Appendix I

BS-0037 95% Design Report Excerpt

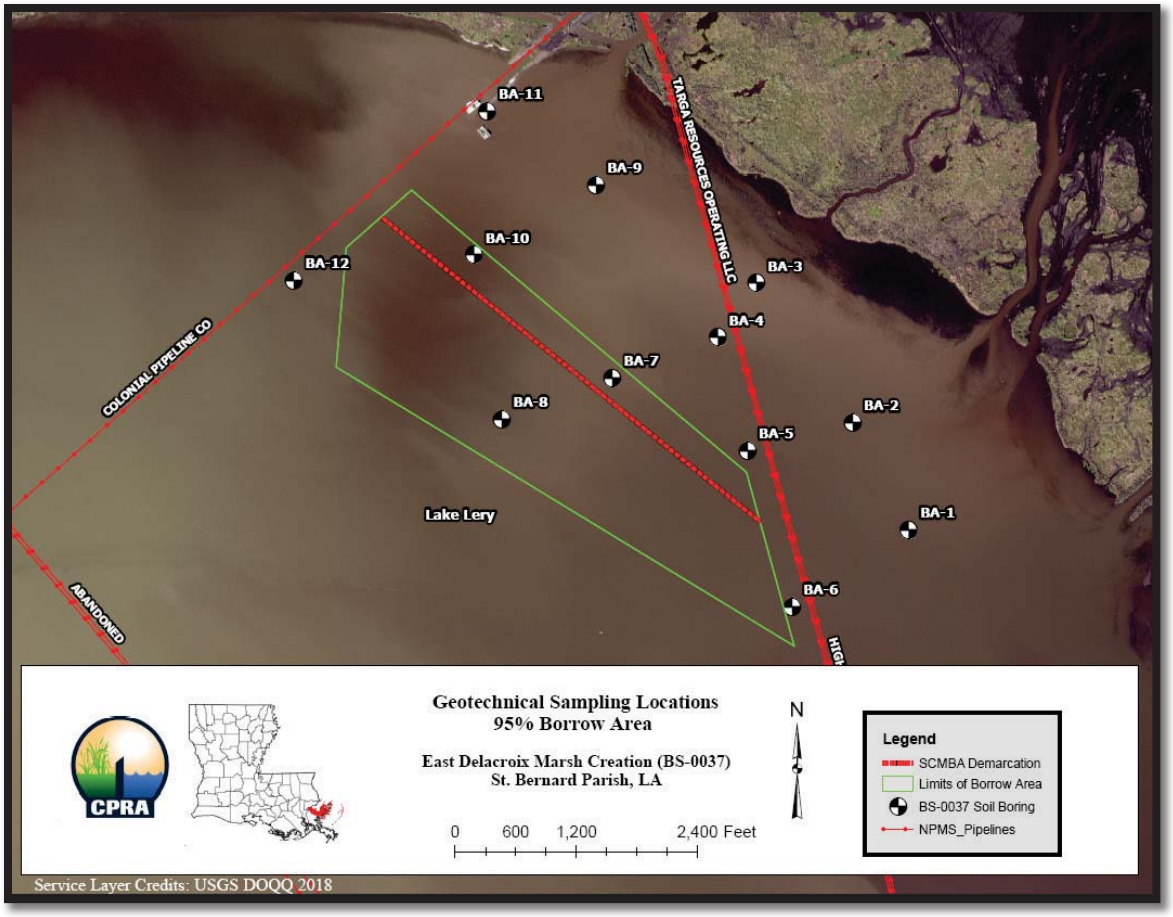

Figure 39: Lake Lery Borrow Area Geotechnical Sampling Locations

AutoCAD Civil 3D was used to calculate the volume of available material in the marsh creation borrow area. This resulted in a total of 3,345,457 cubic yards of material. The available volume of material within the primary and secondary cut borrow areas including the no-dredge buffer zones is shown in **Table 20** and in the 95% Design Drawings (**Appendix G**).

Table 20: Proposed MCBA Acreages and Volumes

Borrow Area	Area (Acres)	Available Volume (yd^3)
Primary	130	2,629,977
Secondary	42	715,480
Total	172	3,345,457

5.6 Dredge Pipeline Corridor

The optimum DPC to reach the MCA is typically the shortest distance from the Borrow Area to the restoration area. Originally, the two (2) DPCs from the Lake Lery Borrow Area to the restoration area were the HWY 300 and the Bayou Lery/BTAB DPC. Both DPCs were investigated/evaluated as shown in **Figure 19**.

