

BENEFICIAL USE OF DREDGED MATERIAL DISPOSAL HISTORY
CALCASIEU RIVER AND PASS, LA
1983 - 2010

The Calcasieu River and Pass, Louisiana, project consists of a number of individual projects designed to improve navigation from the Gulf of Mexico to port facilities in and around Lake Charles, Louisiana, and to prevent salt water intrusion in the river above Lake Charles.

PROJECT AUTHORITY

The Rivers and Harbors Act of August 26, 1937, House Document 299, 75th Congress, 1st Session and prior River and Harbor acts authorized the U.S. Army Corps of Engineers, New Orleans District (CEMVN) to construct and maintain a channel 30 feet deep and 250 feet wide from the Lake Charles docks to the Gulf of Mexico and extend existing jetties to about the 10-foot depth contour; with a channel 30 feet deep by 250 feet wide between the jetties; a 32 feet deep by 400 feet wide approach channel from the sea ends of the jetties to the 32-foot depth contour in the Gulf of Mexico; and further extension to the 15-foot depth contour if found advisable to reduce maintenance dredging costs. Construction of these channel improvements was completed in 1941.

The Rivers and Harbors Act of July 24, 1946, House Document 190, 79th Congress, 2nd Session and prior Rivers and Harbors acts authorized the CEMVN to construct and maintain a channel 35 feet deep and 250 feet wide from the wharves of the Lake Charles Harbor and Terminal District (including the Loop around Clooney Island) to the Gulf of Mexico, via Calcasieu Lake and through Calcasieu Pass; a channel 35-37 feet deep and 250 feet wide between the jetties; and an approach channel 37 feet deep and 400 feet wide seaward to the 37-foot depth contour in the Gulf of Mexico. This act also authorized reconstruction and extension of improvement of the river from Lake Charles to Phillips Bluff by removing logs, snags, overhanging trees and dredging. Construction of these channel improvements was completed in April 1953.

The Rivers and Harbors Act of July 14, 1960, House Document 436, 86th Congress, 2nd Session authorized modification of the existing project to provide an approach channel having a depth of 42 feet below Mean Low Gulf (MLG) over a bottom width of 800 feet from the 42-foot depth in the Gulf of Mexico to the jettied channel; a channel between the jetties varying in depth from 42 to 40 feet at the seaward end and shoreline, respectively, over a bottom width of 400 feet; a channel 40 feet deep over a bottom width of 400 feet from the shoreline at Mile 0.0 to the wharves of the Port of Lake Charles at Mile 34.1; enlargement of the existing turning basin at Mile 29.6 to a depth of 40 feet; a mooring basin at about Mile 3.0 having a width of 350 feet, a length of 2000 feet, and a depth of 40 feet; extension of the ship channel at a depth of 35 feet below MLG over a bottom width of 250 feet from the wharves of the Port of Lake Charles, Mile 34.1, to the vicinity of the bridge on U.S. Highway 90, Mile 36.0; a turning basin of the same depth at the upper end having a width of 750 feet and a length of 1000 feet; and maintenance of the existing channel 12 feet deep and 200 feet wide from the ship channel to Cameron, Louisiana, via the old channel of the Calcasieu River. Construction under this modification was initiated in April 1962, and completed in October 1968.

The Rivers and Harbors Act of October 23, 1962, House Document 582, 8th Congress, 2nd Session authorized construction of a salt water barrier structure with five 40-foot tainter gates in a new bypass channel; a parallel channel with navigation structure and a single sector type gate; an earth closure dam; and a woven lumber type revetment. The salt water barrier was completed in January 1968.

The Senate Public Works committee on December 27, 1970, and the House Public Works committee on December 15, 1970, adopted resolutions giving the CEMVN authority to construct and maintain the project at Devil's Elbow under the provisions of Section 201 of the Flood Control Act of 1965 (Public Law 89-298; S.D. 91-111). This project involved enlarging 2.3 miles of the existing industrial channel to a 40-foot depth over a bottom width of 400 feet; a 1/2 mile eastward extension of the enlarged channel; and the construction of a 1200-foot by 1400-foot turning basin south of the extended channel at its landward end. Construction of the Devil's Elbow Industrial Channel was begun in 1976 and completed in 1978.

Construction and maintenance of the Calcasieu River at Coon Island, Louisiana, project was authorized under Section 107 of the Rivers and Harbors Act of 1960, as amended by Section 310 and Section 112 of the Rivers and Harbors Acts of 1965 and 1979, respectively. The project consists of deepening and widening to -40 feet by 200 feet for a distance of 6,943 feet, and the existing turning basin to -40 feet by 750 feet by 1000 feet. Construction of this project commenced in 1973 and was completed in 1974.

MAINTENANCE DREDGING HISTORY

Dredging records dating back to 1949 indicate that maintenance of discontinuous reaches of the inland reach and bar channel of the 35-foot navigation project occurred on an annual basis from 1953 to 1962. Dredged material from construction and all maintenance events within the inland reach (Mile 34.1 to Mile 0.0) was placed in confined disposal facilities or placed unconfined/semi-confined in open water in Calcasieu Lake. Material from the bar channel was placed in open water off the right-descending bank of the navigational channel.

Maintenance of discontinuous reaches of the inland reach (Mile 36.0 to Mile 0.0) and/or the bar channel of the deep-draft/40-foot navigation project has occurred every year since project completion except for 1970, 1974, 1977 and 1982. Maintenance dredging of the inland reach is accomplished using hydraulic cutterhead pipeline dredges; hopper dredges are used for maintenance of the bar channel. Dredged material removed during construction of the inland reach, and during all maintenance events until 1983, was placed into confined disposal facilities located on either side of the channel. Dredged material from maintenance of the deep-draft channel in the bar is placed in the ocean dredged material disposal site located off the right-descending bank of the navigational channel.

