COLLIER COUNTY
GROUND WATER QUALITY MONITORING
THIRD ANNUAL REPORT
FY09

Prepared by
Collier County Pollution
Control & Prevention Department

For
South Florida Water Management District
Agreement #OT061098

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EXECUTIVE SUMMARY

The Collier County Pollution Control and Prevention Department monitors ground water in Collier County under contract with South Florida Water Management District (SFWMD Agreement #OT061098). This ground water monitoring also satisfies the requirements of the Growth Management Plan's (GMP) Conservation and Coastal Management Element (CCME) Objective 3.1 & 3.4 and the Natural Groundwater Aquifer Recharge Sub-element Objective 3 relative to ground water quality monitoring. This annual report is the third and final report under the original SFWMD Agreement #OT061098. An amendment to this agreement (#OT061098-A01) has been approved by the Board of County Commissioner and has extended the monitoring for one more year.

The reporting period covered in this report spans from September 2006 to June 2009. During that time, a fixed network of publically owned ground water wells were monitored semi-annually during the wet season (August-October) and during the dry season (February-April). An additional three randomly selected privately owned, residential drinking wells (water-table) were sampled semi-annually. All wells were monitored for general physicochemical parameters; heavy metals; pesticides; nutrients; and bacteriological parameters. To ensure the drinking water resources of Collier County are in compliance and being protected, the results were compared to the State Primary and Secondary Drinking Water Standards provided in Florida Administrative Code (FAC) Chapter 62-550. These drinking water standards were established pursuant to the Florida Safe Drinking Water Act and are referenced as ground water standards in FAC Chapter 62-520.

Under this contract, three years of ground water data have been collected on a semiannual basis. Objective 3.1 of the GMP CCME requires that *"ground water data and land use activities will be assessed annually to determine long-term trends…";* however, three years is not enough data to assess change over time and establish long-term trends. Therefore, trends will be examined in future reports once enough data has been collected. This report does examine the relationship between existing land use and current ground water quality conditions.

Heavy metals, including arsenic, chromium, iron, lead, and manganese seem to be the only metals consistently above the State Primary and Secondary Drinking Water Standards. Of these, arsenic is most prevalent, but only in the water-table aquifer. The average arsenic concentration from all wells sited in the water-table aquifer is higher than the 10 μg/L State standard (FAC 62-550). Furthermore, 97% of the arsenic exceedances occurred in managed turf land use areas. This type of land use is known to have used arsenical based herbicides. However, the United States Environmental Protection Agency

(EPA) did not renew the registration for arsenical based herbicides and is phasing out all uses of them in Florida by December 31, 2009, except for cotton crops. Although arsenic is naturally occurring as an elemental metal, it does not degrade and will persist in the environment until it is transported elsewhere. Even without further application of arsenical based herbicides, current arsenic levels will persist in these areas.

Both organochlorine and organophosphorus pesticides were monitored in the water-table and Lower Tamiami aquifers during the first two years of the project. During the third year, triazine herbicides and carbamates were monitored during the wet season. Only organochlorine pesticides were found in the water-table aquifer and none were in exceedance of State Standards.

Currently, the Drinking Water standards only apply to certain fractions of total nitrogen, including nitrate (NO3), nitrite (NO2) and nitrate-nitrite (NOX). However, other species of nitrogen such as ammonia (NH3) and total kjeldahl nitrogen (TKN) are not regulated. When these latter two forms of nitrogen are compared to their corresponding averages in surface water, it becomes evident that the total nitrogen level in the water-table aquifer is much higher. Applying the same comparison, this statement can also be said of total phosphorus. Total phosphorus also has no State Drinking Water standard.

Nitrogen and phosphorus (nutrients) currently have no numeric standards in surface waters; however, the EPA and Florida Department of Environmental Protection are currently working on setting numeric nutrient criteria for all surface water bodies in Florida by January 2010. Elevated nutrients in the surficial ground water could impact the surface water during the dry season.

As required by Objected 3.1 of the GMP CCME, this report will be forwarded to the appropriate regulatory agencies including the Florida Department of Environmental Protection, the Florida Department of Agriculture and Consumer Services and the Florida Department of Health for any further investigation warranted by those agencies. This report will also be forwarded to the owners of the fixed well network, including City of Naples, Collier County Water and Sewer District, and the United States Geologic Survey.

I. Introduction

The report satisfies the requirements of Agreement #OT061098 between Collier County Pollution Control Department and South Florida Water Management District for the collection and analyses of ground water quality samples in Collier County.

II. Scope of Work

Sixty-three (63) groundwater wells are monitored semi-annually during the wet season (August-October) and during the dry season (February-April). These sites are listed in Appendix A. An additional three randomly selected residential drinking wells (water-table) are sampled semi-annually. See Figure 1 and Figure 2 for a map of station locations. All the samples collected are analyzed for the parameters listed in Appendix B.

III. Program Activities

Purging and sampling of wells followed the Collier County Pollution Control & Prevention Department Field Sampling Quality Manual; Florida Department of Environmental Protection's (FDEP) Standard Operating Procedures (SOPs) *DEP-SOP-001/01FS 2200 Groundwater Sampling*; and the SOPs referenced therein.

All chemical parameters for this project were analyzed by the Collier County Pollution Control Laboratory (CCPCL) or Genapure Analytical Services, Inc. (GENAPURE) laboratory. Both laboratories held current NELAP (National Environmental Laboratory Accreditation Program) certification for all the parameters being analyzed for this project. Physical measurements of pH, dissolved oxygen, specific conductance, and temperature were obtained during well purging and stabilization using a Yellow Springs Instrument (YSI) 600XL multi-probe and flow-through cell. Field turbidity measurements were also obtained as part of the purge stabilization process using a HF Scientific MicroTPW portable field meter. However, the turbidity readings provided in the data reports are those obtained through laboratory analysis.

For the random well monitoring portion of the contract, wells were randomly selected from the County's well permit records. Letters of intent were sent to the property owners requesting their voluntary participation in the project. In order to be considered for sampling, each well was required to have a spigot at the well-head to prevent any potential sample contamination from the on-site treatment system. Samples were collected directly from the spigot. Copies of the laboratory results and explanation of the results were sent to all owners of the wells selected for participation in the random well network.

All laboratory analytical results from the CCPCL and GENAPURE are provided in ADaPT (Automated Data Processing Tool) format. Field measurements are provided in comma de-limited format as specified in the contract.

For a quick reference, Appendix C provides the status of the third year monitoring effort including sampling and laboratory analyses.

IV. Additional Monitoring Efforts

Collier County Pollution Control Department added nine (9) wells not included in this contract to the monitoring network to provide more spatial coverage of monitoring efforts and include particular land uses. These wells are also provided in Appendix A.

The Pollution Control Department also added pesticides monitoring to this trend monitoring network. During the first year effort organochlorine pesticides, PCBs (polychlorinated biphenyls), and organophosphate pesticides were analyzed to determine the presence of these constituents and possibly determine the interaction between the surrounding land use and groundwater. These additional analytes were only monitored in the water-table and Lower Tamiami aquifers due to the unlikelihood that these contaminants would bypass the confining layers into the deeper aquifers.

Organochlorine pesticides and PCBs (polychlorinated biphenyls) were included in the monitoring effort because they contain the suite of pesticides that are persistent in the environment. Although most of them are no longer in use or are no longer manufactured in the United States, it is their persistence in the environment that made them so effective and still makes them a potential threat to our drinking water. Also included in the monitoring were the newer pesticides in the organophosphate category. The use of organochlorine pesticides was replaced by organophosphate pesticides because they are less persistent and degrade more rapidly in the environment. But because they degrade more quickly than the organochlorine pesticides, they must be more toxic to be as effective.

During the third year effort wet season sampling event, only those wells that had reportable levels of organochlorine pesticides during the first or second year sampling effort were reanalyzed for organochlorine pesticides. Organophosphate pesticides were reanalyzed in all wells with the addition of Atrazine and Simazine (triazine herbicides) and the carbamate, Aldicarb, for the wet season event only. Since no PCBs were found during the first or second year effort, they were not monitored during the third year.

The pesticide monitoring was discontinued after the wet season monitoring due to budgetary cutbacks.

V. Problems Encountered

Some wells listed in Appendix A were not sampled due to damage or duplication of effort (some wells in the original contract are being sampled by other agencies). Please see Appendix C for the sampling status of each well.

VI. Data Validity

The data provided in this report have been checked for accuracy and completeness and the Collier County Pollution Control & Prevention Department attests to the validity of these results. All data qualifiers follow Florida Administrative Code 62-160.670(1)(h). The data are provided in electronic format on the attached compact disk.

All CCPCL data and GENAPURE data have been submitted using the ADaPT software and the quality control checks provided in the software were applied. Calibration logs for field instruments were reviewed and all associated data that were outside the quality control criteria were qualified using a "J" flag in the electronic data report.

VII. Exceedances

Appendix D provides a list of all results that were in exceedance of the Primary and Secondary Drinking Water Standards, Florida Administrative Code (FAC) Chapter 62-550. These standards were adopted and referenced as the State's ground water quality standards by FAC Chapter 62-520. Copies of this report will be forwarded to the appropriate regulatory authorities including FDEP, FDACS and FDOH for further investigation of exceedances.

Figures 3 through 9 are graphical representations of the spatial extent and concentrations of those parameters that were in exceedance of State standards during this third year. Also provided in these figures are the proposed wellfield protection zones for planned adoption in FY10. These "wellfield risk management special treatment overlay zones" are determined by computer generated flow and solute transport models as required by the Collier County Land Development Code—Chapter 3, Section 3.06.00. Each protection zone represents the potential time it would take a particle of water to move to the wellhead. Zones are broken down into a one, two, five and twenty year increments. These zones are provided to reference the proximity of exceedances to public supply wells.

A. Inorganics

1. Arsenic: All of the arsenic exceedances (>10 µg/l) occurred in the water-table aquifer. All but one of these wells are FDEP permitted re-use monitoring wells that are used to monitor the ground water at facilities that

receive re-use water from public wastewater reclamation facilities for irrigation purposes. However, none of the public wastewater reclamation facilities has reported any exceedances of arsenic in the re-use water they are supplying to their customers. The only arsenic exceedance that was not in a re-use well occurred at well C-00495 during the dry season but not in the previous wet season. Figure 3 shows the arsenic exceedances for this third year reporting period.

There was investigation in 2004 and 2005 involving Collier County Pollution Control & Prevention, Collier County Water and Sewer District, Collier County Parks and Recreation, FDEP, Florida Department of Agriculture and Consumer Services (FDACS), City of Naples and the Collier County Department of Health to investigate the sources of high arsenic in the wells. Although arsenic occurs naturally as an elemental metal in the environment, the use of arsenic based herbicides, specifically MSMA (monosodium methanearsonate), came into question during the investigation as all of the wells with exceedances are located in managed turf areas and was treated with MSMA. There has not been an undisputable link between the use of arsenical based herbicides and the source of ground water contamination in these wells. However, FDEP, FDACS and the Environmental Protection Agency (EPA) investigated the use of these herbicides and their fate and transport in the environment. Based on that investigation, EPA has not renewed the registration of organic arsenical herbicides that contain MSMA (USEPA, 2006). EPA has established a timeline to phase-out the distribution and use of all organic arsenical herbicides by December 31, 2013. However, by December 31, 2009, no products containing MSMA are to be applied in Florida except on cotton crops in permitted counties.
(http:/www.epa.gov/pesticides/reregistration/arsenic_guid_label_table.pdf).

Well CCN11 had the highest arsenic levels. This well is located at Collier County Veterans Park near the maintenance facility in an area that receives stormwater runoff from a managed turf area. Collier County Parks and Recreation has ceased the use of MSMA over two years ago at their facilities to eliminate any further contribution to sources of arsenic contamination of the groundwater. All wells are being monitored for long term arsenic trends.

2. Chromium: Chromium is a naturally occurring metal found in rocks, soils, and plant and animal tissues. Chromium can be found as total chromium, trivalent chromium (Cr-III) and hexavalent chromium (Cr-VI). Cr-III and CR-VI are used in industrial process such as chrome plating, leather tanning and wood preservation. These two forms of chromium can also be found in dyes and pigments. Cr-III is a micronutrient needed by the body to properly metabolize sugar, fat and protein. Cr-VI, however, is a known human carcinogen. (ATSDR 2008).

The testing of chromium for this project included only total chromium. Well C-00495 had the only chromium exceedance. This water-table well is in a remote area off of US29 in the Big Cypress National Preserve.

3. Iron: Most of the wells sampled in the water-table aquifer were above the Primary Drinking Water Standard of 0.3 mg/l (300 µg/l). Naturally occurring background concentrations of iron in the water-table aquifer are typically higher than the Secondary Drinking Water standard. Iron is often associated with a rusty color, metallic taste and reddish staining but is generally not considered a health hazard. Conventional water systems generally remove iron during the treatment cycle. Figure 4 shows the iron exceedances for this third year effort.

4. Lead: Wells C-00977 (Lower Tamiami) and C-00984 (water-table) both have an exceedance of the Primary Drinking Water Standard of 15µg/l again during this third year monitoring effort. Of concern is the wet season exceedance of 16.01 µg/l in well GGW-1D which monitors the Golden Gate Wellfield. However, the following dry season result shows the lead level back down at 6.5 µg/l. This same well had a wet season lead exceedance last year and lead exceedances for both wet and dry seasons during the first year (2006/2007). Figure 5 shows the lead exceedances for this third year effort.

5. Manganese: Manganese is a naturally occurring metal that is found in many types of rocks. It readily combines with other substances such as oxygen, sulfur, or chlorine, so it does not occur naturally in pure form. Manganese can also be combined with carbon to make organic manganese compounds. Common organic manganese compounds include pesticides, such as the fungicides; maneb or mancozeb which are contained in Sevin® and methylcyclopentadienyl manganese tricarbonyl (MMT), a fuel additive in some gasolines. (ATSDR 2000). Most of the wells that had manganese exceedances during the first and second year monitoring efforts were also in exceedance during the third year, with the exception of wells CCN1 and CCS17 which only had exceedances during this third year. Wells CC-00977, CCN8, GGW-1D and CCS19 had no manganese exceedances during this third year, but have had exceedances in previous years. Of note, many of the wells that exceeded the Secondary Drinking Water Standard of 50µg/l are shallow monitoring wells located on golf courses. Also, although manganese readily combines with sulfur and is applied as manganese sulfate as a fertilizer, these same wells did not exceed the sulfate standard. Figure 6 shows the manganese exceedances for this third year effort.

6. Nitrate and Nitrate-Nitrite: Nitrate is a primary component of fertilizer and can enter the ground water through leaching from the surface. Nitrate is a

component of total nitrate-nitrite which is the sum of nitrate (NO_3) and nitrite (NO_2). The primary drinking water standard for nitrate and also total nitrate-nitrite is 10mg/l. Nitrate in drinking water is of particular concern to infants who may consume it. High levels of nitrate can cause an illness called "blue baby syndrome", also known as methemoglobinemia (FDOH[1]). Well CCN4 was only in exceedance during the dry season for nitrate and total nitrate-nitrite; however the value was significantly reduced from the previous year. Well CCS2 had the highest value during the wet season at 100 mg/L of total nitrate-nitrite, but then decreased to 14.15 mg/L during the following dry season. This well was investigated by Collier County Water and Sewer District after they recorded an exceedance in the well for nitrate in early September 2008. They found that the golf course grounds crew had dumped grass plugs from recent greens aeration next to the well. Heavy rains were experienced after the plugs were dumped and before the sampling occurred. It is assumed that these nutrients were washed from the plugs into the well as the depth to water as 2.2 feet below land surface.

For both wells, nitrate was the major fraction of the total nitrate-nitrite. Figure 7 shows the nitrate exceedances for this third year effort.

Although there is no standard for ammonia and total kjeldahl nitrogen in drinking water, many of the shallow wells—especially those located in managed turf or agricultural areas—have high levels of these nitrogen based nutrients. These levels could significantly impact surface water during the dry season as ground water moves into the canals and other surface water impoundments. Eighty-three percent (83%) of the ammonia levels recorded in all wells during the third year were in exceedance of the State Class III Surface Water Standard listed in FAC 62-302.

7. Total Dissolved Solids (TDS): Many of the exceedances for TDS occurred in the water-table monitor wells located on golf courses or near saltwater. The highest levels of TDS were found in the Mid-Hawthorn aquifer which is known to be higher in chlorides. High TDS was also found in two of the four wells located in the Sandstone aquifer and in wells C-01058 and C-00977 located in the Lower Tamiami aquifer. Figure 8 shows the TDS exceedances for this third year effort.

8. Sulfate: Two wells in the mid-Hawthorn aquifer were above the Secondary Drinking Water Standard of 250mg/l during the wet and dry season. The source of sulfate in this aquifer was found by Sacks and Tihansky (1996) to be from upwelling of dissolved gypsum from the Upper Floridan aquifer. Five other wells in the water-table aquifer were found to be above this standard during the wet and dry season. Three wells that were not found to exceed the sulfate standard previously, exceeded the sulfate standard this third year. They include CCN11, CCS2 and CCS5. All of the wells that

exceeded the sulfate standard also had high TDS and specific conductivity readings indicating saltwater intrusion. Other possible sources of sulfate in the water-table aquifer include fertilizers, rain water, and cycling of sulfur in the soils. (Bates, et. al, 2002). Since sulfur is an important link to the methylation of mercury into toxic methylmercury (Gilmour et al., 1992 and Harvey et al., 2002), Pollution Control will continue to monitor trends in the aquifer that are subject to anthropogenic sources of sulfur. Figure 9 shows the sulfate exceedances for this third year effort.

