# 1 MITIGATION SITE OVERVIEW

The applicant is proposing to perform Permittee Responsible Mitigation (PRM) is to compensate for losses of aquatic resource functions for impacts to 16.98 acres (Ac) of emergent wetland and 2.88 Ac of forested wetland after all efforts of minimization and avoidance were made within the Metro Park Square development (SWG-2016-00264). The project site is in the West Fork San Jacinto River Watershed (USGS Hydrologic Unit Code (HUC) 12040101) north of The Woodlands, TX and south of Conroe, TX, immediately east of Interstate 45 and just south of TX–242 (Appendix A - Exhibit 1).

The proposed PRM site for the Metro Park Square Project consists of approximately 28.80 Ac, 17.72 Ac of which is proposed wetland establishment, located within a 3,500-acre tract owned by HCMB LLC, and managed by The Earth Partners LP. The site is located within the same parent tract as the approved Houston-Conroe Mitigation Bank (HCMB) (SWG-2013-00141), and the pending Tarkington Bayou Mitigation Bank (TBMB) (SWG-2015-00169) (Appendix A - Exhibit 2). The PRM site is located directly adjacent to HCMB and is partially within the floodplain of streams restored at HCMB.

# 2 OBJECTIVES

The objectives of this PRM site are to:

- Protect the entire 28.80 Ac site by placing it under a perpetual conservation easement held by an accredited land trust. The current, proposed land trust is Bayou Land Conservancy, however their ability to hold the conservation easement is still under review.
- Establish 17.72 Ac of wetland consisting of 2.28 Ac of herbaceous, 12.95 Ac of scrub/shrub, and 1.95 Ac of forested wetland.
- Enhance 11.08 Ac of upland buffer and inclusions within and around the established wetlands to protect and enhance wetland functions within the PRM site.

# 3 SITE SELECTION

This site was selected for three primary reasons:

1. Proximity to established and proposed compensatory mitigation sites.
2. Ability of this mitigation site and general area to produce high-quality herbaceous and scrub/shrub wetlands.
3. Similarity of wetlands between the impact site and PRM site.

The proposed PRM site is directly adjacent to the permitted HCMB, which is a 396 Ac stream mitigation bank. Stream restoration construction was initiated at HCMB in June, 2017 and a construction completion report for Monitoring Unit 1, which comprised 11,618 linear feet of stream restoration just north of the PRM site, was submitted on September 5, 2017. Construction of Monitoring Unit 2, which

comprises 7,535 linear feet including the stream directly adjacent to the PRM site, is anticipated to be completed from October – December, 2017. Invasive species removal has been implemented throughout the entire HCMB site, and supplemental tree plantings will occur in early 2018. Activities undertaken at HCMB is relevant since this PRM site is directly adjacent and will expand upon the ecological benefits of HCMB. This PRM site will provide valuable wetland habitat that will contribute water quality, species diversity, wildlife habitat, and other benefits to the watershed.

The proposed PRM site is within a tract that supports a variety of rare, high-quality herbaceous and scrub/shrub wetlands. Eric Keith of Raven Environmental, Inc. evaluated these wetlands and classified them at G1 (critically imperiled) and G2 (imperiled) communities. The wetlands that will be established as part of this PRM site, will mimic these rare and imperiled communities. As further discussed in Section 6, Determination of Credits, herbaceous, scrub/shrub, and forested wetlands identified within the parent tract were used as reference sites to determine the amount of uplift achievable as well as to guide the development of the Mitigation Work Plan.

The wetlands proposed to be established at the PRM site are similar and appropriate in-kind compensation to the wetlands proposed to be impacted at the project site. The project site will impact 16.98 Ac of riverine emergent/herbaceous wetlands and 2.88 Ac of riverine forested wetlands. The dominant wetland vegetation at the project site consists of black willow (*Salix nigra*), Chinese tallow (*Triadica sebifera*), green ash (*Fraxinus pennsylvanica*), dwarf palmetto (*Sabal minor*), broadleaf cattail (*Typha latifolia*), Pennsylvania smartweed (*Persicaria pensylvanica*), and annual marsh elder (*Iva annua*). The PRM site will establish 2.28 Ac of riverine emergent wetland, 12.95 Ac of riverine scrub/shrub wetland, and 1.95 Ac of riverine forested wetland. The project site and PRM site are both located within the San Jacinto River Basin (6-digit HUC 120401). Although located in separate 8-digit HUCs, significant hydrologic connectivity has been demonstrated between the West Fork San Jacinto River and East Fork San Jacinto and the primary service area for HCMB extends across both for this reason. The project site and PRM site are also both located in the same level IV ecoregion (flatwoods – 35f), further substantiating the ecological in-kindness of the project and PRM site.

# 4 Site Protection Instrument

A conservation easement will act as a real estate instrument to ensure the land will remain in a state of conservation in perpetuity. The proposed conservation easement holder is Bayou Land Conservancy, however their ability to hold the conservation easement is still under review. Bayou Land Conservancy is an Accredited Land Trust by the Land Trust Accreditation Commission, which is a national accreditation organization. The U.S. Army Corps of Engineers (USACE) will review/approve the conservation easement language prior to filing. A final, recorded conservation will be provided to the USACE within 30-days of filing.

# 5 Baseline Information

The 28.80 Ac PRM sits is a gently sloping, upland young pine plantation directly adjacent to HCMB. Four (4) wetland data points were recorded within the PRM site, which are shown on Appendix A – Exhibit 2, provided in Appendix B, and described below.

## 5.1 HYDROLOGY

No wetland hydrology indicators were observed at delineation data points recorded within the PRM site. The site is gently sloping northward toward HCMB with less than a 1% slope. The site drops from approximately 120 feet (ft.) in elevation along the eastern edge to 115 ft. elevation along the northern boundary. The site is not mapped within a 100-year floodplain but as seen below, floodplain calculations were conducted for streams within HCMB, and lower portions of the site, below 117.6 ft. elevation are within the 100-year floodplain of HCMB streams.

The soils are mapped as the Waller-Kirbiville complex. The Waller soil series is poorly drained and the Kirbyville is moderately well to somewhat poorly drained. Soil bores were taken at wetland delineation plots and a clay argillic horizon was consistently seen from 2-3 ft. deep. A perched water table was observed above this argillic horizon, but did not extend into the upper 12-inches of the soil profile.

### 5.1.1 Floodplain Calculations

The Peak-Streamflow for the 100-year and 500-year storm events were estimated using the U.S. Geological Survey (USGS) Regression Equations for Undeveloped Watersheds in Texas. The equations and associated parameters are listed below.

$$Q_{100} = P^{1.071} S^{0.507} 10^{[0.969\Omega + 10.82 - 8.448 A^{-0.0467}]}$$

$$Q_{500} = P^{0.988} S^{0.569} 10^{[0.976\Omega + 10.40 - 7.605 A^{-0.0554}]}$$

Where:

$P = Average\ annual\ precipation\ (in)$

$S = Dimensionless\ channel\ slope$

$A = Drainage\ area\ (square\ miles)$

$\Omega = Generalized\ terrain\ and\ climate\ index\ parameter$

*Table 1. Resulting flows for the 100-year and 500-year storm events*

| Drainage Area ($mi^2$) | Drainage Area (ac) | Mean annual precipitation (in) | Slope | Q (cfs) | |
|---|---|---|---|---|---|
| | | | | 100-yr | 500-yr |
| 1.21 | 774.40 | 60.5 | 0.00125 | 896 | 1,129 |

*Table 2. Channel roughness coefficients and resulting depths for the 100-year and 500-year storm events*

| Cross-Section | Manning's n | | | Depth (ft) | | WSEL (ft) | |
|---|---|---|---|---|---|---|---|
| | Left Overbank | Main Channel | Right Overbank | 100-yr | 500-yr | 100-yr | 500-yr |
| 1 | 0.080 | 0.045 | 0.130 | 5.6 | 5.8 | 117.6 | 117.8 |

## 5.2 VEGETATION

The habitat across the PRM site is characterized as juvenile pine plantation. The area was clear-cut and replanted in pine approximately 3 years ago. Most of the species within the site were facultative wetland (FAC) so hydrophytic vegetation was present. No tree strata was present and the shrub layer was dominated by loblolly pine (*Pinus taeda*) and Chinese tallow. Other inclusions in the shrub layer included water oak (*Quercus nigra*), sweetgum (*Liquidambar styraciflua*), American beautyberry (*Callicarpa americana*), and others. The herbaceous layer was dominated by broomsedge bluestem (*Andropogon virginicus*), cypress panicgrass (*Dichanthelium dichotomum*), annual ragweed (*Ambrosia artemisiifolia*), and dog fennel (*Eupatorium capillifolium*). The woody vine layer was dominated by trumpet creeper (*Campsis radicans*), sawtooth blackberry (*Rubus argutus*), and Japanese climbing fern (*Lygodium japonicum*).

*Figure 1 – Typical view of vegetation across the site.*

## 5.3 SOILS

All observed soil profiles met the hydric soil criteria A16 – Coast Prairie Redox. The soils are mapped as the Waller-Kirbiville complex. The Waller soil series is poorly drained and the Kirbyville is moderately well to somewhat poorly drained. The observed soil profiles had dark upper horizons (top 2-5 inches) with matrix colors ranging from 10YR 4/3 to 10YR 3/1, no redoximorphic features, and a fine sandy loam texture. In plots 2-4, lower horizons down to 12-inches had a matrix color of 10YR 5/3, with 3% 10YR 5/6 concentrations in pore linings, and a fine sandy loam texture. Plot 1, which was taken at the lowest elevation on the property, exhibited much higher percentages of redoximorphic features at 25-30% of the soil profile. All observed soil profiles met the hydric soil criteria A16 – Coast Prairie Redox. This indicator allows for a matrix chroma of 3 or less with 2% or more redox concentrations. The project site is within the Lissie geologic formation so this indicator is applicable.

# 6 DETERMINATION OF CREDITS

Mitigation requirements at the project site and offsets provided by the mitigation site were determined using the riverine interim hydrogeomorphic method (iHGM) for herbaceous/shrub wetlands and forested wetlands. The fundamental unit of measurement when using the iHGM is the functional capacity unity (FCU) which is the iHGM score or functional capacity index (FCI) multiplied by the acreage of the wetland. As seen in Table 3, the project will result in impacts to 16.98 Ac of emergent (herbaceous) wetlands resulting in a loss of 8.93 temporary storage and detention of storage water (TSDSW) units, 11.46 maintain plant and animal communities (MPAC) units, and 9.21 removal and sequestration of elements and compounds (RSEC) units. The project will also result in impacts to 2.88 Ac of forested wetland resulting in a loss of 0.96 TSDSW, 1.65 MPAC, and 1.34 RSEC units.

