Lockheed Martin Corporation
Wetlands Monitoring Report
July 2014 through June 2015
Tallevast, Florida

Prepared for:

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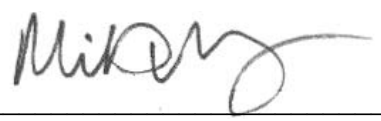

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Acronyms, Abbreviations, and Units of Measurement

ABC	American Beryllium Company
AD zone	Adaptive Zone
ags	above ground surface
BECSD	BECSD, LLC
bgs	below ground surface
ºC	degrees Celsius
COC	Contaminant of Concern
D zone	Deep Zone
DO	Dissolved Oxygen
ºF	degrees Fahrenheit
F.A.C.	Florida Administrative Code
Facility	Lockheed Martin Tallevast Facility
FDEP	Florida Department of Environmental Protection
FGS	Florida Geological Survey
Floridan	Upper Floridan Aquifer
FLUCFCS	Florida Land Use, Cover and Forms Classification System
ft	feet
gpm	gallons per minute
GPS	Global Positioning System
HNP	Historic Normal Pool
HUC	Hydrologic Unit Code
HWE	Historical Wetland Edge
IAS	Intermediate Aquifer System
mg/L	milligrams per liter
msl	mean sea level
mV	millivolts
MW	Monitoring well
NA	Not Applicable
NAVD	North American Vertical Datum
NOAA	National Oceanic and Atmospheric Administration
NP	Normal Pool

NTU	Nephelometric Turbidity Unit
OD	Outer Deep Zone
ORP	Oxidation-Reduction Potential
PDSI	Palmer Drought Severity Index
PVC	Polyvinyl Chloride
QA/QC	Quality Assurance/Quality Control
RAP	Remedial Action Plan
RAPA	Remedial Action Plan Addendum
report	Wetlands Report
RW	Reference Wetland
SARA	Site Assessment Report Addendum
SAS	Surficial Aquifer System
SG	Staff Gauge
Site	Lockheed Martin Tallevast Site
SRQ	Sarasota-Bradenton International Airport
S.U.	Standard Units
SWFWMD	Southwest Florida Water Management District
T zone	Transitional Zone
Tetra Tech	Tetra Tech, Inc.
TW	Target Wetland
UPL	Uplands
USAS	Upper Surficial Aquifer System
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
WAP	Wetlands Assessment Procedure
WMP	Wetlands Monitoring Plan
WPI	WPI Sarasota Division, Inc.

Section 1
Introduction

This Wetlands Monitoring Report – June 2014 through June 2015 report documents the 6th overall monitoring event and the second wetland monitoring event since the start of active groundwater remedial system operations which began on November 18, 2013 (See Section 8.1). Baseline monitoring assessments have been conducted and reports were submitted for four years (through May 2013) prior to groundwater extraction associated with start-up of the remedial system operations. Wetlands were monitored pursuant to the July 2009 Wetlands Monitoring Plan (WMP), which was included as Appendix G of the July 2009 Remedial Action Plan Addendum (RAPA). Background resources used in the development of the WMP include the 1994 United States Geological Survey (USGS) 7.5-minute Topographic Quadrangle, Bradenton, Florida (USGS, 1994), 2003-2009 aerial ortho-photography from the Manatee County Geographic Information System, and Ecosystems of Florida (Myers and Ewel, 1990). The Florida Department of Environmental Protection (FDEP) approved the RAPA in a November 11, 2010 letter.

The WMP provides for the establishment, evaluation, and assessment of wetlands pursuant to agency requirements, including establishment of baseline conditions. The purpose of the WMP is to assist in determining if the RAPA remedy is impacting the wetlands. A summary of annual wetland monitoring activities performed to date and their associated submittals is provided in Table 1-1.

TABLE 1-1
Summary of Wetland Monitoring Activities and Submittals

Event	Monitoring Period	Submittal
Wetlands Monitoring Plan	**July 2009**	July 2009 as Appendix G of the RAPA (Approved November 11, 2010)
Baseline - Year 1	**June 2009 to June 2010**	April 2011 (ARCADIS, 2011a)
Baseline - Year 2	**July 2010 to June 2011**	December 2011 (ARCADIS, 2011b)
Baseline - Year 3	**July 2011 to June 2012**	September 2012 (ARCADIS, 2012)
Baseline - Year 4	**July 2012 to June 2013**	August 2013 (ARCADIS, 2013)
Operational Monitoring Report – Year 1	**July 2013 to June 2014**	August 2014 (AECOM, 2014)

The fifth report was the first operational monitoring report documenting wetland conditions while RAPA operations are under way.

The subject wetlands were selected prior to the start of monitoring. Each wetland is and will continue to be evaluated using the 2005 Southwest Florida Water Management District (SWFWMD) Wetlands Assessment Procedure (WAP), as amended (SWFWMD, 2005), and in conjunction with the FDEP as part of a June 26, 2008 reconnaissance of the wetland areas (see Section 2.1 of the WMP and Figure 1-1). The first four wetland monitoring events were used to establish baseline characteristics against which subsequent annual monitoring is and will continue to be compared. Annual wetland monitoring data is currently being collected to assess whether ongoing RAPA operation has the potential to impact wetland hydrology in the vicinity of the former American Beryllium Company (ABC) Facility, now known as the Lockheed Martin Tallevast Treatment Facility (Site). The Site consists of two parts. The first is the Tallevast Treatment Facility (referred to as the "Facility" or "on-facility" portion of the Site) located at 1600 Tallevast Road in Tallevast, Manatee County, Florida. The second is the groundwater and surface water resources in the surrounding area as defined by the extent of

groundwater impacted by contaminants of concern (COC), which is referred to as the "off-facility" portion of the Site.

A site location map is presented as Figure 1-1. Tallevast, Florida is a small, unincorporated community situated between Sarasota and Bradenton, immediately northeast of the Sarasota-Bradenton International Airport (SRQ), in southwestern Manatee County. Additional detail regarding the project and site history is provided in Section 2 of this report.

The locations for monitoring well and staff gauge installation were determined during preliminary visits to wetland areas and during field assessments conducted in June 2008 and June 2009. Following establishment of access agreements with appropriate landowners in the Tallevast area, wetland monitoring transects were formally established, and water level monitoring instruments were installed from November 2009 through February 2010. As stipulated by the FDEP, the activities detailed in the WMP will be conducted over five years after RAPA system startup, following establishment of a baseline composed of a minimum of two years, resulting in a minimum program length of seven years. The actual program length will be longer than seven years because the baseline data collection spanned an approximately four-year period from November 2009 to June 2013. As described in the RAPA, after five years of system operation and wetland assessments, the monitoring plan will be re-evaluated with the FDEP and SWFWMD to determine whether it needs to continue or be modified. If monitoring demonstrates that wetland impacts are occurring due to groundwater withdrawals, then a mitigation plan will be developed and submitted to FDEP. The observations presented in this report include the following:

- Field observations of vegetative growth, recruitment, and mortality, as well as evidence of changes in land use, disturbance, and indicators of surface hydrology along the established wetland monitoring transects;
- Evidence of changes in land use, abandonment, disturbance, or other activities within areas adjacent to the WMP wetlands that may potentially affect surface hydrology;
- Water level data gathered using staff gauges and transducers in WMP monitoring wells, and annual and monthly rainfall data gathered from a monitoring station located at the SRQ.

Section 2
Project History

Lockheed Martin acquired ownership of the former ABC Facility through its 1996 acquisition of Loral Corporation, the parent company of ABC. Plant operations ended in late 1996. Between 1997 and 2000, Lockheed Martin prepared the property for sale and began site investigations. In early 2000, Lockheed Martin sold the property and its improvements to BECSD, LLC (BECSD), which in turn leased the Facility to WPI Sarasota Division, Inc. (WPI), a privately owned manufacturer. In March 2007, WPI was sold to Cooper Industries, Inc., which assumed the Facility lease and continued the same manufacturing processes until ceasing operations in June 2007. Beginning in July 2007, Lockheed Martin leased the Facility from BECSD, ultimately purchasing it back from BECSD in June 2009.

From 1962 until 1996, the Facility was owned by Loral Corporation and operated by ABC as an ultra-precision machine parts manufacturing plant where metals were milled, lathed, and drilled into various components. Some components were finished by electroplating, anodizing, and ultrasonic cleaning. Chemicals used and wastes generated at the Facility included oils, fuels, solvents, acids, and metals. Facility operations are described in the Phase I Environmental Assessment Report (Tetra Tech, Inc. [Tetra Tech], 1997). Additional information is provided in the Site Assessment Report Addendum (SARA; Tetra Tech, 2005). The RAPA was submitted to FDEP by ARCADIS in 2009, and subsequently approved by FDEP in a November 11, 2010 letter. Wetlands were monitored pursuant to the July 2009 WMP, which was included as Appendix G of the RAPA. RAPA system construction began in February 2011 and was completed in July 2013. Startup and testing occurred in October and November 2013. The Tallevast Treatment Facility began operation on November 18, 2013. The purpose of the RAPA treatment facility is to address COC concentrations in groundwater at the Site.

Section 3
Monitoring Objectives

The RAPA was prepared to satisfy the requirement of a March 16, 2009 FDEP request for submission of a final revised RAP that would incorporate Lockheed Martin's February 11, 2009 responses to third-party comments on the September 2008 RAP. As part of the selected remedy, the July 2009 RAPA scope incorporates removal of contaminated groundwater through a series of extraction wells/trenches, treatment of the extracted groundwater, and discharge of the treated groundwater using a combination of different disposal options. These options include the following:

- Recharging on the on-facility portion of the Site through a series of injection wells operating in tandem with on-facility extraction wells in the surficial aquifer;
- Discharging to the county wastewater collection and treatment system; and
- Recharging the local surficial aquifer in infiltration systems designed to maintain water levels within designated wetland areas, as explained below.

The RAPA remedy includes the likelihood that multiple treated-groundwater discharge methods will occur simultaneously. Implementation of the proposed RAPA groundwater extraction system was expected to cause drawdown in the local surficial aquifer to achieve capture. Because depression of the water level was predicted to occur in the surficial aquifer at nearby wetlands, the FDEP prescribed the use of the WAP (SWFWMD, 2005). The WAP specifies the process and technical methods for monitoring groundwater extraction effects on Target Wetlands (TWs) and for identifying whether mitigation is needed to offset the effects (if any) of such extraction, via comparison to Reference Wetlands (RWs).

Implementation of the WMP was based on this WAP-defined process. Field visits and consultation with the FDEP led to identification of four TWs within the area of anticipated hydrologic influence of the RAPA system, as defined by being within or in close proximity to the predicted extent of drawdown in the upper surficial aquifer system (USAS) from the

implemented RAPA system (Figure 3-1). Initially, four nearby RWs were identified for monitoring because they represent similar wetland resources that are outside the area of anticipated hydrologic influence of the RAPA system. As described in Section 7.1 of this report, one RW (RW-5) was later permitted for development and was subsequently removed from the monitoring program. In selecting the TWs and RWs for this evaluation, proximity and similarity of classification under the Florida Land Use, Cover, and Forms Classification System (FLUCFCS) (FDOT 1999) codes for wetlands were considered. These codes were developed to classify land use, cover, and forms to provide a uniform standard for description of natural and urban land cover types, including the characteristic vegetative cover types associated with the wetlands at the focus of this assessment.

Section 4
Southwest Florida Water Management District Wetland Assessment Procedure

The WAP is generally required as a condition for the issuance of consumptive groundwater well authorization, which is required due to water extraction and disposal incorporated within the RAPA. The objective of the WAP (SWFWMD, 2005) is to collect information on vegetation, hydrology, soils, and other pertinent variables in isolated wetlands to accurately characterize the biological condition and health of each monitored wetland at the time of investigation. This information may be used for a variety of water management purposes, including well field management, development of minimum flows and levels in the wetlands, and assessment of recovery in areas that have experienced historical hydrologic and biologic impacts due to groundwater withdrawals.

As presented in the WAP, the following steps are taken to establish the monitoring points and their characteristics and then to initiate the baseline monitoring process. The first step consists of a 10-meter-wide monitoring transect established in each wetland. Transects are positioned to provide a representative cross-section from the outermost identified historical wetland edge (HWE) to the innermost portion of the wetland interior (deep zone). Upon establishment of the monitoring transect, estimated benchmark elevations are also field-identified. They include the historic normal pool (HNP), as well as elevations 6 inches (NP-6) and 12 inches (NP-12) below the HNP.

Outside the HWE is an area generally referred to as the uplands (UPL). The area between the HWE and NP-6 elevation are referred to as the Transitional Zone (T). The area between the NP-6 and NP-12 is referred to as the Outer Deep Zone (OD), and the zone below the NP-12 elevation, to the lowest point within the wetland, is simply referred to as the Deep Zone (D). A general representation of some of these locations is illustrated on Figure 4-1 below.

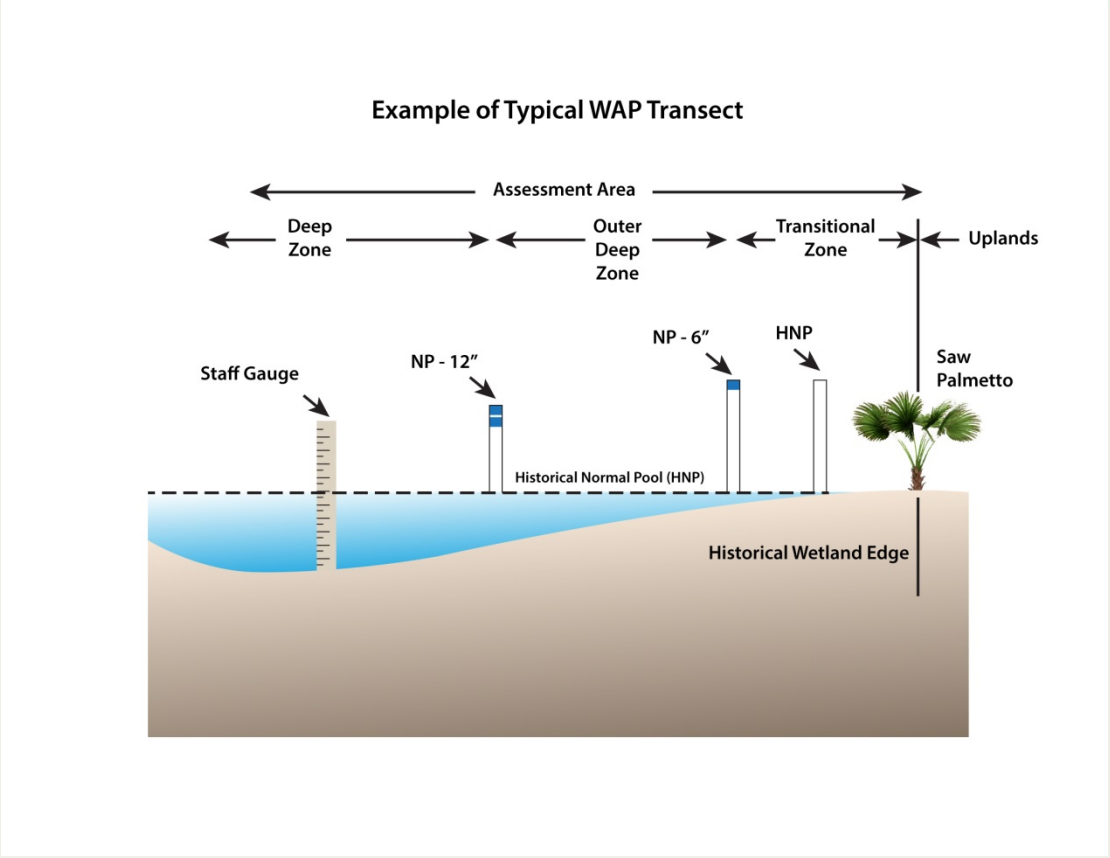


FIGURE 4-1
Example of Typical WAP Transect

Source: SWFWMD, 2009

The location of each transect is based on factors such as minimal disturbance to existing vegetation, clear line of sight, ability to assess characteristics that are representative of the T zone along a straight line, as well as wetland accessibility. Each transect is established with the placement of a monument at the HNP, NP-6, and NP-12 elevations. The innermost transect point within the deepest portion of the wetland pool is identified by the placement of a staff gauge and

surficial aquifer monitoring well, installed to a depth of approximately 8 feet (ft) below ground surface (bgs) per the SWFWMD WAP.

Vegetative, hydrologic, and soil data are collected from each transect and photographs are taken at each monument in all four cardinal directions north (N), east (E), south (S), and west (W). Each monitoring well has been located and surveyed for horizontal and vertical coordinates by a professional surveyor and mapper registered in Florida. During initial and subsequent monitoring events, the provisions of the WAP prescribe that those individuals evaluating the resource should conduct annual assessments by remaining within the established transect as much as possible, while avoiding unnecessary damage to characteristic vegetation. However, the WAP also incorporates provisions to potentially walk throughout the wetland when critical for accurate evaluation of the assessed area.

Section 5

Basis for Wetlands Assessment Procedure Deployment

The results of the WMP will be used to compare changes from baseline conditions to those that may develop during the initial RAP implementation. These comparisons will assess changes in water elevation (surface water or groundwater), periodic inundation, and vegetation, if any, in each wetland zone. As discussed below, changes in wetland conditions due to regional climatic conditions, including persistent drought, will also be considered in the analysis to determine actual impacts of the groundwater remediation on wetland areas, if any. The WAP contains provisions to document and monitor biologic indicators of hydrologic change (more specifically, groundwater withdrawals). SWFWMD established the WAP to provide data that supplements hydrologic data for water use permitting, minimum flows and levels development and assessment, and recovery assessment.

This assessment also includes documenting and evaluating other factors that may affect the TWs and RWs included in this assessment. These factors include encroachment on wetlands by land development and/or areas where land management and drainage activities are occurring, historical and current cattle/livestock operations, disease, introduction of exotic plant species, and other anthropogenic variables that may affect the biological indicators of hydrologic change that occur in the TWs and RWs.

The extent to which historical and current land use and vegetative cover variables affect baseline conditions may not be entirely discernible given the localized nature of this assessment. However, wherever feasible, regional climate and land use variables (including floods, drought, and irrigation use) are reflected in the establishment of baseline conditions in each wetland. New information collected during ongoing assessments will consider any apparent individual or

locally occurring changes as well as the regional conditions that may be affecting (and are subsequently observed in) TW and RW resources.

As determined during consultation with the FDEP, monitoring results will be evaluated for the assessment of effects from the operational RAPA system. The RAPA includes recharging the water table aquifer to mitigate drawdown in wetland areas predicted to be within or in close proximity to USAS drawdown resultant from proposed RAPA extraction pumping. Therefore, it is anticipated that there will be no loss of functions or acreage within the identified TWs. Other variables that could affect wetland hydrology include land-use changes resulting in increased impervious surfaces, which preclude the infiltration of stormwater runoff; the excavation of borrow pits and ponds; the establishment or maintenance of drainage canals; and extreme climatic events such as heightened tropical weather activity or prolonged drought.

Section 6
Project Area Setting and Site Conditions

This section describes the physical environment, ecology, and water resources influencing the wetlands that were assessed from June 8 through 10, 2015 in the Tallevast area.

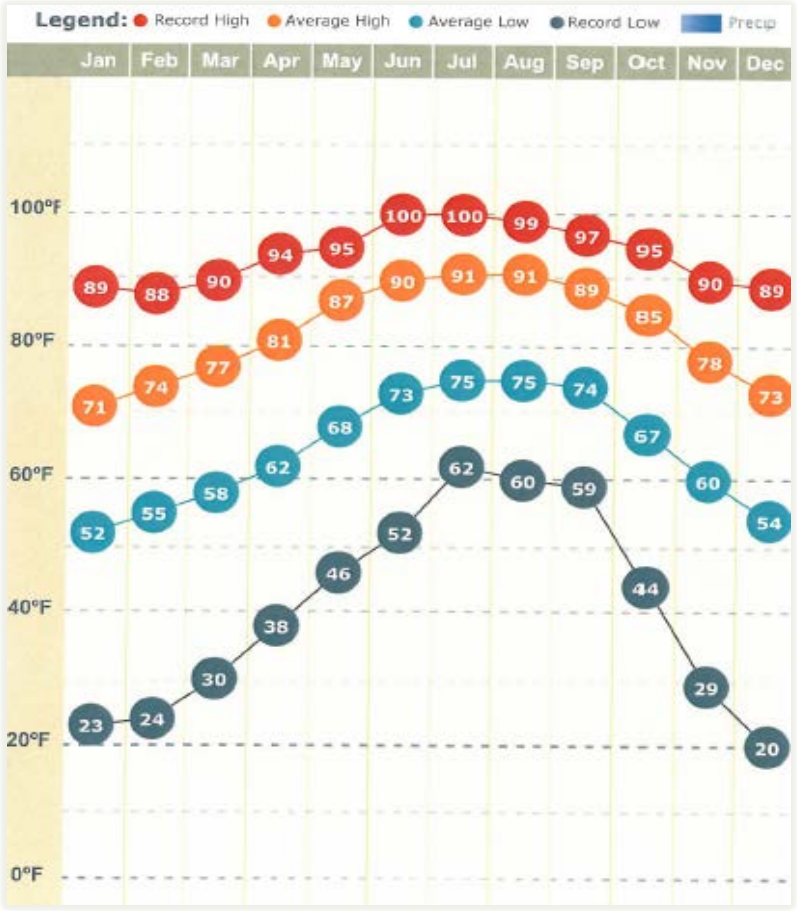
6.1 SITE LOCATION

The facility is located in the northwest quarter of Section 31, Township 35 South, Range 18 East, as shown on the Bradenton, Florida USGS 7.5-minute quadrangle (USGS, 1994) shown in Figure 6-1.

6.2 CLIMATE

The Tallevast area is located within the subtropical zone in southwest Florida. Average daytime high temperatures in June and July are 91 degrees Fahrenheit (°F; 32 degrees Celsius [°C]). The average daytime temperatures during the winter months are in the low to mid-70s °F (22 °C). As shown on Historical Temperature Trends Figure 6-2 (below), extreme temperature records in the area range from 100 °F (38 °C) in July (1998) to 20 °F (-6 °C) in December (1983).

FIGURE 6-2
Historical Temperature Trends in the Tallevast Area



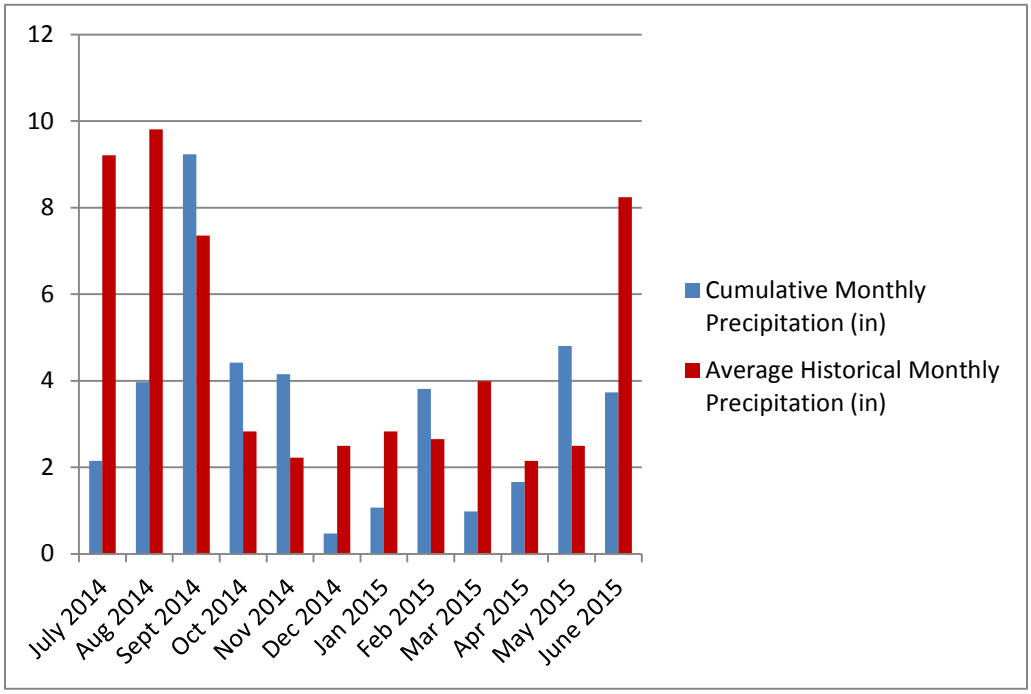
Source: The Weather Channel, 2015, Sarasota, Fl

Annual rainfall totals average 54 inches (1.37 meters). The rainy season generally occurs in the summer in the Tallevast area, with frequent afternoon thunderstorms of short duration. As shown on Figure 6-3 (below), August is usually the wettest month of the year, with an average of 9.81 inches of rain (approximately 24 centimeters). April is generally the driest month of the year, with an average of 1.83 inches of rain (approximately 4.5 centimeters). Hurricane season in Florida occurs from June through the end of November. Figure 6-4 (below) shows the cumulative monthly precipitation occurring from July 2014 to June 2015 compared to the historical monthly precipitation trend for each month.

FIGURE 6-3
Historical Precipitation Trends in the Tallevast Area

Source: The Weather Channel, 2015

FIGURE 6-4
Cumulative Monthly Precipitation 2014 - 2015 vs Historical Monthly Average
Sarasota-Bradenton International Airport (SRQ)



Source: North Carolina State University, 2015

The following local weather details are pertinent to the wetlands assessments performed to date.

- Initial Assessments – A period of drought preceded the 2008 and 2009 initial assessments of wetlands in the Tallevast area, including a relative lull in tropical weather events. A measure of drought conditions known as the Palmer Drought Severity Index (PDSI) is published by the National Oceanic and Atmospheric Administration (NOAA). Published PDSI values (see Appendix A) for a 2- to 3-year period prior to the initial assessment also indicate an extended period of drought.

- 2010 WMP Assessment – A more typical precipitation cycle, still without tropical weather, appeared to have resumed during the months preceding the 2010 WMP transect assessment.

- 2011 WMP Assessment – Precipitation in the six months preceding the 2011 WMP assessment was less than 2010, except for the month of March.

- 2012 WMP Assessment – Precipitation in the three months preceding the 2012 WMP assessment (March, April, and May) was higher than the same 3-month period prior to the 2011 assessment, except for March. In the two weeks prior to the 2012 assessment, more than seven inches of total precipitation were recorded at the SRQ.

- 2013 Assessment – Precipitation in the quarter preceding the 2013 WMP transect assessment was comparable to the 2012 event; however, there was no significant rainfall immediately prior to the assessment as there was in 2012.

- 2014 Assessment – Precipitation in the quarter preceding the 2014 WMP transect assessment was comparable to the 2013 event. Precipitation in the year preceding the 2014 monitoring event was approximately 61 inches (approximately 155 centimeters) which is slightly above average.

- 2015 Assessment – Precipitation in the quarter preceding the 2015 WMP transect assessment was slightly less compared to the 2014 event. Precipitation in the year preceding the 2015 monitoring event was approximately 41 inches (approximately 104 centimeters) which is below average. Average annual rainfalls at the SRQ from 2003 through 2014 are presented in Table 6-1 (below).

TABLE 6-1
Annual Precipitation Totals at Sarasota-Bradenton International Airport (SRQ), 2003-2013

Annual Precipitation Totals at Sarasota-Bradenton International Airport (50-Year Annual Average – 54.12 inches)											
2003	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
50.42 inches	47.27 inches	51.67 inches	48.07 inches	33.47 inches	34.88 inches	32.77 inches	42.80 inches	40.10 inches	42.77 inches	56.20 inches	49.78 inches

Source: North Carolina State University, 2015

6.3 PHYSICAL ENVIRONMENT

The Tallevast community is located on the Gulf Coastal Lowlands, a gently sloping plain ranging from approximate elevations as high as 32 ft above mean sea level (msl) to 15 ft msl. The area is approximately 1.5 to 2 miles east (inland) of Sarasota Bay and approximately six miles from the Gulf of Mexico. The land surface of the Tallevast Site has very little relief and slopes gently toward the south and east.

The Gulf Coastal Lowlands are situated in the Southwestern Flatwoods physiographic region and consist of rock and sediment ranging from the Miocene to Pleistocene eras (23.8 million to 11,000 years ago). Landforms are characterized by low plateaus and ridges, flatwoods, prairies, rockland/marl plains, and various relict coastal features. Surface materials are dominated by sand with clayey substrata, limestone, and sumps of accumulated organic deposits.

The Gulf Coastal Lowlands region and flatwoods soils are moderately to poorly drained, fine-grained, acidic sands with low reserves of available nutrients; low organic matter; and low clay content (often less than 2 percent). These soils may contain a spodic (organic) horizon when organic matter is translocated downward by water percolation. Clay hardpans may also result from transport and accumulation of clays. Many of the soils supporting flatwoods are spodosols, but some variation exists. Soil types in upland areas of the Tallevast Site are largely composed of Eau Gallie fine-grained sand, while soil types in mapped wetlands include complexes of Canova, Anclote, and Okeelanta soils, as well as fine-grained sands of the Floridana-Immokalee-Okeelanta association.

6.4 AQUIFER SYSTEMS

The three aquifer systems, which vary in depth, that underlie the Tallevast site are as follows: Surficial Aquifer System (SAS), Intermediate Aquifer System (IAS), and Floridan Aquifer (Floridan). These aquifer systems are described in detail in the RAPA report, and in the investigative reports that preceded the RAPA. The SAS is recharged locally, and the water table contained in this formation fluctuates due to seasonal and climatic variations in rainfall. In addition, artificial factors have produced impacts on groundwater levels in each of the three aquifer systems, including the water table in the SAS. Artificial factors include:

- Pumping of wells in aquifers beneath the SAS for the irrigation of fields, lawns, and golf course turf or maintenance of pond levels for aesthetic purposes; and
- The presence of drainage canals that, in most cases, lead to lowered surficial groundwater elevations in their immediate vicinity, but can sometimes have the opposite effect in backing up positive drainage during periods of excessive runoff.

6.5 SURFACE WATER RESOURCES/WATERSHED

The United States is divided and sub-divided into successively smaller hydrologic units which are classified by the USGS into four levels: regions, sub-regions, accounting units, and cataloging units. These hydrologic units are nested within each other, from the smallest (cataloging units) to the largest (regions). Each hydrologic unit is identified with a unique hydrologic unit code (HUC) consisting of two to eight digits based on the four levels of classification in the hydrologic unit system. The Tallevast Site is located along the drainage divide between two stream/canal systems, Bowlees Creek and Pearce Canal, within the eight-digit Sarasota Bay watershed, HUC 03100201. Bowlees Creek, a major tributary of Sarasota Bay, is located approximately 1.25 miles northwest of Tallevast. The Pearce Canal trends at an angle to the Tallevast Site and is located southeast (0.75 mile) and east (1 mile) of Tallevast. A ridge (topographical high ground) runs approximately north-south through the Facility. Surface water on the western portion of the Facility flows west toward Bowlees Creek and the improved drainage features around the SRQ, both of which drain to Sarasota Bay. Surface water on the easternmost portion of the Facility flows toward Pearce Canal, which drains both south into the Sarasota Bay watershed and north into the Manatee River watershed (HUC 03100202). The

drainage divide along Pearce Canal is located approximately 1 mile north of the Manatee/Sarasota County line, where the canal crosses U.S. Highway 301, and 1 mile southeast of the Facility.

In addition to drainage facilities (such as Pearce Canal) and consumptive use, groundwater depletion due to other impacts remains an ongoing concern throughout much of west-central Florida, according to the USGS. To the north of the Tallevast area, saltwater intrusion and subsidence in the form of sinkhole development, land subsidence, and surface water depletion from lakes are issues of concern. However, Florida Geological Survey (FGS) poster number 11 (Rupert and Spencer, 2004) indicates that Sarasota and Manatee Counties lie in a region where sinkholes are uncommon. Throughout Florida, broad concerns exist for the reduction of surface water flows, deterioration of wetland water quality, and increased costs to pump needed water resources. Several small surface water bodies (e.g., decorative ponds, stormwater ponds) are located within a 0.5-mile radius of the Facility. Shallow ditches and swales throughout the Tallevast area also convey stormwater runoff to roadside and regional drainage channels.

6.6 ECOLOGY

The dominant historical habitat of the project area is pine (*Pinus spp.*) flatwoods. According to the United States Department of Agriculture (USDA) Natural Resources Conservation Service (formerly the Soil Conservation Service), such habitats in southwest Florida are characterized by savannas, an ecotone spanning grasslands to forests. The ecosystem in the vicinity of the assessed wetlands is now used extensively as rangeland for cattle grazing.

Once the most extensive terrestrial ecosystem in Florida, these historical pine flatwoods evolved under frequent lightning and human-induced fire, seasonal drought, and flooded conditions. Flatwoods are characterized by low, flat topography, relatively poorly drained, acidic, sandy soil, and pine woodlands. This ecosystem historically had open, park-like understories managed by frequent fires.

