# Lockheed Martin Corporation
# Wetlands Monitoring Report
# July 2011 through June 2012
# Tallevast, Florida

Prepared for:

Lockheed Martin Corporation

Prepared by:

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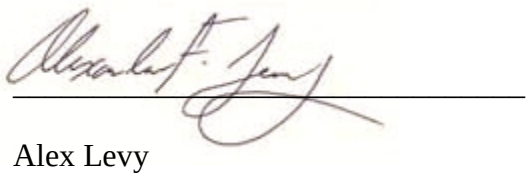

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# Acronyms, Abbreviations, and Units of Measurement

| | |
|---|---|
| ABC | American Beryllium Company |
| AD | Adaptive Zone |
| BECSD | BECSD, LLC |
| bgs | below ground surface |
| ºC | degrees Celsius |
| COC | contaminant of concern |
| D | 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 |
| FLUCFCS | Florida Land Use, Cover and Forms Classification System |
| GPS | Global Positioning System |
| HNP | historical normal pool |
| HUC | hydrologic unit code |
| HWE | historical wetland edge |
| mg/L | milligrams per liter |
| msl | mean sea level |
| mV | millivolts |
| NOAA | National Oceanic and Atmospheric Administration |
| NTU | nephelometric turbidity unit |
| OD | outer deep |
| ORP | oxidation-reduction potential |
| PVC | polyvinyl chloride |
| RAP | Remedial Action Plan |
| report | Wetlands Report |

| | |
|---|---|
| RW | Reference Wetland |
| SAS | Surficial Aquifer System |
| SARA | Site Assessment Report Addendum |
| site | Lockheed Martin Tallevast Site |
| SRQ | Sarasota-Bradenton International Airport |
| S.U. | standard units |
| SWFWMD | Southwest Florida Water Management District |
| T | transitional zone |
| Tetra Tech | Tetra Tech, Inc. |
| TW | target wetland |
| UPL | uplands |
| USAS | upper surficial aquifer system |
| USDA | U.S. Department of Agriculture |
| USEPA | U.S. Environmental Protection Agency |
| USGS | U.S. Geological Survey |
| WAP | Wetlands Assessment Procedure |
| WMP | Wetlands Monitoring Plan |
| WPI | WPI Sarasota Division, Inc. |

# Section 1
# Introduction

In conjunction with proposed groundwater remediation activities at the Lockheed Martin Tallevast Site (site), this Wetlands Monitoring Report – July 2011 through June 2012 (report) documents ongoing wetland monitoring. 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 (RAP) Addendum. The Florida Department of Environmental Protection (FDEP) approved the RAP Addendum 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 will be to assist in determining if the RAP Addendum remedy is impacting the wetlands. The first Wetlands Monitoring Report for activities through June 2010 was submitted in April 2011 (ARCADIS, 2011a). The second report for activities conducted from July 2010 through June 2011 was submitted in December 2011 (ARCADIS, 2011b). This third report is for activities conducted from July 2011 through June 2012.

The subject wetlands were selected prior to the start of monitoring 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). These wetlands are currently being monitored to establish baseline characteristics against which subsequent annual monitoring will be compared. Annual wetland monitoring data will be assessed in conjunction with the implementation of the RAP to evaluate groundwater impacts to wetlands from the former American Beryllium Company (ABC) Facility, now known as the Lockheed Martin Tallevast Facility. The “site” consists of two parts. The first is the Tallevast 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 (COCs), which is referred to as the "off-facility" portion of the site. A site location map showing the entire wetland habitat assessment study area (study area), which encompasses the site as described above as well as wetlands beyond the site, 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 Sections 1.2 and 2 of the RAP Addendum.

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 initially conducted over 5 years after RAP system start up, following establishment of a baseline composed of a minimum of 2 years, resulting in a minimum program length of 7 years. The observations presented in this report will contribute to the establishment of baseline conditions at three reference wetlands (RWs) and four target wetlands (TWs). These observations include the following:

- field observations of vegetative growth, recruitment, and mortality, as well as evidence of land use, abandonment, disturbance, and indicators of surface hydrology along the established wetland monitoring transects
- water level data gathered using staff gauges and transducers in WMP monitoring wells

This report documents the third annual assessment that is part of the baseline period.

Background resources used in the development of the WMP include the 1994 U.S. Geological Survey (USGS) 7.5-minute Topographic Quadrangle, Bradenton, FL, (USGS, 2003), and 2009 ortho(aerial)-photography from the Manatee County Geographic Information System, and Ecosystems of Florida (Myers and Ewel, 1990).

# 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).

# Section 3
# Monitoring Objectives

The RAP Addendum 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 RAP Addendum 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
- recharging the local surficial aquifer in infiltration systems designed to maintain water levels within designated wetland areas, as explained below

The RAP Addendum remedy includes the likelihood that multiple treated groundwater discharge methods will occur simultaneously. Implementation of the proposed RAP groundwater extraction system is expected to cause drawdown in the local surficial aquifer to achieve capture. Because depression of the water level is 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 RAP 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 RAP system (Figure 3-1). Also, four nearby RWs were identified for monitoring because they represent similar wetland resources that are outside the area of anticipated hydrologic influence of the RAP system. 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) 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

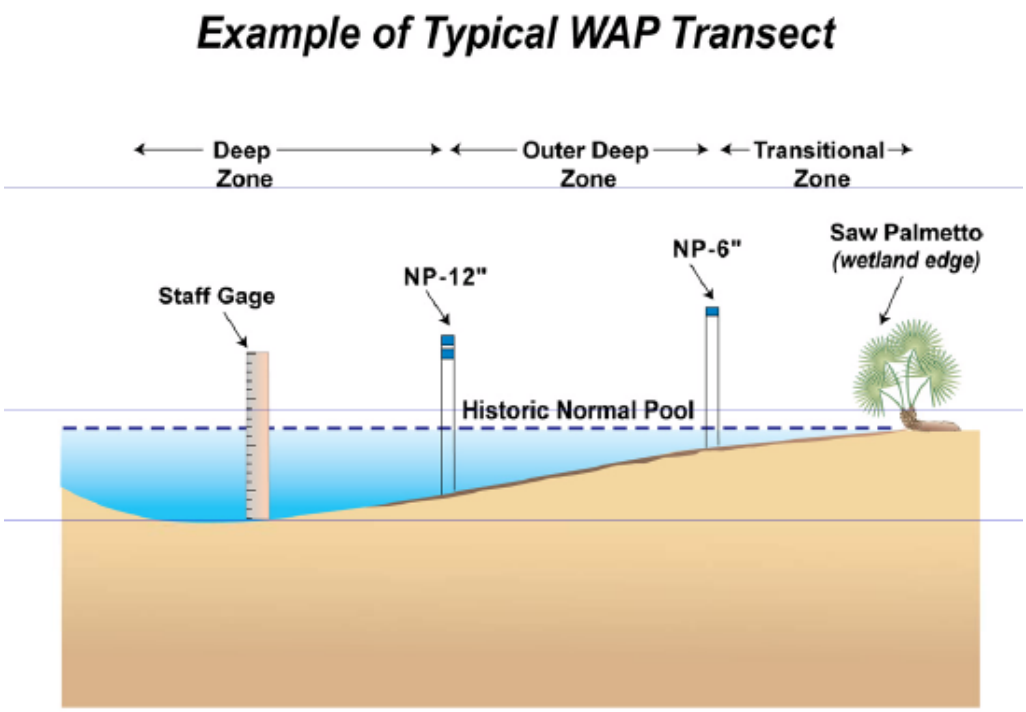
The WAP is generally required as a condition for the issuance of consumptive groundwater well authorization, which is required due to water extraction and disposal incorporated within the RAP. The objective of the WAP (SWFWMD, 2005) is to collect information on vegetation, hydrology, soils, and other 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 historical 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), while the intermediate areas between the HWE and the HNP are referred to as the adaptive zone (AD). Areas between the HNP 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 (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, augured to a depth of approximately 8 feet below the ground surface per the SWFWMD WAP.

Vegetative, hydrologic, and soil data are collected from each transect and each monument, and the monitoring well is 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 compare changes from baseline conditions to those that develop during the initial RAP implementation. These comparisons will assess change in water elevation (surface water or groundwater), periodic inundation, and vegetative changes, 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 remedy 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.

The limits of the study area do not include all land management and drainage activities, including encroachment by land development, historical and current cattle/livestock operations, introduction of exotic plant species, as well as other anthropogenic variables that may affect the biological indicators of hydrologic change that occur in the TWs and RWs included in this assessment. Therefore, the extent to which historical and current land use and vegetative cover variables effect 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 both 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 RAP system. The RAP Addendum 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 RAP extraction pumping. Therefore, it is anticipated that there will be no loss of functions or acreage within the identified TWs. Because groundwater withdrawal related to the operation of the RAP system would not constitute a consumptive-use of groundwater from the surficial aquifer, it is considerably more likely that any significant biologic changes to TWs from baseline conditions, which subsequently warrant mitigation, would be attributable to causes external to the direct effects of the RAP system. Such variables 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 11 through 12, 2012 in the Tallevast area.

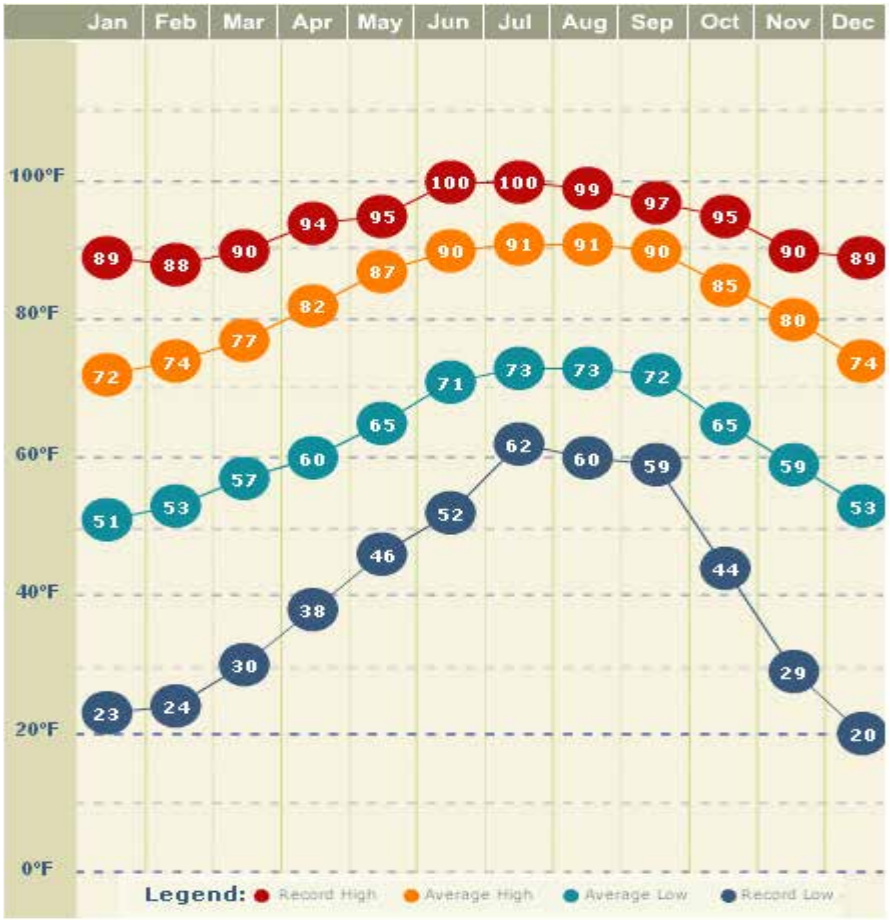
## 6.1 SITE LOCATION

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).

## 6.2 CLIMATE

The Tallevast area is located within the subtropical zone in southwest Florida. Average daytime highs 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 Figure 6-1 (below), extreme temperature records in the area range from 100 °F (38 °C) in July 1998 to 20 °F (-6 °C) in 1983.

**Figure 6-1**
**Historical Temperature Trends in the Tallevast Area**




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 6-2 (below), August is usually the wettest month of the year, with an average of 9.43 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 6-2**
**Historical Precipitation Trends in the Tallevast Area**


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 two- to three-year period prior to the initial assessment also indicate an extended period of drought. A more typical precipitation cycle, still without tropical weather, appeared to have resumed during the months preceding the 2010 WMP transect assessment. Precipitation in the 3 months preceding the 2012 WMP transect assessment (March, April and May) was more than the same 3-month period prior to the 2011 assessment except for March. In the 2 weeks prior to the 2012 assessment, more than 7 inches of total precipitation were recorded at the SRQ. Average rainfalls at the SRQ from 2002 through 2011 are presented on Table 6-1 (below).

**Table 6-1**
**Annual Precipitation Totals at Sarasota-Bradenton International Airport (SRQ), 2002-2011**

| Annual Precipitation Totals at Sarasota-Bradenton International Airport (50-Year Annual Average—54.12 inches) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **2002** | **2003** | **2004** | **2005** | **2006** | **2007** | **2008** | **2009** | **2010** | **2011** |
| 55.71 inches | 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 |

Source: www.nc-climate.ncsu.edu/cronos – Station KSRQ

## 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 feet above mean sea level (msl) to 15 feet msl. The area is approximately 1.5 to 2 miles east (inland) of Sarasota Bay and approximately 6 miles from the Gulf of Mexico. The land surface of the study area has very little relief and slopes gently toward the south-southeast.

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 moderate 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 study area are largely composed of EauGallie 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, Intermediate Aquifer System, and Floridan Aquifer. These aquifer systems are described in detail in the RAP Addendum report, and in the investigative reports that preceded the RAP Addendum. The Surficial Aquifer System (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:

- irrigation 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 study area is located along the drainage divide between two stream/canal systems, Bowlees Creek and Pearce Canal, within the 8-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 study area 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, according to the USGS, groundwater depletion due to other impacts remains an ongoing concern throughout much of west-central Florida. 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 swales throughout the Tallevast area also convey stormwater runoff to roadside and cross-country drainage channels.

## 6.6 ECOLOGY

The dominant historical habitat of the project area is pine flatwoods. According to the U.S. 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 (*Pinus elliottii* var. *densa*) and longleaf pine (*Pinus palustris*). Other infrequently occurring trees include cabbage palm (*Sabal palmetto*) and hardwoods including live oak (*Quercus*

*virginiana*), water oak (*Q. nigra*), sweet gum (*Liquidambar styraciflua*), red maple (*Acer rubrum*), and ash (*Fraxinus* spp.). Commonly occurring understory shrub species include saw palmetto (*Serenoa repens*), wax myrtle (*Morella cerifera*), blueberries (*Vaccinium* spp.), and American beautyberry (*Callicarpa americana*).

The invasive Brazilian pepper tree (*Schinus terebinthofolia*) is identified as locally dominant in both the forest understory and open rangeland scrub strata. According to the University of Florida Center for Aquatic and Invasive Plants, Brazilian pepper tree is native to Argentina, Paraguay, and Brazil. The species was brought to Florida in the middle of the 19th century for use as an ornamental plant. Distribution of Brazilian pepper tree occurs throughout the study area. 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. Plant communities such as hammocks and pineland forests are often invaded and dominated by Brazilian pepper tree. 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 study area 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 RAP system.

Following a June 2009 field assessment to establish WMP monitoring transect locations, a petition for waiver from SWFWMD jurisdiction was granted for the owner of RW-5; therefore, omitting this resource from those available for RAP system performance monitoring. The Wetland Mitigation Notice of Final Agency Action for Approval is included as Appendix B. FDEP has not required provision of an alternate RW and none are proposed as of the date on this 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 the T zone along a straight line, and access to the study 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 elevations of 6 and 12 inches below the HNP and were labeled NP-6 and NP-12, respectively. Monument locations were recorded using a Global Positioning System (GPS) unit with sub-meter accuracy. During a June 2008 study area 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 NP-6, NP-12, staff gauge, and monitoring well locations were surveyed by a professional surveyor and mapper registered in Florida (March 2010).

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 transect termini (HWE and 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 GUAGES 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

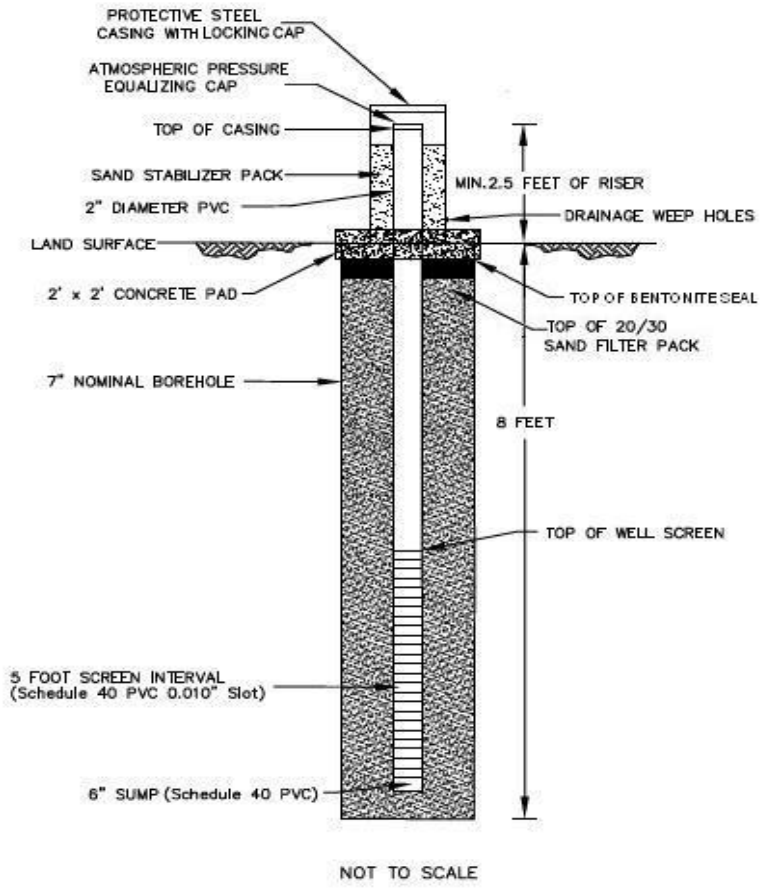
The SWFWMD well construction standards, promulgated in Florida Administrative Code (F.A.C.) Chapter 40D-3, were followed for all monitoring well installations in 2009 and 2010. All monitoring wells are constructed using 2-inch Schedule 40 PVC and installed to a depth of 8 feet below ground surface (bgs) using the mud rotary method (ASTM International Method D-5092), except for the monitoring well in TW-1 which was installed to approximately 10 feet 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 the presence of shallow water conditions.

The screened interval in the monitoring wells is 5 feet long and placed at 3 to 8 feet bgs (5 to 10 feet 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 and mapper registered in Florida, using horizontal and vertical control. Survey data are shown in Table 7-1.

As shown on Figure 7-1 (below), wellhead completion consisted of a 2- by 2-foot, 4-inch-thick concrete pad with a 2.5-foot-high riser with a lockable well cover. All development water from

the monitoring wells was contained and disposed of via the 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 1 minute apart. If during purging a well became dry, 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 are included as Appendix C).

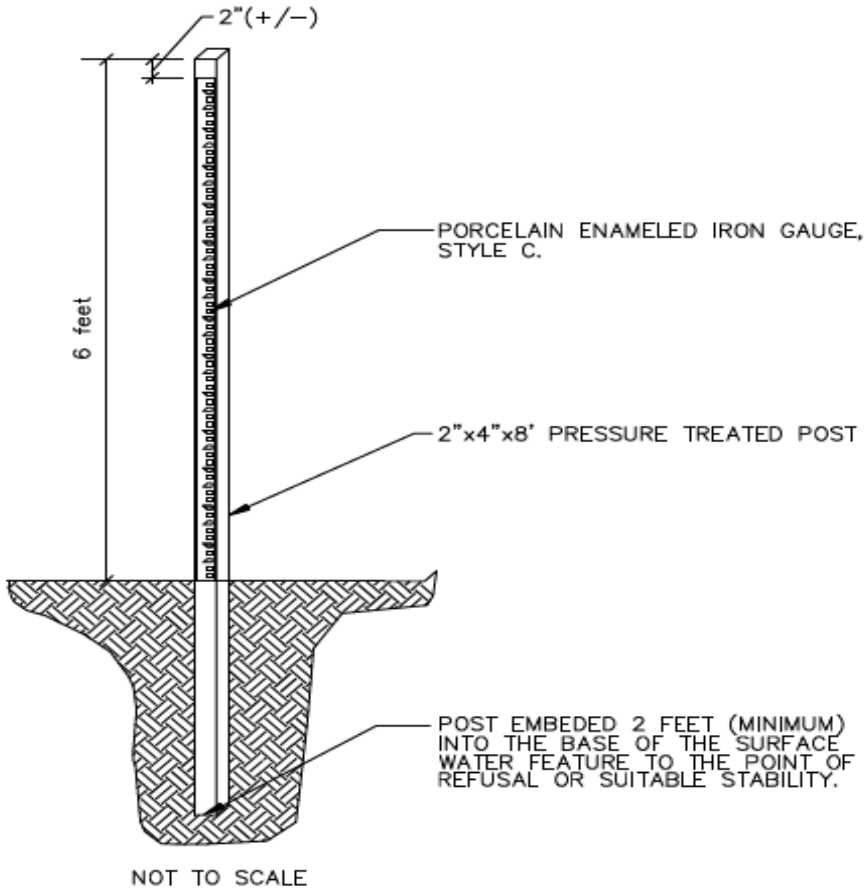
**Figure 7-1**
**Typical Well Installation Cross-Section**




## 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-foot-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 2 feet 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 7-2**
**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 7 days after installation, the data loggers were checked and data downloaded to verify that they were working correctly. Replacement transducers were installed in MW-TW-1 (March 8, 2010) and MW-RW-1 (November 19, 2009). Data from the data loggers were then downloaded after approximately 90 days and continue to be downloaded

on this schedule. The 90-day schedule coincides with existing quarterly groundwater monitoring activities. Battery life and data storage space are routinely confirmed before redeploying the equipment each quarter. 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 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.

# Section 8
# Description of Monitored Wetlands and Evaluation of Baseline Conditions

## 8.1 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 D. Other characteristics of these wetlands are provided in Table 8-1, below. Photographic documentation of conditions at each wetland is provided in Appendix E. Graphic display of transducer data is provided in Appendix F. Manual water level elevations and staff gauge measurements collected during wetland transducer downloads between July 2011 and June 2012 are summarized on Table 8-2. Baseline conditions at each target and reference wetland will be described at the conclusion of the baseline period. Included in the analysis of baseline 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. A score of "1" represents a vegetation community that lacks constituent species considered appropriate for survival in a functioning depressional wetland ecosystem. A score of "5" represents a fully functioning depressional 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 8-1
## 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 11, 2012)** | Yes | Partially | Yes | No | Yes | Partially | Yes |
| **Degree of Upland Transition** | Low | Moderate | Moderate | High | Moderate | Moderate | Moderate |
| **Evidence of Groundwater Interface** | Yes | Yes | Yes | No | Yes | Yes | Yes |

**Table 8-2**
**Summary of Manual Water Level and Staff Gauge Measurements**

| Wetland | Location | Staff Gauge 3' Survey Mark Elevation (ft msl) | Ground Surface Elevation (ft msl) | Staff Gauge Reading/Surface Water Elevation* or Groundwater Elevation (ft NAVD) | | | |
|---|---|---|---|---|---|---|---|
| | | | | Sept 2011 | Dec 2011 | Mar 2012 | June 2012 |
| RW-1 | SG-RW-1 | 16.98 | 13.90 | Dry | Dry | Dry | 1.20/15.18 |
| | MW-RW-1 | NA | 14.06 | 14.03 | 14.09 | 11.68 | 14.44 |
| RW-2 | SG-RW-2 | 20.03** | 17.40 | 0.66/17.69 | 0.40/17.43 | Dry | 0.44/17.47 |
| | MW-RW-2 | NA | 17.36 | 17.99 | 17.29 | 16.13 | 17.60 |
| RW-3 | SG-RW-3 | 23.40 | 20.77 | 1.30/21.70 | 0.80/21.20 | Dry | 0.40/20.80 |
| | MW-RW-3 | NA | 20.78 | 21.58 | 20.94 | 18.18 | 19.86 |
| TW-1 | SG-TW-1 | 25.47 | 22.40 | 1.36/23.83 | 1.00/23.47 | Dry | Dry |
| | MW-TW-1 | NA | 22.82 | 23.60 | 23.29 | 21.68 | 22.42 |
| TW-2 | SG-TW-2 | 24.19 | 21.65 | 1.65/22.84 | 1.45/22.64 | Dry | Dry |
| | MW-TW-2 | NA | 22.37 | 22.67 | 22.39 | 21.08 | 21.00 |
| TW-6 | SG-TW-6 | 23.95 | 21.05 | 2.60/23.55 | 2.14/23.09 | Dry | 0.25/21.20 |
| | MW-TW-6 | NA | 21.34 | 23.05 | 22.78 | 20.93 | 21.28 |
| TW-18 | SG-TW-18 | 29.05 | 25.89 | Dry | Dry | Dry | Dry |
| | MW-TW-18 | NA | 26.16 | 22.02 | 21.57 | 20.47 | 21.22 |

Notes: *Surface water elevation calculated as the surveyed staff gauge 3-foot elevation, minus 3 feet, plus the staff gauge reading obtained during wetland transducer download.

** SG-RW-2 resurveyed on 11/28/11 after it had been disturbed by cattle. Previous survey elevation was 21.12.

NA – Not available

NAVD – North American Vertical Datum

Blue shading – water level above ground surface

Brown shading – water level below ground surface

## 8.2 GENERAL HABITAT CONDITIONS

Often referred to as seasonal ponds, the freshwater wetlands characterized by the monitored resources occur throughout southwest Florida in the 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 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.

During the rainy season, minimal water runoff results in waterlogged and poorly aerated soils and standing water may be present for varying periods. During the dry season, high evapotranspiration draws water from upper soil horizons. Water often cannot move upward from lower horizons where there is an 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. Other species exhibiting rebound from the winter 2010 freezing temperatures include dogfennel (*Eupatorim capillifolium*) and Elliott's aster (*Symphiotrichum elliottii*). Since 2010, seasonal weather patterns are reflective of average climatic norms, with higher winter temperatures and increased precipitation. The increased precipitation has impaired the re-establishment of some native species, such as dogfennel, that prefer dryer habitat conditions and were formerly reported as dominant below the HNP elevation in many of the monitored wetland units. The 2012 findings presented below support this observation.

Widely observed evidence of wildlife during the June 2012 assessment was consistent with observations made during the 2010 baseline monitoring event and was limited to animals typically found in flatwoods. Representative wildlife observed during the June 2012 assessment included mammals such as armadillo (*Dasypus novemcinctus*), white-tailed deer (*Odecoileus virginianus*), and raccoon (*Procyon lotor*). Birds in the area included the cardinal (*Cardinalis cardinalis*), red-shouldered hawk (*Buteo lineatus*), great blue heron (*Ardea herodias*), mockingbird (*Mimus polyglottos*), house wren (*Troglodytes aedon*), and red-winged blackbird (*Agelaius phoeniceus*). The most common amphibian observed was the pinewoods tree frog (*Hyla femoralis*).