*Table 3. Impacts at Project Site.*

| Entire Site | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Resource Type** | **WAA** | **Functional Capacity Index** | | | **Impacts** | **Functional Credit Unit (FCU)** | | | Quality |
| | | TSDSW | MPAC | RSEC | Acres | TSDSW | MPAC | RSEC | |
| Emergent Wetland | WAA1 | 0.4610 | 0.7500 | 0.5733 | **1.07** | 0.49 | 0.80 | 0.61 | Low quality |
| Forested Wetland | WAA2 | 0.3453 | 0.7000 | 0.5333 | **0.51** | 0.18 | 0.36 | 0.27 | Medium quality |
| Emergent Wetland | WAA3 | 0.6376 | 0.7500 | 0.5833 | **2.61** | 1.66 | 1.96 | 1.52 | Low quality |
| Emergent Wetland | WAA4 | 0.6376 | 0.7500 | 0.6933 | **3.78** | 2.41 | 2.84 | 2.62 | Low quality |
| Emergent Wetland | WAA5 | 0.3112 | 0.5000 | 0.2433 | **0.10** | 0.03 | 0.05 | 0.02 | Low quality |
| Emergent Wetland | WAA6 | 0.3701 | 0.5000 | 0.2933 | **3.13** | 1.16 | 1.57 | 0.92 | Low quality |
| Emergent Wetland | WAA7 | 0.3257 | 0.5833 | 0.4900 | **3.66** | 1.19 | 2.13 | 1.79 | Low quality |
| Forested Wetland | WAA8 | 0.3453 | 0.7000 | 0.5333 | **0.35** | 0.12 | 0.25 | 0.19 | Medium quality |
| Forested Wetland | WAA9 | 0.3453 | 0.7000 | 0.5333 | **0.13** | 0.04 | 0.09 | 0.07 | Medium quality |
| Forested Wetland | WAA10 | 0.3453 | 0.7000 | 0.5333 | **0.21** | 0.07 | 0.15 | 0.11 | Medium quality |
| Emergent Wetland | WAA11 | 0.6376 | 0.8333 | 0.6067 | **0.55** | 0.35 | 0.46 | 0.33 | Low quality |
| Emergent Wetland | WAA12 | 0.5603 | 0.7500 | 0.5400 | **0.00** | 0.00 | 0.00 | 0.00 | Low quality |
| Emergent Wetland | WAA13 | 0.7924 | 0.8333 | 0.6767 | **1.60** | 1.27 | 1.33 | 1.08 | Low quality |
| Forested Wetland | WAA14 | 0.3257 | 0.4792 | 0.4167 | **1.68** | 0.55 | 0.81 | 0.70 | Medium quality |
| Emergent Wetland | WAA15 | 0.2440 | 0.4500 | 0.3567 | **0.02** | 0.00 | 0.01 | 0.01 | Low quality |
| Emergent Wetland | WAA16 | 0.8388 | 0.7500 | 0.6567 | **0.33** | 0.28 | 0.25 | 0.22 | Low quality |
| Linear Emergent Wetland | WAA17 | 0.8660 | 0.5833 | 0.7833 | **0.05** | 0.04 | 0.03 | 0.04 | Low quality |
| Linear Emergent Wetland | WAA18 | 0.3297 | 0.3333 | 0.4433 | **0.03** | 0.01 | 0.01 | 0.01 | Low quality |
| Linear Emergent Wetland | WAA19 | 0.3873 | 0.6667 | 0.4800 | **0.03** | 0.01 | 0.02 | 0.01 | Low quality |
| Linear Emergent Wetland | WAA20 | 0.6243 | 0.5833 | 0.7433 | **0.02** | 0.01 | 0.01 | 0.01 | Low quality |
| Open Water 1 | N/A | N/A | N/A | N/A | 0.15 | N/A | N/A | N/A | Low quality |
| Open Water 2 | N/A | N/A | N/A | N/A | 0.80 | N/A | N/A | N/A | Low quality |
| Open Water 3 | N/A | N/A | N/A | N/A | 1.07 | N/A | N/A | N/A | Low quality |
| Open Water 4 | N/A | N/A | N/A | N/A | 0.14 | N/A | N/A | N/A | Low quality |
| Open Water 5 | N/A | N/A | N/A | N/A | 0.06 | N/A | N/A | N/A | Low quality |
| Open Water 6 | N/A | N/A | N/A | N/A | 0.15 | N/A | N/A | N/A | Low quality |
| Open Water 7 | N/A | N/A | N/A | N/A | 0.11 | N/A | N/A | N/A | Low quality |
| Open Water 8 | N/A | N/A | N/A | N/A | 0.51 | N/A | N/A | N/A | Low quality |
| Open Water 9 | N/A | N/A | N/A | N/A | 1.31 | N/A | N/A | N/A | Low quality |
| **Total Emergent Wetland** | | | | | 16.85 | 8.85 | 11.39 | 9.13 | |
| **Total Linear Emergent Wetland** | | | | | 0.13 | 0.08 | 0.07 | 0.08 | |
| **Total Forested Wetland** | | | | | 2.88 | 0.96 | 1.65 | 1.34 | |
| **Total Open Water** | | | | | 4.30 | N/A | N/A | N/A | |
| **Total** | | | | | **24.16** | **9.89** | **13.11** | **10.55** | |
| **Total FCU** | | | | | | 9.9 | 13.2 | 10.6 | |

As seen in Table 4, the mitigation site will establish 2.82 Ac of herbaceous and 12.95 Ac of scrub/shrub wetlands for a total of 15.77 Ac herbaceous/shrub wetlands that will generate 12.36 TSDSW units, 12.67 MPAC units, and 13.19 RSEC units. The PRM site will also establish 1.95 Ac of forested wetland that will generate 1.69 TSDSW, 1.74 MPAC, and 1.69 RSEC units.

*Table 4. Mitigation Generated at PRM Site.*

**Wetland FCU Generation Overview - Metro Park Mitigation Site**

| WAA Number | WAA 1 | | | WAA 2 | | | WAA 3 | | |
|---|---|---|---|---|---|---|---|---|---|
| **Status** | Current | Post | Change | **Current** | **Post** | **Change** | **Current** | **Post** | **Change** |
| **Habitat*** | Upland | Herbaceous | Herbaceous | Upland | Scrub/Shrub | Scrub/Shrub | Upland | Forested | Forested |
| **HGM Class** | PEM/PSS | PEM/PSS | PEM/PSS | PEM/PSS | PEM/PSS | PEM/PSS | PFO | PFO | PFO |
| **Mitigation Plan** | Establishment | | | Establishment | | | Establishment | | |
| **Vdur** | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | **1.00** | 0.00 | 0.75 | **0.75** |
| **Vfreq** | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | **1.00** | 0.00 | 0.75 | **0.75** |
| **Vtopo** | 0.00 | 0.40 | 0.40 | 0.00 | 0.40 | **0.40** | 0.00 | 1.00 | **1.00** |
| **Vcwd** | - | | - | - | | - | 0.00 | 1.00 | **1.00** |
| **Vwood** | 0.00 | 0.25 | 0.25 | 0.00 | 0.75 | **0.75** | 0.00 | 1.00 | **1.00** |
| **Vtree** | - | | - | - | | - | 0.00 | 1.00 | **1.00** |
| **Vrich** | - | | - | - | | - | 0.00 | 0.80 | **0.80** |
| **Vbasal** | - | | - | - | | - | 0.00 | 1.00 | **1.00** |
| **Vdensity** | - | | - | - | | - | 0.00 | 0.60 | **0.60** |
| **Vmid** | 0.00 | 0.25 | 0.25 | 0.00 | 0.75 | **0.75** | 0.00 | 1.00 | **1.00** |
| **Vherb** | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | **1.00** | 0.00 | 1.00 | **1.00** |
| **Vdetritus** | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | **1.00** | 0.00 | 1.00 | **1.00** |
| **Vredox** | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | **1.00** | 0.00 | 1.00 | **1.00** |
| **Vsorpt** | 0.00 | 0.50 | 0.50 | 0.00 | 0.50 | **0.50** | 0.00 | 0.50 | **0.50** |
| **Vconnect** | 0.00 | 0.75 | 0.75 | 0.00 | 0.75 | **0.75** | 0.00 | 1.00 | **1.00** |
| **TSDSW** | 0.00 | 0.72 | 0.72 | 0.00 | 0.80 | **0.80** | 0.00 | 0.87 | **0.87** |
| **MPAC** | 0.00 | 0.67 | 0.67 | 0.00 | 0.83 | **0.83** | 0.00 | 0.93 | **0.93** |
| **RSEC** | 0.00 | 0.73 | 0.73 | 0.00 | 0.86 | **0.86** | 0.00 | 0.87 | **0.87** |
| **WAA Acreage** | 0.00 | 2.82 | 2.82 | 0.00 | 12.95 | **12.95** | 0.00 | 1.95 | **1.95** |
| **TSDSW Units** | 0.00 | 2.02 | 2.02 | 0.00 | 10.34 | **10.34** | 0.00 | 1.69 | **1.69** |
| **MPAC Units** | 0.00 | 1.88 | 1.88 | 0.00 | 10.79 | **10.79** | 0.00 | 1.82 | **1.82** |
| **RSEC Units** | 0.00 | 2.05 | 2.05 | 0.00 | 11.14 | **11.14** | 0.00 | 1.69 | **1.69** |

*See Reference HGMs for Post Implementation Habitat

**Mitigation Overview - Metro Park Mitigation Site**

| | Impact At Metro Park | | Mitigation | | Delta | |
|---|---|---|---|---|---|---|
| | **PEM/PSS** | **PFO** | **PEM/PSS Establishment** | **PFO Establishment** | **PEM/PSS** | **PFO** |
| **Acreage** | 16.98 | 2.88 | 15.77 | 1.95 | **-1.21** | **-0.93** |
| **TSDSW Units** | 8.93 | 0.96 | 12.36 | 1.69 | **3.43** | **0.73** |
| **MPAC Units** | 11.46 | 1.65 | 12.67 | 1.82 | **1.21** | **0.17** |
| **RSEC Units** | 9.21 | 1.34 | 13.19 | 1.69 | **3.98** | **0.35** |

Since the entire PRM site is currently upland, baseline scores are zero. Post-implementation scores were derived from reference sites located nearby within the 3,500 Ac parent tract. Reference wetland iHGM scores can be seen in Table 5 below and data sheets are provided in Appendix C.

*Table 5. Reference Wetland iHGM scores.*

| Reference Wetland iHGM Scores | | | |
|---|---|---|---|
| **Description** | Herbaceous | Scrub/Shrub | Hardwood/Pine |
| **HGM Type** | Herbaceous/Shrub | Herbaceous/Shrub | Forested |
| **Vdur** | 1.00 | 1.00 | 0.75 |
| **Vfreq** | 1.00 | 1.00 | 0.75 |
| **Vtopo** | 0.40 | 0.40 | 1.00 |
| **Vcwd** | | | 1.00 |
| **Vwood** | 0.25 | 0.75 | 1.00 |
| **Vtree** | | | 1.00 |
| **Vrich** | | | 0.80 |
| **Vbasal** | | | 1.00 |
| **Vdensity** | | | 0.60 |
| **Vmid** | 0.25 | 0.75 | 1.00 |
| **Vherb** | 1.00 | 1.00 | 1.00 |
| **Vdetritus** | 1.00 | 1.00 | 1.00 |
| **Vredox** | 1.00 | 1.00 | 1.00 |
| **Vsorpt** | 0.50 | 0.50 | 0.50 |
| **Vconnect** | 0.75 | 0.75 | 1.00 |
| **TSDSW** | **0.72** | **0.80** | **0.87** |
| **MPAC** | **0.67** | **0.83** | **0.93** |
| **RSEC** | **0.73** | **0.86** | **0.87** |

# 7 Mitigation Work Plan

There are two primary components of the mitigation work plan; grading plan and vegetation planting plan. The grading plan describes how elevations will be adjusted to facilitate establishment of wetlands and the vegetation planting plan describes how desirable vegetative communities will be established.

## 7.1 Grading Plan

The site will be mechanically graded to facilitate the establishment of wetlands as seen in Appendix A - Exhibit 4. Wetland Cell 1 will be graded to an elevation of 115 ft. (approximately 1 ft. below current ground level) in the central herbaceous wetland portion and 115.5 ft. (approximately 0.5 ft. below current ground level) in the outer, shrub/scrub wetland area. Wetland Cell 2 will be graded to 117 ft. (approximately 2-2.5 ft. below current ground level) within the two emergent wetland portions and to 117.5 ft. (approximately 1.5 ft. below current ground level) in the shrub-scrub wetland portion. The outer approximately 50 ft. perimeter around the upslope side of the shrub/shrub wetland will be a transition zone from scrub/shrub wetland to upland and will consist of established forested wetland. This area will be graded to 118 ft. which is approximately 1 ft. below current ground level. Soil bores

were taken at wetland delineation data points across the site. A clay, argillic horizon was encountered at a depth of 2-3 ft. at all locations. A perched water table was observed in the sandy loam soils directly above this horizon. If grading extends to or below this clay horizon, the area will be over-dredged by approximately 6-inches and backfilled with the sandy loam upper horizon. This will ensure access to the perched water table above the argillic horizon within the upper 12-inches of the soil profile within the established wetlands.