The dominant tree species of flatwoods in the Tallevast area are limited to South Florida slash pine (*P. elliottii* var. *densa*) and longleaf pine (*P. palustris*). Other infrequently occurring trees

include cabbage palm (*Sabal palmetto*) and hardwoods including live oak (*Quercus virginiana*), water oak (*Q. nigra*), laurel oak (*Q. laurifolia*), sweet gum (*Liquidambar styraciflua*), red maple (*Acer rubrum*), and ash (*Fraxinus* spp.). Commonly occurring understory shrub species include saw palmetto (*Serenoa repens*), wax myrtle (*Myrica cerifera*), blueberries (*Vaccinium* spp.), and American beautyberry (*Callicarpa americana*).

The invasive Brazilian pepper (*Schinus terebinthofolia*) is identified as locally dominant in both the forest understory and open rangeland scrub strata. Distribution of Brazilian pepper occurs throughout the Tallevast Site. It is an aggressive invader of disturbed habitats, a characteristic that has led to its placement on the Florida Exotic Pest Plant Council list of invasive species as a Category I species. Other nonnative and escaped plant species identified in the Tallevast WMP area include camphor tree (*Cinnamomum camphora*), punk tree (*Melaleuca quinquenervia*), primrose willow (*Ludwigia peruviana*), tropical soda apple (*Solanum viarum*), and Caesar's weed (*Urena lobata*).

Section 7
Wetlands Assessment Procedure Implementation

7.1 TRANSECT AND MONITORING LOCATION SELECTION

Four RWs (RW-1, RW-2, RW-3, and RW-5) and four TWs (TW-1, TW-2, TW-6, and TW-18) were originally identified and selected for monitoring based on initial June 26, 2008 Site visits with representatives from the FDEP, CDM, ARCADIS, and Lockheed Martin. The TWs were selected based on their locations within or in close proximity to the area of the SAS predicted to have drawdown due to implementation of the RAP groundwater extraction system. The RWs were also selected based on proximity to the Site, as well as the similarity of FLUCFCS characteristics to those associated with the TWs. However, RWs are anticipated to be beyond the area of groundwater elevation influence from the operational RAPA system.

Following the June 2009 field assessment to establish WMP monitoring transects locations, RW-5 was eliminated as a reference wetland from the RAPA system performance monitoring. The SWFWMD permitted RW-5 for development after adequate mitigation in the form of wetland credits were provided. The removal of RW-5 from monitoring was documented in the first baseline monitoring report.

Pursuant to the WAP, one transect was established in each of the remaining RWs (RW-1, RW-2, and RW-3), as well as in each of the four TWs. Transects were positioned within a representative 10-meter-wide area in each wetland, from the HWE to the wetland interior. Estimated HNP elevations were also field-identified during transect establishment. The location of each transect was based on factors including minimizing disturbance to existing vegetation, clear line of sight, ability to assess all aspects representative of each zone along a straight line, and access to the assessment area.

Permanent monuments were placed in the field to identify these transects during baseline monitoring of wetland conditions. Monuments composed of steel rebar fitted with a sleeve of polyvinyl chloride (PVC) pipe were installed at the HNP and at elevations of 6 and 12 inches below the HNP and were labeled HNP, NP-6, and NP-12, respectively. Monuments marking the HWE have not been installed to date, however, the WAP recommends installing it if possible. During a June 2008 Site visit with the FDEP, vegetative, hydrologic, and soil indicators were used to establish the HNP elevation within the TWs. These same factors were used during transect placement in both TWs and RWs during the subsequent 2009 field season. Subsequent to monument placement and monitoring well installation, the HNP, NP-6, NP-12, staff gauge, and monitoring well locations were professionally surveyed (March 2010). Transect access locations are shown in Figure 7-1.

Pursuant to the WAP, the area to be assessed along each transect will subsequently be referred to as the assessment area. The assessment area is approximately 10 meters wide and extends 10 meters beyond the wetland interior. Subsequent monitoring will be conducted on the established transect as much as possible to avoid unnecessary damage to vegetation, but may be conducted throughout the wetland if critical for an accurate evaluation of the assessment area.

7.2 STAFF GAUGES AND MONITORING WELL INSTALLATION

Groundwater monitoring wells and staff gauges were installed in the TWs and RWs during the 2009 and 2010 field efforts. One monitoring well and one staff gauge were installed in the D zone of each wetland and placed along the WAP transect, or within the assessment area. While an upland monitoring well is traditionally recommended under WAP procedures, it is not required. Under direction from the FDEP, because of the relatively small size of the wetlands, an upland monitoring well was not installed at the HWE in any of the wetlands. The ground elevation was surveyed at the wells and staff gauge locations by a professional surveyor and mapper registered in Florida. An initial water level reading was obtained manually, and interim water elevation data were obtained from data logger downloads.

One well (Stilling Well-3) and one staff gauge (Staff Gauge-8) were found to already exist in TW-2. Per WAP guidelines (3.2 WAP Transect Selection and Setup; SWFWMD, 2005), these

locations were considered in the initial selection process for the monitoring transect and assessment area at TW-2. These devices are located in the outer T zone or HWE. Therefore, while included in the assessment area of the monitoring transect, per SWFWMD guidance, the stilling well and staff gauge are not being monitored under WAP protocols and are not expected to provide valuable data in monitoring the long-term wetland response to RAP system implementation. Similar existing wells and staff gauges were not found at the other wetlands.

7.3 GROUNDWATER MONITORING WELL INSTALLATION

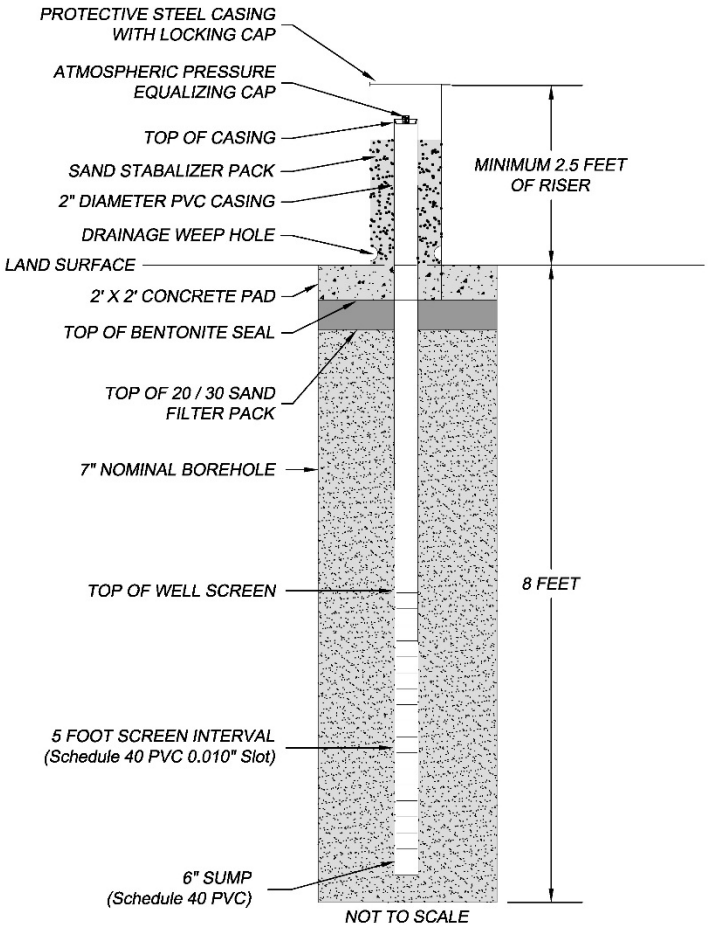
The SWFWMD well construction standards, promulgated in Florida Administrative Code (F.A.C.) Chapter 40D-3, were followed for all monitoring well installations in 2009 and 2010. All monitoring wells are constructed using 2-inch Schedule 40 PVC and installed to a depth of 8 ft bgs using the mud rotary method (ASTM International Method D-5092), except for the monitoring well in TW-1, which was installed to approximately 10 ft bgs. Monitoring well installation in TW-1, TW-2, TW-6, TW-18, RW-1, RW-2, and RW-3 was managed by a qualified wetland scientist and geotechnical well development specialist. Monitoring well installation at TW-2, TW-6, RW-1, RW-2, and RW-3 was accomplished in November 2009 using a skid-mounted mud rotary auger. Due to landowner access restrictions, monitoring well MW-TW-18 was installed in February 2010 using a track-mounted mud rotary auger. Monitoring well installation at TW-1 was accomplished in February 2010 with a tripod-mounted manual mud rotary auger due to shallow water conditions.

The screened interval in the monitoring wells is 5 ft long and placed at 3 to 8 ft bgs (5 to 10 ft bgs in MW-TW-1) and consists of 0.010-slot, 2-inch PVC screen. A 20/30 sand filter pack was placed in the annular space from the bottom of the well to the surface (MW-TW-1) or from the bottom of the well to approximately 1-foot below the surface (all other wells) where a bentonite seal was installed. After well construction was complete, the land surface and top of casing elevations were surveyed by a professional surveyor, using horizontal and vertical control. Survey data are shown in Table 7-1.

As shown on Figure 7-2 (below), wellhead completion consisted of a 2-ft by 2-ft, 4-inch-thick concrete pad with a 2.5-ft-high riser with a lockable well cover. All development water from the

monitoring wells was contained and disposed of via the former on-facility interim remedial action treatment plant. All wells were developed according to United States Environmental Protection Agency (USEPA) guidance to meet the following standards: pH ±0.1 standard units (S.U.), specific conductivity ±3 percent, oxidation-reduction potential (ORP) ±10 millivolt (mV), turbidity <10 nephelometric turbidity units (NTUs), and dissolved oxygen (DO) ±0.3 milligrams per liter (mg/L), for three consecutive readings conducted no less than one minute apart. If a well became dry during purging, development continued after the well recharged. Development was considered complete when the turbidity was less than 10 NTUs and the above criteria were met. Lithologic logs, permits, and well completion reports were prepared for each monitoring well (well development logs were included as Appendix A of the Wetlands Monitoring Report – July 2010 Through June 2011; borehole logs and well completion diagrams were included as Appendix C of the Wetlands Monitoring Report for July 2011 Through June 2012 [ARCADIS, 2012]).

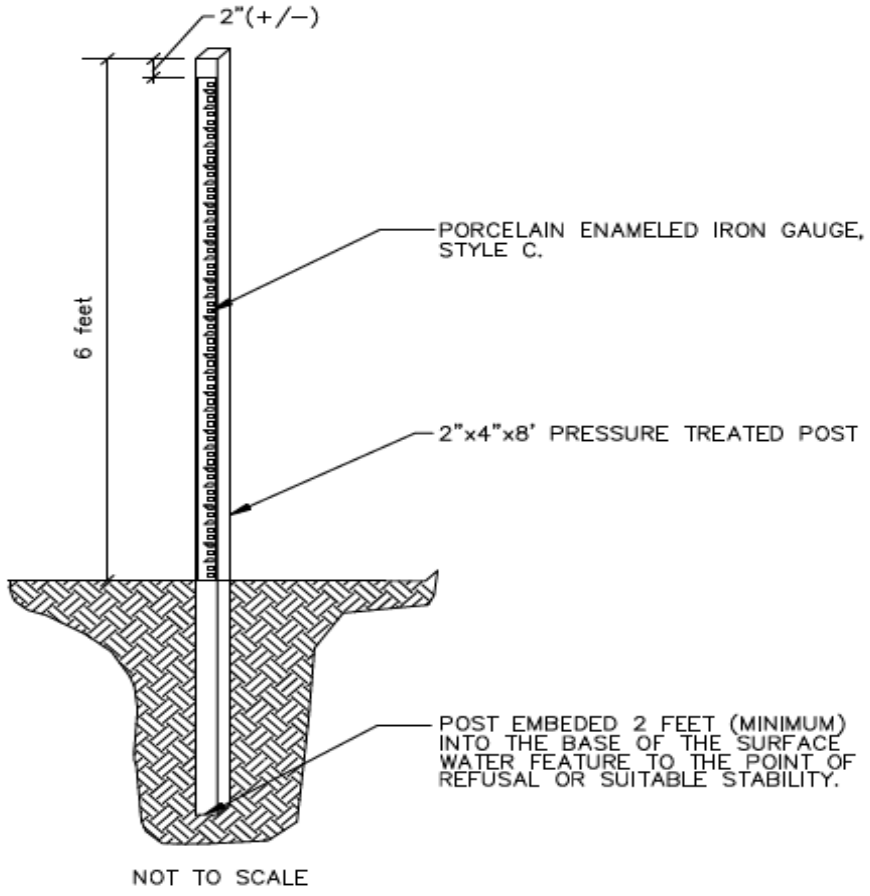
FIGURE 7-2
Typical Well Installation Cross-Section



7.4 STAFF GAUGE INSTALLATION

Staff gauges were installed adjacent to each monitoring well during 2009 and 2010 field efforts. As shown on Figure 7-2, at each staff gauge location, a porcelain-enameled iron Style C staff gauge was attached to a 2- by 4-inch by 8-ft long pressure-treated post. The staff gauges enable measuring stage heights in feet and tenths of feet. A hand level was used to ensure that the post and gauge were plumb. The pressure-treated post was driven into the mud line to the point of refusal or suitable stability. Each post was embedded at least two ft below the base of the surface water feature. After the monitoring well and staff gauge were installed, they were located by a professional surveyor and mapper registered in Florida. Survey data are included in Table 7-1.

FIGURE 7-3
Typical Staff Gauge Installation Cross-Section



7.5 DATA LOGGER DEPLOYMENT

To facilitate monitoring frequency and accuracy, automatic water level measurement devices (Solinst® brand pressure transducers) with data loggers were installed to collect real-time water level data in each of the TW and RW monitoring wells. Data loggers were programmed to collect hourly water level readings. Transducers were installed in five of the seven locations (MW-RW-1, MW-RW-2, MW-RW-3, MW-TW-2, and MW-TW-6) on November 6, 2009. Transducers were installed in the remaining two locations (MW-TW-1 and MW-TW-18) on February 23, 2010. Approximately seven days after installation, the data loggers were checked and data downloaded to verify that they were working correctly. Replacement transducers have since been installed in MW-TW-1 (March 8, 2010), MW-RW-1 (November 19, 2009), MW-RW-3 (January 15, 2014), MW-TW-6 (June 8, 2015), and MW-TW-18 (June 8, 2015). Data

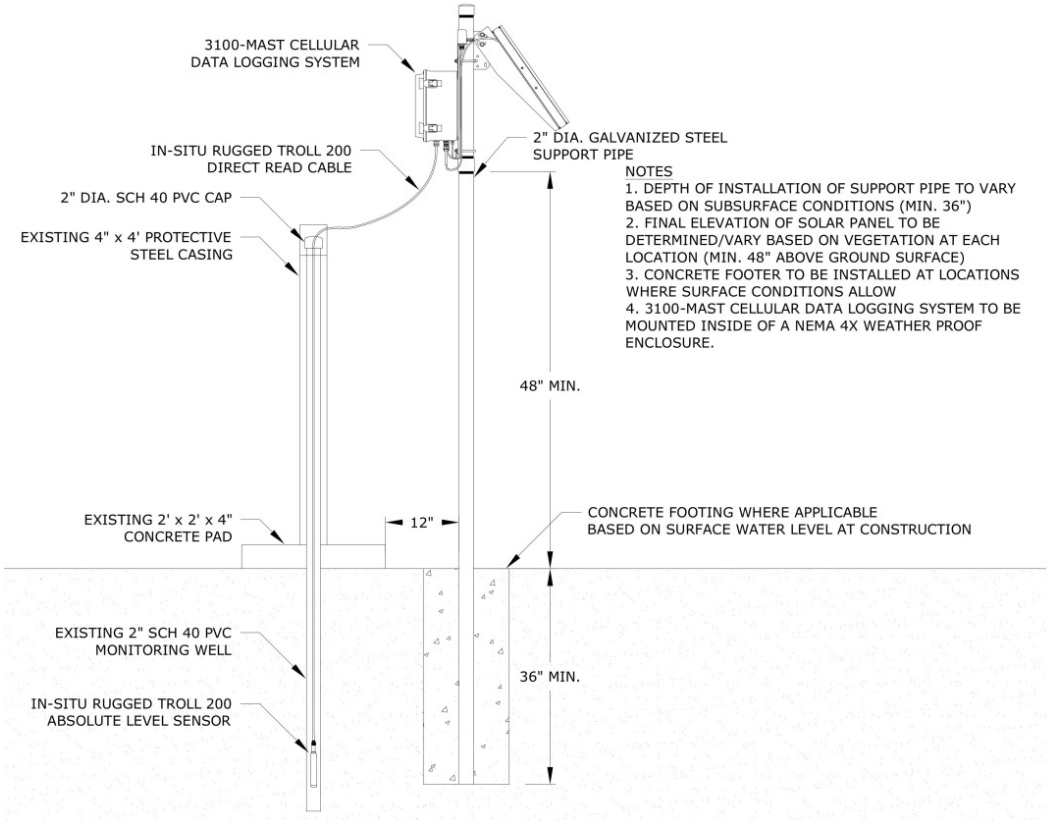
from the data loggers were then downloaded after approximately 90 days and continued to be downloaded on a quarterly schedule until December 2014, after which the schedule changed to a semi-annual frequency with download events in March and September. Battery life and data storage space are routinely confirmed before redeploying the equipment each event. While data are downloaded, groundwater levels are measured manually to confirm the accuracy of the data collected by the automatic water level recorders.

Data are transferred to an Excel spreadsheet as soon as possible after quality assurance/quality control (QA/QC) and validation with day-of-download measurements. In addition, precipitation data are obtained from the NOAA climate history and transferred to the Excel spreadsheet. During any replacement of the transducer, the manual water level data are used to calibrate continuous recording. Manual water level results are compared with calculations to identify and investigate discrepancies and resolve issues with transducer performance prior to redeployment.

7.6 WETLAND TELEMETRY SYSTEM

Wetland telemetry monitoring systems were installed adjacent to each monitoring well during the 2014 Annual Wetland Assessment event. The telemetry systems enable real-time collection of water levels at each of the reference and target wetlands. Water level data is transmitted via cellular signal to a centralized server housed at the main facility. As shown in Figure 7-4, each telemetry system consists of an In-Situ® brand pressure transducer, solar panel, power box, and cellular modem mounted on a steel 2" galvanized steel post installed approximately 3 feet bgs. Data will continue to be collected from the original (non-telemetered) instruments until it is shown that the new instruments are adequately replicating the data collected by the original instruments. The original instruments will be taken out of operation once the telemetry system data accuracy and reliability have been confirmed. The telemetry system is beneficial because it allows quick access to water level instrumentation to determine status and functionality and allows for the use of real time data for continuous optimization and modification of the RAPA treatment system and discharge.

FIGURE 7-4
Wetlands Telemetry System



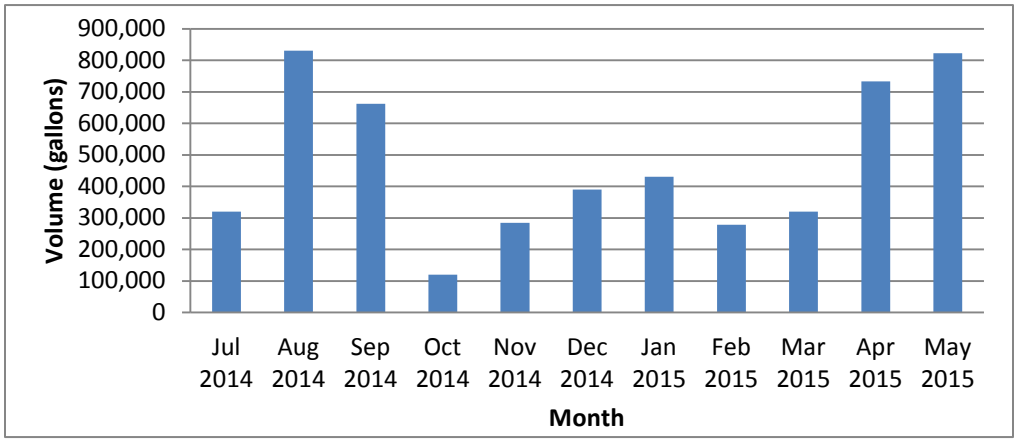
Section 8

Description of System Startup and Operations

8.1 REMEDIAL SYSTEM STARTUP AND OPERATION

Remedial actions as described in the RAPA (Arcadis, 2009) began on November 18, 2013. The remedial system consists of 77 vertical extraction wells, 4 extraction trenches, 5 onsite injection wells, and 3 infiltration galleries. A general layout of the remedial system is provided in Figure 3-1. The 77 vertical extraction wells and 4 extraction trenches have operated at a combined extraction rate of approximately 180 gallons per minute (gpm) since startup. The 5 onsite injection wells and 2 of the 3 infiltration galleries were not in operation during the current monitoring period. One infiltration gallery (RC-7002) has been operational since July 2014 to provide additional water in the vicinity of TW-6 and help offset any potential drawdown affects that may be caused by the nearby horizontal extraction wells (EW-2103 and EW-2104). Figure 8-1 shows the total volume of treated water discharged to RC-7002 per month from July 2014 to May 2015. A total of 5,194,500 gallons of treated effluent water have been discharged through RC-7002.

FIGURE 8-1
Total Volume of Treated Water Discharged to RC-7002 (monthly)



Section 9
Description of Monitored Wetlands and Evaluation of Operational Conditions

9.1 METHODOLOGY FOR DATA COLLECTION AND ASSESSMENT

Findings and observations for the monitored wetlands are presented below. Specific details of each project wetland, such as observations of habitat conditions along the selected transects, are presented on the completed field data sheets in Appendix B. Other characteristics of these wetlands are provided in Table 9-1 below. The WAP requires a thorough assessment of soil conditions every five years. Soil conditions were previously evaluated for all wetlands during the 2014 monitoring event and will be evaluated again in 2019. Observations are described for each wetland in the following sections. Photographic documentation of conditions at each wetland for the 2015 assessment is provided in Appendix C. Graphic display of transducer data is provided in Appendix D. Manual water level elevations and staff gauge measurements collected during wetland transducer downloads between July 2014 and June 2015 are summarized in Table 9-2. Included in the analysis of wetland conditions is a rationale for assignment of WAP zonation scoring for the vegetative stratum. Zonation scoring for conditions in each transect are based on a prescribed range from 1 to 5 points that are detailed in SWFWMD's WAP protocol and the revised ranking scale provided by SWFWMD (SWFWMD, 2008). A score of "1" represents a vegetation community that lacks constituent species considered appropriate for survival in a functioning wetland ecosystem. A score of "5" represents a fully functioning wetland vegetation assemblage. A score of "0" represents conditions or species composition that does not lend itself to a wetland habitat assessment consistent with the definitions under the WAP.

TABLE 9-1
Summary of Project Wetland Characteristics

Wetland ID	TW-1	TW-2	TW-6	TW-18	RW-1	RW-2	RW-3
Wetland Type	Emergent	Emergent/ Forested	Emergent/ Forested	Forested	Emergent/ Forested	Forested	Emergent
Estimated * Historical Acreage	15.15	1.87	3.04	4.08	8.22	8.20	10.45
June 2009 Field Verified Acreage**	11.4***	1.66	1.1	0.39	3.42	4.9	6.3
Historically Inundated	Yes	Yes	Partially	Unknown	Yes	Partially	Yes
Inundated (week of June 8, 2015)	Yes	Yes	Partially	No	Yes	Yes	Yes
Degree of Upland Transition (week of June 8, 2015)	Low	Moderate	Moderate	High	Moderate	Moderate	Low
Evidence of Groundwater at the Surface Comparing Transducer Data To Ground Surface Elevation	Yes	Yes	Yes	Yes, of short duration in heavy rain events only	Yes	Yes	Yes

Notes: * Photo-interpreted using 2003 aerial photographs

** Photo-interpreted during 2009 agency site visit. Shown on wetland monitoring transect maps.

*** Difference between the estimated historical acreage (2003 aerial interpretation) and the June 2009 Field Verified Acreage appears to demonstrate a pre-baseline trend of wetland diminishment and may be a result of long term surficial aquifer drawdown that resulted from residential water wells, agricultural consumptive use, and excavation of regional canals and local ditches.

TABLE 9-2
Summary of Manual Water Level Elevations and Staff Gauge Measurements

Wetland	Location	Ground Surface Elevation (ft msl)	Water Level Elevation (ft NAVD)			
			Sept 2014	Dec 2014[3]	Mar 2015	June 2015
RW-1	SG-RW-1	13.90	14.16	NA	14.24	14.14
	MW-RW-1	14.06	14.34	14.36	14.27	14.21
RW-2	SG-RW-2[2]	17.40	17.65	NA	17.79	17.59
	MW-RW-2	17.36	17.87	17.98	18.06	17.57
RW-3	SG-RW-3	20.77	Damaged[2]	NA	22.05	20.99
	MW-RW-3	20.78	21.41	22.05	21.89	20.30
TW-1	SG-TW-1	22.40	23.99	NA	23.96	24.06
	MW-TW-1	22.82	24.02	23.85	23.92	24.04
TW-2	SG-TW-2	21.65	23.15	NA	NA**	23.59
	MW-TW-2	22.37	23.17	22.65	24.59	23.48
TW-6	SG-TW-6	21.05	21.93	NA	22.99	22.60
	MW-TW-6	21.34	21.87	22.95	22.72	22.47
TW-18	SG-TW-18	25.89	Dry	NA	Dry	Dry
	MW-TW-18	26.16	23.04	24.04	24.27	23.77

Notes:

[1] SG-RW-2 resurveyed on 11/28/11 after it had been disturbed by cattle. Previous survey elevation was 21.12.
[2] Staff gauge is damaged and was replaced and resurveyed in October 2014
[3] December 2014 Event - DTW measurements provided from telemetry system data collected on December 30, 2014 at 13:00

*Monitoring well DTW data indicates water level is above ground surface, but observations indicate ground surface to be dry\
** SG-TW-2 was submerged during the March 2015 event – no measurement was taken.
ft – feet
msl – mean sea level
NAVD – North American Vertical Datum
NA – Not available
Blue shading – water level above ground surface (ags)
Brown shading – water level below ground surface (bgs)
Horizontal: NAD 1983 State Plane Florida West (ft)
Vertical: NAVD88

TABLE 9-3
Summary of Wetland Zonation Scoring – Baseline to Current Assessment Period

Vegetation Type	Event Period	Year	TW-1	TW-2	TW-6	TW-18*	RW-1	RW-2	RW-3
Ground Cover	B	2009	3	4	4	NA	2	3	2
		2010	5	3	4	NA	4	3	3
		2011	3	4	4	NA	4	3	4
		2012	3	4	4	NA	4	3	4
		2013	3	4	4	NA	4	3	3
	O	2014	3	4	3	2	3	3	5
		2015	3	5	3	2	4	3	5
Shrubs	B	2009	4	3	4	NA	2	3	NA
		2010	5	3	4	NA	2	3	NA
		2011	3	3	4	NA	2	3	3
		2012	4	3	4	NA	2	3	3
		2013	4	4	4	NA	2	3	3
	O	2014	4	4	4	3	2	3	5
		2015	4	4	4	3	2	3	5
Trees	B	2009	NA	3	NA	2	4	4	NA
		2010	2	3	NA	2	4	3	NA
		2011	4	4	NA	2	4	3	NA
		2012	3	4	4	2	4	3	NA
		2013	4	4	4	2	4	3	NA
	O	2014	4	4	4	3	4	3	NA
		2015	4	4	4	3	4	3	NA

Note: Assessment scoring is based on a qualitative assessment of vegetation coverage; Qualitative assessments may vary based on the individual assessor.

NA = No score assigned due to lack of vegetation meeting strata requirements.
B = Baseline Period; O = Operational Period

*TW-18 scoring strategy changed for the Groundcover and Shrub strata (see text).

Ranking Scale

1. Species with an **upland** classification have moved into the **deep zone** in high numbers and distribution.

2. Species have moved in two **zones** in high numbers and distribution, and/or some species with an **upland** classification have moved into the deep zone.

3. Species have moved in one **zone** in high numbers and distribution, and/or some plants have moved in two **zones**.

4. Species have moved in one **zone** in enough numbers and distribution to be of concern, and/or species with an **adaptive** classification are extensive in numbers and distribution in the **transition zone**.

5. Normal **zonation**. Some species may have migrated inward one **zone**, but they are small in number and/or right along the **zone** edge.

9.2 GENERAL HABITAT CONDITIONS

The freshwater wetlands on Site are similar to those that occur throughout the southwest Florida landscape in concert with pine flatwoods. These shallow marshes (less than 1 meter deep) occur as slight depressions ranging from 10 to a few hundred meters in diameter in the otherwise flat landscape. The most studied and best-preserved example of these wetlands occurs in the Myakka River State Park in eastern Sarasota County. Flatwood marshes provide an important function as groundwater recharge areas (Myers and Ewel, 1990). The flat topography, soils, and seasonal precipitation of the pine flatwoods strongly influence hydrology in these wetland systems.

During the rainy season, minimal water runoff results in waterlogged and poorly aerated soils and standing water may be present for varying periods of time. During the dry season, high evapotranspiration draws water from upper soil horizons. Water often cannot move upward from lower horizons where there is a natural impermeable hardpan, frequently resulting in drought conditions. While occurring in various stages of succession and land use disturbance, all TWs and RWs subject to monitoring under the WMP are relict flatwood marshes.

A colder-than-normal winter in early 2010 decreased the observed prevalence of some previously reported dominant herbaceous vegetation in the assessment areas. These effects were most pronounced in non-native species including primrose willow, Caesar's weed, and tropical soda apple. This observation of decreased prevalence appeared to be reversing as of the June 2012 assessment and recovery of these species continued to be observed during the May 2013, June 2014, and June 2015 assessments. Other species continuing to exhibit rebound from the winter 2010 freezing temperatures include Elliott's aster (*Symphiotrichum elliottii*). Findings for 2015 discussed below indicate precipitation totals that have resulted in reduced seasonal soil saturation and inundation. The reduced seasonal soil saturation and inundation has allowed for seasonal reestablishment of dominant 2009-2010 species associated with dryer conditions, including Caesar's weed (*Urena lobata*) and dogfennel (*Eupatorium capillifolium*).

Observed evidence of wildlife during the June 2015 assessment was consistent with observations made during the baseline monitoring events and was limited to animals typically found in flatwoods such as armadillo (*Dasypus novemcinctus*), white-tailed deer (*Odecoileus virginianus*),

wild hog (*Sus scrofa)*, and raccoon (*Procyon lotor*). Avian species observed during the June 2015 assessment included Northern cardinal (*Cardinalis cardinalis*), mockingbird (*Mimus polyglottos*), Carolina wren (*Thryothorus ludovicianuss*), snowy egret (*Egretta thula*), White ibis (*Eudocimus albus*), Great blue heron (*Ardea Herodias*), Florida mottled duck (*Anas fulvigula*) and red-winged blackbird (*Agelaius phoeniceus*). Amphibians observed included green anole (*Anolis carolinensis),* brown anole (*Anolis sagrei*), green tree frog (*Hyla cinerea*), and southern leopard frog **(***Lithobates sphenocephalus*).

9.3 TARGET WETLAND 1

9.3.1 Transect Location

Beginning at the collocated monitoring well/staff gauge (installed February 22, 2010) and extending to the HWE, the monitoring transect at TW-1 is oriented from east to west in the northern section of the three contiguous depressional areas in the wetland (Figure 9-1).

9.3.2 Habitat Description

The northernmost depressional area was selected for WMP transect deployment due to favorable accessibility and representative landscape position within an emergent habitat that exhibits minimal encroachment by non-native invasive vegetation. Until timbering activities occurred between the 2011 and 2012 annual assessments, dominant vegetation surrounding TW-1 consisted of planted slash and longleaf pine trees, with a hardwood forest along the southern border. During the June 2015 assessment, the majority of uplands surrounding TW-1 consisted of native shrub and brushland.

9.3.3 Monitoring well TW-1 Data Assessment

The transducer for well MW-TW-1 was installed on February 23, 2010 and was subsequently replaced on March 8, 2010 due to a sensor malfunction. Elevations at MW-TW-1 indicate that groundwater levels ranged from about 3.5 ft bgs to about 2.5 ft above ground surface (ags) since monitoring began. During the current monitoring period (June 2014 to June 2015), groundwater elevations fluctuated between 2.0 ft. ags and 0.6 ft ags from June through August 2014, followed by a steady increase to 2.5 ft ags in September 2014 due to heavy rainfall. Water levels then

dropped to the normal pool elevation where it remained until April 2015, when it fell to approximately 0.5 ft bgs. Moderate rainfall throughout May 2015 increased groundwater elevation to approximately 1.6 ft ags observed at the time of the June 2015 assessment. Staff gauge measurements collected during wetland transducer downloads in September 2014, March 2015 and June 2015 indicated standing surface water at this location (see Table 9-2). Groundwater and surface water responses to precipitation events are evident throughout the data collected to date (Appendix D).