## 8.3 TARGET WETLAND 1

### 8.3.1 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 northernmost section of the three contiguous depressional areas in the wetland (Figure 1-1).

### 8.3.2 Habitat Description

The historical area of the overall TW-1 depressional wetland is approximately 15.15 acres in size. The June 2009 field review determined that approximately 11.4 acres of the 15.15-acre wetland parcel can currently be considered wetland habitat. A review of 2003 Manatee County aerial photography indicates that the overall TW-1 area is composed of three discrete, emergent, and shrubby depressional wetland areas. The northernmost of the three depressional areas was selected for WMP transect deployment due to favorable accessibility and representative landscape position within a functioning emergent habitat that exhibits minimal encroachment by non-native invasive vegetation. Until recent timbering activities, which occurred during the period between the 2011 and 2012 annual assessments, dominant vegetation surrounding TW-1 consisted of planted slash and longleaf pine trees, with hardwood scrub forest along the southern border. The effect on TW-1, from the change in adjacent vegetative cover and species composition, as well as the change in surface groundwater uptake through evapotranspiration, should be considered in the evaluation of habitat conditions during subsequent annual assessments.

### 8.3.3 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. Groundwater elevations at MW-TW-1 indicate that the groundwater levels ranged from about 3 feet bgs to about 2 feet above ground surface since monitoring began. During the current monitoring period (July 2011 to June 2012), groundwater elevations rose from about 3 feet bgs to about 1.5 feet above ground surface during the heavy rainfall period between July and September, then gradually fell down to ground surface by January 2012. They were generally at (within 1 foot or less bgs) or above ground

surface during the monitoring period from January through mid-March 2012. Between mid-March 2012 and June 1, 2012, the groundwater levels dropped sharply below the ground surface elevation until a reported heavy rain event occurred on June 1, 2012. Staff gauge measurements collected during wetland transducer downloads on September 6, 2011 and December 7, 2011 indicated standing surface water at this location, while staff gauge measurements collected during wetland transducer downloads on March 6, 2012 and June 5, 2012 indicated no standing surface water at this location (see Table 8-2). Observation during the annual wetland assessment conducted on June 11, 2012 indicated standing surface water in TW-1 near the HNP (see Appendix D). Groundwater and surface water responses to precipitation events are evident throughout the data collected to date (Appendix F).

### 8.3.4 June 2012 Field Observations

In June 2012, the northern interior sector of the TW-1 transect was dominated by a thick, matted biomass of rice cutgrass (*Leersia hexandra*), softstem rush (*Juncus effusus*), and field paspalum (*Paspalum laeve*). As discussed above, previously dominant planted pines and upland hardwood scrub vegetation surrounding the west, south, and east sides of TW-1 was reduced to scrub/shrub 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 for the 2012 assessment of 3 continues to apply, due to AD and T groundcover species occurring in high numbers (≥25 percent) and distribution in the OD and D zones. 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 shrub/sapling zonation score for the 2011 assessment of 4 also continues to apply, due to species having moved in one zone in sufficient numbers (≥5 percent) and distribution to be of concern for the long-term viability of the wetland habitat. The tree zonation score for the 2012 assessment of 3 continues to apply due to the persistent occurrence of vigorous OD willow species occurring in high numbers and distribution in the D zone.

During the June 2012 assessment, the area of originally reported wetland soil subsidence, observed in June 2009, was in the portion of the D zone where lingering inundation occurred

from the previous week's record rainfall. Also during the June 2012 monitoring event, numerous other areas of shallow inundation were observed throughout the wetland. However, the absence of floating leaf aquatic vegetation, observed in the D zone in during previous years, is strong evidence that even lingering saturation of peaty surface soils in the D zone had not persisted from the previous growing season. Therefore, the observed inundation during the 2012 assessment is construed to be of a recent nature, and its effect on persistent growing conditions would not be expected to substantially affect a progression from baseline conditions.

Except for the recent alteration of the adjacent timber-forested wetland and upland edge, no conspicuous hydrologic alterations were observed along the surface area in or near the TW-1 transect during the June 2012 assessment. However, 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 during the November 2009 through June 2012 monitoring transect screening, development, and assessment visits. While an actual hydrologic relationship has not been established for the purpose of the annual wetland habitat assessments at this location, empirical evidence suggests the potential for a significant hydrologic relationship between these two areas should continue to be evaluated during future assessments.

## 8.4 TARGET WETLAND 2

### 8.4.1 Transect Location

Beginning at the collocated monitoring well/staff gauge (installed November 4, 2009) and extending to the HWE, the TW-2 monitoring transect is oriented from west-southwest to east-northeast, in the eastern portion of the depressional wetland (Figure 1-1).

### 8.4.2 Habitat Description

The historical area of TW-2 is approximately 1.87 acres in size. The June 2009 field review determined that approximately 1.66 acres of the 1.87-acre wetland parcel can currently be considered wetland habitat. A review of 2003 aerial photography indicates that the TW-2 study area once contained an inundated area fed by a conveyance that appeared to drain stormwater

from Tallevast Road and from a commercial/industrial facility located immediately southwest of the wetland. The northern boundary of TW-2 also contained a small stormwater conveyance.

Vegetation shown in the 2003 aerial photograph of TW-2 consisted of emergent vegetation in and near the inundated area, and shrub/scrub vegetation dominating the wetland area surrounding the inundated portion. A parcel of disturbed upland and a commercial/industrial facility bordered TW-2 to the west, with upland prairie habitat surrounding the remaining areas of TW-2. Historic hydrological indicators of TW-2 suggest that this wetland was fed both by surficial stormwater sheet flow and likely by groundwater.

### 8.4.3 Monitoring Well TW-2 Data Assessment

The transducer for well MW-TW-2 was installed on November 6, 2009. Groundwater elevations at MW-TW-2 ranged from about 2 feet bgs to about 2 feet above ground surface since monitoring began. During the current monitoring period (July 2011 through June 2012), groundwater elevations began at about 1 foot bgs, then gradually rose to about 2 feet above ground surface in September 2011. Between September 2011 and January 2012, groundwater levels gradually fell to approximately ground surface. From January through May of 2012, groundwater elevations at MW-TW-2 were generally at to within 2 feet or less bgs. Then, from May through early June of 2012, a steady lowering of the groundwater elevation occurred deeper than 2 feet bgs until the June 1, 2012 event that rapidly raised the groundwater elevation to at or a few inches above ground surface. Staff gauge measurements collected during wetland transducer downloads on March 6, 2012 and June 5, 2012 indicated no standing surface water. Staff gauge measurements collected during wetland transducer downloads on September 6, 2011 and December 7, 2011 indicated standing surface water of approximately 1 foot or more at this location with a measurement at 0.80-foot during the June 11, 2012 annual wetland assessment visit (see Table 8-2 and Appendix D). Groundwater and surface water responses to precipitation events are evident throughout the data collected to date (Appendix F).

### 8.4.4 June 2012 Field Observations

As during all previous monitoring events, 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, and 2012 transect assessments. The TW-2 area displayed signs of prior and ongoing conversion to upland forested and prairie habitats. A dense stand of Carolina willow (*Salix caroliniana*) trees and shrubs lies west and southwest of an area presumed to have been a historically inundated wetland area based on interpolated aerial photography. This wooded wetland area was dominated by OD and D zone floral species, but several transitional and adaptive species are growing on hummocks in the interior of the D zone. As much as 20 inches of wetland soil subsidence caused by oxidation and gasification of carbon that result from drought and drying conditions continued to be observed in the forested core of TW-2. However, conditions during November 2009 monitoring well and staff gauge installation (MW-TW-2 and SG-TW-2), as well as during the June 2010 through June 2012 transect monitoring assessments, included normal inundation that was sufficient to submerge most of the subsided areas within the D zone. Vegetation in the area shown as inundated in the 2003 aerial photograph consists of transitional grass species and a minimal number of small shrubs. Also, in the sapling/shrub stratum, Chinese tallow tree (*Triadica sebifera*) saplings were found occurring in the T zone.

For TW-2, the herbaceous/groundcover zonation score for the 2011 assessment of 4 continued to be assigned due to species having moved in one zone in sufficient numbers and distribution to be of concern, and/or species with an adaptive classification are extensive in numbers and distribution (i.e., located beyond a few feet of the appropriate zone) in the T zone. The shrub/sapling zonation score for the 2012 assessment of 3 continued to be assigned due to adaptive and transitional species occurring in high numbers and distribution in the OD and D zones. 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 tree zonation score for the 2012 assessment of 4 continued to be assigned due to species having moved in one zone in sufficient numbers and distribution to be of concern, and/or species with an adaptive classification are extensive in numbers and distribution in the T zone.

## 8.5 TARGET WETLAND 6

### 8.5.1 Transect Location

The TW-6 monitoring transect is oriented from south to north, beginning at the collocated monitoring well/staff gauge (installed November 2, 2009) and extending to the HWE, in the north-central portion of the depressional wetland (Figure 1-1). Due to historical disturbance within the wetland, definitive evidence of an HNP elevation was not observed outside of the excavated pond within TW-6.

### 8.5.2 Habitat Description

The historical area of TW-6 is approximately 3.04 acres in size. The June 2009 field review determined that approximately 1.1 acres of the 3.04-acre wetland parcel can currently be considered wetland habitat. A review of available 1970, 1980, and 2003 aerial photography indicates that the TW-6 area contained an inundated area in its southern sector. Corresponding 2009 aerial photography depicts the previously inundated area as lacking inundation, which corroborates conditions verified during the June 2009 selection of an appropriate transect location during the study area visit. An associated forested/shrub wetland occurred north of the ponded area. Historical vegetation types consisted of emergent/shrub species in the area of inundation and a thick stand of trees/shrubs outside of the inundated area. This wetland appears to receive stormwater draining from Tallevast Road to the north, the residential property to the west, and from the pastureland to the east and south. Historical hydrological indicators of TW-6 suggest that this wetland was fed by stormwater sheet flow as well as by a likely groundwater interface within the area of inundation. An inundated portion of TW-6 was field-verified and confirmed with the long-term landowner to be an excavated pond. During the 2012 monitoring assessment visit, pastured field adjacent to TW-6 was observed with a visually lush and more vigorous cover of bahiagrass (*Paspalum notatum Flugge*) than had been observed during all previous visits and assessments since June 2009. In addition, evidence of recent construction activity for the planned RAP injection gallery was observed in the pastures adjacent to the south and east sides of the wetland.

### 8.5.3 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 from July 2010 through March 2011. Then, from March through early June of 2012, a steady lowering of the groundwater elevation occurred until the June 1 event that rapidly raised the groundwater elevation up to 1 foot above ground surface. Staff gauge measurement collected during wetland transducer download on March 6, 2012 indicated no standing surface water in TW-6. Staff gauge measurements collected during wetland transducer downloads on September 6, 2011, December 7, 2011, and June 5, 2012 indicated standing surface water at this location (see Table 8-2). Observation during the annual assessment conducted on June 11, 2012 indicated standing surface water of less than 1 inch in transition zones in TW-6 (see Appendix D). Groundwater and surface water responses to precipitation events are evident throughout the data collected to date (Appendix F).

### 8.5.4 June 2012 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, and June 2012 transect monitoring assessments. While June 11, 2012 observations include saturation and shallow inundation evidence consistent with the heavy rain event that preceded the annual habitat assessment, the section of TW-6 north of the historically inundated area continues to display evidence of conversion to upland forested scrub. Soils in this area are composed of sand and loamy sand, with marginal hydric soil indicators.

Conditions during November 2009 monitoring well and staff gauge installation, as well as during the June 2010, 2011, and 2012 transect monitoring assessments, included normal inundation that was sufficient to submerge most of the excavated pond and prohibited access to the previously described deep organic, mucky surface soils. This area was holding up to a 2-foot water column at the time of the June 2010, 2011, and 2012 observations, with cattail (*Typha latifolia*) growing throughout the almost perpetually wetted impoundment. Vegetation in the excavated pond 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. Although

migration of adaptive and upland species continued to be noted, their numbers and distribution were insufficient to warrant a reduction in the zonation score. A minimal amount of wetland soil subsidence within the wetland area outside of the pond and no wetland soil subsidence within the bed of the pond continued to be observed.

As during all previous monitoring events for TW-6, the herbaceous/groundcover zonation score for the 2012 assessment of 4 continued to be assigned due to species having moved in one zone in sufficient numbers and distribution to be of concern for the long-term viability of the wetland habitat. The shrub/sapling zonation score for the 2012 assessment of 4 continued to be assigned 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. The tree zonation score for the 2012 assessment of 4 continued to be assigned 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.

Observed hydrology during the 2012 annual monitoring event continues to suggest that groundwater is a partial source to the pond, but it is also fed by rainfall in the form of stormwater from nearby Tallevast Road. An eroded, north-to-south oriented stormwater conveyance channel continues to occur along the western boundary of TW-6. This eroded rill is likely a hydrological remnant of the historical stormwater flow path that fed the pond. Water level residues on the staff gauge continue to indicate persistent water volumes in the excavated pond are likely due to frequent and normal precipitation events.

## 8.6 TARGET WETLAND 18

### 8.6.1 Transect Location

The TW-18 monitoring transect is oriented from southeast to northwest, beginning at the collocated monitoring well/staff gauge (installed February 22, 2010) and extending to the HWE, in the northern portion of the historical depressional wetland (Figure 1-1).

### 8.6.2 Habitat Description

The historical area of TW-18 is approximately 4.08 acres in size. A review of 2003 aerial photography indicates that the TW-18 area once contained an inundated area fed by a conveyance that appeared to drain stormwater from Tallevast Road and from a commercial/industrial facility southwest of the wetland. The northern boundary of TW-18 also contained a small stormwater swale.

Vegetation shown on the 2003 aerial photograph of TW-18 consisted of emergent vegetation in and near the inundated area, and shrub/scrub vegetation dominating the wetland area surrounding the inundated portion. As during all previous monitoring events, a parcel of disturbed upland and a commercial/industrial facility continued to border TW-18 to the west, with upland-prairie habitat surrounding the remaining areas of TW-18. Historical hydrological indicators of TW-18 suggest that this wetland was fed both by surficial stormwater sheet flow and by a likely groundwater interface.

### 8.6.3 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 feet or more bgs since monitoring began in February 2010, except for a brief period in late August/early September 2010 after heavy precipitation events. Staff gauge measurements during wetland transducer downloads on September 6, 2011, December 7, 2011, March 8, 2012, and June 5, 2012, as well as observations made during the annual assessment conducted on June 12, 2012, indicate no standing surface water at this location (see Table 8-2 and Appendix D). Groundwater and surface water responses to precipitation events are evident throughout the data collected to date (Appendix F).

### 8.6.4 June 2012 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, and 2012 transect monitoring assessments. Vegetation within the historical wetland interior of TW-18 continues to consist of a forested upland hammock of 15- to 20-year-old oak/hardwood and introduced mature punk trees. Due to the known elevated evapotranspiration rate of the

species, which is hypothesized to “dry out” wetlands, the occurrence of punk trees within TW-18 may indicate prior efforts at habitat alteration and wetland reduction. A minimal number of 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 (*Serenoa repens*) thicket continues to encroach along the northern, western, and southern borders of the HWE.

As during all previous monitoring events for TW-18, the herbaceous/groundcover zonation score for the 2012 assessment is 0 due to little or no groundcover species observed and few that are WAP species. The ground surface throughout TW-18 continues to be blanketed by live oak (*Quercus virginiana*) leaf litter. Insufficient vegetative cover was available to make a meaningful evaluation about groundcover condition or zonation. The shrub/sapling zonation score for the 2012 assessment continues to be 0 due to the area having historically converted to upland habitat. While the understory remains thinly vegetated with non-wetland species, insufficient vegetative cover was present for effective WAP evaluation. The tree zonation score for the 2012 assessment continues to be 2 due to species moving in two zones in high numbers and distribution, and some species with an upland classification have moved into the D zone. However, while the WAP prescribes that AD zone species should be regarded as T zone, when occurring in the D or OD zones, it is a prevalence of upland species that continues to dominate the historic D or OD zones.

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. Soils at the TW-18 study area consist of a loamy sand matrix typical of upland forested habitats in this region of Florida. TW-18 no longer contains hydrological indicators consistent with a functional wetland. Based on the maturity of 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.

## 8.7 REFERENCE WETLAND 1

### 8.7.1 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 depressional wetland (Figure 1-1).

### 8.7.2 Habitat Description

The historical area of RW-1 is approximately 8.22 acres in size. The June 2009 field review determined that approximately 3.42 acres of the 8.22-acre wetland parcel can currently be considered wetland habitat. A review of 2003 aerial photography indicates that this study area consists of a historically inundated area, with a scrub-shrub and emergent wetland D zone. As of the June 11, 2012 monitoring assessment, upland prairie habitat continues to border the historical wetland boundary, while a dense thicket of invasive Brazilian pepper tree is ubiquitous throughout the historical T zone and innermost D zone of RW-1.

Hydrological indicators observed in the 2003 aerial photograph of RW-1 suggest that this wetland was historically fed by groundwater, but also received stormwater runoff from adjacent agricultural lands and nearby U.S. Highway 301. In the 2003 aerial photograph, less than 10 percent of this area was inundated, and inundation was limited to the interior of the southern half of the area, where indicators of a former scrub-shrub and thinly forested wetland habitat were observed during the June 2009 visit. Wetland transducer data collected since the start of the monitoring program indicate there may be a feature controlling maximum water elevations at the surface of this wetland; however, this feature has not been verified during field observations.

### 8.7.3 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 due to a malfunction. Groundwater elevations at MW-RW-1 varied from about 4 feet bgs to about 1 foot above ground surface since monitoring began in November 2009. In June 2011, groundwater elevations were about 4 feet bgs, corresponding to a dry period during May and June 2011. A rapid rise in groundwater elevations in July 2011 corresponded to the onset of heavy precipitation. From July 2011 through March of 2012, groundwater elevations

at MW-RW-1 were generally at to within 1-foot bgs or less. From March through early June of 2012, a sharp lowering of the groundwater elevation occurred until June 1, when a precipitation event rapidly raised the groundwater elevation to at or a few inches above ground surface. The staff gauge measurement collected during wetland transducer download on June 7, 2012 indicated standing surface water at this location. The staff gauge measurements collected during wetland transducer downloads on September 6, 2011, December 8, 2011, and March 6, 2012 indicated no standing surface water at this location (see Table 8-2). Observation during the annual assessment conducted on June 11, 2012 found 0.10 foot of inundation up to the HNP in RW-1 from a recent rainfall event (see Appendix D). Groundwater and surface water responses to precipitation events are evident throughout the data collected to date (Appendix F).

### 8.7.4 June 2012 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, and 2012 transect monitoring assessments. Vegetation of RW-1 is dominated by a 20-year-old stand of Brazilian pepper shrubs and small trees. Brazilian pepper is an AD species, which is a facultative wetland or upland species as defined by the FDEP. Within the historical wetland interior, only relict OD zone species occur and are limited to a few mature Carolina willow and red maple trees. These species were visibly more mature than the dominant Brazilian pepper tree, which suggest the historical nature of flatwood wetlands at this study area.

As during all previous monitoring events for RW-1, the herbaceous/groundcover zonation score for the 2012 assessment continued to be 4 due to species having moved in one zone in sufficient numbers and distribution to be of concern for the long-term viability of the wetland habitat. The shrub/sapling zonation score for the 2012 assessment continued to be 2 due to species having moved in two zones and in sufficient numbers and distribution to be of concern for the long-term viability of the wetland habitat. The tree zonation score for the 2012 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.

Up to 14 inches of wetland soil subsidence caused by oxidation and gasification of carbon that result from drought and drying conditions continued to be observed within RW-1, and relict

herbaceous wetland vegetation (i.e., Virginia chain fern) continued to be restricted to hummocks that protrude above the historical wetland floor following exposure by erosion. Soils observed within RW-1 continue to consist of a loamy sand matrix typical of more upland forested habitats within this region of Florida. Hydrologic indicators at RW-1 are no longer consistent with those typical of a functional wetland. Much of the original wetland habitat at this location likely began a transition to upland more than 20 years ago due to undetermined impacts. However, USGS 7.5-minute topographic quadrangle mapping (USGS, 1994) depicts the presence of a surface conveyance draining southeast to the nearby Pearce Canal. The overall character of observed hydric soil (wetland) indicators at RW-1 indicates a transition to a successively drier habitat.

## 8.8 REFERENCE WETLAND 2

### 8.8.1 Transect Location

The RW-2 monitoring transect is oriented from southwest to northeast beginning at the collocated monitoring well/staff gauge (installed November 3, 2009) and extending to the HWE, in the southwestern portion of the depressional wetland (Figure 1-1).

### 8.8.2 Habitat Description

The historical area of RW-2 is approximately 8.20 acres in size. The June 2009 field review determined that approximately 4.9 acres of the 8.20-acre wetland parcel can currently be considered wetland habitat. A review of 2003 aerial photography indicates that this study area 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.

Hydrological indicators observed on the 2003 aerial photograph of RW-2 suggest that the water source for this wetland was primarily from stormwater runoff that is concentrated in two linear drainage features that enter RW-2 at the northeastern and northwestern portions of its historical wetland boundary. During the June 11, 2012 study area visit, surface drainage was observed actively flowing toward the Pearce Canal in a historically excavated swale at the southeastern corner of RW-2.

### 8.8.3 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 feet bgs to about 2 feet above ground surface since monitoring began in November 2009. The current monitoring period is between July 2011 and June 2012. During June 2011, groundwater elevations were below ground surface, but they rose to about 1 foot above ground surface in July 2011, corresponding with the onset of heavy precipitation. Groundwater elevations remained above ground surface until late December 2011. From January through March of 2012, groundwater elevations at MW-RW-2 were generally at to within 1-foot bgs or less. From March through early June of 2012, a sharp lowering of the groundwater elevation occurred until June 1, when a precipitation event raised the groundwater elevation to a few inches above ground surface. Staff gauge measurements obtained during wetland transducer downloads on September 6, 2011, December 7, 2011, and June 5, 2012 indicated standing surface water at this location. The staff gauge measurement collected on March 6, 2012 indicated no standing surface water at this location (see Table 8-2). Observation during the annual assessment conducted on June 11, 2012 found no standing surface water in RW-2 (see Appendix D). Groundwater and surface water responses to precipitation events are evident throughout the data collected to date (Appendix F).

### 8.8.4 June 2012 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, and 2012 transect monitoring assessments. Several D zone and aquatic floral species continued to occur in the interior of RW-2, but vegetation of this wetland is increasingly dominated by OD zone and T zone species. Evidence of prior conversion of RW-2 to upland forest, observed during the initial June 2009 field investigation, continued to be observed on June 11, 2012. Of the 8.20-acre wetland parcel originally identified from aerial photography prior to the June 2009 investigation, 4.9 acres continue to be functioning wetland habitat.

As during all previous monitoring events for RW-2, the herbaceous/groundcover zonation score for the 2012 assessment continued to be 3 due to T zone groundcover species occurring in high numbers and distribution in the OD 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" to be of concern for the long-term viability of the wetland habitat. The shrub/sapling zonation score for the 2012 assessment continued to be 3 due to AD zone shrub and small tree species occurring in high numbers and distribution in the OD 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" to be of concern for the long-term viability of the wetland habitat. The tree zonation score for the 2012 assessment continued to be 3 due to T zone tree species occurring in enough numbers and distribution in the OD and D zones. 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" to be of concern for the long-term viability of the wetland habitat.

The area of RW-2 most typical of wetland habitat occurs in the upper central sector of the historical wetland boundary (the monitoring transect was established in this location). This area continues to be dominated by OD and D zone floral species, but adaptive and upland species continue to migrate into the wetland area. The transitional and adaptive wetland floral species in the section of RW-2 south of the transected wetland are limited to an area that was excavated and dammed many years ago. According to the landowner, this excavated area was once used to collect and hold stormwater for livestock. A small concrete weir constructed to dam this excavated area has failed and is no longer functional, which has allowed most of this wetland to return to upland habitat.

As during all previous monitoring events for RW-2, up to 20 inches of wetland soil subsidence caused by oxidation and gasification of carbon that result from drought and drying conditions continued to be observed. The subsidence of this wetland area is likely due to hydrological alterations of both surface and groundwater. Evidence of active and continuous trampling by cattle in this area of RW-2 was observed during the June 11, 2012 annual assessment and has visibly increased the rate of wetland soil subsidence through direct compaction.

## 8.9 REFERENCE WETLAND 3

### 8.9.1 Transect Location

The RW-3 monitoring transect is oriented from northeast to southwest beginning at the collocated monitoring well/staff gauge (installed November 2, 2009) and extending to the HWE, in the northwestern portion of the depressional wetland (Figure 1-1).

### 8.9.2 Habitat Description

The historical area of RW-3 is approximately 10.45 acres in size. The June 2009 field review determined that approximately 6.3 acres of the 10.45-acre wetland parcel can currently be considered wetland habitat. A review of 2003 aerial photography indicates that this study area primarily consisted of an emergent wetland that was frequently inundated. Upland pasture and scrub 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 suggest that the water source for this wetland was primarily groundwater, but there also was a stormwater source. The 2003 aerial photograph shows 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-3in 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 2006 aerial photograph of RW 3 also shows this area as inundated.

### 8.9.3 Monitoring Well RW-3 Data Assessment

The transducer for well MW-RW-3 was installed on November 6, 2009. Groundwater elevations in monitoring well RW-3 varied between about 4 feet bgs to about 3 feet above ground surface since monitoring began in November 2009. The current monitoring period is between July 2011 and June 2012. During June 2011, groundwater elevations were below ground surface, but they rose to about 1 foot above ground surface in July 2011, corresponding with the onset of heavy precipitation. Groundwater elevations remained above ground surface until December 2011. From December 2011 through early June of 2012, the groundwater elevation declined until it

reached about 4 feet bgs. On June 1, a precipitation event raised the groundwater elevation to at or above ground surface. Staff gauge measurements collected during wetland transducer downloads on September 6, 2011, December 7, 2011, and June 5 2012 indicated standing water at this location. The staff gauge measurement collected during the wetland transducer download on March 6, 2012 indicated no standing surface water at this location (see Table 8-2). However, the staff gauge measurement observed during the annual wetland assessment on June 11, 2012 indicated inundation at 1.24 feet above the ground surface (see Appendix D). Groundwater and surface water responses to precipitation events are evident throughout the data collected to date (Appendix F).

### 8.9.4 June 2012 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, and 2012 transect monitoring assessments. Evidence of prior conversion of RW-3 to upland prairie continued to be observed. Of the 10.45-acre wetland parcel identified, approximately 6.3 acres are currently functional wetland habitat. The lower half of RW-3 is rapidly transitioning to upland.