SABINE NATIONAL WILDLIFE REFUGE

1983

Background:

The first beneficial use (BU) of dredge material from maintenance of the Calcasieu River and Pass, Louisiana, navigational channel took place in 1983 (contract DACW29-83-C-0132: 5 April 1983 – 28 July 1983) during maintenance dredging of the Mile 5.0 to Mile 22.7 reach. A section of the eroding bankline along the western side of the channel between Miles 9.5 and 11.0 was chosen for this effort on the recommendation of state and federal natural resource agencies. The placement site was located within the Sabine National Wildlife Refuge (SNWR).

Dredged Material Placement Event:

From 25 April 1983 through May 1983, the cutterhead dredge BILL JAMES discharged approximately 200,000 cubic yards of dredged material at each of two sites (about 86 acres and 44 acres, respectively) within the SNWR off the right-descending bank of the channel in the vicinity of river Miles 9.5-11 in an attempt to stabilize the bank and restore eroded wetlands. The maximum height of the dredged material placed in these disposal areas was +4.0 feet Mean Low Gulf (MLG) with an anticipated final elevation, following compaction and dewatering, of about +2.8 feet MLG. During the disposal event, construction equipment was used to make ruts in the site in order to facilitate flow of the dredged material slurry from the discharge point adjacent to the channel eastward to the back portion of these sites.

Containment and Access:

Earthen dikes were only constructed on the channel-side of these open water disposal areas to prevent the flow of dredged material back into the navigational channel. Borrow material for earthen dikes was taken from within the SNWR marsh restoration disposal area.

Result:

About 130 acres of marsh and mud flats were created in the SNWR as a result of this BU effort using about 400,000 cubic yards of dredged material.

1985

Background:

During the 1985 maintenance of the Mile 5.0 to Mile 22.7 reach (contract DACW29-85-C-0109: August 1985 - December 1985), two open water areas located adjacent to the 1983 sites, between river Miles 9.3 and 10.2, on the SNWR were used for the placement of dredged material to stabilize the bank and restore eroded wetlands.

Dredged Material Placement Event:

From 10 December 1985 through 29 December 1985, the cutterhead dredges E. STROUD and GALVESTON placed approximately 100,000 cubic yards in the northern C-1 site (35 acres), and approximately 150,000 cubic yards in the southern C-2 site (57 acres) to create approximately 92 acres of marsh and mud flats. The maximum height of the dredged material placed in these disposal areas was +4.0 feet MLG with an anticipated final elevation, following compaction and dewatering, of about +2.8 feet MLG.

Containment and Access:

Earthen dikes were constructed on the channel-side of these areas and perpendicular to the channel on the north and south sides of these two sites to prevent dredged material from entering the 1983 sites. Borrow material for earthen dikes was taken from within the SNWR marsh restoration disposal area.

Result:

About 92 acres of marsh and mud flats were created in the SNWR as a result of this BU effort using about 250,000 cubic yards of dredged material.

1993

Background:

In 1992, the CEMVN designated shallow open water areas in the SNWR pursuant to Section 404 of the Clean Water Act for the placement of dredged material from maintenance of the navigational channel for wetlands restoration. These areas had been identified as alternatives for the placement of dredged material for BU during development of the Long Term Disposal Plan/Dredged Material Management Plan for the Calcasieu River and Pass, Louisiana, project; however, use of the sites required special authority and funding because placement of dredged material into these sites was beyond the Base Plan (disposal into CDFs located adjacent to the channel).

Prior to the 1993 maintenance of the Mile 5.0 to Mile 22.7 reach, Congress provided authorization and funding for the beneficial use of dredged material in association with routine maintenance of the navigation project in the Fiscal Year 1993 Energy and Water Appropriation Act. The CEMVN also sought and received authority and funding pursuant to Section 1135 of the Water Resources and Development Act (WRDA) of 1986 for the BU of dredged material at the SNWR. The state of Louisiana was the non-Federal sponsor for the Section 1135 project (with a total project cost of \$232,410). Detailed plans for the placement of dredged material at the SNWR were developed in coordination with state and Federal natural resources agencies and the SNWR manager.

During the 1993 maintenance event (contract DACW29-93-C-0033: 26 February 1993 – 23 August 1993), dredged material from Mile 5.0 to Mile 22.7 was placed at an approximately 480-acre area of shallow open water and eroded marsh in the SNWR to restore marsh.

Dredged Material Placement Event:

From 15 September 1993 through 6 October 1993, the cutterhead dredge GEORGE D. WILLIAMS II placed approximately 1,840,600 cubic yards of dredged material removed from Mile 7.8 to Mile 12.2 of the navigational channel in the SNWR north of West Cove Canal. In order to achieve a final dredged material elevation of about +2.0 feet MLG, which was determined to be conducive to emergent marsh development, the maximum initial elevation for dredged material slurry was set at +4.0 feet MLG. In order to minimize stacking of dredged material to elevations in excess of +4.0 feet MLG, three discharge points were utilized during to facilitate the spreading of dredged material slurry into the refuge: (1) located approximately 250 feet west of the channel at about river mile 10.5, (2) located approximately 2,000 feet west of the

navigation channel at about river mile 9.2, and 3) located approximately 5,000 feet west of the navigation channel at about river mile 9.3. The longest discharge line used to place dredged material into the refuge measured about 13,000 feet.

Containment and Access:

Earthen containment dikes were only constructed along the navigation channel (to a height of about +8.0 feet MLG) and along the north bank of West Cove Canal (to a height of about +6.0 feet MLG); no back dikes were required. Borrow material for earthen dikes was taken from within the SNWR marsh restoration disposal area.