9.3.4 June 2015 Field Observations

In June 2015, the northern interior sector of the TW-1 transect continued to be dominated by rice cutgrass (*Leersia hexandra*), Carolina willow (*Salix caroliniana*), field paspalum (*Paspalum laeve*) and maidencane (*Panicum hemitomon*). As discussed above, previously dominant planted pines and upland hardwood and shrub vegetation surrounding the west, south, and east sides of TW-1 was reduced to a native shrub habitat with some minor slash (i.e., woody debris generated by timber harvesting); see Attachment C field data sheets.

As during all previous monitoring events for TW-1, the herbaceous/groundcover zonation score of 3 for the 2015 assessment continues to apply due the diversity of T zone groundcover species present in the D zone. This meets the WAP qualification where "species have moved in one zone in high numbers and distribution, and/or some plants have moved in two zones." The previous year's shrub/sapling zonation score of 4 also continues to apply due to species having moved in one zone in enough numbers (i.e., ≥5 percent) and distribution to be of concern for the long-term viability of the wetland habitat. The tree zonation score for the 2015 assessment of 4 was assigned due to the persistent occurrence of vigorous OD Carolina willow species having moved in one zone in enough numbers (i.e., ≥5 percent) and distribution in the D zone to be of concern for the long-term viability of the wetland habitat.

During the June 2015 assessment, the majority of the wetland was inundated. Except for the alteration of the adjacent timber-forested wetland and upland edge noted in the May 2013 assessment, no conspicuous hydrologic alterations were observed along the surface area in or near the TW-1 transect during the June 2015 assessment. The previously reported 5.25-acre

stormwater retention pond, associated with an industrial facility adjacent to the northern boundary of TW-1, continues to exhibit surface-water elevation changes similar to TW-1.

9.4 TARGET WETLAND 2

9.4.1 Transect Location

Initial field investigations identified one well (Stilling Well-3) and one staff gauge (Staff Gauge-8), which were incorporated into the original proposed transect as prescribed by the WAP manual. However, since these devices are located in the outer transition zone, rather than the wetlands deep zone, they are not included in the monitoring transect. AS a result, a new collocated monitoring well and staff gauge (MW-TW-2 and SG-TW-2) were installed in the deep zone to the north of the monitoring transect in November 2009. The TW-2 monitoring transect is oriented from west to northeast, beginning at the wetland interior and extending to the HWE (Figure 9-2). Although MW-TW-2 and SG-TW-2 are not considered part of the monitoring transect, photographs are taken in all four cardinal directions at this location and water level data is collected and used for assessment purposes.

9.4.2 Habitat Description

A review of 2003 aerial photography indicated that TW-2 once contained a conveyance that appeared to drain stormwater from Tallevast Road and from a commercial/industrial facility located immediately southwest of the wetland. Vegetation in TW-2 consisted of shrub vegetation in the interior of the wetland and herbaceous wetland vegetation in and near the periphery of the wetland. A parcel of disturbed upland and a commercial/industrial facility bordered TW-2 to the west, with upland pasture surrounding the remaining areas of TW-2 with the exception of the area east of the access road. The pasture east of the access road is currently being developed and a master stormwater system is being installed. Historical hydrological indicators of TW-2 suggest that this wetland was hydrated both by surficial stormwater sheet flow and groundwater.

9.4.3 Monitoring well TW-2 Data Assessment

The transducer for the new well MW-TW-2 was installed on November 6, 2009. During the current monitoring period (June 2014 through June 2015), groundwater elevations were at about

3 ft ags in June 2014. Due to failure of the manual transducer and improper deployment of the telemetric transducer, no data was collected from June 27, 2014 to September 30, 2014, when the telemetric transducer was properly deployed. Groundwater elevations fluctuated between approximately 3 ft ags and 2 ft ags from October 2014 through March 2015, followed by a steady decrease to approximately 0.5 ft ags between March and May 2015. By the time of the June 2015 assessment, groundwater elevation had increased to just above the normal pool elevation (1 ft ags). Staff gauge measurements collected during wetland transducer downloads in September 2014, March 2015 and June 2015 indicated standing surface water at this location (see Table 9-2). Standing surface water was observed in TW-2 (Appendix B) during the annual wetland assessment conducted on June 10, 2015. Groundwater and surface water responses to precipitation events are evident throughout the data collected to date (Appendix D).

9.4.4 June 2015 Field Observations

No major alteration or conversion of previously reported land use or vegetative cover types in TW-2 was observed between the June 2009 preliminary investigation and the subsequent June 2010, 2011, 2012, May 2013, June 2014, and June 2015 transect assessments. TW-2 was historically an herbaceous wetland but continues to display signs of ongoing transition to forest and prairie habitats. A dense stand of Carolina willow trees and shrubs occurs in the area presumed to have been the deepest portion of the wetland based on interpolated aerial photography. This wooded wetland area was dominated by OD zone species. Both the D and OD zones were inundated with *Salvinia minima* observed floating on the surface throughout. Adventitious roots were observed approximately 18-24 inches above the observed water level, indicating wet season water level is at least 18-24 inches higher than the current water level.

TW-2 was assigned an herbaceous/groundcover zonation score of 5 for the 2015 assessment, due to normal zonation observed within the transition zone. OD and D zones were NA for scoring due to lack of WAP species observed. This represents a slight improvement from previous years' assessments and reflects seasonally high standing water levels that persisted for long enough to reverse the trend of colonization by species with AD, T, and UPL indicator classifications. The shrub/sapling zonation score remained a 4 for the 2015 assessment due to OD species having moved in one zone in enough numbers and distribution to be of concern. The tree zonation score

of 4 continued to be assigned in the 2015 assessment due to OD species having moved in one zone in enough numbers and distribution to be of concern.

9.5 TARGET WETLAND 6

9.5.1 Transect Location

The TW-6 monitoring transect is oriented from southeast to northwest, beginning at the collocated monitoring well/staff gauge (installed November 2, 2009) and extending to the HWE, in the north-central portion of the wetland (Figure 9-3). The monitoring well/staff gauge was installed in a portion of TW-6 that was confirmed to have been historically excavated. The elevation of the ground surface outside of the excavated area (north along the transect) is approximately three feet higher than at the location of the monitoring well/staff gauge. Due to historical disturbance within the wetland, definitive surface hydrology and vegetative evidence of an HNP elevation was not observed outside of the excavated pond within TW-6, during the initial 2009 field review.

9.5.2 Habitat Description

A review of available 1970, 1980, and 2003 aerial photography indicated that TW-6 contained an inundated area in its southern sector. This inundated portion of TW-6 was field-verified and confirmed with the long-term landowner to be an excavated cattle pond. Historical aerial photographs show that the excavation of this cattle pond occurred between 1951 and 1962. During the June 2009 site visit to select an appropriate transect location for the assessment area the wetland was dry, including the excavated portion. During the 2009 site visit, vegetation types in TW-6 consisted of emergent/shrub species in the excavated area and a thick stand of trees/shrubs north of the excavated area. Historical hydrological indicators of TW-6 suggest that this wetland is hydrated by stormwater sheet flow as well as by a groundwater interface within the excavated area. This wetland appears to receive stormwater drainage from Tallevast Road to the north, the residential property to the west, and from the pastureland to the east and south. Additionally, treated effluent water from the RAPA system has been discharged through an injection gallery (RC-7002) located along the south and east sides of the wetland since July 2014. A total of 5,194,500 gallons of treated effluent water have been discharged through RC-

7002. This wetland discharges to the east through a drainage ditch along the south side of Tallevast road. A high point in this roadside ditch, approximately 0.25 miles east of TW-6 appears to control high water levels in this wetland. The four baseline reports indicate that the section of TW-6 north of the historically excavated cattle pond displays evidence of conversion to an upland forested/shrub habitat type and that soils in this area are composed of sand and loamy sand, with marginal hydric soil indicators.

9.5.3 Monitoring well TW-6 Data Assessment

The transducer for well MW-TW-6 was installed on November 6, 2009. Groundwater elevations at MW-TW-6 were generally above ground surface for all monitoring periods except for short periods from November to December 2009 and March 2012 through June 2012. Groundwater elevations were at about 3 ft ags within the excavated pond portion of TW-6 during July 2012 and stayed at these levels until starting to fall in late October 2012 to the ground surface until June 2013. During the current monitoring period (July 2014 through June 2015), water elevations fluctuated between 1 ft ags and 1 ft bgs from June 2014 to September 2014. Water elevations quickly increased to approximately 3 ft ags in September 2014 due to heavy rainfall, followed by a gradual decrease to the normal pool elevation from October 2014 through January 2015, where it remained until the June 2015 assessment event. Groundwater and surface water responses to precipitation events are evident throughout the data collected to date (Appendix D).

9.5.4 June 2015 Field Observations

As during all previous monitoring events, no major alteration or conversion of previously reported land use or vegetative cover types in TW-6 was observed between the June 2009 preliminary investigation and the June 2010, June 2011, June 2012, May 2013, and June 2014 transect monitoring assessments. Conditions during the November 2009 monitoring well and staff gauge installation, as well as during the June 2010, 2011, 2012, and May 2013 baseline monitoring assessments, included normal inundation that was sufficient to submerge most of the excavated pond. This area was holding up to a 2-foot water column at the time of the June 2010, 2011, 2012, and May 2013 observations. The previous annual report noted observations indicating dry conditions with no evidence of recent inundation other than the inundation in the deepest portion of the wetland. Observed hydrology during previous monitoring events suggest

that groundwater is a partial source to the pond, but it is also fed by stormwater runoff from nearby Tallevast Road. Rust, stains, and residues on the staff gauge continue to indicate persistent water volumes in the excavated pond. It was noted in the June 2014 assessment event that water levels in this wetland appeared to have been reduced as a result of the initiation of the RAPA extraction wells and trenches. Installation of injection gallery (RC-7002) to the south and east sides of the wetland was completed mid-2013. RC-7002 was designed and installed to augment groundwater in the area and to buffer TW-6 from drawdown associated with the RAPA system.

Conditions observed during the June 2015 assessment event were similar to those observed during the 2014 event, indicating that the wetland was experiencing dry conditions, with no evidence of recent inundation other than the inundation in the deepest portion of the wetland. Rainfall data indicates seasonal events that occurred prior to the 2015 assessment yielded less rainfall than those observed prior to the 2014 assessment event. Recharge to RC-7002 began on July 9, 2014, subsequent to the First Operational Monitoring event. A total of 5,194,500 gallons of treated effluent water have been discharged through RC-7002 since infiltration began. Water level data indicates that groundwater elevations have not dropped bgs since August of 2014. Conditions in TW-6 during the June 2015 monitoring event are similar to conditions that would be expected during an average spring dry season, as noted in the previous assessment. Based on water level data collected during this monitoring period, RC-7002 appears to be effectively augmenting groundwater recharge and buffering TW-6 from drawdown associated with the RAPA system. The effect of the groundwater extraction and recharge on TW-6 groundwater and surface water elevations will continue to be evaluated. Based on this, the water flow from the extraction wells and to the RC-7002 infiltration gallery will be adjusted as needed during the 2015-2016 monitoring period.

During the June 2015 assessment, the vegetation in the excavated portion of TW-6 continued to consist of predominantly OD and D zone species. Vegetation of the wetland area north of the pond continued to be dominated by OD zone and T zone species. AD and T species have historically been noted in the D zone and were noted during the 2015 event. Additionally, Caesar weed (*Urena lobata*), an upland species, was observed in small numbers within the D zone

during this monitoring event. Caesar weed is an opportunistic vegetative species, with seeds that cling to wildlife, thereby easily spreading the seed source. Caesar weed does not persist in areas of saturated or inundated soils and areas shaded by canopy. Therefore, it is anticipated that the Caesar weed observed during the 2015 monitoring event will not persist due to seasonal inundation. Despite the observation of Caesar weed, the herbaceous/groundcover zonation score for the 2015 monitoring event has remained a 3, since the upland species was not observed in enough numbers (>5%) to be of concern as described in the revised scoring guidance provided by the SWFWMD (SWFWMD, 2008). The shrub/small tree and tree zonation scores for the 2015 event continued to be a 4 compared to the last monitoring report, due to species having moved in one zone in enough numbers and distribution to be of concern, and species with an AD classification (i.e., Brazilian pepper) are extensive in numbers and distribution in the T zone.

9.6 TARGET WETLAND 18

9.6.1 Transect Location

The TW-18 monitoring transect is oriented from south to north, beginning at the collocated monitoring well/staff gauge (installed February 22, 2010) and extending to the HWE in the northern portion of the historical wetland (Figure 9-4).

9.6.2 Habitat Description

Review of 2003 aerial photography during the 2009 site review indicated that the TW-18 area appeared to have been consistently dry. Vegetation shown on the 2003 aerial photograph of TW-18 consisted of a chiefly hardwood forested hammock, bounded on the west side by a railroad, on the south side by a single family residence, on the east side by the unimproved extension of 19th Street, and on the north side by upland pine silviculture. The baseline monitoring reports indicated that the historical hydrological indicators of TW-18 suggest that this habitat was likely once a persistent wetland that was fed both by surficial stormwater sheet flow as well as a groundwater interface that is no longer conspicuous. The baseline reports indicated that up to 12 inches of wetland soil subsidence caused by oxidation and gasification of carbon that result from drought and drying conditions continued to be observed within TW-18 and relict wetland vegetation remained restricted to hummocks that protrude above the historical wetland floor.

Baseline reports for TW-18 indicate soils consist of a loamy sand matrix typical of upland forested habitats in this region of Florida, and that TW-18 no longer contains hydrological indicators consistent with a functional wetland. The baseline reports determined that based on the maturity of transitional and upland trees present, the wetland habitat at TW-18 likely began transitioning to upland more than 20 years ago and is now devoid of all but relict wetland characteristics. During the June 2015 monitoring event, soil core profiles collected within the D, OD, and T zones indicated that hydric soil indicators were present. A stripped matrix (Munsell color 10YR (4/1 dark gray to 5/1 gray)) starting within the top 6 inches of soil was observed during the 2015 monitoring event. Vegetation and above ground hydrologic indicators generally transition more rapidly than soils. We will continue to assess the soils in all three zones to document changes during the requisite monitoring period.

9.6.3 Monitoring well TW-18 Data Assessment

The transducer for well MW-TW-18 was installed on February 23, 2010. Groundwater elevations at MW-TW-18 were approximately 2 ft or more bgs since monitoring began in February 2010, except for a brief period in late August/early September 2010 and a more extended period of time in late August/early September 2012, where groundwater elevations were at or slightly above ground surface after heavy precipitation events. Groundwater elevations during the first operational monitoring period (June 2013 to June 2014) were consistent with historical trends, influenced primarily by seasonal rainfall. During the current monitoring period (June 2014 through June 2015), groundwater elevations decreased from 1 ft bgs to 4.5 bgs from June 2014 to August 2014, followed by a rapid increase to the normal pool elevation a few inches above ground surface. Between September 2014 and February 2015, groundwater elevations fluctuated between ground surface and approximately 2.5 ft bgs, and then fell gradually to 4 ft bgs through May 2015. Between May and June 2015, groundwater elevations increased steadily to approximately 2 ft bgs. Staff gauge measurements during wetland transducer downloads in September 2014, March 2015, and June 2015 as well as observations made during the annual assessment conducted in June 2015, indicated no standing surface water at this location (see Table 9-2 and Appendix B). Groundwater and surface water responses to precipitation events are evident throughout the data collected to date (Appendix D).

9.6.4 June 2015 Field Observations

No major alteration or conversion of previously reported land use or vegetative cover types in TW-18 was observed between the June 2009 preliminary investigation and the June 2010, 2011, 2012, May 2013, June 2014, and June 2015 transect monitoring assessments. The interior of TW-18 continues to consist of a mix of primarily adaptive and transitional oaks/hardwoods and introduced mature punk trees. Relict obligate-wetland ferns, including royal fern (*Osmunda regalis*) and Virginia chain fern (*Woodwardia virginica*); continue to occur on hummocks within the historical wetland interior. A dense saw palmetto fringe continues to encroach along the northern, western, and southern borders of the HWE.

The herbaceous/groundcover zonation score assigned to TW-18 for the 2015 assessment continues to be a 2, due to species having moved in two zones in high numbers and distribution, and/or some species with an upland classification having moved into the deep zone. The ground surface throughout TW-18 continues to be blanketed by laurel and live oak leaf litter. Both the shrub/small tree and tree zonation score for the 2015 assessment remains at 3, due to species having moved in one zone in high numbers and distribution, and/or some plants have moved in two zones. However, while the WAP prescribes that AD zone species should be regarded as T zone species when occurring in the D or OD zones, it is a prevalence of T zone species (name them) that continues to dominate the historic D or OD zones.

9.7 REFERENCE WETLAND 1

9.7.1 Transect Location

The RW-1 monitoring transect is oriented from west to east beginning at the collocated monitoring well/staff gauge (installed November 3, 2009) and extending to the HWE in the eastern portion of the wetland (Figure 9-5).

9.7.2 Habitat Description

A review of 2003 aerial photography indicated that RW-1 consisted of a historically inundated area, with a shrub and emergent wetland D zone. During the May 13, 2013 assessment, the northern upland edge of the area was actively undergoing clearing, grubbing, and windrowing to

maintain the adjacent pasture and prevent livestock from accessing the wetland. As of the June 2015 monitoring assessment, upland pasture habitat continues to border the historical wetland boundary. Dense thickets of invasive Brazilian pepper tree are ubiquitous throughout the historical T, OD, and D zones of RW-1.

This wetland historically received surface flow from a relatively small drainage basin in the surrounding pine flatwoods. The surrounding uplands were converted to agricultural land uses prior to 1941 and RW-1 continues to receive stormwater runoff from adjacent agricultural lands. The USGS 7.5-minute topographic quadrangle mapping (USGS, 1994) and historical aerial photographs depict the presence of a surface conveyance draining southeast to the Pearce Canal.

9.7.3 Monitoring well RW-1 Data Assessment

The transducer for well MW-RW-1 was installed on November 6, 2009 and was subsequently replaced on November 19, 2009 due to a malfunction. Groundwater elevations at MW-RW-1 varied from about 4 ft bgs to about 1-ft ags since monitoring began in November 2009. Wetland transducer data collected since the start of the monitoring program indicates a drainage feature controlling maximum water elevations in this wetland. In general, this wetland appears to experience shallow inundation in response to rainfall events during the wet season.

During the current monitoring period (July 2014 through June 2015), groundwater elevations decreased from a few inches ags to approximately 2 ft bgs from July 2014 through August 2014, followed by an increase from 2 ft bgs back up to the normal pool elevation, where it remained until April 2015. Groundwater elevations between April and June 2015 fluctuated rapidly with precipitation events between the normal pool elevation and approximately 2 ft bgs. Observation during the annual assessment conducted on June 9, 2015 also indicated shallow inundation at this location (see Appendix B). Groundwater and surface water responses to precipitation events are evident throughout the data collected to date (Appendix D).

9.7.4 June 2015 Field Observations

No major alteration or conversion of previously reported land use or vegetative cover types in RW-1 was observed between the June 2009 preliminary investigation and the June 2010, 2011, 2012, May 2013, June 2014, and June 2015 transect monitoring assessments (except clearing of

Brazilian pepper around the wetland as reported in the last baseline monitoring report). Vegetation of RW-1 is dominated by dense stands of Brazilian pepper (AD species) shrubs and small trees. Within the historical wetland interior, only relict OD zone species occur, which are limited to a few mature Carolina willow and red maple trees.

All previous monitoring events for RW-1 indicated an herbaceous/groundcover zonation score of 3 due to species having moved in one zone in high numbers and distribution, and/or some plants having moved in two zones. However, observations made during the 2015 monitoring event indicate that the score increased from 3 to 4 due to species having moved in one zone in enough numbers and distribution to be of concern and/or species with an adaptive classification are extensive in numbers and distribution in the transition zone. The shrub/sapling zonation score for the 2015 assessment continued to be 3 due to species having moved in one zone in high numbers and distribution, and/or some plants having moved in two zones. The tree zonation score for the 2015 assessment continued to be 4 due to species having moved in one zone in enough numbers and distribution to be of concern for the long-term viability of the wetland habitat.

Relict herbaceous wetland vegetation (i.e., Virginia chain fern) continues to grow on hummocks that protrude above the historical wetland floor possibly indicating soil subsidence. Much of the original wetland habitat has been invaded by dense Brazilian pepper and the perimeter of the wetland appears to be transitioning to a dryer habitat due to drainage and surrounding agricultural activities.

9.8 REFERENCE WETLAND 2

9.8.1 Transect Location

The RW-2 monitoring transect is generally oriented from east to west beginning at the collocated monitoring well/staff gauge (installed November 3, 2009) and extending to the HWE on the western portion of the wetland (Figure 9-6).

9.8.2 Habitat Description

A review of 2003 aerial photography indicated that RW-2 consisted of a thick canopy of trees, with small areas of shrubby and emergent vegetation scattered inside of the eastern and southern boundaries. Active pastureland surrounds the historical wetland boundaries.

Historical aerial photographs of RW-2 suggest that this wetland receives stormwater runoff from two linear drainage features to the north and northwest of the wetland and surface water flow from the surrounding pastures. The historical aerial photographs indicate that between 1951 and 1962 a rim ditch was excavated around the east side, a cattle pond was excavated in the southern lobe, and a ditch was excavated through the natural outfall marsh to the south. This ditch connected RW-2 to the Pearce Canal. A notched cement control weir at the south end of the wetland historically controlled water elevations in RW-2. This cement control structure was collapsed during the baseline assessments.

9.8.3 Monitoring well RW-2 Data Assessment

The transducer for well MW-RW-2 was installed on November 6, 2009. Groundwater elevations ranged from about 4 ft bgs to about 2 ft ags since monitoring began in November 2009. During the current monitoring period (July 2014 to June 2015), groundwater elevations ranged from the normal pool elevation (1 ft ags) to approximately 1 to 1.5 ft bgs from July 2014 through September 2014. Between September 2014 and March 2015, groundwater elevations remained at the normal pool elevation, followed by a gradual decrease to ground surface between March and May 2015. Water levels fluctuated between at grade ground elevations and 0.5 ft ags until June 2015. Observations during the June 2015 assessment indicated standing surface water in RW-2 (Appendix C). Groundwater and surface water responses to precipitation events are evident throughout the data collected to date (Appendix D).

9.8.4 June 2015 Field Observations

No major alteration or conversion of previously reported land use or vegetative cover types in RW-2 was observed between the June 2009 preliminary investigation and the June 2010, 2011, 2012, May 2013, and June 2014 monitoring assessments. Evidence of prior transition of RW-2 to drier conditions, observed during the initial June 2009 field investigation, continued to be

observed during the baseline monitoring events, as well as the 2014 and 2015 monitoring events. This wetland appears to be a moderately functional wetland which has been impacted by historical drainage and surrounding agricultural land uses. The perimeter of the wetland shows signs of reduced hydroperiods resulting from the drainage feature to the south. Evidence of trampling by cattle was observed throughout the drier portions of the wetland (T and OD zones) during the June 2015 assessment. Hydrologic indictors observed during the 2015 monitoring event include vegetation growing on hummocks, along with moss and lichen lines that appear to correspond with normal pool elevations.

Several D zone and aquatic floral species continued to occur in the interior of RW-2, but vegetation within the monitoring transect of this wetland is increasingly dominated by OD zone and T zone species. As during all previous monitoring events for RW-2, the herbaceous/groundcover zonation score for the 2015 assessment is a 3 due to species having moved in one zone in high numbers and distribution, and/or some plants having moved in two zones. The shrub/sapling and tree zonation score for the 2015 assessment also continued to be 3 due to species having moved in one zone in high numbers and distribution, and/or some plants having moved in two zones.

9.9 REFERENCE WETLAND 3

9.9.1 Transect Location

The RW-3 monitoring transect is generally oriented from east to west beginning at the collocated monitoring well/staff gauge (installed November 2, 2009) and extending to the HWE in the northwestern portion of the wetland (Figure 9-7).

9.9.2 Habitat Description

A review of 2003 aerial photography indicated that RW-3 primarily consisted of an emergent wetland that was frequently inundated. Upland pasture and shrub habitat bordered the wetland boundary of RW-3. The outer perimeter of the southern half of RW-3 was bordered by thick shrub and tree vegetation. Hydrological indicators from the 2003 aerial photograph of RW-3 suggested that the water source for this wetland was primarily groundwater and surface flow from the surrounding drainage basin. The 2003 aerial photograph showed that three quarters of

the wetland area was inundated, and the interior of the northern boundary displayed obvious hydrology and vegetative patterns of a shrub wetland. Floating vegetation was prevalent within the upper portion of RW-3 in the 2003 aerial photograph, and rooted vegetation appeared to be depressed or absent within the lower sections, indicating that this wetland was historically inundated throughout much of the growing season. The historical aerial photographs indicate that no significant drainage features exist around this wetland. The northern portion of this wetland was excavated for a cattle pond prior to 1995 as indicated in aerial photography.

9.9.3 Monitoring well RW-3 Data Assessment

The transducer for well MW-RW-3 was installed on November 6, 2009. Groundwater elevations varied between 4 ft bgs to 3 ft ags since monitoring began in November 2009. No data was collected by the transducer between May 2013 and January 2014 due to a low transducer battery. In addition, staff gauge data was not collected between May 2013 and December 2014 due to the staff gauge being damaged. A new transducer was installed on January 15, 2014 and a new staff gauge was installed and surveyed in October 2014. During the current monitoring period (June 2014 through June 2015), groundwater elevations decreased from 1 ft ags to approximately 1.5 ft bgs in June 2014, followed by several rapid fluctuations between ground surface and 1.5 ft bgs in August and September 2014. In late September, groundwater elevations rapidly increased to the normal pool elevation (approximately 2 ft ags), followed by a slow decrease to ground surface between October 2014 and April 2015. Between April and June 2015, groundwater elevations fluctuated rapidly from 0.5 ft ags to approximately 1.5 - 2.0 ft bgs. Observations made during the semi-annual transducer download events in September 2014 and March 2015, as well as during annual wetland assessment conducted in June 2015, indicated standing surface water at this location (see Appendix B). Groundwater and surface water responses to precipitation events are evident throughout the data collected to date (Appendix D).

9.9.4 June 2015 Field Observations

No major alteration or conversion of previously reported land use or vegetative cover types in RW-3 was observed between the June 2009 preliminary investigation and the June 2010, 2011, 2012, May 2013, June 2014, and June 2015 transect monitoring assessments. Evidence of prior conversion of RW-3 to upland prairie, as previously reported in the baseline reports, was not

observed. The 2013 baseline report indicated that the lower half of RW-3 was rapidly transitioning to upland. This conclusion may have been due to hydrologic and vegetative evidence resulting from drought conditions preceding the monitoring event. Similar to the 2014 monitoring event, water levels were at or above normal pool elevations for several months prior to the 2015 monitoring event resulting in a diverse assemblage of hydrophytic vegetation in each zone especially in the southern herbaceous fringe. As during the previous monitoring event for RW-3, the herbaceous/groundcover zonation score for RW-3 remains a 5 indicating a normal zonation pattern. While there was an absence of woody vegetation in the OD and D zones, the shrub/sapling zonation score for the 2015 assessment was 5, indicating a normal zonation pattern. The tree zonation score for the 2015 assessment was NA due to the absence of trees in the T, OD, and D zones.

During the 2015 assessment, the monitoring transect established in the northwestern quadrant of RW-3 was dominated by OD and D zone floral species, but two adaptive upland ruderal species (*Phyla nodiflora and Ptillimnium capillifolium*) were observed in the T zone of the wetland. The high water levels prior to the 2015 monitoring event appear to have eliminated most of the opportunistic ruderal (adaptive) upland species which had dominated the prairie vegetation observed during previous baseline monitoring events.

Section 10
Conclusions

Implementation of the July 2009 WMP is conducted in accordance with an FDEP requirement for wetlands monitoring associated with the anticipated installation and activation of the RAPA (groundwater remediation system) for the site. Staff gauges and monitoring wells were installed between November 2009 and February 2010. Annual baseline assessments were conducted for four years (through May 2013) prior to groundwater extraction associated with the RAPA implementation. Data collected from 2009 to May 2013 was used to establish a baseline of groundwater and surficial wetland hydrology information to document local fluctuations in groundwater elevations and the corresponding effect on wetland function. These data were used to establish thresholds that determine whether TWs will require hydraulic maintenance or compensatory mitigation as a result of RAPA system operation. The RAPA system startup occurred on November 18, 2013. The June 2014 annual assessment marked the first monitoring event conducted during RAPA operations. This 2015 operational monitoring event was conducted in each of the WMP wetlands (TWs nearer the Facility and RWs in the greater Tallevast area). Data collected during the current monitoring was evaluated against the established baseline conditions.

Precipitation in the quarter preceding the 2015 WMP transect assessment was slightly less compared to the 2014 event. Precipitation in the year preceding the 2015 monitoring event was approximately 41 inches, which is below average. All of the TWs and RWs showed evidence of normal water level fluctuation given the average rainfall for the region.

As noted in the June 2014 assessment event, water levels in TW-6 appeared to have been reduced as a result of the initiation of the RAPA extraction wells and trenches. In response to this observation, the infiltration gallery (RC-7002) located south and southeast of TW-6 was placed into operation in July 2014 and has remained operational to date. A total of 5,194,500 gallons of treated effluent water have been discharged through RC-7002 since it was started. Water level

data indicates that groundwater elevations have not dropped bgs since August of 2014. Groundwater elevations observed at TW-6 during the 2015 monitoring event appear to have been maintained at a higher elevation when compared to the previous monitoring event, indicating that RC-7002 is augmenting groundwater recharge and effectively buffering TW-6 from drawdown associated with the RAPA system. The effect of the groundwater extraction and recharge on TW-6 groundwater and surface water elevations will continue to be evaluated. Groundwater levels and water flow to EW-2103, EW-2104, and RC-7002 will be monitored and adjusted as needed during the 2015-2016 monitoring period. The vegetation in TW-6 continues to be similar to that recorded in the baseline monitoring reports and has not been affected by the drawdown noted in the 2014 monitoring report.

The WAP vegetative score in TW-6 remained the same in all categories. One upland species (Caesar weed) was observed at 5% coverage within the D zone. However, this upland species is not present in enough numbers to be of concern and it is anticipated that the presence and subsequent absence of this species is commensurate with seasonal rainfall. The vegetative scores for TW-2 and RW-1 were increased in groundcover, from 4 to 5 and 3 to 4, respectively. The WAP scores of the rest of the TWs and RWs have not changed from those assigned for the previous monitoring period.

The telemetry system installed in June 2014 continues to operate normally, allowing quick access to water level instrumentation to determine status and functionality. Data provided by the telemetry system continues to be used for continuous RAPA system optimization, specifically for monitoring and adjusting groundwater extraction and recharge in the vicinity of TW-6. Groundwater elevation data in wetlands will continue to be manually verified to confirm telemetry system operation and manual transducers will be downloaded on a semi-annual basis. Groundwater elevation data will continue to be collected hourly and will be transmitted on a weekly basis. Manual transducers will remain deployed in the monitoring wells until the accuracy and reliability of the telemetry system has been verified. Annual WMP investigations will continue to occur in May/June of each successive year of the active monitoring 5 year period. A subsequent Wetlands Monitoring Report and comparative analysis with local climate

and previously collected data will be submitted to the SWFWMD by September 1 annually until year 2018.

