

### **3. QUARTERLY GROUNDWATER AND SURFACE WATER SAMPLING RESULTS**

The Monitoring Plan (SFWMD 2009a) and QAPP (FPL 2010) for this project outline the locations and analytes for the groundwater and surface water sampling and the analyses for quarterly and semi-annual events. Tables 3.0-1 and 3.0-2 provide a summary of the sampling locations and analyses. Each groundwater location is a cluster of three wells at different depth intervals. The groundwater wells are designated by depth and include “S” for shallow wells, “M” for intermediate wells, and “D” for deep wells. Surface water samples are also designated by depth, but include “T” for top (1 ft below surface) and “B” for bottom (1 ft above bottom).

During the semi-annual monitoring period, samples were collected at all locations in June 2011 and September 2011. The June 2011 event was designated as a quarterly event and the September 2011 event was designated as a semi-annual event. All samples were analyzed for the parameters as required in the Monitoring Plan.

Samples also were collected from several of the historic wells that have been monitored as part of the ID operations. Monitoring wells L-3, L-5, G-21, G-28, and G-35 were sampled in June 2011 and September 2011. Since the historic wells are screened across the entire aquifer, samples were collected from two depths (18 ft and 58 ft below top of casing).

The majority of the samples were analyzed by TestAmerica Laboratories, Inc. (TestAmerica); however, more specialized analyses were conducted by the following laboratories:

- University of Miami Rosenstiel School of Marine & Atmospheric Science Laboratory: carbon isotopes ( $\delta^{13}\text{C}$ );
- University of Miami L7 Isotope Laboratory: hydrogen ( $\delta\text{D}$ ) and oxygen isotopes ( $\delta^{18}\text{O}$ );
- United States Geological Survey (USGS) Tritium Laboratory: tritium; and
- USGS Strontium Laboratory: strontium isotopes ( $^{87}\text{Sr}/^{86}\text{Sr}$ ).

Details of the analytical methodologies for each analyte are provided in the project QAPP (FPL 2010). The following subsections provide a brief overview of the methods used to collect the samples and discusses notable exceptions in data collection methodology, sample collection, and/or laboratory analysis. A summary of the field parameters and analytical results is also included. Details on the sampling methodologies and laboratory procedures are described in the project QAPP (FPL 2010) and subsequent revisions recommended by the Agencies in June 2011 and FPL in August 2011.

## **3.1 GROUNDWATER QUALITY**

### **3.1.1 Sample Collection and Analysis**

Groundwater samples were collected in accordance with the QAPP using a peristaltic pump and dedicated Teflon® tubing that extended to the middle of each well screen interval. Three equipment volumes were purged before stability readings were taken. When three consecutive readings were recorded that coincided with FDEP criteria for parameter stabilization, sampling was initiated. Groundwater and surface water sampling logs from the June 2011 and September 2011 sampling events are provided in Appendix F of this report.

### **3.1.2 Results**

Much of the discussion during the certification of the Uprate project was related to the effects of hypersaline marine water from the CCS. Some of the key indicator constituents or parameters of interest are chloride, sodium, and specific conductance. Additional parameters had been included for various reasons as discussed in the Monitoring Plan (SFWMD 2009a).

Since saltwater intrusion has been documented in south Miami-Dade County since the early 1900s and was far inland in the 1950s (Klein 1957), the challenge is in determining the source of saltwater today. A number of other constituents are being analyzed to better understand the geochemistry of the water from different sources and to determine whether the water from the CCS can be fingerprinted. This analysis includes tritium and stable isotopes of water ( $^{18}\text{O}/^{16}\text{O}$ ), hydrogen ( $^3\text{H}/^2\text{H}$ ), carbon ( $^{13}\text{C}/^{12}\text{C}$ ), strontium ( $^{87}\text{Sr}/^{86}\text{Sr}$ ), and dissolved inorganic carbon (DIC), as well as ions listed in Table 3.0-2 of this report, barium, and iron.

Tables 3.1-1 and 3.1-2 provide a summary of the groundwater analytical results from the June 2011 and September 2011 sampling events. Results for the sampling events from the historic monitoring wells L-3, L-5, G-21, G-28, and G-35 during the same time period are provided in Tables 3.1-3 and 3.1-4. Data Usability Reports for all events are provided in Appendix G, and the detailed Level IV laboratory reports from TestAmerica are included in Appendix H.

#### **3.1.2.1 Chloride, Sodium, and Specific Conductance**

Figures 3.1-1, 3.1-2 and 3.1-3 illustrate chloride, sodium, and specific conductance, respectively, for the June 2011 and September 2011 sampling events as well as the results from the previous sampling events to show changes, or lack thereof, in these values at each location over time. The concentrations at most wells remained relatively consistent for the entire sampling period. Unless specifically stated otherwise, the discussion is limited to the June 2011 and September 2011 results.

Chloride concentrations in the CCS wells (TPGW-13S, TPGW-13M, and TPGW-13D) ranged from 32,000 mg/L to 36,000 mg/L during the June 2011 and September 2011 sampling events.

The highest concentration was in the CCS shallow well (TPGW-13S) in June 2011, but there was limited change in concentration (less than 10%) with depth. Biscayne Bay wells had lower concentrations than those found in TPGW-13. The typical range of chloride concentrations in the Biscayne Bay wells was between 19,000 mg/L to 24,000 mg/L, with the exception of TPGW-14D (32,000 mg/L and 29,000 mg/L in June 2011 and September 2011, respectively). These values in the deep well are above the concentrations reported in Biscayne Bay surface water samples. Well clusters immediately to the west of the CCS (TPGW-1, TPGW-2, L-3, and L-5) had chloride levels in the intermediate and deep zones that were between 24,000 mg/L and 32,000 mg/L. Further to the west, shallow wells located near the northern half of Tallahassee Road (TPGW-5, TPGW-6, and G-21) had chloride levels less than 250 mg/L, while the intermediate and deep wells ranged from 4,600 mg/L to 11,000 mg/L. Historic well G-28 and TPGW-4, which are located along the southern half of Tallahassee Road, were more saline in the shallow zone than wells to the north. The chloride concentration in those wells ranged from 480 mg/L to 2300 mg/L. It is not yet clear if the occasionally high chloride concentrations in the Card Sound Road Canal surface water are affecting the shallow groundwater in the vicinity of G-28 and TPGW-4. The clusters TPGW-7, TPGW-8, and TPGW-9 had chloride concentrations of less than 51 mg/L at all depths, which indicate freshwater throughout the water column.

Figure 3.1-4 shows the chloride concentrations at each well and how these concentrations compare to average surface water concentrations in Biscayne Bay, Card Sound Road Canal, and the CCS in June 2011. This period is of interest since it reflects conditions near the end of a drier than normal and prolonged dry season that lasted from November 2010 through June 2011. Based on records from SFWMD rainfall station S-20F, located on the L-31 canal berm, a total of 13.99 inches fell during the dry period as compared to 23.63 inches based on a historical average for those months from 1968 to 2010.

In nearly all instances for groundwater, high specific conductance values (greater than 1,275  $\mu\text{S}/\text{cm}$ ) are attributable to marine water and high chlorides. The SFWMD and FPL have historically used a relationship with specific conductance to calculate chloride. In the case of TPGW-8, the specific conductance in the shallow zone ranged from 2,051  $\mu\text{S}/\text{cm}$  to 2,570  $\mu\text{S}/\text{cm}$ , but the chloride values are much less than would be calculated. The specific conductance reading at this location appears to be influenced by another ion (i.e., calcium). This well also has a very high pH (11.72) that may not necessarily be influenced by grout contamination. Note that the intermediate and deep zones at TPGW-8 have a pH around 7 and specific conductance value below 1,275  $\mu\text{S}/\text{cm}$ .

Sodium results across the sampling events in June 2011 and September 2011 ranged from 8.0 mg/L to 18,000 mg/L. The highest concentrations were in TPGW-13 at 16,000 mg/L to 18,000 mg/L, and the values were fairly consistent with depth. Biscayne Bay wells TPGW-10 and TPGW-11 ranged from 10,000 mg/L to 12,000 mg/L, and TPGW-14 had high values that ranged from 13,000 mg/L to 15,000 mg/L. For comparison, the sodium value in Biscayne Bay surface water during the sampling period ranged from 11,000 mg/L to 13,000 mg/L. The intermediate and or deep wells in TPGW-1, TPGW-2, L-3, and L-5 had sodium concentrations that ranged from 14,000 mg/L to 17,000 mg/L, with the shallow well concentrations being much lower in L-3 and L-5 since they intersected a fresh water lens. Sodium concentrations in

TPGW-4, TPGW-5, TPGW-6, and G-21 at depth ranged from 2,200 mg/L to 8,000 mg/L, while the shallow wells had concentrations ranging from 26 mg/L to 310 mg/L. The clusters TPGW-7, TPGW-8, and TPGW-9 had sodium concentrations below 31 mg/L at all depths.

All these results are consistent with previous monitoring efforts. The only notable change was an increase in one or more parameters in the shallow predominantly freshwater samples (as defined by FDEP) in L-3 and L-5 during at least one of the sampling periods. For example, the chloride concentration at L-5 increased from an average of 114 mg/L from the previous three quarters to 1,500 mg/L in June 2011 which was towards the end of the very dry period. The samples at the L-3 and L-5 wells are collected very close to the freshwater (as defined by  $<1,275 \mu\text{S/cm}$ ) and saltwater interface, and drought or rainfall conditions can impact where that interface may lie.

### **3.1.2.2 Ions**

Ion (calcium, magnesium, potassium, sodium, boron, strontium, bromide, chloride, fluoride, and sulfate) concentrations at the TPGW sites appeared to correspond with specific conductance values in most of the wells. Freshwater sites had low concentrations of ions, while marine-influenced sites generally had higher values. The range of values remained consistent for most of the sites during this semi-annual monitoring period. Ionic concentrations in the marine stations (TPGW-10, TPGW-11, and TPGW-14) were similar to the values observed by Reich et al. (2006) from a well in the middle of Biscayne Bay (Mid-Bay: well GW-MB). The well cluster in the CCS, TPGW-13, had higher ionic concentrations than those of the marine stations.

Groundwater stations have been grouped based on their general characteristics and location and Table 3.1-5 shows the associated range of ions for the June and September sampling events. For comparison, refer to Table 3.2-3 for the range of ions in surface water.

The Piper diagram (Figure 3.1-5) shows similar ionic patterns across the landscape, regardless of whether it was the end the dry season (June) or the middle of the wet season (September). Wells TPGW-7, -8, and -9 are reflective of calcium-bicarbonate waters indicative of fresh Everglades water, while around and in the CCS (i.e., TPGW-1, -2, -3, -10, -11, -12, -13, and -14) wells are indicative of a marine sodium-chloride water source. The CCS well cluster (TPGW-13) overlaps with the marine waters for both June 2011 and September 2011. Wells farther from the CCS (i.e., TPGW-4, -5, and -6) are a mix of both fresh and marine waters; the shallow (S) wells reflect a range of mixing from both water sources, while the intermediate (M) and deeper (D) depths approached marine ionic composition (Figure 3.1-5).

### **3.1.2.3 Isotopes**

The  $\delta\text{D}$  and  $\delta^{18}\text{O}$  isotopic values seasonally tracked the freshwater-marine water influence observed at the TPGW sites (i.e., trended with the specific conductance). Freshwater sites had lower concentrations of both isotopes, while marine-influenced sites were more enriched. The oxygen isotopic signatures during the June dry season were not statistically different from the values observed during the September 2011 wet season (paired t-test ( $df = 41$ ):  $t = 0.762$ ,  $p > 0.10$ ), but the  $\delta\text{D}$  values were significantly greater in the dry season relative to the wet (paired t-

test ( $df = 41$ ):  $t = 2.362$ ,  $p < 0.05$ ), indicating a decrease in evaporative enrichment when the rains started.

June 2011  $^{87}\text{Sr}/^{86}\text{Sr}$  signatures ranged from 0.70907 to 0.70915 across the landscape for that quarter (Table 3.1-6). The predominantly marine-type samples had the widest range, followed by the freshwater-type samples and TPGW-13. The lowest  $^{87}\text{Sr}/^{86}\text{Sr}$  signatures values (0.70907) were observed at TPGW-3M and -6D, while the highest values were found at a number of wells (TPGW-5M, -6S, -9M, -10M, -10D, -11M, and -11D).

The  $\delta^{13}\text{C}$  of a sample is the function of the processes that have influence on the DIC pool. Geophysical processes within the aqueous carbonate bedrock, biogenically-derived uptake and release of carbon dioxide ( $\text{CO}_2$ ), the exchange of the water with atmospheric  $\text{CO}_2$ , or mixing of carbon from various sources can all influence the  $\delta^{13}\text{C}$  value observed. Sources that can influence the  $\delta^{13}\text{C}$  of these samples include limestone dissolution (0‰), atmospheric  $\text{CO}_2$  (-8‰), carbonate weathering by soil  $\text{CO}_2$  in Florida aquifers which results in a  $\delta^{13}\text{C}$  of -13‰ (Sackett et al. 1997), and terrestrially-derived  $\text{C}_3$  carbon (-26‰).

Carbon isotopes ( $\delta^{13}\text{C}$ ) in the groundwater ranged from -3.9‰ to -12.5‰ in June 2011 and from -4.3‰ to -15.3‰ in September 2011. The well cluster with the highest  $\delta^{13}\text{C}$  values for both seasons was TPGW-10 at all depths, indicating that this water is likely from the carbonate dissolution of the bedrock. TPGW-12S had the lowest value in June 2011 (-12.5‰), but TPGW-8S has the lowest value in September 2011 (-15.3‰); the values at TPGW-12S are probably a consequence of various mixing sources, but the value at TPGW-8S may be a result of the high pH (11.72) at this site affecting the geophysical and biogenic processes in the groundwater at this location. With the exception of the wells discussed above, most of the other groundwater sources had  $\delta^{13}\text{C}$  between -6‰ to -10‰ over both the dry (June) and wet (September) seasons, indicating consistency in the mix of sources contributing to the isotopic signature. Unlike Sackett et al. (1997) and Bouillon et al. (2007) that showed significant positive relationships between  $\delta^{13}\text{C}$  and salinity, the groundwater data did not demonstrate clear patterns with salinity.

Tritium values are only available for the June 2011 event, as the USGS did not provide the results from the September 2011 event in time for inclusion in this report. At TPGW-6 through TPGW-10, tritium concentrations were less than 33 picocuries per liter (pCi/L) at all depths. Also the shallow wells or samples at TPGW-4, TPGW-5, G-21 and G-28 had tritium concentrations below 31 pCi/L. Values at TPGW-1, TPGW-2, TPGW-3, TPGW-12, and TPGW-14 (all depths), and the intermediate and deep wells of TPGW-4, TPGW-5, and TPGW-11, were higher. While the concentrations varied from station to station, the levels at any given station (based on five quarters of data since June 2010) were fairly stable. It is important to note that tritium values at all locations are far below any regulatory standard and do not pose any public health and safety concerns. Figure 3.1-6 illustrates tritium concentrations in the June 2011 groundwater samples as well as the results from the previous sampling events.

Groundwater stations have been grouped based on their general characteristics and location. Table 3.1-6 shows the associated range of isotopes for the June 2011 and September 2011 sampling events. For comparison, refer to Table 3.2-4 for the range of isotopes in surface water.

#### **3.1.2.4 Nutrients**

Figure 3.1-7 shows nutrient results for the September 2011 sampling event. A brief discussion of these results is provided below.

Total nitrogen (TN) values in well clusters TPGW-1, TPGW-2, and TPGW-13 and the deep well at TPGW-14 ranged from 1.2 mg/L to 2.8 mg/L. Well cluster TPGW-10 had much lower TN levels, all below 0.40 mg/L. In all but one well (TPGW-1D), the majority of TN (60% to nearly 100%) was comprised of ammonia which is an inorganic form of nitrogen. While the values are slightly different, these findings are generally consistent with previous results with a few exceptions. For TPGW-1D, the results in September 2011 reveal low ammonia levels and indicate that approximately 60% of the TN is organic nitrogen. In March 2011, however, the results showed total ammonia levels comparable to the other wells, but showed very high levels of TN (9.8 mg/L) and nitrate/nitrite (NO<sub>x</sub>); these latter two inorganic nitrogen forms comprised most of the TN (over 80%). Also in March 2011, TPGW-2D had high levels of TN (7.7 mg/L), with nitrate comprising most of the TN (nearly 70%). Some of these results are suspect, and FPL split samples with PERA during the March 2012 sampling event to compare results.

Total phosphorus (TP) concentrations ranged from 0.020 mg/L to 0.066 mg/L, with the highest value found in TPGW-13D. The September 2011 results show that more than 50% of TP is orthophosphate, with concentrations ranging from 0.014 mg/L to 0.039 mg/L. This is consistent with previous results from March 2011. The orthophosphate values are similar to data from the USGS (Reich et al. 2006) for two wells north of the study area (onshore G3613 and Mid-Bay: SRP: 0.012 mg/L to 0.032 mg/L), although the TP values obtained are higher than the USGS sites (TP: 0.012 mg/L to 0.033 mg/L).

#### **3.1.2.5 Trace Elements**

Per the Monitoring Plan (SFWMD 2009a), trace elements (arsenic, barium, beryllium, cadmium, hexavalent chromium, copper, iron, lead, mercury, manganese, molybdenum, nickel, selenium, thallium, vanadium, and zinc) are to be collected in TPGW-1, TPGW-2, TPGW-10, TPGW-13, and TPGW-14 during semi-annual sampling events. For this monitoring period, semi-annual samples were collected in September 2011. Most concentrations were non-detected or low values between the method detection limit (MDL) and quantitation limit and reported as estimated values. Due to salt water interferences, the laboratory is continuing to have difficulty in reaching MDLs as specified in the QAPP (FPL 2010) for many of the parameters. TestAmerica is currently evaluating their protocols per the FPL December 2011 audit. FPL requests that the sampling and analysis for these parameters be further discussed with the Agencies.

Iron was previously reported to exhibit high concentrations in some of the wells; however, during the September 2011 sampling event, iron, while often qualified, was reported at much

lower values. For example, at TPGW-1M, an estimated value of 2.6 mg/L was reported in September 2011, but a value of 13 mg/L was reported in September 2010.

## **3.2 SURFACE WATER QUALITY**

### **3.2.1 Sample Collection and Analysis**

For the purposes of this discussion, surface water includes canals, the CCS, and Biscayne Bay. Surface water samples were collected using a peristaltic pump and new Teflon<sup>®</sup> or polyethylene tubing that was affixed to rigid pipe to ensure the samples were collected at the appropriate depth. Once parameters had stabilized, water was extracted from the tubing and collected directly into the sample bottles. After each sample collection, the tubing was disposed and new tubing used. Samples for surface water are typically collected from fixed platforms or from a boat.

Samples were collected at the surface water stations identified in Table 3.0-1. Samples were collected from one foot below the surface (T) and one foot above the bottom (B) unless the water depths were less than 3 feet. In those cases, only one sample was collected at the bottom.

### **3.2.2 Results and Discussion**

Tables 3.2-1 and 3.2-2 provide a summary of the surface water analytical results from the June 2011 and September 2011 sampling events. Data Usability Reports for each event are provided in Appendix G and the detailed Level IV laboratory reports from TestAmerica are included in Appendix H. Unless specifically stated otherwise, the discussion is for the June 2011 and September 2011 results.

#### **3.2.2.1 Chloride, Sodium, and Specific Conductance**

Figures 3.2-1, 3.2-2, and 3.2-3 detail chloride, sodium, and specific conductance values for all surface water stations for the June 2011 and September 2011 sampling events and include results from the previous monitoring efforts. High levels of these parameters in a coastal area are typically reflective of marine influences. For example, surface waters with chloride concentrations greater than 1,500 mg/L are defined as predominately marine, while those with less than 1,500 mg/L are defined as predominately fresh (FDEP Florida Administrative Code [F.A.C.] 62-302.200). The Class I/III criteria for specific conductance in freshwater is less than 1,275  $\mu\text{S}/\text{cm}$ . Values higher than 1,275  $\mu\text{S}/\text{cm}$  in a coastal environment are often viewed as potentially having some marine influence. Note though, other constituents not related to marine water can cause high specific conductance readings (e.g., calcium, magnesium, etc.).

Chloride concentrations in the CCS ranged from 32,000 mg/L to 38,000 mg/L, with the average value being 10.4% higher in June 2011 than September 2011. There was little difference in concentration between samples collected near the surface or near the bottom. During the same period, Biscayne Bay chloride values ranged from 19,000 mg/L to 28,000 mg/L. Values were between 26,000 mg/L and 28,000 mg/L in June 2011 as a result of an extended very dry season

(refer to Section 2.4-2) and reflected the highest values recorded in the Bay since the beginning this monitoring effort. In September 2011, with the onset of the rainy season, the chloride concentration dropped and levels ranged from 19,000 mg/L to 22,000 mg/L. In comparison, average seawater chloride levels are 19,840 mg/L at a salinity of 35 on PSS78 (Millero 1996).

Chloride concentrations at TPSWC-5 (located in the deep historic outfall canal) were similar to values observed at the TPBBSW stations. TPSWC-4, which is affected by both Biscayne Bay and freshwater discharges, had a chloride concentration in June 2011 of 27,000 mg/L. ID chloride concentrations varied, depending, in part, on when pumping was occurring; higher values were noted during periods of pumping. For example, TPSWID-2 had a maximum concentration of 27,000 mg/L in June 2011 during a period when the ID pumps were operating frequently, but were as low as 900 mg/L in September 2011 during a wetter non-pumping period. FPL previously reported (August 2011) that as the dry season progressed and the drought in the region continued, chloride levels in the L-31E Canal increased at all three stations. By June 2011, the values most notably at TPSWC-2 and TPSWC-3 increased to 2,500 mg/L and 5,300 mg/L, respectively. There was not a corresponding increase in tritium. Station TPSWC-1 showed the least increase (62 mg/L in March 2011 to 140 mg/L in June 2011). All appear to be effected from the drought. Due to restoration efforts by others, the segment of canal that TPSWC-1 is located in is partially blocked from portions of the canal where TPSWC-2 and TPSWC-3 are located.

The manual monitoring station, TPSWC-6 located on the Card Sound Road Canal, had chloride levels indicating very saline water during one sampling period and fresh water the during next. In June 2011, the chloride level at TPSWC-6 (bottom sample) was 25,000 mg/L. In September 2011, the concentration dropped to 130 mg/L. This station is about 6 miles inland, but the USGS has previously indicated that they found hypersaline conditions past this station all the way to Florida City several years ago during the last drought (M. Wacker 2010).

The highest sodium concentrations were in the CCS samples and were consistently between 17,000 mg/L and 19,000 mg/L. The Biscayne Bay surface water samples ranged from 11,000 mg/L to 14,000 mg/L. Average sodium levels in seawater are 11,050 mg/L (Millero 1996), but can approach 14,000 mg/L in Biscayne Bay depending on location and time of year (Reich et al. 2006). The ID samples (TPSWID-1, TPSWID-2, and TPSWID-3) exhibited sodium levels that ranged from 500 mg/L to 14,000 mg/L and, as discussed above, the concentrations increased during periods of frequent ID pumping, with the highest values in June 2011. The sodium concentrations in the L-31 Canal (TPSWC-1, TPSWC-2, and TPSWC-3) peaked in June 2011, with the highest values being found at TPSWC-3 (2,600 mg/L). The sodium values in the manual station TPSWC-6 were reflective of saline marine influences in June 2011 and the fresh conditions in September 2011.