Result:

Approximately 205 acres of marsh, mud flats, and scrub-shrub habitat were created in the SNWR as a result of this BU effort using about 1,840,600 cubic yards of dredged material.

Notes:

June 2001 transects showed average elevations within the 1993 SNWR marsh creation site of about +1.4 feet MLG across the eastern portion and about +1.05 feet MLG across the western portion. Vegetation along these transects could be broken into three main zones across the placement site. The area nearest the containment dikes along West Cove Canal was densely colonized by *Spartina patens*, and was broken up by a maze of ditches, ponds and waterways. The middle zone was characterized by *Scirpus*, *Distichlis spicata* and *Iva frutescens* shrubs. The zone furthest away from the containment dikes was densely colonized by *Spartina alterniflora* saltmarsh.

1996

Background:

During the 1996 maintenance event (contract DACW29-96-C-0039: May 1996 - January 1997), dredged material from maintenance of the Mile 5.0 to Mile 22.7 reach of the Calcasieu River navigation channel was placed at an approximately 360-acre marsh creation disposal site south of West Cove Canal within the SNWR pursuant to Section 204 of WRDA of 1992. The state of Louisiana was the non-federal sponsor for this project. The SNWR staff and other state and Federal natural resources agencies actively participated in the development of the disposal plan. The SNWR Special Use Permit specified that all work in the SNWR was to be completed by 15 October 1996.

Dredged Material Placement Event:

From 22 September 1996 through 17 October 1996, the cutterhead dredge BEAN placed approximately 1,032,000 cubic yards of material removed from Mile 7.0 to Mile 11.5 of the navigational channel into the SNWR marsh creation disposal site. The initial maximum height of the dredged material slurry was +5.0 feet MLG. Dredged material was initially discharged into the western portion of this disposal site and the effluent was allowed to discharge back into West Cove Canal.

Submerged dredge pipeline was run from the Calcasieu River channel through West Cove Canal and then connected to shore pipeline (approximately 1,840 feet) laid across the top of the

disposal site's northern dike along West Cove Canal. A 30-inch "Y" valve was installed and used to reduce the discharge down to 20 inches by connecting to two lines of 20-inch PVC pipeline (total length of about 2,400 feet). Use of plastic pipeline into the marsh creation disposal site allowed the discharge point to be moved around within the disposal site without having to rebuild line each time.

Shore pipeline placed on top of the northern West Cove Canal dike experienced vibrations caused by the dredge's pumping actions that caused the shoreline to sink into the soft earthen dike. In some places, pipeline sank 3 to 4 feet into the earthen dike. Leaks in the pipeline had to be dug out by shovel and hand, welded close, and dike material replaced. The more the discharge line vibrated, the lower the pipeline sank into the earthen dike. In some spots this action also made the dike settle, which required additional capping of these dike sections, which led to burial of even more pipeline sections. Upon completion of pumping into the marsh creation disposal site, it was decided to temporarily leave approximately 1,200 feet of buried pipeline in place rather than attempting to remove it due to concerns that dike failure could occur, which would then lead to dredged material entering West Cove Canal. Once the marsh creation disposal site had dewatered and settled sufficiently to prevent dredged material from escaping into West Cove Canal, the 1,200-foot section of pipeline would be removed.

Containment and Access:

Beginning on 25 August 1996, containment dikes were constructed along the south bank of West Cove Canal (elevation of about 6.5 feet MLG) and along the east bank of Hog Island Gully. Due to the poor site soil conditions (all borrow material for these dikes came from within the marsh creation disposal site), construction of these earthen dikes was difficult as sections frequently tended to slump to less than design elevations, requiring multiple recapping efforts before achieving the targeted settled elevation.

To facilitate drainage of the marsh creation disposal site prior to discharge of dredged material, two openings were excavated in the northern containment dikes along West Cove Canal to a depth that matched adjacent marsh elevations, and an 8-inch drain pipe was installed in the northwestern corner of this site.

On 28 September 1996, the westernmost gap in the site's northern dike was plugged to prevent dredged material slurry from exiting the disposal site into West Cove Canal. The easternmost opening in the northern dike remained open into West Cove Canal. On 30 September 1996, the easternmost opening in the northern dike was also plugged, forcing all effluent to exit the disposal site into Hog Bayou to the south of the site. Effluent water remained clear in Hog Bayou during the remainder of disposal operations at this site.

In the event that the marsh creation disposal site could not contain all of the dredged material removed from Mile 7.0 to Mile 11.5 of the navigation channel, the refuge personnel gave permission for the preparation of a secondary marsh creation site located on the north side of, and adjacent to, West Cove Canal. Earthen dikes were constructed along the north bank of West Cove Canal from Highway 27 eastward to an old ridge of dredged material. However, on 17 October 1996, disposal operations in the marsh creation disposal site was curtailed due to extremely high tides that raised concerns that drainage of this disposal site would be slowed

down and could result in dike failures and/or poor effluent quality. The secondary marsh creation disposal site was never used under this contract.

Result:

Approximately 360 acres of marsh, mud flats, and scrub-shrub habitat were created in the SNWR as a result of this BU effort using about 1,032,000 cubic yards of dredged material.

Notes:

June 2001 transects showed average elevations within the 1996 SNWR marsh creation site of about +2.2 feet MLG. This site was found to be lightly colonized by high marsh grasses, composites and salt-flat species along transect northern ends (West Cove Canal), and densely colonized by *Spartina alterniflora* saltmarsh at the southern end of these transects.

