

Attachment D-3
Marine Mammal Protection Act Report

MARINE MAMMAL PROTECTION ACT REPORT

GULF INTRACOASTAL WATERWAY,
BRAZOS RIVER FLOODGATES AND COLORADO
RIVER LOCKS FEASIBILITY STUDY



**US Army Corps
of Engineers** ®



**Texas
Department
of Transportation**

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Acronyms and Abbreviations

| Acronym or Abbreviation | Definition or Meaning |
|-------------------------|--|
| BRFG | Brazos River Floodgates |
| BSE | bay, sound, and estuary |
| CFR | Code of Federal Regulations |
| CRL | Colorado River Locks |
| dB | decibels |
| DMPA | Dredged Material Placement Area |
| ESA | Endangered Species Act |
| FR-EIS | Integrated Feasibility Report and Environmental Impact Statement |
| GARFO | Gulf Atlantic Regional Fisheries Office |

| Acronym or Abbreviation | Definition or Meaning |
|--------------------------------|---------------------------------------|
| GIWW | Gulf Intracoastal Waterway |
| H&H | hydrology and hydraulics |
| LF | linear feet |
| MMPA | Marine Mammal Protection Act |
| μPaRMS | micro-Pascal root-mean square |
| NAVD88 | North American Vertical Datum of 1988 |
| NEPA | National Environmental Policy Act |
| NMFS | National Marine Fisheries Service |
| ODMDS | ocean dredged material disposal sites |
| OSP | optimum sustainable population |
| PBR | potential biological removal |
| SONAR | Sound Navigation and Ranging |
| TxDOT | Texas Department of Transportation |
| U.S. | United States |
| USACE | U.S. Army Corps of Engineers |

1.0 INTRODUCTION

The United States Army Corps of Engineers (USACE), in cooperation with the Texas Department of Transportation (TxDOT) Maritime Division, is conducting a feasibility study to investigate improvements to the Gulf Intracoastal Waterway (GIWW), Brazos River Floodgates (BRFG) and Colorado River Locks (CRL) facilities that would reduce navigational difficulties, delays, and accidents occurring as tow operators transit the BRFG and CRL structures and across the Brazos and Colorado Rivers. As part of the Feasibility Study, the USACE has prepared an integrated Feasibility Report and Environmental Impact Statement (FR-EIS) in compliance with the National Environmental Policy Act (NEPA), USACE regulation ER-200-2, 33 Code of Federal Regulations (CFR) 230, the Flood Control Act of 1970 – Section 216, and other Federal, state, and local environmental policies and procedures.

This Marine Mammal Protection Act (MMPA) report was prepared to provide information regarding the project's potential impacts to marine mammals for review by the National Oceanic and Atmospheric Administration National Marine Fisheries Service (NMFS). Only one marine mammal species, the common bottlenose dolphin (*Tursiops truncatus*), is likely to occur in the BRFG and CRL study areas. The common bottlenose dolphin is not listed as threatened or endangered under the Endangered Species Act (ESA).

NMFS identifies four endangered whale species of potential occurrence in the Gulf of Mexico: the fin whale (*Balaenoptera physalus*), humpback whale (*Megaptera novaeangliae*), sei whale (*Balaenoptera borealis*), and sperm whale (*Physeter macrocephalus*). These whale species are generally restricted to deeper offshore waters (NMFS 2017); therefore, it is unlikely that any of these four species would venture into the study areas, and the project is expected to have no effect on whale species. Whale species are not considered further in this report.

The West Indian manatee (*Trichechus manatus*), which is listed as threatened under the ESA, has also been recorded along the Texas coast; however, occurrences in Texas are extremely rare, and the potential for them to occur in the BRFG and CRL study areas is low. As a result, the proposed project is expected to have no effect on the West Indian manatee, and manatees are not considered further in this report. Manatees are fully addressed in the ESA Biological Assessment that has been prepared for the project and submitted to the NMFS under separate cover.

1.1 Background Information

The GIWW is a shallow-draft navigation channel that extends from Brownsville, Texas, to the Okeechobee waterway at Fort Meyers, Florida. The authorized channel in the GIWW is 125 feet wide and is typically about 12 feet deep. The GIWW is an essential component of the transportation network of Texas and the nation, reducing congestion on highway and rail systems, thereby decreasing maintenance costs and extending the life of these transportation systems. Compared to truck or rail transport, the use of barges to transport goods produces fewer air emissions, is more fuel-efficient, and provides a safer mode of transportation. The GIWW is also used by the commercial fishing industry and for recreational activities such as fishing, skiing, sightseeing, and traveling long distances in the protected waterway (TxDOT 2016).

The BRFG and CRL are two lock-type structures on the GIWW located about 40 miles apart on the upper to mid-Texas coast, in Brazoria and Matagorda Counties, respectively (**Figure 1**). They were initially installed in the early 1940s to prevent heavy sediment loads in the Brazos and Colorado Rivers from entering the GIWW. The structures are over 60 years old and were installed at a time when most tug boats pulled barges behind them, rather than using the modern pushing method. At each facility, the gate openings are 75 feet wide, which is narrower than the 125-foot-wide GIWW navigation channel. Although regulations restrict the width of tows to 55 feet, oversize tow permits are routinely granted for tows as wide as 108 feet, particularly along the upper Texas coast (TxDOT 2016). To move these wider tows through the BRFG and CRL, vessel operators must park the tows, break the barges apart, move them through the locks in smaller sets or individually, and reconnect the tows on the other side. This process, known as “tripping,” is inefficient and causes delays that result in substantial costs to the towing industry each year (TxDOT 2013). In addition to the narrow gates, high flows in the Brazos and Colorado Rivers make navigation through the BRFG and CRL structures more difficult and result in temporary navigation restrictions and/or closures imposed by the USACE and United States (U.S.) Coast Guard. These restrictions and closures result in additional delays and economic impact to the towing industry.

1.2 Structure of this Report

Section 2.0 of this report provides a description of existing conditions in the study areas. Section 3.0 summarizes the alternatives considered and the Recommended Plan. Marine mammal species of potential occurrence in the study areas are described in Section 4.0. Section 5.0 discusses the potential effects of the Recommended Plan on marine mammals.

