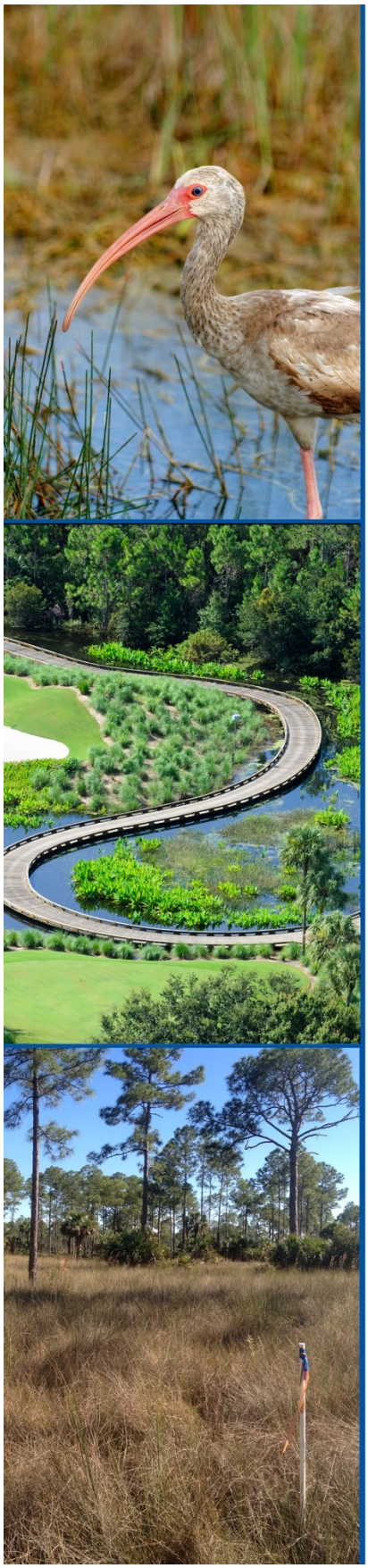
DRAFT BIOLOGICAL ASSESSMENT

COLLIER COUNTY
COMPREHENSIVE WATERSHED IMPROVEMENT PLAN
COLLIER COUNTY, FLORIDA

APPENDIX B: MONITORING REPORT



COLLIER COUNTY COMPREHENSIVE WATERSHED IMPROVEMENT PLAN

MONITORING PLAN

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February 14, 2019

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Attachments

1.0 INTRODUCTION

This monitoring plan outlines the methods to quantify baseline (pre-project) and with-project vegetation and surface water conditions in and around the Collier County Comprehensive Watershed Improvement Project (CCCWIP). The project includes about 25,761 acres including the western portion of the Picayune Strand State Forest and the landward end of Rookery Bay. Water withdrawn from Golden Gate Canal will flow through a preliminary water treatment flow-way north of I-75 and discharge into the CCCWIP area south of Interstate 75, east of Collier Boulevard and west of the southern blocks of the Golden Gate Estates. The majority of the total project area (about 22,839 acres)