The first DPC evaluated was the shortest path to the restoration area, or the HWY 300 DPC. The distance from Lake Lery to the furthest point in the fill area via the HWY 300 DPC is approximately five (5) miles. Once the sediment pipeline reaches the North Corridor, the pipeline would be required to cross HWY 300.

The second DPC examined passes through Bayou Lery and BTAB with a crossing near the End of the World, Inc. property as shown in **Figure 41**. The total length of this DPC is approximately 6.35 miles from Lake Lery to the furthest point in the fill area. This DPC is an additional mile of pumping distance along with several navigational crossings that would be required at major intersections of BTAB and Bayou Lery & Bayou Gentilly. Due to the long pumping distance from the borrow area to the MCAs, booster pumps will likely be required for conveyance of dredged slurry from the borrow area to the MCA.

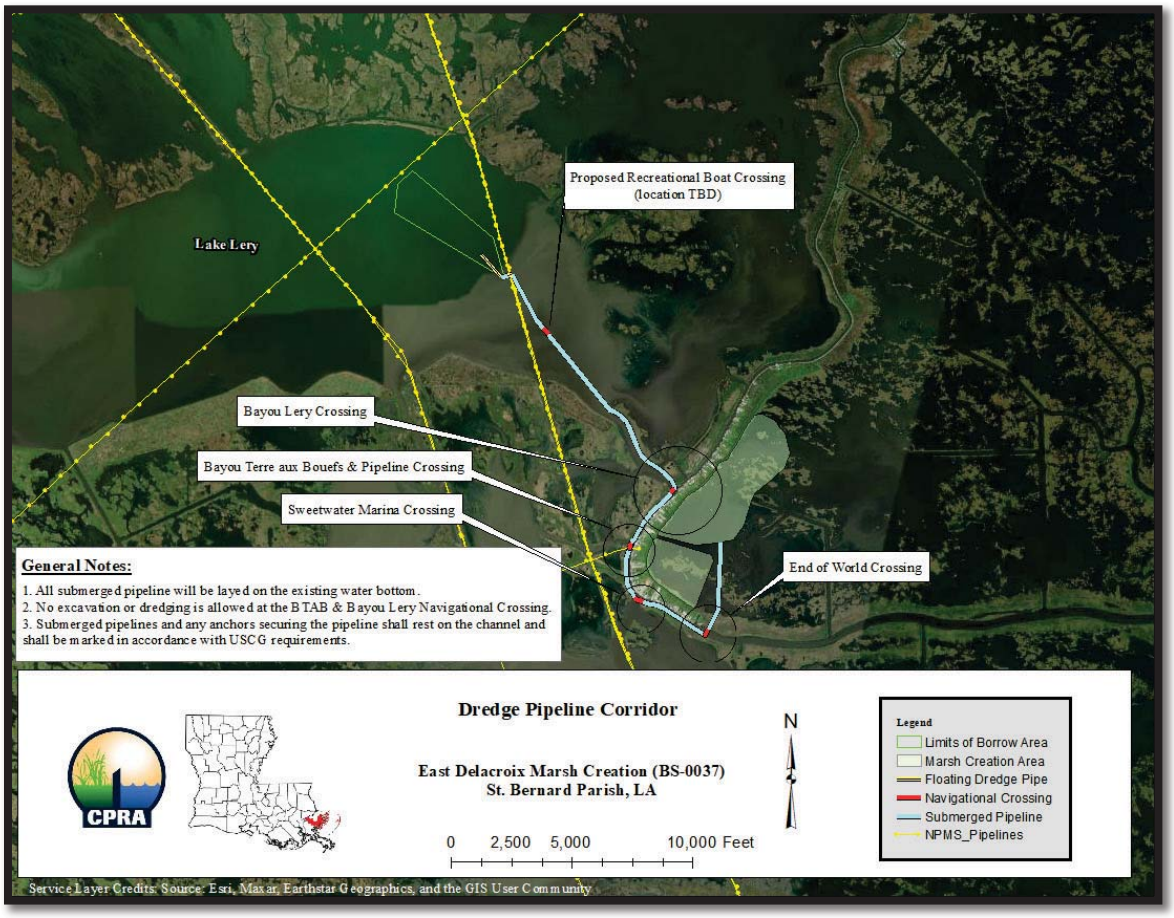

Figure 40: Proposed BTAB Dredge Pipeline Corridor

The DPC proposed for the construction of this project is the "Bayou Lery/BTAB" DPC alternative as shown in **Figure 40**. Although the HWY 300 DPC is one (1) mile shorter, the BTAB DPC alternative was selected as the proposed DPC for construction to reduce risk to the owner and contractor. More details on the HWY 300 alternative analysis and why this decision was made are presented in **Section 5.6.1**.