2.0 ENVIRONMENTAL BASELINE

2.1 Location

As described above, the BRFG and CRL are located about 40 miles apart on the upper to mid-Texas coast, in Brazoria and Matagorda Counties, respectively (**Figure 1**). For each facility, existing environmental conditions were evaluated within a study area that encompasses the maximum disturbance area for the reasonable alternatives. The BRFG study area encompasses roughly 600 acres and extends along the GIWW 1 mile east and west of the Brazos River crossing and up to 0.5 mile along the Brazos River north and south of the GIWW crossing (**Figure 2**). The CRL study area encompasses roughly 400 acres and extends along the GIWW 1 mile east and west of the Colorado River crossing and up to 0.25 mile along the Colorado River north and south of the GIWW crossing (**Figure 3**). Under the reasonable alternatives, all construction activities and associated direct impacts would occur within these study areas. Potential impacts to marine mammals are also expected be limited to these study areas.

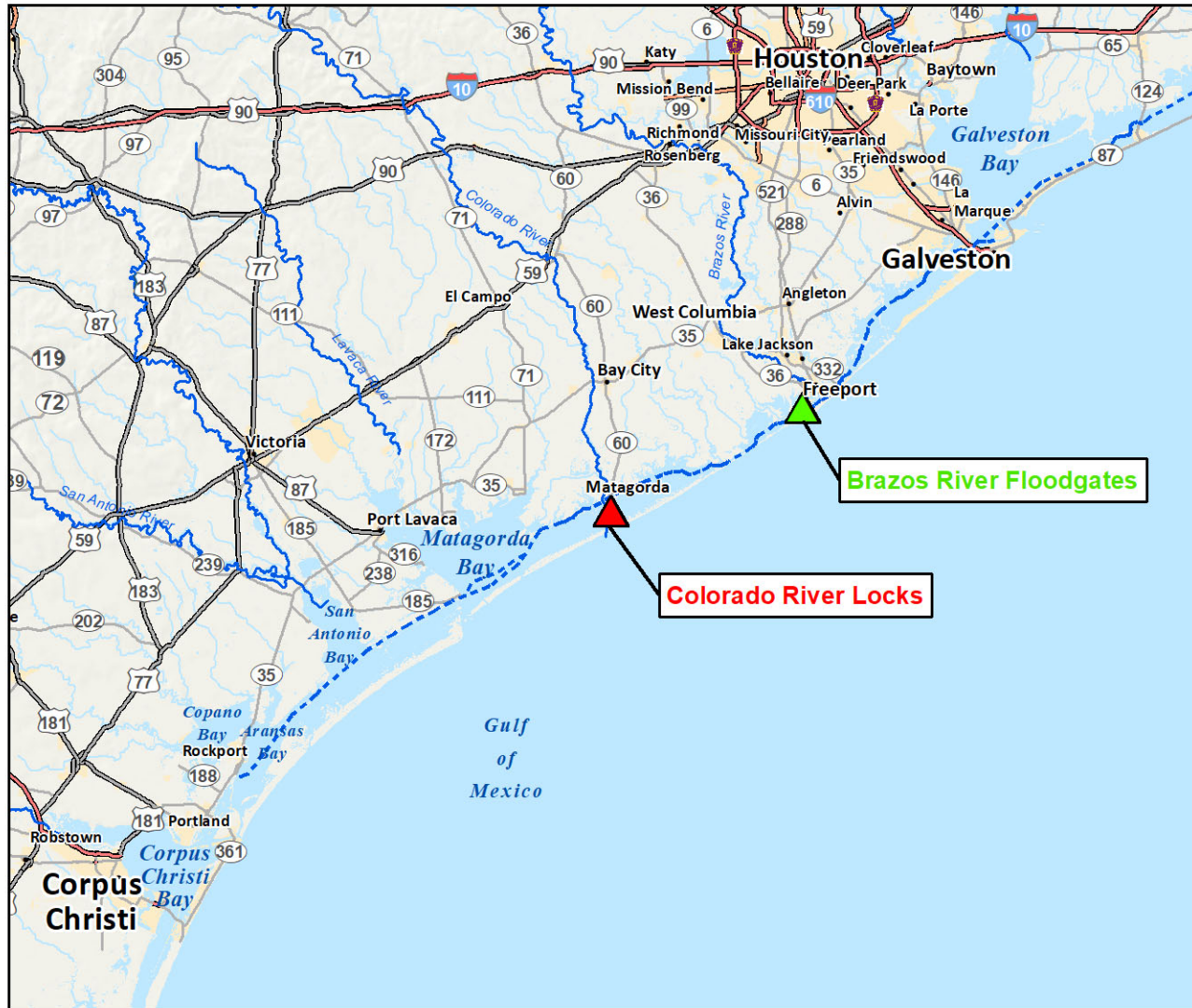
2.2 Overview of Study Areas and Marine Habitats

Based on aerial photograph review and field reconnaissance, the BRFG and CRL study areas are largely undeveloped, with open water, emergent marsh, and upland shrub/woods being the major land cover types (**Figures 2 and 3**). Some livestock grazing occurs within these areas. Commercial navigation is a major land use in both study areas, represented by the GIWW, BRFG and CRL facilities and access roads, and



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Project Location Brazos River Floodgates and Colorado River Locks



Legend

- ▲ Brazos River Floodgates
- ▲ Colorado River Locks
- - - Gulf Intracoastal Waterway
- ~ River



1:2,000,000

0 10 20 40 Miles

Base Map: ESRI

Location Map



Figure 1 Project Location



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Land Use/Land Cover Brazos River Floodgates Study Area