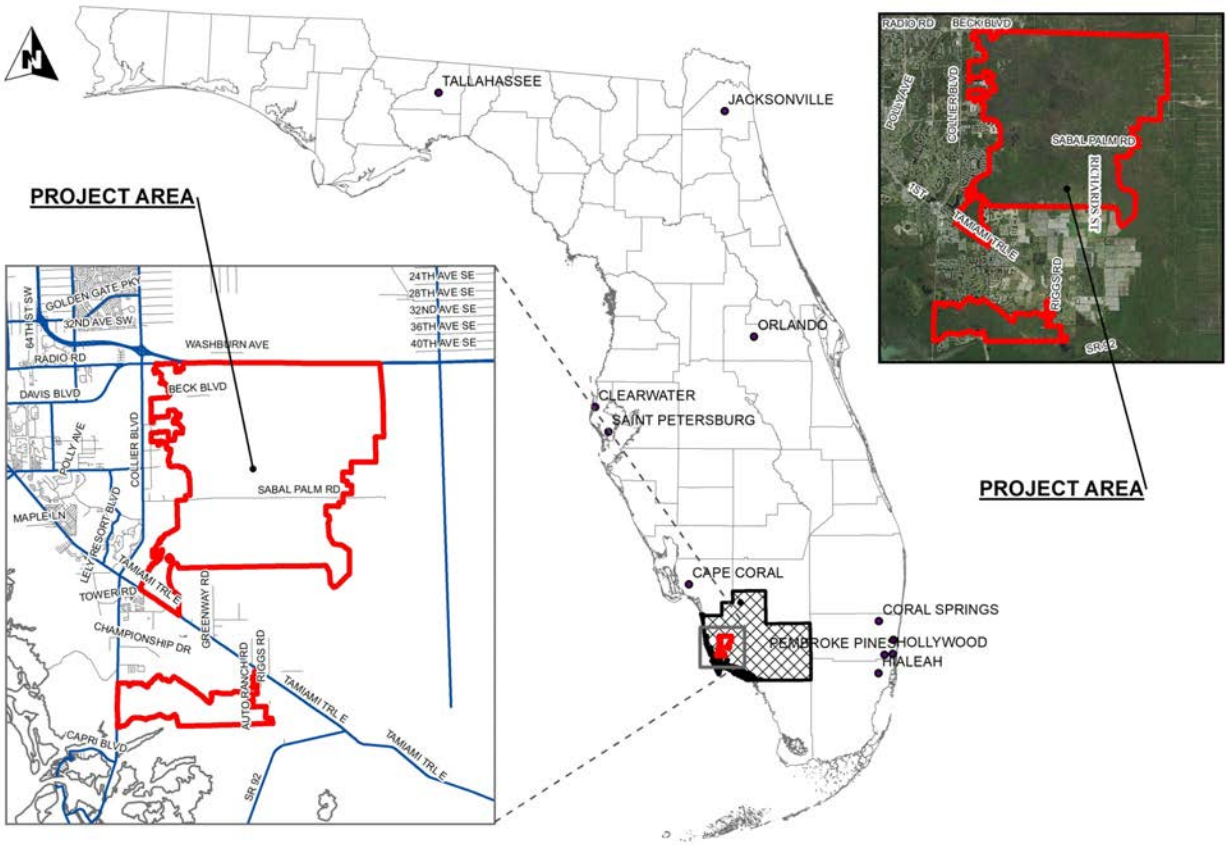


Figure 1. Project Location Map

is within the western portion of Picayune Strand State Forest (PSSF). Based on a conservative estimate of the water available from Golden Gate canal, the potential effect area is about 14,309 acres. The remainder of the main project area is defined to ensure that the project effects are separated from development (to the west) and the SFWMD Picayune Strand Restoration project to the east. The potential effect area may change as the available water calculations are refined. Water will flow out of the CCWIP under US 41 / Alligator Alley into the mangroves of Rookery Bay (see Figures 1 and 2). The project boundary includes about 2,921 acres of the landward end of the Rookery Bay watershed where monitoring for salinity changes will occur.

The goal of the monitoring program is to provide an accurate understanding of project-related ecosystem changes by comparing areas potentially influenced by the project with adjacent areas not expected to be influenced used for comparison. The monitoring objective is to provide data sufficiently accurate to assess changes in the hydrology, water quality, and vegetation communities in and around the project area of influence. The baseline monitoring plan includes hydrologic, water

quality, and vegetation monitoring at 60 locations in and around the Picayune Strand State Forest (PSSF), and water quality sampling at the Golden Gate Canal inflow point, after passage through the initial flow-way, and at the project outflow points on the east side of the Tamiami Trail.

The sampling design is before – after, control – impact (BACI). Baseline sampling (before project operation) will be compared to with-project (after construction) data. Baseline data for all monitoring locations will be collected from the time of monitoring plan implementation until project construction. Based on pre-project simulation modeling, the anticipated limits of the core flow-way are shown in (Figure 2). Sampling will occur in the common, dominant Florida Land Use and Cover Classification System (FLUCCS) community types at inflow location and at outflow locations at the southern end of the project. Sampling will also occur at locations outside (control locations) and within (impact locations) the projected core flow-way.