As during all previous monitoring events for RW-3, the herbaceous/groundcover zonation score for the 2012 assessment continued to be 4 due to adaptive and transitional groundcover species occurring in high numbers and distribution in the OD and D zones. 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”. While there was a virtual absence of woody vegetation in the OD and D zones, the shrub/sapling zonation score for the 2012 assessment continued to be 3 due to species having moved in one zone in sufficient numbers and distribution to be of concern for the long-term viability of the wetland habitat. The tree zonation score for the 2012 assessment continued to be 0 due to the absence of trees in the T, OD, and D zones.

During the 2012 assessment, the monitoring transect established in the northwestern quadrant of RW-3 continued to display the most typical wetland habitat. This area continued to be dominated by OD and D zone floral species, but adaptive and upland species are migrating into the outer limits of the wetland. While struggling against periodic inundation, opportunistic ruderal

(adaptive) upland species continue to dominate the prairie vegetation of areas outside of the wetland area identified by the June 2009 field investigation. Soils of the wetland interior continued to be consistent with sandy wetland soils, and the soils of the transitional and upland areas are composed of upland loamy sands.

A small amount of wetland soil subsidence caused by oxidation and gasification of carbon that are the result of prolonged drought and drying conditions was observed in the interior of the western wetland boundary; however, indicators of active wetland soil subsidence were obscured by previous landowner attempts (confirmed) to excavate areas within the D zone to dewater the study area and create wallows for livestock. No obvious evidence of surficial hydrological impacts was observed.

# Section 9
# Conclusions

Implementation of the July 2009 WMP has commenced. Staff gauges and monitoring wells were installed between November 2009 and February 2010. The start of the minimum 2-year baseline period is considered to be November 2009 except for TW-1 and TW-18, for which the start of the minimum 2-year baseline is considered February 2010. Currently, data are being collected to establish baseline conditions in the wetlands using the SWFWMD assessment procedures. This monitoring is conducted in accordance with an FDEP requirement for wetlands monitoring associated with the anticipated installation and activation of a groundwater remediation system for the site.

In each of the area wetlands (TWs nearer the facility and RWs in the greater Tallevast area), data have been collected and conditions have been evaluated for a minimum of 2 years (through November 2011 or February 2012, as appropriate) prior to groundwater extraction associated with the RAP Addendum implementation. These data are being used to establish a baseline of groundwater and surficial wetland hydrology information to better understand local fluctuations in groundwater elevation and the corresponding effect on the habitat and function of the depressional wetlands within the isolated area. The collection and evaluation of these data are to be used to establish thresholds for determining whether TWs require hydraulic maintenance or compensatory mitigation as a result of RAP system operation and potential impacts of regional changes on wetlands.

Groundwater elevation data in wetlands will continue to be collected approximately every 90 days, with annual WMP investigations occurring in May or June of each successive year. A subsequent baseline findings report and comparative analysis with local climate and previously collected data will be issued following the annual WMP investigations.

# Section 10
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# TABLES

**TABLE 7-1**
**WETLANDS MONITORING REPORT SURVEY DATA**

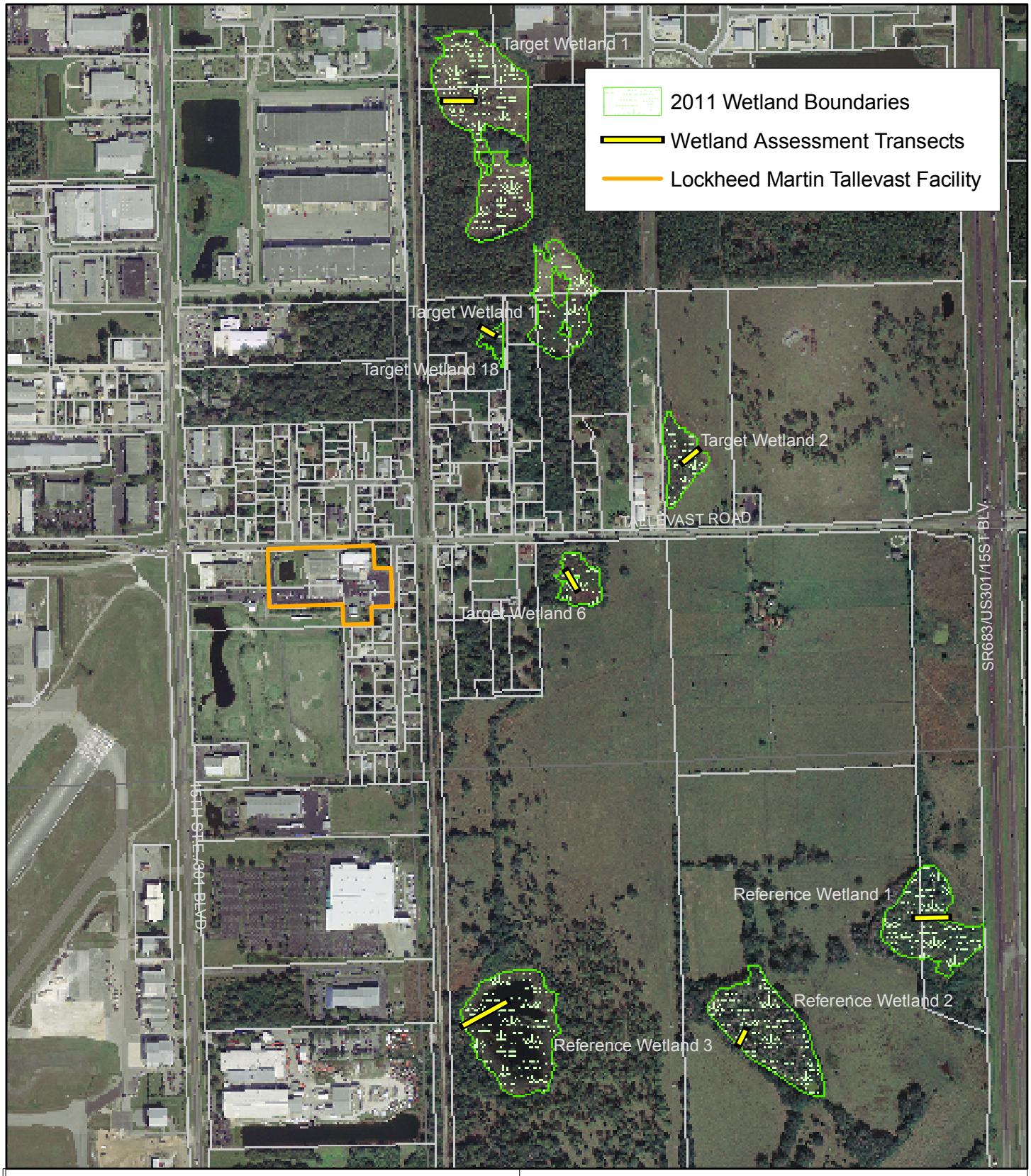
**Wetlands Monitoring Report**
Lockheed Martin Tallevast Site
Tallevast, Florida

| Description | State Plane North | State Plane East | Top 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 | 1113697.44 | 480440.70 | 23.73 | NA | 20.77 | 23.40 | 21.40 | 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
ft msl - feet mean sea level

# FIGURES




N

0 250 500 1,000

Scale in Feet

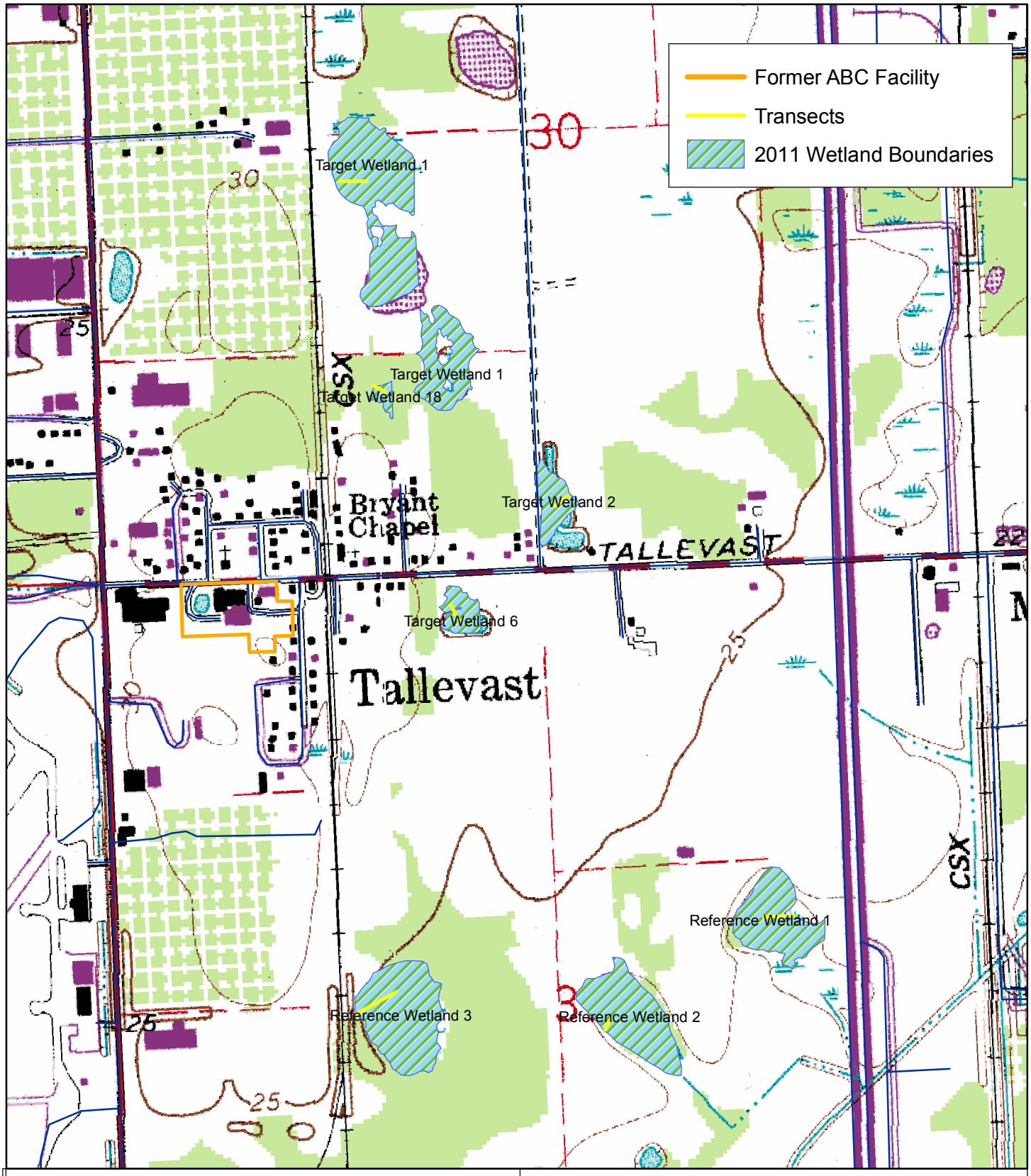

LOCKHEED MARTIN TALLEVAST SITE
TALLEVAST, FLORIDA
WETLANDS MONITORING PLAN

Wetland and Transect Location Map

ARCADIS

Figure 1-1

R625-STA-002274-0

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Scale in Feet


FLORIDA

LOCKHEED MARTIN TALLEVAST SITE
TALLEVAST, FLORIDA
WETLANDS MONITORING PLAN

Wetland and Transect Location Map

ARCADIS

Figure 3-1

R625-STA-002274-0

# APPENDICES

# APPENDIX A

## Palmer Drought Severity Index Graphs

NOAA Satellite and Information Service
National Environmental Satellite, Data, and Information Service (NESDIS)

National Climatic Data Center
U.S. Department of Commerce

DOC > NOAA > NESDIS > NCDC Search Field: Search NCDC

Land-Based Data / NNDC CDO / Product Search / Help

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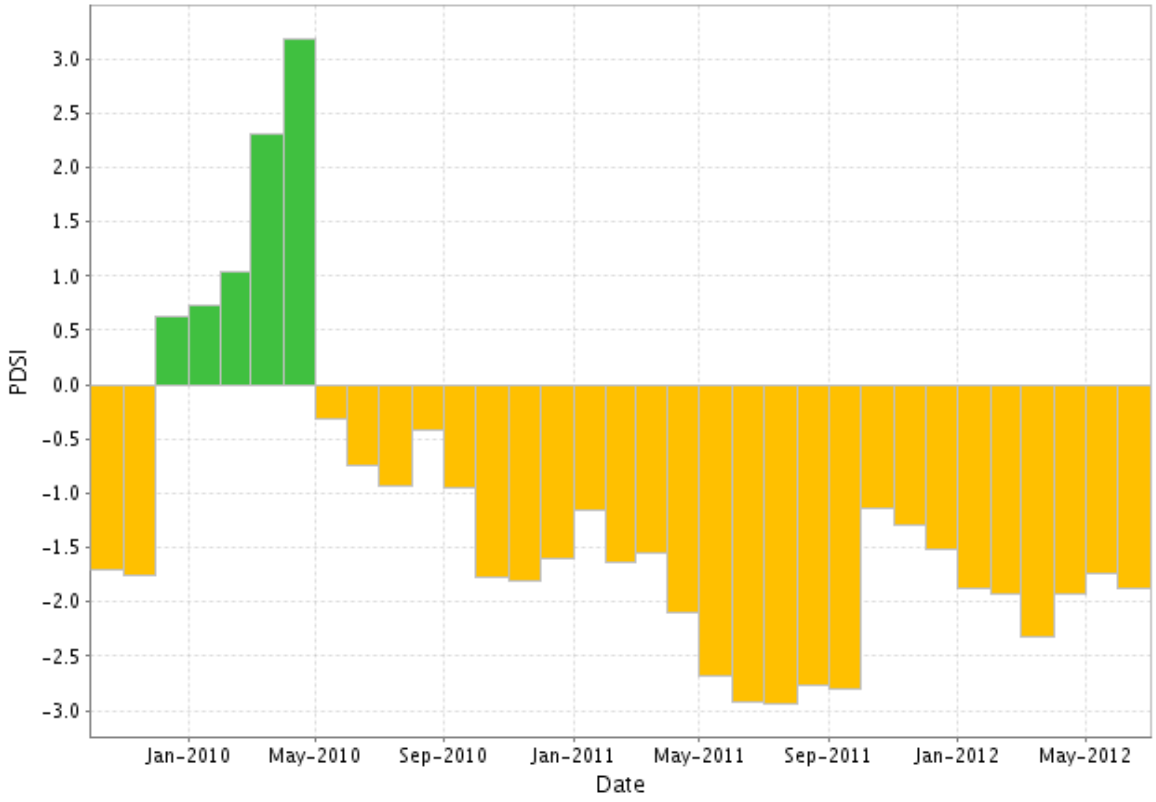
## 200910 - 201207

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National Environmental Satellite, Data, and Information Service (NESDIS)

National Climatic Data Center
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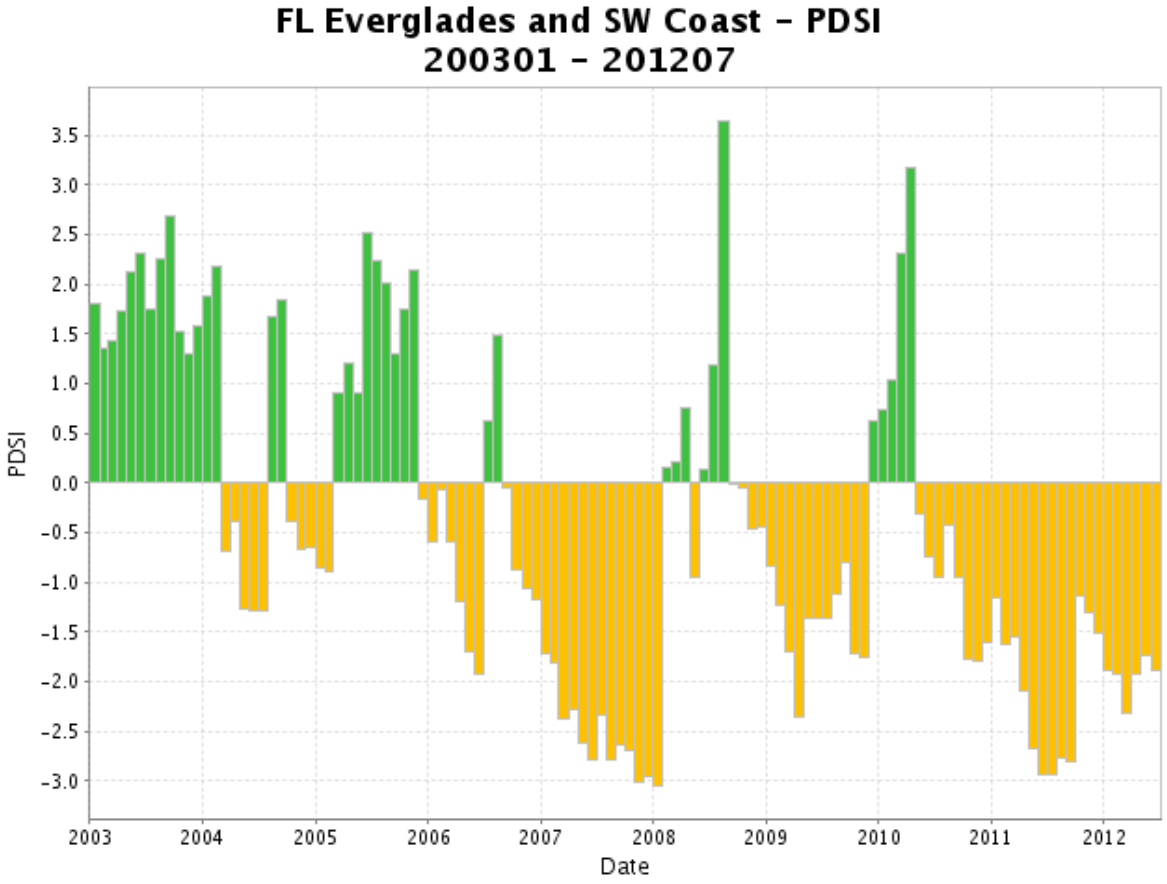
Land-Based Data / NNDC CDO / Product Search / Help

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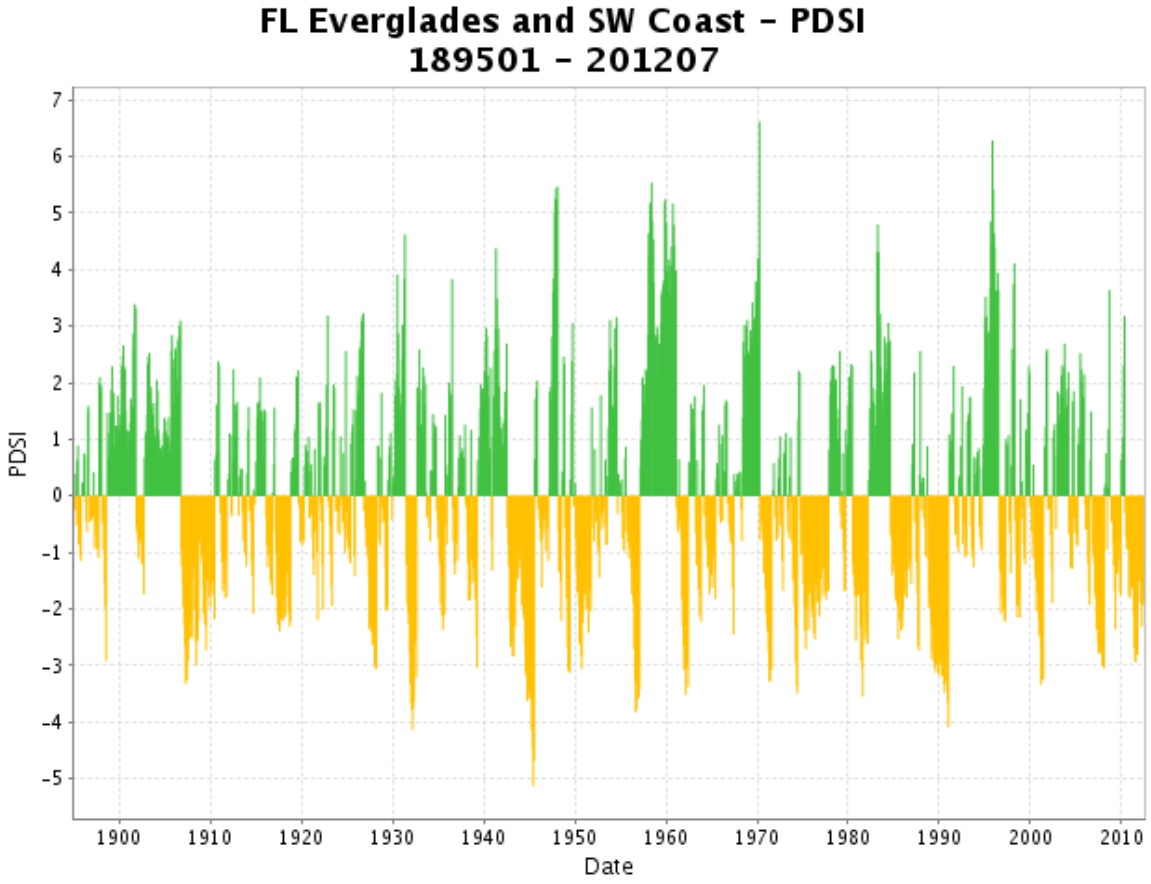
DOC > NOAA > NESDIS > NCDC Search Field: Search NCDC

Land-Based Data / NNDC CDO / Product Search / Help




Privacy Policy USA.gov Disclaimer

# APPENDIX B

## Wetland Mitigation Notice of Final Agency Action for Approval

Complete

Southwest Florida Water Management District
2379 Broad Street, Brooksville, Florida 34604-6899
(352) 796-7211 or 1-800-423-1476 (FL only)
SUNCOM 628-4150 TDD only 1-800-231-6103 (FL only)
*On the Internet at:* WaterMatters.org

An Equal Opportunity Employer

**Bartow Service Office**
170 Century Boulevard
Bartow, Florida 33830-7700
(863) 534-1448 or
1-800-492-7862 (FL only)

**Sarasota Service Office**
6750 Fruitville Road
Sarasota, Florida 34240-9711
(941) 377-3722 or
1-800-320-3503 (FL only)

**Tampa Service Office**
7601 Highway 301 North
Tampa, Florida 33637-6759
(813) 985-7481 or
1-800-836-0797 (FL only)

October 27, 2010

Swift Holdings
Tallevast Comm Ctr

Lakewood Ranch Town Center Owners Association
14400 Covenant Way
Lakeweood Ranch, FL 34202

Subject: **Notice of Final Agency Action for Approval**
ERP Short Form

| | |
|---|---|
| Project Name: | Braden River Mitigation Bank |
| App ID/Permit No: | 640067 / 44024579.003 |
| County: | MANATEE |
| Letter Received: | October 01, 2010 |
| Expiration Date: | October 27, 2015 |
| Sec/Twp/Rge: | 23/35S/19E |

Reference: Chapters 40D-4 and 40, Florida Administrative Code (F.A.C)
Sections 373.4141 and 120.60, Florida Status (F.S)

Dear Permittee(s):

Your request to modify Permit No. 43024579.000 by Short Form has been approved. This modification authorizes:

1. The withdrawal of 0.50 mitigation credits to mitigate for wetland impacts associated with ERP No. 43014262.003, entitled "Tallevast Commercial Center". The 0.50 credits will be withdrawn from the following credit categories: 0.50 credits from Freshwater Herbaceous.

2. The updated and attached Attachment 5, Exhibits A and B (Mitigation Credit Ledger) is a part of this Short Form Modification.

3. All other terms and conditions of Permit No. 43024579.000, dated March 28, 2006, and entitled "Braden River Mitigation Bank", apply.

Plans and information you submitted to support your request to modifiy this permit will be kept on file.

Final approval is contingent upon no objection to the District's action being received by the District within the time frames described below.

You or any person whose substantial interests are affected by the District's action regarding a permit may request an administrative hearing in accordance with Sections 120.569 and 120.57, F.S., and Chapter 28-106, F.A.C., of the Uniform Rules of Procedure. A request for hearing must: (1) explain how the substantial interests of each person requesting the hearing will be affected by the District's action, or proposed action, (2) state all material facts disputed by the person requesting the hearing or state that there are no disputed facts, and (3) otherwise comply with Chapter 28-106, F.A.C. Copies of Sections 28-106.201 and 28-106.301, F.A.C. are enclosed for reference. A request for hearing must be filed with (received by) the Agency Clerk of the District at the District's Brooksville address within 21 days of receipt of this notice. Receipt is deemed to be the fifth day after the date on which this notice is deposited in the United States mail. Failure to file a request for hearing within this time period shall constitute a waiver of any right you or such person may have to request a hearing under Sections 120.569 and 120.57, F.S. Mediation pursuant to Section 120.573, F.S., to settle an administrative dispute regarding the District's action in this matter is not available

prior to the filing of a request for hearing.

Enclosed is a "Noticing Packet" that provides information regarding District Rule, 40D-1.1010, F.A.C., which addresses the notification of persons whose substantial interests may be affected by the District's action in this matter. The packet contains guidelines on how to provide notice of the District's action, and a notice that you may use.

Approved construction plans are part of the permit, and construction must be in accordance with these plans. *These drawings are available for viewing or downloading at* www.watermatters.org.

If you have questions regarding this letter modification, please contact Tasha Bowers, at the Sarasota Service Office, extension 6538. For assistance with environmental concerns, please contact Tasha Bowers, extension 6538.