B. Biological

1. Total and Fecal Coliform: The maximum contaminant level for total and fecal coliforms is zero. However, this standard is only applicable to the samples collected at the randomly selected residential wells as these are the only wells used as primary drinking water source and are sealed from outside contaminants. Many of the trend network monitoring wells are not sealed at the top and frogs and other wildlife have been found inside the well casings. In addition, the purge equipment used to sample the wells is not sterile.

   Samples collected from the private drinking water systems are taken directly from the permanent pumps installed in the well head. One total coliform sample collected in November 2008 from 2611 8th Ave NE, Naples showed total coliform bacteria was present. The site was resampled with the same result and the Florida Department of Health (FDOH) was notified. FDOH re-sampled the residence at the tap inside the house and found no bacteria.

C. Pesticides

During this third year monitoring effort, no pesticides were found to exceed State or Federal Standards. However, pesticides found above the laboratory method are provided in Appendix E. Only organochlorine pesticides were again detected this third year, but in fewer wells than years 1 and 2.

1. Alpha, beta, gamma, and delta--BHC—BHC (benzene hexochloride) is now known as HCH (hexochlorocyclohexane). HCH has several different isomers which include alpha (α), beta (β), gamma (γ), and delta (δ). Of those, most of the insecticidal properties are derived in the gamma-HCH, also known as Lindane. Technical-grade HCH contains 10-15% γ-HCH and has not been produced or used in the United States in over 20 years. However, imported γ-HCH is available as an insecticide in dust, powder, liquid, or concentrate. It is also available through medical prescription for the treatment/control of scabies and head lice. Lindane was used as an

insecticide on fruit, vegetables, forest crops, and animal and animal premises. γ-HCH readily adsorbs to soils and shows low mobility, but has been found to leach to groundwater (ATSDR 2005[1]). There are no state drinking water criteria for the alpha, beta, or delta BHC.

Well CCN6 was the only well with measurable levels of BHC (gamma-BHC) during the third year. This well did not have any detectable levels of BHC during the first or second year effort.

2. Heptachlor—Heptachlor is both a component and a breakdown product of chlordane. It was used in the United States as an insecticide in buildings and crops until 1988. However, heptachlor is still approved by the EPA for killing fire ants in power transformers. Heptachlor further breaks down into heptachlor epoxide which is more persistent in the environment. Because heptachlor readily adsorbs to soil and has low solubility in water, leaching to groundwater is not likely (ATSDR 2005[2]). The primary drinking water standard is 0.4 μg/l for heptachlor and 0.2 μg/l for heptachlor epoxide. Well C-00996 had a detectable level of heptachlor and well MW-7 had a detectable level of heptachlor epoxide, but neither level was in exceedance of the standard. MW-7 has not previously had any detectable levels of chlordane or its metabolites. Well C-00996 has had previous levels of chlordane and now only has the breakdown product.

3. Endrin & Endrin Aldehyde—Endrin has not been produced or sold in the United States for general use since 1986. It was primarily used as an insecticide, rodenticide, and avicide. Endrin in the environment readily bonds to soils and sediments and is not suspected of being a common ground water contaminant although it has been found in ground water. Less is known about the fate of the breakdown product, endrin aldehyde, except it is highly insoluble in water and also strongly bonds to sediment and soils. Sedimentation and bioaccumulation are expected to be significant transport factors through the environment. (ATSDR 1996). The primary drinking water standard for endrin is 2.0 μg/l. Well C-00996 was the only well with reportable quantities of endrin aldehyde, but did not exceed the standard for endrin. This pesticide was not found in this well during the first or second year. Additionally, this pesticide was only found in well CCS15 during the second year effort.

V. Three Year Summary

A. Overall Trends: There have been only 3 years of data collected for this project and only two sampling events per year. The maximum sample number of results for any site is only 6. This does not allow for the analysis of statistically significant trends.

B. **Land Use:** Land use in Collier County plays an important role in the loading of pollutants into surface water and shallow ground water aquifers. Sandy soils promote the percolation and leaching of land-based pollutants into these systems. Effects of land use on the ground water in Collier County are discussed below for those constituents that have been in exceedance of State drinking water standards or play an important role in ground water/surface water interaction.

For this report, land use surrounding each well was determined using the South Florida Water Management District's Florida Land Cover/Land Use 1995 and 2001 geospacial data and the Florida Land Use and Cover Classification System (FLUCCS). At the writing of this report, the SFWMD 2004-2005 FLUCCS geodatabase internet link was not functional and could not be accessed.

For non-urban areas, the broadest land use code was used with the exception of those listed in this report as "rural residential". In many cases these wells were located in Golden Gate Estates and had land uses based on surrounding vegetation. However, for the purposes of this report, a designation of "rural residential" was used to separate these from natural areas with little or no human activity. For those urban and built-up categories, sub-categories were used to further delineate the land use. High, medium and low residential were combined into urban residential.

To determine land use impacts on ground water quality, only the wells located in the water-table aquifer were used. Table 1 shows the number of wells located within each land use. It should be noted that wells sampled for this program were not selected based on surrounding land use. This program sampled only existing wells based on availability and accessibility. The project design is to monitor a fixed network of wells to establish a baseline and examine long term trends.

Table 1. Number of wells monitored in the water-table aquifer by land use.

Land Use	Number of wells
Agriculture	3
Commercial	2
Golf Course	23
Park	3
Rural Residential	6
Urban Residential	12
Utilities	1
Wetland	5

C. Conclusions

1. Inorganics

a. Arsenic

- All arsenic exceedances occurred in water-table wells.
- Highest levels (95th percentile) continue to be in wells CCN11 (Veterans Memorial Park); MW-11 (Moorings Country Club); CCN5 and CCN4 (both in La Playa Golf Club).
- Many of the arsenic exceedances have occurred with the Coastal Ridge Wellfield protection zones (see Figure 10). This is part of the City of Naples' public water supply system.
- The highest average arsenic concentrations in the water-table aquifer occur in parks and golf courses. Furthermore 97% of the exceedances occurred in these two types of managed turf areas with the exception of two wells, C-00495 and C-01097. Previous studies (see V.A.1. above) have shown that both of these types of land uses commonly used arsenical based herbicides. Although arsenic is naturally occurring as an elemental metal, it does not degrade and will persist in the environment until it is transported elsewhere. Even though arsenical based herbicides may not be applied currently, these arsenic levels will persist in these areas until the arsenic is transported through the aquifer or into the surface water.

b. Chromium

- There have only been two exceedances of the chromium standard. One during the third year in well C-00495 and in well C-00984 during the wet season of 2007. However, the exceedance in well C-00984 seems to be an outlier based on all reported levels of chromium in this well.
- Four out of six chromium results for well C-00495 have been in the upper 95th percentile of all reported chromium levels for all wells sampled during the 3 year project. Although this well is in a remote location with minimal land use impacts (National Preserve), there may be an isolated anthropogenic source. Further investigation will be performed by the Pollution Control Department to determine if such a contamination source exists.

c. Manganese

- The majority of the manganese exceedances occurred in water-table wells (47/50). The other three occurred in the Lower Tamiami aquifer.

- Well CCN5 has the highest concentration of manganese each year. The average concentration recorded in this well is over 400 times higher than the overall median for all wells.
- CCN11 and CCN2 are also consistently high in manganese and rank in the 95th percentile of all wells for manganese concentrations.
- Wells CCN5 and CCN11 also have the highest arsenic levels.
- Figure 11 shows that parks and golf courses have the highest average concentration of manganese in the water-table aquifer and it is significantly above the 50 μg/L state standard. However, it should be noted that not all wells located in these land uses had manganese exceedances. The few wells that are in exceedance are so high that they raise the overall average for these two land uses. There may be other sources of manganese affecting these wells.
- The fate of manganese in the environment would be the same as arsenic as it does not degrade. A decrease in concentration would mean that the manganese had be transported through the aquifer.

d. Nitrogen Constituents

Nitrogen, a plant nutrient, occurs in many different species including organic and inorganic. Cycling between species is a complex process involving the nitrification, denitrification, oxidation and reduction and these processes are driven by the amount of oxygen, pH and type of bacteria present in the environment. Currently, the State Drinking Water standards only addresses nitrate (NO3), nitrite (NO2) and nitrate-nitrite (NOX); however, other species of nitrogen such as ammonia (NH3) and total kjeldahl nitrogen (TKN) are not regulated. It is these latter two species are the dominant forms of nitrogen found in each aquifer.

Table 2 provides the average ammonia, TKN, and NOX for each aquifer. Also provided for comparison is the county-wide average of each constituent for all surface water samples collected during the same reporting period (September 2006-March 2009). As noted from this table, the water-table aquifer is highest in both TKN and NOX. The Lower Tamiami aquifer has the highest NH3 average. In all cases, the water-table aquifer is significantly higher in each nitrogen species when compared to the average surface water concentrations.

Table 2. Average nitrogen species in groundwater

AQUIFER	NH3 (mg/L)	TKN (mg/L)	NOX (mg/L)
water-table	1.42	2.73	0.86
Lower Tamiami	1.46	0.92	0.09
Sandstone	0.23	0.50	0.04
Mid-Hawthorn	0.24	0.42	0.01
Surface Water Average Collier County From Sep-06 to Mar-09	0.11	0.96	0.06

Figure 12 shows the average nitrogen species in the water-table aquifer based on surrounding land use (<1000ft). For each land use shown on the x-axis, the number represents the number of results for each calculation. It should be noted that the majority of the water-table wells sampled for this program are located in golf courses. In order to maximize monitoring resources, wells owned by multiple agencies were included in this project. There were more water-table wells in golf courses available to sample because these wells were required under FDEP permits to monitor re-use irrigation at these facilities.

It was the TKN form of nitrogen that was found to significantly contribute to the chlorophyll levels in the surface waters of Southwest Florida (Janicki). Chlorophyll, a plant pigment, is used to measure the algal biomass in surface water. The amount of algal biomass is used to determine the health of the surface water body. If there is too much algal biomass, the water body is considered to be impaired (FDEP). During the dry season when surface water levels are low, water-table ground water migrates toward these surface waters. Therefore, water-table ground water in the land uses shown in Figure 12 that have higher nitrogen levels, specifically TKN, has the potential of contributing greater loading of nutrients to the surface waters during the dry season and could cause potential impairment.

e. Phosphorus

Phosphorus, another plant nutrient, is also found in the water-table aquifer in higher amounts than the surrounding surface waters (see Table 3). Currently, there are no State Drinking Water standards for phosphorus and no numeric State standards for phosphorus in surface waters. The current State surface water standard (FAC 62-302) for phosphorus is a narrative standard that states *"in no case shall nutrient concentrations of a body of water be altered so as to cause an imbalance in natural populations of aquatic flora or fauna."* This narrative surface water standard applies to nitrogen as well. In south

Florida, this imbalance in natural populations is typically seen in the aquatic flora, specifically in the formation of algal blooms and overgrowth of aquatic vegetation.

In the surface freshwater systems in Collier County, phosphorus is the limiting nutrient—meaning nitrogen is typically more prevalent than phosphorus. Since plants need a ratio of nitrogen to phosphorus in order to sustain themselves, if there is an overabundance of nitrogen and no phosphorus, the plants will not grow. However, if phosphorus is readily available in the presence of nitrogen, plants (and algae) will thrive. Figure 13 shows the average concentration of total phosphorus in the water-table aquifer based on surrounding land use.

Table 3. Average total phosphorus in ground water

AQUIFER	Total Phosphorus (mg/L)
Water-table	0.23
Lower Tamiami	0.05
Sandstone	0.02
Mid-Hawthorn	0.06
Surface Water Average Collier County From Sep-06 to Mar-09	0.06

Janicki (2006) found total phosphorus to be a contributor to chlorophyll levels (the pigment found in algae) in surface waters in Southwest Florida. This indicates that the water-table aquifer near the land uses shown in Figure 13 could also be contributing to the total surface water nutrient loading during the dry season.

2. Pesticides

- There have been no exceedances of drinking water standards.
- All pesticide results found above the method detection limit have been in the water-table aquifer.
- Only organochlorine pesticides have been detected.
- No pesticides have been detected in any Lower Tamiami aquifer.
- There were more results found above the method detection limit in the wet season than dry season.
- 71% of the pesticide results found above the method detection limit occurred in golf courses.
- No DDT or metabolites were detected after the first year effort.
- Well C-00996 had the most results found above the method detection limit and highest levels of different pesticides but this has declined during the 3 year monitoring effort. This site is a mixed

land use site located on the southeast corner of CR 951 and Davis Blvd.

Recommendations

A. Continued monitoring will occur as the SFWMD Contract #OT061098 has been extended for one additional monitoring year. This report will be updated annually.

B. Trends in arsenic will be further examined, especially those wells located within the Coastal Ridge Wellfield protection zone. Owners of those public supply wells may want to examine the wellfield for arsenic impacts and implement best management practices to ensure further contamination or migration is minimized.

C. Only organochlorine pesticides have been found at levels above the method detection limit, but below any State standard. Since these pesticides are no longer in use, further contamination is unlikely. Changes to existing levels may occur through soil disturbance and transport. Monitoring for these legacy pesticides could be reduced to once every five years to ensure that drinking water resources are not being impacted.

D. Organophosphate, triamine and carbamate pesticides tend to be more acutely toxic, but have less sustainability in the environment. Although they were not found above the method detection limit during this project, these pesticides are still being applied. In addition, new pesticides are developed and new uses for existing approved pesticides change frequently. Monitoring of these existing pesticides should be examined to determine an acceptable sampling frequency.

E. Well C-00495 will be further investigated to determine a possible source for the multiple heavy metals exceedances. This site has minimally impacted land use surrounding the well that could introduce heavy metals to the water-table well.

F. Exceedances of lead in wells C-00977 (Lower Tamiami), C-00984 (water-table), and GGW-1D (Lower Tamiami) will be investigated to determine potential sources.

G. All manganese exceedances will be further investigated to determine potential sources.

H. Nutrients in the water-table aquifer should be further examined to determine sources and future best management practices. This is especially important relative to upcoming legislation on establishing numeric nutrient criteria; Impaired Waters and Total Maximum Daily Loads assessments; and development of County watershed management plans.

X. References

Agency for Toxic Substances and Disease Registry (ATSDR). 1996. Toxicological Profile for Endrin (http://www.atsdr.cdc.gov/toxprofiles/tp89.html). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Agency for Toxic Substances and Disease Registry (ATSDR). 2000. Toxicological profile for Manganese (http://www.atsdr.cdc.gov/toxprofiles/tp151.pdf). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

[1]Agency for Toxic Substances and Disease Registry (ATSDR). 2005. Toxicological Profile for Alpha-, Beta-, Gamma-, and Delta-Hexachlorocyclohexane—Update (http://www.atsdr.cdc.gov/toxprofiles/tp43.html). Atlanta, GA: U.S. Department of Public Health and Human Services, Public Health Service.

[2]Agency for Toxic Substances and Disease Registry (ATSDR). 2005. (*Draft for Public Comment*). Toxicological profile for Heptachlor and Heptachlor Epoxide (http://www.atsdr.cdc.gov/toxprofiles/tp12.pdf). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Agency for Toxic Substances and Disease Registry (ATSDR). 2008. Toxicological Profile for chromium (http://www.atsdr.cdc.gov/toxprofiles/tp7.pdf). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Bates, Anne L., W.H. Orem, J.W. Harvey, and E.C. Spiker. 2002. Tracing Sources of Sulfur in the Florida Everglades. Journal of Environmental Quality 31:287-299 (http://jeq.scijournals.org/cgi/content/full/31/1/287).

Gilmour, Cynthia C., E.A. Henry, and R. Mitchell. 1992. Sulfate Stimulation of Mercury Methylation in Freshwater Sediments. Environ. Sci. Technol., Vol. 26, 2281-2287. (http://www.serc.si.edu/labs/microbial/pubs/Gilmour%20ES&T%201992%20Sulfate%20stimulates%20methylation%20in%20freshwater%20sediments.pdf).

Harvey, Judson W., S.L. Krupa, C. Gefvert, R.H. Mooney, J. Choi, S.A. King, and J.B. Giddings. 2002. Interactions between Suface Water and Ground Water and Effects on Mercury Transport in the North-Central Everglades. Water-Resources Investigations Report 02-4050. (http://sofia.usgs.gov/publications/wri/02-4050/sourcegwd.html) U.S. Geological Survey. Reston, Virginia.

Florida Department of Environmental Protection (FDEP). September 2007. Identification of Impaired Surface Waters. Florida Administrative Code Chapter 62-303 (http://www.dep.state.fl.us/legal/Rules/shared/62-303/62-303.pdf).

[1]Florida Department of Health (FDOH). September 2008. Dinking Water Toxics Program. (http://www.doh.state.fl.us/Environment/water/petroleum/watertox/nitrate.htm).

[2]Florida Department of Health (FDOH). September 2008. Health Advisory Levels. Florida Department of Health website. (http://www.doh.state.fl.us/environment/community/health-advisory/HAL_list.pdf).

Janicki Environmental Inc., September 2006. Developing Water Quality Targets or water Bodies Associated With the Southwest Florida Feasibility Study, Technical Memorandum. Prepared for the Everglades Partners Joint Venture.

Sacks, Laura A., A.B.Tihansky. 1996. Geochemical and Isotopic Composition of Ground Water, with Emphasis on Sources of Sulfate, in the Upper Floridan and Intermediate Aquifer System in Southwest Florida. Water-Resources Investigations Report 96-4146. (http://fl.water.usgs.gov/Abstracts/wri96_4146_sacks.html). U.S. Geological Survey. Tallahassee, Florida.