Fill from the graded areas will be discharged in uplands predominately around the perimeter of the wetland areas, however to replicate the natural mima mound type complex seen in reference sites, four upland fill areas comprising a total of 1.09 Ac are scattered within the wetland acreage. This acreage has been removed from the wetland acreage and is not generating any wetland credit.

Best management practices (BMPs) will be employed during and after construction to reduce erosion and runoff into established wetland areas as well as surrounding areas. Disturbed soils will be stabilized as soon as practicable by planting temporary grass species in a way that won't restrict establishment of desirable vegetation and mulching with weed free straw/hay or hydro-mulch. Sediment runoff will be attenuated by employing silt fencing or other filtering device around the downslope perimeter to stop any sediment from leaving the general area.

*Table 6. Grading plan*

| Mitigation Plan | Wetland Type | Acreage | Current Elevation (Feet) | Proposed Elevation (Feet) | Elevation Change (Feet) | Cut/Fill (Cubic Yards) |
|---|---|---|---|---|---|---|
| **Wetland Cell 1** | | | | | | |
| Establishment | Herbaceous | 0.68 | 116.0 | 115.0 | -1.0 | (1,101.7) |
| Establishment | Scrub/Shrub | 2.43 | 116.0 | 115.5 | -0.5 | (1,961.7) |
| **Wetland Cell 2** | | | | | | |
| Establishment | Herbaceous | 1.06 | 119.5 | 117.0 | -2.5 | (4,280.6) |
| Establishment | Herbaceous | 1.07 | 119.0 | 117.0 | -2.0 | (3,455.3) |
| Establishment | Scrub/Shrub | 10.51 | 119.0 | 117.5 | -1.5 | (25,443.6) |
| Establishment | Forested | 1.95 | 119.0 | 118.0 | -1.0 | (3,148.4) |
| **Upland Areas** | | | | | | |
| Upland | Upland | 7.66 | 120.0 | 123.0 | 3.0 | 37,083.9 |
| Upland | Upland | 0.17 | 119.0 | 122.0 | 3.0 | 805.0 |
| Upland | Upland | 0.48 | 119.0 | 122.0 | 3.0 | 2,341.5 |
| Upland | Upland | 0.23 | 119.0 | 122.0 | 3.0 | 1,115.4 |
| Upland | Upland | 0.21 | 119.0 | 122.0 | 3.0 | 992.3 |
| Upland | Upland | 2.33 | 116.0 | 116.0 | 0.0 | - |
| **TOTAL CUT** | | | | | | **(39,391.3)** |
| **TOTAL FILL** | | | | | | **42,338.1** |

## 7.2 Vegetation Planting Plan

There will four separate zones for the planting plan to reflect different site conditions as described in the grading plan. These zones are shown in Appendix A - Exhibit 5 and discussed below:

- Herbaceous wetlands - the deepest part of the established wetland areas. These areas will be graded to 1-2.5 ft. below natural ground elevation and planted with a mix of native, wetland, herbaceous species.
- Shrub/scrub wetlands – most of the established wetlands fall into this category. These areas will be graded to .5 – 1.5 ft. below natural ground elevation and planted with a mix of native, wetland, shrub/scrub species.
- Forested Wetlands – This represents a transition zone between shrub/scrub wetland and the adjacent upland areas. These areas will be graded to approximately 1 ft. below current ground level and planted with a mix of wetland tree species.
- Forested Uplands – These are areas where 2-3 ft. of fill from graded areas will be deposited. These areas will be planted with a mix of native, upland tree species.

### 7.2.1 Herbaceous wetland

Herbaceous wetlands will be planted with a mix of native herbaceous wetland species seen in reference wetlands in the area. These species are anticipated to include at least five species identified in Table 7. A native seed mix will likely be utilized for most of the plantings, but plugs from local wetlands may be utilized as well.

*Table 7. Preferred Herbaceous Species.*

| Herbs | | | | | |
|---|---|---|---|---|---|
| **Scientific** | **Common** | **WIS** | **Scientific** | **Common** | **WIS** |
| *Andropogon gerardii* | Big Bluestem | FAC | *Eleocharis obtusa* | Blunt Spike Rush | OBL |
| *Andropogon glomeratus* | Bushy Bluestem | FACW | *Eleocharis palustris* | Common Spikerush | OBL |
| *Carex caroliniana* | Carolina Sedge | FACW | *Eleocharis tortilis* | Twisted Spike Rush | FACW |
| *Carex cherokeensis* | Cherokee Sedge | FACW | *Hydrocotyle verticillata* | Pennywort | OBL |
| *Carex crebriflora* | Coastal Plain Sedge | FACW | *Hymenocallis liriosme* | Spring Spider Lily | OBL |
| *Carex gigantea* | Giant Sedge | OBL | *Hymenocallis occidentalis* | Carolina Spider Lily | OBL |
| *Carex glaucescens* | Southern Waxy Sedge | FACW | *Juncus brachycarpus* | White Root Rush | FACW |
| *Carex intumescens* | Great Bladder Sedge | FACW | *Juncus bufonius* | Toad Rush | FACW |
| *Carex louisianica* | Louisiana Sedge | OBL | *Juncus effusus* | Lamp Rush | OBL |
| *Chasmanthium latifolium* | Broadleaf Woodoats | FAC | *Juncus marginatus* | Bog Rush | FACW |
| *Chasmanthium laxum* | Slender Woodoats | FACW | *Persicaria hydropiperoides* | Swamp Smartweed | OBL |
| *Chasmanthium sessiliflorum* | Narrowleaf Woodoats | FAC | *Polygonatum biflorum* | King Solomon's Seal | FACU |
| *Cyperus erythrorhizos* | Red-Root Flat Sedge | OBL | *Saururus cernuus* | Lizardstail | OBL |
| *Cyperus esculentus* | Yellow Nutsedge | FAC | *Schizachyrium scoparium* | Little False Bluestem | FACU |
| *Cyperus flavescens* | Yellow Flat Sedge | OBL | *Schoenoplectus americanus* | Olney Bulrush | OBL |
| *Cyperus rotundus* | Purple Flat Sedge | FAC | *Scirpus cyperinus* | Cottongrass Bulrush | OBL |
| *Cyperus virens* | Green Flat Sedge | FACW | *Sesbania macrocarpa* | Coffee Bean | FACW |
| *Eleocharis microcarpa* | Small Fruit Spike Rush | OBL | *Sorghastrum nutans* | Yellow Indiangrass | FACU |

### 7.2.2 Scrub/Shrub Wetlands

Scrub/Shrub wetlands will be planted with a mix of herbaceous and shrub species. Herbaceous species to be planted include those described within the herbaceous wetlands. Shrub species to be planted will include at least three of the species identified in Table 8.

*Table 8. Preferred Shrub Species.*

| Shrubs | | | | | |
|---|---|---|---|---|---|
| Scientific | Common | WIS | Scientific | Common | WIS |
| *Alnus serrulata* | Hazel Alder | FACW | *Lindera benzoin* | Common Spicebush | FACW |
| *Amorpha fruticosa* | False Indigo Bush | FACW | *Morella cerifera* | Southern Wax Myrtle | FAC |
| *Baccharis halimifolia* | Eastern Baccharis | FAC | *Prunus angustifolia* | Chickasaw Plum | NL/FAC |
| *Callicarpa americana* | American Beautyberry | FACU | *Prunus mexicana* | Mexican Plum | NL/FAC |
| *Cephalanthus occidentalis* | Buttonbush | OBL | *Rhododendron canescens* | Wild Azalea | FACW |
| *Chionanthus virginicus* | White Fringetree | FACU | *Sabal minor* | Palmetto | FACW |
| *Cyrilla racemiflora* | White Titi | FACW | *Salix nigra* | Black Willow | OBL |
| *Euonymus americanus* | Strawberry Bush | FAC | *Sambucus canadensis* | American Elderberry | FAC |
| *Hibiscus aculeatus* | Big Thicket Hibiscus | FACW | *Styrax americanus* | American Snowbell | FACW |
| *Hibiscus coccineus* | Texas Star Hibiscus | OBL | *Styrax grandifolius* | Big Leaf Snowbell | FACU |
| *Hibiscus grandiflorus* | Swamp Rosemallow | OBL | *Symphoricarpos orbiculatus* | Coralberry | FACU |
| *Hibiscus laevis* | Rosemallow | OBL | *Vaccinium arboreum* | Farkleberry / Huckleberry | FACU |
| *Hypericum hypericoides* | St. Andrew's Cross | FAC | *Viburnum dentatum* | Southern Arrowwood | FACU |
| *Ilex coriacea* | Sweet Gallberry | FACW | *Viburnum nudum* | Possum-Haw Viburnum | FACW |
| *Ilex glabra* | Gallberry | FACW | | | |

### 7.2.3 Forested Wetlands

Forested wetlands will be planted with at least five tree species identified in Table 9. To provide for short-term stability as well as increase species diversity, the areas will also be planted with a mix of herbaceous and shrub species identified in Table 5 and Table 6.

*Table 9. Preferred Tree Species*

| Trees | | | | | |
|---|---|---|---|---|---|
| Scientific | Common | WIS | Scientific | Common | WIS |
| *Acer rubrum* | Red Maple | FAC | *Nyssa biflora* | Swamp Tupelo | OBL |
| *Acer saccharum* | Southern Sugar Maple | FAC | *Nyssa sylvatica* | Blackgum | FAC |
| *Asimina triloba* | Common Pawpaw | FAC | *Ostrya virginiana* | Eastern Hop Hornbeam | FACU |
| *Betula nigra* | River Birch | FACW | *Pinus echinata* | Shortleaf Pine | FACU |
| *Carpinus caroliniana* | American Hornbeam | FAC | *Pinus palustris* | Longleaf Pine | FAC |
| *Carya aquatica* | Water Hickory | OBL | *Pinus taeda* | Loblolly Pine | FAC |
| *Carya cordiformis* | Bitternut Hickory | FAC | *Planera aquatica* | Planertree | OBL |
| *Carya tomentosa* | Mockernut Hickory | FACU | *Prunus caroliniana* | Carolina Laurel Cherry | FACU |
| *Celtis laevigata* | Sugarberry | FACW | *Prunus serotina* | Black Cherry | FACU |
| *Cercis canadensis* | Eastern Redbud | UPL | *Quercus alba* | White Oak | FACU |
| *Cornus florida* | Flowering Dogwood | FACU | *Quercus falcata* | Southern Red Oak | FACU |
| *Crataegus opaca* | Mayhaw | OBL | *Quercus laurifolia* | Laurel Oak | FACW |
| *Diospyros virginiana* | Common Persimmon | FAC | *Quercus lyrata* | Overcup Oak | OBL |
| *Fagus grandifolia* | American Beech | FACU | *Quercus macrocarpa* | Bur Oak | FACU |
| *Fraxinus pennsylvanica* | Green Ash | FACW | *Quercus michauxii* | Swamp Chestnut Oak | FACW |
| *Fraxinus profunda* | Pumpkin Ash | OBL | *Quercus nigra* | Water Oak | FAC |
| *Ilex opaca* | American Holly | FAC | *Quercus pagoda* | Cherrybark Oak | FACW |
| *Juglans nigra* | Black Walnut | UPL | *Quercus phellos* | Willow Oak | FACW |
| *Juniperus virginiana* | Eastern Red Cedar | FACU | *Quercus shumardii* | Shumard Oak | FAC |
| *Magnolia grandiflora* | Magnolia | FAC | *Quercus stellata* | Post Oak | UPL |
| *Magnolia virginiana* | Sweetbay | FACW | *Taxodium distichum* | Baldcypress | OBL |
| *Morus rubra* | Red Mulberry | FACU | *Ulmus alata* | Winged Elm | FACU |
| *Nyssa aquatica* | Water Tupelo | OBL | *Ulmus americana* | American Elm | FAC |

### 7.2.4 Forested Uplands

Forested uplands will be planted with at least five (5) species identified in Table 9 with a focus on FAC and facultative upland (FACU) species.