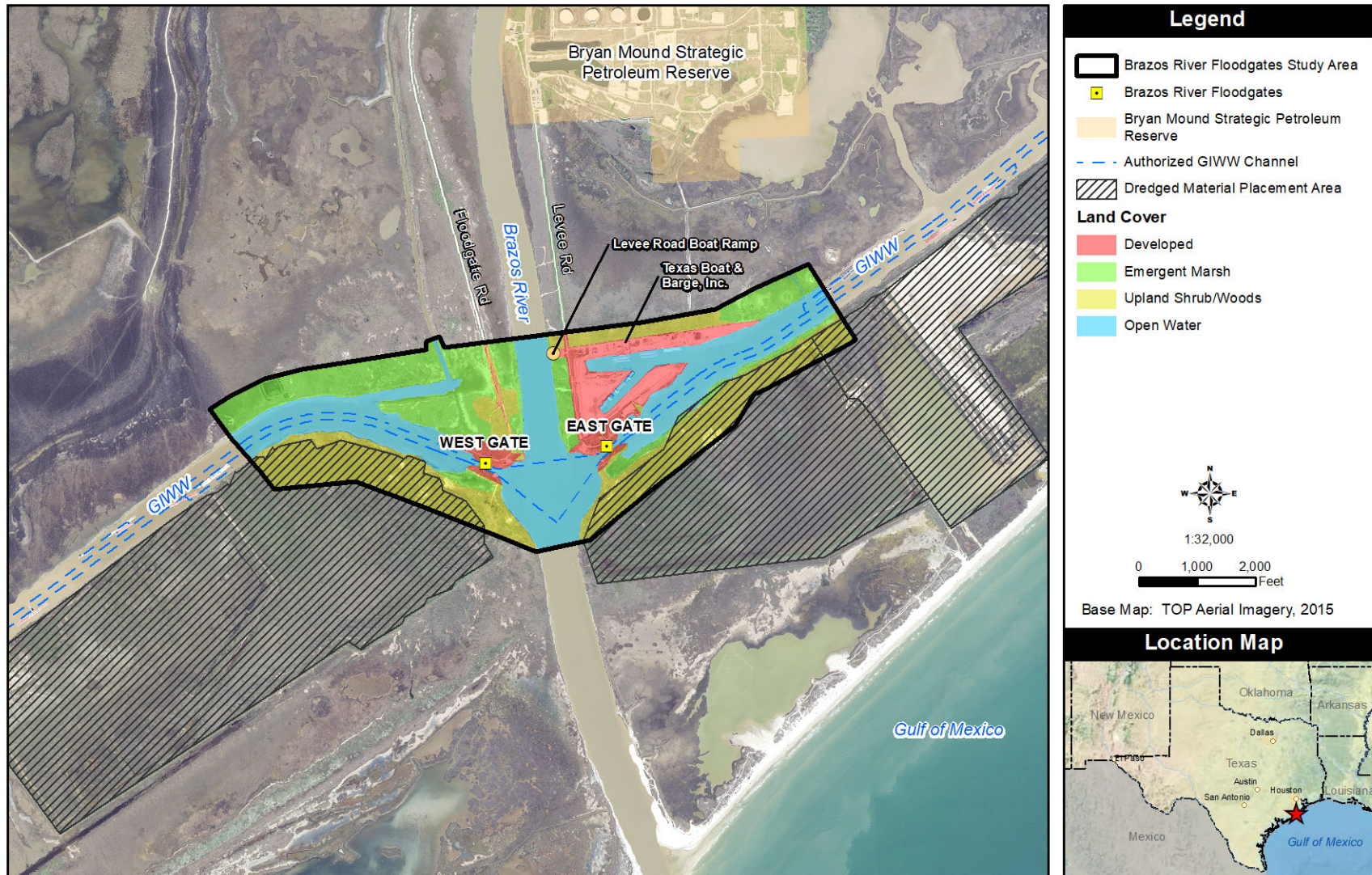


Figure 2 BRFG Study Area and Land Use/Land Cover



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Land Use/Land Cover Colorado River Locks Study Area

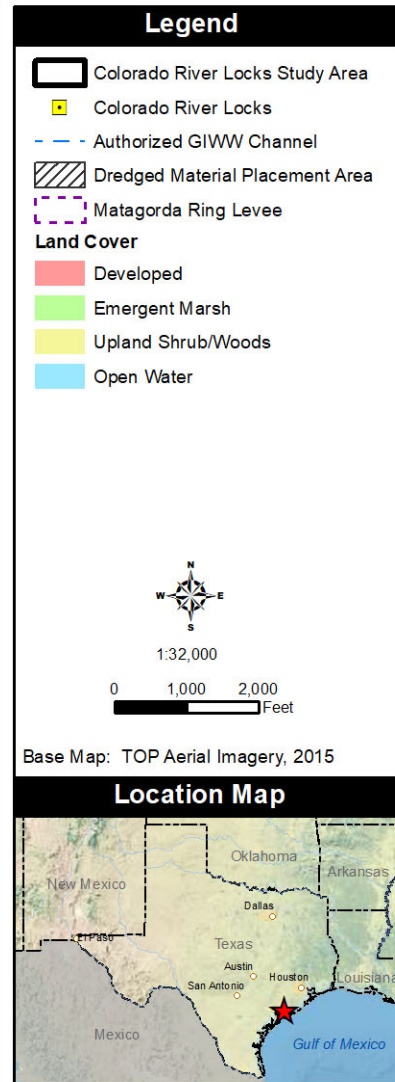
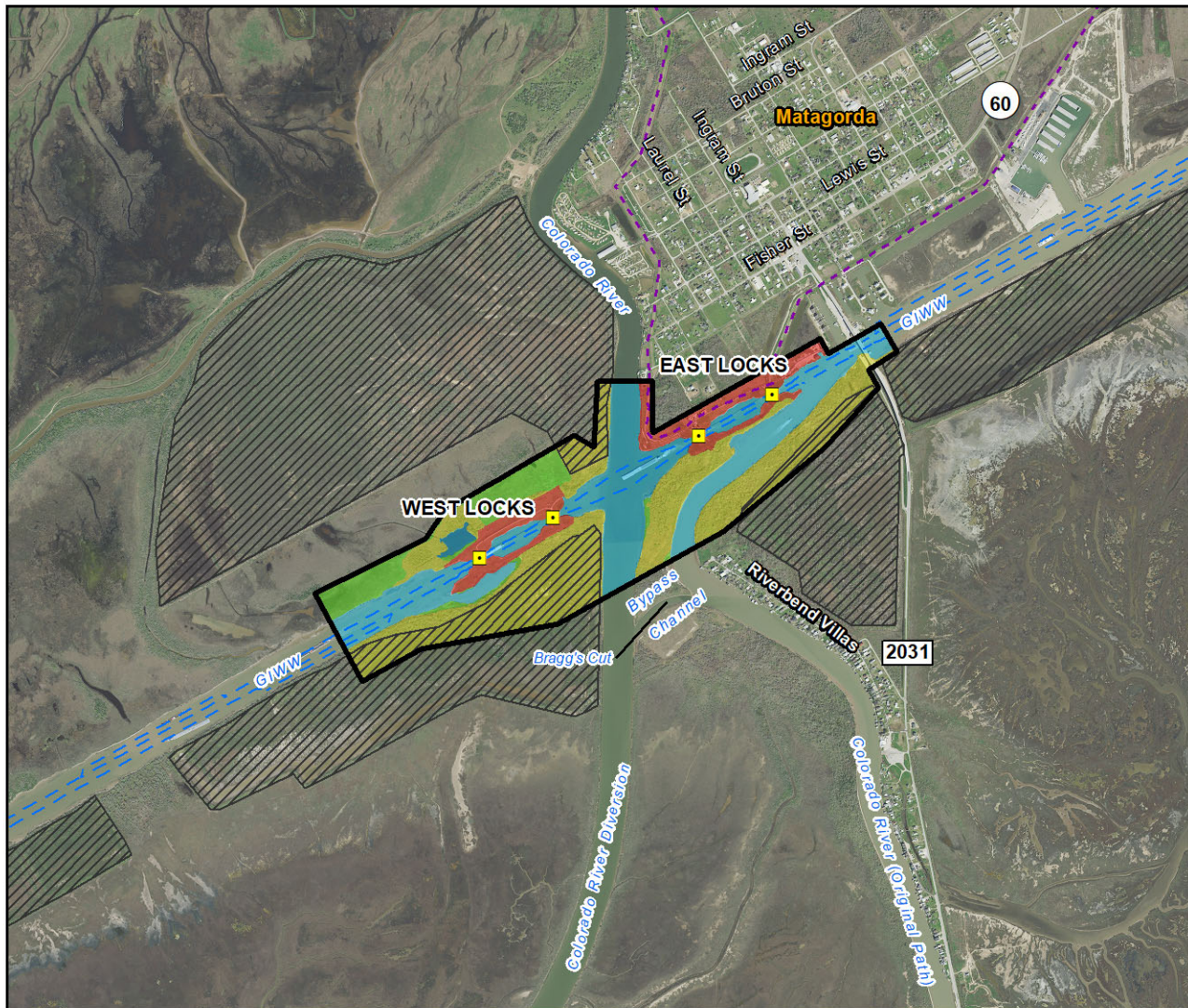