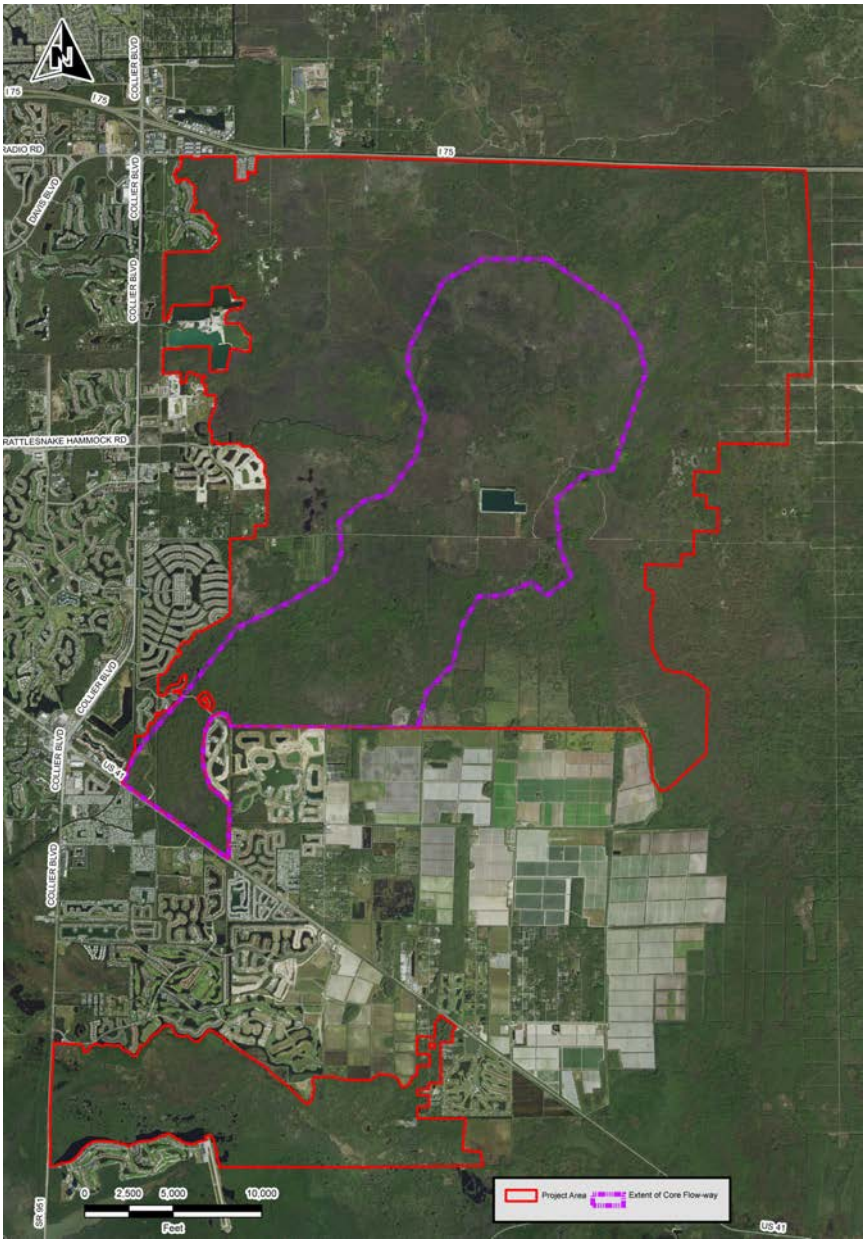


Figure 2. Project Area with Anticipated Limits of Core Flow-way (Area of Influence).

2.0 HYDROLOGIC MONITORING

Sixty (60) shallow groundwater monitoring wells will be installed within and outside the area of potential project influence (see Attachment A for well locations). Monitoring wells will be placed in as diverse a selection of existing vegetation communities as possible. Each monitoring well will be equipped with a HOBO MX2001-04 water level data logger that will record water levels and barometric pressure at least twice daily. On a quarterly basis, water level data will be downloaded, saved in raw data and spreadsheet formats, and summarized in graphs. Rainfall data will be obtained from the same stations used in the surface water – ground water modeling effort or obtained from appropriate stations reported in National Oceanic and Atmospheric Administration's (NOAA) Climate Data Online (CDO) for correlations to surface water and ground water elevations. Alternatively, if a site can be identified within the PSSF, a stand-alone rain gauge will be installed to directly collect rainfall data for the project area.

At each quarterly download event, the wells will be inspected and appropriately maintained.

2.1 Well Installation Methodology

At each well location, soil borings will be conducted utilizing a mechanical auger, a hand auger, or a combination of the two in order to reach a target depth of 4 feet below grade surface (bgs). Once the target depth is achieved a screened portion of PVC, with a well point, will be placed into the boring hole. Clean gravel will be poured around the screened portion of the PVC to alleviate silt/fine sediment build up around the screen. A solid PVC riser will be attached to the screened portion of PVC to achieve an elevation of approximately 3 feet above grade surface (ags). The HOBO MX2001-04 water level data logger will be placed within the well, suspended just above the bottom of the well. A cap equipped with a combination lock will be placed on top of the riser portion of the PVC for protection. Each well will be labeled with an ETE company sticker for identification. The well locations, natural ground level elevation, and top of pipe elevations will be surveyed by Marco Surveying & Mapping LLC following the completed installation. See Attachment B for well installation cross section\data form.