The proposed DPC will consist of mostly subline from the Lake Lery Borrow Area through BTAB except where crossing the Gulf South Pipelines. As mentioned previously, water depths, when measured from mean low water, in Lake Lery are generally five to six (5-6)

ft. Water depths in the middle of Bayou Lery are generally eight to ten (8-10) ft. At the confluence of Bayou Lery & BTAB water depths exceed ten (10) ft. The water depth along the centerline in BTAB continues to provide sufficient water depth (excess of ten (10) ft.) for recreational boat traffic up until the DPC crosses into the MCA. The End of the World Crossing (**Figure 41**) in BTAB lacks sufficient water depth for laying a two (2) ft. diameter dredge pipe on the bottom of the bayou surface. The End of World Inc. Crossing will require the contractor to trench and install the top of the dredge pipeline four (4) feet below the existing mudline (49 CFR § 195.248). Material excavated from the trench will be placed within temporary disposal areas on either side of the trench and backfilled after installation of the dredge pipeline. DPC types and quantities from the Borrow Area to each MCA are summarized in the **Table 21**.

Table 21: Dredge Pipeline Corridor Quantities

Type	LF	Miles
Distance from Center of BA to MCA-1 (Furthest Point)	32,748	6.20
Distance from Center of BA to MCA-2 (Furthest Point)	28,528	5.40
Type	**LF**	**Miles**
Floated Pipeline	8,020	1.52
Submerged Pipeline	23,948	4.54
Board Mat Pipeline	780	0.15

Maps of all navigational crossings along with bathymetric data and cross sections are provided in **Appendix I**.