Section 11
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TABLES

[Tables 1-1, 6-1, 9-1, 9-2, and 9-3 are within Report text]

TABLE 7-1
WETLANDS MONITORING REPORT SURVEY DATA

Wetlands Monitoring Report July 2014 through June 2015
Lockheed Martin Tallevast Site
Tallevast, Florida

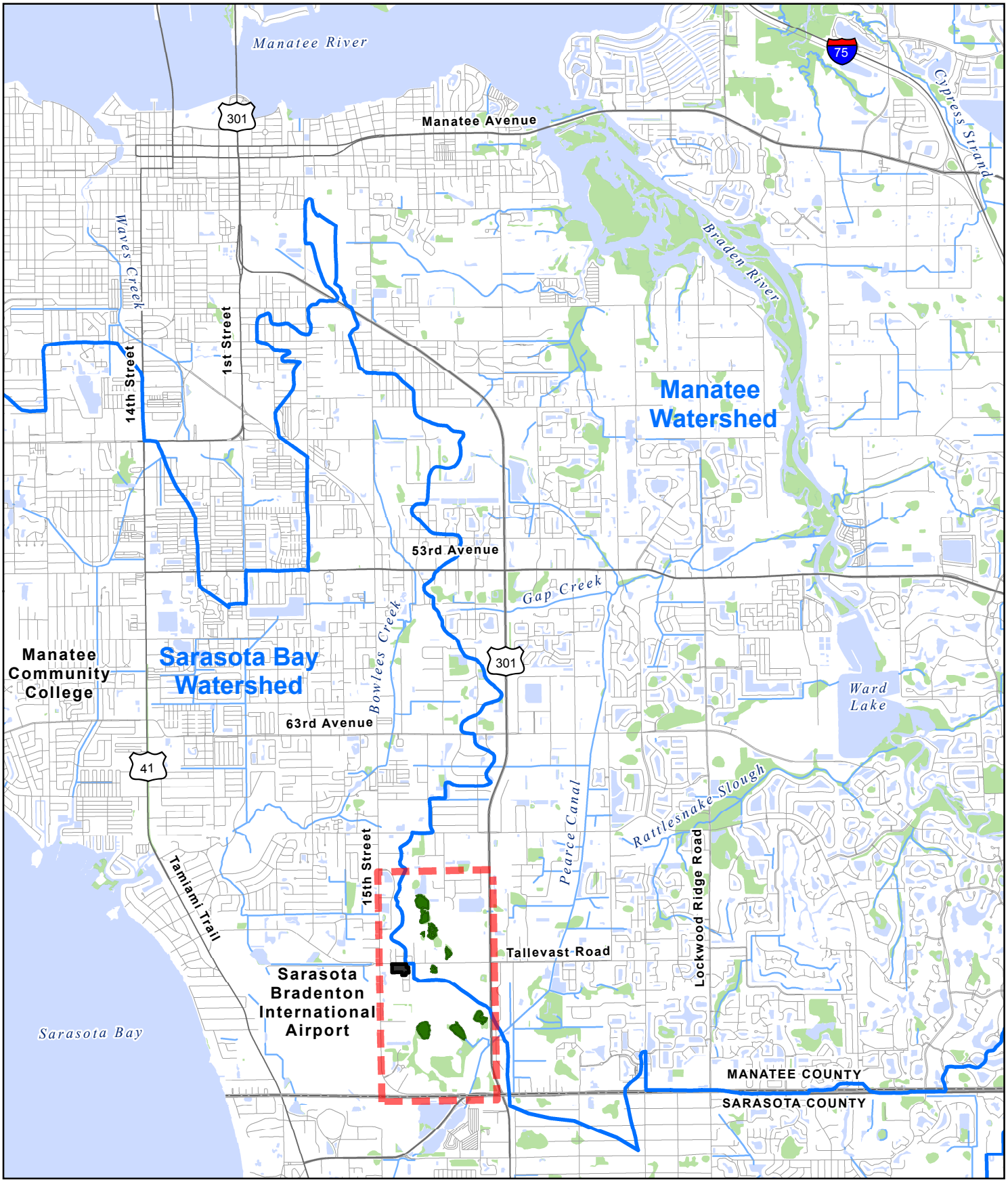
Description	State Plane North	State Plane East	Casing/Gauge Elevation (ft msl)	Concrete Pad Elevation (ft msl)	Ground Elevation (ft msl)	3' Mark Elevation (ft msl)	1' Mark Elevation (ft msl)	0' Mark Elevation (ft msl)
RW-1								
MW-RW-1	1114069.58	482819.52	18.44	14.09	13.90	NA	NA	NA
SG-RW-1	1114070.45	482818.27	17.31	NA	13.90	16.98	14.98	NA
NP-12-RW-1	1114074.36	482833.78	NA	NA	NA	NA	NA	NA
NP-6-RW-1	1114083.95	482871.81	NA	NA	NA	NA	NA	NA
RW-2								
MW-RW-2	1113508.03	481763.66	21.19	17.40	17.40	NA	NA	NA
SG-RW-2	1113507.17	481765.54	20.45	NA	17.40	21.12	18.21	NA
NP-12-RW-2	1113487.82	481743.02	NA	NA	NA	NA	NA	NA
NP-6-RW-2	1113467.04	481724.38	NA	NA	NA	NA	NA	NA
RW-3								
MW-RW-3	1113699.69	480440.25	25.31	20.89	20.75	NA	NA	NA
SG-RW-3*	1113704.76	480439.51	24.77	NA	20.77	NA	NA	NA
NP-12-RW-3	1113717.61	480428.18	NA	NA	NA	NA	NA	NA
NP-6-RW-3	1113744.98	480397.51	NA	NA	NA	NA	NA	NA
TW-1								
MW-TW-1	1118667.53	480476.65	26.72	23.02	22.44	NA	NA	NA
SG-TW-1	1118666.21	480478.55	25.80	NA	22.40	25.47	NA	NA
NP-12-TW-1	1118657.97	480452.50	NA	NA	NA	NA	NA	NA
NP-6-TW-1	1118658.70	480395.88	NA	NA	NA	NA	NA	NA
TW-2								
MW-TW-2	1116668.18	481552.76	26.29	22.22	21.65	NA	NA	NA
SG-TW-2	1116663.81	481546.47	24.52	NA	21.65	24.19	22.19	NA
NP-12-TW-2	1116642.28	481579.62	NA	NA	NA	NA	NA	NA
NP-6-TW-2	1116636.16	481576.79	NA	NA	NA	NA	NA	NA
TW-6								
MW-TW-6	1115977.75	480939.06	25.11	21.25	21.05	NA	NA	NA
SG-TW-6	1115975.49	480938.40	24.28	NA	21.05	23.95	NA	NA
NP-12-TW-6	1115980.54	480935.18	NA	NA	NA	NA	NA	NA
NP-6-TW-6	1115984.11	480933.62	NA	NA	NA	NA	NA	NA
TW-18								
MW-TW-18	1117379.14	480524.02	29.15	26.28	25.89	NA	NA	NA
SG-TW-18	1117379.81	480526.54	29.38	NA	25.89	29.05	27.05	26.05
NP-12-TW-18	1117386.41	480523.16	NA	NA	NA	NA	NA	NA
NP-6-TW-18	1117397.32	480519.94	NA	NA	NA	NA	NA	NA

Footnotes:
NA - Not applicable
RW - Reference Wetland
TW - Target Wetland
NP - Normal Pool
SG - Staff Gauge
ft msl - feet mean sea level
MW - Monitoring Well

Data Source: ARCADIS, Wetlands Monitoring Report; April 29, 2011
Horizontal: NAD 1983 State Plane Florida West (Feet)
Vertical: NAVD88 (Feet)
*SG-RW-3 was replaced with a new staff gauge on Nov. 11, 2014. The Top Gauge Elevation of 24.52 ft msl was measured at the 8' Mark on the Staff Gauge. This survey data was collected and presented by Palmer Land Surveying, L.L.C. in the Professional Land Survey Report, dated Dec. 5, 2014.

FIGURES

[Figures 4-1, 6-2, 6-3, 6-4, 7-2, 7-3, 7-4 and 8-1 are within Report text]



Legend

- Site Location
- Lockheed Martin Tallevast Facility
- Watershed Boundary
- Target and Reference Wetlands

0 1 Miles

N

LOCKHEED MARTIN
TALLEVAST SITE
TALLEVAST, FLORIDA
2015 WETLAND MONITORING

SITE LOCATION MAP

AECOM

FIGURE
1-1

Document Path: L:\projects\Lockheed Martin\Tallevast\60336439 - 2015 Wetlands Monitoring\920 - GIS\MXD\2015_Wetland_Monitoring_Report_Figures\LMT_WetMon_Fig1_1_LocMap.mxd

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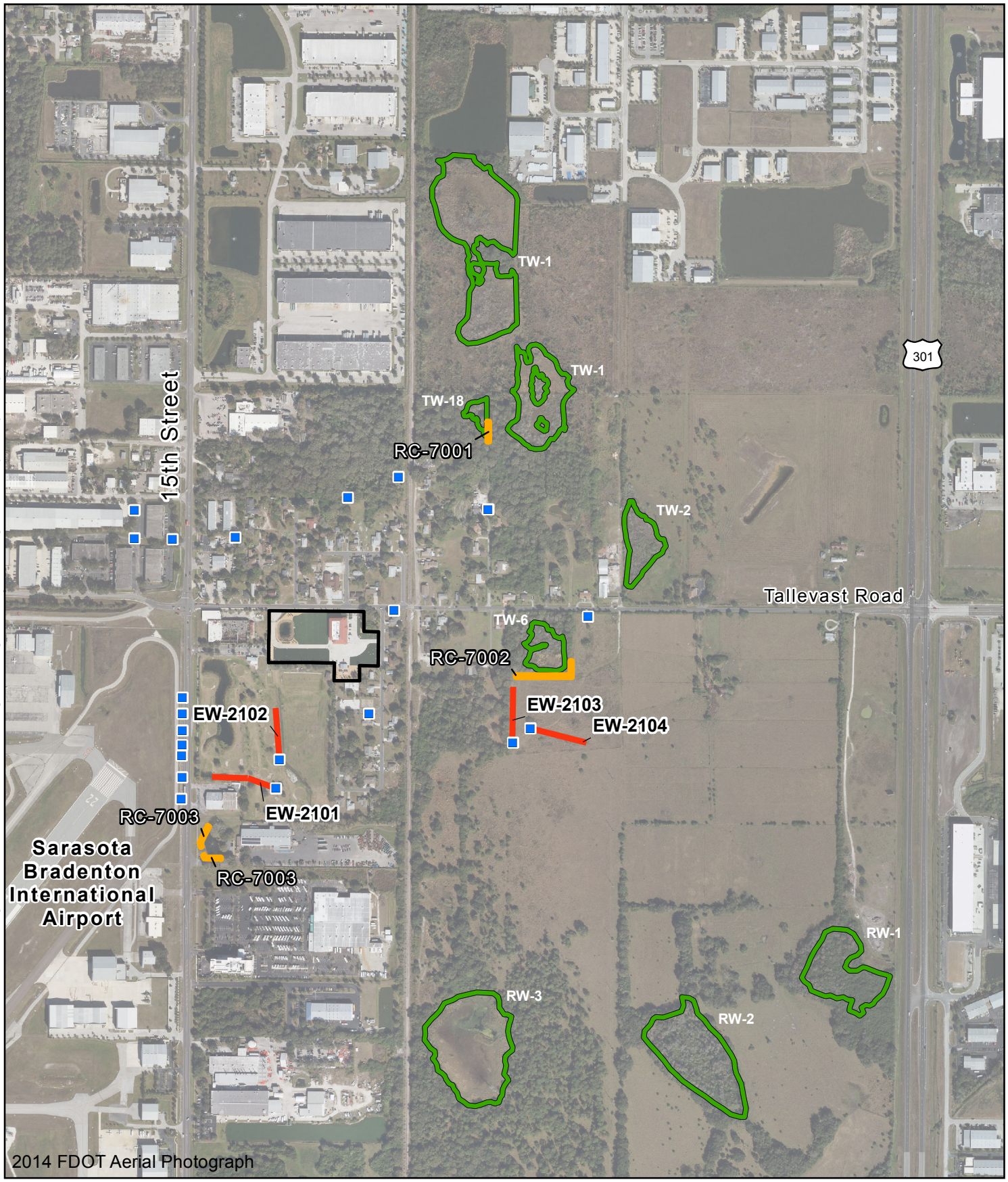

Legend

Off-Facility Extraction Well Locations

Upper Surficial Aquifer System (USAS) Zone

RC-7003 Infiltration Gallery

EW-2104 Horizontal Extraction Trench

TW - Target Wetland
RC - Recharge
RW - Reference Wetland
EW - Extraction Well

Target and Reference Wetlands

Lockheed Martin Tallevast Facility

0 800 Feet

N

Area Location

FLORIDA

LOCKHEED MARTIN
TALLEVAST SITE
TALLEVAST, FLORIDA
2015 WETLAND MONITORING

OFF-FACILITY
RAPA SYSTEM LAYOUT

AECOM

FIGURE
3-1

Document Path: L:\projects\Lockheed Martin\Tallevast\60336439 - 2015 Wetlands Monitoring\920 - GIS\MXD\2015_Wetland_Monitoring_Report_Figures\LMT_WetMon_Fig3_1_OffFacilityRAPASystemLayout_r1.mxd

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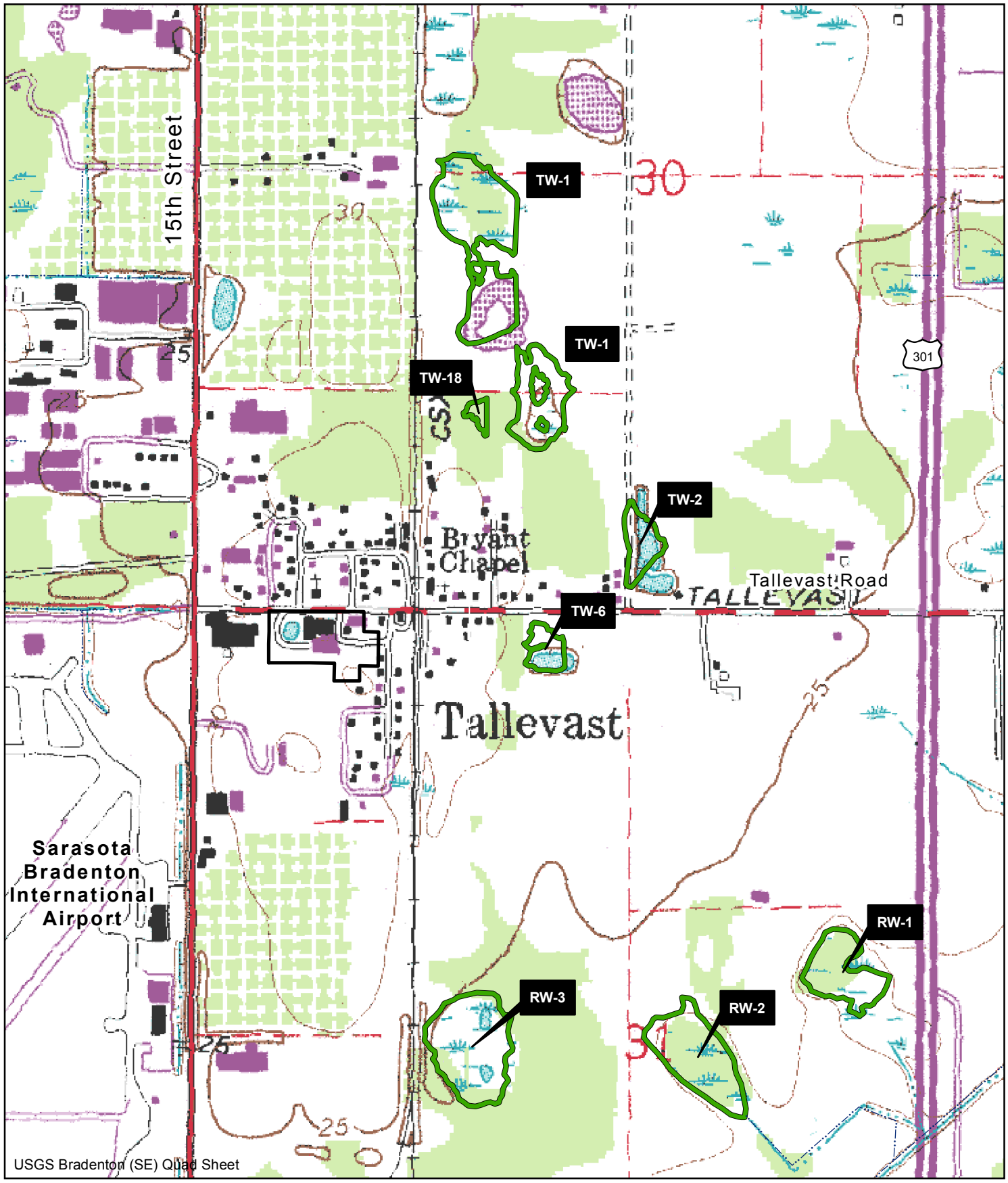


Legend

Target and Reference Wetlands

Lockheed Martin Tallevast Facility

TW - Target Wetland
RW - Reference Wetland

0 800 Feet

N

Area Location

FLORIDA

LOCKHEED MARTIN
TALLEVAST SITE
TALLEVAST, FLORIDA
2015 WETLAND MONITORING

SITE LOCATION MAP WITH BRADENTON, FLORIDA USGS 7.5-MINUTE QUADRANGLE

AECOM

FIGURE 6-1

Document Path: L:\projects\Lockheed Martin\Tallevast\60336439 - 2015 Wetlands Monitoring\920 - GIS\MXD\2015_Wetland_Monitoring_Report_Figures\LMT_WetMon_Fig6_1_SiteLocMap_BradentonFLIUSGS7_5MinQuad.mxd

R625-EDC-002274-2

Legend

Target and Reference Wetlands

Lockheed Martin Tallevast Facility

Transects

Access

TW - Target Wetland
RW - Reference Wetland

0 800 Feet

N

Area Location

FLORIDA

LOCKHEED MARTIN
TALLEVAST SITE
TALLEVAST, FLORIDA
2015 WETLAND MONITORING

WETLAND AND TRANSECT LOCATIONS MAP

AECOM

FIGURE 7-1

Document Path: L:\projects\Lockheed Martin\Tallevast\60336439 - 2015 Wetlands Monitoring\920 - GIS\MXD\2015_Wetland_Monitoring_Report_Figures\LMT_WetMon_Fig7_1_WetlandAndTransectLocMap.mxd

R625-EDC-002274-2

Legend

- Field Identified Locations
- Surface Water Staff Gauge
- Wetland Monitoring Well
- Target and Reference Wetlands
- Transects

HNP - Historic Normal Pool
NP - Normal Pool

0 100 Feet

N

Area Location

FLORIDA

LOCKHEED MARTIN
TALLEVAST SITE
TALLEVAST, FLORIDA
2015 WETLAND MONITORING

TARGET WETLAND 1
TRANSECT MAP

AECOM

FIGURE
9-1

Document Path: L:\projects\Lockheed Martin\Tallevast\60336439 - 2015 Wetlands Monitoring\920 - GIS\MXD\2015_Wetland_Monitoring_Report_Figures\LMT_WetMon_Fig9_1_TargetWetland_1_TransectMap.mxd

R625-EDC-002274-2

Legend

- Field Identified Locations
- Target and Reference Wetlands
- Surface Water Staff Gauge
- Transects
- Wetland Monitoring Well

Note:
HNP - Historic Normal Pool
NP - Normal Pool
*Stilling Well-3 and Staff Gauge-8 are not included in the transect

0 60 Feet

N

LOCKHEED MARTIN
TALLEVAST SITE
TALLEVAST, FLORIDA
2015 WETLAND MONITORING

TARGET WETLAND 2 TRANSECT MAP

AECOM

FIGURE 9-2

Document Path: L:\projects\Lockheed Martin\Tallevast\60336439 - 2015 Wetlands Monitoring\920 - GIS\MXD\2015_Wetland_Monitoring_Report_Figures\LMT_WetMon_Fig9_2_TargetWetland_2_TransectMap.mxd

R625-EDC-002274-2

Legend

- Field Identified Locations
- Target and Reference Wetlands
- Surface Water Staff Gauge
- Transects
- Wetland Monitoring Well

Note:
HNP - Historic Normal Pool
NP - Normal Pool

0 60 Feet

N

Area Location

FLORIDA

LOCKHEED MARTIN
TALLEVAST SITE
TALLEVAST, FLORIDA
2015 WETLAND MONITORING

TARGET WETLAND 6
TRANSECT MAP

AECOM

FIGURE
9-3

Document Path: L:\projects\Lockheed Martin\Tallevast\60336439 - 2015 Wetlands Monitoring\920 - GIS\MXD\2015_Wetland_Monitoring_Report_Figures\LMT_WetMon_Fig9_3_TargetWetland_6_TransectMap.mxd

R625-EDC-002274-2

Legend

- Field Identified Locations
- Target and Reference Wetlands
- Surface Water Staff Gauge
- Transects
- Wetland Monitoring Well

Note:
HNP - Historic Normal Pool
NP - Normal Pool

0 50 Feet

N

Area Location

FLORIDA

LOCKHEED MARTIN
TALLEVAST SITE
TALLEVAST, FLORIDA
2015 WETLAND MONITORING

TARGET WETLAND 18
TRANSECT MAP

AECOM

FIGURE
9-4

Document Path: L:\projects\Lockheed Martin\Tallevast\60336439 - 2015 Wetlands Monitoring\920 - GIS\MXD\2015_Wetland_Monitoring_Report_Figures\LMT_WetMon_Fig9_4_TargetWetland_18_TransectMap.mxd

R625-EDC-002274-2

Legend

- Field Identified Locations
- Target and Reference Wetlands
- Surface Water Staff Gauge
- Transects
- Wetland Monitoring Well

Note:
HNP - Historic Normal Pool
NP - Normal Pool

0 80 Feet

N

LOCKHEED MARTIN
TALLEVAST SITE
TALLEVAST, FLORIDA
2015 WETLAND MONITORING

REFERENCE WETLAND 1
TRANSECT MAP

AECOM

FIGURE
9-5

Document Path: L:\projects\Lockheed Martin\Tallevast\60336439 - 2015 Wetlands Monitoring\920 - GIS\MXD\2015_Wetland_Monitoring_Report_Figures\LMT_WetMon_Fig9_5_ReferenceWetland_1_TransectMap.mxd

R625-EDC-002274-2

Legend

- Field Identified Locations
- Target and Reference Wetlands
- Surface Water Staff Gauge
- Transects
- Wetland Monitoring Well

Note:
HNP - Historic Normal Pool
NP - Normal Pool

0 80 Feet

N

Area Location

FLORIDA

LOCKHEED MARTIN
TALLEVAST SITE
TALLEVAST, FLORIDA
2015 WETLAND MONITORING

REFERENCE WETLAND 2 TRANSECT MAP

AECOM

FIGURE 9-6

Document Path: L:\projects\Lockheed Martin\Tallevast\60336439 - 2015 Wetlands Monitoring\920 - GIS\MXD\2015_Wetland_Monitoring_Report_Figures\LMT_WetMon_Fig9_6_ReferenceWetland_2_TransectMap.mxd

R625-EDC-002274-2

Legend

- Field Identified Locations
- Target and Reference Wetlands
- Surface Water Staff Gauge
- Transects
- Wetland Monitoring Well

Note:
HNP - Historic Normal Pool
NP - Normal Pool

0 80 Feet

N

Area Location

FLORIDA

LOCKHEED MARTIN
TALLEVAST SITE
TALLEVAST, FLORIDA
2015 WETLAND MONITORING

REFERENCE WETLAND 3 TRANSECT MAP

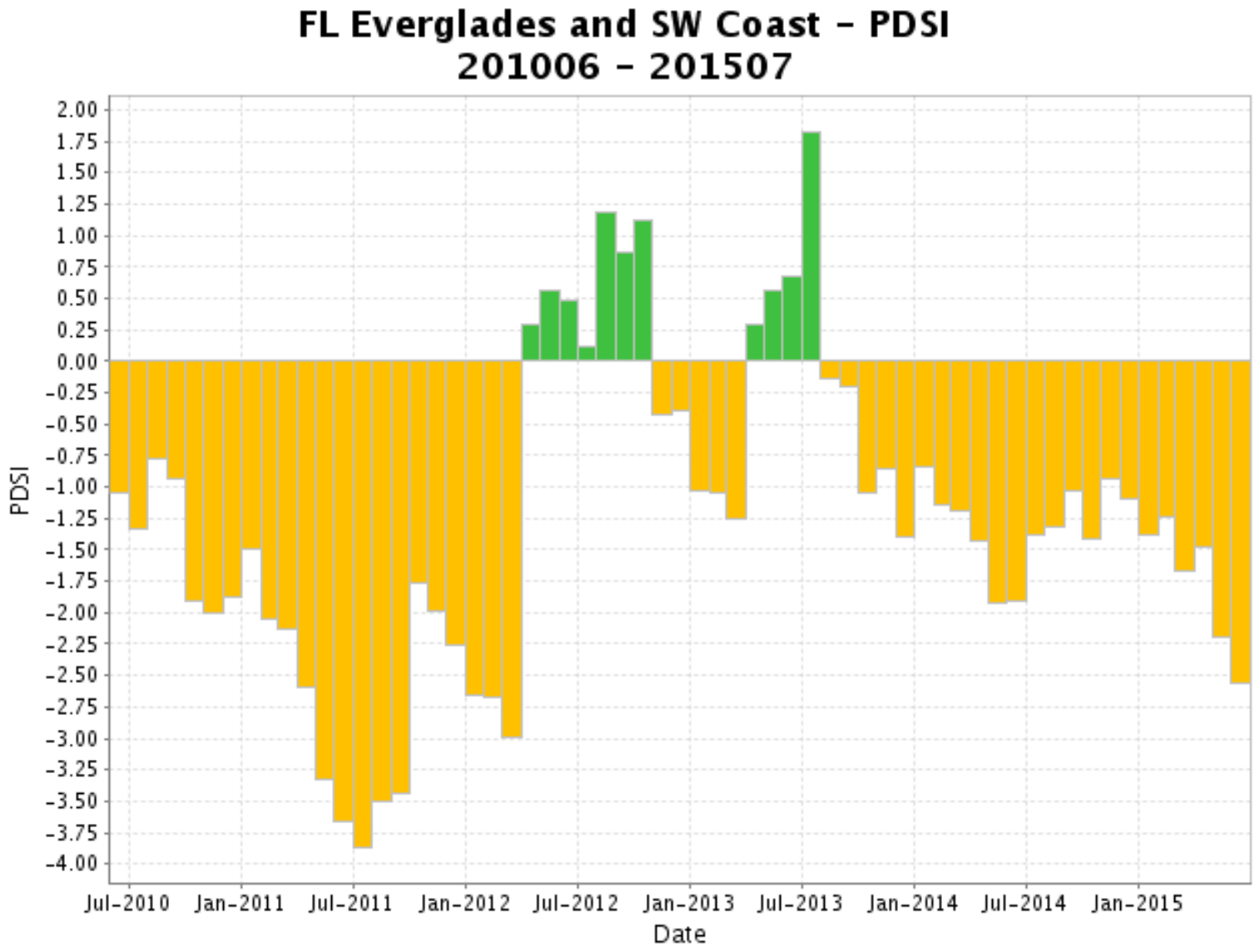
AECOM

FIGURE 9-7

Document Path: L:\projects\Lockheed Martin\Tallevast\60336439 - 2015 Wetlands Monitoring\920 - GIS\MXD\2015_Wetland_Monitoring_Report_Figures\LMT_WetMon_Fig9_7_ReferenceWetland_3_Transect.mxd

APPENDIX A

PALMER DROUGHT SEVERITY INDEX GRAPHS



APPENDIX B

FIELD DATA SHEETS

WETLAND ASSESSMENT PROCEDURE

Wellfield / Property	Wetland Name	Wetland Type
H. Boothe (P-52)	Target Wetland 1	Emergent

Wetland ID	Data Owner	Data Source	Personnel	Date	Start/End	
TW-1			M. Martin & K. Peterman	June 9, 2015	1430	1600

PHOTO-DOCUMENTATION

Frame	Description	Photo Pt.	Direction
3281-3284	MW		N, E, S, W
3286-3289	NP-12		N, E, S, W
3291-3294	NP-6		N, E, S, W
3300-3303	HNP		N, E, S, W

WATER LEVEL INFORMATION

Dry?	Elevation (ft)	Device	Well/Gage ID
No	24.06	SG	SG-TW-1

Description

MW = 2.68; SG = 1.59' above ground surface

Please enter Yes (Y), No (N), or Not Sure (NS) for the following questions and provide comments/explanations.

WETLAND IMPACTS

Wetland edges filled or disturbed?	Yes
Excessive dumping or trash in wetland?	No
Hog disturbance?	No
Signficant impact from cattle (trampling)?	No
Vehicles through wetland (includes bicycles)?	No
Insect damage?	No
Disease?	No

Explanation(s)

Yes - Previous baseline report noted that the south and west sides of unit had been timbered and grubbed(confirmed). Industrial development around northeast edges of wetland (existing condition).

WETLAND DRAINAGE

Augmentation equipment in place?	Yes
Augmentation occurring at time of WAP?	No
Clear evidence of direct stormwater inflow?	Yes
Clear evidence of direct drainage from wetland?	No
Other drainage activities in area?	No
Borrow pit/retention pond in wetland vicinity?	Yes

Explanation(s)

Yes - Excavated/impounded pond is located immediately north of TW-1 with overflow to adjacent railroad ditch (as stated in previous baseline reports but not confirmed). Stormwater treatment pond on northeast corner of wetland discharges through control structure into TW-1.

Fire

Signs of Fire? No

Explanation (year, expanse, intensity)

Lakes / Docks

Docks completely out of water
Docks touching water or with <50% of dock over water
Docks >50% out of water
Not Applicable

Is the littoral zone stranded? ☐

Comments

Soil Subsidence

New signs of oxidation/subsidence? No

Explanation

General Comments/Observations

This wetland appears to have relatively high functional value with relatively appropriate zonation.

Future users of this data may not want to analyze / compare this data with other wetlands due to the extensive level of:

- ☐ non-groundwater withdrawal-related disturbance
- ☐ soil subsidence

WILDLIFE

Wildlife	Count	Evidence
Quiscalus major	1	
Anolis carolinensis	Several	
Agelaius phoeniceus	Several	

Wildlife	Count	Evidence

Wildlife	Count	Evidence

WETLAND ASSESSMENT PROCEDURE

Wellfield / Property	Wetland Name	Wetland Type
H. Boothe (P-52)	Target Wetland 1	Emergent

Wetland ID	Area Assessed	Zone Assessment Notes
TW-1		

GROUNDCOVER

For each zone assessed, please document the following: species abbreviation, WAP zone (U, AD, T, OD, or D), % cover (5% or 10-100% in increments of 10%), count (1-4), and distribution (E=edge, B=beyond a few feet, or T=throughout).

TRANSITION ZONE

transition zone assessed? ☑
check if no groundcover ☐

SPECIES	ZONE	%	#	DIST
Hydrocotle unbellata	OD	Ind		T
Mikania scandens	T	5		T
Panicum hemitomon		30		T
Spartina bakeri		40		T
Saggittaria subulata		5		T
Polygonum hydropiperoides	OD	5		T
Ludwigia repens		5		T
Ludwigia peruviana		5		
Cephalanthus occidentalis		5		
Utricularia floridana		5		
Thelypteris palustris		5		
Eleocharis baldwinii		5		

OUTER DEEP ZONE

outer deep zone assessed? ☑
check if no groundcover ☐

SPECIES	ZONE	%	#	DIST
Andropogon muhlenbergianum	OD	10		T
Ludwigia peruviana	OD	30		T
Juncus effusus		20		T
Leersia hexandra	OD	5		T
Panicum hemitomon		30		
Polygonum hydropiperoides	OD	15		T
Mikania scandens	T	5		T
Ptilimnium capillaceum	T	Ind		T
Salvinia minima		10		
Spartina bakeri		10		E

DEEP ZONE

deep zone assessed? ☑
check if no groundcover ☐

SPECIES	ZONE	%	#	DIST
Paspalum laeve	T	10		
Polygonum hydropiperoides	OD	10		T
Juncus effusus		10		
Leersia hexandra	OD	10		T
Ludwigia peruviana	OD	10		E
Panicum hemitomon		20		T
Salvinia minima		10		
Cyperus lecontei		5		

Groundcover Comments

ZONATION

Zonation Score: 3 Please assign a score of 1 - 5 or 0 and provide an explanation.

Zonation Score Explanation

Species have moved in one zone in enough numbers to be of concern and one species has moved in two zones.

WETLAND ASSESSMENT PROCEDURE

Wellfield / Property	Wetland Name	Wetland Type
Swift-Richardson Holdings (P-68)	Target Wetland 1	Emergent

Wetland ID	Area Assessed	Zone Assessment Notes
TW-1		

SHRUB / SMALL TREES

For each zone assessed, please document the following: species abbreviation, WAP zone (U, AD, T, OD, or D), percent cover (5% or 10-100% in increments of 10%), count (1-50 or ">50"), and distribution (E=edge, B=beyond a few feet, or T=throughout).

TRANSITION ZONE

transition zone assessed? ☑
check if no shrubs/small trees ☐

SPECIES	ZONE	%	#	DIST
Cephalanthus occidentalis	D	10		T
Schinus terebinthifolius	AD	Ind		T

OUTER DEEP ZONE

outer deep zone assessed? ☑
check if no shrubs/small trees ☐

SPECIES	ZONE	%	#	DIST
Ludwigia peruviana	OD	60		E
Cephalanthus occidentalis	D	10		T

DEEP ZONE

deep zone assessed? ☑
check if no shrubs/small trees ☐

SPECIES	ZONE	%	#	DIST
Salix carolina	OD	90		T
Ludwigia peruviana	OD	10		E

Shrub/Small Tree Comments

ZONATION

Zonation Score: 4 Please assign a score of 1 - 5 or 0 and provide an explanation.

Zonation Score Explanation

Species have moved in one zone in enough numbers and distribution to be of concern, and/or species with an adaptive classification are extensive in numbers and distribution in the transition zone.

STRESS

Signs of stress of appropriate shrubs and small trees (include dead species)

(Few/None) Noticeable Significant Not Applicable

Signs of stress of inappropriate shrubs and small trees (include dead species)

(Few/None) Noticeable Significant Not Applicable

WETLAND ASSESSMENT PROCEDURE

Wellfield / Property	Wetland Name	Wetland Type
Swift-Richardson Holdings (P-68)	Target Wetland 1	Emergent

Wetland ID	Area Assessed	Zone Assessment Notes
TW-1		

TREES

For each zone assessed, please document the following: species abbreviation, WAP zone (U, AD, T, OD, or D), percent cover (5% or 10-100% in increments of 10%), count (1-50 or ">50"), and distribution (E=edge, B=beyond a few feet, or T=throughout).