3.0 WATER QUALITY MONITORING

The primary objective of the water quality monitoring is to assess project-related changes in total nitrogen and total phosphorus. The data will allow assessment of these changes in the project area and Rookery Bay receiving waters within the overall project footprint (Figure 2). Samples collected at the inflow and outflow ends of the project will provide the data to assess inflow and outflow nutrient concentration differences. Water quality data collected in the receiving waters of Rookery Bay will assess salinity changes as a result of the project. Samples collected within the project area will allow assessment of any differences in nutrient levels within and outside the project area of influence.

Samples for lab analysis of water quality will be collected on a quarterly basis from twenty (20) of the monitoring wells (See Attachment A; monitoring wells where lab analyzed water sampling will take place are showing in blue). If the surface water depth is greater than 15 cm (6 inches) at any of the well locations, a surface water sample will also be collected for lab analysis. Sampling will be conducted in accordance with the Florida Department of Environmental Protection's (FDEP) Standard Operating Procedures (SOPs) F.A.C 62-160.110, FS 2100 for surface water sampling and FS 2200 for groundwater sampling. All water samples will be properly labeled in laboratory provided sample bottles, stored on ice in a cooler, and sent to a National Environmental Laboratory Accreditation Program (NELAP) certified laboratory.

The following water quality parameters will be measured.

- Field Sampling Parameters (taken at all wells)
  - water temperature
  - pH
  - dissolved oxygen
  - specific conductance (as the basis for salinity calculation)
- Well and/or Surface Water* Laboratory Parameters (taken at 20 wells)
  - NOx (NO_2 + NO_3 soluble)
  - Total Kjeldahl nitrogen (TKN)
  - Total dissolved Kjeldahl nitrogen (TKN-D)
  - total phosphorus (TP)
  - total dissolved phosphorus (TPD)

*Surface water samples will only be obtained if the surface water depth at the well location is greater than 15 cm (6 inches)

At each sampling location, the sampling technician will also collect general meteorological conditions (wind speed/direction, air temperature, etc.) date, time of day, water depth within the well, and, if surface water is present, surface water depth and sample collection depth. If no surface water is present, soil saturation condition (saturated or not saturated) will be recorded. During each day of water quality sampling, a field blank and equipment blank will be submitted to the NELAP Lab for quality assurance.

4.0 SOIL CHARACTERIZATION

Soil characterizations will provide information necessary to fully understand changes in hydrology and vegetation over time. An initial physical/hydrologic characterization of the soil will be made at each well location during installation and at the center of each of the tree and shrub vegetation monitoring plots along each transect (see below) using the methods outlined in *Field Indicators of Hydric Soils in the United States, A Guide for Identifying and Delineating Hydric Soils*. Each soil characterization will be cross-referenced with the Natural Resources Conservation Service (NRCS) soil survey data for that location.

5.0 QUANTITATIVE VEGETATION MONITORING

Sixty (60) 75-meter monitoring transects will be established to monitor vegetation changes over time. Transects will be placed near well locations within homogeneous vegetation communities (FLUCCS community). Transect orientation will be field-determined. Each transect will contain three (3) canopy\shrub vegetation monitoring plots and six (6) groundcover vegetation monitoring plots. Plot-based methods will quantify vegetation along each transect. See Attachment C for a sample well location with vegetation transect layout. After initial monitoring efforts are completed, some transects, particularly those associated with wells outside natural vegetation areas, may be eliminated from future monitoring.

Field ecologists will establish each monitoring transect using a sub-meter, Differential Global Positioning System (DGPS) and tape measure. Each vegetation monitoring plot will be a 10-meter square and the corners will be permanently marked using PVC pipes. The GPS coordinates will be recorded at the center of each plot. Additionally, the center of each 1-meter groundcover quadrat will be marked with PVC and GPS located along the monitoring transect.

Quantitative vegetation monitoring parameters will consist of:

a) density, dominance, area, and composition of canopy and sub-canopy species;
b) percent cover and composition of shrub species;
c) percent cover and composition of groundcover species.

The vegetation strata to be monitored are defined as follows:

1. Canopy and sub-canopy trees will be defined as those woody plants with a diameter at breast height (dbh) greater than 2.5 cm (dbh to be measured 130 cm above ground surface).
2. The shrub layer will consist of shrub species and trees with a dbh less than 2.5 cm.
3. Ground cover will consist of all plants not found in the other strata, primarily herbaceous species.

Canopy, sub-canopy, shrub species, and groundcover will be monitored annually during the dry season. High water levels in portions of the PSSF and limited access would make monitoring of vegetation (especially groundcover) difficult during the rainy season. For this reason, vegetation monitoring will take place on an annual basis, in early spring.

