Block 18: Nature of Activity

The restoration activity will consist of two main actions. The first will be to create a system of levees across the Nelda Stark Unit of Lower Neches Wildlife Management Area to act as containment infrastructure for the beneficial use of dredge material. The second will be placing new work and maintenance dredge material beneficially to restore soil elevations within the area to a level that will support submerged aquatic and emergent wetland plants. Soil surface elevations will range from -0.8 ft. NAVD 88 in ponds and shallow open water areas, and within emergent marsh areas not to exceed +1.6 ft. NAVD 88, the mean higher high water mark measured at the tide gauge at Rainbow Bridge on the Neches River. Levees will be constructed using amphibious excavators to excavate, stack and shape in situ soils to form the levees. New work dredge material also may be used to construct levees if it is available at the time of construction. Levees will be allowed to stand for 2-4 weeks so that soils can dewater sufficiently to hold transplanted wetland vegetation. Vegetation will be planted to provide protection against erosion on the slopes of levees before beneficial use activities can begin.

Containment levees will be constructed from in situ soils along the boundary of Nelda Stark Unit as shown in Lower Neches WMA Restoration Sheet 3 of 10. Amphibious excavators will be used to stack and shape levees to specification. New work dredge material also may be used to construct levees if it is available at the time of construction. Levees will be overbuilt sufficiently to compensate for settlement. Borrowing for construction of the levees will occur to the interior of the cells so that the borrow areas can be filled with dredge material during the second major action of the project. New levees will form a nearly closed cell, or be connected with existing levees constructed during past oil field operations to form a nearly closed cell pattern. Dimensions of the levees will be 35 feet toe to toe, 10 feet at the crown, and have a final elevation of +3.0 feet NAVD 88. Side slopes will be 1:5 rise:run on the interior levees, 1:7 rise:run on ring levees to form ponds, and 1:7 rise:run on both slopes of exterior levees to reduce the erosive impact of waves striking the levee slopes. All levees will be planted with species of native wetland plants after being allowed to solidify for a minimum of 2 weeks. Gaps with a baffle configuration will be left in the levees to act as decant structures and to allow exchange of tidal waters and marine organisms between the cells and surrounding waters. Gaps will be 20-40 feet wide and left at the existing bottom elevation. Gaps will remain open to allow decant water to exit the cell during beneficial use placement operations and closed only if the beneficial use dredge material threatens to escape. At that time, temporary measures to control silt will be put into place. Once the dredge material has consolidated, these gaps will promote exchange of tidal waters and allow the formation of tidal channels and access for marine organisms. Small channels will be allowed to form between the main channels and ponds, but it is not the intention of this restoration project to have all ponds become tidal. To increase diversity of habitats, an effort will be made to keep some ponds isolated except for tidal exchange that occurs during tides that exceed the elevation of the marsh.

A series of shallow ponds within cells will be defined by creating a ring levee having an interior acreage of 1-5 acres each. These rings will have spaces prior to beneficial placement of dredge material to allow for access by marine organisms to the interior of the ring. Prior to placement of dredge material, the spaces will be closed with in situ soils to the same cross section and elevation, or slightly lower elevation, as the surrounding terraces. The intent is not to completely

seal off the pond from receiving dredge material, but to regulate the volume of dredge material entering into the pond so that the elevation of the pond bottom increases enough to create surface water of 12-24 inches in depth after dredge material has consolidated. In addition to planned ponds, some areas of larger shallow water may be created by varying the amount of beneficial use material placed within units or subunits such that bottom elevation is below mean sea level. In doing so, such areas may become mudflat habitat on low tides and shallow water habitat on high tides, thereby increasing habitat diversity within the project area.

The goal of this project is to provide an opportunity for smaller dredging projects to economically and beneficially dispose of dredge material by reducing the costs that would be incurred in constructing the levees needed to contain material while it is placed and consolidates. This goal requires placement of beneficial use material within the project site over several years to obtain the required soil elevation to support emergent wetland plants. Dividing cells into smaller units and subunits will allow these smaller dredging projects to stack material to the required depth more efficiently than if the material was placed within the larger cell. Multiple discharges into a unit or subunit may be required to obtain required soil elevation. Each unit will have an estimated volume of dredge material that it is able to hold. An accounting of the volume of dredge material placed during each placement will be maintained by TPWD, as well as the estimated remaining volume for the unit. The accounting of dredge material will act as a guide for TPWD in the placement of dredge material, but should not be considered the final arbiter of placement into a cell or unit. The success of a marsh restoration project is determined by achieving the necessary soil elevation to foster the growth of desired marsh vegetation, not by volume of material placed in an area. Therefore, TPWD requests the flexibility to place more material into a unit of the restoration area than what is estimated that unit can contain if final elevations have not been achieved by the time the estimated volume of material has been placed. This difference may arise because, for example, beneficial use materials compressed the underlying soils to a degree greater than anticipated.

All dredge material will be tested and will not exceed contaminant levels set by Texas Commission on Environmental Quality or USACE. If contaminant levels exceed acceptable levels TPWD will not approve its use in the restoration project. Dredge material will be placed by standard methods (e.g., hydraulic dredge or from a hopper dredge).

Block 19: Project Purpose

The project is to restore approximately 1,000 acres of emergent marsh within the Bessie Heights Marsh area that has degraded to shallow open water between the 1950s and today. Restoration will be accomplished by creating levees, and associated structures coupled with beneficial use of dredge material from multiple dredging projects to restore soil elevations sufficiently to support submerged aquatic and emergent wetland plants. Restoration of the emergent plant community will occur within the existing constraints of an operating oil field, and hydrology and salinity created by conditions within and along the Sabine Neches Waterway.

