

# **Groundwater Monitoring Plan Southeast County Landfill and Capacity Expansion Area Hillsborough County, Florida**



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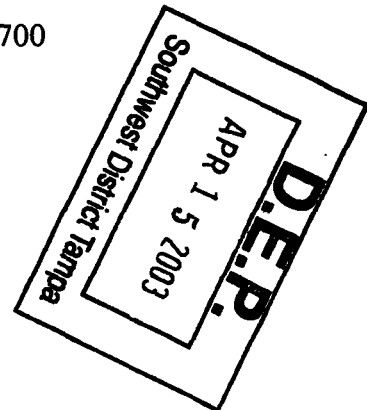
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**GROUNDWATER MONITORING PLAN  
SOUTHEAST COUNTY LANDFILL  
AND CAPACITY EXPANSION AREA  
HILLSBOROUGH COUNTY, FLORIDA**

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## **SECTION 1**

### **INTRODUCTION**

#### **BACKGROUND**

The current Florida Department of Environmental Protection (FDEP) permit (Permit Number 35435-006-SO) to operate the Hillsborough County Southeast County Landfill (SCLF) (see Figure 1-1) was issued to the Hillsborough County Solid Waste Management Department (SWMD) on June 25, 2002. The permit expires June 20, 2007 and is referred to in this document as the “current operations permit”.

The required components of the Groundwater Monitoring Plan (GWMP) are included in Specific Condition Nos. 29, 30, and 34-42 of the current operations permit. This GWMP addresses the current operations permit requirements and the results of the evaluation of the groundwater flow on the eastern portion of the SCLF.

#### **REQUIREMENTS OF F.A.C. 62-701.510(9)(b)**

The requirements of F.A.C. 62-701.510(9)(b) include the following items that, at a minimum, must be included in the evaluation:

1. Tabular and graphical displays of any data which show that a monitoring parameter has been detected, including hydrographs for all monitoring wells.
2. Trend analyses of any monitoring parameters detected.
3. Comparisons among shallow, middle, and deep zone wells.
4. Comparisons between upgradient and downgradient wells.
5. Correlations between related parameters such as total dissolved solids and specific conductance.
6. Discussion of erratic and/or poorly correlated data.
7. An interpretation of the groundwater contour maps, including an evaluation of groundwater flow rates.
8. An evaluation of the adequacy of the water quality monitoring frequency and sampling locations based upon site conditions.

The following sections of this evaluation report address each of the above requirements, although not necessarily in the order listed. The evaluation includes groundwater and surface water data and findings from February 1996 to August 2000, and available water level data from 2001. The final section of this report is an assessment of the effectiveness of the existing landfill design and operation as related to the prevention of groundwater contamination.

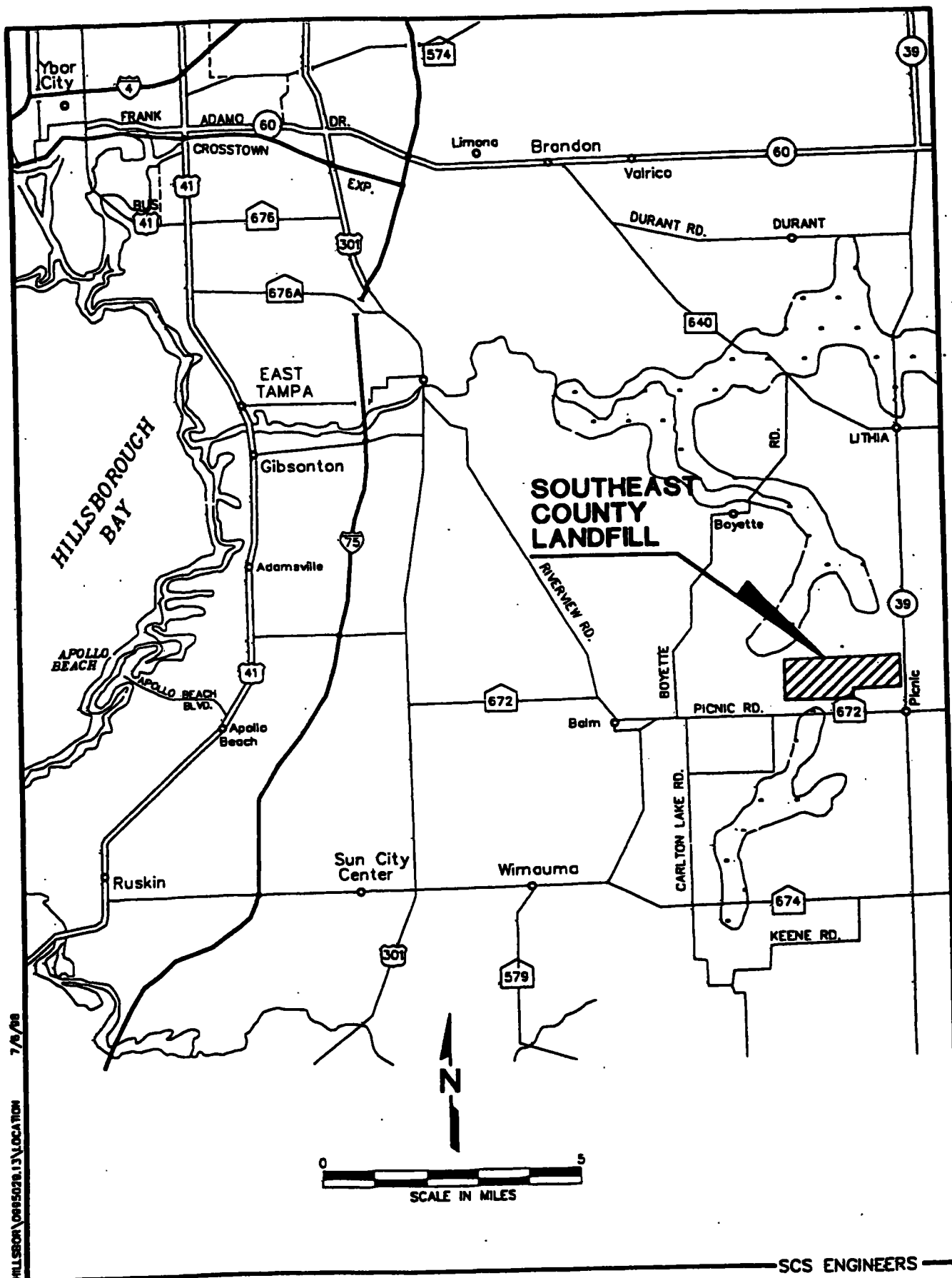


Figure 1-1. Location of the Southeast County Landfill, Hillsborough County, Florida.

## SECTION 2

### SUMMARY OF THE GROUNDWATER AND SURFACE WATER MONITORING PROGRAM

Water quality monitoring at the SCLF is conducted at several groundwater and surface water sites. The following summarizes the monitoring described in the current operations permit, which addresses Phases I-VI, as well as the monitoring for the Section 7 of the Capacity Expansion Area.

#### GROUNDWATER MONITORING

##### Groundwater Monitoring Wells, Phases I-VI

The current operations permit establishes the groundwater-monitoring program for Phases I-VI. The program consists of the monitoring wells as noted in Table 2-1a (see Figure 2-1 for locations of the wells) with the indicated purpose. TH-38B will become inactive as a background well but will remain in the monitoring system for collection of water level data. TH-66 as noted in Table 2-1a is currently piezometer (P-10D), but will be converted to a detection well. TH-65 and TH-67 will be constructed, also as detection wells for Phase II.

**TABLE 2-1a. GROUNDWATER MONITORING WELLS AT  
SOUTHEAST COUNTY LANDFILL (PHASES I-VI) AND AQUIFER MONITORED**

Well Number	Aquifer Monitored	Purpose
TH-19	Floridan	Background
TH-40	Floridan	Detection/ Compliance
TH-22A	Surficial	Background
TH-38B	Surficial	Inactive
TH-28A	Surficial	Detection

Well Number	Aquifer Monitored	Purpose
TH-57	Surficial	Detection
TH-58	Surficial	Detection
TH-65	Surficial	Detection
TH-66	Surficial	Detection
TH-67	Surficial	Detection

Note: See Table 2-2 for construction characteristics.

#### **Groundwater Monitoring Wells, Capacity Expansion Area, Section 7**

The operations permit for Section 7 will establish the groundwater-monitoring program for Section 7 and activate the program for the Capacity Expansion Area. The proposed program for Section 7 consists of the monitoring wells as noted in Table 2-1b (see Figure 2-1 for locations of the wells) with the indicated purpose. Piezometer P-9D will be converted to an east detection well, TH-61. Other detection wells, TH-59, TH-60 and TH-64, will be constructed.

**TABLE 2-1b. GROUNDWATER MONITORING WELLS FOR  
THE CAPACITY EXPANSION AREA**

Well Number	Aquifer Monitored	Purpose
TH-36A	Surficial	Background
TH-61 <sup>1</sup>	Surficial	East Detection
TH-64 <sup>2</sup>	Surficial	East Detection
TH-59 <sup>2</sup>	Surficial	West Detection
TH-60	Surficial	West Detection

**Notes:**

1. Piezometer P-9D re-designated as TH-61.
2. TH-59, TH-60 and TH-64 to be constructed.
3. See Table 2-2 for construction characteristics.

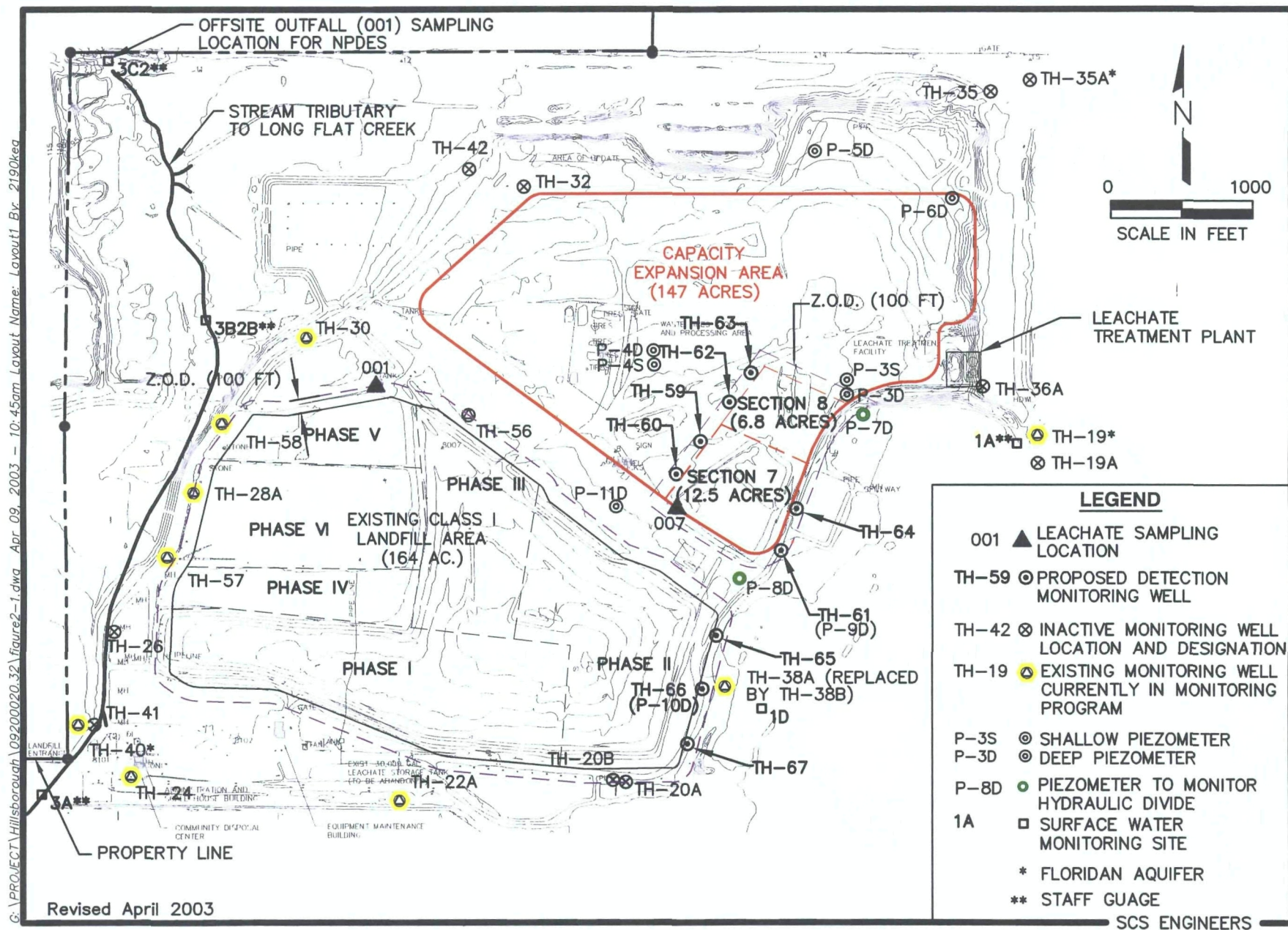


Figure 2-1. Location of Monitoring Wells, Piezometers, and Surface Water Sampling Points  
Southeast County Facility, Hillsborough County, Florida

The monitoring program for the SCLF will include three background wells and eleven detection wells. As noted in the tables above, Phases I-VI includes two background wells and seven detection wells. Section 7 includes one background well and four detection wells. There is one Floridan aquifer background monitoring well (TH-19) and one Floridan detection well (TH-40) for Phases I-VI. Additionally, for Phases I-VI there is one surficial aquifer background well (TH-22A) and six surficial aquifer detection wells (TH-28A, TH-57, TH-58, TH-65, TH-66, and TH-67). The proposed surficial aquifer background well for Section 7 at the Capacity Expansion area is TH-36A. Four surficial aquifer detection wells will be constructed to monitor Section 7. TH-61(P-9D) and TH-64 will be located on the east side and TH-59 and TH-60 will be located on the west side. There are no intermediate aquifer (permeable beds of the Hawthorn Group) monitoring wells because the aquifer is not present at the site (Ardaman 1983, p. 4-3).

Table 2-2 lists monitoring well construction characteristics of these wells. The typical well construction characteristics for those wells yet to be constructed (TH-59, TH-60, TH-64, TH-65, and TH-67) also are listed in Table 2-2. Typical construction is shown on Figure M-2 of the Engineering Report.

### **Groundwater Quality Parameters**

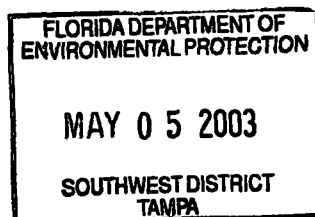
The current permit requires semi-annual sampling of the background and detection wells for the field and laboratory parameters listed below.

#### **Field Parameters**

- Static water level before purging
- Specific conductivity
- pH
- Dissolved oxygen
- Turbidity
- Temperature
- Color and sheens by observation

#### **Laboratory Parameters (Unfiltered)**

- Total ammonia-nitrogen
- Chlorides
- Iron
- Mercury



The monitoring program for the SCLF will include three background wells and eleven detection wells. As noted in the tables above, Phases I-VI includes two background wells and seven detection wells. Section 7 includes one background well and four detection wells. There is one Floridan aquifer background monitoring well (TH-19) and one Floridan detection well (TH-40) for Phases I-VI. Additionally, for Phases I-VI there is one surficial aquifer background well (TH-22A) and six surficial aquifer detection wells (TH-28A, TH-57, TH-58, TH-65, TH-66, and TH-67). The proposed surficial aquifer background well for Section 7 at the Capacity Expansion area is TH-36A. Four surficial aquifer detection wells will be constructed to monitor Section 7. TH-61(P-9D) and TH-64 will be located on the east side and TH-59 and TH-60 will be located on the west side. There are no intermediate aquifer (permeable beds of the Hawthorn Group) monitoring wells because the aquifer is not present at the site (Ardaman 1983, p. 4-3).

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#### **Groundwater Quality Parameters**

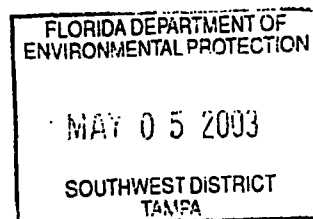
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#### **Field Parameters**

- Static water level before purging
- Specific conductivity
- pH
- Dissolved oxygen
- Turbidity
- Temperature
- Color and sheens by observation

#### **Laboratory Parameters (Unfiltered)**

- Total ammonia-nitrogen
- Chlorides
- Iron
- Mercury



- Nitrate
- Sodium
- Total dissolved solids (TDS)
- Parameters listed in 40 CFR (Code of Federal Regulations) Part 258, Appendix I

## **SURFACE WATER MONITORING SITES AND PARAMETERS**

The surface water monitoring sites include one site in Smith Lake (1D) along the eastern boundary of the landfill and three sites in or contributing to Long Flat Creek (3A, 3B2B, and 3C2) along the western boundary of the landfill. These sampling sites are listed in Table 2-3 and shown on Figure 2-1.

**TABLE 2-2. MONITORING WELL CHARACTERISTICS SUMMARY  
SOUTHEAST COUNTY LANDFILL**

Well No.	Purpose	Aquifer Monitored <sup>1</sup>	Appx Elevation at Well <sup>2</sup> Ft., NGVD	Top of Screen or Open Hole		Length Of Screen Or Open Hole, Ft	Total Depth		MP <sup>5</sup>	MP Elev Ft, NGVD	Construction Date	Last Survey Date	Historical Water Level	
				Ft, BLS <sup>3</sup>	Ft, NGVD <sup>4</sup>		Ft, BLS	Ft, NGVD					High (Ft. NGVD)	Low
TH-19	Background	Floridan	127.50	146.0	-18.68	5	151.0	-23.68	TPVC <sup>6</sup>	130.05	12/82	3/97		
TH-22A	Background	Surficial	126	2	124	10	12	114 <sup>11</sup>	TPVC	TBD <sup>10</sup>	10-01-02	TBD	125.22 <sup>12</sup>	122.20 <sup>12</sup>
TH-28A	Detection	Surficial	128	18	110	10	28	100 <sup>11</sup>	TPVC	TBD	9-30-02	TBD	107.84 <sup>13</sup>	102.88 <sup>13</sup>
TH-38B	Inactive	Surficial	128	2	126	10	12	116 <sup>11</sup>	TPVC	TBD	TBD	TBD	123.59 <sup>14</sup>	118.74 <sup>14</sup>
TH-36A	Background	Surficial	150.08	26	124.08	10	36	114.08	TPVC	152.70	7-11-97	TBD	121.81	118.22
TH-40	Detection	Floridan	122.05	158.0	-35.70	5	163.0	-40.7	TPVC	124.77	12/82	3/97	45.65	-14.07
TH-57	Detection	Surficial	ND <sup>7</sup>	14	111.09	10	24	101.09	TPVC	128.09	12/82	3/97	109.64	107.19
TH-58	Detection	Surficial	ND	18	109.67	10	28	99.67	TPVC	127.67	12/82	3/97	100.17	99.12
TH-59 <sup>9</sup>	Detection	Surficial	138	13	125	10	23	115 <sup>11</sup>	TPVC	TBD	TBD	TBD	123.15 <sup>16</sup>	117.15 <sup>16</sup>
TH-60 <sup>9</sup>	Detection	Surficial	137	12	125	10	22	115 <sup>11</sup>	TPVC	TBD	TBD	TBD	123.15 <sup>16</sup>	117.15 <sup>16</sup>
TH-61 <sup>15</sup>	Detection	Surficial	135	12	125	10	22	115 <sup>11</sup>	TPVC	138.25	TBD	TBD	123.15 <sup>16</sup>	117.15 <sup>16</sup>
TH-62	Well designation is reserved for future use at the Capacity Expansion Area, Section 8													
TH-63	Well designation is reserved for future use at the Capacity Expansion Area, Section 8													
TH-64 <sup>9</sup>	Detection	Surficial	135	12	125	10	22	115 <sup>11</sup>	TPVC	TBD	TBD	TBD	123.15 <sup>16</sup>	117.15 <sup>16</sup>
TH-65 <sup>9</sup>	Detection	Surficial	135	TBD	TBD	10	TBD	115 <sup>11</sup>	TBD	TBD	TBD	TBD	123.40 <sup>17</sup>	118.74 <sup>17</sup>
TH-66 <sup>18</sup>	Detection	Surficial	127	TBD	TBD	10	TBD	115 <sup>11</sup>	TPVC	130.06	TBD	TBD	123.40 <sup>17</sup>	118.74 <sup>17</sup>
TH-67 <sup>9</sup>	Detection	Surficial	127	TBD	TBD	10	TBD	115 <sup>11</sup>	TBD	TBD	TBD	TBD	123.40 <sup>17</sup>	118.74 <sup>17</sup>

Data from Hillsborough County Solid Waste Management Department

TABLE 2-2 REVISED (Continued)

Notes:	
1	Aquifer from which the well is deriving its water.
2.	Elevation of brass disk set in concrete pad.
3.	Below land surface
4.	National Geodetic Vertical Datum of 1929.
5.	Measuring point
6.	Top of PVC Casing
7	ND: No data
8.	TH-38 drilled in 1982 and replaced by TH-38A in 1987.
9.	To be constructed
10.	TBD - to be determined.
11.	More precise elevations will be listed following well construction and surveying.
12.	Historical high or low for TH-22 (August 1997 - August 2002)
13.	Historical high or low for TH-28 (August 1997 - August 2002)
14.	Historical high or low for TH-38A (August 1997 - November 2002)
15.	P-9D redesignated as TH-61
16.	Estimated based on January 2001-November 2002 measurements at P-2D and P-9D
17.	Estimated based on January 2002-November 2002 measurements at TH-38A and March 2002-November 2002 measurements at P-10D.
18.	P-10D redesignated as TH-66

These sites are sampled every six months for the following parameters:

**Field Parameters**

- Specific Conductivity
- pH
- Dissolved Oxygen
- Turbidity
- Temperature
- Colors and Sheens (by observation)

**Laboratory Parameters**

- Unionized Ammonia
- Total Hardness
- Biochemical Oxygen Demand (BOD<sub>5</sub>)
- Copper
- Iron
- Mercury
- Nitrate
- Zinc
- Total Dissolved Solids (TDS)
- Total Organic Carbon (TOC)
- Fecal Coliform
- Total Phosphates
- Chlorophyll A
- Total Nitrogen
- Chemical Oxygen Demand (COD)
- Total Suspended Solids (TSS)
- Parameters listed in 40 CFR Part 258, Appendix I

Staff gages are located at sites 3A, 3B2B, 3C2, and site 1A (Smith Lake). Lake and creek levels are read and recorded at each staff gage during each sampling event.

**TABLE 2-3. SURFACE WATER MONITORING SITE CHARACTERISTICS SUMMARY  
SOUTHEAST COUNTY LANDFILL**

Site No.	Site Description	Date Established	Date Staff Gauge Installed	Elevation Correlation <sup>1</sup>	Last Survey Date
3A	Long Flat Creek South	12/82	10/93	3.00 ft = 125.00 ft NGVD <sup>2</sup>	10/96
3B2B	Long Flat Creek Central	12/82	10/93	3.00 ft = 97.63 ft NGVD	10/96
3C2	Long Flat Creek North	12/82	10/93	3.00 ft = 91.99 ft NGVD	10/96
1A	Smith Lake Elevation	12/82	10/93	6.00 ft = 124.73 ft NGVD	10/96
S.L. 1-D	Smith Lake, Sample Only	12/82	N/A	N/A	N/A

Source: Data from Hillsborough County Solid Waste Management Department

Notes:

1. Elevation Correlation = Staff gage reading - surveyed elevation in feet NGVD at the indicated gage value
2. National Geodetic Vertical Datum of 1929.
3. Not Applicable

Revised April 2003

The following describes the methods used at each Smith Lake sampling location for collecting composite and individual samples.

**Staff Gage:** measurements are made at near site 1-B.

**Conductivity:** measurements are made at each site and the values averaged.

**pH:** measurements are made at each site and the values averaged.

**TDS:** samples are composited in the field.

**TSS:** samples are composited in the field.

**Temperature:** measurements are made at each site and the values averaged.

**Turbidity:** measurements are made at each site and the values averaged.

**Nitrate:** samples are composited in the field.

**Dissolved Oxygen:** measurement are made at each site and values averaged.

**Total Phosphorus:** samples are composited in the field.

**Biochemical Oxygen Demand:** samples are composited in the field.

**Chemical Oxygen Demand:** samples are composited in the field.

**Chlorophyll A:** samples are composited in the field.

**Total Hardness:** samples are composited in the field.

**Fecal Coliform:** samples are collected at each site and analyzed individually.

**40 CFR Part 258 Appendix I:** samples are collected at each site and analyzed individually.

## **SECTION 3**

### **WATER QUALITY MONITORING DATA FINDINGS**

Water quality data collection at the SCLF includes groundwater and surface water sites. This section summarizes these data for the period of 1996 to 2000.

#### **GROUNDWATER**

Groundwater monitoring data includes results from surficial and Floridan aquifer monitoring wells. These findings are presented below.

##### **Surficial Aquifer**

Appendix A includes tables of water quality data for groundwater-monitoring data compiled by Hillsborough County from laboratory analyses from February 1996 to August 2000. The tables include the values above detection limits for the FDEP drinking water standards as listed in F.A.C. Chapter 62-550. The tables also include guidance concentrations and groundwater cleanup target levels for parameters that do not have primary or secondary drinking water standards. Guidance concentrations are listed through the February 1999 data set. Beginning with the August 1999 data set, groundwater cleanup target levels are listed that reflect promulgation of Chapter 62-777, F.A.C.

##### **Regulatory Exceedances—**

The data listed on the tables have been highlighted when they exceed either their respective primary or secondary drinking water standard or their groundwater cleanup target level. Review of the highlighted data indicates that constituents in excess of drinking water standards include only pH and iron and these exceedances have occurred in the background as well as detection monitoring wells. Historically, no other constituents have exceeded primary and secondary drinking water standards or guidance concentrations.

The 1998 groundwater monitoring plan biennial evaluation indicated the presence of ammonia in groundwater at the site and drew attention to the presence of ammonia at relatively higher concentrations in the background well, TH-38A. However, prior to 1999, there was no regulatory groundwater standard for ammonia, either a drinking water standard or guidance standard and, consequently, the occurrence of ammonia in TH-38A has not been previously assessed. As of August 1999, with the promulgation of Chapter 62-777, F.A.C., there is now a groundwater cleanup target level for ammonia (2.8 mg/l) and this target level is less than the ammonia concentrations occurring at TH-38A during 1995 to 2000.

In early 1987, TH-38A replaced TH-38, which was destroyed during road construction activities. No historical ammonia data are available for TH-38. The initial sampling

parameters for the TH-38A did not include ammonia, but total kjeldahl nitrogen (TKN) results were 8.32 and 9.84 mg/l in May and August 1987, respectively. Because organic nitrogen concentrations typically are small in the surficial aquifer sands, it can be assumed that the TKN values are representative of the ammonia. Consequently, ammonia concentrations at TH-38A have been in excess of the groundwater cleanup target level since its construction. However, the source of the ammonia is not thought to be related to landfill operations for several reasons:

- Other leachate indicator parameters such as chloride, sodium, and TDS are not elevated at the well.
- Chloride concentrations are relatively low in TH-38A than in the other monitoring wells.
- The landfill cell closest to the well site (Phase II) was not completed until after the well was constructed and the ammonia was first detected.

#### **Trends--**

Appendix B includes figures that show graphs of pH, iron, and ammonia concentrations in surficial aquifer monitoring wells over time (Figures B-1, B-2, and B-3, respectively).

**pH trends--** Figure B-1 indicates pH concentrations occur in all six surficial aquifer monitoring wells, including the background monitoring wells at concentrations below the lower MCL limit for pH. There are no apparent increasing or decreasing trends in the concentrations occurring at any of the wells.