5.1 Canopy, Sub-canopy, and Shrub Vegetation Monitoring Methodology

Quantification of canopy and sub-canopy species will occur at three (3) 10-meter square plots centered on three randomly selected quadrat locations of the six (6) groundcover monitoring locations along each transect. Once the sampling areas are established, subsequent monitoring will occur at the same locations during each annual monitoring event. Each canopy, sub-canopy, and shrub species will be identified to the lowest taxonomic level possible and percent coverage will be determined. All trees located within each 10-meter plot with a dbh greater than 2.5 cm will be identified with numbered tree tags to allow tracking of health and growth rates over time. Measurements will include dbh, percent canopy cover, and general health. For trees with multiple trunks, each trunk dbh will be measured separately and recorded to indicate the affiliation of the multiple trunks with a single tree.

In evaluating health condition of each tagged tree, a Health Assessment Score (HAS) will be assigned. The HAS scoring matrix breaks down as follows:

Canopy Tree Health Assessment Scoring System		
Tree Condition	**Condition Characteristics**	**Health Assessment Score (HAS)**
Dead	no foliage or other signs of life, fallen	0
Stressed	wilting, dead limbs/trunks, brittle, peeling bark, insect damage, root damage, masses/growths	1
Good	robust, abundant leaves/needles/limbs, no signs of stress	2

Once each tree is assigned a HAS, each plot will then be assigned an average HAS relative to the total number of trees in that plot. A plot HAS closer to "0" generally indicates poorer health, while a HAS closer to "2" generally indicates greater health.

5.2 Groundcover Vegetation Monitoring Methodology

Groundcover will be quantified within 1-meter quadrats located at 15-meter intervals along each transect (total of 6 quadrats). A 1-meter square quadrat frame centered on a fixed transect point will provide the areal basis for groundcover data collection. The composition and cover of vegetation, as defined above, will be quantified using direct visual estimates. Vegetation not identified to species level will be identified to the lowest taxonomic level possible.

All monitoring data will be entered into a Microsoft Excel database. The wetland indicator status as defined in Chapter 62-340, Florida Administrative Code and the native/non-native status of each species will also be recorded. An example vegetation plot data form is attached.

6.0 QUALITATIVE MONITORING

Qualitative monitoring will occur at each plot location. Notes on the type of community being sampled, the general health of the vegetation, soil inundation, standing water levels, recruitment of new species, and the presence or spread of nuisance/exotic species will be recorded on field data sheets. Observations of wildlife, consisting of direct sightings, scat, tracks, or vocalizations, will also be noted. The qualitative monitoring for each plot will be summarized in paragraph format.

7.0 PHOTOGRAPHIC DOCUMENTATION

On an annual basis, 180-degree panoramic photos will be taken at each plot location. Orientation of the panoramas will be north, with the plot station marker in the center of the frame. Panoramas are meant to assist in documentation of trends over time.

8.0 SCHEDULE AND REPORTING

Quarterly well data (water levels \ water quality) and annual vegetation monitoring data will be compiled into an annual report at the end of each calendar year. The annual report will contain data for each monitoring plot with GIS exhibits, spreadsheets, and summary graphs sufficient enough to convey field data.

The annual schedule below is anticipated to continue in this format as the project progresses.

Task	Date
Initial Well Install and Vegetation Transect Setup (Baseline)	March 2019
Quarterly Well Download & Water Quality	June 2019
Quarterly Well Download & Water Quality	September 2019
Quarterly Well Download & Water Quality	December 2019
First Annual Vegetation Monitoring with Well Download & Water Quality	March 2020
Quarterly Well Download & Water Quality	June 2020
Quarterly Well Download & Water Quality	September 2020
Quarterly Well Download & Water Quality	December 2020
Second Annual Vegetation Monitoring with Well Download & Water Quality	March 2021

9.0 MODIFICATIONS TO MONITORING PLAN

Future modifications to the methodology or scope of this plan may be necessary due to changes in the Collier County Comprehensive Watershed Improvement Project.

10.0 REFERENCES CITED

Delineation of the Landward Extent of Wetlands and Surface Waters, Chapter 62-340, Florida Administrative Code. 1994.

Lichvar, R.W., M. Butterwick, N.C. Melvin, and W.N. Kirchner. 2014. The National Wetland Plant List: 2014 Update of Wetland Ratings. Phytoneuron 2014-41: 1-42.

Water Use/Consumptive Use Permits Wetlands/Surface Waters Monitoring Plan Guidelines, South Florida Water Management District. 2018.