The CCS is characterized as typically having hypersaline water, with values in June 2011 and September 2011 being in excess of 80,000  $\mu$ S/cm. Previous sampling efforts also reveal hypersaline conditions in the CCS (FPL 2011b). In June 2011, Biscayne Bay stations had specific conductance levels that ranged from 61,153  $\mu$ S/cm to 66,855  $\mu$ S/cm and these conditions do naturally occur in the Bay during dry conditions. For comparison, average



seawater (salinity at 35 PSS78 at a temperature of 25°C) has a specific conductance of 54,700  $\mu\text{S}/\text{cm}$ . Lee et al. (2006) defined hypersaline conditions as salinity greater than 40 (in PSS78 scale), which equates to a specific conductance of 61,500  $\mu\text{S}/\text{cm}$  at 25°C.

### **3.2.2.3 Ions and Silica**

Ion (calcium, magnesium, potassium, sodium, boron, strontium, bromide, chloride, fluoride, and sulfate) concentrations at the Biscayne Bay surface water sites were typical of seawater (Millero 1996) and of similar range to the values observed by Reich et al. (2006) in Biscayne Bay. CCS values were higher than those of Biscayne Bay, while the TPSWC and TPSWID ions were generally lower in concentration, although they varied depending on fresh and marine influence. Fluoride, and sulfide were extremely low and virtually undetectable in most of the samples. Few inferences could be made from those datasets due to the limited detectable values available.

Silica in the September 2011 CCS samples ranged from 0.14 mg/L to 1.6 mg/L. The lowest values were in samples TPSWCCS-4B (0.14 mg/L) and TPSWCCS-5B (0.17 mg/L). All the higher silica values are on the west side of the CCS. Water pathways through quartz material often result in higher silica concentrations in groundwater samples than surface water samples; this was observed for the groundwater collected from wells around Biscayne Bay that had in excess of 7 mg/L of silica (Reich et al. 2006). FPL previously postulated (FPL 2011b) that the higher silica values may indicate some contribution of groundwater to the system, while the lower silica values to the southern and eastern end of the CCS indicate a contribution of seawater to the system. Historic quarterly values of silica in the surface waters of Biscayne Bay ranged from 0 to 0.3 mg/L (Florida International University Water Quality Monitoring Network [FIU-WQM]) between 1996 and 2005 at Site 122 ([http://serc.fiu.edu/wqmnetwork/SFWMD-CD/Sites/Bb/site122\\_files/Site122.htm](http://serc.fiu.edu/wqmnetwork/SFWMD-CD/Sites/Bb/site122_files/Site122.htm)). These values are similar to those found on the south and east sides of the CCS.

Surface stations have been grouped based on their general characteristics and location, and Table 3.2-3 shows the associated range of ions for the June 2011 and September 2011 sampling events. TPSWC-4 and TPSWC-5 are not included since they do not readily fit into the categories. For comparison, refer to Table 3.1-5 for the range of ions in groundwater.

Surface water ionic concentrations of the major cations and anions for June 2011 and September 2011 are shown in piper diagrams for each quarter (Figure 3.2-4). In June 2011, most of the surface waters had high sodium chloride concentrations, with the exception of TPSWC-1T and -1B which had higher calcium but lower chloride and sodium concentrations relative to the other TPSWC sites. In September, with the onset of the rains, the TPSWC and TPSWID sites had more variation in ionic concentrations. The TPSWC sites showed an increase in calcium concentrations and lowered chloride ratios; TPSWID sites showed a broader distribution indicating a mix of marine and freshwaters. The TPBBSW and TPSWCCS ionic concentrations however, appeared to remain the same for both seasons.

#### **3.2.2.4 Isotopes**

The isotopic values ( $\delta D$  and  $\delta^{18}O$ ) for all sites were higher in June 2011 than September 2011 and follow previous seasonal patterns (FPL 2011b). The seasonal enrichment patterns are a consequence of evaporative enrichment and limited rainfall at the end of the dry season in June. After the rainy season begins, the values start to drop and the isotopic signature of the water bodies converge towards values reflecting significant rainfall (Florida:  $\delta D \approx 6\text{‰}$  and  $\delta^{18}O \approx 0\text{‰}$ ) input.

The TPBBSW values reflected a nearshore enriched isotopic signature range, while the CCS values reflected recirculating, highly enriched water that had encountered continued evaporation. The samples from TPSWC-1 to TPSWC-3 reflect an isotopic range of a rain-driven system, while TPSWC-4 and TPSWC-5 are more marine-derived. The ID reflected enriched values in June 2011, but more rain driven influences in September 2011.

The  $^{87}Sr/^{86}Sr$  signatures ranged from 0.70909 to 0.70915 across the landscape in June 2011. While samples were collected, results from the September 2011 event were not available from the USGS in time for inclusion in this report. These values are within the range of values previously measured at these sites (FPL 2011b).

Carbon isotopes ( $\delta^{13}C$ ) can provide insight into the hydrologic influences on the water (see Section 3.1.2.3 for discussion). June values ranged from  $-0.3\text{‰}$  to  $-9.0\text{‰}$ , while values in September ranged from  $-1.9\text{‰}$  to  $-10.0\text{‰}$ , indicating a predominantly limestone carbonate derived source of  $\delta^{13}C$  in the waters. The isotopic values between seasons did not shift significantly in Biscayne Bay or the ID, but the L-31E Canal sites were more negative in September 2011 relative to June 2011, possibly as a consequence of greater biogenic activities in the canal during the wet season.

Tritium values are only available for the June 2011 sampling event, as the USGS had not provided the results from the September 2011 event in time for inclusion in this report. The CCS tritium values ranged from 2,430 pCi/L to 2,973 pCi/L and were less than values recorded in December 2010 but similar to values reported in June 2010. All tritium values measured in the CCS were within expected and previously measured ranges. Consistent with findings from the other analytical data, there was no clear stratification in the CCS where surface and bottom samples were collected. Figure 3.2-5 illustrates tritium concentrations in the June 2011 surface water samples as well as the results from the previous sampling events.

Surface stations have been grouped based on their general characteristics and location, and Table 3.2-4 shows the associated range of isotopes for the June 2011 and September 2011 sampling events. TPSWC-4 and TPSWC-5 are not included since they do not readily fit into the categories. For comparison, refer to Table 3.1-6 for the range of isotopes in groundwater.

#### **3.2.2.5 Nutrients**

Figure 3.2-6 shows nutrient surface water results for the September 2011 sampling event. A brief discussion of these results is provided below.

In Biscayne Bay, the TN values in September 2011 ranged from 0.34 mg/L to 0.65 mg/L, with the highest concentrations at the southerly reference station (TPBBSW-5). This range is a little higher than was reported for the June/July 2010 and March 2011 sampling events; 70 to 90% of the TN appears to be organic nitrogen. All inorganic nitrogen forms were low in Biscayne Bay, similar to observations by Reich et al. (2006) and the analytical data from the FIU-WQM. Surface water canal station TPSWC-5, which is located in the historic discharge canal, had similar concentrations as those in the Bay as well as the station which is 6 miles up the Card Sound Road Canal (TPSWC-6). Stations in the L-31 Canal (TPSWC-1, -2, and -3) and the S-20 discharge canal (TPSWC-4) had higher TN values that ranged from 0.96 mg/L to 1.60 mg/L, with the majority of the nitrogen (greater than 65%) being organic nitrogen at nearly all sites. There were two samples with nitrate/nitrite values that were high (0.55 mg/L at TPSWC-2B and 0.30 mg/L at TPSWC-3T) and reduced the percent of organic nitrogen; however, organic nitrogen makes up the majority of the nitrogen. The maximum ammonia concentration in the above-referenced canals was 0.37 mg/L at TPSWC-3. In the CCS, TN values are highest and ranged from 1.7 mg/L to 3.0 mg/L, with the majority of the nitrogen being in organic form (typically over 90%). There was one station (TPSWCCS-2) where the NO<sub>x</sub> values were uncharacteristically high (1.0 mg/L, which results in only 67% of the nitrogen being in an organic form). The maximum value of NO<sub>x</sub> in all of the CCS samples collected since the beginning of monitoring is only 0.120 mg/L, and the average value is less than 0.050 mg/L; therefore, the 1.0 mg/L value may be questionable.

TP values in Biscayne Bay in September 2011 ranged from 0.022 mg/L to 0.052 mg/L, with the highest values found at the station just north of the CCS (TPBBSW-1) and the reference station (TPBBSW-5). The TP in all the L-31 Canal stations was low (0.004 mg/L); however, the bottom sample at S-20 canal discharge station (TPSWC-4) had the highest TP concentration of all surface water sites, with a value of 0.140 mg/L. The total phosphorus levels in the CCS ranged from 0.004 mg/L to 0.073 mg/L, with only three samples having higher concentrations than the reference station in Biscayne Bay. Orthophosphate was typically very low at all sites and comprised only a small percentage of TP, with the most common value being 0.001 mg/L. At four of the Biscayne Bay stations, orthophosphate ranged from 0.001 mg/L to 0.003 mg/L. The highest value was recorded at the fifth Biscayne station TPBBSW-1 (0.011 mg/L). The average value in the CCS was 0.002 mg/L. The orthophosphate concentration at TPSWC-4 that had the highest TP value was only 0.002 mg/L.

As a point of comparison, TP concentrations in Biscayne Bay were reported by Reich et al. (2006) in the mid-Bay area to range from 0.005 mg/L to 0.045 mg/L, while the FIU-WQM reported an average value of <0.01 mg/L over a 13-year period (1993 to 2005) at Site 122, offshore and southwest of Turkey Point. Also, the FIU-WQM data showed a range of 0 to 0.008 mg/L just offshore Turkey Point for orthophosphate, while Reich et al. (2006) observed a wider range, from about 0.020 mg/L to 0.041 mg/L north of Turkey Point in the middle of the Bay.

### **3.3 TRACER SUITE ASSESSMENT**

No additional assessment of potential tracers was conducted, as FPL previously concluded that stable isotope and ion data are unable to clearly distinguish CCS water from Biscayne Bay and fresh water, especially at the lower values and concentrations. Tritium, as it is present in the CCS, may be more useful than other potential tracers in determining the presence of CCS water, even at low values of specific conductance.

### **3.4 RAINFALL SAMPLE RESULTS**

As part of the monitoring effort, rainfall samples are proposed to be collected and to be analyzed for tritium, once per quarter, from each of seven rainfall collectors located throughout the project area (Figure 1.1-3). As discussed in the previous section and identified in the Monitoring Plan, tritium is being assessed as a possible tracer of the CCS water via a groundwater pathway. However, since tritium is present in the rainfall, its contribution via an atmospheric pathway needs to be assessed. Rainfall results will be used to help determine rainfall contributions to tritium levels found in groundwater.

#### **3.4.1 Sample Collection and Analysis**

The rainfall collectors were one of the last components to be installed as part of the vast monitoring network. These collectors were completely installed in late January 2011. Unfortunately, due to extremely dry conditions in the area, there was not enough water in the rainfall collectors until later in the year. Tritium samples were collected in late July 2011 from five of the collectors (TPRC-2, -3, -4, -8, and -12). A sample was collected in August 2011 from TPRC-7. No sample was collected in the July/August 2011 timeframe from TPRC-5 as the collector had been stolen. Tritium samples were collected again in September 2011 for all the stations, including TPRC-5.

#### **3.4.2 Results**

The tritium results from the July/August 2011 sampling effort are included in Table 3.4-1. The results show the highest levels of tritium near the plant, with a concentration of 34 pCi/L at TPRC-2. However, a concentration of 24.7 pCi/L (1 sigma of 5.3 pCi/L) was recorded at TPRC-7. The blank had a tritium concentration of 6.3 pCi/L. These results are far below any levels that could pose a public health and safety issue. Results from the September 2011 sampling effort are still pending.

### **3.5 EVAPORATION PANS**

Following development of the Monitoring Plan (SWFMD 2009a), FPL identified that, in addition to rainfall, there is a likely exchange of tritium between water vapor in the atmosphere and water in its liquid form, in the environment. The rainfall collectors discussed above are designed to capture rain and prevent its evaporation. The layer of mineral oil (approximately 1-inch thick) that floats on top of the rainfall collectors essentially reduces or eliminates vapor

exchange. Therefore, it does not monitor the input of vapor-phase tritium. As a result, FPL installed evaporation pans at different distances from the CCS to assess the extent of vapor exchange.

### **3.5.1 Sample Collection and Analysis**

Evaporation pans were installed adjacent to well clusters TPGW-2, -3, -5, and -12 (TPEVP-2, -3, -5, and -12), and water was initially added to them in early February 2011. A fifth evaporation pan was deployed in close proximity to TPGW-13 (TPEVP-13 which is also referred to as TPEVP-GC since it is adjacent to the Grand Canal) in May 2011. The first samples were collected during the March 2011 sampling event from the four initially installed pans and those results were included in the August 2011 Annual Report (FPL 2011b). Samples were subsequently collected in April 2011, May 2011, June 2011, August 2011 (TPEVP-5 sample collected in late July), September 2011, October 2011, and November 2011. The methodology used to collect and analyze the samples was included in the August 2011 Annual Report (FPL 2011b, Appendix C).

### **3.5.2 Results**

Analytical results from April 2011 through August 2011 are included in this Semi-Annual Report. Results after August 2011 were not available from the USGS in time to include in this report. Table 3.5-1 reflects the tritium concentrations in the evaporation pans each month after approximately 30 to 45 days of being exposed to tritium vapor in the atmosphere. The maximum tritium concentrations of 490 pCi/L and 283 pCi/L were found at TPEVP-13 and TPEVP-2 respectively in May 2011. Nearly 50 pCi/L of tritium was detected in April 2011 at TPGW-5 which is approximately 3 miles west of the CCS.

Tritium concentration of water vapor in the atmosphere, the amount and timing of rainfall, and the tritium concentration in this rain influence the values observed in the evaporation pan. After monthly samples are collected from the evaporation pans, the water level is adjusted to a prescribed level by adding tap water which has a low tritium concentration (approximately 13-23 pCi/L). Thus the results shown in Table 3.5-1 reflect the tritium concentration in the pan before source water is added. The tritium concentration drops immediately once the source water is added since in most instances the tritium source water is lower in concentration than that in the evaporation pans. In the days that follow, the tritium concentration in the pan can increase due to exchange with the atmosphere, and at the same time the water level declines due to evaporation. In the absence of rain, the tritium concentration in the pan would eventually reach equilibrium with atmospheric water vapor. However, if a rain event occurs during the equilibration period, the tritium concentration in the pan can decline as a result of dilution by low tritium water. After the rain event, the tritium concentration in the pan will once again start moving towards the equilibrium concentration. Thus, the concentration of tritium in the pan is dynamic during the equilibration period and can change dramatically after rain events. This dynamic behavior is likely to be similar to surface water such as marsh water near the CCS as tritium vapor exchange and dilution by rainwater continuously adjust the tritium concentration. In this regard, the pan tritium measurements represent the dynamic nature of tritium in surface water that is influenced

by vapor exchange; however it does not necessarily reflect the upper bound of tritium concentration that might be measured in the environment.

# TABLES

**Table 3.0-1. Groundwater and Surface Water Sampling Locations**

<b>Event</b>	<b>Locations (refer to Figure 1.1-1)</b>	<b>Analytes<sup>1</sup></b>
Quarterly	TPGW – 1, -2, -3, -4, -5, -6, -7, -8, -9, -10, -11, -12, -13, -14; L-3, -5; G-21, -28, -35	GW
	BBSW – 1, 2, 3, 4, 5 TPSWC – 1, 2, 3, 4, 5, 6 TPSWID – 1, 2, 3	SW
	TPSWCCS – 1, 2, 3, 4, 5, 6, 7 and 8 (anomaly) <sup>2</sup>	CCS
Semiannual	TPGW – 3, 4, 5, 6, 7, 8, 9, 11, 13, L-3, L-5, G-21, G-28, G-35	GW
	TPGW – 1, 2, 10, 13, 14	GW - quarterly analytes plus nutrients & trace elements
	BBSW – 1, 2, 3, 4, 5 TPSWC – 1, 2, 3, 4, 5, 6 TPSWID – 1, 2, 3	SW - quarterly analytes plus nutrients
	TPSWCCS – 1, 2, 3, 4, 5, 6, 7	CCS - quarterly analytes plus nutrients and gross alpha <sup>3</sup>

**Notes:**

<sup>1</sup> = Excerpted from Table 3-2 plus field parameters (temperature, specific conductivity, DO, percent oxygen saturation, pH, ORP, and salinity) at all stations.

<sup>2</sup> = Sampled first event only as directed by the Agencies.

<sup>3</sup> = Sampling performed for one year (2 semi annual events).

**Key:**

BBSW – Biscayne Bay Surface Water.

CCS – Cooling Canal System.

GW – Groundwater.

SW – Surface Water.

TPGW – Turkey Point Groundwater.

TPSWC – Turkey Point Surface Water Canal.

TPSWID – Turkey Point Surface Water Interceptor Ditch.

TPSWCCS – Turkey Point Surface Water Cooling Canal System.



**Table 3.0-2. Analytes Measured in Groundwater, Surface Water and the Cooling Canal System**

Analyte	Monitoring Plan (Table 2-1) Label	GW	SW	CCS
Metals, Total Recoverable (Ar, Be, Cd, Cr (VI), Cu, Pb, Hg, Mn, Mb, Ni, Se, Th, Vn, Zn) <sup>1</sup>	Elements	SA	-	-
Iron and Barium <sup>1</sup>	Elements/Tracer	Q / SA	Q / SA	Q / SA
Anions (Cl <sup>-</sup> , SO <sub>4</sub> <sup>2-</sup> , F <sup>-</sup> , Br <sup>-</sup> )	Ions	Q / SA	Q / SA	Q / SA
Cations (Ca <sup>2+</sup> , Na <sup>+</sup> , Mg <sup>2+</sup> , K <sup>+</sup> , Sr <sup>2+</sup> , B <sup>+</sup> ) <sup>2</sup>	Ions	Q / SA	Q / SA	Q / SA
Alkalinity	Ions	Q / SA	Q / SA	Q / SA
Ammonia + unionized	Nutrients	SA	SA	SA
Nitrate+Nitrite	Nutrients	SA	SA	SA
Total Kjeldahl Nitrogen	Nutrients	SA	SA	SA
Total Phosphorus	Nutrients	SA	SA	SA
Soluble Reactive Phosphorus	Nutrients	SA	SA	SA
Silica	Nutrients	-	-	SA
Sulfides	Ions	Q / SA	Q / SA	Q / SA
TDS	Other	Q / SA	-	-
Dissolved Inorganic Carbon	Tracer	Q / SA	Q / SA	Q / SA
<sup>3</sup> H	Tracer	Q / SA	Q / SA	Q / SA
<sup>2</sup> H/ <sup>1</sup> H	Tracer	Q / SA	Q / SA	Q / SA
<sup>18</sup> O/ <sup>16</sup> O	Tracer	Q / SA	Q / SA	Q / SA
<sup>87</sup> Sr/ <sup>86</sup> Sr	Tracer	Q / SA	Q / SA	Q / SA
<sup>13</sup> C/ <sup>12</sup> C	Tracer	Q / SA	Q / SA	Q / SA
Gross Alpha	Other	-	-	SA

Notes:

<sup>1</sup> = Trace elements (arsenic, barium, beryllium, cadmium, hexavalent chromium, copper, iron, lead, mercury, manganese, molybdenum, nickel, selenium, thallium, vanadium, and zinc) are referred to by the lab as "trace metals". Barium and Iron are also part of tracer suite so broken out separately.

<sup>2</sup> = Cations referred to by the lab as "metals" due to analytical method specified for cations

Key:

Q = Quarterly event.

SA = Semiannual event.

Table 3.1-1. Summary of Groundwater Analytical Results from the June 2011 Sampling Event

Parameter	Units	TPGW-1S	TPGW-1M	TPGW-1D	TPGW-2S	TPGW-2M	TPGW-2D	TPGW-3S	TPGW-3M	TPGW-3D	TPGW-4S	TPGW-4M	TPGW-4D	TPGW-5S	TPGW-5M	TPGW-5D
		6/10/2011	6/10/2011	6/10/2011	6/15/2011	6/15/2011	6/15/2011	6/15/2011	6/15/2011	6/15/2011	6/7/2011	6/7/2011	6/7/2011	6/16/2011	6/16/2011	6/16/2011
Temperature	°C	26.31	26.53	26.89	27.3	27.33	27.23	26.58	27.08	26.97	25.18	25.11	25.26	24.73	24.79	24.48
pH	SU	7.2	7.19	7.27	7.3	6.86	7.22	6.88	7.18	6.81	7.05	7.07	7.07	8.49	6.76	7.09
Dissolved Oxygen	mg/L	0.18	0.26	0.18	0.17	0.35	0.26	0.25	0.24	0.36	0.11	0.17	0.1	0.9	0.6	0.33
Spec Cond	µS/cm	59744	70948	70747	77917	78540	76277	64589	69075	70195	2632	37818	43139	1189	31007	32996
Turbidity	NTU	1.06	1.29	1.2	0.94	0.93	0.6	1.05	1.02	0.59	0.36	0.62	0.15	3.27	1.31	1.43
Arsenic	mg/L															
Barium	mg/L	0.1	I	0.39	I	0.081	U	0.081	U	0.081	U	0.081	U	0.590	2.4	2.0
Beryllium	mg/L													0.081	U	0.087
Cadmium	mg/L													I	0.081	U
Copper	mg/L															
Iron	mg/L	1.2	I V	1.5	I	0.27	U	0.93	I	0.71	I	1.3	I	0.4	I	1.5
Lead	mg/L													0.52	I	2.0
Manganese	mg/L													I	2.0	I
Molybdenum	mg/L													I	1.5	I
Nickel	mg/L															
Selenium	mg/L															
Thallium	mg/L															
Vanadium	mg/L															
Zinc	mg/L															
Silica, dissolved	mg/L															
Calcium	mg/L	580	640	640	740	730	710	690	670	660	160	580	560	130	580	590
Magnesium	mg/L	1500	1800	1800	2100	2200	2100	1700	1900	1800	31	840	970	7.3	640	720
Potassium	mg/L	460	590	590	690	700	670	540	600	590	6.4	180	270	8.2	120	150
Sodium	mg/L	12000	14000	14000	16000	17000	16000	13000	15000	15000	310	6800	8000	100	5500	6100
Boron	mg/L	4.4	5.7	5.6	6.7	6.7	6.4	4.9	5.6	5.6	0.088	I J	1.3	1.9	0.048	I J
Strontium	mg/L	9.9	11	11	14	14	14	11	12	12	1.5	7.7	7.8	1.3	6.8	7.5
ChromiumVI	mg/L															
Mercury	mg/L															
Bromide	mg/L	84	100	J	110	J	100	130	100	J-	85	94	99	2	43	54
Chloride	mg/L	24000	30000	J	30000	J	31000	31000	32000	25000	28000	26000	610	14000	15000	200
Fluoride	mg/L	2	I	2	UJ	2	UJ	0.4	U	0.4	U	0.4	U	0.62	I	0.095
Sulfate	mg/L	2700	3400	J	3400	J	3500	3100	3300	2500	2600	3400	30	0.69	0.73	0.2
Ammonia	mg/L as N													0.2	U	0.47
Ammonium ion NH4	mg/L													I	0.32	I J-
Unionized NH3	mg/L													J-		
Nitrate/Nitrite as N	mg/L															
TKN	mg/L															
TN	mg/L															
Orthophosphate	mg/L															
Phosphorus (P)	mg/L															
Alkalinity	mg/L	80	160	J	160	J	160	110	140	250	190	170	290	200	190	220
Bicarbonate Alkalinity as CaCO3	mg/L	80	160	J	160	J	160	110	140	250	190	170	290	200	190	220
Sulfide	mg/L	1	U	1	U	1	U	2.6	2.7	1	U	4.6	1	U	1	U
Total Dissolved Solids	mg/L	37000	48000	48000	54000	54000	52000	43000	47000	47000	1400	24000	28000	640	20000	20000
Dissolved Inorganic Carbon	mg/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10
δ18O	‰	3.90	4.80	4.80	4.50	4.80	4.90	3.20	3.70	3.80	-0.80	1.90	2.70	-1.50	0.40	0.90
δ2H	‰	22.00	26.00	26.00	27.70	32.10	31.10	23.40	26.30	28.90	-2.00	10.00	15.00	0.20	9.00	7.80
δ13C	‰	-6.60	-6.41	-6.16	-6.88	-6.97	-6.67	-9.09	-7.57	-7.63	-10.54	-7.84	-7.17	-10.19	-8.51	-8.15
Gross Alpha	pCi/L															
Salinity	‰	40.0	48.6	48.5	54.1	54.6	52.8	43.7	47.1	48.0	1.4	24.0	27.7	0.6	19.3	20.6
Sr 87/86	‰ / ug/L**	0.70914	0.70913	0.70913	0.7091	0.70911	0.70912	0.70911	0.70907	0.70911	0.70913	0.70912	0.7091	0.70915	0.70912	0.70912
Tritium	pCi/L (1σ)	1320 (80)	2510 (140)	1980 (110)	3670 (210)	3690 (210)	3270 (190)	620 (40)	1960 (110)	2070 (120)	10.2 (5.6)	J	281 (18)	433 (26)	16 (4.7)	156 (11)

Notes:  
\* Sample 092310-Dup1 is a duplicate of 092310-TPGW-11M.  
°C = Degrees Celcius.  
µS/cm = Micro Siemens per centimeter.  
I = Value between the MDL and PQL.  
J = Estimated (+/- indicate bias).  
MCL = Maximum Contaminant Levels.  
MDL = Minimum detection limits.  
mg/L = Milligram(s) per liter.  
N = Nitrogen.  
N.A. - Not applicable.  
NTU = Nephelometric turbidity unit(s).  
PQL = Practical Quantitation Levels.  
SU = Salinity units.  
TKN = Total Kjeldahl nitrogen.  
U = Analyzed for but not detected at the reported value.  
V = Detected in method blank (result<10X blank).

