

Mitigation Plan - Laguna Shores Rehabilitation - Segments 1, 2, and 3

1) Goals and Objectives

The proposed mitigation plan for unavoidable impacts of filling approximately 1.12 acres of 404 Waters and approximately 0.2 acres of Section 10 Waters of the U.S. (.07 for roadway, and .134 for the living shoreline breakwater), as well as dredging .07 acres of wetlands (1.39 acres total) to offset unavoidable impacts caused by the raising and widening of Laguna Shores Road and upsizing of culverts. The least environmentally damaging practicable alternative was reached through avoidance and minimization, with ecological considerations and reasonable costs influencing the selection of the preferred alternative. The on-site mitigation is proposed to as a "watershed approach." Specifically, the proposed mitigation for impacts involves the hydrologic restoration of 9.75 acres of an open water freshwater pond, Redhead Pond, adjacent to the project site. (See Redhead Pond Mitigation Exhibits)

Due to nuisance tides, re-routing of stormwater, and sea level rise, Redhead pond has been converted from a vital freshwater source for many wintering duck and shorebird populations to a brackish/saline water pond which has almost no duck usage these days. The extreme hydrological shifts on a seasonal basis and lack of a permanent connection has rendered Redhead Pond to a much lower value body of water, for either salt water or fresh water characteristics.

History

Redhead Pond was created in the 1940's by the excavation of approximately a 9.75 acre area supposedly for fill for adjacent projects (*A Management Plan for Redhead Pond*, TPWD). The 37 acre tract was purchased from Dr. Beverly Held by the Nature Conservancy (TNC) in 1990, and then TNC conveyed the property to Texas Parks and Wildlife Department (TPWD) while retaining a conservation easement. The property was acquired with the purpose to protect and enhance wintering waterfowl habitat and wetland natural resources. The northern section of Redhead Pond, where the proposed improvements are to occur, is currently owned by Tracy Duncan, a copasetic landowner.

2) Mitigation Site Selection

The mitigation site was selected due to several factors. Proximity to the proposed impacts of raising and widening Laguna Shores being first and foremost and the mitigation can be considered "on site." The need for hydrologic restoration in the area is also paramount and a stated goal in the Management Plan. Agency support, namely from the owners, TPWD and Tracy Duncan, is also high due to lack of funding, smaller size of the tract compared to other TPWD holdings, and distance from other TPWD managed areas. In addition, the site was selected as it is being influenced by the same factors that are causing the purpose and need of raising the road, namely flooding and saltwater intrusion.

3) Mitigation preservation sites protection

The majority of the site is already preserved by the TPWD as a wildlife management area, and also by a permanent conservation easement that is held by TNC. These have been filed as permanent dedications in the Nueces County record files in perpetuity. The northern portion of Redhead Pond (Tracy's tract) is wetlands, and is protected by the Clean Water Act.

4) Baseline Conditions

The wetlands that are adjacent to primarily segments 1 and 2 of Laguna Shores have long been disturbed by the construction of the road, as well as constant disturbance from vehicular traffic going off the edge of the road. Erosion on segment 1 adjacent to the road on the east side is on the order of 60-70 feet over time. Storm and nuisance tides, and the resulting erosion are threatening the road base, hence the proposed pilot living shoreline project. A majority of the wetlands adjacent to the road in segment 1 are unvegetated sand flat that has a variety of hydrologic regimes due to the raised road acting as a dam for both sides.

A hydrology and hydrologic (H&H) study was completed during the early stages of design for the new road, and it was determined that the current culverts crossing Laguna Shores are undersized and causing impoundment of flood and storm water. Raising the road would require the widening of the four mentioned drainage channels.

The shoulders of the current road vary between asphalt fill for slopes, to some unvegetated flats, to wetlands that grow up to the edge of the current road. A wetland delineation was completed as a component of the overall application.

Historically there have been stormwater infrastructure re-routes in the area that have changed the drainage patterns over time and are negatively influencing Redhead Pond. Drainage improvements with the reconstruction of Waldron Road shunted some of the stormwater that had flowed to the east now flow to the south to the Van Galen drainage and away from Redhead. There is also an 18" stormwater drain from the Flour Bluff Independent School District (FBISD) property (Jr. High area) that moves water from the track area, east down Gadwell, and then into the outfall drainage on the north side of Gadwell. This drainage infrastructure is shunting stormwater away from Redhead Pond into the adjacent Beasley pond/ditch. In addition, this stormwater drain is also inadequate for the area it is expected to drain, and this causes flooding in the adjacent neighborhood on Oakdale Street.