Figure 3 CRL Study Area and Land Use/Land Cover

existing dredged material placement areas (DMPAs) along the GIWW. Developed areas in the BRFG study area include Texas Boat and Barge, Inc., which is a barge storage, cleaning, maintenance, and repair facility located adjacent to the east floodgate. Nearby, the U.S. Department of Energy’s Bryan Mound Strategic Petroleum Reserve, one of two Federal strategic petroleum reserve sites in Texas, is located about 1 mile north of the east floodgate (**Figure 2**). At the CRL facility, residential areas lie to the northeast of the facility in the town of Matagorda and to the south of the facility along the east bank of the original Colorado River channel (**Figure 3**). The area surrounding the study areas is also relatively undeveloped, although the City of Freeport lies northeast of the BRFG facility, and the town of Matagorda lies northeast of the CRL facility. Much of the surrounding undeveloped areas contain coastal bays and marshes, with upland coastal prairie and some cropland occurring further inland.

Habitats that could be used by marine mammals include open water habitats in the GIWW and Brazos and Colorado Rivers, which account for 35 to 36 percent of the study areas. The GIWW has an authorized channel depth of 12 feet. At the river intersections, the open water depths are up to 20 feet or more. Most of the open water habitat experiences regular disturbances by barge tows and other vessels traveling through the GIWW, as well as periodic maintenance dredging and flooding. Open water habitats in the study areas do not contain seagrass beds or other unique habitat types. Estuarine emergent wetlands (intertidal marsh and high marsh) are located along the GIWW and Colorado and Brazos River throughout the study areas.

3.0 SUMMARY OF ALTERNATIVES CONSIDERED AND RECOMMENDED PLAN

3.1 Summary of Alternatives Considered and Recommended Plan Identification

The FR-EIS describes the alternatives that were evaluated for the project, but the alternatives are also summarized here for reference. Early on in alternatives development, the USACE and TxDOT identified a number of alternatives that involved various measures to improve navigation through the BRFG and CRL facilities. Through multiple screening efforts, the USACE and TxDOT narrowed the reasonable alternatives to the No Action Alternative and five Action Alternatives at the BRFG facility, and the No Action Alternative and three Action Alternatives at the CRL facility. In an effort to minimize environmental impacts, the disturbance areas associated with the reasonable alternatives are located in and adjacent to the existing GIWW, BRFG, and CRL facilities. The USACE and TxDOT further evaluated these alternatives through hydrology and hydraulics (H&H) modeling, economic analysis, and environmental analysis to identify a Recommended Plan at each facility. **Table 1** lists the alternatives, provides a general overview of each alternative, and provides an estimated area that would be affected by the alternative.

Table 1. Summary of BRFG and CRL Alternatives Considered

| Alternative | Alternative Overview | Recommended Plan? ² |
|--------------------------|--|--------------------------------|
| BRFG Alternatives | | |
| No Action | No improvements would be made to the BRFG facility. Normal maintenance activities would continue. | No |
| 2a | <u>Rehab Existing Facilities</u> – Rehabilitate existing floodgates, guide walls, and other infrastructure; no major changes to overall footprint, orientation, operations, or bathymetry; H&H and salinity modeling and analysis assume conditions would be the same as existing. | No |