Table 3.1-1. Summary of Groundwater Analytical Results from the June 2011 Sampling Event

		TPGW-6S		TPGW-6M		TPGW-6D		TPGW-7S		TPGW-7M		TPGW-7D		TPGW-8S		TPGW-8M		TPGW-8D		TPGW-9S		TPGW-9M		TPGW-9D	
Parameter	Units	6/6/2011		6/6/2011		6/6/2011		6/16/2011		6/16/2011		6/16/2011		6/6/2011		6/6/2011		6/6/2011		6/6/2011		6/6/2011		6/6/2011	
Temperature	°C	24.37		24.53		24.43		24.33		24.47		24.47		24.22		29.18		24.46		25		25.22		24.68	
pH	SU	7.06		6.96		7.18		7.12		7.13		7.44		12.03	J	7.11		7.14		7.08		6.97		7.07	
Dissolved Oxygen	mg/L	1.29	J	0.29	J	0.15		0.4		0.35		0.31		0.17		0.31	J	0.23		0.25		0.38	J	0.31	
Spec Cond	µS/cm	1120		22835		24011		572		579		586		2570		645		694		643		651		646	
Turbidity	NTU	0.34		0.65		0.59		1.19		1.25		1.43		0.8		0.55		0.37		2.41		7		0.57	
Arsenic	mg/L																								
Barium	mg/L	0.2		2.6		3.0		0.081	U	0.081	U	0.081	U	2.2		0.31		0.32		0.39		0.35		0.35	
Beryllium	mg/L																								
Cadmium	mg/L																								
Copper	mg/L																								
Iron	mg/L	2.6		21		20		0.31	I	0.27	U	0.4	I	0.068	I	8.6		3.8		1.3		5.2		13	
Lead	mg/L																								
Manganese	mg/L																								
Molybdenum	mg/L																								
Nickel	mg/L																								
Selenium	mg/L																								
Thallium	mg/L																								
Vanadium	mg/L																								
Zinc	mg/L																								
Silica, dissolved	mg/L																								
Calcium	mg/L	110		490		490		87		85		86		210		100		97		110		110		110	
Magnesium	mg/L	12		460		490		4.1		3.9		3.7		0.022	I	3.7		6		3		3.1		3.7	
Potassium	mg/L	4.6		110		120		9.5		8.3		4.5		10		8.4		7.7		6.9		6.7		3.2	
Sodium	mg/L	87		3800		4000		20		20		26		20		19		28		13		13		16	
Boron	mg/L	0.058	J	0.78		0.82		0.051	J	0.05	J	0.05	J	0.03	I J	0.062	J	0.068	J	0.049	I J	0.047	I J	0.049	I J
Strontium	mg/L	1.2		8.0		8.1		0.88		0.88		0.85		0.76		1.0		1.0		0.98		0.98		1.1	
ChromiumVI	mg/L																								
Mercury	mg/L																								
Bromide	mg/L	0.74		25		27		0.18		0.18		0.2		0.19		0.2		0.26		0.29		0.3		0.4	J+
Chloride	mg/L	180		7300		7300		37		37		42		32		30		43		21		22		27	J-
Fluoride	mg/L	0.1		0.61		0.62		0.11		0.13		0.1		0.17		0.11		0.11		0.11		0.1		0.13	
Sulfate	mg/L	7.2		680		770		23		23		23		22		39		46		15		15		28	J-
Ammonia	mg/L as N																								
Ammonium ion NH4	mg/L																								
Unionized NH3	mg/L																								
Nitrate/Nitrite as N	mg/L																								
TKN	mg/L																								
TN	mg/L																								
Orthophosphate	mg/L																								
Phosphorus (P)	mg/L																								
Alkalinity	mg/L	270		200		210		200		200		200		490		220		210		270		270		250	
Bicarbonate Alkalinity as CaCO3	mg/L	270		200		210		200		200		200		1	U	220		210		270		270		250	
Sulfide	mg/L	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1.1		1	U	1	U
Total Dissolved Solids	mg/L	610		14000		14000		310		320		320		550		350		370		350		350		350	
Dissolved Inorganic Carbon	mg/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
δ18O	‰	-1.50		-0.60		-0.50		-1.50		-1.30		-1.40		-2.60		-1.80		-1.90		-1.50		-1.30		-1.80	
δ2H	‰	-3.00		1.00		4.00		-4.90		-7.70		-7.00		-8.00		-5.00		-10.00		-4.00		-5.00		-9.00	
δ13C	‰	-11.24		-7.14		-7.03		-9.44		-9.23		-9.15		-11.55		-10.28		-9.84		-10.60		-10.42		-10.01	
Gross Alpha	pCi/L																								
Salinity	‰	0.6		13.8		14.6		0.3		0.3		0.3		1.3		0.3		0.3		0.3		0.3		0.3	
Sr 87/86	‰ / ug/L**	0.70915		0.70911		0.70907		0.70914		0.70912		0.70912		0.70913		0.70912		0.70913		0.70913		0.70915		0.7091	
Tritium	pCi/L (1σ)	19.7 (5.7)	J	5.7 (5.6)	J	32.7 (6.1)	J	17.5 (5.7)		-1 (4.3)	UJ	4.9 (4.4)		16.6 (6.4)	J	24.4 (6.6)	J	28.8 (6.8)	J	10.2 (6.2)	J	15.6 (7.1)	J	13.3 (6.4)	J

Notes:  
\* Sample 092310-Dup1 is a duplicate of 092310-TPGW-11M.  
°C = Degrees Celcius.  
µS/cm = Micro Siemens per centimeter.  
I = Value between the MDL and PQL.  
J = Estimated (+/- indicate bias).  
MCL = Maximum Contaminant Levels.  
MDL = Minimum detection limits.  
mg/L = Milligram(s) per liter.  
N = Nitrogen.  
N.A. - Not applicable.  
NTU = Nephelometric turbidity unit(s).  
PQL = Practical Quantitation Levels.  
SU = Salinity units.  
TKN = Total Kjeldahl nitrogen.  
U = Analyzed for but not detected at the reported value.  
V = Detected in method blank (result<10X blank).

Table 3.1-1. Summary of Groundwater Analytical Results from the June 2011 Sampling Event

		TPGW-10S	TPGW-10M	TPGW-DUP1	TPGW-10D	TPGW-11S	TPGW-11M*	TPGW-11D	TPGW-12S	TPGW-12M	TPGW-12D	TPGW-13S	TPGW-13M	TPGW-13D													
Parameter	Units	6/14/2011	6/14/2011	6/14/2011	6/14/2011	6/13/2011	6/13/2011	6/13/2011	6/9/2011	6/9/2011	6/9/2011	6/9/2011	6/9/2011	6/9/2011													
Temperature	°C	26.71		26.86				27.17		26.69		27.05		26.86		26.87		26.67		26.91		29.74		29.74		29.88	
pH	SU	7.24		7.44				7.2		6.93		6.7		7.04		6.64		7.19		7.24		6.94		7.13		7.02	
Dissolved Oxygen	mg/L	0.32		0.35				0.19		0.33		1.04		0.3		1.67		0.17	J	0.81		0.39	J	0.15	J	0.07	
Spec Cond	µS/cm	51442		55203				55931		55906		56720		59546		41853		60849		63264		82111		82262		82779	
Turbidity	NTU	1.24		1.07				0.85		1.21		1.39		1.41		0.75		0.99		6.85		0.92		1.05		0.87	
Arsenic	mg/L																										
Barium	mg/L	0.081	U	0.081	U	0.15	I	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.28	I	160	U	0.23	I	160	U	160	U
Beryllium	mg/L																										
Cadmium	mg/L																										
Copper	mg/L																										
Iron	mg/L	0.63	IV	0.66	IV	0.65	IV	0.63	IV	0.54	IV	0.48	IV	0.62	IV	0.34	I	0.63	I	0.78	IV	0.72	IV	3.4	I	1.5	IV
Lead	mg/L																										
Manganese	mg/L																										
Molybdenum	mg/L																										
Nickel	mg/L																										
Selenium	mg/L																										
Thallium	mg/L																										
Vanadium	mg/L																										
Zinc	mg/L																										
Silica, dissolved	mg/L																										
Calcium	mg/L	410		450		470		470		490		520		570		450		560		590		720	J	710		720	
Magnesium	mg/L	1300		1400		1400		1400		1400		1400		1500		930		1400		1500		2100	J	2000		2100	
Potassium	mg/L	420		460		470		450		460		450		490		310		460		500		720	J	680		710	
Sodium	mg/L	10000		11000		11000		11000		12000		12000		12000		7700		11000		13000		17000	J	16000		16000	
Boron	mg/L	4.2		4.5		4.6		4.4		4.7		4.7		4.7		3.0		4.4		4.7		7.1		6.6		6.9	
Strontium	mg/L	7.5		8.6		8.8		8.9		8.5		8.7		9.7		6.9		9.7		10		14		14		14	
ChromiumVI	mg/L																										
Mercury	mg/L																										
Bromide	mg/L	74		79		82		82		70		76		81		50		77	J	85	J	110	J	110	J	110	J
Chloride	mg/L	21000		24000		21000		23000		21000		22000		23000		16000	J+	24000	J	26000	J	36000	J	34000	J	35000	J
Fluoride	mg/L	0.61		0.49	I J-	0.54		20	U	0.52		0.4	I	0.32	I	0.66		1.2	J	1.5	J	0.64	J	2.1	J	3.6	J
Sulfate	mg/L	2400		2700		2700		2700		2400		2600		2700		1800		2700	J	3000	J	3800	J	3700	J	3900	J
Ammonia	mg/L as N																										
Ammonium ion NH4	mg/L																										
Unionized NH3	mg/L																										
Nitrate/Nitrite as N	mg/L																										
TKN	mg/L																										
TN	mg/L																										
Orthophosphate	mg/L																										
Phosphorus (P)	mg/L																										
Alkalinity	mg/L	100		100		85		110		240		290		270		320		48	J	120	J	54	J	150	J	150	J
Bicarbonate Alkalinity as CaCO3	mg/L	100		100		85		110		240		290		270		320		48	J	120	J	54	J	150	J	150	J
Sulfide	mg/L	5.6		1.3	J	1.6	J	1	U	12		6.2		6.1		9.3		3.4		1.1		14		1	U	1	U
Total Dissolved Solids	mg/L	34000		37000		36000		37000		35000		37000		40000		26000		39000		43000		58000		56000		56000	
Dissolved Inorganic Carbon	mg/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	13		10	U	10	U	10	U	10	U	10	U
δ18O	‰	1.60		2.10		1.90		2.00		1.80		1.60		2.70		1.70		3.60		4.20		5.30		5.20		5.30	
δ2H	‰	17.00		16.00	J	20.00	J	18.00		22.00		18.00		23.00		16.20		21.70		18.20		34.00		33.00		36.00	
δ13C	‰	-4.57		-3.94		-4.16		-6.81		-9.84		-10.54		-11.52		-12.52		-7.76		-6.63		-8.05		-6.66		-6.95	
Gross Alpha	pCi/L																										
Salinity	‰	33.7		36.5				37.1		37.1		37.7		39.8		26.8		40.8		42.6		57.4		57.6		58.0	
Sr 87/86	‰ / ug/L**	0.70914		0.70915		0.70913		0.70915		0.70913		0.70915		0.70915		0.70914		0.70911		0.70911		0.70909		0.7091		0.70908	
Tritium	pCi/L (1σ)	24.2 (5.2)		14.5 (4.9)		12 (4.9)		16.2 (5.1)		21.6 (5.2)		25.8 (5.1)		429 (27)		72.8 (17)		1260 (80)		1490 (90)		4190 (250)		3800 (230)		3650 (220)	

Notes:

\* Sample 092310-Dup1 is a duplicate of 092310-TPGW-11M.

°C = Degrees Celcius.

µS/cm = Micro Siemens per centimeter.

I = Value between the MDL and PQL.

J = Estimated (+/- indicate bias).

MCL = Maximum Contaminant Levels.

MDL = Minimum detection limits.

mg/L = Milligram(s) per liter.

N = Nitrogen.

N.A. - Not applicable.

NTU = Nephelometric turbidity unit(s).

PQL = Practical Quantitation Levels.

SU = Salinity units.

TKN = Total Kjeldahl nitrogen.

U = Analyzed for but not detected at the reported value.

V = Detected in method blank (result<10X blank).

Table 3.1-1. Summary of Groundwater Analytical Results from the June 2011 Sampling Event

Parameter	Units	TPGW-14S 6/13/2011	TPGW-14M 6/13/2011	TPGW-14D 6/13/2011	060611-TPGW-EB1 6/6/2011	060711-TPGW-FB1 6/7/2011	060911-TPGW-FB1 6/9/2011	061311-TPGW-FB1 6/13/2011	061511-TPGW-FB1 6/15/2011	061611-TPGW-FB1 6/16/2011
Temperature	°C	27.05	26.91	27.3						
pH	SU	6.86	6.96	6.81						
Dissolved Oxygen	mg/L	0.54	0.26	0.22						
Spec Cond	µS/cm	58014	62228	74774						
Turbidity	NTU	0.76	0.85	0.71						
Arsenic	mg/L									
Barium	mg/L	0.081	U	0.081	U	0.081	U	0.081	U	0.081
Beryllium	mg/L									
Cadmium	mg/L									
Copper	mg/L									
Iron	mg/L	0.63	I V	0.65	I V	0.95	I	0.0027	U	0.0027
Lead	mg/L									
Manganese	mg/L									
Molybdenum	mg/L									
Nickel	mg/L									
Selenium	mg/L									
Thallium	mg/L									
Vanadium	mg/L									
Zinc	mg/L									
Silica, dissolved	mg/L									
Calcium	mg/L	520	580	670	0.1	U	0.1	U	0.1	U
Magnesium	mg/L	1500	1600	2000	0.02	U	0.026	I	0.038	I
Potassium	mg/L	470	520	640	0.19	U	0.19	U	0.86	I
Sodium	mg/L	12000	13000	17000	0.31	U	0.31	U	0.31	U
Boron	mg/L	4.6	4.9	6.1	0.067		0.075		0.075	
Strontium	mg/L	9.1	10	13	0.001	U	0.001	U	0.001	U
ChromiumVI	mg/L									
Mercury	mg/L									
Bromide	mg/L	77	86	110	0.027	U	0.027	U	0.027	U
Chloride	mg/L	24000	24000	32000	0.21	I	0.2	U	0.2	I
Fluoride	mg/L	0.36	I	0.48	I	0.96	0.02	U	0.02	U
Sulfate	mg/L	2700	3000	3600	0.21	I	0.2	U	0.2	U
Ammonia	mg/L as N									
Ammonium ion NH4	mg/L									
Unionized NH3	mg/L									
Nitrate/Nitrite as N	mg/L									
TKN	mg/L									
TN	mg/L									
Orthophosphate	mg/L									
Phosphorus (P)	mg/L									
Alkalinity	mg/L	220	250	160	1	U	1	U	1	U
Bicarbonate Alkalinity as CaCO3	mg/L	220	250	160	1	U	1	U	1	U
Sulfide	mg/L	3.4	8.8	3.5	1	U	1	U	1	U
Total Dissolved Solids	mg/L	38000	41000	50000	5	U	16	5	U	12
Dissolved Inorganic Carbon	mg/L	10	U	10	U	10	U	10	U	10
δ18O	‰	2.50	3.30	4.60	-1.40		-1.00		-1.30	
δ2H	‰	21.00	20.00	24.00	-4.00		-3.00		-4.00	
δ13C	‰	-7.94	-10.12	-8.17	-18.18		-17.89		-16.70	
Gross Alpha	pCi/L									
Salinity	‰	38.6	41.8	51.6						
Sr 87/86	‰ / ug/L**	0.70911	0.70914	0.70911	0.1		0.1		0.1	
Tritium	pCi/L (1σ)	186 (13)	600 (40)	2490 (140)	12.7 (6.3)		8.6 (5.6)		11 (7.8)	

Notes:

\* Sample 092310-Dup1 is a duplicate of 092310-TPGW-11M.

°C = Degrees Celcius.

µS/cm = Micro Siemens per centimeter.

I = Value between the MDL and PQL.

J = Estimated (+/- indicate bias).

MCL = Maximum Contaminant Levels.

MDL = Minimum detection limits.

mg/L = Milligram(s) per liter.

N = Nitrogen.

N.A. - Not applicable.

NTU = Nephelometric turbidity unit(s).

PQL = Practical Quantitation Levels.

SU = Salinity units.

TKN = Total Kjeldahl nitrogen.

U = Analyzed for but not detected at the reported value.

V = Detected in method blank (result<10X blank).

Table 3.1-2. Summary of Groundwater Analytical Results from the September 2011 Sampling Event

Parameter	Units	TPGW-1S	TPGW-1M	TPGW-1D	TPGW-2S	TPGW-2M	TPGW-2D	TPGW-3S	TPGW-3M	TPGW-3D	TPGW-4S	0611-TPGW-DU	TPGW-4M	TPGW-4D
		9/22/2011	9/22/2011	9/22/2011	9/13/2011	9/13/2011	9/13/2011	9/14/2011	9/14/2011	9/14/2011	9/6/2011	9/6/2011	9/6/2011	9/6/2011
Temperature	°C	26.17	26.49	26.59	27.26	27.67	28.11	26.85	26.88	26.50	25.37		25.43	25.95
pH	SU	7.05	7.24	7.13	6.97	6.87	6.96	6.59	6.95	6.69	6.94		6.89	6.81
Dissolved Oxygen	mg/L	1.11	0.08	0.19	0.40	0.16	0.15	0.25	0.10	0.18	0.54		0.24	0.08
Spec Cond	µS/cm	44022.00	70784.00	70471.00	74150.00	75599.00	76249.00	63997.00	67273.00	69305.00	2174		38273	42964
Turbidity	NTU	1.23	1.46	1.56	0.01	0.01	0.01	0.68	0.13	0.02	0.1		0.18	0.12
Arsenic	mg/L	0.12	U	0.12	U	0.21	I	0.12	U	0.12	U			
Barium	mg/L	0.08	U	0.08	U	0.08	U	0.12	I	0.08	U	0.08	U	0.08
Beryllium	mg/L	0.02	U	0.02	U	0.02	U	0.02	U	0.02	U			
Cadmium	mg/L	0.04	U	0.04	U	0.04	U	0.04	U	0.04	U			
Copper	mg/L	0.03	U	0.03	U	0.07	I	0.23	IV	0.19	IV			
Iron	mg/L	1.20	I	2.60	I	1.60	IV	1.10	IV	0.92	IV	0.73	IV	0.87
Lead	mg/L	0.24	U	0.24	U	0.24	U	0.24	U	0.24	U			
Manganese	mg/L	0.05	U	0.05	U	0.08	I	0.05	I	0.06	I			
Molybdenum	mg/L	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U			
Nickel	mg/L	0.14	U	0.14	U	0.14	U	0.14	U	0.14	U			
Selenium	mg/L	0.34	U	0.34	U	0.34	U	0.69	IV	0.44	IV			
Thallium	mg/L	0.16	U	0.16	U	0.16	U	0.16	U	0.16	U			
Vanadium	mg/L	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U			
Zinc	mg/L	0.18	U	0.18	U	0.19	I	0.18	U	0.18	U			
Silica, dissolved	mg/L													
Calcium	mg/L	510.00	660.00	660.00	710.00	690.00	710.00	740.00	710.00	700.00	160.00	150.00	600.00	610.00
Magnesium	mg/L	1000.00	1800.00	1800.00	1900.00	2000.00	2100.00	1800.00	1900.00	1900.00	26.00	26.00	1000.00	910.00
Potassium	mg/L	300.00	560.00	560.00	580.00	610.00	620.00	520.00	570.00	570.00	5.20	5.20	250.00	180.00
Sodium	mg/L	8100.00	14000.00	15000.00	15000.00	16000.00	16000.00	14000.00	15000.00	14000.00	240.00	240.00	8400.00	7400.00
Boron	mg/L	3.00	5.70	5.70	6.10	6.30	6.40	5.30	6.00	5.90	0.08	0.08	2.10	1.40
Strontium	mg/L	7.70	11.00	11.00	13.00	14.00	14.00	12.00	13.00	12.00	1.50	1.50	8.50	8.10
ChromiumVI	mg/L	5.00	U	5.00	U	5.00	U	5.00	U	5.00	U			
Mercury	mg/L	0.07	U	0.07	U	0.07	U	0.07	U	0.07	U			
Bromide	mg/L	49.00	92.00	88.00	98.00	110.00	110.00	100.00	120.00	180.00	1.80	2.30	53.00	47.00
Chloride	mg/L	15000.00	27000.00	27000.00	30000.00	32000.00	32000.00	25000.00	26000.00	27000.00	480.00	470.00	15000.00	13000.00
Fluoride	mg/L	0.40	U	0.40	U	2.00	U	2.00	U	0.40	U	0.40	U	0.40
Sulfate	mg/L	1900.00	3400.00	3100.00	3600.00	3700.00	3700.00	740.00	4200.00	540.00	24.00	23.00	1800.00	1500.00
Ammonia	mg/L as N	0.38	1.10	1.50	1.80	2.00	1.80							
Ammonium ion NH4	mg/L	0.48	1.40	1.90	2.30	2.60	2.30							
Unionized NH3	mg/L													
Nitrate/Nitrite as N	mg/L	0.04	0.01	0.03	0.01	I	0.03	0.00	U					
TKN	mg/L	1.40	1.70	1.90	1.80	2.00	2.20	J-						
TN	mg/L	1.40	1.70	1.90	1.80	2.00	2.20							
Orthophosphate	mg/L	0.038	J	0.019	0.020	0.029	0.035	0.039						
Phosphorus (P)	mg/L	0.015	J-	0.027	0.023	0.030	0.037	0.042						
Alkalinity	mg/L	220.00	160.00	160.00	170.00	180.00	160.00	330.00	180.00	180.00	290.00	300.00	180.00	190.00
Bicarbonate Alkalinity as CaCO3	mg/L	220.00	160.00	160.00	170.00	180.00	160.00	330.00	180.00	180.00	290.00	300.00	180.00	190.00
Sulfide	mg/L	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.30	1.00	1.00
Total Dissolved Solids	mg/L	27000.00	J	47000.00	47000.00	52000.00	54000.00	54000.00	42000.00	48000.00	48000.00	960.00	1000.00	27000.00
Dissolved Inorganic Carbon	mg/L	10.00	U	10.00	U	10.00	U	62.00	65.00	62.00	10.00	U	94.00	65.00
δ18O	‰	2	4.5	4.3	4.50	4.70	4.80	3.20	3.90	4.10	-1.10	-1.00	2.30	-1.10
δ2H	‰	10	19	26	27.00	25.00	32.00	21.00	24.00	19.00	-7.00	-7.00	14.00	-1.00
δ13C	‰	-6.1	-6.27	-6.94	-7.22	-7.14	-6.66	-9.85	-8.09	-8.30	-7.52		-7.19	-8.19
Gross Alpha	pCi/L													
Salinity	‰	49.320	48.490	28.360	51.130	52.270	52.770	43.200	43.490	47.330				
Sr 87/86	‰ / ug/L**													
Tritium	pCi/L (1σ)													

Notes:  
\* Sample 092310-Dup1 is a duplicate of 092310-TPGW-11M.  
°C = Degrees Celcius.  
µS/cm = Micro Siemens per centimeter.  
I = Value between the MDL and PQL.  
J = Estimated (+/- indicate bias).  
MCL = Maximum Contaminant Levels.  
MDL = Minimum detection limits.  
mg/L = Milligram(s) per liter.  
N = Nitrogen.  
N.A. - Not applicable.  
NTU = Nephelometric turbidity unit(s)  
PQL = Practical Quantitation Levels.  
SU = Salinity units.  
TKN = Total Kjeldahl nitrogen.  
U = Analyzed for but not detected at the reported value.  
V = Detected in method blank (result<10X blank).