A second perpendicular culvert under Gadwell Road on the north end of Redhead pond connects it to the Beasley pond and drainage, which drains into but also exchanges salt water with the Laguna Madre through a set of culverts under Laguna Shores Road. During the 2018 season and recently (spring and fall 2019), there have been many instances of "nuisance tides" (Dr. Philippe Tissot, per. Comm.) which have resulted in water levels that have exceeded the upper outfall pipe elevation under Gadwell. This has resulted in waters from the Laguna Madre flooding into Redhead Pond. Salinities measured 15ppt in November 2018, and then 20ppt in January 2019, despite a higher-than-normal amount of rainfall during that period.

The hypersaline waters from the Laguna Madre flooding into Redhead Pond has converted Redhead pond from a vital freshwater source for wintering duck and shorebird populations to a brackish/saline water pond which has little usage these days. The extreme hydrological shifts on a seasonal basis and lack of a permanent connection has rendered Redhead Pond to a lower value body of water, for either salt water or fresh water characteristics. The proposed mitigation will include the replacement of the existing culvert under Gadwell. In addition, this will help prevent flooding of about a half dozen houses along the adjacent Oakdale Street.

5) Determination of Mitigation Requirements

The widening and raising of Laguna Shores road, upsizing the drainage channels at the O'Neill, Beasley, Van Galen, and Yorktown culverts, and fill for the living shoreline component will impact 1.39 acres of wetland areas (see Table 1 below). The living shoreline breakwater and marsh fill of .134 acres is included as impact, although it could be considered a restoration component outside of the mitigation ratio. The proposed mitigation is the restoration of previously impaired adjacent wetlands through a watershed approach. Restoration of a Category II wetland is general accepted at a 1:1 ratio. (Category II wetlands can be important for a variety of wildlife species and can be critical for the watershed depending on where they are located. In contrast to Category I wetlands, Category II wetlands do not provide critical habitat for any T&E species or species of concern. Generally these wetlands are pristine, not fragmented; common but more productive and sustain higher biodiversity compared to Category III wetlands.) The proposed mitigation is 9.75 acres of hydrologic restoration to 1.39 acres of impact to wetlands, both vegetated and non-vegetated. This would indicate that a 1:1 mitigation ratio is 7 acres of mitigation to 1 acre of impact (7:1). If the Category I ratio of 2:1 is used, this would result in 3.9 acres of mitigation to 1 acre of impact, which still exceeds the minimum mitigation ratio (~4:1). The USACE will determine what level of mitigation is acceptable.

Table 1 – Impacts from Widening Segments 1, 2, and 3 and drainage channels

	Segment 1 (sf)	Segment 2 (sf)	Segment 3 (sf)	Total (sf)
Section 10 (fill)	6690	274	207	7171
Section 10 (dredge)	0	660	0	660
Section 10 (matting)	1016	854	3	1873
Section 404 (fill)	129	2614	56	2799
Section 404 (dredge)	0	2090	0	2090
Section 404 (matting)	739	1697	65	2501
Mud Flat (fill)	548	0	0	548
Mud Flat (matting)	716	0	0	716
Riprap (fill)	417	1395	437	2249
Sand Flat (fill)	404	2519	2941	5864
Sand Flat (matting)	1261	0	1072	2333
Vegetation (fill)	5681	11663	7541	24885
Vegetation (dredge)	0	287	0	287

Vegetation (matting)	206	980	4142	5328
Wingwalls (fill)	490	731	123	1344
Total (sf)	12460	25764	16587	60648
Total (acre)				1.392

6) Mitigation Work Plan

The proposed work plan is the re-establishment of the stormwater flows into Redhead Pond from the adjacent Oakdale neighborhood, as well as from the FBISD property. This will involve the removal of an inadequate storm water system and construction of approximately 540 feet of open concrete lined ditch in the 30' utility easement, an intake structure with wingwalls, and 480 feet of 8' by 3' reinforced concrete box (RCB). The terminal end of the RCB will also be placed on the south side of Gadwell in the same footprint as the existing culvert on that side. If requested, a set of roughness baffles ("dragons teeth") may be added. This will restore approximately 9.75 acres of freshwater habitat, which is critical to wintering ducks and other local shorebirds and wildlife. A similar restoration project has already been accomplished on a nearby pond (corner of Graham Road and Laguna Shores) through the reestablishment of stormwater flows. This has resulted in extremely high usage numbers of ducks in the short time that flows have been restored.