1999

Background:

During the 1999 maintenance event (contract DACW29-99-C-0050: 30 July 1999 – 12 November 1999), the CEMVN again received Section 204 authority and funding to place dredged material from the Mile 5.0 to Mile 14.2 reach of the navigational channel into an approximately 290-acre area of shallow open water and eroded marsh in the SNWR. The state of Louisiana was the non-Federal sponsor for this project, and the SNWR staff and other state and Federal natural resources agencies participated in the development of the disposal plan. A condition of the refuge Special Use Permit required completion of all work in the refuge, and removal of all equipment, by 15 November 1999.

Dredged Material Placement Event:

From 14 October 1999 through 27 October 1999, the cutterhead dredge GEORGE D. WILLIAMS placed approximately 1,394,015 cubic yards of dredged material removed from the Mile 7.0 to Mile 11.5 reach of the navigational channel into the 1999 SNWR marsh creation disposal site. The elevation of the dredged material slurry was limited to a maximum of about +5.0 feet MLG. A booster pump was required to pump the dredged material from the navigational channel to this disposal site. Initial discharge of dredged material began in the southwestern portion of this marsh creation disposal site approximately 500 feet into the area and angled to the northeast. Although a spreader plate was initially installed on the end of the discharge pipeline to facilitate spreading of the dredged material slurry, the high content of clay being encountered by the dredge made it necessary to move the discharge point several times to prevent dredged material from building above an elevation of +5.0 feet MLG. The discharge site was later moved about 2,000 feet east of the initial discharge site. A marsh backhoe was utilized to reduce elevations in areas where dredged material had built up too high and to create ruts to facilitate flow of the dredged material slurry.

Containment and Access:

Perimeter dikes were constructed to an elevation of +8.0 feet MLG along the north bank of West Cove Canal and on the east and west boundaries of the approximately 230-acre disposal site; a low level dike was constructed to an elevation of +4.5 feet MLG along the northern boundary of the disposal site (about 5,800 feet) to allow some overflow of the dredged material slurry into the

eroded marsh north of this site. Borrow material for earthen dikes was taken from within the SNWR marsh restoration disposal area. Dredged material effluent was drained via spillboxes from the northwest and northeastern sides of this marsh creation disposal site.

The earthen perimeter dike was purposefully breached on the western side of the marsh creation disposal site to allow dredged material to flow into a small shallow open water area ringed by an existing containment dike. Approximately 2 feet of dredged material was allowed to flow into this site, at which time the breach was sealed off. Two other breaches were made to the rear dike such that the dredged material effluent would flow into adjacent marsh rather than into adjacent shallow open water. These rear dike breaches were initially excavated to an elevation of +4.0 feet MLG, but subsequent settling at these breaches resulted in a final elevation of about +3.5 feet MLG and were never rebuilt to the original +4.5 feet MLG elevation.

Result:

Approximately 230 acres of marsh were created in the 1999 SNWR site as a result of this BU effort using about 1,394,015 cubic yards of dredged material.

Notes:

June 2001 transects showed average elevations within the 1999 SNWR marsh creation site of about +2.2 feet MLG. As of June 2001, even though *Spartina alterniflora* was present sparsely, this site remained largely as un-vegetated mudflats just over one and a half years following the cessation of dredged material discharge. However, by 2004, about two thirds of this site had converted to marsh.

2001

Background:

During the 2001 maintenance event (contract DACW29-01-C-0038: 8 May 2001 – 20 January 2002), dredged material was deposited in the SNWR as part of the Sabine Refuge Marsh Creation (XCS-48/SA-1) Coastal Wetlands, Planning, Protection, and Restoration Act (CWPPRA) project. The CWPPRA project paid for the incremental costs to place Calcasieu River dredged material at this approximately 203-acre shallow open water and eroded marsh Cycle 1 SNWR site.

Dredged Material Placement Event:

From 1 January 2002 through 20 January 2002, the cutterhead dredge CALIFORNIA placed approximately 834,416 cubic yards of dredged material from the Mile 11.5 to Mile 14.0 reach of the navigational channel in the SNWR Cycle 1 wetlands development site. Dredged material was placed at this site to a maximum height of about +4.5 feet MLG (with an anticipated final elevation following dewatering and compaction of about +2.5 feet MLG). About 450,000 cubic yards were pumped into the eastern cell (125 acres) to about +4.4 feet MLG slurry height. About 235,000 cubic yards were pumped into the western cell (78 acres) to a maximum elevation of about +4.0 feet MLG slurry height.

Containment and Access:

The Cycle 1 placement site was separated into two cells by an interior dike running north and south constructed to an elevation of about +5.5 feet MLG. North and east perimeter dikes were constructed to a maximum elevation of +6.5 feet MLG. West and south perimeter dikes were constructed to a maximum elevation of +5.0 – 5.5 feet MLG. Borrow material for earthen dikes was taken from within the SNWR marsh restoration disposal area.

A series of interior ditches (trenasses) were excavated prior to discharge of dredged material to a depth of about -5.0 feet MLG and a width of about 25 feet. Trenasses were intended to function as artificial tidal creeks within the Cycle 1 marsh creation site. Trenasse material was placed about 40 feet outside of the cuts and staggered on opposite sides every 500 feet to a maximum elevation of about +5.0 feet MLG.

The interior dike and south perimeter dike were breached at various locations to enhance flow of material to the west cell and towards the overflow weir in the south perimeter dike located at the southwestern corner of the west cell, to allow creation of mud flats outside of the Cycle 1 site, and to prevent a buildup of material in the east cell above elevation +4.5 feet MLG. About 150,000 cubic yards of dredged material were allowed to flow out of the south perimeter dike.

Prior to the start of construction work on this contract, the dredge pipeline access corridor was modified from the original plan to run the pipeline through West Cove Canal into the SNWR Cycle 1 site. Following the dredging contractor's request to modify this access corridor to an alternate route that they had conceived, the CEMVN obtained environmental clearances and landowner permissions to use this new pipeline access corridor. Use of the SNWR Cycle 1 site was delayed by approximately six months while environmental clearances and real estate agreements were obtained.