Table 3.1-2. Summary of Groundwater Analytical Results from the September 2011 Sampling Event

Parameter	Units	TPGW-5S	TPGW-5M	TPGW-5D	TPGW-6S	TPGW-6M	TPGW-6D	TPGW-7S	TPGW-7M	TPGW-7D	TPGW-8S	TPGW-8M	TPGW-8D	TPGW-9S	TPGW-9M	TPGW-9D
		9/22/2011	9/22/2011	9/22/2011	9/2/2011	9/2/2011	9/2/2011	9/6/2011	9/6/2011	9/6/2011	9/2/2011	9/2/2011	9/2/2011	9/2/2011	9/2/2011	9/2/2011
Temperature	°C	24.23	24.57	24.28	24.38	24.86	25.07	25.87	25.56	25.7	25.17	24.69	25.02	25.37	25.31	25.13
pH	SU	8.77	7.02	6.9	7.29	7.33	6.76	7.09	7.13	7.06	11.72	7.10	6.99	7.03	6.87	6.96
Dissolved Oxygen	mg/L	0.08	0.22	0.11	0.59	0.17	0.23	0.21	0.21	0.11	0.15	0.17	0.27	0.20	0.24	0.27
Spec Cond	µS/cm	1192	31197	32965	1163.00	23018.00	24033.00	580	578	590	2051.00	651.00	702.00	582.00	657.00	651.00
Turbidity	NTU	2.5	0.26	0.3	0.39	0.22	0.29	0.02	0.01	0.56	1.07	0.07	0.21	0.28	1.25	0.00
Arsenic	mg/L															
Barium	mg/L	0.08	U	0.20	I	0.16	I	0.08	U	0.08	I	0.08	U	0.08	U	0.08
Beryllium	mg/L															
Cadmium	mg/L															
Copper	mg/L															
Iron	mg/L	0.50	I	2.30	I	1.60	I	0.27	U	1.20	IV J	1.20	IV J	0.31	IV	0.38
Lead	mg/L															
Manganese	mg/L															
Molybdenum	mg/L															
Nickel	mg/L															
Selenium	mg/L															
Thallium	mg/L															
Vanadium	mg/L															
Zinc	mg/L															
Silica, dissolved	mg/L															
Calcium	mg/L	130.00	600.00	590.00	120.00	470.00	510.00	91.00	90.00	90.00	180.00	J	100.00	100.00	120.00	110.00
Magnesium	mg/L	7.20	630.00	690.00	12.00	420.00	450.00	4.10	4.00	3.80	0.08	I J	3.80	6.00	2.20	3.70
Potassium	mg/L	7.50	120.00	140.00	4.30	95.00	100.00	9.90	8.50	4.80	10.00	J	8.70	7.90	3.60	3.20
Sodium	mg/L	110.00	5400.00	5700.00	100.00	4100.00	4300.00	20.00	21.00	25.00	21.00	J	21.00	31.00	8.00	17.00
Boron	mg/L	0.06	0.81	1.10	0.06	0.76	0.82	0.05	0.05	0.05	0.04	I	0.07	0.07	0.03	0.05
Strontium	mg/L	1.30	6.90	7.10	1.20	7.60	8.10	0.92	0.88	0.88	0.71		1.00	1.00	0.87	1.20
ChromiumVI	mg/L															
Mercury	mg/L															
Bromide	mg/L	1.20	33.00	36.00	0.72	37.00	I	40.00	I	0.17	0.16	0.19	0.23	J	0.20	0.27
Chloride	mg/L	210.00	10000.00	10000.00	200.00	7600.00	8600.00	34.00	34.00	39.00	J-	36.00	J	35.00	51.00	15.00
Fluoride	mg/L	0.40	U	0.45	I	0.40	U	0.09	0.20	U	0.09	0.09	J	0.08	0.07	0.07
Sulfate	mg/L	17.00	1000.00	1100.00	8.30	690.00	800.00	23.00	22.00	24.00	J-	29.00	J	43.00	47.00	10.00
Ammonia	mg/L as N															
Ammonium ion NH4	mg/L															
Unionized NH3	mg/L															
Nitrate/Nitrite as N	mg/L															
TKN	mg/L															
TN	mg/L															
Orthophosphate	mg/L															
Phosphorus (P)	mg/L															
Alkalinity	mg/L	250.00	200.00	170.00	290.00	190.00	200.00	190.00	200.00	190.00	380.00		210.00	210.00	260.00	270.00
Bicarbonate Alkalinity as CaCO3	mg/L	250.00	200.00	170.00	290.00	190.00	200.00	190.00	200.00	190.00	1.00	U	210.00	210.00	260.00	270.00
Sulfide	mg/L	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	2.70
Total Dissolved Solids	mg/L	650.00	19000.00	20000.00	560.00	13000.00	14000.00	280.00	250.00	300.00	320.00		320.00	350.00	280.00	330.00
Dissolved Inorganic Carbon	mg/L	10.00	U	10.00	U	10.00	U	63.00	59.00	61.00	58.00		73.00	63.00	64.00	85.00
δ18O	‰	-1.4	0.5	0.9	-1.70	-0.80	-0.60	-1.30	-1.40	1.70	-2.20		-1.80	-1.90	-2.30	-1.70
δ2H	‰	-5	6	6	-6.00	3.00	3.00	-9.00	-6.00	15.00	-7.00		-8.00	-5.00	-14.00	-8.00
δ13C	‰	-10.07	-8.55	-7.87	-11.79	-7.38	-6.32	-9.34	-9.90	-9.36	-15.32		-10.49	-8.66	-9.84	-9.64
Gross Alpha	pCi/L															
Salinity	‰				0.577	13.880	14.550				1.040		0.316	0.342	0.282	0.319
Sr 87/86	‰ / ug/L**															
Tritium	pCi/L (1σ)															

Notes:  
\* Sample 092310-Dup1 is a duplicate of 092310-TPGW-11M.  
°C = Degrees Celcius.  
µS/cm = Micro Siemens per centimeter.  
I = Value between the MDL and PQL.  
J = Estimated (+/- indicate bias).  
MCL = Maximum Contaminant Levels.  
MDL = Minimum detection limits.  
mg/L = Milligram(s) per liter.  
N = Nitrogen.  
N.A. - Not applicable.  
NTU = Nephelometric turbidity uni  
PQL = Practical Quantitation Levels.  
SU = Salinity units.  
TKN = Total Kjeldahl nitrogen.  
U = Analyzed for but not detected at the reported value.  
V = Detected in method blank (result<10X blank).

Table 3.1-2. Summary of Groundwater Analytical Results from the September 2011 Sampling Event

		TPGW-10S	TPGW-10M	TPGW-10D	TPGW-11S	TPGW-11M	TPGW-11D	TPGW-12S	TPGW-12M	TPGW-12D	TPGW-13S	TPGW-13M	TPGW-13D	TPGW-14S	TPGW-14M	TPGW-14D
Parameter	Units	9/8/2011	9/8/2011	9/8/2011	9/9/2011	9/9/2011	9/9/2011	9/7/2011	9/7/2011	9/7/2011	9/7/2011	9/7/2011	9/7/2011	9/9/2011	9/9/2011	9/9/2011
Temperature	°C	28.20	28.14	27.71	27.63	27.70	27.66	27.72	26.97	27.70	30.37	29.90	30.08	28.45	28.32	28.10
pH	SU	7.54	7.57	7.33	7.50	6.79	7.09	6.72	7.18	7.13	7.25	7.18	6.96	7.24	6.86	7.14
Dissolved Oxygen	mg/L	0.09	0.12	0.17	0.22	0.14	0.28	0.19	0.23	0.10	0.11	0.18	0.06	0.21	0.40	0.28
Spec Cond	µS/cm	52279.00	54719.00	54911.00	54734.00	56277.00	58768.00	40848.00	63017.00	64298.00	82473.00	80616.00	82287.00	57317.00	62560.00	72650.00
Turbidity	NTU	0.00	0.00	0.00	0.10	0.00	2.00	0.16	0.09	0.77	0.00	0.23	0.01	0.60	0.09	0.13
Arsenic	mg/L	0.12	U	0.12	U	0.12	U				0.12	U	0.12	U	0.12	U
Barium	mg/L	0.08	U	0.08	U	0.08	U	0.08	U	0.08	U	0.08	U	0.08	U	0.08
Beryllium	mg/L	0.02	U	0.02	U	0.02	U				0.02	U	0.02	U	0.02	U
Cadmium	mg/L	0.04	U	0.04	U	0.04	U				0.04	U	0.04	U	0.04	U
Copper	mg/L	0.03	U	0.03	U	0.03	U				0.03	U	0.03	U	0.03	U
Iron	mg/L	0.27	U	0.31	IV	0.43	IV	1.20	IV J	1.10	IV J	1.20	IV J	0.29	IV	0.50
Lead	mg/L	0.24	U	0.24	U	0.26	I				0.24	U	0.24	U	0.24	U
Manganese	mg/L	0.05	U	0.05	U	0.05	U				0.05	U	0.05	U	0.05	U
Molybdenum	mg/L	0.05	U	0.05	U	0.05	U				0.05	U	0.05	U	0.05	U
Nickel	mg/L	0.14	U	0.14	U	0.14	U				0.14	U	0.14	U	0.14	U
Selenium	mg/L	0.34	U	0.34	U	0.34	U				0.42	I	0.34	U	0.34	U
Thallium	mg/L	0.16	U	0.16	U	0.16	U				0.16	U	0.18	IV	0.16	U
Vanadium	mg/L	0.05	U	0.05	U	0.05	U				0.05	U	0.05	U	0.05	U
Zinc	mg/L	0.18	U	0.18	U	0.18	U				0.18	U	0.18	U	0.24	I
Silica, dissolved	mg/L															
Calcium	mg/L	450.00	J	470.00		500.00		500.00	550.00	590.00	470.00	630.00	650.00	790.00	770.00	770.00
Magnesium	mg/L	1400.00	J	1400.00		1400.00		1400.00	1500.00	980.00	1600.00	1700.00	2300.00	2200.00	2200.00	1500.00
Potassium	mg/L	420.00	J	440.00		440.00		420.00	430.00	460.00	310.00	J	490.00	J	710.00	J
Sodium	mg/L	11000.00	J	11000.00		11000.00		11000.00	11000.00	12000.00	8100.00	J	13000.00	J	13000.00	J
Boron	mg/L	4.60		4.80		4.80		4.80	5.00	4.90	3.30	J	5.10	J	5.30	J
Strontium	mg/L	7.90		8.60		9.10		8.10	8.70	9.70	6.90	J	11.00	J	11.00	J
ChromiumVI	mg/L	5.00	U	5.00	U	5.00	U				5.00	U	5.00	U	5.00	U
Mercury	mg/L	0.07	U	0.07	U	0.07	U				0.07	U	0.07	U	0.07	U
Bromide	mg/L	78.00		72.00	J	73.00	J	75.00		76.00	80.00		50.00		84.00	
Chloride	mg/L	19000.00		21000.00	J	21000.00	J	20000.00		21000.00	20000.00		14000.00		24000.00	
Fluoride	mg/L	0.48	I	0.40	U J	0.40	U J	0.67	I	0.40	U	0.40	U	0.40	U	0.40
Sulfate	mg/L	2400.00		2600.00	J	2600.00	J	2600.00		2600.00	2700.00		1700.00		2900.00	
Ammonia	mg/L as N	0.46		0.32		0.32					2.30		1.60		1.90	
Ammonium ion NH4	mg/L	0.58		0.40		0.41					2.90		2.00		2.40	
Unionized NH3	mg/L															
Nitrate/Nitrite as N	mg/L	0.00	U	0.00	U	0.02	J+				0.01	J+	0.08	J	0.16	J
TKN	mg/L	0.41		0.29		0.38					2.80		2.20		2.40	
TN	mg/L	0.38		0.29		0.40					2.80		2.30		2.60	
Orthophosphate	mg/L	0.014		0.015		0.016					0.033		0.035		0.038	
Phosphorus (P)	mg/L	0.020		0.022		0.022	?				0.049	I	0.057		0.066	
Alkalinity	mg/L	120.00		100.00		110.00		240.00		290.00	270.00		330.00		180.00	
Bicarbonate Alkalinity as CaCO3	mg/L	120.00		100.00		110.00		240.00		290.00	270.00		330.00		180.00	
Sulfide	mg/L	14.00		1.60		1.10		18.00		12.00	9.10		12.00		2.10	
Total Dissolved Solids	mg/L	32000.00		35000.00		36000.00		35000.00		37000.00	38000.00		25000.00		42000.00	
Dissolved Inorganic Carbon	mg/L	32.00		33.00		36.00		75.00		89.00	88.00		110.00		66.00	
δ18O	‰	1.80		1.60		2.00		1.50		1.60	2.70		1.50		4.10	
δ2H	‰	8.00		17.00		19.00		8.00		15.00	14.00		4.00		24.00	
δ13C	‰	-9.56		-4.34		-6.82		-9.31		-10.53	-10.94		-12.82		-7.74	
Gross Alpha	pCi/L															
Salinity	‰	34.320		36.130		36.290		36.160		37.310	39.190		26.050		42.440	
Sr 87/86	‰ / ug/L**															
Tritium	pCi/L (1σ)															

Notes:  
\* Sample 092310-Dup1 is a duplicate of 092310-TPGW-11M.  
°C = Degrees Celcius.  
µS/cm = Micro Siemens per centimeter.  
I = Value between the MDL and PQL.  
J = Estimated (+/- indicate bias).  
MCL = Maximum Contaminant Levels.  
MDL = Minimum detection limits.  
mg/L = Milligram(s) per liter.  
N = Nitrogen.  
N.A. - Not applicable.  
NTU = Nephelometric turbidity unit  
PQL = Practical Quantitation Levels.  
SU = Salinity units.  
TKN = Total Kjeldahl nitrogen.  
U = Analyzed for but not detected at the reported value.  
V = Detected in method blank (result<10X blank).



Table 3.1-2. Summary of Groundwater Analytical Results from the September 2011 Sampling Event

Parameter	Units	TPGW-DUP1 9/9/2011	TPGW-FB1 9/14/2011	TPGW-FB-1 9/2/2011	TPGW-FB1 9/6/2011	TPGW-EB1 9/9/2011	TPGW-FB1 9/7/2011
Temperature	°C						
pH	SU						
Dissolved Oxygen	mg/L						
Spec Cond	µS/cm						
Turbidity	NTU						
Arsenic	mg/L		0.00	U			0.00
Barium	mg/L	0.08	U	0.00	U	0.00081	U
Beryllium	mg/L		0.00	U			0.00
Cadmium	mg/L		0.00	U			0.00
Copper	mg/L		0.00	U			0.00
Iron	mg/L	6.00	J	0.02	I	0.01	I V
Lead	mg/L		0.00	U			0.00
Manganese	mg/L		0.00	U			0.00
Molybdenum	mg/L		0.00	U			0.00
Nickel	mg/L		0.00	U			0.00
Selenium	mg/L		0.00	U			0.00
Thallium	mg/L		0.00	I V			0.00
Vanadium	mg/L		0.00	U			0.00
Zinc	mg/L		0.00	U			0.00
Silica, dissolved	mg/L						
Calcium	mg/L	670.00	0.10	U	0.10	U	0.10
Magnesium	mg/L	1900.00	0.03	I	0.02	U	0.02
Potassium	mg/L	570.00	0.19	U	0.19	U	0.19
Sodium	mg/L	15000.00	0.31	U	0.31	U	0.31
Boron	mg/L	6.20	0.07		0.09		0.09
Strontium	mg/L	12.00	0.00	U	0.00	U	0.00
ChromiumVI	mg/L	5.00	U	5.00	U Q		5.00
Mercury	mg/L	0.07	U	0.07	U		0.07
Bromide	mg/L	100.00	0.03	U	0.03	U	0.03
Chloride	mg/L	27000.00	0.29	I	0.30	I	0.20
Fluoride	mg/L	0.40	U	0.02	U	0.02	U
Sulfate	mg/L	3500.00	0.20	U	0.20	U	0.20
Ammonia	mg/L as N	2.00	0.07				0.05
Ammonium ion NH4	mg/L						0.08
Unionized NH3	mg/L						J3
Nitrate/Nitrite as N	mg/L	0.03	0.00	U		0.50	0.02
TKN	mg/L	2.30	0.14	I		0.05	U
TN	mg/L	2.30	0.25	U		0.55	0.25
Orthophosphate	mg/L	0.034	0.001	U		0.001	I
Phosphorus (P)	mg/L	0.036	0.004	U		0.004	U
Alkalinity	mg/L	190.00	1.30		1.10	1.20	1.30
Bicarbonate Alkalinity as CaCO3	mg/L	190.00	1.30		1.10	1.20	1.30
Sulfide	mg/L	5.40	1.00	U	1.00	U	1.00
Total Dissolved Solids	mg/L	49000.00	5.00	U	5.00	U	5.00
Dissolved Inorganic Carbon	mg/L	66.00	10.00	U	10.00	U	10.00
δ18O	‰	4.50	broke			-1.10	-1.30
δ2H	‰	31.00				-8.00	-7.00
δ13C	‰	-8.22	-10.59		-11.65		-11.31
Gross Alpha	pCi/L						
Salinity	‰						
Sr 87/86	‰ / ug/L**						
Tritium	pCi/L (1σ)						

Notes:  
\* Sample 092310-Dup1 is a duplicate of 092310-TPGW-11M.  
°C = Degrees Celcius.  
µS/cm = Micro Siemens per centimeter.  
I = Value between the MDL and PQL.  
J = Estimated (+/- indicate bias).  
MCL = Maximum Contaminant Levels.  
MDL = Minimum detecti  
mg/L = Milligram(s) per  
N = Nitrogen.  
N.A. - Not applicable.  
NTU = Nephelometric t  
PQL = Practical Quantitation Levels.  
SU = Salinity units.  
TKN = Total Kjeldahl nitrogen.  
U = Analyzed for but not detected at the reported value.  
V = Detected in method blank (result<10X blank).