Table 1. Summary of BRFG and CRL Alternatives Considered

| Alternative | Alternative Overview | Recommended Plan? ² |
|-------------------------|---|--------------------------------|
| 3a | <u>Gate Relocation on Existing Alignment</u> – Move floodgates farther from Brazos River along existing GIWW alignment; widen chamber wall opening from 75 feet to 125 feet wide. | No |
| 3a.1 | <u>Open Channel West/East Gate Relocation</u> – Similar to Alternative 3a but only includes a new east floodgate; removes west floodgate, leaving an open channel on the west side of the river. | Yes ² |
| 9a | <u>Open Channel</u> – Remove floodgates and excavate an open channel north of the existing GIWW alignment to straighten this section of the GIWW. | No |
| 9b/c | <u>New Alignment/Gates with Control Structures</u> – Excavate new channel north of existing GIWW alignment and construct 125-foot-wide floodgates on the new channel. Alt. 9c includes a flow control structure at existing west gate location, while Alt. 9b does not. | No |
| CRL Alternatives | | |
| No Action | No improvements would be made to the BRFG facility. Normal maintenance activities would continue. | No |
| 2a | <u>Rehab Existing Facilities</u> – Rehabilitate existing locks, guide walls, and other infrastructure as needed; no major changes to overall footprint, guide wall orientation, gate operations, or bathymetry; H&H and salinity modeling/analysis assume conditions would be the same as existing. | No |
| 3b | <u>Open Channel</u> – Remove existing locks, creating an open channel through the intersection at the GIWW. | No |
| 4b.1 | <u>Removal of Riverside Gates</u> – Remove riverside gates, converting the locks to floodgates. | Yes ² |

¹ BRFG Alternative 2a and CRL Alternative 2a would rehabilitate the existing facilities within existing footprints.

² The Recommended Plan presented in the February 2018 DIFR-EIS was BRFG Alternative 3a.1 and CRL Alternative 4b.1.

The Recommended Plan that was presented to the public for review in the February 2018 DIFR-EIS included implementing Alternative 3a.1 (Open Channel West/East Gate Relocation) at the BRFG facility and Alternative 4b.1 (Removal of Riverside Gates) at the CRL facility. At the BRFG facility, the Recommended Plan consisted of (1) removing the existing floodgates, (2) constructing a new 125-foot-wide floodgate on the east side of the river (along the existing GIWW alignment and set back approximately 1,000 feet from the river), and constructing a minimum 125-foot-wide open channel (no floodgate) on the west side of the river crossing. At the CRL facility, the Recommended Plan consisted of the removal of the existing river side sector gate structures and rehabilitation of the existing GIWW side sector gate structures.

3.2 Refinement of the Recommended Plan

In consideration of public comments and further discussions with the navigation industry, the USACE and TxDOT refined the Recommended Plan at each facility. First, the GIWW alignment at both facilities was shifted to the south of the existing alignment in order to maintain operation of the existing structures during construction. This refinement was made in response to concerns that the originally proposed temporary bypass channel, which would have remained open during the entire 1 to 2 years of anticipated construction, would result in excessive sedimentation and maintenance dredging costs in the GIWW and Freeport Channel during that period. Second, at the CRL facility, the Recommended Plan was refined to remove all

four existing gate structures and construction a new 125-foot-wide gate on each side of the river. The following sections describe the refined plans at each facility.

3.2.1 Refined Plan at the BRFG

At the BRFG, the main features of the Recommended Plan are the removal of the existing gates on both sides of the river crossing, the construction of a 125-foot-wide open channel (no gate structure) on the west side of the river, and construction of a new 125-foot-wide sector gate structure on the east side of the river. **Figure 4** shows the refined plan at the BRFG. Detailed drawings are provided in **Attachment 1**. The centerline of the GIWW through the BRFG area would be shifted 300 feet south of the existing centerline, allowing the existing floodgates to remain in operation until the new channel and west floodgate are completed. The open channel on the west side of the river will have a bottom width of 125 feet and bottom depth of -12 feet NAVD88. The new 125-foot-wide sector gate on the east side of the river will be set back approximately 1,300 feet from the existing gate structure, providing increased safety and efficient vessel operation through the crossing. Construction of the open channel and new sector gate at the BRFG will take approximately two years to complete, if adequate funding is provided. Assuming one contract, the general construction sequence will include the following:

- Dredge the new channel alignment on the west and east sides of the river, leaving a plug at the existing floodgates to maintain separation between the new channel and the river.
- Construct the new gate structure, guidewalls, and end cells on the east side of the river.
- Excavate the plugs at the river, and complete dredging of the new channel.
- Transfer navigation traffic to the new GIWW channel and gate structure.
- Decommission existing floodgates, demolish the southern gate leaf on both sides of the river, and build levee access to the new gate structure.
- Complete final site work, including grading, parking, and support buildings.

Anticipated pile-driving activities associated with the proposed BRFG plan are outlined in **Table 2**.

Table 2. Anticipated Pile-Driving for the BRFG Recommended Plan

| Project Component | Pile Size | Pile Type | Number of Piles | Hammer Type | Water Depth (meters) |
|---------------------------|-----------|------------------|-----------------|-------------|----------------------|
| Gate Structure Foundation | 24" | Steel Pipe | 246 | Impact | < 5 |
| Guidewalls | 13" | Timber Piles | 96 | Impact | < 5 |
| End Cells | 18" | Steel Pipe | 120 | Impact | < 5 |
| | 20" | PS 31 Sheet Pile | 930 LF | Impact | < 5 |
| Needle Girder Storage | 24" | Concrete | 60 | Impact | 0 (on land) |
| Reservation Buildings | 13" | Timber Piles | 272 | Impact | 0 (on land) |



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Brazos River Floodgates - Refined Alternative 3A.1