United States Environmental Protection Agency, July 2006. Reregistration Eligibility Decision for MSMA, DSMA, CAMA, and Cacodylic Acid. EPA 738-R-06-021. http://www.epa.gov/oppsrrd1/REDs/organic_arsenicals_red.pdf). Pesticides And Toxic

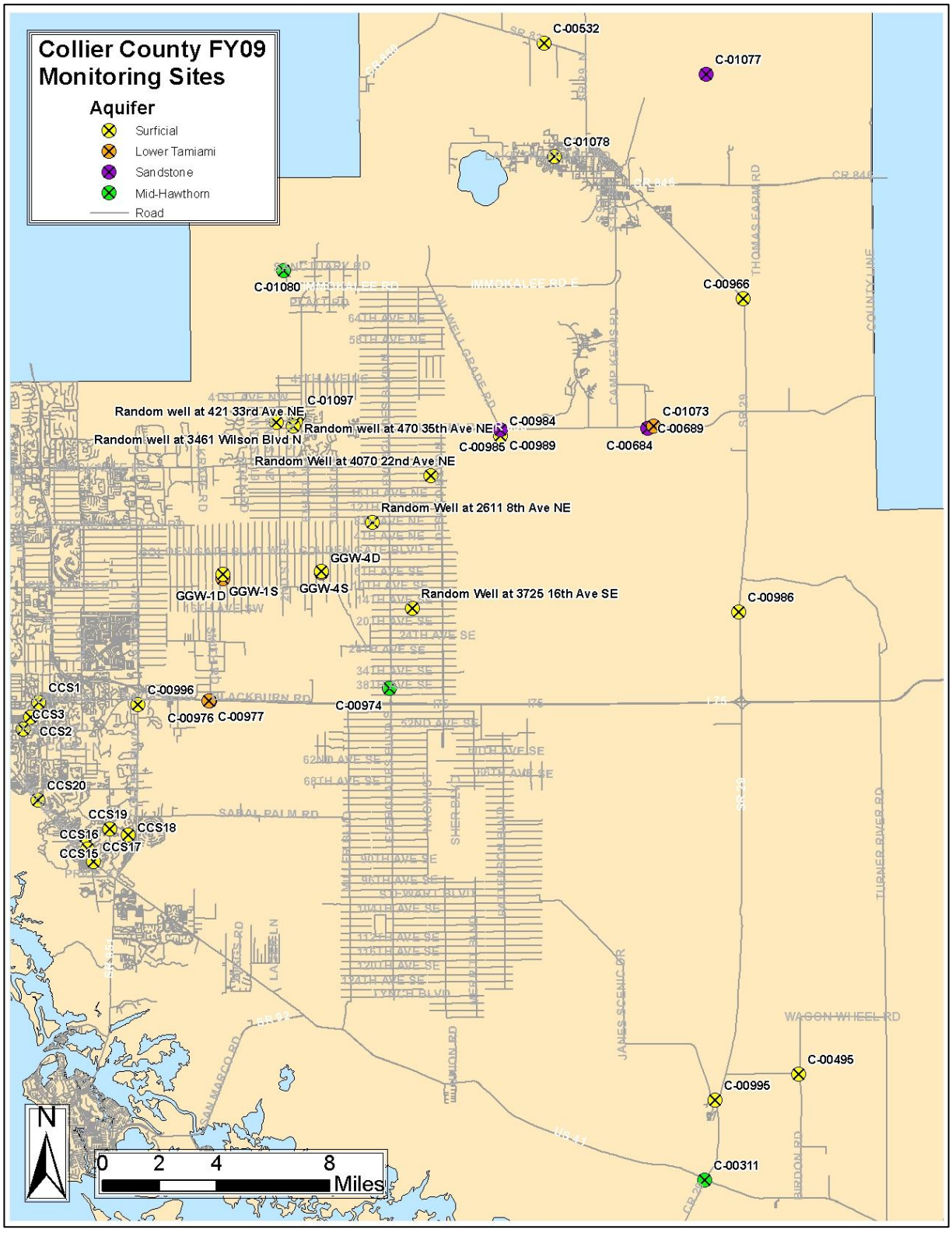

Figure 1. Monitoring Sites-Eastern Collier

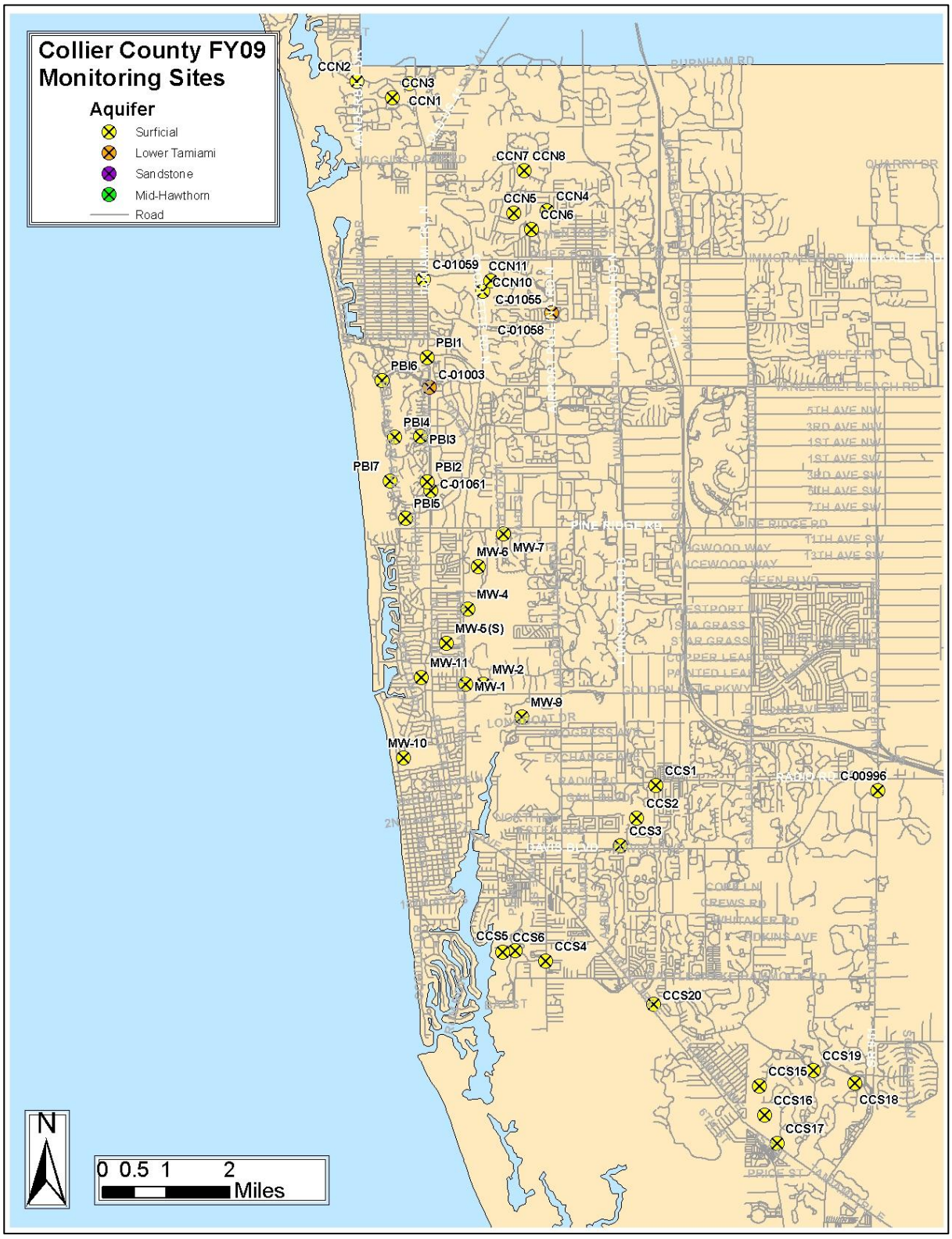

Figure 2. Monitoring Sites-Western Collier

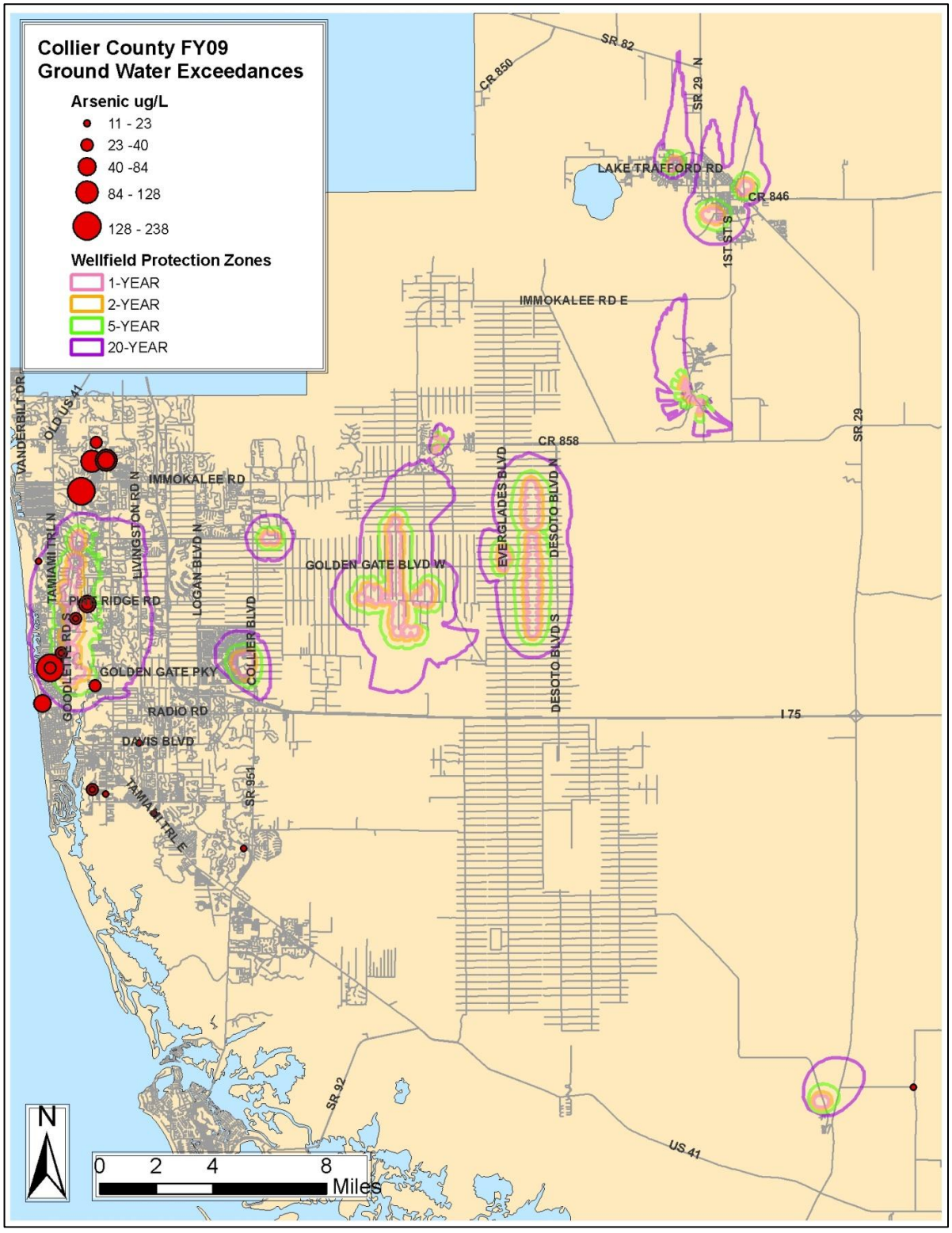

Figure 3. Arsenic exceedances in ground water during FY09

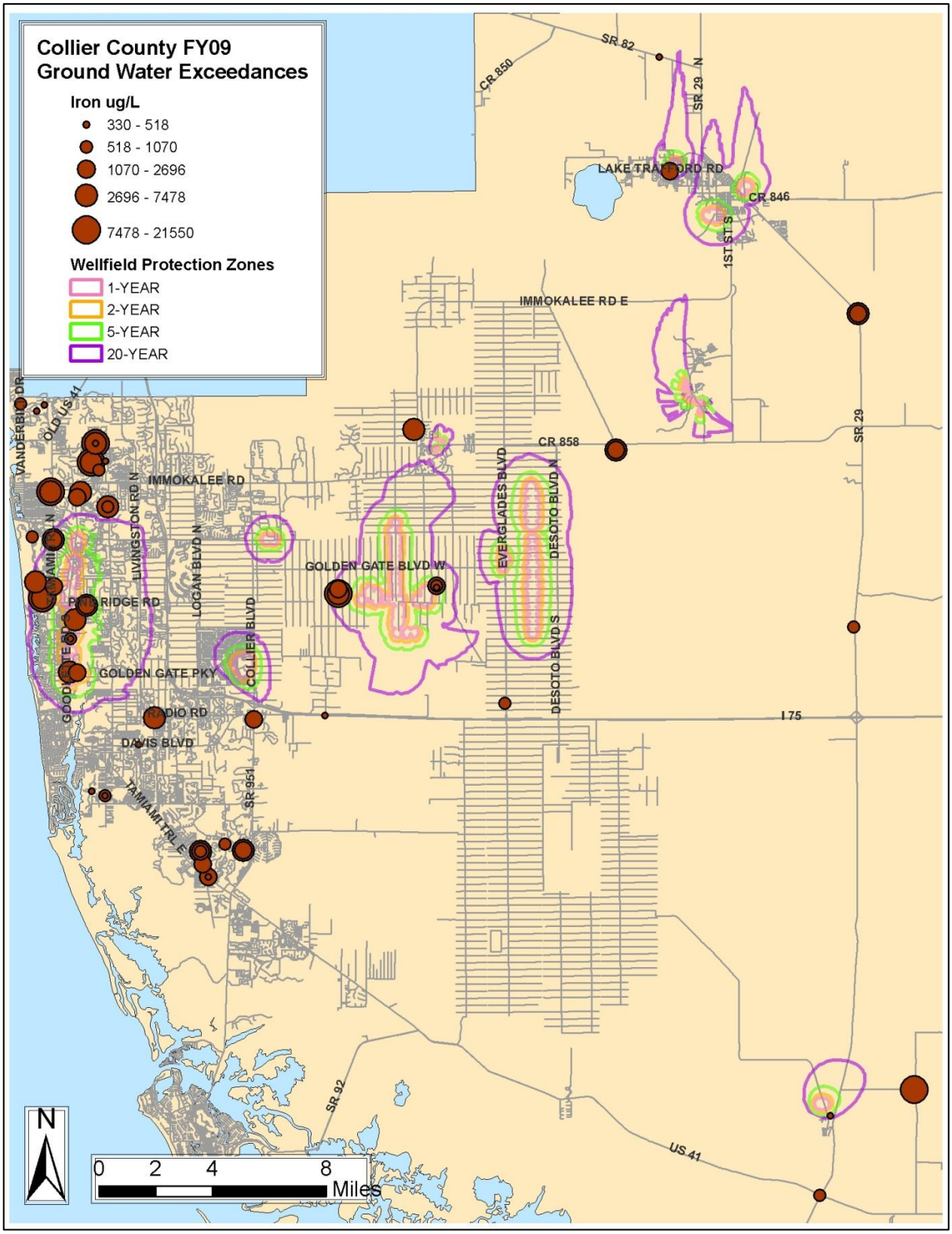

Figure 4. Iron exceedances in ground water during FY09