**Iron trends--** Figure B-2 shows iron concentrations in all surficial aquifer monitoring wells and indicates the difference in concentrations in TH-38A and TH-58 relative to the other monitoring wells. TH-38A is a background monitoring well while TH-58 is a detection well located hydraulically down gradient from the landfill. Both these surficial aquifer monitoring wells indicate groundwater at the wells contains substantially higher concentrations of iron than the other monitoring wells, either hydraulically down gradient (TH-57, TH-28, TH-30) or at background monitoring well (TH-22) from the landfill. Close inspection of Figure B-2 iron concentrations in TH-38A indicate they may be decreasing slightly over time while iron concentrations in TH-28 may be increasing over time.

**Ammonia trends--** Figure B-3 shows ammonia concentrations in all surficial aquifer monitoring wells and indicates the presence of relatively higher concentrations of ammonia in background monitoring well TH-38A as compared with the surficial aquifer detection monitoring wells. There do not appear to be any trends in the concentrations of ammonia in the surficial aquifer monitoring wells although concentrations in TH-38A are very erratic.

### **Correlations Between Parameters and Data--**

Groundwater and leachate data were reviewed to assess potential correlations with ammonia data from monitoring well TH-38A. No correlations were observed between leachate water quality and ammonia in TH-38A. Ammonia concentrations in leachate are relatively constant over time on the order of 200 mg/l which is one to two orders of magnitude greater than the ammonia concentrations found in TH-38A. While ammonia concentrations in the leachate are relatively constant, concentrations of TDS, chloride, and sodium have been increasing over time in the leachate. However, concentrations of these parameters have not been increasing over time in TH-38A. Comparing concentrations of chloride with ammonia in TH-38A and other monitoring wells indicates that when ammonia increases, chloride decreases. If the ammonia concentrations were related to landfill leachate, one would expect the chloride to increase when the ammonia increased. The decreasing chloride suggests that water entering the surficial aquifer in the vicinity of TH-38A may be somewhat less mineralized than the surficial aquifer groundwater indicating that its source is not the more mineralized leachate.

### **Floridan Aquifer**

#### **Regulatory Exceedances--**

Appendix A includes the water quality data for the two Floridan aquifer wells, TH-19 (background) and TH-40 (detection). No parameters with values above detection limits exceeded FDEP drinking water standards.

#### **Trends--**

No graphs of concentration data relative to time have been prepared because no regulatory exceedances have occurred.

### **Correlations Between Parameters and Data--**

No correlations between related parameters have been evaluated because regulatory exceedances have not occurred.

### **SURFACE WATER**

Surface water quality data have been collected from eight surface water-monitoring sites at the SCLF. The locations and designations of these sites are shown on Figure 2-1. The sites include three locations along Long Flat Creek, which flows north along the western side of the landfill and five sites on Smith Lake. On Long Flat Creek, site 3A is the hydraulically up gradient site which provides water quality data affected by citrus grove operations south of the

landfill. Site 3C2 is the location of surface water discharge from the landfill that is permitted under the National Pollutants Elimination System (NPDES) program. The five sites on Smith Lake are used to obtain representative composite samples of the lake water with the exception of fecal coliform samples which are not composited.

Appendix C includes tables of surface water quality data compiled by Hillsborough County from laboratory analyses from February 1997 to August 2000. The tables include the values above detection limits for the FDEP surface water criteria as listed in F.A.C. Chapter 62-302. The tables also include the fresh surface water cleanup target level for barium (i.e., < 10% above background), which does not have surface water criteria. Surface water criteria concentrations are listed through the February 1999 data set. Beginning with the August 1999 data set, the barium surface water cleanup target level is listed to reflect promulgation of Chapter 62-777, F.A.C.

### **Regulatory Exceedances**

Review of the surface water quality data listed in Appendix C indicates various parameters exceed regulatory standards at various times. However, the exceedances are intermittent and there do not appear to be any patterns to the exceedances. Table 3-2 lists the parameters whose regulatory standards have been exceeded since February 1997 and the number of exceedances that have occurred out of eight sampling events.

**TABLE 3-1. NUMBER OF EXCEEDANCES OF SURFACE WATER STANDARDS FROM 1997 TO 2000, SOUTHEAST COUNTY LANDFILL**

PARAMETER	NUMBER OF EXCEEDANCES IN EIGHT SAMPLE EVENTS			
	LONG FLAT CREEK SITES			SMITH LAKE SITES
	3A (Upgradient)	3B2B	3C2	
pH	3	1	0	3
Turbidity	0	0	0	3
Dissolved Oxygen	3	3	2	2 <sup>(1)</sup>
Fecal Coliform	1	1	1	2 <sup>(2)</sup>

**Notes:**

1. Results of composite samples from five sample sites in Smith Lake.
2. Results from 40 individual samples (five sites for eight events).

With regard to Long Flat Creek, the table indicates that there are three parameters with one or more exceedances for the period of record including pH, dissolved oxygen, and fecal coliform.

However, it appears that the exceedances are present in the surface water before it reaches the landfill as a result of up gradient conditions.

The table also indicates that the regulatory standards for all four parameters listed in Table 3-2 have been exceeded in the Smith Lake samples for two to three sample events. The pH exceedance is due to the presence of slightly alkaline waters in the lake, possibly due to the contact of the lake water with carbonate components of the bone valley formation. The few occasions of elevated turbidity are associated with organic and inorganic colloidal materials suspended in the water column.

On a few occasions, dissolved oxygen concentrations in the lake have been lower than the regulatory standard for surface water. Since the dissolved oxygen measurements are a result of composited samples, it is not clear if they are representative of the lake. It is possible that dissolved oxygen levels are more frequently lower than the standard and are increased through the compositing effort. Low dissolved oxygen levels can occur in the lake due to its relatively stagnant conditions.

On two occasions out of 40 samples collected from the lake, fecal coliform has been higher than the regulatory standard. These infrequent occurrences are thought to be related to the large bird population on and around the lake.

### **TRENDS AND CORRELATIONS**

Trends and correlations of data were not assessed further than indicated above because exceedances were intermittent and there do not appear to be substantive patterns in the data.

## SECTION 4

### GROUNDWATER LEVELS AND FLOW

The following summary includes a brief description of the primary hydrogeologic units at the site. Hydraulic characteristics are provided for use in subsequent sections of this report. These include hydraulic conductivity and permeability values, unit thickness, and effective porosity along with related hydraulic characteristics.

### HYDROGEOLOGY AND HYDRAULICS CHARACTERISTICS

#### Landfill

Four geologic cross sections were prepared previously to show the hydrogeologic system and relationship of the monitoring wells for Phases I-VI at the site. The locations of the cross sections are shown on Figure 4-1. Previously prepared cross sections were updated in March 2001 with the most recent groundwater elevations at monitor wells of Phases I-VI and are shown on Figure 4-2. The background and detection wells are highlighted on both figures.

Phases I-VI of the landfill is built upon existing phosphatic clays that are used as a bottom liner. These clays have permeabilities that range from  $6.0 \times 10^{-7}$  to  $3.0 \times 10^{-10}$  centimeters per second (cm/sec) (Ardaman, 1983, p. 5-2). These values are approximately equal to  $1.7 \times 10^{-3}$  to  $8.5 \times 10^{-7}$  feet per day (ft/d). Following compaction that occurs 5 to 10 years after placement of the final landfill cover, the permeability of these clays is calculated to decrease to  $1.3 \times 10^{-8}$  cm/sec (Ardaman, 1983, p. 6-7) or approximately  $3.7 \times 10^{-5}$  ft/d. The effective porosity of the phosphatic clay liner is assumed to be 20 percent following compaction.

Based on mapping of the surficial aquifer and the top and bottom of the phosphatic clay liner, it appears that the potentiometric surface of the aquifer slopes across the clay liner of Phases I-VI. It is above the top of the liner on the east side of the landfill, and slightly below the bottom of the liner on the west side (SCS Engineers, 1994 Permit Application, Exhibit L, Figures 2 and 3). Once the clays consolidate, the differential pore pressure that occurs during consolidation will be dissipated. The clays will remain saturated and the potential for vertical movement of fluid through the clays will be related to the leachate head overlying the clay and the surficial aquifer potentiometric surface. It was assumed that the surficial aquifer potentiometric surface would, on average, lie approximately at the bottom of the clay. The resulting hydraulic gradient across the clay would then be approximately 1 ft/ft since the leachate head over the clay is small.

### **Surficial Aquifer**

Generally, the phosphatic clays of Phases I-VI are underlain and surrounded by fine sands that contain the surficial aquifer (Figures 4-1 and 4-2). The surficial aquifer is approximately 20 feet thick based on water level data and the depth to the base of the aquifer. The average hydraulic conductivity of the aquifer is  $2.0 \times 10^{-4}$  to  $7.1 \times 10^{-3}$  cm/sec (Ardaman, Inc., 1983, p. 4-6). These values are approximately equivalent to 0.6 to 20 (ft/d). Barnes, Ferland, and Associates, Inc., (1997) estimated the hydraulic conductivity at the surficial aquifer as 1.34 (ft/d).

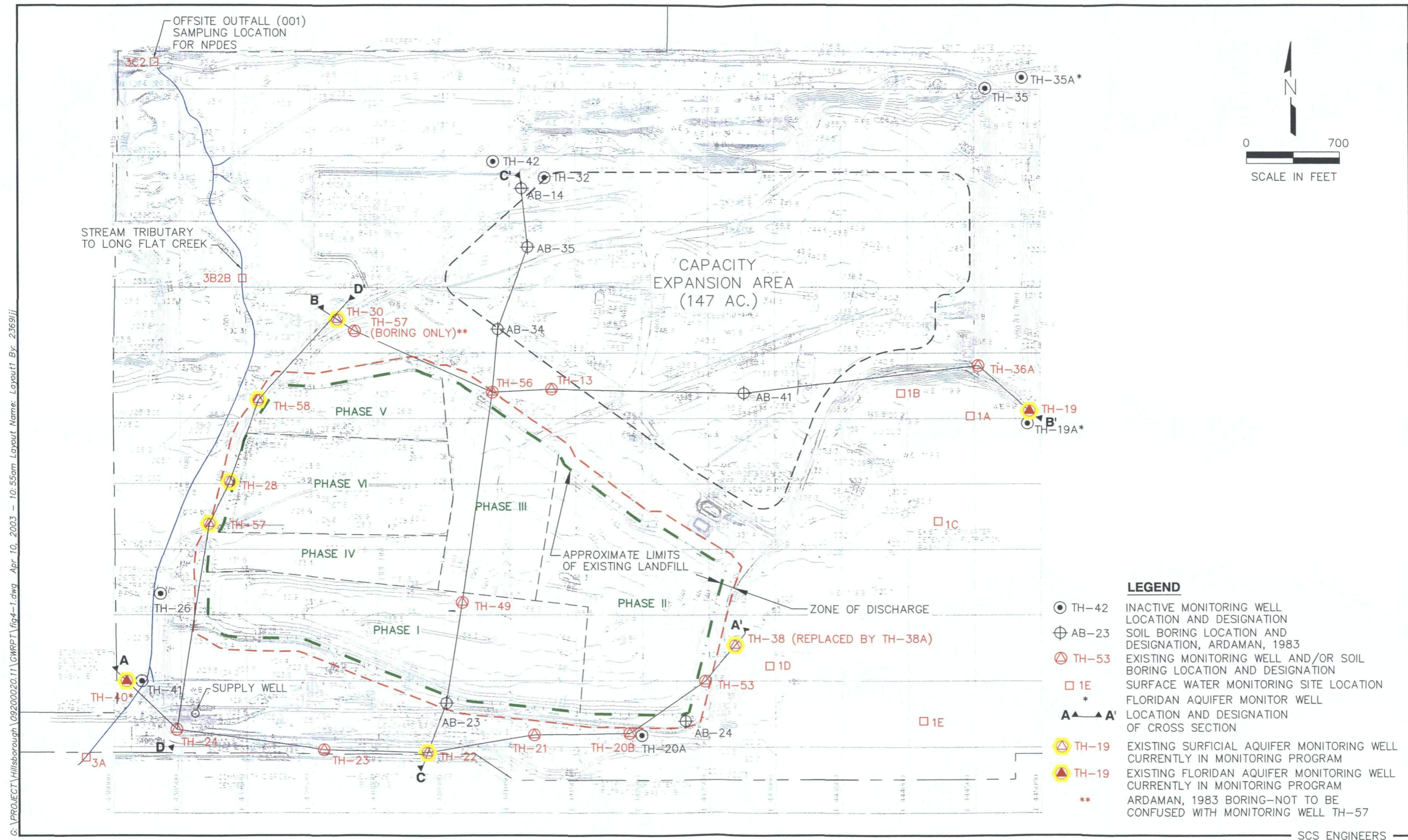
The effective (interconnected) porosity of the surficial aquifer is assumed to be approximately equal to the aquifer's pore space, expressed as a percent of total volume. A porosity of 30 percent was used for the surficial aquifer groundwater flow, based on averaging the 20 percent value estimated in the Barnes, Ferland, and Associates, Inc., (1997) with the typical value for fine to medium sands, such as those encountered at the site, of 39 percent (Todd, 1980, p. 28).

### **Hawthorn Group**

The surficial aquifer is immediately underlain by the thin remnants of the Bone Valley formation which are the weathered and reworked sediments in the upper portion of the Hawthorn Group (Scott and McGill, 1981). The Bone Valley is composed of phosphatic sands and clays and may be on the order of 25 to 50 feet thick at the site (Barnes, Ferland, and Associates, Inc., (1997), p. 3-1).

Clastic and carbonate sediments of the Hawthorn Group underlie the Bone Valley formation at the base of the surficial aquifer. The Hawthorn Group typically includes limestone and other sediments that can be sufficiently permeable to supply water to small wells. In areas where these permeable units exist in the Hawthorn, they compose the "intermediate aquifer." The Hawthorn Group as a whole acts as an aquitard to restrict movement between the surficial aquifer and Floridan aquifer. The Hawthorn Group is estimated to be approximately 130 feet thick at the site. There are no vertical permeability data available for the Hawthorn group at the SCLF. However, Barnes, Ferland, and Associates, Inc., researched this issue for their work on the adjacent expansion area. They report that regional Floridan aquifer hydraulic tests' leakance values range from  $1.0 \times 10^{-7}$  to  $4 \times 10^{-4}$  ft/d/ft. If the leakance values are assumed to represent the Hawthorn group at the SCLF, the values indicate that the vertical hydraulic conductivity of the Hawthorn Group ranges between approximately  $1.3 \times 10^{-5}$  to  $5.2 \times 10^{-2}$  ft/d (leakance times the Hawthorn Group thickness).

The effective porosity of the Hawthorn Group is on the order of 35 percent (estimated from values presented by Todd, 1980, Table 2-1, for limestone and clay). Based on comparison of water levels in surficial and Floridan aquifer monitoring wells for 1997 and 1998, Tables A1-A3, Appendix A, the hydraulic head change across the Hawthorn Group is approximately 80 feet and is directed downward.



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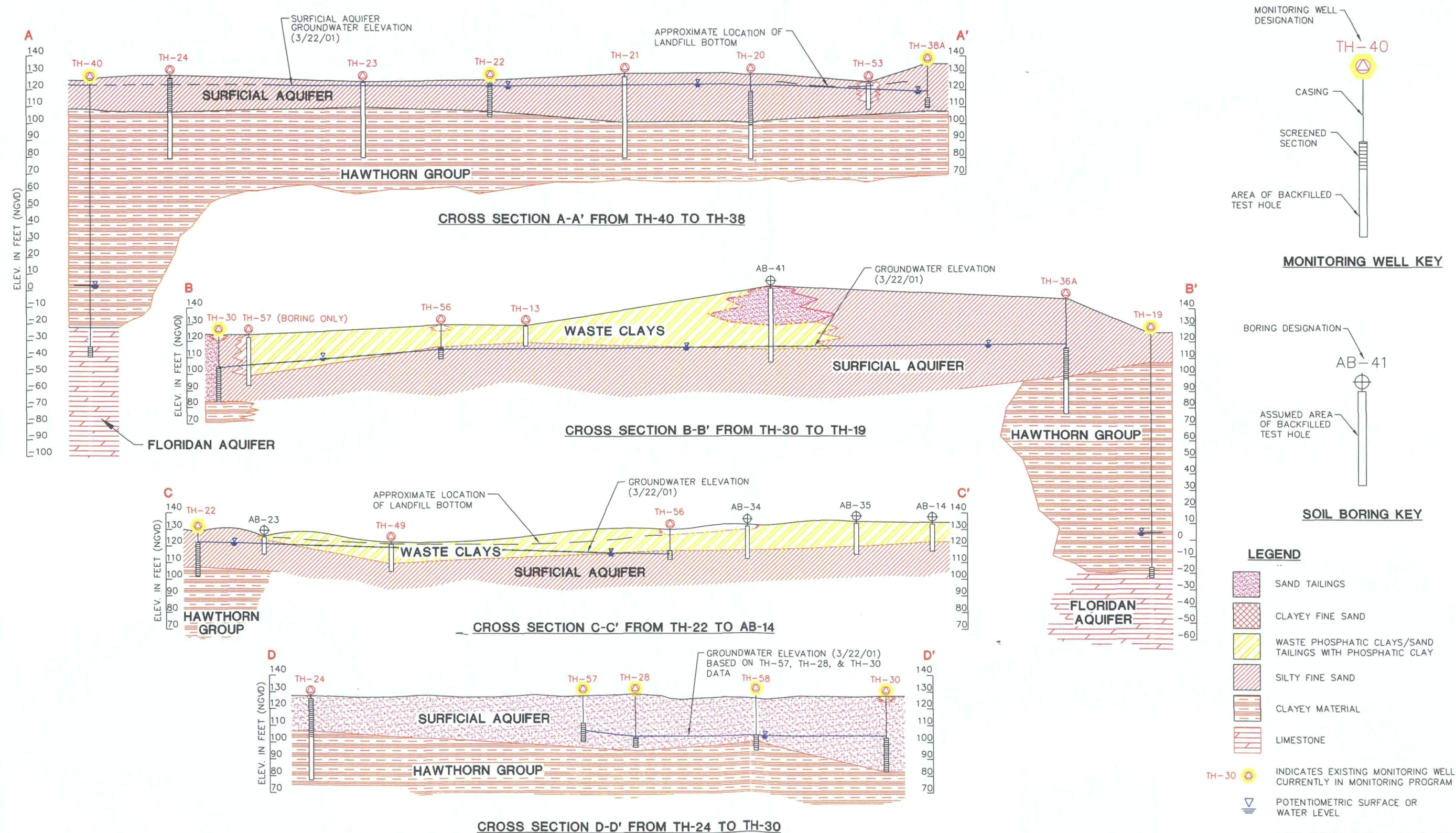


Figure 4-2. Geologic Cross Sections

### **Floridan Aquifer**

The upper part of the Floridan aquifer is approximately 1,200 feet thick (Barnes, Ferland, and Associates, Inc., 1997, p. 3-2). This represents that portion of the aquifer for which potentiometric maps are prepared semi-annually by the Southwest Florida Water Management District (SWFWMD). Barnes, Ferland, and Associates, Inc., (1997, p. 3-2) reports the transmissivity of the upper Floridan aquifer in the vicinity of the site is 100,000 square-feet per day (ft<sup>2</sup>/d). Based on a thickness of 1,200 feet, this indicates the upper Floridan aquifer at the site has a hydraulic conductivity of approximately 83 ft/d. The effective porosity of the Floridan aquifer is estimated to be approximately 30 percent based on the typical value reported by Todd 1980, p. 28, Table 2.1.

## **GROUNDWATER LEVELS AND FLOW DIRECTION**

### **Surficial Aquifer**

Water level data collected by Hillsborough County are included in Appendix D. The appendix was updated to include data collected through November 2002. Hydrographs of the data were also updated and are included in Appendix E. Surficial aquifer potentiometric maps were prepared for the 1999 and 2001 measurements and are included in Appendix F. These potentiometric maps show the water surface of the surficial aquifer and were prepared using SURFER ® Version 6 software.

Historical potentiometric maps prepared for the SCLF indicate surficial aquifer groundwater flow across Phases I-VI generally is toward the northwest with a hydraulic gradient of approximately 0.005 feet per foot (ft/ft) (see Appendix F). However potentiometric maps indicate the presence of a groundwater divide occurring over the Phase II area. Along the east side of the divide groundwater appears to flow toward Smith Lake.

Potentiometric map contours over Section 7 indicate that surficial aquifer groundwater flow is generally toward the northwest across the Capacity Expansion Area. However, there appears to be a groundwater divide near the eastern portion of Section 7. Along the east side of the divide, groundwater appears to flow toward Smith Lake. It is projected that groundwater will move a maximum distance of approximately 88 feet per year from Section 7 toward the east and west.

Groundwater and surface water elevations for March 2001 through November 2002 were added in chronological order to Appendix D in addition to the data previously submitted.

### **Floridan Aquifer**

Water level data collected from the two Floridan aquifer-monitoring wells are also listed in Appendix D. Revised hydrographs of the data are shown on Figure E-1, Appendix E. Regional Groundwater Monitoring Plan

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maps of the potentiometric surface of the aquifer are prepared semi-annually by the SWFWMD for the months of May and September. The portions of the latest available maps including the site are reproduced in Appendix G (Figures G-1 and G-2). The maps indicate the direction of groundwater flow in the aquifer beneath the site is generally west-southwest. However, as one moves toward the western portion of the SCLF area, Floridan groundwater flow may shift toward the northwest in May because of water levels measured in a single well (see Figure G-1). Based on a conversation with Mr. Dan Duerr at the U.S. Geological Survey, the well belongs to a fish farm business. The cause for its relatively low water level is unknown but Mr. Duerr indicated it was possible that a nearby pumping well could affect the well water level measurement. Although the May map shows an area of potentiometric drawdown around this well, the radius of its influence is unknown.

The SWFWMD maps indicate the hydraulic gradient across the site is on the order of 0.0003 ft/ft. If it is assumed that TH-19 and TH-40 lie along the direction of groundwater flow, water level measurements taken from these wells indicate a gradient of 0.0002 ft/ft. This is consistent with the regional gradient calculated from the SWFWMD maps.

## **GROUNDWATER FLOW RATE**

The apparent horizontal groundwater flow rate was calculated for both the surficial and Floridan aquifers and the vertical flow rate across the phosphatic clay liner and the Hawthorn group also was calculated. Flow rates were calculated using a modification of the Darcy equation as described in Lohman (1972), p.10. Hydraulic values used in the calculations are those presented in the previous section. These flow rates are used in evaluations discussed later in this report regarding the adequacy of the GWMP.

### **Phosphatic Clay Liner Vertical Flow**

When the phosphatic clay liner beneath Phases I-VI reaches full consolidation, internal pore pressures will reach equilibrium with hydraulic heads associated with the overlying leachate and underlying surficial aquifer. Once this occurs, the potential for leachate to move through the liner develops. The values discussed above were used to calculate the travel time through the liner after consolidation:

- Vertical hydraulic conductivity:  $3.7 \times 10^{-5}$  ft/day.
- Hydraulic gradient: 1 ft/ft.
- Effective porosity: 0.20

Based on these values and the Darcy equation, the leachate flow rate through the clay liner of Phases I-VI will be approximately  $2 \times 10^{-4}$  ft/d. Consequently, based on an 8-foot thickness, leachate would require approximately 118 years to move through the liner and into the surficial aquifer.

The calculations of leachate travel time through the liner were based on an assumed approximate location of the surficial aquifer water table at the bottom of the liner of Phases I-VI. This is a conservative assumption indicating the potential for leachate to migrate out of the landfill via seepage downward through the liner. The assumed approximate location of the water table was based on its presence above the liner on the east and crossing the liner to a point where it is below the liner on the west. The actual potential flow of water through the liner is somewhat more complex than the assumption of a general downward flow. On the east side, where the groundwater elevations may exceed the elevation of the leachate inside the landfill, groundwater flow potentially is upward and into the landfill. On the west side where groundwater elevation is lower than the leachate elevation inside the landfill, leachate will potentially move downward and out of the landfill. Toward the center of the landfill, the groundwater level will be similar to the leachate level and there will be no potential for vertical movement through the liner.

#### **Surficial Aquifer Horizontal Flow at Phases I-VI**

The following values were used for the horizontal groundwater flow calculation for the surficial aquifer:

- Horizontal hydraulic conductivity: 20 ft/day (most conservative value).
- Hydraulic gradient: 0.005 ft/ft.
- Effective porosity: 0.3.

Based on these values and the Darcy equation, the groundwater flow rate in the surficial aquifer is approximately 0.3 ft/d. From the edge of the waste of Phases I-VI, surficial aquifer groundwater requires approximately 330 days to travel laterally to the edge of the zone of discharge (ZOD), located 100 feet from the edge of waste.

Review of the surficial aquifer potentiometric maps included previously in Appendix F indicates surficial aquifer flow lines beneath Phases I-VI can be as long as approximately 3,000 to 4,000 feet before reaching a detection monitoring well. This indicates that potential contaminants entering the surficial aquifer could take as long as approximately 15 to 20 years to reach the closest detection monitoring well.

The steepest observed hydraulic gradient east of the divide in Phase II is approximately 0.006 ft/ft which is similar to the gradient west of the divide in Phase II. Based on a maximum hydraulic conductivity of 20 ft/day and a estimated porosity of 0.3, the groundwater velocity in Phase II is approximately 0.4 ft/day. Consequently surficial aquifer groundwater requires approximately 250 days to travel laterally to the edge of the ZOD on the east side of Phase II.

### **Surficial Aquifer Horizontal Flow at Section 7**

The average observed hydraulic gradient west of the divide in Section 7 is approximately 0.0036 ft/ft which is similar to the gradient east of the divide in Section 7. Based on a maximum hydraulic conductivity of 20 ft/day and an estimated porosity of 0.3, the groundwater velocity is approximately 0.24 ft/day or 88 ft/yr. Consequently surficial aquifer groundwater requires approximately 417 days to travel laterally to the edge of the ZOD on the east side of Section 7.

### **Hawthorn Group Vertical Flow**

A range of vertical hydraulic conductivity values was presented above for the Hawthorn group. The highest value was used in the following calculations to obtain conservative results.

- Vertical hydraulic conductivity:  $5 \times 10^{-2}$  ft/day.
- Hydraulic gradient: 0.61 ft/ft.
- Effective porosity: 0.35

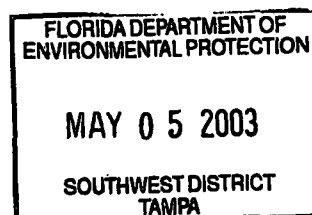
Based on these values and the Darcy equation, the groundwater flow rate across the Hawthorn group is 0.09 ft/d. This vertical flow rate probably is not representative of flow rates across the Hawthorn at the SCLF because the rate appears to be too high to allow development of the surficial aquifer at SCLF. However, since no data are available for the SCLF, the value is used in following discussions to provide conservative results (i.e., high rates of groundwater flow).

### **Floridan Aquifer Horizontal Flow**

The following values were used for the horizontal groundwater flow rate calculation for the Floridan aquifer:

- Horizontal hydraulic conductivity: 83 ft/day.
- Hydraulic gradient: 0.0003 ft/ft.
- Effective porosity: 0.3.

Based on these values and Darcy equation, the groundwater flow rate in the Floridan aquifer is approximately 0.08 ft/day.



### **Surficial Aquifer Horizontal Flow at Section 7**

The average observed hydraulic gradient west of the divide in Section 7 is approximately 0.0036 ft/ft which is similar to the gradient east of the divide in Section 7. Based on a maximum hydraulic conductivity of 20 ft/day and an estimated porosity of 0.3, the groundwater velocity is approximately 0.24 ft/day or 88 ft/yr. Consequently surficial aquifer groundwater requires approximately 417 days to travel laterally to the edge of the ZOD on the east side of Section 7.

### **Hawthorn Group Vertical Flow**

A range of vertical hydraulic conductivity values was presented above for the Hawthorn group. The highest value was used in the following calculations to obtain conservative results.