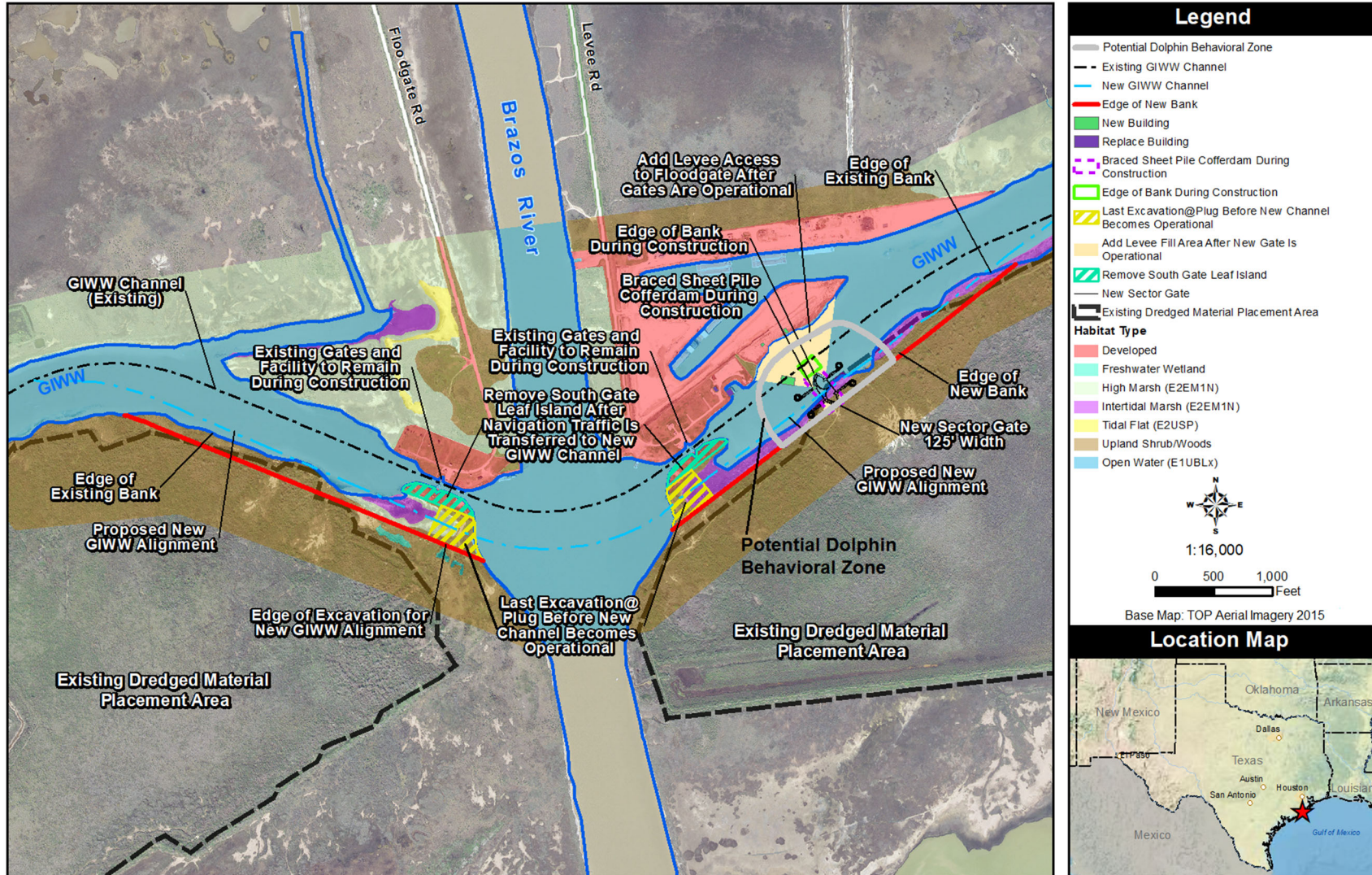


Figure 4 BRFG Refined Alternative 3a.1

3.2.2 Refined Plan at the CRL

At the CRL, the main features of the Recommended Plan are the decommissioning of all four existing gate structures and the construction of a new 125-foot-wide sector gate structure on the east and west sides of the river. **Figure 5** shows the refined plan at the BRFG. Detailed drawings are provided in **Attachment 1**. The centerline of the GIWW through the CRL area would be shifted 260 feet south of the existing centerline, allowing the existing lock structures to remain in operation until the new channel and gates are completed. The new channel will have a bottom width of 125 feet and bottom depth of -12 feet NAVD88. Construction of the new CRL facility will take approximately two years to complete, if adequate funding is provided. Assuming one contract, the general construction sequence will include the following:

- Dredge the new channel alignment on the west and east sides of the river, leaving a plug to maintain separation between the new channel and the river.
- Construct the new gate structures, guidewalls, and end cells on each side of the river.
- Excavate the plugs at the river, and complete dredging of the new channel.
- Transfer navigation traffic to the new GIWW channel and gate structures.
- Decommission the existing lock facilities, demolish the southern gate leaf at each gate, and build levee access to the new gate structures.
- Complete final site work, including grading, parking, and support buildings.

The new CRL gate structures will be the same general dimensions as the new BRFG gate structure, so pile-driving activities associated with the proposed CRL plan are expected to be double the anticipated pile-driving at the BRFG (**Table 3**).

Table 3. Anticipated Pile-Driving for the CRL Recommended Plan

| Project Component | Pile Size | Pile Type | Number of Piles | Hammer Type | Water Depth (meters) |
|----------------------------|-----------|------------------|-----------------|-------------|----------------------|
| <i>West Gate Structure</i> | | | | | |
| Gate Structure Foundation | 24" | Steel Pipe | 246 | Impact | < 5 |
| Guidewalls | 13" | Timber Piles | 96 | Impact | < 5 |
| End Cells | 18" | Steel Pipe | 120 | Impact | < 5 |
| | 20" | PS 31 Sheet Pile | 930 LF | Impact | < 5 |
| <i>East Gate Structure</i> | | | | | |
| Gate Structure Foundation | 24" | Steel Pipe | 246 | Impact | < 5 |
| Guidewalls | 13" | Timber Piles | 96 | Impact | < 5 |
| End Cells | 18" | Steel Pipe | 120 | Impact | < 5 |
| | 20" | PS 31 Sheet Pile | 930 LF | Impact | < 5 |
| Reservation Buildings | 13" | Timber Piles | 272 | Impact | 0 (on land) |
| Flow Separator | 22" | PZ-22 Sheet Pile | 500 | Vibratory | < 5 |



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Vegetation/Wildlife Habitats Affected Colorado River Locks - Refined Alternative 4b.1

