO ROCK: 0.0 Ft.
8. TOTAL DEPTH OF BORING: 20.0 Ft.
9. SIZE AND TYPE OF BIT: 3.0 In.
10. COORDINATE SYSTEM/DATUM: Louisiana South State Plane | HORIZONTAL: NAD 1983 | VERTICAL: NAVD 88
11. MANUFACTURER'S DESIGNATION OF DRILL: APTIM SEAS VC-700 Vibracore | ☐ AUTO HAMMER ☐ MANUAL HAMMER
12. TOTAL SAMPLES | DISTURBED | UNDISTURBED (UD)
13. TOTAL NUMBER CORE BOXES
14. ELEVATION GROUND WATER
15. DATE BORING: STARTED 08-01-19 15:46 | COMPLETED 08-01-19 15:47
16. ELEVATION TOP OF BORING: -23.8 Ft.
17. TOTAL RECOVERY FOR BORING: 18.8 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR: Kristina McCoy, P.G.

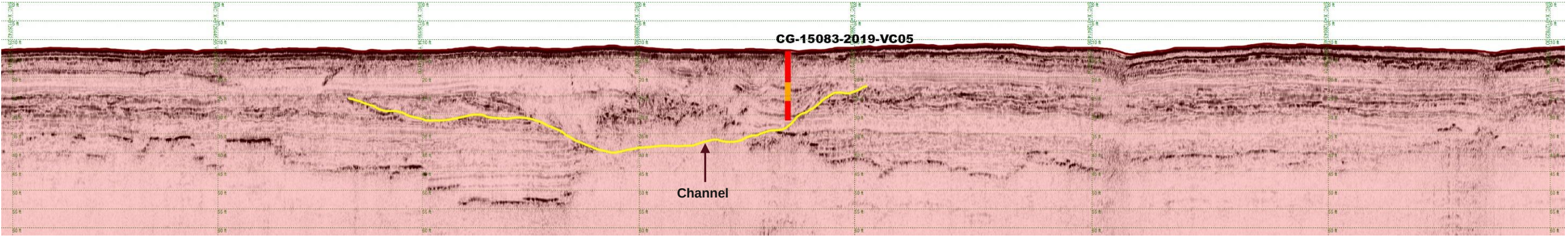
ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Depths and elevations based on measured values)	% REC.	BOX OR SAMPLE	REMARKS
-23.8	0.0					
-25.4	1.6		CLAY, very soft, trace shell hash, trace sandy laminae, dark greenish gray (10Y-4/1), (CL).			
-26.6	2.8		CLAY, very soft, some shell hash, trace sandy laminae, 2.25" shell fragment @ 2.3', dark greenish gray (10Y-4/1), (CL).			
-27.0	3.2		Shelly CLAY, very soft, shell components are shell hash and shell fragments up to (0.5"x0.75"), dark greenish gray (10Y-4/1), (GC).			
-28.0	4.2		CLAY, very soft, some shell hash, trace sandy laminae, dark greenish gray (10Y-4/1), (CL).			
-32.4	8.6		CLAY, very soft, trace organics, dark greenish gray (10Y-4/1), (CL).			
-37.4	13.6		Silty CLAY, soft, trace sandy laminae, dark greenish gray (10Y-4/1), (CL).			
-42.6	18.8		CLAY, soft, trace organics, trace silty laminae, Bit Sample from 18.4' to 18.8', dark greenish gray (10Y-4/1), (CL).			
-43.8	20.0		No Recovery.			
			End of Boring			

- Sand
- Mixed quality sandy silts or silty sands
- Sandy clay, silty clay, silt, and clayey sand
- Clay, shelly clay, clayey silt