# 8 MAINTENANCE PLAN

After initial construction and planting, the focus will be on maintaining healthy populations of desirable vegetative plantings and natural regeneration, as well invasive species eradication. The site will be monitored at least yearly and during the monitoring site visit species percent coverage, stems / acre of tree species, wetland hydrology indicators, as well as hydric soil indicators will be documented. If desirable vegetation success is not meeting performance standards for either density (percent cover and/or stems / acre) or diversity (number of species over 5% cover), re-plantings will occur until performance standards are met. Percent cover of invasive species will be documented yearly during each monitoring site visit. If percentages are nearing or exceeding performance standards, additional eradication measure will be taken.

Signage will be placed along the periphery of the site to discourage trespassing. Steps will be taken to mitigate any damage and prevent future incidents should any trespass or property damage occur. Signage will be inspected and maintained on a yearly basis. A periphery will be maintained for site access and sign maintenance, but no vehicular or other traffic will be permitted within the site boundary to prevent soil compaction, plant mortality, or invasive species introduction.

# 9 PERFORMANCE STANDARDS

Ecological performance standards are outlined in Table 10 and a general discussion of these, and administrative performance standards is below.

- **Year 0-1**
  - The PRM site is placed under a conservation easement reviewed/approved by the USACE after the permit is issued and within 60-days of the USACE approving the conservation easement language. A final, recorded conservation easement will be provided to the USACE within 30-days of filing.
  - Short-term financial assurances, in the form of a bond, letter of credit, escrow account, or casualty insurance policy, will be put in place after the permit is issued and within 60-days of the USACE approving financial assurance mechanism language.
  - Construction at the PRM site will be implemented within 180 days of permit issuance and impacts occur at the project site.
  - Plantings will be completed following construction. Herbaceous plantings will be implemented as soon as practicable after construction to ensure stability. Woody plantings will be conducted during the first dormant season (December – February) after construction.
  - Species diversity requirements for plantings include:
    - Five or more herbaceous species greater than 5% of planting density
    - Three or more shrub species greater than 5% of planting density
    - Five or more tree species greater than 5% of planting density (400+ stems / acre)

- **Year 2 (at least 2 growing seasons after construction)**
  - Noxious/Invasive species less than 1% in canopy (if applicable) and less than 5% in all other strata.
  - Wetland establishment areas meet criteria for hydrophytic vegetation, wetland hydrology, and hydric soils.
  - Desirable species coverage requirements include:
    - 50% coverage of desirable, herbaceous species
    - 30% coverage of desirable, shrub species
    - 80% survival (320+ Stems / Acre) of planted tress species. Desirable natural regeneration can be counted.
  - Species diversity requirements are:
    - Five or more herbaceous species greater than 5% aerial coverage
    - Three or more shrub species greater than 5% aerial coverage
    - Five or more tree species greater than 5% of the total stems / acre.
- **Year 3 (at least 3 growing seasons after construction)**
  - Noxious/Invasive species less than 1% in canopy (if applicable) and less than 5% in all other strata.
  - Wetland establishment areas meet criteria for hydrophytic vegetation, wetland hydrology, and hydric soils.
  - Desirable species coverage requirements include:
    - 60% coverage of desirable, herbaceous species
    - 40% coverage of desirable, shrub species
    - 70% survival (280+ Stems / Acre) of planted tress species. Desirable natural regeneration can be counted.
  - Species diversity requirements are:
    - Five or more herbaceous species greater than 5% aerial coverage
    - Three or more shrub species greater than 5% aerial coverage
    - Five or more tree species greater than 5% of the total stems / acre.
- **Year 5 (at least 5 growing seasons after construction)**
  - Long-term management account, as described in the Long-Term Management Plan, established and funded.
  - Noxious/Invasive species less than 1% in canopy (if applicable) and less than 5% in all other strata.
  - Wetland establishment areas meet criteria for hydrophytic vegetation, wetland hydrology, and hydric soils.
  - Desirable species coverage requirements include:
    - 70% coverage of desirable, herbaceous species
    - 50% coverage of desirable, shrub species
    - 60% survival (240+ Stems / Acre) of planted tress species. Desirable natural regeneration can be counted.
  - Species diversity requirements are:
    - Five or more herbaceous species greater than 5% aerial coverage
    - Three or more shrub species greater than 5% aerial coverage
    - Five or more tree species greater than 5% of the total stems / acre.

*Table 10. Ecological Performance Standards.*

| | Parameter | Measurement Method | Year 0 - 1 | Year 2 | Year 3 | Year 5 |
|---|---|---|---|---|---|---|
| All Wetland Areas | Noxious/ Invasive Species* | Percent Cover | Noxious/Invasive species less than 1% in canopy (if applicable) and less than 5% in all other strata. | | | |
| | Wetland Hydrology and Hydric Soils | Delineation Data Points | Construction Complete | Wetland establishment areas meet criteria for hydrophytic vegetation, wetland hydrology, and hydric soils. | | |
| Herbaceous Wetlands | Desirable Species Coverage | Percent Cover | Plantings Complete | 50% coverage of desirable, herbaceous species | 60% coverage of desirable, herbaceous species | 70% coverage of desirable, herbaceous species |
| | Species Diversity | Number of Species over 5% Coverage | Five or more herbaceous species greater than 5% of planting density | Five or more herbaceous species greater than 5% aerial coverage. | | |
| Scrub/Shrub Wetlands | Desirable Species Coverage | Percent Cover | Plantings Complete | 30% coverage of desirable, shrub species. | 40% coverage of desirable, shrub species. | 50% coverage of desirable, shrub species. |
| | Species Diversity | Number of Species over 5% Coverage | Three or more shrub species greater than 5% of planting density | Three or more shrub species greater than 5% aerial coverage. | | |
| Forested Wetlands | Desirable Species Coverage | Stems / Acre | Plantings Complete at 400+ Stems / Acre | 80% Survivability (320+ Stems / Acre)** | 70% Survivability (280+ Stems / Acre)** | 60% Survivability (240+ Stems / Acre)** |
| | Species Diversity | Number of Species over 5% Coverage | Five or more tree species greater than 5% of planting density | Five or more tree species greater than 5% of the total stems / acre. | | |

* Noxious/Invasive species as defined in the Texas Department of Agriculture Noxious and Invasive Plant List (http://texreg.sos.state.tx.us/fids/200701978-1.html).

** Desirable natural regeneration can be counted.

# 10 MONITORING REQUIREMENTS

To provide documentation of success of the restorative efforts, the Sponsor will perform routine, annual monitoring of the ecological conditions of the proposed PRM Site. Monitoring reports will clearly demonstrate whether performance standards are being met. This will include documenting species coverage (percent cover for herbaceous and shrub and stems / acre for tree species), species diversity, as well as delineation data points documenting wetland establishment areas meet the criteria for hydrophytic vegetation, wetland hydrology, and hydric soils. The monitoring schedule and frequency proposed for the PRM site will include annual assessments for a minimum of 5 years per the criteria established in the USACE Guidance Letter (08-03), Minimum Requirements for Compensatory Mitigation

Projects Involving the Restoration, Establishment, and/or Enhancement of Aquatic Resources (USACE, 2008). Yearly monitoring reports will be submitted on or before December 31st of the monitoring year.

# 11 Long-Term Management Plan

After performance standards have been achieved, minimal long-term management may be required to ensure the sustainability of the site as a high-quality wetland area. The Earth Partners, LP will serve as the long-term manager for the site. The site will be managed concurrently with other conservation / mitigation areas, including Houston-Conroe Mitigation Bank and Tarkington Bayou Mitigation Bank. Anticipated long-term management activities include restricting access to the site by posting signage and/or fencing, maintaining signage and/or fencing, on-going monitoring, and control of invasive species. Annual inspections will be conducted by The Earth Partners, LP, or designated agent, to document site conditions, check for signs of trespass, identify any other potential concerns, and to check for invasive species infestation. A long-term management account will be established prior to the final annual monitoring event to fund these management activities. The amount of this account is under development.

# 12 Adaptive Management Plan

Adaptive management is a strategy to address unforeseen changes in site conditions or other components of the compensatory mitigation project. If the compensatory mitigation project cannot be constructed in accordance with the approved Compensatory Mitigation Plan, or if performance standards are not being met as anticipated, the permittee must notify the USACE, with approval required for any significant modification of the Compensatory Mitigation Plan. Performance standards may be revised in accordance with adaptive management to account for measures taken to address deficiencies in the mitigation project.

For the proposed mitigation areas, adaptive management may include the following measures. These measures must be approved by the USACE before implementing. The USACE will be notified during the annual reporting process if performance standards are not being met and if adaptive management measures are needed.

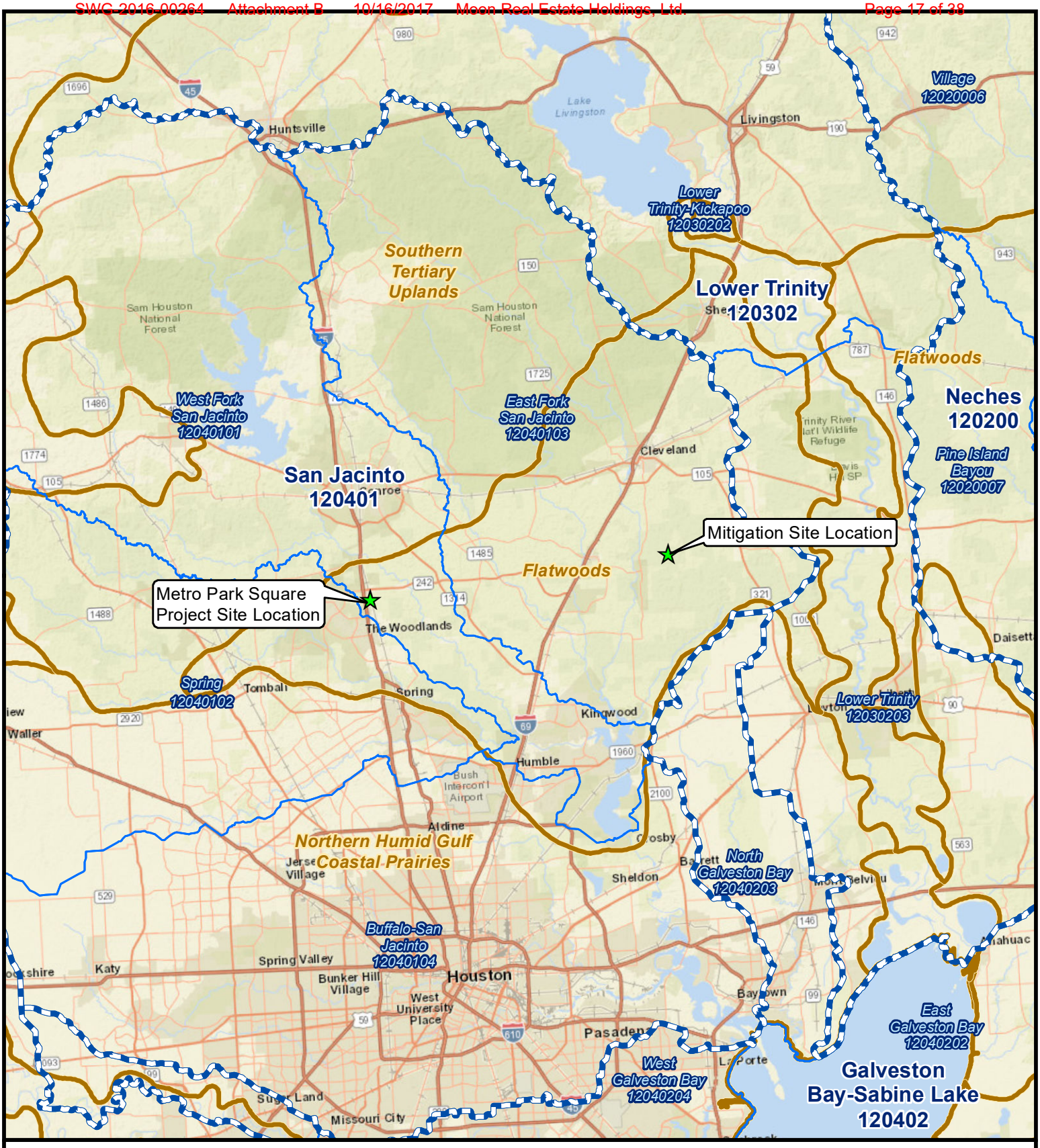
- Plant additional wetland vegetation species in areas where new growth is inadequate
- Adjust site conditions to improve hydrologic conditions
- Improve or enhance erosion control measures
- Provide for additional access restrictions if human/domestic animal disturbance is impacting the site

# 13 Financial Assurances

Short-term financial assurances in the form of a bond, letter of credit, escrow account, or casualty insurance policy, will be put in place after the permit is issued and within 60-days of the USACE

approving financial assurance mechanism language. This financial vehicle will cover costs associated with construction, monitoring, and maintenance during the monitoring period for the PRM site. Financial assurance amounts may be phased down once construction is completed and success is documented. The amount of financial assurances required is under development.