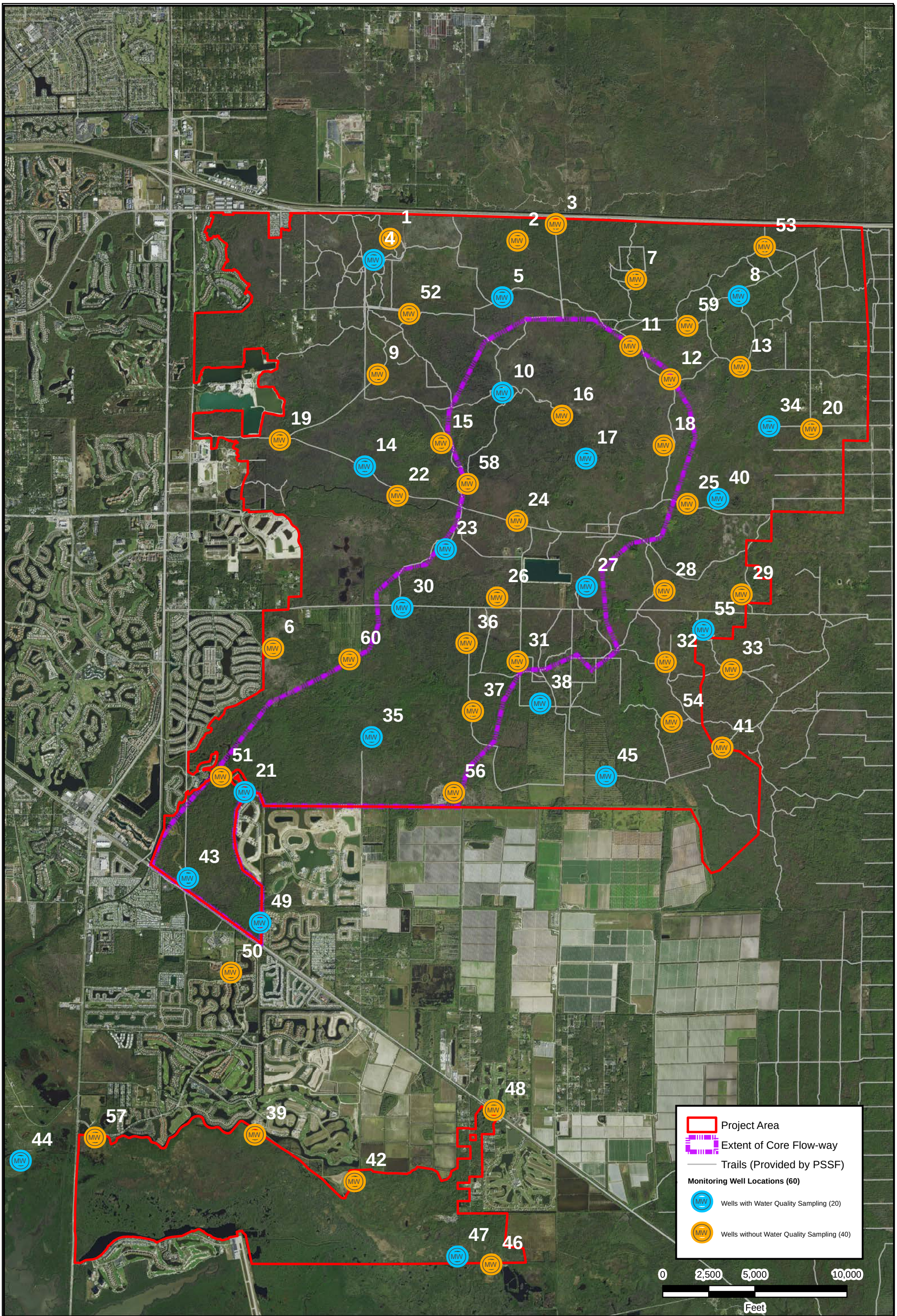
United States Department of Agriculture, Natural Resources Conservation Service. 2010. Field Indicators of Hydric Soils in the United States, Version 7.0. L.M. Vasilas, G.W. Hurt, and C.V. Noble (eds.). USDA, NRCS, in cooperation with the National Technical Committee for Hydric Soils.

National Academies of Sciences, Engineering & Medicine 2017. Effective Monitoring of Evaluate Ecological Restoration in the Gulf of Mexico. Washington, DC: The National Academies Press. https://doi.org/10.17226/23476.

Florida Department of Environmental Protection's (FDEP) Standard Operating Procedures (SOPs), F.A.C 62-160.110. FS 2100. Surface Water Sampling & FS 2200 Groundwater Sampling.