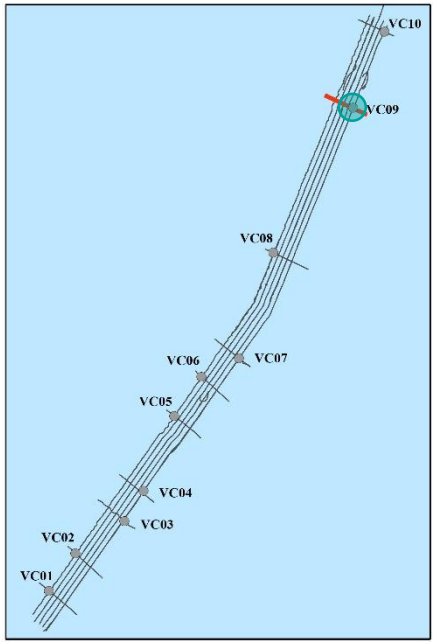
Crimson Midstream, LLC 811

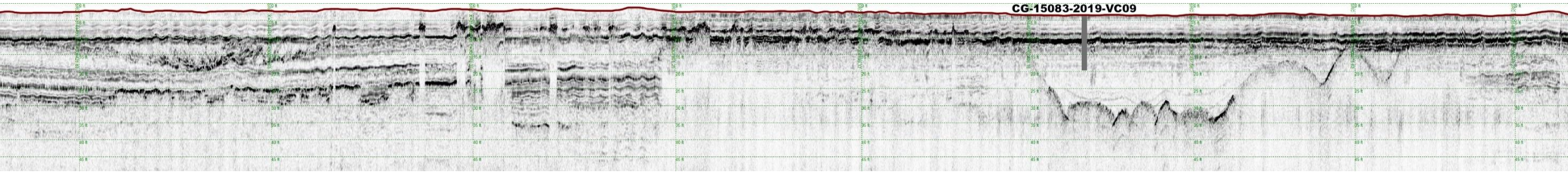
LINE 100 – CG-15083-2019-VC05





LINE 201 – CG-15083-2019-VC09





Crimson Midstream, LLC

CG-15083-2019-VC09

Boring Designation CG-15083-2019-VC09

DRILLING LOG | DIVISION | INSTALLATION | SHEET 1 OF 1 SHEETS

1. PROJECT	Crimson Gulf SSRA Analysis Offshore Louisiana
2. BORING DESIGNATION	CG-15083-2019-VC09
LOCATION COORDINATES (ft)	X = 3,146,923 Y = 307,386
3. DRILLING AGENCY	APTIM
CONTRACTOR FILE NO.	
4. NAME OF DRILLER	Francis Stankiewicz
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED
DEG. FROM VERTICAL	
BEARING	
6. THICKNESS OF OVERBURDEN	0.0 Ft.
7. DEPTH DRILLED INTO ROCK	0.0 Ft.
8. TOTAL DEPTH OF BORING	20.0 Ft.
9. SIZE AND TYPE OF BIT	3.0 In.
10. COORDINATE SYSTEM/DATUM	Louisiana South State Plane / NAD 1983 / NAVD 88
11. MANUFACTURER'S DESIGNATION OF DRILL	APTIM SEAS VC-700 Vibracore
AUTO HAMMER / MANUAL HAMMER	☐ / ☐
12. TOTAL SAMPLES	DISTURBED / UNDISTURBED (UD)
13. TOTAL NUMBER CORE BOXES	
14. ELEVATION GROUND WATER	
15. DATE BORING	STARTED 08-02-19 10:38 / COMPLETED 08-02-19 10:39
16. ELEVATION TOP OF BORING	-15.0 Ft.
17. TOTAL RECOVERY FOR BORING	16.4 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR	Kristina McCoy, P.G.