Sincerely,

**Ross T. Morton, P.W.S.**
Authorized Signature
Director, Sarasota Regulation Department

Enclosures: Section 28-106.201 and 28-106.301, F.A.C.
Notice of Packet (42.00-039)

cc: Gary S. Comp, WilsonMiller Stantec

R625-STA-002274-0

# ATTACHMENT 5, EXHIBIT A
## Braden River Mitigation Bank
## ERP 43024579.004
## Mitigation Credit Ledger
## Freshwater Herbaceous Wetland Credits

| Date | Source of Credits (If Crediting) | Entity Using Credits (If Debiting) | Permit Number of Credit User (If Debiting) | Credits Currently Available | Credits Added (If Crediting) | Credits Used (If Debiting) | Credit Balance |
|---|---|---|---|---|---|---|---|
| 24-Jan-07 | Polygons 3, 8, 9,10, 11 | N/A | N/A | 0.00 | 21.05 | 0.00 | 21.05 |
| 1-Sep-10 | N/A | Ring Power Corporation | 43026960.002 | 21.05 | N/A | 0.72 | 20.33 |
| 8-Oct-10 | N/A | Tallevast Commerce Center | 43024579.003 | 20.33 | N/A | 0.50 | 19.83 |
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# APPENDIX C

## Borehole Logs and Well Completion Diagrams

ARCADIS
Infrastructure, environment, facilities

# DRILLING LOG

| | |
|---|---|
| Project Name: Lockheed Martin Tallevast Site | **ID: MW-TW-1** |
| Project #: B0038055 | |
| Location: Tallevast, Florida | Total Depth: 10 feet bls |
| Date Drilled: 2/22/2010 | Screened Interval: 5-10 feet bls |
| Drilling Contractor/Method: Huss / Mud Rotary | Well Diameter 2 inches |
| Ground Surface Elevation: 22.44 ft msl | Monitoring Device: PID |
| Measuring Point Elevation: 26.72 ft msl | Logged by: Sara Klimek |

| Depth Below Surface (Feet) | Blow Counts per 6" | Recovery (%) | PID/FID reading (PPM) | Lithologic Description | Graphic Log | Well Construction | Depth Below Surface (Feet) |
|---|---|---|---|---|---|---|---|
| | | | | | | Steel Protective Casing | |
| | | | | | | Concrete Pad | |
| 0.0 | | | 0.0 | Lithologic descriptions of drill cuttings are not available because the well was installed in water using a mud rotary tripod rig | | 2" Schedule 40 PVC Riser | 0.0 |
| | | | | | | 20/30 Sand Pack | |
| 5.0 | | | | | | 2" Schedule 40 PVC 0.010 Slot Screen | 5.0 |
| 10.0 | | | | | | | 10.0 |

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ARCADIS
Infrastructure, environment, facilities

# DRILLING LOG

| | |
|---|---|
| Project Name: Lockheed Martin Tallevast Site | **ID: MW-TW-2** |
| Project #: B0038055 | Total Depth: 8 feet bls |
| Location: Tallevast, Florida | Screened Interval: 3-8 feet bls |
| Date Drilled: 11/4/2009 | Well Diameter 2 inches |
| Drilling Contractor/Method: AM Drill / CME 45 | Monitoring Device: A verbal interview of the field geologist indicates a PID was used and there were no readings above zero. |
| Ground Surface Elevation: 21.65 ft msl | Logged by: Sara Klimek |
| Measuring Point Elevation: 26.29 ft msl | |

| Depth Below Surface (Feet) | Blow Counts per 6" | Recovery (%) | PID/FID reading (PPM) | Lithologic Description | Graphic Log | Well Construction | Depth Below Surface (Feet) |
|---|---|---|---|---|---|---|---|
| 0.0 | | Hand-Auger | | **0-0.5':** Dark brown organic rich very fine sand, little roots, moist, no odor<br>**0.5-5':** Brown very fine sand grading to light brown fine sand, water table at 2.5 ft bgs | | Steel Protective Casing; Concrete Pad; Bentonite Seal; 2" Schedule 40 PVC Riser; 20/30 Sand Pack | 0.0 |
| 5.0 | | Drill Cuttings | | **5-8':** Light brown fine sand, wet, loose, no odor | | 2" Schedule 40 PVC 0.010 Slot Screen | 5.0 |
| 10.0 | | | | | | | 10.0 |

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ARCADIS
*Infrastructure, environment, facilities*

# DRILLING LOG

| | |
|---|---|
| Project Name: Lockheed Martin Tallevast Site | **ID: MW-TW-6** |
| Project #: B0038055 | Total Depth: 8 feet bls |
| Location: Tallevast, Florida | Screened Interval: 3-8 feet bls |
| Date Drilled: 11/3/2009 | Well Diamater 2 inches |
| Drilling Contractor/Method: AM Drill / CME 45 | Monitoring Device: A verbal interview of the field geologist indicates a PID was used and there were no readings above zero. |
| Ground Surface Elevation: 21.05 ft msl | Logged by: Sara Klimek |
| Measuring Point Elevation: 25.11 ft msl | |

| Depth Below Surface (Feet) | Blow Counts per 6" | Recovery (%) | PID/FID reading (PPM) | Lithologic Description | Graphic Log | Well Construction | Depth Below Surface (Feet) |
|---|---|---|---|---|---|---|---|
| 0.0 | | Hand-Auger | | **0 -6':** Dark brown marshy very fine sandy silt, very loose, wet, little organics, organic odor | | Steel Protective Casing; Concrete Pad; Bentonite Seal; 2" Schedule 40 PVC Riser; 20/30 Sand Pack | 0.0 |
| 5.0 | | Drill Cuttings | | **6-8':** Brown fine sand, mod dense, wet, no odor | | 2" Schedule 40 PVC 0.010 Slot Screen | 5.0 |
| 10.0 | | | | | | | 10.0 |

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ARCADIS
Infrastructure, environment, facilities

# DRILLING LOG

| | |
|---|---|
| Project Name: Lockheed Martin Tallevast Site | **ID: MW-TW-18** |
| Project #: B0038055 | Total Depth: 8 feet bls |
| Location: Tallevast, Florida | Screened Interval: 3-8 feet bls |
| Date Drilled: 2/22/2010 | Well Diameter 2-inches |
| Drilling Contractor/Method: Huss / Mud Rotary | Monitoring Device: PID |
| Ground Surface Elevation: 25.89 ft msl | Logged by: Sara Klimek |
| Measuring Point Elevation: 29.15 ft msl | |

| Depth Below Surface (Feet) | Blow Counts per 6" | Recovery (%) | PID/FID reading (PPM) | Lithologic Description | Graphic Log | Well Construction | Depth Below Surface (Feet) |
|---|---|---|---|---|---|---|---|
| 0.0 | | Hand-Auger | 0.0 | **0 -2':** Dark brown fine sand, some roots, dry | | Steel Protective Casing; Concrete Pad | 0.0 |
| | | | 0.0 | **2-5':** Light brown fine sand, dry to moist with depth, no odor | | Bentonite Seal; 2" Schedule 40 PVC Riser | |
| 5.0 | | Drill Cuttings | 0.0 | **5-8':** Drill mud return - Light brown silt and fine sand, no odor | | 20/30 Sand Pack; 2" Schedule 40 PVC 0.010 Slot Screen | 5.0 |
| 10.0 | | | | | | | 10.0 |

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Infrastructure, environment, facilities

# DRILLING LOG

| | |
|---|---|
| Project Name: Lockheed Martin Tallevast Site | **ID: MW-RW-1** |
| Project #: B0038055 | |
| Location: Tallevast, Florida | Total Depth: 8 feet bls |
| Date Drilled: 11/3/2009 | Screened Interval: 3-8 feet bls |
| Drilling Contractor/Method: AM Drill / CME 45 | Well Diamater 2 inches |
| Ground Surface Elevation: 13.90 ft msl | Monitoring Device: A verbal interview of the field geologist indicates a PID was used and there were no readings above zero. |
| Measuring Point Elevation: 18.44 ft msl | Logged by: Sara Klimek |

| Depth Below Surface (Feet) | Blow Counts per 6" | Recovery (%) | PID/FID reading (PPM) | Lithologic Description | Graphic Log | Well Construction | Depth Below Surface (Feet) |
|---|---|---|---|---|---|---|---|
| 0.0 | | Hand-Auger | | **0 -2':** Dark brown organic very fine sandy silt, moist, trace organics, no odor | | Steel Protective Casing; Concrete Pad; Bentonite Seal; 2" Schedule 40 PVC Riser | 0.0 |
| | | | | **2-8':** Dark brown grading to brown fine sand, mod dense, wet at 4 ft bgs, no odor | | 20/30 Sand Pack | |
| 5.0 | | Drill Cuttings | | | | 2" Schedule 40 PVC 0.010 Slot Screen | 5.0 |
| 10.0 | | | | | | | 10.0 |

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ARCADIS
Infrastructure, environment, facilities

# DRILLING LOG

| | |
|---|---|
| Project Name: Lockheed Martin Tallevast Site | **ID: MW-RW-2** |
| Project #: B0038055 | Total Depth: 8 feet bls |
| Location: Tallevast, Florida | Screened Interval: 3-8 feet bls |
| Date Drilled: 11/2/2009 | Well Diamater 2-inches |
| Drilling Contractor:/ Method AM Drill / CME 45 | Monitoring Device: A verbal interview of the field geologist indicates a PID was used and there were no readings above zero. |
| Ground Surface Elevation: 17.40 ft msl | Logged by: Sara Klimek |
| Measuring Point Elevation: 21.19 ft msl | |

| Depth Below Surface (Feet) | Blow Counts per 6" | Recovery (%) | PID/FID reading (PPM) | Lithologic Description | Graphic Log | Well Construction | Depth Below Surface (Feet) |
|---|---|---|---|---|---|---|---|
| | | | | | | Steel Protective Casing | |
| 0.0 | | Hand-Auger | | **0 -5':** Dark brown organic very fine sand, roots, moist to wet 3.5 ft, no odor, trace silt and clay | | Concrete Pad; Bentonite Seal; 2" Schedule 40 PVC Riser; 20/30 Sand Pack | 0.0 |
| 5.0 | | Drill Cuttings | | **5-8':** Brown fine sandy silt, very loose, wet, no odor | | 2" Schedule 40 PVC 0.010 Slot Screen | 5.0 |
| 10.0 | | | | | | | 10.0 |

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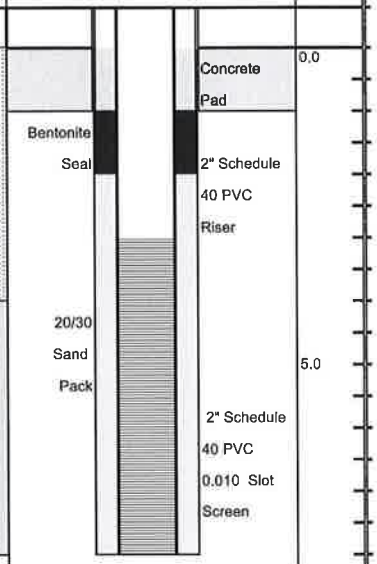
ARCADIS
Infrastructure, environment, facilities

# DRILLING LOG

| | |
|---|---|
| Project Name: Lockheed Martin Tallevast Site | **ID: MW-RW-3** |
| Project #: B0038055 | |
| Location: Tallevast, Florida | Total Depth: 8 feet bls |
| Date Drilled: 11/2/2009 | Screened Interval: 3-8 feet bls |
| Drilling Contractor/Method: AM Drill / CME 45 | Well Diameter 2 inches |
| Ground Surface Elevation: 20.75 ft msl | Monitoring Device: A verbal interview of the field geologist indicates a PID was used and there were no readings above zero. |
| Measuring Point Elevation: 25.31 ft msl | Logged by: Sara Klimek |

| Depth Below Surface (Feet) | Blow Counts per 6" | Recovery (%) | PID/FID reading (PPM) | Lithologic Description | Graphic Log |
|---|---|---|---|---|---|
| 0.0 | | Hand-Auger | | **0-4':** Dark brown very fine sand, trace grass roots, moist to dry, no odor | |
| 5.0 | | Drill Cuttings | | **4-8':** Brown silt, loose, wet, no odor | |
| 10.0 | | | | | |




R625-STA-002274-0

# APPENDIX D

# Field Data Sheets

# WETLAND ASSESSMENT PROCEDURE

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

| Wetland ID | Data Owner | Data Source | Personnel | Date | Start/End | |
|---|---|---|---|---|---|---|
| RW-1 | | | A. Levy - ARCADIS /S. Burnett - BSI | 11 June 2012 | 10:30 | 11:45 |

## PHOTO-DOCUMENTATION

| Frame | Description | Photo Pt. | Direction |
|---|---|---|---|
| 525 | looking north from MW | | north |
| 377 | looking east at MW | | east |
| 343 | looking south from MW | | south |
| 972 | looking west at MW | | west |

## WATER LEVEL INFORMATION

| Dry? | Elevation (ft) | Device | Well/Gage ID |
|---|---|---|---|
| No | 0.10 | SG | |

**Description**

recent inundation evident from wrack line on SG

**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.

## WETLAND DRAINAGE

| | |
|---|---|
| Augmentation equipment in place? | No |
| 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? | Yes |
| Borrow pit/retention pond in wetland vicinity? | No |

**Explanation(s)**

Saturation observed to HNP as a result of recent heavy precipitation.

## 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**

OD & D zone wetland vegetation observed on hummocks with indicators of wetland floor subsidence of up to 14 inches in wetlands interior. Subsidence mounds moderately eroded, suggesting recent history of subsidence. linear slough containing obligate wetland vegetation was employed as Deep zone for well and staff gage placement

**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

## WILDLIFE

| Wildlife | Count | Evidence | Wildlife | Count | Evidence | Wildlife | Count | Evidence |
|---|---|---|---|---|---|---|---|---|
| *Cardinalis cardinalis* | | calls | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

# WETLAND ASSESSMENT PROCEDURE

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

| Wetland ID | Area Assessed | Zone Assessment Notes |
|---|---|---|
| RW-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 |
|---|---|---|---|---|
| *Ampelopsis arborea* | AD | 80 | | T |

### OUTER DEEP ZONE

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

| SPECIES | ZONE | % | # | DIST |
|---|---|---|---|---|
| *Ampelopsis arborea* | AD | <5 | | B |
| *Urena lobata* | AD | <5 | | E |

### DEEP ZONE

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

| SPECIES | ZONE | % | # | DIST |
|---|---|---|---|---|
| *Ludwigia peruviana* | AD | 5 | | E |
| *Polygonum hydropiperoides* | OD | 10 | | T |
| *Polygonum persicaria* | - | 20 | | T |
| *Saururus cernuus* | - | 40 | | T |
| *>>>NEW HERB<<<* | | <10 | | B |

**Groundcover Comments**

Rumex verticillatus (20%) FACW+ and Saururus cernuus (40%) 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. The WAP prescribes AD zone species should be regarded as T zone, when occurring in the D or OD zones.

# WETLAND ASSESSMENT PROCEDURE

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

| Wetland ID | Area Assessed | Zone Assessment Notes |
|---|---|---|
| RW-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 |
|---|---|---|---|---|
| *Sambucus canadensis* | AD | 90 | | T |
| *Schinus terebinthifolius* | AD | 10 | | T |
| *Symphyotrichum eliottii* | T | * | | T |
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### OUTER DEEP ZONE

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

| SPECIES | ZONE | % | # | DIST |
|---|---|---|---|---|
| *Schinus terebinthifolius* | AD | 85 | | T |
| *Sambucus canadensis* | AD | 10 | | T |
| *Salix carolina* | OD | 5 | | T |
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### DEEP ZONE

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

| SPECIES | ZONE | % | # | DIST |
|---|---|---|---|---|
| *Schinus terbinthifolius* | AD | 80 | | T |
| *Salix carolina* | OD | 10 | | T |
| *Ludwigia peruviana* | OD | 5 | | T |
| *Acer rubrum* | OD | <5 | | T |
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**Shrub/Small Tree Comments**

* off transect, but nearby

## 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 D 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 OD and D 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/Scrub/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 |
|---|---|---|---|---|
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### OUTER DEEP ZONE

*outer deep zone assessed?* ✓
*check if no trees* ✓

| SPECIES | ZONE | % | # | DIST |
|---|---|---|---|---|
| *Schinus terebinthifolius* | AD | 90 | | T |
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### DEEP ZONE

*deep zone assessed?* ✓
*check if no trees* ☐

| SPECIES | ZONE | % | # | DIST |
|---|---|---|---|---|
| *Acer rubrum* | OD | 10 | | B |
| *Salix carolina* | OD | 80 | | B |
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**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

tree cover sparse and limited to margin between D & OD, where Brazilian peppertree is dominant

**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/Emergent |

| Wetland ID | Data Owner | Data Source | Personnel | Date | Start/End | |
|---|---|---|---|---|---|---|
| RW-2 | | | A. Levy - ARCADIS /S. Burnett - BSI | 11 June 2012 | 12:40 | 14:00 |

## PHOTO-DOCUMENTATION

| Frame | Description | Photo Pt. | Direction |
|---|---|---|---|
| 799 | looking north at MW | | north |
| 311 | looking east from MW | | east |
| 732 | looking south from MW | | south |
| 221 | excavated ponded weir on east side RW-2 | | west |

## WATER LEVEL INFORMATION

| Dry? | Elevation (ft) | Device | Well/Gage ID |
|---|---|---|---|
| Yes | NA | | |

**Description**

dry, but with observed evidence of water line on SG

**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)**

Southeastern edge of wetland historically excavated with now-forested overburden stockpiled along historic wetland boundary.

## WETLAND DRAINAGE

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

**Explanation(s)**

Historic excavation and impoundment for livestock pond in southeast side of wetland. Wier and outfall on SE corner of resource drains offsite to Pearce Canal.

## 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**

Deep zone wetland vegetation on hummocks and indicators of wetland floor subsidence of up to 18 inches within Deep & Outer Deep observed. Subsided mounds not too eroded, which suggests subsidence is moderately recent, but heavily trampled by cattle.

**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

Portions of this wetland have 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 zonation impacts are primarily due to historic agricultural use. See additional photos of weir and drainage swale.

## WILDLIFE

| Wildlife | Count | Evidence | Wildlife | Count | Evidence | Wildlife | Count | Evidence |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
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# WETLAND ASSESSMENT PROCEDURE

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

| 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 |
|---|---|---|---|---|
| *Cyperus sp.* | - | 60 | | T |
| *Thyloipteris sp.* | - | 10 | | T |
| *Microstegium vimineum* | - | 20 | | B |

### OUTER DEEP ZONE

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

| SPECIES | ZONE | % | # | DIST |
|---|---|---|---|---|
| *Asplenium sp.* | - | 30 | | T |
| *Saururus cernuus* | - | 20 | | T |
| *Carex longii* | T | 10 | | T |
| *Apios sp.* | - | 5 | | T |

### DEEP ZONE

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

| SPECIES | ZONE | % | # | DIST |
|---|---|---|---|---|
| *Saururus cernuus* | - | 40 | | T |
| *Polygonum persicaria* | - | 5 | | T |
| *Hydrocotyle sp.* | OD | 5 | | T |
| *Solanum viarum* | U | <5 | | B |
| *Pontederia cordata* | - | <5 | | T |

**Groundcover Comments**

Saururus cernuus (10%) OBL and Apios americana round-out the dominant species in the Outer Deep and Deep Zones. Moderate to heavy browsing and trampling by livestock (cattle) is evident.

## 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 species have moved in two zones in enough numbers and distribution to be of concern.

# WETLAND ASSESSMENT PROCEDURE

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

| 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 |
|---|---|---|---|---|
| *Urena lobata* | UPL | 5 | | T |
| *Sabal minor* | - | 5 | | B |
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### OUTER DEEP ZONE

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

| SPECIES | ZONE | % | # | DIST |
|---|---|---|---|---|
| *Schinus terebinthifolius* | AD | 5 | | T |
| *Myrica cerifera* | AD | 10 | | T |
| *Vitis rotundifolia* | AD | 5 | | T |
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### DEEP ZONE

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

| SPECIES | ZONE | % | # | DIST |
|---|---|---|---|---|
| *Cephelanthus occidentalis* | D | 30 | | T |
| *Schinus terebinthifolius* | AD | 10 | | T |
| *Ludwigia peruviana* | OD | 20 | | T |
| *Morella cerifera** | AD | 10 | | T |
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**Shrub/Small Tree Comments**

* formerly Myrica cerifera

## 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 species have moved in two zones in enough numbers and distribution to be of concern.

## STRESS

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

Few/None
(Noticeable)
Significant
Not Applicable

Impacts from moderate to severe trampling and compaction by livestock

**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 |
|---|---|---|
| W. Schmid (P-69) | Reference Wetland 2 | Forested/Scrub/Emergent |

| 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 | 25 | | T |
| *Nyssa sylvatica biflora* | D | 20 | | |
| *Quercus laurifolia* | T | 20 | | |
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### OUTER DEEP ZONE

*outer deep zone assessed?* ☐
*check if no trees* ☐

| SPECIES | ZONE | % | # | DIST |
|---|---|---|---|---|
| *Acer rubrum* | OD | 25 | | T |
| *Ulmus americana* | T | 20 | | T |
| *Nyssa sylvatica biflora* | D | 20 | | B |
| *Magnolia virginiana* | OD | 20 | | B |
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### DEEP ZONE

*deep zone assessed?* ☐
*check if no trees* ☐

| SPECIES | ZONE | % | # | DIST |
|---|---|---|---|---|
| *Acer rubrum* | OD | 30 | | T |
| *Ulmus americana* | T | 15 | | T |
| | | | | |
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**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 species have moved in two zones in enough numbers and distribution to be of concern.

## STRESS

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

Few/None
Noticeable
(Significant)
Not Applicable

Sporadic impacts from severe trampling by livestock

**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 | | | A. Levy - ARCADIS /S. Burnett - BSI | 11 June 2012 | 14:20 | 15:45 |

## PHOTO-DOCUMENTATION

| Frame | Description | Photo Pt. | Direction |
|---|---|---|---|
| 280 | looking north from MW | | N |
| 397 | looking south from MW | | S |
| 986 | looking east from MW | | E |
| 374 | looking west from MW | | W |

## WATER LEVEL INFORMATION

| Dry? | Elevation (ft) | Device | Well/Gage ID |
|---|---|---|---|
| No | 1.24 feet | SG | |

**Description**

water level in the process of receding from SG

**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)? | Yes |
| Vehicles through wetland (includes bicycles)? | No |
| Insect damage? | No |
| Disease? | No |

**Explanation(s)**

Impacts from livestock observed include browsing, trampling, and wallowing use are not evident.

## WETLAND DRAINAGE

| | |
|---|---|
| Augmentation equipment in place? | No |
| 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? | Yes |
| Borrow pit/retention pond in wetland vicinity? | No |

**Explanation(s)**

historically excavated cattle wallows in center of resource were inundated, but with receding water-levels evidenced by wrack-lines at time of annual monitoring assessment

## 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**

Indicators of wetland floor subsidence not observed within Deep Zone. Modest indicators of recent subsidence was observed among hummock-borne wax myrtles along southern historic wetland boundary.

**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 recent inundation and appears to be functioning normally, when compared to initial conditions screened, but not assessed in June 2009.

## WILDLIFE

| Wildlife | Count | Evidence |
|---|---|---|
| *Cardinalis cardinalis* | | calls |
| *Mimus polyglottos* | | calls |
| *Aix sponsa* | 4 | observed |

| Wildlife | Count | Evidence |
|---|---|---|
| *Anas platyrhynchos* | 6 | observed |
| | | |
| tadpoles | >100 | observed |

| Wildlife | Count | Evidence |
|---|---|---|
| | | |
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# 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 | | |

## 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 |
|---|---|---|---|---|
| *Cynodon dactylon* | AD | 10 | | T |
| *Erichtites heiracifolius* | AD | <5 | | B |
| *Eupatoruim capillifolium* | AD | 25 | | T |
| *Phyla nodiflora* | AD | 10 | | T |
| *Schinus terebinthifolius* | AD | 10 | | T |

### OUTER DEEP ZONE

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

| SPECIES | ZONE | % | # | DIST |
|---|---|---|---|---|
| *Ludwigia peruviana* | OD | <5 | | T |
| *Polygonum hydropiperoides* | OD | <10 | | T |
| *Phyla nodiflora* | AD | <5 | | T |
| *Carex longii* | T | <5 | | T |
| *Juncus effusus* | - | <5 | | T |
| *Cirsium sp.* | - | <5 | | B |
| *Oxypolis sp.* | - | <5 | | B |
| *Paspalum laeve* | AD | <10 | | B |
| *Eupatorium capillifolium* | AD | 70 | | T |

### DEEP ZONE

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

| SPECIES | ZONE | % | # | DIST |
|---|---|---|---|---|
| *Eupatorium capillifolium* | AD | 30 | | T |
| *Paspalum laeve* | AD | 5 | | T |

**Groundcover Comments**

Deep zone ponded at time of annual assessment with scant herbaceous cover in shallow areas and hummocks. Up to 4 inches ponding in Outer Deep with herbaceous cover throughout.

## 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.

# 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 |
|---|---|---|---|---|
| *Myrica cerifera* | AD | 75 | | E |
| *Cephelanthus occidentalis* | D | 5 | | E |
| *Schinus terebinthifolius* | AD | 20 | | E |
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### OUTER DEEP ZONE

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

| SPECIES | ZONE | % | # | DIST |
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### DEEP ZONE

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

| SPECIES | ZONE | % | # | DIST |
|---|---|---|---|---|
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**Shrub/Small Tree Comments**

OD and Deep zones are devoid of woody vegetation. Woody vegetation present only in outer-edge of Transition zone.

## ZONATION

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

**Zonation Score Explanation**

Shrub/sapling tree species are limited to the outer-edge of the T zone and are largely represented by AD zone species. While no woody species are located in the OD and D zones, a zonation score of 3 represents species having 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
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 |
|---|---|---|
| W. Schmid (P-66) | Reference Wetland 3 | Emergent |

| Wetland ID | Area Assessed | Zone Assessment Notes |
|---|---|---|
| RW-3 | | |

## 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 |
|---|---|---|---|---|
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### OUTER DEEP ZONE

*outer deep zone assessed?* ✓
*check if no trees* ✓

| SPECIES | ZONE | % | # | DIST |
|---|---|---|---|---|
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### DEEP ZONE

*deep zone assessed?* ✓
*check if no trees* ✓

| SPECIES | ZONE | % | # | DIST |
|---|---|---|---|---|
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**Tree Comments**

## ZONATION

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

**Zonation Score Explanation**

No woody WAP species are located within the OD or D zones of RW-3.

## 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 |
|---|---|---|
| H. Boothe (P-52) | Target Wetland 1 | Emergent |

| Wetland ID | Data Owner | Data Source | Personnel | Date | Start/End | |
|---|---|---|---|---|---|---|
| TW-1 | | | A. Levy - ARCADIS /S. Burnett - BSI | 11 June 2012 | 11:35 | 12:45 |

## PHOTO-DOCUMENTATION

| Frame | Description | Photo Pt. | Direction |
|---|---|---|---|
| 77 | looking south from MW | | S |
| 638 | looking north from MW | | N |
| 444 | looking east from MW | | E |
| 267 | toward HNP looking west | | W |

## WATER LEVEL INFORMATION

| Dry? | Elevation (ft) | Device | Well/Gage ID |
|---|---|---|---|
| No | 1.55 | SG | TW-1 |

**Description**

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)**

## WETLAND DRAINAGE

| | |
|---|---|
| Augmentation equipment in place? | No |
| 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? | Yes |

**Explanation(s)**

Ponding observed to near HNP

## 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

Evidence of fluctuating inundation on staff gage. Timbering of all adjacent forested habitats in previous year has removed wetland edge canopy and may result in decreased evapotranspiration of surficial aquifer.