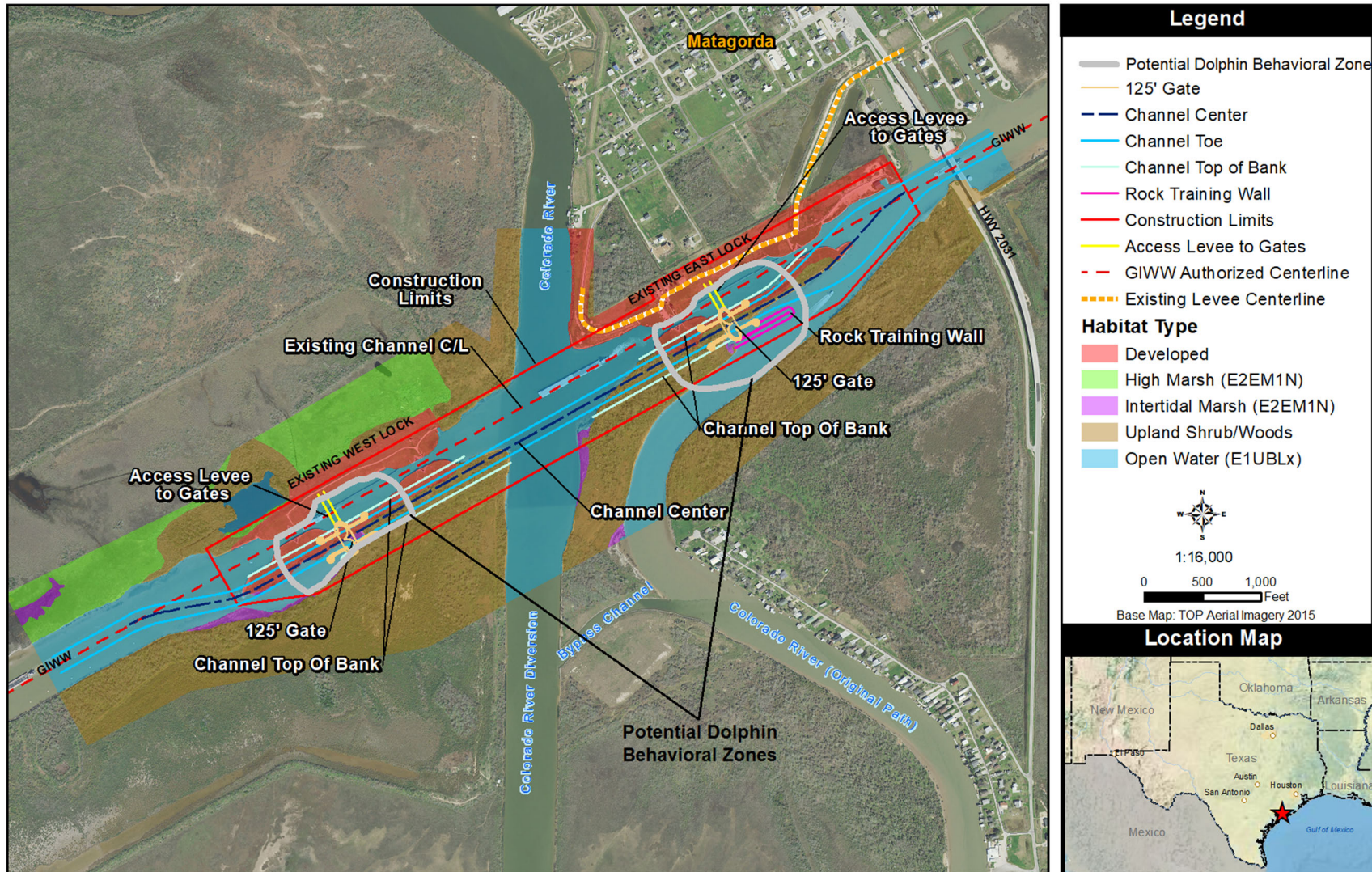


Figure 5 CRL Refined Alternative 4b.1

4.0 MARINE MAMMALS OF POTENTIAL OCCURRENCE

The only marine mammal species that is expected to occur in the BRFG and CRL study areas is the common bottlenose dolphin. Other cetaceans that occur in the Gulf of Mexico inhabit areas over the continental shelf or beyond (20 meters or deeper water) (Deepwater Horizon Natural Resource Damage Assessment Trustees 2017) and are not expected to enter inshore waterways such as the GIWW and Brazos and Colorado Rivers. In addition, occurrence of the West Indian manatee in Texas is extremely rare, and the potential for a manatee to occur in the BRFG and CRL study areas is very low.

4.1 Status of Common Bottlenose Dolphins

Common bottlenose dolphins are distributed throughout the Gulf of Mexico, including associated bays, sounds, and estuaries, and are not listed as threatened or endangered under the ESA. According to the 2016 Stock Assessment for the Northern Gulf of Mexico Bay, Sound, and Estuary Stocks (BSE), distinct stocks of bottlenose dolphins have been delineated in 31 areas of inshore waters adjacent to the Gulf of Mexico, which includes seven areas on the Texas coast (NMFS 2017). The NMFS is in the process of developing individual stock assessment reports for each area, and stocks/stock boundaries may be combined, further divided, or revised as more information becomes available.

Current population estimates and population trends for the Texas BSE stocks are not known; as a result, the status of BSE stocks relative to the optimum sustainable population (OSP), and the potential biological removal (PBR) level are unknown. Because most of the stock sizes are not known, the NMFS considers each of the BSE stocks to be strategic under the MMPA; however, it is likely that small and relatively few mortalities and serious injuries exceed the PBR level (NMFS 2017).

Bottlenose dolphins have been documented to reside in Texas bays and associated channels year-round (Gruber 1981, Fertl 1994, Maze and Würsig 1999) and could travel through the BRFG and CRL study areas anytime during the year. Occurrence of dolphins in the study areas is expected to be temporary and limited to sporadic travel of small groups through the area.

5.0 EFFECTS OF THE RECOMMENDED PLAN

The Marine Mammal Protection Act (MMPA) was enacted in 1972 and prohibits the “take” of marine mammals in U.S. waters and by U.S. citizens on the high seas, as well as the importation of marine mammals and marine mammal products into the U.S. (NOAA 2017c). Take, as defined by the MMPA, means “to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal” (16 United States Code 1362). Although taking of marine mammals is prohibited, the NMFS can issue incidental take authorizations for activities that may unintentionally take marine mammals, such as harassment from sonar and noise-producing activities (e.g., military sonar activities, oil/gas development, geophysical surveys, pile-driving, and demolition using explosives).