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-15.0	0.0					
-21.3	6.3		CLAY, very soft, trace shell hash, color is mottled dark grayish brown (2.5Y-4/2) and, dark gray (2.5Y-4/1), (CL).			
-22.4	7.4		CLAY, very soft, trace shell hash, trace silty laminae, (1.0"x2.0") silty sand pocket @ 6.6', dark greenish gray (10Y-4/1), (CL).			
-22.9	7.9		CLAY, very soft, little shell hash, trace shell fragments, shell fragments up to (0.5"x0.75"), shell hash lamina @ 7.4', dark greenish gray (10Y-4/1), (CL).			
-31.4	16.4		CLAY, soft, (0.5"x0.75") shell hash pocket @ 9.3', Bit Sample from 16.1' to 16.4', dark greenish gray (10Y-4/1), (CL).			
-35.0	20.0		No Recovery.			
			End of Boring			

- Sand
- Mixed quality sandy silts or silty sands
- Sandy clay, silty clay, silt, and clayey sand
- Clay, shelly clay, clayey silt

Crimson Midstream, LLC 811

CG-15083-2019-VC09

Boring Designation CG-15083-2019-VC09

DRILLING LOG	DIVISION	INSTALLATION	SHEET 1 OF 1 SHEETS

1. PROJECT: Crimson Gulf SSRA Analysis Offshore Louisiana (APTIM)		9. SIZE AND TYPE OF BIT: 3.0 In.	
		10. COORDINATE SYSTEM/DATUM: Louisiana South State Plane	HORIZONTAL: NAD 1983 / VERTICAL: NAVD 88
2. BORING DESIGNATION: CG-15083-2019-VC09	LOCATION COORDINATES (ft): X = 3,146,923 Y = 307,386	11. MANUFACTURER'S DESIGNATION OF DRILL: APTIM SEAS VC-700 Vibracore	☐ AUTO HAMMER ☐ MANUAL HAMMER
3. DRILLING AGENCY: APTIM	CONTRACTOR FILE NO.	12. TOTAL SAMPLES	DISTURBED / UNDISTURBED (UD)
4. NAME OF DRILLER: Francis Stankiewicz		13. TOTAL NUMBER CORE BOXES	
5. DIRECTION OF BORING: ☒ VERTICAL ☐ INCLINED	DEG. FROM VERTICAL / BEARING	14. ELEVATION GROUND WATER	
		15. DATE BORING	STARTED: 08-02-19 10:38 / COMPLETED: 08-02-19 10:39
6. THICKNESS OF OVERBURDEN: 0.0 Ft.		16. ELEVATION TOP OF BORING: -15.0 Ft.	
7. DEPTH DRILLED INTO ROCK: 0.0 Ft.		17. TOTAL RECOVERY FOR BORING: 16.4 Ft.	
8. TOTAL DEPTH OF BORING: 20.0 Ft.		18. SIGNATURE AND TITLE OF INSPECTOR: Kristina McCoy, P.G.	

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-15.0	0.0					
			CLAY, very soft, trace shell hash, color is mottled dark grayish brown (2.5Y-4/2) and, dark gray (2.5Y-4/1), (CL).			
-21.3	6.3					
			CLAY, very soft, trace shell hash, trace silty laminae, (1.0"x2.0") silty sand pocket @ 6.6', dark greenish gray (10Y-4/1), (CL).			
-22.4	7.4					
-22.9	7.9		CLAY, very soft, little shell hash, trace shell fragments, shell fragments up to (0.5"x0.75"), shell hash lamina @ 7.4', dark greenish gray (10Y-4/1), (CL).			
			CLAY, soft, (0.5"x0.75") shell hash pocket @ 9.3', Bit Sample from 16.1' to 16.4', dark greenish gray (10Y-4/1), (CL).			
-31.4	16.4					
			No Recovery.			
-35.0	20.0					
			End of Boring			

Sand
Mixed quality sandy silts or silty sands
Sandy clay, silty clay, silt, and clayey sand
Clay, shelly clay, clayey silt