# Appendix A – Exhibits




Coordinate System: NAD 1983 2011 StatePlane Texas Central FIPS 4203 Ft US

the earth partners

Created By: Neil Boitnott
Date: September 14, 2017

# Exhibit 1
## General Location Map
## Metro Park Square PRM
## SWG-2016-00264

**Legend**

- Metro Park Impact/PRM Location
- Basins (6-Digit HUC)
- Sub-Basins (8-Digit HUC)
- Level IV Ecoregions

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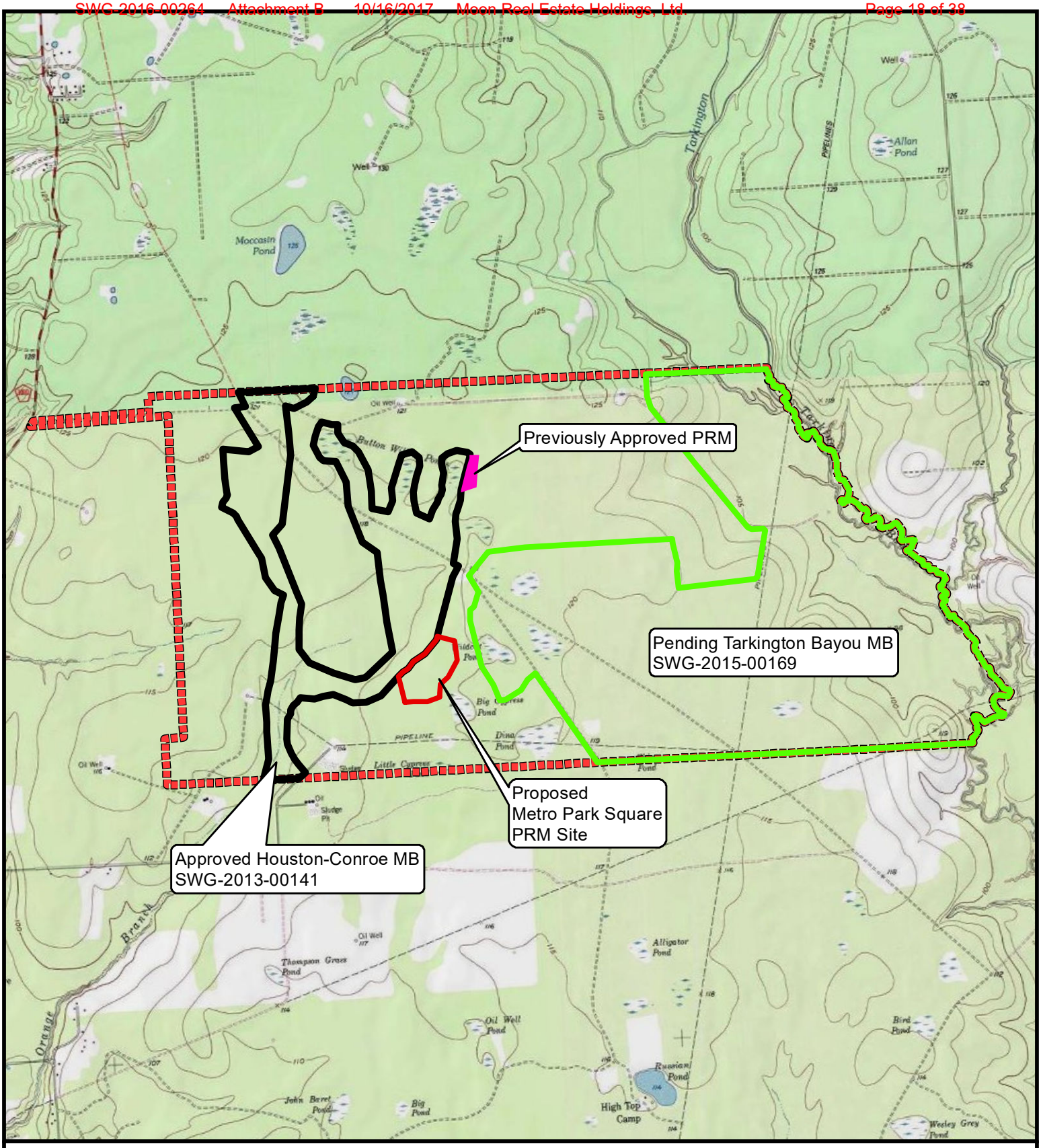


0 3,000 6,000 9,000 12,000 15,000 Feet

Coordinate System: NAD 1983 2011 StatePlane Texas Central FIPS 4203 Ft US

the earth partners

Created By: Neil Boitnott
Date: September 14, 2017

# Exhibit 2
## Parent Tract Map
## Metro Park Square PRM
## SWG-2016-00264

**Legend**

- Proposed Metro Park Square PRM
- Previously Permitted PRM
- Tarkington Bayou MB
- Houston/Conroe Boundary
- Parent Tract Boundary

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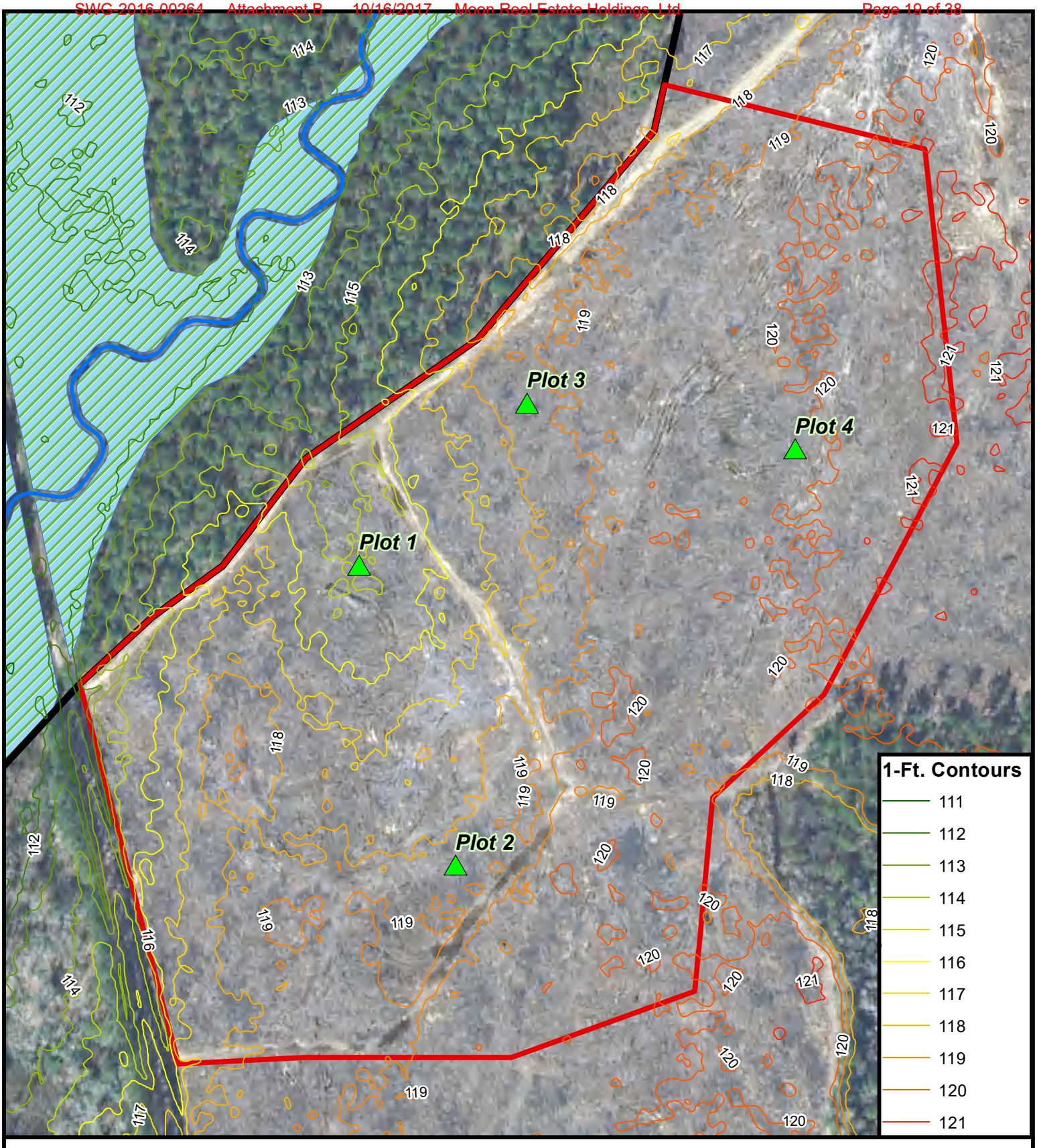