TRANSITION ZONE

transition zone assessed? ☑
check if no trees ☑

SPECIES	ZONE	%	#	DIST
Schinus tterebinthifolius		5		

OUTER DEEP ZONE

outer deep zone assessed? ■
check if no trees ■

SPECIES	ZONE	%	#	DIST

DEEP ZONE

deep zone assessed? ■
check if no trees ☐

SPECIES	ZONE	%	#	DIST
Salix caroliniana	OD	50		T

Tree Comments

ZONATION

Zonation Score: 4 Please assign a score of 1 - 5 or 0 and provide an explanation.

Zonation Score Explanation

Species have moved in one zone in enough numbers to be of concern.

STRESS

Signs of stress of appropriate trees (do not include dead species)

(Few/None) Noticeable Significant Not Applicable

No subsided soils observed in contrast to previous baseline report.

Signs of stress of inappropriate trees (include dead species)

Few/None Noticeable Significant (Not Applicable)

RECOVERY

Dead or leaning trees (include standing dead trees and dead trees on ground that are appropriate)

(Few/None) Noticeable Significant

Signs of tree recovery

Yes (No) Not Sure

Inappropriate vine death suggesting recovery

Yes (No) Not Sure

WETLAND ASSESSMENT PROCEDURE

Wellfield / Property	Wetland Name	Wetland Type
H. Boothe (P-35)	Target Wetland 2	Emergent

Wetland ID	Data Owner	Data Source	Personnel	Date	Start/End	
TW-2			M. Martin & K. Peterman	10 June 2015	8:30	10:00

PHOTO-DOCUMENTATION

Frame	Description	Photo Pt.	Direction
3415-3420	MW		north
3397-3402	NP-12		east
3403-3407	NP-6		south
3408-3411	HNP		west

WATER LEVEL INFORMATION

Dry?	Elevation (ft)	Device	Well/Gage ID
No	23.59	SG	SG-TW-2

Description

MW DTW = 2.81; Water depth from SG = 2.40'

Please enter Yes (Y), No (N), or Not Sure (NS) for the following questions and provide comments/explanations.

WETLAND IMPACTS

Wetland edges filled or disturbed?	Yes
Excessive dumping or trash in wetland?	No
Hog disturbance?	No
Signficant impact from cattle (trampling)?	No
Vehicles through wetland (includes bicycles)?	No
Insect damage?	No
Disease?	No

Explanation(s)

Historical aerials show that the west half of this wetland was filled for an industrial land use between 1951 and 1962.

WETLAND DRAINAGE

Augmentation equipment in place?	No
Augmentation occurring at time of WAP?	No
Clear evidence of direct stormwater inflow?	Yes
Clear evidence of direct drainage from wetland?	No
Other drainage activities in area?	No
Borrow pit/retention pond in wetland vicinity?	No

Explanation(s)

Wetland receives direct stormwater from filled industrial land use west of wetland and surficial stormwater flow from pasture north and east of wetland.

Fire

Signs of Fire? No

Explanation (year, expanse, intensity)

Lakes / Docks

Docks completely out of water
Docks touching water or with <50% of dock over water
Docks >50% out of water
Not Applicable

Is the littoral zone stranded? ☐

Comments

Adventitious roots observed 18-24 inches above current water level

Soil Subsidence

New signs of oxidation/subsidence? No

Explanation

No sign of soil subsidence

Future users of this data may not want to analyze / compare this data with other wetlands due to the extensive level of:

- ☐ non-groundwater withdrawal-related disturbance
- ☐ soil subsidence

General Comments/Observations

Wetland hydrology is very dynamic and during the 2015 assessment appeared to accommodate an additional 18-24 inches of water in the wet season as evidenced by dense adventitious roots. Lichen lines were observed approx. 6 inches above the adventitious roots. There is no evident outfall from this wetland and it appears to stage up into the adjacent pasture during high water levels.

WILDLIFE

Wildlife	Count	Evidence
Bubulcus ibis	Several	
Anolis sagrei	1	
Agelaius phoeniceus		aural

Wildlife	Count	Evidence

Wildlife	Count	Evidence

WETLAND ASSESSMENT PROCEDURE

Wellfield / Property	Wetland Name	Wetland Type
H. Boothe (P-35)	Target Wetland 2	Emergent

Wetland ID	Area Assessed	Zone Assessment Notes
TW-2		

GROUNDCOVER

For each zone assessed, please document the following: species abbreviation, WAP zone (U, AD, T, OD, or D), % cover (5% or 10-100% in increments of 10%), count (1-4), and distribution (E=edge, B=beyond a few feet, or T=throughout).

TRANSITION ZONE

transition zone assessed? ☑
check if no groundcover ☐

SPECIES	ZONE	%	#	DIST
Paspalum leave	T	10		T
Hydrocotle unbellata	OD	5		T
Ptilimnium capillaceum	T	10		
Salvinia minima		10		
Eichhornia crassipes		50		
Polygonum		20		
Panicum hemitomon		20		

OUTER DEEP ZONE

outer deep zone assessed? ☑
check if no groundcover ☐

SPECIES	ZONE	%	#	DIST
Elchhornia crassipes		20		T
Salvinia minima		80		T

DEEP ZONE

deep zone assessed? ☑
check if no groundcover ☐

SPECIES	ZONE	%	#	DIST
Elchhornia crassipes		90		E
Salvinia minima		10		T

Groundcover Comments

~~Eichhornia and Sal~~vinia observed floati~~ng throughout wet~~land. No rooted groundcover species were observed in the D or OD zones due to deep inundation throughout the wetland.

ZONATION

Zonation Score: 5 Please assign a score of 1 - 5 or 0 and provide an explanation.

Zonation Score Explanation

Species exhibit normal zonation in transition zone; No WAP species were observed in OD and D zones

WETLAND ASSESSMENT PROCEDURE

Wellfield / Property	Wetland Name	Wetland Type
Swift-Richardson Holdings (P-68)	Target Wetland 2	Emergent

Wetland ID	Area Assessed	Zone Assessment Notes
TW-2		

SHRUB / SMALL TREES

For each zone assessed, please document the following: species abbreviation, WAP zone (U, AD, T, OD, or D), percent cover (5% or 10-100% in increments of 10%), count (1-50 or ">50"), and distribution (E=edge, B=beyond a few feet, or T=throughout).

TRANSITION ZONE

transition zone assessed? ☑
check if no shrubs/small trees ☐

SPECIES	ZONE	%	#	DIST
Ludwigia peruviana	OD	5		T
Salix carolina	OD	30		

OUTER DEEP ZONE

outer deep zone assessed? ☑
check if no shrubs/small trees ☐

SPECIES	ZONE	%	#	DIST
Salix carolina	OD	40		T

DEEP ZONE

deep zone assessed? ☑
check if no shrubs/small trees ☐

SPECIES	ZONE	%	#	DIST
Salix carolina	OD	90		T

Shrub/Small Tree Comments

ZONATION

Zonation Score: 4 Please assign a score of 1 - 5 or 0 and provide an explanation.

Zonation Score Explanation

Species have moved in one zone in enough numbers and distribution to be of concern, and/or species with an adaptive classification are extensive in numbers and distribution in the transition zone.

STRESS

Signs of stress of appropriate shrubs and small trees (include dead species)

Few/None (circled)
Noticeable
Significant
Not Applicable

Signs of stress of inappropriate shrubs and small trees (include dead species)

Few/None (circled)
Noticeable
Significant
Not Applicable

WETLAND ASSESSMENT PROCEDURE

Wellfield / Property	Wetland Name	Wetland Type
Swift-Richardson Holdings (P-68)	Target Wetland 2	Emergent

Wetland ID	Area Assessed	Zone Assessment Notes
TW-2		

TREES

For each zone assessed, please document the following: species abbreviation, WAP zone (U, AD, T, OD, or D), percent cover (5% or 10-100% in increments of 10%), count (1-50 or ">50"), and distribution (E=edge, B=beyond a few feet, or T=throughout).

TRANSITION ZONE

transition zone assessed? ☑
check if no trees ☐

SPECIES	ZONE	%	#	DIST
Salix caroliniana	OD	50		T

OUTER DEEP ZONE

outer deep zone assessed? ■
check if no trees ☐

SPECIES	ZONE	%	#	DIST
Salix caroliniana	OD	50		

DEEP ZONE

deep zone assessed? ■
check if no trees ☐

SPECIES	ZONE	%	#	DIST
Salix caroliniana	OD	50		T

Tree Comments

ZONATION

Zonation Score: 4 Please assign a score of 1 - 5 or 0 and provide an explanation.

Zonation Score Explanation

Species have moved in one zone in enough numbers and distribution to be of concern, and/or species with an adaptive classification are extensive in numbers and distribution in the transition zone.

STRESS

Signs of stress of appropriate trees (do not include dead species)

(Few/None)
Noticeable
Significant
Not Applicable

Signs of stress of inappropriate trees (include dead species)

Few/None
Noticeable
Significant
(Not Applicable)

RECOVERY

Dead or leaning trees (include standing dead trees and dead trees on ground that are appropriate)

(Few/None)
Noticeable
Significant

Signs of tree recovery

Yes
(No)
Not Sure

Inappropriate vine death suggesting recovery

Yes
(No)
Not Sure

WETLAND ASSESSMENT PROCEDURE

Wellfield / Property	Wetland Name	Wetland Type
W. Schmid (P-66)	Target Wetland 6	Emergent/Forested

Wetland ID	Data Owner	Data Source	Personnel	Date	Start/End	
TW-6			M. Martin & K. Peterman	8 June 2015	17:23	18:45

PHOTO-DOCUMENTATION

Frame	Description	Photo Pt.	Direction
3249-3253	MW		N,E,S,W
3254-3260	NP-12		N,E,S,W
3261-6268	NP-6		N,E,S,W
3269-3274	NP		N,E,S,W

WATER LEVEL INFORMATION

Dry?	Elevation (ft)	Device	Well/Gage ID
No	22.60	SG	SG-TW-6

Description

Water depth from SG = 1.65; Well DTW - 2.64 feet BTC

Please enter Yes (Y), No (N), or Not Sure (NS) for the following questions and provide comments/explanations.

WETLAND IMPACTS

Wetland edges filled or disturbed?	Yes
Excessive dumping or trash in wetland?	No
Hog disturbance?	No
Signficant impact from cattle (trampling)?	No
Vehicles through wetland (includes bicycles)?	No
Insect damage?	No
Disease?	No

Explanation(s)

Overburden located along southern edge of wetland from livestock pond excavated between 1951 and 1962. Livestock fencing in place excluding cattle from wetland.

WETLAND DRAINAGE

Augmentation equipment in place?	Yes
Augmentation occurring at time of WAP?	No
Clear evidence of direct stormwater inflow?	Yes
Clear evidence of direct drainage from wetland?	Yes
Other drainage activities in area?	No
Borrow pit/retention pond in wetland vicinity?	Yes

Explanation(s)

Cattle pond excavated between 1951 and 1962 in southern portion of wetland. Ditches along Tallevast Road convey stormwater into TW-6 and discharge from TW-6 to east after control elevation near US 301 is reached. RAPA injection gallery (RC-7002) complete and operational during monitoring. RC-7002 start-up initiated 7/9/2014.

Fire

Signs of Fire? No

Explanation (year, expanse, intensity)

Lakes / Docks

Docks completely out of water
Docks touching water or with <50% of dock over water
Docks >50% out of water
(Not Applicable)

Is the littoral zone stranded? ☐

Comments

Soil Subsidence

New signs of oxidation/subsidence? No

Explanation

No subsidence observed

General Comments/Observations

Adventitious roots observed at 6-8 inches above ground elevation. SHWL/lichen line at +/-12 inches above ground at NPL-6 pole. Hydrologic indicators observed include water stained leaves.

Future users of this data may not want to analyze / compare this data with other wetlands due to the extensive level of:

- ☐ non-groundwater withdrawal-related disturbance
- ☐ soil subsidence

WILDLIFE

Wildlife	Count	Evidence
Agelaius phoeniceus		aural

Wildlife	Count	Evidence

Wildlife	Count	Evidence

WETLAND ASSESSMENT PROCEDURE

Wellfield / Property	Wetland Name	Wetland Type
W. Schmid (P-66)	Target Wetland 6	Emergent/Forested

Wetland ID	Area Assessed	Zone Assessment Notes
TW-6		

GROUNDCOVER

For each zone assessed, please document the following: species abbreviation, WAP zone (U, AD, T, OD, or D), % cover (5% or 10-100% in increments of 10%), count (1-4), and distribution (E=edge, B=beyond a few feet, or T=throughout).

TRANSITION ZONE

transition zone assessed? ☑ *check if no groundcover* ☐

SPECIES	ZONE	%	#	DIST
Baccharis halimifolia	AD	5		T
Eriehtites heiraciifolius	AD	5		T
Ampelopsis arborea	AD	Ind		E
Ptilimnium capillaceum	T	5		T
Thelypteris sp.		35		T
Schinus terebinthifolius	AD	10		
Mikania scandens	T	5		T
Symphyotrichum elliottii	T	25		T
Ludwigia peruviana	OD	5		T
Urena lobata	U	20		T
Commelina diffusa	T	5		E
Blechnum serrulatum	D	Ind		E
Juncus effucious		5		

OUTER DEEP ZONE

outer deep zone assessed? ☑ *check if no groundcover* ☐

SPECIES	ZONE	%	#	DIST
Ptilimnium capillaceum	T	10		T
Eriehtites heiraciifolius	AD	10		E
Symphyotrichum elliottii	T	5		B
				E
Eupatorium capilifolium	AD	10		E
Urena lobata	U	5		
Lemna minor		20		
Salvinia minima		20		
Ludwigia peruviana		5		
Cyperus haspan		5		
Typha latifolia		Ind		
Commelina diffusa		5		

DEEP ZONE

deep zone assessed? ☑ *check if no groundcover* ☐

SPECIES	ZONE	%	#	DIST
Ptilimnium capillaceum	T	5		E
				T
Lemna minor		35		B
Salvinia minima		35		B
Ludwigia peruviana	OD	5		E
Hydrocotyle umbellata		5		
Urena lobata	U	5		
Mikania scandens	T	5		
Eriehtites heiraciifolius	AD	5		

Groundcover Comments

ZONATION

Zonation Score: 2 Please assign a score of 1 - 5 or 0 and provide an explanation.

Zonation Score Explanation

Species have moved in two zones in high enough numbers and distribution, and/or some species with an upland classification have moved into the deep zone.

WETLAND ASSESSMENT PROCEDURE

Wellfield / Property	Wetland Name	Wetland Type
W. Schmid (P-66)	Target Wetland 6	Emergent/Forested

Wetland ID	Area Assessed	Zone Assessment Notes
TW-6		

SHRUB / SMALL TREES

For each zone assessed, please document the following: species abbreviation, WAP zone (U, AD, T, OD, or D), percent cover (5% or 10-100% in increments of 10%), count (1-50 or ">50"), and distribution (E=edge, B=beyond a few feet, or T=throughout).

TRANSITION ZONE

transition zone assessed? ☑
check if no shrubs/small trees ☐

SPECIES	ZONE	%	#	DIST
Myrica cerifera	AD	5		T
Schinus terrebinthifolius	AD	50		T
Baccharis halimifolia	AD	5		T
Sambucus nigra	AD	5		T
Salix caroliniana	OD	10		B
Acer rubrum	OD	5		B
Ludwigia peruviana	OD	Ind		T

OUTER DEEP ZONE

outer deep zone assessed? ☑
check if no shrubs/small trees ☐

SPECIES	ZONE	%	#	DIST
Salix caroliniana	OD	20		T
Schinus terebinthifolius	AD	20		T
Typha latifolia	D	20		B

DEEP ZONE

deep zone assessed? ☑
check if no shrubs/small trees ☐

SPECIES	ZONE	%	#	DIST
Ludwigia pervuviana	OD	Ind		T
Typha latifolia		50		

Shrub/Small Tree Comments

ZONATION

Zonation Score: 4 Please assign a score of 1 - 5 or 0 and provide an explanation.

Zonation Score Explanation

Species have moved in one zone in high numbers and distribution, and/or some plants have moved in two zones.

STRESS

Signs of stress of appropriate shrubs and small trees (include dead species)

Few/None (circled)
Noticeable
Significant
Not Applicable

Signs of stress of inappropriate shrubs and small trees (include dead species)

Few/None (circled)
Noticeable
Significant
Not Applicable

WETLAND ASSESSMENT PROCEDURE

Wellfield / Property	Wetland Name	Wetland Type
W. Schmid (P-66)	Target Wetland 6	Emergent/Forested

Wetland ID	Area Assessed	Zone Assessment Notes
TW-6		No trees

TREES

For each zone assessed, please document the following: species abbreviation, WAP zone (U, AD, T, OD, or D), percent cover (5% or 10-100% in increments of 10%), count (1-50 or ">50"), and distribution (E=edge, B=beyond a few feet, or T=throughout).

TRANSITION ZONE

transition zone assessed? ☑
check if no trees ☐

SPECIES	ZONE	%	#	DIST
Schinus terebinthifolius	AD	30		T
Salix caroliniana	OD	20		T
Acer rubrum	OD	10		E
Quercus virginiana	U	5		E

OUTER DEEP ZONE

outer deep zone assessed? ■
check if no trees ☐

SPECIES	ZONE	%	#	DIST
Salix caroliniana	OD	40		T

DEEP ZONE

deep zone assessed? ■
check if no trees ■

SPECIES	ZONE	%	#	DIST

Tree Comments

All coverage was counted from multi-stemmed Brazilian pepper over plot.

ZONATION

Zonation Score: 4 Please assign a score of 1 - 5 or 0 and provide an explanation.

Zonation Score Explanation

Species have moved in one zone in enough numbers to be of concern.

STRESS

Signs of stress of appropriate trees (do not include dead species)

(Few/None)
Noticeable
Significant
Not Applicable

Signs of stress of inappropriate trees (include dead species)

Few/None
Noticeable
Significant
(Not Applicable)

RECOVERY

Dead or leaning trees (include standing dead trees and dead trees on ground that are appropriate)

(Few/None)
Noticeable
Significant

Signs of tree recovery

Yes
(No)
Not Sure

Inappropriate vine death suggesting recovery

Yes
(No)
Not Sure

WETLAND ASSESSMENT PROCEDURE

Wellfield / Property	Wetland Name	Wetland Type
Howard Thomas	Target Wetland 18	Forested

Wetland ID	Data Owner	Data Source	Personnel	Date	Start/End	
TW-18			M. Martin & K. Peterman	8 June 2015	15:30	17:00

PHOTO-DOCUMENTATION

Frame	Description	Photo Pt.	Direction
3217-3224	MW		N,E,S,W
3226-3232	NP-12		N,E,S,W
3235-3240	NP-6		N,E,S,W
3242-3247	NP		N,E,S,W

WATER LEVEL INFORMATION

Dry?	Elevation (ft)	Device	Well/Gage ID
No	23.77	MW	MW-SG-1

Description

SG = Dry; Well DTW = 5.38 BTC

Please enter Yes (Y), No (N), or Not Sure (NS) for the following questions and provide comments/explanations.

WETLAND IMPACTS

Wetland edges filled or disturbed?	No
Excessive dumping or trash in wetland?	No
Hog disturbance?	No
Signficant impact from cattle (trampling)?	No
Vehicles through wetland (includes bicycles)?	No
Insect damage?	No
Disease?	No

Explanation(s)

In 2015, soil pits were dug in each zone and hydric soil indicators (stripped matrix within the top 10 inches of the profile (10YR 4/1 and 5/1) were observed in all three zones within the wetland. No hydric soil indicators were observed landward of the wetland.

WETLAND DRAINAGE

Augmentation equipment in place?	Yes
Augmentation occurring at time of WAP?	No
Clear evidence of direct stormwater inflow?	No
Clear evidence of direct drainage from wetland?	No
Other drainage activities in area?	No
Borrow pit/retention pond in wetland vicinity?	No

Explanation(s)

RC 7001 is in place east of TW-18 and is operational

Fire

Signs of Fire? No

Explanation (year, expanse, intensity)

Lakes / Docks

Docks completely out of water
Docks touching water or with <50% of dock over water
Docks >50% out of water
(Not Applicable)

Is the littoral zone stranded? ☐

Comments

Soil Subsidence

New signs of oxidation/subsidence? No

Explanation

Future users of this data may not want to analyze / compare this data with other wetlands due to the extensive level of:

- ☐ non-groundwater withdrawal-related disturbance
- ☐ soil subsidence

General Comments/Observations

Historical aerials dating back to 1940 do not show a wetland in this area. No visible hydrological evidence present to indicate inundation occurs at any time throughout the year. However, groundwater elevation data suggests that brief inundation may occur within the deep zone. TW-18 consists of a very small shallow depression with no apparent elevation change between NP-6 and NP-12.

WILDLIFE

Wildlife	Count	Evidence	Wildlife	Count	Evidence	Wildlife	Count	Evidence
Baeolophus bicolor								
Dasypus novemcinctus								

WETLAND ASSESSMENT PROCEDURE

Wellfield / Property	Wetland Name	Wetland Type
Howard Thomas	Target Wetland 18	Forested

Wetland ID	Area Assessed	Zone Assessment Notes
TW-18		

GROUNDCOVER

For each zone assessed, please document the following: species abbreviation, WAP zone (U, AD, T, OD, or D), % cover (5% or 10-100% in increments of 10%), count (1-4), and distribution (E=edge, B=beyond a few feet, or T=throughout).

TRANSITION ZONE

transition zone assessed? ☑
check if no groundcover ☐

SPECIES	ZONE	%	#	DIST
Eriehtites heiraciifolius	AD	Ind		B
Urena lobata	U	5		T
Woodwardia virginica		20		T
Osmunda regalis		5		T
Smilax bona-nox	AD	15		T
Serenoa repens		Ind		E
Blechnum serrulatum		10		T
Rubus sp.	AD	5		T
Eupitorium capillifolium	AD	Ind		T
Magnolia virginiana	OD	Ind		
Sabal palmetto	NL	5		
Juncus marginatus	NL	Ind		
Lachnanthes caroliniana	NL	5		
Eclipta prostrata		5		

OUTER DEEP ZONE

outer deep zone assessed? ☑
check if no groundcover ☐

SPECIES	ZONE	%	#	DIST
Erechtites hieraciifolius	AD	<5		B
Quercus laurifolia (seedling)	T	5		T
Woodwardia virginiana		30		
Blechnum serrulatum		10		
Sabal palmetto		5		
Vitis rotundifolia	AD	5		
Smilax bona-nox	AD	5		
Shinus terebinthifolius	AD	Ind		
Juncus marginatus		Ind		
Schinus terebinthifolius	AD	5		T
UNK Runner		5		

DEEP ZONE

deep zone assessed? ☑
check if no groundcover ☐

SPECIES	ZONE	%	#	DIST
Vitis rotundifolia	AD	10		B
Osmunda regalis		10		T
Woodwardia virginica		15		T
Blechnum serrulatum		10		T
Quercus laurifolia (Saplings)	T	Ind		
Smilax bona-nox	AD	5		T
Urena lobata	U	Ind		
Sabal palmetto		5		T
Andropogon virginicus	AD	Ind		
Eupitorium capillifolium	AD	Ind		
Erechtites hieraciifolius	AD	Ind		
Schinus terebinthifolius	AD	5		T
Dichanthelium sp.				

Groundcover Comments

ZONATION

Zonation Score: 2 Please assign a score of 1 - 5 or 0 and provide an explanation.

Zonation Score Explanation

Species have moved in two zones in high enough numbers and distribution, and/or some species with an upland classification have moved into the deep zone.

WETLAND ASSESSMENT PROCEDURE

Wellfield / Property	Wetland Name	Wetland Type
Swift-Richardson Holdings (P-68)	Target Wetland 18	Forested

Wetland ID	Area Assessed	Zone Assessment Notes
TW-18		

SHRUB / SMALL TREES

For each zone assessed, please document the following: species abbreviation, WAP zone (U, AD, T, OD, or D), percent cover (5% or 10-100% in increments of 10%), count (1-50 or ">50"), and distribution (E=edge, B=beyond a few feet, or T=throughout).

TRANSITION ZONE

transition zone assessed? ☑
check if no shrubs/small trees ☐

SPECIES	ZONE	%	#	DIST
Cinnamomum camphora	U	5		T
Myrica cerifera	AD	5		T
Q. laurifolia	T	50		T
Ilex glabra	AD	5		T

OUTER DEEP ZONE

outer deep zone assessed? ☑
check if no shrubs/small trees ☑

SPECIES	ZONE	%	#	DIST

DEEP ZONE

deep zone assessed? ☑
check if no shrubs/small trees ☐

SPECIES	ZONE	%	#	DIST
Q. laurifolia	T	Ind		T
Sabal palmetto		Ind		E
Schinus terebinthifolius	AD	Ind		E

Shrub/Small Tree Comments

ZONATION

Zonation Score: 3 Please assign a score of 1 - 5 or 0 and provide an explanation.

Zonation Score Explanation

Species have moved in one zone in high numbers and distribution, and/or some speceis have moved in two zones. One species (Q. laurifolia) has moved in two zones.

STRESS

Signs of stress of appropriate shrubs and small trees (include dead species)

Few/None (circled)
Noticeable
Significant
Not Applicable

Signs of stress of inappropriate shrubs and small trees (include dead species)

Few/None (circled)
Noticeable
Significant
Not Applicable

WETLAND ASSESSMENT PROCEDURE

Wellfield / Property	Wetland Name	Wetland Type
Swift-Richardson Holdings (P-68)	Target Wetland 18	Forested

Wetland ID	Area Assessed	Zone Assessment Notes
TW-18		

TREES

For each zone assessed, please document the following: species abbreviation, WAP zone (U, AD, T, OD, or D), percent cover (5% or 10-100% in increments of 10%), count (1-50 or ">50"), and distribution (E=edge, B=beyond a few feet, or T=throughout).

TRANSITION ZONE

transition zone assessed? ☑
check if no trees ☑

SPECIES	ZONE	%	#	DIST
Q. laurifolia	T	60		T
Cinnamomum camphora	U	30		E

OUTER DEEP ZONE

outer deep zone assessed? ■
check if no trees ■

SPECIES	ZONE	%	#	DIST
Quercus virginiana	U	30		T
Melaleuca quinqueveria	AD	40		B

DEEP ZONE

deep zone assessed? ■
check if no trees ☐

SPECIES	ZONE	%	#	DIST
Q. laurifolia	T	60		B

Tree Comments

ZONATION

Zonation Score: 3 Please assign a score of 1 - 5 or 0 and provide an explanation.

Zonation Score Explanation

Species have moved in one zone in high numbers and distribution, and/or some speceis have moved in two zones.

STRESS

Signs of stress of appropriate trees (do not include dead species)

(Few/None)
Noticeable
Significant
Not Applicable

Signs of stress of inappropriate trees (include dead species)

Few/None
Noticeable
Significant
(Not Applicable)

RECOVERY

Dead or leaning trees (include standing dead trees and dead trees on ground that are appropriate)

(Few/None)
Noticeable
Significant

Signs of tree recovery

Yes
(No)
Not Sure

Inappropriate vine death suggesting recovery

Yes
(No)
Not Sure

WETLAND ASSESSMENT PROCEDURE

Wellfield / Property	Wetland Name	Wetland Type
Swift-Richardson Holdings (P-68)	Reference Wetland 1	Forested/Shrub/Emergent

Wetland ID	Data Owner	Data Source	Personnel	Date	Start/End	
RW-1			M. Martin & K. Peterman	9 June 2015	14:30	16:00

PHOTO-DOCUMENTATION

Frame	Description	Photo Pt.	Direction
3360-3365	MW		N,E,S,W
3366-3371	NP-12		N,E,S,W
3377-3383	NP-6		N,E,S,W
3385-3392	HNP		N,E,S,W

WATER LEVEL INFORMATION

Dry?	Elevation (ft)	Device	Well/Gage ID
No	14.14	SG	SG-RW-1

Description

SG = 0.16 above ground surface (14.14); DTW = 4.23 (14.21)

Please enter Yes (Y), No (N), or Not Sure (NS) for the following questions and provide comments/explanations.

WETLAND IMPACTS

Wetland edges filled or disturbed?	Yes
Excessive dumping or trash in wetland?	No
Hog disturbance?	No
Signficant impact from cattle (trampling)?	Yes
Vehicles through wetland (includes bicycles)?	No
Insect damage?	No
Disease?	No

Explanation(s)

Periphery of entire depressional area was historically farmed/pastured and is characterized by upland old-field plant community. East side of wetland is lined with large piles of Brazilian pepper cleared from adjacent pasture.
Wetland completely dominated by Brazillian pepper
Consideration - Previous (2013) assessment noted that outer margin along the north side of wetland had been cleared/grubbed with the potential to affect hydrology/runoff and alter plant community structure

WETLAND DRAINAGE

Augmentation equipment in place?	No
Augmentation occurring at time of WAP?	No
Clear evidence of direct stormwater inflow?	Yes
Clear evidence of direct drainage from wetland?	No
Other drainage activities in area?	Yes
Borrow pit/retention pond in wetland vicinity?	No

Explanation(s)

USGS 7.5 minute topo/quad mapping depicts nearby/offsite surface drainage (conveyance) along US 301 ditch into the Pearce Canal. Receives storm water from adjacent pastures surrounding wetland.

Fire

Signs of Fire? No

Explanation (year, expanse, intensity)

Lakes / Docks

Docks completely out of water
Docks touching water or with <50% of dock over water
Docks >50% out of water
Not Applicable

Is the littoral zone stranded? ☐

Comments

Soil Subsidence

New signs of oxidation/subsidence? No

Explanation

The base of some Brazilian peppers exhibit exposed roots. However, it is unclear if these exposed roots are from oxidized soils or from the shallow waters which occur frequently in this wetland.

Future users of this data may not want to analyze / compare this data with other wetlands due to the extensive level of:

- ☐ non-groundwater withdrawal-related disturbance
- ☑ soil subsidence

General Comments/Observations

This wetland has experienced moderate to severe hydrological alterations due to historic modification as a livestock pond and the provision of a discrete drainage swale to the Pearce Canal, which is depicted on USGS 7.5 minute topographic quadrangle. Observed impacts primarily due to historic agricultural use.

WILDLIFE

Wildlife	Count	Evidence
Thryothorus ludovicianus		call
Mimus polyglottos		call
Dasypus novemcinctus		burrow

Wildlife	Count	Evidence
Procyon lotor		tracks

Wildlife	Count	Evidence

WETLAND ASSESSMENT PROCEDURE

Wellfield / Property	Wetland Name	Wetland Type
Swift-Richardson Holdings (P-68)	Reference Wetland 1	Forested/Shrub/Emergent

Wetland ID	Area Assessed	Zone Assessment Notes
RW-1		This wetland is shallow and gently sloping without any substantial hydrological, vegetative, or elevation differences between the three zones

GROUNDCOVER

For each zone assessed, please document the following: species abbreviation, WAP zone (U, AD, T, OD, or D), % cover (5% or 10-100% in increments of 10%), count (1-4), and distribution (E=edge, B=beyond a few feet, or T=throughout).

TRANSITION ZONE

transition zone assessed? ☑
check if no groundcover ☐

SPECIES	ZONE	%	#	DIST
Acer rubrum seedlings	OD	5		B
Toxicodendron radicans	AD	20		T

OUTER DEEP ZONE

outer deep zone assessed? ☑
check if no groundcover ☐

SPECIES	ZONE	%	#	DIST
Saururus cernuus		5		E
Acer rubrum	OD	10		T
Salix carolinana	OD	5		T

DEEP ZONE

deep zone assessed? ☑
check if no groundcover ☐

SPECIES	ZONE	%	#	DIST
Ludwigia peruviana	OD	20		E
Saururus cernuus		70		T
Blechnum serrulatum		Ind		E
Acer rubrum	OD	Ind		T
Woodwardia virginica		20		T

Groundcover Comments

~~Woodwardia virgini~~ica (20%) FACW and ~~Saururus cernuu~~s (70%) OBL round-out the dominant species in the Deep Zone

ZONATION

Zonation Score: 4 Please assign a score of 1 - 5 or 0 and provide an explanation.

Zonation Score Explanation

Species have moved in one zone in enough numbers to be of concern.

WETLAND ASSESSMENT PROCEDURE

Wellfield / Property	Wetland Name	Wetland Type
Swift-Richardson Holdings (P-68)	Reference Wetland 1	Forested/Shrub/Emergent

Wetland ID	Area Assessed	Zone Assessment Notes
RW-1		This wetland is gently sloping without any substantial or clear hydrological, vegetative, or elevation differences between the three zones

SHRUB / SMALL TREES

For each zone assessed, please document the following: species abbreviation, WAP zone (U, AD, T, OD, or D), percent cover (5% or 10-100% in increments of 10%), count (1-50 or ">50"), and distribution (E=edge, B=beyond a few feet, or T=throughout).