- Vertical hydraulic conductivity:  $5 \times 10^{-2}$  ft/day.
- Hydraulic gradient: 0.61 ft/ft.
- Effective porosity: 0.35

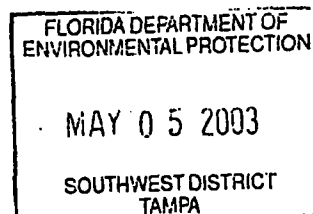
Based on these values and the Darcy equation, the groundwater flow rate across the Hawthorn group is 0.09 ft/d. This vertical flow rate probably is not representative of flow rates across the Hawthorn at the SCLF because the rate appears to be too high to allow development of the surficial aquifer at SCLF. However, since no data are available for the SCLF, the value is used in following discussions to provide conservative results (i.e., high rates of groundwater flow).

### **Floridan Aquifer Horizontal Flow**

The following values were used for the horizontal groundwater flow rate calculation for the Floridan aquifer:

- Horizontal hydraulic conductivity: 83 ft/day.
- Hydraulic gradient: 0.0003 ft/ft.
- Effective porosity: 0.3.

Based on these values and Darcy equation, the groundwater flow rate in the Floridan aquifer is approximately 0.08 ft/day.



## **SECTION 5**

### **ADEQUACY OF GROUNDWATER QUALITY MONITORING LOCATIONS AND SAMPLING FREQUENCY**

The adequacy of the monitoring well locations and sampling frequency is based primarily on characterization of groundwater flow direction and rate of flow. The following discussion assumes that groundwater flow is perpendicular to potentiometric contours. Further, travel time calculations for estimating groundwater flow rates do not consider the time for potential contaminants to move through the phosphatic clay liner of Phases I-VI (calculated above to be on the order of 200 years). The following discussion assumes that contaminants can potentially enter the surficial aquifer instantaneously from the landfill.

#### **SURFICIAL AQUIFER**

##### **Monitoring Well Locations, Phases I-VI**

Monitoring locations in the surficial aquifer were reviewed against the measured direction of groundwater flow. Surficial aquifer groundwater apparently enters the site from the south in the vicinity of background monitoring well TH-22A. The groundwater exits the site toward the northwest where the detection wells are located. Three of the four detection wells are located within 100 feet of the edge of liner and, consequently, within the zone of discharge. Well TH-30 is located approximately 400 feet beyond the edge of the zone of discharge.

Based on the groundwater flow direction indicated by the potentiometric lines on the figures in Appendix F, it is concluded that the locations of the three surficial aquifer monitoring detection wells (TH-57, TH-28, and TH-58) are adequate to monitor potential landfill effects in the surficial aquifer on the west side of the SCLF. TH-30 is located beyond detection and compliance distances from the nearest waste body and it is proposed to remove this well from the monitoring program.

TH-38A (recently replaced by TH-38B) historically has been identified as a background monitoring well. Surficial aquifer potentiometric maps (Appendix F) now indicate the presence of a groundwater divide immediately west of Smith Lake at various times. The maps indicate groundwater flows east toward Smith Lake from Phase II. Consequently detection monitoring wells will be constructed along the east side of Phase II as shown on Figure 2-1. These wells include TH-65, TH-66, and TH-67. TH-38B will be inactivated and used for water level measurements only.

### **Monitoring Well Locations, Section 7**

Four surficial aquifer detection wells will be constructed for monitoring Section 7. These wells will be placed approximately 300 feet apart and 50 feet down the hydraulic gradient from the planned edge of waste of Section 7 (see Figure 2-1). On the east side, piezometer P-9D will be re-designated TH-61 as one of the eastern detection wells. In addition TH-64 will be constructed approximately 300 feet north of TH-61 as the second detection well on the east side. Two detection wells (TH-59 and TH-60) will be constructed on the west side within 50 feet of Section 7.

### **Well Screen Locations**

Review of the historical water level ranges at the monitoring wells listed in Table 5-1 (revised) (compared to Table 2-2) indicates that all well screens intercept the seasonal low water levels. On a few occasions, TH-58 has been indicated to be "dry" in the monthly water level data tables. However, this is an indication that the water level in the well has been below the top of the dedicated bladder pump (approximately eight feet long) and could not be measured because of the lack of clearance for the water level indicator. TH-58 has produced a water sample during each sampling event since its construction.

Previously it was recommended that monitor wells TH-22, TH-28 and TH-38A be replaced to assure the tops of their screens are set above historical high groundwater levels. These wells have been replaced by TH-22A, TH-28A, and TH-38A to address this issue. Well construction characteristics are located in Table 2-2. Screen locations for proposed monitor wells are listed in Table 2-2 and are designed to cross the historical high and historical low water level elevations at their respective locations. The exception is TH-22A where the historical high water level is within one foot of land surface. This distance does not provide a sufficient length for construction of a well with a properly sealed casing if the screen is set above the historical high water level.

### **Monitoring Frequency for Phases I-VI**

Based on the maximum groundwater velocity calculation of 0.3 ft/day, at the SCLF groundwater will move 50 feet in 167 days. Therefore, continued semi-annual monitoring is appropriate. If contaminants reach the detection wells immediately following a sampling event, sufficient time is available to assess the groundwater quality at the edge of the zone of discharge beyond the wells.

**TABLE 5-1 REVISED. HISTORICAL WATER LEVEL RANGES  
SOUTHEAST COUNTY LANDFILL**

Measuring Point	Water Level <sup>1</sup> ft, NGVD				
	Min	Date	Max	Date	Mean <sup>2</sup>
<b>Piezometers</b>					
P-1D <sup>3</sup>	121.45	8-24-98	126.51	08-15-97	124.39
P-1S <sup>3</sup>	123.65	8-24-98	127.39	02-16-98	125.98
P-2D	117.15	01-30-01	123.63	02-16-98	118.86
P-2S	129.20	02-19-01	132.99	02-16-98	130.64
P-3D	120.61	05-11-01	125.42	02-16-98	121.62
P-3S	133.96	11-28-00	137.92	02-16-98	135.54
P-4D	116.90	06-15-01	122.52	02-16-98	118.81
P-4S	132.60	03-22-01	138.23	02-16-98	135.00
P-5D	129.58	08-15-97	137.69	08-20-01	132.09
P-6D	120.30	06-15-00	127.15	02-16-98	122.55
P-7D <sup>4</sup>	118.30	06-15-01	122.96	09-17-02	120.73
P-8D <sup>4</sup>	117.68	06-15-01	128.66	09-17-02	120.46
P-9D <sup>4</sup>	117.75	06-15-01	123.15	09-17-02	120.41
P-10D <sup>4</sup>	118.78	06-15-01	123.40	09-17-02	121.10
P-11D <sup>4</sup>	117.03	02-11-02	122.50	09-17-02	119.49
<b>Groundwater Sites</b>					
TH-19	-9.53	05-19-00	47.21	02-16-98	17.13
TH-22	122.30	05-19-00	125.22	02-16-98	122.35
TH-28	96.30	8-24-98	105.38	02-16-98	103.66
TH-30	91.09	11-28-00	105.50	08-20-01	103.78
TH-32	112.05	06-15-01	115.82	02-16-98	113.37
TH-35	115.57	06-15-01	119.46	02-16-98	116.87
TH-36A	118.22	06-15-01	121.81	02-16-98	119.87
TH-38A	118.74	06-15-01	123.59	02-16-98	120.77
TH-40	-14.07	05-19-00	45.65	02-16-98	14.35
TH-56	114.67	06-15-01	119.46	02-16-98	115.92
TH-57	107.19	01-30-01	109.64	02-16-98	108.22
TH-58	99.12	02-19-01	100.17	02-16-98	99.51

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**TABLE 5-1 REVISED. (Continued)**

Measuring Point	Water Level <sup>1</sup> ft, NGVD				
	Min	Date	Max	Date	Mean <sup>2</sup>
Surface Water Sites					
SW-3A	122.40	05-19-00	125.23	11-28-00	123.14
SW-3B2B	94.68	04-12-00	97.87	06-15-00	96.09
SW-3C2	90.09	05-11-01	92.29	02-16-98	90.65
Smith Lake	118.77	03-22-01	125.08	01-30-01	121.17

**Notes:**

1. Period of record for measuring points unless otherwise specified:  
August 15, 1997 - November 7, 2002
2. Wells noted as 'dry' and sampling events without data were not considered in the arithmetical average.
3. P-1D and P-1S period of record: August 15, 1997 – August 24, 1998.
4. P-7D, P-8D, P-9D, P-10D, P-11D, period of record began March 22, 2001.

Revised April 15, 2003

### **Monitoring Frequency for Section 7**

As estimated from the groundwater data, the estimated maximum groundwater velocity in the vicinity of Section 7 is approximately 88 feet per year. Therefore, semi-annual monitoring is appropriate. If contaminants reach the detection wells immediately following a sampling event, sufficient time is available to assess the groundwater quality at the edge of the zone of discharge beyond the wells

### **FLORIDAN AQUIFER**

Monitoring of groundwater in the Floridan aquifer is intended to observe impacts on the aquifer from potential leakage from the landfill. Consequently, the major concern is the potential rate of movement of contaminants to the aquifer from the overlying landfill. Potential contaminants from the landfill would have to move downward through the phosphatic clay liner (time required for this movement is ignored); across a small interval of the surficial aquifer (time for this movement is considered negligible); and then across approximately 130 feet of the Hawthorn group to reach the Floridan aquifer.

Based on the estimated (conservative) velocity of groundwater flow downward through the Hawthorn (0.09 ft/d), if contaminants leak through the phosphatic clays, they could, theoretically, reach the Floridan aquifer in approximately four years. Once a potential contaminant reaches the aquifer, it would move laterally toward the Floridan aquifer monitoring well, TH-40, at a rate of approximately 0.08 ft/d. TH-40 is located approximately 800 feet downgradient from the landfill. Based on the flow rate of 0.08 ft/d, the contaminant would require 27 years to reach the monitoring well if it entered the Floridan aquifer at the edge of waste. Travel time would be longer if the contaminant entered the aquifer farther from the edge of waste. Based on the above finding, the semi-annual frequency of sampling should be maintained.

### **INTERMEDIATE AQUIFER**

As indicated in Section 2 of this report, apparently the intermediate aquifer is not present at the site (Ardaman, 1983, p. 4-3) due to the absence of significant permeable units within the Hawthorn Group. Consequently, no groundwater monitoring is performed between the surficial and Floridan aquifers.

### **SURFACE WATER**

No modifications to the water quality parameters or frequency of sampling are recommended at this time.

## **SECTION 6**

### **LANDFILL DESIGN AND OPERATION EFFECTIVENESS**

#### **DESIGN, PHASES I-VI**

The design of Phases I-VI of the SCLF takes advantage of the presence of relatively impermeable phosphatic clay for use as the bottom liner. The permeability of this clay is extremely low and provides excellent protection against leachate movement into the underlying surficial aquifer. A leachate removal and collection system is effective in removing the leachate generated on a daily basis and maintains the hydraulic head in the landfill within the goals of the Leachate Management Plan for the SCLF.

Groundwater flow rate within the surficial aquifer will transport potential contaminants entering the aquifer beneath the landfill to the location of the detection wells within approximately 1 to 30 years after passing through the liner, depending on where the contaminants enter the aquifer. Although conservative estimates of vertical travel time through the Hawthorn Group are relatively small, the presence of large hydraulic head differences across the Hawthorn Group indicate its effectiveness in limiting movement of contaminants to the Floridan aquifer. The landfill has been in operation for more than 15 years, and the detection wells do not indicate the presence of landfill contaminants. Consequently, the phosphatic clay liner is being demonstrated to be effective in limiting movement of potential groundwater contaminants into the groundwater systems of the site.

#### **DESIGN, CAPACITY EXPANSION SECTION 7**

Section 7 and the Capacity Expansion Area at the SCLF was designed and constructed with a conventional double liner according to the design requirements specified by Chapter 62-701, FAC for double liner systems. The Section 7 design and operation effectiveness will be evaluated as groundwater data are collected during its operations.

## SECTION 7

### REFERENCES

Ardaman & Associates, Inc. "Hydrogeological Investigation Southeast County Landfill Hillsborough County, Florida," prepared for Camp Dresser & McKee, Inc., February 22, 1983.

Barnes, Ferland and Associates, Inc. "Results of Hillsborough County Southeast County Landfill Capacity Expansion Area Hydrogeological/Geotechnical Investigation," prepared for SCS Engineers, Tampa, Florida, 1997

Florida Geological Survey, Florida's Ground Water Quality Monitoring Program Background Hydrogeochemistry, Florida Geological Survey Bulletin, 1992, No. 34, 364 pp.

Golden Software, Inc. SURFER ® Version 6 software, 1994. Golden, Colorado.

Lohman, S. W., "Ground-Water Hydraulics," Geological Survey Professional Paper 708, United States Government Printing Office, 1972, 80 pp.

Metz, P.A., Mattie, J.A., Corral, M.A.. Potentiometric Surface of the Upper Floridan Aquifer, West-Central Florida, September 1996. U.S. Geological Survey Open File Report 97-179.

Metz, P.A., Mattie, J.A., Corral, M.A. Potentiometric, Surface of the Upper Floridan Aquifer, West-Central Florida, May 1997, U.S. Geological Survey Open File Report 97-643.

Scott, Thomas M., and MacGill, Peter L. The Hawthorn Group of Central Florida. State of Florida Department of Natural Resources, 1981, Report of Investigation No. 91, p. 24.

SCS Engineers. Operation Permit Renewal Application, Southeast Landfill, Hillsborough County, Florida – Responses to the Florida Department of Environmental Protection, 1994.

Southwest Florida Water Management District. "Ground-Water Resource Availability Inventory: Hillsborough County, Florida, prepared by the Resource Management and Planning Departments of the Southwest Florida Water Management District, 1988, 203 pp.

Todd, David Keith. Groundwater Hydrology. John Wiley & Sons, New York, 1980, pp.535.

**APPENDIX A**

**ANALYTICAL RESULTS FROM GROUNDWATER MONITORING WELLS**

# Analytical Results from Groundwater Monitoring Wells Located at the Southeast Landfill

## August 21, 2000

GENERAL (mg/l)	Floridan Aquifer		Surficial Aquifer Wells						
PARAMETERS	TH-19	TH-40	TH-22	TH-28	TH-30	TH-38A	TH-57	TH-58	Regulatory Standard
conductivity (umhos/cm) (field)	427	351	258	225	189	190	151	324	NS
pH (field)	7.22	7.45	4.5	5.06	4.86	5.34	5.33	7.75	(6.5 - 8.5)**
total dissolved solids (mg/l)	280	240	200	170	140	130	110	190	500**
temperature (°C) (field)	23.7	23.9	23.9	24.5	23.6	25	26.9	24.6	NS
turbidity (NTU) (field)	0.8	5.4	16.4	2.9	8.5	1	2.9	7.3	NS
chloride (mg/l)	8.2	8.3	21	52	30	6.4	18	13	250**
ammonia nitrogen (mg/l as N)	0.41	0.41	0.64	1	1.7	6.1	1.3	2.1	2.8****
nitrate (mg/l as N)	BDL	BDL	BDL	BDL	0.18	BDL	BDL	BDL	10*
dissolved oxygen (mg/l) (field)	1.4	0.92	0.92	0.88	0.87	1.1	0.86	2.1	NS
Metals: (mg/l)	Floridan Aquifer		Surficial Aquifer Wells						Regulatory Standard
iron	BDL	BDL	0.480	2.400	0.23	8.000	0.560	7.800	0.3**
barium	BDL	BDL	0.100	BDL	0.017	BDL	BDL	0.012	2*
arsenic	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.027	0.05*
sodium	14	15	6.2	13	9.5	8.6	8.4	10	160*
Organics: (µg/l)	Floridan Aquifer		Surficial Aquifer Wells						
E.P.A. Methods 8260	TH-19	TH-40	TH-22	TH-28	TH-30	TH-38A	TH-57	TH-58	Regulatory Standard
Organic Parameters Detected	BDL	BDL	BDL	BDL	1.6	BDL	BDL	BDL	700***
1,1-dichloroethane									
NOTE	Reference Groundwater Guidance Concentrations, FDEP June 1994								
NS	No Standard								
MCL	Maximum Contaminant Level								
BDL	Below Detection Limit								
ND	No Survey Data Available								
*	Denotes Primary Drinking Water Standard, F.A.C. 62-550								
**	Denotes Secondary Drinking Water Standard, F.A.C. 62-550								
***	Standards, or Florida Guidance Concentration MCL								
****	Denotes Groundwater Cleanup Target Level, F.A.C. 62-777								
4.5	Exceeds Regulatory Standard (shaded and bold)								
NTU	Nephelometric Turbidity Units								
µg/l	micrograms per liter								
mg/l	milligrams per liter								
NGVD	National Geodetic Vertical Datum								
-	Indicates that the sample was not analyzed for this parameter								

Analytical Results from Groundwater Monitoring Wells Located at the Southeast Landfill  
February 14, 2000

GENERAL (mg/l)		Floridan Aquifer		Surficial Aquifer Wells						
PARAMETERS		TH-19	TH-40	TH-22	TH-28	TH-30	TH-38A	TH-57	TH-58	Regulatory Standard
depth to water (feet)		110.34	108.33	5.64	26.54	24.19	9.69	20.00	28.37	NS
conductivlty (umhos/cm) (field)		169	364	265	216	191	169	149	336	NS
pH (field)		5.14	7.29	4.22	4.88	4.62	5.14	5.07	5.5	(6.5 - 8.5)**
total dissolved solids (mg/l)		72	236	320	140	124	112	108	188	500**
temperature (°C) (field)		23.4	23.6	22.5	23.6	23.4	23.4	26	23.7	NS
turbidity (NTU) (field)		0.9	5.8	36.5	1.7	5.4	0.9	2.9	0.9	NS
chloride (mg/l)		8	8	23	45	50	6	18	11	250**
ammonia nitrogen (mg/l as N)		BDL	0.18	0.29	0.96	0.71	7.99	1.24	1.29	2.8****
dissolved oxygen (mg/l) (field)		1.08	0.91	1.24	1.65	0.8	1.08	1.12	1.39	NS
		Floridan Aquifer		Surficial Aquifer Wells						
Metals: (mg/l)		TH-19	TH-40	TH-22	TH-28	TH-30	TH-38A	TH-57	TH-58	Regulatory Standard
iron		0.150	0.140	0.640	2.300	0.28	7.540	0.510	7.000	0.3**
chromium		BDL	BDL	0.007	BDL	0.002	0.002	BDL	0.001	0.2
copper		BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	1**
barium		0.005	0.006	0.223	0.001	0.011	0.002	0.004	0.011	2*
arsenic		BDL	BDL	BDL	BDL	BDL	0.005	BDL	0.024	0.05*
lead		BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.015*
sodium		15.1	15.8	6.6	12.6	9.8	8.3	8.6	9.7	160*
vanadium		BDL	BDL	0.006	BDL	BDL	BDL	BDL	BDL	49***
Organics: (µg/l)										
E.P.A. Methods 8260		Floridan Aquifer		Surficial Aquifer Wells						
Organic Parameters Detected		TH-19	TH-40	TH-22	TH-28	TH-30	TH-38A	TH-57	TH-58	Regulatory Standard
1,1-dichloroethane		BDL	BDL	BDL	BDL	1.5	BDL	BDL	BDL	700***
		NOTE	Reference Groundwater Guidance Concentrations, FDEP June 1994							
		NS	No Standard							
		MCL	Maximum Contaminant Level							
		BDL	Below Detection Limit							
		ND	No Survey Data Available							
		*	Denotes Primary Drinking Water Standard, F.A.C. 62-550							
		**	Denotes Secondary Drinking Water Standard, F.A.C. 62-550							
		***	Standards, or Florida Guidance Concentration MCL							
		****	Denotes Groundwater Cleanup Target Level, F.A.C. 62-777							
		5.14	Exceeds Regulatory Standard (shaded and bold)							
		NTU	Nephelometric Turbidity Units							
		µg/l	micrograms per liter							
		mg/l	milligrams per liter							
		NGVD	National Geodetic Vertical Datum							
		-	Indicates that the sample was not analyzed for this parameter							

# Analytical Results from Groundwater Monitoring Wells Located at the Southeast Landfill August 17, 1999

GENERAL (mg/l)	Floridan Aquifer		Surficial Aquifer Wells						REGULATORY STANDARD
PARAMETERS	TH-19	TH-40	TH-22	TH-28	TH-30	TH-38A	TH-57	TH-58	
depth to water (feet)	97.20	93.10	5.70	27.04	24.25	10.20	20.23	28.40	NS
water table elevation (NGVD)	32.85	31.67	123.12	103.56	104.12	121.00	107.86	99.27	NS
conductivity (umhos/cm) (field)	427	354	260	195	196	185	149	351	NS
pH (field)	7.14	7.35	4.420	4.970	4.810	5.210	5.220	5.700	(6.5 - 8.5)**
total dissolved solids (mg/l)	264	212	184	140	128	132	108	212	500**
temperature (°C) (field)	23.8	24.1	23.5	23.7	23.5	25	26.6	24	NS
turbidity (NTU) (field)	0.7	2.5	5.4	1.6	5.6	1.6	2.3	2.6	NS
chloride (mg/l)	9	8	23	43	33	7	20	12	250**
ammonia nitrogen (mg/l as N)	0.25	0.32	0.34	0.69	1.32	5.5	1.05	1.48	2.8***
nitrate (mg/l as N)	0.01	BDL	BDL	BDL	BDL	0.01	BDL	0.01	10*
dissolved oxygen (mg/l) (field)	0.52	1.31	0.33	0.45	0.95	0.8	1.14	1.02	NS
Metals: (mg/l)	TH-19	TH-40	TH-22	TH-28	TH-30	TH-38A	TH-57	TH-58	REGULATORY STANDARD
iron	0.140	0.120	0.570	2.050	0.28	7.250	0.560	7.300	0.3**
chromium	BDL	BDL	0.001	0.001	0.002	0.002	0.001	0.002	0.2
copper	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	1**
barium	0.005	0.006	0.044	0.001	0.005	0.002	0.004	0.010	2*
arsenic	BDL	BDL	BDL	BDL	BDL	0.006	BDL	0.026	0.05*
lead	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.015*
sodium	14.3	BDL	6.6	10.5	9.9	8.9	8.2	9.6	160*
mercury	BDL	BDL	BDL	BDL	0.00021	0.0002	0.00023	BDL	0.002
zinc	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	5**
Organics: (ug/l)	TH-19	TH-40	TH-22	TH-28	TH-30	TH-38A	TH-57	TH-58	REGULATORY STANDARD
E.P.A. Methods 8260	TH-19	TH-40	TH-22	TH-28	TH-30	TH-38A	TH-57	TH-58	
Organic Parameters Detected	TH-19	TH-40	TH-22	TH-28	TH-30	TH-38A	TH-57	TH-58	
NONE	-	-	-	-	-	-	-	-	-
NOTE	Reference Groundwater Guidance Concentrations, FDEP June 1994								
NS	No Standard								
MCL	Maximum Contaminant Level								
BDL	Below Detection Limit								
ND	No Survey Data Available								
*	Denotes Primary Drinking Water Standard, F.A.C. 62-550								
**	Denotes Secondary Drinking Water Standard, F.A.C. 62-550								
***	Denotes Groundwater Cleanup Target Level, F.A.C. 62-777								
4.420	Exceeds Regulatory Standard (shaded and bold)								
NTU	Nephelometric Turbidity Units								
ug/l	micrograms per liter								
mg/l	milligrams per liter								
NGVD	National Geodetic Vertical Datum								
-	Indicates that the sample was not analyzed for this parameter								

## February 15, 16, and 17, 1999

[illegible]

**Chemical Constituents Detected in the Groundwater Samples Collected at the  
Southeast Landfill Groundwater Monitoring Wells  
August 24 - 27, 1998**

GENERAL	Floridan Aquifer		Surficial Aquifer Wells						(MCL) STANDARD
PARAMETERS	TH-19	TH-40	TH-22	TH-28	TH-30	TH-38A	TH-57	TH-58	F.A.C. 62-550
depth to water (feet)	82.68	96.03	5.55	26.64	24.00	9.13	19.74	28.32	NS
water table elevation (NGVD)	47.26	29.20	124.17	105.44	105.44	123.62	108.35	99.35	NS
Colors and sheens (field)	none	none	none	none	none	none	none	none	15**
conductivity (umhos/cm) (field)	433	363	269	182	211	194	170	346	NS
pH (field)	7.19	6.87	4.48	5.25	4.91	5.52	5.56	5.66	(6.5 - 8.5)**
total dissolved solids (mg/l)	268	224	180	108	120	120	100	200	500**
temperature (°C) (field)	23.7	23.8	23.5	23.3	23.2	24.7	26.7	23.9	NS
turbidity (NTU) (field)	1.1	3.2	12.8	1.3	9.1	4.7	4	3.6	NS
chloride (mg/l)	8	9	32	35	34	9	20	16	250**
ammonia nitrogen (mg/l as N)	0.31	0.35	0.43	0.8	1.43	6.23	1.41	1.43	NS
nitrate (mg/l as N)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.01	10*
dissolved oxygen (mg/l) (field)	0.35	0.46	1.49	1.08	0.54	1.24	7.49	2.15	NS
Metals: (mg/l)	Floridan Aquifer		Surficial Aquifer Wells						(MCL) STANDARD
	TH-19	TH-40	TH-22	TH-28	TH-30	TH-38A	TH-57	TH-58	F.A.C. 62-550
iron	BDL	0.040	0.58	1.680	0.25	7.450	0.59	8.320	0.3**
barium	0.005	0.005	0.089	BDL	0.016	0.002	0.004	0.011	2*
chromium	BDL	BDL	0.004	0.001	0.003	0.003	0.002	0.002	
arsenic	BDL	BDL	BDL	BDL	BDL	0.011	BDL	0.025	0.05*
sodium	13.9	15.8	6.4	8.9	10.1	9.9	8.8	9.1	160*
Organics: (µg/l)	Floridan Aquifer		Surficial Aquifer Wells						(MCL) STANDARD
E.P.A. Methods 8260	TH-19	TH-40	TH-22	TH-28	TH-30	TH-38A	TH-57	TH-58	F.A.C. 62-550
Organic Parameters Detected	BDL	BDL	BDL	BDL	2	BDL	BDL	BDL	70***
1,1-dichloroethane									
NOTE: Reference Groundwater Guidance Concentrations, FDEP June 1994									
NS= NO STANDARD									
MCL= MAXIMUM CONTAMINANT LEVEL									
BDL= BELOW DETECTION LIMIT									
ND= NO SURVEY DATA AVAILABLE									
* DENOTES PRIMARY DRINKING WATER STANDARD									
** DENOTES SECONDARY DRINKING WATER STANDARD									
*** GUIDANCE CONCENTRATION									
4.48 EXCEEDS PRIMARY OR SECONDARY DRINKING WATER									
STANDARDS, OR FLORIDA GUIDANCE CONCENTRATION MCL (shaded and bold)									
NTU= NEPHELOMETRIC TURBIDITY UNITS									
pCi/l= PICOCURIES PER LITER									
µg/l= MICROGRAMS PER LITER									
mg/l= MILLIGRAMS PER LITER									
NOTE: a dash entry ( - ) indicates that the sample was not analyzed for this parameter									

**Chemical Constituents Detected in the Groundwater Samples Collected at the  
Southeast Landfill Groundwater Monitoring Wells  
February 17 and 18, 1998**