Crimson Midstream, LLC 811

CG-15083-2019-VC09

Boring Designation CG-15083-2019-VC09

DRILLING LOG | DIVISION | INSTALLATION | SHEET 1 OF 1 SHEETS

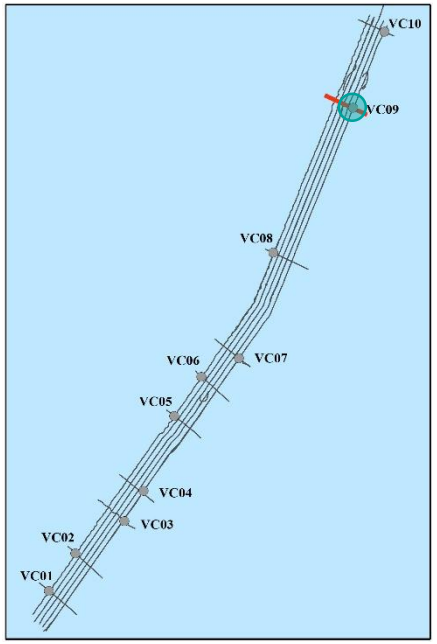
1. PROJECT: Crimson Gulf SSRA Analysis, Offshore Louisiana (APTIM)
2. BORING DESIGNATION: CG-15083-2019-VC09 | LOCATION COORDINATES (ft): X = 3,146,923 Y = 307,386
3. DRILLING AGENCY: APTIM | CONTRACTOR FILE NO.:
4. NAME OF DRILLER: Francis Stankiewicz
5. DIRECTION OF BORING: ☒ VERTICAL ☐ INCLINED | DEG. FROM VERTICAL: | BEARING:
6. THICKNESS OF OVERBURDEN: 0.0 Ft.
7. DEPTH DRILLED INTO ROCK: 0.0 Ft.
8. TOTAL DEPTH OF BORING: 20.0 Ft.
9. SIZE AND TYPE OF BIT: 3.0 In.
10. COORDINATE SYSTEM/DATUM: Louisiana South State Plane | HORIZONTAL: NAD 1983 | VERTICAL: NAVD 88
11. MANUFACTURER'S DESIGNATION OF DRILL: APTIM SEAS VC-700 Vibracore | ☐ AUTO HAMMER ☐ MANUAL HAMMER
12. TOTAL SAMPLES | DISTURBED | UNDISTURBED (UD)
13. TOTAL NUMBER CORE BOXES
14. ELEVATION GROUND WATER
15. DATE BORING | STARTED: 08-02-19 10:38 | COMPLETED: 08-02-19 10:39
16. ELEVATION TOP OF BORING: -15.0 Ft.
17. TOTAL RECOVERY FOR BORING: 16.4 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR: Kristina McCoy, P.G.

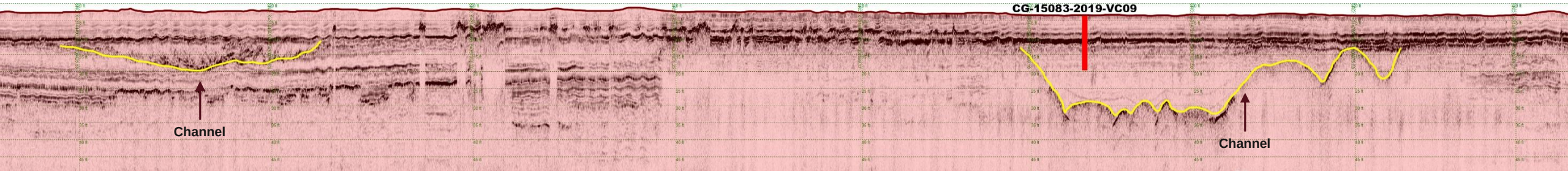
ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Depths and elevations based on measured values)	% REC.	BOX OR SAMPLE	REMARKS
-15.0	0.0					
			CLAY, very soft, trace shell hash, color is mottled dark grayish brown (2.5Y-4/2) and, dark gray (2.5Y-4/1), (CL).			
-21.3	6.3					
-22.4	7.4		CLAY, very soft, trace shell hash, trace silty laminae, (1.0"x2.0") silty sand pocket @ 6.6', dark greenish gray (10Y-4/1), (CL).			
-22.9	7.9		CLAY, very soft, little shell hash, trace shell fragments, shell fragments up to (0.5"x0.75"), shell hash lamina @ 7.4', dark greenish gray (10Y-4/1), (CL).			
			CLAY, soft, (0.5"x0.75") shell hash pocket @ 9.3', Bit Sample from 16.1' to 16.4', dark greenish gray (10Y-4/1), (CL).			
-31.4	16.4					
			No Recovery.			
-35.0	20.0					
			End of Boring			