Aerial photography from the 1930s show this area to have been primarily emergent marsh with little naturally occurring surface water. Historic accounts describe the area being a nearly impenetrable stand of Jamaican saw grass (*Cladium jamaicensis*) growing on an organic soil

under fresh to intermediate salinity levels. By 1938, several canals had been cut through the marsh to develop the oil and gas field. Soils dredged from the canals were side cast along the canals and created an effective barrier from saline waters in the canals that came from the Sabine Neches Ship Channel. These levees along the canals prevented deterioration of the fresh to intermediate marsh while they remained intact. After Hurricane Carla, the levees along the canals eroded, allowing salt water to infiltrate the surrounding marshes. The salinity within the marsh exceeded that which the emergent vegetation could tolerate, and the plants began to die. As they did, the fragile organic soils were washed away, leaving a deeper layer with more clay content that was constantly inundated by water. The loss of soils happened too quickly for more salt tolerant plants to become established. Surface subsidence from mineral and ground water extraction contributed to the loss of surface elevation as well.

The Texas Bureau of Economic Geology reported that in 1956, the area from Rose City marsh to Old River Cove consisted of 15,740 acres of wetlands, but by 1978 marsh loss had reduced the acreage to 6,330. Nearly all of the emergent vegetation within the Bessie Heights Marsh had disappeared during this time. At present, within the 1,000 acre project site, only about 85 acres of restored marsh formed in 2004-05 by a joint effort among TPWD, SNND, and USACE, a field of man-made terraces, and several remnant levees remain.

Prior to development of the Sabine Neches Waterway, Bessie Heights marsh received hydrologic inputs from flooding of the Neches River, surface runoff and drainages from surrounding uplands, and direct inputs from precipitation. Salinity was determined by these inputs, with little salt influence before the navigation channel was dredged. Dredging of the river resulted in two major changes to hydrology. The first was an increase in salinity within the river as salt water from the Gulf made its way up the channel. The second is formation of placement areas along the shore that restrict inputs from the river primarily to the Bessie Heights Canal, a secondary canal to the south, and exchange with the river from remnant bayous, canals, and openings that directly enter the broken marsh to the south of the project area (Figure A). These conditions result in salinity within the marsh being determined primarily by salinity of water in the navigation channel. The project area continues to receive inputs from surrounding uplands and directly from precipitation, but the influence on salinity from these sources is exceeded by that from the Sabine Neches Waterway. Because of this constraint, restoring the plant species found in the pre-development plant community is not likely. Restoration efforts for the plant community will focus on establishing species of native submerged aquatic and wetland plants adapted to the intermediate to brackish range in salinity that is more typical of the project site at present.

Current wildlife value within the Bessie Heights marsh is constrained to the 2004-2005 restoration project where the edge habitat created under water lends itself to increased fisheries use. Otherwise, the area is devoid of useful wildlife habitat. Likewise, the lack of shallow emergent wetlands and the subsequent lack of emergent vegetation severely reduce the wetlands ability to dissipate storm surge energy during hurricanes and the ability to filter storm water runoff and trap suspended sediments thus decreasing the quality of the water flowing into Sabine Lake. During the construction of the levees and the subsequent deposition of beneficial use material, there is potential for a loss in wildlife use of the area due to increased boat and equipment traffic and a slight decrease in water quality due to fine silt escaping through the

decant barriers. If this occurs, Texas Parks and Wildlife will take the appropriate steps to contain the silt within the deposit areas utilizing appropriate best management practices.

Once the restoration is complete, a significant increase in wildlife habitat is expected as is evidenced by the level of use by wildlife of the 85-acre restored area. The increase in shallow emergent wetlands will provide valuable habitat for waterfowl, marsh and waterbirds, aquatic organisms, and multiple other wetland dependent species. Restored emergent grasses will provide foraging and nesting habitat for secretive marsh birds as well as nesting habitat for waterfowl. Shallow open water habitat provides foraging and brood rearing habitat for waterfowl as well as estuarine habitat for multiple aquatic species which, in turn, feed multiple species of waterbirds. Once the levees are brought down to marsh level and water is allowed to flow over the wetlands, an increase in water quality should be seen downstream due to the filtration qualities of emergent wetlands.

Block 20: Reasons for Discharge

Both in-situ clay and off site clay will be deposited to build the levees needed to contain the beneficial use material until it has settled to its final elevation. The in-situ clay will be dug from the interior of the cells so that the borrow areas will refill with beneficial use material during the second major action of the project. As availability of space in the federal placement areas becomes more restrictive, private companies needing to dispose of dredge material may bring in clays from off site in order to build levees of units into which they intend to dispose of maintenance dredge material.

Beneficial use material will be deposited within the leveed off areas in order to raise the interior elevation to that needed support germination, vegetative reproduction, and growth of emergent plants. These materials will be deposited over multiple years through multiple small dredging projects until the proper elevation is reached.

Block 23: Description of Avoidance, Minimization, and Compensation

Marsh restoration in this area will require placing fill material over the existing benthic region. While benthic organisms found in the existing bottom substrate at the time of construction will be covered, the newly deposited material will provide a sufficient source for benthic colonization and Texas Parks and Wildlife anticipates recolonization to occur quickly. Along with this, the footprint of construction at any one time will be small in comparison to the total are of the Bessie Heights Marsh. Once the newly deposited material has consolidated and revegetated, the quantity of interior and edge habitat available for fish and wildlife will increase greatly.

For these reasons, Texas Parks and Wildlife believes this project is self-mitigating and does not require alternate forms of compensation for the temporary impacts.