The new 100-foot wide by 19,350-foot long access corridor for pipeline placement called for temporary pipeline to be laid from the Calcasieu River to the SNWR Cycle 1 site via an overland route. The pipeline extended from the navigation channel at about Mile 13.5, crossing over the existing upland confined disposal areas at Dugas Landing, across the shallow open water area between the Dugas Landing upland confined disposal areas and the bankline, through private property and under Louisiana Highway 27 to reach the northeastern corner of the SNWR to reach the Cycle 1 site. The dredging contractor started construction on the new pipeline access corridor on 31 October 2001, and completed work on 30 December 2001. About 20,850 feet of shore pipeline was used for this BU placement event.

Result:

Approximately 186 acres of marsh were created at the SNWR Cycle 1 site as a result of this BU effort using about 834,416 cubic yards of dredged material.

Notes:

The southern containment dike was degraded about one year after completion of dredged material discharge at the SNWR Cycle 1 site.

Although *Spartina alterniflora* was planted along the inside perimeter soon after the completion of disposal work at this site, *Spartina patens* quickly colonized the interior portions of this site. However, by 2004, this site was dominated by *S. alterniflora*.

An April 2009 elevation survey found that the SNWR Cycle 1 site was characterized by an average elevation of about +2.66 feet MLG.

2007

Background:

During the 2007 maintenance event (contract W912P8-06-C-0192: 25 October 2006 – 29 August 2007), dredged material was deposited in the SNWR as part of the Sabine Refuge Marsh Creation CWPPRA project. The approximately 230-acre SNWR Cycle 3 site was composed of shallow open water and eroded marsh. The CWPPRA project paid for the incremental costs to place Calcasieu River dredged material to the SNWR Cycle 3 site.

Dredged Material Placement Event:

From 12 February 2007 through 31 March 2007, the cutterhead dredge DREDGE 32 placed approximately 828,767 cubic yards of dredged material removed from the Mile 8.3 to Mile 11.8 reach of the Calcasieu River navigation channel into the SNWR CWPPRA Cycle 3 marsh creation disposal site located west of the channel.

Dredged material slurry was pumped into the Cycle 3 site to a maximum elevation of about +4.2 feet MLG at the end of the discharge pipeline (maximum allowable initial elevation +4.5 feet MLG with an expected target elevation following dewatering and compaction of approximately +2.5 feet MLG). From the discharge location, dredged material elevations tapered off to a height of about +2.6 feet MLG, with the slurry reaching a height of about +3.2 feet MLG in the far northwest corner of the Cycle 3 site. Pumping of dredged material was interrupted from 23 February 2007 through 3 March 2007 due to the dredge encountered sandy material that was undesirable for placement in the Cycle 3 marsh creation site.

Containment and Access:

Approximately 8,000 feet of perimeter earthen retention dikes were constructed along the southern and eastern boundaries of the Cycle 3 site to a maximum height of about + 6.5 feet MLG, with a minimum of 1:3 side slopes, and with a 5-foot crown width. Approximately 5,800 feet of low level earthen dikes/weirs were constructed along the western and northern boundaries of the Cycle 3 site to a maximum height of about +3.5 feet MLG. Dredged material was allowed to overflow these low level earthen dikes/weirs to form mud flats on the outside of the Cycle 3 site. Borrow material for dike construction was taken from shallow open water areas located within the Cycle 3 site.

Approximately 41,470 feet of floating and submerged pipeline was used to reach the Cycle 3 site from the channel dredging reach. The pipeline route from the channel to the Cycle 3 site followed West Cove Canal, went around a water control structure, under Highway 27, and through the SNWR Unit 1A impoundment area. Approximately 800 feet of shore pipeline was added at the end of the discharge in the Cycle 3 site. Following completion of dredged material

pumping activities, the overflow dike/weir was also breached every 500 feet to an elevation of about +3.0 feet MLG at the request of the refuge personnel.

Result:

Approximately 180 acres of marsh and mud flats were created at the SNWR Cycle 3 site as a result of this BU effort using about 828,767 cubic yards of dredged material.

During the 2010 Calcasieu River maintenance event, the SNWR Cycle 3 site perimeter dikes were degraded to an elevation of about +2.0 feet MLG to facilitate tidal/fisheries access to the interior of this marsh creation site. In addition, six 50-foot wide gaps were constructed in the perimeter dikes to an elevation of about +1.5 feet MLG. Dike degradation work began on 19 July 2010 and was completed on 30 July 2010 at a cost of about \$55,674.

As of 2010, the dominant vegetation at the SNWR Cycle 3 site was composed of *Spartina alterniflora* and *Salicornia depressa*.

2010

Background:

During the 2010 maintenance event (contract W912P8-09-C-0069: 7 September 2009 – 15 July 2011), dredged material from the Calcasieu River navigation channel was placed in the SNWR at the Sabine Refuge Marsh Creation CWPPRA project Cycle 2 site. The approximately 220-acre Cycle 2 site was composed of shallow open water and eroded marsh. The incremental cost (\$3,935,956 total = \$3,060,956 for dredging & pumping, \$875,000 for dike construction, \$350,000 for staging area preparation) to place dredged material at the Cycle 2 site was authorized and paid for by State surplus funds provided to the Corps as Contributed Funds through the project local sponsor (Lake Charles Harbor and Terminal District).

Dredged Material Placement Event:

From 1 April 2010 to 14 May 2010, the cutterhead dredge G.D. MORGAN placed approximately 1,080,686 cubic yards of dredged material removed from the Mile 8.5 to Mile 10.0 reach of the Calcasieu River navigation channel into the SNWR CWPPRA Cycle 2 marsh creation disposal site located west of the channel.