**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* | unknown | calls |
| | | |
| | | |

| Wildlife | Count | Evidence |
|---|---|---|
| | | |
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| Wildlife | Count | Evidence |
|---|---|---|
| | | |
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# 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 |
|---|---|---|---|---|
| *A. muhlenbergianum* | OD | 70 | | T |
| *Paspalum setaceum* | AD | <5 | | T |
| *Hydrocotle umbellata* | OD | 10 | | T |
| *Mikania scandens* | T | 5 | | T |

### OUTER DEEP ZONE

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

| SPECIES | ZONE | % | # | DIST |
|---|---|---|---|---|
| *A. muhlenbergianum* | OD | 10 | | T |
| *Euthamia caroliniana* | AD | <5 | | T |
| *Ludwigia peruviana* | OD | 30 | | T |
| *Juncus effusus* | - | 20 | | T |
| *Leersia hexandra* | OD | 20 | | T |
| *Mikania scandens* | T | <5 | | T |
| *Typha sp.* | - | <5 | | B |
| *Sagittaria subulata* | - | <5 | | B |
| *Ludwigia decurrens* | - | <5 | | B |

### DEEP ZONE

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

| SPECIES | ZONE | % | # | DIST |
|---|---|---|---|---|
| *Polygonum hydropiperoides* | OD | 20 | | T |
| *Paspalum laeve* | T | <5 | | T |
| *Juncus effusus* | - | <20 | | T |
| *Leersia hexandra* | OD | 50 | | T |

**Groundcover Comments**

Approximately 4 - 6" inundation at HNP where inundation-stressed Eupatorium capillifolium lingers.

## ZONATION

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

**Zonation Score Explanation**

Adaptive and transitional groundcover species dominate in high numbers/distribution in the outer deep and deep zones. 3. Species have moved in one zone in high numbers and distribution, and/or some plants have moved in two zones.

# 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 | | |

## 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 | 5 | | T |
| *Schinus terebinthifolius* | AD | <5 | | T |

### OUTER DEEP ZONE

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

| SPECIES | ZONE | % | # | DIST |
|---|---|---|---|---|
| *Ludwigia peruviana* | OD | 80 | | E |
| *Cephalanthus occidentalis* | D | <5 | | T |

### DEEP ZONE

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

| SPECIES | ZONE | % | # | DIST |
|---|---|---|---|---|
| *Salix caroliniana* | OD | 90 | | T |
| *Schinus terebinthifolius* | AD | <5 | | B |
| *Morella cerifera* | AD | <5 | | B |

**Shrub/Small Tree Comments**

AD zone species occurring on subsidence hummocks and willow tussocks witihin 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 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 |
|---|---|---|
| H. Boothe (P-52) | 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 |
|---|---|---|---|---|
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### OUTER DEEP ZONE

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

| SPECIES | ZONE | % | # | DIST |
|---|---|---|---|---|
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### DEEP ZONE

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

| SPECIES | ZONE | % | # | DIST |
|---|---|---|---|---|
| *Salix caroliniana* | OD | 100 | | T |
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**Tree Comments**

Timbering of all adjacent forested habitats in previous year has removed wetland edge canopy and may result in decreased evapotranspiration of surficial aquifer.

## 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 to be of concern,and/or some plants 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 |
|---|---|---|
| H. Boothe (P-35) | Target Wetland 2 | Emergent/Forested |

| Wetland ID | Data Owner | Data Source | Personnel | Date | Start/End | |
|---|---|---|---|---|---|---|
| TW-2 | | | A. Levy - ARCADIS /S. Burnett - BSI | 11 June 2012 | 10:30 | 11:45 |

## PHOTO-DOCUMENTATION

| Frame | Description | Photo Pt. | Direction |
|---|---|---|---|
| 685 | from NP-6 | | NW |
| 436 | from NP-6 | | W |
| 524 | looking at MW | | W |
| 515 | looking west from NP-12 | | W |

## WATER LEVEL INFORMATION

| Dry? | Elevation (ft) | Device | Well/Gage ID |
|---|---|---|---|
| no | 0.80 | Staff Gage | |

**Description**

**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)**

edges of the wetland area transition to ungrazed, grassed pasture, without the traditional saw palmetto scrub layer

## WETLAND DRAINAGE

| | |
|---|---|
| Augmentation equipment in place? | No |
| 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)**

## 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**

Persistent/relict subsidence remains below the NP-6 elevation with no observed changes since the initial 2009 screening or 2010 baseline assessment

**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

Preexisting staff gage (SG-8) and sampling well (SW-3) occur outside HNP. No inundation, or indicators of recent inundation, were observed at these monuments.

## WILDLIFE

| Wildlife | Count | Evidence |
|---|---|---|
| *Thryothorus ludovicianus* | | calls |
| *Cardinalis cardinalis* | | calls |
| *Mimus polyglottos* | | calls |

| Wildlife | Count | Evidence |
|---|---|---|
| | | |
| | | |
| | | |

| Wildlife | Count | Evidence |
|---|---|---|
| | | |
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# WETLAND ASSESSMENT PROCEDURE

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

| 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 |
|---|---|---|---|---|
| *Eupatorium capillifolium* | AD | <5 | | T |
| *Paspalum laeve* | T | 10 | | T |
| *Hydrocotle umbellata* | OD | 10 | | T |
| *Mikania scandens* | T | 10 | | T |
| *Phyla nodiflora* | AD | <5 | | T |
| *Cynodon dactylon* | U | 80 | | T |
| *Erichtites heiracifolius* | AD | 5 | | B |

### OUTER DEEP ZONE

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

| SPECIES | ZONE | % | # | DIST |
|---|---|---|---|---|
| *Mikania scandens* | T | 30 | | T |
| *Hydrocotle umbellata* | OD | 50 | | T |
| *Eupatorium capillifolium* | AD | <10 | | B |
| *Cynodon dactylon* | U | <10 | | E |
| *Erichtites heiracifolius* | AD | <5 | | E |

### DEEP ZONE

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

| SPECIES | ZONE | % | # | DIST |
|---|---|---|---|---|
| *Eupatorium capillifolium* | AD | <5 | | E |
| *Eichhornia crassipes* | n/a | 10 | | E |

**Groundcover Comments**

water hyacinth identified in areas of standing water in Deep Zone. Appears to have been drought-stressed, though raft of floating live and formerly-dessicated plant material is evident.

## ZONATION

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

**Zonation Score Explanation**

Score assigned due to species having moved in one zone in enough numbers and distribution to be of concern.

# WETLAND ASSESSMENT PROCEDURE

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

| 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 |
| *Schinus terbinthifolius* | AD | 5 | | T |
| *Triadica sebifera* | - | <5 | | B |
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### OUTER DEEP ZONE

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

| SPECIES | ZONE | % | # | DIST |
|---|---|---|---|---|
| *Salix caroliniana* | OD | 40 | | T |
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### DEEP ZONE

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

| SPECIES | ZONE | % | # | DIST |
|---|---|---|---|---|
| *Salix caroliniana* | OD | 90 | | T |
| *Schinus terbinthifolius* | AD | 5 | | B |
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**Shrub/Small Tree Comments**

Chinese tallowtree saplings occurring in the Transition Zone. Some invasion by non-appropriate S. terebinthifolius (AD) within wetland interior (D). Formerly identified hummock within the subsided area below NP-12 is inundated and supporting only marginal numbers of upland vegetation, originally identified during 2009 screening and 2010 baseline assessments.

## ZONATION

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

**Zonation Score Explanation**

Assigned due to adaptive and transitional species occurring in high numbers and distribution in the outer deep and deep zones. 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."

## 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 |
|---|---|---|
| H. Boothe (P-35) | Target Wetland 2 | Emergent/Forested |

| 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 |
|---|---|---|---|---|
| *Schinus terbinthifolius* | AD | 5 | | T |
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### OUTER DEEP ZONE

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

| SPECIES | ZONE | % | # | DIST |
|---|---|---|---|---|
| *Salix caroliniana* | OD | 98 | | T |
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### DEEP ZONE

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

| SPECIES | ZONE | % | # | DIST |
|---|---|---|---|---|
| *Salix caroliniana* | OD | 100 | | T |
| | | | | |
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**Tree Comments**

Some invasion by non-appropriate S. terebinthifolius (AD) within wetland interior (D). However, this occurrence should be non-threatening to wetland ecosystem, given sustained seasonal inundation below NP-6.

## ZONATION

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

**Zonation Score Explanation**

Score assigned 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.

## 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 | | | A. Levy - ARCADIS /S. Burnett - BSI | 11 June 2012 | 15:40 | 17:00 |

## PHOTO-DOCUMENTATION

| Frame | Description | Photo Pt. | Direction |
|---|---|---|---|
| 874 | looking east at MW | | E |
| 62 | looking west at MW | | W |
| 811 | looking north from MW | | N |
| 357 | looking south from NP-12 | | S |

## WATER LEVEL INFORMATION

| Dry? | Elevation (ft) | Device | Well/Gage ID |
|---|---|---|---|
| No | 1.75 | staff gage | TW-6 |

**Description**

**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 perimeter of excavated pond, within palustrine 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? | No |
| Other drainage activities in area? | No |
| Borrow pit/retention pond in wetland vicinity? | Yes |

**Explanation(s)**

Excavated pond located within southern sector of wetland. Evidence of stormwater drainage into wetland occurs along western wetland edge. Standing water in puddled areas, <1" deep in Transition zone.

## 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?** Yes

**Explanation**

Subsidence observed within forested portion of 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

- RAP injection well installation commencing adjacent to TW-6 at time of 2012 assessment.
- Most typical wetland characteristics of wetland observed within the pond bed/emergent portion.
- Evidence observed of recent heavy rainfall/runoff into Transitional zone, above NP-6 (i.e., isolated areas of standing water <1" deep)

## WILDLIFE

| Wildlife | Count | Evidence |
|---|---|---|
| *Cardinalis cardinalis* | | calls |
| *Agelaius phoeniceus* | | calls |
| *Colaptes auratus* | | sighting |

| Wildlife | Count | Evidence |
|---|---|---|
| | | |
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| Wildlife | Count | Evidence |
|---|---|---|
| | | |
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# 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 sp.** | AD | <10 | | T |
| *Apios sp.* | - | <5 | | T |
| *Eriehtites heiracifolius* | AD | <5 | | T |
| *Ampelopsis arborea* | AD | 10 | | T |

### OUTER DEEP ZONE

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

| SPECIES | ZONE | % | # | DIST |
|---|---|---|---|---|
| *Ampelopsis arborea* | AD | 10 | | T |
| *Urena lobata* | U | 10 | | B |
| *Eupatorium capillifolium* | AD | 10 | | B |

### DEEP ZONE

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

| SPECIES | ZONE | % | # | DIST |
|---|---|---|---|---|
| *Lemna minor* | - | <5 | | T |
| *Typha latifolia* | - | 70 | | T |
| *Eupatorium capillifolium* | AD | <5 | | E |

**Groundcover Comments**

Cattail constitutes >70%, respectively, of vigorous Deep zone vegetation.
*Eastern baccharis seedlings visually abundant in patches throughout AD and T zones.

## ZONATION

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

**Zonation Score Explanation**

Zonation slightly below typical: species having moved in one zone in enough numbers and distribution to be of concern

# 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 terebinthifolius* | AD | 60 | | T |
| *Baccharis spp.* | AD | <5 | | T |
| *Sambucus nigra* | AD | 10 | | T |
| *Cephalanthus occidentalis* | D | <5 | | B |
| *Acer rubrum* | OD | <5 | | B |
| *Ludwigia peruviana* | OD | <5 | | T |
| *Salix caroliniana* | OD | 10 | | B |
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### OUTER DEEP ZONE

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

| SPECIES | ZONE | % | # | DIST |
|---|---|---|---|---|
| *Salix caroliniana* | OD | 20 | | T |
| *Schinus terebinthifolius* | AD | 80 | | T |
| *Cephalanthus occidentalis* | D | <5 | | B |
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### DEEP ZONE

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

| SPECIES | ZONE | % | # | DIST |
|---|---|---|---|---|
| *Ludwigia peruviana* | OD | 10 | | T |
| *Typha latifolia* | - | 70 | | T |
| | | | | |
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**Shrub/Small Tree Comments**

cattail dominates ponded area below NP-12 elevation

## ZONATION

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

**Zonation Score Explanation**

Zonation slightly below typical: species having moved in one zone in enough numbers and distribution to be of concern

## 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

dominant Brazilian pepper tree encroachment between HNP and NP-12

# 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 | | |

## 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 |
| *Myrica cerifera* | AD | 5 | | T |
| *Salix caroliniana* | OD | 20 | | T |
| *Acer rubrum* | OD | 10 | | T |
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### OUTER DEEP ZONE

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

| SPECIES | ZONE | % | # | DIST |
|---|---|---|---|---|
| *Salix caroliniana* | OD | 100 | | T |
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### DEEP ZONE

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

| SPECIES | ZONE | % | # | DIST |
|---|---|---|---|---|
| *None* | | | | |
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**Tree Comments**

## ZONATION

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

**Zonation Score Explanation**

Score assigned due to species having moved in one zone in enough numbers and distribution to be of concern, and species with an adaptive classification (i.e., Brazilian pepper) 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

Slight impacts around trunks/feeder roots exposed by subsidence

**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)

Occurrence of a few red maple saplings in Transition zone, not likely related to recovery, but will continue to monitor.

**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 | | | A. Levy - ARCADIS /S. Burnett - BSI | 12 June 2012 | 12:00 | 12:30 |

## PHOTO-DOCUMENTATION

| Frame | Description | Photo Pt. | Direction |
|---|---|---|---|
| 752 | looking west at MW | | west |
| 756 | looking east from MW | | east |
| | | | |
| | | | |

## WATER LEVEL INFORMATION

| Dry? | Elevation (ft) | Device | Well/Gage ID |
|---|---|---|---|
| Yes | N/A | | |

**Description**

**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)**

Shallow embankment of 19th Street extension borders immediate east side of site

## WETLAND DRAINAGE

| | |
|---|---|
| Augmentation equipment in place? | No |
| 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? | Yes |
| Borrow pit/retention pond in wetland vicinity? | No |

**Explanation(s)**

Mature punk trees (Melaleuca quinqueveria) prevalent. Frequently associated with accelerated evapotranspiration and were historically planted to dry-out wetlands.

## 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?** Yes

**Explanation**

Some soils within the historic wetland area lack hydric indicators. Up to 12 inches of subsidence within the wetland interior was observed. Prominent hummocks on otherwise sandy, flat surface suggests subsidence is not recent.

**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

TW-18 has not likely been altered since available 2003 aerial photography. Observed impacts primarily due to historic regional groundwater draw-down and accelerated evapotranspiration by punk trees have reduced site's value and definition as a viable WAP resource.

## WILDLIFE

| Wildlife | Count | Evidence | Wildlife | Count | Evidence | Wildlife | Count | Evidence |
|---|---|---|---|---|---|---|---|---|
| *Procyon lotor* | | scat | *Eumeces sp.* | | observed | | | |
| *Odocoileus virginicus* | | browse | | | | | | |
| *Hyla sp.* | | calls | | | | | | |

# 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 |
|---|---|---|---|---|
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### OUTER DEEP ZONE

*outer deep zone assessed?* ✓
*check if no groundcover* ✓

| SPECIES | ZONE | % | # | DIST |
|---|---|---|---|---|
| *Phlox sp.* | - | <5 | | Eumeces s |
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### DEEP ZONE

*deep zone assessed?* ✓
*check if no groundcover* ✓

| SPECIES | ZONE | % | # | DIST |
|---|---|---|---|---|
| *Vitis rotundifolia* | AD | 10 | | B |
| *Osmunda cinnamomea* | T | <10 | | T |
| *Osmunda regalis* | - | <10 | | T |
| *Woodwardia virginica* | - | <5 | | T |
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**Groundcover Comments**

several clumps/hummocks of cinnamon fern, royal fern, and southern shield fern are all that remain as evidence of former wetland conditions

## ZONATION

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

**Zonation Score Explanation**

Little or no groundcover species were observed and few that are WAP species. Surface throughout TW-18 is blanketed by live oak leaf litter. Not enough extant vegetative cover to make a groundcover evaluation.

# WETLAND ASSESSMENT PROCEDURE

| Wellfield / Property | Wetland Name | Wetland Type |
|---|---|---|
| H. Boothe (P-52) | 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 |
|---|---|---|---|---|
| *Cinnamomium camphora* | U | <5 | | T |
| *Serenoa repens* | - | 90 | | T |
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### OUTER DEEP ZONE

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

| SPECIES | ZONE | % | # | DIST |
|---|---|---|---|---|
| *Callicarpa americana* | - | <5 | | B |
| | | | | |
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### DEEP ZONE

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

| SPECIES | ZONE | % | # | DIST |
|---|---|---|---|---|
| *Callicarpa americana* | - | <5 | | B |
| *Quercus laurifolia* | U | <5 | | T |
| | | | | |
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**Shrub/Small Tree Comments**

Little to no sapling growth of WAP-listed species in the sub-canopy. Laurel oak and brazilian peppertree seedlings observed on fern hummocks within NP-12. Heavy Smilax bona-nox scrub observed in understory.

## ZONATION

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

**Zonation Score Explanation**

Area has effectively converted to upland habitat, but though understory remains thinly vegetated, though not enough for WAP evaluation.

## 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 |
|---|---|---|
| H. Boothe (P-52) | 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 |
|---|---|---|---|---|
| *Quercus virginiana* | U | 60 | | T |
| *Melaleuca quinqueveria* | AD | 10 | | B |
| | | | | |
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### OUTER DEEP ZONE

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

| SPECIES | ZONE | % | # | DIST |
|---|---|---|---|---|
| *Quercus virginiana* | U | 60 | | T |
| *Melaleuca quinqueveria* | AD | 20 | | B |
| *Sabal minor* | - | 10 | | T |
| | | | | |
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### DEEP ZONE

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

| SPECIES | ZONE | % | # | DIST |
|---|---|---|---|---|
| *Quercus virginiana* | U | 60 | | B |
| *Melaleuca quinqueveria* | AD | 20 | | T |
| | | | | |
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**Tree Comments**

non-WAP species Sabal palmetto is also present. one Pinus palustris noted on west side of HWE.

## ZONATION

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

**Zonation Score Explanation**

Species moving in two zones in high numbers and distribution, and some species with an upland classification have moved into the deep zone. AD zone species regarded as T zone, pursuant to WAP, but there is a prevalence of upland species in historic deep zone.

## STRESS

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

~~Few/None~~
Noticeable
Significant
Not Applicable

Subsided soils at base of trees, resulting in some leaning trees

**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 E

# Photographic Documentation

ARCADIS

# Wetland Site
# TW – 1

**Photo 1 – From TW1 Facing North**

**Photo 2 - TW1 Facing South**

**Photo 3 – TW1 Facing East**

**Photo 4 – TW1 Facing West**

**Photo 5 – TW2 Facing North**

**Photo 6 – TW2 Facing West**

**Photo 7 – TW2 Facing West from Upland**

**Photo 8 – TW2 Facing West**

**Photo 9 – TW6 Facing North**

**Photo 10 – TW6 Facing South**

**Photo 11 – TW6 Facing East**

**Photo 12 – TW6 Facing West**

**Photo 13 – TW18 Facing North**

**Photo 14 – TW18 Facing South**

**Photo 15 – TW18 Facing East**

**Photo 16 – TW18 Facing West**

**Photo 17 – RW1 Facing North**

**Photo 18 – RW1 Facing South**

**Photo 19 – RW1 Facing East**

**Photo 20 – RW1 Facing West**

**Photo 21 – RW2 Facing North**

**Photo 22 – RW2 Facing South**

**Photo 23 – RW2 Facing East**

**Photo 24 – RW2 Facing West**

**Photo 25 – RW3 Facing North**

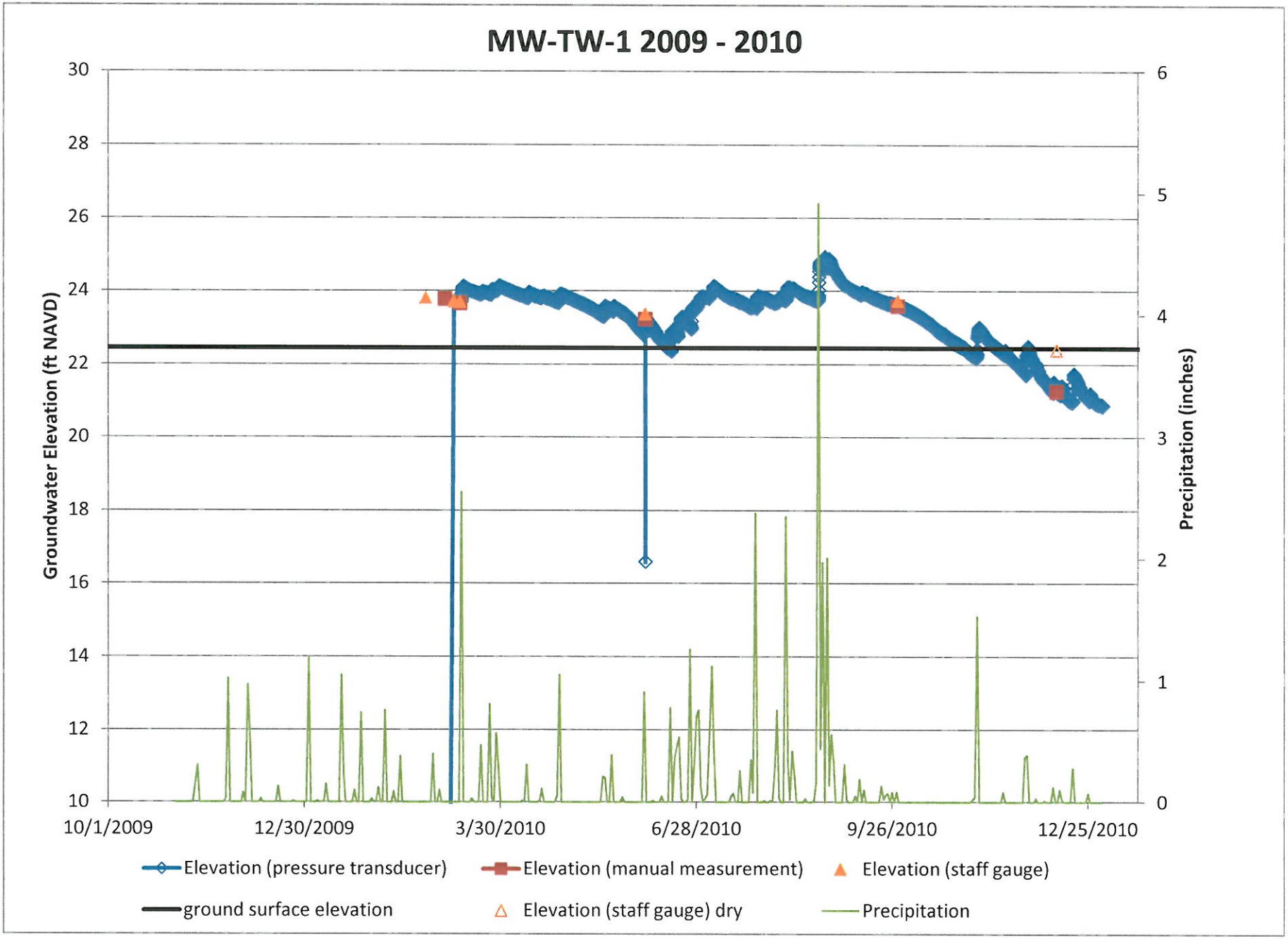
**Photo 26 – RW3 Facing South**

**Photo 27 – RW3 Facing East**

**Photo 28 – RW3 Facing West**

# APPENDIX F

# Hydroperiod Graphs


MW-TW-1 2009 - 2010
Groundwater Elevation (ft NAVD)
Precipitation (inches)
30
28
26
24
22
20
18
16
14
12
10
6
5
4
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2
1
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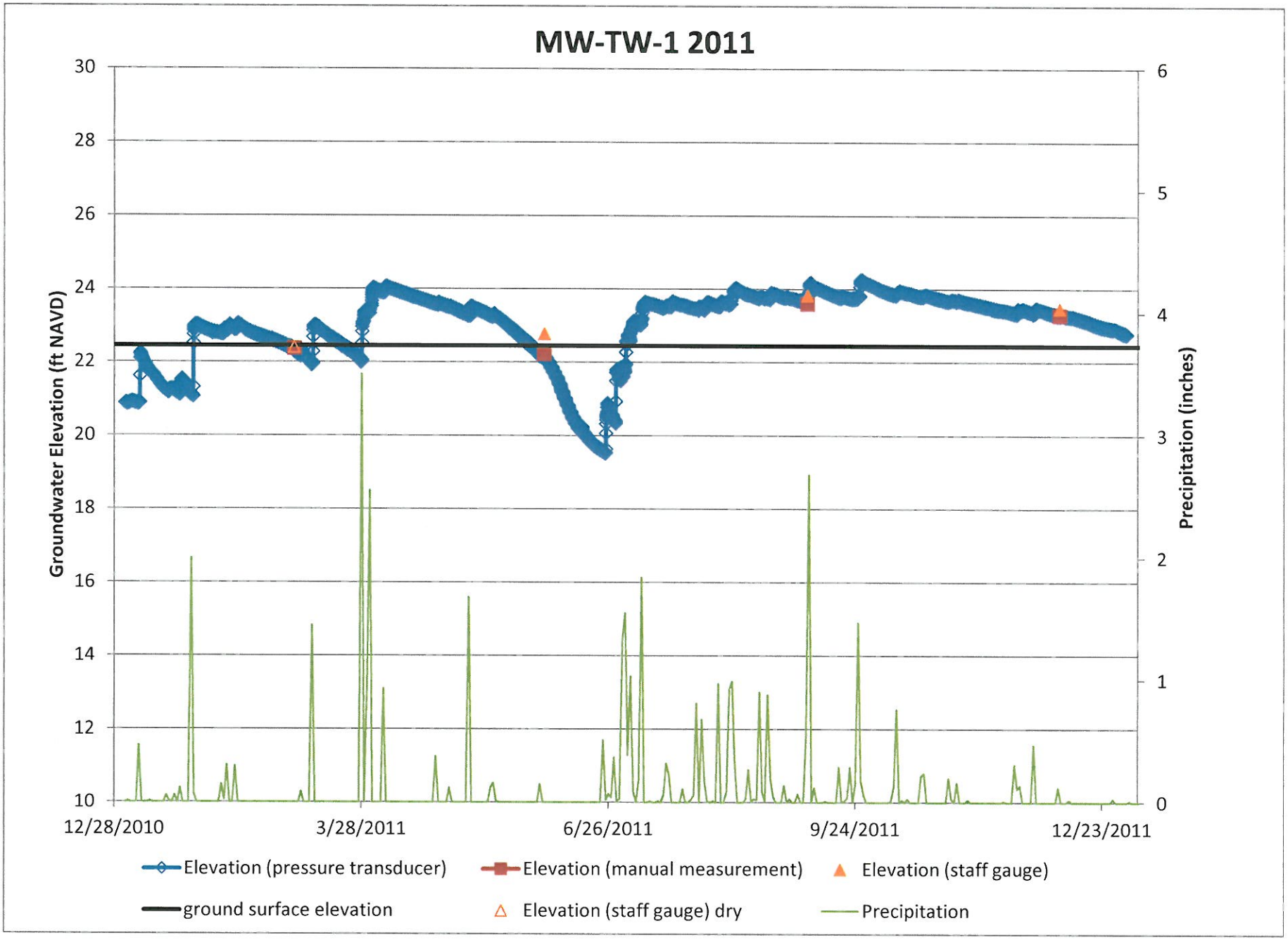
10/1/2009
12/30/2009
3/30/2010
6/28/2010
9/26/2010
12/25/2010
Elevation (pressure transducer)
Elevation (manual measurement)
Elevation (staff gauge)
ground surface elevation
Elevation (staff gauge) dry
Precipitation