TRANSITION ZONE

transition zone assessed? ☑
check if no shrubs/small trees ☐

SPECIES	ZONE	%	#	DIST
Schinus terebinthifolius	AD	25		T
Acer rubrum	OD	Ind		T

OUTER DEEP ZONE

outer deep zone assessed? ☑
check if no shrubs/small trees ☑

SPECIES	ZONE	%	#	DIST

DEEP ZONE

deep zone assessed? ☑
check if no shrubs/small trees ☐

SPECIES	ZONE	%	#	DIST
Schinus terbinthifolius	AD	45		T
Salix caroliniana	OD	40		T
Ludwigia peruviana	OD	5		T
Acer rubrum	OD	10		T

Shrub/Small Tree Comments

ZONATION

Zonation Score: 2 Please assign a score of 1 - 5 or 0 and provide an explanation.

Zonation Score Explanation

Species have moved in two zones and in high numbers and distribution, and/or some species with an upland classification have moved into the deep zone in enough numbers and distribution to be of concern. For scoring purposes, AD species are treated the same as T species when they are found in the Outer Deep and Deep Zones.

STRESS

Signs of stress of appropriate shrubs and small trees (include dead species)

Few/None (circled)
Noticeable
Significant
Not Applicable

Signs of stress of inappropriate shrubs and small trees (include dead species)

Few/None (circled)
Noticeable
Significant
Not Applicable

WETLAND ASSESSMENT PROCEDURE

Wellfield / Property	Wetland Name	Wetland Type
Swift-Richardson Holdings (P-68)	Reference Wetland 1	Forested/Shrub/Emergent

Wetland ID	Area Assessed	Zone Assessment Notes
RW-1		

TREES

For each zone assessed, please document the following: species abbreviation, WAP zone (U, AD, T, OD, or D), percent cover (5% or 10-100% in increments of 10%), count (1-50 or ">50"), and distribution (E=edge, B=beyond a few feet, or T=throughout).

TRANSITION ZONE

transition zone assessed? ☑
check if no trees ☑

SPECIES	ZONE	%	#	DIST
Schinus terebinthifolius	AD	60		T

OUTER DEEP ZONE

outer deep zone assessed? ■
check if no trees ■

SPECIES	ZONE	%	#	DIST
Schinus terebinthifolius	AD	60		T
Salix caroliniana	OD	40		T

DEEP ZONE

deep zone assessed? ■
check if no trees ☐

SPECIES	ZONE	%	#	DIST
Acer rubrum	OD	10		B
Salix caroliniana	OD	80		B

Tree Comments

Score remained a 4 and is based on the aerial coverage of OD in the D zone which is consistent with previous reports, but the number of tree specimens was not recorded. Check the number of specimens next year since that is the only thing that differentiates between a 3 and 4.

ZONATION

Zonation Score: 4 Please assign a score of 1 - 5 or 0 and provide an explanation.

Zonation Score Explanation

Species have moved in one zone in enough numbers to be of concern.

STRESS

Signs of stress of appropriate trees (do not include dead species)

(Few/None)
Noticeable
Significant
Not Applicable

Signs of stress of inappropriate trees (include dead species)

(Few/None)
Noticeable
Significant
Not Applicable

RECOVERY

Dead or leaning trees (include standing dead trees and dead trees on ground that are appropriate)

(Few/None)
Noticeable
Significant

Signs of tree recovery

Yes
(No)
Not Sure

Inappropriate vine death suggesting recovery

Yes
(No)
Not Sure

WETLAND ASSESSMENT PROCEDURE

Wellfield / Property	Wetland Name	Wetland Type
W. Schmid (P-69)	Reference Wetland 2	Forested/scrub

Wetland ID	Data Owner	Data Source	Personnel	Date	Start/End	
RW-2			M. Martin & K.Peterman	10 June 2015	9:30	12:00

PHOTO-DOCUMENTATION

Frame	Description	Photo Pt.	Direction
3354-3358	MW		N,E,S,W
3346-3351	NP-12		N,E,S,W
3341-3344	NP-6		N,E,S,W
3333-3336	HNP		N,E,S,W

WATER LEVEL INFORMATION

Dry?	Elevation (ft)	Device	Well/Gage ID
No	17.59	SG	SG-RW-2

Description

Water depth from SG = 0.56'; MW DTW = 3.62' BTOC

Please enter Yes (Y), No (N), or Not Sure (NS) for the following questions and provide comments/explanations.

WETLAND IMPACTS

Wetland edges filled or disturbed?	Yes
Excessive dumping or trash in wetland?	No
Hog disturbance?	No
Signficant impact from cattle (trampling)?	Yes
Vehicles through wetland (includes bicycles)?	No
Insect damage?	No
Disease?	No

Explanation(s)

Yes - A large rim ditch and livestock pond were historically excavated around the Southern edge of the wetland. Dredged material from rim ditch deposited around wetland. Elevations from this rim ditch were controlled by a concrete weir at the southern tip of the wetland.

WETLAND DRAINAGE

Augmentation equipment in place?	No
Augmentation occurring at time of WAP?	No
Clear evidence of direct stormwater inflow?	Yes
Clear evidence of direct drainage from wetland?	Yes
Other drainage activities in area?	No
Borrow pit/retention pond in wetland vicinity?	No

Explanation(s)

Rim ditch and livestock pond drain to the south into a ditch connected to Pierce Canal. The concrete weir which used to control elevations of RW-2 is now collapsed. The current control elevation is a high spot in the outfall ditch, approximately 200' south of RW-2

Fire

Signs of Fire? No

Explanation (year, expanse, intensity)

Lakes / Docks

Docks completely out of water
Docks touching water or with <50% of dock over water
Docks >50% out of water
Not Applicable

Is the littoral zone stranded? ☐

Comments

Hydrologic indicators observed during the 2015 assessment include moss lines and lichens that appear to correspond with normal pool elevations. Vegetation growing on hummocks.

Soil Subsidence

New signs of oxidation/subsidence? Yes

Explanation

12" - 18" of soil oxidation/subsidence evident in this wetland apparently caused by historical outfall through ditch to south and historical failure of concrete control weir.

Future users of this data may not want to analyze / compare this data with other wetlands due to the extensive level of:

- ☑ non-groundwater withdrawal-related disturbance
- ☑ soil subsidence

General Comments/Observations

This wetland has experienced moderate hydrological alterations due to historical agricultural modifications such as the excavation a rim ditch and livestock pond and the drainage ditch to the south to the Pearce Canal (depicted on USGS 7.5 minute Topographic Quadrangle). Small drainage swale (18" deep) directs storm water to the wetland from the northwest.

WILDLIFE

Wildlife	Count	Evidence
Cardinalis Cardinalis		call
Buteo jamaicensis		Flyover
Plestiodon fasciatus		observed

Wildlife	Count	Evidence
Aix sponsa	2	Observed
Grus canadensis	2	Observed
Mimus polyglottos		Call

Wildlife	Count	Evidence
Lithobates sphenocephala		

WETLAND ASSESSMENT PROCEDURE

Wellfield / Property	Wetland Name	Wetland Type
W. Schmid (P-69)	Reference Wetland 2	Forested/scrub

Wetland ID	Area Assessed	Zone Assessment Notes
RW-2		

GROUNDCOVER

For each zone assessed, please document the following: species abbreviation, WAP zone (U, AD, T, OD, or D), % cover (5% or 10-100% in increments of 10%), count (1-4), and distribution (E=edge, B=beyond a few feet, or T=throughout).

TRANSITION ZONE

transition zone assessed? ☑ *check if no groundcover* ☐

SPECIES	ZONE	%	#	DIST
Nephrolepis exaltata		30		T
Thelypteris kunthii		30		T
Paspalum conjugatum		5		T
Paspalum Sp.		10		T
Rhynchospora miliacea		5		T
Urena lobata	U	10		T
Hydrocotyle umbulleta	OD	5		T
Commelina diffusa	T	Ind		
Acer rubrum (saplings)	OD	Ind		
Nyssa sylvatica var. bilflora (saplings)	D	Ind		
Smilax bona-nox		5		
Parthenocissus quinquefolia		5		

OUTER DEEP ZONE

outer deep zone assessed? ☑ *check if no groundcover* ☐

SPECIES	ZONE	%	#	DIST
Nephrolepis exaltata		60		T
Blechnum serrulatum		10		T
Magnolia virginiana	OD	5		T
Saururus cernuus		10		T
Urena lobata	U	5		
Quercus laurifolia	T	Ind		E
Acer rubrum	OD	5		
Boehmeria cylindrica		Ind		
Dryopteris erythrosora		5		
Rhynchospora miliacea		5		
Parthenocissus quinquefolia		5		
Sabal palmetto		Ind		
Thelypteris palustris		10		
Toxicodendron radicans	AD	5		

DEEP ZONE

deep zone assessed? ☑ *check if no groundcover* ☐

SPECIES	ZONE	%	#	DIST
Erechtites hieraciifolius	AD	5		
Thalia geniculata		5		E
Saururus cernuus		30		T
Blechnum serrulatum		30		T
Ludwigia peruviana	OD	30		E
				T
				T
Pontedaria cordata		5		E
Mikania scandens	T	5		E
Commelina diffusa	T	5		T
Hydrocotyle umbelleta	OD	20		

Groundcover Comments

~~Ground cover in ea~~each zone appears to ~~indicate that this w~~etland has experienced historical drainage.

ZONATION

Zonation Score: 3 Please assign a score of 1 - 5 or 0 and provide an explanation.

Zonation Score Explanation

Species have moved in one zone in high numbers and distribution, and/or some speceis have moved in two zones.

WETLAND ASSESSMENT PROCEDURE

Wellfield / Property	Wetland Name	Wetland Type
W. Schmid (P-66)	Reference Wetland 2	Forested/scrub

Wetland ID	Area Assessed	Zone Assessment Notes
RW-2		

SHRUB / SMALL TREES

For each zone assessed, please document the following: species abbreviation, WAP zone (U, AD, T, OD, or D), percent cover (5% or 10-100% in increments of 10%), count (1-50 or ">50"), and distribution (E=edge, B=beyond a few feet, or T=throughout).

TRANSITION ZONE

transition zone assessed? ☑
check if no shrubs/small trees ☐

SPECIES	ZONE	%	#	DIST
Callicarpa americana	U	15		T
Sabal palmetto		5		E
Urena lobata	U	25		E
Myrica cerifera	AD	10		T
Ludwigia pervuviana	OD	5		T

OUTER DEEP ZONE

outer deep zone assessed? ☑
check if no shrubs/small trees ☐

SPECIES	ZONE	%	#	DIST
Schinus terebinthifolius	AD	50		T
Myrica cerifera	AD	15		T
Magnolia virginiana	OD	15		

DEEP ZONE

deep zone assessed? ☑
check if no shrubs/small trees ☐

SPECIES	ZONE	%	#	DIST
Cephelanthus occidentalis	D	35		T
	AD			T
Ludwigia peruviana	OD	40		T
Quercus laurifolia	T	10		E
Schinus terebinthifolius	AD	10		E

Shrub/Small Tree Comments

Quercus laurifolia growing on hummocks in the Deep Zone; Significant Sweet Bay regeneration noted in the Outer Deep Zone.

ZONATION

Zonation Score: 3 Please assign a score of 1 - 5 or 0 and provide an explanation.

Zonation Score Explanation

Species have moved in one zone in high numbers and distribution, and/or some speceis have moved in two zones.

STRESS

Signs of stress of appropriate shrubs and small trees (include dead species)

Few/None (circled)
Noticeable
Significant
Not Applicable

Signs of stress of inappropriate shrubs and small trees (include dead species)

Few/None (circled)
Noticeable
Significant
Not Applicable

WETLAND ASSESSMENT PROCEDURE

Wellfield / Property	Wetland Name	Wetland Type
W. Schmid (P-66)	Reference Wetland 2	Forested/scrub

Wetland ID	Area Assessed	Zone Assessment Notes
RW-2		

TREES

For each zone assessed, please document the following: species abbreviation, WAP zone (U, AD, T, OD, or D), percent cover (5% or 10-100% in increments of 10%), count (1-50 or ">50"), and distribution (E=edge, B=beyond a few feet, or T=throughout).

TRANSITION ZONE

transition zone assessed? ☑
check if no trees ☑

SPECIES	ZONE	%	#	DIST
Acer rubrum	OD	5		T
Nyssa sylvatica var. biflora	D	40		T
Quercus laurifolia	T	5		T
Ulmus americana	T	15		T

OUTER DEEP ZONE

outer deep zone assessed? ■
check if no trees ■

SPECIES	ZONE	%	#	DIST
Ulmus americana	T	15		E
Magnolia virginiana	OD	60		T

DEEP ZONE

deep zone assessed? ■
check if no trees ☐

SPECIES	ZONE	%	#	DIST
Ulmus americana	T	15		T
Nyssa sylvatica var. biflora	D	30		T
Schinus terebinthifolius	AD	10		E

Tree Comments

Observed tree species appear to either be relic species from before wetland was drained or dryer species appear be recruiting into deeper zones due to historical agricultural drainage.

ZONATION

Zonation Score: 3 Please assign a score of 1 - 5 or 0 and provide an explanation.

Zonation Score Explanation

Species have moved in one zone in high numbers and distribution, and/or some speceis have moved in two zones.

STRESS

Signs of stress of appropriate trees (do not include dead species)

Few/None
(Noticeable)
Significant
Not Applicable

Signs of stress of inappropriate trees (include dead species)

Few/None
Noticeable
Significant
(Not Applicable)

RECOVERY

Dead or leaning trees (include standing dead trees and dead trees on ground that are appropriate)

Few/None
(Noticeable)
Significant

Signs of tree recovery

Yes
(No)
Not Sure

Inappropriate vine death suggesting recovery

Yes
(No)
Not Sure

WETLAND ASSESSMENT PROCEDURE

Wellfield / Property	Wetland Name	Wetland Type
W. Schmid (P-66)	Reference Wetland 3	Emergent

Wetland ID	Data Owner	Data Source	Personnel	Date	Start/End	
RW-3			M. Martin & K. Peterman	9 June 2015	10:30	12:00

PHOTO-DOCUMENTATION

Frame	Description	Photo Pt.	Direction
3315-3318	MW		N,E,S,W
3319-3322	NP-12		N,E,S,W
3323-3326	NP-6		N,E,S,W
3327-3330	NP		N,E,S,W

WATER LEVEL INFORMATION

Dry?	Elevation (ft)	Device	Well/Gage ID
No	20.99	SG	SG-RW-3

Description

SG = 4.22'; DTW - 5.01

Please enter Yes (Y), No (N), or Not Sure (NS) for the following questions and provide comments/explanations.

WETLAND IMPACTS

Wetland edges filled or disturbed?	No
Excessive dumping or trash in wetland?	No
Hog disturbance?	Yes
Signficant impact from cattle (trampling)?	Yes
Vehicles through wetland (includes bicycles)?	No
Insect damage?	No
Disease?	No

Explanation(s)

Yes - Some signs of hog activity observed within southern herbaceous prairie the southern edge of the wetland; Yes - Moderate cattle activity observed around edges and along paths to center of wetland; Excavated portion of the Interior of the wetland covered with Lemna minor; 50% of the interior is open water.

WETLAND DRAINAGE

Augmentation equipment in place?	No
Augmentation occurring at time of WAP?	No
Clear evidence of direct stormwater inflow?	Yes
Clear evidence of direct drainage from wetland?	No
Other drainage activities in area?	No
Borrow pit/retention pond in wetland vicinity?	Yes

Explanation(s)

Yes - This wetland receives storm water inflow from surrounding natural drainage basin and surrounding cattle pastures; Yes - Center of wetland appears to have been historically excavated to provide dry season water source for cattle.

Fire

Signs of Fire? No

Explanation (year, expanse, intensity)

Lakes / Docks

Docks completely out of water
Docks touching water or with <50% of dock over water
Docks >50% out of water
(Not Applicable)

Is the littoral zone stranded? ☐

Comments

Soil Subsidence

New signs of oxidation/subsidence? No

Explanation

No subsidence observed

General Comments/Observations

This wetland appears to continue to exhibit a relatively high functional value as indicated by high species diversity in the appropriate zones and limited hydrological and topographical impacts. This wetland appears to be most closely matched to TW 1.

Future users of this data may not want to analyze / compare this data with other wetlands due to the extensive level of:

- ☑ non-groundwater withdrawal-related disturbance
- ☑ soil subsidence

WILDLIFE

Wildlife	Count	Evidence
Sandhill Crane nest 2014	1	nest
Anas fulvigula	2	
Eudocimus albus	4	

Wildlife	Count	Evidence
Ardea herodias	1	
Egretta thula	1	

Wildlife	Count	Evidence

WETLAND ASSESSMENT PROCEDURE

Wellfield / Property	Wetland Name	Wetland Type
W. Schmid (P-66)	Reference Wetland 3	Emergent

Wetland ID	Area Assessed	Zone Assessment Notes
RW-3		Deepwater herbaceous marsh with significant topographic relief and relatively obvious zonation.

GROUNDCOVER

For each zone assessed, please document the following: species abbreviation, WAP zone (U, AD, T, OD, or D), % cover (5% or 10-100% in increments of 10%), count (1-4), and distribution (E=edge, B=beyond a few feet, or T=throughout).

TRANSITION ZONE

transition zone assessed? ✓
check if no groundcover ☐

SPECIES	ZONE	%	#	DIST
Ludwigia peruviana	OD	5		T
Juncus effusus		45		T
Paspalum distichum		5		T
Polygonum hydropiperoides	OD	15		T
Ptilimnium capilifolium	AD	5		E
Phyla nodiflora	AD	5		T
Cyperus haspens		5		T
Hydrocotyle umbellata	OD	15		T
Spartina bakerii		10		T
Setaria geniculata		5		
Amphicarpum muhlenbergium		20		
Eleocharis baldwinii		20		
Urena lobata		5		
Eclipta prostrata		5		
Diodia virginiana		5		

OUTER DEEP ZONE

outer deep zone assessed? ✓
check if no groundcover ☐

SPECIES	ZONE	%	#	DIST
Polygonum hydropiperoides	OD	35		T
Paspalum distichum		10		T
		5		E
		Ind		T
		Ind		T
Ludwigia peruviana	OD	8		T
Juncus effusus		Ind		T
Ludwigia decurrens		5		E
Echinochloa walteri		Ind		T
Eleocharis baldwinii		10		
Amphicarpum muhlenbergium		50		
Eclipta prostrata		5		

DEEP ZONE

deep zone assessed? ✓
check if no groundcover ☐

SPECIES	ZONE	%	#	DIST
Polygonum hydropiperoides	OD	25		E
				T
Salvinia minima		5		T
Lemna minor		5		T
Paspalum distichum		25		T
open water		5		T
Cyperus lecontei		10		B

Groundcover Comments

ZONATION

Zonation Score: 5 Please assign a score of 1 - 5 or 0 and provide an explanation.

Zonation Score Explanation

Deep zone flora species which are on the WAP form do not occur within deep zone/wetland interior (except Polygonum hydropiperoides). However, flora species which are not on the WAP form but would be appropriate to a deep zone were observed within the deep zone (mostly floating aquatic species).

WETLAND ASSESSMENT PROCEDURE

Wellfield / Property	Wetland Name	Wetland Type
W. Schmid (P-66)	Reference Wetland 3	Emergent

Wetland ID	Area Assessed	Zone Assessment Notes
RW-3		

SHRUB / SMALL TREES

For each zone assessed, please document the following: species abbreviation, WAP zone (U, AD, T, OD, or D), percent cover (5% or 10-100% in increments of 10%), count (1-50 or ">50"), and distribution (E=edge, B=beyond a few feet, or T=throughout).

TRANSITION ZONE

transition zone assessed? ☑
check if no shrubs/small trees ☐

SPECIES	ZONE	%	#	DIST
Ludwigia pervuviana	OD	40		T

OUTER DEEP ZONE

outer deep zone assessed? ☑
check if no shrubs/small trees ☐

SPECIES	ZONE	%	#	DIST

DEEP ZONE

deep zone assessed? ☑
check if no shrubs/small trees ☐

SPECIES	ZONE	%	#	DIST

Shrub/Small Tree Comments

ZONATION

Zonation Score: 5 Please assign a score of 1 - 5 or 0 and provide an explanation.

Zonation Score Explanation

Normal zonation - all identified species are within their appropriate zone

STRESS

Signs of stress of appropriate shrubs and small trees (include dead species)

Few/None (circled)
Noticeable
Significant
Not Applicable

Signs of stress of inappropriate shrubs and small trees (include dead species)

Few/None (circled)
Noticeable
Significant
Not Applicable

WETLAND ASSESSMENT PROCEDURE

Wellfield / Property	Wetland Name	Wetland Type
W. Schmid (P-66)	Reference Wetland 3	Emergent

Wetland ID	Area Assessed	Zone Assessment Notes
RW-3		Herbaceous Wetland. No trees

TREES

For each zone assessed, please document the following: species abbreviation, WAP zone (U, AD, T, OD, or D), percent cover (5% or 10-100% in increments of 10%), count (1-50 or ">50"), and distribution (E=edge, B=beyond a few feet, or T=throughout).

TRANSITION ZONE

transition zone assessed? ☑
check if no trees ☑

SPECIES	ZONE	%	#	DIST

OUTER DEEP ZONE

outer deep zone assessed? ■
check if no trees ■

SPECIES	ZONE	%	#	DIST

DEEP ZONE

deep zone assessed? ■
check if no trees ■

SPECIES	ZONE	%	#	DIST

Tree Comments

ZONATION

Zonation Score: NA Please assign a score of 1 - 5 or 0 and provide an explanation.

Zonation Score Explanation

STRESS

Signs of stress of appropriate trees (do not include dead species)

(Few/None)
Noticeable
Significant
Not Applicable

Signs of stress of inappropriate trees (include dead species)

Few/None
Noticeable
Significant
(Not Applicable)

RECOVERY

Dead or leaning trees (include standing dead trees and dead trees on ground that are appropriate)

(Few/None)
Noticeable
Significant

Signs of tree recovery

Yes
(No)
Not Sure

Inappropriate vine death suggesting recovery

Yes
(No)
Not Sure

APPENDIX C

PHOTOGRAPHIC DOCUMENTATION

North

East

West

South

AECOM

AECOM Project
#60336439
June 2015

Target Wetland (TW) 1 – Monitoring Well (MW) 1 Photostation
Tallevast Site
2015 Wetlands Monitoring
Tallevast, Manatee County, Florida
R625-STA-002274-2

North

East

West

South

AECOM

AECOM Project
#60336439
June 2015

Target Wetland (TW) 1 – NP-12 Photostation
Tallevast Site
2015 Wetlands Monitoring
Tallevast, Manatee County, Florida
R625-STA-002274-2

North

East

West

South

AECOM

AECOM Project
#60336439
June 2015

Target Wetland (TW) 1 – NP-6 Photostation
Tallevast Site
2015 Wetlands Monitoring
Tallevast, Manatee County, Florida
R625-STA-002274-2

North

East

West

South

AECOM

AECOM Project
#60336439
June 2015

Target Wetland (TW) 1 – HNP Photostation
Tallevast Site
2015 Wetlands Monitoring
Tallevast, Manatee County, Florida
R625-STA-002274-2

North

East

West

South

AECOM

AECOM Project
#60336439
June 2015

Target Wetland (TW) 2 - Monitoring Well (MW) 2 Photostation
Tallevast Site
2015 Wetlands Monitoring
Tallevast, Manatee County, Florida
R625-STA-002274-2

North

East

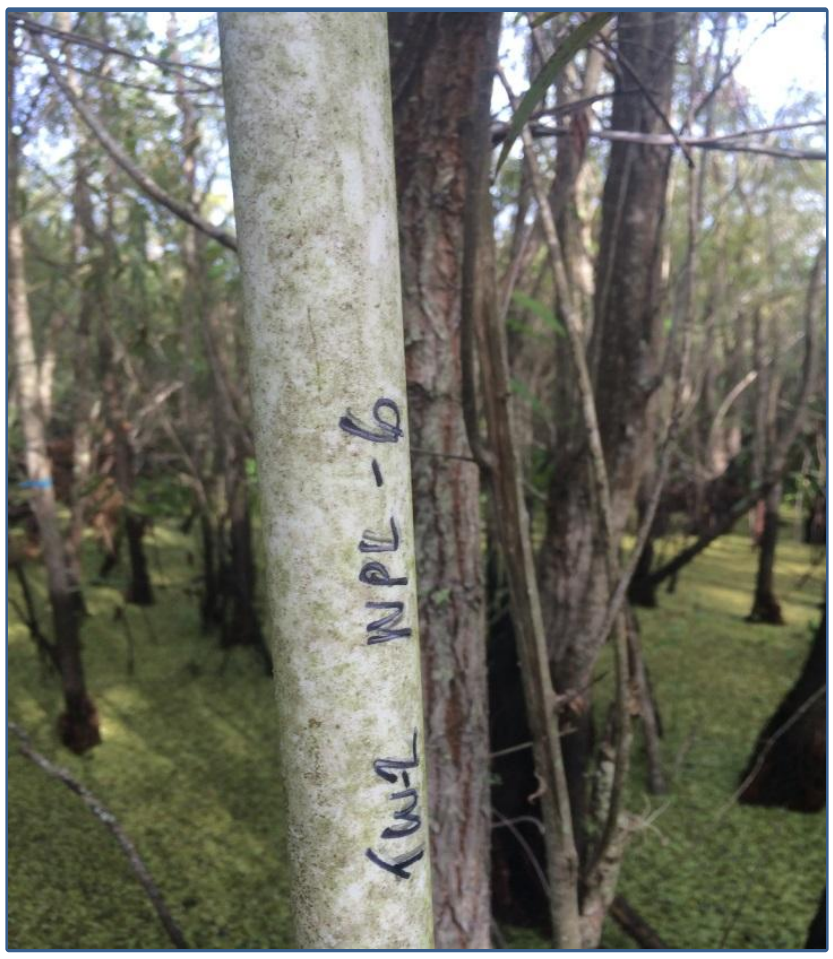
West

South

AECOM

AECOM Project
#60336439
June 2015

Target Wetland (TW) 2 – NP-12 Photostation
Tallevast Site
2015 Wetlands Monitoring
Tallevast, Manatee County, Florida
R625-STA-002274-2



North

East

West

South

AECOM

AECOM Project
#60336439
June 2015

Target Wetland (TW) 2 – NP-6 Photostation
Tallevast Site
2015 Wetlands Monitoring
Tallevast, Manatee County, Florida
R625-STA-002274-2

North

East

West

South

AECOM

AECOM Project
#60336439
June 2015

Target Wetland (TW) 2 – HNP Photostation
Tallevast Site
2015 Wetlands Monitoring
Tallevast, Manatee County, Florida
R625-STA-002274-2

North

East

West

South

AECOM

AECOM Project
#60336439
June 2015

Target Wetland (TW) 6 - Monitoring Well (MW) 6 Photostation
Tallevast Site
2015 Wetlands Monitoring
Tallevast, Manatee County, Florida
R625-STA-002274-2

North

East

West

South

AECOM

AECOM Project
#60336439
June 2015

Target Wetland (TW) 6 – NP-12 Photostation
Tallevast Site
2015 Wetlands Monitoring
Tallevast, Manatee County, Florida
R625-STA-002274-2

North

East

West

South

Target Wetland (TW) 6 – NP-6 Photostation
Tallevast Site
2015 Wetlands Monitoring
Tallevast, Manatee County, Florida
R625-STA-002274-2

AECOM

AECOM Project
#60336439
June 2015

North

East

West

South

AECOM

AECOM Project
#60336439
June 2015

Target Wetland (TW) 6 – HNP Photostation
Tallevast Site
2015 Wetlands Monitoring
Tallevast, Manatee County, Florida
R625-STA-002274-2

North

East

West

South

AECOM

AECOM Project
#60336439
June 2015

Target Wetland (TW) 18 - Monitoring Well (MW) 18 Photostation
Tallevast Site
2015 Wetlands Monitoring
Tallevast, Manatee County, Florida
R625-STA-002274-2

North

East

West

South

AECOM

AECOM Project
#60336439
June 2015

Target Wetland (TW) 18 NP–12 Photostation
Tallevast Site
2015 Wetlands Monitoring
Tallevast, Manatee County, Florida
R625-STA-002274-2

North

East

West

South

AECOM

AECOM Project
#60336439
June 2015

Target Wetland (TW) 18 – NP-6 Photostation
Tallevast Site
2015 Wetlands Monitoring
Tallevast, Manatee County, Florida
R625-STA-002274-2

North

East

West

South

AECOM

AECOM Project
#60336439
June 2015

Target Wetland (TW) 18 – HNP Photostation
Tallevast Site
2015 Wetlands Monitoring
Tallevast, Manatee County, Florida
R625-STA-002274-2

North

East

West

South

AECOM

AECOM Project
#60336439
June 2015

Reference Wetland (RW) 1 - Monitoring Well (MW) 1 Photostation
Tallevast Site
2015 Wetlands Monitoring
Tallevast, Manatee County, Florida
R625-STA-002274-2

LB1

North

East

West

South

AECOM

AECOM Project
#60336439
June 2015

Reference Wetland (RW) 1 – NP-12 Photostation
Tallevast Site
2015 Wetlands Monitoring
Tallevast, Manatee County, Florida
R625-STA-002274-2

North

East

West

South

AECOM

AECOM Project
#60336439
June 2015

Reference Wetland (RW) 1 – NP-6 Photostation
Tallevast Site
2015 Wetlands Monitoring
Tallevast, Manatee County, Florida
R625-STA-002274-2

North

East

West

South

AECOM

AECOM Project
#60336439
June 2015

Reference Wetland (RW) 1 – HNP Photostation
Tallevast Site
2015 Wetlands Monitoring
Tallevast, Manatee County, Florida
R625-STA-002274-2

North

East

West

South

AECOM

AECOM Project
#60336439
June 2015

Reference Wetland (RW) 2 - Monitoring Well (MW) 2 Photostation
Tallevast Site
2015 Wetlands Monitoring
Tallevast, Manatee County, Florida
R625-STA-002274-2

North

East

West

South

AECOM

AECOM Project
#60336439
June 2015

Reference Wetland (RW) 2 – NP-12 Photostation
Tallevast Site
2015 Wetlands Monitoring
Tallevast, Manatee County, Florida
R625-STA-002274-2

North

East

West

South

AECOM

AECOM Project
#60336439
June 2015

Reference Wetland (RW) 2 – NP-6 Photostation
Tallevast Site
2015 Wetlands Monitoring
Tallevast, Manatee County, Florida
R625-STA-002274-2

North

East

West

South

AECOM

AECOM Project
#60336439
June 2015

Reference Wetland (RW) 2 – HNP Photostation
Tallevast Site
2015 Wetlands Monitoring
Tallevast, Manatee County, Florida
R625-STA-002274-2

North

East

West

South

AECOM

AECOM Project
#60336439
June 2015

Reference Wetland (RW) 3 - Monitoring Well (MW) 3 Photostation
Tallevast Site
2015 Wetlands Monitoring
Tallevast, Manatee County, Florida
R625-STA-002274-2

North

East

West

South

AECOM

AECOM Project
#60336439
June 2015

Reference Wetland (RW) 3 – NP-12 Photostation
Tallevast Site
2015 Wetlands Monitoring
Tallevast, Manatee County, Florida
R625-STA-002274-2

North

East

West

South

AECOM

AECOM Project
#60336439
June 2015

Reference Wetland (RW) 1 – NP-6 Photostation
Tallevast Site
2015 Wetlands Monitoring
Tallevast, Manatee County, Florida
R625-STA-002274-2