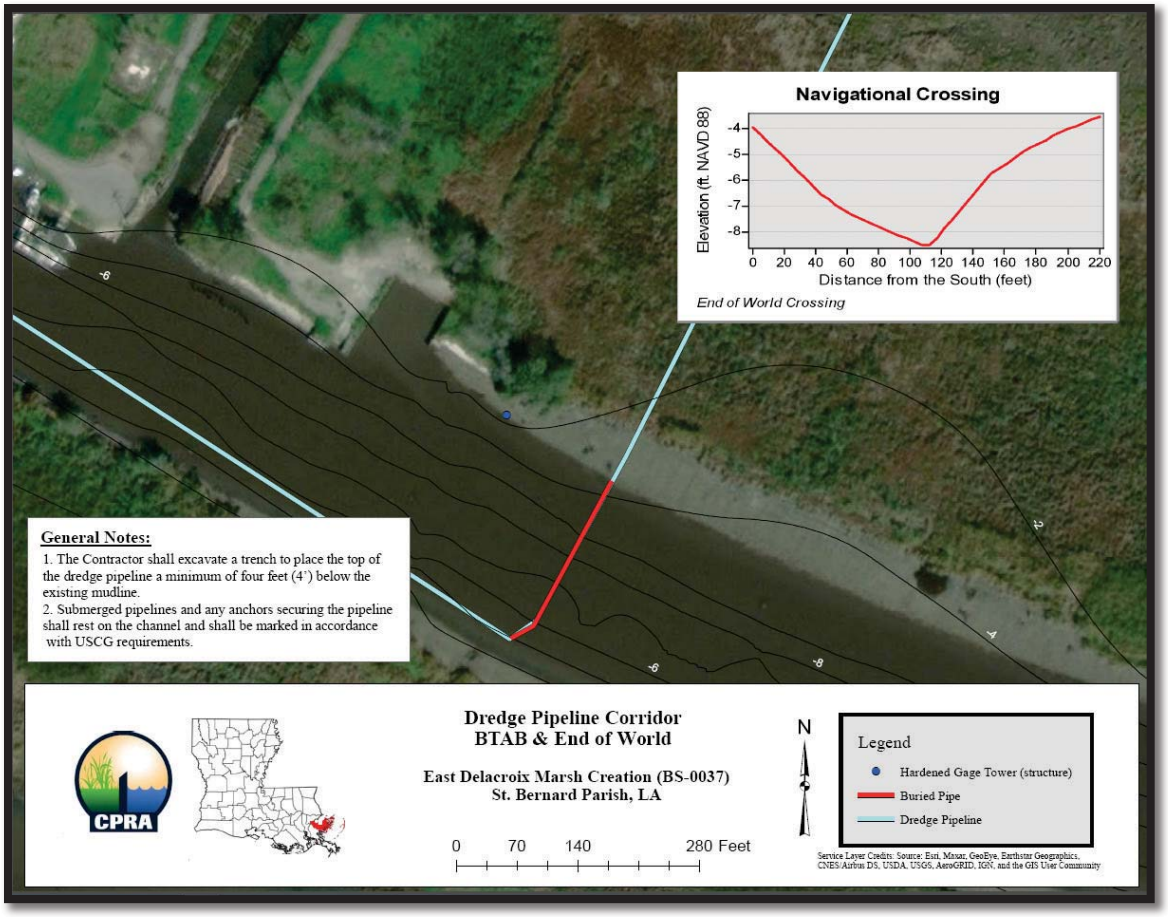

Figure 41: Dredge Pipeline Corridor (End of World Crossing)

5.6.1 Highway 300 Crossing – Alternative Analysis

The goals of the HWY 300 sediment pipeline crossing alternative analysis were to investigate the feasibility of different crossing methods to minimize risk to the public, contractor, utilities, and owner. The specific goals of each highway crossing method included ensuring the structural quality of the roadway is not impaired, safety to public, minimizing the workspace required outside the Right-of-Way (ROW), reusability for future projects, and having a cost-effective design. The project team consulted with St. Bernard Parish Government, Louisiana Department of Transportation and Development (LADOTD) District 02 during the highway crossing feasibility analysis phase and gained valuable input into the highway design specifications that would be required for safely installing a dredge pipe casing at this location. The project team consulted with dredging contractors, general contractors, and transportation engineering firms that work in the coastal environment during this phase of the alternative analysis.

A summary of relevant topographic survey results and highway design parameters collected for the design of a sediment pipeline crossing along HWY 300 is shown in **Table 22**. Recreational boat traffic and commercial seafood trucks are the main sources of traffic on the highway. The speed limit along HWY 300 ranges from twenty-five to thirty-five (25-35) miles per hour. The width of the crowned asphalt road was found to be approximately twenty-two (22) feet at the location of the crossing. Various erosion control measures,

highlighted in **Figure 21**, including rock, wooden pilings, and bulkheads are placed along HWY 300 to protect the embankment from eroding into BTAB.

Table 22: HWY 300 Collected Data Summary

AADT (vehicles/day)	447	**Number of Travel Lanes**	2
Road Classification	RC-2	**Width of Travel Lanes (ft.)**	11
Design Speed (mph)	35	**Distance from edge of pavement (northbound) to drainage canal (ft.)**	15
Existing Crown Elevation (ft. NAVD88)	+4.00	**Distance from edge of pavement (southbound) to bayou (ft.)**	10

Sediment pipeline road crossings are typically accomplished by installing a reinforced concrete or steel casing pipe via open cut trenching, jack-and-bore, or horizontal directional drilling (HDD). These utility installation methods were considered for the design of the sediment pipeline highway crossing. The maximum cutter suction dredge pipe size, based on minimum operating depth in Lake Lery, is twenty-four (24) inches. To facilitate the passing of this pipe safely underneath HWY 300, a thirty (30) inch casing would be required to allow for pipe deflection and bending within the casing. This casing will allow a contractor to pass the dredge pipe through the installed casing sleeve providing protection to the dredge pipe and existing infrastructure. As per the Louisiana Administrative Code (LAC), Title 70- Transportation Part II Utilities, the minimum bury under pavement must be four (4) feet for cased crossings and five (5) feet for uncased crossings. The minimum bury requirement for utilities under pavement in Title 70 is the critical design factor that governs the design of the highway sediment pipeline crossing. Given the existing +4.0 NAVD88 crown elevation of HWY 300 and the estimated casing diameter, the installed invert elevation of the casing would be fully submerged at -2.50 ft. NAVD88 or 3.5 feet below mean high water as shown in the open cut highway cross section, **Figure 42**. Other critical design factors include the proximity of BTAB and the limited dry workspace near the crossing location. For open cut or jack and bore type of work at this location, it would require an extensive construction-dewatering plan for the entire shored excavation pit along with marine-based equipment for the removal of wooden timber piles, riprap, and for the installation of sheet piles to form cofferdams.