MW-TW-1 2011
Groundwater Elevation (ft NAVD)
Precipitation (inches)
30
28
26
24
22
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18
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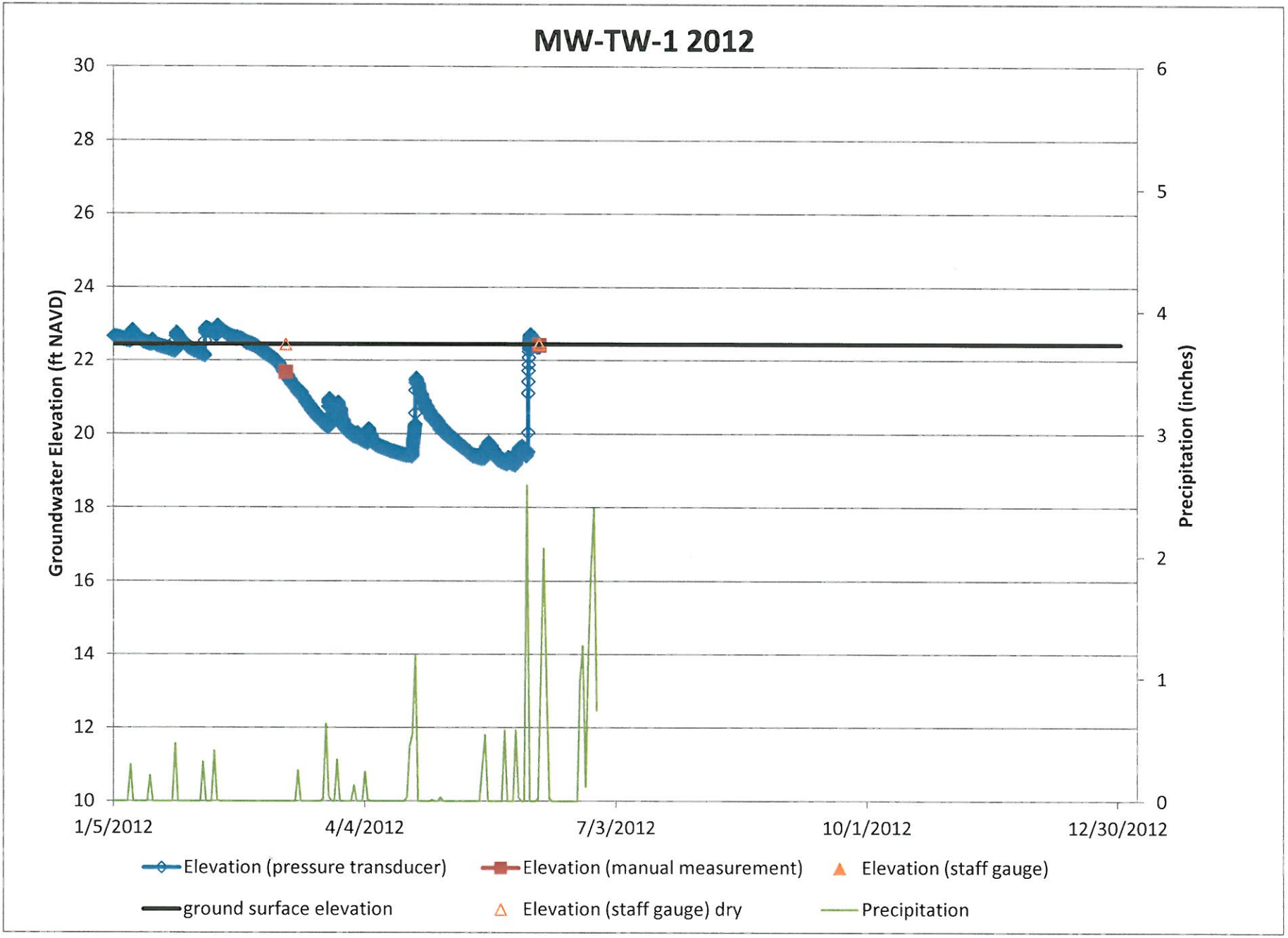
12/28/2010
3/28/2011
6/26/2011
9/24/2011
12/23/2011
Elevation (pressure transducer)
Elevation (manual measurement)
Elevation (staff gauge)
ground surface elevation
Elevation (staff gauge) dry
Precipitation


MW-TW-1 2012
Groundwater Elevation (ft NAVD)
Precipitation (inches)
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10
6
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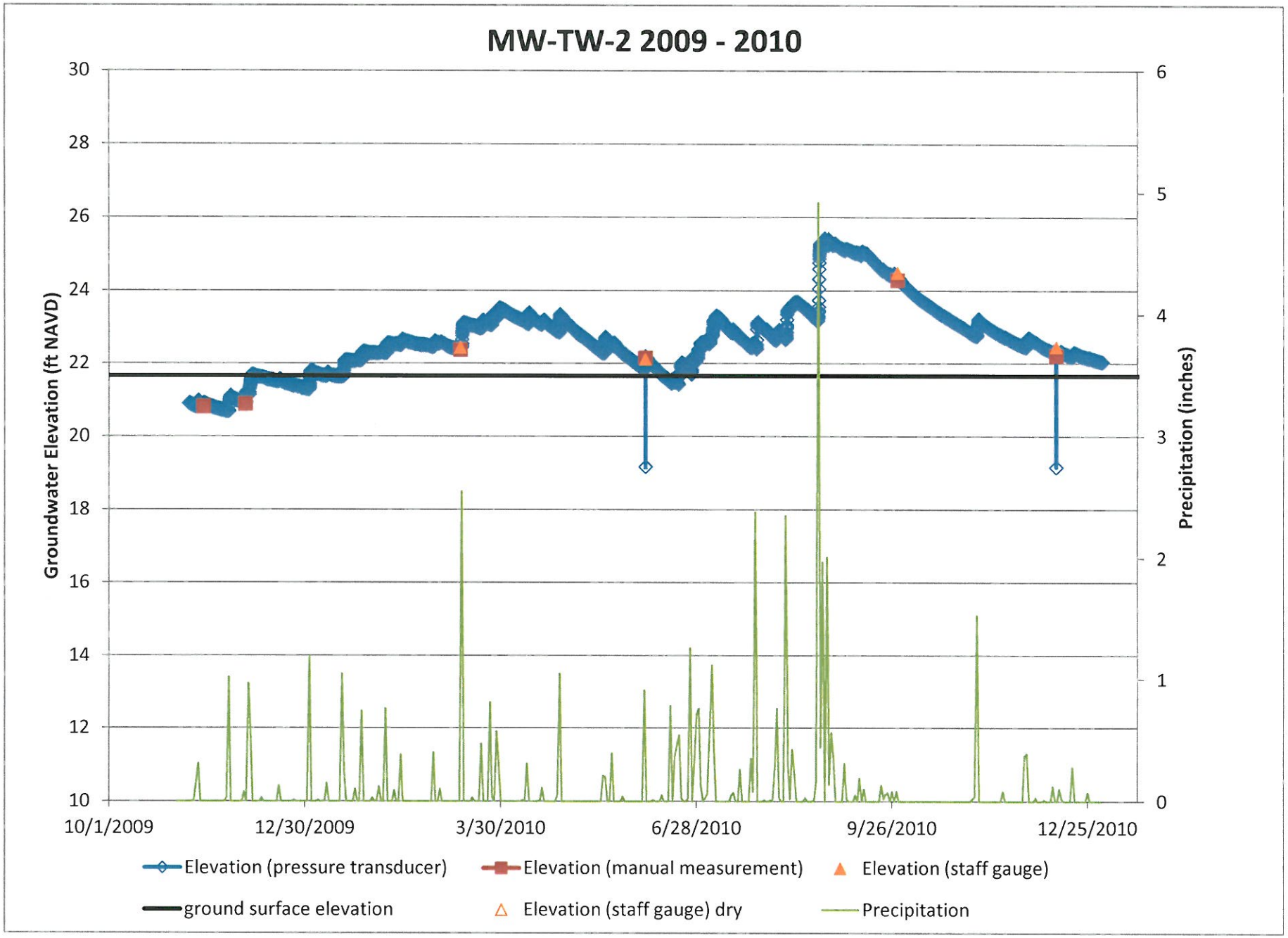
2
1
0
1/5/2012
4/4/2012
7/3/2012
10/1/2012
12/30/2012
Elevation (pressure transducer)
Elevation (manual measurement)
Elevation (staff gauge)
ground surface elevation
Elevation (staff gauge) dry
Precipitation


MW-TW-2 2009 - 2010
Groundwater Elevation (ft NAVD)
Precipitation (inches)
30
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6
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4
3
2
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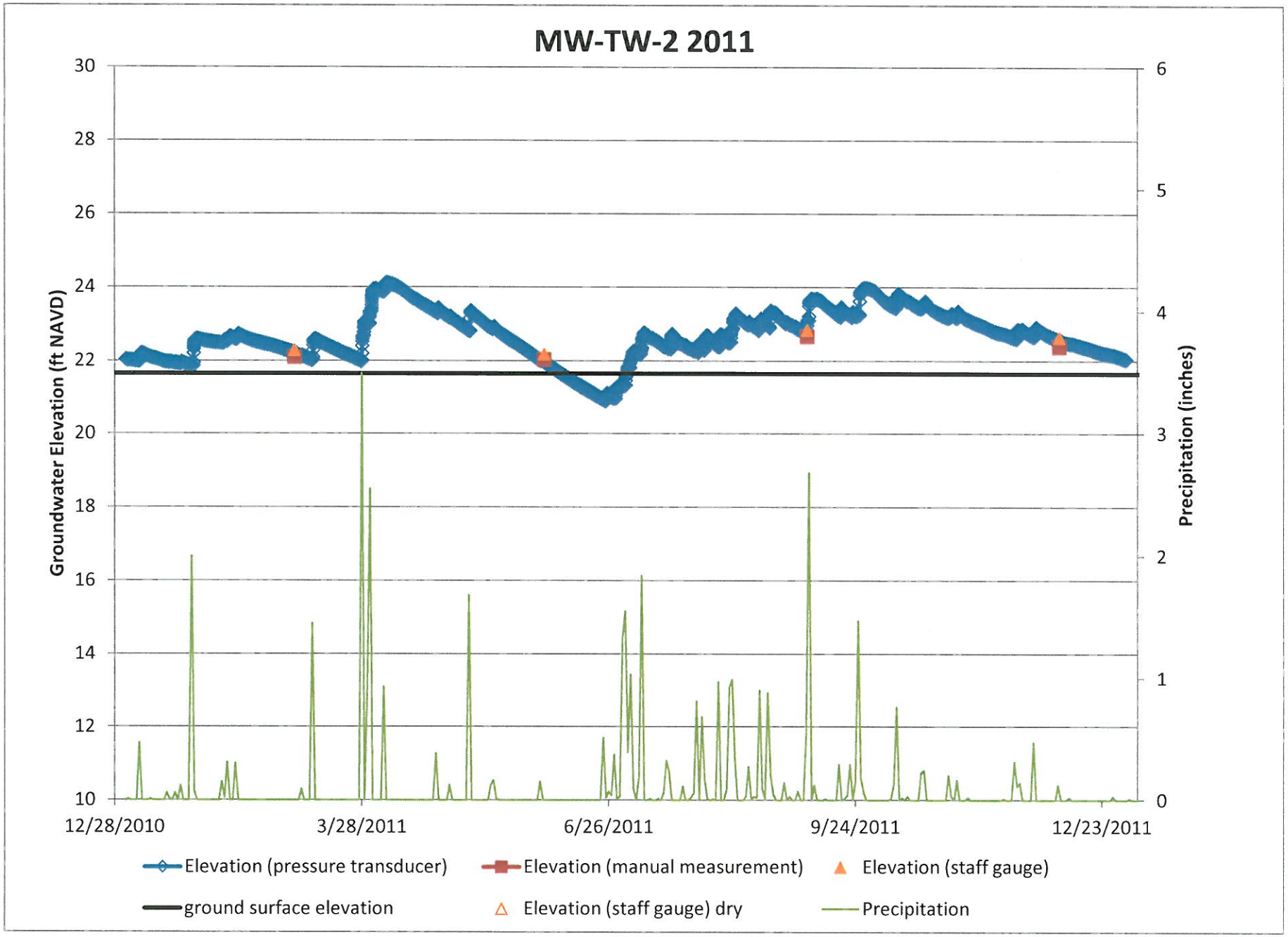
0
10/1/2009
12/30/2009
3/30/2010
6/28/2010
9/26/2010
12/25/2010
Elevation (pressure transducer)
Elevation (manual measurement)
Elevation (staff gauge)
ground surface elevation
Elevation (staff gauge) dry
Precipitation


MW-TW-2 2011
Groundwater Elevation (ft NAVD)
Precipitation (inches)
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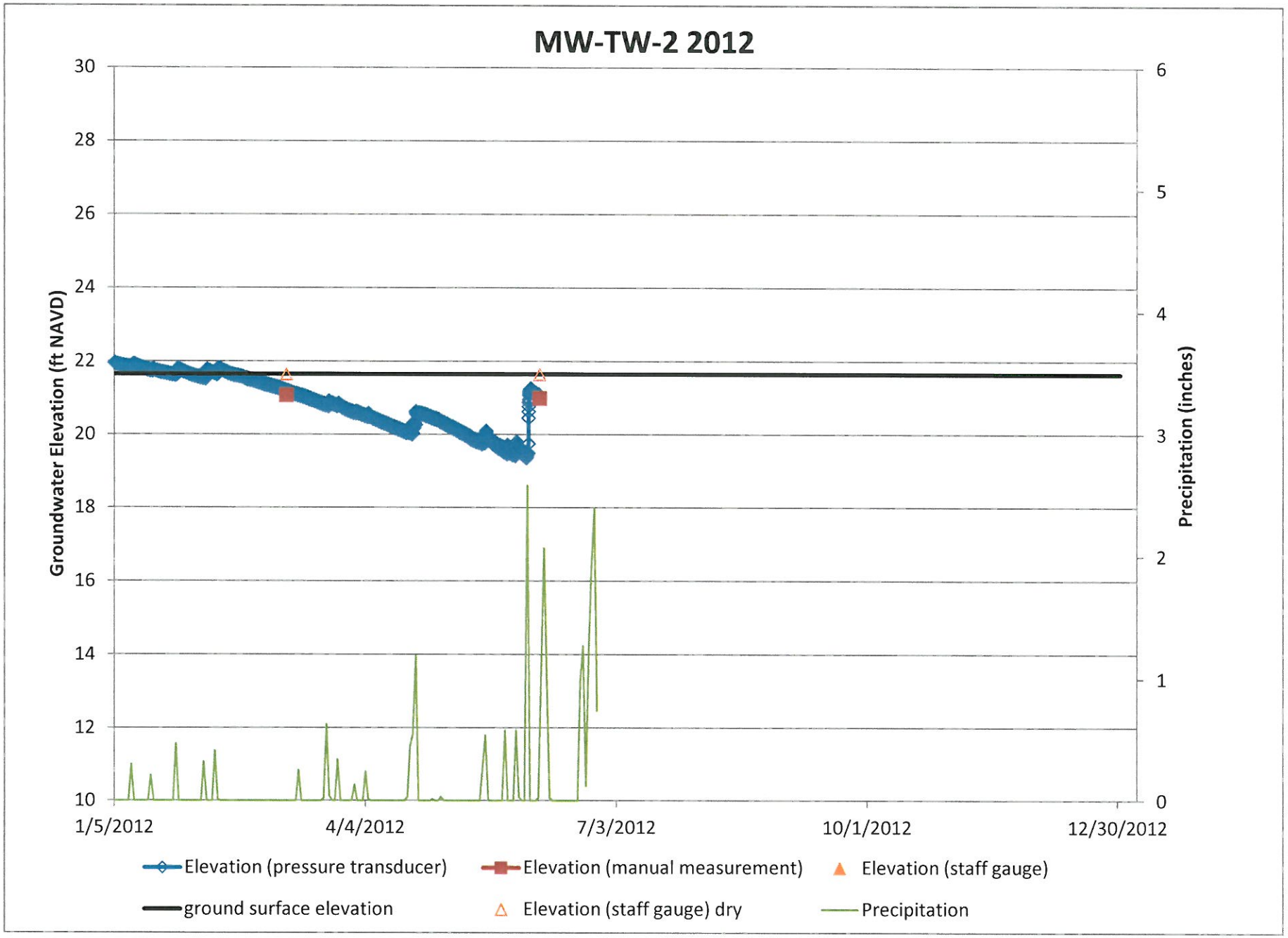
12/28/2010
3/28/2011
6/26/2011
9/24/2011
12/23/2011
Elevation (pressure transducer)
Elevation (manual measurement)
Elevation (staff gauge)
ground surface elevation
Elevation (staff gauge) dry
Precipitation


MW-TW-2 2012
Groundwater Elevation (ft NAVD)
Precipitation (inches)
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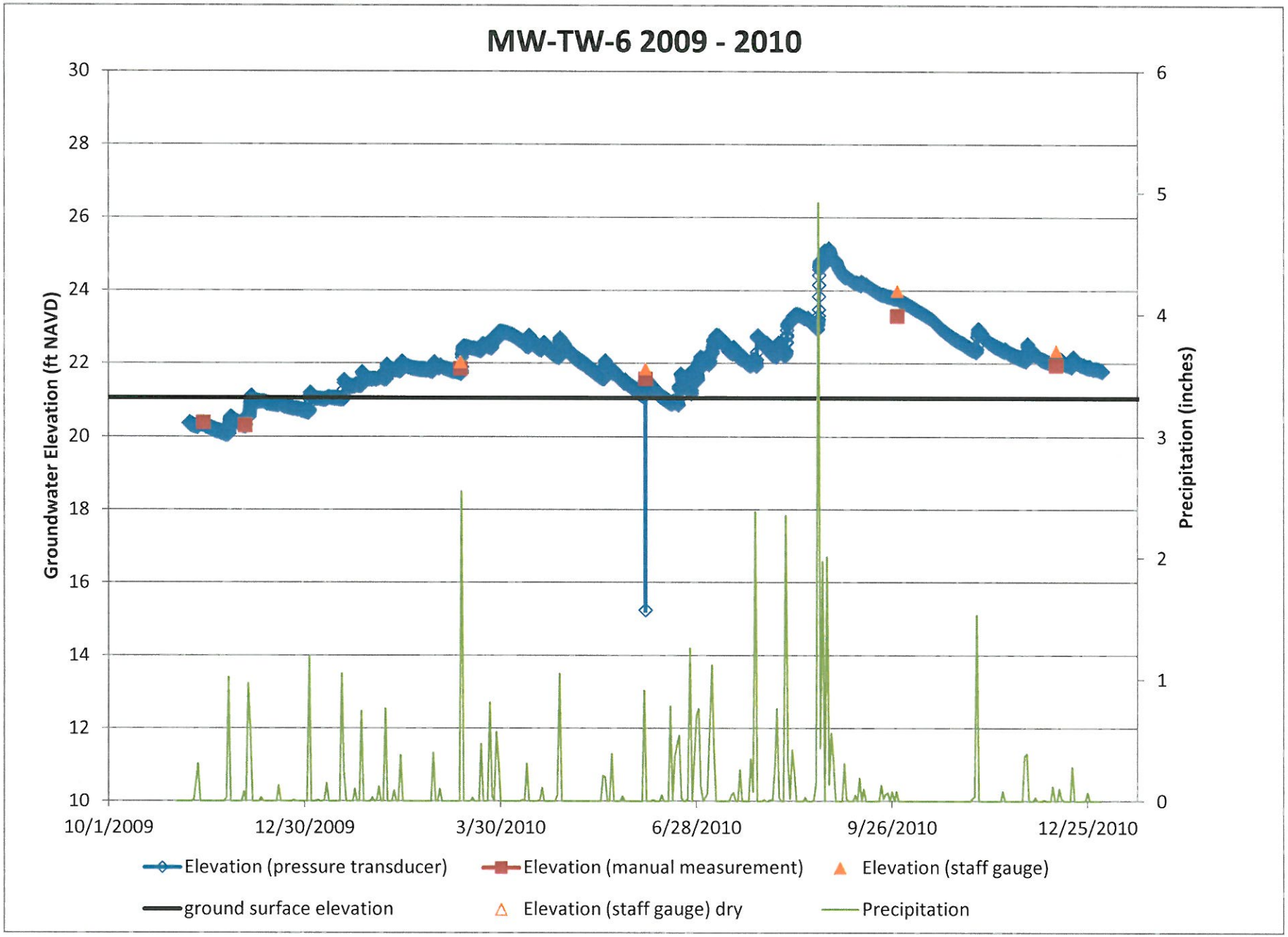
1/5/2012
4/4/2012
7/3/2012
10/1/2012
12/30/2012
Elevation (pressure transducer)
Elevation (manual measurement)
Elevation (staff gauge)
ground surface elevation
Elevation (staff gauge) dry
Precipitation


MW-TW-6 2009 - 2010
Groundwater Elevation (ft NAVD)
Precipitation (inches)
30
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6
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4
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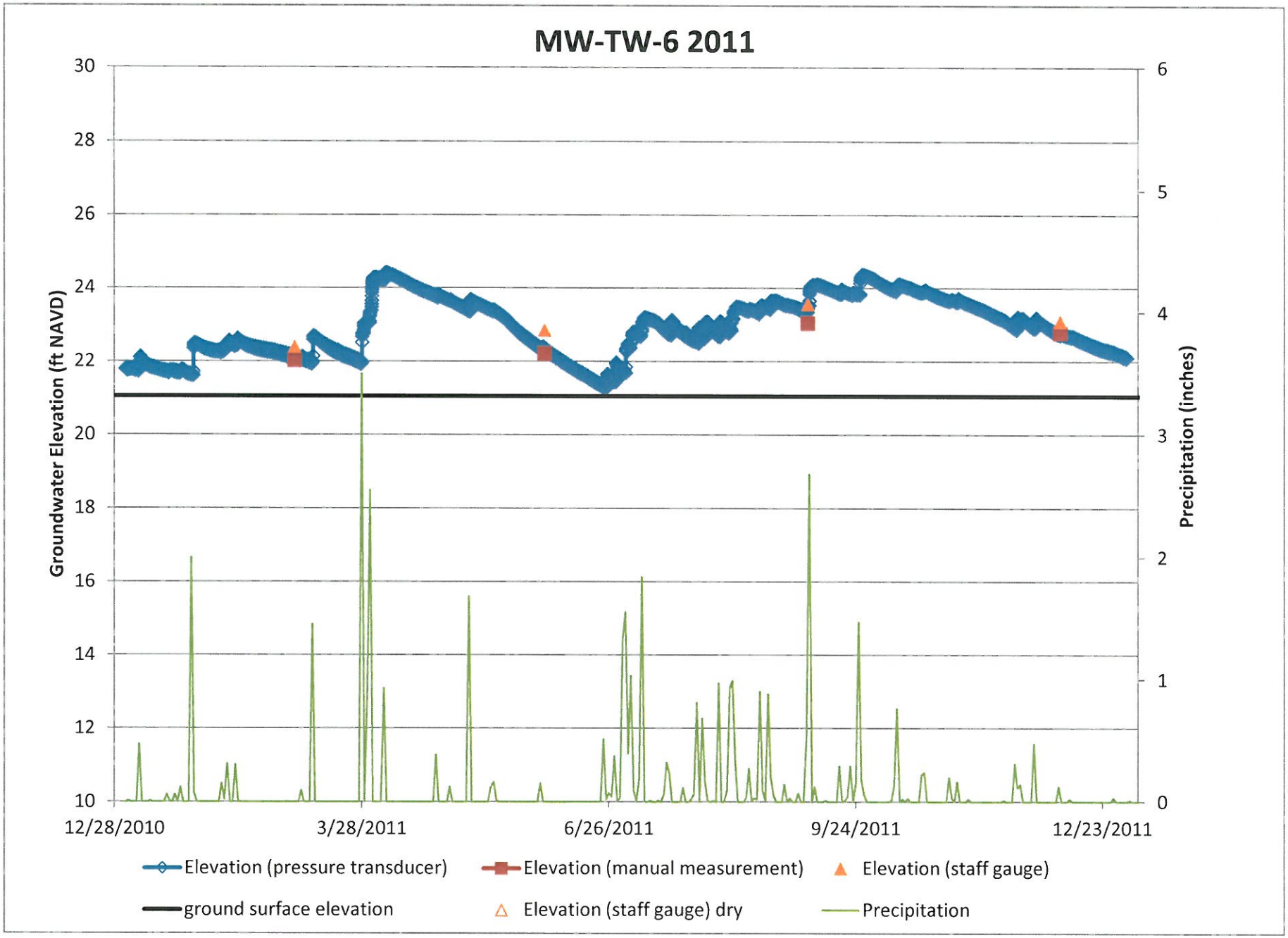
10/1/2009
12/30/2009
3/30/2010
6/28/2010
9/26/2010
12/25/2010
Elevation (pressure transducer)
Elevation (manual measurement)
Elevation (staff gauge)
ground surface elevation
Elevation (staff gauge) dry
Precipitation