GENERAL	Floridan Aquifer		Surficial Aquifer Wells						(MCL) STANDARD
PARAMETERS	TH-19	TH-40	TH-22	TH-28	TH-30	TH-38A	TH-57	TH-58	F.A.C. 62-550
depth to water (feet)	82.68	79.02	3.60	24.99	22.97	7.15	18.24	27.14	NS
water table elevation (NGVD)	47.26	46.21	126.12	107.09	106.47	125.60	109.85	100.53	NS
conductivity (umhos/cm) (field)	437	366	264	187	214	177	163	361	NS
pH (field)	7.37	7.56	4.56	5.27	4.8	6.03	5.41	5.73	(6.5 - 8.5)**
total dissolved solids (mg/l)	168	252	188	140	148	136	100	220	500**
temperature (°C) (field)	23.2	23.6	22	23.2	23.1	23.1	25.3	23.3	NS
turbidity (NTU) (field)	2.5	0.8	18.2	2.8	10.7	2.1	8.2	3.2	NS
chloride (mg/l)	8	8	31	31	35	17	18	15	250**
ammonia nitrogen (mg/l as N)	0.31	BDL	0.41	0.46	1.28	2.01	0.71	0.77	NS
nitrate (mg/l as N)	BDL	BDL	BDL	BDL	BDL	0.2	0.02	0.27	10*
dissolved oxygen (mg/l) (field)	2.68	0.79	0.43	0.8	1.02	1.57	0.71	0.96	NS
	Floridan Aquifer		Surficial Aquifer Wells						(MCL) STANDARD
Metals: (mg/l)	TH-19	TH-40	TH-22	TH-28	TH-30	TH-38A	TH-57	TH-58	F.A.C. 62-550
iron	0.044	0.043	0.627	1.850	0.263	8.510	0.575	8.530	0.3**
barium	0.005	0.005	0.110	0.001	0.022	0.002	0.006	0.010	2*
arsenic	BDL	BDL	BDL	BDL	BDL	0.008	BDL	0.023	0.05*
sodium	15.1	16.2	7.4	9	11.3	10.3	8.9	12.2	160*
zinc	BDL	BDL	BDL	BDL	0.030	BDL	BDL	BDL	5**
Organics: (µg/l)	Floridan Aquifer		Surficial Aquifer Wells						(MCL) STANDARD
E.P.A. Methods 8260	TH-19	TH-40	TH-22	TH-28	TH-30	TH-38A	TH-57	TH-58	F.A.C. 62-550
Organic Parameters Detected	TH-19	TH-40	TH-22	TH-28	TH-30	TH-38A	TH-57	TH-58	F.A.C. 62-550
1,1-dichloroethene	BDL	BDL	BDL	BDL	3	BDL	BDL	BDL	7*
NOTE: Reference Groundwater Guidance Concentrations, FDEP June 1994									
NS= NO STANDARD									
MCL= MAXIMUM CONTAMINANT LEVEL									
BDL= BELOW DETECTION LIMIT									
ND= NO SURVEY DATA AVAILABLE									
*= DENOTES PRIMARY DRINKING WATER STANDARD									
**= DENOTES SECONDARY DRINKING WATER STANDARD									
4.56: EXCEEDS PRIMARY OR SECONDARY DRINKING WATER									
STANDARDS, OR FLORIDA GUIDANCE CONCENTRATION MCL (shaded and bold)									
NTU= NEPHELOMETRIC TURBIDITY UNITS									
pCi/l= PICOCURIES PER LITER									
µg/l= MICROGRAMS PER LITER									
mg/l= MILLIGRAMS PER LITER									
NOTE: a dash entry ( - ) indicates that the sample was not analyzed for this parameter									

**Chemical Constituents Detected in the Groundwater Samples Collected at the  
Southeast Landfill Groundwater Monitoring Wells  
August 18, 19, and 20, 1997**

GENERAL	Floridan Aquifer		Surficial Aquifer Wells						(MCL) STANDARD
PARAMETERS	TH-19	TH-40	TH-22	TH-28	TH-30	TH-38A	TH-57	TH-58	F.A.C. 62-550
depth to water (feet)	91.95	88.19	4.65	26.20	23.95	8.62	19.00	28.02	NS
water table elevation (NGVD)	38.10	36.58	124.17	104.40	104.42	124.13	109.09	99.65	NS
conductivity (umhos/cm) (field)	434	364	265	172	193	183	181	196	NS
pH (field)	7.08	7.38	4.2	4.98	4.65	4.99	5	5.53	(6.5 - 8.5)**
total dissolved solids (mg/l)	216	192	140	76	120	120	92	160	500**
temperature (°C) (field)	23.8	23.7	24.2	23.5	23.3	25.1	26	23.9	NS
turbidity (NTU) (field)	1.4	6.2	24.1	3	8.1	0.26	2.7	5	NS
chloride (mg/l)	8	8	30	30	26	9	26	13	250**
ammonia nitrogen (mg/l as N)	0.3	0.37	0.42	0.81	1.6	8.08	1.23	1.53	NS
dissolved oxygen (mg/l) (field)	0.27	0.83	0.79	1.28	0.72	1.11	1.74	1.74	NS
total alpha (pCi/l)	-	-	-	-	-	-	-	-	15*
radium 226 (pCi/l)	-	-	-	-	-	-	-	-	5*
Metals: (mg/l)	TH-19	TH-40	TH-22	TH-28	TH-30	TH-38A	TH-57	TH-58	(MCL) STANDARD F.A.C. 62-550
iron	0.030	0.040	0.475	1.47	0.830	7.600	1.74	7.700	0.3**
barium	0.005	0.006	0.162	0.001	0.008	0.002	0.014	0.012	2*
arsenic	BDL	BDL	0.005	0.005	BDL	0.016	BDL	0.028	0.05*
lead	BDL	BDL	0.004	BDL	BDL	BDL	BDL	BDL	0.015*
sodium	12.9	13.8	6.33	7.33	9.54	9.16	7.56	9.41	160*
NOTE: All wells tested for EPA Test Method 8260, no parameters detected									
NOTE: Reference Groundwater Guidance Concentrations, FDEP June 1994									
NS= NO STANDARD									
MCL= MAXIMUM CONTAMINANT LEVEL									
BDL= BELOW DETECTION LIMIT									
ND= NO SURVEY DATA AVAILABLE									
*= DENOTES PRIMARY DRINKING WATER STANDARD									
**= DENOTES SECONDARY DRINKING WATER STANDARD									
4.2 : EXCEEDS PRIMARY OR SECONDARY DRINKING WATER									
STANDARDS, OR FLORIDA GUIDANCE CONCENTRATION MCL (shaded and bold)									
NTU= NEPHELOMETRIC TURBIDITY UNITS									
pCi/l= PICOCURIES PER LITER									
µg/l= MICROGRAMS PER LITER									
mg/l= MILLIGRAMS PER LITER									
NOTE: a dash entry ( - ) indicates that the sample was not analyzed for this parameter									

**Chemical Constituents Detected in the Groundwater Samples Collected at the  
Southeast Landfill Groundwater Monitoring Wells  
February 17, 18, and 19, 1997**

GENERAL	Floridan Aquifer		Surficial Aquifer Wells						(MCL) STANDARD
PARAMETERS	TH-19	TH-40	TH-22	TH-28	TH-30	TH-38A	TH-57	TH-58	F.A.C. 62-550
depth to water (feet)	108.41	106.41	5.15	26.62	24.22	10.10	20.00	28.34	NS
water table elevation (NGVD)	21.64	18.36	123.67	103.98	104.15	121.10	108.09	99.33	NS
conductivity (umhos/cm) (field)	435	362	267	171	192	199	148	371	NS
pH (field)	7.13	7.48	4.2	4.96	4.6	5.09	5.1	5.52	(6.5 - 8.5)**
total dissolved solids (mg/l)	244	204	152	120	116	132	88	242	500**
temperature (°C) in field	23.6	23.4	21.8	23.1	23.2	23.1	25.4	23.4	NS
turbidity (NTU)	0.48	0.47	24.4	0.35	8.2	1.6	8.46	14.6	NS
chloride (mg/l)	7.68	8.15	27.7	26.5	24.9	8.86	18.3	11.9	250**
ammonia nitrogen (mg/l as N)	0.36	0.43	0.52	0.8	1.47	6.4	1.11	1.77	NS
nitrate (mg/l as N)	BDL	BDL	BDL	BDL	BDL	0.17	BDL	BDL	10*
dissolved oxygen (mg/l) (field)	0.43	0.42	0.75	0.85	2.28	1.28	1.39	1.3	NS
total alpha (pCi/l)	-	-	-	-	-	-	-	-	15*
radium 226 (pCi/l)	-	-	-	-	-	-	-	-	5*
Metals: (mg/l)	TH-19	TH-40	TH-22	TH-28	TH-30	TH-38A	TH-57	TH-58	(MCL) STANDARD F.A.C. 62-550
iron	BDL	0.034	0.576	1.73	0.223	8.11	0.692	8.78	0.3**
copper	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	1**
barium	BDL	BDL	0.12	BDL	0.013	BDL	BDL	0.013	2*
arsenic	BDL	BDL	BDL	BDL	BDL	0.008	BDL	0.027	0.05
sodium	13.3	15.8	6.49	7.32	10.2	10.2	8.55	10.5	160*
NOTE: Reference Groundwater Guidance Concentrations, FDEP June 1994									
NS= NO STANDARD									
MCL= MAXIMUM CONTAMINANT LEVEL									
BDL= BELOW DETECTION LIMIT									
ND= NO SURVEY DATA AVAILABLE									
*= DENOTES PRIMARY DRINKING WATER STANDARD									
**= DENOTES SECONDARY DRINKING WATER STANDARD									
4.2 : EXCEEDS PRIMARY OR SECONDARY DRINKING WATER									
STANDARDS, OR FLORIDA GUIDANCE CONCENTRATION MCL (shaded and bold)									
NTU= NEPHELOMETRIC TURBIDITY UNITS									
pCi/l= PICOCURIES PER LITER									
µg/l= MICROGRAMS PER LITER									
mg/l= MILLIGRAMS PER LITER									
NOTE: a dash entry ( - ) indicates that the sample was not analyzed for this parameter									

**Chemical Constituents Detected in the Groundwater Samples Collected at the  
Southeast Landfill Groundwater Monitoring Wells  
August 7, and 8, 1996**

GENERAL	Floridan Aquifer		Surficial Aquifer Wells						(MCL) STANDARD
PARAMETERS	TH-19	TH-40	TH-22	TH-28	TH-30	TH-38A	TH-57	TH-58	F.A.C. 62-550
depth to water (feet)	96.12	94.11	5.39	26.75	23.98	9.02	19.59	28.46	NS
water table elevation (NGVD)	33.82	31.12	124.43	105.33	105.46	123.73	ND	ND	NS
conductivity (umhos/cm) (field)	434	376	266	154	199	181	171	383	NS
pH (field)	7.13	7.26	4.2	4.48	4.42	5.13	4.88	5.45	(6.5 - 8.5)**
total dissolved solids (mg/l)	256	218	166	84	110	90	96	202	500**
temperature (°C) in field	24.6	23.9	23.2	23.2	23.2	24.9	25.3	23.7	NS
turbidity (NTU)	0.103	<0.1	15	1.96	6.59	2.77	7.54	6.38	NS
chloride (mg/l)	9.02	8.17	30.3	24.4	25.4	10.9	19.3	14.2	250**
nitrate (mg/l as N)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	10*
ammonia nitrogen (mg/l as N)	0.16	0.2	0.28	0.42	0.8	5.09	0.75	1.74	NS
dissolved oxygen (mg/l) (field)	1.4	0.67	0.9	1.95	1.21	1.4	1.63	2.21	NS
total alpha (pCi/l)	-	-	-	-	-	-	-	-	15*
radium 226 (pCi/l)	-	-	-	-	-	-	-	-	5*
Metals: (mg/l)	TH-19	TH-40	TH-22	TH-28	TH-30	TH-38A	TH-57	TH-58	(MCL) STANDARD F.A.C. 62-550
iron	BDL	BDL	0.604	1.51	0.263	7.87	1.03	7.47	0.3**
copper	0.002	0.002	BDL	0.003	0.003	BDL	BDL	BDL	1**
barium	BDL	BDL	0.107	BDL	0.011	BDL	BDL	0.017	2*
arsenic	BDL	BLD	BDL	BDL	BDL	0.006	BDL	0.027	0.05
sodium	13.9	15	6.45	7.17	10.9	10.4	8.6	9.88	160*
NOTE: Reference Groundwater Guidance Concentrations, FDEP June 1994									
NS= NO STANDARD									
MCL= MAXIMUM CONTAMINANT LEVEL									
BDL= BELOW DETECTION LIMIT									
ND= NO SURVEY DATA AVAILABLE									
*= DENOTES PRIMARY DRINKING WATER STANDARD									
**= DENOTES SECONDARY DRINKING WATER STANDARD									
4.2 EXCEEDS PRIMARY OR SECONDARY DRINKING WATER STANDARDS, OR FLORIDA GUIDANCE CONCENTRATION MCL (shaded and bold)									
NTU= NEPHELOMETRIC TURBIDITY UNITS									
pCi/l= PICOCURIES PER LITER									
µg/l= MICROGRAMS PER LITER									
mg/l= MILLIGRAMS PER LITER									
NOTE: a dash entry ( - ) indicates that the sample was not analyzed for this parameter									

**Chemical Constituents Detected in the Groundwater Samples Collected at the  
Southeast Landfill Groundwater Monitoring Wells  
February 12, 14, 22, 1996**

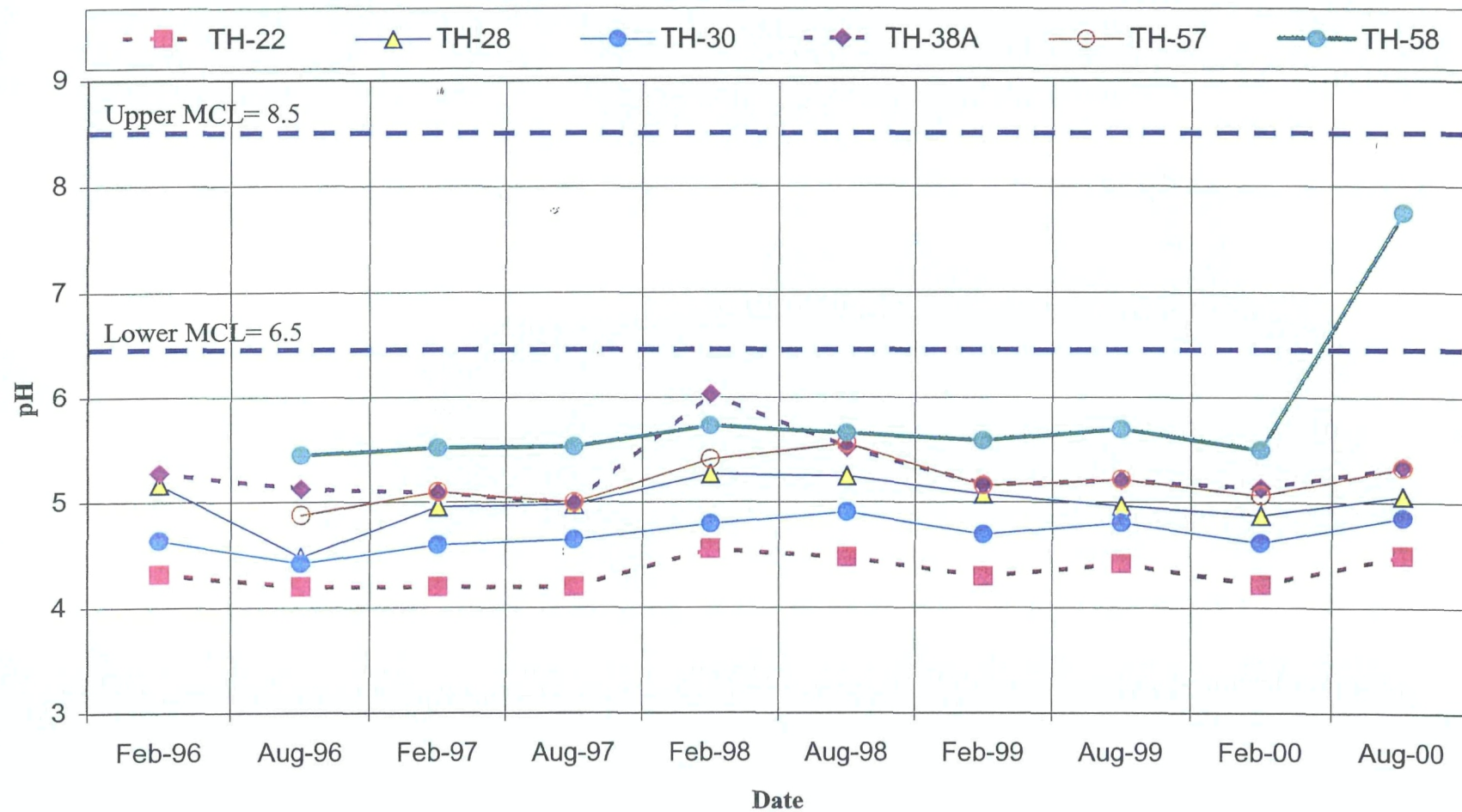
GENERAL	Surficial Aquifer Wells										(MCL) STANDARD
PARAMETERS	supply	TH-19	TH-40	TH-20B	TH-22	TH-24A	TH-28	TH-30	TH-38A	TH-56A	F.A.C. 62-550
depth to water (feet)	-	100.22	97.55	9.50	5.16	4.78	24.24	23.89	8.66	13.75	NS
water table elevation (NGVD)	-	29.72	27.68	124.26	124.60	124.53	107.84	105.55	124.09	119.50	NS
conductivity (umhos/cm) (field)	516	434	372	232	265	170	163	194	184	350	NS
pH (field)	7.63	7.28	7.43	5.63	4.32	5.36	8.17	4.84	5.28	5.78	(6.5 - 8.5)**
total dissolved solids (mg/l)	280	138	242	144	96	120	62	94	216	260	500**
temperature (°C) in Field	23.6	23.4	23.2	22.7	22.1	21.5	22.9	23	23	23.7	NS
turbidity (NTU)	0.85	BDL	BDL	7.29	2.1	18.1	1.46	5.89	5.48	24.1	NS
chloride (mg/l)	44.5	9.18	8.03	19.2	27.8	23.3	19.9	16.6	10.2	11.1	250**
nitrate (mg/l as N)	0.02	BDL	BDL	0.04	0.01	BDL	BDL	BDL	0.04	BDL	10*
sulfate (mg/l)	36.2	BDL	3.29	5.66	53.8	16.5	BDL	43.3	BDL	43.8	250**
BOD (mg/l)	BDL	2	BDL	4	BDL	1	2	5	7	3	NS
Total Organic Carbon (mg/l as C)	BDL	3.87	2.4	14.1	3.75	6.27	5.31	8.02	18.7	37.3	NS
Total Alpha (pCi/l)	-	-	-	-	-	-	8	122.5	-	-	15 pCi/l*
Radium 226 (pCi/l)	-	-	-	-	-	-	0.9	4.2	-	-	5 pCi/l*
Metals: (mg/l)	supply	TH-19	TH-40	TH-20B	TH-22	TH-24A	TH-28	TH-30	TH-38A	TH-56A	(MCL) STANDARD
aluminum	-	-	-	-	-	-	0.284	1.19	-	-	0.2**
iron	0.142	BDL	0.059	10.5	0.717	0.207	1.56	0.246	9.97	0.034	0.3**
manganese	-	-	-	-	-	-	0.019	0.002	-	-	0.05**
copper	-	-	-	-	-	-	BDL	0.002	-	-	1**
lead	-	-	-	-	-	-	BDL	BDL	-	-	0.015*
sodium	38.7	15.5	17	7.09	7.45	7.78	5.84	9.05	11.9	12.5	160*
NOTE: Reference Groundwater Guidance Concentrations, FDEP June 1994											
NS= NO STANDARD											
MCL= MAXIMUM CONTAMINANT LEVEL											
BDL= BELOW DETECTION LIMIT											
ND= NO SURVEY DATA AVAILABLE											
*= DENOTES PRIMARY DRINKING WATER STANDARD											
**= DENOTES SECONDARY DRINKING WATER STANDARD											
122.5: EXCEEDS PRIMARY OR SECONDARY DRINKING WATER											
STANDARDS, OR FLORIDA GUIDANCE CONCENTRATION MCL (shaded and bold)											
NTU= NEPHELOMETRIC TURBIDITY UNITS											
pCi/l= PICOCURIES PER LITER											
µg/l= MICROGRAMS PER LITER											
mg/l= MILLIGRAMS PER LITER											
NOTE: a dash entry ( - ) indicates that the sample was not analyzed for this parameter											

# Analytical Results from Groundwater Monitoring Wells Located at the Southeast Landfill February 21, 2001

GENERAL (mg/l)	Floridan Aquifer		Surficial Aquifer Wells						(MCL) STANDARD
PARAMETERS	TH-19	TH-40	TH-22	TH-28	TH-30	TH-38A	TH-57	TH-58	F.A.C. 62-550
conductivity (umhos/cm) (field)	424	362	263	238	181	199	155	349	NS
pH (field)	7.31	7.41	4.60	5.14	4.95	5.47	5.47	5.96	(6.5 - 8.5)**
total dissolved solids (mg/l)	270	240	180	160	120	140	100	210	500**
temperature (°C) (field)	23.1	23.7	22.5	24.1	23.2	22.7	26.4	23.7	NS
turbidity (NTU) (field)	0.8	1.7	14.3	0.7	8.4	0.6	1.3	1.7	NS
chloride (mg/l)	8.1	8.0	23	52	29	5.4	17	20	250**
ammonia nitrogen (mg/l as N)	0.46	0.53	0.81	1.2	1.9	5.9	1.5	2.1	NS
nitrate (mg/l as N)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	10*
dissolved oxygen (mg/l) (field)	1.0	1.1	0.78	0.73	0.38	1.9	0.47	3.3	NS
Metals: (mg/l)	Floridan Aquifer		Surficial Aquifer Wells						(MCL) STANDARD
	TH-19	TH-40	TH-22	TH-28	TH-30	TH-38A	TH-57	TH-58	F.A.C. 62-550
iron	BDL	BDL	0.810	2.400	0.22	0.700	0.490	0.900	0.3**
chromium	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.2
copper	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	1**
barium	BDL	BDL	0.120	BDL	0.018	BDL	BDL	0.010	2*
arsenic	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.028	0.05*
lead	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.015*
sodium	15	16	6.4	14	9.8	8.0	8.9	8.7	160*
mercury	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.002
vanadium	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	49***
zinc	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	5**
Organics: (µg/l)	Floridan Aquifer		Surficial Aquifer Wells						(MCL) STANDARD
E.P.A. Methods 8260	TH-19	TH-40	TH-22	TH-28	TH-30	TH-38A	TH-57	TH-58	F.A.C. 62-550
Organic Parameters Detected	BDL	BDL	BDL	BDL	1.3	BDL	BDL	BDL	700***
1,1-dichloroethane	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	7*
1,1-dichloroethene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	7*
NOTE: Reference Groundwater Guidance Concentrations, FDEP June 1994									
NS= NO STANDARD									
MCL= MAXIMUM CONTAMINANT LEVEL									
BDL= BELOW DETECTION LIMIT									
ND= NO SURVEY DATA AVAILABLE									
*= DENOTES PRIMARY DRINKING WATER STANDARD									
**= DENOTES SECONDARY DRINKING WATER STANDARD									
***= STANDARDS, OR FLORIDA GUIDANCE CONCENTRATION MCL (shaded and bold)									
4.50: EXCEEDS STANDARDS									
NTU= NEPHELOMETRIC TURBIDITY UNITS									
µg/l= MICROGRAMS PER LITER									
mg/l= MILLIGRAMS PER LITER									
NGVD National Geodetic Vertical Datum									
(-) indicates that the sample was not analyzed for this parameter									