Under the MMPA (1994 amendments), harassment is statutorily defined as any act of pursuit, torment, or annoyance which (1) has the potential to injure a marine mammal or marine mammal stock in the wild (known as Level A harassment) or (2) has the potential to disturb a marine mammal or marine mammal

stock in the wild by causing disruption of behavioral patterns but which does not have the potential to injure a marine mammal or marine mammal stock in the wild (known as Level B harassment).

The proposed construction at the BRFG and CRL facilities will temporarily disturb open water habitats, as well as fill some open water areas and dredge other open waters. The modification of open water habitats and temporary increases in turbidity that may occur are not expected to result in substantially affect bottlenose dolphins, especially considering the frequent disturbances that occur from daily barge traffic.

Noise and Vibration

The proposed construction at each facility will result in temporary increases in noise levels in the study areas. Primarily, underwater noise from the proposed pile-driving activities outlined in **Tables 2 and 3**, above, has the potential to result in harassment of bottlenose dolphins if they are in the study area during construction. No blasting or sonar is anticipated during construction.

To estimate noise pressure levels resulting from proposed pile-driving activities, the USACE used the NMFS Greater Atlantic Regional Fisheries Office (GARFO) publicly available model (NMFS 2016), which was developed by NMFS as an in-house tool for assessing potential effects on federally listed species from elevated levels of underwater sound produced during pile driving. For cetaceans, the GARFO model considers behavioral thresholds of 160 decibels (dB) re 1 micro-Pascal root-mean square (µPaRMS) for impulsive noises (such as pile driving using impact hammers) and 120 db µPaRMS for non-pulse noises (such as pile driving using vibratory hammers). The GARFO model predicts the distance to those behavioral thresholds from pile driving activities, depending on pile type and size, hammer type, and water depth.

Table 4 identifies the proxy projects in the GARFO model that were used to estimate underwater noise from the proposed pile-driving activities at the BRFG and CRL facilities. **Table 5** summarizes the proxy-based estimates for underwater noise anticipated from pile driving. **Table 6** provides estimated distances to cetacean behavioral thresholds resulting from pile-driving activities that may occur at the BRFG and CRL under the Recommended Plan. *Note that in some cases, actual sound levels should be lower because the “proxy” used in GARFO involved larger pile size than is proposed.* The estimated noise levels for all proposed pile types exceed the behavioral thresholds for cetaceans; the distance to the behavior thresholds range from 30 to 107 meters.

Table 4. Proxy Projects for Estimating Underwater Noise from the Recommended Plan

| Project Location | Water Depth (meters) | Pile Size (inches) | Pile Type | Hammer Type | Attenuation Rate (dB/10 m) |
|----------------------------------|----------------------|--------------------|----------------|------------------|----------------------------|
| Rodeo, CA – San Francisco Bay | 5 | 24 | Steel Pipe | Impact | 3 |
| Alameda, CA – San Francisco Bay | 2-4 | 12-14 | Timber | Cushioned Impact | 5 |
| Stockton, CA – San Joaquin River | 3-4 | 20 ¹ | Steel Pipe | Impact | 3 |
| Not Available | 15 | 24 ² | AZ Steel Sheet | Impact | 5 |
| Not Available | 15 | 24 ² | AZ Steel Sheet | Vibratory | 5 |

¹ 20” steel pipe used as a proxy; actual pile size proposed for the end cells is 18”.

² 24” AZ steel sheet used as a proxy; actual sheet pile size/type proposed for the end cells is 20” PS-31 sheet pile.

Table 5. Proxy-Based Estimates for Underwater Noise

| Type of Pile | Hammer Type | Estimated Peak Noise Level (dB _{Peak}) | Estimated Pressure Level (dB _{RMS}) | Estimated Single Strike Sound Exposure Level (dB _{sSEL}) |
|---------------------------------|------------------|--|---|--|
| 24" Steel Pipe | Impact | 203 | 189 | 178 |
| 12-14" Timber | Cushioned Impact | 180 | 170 | 160 |
| 20" Steel Pipe ¹ | Impact | 208 | 187 | 176 |
| 24" AZ Steel Sheet ² | Impact | 205 | 190 | 180 |
| 24" AZ Steel Sheet ² | Vibratory | 175 | 160 | 160 |

¹ 20" steel pipe used as a proxy; actual pile size proposed for the end cells is 18".

² 24" AZ steel sheet used as a proxy; actual sheet pile size/type proposed for the end cells is 20" PS-31 sheet pile.

Table 6. Estimated Distances to Cetacean Behavioral Thresholds from Pile-Driving Activities

| Project Component | Pile Size and Type | Hammer Type | Distance (m) to 160 dB RMS (behavior for impulsive noise) | Distance (m) to 120 dB RMS (behavior for non-pulse noise) |
|---------------------------|---------------------------------|------------------|---|---|
| Gate Structure Foundation | 24" Steel Pipe | Impact | 106.7 | 86.7 |
| Guidewalls | 12-14" Timber | Cushioned Impact | 30.0 | 18.0 |
| End Cells | 20" Steel Pipe ¹ | Impact | 100.0 | 80.0 |
| | 24" AZ Steel Sheet ² | Impact | 70.0 | 58.0 |
| Needle Girder Storage | 24" Concrete | Impact | NA (on land) | NA (on land) |
| Reservation Buildings | 12-14" Timber | Impact | NA (on land) | NA (on land) |
| Flow Separator | 24" AZ Steel Sheet ² | Vibratory | NA | 90.0 |

¹ 20" steel pipe used as a proxy; actual pile size proposed for the end cells is 18".

² 24" AZ steel sheet used as a proxy; actual sheet pile size/type proposed for the end cells is 20" PS-31 sheet pile.

Figures 4 and 5 show the maximum area where estimated noise levels from pile driving may exceed behavioral thresholds for cetaceans. Although estimated noise levels exceed behavioral thresholds for cetaceans and could result in harassment of bottlenose dolphins if they come within the distances outlined in **Table 6**, dolphins are expected to avoid the areas during construction. If needed, and in final consultation with NMFS, appropriate measures would be incorporated to minimize effects of pile driving on bottlenose dolphins. Also if needed based on final consultation with NMFS, the USACE would obtain an incidental harassment authorization from the NMFS prior to commencement of pile-driving activities.

6.0 REFERENCES

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ATTACHMENT 1
ENGINEERING DRAWINGS OF PROPOSED PLANS