Table 3.1-3. Summary of Groundwater Analytical Results from the June 2011 Historic Well Sampling Event

Parameter	Units	TPGW-L3-18 6/7/2011		TPGW-L3-58 6/7/2011		TPGW-L5-18 6/7/2011		TPGW-L5-58 6/7/2011		TPGW-G21-18 6/8/2011		TPGW-G21-58 6/8/2011		TPGW-G28-18 6/8/2011		TPGW-G28-58 6/8/2011		TPGW-G35-18 6/8/2011		TPGW-G35-58 6/8/2011		060711-TPGW-FB1 6/7/2011		060811-TPGW-FB1 6/8/2011	
Temperature	°C	25.86		28.60		29.92		29.05		24.57		24.72		26.86		24.52		24.53		24.27					
pH	SU	7.39		7.02		7.58		7.15		7.21		6.80		8.87		7.83		7.44		7.25					
Dissolved Oxygen	mg/L	0.29		0.26		0.17		0.16		0.20		0.28		0.27		0.25		0.25		0.30					
Spec Cond	µS/cm	1432.00		81271.00		5724.00		76804.00		629.00		14355.00		7130.00		38862.00		710.00		18915.00					
Turbidity	NTU	1.37		0.54		0.92		0.60		1.78		0.67		22.61		25.50		1.25		1.16					
Arsenic	mg/L																								
Barium	mg/L	0.07	I	1.20	I	0.29		1.70	I	0.02	U	0.35		0.02	I	0.08	U	0.02	U	0.08	U	0.001	U	0.001	U
Beryllium	mg/L																								
Cadmium	mg/L																								
Copper	mg/L																								
Iron	mg/L	4.70		2.60	I	3.00		3.00	I	0.19	IV	0.34	IV	0.23	IV	3.60	I	0.16	IV	3.10	I	0.003	U	0.003	IV
Lead	mg/L																								
Manganese	mg/L																								
Molybdenum	mg/L																								
Nickel	mg/L																								
Selenium	mg/L																								
Thallium	mg/L																								
Vanadium	mg/L																								
Zinc	mg/L																								
Silica	mg/L																								
Calcium	mg/L	110.00		720.00		170.00		720.00		98.00		560.00		290.00		590.00		87.00		310.00		0.10	U	0.10	U
Magnesium	mg/L	19.00		2200.00		89.00		2000.00		4.20		170.00		44.00		870.00		6.70		370.00		0.03	I	0.02	U
Potassium	mg/L	6.20		720.00		26.00		660.00		4.90		29.00		16.00		200.00		9.50		110.00		0.19	U	0.19	U
Sodium	mg/L	140.00		17000.00		820.00		16000.00		26.00		2200.00		1000.00		6900.00		41.00		3200.00		0.31	U	0.31	U
Boron	mg/L	0.08	J	7.10		0.26	J	6.40		0.05	I J	0.15	J	0.19	J	1.40		0.08	J	1.60		0.08		0.08	
Strontium	mg/L	1.00		14.00		1.90		14.00		0.96		6.70		2.60		7.70		0.94		5.00		0.001	U	0.001	U
Chromium VI	mg/L																								
Mercury	mg/L																								
Bromide	mg/L	0.87		110.00		5.30		96.00		0.27	UJ	17.00		7.00		50.00		0.32	I	19.00		0.03	U	0.03	U
Chloride	mg/L	260.00		31000.00		1500.00		29000.00		43.00	J	4600.00		2000.00		13000.00		65.00		5900.00		0.20	U	0.20	U
Fluoride	mg/L	0.08		2.10		0.07		2.10		0.20	UJ	0.65		0.20	U	0.20	U	0.20	U	0.20	U	0.02	U	0.02	U
Sulfate	mg/L	100.00		310.00		150.00		3500.00		14.00	J	130.00		140.00		1700.00		62.00		1100.00		0.20	U	0.26	I
Total Ammonia	mg/L as N																								
Ammonium ion NH4	mg/L as N																								
Unionized NH3	mg/L																								
Nitrate/Nitrite as N	mg/L																								
TKN	mg/L																								
TN <sup>9</sup>	mg/L																								
Orthophosphate	mg/L																								
Phosphorus (P)	mg/L																								
Alkalinity	mg/L (CaCO <sub>3</sub> )	160.00		170.00		200.00		180.00		160.00	J	110.00	J	45.00		140.00		160.00		32.00		1.00	U	1.00	U
Bicarbonate Alkalinity	mg/L	160.00		170.00		200.00		180.00		160.00	J	110.00	J	45.00		140.00		160.00		32.00		1.00	U	1.00	U
Sulfides	mg/L	1.00	U	4.50		1.40		1.30		1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U
Total Dissolved Solids	mg/L	820.00		60000.00		3100.00		54000.00		340.00		9300.00		4400.00		24000.00		400.00		10000.00		16.00		14.00	
Dissolved Inorganic Carbon	mg/L	10.00	U	10.00	U	10.00	U	10.00	U	10.00	U	10.00	U	10.00	U	10.00	U	10.00	U	10.00	U	10.00	U	10.00	U
δ18O	‰	-0.20		5.60		0.60		5.00		-1.30		-0.80		-0.90		2.10		-0.70		-0.60		-1.00		-1.00	
δ2H	‰	3.00		28.00		6.00		26.00		-4.00		4.00		0.00		16.00		-7.00		-1.00		-3.00		-6.00	
δ13C	‰	-10.81		-7.74		-9.94		-7.54		-9.69		-9.31		-10.79		-7.76		-9.70		-7.16		-17.89		-17.24	
Gross Alpha	pCi/L																								
Salinity	‰	0.7		56.8		3.1		53.2		0.3		8.3		3.9		24.7		0.3		11.2					
Sr 87/86	‰	0.70914		0.70912		0.70915		0.70911		0.70915		0.70913		0.70913		0.70912		0.70914		0.7091		0.1		0.1	
Tritium	pCi/L (1σ)	94.7 (8.4)		3730 (210)		113.2 (9.3)		3438 (198)		22.5 (5.8)		24 (5.8)		16.8 (7.9)		410 (27)		7.7 (7.8)	UJ	15.9 (7.8)		8.6 (5.6)		4.8 (5.5)	UJ

Notes:  
\* = F.A.C 62-520.420 states primary and secondary drinking water standards applies to G-1 and G-2 groundwater.  
Standards can be found at <http://www.dep.state.fl.us/water/drinkingwater/standard.htm>.  
°C = Degrees Celcius. MDL = Minimum detection limits. PQL = Practical Quantitation Levels.  
µS/cm = Micro Siemens per centimeter. mg/L = Milligram(s) per liter. SU = Salinity units.  
I = Value between the MDL and PQL. N = Nitrogen. TKN = Total Kjeldahl nitrogen.  
J = Estimated (+/- indicate bias). N.A. = Not applicable. U = Analyzed for but not detected at the reported value.  
MCL = Maximum Contaminant Levels. NTU = Nephelometric turbidity unit(s). V = Detected in method blank (result<10X blank).

Table 3.1-4. Summary of Groundwater Analytical Results from the September 2011 Historic Well Sampling Event

Parameter	Units	TPGW-L3-18		TPGW-L3-58		TPGW-L5-18		TPGW-L5-58		TPGW-G21-18		TPGW-G21-58		TPGW-G28-18		TPGW-G28-58		TPGW-G35-18		TPGW-G35-58		092011-TPGW-FB1		091911-TPGW-FB1	
		9/19/2011		9/19/2011		9/19/2011		9/19/2011		9/20/2011		9/20/2011		9/20/2011		9/20/2011		9/20/2011		9/20/2011		9/20/2011		9/19/2011	
Temperature	°C	28.62		29.40		30.12		29.10		25.7		25.26		24.88		25.18		25.59		25.91					
pH	SU	7.16		7.11		7.55		7.00		7.42		6.89		8.23		7.09		7.36		7.34					
Dissolved Oxygen	mg/L	0.06		0.07		0.18		0.54		0.14		0.26		0.25		0.24		0.16		0.27					
Spec Cond	µS/cm	3742.00		79557.00		797.00		75568.00		588		14409		7824		38933		697		16117					
Turbidity	NTU	1.37		0.37		0.42		0.06		0.65		0.47		15.04		9.67		1.06		0.17					
Arsenic	mg/L																								
Barium	mg/L	0.09	I	0.08	U	0.08	I	0.08	U	0.13	I J	0.34	I J	0.08	U	0.08	U	0.08	U	0.09	I J	0.00	I	0.00	U
Beryllium	mg/L																								
Cadmium	mg/L																								
Copper	mg/L																								
Iron	mg/L	0.27	U	1.30	I	0.27	U	1.20	I	6.90		0.51	I V J	0.76	I V J	4.30	I J	0.39	I V J	1.60	I V J	0.01	I V	0.00	U
Lead	mg/L																								
Manganese	mg/L																								
Molybdenum	mg/L																								
Nickel	mg/L																								
Selenium	mg/L																								
Thallium	mg/L																								
Vanadium	mg/L																								
Zinc	mg/L																								
Silica	mg/L																								
Calcium	mg/L	150.00		720.00		64.00		730.00		83.00		560.00		290.00		570.00		110.00		250.00		0.10	U	0.10	U
Magnesium	mg/L	62.00		2100.00		8.60		2100.00		4.30		180.00		70.00		870.00		5.90		310.00		0.04	I V	0.02	U
Potassium	mg/L	18.00		660.00		3.30		630.00		4.20		26.00		18.00		190.00		8.10		98.00		0.19	U	0.19	U
Sodium	mg/L	480.00		17000.00		79.00		16000.00		30.00		2200.00		1200.00		7300.00		28.00		2800.00		0.31	U	0.31	U
Boron	mg/L	0.21		7.00		0.05	J	6.50		0.05	I	0.15		0.20		1.50		0.07		1.40		0.07		0.07	
Strontium	mg/L	1.50		13.00		0.66		14.00		0.98		6.90		3.00		7.70		1.10		3.90		0.00	U	0.00	U
Chromium VI	mg/L																								
Mercury	mg/L																								
Bromide	mg/L	3.60		97.00		0.86	I	92.00		0.25		20.00		8.20		62.00		0.30		22.00		0.03	U	0.03	U
Chloride	mg/L	950.00		32000.00		150.00		30000.00		55.00		4800.00		2300.00		14000.00		43.00		4600.00		0.35	I	0.31	I
Fluoride	mg/L	0.40	U	0.40	U	0.40	U	0.40	U	0.10		0.40	U	0.40	U	0.40	U	0.10		0.40	U	0.02	U	0.02	U
Sulfate	mg/L	140.00		3900.00		17.00		3600.00		12.00		170.00		140.00		1500.00		45.00		870.00		0.20	U	0.20	U
Total Ammonia	mg/L as N																								
Ammonium ion NH4	mg/L as N																								
Unionized NH3	mg/L																								
Nitrate/Nitrite as N	mg/L																								
TKN	mg/L																								
TN <sup>3</sup>	mg/L																								
Orthophosphate	mg/L																								
Phosphorus (P)	mg/L																								
Alkalinity	mg/L (CaCO <sub>3</sub> )	250.00		150.00		120.00		160.00		160.00		170.00		99.00		190.00		220.00		150.00		1.00	U	1.00	U
Bicarbonate Alkalinity	mg/L	250.00		150.00		120.00		160.00		160.00		170.00		99.00		190.00		220.00		150.00		1.00	U	1.00	U
Sulfides	mg/L	8.30		2.40		1.00	U	1.00	U	1.40		1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U
Total Dissolved Solids	mg/L	1500.00		56000.00		450.00		52000.00		320.00		9600.00		4300.00		25000.00		300.00		9100.00		5.00	U	5.00	U
Dissolved Inorganic Carbon	mg/L	10.00	U	10.00	U	10.00	U	10.00	U	10.00	U	10.00	U	10.00	U	10.00	U	10.00	U	10.00	U	10.00	U	10.00	U
δ18O	‰	0.00		4.90		0.10		4.60		-1.7		-1		-1.2		1.7		-1.7		-0.8		-1.30		-1.40	
δ2H	‰	3.00		29.00		-1.00		22.00		-9		0		-4		12		-3		-3		-2.00		-8.00	
δ13C	‰	-11.47		-8.13		-11.11		-7.65		-10.54		-9.86		-10.82		-8.02		-11.26		-8.02		-13.71		-12.45	
Gross Alpha	pCi/L																								
Salinity	‰	2.0		55.4		0.4		52.2																	
Sr 87/86	‰																								
Tritium	pCi/L (1σ)																								

Notes:  
\* F.A.C 62-520.420 states primary and secondary drinking water standards applies to G-1 and G-2 groundwater.  
Standards can be found at <http://www.dep.state.fl.us/water/drinkingwater/standard.htm>.  
°C = Degrees Celcius.  
µS/cm = Micro Siemens per centimeter.  
I = Value between the MDL and PQL.  
J = Estimated (+/- indicate bias).  
MCL = Maximum Contaminant Levels.  
MDL = Minimum detection limits.  
mg/L = Milligram(s) per liter.  
N = Nitrogen.  
N.A. - Not applicable.  
NTU = Nephelometric turbidity unit(s).  
PQL = Practical Quantitation Levels.  
SU = Salinity units.  
TKN = Total Kjeldahl nitrogen.  
U = Analyzed for but not detected at the reported value.  
V = Detected in method blank (result<10X blank).

Table 3.1-5. Range of Ion Concentrations in Groundwater (June and September 2011)

Parameter	GROUNDWATER																	
	Predominantly Marine <sup>1</sup>						Predominantly Fresh <sup>2</sup>						TPGW-13 <sup>3</sup>					
	JUNE			SEPTEMBER			JUNE			SEPTEMBER			JUNE			SEPTEMBER		
	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg
Temperature	24.43	27.3	26.4	24.3	28.5	26.9	24.2	29.2	25.0	24.2	25.9	25.2	29.7	29.9	29.8	29.9	30.4	30.1
pH	6.64	7.4	7.0	6.6	7.6	7.0	7.0	12.0	7.6	6.9	11.7	7.6	6.9	7.1	7.0	7.0	7.3	7.1
Dissolved Oxygen	0.1	1.7	0.4	0.1	1.1	0.2	0.1	1.3	0.4	0.1	0.6	0.3	0.1	0.4	0.2	0.1	0.2	0.1
Spec Cond	22835	78540	56503	23018	76249	55433	572	2632	1044	578	2174	964	82111	82779	82384	80616	82473	81792
Turbidity	0.15	6.9	1.2	0.0	2.0	0.4	0.3	7.0	1.6	0.0	2.5	0.5	0.9	1.1	0.9	0.0	0.2	0.1
Barium	0.081	160.0	6.2	0.1	0.2	0.1	0.1	2.2	0.4	0.1	0.1	0.1	0.2	160.0	106.7	0.1	0.1	0.1
Iron	0.27	97.0	8.7	0.3	6.6	1.9	0.1	13.0	3.2	0.3	5.3	0.8	0.7	3.4	1.9	0.7	2.8	1.6
Calcium	410	740	575	450	740	595	85	210	116	90	180	118	710	720	717	770	790	777
Magnesium	460	2200	1420	420	2100	1410	0	31	7	0	26	6	2000	2100	2067	2200	2300	2233
Potassium	110	700	446	95	620	415	3	10	7	3	10	7	680	720	703	670	710	687
Sodium	3800	17000	11389	4100	16000	11241	13	310	56	8	240	52	16000	17000	16333	17000	18000	17333
Boron	0.76	6.7	4.2	0.8	6.4	4.3	0.0	0.1	0.1	0.0	0.1	0.1	6.6	7.1	6.9	7.1	7.9	7.5
Strontium	6.8	14.0	9.8	6.9	14.0	9.8	0.8	1.5	1.0	0.7	1.5	1.0	14.0	14.0	14.0	14.0	15.0	14.3
Bromide	25	130.0	76.8	33.0	180.0	78.4	0.2	2.0	0.4	0.0	1.8	0.5	110.0	110.0	110.0	81.0	110.0	100.3
Chloride	2100	32000	21446	7600	32000	20822	21	610	107	15	480	99	34000	36000	35000	32000	33000	32333
Fluoride	0.32	20.0	1.4	0.2	2.0	0.6	0.1	0.2	0.1	0.1	0.4	0.1	0.6	3.6	2.1	0.4	0.4	0.4
Sulfate	680	3600	2487	540	4200	2369	7	46	24	8	47	25	3700	3900	3800	3900	4200	4033
Alkalinity	48	320	176	100	330	197	200	490	258	190	380	249	54	150	118	150	170	157
Bicarbonate																		
Alkalinity as	48	320	176	100	330	197	1	290	217	1	290	218	54	150	118	150	170	157
Sulfide	1	12.0	3.0	1.0	18.0	4.1	1.0	1.1	1.0	1.0	2.7	1.2	1.0	14.0	5.3	1.0	16.0	6.0

Notes:  
<sup>1</sup> Based on FDEP criteria for specific conductance, includes Wells TPGW-1 S-M-D, TPGW-2 S-M-D, TPGW-3 S-M-D, TPGW-4 M-D, TPGW-5 M-D, TPGW-6 M-D, TPGW-10 S-M-D, TPGW-11 S-M-D, TPGW-12-S-M-D, TPGW-14 S-M-D, L-3 and L5.  
<sup>2</sup> Based on FDEP criteria for specific conductance, includes Wells TPGW-4 S, TPGW-5 S, TPGW-6 S, TPGW-7 S-M-D, TPGW-8 S-M-D and TPGW-9 S-M-D.  
<sup>3</sup> Includes Wells TPGW-13 S-M-D.  
*TPGW-4S is above FDEP standards for specific conductance; however, it is included in the freshwater group since the specific conductance and other constituents are closer to predominately freshwater values than to predominately marine values found in the other stations.*

Table 3.1-6. Range of Isotope Concentrations in Groundwater (June and September 2011)

Parameter	GROUNDWATER																	
	Predominantly Marine <sup>1</sup>						Predominantly Fresh <sup>2</sup>						TPGW-13 <sup>3</sup>					
	JUNE			SEPTEMBER			JUNE			SEPTEMBER			JUNE			SEPTEMBER		
	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg
δ18O	-0.6	4.9	2.7	-1.1	4.8	2.5	-2.6	-0.8	-1.6	-2.3	1.7	-1.4	5.2	5.3	5.3	5.1	5.4	5.2
δ2H	1	32.1	19.5	-1.0	32.0	15.8	-10.0	0.2	-5.5	-14.0	15.0	-5.1	33.0	36.0	34.3	29.0	33.0	30.7
δ13C	-12.52	-3.94	-7.65	-12.82	-4.34	-8.06	-11.55	-9.15	-10.21	-15.32	-7.52	-10.21	-8.05	-6.66	-7.22	-8.89	-7.17	-7.93
Sr 87/86	0.70907	0.70915	0.70912				0.70910	0.70915	0.70913				0.70908	0.70910	0.70909			
Tritium	5.7	3690	1033				5	29	16				3650	4190	3880			

Notes:  
<sup>1</sup> Based on FDEP criteria for specific conductance, includes Wells TPGW-1 S-M-D, TPGW-2 S-M-D, TPGW-3 S-M-D, TPGW-4 M-D, TPGW-5 M-D, TPGW-6 M-D, TPGW-10 S-M-D, TPGW-11 S-M-D, TPGW-12-S-M-D, TPGW-14 S-M-D, L-3 and L5.  
<sup>2</sup> Based on FDEP criteria for specific conductance, includes Wells TPGW-4 S, TPGW-5 S, TPGW-6 S, TPGW-7 S-M-D, TPGW-8 S-M-D and TPGW-9 S-M-D.  
<sup>3</sup> Includes Wells TPGW-13 S-M-D.  
*TPGW-4S is above FDEP standards for specific conductance; however, it is included in the freshwater group since the specific conductance and other constituents are closer to predominately freshwater values than to predominately marine values found in the other stations.*

Table 3.2-1. Summary of Surface Water Analytical Results from the June 2011 Sampling Event

Parameter	Units	TPBBSW-1B 6/14/2011	TPBBSW-2B 6/14/2011	TPBBSW-3B 6/14/2011	TPBBSW-4B 6/14/2011	TPBBSW-5B 6/14/2011	TPSWC-1T 6/10/2011	TPSWC-1B 6/10/2011	TPSWC-2T 6/10/2011	TPSWC-2B 6/10/2011	TPSWC-3T* 6/10/2011	061011-TPSWC-DUP1* 6/10/2011	TPSWC-3B 6/10/2011
Temperature	°C	30.49	30.95	31.36	31.02	31.42	29.1	28.6	29.78	29.61	29.3		29.26
pH	SU	8.3	8.39	8.31	8.24	8	8.32	8.32	8.15	7.81	8.09		7.25
Dissolved Oxygen	mg/L	4.56	5.29	J 6.41	5.75	4.13	8.16	7.34	6.76	3.72	7.5		0.92
Spec Cond	µS/cm	66855	64198	64512	61153	62727	1321	1288	6120	7942	5788		16610
Turbidity	NTU	2.31	0.85	1.33	1.62	1.58	11.45	11.97	3.66	5.89	3.22		17.82
Arsenic	mg/L												
Barium	mg/L	0.081	U 0.081	U 0.081	U 0.081	U 0.081	U 0.016	U 0.016	U 0.016	U 0.056	I 0.018	I 0.025	0.081
Beryllium	mg/L												
Cadmium	mg/L												
Copper	mg/L												
Iron	mg/L	0.27	U 0.6	I V 0.68	I V 0.71	I V 0.72	I 0.077	I 0.5	I 0.054	U 0.054	U 0.054	U 0.054	0.27
Lead	mg/L												
Manganese	mg/L												
Molybdenum	mg/L												
Nickel	mg/L												
Selenium	mg/L												
Thallium	mg/L												
Vanadium	mg/L												
Zinc	mg/L												
Silica, dissolved	mg/L												
Calcium	mg/L	540	J 500	J 500	J 480	J 500	75	73	150	160	140	140	230
Magnesium	mg/L	1700	J 1700	J 1700	J 1600	J 1600	19	19	100	140	86	85	320
Potassium	mg/L	570	J 550	J 560	J 530	J 540	6.5	6.4	36	48	30	29	100
Sodium	mg/L	14000	J 14000	J 14000	J 13000	J 13000	140	140	920	1300	780	790	2600
Boron	mg/L	5.5	5.4	5.4	5.2	5.4	0.078	0.076	0.35	0.48	0.29	0.29	1.1
Strontium	mg/L	9.9	9.4	9.5	9.0	9.3	0.93	0.91	1.8	2.0	1.7	1.7	3.0
ChromiumVI	mg/L												
Mercury	mg/L												
Bromide	mg/L	100	J 96	J 92	J 91	J 95	0.84	0.88	6.8	7.8	5.4	5.1	19
Chloride	mg/L	28000	J 28000	J 26000	J 26000	J 26000	300	300	1700	2500	1600	1600	5300
Fluoride	mg/L	0.6	J 0.67	J 0.7	J 0.67	J 0.66	0.77	0.79	0.68	0.69	0.88	J 0.68	0.72
Sulfate	mg/L	3400	J 3200	J 3100	J 3000	J 3100	29	30	190	250	150	140	640
Ammonia	mg/L as N												
Ammonium ion NH4	mg/L												
Unionized NH3	mg/L												
Nitrate/Nitrite as N	mg/L												
TKN	mg/L												
TN	mg/L												
Orthophosphate	mg/L												
Phosphorus (P)	mg/L												
Alkalinity	mg/L	77	J 92	J 82	J 58	J 82	160	160	200	200	190	190	200
Bicarbonate Alkalinity as CaCO <sub>3</sub>	mg/L	76	J 91	J 81	J 57	J 82	160	160	200	200	190	190	200
Sulfide	mg/L	1	U 1	U 1	U 1	U 1	U 1	U 1	U 1	U 1	U 1	U 1	1
Total Dissolved Solids	mg/L												
Dissolved Inorganic Carbon	mg/L	10	U 10	U 10	U 10	U 10	U 10	U 10	U 10	U 10	U 10	U 10	10
δ18O	‰	2.80	2.40	2.30	1.90	2.10	2.70	2.60	2.00	1.90	1.80	2.00	1.50
δ2H	‰	20.00	17.00	17.00	16.00	23.00	16.00	17.00	7.00	12.00	10.00	J 6.00	8.00
δ13C	‰	-5.18	-3.22	-2.46	-0.83	-4.25	-0.62	-0.32	-4.28	-5.16	-4.67	-4.61	-7.68
Gross Alpha	pCi/L												
Salinity		45.3	43.2	43.4	40.9	42.1	0.7	0.6	3.3	4.4	3.1		9.7
Sr 87/86	‰ / ug/L**	0.70915	0.70913	0.70913	0.70914	0.70913	0.70911	0.70912	0.70913	0.70913	0.70912	0.70914	0.70915
Tritium	pCi/L (1σ)	16.4 (5.4)	J 12.1 (4.9)	J 19.1 (5.1)	J 9.8 (4.8)	J 13.9 (5)	J 93.3 (10.5)	J 84.5 (7.7)	J 75.4 (7.6)	J 74.3 (6.9)	J 55 (6.1)	J 74.5 (7.9)	35 (5.1)

Notes:

FL surface water quality standards are provided in F.A.C. 62-302-530 and can be found at [http://water.epa.gov/scitech/swguidance/waterquality/standards/upload/2008\\_12\\_29\\_standards\\_w](http://water.epa.gov/scitech/swguidance/waterquality/standards/upload/2008_12_29_standards_w)

\* = 061011-TPSWC-DUP1 is a duplicate of 061011-TPSWC-3T

\*\* = 062311-TPSWCCS-DUP1 is a duplicate of 062311-TPSWCCS-1B

Surface water standards separated into 2 catagories - fresh and marine (<1500mg/L Chloride and > \*\*\* = 062011-TPSWID-DUP1 is a duplicate of 062011-TPSWID-1T

Standards do not apply to the cooling canal system.