MW-TW-6 2011
Groundwater Elevation (ft NAVD)
Precipitation (inches)
30
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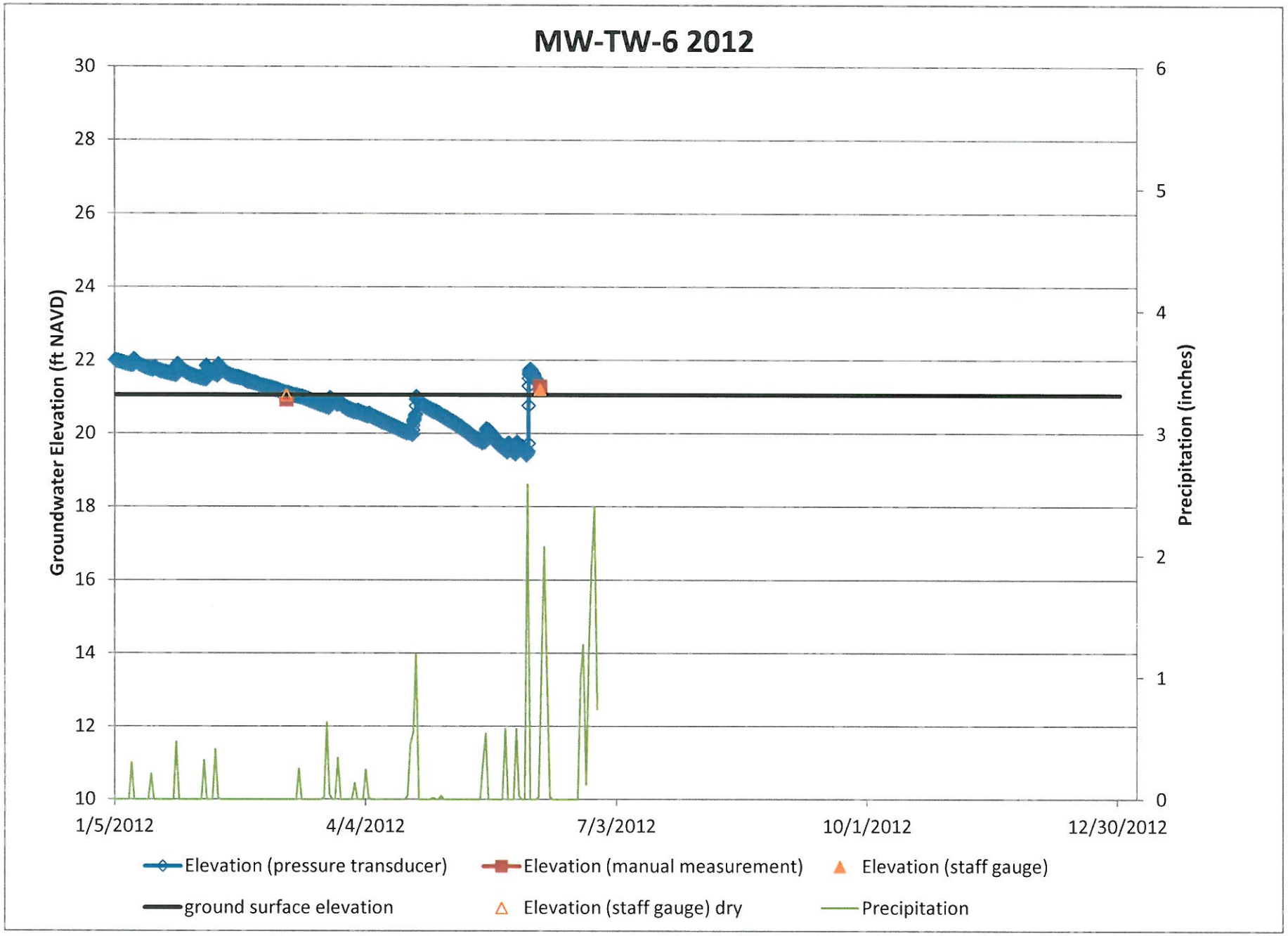
12/28/2010
3/28/2011
6/26/2011
9/24/2011
12/23/2011
Elevation (pressure transducer)
Elevation (manual measurement)
Elevation (staff gauge)
ground surface elevation
Elevation (staff gauge) dry
Precipitation


MW-TW-6 2012
Groundwater Elevation (ft NAVD)
Precipitation (inches)
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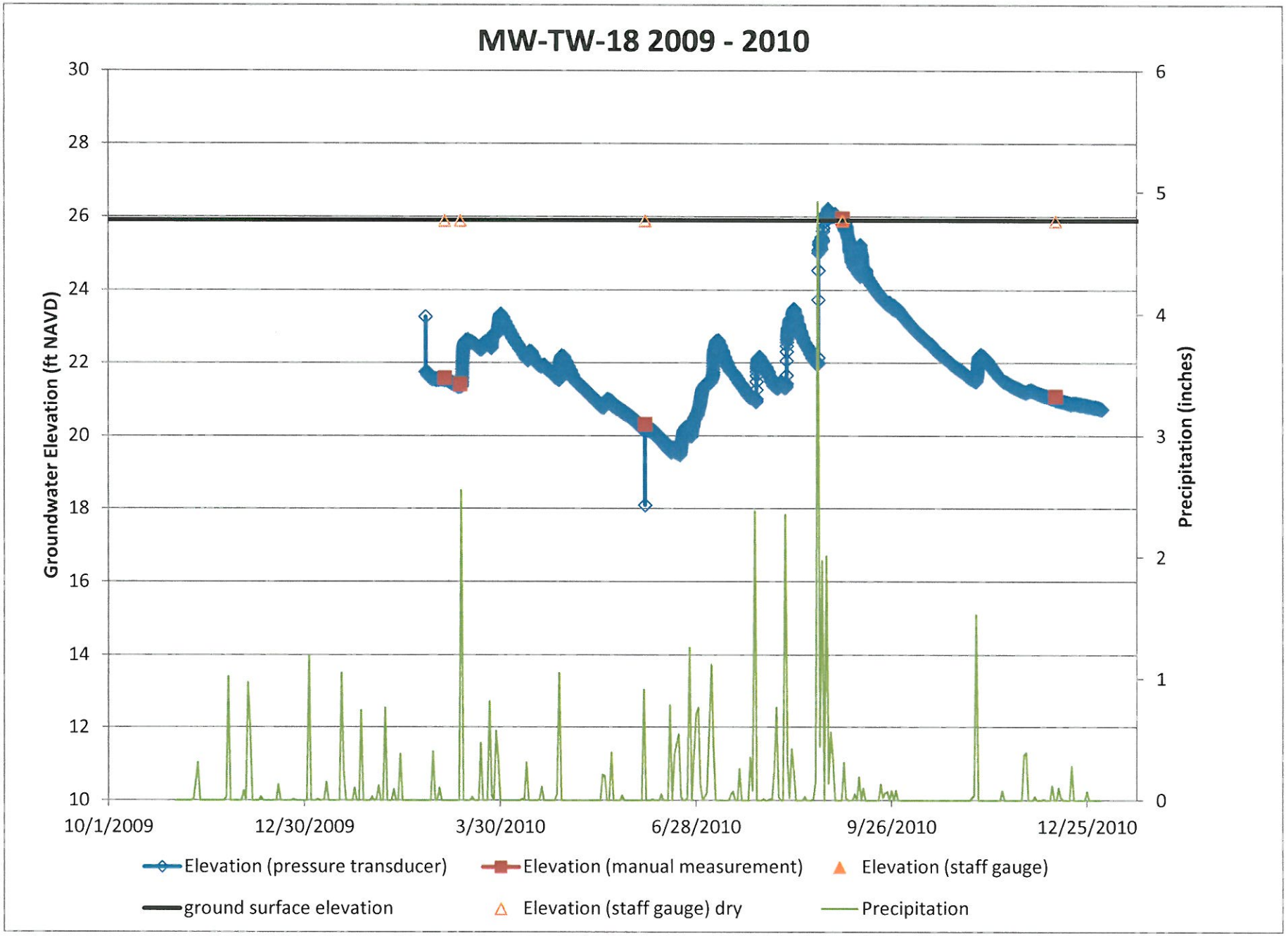
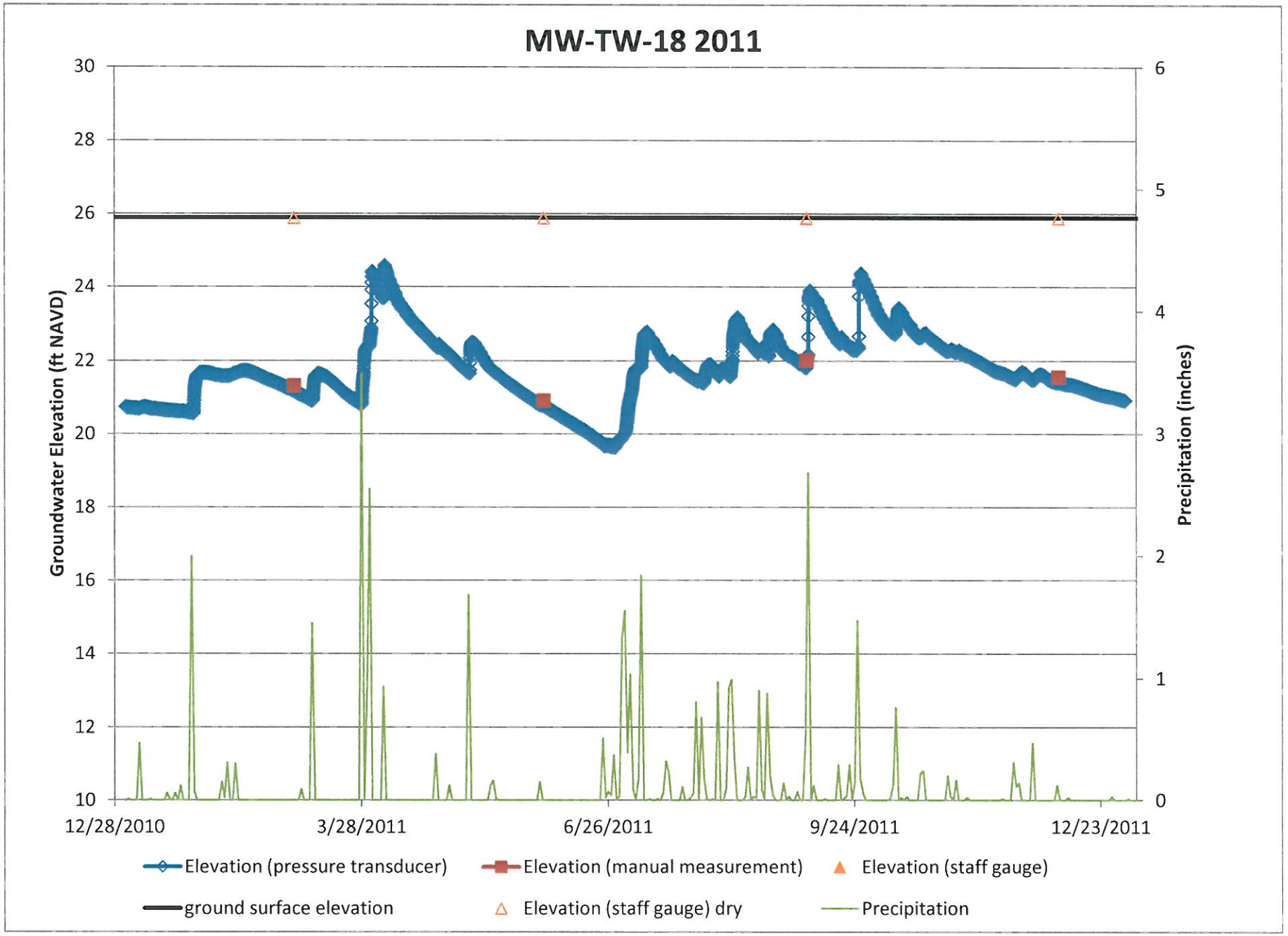
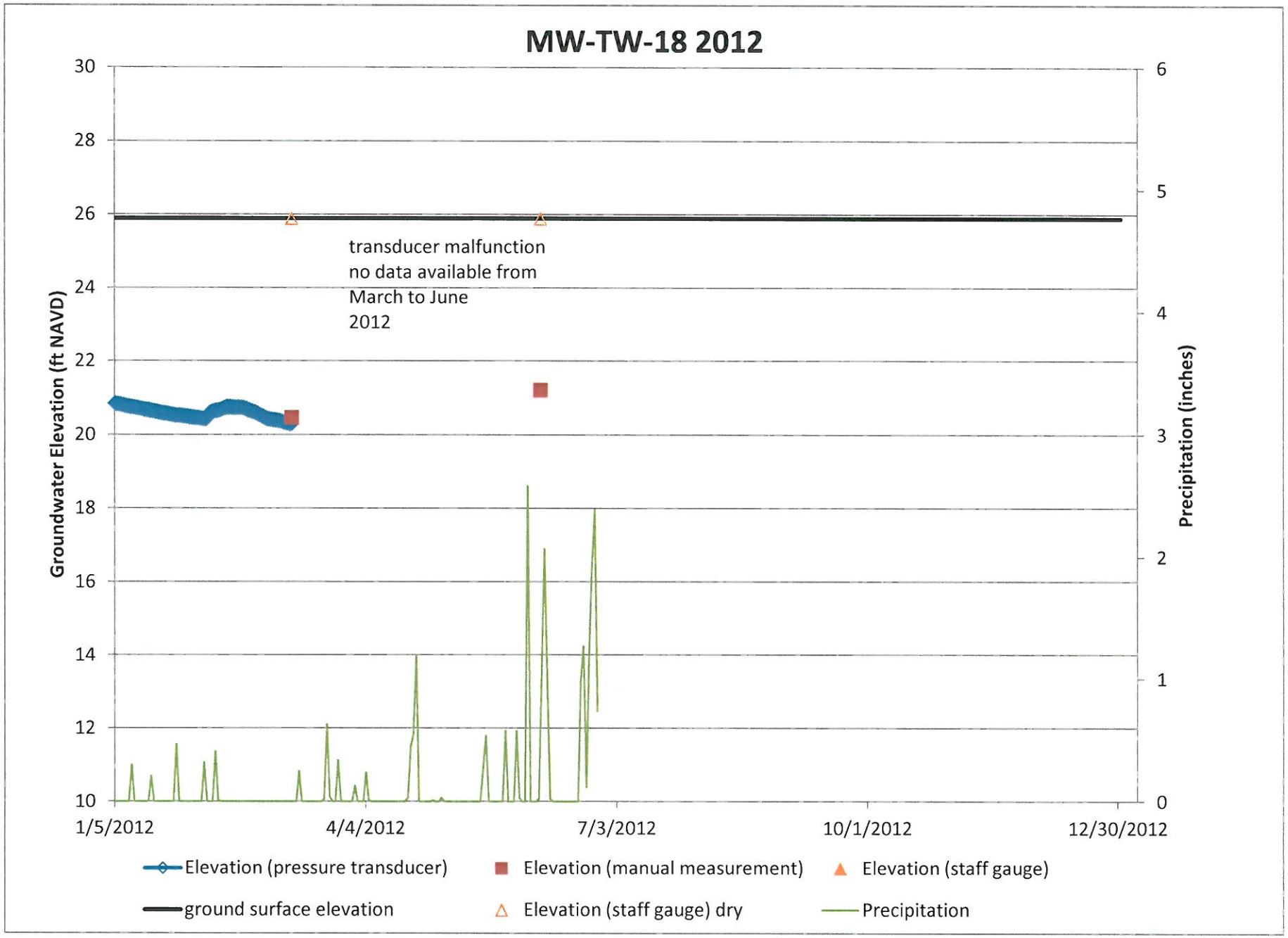
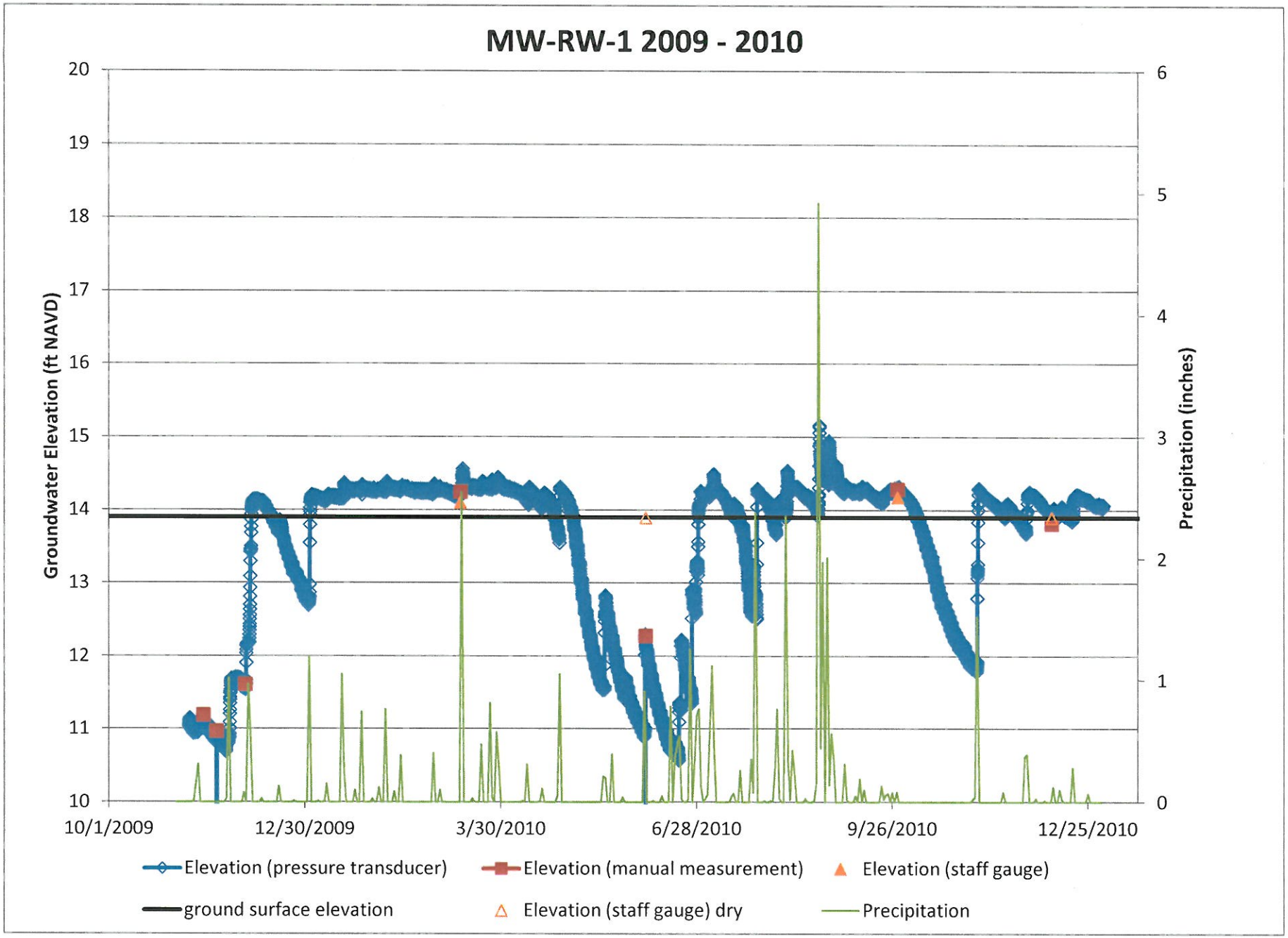
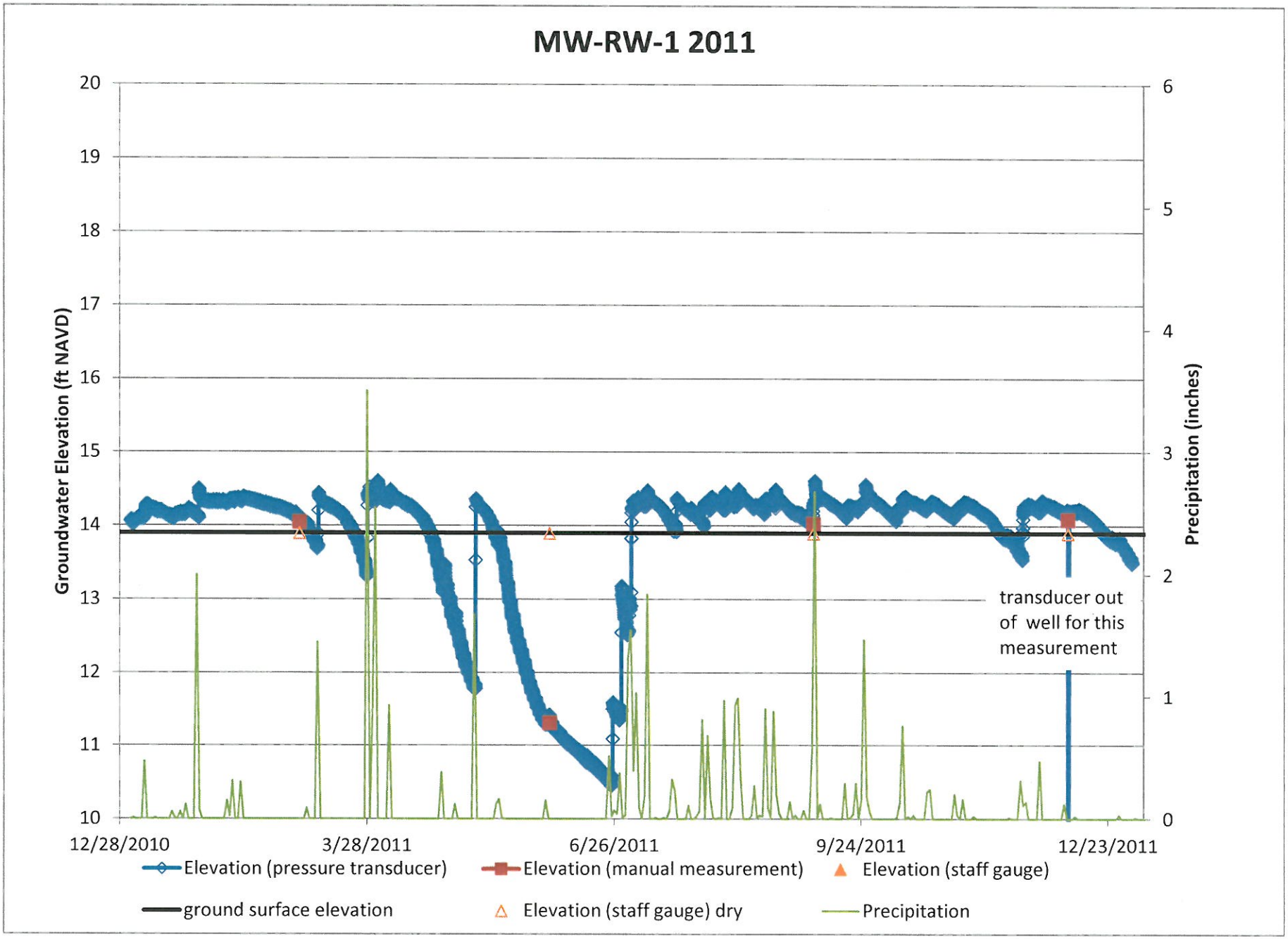
4/4/2012
7/3/2012
10/1/2012
12/30/2012
Elevation (pressure transducer)
Elevation (manual measurement)
Elevation (staff gauge)
ground surface elevation
Elevation (staff gauge) dry
Precipitation

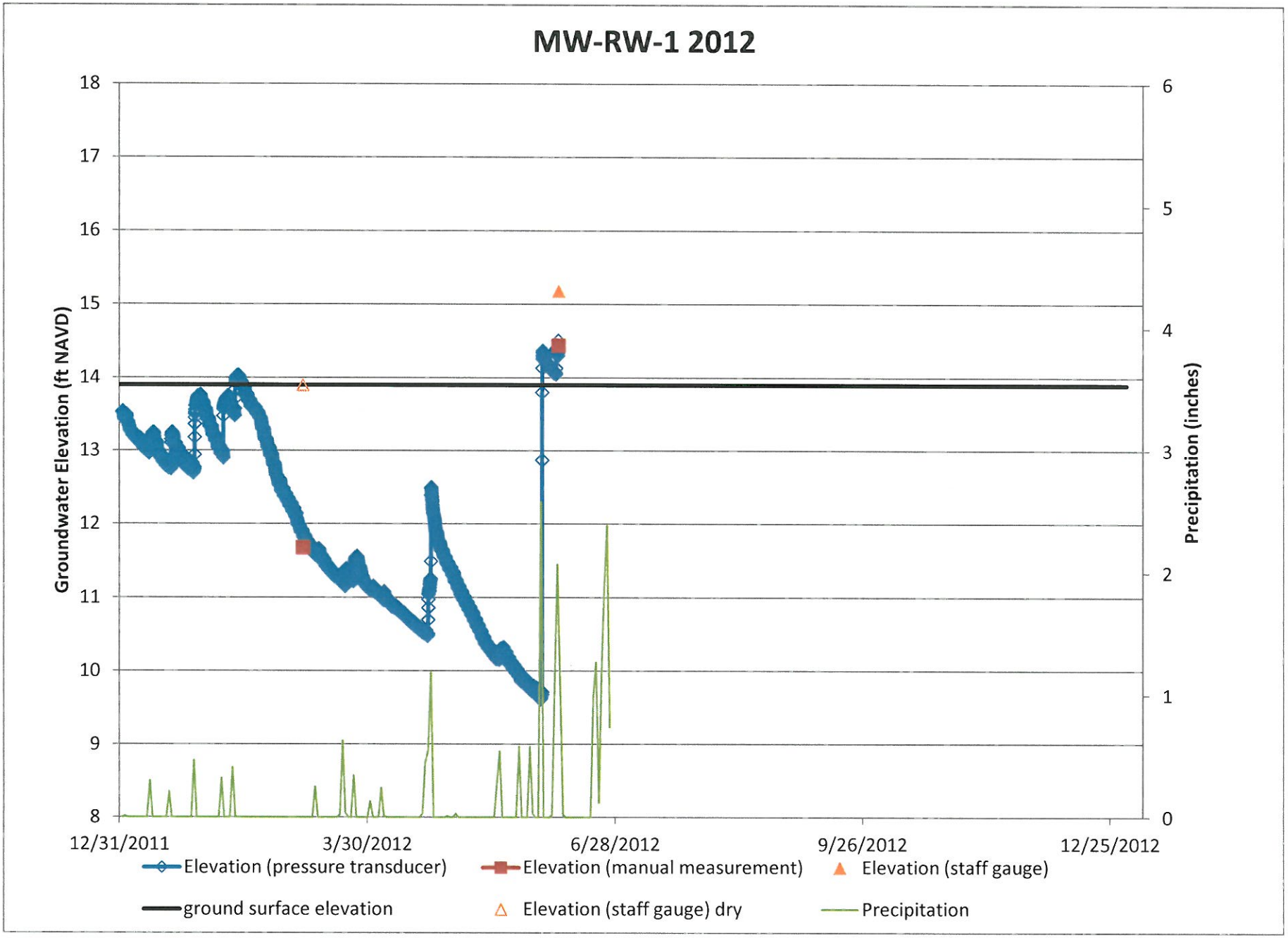

MW-TW-18 2009 - 2010
Groundwater Elevation (ft NAVD)
Precipitation (inches)
30
28
26
24
22
20
18
16
14
12
10
6
5
4
3
2
1
0
10/1/2009
12/30/2009
3/30/2010
6/28/2010
9/26/2010
12/25/2010
Elevation (pressure transducer)
Elevation (manual measurement)
Elevation (staff gauge)
ground surface elevation
Elevation (staff gauge) dry
Precipitation