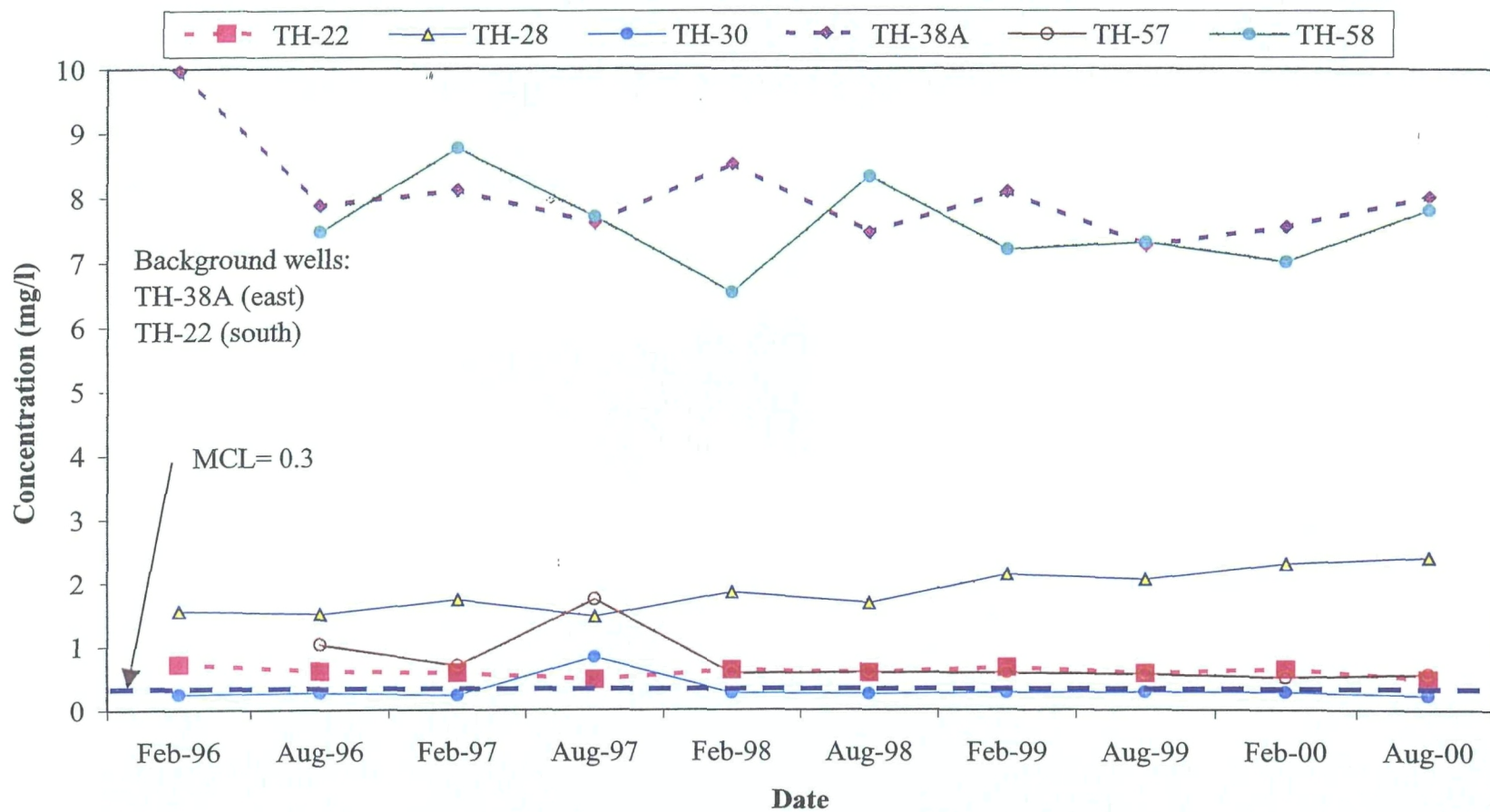
**APPENDIX B**  
**GRAPHS OF TRENDS**

**Southeast County Landfill  
Groundwater pH Trends in Surficial Aquifer Wells**



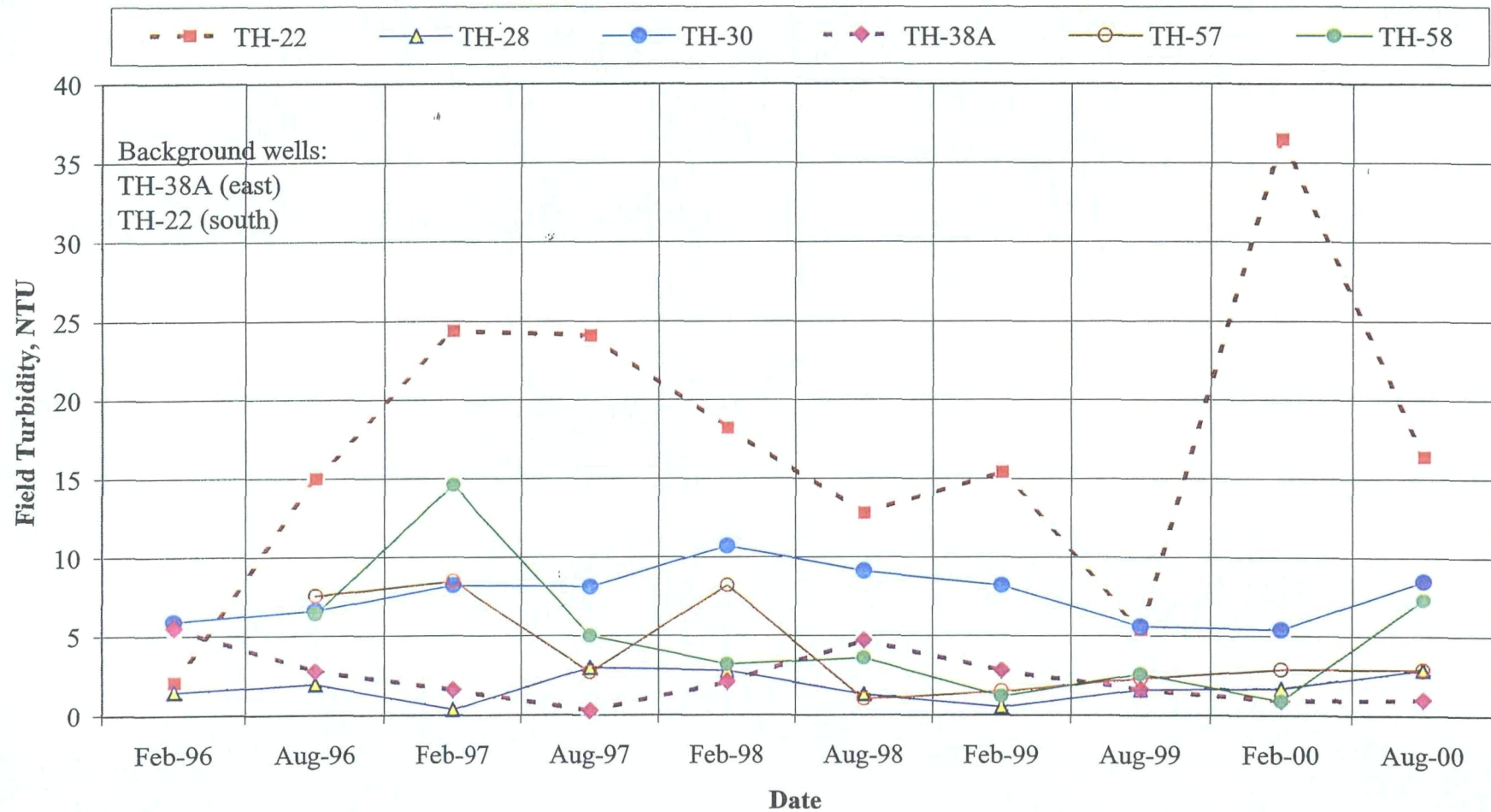
**Figure B-1. pH Trends**

# **Southeast County Landfill Groundwater Iron Trends in Surficial Aquifer Wells**



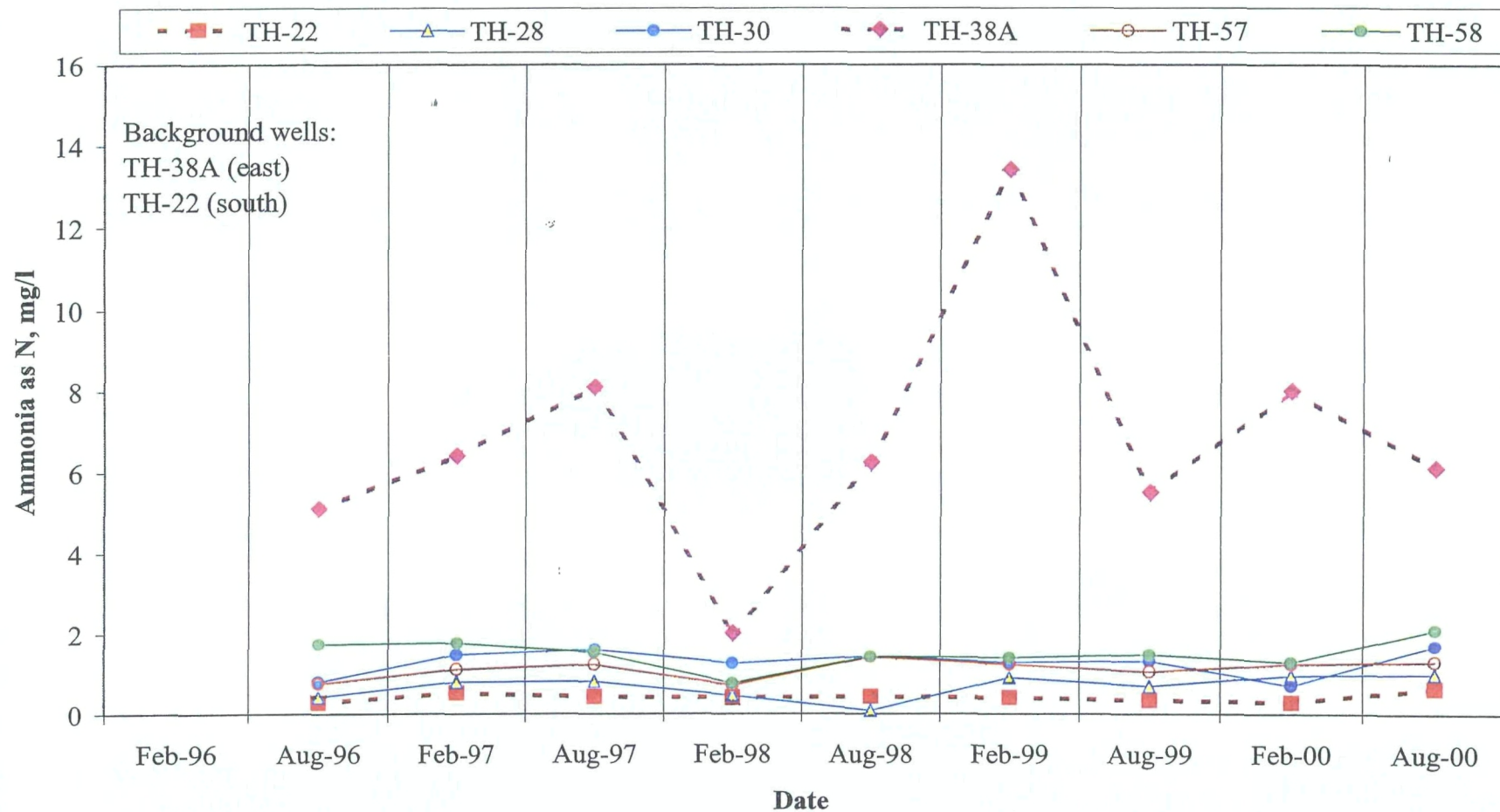
**Figure B-2. Iron Trends**

# **Southeast County Landfill Groundwater Turbidity Trends in Surficial Aquifer Wells**



**Figure B-3. Turbidity Trends**

# **Southeast County Landfill Ammonia Trends in Surficial Aquifer Wells**



**Figure B-4. Ammonia Trends**

**APPENDIX C**

**ANALYTICAL RESULTS FROM SURFACE WATER SAMPLES**

**August 23, 2000**

	NOTE:	Referenced, Surface Water Quality Standards Chapter 62-302, F.A.C.; Class III: Fresh, or Chapter 62-777, F.A.C.
	NS	No Standard
	MCL	Maximum Contaminant Level
	1A-1E	Smith Lake Composite Sample
	S.L. 1-A	Smith Lake Sample 1-A
	BDL	Below Detection Limit
	*	Zn less than or equal to $e^{(0.8473[\ln H]+0.7614)}$ ; note: H=Hardness
	**	Cu less than or equal to $e^{(0.8545[\ln H]-1.465)}$
	***	Cr less than or equal to $e^{(0.819[\ln H]+1.561)}$
	****	N less than or equal to $e^{(0.846[\ln H]+1.1645)}$
	4.5	Exceeds Title 62 Chapter 62-302 Surface Water Quality Standards
	NTU	Nephelometric Turbidity Units
	µg/l	micrograms per liter
	mg/l	milligrams per liter
	-	Indicates that the sample was not analyzed for this parameter
	NGVD	National Geodetic Vertical Datum

February 17, 2000

	NOTE:	Referenced, Surface Water Quality Standards Chapter 62-302, F.A.C.; Class III: Fresh, or Chapter 62-777, F.A.C.
	NS	No Standard
	MCL	Maximum Contaminant Level
	1A-1E	Smith Lake Composite Sample
	S.L. 1-A	Smith Lake Sample 1-A
	BDL	Below Detection Limit
	*	Zn less than or equal to $e^{(0.8473(\ln H) + 0.7614)}$ ; note: H=Hardness
	**	Cu less than or equal to $e^{(0.8545(\ln H) - 1.465)}$
	***	Cr less than or equal to $e^{(0.819(\ln H) + 1.561)}$
	****	Ni less than or equal to $e^{(0.846(\ln H) + 1.1645)}$
	4.5	Exceeds Title 62 Chapter 62-302 Surface Water Quality Standards
	NTU	Nephelometric Turbidity Units
	µg/l	micrograms per liter
	mg/l	milligrams per liter
	-	Indicates that the sample was not analyzed for this parameter
	NGVD	National Geodetic Vertical Datum

Chemical Constituents Detected in the Surface Water Samples Collected at the  
Southeast County Landfill  
August 19, 1999

GENERAL PARAMETERS	3A	1A-1E	3B2B	3C2	S.L. 1-A	S.L. 1-B	S.L. 1-C	S.L. 1-D	S.L. 1-E	REGULATORY STANDARD
staff gauge reading	0.39	1.62	1.18	1.26	-	-	-	-	-	NS
water level NGVD	122.59	120.35	95.81	90.25	-	-	-	-	-	NS
conductivity (umhos/cm) (field)	327	219	287	258	-	-	-	-	-	1275
pH (field)	6.06	6.04	6.22	6.38	-	-	-	-	-	(6.0 - 8.5)
total dissolved solids (mg/l)	268	148	240	196	-	-	-	-	-	NS
total suspended solids (mg/l)	BDL	38	167	11	-	-	-	-	-	NS
temperature (°C) in field	25.5	29.5	24.6	25.2	-	-	-	-	-	NS
turbidity (field) (NTU)	3.4	34.5	1.7	11.5	-	-	-	-	-	29
nitrate (mg/l)	0.74	BDL	0.2	0.11	-	-	-	-	-	NS
dissolved oxygen (mg/l) (field)	3.53	4.31	3.92	5.26	-	-	-	-	-	Must Be > OR=5.0
total phosphorous (mg/l)	BDL	2.21	0.3	0.72	-	-	-	-	-	NS
biochem. oxygen demand (mg/l)	BDL	7	1	BDL	-	-	-	-	-	NS
chemical oxygen demand (mg/l)	14	78	21	24	-	-	-	-	-	NS
total organic carbon (mg/l as C)	8	24	9	9	-	-	-	-	-	NS
chlorophyll-A (MG/M3)	BDL	179	BDL	8	-	-	-	-	-	NS
total hardness (mg/l as CaCO3)	105	78	91	86	-	-	-	-	-	NS
fecal coliform (Col/100ml)	62	-	122	54	149	4	1300	24	4	800

Metals: (mg/l)	3A	1A-1E	3B2B	3C2	S.L. 1-A	S.L. 1-B	S.L. 1-C	S.L. 1-D	S.L. 1-E	REGULATORY STANDARD
Iron	0.260	0.12	0.340	0.460	-	-	-	-	-	1
copper	BDL	BDL	BDL	BDL	-	-	-	-	-	**
barium	0.024	0.005	0.02	0.013	-	-	-	-	-	<10% above background
vanadium	BDL	0.008	BDL	BDL	-	-	-	-	-	NS
chromium	0.001	0.002	0.001	0.003	-	-	-	-	-	***
nickel	BDL	BDL	BDL	BDL	-	-	-	-	-	****
zinc	BDL	BDL	BDL	BDL	-	-	-	-	-	*=105.99
mercury	BDL	BDL	BDL	BDL	-	-	-	-	-	0.000012

NOTE:	Referenced, Surface Water Quality Standards Chapter 62-302, F.A.C.; Class III; Fresh, or Chapter 62-777, F.A.C.
NS	No Standard
MCL	Maximum Contaminant Level
1A-1E	Smith Lake Composite Sample
S.L. 1-A	Smith Lake Sample 1-A
BDL	Below Detection Limit
*	Zn less than or equal to $e^{(0.8473(\ln H) + 0.7614)}$ ; note: H=Hardness
**	Cu less than or equal to $e^{(0.8545(\ln H) - 1.465)}$
***	Cr less than or equal to $e^{(0.819(\ln H) + 1.561)}$
****	Ni less than or equal to $e^{(0.846(\ln H) + 1.1645)}$
4.5	Exceeds Title 62 Chapter 62-302 Surface Water Quality Standards
NTU	Nephelometric Turbidity Units
µg/l	micrograms per liter
mg/l	milligrams per liter
-	Indicates that the sample was not analyzed for this parameter
NGVD	National Geodetic Vertical Datum

**Chemical Constituents Detected in the Surface Water Samples Collected at the  
Southeast County Landfill  
February 17, 1999**

GENERAL PARAMETERS										REGULATORY STANDARD
	3A	1A-1E	3B2B	3C2	S.L. 1-A	S.L. 1-B	S.L. 1-C	S.L. 1-D	S.L. 1-E	F.A.C. 62-302
staff gauge reading	0.30	2.80	1.10	1.26	-	-	-	-	-	NS
water level NGVD	122.50	121.53	95.73	90.25	-	-	-	-	-	NS
conductivity (umhos/cm) (field)	315	180	242	207	-	-	-	-	-	1275
pH (field)	6.6	6.71	6.64	5.85	-	-	-	-	-	(6.0 - 8.5)
total dissolved solids (mg/l)	180	104	140	144	-	-	-	-	-	NS
total suspended solids (mg/l)	BDL	21	5	BDL	-	-	-	-	-	NS
temperature (°C) in field	18.1	18.9	16.3	16.8	-	-	-	-	-	NS
turbidity (field) (NTU)	3.1	8.82	4.4	2.8	-	-	-	-	-	29
nitrate (mg/l)	0.5	BDL	0.28	0.14	-	-	-	-	-	NS
dissolved oxygen (mg/l) (field)	6.78	13.9	8.46	7.97	-	-	-	-	-	Must Be > OR=5.0
total phosphorous (mg/l)	0.04	1.39	0.28	0.67	-	-	-	-	-	NS
biochem. oxygen demand (mg/l)	BDL	5	1	BDL	-	-	-	-	-	NS
chemical oxygen demand (mg/l)	7	56	24	BDL	-	-	-	-	-	NS
total organic carbon (mg/l as C)	6	16	8	11	-	-	-	-	-	NS
chlorophyll-A (MG/M3)	4	68	10	BDL	-	-	-	-	-	NS
total hardness (mg/l as CaCO)	100	64	76	73	-	-	-	-	-	NS
fecal coliform (Col/100ml)	4	-	256	34	0	40	12	26	24	800

										REGULATORY STANDARD
	3A	1A-1E	3B2B	3C2	S.L. 1-A	S.L. 1-B	S.L. 1-C	S.L. 1-D	S.L. 1-E	F.A.C. 62-302
Metals: (mg/l)										
Iron	0.153	0.041	0.715	0.158	-	-	-	-	-	1
Copper	BDL	BDL	BDL	BDL	-	-	-	-	-	**
barium	0.028	0.002	0.019	0.008	-	-	-	-	-	NS
vanadium	BDL	BDL	BDL	BDL	-	-	-	-	-	NS
chromium	BDL	0.001	0.001	0.001	-	-	-	-	-	***
nickel	BDL	BDL	BDL	BDL	-	-	-	-	-	****
zinc	BDL	BDL	BDL	BDL	-	-	-	-	-	*=105.99
mercury	BDL	BDL	BDL	BDL	-	-	-	-	-	0.000012

	NOTE:	Referenced, Surface Water Quality Standards Title 62 Chapter 62-302, Class III: Fresh
	NS	No Standard
	MCL	Maximum Contaminant Level
	1A-1E	Smith Lake Composite Sample
	S.L. 1-A	Smith Lake Sample 1-A
	BDL	Below Detection Limit
	*	Zn less than or equal to $e(0.8473[\ln H]+0.7614)$ , note: H=Hardness, for 3A standard is 105.99
	**	Cu less than or equal to $e(0.8545[\ln H]-1.465)$
	***	Cr less tha or equal to $e(0.819[\ln H]+1.561)$
	****	Ni< or = $e(0.846[\ln H]+1.1645)$
	4.5	Exceeds Title 62 Chapter 62-302 Surface Water Quality Standards
	NTU	Nephelometric Turbidity Units
	µg/l	micrograms per liter
	mg/l	milligrams per liter
	-	Indicates that the sample was not analyzed for this parameter
	NGVD	National Geodetic Vertical Datum

**Chemical Constituents Detected in the Surface Water Samples Collected at the  
Southeast County Landfill  
August 27, 1998**

GENERAL PARAMETERS										REGULATORY STANDARD F.A.C. 62-302
	3A	1A-1E	3B2B	3C2	S.L. 1-A	S.L. 1-B	S.L. 1-C	S.L. 1-D	S.L. 1-E	
staff gauge reading	0.45	2.40	1.22	1.32	-	-	-	-	-	NS
water level NGVD	122.65	121.14	95.85	90.31	-	-	-	-	-	NS
conductivity (umhos/cm) (field)	332	196	267	243	-	-	-	-	-	1275
pH (field)	6.1	6.63	6.51	6.78	-	-	-	-	-	(6.0 - 8.5)
total dissolved solids (mg/l)	228	144	172	168	-	-	-	-	-	NS
total suspended solids (mg/l)	18	28	10	6	-	-	-	-	-	NS
temperature (°C) in field	26.1	30.5	25.3	26.6	-	-	-	-	-	NS
turbidity (field) (NTU)	7.2	27.3	2.1	3.9	-	-	-	-	-	29
nitrate (mg/l)	0.41	BDL	0.2	0.18	-	-	-	-	-	NS
dissolved oxygen (mg/l) (field)	3.34	4.4	2.76	4.25	-	-	-	-	-	Must Be > OR=5.0
total phosphorous (mg/l)	0.05	7.75	0.42	0.54	-	-	-	-	-	NS
biochem. oxygen demand (mg/l)	BDL	4	BDL	BDL	-	-	-	-	-	NS
chemical oxygen demand (mg/l)	10	71	29	22	-	-	-	-	-	NS
total organic carbon (mg/l as C)	7	21	9	10	-	-	-	-	-	NS
chlorophyll-A (MG/M3)	17	76	3	BDL	-	-	-	-	-	NS
total hardness (mg/l as CaCO)	105	68.9	85.5	88.1	-	-	-	-	-	NS
fecal coliform (Col/100ml)	1144	-	160	71	32	14	44	240	58	800

METALS (mg/l)										REGULATORY STANDARD F.A.C. 62-302
	3A	1A-1E	3B2B	3C2	S.L. 1-A	S.L. 1-B	S.L. 1-C	S.L. 1-D	S.L. 1-E	
Iron	0.360	0.100	0.360	0.240	-	-	-	-	-	1
copper	BDL	BDL	BDL	BDL	-	-	-	-	-	**
barium	0.03	0.005	0.019	0.009	-	-	-	-	-	NS
vanadium	BDL	BDL	BDL	BDL	-	-	-	-	-	NS
chromium	0.002	0.002	0.001	0.001	-	-	-	-	-	***
nickel	BDL	BDL	BDL	BDL	-	-	-	-	-	***
zinc	0.026	BDL	BDL	BDL	-	-	-	-	-	*=105.99
mercury	BDL	BDL	BDL	BDL	-	-	-	-	-	0.000012

NOTE:	Referenced, Surface Water Quality Standards Title 62 Chapter 62-302, Class III; Fresh
NS	No Standard
MCL	Maximum Contaminant Level
1A-1E	Smith Lake Composite Sample
S.L. 1-A	Smith Lake Sample 1-A
BDL	Below Detection Limit
*	Zn less than or equal to $e(0.8473[\ln H]+0.7614)$ , note: H=Hardness, for 3A standard is 105.99
**	Cu less than or equal to $e(0.8545[\ln H]-1.465)$
***	Cr less tha or equal to $e(0.819[\ln H]+1.561)$
****	Ni < or = $e(0.846[\ln H]+1.1645)$
4.9	Exceeds Title 62 Chapter 62-302 Surface Water Quality Standards
NTU	Nephelometric Turbidity Units
µg/l	micrograms per liter
mg/l	milligrams per liter
-	Indicates that the sample was not analyzed for this parameter
NGVD	National Geodetic Vertical Datum

**Chemical Constituents Detected in the Surface Water Samples Collected at the  
Southeast County Landfill  
February 19, 1998**

GENERAL										REGULATORY STANDARD
PARAMETERS	3A	1A-1E	3B2B	3C2	S.L. 1-A	S.L. 1-B	S.L. 1-C	S.L. 1-D	S.L. 1-E	F.A.C. 62-302
staff gauge reading	1.69	3.57	2.87	3.30	-	-	-	-	-	NS
water level NGVD	123.89	122.31	97.51	92.30	-	-	-	-	-	NS
conductivity (umhos/cm) (field)	287	173	243	181	-	-	-	-	-	1275
pH (field)	8.02	7.25	6.52	6.72	-	-	-	-	-	(6.0 - 8.5)
total dissolved solids (mg/l)	176	132	152	112	-	-	-	-	-	NS
total suspended solids (mg/l)	BDL	15	5	5	-	-	-	-	-	NS
temperature (°C) in field	18.7	19.4	17.9	18.4	-	-	-	-	-	NS
turbidity (field) (NTU)	5.1	15.3	15.1	18.4	-	-	-	-	-	29
nitrate (mg/l)	3.09	BDL	1.81	0.63	-	-	-	-	-	NS
dissolved oxygen (mg/l) (field)	6.28	8.13	9.12	8.41	-	-	-	-	-	Must Be > OR=5.0
total phosphorous (mg/l)	0.03	2.27	0.28	1.14	-	-	-	-	-	NS
biochem. oxygen demand (mg/l)	1	5	BDL	2	-	-	-	-	-	NS
chemical oxygen demand (mg/l)	16	56	25	35	-	-	-	-	-	NS
total organic carbon (mg/l as C)	8	16	10	12	-	-	-	-	-	NS
chlorophyll-A (MG/M3)	4	76	5	8	-	-	-	-	-	NS
total hardness (mg/l as CaCO)	100	62.5	86	56.8	-	-	-	-	-	NS
fecal coliform (Col/100ml)	106	-	260	436	90	46	62	180	38	800

METALS (mg/l)										REGULATORY STANDARD
	3A	1A-1E	3B2B	3C2	S.L. 1-A	S.L. 1-B	S.L. 1-C	S.L. 1-D	S.L. 1-E	F.A.C. 62-302
iron	0.147	0.136	0.333	0.409	-	-	-	-	-	1
copper	BDL	BDL	BDL	BDL	-	-	-	-	-	**
barium	0.018	0.004	0.015	0.011	-	-	-	-	-	NS
vanadium	BDL	BDL	BDL	BDL	-	-	-	-	-	NS
chromium	BDL	BDL	BDL	BDL	-	-	-	-	-	***
nickel	BDL	BDL	BDL	BDL	-	-	-	-	-	****
zinc	0.03	BDL	BDL	BDL	-	-	-	-	-	*=105.99
mercury	BDL	BDL	BDL	BDL	-	-	-	-	-	0.000012

NOTE:	Referenced, Surface Water Quality Standards Title 62 Chapter 62-302, Class III: Fresh
NS	No Standard
MCL	Maximum Contaminant Level
1A-1E	Smith Lake Composite Sample
S.L. 1-A	Smith Lake Sample 1-A
BDL	Below Detection Limit
*	Zn less than or equal to $e(0.8473[\ln H]+0.7614)$ , note: H=Hardness, for 3A standard is 105.99
**	Cu less than or equal to $e(0.8545[\ln H]-1.465)$
***	Cr less tha or equal to $e(0.819[\ln H]+1.561)$
****	Ni < or = $e(0.846[\ln H]+1.1645)$
4.5	Exceeds Title 62 Chapter 62-302 Surface Water Quality Standards
NTU	Nephelometric Turbidity Units
µg/l	micrograms per liter
mg/l	milligrams per liter
-	Indicates that the sample was not analyzed for this parameter
NGVD	National Geodetic Vertical Datum

**Chemical Constituents Detected in the Surface Water Samples Collected at the  
Southeast County Landfill  
August 20, 1997**

GENERAL PARAMETERS										REGULATORY STANDARD F.A.C. 62-302
	3A	1A-1E	3B2B	3C2	S.L. 1-A	S.L. 1-B	S.L. 1-C	S.L. 1-D	S.L. 1-E	
staff gauge reading	0.60	5.60	1.60	1.55	-	-	-	-	-	NS
water level NGVD	122.80	124.34	96.24	90.55	-	-	-	-	-	NS
conductivity (umhos/cm) (field)	336	226	299	267	-	-	-	-	-	1275
pH (field)	6.09	7.04	6.33	6.56	-	-	-	-	-	(6.0 - 8.5)
total dissolved solids (mg/l)	208	136	172	164	-	-	-	-	-	NS
total suspended solids (mg/l)	5	24	6	20	-	-	-	-	-	NS
temperature (°C) in field	25.8	30.4	25.5	25.6	-	-	-	-	-	NS
turbidity (field) (NTU)	3.2	23.8	4.2	7.9	-	-	-	-	-	29
nitrate (mg/l)	1	2.87	0.45	0.28	-	-	-	-	-	NS
dissolved oxygen (mg/l) (field)	4.54	4.31	4.42	5.57	-	-	-	-	-	Must Be > OR=5.0
total phosphorous (mg/l)	0.07	2.06	0.22	0.73	-	-	-	-	-	NS
biochem. oxygen demand (mg/l)	1	6	BDL	BDL	-	-	-	-	-	NS
chemical oxygen demand (mg/l)	13	52	16	21	-	-	-	-	-	NS
total organic carbon (mg/l as C)	11	22.3	10.1	10.5	-	-	-	-	-	NS
chlorophyll-A (MG/M3)	BDL	88.1	BDL	5.3	-	-	-	-	-	NS
total hardness (mg/l as CaCO)	109	7.05	97.6	94.5	-	-	-	-	-	NS
fecal coliform (Col/100ml)	360	-	32	48	4	4	8	160	18	800

GENERAL PARAMETERS										REGULATORY STANDARD F.A.C. 62-302
	3A	1A-1E	3B2B	3C2	S.L. 1-A	S.L. 1-B	S.L. 1-C	S.L. 1-D	S.L. 1-E	
Metals: (mg/l)										
Iron	0.180	0.100	0.310	0.510	-	-	-	-	-	1
Copper	BDL	BDL	BDL	BDL	-	-	-	-	-	**
Barium	0.025	0.004	0.019	0.017	-	-	-	-	-	NS
Vanadium	BDL	0.005	BDL	BDL	-	-	-	-	-	NS
Chromium	BDL	BDL	BDL	0.011	-	-	-	-	-	***
Nickel	BDL	BDL	BDL	0.005	-	-	-	-	-	****
Mercury	BDL	BDL	BDL	BDL	-	-	-	-	-	0.000012