The freshwater may also influence the surrounding wetlands. There may be some restoration of unvegetated salt flats to brackish and fresh water vegetation and natural revegetation as a result of the hydrologic restoration. There are pockets of leafy three-square, bulrush, cattails and salt meadow cordgrass in the area that may re-establish and expand over time. The pond was historically ringed with cattails, but the high salinities have extirpated all freshwater vegetation from the area. The proposed mitigation plan may restore over 9 acres of habitat in addition to the 9.75-acre freshwater pond, however the habitat restoration of the adjacent marsh is not included in the mitigation computations due to uncertainty of rainfall amounts.

Living shoreline component

The City of Corpus Christi has partnered with the Corpus Christi Metropolitan Planning Organization (MPO) in support of the Laguna Shores Living Shoreline project that will be located along segment 1 near the intersection of Graham. The intent of the project is to provide shoreline protection to reduce erosion to the adjacent road. The project is part of a Federal Highway Administration (FHWA) pilot program to deploy nature-based shore protection features to increase the resilience of roadways in extreme weather.

The City proposes to construct a low-crested stone breakwater, consisting of approximately 160 cubic yards of graded riprap within a 0.134-acre footprint. The riprap will be placed on geotextile filter fabric and fill of 160 cubic yards will be placed between the breakwater and shoreline at elevations conducive to salt marsh plants, which are expected to naturally recruit. See attached exhibits.

The proposed low-crested breakwater will have a crest width of 4 feet and set to an elevation of approximately 3 feet NAVD. The front and back slopes to the breakwater will be constructed at

approximately a 1.5:1 slope and extend to a bottom elevation of approximately -1.0 ft NAVD. Elevations of the marsh vegetation area behind the breakwater will range from approximately 0.75 feet to 1.25 feet NAVD to create an area suited for settlement by salt marsh vegetation.

Impacts

A majority of the mitigation activities will occur in uplands. The RCB pipe placed at the end of the drainage in the current roadway (Gadwell) for the freshwater restoration will remain in the existing culvert footprint for no net change. A set of roughness baffles ("dragons teeth") may be added if requested. This will include a small amount of fill, but still well within mitigation ratio requirements. The existing perpendicular culvert under Gadwell to be removed is in uplands.

The proposed hydrologic restoration will occur through improvements to the existing stormwater system. In addition, this will help prevent flooding of about a half dozen houses along the adjacent Oakdale Street, for an ancillary positive benefit.

The H&H study determined that the culverts at the O'Neill, Beasley, Van Galen, and Yorktown ditches all need to be upsized in order to prevent impoundment of storm water. These impacts are included in the impact table above.

The living shoreline component could be considered a restoration or conversion of habitats, however it is included as an impact of 0.134 acres of impact included in the mitigation ratio.

7) Maintenance Plan

No planting is proposed as the mitigation is hydrologic restoration in nature. The only maintenance is for the City of Corpus Christi to monitor that the storm water system is functioning properly. The City of Corpus Christi has an Indefinite Delivery/Indefinite Quantity Program (IDIQ) that is ongoing and is funded yearly through the Engineering Department that will ensure any potential future costs for maintaining the mitigation/restoration system. The scope of the IDIQ program includes, but is not limited to; rehabilitation and/or replacement of manholes, curb inlets, and storm water pipes or box culverts by open cut installation methods, well pointing, cleaning and televised inspection of conduits, and other stormwater pollution prevention plans/permit compliance (SWPPP). Once constructed, the infrastructure will become a part of this program that is inspected on a regular basis to ensure that it is operating correctly, and any maintenance that is needed in the future.

In addition, inspection of the property will also continue as completed by both the TPWD, and the Friends of Redhead Pond. They will provide feedback to the owners of the infrastructure (City of Corpus Christi) regarding the function of the restored stormwater system.

The breakwater is expected to have a lifespan of at least 20 years, without the need for maintenance. The marsh behind the living shoreline is expected to vegetate naturally, and as no planting is proposed, no maintenance is proposed.