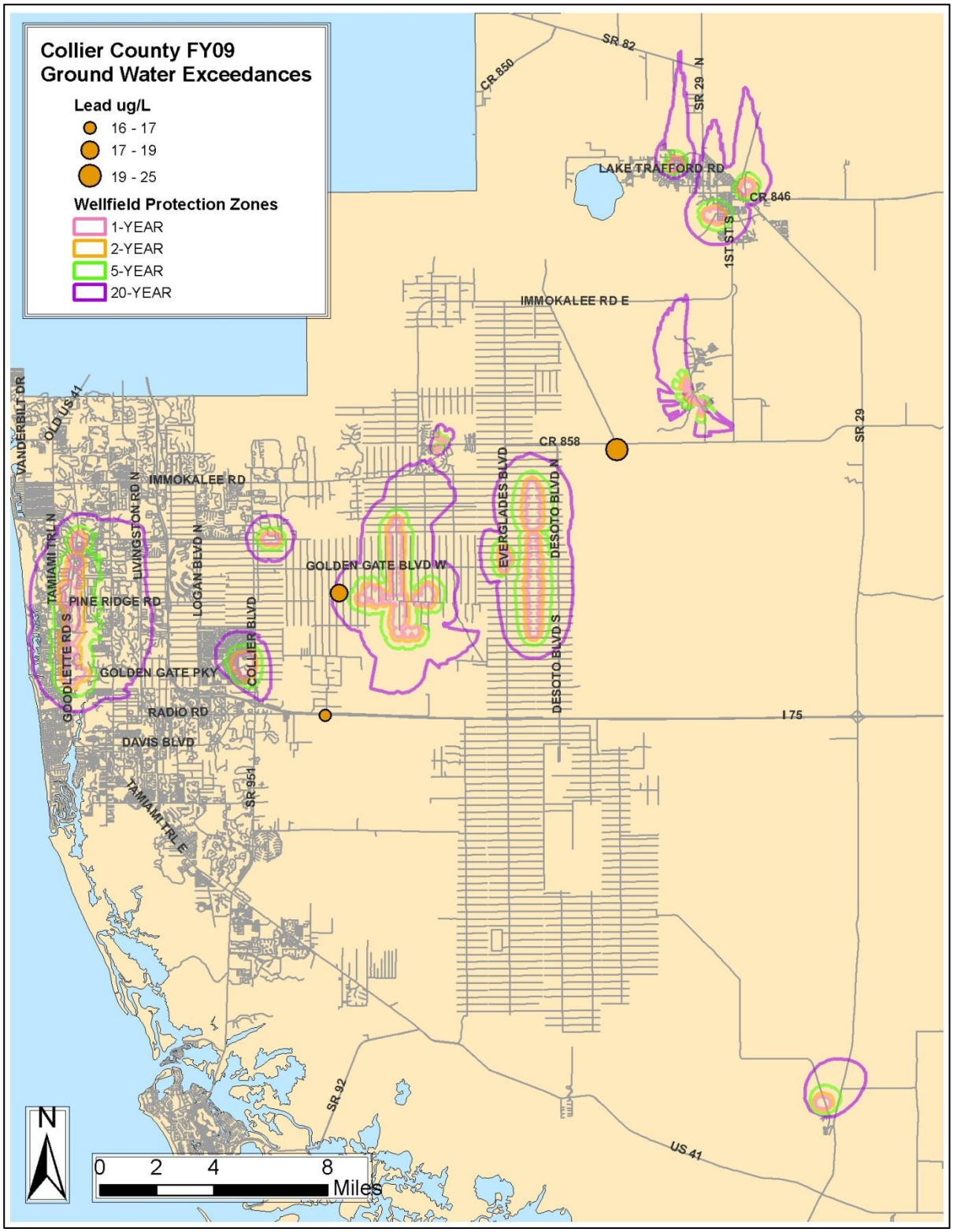

Figure 5. Lead exceedances in ground water during FY09

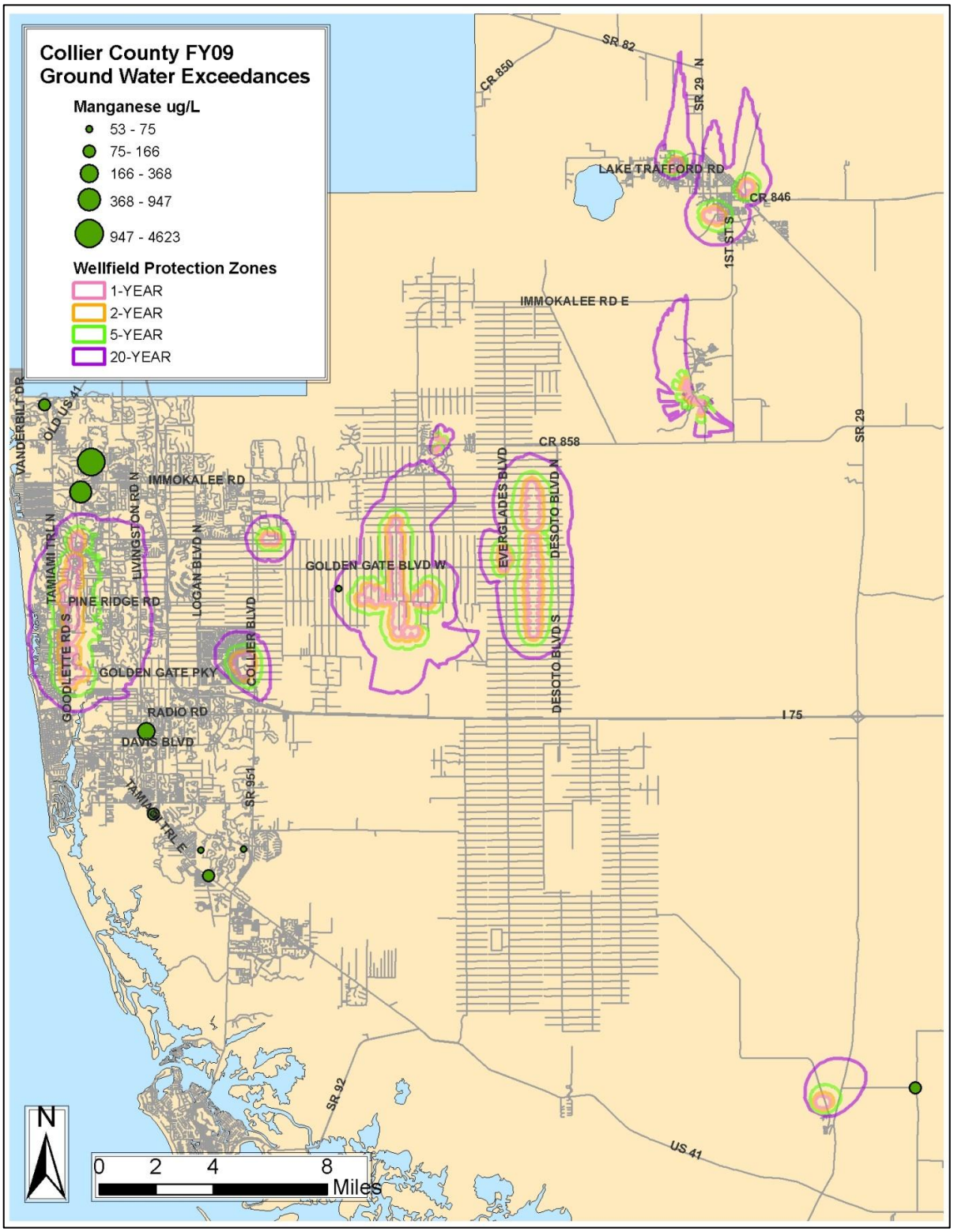

Figure 6. Manganese exceedances in ground water during FY09

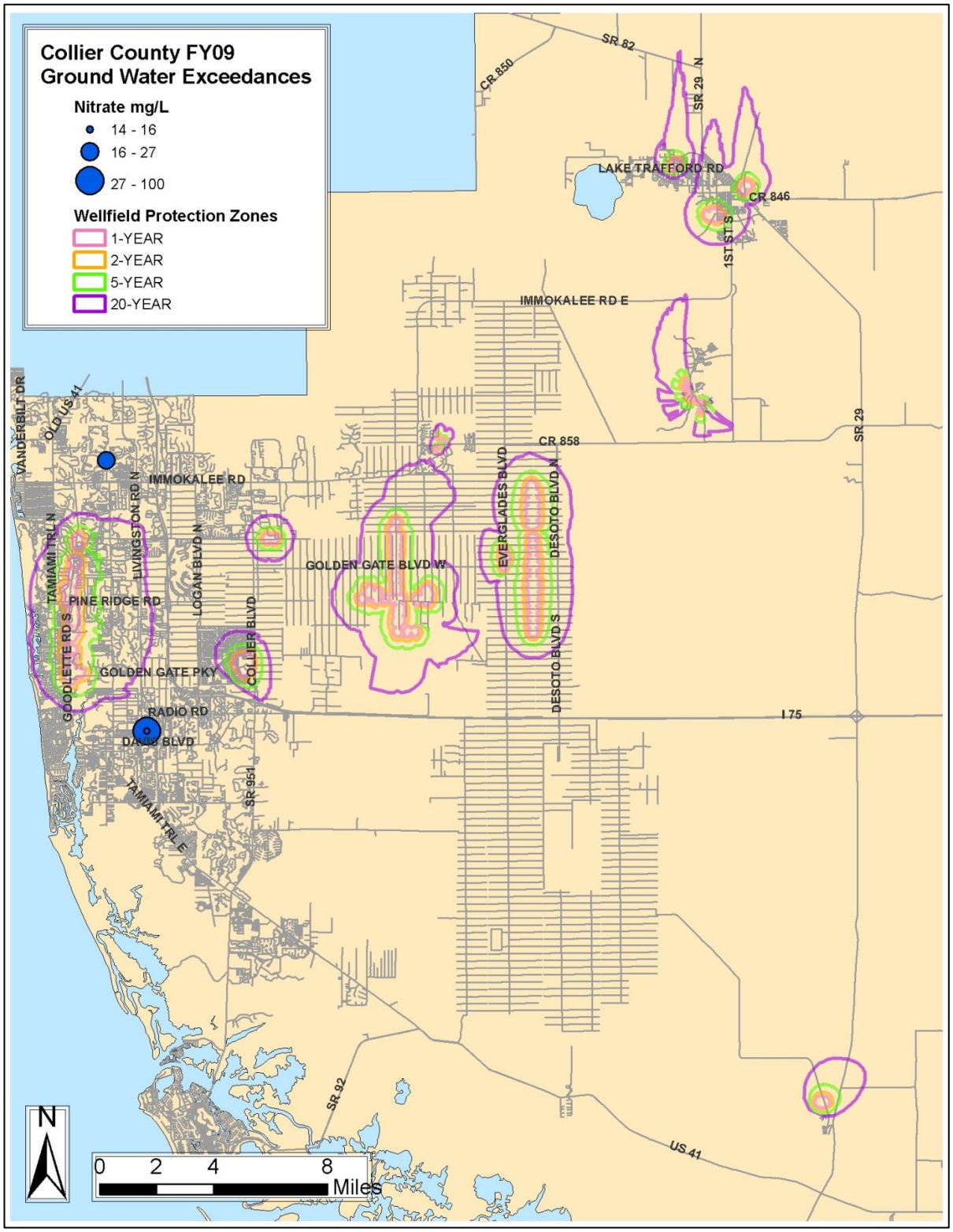

Figure 7. Nitrate exceedances in ground water during FY09

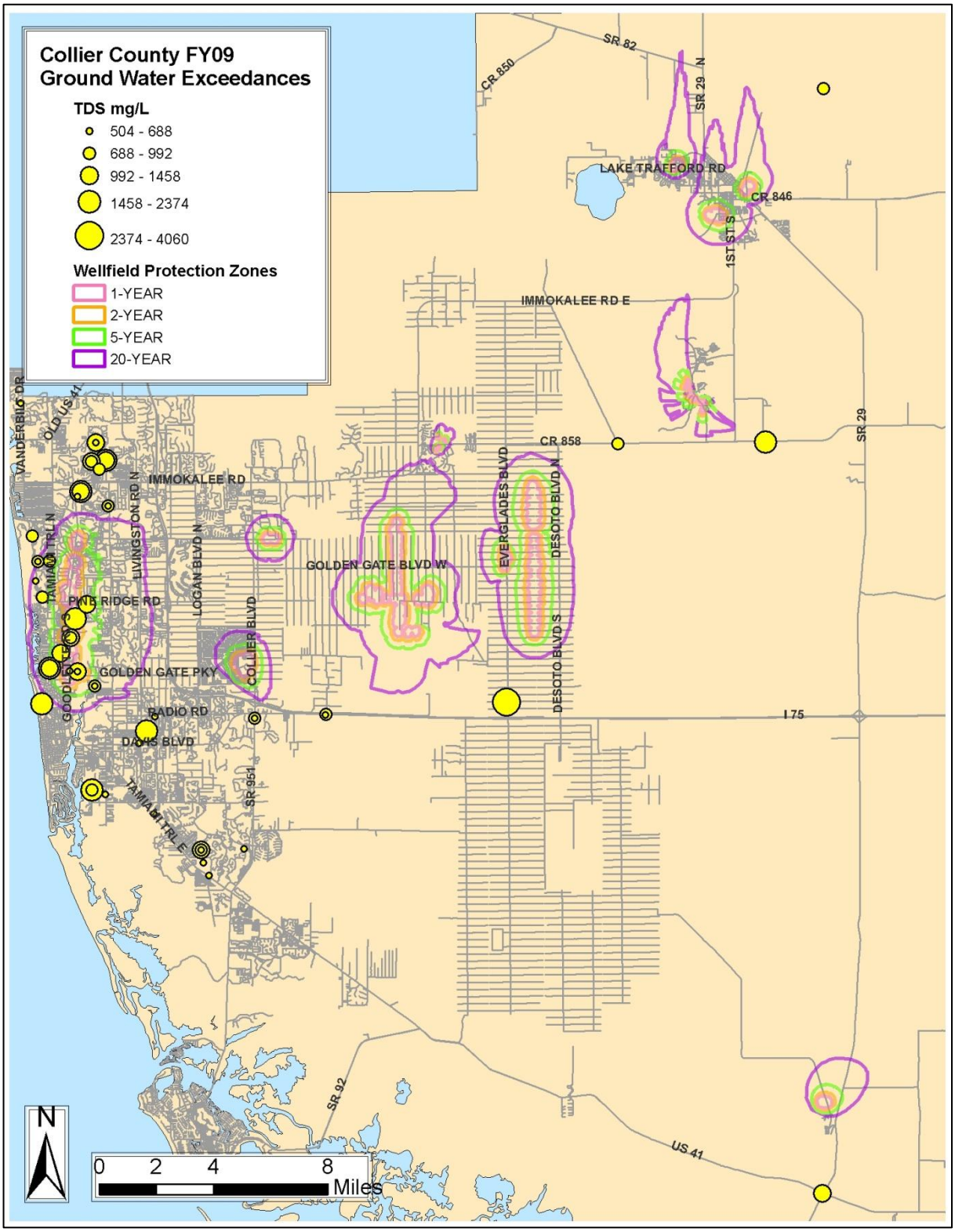

Figure 8. TDS exceedances in ground water during FY09

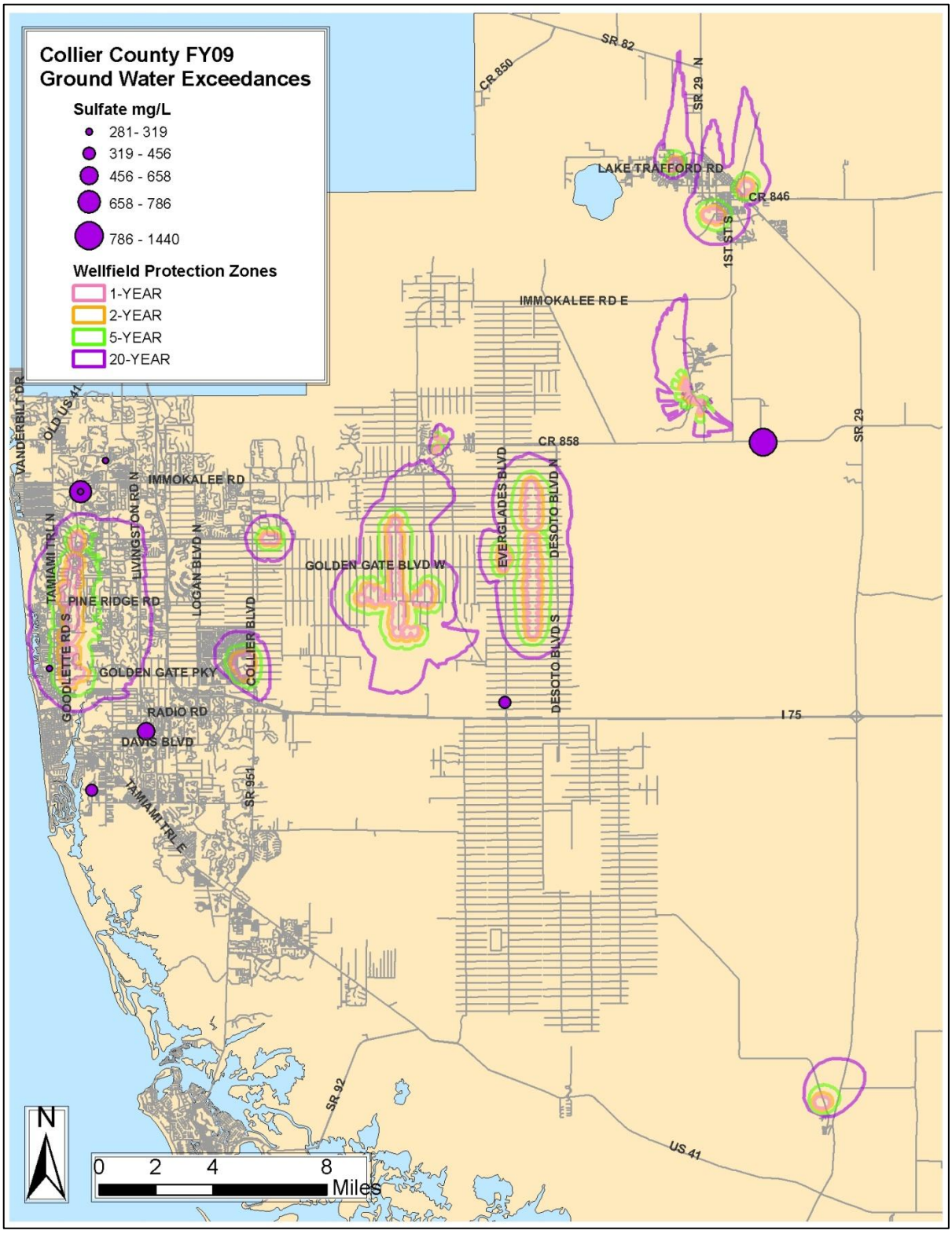

Figure 9. Sulfate exceedances in ground water during FY09

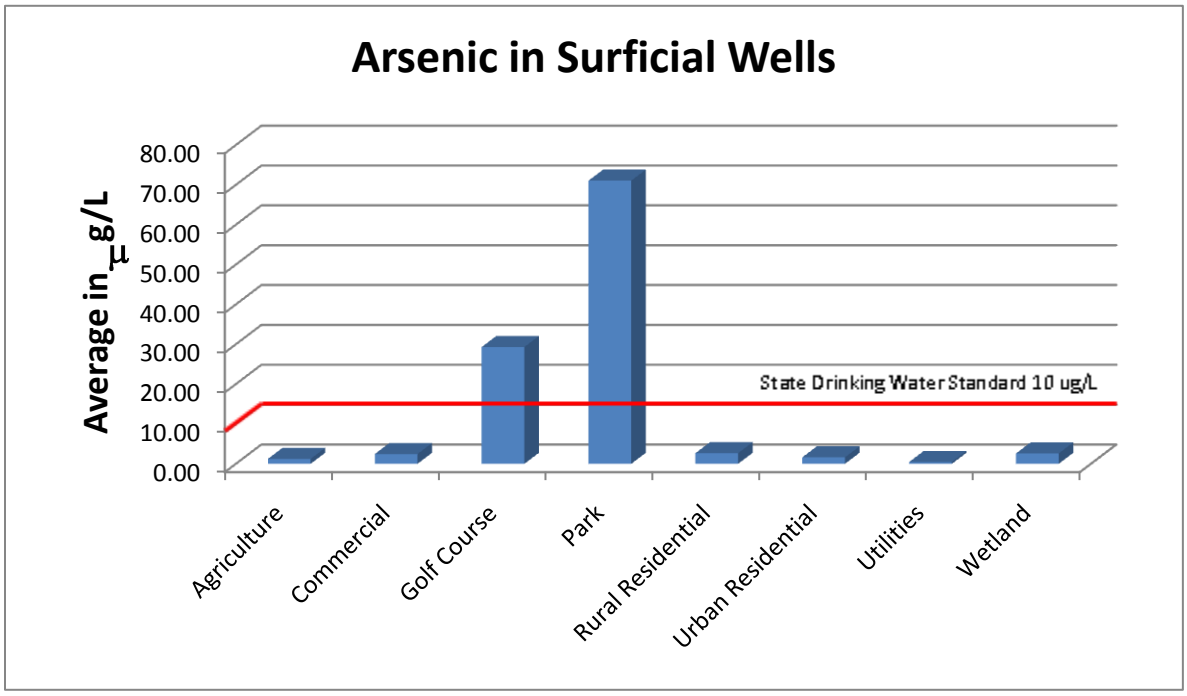

Figure 10. Average Arsenic Concentrations in the Water-table Aquifer by Land Use*