Approximately 32,050 feet of 30-inch discharge pipeline was used for this project. The dredge was assisted with a booster pump, which was positioned at the mouth of West Cove Canal. The dredge pipeline route consisted of 30-inch sub-line that ran down West Cove Canal to the water control structure, which was converted to 30-inch plastic pipe routed to the north of the water control structure and placed under the Highway 27 “Hog Island Gully” bridge. The pipeline was routed across the SNWR Unit 1A impoundment, across Brown’s Lake, and ending in the Cycle 2 site.

Containment and Access:

Approximately 13,350 feet of perimeter earthen retention dikes were constructed around the Cycle 2 site in 2007 in preparation for its use in 2009-2010. These perimeter retention dikes were constructed to a maximum height of about + 6.5 feet MLG, with a minimum of 1:3 side

slopes, and with a 5-foot crown width. Due to erosion experienced since 2007, some portions of these previously constructed perimeter retention dikes required refurbishment prior to the discharge of dredged material into the Cycle 2 site. Borrow material for dike refurbishment came from shallow open water areas located within the Cycle 2 site.

Approximately 2,850 feet of low level earthen dikes/weirs were constructed along the western boundary of the Cycle 2 site to a maximum height of about +3.5 to +4.0 feet MLG, with a minimum of 1:3 side slopes, and with a 5-foot crown width. This low level dike/weir allowed dredged material to overflow from the Cycle 2 primary discharge site into the adjacent shallow open water secondary discharge site with the intention of creating a habitat mix of mud flats and emergent marsh. Borrow material for dike construction came from shallow open water areas located within the Cycle 2 site.

An additional 2,950-foot retention dike was constructed in shallow open water along the northeastern boundary of Brown's Lake to prevent dredged material from entering this water body. This retention dike was constructed to the same dimensions as the previously constructed earthen perimeter retention dike, and borrow material was taken from Brown's Lake.

Result:

Approximately 282 acres of marsh and mud flats were created in the SNWR as a result of this BU effort using about 1,080,686 cubic yards of dredged material.

BROWN LAKE

1993

Background:

In 1992, the CEMVN designated shallow open water areas in the vicinity of Brown Lake pursuant to Section 404 of the Clean Water Act for the placement of dredged material from maintenance of the navigational channel for wetlands restoration. These areas had been identified as alternatives for the placement of dredged material for beneficial use during development of the Long Term Disposal Plan/Dredged Material Management Plan for the Calcasieu River and Pass, Louisiana, project; however, use of the sites required special authority and funding because placement of dredged material into these sites was beyond the Base Plan.

Prior to the 1993 maintenance of the Mile 5.0 to Mile 22.7 reach, Congress provided authorization and funding for the beneficial use of dredged material in association with maintenance of the navigation project in the Fiscal Year 1993 Energy and Water Appropriation Act. The CEMVN also sought and received authority and funding pursuant to Section 1135 of the Water Resources Development Act (WRDA) of 1986 for the beneficial use of dredged material at Brown Lake. The state of Louisiana was the non-Federal sponsor for the Section 1135 project. Detailed plans for the placement of dredged material at Brown Lake were developed in coordination with state and Federal natural resources agencies, and private land owners.

During the 1993 maintenance event (contract DACW29-93-C-0033: February 26 - August 23, 1993), dredged material from Mile 18.0 to Mile 19.3 was placed at the shallow open water Brown Lake site to restore wetlands. Five (5) contiguous containment cells were constructed on the eastern side of the Brown Lake area: Cell #1 – 39 acres, Cell #2 – 30 acres, Cell #3 – 27 acres, Cell #4 – 28 acres, and Cell #5 – 58 acres. Low level interior dikes were constructed to allow the containment cells to be filled in pairs; dredged material was placed directly into the southeastern portion of Cell #1 and the dredged material slurry was allowed to pass through Cells #2 and #3 until exiting through spill pipes located in the western side of Cell #4. A fifth cell, Cell #5, was constructed as a project modification after the first four cells had already been constructed.

Dredged Material Placement Event:

The cutterhead dredge GEORGE D. WILLIAMS began pumping into Cell #1 on 12 June 1993. By 25 June 1993, dredged material overflowing from Cell #1 into Cells #2 and #3 had achieved elevations of +4.7 feet MLG and +4.5 feet MLG, respectively (about 1.5 to 2.0 feet of freeboard remained for these cells). On the recommendation of the U.S. Soil Conservation Service, discharge into the Brown Lake cells was then halted.

On 17 October 1993, disposal discharge was again initiated in Cell #1 with Cells #2 and #3 sealed off from the remainder of the disposal cells. Dredged material slurry was pumped into Cell #1 and allowed to flow through Cell #5 then into Cell #4 through openings excavated in the separating earthen dikes. Drainage still occurred through the western dike of Cell #4. Combined with settling of the Cell #5 southern dikes during discharge operations, dredged material slurry approached an elevation of about 1 foot below the top of the dikes. This resulted in the contractor halting disposal work at the Brown Lake site on 20 October 1993.

Approximately 756,000 cubic yards of dredged material was discharged into cells 1, 2, 3, 4 and 5 and reached maximum initial elevations of approximately +5.5 feet MLG, +4.7 feet MLG, 4.5 feet MLG, +4.5 feet MLF and 5.0 feet MLG, respectively.

Containment and Access:

Perimeter earthen containment dikes were constructed to a height sufficient (+6.0 feet MLG) to contain the dredged material to a maximum height of +5.5 feet MLG. Low level interior dikes separating each cell were constructed to an elevation of about + 5.0 feet MLG. Borrow material for earthen dikes was taken from within the Brown Lake marsh restoration disposal area. A dike failure on 15 June 1993 in the southwestern portion of Cell #1 caused disposal operations to temporarily be suspended until the containment dike could be repaired. Dike failures and settlement issues were particularly problematic in Cell #1, but also occurred in the other cells during disposal operations.