Coordinate System: NAD 1983 2011 StatePlane Texas Central FIPS 4203 Ft US

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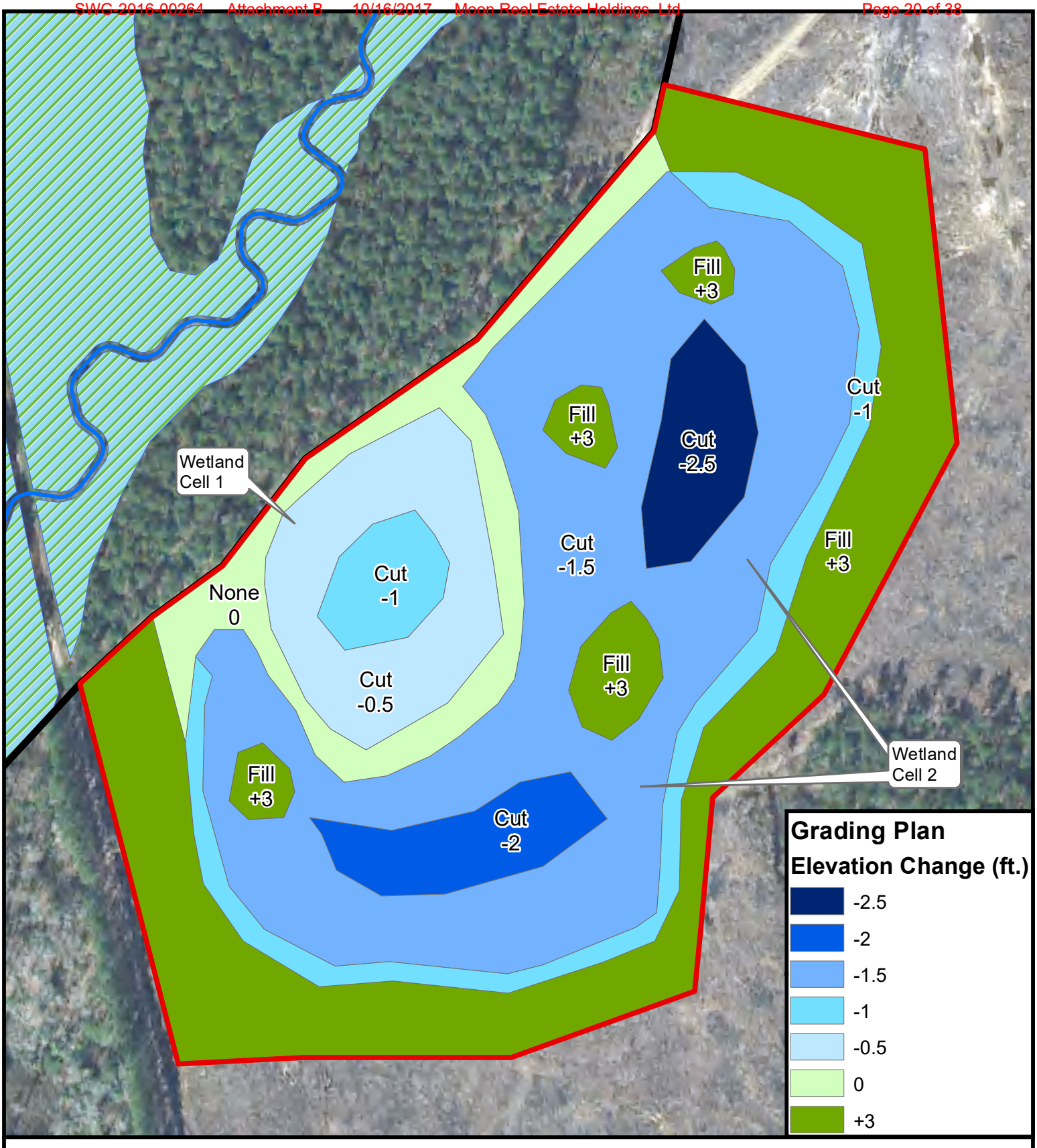
Created By: Neil Boitnott
Date: September 14, 2017

# Exhibit 3
## Delineation Data Point Map
## Metro Park Square PRM
## SWG-2016-00264

Delineation Data Points
Proposed Metro Park Square PRM
**Houston-Conroe Mitigation Bank**
HCMB Restored Stream
Houston/Conroe Boundary
HCMB Wetlands

Document Path: E:\TEP General\Metro Park\MXD\Exhibit 3.mxd

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Coordinate System: NAD 1983 2011 StatePlane Texas Central FIPS 4203 Ft US

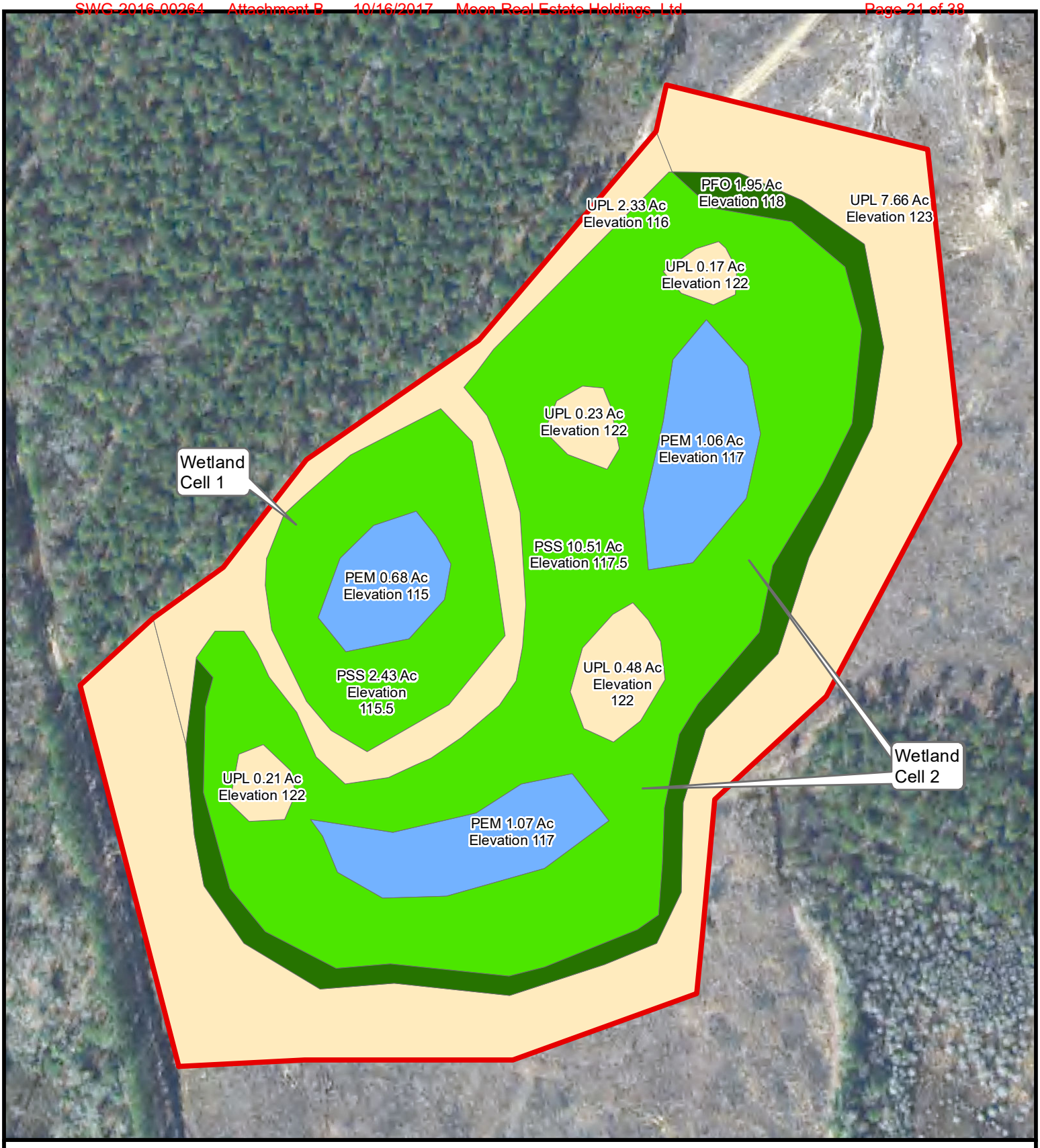
the earth partners

Created By: Neil Boitnott
Date: September 14, 2017

# Exhibit 4
## Grading Plan
## Metro Park Square PRM
## SWG-2016-00264

Proposed Metro Park Square PRM
**Houston-Conroe Mitigation Bank**
HCMB Restored Stream
Houston/Conroe Boundary
HCMB Wetlands

Document Path: E:\TEP General\Metro Park\MXD\Exhibit 4.mxd




0 200 400 600 800 1,000 Feet

Coordinate System: NAD 1983 2011 StatePlane Texas Central FIPS 4203 Ft US

the earth partners

Created By: Neil Boitnott
Date: September 14, 2017

# Exhibit 5
## Mitigation Plan
## Metro Park Square PRM
## SWG-2016-00264

Proposed Metro Park Square PRM

**Metro Park Mitigation Plan**

- PEM, Establishment (WAA 1)- 2.82 Acres
- PSS, Establishment (WAA 2) - 12.95 Acres
- PFO, Establishment (WAA 3) - 1.95 Acres
- UPL, Enhancement - 11.08 Acres

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# Appendix B – Delineation Data Forms

# WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Metro Park Square PRM Site City/County: Liberty County Sampling Date: 9/12/2017

Applicant/Owner: Moon Real Estate Holdings, Ltd. State: TX Sampling Point: Plot 1

Investigator(s): Boitnott and Goodrum Section, Township, Range: NA

Landform (hillslope, terrace, etc.): Gentle Hillslope Local relief (concave, convex, none): Convex Slope (%): 1%

Subregion (LRR or MLRA): LRR-T Lat: 30.232868 Long: -95.060028 Datum: NAD 83

Soil Map Unit Name: Waller-Kirbyville Complex NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes _____ No ✓ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

## SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | | |
|---|---|---|---|
| Hydrophytic Vegetation Present? | Yes ✓ | No _____ | **Is the Sampled Area within a Wetland?** Yes _____ No ✓ |
| Hydric Soil Present? | Yes ✓ | No _____ | |
| Wetland Hydrology Present? | Yes _____ | No ✓ | |

Remarks:

Habitat consists of upland juvenile pine plantation on gentle hillslope. Hydrophytic vegetation and hydric soils were present but the area lacked wetland hydrology indicators.
Climatic conditions not typical due to Hurricane Harvey and associated 30+ inches of rain to the area.

## HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15) **(LRR U)**
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Sphagnum moss (D8) **(LRR T, U)**

**Field Observations:**

| | | | |
|---|---|---|---|
| Surface Water Present? | Yes _____ | No ✓ | Depth (inches): _____ |
| Water Table Present? | Yes _____ | No ✓ | Depth (inches): _____ |
| Saturation Present? (includes capillary fringe) | Yes _____ | No ✓ | Depth (inches): _____ |

**Wetland Hydrology Present?** Yes _____ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No wetland hydrology indicators were observed. Criteria not met.

**VEGETATION (Four Strata) –** Use scientific names of plants. Sampling Point: Plot 1

| Tree Stratum (Plot size: 30 ft) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. None | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| | 0 = Total Cover | | |
| 50% of total cover: 0.0 | 20% of total cover: 0.0 | | |
| **Sapling/Shrub Stratum** (Plot size: 30 ft) | | | |
| 1. Pinus taeda | 30 | YES | FAC |
| 2. Triadica sebifera | 10 | YES | FAC |
| 3. Quercus nigra | 5 | NO | FAC |
| 4. Fraxinus pennsylvanica | 1 | NO | FACW |
| 5. Morella cerifera | 1 | NO | FAC |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| | 47 = Total Cover | | |
| 50% of total cover: 23.5 | 20% of total cover: 9.4 | | |
| **Herb Stratum** (Plot size: 30 ft) | | | |
| 1. Andropogon virginicus | 60 | YES | FAC |
| 2. Dichanthelium dichotomum | 20 | YES | FAC |
| 3. Eupatorium perfoliatum | 5 | NO | FACW |
| 4. Eupatorium capillifolium | 2 | NO | FACU |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| 9. | | | |
| 10. | | | |
| 11. | | | |
| 12. | | | |
| | 87 = Total Cover | | |
| 50% of total cover: 43.5 | 20% of total cover: 17.4 | | |
| **Woody Vine Stratum** (Plot size: 30 ft) | | | |
| 1. Campsis radicans | 10 | YES | FAC |
| 2. Rubus argutus | 2 | NO | FAC |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| | 12 = Total Cover | | |
| 50% of total cover: 6.0 | 20% of total cover: 2.4 | | |

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 5 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | Multiply by: |
|---|---|
| OBL species | x 1 = |
| FACW species | x 2 = |
| FAC species | x 3 = |
| FACU species | x 4 = |
| UPL species | x 5 = |
| Column Totals: 0 (A) | 0 (B) |

Prevalence Index = B/A = 0.0

**Hydrophytic Vegetation Indicators:**

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ✓ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

**Definitions of Four Vegetation Strata:**

**Tree** – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

**Sapling/Shrub** – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

**Herb** – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

**Woody vine** – All woody vines greater than 3.28 ft in height.

**Hydrophytic Vegetation Present?** Yes ✓ No ___

Remarks: (If observed, list morphological adaptations below).

Hydrophytic vegetation was dominant. Criteria met.
Habitat consisted of juvenile pine plantation.