°C = Degrees Celcius.

MDL = Minimum detection limits.

PQL = Practical Quantitation Levels.

µS/cm = Micro Siemens per centir

mg/L = Milligram(s) per liter.

SU = Salinity units.

I = Value between the MDL and P

N = Nitrogen.

TKN = Total Kjeldahl nitrogen.

J = Estimated (+/- indicate bias).

N.A. - Not applicable.

U = Analyzed for but not detected 12

MCL = Maximum Contaminant Le

NTU = Nephelometric turbidity uni

V = Detected in method blank (res 9.6

Table 3.2-1. Summary of Surface Water Analytical Results from the June 2011Sampling Event

Parameter	Units	TPSWCCS-4T		TPSWCCS-4B		TPSWCCS-5T		TPSWCCS-5B		TPSWCCS-6T		TPSWCCS-6B		TPSWCCS-7B		TPSWID-1T***		062011-TPSWID-Dup1***		TPSWID-1B		TPSWID-2T		TPSWID-2B	
		6/23/2011		6/23/2011		6/23/2011		6/23/2011		6/23/2011		6/23/2011		6/20/2011		6/20/2011		6/20/2011		6/20/2011		6/20/2011		6/20/2011	
Temperature	°C	33.22		33.36		31.71		31.72		32.77		32.73		38.16		30.98				29.61		31.22		30.37	
pH	SU	8.35		8.36		8.11		8.15		8.23		8.26		8.23		7.28				7.04		7.58		6.91	
Dissolved Oxygen	mg/L	6.84		7.78		2.28		2.05		5.59		5.09		4.84		1.05				0.44		7.44		0.31	
Spec Cond	µS/cm	88902		88496		88186		88139		87799		87842		87634		36249				37557		41662		66251	
Turbidity	NTU	8.08		9.27		10.55		9.8		11.37		10.98		9.96		3.85				5.98		3.3		3.99	
Arsenic	mg/L																								
Barium	mg/L	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.094	I J	0.081	U
Beryllium	mg/L																								
Cadmium	mg/L																								
Copper	mg/L																								
Iron	mg/L	0.86	I	0.8	I	0.88	I	0.91	I	0.84	I	0.86	I	0.93	I	0.27	U	0.29	I	0.27	U	0.57	I	0.6	I
Lead	mg/L																								
Manganese	mg/L																								
Molybdenum	mg/L																								
Nickel	mg/L																								
Selenium	mg/L																								
Thallium	mg/L																								
Vanadium	mg/L																								
Zinc	mg/L																								
Silica, dissolved	mg/L																								
Calcium	mg/L	830	J	810	J	810	J	830	J	820	J	820	J	800		380		400		380		440		610	
Magnesium	mg/L	2500	J	2400	J	2500	J	2500	J	2500	J	2500	J	2400		800		860		830		980		1700	
Potassium	mg/L	820	J	800	J	830	J	830	J	810	J	820	J	810		270		290		280		330		560	
Sodium	mg/L	19000	J	19000	J	18000	J	19000	J	18000	J	19000	J	19000		6700		6800		6900		8400		14000	
Boron	mg/L	8		7.8		7.8		8		7.9		8		7.7		2.6		2.7		2.6		3.1		5.3	
Strontium	mg/L	15		15		15		15		15		15		15		6.0		6.3		6.2		7.1		11	
ChromiumVI	mg/L																								
Mercury	mg/L																								
Bromide	mg/L	130	J	130	J	120	J	120	J	130	J	130	J	110		41		48		42		48		85	
Chloride	mg/L	38000	J	38000	J	37000	J	38000	J	38000	J	37000	J	37000		13000		13000		14000	J-	15000		27000	
Fluoride	mg/L	5.2	J	4.6	I J	4.7	I J	4.9	I J	4.6	I J	5.1	J	0.45	I	0.2	U	2	U	0.48	I	0.47	I	0.2	U
Sulfate	mg/L	2	U J	2	U J	2	U J	2	U J	260	J	2	U J	3700		1400		1400		1200		1400		2900	
Ammonia	mg/L as N																								
Ammonium ion NH4	mg/L																								
Unionized NH3	mg/L																								
Nitrate/Nitrite as N	mg/L																								
TKN	mg/L																								
TN	mg/L																								
Orthophosphate	mg/L																								
Phosphorus (P)	mg/L																								
Alkalinity	mg/L	140	J	140	J	130	J	140	J	140	J	130	J	73		260		270		260		210		160	
Bicarbonate Alkalinity as CaCO3	mg/L	140	J	140	J	130	J	140	J	140	J	120	J	73		260		270		260		210		160	
Sulfide	mg/L	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	2.7		3.4		1	U	13	
Total Dissolved Solids	mg/L																								
Dissolved Inorganic Carbon	mg/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
δ18O	‰	6.10		6.10		6.20		6.20		6.00		5.90		5.70		2.10		2.00		2.20		2.30		4.20	
δ2H	‰	30.00		32.00		35.00		35.40		28.00		29.00		29.00		15.40	J	12.00	J	13.00		17.30		27.00	
δ13C	‰	-2.29				-3.79		-3.67		-3.15		-3.15		-3.11		-7.86		-8.82		-9.00		-6.41		-8.86	
Gross Alpha	pCi/L																								
Salinity		62.9		62.5		62.4		62.3		62.0		62.0		0.0		22.7				23.7		26.5		44.8	
Sr 87/86	‰ / ug/L **	0.70909		0.70909		0.70915		0.7091		0.70911		0.70909		0.70911		0.70913		0.7091		0.7091		0.7091		0.70912	
Tritium	pCi/L (1σ)	2704 (163)		2894 (172)		2648 (159)		2716 (161)		2430 (150)		2770 (170)		2690 (160)		1391 (8.3)		1510 (9)		1597 (9.6)		1920 (110)		4350 (260)	

Notes:  
FL surface water quality standards are provided in F.A.C. 62-302-530 and can be found at [http://water.epa.gov/scitech/swguidance/waterquality/standards/upload/2008\\_12\\_29\\_standards\\_wqslibrary\\_fl](http://water.epa.gov/scitech/swguidance/waterquality/standards/upload/2008_12_29_standards_wqslibrary_fl). \* = 061011-TPSWC-DUP1 is a duplicate of 061011-TPSWC-3T  
\*\* = 062311-TPSWCCS-DUP1 is a duplicate of 062311-TPSWCCS-1B  
Surface water standards separated into 2 catagories - fresh and marine (<1500mg/L Chloride and >1500mg/L cl \*\*\* = 062011-TPSWID-DUP1 is a duplicate of 062011-TPSWID-1T  
Standards do not apply to the cooling canal system.  
°C = Degrees Celcius. MDL = Minimum detection limits. PQL = Practical Quantitation Levels.  
µS/cm = Micro Siemens per centimeter mg/L = Milligram(s) per liter. SU = Salinity units.  
I = Value between the MDL and PQL. N = Nitrogen. TKN = Total Kjeldahl nitrogen.  
J = Estimated (+/- indicate bias). N.A. - Not applicable. U = Analyzed for but not detected at the 12  
MCL = Maximum Contaminant Levels. NTU = Nephelometric turbidity unit(s). V = Detected in method blank (result<109.6



Table 3.2-1. Summary of Surface Water Analytical Results from the June 2011 Sampling Event

		TPSWID-3T		TPSWID-3B		061011-TPSWC-FB1		061411-TPBBSW-FB1		062011-TPSWID-FB1		062311-TPSWC-FB1	
Parameter	Units	6/20/2011		6/20/2011		6/10/2011		6/14/2011		6/20/2011		6/23/2011	
Temperature	°C	30.43		30.21									
pH	SU	7.26		7.11									
Dissolved Oxygen	mg/L	2.74		0.57									
Spec Cond	µS/cm	45986		64951									
Turbidity	NTU	2.19		1.37									
Arsenic	mg/L												
Barium	mg/L	0.081	U	0.081	U	0.081	U	0.00081	I	0.0011	I	0.00081	U
Beryllium	mg/L												
Cadmium	mg/L												
Copper	mg/L												
Iron	mg/L	0.4	I	0.62	I	0.0027	U	0.0027	U	0.0027	U	0.0027	U
Lead	mg/L												
Manganese	mg/L												
Molybdenum	mg/L												
Nickel	mg/L												
Selenium	mg/L												
Thallium	mg/L												
Vanadium	mg/L												
Zinc	mg/L												
Silica, dissolved	mg/L												
Calcium	mg/L	440		580		0.1	U	0.1	U	0.1	U	0.1	U
Magnesium	mg/L	1100		1700		0.02	U	0.025	I	0.02	U	0.026	I
Potassium	mg/L	360		550		0.19	U	0.19	U	0.19	U	0.19	U
Sodium	mg/L	8800		14000		0.31	U	0.31	U	0.31	U	0.31	U
Boron	mg/L	3.4		5.3		0.078		0.082		0.084		0.082	
Strontium	mg/L	7.1		10		0.001	U	0.001	U	0.001	U	0.001	U
ChromiumVI	mg/L												
Mercury	mg/L												
Bromide	mg/L	55		67		0.027	U	0.027	U	0.027	U	0.027	U
Chloride	mg/L	17000		26000		0.37	I	25		0.31	I	0.67	
Fluoride	mg/L	0.49	I	0.45	I	0.02	U	0.02	U	0.02	U	0.02	U
Sulfate	mg/L	1800		2300		0.28	I	0.2	U	0.2	U	0.29	I
Ammonia	mg/L as N												
Ammonium ion NH4	mg/L												
Unionized NH3	mg/L												
Nitrate/Nitrite as N	mg/L												
TKN	mg/L												
TN	mg/L												
Orthophosphate	mg/L												
Phosphorus (P)	mg/L												
Alkalinity	mg/L	140		120		1.2		1.8		1	U	1.4	
Bicarbonate Alkalinity as CaCO <sub>3</sub>	mg/L	140		120		1.2		1.8		1	U	1.4	
Sulfide	mg/L	1	U	4		1	U	1	U	1	U	1	U
Total Dissolved Solids	mg/L												
Dissolved Inorganic Carbon	mg/L	10	U	10	U	10	U	10	U	10	U	10	U
δ18O	‰	2.50		3.50		-1.10		-1.40		-1.20		-1.40	
δ2H	‰	11.00		24.40		-8.00		-8.00		-3.00		-13.00	
δ13C	‰	-7.70		-8.38		-16.11		-20.40		-20.60		-15.84	
Gross Alpha	pCi/L												
Salinity		29.7		43.8									
Sr 87/86	‰ / ug/L **	0.70913		0.70913		0.1		0.1		0.1		0.1	
Tritium	pCi/L (1σ)	1330 (80)		1990 (230)		13.6 (7.1)		11.4 (9.5)		8.1 (4.5)		8.3 (5)	

Notes:

FL surface water quality standards are provided in F.A.C. 62-302-530 and can be found at [http://water.epa.gov/scitech/swguidance/waterquality/standards/upload/2008\\_12\\_29\\_standards\\_wqslibrary\\_fl\\_fl\\_4\\_62-302t.pdf](http://water.epa.gov/scitech/swguidance/waterquality/standards/upload/2008_12_29_standards_wqslibrary_fl_fl_4_62-302t.pdf)  
Surface water standards separated into 2 catagories - fresh and marine (<1500mg/L Chloride and >1500mg/L chloride, respectively).  
Standards do not apply to the cooling canal system.  
°C = Degrees Celcius. MDL = Minimum detection limits.  
µS/cm = Micro Siemens per centir mg/L = Milligram(s) per liter.  
I = Value between the MDL and P N = Nitrogen.  
J = Estimated (+/- indicate bias). N.A. - Not applicable.  
MCL = Maximum Contaminant Le NTU = Nephelometric turbidity unit(s).  
PQL = Practical Quantitation Levels.  
SU = Salinity units.  
TKN = Total Kjeldahl nitrogen.  
U = Analyzed for but not detected at the reported value.  
V = Detected in method blank (result<10X blank).



Table 3.2-2. Summary of Surface Water Analytical Results from the September 2011 Sampling Event

Parameter	Units	TPBBSW-1B	TPBBSW-2B	TPBBSW-3B	TPBBSW-4B	TPBBSW-5B	TPSWCCS-1B*	TPSWCCS-DUP1*	TPSWCCS-2B	TPSWCCS-3B	TPSWCCS-4B	TPSWCCS-4T	TPSWCCS-5B	TPSWCCS-5T
		9/8/2011	9/8/2011	9/9/2011	9/8/2011	9/8/2011	9/12/2011	9/12/2011	9/7/2011	9/14/2011	9/1/2011	9/1/2011	9/1/2011	9/1/2011
Temperature	°C	31.62	31.15	31.22	31.19	31.11	40.31		36.19	34.35	33.67	33.46	32.36	32.16
pH	SU	8.94	8.45	8.18	8.21	8.33	8.94		8.68	8.24	8.48	8.45	8.37	8.30
Dissolved Oxygen	mg/L	4.66	4.47	5.05	4.69	4.72	4.20		5.55	3.65	6.13	5.89	2.11	2.45
Spec Cond	µS/cm	53742.00	54062.00	55918.00	55450.00	52959.00	83866.00		81722.00	81641.00	85590.00	85563.00	84992.00	84785.00
Turbidity	NTU	1.95	0.58	0.69	0.44	0.90	3.18		6.03	5.57	4.99	5.65	4.72	5.61
Arsenic	mg/L													
Barium	mg/L	0.08	U	0.08	U	0.08	U	0.081	U	0.081	U	0.081	U	0.081
Beryllium	mg/L													
Cadmium	mg/L													
Copper	mg/L													
Iron	mg/L	5.50	0.60	I	1.90	I V	0.56	I	0.76	I	0.88	I	0.86	I
Lead	mg/L													
Manganese	mg/L													
Molybdenum	mg/L													
Nickel	mg/L													
Selenium	mg/L													
Thallium	mg/L													
Vanadium	mg/L													
Zinc	mg/L													
Silica, dissolved	mg/L						1500.00	1500.00	1300.00	1500.00	140.00	I J	140.00	I J
Calcium	mg/L	440.00	J	450.00	500.00	480.00	J	460.00	750.00	760.00	810.00	J	820.00	790.00
Magnesium	mg/L	1300.00	J	1400.00	1500.00	1500.00	J	1400.00	2300.00	2300.00	2300.00	J	2300.00	2200.00
Potassium	mg/L	420.00	J	430.00	470.00	450.00	J	420.00	680.00	710.00	720.00	J	710.00	670.00
Sodium	mg/L	11000.00	J	11000.00	11000.00	12000.00	J	11000.00	17000.00	18000.00	17000.00	J	19000.00	18000.00
Boron	mg/L	4.70	4.8	5.2	5.00	4.70	7.50	7.80	8.00	7.30	8.00	7.7	7.9	7.6
Strontium	mg/L	7.80	7.9	8.5	8.40	8.10	14.00	15.00	15.00	14.00	15.00	14	15	14
ChromiumVI	mg/L													
Mercury	mg/L													
Bromide	mg/L	70.00	71.00	73.00	75.00	J	69.00	J	110.00	110.00	110.00	J	120.00	120.00
Chloride	mg/L	20000.00	19000.00	20000.00	21000.00	J	19000.00	J	33000.00	34000.00	33000.00	J	32000.00	35000.00
Fluoride	mg/L	0.51	I	0.53	I	0.76	I	0.46	I J	0.42	I J	0.40	U	0.49
Sulfate	mg/L	2500.00	2600.00	2600.00	2600.00	J	2500.00	J	830.00	850.00	4200.00	J	3900.00	4500.00
Ammonia	mg/L as N	0.10	J	0.06	J	0.05	0.06	J	0.08	J	0.12		0.09	J
Ammonium ion NH4	mg/L	0.07	0.07	0.06	0.07	0.08	0.07	0.08	0.07	0.09	0.11	J	0.15	J+
Unionized NH3	mg/L												0.07	J
Nitrate/Nitrite as N	mg/L	0.06	0.02	0.03	0.03	0.02	0.01	0.02	1.00	0.04	0.13	J	0.05	J
TKN	mg/L	0.28	J	0.37	J	0.34	0.43	J	0.63	J	2.30		2.20	2.00
TN	mg/L	0.34	0.39	0.37	0.46	0.65	2.30	2.20	3.00	1.70	2.10		2.20	2.30
Orthophosphate	mg/L	0.011	0.0016	I	0.0014	U	0.0014	U J-	0.0014	U	0.0014	U	0.0015	I
Phosphorus (P)	mg/L	0.05	0.05	I	0.02	U	0.05	I	0.05	I J-	0.07		0.03	I
Alkalinity	mg/L	120.00	120.00	120.00	120.00	130.00	130.00	130.00	130.00	130.00	120.00		140.00	130.00
Bicarbonate Alkalinity as CaCO <sub>3</sub>	mg/L	120.00	120.00	120.00	120.00	130.00	120.00	110.00	130.00	120.00	130.00		130.00	130.00
Sulfide	mg/L	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00
Total Dissolved Solids	mg/L													
Dissolved Inorganic Carbon	mg/L	39.00	J	44.00	J	41.00	44.00	J	47.00	J	36.00	34.00	42.00	39.00
δ18O	‰	1.60	1.60	2.10	2.30	2.40	4.70	4.50	4.50		4.70	4.70	4.70	4.80
δ2H	‰	9.00	10.00	7.00	12.00	17.00	19.00	24.00	25.00		28.00	27.00	25.00	28.00
δ13C	‰	-2.01	-2.21	-1.86	-3.01	-4.47	-4.90	-5.15	-5.19		-2.88	-4.48	-4.64	-5.59
Gross Alpha	pCi/L													
Salinity		35.3	35.5	36.9	36.6	34.7	>temp	>temp	56.8	60.1	60.1	59.7	59.5	
Sr 87/86	‰ / ug/L**													
Tritium	pCi/L (1σ)													

Notes:

FL surface water quality standards are provided in F.A.C. 62-302-530 and can be found at

[http://water.epa.gov/scitech/swguidance/waterquality/standards/upload/2008\\_12\\_29\\_standards\\_wqslibrary\\_fl\\_fl\\_4\\_62-302t.pdf](http://water.epa.gov/scitech/swguidance/waterquality/standards/upload/2008_12_29_standards_wqslibrary_fl_fl_4_62-302t.pdf)  
Surface water standards separated into 2 catagories - fresh and marine (<1500mg/L Chloride and >1500mg/L chloride, respectively).  
Standards do not apply to the cooling canal system.

°C = Degrees Celcius. MDL = Minimum detection limits. PQL = Practical Quantitation Levels.  
µS/cm = Micro Siemens per centir mg/L = Milligram(s) per liter. SU = Salinity units.  
I = Value between the MDL and P N = Nitrogen. TKN = Total Kjeldahl nitrogen.  
J = Estimated (+/- indicate bias). N.A. - Not applicable. U = Analyzed for but not detected at 12  
MCL = Maximum Contaminant Le' NTU = Nephelometric turbidity uni V = Detected in method blank (result 9.6

\* = 061011-TPSWC-DUP1 is a duplicate of 061011-TPSWC-3T

\*\* = 062311-TPSWCCS-DUP1 is a duplicate of 062311-TPSWCCS-1B

Table 3.2-2. Summary of Surface Water Analytical Results from the September 2011 Sampling Event

Parameter	Units	TPSWCCS-6B	TPSWCCS-6T	TPSWCCS-7B	TPSWID-1B	TPSWID-1T	TPSWID-2B	TPSWID-2T	TPSWID-3B	TPSWID-3T	TPSWC-1B	TPSWC-1T**	TPSWC-DUP1**	TPSWC-2B	TPSWC-2T	TPSWC-3B	TPSWC-3T
		9/1/2011	9/1/2011	9/12/2011	9/12/2011	9/12/2011	9/12/2011	9/12/2011	9/12/2011	9/12/2011	9/14/2011	9/14/2011	9/14/2011	9/14/2011	9/14/2011	9/14/2011	9/14/2011
Temperature	°C	31.80	31.86	37.44	29.40	28.70	30.07	30.14	29.47	30.67	29.28	31.31		30.61	31.56	30.84	31.68
pH	SU	8.43	8.40	8.84	7.30	7.57	7.38	8.10	7.96	8.52	7.33	7.47		7.74	7.66	7.64	8.19
Dissolved Oxygen	mg/L	4.28	4.45	4.56	0.43	2.29	0.09	2.40	0.27	5.73	3.72	4.37		3.16	3.27	0.46	4.91
Spec Cond	µS/cm	83516.00	83338.00	76581.00	23723.00	7162.00	53912.00	6789.00	11236.00	3494.00	888.00	952.00		753.00	742.00	651.00	663.00
Turbidity	NTU	4.67	5.13	6.25	6.34	3.54	8.31	1.15	8.23	1.04	0.78	0.87		0.82	0.93	1.14	0.73
Arsenic	mg/L																
Barium	mg/L	0.081	U	0.081	U	0.08	U	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U
Beryllium	mg/L																
Cadmium	mg/L																
Copper	mg/L																
Iron	mg/L	0.62	I	0.66	I	0.93	I	0.27	U	0.27	U	0.63	I	0.27	U	0.27	U
Lead	mg/L																
Manganese	mg/L																
Molybdenum	mg/L																
Nickel	mg/L																
Selenium	mg/L																
Thallium	mg/L																
Vanadium	mg/L																
Zinc	mg/L																
Silica, dissolved	mg/L	190.00	I J	260.00	I J	1600.00											
Calcium	mg/L	760.00		760.00		680.00		280.00	150.00	530.00	150.00	190.00	110.00	62.00	67.00	J	68.00
Magnesium	mg/L	2200.00		2200.00		2000.00		520.00	140.00	1300.00	120.00	230.00	56.00	11.00	12.00	J	8.80
Potassium	mg/L	650.00		670.00		620.00		160.00	47.00	400.00	40.00	72.00	19.00	3.70	4.60	J	4.60
Sodium	mg/L	17000.00		17000.00		16000.00		4100.00	1100.00	10000.00	1000.00	1800.00	500.00	99.00	100.00	J	110.00
Boron	mg/L	7.5		7.5		6.9		1.7	0.54	J	4.3	0.41	J	0.79	0.2	J	0.06
Strontium	mg/L	14		14		13		4.2	1.7		9.2	1.90		2.7	1.3		0.62
ChromiumVI	mg/L																
Mercury	mg/L																
Bromide	mg/L	120.00		120.00		100.00		26.00	8.70	67.00	9.20	12.00	5.00	0.37	0.35		0.41
Chloride	mg/L	34000.00		34000.00		30000.00		7300.00	1900.00	19000.00	1900.00	3200.00	J-	900.00	190.00	J-	170.00
Fluoride	mg/L	2.00	U	2.00	U	0.42	I	0.40	U	0.40	U	0.40	U	0.07	0.06		0.12
Sulfate	mg/L	4300.00		4400.00		3500.00		800.00	240.00	2300.00	220.00	430.00	J-	110.00	16.00	26.00	27.00
Ammonia	mg/L as N	0.11	J	0.14	J	0.13	J	1.10	0.38	1.90	0.35	0.41	0.17	J	0.23	0.23	0.23
Ammonium ion NH4	mg/L	0.11		0.15		0.09		1.40	0.48	2.40	0.41	0.49	0.17		0.29	0.29	0.29
Unionized NH3	mg/L																
Nitrate/Nitrite as N	mg/L	0.05	J+	0.06	J	0.03		0.00	U	0.02		0.00	U	0.04	J+	0.02	
TKN	mg/L	2.00		2.30		2.10		1.80	1.20	J	2.40	0.94	J	1.00	J	0.79	J
TN	mg/L	2.10		2.40		2.10		1.80	1.20		2.40	0.95		1.00		0.83	0.96
Orthophosphate	mg/L	0.0014	U	0.0014	U	0.0014	U	0.017	0.0025	I	0.0028	I	0.0014	U	0.0037	I	0.0014
Phosphorus (P)	mg/L	0.00	U	0.03	I J-	0.07	J-	0.03	0.00	U	0.04		0.00	U	0.00	U	0.0044
Alkalinity	mg/L	130.00		130.00		130.00		270.00	250.00		200.00	190.00	200.00	160.00	93.00	100.00	96.00
Bicarbonate Alkalinity as CaCO3	mg/L	130.00		130.00		120.00		270.00	250.00		200.00	190.00	200.00	160.00	93.00	100.00	96.00
Sulfide	mg/L	1.00	U	1.00	U	1.00	U	8.50	1.00	U	12.00	1.00	U	1.00	U	1.00	U
Total Dissolved Solids	mg/L																
Dissolved Inorganic Carbon	mg/L	43.00		44.00		35.00		79.00	71.00		76.00	66.00		70.00	53.00	10.00	U
δ18O	‰	4.50		4.60		4.20		1.30	0.20		3.20	0.10		0.10	0.30	-0.40	-0.50
δ2H	‰	28.00		28.00		27.00		8.00	6.00		18.00	2.00		5.00	1.00	4.00	0.00
δ13C	‰	-5.19		-4.66		-5.17		-9.00	-7.86		-9.39	-6.41		-9.29	-7.95	-9.28	-9.90
Gross Alpha	pCi/L																
Salinity		58.5		58.3		>temp		14.3	3.9		35.5	3.7		6.3	1.8	0.4	0.5
Sr 87/86	‰ / ug/L**																
Tritium	pCi/L (1σ)																