8) Performance Standards

Performance standards are observable or measurable physical, chemical, and/or biological attributes that are used to determine if a compensatory mitigation project meets its objectives. The functional capacity of Redhead Pond as a freshwater wetland has been altered over time due to changes in freshwater inflows and saltwater intrusion. Current USACE performance standards are primarily related to vegetation with little standards for evaluation of hydrologic regimes. The proposed mitigation will restore freshwater inflows, however as no historical data regarding salinity is available, no analysis regarding pre- or post- construction can be performed. While there is an expectation of hydrology to affect biology through hydraulic mitigation, the geomorphology and physiochemical parameters cannot be assessed meristically or by data analysis. In addition, while there are standard monitoring programs for stream restoration and marsh restoration, there is not a specific, accepted standard monitoring program for hydrologic/salinity regime restoration. A similar hydrologic project was recently completed adjacent in a similar area, but the history and hydrologic regimes of the two project vary in regards to their connection (or lack thereof) with the Laguna Madre, that data or comparison between the two would not result in a pertinent analysis.

Performance standards will include monitoring conducted by the City of Corpus Christi as required by the Texas Commission on Environmental Quality (TCEQ) as the City operates a Municipal Separate Storm Sewer System (MS4). An MS4 stormwater system does not connect with a waste water collection system or treatment plant. In order to maintain its MS4 designation, storm water quality is required to be tested and maintained. The City has previously designated Redhead Pond as a sampling station, and will include salinity in their monitoring efforts. These reports can be sent to the USACE or other agency upon request. Performance standards are expected to include the reduced salinity of Redhead Pond; however, as rainfall is unpredictable, monitoring of Redhead Pond may have varied results.

One of the simplest and most assured performance standards of the goal of reducing salinities is to increase wintering waterfowl usage of the freshwater. Yearly monitoring of waterfowl can occur if required by the USACE, although anecdotal observations will suffice to get a relative idea of the increase of duck usage from the current presence of zero. In addition, the site is a part of the Christmas Bird Count by Audubon and is monitored yearly (David Newstead, pers. Comm.).

9) Monitoring Plan

As mentioned above in the performance standards, the City of Corpus Christi will monitor the salinity along with their required storm water monitoring, and can provide reports to the USACE. The salinity in Redhead Pond relative to recent rainfall will be the success criteria, resulting in increased wintering waterfowl usage. The presence of any wintering waterfowl post construction can be deemed a success over the past couple of seasons, as there was little to no usage anecdotally observed on several occasions. In addition, the Friends of Redhead Pond completes reconnaissance observations of the property monthly.

The monitoring reports will include:

- a) The Corps permit number and name
- b) Name of party responsible for conducting the monitoring

- c) A brief description of the purpose of the project and aquatic resources
- d) Written description of the location of the salinity monitoring locations
- e) Dates and any notes on when the mitigation construction occurred
- f) Short statement on whether the performance standards are being met
- g) Dates of any corrective or maintenance activities
- h) Specific recommendations for any corrective or remedial actions

Neither the TPWD nor the TNC will be responsible or liable for any monitoring, either pre- or post-construction, or in the future.

10) Long Term Management Plan

The City of Corpus Christi will manage the infrastructure yearly for their required MS4 and IDIQ programs as required by the TCEQ. In addition, the Friends of Redhead Pond has recently achieved 501c3 status in order to be able to accept and manage portions of Redhead Pond, and any additional lands that are added to the project in the future, if TPWD and/or Tracy Duncan sees fit to relinquish management duties. The Nature Conservancy also holds a Conservation Easement of the TPWD section of Redhead Pond, which has been filed with Nueces County and is included in the Deed Records of the parcels. The mitigation plan is considered "in perpetuity."

11) Adaptive Management Plan

Revise the existing Management Plan for Redhead Pond as needed, which can be accomplished by either TPWD or the Friends of Redhead Pond. The first Management Plan was written by TPWD in 1992, with an update in 2010. Based on that schedule, the next update will be due in 2028.

12) Financial Assurances

The construction of the mitigation will occur before or during the construction of Laguna Shores Road. Mitigation funds are included in the Laguna Shores project budget, which is previously voter approved Bond 2018 funds, or by the IDIQ Program, both of which are long term programs. The hydrologic restoration activities will occur at the same time as construction, and coupled with the referenced programs, preclude the need for proof of long term financial capability/responsibility. If the proposed drainage improvements fail, then the City will be responsible for any corrective actions.