NOTE:	Referenced, Surface Water Quality Standards Title 62 Chapter 62-302, Class III: Fresh
NS	No Standard
MCL	Maximum Contaminant Level
1A-1E	Smith Lake Composite Sample
S.L. 1-A	Smith Lake Sample 1-A
BDL	Below Detection Limit
*	Zn less than or equal to $e(0.8473[\ln H]+0.7614)$ , note: H=Hardness, for 3A standard is 105.99
**	Cu less than or equal to $e(0.8545[\ln H]-1.465)$
***	Cr less than or equal to $e(0.819[\ln H]+1.561)$
****	Ni < or = $e(0.846[\ln H]+1.1645)$
4.5	Exceeds Title 62 Chapter 62-302 Surface Water Quality Standards
NTU	Nephelometric Turbidity Units
µg/l	micrograms per liter
mg/l	milligrams per liter
-	Indicates that the sample was not analyzed for this parameter
NGVD	National Geodetic Vertical Datum

**Chemical Constituents Detected in the Surface Water Samples Collected at the  
Southeast County Landfill  
February 19, 1997**

GENERAL PARAMETERS										REGULATORY STANDARD
	3A	1A-1E	3B2B	3C2	S.L. 1-A	S.L. 1-B	S.L. 1-C	S.L. 1-D	S.L. 1-E	F.A.C. 62-302
staff gauge reading	0.34	1.85	1.14	1.24	-	-	-	-	-	NS
water level NGVD	122.54	120.59	95.78	90.24	-	-	-	-	-	NS
conductivity (umhos/cm) (field)	343	250	283	240	-	-	-	-	-	1275
pH (field)	5.82	8.78	6.24	6.48	-	-	-	-	-	(6.0 - 8.5)
total dissolved solids (mg/l)	224	160	188	160	-	-	-	-	-	NS
total suspended solids (mg/l)	4	36	10	8	-	-	-	-	-	NS
temperature (°C) in field	21.4	19.7	19.3	18.8	-	-	-	-	-	NS
turbidity (field) (NTU)	2.8	25.4	2.2	3.9	-	-	-	-	-	29
nitrate (mg/l)	0.71	BDL	0.23	0.13	-	-	-	-	-	NS
dissolved oxygen (mg/l) (field)	6.09	11.3	6.36	8.55	-	-	-	-	-	Must Be > OR=5.0
total phosphorous (mg/l)	0.03	3	0.38	0.71	-	-	-	-	-	NS
biochem. oxygen demand (mg/l)	BDL	10	2	BDL	-	-	-	-	-	NS
chemical oxygen demand (mg/l)	7	75	15	22	-	-	-	-	-	NS
total organic carbon (mg/l as C)	8.04	26.5	9.78	12.5	-	-	-	-	-	NS
chlorophyll-A (MG/M3)	18.7	158	17.4	9.34	-	-	-	-	-	NS
total hardness (mg/l as CaCO3)	120	88	93.6	87	-	-	-	-	-	NS
fecal coliform (Col/100ml)	325	-	306	94	96	68	164	48	20	800

METALS (mg/l)										REGULATORY STANDARD
	3A	1A-1E	3B2B	3C2	S.L. 1-A	S.L. 1-B	S.L. 1-C	S.L. 1-D	S.L. 1-E	F.A.C. 62-302
iron	0.172	0.097	0.449	0.618	-	-	-	-	-	1
copper	BDL	BDL	BDL	0.002	-	-	-	-	-	**
barium	0.026	BDL	0.019	0.014	-	-	-	-	-	NS
vanadium	BDL	0.006	BDL	BDL	-	-	-	-	-	NS
mercury	BDL	BDL	BDL	BDL	-	-	-	-	-	0.000012

NOTE:	Referenced, Surface Water Quality Standards Title 62 Chapter 62-302, Class III: Fresh
NS	No Standard
MCL	Maximum Contaminant Level
1A-1E	Smith Lake Composite Sample
S.L. 1-A	Smith Lake Sample 1-A
BDL	Below Detection Limit
*	Zn less than or equal to $e(0.8473[\ln H] + 0.7614)$ , note: H=Hardness, for 3A standard is 105.99
**	Cu less than or equal to $e(0.8545[\ln H] - 1.485)$
***	Cr less than or equal to $e(0.819[\ln H] + 1.561)$
****	Ni < or = $e(0.846[\ln H] + 1.1845)$
4.5	Exceeds Title 62 Chapter 62-302 Surface Water Quality Standards
NTU	Nephelometric Turbidity Units
µg/l	micrograms per liter
mg/l	milligrams per liter
-	Indicates that the sample was not analyzed for this parameter
NGVD	National Geodetic Vertical Datum

# Analytical Results from Surface Water Samples Collected at Southeast Landfill February 21, 2001

GENERAL										(MCL) STANDARD
PARAMETERS	3A	1A-1E	3B2B	3C2	S.L. 1-A	S.L. 1-B	S.L. 1-C	S.L. 1-D	S.L. 1-E	F.A.C. 62-302
conductivity (umhos/cm) (field)	346	281	287	283	-	-	-	-	-	1275
pH (field)	6.41	7.89	6.77	6.8	-	-	-	-	-	(6.5 - 8.5)
total dissolved solids (mg/l)	260	220	210	200	-	-	-	-	-	NS
total suspended solids (mg/l)	5.0	27	16	14	-	-	-	-	-	NS
temperature (°C) in field	18.9	21.2	18.3	18.2	-	-	-	-	-	NS
turbidity (field) (NTU)	5.1	26.6	8.1	8.9	-	-	-	-	-	29
nitrate (mg/l)	0.55	BDL	0.16	0.12	-	-	-	-	-	NS
dissolved oxygen (mg/l) (field)	7.7	3.5	9.6	6.4	-	-	-	-	-	Must Be > OR=5.0
total phosphorous (mg/l)	BDL	3.2	0.88	1.6	-	-	-	-	-	NS
biochem. oxygen demand (mg/l)	BDL	20	BDL	BDL	-	-	-	-	-	NS
chemical oxygen demand (mg/l)	16	100	28	26	-	-	-	-	-	NS
total organic carbon (mg/l as C)	4.1	24	6.4	7.3	-	-	-	-	-	NS
chlorophyll-A (MG/M3)	7.2	170	5.7	4.4	-	-	-	-	-	NS
total hardness (mg/l as CaCO)	120	120	100	110	-	-	-	-	-	NS
fecal coliform (Col/100ml)	500	-	1800	1600	300	BDL	100	BDL	BDL	800
Metals: (mg/l)	3A	1A-1E	3B2B	3C2	S.L. 1-A	S.L. 1-B	S.L. 1-C	S.L. 1-D	S.L. 1-E	(MCL) STANDARD F.A.C. 62-302
iron	0.130	0.064	0.690	1.100	-	-	-	-	-	1
copper	BDL	BDL	BDL	BDL	-	-	-	-	-	**
barium	0.04	BDL	0.027	0.025	-	-	-	-	-	NS
vanadium	BDL	BDL	BDL	BDL	-	-	-	-	-	NS
chromium	BDL	BDL	BDL	BDL	-	-	-	-	-	***
nickel	BDL	BDL	BDL	BDL	-	-	-	-	-	****
zinc	0.022	BDL	BDL	BDL	-	-	-	-	-	*=105.99
mercury	BDL	BDL	BDL	BDL	-	-	-	-	-	0.000012
NOTE: Water Levels taken on August 17, 1998										
NOTE: Referenced, Surface Water Quality Standards Title 62 Chapter 62-302, Class III: Fresh										
NS= NO STANDARD										
MCL= MAXIMUM CONTAMINANT LEVEL										
1A-1E= SMITH LAKE COMPOSITE SAMPLE										
S.L. 1-A= SMITH LAKE SAMPLE 1-A										
BDL= BELOW DETECTION LIMIT										
*= $Zn < \text{or} = e(0.8473[\ln H] + 0.7614)$ , note: H=Hardness, for 3A standard is 105.99										
**= $Cu < \text{or} = e(0.8545[\ln H] - 1.465)$										
***= $Cr < \text{or} = e(0.819[\ln H] + 1.561)$										
****= $Ni < \text{or} = e(0.846[\ln H] + 1.1645)$										
6.49: EXCEEDS TITLE 62 CHAPTER 62-302 SURFACE WATER QUALITY STANDARDS										
NTU= NEPHELOMETRIC TURBIDITY UNITS										
µg/l= MICROGRAMS PER LITER										
mg/l= MILLIGRAMS PER LITER										
NOTE: (·) indicates that the sample was not analyzed for this parameter										
TNT= TO NUMERIOUS TO COUNT										
NGVD: National Geodetic Vertical Datum										

**APPENDIX D**  
**WATER LEVEL DATA**

# Groundwater and Surface Water Elevation For Southeast County Landfill

February 19, 2001

Measuring Point I.D.	T.O.C. Elevations (NGVD)	2/19/2001 W.L. B.T.O.C.	W.L. (NGVD)
P-2D	138.73	21.00	117.73
P-2S	138.82	9.62	129.20
P-3D	143.19	22.55	120.64
P-3S	143.20	DRY	DRY
P-4D	141.80	24.63	117.17
P-4S	141.98	9.20	132.78
P-5D	156.84	26.25	130.59
P-6D	159.10	38.62	120.48
TH-19*	130.05	127.19	2.86
TH-22	128.82	6.50	122.32
TH-28	130.60	26.90	103.70
TH-30	128.37	24.49	103.88
TH-32	129.25	17.02	112.23
TH-35	145.19	29.15	116.04
TH-36A	152.70	33.94	118.76
TH-38A	131.20	11.93	119.27
TH-40*	124.77	124.38	0.39
TH-56	131.69	16.89	114.80
TH-57	128.09	20.41	107.68
TH-58	127.67	28.55	99.17
SW-3A	3.0'=125.2'	0.40	122.60
SW-3B2B	3.0'=97.63'	1.10	95.73
SW-3C2	3.0'=91.99'	1.20	90.19
SMITH LAKE	6.0'=124.73'	6.17	124.90
NGVD = National Geodetic Vertical Datum			
T.O.C. = Top of Casing			
B.T.O.C. = Below Top of Casing			
* = Floridan Well			
ND = No Data			
W.L. = Water Level			

# GROUNDWATER AND SURFACE WATER ELEVATIONS FOR SOUTHEAST LANDFILL

March 10, 2000

Measuring Point I.D.	T.O.C. Elevations (NGVD)	March 10, 2000	
		W.L. B.T.O.C.	W.L. (NGVD)
P-2D	138.73	ND	ND
P-2S	138.82	ND	ND
P-3D	143.19	21.98	121.21
P-3S	143.20	8.78	134.42
P-4D	141.80	ND	ND
P-4S	141.98	7.30	134.68
P-5D	156.84	26.02	130.82
P-6D	159.10	37.10	122.00
TH-19*	130.05	ND	ND
TH-22	128.82	5.90	122.92
TH-28	130.60	26.74	103.86
TH-30	128.37	24.28	104.09
TH-32	129.25	15.94	113.31
TH-35	145.19	28.38	116.81
TH-36A	152.70	32.32	120.38
TH-38A	131.20	9.88	121.32
TH-40*	124.77	ND	ND
TH-56	131.69	15.94	115.75
TH-57	128.09	20.18	107.91
TH-58	127.67	28.48	99.19
SW-3A	125.53	0.28	122.48
SW-3B2B	97.97	1.12	95.75
SW-3C2	92.33	1.20	90.19
SMITH LAKE	125.4	2.12	120.85
NGVD = National Geodetic Vertical Datum			
T.O.C. = Top of Casing			
B.T.O.C. = Below Top of Casing			
* = Floridan Well			
ND = No Data			
W.L. = Water Level			

# GROUNDWATER AND SURFACE WATER ELEVATIONS FOR SOUTHEAST LANDFILL

February 14, 2000

Measuring Point	T.O.C. Elevations (NGVD)	02/14/2000 W.L. B.T.O.C.	W.L. (NGVD)
P-2D	138.73	19.88	118.85
P-2S	138.82	8.16	130.66
P-3D	143.19	21.70	121.49
P-3S	143.20	8.42	134.78
P-4D	141.80	23.20	118.60
P-4S	141.98	6.88	135.10
P-5D	156.84	25.66	131.18
P-6D	159.10	36.74	122.36
TH-19*	130.05	110.00	20.05
TH-22	128.82	5.64	123.18
TH-28	130.60	26.54	104.06
TH-30	128.37	24.19	104.18
TH-32	129.25	15.75	113.50
TH-35	145.19	28.30	116.89
TH-36A	152.70	32.15	120.55
TH-38A	131.20	9.69	121.51
TH-40*	124.77	108.33	16.44
TH-56	131.69	15.70	115.99
TH-57	128.09	20.00	108.09
TH-58	127.67	28.37	99.30
SW-3A	125.53	0.30	122.50
SW-3B2B	97.97	1.24	95.87
SW-3C2	92.33	1.28	90.27
SMITH LAKE	125.4	2.37	121.10
NGVD = National Geodetic Vertical Datum			
T.O.C. = Top of Casing			
B.T.O.C. = Below Top of Casing			
* = Floridan Well			
ND = No Data			
W.L. = Water Level			

# GROUNDWATER AND SURFACE WATER ELEVATIONS FOR SOUTHEAST LANDFILL

August 17, 1999

Measuring Point I.D.	T.O.C. Elevations (NGVD)	8/19/99 W.L. B.T.O.C.	W.L. (NGVD)
P-2D	138.73	20.00	118.73
P-2S	138.82	7.83	130.99
P-3D	143.19	22.36	120.83
P-3S	143.20	7.84	135.36
P-4D	141.80	23.27	118.53
P-4S	141.98	6.53	135.45
P-5D	156.84	27.26	129.58
P-6D	159.10	37.71	121.39
TH-19*	130.05	97.20	32.85 ✓
TH-22	128.82	5.70	123.12
TH-28	130.60	27.04	103.56
TH-30	128.37	24.25	104.12
TH-32	129.25	15.25	114.00
TH-35	145.19	28.55	116.64
TH-36A	152.70	32.72	119.98
TH-38A	131.20	10.20	121.00
TH-40*	124.77	93.10	31.67
TH-56	131.69	15.67	116.02
TH-57	128.09	20.23	107.86
TH-58	127.67	28.40	99.27
SW-3A	125.53	0.39	122.59
SW-3B2B	97.97	1.18	95.81
SW-3C2	92.33	1.26	90.25
SMITH LAKE	125.4	1.62	120.35
NGVD = National Geodetic Vertical Datum			
T.O.C. = Top of Casing			
B.T.O.C. = Below Top of Casing			
* = Floridan Well			
W.L. = Water Level			

**Groundwater and Surface Water Levels Recorded at the Southeast Landfill  
Site  
February 15, 1999**

Measuring Point I.D.	T.O.C. Elevations (NGVD)	2/15/99	
		W.L. B.T.O.C.	W.L. (NGVD)
P-1D	129.45	ND	ND
P-1S	129.85	ND	ND
P-2D	138.73	17.77	120.96
P-2S	138.82	7.79	131.03
P-3D	143.19	20.00	123.19
P-3S	143.20	7.79	135.41
P-4D	141.80	21.44	120.36
P-4S	141.98	6.41	135.57
P-5D	156.84	24.47	132.37
P-6D	159.10	34.64	124.46
TH-19*	130.05	101.20	28.85
TH-22	128.82	5.65	123.17
TH-28	130.60	26.55	104.05
TH-30	128.37	24.11	104.26
TH-32	129.25	14.78	114.47
TH-35	145.19	27.24	117.95
TH-36A	152.70	31.75	120.95
TH-38A	131.20	9.00	122.20
TH-40*	124.77	100.92	23.85
TH-56	131.69	14.45	117.24
TH-57	128.09	19.75	108.34
TH-58	127.67	28.43	99.24
SW-3A	3.33=125.53	0.30	122.50
SW-3B2B	3.34=97.97	1.10	95.73
SW-3C2	3.34=92.33	1.26	90.25
SMITH LAKE	6.66=125.40	2.80	121.53
NGVD = National Geodetic Vertical Datum			
T.O.C. = Top of Casing			
B.T.O.C. = Below Top of Casing			
* = Floridan Well			
W.L. = Water Level			

**Water Level Data Base  
Southeast Landfill  
Hillsborough County, Florida**

Measuring	T.O.C.	8/15/97		2/16/98		8/24/98	
Point	Elevations	W.L.	W.L.	W.L.	W.L.	W.L.	W.L.
I.D.	(NGVD)	B.T.O.C.	(NGVD)	B.T.O.C.	(NGVD)	B.T.O.C.	(NGVD)
P-1D	129.45	5.36	124.09	4.25	125.20	8.00	121.45
P-1S	129.85	2.94	126.91	2.46	127.39	6.20	123.65
P-2D	138.73	16.89	121.84	15.10	123.63	17.26	121.47
P-2S	138.82	6.71	132.11	5.83	132.99	7.10	131.72
P-3D	143.19	19.58	123.61	17.77	125.42	19.98	123.21
P-3S	143.20	6.29	136.91	5.28	137.92	7.25	135.95
P-4D	141.80	21.78	120.02	19.28	122.52	21.10	120.70
P-4S	141.98	4.67	137.31	3.75	138.23	5.44	136.54
P-5D	156.84	21.03	135.81	19.94	136.90	25.49	131.35
P-6D	159.10	34.90	124.20	31.95	127.15	35.00	124.10
TH-19*	130.05	91.95	38.10	82.84	47.21	99.88	30.17
TH-22	128.82	4.65	124.17	3.60	125.22	5.55	123.27
TH-28	130.60	26.20	104.40	25.22	105.38	34.30	96.30
TH-30	128.37	23.90	104.47	23.28	105.09	24.00	104.37
TH-32	129.25	14.12	115.13	13.43	115.82	14.43	114.82
TH-35	145.19	27.35	117.84	25.73	119.46	27.37	117.82
TH-36A	152.70	31.65	121.05	30.89	121.81	31.94	120.76
TH-38A	131.20	8.62	122.58	7.61	123.59	9.13	122.07
TH-40*	124.77	88.19	36.58	79.12	45.65	96.03	28.74
TH-56	131.69	14.27	117.42	12.23	119.46	14.27	117.42
TH-57	128.09	19.00	109.09	18.45	109.64	19.74	108.35
TH-58	127.67	28.02	99.65	27.50	100.17	28.32	99.35
SW-3A	3.33=125.53	0.62	122.82	1.69	123.89	0.45	122.65
SW-3B2B	3.34=97.97	1.50	96.13	2.87	97.50	1.22	95.85
SW-3C2	3.34=92.33	1.53	90.52	3.30	92.29	1.32	90.31
SMITH LAKE	6.66=125.40	2.58	121.31	3.57	122.31	2.40	121.14
NGVD = National Geodetic Vertical Datum							
T.O.C. = Top of Casing							
B.T.O.C. = Below Top of Casing							
* = Floridan Well							
W.L. = Water Level							

**APPENDIX D**

**WATER LEVEL DATA**  
**(SUPPLEMENT PAGES)**

Groundwater and Surface Water Elevations for  
Southeast County Landfill

Measuring Point I.D.	T.O.C. Elevations (NGVD)	March 22, 2001	
		W.L. B.T.O.C.	W.L. (NGVD)
P-2D	138.73	21.00	118.19
P-2S	138.82	9.66	129.54
P-3D	143.19	22.53	120.66
P-3S	143.20	Dry	Dry
P-4D	141.80	Dry	Dry
P-4S	141.98	9.38	132.60
P-5D	156.84	Dry	Dry
P-6D	159.10	ND	ND
P-7D	138.18	19.46	118.72
P-8D	138.72	20.68	118.04
P-9D	138.25	20.20	118.05
P-10D	130.06	11.14	118.92
P-11D	137.28	19.64	117.64
TH-19*	130.05	125.58	4.47
TH-22	128.82	6.30	122.52
TH-28	130.60	26.84	103.76
TH-30	128.37	24.40	103.97
TH-32	129.25	17.06	112.19
TH-35	145.19	29.26	115.93
TH-36A	152.70	34.00	118.70
TH-38A	131.20	11.94	119.26
TH-40*	124.77	121.40	3.37
TH-56	131.69	16.40	115.29
TH-57	128.09	20.36	107.73
TH-58	127.67	Dry	Dry
SW-3A	3.0'=125.2	0.38	122.58
SW-3B2B	3.0'=97.63	1.00	95.63
SW-3C2	3.0'=91.99	1.18	90.17
SMITH LAKE	6.0'=124.73	0.04	118.77
NGVD = National Geodetic Vertical Datum T.O.C. = Top of Casing B.T.O.C. = Below Top of Casing * = Floridan Well ND = No Data W.L. = Water Level			

Groundwater and Surface Water Elevations for  
Southeast County Landfill

Measuring Point I.D.	T.O.C. Elevations (NGVD)	April 13, 2001 W.L. B.T.O.C.      W.L. (NGVD)	
P-2D	138.73	20.92	117.81
P-2S	138.82	8.62	130.20
P-3D	143.19	22.54	120.65
P-3S	143.20	8.00	135.20
P-4D	141.80	24.58	117.22
P-4S	141.98	8.46	133.52
P-5D	156.84	Dry	Dry
P-6D	159.10	ND	ND
P-7D	138.18	19.02	118.98
P-8D	138.72	20.16	118.56
P-9D	138.25	19.46	118.79
P-10D	130.06	9.86	120.20
P-11D	137.28	19.40	117.88
TH-19*	130.05	123.90	6.15
TH-22	128.82	5.70	123.12
TH-28	130.60	26.72	103.88
TH-30	128.37	24.42	103.95
TH-32	129.25	16.36	112.89
TH-35	145.19	28.98	116.21
TH-36A	152.70	33.62	119.08
TH-38A	131.20	11.18	120.02
TH-40*	124.77	121.04	3.73
TH-56	131.69	16.78	114.91
TH-57	128.09	19.88	108.21
TH-58	127.67	Dry	Dry
SW-3A	3.0'=125.2	0.54	122.74
SW-3B2B	3.0'=97.63	1.18	95.81
SW-3C2	3.0'=91.99	1.22	90.21
SMITH LAKE	6.0'=124.73	ND	ND

NGVD = National Geodetic Vertical Datum

T.O.C. = Top of Casing

B.T.O.C. = Below Top of Casing

\* = Floridan Well

ND = No Data

W.L. = Water Level

**Groundwater and Surface Water Elevations for  
Southeast County Landfill**

Measuring Point I.D.	T.O.C. Elevations (NGVD)	May 11, 2001	
		W.L. B.T.O.C.	W.L. (NGVD)
P-2D	138.73	21.24	117.49
P-2S	138.82	9.26	129.56
P-3D	143.19	22.58	120.61
P-3S	143.20	8.70	134.50
P-4D	141.80	24.72	117.08
P-4S	141.98	8.88	133.10
P-5D	156.84	26.20	130.64
P-6D	159.10	ND	ND
P-7D	138.18	19.60	118.58
P-8D	138.72	20.86	117.86
P-9D	138.25	20.28	117.97
P-10D	130.06	10.66	119.40
P-11D	137.28	19.98	117.30
TH-19*	130.05	132.04	-1.99
TH-22	128.82	6.38	122.44
TH-28	130.60	27.38	103.22
TH-30	128.37	24.58	103.79
TH-32	129.25	16.84	112.41
TH-35	145.19	29.42	115.77
TH-36A	152.70	34.20	118.50
TH-38A	131.20	11.88	119.32
TH-40*	124.77	128.64	-3.87
TH-56	131.69	16.98	114.71
TH-57	128.09	20.46	107.63
TH-58	127.67	Dry	Dry
SW-3A	3.0'=125.2	0.29	122.49
SW-3B2B	3.0'=97.63	0.80	95.43
SW-3C2	3.0'=91.99	1.10	90.09
SMITH LAKE	6.0'=124.73	ND	ND

**NGVD = National Geodetic Vertical Datum**  
**T.O.C. = Top of Casing**  
**B.T.O.C. = Below Top of Casing**  
**\* = Floridan Well**  
**ND = No Data**  
**W.L. = Water Level**

**Groundwater and Surface Water Elevations for  
Southeast County Landfill**

Measuring Point I.D.	T.O.C. Elevations (NGVD)	6/15/01 W.L. B.T.O.C.	W.L. (NGVD)
P-2D	138.73	21.32	117.41
P-2S	138.82	9.60	129.22
P-3D	143.19	22.54	120.65
P-3S	143.20	Dry	Dry
P-4D	141.80	24.90	116.90
P-4S	141.98	9.28	132.70
P-5D	156.84	26.22	130.62
P-6D	159.10	ND	ND
P-7D	138.18	19.88	118.30
P-8D	138.72	21.04	117.68
P-9D	138.25	20.50	117.75
P-10D	130.06	11.28	118.78
P-11D	137.28	19.96	117.32
TH-19*	130.05	127.96	2.09
TH-22	128.82	6.62	122.20
TH-28	130.60	27.40	103.20
TH-30	128.37	24.54	103.83
TH-32	129.25	17.20	112.05
TH-35	145.19	29.62	115.57
TH-36A	152.70	34.48	118.22
TH-38A	131.20	12.46	118.74
TH-40*	124.77	124.70	0.07
TH-56	131.69	17.02	114.67
TH-57	128.09	20.62	107.47
TH-58	127.67	Dry	Dry
SW-3A	3.0'=125.2	0.30	122.50
SW-3B2B	3.0'=97.63	1.00	95.63
SW-3C2	3.0'=91.99	1.10	90.09
SMITH LAKE	6.0'=124.73	ND	ND

**NGVD = National Geodetic Vertical Datum**

**T.O.C. = Top of Casing**

**B.T.O.C. = Below Top of Casing**

**\* = Floridan Well**

**ND = No Data**

**W.L. = Water Level**

**Groundwater and Surface Water Elevations for  
Southeast County Landfill**

<b>Measuring Point I.D.</b>	<b>T.O.C. Elevations (NGVD)</b>	<b>7/13/02 W.L. B.T.O.C.</b>	<b>W.L. (NGVD)</b>
P-2D	138.73	20.56	118.17
P-2S	138.82	7.00	131.82
P-3D	143.19	22.54	120.65
P-3S	143.20	5.88	137.32
P-4D	141.80	24.58	117.22
P-4S	141.98	5.36	136.62
P-5D	156.84	25.02	131.82
P-6D	159.10	ND	ND
P-7D	138.18	18.56	119.62
P-8D	138.72	19.44	119.28
P-9D	138.25	18.70	119.55
P-10D	130.06	8.54	121.52
P-11D	137.28	18.70	118.58
TH-19*	130.05	110.42	19.63
TH-22	128.82	4.32	124.50
TH-28	130.60	26.60	104.00
TH-30	128.37	23.94	104.43
TH-32	129.25	15.44	113.81
TH-35	145.19	28.74	116.45
TH-36A	152.70	33.06	119.64
TH-38A	131.20	10.58	120.62
TH-40*	124.77	105.98	18.79
TH-56	131.69	15.94	115.75
TH-57	128.09	19.10	108.99
TH-58	127.67	27.52	100.15
SW-3A	3.0'=125.2	1.22	123.42
SW-3B2B	3.0'=97.63	1.80	96.43
SW-3C2	3.0'=91.99	2.12	91.11
SMITH LAKE	6.0'=124.73	0.60	119.33

**NGVD = National Geodetic Vertical Datum**  
**T.O.C. = Top of Casing**  
**B.T.O.C. = Below Top of Casing**  
**\* = Floridan Well**  
**ND = No Data**  
**W.L. = Water Level**