Attachment A

Proposed Monitoring Well Locations



CCCWIP
Collier County, Florida

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EARTH TECH ENVIRONMENTAL, LLC
10600 JOLEA AVE
BONITA SPRINGS, FLORIDA 34135
PHONE (239) 304-0030

N

HABITAT & GROUNDWATER MONITORING LOCATIONS

SHEET NO.	DATE	PROJECT NO.	SCALE
	2/25/19	N/A	AS SHOWN

Attachment B

Well Installation Cross Section \ Data Form

Earth Tech Environmental, LLC

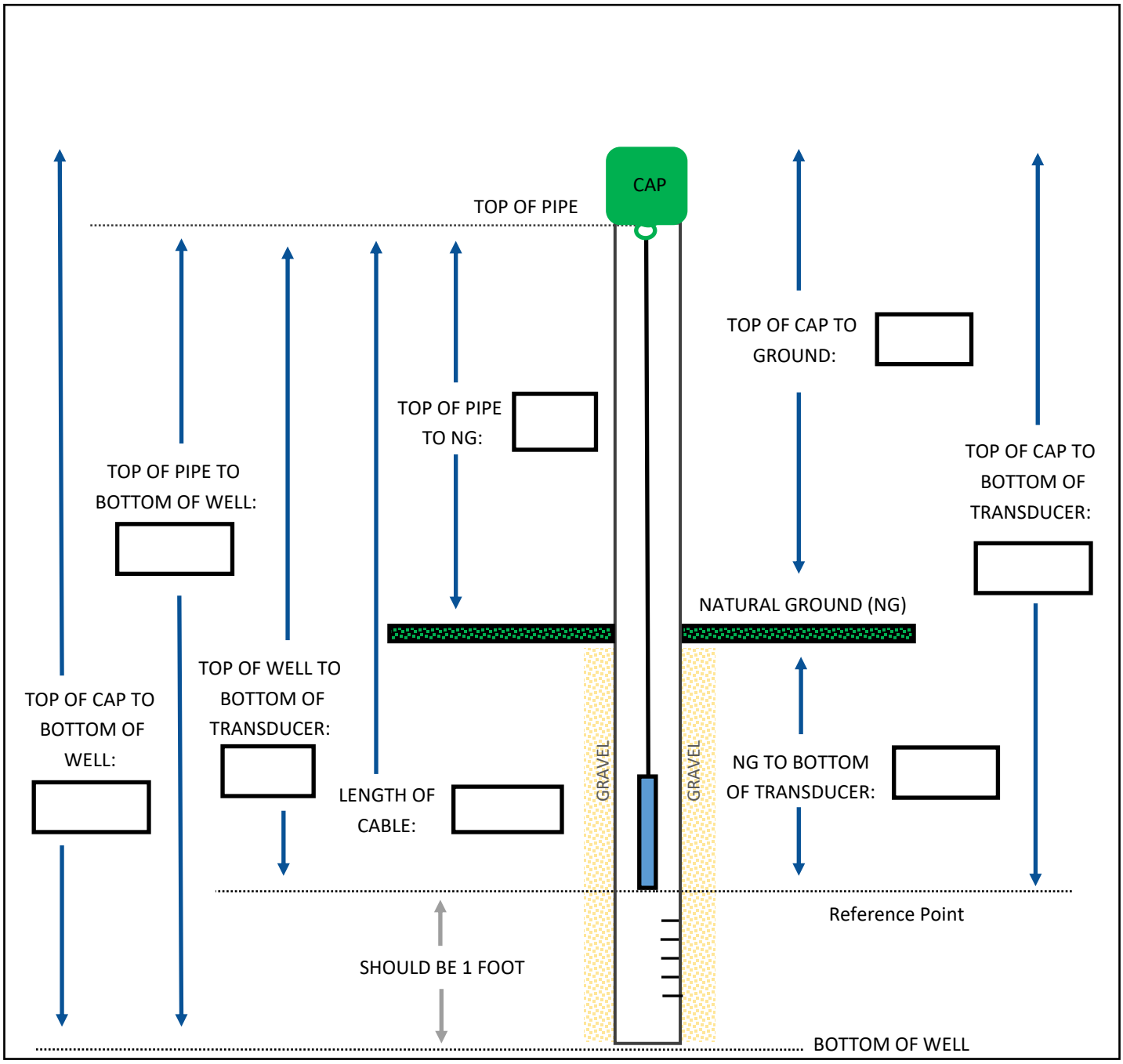
Well Installation Form

Project: _____ Well #: _____