Between disposal efforts at the Brown Lake disposal site, a new disposal cell (Cell #5) was constructed adjacent to the west side of Cells #1 and #2 and adjacent to the south side of Cell #4. Perimeter earthen dikes for Cell #5 were constructed to an elevation of about +6.0 feet MLG.

A 50-foot wide pipeline/equipment access corridor was designated from the navigation channel at about Mile 18.3 extending overland east from the channel bankline to go under Highway 27,

then across shallow open water and eroded marsh, and ending at the southeastern side of the Brown Lake disposal Cell #1. A flotation access channel was excavated across the area of shallow open water and eroded marsh to a depth of 4 feet and a width of 4 feet to facilitate transportation of discharge pipeline. The contractor used as much as 12,500 feet of pipeline to reach the Brown Lake disposal site from the channel dredging reach.

Result:

1998 aerial photography showed that approximately 31 acres of marsh had been created in Cell #1, approximately 24 acres of mudflats had been created in Cell #2, approximately 8 acres of mudflats and 2 acres of marsh had been created in Cell #3, approximately 4 acres of mudflats had been created in Cell #4, and approximately 43 acres of mudflats and 2 acres of marsh had been created in Cell #5 as a result of this BU effort using approximately 756,000 cubic yards of dredged material.

Notes:

Cell #1 did not begin to re-vegetate extensively until about 1996, following plantings by the National Resources and Conservation Service (NRCS). Cells #2-#5 remained as shallow open water from 1993 to 1999, when additional dredged material was placed in these cells. Cell #1 was connected tidally with surrounding shallow open water areas while Cells #2-#5 were only tidally connected when water levels in this area were high enough to overtop the slowly degrading perimeter and interior low-level earthen dikes. More recently, perimeter dikes in Cells #1 and #5 have been breached by SEMPRA LNG, the new landowner.

1999

Background:

During the 1999 maintenance of the Mile 14.0 to Mile 26.0 reach of the navigational channel (contract DACW29-98-C-0065: 4 January 1999 – 8 July 1999), the CEMVN obtained authority and funding under Section 204 of WRDA 1992 to place dredged material removed from Mile 16.5 to Mile 21.0 at the Brown Lake marsh creation disposal site. The state of Louisiana was the non-federal sponsor for this project and the property manager and other state and Federal natural resources agencies participated in the development of the disposal plan.

Dredged Material Placement Event:

The primary disposal site for this event consisted of four new contiguous containment cells, "A", "B", "C", and "D", constructed on the western side of the Brown Lake site: Cell "A" – 58 acres, Cell "B" – 66 acres, Cell "C" – 56 acres, and Cell "D" – 10 acres. Four of the cells constructed during the 1993 maintenance event, Cells #2, #3, #4, and #5, were specified as a secondary disposal site to be used if the primary disposal site could not contain all of the material from the specified reach.

The dredged material discharge was directed into northernmost Cell "A" and allowed to overflow the low-level internal dikes into Cells "B", "C", and "D", in that order. From 18 May 1999 through 12 June 1999, the cutterhead dredge TOM JAMES placed approximately 1,233,539 cubic yards of dredged material into the primary disposal site before the discharge location was moved to Cell #2 of the secondary disposal site. The dredged material slurry elevations in the

primary disposal site cells were: Cell "A" +6.2 to +6.0 feet MLG; Cell "B" +6.0 to +4.4 feet MLG; Cell "C" +4.1 to +4.0 feet MLG; and Cell "D" +3.9 feet MLG.

From 13 June 1999 through 30 June 1999, approximately 727,100 cubic yards of dredged material was placed into Cell #2 of the secondary disposal site and allowed to flow over low-level interior dikes into Cells #3, #4, and #5. The dredged material slurry elevation in Cells #2, #3, #4, and #5 was limited to a maximum initial elevation of about +6.0 feet MLG. No dredged material was placed in Cell #1 during this maintenance event.

Containment and Access:

Although the contract specified that the perimeter dikes be constructed to a height of +8.0 feet MLG, poor soil conditions at the primary disposal site precluded construction of dikes at Cells "C" and "D" to this height. Perimeter dikes at Cells "A" and "B" were constructed to +8.0 feet MLG; dikes at Cells "C" and "D" were built to +6.5 feet and +6.8 feet MLG, respectively. Low-level internal dikes constructed to +5.0 feet MLG separated the cells in the primary disposal area and allowed effluent to flow from one cell to the next. Borrow material for earthen dikes was taken from within the Brown Lake marsh restoration disposal area.

Result:

Cells A-D:

As a result of this 1999 BU placement effort using about 1,233,539 cubic yards of dredged material, approximately 47 acres of mudflats and marsh were created in Cell "A", approximately 24 acres of marsh were created in Cell "B", approximately 45 acres of mudflats were created in Cell "C", and less than 1 acre of marsh was created in Cell "D". Of the 24 acres of marsh created in Cell "B", about 5.5 acres were used by the NRCS to plant preferred vegetation within a year following completion of disposal at this site.

Elevation transects taken during July 2001 showed average elevations within Cells "A", "B", "C", and "D" of +3.41 feet MLG, +2.55 feet MLG, +2.04 feet MLG, and +1.81 feet MLG, respectively. While the interior of these cells were primarily characterized by shallow open water and un-vegetated mudflats, Cells "A" and "B" did have some sparse vegetation comprised mostly of saltmarsh species (dominated by *Spartina alterniflora* and *Distichlis spicata*).