North

East

West

South

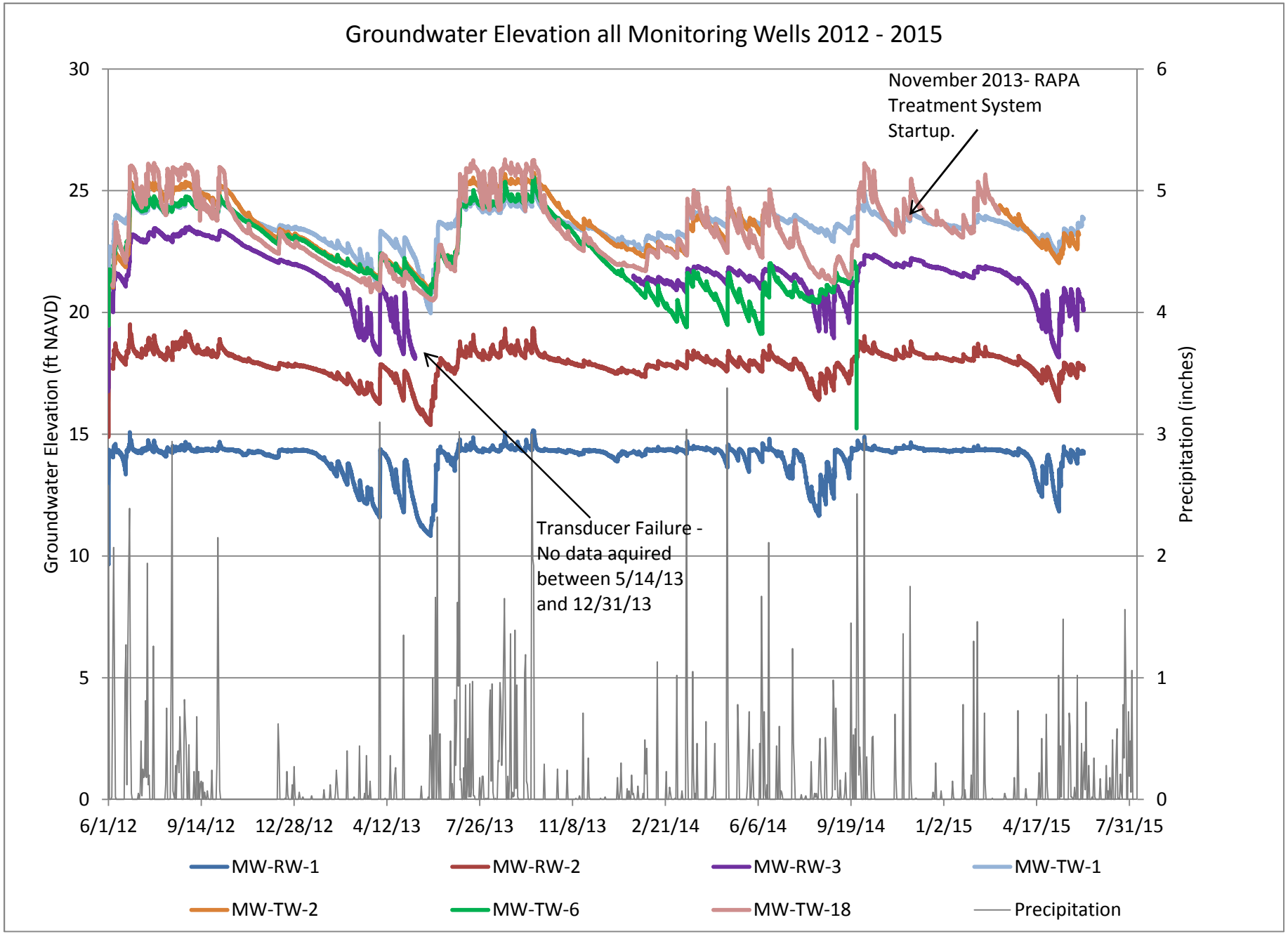
AECOM

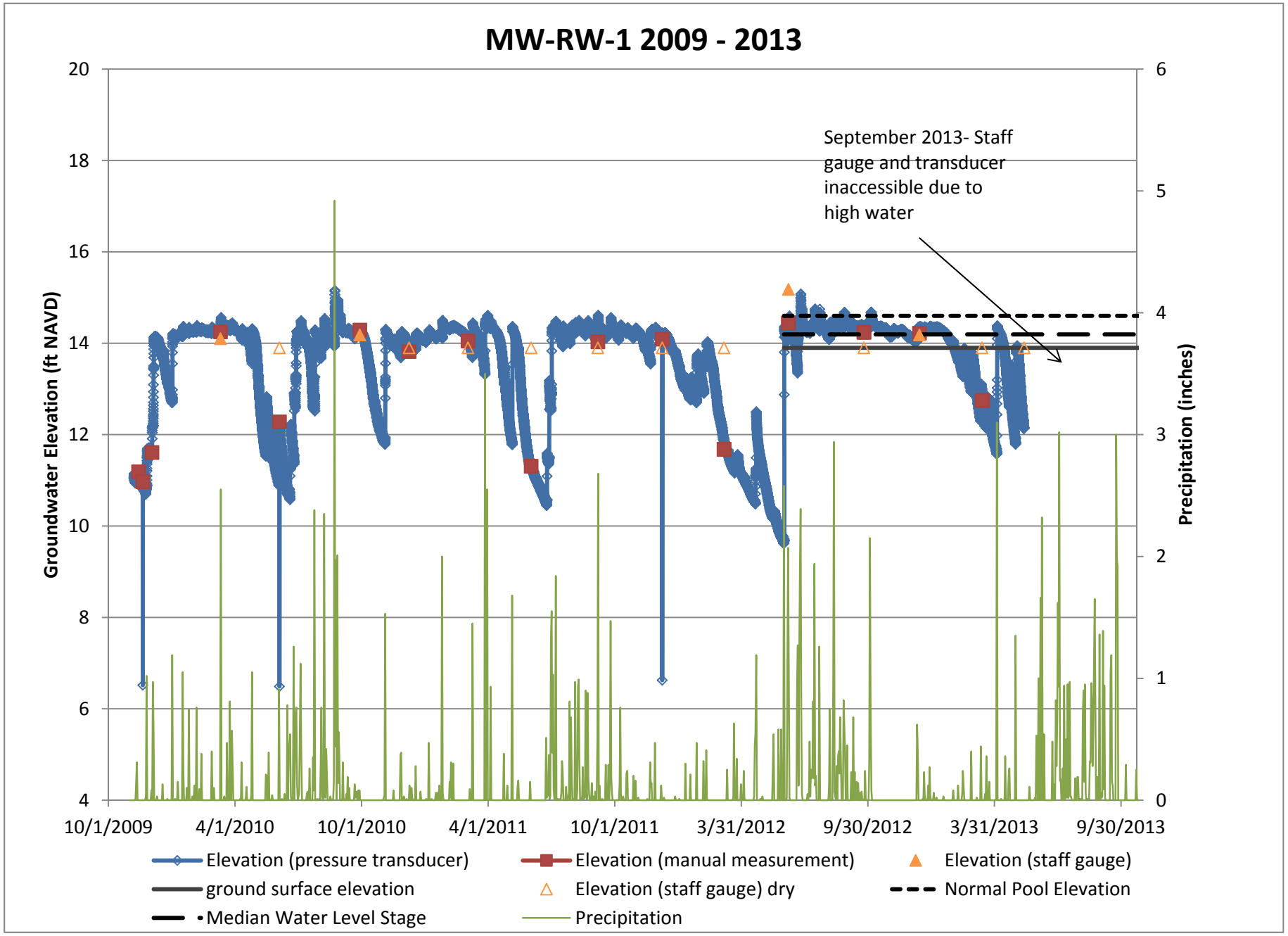
AECOM Project
#60336439
June 2015

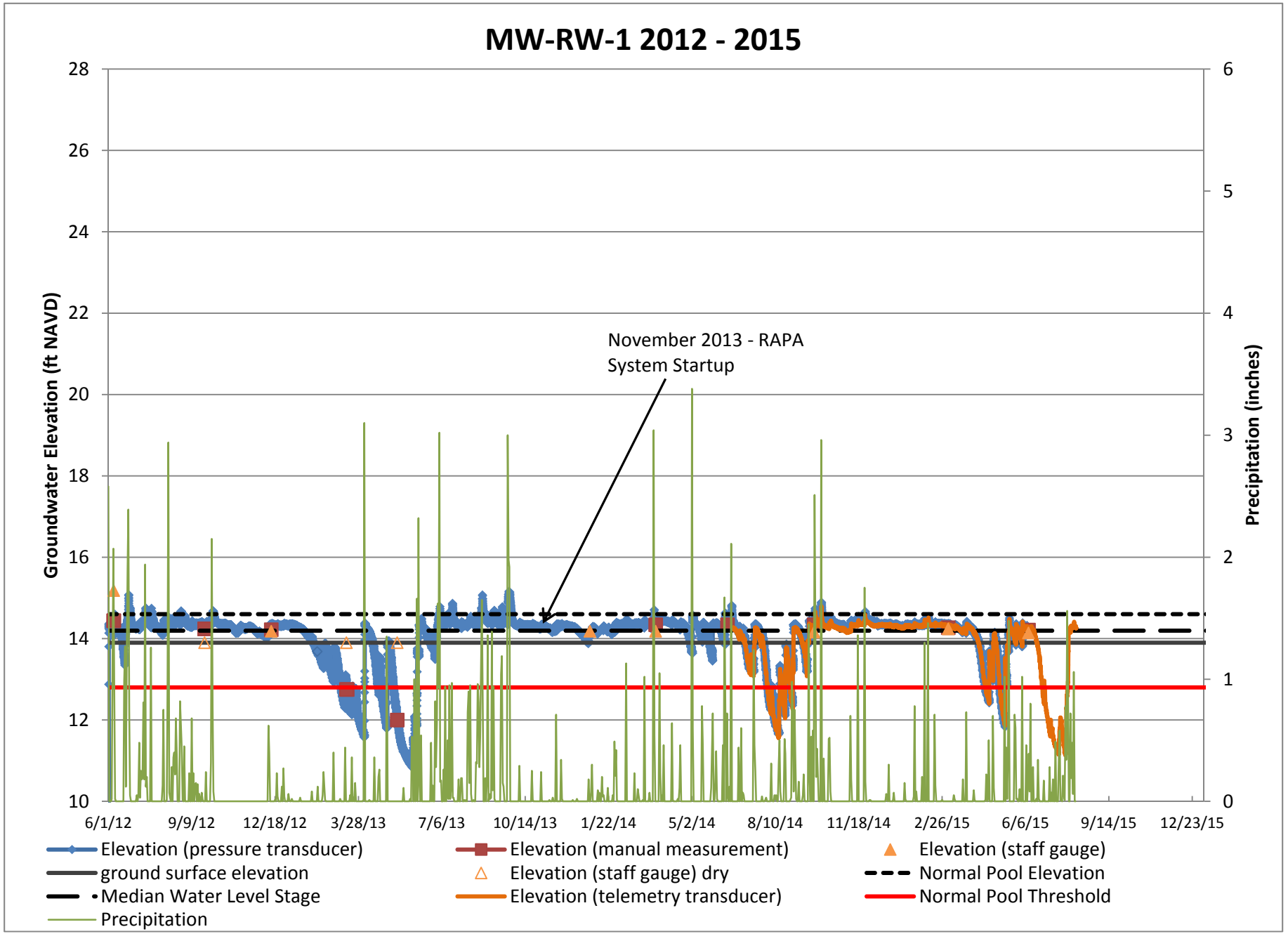
Reference Wetland (RW) 3 – HNP Photostation
Tallevast Site
2015 Wetlands Monitoring
Tallevast, Manatee County, Florida
R625-STA-002274-2

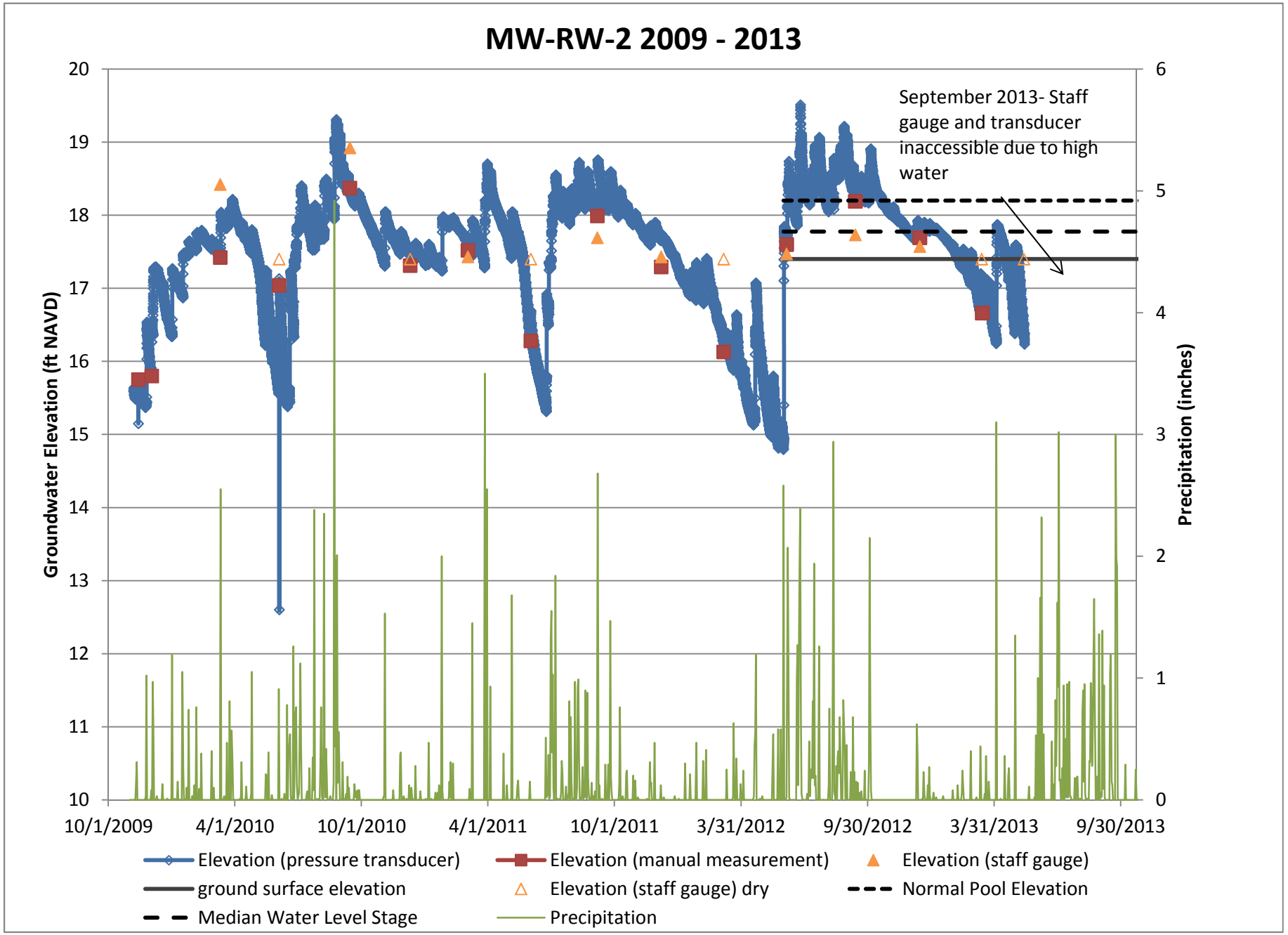
APPENDIX D

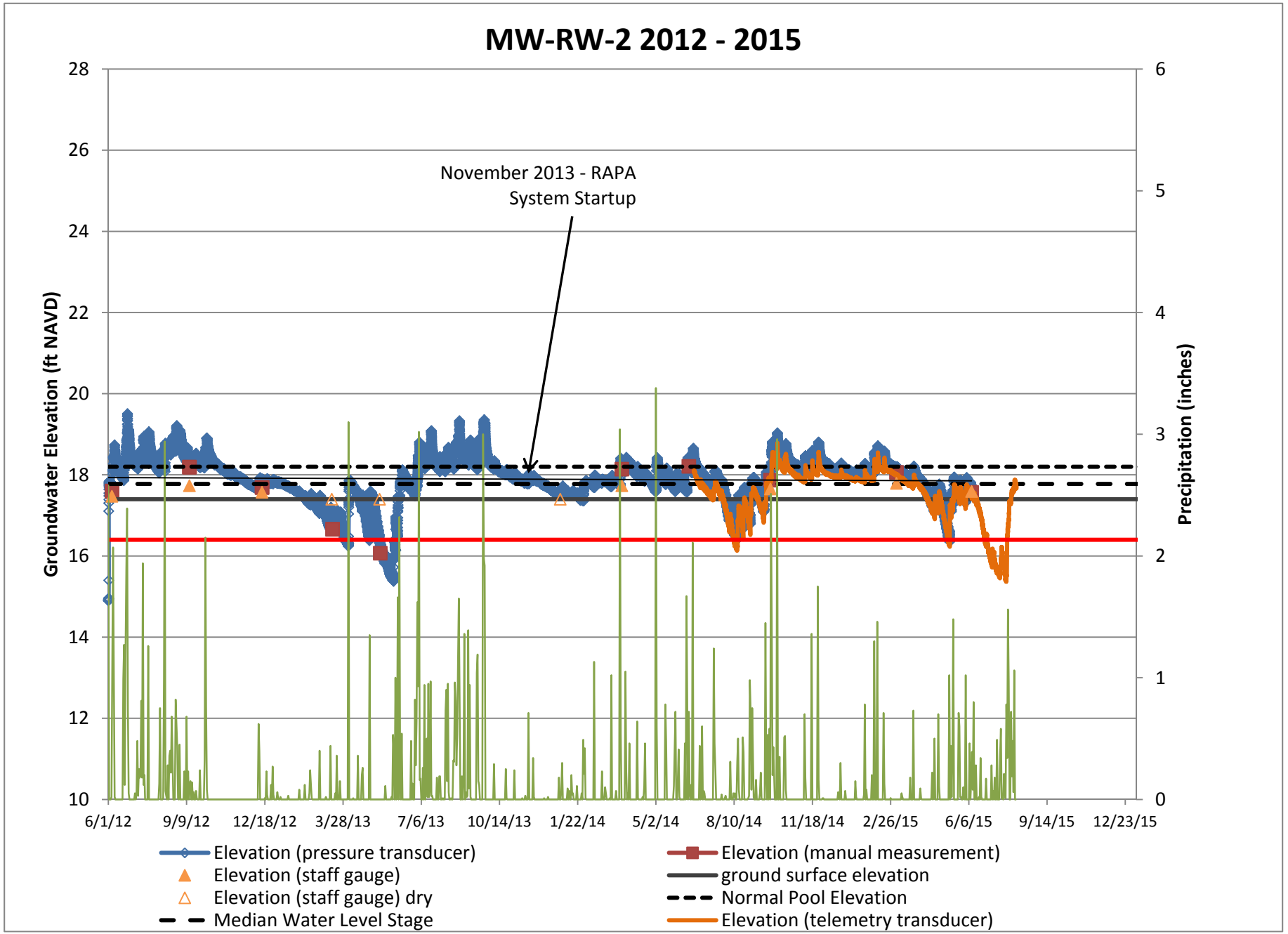
HYDROPERIOD GRAPHS

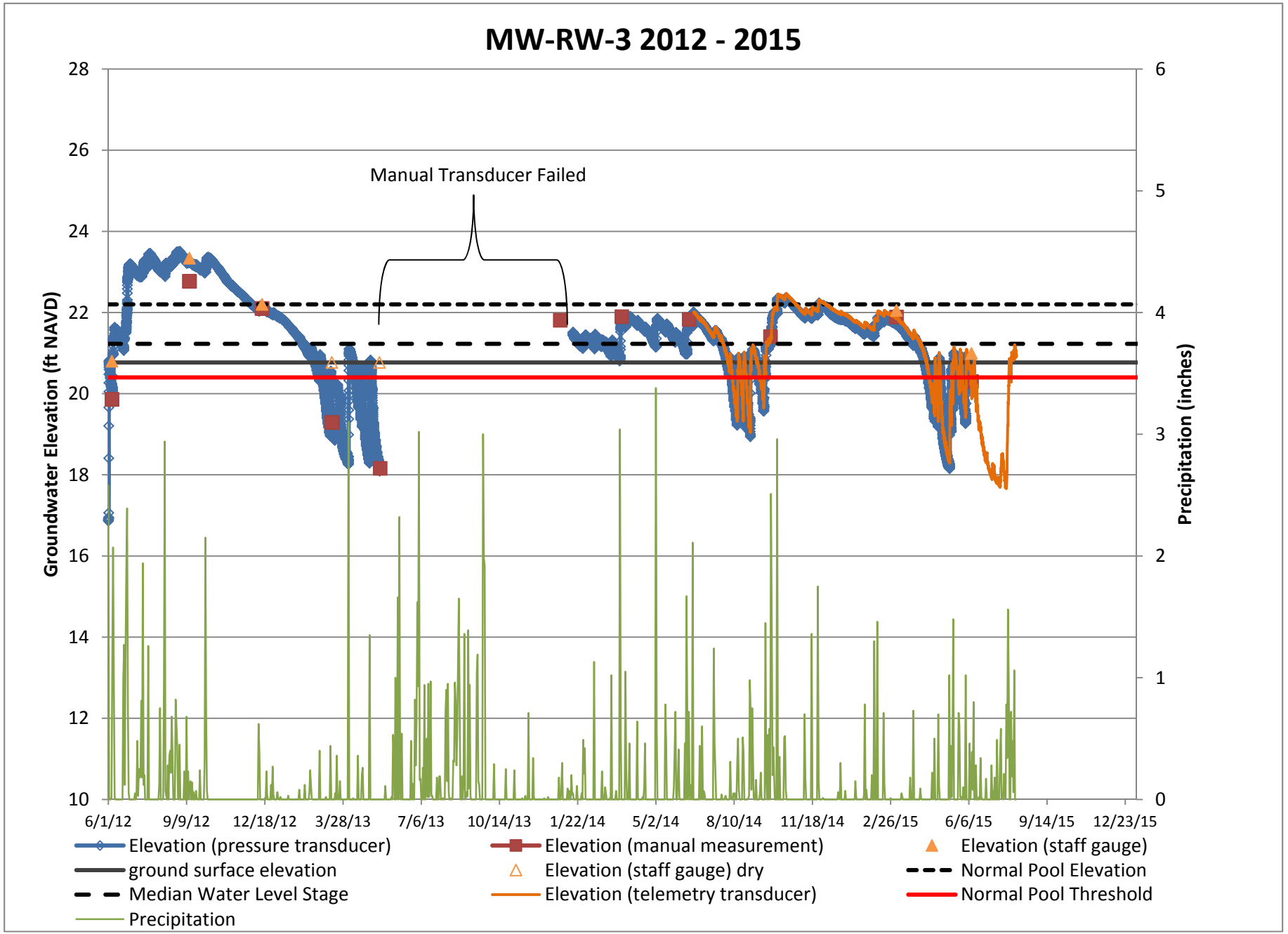

Groundwater Elevation all Monitoring Wells 2012 - 2015
Groundwater Elevation (ft NAVD)
Precipitation (inches)
30
25
20
15
10
5
0
6
5
4
3
2
1
0
November 2013- RAPA Treatment System Startup.
Transducer Failure - No data aquired between 5/14/13 and 12/31/13
6/1/12
9/14/12
12/28/12
4/12/13
7/26/13
11/8/13
2/21/14
6/6/14
9/19/14
1/2/15
4/17/15
7/31/15
MW-RW-1
MW-RW-2
MW-RW-3
MW-TW-1
MW-TW-2
MW-TW-6
MW-TW-18
Precipitation

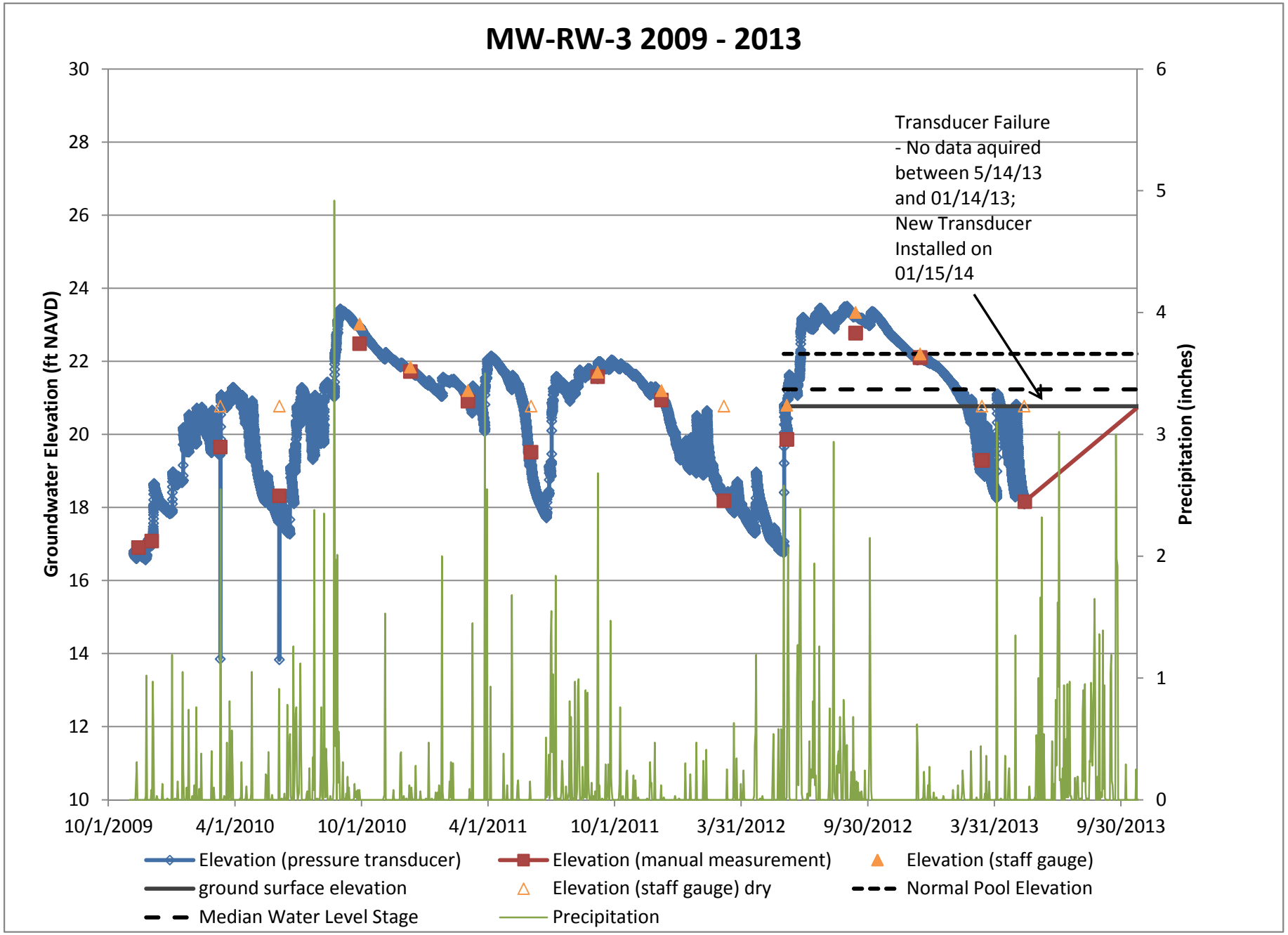

MW-RW-1 2009 - 2013
Groundwater Elevation (ft NAVD)
Precipitation (inches)
20
18
16
14
12
10
8
6
4
6
5
4
3
2
1
0
10/1/2009
4/1/2010
10/1/2010
4/1/2011
10/1/2011
3/31/2012
9/30/2012
3/31/2013
9/30/2013
September 2013- Staff gauge and transducer inaccessible due to high water
Elevation (pressure transducer)
Elevation (manual measurement)
Elevation (staff gauge)
ground surface elevation
Elevation (staff gauge) dry
Normal Pool Elevation
Median Water Level Stage
Precipitation

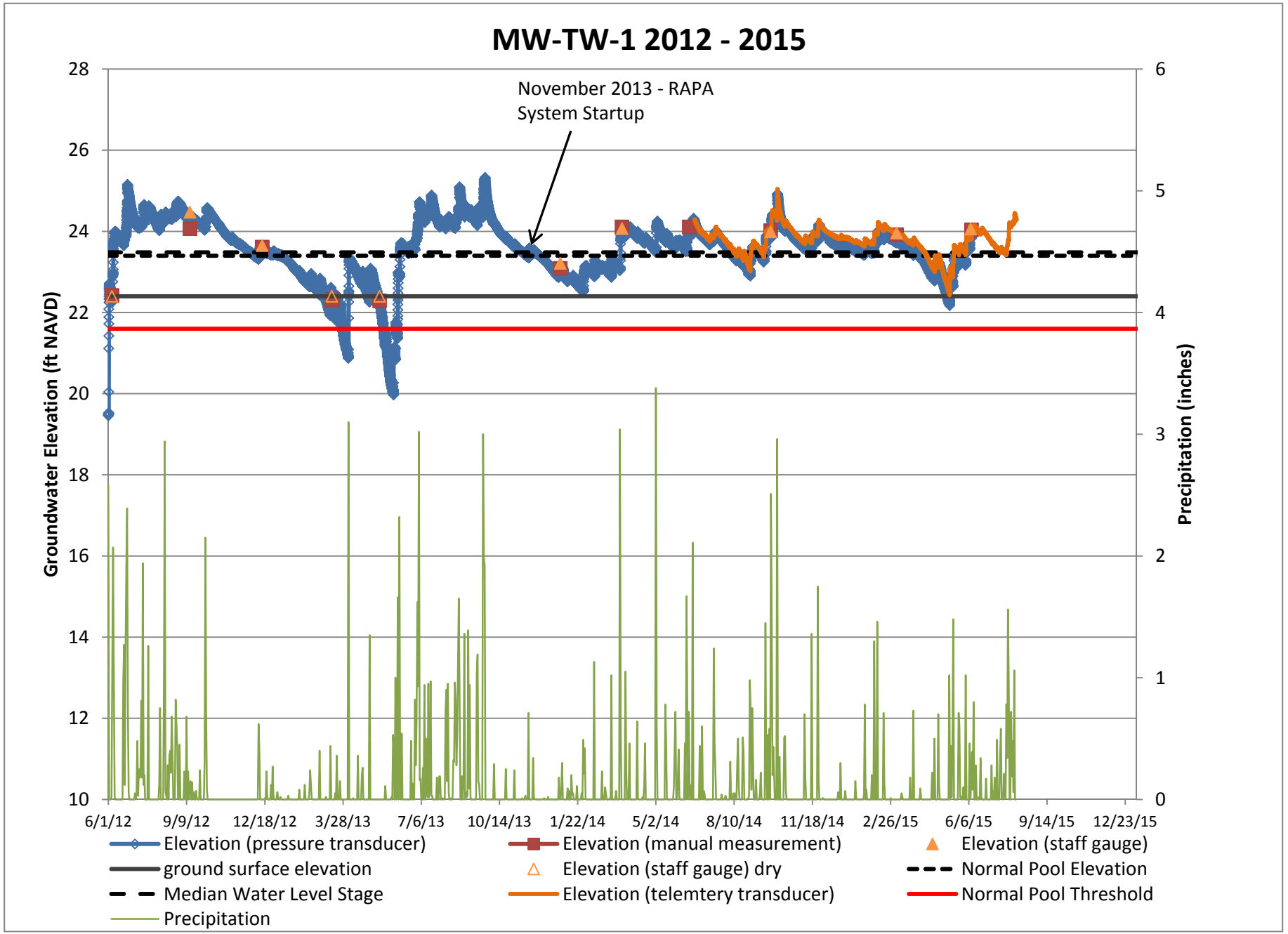

MW-RW-1 2012 - 2015
Groundwater Elevation (ft NAVD)
Precipitation (inches)
28
26
24
22
20
18
16
14
12
10
6
5
4
3
2
1
0
6/1/12
9/9/12
12/18/12
3/28/13
7/6/13
10/14/13
1/22/14
5/2/14
8/10/14
11/18/14
2/26/15
6/6/15
9/14/15
12/23/15
November 2013 - RAPA
System Startup
Elevation (pressure transducer)
Elevation (manual measurement)
Elevation (staff gauge)
ground surface elevation
Elevation (staff gauge) dry
Normal Pool Elevation
Median Water Level Stage
Elevation (telemetry transducer)
Normal Pool Threshold
Precipitation