Date Installed: _____ Hobo Logger S/N: _____

Installed by: _____ Hobo Water Level S/N:_____

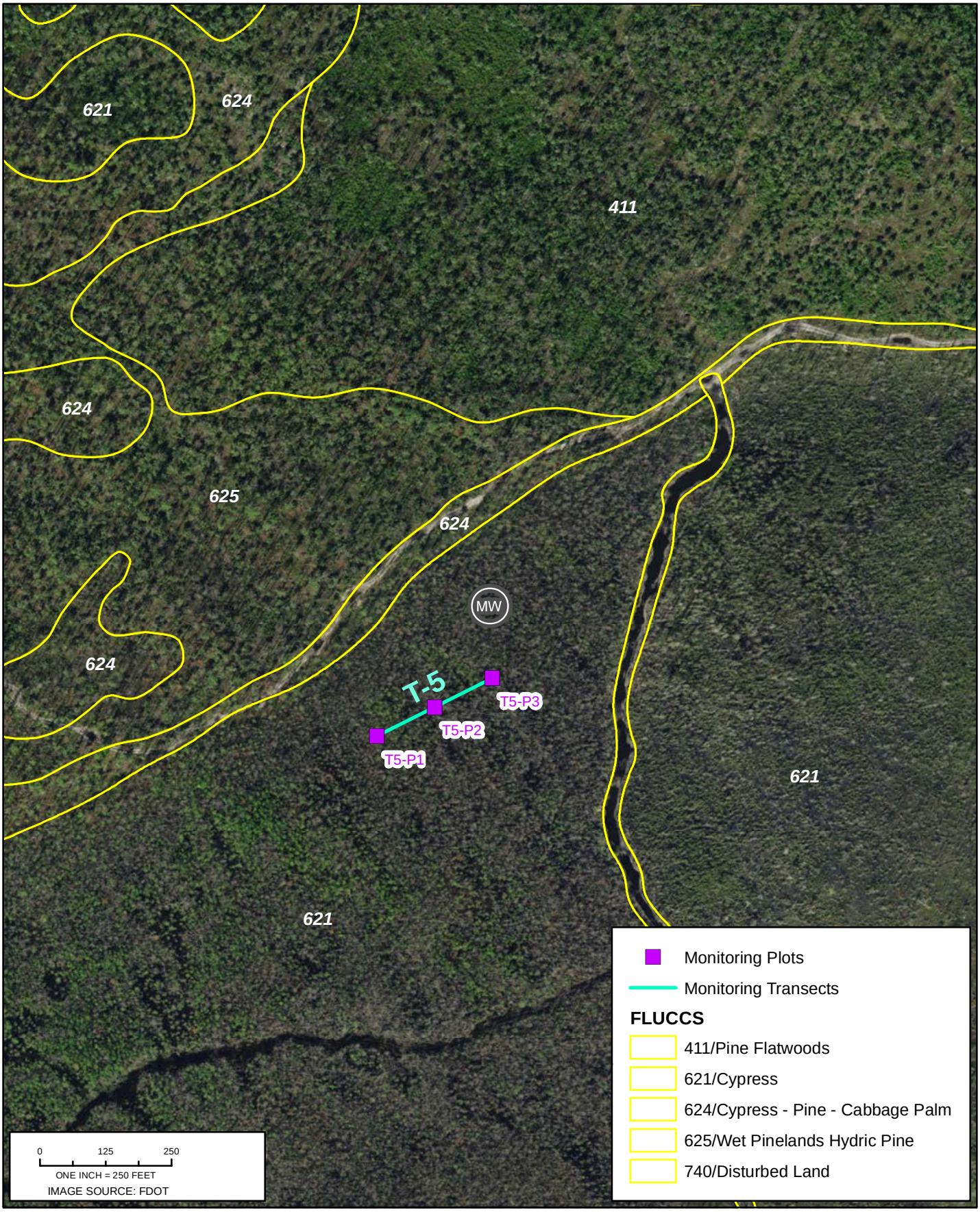
Well #: _____ Logging Interval:_____



Notes:

Attachment C

Example Well and Vegetation Transect Map



TAYLOR ENGINEERING INC.
10199 SOUTHSIDE BOULEVARD
SUITE 310
JACKSONVILLE, FL 32256
CERTIFICATE OF AUTHORIZATION # 4815

CCCWIP EXAMPLE WELL & TRANSECT
WELL POINT # 5
COLLIER COUNTY, FLORIDA

PROJECT	C2018-052
DRAWN BY	KM
SHEET	5 OF 60
DATE	FEB 2019

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