Aerial photography taken in December 2012 showed that about 48 acres of marsh had developed in Cell "A", about 52 acres of marsh had developed in Cell "B", about 2 acres of marsh had developed in Cell "C", and less than 1 acre of marsh had developed in Cell "D". Cells "C" and "D" remain dominated by shallow open water and mudflats.

Cells #1-#5:

Elevation transects taken during June 2001 showed average elevations within Cells #1, #2, #3, #4 and #5 of +2.24 feet MLG, +3.0 feet MLG, +3.95 feet MLG, +3.57 feet MLG, and +2.68, respectively. While vegetation was relatively sparse in Cells #2, #3, #4, and #5 at the time of these transects, Cell #1 was well vegetated with saltmarsh species (dominated by *Spartina alterniflora* and *Distichlis spicata*).

Following the 1999 placement of about 727,100 cubic yards of dredged material in Cells #2, #3, #4 and #5, aerial photography taken in December 2012 showed that about 131 acres of marsh had developed within the 5 original Brown Lake disposal site cells: 32 acres in Cell #1, 24 acres in Cell #2, 19 acres in Cell #3, 19 acres in Cell #4, and 37 acres in Cell #5.

Notes:

Cell "B" was planted by the NRCS sometime between 2000 and 2002. Natural erosion of earthen dikes around cells "C" and "D", along with some man-made degradation efforts, have resulted in cells "B", "C", and "D" having tidal/fisheries connection with the surrounding shallow open water areas. Cell "A" is only tidally connected when water levels in this area are high enough to overtop the slowly degrading perimeter and interior low-level earthen dikes. Following completion of the 1999 work, refusal by the Brown Lake landowner to allow any further placement of dredged material in, or maintenance of, the existing disposal cells resulted in the CEMVN abandoning the Brown Lake site.

Black Lake

Background:

During the 2010 maintenance event (contract W912P8-09-C-0069: 7 September 2009 – 15 July 2011), dredged material removed from the Mile 18.2 to Mile 14.0 reach of the Calcasieu River navigation channel were deposited by the cutterhead dredge G.D. MORGAN into the Black Lake marsh creation disposal site located west of the channel. The approximately 440-acre Black Lake site was composed of shallow open water and eroded marsh. The incremental cost (\$15,920,415 total = \$14,170,415 for dredging & pumping; \$1,750,000 for dike construction) to place dredged material at the Black Lake site was authorized and paid for by a combination of State surplus funds and Coastal Impact Assistance Programs funds provided to the Corps as Contributed Funds through the project local sponsor (Lake Charles Harbor and Terminal District).

Dredged Material Placement Event:

From 5 July 2010 through 25 October 2010, the cutterhead dredge G.D. MORGAN placed about 3,159,825 cubic yards of dredged material into the Black Lake marsh creation placement site. Dredged material slurry was pumped into the Black Lake site to a maximum initial elevation of about +4.5 feet North American Vertical Datum of 1988 (NAVD 88) with an expected target elevation following dewatering and compaction of approximately +2.5 feet NAVD 88. The Black Lake site was divided into 2 disposal cells of approximately 330 and 110 acres in size. The 330-acre cell was designated as the primary disposal cell to receive dredged material from the Mile 14.0 to Mile 17.0 dredging reach for this marsh restoration project. Construction of the 110-acre secondary cell resulted from increasing the dredging reach targeted for placement of material in the Black Lake site to include the Mile 17.0 to Mile 18.2 reach.

The dredge G.D. MORGAN utilized a maximum of about 56,000 feet of 30-inch dredge pipeline to reach this placement site. A booster pump, stationed at the mouth of Black Lake Bayou, was utilized to assist in pumping dredged material this distance.

Containment and Access:

About 13,500 feet of earthen perimeter dikes were constructed around the primary cell south and east boundaries to a maximum elevation of about +6.5 feet NAVD 88, a crown width of about 10 feet, and side slopes of about 1V:3H on the lake side and side slopes of about 1V:2H on the disposal side. About 13,500 feet of existing earthen dikes along the north and west boundaries of the Black Lake site were refurbished as necessary to achieve a maximum elevation of about +6.5 feet NAVD 88, a crown width of about 5 feet, and side slopes of about 1V:2H. Borrow material for earthen perimeter dikes came from within the Black Lake site. Following completion of disposal activities, project plans called for the earthen dikes to remain until the dredged material became stabilized by emergent vegetation. Following vegetative colonization, any dikes remaining would be breached or degraded as necessary to allow fisheries access into the restored wetland area.

A low level interior earthen weir was constructed in the primary cell aligned in a southwest-to-northeast direction to facilitate flow of the dredged material slurry towards the western side of the cell. Drainage of the dredged material effluent was controlled by a spill box weir placed in the southwest corner of the primary cell such that no effluent entered the historic boundaries of Black Lake.

This secondary cell was constructed to contain material that exceeded the capacity of the primary cell. To facilitate the flow of excess material from the primary cell into the secondary cell, the 4,000-foot earthen perimeter dike that comprised the primary cell southern boundary was constructed to an elevation of about +3.5 to +4.0 feet NAVD 88 to maximize the retention of dredged material in the primary cell while allowing excess material to overflow into the secondary cell. The remaining secondary cell perimeter dikes were constructed to an elevation of +6.5 feet NAVD 88 to prevent dredged material slurry from escaping and entering the adjacent shallow open water areas comprising the historic boundaries of Black Lake.

The dredge pipeline route from the Calcasieu River navigation channel followed Black Lake Bayou westward from its mouth to under the Highway 27 swing bridge, along existing petroleum industry canals, across Alkali Ditch, and finally across a shallow open water area to reach the Black Lake disposal site.

Result:

Approximately 430 acres of marsh and mud flats were created as a result of this BU effort using about 3,159,825 cubic yards of dredged material.