Notes:

FL surface water quality standards are provided in F.A.C. 62-302-530 and can be found at  
[http://water.epa.gov/scitech/swguidance/waterquality/standards/upload/2008\\_12\\_29\\_standards\\_wqslibrary\\_fl\\_fl\\_4\\_62-302.p](http://water.epa.gov/scitech/swguidance/waterquality/standards/upload/2008_12_29_standards_wqslibrary_fl_fl_4_62-302.p)

Surface water standards separated into 2 catagories - fresh and marine (<1500mg/L Chloride and >1500mg/L chloride, respectively).  
Standards do not apply to the cooling canal system.  
°C = Degrees Celcius.  
µS/cm = Micro Siemens per centimet  
I = Value between the MDL and PQL  
J = Estimated (+/- indicate bias).  
MCL = Maximum Contaminant Level;

MDL = Minimum detection limits.  
mg/L = Milligram(s) per liter.  
N = Nitrogen.  
N.A. - Not applicable.  
NTU = Nephelometric turbidity unit

PQL = Practical Quantitation Levels.  
SU = Salinity units.  
TKN = Total Kjeldahl nitrogen.  
U = Analyzed for but not detected 12  
V = Detected in method blank (res 9.6

\* = 061011-TPSWC-DUP1 is a duplicate of 061011-TPSWC-3T  
\*\* = 062311-TPSWCCS-DUP1 is a duplicate of 062311-TPSWCCS-1B

Table 3.2-2. Summary of Surface Water Analytical Results from the September 2011 Sampling Event

Parameter	Units	TPSWC-4B	TPSWC-4T	TPSWC-5B	TPSWC-5T	TPSWC-6B	TPSWC-6T	TPSWCCS-EB1	TPSWC-FB1	TPSWC-FB1	TPSWCCS-FB1	TPSWC-FB1
		9/13/2011	9/13/2011	9/14/2011	9/14/2011	9/1/2011	9/1/2011	9/1/2011	9/8/2011	9/12/2011	9/13/2011	9/22/2011
Temperature	°C	30.29	32.31	32.40	32.03	26.96	26.96					
pH	SU	7.24	7.66	7.72	7.72	7.58	7.59					
Dissolved Oxygen	mg/L	0.22	2.19	3.17	0.45	2.71	2.91					
Spec Cond	µS/cm	45758.00	9906.00	59712.00	55387.00	928.00	933.00					
Turbidity	NTU	107.80	2.16	1.74	0.57	0.66	0.68					
Arsenic	mg/L											
Barium	mg/L	0.081 U	0.081 U	0.081 U	0.081 U	0.081 U	0.081 U	0.00081 U	0.00081 U	0.00081 U	0.00081 U	0.00094 I
Beryllium	mg/L											
Cadmium	mg/L											
Copper	mg/L											
Iron	mg/L	0.52 I V	0.27 U	0.58 I	1.2 I	0.27 U	0.27 U	0.0027 U	0.0027 U	0.0027 U	0.0027 U	0.0027 U
Lead	mg/L											
Manganese	mg/L											
Molybdenum	mg/L											
Nickel	mg/L											
Selenium	mg/L											
Thallium	mg/L											
Vanadium	mg/L											
Zinc	mg/L											
Silica, dissolved	mg/L							8100.00			5100.00	
Calcium	mg/L	440.00	130.00	560.00 J	510.00	98.00	99.00	0.10 U	0.10 U	0.12 I	0.10 U	0.10 U
Magnesium	mg/L	1100.00	190.00	1600.00 J	1500.00	11.00	11.00	0.02 U	0.04 I V	0.04 I	0.02 U	0.02 I
Potassium	mg/L	320.00	60.00	510.00 J	460.00	9.30	9.40	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U
Sodium	mg/L	8500.00	1600.00	13000.00 J	11000.00	74.00	76.00	0.31 U	0.31 U	0.31 U	0.31 U	0.31 U
Boron	mg/L	3.4	0.65	5.7	5.2	0.084 J	0.085 J	0.073	0.09	0.064	0.064	0.068
Strontium	mg/L	7.3	1.9	9.6	8.6	1	1	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
ChromiumVI	mg/L											
Mercury	mg/L											
Bromide	mg/L	53.00	10.00	78.00 J	74.00	0.83 I	0.54 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U
Chloride	mg/L	16000.00	3000.00	22000.00 J	20000.00	130.00	140.00	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Fluoride	mg/L	0.40 U	0.40 U	0.79 I J	0.74 I	0.40 U	0.40 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Sulfate	mg/L	2200.00	350.00	2900.00 J	2700.00	43.00	44.00	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Ammonia	mg/L as N	0.34	0.34	0.17	0.11	0.10	0.11	0.04 I	0.04 I	0.03 I	0.03 U	0.03 U
Ammonium ion NH4	mg/L	0.43	0.42	0.21	0.13	0.12	0.14					
Unionized NH3	mg/L											
Nitrate/Nitrite as N	mg/L	0.04	0.02	0.03	0.03	0.02	0.03	0.02	0.00 U	0.00 U	0.00 U	0.09
TKN	mg/L	0.97	1.10	0.42	0.34	0.40	0.51	0.15 I	0.08 I	0.14 I	0.09 I	0.06 I
TN	mg/L	1.00	1.10	0.45	0.37	0.42	0.54	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
Orthophosphate	mg/L	0.0022 I	0.0014 U J-	0.0014 U J-	0.0014 U	0.0022 I	0.0014 U	0.0014 U	0.0014 U	0.0014 U	0.0014 U	0.01 U
Phosphorus (P)	mg/L	0.1400	0.0051 I	0.0220 U	0.0330 I	0.0044 U	0.0044 U	0.0044 U	0.0044 U	0.0044 U	0.0044 U	0.0044 U
Alkalinity	mg/L	240.00	140.00	130.00	130.00	200.00	190.00	1.00 U	1.00 U	1.00 U	1.40	4.10
Bicarbonate Alkalinity as CaCO3	mg/L	240.00	140.00	130.00	130.00	200.00	190.00	1.00 U	1.00 U	1.00 U	1.40	4.10
Sulfide	mg/L	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Total Dissolved Solids	mg/L	28000.00	4800.00			450.00	440.00					
Dissolved Inorganic Carbon	mg/L	88.00	54.00	10.00 U	10.00 U	63.00	10.00 U	10.00 U	42.00	10.00 U	10.00 U	10.00 U
δ18O	‰	2.10	0.50	2.20	2.40			-1.50	-1.20	-1.20	-1.20	-1.10
δ2H	‰	14.00	-1.00	19.00	8.00			-2.00	-6.00	-1.00	-7.00	-7.00
δ13C	‰	-10.26	-9.34	-4.64	-3.75			-11.53	-9.87	-11.96	-11.07	-9.79
Gross Alpha	pCi/L											
Salinity		29.5	5.5	39.7	36.5	0.5	0.5					
Sr 87/86	‰ / ug/L**											
Tritium	pCi/L (1σ)											

Notes:

FL surface water quality standards are provided in F.A.C. 62-302-530 and can be found at

[http://water.epa.gov/scitech/swguidance/waterquality/standards/upload/2008\\_12\\_29\\_standards\\_wqslibrary\\_fl\\_fl\\_4\\_62-302t.pdf](http://water.epa.gov/scitech/swguidance/waterquality/standards/upload/2008_12_29_standards_wqslibrary_fl_fl_4_62-302t.pdf).

Surface water standards separated into 2 catagories - fresh and marine (<1500mg/L Chloride and >1500mg/L chloride, respectively).

Standards do not apply to the cooling canal system.

°C = Degrees Celcius.

µS/cm = Micro Siemens per centimeter.

I = Value between the MDL and PQL.

J = Estimated (+/- indicate bias).

MCL = Maximum Contaminant Levels.

MDL = Minimum detection limits.

mg/L = Milligram(s) per liter.

N = Nitrogen.

N.A. - Not applicable.

NTU = Nephelometric turbidity unit(s).

PQL = Practical Quantitation Levels.

SU = Salinity units.

TKN = Total Kjeldahl nitrogen.

U = Analyzed for but not detected at the reported value.

V = Detected in method blank (result<10X blank).

Table 3.2-3. Range of Ion Concentrations in Surface Water (June and September 2011)

Parameter	SURFACE WATER																							
	Cooling Canal System						Interceptor Ditch						Biscayne Bay						L-31 Canal <sup>1</sup>					
	JUNE			SEPTEMBER			JUNE			SEPTEMBER			JUNE			SEPTEMBER			JUNE			SEPTEMBER		
	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg
Temperature	30.5	39.5	33.3	31.8	40.3	34.4	29.6	31.2	30.5	28.7	30.7	29.7	30.5	31.4	31.0	31.1	31.6	31.3	28.6	29.8	29.3	29.3	31.7	30.9
pH	8.1	8.4	8.3	8.2	8.9	8.5	6.9	7.6	7.2	7.3	8.5	7.8	8.0	8.4	8.2	8.2	8.9	8.4	7.3	8.3	8.0	7.3	8.2	7.7
Dissolved Oxygen	2.1	7.8	4.9	2.1	6.1	4.3	0.3	7.4	2.1	0.1	5.7	2.5	4.1	6.4	5.2	4.5	5.1	4.7	0.9	8.2	5.7	0.5	4.9	3.3
Spec Cond	87350	88902	88078	76581	85590	83159	36249	66251	48776	3494	53912	17719	61153	66855	63889	52959	55918	54426	1288	16610	6512	651	952	775
Turbidity	8.1	11.4	9.6	3.2	6.3	5.2	1.4	6.0	3.4	1.0	8.3	4.8	0.9	2.3	1.5	0.4	2.0	0.9	3.2	17.8	9.0	0.7	1.1	0.9
Barium	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.0	0.1	0.1	0.1
Iron	0.8	1.0	0.9	0.6	1.1	0.8	0.3	0.6	0.5	0.3	0.6	0.3	0.3	0.7	0.6	0.6	5.5	1.9	0.1	0.5	0.2	0.3	0.4	0.3
Calcium	800	830	815	680	820	770	380	610	472	110	530	235	480	540	504	440	500	466	73	230	138	54	67	60
Magnesium	2300	2500	2450	2000	2300	2230	800	1700	1185	56	1300	394	1600	1700	1660	1300	1500	1420	19	320	114	7	12	9
Potassium	770	830	812	620	750	682	270	560	392	19	400	123	530	570	550	420	470	438	6	100	38	3	5	4
Sodium	18000	19000	18600	16000	19000	17600	6700	14000	9800	500	10000	3083	13000	14000	13600	11000	12000	11200	140	2600	980	58	100	78
Boron	7.7	8.0	7.8	6.9	8.0	7.6	2.6	5.3	3.7	0.2	4.3	1.3	5.2	5.5	5.4	4.7	5.2	4.9	0.1	1.1	0.4	0.0	0.1	0.1
Strontium	15.0	15.0	15.0	13.0	15.0	14.2	6.0	11.0	7.9	1.3	9.2	3.5	9.0	9.9	9.4	7.8	8.5	8.1	0.9	3.0	1.7	0.6	0.7	0.6
Bromide	110.0	130.0	124.0	100.0	120.0	116.0	41.0	85.0	56.3	5.0	67.0	21.3	91.0	100.0	94.8	69.0	75.0	71.6	0.8	19.0	6.8	0.3	0.4	0.3
Chloride	36000	38000	37400	30000	35000	33500	13000	27000	18667	900	19000	5700	26000	28000	26800	19000	21000	19800	300	5300	1950	91	190	131
Fluoride	0.2	21.0	5.5	0.4	2.0	1.4	0.2	0.5	0.4	0.4	0.4	0.4	0.6	0.7	0.7	0.4	0.8	0.5	0.7	0.9	0.8	0.1	0.1	0.1
Sulfate	2	4400	1247	830	4500	3893	1200	2900	1833	110	2300	683	3000	3400	3160	2500	2600	2560	29	640	215	9	26	15
Alkalinity	73	140	120	120	140	130	120	260	192	160	270	212	58	92	78	120	130	122	160	200	185	1	110	83
Bicarbonate Alkalinity as CaCO3	73	140	119	120	130	127	120	260	192	160	270	212	57	91	77	120	130	122	160	200	185	1	110	83
Sulfide	1.0	1.6	1.1	1.0	1.0	1.0	1.0	13.0	3.9	1.0	12.0	4.1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0

Notes:  
<sup>1</sup> Includes TPSWC-1, -2, -3 only.

Table 3.2-4. Range of Isotope Concentrations in Surface Water (June and September 2011)

Parameter	SURFACE WATER																							
	Cooling Canal System						Interceptor Ditch						Biscayne Bay						L-31 Canal <sup>1</sup>					
	JUNE			SEPTEMBER			JUNE			SEPTEMBER			JUNE			SEPTEMBER			JUNE			SEPTEMBER		
	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg
δ18O	5.60	6.40	6.02	4.20	4.80	4.60	2.10	4.20	2.80	0.10	3.20	0.87	1.90	2.80	2.30	1.60	2.40	2.00	1.50	2.70	2.08	-0.50	0.20	-0.07
δ2H	28.00	35.40	31.54	19.00	28.00	26.11	11.00	27.00	18.02	1.00	18.00	6.67	16.00	23.00	18.60	7.00	17.00	11.00	7.00	17.00	11.67	0.00	7.00	3.33
δ13C	-3.79	-2.29	-3.21	-5.64	-2.88	-4.83	-9.00	-6.41	-8.03	-9.39	-6.41	-8.32	-5.18	-0.83	-3.19	-4.47	-1.86	-2.71	-7.68	-0.32	-3.79	-10.17	-8.93	-9.36
Sr 87/86	0.70909	0.70915	0.70911				0.70910	0.70913	0.70912				0.70913	0.70915	0.70914				0.70911	0.70915	0.70913			
Tritium	2430	2973	2711.5				1330	4350	2096.33				16.4	16.4	16.4				35	93.3	69.5833			

Notes:  
<sup>1</sup> Includes TPSWC-1, -2, -3 only.

**Table 3.4-1. Rainfall Tritium Results**

Rainfall Station	Sample Date	pCi/L		
		Concentration	1-Sigma	MDL
TPRC-2	7/29/2011	34.1	5.4	4.6
TPRC-3	7/29/2011	23.5	5.5	5
TPRC-4	7/29/2011	11.3	5.2	5
TPRC-8	7/29/2011	4.4	4.8	4.8
TPRC-12	7/29/2011	29.2	5.8	5.1
RC-BLANK	7/29/2011	6.3	5.0	4.9
TPRC-7	8/18/2011	24.7	5.6	5.1

Key:

pCi/L = picoCuries per liter.

MDL = Minimum detection limit.

**Table 3.5-1. Evaporation Pan Results**

Evaporation Pan Station	Sample Date	Concentration (pCi/L) *		
		Value	1-Sigma	MDL
TPEVP-2	4/19/2011	249	19.0	5.1
TPEVP-3	4/19/2011	45.1	6.5	5.1
TPEVP-5	4/20/2011	49.6	7.0	5.4
TPEVP-12	4/19/2011	55.0	6.9	5.0
TPEVP-Source	4/19/2011	13.4	5.3	5.1
TPEVP-Source5	4/20/2011	23.5	5.5	4.9
TPEVP-2	5/24/2011	283.4	19.6	6.2
TPEVP-3	5/24/2011	36.0	7.2	6.3
TPEVP-5	5/24/2011	39.2	7.2	6.1
TPEVP-12	5/24/2011	30.0	6.9	6.1
TPEVP-13	5/24/2011	490.3	31.5	6.4
TPEVP-Source	5/24/2011	15.3	8.3	7.9
TPEVP-Source5	5/24/2011	20.8	6.7	6.2
TPEVP-2	6/24/2011	26.3	6.8	6.1
TPEVP-3	6/24/2011	17.9	6.7	6.2
TPEVP-5	6/27/2011	39.0	7.2	6.1
TPEVP-12	6/27/2011	22.6	6.6	6.1
TPEVP-13	6/24/2011	274.7	19	6.1
TPEVP-Source	6/24/2011	21.4	6.7	6.2
TPEVP-Source5	6/27/2011	20.9	6.6	6.0
TPEVP-2	8/2/2011	75.3	7.0	4.3
TPEVP-3	8/2/2011	57.2	6.3	4.4
TPEVP-5	7/29/2011	19.6	4.8	4.3
TPEVP-12	8/2/2011	10.9	4.5	4.2
TPEVP-13	8/2/2011	181.0	13.0	4.3

Notes:

pCi/L = picoCuries per liter.

TPEVP-13 is also referred to as TPEVP-GC.

\* Pans were full in July/August sampling event and no source water was added after sampling.

# FIGURES



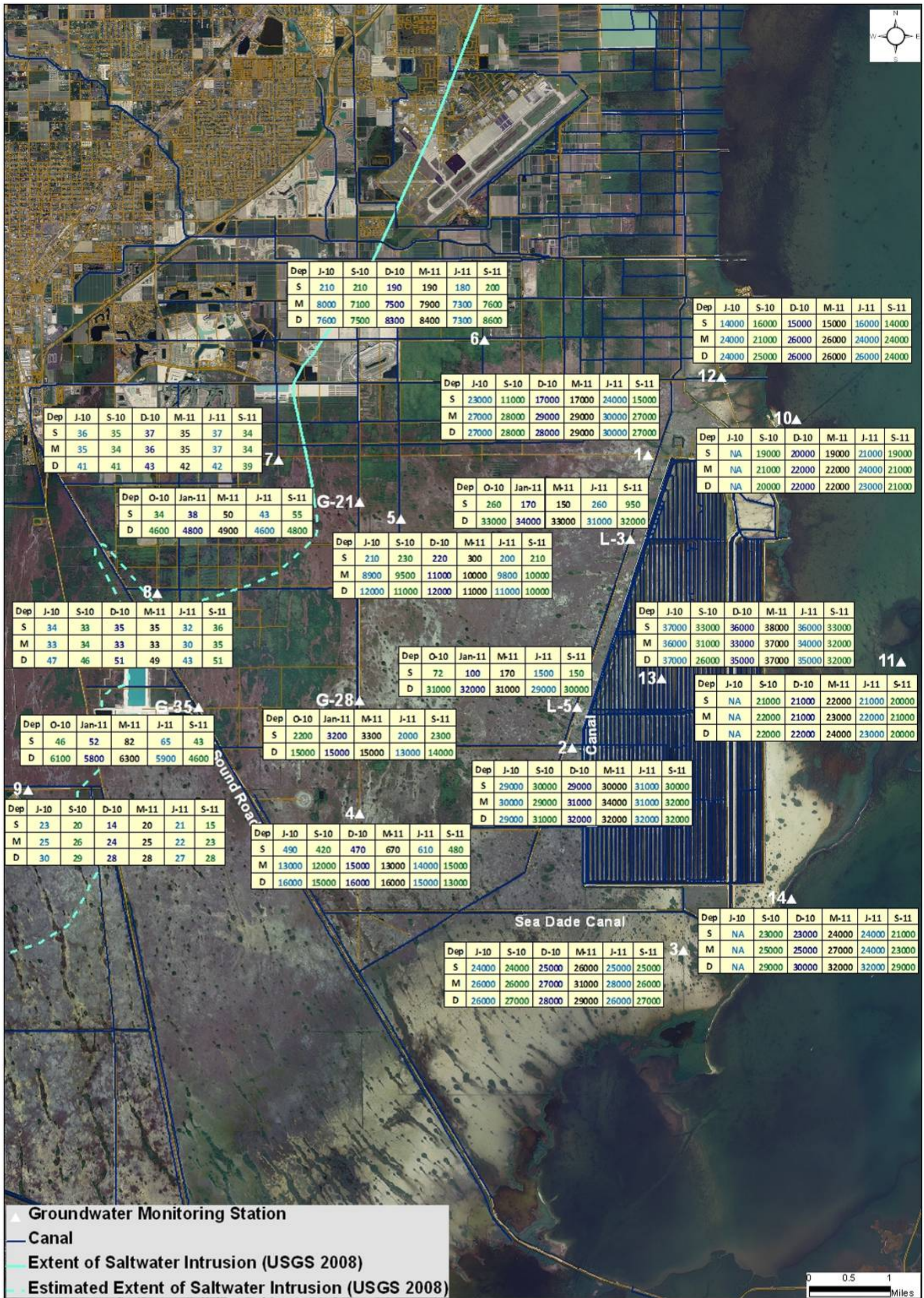


Figure 3.1-1. Chloride Concentrations (mg/L) in Groundwater for All Quarters.





Figure 3.1-2. Sodium Concentrations (mg/L) in Groundwater for All Quarters.