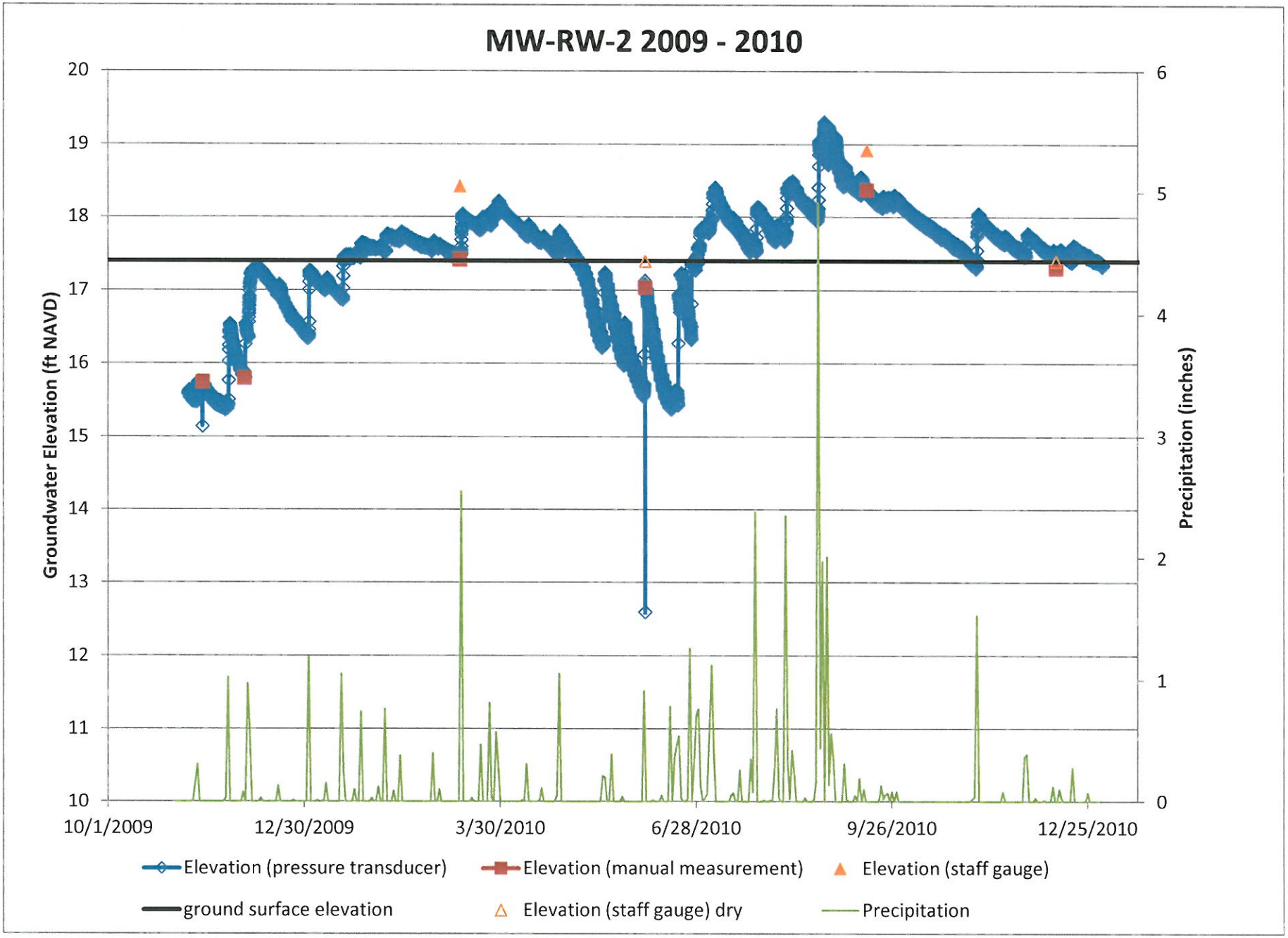

MW-TW-18 2011
Groundwater Elevation (ft NAVD)
Precipitation (inches)
30
28
26
24
22
20
18
16
14
12
10
6
5
4
3
2
1
0
12/28/2010
3/28/2011
6/26/2011
9/24/2011
12/23/2011
Elevation (pressure transducer)
Elevation (manual measurement)
Elevation (staff gauge)
ground surface elevation
Elevation (staff gauge) dry
Precipitation

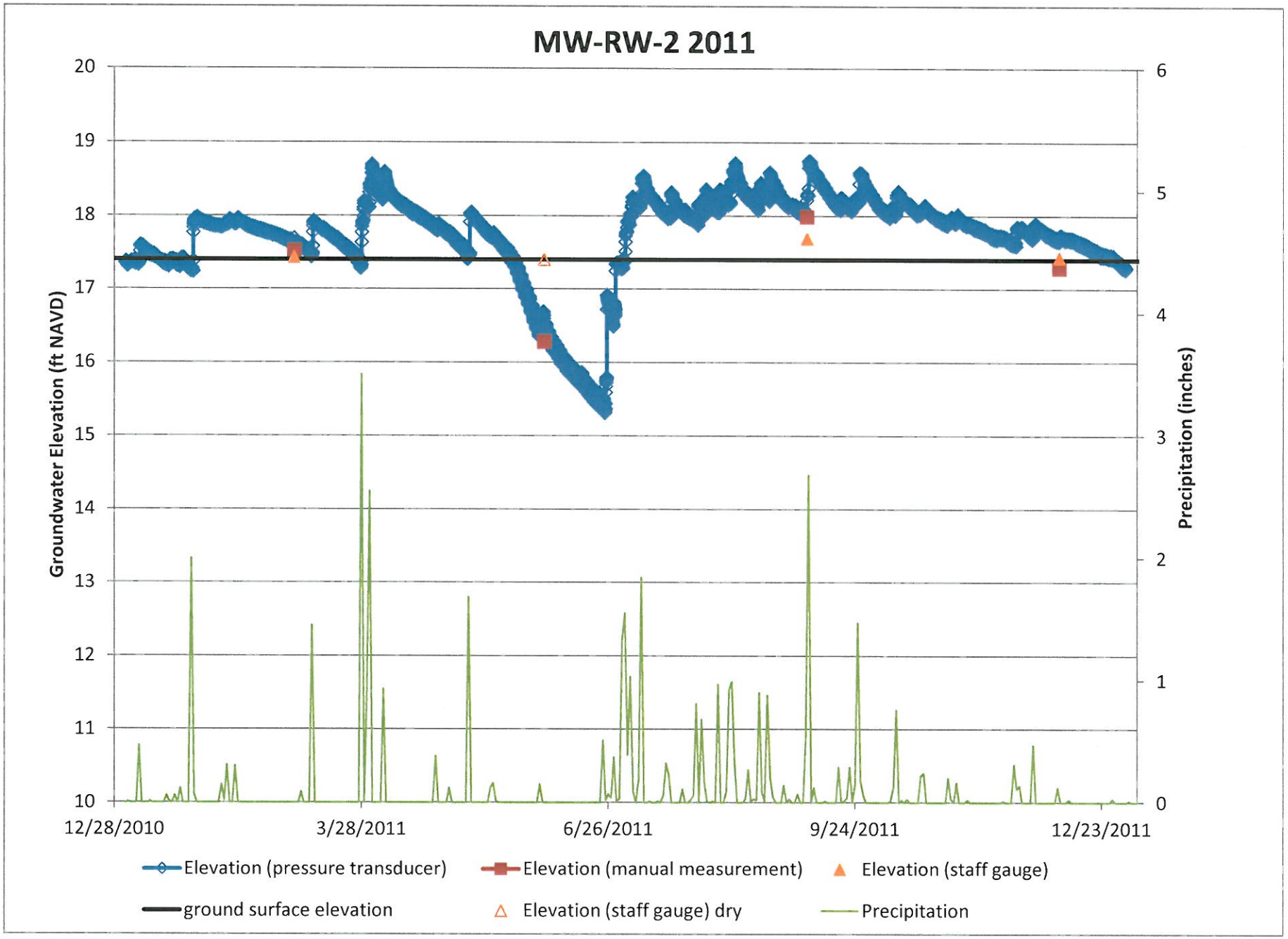

MW-TW-18 2012
Groundwater Elevation (ft NAVD)
Precipitation (inches)
30
28
26
24
22
20
18
16
14
12
10
6
5
4
3
2
1
0
transducer malfunction
no data available from
March to June
2012
1/5/2012
4/4/2012
7/3/2012
10/1/2012
12/30/2012
Elevation (pressure transducer)
Elevation (manual measurement)
Elevation (staff gauge)
ground surface elevation
Elevation (staff gauge) dry
Precipitation

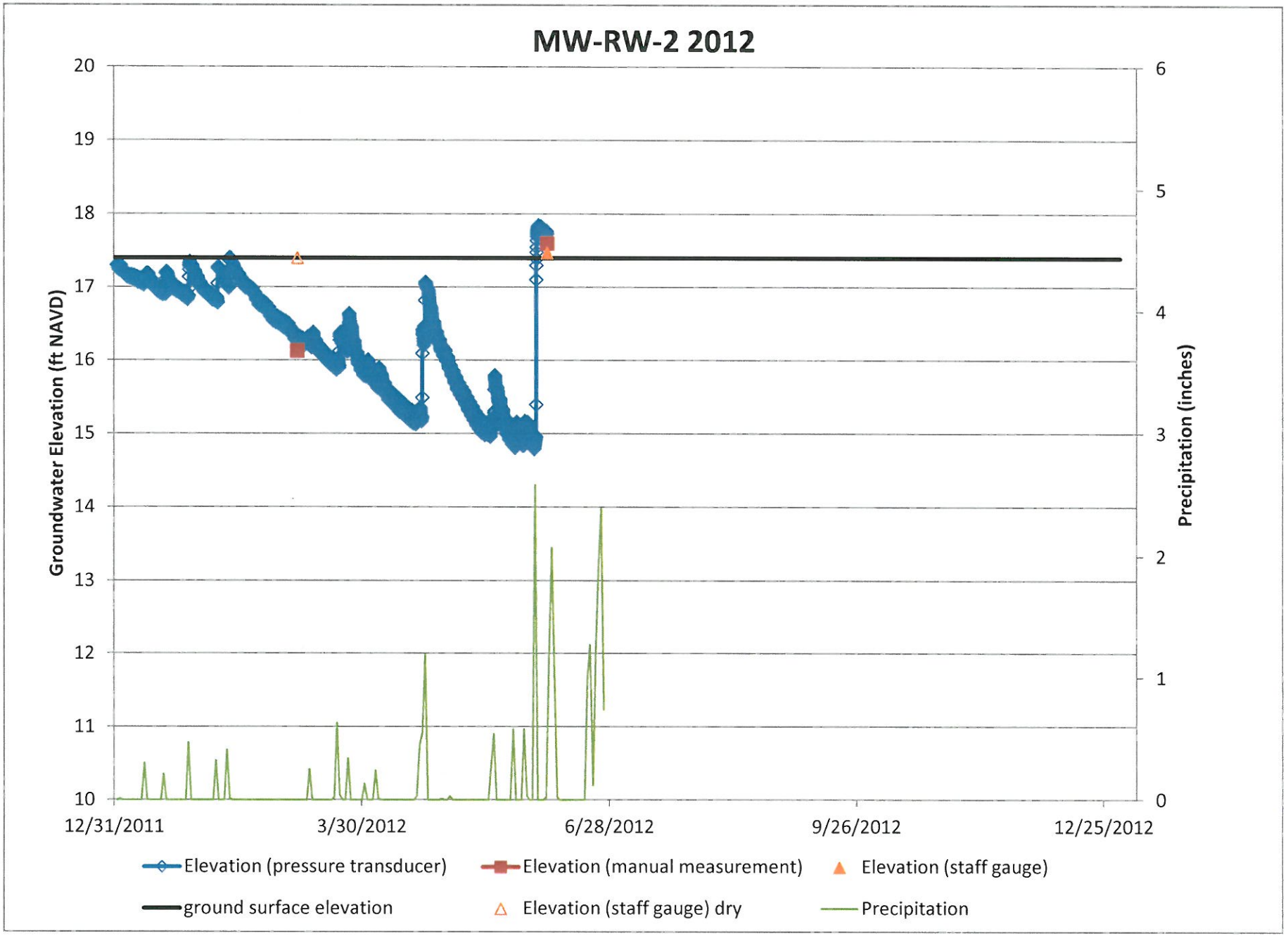

MW-RW-1 2009 - 2010
Groundwater Elevation (ft NAVD)
Precipitation (inches)
20
19
18
17
16
15
14
13
12
11
10
6
5
4
3
2
1
0
10/1/2009
12/30/2009
3/30/2010
6/28/2010
9/26/2010
12/25/2010
Elevation (pressure transducer)
Elevation (manual measurement)
Elevation (staff gauge)
ground surface elevation
Elevation (staff gauge) dry
Precipitation


MW-RW-1 2011
Groundwater Elevation (ft NAVD)
Precipitation (inches)
20
19
18
17
16
15
14
13
12
11
10
6
5
4
3
2
1
0
12/28/2010
3/28/2011
6/26/2011
9/24/2011
12/23/2011
transducer out of well for this measurement
Elevation (pressure transducer)
Elevation (manual measurement)
Elevation (staff gauge)
ground surface elevation
Elevation (staff gauge) dry
Precipitation

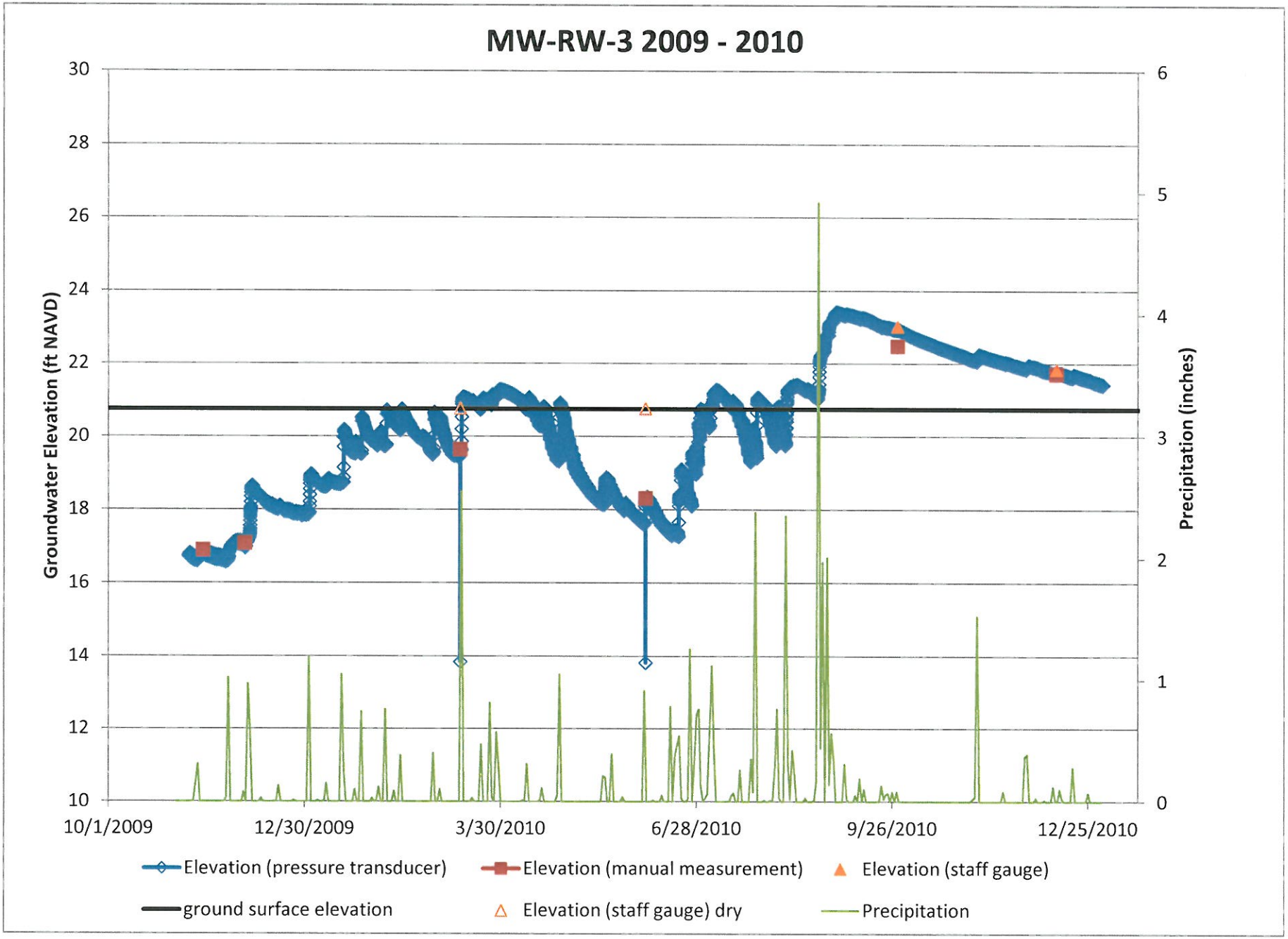

MW-RW-1 2012
Groundwater Elevation (ft NAVD)
Precipitation (inches)
18
17
16
15
14
13
12
11
10
9
8
6
5
4
3
2
1
0
12/31/2011
3/30/2012
6/28/2012
9/26/2012
12/25/2012
Elevation (pressure transducer)
Elevation (manual measurement)
Elevation (staff gauge)
ground surface elevation
Elevation (staff gauge) dry
Precipitation

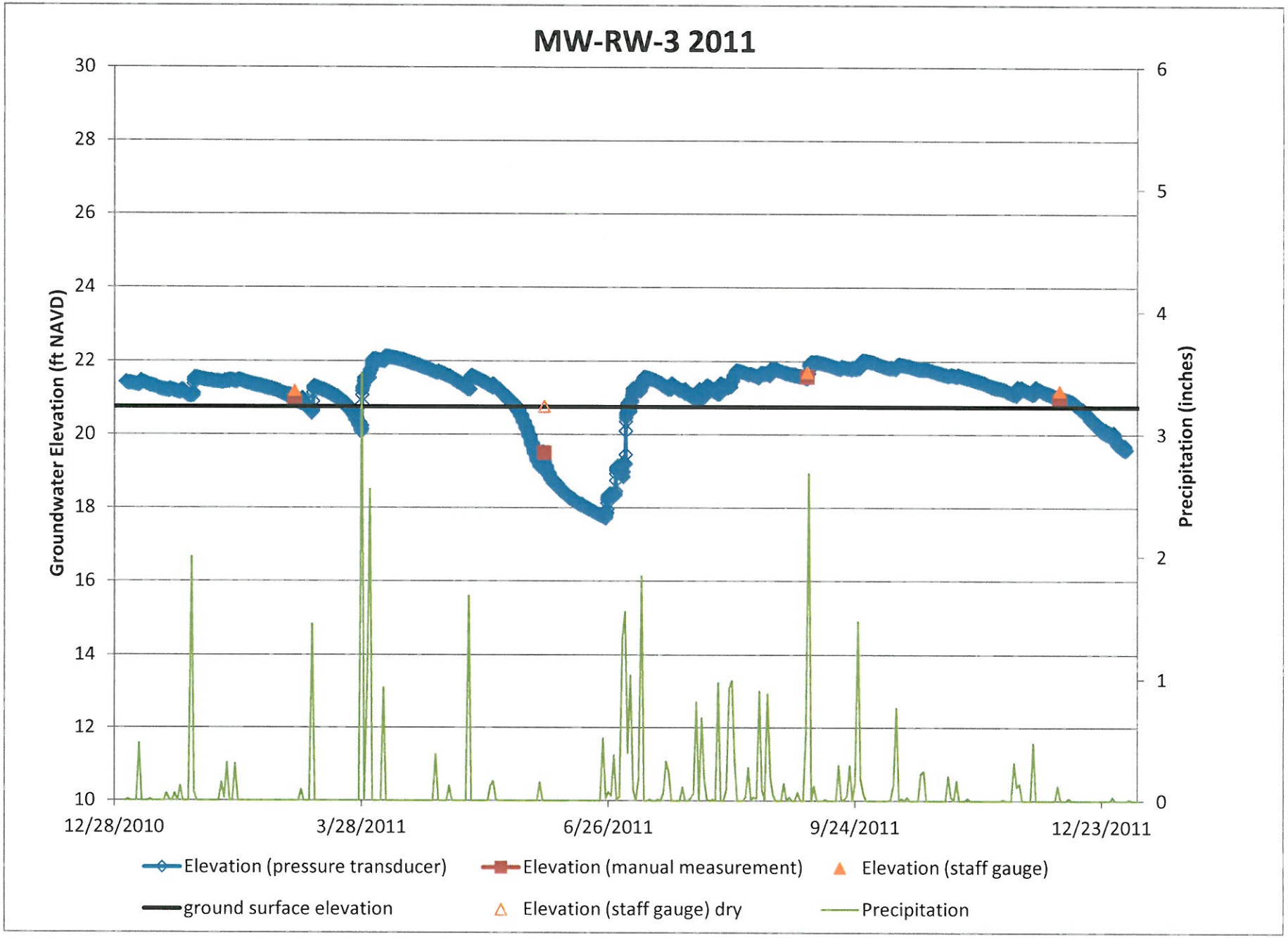

MW-RW-2 2009 - 2010
Groundwater Elevation (ft NAVD)
Precipitation (inches)
20
19
18
17
16
15
14
13
12
11
10
6
5
4
3
2
1
0
10/1/2009
12/30/2009
3/30/2010
6/28/2010
9/26/2010
12/25/2010
Elevation (pressure transducer)
Elevation (manual measurement)
Elevation (staff gauge)
ground surface elevation
Elevation (staff gauge) dry
Precipitation

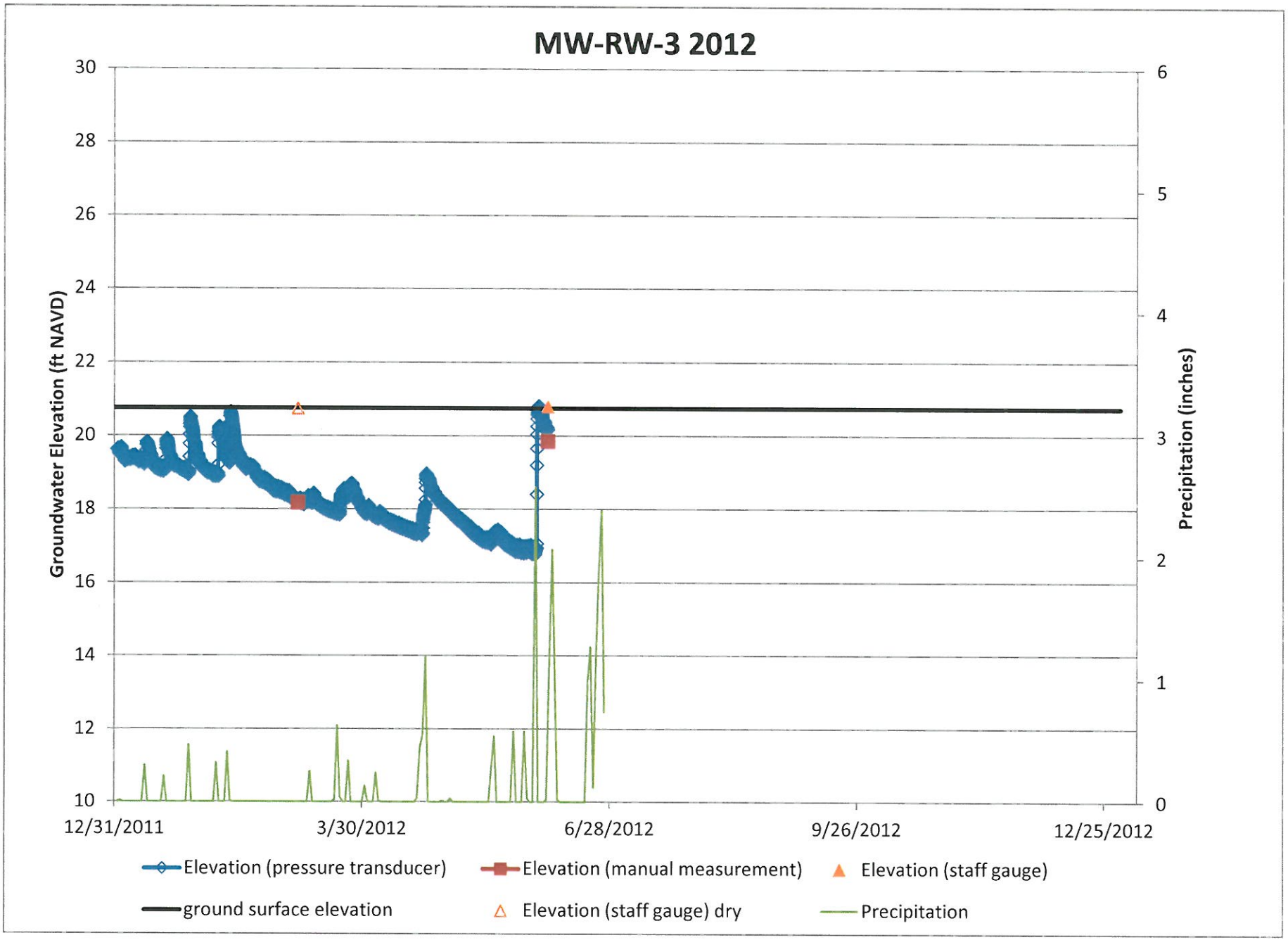

MW-RW-2 2011
Groundwater Elevation (ft NAVD)
Precipitation (inches)
20
19
18
17
16
15
14
13
12
11
10
6
5
4
3
2
1
0
12/28/2010
3/28/2011
6/26/2011
9/24/2011
12/23/2011
Elevation (pressure transducer)
Elevation (manual measurement)
Elevation (staff gauge)
ground surface elevation
Elevation (staff gauge) dry
Precipitation




R625-STA-002274-0


MW-RW-3 2009 - 2010
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
12/30/2009
3/30/2010
6/28/2010
9/26/2010
12/25/2010
Elevation (pressure transducer)
Elevation (manual measurement)
Elevation (staff gauge)
ground surface elevation
Elevation (staff gauge) dry
Precipitation


MW-RW-3 2011
Groundwater Elevation (ft NAVD)
Precipitation (inches)
30
28
26
24
22
20
18
16
14
12
10
6
5
4
3
2
1
0
12/28/2010
3/28/2011
6/26/2011
9/24/2011
12/23/2011
Elevation (pressure transducer)
Elevation (manual measurement)
Elevation (staff gauge)
ground surface elevation
Elevation (staff gauge) dry
Precipitation


MW-RW-3 2012
Groundwater Elevation (ft NAVD)
Precipitation (inches)
30
28
26
24
22
20
18
16
14
12
10
6
5
4
3
2
1
0
12/31/2011
3/30/2012
6/28/2012
9/26/2012
12/25/2012
Elevation (pressure transducer)
Elevation (manual measurement)
Elevation (staff gauge)
ground surface elevation
Elevation (staff gauge) dry
Precipitation