Sand
Mixed quality sandy silts or silty sands
Sandy clay, silty clay, silt, and clayey sand
Clay, shelly clay, clayey silt

Crimson Midstream, LLC 811

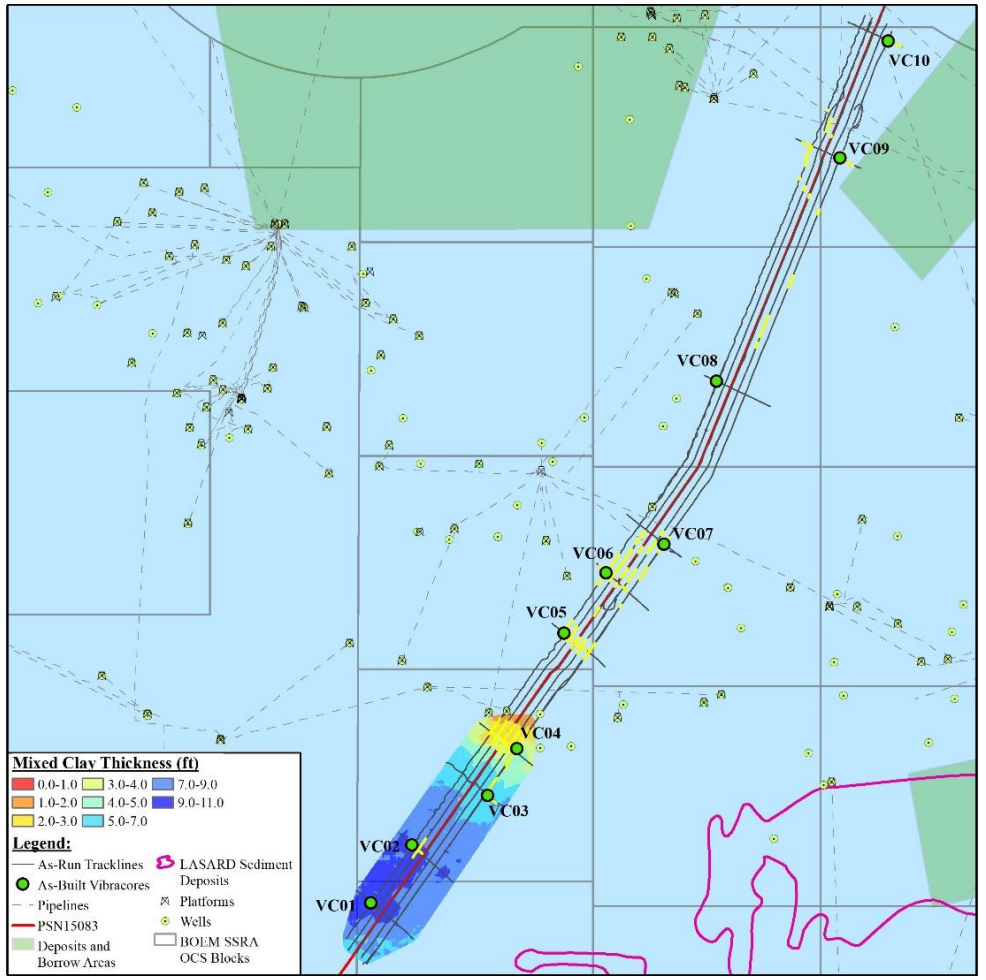
LINE 201 – CG-15083-2019-VC09





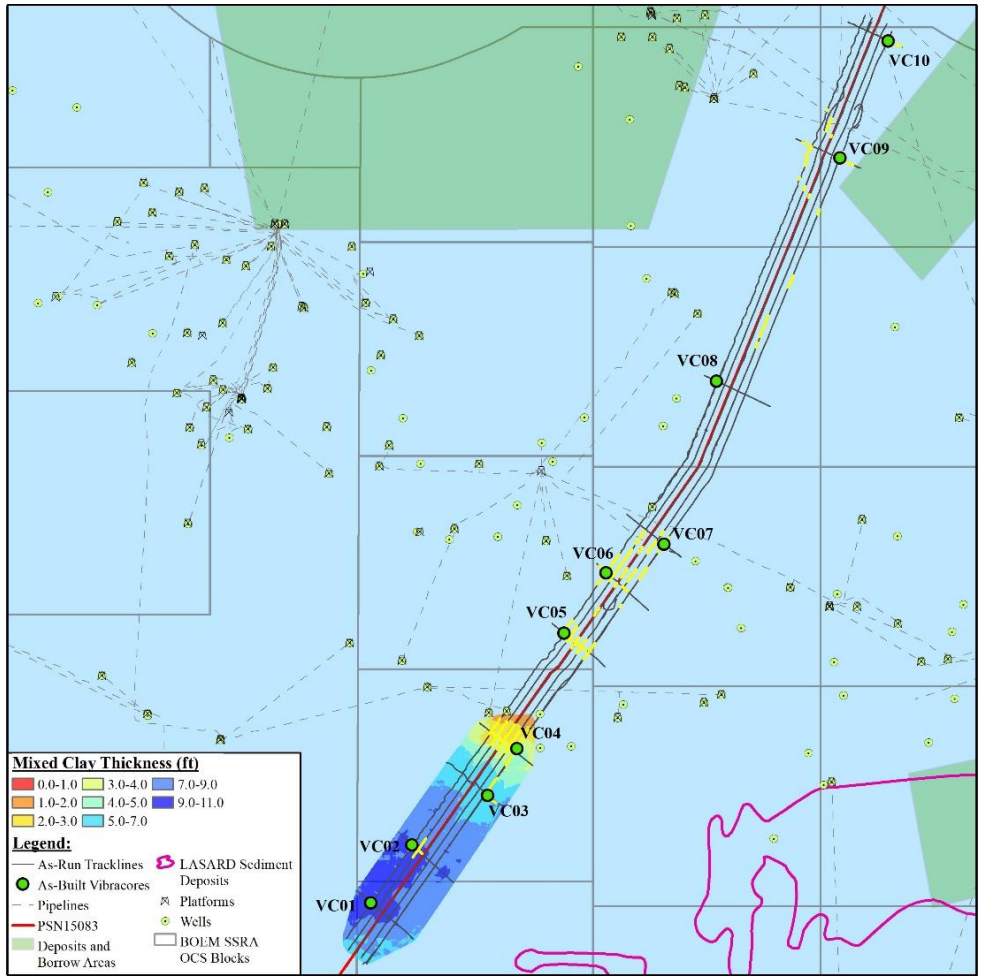
RESULTS

- BOEM Meeting to present and discuss results
- Discussion of vibracore placement in channels and constraints on pipeline proximity
- Geology is mostly very soft/soft clays
- No evidence of large sand deposits
- Several buried paleochannels
  - > Soft clays, silty clay, silt, little sand
  - > Small areal extent, sand at depth (>18ft overburden)