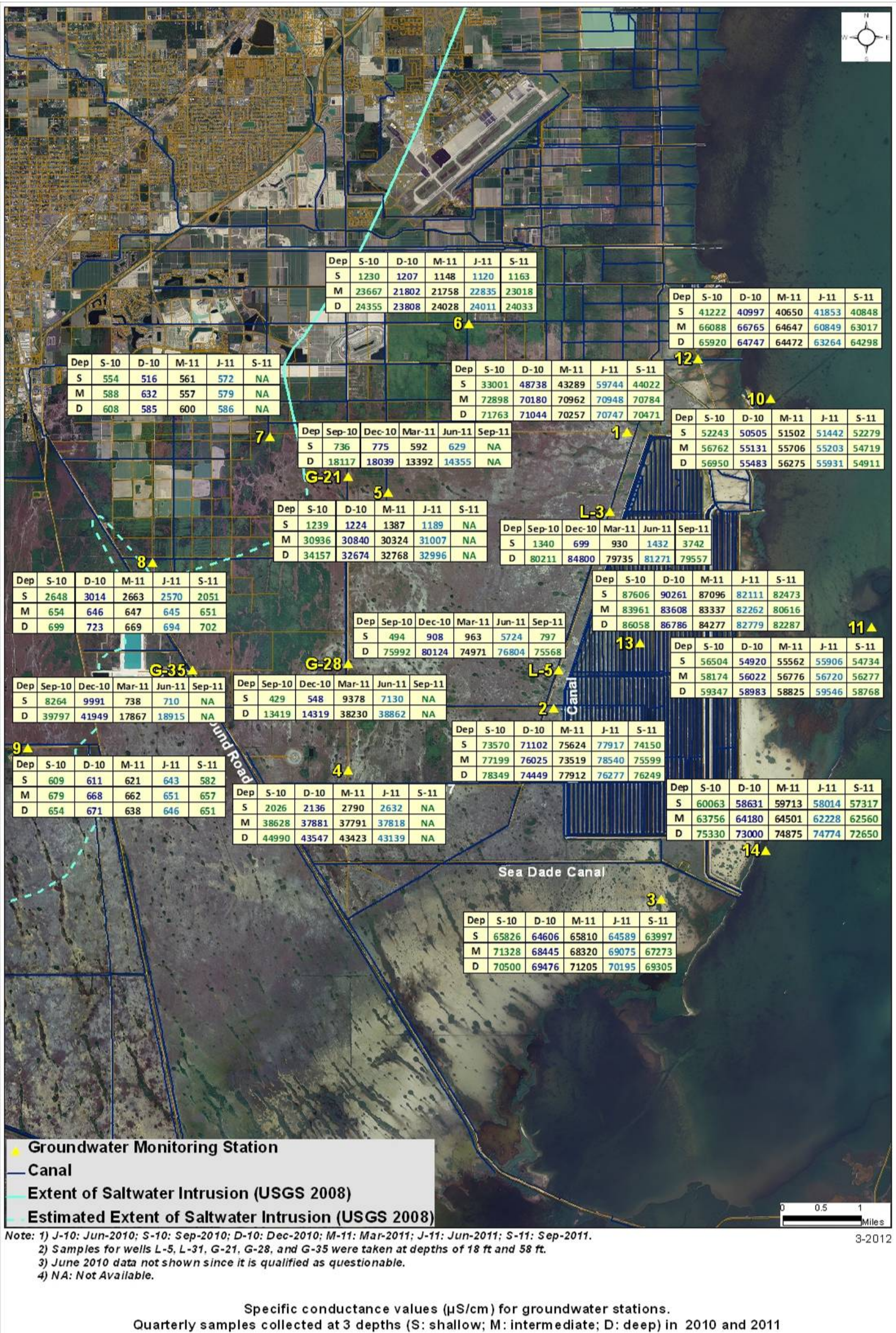


Figure 3.1-3. Specific Conductance (µS/cm) in Groundwater for All Quarters.



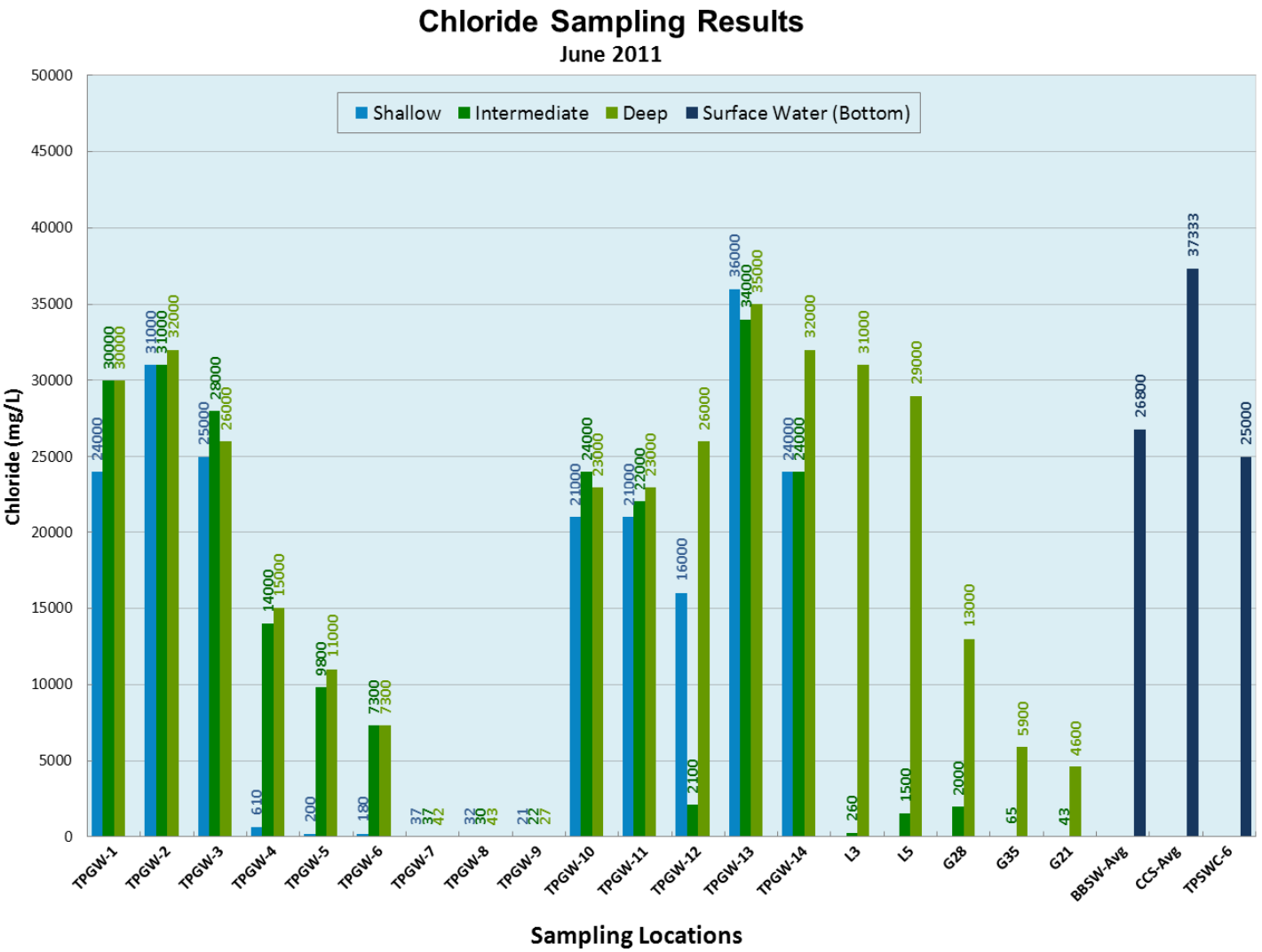


Figure 3.1-4. Average Quarterly Chloride Concentrations at Each Well Compared to Biscayne Bay and CCS Surface Water Concentrations (June 2011).

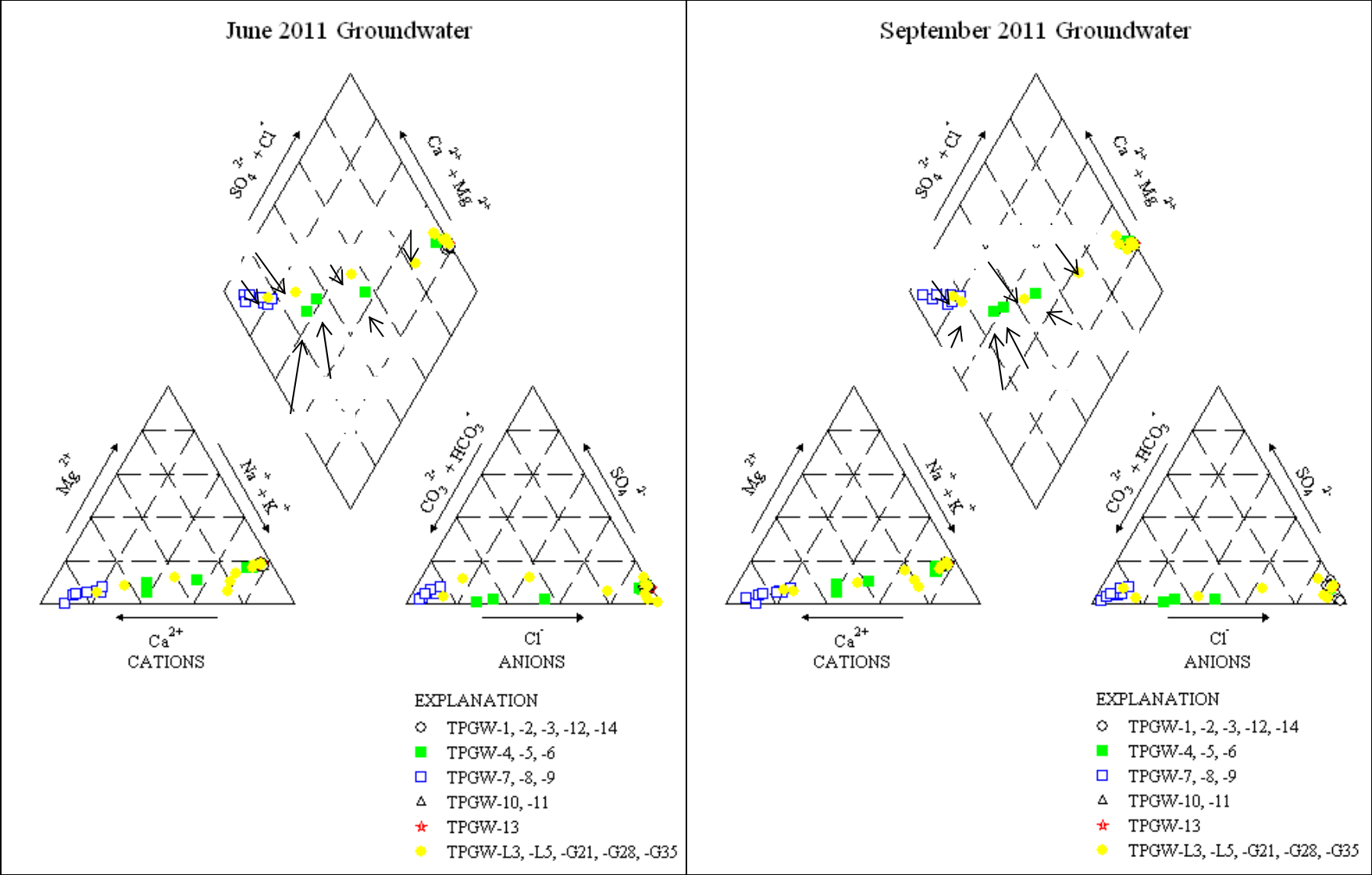


Figure 3.1-5. June 2011 and September 2011 Groundwater Piper Diagrams.





Figure 3.1-6. Tritium Concentrations in Groundwater for All Quarters.

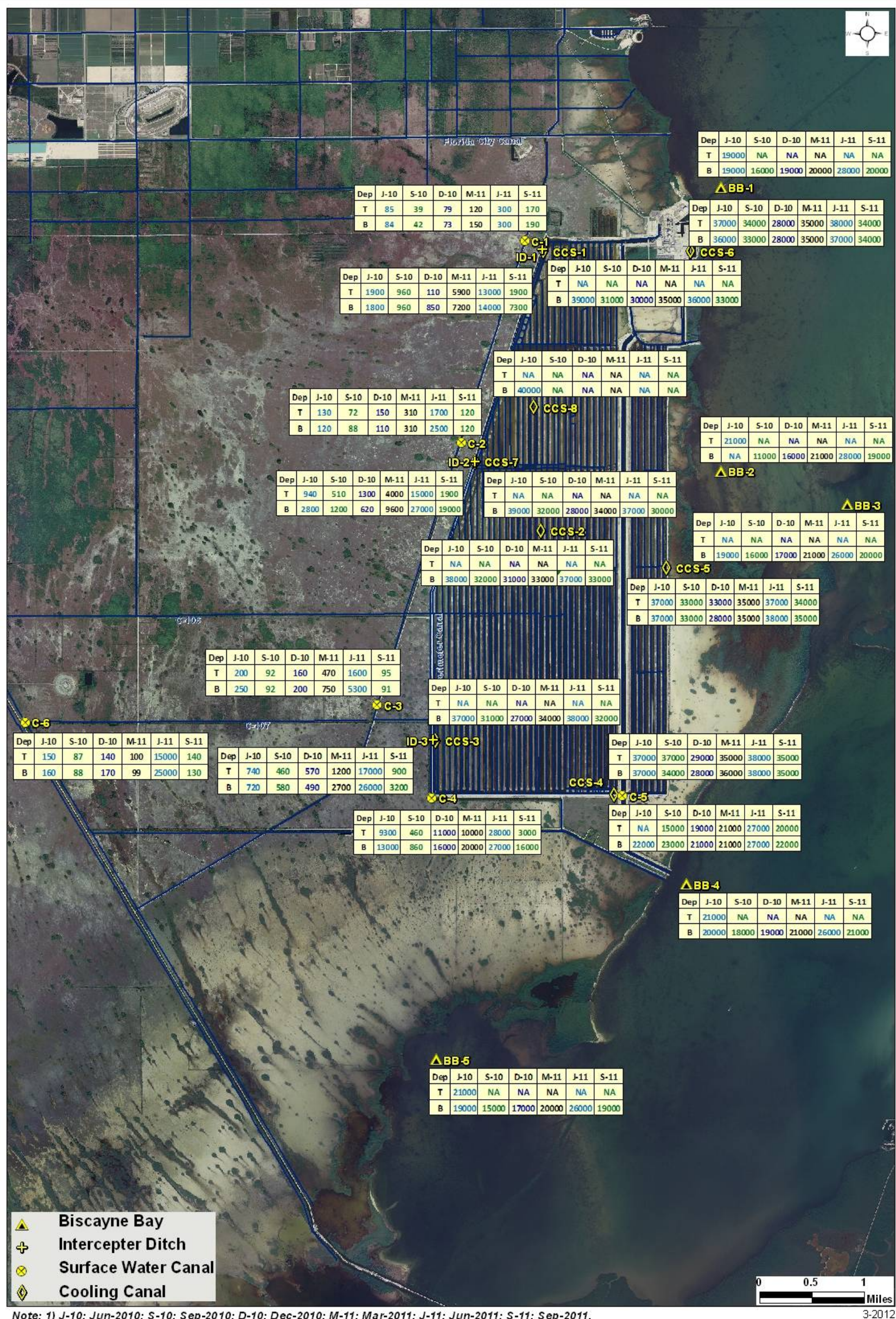




Nutrient Values for Groundwater Samples Taken at  
3 Depths (S: shallow; M: intermediate; D: deep) in September 2011.

Figure 3.1-7. Nutrient Concentrations in Groundwater for September 2011.





**Figure 3.2-1. Chloride Concentrations (mg/L) in Surface Water for All Quarters.**





Note: 1) J-10: Jun-2010; S-10: Sep-2010; D-10: Dec-2010; M-11: Mar-2011; J-11: Jun-2011; S-11: Sep-2011.

2) NA: Not Available.

Sodium values (mg/L) for Surface Water stations. Samples are collected quarterly at 1 foot from the top (T) or 1 foot from the bottom (B) for most of the stations unless in the Bay or where water depth < 5 feet.

**Figure 3.2-2. Sodium Concentrations (mg/L) in Surface Water for All Quarters.**











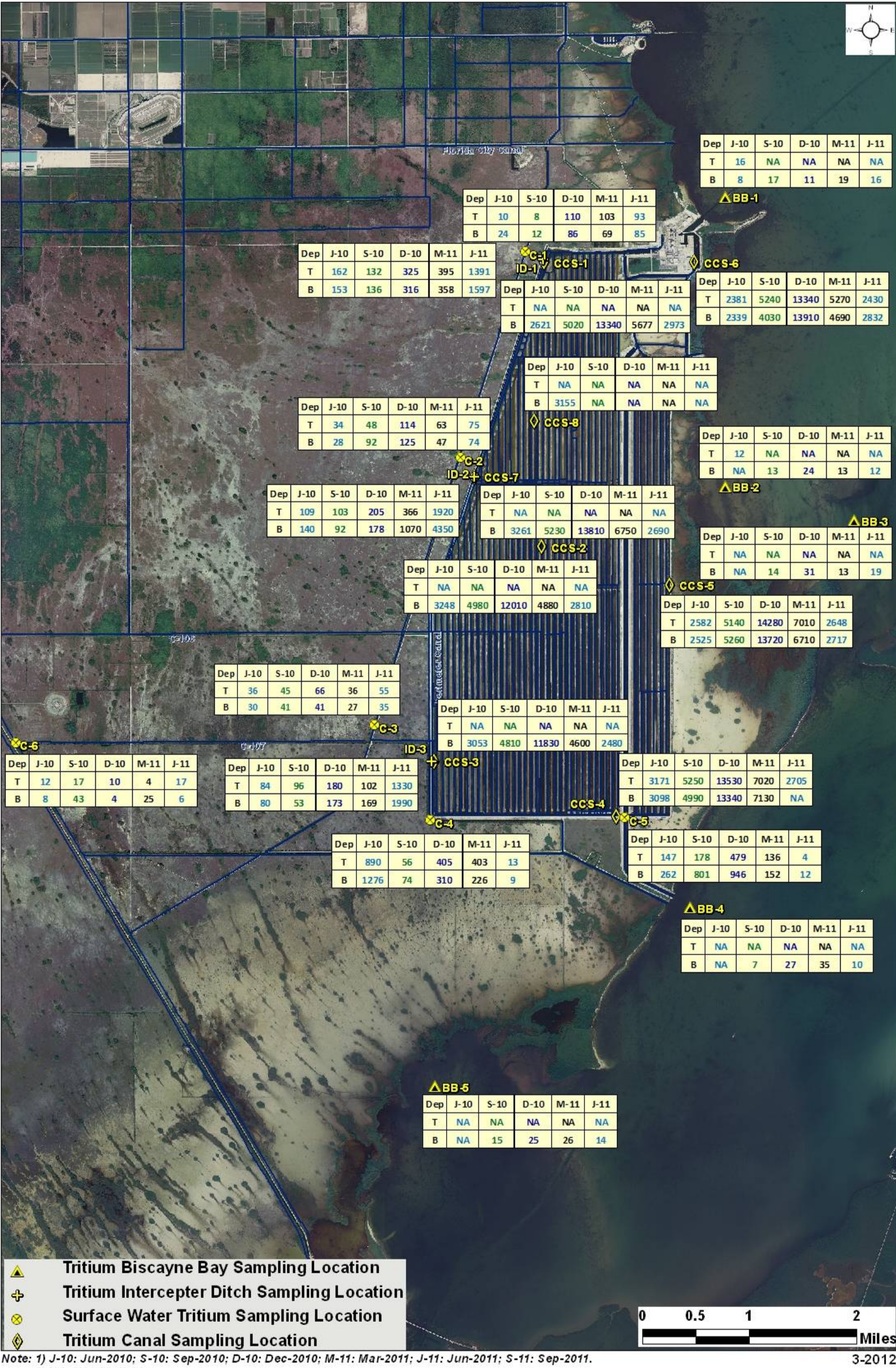


Figure 3.2-5. Tritium Concentrations (mg/L) in Surface Water for All Quarters.



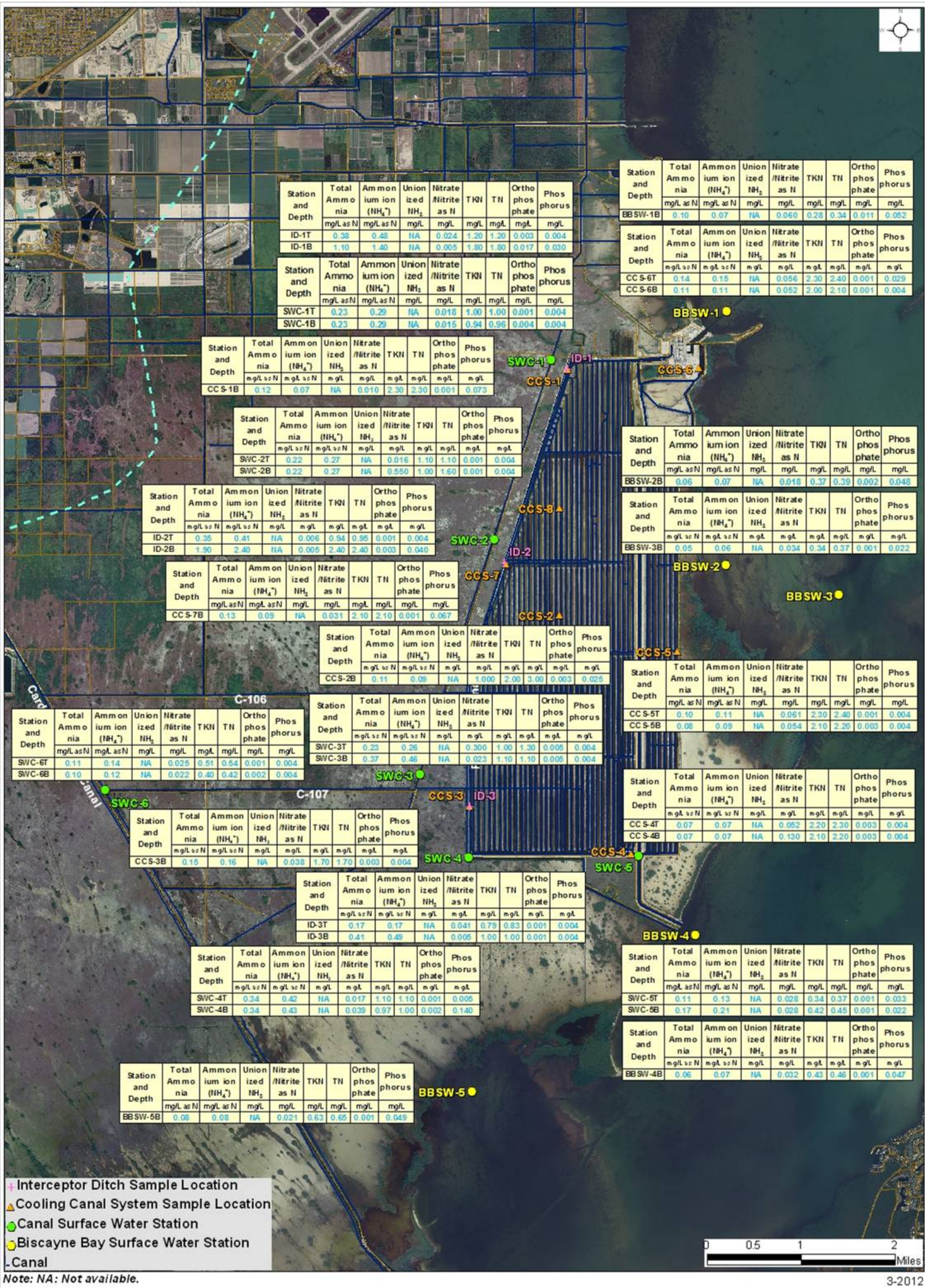


Figure 3.2-6. Nutrient Concentrations in Surface Water (September 2011).