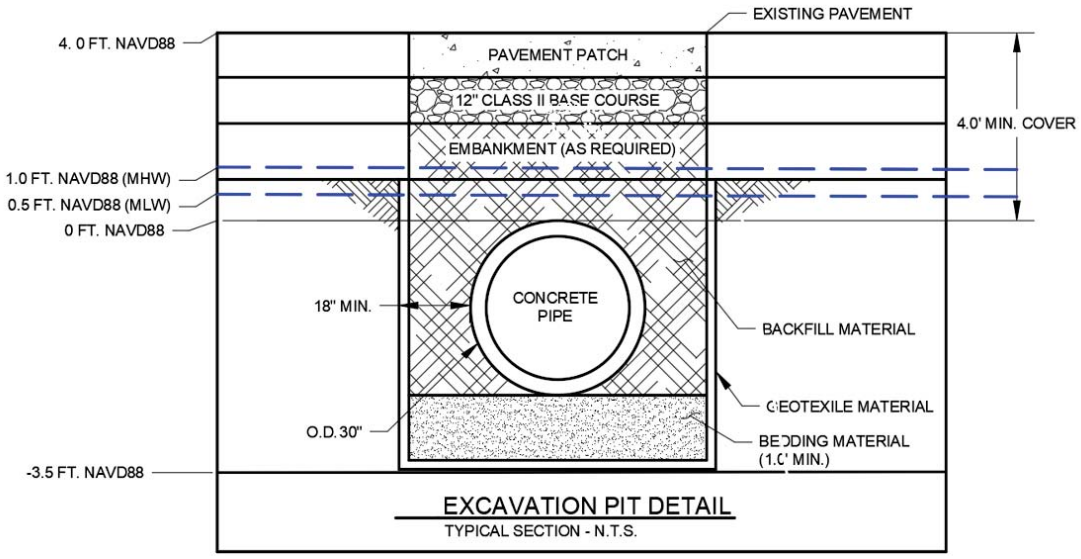

Figure 42: Open Cut Cross Section with Typical Water Elev.

The most common method for installing a casing at highway crossings on previous marsh restoration projects with CPRA is the open cut and trenching method. The typical excavation pit size for open cut and trenching work requires approximately seventy-two (72) ft. x twenty (20) ft. of dry space as shown **Figure 43**. Workspace beyond the excavation pit will be required to accommodate construction equipment for the installation of a casing pipe underneath the highway. Based on the survey data collected at the proposed crossing location, the dimensions of available dry space and space for traffic control are insufficient for traditional methods of open cut and trenching due to the encroaching bayou.

Figure 43: HWY 300 & BTAB with Typical Open Cut Excavation Pit Dimensions

Trenchless drilling methods (jack-and-bore and horizontal directional drilling) along HWY 300 were also considered. These methods were ultimately deemed costly and risky due to site conditions at the crossing location. The major factors that played a role in ruling out jack and bore methods were the existing erosion control features along HWY 300, site topography, minimum depth of cover requirements (in Title 70), and cost. Due to the site topography, jack and bore methods would require an approach very similar to the open cut method with braced excavation pits on either side of the crossing including an extensive dewatering plan to keep the excavation pit dry during construction. The considerations for performing HDD for the utility crossing at HWY 300 included entry and exit point locations, work space requirements, site access, minimum required HDD length, and construction risks. The construction risks identified during the alternative analysis ranged from failure to completing bore, the contractor not being able to visualize and monitor dredge pipe during dredging operations and potential damage to surface structures from settlement of the buried pipe.

CPRA also considered elevating a section of HWY 300 to allow for casing and dredge pipe to lay at the current elevation of HWY 300. This method may consist of a combination of trench cutting the highway down to the base course and building a permanent asphalt ramp over the casing pipe. The objective of this method was to keep the casing above the water surface while also minimizing the height of ramp. Due to the narrow and winding nature of this highway, the goal would be to maintain the existing travel lane widths and shoulders as much as possible. To accommodate these requirements, it would necessitate raising of the existing shoulders and installation of guardrails to protect vehicular traffic from veering into BTAB. To build this section of highway to the specifications required in the LADOTD

Minimum Design Guidelines for highway construction, it would also require the construction of a temporary detour road for vehicular traffic to pass the construction site for the entire duration of the work. This alternative was ultimately ruled out due to the extensive land rights agreements that would be required to build the required detour road and the construction cost for raising a five hundred (500) foot section of highway to the appropriate height.