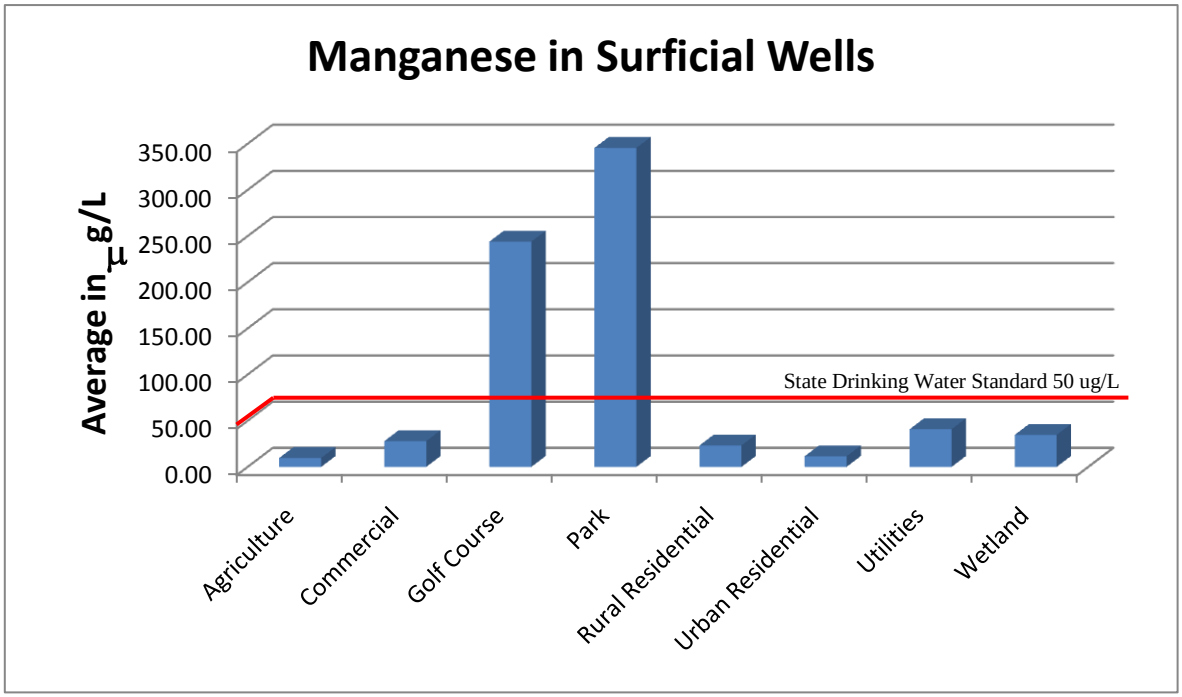

Figure 11. Manganese Concentrations in the Water-table Aquifer by Land Use*

**Land Use Codes are taken from the 2001 SFWMD Florida Land Use and Cover Classification System (FLUCCS)*

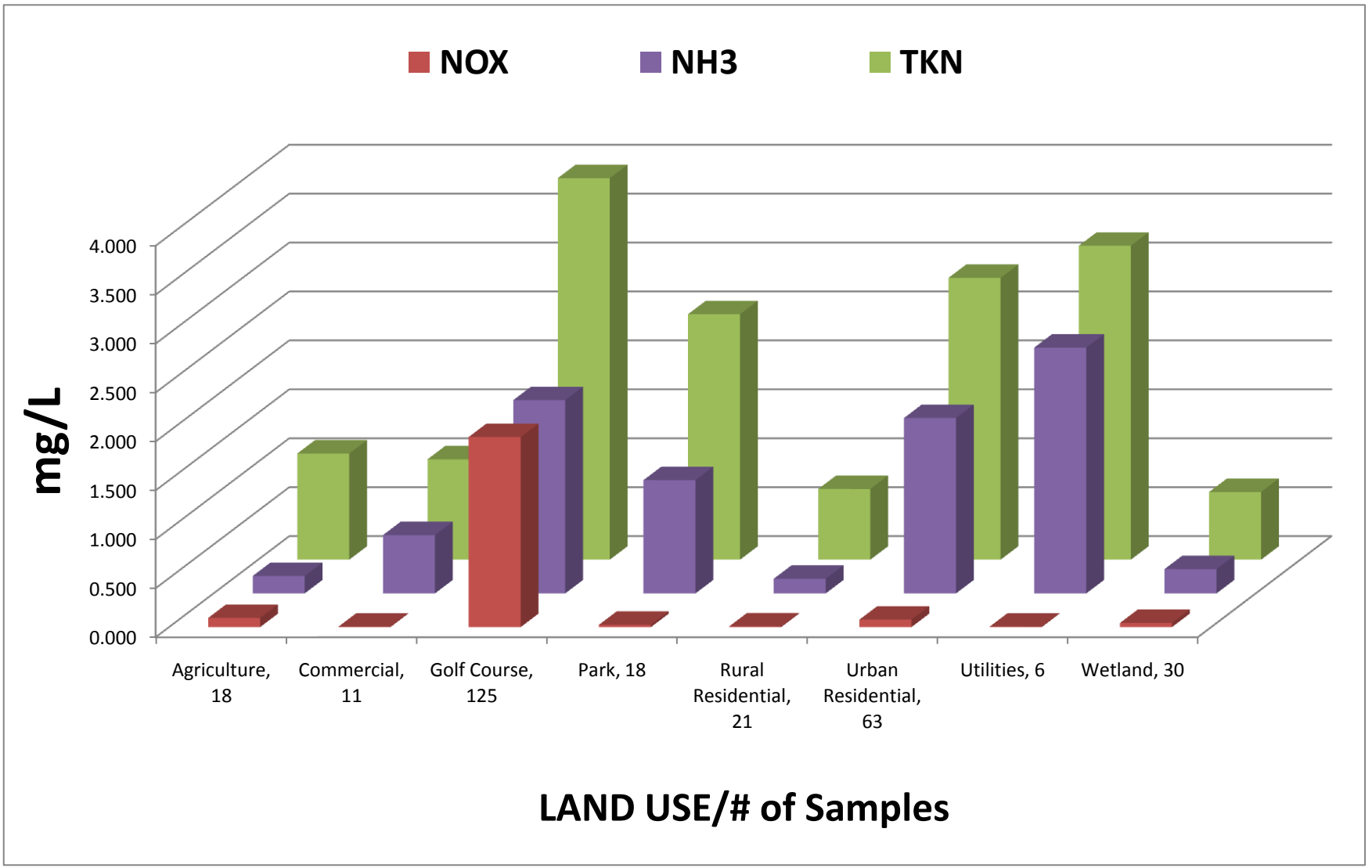

Figure 12. Average Nitrogen Species Concentrations in the Water-table Aquifer by Land Use*.

**Land Use Codes are taken from the 2001 SFWMD Florida Land Use and Cover Classification System (FLUCCS)*

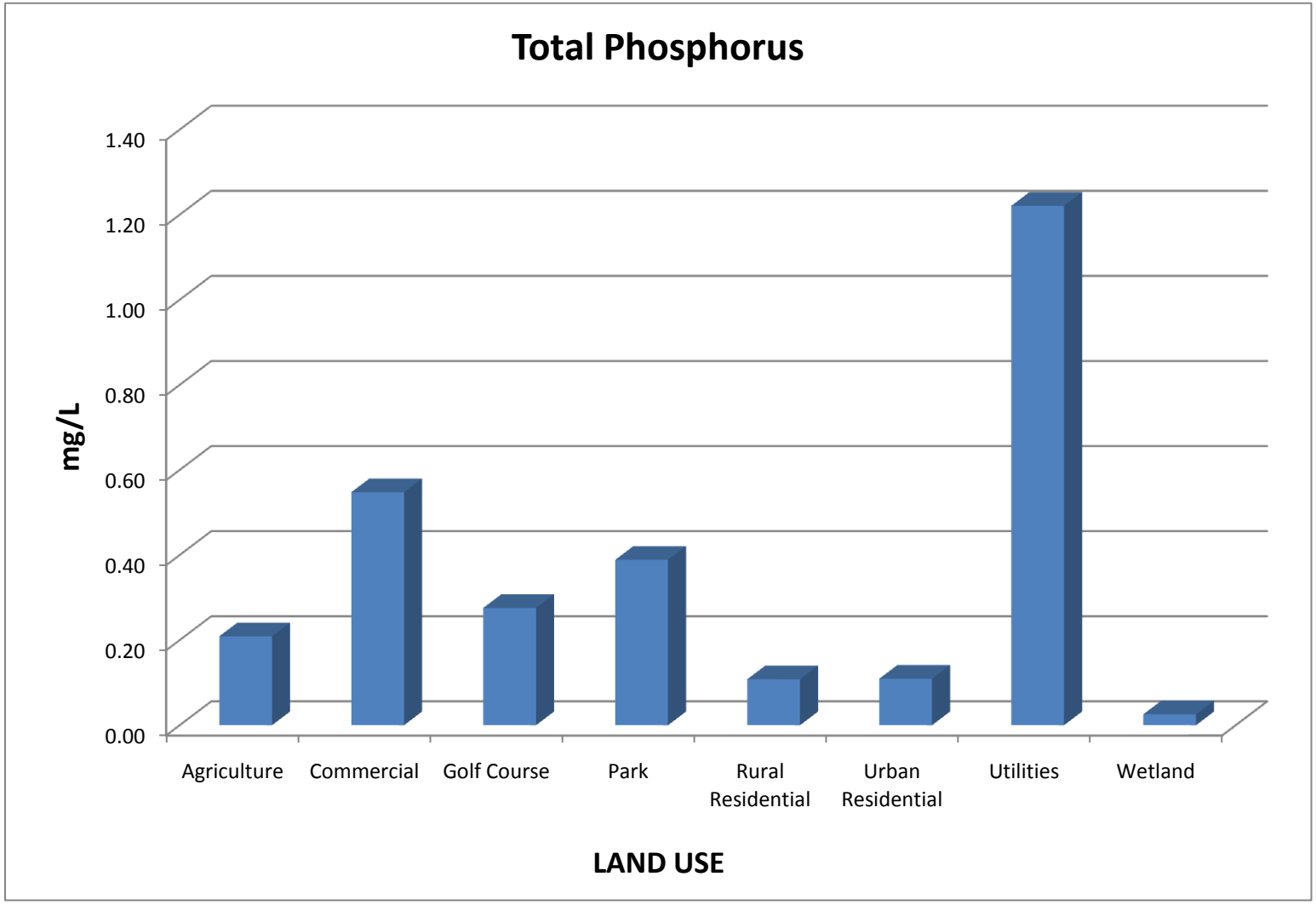

Figure 13. Average Total Phosphorus Concentrations in the Water-table Aquifer by Land Use*

**Land Use Codes are taken from the 2001 SFWMD Florida Land Use and Cover Classification System (FLUCCS)*

APPENDIX A
Station List

Well #	Latitude	Longitude	Aquifer
C-00973	26.14528	-81.54500	Lower Tamiami
C-00985	26.29333	-81.48194	Lower Tamiami
C-01003	26.24333	-81.80083	Lower Tamiami
C-01058	26.26028	-81.77000	Lower Tamiami
C-00311	25.91056	-81.36500	Mid-Hawthorn
C-00684	26.29444	-81.39833	Mid-Hawthorn
C-01080	26.37444	-81.60528	Mid-Hawthorn
C-00689	26.29444	-81.39833	Sandstone
C-00989	26.29333	-81.48194	Sandstone
C-00298	26.41861	-81.39778	Sandstone-artesian
C-00495	25.96472	-81.31194	Water-table
C-00532	26.49111	-81.45806	Water-table
C-00972	26.14528	-81.54500	Water-table
C-00984	26.29056	-81.48194	Water-table
C-00996	26.15222	-81.68667	Water-table
C-01055	26.26030	-81.77000	Water-table
C-01059	26.26778	-81.80250	Water-table
C-01061	26.21972	-81.80028	Water-table
C-01097	26.30056	-81.59667	Water-table
CCN1	26.31223	-81.80630	Water-table
CCN2	26.31263	-81.81968	Water-table
CCN3	26.30903	-81.81068	Water-table
CCN4	26.28355	-81.77125	Water-table
CCN5	26.28295	-81.77970	Water-table
CCN6	26.27922	-81.77523	Water-table
CCN7	26.29268	-81.77723	Water-table
CCN8	26.29263	-81.77722	Water-table
CCN10	26.26508	-81.78745	Water-table
CCN11	26.26758	-81.78540	Water-table
CCS1	26.15300	-81.74293	Water-table
CCS2	26.14553	-81.74760	Water-table
CCS3	26.13935	-81.75177	Water-table
CCS4	26.11302	-81.77055	Water-table
CCS5	26.11523	-81.77828	Water-table
CCS6	26.11492	-81.78137	Water-table
CCS15	26.08482	-81.71621	Water-table
CCS16	26.07822	-81.71490	Water-table
CCS17	26.07178	-81.71171	Water-table
CCS18	26.08570	-81.69195	Water-table
CCS19	26.08853	-81.70257	Water-table
CCS20	26.10322	-81.74302	Water-table
PBI1	26.24997	-81.80142	Water-table
PBI2	26.22177	-81.80133	Water-table
PBI3	26.23207	-81.80295	Water-table

Well #	Latitude	Longitude	Aquifer
PBI4	26.23183	-81.80952	Water-table
PBI5	26.21350	-81.80672	Water-table
PBI6	26.24478	-81.81278	Water-table
PBI7	26.22183	-81.81072	Water-table
MW-1	26.17582	-81.79115	Water-table
MW-2	26.17575	-81.78667	Water-table
MW-3	26.17723	-81.78437	Water-table
MW-4	26.19288	-81.79068	Water-table
MW-5	26.18513	-81.79613	Water-table
MW-6	26.20258	-81.78825	Water-table
MW-7	26.20997	-81.78177	Water-table
MW-8	26.19327	-81.78327	Water-table
MW-9	26.16838	-81.77692	Water-table
MW-10	26.15898	-81.80683	Water-table
MW-11	26.17727	-81.80243	Water-table
GGW-1S	26.21889	-81.63900	Water-table
GGW-1D	26.21667	-81.63900	Lower Tamiami
GGW-4S	26.22083	-81.58333	Water-table
GGW-4D	26.22000	-81.58333	Lower Tamiami
3 Random Locations	TBA	TBA	Water-table
Additional Wells Added by Pollution Control Department			
C-00966	26.3606	-81.3447	Water-table
C-00974	26.1611	-81.5444	Mid-Hawthorn
C-00976	26.1544	-81.6464	Water-table
C-00977	26.1542	-81.6467	Lower Tamiami
C-00986	26.2008	-81.3467	Water-table
C-00995	25.9514	-81.3594	Water-table
C-01073	26.2954	-81.3953	Lower Tamiami
C-01074	26.4222	-81.2719	Lower Tamiami
C-01077	26.4753	-81.3661	Sandstone
C-01078	26.4331	-81.4519	Water-table