## SOIL

Sampling Point: Plot 1

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth (inches) | Matrix Color (moist) | Matrix % | Redox Features Color (moist) | Redox Features % | Type[1] | Loc[2] | Texture | Remarks |
|---|---|---|---|---|---|---|---|---|
| 0-2 | 10YR 4/3 | 100 | | | | | FSL | Fine sandy loam |
| 2-6 | 10YR 5/3 | 75 | 10YR 5/6 | 15 | C | M | FSL | Fine sandy loam |
| | | | 10YR 5/6 | 10 | C | PL | | |
| 6-12 | 10YR 5/3 | 70 | 10YR 5/6 | 15 | C | M | FSL | Fine sandy loam |
| | | | 10YR 5/6 | 10 | C | PL | | |
| | | | 10YR 5/2 | 5 | D | M | | |
| | | | | | | | | |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

**Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)**

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Organic Bodies (A6) **(LRR P, T, U)**
- ___ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ___ Muck Presence (A8) **(LRR U)**
- ___ 1 cm Muck (A9) **(LRR P, T)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ✓ Coast Prairie Redox (A16) **(MLRA 150A)**
- ___ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR P, S, T, U)**
- ___ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ___ Thin Dark Surface (S9) **(LRR S, T, U)**
- ___ Loamy Mucky Mineral (F1) **(LRR O)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) **(LRR U)**
- ___ Depleted Ochric (F11) **(MLRA 151)**
- ___ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ___ Umbric Surface (F13) **(LRR P, T, U)**
- ___ Delta Ochric (F17) **(MLRA 151)**
- ___ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ___ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

**Indicators for Problematic Hydric Soils[3]:**

- ___ 1 cm Muck (A9) **(LRR O)**
- ___ 2 cm Muck (A10) **(LRR S)**
- ___ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ___ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ___ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

**Restrictive Layer (if observed):**

Type: Clay, argillic horizon

Depth (inches): 25"

**Hydric Soil Present?** Yes ✓ No ___

Remarks:

Soils met the criteria for coast prairie redox indicator (A16) which allows for a "matrix chroma of 3 or less with 2 percent or more distinct or prominent redox concentrations occurring as soft masses and/or pore linings." The project site is within the Lissie geologic formation so this indicator is applicable.

## WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Metro Park Square PRM Site City/County: Liberty County Sampling Date: 9/12/2017

Applicant/Owner: Moon Real Estate Holdings, Ltd. State: TX Sampling Point: Plot 2

Investigator(s): Boitnott and Goodrum Section, Township, Range: NA

Landform (hillslope, terrace, etc.): Gentle Hillslope Local relief (concave, convex, none): Convex Slope (%): 1%

Subregion (LRR or MLRA): LRR-T Lat: 30.231566 Long: -95.059616 Datum: NAD 83

Soil Map Unit Name: Waller-Kirbyville Complex NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes _____ No ✓ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

### SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | | |
|---|---|---|---|
| Hydrophytic Vegetation Present? | Yes ✓ | No _____ | **Is the Sampled Area within a Wetland?** Yes _____ No ✓ |
| Hydric Soil Present? | Yes ✓ | No _____ | |
| Wetland Hydrology Present? | Yes _____ | No ✓ | |

Remarks:

Habitat consists of upland juvenile pine plantation on gentle hillslope. Hydrophytic vegetation and hydric soils were present but the area lacked wetland hydrology indicators.
Climatic conditions not typical due to Hurricane Harvey and associated 30+ inches of rain to the area.

### HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15) **(LRR U)**
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Sphagnum moss (D8) **(LRR T, U)**

**Field Observations:**

| | | | |
|---|---|---|---|
| Surface Water Present? | Yes _____ | No ✓ | Depth (inches): _____ |
| Water Table Present? | Yes _____ | No ✓ | Depth (inches): _____ |
| Saturation Present? (includes capillary fringe) | Yes _____ | No ✓ | Depth (inches): _____ |

**Wetland Hydrology Present?** Yes _____ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No wetland hydrology indicators were observed. Criteria not met.

**VEGETATION (Four Strata) –** Use scientific names of plants. Sampling Point: Plot 2

| Tree Stratum (Plot size: 30 ft) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. None | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| | 0 = Total Cover | | |
| 50% of total cover: 0.0 | 20% of total cover: 0.0 | | |
| **Sapling/Shrub Stratum** (Plot size: 30 ft) | | | |
| 1. Pinus taeda | 50 | YES | FAC |
| 2. Quercus nigra | 10 | NO | FAC |
| 3. Triadica sebifera | 5 | NO | FAC |
| 4. Liquidambar styraciflua | 1 | NO | FAC |
| 5. Callicarpa americana | 1 | NO | FACU |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| | 67 = Total Cover | | |
| 50% of total cover: 33.5 | 20% of total cover: 13.4 | | |
| **Herb Stratum** (Plot size: 30 ft) | | | |
| 1. Andropogon virginicus | 60 | YES | FAC |
| 2. Dichanthelium dichotomum | 20 | YES | FAC |
| 3. Chasmanthium sessiliflorum | 10 | NO | FAC |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| 9. | | | |
| 10. | | | |
| 11. | | | |
| 12. | | | |
| | 90 = Total Cover | | |
| 50% of total cover: 45.0 | 20% of total cover: 18.0 | | |
| **Woody Vine Stratum** (Plot size: 30 ft) | | | |
| 1. Campsis radicans | 10 | YES | FAC |
| 2. Lygodium japonicum | 5 | YES | FAC |
| 3. Rubus argutus | 1 | NO | FAC |
| 4. | | | |
| 5. | | | |
| | 16 = Total Cover | | |
| 50% of total cover: 8.0 | 20% of total cover: 3.2 | | |

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 5 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | Multiply by: |
|---|---|
| OBL species | x 1 = |
| FACW species | x 2 = |
| FAC species | x 3 = |
| FACU species | x 4 = |
| UPL species | x 5 = |
| Column Totals: 0 (A) | 0 (B) |

Prevalence Index = B/A = 0.0

**Hydrophytic Vegetation Indicators:**

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ✓ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

**Definitions of Four Vegetation Strata:**

**Tree** – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

**Sapling/Shrub** – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

**Herb** – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

**Woody vine** – All woody vines greater than 3.28 ft in height.

**Hydrophytic Vegetation Present?** Yes ✓ No ___

Remarks: (If observed, list morphological adaptations below).

Hydrophytic vegetation was dominant. Criteria met.
Habitat consisted of juvenile pine plantation.

## SOIL

Sampling Point: Plot 2

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth (inches) | Matrix Color (moist) | Matrix % | Redox Features Color (moist) | Redox Features % | Type[1] | Loc[2] | Texture | Remarks |
|---|---|---|---|---|---|---|---|---|
| 0-4 | 10YR 4/1 | 100 | | | | | FSL | Fine sandy loam |
| 4-12 | 10YR 5/3 | 97 | 10YR 5/6 | 3 | C | PL | FSL | Fine sandy loam |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

**Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)**

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Organic Bodies (A6) **(LRR P, T, U)**
- ___ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ___ Muck Presence (A8) **(LRR U)**
- ___ 1 cm Muck (A9) **(LRR P, T)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ✓ Coast Prairie Redox (A16) **(MLRA 150A)**
- ___ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR P, S, T, U)**
- ___ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ___ Thin Dark Surface (S9) **(LRR S, T, U)**
- ___ Loamy Mucky Mineral (F1) **(LRR O)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) **(LRR U)**
- ___ Depleted Ochric (F11) **(MLRA 151)**
- ___ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ___ Umbric Surface (F13) **(LRR P, T, U)**
- ___ Delta Ochric (F17) **(MLRA 151)**
- ___ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ___ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

**Indicators for Problematic Hydric Soils[3]:**

- ___ 1 cm Muck (A9) **(LRR O)**
- ___ 2 cm Muck (A10) **(LRR S)**
- ___ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ___ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ___ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

**Restrictive Layer (if observed):**

Type: Clay, argillic horizon

Depth (inches): 25"

**Hydric Soil Present?** **Yes** ✓ **No** ___

Remarks:

Soils met the criteria for coast prairie redox indicator (A16) which allows for a "matrix chroma of 3 or less with 2 percent or more distinct or prominent redox concentrations occurring as soft masses and/or pore linings." The project site is within the Lissie geologic formation so this indicator is applicable.

## WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Metro Park Square PRM Site City/County: Liberty County Sampling Date: 9/12/2017

Applicant/Owner: Moon Real Estate Holdings, Ltd. State: TX Sampling Point: Plot 3

Investigator(s): Boitnott and Goodrum Section, Township, Range: NA

Landform (hillslope, terrace, etc.): Gentle Hillslope Local relief (concave, convex, none): Convex Slope (%): 1%

Subregion (LRR or MLRA): LRR-T Lat: 30.233275 Long: -95.057854 Datum: NAD 83

Soil Map Unit Name: Waller-Kirbyville Complex NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes _____ No ✓ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

### SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | | |
|---|---|---|---|
| Hydrophytic Vegetation Present? | Yes ✓ | No _____ | **Is the Sampled Area within a Wetland?** Yes _____ No ✓ |
| Hydric Soil Present? | Yes ✓ | No _____ | |
| Wetland Hydrology Present? | Yes _____ | No ✓ | |

Remarks:

Habitat consists of upland juvenile pine plantation on gentle hillslope. Hydrophytic vegetation and hydric soils were present but the area lacked wetland hydrology indicators.
Climatic conditions not typical due to Hurricane Harvey and associated 30+ inches of rain to the area.

### HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15) **(LRR U)**
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Sphagnum moss (D8) **(LRR T, U)**

**Field Observations:**

| | | | |
|---|---|---|---|
| Surface Water Present? | Yes _____ | No ✓ | Depth (inches): _____ |
| Water Table Present? | Yes _____ | No ✓ | Depth (inches): _____ |
| Saturation Present? (includes capillary fringe) | Yes _____ | No ✓ | Depth (inches): _____ |

**Wetland Hydrology Present?** Yes _____ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No wetland hydrology indicators were observed. Criteria not met.

**VEGETATION (Four Strata) –** Use scientific names of plants. Sampling Point: Plot 3

| Tree Stratum (Plot size: 30 ft) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. None | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| | 0 = Total Cover | | |
| 50% of total cover: 0.0 | 20% of total cover: 0.0 | | |
| **Sapling/Shrub Stratum** (Plot size: 30 ft) | | | |
| 1. Pinus taeda | 50 | YES | FAC |
| 2. Triadica sebifera | 10 | NO | FAC |
| 3. Callicarpa americana | 10 | NO | FACU |
| 4. Liquidambar styraciflua | 5 | NO | FAC |
| 5. Quercus nigra | 5 | NO | FAC |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| | 80 = Total Cover | | |
| 50% of total cover: 40.0 | 20% of total cover: 16.0 | | |
| **Herb Stratum** (Plot size: 30 ft) | | | |
| 1. Andropogon virginicus | 40 | YES | FAC |
| 2. Ambrosia artemisiifolia | 30 | YES | FACU |
| 3. Eupatorium capillifolium | 20 | YES | FACU |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| 9. | | | |
| 10. | | | |
| 11. | | | |
| 12. | | | |
| | 90 = Total Cover | | |
| 50% of total cover: 45.0 | 20% of total cover: 18.0 | | |
| **Woody Vine Stratum** (Plot size: 30 ft) | | | |
| 1. Campsis radicans | 10 | YES | FAC |
| 2. Rubus argutus | 2 | NO | FAC |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| | 12 = Total Cover | | |
| 50% of total cover: 6.0 | 20% of total cover: 2.4 | | |

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 60.0% (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | Multiply by: |
|---|---|
| OBL species | x 1 = |
| FACW species | x 2 = |
| FAC species | x 3 = |
| FACU species | x 4 = |
| UPL species | x 5 = |
| Column Totals: 0 (A) | 0 (B) |

Prevalence Index = B/A = 0.0

**Hydrophytic Vegetation Indicators:**

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ✓ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

**Definitions of Four Vegetation Strata:**

**Tree** – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

**Sapling/Shrub** – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

**Herb** – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

**Woody vine** – All woody vines greater than 3.28 ft in height.

**Hydrophytic Vegetation Present?** Yes ✓ No ___

Remarks: (If observed, list morphological adaptations below).