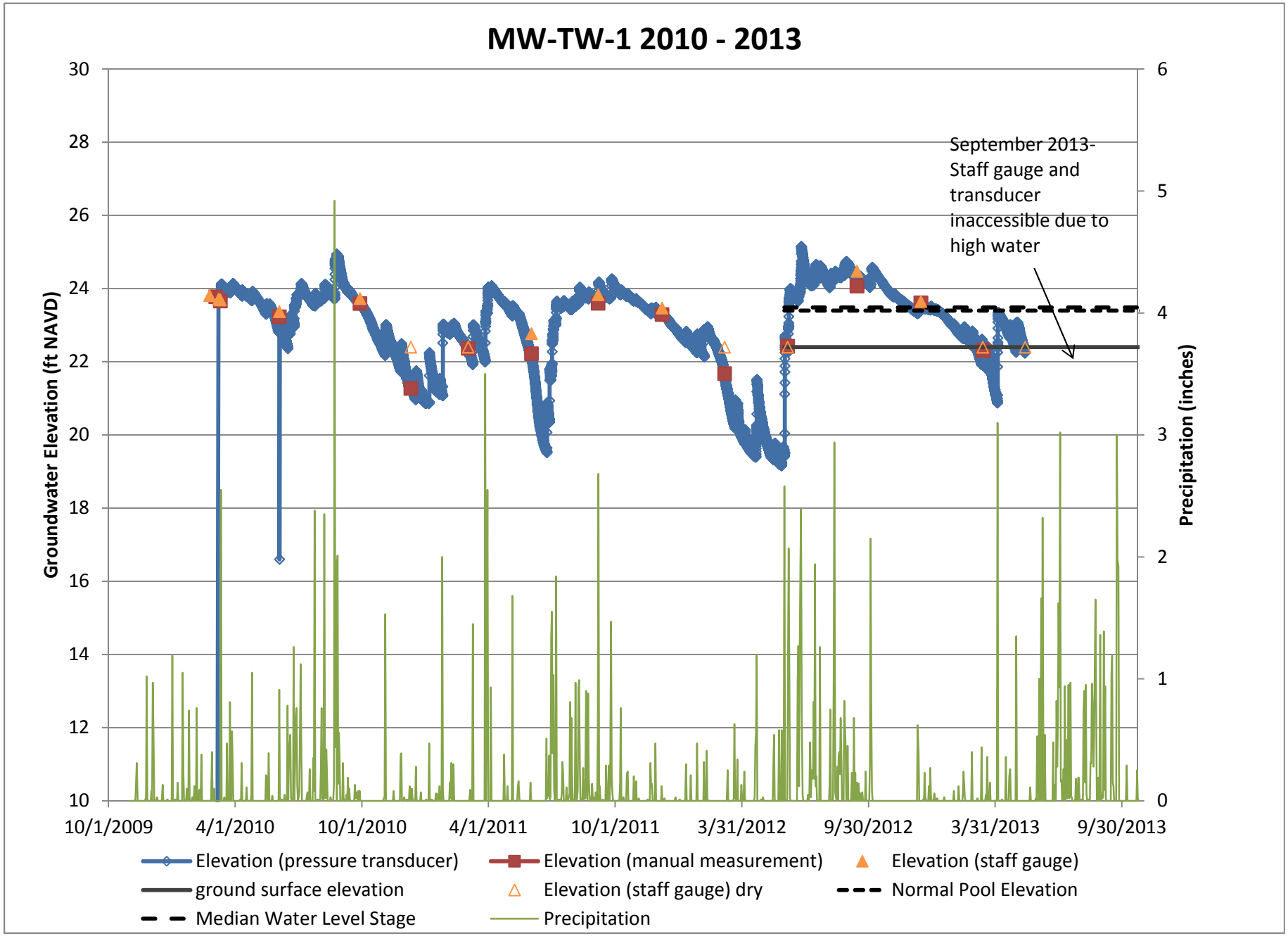

MW-RW-2 2009 - 2013
Groundwater Elevation (ft NAVD)
Precipitation (inches)
20
19
18
17
16
15
14
13
12
11
10
6
5
4
3
2
1
0
10/1/2009
4/1/2010
10/1/2010
4/1/2011
10/1/2011
3/31/2012
9/30/2012
3/31/2013
9/30/2013
September 2013- Staff gauge and transducer inaccessible due to high water
Elevation (pressure transducer)
Elevation (manual measurement)
Elevation (staff gauge)
ground surface elevation
Elevation (staff gauge) dry
Normal Pool Elevation
Median Water Level Stage
Precipitation

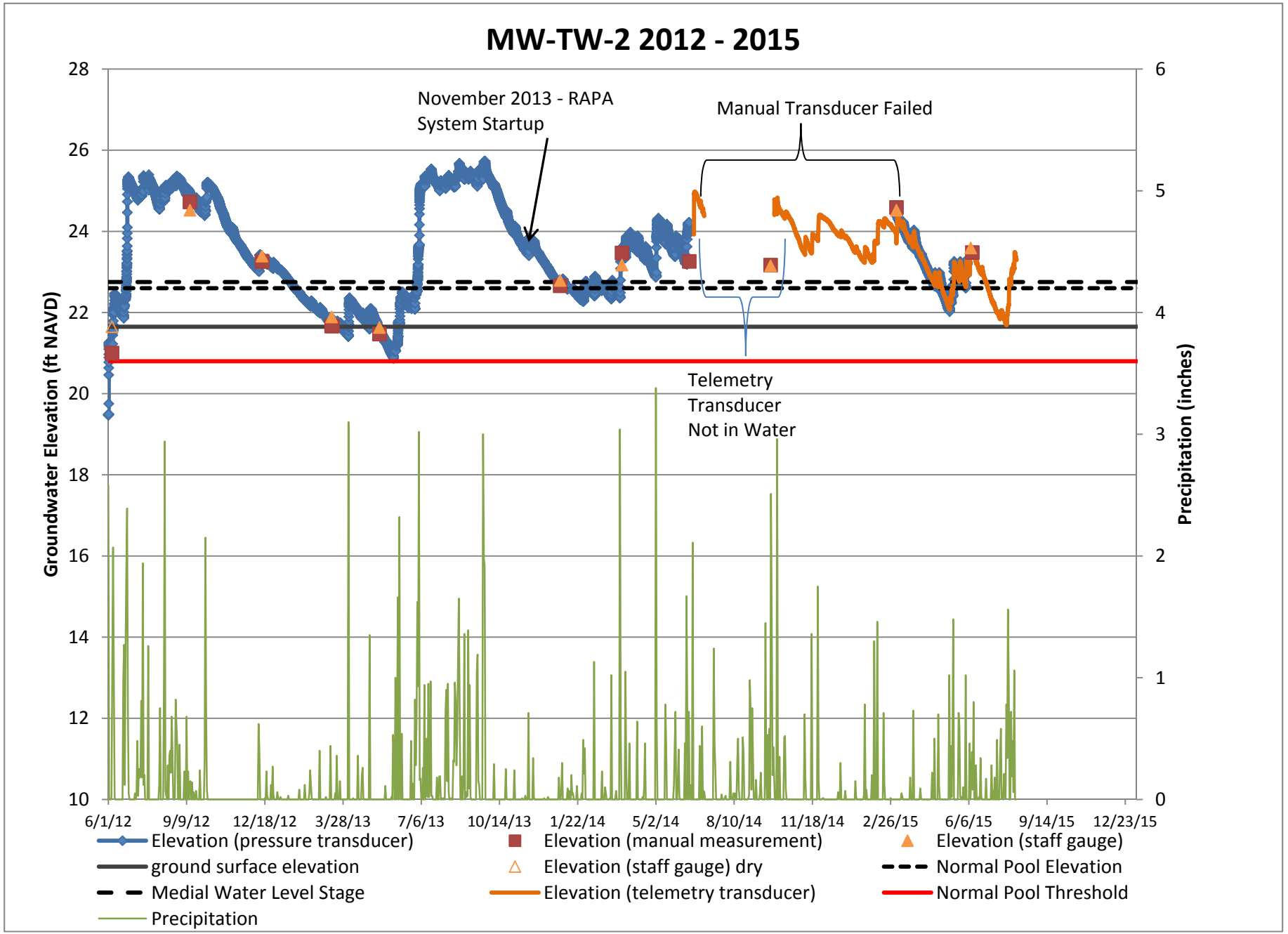

MW-RW-2 2012 - 2015
November 2013 - RAPA
System Startup
Groundwater Elevation (ft NAVD)
Precipitation (inches)
28
26
24
22
20
18
16
14
12
10
6
5
4
3
2
1
0
6/1/12
9/9/12
12/18/12
3/28/13
7/6/13
10/14/13
1/22/14
5/2/14
8/10/14
11/18/14
2/26/15
6/6/15
9/14/15
12/23/15
Elevation (pressure transducer)
Elevation (manual measurement)
Elevation (staff gauge)
ground surface elevation
Elevation (staff gauge) dry
Normal Pool Elevation
Median Water Level Stage
Elevation (telemetry transducer)

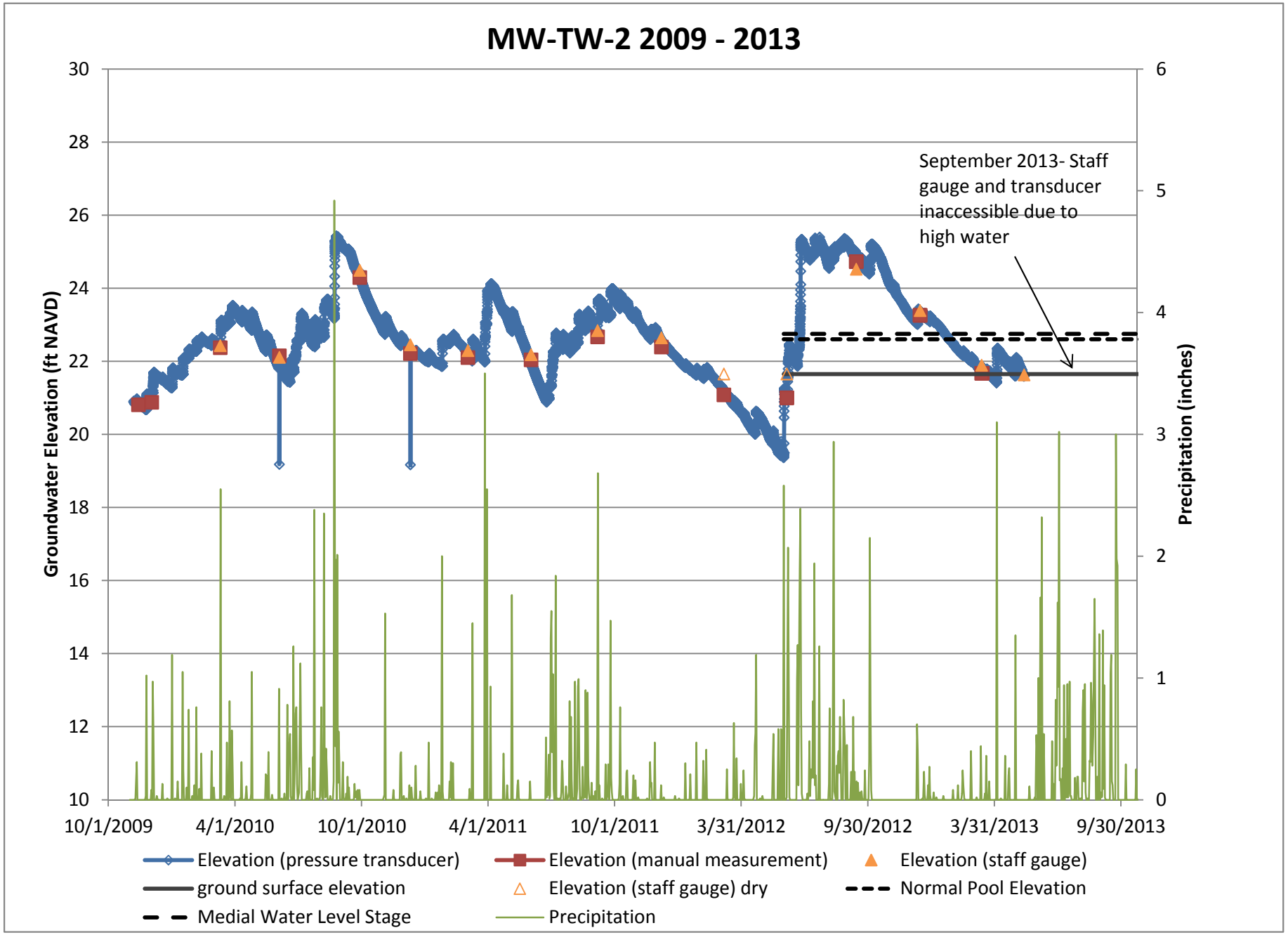

MW-RW-3 2012 - 2015
Manual Transducer Failed
Groundwater Elevation (ft NAVD)
Precipitation (inches)
28
26
24
22
20
18
16
14
12
10
6
5
4
3
2
1
0
6/1/12
9/9/12
12/18/12
3/28/13
7/6/13
10/14/13
1/22/14
5/2/14
8/10/14
11/18/14
2/26/15
6/6/15
9/14/15
12/23/15
Elevation (pressure transducer)
Elevation (manual measurement)
Elevation (staff gauge)
ground surface elevation
Elevation (staff gauge) dry
Normal Pool Elevation
Median Water Level Stage
Elevation (telemetry transducer)
Normal Pool Threshold
Precipitation

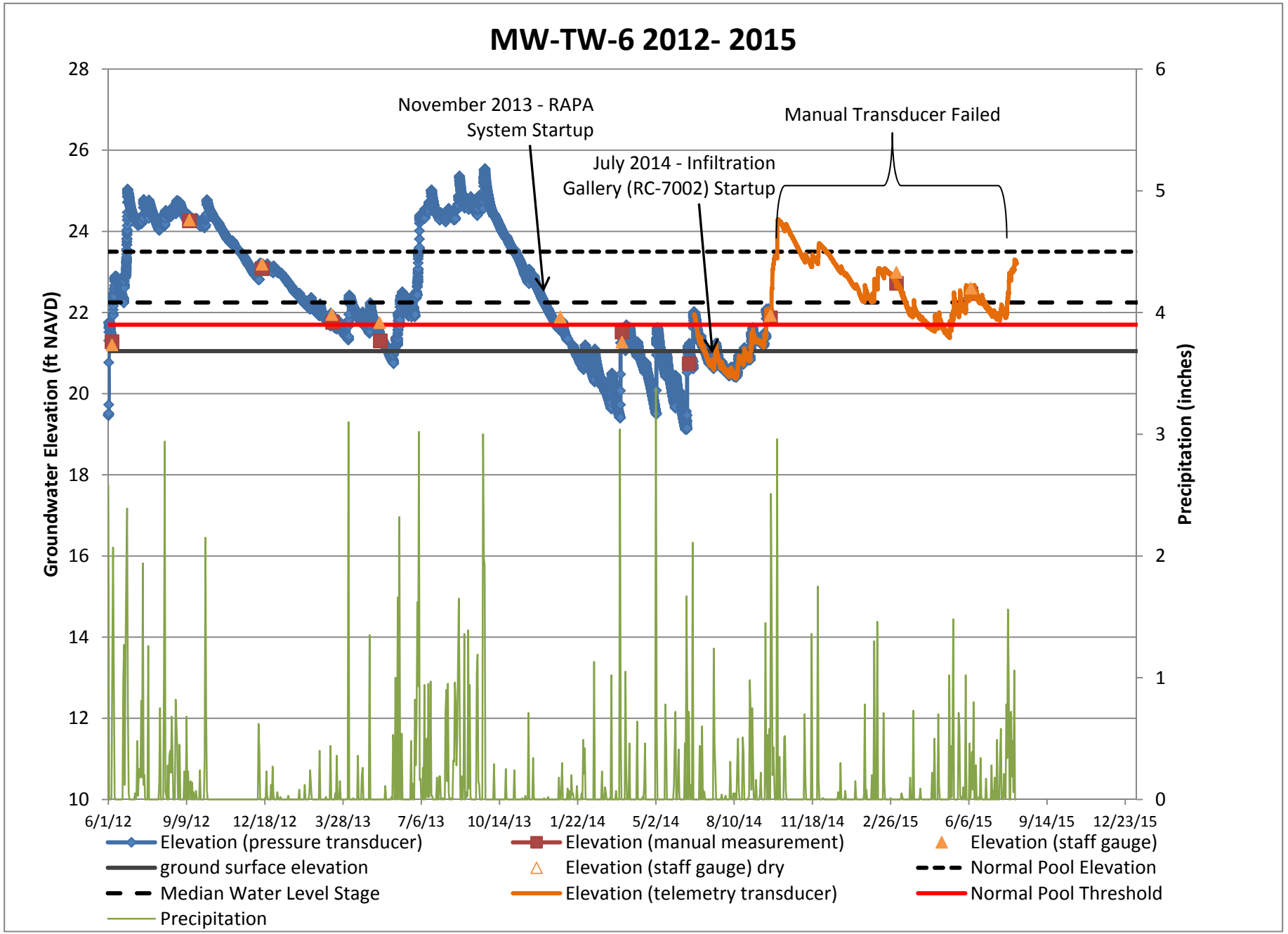

MW-RW-3 2009 - 2013
Groundwater Elevation (ft NAVD)
Precipitation (inches)
30
28
26
24
22
20
18
16
14
12
10
6
5
4
3
2
1
0
10/1/2009
4/1/2010
10/1/2010
4/1/2011
10/1/2011
3/31/2012
9/30/2012
3/31/2013
9/30/2013
Transducer Failure - No data aquired between 5/14/13 and 01/14/13; New Transducer Installed on 01/15/14
Elevation (pressure transducer)
Elevation (manual measurement)
Elevation (staff gauge)
ground surface elevation
Elevation (staff gauge) dry
Normal Pool Elevation
Median Water Level Stage
Precipitation

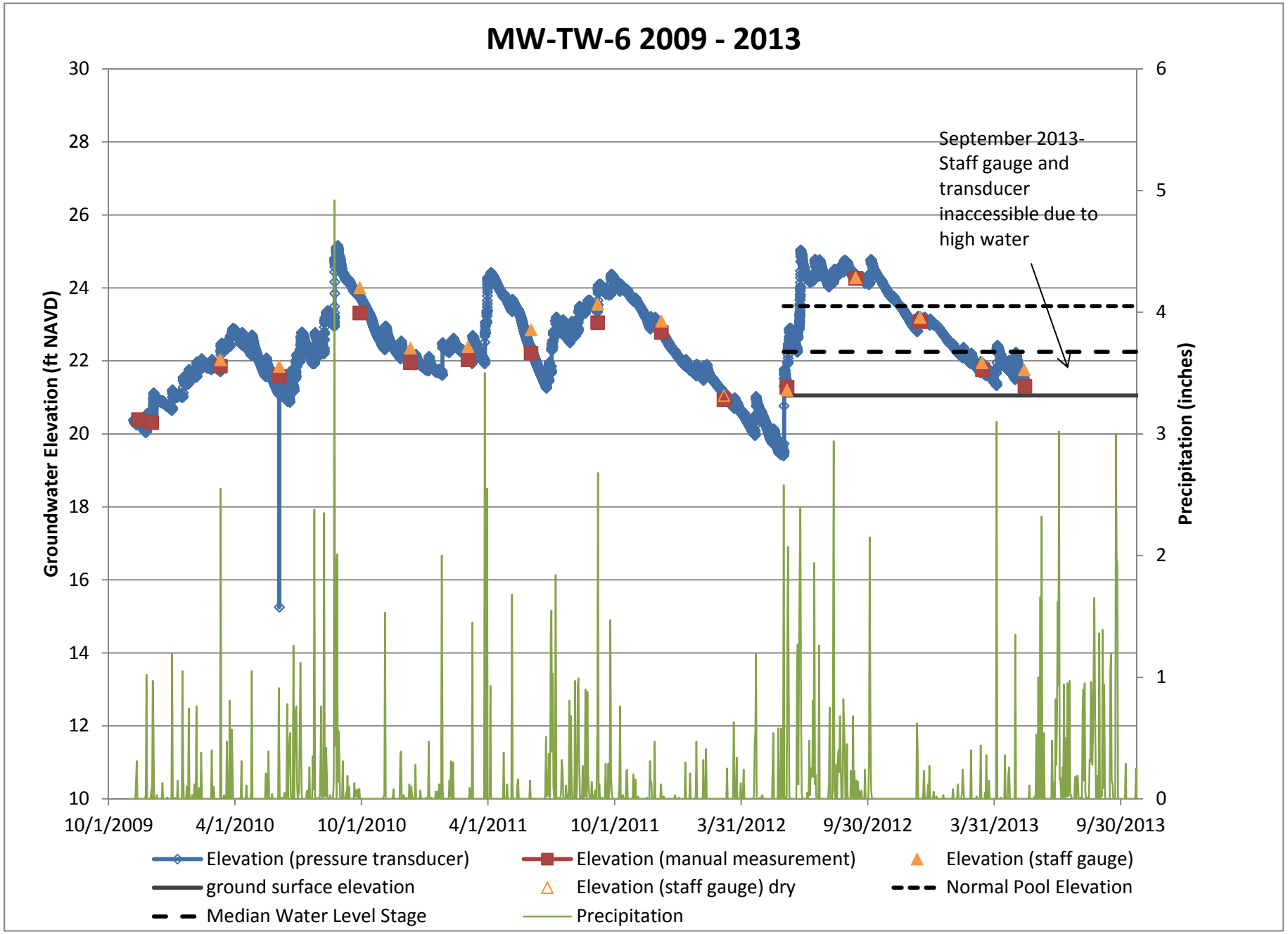

MW-TW-1 2012 - 2015
November 2013 - RAPA System Startup
Groundwater Elevation (ft NAVD)
Precipitation (inches)
28
26
24
22
20
18
16
14
12
10
6
5
4
3
2
1
0
6/1/12
9/9/12
12/18/12
3/28/13
7/6/13
10/14/13
1/22/14
5/2/14
8/10/14
11/18/14
2/26/15
6/6/15
9/14/15
12/23/15
Elevation (pressure transducer)
Elevation (manual measurement)
Elevation (staff gauge)
ground surface elevation
Elevation (staff gauge) dry
Normal Pool Elevation
Median Water Level Stage
Elevation (telemtery transducer)
Normal Pool Threshold
Precipitation

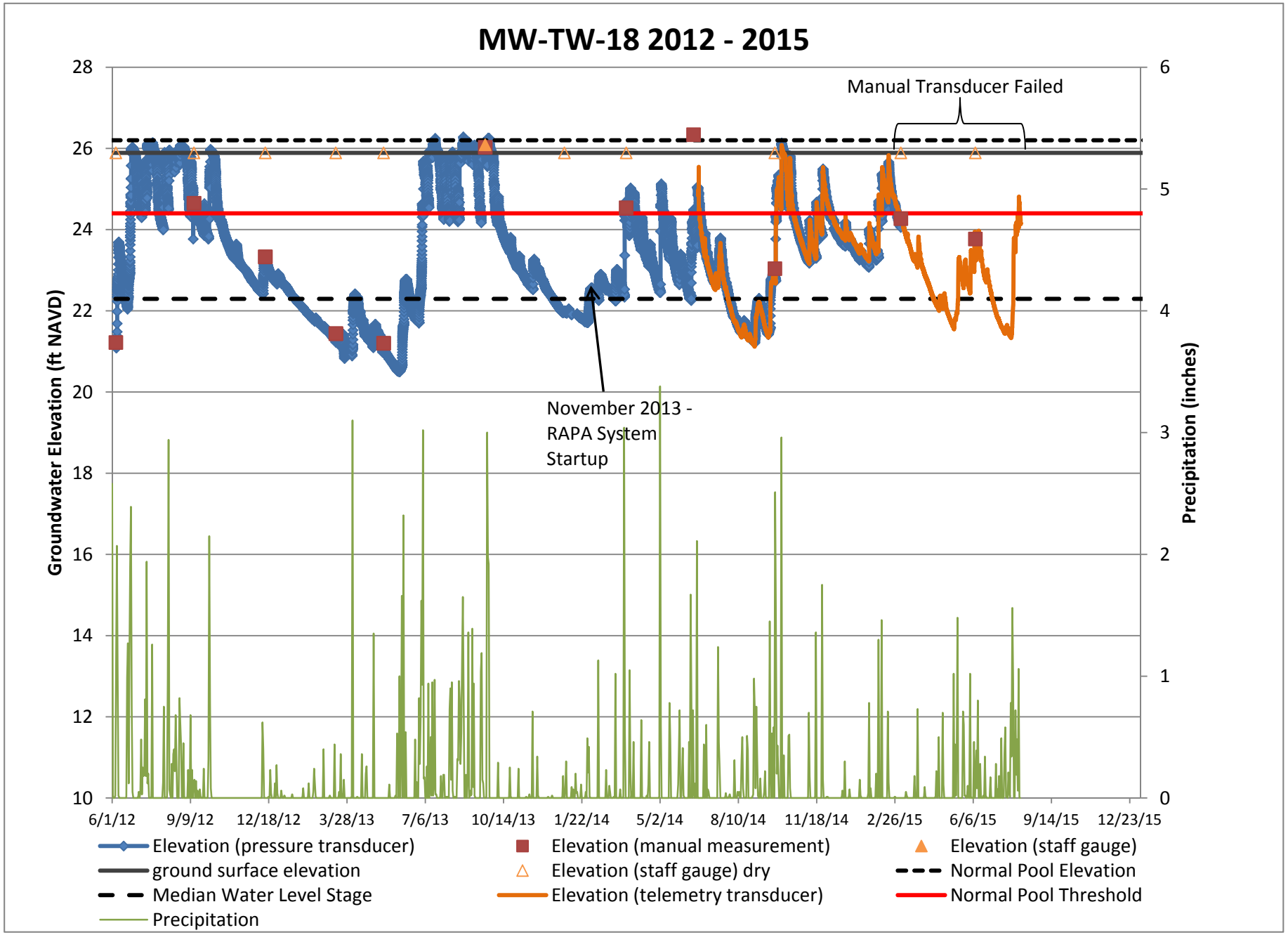

MW-TW-1 2010 - 2013
Groundwater Elevation (ft NAVD)
Precipitation (inches)
30
28
26
24
22
20
18
16
14
12
10
6
5
4
3
2
1
0
10/1/2009
4/1/2010
10/1/2010
4/1/2011
10/1/2011
3/31/2012
9/30/2012
3/31/2013
9/30/2013
September 2013- Staff gauge and transducer inaccessible due to high water
Elevation (pressure transducer)
Elevation (manual measurement)
Elevation (staff gauge)
ground surface elevation
Elevation (staff gauge) dry
Normal Pool Elevation
Median Water Level Stage
Precipitation

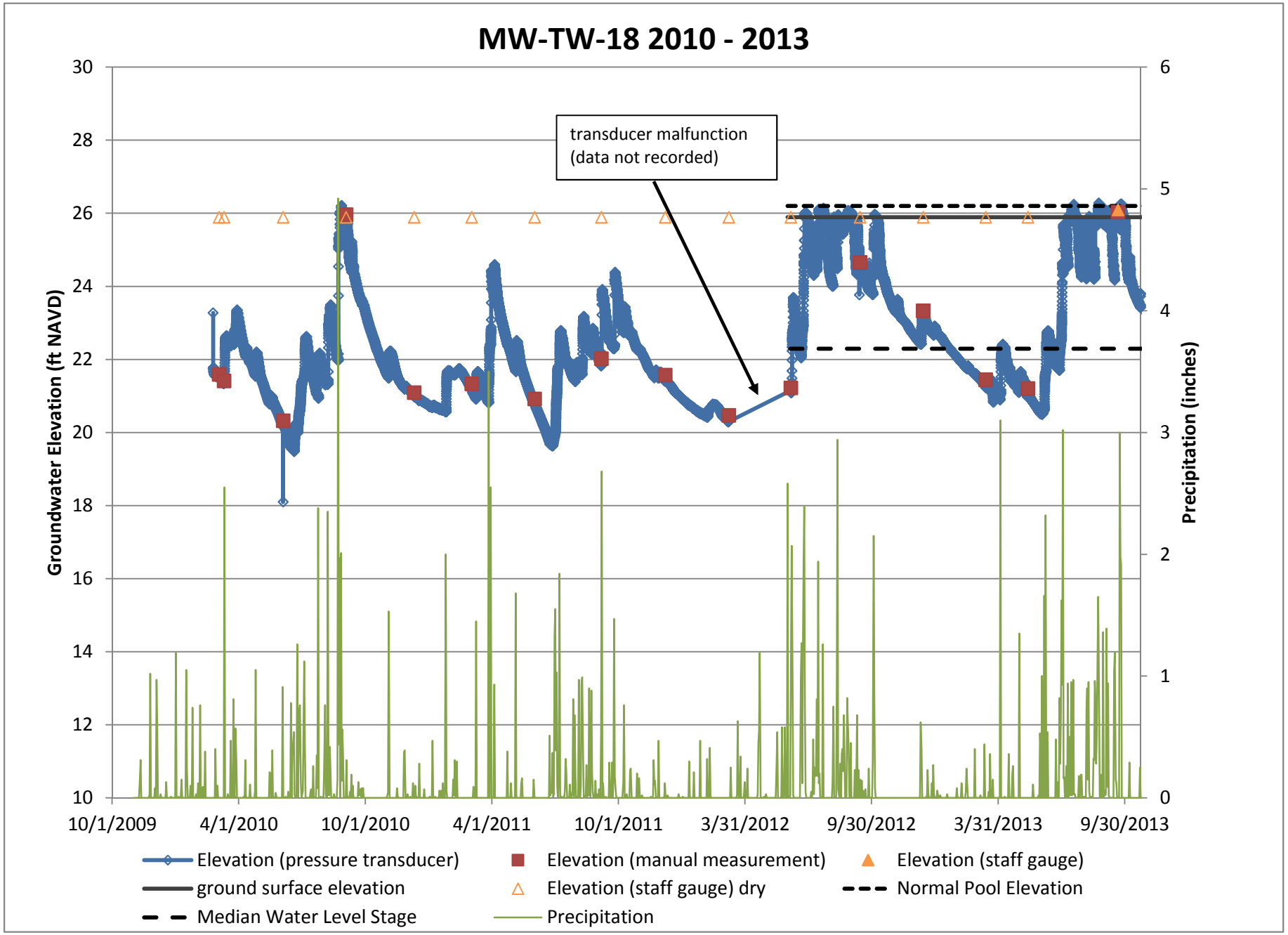

MW-TW-2 2012 - 2015
November 2013 - RAPA System Startup
Manual Transducer Failed
Telemetry Transducer Not in Water
Groundwater Elevation (ft NAVD)
Precipitation (inches)
28
26
24
22
20
18
16
14
12
10
6
5
4
3
2
1
0
6/1/12
9/9/12
12/18/12
3/28/13
7/6/13
10/14/13
1/22/14
5/2/14
8/10/14
11/18/14
2/26/15
6/6/15
9/14/15
12/23/15
Elevation (pressure transducer)
Elevation (manual measurement)
Elevation (staff gauge)
ground surface elevation
Elevation (staff gauge) dry
Normal Pool Elevation
Medial Water Level Stage
Elevation (telemetry transducer)
Normal Pool Threshold
Precipitation


MW-TW-2 2009 - 2013
Groundwater Elevation (ft NAVD)
Precipitation (inches)
30
28
26
24
22
20
18
16
14
12
10
6
5
4
3
2
1
0
10/1/2009
4/1/2010
10/1/2010
4/1/2011
10/1/2011
3/31/2012
9/30/2012
3/31/2013
9/30/2013
September 2013- Staff gauge and transducer inaccessible due to high water
Elevation (pressure transducer)
Elevation (manual measurement)
Elevation (staff gauge)
ground surface elevation
Elevation (staff gauge) dry
Normal Pool Elevation
Medial Water Level Stage
Precipitation


MW-TW-6 2012- 2015
November 2013 - RAPA System Startup
July 2014 - Infiltration Gallery (RC-7002) Startup
Manual Transducer Failed
Groundwater Elevation (ft NAVD)
Precipitation (inches)
28
26
24
22
20
18
16
14
12
10
6
5
4
3
2
1
0
6/1/12
9/9/12
12/18/12
3/28/13
7/6/13
10/14/13
1/22/14
5/2/14
8/10/14
11/18/14
2/26/15
6/6/15
9/14/15
12/23/15
Elevation (pressure transducer)
Elevation (manual measurement)
Elevation (staff gauge)
ground surface elevation
Elevation (staff gauge) dry
Normal Pool Elevation
Median Water Level Stage
Elevation (telemetry transducer)
Normal Pool Threshold
Precipitation


MW-TW-6 2009 - 2013
Groundwater Elevation (ft NAVD)
Precipitation (inches)
30
28
26
24
22
20
18
16
14
12
10
6
5
4
3
2
1
0
10/1/2009
4/1/2010
10/1/2010
4/1/2011
10/1/2011
3/31/2012
9/30/2012
3/31/2013
9/30/2013
September 2013- Staff gauge and transducer inaccessible due to high water
Elevation (pressure transducer)
Elevation (manual measurement)
Elevation (staff gauge)
ground surface elevation
Elevation (staff gauge) dry
Normal Pool Elevation
Median Water Level Stage
Precipitation


MW-TW-18 2012 - 2015
Groundwater Elevation (ft NAVD)
Precipitation (inches)
28
26
24
22
20
18
16
14
12
10
6
5
4
3
2
1
0
6/1/12
9/9/12
12/18/12
3/28/13
7/6/13
10/14/13
1/22/14
5/2/14
8/10/14
11/18/14
2/26/15
6/6/15
9/14/15
12/23/15
Manual Transducer Failed
November 2013 - RAPA System Startup
Elevation (pressure transducer)
Elevation (manual measurement)
Elevation (staff gauge)
ground surface elevation
Elevation (staff gauge) dry
Normal Pool Elevation
Median Water Level Stage
Elevation (telemetry transducer)
Normal Pool Threshold
Precipitation


MW-TW-18 2010 - 2013
transducer malfunction
(data not recorded)
Groundwater Elevation (ft NAVD)
Precipitation (inches)
30
28
26
24
22
20
18
16
14
12
10
6
5
4
3
2
1
0
10/1/2009
4/1/2010
10/1/2010
4/1/2011
10/1/2011
3/31/2012
9/30/2012
3/31/2013
9/30/2013
Elevation (pressure transducer)
Elevation (manual measurement)
Elevation (staff gauge)
ground surface elevation
Elevation (staff gauge) dry
Normal Pool Elevation
Median Water Level Stage
Precipitation