APPENDIX B
Parameter List

Parameter	Method	Required Method Detection Limit	Frequency
Temperature	FDEP SOP FT1400	± 0.2 mg/L °C	Semi-annually
pH	FDEP SOP FT 1100	± 0.2 standard units	Semi-annually
Specific conductance	FDEP SOP FT1200	± 5% of the true value of the KCl standard	Semi-annually
Dissolved Oxygen	FDEP SOP FT1500	± 0.3 mg/L of saturation chart at temp	Semi-annually
Depth to water level	FDEP SOP FS2200	± 0.01 feet	Semi-annually
Total dissolved solids	SM 2540C	1.0 mg/L	Semi-annually
Turbidity	SM 2130 B	0.10 NTU	Semi-annually
Fecal coliform	SM 9222D	1 cfu/100ml	Semi-annually
Total coliform	SM 9222B	1 cfu/100ml	Semi-annually
Chloride	SM 4500 Cl-C	1.0 mg/L	Semi-annually
Total Nitrogen	TKN+NO_X	0.04 mg/L	Semi-annually
Calcium	SM 3111 B	0.08 mg/L	Semi-annually
Sodium	SM 3111 B	1.7 mg/l	Semi-annually
Bicarbonate	SM4500 CO2D	2.0 mg/L	Semi-annually
Nitrate	(NO_x-NH_2)	0.01 mg/L	Semi-annually
Nitrite	SM4500 NO_2 B	0.002 mg/L	Semi-annually
Nitrate/Nitrite (NOX)	SM 4500 NO_3 E	0.01 mg/L	Semi-annually
Ammonia	EPA 350.3	0.01 mg/L	Semi-annually
Total Kjeldahl Nitrogen	EPA 351.2	0.04 mg/L	Semi-annually
Total phosphorus	SM 4500 PE	0.004 mg/L	Semi-annually
Ortho-phosphate	SM 4500 PE	0.004 mg/L	Semi-annually
Sulfate	EPA 375.4	1.0 mg/L	Semi-annually
Sulfide	EPA 376.1	0.76 mg/L	Semi-annually
Alkalinity	SM 2320B	1.0 mg/L	Semi-annually
Iron	SM 3111 B	120 ug/l	Semi-annually
Fluoride	SM 4500 F-C	0.05 mg/L	Semi-annually
Potassium	EPA 200.7	170 ug/L	Semi-annually
Magnesium (total)	SM 3111 B	0.007 mg/L	Semi-annually
Manganese (total)	EPA 200.8	0.2 mg/L	Semi-annually
Hardness (total)	SM2340 B	1.0 mg/L	Semi-annually
Arsenic (total)	EPA 200.8	1.0 ug/L	Semi-annually
Barium (total)	EPA 200.7	2.6 ug/L	Semi-annually
Cadmium (total)	EPA 200.8	0.1 ug/L	Semi-annually
Chromium (total)	EPA 200.8	2.0 ug/L	Semi-annually
Copper (total)	EPA 200.8	1.0 ug/L	Semi-annually
Lead (total)	EPA 200.8	1.0 ug/L	Semi-annually
Nickel (total)	EPA 200.7	2.4 ug/L	Semi-annually
Selenium (total)	EPA 200.7	7.5 ug/L	Semi-annually
Strontium (total)	EPA 200.7	3.6 ug/L	Semi-annually
Silver (total)	EPA 200.7	4.9 ug/L	Semi-annually

APPENDIX C—Third Year Monitoring Effort Summary

Well #	Aquifer	Wet Season 2008 Sampling Date	Dry Season 2009 Sampling Date	Comments
C-00298	Sandstone	N/A	N/A	Well was removed from the network due to well construction problem that would not allow the well to recharge. Well was replaced with well C-01077.
C-00311	Mid-Hawthorn	10/21/2008	4/6/2009	Wet and dry season sampling and lab analysis complete
C-00495	Water-table	10/13/2008	4/6/2009	Wet and dry season sampling and lab analysis complete
C-00532	Water-table	10/2/2008	4/7/2009	Wet and dry season sampling and lab analysis complete
C-00684	Mid-Hawthorn	8/11/2008	3/31/2009	Wet and dry season sampling and lab analysis and Lab Analysis complete
C-00689	Sandstone	8/6/2008	3/31/2009	Wet and dry season sampling and lab analysis complete
C-00972	Water-table	N/A	N/A	FDEP is sampling well as part of their Status and Trends network. This well is considered a trend site and is sampled quarterly by FDEP. Since this Water-table aquifer resource is already being monitored, well C-00976 was added to Collier County's network.
C-00973	Lower Tamiami	N/A	N/A	FDEP is sampling well as part of their Status and Trends network. This well is considered a trend site and is sampled quarterly by FDEP. Since this Water-table aquifer resource is already being monitored, well C-00977 was added to Collier County's network.
C-00984	Water-table	8/28/2008	4/16/2009	Wet and dry season sampling and lab analysis complete
C-00985	Lower Tamiami	8/28/2008	4/15/2009	Wet and dry season sampling and lab analysis complete
C-00989	Sandstone	8/26/2008	4/1/2009	Wet and dry season sampling and lab analysis complete

APPENDIX C—Third Year Monitoring Effort Summary

Well #	Aquifer	Wet Season 2008 Sampling Date	Dry Season 2009 Sampling Date	Comments
C-00996	Water-table	9/22/2008	3/26/2009	Wet and dry season sampling and lab analysis complete
C-01003	Lower Tamiami	8/5/2008	2/24/2009	Wet and dry season sampling and lab analysis complete
C-01055	Water-table	10/6/2008	3/19/2009	Wet and dry season sampling and lab analysis complete
C-01058	Lower Tamiami	7/24/2008	3/30/2009	Wet and dry season sampling and lab analysis complete
C-01059	Water-table	7/24/2008	3/19/2009	Wet and dry season sampling and lab analysis complete
C-01061	Water-table	8/4/2008	2/12/2009	Wet and dry season sampling and lab analysis complete
C-01074	Lower Tamiami	N/A	N/A	Well is not properly developed and well is not able to be sampled properly. Well was removed from the network.
C-01080	Mid-Hawthorn	10/7/2008	4/8/2009	Wet and dry season sampling and lab analysis complete
C-01097	Water-table	8/21/2008	3/26/2009	Wet and dry season sampling and lab analysis complete
CCN1	Water-table	8/5/2008	2/4/2009	Wet and dry season sampling and lab analysis complete
CCN10	Water-table	10/6/2008	2/17/2009	Wet and dry season sampling and lab analysis complete
CCN11	Water-table	8/5/2008	2/4/2009	Wet and dry season sampling and lab analysis complete
CCN2	Water-table	9/4/2008	2/5/2009	Wet and dry season sampling and lab analysis complete
CCN3	Water-table	9/4/2008	2/5/2009	Wet and dry season sampling and lab analysis complete

APPENDIX C—Third Year Monitoring Effort Summary

Well #	Aquifer	Wet Season 2008 Sampling Date	Dry Season 2009 Sampling Date	Comments
CCN4	Water-table	10/20/2008	4/9/2009	Wet and dry season sampling and lab analysis complete
CCN5	Water-table	10/20/2008	4/13/2009	Wet and dry season sampling and lab analysis complete
CCN6	Water-table	10/20/2008	3/30/2009	Wet and dry season sampling and lab analysis complete
CCN7	Water-table	7/21/2008	2/4/2009	Wet and dry season sampling and lab analysis complete
CCN8	Water-table	7/21/2008	2/4/2009	Wet and dry season sampling and lab analysis complete
CCN9	Water-table	N/A	N/A	Well is owned by Collier County Water and Sewer District. Well is damaged and has not been re-drilled.
CCS1	Water-table	8/4/2008	2/12/2009	Wet and dry season sampling and lab analysis complete
CCS15	Water-table	10/23/2008	4/2/2009	Wet and dry season sampling and lab analysis complete
CCS16	Water-table	9/2/2008	3/18/2009	Wet and dry season sampling and lab analysis complete
CCS17	Water-table	9/2/2008	3/10/2009	Wet and dry season sampling and lab analysis complete
CCS18	Water-table	8/12/2008	3/10/2009	Wet and dry season sampling and lab analysis complete
CCS19	Water-table	9/25/2008	4/2/2009	Wet and dry season sampling and lab analysis complete
CCS2	Water-table	9/22/2008	3/12/2009	Wet and dry season sampling and lab analysis complete
CCS20	Water-table	8/12/2008	2/5/2009	Wet and dry season sampling and lab analysis complete

APPENDIX C—Third Year Monitoring Effort Summary

Well #	Aquifer	Wet Season 2008 Sampling Date	Dry Season 2009 Sampling Date	Comments
CCS3	Water-table	9/22/2008	3/12/2009	Wet and dry season sampling and lab analysis complete
CCS4	Water-table	7/23/2008	3/25/2009	Wet and dry season sampling and lab analysis complete
CCS5	Water-table	9/4/2008	3/25/2009	Wet and dry season sampling and lab analysis complete
CCS6	Water-table	7/23/2008	3/25/2009	Wet and dry season sampling and lab analysis complete
GGW-1D	Lower Tamiami	10/14/2008	4/13/2009	Wet and dry season sampling and lab analysis complete
GGW-1S	Water-table	10/14/2008	4/13/2009	Wet and dry season sampling and lab analysis complete
GGW-4D	Lower Tamiami	10/16/2008	4/14/2009	Wet and dry season sampling and lab analysis complete
GGW-4S	Water-table	10/16/2008	4/14/2009	Wet and dry season sampling and lab analysis complete
MW-1	Water-table	9/16/2008	3/9/2009	Wet and dry season sampling and lab analysis complete
MW-10	Water-table	9/17/2008	3/5/2009	Wet and dry season sampling and lab analysis complete
MW-11	Water-table	9/18/2008	3/5/2009	Wet and dry season sampling and lab analysis complete
MW-2	Water-table	10/21/2008	3/11/2009	Wet and dry season sampling and lab analysis complete

APPENDIX C—Third Year Monitoring Effort Summary

Well #	Aquifer	Wet Season 2008 Sampling Date	Dry Season 2009 Sampling Date	Comments
MW-3	Water-table	N/A	N/A	Well is owned by City of Naples. This is the third well located in Wilderness Country Club, but it is located in a parking lot. Wells MW-1 and MW-2 were more representative of the land use. Therefore this well was dropped from the network per discussion with Ananta Nath, SFWMD-Big Cypress Basin.
MW-4	Water-table	9/16/2008	3/4/2009	Wet and dry season sampling and lab analysis complete
MW-5(S)	Water-table	9/16/2008	3/5/2009	Wet and dry season sampling and lab analysis complete
MW-6	Water-table	9/17/2008	3/18/2009	Wet and dry season sampling and lab analysis complete
MW-7	Water-table	9/17/2008	3/4/2009	Wet and dry season sampling and lab analysis complete
MW-8	Water-table	N/A	N/A	Well is owned by City of Naples. Well is located in the middle of a golf course fairway and could not be reached with the Sampling and Lab Analysis equipment. Site was removed from the monitoring network.
MW-9	Water-table	9/18/2008	3/18/2009	Wet and dry season sampling and lab analysis complete
PBI1	Water-table	9/23/2008	2/17/2009	Wet and dry season sampling and lab analysis complete
PBI2	Water-table	9/23/2008	3/11/2009	Wet and dry season sampling and lab analysis complete
PBI3	Water-table	10/9/2008	3/3/2009	Wet and dry season sampling and lab analysis complete
PBI4	Water-table	10/9/2008	3/11/2009	Wet and dry season sampling and lab analysis complete

APPENDIX C—Third Year Monitoring Effort Summary

Well #	Aquifer	Wet Season 2008 Sampling Date	Dry Season 2009 Sampling Date	Comments
PBI5	Water-table	9/23/2008	3/3/2009	Wet and dry season sampling and lab analysis complete
PBI6	Water-table	10/9/2008	2/24/2009	Wet and dry season sampling and lab analysis complete
PBI7	Water-table	9/25/2008	3/4/2009	Wet and dry season sampling and lab analysis complete
Random Well at 4070 22nd Ave NE	Water-table	11/3/2008	N/A	Wet season sampling and lab analysis complete
Random Well at 2611 8th Ave NE	Water-table	11/3/2008	N/A	Wet season sampling and lab analysis complete
Random Well at 3725 16th Ave SE	Water-table	11/3/2008	N/A	Wet season sampling and lab analysis complete
C-00966	Water-table	9/8/2008	3/24/2009	Wet and dry season sampling and lab analysis complete. Well was added to the network by Pollution Control.
C-00974	Mid-Hawthorn	10/23/2008	4/16/2009	Wet and dry season sampling and lab analysis complete. Well was added to the network by Pollution Control.
C-00976	Water-table	9/3/2008	3/23/2009	Wet and dry season sampling and lab analysis complete. Well was added to the network by Pollution Control to replace well C-00972..
C-00977	Lower Tamiami	9/3/2008	3/23/2009	Wet and dry season sampling and lab analysis complete. Well was added to the network by Pollution Control to replace well C-00973..

APPENDIX C—Third Year Monitoring Effort Summary

Well #	Aquifer	Wet Season 2008 Sampling Date	Dry Season 2009 Sampling Date	Comments
C-00986	Water-table	9/15/2008	3/24/2009	Wet and dry season sampling and lab analysis complete. Well was added to the network by Pollution Control.
C-00995	Water-table	10/13/2008	4/6/2009	Wet and dry season sampling and lab analysis complete. Well was added to the network by Pollution Control.
C-01073	Lower Tamiami	8/6/2008	3/31/2009	Wet and dry season sampling and lab analysis complete. Well was added to the network by Pollution Control.
C-01077	Sandstone	10/2/2008	4/9/2009	Wet and dry season sampling and lab analysis complete. Well was added to the network by Pollution Control to replace well C-00298. No Wet and dry season sample was collected due to late Sampling and Lab Analysis start and contract initiation. Site was sampled twice in the dry season.
C-01078	Water-table		4/7/2009	Unable to sample during Wet and dry season because well was damaged. USGS was notified and well was repaired before dry season sampling.
Random well at 3461 Wilson Blvd N	Water-table	N/A	5/14/2009	Dry season sampling and lab analysis complete
Random well at 470 35th Ave NE	Water-table	N/A	6/22/2009	Dry season sampling and lab analysis complete
Random well at 421 33rd Ave NE	Water-table	N/A	6/22/2009	Dry season sampling and lab analysis complete

APPENDIX D—Third Year Exceedances

Client Sample ID	Station ID	Aquifer	Date Collected	Analyte Name	Result	Result Units	Lab Qualifiers (FAC 62-160)	Detection Limit	FAC 62-550 Primary Drinking Water Standard	FAC 62-550 Secondary Drinking Water Standard
08101416-63	GGW-1D	Lower Tamiami	10/14/2008 11:20	Iron	4780	ug/L		100		300
09041316-69	GGW-1D	Lower Tamiami	4/13/2009 12:25	Iron	10600	ug/L		1000		300
08101416-63	GGW-1D	Lower Tamiami	10/14/2008 11:20	Lead	17.12	ug/L		0.06	15	
08101416-65	GGW-1S	Water-table	10/14/2008 13:19	Iron	2460	ug/L	J	100		300
09041316-68	GGW-1S	Water-table	4/13/2009 11:10	Iron	2030	ug/L		100		300
09041316-68	GGW-1S	Water-table	4/13/2009 11:10	Manganese	58.15	ug/L		0.12		50
08101616-66	GGW-4D	Lower Tamiami	10/16/2008 11:28	Iron	350	ug/L	I	100		300
08101616-67	GGW-4S	Water-table	10/16/2008 12:44	Iron	1360	ug/L	J	100		300
09041416-71	GGW-4S	Water-table	4/14/2009 11:25	Iron	940	ug/L		100		300
08102116-71	C-00311	Mid-Hawthorn	10/21/2008 13:04	Chloride	430	mg/L		5		250
09040630-59	C-00311	Mid-Hawthorn	4/6/2009 11:47	Chloride	540	mg/L		4		250
08102116-71	C-00311	Mid-Hawthorn	10/21/2008 13:04	Iron	690	ug/L	J	100		300
08102116-71	C-00311	Mid-Hawthorn	10/21/2008 13:04	Total Dissolved Solids	1226	mg/L		2		500
09040630-59	C-00311	Mid-Hawthorn	4/6/2009 11:47	Total Dissolved Solids	1316	mg/L		2		500
08102116-71	C-00311	Mid-Hawthorn	10/21/2008 13:04	Sodium	450	mg/L	I	170	160	
09040630-59	C-00311	Mid-Hawthorn	4/6/2009 11:47	Sodium	394.2	mg/L		34	160	
09040630-60	C-00495	Water-table	4/6/2009 13:13	Arsenic	17.05	ug/L		0.23	10	
09040630-60	C-00495	Water-table	4/6/2009 13:13	Chromium	148.1	ug/l		0.07	100	
08101316-61	C-00495	Water-table	10/13/2008 11:07	Iron	7830	ug/L		100		300
09040630-60	C-00495	Water-table	4/6/2009 13:13	Iron	11000	ug/L		1000		300
08101316-61	C-00495	Water-table	10/13/2008 11:07	Manganese	109	ug/l		3.9		50
09040630-60	C-00495	Water-table	4/6/2009 13:13	Manganese	130.7	ug/L		0.12		50
09040716-62	C-00532	Water-table	4/7/2009 11:45	Iron	450	ug/L	I	100		300
09033116-52	C-00684	Mid-Hawthorn	3/31/2009 14:06	Chloride	779	mg/L		4		250
08081116-15	C-00684	Mid-Hawthorn	8/11/2008 14:22	Total Dissolved Solids	2140	mg/L		2		500
09033116-52	C-00684	Mid-Hawthorn	3/31/2009 14:06	Total Dissolved Solids	2374	mg/L		2		500
08081116-15	C-00684	Mid-Hawthorn	8/11/2008 14:22	Sodium	376	mg/L		34	160	
09033116-52	C-00684	Mid-Hawthorn	3/31/2009 14:06	Sodium	209.2	mg/L		34	160	