Groundwater and Surface Water Elevations for  
Southeast County Landfill

Measuring Point I.D.	T.O.C. Elevations (NGVD)	8/20/01 W.L. B.T.O.C.	W.L. (NGVD)
P-2D	138.73	19.81	118.92
P-2S	138.82	6.65	132.17
P-3D	143.19	21.60	121.59
P-3S	143.20	6.34	DRY
P-4D	141.80	23.81	117.99
P-4S	141.98	4.75	137.23
P-5D	156.84	19.15	137.69
P-6D	159.10	35.10	124.00
P-7D	138.18	16.93	121.25
P-8D	138.72	18.54	120.18
P-9D	138.25	17.65	120.60
P-10D	130.06	7.50	122.56
P-11D	137.28	18.19	119.09
TH-19*	130.05	96.44	33.61
TH-22	128.82	27.90	100.92
TH-28	130.60	25.61	104.99
TH-30	128.37	22.87	105.50
TH-32	129.25	14.86	114.39
TH-35	145.19	27.44	117.75
TH-36A	152.70	32.12	120.58
TH-38A	131.20	9.42	121.78
TH-40*	124.77	91.82	32.95
TH-56	131.69	15.03	116.66
TH-57	128.09	18.65	109.44
TH-58	127.67	27.61	100.06
SW-3A	3.0'=125.2'	1.12	123.32
SW-3B2B	3.0'=97.63'	1.56	96.19
SW-3C2	3.0'=91.99'	1.62	90.61
SMITH LAKE	6.0'=124.73'	1.68	120.41

NGVD = National Geodetic Vertical Datum
T.O.C. = Top of Casing
B.T.O.C. = Below Top of Casing
* = Floridan Well
ND = No Data
W.L. = Water Level

Groundwater and Surface Water Elevations for  
Southeast County Landfill

Measuring Point I.D.	T.O.C. Elevations (NGVD)	9/7/01 W.L. B.T.O.C.	W.L. (NGVD)
P-2D	138.73	19.42	119.31
P-2S	138.82	6.00	132.82
P-3D	143.19	20.98	122.21
P-3S	143.20	6.64	136.96
P-4D	141.80	23.48	118.32
P-4S	141.98	4.46	137.52
P-5D	156.84	19.94	136.90
P-6D	159.10	ND	ND
P-7D	138.18	16.94	121.24
P-8D	138.72	18.54	120.18
P-9D	138.25	18.02	120.23
P-10D	130.06	7.84	122.22
P-11D	137.28	17.98	119.30
TH-19*	130.05	99.20	30.85
TH-22	128.82	4.60	124.22
TH-28	130.60	25.76	104.84
TH-30	128.37	23.78	104.59
TH-32	129.25	14.88	114.37
TH-35	145.19	27.10	118.09
TH-36A	152.70	31.94	120.76
TH-38A	131.20	9.66	121.54
TH-40*	124.77	94.76	30.01
TH-56	131.69	14.90	116.79
TH-57	128.09	18.72	109.37
TH-58	127.67	27.78	99.89
SW-3A	3.0'=125.2	1.42	123.62
SW-3B2B	3.0'=97.63	1.82	96.45
SW-3C2	3.0'=91.99	2.30	91.29
SMITH LAKE	6.0'=124.73	1.86	122.87

NGVD = National Geodetic Vertical Datum  
 T.O.C. = Top of Casing  
 B.T.O.C. = Below Top of Casing  
 \* = Floridan Well  
 ND = No Data  
 W.L. = Water Level

**Groundwater and Surface Water Elevations for  
Southeast County Landfill**

<b>Measuring Point I.D.</b>	<b>T.O.C. Elevations (NGVD)</b>	<b>10/12/01 W.L. B.T.O.C.</b>	<b>W.L. (NGVD)</b>
P-2D	138.73	17.85	120.88
P-2S	138.82	8.16	130.66
P-3D	143.19	19.68	123.51
P-3S	143.20	7.50	135.70
P-4D	141.80	22.52	119.28
P-4S	141.98	5.00	136.98
P-5D	156.84	19.39	137.45
P-6D	159.10	32.84	126.26
P-7D	138.18	16.04	122.14
P-8D	138.72	17.54	121.18
P-9D	138.25	16.68	121.57
P-10D	130.06	7.86	122.20
P-11D	137.28	16.60	120.68
TH-19*	130.05	97.32	32.73
TH-22	128.82	5.19	123.63
TH-28	130.60	26.15	104.45
TH-30	128.37	23.95	104.42
TH-32	129.25	14.72	114.53
TH-35	145.19	26.52	118.67
TH-36A	152.70	31.94	120.76
TH-38A	131.20	9.34	121.86
TH-40*	124.77	93.95	30.82
TH-56	131.69	14.48	117.21
TH-57	128.09	18.92	109.17
TH-58	127.67	27.96	99.71
SW-3A	3.0'=125.2	1.12	123.32
SW-3B2B	3.0'=97.63	1.41	96.04
SW-3C2	3.0'=91.99	1.40	90.39
SMITH LAKE	6.0'=124.73	2.32	121.05

**NGVD = National Geodetic Vertical Datum**  
**T.O.C. = Top of Casing**  
**B.T.O.C. = Below Top of Casing**  
**\* = Floridan Well**  
**ND =No Data**  
**W.L. = Water Level**

**Groundwater and Surface Water Elevations for  
Southeast County Landfill**

<b>Measuring Point I.D.</b>	<b>T.O.C. Elevations (NGVD)</b>	<b>11/20/01 W.L. B.T.O.C.</b>	<b>W.L. (NGVD)</b>
P-2D	138.73	19.20	119.53
P-2S	138.82	9.16	129.66
P-3D	143.19	20.60	122.59
P-3S	143.20	8.58	134.62
P-4D	141.80	22.50	119.30
P-4S	141.98	6.68	135.30
P-5D	156.84	22.06	134.24
P-6D	159.10	ND	ND
P-7D	138.18	16.82	121.36
P-8D	138.72	18.86	119.86
P-9D	138.25	18.46	119.79
P-10D	130.06	8.86	121.20
P-11D	137.28	18.18	119.10
TH-19*	130.05	106.16	23.89
TH-22	128.82	5.68	123.14
TH-28	130.60	26.40	104.20
TH-30	128.37	24.16	104.21
TH-32	129.25	15.46	113.79
TH-35	145.19	27.00	118.19
TH-36A	152.70	32.10	120.60
TH-38A	131.20	9.80	121.40
TH-40*	124.77	103.76	21.01
TH-56	131.69	15.08	116.61
TH-57	128.09	19.22	108.87
TH-58	127.67	ND	ND
SW-3A	3.0'=125.2	0.62	122.82
SW-3B2B	3.0'=97.63	1.12	95.75
SW-3C2	3.0'=91.99	1.22	90.20
SMITH LAKE	6.0'=124.73	2.10	120.83

**NGVD = National Geodetic Vertical Datum**  
**T.O.C. = Top of Casing**  
**B.T.O.C. = Below Top of Casing**  
**\* = Floridan Well**  
**ND = No Data**  
**W.L. = Water Level**

**Groundwater and Surface Water Elevations for  
Southeast County Landfill**

<b>Measuring Point I.D.</b>	<b>T.O.C. Elevations (NGVD)</b>	<b>12/7/01 W.L. B.T.O.C.</b>	<b>W.L. (NGVD)</b>
P-2D	138.73	ND	ND
P-2S	138.82	ND	ND
P-3D	143.19	21.06	122.13
P-3S	143.20	9.14	134.06
P-4D	141.80	22.56	119.24
P-4S	141.98	7.00	134.98
P-5D	156.84	22.88	133.96
P-6D	159.10	ND	ND
P-7D	138.18	17.16	121.02
P-8D	138.72	19.30	119.42
P-9D	138.25	19.06	119.19
P-10D	130.06	9.12	120.94
P-11D	137.28	18.58	118.70
TH-19*	130.05	111.38	18.67
TH-22	128.82	5.90	122.92
TH-28	130.60	26.60	104.00
TH-30	128.37	24.10	104.27
TH-32	129.25	15.68	113.57
TH-35	145.19	27.30	117.89
TH-36A	152.70	32.22	120.48
TH-38A	131.20	10.00	121.20
TH-40*	124.77	108.86	15.91
TH-56	131.69	15.28	116.41
TH-57	128.09	19.54	108.55
TH-58	127.67	ND	ND
SW-3A	3.0'=125.2	0.54	122.74
SW-3B2B	3.0'=97.63	1.04	95.67
SW-3C2	3.0'=91.99	2.00	90.99
SMITH LAKE	6.0'=124.73	1.94	120.67

**NGVD = National Geodetic Vertical Datum**  
**T.O.C. = Top of Casing**  
**B.T.O.C. = Below Top of Casing**  
**\* = Floridan Well**  
**ND = No Data**  
**W.L. = Water Level**

**Groundwater and Surface Water Elevations for  
Southeast County Landfill**

<b>Measuring Point I.D.</b>	<b>T.O.C. Elevations (NGVD)</b>	<b>1/17/02 W.L. B.T.O.C.</b>	<b>W.L. (NGVD)</b>
P-2D	138.73	ND	ND
P-2S	138.82	ND	ND
P-3D	143.19	22.02	121.17
P-3S	143.20	DRY	DRY
P-4D	141.80	23.36	118.44
P-4S	141.98	7.68	134.30
P-5D	156.84	25.52	131.32
P-6D	159.10	ND	ND
P-7D	138.18	17.90	120.28
P-8D	138.72	19.48	119.24
P-9D	138.25	18.88	119.37
P-10D	130.06	9.70	120.36
P-11D	137.28	19.38	118.70
TH-19*	130.05	108.80	21.25
TH-22	128.82	6.00	122.82
TH-28	130.60	26.56	104.04
TH-30	128.37	24.18	104.19
TH-32	129.25	16.10	113.15
TH-35	145.19	27.78	117.41
TH-36A	152.70	32.32	120.38
TH-38A	131.20	10.38	120.82
TH-40*	124.77	105.25	19.52
TH-56	131.69	15.70	115.99
TH-57	128.09	20.00	108.09
TH-58	127.67	28.40	99.27
SW-3A	3.0'=125.2	0.62	122.82
SW-3B2B	3.0'=97.63	1.00	96.63
SW-3C2	3.0'=91.99	1.24	90.75
SMITH LAKE	6.0'=124.73	1.78	120.51

**NGVD = National Geodetic Vertical Datum**

**T.O.C. = Top of Casing**

**B.T.O.C. = Below Top of Casing**

**\* = Floridan Well**

**ND =No Data**

**W.L. = Water Level**

Groundwater and Surface Water Elevations for  
Southeast County Landfill

Measuring Point I.D.	T.O.C. Elevations (NGVD)	2/11/02 W.L. B.T.O.C.	W.L. (NGVD)
P-2D	138.73	ND	ND
P-2S	138.82	ND	ND
P-3D	143.19	22.28	120.91
P-3S	143.20	DRY	DRY
P-4D	141.80	23.48	118.32
P-4S	141.98	7.85	134.13
P-5D	156.84	25.77	131.07
P-6D	159.10	ND	ND
P-7D	138.18	18.10	120.08
P-8D	138.72	19.39	119.33
P-9D	138.25	18.81	119.44
P-10D	130.06	9.70	120.36
P-11D	137.28	20.25	117.03
TH-19*	130.05	109.10	20.95
TH-22	128.82	6.18	122.64
TH-28	130.60	26.64	103.96
TH-30	128.37	24.25	104.12
TH-32	129.25	16.29	112.96
TH-35	145.19	28.00	117.19
TH-36A	152.70	32.48	120.22
TH-38A	131.20	10.52	120.68
TH-40*	124.77	105.86	18.91
TH-56	131.69	15.88	115.81
TH-57	128.09	20.10	107.99
TH-58	127.67	28.43	99.24
SW-3A	3.0'=125.2'	0.50	122.70
SW-3B2B	3.0'=97.63'	1.00	95.63
SW-3C2	3.0'=91.99'	1.20	90.79
SMITH LAKE	6.0'=124.73'	1.59	120.32

NGVD = National Geodetic Vertical Datum

T.O.C. = Top of Casing

B.T.O.C. = Below Top of Casing

\* = Floridan Well

ND = No Data

W.L. = Water Level

Groundwater and Surface Water Elevations for  
Southeast County Landfill

Measuring Point I.D.	T.O.C. Elevations (NGVD)	3/14/02 W.L. B.T.O.C.	W.L. (NGVD)
P-2D	138.73	ND	ND
P-2S	138.82	ND	ND
P-3D	143.19	22.22	120.97
P-3S	143.20	DRY	DRY
P-4D	141.80	23.32	118.48
P-4S	141.98	7.72	134.26
P-5D	156.84	26.70	130.14
P-6D	159.10	ND	ND
P-7D	138.18	17.82	120.36
P-8D	138.72	18.70	120.02
P-9D	138.25	18.06	120.19
P-10D	130.06	9.66	120.40
P-11D	137.28	18.40	118.88
TH-19*	130.05	111.60	18.45
TH-22	128.82	6.08	122.74
TH-28	130.60	26.58	104.02
TH-30	128.37	24.30	104.07
TH-32	129.25	16.28	112.97
TH-35	145.19	28.14	117.05
TH-36A	152.70	32.46	120.24
TH-38A	131.20	10.56	120.64
TH-40*	124.77	109.34	15.43
TH-56	131.69	15.88	115.81
TH-57	128.09	20.04	108.05
TH-58	127.67	28.36	99.31
SW-3A	3.0'=125.2	0.70	122.90
SW-3B2B	3.0'=97.63	1.16	95.79
SW-3C2	3.0'=91.99	1.20	90.19
SMITH LAKE	6.0'=124.73	1.48	120.21

NGVD = National Geodetic Vertical Datum
T.O.C. = Top of Casing
B.T.O.C. = Below Top of Casing
* = Floridan Well
ND = No Data
W.L. = Water Level

Groundwater and Surface Water Elevations for  
Southeast County Landfill

Measuring Point I.D.	T.O.C. Elevations (NGVD)	4/12/02 W.L. B.T.O.C.	W.L. (NGVD)
P-2D	138.73	ND	ND
P-2S	138.82	ND	ND
P-3D	143.19	22.42	120.77
P-3S	143.20	DRY	DRY
P-4D	141.80	23.22	118.58
P-4S	141.98	8.10	133.88
P-5D	156.84	27.14	129.70
P-6D	159.10	ND	ND
P-7D	138.18	18.08	120.10
P-8D	138.72	18.56	120.16
P-9D	138.25	17.96	120.29
P-10D	130.06	9.88	120.18
P-11D	137.28	17.98	119.30
TH-19*	130.05	119.64	10.41
TH-22	128.82	6.44	122.38
TH-28	130.60	27.16	103.44
TH-30	128.37	24.42	103.95
TH-32	129.25	16.46	112.97
TH-35	145.19	28.48	116.71
TH-36A	152.70	32.88	119.82
TH-38A	131.20	10.86	120.34
TH-40*	124.77	117.20	7.57
TH-56	131.69	16.08	115.61
TH-57	128.09	20.36	107.73
TH-58	127.67	Dry	Dry
SW-3A	3.0'=125.2	0.60	122.80
SW-3B2B	3.0'=97.63	1.00	95.63
SW-3C2	3.0'=91.99	1.12	90.11
SMITH LAKE	6.0'=124.73	1.06	119.79

NGVD = National Geodetic Vertical Datum  
 T.O.C. = Top of Casing  
 B.T.O.C. = Below Top of Casing  
 \* = Floridan Well  
 ND = No Data  
 W.L. = Water Level

**Groundwater and Surface Water Elevations for  
Southeast County Landfill**

<b>Measuring Point I.D.</b>	<b>T.O.C. Elevations (NGVD)</b>	<b>5/9/02 W.L. B.T.O.C.</b>	<b>W.L. (NGVD)</b>
P-2D	138.73	ND	ND
P-2S	138.82	ND	ND
P-3D	143.19	21.94	121.25
P-3S	143.20	8.58	134.62
P-4D	141.80	22.90	118.90
P-4S	141.98	7.50	134.48
P-5D	156.84	27.00	129.84
P-6D	159.10	ND	ND
P-7D	138.18	17.60	120.58
P-8D	138.72	17.80	120.92
P-9D	138.25	16.90	121.35
P-10D	130.06	9.38	120.68
P-11D	137.28	17.12	120.16
TH-19*	130.05	102.49	27.56
TH-22	128.82	6.10	122.72
TH-28	130.60	27.08	103.52
TH-30	128.37	24.40	103.97
TH-32	129.25	16.12	113.13
TH-35	145.19	28.52	116.67
TH-36A	152.70	32.88	119.82
TH-38A	131.20	10.76	120.44
TH-40*	124.77	124.50	0.27
TH-56	131.69	15.80	115.89
TH-57	128.09	20.20	107.89
TH-58	127.67	Dry	Dry
SW-3A	3.0'=125.2	0.60	122.80
SW-3B2B	3.0'=97.63	1.20	95.83
SW-3C2	3.0'=91.99	ND	ND
SMITH LAKE	6.0'=124.73	1.00	119.73

**NGVD = National Geodetic Vertical Datum**  
**T.O.C. = Top of Casing**  
**B.T.O.C. = Below Top of Casing**  
**\* = Floridan Well**  
**ND = No Data**  
**W.L. = Water Level**

Groundwater and Surface Water Elevations for  
Southeast County Landfill

Measuring Point I.D.	T.O.C. Elevations (NGVD)	6/6/02 W.L. B.T.O.C.	W.L. (NGVD)
P-2D	138.73	ND	ND
P-2S	138.82	ND	ND
P-3D	143.19	22.26	120.93
P-3S	143.20	Dry	Dry
P-4D	141.80	22.96	118.84
P-4S	141.98	7.84	134.14
P-5D	156.84	Dry	Dry
P-6D	159.10	ND	ND
P-7D	138.18	17.96	120.22
P-8D	138.72	18.28	120.44
P-9D	138.25	17.50	120.75
P-10D	130.06	9.88	120.18
P-11D	137.28	17.56	119.72
TH-19*	130.05	123.86	6.19
TH-22	128.82	6.36	122.46
TH-28	130.60	27.30	103.30
TH-30	128.37	24.42	103.95
TH-32	129.25	16.40	112.85
TH-35	145.19	28.90	116.29
TH-36A	152.70	33.42	119.28
TH-38A	131.20	11.24	119.96
TH-40*	124.77	120.62	4.15
TH-56	131.69	15.90	115.79
TH-57	128.09	20.44	107.65
TH-58	127.67	Dry	Dry
SW-3A	3.0'=125.2	0.54	122.74
SW-3B2B	3.0'=97.63	0.90	95.53
SW-3C2	3.0'=91.99	ND	ND
SMITH LAKE	6.0'=124.73	0.58	119.31

NGVD = National Geodetic Vertical Datum

T.O.C. = Top of Casing

B.T.O.C. = Below Top of Casing

\* = Floridan Well

ND = No Data

W.L. = Water Level

Groundwater and Surface Water Elevations for  
Southeast County Landfill

Measuring Point I.D.	T.O.C. Elevations (NGVD)	7/9/02 W.L. B.T.O.C.	W.L. (NGVD)
P-2D	138.73	ND	ND
P-2S	138.82	ND	ND
P-3D	143.19	21.14	122.05
P-3S	143.20	6.68	136.52
P-4D	141.80	22.56	119.24
P-4S	141.98	5.18	136.80
P-5D	156.84	25.76	131.08
P-6D	159.10	ND	ND
P-7D	138.18	16.22	121.96
P-8D	138.72	16.60	122.12
P-9D	138.25	15.44	122.81
P-10D	130.06	7.60	122.46
P-11D	137.28	15.62	121.66
TH-19*	130.05	105.82	24.23
TH-22	128.82	4.70	124.12
TH-28	130.60	25.86	104.74
TH-30	128.37	24.04	104.33
TH-32	129.25	15.20	114.05
TH-35	145.19	27.70	117.49
TH-36A	152.70	31.96	120.74
TH-38A	131.20	9.58	121.62
TH-40*	124.77	101.58	23.19
TH-56	131.69	15.00	116.69
TH-57	128.09	19.06	109.03
TH-58	127.67	27.66	100.01
SW-3A	3.0'=125.2	1.20	123.40
SW-3B2B	3.0'=97.63	1.54	96.17
SW-3C2	3.0'=91.99	ND	ND
SMITH LAKE	6.0'=124.73	1.68	120.41

NGVD = National Geodetic Vertical Datum  
 T.O.C. = Top of Casing  
 B.T.O.C. = Below Top of Casing  
 \* = Floridan Well  
 ND = No Data  
 W.L. = Water Level

Groundwater and Surface Water Elevations for  
Southeast County Landfill

Measuring Point I.D.	T.O.C. Elevations (NGVD)	8/20/02 W.L. B.T.O.C.	W.L. (NGVD)
P-3D	143.19	19.69	123.50
P-3S	143.20	7.48	135.72
P-4D	141.80	21.66	120.14
P-4S	141.98	5.18	136.80
P-5D	156.84	22.56	134.28
P-7D	138.18	15.70	122.48
P-8D	138.72	16.62	122.10
P-9D	138.25	15.66	122.59
P-10D	130.06	7.42	122.64
P-11D	137.28	15.30	121.98
TH-19*	130.05	94.86	35.19
TH-22	128.82	4.78	124.04
TH-28	130.60	26.03	104.57
TH-30	128.37	23.98	104.39
TH-32	129.25	15.00	114.25
TH-35	145.19	27.42	117.77
TH-36A	152.70	31.77	120.93
TH-38A	131.20	9.60	121.60
TH-40*	124.77	90.66	34.11
TH-56	131.69	14.42	117.27
TH-57	128.09	19.06	109.03
TH-58	127.67	27.90	99.77
SW-3A	3.0'=125.2'	1.22	123.42
SW-3B2B	3.0'=97.63'	1.64	97.63
SW-3C2	3.0'=91.99'	gauge missing	ND
SMITH LAKE	6.0'=124.73'	1.88	120.61
<p>NGVD = National Geodetic Vertical Datum  T.O.C. = Top of Casing  B.T.O.C. = Below Top of Casing  * = Floridan Well  ND = No Data  W.L. = Water Level</p>			

**Groundwater and Surface Water Elevations for  
Southeast County Landfill**

Measuring Point I.D.	T.O.C. Elevations (NGVD)	9/17/02	
		W.L. B.T.O.C.	W.L. (NGVD)
P-3D	143.19	19.16	124.03
P-3S	143.20	6.42	136.78
P-4D	141.80	21.08	120.72
P-4S	141.98	4.66	137.32
P-5D	Damaged	ND	ND
P-6D	Damaged	ND	ND
P-7D	138.18	15.22	122.96
P-8D	138.72	10.06	128.66
P-9D	138.25	15.10	123.15
P-10D	130.06	6.66	123.40
P-11D	137.28	14.78	122.50
TH-20A	131.02	7.58	123.44
TH-20B	132.18	8.46	123.72
TH-38A	131.20	8.94	122.26
TH-38B	To be installed	ND	ND
Smith Lake	6.0'=124.73	2.20	120.93
NGVD = National Geodetic Vertical Datum T.O.C. = Top of Casing B.T.O.C. = Below Top of Casing * = Floridan Well ND =No Data W.L. = Water Level			

Groundwater and Surface Water Elevations for  
Southeast County Landfill

Measuring Point I.D.	T.O.C. Elevations (NGVD)	10/1/02 W.L. B.T.O.C.	W.L. (NGVD)
P-3D	143.19	19.08	124.11
P-3S	143.20	7.18	136.02
P-4D	141.80	21.00	120.80
P-4S	141.98	5.22	136.76
P-5D	Damaged	ND	ND
P-6D	Damaged	ND	ND
P-7D	138.18	15.40	122.78
P-8D	138.72	16.26	122.46
P-9D	138.25	15.34	122.91
P-10D	130.06	7.34	122.72
P-11D	137.28	15.00	122.28
TH-20A	131.02	8.58	122.44
TH-20B	132.18	9.54	122.64
TH-38A	131.20	9.26	121.94
TH-38B	To be installed	10.00	ND
Smith Lake	6.0'=124.73	2.20	120.93
NGVD = National Geodetic Vertical Datum T.O.C. = Top of Casing B.T.O.C. = Below Top of Casing * = Floridan Well ND =No Data W.L. = Water Level			

Groundwater and Surface Water Elevations for  
Southeast County Landfill

Measuring Point I.D.	T.O.C. Elevations (NGVD)	11/7/02 W.L. B.T.O.C.	W.L. (NGVD)
P-3D	143.19	19.70	123.49
P-3S	143.20	8.44	134.76
P-4D	141.80	21.12	120.68
P-4S	141.98	6.34	135.64
P-5D	Damaged	Dry	Dry
P-6D	Damaged	ND	ND
P-7D	138.18	15.90	122.28
P-8D	138.72	16.84	121.88
P-9D	138.25	16.02	122.23
P-10D	130.06	8.30	121.76
P-11D	137.28	15.74	121.54
TH-20A	131.02	9.32	121.70
TH-20B	132.18	10.32	121.86
TH-38A	131.20	9.56	121.64
TH-38B	To be determined	10.60	ND
1-D (Smith Lake)	6.0'=124.73	1.90	120.63
NGVD = National Geodetic Vertical Datum T.O.C. = Top of Casing B.T.O.C. = Below Top of Casing * = Floridan Well ND =No Data W.L. = Water Level			