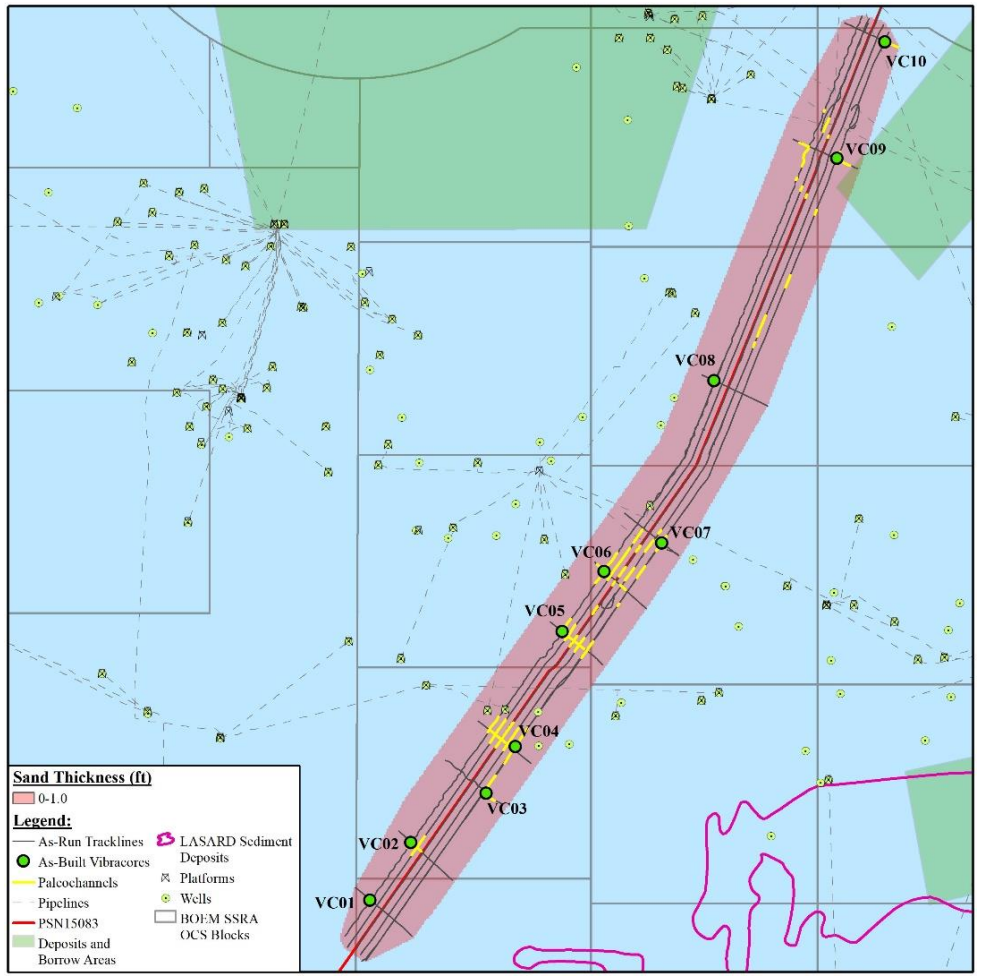
RESULTS

- Southern surficial mixed clay wedge
  - > Thin sandy layers intermixed with very soft and soft clay layers (Estimated composite: 46%)
  - > Not significant resource for marsh creation
  - > Economically unviable (14 miles from Marsh Island, 25 miles from mainland marsh)
  - > Not compatible for beach restoration
  - > Not compatible or economically viable for marsh creation



PROJECT CONCLUSIONS

- Pipeline not on sand deposit (shoal)
- Mixed clay sediment wedge
  - > Not significant resource for marsh creation or beach restoration
- Paleochannels not indicative of viable sediment resources
- 70,397 feet abandoned in place



QUESTIONS?

Eric Lyons
(985) 872-3100 Ext. 6029
elyons@crimsonpl.com

Beau Suthard
(727) 374-2150
beau.suthard@aptim.com