APPENDIX D—Third Year Exceedances

Client Sample ID	Station ID	Aquifer	Date Collected	Analyte Name	Result	Result Units	Lab Qualifiers (FAC 62-160)	Detection Limit	FAC 62-550 Primary Drinking Water Standard	FAC 62-550 Secondary Drinking Water Standard
08081116-15	C-00684	Mid-Hawthorn	8/11/2008 14:22	Sulfate	1395	mg/L		50		250
09033116-52	C-00684	Mid-Hawthorn	3/31/2009 14:06	Sulfate	1440	mg/L		50		250
08080616-13	C-00689	Sandstone	8/6/2008 12:03	Coliform Total	12	cfu/100ml	B	1	0	
08090816-31	C-00966	Water-table	9/8/2008 11:30	Iron	1700	ug/L		100		300
09032416-42	C-00966	Water-table	3/24/2009 11:30	Iron	5880	ug/L		100		300
08102316-74	C-00974	Mid-Hawthorn	10/23/2008 13:35	Chloride	2282	mg/L		100		250
08102316-74	C-00974	Mid-Hawthorn	10/23/2008 13:35	Iron	630	ug/L	J	100		300
08102316-74	C-00974	Mid-Hawthorn	10/23/2008 13:35	Total Dissolved Solids	4060	mg/L		2		500
09041616-75	C-00974	Mid-Hawthorn	4/16/2009 10:34	Total Dissolved Solids	3680	mg/L		2		500
08102316-74	C-00974	Mid-Hawthorn	10/23/2008 13:35	Sodium	780	mg/L	I	170	160	
09041616-75	C-00974	Mid-Hawthorn	4/16/2009 10:34	Sodium	1152	mg/L		22.4	160	
09041616-75	C-00974	Mid-Hawthorn	4/16/2009 10:34	Sulfate	456	mg/L		20		250
09032316-41	C-00976	Water-table	3/23/2009 13:44	Iron	360	ug/L	I	100		300
09032316-41	C-00976	Water-table	3/23/2009 13:44	Total Dissolved Solids	824	mg/L		2		500
08090316-26	C-00977	Lower Tamiami	9/3/2008 11:22	Lead	16.01	ug/L		0.06	15	
08090316-26	C-00977	Lower Tamiami	9/3/2008 11:22	Total Dissolved Solids	622	mg/L		2		500
09032316-39	C-00977	Lower Tamiami	3/23/2009 12:17	Total Dissolved Solids	626	mg/L		2		500
08082816-22	C-00984	Water-table	8/28/2008 12:46	Iron	1680	ug/L		100		300
09041616-76	C-00984	Water-table	4/16/2009 12:05	Iron	5100	ug/L		100		300
08082816-22	C-00984	Water-table	8/28/2008 12:46	Lead	24.76	ug/L		0.06	15	
08091516-33	C-00986	Water-table	9/15/2008 11:11	Coliform Total	17	cfu/100ml	B	1	0	
09032416-43	C-00986	Water-table	3/24/2009 13:20	Iron	770	ug/L		100		300
08082616-20	C-00989	Sandstone	8/26/2008 12:46	Total Dissolved Solids	826	mg/L		2		500
09040116-55	C-00989	Sandstone	4/1/2009 12:45	Total Dissolved Solids	762	mg/L		2		500
08082616-20	C-00989	Sandstone	8/26/2008 12:46	Sodium	220	mg/L		17	160	
09040116-55	C-00989	Sandstone	4/1/2009 12:45	Sodium	230.2	mg/L		34	160	

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Client Sample ID	Station ID	Aquifer	Date Collected	Analyte Name	Result	Result Units	Lab Qualifiers (FAC 62-160)	Detection Limit	FAC 62-550 Primary Drinking Water Standard	FAC 62-550 Secondary Drinking Water Standard
08101316-62	C-00995	Water-table	10/13/2008 12:31	Iron	420	ug/L	I	100		300
09040630-61	C-00995	Water-table	4/6/2009 14:20	Iron	330	ug/L	I	100		300
08092216-45	C-00996	Water-table	9/22/2008 14:36	Iron	2020	ug/L		100		300
09032616-48	C-00996	Water-table	3/26/2009 14:19	Iron	2640	ug/L		100		300
08092216-45	C-00996	Water-table	9/22/2008 14:36	Total Dissolved Solids	514	mg/L		2		500
09032616-48	C-00996	Water-table	3/26/2009 14:19	Total Dissolved Solids	712	mg/L		2		500
08080516-10	C-01003	Lower Tamiami	8/5/2008 10:10	Iron	3000	ug/L		100		300
09022416-13	C-01003	Lower Tamiami	2/24/2009 11:08	Iron	1860	ug/L		100		300
08100616-55	C-01055	Water-table	10/6/2008 13:22	Iron	4690	ug/L		100		300
09031916-38	C-01055	Water-table	3/19/2009 14:00	Iron	4090	ug/L		100		300
08100616-55	C-01055	Water-table	10/6/2008 13:22	Total Dissolved Solids	524	mg/L		2		500
09031916-38	C-01055	Water-table	3/19/2009 14:00	Total Dissolved Solids	548	mg/L		2		500
08072416-06	C-01058	Lower Tamiami	7/24/2008 12:22	Chloride	252	mg/L		10		250
08072416-06	C-01058	Lower Tamiami	7/24/2008 12:22	Iron	590	ug/L		100		300
08072416-06	C-01058	Lower Tamiami	7/24/2008 12:22	Total Dissolved Solids	750	mg/L		2		500
09033016-50	C-01058	Lower Tamiami	3/30/2009 11:34	Total Dissolved Solids	614	mg/L		2		500
09031916-37	C-01059	Water-table	3/19/2009 10:57	Coliform Fecal	2	cfu/100ml	B	1	0	
09031916-37	C-01059	Water-table	3/19/2009 10:57	Coliform Total	4	cfu/100ml	B	1	0	
08072416-05	C-01059	Water-table	7/24/2008 10:37	Iron	21550	ug/L		500		300
09031916-37	C-01059	Water-table	3/19/2009 10:57	Iron	5130	ug/L		200		300
08080416-07	C-01061	Water-table	8/4/2008 11:54	Coliform Total	28	cfu/100ml		1	0	
08080416-07	C-01061	Water-table	8/4/2008 11:54	Iron	1520	ug/L		100		300
09021216-09	C-01061	Water-table	2/12/2009 12:46	Iron	1650	ug/L		100		300
08080616-14	C-01073	Lower Tamiami	8/6/2008 13:26	Coliform Total	10	cfu/100ml	B	1	0	
08100216-52	C-01077	Sandstone	10/2/2008 12:04	Chloride	296	mg/L		4		250
09040916-66	C-01077	Sandstone	4/9/2009 12:17	Chloride	300	mg/L		1		250

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Client Sample ID	Station ID	Aquifer	Date Collected	Analyte Name	Result	Result Units	Lab Qualifiers (FAC 62-160)	Detection Limit	FAC 62-550 Primary Drinking Water Standard	FAC 62-550 Secondary Drinking Water Standard
08100216-52	C-01077	Sandstone	10/2/2008 12:04	Total Dissolved Solids	894	mg/L		2		500
09040916-66	C-01077	Sandstone	4/9/2009 12:17	Total Dissolved Solids	858	mg/L		2		500
09040916-66	C-01077	Sandstone	4/9/2009 12:17	Sodium	178.4	mg/L		34	160	
09040716-63	C-01078	Water-table	4/7/2009 14:01	Iron	2520	ug/L		100		300
08082116-19	C-01097	Water-table	8/21/2008 12:17	Iron	4860	ug/L		100		300
09032616-47	C-01097	Water-table	3/26/2009 12:09	Iron	4890	ug/L		100		300
09020416-03	CCN1	Water-table	2/4/2009 12:52	Coliform Total	33	cfu/100ml		1	0	
09020416-03	CCN1	Water-table	2/4/2009 12:52	Iron	460	ug/L	I	100		300
09020416-03	CCN1	Water-table	2/4/2009 12:52	Manganese	117.3	ug/L		0.12		50
08100616-54	CCN10	Water-table	10/6/2008 10:48	Iron	1590	ug/L		100		300
09021716-11	CCN10	Water-table	2/17/2009 11:19	Iron	1240	ug/L	J	100		300
08100616-54	CCN10	Water-table	10/6/2008 10:48	Total Dissolved Solids	610	mg/L		2		500
09021716-11	CCN10	Water-table	2/17/2009 11:19	Total Dissolved Solids	622	mg/L		2		500
08080516-12	CCN11	Water-table	8/5/2008 12:40	Arsenic	184.4	ug/L		0.23	10	
09020416-04	CCN11	Water-table	2/4/2009 13:56	Arsenic	237.9	ug/L		4.6	10	
08080516-12	CCN11	Water-table	8/5/2008 12:40	Chloride	348	mg/L		5		250
09020416-04	CCN11	Water-table	2/4/2009 13:56	Chloride	402	mg/L		1		250
08080516-12	CCN11	Water-table	8/5/2008 12:40	Coliform Total	4	cfu/100ml	B	1	0	
08080516-12	CCN11	Water-table	8/5/2008 12:40	Iron	3050	ug/L		100		300
09020416-04	CCN11	Water-table	2/4/2009 13:56	Iron	4090	ug/L		100		300
08080516-12	CCN11	Water-table	8/5/2008 12:40	Manganese	947	ug/l		3.9		50
09020416-04	CCN11	Water-table	2/4/2009 13:56	Manganese	922.5	ug/L		0.12		50
08080516-12	CCN11	Water-table	8/5/2008 12:40	Total Dissolved Solids	1308	mg/L		2		500
09020416-04	CCN11	Water-table	2/4/2009 13:56	Total Dissolved Solids	1726	mg/L		2		500
08080516-12	CCN11	Water-table	8/5/2008 12:40	Sodium	266	mg/L		34	160	
08080516-12	CCN11	Water-table	8/5/2008 12:40	Sulfate	319	mg/L		10		250

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09020416-04	CCN11	Water-table	2/4/2009 13:56	Sulfate	786	mg/L		20		250
09020516-06	CCN2	Water-table	2/5/2009 12:24	Iron	570	ug/L		100		300
08090416-29	CCN2	Water-table	9/4/2008 11:40	Total Dissolved Solids	610	mg/L		2		500
09020516-06	CCN2	Water-table	2/5/2009 12:24	Total Dissolved Solids	606	mg/L		2		500
09020516-06	CCN2	Water-table	2/5/2009 12:24	Sodium	181	mg/L		17	160	
09020516-05	CCN3	Water-table	2/5/2009 11:24	Iron	340	ug/L	I	100		300
08102016-68	CCN4	Water-table	10/20/2008 10:46	Arsenic	84.01	ug/L		0.23	10	
09040916-67	CCN4	Water-table	4/9/2009 14:45	Arsenic	110.7	ug/L		0.46	10	
09040916-67	CCN4	Water-table	4/9/2009 14:45	CC-Nitrate-N	16.089	mg/L		0.002	10	
08102016-68	CCN4	Water-table	10/20/2008 10:46	Chloride	391	mg/L		5		250
08102016-68	CCN4	Water-table	10/20/2008 10:46	Iron	420	ug/L	I	100		300
09040916-67	CCN4	Water-table	4/9/2009 14:45	Nitrate-Nitrite (N)	16.146	mg/L		0.002	10	
08102016-68	CCN4	Water-table	10/20/2008 10:46	Total Dissolved Solids	1294	mg/L		2		500
09040916-67	CCN4	Water-table	4/9/2009 14:45	Total Dissolved Solids	1774	mg/L		2		500
08102016-68	CCN4	Water-table	10/20/2008 10:46	Sodium	220	mg/L		17	160	
09040916-67	CCN4	Water-table	4/9/2009 14:45	Sodium	428	mg/L		68	160	
09040916-67	CCN4	Water-table	4/9/2009 14:45	Sulfate	281	mg/L		10		250
08102016-69	CCN5	Water-table	10/20/2008 12:01	Arsenic	128.2	ug/L		0.23	10	
09041316-70	CCN5	Water-table	4/13/2009 14:07	Arsenic	113.4	ug/L		0.46	10	
08102016-69	CCN5	Water-table	10/20/2008 12:01	Iron	6470	ug/L	J	100		300
09041316-70	CCN5	Water-table	4/13/2009 14:07	Iron	7900	ug/L		100		300
09041316-70	CCN5	Water-table	4/13/2009 14:07	Manganese	4623	ug/L		6		50
08102016-69	CCN5	Water-table	10/20/2008 12:01	Total Dissolved Solids	1036	mg/L		2		500
09041316-70	CCN5	Water-table	4/13/2009 14:07	Total Dissolved Solids	938	mg/L		2		500
08102016-69	CCN5	Water-table	10/20/2008 12:01	Sodium	173	mg/L		17	160	
09041316-70	CCN5	Water-table	4/13/2009 14:07	Sodium	170.4	mg/L		34	160	

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Client Sample ID	Station ID	Aquifer	Date Collected	Analyte Name	Result	Result Units	Lab Qualifiers (FAC 62-160)	Detection Limit	FAC 62-550 Primary Drinking Water Standard	FAC 62-550 Secondary Drinking Water Standard
08102016-70	CCN6	Water-table	10/20/2008 13:13	Iron	750	ug/L	J	100		300
09033016-51	CCN6	Water-table	3/30/2009 12:46	Iron	930	ug/L		100		300
08102016-70	CCN6	Water-table	10/20/2008 13:13	Total Dissolved Solids	760	mg/L		2		500
09033016-51	CCN6	Water-table	3/30/2009 12:46	Total Dissolved Solids	750	mg/L		2		500
08072116-01	CCN7	Water-table	7/21/2008 11:07	Arsenic	34.28	ug/L		0.23	10	
09020416-01	CCN7	Water-table	2/4/2009 10:36	Arsenic	33.93	ug/L		0.23	10	
08072116-01	CCN7	Water-table	7/21/2008 11:07	Iron	9390	ug/L		100		300
09020416-01	CCN7	Water-table	2/4/2009 10:36	Iron	450	ug/L	I	100		300
08072116-01	CCN7	Water-table	7/21/2008 11:07	Total Dissolved Solids	504	mg/L		2		500
08072116-01	CCN7	Water-table	7/21/2008 11:07	Sodium	202	mg/L		3.4	160	
08072116-02	CCN8	Water-table	7/21/2008 12:50	Chloride	333	mg/L		10		250
09020416-02	CCN8	Water-table	2/4/2009 12:05	Chloride	280	mg/L		5		250
08072116-02	CCN8	Water-table	7/21/2008 12:50	Iron	9660	ug/L		100		300
09020416-02	CCN8	Water-table	2/4/2009 12:05	Iron	4890	ug/L		100		300
08072116-02	CCN8	Water-table	7/21/2008 12:50	Total Dissolved Solids	1110	mg/L		2		500
09020416-02	CCN8	Water-table	2/4/2009 12:05	Total Dissolved Solids	1086	mg/L		2		500
08072116-02	CCN8	Water-table	7/21/2008 12:50	Sodium	200	mg/L		3.4	160	
09020416-02	CCN8	Water-table	2/4/2009 12:05	Sodium	176	mg/L		17	160	
09021216-10	CCS1	Water-table	2/12/2009 14:33	Iron	5000	ug/L		100		300
08080416-09	CCS1	Water-table	8/4/2008 14:06	Total Dissolved Solids	526	mg/L		2		500
08102316-75	CCS15	Water-table	10/23/2008 15:24	Iron	6190	ug/L		100		300
09040216-57	CCS15	Water-table	4/2/2009 12:17	Iron	5400	ug/L		100		300
09040216-57	CCS15	Water-table	4/2/2009 12:17	Manganese	74.68	ug/L		0.12		50
08102316-75	CCS15	Water-table	10/23/2008 15:24	Total Dissolved Solids	560	mg/L		2		500
09040216-57	CCS15	Water-table	4/2/2009 12:17	Total Dissolved Solids	582	mg/L		2		500

APPENDIX D—Third Year Exceedances

Client Sample ID	Station ID	Aquifer	Date Collected	Analyte Name	Result	Result Units	Lab Qualifiers (FAC 62-160)	Detection Limit	FAC 62-550 Primary Drinking Water Standard	FAC 62-550 Secondary Drinking Water Standard
08090216-25	CCS16	Water-table	9/2/2008 12:02	Iron	1840	ug/L		100		300
09031816-36	CCS16	Water-table	3/18/2009 14:23	Iron	1740	ug/L		100		300
08090216-25	CCS16	Water-table	9/2/2008 12:02	Total Dissolved Solids	666	mg/L		2		500
09031816-36	CCS16	Water-table	3/18/2009 14:23	Total Dissolved Solids	664	mg/L		2		500
08090216-23	CCS17	Water-table	9/2/2008 10:11	Iron	2590	ug/L		100		300
09031016-26	CCS17	Water-table	3/10/2009 13:47	Iron	500	ug/L		100		300
08090216-23	CCS17	Water-table	9/2/2008 10:11	Manganese	166	ug/l		3.9		50
08090216-23	CCS17	Water-table	9/2/2008 10:11	Total Dissolved Solids	674	mg/L		2		500
09031016-26	CCS17	Water-table	3/10/2009 13:47	Total Dissolved Solids	506	mg/L		2		500
09031016-27	CCS18	Water-table	3/10/2009 14:38	Arsenic	11.08	ug/L		0.23	10	
08081216-18	CCS18	Water-table	8/12/2008 13:58	Iron	2230	ug/L		100		300
09031016-27	CCS18	Water-table	3/10/2009 14:38	Iron	4810	ug/L		100		300
08081216-18	CCS18	Water-table	8/12/2008 13:58	Manganese	53.2	ug/l		3.9		50
09031016-27	CCS18	Water-table	3/10/2009 14:38	Manganese	65.95	ug/L		0.12		50
09031016-27	CCS18	Water-table	3/10/2009 14:38	Total Dissolved Solids	586	mg/L		2		500
08092516-51	CCS19	Water-table	9/25/2008 14:22	Iron	540	ug/L		100		300
08092216-44	CCS2	Water-table	9/22/2008 11:43	CC-Nitrate-N	100	mg/L		0.003	10	
09031216-31	CCS2	Water-table	3/12/2009 9:52	CC-Nitrate-N	14.126	mg/L		0.002	10	
08092216-44	CCS2	Water-table	9/22/2008 11:43	Manganese	368	ug/l		3.9		50
09031216-31	CCS2	Water-table	3/12/2009 9:52	Manganese	362.1	ug/L	J	1.2		50
09031216-31	CCS2	Water-table	3/12/2009 9:52	Nitrate-Nitrite (N)	14.15	mg/L		0.1	10	
08092216-44	CCS2	Water-table	9/22/2008 11:43	Total Dissolved Solids	1854	mg/L		2		500
09031216-31	CCS2	Water-table	3/12/2009 9:52	Total Dissolved Solids	1526	mg/L		2		500
08092216-44	CCS2	Water-table	9/22/2008 11:43	Sulfate	658	mg/L		20		250
09031216-31	CCS2	Water-table	3/12/2009 9:52	Sulfate	622	mg/L		20		250

APPENDIX D—Third Year Exceedances

Client Sample ID	Station ID	Aquifer	Date Collected	Analyte Name	Result	Result Units	Lab Qualifiers (FAC 62-160)	Detection Limit	FAC 62-550 Primary Drinking Water Standard	FAC 62-550 Secondary Drinking Water Standard
08081216-17	CCS20	Water-table	8/12/2008 12:27	Arsenic	16.08	ug/L		0.23	10	
08081216-17	CCS20	Water-table	8/12/2008 12:27	Manganese	136	ug/l		3.9		50
09020516-07	CCS20	Water-table	2/5/2009 14:22	Manganese	63.65	ug/L		0.12		50
08081216-17	CCS20	Water-table	8/12/2008 12:27	Total Dissolved Solids	586	mg/L		2		500
08092216-43	CCS3	Water-table	9/22/2008 10:22	Arsenic	13.97	ug/L		0.23	10	
08092216-43	CCS3	Water-table	9/22/2008 10:22	Coliform Fecal	4	cfu/100ml	B	1	0	
08092216-43	CCS3	Water-table	9/22/2008 10:22	Iron	440	ug/L	I	100		300
09031216-33	CCS3	Water-table	3/12/2009 11:13	Iron	370	ug/L	I	100		300
08092216-43	CCS3	Water-table	9/22/2008 10:22	Total Dissolved Solids	554	mg/L		2		500
09031216-33	CCS3	Water-table	3/12/2009 11:13	Total Dissolved Solids	504	mg/L		2		500
08072316-03	CCS4	Water-table	7/23/2008 9:35	Arsenic	12.71	ug/L		0.23	10	
09032516-44	CCS4	Water-table	3/25/2009 10:36	Arsenic	13.07	ug/L		0.23	10	
08072316-03	CCS4	Water-table	7/23/2008 9:35	Iron	670	ug/L		100		300
09032516-44	CCS4	Water-table	3/25/2009 10:36	Iron	490	ug/L	I	100		300
08072316-03	CCS4	Water-table	7/23/2008 9:35	Total Dissolved Solids	658	mg/L		2		500
09032516-44	CCS4	Water-table	3/25/2009 10:36	Total Dissolved Solids	586	mg/L		2		500
08090416-30	CCS5	Water-table	9/4/2008 13:56	Arsenic	27.88	ug/L		0.23	10	
09032516-46	CCS5	Water-table	3/25/2009 12:29	Arsenic	22.38	ug/L		0.23	10	
09032516-46	CCS5	Water-table	3/25/2009 12:29	Chloride	417	mg/L		1		250
09032516-46	CCS5	Water-table	3/25/2009 12:29	Iron	500	ug/L		100		300
08090416-30	CCS5	Water-table	9/4/2008 13:56	Total Dissolved Solids	980	mg/L		2		500
09032516-46	CCS5	Water-table	3/25/2009 12:29	Total Dissolved Solids	1544	mg/L		2		500
09032516-46	CCS5	Water-table	3/25/2009 12:29	Sodium	296.8	mg/L		34	160	
09032516-46	CCS5	Water-table	3/25/2009 12:29	Sulfate	375	mg/L		10		250
08072316-04	CCS6	Water-table	7/23/2008 10:52	Chloride	304	mg/L		10		250
08072316-04	CCS6	Water-table	7/23/2008 10:52	Iron	930	ug/L		100		300

APPENDIX D—Third Year Exceedances

Client Sample ID	Station ID	Aquifer	Date Collected	Analyte Name	Result	Result Units	Lab Qualifiers (FAC 62-160)	Detection Limit	FAC 62-550 Primary Drinking Water Standard	FAC 62-550 Secondary Drinking Water Standard
09032516-45	CCS6	Water-table	3/25/2009 11:39	Iron	1360	ug/L		100		300
08072316-04	CCS6	Water-table	7/23/2008 10:52	Total Dissolved Solids	1458	mg/L		2		500
09032516-45	CCS6	Water-table	3/25/2009 11:39	Total Dissolved Solids	824	mg/L		2		500
08072316-04	CCS6	Water-table	7/23/2008 10:52	Sodium	285	mg/L		8.5	160	
09032516-45	CCS6	Water-table	3/25/2009 11:39	Sodium	184	mg/L		2.24	160	
08091616-34	MW-1	Water-table	9/16/2008 10:25	Iron	3500	ug/L		100		300
09030916-25	MW-1	Water-table	3/9/2009 11:08	Iron	3410	ug/L		100		300
08091616-34	MW-1	Water-table	9/16/2008 10:25	Total Dissolved Solids	556	mg/L		2		500
09030916-25	MW-1	Water-table	3/9/2009 11:08	Total Dissolved Solids	546	mg/L		2		500
08091716-39	MW-10	Water-table	9/17/2008 14:21	Arsenic	62.29	ug/L		0.23	10	
09030516-22	MW-10	Water-table	3/5/2009 11:44	Arsenic	54.39	ug/L		0.23	10	
08091716-39	MW-10	Water-table	9/17/2008 14:21	Chloride	606	mg/L		10		250
09030516-22	MW-10	Water-table	3/5/2009 11:44	Chloride	501	mg/L		1		250
08091716-39	MW-10	Water-table	9/17/2008 14:21	Total Dissolved Solids	1612	mg/L		2		500
09030516-22	MW-10	Water-table	3/5/2009 11:44	Total Dissolved Solids	1604	mg/L		2		500
08091716-39	MW-10	Water-table	9/17/2008 14:21	Sodium	255	mg/L		17	160	
09030516-22	MW-10	Water-table	3/5/2009 11:44	Sodium	313	mg/L		34	160	
08091816-41	MW-11	Water-table	9/18/2008 13:06	Arsenic	206.3	ug/L		0.23	10	
09030516-21	MW-11	Water-table	3/5/2009 10:35	Arsenic	33.5	ug/L		0.23	10	
09030516-21	MW-11	Water-table	3/5/2009 10:35	Chloride	366	mg/L		1		250
09030516-21	MW-11	Water-table	3/5/2009 10:35	Coliform Total	16	cfu/100ml	B	1	0	
08091816-41	MW-11	Water-table	9/18/2008 13:06	Total Dissolved Solids	1840	mg/L		2		500
09030516-21	MW-11	Water-table	3/5/2009 10:35	Total Dissolved Solids	1204	mg/L		2		500
08091816-41	MW-11	Water-table	9/18/2008 13:06	Sodium	284	mg/L	J	34	160	
09030516-21	MW-11	Water-table	3/5/2009 10:35	Sodium	224.6	mg/L		34	160	

APPENDIX D—Third Year Exceedances

Client Sample ID	Station ID	Aquifer	Date Collected	Analyte Name	Result	Result Units	Lab Qualifiers (FAC 62-160)	Detection Limit	FAC 62-550 Primary Drinking Water Standard	FAC 62-550 Secondary Drinking Water Standard
08091816-41	MW-11	Water-table	9/18/2008 13:06	Sulfate	308	mg/L		10		250
08102116-73	MW-2	Water-table	10/21/2008 15:29	Iron	1900	ug/L	J	100		300
09031116-30	MW-2	Water-table	3/11/2009 12:22	Iron	1270	ug/L		100		300
08102116-73	MW-2	Water-table	10/21/2008 15:29	Total Dissolved Solids	1052	mg/L		2		500
09031116-30	MW-2	Water-table	3/11/2009 12:22	Total Dissolved Solids	516	mg/L		2		500
08091616-35	MW-4	Water-table	9/16/2008 12:28	Chloride	266	mg/L		5		250
09030416-20	MW-4	Water-table	3/4/2009 14:06	Chloride	370	mg/L		1		250
08091616-35	MW-4	Water-table	9/16/2008 12:28	Iron	390	ug/L	I	100		300
09030416-20	MW-4	Water-table	3/4/2009 14:06	Iron	520	ug/L		100		300
08091616-35	MW-4	Water-table	9/16/2008 12:28	Total Dissolved Solids	992	mg/L		2		500
09030416-20	MW-4	Water-table	3/4/2009 14:06	Total Dissolved Solids	1200	mg/L		2		500
08091616-36	MW-5(S)	Water-table	9/16/2008 14:32	Arsenic	22.41	ug/L		0.23	10	
08091616-36	MW-5(S)	Water-table	9/16/2008 14:32	Chloride	495	mg/L		5		250
08091616-36	MW-5(S)	Water-table	9/16/2008 14:32	Total Dissolved Solids	1340	mg/L		2		500
08091616-36	MW-5(S)	Water-table	9/16/2008 14:32	Sodium	272	mg/L		34	160	
09030516-23	MW-5(S)	Water-table	3/5/2009 13:12	Arsenic	26.24	ug/L		0.23	10	
09030516-23	MW-5(S)	Water-table	3/5/2009 13:12	Chloride	398	mg/L		1		250
09030516-23	MW-5(S)	Water-table	3/5/2009 13:12	Total Dissolved Solids	1088	mg/L		2		500
09030516-23	MW-5(S)	Water-table	3/5/2009 13:12	Sodium	254.6	mg/L		34	160	
09031816-34	MW-6	Water-table	3/18/2009 10:38	Arsenic	22.62	ug/L		0.23	10	
09031816-34	MW-6	Water-table	3/18/2009 10:38	Chloride	511	mg/L		1		250
09031816-34	MW-6	Water-table	3/18/2009 10:38	Iron	4480	ug/L		100		300
09031816-34	MW-6	Water-table	3/18/2009 10:38	Total Dissolved Solids	1538	mg/L		2		500
09031816-34	MW-6	Water-table	3/18/2009 10:38	Sodium	261.8	mg/L		34	160	
08091716-37	MW-6	Water-table	9/17/2008 10:41	Arsenic	34.6	ug/L		0.23	10	
08091716-37	MW-6	Water-table	9/17/2008 10:41	Chloride	572	mg/L		5		250

APPENDIX D—Third Year Exceedances

Client Sample ID	Station ID	Aquifer	Date Collected	Analyte Name	Result	Result Units	Lab Qualifiers (FAC 62-160)	Detection Limit	FAC 62-550 Primary Drinking Water Standard	FAC 62-550 Secondary Drinking Water Standard
08091716-37	MW-6	Water-table	9/17/2008 10:41	Iron	4230	ug/L		100		300
08091716-37	MW-6	Water-table	9/17/2008 10:41	Total Dissolved Solids	1545	mg/L		2		500
08091716-37	MW-6	Water-table	9/17/2008 10:41	Sodium	243	mg/L		17	160	
08091716-38	MW-7	Water-table	9/17/2008 12:17	Arsenic	52.31	ug/L		0.23	10	
09030416-19	MW-7	Water-table	3/4/2009 13:01	Arsenic	39.71	ug/L		0.23	10	
08091716-38	MW-7	Water-table	9/17/2008 12:17	Chloride	385	mg/L		5		250
09030416-19	MW-7	Water-table	3/4/2009 13:01	Chloride	414	mg/L		1		250
08091716-38	MW-7	Water-table	9/17/2008 12:17	Iron	2400	ug/L		100		300
09030416-19	MW-7	Water-table	3/4/2009 13:01	Iron	2970	ug/L		100		300
08091716-38	MW-7	Water-table	9/17/2008 12:17	Total Dissolved Solids	1322	mg/L		2		500
09030416-19	MW-7	Water-table	3/4/2009 13:01	Total Dissolved Solids	1368	mg/L		2		500
08091716-38	MW-7	Water-table	9/17/2008 12:17	Sodium	210	mg/L		17	160	
09030416-19	MW-7	Water-table	3/4/2009 13:01	Sodium	192	mg/L		17	160	
09031816-35	MW-9	Water-table	3/18/2009 12:33	Arsenic	29.96	ug/L		0.23	10	
08091816-42	MW-9	Water-table	9/18/2008 14:52	Coliform Total	2	cfu/100ml	B	1	0	
09031816-35	MW-9	Water-table	3/18/2009 12:33	Coliform Total	80	cfu/100ml		1	0	
08091816-42	MW-9	Water-table	9/18/2008 14:52	Total Dissolved Solids	688	mg/L		2		500
09031816-35	MW-9	Water-table	3/18/2009 12:33	Total Dissolved Solids	726	mg/L		2		500
08100916-58	PBI3	Water-table	10/9/2008 10:04	Chloride	254	mg/L		10		250
09030316-17	PBI3	Water-table	3/3/2009 11:24	Chloride	253	mg/L		1		250
08100916-58	PBI3	Water-table	10/9/2008 10:04	Total Dissolved Solids	748	mg/L		2		500
09030316-17	PBI3	Water-table	3/3/2009 11:24	Total Dissolved Solids	790	mg/L		2		500
08100916-58	PBI3	Water-table	10/9/2008 10:04	Sodium	168	mg/L		17	160	
08100916-59	PBI4	Water-table	10/9/2008 11:11	Arsenic	17.12	ug/L		0.23	10	
09031116-29	PBI4	Water-table	3/11/2009 11:12	Chloride	271	mg/L		1		250

APPENDIX D—Third Year Exceedances

Client Sample ID	Station ID	Aquifer	Date Collected	Analyte Name	Result	Result Units	Lab Qualifiers (FAC 62-160)	Detection Limit	FAC 62-550 Primary Drinking Water Standard	FAC 62-550 Secondary Drinking Water Standard
08100916-59	PBI4	Water-table	10/9/2008 11:11	Total Dissolved Solids	688	mg/L		2		500
09031116-29	PBI4	Water-table	3/11/2009 11:12	Total Dissolved Solids	758	mg/L		2		500
08100916-59	PBI4	Water-table	10/9/2008 11:11	Sodium	192	mg/L		17	160	
09031116-29	PBI4	Water-table	3/11/2009 11:12	Sodium	199.8	mg/L		17	160	
08092316-46	PBI5	Water-table	9/23/2008 10:06	Iron	9770	ug/L		100		300
09030316-15	PBI5	Water-table	3/3/2009 10:23	Iron	6580	ug/L		200		300
08092316-46	PBI5	Water-table	9/23/2008 10:06	Total Dissolved Solids	720	mg/L		2		500
09030316-15	PBI5	Water-table	3/3/2009 10:23	Total Dissolved Solids	732	mg/L		2		500
09022416-14	PBI6	Water-table	2/24/2009 12:17	Iron	770	ug/L		100		300
08100916-60	PBI6	Water-table	10/9/2008 12:14	Total Dissolved Solids	762	mg/L		2		500
09022416-14	PBI6	Water-table	2/24/2009 12:17	Total Dissolved Solids	940	mg/L		2		500
08100916-60	PBI6	Water-table	10/9/2008 12:14	Sodium	177	mg/L		17	160	
09022416-14	PBI6	Water-table	2/24/2009 12:17	Sodium	219	mg/L		17	160	
08092516-50	PBI7	Water-table	9/25/2008 11:20	Iron	5000	ug/L		100		300
08092516-50	PBI7	Water-table	9/25/2008 11:20	Total Dissolved Solids	590	mg/L		2		500
09030416-18	PBI7	Water-table	3/4/2009 11:20	Total Dissolved Solids	562	mg/L		2		500

APPENDIX E—Pesticides Found

Client Sample ID	Station ID	Aquifer	Date Collected	Analyte Name	Result	Result Units	Lab Qualifiers	Detection Limit	FAC 62-550 Primary Drinking Water Standard	EPA Unreg. Contaminant (Yes/No)
08092216-45	C-00996	Water-table	9/22/2008 14:36	Endrin aldehyde	0.0011	ug/l	I	0.0005	2*	No
08092216-45	C-00996	Water-table	9/22/2008 14:36	Heptachlor	0.0011	ug/l	I	0.0004	0.4	No
08102016-70	CCN6	Water-table	10/20/2008 13:13	g-BHC (Lindane)	0.000774	ug/L	I	0.000563	0.2	No
08091716-38	MW-7	Water-table	9/17/2008 12:17	Heptachlor epoxide	0.0008	ug/l	I	0.0003	0.4	No

* Primary Drinking water standard is for Endrin