**APPENDIX E**  
**HYDROGRAPHS**  
**(REPLACEMENT PAGE)**

# Southeast County Landfill Hydrographs

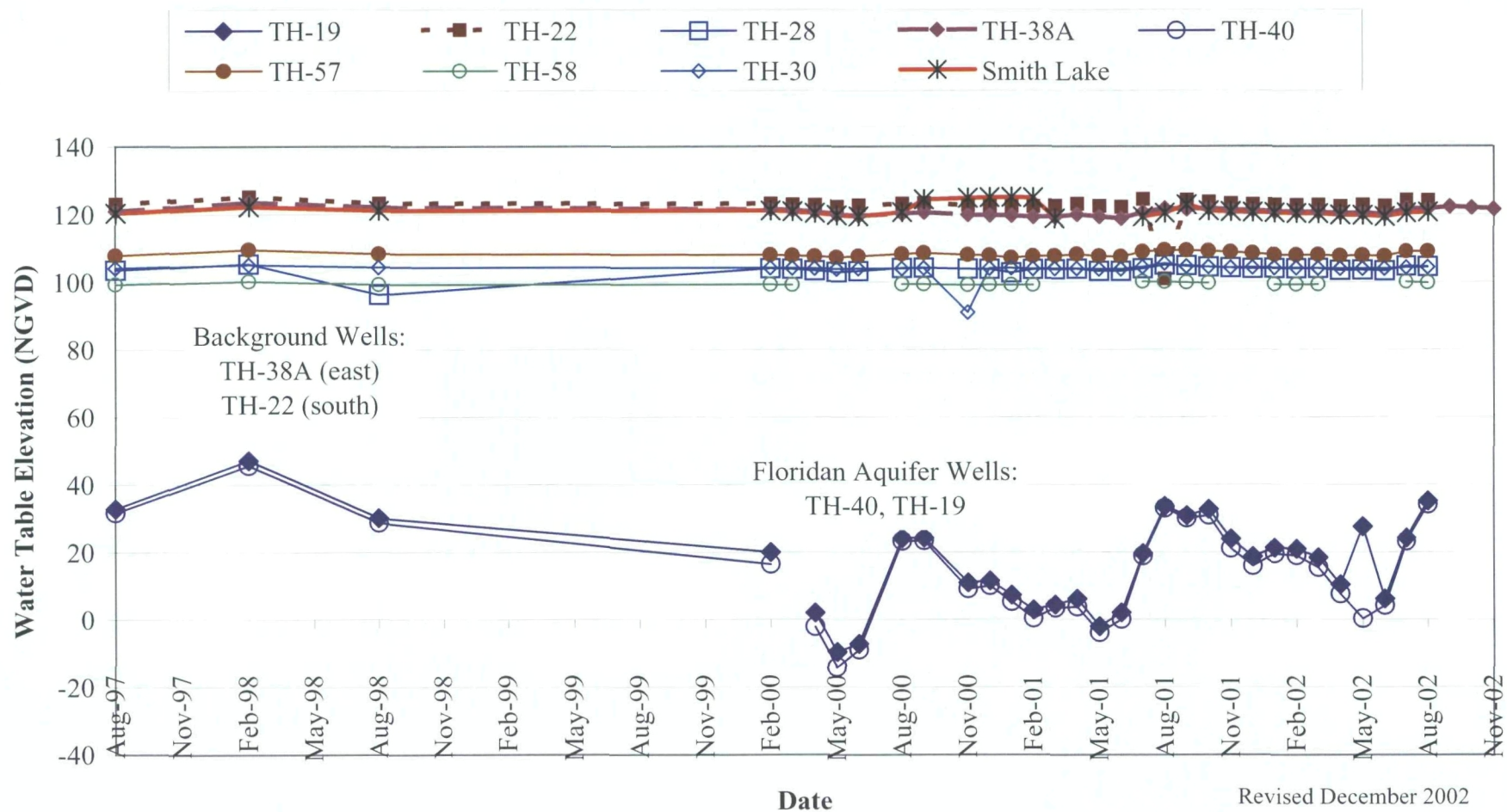
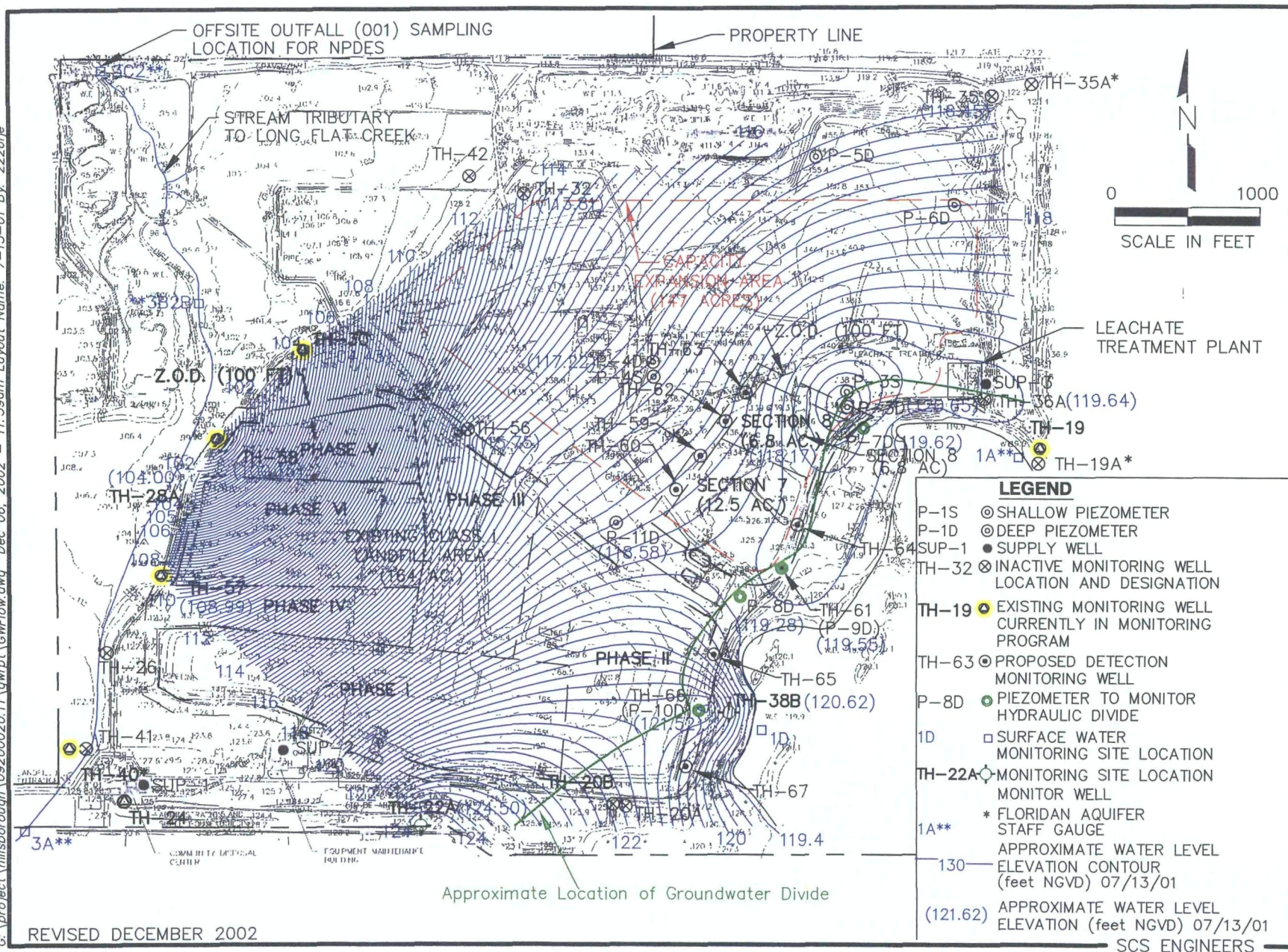
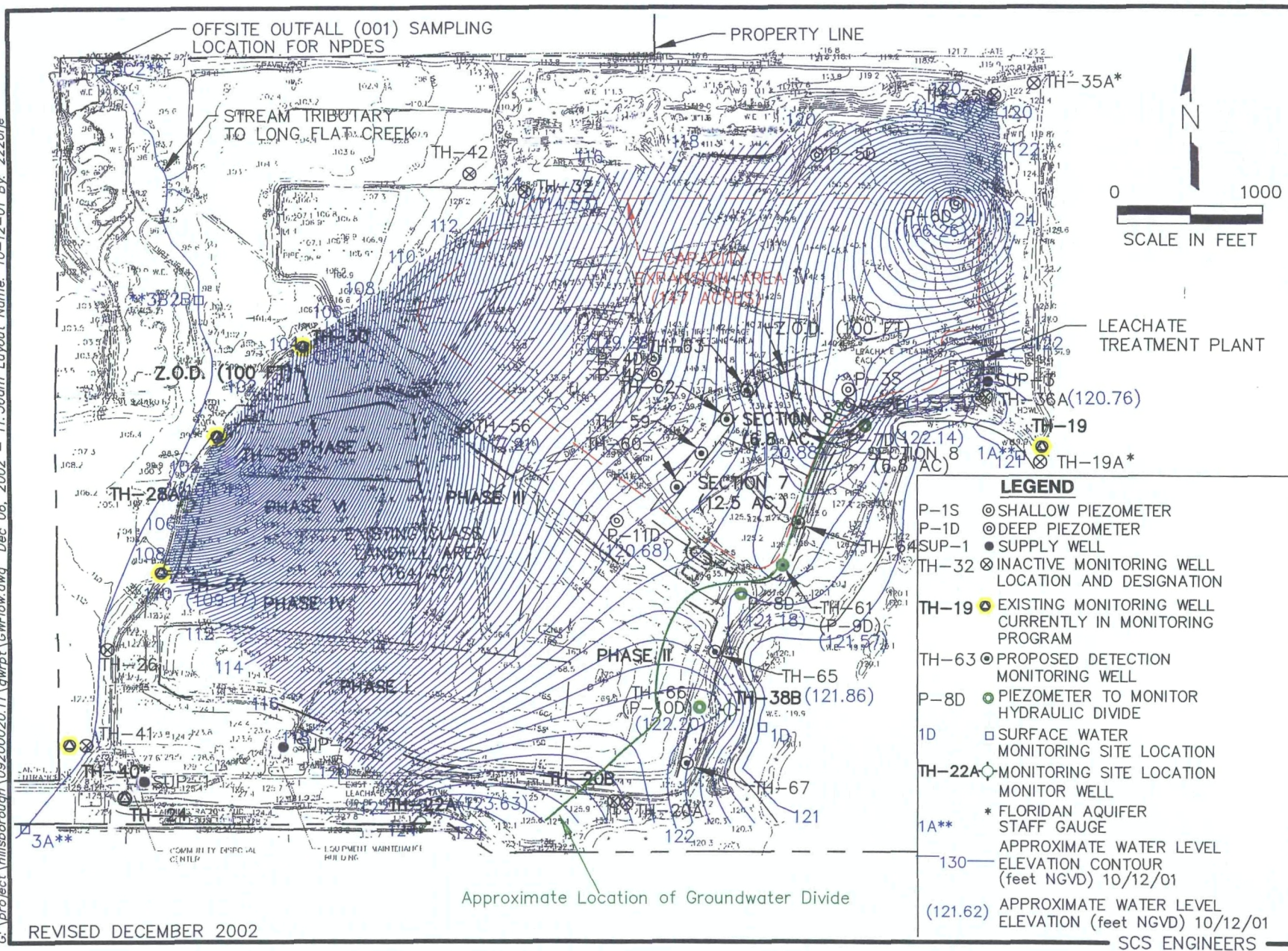


Figure E-1. Southeast County Landfill Hydrographs

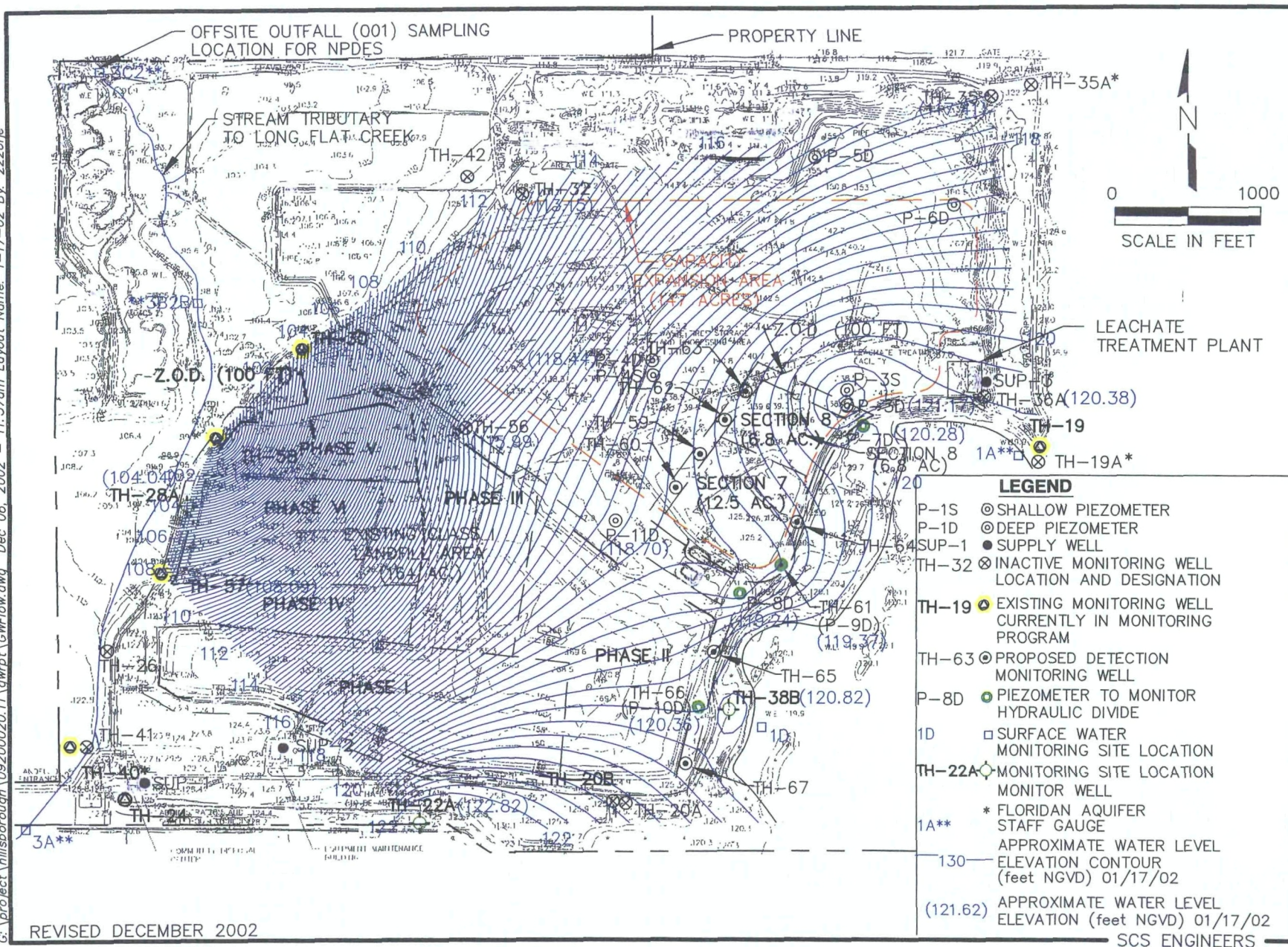
**APPENDIX F**

**SURFICIAL AQUIFER POTENTIOMETRIC MAPS**  
**(REPLACEMENT PAGES)**



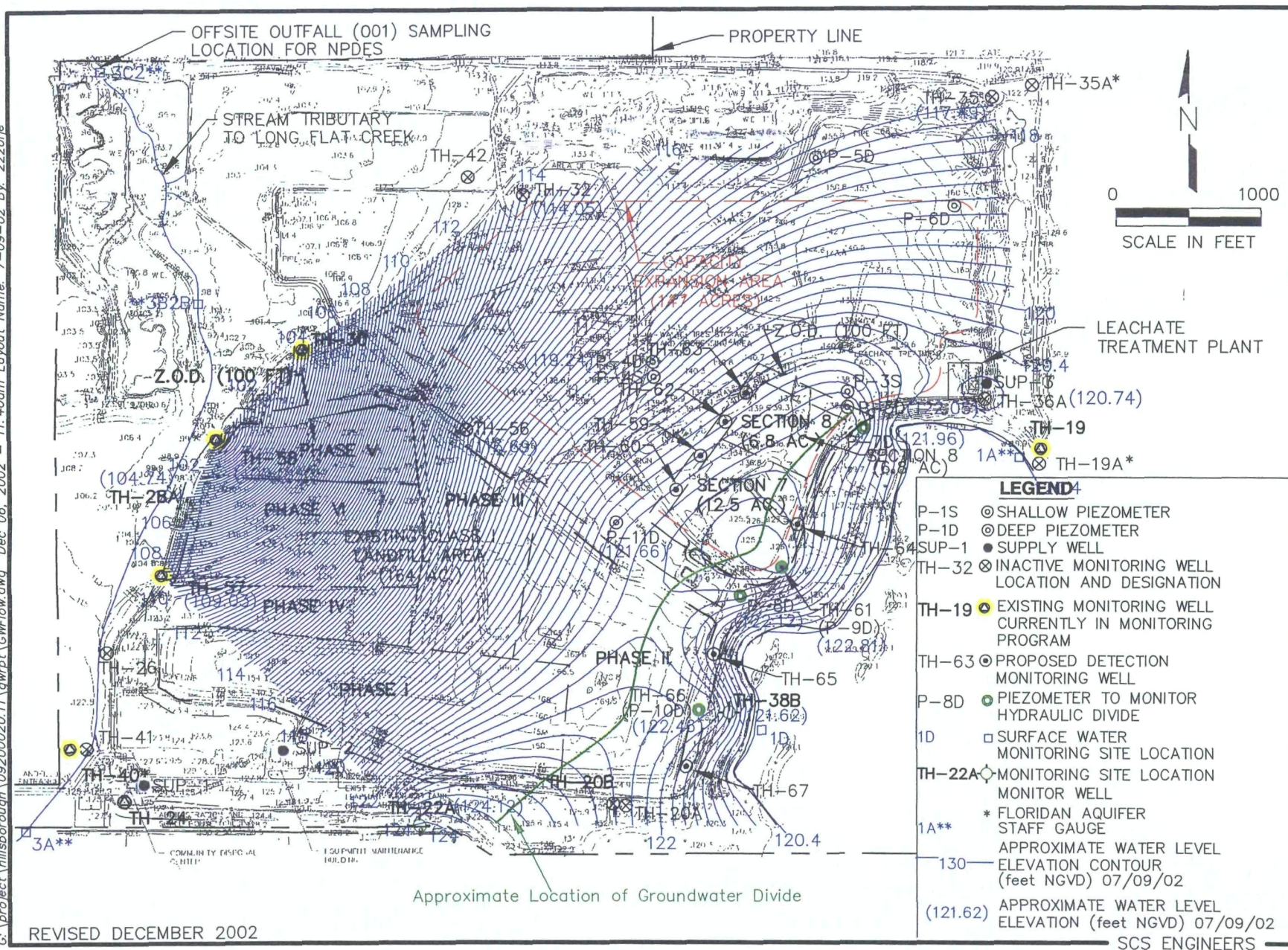


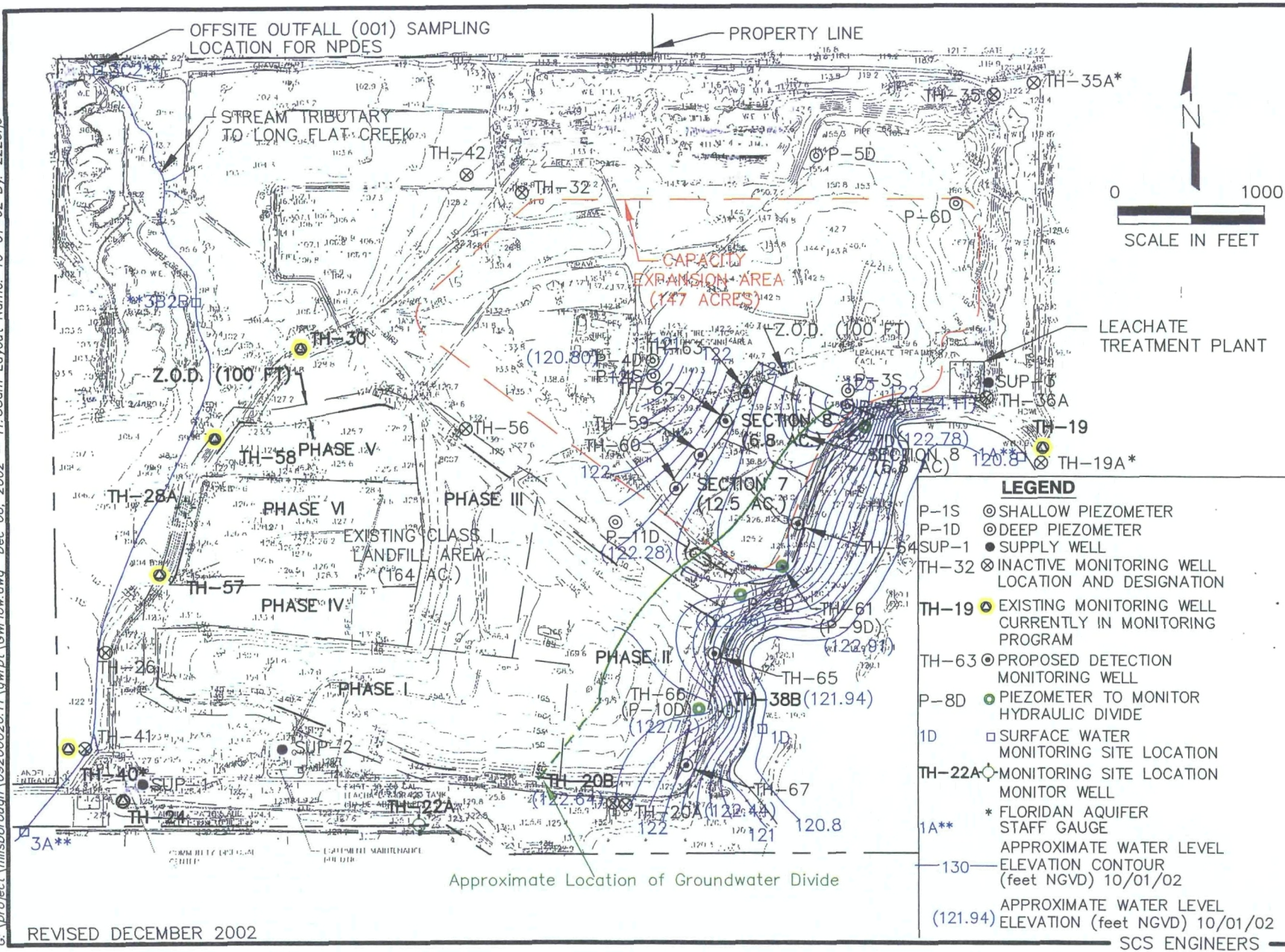
Potentiometric Map, October 2001.



Potentiometric Map, January 2002.

Potentiometric Map, April 2002.





Potentiometric Map, October 2002.

**APPENDIX G**

**FLORIDAN AQUIFER POTENTIOMETRIC MAPS**

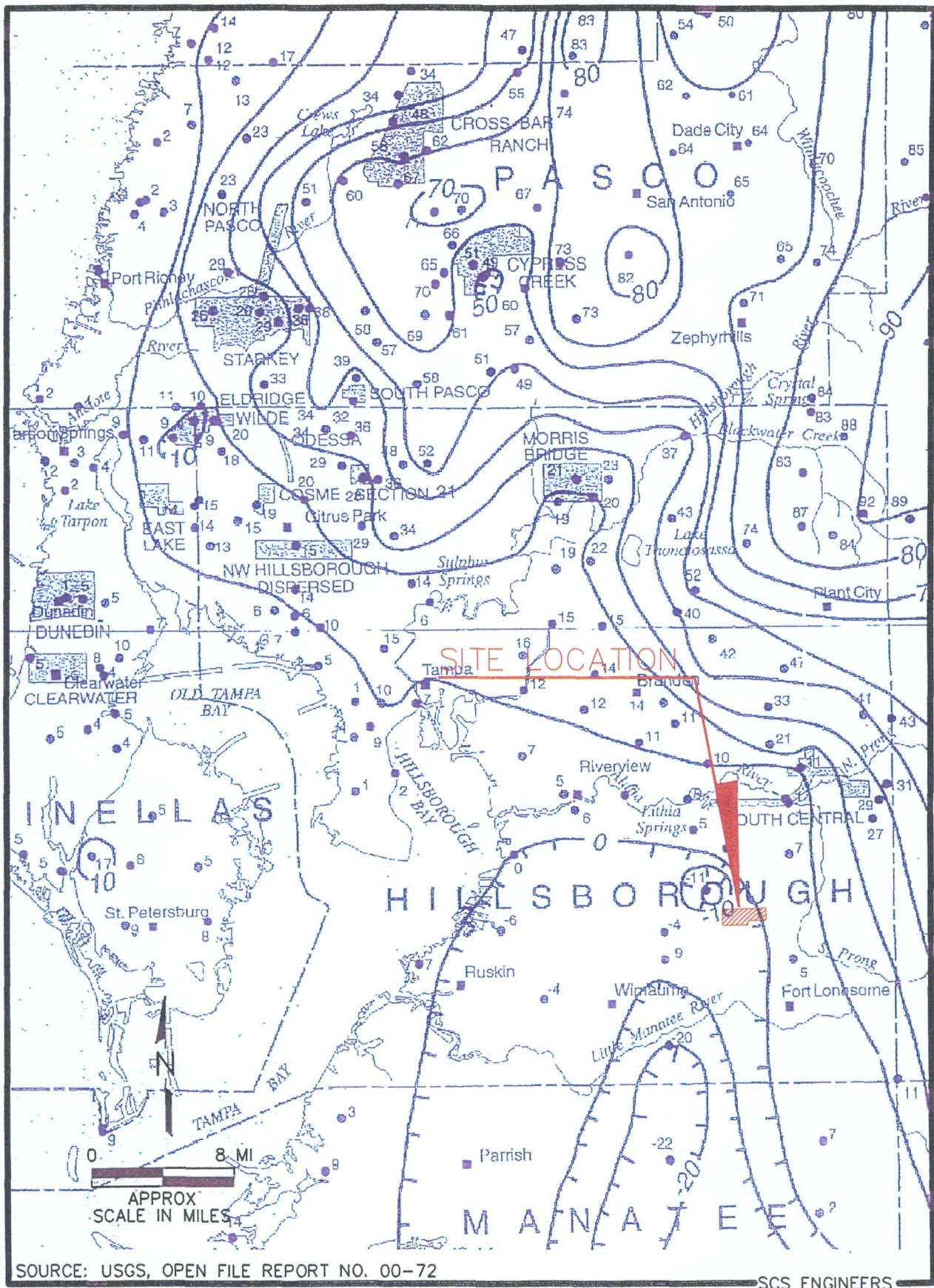


Figure G-1. Potentiometric Surface of the Upper Floridan Aquifer, May 1999

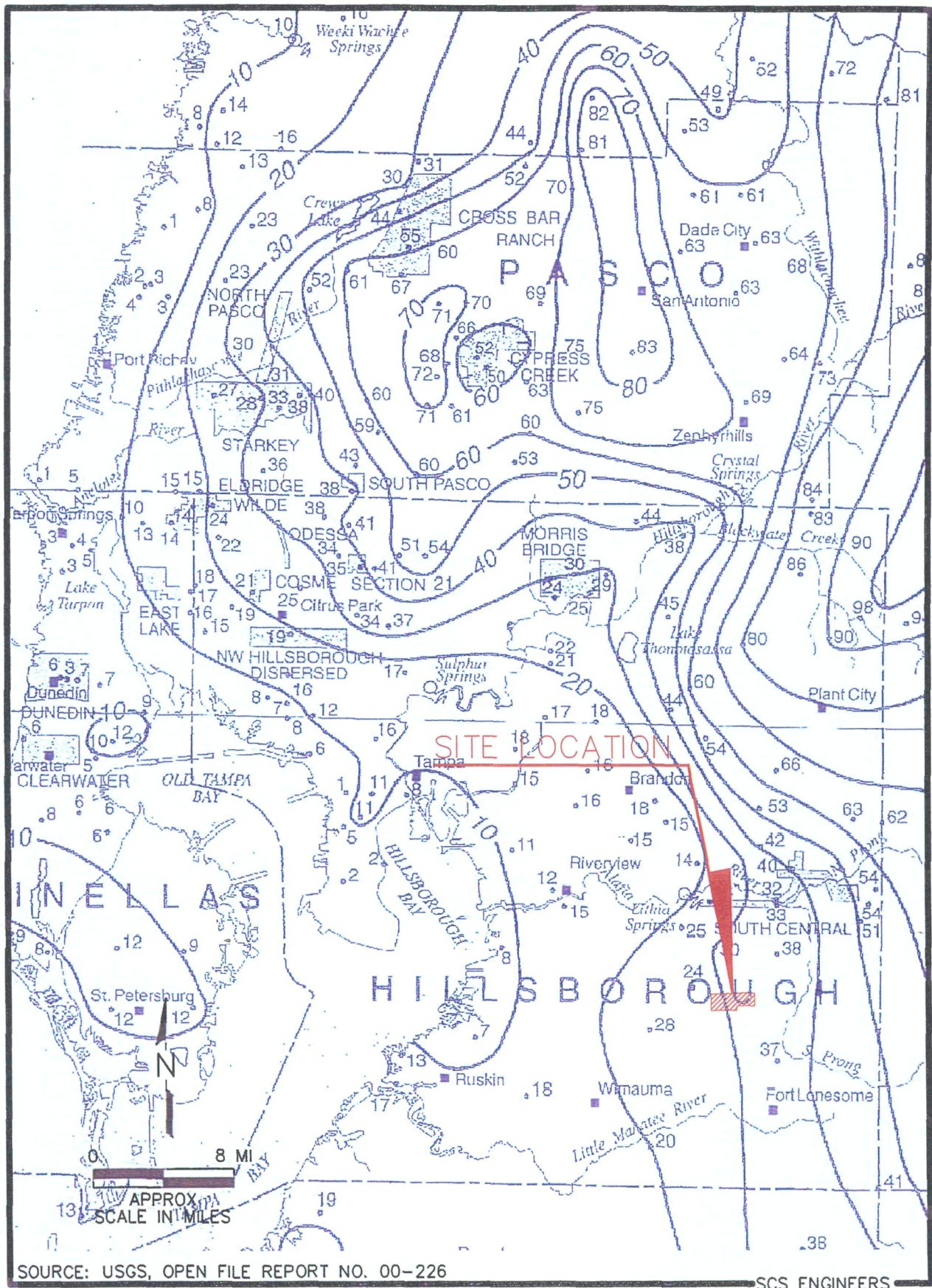


Figure G-2 Potentiometric Surface of the Upper Floridan Aquifer, September 1999