Hydrophytic vegetation was dominant. Criteria met.
Habitat consisted of juvenile pine plantation.

## SOIL

Sampling Point: Plot 3

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth (inches) | Matrix Color (moist) | Matrix % | Redox Features Color (moist) | Redox Features % | Type[1] | Loc[2] | Texture | Remarks |
|---|---|---|---|---|---|---|---|---|
| 0-4 | 10YR 4/1 | 100 | | | | | FSL | Fine sandy loam |
| 4-12 | 10YR 5/3 | 97 | 10YR 5/6 | 3 | C | PL | FSL | Fine sandy loam |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

**Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)**

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Organic Bodies (A6) **(LRR P, T, U)**
- ___ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ___ Muck Presence (A8) **(LRR U)**
- ___ 1 cm Muck (A9) **(LRR P, T)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ✓ Coast Prairie Redox (A16) **(MLRA 150A)**
- ___ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR P, S, T, U)**
- ___ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ___ Thin Dark Surface (S9) **(LRR S, T, U)**
- ___ Loamy Mucky Mineral (F1) **(LRR O)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) **(LRR U)**
- ___ Depleted Ochric (F11) **(MLRA 151)**
- ___ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ___ Umbric Surface (F13) **(LRR P, T, U)**
- ___ Delta Ochric (F17) **(MLRA 151)**
- ___ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ___ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

**Indicators for Problematic Hydric Soils[3]:**

- ___ 1 cm Muck (A9) **(LRR O)**
- ___ 2 cm Muck (A10) **(LRR S)**
- ___ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ___ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ___ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

**Restrictive Layer (if observed):**

Type: Clay, argillic horizon

Depth (inches): 25"

**Hydric Soil Present?** **Yes** ✓ **No** ___

Remarks:

Soils met the criteria for coast prairie redox indicator (A16) which allows for a "matrix chroma of 3 or less with 2 percent or more distinct or prominent redox concentrations occurring as soft masses and/or pore linings." The project site is within the Lissie geologic formation so this indicator is applicable.

## WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Metro Park Square PRM Site City/County: Liberty County Sampling Date: 9/12/2017

Applicant/Owner: Moon Real Estate Holdings, Ltd. State: TX Sampling Point: Plot 4

Investigator(s): Boitnott and Goodrum Section, Township, Range: NA

Landform (hillslope, terrace, etc.): Gentle Hillslope Local relief (concave, convex, none): Convex Slope (%): 1%

Subregion (LRR or MLRA): LRR-T Lat: 30.233275 Long: -95.057854 Datum: NAD 83

Soil Map Unit Name: Waller-Kirbyville Complex NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes _____ No ✓ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

### SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | | |
|---|---|---|---|
| Hydrophytic Vegetation Present? | Yes ✓ | No _____ | **Is the Sampled Area within a Wetland?** Yes _____ No ✓ |
| Hydric Soil Present? | Yes ✓ | No _____ | |
| Wetland Hydrology Present? | Yes _____ | No ✓ | |

Remarks:

Habitat consists of upland juvenile pine plantation on gentle hillslope. Hydrophytic vegetation and hydric soils were present but the area lacked wetland hydrology indicators.
Climatic conditions not typical due to Hurricane Harvey and associated 30+ inches of rain to the area.

### HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15) **(LRR U)**
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Sphagnum moss (D8) **(LRR T, U)**

**Field Observations:**

| | | | |
|---|---|---|---|
| Surface Water Present? | Yes _____ | No ✓ | Depth (inches): _____ |
| Water Table Present? | Yes _____ | No ✓ | Depth (inches): _____ |
| Saturation Present? (includes capillary fringe) | Yes _____ | No ✓ | Depth (inches): _____ |

**Wetland Hydrology Present?** Yes _____ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No wetland hydrology indicators were observed. Criteria not met.

**VEGETATION (Four Strata) –** Use scientific names of plants. Sampling Point: Plot 4

| Tree Stratum (Plot size: 30 ft) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. None | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| | 0 = Total Cover | | |
| 50% of total cover: 0.0 | 20% of total cover: 0.0 | | |
| **Sapling/Shrub Stratum** (Plot size: 30 ft) | | | |
| 1. Pinus taeda | 40 | YES | FAC |
| 2. Callicarpa americana | 10 | NO | FACU |
| 3. Quercus nigra | 5 | NO | FAC |
| 4. Liquidambar styraciflua | 5 | NO | FAC |
| 5. Morella cerifera | 1 | NO | FAC |
| 6. Ilex vomitoria | 1 | NO | FAC |
| 7. | | | |
| 8. | | | |
| | 62 = Total Cover | | |
| 50% of total cover: 31.0 | 20% of total cover: 12.4 | | |
| **Herb Stratum** (Plot size: 30 ft) | | | |
| 1. Andropogon virginicus | 50 | YES | FAC |
| 2. Eupatorium capillifolium | 20 | YES | FACU |
| 3. Solidago canadensis | 10 | NO | FACU |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| 9. | | | |
| 10. | | | |
| 11. | | | |
| 12. | | | |
| | 80 = Total Cover | | |
| 50% of total cover: 40.0 | 20% of total cover: 16.0 | | |
| **Woody Vine Stratum** (Plot size: 30 ft) | | | |
| 1. Campsis radicans | 10 | YES | FAC |
| 2. Rubus argutus | 10 | YES | FAC |
| 3. Passiflora sp. | 1 | NO | FAC |
| 4. | | | |
| 5. | | | |
| | 21 = Total Cover | | |
| 50% of total cover: 10.5 | 20% of total cover: 4.2 | | |

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 80.0% (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | Multiply by: |
|---|---|
| OBL species | x 1 = |
| FACW species | x 2 = |
| FAC species | x 3 = |
| FACU species | x 4 = |
| UPL species | x 5 = |
| Column Totals: 0 (A) | 0 (B) |

Prevalence Index = B/A = 0.0

**Hydrophytic Vegetation Indicators:**

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ✓ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

**Definitions of Four Vegetation Strata:**

**Tree** – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

**Sapling/Shrub** – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

**Herb** – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

**Woody vine** – All woody vines greater than 3.28 ft in height.

**Hydrophytic Vegetation Present?** Yes ✓ No ___

Remarks: (If observed, list morphological adaptations below).

Hydrophytic vegetation was dominant. Criteria met.
Habitat consisted of juvenile pine plantation.

## SOIL

Sampling Point: Plot 4

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth (inches) | Matrix Color (moist) | Matrix % | Redox Features Color (moist) | Redox Features % | Type[1] | Loc[2] | Texture | Remarks |
|---|---|---|---|---|---|---|---|---|
| 0-5 | 10YR 3/1 | 100 | | | | | FSL | Fine sandy loam |
| 5-12 | 10YR 5/3 | 97 | 10YR 5/6 | 3 | C | PL | FSL | Fine sandy loam |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

**Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)**

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Organic Bodies (A6) **(LRR P, T, U)**
- ___ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ___ Muck Presence (A8) **(LRR U)**
- ___ 1 cm Muck (A9) **(LRR P, T)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ✓ Coast Prairie Redox (A16) **(MLRA 150A)**
- ___ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR P, S, T, U)**
- ___ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ___ Thin Dark Surface (S9) **(LRR S, T, U)**
- ___ Loamy Mucky Mineral (F1) **(LRR O)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) **(LRR U)**
- ___ Depleted Ochric (F11) **(MLRA 151)**
- ___ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ___ Umbric Surface (F13) **(LRR P, T, U)**
- ___ Delta Ochric (F17) **(MLRA 151)**
- ___ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ___ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

**Indicators for Problematic Hydric Soils[3]:**

- ___ 1 cm Muck (A9) **(LRR O)**
- ___ 2 cm Muck (A10) **(LRR S)**
- ___ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ___ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ___ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

**Restrictive Layer (if observed):**

Type: Clay, argillic horizon

Depth (inches): 25"

**Hydric Soil Present?** **Yes** ✓ **No** ___

Remarks:

Soils met the criteria for coast prairie redox indicator (A16) which allows for a "matrix chroma of 3 or less with 2 percent or more distinct or prominent redox concentrations occurring as soft masses and/or pore linings." The project site is within the Lissie geologic formation so this indicator is applicable.

# Appendix C – iHGM Data Forms

# SWG Riverine Herbaceous/Shrub iHGM

## WAA 1 - Herbaceous Wetland

Site: SWG-2016-00264
Date: 9/12/17 Team: BG & NB

| Location | Vdur | Vfreq | Vtopo | Vwood | Vmid | Vherb | Vdetritu | Vredox | Vsorpt | Vconnect |
|---|---|---|---|---|---|---|---|---|---|---|
| WAA 1 | 1.00 | 1.00 | 0.40 | 0.25 | 0.25 | 1.00 | 1.00 | 1.00 | 0.50 | 0.75 |

**Functional Capacity Index**

| HGM# | WAA 1 |
|---|---|
| TSDSW | 0.72 |
| MPAC | 0.67 |
| RSEC | 0.73 |

**WAA Acres =** **2.82**

**Functional Capacity Units**

| HGM# | WAA 1 |
|---|---|
| TSDSW | 2.02 |
| MPAC | 1.88 |
| RSEC | 2.05 |

Notes:

Herbaceous wetland associated with natural impoundment on HCMB. Area was dominated by common rush (Juncus effusus) and maidencane (Panicum hemitomon).

North:

South:

East:

West:

# SWG Riverine Herbaceous/Shrub iHGM

## WAA 2 - Scrub/Shrub Wetland

Site: SWG-2016-00264
Date: 9/12/17 Team: BG & NB

| Location | Vdur | Vfreq | Vtopo | Vwood | Vmid | Vherb | Vdetritu | Vredox | Vsorpt | Vconnect |
|---|---|---|---|---|---|---|---|---|---|---|
| WAA 2 | 1.00 | 1.00 | 0.40 | 0.75 | 0.75 | 1.00 | 1.00 | 1.00 | 0.50 | 0.75 |

**Functional Capacity Index**

| HGM# | WAA 2 |
|---|---|
| TSDSW | 0.80 |
| MPAC | 0.83 |
| RSEC | 0.86 |

**WAA Acres =** **12.95**

**Functional Capacity Units**

| HGM# | WAA 2 |
|---|---|
| TSDSW | 10.34 |
| MPAC | 10.79 |
| RSEC | 11.14 |

Notes:

Scrub-shrub wetland adjacent to herbaceous wetland near HCMB. Area was dominated by common buttonbush (Cephalanthus occidentalis), American snobell (Styrax americanus), and green ash (Fraxinus pennsylvanica).

North:

South:

East:

West:

# SWG Riverine Forested iHGM

## WAA 3 - Forested Wetland

Site: SWG-2016-00264
Date: 9/12/17 Team: BG & NB

| Location | Vdur | Vfreq | Vtopo | Vcwd | Vwood | Vtree | Vrich | Vbasal | Vdensity | Vmid | Vherb | Vdetritus | Vredox | Vsorpt | Vconnect |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WAA 3 | 0.75 | 0.75 | 1.00 | 1.00 | 1.00 | 1.00 | 0.80 | 1.00 | 0.60 | 1.00 | 1.00 | 1.00 | 1.00 | 0.50 | 1.00 |

**Functional Capacity Index**

| HGM# | WAA 3 |
|---|---|
| TSDSW | 0.87 |
| MPAC | 0.93 |
| RSEC | 0.87 |

**WAA Acres =** **1.95**

**Functional Capacity Units**

| HGM# | WAA 3 |
|---|---|
| TSDSW | 1.69 |
| MPAC | 1.82 |
| RSEC | 1.69 |

Notes:

Mixed hardwood/pine forested wetland in unharvested portion of parent tract. Area contained cherrybark oak (Quercus pagoda), water oak (Quercus nigra), willow oak (Quercus phellos), swamp chestnut oak (Quercus michauxii), white oak (Quercus alba), sweetgum (Liquidambar styraciflua), American holly (Ilex opaca), and red maple (Acer rubrum).

North:

South:

East:

West: