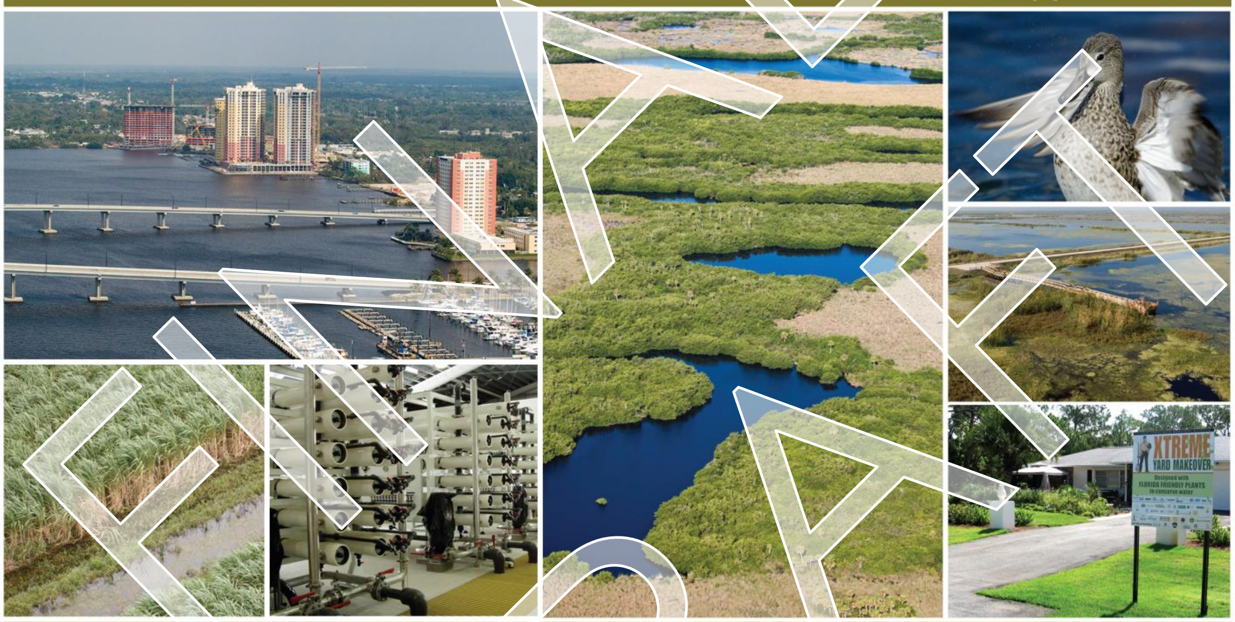
SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Appendices



LOWER WEST COAST
WATER SUPPLY PLAN UPDATE

2012

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Acronyms and Abbreviations

2005–2006 LWC Plan Update	*2005–2006 Lower West Coast Water Supply Plan Update* (SFWMD 2006)
2008 LORS	2008 Lake Okeechobee Regulation Schedule
AFSIRS	Agricultural Field Scale Irrigation Requirements Simulation
AGR Self-Supply	Agricultural Self-Supply
ASR	aquifer storage and recovery
Basis of Review	*Basis of Review for Water Use Permit Applications within the South Florida Water Management District*
BEBR	Bureau of Economic and Business Research
bls	below land surface
BMP	best management practice
C&SF Project	Central and Southern Florida Flood Control Project
CERP	Comprehensive Everglades Restoration Plan
cfs	cubic feet per second
DSS	Domestic Self-Supply
F.A.C.	Florida Administrative Code
FAS	Floridan aquifer system
FDACS	Florida Department of Agriculture and Consumer Services
FDEO	Florida Department of Economic Opportunity
FDEP	Florida Department of Environmental Protection
FGUA	Florida Government Utility Authority
FPL	Florida Power & Light
F.S.	Florida Statutes
FY	Fiscal Year
GIS	geographic information system
GPCD	gallons per capita per day
GPD	gallons per day
IAS	intermediate aquifer system

ICI Self-Supply	Industrial/Commercial/Institutional Self-Supply
LWC	Lower West Coast
MDL	maximum developable limit
MDWASD	Miami-Dade Water and Sewer Department
MFL	Minimum Flow and Level
MGD	million gallons of water per day
mg/L	milligrams per liter
MGY	million gallons per year
NA	not applicable or no associated allocations
NEEPP	Northern Everglades and Estuaries Protection Program
NGVD	National Geodetic Vertical Datum of 1929
PCUR	per capita use rate
PWR Self-Supply	Power Generation Self-Supply (water use category)
PWS	Public Water Supply
REC Self-Supply	Recreational/Landscape Self-Supply
RO	reverse osmosis
SAS	surficial aquifer system
SFWMD	South Florida Water Management District
SWFWMD	Southwest Florida Water Management District
Support Document	*2011–2012 Water Supply Plan Support Document*
TAZ	traffic analysis zone
TBD	to be determined
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USDA–NASS	United States Department of Agriculture – National Agriculture Statistics Service
USDA–NRCS	United States Department of Agriculture – Natural Resources Conservation Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WWTF	wastewater treatment facility

A

LWC Demand Projections

> **NOTE**
>
> Perceived discrepancies in demand totals within this appendix are due to rounding.

The South Florida Water Management District (SFWMD) accomplishes the complex process of water demand projection in coordination with staff from local governments, utilities, other agencies and stakeholder groups. This appendix provides the methods and detailed water demand projections developed for this update. As noted in **Chapter** 2 of the Planning Document, an economic downturn affected this region, which is evident in the area's slowed population growth.

The water demands in this update were analyzed in two ways, gross and net demand. Gross or raw water demand is the water allocated in a consumptive use permit, and is the volume of water withdrawn from a source. Net demand is the volume of water needed by an end user or customer to meet their needs, after deducting treatment and process water losses, and system inefficiencies. Net demand is commonly referred to as finished water.

The approach detailed in this appendix addresses situations in which net and gross demands differ. For example, with Public Water Supply (PWS) demands, a large percentage of new net water demands are met using brackish water sources. Raw water withdrawals from brackish water sources are normally 20 to 25 percent higher in volume than a like amount of net water from freshwater sources, due to losses incurred during associated treatment processes.

This appendix presents water demand assessments for the following water use categories:

- **Public Water Supply (PWS).** Water supplied by water treatment facilities for potable use (drinking quality) with projected average pumpages equal to or greater than 100,000 gallons per day (GPD) or 0.1 million gallons of water per day (MGD).
- **Domestic Self-Supply (DSS).** Water used by households served by small utilities (less than 0.1 MGD) and private wells.
- **Industrial/Commercial/Institutional (ICI) Self-Supply.** Self-supplied water consumed by business operations and institutions, such as schools, hospitals and prisons that have demands of 0.1 MGD or greater.

- **Recreational/Landscape (REC) Self-Supply.** Water used for irrigation of golf courses, parks, cemeteries, large common areas such as homeowner associations and commercial developments, and other self-supplied irrigation uses with demands of 0.1 MGD or greater.
- **Power Generation (PWR) Self-Supply.** Water consumed by power plants in the production of electricity, excluding use of seawater sources
- **Agricultural (AGR) Self-Supply.** Water used for commercial crop irrigation, livestock watering, and aquaculture

The PWS systems, both public and private, supply potable water to all types of customers and land uses. Finished water demand is the measure used by the PWS category, because water is measured by the amount of water leaving a treatment facility.

DATA SOURCES AND METHODS

This section describes the data and analysis used to develop urban water demand estimates and projections for this plan update. Specific dataset sources, analysis methods, and application of projections are provided in the discussion of each use category below.

In general, the preparation of reasonable estimates and projections of population and certain land use activities are essential in calculating water demands, as is the development of appropriate use factors. Use factors are applied to population and land use data as a means of projecting gross (raw) and net (finished) water demands. Estimates of irrigated acres are equally fundamental in projecting demands for the AGR Self-Supply and REC Self-Supply water use categories.

Water demand base year estimates for 2005 and projections for the 20-year planning horizon from 2010 to 2030 are provided for each category. The projections are made in five-year increments for average rainfall and 1-in-10 year drought conditions, as mandated by Paragraph 373.709(2)(a)1, Florida Statutes (F.S.).

PUBLIC WATER SUPPLY AND DOMESTIC SELF-SUPPLY

The following sections describe the methodology used to estimate and project PWS and DSS gross and net water demands for Collier and Lee counties, and the portions of Charlotte, Glades, and Hendry counties within SFWMD boundaries. The approach and assumptions used for this plan update are similar to those used for the *2005–2006 Lower West Coast Water Supply Plan Update* (2005–2006 LWC Plan Update) (SFWMD 2006), although some adjustments were made to accommodate current data.

Population Estimates and Methodology

Population is the principal independent variable for PWS and DSS water use projections. Population projections are developed using the best available data.

2005 Base Year Estimates

The base year for this plan update is 2005. The University of Florida's Bureau of Economic and Business Research (BEBR) 2005 estimates for permanent resident population (BEBR 2006) are used as control populations for each county in the Lower West Coast (LWC) Planning Area. According to the BEBR (BEBR 2008), the definition of permanent population is the location "where one lives and sleeps most of the time." Base year total population estimates for each of the LWC counties, including portions of the counties outside of the Lower West Coast Planning Area are as follows:

- Charlotte County: 154,030 residents
- Collier County: 317,789 residents
- Glades County: 10,729 residents
- Hendry County: 38,376 residents
- Lee County: 549,441 residents

Only portions of Charlotte, Glades, and Hendry counties are situated within the LWC Planning Area. The share of populations within these split counties assigned to the SFWMD is based on detailed analysis of traffic analysis zone (TAZ) data distributions of populations within each county. The balance of resident populations in split counties are located within the Lower East Coast (Hendry County) or Kissimmee Basin (Glades County) planning areas of the SFWMD, or the Southwest Florida Water Management District (Charlotte County).

Although part of Collier County is also in the SFWMD Lower East Coast Planning Area, the specific portion is within the Big Cypress Preserve and contains no permanent residents. Furthermore, estimation of the total county population of Charlotte County was coordinated with the planning staff at the Southwest Florida Water Management District.

After county control populations were established, information from the SFWMD consumptive use permit files and the SFWMD Water Use Regulatory Database, as well as data from water utility staff, were used to map areas served by each PWS utility within the LWC Planning Area. Data supplied by the PWS utilities were especially important for identifying areas served. In many instances, there are differences between areas actually served and franchised or legislated service areas. The focus on areas served by PWS utilities improves the accuracy of distributing county base populations into PWS and DSS populations. In **Appendix B**, Figure B-1 through Figure B-6 show maps of areas served.

The populations residing outside of areas served by PWS utilities are included in DSS population estimates. Data from the 1990 United States Census had previously identified the source of water for households, including those using individual wells.

However, subsequent to 1990, these data were no longer included in the census. For this plan update, the DSS population estimates include data developed with the assistance of local metropolitan planning organizations.

In addition, TAZ data prepared by the Florida Department of Transportation served as the basis for distributing 2005 control populations to the various PWS areas served within each LWC county. The population estimates from the TAZ data originate from the 2000 United States Census (U.S. Census Bureau 2000, 2001).

To determine which TAZs were within the area served by each PWS utility, the geographic areas represented by TAZs and PWS utility areas served were input as polygon layers into the SFWMD's geographic information system (GIS) and overlaid. Imagery was used, as necessary, to assist in the allocation of TAZs to appropriate PWS areas served. Once TAZs were allocated, the population was totaled for each PWS area served and prorated to reach the 2005 county control population. Populations not within a PWS area served were, by definition, placed within the DSS category. Seasonal residents, prison inmates, and tourists are not included in these estimates (see *Per Capita Use Rates* section that follows). **Table A-1** represents permanent resident population estimates, by PWS utility, for the five LWC counties.

2030 County Control Populations

The initial step in the process of preparing population projections was the development of 2030 control populations for each LWC county. Paragraph 373.709(2)(a)1, F.S. prescribes the use of population projections in determining needs in regional water supply plans:

> Population projections used for determining Public Water Supply needs must be based upon the best available data. In determining the best available data, the district shall consider the University of Florida's Bureau of Economic and Business Research (BEBR) medium population projections and any population projection data and analysis submitted by a local government pursuant to the public workshop described in subsection (1) if the data and analysis support the local government's comprehensive plan. Any adjustment of or deviation from the BEBR projections must be fully described, and the original BEBR data must be presented along with the adjusted data.

Following an analysis of various population projection data provided by LWC county governments, it was determined that BEBR medium projections (BEBR 2009) for the 2030 planning horizon are both appropriate and consistent with local water supply planning programs. The source data for this analysis include 10-year water supply facilities work plans, local government comprehensive plans, information provided in consumptive use permit applications, and data provided specifically to the SFWMD for this planning effort.

Table A-1. 2005 LWC Planning Area permanent resident population estimates.

County	PWS Utility or DSS	2005 Population
Charlotte	**Charlotte County PWS Total**	0
	Charlotte County DSS	68
	Charlotte County Total	68
Collier	Ave Maria Utility Company	284
	Collier County Water-Sewer District	151,452
	Everglades City, City of	1,436
	Florida Government Utility Authority (FGUA) – Golden Gate	27,014
	Immokalee	25,821
	Marco Island Utilility Department	19,356
	Naples, City of	64,971
	Orange Tree	1,261
	Port of the Islands	518
	Collier County PWS Total	292,113
	Collier County DSS	25,676
	Collier County Total	317,789
Glades	Clewiston Utilities (portion)	401
	Moore Haven Utilities	1,942
	Port LaBelle (portion)	305
	Glades County PWS Total	2,648
	Glades County DSS	3,309
	Glades County Total	5,957
Hendry	Clewiston Utilities (portion)	14,726
	Future western Hendry County[a]	not applicable (NA)
	LaBelle, City of	5,572
	Port LaBelle (portion)	3,118
	Hendry County PWS Total	23,416
	Hendry County DSS	11,600
	Hendry County Total	35,016
Lee	Bonita Springs Utilities	44,371
	Burnt Store	1,485
	Cape Coral	113,221
	Citrus Park RV Resort	1,685
	Florida Government Utility Authority (FGUA) – Lake Fairways	3,322
	Florida Government Utility Authority (FGUA) – Lehigh Acres	21,430
	Fort Myers, City of	58,505
	Greater Pine Island	12,259
	Island Water Association	8,254
	Lee County Utilities	216,343
	Lee County PWS Total	480,875
	Lee County DSS	68,566
	Lee County Total	549,441
	LWC Planning Area Total	908,271

a. No served area is defined.

Distribute County Control Projections to Utility Service Areas and Prepare Five-Year Incremental Projections

The TAZ data were used as the principal means to distribute 2030 county control populations to the various PWS future service areas within LWC counties. The methodology was similar to how the 2005 county control population was distributed to the various PWS areas served, as described in the previous section.

The geographic areas represented by TAZs and PWS utility future service areas were input as polygon layers into the SFWMD's GIS. The two layers were overlaid to determine which TAZs were within the future service areas of each PWS utility. Imagery was used to assist in the allocation of TAZs to appropriate PWS areas served and adjustments to the data were made based on guidance provided by individual local governments or PWS utilities. Once TAZs were allocated, the 2030 population was totaled for each PWS future service area. Populations not within a PWS future service area were, by definition, placed within the DSS category.

The compound annual growth rate method was selected as the most appropriate means to distribute population growth to the required five-year periods (i.e., 2010, 2015, 2020, and 2025) for each PWS utility. This method accounts for an initial short-term continuation of the current economic downturn, and assumes that projected growth over the 25-year planning period (i.e., 2005 base year to 2030) will increase at an accelerated rate during the later years. The five-year incremental projections for the LWC counties, by PWS utility and DSS populations, prepared using this methodology are provided in **Table A-2**.

Per Capita Use Rate

The per capita use rate (PCUR) is the total annual water use divided by the permanent residents. This PCUR includes the finished water used by seasonal residents, tourists, industrial users, commercial users, institutional users, and the losses incurred in water delivery. Some PWS utilities, particularly those with high seasonal populations, plan their needs based on the seasonal population figures to ensure capacity for peak populations. Irrigation demand for PWS-served households using private well water for irrigation was not assessed due to the lack of available data. The PCURs for DSS within each LWC county were assumed the same as for the countywide PWS utility average. This plan update provides a uniform methodology for all utilities.

The initial step was to establish net water PCURs for average conditions in 2005, which is the base year, for each PWS utility. These PCURs were calculated by dividing water produced by the PWS utilities by the permanent resident population of the area served. Florida Department of Environmental Protection (FDEP) monthly reports, generated using the methodology described in the previous sections, provided net water production data (FDEP 2009).

Table A-2. PWS and DSS population projections for the LWC Planning Area.

County	Utility	2005	2010	2015	2020	2025	2030
Charlotte	Town & Country Utilities	0	0	2,485	5,828	9,758	13,948
	PWS Total	0	0	2,485	5,828	9,758	13,948
	Charlotte County DSS	68	66	91	124	166	218
	Charlotte County Total	68	66	2,576	5,952	9,924	14,166
Collier	Ave Maria Utility Company	284	1,435	2,638	4,850	8,915	16,378
	Collier County Water-Sewer District	151,452	164,933	179,613	195,601	213,011	232,197
	Everglades City, City of	1,436	1,523	1,616	1,715	1,819	1,929
	Florida Government Utility Authority (FGUA) – Golden Gate	27,014	27,890	28,794	29,727	30,690	31,711
	Immokalee	25,821	27,273	28,806	30,426	32,136	33,947
	Marco Island Utilility Department	19,356	19,424	19,492	19,560	19,629	19,707
	Naples, City of	64,971	66,645	68,362	70,123	71,929	73,438
	Orange Tree[a]	1,261	1,261	0	0	0	0
	Port of the Islands	518	568	622	682	747	819
	PWS Total	292,113	310,952	329,943	352,684	378,876	410,126
	Collier County DSS	25,676	30,613	36,499	43,518	51,885	61,873
	Collier County Total	317,789	341,565	366,442	396,202	430,761	471,999
Glades	Clewiston Utililities (portion)	401	435	472	512	555	642
	Moore Haven Utilities[c]	1,942	2,088	2,245	2,414	2,595	2,653
	Port LaBelle (portion)	305	334	366	401	439	481
	PWS Total	2,648	2,857	3,083	3,327	3,589	3,776
	Glades County DSS	3,309	3,556	3,818	4,095	4,386	4,637
	Glades County Total	5,957	6,413	6,901	7,422	7,975	8,413
Hendry	Clewiston Utilities (portion)	14,726	14,852	14,978	15,106	15,235	15,359
	Future western Hendry County[b]	NA	NA	NA	NA	NA	NA
	Hendry County Correctional[c d]	0	0	0	0	0	0
	LaBelle, City of	5,572	5,804	6,046	6,298	6,561	6,831
	Port LaBelle (portion)	3,118	3,623	4,211	4,893	5,686	6,603
	PWS Total	23,416	24,279	25,235	26,297	27,482	28,793
	Hendry County DSS	11,600	13,214	15,053	17,148	19,534	22,230
	Hendry County Total	35,016	37,493	40,288	43,445	47,016	51,023
Lee	Bonita Springs Utilities	44,371	50,866	58,313	66,849	76,635	87,845
	Burnt Store	1,485	1,798	2,177	2,636	3,192	3,862
	Cape Coral	113,221	136,694	165,034	199,249	240,558	290,717
	Citrus Park RV Resort	1,685	1,706	1,728	1,749	1,771	1,795
	Florida Government Utility Authority (FGUA) – Lake Fairways[e]	3,322	3,322	0	0	0	0
	Florida Government Utility Authority (FGUA) – Lehigh Acres	21,430	29,059	39,404	53,431	72,452	98,298
	Fort Myers, City of	58,505	62,964	67,764	72,929	78,488	84,528
	Greater Pine Island	12,259	13,877	15,708	17,781	20,127	22,795
	Island Water Association	8,254	8,509	8,772	9,042	9,322	9,605
	Lee County Utilities	216,343	233,637	252,314	272,484	294,267	317,567
	PWS Total	480,875	542,432	611,214	696,150	796,812	917,012
	Lee County DSS	68,566	64,517	60,707	57,122	53,749	40,088
	Lee County Total	549,441	606,949	671,921	753,272	850,561	957,100
	LWC Planning Area Total	908,271	992,486	1,088,128	1,206,293	1,346,237	1,502,701

a. Population served by Orange Tree Utility Company will be in the Collier County Water-Sewer District's service area by 2015.
b. No served area is defined.
c. Inmate population not included as permanent population.
d. Florida Department of Corrections closed the facility in June 2011.
e. Population served by Florida Government Utility Authority (FGUA) – Lake Fairways will be in the Lee County Utilities' service area by 2015.

Each utility may have specific demographics, seasonality and distribution characteristics that can be analyzed in detail to better quantify per capita use of specific user categories. A more localized, in-depth analysis of water use may be used to manage water conservation efforts and assist in determining consumptive use permit allocations.

Gross and Net Water Demand Projections

For each PWS utility, gross (raw) water adjustment factors were calculated by comparing 2005 United States Geological Survey (USGS) data for annual gross water withdrawals to the 2005 FDEP data for net (finished) water production. During this process, adjustment factors were applied to net water projections for average conditions, as a basis to project gross water demand under average conditions for each PWS utility.

Finally, 1-in-10 year drought conditions adjustment factors were applied to average conditions for net and gross water projections to differentiate drought conditions demand from average conditions demand (SFWMD 1998) as follows:

- Charlotte County: 1.07
- Collier County: 1.08
- Glades County: 1.03
- Hendry County: 1.06
- Lee County: 1.06

Projection Results

Table A-3 through **Table A-7** present net and gross water demand under average and 1-in-10 year drought conditions for the five LWC counties, by PWS utility and DSS populations. Demand projections were calculated by applying average conditions PCURs and drought and gross water adjustment factors, as appropriate, to the population projections presented in **Table A-2**. The PCUR was held constant for the planning horizon. Conservation and potential water savings are evaluated in this plan update (see **Chapter 4** of the Planning Document) and in **Appendix E**. Water conservation is essential to water supply planning and water resource management because it reduces or delays the need for future expansion of the water supply infrastructure. Various water conservation options are available to PWS utilities and local governments, including a goal-based water conservation program. A goal-based water conservation program is a long-term water use reduction program with a specified numerical water use target. The target is expressed in per capita use or quantifiable volume of water saved. A well-designed goal-based conservation program can help a utility meet future water supply demands without building new facilities or wells. Regional totals by county are shown in **Table A-8**. Since the LWC Plan was developed, the 2010 Census population numbers (U.S. Census Bureau 2010) and the 2010 medium BEBR population projections were released (BEBR 2011). In reviewing, the census population numbers it was found there was slightly less than a one percent decrease in the census population from the 2010 population used in this plan. The 2010 medium BEBR 2030 population projections decreased slightly by three percent from the plan's 2030 population projections. In summary, the 2010 and 2030 population numbers in this plan are still reflective of the best available data.

Table A-3. Net and gross water demand projections in MGD for PWS and DSS under average rainfall and 1-in-10 year drought conditions in Charlotte County.

Net Water Demand						
Average Conditions	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**
Town & Country	0.00	0.00	0.25	0.58	0.98	1.39
PWS Total	0.00	0.00	0.25	0.58	0.98	1.39
Domestic Self-Supply	0.01	0.01	0.01	0.01	0.01	0.02
Charlotte County Total	0.01	0.01	0.26	0.59	0.99	1.41
1-in-10 Year Drought Conditions	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**
Town & Country	0.00	0.00	0.27	0.62	1.04	1.49
PWS Total	0.00	0.00	0.27	0.62	1.04	1.49
Domestic Self-Supply	0.01	0.01	0.01	0.01	0.02	0.02
Charlotte County Total	0.01	0.01	0.28	0.63	1.06	1.51
Gross Water Demand						
Average Conditions	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**
Town & Country	0.00	0.00	0.30	0.70	1.17	1.67
PWS Total	0.00	0.00	0.30	0.70	1.17	1.67
Domestic Self-Supply	0.01	0.01	0.01	0.01	0.02	0.03
Charlotte County Total	0.01	0.01	0.31	0.71	1.19	1.70
1-in-10 Year Drought Conditions	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**
Town & Country	0.00	0.00	0.32	0.75	1.25	1.79
PWS Total	0.00	0.00	0.32	0.75	1.25	1.79
Domestic Self-Supply	0.01	0.01	0.01	0.02	0.02	0.03
Charlotte County Total	0.01	0.01	0.33	0.77	1.27	1.82

Table A-4. Net and gross water demand projections in MGD for PWS and DSS under average rainfall and 1-in-10 year drought conditions in Collier County.

Net Water Demand						
Average Conditions	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**
Ave Maria Utility Company	0.03	0.17	0.32	0.59	1.08	1.98
Collier County Water-Sewer District	26.61	29.03	31.61	34.43	37.49	40.87
Everglades City, City of	0.24	0.25	0.27	0.29	0.30	0.32
Florida Government Utility Authority (FGUA) – Golden Gate	1.46	1.51	1.55	1.61	1.66	1.71
Immokalee	2.45	2.59	2.74	2.89	3.05	3.22
Marco Island	8.28	8.31	8.34	8.37	8.40	8.43
Naples, City of	16.89	17.33	17.77	18.23	18.70	19.09
Orange Tree[a]	0.30	0.30	0.00	0.00	0.00	0.00
Port of the Islands	0.09	0.10	0.11	0.12	0.13	0.14
PWS Total	56.35	59.59	62.71	66.53	70.81	75.76
Domestic Self-Supply	4.93	5.88	7.01	8.36	9.96	11.88
Collier County Total	61.28	65.47	69.72	74.89	80.77	87.64
1-in-10 Year Drought Conditions	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**
Ave Maria Utility Company	0.04	0.19	0.34	0.63	1.17	2.14
Collier County Water-Sewer District	28.79	31.35	34.14	37.18	40.49	44.14
Everglades City, City of	0.26	0.27	0.29	0.31	0.33	0.35
Florida Government Utility Authority (FGUA) – Golden Gate	1.58	1.63	1.68	1.73	1.79	1.85
Immokalee	2.65	2.80	2.96	3.12	3.30	3.48
Marco Island	8.95	8.98	9.01	9.04	9.07	9.11
Naples, City of	18.24	18.71	19.20	19.69	20.20	20.62
Orange Tree[a]	0.32	0.32	0.00	0.00	0.00	0.00
Port of the Islands	0.10	0.11	0.12	0.13	0.14	0.15
PWS Total	60.93	64.36	67.74	71.83	76.49	81.84
Domestic Self-Supply	5.32	6.35	7.57	9.02	10.76	12.83
Collier County Total	66.25	70.71	75.31	80.85	87.25	94.67
Gross Water Demand						
Average Conditions	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**
Ave Maria Utility Company	0.05	0.28	0.51	0.93	1.71	3.14
Collier County Water-Sewer District	36.28	39.58	43.11	46.94	51.12	55.73
Everglades City, City of	0.24	0.25	0.27	0.29	0.30	0.32
Florida Government Utility Authority (FGUA) – Golden Gate	1.59	1.65	1.70	1.75	1.81	1.87
Immokalee	2.67	2.81	2.97	3.13	3.31	3.50
Marco Island	9.28	9.30	9.34	9.37	9.40	9.44
Naples, City of	16.90	17.33	17.77	18.23	18.70	19.09
Orange Tree[a]	0.30	0.30	0.00	0.00	0.00	0.00
Port of the Islands	0.12	0.13	0.14	0.16	0.17	0.19
PWS Total	67.43	71.63	75.81	80.80	86.52	93.28
Domestic Self-Supply	5.91	7.04	8.39	10.01	11.93	14.23
Collier County Total	73.34	78.67	84.20	90.81	98.45	107.51
1-in-10 Year Drought Conditions	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**
Ave Maria Utility Company	0.06	0.30	0.55	1.01	1.85	3.40
Collier County Water-Sewer District	39.26	42.75	46.56	50.70	55.21	60.19
Everglades City, City of	0.26	0.27	0.29	0.31	0.33	0.35
Florida Government Utility Authority (FGUA) – Golden Gate	1.72	1.78	1.83	1.89	1.96	2.02
Immokalee	2.87	3.03	3.20	3.38	3.57	3.78
Marco Island	10.01	10.05	10.08	10.12	10.15	10.19
Naples, City of	18.24	18.71	19.20	19.69	20.20	20.62
Orange Tree[a]	0.31	0.31	0.00	0.00	0.00	0.00
Port of the Islands	0.13	0.14	0.15	0.17	0.19	0.20
PWS Total	72.86	77.34	81.86	87.27	93.46	100.75
Domestic Self-Supply	6.38	7.60	9.07	10.81	12.89	15.37
Collier County Total	79.24	84.94	90.93	98.08	106.35	116.12

a. Demands in the Collier County Water-Sewer District's service area by 2015.

Table A-5. Net and gross water demand projections in MGD for PWS and DSS under average rainfall and 1-in-10 year drought conditions in Glades County.

Net Water Demand						
Average Conditions	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**
Clewiston Utilities(portion)	0.04	0.05	0.05	0.06	0.06	0.07
Moore Haven Utilities[a]	0.36	0.41	0.46	0.52	0.59	0.66
Port LaBelle (portion)	0.03	0.03	0.03	0.03	0.04	0.04
PWS Total	0.43	0.49	0.54	0.61	0.69	0.77
Domestic Self-Supply	0.44	0.47	0.51	0.54	0.58	0.62
Glades County Total	0.87	0.96	1.05	1.15	1.27	1.39
1-in-10 Year Drought Conditions	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**
Clewiston Utilities (portion)	0.04	0.05	0.05	0.05	0.06	0.07
Moore Haven Utilities[a]	0.37	0.42	0.48	0.54	0.61	0.68
Port LaBelle (portion)	0.03	0.03	0.03	0.04	0.04	0.04
PWS Total	0.44	0.50	0.56	0.63	0.71	0.79
Domestic Self-Supply	0.45	0.49	0.52	0.56	0.60	0.64
Glades County Total	0.89	0.99	1.08	1.19	1.31	1.43
Gross Water Demand						
Average Conditions	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**
Clewiston Utilities (portion)	0.06	0.06	0.07	0.07	0.08	0.09
Moore Haven Utilities[a]	0.39	0.44	0.50	0.56	0.63	0.71
Port LaBelle (portion)	0.03	0.03	0.03	0.04	0.04	0.05
PWS Total	0.48	0.53	0.60	0.67	0.75	0.85
Domestic Self-Supply	0.47	0.50	0.54	0.58	0.62	0.66
Glades County Total	0.95	1.03	1.14	1.25	1.37	1.51
1-in-10 Year Drought Conditions	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**
Clewiston Utilities (portion)	0.06	0.06	0.07	0.07	0.08	0.09
Moore Haven Utilities[a]	0.40	0.46	0.51	0.58	0.65	0.74
Port LaBelle (portion)	0.03	0.03	0.04	0.04	0.04	0.05
PWS Total	0.49	0.55	0.62	0.69	0.77	0.88
Domestic Self-Supply	0.48	0.52	0.56	0.60	0.64	0.68
Glades County Total	0.97	1.07	1.18	1.29	1.41	1.56

a. Includes prison inmate demands.

Table A-6. Net and gross water demand projections in MGD for PWS and DSS under average rainfall and 1-in-10 year drought conditions in Hendry County.

Net Water Demand						
Average Conditions	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**
Clewiston Utilities (portion)	1.53	1.54	1.56	1.57	1.58	1.60
Future Western Hendry Co.[a]	0.00	0.00	0.00	0.00	0.00	0.00
Hendry County Correctional[b]	0.21	0.21	0.00	0.00	0.00	0.00
LaBelle, City of	0.69	0.72	0.75	0.78	0.81	0.85
Port LaBelle (portion)	0.27	0.31	0.36	0.42	0.48	0.56
PWS Total	2.70	2.78	2.67	2.77	2.87	3.01
Domestic Self-Supply	1.29	1.47	1.67	1.90	2.17	2.47
Hendry County Total	3.99	4.25	4.34	4.67	5.04	5.48
1-in-10 Year Drought Conditions	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**
Clewiston Utilities (portion)	1.62	1.64	1.65	1.67	1.68	1.69
Future Western Hendry Co.[a]	0.00	0.00	0.00	0.00	0.00	0.00
Hendry County Correctional[b]	0.23	0.23	0.00	0.00	0.00	0.00
LaBelle, City of	0.73	0.76	0.79	0.83	0.86	0.90
Port LaBelle (portion)	0.28	0.33	0.38	0.44	0.51	0.59
PWS Total	2.86	2.96	2.82	2.94	3.05	3.18
Domestic Self-Supply	1.36	1.55	1.77	2.02	2.30	2.62
Hendry County Total	4.22	4.51	4.59	4.96	5.35	5.80
Gross Water Demand						
Average Conditions	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**
Clewiston Utilities (portion)	2.04	2.06	2.08	2.10	2.12	2.13
Future Western Hendry Co.[a]	0.00	0.00	0.00	0.00	0.00	0.00
Hendry County Correctional[b]	0.25	0.25	0.00	0.00	0.00	0.00
LaBelle, City of	0.79	0.83	0.86	0.90	0.94	0.98
Port LaBelle (portion)	0.30	0.36	0.41	0.48	0.56	0.65
PWS Total	3.38	3.50	3.35	3.48	3.62	3.76
Domestic Self-Supply	1.67	1.90	2.17	2.47	2.81	3.20
Hendry County Total	5.05	5.40	5.52	5.95	6.43	6.96
1-in-10 Year Drought Conditions	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**
Clewiston Utilities (portion)	2.17	2.19	2.21	2.23	2.24	2.26
Future Western Hendry Co.[a]	0.00	0.00	0.00	0.00	0.00	0.00
Hendry County Correctional[b]	0.26	0.26	0.00	0.00	0.00	0.00
LaBelle, City of	0.84	0.88	0.92	0.95	0.99	1.04
Port LaBelle (portion)	0.32	0.38	0.44	0.51	0.59	0.69
PWS Total	3.59	3.71	3.57	3.69	3.82	3.99
Domestic Self-Supply	1.77	2.02	2.30	2.62	2.98	3.39
Hendry County Total	5.36	5.73	5.87	6.31	6.80	7.38

a. No service are is defined

b. Florida Department of Corrections closed the facility in June 2011.

Table A-7. Net and gross water demand projections in MGD for PWS and DSS under average rainfall and 1-in-10 year drought conditions in Lee County.

Net Water Demand						
Average Conditions	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**
Bonita Springs Utilities	8.84	10.12	11.60	13.30	15.25	17.48
Burnt Store	0.14	0.17	0.20	0.25	0.30	0.36
Cape Coral Utilities	11.44	13.81	16.67	20.12	24.30	29.36
Citrus Park RV Resort	0.19	0.19	0.20	0.20	0.20	0.20
Florida Government Utility Authority (FGUA) – Lake Fairways[a]	0.58	0.58	0.00	0.00	0.00	0.00
Florida Government Utility Authority (FGUA) – Lehigh Acres	2.42	2.32	3.15	4.27	5.80	7.86
Fort Myers, City of	7.78	8.37	9.01	9.70	10.44	11.24
Greater Pine Island	1.35	1.53	1.73	1.96	2.21	2.51
Island Water Association	3.11	3.21	3.31	3.41	3.51	3.62
Lee County Utilities	26.18	28.27	30.53	32.97	35.61	38.43
PWS Total	62.03	68.57	76.40	86.18	97.62	111.06
Domestic Self-Supply	8.37	7.87	7.41	6.97	6.56	4.89
Lee County Total	70.40	76.44	83.81	93.15	104.18	115.95
1-in-10 Year Drought Conditions	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**
Bonita Springs Utilities	9.36	10.73	12.30	14.10	16.17	18.53
Burnt Store	0.15	0.18	0.22	0.26	0.32	0.38
Cape Coral Utilities	12.12	14.63	17.67	21.33	25.75	31.12
Citrus Park RV Resort	0.20	0.20	0.21	0.21	0.21	0.22
Florida Government Utility Authority (FGUA) – Lake Fairways[a]	0.62	0.62	0.00	0.00	0.00	0.00
Florida Government Utility Authority (FGUA) – Lehigh Acres	2.57	2.46	3.34	4.53	6.15	8.33
Fort Myers, City of	8.25	8.88	9.55	10.28	11.07	11.92
Greater Pine Island	1.43	1.62	1.83	2.07	2.35	2.66
Island Water Association	3.30	3.40	3.51	3.61	3.73	3.84
Lee County Utilities	27.75	29.97	32.36	34.95	37.74	40.73
PWS Total	65.75	72.69	80.99	91.34	103.49	117.73
Domestic Self-Supply	8.87	8.34	7.85	7.39	6.95	5.18
Lee County Total	74.62	81.03	88.84	98.73	110.44	122.91
Gross Water Demand						
Average Conditions	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**
Bonita Springs Utilities	9.99	11.44	13.12	15.04	17.24	19.77
Burnt Store	0.15	0.19	0.23	0.27	0.33	0.40
Cape Coral Utilities	13.95	16.81	20.30	24.51	29.59	35.76
Citrus Park RV Resort	0.21	0.21	0.22	0.22	0.22	0.22
Florida Government Utility Authority (FGUA) – Lake Fairways[a]	0.65	0.65	0.00	0.00	0.00	0.00
Florida Government Utility Authority (FGUA) – Lehigh Acres	2.45	2.34	3.18	4.31	5.86	7.94
Fort Myers, City of	9.90	10.64	11.45	12.33	13.26	14.29
Greater Pine Island	1.54	1.75	1.98	2.24	2.54	2.87
Island Water Association	3.75	3.86	3.98	4.11	4.23	4.36
Lee County Utilities	29.06	32.76	35.38	39.91	43.10	46.88
PWS Total	71.65	80.65	89.84	102.94	116.30	132.49
Domestic Self-Supply	10.08	9.48	8.92	8.40	7.90	5.89
Lee County Total	81.73	90.13	98.76	111.34	124.27	138.38
1-in-10 Year Drought Conditions	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**
Bonita Springs Utilities	10.58	12.13	13.91	15.94	18.28	20.95
Burnt Store	0.16	0.20	0.24	0.29	0.35	0.43
Cape Coral Utilities	14.76	17.82	21.52	25.98	31.36	37.90
Citrus Park RV Resort	0.22	0.23	0.23	0.23	0.23	0.24
Florida Government Utility Authority (FGUA) – Lake Fairways[a]	0.68	0.68	0.00	0.00	0.00	0.00
Florida Government Utility Authority (FGUA) – Lehigh Acres	2.59	2.48	3.37	4.57	6.21	8.41
Fort Myers, City of	10.48	11.28	12.14	13.06	14.06	15.14
Greater Pine Island	1.64	1.85	2.10	2.37	2.69	3.04
Island Water Association	3.97	4.09	4.22	4.35	4.49	4.62
Lee County Utilities	30.80	34.73	37.50	42.30	45.68	49.69
PWS Total	75.88	85.49	95.23	109.09	123.35	140.42
Domestic Self-Supply	10.68	10.05	9.46	8.90	8.38	6.25
Lee County Total	86.56	95.54	104.69	117.99	131.73	146.67

Table A-8. Net and gross water demand projections in MGD for PWS and DSS under average rainfall and 1-in-10 year drought conditions in the LWC Planning Area.

Net Water Demand						
Average Conditions	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**
Charlotte County PWS (portion)	0.00	0.00	0.25	0.58	0.98	1.39
Collier County PWS	56.35	59.59	62.71	66.53	70.81	75.76
Glades County PWS (portion)	0.43	0.49	0.54	0.61	0.69	0.77
Hendry County PWS (portion)	2.70	2.78	2.67	2.77	2.87	3.01
Lee County PWS	62.03	68.57	76.40	86.18	97.62	111.06
LWC PWS Subtotal	121.51	131.43	142.57	156.67	172.97	191.99
LWC DSS Subtotal	15.04	15.70	16.61	17.78	19.28	19.88
LWC Planning Area Total	136.55	147.13	159.18	174.45	192.25	211.87
1-in-10 Year Drought Conditions	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**
Charlotte County PWS (portion)	0.00	0.00	0.27	0.62	1.04	1.49
Collier County PWS	60.93	64.36	67.74	71.83	76.49	81.84
Glades County PWS (portion)	0.44	0.50	0.56	0.63	0.71	0.79
Hendry County PWS (portion)	2.86	2.96	2.82	2.94	3.05	3.18
Lee County PWS	65.75	72.69	80.99	91.33	103.49	117.73
LWC PWS Subtotal	129.98	140.51	152.38	167.35	184.78	205.03
LWC DSS Subtotal	16.01	16.74	17.72	19.00	20.63	21.29
LWC Planning Area Total	145.99	157.25	170.10	186.35	205.41	226.32
Gross Water Demand						
Average Conditions	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**
Charlotte County PWS (portion)	0.00	0.00	0.30	0.70	1.17	1.67
Collier County PWS	67.43	71.63	75.81	80.80	86.52	93.28
Glades County PWS (portion)	0.48	0.53	0.60	0.67	0.75	0.85
Hendry County PWS (portion)	3.38	3.50	3.35	3.48	3.62	3.76
Lee County PWS	71.65	80.65	89.84	102.94	116.30	132.49
LWC PWS Subtotal	142.94	156.31	169.90	188.59	208.36	232.05
LWC DSS Subtotal	18.14	18.93	20.03	21.47	23.28	24.01
LWC Planning Area Total	161.08	175.24	189.83	210.06	231.64	256.06
1-in-10 Year Drought Conditions	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**
Charlotte County PWS (portion)	0.00	0.00	0.32	0.75	1.25	1.79
Collier County PWS	72.86	77.34	81.86	87.27	93.46	100.75
Glades County PWS (portion)	0.49	0.55	0.62	0.69	0.77	0.88
Hendry County PWS (portion)	3.59	3.71	3.57	3.69	3.82	3.99
Lee County PWS	75.88	85.49	95.23	109.09	123.35	140.43
LWC PWS Subtotal	152.82	167.09	181.60	201.49	222.65	247.84
LWC DSS Subtotal	19.32	20.20	21.40	22.95	24.91	25.72
LWC Planning Area Total	172.14	187.29	203.00	224.44	247.56	273.56

INDUSTRIAL/COMMERCIAL/INSTITUTIONAL SELF-SUPPLY

This category includes industrial, commercial, and institutional demands not supported by a public utility. Water used for industrial and commercial purposes supplied by utilities is included in the PWS utility demands. In the LWC Planning Area, the ICI Self-Supply use category is primarily associated with mining or citrus and sugar processing. Excavations for fill materials and borrow pit operations are permitted water uses to dewater excavated areas but the pumped water is routed back to its source and not included in the demand estimates.

Projection Methodology

The ICI category is a composite of different use types. Demands for the LWC Planning Area are based on reported 2005 water use in the SFWMD Water Use Regulatory Database. According to the Marella (2004), levels of use and changes in use of some commercial activities are not directly related to population and general economic development, while other activities are related to population. ICI projections assume demands remain unchanged between average and 1-in-10 year drought conditions, and withdrawal demands (gross) are considered approximately equal to user demands (net).

Both limerock mining and food processing plants attempt to serve many markets to maintain a constant rate of production, which generates consistent water use consumption. As water recirculates continually in the production of limerock, an increase in product demand does not generally require an increase in water needed. Production rates for limerock mining are affected by market forces, and the downturn in the construction industry, which occurred after publication of the 2005–2006 LWC Plan Update, has affected limerock production. Housing starts in Florida peaked in 2005 and the related limerock production was reported to peak between 2005 and 2006. The population projections in the previous section indicate that the rate of growth is expected to be less than rates estimated in the 2005–2006 LWC Plan Update. Furthermore, older existing mines are expected to be complete, and several proposed mines are planned over the next 20 years to replace them. The production of rock and resulting water use are not expected to be any more than 2005 production levels during the current planning horizon.

Self-supplied commercial and institutional operations typically have water demands of less than 0.1 MGD and are not included in planning analyses. Light manufacturing operations, cement and asphalt plants, schools, special needs, and other public or nonprofit facilities are included in this water use category. Over the next 20 years, Collier and Lee counties have plans for 13 and 28 new schools, respectively. However, all of the schools are likely to be served by a utility. New schools proposed in Glades and Hendry counties may be self-supplied because water demands for each facility are expected to be less than 0.1 MGD.

The United States Sugar Clewiston mill is no longer supplying water to the City of Clewiston. The city has constructed a separate reverse osmosis (RO) facility and Floridan aquifer supply source that is now included in the ICI water use category. Its sugar production and water consumption are related to commodity market forces, and its water use demands are assumed to remain relatively constant over the next 20 years.

Projection Results

Table A-9 summarizes the ICI demand estimates and projections in the LWC Planning Area.

Table A-9. ICI Self-Supply demand projections.

County	MGD					
	2005	2010	2015	2020	2025	2030
Charlotte – SFWMD Portion	2.5	2.5	2.5	2.5	2.5	2.5
Collier	3.9	3.9	3.9	3.9	3.9	3.9
Glades – Southern	7.8	7.8	7.8	7.8	7.8	7.8
Hendry – Western	0.9	0.9	0.9	0.9	0.9	0.9
Lee	20.2	20.2	20.2	20.2	20.2	20.2
LWC Planning Area Total	35.3	35.3	35.3	35.3	35.3	35.3

RECREATIONAL/LANDSCAPE SELF-SUPPLY

The Recreational (REC) Self-Supply category includes self-supplied irrigation demands for large landscaped and recreational areas, and for golf courses. Landscape irrigation includes water demands for all parks (small to large), communities and homeowner associations with large common areas, and areas with large green spaces, such as ball fields, stadiums, and cemeteries. These REC Self-Supply uses are identified through consumptive use permits. With the exception of private home landscape irrigation provided by permitted homeowner associations, private home landscape irrigation is not included in this water use category. Irrigation of single-family residential landscape is included in DSS demands.

A substantial portion of REC Self-Supply water demands will be met by the use of reclaimed water throughout the 20-year planning horizon. Not only will this reduce future withdrawal demands on water resources, it will also provide additional recharge of the surficial aquifer system (SAS). As an example, the Water Independence for Cape Coral water supply system will use all of the city's treated wastewater along with surface water to meet irrigation demands of 12,355 acres of landscape by 2025.

Projection Methodology

Demand projections for the landscape portion of the REC Self-Supply use category include all forms of commercial landscaping that require a consumptive use permit except golf courses. Landscape acres are based on the SFWMD's Water Use Regulatory Database, and information found in water supply plans for 2005. For counties not wholly in the LWC Planning Area, the SFWMD's GIS was used to locate permitted acres within the region.

The REC demand estimates for average and 1-in-10 year drought conditions are calculated using the Agricultural Field Scale Irrigation Requirements Simulation (AFSIRS) Model (Smajstrla 1990). The AFSIRS Model calculates the net irrigation requirements of a landscape and its irrigation system.

Net irrigation demand, also referred to as net irrigation requirement, is the amount of water the plant needs in addition to anticipated rainfall. It reflects an estimate of the amount of water (expressed in inches per year) that should be delivered to the plant's root zone. The gross irrigation demand, or gross irrigation requirement, is the amount of water that must be withdrawn from the source to be delivered to the plant's root zone. It includes both the net irrigation requirement and the losses incurred in the process of delivering irrigation to the plant's root zone. Irrigation efficiency as a modeled factor refers to the average percent of total water applied that is delivered to the plant's root zone. This relationship is expressed as follows:

Gross Irrigation Requirement = Net Irrigation Requirement / Irrigation Efficiency

Projections of gross irrigation demands for REC Self-Supply are based on an assumed sprinkler irrigation system type, which has an efficiency of 75 percent.

Available water capacity and depth of soil have a direct effect on effective rainfall infiltration and are considered in the AFSIRS Model. The default AFSIRS Model soil database includes a generic sandy soil. While soils vary across the planning area, sandy soil parameters are used as a simplifying and conservative assumption, and are considered reasonable for planning purposes. The assumption is conservative, because it results in higher estimated irrigation requirements in comparison with other soil types that generally hold more water.

The AFSIRS Model calculations for the irrigation requirements for average and 1-in-10 year drought conditions use 35 years (1965–2000) of rainfall and potential evapotranspiration climate data from appropriate meteorological stations. The model also uses assumed crop coefficients of sod to represent turf and landscape plants.

Landscape

Landscape acres are projected to increase based on population growth rates calculated in the plan update for each county (**Table A-2**). Projected growth in the REC water use category is almost entirely the result of the projected increases in landscape acres, as new golf course development is anticipated to be low.

Golf Courses

Golf course acreage is estimated for 2010 using the SFWMD Water Use Regulatory Database and information from golf course publications, communication with local planning officials and golf course personnel, and GIS land use information. Table E-11 in **Appendix E** lists the LWC Planning Area's golf courses by county. Based on available information, golf course acres are assumed to increase minimally over the 20-year planning horizon with only six 18-hole courses planned.

Projection Results

The REC Self-Supply acreage projections are shown in **Table A-10** through **Table A-12.** These tables summarize golf course acreage, estimated acreage of other landscaped areas, and total acreage.

Table A-10. Acreage for golf courses in the LWC Planning Area.

County	2005	2010	2015	2020	2025	2030
Charlotte – SFWMD Portion	0	40	40	144	184	385
Collier	10,340	11,978	11,978	12,178	12,178	12,178
Glades – Southern area	24	235	235	235	235	235
Hendry – Western area	172	40	40	40	140	140
Lee	7,964	12,960	12,960	12,960	12,960	12,960
LWC Planning Area Total	18,500	25,253	25,253	25,557	25,697	25,898

Table A-11. Acreage for landscape self-supply in the LWC Planning Area.

County	2005	2010	2015	2020	2025	2030
Charlotte – SFWMD Portion	0	42	1,639	3,788	6,315	9,015
Collier	13,220	15,757	16,905	18,278	19,872	21,774
Glades – Southern area	0	87	95	105	115	126
Hendry – Western area	0	68	73	78	84	91
Lee	9,185	22,728	25,161	28,208	31,851	35,840
LWC Planning Area Total	22,405	38,682	43,873	50,457	58,237	66,846

Table A-12. Summary of total acres for REC Self-Supply in the LWC Planning Area.

County	2005	2010	2015	2020	2025	2030
Charlotte – SFWMD Portion	0	82	1,679	3,932	6,499	9,400
Collier	23,560	27,735	28,883	30,456	32,050	33,952
Glades – Southern area	24	322	330	340	350	361
Hendry – Western area	172	108	113	118	224	231
Lee	17,149	35,688	38,121	41,168	44,811	48,800
LWC Planning Area Total	40,905	63,935	69,126	76,014	83,934	92,744

The recreational (golf courses) and landscape demand projections are based on the assumption that the LWC Planning Area can be represented with average soil and crop coefficients and regional rainfall conditions. The AFSIRS Model calculates a net irrigation demand of 20.5 inches per year per acre (1,525 GPD) for an average year, and 26.4 inches per year per acre (1,964 GPD) for a 1-in-10 drought year.

Table A-13 presents the projected net irrigation demands under average and 1-in-10 year drought conditions. Gross irrigation demands (withdrawal demands) under average and 1-in-10 year drought conditions are shown in **Table A-14**, and are based on an irrigation efficiency of 75 percent.

Table A-13. Net irrigation demands for REC Self-Supply under average rainfall and 1-in-10 year drought conditions in the LWC Planning Area.

County	2005	2010	2015	2020	2025	2030
Average Conditions (MGD)						
Charlotte – SFWMD Portion	0.0	0.1	2.6	6.0	9.9	14.3
Collier	35.9	42.3	44.0	46.4	48.9	51.8
Glades – Southern area	0.0	0.5	0.5	0.5	0.5	0.6
Hendry – Western area	0.3	0.2	0.2	0.2	0.3	0.4
Lee	26.2	54.4	58.1	62.8	68.3	74.4
LWC Planning Area Total	62.4	97.5	105.4	115.9	127.9	141.5
1-in-10 Year Drought Conditions (MGD)						
Charlotte – SFWMD Portion	0.0	0.2	3.3	7.7	12.8	18.5
Collier	46.3	54.5	56.7	59.8	62.9	66.7
Glades – Southern area	0.0	0.6	0.6	0.7	0.7	0.7
Hendry – Western area	0.3	0.2	0.2	0.2	0.4	0.5
Lee	33.7	70.1	74.9	80.9	88.0	95.8
LWC Planning Area Total	80.3	125.6	135.7	149.3	164.8	182.2

Table A-14. Gross irrigation demands for REC Self-Supply under average rainfall and 1-in-10 year drought conditions in the LWC Planning Area.

County	2005	2010	2015	2020	2025	2030
Average Conditions (MGD)						
Charlotte – SFWMD Portion	0.0	0.2	3.4	8.0	13.2	19.1
Collier	47.9	56.4	58.7	61.9	65.2	69.0
Glades – Southern area	0.0	0.7	0.7	0.7	0.7	0.7
Hendry – Western area	0.3	0.2	0.2	0.2	0.5	0.5
Lee	34.9	72.6	77.5	83.7	91.1	99.2
LWC Planning Area Total	83.1	130.1	140.5	154.5	170.7	188.5
1-in-10 Year Drought Conditions (MGD)						
Charlotte – SFWMD Portion	0.0	0.2	4.4	10.3	17.0	24.6
Collier	61.7	72.6	75.6	79.8	83.9	88.9
Glades – Southern area	0.1	0.8	0.9	0.9	0.9	0.9
Hendry – Western area	0.5	0.3	0.3	0.3	0.6	0.6
Lee	44.9	93.5	99.8	107.8	117.3	127.8
LWC Planning Area Total	107.2	167.4	181.0	199.1	219.7	242.8

POWER GENERATION SELF-SUPPLY

The primary use of water at thermoelectric power plants is for cooling purposes. Additional water uses at power plants include boiler make-up water and ancillary uses, such as maintenance and domestic use by employees.

Florida Power & Light (FPL), a major electrical power supplier serving three regions within south Florida, provided input during the water supply planning process. In 2010, FPL's power generation facility in the LWC Planning Area was the Fort Myers Plant, which is located one mile east of Interstate 75, next to the Caloosahatchee River. Cooling water for this facility is provided through an intake from the river, a source that does not require a consumptive use permit.

In addition, the Lee County Solid Waste Energy Recovery Facility operated by Covanta, Incorporated, consumes solid waste and generates power in the process. This facility uses up to 2.0 MGD of reclaimed water from the City of Fort Myers and has a backup supply of 1.5 MGD of fresh groundwater. No future facility expansions are planned for this facility during the 20-year planning horizon.

The Lee County Electric Cooperative also distributes power within the LWC Planning Area, but contracts with Seminole Electric and FPL. The cooperative does not have its own power generating facilities and therefore does not require water for power generation.

Projection Methodology

Water demand projections were made in conjunction with FPL to reflect 1) expectations for power demand growth, 2) strategies for obtaining the electricity to meet those demands, which leads to estimation of power plant construction, 3) types and locations of power plants, 4) types of cooling facilities, and 5) ability to achieve efficiencies in water use. Most of these factors are subject to considerable uncertainty. The efficacy of meeting demands from freshwater and saltwater sources needs further consideration, as does the cost-effectiveness of design and operational strategies that could significantly reduce water use. Projections for power generation water demands are based on current usage and are assumed to remain approximately the same between average and 1-in-10 year drought conditions. Withdrawal demands are considered equal to user demands.

Projection Results

The estimates presented in **Table A-15** include the water demands for a potential increase in power generating capacity at FPL's Fort Myers Plant. Although FPL has power generation demands occurring elsewhere within the FPL system, power generation at the Fort Myers Plant has the potential for an expansion within the next 20 years.

Water demands for 2005 through 2015 reflect the use of the Sandstone aquifer at the Fort Myers Plant at quantities presently permitted, and account for total Power Generation (PWR) Self-Supply water use in the LWC Planning Area. The bulk of water withdrawals for the plant is salt water, which does not require a permit, and therefore is not included in the water demands. The efficacy and availability of water sources will be a consideration for future plant site selection. The primary sources of water for a possible plant expansion or a new generation facility may include traditional (fresh) or alternative water sources such as: captured excess storm water, surface water, brackish water from the Floridan aquifer system, and reclaimed water.

Table A-15. PWR Self-Supply demands in the LWC Planning Area.

Power	MGD					
	2005	2010	2015	2020	2025	2030
FPL Fort Myers (Existing)	0.5	0.5	0.5	0.5	0.5	0.5
FPL Fort Myers (Proposed)	0.0	0.0	0.0	11.6	11.6	41.6
LWC Planning Area Total	0.5	0.5	0.5	12.1	12.1	42.1

AGRICULTURAL SELF-SUPPLY

In 2010, agriculture is, and is expected to remain, the dominant land use in the region. Subsequent to publication of the 2005–2006 LWC Plan Update, state and national economic issues, hurricanes and citrus crop diseases affected the LWC Planning Area. In spite of these challenges, the acres dedicated to agriculture are expected to grow and possibly exceed past projections.

Due to the complexity of developing agricultural projections, this plan update uses ranges of acres and water demand to represent agricultural projections. These ranges of acres were determined for the entire LWC Planning Area and not delineated for each county; thus, ranges are reflected in tables as totals by planning area and not by county.

Agricultural water use includes water for the following irrigated commercially grown crop categories: 1) Citrus, 2) Other Fruits and Nuts, 3) Vegetables, Melons and Berries, 4) Field Crops – Sugarcane, 5) Field Crops – Other Field Crops, 6) Sod, 7) Greenhouse/Nursery, 8) Improved Pasture, and 9) Miscellaneous – Cattle Watering.

Projection Methodology

The SFWMD developed agricultural demands for the LWC Planning Area by coordinating with staff from government agencies and agricultural stakeholders. The projections were dependent on estimates of existing and proposed irrigated acres. The methods chosen to estimate crop acreages were those judged by SFWMD staff, in cooperation with agricultural industry and agency representatives, to best reflect the specific crop condition in each county in the LWC Planning Area.

The agricultural demand assessment used acreage estimates developed from the following sources:

- The United States Department of Agriculture (USDA)–National Agriculture Statistics Service 2007 Census of Agriculture (USDA–NASS 2007)
- The SFWMD Water Use Regulatory Database (SFWMD 2009)
- Local agricultural extension offices
- University of Florida/Institute of Food and Agricultural Services
- National Resources and Conservation Services
- Florida Farm Bureau and other SFWMD agricultural stakeholders
- Florida Department of Agriculture and Consumer Services
- The Southwest Florida Water Management District
- The Southwest Florida Feasibility Study GIS land use layers (SDI Environmental, Inc. et al. 2008, Liebermann 2006)

When data from these sources were insufficient for indicating trends, and no convincing empirical knowledge of future changes in a crop's acreage was available, the acreage for that crop category was projected to remain at its most recently reported level.

Demand estimates associated with the acreage for each crop-referenced information from the *District Water Supply Assessment* (SFWMD 1998) and past hydrologic modeling efforts, to identify soil types, growing seasons, irrigation system types, and irrigation system efficiencies. The AGR Self-Supply demand calculations for this plan update use results from the AFSIRS Model.

The AFSIRS Model calculates the net irrigation requirements for each crop category and irrigation system. As described in the *Recreational/Landscape Self-Supply* section of this appendix, the net irrigation requirement reflects an estimate of the amount of water (expressed in inches per year) that should be delivered to a plant's root zone. The gross irrigation requirement is the amount of water that must be withdrawn from the source to be delivered to the plant's root zone. It includes both the net irrigation requirement and the losses incurred irrigating the plant's root zone. Irrigation efficiency as a modeled factor refers to the average percent of total water applied that is delivered to the plant's root zone. This relationship is expressed as follows:

Gross Irrigation Requirement = Net Irrigation Requirement / Irrigation Efficiency

The AFSIRS Model calculates irrigation requirements for the average rainfall year and 1-in-10 year drought conditions. Historical weather data from appropriately located rainfall stations were used to best represent the average and 1-in-10 year drought conditions for each crop/county combination to calculate the irrigation requirements.

Projections of gross irrigation demands are based on an assumed or estimated irrigation system type. The effect of the corresponding irrigation efficiency (shown in parentheses) is based on the interpretation of current ratios and trends. The three basic types of irrigation systems currently used in south Florida crop production are seepage or flood (50%), sprinkler (75%), and low-volume (85%) systems, such as microjets. A weighted irrigation efficiency is calculated for each crop type category based on percent use of the three different irrigation systems, as reported in the SFWMD Water Use Regulatory Database.

Available water capacity and depth of soil have a direct effect on effective rainfall infiltration, which is considered in the AFSIRS Model. Another factor considered explicitly is the on farm irrigation management strategy, which was combined with soil properties for this analysis. As explained in the *Recreational/Landscape Self-Supply* section of this appendix, the default AFSIRS Model soil database includes a generic sandy soil, which is considered reasonable for planning purposes.

Improved pasture is defined by the SFWMD as pasture that has facilities in place to carry out irrigation. Irrigation of pastureland is believed to be limited and based more on drought maintenance, and not as part of regular crop management. The water supply planning assumption that improved pasture is not irrigated does not preclude ranchers from acquiring SFWMD consumptive use permits or carrying out pasture irrigation.

Agricultural alternative water supply projects are likely to target changes in the sources and efficiencies of water delivery to meet the crop net irrigation demands. For instance, tailwater recovery captures some of the water not effectively delivered to the root zone. However, tailwater recovery is not a consistently reliable source of water and may not be used for all crops (see the Planning Document).

Water Demand Calculation Example

A detailed example of the procedure in calculating water demand is presented in this section. Final water demand results are shown in the following section.

First, the acreage of each crop in each county within the LWC Planning Area was determined. Next, the area-weighted irrigation efficiency for the crop type in a particular county was calculated from irrigation system information contained in the SFWMD Water Use Regulatory Database. **Table A-16** lists the estimated irrigation efficiency for each of the three irrigation system categories.

Table A-16. Estimated irrigation efficiency for each type of irrigation system.

Irrigation Category	Irrigation Efficiency
Low-volume	0.85
Seepage	0.50
Sprinkler	0.75

Consumptive use permit data categorized as citrus in Collier County show that 99.1 percent of the planning area's permittees use low volume irrigation systems, 0.862 percent use seepage systems, and 0.005 percent use sprinkler systems. These data were consistent with the information collected in other research, which indicate 98 percent of the citrus crop area uses low-volume systems. Using the permit data, the area weighted irrigation efficiency is as follows:

$$\textbf{Irrigation Efficiency} = (0.991 \times 0.85) + (0.00005 \times 0.75) + (0.00862 \times 0.50) / (0.991+0.00005+0.00862)$$
$$= 84.7\%$$

Of the water withdrawn (gross demand) for citrus irrigation in Collier County, 84.7 percent is available to the crop. Losses occur due to evaporation and line system leakage.

The AFSIRS output is given as the net irrigation requirement in inches per year (in/yr), which is the amount of water the crop needs to supplement rainfall. The input to the model is daily rainfall and evapotranspiration rates in inches. The model uses input data for the period from 1965 through 2000. Based on the rainfall, evapotranspiration data, and calculated irrigation requirements, the AFSIRS outputs include irrigation requirements for both the average rainfall year and 1-in-10 year drought conditions. Fifty percent of the calculated yearly irrigation requirement rates are lower than the average rainfall irrigation requirement. Ninety percent of the calculated yearly irrigation requirements are lower than the 1-in-10 year drought conditions irrigation requirement.

Continuing with the Collier County citrus crop example, the net irrigation requirements for average and 1-in-10 year drought conditions calculated by AFSIRS are 10.35 in/yr and 15.45 in/yr, respectively. Consumptive use permits show that there were about 40,500 acres of irrigated citrus in Collier County in 2005. The USDA did not report citrus acres for 2005. Using the 2004 and 2006 USDA commercial citrus inventory data and averaging the reported acreage for the two years, the estimate for 2005 was 34,136 acres of citrus. The USDA data represent the area covered by tree canopy, or net acres, and is estimated to cover 70 percent of the entire grove area (gross acres). Using this factor, the estimated gross acreage for 2005 according to USDA data is 48,766 acres.

The AFSIRS average irrigation requirement for 48,766 acres uses the net irrigation requirement for average conditions and the irrigation efficiency of 0.847 to estimate the gross irrigation demand for an average year for citrus in Collier County as follows:

Gross Irrigation Requirement (MGD) = Net Irrigation Requirement/Irrigation Efficiency

$$\textbf{Gross Irrigation Requirement (MGD)} =$$

$$\frac{10.35\ {in}/{yr} \times 48{,}766\ acres \times \left[{1\ yr}/{365\ days}\right] \times \left[{1 ft}/{12\ in}\right] \times \left[{43{,}560 ft^2}/{acre}\right] \times \left[{7.4805\ gal}/{ft^3}\right]}{0.847} \times \mathbf{10^{-6} \approx 64.3\ MGD}$$

Note: ft = foot; ft^2 = square feet; ft^3 = cubic feet; gal = gallon; in = inches; yr = year

Calculation of Net Demand Example

The irrigation requirements tables in the following *Projections Results* section provide the gross irrigation requirement (or gross irrigation demand), and the crop irrigation efficiency in each LWC county. To calculate net irrigation requirement, use the water to sustain the crop (net irrigation requirement) data (average rainfall year and 1-in-10 year drought conditions), which can be found in the left column of the irrigation requirements tables. This information can be used to calculate the net irrigation requirement as follows:

Net Irrigation Requirement (MGD) = Gross Irrigation Requirement (MGD) x Irrigation Efficiency

This example uses the gross demand in 2005 for an average rainfall year in Collier County:

Net Irrigation Requirement (MGD) = 64.3 MGD x 85.7 percent ≈ 54.5 MGD

Projection Results

Citrus

All categories of citrus (e.g., oranges, tangerines, limes) were grouped together for projection purposes. Currently, the USDA–National Agricultural Statistics Service, in cooperation with the Florida Department of Agriculture and Consumer Services, publishes a commercial citrus inventory every year. For this plan update, the citrus acreage and citrus industry trends were estimated from the commercial citrus inventory data from 2004, 2006, 2008, and 2009. The USDA did not report acreage for 2005 and 2007.

The USDA data indicate producing acres based on the number of trees per acre, but excludes young and inactive groves that do not generate crops. The 2005–2006 LWC Plan Update and the SFWMD Water Use Regulatory Database report irrigated gross acres, which are based on entire grove parcels. Additionally, because the commercial citrus inventory reports countywide production acres, areal adjustments are needed for Charlotte, Glades, and Hendry counties, which have portions outside of the LWC Planning Area.

Citrus producing acres have declined since publication of the 2005–2006 LWC Plan Update. This decline is primarily due to citrus canker, citrus greening, hurricanes, international competition, and transition from agricultural land use to urban use or ecosystem restoration. However, citrus producing acres are expected to increase once new rootstock or new production techniques are available. Currently funded research is examining trees with resistance to citrus greening and canker, and studying possible genetically engineered strains. Consumptive use permits for citrus groves were renewed in the LWC Planning Area from 2005 through 2010, and in most cases, are valid for 20-year durations.

Some lost citrus acreage will not return to production; specifically, the land that the SFWMD purchased for the Comprehensive Everglades Restoration Plan (CERP) Caloosahatchee (C-43) West Basin Storage Reservoir Project in Hendry County. Additional land purchased by the SFWMD in Glades County designates 950 citrus acres for permanent removal in 2015. The projections in **Table A-17** are based on the assumption that citrus acres will increase minimally from 2015 to 2020, and then begin to increase (using resistant crop strains), reaching currently permitted acres by 2030.

Irrigation efficiencies are based on the estimated water use of each type of irrigation system shown in consumptive use permits. Irrigation efficiency was calculated for each LWC county as follows:

- Charlotte County: 85.0 percent
- Collier County: 84.7 percent
- Glades County: 83.0 percent
- Hendry County: 72.4 percent
- Lee County: 85.0 percent

Table A-17. Gross irrigation requirements for citrus crop acreage in the LWC Planning Area.

Rainfall Year	Water to Sustain Crops (Net Irrigation Requirement; annual inches based on rainfall)	Irrigated Acreage (acres) Gross Demand (MGD) (total volume needed for withdrawal including net irrigation demand as well as accounting for system losses and inefficiencies.) 2005	2010	2015	2020	2025	2030
Charlotte County – SFWMD Portion							
	Irrigated Acreage	8,933 acres	6,740 acres	6,740 acres	6,740 acres	7,006 acres	7,273 acres
	Net Demand	**Gross Demand (MGD)**					
Average	12.30 inches	9.6	7.3	7.3	7.3	7.6	7.8
1-in-10 year drought	16.90 inches	13.1	9.9	9.9	9.9	10.3	10.7
Collier County							
	Irrigated Acreage	48,766 acres	44,639 acres	44,639 acres	44,639 acres	44,639 acres	44,639 acres
	Net Demand	**Gross Demand (MGD)**					
Average	10.35 inches	64.3	58.9	58.9	58.9	58.9	58.9
1-in-10 year drought	15.45 inches	90.0	82.4	82.4	82.4	82.4	82.4
Glades County – Southern							
	Irrigated Acreage	6,930 acres	6,753 acres	5,803 acres	5,803 acres	5,803 acres	5,803 acres
	Net Demand	**Gross Demand (MGD)**					
Average	13.48 inches	12.2	11.4	9.5	9.5	9.5	9.5
1-in-10 year drought	20.33 inches	17.1	16.0	13.2	13.2	13.2	13.2
Hendry County – Western							
	Irrigated Acreage	71,622 acres	44,966 acres	44,966 acres	44,966 acres	47,730 acres	50,495 acres
	Net Demand	**Gross Demand (MGD)**					
Average	14.68 inches	122.0	76.6	76.6	76.6	81.3	86.0
1-in-10 year drought	19.67 inches	162.5	102.0	102.0	102.0	108.3	114.6
Lee County							
	Irrigated Acreage	15,518 acres	14,967 acres	14,967 acres	14,967 acres	14,967 acres	14,967 acres
	Net Demand	**Gross Demand (MGD)**					
Average	14.60 inches	29.7	28.6	28.6	28.6	28.6	28.6
1-in-10 year drought	21.50 inches	39.8	38.4	38.4	38.4	38.4	38.4
Transitional Acres							
	Irrigated Acreage				29,000 acres	29,000 acres	29,000 acres
		Gross Demand (MGD)					
Average					45.0	45.0	45.0
1-in-10 year drought					62.0	62.0	62.0
LWC Planning Area Totals							
	Total Irrigated Acreage	151,769 acres	118,065 acres	117,115 acres	117,115–146,115 acres	120,145–149,145 acres	123,177–152,177 acres
		Gross Demand (MGD)					
	Total average rainfall year	237.8	182.8	180.9	180.9–225.9	185.9–230.9	190.8–235.8
	Total 1-in-10 year drought	322.5	248.7	245.9	245.9–307.9	252.6–314.6	259.3–321.3

a. Net irrigation demand is the water needed to sustain the crop.

b. Gross demand is the total volume needed for withdrawal. It includes the net irrigation demand as well as accounting for system losses and inefficiencies.

Other Fruits and Nuts

Total acreage of the other fruits and nuts crop category (non-citrus fruit crops) in the LWC Planning Area is small relative to other crop categories, and is expected to remain at less than 0.05 percent of the planning area's total irrigated acres. The major crops in this category are avocados, mangos, and peaches. The projections in **Table A-18** are based on 2007 USDA-reported data and the assumption that the acreage for the crop category will remain constant through 2030. Because these crops are not currently grown, and not projected to be grown in Charlotte and Glades counties, neither county is represented in the table.

Based on the estimated water usage of each type of irrigation system (as shown in consumptive use permit records), the irrigation efficiency was calculated for each LWC county as follows:

- Collier County: 82.4 percent
- Hendry County: 85.0 percent
- Lee County: 83.8 percent

Table A-18. Gross irrigation requirements for other fruits and nuts crop acreage in the LWC Planning Area.

Rainfall Year	Water to Sustain Crops (Net Irrigation Requirement; annual inches based on rainfall)	Irrigated Acreage (acres) Gross Demand (MGD)[b] 2005	2010	2015	2020	2025	2030
Collier County							
	Irrigated Acreage	130 acres	130 acres	130 acres	130 acres	130 acres	130 acres
	Net Demand	**Gross Demand (MGD)**					
Average	10.18 inches	0.1	0.1	0.1	0.1	0.1	0.1
1-in-10 year drought	15.22 inches	0.2	0.2	0.2	0.2	0.2	0.2
Hendry County – Western							
	Irrigated Acreage	35 acres	35 acres	35 acres	35 acres	35 acres	35 acres
	Net Demand	**Gross Demand (MGD)**					
Average	12.40 inches	0.1	0.1	0.1	0.1	0.1	0.1
1-in-10 year drought	17.40 inches	0.1	0.1	0.1	0.1	0.1	0.1
Lee County							
	Irrigated Acreage	403 acres	403 acres	403 acres	403 acres	403 acres	403 acres
	Net Demand	**Gross Demand (MGD)**					
Average	15.04 inches	0.6	0.6	0.6	0.6	0.6	0.6
1-in-10 year drought	21.28 inches	0.8	0.8	0.8	0.8	0.8	0.8
LWC Planning Area Totals							
	Total Irrigated Acreage	568 acres	568 acres	568 acres	568 acres	568 acres	568 acres
		Gross Demand (MGD)					
	Total average rainfall year	0.8	0.8	0.8	0.8	0.8	0.8
	Total 1-in-10 year drought	1.1	1.1	1.1	1.1	1.1	1.1

a. Net irrigation demand is the water needed to sustain the crop.
b. Gross demand is the total volume needed for withdrawal. It includes the net irrigation demand as well as accounting for system losses and inefficiencies.

Vegetables, Melons, and Berries

The main crops in this category include tomatoes, peppers, eggplant, squash, melons, tropical vegetables, blueberries, and strawberries. For this plan update, active consumptive use permits were used to estimate vegetable crop acreage in 2005 and 2010. Vegetable acreage for the 20-year planning horizon is expected to remain at about 5,000 acres higher than the 2000 level reported in the 2005–2006 LWC Plan Update. The permitted acreage is projected to remain constant through 2030. An observed trend is citrus acreage—negatively affected by citrus greening and canker—transitioning into this crop category. This trend may continue in the future, but is not quantified at this time due to many uncertainties. Cultivated vegetable acres vary from year to year while most of the currently permitted acres are under permit durations of 20 years. **Table A-19** summarizes the projected water demand for the vegetables, melons and berries crop category acreage in the LWC Planning Area.

Flood irrigation is the primary irrigation system used for small vegetables. Based on the estimated use of each type of irrigation system shown in consumptive use permits, the irrigation efficiency was calculated for each LWC county as follows:

- Charlotte County: 53.0 percent
- Collier County: 55.6 percent
- Glades County: 63.4 percent
- Hendry County: 52.5 percent
- Lee County: 63.4 percent

Table A-19. Gross irrigation requirements for vegetables, melons, and berries crops in the LWC Planning Area.

Rainfall Year	Water to Sustain Crops (Net Irrigation Requirement; annual inches based on rainfall)	Irrigated Acreage (acres) Gross Demand (MGD)[b] 2005	2010	2015	2020	2025	2030
Charlotte County – SFWMD Portion							
	Irrigated Acreage	2,929 acres	8,067 acres	8,067 acres	8,067 acres	8,067 acres	8,067 acres
	Net Demand	**Gross Demand (MGD)**					
Average	16.10 inches	7.0	19.3	19.3	19.3	19.3	19.3
1-in-10 year drought	20.30 inches	8.8	24.4	24.4	24.4	24.4	24.4
Collier County							
	Irrigated Acreage	39,724 acres	43,665 acres	43,665 acres	43,665 acres	43,665 acres	43,665 acres
	Net Demand	**Gross Demand (MGD)**					
Average	14.50 inches	85.4	93.9	93.9	93.9	93.9	93.9
1-in-10 year drought	18.48 inches	107.8	117.8	117.8	117.8	117.8	117.8
Glades County – Southern							
	Irrigated Acreage	4,719 acres	4,744 acres	4,744 acres	4,744 acres	4,744 acres	4,744 acres
	Net Demand	**Gross Demand (MGD)**					
Average	11.00 inches	5.4	5.4	5.4	5.4	5.4	5.4
1-in-10 year drought	15.80 inches	7.8	7.7	7.7	7.7	7.7	7.7
Hendry County – Western							
	Irrigated Acreage	18,580 acres	20,668 acres	20,668 acres	20,668 acres	20,668 acres	20,668 acres
	Net Demand	**Gross Demand (MGD)**					
Average	16.10 inches	44.5	49.5	49.5	49.5	49.5	49.5
1-in-10 year drought	20.30 inches	56.1	62.4	62.4	62.4	62.4	62.4
Lee County							
	Irrigated Acreage	4,598 acres	5,058 acres	5,058 acres	5,058 acres	5,058 acres	5,058 acres
	Net Demand	**Gross Demand (MGD)**					
Average	15.66 inches	12.1	13.3	13.3	13.3	13.3	13.3
1-in-10 year drought	20.30 inches	14.8	16.3	16.3	16.3	16.3	16.3
LWC Planning Area Totals							
	Total Irrigated Acreage	70,550 acres	82,202 acres	82,202 acres	82,202 acres	82,202 acres	82,202 acres
		Gross Demand (MGD)					
	Total average rainfall year	154.4	181.4	181.4	181.4	181.4	181.4
	Total 1-in-10 year drought	195.3	228.6	228.6	228.6	228.6	228.6

a. Net irrigation demand is the water needed to sustain the crop.

b. Gross demand is the total volume needed for withdrawal. It includes the net irrigation demand as well as accounting for system losses and inefficiencies.

Field Crops – Sugarcane

Sugarcane is the principal field crop grown within the LWC Planning Area. Other field crops include rice, seed corn, and soybeans. Sugarcane is discussed separately from the category of other field crops because of its dominance in terms of acreage.

Sugarcane is initially propagated by planting stalk cuttings. Four harvests can be obtained from a planting. The first harvest takes place approximately 13 months after planting and then three ratoons (shoots from the root of the plant after it has been cropped) provide the harvest over the next three years. Sugar production per unit of land surface declines gradually with each harvest. In approximately four years, the increased yields associated with replanting outweigh the costs of obtaining the reduced crop from the ratoons. Because land may lie fallow for several months between crop rotation cycles, approximately 20 percent of the land associated with sugarcane production will not be harvested in any given year. Additionally, about one in 10 acres of sugarcane is grown for seed production.

While the largest percentage of sugarcane acreage in south Florida is grown in the muck soils of the Everglades Agricultural Area, significant sugarcane acreage is also in portions of Hendry and Glades counties in the LWC Planning Area. The estimated acres for 2005 and the projected future sugarcane acres use data from the SFWMD Water Use Regulatory Database and the Southwest Florida Feasibility Study GIS-based land use layer for 2005 (Liebermann 2006).

Flood or seepage irrigation is the predominant irrigation method for sugarcane. The irrigation efficiency for these crops was reported as 50 percent for both Glades and Hendry counties.

Table A-20 summarizes the projected water demand for the sugarcane crop category acreage in the LWC Planning Area.

Table A-20. Gross irrigation requirements for sugarcane crop acreage in the LWC Planning Area.

Rainfall Year	Water to Sustain Crops (Net Irrigation Requirement; annual inches based on rainfall)	Irrigated Acreage (acres) / Gross Demand (MGD)[b] 2005	2010	2015	2020	2025	2030
Glades County – Southern							
	Irrigated Acreage	31,380 acres	32,849 acres	34,318 acres	35,787 acres	38,726 acres	41,664 acres
	Net Demand	**Gross Demand (MGD)**					
Average	17.20 inches	80.3	84.1	87.8	91.6	99.1	106.6
1-in-10 year drought	23.00 inches	107.4	112.0	117.5	122.5	132.5	142.6
Hendry County – Western							
	Irrigated Acreage	60,204 acres	61,577 acres	62,950 acres	64,323 acres	67,069 acres	69,815 acres
	Net Demand	**Gross Demand (MGD)**					
Average	16.20 inches	145.1	148.5	151.8	155.1	161.7	168.3
1-in-10 year drought	21.90 inches	196.2	200.7	205.2	209.6	218.6	227.5
LWC Planning Area Totals							
	Total Irrigated Acreage	91,584 acres	94,426 acres	97,268 acres	100,110 acres	105,795 acres	111,479 acres
		Gross Demand (MGD)					
	Total average rainfall year	225.4	232.6	239.6	246.7	260.8	274.9
	Total 1-in-10 year drought	303.6	312.7	322.7	332.1	351.1	370.1

a. Net irrigation demand is the water needed to sustain the crop.
b. Gross demand is the total volume needed for withdrawal. It includes the net irrigation demand as well as accounting for system losses and inefficiencies.

Field Crops – Other Field Crops

Other field crops in the LWC Planning Area represent about 11 percent of the region's agricultural land and include rice, seed corn, and soybeans. Data used from projections came primarily from the SFWMD Water Use Regulatory Database. Other data were not available from the SFWMD's stakeholders or cooperating agencies. It should be noted that this crop category would be used for biofuel crops, should they expand to this region in the future.

In Collier County, consumptive use permits indicated an area-weighted irrigation efficiency of 67.5 percent. In all other counties, the irrigation efficiency was calculated to be 50 percent.

Table A-21 summarizes the projected water demand for the other field crops category (excluding sugarcane) acreage in the LWC Planning Area.

Table A-21. Gross irrigation requirements for other field crops acreage in the LWC Planning Area.

Rainfall Year	Water to Sustain Crops (Net Irrigation Requirement; annual inches based on rainfall)	Irrigated Acreage (acres) Gross Demand (MGD)[b] 2005	2010	2015	2020	2025	2030
Charlotte County – SFWMD Portion							
	Irrigated Acreage	939 acres	822 acres	822 acres	822 acres	822 acres	822 acres
	Net Demand	**Gross Demand (MGD)**					
Average	16.60 inches	2.3	2.0	2.0	2.0	2.0	2.0
1-in-10 year drought	21.10 inches	3.0	2.6	2.6	2.6	2.6	2.6
Collier County							
	Irrigated Acreage	222 acres	222 acres	222 acres	222 acres	222 acres	222 acres
	Net Demand	**Gross Demand (MGD)**					
Average	12.30 inches	0.3	0.3	0.3	0.3	0.3	0.3
1-in-10 year drought	17.35 inches	0.5	0.5	0.5	0.5	0.5	0.5
Glades County – Southern							
	Irrigated Acreage	1,132 acres	1,071 acres	1,071 acres	1,071 acres	1,071 acres	1,071 acres
	Net Demand	**Gross Demand (MGD)**					
Average	18.20 inches	3.1	2.9	2.9	2.9	2.9	2.9
1-in-10 year drought	23.50 inches	4.0	3.8	3.8	3.8	3.8	3.8
Hendry County – Western							
	Irrigated Acreage	204 acres	190 acres	190 acres	190 acres	190 acres	190 acres
	Net Demand	**Gross Demand (MGD)**					
Average	16.60 inches	0.5	0.5	0.5	0.5	0.5	0.5
1-in-10 year drought	21.10 inches	0.6	0.6	0.6	0.6	0.6	0.6
Lee County							
	Irrigated Acreage	1,094 acres	1,017 acres	1,017 acres	1,017 acres	1,017 acres	1,017 acres
	Net Demand	**Gross Demand (MGD)**					
Average	19.2 inches	3.1	2.9	2.9	2.9	2.9	2.9
1-in-10 year drought	23.6 inches	3.8	3.6	3.6	3.6	3.6	3.6
LWC Planning Area Totals							
	Total Irrigated Acreage	3,591 acres	3,322 acres	3,322 acres	3,322 acres	3,322 acres	3,322 acres
		Gross Demand (MGD)					
	Total average rainfall year	9.3	8.6	8.6	8.6	8.6	8.6
	Total 1-in-10 year drought	11.9	11.1	11.1	11.1	11.1	11.1

a. Net irrigation demand is the water needed to sustain the crop.
b. Gross demand is the total volume needed for withdrawal. It includes the net irrigation demand as well as accounting for system losses and inefficiencies.

Sod Production

Just as with food crops, the sod sold for landscape purposes is irrigated while it is growing. In the 2005–2006 LWC Plan Update, the 2025 irrigated sod acreage and associated water demand were anticipated to increase at a significant rate because of the projected population growth, primarily in Hendry and Charlotte counties, to meet demand for sod used in urban landscaping.

Because of changes in economic conditions, projected growth in sod acres is less than indicated in the 2005–2006 LWC Plan Update. Data from the 2007 USDA agriculture census (USDA–NASS 2007) show growth of sod production in Charlotte and Glades counties over previous years, but contain no data for Collier, Hendry, and Lee counties. Due to the scheduled residential development of Babcock Ranch, sod acreage in Charlotte County is anticipated to increase. For the 2012 planning effort, sod acreage projections are derived from the SFWMD Water Use Regulatory Database, the Florida Sod Growers Association, and the 2007 USDA census.

Flood or seepage is the primary irrigation method for sod in the region. Based on the irrigation system shown in consumptive use permits, the irrigation efficiency was calculated for each LWC county as follows:

- Charlotte County: 61.6 percent
- Collier County: 50.1 percent
- Glades County: 60.3 percent
- Hendry County: 59.3 percent
- Lee County: 80.9 percent

Table A-22 summarizes the projected water demand for the sod crop category acreage in the LWC Planning Area.

Greenhouse/Nursery

Crops grown in greenhouses may include vegetables, herbs, fruits and berries, garden plants for sale, cut flowers, and caladium bulbs. The same crops may be grown in the open or in a nursery setting where the plants are the product for sale. For this plan update, an increase in greenhouse/nursery acreage is projected. The acreage estimates in this plan update are based on the USDA's 2005, 2007, and 2009 agriculture censuses and the SFWMD Water Use Regulatory Database.

Greenhouse/nursery irrigation is often provided by low volume methods for container grown and greenhouse plants, but larger field grown nurseries use seepage and flood irrigation. Based on the estimated use of each type of irrigation system shown in consumptive use permits, the irrigation efficiency was calculated for each LWC county as follows:

- Charlotte County: 61.6 percent
- Collier County: 50.1 percent
- Glades County: 60.3 percent
- Hendry County: 59.3 percent
- Lee County: 80.9 percent

Table A-23 summarizes the projected water demand for the greenhouse/nursery crop category acreage in the LWC Planning Area.

Table A-22. Gross irrigation requirements for sod acreage in the LWC Planning Area.

Rainfall Year	Water to Sustain Crops (Net Irrigation Requirement; annual inches based on rainfall)	Irrigated Acreage (acres) Gross Demand (MGD)[b] 2005	2010	2015	2020	2025	2030
Charlotte County – SFWMD Portion							
	Irrigated Acreage	1,290 acres	2,284 acres	3,278 acres	4,272 acres	4,884 acres	5,496 acres
	Net Demand	**Gross Demand (MGD)**					
Average	20.50 inches	3.9	7.0	10.0	13.0	15.0	16.8
1-in-10 year drought	26.40 inches	5.1	9.0	12.9	16.8	19.2	21.6
Collier County							
	Irrigated Acreage	115 acres	115 acres	115 acres	115 acres	115 acres	115 acres
	Net Demand	**Gross Demand (MGD)**					
Average	20.50 inches	0.4	0.4	0.4	0.4	0.4	0.4
1-in-10 year drought	26.40 inches	0.5	0.5	0.5	0.5	0.5	0.5
Glades County – Southern							
	Irrigated Acreage	451 acres	893 acres	1,334 acres	1,776 acres	2,057 acres	2,338 acres
	Net Demand	**Gross Demand (MGD)**					
Average	20.50 inches	1.4	2.7	4.1	5.4	6.3	7.1
1-in-10 year drought	26.40 inches	1.8	3.5	5.2	7.0	8.1	9.2
Hendry County – Western							
	Irrigated Acreage	475 acres	475 acres	475 acres	475 acres	475 acres	475 acres
	Net Demand	**Gross Demand (MGD)**					
Average	20.50 inches	1.5	1.5	1.5	1.5	1.5	1.5
1-in-10 year drought	26.40 inches	1.9	1.9	1.9	1.9	1.9	1.9
Lee County							
	Irrigated Acreage	100 acres	100 acres	100 acres	100 acres	100 acres	100 acres
	Net Demand	**Gross Demand (MGD)**					
Average	20.50 inches	0.3	0.3	0.3	0.3	0.3	0.3
1-in-10 year drought	26.40 inches	0.4	0.4	0.4	0.4	0.4	0.4
LWC Planning Area Totals							
	Total Irrigated Acreage	2,431 acres	3,867 acres	5,302 acres	6,738 acres	7,631 acres	8,524 acres
		Gross Demand (MGD)					
	Total average rainfall year	7.5	11.9	16.4	20.6	23.5	26.1
	Total 1-in-10 year drought	9.7	15.3	20.9	26.6	30.1	33.6

a. Net irrigation demand is the water needed to sustain the crop.

b. Gross demand is the total volume needed for withdrawal. It includes the net irrigation demand as well as accounting for system losses and inefficiencies.

Table A-23. Gross irrigation requirements for greenhouse/nursery acreage in the LWC Planning Area.

Rainfall Year	Water to Sustain Crops (Net Irrigation Requirement; annual inches based on rainfall)	Irrigated Acreage (acres) Gross Demand (MGD)[b] 2005	2010	2015	2020	2025	2030
Charlotte County – SFWMD Portion							
	Irrigated Acreage	98 acres	115 acres	132 acres	149 acres	166 acres	183 acres
	Net Demand	**Gross Demand (MGD)**					
Average	21.28 inches	0.5	0.6	0.7	0.7	0.8	0.9
1-in-10 year drought	26.78 inches	0.6	0.7	0.8	0.9	1.0	1.1
Collier County							
	Irrigated Acreage	546 acres	546 acres	546 acres	546 acres	546 acres	546 acres
	Net Demand	**Gross Demand (MGD)**					
Average	20.54 inches	1.8	1.8	1.8	1.8	1.8	1.8
1-in-10 year drought	24.27 inches	2.1	2.1	2.1	2.1	2.1	2.1
Glades County – Southern							
	Irrigated Acreage	100 acres	319 acres	319 acres	319 acres	319 acres	319 acres
	Net Demand	**Gross Demand (MGD)**					
Average	26.43 inches	0.5	1.7	1.7	1.7	1.7	1.7
1-in-10 year drought	31.11 inches	0.6	2.0	2.0	2.0	2.0	2.0
Hendry County – Western							
	Irrigated Acreage	185 acres	247 acres	299 acres	355 acres	410 acres	465 acres
	Net Demand	**Gross Demand (MGD)**					
Average	21.28 inches	0.9	1.2	1.5	1.8	2.0	2.3
1-in-10 year drought	26.78 inches	1.1	1.4	1.8	2.1	2.5	2.8
Lee County							
	Irrigated Acreage	1,938 acres	2,342 acres	2,342 acres	2,342 acres	2,342 acres	2,342 acres
	Net Demand	**Gross Demand (MGD)**					
Average	26.98 inches	5.5	6.6	6.6	6.6	6.6	6.6
1-in-10 year drought	31.29 inches	6.3	7.6	7.6	7.6	7.6	7.6
LWC Planning Area Totals							
	Total Irrigated Acreage	2,867 acres	3,569 acres	3,638 acres	3,711 acres	3,783 acres	3,855 acres
		Gross Demand (MGD)					
	Total average rainfall year	9.2	11.9	12.3	12.6	12.9	13.3
	Total 1-in-10 year drought	10.7	13.8	14.3	14.7	15.2	15.6

a. Net irrigation demand is the water needed to sustain the crop.
b. Gross demand is the total volume needed for withdrawal. It includes the net irrigation demand as well as accounting for system losses and inefficiencies.

Improved Pasture

The SFWMD definition of improved pasture is any pasture with the facilities in place to carry out irrigation. Pastures are typically irrigated using overhead sprinklers or sub-irrigation with lateral and perimeter ditches. Pasture areas often have facilities designed for drainage, but may also be configured and operated to provide irrigation.

The 2005–2006 LWC Plan Update did not estimate improved pasture acreage, but GIS land use data developed for the Southwest Florida Feasibility Study (USACE and SFWMD 2009) does include improved pasture. For 2000, the study estimated 189,000 acres of improved pasture within the LWC Planning, and projected that 87,584 acres for 2025 would remain as improved pasture. Current information from the SFWMD Water Use Regulatory Database indicates that the 2010 pasture acreage is about 100,000 acres. This acreage includes consumptive use permitted existing improved pasture, as well as the proposed conversion of lands to improved pasture. Based on input from agricultural stakeholders and agencies such as the University of Florida Institute of Food and Agriculture Sciences and Florida Farm Bureau, a small increase is likely over the planning horizon. Since most permit renewals for irrigation have 20-year permit durations, the total irrigated pasture is not likely to exceed the current estimate by 2030.

In past water supply plans, improved pasture has not been included in the total water demands due to the uncertainty associated with irrigation practices and the number of acres of improved pasture. A review of the actual pumpage data provided by permit holders is insufficient to make projections at this time. The SFWMD did not include projections for the improved pasture use category in this plan update, but it intends to work with the other water management districts and FDEP on a cohesive statewide methodology. Water demand projections for the improved pasture use category will be addressed in future water supply plans.

Miscellaneous – Cattle Watering

Water required for cattle watering is included in the miscellaneous – cattle watering use category. This water demand category is calculated as a function of the number and type of cattle (beef or dairy). Demand projections for cattle watering were based on an assumed 12 gallons per head per day for beef cattle, 185 gallons per head per day for dairy cattle, 35 gallons per dairy cow per day for drinking, and 150 gallons per dairy cow per day for related barn washing.

For this plan update, the cattle population was obtained from the USDA–National Agriculture Statistics Service database in late 2009. Demands for the miscellaneous – cattle watering use category are projected to remain at the 2005 level throughout the planning horizon (**Table A-24**).

Table A-24. Water requirements for the miscellaneous – cattle watering category in the LWC Planning Area.

County/Area	Beef Cattle Acres	Dairy Cattle Acres	Total MGD
Charlotte – SFWMD Portion	14,000	0.0	0.2
Collier	7,000	0.0	0.1
Glades – Southern	34,000	0.0	0.4
Hendry – Western	48,000	0.0	0.6
Lee	9,000	0.0	0.1
LWC Planning Area Total	112,000	0.0	1.4

Summary of Agricultural Results

Although estimates and projections for the agricultural subsections have been discussed in terms of crop/use categories, it is also important to summarize the results in terms of total acreage and use by crop type and county. Total irrigated agricultural acreages by crop type are presented in **Table A-25** and by county in **Table A-26**. The total net irrigation demands by county are presented in **Table A-27.** Gross irrigation demands by county (water withdrawal demands) are presented in **Table A-28**.

Table A-25. Total irrigated agricultural acreage in the LWC Planning Area by crop type.

Crop Category	2005	2010	2015	2020	2025	2030
Citrus	151,769	118,065	117,115	117,115–146,115	120,145–149,145	123,177–152,177
Sugarcane	91,584	94,426	97,268	100,110	105,795	111,479
Vegetables, melons and berries	70,550	82,202	82,202	82,202	82,202	82,202
Sod	2,431	3,867	5,302	6,738	7,631	8,524
Other field crops	3,591	3,322	3,322	3,322	3,322	3,322
Greenhouse/ nursery	2,867	3,569	3,638	3,712	3,783	3,855
Other fruits and nuts	568	568	568	568	568	568
LWC Planning Area Total	323,360	306,019	309,415	313,767–342,767	323,446–352,446	333,127 – 362,127

Table A-26. Total irrigated agricultural acreage in the LWC Planning Area by county.

County/ Area	2005	2010	2015	2020	2025	2030
Charlotte – SFWMD Portion	14,189	18,028	19,039	20,050	20,945	21,841
Collier	89,503	89,317	89,317	89,317	89,317	89,317
Glades – Southern	44,712	46,629	47,589	49,500	52,720	55,939
Hendry – Western	151,305	128,158	129,583	131,012	136,577	142,143
Lee	23,651	23,887	23,887	23,887	23,887	23,887
LWC Planning Area Total	323,360	306,019	309,415	313,766–342,766	323,446–352,446	333,127–362,127

Table A-27. Net irrigation demands for total irrigated agricultural acreage under average rainfall and 1-in-10 year drought conditions in the LWC Planning Area.

County	2005	2010	2015	2020	2025	2030
Average Conditions (MGD)						
Charlotte – SFWMD Portion	17.6	24.1	25.9	27.6	29.1	30.3
Collier	101.6	102.1	102.1	102.1	102.1	102.1
Glades – Southern	62.3	66.0	67.7	71.2	75.2	79.9
Hendry – Western	201.1	171.6	173.7	175.9	183.5	191.0
Lee	38.5	39.3	39.3	39.3	39.2	39.2
LWC Planning Area Total	421.1	403.1	408.6	416.0–451.0	428.9–463.9	442.4–477.4
1-in-10 Year Drought Conditions (MGD)						
Charlotte – SFWMD Portion	23.6	31.4	33.6	35.9	37.7	39.6
Collier	134.7	134.9	134.9	134.9	134.9	134.9
Glades – Southern	129.1	135.9	140.2	146.1	156.5	167.1
Hendry – Western	348.8	311.0	315.7	320.4	334.3	348.1
Lee	48.7	49.7	49.7	49.6	49.6	50.0
LWC Planning Area Total	684.9	662.9	674.0	686.8–733.9	712.9–760.0	739.6–786.7

Table A-28. Gross irrigation demands for total irrigated agricultural acreage under average rainfall and 1-in-10 year drought conditions in the LWC Planning Area.

County/Demand	2005	2010	2015	2020	2025	2030
Average Conditions (MGD)						
Charlotte – SFWMD Portion	23.3	36.2	39.3	42.3	44.7	46.8
Collier	152.3	155.4	155.4	155.4	155.4	155.4
Glades – Southern	102.9	108.2	111.4	116.5	124.9	133.2
Hendry – Western	314.6	277.9	281.5	285.1	296.6	308.2
Lee	51.3	52.3	52.3	52.3	52.3	52.3
LWC Planning Area Total	644.4	630.0	639.9	651.6–696.6	673.9–718.9	695.9–740.9
1-in-10 Year Drought Conditions (MGD)						
Charlotte – SFWMD Portion	30.6	46.6	50.6	54.6	57.5	60.4
Collier	201.1	203.5	203.5	203.5	203.5	203.5
Glades – Southern	138.7	145.0	149.4	156.2	167.3	178.5
Hendry – Western	418.5	369.1	374.0	378.7	394.4	409.9
Lee	65.9	67.1	67.1	67.1	67.1	67.1
LWC Planning Area Total	854.8	831.3	844.6	860.1–922.1	889.8–951.8	919.4–981.4

TOTAL PLANNING AREA DEMANDS

This section summarizes the total net user (customer demands) and total gross (withdrawal) demands in the LWC Planning Area. The water supply development projects identified in this plan update (**Chapter 6** of the Planning Document and **Appendix C**) are designed to meet net user demands. The net demands are presented for average and 1-in-10 year drought conditions. **Table A-29** shows net demands and **Table A-30** presents estimated gross demands for water-supply water use categories from 2005 to 2030 for the LWC Planning Area for average and 1-in-10 year drought demands.

Table A-29. Net water demands by water use category under average rainfall and 1-in-10 year drought conditions in the LWC Planning Area.

Water Use Category	2005	2010	2015	2020	2025	2030
Average Conditions (MGD)						
PWS	121.6	131.4	142.6	156.7	173.0	192.0
DSS	15.0	15.7	16.6	17.8	19.3	19.9
ICI Self-Supply	35.3	35.3	35.3	35.3	35.3	35.3
REC Self-Supply	62.4	97.5	105.4	115.9	127.9	141.5
PWR Self-Supply	0.5	0.5	0.5	12.1	12.1	42.1
AGR Self-Supply	421.1	403.1	408.6	416.0–451.0	428.9–463.9	442.4–477.4
LWC Planning Area Total	655.9	683.5	709.0	753.8–788.8	796.4–831.4	873.2–908.2
1-in-10 Year Drought Conditions (MGD)						
PWS	130.0	140.5	152.4	167.4	184.8	205.0
DSS	16.0	16.7	17.7	19.0	20.6	21.3
ICI Self-Supply	35.3	35.3	35.3	35.3	35.3	35.3
REC Self-Supply	80.3	125.6	135.7	149.3	164.8	182.2
PWR Self-Supply	0.5	0.5	0.5	12.1	12.1	42.1
AGR Self-Supply	684.9	662.9	674.0	686.8–733.9	712.9–760.0	739.6–786.7
LWC Planning Area Total	947.0	981.6	1,117.0	1071.8–1118.9	1,130.5–1,177.6	1,225.5–1,272.6

Table A-30. Gross water demands by water use category under average rainfall and 1-in-10 year drought conditions in the LWC Planning Area.

Water Use Category	2005	2010	2015	2020	2025	2030
Average Conditions (MGD)						
PWS	143.0	156.3	169.9	188.6	208.4	232.1
DSS	18.1	18.9	20.0	21.5	23.3	24.0
ICI Self-Supply	35.3	35.3	35.3	35.3	35.3	35.3
REC Self-Supply	83.1	130.1	140.5	154.5	170.7	188.5
PWR Self-Supply	0.5	0.5	0.5	12.1	12.1	42.1
AGR Self-Supply	644.4	630.0	639.9	651.6-696.6	673.9–718.9	695.9–740.9
LWC Planning Area Total Water Use	924.4	971.1	1,006.1	1,063.1–1,108.6	1,123.7–1,168.7	1,217.9–1,262.9
1-in-10 Year Drought Conditions (MGD)						
PWS	152.8	167.1	181.6	201.5	222.7	247.8
DSS	19.3	20.2	21.4	23.0	24.9	25.7
ICI Self-Supply	35.3	35.3	35.3	35.3	35.3	35.3
REC Self-Supply	107.2	167.4	181.0	199.1	219.7	242.8
PWR Self-Supply	0.5	0.5	0.5	12.1	12.1	42.1
AGR Self-Supply	854.8	831.3	844.6	860.1–922.1	889.8–951.8	919.4–981.4
LWC Planning Area Total	1,170.0	1,221.8	1,264.4	1,331.1–1,393.1	1,404.5–1,466.5	1,513.1–1,575.1

COMPARISON OF WATER DEMAND PROJECTIONS IN 2005–2006 AND CURRENT LWC PLAN UPDATES

A few changes in methodology were applied from the previous LWC plan update to the demand assessment and projections in this plan update. These are summarized as follows:

- Population projections use countywide 2009 medium-BEBR data for all counties. In the 2005–2006 LWC Plan Update, the Collier County population projections were based on a Florida Department of Economic Opportunity approved alternative to medium BEBR.
- Population distribution within utility service areas in all counties are based on 2000 TAZ data, whereas the 2005–2006 LWC Plan Update used census block data for Charlotte, Glades and Hendry counties, and 2000 TAZ data for Lee and Collier counties.
- Current and future areas served have changed since publication of the 2005–2006 LWC Plan Update and the publication of this plan update. Maps of the currently served areas were coordinated with each utility.

- ICI Self-Supply demands are based on actual 2005 water use data, not USGS reported data for 2000.
- REC Self-Supply is based on consumptive use permit data for golf course and landscape irrigation, GIS land use data, and reclaimed water use data.
- For this plan update, AGR Self-Supply acreage is estimated using multiple sources to provide current data, rather than 2005 GIS land use data as a primary source.

Table A-31 compares the projected average gross water demands estimated in the 2005–2006 LWC Plan Update with those estimated for the current plan update. **Table A-32** compares projected demands for 1-in-10 year drought conditions for both plan updates.

The most significant differences between the 2005–2006 LWC Plan Update demand estimates and the demands estimated in this plan update occur for the following reasons:

- Population projections for this plan update show smaller growth than projections in the 2005–2006 LWC Plan Update. This change has a significant effect on both PWS and DSS demands.
- In the PWR Self-Supply water use category, the 2005–2006 LWC Plan Update projected a 2025 demand of 66.9 MGD. In the current plan update, expansion of existing facilities (Fort Myers Plant) or new generation projects are anticipated. Demand increases are greater in the REC and ICI Self-Supply water use categories than were projected in the 2005–2006 LWC Plan Update. However, these estimated rates of increase are partially due to the use of different sources of data.

Table A-31. End point projections of gross water demands under average rainfall conditions in the 2005–2006 LWC Plan Update and the current plan update.

Water Use Category	2005–2006 LWC Plan Average Demands for 2025 (MGD)	Current Plan Average Demands for 2030 (MGD)	Percent Change between 2005–2006 LWC Plan (2025) and Current Plan (2030)
PWS	272.0	232.1	(14.7%)
DSS	31.1	24.0	(22.8%)
ICI Self-Supply	28.9	35.3	22.1%
REC Self-Supply	62.2	188.5	203.1%
PWR Self-Supply	66.9	42.1	(37.1%)
AGR Self-Supply	729.0	695.9–740.9	(4.5%)–1.6%
LWC Planning Area Total	1,190.1	1217.9–1,262.9	2.3%–6.1%

Table A-32. End point projections of gross water demands under 1-in-10 year drought conditions in the 2005–2006 LWC Plan Update and current plan update.

Water Use Category	2005–2006 LWC Plan Update 1-in-10 Year Drought Conditions Demands for 2025 (MGD)	Current Plan Update 1-in-10 Year Drought Conditions Demands for 2030 (MGD)	Percent Change 2005–2006 between 2005–2006 LWC Plan (2025) and Current Plan (2030)
PWS	289.0	247.8	(14.2%)
DSS	33.0	25.7	(22.1%)
ICI Self-Supply	28.9	35.3	22.1%
REC Self-Supply	73.9	242.8	228.6%
PWR Self-Supply	66.9	42.1	(37.1%)
AGR Self-Supply	967.0	919.4–981.4	(4.9%)–1.5%
LWC Planning Area Total Water Use	1,458.0	1,513.1–1,575.1	3.8%–8.0%

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B

Information for Local Government Comprehensive Plans

The South Florida Water Management District (SFWMD) prepares water supply plans for each of its four planning areas to effectively support planning initiatives and address local issues. The regional water supply plans encompass a 20-year future planning horizon and are updated every five years. All local governments are required by statute to update their water supply facilities work plan, and adopt revisions to their comprehensive plan, within 18 months following the approval of this plan update.

This appendix contains water supply planning information useful to local governments for preparing and amending comprehensive plans. In addition to this appendix, the following chapters (see the Planning Document) and appendices are particularly relevant for local governments:

Water Sources	Chapters 4 and 6; Appendix C
Utility Service Areas (2010 and 2030)	Chapter 6; Appendix D
Population Projections (2010–2030)	Chapter 2; Appendix A
Demand Projections (2010–2030)	Chapter 2; Appendix A
Water Supply Projects (2005–2030)	Chapter 6; Appendix C

This appendix includes the following information useful for the review and revision of local government comprehensive plans:

1. The SFWMD Checklist of Needed Comprehensive Plan Data
2. Relevant portions of cited statutory provisions
3. Tables identifying the utilities serving each Lower West Coast LWC Planning Area jurisdiction
4. Maps of utility areas currently served (2010) and future utility service areas expected to be served (2030)

1. CHECKLIST OF NEEDED COMPREHENSIVE PLAN DATA

Local governments are required to plan for their water and wastewater needs along with other infrastructure and public service elements of their comprehensive plan. This section provides a general checklist of the type of data and information the SFWMD water supply planning staff look for during their review of the water supply element, policies, and other topics in local government comprehensive plans. This checklist is not all-inclusive, but provides a broad, general framework for use with the more detailed Florida Department of Economic Opportunity (FDEO) related guidelines and SFWMD comments on specific water supply topics.

Checklist guidance is given for three water supply-related aspects of comprehensive plans:

A. Work plans and other potable water sub-element revisions
B. Evaluation and appraisal of comprehensive plan requirements
C. Plan amendments (future land use change)

A. Work Plan and Other Potable Water Sub-Element Revisions

(Within 18 months following publication of this plan update)

Overall Guidance

For consistency in the water supply planning process, the SFWMD, local governments, and utilities work closely with the FDEO, projecting demands and proposing water supply projects for the future. This plan update provides water demand estimates, water source options, and water supply development projects to ensure adequate water supplies to support the region. Local governments should demonstrate consistency with the regional water supply plan and updates when developing or updating their work plans. The following guidance is provided to local governments for updating their work plans.

Review This Plan Update and Confirm Major Public Water Supply Entities Providing Service within Local Government's Jurisdiction

To be consistent with the regional water supply plan and updates, the local government's work plan should be in agreement with the major Public Water Supply (PWS) entities serving most of the urban population. This plan update identifies PWS entities with projected average pumpage greater than 0.1 millions of gallons of water per day (MGD), serving most of the urban population. Some smaller communities or municipalities may not be identified. The FDEO guidance for work plans recommends including all small community systems and Domestic Self-Supply (DSS) users on private wells. Information on these small in-community systems and DSS is available from the following webpage: http://www.dep.state.fl.us/water/drinkingwater/flow.htm.

This plan update provides information about PWS entities and urban water use by PWS service area. To be consistent with the regional water supply plan and updates, at a minimum, the work plan should identify the urban water demand and adequacy of PWS water sources within the municipal boundary to meet such water demand. If appropriate, the sale or purchase of water from PWS entities with service areas outside of the municipal boundary should also be identified. Municipal boundaries and land use are not primary determinants of water use.

Review PWS Utility Summaries Provided in Chapter 6 of this Plan Update

The SFWMD worked with the staff from PWS entities to identify water supply development projects for this plan update. Utility summaries were compiled using information from various sources, including input from PWS entities. The utility summaries provide baseline information about finished water demands, existing consumptive use permitted sources and allocations, recently constructed and proposed projects that create water capacity, as well as other related information. Multiple sources of water supply may be needed to accommodate projected water demand in future years. PWS entity staff should confirm the information provided in the utility summaries in this plan update. Subsequent to adoption of the plan update, PWS entities must respond to the SFWMD with their intentions to develop and implement the projects identified by this plan update, or provide a list of other projects or methods to meet water demands within 12 months.

To be consistent with the regional water supply plan, the local government's work plan should be in general agreement with this plan update utility summaries' water sources and schedule of water sources to be made available to meet projected water demands. However, it is not necessary to use the same population projections or per capita use rates used by the regional water supply plan to project water demand. Generally accepted professional planning methods may be used as input to the local planning process, which may result in differences between the demand and supply estimates provided in this plan update's utility summaries. If planning assumptions or information differs from what is provided in the utility summaries, the work plan should identify and explain the basis for any differences.

Furthermore, consistency between a work plan and regional water supply plan does not require the same planning periods. The minimum planning period for regional water supply plans is 20 years (referred to as the 20-year planning horizon). The historical perspectives for the regional hydrologic assumptions are even longer in duration. Regional water supply plans are updated every five years. As the updated regional water supply plan is implemented through water use regulations, a high priority is placed on the ability of local water supply projects to be permitted via the consumptive use permitting process in advance of demand within the near term (five-year increment); however, a minimum 10-year planning period is required (Paragraph 163.3177(5)(a), Florida Statutes [F.S.]) and a 20-year planning period is preferred.

Additional information about developing a work plan, including guidelines, is available from http://www.floridajobs.org/community-planning-and-development/programs/technical-assistance/planning-initiatives/natural-resource-planning/water-supply-planning.

Checklist of Key Considerations

Water Supply Demand Projections

- ☐ Review this plan update and revise the local government's adopted work plan to be consistent with the water demand estimates and population projections cited in this plan update. The objective is to provide best available data. If the local government can provide data that improves that data in this plan, then the local government data should be used in the work plan. All differences in water demand estimates and population projections used in the work plan should be identified and explained.
  - ☐ Plan for both raw and finished (i.e., water volume after any losses due to water treatment) water supply demands within the city or county jurisdiction for each supplier.
  - ☐ The projections should cover at least a 10-year planning period, but projections for the entire established local government comprehensive plan's planning period are preferred.
  - ☐ The projections should plan for the building of all public, private, and regional water supply facilities and bulk sales of water that will be necessary to provide water supply service within the local government's jurisdiction.

Water Source Identification

- ☐ Review the water supply sources identified by the local government or its water suppliers as necessary to meet and achieve the existing and projected water use demand for the established planning period.
  - ☐ Compare this information with the available sources in this plan update.
- ☐ Provide separate projections for existing and future DSS.
  - ☐ Identify the general areas served by DSS.

Water Supply Project Identification

- ☐ Either incorporate water supply project(s) selected by the local government's utility or utilities providing PWS to the local government, as identified in the regional water supply plan, or propose alternatives for inclusion in the work plan.
  - ☐ All other public and private water supply capital improvements, including wells, treatment plants, distribution systems, etc., necessary to maintain level-of-service standards within the jurisdiction should also be included in the work plan.
- ☐ Coordinate the work plan water supply projects with this SFWMD water supply plan update and the water supplier(s) annual progress reports.
  - ☐ Update the work plan accordingly.

- Identify sufficient water conservation, reclaimed water, and water supply projects necessary to meet projected demands.
- Update the capital improvements element as required.

Water Supply Intergovernmental Coordination

- The work plan should address ongoing and future coordination with existing and future water supply and reuse providers for meeting future demands. This should occur before, during, and after the water supply plan update process.
- Review existing and future utility service areas for each provider within the jurisdiction. Refer to the maps provided in this appendix. Compare and update the work plan as needed.
    - Identify existing or potential service area conflicts and solutions. Include a conflict resolution policy.
    - Ensure all areas of the local government are accounted for by the local government's own utility or other providers.
- Review and update the work plan language concerning needed coordination with water supplier(s), other local governments and entities, and others.
    - Include updates to agreements (e.g., bulk service agreements and interconnect agreements).

Related Comprehensive Plan Amendments

- If additional revisions are needed for coordination with this water supply plan update, but not listed here, incorporate changes into the comprehensive plan and work plan, as appropriate.
- This plan update will require changes to the work plan and possibly other elements within the comprehensive plan. Revisions may include population projections, established planning period, existing and future water resource projects, intergovernmental coordination activities, conservation and reuse measures, and the capital improvements element.
    - Review the comprehensive plan for consistency between all elements of the work plan and other comprehensive plan elements in consideration of all proposed modifications to the comprehensive plan. Other comprehensive plan elements include, but may not be limited to, future land use, potable water, sanitary sewer, conservation, intergovernmental coordination, and capital improvements.

B. Evaluation and Appraisal of Comprehensive Plans Subsections 163.3191(1)–(3), F.S.

(Evaluation of the comprehensive plan after the adoption of a work plan)

Water Supply Project Identification and Selection

At least every seven years, local governments must evaluate whether the need exists to amend their comprehensive plan since the last comprehensive plan update. The evaluation should address changes in state requirements since the last update of the comprehensive plan.

While an evaluation and appraisal report is not required, local governments are encouraged to comprehensively evaluate, and as necessary, update comprehensive plans to reflect changes in local conditions. The evaluation could address the issues below related to their work plans.

- Identify the extent to which the local government has been successful in identifying water supply projects, including water conservation and reuse, necessary to meet projected demands.
- Evaluate the degree to which the work plan has been implemented for building all public, private, and regional water supply facilities within the jurisdiction necessary to meet projected demands.
- Include recommendations for revising the work plan and the applicable comprehensive plan elements to address the conclusions of the evaluation, as necessary.

C. Plan Amendments (Future Land Use Change)

Water Supply Demand Projections

- Address both raw and finished (i.e., after any losses due to water treatment) water supply needs for both potable and nonpotable (i.e., irrigation) demands, using professionally acceptable methodologies for population projections and per capita use rates.
- Address existing and future water conservation and reuse commitments, and levels of service (i.e., per capita use rates), for both the proposed future land use change and the comprehensive plan.
- Address both the build-out time frame for a proposed future land use change, and the established planning time frame for the comprehensive plan.

Water Source Identification

- For existing demands, reflect water source(s) from the supplier's consumptive use permit.
- For future demands covered by a supplier's commitment to provide service under remaining available capacity of an existing consumptive use permit, reflect the source(s) from the supplier's consumptive use permit, including bulk supply contracted quantities, duration, and provider.
- For future demands not covered by an existing consumptive use permit, provide sufficient planning-level data and analysis to demonstrate the availability of a sustainable water source as identified in the appropriate SFWMD regional water supply plan.

Availability of Water Supply and Public Facilities

- Demonstrate that there is an availability of raw water supply from the proposed source(s) of raw supply for the future land use change, given all other approved land use commitments within the local government's jurisdiction over both the proposed amendment's build-out and the established planning period of the comprehensive plan (see Paragraphs 163.3167(9) and 163.3177(6)(a), F.S.).
- Demonstrate that there is an availability of both treatment facility capacity and consumptive use permitted, available finished water supply for the future land use change, given all other commitments for that capacity and supply over the proposed build-out time frame.
- If the availability of either water supply and/or public facilities is not currently demonstrable, this will require either phasing of the future land use (see Paragraph 163.3177(6)(h)1, F.S.), and/or appropriate amendments to the capital improvements element/potable water sub-element, to ensure the necessary capital planning and timely availability of the needed infrastructure and water supply (see Paragraphs 163.3177(3)(a), 163.3177(6)(c), and 163.3177(6)(h)3.b., F.S.).
- If the water provider is an entity other than the local government responsible for the comprehensive plan amendment, demonstrate that coordination of the plan amendment has occurred between the water provider and the local government (see Paragraph 163.3177(6)(h)3.b., F.S.).

Related Comprehensive Plan Amendments

- A future land use change may also require amendments to other specific elements within the comprehensive plan if it requires an adjustment to either the plan's future population or demand projections, the comprehensive plan's established planning period, the water supply sources, or water providers required to be addressed in the comprehensive plan (see Subsections 163.3167(9), 163.3177(4)(a), 163.3177(5)(a), 163.3177(6)(a), 163.3177(6)(c), and 163.3177(6)(d), F.S., and Section 163.3180, F.S.).

2. CITED FLORIDA STATUTE PROVISIONS (RELEVANT PORTIONS)

163.3167(9): Each local government shall address in its comprehensive plan, as enumerated in this chapter, the water supply sources necessary to meet and achieve the existing and projected water use demand for the established planning period, considering the applicable plan developed pursuant to s. 373.709.

163.3177(3)(a): The comprehensive plan shall contain a capital improvements element designed to consider the need for and the location of public facilities in order to encourage the efficient use of such facilities and set forth:

1. A component that outlines principles for construction, extension, or increase in capacity of public facilities, as well as a component that outlines principles for correcting existing public facility deficiencies, which are necessary to implement the comprehensive plan. The components shall cover at least a five-year period.
2. Estimated public facility costs, including a delineation of when facilities will be needed, the general location of the facilities, and projected revenue sources to fund the facilities.
3. Standards to ensure the availability of public facilities and the adequacy of those facilities including acceptable levels of service.
4. A schedule of capital improvements which includes any publicly funded project of federal, state or local government, and which may include privately funded projects for which the local government has no fiscal responsibility. Projects necessary to ensure that any adopted level-of-service standards are achieved and maintained for the 5-year period must be identified as either funded or unfunded and given a level of priority for funding.

163.3177(4)(a): Coordination of the local comprehensive plan with the comprehensive plans of adjacent municipalities, the county, adjacent counties, or the region; with the appropriate water management district's regional water supply plans approved pursuant to s. 373.709; and with adopted rules pertaining to designated areas of critical state concern shall be a major objective of the local comprehensive planning process. To that end, in the preparation of a comprehensive plan or element thereof, and in the comprehensive plan or element as adopted, the governing body shall include a specific policy statement indicating the relationship of the proposed development of the area to the comprehensive plans of adjacent municipalities, the county, adjacent counties, or the region, as the case may require and as such adopted plans or plans in preparation may exist.

163.3177(5)(a): Each local government comprehensive plan must include at least two planning periods, one covering at least the first 5-year period occurring after the plan's adoption and one covering at least a 10-year period. Additional planning periods for specific components, elements, land use amendments, or projects shall be permissible and accepted as part of the planning process.

163.3177(6)(a): A future land use plan element designating proposed future general distribution, location, and extent of the uses of land for residential uses, commercial uses, industry, agriculture, recreation, conservation, education public facilities, and other categories of the public and private uses of land. The approximate acreage and the general range of density or intensity of use shall be provided for the gross land area included in each existing land use category. The element shall establish the long-term end toward which land use programs and activities are ultimately directed.

163.3177(6)(a)2: The future land use plan and plan amendments shall be based upon surveys, studies, and data regarding the area, as applicable including:

a. The amount of land required to accommodate anticipated growth.

b. The projected permanent and seasonal population of the area.

c. The character of undeveloped land.

d. The availability of water supplies, public facilities, and services.

e. The need for redevelopment, including the renewal of blighted areas and the elimination of nonconforming uses which are inconsistent with the character of the community.

163.3177(6)(c): A general sanitary sewer, solid waste, drainage, potable water, and natural groundwater aquifer recharge element correlated to principles and guidelines for future land use, indicating ways to provide for future potable water, drainage, sanitary sewer, solid waste, and aquifer recharge protection requirements for the area. The element may be a detailed engineering plan including a topographic map depicting areas of prime groundwater recharge.

1. Each local government shall address in the data and analyses required by this section those facilities that provide service within the local government's jurisdiction. Local governments that provide facilities to serve areas within other local government jurisdictions shall also address those facilities in the data and analyses required by this section, using data from the comprehensive plan for those areas for the purpose of projecting facility needs as required in this subsection. For shared facilities, each local government shall indicate the proportional capacity of the systems allocated to serve its jurisdiction.

2. The element shall describe the problems and needs and the general facilities that will be required for solution of the problems and needs including correcting existing facility deficiencies. The element shall address coordinating the extension of, or increase in the capacity of,

facilities to meet future needs while maximizing the use of existing facilities and discouraging urban sprawl; conserving potable water resources; and protecting the functions of natural groundwater recharge areas and natural drainage features.

3. Within 18 months after the governing board approves an updated regional water supply plan, the element must incorporate the alternative water supply project or projects selected by the local government from those identified in the regional water supply plan pursuant to s. 373.709(2)(a) or proposed by the local government under s. 373.709(8)(b). If a local government is located within two water management districts, the local government shall adopt its comprehensive plan amendment within 18 months after the later updated regional water supply plan. The element must identify such alternative water supply projects and traditional water supply projects and conservation and reuse necessary to meet the water needs identified in s. 373.709(2)(a) within the local government's jurisdiction and include a work plan, covering at least a 10 year planning period, for building public, private, and regional water supply facilities, including development of alternative water supplies, which are identified in the element as necessary to serve existing and new development. The work plan shall be updated, at a minimum, every five years within 18 months after the governing board of a water management district approves an updated regional water supply plan. Local governments, public and private utilities, regional water supply authorities, special districts, and water management districts are encouraged to cooperatively plan for the development of multijurisdictional water supply facilities that are sufficient to meet projected demands for established planning periods, including the development of alternative water sources to supplement traditional sources of groundwater and surface water supplies.

163.3177(6)(d): A conservation element for the conservation, use, and protection of natural resources in the area, including air, water, water recharge areas, wetlands, water wells, estuarine marshes, soils, beaches, shores, flood plains, rivers, bays, lakes, harbors, forests, fisheries and wildlife, marine habitat, minerals, and other natural and environmental resources, including factors that affect energy conservation.

1. The following natural resources, where present within the local government's boundaries, shall be identified and analyzed and existing recreational or conservation uses, known pollution problems, including hazardous wastes, and the potential for conservation, recreation, use, or protection shall also be identified:

    a. Rivers, bays, lakes, wetlands including estuarine marshes, groundwater, and springs, including information on quality of the resource available.

    b. Floodplains.

2. The element must contain principles, guidelines, and standards for conservation that provide long-term goals and which:

    b. Conserves, appropriately uses, and protects the quality and quantity of current and projected water sources and waters that flow into estuarine waters or oceanic waters and protect from activities and land uses known to affect adversely the quality and quantity of identified water sources, including natural groundwater recharge areas, wellhead protection areas, and surface waters used as a source of public water supply.

    c. Provides for the emergency conservation of water sources in accordance with the plans of the regional water management district.

3. Current and projected needs and sources for at least a 10-year period based on the demands for industrial, agricultural, and potable water use and the quality and quantity of water available to meet these demands shall be analyzed. The analysis shall consider the existing levels of water conservation, use, and protection and applicable policies of the regional water management district and further must consider the appropriate regional water supply plan approved pursuant to s. 373.709, or, in the absence of an approved regional water supply plan, the district water management plan approved pursuant to s. 373.036(2). This information shall be submitted to the appropriate agencies…

163.3177(6)(h)1: An intergovernmental coordination element showing relationships and stating principles and guidelines to be used in coordinating the adopted comprehensive plan with the plans of school boards, regional water supply authorities, and other units of local government providing services but not having regulatory authority over the use of land, with the comprehensive plans of adjacent municipalities, the county, adjacent counties, or the region, with the state comprehensive plan and with the applicable regional water supply plan approved pursuant to s. 373.709, as the case may require and as such adopted plans or plans in preparation may exist…

    a. The intergovernmental coordination element must provide procedures for identifying and implementing joint planning areas, especially for the purpose of annexation, municipal incorporation, and joint infrastructure service areas.

163.3177(6)(h)3.b: Ensure coordination in establishing level of service standards for public facilities with any state, regional, or local entity having operational and maintenance responsibility for such facilities.

163.3180: **Concurrency.—**

163.3180(1)(a): Sanitary sewer, solid waste, drainage, and potable water are the only public facilities and services subject to the concurrency requirement on a statewide basis…

163.3180(1)(b): The local government comprehensive plan must demonstrate, for required or optional concurrency requirements, that the levels of service adopted can be reasonably met. Infrastructure needed to ensure that adopted level-of-service standards are achieved and maintained for the 5-year period of the capital improvement schedule must be identified pursuant to the requirements of s. 163.3177(3). The comprehensive plan must include principles, guidelines, standards, and strategies for the establishment of a concurrency management system.

163.3180(2): Consistent with public health and safety, sanitary sewer, solid waste, drainage, adequate water supplies, and potable water facilities shall be in place and available to serve new development no later than the issuance by the local government of a certificate of occupancy or its functional equivalent. Prior to approval of a building permit or its functional equivalent, the local government shall consult with the applicable water supplier to determine whether adequate water supplies to serve the new development will be available no later than the anticipated date of issuance by the local government of a certificate of occupancy or its functional equivalent…

163.3180(3): Governmental entities that are not responsible for providing, financing, operating, or regulating public facilities needed to serve development may not establish binding level-of-service standards on governmental entities that do bear those responsibilities.

163.3191: **Evaluation and appraisal of comprehensive plan.—**

163.3191(1): At least once every 7 years, each local government shall evaluate its comprehensive plan to determine if plan amendments are necessary to reflect changes in state requirements in this part since the last update of the comprehensive plan, and notify the state land planning agency as to its determination.

163.3191(2): If the local government determines amendments to its comprehensive plan are necessary to reflect changes in state requirements, the local government shall prepare and transmit within 1 year such plan amendment or amendments for review pursuant to s. 163.3184.

163.3191(3): Local governments are encouraged to comprehensively evaluate and, as necessary, update comprehensive plans to reflect changes in local conditions…

3. TABLES SHOWING WHICH UTILITIES SERVE WHICH JURISDICTIONS

This portion of this appendix contains two tables showing local government jurisdictions and the utilities that provide raw or finished water to those local governments. These utilities have treatment capacity and water use greater than 0.1 MGD.

Table B-1 identifies the local governments within the jurisdiction of the LWC Planning Area and the PWS utilities serving those local governments. The first column in **Table B-1** lists the name of the local government, and the second column identifies whether that local government owns and operates a PWS utility (yes or no). If the local government does not own and operate a PWS utility, the third column identifies the other local government or private PWS utility or utilities providing raw or finished water to the local government.

Table B-1. Utilities and entities serving local governments in the LWC Planning Area.

Local Government	Local Government Utility	Other Utility Serving Local Government
Charlotte County		
Charlotte County	Yes	Town and Country Utilities Company
Collier County		
Collier County	Yes	Ave Maria Utility Company; Florida Government Utility Authority (FGUA) – Golden Gate; Immokalee Water & Sewer District; Marco Island Utilities; City of Naples Utility Department; Orange Tree Utility Company; and Port of the Islands Community Improvement District
Everglades City, City of	Yes	--
Marco Island, City of	Yes	Collier County Water-Sewer District
Naples, City of	Yes	Collier County Water-Sewer District
Glades County		
Glades County	No	Port LaBelle Utility System of Hendry County; South Shore Water Association (distributes water purchased from Clewiston Utilities); Clewiston Utilities; and Moore Haven Utilities
Moore Haven, City of	Yes	--
Hendry County		
Clewiston, City of	Yes	--
Hendry County	Yes	Hendry Correctional Institution, Florida Department of Corrections (closed in June 2011); South Shore Water Association; and City of LaBelle Department of Public Works
LaBelle, City of	Yes	--
Lee County		
Bonita Springs, City of	No	Bonita Springs Utilities; Citrus Park RV Resort
Cape Coral, City of	Yes	Greater Pine Island Water Association
Fort Myers, City of	Yes	Lee County Utilities
Fort Myers Beach	Yes	Lee County Utilities (bulk water)
Lee County	Yes	Bonita Springs Utilities; Florida Government Utility Authority (FGUA) – Lehigh Acres; Greater Pine Island Water Association; Island Water Association; Florida Government Utility Authority (FGUA) – Lake Fairways; Fort Myers Public Utility; and Cape Coral Utilities (bulk water only)
Sanibel, City of	No	Island Water Association
Monroe County		
Monroe County	No	--

Conversely, **Table B-2** identifies the PWS utilities providing raw or finished water to the local governments within the jurisdiction of the LWC Planning Area. The first column of **Table B-2** lists the name of the PWS utility, and the second column identifies whether the utility is local government-owned and operated (yes or no). The third column identifies the incorporated and unincorporated areas of the LWC Planning Area within that PWS utility's service area.

Table B-2. Utilities and local governments that serve the LWC Planning Area.

Utility Name	Local Government Utility	Local Governments Served
Charlotte County		
Charlotte County Utilities	Yes	Charlotte County and Lee County (serving unincorporated Burnt Store Marina)
Town and Country Utilities Company	No	Charlotte County
Collier County		
Ave Maria Utility Company	No	Collier County (serving unincorporated Ave Maria)
Collier County Water-Sewer District	Yes	Collier County (serving unincorporated Goodland, Golden Gate Estates, and Orange Tree); portion of City of Naples; and bulk water to City of Marco Island
Everglades City, City of	Yes	City of Everglades City and Collier County (serving unincorporated Plantation Island and Seaboard Village in Copeland)
Florida Government Utility Authority (FGUA) – Golden Gate	No	Collier County (serving unincorporated Golden Gate)
Immokalee Water & Sewer District	No	Collier County (serving unincorporated Immokalee)
Marco Island Utilities	Yes	City of Marco Island and bulk water to Collier County (serving unincorporated Goodland)
Naples, City of – Utility Department	Yes	City of Naples and Collier County (serving unincorporated East Naples)
Orange Tree Utility Company	No	Collier County (serving unincorporated Orange Tree)
Port of the Islands Community Improvement District	No	Collier County (serving unincorporated Port of the Islands)
Glades County		
Moore Haven Utilities	Yes	City of Moore Haven and Glades County
Hendry County		
Clewiston Utilities	Yes	City of Clewiston; Hendry County; and Glades County)
Hendry Correctional Institution, Florida Dept. of Corrections (closed in June 2011)	No	Hendry County (serving Hendry Correctional Institution)
LaBelle, City of – Department of Public Works	Yes	City of LaBelle and Hendry County
Port LaBelle Utility System of Hendry County	Yes	Hendry and Glades counties
Lee County		
Bonita Springs Utilities	No	City of Bonita Springs and Lee County (serving unincorporated Estero)
Cape Coral Utilities	Yes	City of Cape Coral
Citrus Park RV Resort	No	City of Bonita Springs
Florida Government Utility Authority (FGUA) – Lake Fairways	No	Lee County (serving unincorporated North Fort Myers)
Florida Government Utility Authority (FGUA) – Lehigh Acres	No	Lee County (serving unincorporated Lehigh Acres)
Fort Myers, City of – Public Utility	Yes	City of Fort Myers and Lee County (sells water to FGUA – Lehigh Acres)
Greater Pine Island Water Association	No	Lee County (serving unincorporated Pine Island and Matlacha) and a portion of the City of Cape Coral
Island Water Association	No	City of Sanibel and Lee County (serving unincorporated Captiva)
Lee County Utilities	Yes	Lee County; Fort Myers; and bulk water to Fort Myers Beach

4. MAPS OF UTILITY AREAS CURRENTLY SERVED (2010) AND FUTURE UTILITY AREA SERVICE (2030)

Figure B-1 is a map of the 2010 utility service areas in Collier County. **Figure B-2** is a map of the projected 2030 utility service area maps in Collier County. **Figure B-3** and **Figure B-4** provide this same information for Hendry and Glades counties, and **Figure B-5** and **Figure B-6** provide this information for Lee and Charlotte counties. The portion of Monroe County within the LWC Planning Area is not served by any PWS utility.

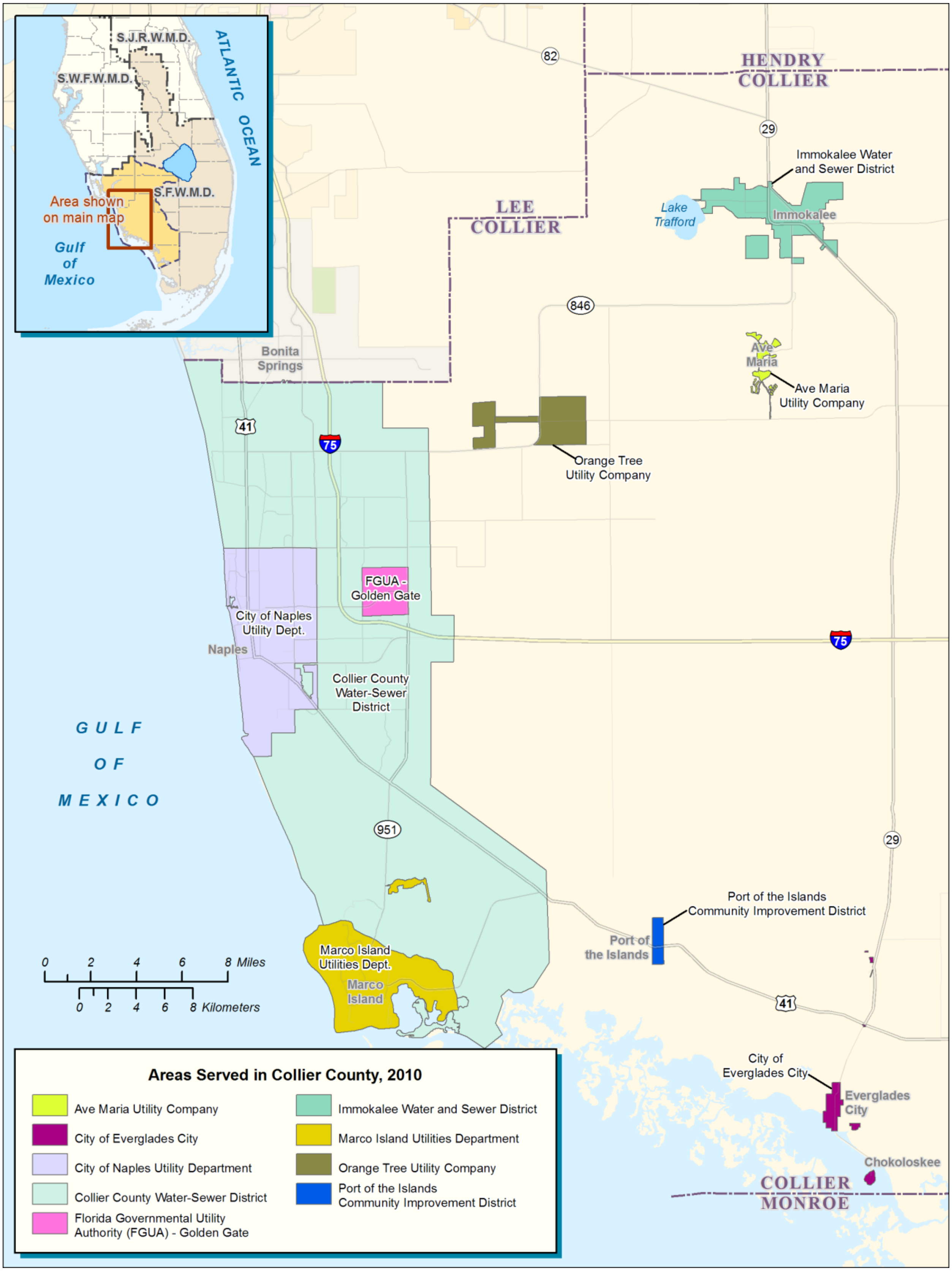


Figure B-1. 2010 utility service areas in Collier County.

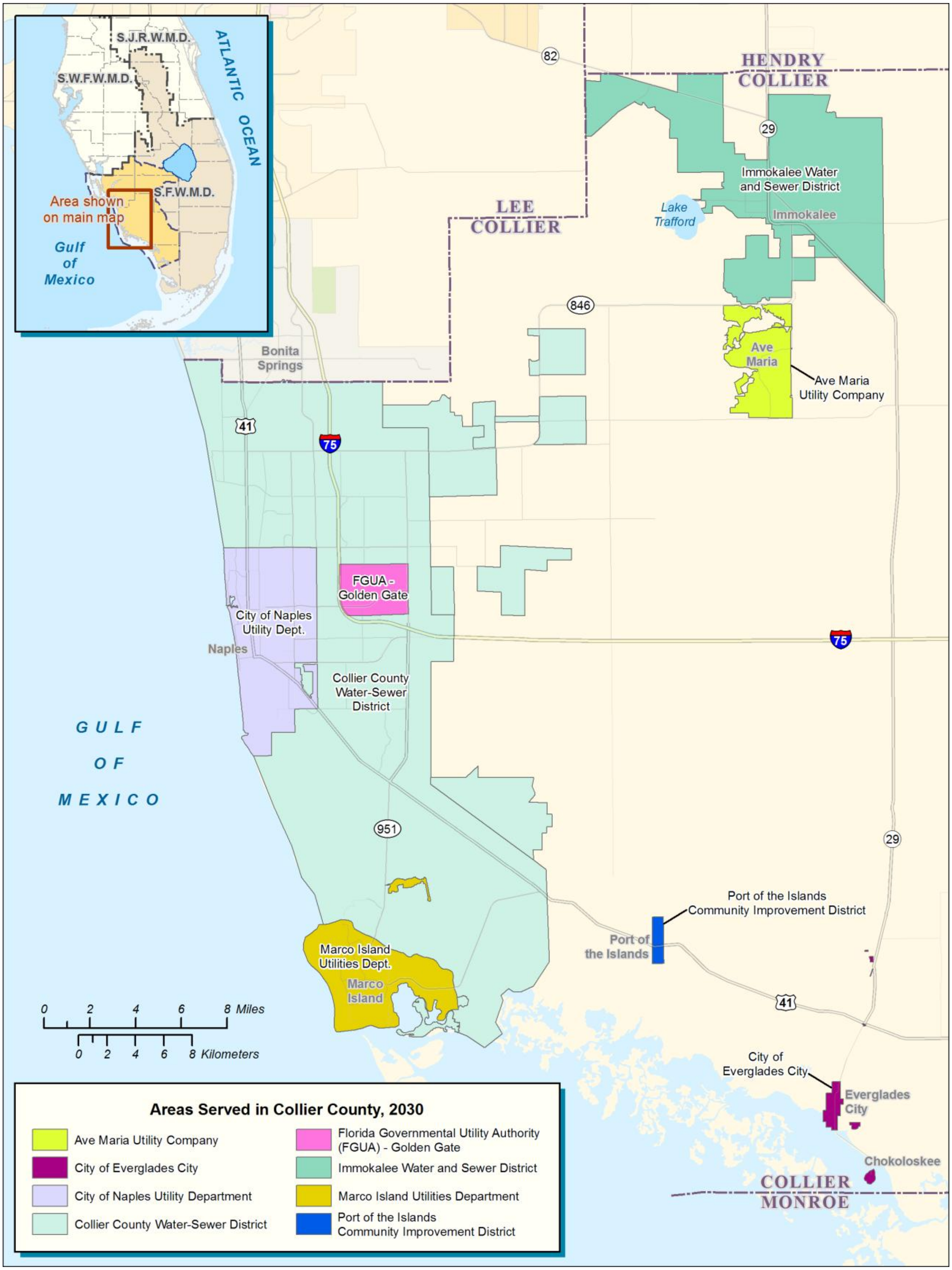


Figure B-2. Projected 2030 utility service areas in Collier County.

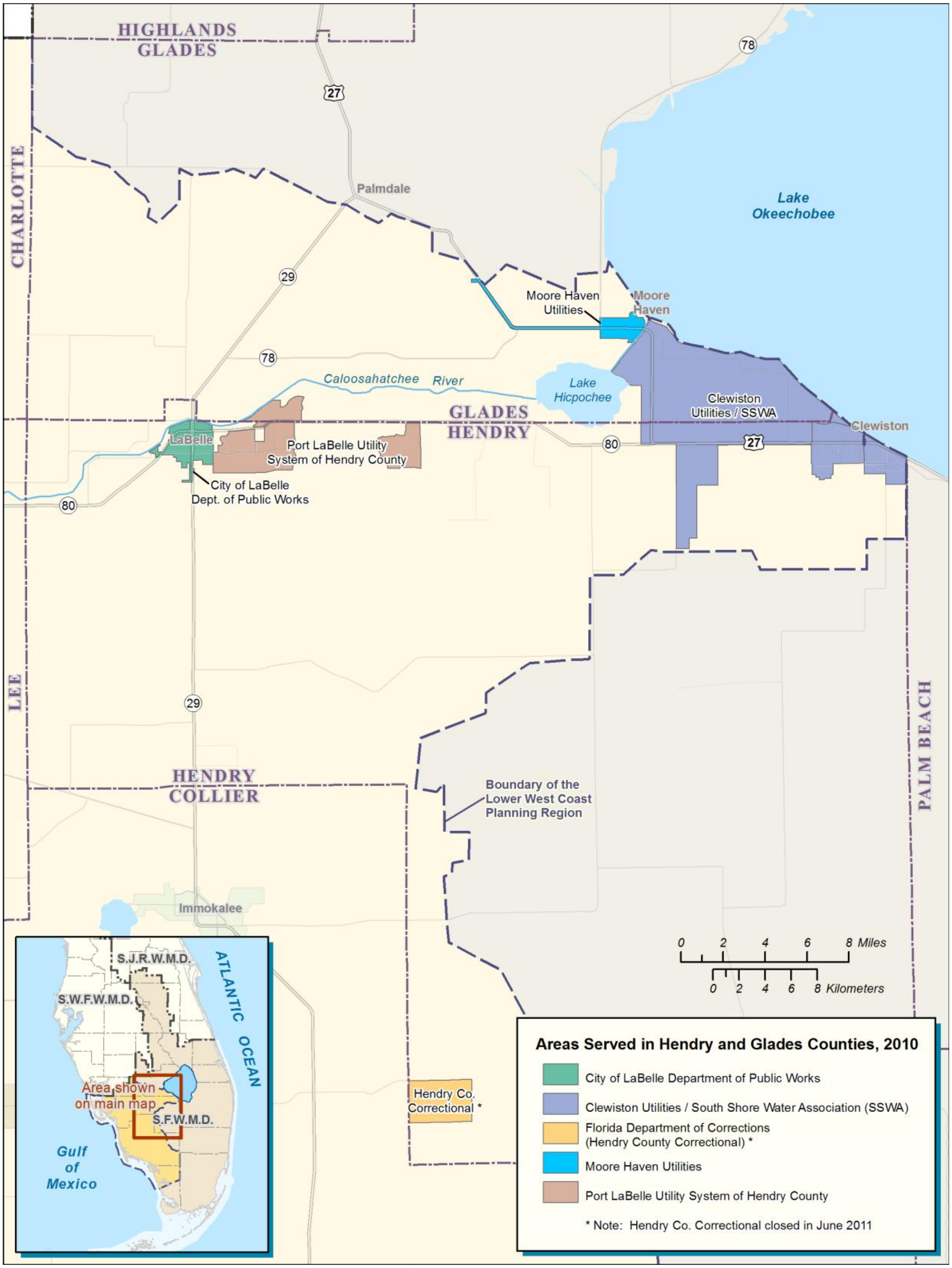


Figure B-3. 2010 utility service areas in Hendry and Glades counties.

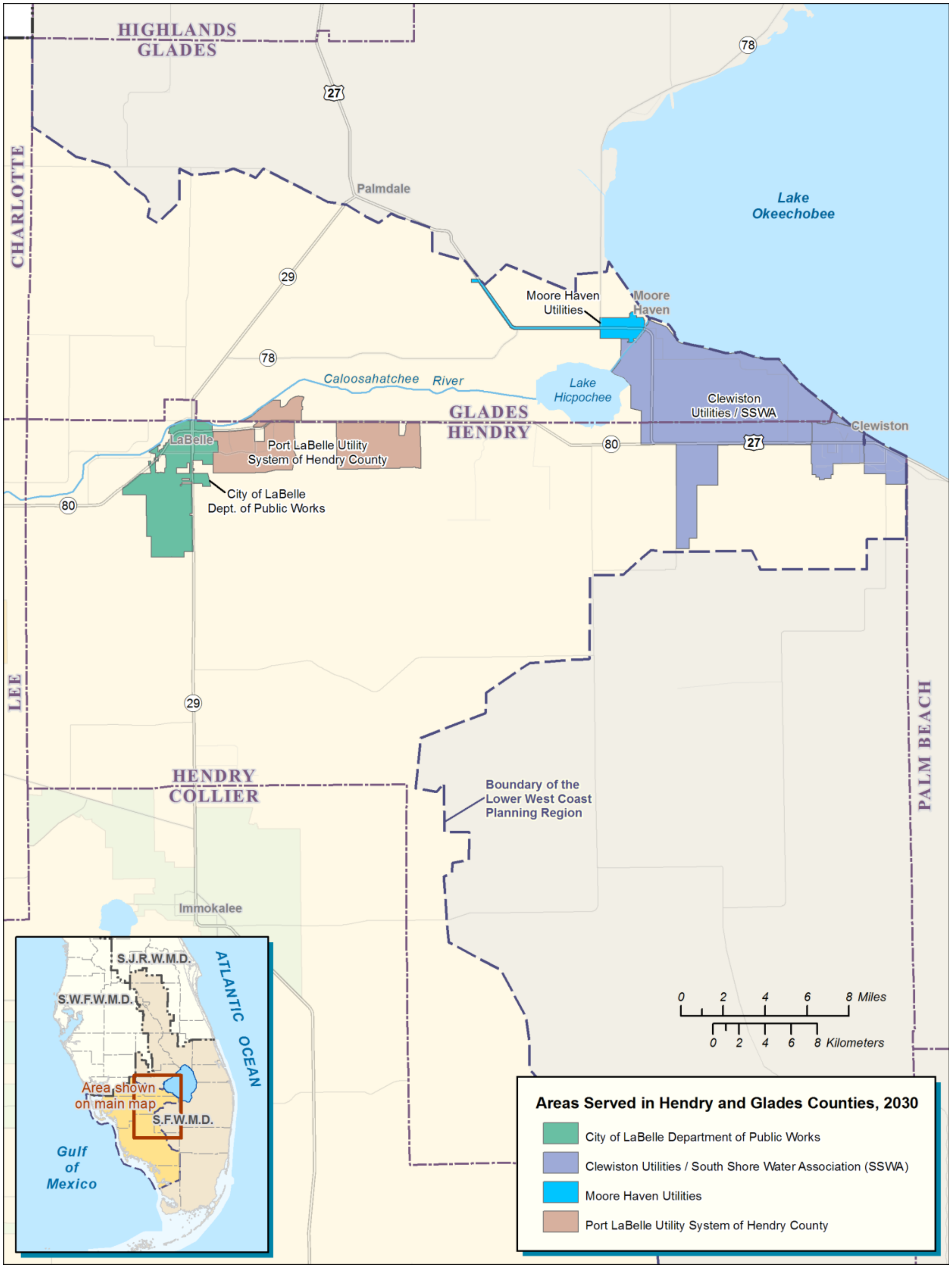


Figure B-4. Projected 2030 utility service areas in Hendry and Glades counties.

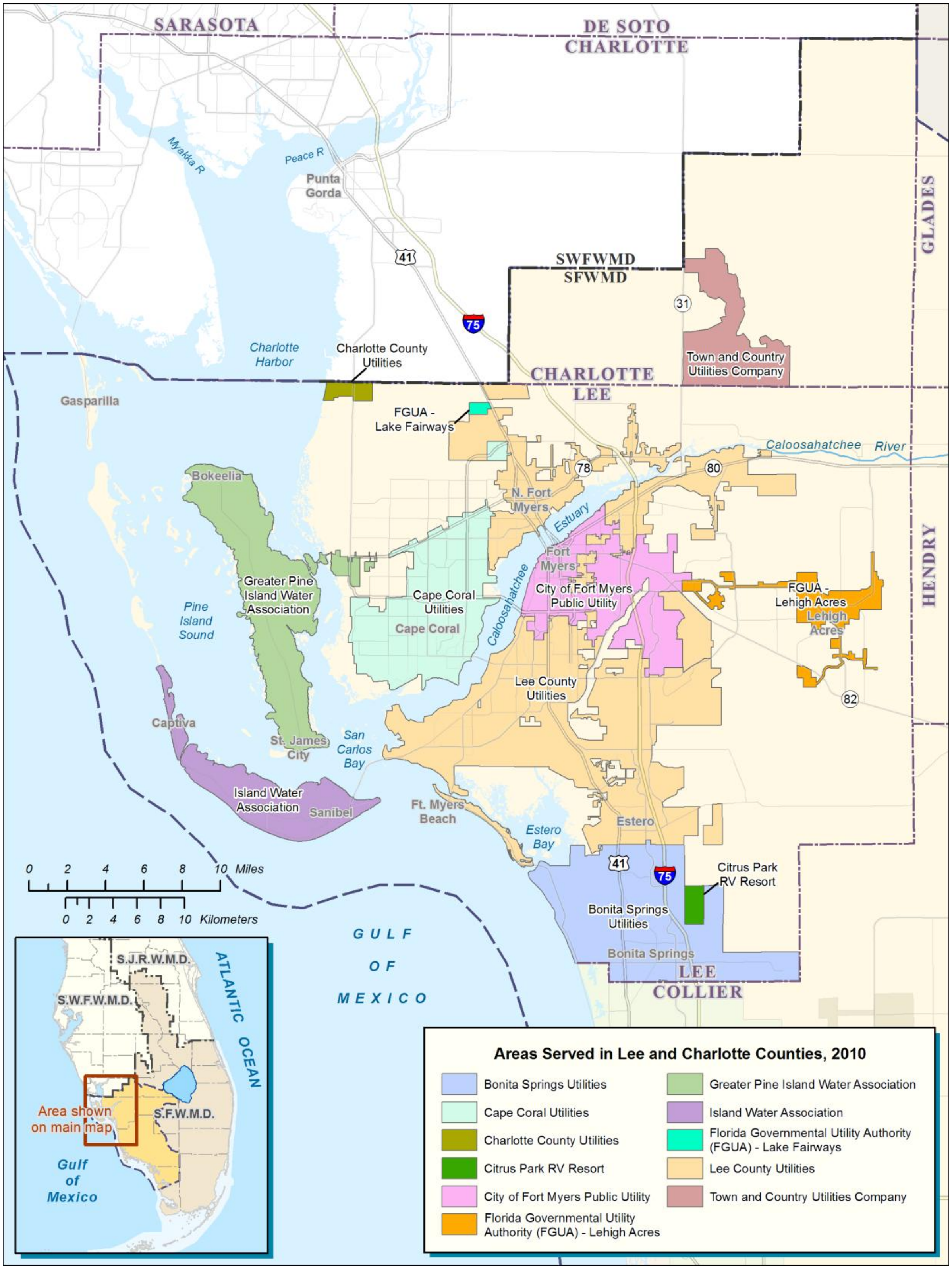


Figure B-5. 2010 utility service areas in Lee and Charlotte counties.

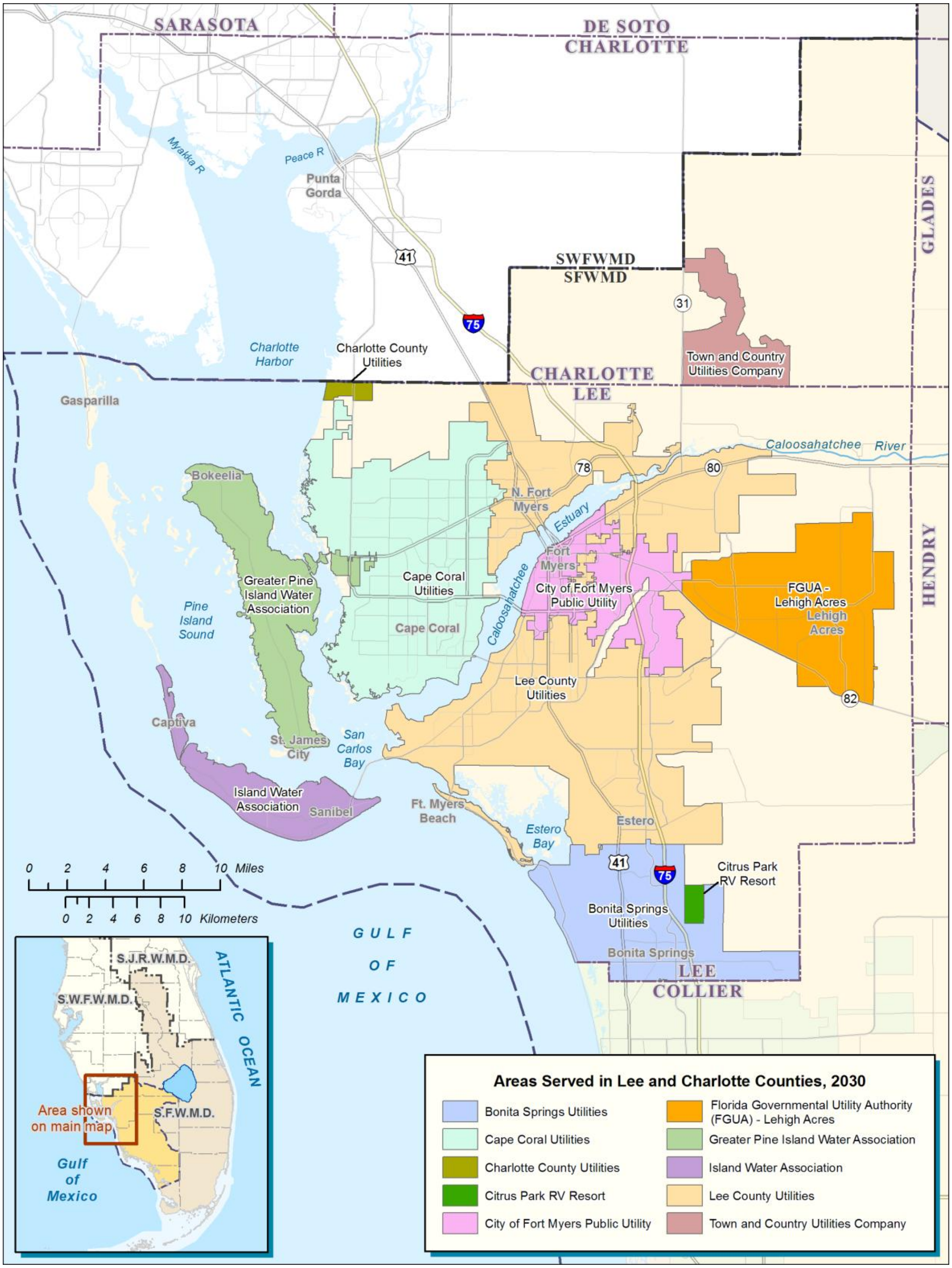


Figure B-6. Projected 2030 utility service areas in Lee and Charlotte counties.

C
Water Supply Development Projects

Planned water supply development projects from Fiscal Year (FY) 2012–FY 2030 are provided in **Table C-1**.

Table C-1. FY 2012–FY 2030 planned water supply development projects.

County	Utility/Entity	Water Source Type	Facility	Project	Total Capital Costs ($M)	Capacity (MGD)		
						2012	2013–2020	2021–2030
Charlotte	Town and Country	Fresh		0.75-million gallons of water per day (MGD) Expansion of Water Treatment Facility from 0.5 MGD to 1.25 MGD (2018)	$7.0	0.00	0.75	0.75
	Town and Country	Fresh		1.25-MGD Expansion of Water Treatment Facility from 1.25 MGD to 2.5 MGD (2021)	$8.0	0.00	0.00	1.25
	Town and Country	Fresh		1.5-MGD Expansion of Water Treatment Facility from 2.5 MGD to 4.0 MGD (2026)	$11.0	0.00	0.00	1.50
	Town and Country	Reclaimed		0.8-MGD Expansion of Wastewater Treatment Facility from 0.2 MGD (2015) to 1.0 MGD (2018)	$6.0	0.00	0.80	0.80
	Town and Country	Reclaimed		1.0-MGD Expansion of Wastewater Treatment Facility from 1.0 MGD to 2.0 MGD (2021)	$8.0	0.00	0.00	1.00
	Town and Country	Reclaimed		1.5-MGD Expansion of Wastewater Treatment Facility from 2.0 MGD to 3.5 MGD (2026)	$12.0	0.00	0.00	1.50
Collier	Ave Maria Utility Company	Fresh/Brackish		1.7-MGD Fresh and 1.7-MGD Brackish Water Treatment Facility Expansion	$20.5	0.00	1.70	3.40
	Ave Maria Utility Company	Reclaimed		4.3-MGD Phase Expansion of Wastewater Treatment Facility	$17.0	0.00	3.00	4.30
	Collier County Water-Sewer District	Brackish	Northeast County	Construct 10.0-MGD Northeast County Reverse Osmosis Water Treatment Facility (including Floridan wells) (2024)	$120.0	0.00	0.00	10.00
	Collier County Water-Sewer District	Brackish	North County	2.0-MGD Expansion of North County Regional High Pressure Reverse Osmosis Train (2017)	$9.0	0.00	0.00	2.00
	Collier County Water-Sewer District	Aquifer Storage & Recovery		2.5 MGD of reclaimed water aquifer storage and recovery will be created from this project	$5.0	0.00	2.50	2.50
	Florida Governmental Utility Authority- Golden Gate	Fresh		0.3-MGD Expansion of Fresh Water Treatment Facility (with Reverse Osmosis Treatment) and SAS Wells, Phase 4	$1.9	0.00	0.30	0.30
	Immokalee Water and Sewer District	Brackish		2.5-MGD Reverse Osmosis Water Treatment Facility and Floridan Wells (2020)	$10.0	0.00	2.50	2.50
	Immokalee Water and Sewer District	Reclaimed		3.0-MGD Wastewater Treatment Facility (2013)	$2.0	0.00	3.00	3.00
	Marco Island Utilities Department	Fresh	North	3.3-MGD North Water Treatment Facility Expansion with 2 Pall Membrane Trains Followed by Replacement of Lime Softening System with Low Pressure Reverse Osmosis	$10.0	0.00	3.33	3.33
	Marco Island Utilities Department	Reclaimed	Marco Island	Marco Island Wastewater Treatment Facility (existing capacity 4.92 MGD), Two Pipeline Extensions (Club Marco and West Elkcam) [a]	$6.2	0.00	0.00	0.00
	Marco Island Utilities Department	Reclaimed	Marco Shores	0.3-MGD Expansion of Marco Shores Wastewater Treatment Facility	$1.6	0.00	0.30	0.30
	Naples Utility Department, City of	Aquifer Storage & Recovery		Construct 4.0-MGD Aquifer Storage & Recovery Wells to Supplement Reclaimed Water during Dry Season with Surface and/or Reclaimed Water	$6.0	0.00	4.00	4.00
	Naples Utility Department, City of	Surface Water		Construct 10-MGD Pump Station and Transmission Main from Golden Gate Canal to Wastewater Treatment Facility	$5.5	0.00	10.00	10.00

a. Not included as new treatment capacity.

Table C-1. Continued

County	Utility/Entity	Water Source Type	Facility	Project	Total Capital Costs ($M)	Capacity (MGD)		
						2012	2013–2020	2021–2030
Hendry	Clewsiton Utilities	Reclaimed		0.75-MGD Wastewater Treatment Facility for Public Access Irrigation (Golf Course) (2014)	$1.5	0.00	0.75	0.75
	LaBelle Department of Public Works, City of	Brackish		Construct 1.5-MGD Reverse Osmosis Water Treatment Facility and Floridan Wells (Lower Hawthorn) (2011-2013)	$18.0	0.00	1.50	1.50
	LaBelle Department of Public Works, City of	Reclaimed		0.3-MGD Wastewater Treatment Facility Expansion	$4.0	0.00	0.30	0.30
Lee	Bonita Springs Utilities	Brackish		3.0-MGD Water Treatment Facility Reverse Osmosis Expansion, Phase 2 (2020)	$30.0	0.00	3.00	3.00
	Cape Coral Utilities	Brackish	North	24.0-MGD Expansion of North Reverse Osmosis Water Treatment Facility, Expansion from 12 MGD to 36 MGD, Phase 1	$134.0	0.00	24.00	24.00
	Cape Coral Utilities	Surface Water		1.8-MGD Canal Weir Improvements	$3.5	0.00	1.80	1.80
	Florida Governmental Utility Authority-Lehigh Acres	Brackish	Mirror Lakes	10.0-MGD Expansion of Mirror Lakes Reverse Osmosis Water Treatment Facility including Floridan Wells and Distribution Lines (contingent upon growth)	$91.0	0.00	10.00	10.00
	Fort Myers Public Utility	Reclaimed	South	12.0-MGD Expansion of the South Advanced Wastewater Treatment Reclamation Facility (2013)	$13.2	0.00	12.00	12.00
	Fort Myers Public Utility	Reclaimed	Central	11.0-MGD Wastewater Treatment Facility Upgrades at the Central Advanced Wastewater Treatment Facility (2011-2014)	$10.0	0.00	11.00	11.00
	Lee County Utilities	Brackish	Green Meadows	Green Meadows Water Treatment Facility Reverse Osmosis Expansion (includes Floridan aquifer wells). This Water Treatment Facility Currently has 9 MGD of Fresh Capacity (2011-2013)	$53.4	0.00	5.00	5.00
	Lee County Utilities	Brackish	North County	North Lee County Water Treatment Facility 5.0 MGD Reverse Osmosis Expansion from 10.0 MGD to 15.0 MGD (2025)	$21.0	0.00	0.00	5.00
	Lee County Utilities	Brackish	Olga	Olga Water Treatment Facility Reverse Osmosis Expansion from 5 MGD to 10 MGD (2025)	$40.0	0.00	0.00	5.00
	Lee County Utilities	Fresh	Green Meadows	Green Meadows Aquifer Storage & Recovery Wells for Potable Water with FAS Storage (2018) [a]	$21.0	0.00	3.40	3.40
	Lee County Utilities	Aquifer Storage & Recovery	West	Construct the 2.0-MGD West Aquifer Storage & Recovery Wells for Reclaimed Water Storage (2018)	$5.4	0.00	2.00	2.00
	Lee County Utilities	Aquifer Storage & Recovery	Gateway	Construct the 1.0-MGD Gateway Wastewater Treatment Facility Aquifer Storage & Recovery Well System for Reclaimed Water Storage (2018)	$2.5	0.00	1.00	1.00
	Lee County Utilities	Fresh	Three Oaks	2.6-MGD Three Oaks Irrigation Quality Water Supplemental Reclaimed Supply (2013)	$0.7	0.00	2.60	2.60

a. Not included as new treatment capacity.

D

Potable and Wastewater Treatment Facilities

POTABLE WATER TREATMENT FACILITIES

Potable water used in the Lower West Coast (LWC) Planning Area is produced by large water treatment facilities, some smaller "package" water treatment facilities, and self-supply (i.e., private wells supplying individual users). This appendix focuses on large facilities with average pumpages equal to or greater than 100,000 gallons per day or 0.1 million gallons of water per day (MGD).

Descriptions of Existing Water Facilities

Raw water withdrawal sources in the LWC Planning Area include water from the surficial aquifer system (SAS), intermediate aquifer system (IAS), and Floridan aquifer system (FAS). **Table D-1** presents summary descriptions for each of the potable water treatment facilities located in the LWC Planning Area. The table contains the name of the supply entity or facility; the South Florida Water Management District (SFWMD) or Southwest Florida Water Management District (SWFWMD) consumptive use permit number and permitted annual water allocation in MGD; raw water withdrawal sources including surface water, SAS, IAS, FAS, and aquifer storage and recovery (ASR); and Florida Department of Environmental Protection (FDEP) permit number and rated (design) capacity. **Figure D-1** through **Figure D-3** show the locations of potable water treatment facilities in Collier, Hendry, Glades, Lee, and Charlotte counties. Additional information about each public water supply utility is available from the SFWMD's Water Use Regulatory Database, which is available on http://www.sfwmd.gov.

Table D-1. Potable water treatment facilities in the LWC Planning Area.

Supply Entity-Facility	Water Use: SFWMD or SWFWMD Permit Number	Water Use: Annual Allocation (MGD)	Withdrawal Sources (MGD): Surface Water	Withdrawal Sources (MGD): SAS	Withdrawal Sources (MGD): IAS	Withdrawal Sources (MGD): FAS	Withdrawal Sources (MGD): ASR	Water Treatment: FDEP Permit Number	Water Treatment: Rated Capacity (MGD)
Charlotte County									
Charlotte County Utilities – Burnt Store Marina	3522.011[a]	3.17		3.17				6080318	1.13
Town and Country Utilities Company	08-00122-W	0.43			0.43			5084116	0.50
Charlotte County Total		**1.17**	**0.00**	**1.17**	**0.43**	**0.00**	**0.00**		**1.63**
Collier County									
Ave Maria Utility Company	11-02298-W	1.02		1.02				5114154	0.99
Collier County Water-Sewer District – North County Regional, South County Regional	11-00249-W	56.14		26.50	16.00	10.00	NA[e]	5114069	52.00
Everglades City, City of	11-00160-W[b]	0.29		0.29				5110089	0.50
Florida Government Utility Authority (FGUA) – Golden Gate	11-00148-W	3.42		3.42				5110117	2.10
Immokalee Water & Sewer District – Airport Road, Jerry Warden, Carson Road	11-00013-W	4.15		3.45		0.70		5110142	5.60
Marco Island Utilities – Marco Island Lime, Marco Island Reverse Osmosis	11-00080-W	12.43	4.38		4.00		4.38	5110183	12.70
Naples, City of – Utility Department	11-00017-W	18.42		18.42				5110198	30.00
Orange Tree Utility Company	11-00419-W[b]	1.30		1.30				5114085	0.75
Port of the Islands Community Improvement District	11-00372-W	0.55		0.55				5110230	0.44
Collier County Total		**97.72**	**4.38**	**54.94**	**20.00**	**10.70**	**4.38**		**105.08**
Glades County									
Moore Haven Utilities	22-00045-W	0.89		0.89				5220192	0.96
Glades County Total		**0.89**		**0.89**	**0.00**	**0.00**	**0.00**		**0.96**
Hendry County									
Clewiston Utilities	26-00769-W	2.58				2.58		5260053	3.00
Hendry Correctional Institution, Florida Department of Corrections	26-00164-W[d]	0.07		0.07				5260319	0.60
LaBelle, City of – Department of Public Works	26-00105-W	1.06		0.93		0.12		5260050	1.00
Port LaBelle Utility System of Hendry County	26-00096-W	0.56			0.56			5260226	0.90
Hendry County Total		**4.27**	**0.00**	**1.00**	**0.56**	**2.70**	**0.00**		**5.50**

a. Southwest Florida Water Management District consumptive use permit.

b. Consumptive use permit application under review.

c. Florida Governmental Utility Authority (FGUA) – North Fort Myers is planning to purchase Lake Fairways/Pine Lake Mobile Home Parks – Lake Fairways in 2013.

d. Hendry Correctional Institution facility closed June 2011. Work camp is scheduled to close in July 2012.

e. NA indicates no associated allocation; ASR wells for treated water storage.

Note: SW=surface water, SAS=surficial aquifer system; IAS=intermediate aquifer system, FAS=Floridan aquifer system, ASR=aquifer storage and recovery.

Table D-1. Continued.

Supply Entity-Facility	Water Use		Withdrawal Sources (MGD)					Water Treatment	
	SFWMD or SWFWMD Permit Number	Annual Allocation (MGD)	SW	SAS	IAS	FAS	ASR	FDEP Permit Number	Rated Capacity (MGD)
Lee County									
Bonita Springs Utilities – Lime Softening	36-00008-W	5.74		5.74				5360025	9.00
Bonita Springs Utilities – Reverse Osmosis	36-04062-W	13.07				13.07		5360025	6.60
Cape Coral Utilities – Reverse Osmosis Facilities 1 & 2	36-00046-W	39.25				39.75		5360325	30.00
Citrus Park RV Resort	36-00208-W	0.21		0.21				5360048	0.54
Florida Government Utility Authority (FGUA) – Lake Fairways[c]	36-00081-W	0.10			0.10			5364040	0.20
Florida Government Utility Authority (FGUA) – Lehigh Acres	36-00166-W	3.30			3.30			5360172	4.70
Fort Myers, City of – Public Utility	36-00035-W	11.95				11.95		5360102	13.00
Greater Pine Island Water Association	36-00045-W	2.44				2.44		5360322	3.30
Island Water Association	36-00034-W	4.96				4.96		5360146	6.00
Lee County Utilities – North Fort Myers, Waterway Estates, Estero	36-00152-W	10.79		0.25	0.56	9.98		5364048	13.10
Lee County Utilities – Olga, Corkscrew, Green Meadows	36-00003-W	34.27	4.43	7.84	10.61	14.21	NA[e]	5364048	29.00
Lee County Utilities – Pinewoods	36-00122-W	6.10		2.29	0.74	3.06		5364048	5.30
Lee County Total		**132.18**	**4.43**	**16.33**	**15.31**	**99.42**	**0.00**		**120.74**
LWC Planning Area Total		**236.23**	**8.81**	**74.33**	**36.30**	**112.82**	**0.00**		**233.91**

a. Southwest Florida Water Management District consumptive use permit.

b. Consumptive use permit application under review.

c. Florida Governmental Utility Authority (FGUA) – North Fort Myers is planning to purchase Lake Fairways/Pine Lake Mobile Home Parks – Lake Fairways in 2013.

d. Hendry Correctional Institution facility closed June 2011. Work camp to close July 2012.

e. NA indicates no associated allocation; ASR wells for treated water storage.

Note: SW=surface water, SAS=surficial aquifer system; IAS=intermediate aquifer system, FAS=Floridan aquifer system, ASR=aquifer storage and recovery.

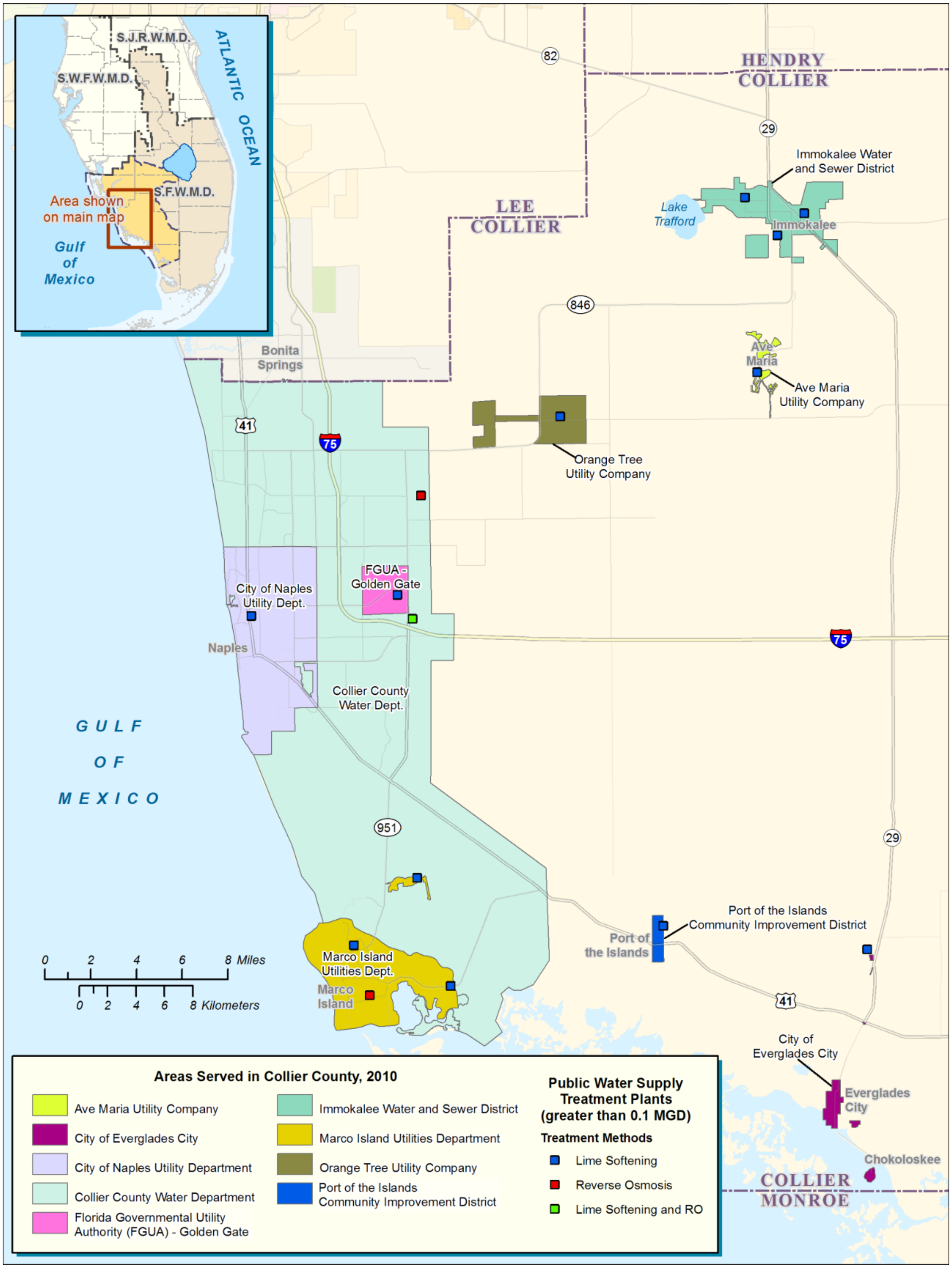


Figure D-1. Potable water treatment facilities in Collier County.

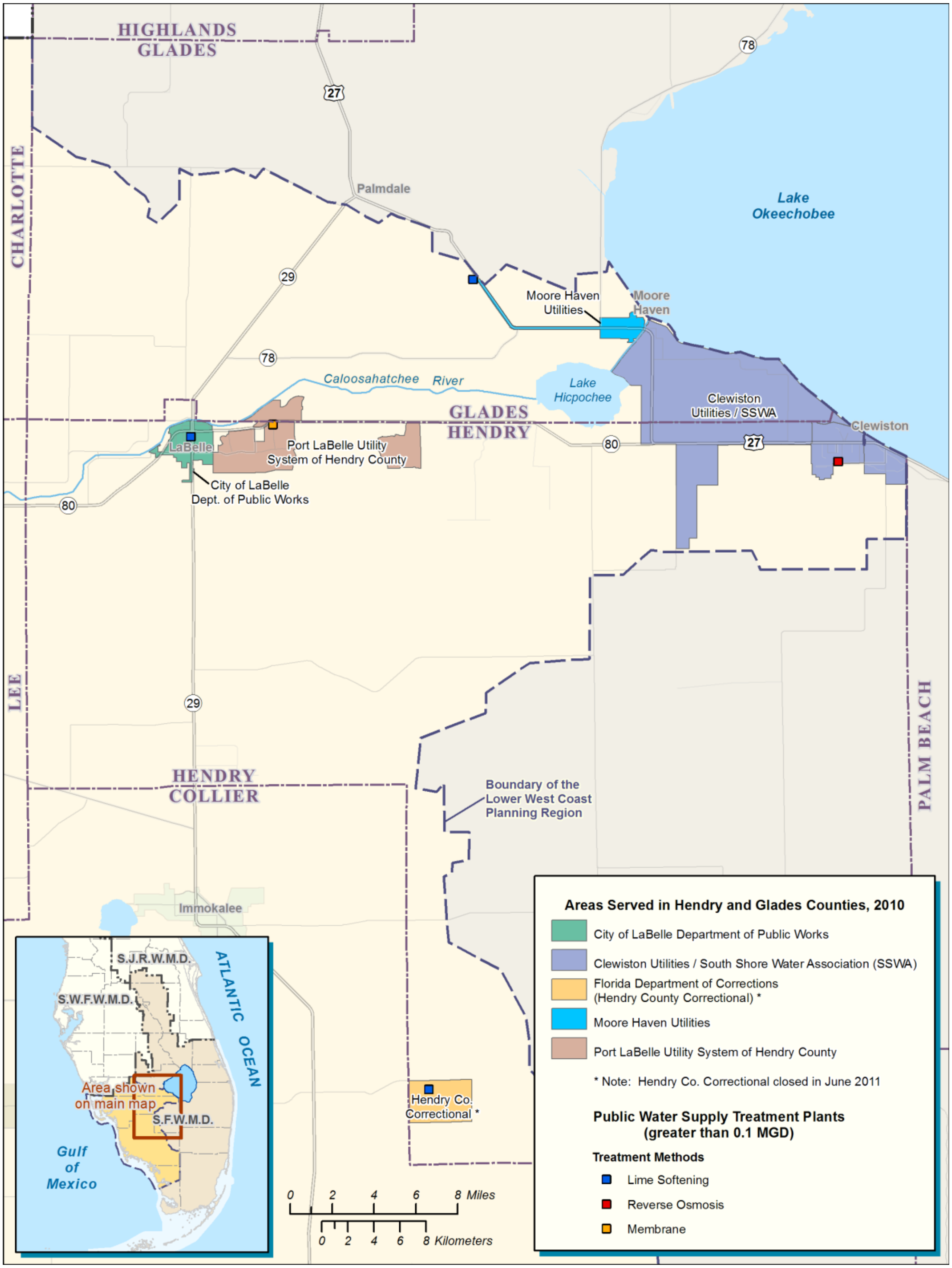


Figure D-2. Potable water treatment facilities in Hendry and Glades counties.

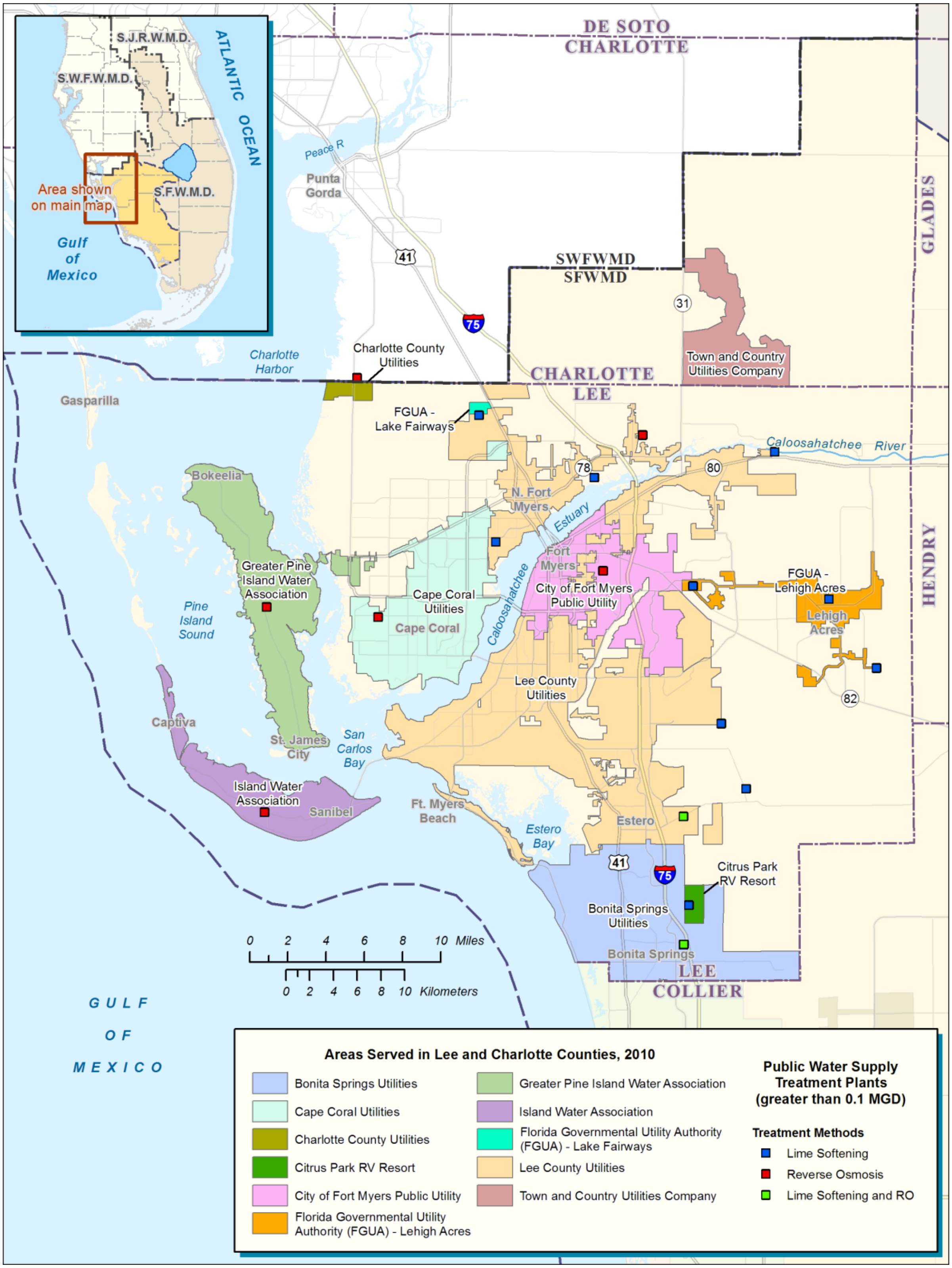


Figure D-3. Potable water treatment facilities in Lee and Charlotte counties.

AQUIFER STORAGE AND RECOVERY

Figure D-4 reflects the locations of the utility ASR systems in the LWC Planning Area. See **Chapter 4** of the Planning Document for further information on ASR systems.

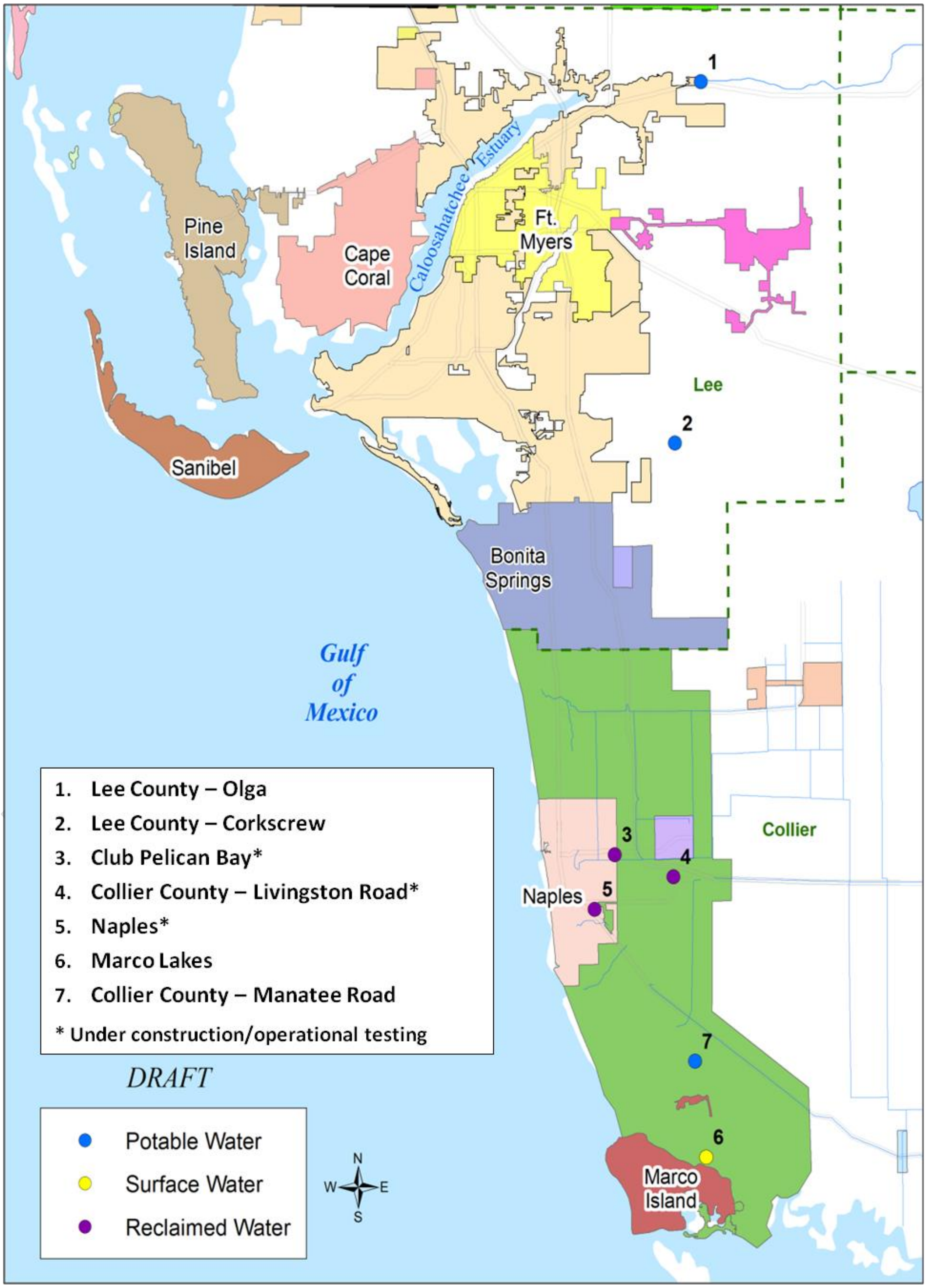


Figure D-4. LWC utility ASR systems.

WASTEWATER TREATMENT FACILITIES

Wastewater treatment is accomplished through regional wastewater treatment facilities (WWTFs), smaller "package plants," and septic tanks. The focus of this appendix is on the larger system facilities within the region because they allow economy of operation, and have flows sufficient to positively impact water resources through reuse and support for a regional reuse program. Many facilities are located in areas close to potential reclaimed water users. In addition, some of the facilities use distribution pipelines to serve their reclaimed water customers.

Table D-2 in the *Wastewater and Water Reuse Data* section of this appendix lists the LWC Planning Area's 41 WWTFs with a capacity of 0.1 MGD or greater (as of 2010). According to the FDEP, 38 of these reuse at least part of their wastewater (FDEP 2011). **Table D-2** provides each facility's rated treatment capacity, map identification number (referred to as Map ID in the table), 2010 average daily wastewater and reuse flows, and a reuse percentage. The Map ID in **Table D-2** corresponds to the numbers in the WWTF location maps provided in **Figure D-4** through **Figure D-6**. Reclaimed water distribution pipelines are also shown on these maps. Data in **Table D-3** toward the end of this appendix summarize the past, present, and future wastewater and reuse flows for the facilities profiled in this appendix. **Table D-4** shows the flows for the different reuse types for each of the profiled facilities. **Table D-5** presents flows for the various disposal options.

Although the regionwide capacity of the WWTFs in the LWC Planning Area totals 147.67 MGD, only an annual average of 77.38 MGD of wastewater was treated in 2010. Excess treatment capacity is needed to ensure a margin of safety in meeting daily peak flows. Overall utility use of wastewater flows rose slightly in 2010 compared to 2009. Regionally, 70.40 MGD (91.0 percent) of treated wastewater was reused, mainly. The majority (60.48 MGD) of treated wastewater supply was used for public access irrigation, which includes irrigation of golf courses, parks, schools, and residences. Groundwater recharge through percolation ponds used 4.3 MGD, and other miscellaneous uses, such as agriculture and industry, used 5.13 MGD. Treated effluent not reused was disposed of through deep well injection (8.8 MGD) or surface discharge (16.5 MGD).

By 2030, wastewater utilities project flows will increase by 98 percent over the 2010 flows in the LWC Planning Area. Similarly, utilities estimate water reuse will increase 104 percent to 138 MGD by 2030. The increase in projected water reuse may be attributed to greater use of supplemental sources of water (e.g., ASR) and the addition of large capacity users.

Because supplemental reuse sources, such as groundwater or surface water, are used in some cases, reuse flow may exceed processed wastewater flow at the treatment facility. If so, the "reuse percentage" would exceed 100 percent. In these cases, the reuse percentage is reported as 100 percent to avoid confusion. This is consistent with the manner in which the reuse percentage is reported in the FDEP's annual reuse inventory.

Profiles of Water Reuse Facilities

The following sections provide profiles by county for the larger WWTFs within the LWC Planning Area. These WWTFs each have a capacity of 0.1 MGD or greater. The facilities profiled are as follows:

Collier County

- Ave Maria
- Collier County
- Florida Golden Gate Utility Authority (FGUA) – Golden Gate
- Immokalee
- Marco Island
- Naples, City of

Hendry County

- Clewiston
- LaBelle, City of

Lee County

- Bonita Springs Utilities
- Cape Coral Utilities
- Florida Golden Gate Utility Authority (FGUA) – Lehigh Acres
- Florida Golden Gate Utility Authority (FGUA) – North Fort Myers
- Fort Myers, City of
- Lee County
- Sanibel, City of

The information for each profile was obtained from at least one of the following sources:

- *2010 Reuse Inventory* (FDEP 2011)
- Communication with the utility
- Planning documents (e.g., 10-year water supply facilities work plans)

The profiles are organized alphabetically by county then by utility. Each profile contains the following:

- **Treatment/Flows** – This section presents the FDEP-rated capacity and average daily flows of wastewater and reclaimed water. Current capacity and flow information was gathered from the *2010 Reuse Inventory* (FDEP 2011).
- **Reuse/Disposal** – This section presents information about the types and flows of water reuse and disposal. A list of primary end users, if available, is included.
- **Proposed/Future** – This section provides a summary of any proposed/future plans for the utility, which may include increased capacities, flows, or reclaimed water customers.

Collier County Wastewater Treatment Facilities

Ave Maria Wastewater Treatment Facility

Treatment/Flows

The Ave Maria Wastewater Treatment Facility has a FDEP-rated capacity of 0.90 MGD. The facility processed a daily average 0.14 MGD of wastewater in 2010.

Reuse/Disposal

Reclaimed water is pumped from the treatment facility to three water storage ponds. The storage ponds serve as the supply source for irrigation water for the Town of Ave Maria and Ave Maria University. In 2010, Ave Maria distributed a daily average of 0.97 MGD of irrigation water for parks and schools and 0.41 MGD for approximately 270 residences. Although the WWTF only produced 0.14 MGD of reclaimed water in 2010, it supplemented the irrigation water supply with 1.24 MGD of groundwater.

Primary End Users
Ave Maria North Park
Ave Maria South Park
Ave Maria Aquatic Facility
Ave Maria Lake Park
Ave Maria University
Rhodora J. Donahue of Ave Maria

Proposed/Future

Wastewater flow to the Ave Maria WWTF is projected to increase to 4.2 MGD by 2030. Expansion of the facility's capacity is planned in several phases. By 2020, the facility is expected to have an increased capacity of 4.67 MGD. The utility also plans to add three reclaimed water storage ponds within Ave Maria, and a wetlands storage system for seasonal water storage.

Information Sources

This information was provided by the Ave Maria Utility Company and taken from the *Collier County 10-Year Water Supply Facilities Work Plan* (Collier County 2007) and the *2010 Reuse Inventory* (FDEP 2011).

Collier County – North County Water Reclamation Facility

Treatment/Flows

The Collier County – North County Water Reclamation Facility has a FDEP-rated capacity of 24.10 MGD. The 2010 average daily wastewater flow treated by the facility was 7.26 MGD. On average, groundwater provides 0.59 MGD of supplemental flow to the reuse system. A few small independently operated interconnects, such as the North and South systems, are within the South County system, but these connections are hydraulically limited.

Reuse/Disposal

The amount of water reclaimed by the facility was 7.07 MGD, including supplemental flow. Treated effluent at the North County facility is reused primarily by golf courses, parks, and residences. In the *2010 Reuse Inventory* (FDEP 2011), 10 golf courses, three parks, one school, and over 2,200 residences are listed as users of reclaimed water irrigation.

The average daily flow of reclaimed water was 2.08 MGD for golf courses, 4.59 MGD for residences, and 0.40 MGD for public access lands such as parks and medians. The remaining 1.60 MGD of treated wastewater flow was disposed of through deep well injection.

Primary End Users
Collier County Vineyards Park
Collier County Veterans Park
Collier County North County Regional Park
Vineyards Elementary School
Autumn Woods Community Association
Audubon Country Club
Colliers Reserve Country Club
Imperial Boulevard (Imperial Golf Club)
Imperial Clubhouse (Imperial Golf Club)
Palm River (La Playa Golf)
Vineyards South (Vineyards Country Club)
Vineyards North (Vineyards Country Club)
Vineyards Press Residential/Common Areas
Vineyards East (Vineyards Country Club)
Pelican Bay
Pelican Marsh
Tarpon Cove
Charleston Square
Bermuda Greens
Calusa Bay

Proposed/Future

Wastewater flow to the North County facility is expected to increase to 19.68 MGD by 2030. The capacity of the facility is expected to remain at 24.10 MGD. Due to the expected increasing demand for reclaimed water, reuse flows are projected to increase to about

18.7 MGD by 2030. Additional storage using ASR is planned. Deep well injection disposal is expected to continue through 2030, although disposal rates are not anticipated to increase over the current rates (about 1.0 MGD).

Information Sources

This information is from the *Collier County 10-Year Water Supply Facilities Work Plan* (Collier County 2007), the *Collier County 2009 Annual Utility Inventory Report* (Collier County 2010), and the *2010 Reuse Inventory* (FDEP 2011).

Collier County – Northeast Water Reclamation Facility (Future)

Proposed/Future

Collier County intends to build a new facility to be named the Northeast Water Reclamation Facility. This project is deferred beyond the 2030 planning horizon.

Collier County plans to acquire the Orange Tree Water Reclamation Facility in 2012, which serves the Orange Tree and Twin Eagles communities. The proposed service areas for the Northeast Water Reclamation Facility are near these communities. The Orange Tree Water Reclamation Facility has a 1.1 MGD treatment capacity and a projected average daily flow of 0.62 MGD in 2012. The projected average daily flow for 2030 is 1.0 MGD, with 100 percent reuse.

Information Sources

This information is from the *Collier County 10-Year Water Supply Facilities Work Plan* (Collier County 2007) and the *Collier County 2009 Annual Utility Inventory Report* (Collier County 2010).

Collier County – South County Water Reclamation Facility

Treatment/Flows

The Collier County – South County Water Reclamation Facility has a FDEP-rated capacity of 16.0 MGD. The 2010 average daily wastewater flow treated by the facility was 7.04 MGD, of which 5.21 MGD was reclaimed.

Reuse/Disposal

Treated effluent from the South County facility is reused primarily by golf courses and residences. According to the *2010 Reuse Inventory* (FDEP 2011), nine golf courses, over 1,500 residences, one park, and one school used reclaimed water for irrigation. The average daily flow was 2.38 MGD for golf courses, 1.57 MGD for residences, and 1.26 MGD for a park, school, and power plant cooling tower. The remaining 1.93 MGD of treated wastewater flow was disposed of through deep well injection.

Primary End Users

Foxfire 9 (Foxfire Golf and Country Club)
Foxfire 18 (Foxfire Golf and Country Club)
Lely Mustang Golf (Lely Resort)
Lely Classics Golf (Lely Resort)
Lely Flamingo Golf (Lely Resort)
Wind Star Golf
Winter Park Golf
Lely Community Development District
Hibiscus Golf
Riviera Golf Course
Countryside Golf
Glades Golf & Country Club
Lakewood Country Club

Proposed/Future

Wastewater flows to the South County facility are expected to increase to 13.69 MGD in 2030. The planned FDEP-rated capacity of the facility will remain at 16.0 MGD. Due to the expected increasing demand for reclaimed water, reuse flows are projected to increase to approximately 13.0 MGD by 2030. Additional storage using ASR is also planned. Deep well injection disposal is expected to continue through 2030, although disposal rates are anticipated to decrease to approximately 0.68 MGD.

Information Sources

This information is from the *Collier County 10-Year Water Supply Facilities Work Plan* (Collier County 2007), the *Collier County 2009 Annual Utility Inventory Report* (Collier County 2010), and the *2010 Reuse Inventory* (FDEP 2011).

Collier County – Southeast Water Reclamation Facility (Future)

Proposed/Future

Collier County intends to build a new facility to be named Southeast Water Reclamation Facility with an initial capacity of 4.0 MGD. The proposed project is deferred beyond 2030.

Information Sources

Information on this proposed project was submitted by the Collier County Wastewater Department and was taken from the *Collier County 2009 Annual Utility Inventory Report* (Collier County 2010).

Florida Governmental Utility Authority – Golden Gate Wastewater Treatment Facility

Treatment/Flows

Operated by the Florida Golden Gate Utility Authority, the FDEP-permitted capacity of this WWTF was 1.50 MGD in 2010. The average daily wastewater flow in 2010 was 1.03 MGD.

Reuse/Disposal

Reclaimed water is distributed to the facility's on-site seven-acre, four-pond rapid infiltration basins. In 2010, 0.49 MGD of treated effluent was reused through these rapid infiltration basins. The remaining 0.65 MGD of treated effluent was disposed of through deep well injection.

Proposed/Future

Upgrades to the facility have increased the design capacity to 1.50 MGD. The capacity may be expanded to 2.0 MGD by 2030. Anticipated average daily flow by 2030 is projected to be 1.39 MGD.

The Florida Golden Gate Utility Authority is evaluating adding customers to the water reuse system, which would require additional upgrades to the treatment facility. The only large potential user of reclaimed water in the service area is the Golden Gate Country Club. The Florida Golden Gate Utility Authority has installed a 12-inch diameter pipeline to Golden Gate Country Club in anticipation of providing reclaimed water. Residential use of reclaimed water is not deemed practical within the service area.

Information Sources

This information was provided by the Florida Golden Gate Utility Authority and taken from the *Collier County 10-Year Water Supply Facilities Work Plan* (Collier County 2007) and the *2010 Reuse Inventory* (FDEP 2011).

Immokalee Wastewater Treatment Facility

Treatment/Flows

The Immokalee Wastewater Treatment Facility has a FDEP-rated capacity of 2.50 MGD. In 2010, the average daily wastewater flow treated by the facility was 1.50 MGD.

Reuse/Disposal

Water reuse is achieved through irrigation of agricultural crops. In 2010, the average daily water reuse was 0.54 MGD, and 0.96 MGD of the remaining effluent was disposed of through deep well injection.

Proposed/Future

The Immokalee Water and Sewer District proposes improvements to its WWTF to begin providing public access irrigation. The Immokalee Water and Sewer District has been contacting nearby agricultural users about providing reclaimed water to replace dependence on existing irrigation wells. The initial phase of expansion is expected to add advanced wastewater treatment of 1.5 MGD, and a later phase will increase the treatment capacity to 3.0 MGD by 2020. The total planned wastewater treatment capacity for the facility is 3.0 MGD by 2030.

Information Sources

This information is from the *Collier County 10-Year Water Supply Facilities Work Plan* (Collier County 2007), Immokalee Water and Sewer District Water Use Permit Application 1005114-6, and the *2010 Reuse Inventory* (FDEP 2011).

Marco Island – Marco Island Wastewater Treatment Facility

Treatment/Flows

The FDEP-rated capacity of the Marco Island Wastewater Treatment Facility is 3.50 MGD. The 2010 average daily wastewater flow treated was 1.80 MGD. The amount of water reclaimed averaged 1.46 MGD per day.

Reuse/Disposal

Based on 2010 data, reclaimed water was used for irrigation of three golf courses, three parks, and two schools. The golf course received an average of 0.33 MGD of reclaimed water. Parks, schools, businesses, hotels, and condominiums received an average of 1.13 MGD. The remaining daily average 0.40 MGD flow of treated wastewater was disposed of through deep well injection. No reclaimed water is planned for residential irrigation.

Primary End Users
Marco Island Golf Course
Marco Shores Golf Course
Hideaway Beach Golf Course
Jane Hitler Park
Veterans Park
Tommie Barfield Elementary School
Marco Island Charter Middle School

Proposed/Future

Wastewater flow to the Marco Island facility is expected to increase to 2.90 MGD by 2030. The planned capacity of the facility is 4.92 MGD. Projected 2030 reuse flows are 2.50 MGD. Water reuse for public access areas such as golf courses, parks, and schools is expected to continue; however, no reuse water supply is planned for residential irrigation. Deep well injection of an estimated 0.40 MGD of treated wastewater is planned through 2030.

Information Sources

This information was provided by the City of Marco Island and taken from the *2010 Reuse Inventory* (FDEP 2011).

Marco Island – Marco Shores Wastewater Treatment Facility

Treatment/Flows

The FDEP-rated capacity of the Marco Shores Wastewater Treatment Facility is 0.30 MGD. The 2010 average daily wastewater flow treated by the facility was 0.09 MGD and the water reclaimed averaged 0.09 MGD.

Reuse/Disposal

Based on 2010 data, all of the 0.09 MGD wastewater was reused through a rapid infiltration basin.

Proposed/Future

The design capacity is expected to remain at 0.30 MGD and annual average wastewater flow is projected to reach 0.20 MGD in 2030. The reclaimed water may be connected to a reclaimed water line that serves the Hammock Bay community, but a proposed project was not prepared at the time of this plan update.

Information Source

This information is from the *2010 Reuse Inventory* (FDEP 2011).

Naples Wastewater Treatment Facility

Treatment/Flows

The Naples Wastewater Treatment Facility has a FDEP-rated capacity of 10.0 MGD. The 2010 average daily wastewater flow treated by the facility was 6.59 MGD. The daily average of water reused was 4.65 MGD.

Reuse/Disposal

According to 2010 data, the Naples facility used reclaimed water to irrigate ten golf courses, eight parks, three schools, and various other public access areas. The remaining 1.94 MGD of treated wastewater was disposed of through surface water discharge to the Gordon River.

Primary End Users
Moorings Country Club
Royal Poinciana
Country Club of Naples
Hole-In-The-Wall Golf Club
Quail Run Country Club
High Point Country Club
Naples Beach Club
Bear's Paw Condo
Wilderness Country Club
Grey Oaks (The Estuary)
Moorings Park

Proposed/Future

Wastewater flows to the Naples Wastewater Treatment Facility are expected to increase to 8.0 MGD by 2030. The planned capacity of the facility is 10.0 MGD. Projected reuse flows are 15.0 MGD.

Expansion of the reclaimed water irrigation system is planned within city limits. The City of Naples has already started increasing the capacity of water reuse by constructing four 1-MGD ASR wells for storage. The city plans on an allocation of surface water from the Golden Gate Canal to provide 15.0 MGD of irrigation quality water for the city's reclaimed water distribution system.

Information Sources

This information was provided by the City of Naples and taken from the *2010 Reuse Inventory* (FDEP 2011) and City of Naples Water Use Permit Application 100824-35.

Hendry County Wastewater Treatment Facilities

Clewiston Wastewater Treatment Facility

Treatment/Flows

The Clewiston Wastewater Treatment Facility has a FDEP-rated capacity of 1.50 MGD. The facility processed a daily average of 1.18 MGD of wastewater in 2010.

Reuse/Disposal

Water reuse is provided via land application at a 193-acre sprayfield. The sprayfield has under-drains that lead to a perimeter ditch of the sprayfield. All of the 1.18-MGD daily average flow of wastewater was reused in 2010.

Proposed/Future

Wastewater flows to the facility are expected to increase to 2.0 MGD by 2030. The planned capacity for the facility is 2.25 MGD; however, formal plans for expansion were not prepared at the time of this plan update.

Information Sources

This information was provided by the City of Clewiston and taken from the *2010 Reuse Inventory* (FDEP 2011).

LaBelle Wastewater Treatment Facility

Treatment/Flows

The City of LaBelle Wastewater Treatment Facility has a FDEP-rated capacity of 0.75 MGD. The facility processed 0.33 MGD average daily flow of wastewater in 2010.

Reuse/Disposal

The distribution system for the facility's reclaimed water includes a 99-acre absorption field with a FDEP-rated total capacity of 0.75 MGD (average daily flow). All 0.33 MGD of reclaimed water was reused at the absorption field.

Proposed/Future

The City of LaBelle projects its wastewater flow will increase to 0.38 MGD by 2030. The capacity of the facility is planned to expand to 1.1 MGD by 2020 to meet potential needs. The city anticipates reclaimed water will be provided for public access irrigation within the city and the west Hendry County area, but no formal plans were prepared at the time of this plan update. Any plans to include public access irrigation will likely focus on new development in the area.

Information Sources

This information was provided by the City of LaBelle and taken from the *City of LaBelle Water Supply Plan* (City of LaBelle 2008), the *Hendry County 10-Year Water Supply Facilities Work Plan* (Hendry County 2010), and the *2010 Reuse Inventory* (FDEP 2011).

Lee County Wastewater Treatment Facilities

Bonita Springs – East Water Reclamation Facility

Treatment/Flows

The Bonita Springs East Water Reclamation Facility has a FDEP-rated capacity of 4.00 MGD. Wastewater flows to the facility averaged 2.50 MGD in 2010.

Reuse/Disposal

Water reuse, reported as a combined flow from the East and West facilities and supplemental water was 7.55 MGD in 2010. The combined total remaining 0.04 MGD of treated wastewater was disposed of through deep well injection. Reclaimed water from both facilities is distributed by the bulk utility, Resource Conservation Systems, for irrigation of five golf courses, four parks, and more than 6,600 residences.

Primary End Users
Bonita Bay
The Brooks
Highland Woods (irrigation water supplemented with groundwater)
Cedar Creek

Proposed/Future

Wastewater flows to the Bonita Springs East and West Reclamation facilities are projected to increase to a daily average of 7.55 MGD by 2030. Reclaimed water flows for the service area that require supplemental flow are projected to reach 12.47 MGD by 2030.

Information Sources

This information is from the *City of Bonita Springs Comprehensive Plan* (City of Bonita Springs 2009) and the *2010 Reuse Inventory* (FDEP 2011).

Bonita Springs – West Water Reclamation Facility

Treatment/Flows

The Bonita Springs West Water Reclamation Facility has a FDEP-rated capacity of 7.00 MGD. Wastewater flows to the facility averaged 1.38 MGD in 2010.

Reuse/Disposal

Water reuse, reported as a combined flow from the East and West facilities, was a daily average of 7.20 MGD in 2010. On average, a combined effluent total of 0.04 MGD was disposed of through deep well injection. Reclaimed water from both facilities is distributed by the bulk utility, Resource Conservation Systems, for irrigation of five golf courses, four parks, and more than 6,600 residences (see *Bonita Springs – East Water Reclamation Facility* for end users).

Proposed/Future

Wastewater flows to the Bonita Springs West and East facilities are expected to increase to 7.55 MGD by 2030. The treatment capacity of the West facility is planned to remain at 7.00 MGD. Reclaimed water flows are projected to reach 12.47 MGD by 2030 and will require supplemental flow.

Information Sources

This information is from the *City of Bonita Springs Comprehensive Plan* (City of Bonita Springs 2009) and the *2010 Reuse Inventory* (FDEP 2011).

Cape Coral – Everest Water Reclamation Facility

Treatment/Flows

The Everest Water Reclamation Facility is part of the Water Independence for Cape Coral utility. The Everest facility has a FDEP-rated capacity of 13.40 MGD, as reported in FDEP's *2010 Reuse Inventory* (FDEP 2011). In 2010, the facility treated an average of 6.51 MGD of wastewater for reuse.

Reuse/Disposal

In 2010, a total daily average of 23.39 MGD of wastewater was reused by the Water Independence for Cape Coral utility through the Everest and Southwest facilities. This total includes 10.12 MGD of supplemental surface water that was combined with treated water for irrigation water supply. On average, 0.27 MGD of treated effluent was disposed of through deep well injection.

The city's reclaimed water is primarily used for residential irrigation, as well as for irrigation of public areas, such as parks, schools, and medians. Based on 2010 data, the city's system provided 16.89 MGD of irrigation for over 37,000 residences, and 6.50 MGD of reclaimed water for 17 parks, 11 schools, and other public areas. A small amount (0.27 MGD) of treated effluent was discharged through deep well injection in 2010.

Proposed/Future

The increased capacity of 13.4 MGD at the Everest facility is anticipated to meet the water treatment needs of the service area, but additional water will be needed to meet future irrigation demands. Aquifer storage and recovery, increased canal storage, irrigation metering, and water conservation measures are options for future supplemental water supply sources.

Information Sources

This information is from the *City of Cape Coral Long-Range Water Supply Facilities Work Plan* (City of Cape Coral 2009) and the *2010 Reuse Inventory* (FDEP 2011).

Cape Coral – Southwest Water Reclamation Facility

Treatment/Flows

The Southwest Water Reclamation Facility is part of the Water Independence for Cape Coral utility. As reported in FDEP's *2010 Reuse Inventory* (FDEP 2011), the Southwest facility had a FDEP-rated capacity of 6.60 MGD. The permitted capacity of the facility has recently been increased to 15.0 MGD. In 2010, the facility treated an annual daily average of 7.03 MGD of wastewater, with some of the wastewater being provided from the Lee County – Waterway Estates facility.

Reuse/Disposal

In 2010, a total daily average of 23.39 MGD of wastewater was reused by the Water Independence for Cape Coral utility through the Everest and Southwest facilities. This total includes 10.12 MGD of supplemental surface water that was combined with treated water for irrigation water supply.

Proposed/Future

The current capacity of 15.0 MGD at the Southwest facility should meet water treatment demands, but additional water will be necessary to meet future irrigation demands. Aquifer storage and recovery, increased canal storage, irrigation metering, and water conservation measures are options for future supplemental water supply sources.

Information Sources

This information was provided by the City of Cape Coral and taken from the *City of Cape Coral 10-Year Water Supply Facilities Work Plan* (City of Cape Coral 2009) and the *2010 Reuse Inventory* (FDEP 2011).

Cape Coral – North Cape Water Reclamation Facility (Proposed)

Proposed/Future

The proposed North Cape Water Reclamation Facility would serve the northern part of the City of Cape Coral's service area. The proposed initial reclaimed water capacity for the North Cape facility is 5.0 MGD, with phased expansions to 8.0 MGD capacity by 2030, and 20 MGD capacity by 2050.

Information Source

This information is from the *City of Cape Coral Long-Range Water Supply Facilities Work Plan* (City of Cape Coral 2009).

Florida Governmental Utility Authority – Lehigh Acres Wastewater Treatment Facility

Treatment/Disposal

Operated by the Florida Golden Gate Utility Authority, the Lehigh Acres Wastewater Treatment Facility has a FDEP-rated capacity of 2.50 MGD with a design capacity of 3.5 MGD. It is limited by its disposal capacity. In 2010, the facility's annual average daily wastewater flow was 1.97 MGD.

Reuse/Disposal

All of the reclaimed water was used for golf course irrigation and rapid infiltration basins. In 2010, 1.03 MGD was sent to the rapid infiltration basins, and the remaining 0.67 MGD reclaimed water supply was used for irrigating the Lehigh Resort, Mirror Lakes, and Majestic golf courses. Disposal of the remaining treated effluent (0.28 MGD) was done using deep well injection.

Proposed/Future

Wastewater flows to the facility are expected to increase to 2.31 MGD by 2030. A recently constructed deep injection well for disposal of excess effluent should allow the treatment capacity of the Lehigh Acres facility to increase to 3.5 MGD. Additional phases of planned expansions will increase treatment capacity to 5.0, 6.0, and 8.0 MGD as sufficient growth occurs within the service area. The 5.0-MGD capacity will be needed by 2030. Although the Florida Golden Gate Utility Authority's plans to extend reclaimed water lines to Copperhead and Westminster golf courses are currently on hold, construction is anticipated by 2020.

Information Sources

This information was provided by the Florida Golden Gate Utility Authority and taken from the *2010 Reuse Inventory* (FDEP 2011).

Florida Governmental Utility Authority –
North Fort Myers Wastewater Treatment Facility

Treatment/Flows

The Florida Golden Gate Utility Authority (FGUA) – North Fort Myers facility has a FDEP-rated capacity of 3.50 MGD. The facility processed a daily average of 1.87 MGD of wastewater in 2010. Water reused in 2010 averaged 1.39 MGD with 0.60 MGD disposed through deep well injection.

Reuse/Disposal

Reclaimed water from the North Fort Myers facility is used for irrigation of golf courses and residences. In 2010, irrigation of seven golf courses averaged 1.12 MGD, residential irrigation (500 residences) averaged 0.33 MGD, and irrigation of one park averaged 0.06 MGD. The 0.60 MGD of wastewater not reused was disposed of through deep well injection.

Primary End Users
Magnolia Landing
Herons Glenn Recreational District
Del Tura Country Club
Sable Springs Golf & Racquet Club
Estates of Entrada
Riverbend Golf Course
Six Lakes Country Club

Proposed/Future

North Fort Myers expects wastewater flow to the facility will increase to 7.0 MGD by 2030. The planned capacity of the facility is 7.50 MGD and will occur in two phases. As the facility's treatment capacity expands, capacity for its injection well may also be increased to accommodate seasonal disposal flows. The planned expansion includes future reclaimed water distribution for residential developments at Magnolia Landing and Herons Glenn, and additional golf course irrigation at the Del Tura Country Club.

Information Sources

This information was provided by the North Fort Myers Utility and taken from the *2010 Reuse Inventory* (FDEP 2011).

Fort Myers – Central Wastewater Treatment Facility

Treatment/Flows

The Fort Myers – Central Wastewater Treatment Facility has a FDEP-rated capacity of 11.00 MGD. In 2010, the average daily treated wastewater flow was 5.42 MGD.

Reuse/Disposal

In 2010, 1.39 MGD of reclaimed water was used for irrigation of two golf courses and 0.09 MGD was used for irrigation of one park. The remaining 1.08 MGD was used for miscellaneous purposes, including the Lee County Resource Recovery Facility, bringing total reuse to 2.56 MGD. Effluent management for this facility includes surface water discharge to the Caloosahatchee River. In 2010, an average of 3.16 MGD of treated effluent was discharged to the river.

Primary End Users
Heritage Palms Country Club
Eastwood Golf Course
Red Sox Facility
Buckingham Park
ValleyCrest Landscaping
Calvary Gardens Cemetery
Various city facilities and public areas

In addition, a reclaimed water pipeline was being extended to serve the Colonial Country Club at the time this plan update was being developed.

Proposed/Future

Wastewater flows to the facility are expected to increase to 8.0 MGD by 2030. According to the city's plans, additional reclamation capacity will be provided by the Central facility after the addition of the East Water Reclamation Facility to the distribution system. By 2024, the combined Central and East facilities are expected to have a reuse capacity of 16 MGD, with reclaimed water flows estimated at 15.15 MGD.

Information Sources

This information was provided by the City of Fort Myers and taken from the *2010 Reuse Inventory* (FDEP 2011).

Fort Myers – East Water Reclamation Facility (Future)

The City of Fort Myers plans to add the East Water Reclamation Facility to its existing reuse distribution system. The facility is expected to be dedicated 100 percent to water reuse, serving the eastern portion of the city. The planned capacity of the facility is 8.0 MGD, with flows anticipated to exceed 7.0 MGD. The primary use of the facility's reclaimed water would be public access irrigation.

Fort Myers – South Wastewater Treatment Facility

Treatment/Flows

In 2010, the Fort Myers – South Wastewater Treatment Facility had a FDEP-rated capacity of 12.0 MGD and treated an average of 9.44 MGD of wastewater.

Reuse/Disposal

The South facility did not provide reclaimed water in 2010 and discharged all 9.44 MGD of its treated wastewater to the Caloosahatchee River.

Proposed/Future

In the future, the City of Fort Myers plans to upgrade its treatment facility and construct an injection well to dispose of wastewater flows. Future interconnection with the City of Cape Coral's Everest Water Reclamation Facility is possible, but a proposed project was not prepared at the time this plan update was developed. Capacities and flows are not expected to increase significantly by 2030.

Information Sources

This information was provided by the City of Fort Myers and taken from the *2010 Reuse Inventory* (FDEP 2011).

Lee County – Fiesta Village Wastewater Treatment Facility

Treatment/Flows

The Lee County – Fiesta Village Wastewater Treatment Facility has a FDEP-rated capacity of 5.0 MGD. In 2010, an average daily flow of 2.88 MGD was treated at the facility. The Fiesta Village system is interconnected with the Lee County – Fort Myers Beach system.

Reuse/Disposal

Treated effluent from the Fiesta Village facility is reused primarily for irrigation of four golf courses, two parks, one school, and 75 residences. Reclaimed water use was 0.67 MGD for golf course irrigation, 0.23 MGD for residential irrigation, and 0.09 MGD for parks and a school. The remaining 1.86 MGD of treated wastewater was discharged to the Caloosahatchee River.

Primary End Users
Crown Colony
Cypress Lake Country Club
Laguna Lakes Community
Landings Yacht and Golf Club
Myerlee Country Club
Parker Lakes Development

Proposed/Future

Wastewater flow to the Fiesta Village facility is expected to increase to 4.08 MGD by 2030. The planned capacity of the facility is projected to increase to 5.10 MGD. Lee County Utilities' goal is to achieve 100 percent water reuse at the Fiesta Village facility, and the utility is exploring the feasibility of ASR to provide seasonal storage of reclaimed water. Additional storage and the existing interconnect with the Fort Myers Beach system will allow the Fiesta Village facility to expand water reuse and minimize discharge to the river. Excess reclaimed water from the Fiesta Village facility may be used to supplement demands in the Fort Myers Beach service area. Any excess flows could be disposed of in the Fort Myers Beach injection well instead of being discharged to the river.

Future Major Users
Edison Community College
Village of Seven Lakes
Principa
Golfview Country Club
Cypress Cove

Information Sources

This information was provided by Lee County Utilities, and taken from the *2010 Reuse Inventory* (FDEP 2011) and FDEP/Fort Myers files.

Lee County – Fort Myers Beach Wastewater Treatment Facility

Treatment/Flows

The Lee County – Fort Myers Beach Wastewater Treatment Facility has a FDEP-rated capacity of 6.00 MGD. In 2010, an average daily flow of 4.00 MGD was treated at the facility. Total average daily reuse flows were 3.04 MGD in 2010.

Reuse/Disposal

Of the 3.04 MGD total reuse, 1.55 MGD was used for golf course irrigation, 0.31 MGD for residences, and 0.57 MGD for parks and schools. An additional 0.12 MGD was reused for groundwater recharge using percolation ponds, and 0.48 MGD for miscellaneous uses such as irrigation of medians. The remaining 0.96 MGD of wastewater flow was disposed of through deep well injection.

Primary End Users
Bayside Estates
Shellpoint Woodlands
Shellpoint Village
Summerlin Ridge
Kelly Greens
Lexington
Shellpoint
Health Park Hospital
Gulf Harbor

Proposed/Future

Wastewater flows to the Fort Myers Beach facility are expected to increase to 3.94 MGD by 2030, with water reuse flows increasing to 3.84 MGD. The capacity of the facility is not expected to increase during that period. Lee County Utilities' goal is to achieve 100 percent water reuse at the Fort Myers Beach facility. The excess demand is expected to be met through additional storage (i.e., ASR) and an existing interconnect with the utility's Fiesta Village system. The additional storage and flexibility will allow the Fort Myers Beach facility to expand water reuse and minimize discharges using deep well injection. No additional future users of reclaimed water are listed for this facility.

Information Sources

This information was provided by Lee County Utilities, and taken from the *2010 Reuse Inventory* (FDEP 2011) and FDEP/Fort Myers files.

Lee County – Gateway Wastewater Treatment Facility

Treatment/Flows

The Lee County – Gateway Wastewater Treatment Facility has a FDEP-rated capacity of 1.00 MGD. In 2010, an average daily flow of 0.72 MGD was treated at the facility. The average daily flow was 0.58 MGD for residences and 0.14 MGD for parks and schools. The average daily flow of reclaimed water was supplemented with 1.72 MGD of groundwater to meet the total demand.

Reuse/Disposal

Reclaimed water from the Gateway facility is used for irrigation. Irrigated areas include residences, parks, and a school. The *2010 Reuse Inventory* (FDEP 2011) listed over 2,400 residences, three parks, and one school as customers of the reuse system.

Proposed/Future

Wastewater flows to the Gateway facility are expected to increase to 1.39 MGD by 2030. The planned capacity of the facility is 3.0 MGD. Irrigation demand within the service area is projected to exceed the amount of reclaimed water that will be available in 2030. Lee County Utilities has proposed a reclaimed water ASR well to develop an additional 1.0 MGD of storage capacity. The ASR well is planned to be in operation by 2020.

Information Sources

This information was provided by Lee County Utilities and taken from the *2010 Reuse Inventory* (FDEP 2011).

Lee County – Pine Island Wastewater Treatment Facility

Treatment/Flows

The Lee County – Pine Island Wastewater Treatment Facility has a FDEP-rated capacity of 0.25 MGD. In 2010, an average daily flow of 0.09 MGD was treated.

Reuse/Disposal

Reclaimed water from the Pine Island facility is used by sites adjacent to an existing pipeline. The primary user of reclaimed water is agriculture (0.08 MGD) with less than 0.01 MGD used to irrigate five residences.

Primary End Users
Village Links Sprayfield
Pine Island Tree Farm
Island Acre Estates
Pine Island Wastewater Treatment Facility Sprayfield

Proposed/Future

Wastewater flows to the Pine Island facility are expected to increase to 1.24 MGD by 2030. The planned facility capacity is expected to increase incrementally to 1.50 MGD. Although irrigation demand within the service area exceeds the amount of reclaimed water that will be available in 2030, no additional reclaimed water projects or additional supplemental water sources were planned at the time this plan update was being developed.

Information Sources

This information was provided by Lee County Utilities, and taken from the *2010 Reuse Inventory* (FDEP 2011) and FDEP/Fort Myers files.

Lee County – San Carlos Wastewater Treatment Facility

Treatment/Flows

The Lee County – San Carlos Wastewater Treatment Facility has a FDEP-rated capacity of 0.30 MGD. In 2010, the average wastewater flow to the facility was 0.14 MGD.

Reuse/Disposal

On average, 0.12 MGD of reclaimed water was reused for golf course irrigation at the San Carlos Country Club and 0.02 MGD was used at the treatment facility. The remaining water demand for the golf course is met using traditional water sources.

Proposed/Future

Wastewater flow to the San Carlos facility is expected to increase to 0.41 MGD by 2030. The planned capacity of the facility is 0.51 MGD. The increased capacity will help meet irrigation demands within the service area. Another option is to divert all or a portion of the flow from the San Carlos facility to the Three Oaks facility. No additional wastewater reuse projects within the San Carlos service area were proposed at the time this plan update was being developed.

Information Sources

This information was provided by Lee County Utilities, and taken from the *2010 Reuse Inventory* (FDEP 2011) and FDEP/Fort Myers files.

Lee County – Three Oaks Wastewater Treatment Facility

Treatment/Flows

The Lee County – Three Oaks Wastewater Treatment Facility has a FDEP-rated capacity of 6.00 MGD. In 2010, an average daily flow of 2.41 MGD was treated at the facility.

Reuse/Disposal

Most of the reclaimed water was used for irrigation of six golf courses (1.30 MGD), medians (0.02 MGD), and residences (0.05 MGD). Wastewater not reused (0.79 MGD) was disposed of through deep well injection.

Primary End Users
Vines Country Club
Pelican Sound
West Bay Club
Stoneybrook
Grandezza (formerly known as Grand Oaks)
Villages of Country Creek

Proposed/Future

Wastewater flow to the Three Oaks facility is expected to increase to 6.71 MGD by 2030. The planned capacity of the expanded facility is 8.38 MGD by 2030. The service area's existing and proposed demands for reclaimed water exceed the facility's current and planned future capacity. These demands are expected to reduce the deep well injection of effluent. Lee County Utilities is proposing to add the following users:

Future Major Users
Miromar Lakes
Florida Gulf Coast University
Estero Community Park
Cypress Shadows
Resource Conservation Systems
Shadow Wood Preserve
Meadows at Pelican Sound
Villages of Country Creek

Information Sources

This information was provided by Lee County Utilities, and taken from the *2010 Reuse Inventory* (FDEP 2011) and FDEP/Fort Myers files.

Lee County – Waterway Estates Wastewater Treatment Facility

Treatment/Flows

The Lee County – Waterway Estates Wastewater Treatment Facility has a FDEP-rated capacity of 1.25 MGD. In 2010, wastewater flow to the facility was 0.14 MGD, with most of the wastewater routed to the City of Cape Coral for reuse. The remainder of treated wastewater (0.14 MGD) was discharged to surface water.

Reuse/Disposal

The *2010 Reuse Inventory* (FDEP 2011) reported no water reuse at the Waterway Estates facility; however, through an interconnect with the City of Cape Coral, the county provides reclaimed water to the city's Water Independence for Cape Coral wastewater system. The volume of effluent the city is not able to distribute is discharged to surface water.

Proposed/Future

Lee County Utilities is proposing to divert all flow from the Waterway Estates facility to the neighboring Florida Golden Gate Utility Authority (FGUA) – North Fort Myers facility.

Information Sources

This information was provided by Lee County Utilities and taken from the *2010 Reuse Inventory* (FDEP 2011).

Sanibel – Donax Water Reclamation Facility

Treatment/Flows

The Sanibel – Donax Water Reclamation Facility has a FDEP-rated capacity of 2.38 MGD. In 2010, the facility treated a daily average of 1.52 MGD of wastewater.

Reuse/Disposal

The Donax facility provides reclaimed water primarily to golf courses and residences for irrigation, reusing a total of 1.52 MGD. Of this total amount, 0.88 MGD was used by three golf courses, one park, one school, and multiple residences for irrigation. In addition, 0.16 MGD was used at the treatment facility for equipment cleaning, landscape irrigation, and filling irrigation trucks. The remaining 0.40 MGD of treated effluent was disposed of through deep well injection via a well shared with the Island Water Association (Sanibel's potable water provider).

Proposed/Future

Wastewater flows to the Donax facility are expected to increase to 1.75 MGD by 2030. No expansion of capacity is planned. In addition to irrigation of golf courses and residences, the facility plans to distribute reclaimed water to percolation ponds (Dunes Ponds) near the facility. The City of Sanibel is investigating supplemental sources of water for increasing the reliability of its reclaimed water supply.

Information Sources

This information was provided by the City of Sanibel and taken from the *2010 Reuse Inventory* (FDEP 2010).

Sanibel – Wulfert Water Reclamation Facility

The City of Sanibel's Wulfert Water Reclamation Facility is currently out of service, but the city does not have plans to decommission it. Instead, the city plans to reconstruct the facility's operations building for possible future use, either in the city's service area or in unincorporated Lee County on Captiva Island.

Information Sources

This information was provided by the City of Sanibel and taken from the *2010 Reuse Inventory* (FDEP 2011).

Wastewater and Water Reuse Data

The tables on the following pages provide information about wastewater and water reuse in the LWC Planning Area. The primary sources of information for these tables are the FDEP 2005 and 2010 reuse inventories (FDEP 2006, 2011). These inventories are compilations of wastewater and reuse information from around the state. The FDEP inventory information is based on fiscal year data from annual reuse reports submitted to the FDEP by each wastewater utility or system. Secondary sources of information include planning documents, such as 10-year water supply facilities work plans prepared by local governments.

Table D-2 lists all the WWTFs in the LWC Planning Area with treatment capacity equal to or greater than 100,000 gallons per day (0.1 MGD). The table also presents the 2010 wastewater and water reuse information for the facilities in the region. In the past, the treatment facilities tended to be smaller, providing reclaimed water to a single local development or golf course. Today, many of the smaller facilities have been incorporated into larger, expanded utilities that serve larger areas. In the long term, continued expansion of water reuse is expected with the construction of additional regional treatment facilities.

Figure D-4 through **Figure D-6** show the location of the WWTFs with treatment capacity equal to or greater than 0.1 MGD in the LWC Planning Area.

Table D-3 compares historical, current, and projected data from the larger profiled utilities and their WWTFs in the LWC Planning Area. The table shows a decrease in wastewater and water reuse flows in the region from 2005 to 2010. However, a significant increase is expected by 2030.

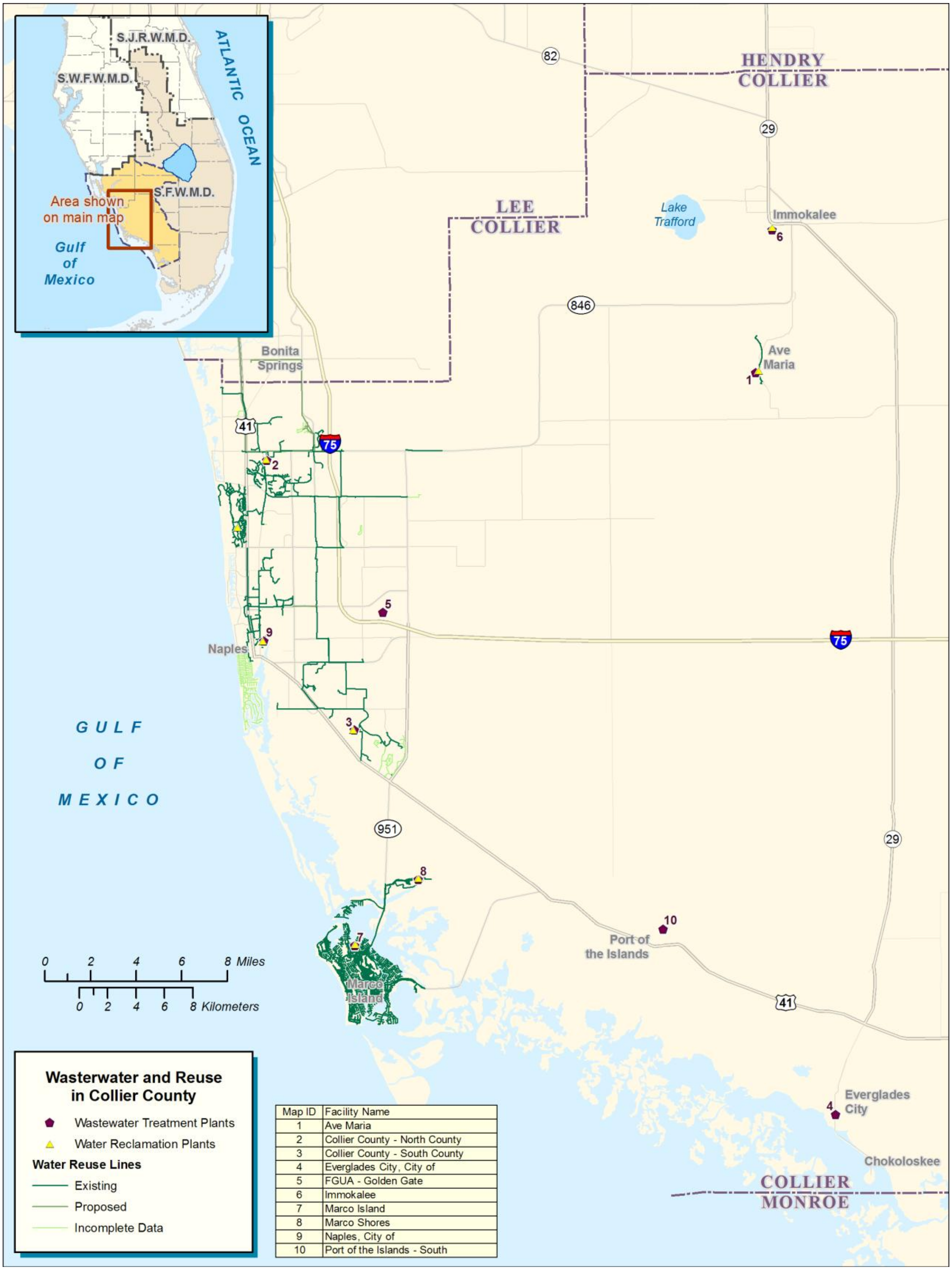
It should be noted that, in **Table D-2** and **Table D-3**, the reuse percentage is frequently used when describing reuse facilities and is intended to reflect the amount of water reused when compared with the amount of wastewater treated. In the annual FDEP reuse inventories, "flow ratio" is used, and is defined as "the total reuse flow divided by the total wastewater flow." The definition continues by clarifying "…flow ratios greater than 1.0 (i.e., greater than 100 percent) indicate that reuse may include supplemental water supplies…" Any supplemental water supplies (e.g., groundwater or surface water) are included in the "reuse flows." If supplemental flows cause the reuse percentage to exceed 100 percent, the reuse percentage will show 100 percent.

Table D-4 represents the types of water reuse practiced by the profiled facilities in Collier, Hendry, and Lee counties. These three counties represent all reuse in the LWC Planning Area. The tables show that public access irrigation (e.g., golf courses, parks, schools) has been, and will continue to be, the primary means of water reuse in the region. **Table D-5** provides the types of effluent disposal used by the profiled facilities in Collier, Hendry, and Lee counties. This is for reclaimed water/effluent that is not reused, and is used as a backup to reuse. As shown, the primary means of disposal has been surface water discharge. By 2030, it is expected that deep well injection will replace surface water discharge as the primary means of disposal.

Table D-2. Capacity, flow, and reuse percentage of existing wastewater treatment facilities in the LWC Planning Area with capacities of 0.1 MGD or higher.[a]

Entity/Facility	Map ID	2010			
		FDEP Rated WWTF Capacity (MGD)	Average Daily WWTF Flow (MGD)	Average Daily Reuse Flow (MGD)	Reuse Percentage[b]
Collier County					
Ave Maria	1	0.90	0.14	1.38	100.0%
Collier County – North County	2	24.10	7.26	7.07	97.4%
Collier County – South County	3	16.00	7.04	5.21	74.0%
Everglades, City of	4	0.16	0.12	0.07	58.3%
Florida Government Utility Authority (FGUA) – Golden Gate	5	1.50	1.03	0.49	40.5%
Immokalee	6	2.50	1.50	0.54	29.4%
Marco Island	7	3.50	1.80	1.46	81.1%
Marco Shores	8	0.30	0.09	0.09	100.0%
Naples, City of	9	10.00	6.59	4.65	70.6%
Port of the Islands – South	10	0.20	0.05	0.19	100.0%
10 Facilities		**59.16**	**25.62**	**21.15**	**82.6%**
Glades County					
Glades County Correctional	11	0.14	0.15	0.00	0.0%
1 Facility		**0.14**	**0.15**	**0.00**	**0.0%**
Hendry County					
Clewiston	12	1.50	1.18	1.18	100.0%
Hendry Correctional Institution (closed June 2011)	13	0.36	0.24	0.24	100.0%
LaBelle, City of	14	0.75	0.33	0.33	100.0%
Port LaBelle	15	0.50	0.23	0.23	100.0%
4 Facilities		**3.11**	**1.98**	**1.98**	**100.0%**
Lee County					
Bonita Springs – East	16	4.00	2.50	7.20[c]	100.0%[c]
Bonita Springs – West	17	7.00	1.38		
Cape Coral – Everest/ Water Independence for Cape Coral	18	13.40	6.51	23.39[d]	100.0%[d]
Cape Coral – Southwest/ Water Independence for Cape Coral utility[d]	19	6.60	7.03[f]	--	--
Citrus Park – North	20	0.20	0.09	0.09	100.0%
Cross Creek	21	0.25	0.12	0.12	100.0%
Eagle Ridge	22	0.32	0.18	0.18	100.0%
Florida Government Utility Authority (FGUA) – Lehigh Acres	23	2.50	1.97	1.70	86.3%
Fiddlesticks Country Club	24	0.15	0.07	0.07	100.0%
Forest Utilities	25	0.50	0.30	0.30	100.0%
Fort Myers, City of – Central	26	11.00	5.42	2.56	47.2%
Fort Myers, City of – South	27	12.00	9.44	0.00	0.0%
Fountain Lakes	28	0.19	0.15	0.15	100.0%
Gasparilla Island	29	0.71	0.36	0.28	77.8%
Hunter's Ridge	30	0.20	0.05	0.26	100.0%
Lake Fairways FFEC Six[a,e]	31	0.30	0.18	0.09	50.0%
Lee County Utilities – Fiesta Village	32	5.00	2.88	1.02	35.4%
Lee County – Fort Myers Beach	33	6.00	4.00	3.04	76.0%
Lee County – Gateway	34	1.00	0.72	2.44	100.0%
Lee County – Pine Island	35	0.25	0.09	0.09	100.0%
Lee County – San Carlos	36	0.30	0.14	0.14	100.0%
Lee County – Three Oaks	37	6.00	2.41	1.62	67.2%
Lee County – Waterway Estates	38	1.25	0.14	0.00	0.0%
North Fort Myers[a,e]	39	3.50	1.87	1.39	74.3%
Sanibel, City of – Donax	40	2.38	1.52	1.03	67.8%
South Seas Plantation	41	0.26	0.11	0.11	100.0%
26 Facilities		**85.26**	**49.63**	**47.27**	**95%**
LWC Planning Area Total: 41 Facilities		**135.67**	**67.94**	**70.40**	**100%**

a. As reported in the *2010 Reuse Inventory* (FDEP 2011).
b. Reuse percentage is calculated by dividing "reuse flow" (including any supplemental flow) by "WWTF flow." Percentages greater than 100 percent are reported as 100 percent.
c. Reclaimed water for Bonita Springs – East and Bonita Springs – West are reported as a combined total in the *2010 Reuse Inventory* (FDEP 2011).
d. The reuse flows for Cape Coral – Everest and Cape Coral – Southwest are a combined total for the Water Independence for Cape Coral utility in the *2010 Reuse Inventory* (FDEP 2011).
e. Florida Government Utility Authority purchased Lake Fairways FFEC-Six and North Fort Myers Utility.
f. Includes 0.81 MGD of wastewater flow from the Lee County Waterway Estates facility.



Map ID	Facility Name
1	Ave Maria
2	Collier County - North County
3	Collier County - South County
4	Everglades City, City of
5	FGUA - Golden Gate
6	Immokalee
7	Marco Island
8	Marco Shores
9	Naples, City of
10	Port of the Islands - South

Figure D-5. Wastewater treatment facilities in Collier County.

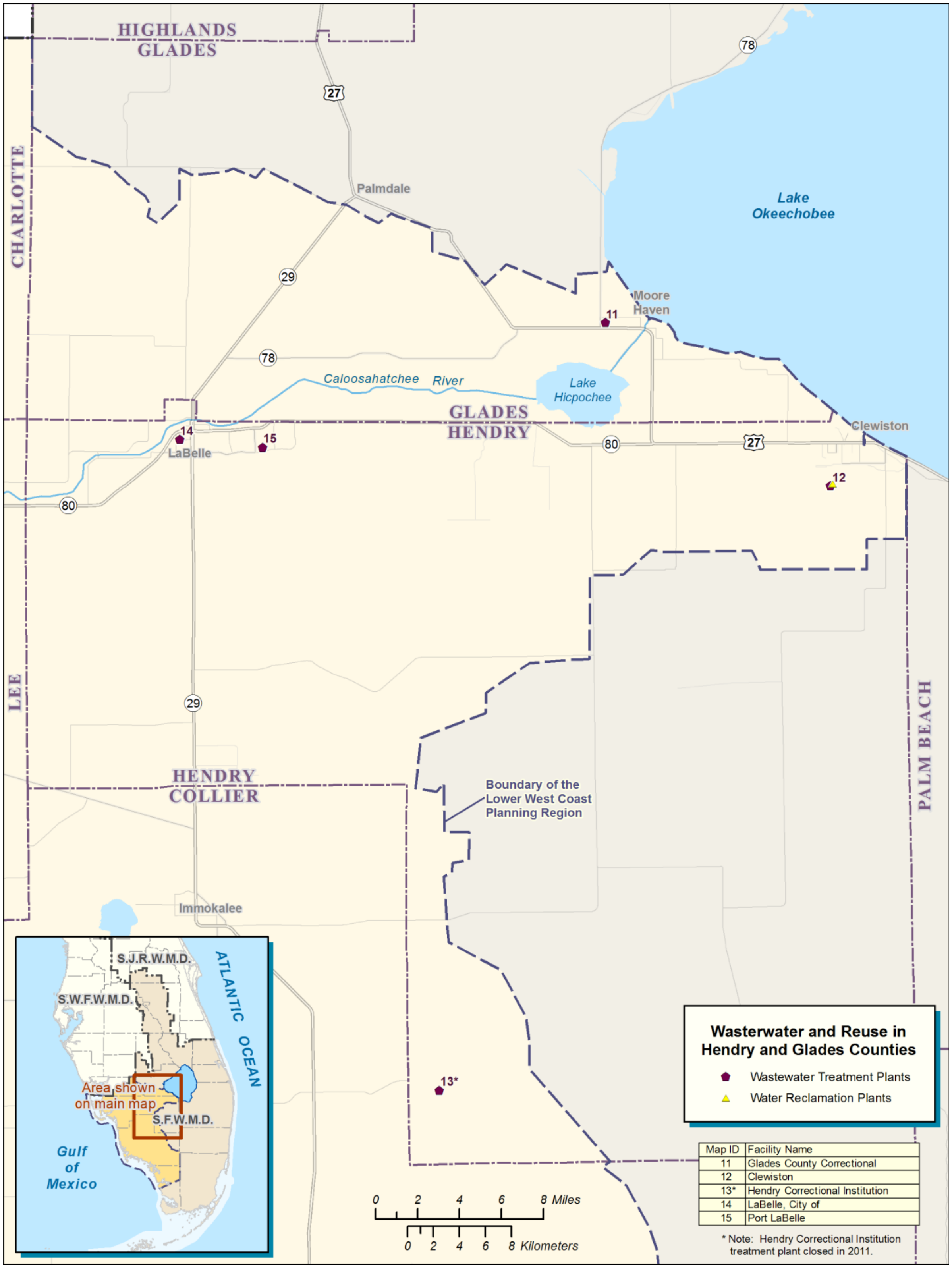
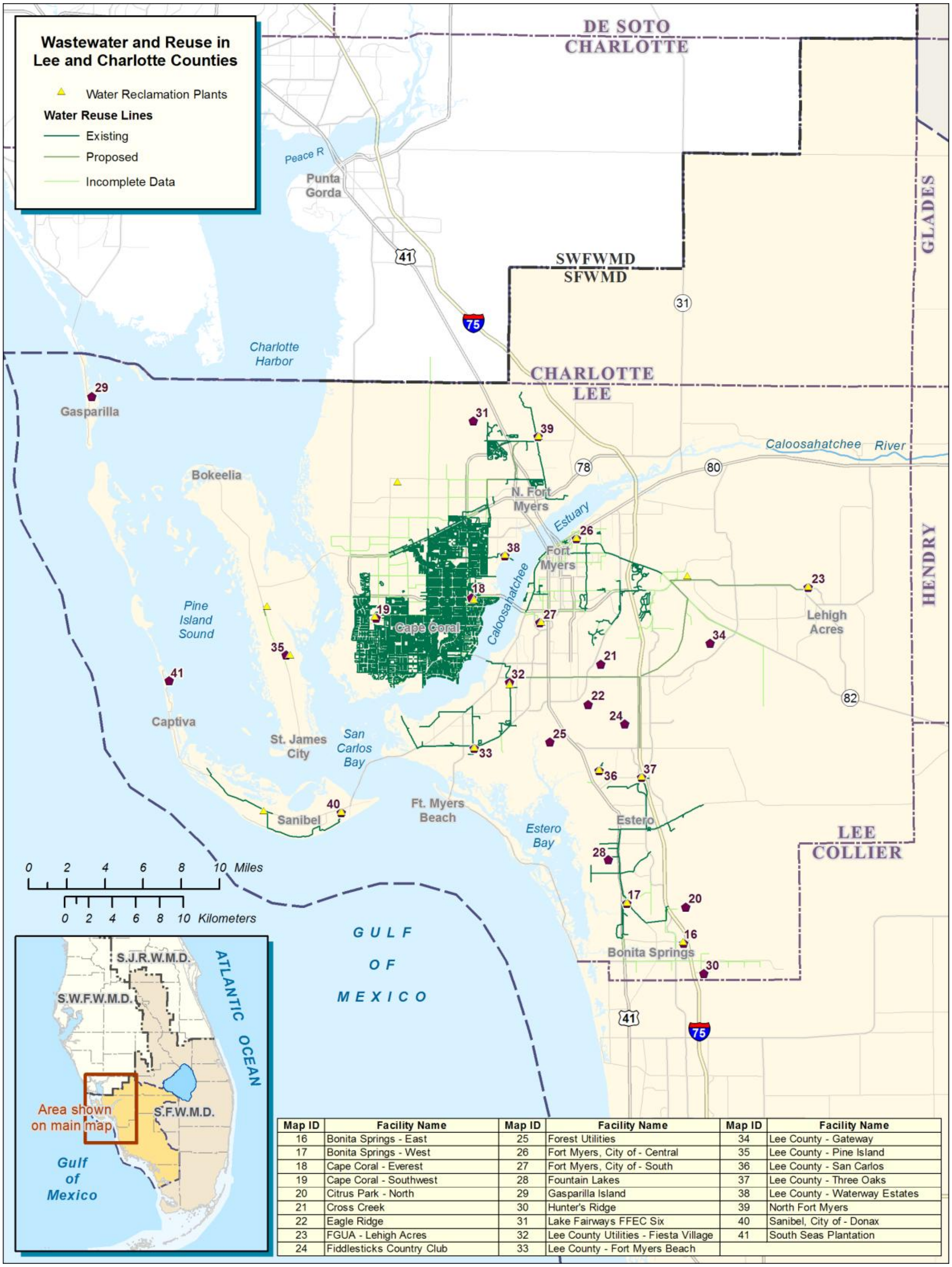


Figure D-6. Wastewater treatment facilities in Hendry and Glades counties.



Map ID	Facility Name	Map ID	Facility Name	Map ID	Facility Name
16	Bonita Springs - East	25	Forest Utilities	34	Lee County - Gateway
17	Bonita Springs - West	26	Fort Myers, City of - Central	35	Lee County - Pine Island
18	Cape Coral - Everest	27	Fort Myers, City of - South	36	Lee County - San Carlos
19	Cape Coral - Southwest	28	Fountain Lakes	37	Lee County - Three Oaks
20	Citrus Park - North	29	Gasparilla Island	38	Lee County - Waterway Estates
21	Cross Creek	30	Hunter's Ridge	39	North Fort Myers
22	Eagle Ridge	31	Lake Fairways FFEC Six	40	Sanibel, City of - Donax
23	FGUA - Lehigh Acres	32	Lee County Utilities - Fiesta Village	41	South Seas Plantation
24	Fiddlesticks Country Club	33	Lee County - Fort Myers Beach		

Note: Florida Government Utility Authority (FGUA) – North Fort Myers purchased Lake Fairways FFEC-Six and North Fort Myers Utility in 2010.

Figure D-7. Wastewater treatment facilities in Lee and Charlotte counties.

Table D-3. Wastewater/reclaimed flows and reuse percentage for facilities with capacities of 0.1 MGD or greater in the LWC Planning Area.

	2005					2010					2030				
Entity/Facility	FDEP Rated WWTF Capacity (MGD)	Average Daily WWTF Flow (MGD)	Average Daily Reuse Flow (MGD)[a]	Supple-mental Flow (MGD)	Reuse[b]	FDEP Rated WWTF Capacity (MGD)	Average Daily WWTF Flow (MGD)	Average Daily Reuse Flow (MGD)[a]	Supple-mental Flow (MGD)	Reuse[b]	FDEP Rated WWTF Capacity (MGD)	Average Daily WWTF Flow (MGD)	Average Daily Reuse Flow (MGD)	Supple-mental Flow (MGD)	Reuse[b]
Collier County															
Ave Maria[c]	--	--	--	--	--	0.90	0.14	1.38	1.24	100%	4.67	4.20	3.55	0.00	85%
Collier County – North County	24.10	9.10	8.90	1.00	98%	24.10	7.26	7.07	0.59	97%	24.10	19.68	18.69	0.00	95%
Collier County – Northeast[d]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Collier County –Orange Tree[e]	--	--	--	--	--	--	--	--	--	--	1.10	1.00	1.00	0.00	100%
Collier County – South County	9.25	7.20	6.10	0.00	85%	16.00	7.04	5.21	0.00	74%	16.00	13.69	13.04	0.00	95%
Collier County – Southeast[d]	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00	--
Florida Government Utility Authority (FGUA) – Golden Gate	0.95	1.19	1.19	0.00	100%	1.50	1.03	0.49	0.12	48%	1.50	1.39	1.39	0.00	100%
Immokalee	2.50	2.07	0.47	0.00	23%	2.50	1.50	0.54	0.00	29%	3.00	2.50	1.90	0.00	76%
Marco Island – Marco Island	3.50	2.06	1.19	0.00	58%	3.50	1.80	1.46	0.00	81%	4.92	2.90	2.50	0.00	86%
Marco Island – Marco Shores	0.3	0.08	0.08	0.00	100%	0.30	0.09	0.09	0.00	100%	0.30	0.15	0.15	0.00	100%
Naples, City of	10.00	7.06	5.47	0.00	77%	10.00	6.59	4.65	0.00	71%	10.00	8.00	15.00	15.00	100%
Collier County Subtotal	**50.60**	**28.76**	**23.40**	**1.00**	**81%**	**58.80**	**25.45**	**20.89**	**1.95**	**82%**	**65.59**	**53.51**	**57.22**	**15.00**	**100%**
Hendry County															
Clewiston	1.50	1.30	1.30	0.00	100%	1.50	1.18	1.18	0.00	100%	2.25	2.00	0.75	0.00	38%
LaBelle, City of	0.75	0.24	0.24	0.00	100%	0.75	0.33	0.33	0.00	100%	0.75	0.38	0.38	0.00	100%
Hendry County Subtotal	**2.25**	**1.54**	**1.54**	**0.00**	**100%**	**2.25**	**1.51**	**1.51**	**0.00**	**100%**	**3.00**	**2.38**	**1.13**	**0.00**	**47%**
Lee County															
Bonita Springs (East and West)[f]	7.00	3.80	6.30	2.80	100%	11.00	3.88	7.20	3.31	100%	11.00	7.55	7.55	0.00	100%
Cape Coral (Water Independence for Cape Coral) (Total)[g]	--	--	25.56	13.53	100%	--	--	23.39	10.12	100%	--	--	--	31.80	--
Cape Coral – Everest	8.50	7.08	--	--	--	13.40	6.51	--	--	--	13.40	12.00	12.00	--	100%
Cape Coral – Southwest	6.60	5.68	--	--	--	6.60	7.03	--	--	--	15.00	13.00	13.00	--	100%
Cape Coral – North Cape[h]	--	--	--	--	--	--	--	--	--	--	8.00	7.00	7.00	--	100%

a. Includes supplemental flow.

b. Reuse percentage is calculated by dividing "reuse flow" (including supplemental flow) by "WWTF flow." Percentages greater than 100 percent are reported as 100 percent.

c. The Ave Maria Facility came online in late 2006.

d. The Northeast and Southeast facilities, as stated by the *Collier County 2009 Annual Utility Inventory Report* (Collier County 2010), will not be constructed until after 2030.

e. The Orange Tree Water Reclamation Facility is to be acquired by Collier County Water-Sewer District in 2012.

f. Reclaimed water for Bonita Springs – East and Bonita Springs – West are reported as a combined total in the *2010 Reuse Inventory* (FDEP 2011).

g. The *2010 Reuse Inventory* (FDEP 2011) reports some data by individual facilities (Everest and Southwest). Other data are combined into a Water Independence for Cape Coral utility total.

h. Reuse flow is supplemented using ASR wells.

Table D-3. Continued.

Entity/Facility	2005 FDEP Rated WWTF Capacity (MGD)	2005 Average Daily WWTF Flow (MGD)	2005 Average Daily Reuse Flow (MGD)[a]	2005 Supple-mental Flow (MGD)	2005 Reuse[b]	2010 FDEP Rated WWTF Capacity (MGD)	2010 Average Daily WWTF Flow (MGD)	2010 Average Daily Reuse Flow (MGD)[a]	2010 Supple-mental Flow (MGD)	2010 Reuse[b]	2030 WWTF Capacity (MGD)	2030 Average Daily WWTF Flow (MGD)	2030 Average Daily Reuse Flow (MGD)	2030 Supple-mental Flow (MGD)	2030 Reuse[b]
Lee County (Continued)															
Florida Government Utility Authority (FGUA) – Lehigh Acres	2.50	2.26	2.25	0.00	100%	2.50	1.97	1.70	0.00	86%	5.00	2.31	2.31	0.00	100%
Fort Myers, City of – Central	11.00	6.48	0.80	0.00	12%	11.00	5.42	2.56	0.00	47%	11.00	8.00	7.92	0.00	99%
Fort Myers, City of – South	12.00	9.50	0.00	0.00	0%	12.00	9.44	0.00	0.00	0%	12.00	9.29	0.00	0.00	0%
Fort Myers, City of – East	--	--	--	--	--	--	--	--	--	--	8.00	7.23	7.23	0.00	100%
Lee County – Fiesta Village	5.00	2.88	1.72	0.00	60%	5.00	2.88	1.02	0.00	35%	5.10	4.08	4.00	0.00	98%
Lee County – Fort Myers Beach	6.00	3.46	2.55	0.00	74%	6.00	4.00	3.04	0.00	76%	6.00	3.94	3.84	0.00	97%
Lee County – Gateway	0.50	0.53	1.93	1.40	100%	1.00	0.72	2.44	1.72	100%	3.00	1.39	1.39	0.00	100%
Lee County – Pine Island	0.25	0.10	0.04	0.00	40%	0.25	0.09	0.09	0.00	100%	1.50	1.24	1.14	0.00	92%
Lee County – San Carlos	0.30	0.21	0.21	0.00	100%	0.30	0.14	0.14	0.00	100%	0.51	0.41	0.41	0.00	100%
Lee County – Three Oaks	3.27	2.40	2.40	0.00	100%	6.00	2.41	1.62	0.00	67%	8.38	6.71	6.71	2.40	100%
Lee County – Waterway Estates[c]	1.25	1.10	0.00	0.00	0%	1.25	0.14	0.00	0.00	0%	--	--	--	--	--
North Fort Myers[d]	2.00	1.40	0.44	0.00	31%	3.50	1.87	1.39	0.00	74%	7.50	7.00	5.25	0.00	75%
Sanibel, City of – Donax	1.60	1.44	0.99	0.00	69%	2.38	1.52	1.03	0.00	68%	2.38	1.75	0.48	0.00	27%
Sanibel, City of – Wulfert	0.13	0.03	0.03	0.00	100%	--	--	--	--	--	0.13	0.00	0.00	0.00	0%
Lee County Subtotal	**67.90**	**48.35**	**45.22**	**17.73**	**94%**	**82.18**	**48.02**	**45.62**	**15.15**	**94%**	**117.90**	**92.90**	**80.23**	**34.20**	**86%**
LWC Planning Area Total	**120.75**	**78.65**	**70.16**	**18.73**	**89%**	**143.23**	**74.98**	**68.02**	**17.10**	**91%**	**186.84**	**148.79**	**138.58**	**49.20**	**93%**

a. Includes supplemental flow.

b. Reuse percentage is calculated by dividing "reuse flow" (including supplemental flow) by "WWTF flow." Percentages greater than 100 percent are reported as 100 percent.

c. Waterway Estates Facility was not listed in the 2004–2006 FDEP reuse inventories (FDEP 2005, 2006, 2007); 2007 data are used in place of 2005 data.

d. Florida Government Utility Authority purchased North Fort Myers Utility in 2010.

Table D-4. Reuse types for facilities with capacities of 0.1 MGD or greater in the LWC Planning Area.

Entity/Facility	MGD 2005 Public Access Irrigation[a]	2005 Groundwater Recharge[b]	2005 Other[c]	2010 Public Access Irrigation[a]	2010 Groundwater Recharge[b]	2010 Other[c]	2030 Public Access Irrigation[a]	2030 Groundwater Recharge[b]	2030 Other[c]
Collier County									
Ave Maria[d]	--	--	--	0.90	0.00	0.00	3.55	0.00	0.00
Collier County – North County	8.90	0.00	0.00	7.07	0.00	0.00	18.69	0.00	0.00
Collier County – Northeast[e]	--	--	--	--	--	--	--	--	--
Collier County – Orange Tree[f]	--	--	--	--	--	--	1.00	0.00	0.00
Collier County – South County	6.10	0.00	0.00	4.13	0.00	1.08	13.01	0.00	0.00
Collier County – Southeast[e]	--	--	--	--	--	--	--	--	--
Florida Government Utility Authority (FGUA) – Golden Gate	0.00	1.19	0.00	0.00	0.49	0.00	0.25	1.14	0.00
Immokalee	0.00	0.00	0.47	0.00	0.00	0.54	1.00	1.30	1.50
Marco Island – Marco Island	1.19	0.08	0.00	1.46	0.00	0.00	2.50	0.00	0.00
Marco Island – Marco Shores	0.00	0.08	0.00	0.00	0.09	0.00	0.00	0.15	0.00
Naples, City of	4.88	0.00	0.59	4.65	0.00	0.00	15.00	0.00	0.00
Collier County Subtotal	**21.07**	**1.35**	**1.06**	**18.21**	**0.58**	**1.62**	**55.00**	**2.59**	**1.50**
Hendry County									
Clewiston	0.00	0.00	1.30	0.00	0.00	1.18	0.75	0.00	0.00
LaBelle, City of	0.00	0.00	0.24	0.00	0.33	0.00	0.00	0.38	0.00
Hendry County Subtotal	**0.00**	**0.00**	**1.54**	**0.00**	**0.33**	**1.18**	**0.75**	**0.38**	**0.00**
Lee County									
Bonita Springs – East[g]	6.30	0.00	0.00	7.20	0.00	0.00	7.55	0.00	0.00
Bonita Springs – West[g]	--	--	--	--	--	--	--	--	--
Cape Coral (Water Independence for Cape Coral)[h]	25.56	0.00	0.00	23.39	0.00	0.00	32.00	0.00	0.00
Cape Coral – Everest	--	--	--	--	--	--	--	--	--
Cape Coral – North Cape[i]	--	--	--	--	--	--	--	--	--
Cape Coral – Southwest	--	--	--	--	--	--	--	--	--

a. Public access irrigation includes golf courses, residential, parks, common areas, and other public access areas.

b. Groundwater recharge includes rapid infiltration basins, percolation ponds, shallow injection wells, and ASR wells.

c. Other includes agriculture, wetlands, cooling water, treatment processes, toilet flushing, etc.

d. Ave Maria came online in late 2006.

e. These regional facilities are planned beyond 2030.

f. The Orange Tree Water Reclamation Facility is to be acquired by Collier County Water-Sewer District in 2012.

g. Reclaimed water for Bonita Springs – East and Bonita Springs – West are a reported as a combined total in the 2010 Reuse Inventory (FDEP 2011).

h. The *2010 Reuse Inventory* (FDEP 2011) reports some data by individual facilities (Everest and Southwest). Other data are combined into a Water Independence for Cape Coral utility total.

i. The North Cape Facility is proposed at this time.

Table D-4. Continued.

Entity/Facility	MGD 2005 Public Access Irrigation[a]	2005 Groundwater Recharge[b]	2005 Other[c]	2010 Public Access Irrigation[a]	2010 Groundwater Recharge[b]	2010 Other[c]	2030 Public Access Irrigation[a]	2030 Groundwater Recharge[b]	2030 Other[c]
Lee County (Continued)									
Florida Government Utility Authority (FGUA) – Lehigh Acres	0.30	1.95	0.00	0.67	1.03	0.00	1.38	0.83	0.00
Fort Myers, City of – Central	0.12	0.00	0.80	1.48	0.00	1.08	6.41	0.00	1.51
Fort Myers, City of – East	--	--	--	--	--	--	7.23	0.00	0.00
Fort Myers, City of – South	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Lee County – Fiesta Village	1.64	0.00	0.08	0.99	0.00	0.04	4.00	0.00	0.00
Lee County – Fort Myers Beach	2.25	0.30	0.00	2.43	0.12	0.48	3.29	0.55	0.00
Lee County – Gateway	1.93	0.00	0.00	0.72	1.72	0.00	1.39	0.00	0.00
Lee County – Pine Island	0.04	0.00	0.04	0.00	0.00	0.08	0.00	0.14	1.00
Lee County – San Carlos	0.21	0.00	0.00	0.14	0.00	0.00	0.41	0.00	0.00
Lee County – Three Oaks	2.40	0.00	0.00	1.37	0.00	0.25	6.71	0.00	0.00
Lee County – Waterway Estates[d]	--	--	--	0.00	0.00	0.00	--	--	--
North Fort Myers[e]	0.44	0.00	0.00	1.39	0.00	0.00	5.25	0.00	0.00
Sanibel, City of – Donax	0.85	0.00	0.14	0.88	0.00	0.16	0.80	0.42	0.00
Sanibel, City of – Wulfert	0.03	0.00	0.00	--	--	--	0.00	0.00	0.00
Lee County Subtotal	**42.07**	**2.25**	**1.06**	**40.66**	**2.87**	**2.09**	**76.42**	**1.94**	**2.51**
LWC Planning Area Total	**63.14**	**3.60**	**2.12**	**58.87**	**3.78**	**4.89**	**132.17**	**4.91**	**4.01**

a. Public access irrigation includes golf courses, residential, parks, common areas, and other public access areas.

b. Groundwater recharge includes rapid infiltration basins, percolation ponds, shallow injection wells, and ASR wells.

c. Other includes agriculture, wetlands, cooling water, treatment processes toilet flushing, etc.

d. Waterway Estates Facility was not listed in the 2004–2006 FDEP reuse inventories (FDEP 2005, 2006, 2007); 2007 data are used in place of 2005 data.

e. The Florida Government Utility Authority purchased North Fort Myers Utility in 2010.

Table D-5. Wastewater disposal types for facilities with capacities of 0.1 MGD or greater in the LWC Planning Area.

Entity/Facility	MGD								
	2005			2010			2030		
	Deep Injection Well	Ocean Outfall Discharge	Surface Water Discharge[a]	Deep Injection Well	Ocean Outfall Discharge	Surface Water Discharge[a]	Deep Injection Well	Ocean Outfall Discharge	Surface Water Discharge[a]
Collier County									
Ave Maria[b]	--	--	--	0.00	0.00	0.00	0.00	0.00	0.00
Collier County – North County	1.20	0.00	0.00	1.60	0.00	0.00	0.99	0.00	0.00
Collier County – Northeast[c]	--	--	--	--	--	--	--	--	--
Collier County – Orange Tree	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Collier County – South County	1.10	0.00	0.00	1.93	0.00	0.00	0.68	0.00	0.00
Collier County – Southeast[c]	--	--	--	--	--	--	--	--	--
Florida Government Utility Authority (FGUA) – Golden Gate	0.00	0.00	0.00	0.65	0.00	0.00	0.20	0.00	0.00
Immokalee	1.60	0.00	0.00	0.96	0.00	0.00	1.20	0.00	0.00
Marco Island – Marco Island	0.87	0.00	0.00	0.34	0.00	0.00	0.40	0.00	0.00
Marco Island- Marco Shores	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Naples, City of	0.00	0.00	1.59	0.00	0.00	1.94	0.00	0.00	0.00
Collier County Subtotal	**4.77**	**0.00**	**1.59**	**5.48**	**0.00**	**1.94**	**3.47**	**0.00**	**0.00**
Hendry County									
Clewiston	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.25
LaBelle, City of	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hendry County Subtotal	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**1.25**
Lee County									
Bonita Springs – East[d]	0.30	0.00	0.00	0.04	0.00	0.00			
Bonita Springs – West[d]	--	--	--	--	--	--	--	--	--
Cape Coral (Water Independence for Cape Coral)[e]	0.00	0.00	0.00	0.27	0.00	0.00			
Cape Coral – Everest/North Cape[f]/Southwest	--	--	--	--	--	--	--	--	--

a. Surface water discharge not including ocean outfalls.

b. Ave Maria came online in late 2006.

c. This is a regional facility planned sometime in the future and no projected numbers were provided.

d. Reclaimed water is produced by the Bonita Springs Utilities East and West facilities but data are not reported individually in the *2010 Reuse Inventory* (FDEP 2011).

e. The *2010 Reuse Inventory* (FDEP 2011) reports some data by individual facilities (Everest and Southwest). Other data are combined into a Water Independence for Cape Coral utility total.

f. The North Cape Facility is proposed at this time.

g. Waterway Estates Facility was not listed in the 2004–2006 FDEP reuse inventories (FDEP 2005, 2006, 2007); 2007 data are used in place of 2005 data.

h. Florida Government Utility Authority purchased North Fort Myers Utility in 2010.

Table D-5. Continued.

Entity/Facility	MGD								
	2005						2005		
	Deep Injection Well	Ocean Outfall Discharge	Surface Water Discharge[a]	Deep Injection Well	Ocean Outfall Discharge	Surface Water Discharge[a]	Deep Injection Well	Ocean Outfall Discharge	Surface Water Discharge[a]
Lee County (Continued)									
Florida Government Utility Authority (FGUA) – Lehigh Acres	0.00	0.00	0.00	0.28	0.00	0.00	0.10	0.00	0.00
Fort Myers, City of – Central	0.00	0.00	5.68	0.00	0.00	3.16	0.00	0.00	0.00
Fort Myers, City of – East	--	--	--	--	--	--	0.00	0.00	0.00
Fort Myers, City of – South	0.00	0.00	9.50	0.00	0.00	9.44	9.29	0.00	0.00
Lee County – Fiesta Village	0.00	0.00	1.17	0.00	0.00	1.86	0.08	0.00	0.00
Lee County – Fort Myers Beach	0.90	0.00	0.00	0.96	0.00	0.00	0.10	0.00	0.00
Lee County – Gateway	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Lee County – Pine Island	0.06	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00
Lee County – San Carlos	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Lee County – Three Oaks	0.00	0.00	0.00	0.79	0.00	0.00	0.00	0.00	0.00
Lee County – Waterway Estates[b]	--	--	--	0.00	0.00	0.14	--	--	--
North Fort Myers[c]	0.96	0.00	0.00	0.60	0.00	0.00	1.75	0.00	0.00
Sanibel, City of – Donax	0.44	0.00	0.00	0.40	0.00	0.00	0.00	0.00	0.00
Sanibel, City of – Wulfert	0.00	0.00	0.00	--	--	--	0.00	0.00	0.00
Lee County Subtotal	**2.66**	**0.00**	**16.35**	**3.34**	**0.00**	**14.60**	**11.42**	**0.00**	**0.00**
LWC Planning Area Total	**7.43**	**0.00**	**17.94**	**8.82**	**0.00**	**16.54**	**14.89**	**0.00**	**1.25**

a. Surface water discharge not including ocean outfalls.

b. Waterway Estates Facility was not listed in the 2004–2006 FDEP reuse inventories (FDEP 2005, 2006, 2007); 2007 data are used in place of 2005 data.

c. Florida Government Utility Authority purchased North Fort Myers Utility in 2010.

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E

Water Conservation

INTRODUCTION

Water conservation, covered in **Chapter 4** of this update (see the Planning Document), is essential to water supply planning and water resource management. Water conservation is considered a water source option because it reduces or delays the need for future expansion of the water supply infrastructure.

This appendix provides further detail about water conservation in the LWC Planning Area and includes the following:

- Status of water conservation implementation
- Water conservation rate structures
- Water conservation versus development of additional water supplies
- Goal-based water conservation plans
- Summary of permitted golf courses, water sources, and irrigation acreage
- Water Savings Incentive Programs projects funded for Fiscal Years 2007–2012

Public Water Supply – Conservation

Table E-1. Charlotte County Public Water Supply water conservation implementation status.

Public Water Supply Utility	Irrigation Hours Ordinance	Florida-Friendly Landscape Ordinance[a]	Ultralow Volume Fixtures Ordinance[b]	Rain Sensor Ordinance	Water Conservation Rate Structure	Leak Detect & Repair Program[c]	Public Education Program[d]
Charlotte County							
Charlotte County[e]	Not Applicable (NA)	NA	NA	NA	NA	NA	NA
Town and Country Utility Company[f]	Yes	Yes	Yes	Yes	To Be Determined (TBD)	TBD	TBD

Note: This information was gathered from consumptive use permits, water conservation plans, and utility staff surveys completed in August and September 2010.

a. Includes Xeriscape™ ordinances not updated to reflect Florida-friendly principles.

b. Utility adopts either its own ordinance or Florida Building Code.

c. Program initiated when unaccounted for water is greater than 10 percent.

d. Programs can vary depending on permit requirements and other factors.

e. Located in Southwest Florida Water Management District.

f. Follows Charlotte County water conservation ordinances.

Table E-2. Collier County Public Water Supply water conservation implementation status.

Public Water Supply Utility	Irrigation Hours Ordinance	Florida-Friendly Landscape Ordinance[a]	Ultralow Volume Fixtures Ordinance[b]	Rain Sensor Ordinance	Water Conservation Rate Structure	Leak Detect & Repair Program[c]	Public Education Program[d]
Collier County							
Ave Maria Utility Company[e]	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Collier County Water-Sewer District	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Everglades City, City of	Yes	No	Yes	Yes	Yes	Yes	Yes
Florida Government Utility Authority[e]	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Immokalee Water and Sewer District[e]	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Marco Island Utilities	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Naples, City of – Utility Department	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Orange Tree Utility Company[e]	Yes	Yes	Yes	Yes	No	Yes	Yes
Port of the Islands Community Improvement District[e]	Yes	Yes	Yes	Yes	No	Yes	Yes

Note: This information was gathered from consumptive use permits, water conservation plans, and utility staff surveys completed in August and September 2010.

a. Includes Xeriscape™ ordinances not updated to reflect Florida-friendly principles.
b. Utility adopts either its own ordinance or Florida Building Code.
c. Program initiated when unaccounted for water is greater than 10 percent.
d. Programs can vary depending on permit requirements and other factors.
e. Follows Collier County water conservation ordinances.

Table E-3. Glades County Public Water Supply water conservation implementation status.

Public Water Supply Utility	Irrigation Hours Ordinance	Florida-Friendly Landscape Ordinance[a]	Ultralow Volume Fixtures Ordinance[b]	Rain Sensor Ordinance	Water Conservation Rate Structure	Leak Detect & Repair Program[c]	Public Education Program[d]
Glades County							
Moore Haven Utilities[e]	Yes	Yes	Yes	Yes	No	Yes	Yes

Note: This information was gathered from consumptive use permits, water conservation plans, and utility staff surveys completed in August and September 2010.

a. Includes Xeriscape™ ordinances not updated to reflect Florida-friendly principles.
b. Utility adopts either its own ordinance or Florida Building Code.
c. Program initiated when unaccounted for water is greater than 10 percent.
d. Programs can vary depending on permit requirements and other factors.
e. Follows Hendry County water conservation ordinances.

Table E-4. Hendry County Public Water Supply water conservation implementation status.

Public Water Supply Utility	Irrigation Hours Ordinance	Florida-Friendly Landscape Ordinance[a]	Ultralow Volume Fixtures Ordinance[b]	Rain Sensor Ordinance	Water Conservation Rate Structure	Leak Detect & Repair Program[c]	Public Education Program[d]
Hendry County							
Clewiston Utilities[e]	Yes	No	Yes	Yes	Yes	Yes	Yes
Florida Department of Corrections (Hendry County Correctional Institution; closed in June 2011)[f]	Yes	Yes	Yes	Yes	No	No	No
LaBelle, City of – Department of Public Works	Yes	No	Yes	Yes	Yes	Yes	Yes
Port LaBelle Utility System of Hendry County[f]	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: This information was gathered from consumptive use permits, water conservation plans, and utility staff surveys completed in August and September 2010.

a. Includes Xeriscape™ ordinances not updated to reflect Florida-friendly principles.
b. Utility adopts either its own ordinance or Florida Building Code.
c. Program initiated when unaccounted for water is greater than 10 percent.
d. Programs can vary depending on permit requirements and other factors.
e. The city’s water conservation ordinance is enacted when a water shortage or water shortage emergency is declared by the South Florida Water Management District.
f. Follows Hendry County water conservation ordinances.

Table E-5. Lee County Public Water Supply water conservation implementation status.

Public Water Supply Utility	Irrigation Hours Ordinance	Florida-Friendly Landscape Ordinance[a]	Ultralow Volume Fixtures Ordinance[b]	Rain Sensor Ordinance	Water Conservation Rate Structure	Leak Detect & Repair Program[c]	Public Education Program[d]
Lee County							
Bonita Springs Utility[e]	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cape Coral Utilities	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Citrus Park RV Resort[f]	Yes	Yes	Yes	Yes	No	Yes	No
City of Fort Myers Public Utility	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Florida Government Utility Authority (FGUA) – Lake Fairways[f]	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Florida Government Utility Authority (FGUA) – Lehigh Acres[f]	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Greater Pine Island Water Association[f]	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Island Water Association[f]	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Lee County Utilities	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: This information was gathered from consumptive use permits, water conservation plans, and utility staff surveys completed in August and September 2010.

a. Includes Xeriscape™ ordinances not updated to reflect Florida-friendly principles.
b. Utility adopts either its own ordinance or Florida Building Code.
c. Program initiated when unaccounted for water is greater than 10 percent.
d. Programs can vary depending on permit requirements and other factors.
e. Bonita Springs Utility serves the City of Bonita Springs and the Estero area.
f. Follows Lee County water conservation ordinances. Island Water Association follows either Lee County or City of Sanibel ordinances.

Water Conservation Rate Structures

Table E-6. Single-family residential water rates in the LWC Planning Area.

Utility Name	Effective Date	Utility Tax	Single Family Residential Water Rates $/1,000 gallons[a] Base Charge	1	2	3	4	5	6	$/3,000 gallons	$/7,000 gallons	$/10,000 gallons
Charlotte County												
Charlotte County Utilities/Burnt Store Marina	October 2009	–	**$21.77**	**$4.67** 0–5,999	**$5.37** 6,000–10,999	**$6.77** 11,000–15,999	**$7.70** 16,000–25,999	**$8.87** >26,000	–	**$35.78**	**$55.16**	**$71.27**
Collier County												
Ave Maria Utility Company	–	–	**$26.59**	**$1.70** 0–5,000	**$2.56** 5,001–10,000	**$3.42** 10,001–15,000	**$5.11** >15,000	–	–	**$31.69**	**$40.21**	**$47.89**
Florida Government Utility Authority (FGUA) –Golden Gate	October 2009	–	**$22.39**	**$5.06** 0–6,000	**$5.56** 6,001–10,000	**$6.32** 10,001–20,000	**$7.90** >20,000	–	–	**$37.57**	**$58.31**	**$74.99**
Immokalee Water & Sewer District	January 2009	–	**$15.11**	**$2.16** 0–10,000	**$3.05** >10,000	–	–	–	–	**$21.59**	**$30.23**	**$36.71**
Marco Island Utilities	October 2009	–	**$27.90**	**$3.48** 0–21,000	**$5.22** 21,001–32,000	**$6.96** >32,000	–	–	–	**$35.70**	**$46.90**	**$55.90**
Naples Utility Department, City of (within city limits)	October 2009	–	**$7.94**	**$1.28** 0–7,500	**$2.25** 7,501–15,000	**$3.21** 15,001–22,500	**$3.85** >22,500	–	–	**$11.78**	**$16.90**	**$23.17**
Naples (surrounding unincorporated area)	October 2009	–	**$9.93**	**$1.60** 0–7,500	**$2.81** 7,501–15,000	**$4.01** 15,001–22,500	**$4.81** >22,500	–	–	**$14.73**	**$21.13**	**$28.96**
Orange Tree Utility Company	–	–	**$15.29**	**$4.70**	–	–	–	–	–	**$29.39**	**$48.19**	**$62.29**

a. Information collected from utilities; valid as of July 2010.

b. The first 1,000 gallons are included in the base charge.

Table E-7. Continued.

Utility Name	Effective Date	Utility Tax	Single Family Residential Water Rates $/1,000 gallons[a] Base Charge	1	2	3	4	5	6	$/3,000 gallons	$/7,000 gallons	$/10,000 gallons
Glades County												
Moore Haven Utilities	November 2007	–	**$28.20**	**$3.10**						**$37.50**	**$49.90**	**$59.20**
Hendry County												
Clewiston Utilities	January 2006	–	**$6.00**	**$3.91** 0–10,000	**$4.30** 10,001–20,000	**$4.73** >20,000	–	–	–	**$17.73**	**$33.37**	**$45.10**
Labelle Department of Public Works, City of (within city limits)	March 2009	–	**$14.71**	**$1.90**	–	–	–	–	–	**$20.41**	**$28.01**	**$33.71**
Labelle (surrounding unincorporated area)	March 2009	–	**$18.39**	**$2.38**	–	–	–	–	–	**$25.53**	**$35.05**	**$42.19**
Port LaBelle	June 2007	–	**$20.00**	**$2.75** 0–2,000	**$3.25** 2,001–4,000	**$4.00** 4,001–8,000	**$5.50** >8,000	–	–	**$28.75**	**$44.00**	**$59.00**
South Shore Water Association (serving Harlem)	–	–	[b]**$30.41**	**$4.15** 1,001–5,000	**$4.20** 5,001–10,000	**$4.25** 10,001–15,000	**$5.00** 15,001–20,000	**$5.45** >20,000	–	**$38.71**	**$55.41**	**$68.01**
Lee County												
Bonita Springs Utilities	October 2008	–	**$11.88**	**$3.57** 0–6,000	**$4.34** 6,001–12,000	**$5.10** 12,001–18,000	**$5.86** >18,000	–	–	**$22.59**	**$37.64**	**$50.66**
Cape Coral Utilities, City of	–	–	**$14.86**	**$3.34** 0–5,000	**$3.91** 5,001–10,000	**$5.88** 10,001–15,000	**$8.80** 15,001–20,000	**$9.70** 20,001–30,000	**$10.67** >30,000	**$24.88**	**$39.38**	**$51.11**

a. Information collected from utilities; valid as of July 2010.

b. The first 1,000 gallons are included in the base charge.

Table E7. Continued.

Utility Name	Effective Date	Utility Tax	Single Family Residential Water Rates $/1,000 gallons[a]							$/3,000 gallons	$/7,000 gallons	$/10,000 gallons
			Base Charge	1	2	3	4	5	6			
Florida Government Utility Authority (FGUA) – Lehigh Acres	October 2009	–	**$12.46**	**$4.56** 0–6,000	**$5.25** 6,001–12,000	**$5.93** 12,001–18,000	**$6.84** >18,000	–	–	**$26.14**	**$45.07**	**$60.82**
Fort Myers Public Utility, City of (within city limits)	October 2009	10%	**$8.02**	**$3.93** 0–5,000	**$6.89** 5,001–10,000	**$8.61** 10,001–15,000	**$12.92** >15,000	–	–	**$21.79**	**$45.60**	**$68.33**
Fort Myers (surrounding unincorporated area)	October 2009	10%	**$10.02**	**$4.92** 0–5,000	**$8.61** 5,001–10,000	**$10.77** 10,001–15,000	**$16.14** >15,000	–	–	**$27.26**	**$57.02**	**$85.44**
Fort Myers Beach, Town of	January 2010	–	**$12.02**	**$4.80** 0–6,000	**$5.80** 6,001–30,000	**$6.80** 30,001–50,000	**$7.80** >50,000	–	–	**$26.42**	**$46.62**	**$64.02**
Greater Pine Island Water Association	–	–	**$14.36**	**$3.02** 0–2,000	**$3.38** 2,001–5,000	**$3.77** 5,001–10,000	**$4.71** 10,001–15,000	**$5.65** >15,000	–	**$23.78**	**$38.08**	**$49.39**
Island Water Association	March 2009	–	**$13.00**	**$3.30** 0–5,000	**$3.95** 5,001–10,000	**$4.60** 10,001–15,000	**$5.25** 15,001–20,000	**$5.90** 20,001–25,000	**$6.55** >25,000	**$22.90**	**$37.40**	**$49.25**
Lee County Utilities	–	–	**$10.62**	**$2.84** 0–6,000	**$3.49** 6,001–12,000	**$4.14** 12,001–18,000	**$5.43** >18,000	–	–	**$19.14**	**$31.15**	**$41.62**

a. Information collected from utilities; valid as of July 2010.

b. The first 1,000 gallons are included in the base charge.

Water Conservation versus Development of Alternative Water Supplies

The following three water supply development scenarios compare alternative supply development costs to the costs of saving water through aggressive water conservation programs:

- Costs required for full facility construction of between 1 and 5 million of gallons of water per day (MGD) using the surficial aquifer system (fresh water) or the Upper Floridan aquifer (brackish water) as source.
- Expansion of current facility production through the addition of a low-pressure reverse osmosis (RO) train.
- Expansion of current facility production using a nanofiltration train.

Full Facility Construction

Costs for full facility construction to provide 1 MGD to 5 MGD capacity range from $3.42 per 1,000 gallons for a nanofiltration facility using fresh groundwater, to $11.33 per 1,000 gallons for a low-pressure RO facility using brackish groundwater (CDM 2007a, 2007b). Costs include expenses for raw water supply, pretreatment, nanofiltration or RO process train(s), and post-treatment. Costs such as annual operations and maintenance expenses, and renewal and replacement fund deposits that are not part of the operations and maintenance expense, are also included. The cost estimates presented in this appendix are considered to be order-of-magnitude estimates as defined by the American Association of Cost Engineers, accurate within +50 percent or -30 percent.

Facility Expansion

Facility expansion costs for the purchase and operation of 1 MGD to 5 MGD capacity low-pressure RO trains range from $3.69 to $10.38 per 1,000 gallons. Costs for 1 MGD to 5 MGD nanofiltration process trains range from $3.13 to $9.07 per 1,000 gallons of finished water (CDM 2007a, 2007b). Facility expansion costs include expenses for cartridge filters; membrane feed pumps; pretreatment chemicals; the nanofiltration or RO membrane units; piping inside the membrane building; cleaning system; instruments and controls; and electrical equipment. **Table E-7** compares the production costs of developing 1,000 gallons of water supply and the costs of saving 1,000 gallons through water conservation. **Table E-8** shows the costs per day to develop 1 MGD, 3 MGD, or 5 MGD of water supply versus water conservation.

Table E-7. Comparison of alternative water supply development production costs and water conservation costs for 1,000 gallons.

Water Conservation[a]	New Facility Construction		Expansion of Existing Facility	
Typical Retrofit/Replacement Programs[b]	Nanofiltration Capacity 1 to 5 MGD	Low-pressure RO Capacity 1 to 5 MGD	Nanofiltration Process Train Capacity 1 to 5 MGD	Low-pressure RO Train Capacity 1 to 5 MGD
$0.40 to $3.00 [c]	$9.46 to $3.42	$11.33 to $4.41	$9.07 to $3.13	$10.38 to $3.69

a. The cost of 1,000 gallons of water saved is based on the cost of all devices across the service life and the number of gallons saved per day normalized to 1,000 gallons. The actual figure is calculated as follows:
[(Cost per device × Number of devices)/Service life/365] / (Gallons saved per day by all devices in program/1,000).

b. Typical programs support the purchase and installation of, but may not be limited to, efficient toilets, faucet aerators, showerheads, irrigation sprayheads, rain and soil moisture sensors, and computerized irrigation controllers for large-scale irrigation.

c. Water conservation projects exceeding $3.00 per 1,000 gallons of water saved are typically not implemented by utilities; therefore, projects with costs above this threshold were not included in this comparison.

Table E-8. Comparison of alternative water supply development production costs per day and water conservation costs per day.

	Water Conservation[a]	New Facility Nanofiltration	New Facility RO	Nanofiltration Process Train Expansion	Low-pressure RO Train Expansion
1 MGD	$400 - $3,000	$9,460	$11,330	$9,070	$10,380
3 MGD	$1,200 - $9,000	$13,500	$17,430	$12,330	$14,580
5 MGD	$2,000 - $15,000	$17,100	$22,050	$15,650	$18,450

As shown in **Table E-8**, the unit cost per 1,000 gallons of finished water goes down as facility expansion capacity increases from 1 MGD to 5 MGD. In addition to economies of scale, fixed capital costs associated with treatment processes and equipment do not decrease with the reduction in the facility treatment capacity. For example, the fixed capital cost of a deep injection well for concentrate disposal for a 1-MGD low-pressure RO water treatment facility is the same as the cost for concentrate disposal for a 5-MGD or a 20-MGD low-pressure RO facility. The concentrate disposal cost becomes a much larger component of the total project cost as the facility's expanded capacity decreases. For this reason, many utilities do not consider low-pressure RO (or other membrane water treatment process expansions) cost-effective below the 3-MGD to 5-MGD capacity range.

The cost ranges for common water treatment technologies shown in **Table E-8** illustrate an inverse relationship of cost to production. This is due to initial fixed capital costs and economies of scale in production. The cost range for conservation items (per 1,000 gallons saved) relates to the costs for the various conservation items themselves (faucet aerators, toilets, irrigation hardware, etc.), minus any shared costs with end users (via utility rebate programs) and the cost of program administration. The fixed savings rates of each conservation item can have a linear effect on total program cost as the program size increases, in contrast to common water treatment technologies. Once administrative and end-user shared costs have been established, the costs and savings rates of the individual conservation items are likely to be the strongest driver of conservation program expenses.

Within the 1-MGD to 5-MGD capacity range, the unit cost for the production of new water using an upgraded technical process is nearly identical for the costs of capacity expansion of an existing facility and the construction of a new facility. Within the 1-MGD to 5-MGD capacity range, both water supply development cost options are significantly higher than the cost of water conservation. For many utilities, water conservation can be more cost-effective than developing alternative water supply solutions and should be part of its demand management planning.

Goal-based Water Conservation Plans

A goal-based water conservation program is a longer-term water use reduction program that has a specified numerical water use target. The target is expressed in per capita use or quantifiable volume of water saved. A well-designed goal-based water conservation program can help a utility meet future water supply demands without building new facilities or wells.

Goal-based Water Use Efficiency Plan

A good example of a goal-based water use efficiency plan is the *Miami-Dade County Water Use Efficiency Five-Year Plan* (Miami-Dade County 2006). This initial five-year plan became the basis for the *Miami-Dade County Water Use Efficiency 20-Year Plan* (Miami-Dade County 2007), which is estimated to generate 19.6 MGD in water savings by 2026. Since 2006, each dollar the Miami-Dade Water and Sewer Department (MDWASD) has spent implementing its water conservation plan has deferred or eliminated between $5 and $9 in capital project costs. This calculation is based on the initial cost estimates of water supply development and quantified water conservation savings observed through 2009.

The county's water conservation plan contains both quantifiable and nonquantifiable conservation best management practices and measures. Some of the practices and measures include plumbing fixture retrofit projects, a permanent two-day-per-week residential irrigation schedule, and irrigation efficiency improvement projects.

The quantifiable measures included in the MDWASD's goal-based water conservation plan were evaluated and selected using the Conserve Florida Water Clearinghouse's water conservation tool, the *EZ Guide*. Only measures costing the utility less than $0.9605 per 1,000 gallons saved (the cost of water production for the utility) were included in the initial plan. The MDWASD is currently revising its production cost per gallon of water to include all withdrawal, treatment, and transportation costs.

The water conservation plan implementation, together with smaller-than-projected population growth rates, culminated in a per-capita water demand reduction from 154 gallons per capita per day (GPCD) in 2005 (before the plan was adopted) to 140 GPCD in 2009. Since 2006, the MDWASD has spent $3,046,000 implementing its water conservation plan. The county achieved a three-year cumulative water savings of 9.59 MGD. Note that the implementation cost does not include costs associated with water loss reduction efforts.

Table E-9 summarizes the MDWASD's water conservation budget, the estimated water savings from the quantifiable water conservation measures, and the overall shift in GPCD over the three-year period from 2006 through 2009.

Table E-9. Miami-Dade Water and Sewer Department water conservation plan expenses and effects on consumption by year.

	2006	2007	2008	2009
20-Year Water Conservation Plan Budget		$903,000	$943,000	$1,200,000
Estimated Water Saved (MGD)[a]		1.2	3.5	4.0
Finished Water Demand (MGD)	341.6	319.5	309.9	312.5
Water Demand (GPCD)	157.0	140.0	138.0	[b]140.0

a. Quantifiable conservation programs only.

b. Increased GPCD consumption from 2008 to 2009 is attributed, in part, to an increase in commercial consumption and in residential outdoor water use after the South Florida Water Management District (SFWMD) removed regional drought restrictions. The MDWASD then began a campaign to generate public awareness of the county's permanent, year-round, two-day-per-week watering restrictions.

The drop in per capita water demand enabled the MDWASD to reschedule its water supply development plan and extend the life of its consumptive use permit. **Figure E-1** shows the original and revised water supply development project schedules, and the pre- and post-conservation finished water demand curves. The development of Projects 1 and 2 (totaling 11.9 MGD of new water supply at a $16.7 million cost) was a limiting condition of the MDWASD's consumptive use permit. If these projects were completed, they would bridge the MDWASD's water supply needs until the Floridan wells (Projects 3, 5, and 8) became operational.

Projects 1 and 2 were initially halted due to water quality issues, but were not replaced. Water savings achieved through water conservation efforts is credited as one reason the county's projects were not replaced. As a result of the 17 MGD drop in GPCD since 2006, the MDWASD has remained within its Biscayne aquifer water supply allocation and subsequently has shifted its 2027 demand to 2030. The District has since extended the MDWASD's current consumptive use permit by three years, to 2030, which defers additional expenses incurred for modeling and other necessary permit application preparation.

The county's new water supply development schedule postpones the construction of four of its remaining six projects. **Table E-10** provides a list of specific measures taken.

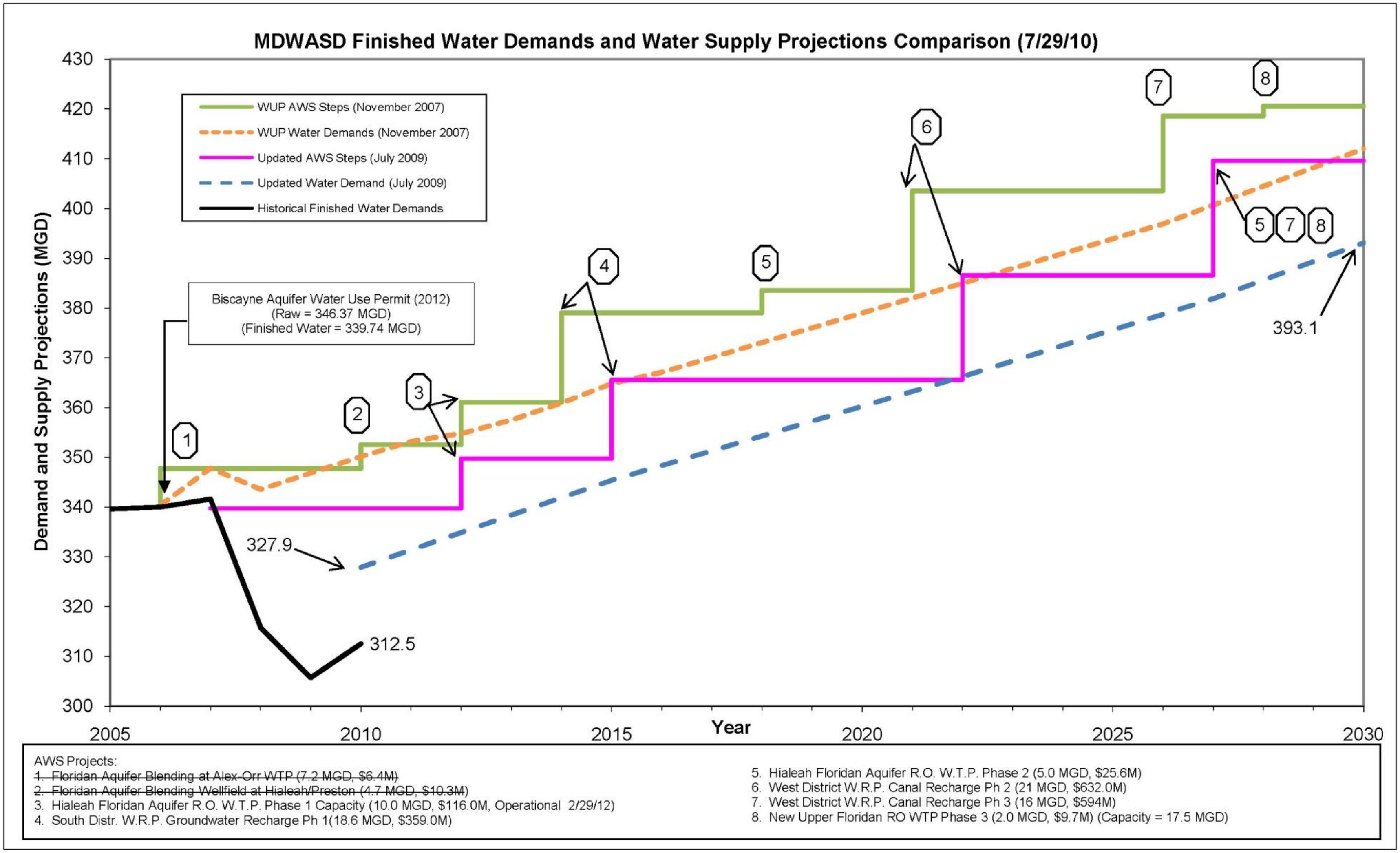

Figure E-1. MDWASD finished water demands and water supply projections comparison.

Table E-10. Miami-Dade Goal-based Water Use Efficiency Plan water conservation measures and best management practices (BMPs).

Operational Measures
Metering program
System audits and leak detection/repair
Recycled water for filter backwashing at treatment facilities
Distribution system pressure control
Wholesale water supplier assistance program
Policy Measures
Ultralow volume plumbing fixtures for new ordinance
Year-round outdoor irrigation restrictions
Use of Florida-friendly landscaping principles
Use of advanced irrigation controllers on residential systems
Expedited review of building permit applications
Sustainable development building measures for county buildings
Reuse feasibility study
Conservation rate structure
Requirements for water conservation planning/implementation by wholesale customers
Water re-metering ordinance
Proposed retrofit upon sale ordinance
Proposed mandatory reuse area ordinance
Educational Measures
Media campaigns
Public informational materials
In-school programs
Outreach and public education
Water conservation retrofit kit giveaways
Quantifiable BMPs
Non-potable irrigation source replacement or rebates
Showerhead exchange retrofit kit giveaways
High-efficiency clothes washer rebates
Water efficiency irrigation system evaluations and rebates for advanced controllers and soil moisture sensors
Industrial, commercial, and institutional water use evaluations

LWC Golf Courses – Irrigation

Table E-11. Summary of permitted golf courses in the LWC Planning Area, water sources, and irrigated acreage as of February 1, 2010.

Golf Course Name	City	Irrigated Acreage	Self-Supplied Acreage	Number of Golf Course Holes	Reclaimed Use	FAS Use	Other Source Use[a]	Consumptive Use Permit
Charlotte County								
Prestwick Golf Course	Punta Gorda	40	40	18			Yes	08-00093-W
Charlotte County Total		**40**	**40**	**18**				
Collier County								
Arrowhead Golf Course at Heritage Greens	Naples	155	155	18			Yes	11-00718-W
Audubon Country Club	Naples	110	45	18	Yes		Yes	11-00437-W
Bear's Paw Country Club	Naples	144	70	18	Yes		Yes	11-00130-W
Bentley Village Golf Club	Naples	65	65	18			Yes	11-00381-W
Bonita Bay East	Bonita Springs	300	300	36			Yes	11-01336-W
Calusa Pines Golf Club	Naples	223	223	18			Yes	11-01843-W
Cedar Hammock Golf & Country Club	Naples	152	152	18			Yes	11-01711-W
Collier's Reserve Country Club	Naples	139	80	18	Yes		Yes	11-00917-W
Country Club of Naples	Naples	115	0	18	Yes			11-00064-W
Countryside Golf & Country Club	Naples	78	0	18	Yes			11-00377-W
Cypress Woods	Naples	120	120	18			Yes	11-01561-W
Del Webb at Ave Maria	Ave Maria	132	132	18			Yes	11-02336-W
Eagle Creek Golf & Country Club	Naples	190	190	18			Yes	11-00179-W
Evergreen Golf & Country Club	Naples	25	25	18			Yes	11-00050-W
Fiddlers Creek	Naples	783	783	54			Yes	11-01808-W
Forest Glen of Naples	Naples	127	0	18			Yes	11-01176-W
Foxfire Country Club	Naples	228	0	27	Yes			11-00221-W
Glades Country Club	Naples	188	0	36	Yes			11-00020-W
Glen Eagle Golf & Country Club	Naples	52	52	18			Yes	11-00475-W
Golden Gate Country Club	Golden Gate	90	90	18			Yes	11-00138-W
Golf Club of the Everglades	Naples	130	130	18			Yes	11-00661-W
Grey Oaks Country Club	Naples	629	400	54	Yes		Yes	11-00803-W
Hammock Bay (Marco Shores)	Marco Island	109	0	18	Yes			11-02058-W
Heritage Bay Bayvest	Naples	118	118	18			Yes	11-02235-W
Heritage Bay Centex	Naples	136	136	18			Yes	11-02319-W
Heritage Greens	Naples	95	95	18			Yes	11-00718-W

a. Other sources may include surface water, surficial aquifer system, or intermediate aquifer system.

Table E-11. Continued.

Golf Course Name	City	Irrigated Acreage	Self-Supplied Acreage	Number of Golf Course Holes	Reclaimed Use	FAS Use	Other Source Use[a]	Consumptive Use Permit
Hideaway Country Club	Marco Island	43	0	18	Yes			no permit
Hideout Golf Club	Naples	120	120	18			Yes	11-01701-W
High Point Country Club	Naples	20	0	9	Yes		Yes	11-00019-W
Hole in the Wall Golf Club	Naples	70	0	18	Yes			11-00030-W
Imperial Golf Club	Bonita Springs	321	0	36	Yes			11-02104-W
Kensington Park	Naples	108	108	18			Yes	11-00993-W
Kinsale Golf Club	Naples	114	114	18			Yes	11-01970-W
Lakewood Country Club	Naples	48	0	18	Yes			11-00150-W
LaPlaya Golf Club	Naples	113	0	18	Yes			11-00139-W
Lely Resort Golf & Country Club	Naples	350	180	36	Yes		Yes	11-00044-W
Marco Island Golf Course	Marco Island	90	0	18	Yes			no permit
Marriott Marco Golf Club	Naples	120	120	18			Yes	11-00685-W
Mirasol Golf Club	Naples	199	199	36			Yes	11-02032-W
Naples Beach Hotel & Golf Club	Naples	94	0	18	Yes			11-00063-W
Naples Golf Club South	Naples	120	120	18			Yes	11-01281-W
Naples Grande Golf Club	Naples	100	100	18			Yes	11-00806-W
Naples Heritage Golf & Country Club	Naples	155	155	18			Yes	11-00660-W
Naples Lake Country Club	Naples	164	164	18			Yes	11-01623-W
Naples National Golf Club	Naples	50	50	18			Yes	11-00975-W
Naples Reserve Golf Club	Naples	243	243	18			Yes	11-01836-W
Old Collier Golf Club	Naples	90	90	18		Yes	Yes	11-01758-W
Olde Florida Golf Club	Naples	105	105	18			Yes	11-00898-W
Parklands Collier	Naples	195	195	36			Yes	11-02233-W
Pelican Marsh	Naples	941	377	72	Yes		Yes	11-01118-W
Quail Creek Country Club	Naples	457	457	36			Yes	11-00192-W
Quail Run Golf Club	Naples	55	0	18	Yes			11-00224-W
Quail Village Golf Club	Naples	78	78	18			Yes	11-01321-W
Quail West	Naples	367	367	36			Yes	11-00785-W
Riviera Golf Club	Naples	85	0	18	Yes			11-00053-W
Royal Palm Country Club	Naples	110	0	18	Yes			11-00336-W
Royal Poinciana Golf Club	Naples	162	0	36	Yes			11-00045-W
Royal Wood Golf & Country Club	Naples	132	132	18			Yes	11-00423-W
Sabal Bay	Naples	175	175	18			Yes	11-02535-W
Silver Lakes Resort & Golf Club	Naples	60	60	9			Yes	11-01381-W

a. Other sources may include surface water, surficial aquifer system, or intermediate aquifer system.

Table E-11. Continued.

Golf Course Name	City	Irrigated Acreage	Self-Supplied Acreage	Number of Golf Course Holes	Reclaimed Use	FAS Use	Other Source Use[a]	Consumptive Use Permit
Stonebridge Country Club	Naples	176	176	18			Yes	11-00032-W
The Club at Mediterra	Bonita Springs	678	678	36			Yes	11-00171-W
The Club at Olde Cypress	Naples	168	168	18			Yes	11-01699-W
The Club at TwinEagles	Immokalee	227	227	18		Yes	Yes	11-01567-W
The Club Pelican Bay	Naples	160	105	27	Yes		Yes	11-01715-W
The Golf Lodge at the Quarry	Naples	329	329	18			Yes	11-02319-W
The Links of Naples	Naples	36	36	18			Yes	11-01175-W
The Moorings Country Club	Naples	42	0	18	Yes			11-00054-W
The Rookery at Marco	Naples	105	105	18			Yes	11-02058-W
The Strand	Naples	185	185	27			Yes	11-01462-W
The Vineyards of Naples	Naples	225	105	36	Yes		Yes	11-00470-W
TPC at Treviso Bay	Naples	120	120	18		Yes	Yes	11-02274-W
Tuscany Reserve	Naples	223	223	18			Yes	11-00151-W
Valencia Golf & Country Club	Naples	157	157	18			Yes	11-01444-W
Vanderbilt Country Club	Naples	120	120	18			Yes	11-01576-W
Wilderness Country Club	Naples	120	0	18	Yes			11-00057-W
Winding Cypress Country Club	Naples	82	82	18			Yes	11-02265-W
Windstar on Naples Bay	Naples	100	0	18	Yes			11-01754-W
Wyndemere Country Club	Naples	194	194	27			Yes	11-00167-W
Collier County Total		**13,734**	**10,080**	**1,764**				
Glades County								
The Glades RV Resort	Moore Haven	20	20	9			Yes	090624-15
Glades County Total		**20**	**20**	**9**				
Hendry County								
Clewiston Golf Course	Clewiston	85	85	18			Yes	26-00024-W
Hendry County Total		**85**	**85**	**18**				
Lee County								
Alden Pines	Bokeelia	55	55	18		Yes	Yes	36-00204-W
Bonita Bay West	Bonita Springs	720	0	54	Yes	Yes		36-00282-W
Bonita Beach Golf Club	Fort Myers	260	260	18			Yes	36-01110-W
Bonita Fairways	Bonita Springs	57	57	18			Yes	36-02027-W
Bonita Springs Golf & Country Club	Bonita Springs	157	0	18	Yes		Yes	36-00186-W
Breckenridge Golf & Tennis Club	Estero	10	10	18			Yes	36-00676-W
Burnt Store Marina & Country Club	Punta Gorda	70	70	27		Yes		36-00066-W

a. Other sources may include surface water, surficial aquifer system, or intermediate aquifer system.

Table E-11. Continued.

Golf Course Name	City	Irrigated Acreage	Self-Supplied Acreage	Number of Golf Course Holes	Reclaimed Use	FAS Use	Other Source Use[a]	Consumptive Use Permit
Cape Coral Executive Golf Course	Cape Coral	20	20	9			Yes	36-00051-W
Colonial Country Club	Fort Myers	220	220	18		Yes		36-03978-W
Copperhead Golf & Country Club	Lehigh Acres	150	150	18			Yes	36-03765-W
Coral Oaks Golf Course	Cape Coral	124	124	18			Yes	36-00708-W
Cross Creek Country Club	Fort Myers	62	0	18	Yes			36-00441-W
Crown Colony	Fort Myers	116	0	18	Yes			36-03767-W
Cypress Lake Country Club	Fort Myers	110	0	8	Yes	Yes		36-04405-W
Del Tura Country Club	North Fort Myers	126	0	27	Yes	Yes		36-00264-W
Eagle Ridge Golf & Tennis Club	Fort Myers	68	0	18	Yes			36-00405-W
Eastwood Golf Course	Fort Myers	100	0	18	Yes			36-01102-W
El Rio Golf Club	North Fort Myers	35	35	18		Yes	Yes	36-00026-W
Estero Country Club	Estero	98	0	18	Yes			36-00479-W
Fiddlesticks Country Club	Estero	266	0	36	Yes		Yes	36-00261-W
Fort Myers Beach Golf Club	Fort Myers Beach	29	29	18			Yes	36-00322-W
Fort Myers Country Club	Fort Myers	125	125	18	Yes	Yes	Yes	36-00019-W
Gateway Golf & Country Club	Fort Myers	149	149	18			Yes	36-00677-W
Ginn Development and Golf Course	Estero	493	493	27			Yes	36-05078-W
Golfview Golf and Racquet Club	Cape Coral	27	0	9		Yes		36-00626-W
Gulf Harbour Yacht & Country Club	Fort Myers	299	0	18	Yes			36-00430-W
Heritage Palms Golf & Country Club	Fort Myers	181	0	36	Yes	Yes	Yes	36-03334-W
Heritage Pointe	Fort Myers	16	16	18			Yes	36-04462-W
Heron's Glen	North Fort Myers	110	0	18	Yes			36-01395-W
Hideaway Country Club	Fort Myers	90	90	18		Yes		36-00395-W
Highland Woods Golf Course	Bonita Springs	162	0	18	Yes			36-02912-W
Hunters Ridge Country Club	Bonita Springs	112	0	18	Yes		Yes	36-00715-W
Kelly Greens	Fort Myers	27	0	18	Yes	Yes		36-00455-W
Lake Fairways Country Club	North Fort Myers	54	54	18			Yes	36-00212-W
Legends Golf & Country Club	Fort Myers	75	75	18			Yes	36-03145-W
Lehigh Resort Club	Lehigh Acres	54	0	18	Yes			36-07076-W

a. Other sources may include surface water, surficial aquifer system, or intermediate aquifer system.

Table E-11. Continued.

Golf Course Name	City	Irrigated Acreage	Self-Supplied Acreage	Number of Golf Course Holes	Reclaimed Use	FAS Use	Other Source Use[a]	Consumptive Use Permit
Lexington Country Club	Fort Myers	111	0	18	Yes			no permit
Magnolia Landing	North Fort Myers	204	204	18		Yes	Yes	36-05392-W
Majestic Golf Club	Lehigh Acres	89	0	18	Yes		Yes	36-00303-W
Miromar Lakes Golf Course	Fort Myers	487	487	18		Yes	Yes	36-03568-W
Mirror Lakes Golf Club	Lehigh Acres	115	0	18	Yes		Yes	36-00143-W
Myerlee Golf Course	Fort Myers	65	0	18	Yes			no permit
Olde Hickory Golf & Country Club	Estero	84	84	18			Yes	36-01070-W
Palmetto Pine Country Club	Cape Coral	93	93	18			Yes	36-00032-W
Palmira Golf & Country Club	Bonita Springs	167	167	27			Yes	36-00103-W
Paradise Preserve	North Fort Myers	100	0	18	Yes	Yes	Yes	36-00025-W
Pelican Colony	Estero	92	92	18		Yes	Yes	36-03745-W
Pelican Preserve Golf Club	Fort Myers	151	151	27		Yes	Yes	36-03955-W
Pelican Sound	Estero	270	0	27	Yes		Yes	36-03219-W
Pelican’s Nest	Estero	123	123	36		Yes	Yes	36-00433-W
Pine Lakes Country Club	North Fort Myers	57	0	18	Yes			36-00599-W
Raptor Bay Golf Club	Bonita Springs	144	144	18		Yes	Yes	36-03813-W
River Hall	Alva	402	402	18		Yes	Yes	36-04006-W
Riverbend	North Fort Myers	60	0	18	Yes			36-00778-W
Royal Tee Golf Club	Cape Coral	146	146	27		Yes	Yes	36-00451-W
San Carlos Golf Club	Fort Myers	118	60	18	Yes		Yes	36-00308-W
Seven Lakes Golf & Tennis	Fort Myers	70	70	18		Yes	Yes	36-00088-W
Shadow Wood Preserve	Bonita Springs	92	92	36			Yes	36-04122-W
Shell Point	Fort Myers	149	0	18	Yes	Yes		36-03730-W
Six Lakes Country Club	Fort Myers	38	0	18	Yes			36-03674-W
Somerset Golf Course	Fort Myers	154	154	18		Yes	Yes	36-07137-W
South Seas Resort	Captiva Island	32	0	9	Yes		Yes	36-00109-W
Spanish Wells Country Club	Bonita Springs	132	132	27			Yes	36-00586-W
Stoneybrook	Estero	131	0	18	Yes		Yes	36-02571-W
Terraverde Country Club	Fort Myers	10	10	9			Yes	36-00534-W
The Club at Grandezza	Estero	255	0	18	Yes		Yes	36-01871-W
The Club at Renaissance	Fort Myers	209	209	18			Yes	36-04076-W
The Colony Golf & Country Club	Fort Myers	118	118	18		Yes	Yes	36-03978-W
The Forest Country Club	Fort Myers	160	0	36	Yes		Yes	36-00161-W

a. Other sources may include surface water, surficial aquifer system, or intermediate aquifer system.

Table E-11. Continued.

Golf Course Name	City	Irrigated Acreage	Self-Supplied Acreage	Number of Golf Course Holes	Reclaimed Use	FAS Use	Other Source Use[a]	Consumptive Use Permit
The Golf Club of Southwest Florida	Fort Myers	120	120	18			Yes	36-00056-W
The Heritage	Fort Myers	26	26	9			Yes	36-00750-W
The Landings Yacht & Golf Club	Fort Myers	132	0	18	Yes			36-00138-W
The Plantation Golf & Country Club	Fort Myers	234	234	18		Yes	Yes	36-04806-W
The Retreat	Estero	108	108	18		Yes	Yes	36-03937-W
The Sanctuary Golf Club	Sanibel Island	75	75	18	Yes	Yes		36-01967-W
The Villages of Country Creek	Estero	167	0	18	Yes		Yes	36-00737-W
Vasari Country Club	Bonita Springs	170	170	18			Yes	36-04045-W
Verandah	Buckingham	319	319	36		Yes	Yes	36-04340-W
West Bay Golf Course	Estero	115	0	18	Yes		Yes	36-03098-W
Westminster Golf Club	Lehigh Acres	105	105	18			Yes	36-00142-W
Whiskey Creek Country Club	Fort Myers	51	51	18			Yes	36-00055-W
Wildcat Run Golf Course	Estero	132	132	18			Yes	36-00252-W
Worthington Country Club	Bonita Springs	166	166	18			Yes	36-01462-W
Lee County Total		**11,374**	**6,476**	**1,655**				
LWC Total		**25,253**	**16,701**	**3,464**				

a. Other sources may include surface water, surficial aquifer system, or intermediate aquifer system.

Water Savings Incentive Program

Table E-12. Water Savings Incentive Program projects funded through Fiscal Year (FY) 2007–FY 2012.

Fiscal Funding Year	County	Entity Name	Project Title	Total Project Cost	Approved Funding	Proposed Water Savings in MGY[a]
2012	Hendry	Port LaBelle Utility System	Fixed Network Automatic Meter Reading and District Metered Area System for Leak Detection	$69,925	$38,250	2.00
2012	Hendry	City of LaBelle	Mobile Meter Reading III	$49,955	$38,250	1.57
2012	Lee	City of Cape Coral	Automatic Hydrant Flushing and Best Engineering Practice	$29,986	$14,000	3.50
2011	Collier	Ave Maria Utility, LLLP	Automatic Flushing Program	$15,660	$7,830	8.72
2011	Collier	City of Naples	City Potable Water Reduction (irrigation retrofits and urinal retrofits)	$31,620	$10,635	3.06
2011	Hendry	City of LaBelle	LaBelle Utilities Mobile Meter Reading II (with residential meter change out)	$49,874	$49,874	1.50
2011	Hendry	Port LaBelle Utility System	Port LaBelle Bathroom Fixture Replacement	$57,300	$33,300	2.01
2010	Lee	Lee County Utilities	Automatic Flushing Devices	$29,292	$14,646	35.49
2010	Lee	Mediterra Community Association, Inc.	TORO® Satellite Controllers	$35,622	$17,811	14.10
2009	Collier	Villoresi at Mediterra Neighborhood Association, Inc.	Villoresi Water Conservation Project – Irrigation System Upgrade	$130,000	$50,000	5.50
2009	Collier	Marco Resort & Club Condominium Association, Inc.	Toilet Retrofit Program	$10,952	$5,475	0.20
2009	Collier	Royal Seafarer Condominium Apartments	Potable Water Use Reduction Utilizing Low-Flow Toilets	$56,800	$28,400	1.00
2009	Collier	Florida Government Utility Authority (FGUA)	Dead End Mains Automatic Flushing Devices	$35,000	$17,500	0.08
2009	Hendry	City of LaBelle	Labelle Utilities Flushing Automation	$49,900	$49,900	1.50
2009	Hendry	City of LaBelle	LaBelle Utilities Mobile Meter Reading and Leak Detection Program	$20,000	$20,000	0.40
2009	Lee	Mediterra Community Association, Inc.	TORO® Satellite Irrigation Control	$5,823	$2,911	16.85
2009	Lee	School District of Lee County	Saving Water with Florida Power & Light – Indoor Plumbing Fixture Retrofits	$480,210	$50,000	5.90
2009	Lee	Town of Fort Myers Beach	Auto Flush – Automatic Hydrant Flushers Program	$4,850	$2,425	0.90
2009	Lee	City of Sanibel	Rain Sensor Project	$2,500	$1,250	0.93
2009	Collier	Villoresi at Mediterra Neighborhood Association, Inc.	Villoresi Water Conservation Project – Irrigation System Upgrade	$130,000	$50,000	5.50
2008	Lee	City of Sanibel	Reuse Expansion Project	$100,000	$25,000	30.00
2007	Collier	City of Marco Island	Drinking Water Leak Detection System	$100,000	$50,000	29.00
2007	Hendry	Port LaBelle Utility System	Automatic Flushing Devices	$50,000	$50,000	8.40
			Totals	**$1,545,269**	**$627,457**	**178.11**

a. MGY – million gallons per year

REFERENCES

CDM. 2007a. *Water Supply Cost Estimation Study.* Prepared by Camp Dresser & McKee. Inc. for South Florida Water Management District, West Palm Beach, FL.

CDM. 2007b. *Water Supply Cost Estimation Study – Phase II Addendum.* Prepared by Camp Dresser & McKee. Inc. for South Florida Water Management District D, West Palm Beach, FL.

Miami-Dade County. 2006. *Miami-Dade County Water Use Efficiency Five-Year Plan.* Miami-Dade County, Miami, FL.

Miami-Dade County. 2007. *Miami-Dade County Water Use Efficiency 20-Year Plan.* Miami-Dade County, Miami, FL.

F
Existing Conditions

This appendix provides additional hydrogeologic data that present existing conditions discussed in **Chapter 3**: Issues and Evaluations (see the Planning Document).

CHLORIDE CONCENTRATIONS

A series of maps, tables and figures of coastal areas of Collier and Lee counties follows, locating chloride concentrations within the Surficial, Lower Tamiami, Sandstone, Mid-Hawthorn, and Lower Hawthorn aquifers. The Surficial (**Figure F-1** and **Figure F-12**) and Lower Tamiami (**Figure F-22**) aquifers are within the surficial aquifer system (SAS), the Sandstone (**Figure F-35**) and Mid-Hawthorn (**Figure F-47** and **Figure F-58**) aquifers are within the IAS, and the Lower Hawthorn aquifer (**Figure F-65** and **Figure F-78**) is part of the Floridan aquifer system (FAS). [1]

Well and chloride information were obtained from United States Geological Survey (USGS) and South Florida Water Management District (SFWMD) records. Chloride values are given in milligrams per liter (mg/L). Map data represents the average of available chloride values for the period of April–May 2009. Graphs of selected wells represent the period of record for each well through May 2009. The dashed red line on each map marks an approximation of the farthest landward extent of the saltwater interface as defined by the 250 mg/L isochlor, regardless of well depth, and/or the farthest landward extent of saline surface water.

Each map uses colored symbols to depict ranges in concentration and delineates an approximate inland location of the 250 mg/L chloride concentration. The 250 mg/L concentration is a secondary drinking water standard and used as a reference. Representative wells are labeled on each map and listed in a table after each map. A selection of well graphs is presented after each map and table, showing period-of-record chloride concentrations.

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[1] These maps are conceptual tools used for project development and implementation only. These maps are not self-executing or binding, and do not otherwise affect the interests of any person including any vested rights or existing uses of real property. Any information, including but not limited to maps and data, received from the SFWMD is provided "as is" without any warranty, and the SFWMD expressly disclaims all express and implied warranties of merchantability and fitness for a particular purpose. The SFWMD does not make any representations regarding the use, or the results of the use, of the information provided.

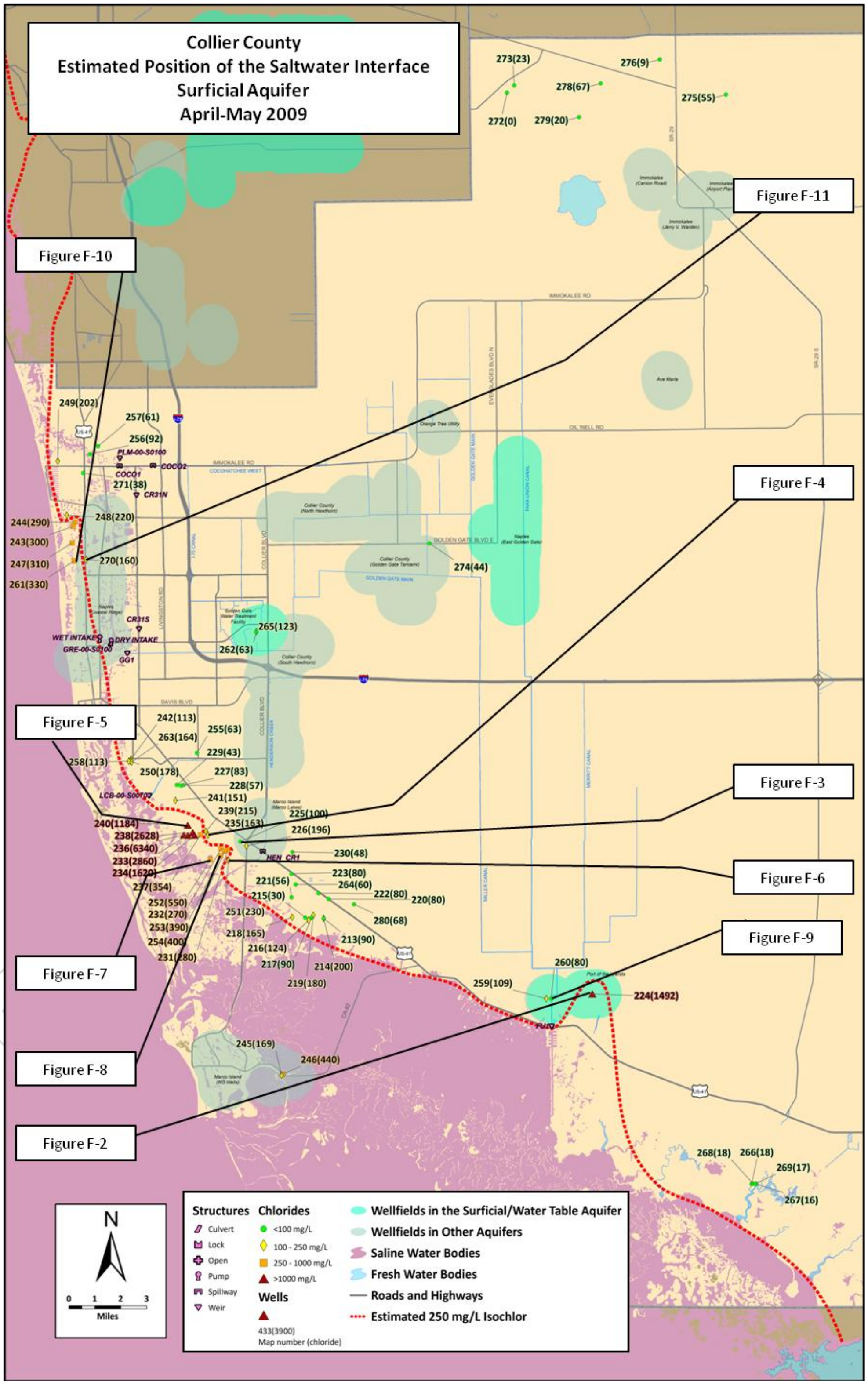

Figure F-1. Estimated position of the saltwater interface within the surficial aquifer in Collier County in April–May 2009. The figure number labels on the map refer to **Figure F-2** through **Figure F-11**, which show chloride levels for the indicated wells.

Table F-1. Chloride levels measured at surficial aquifer wells within Collier County. The map numbers in the first column refer to the numbers on the map in **Figure F-1**. (Note: bls – below land surface.)

Map Number	SFWMD Facility	Project Name	Well Name	X	Y	Casing Depth (feet bls)	Total Depth (feet bls)	Chloride (mg/L)
213	147841	Fiddler's Creek	Monitor Well MW-6	442250	613523	7	17	90
214	147842	Fiddler's Creek	Monitor Well MW-7	442222	613537	7	17	200
215	147838	Fiddler's Creek	Monitor Well MW-3	438491	613706	8	20	30
216	147839	Fiddler's Creek	Monitor Well MW-4	439167	613171	10	20	124
217	147837	Fiddler's Creek	Monitor Well MW-2	439730	613635	10	20	90
218	147840	Fiddler's Creek	Monitor Well MW-5	435815	613734	10	20	165
219	147834	Fiddler's Creek	Monitor Well MW-1	440082	614142	10	20	180
220	147846	Fiddler's Creek	Monitor Well MW-11	443251	617466	10	20	80
221	147843	Fiddler's Creek	Monitor Well MW-8	435674	617804	10	20	56
222	147845	Fiddler's Creek	Monitor Well MW-10	441181	618649	10	20	80
223	147844	Fiddler's Creek	Monitor Well MW-9	435689	622619	10	23	80
224	193794	Port of the Islands (**Figure F-2**)	EW-1	496955	598180	16	21	1,492
225	151307	Eagle Creek Country Club (**Figure F-3**)	MW-1	425264	629136	unknown	18	100
226	151308	Eagle Creek Country Club	MW-2	426509	628265	unknown	24	196
227	154788	Treviso Bay - aka Wentworth Estates	PW-1	413154	640565	28	80	83
228	154793	Treviso Bay - aka Wentworth Estates	PW-2	413679	640633	28	80	57
229	155692	Treviso Bay - aka Wentworth Estates	JE438	412323	640676	31	138	43
230	142632	Winding Cypress Country Club	PWG-1	435871	627033	40	80	48
231	219872	Lands End	MW-7	422653	627411	1	5	280
232	219871	Lands End	MW-6	421309	627706	1	5	270
233	224935	Treviso Bay - aka Wentworth Estates	JE 466_cluster	414559	630429	unknown	4	2,860
234	224937	Treviso Bay - aka Wentworth Estates	JE 459_cluster	415905	630464	unknown	4	1,620
235	224947	Treviso Bay - aka Wentworth Estates (**Figure F-4**)	JE 455_cluster	418691	630481	unknown	4	163
236	224964	Treviso Bay - aka Wentworth Estates	JE 460_cluster	413735	630507	unknown	4	6,340
237	224938	Treviso Bay- aka Wentworth Estates	JE 465_cluster	417129	630542	unknown	4	354
238	224936	Treviso Bay - aka Wentworth Estates	JE 457_cluster	415575	631002	unknown	4	2,628
239	224946	Treviso Bay - aka Wentworth Estates	JE 456_cluster	418257	631254	unknown	4	215
240	224934	Treviso Bay - aka Wentworth Estates (**Figure F-5**)	JE 458_cluster	414533	632495	unknown	4	1,184
241	155706	Treviso Bay - aka Wentworth Estates	JE414	412043	637527	8	13	151
242	150798	Naples Botanical Garden	PW-3	402991	645926	8	18	113
243	145301	The Club Pelican Bay	CO-2570	391233	693272	9	24	300
244	145303	The Club Pelican Bay	CO-2572	391602	694167	9	19	290
245	228265	Key Marco	MW-2	433655	581646	10	27	169
246	228266	Key Marco	CP-2	433901	581848	10	28	440
247	145295	The Club Pelican Bay	CO-2485	390996	689904	10	13	310
248	145297	The Club Pelican Bay	CO-2486	389891	695535	10	13	220
249	30958	The Dunes	1	388067	706545	10	20	202
250	150796	Naples Botanical Garden	PW-1	402906	645516	13	20	178
251	155623	Lands End (**Figure F-6**)	Monitor Well 4	422828	625324	15	20	230
252	155618	Lands End (**Figure F-7**)	Monitor Well 1	419152	625485	15	20	550
253	155622	Lands End (**Figure F-8**)	Monitor Well 3	421258	626270	15	20	390
254	155619	Lands End	Monitor Well 2	422025	627251	15	20	400
255	32182	Villas at Greenwood Lake	PW-1	416417	647160	15	30	63

Table F-1. Continued

Map Number	SFWMD Facility	Project Name	Well Name	X	Y	Casing Depth (feet bls)	Total Depth (feet bls)	Chloride (mg/L)
256	185584	Collier's Reserve	B	394607	707941	unknown	15	92
257	185583	Collier's Reserve	A	396253	709560	unknown	15	61
258	150797	Naples Botanical Garden	PW-2	402517	645521	15	25	113
259	193520	050812-4 (Port of the Islands Community Improvement District)	Chloride for Well 1	487573	597216	16	21	109
260	5473	Port of the Islands Community Improvement District (**Figure F-9**)	2	488573	597216	16	21	80
261	145299	The Club Pelican Bay (**Figure F-10**)	CO-2487R	391408	686268	17	20	330
262	139075	Golden Gate Water Treatment Facility	MW-A	428513	671845	19	22	63
263	227364	Naples Botanical Garden	PW-4	403075	645335	23	24	164
264	144936	Imperial Wilderness Condominium Association	MW-1	436525	620420	37	47	60
265	139076	Golden Gate Water Treatment Facility	MW-B	428513	671873	42	45	123
266	139115	Everglades City Potable Water Supply	EV587	529409	559525	45	48	18
267	139114	Everglades City Potable Water Supply	EV305	530341	559525	45	48	16
268	139116	Everglades City Potable Water Supply	EV589	529705	559567	45	48	18
269	139117	Everglades City Potable Water Supply	EV590	530228	559567	45	48	17
270		USGS 261311081480101 (**Figure F-11**)	C-1061	393837	686493	10	25	160
271		USGS 261604081480901	C-1059	393245	704136	10	25	38
273		USGS 262911081320801	BAK-3	481040	782961	unknown	10	23
274		USGS 261347081351201	C-953	463760	689823	12	40	44
275		USGS 262854081241301	LUC-2	524175	781107	unknown	12	55
276		USGS 263004081264201	BAK-1	510688	788239	unknown	12	9
277		USGS 261947081171401	LUC-6	562160	725747	unknown	13	155
278		USGS 262916081285401	LUC-27	498660	783376	unknown	13	67
279		USGS 262808081294201	LUC-26	494254	776517	unknown	15	20
280		USGS 260137081375901	C-1063	448405	616391	30	55	68

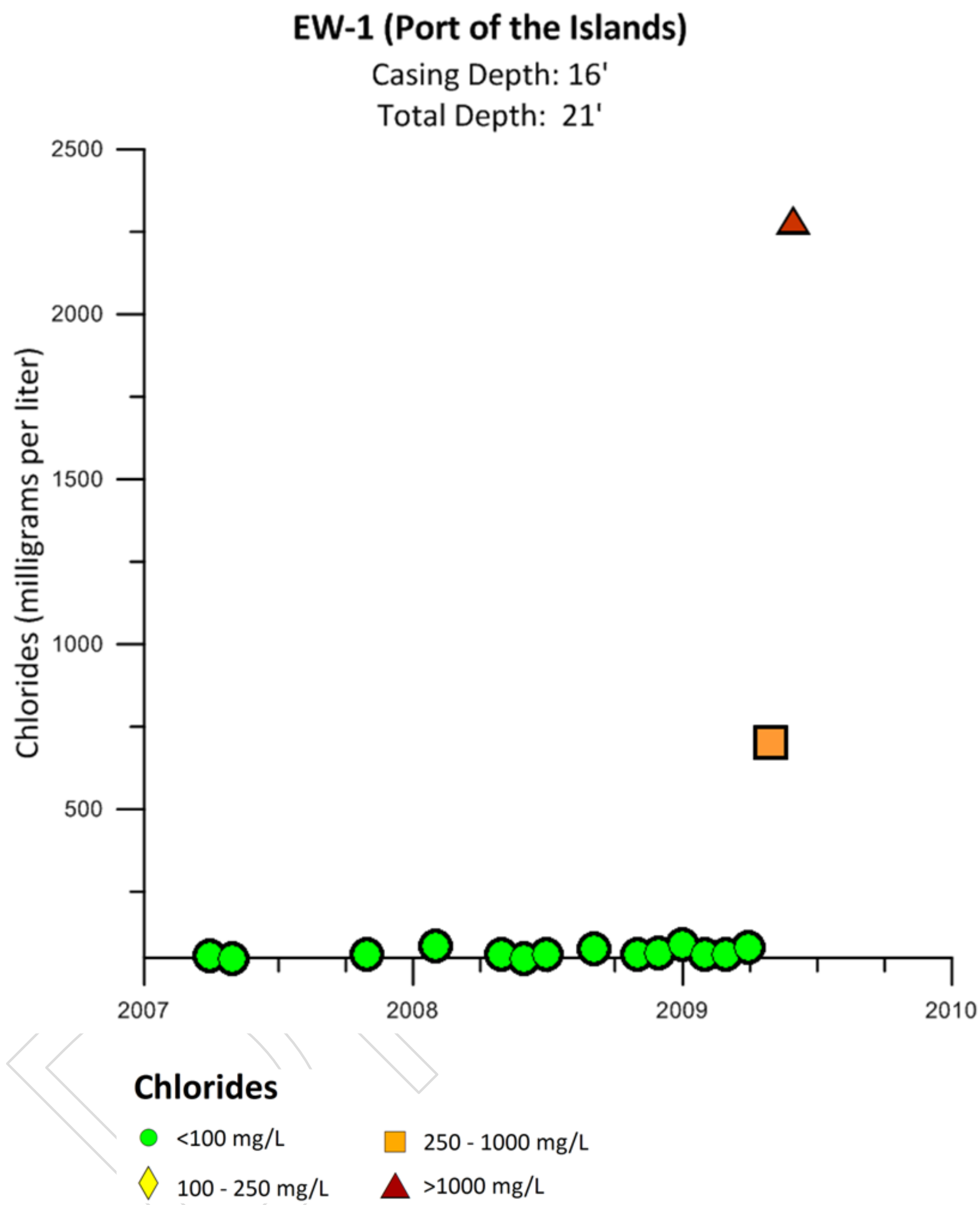

Figure F-2. Chloride levels at Port of the Islands well EW-1. The well is labeled 224 on **Figure F-1**.

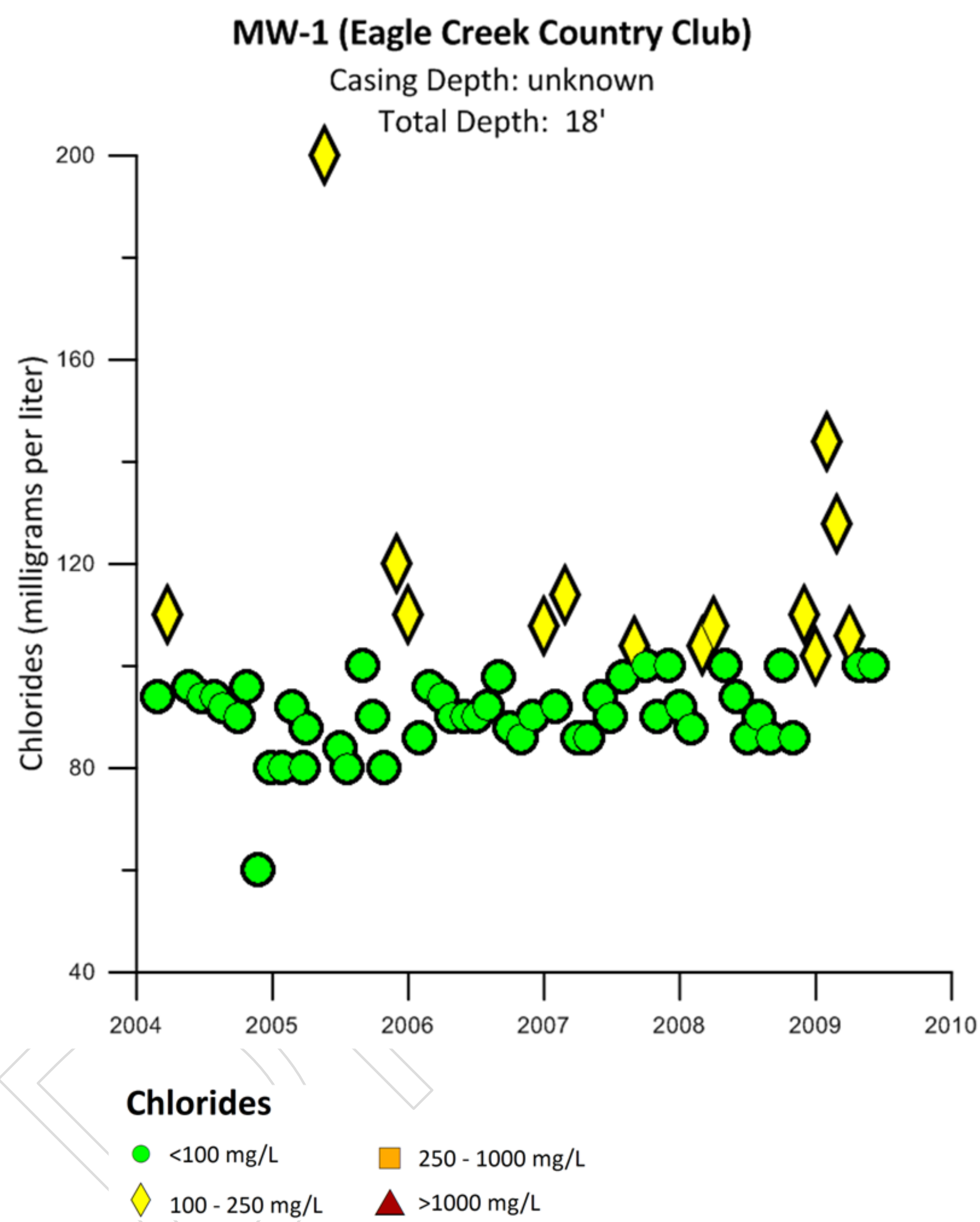

Figure F-3. Chloride levels at Eagle Creek Country Club well MW-1.
This well is labeled 225 on **Figure F-1**.

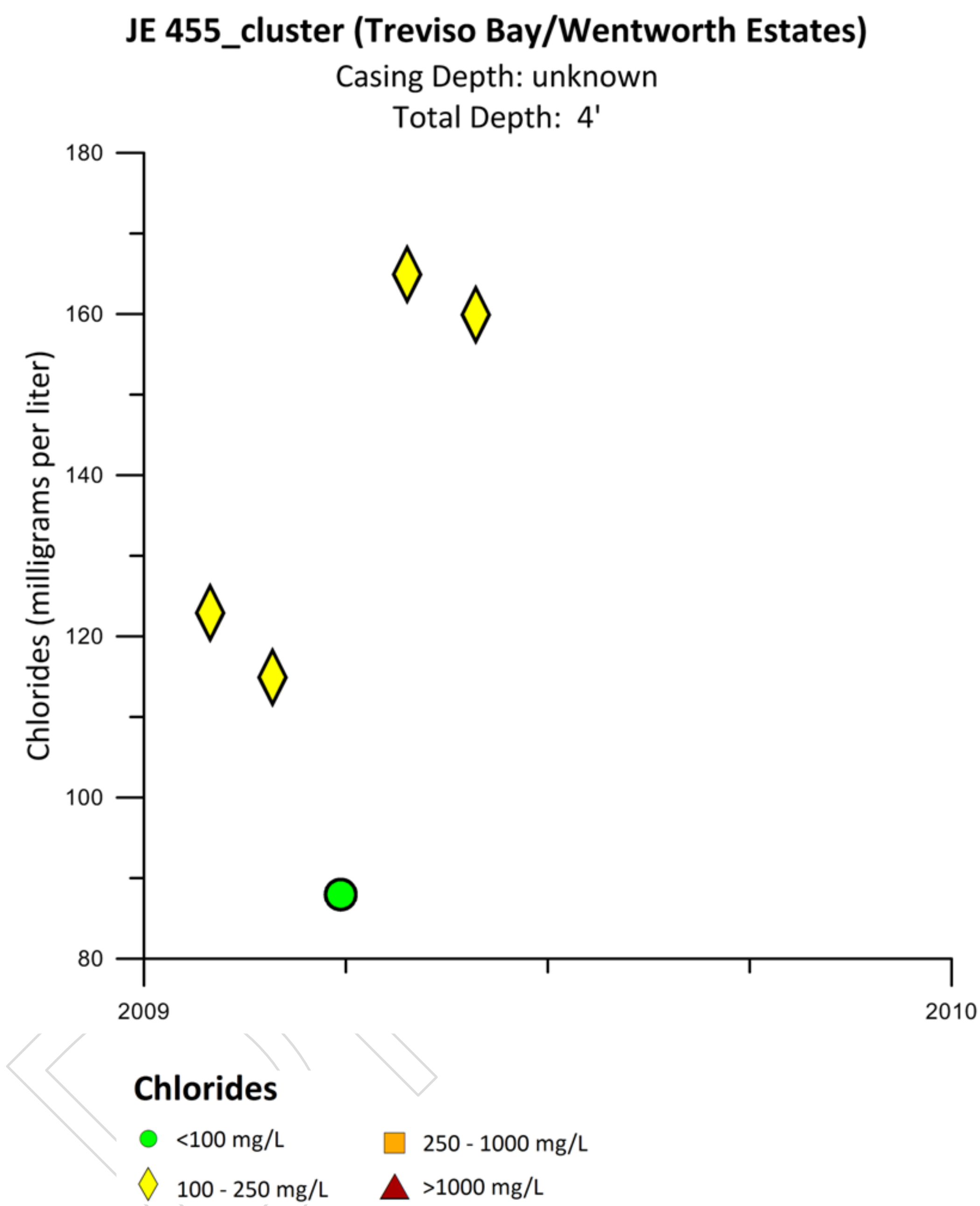

Figure F-4. Chloride levels at Treviso Bay – aka Wentworth Estates well JE_455 cluster. The well is labeled 235 on **Figure F-1**.

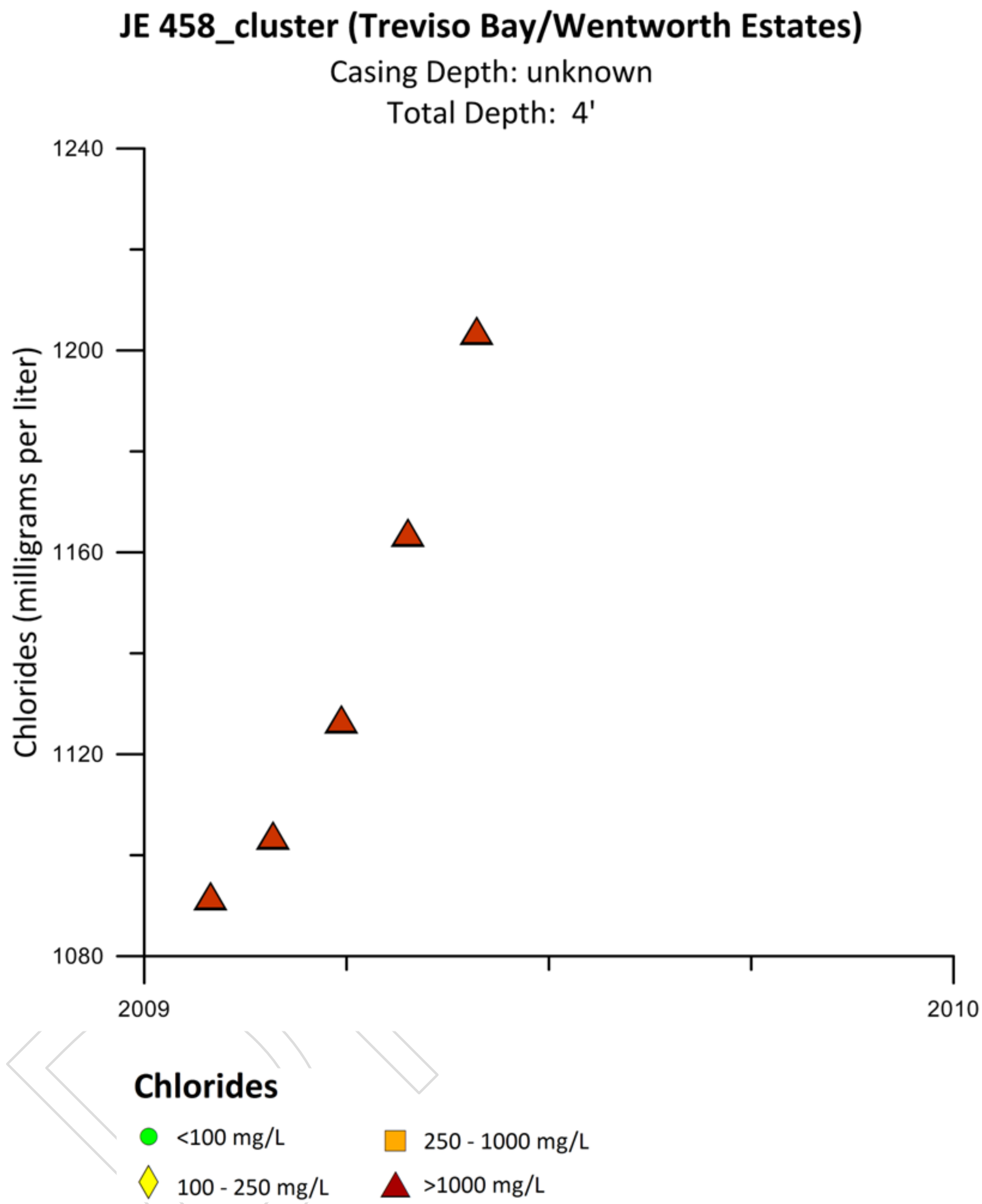

Figure F-5. Chloride levels at Treviso Bay – aka Wentworth Estates well JE_458 cluster. The well is labeled 240 on **Figure F-1**.

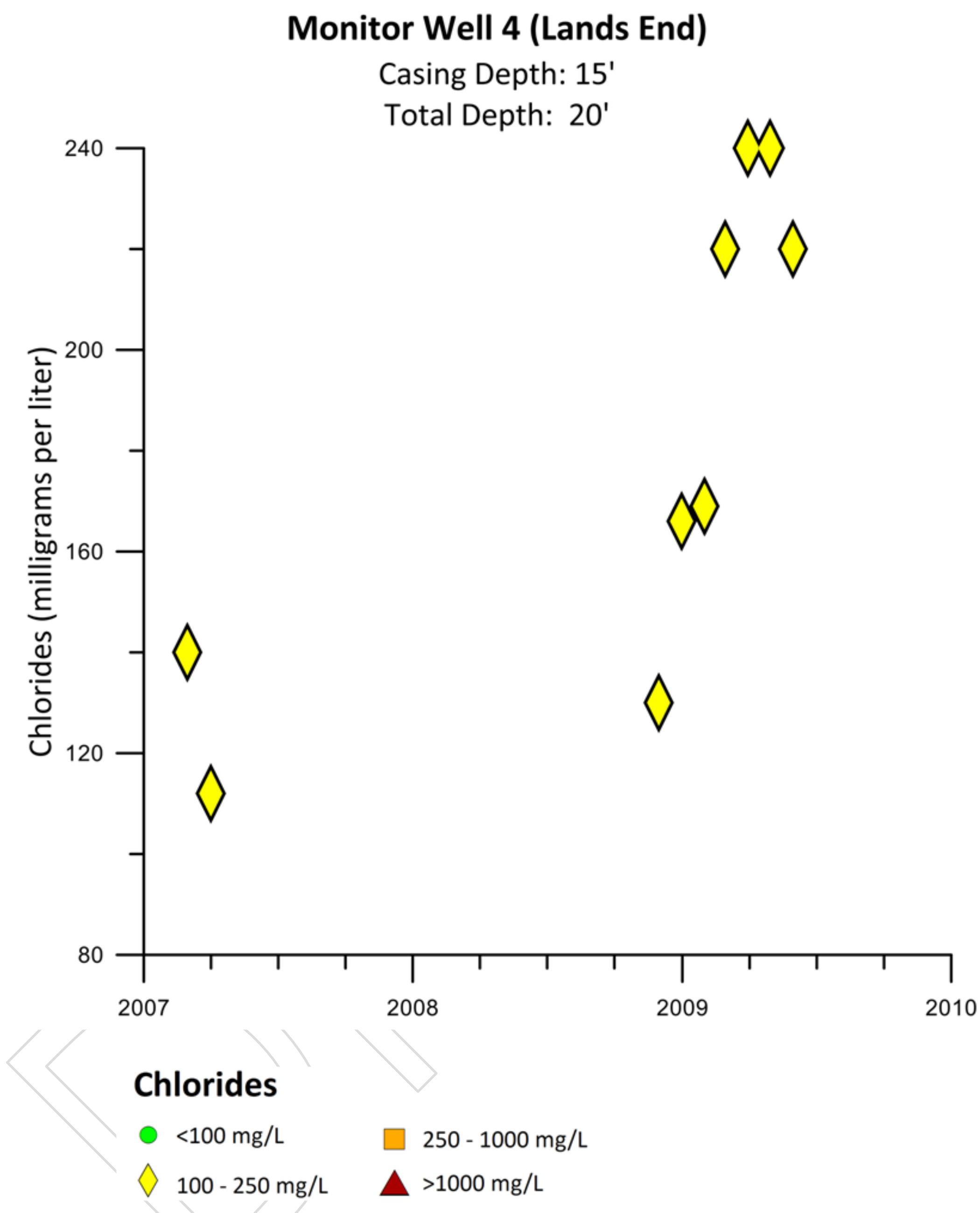

Figure F-6. Chloride levels at Lands End monitor well 4.
This well is labeled 251 on **Figure F-1**.

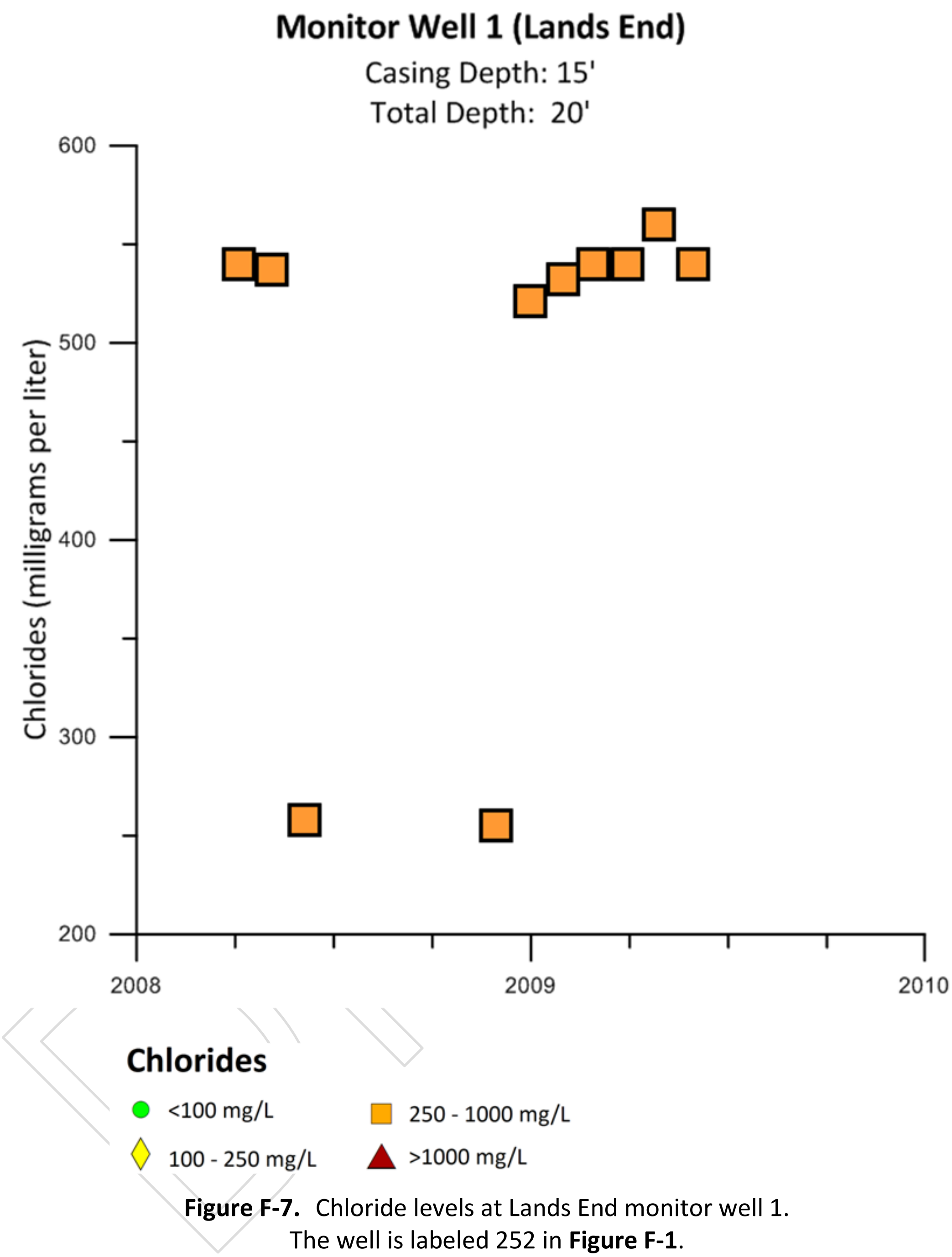

Figure F-7. Chloride levels at Lands End monitor well 1.
The well is labeled 252 in **Figure F-1**.

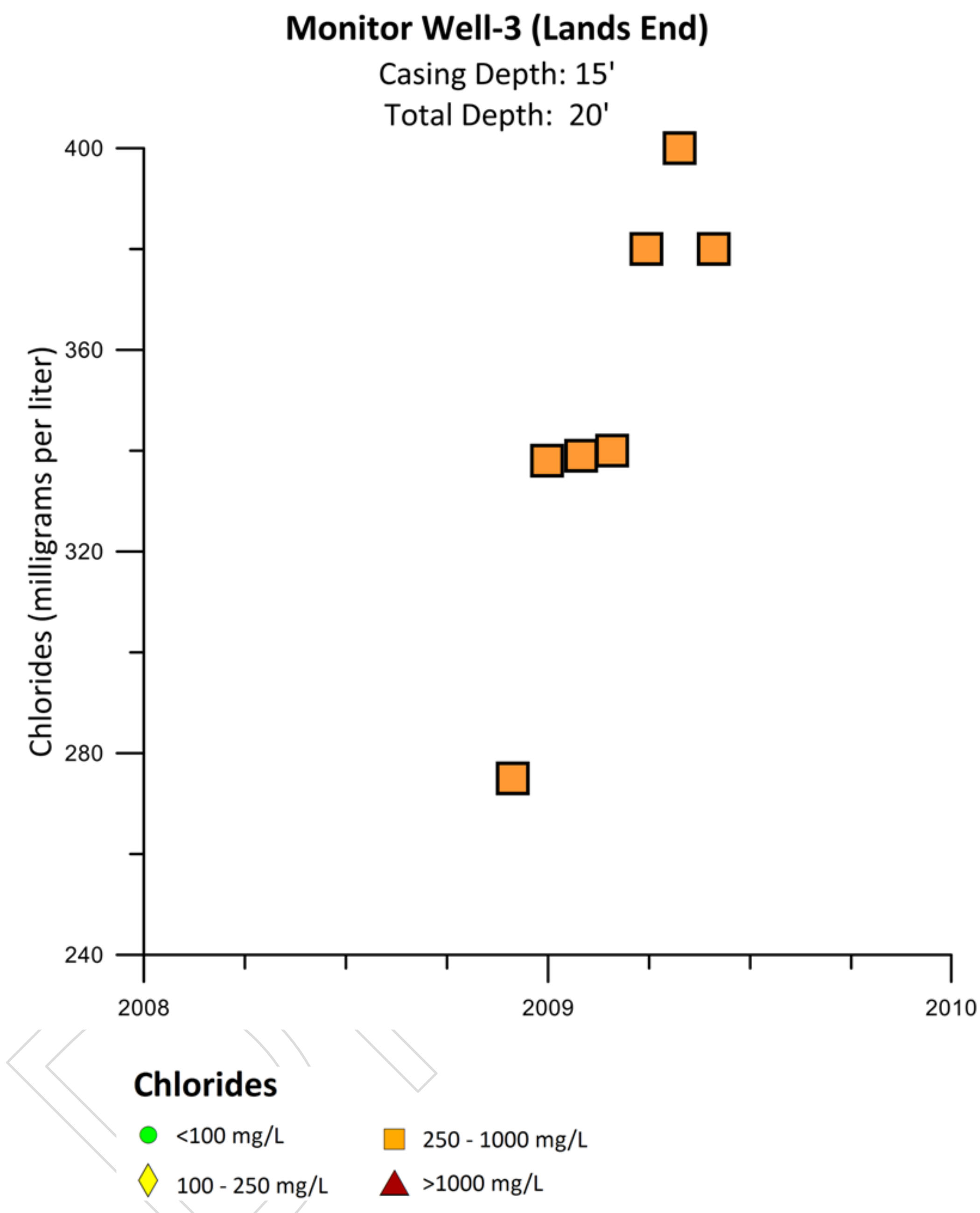

Figure F-8. Chloride levels at Lands End monitor well 3.
The well is labeled 253 in **Figure F-1**.

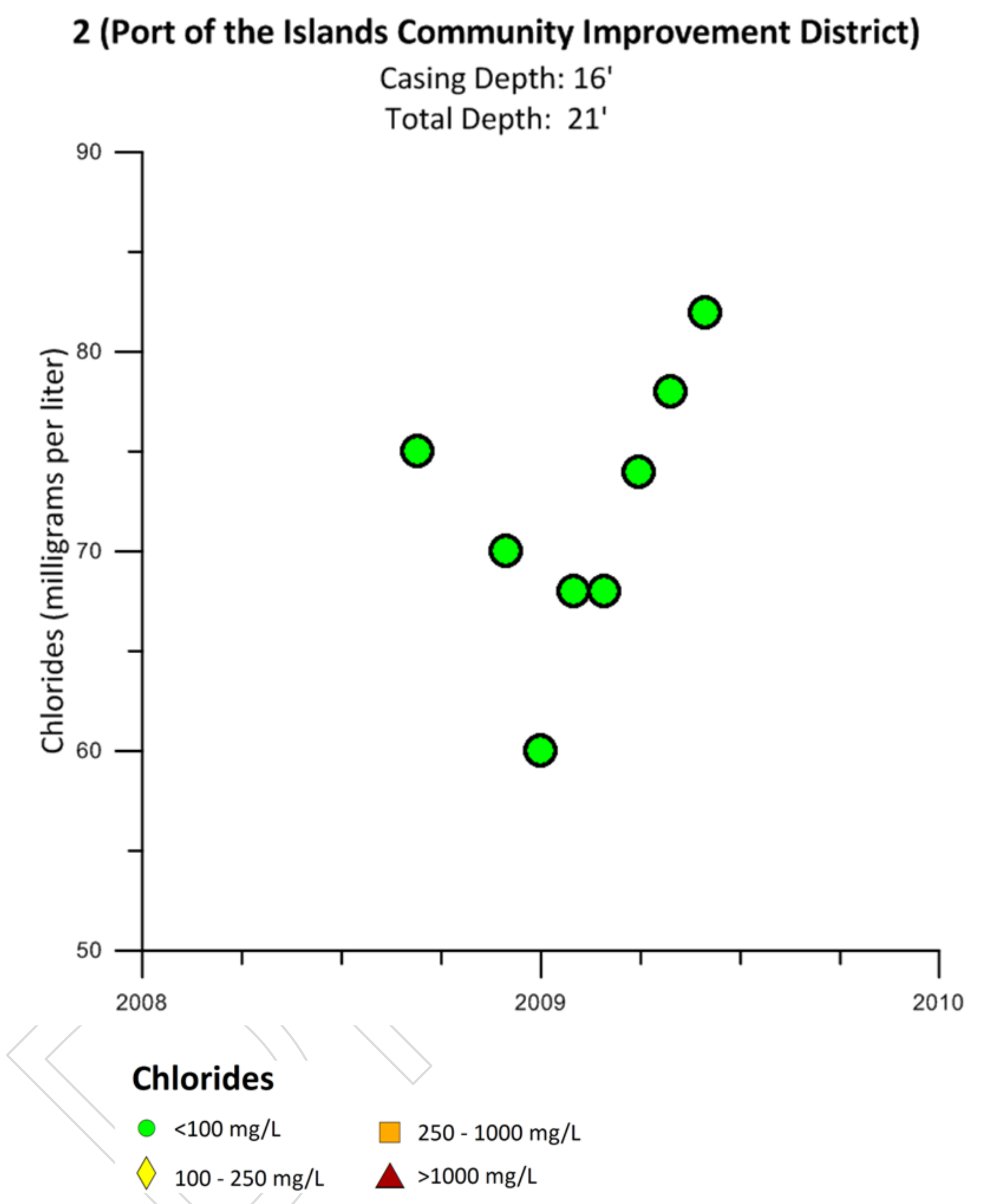

Figure F-9. Chloride levels at Port of the Islands Community Improvement District well 2. This well is labeled 260 on **Figure F-1**.

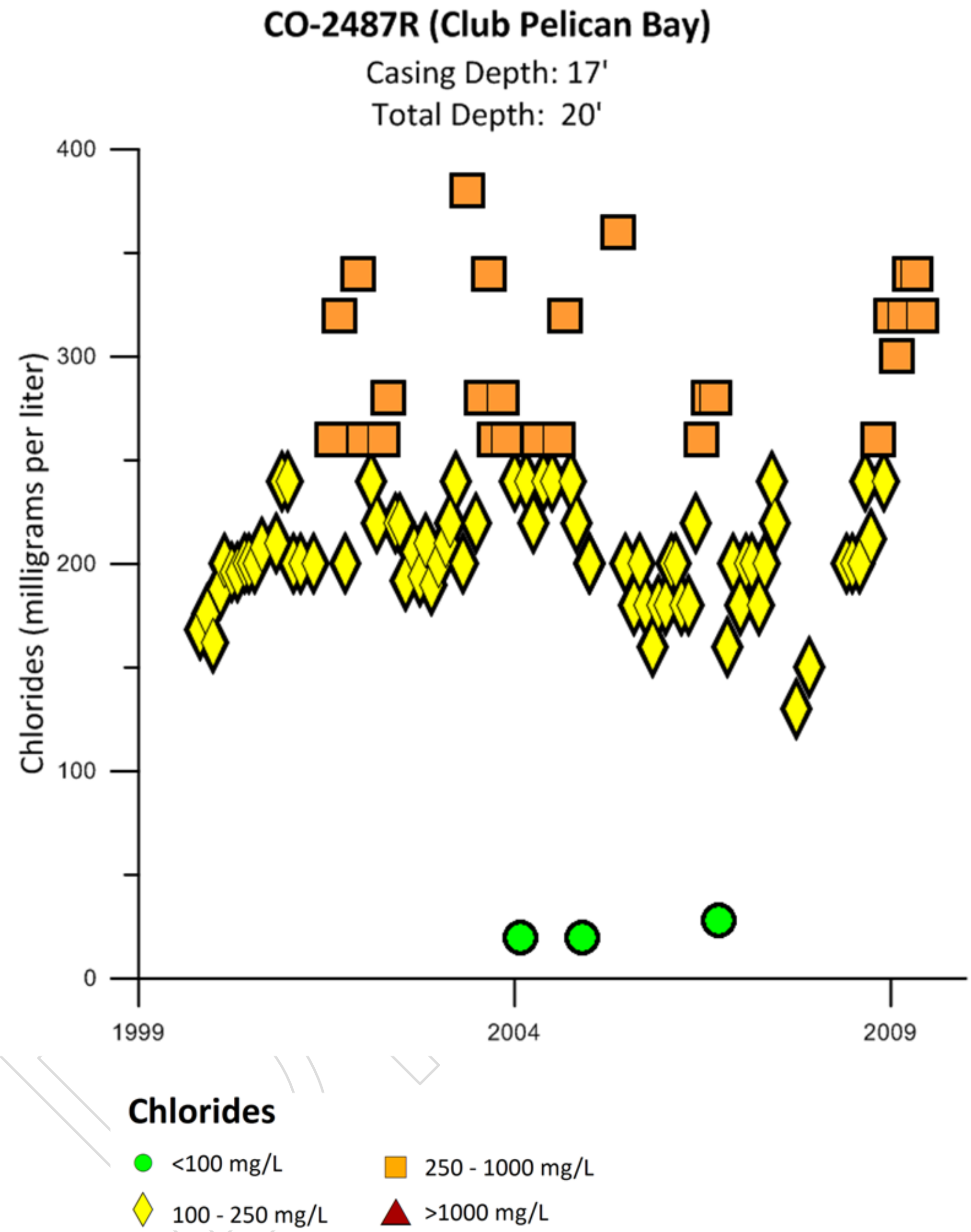

Figure F-10. Chloride levels at Club Pelican Bay well CO-2487R. The well is labeled 261 on **Figure F-1**.

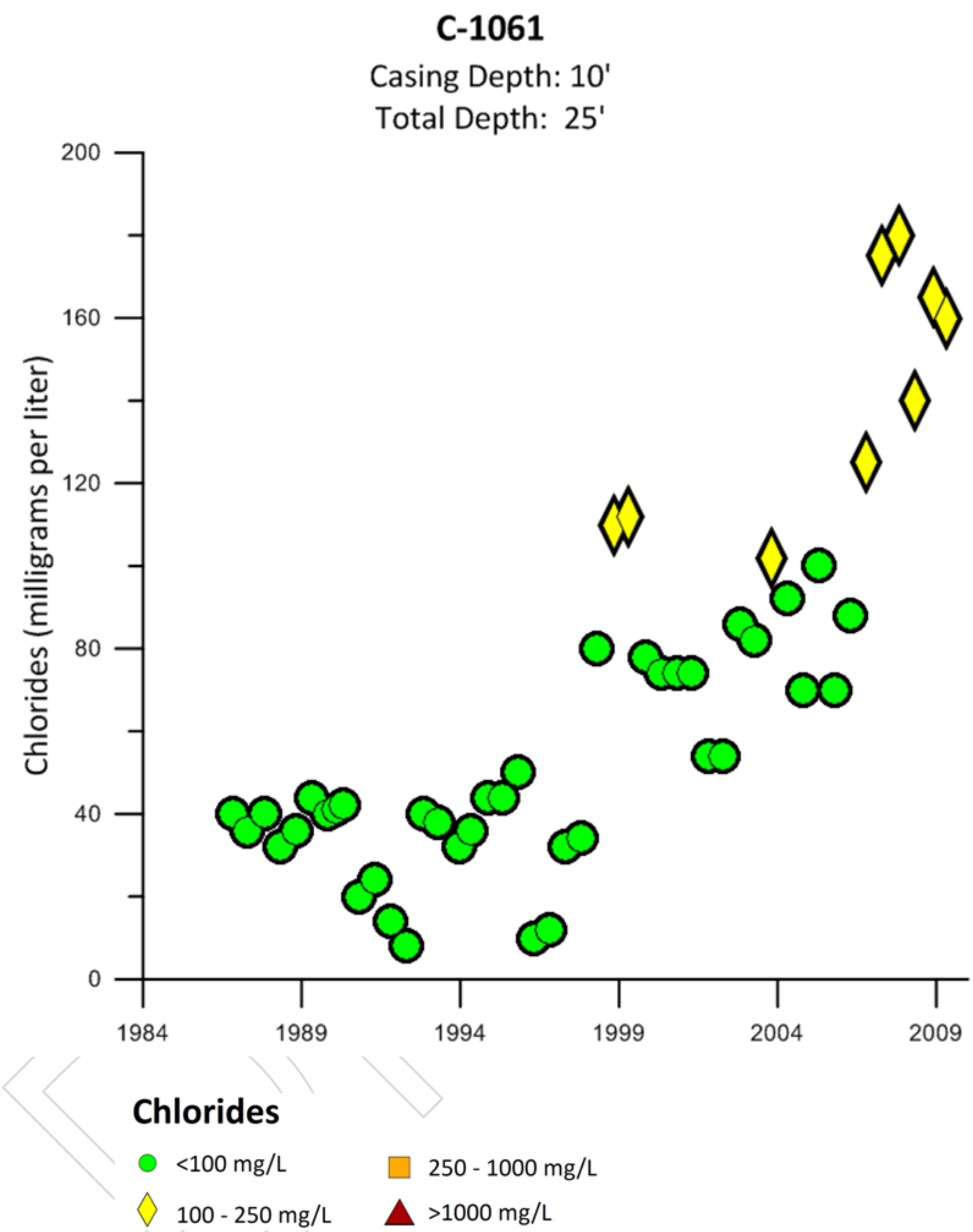

Figure F-11. Chloride levels at USGS station 261311081480101 well C-1061. The well is labeled 270 on **Figure F-1**.

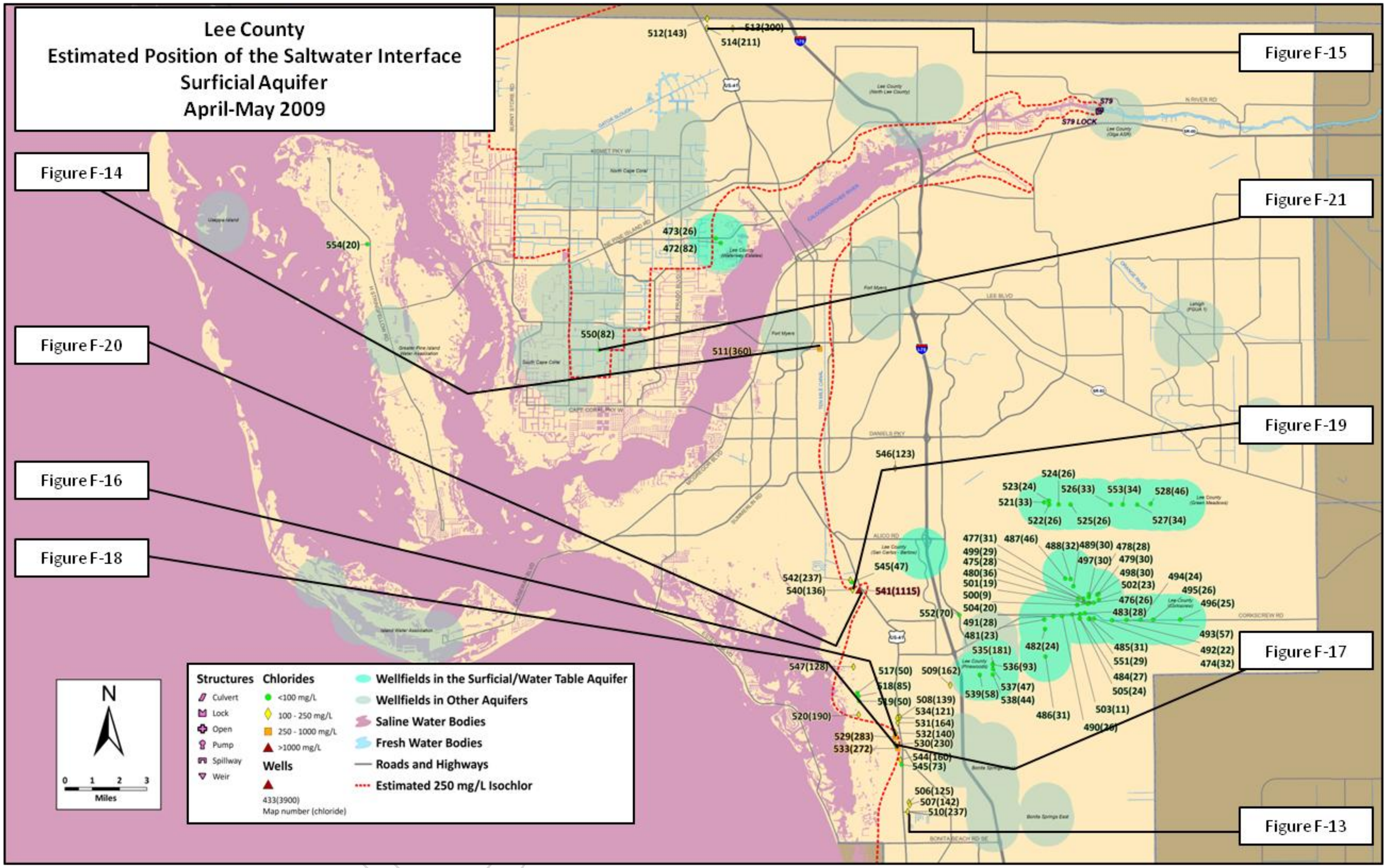

Figure F-12. Estimated position of the saltwater interface within the surficial aquifer in Lee County in April–May 2009. The figure number labels on the map refer to **Figure F-13** through **Figure F-21**, which show chloride levels for the indicated wells.

Table F-2. Chloride levels measured at surficial aquifer/water table wells within Lee County. The map numbers in the first column refer to the numbers on the map in **Figure F-12**.

Map Number	SFWMD Facility	Project Name	Well Name	X	Y	Casing Depth (feet bls)	Total Depth (feet bls)	Chloride (mg/L)
472	30809	Lee County Utilities North System	N-2	356488	843070	42	57	82
473	30812	Lee County Utilities North System	N-12	355517	843944	40	60	26
474	25532	Lee County Utilities Public Water Supply (PWS)	15 Corkscrew	428722	770257	58	150	32
475	25534	Lee County Utilities PWS	19 Corkscrew	427815	773298	50	120	28
476	25535	Lee County Utilities PWS	20 Corkscrew	428696	773349	50	120	26
477	25536	Lee County Utilities PWS	21 Corkscrew	426664	774111	35	105	31
478	25537	Lee County Utilities PWS	22 Corkscrew	427713	774370	40	110	28
479	25539	Lee County Utilities PWS	24 Corkscrew	429351	774884	50	120	30
480	25540	Lee County Utilities PWS	18 Corkscrew	426741	773328	45	115	36
481	25545	Lee County Utilities PWS	25S Corkscrew	419112	770079	30	80	23
482	25546	Lee County Utilities PWS	26S Corkscrew	419232	768227	30	80	24
483	25548	Lee County Utilities PWS	8 Corkscrew	426929	771303	60	145	28
484	25552	Lee County Utilities PWS	12 Corkscrew	425952	770294	50	145	27
485	25554	Lee County Utilities PWS	14 Corkscrew	427832	770263	50	150	31
486	26837	Lee County Utilities PWS	28S Corkscrew	419333	762911	30	85	31
487	128363	Lee County Utilities PWS	29S Corkscrew	423170	778002	31	62	46
488	128365	Lee County Utilities PWS	30S Corkscrew	424218	777905	40	59	32
489	128367	Lee County Utilities PWS	31S Corkscrew	424747	776511	45	110	30
490	128741	Lee County Utilities PWS	32S Corkscrew	422552	770757	40	89	26
491	128755	Lee County Utilities PWS	33S Corkscrew	420872	770670	40	79	28
492	129348	Lee County Utilities PWS	34S Corkscrew	432247	769942	40	160	22
493	129349	Lee County Utilities PWS	35S Corkscrew	435017	769991	42	150	57
494	129350	Lee County Utilities PWS	36S Corkscrew	437728	770040	40	120	24
495	129351	Lee County Utilities PWS	37S Corkscrew	440198	770030	45	110	26
496	129353	Lee County Utilities PWS	39S Corkscrew	445419	770080	40	120	25
497	135788	Lee County Utilities PWS	LCUA-I Corkscrew Observation Well (COW) A-1	427728	774959	30	50	30
498	136893	Lee County Utilities PWS	LCUB-I COW B-I	429603	775003	30	36	30
499	136900	Lee County Utilities PWS	LCUC-I COW C-I	425693	774183	30	50	29
500	136905	Lee County Utilities PWS	LCUD-I COW D-I	425488	772880	35	50	9
501	136911	Lee County Utilities PWS	LCUE-I COW E-I	427494	773114	30	50	19
502	136918	Lee County Utilities PWS	LCUF-I COW F-I	429647	773875	35	50	23
503	136944	Lee County Utilities PWS	LCUG-I COW G-I	424521	771049	30	50	11
504	136946	Lee County Utilities PWS	LCUH-I COW H-I	426030	771152	20	40	20
505	136950	Lee County Utilities PWS	LCUL-I COW L-I	425971	770258	32	45	24
506	30941	Bonita Bay	W-1-1684	392881	734632	19	33	125
507	30942	Bonita Bay	W-2-LM-2241	393042	734207	23	30	142
508	32582	Bonita Bay	BW-2	391133	751098	22	35	139
509	32596	Bonita Bay	BW-9	400884	757355	20	40	162
510	140758	Bonita Bay (**Figure F-13**)	LM-1650	392648	732811	20	25	237
511	220004	Fort Myers Post Office (**Figure F-14**)	MW-1	375671	822526	5	15	360
512	151658	Herons Glen	DV-1	353815	886551	6	16	143
513	151659	Herons Glen	DV-2	358805	884691	3	13	201
514	151660	Herons Glen (**Figure F-15**)	DV-3	353815	884739	5	15	211
517	175717	Hyatt Golf Resort	MW-1	382907	755812	10	20	50
518	175718	Hyatt Golf Resort	MW-2	383134	755179	10	20	85
519	175719	Hyatt Golf Resort	MW-3	383264	754237	10	20	50
520	175720	Hyatt Golf Resort	MW-4	383150	751591	10	20	190
521	31354	Lee County Utilities PWS	GM-1D	419090	792800	20	38	33
522	31355	Lee County Utilities PWS	GM-2A	420058	792345	20	36	26
523	31356	Lee County Utilities PWS	GM-3A	419992	793086	23	42	24
524	31358	Lee County Utilities PWS	GM-4A	421887	792381	20	43	26

Table F-2. Continued.

Map Number	SFWMD Facility	Project Name	Well Name	X	Y	Casing Depth (feet bls)	Total Depth (feet bls)	Chloride (mg/L)
525	31359	Lee County Utilities PWS	GM-5A	424184	792387	20	24	26
526	31362	Lee County Utilities PWS	GM-8A	431995	792381	20	42	33
527	31363	Lee County Utilities PWS	GM-10A	437087	792359	18	42	34
528	31364	Lee County Utilities PWS	GM-11A	439696	792492	23	60	46
529	141491	Pelican Landing (**Figure F-16**)	LM-3410	390256	747225	21	32	283
530	141492	Pelican Landing (**Figure F-17**)	LM-3678	390263	745808	21	30	230
531	141493	Pelican Landing	LM-3991	390716	750064	20	30	164
532	141494	Pelican Landing	LM-3997	390253	748114	20	30	140
533	141496	Pelican Landing (**Figure F-18**)	LM-3679	390798	745033	18	29	272
534	141497	Pelican Landing	LM-3500	390667	750954	22	30	121
535	13601	Pinewoods PWS	1 (WTA)	409134	761381	16	31	181
536	13602	Pinewoods PWS	2 (WTA)	409106	761381	19	40	93
537	13604	Pinewoods PWS	4 (WTA)	409195	760452	19	39	47
538	13606	Pinewoods PWS	6 (WTA)	409136	759393	22	32	44
539	13610	Pinewoods PWS	10 (WTA)	406604	759336	18	30	58
540	114388	Shadow Wood Preserve (**Figure F-19**)	PW-3	382005	775815	20	40	136
541	114389	Shadow Wood Preserve (**Figure F-20**)	PW-7	383280	775754	20	40	1,115
542	114406	Shadow Wood Preserve	MW-1	381560	777696	32	37	237
545	114407	Shadow Wood Preserve	MW-2	381924	777291	32	37	47
544	141555	Spring Creek at Pelican Landing	LM-4014	391271	742856	11	21	160
545	141556	Spring Creek at Pelican Landing	LM-4015	391482	741939	9	19	73
546	26903	The Legends Golf & Country Club	WT-1	390200	799400	15	35	123
547	191800	West Bay	JB-1	382147	760905	10	35	128
550		USGS 263532081592202 (**Figure F-21**)	L-1136	332949	822316	15	20	82
551	136952	Lee County Utilities PWS	LCUM-I COW M-I	427743	770156	32	40	29
552	142772	Ben Hill Griffin Parkway	LM-7725	402660	770950	15	25	70
553	31400	Lee County Utilities PWS	GM-9A	434292	792387	20	42	34
554	147790	Palms Away, Inc.	MW1	288067	842839	30	30	20

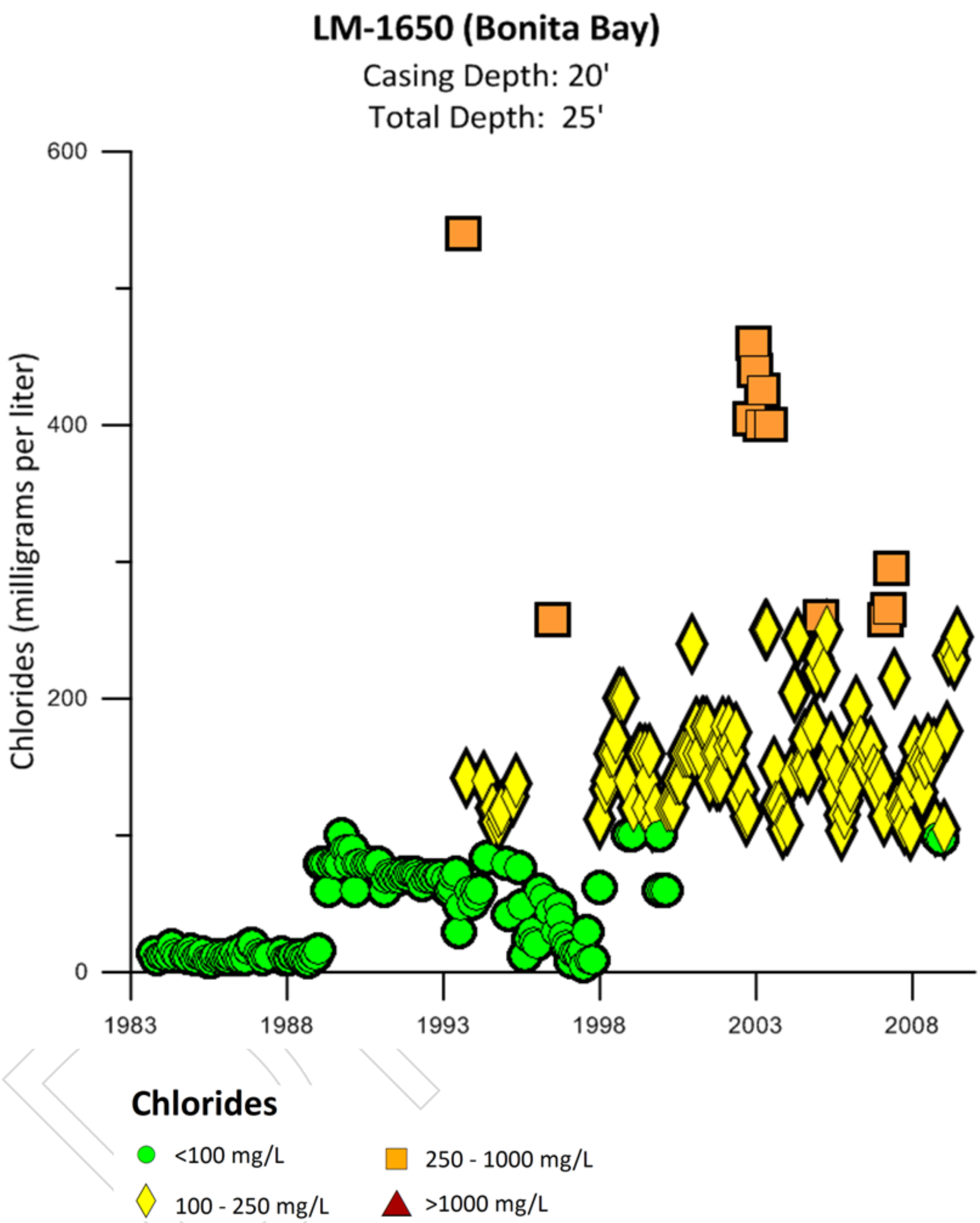

Figure F-13. Chloride levels at Bonita Bay well LM-1650
This well is labeled 510 in **Figure F-12**.

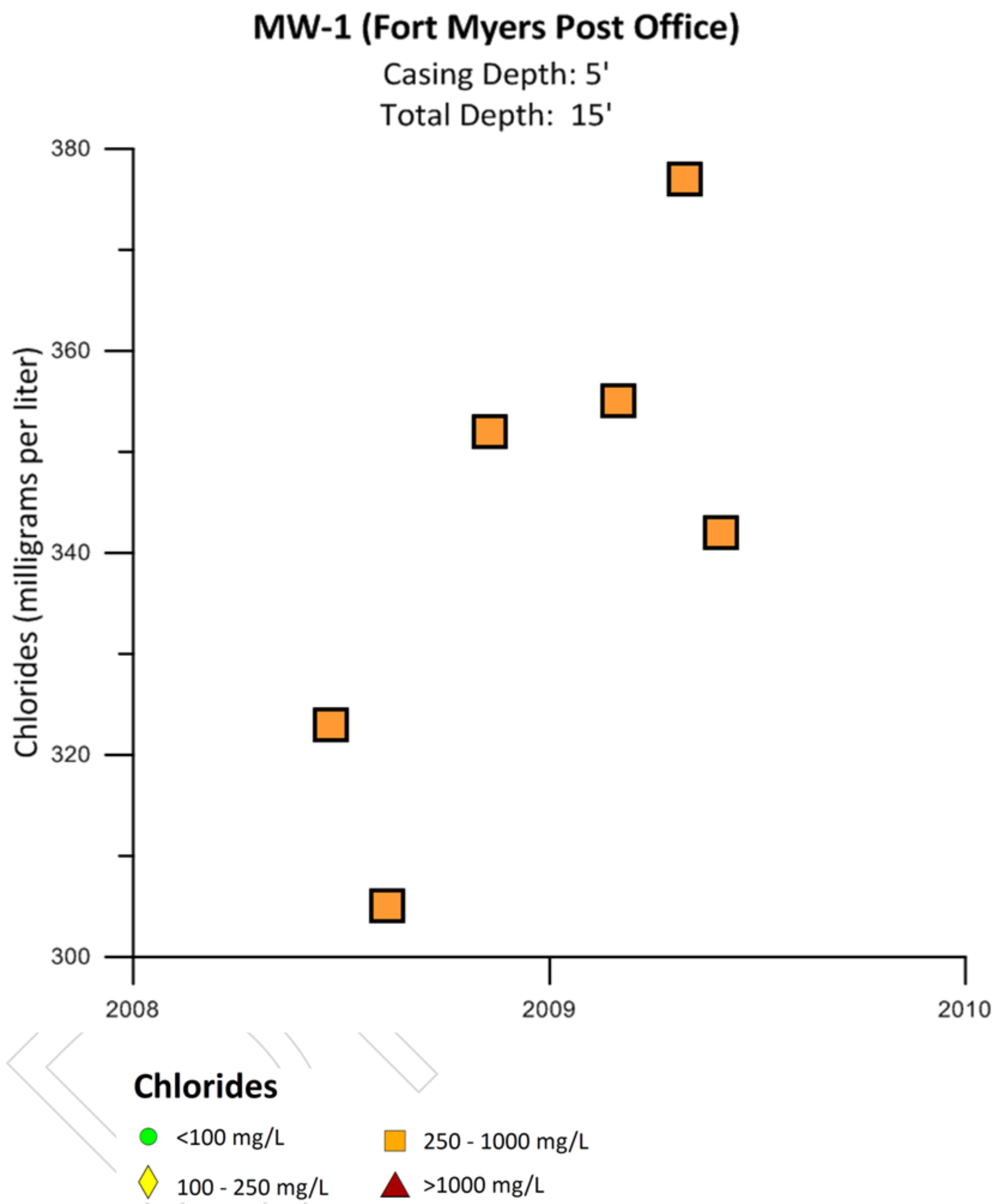

Figure F-14. Chloride levels at Fort Myers Post Office well MW-1. The well is labeled 511 on **Figure F-12**.

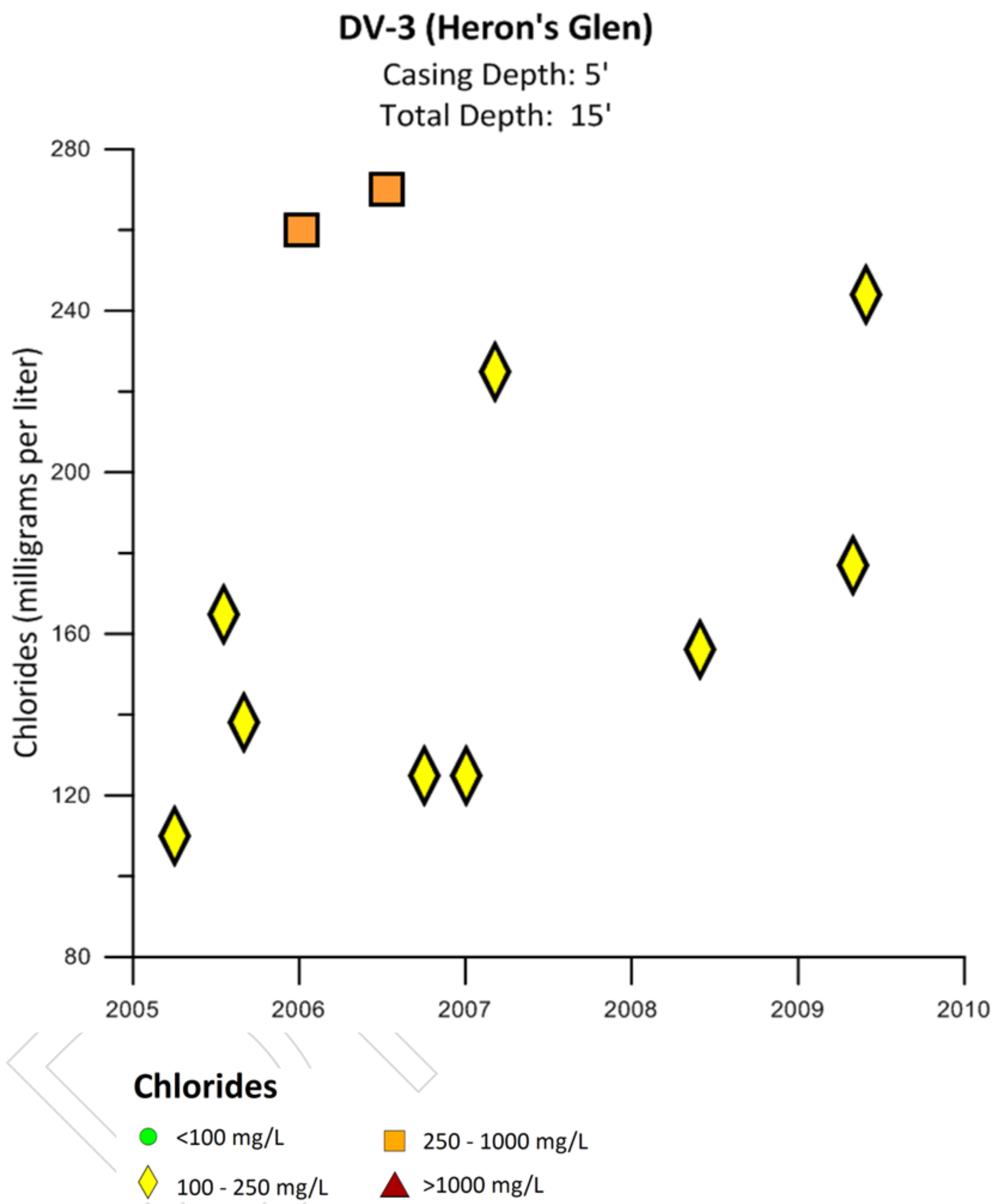

Figure F-15. Chloride levels at Heron's Glen well DV-3.
This well is labeled 514 on **Figure F-12**.

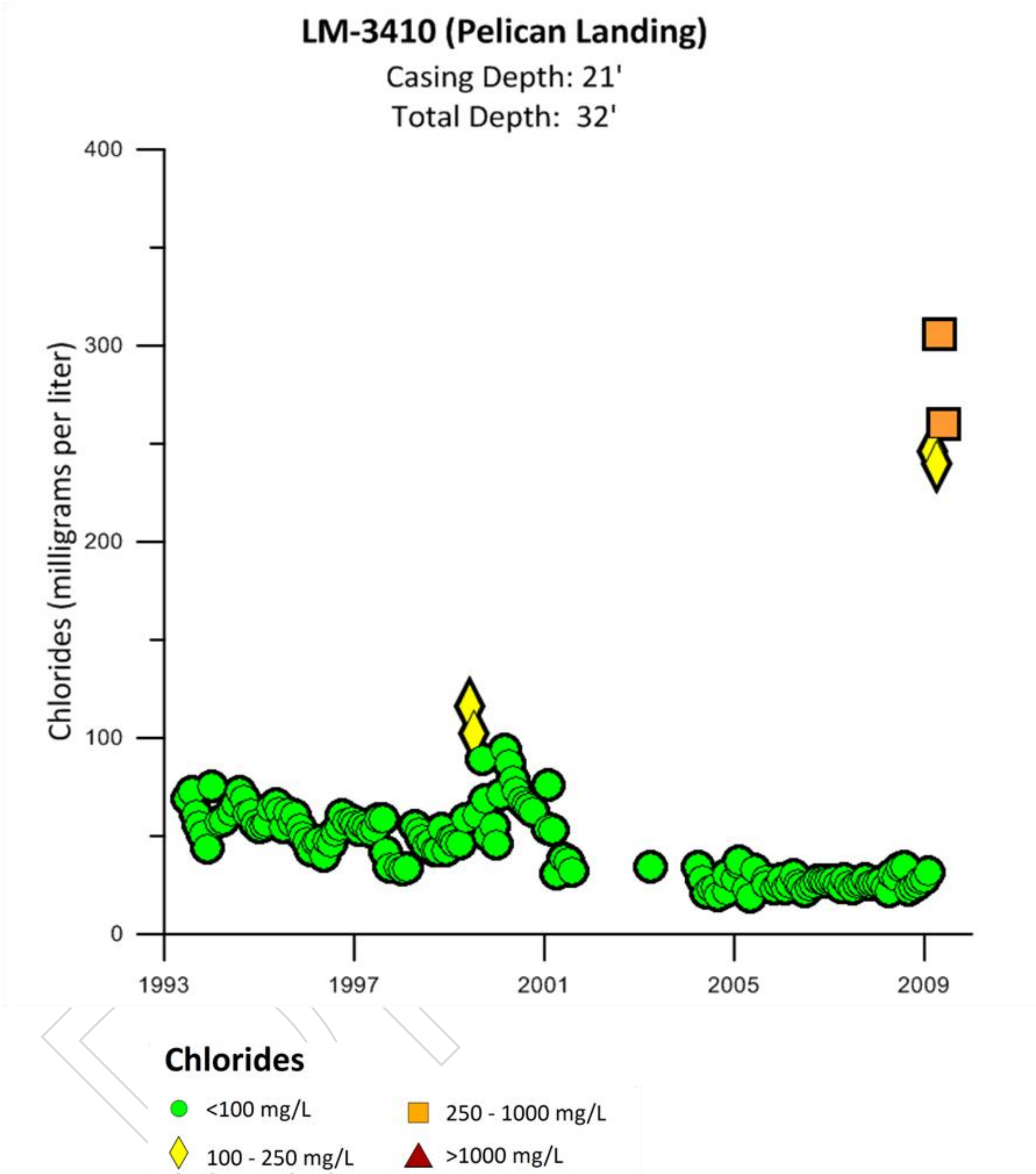

Figure F-16. Chloride levels at Pelican Landing well LM-3410.
The well is labeled 529 on **Figure F-12**.

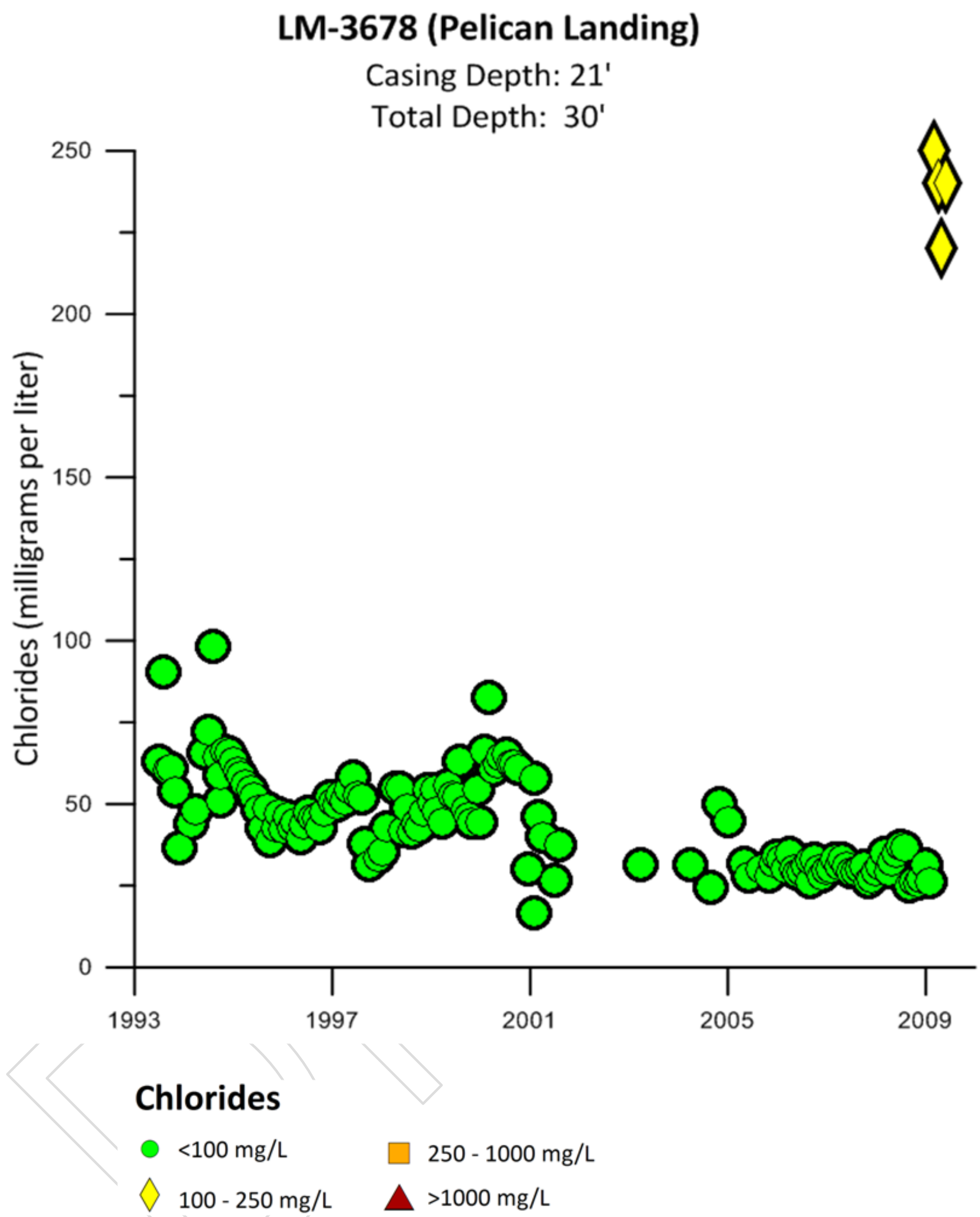

Figure F-17. Chloride levels at Pelican Landing well LM-3678.
This well is labeled 530 on **Figure F-12**.

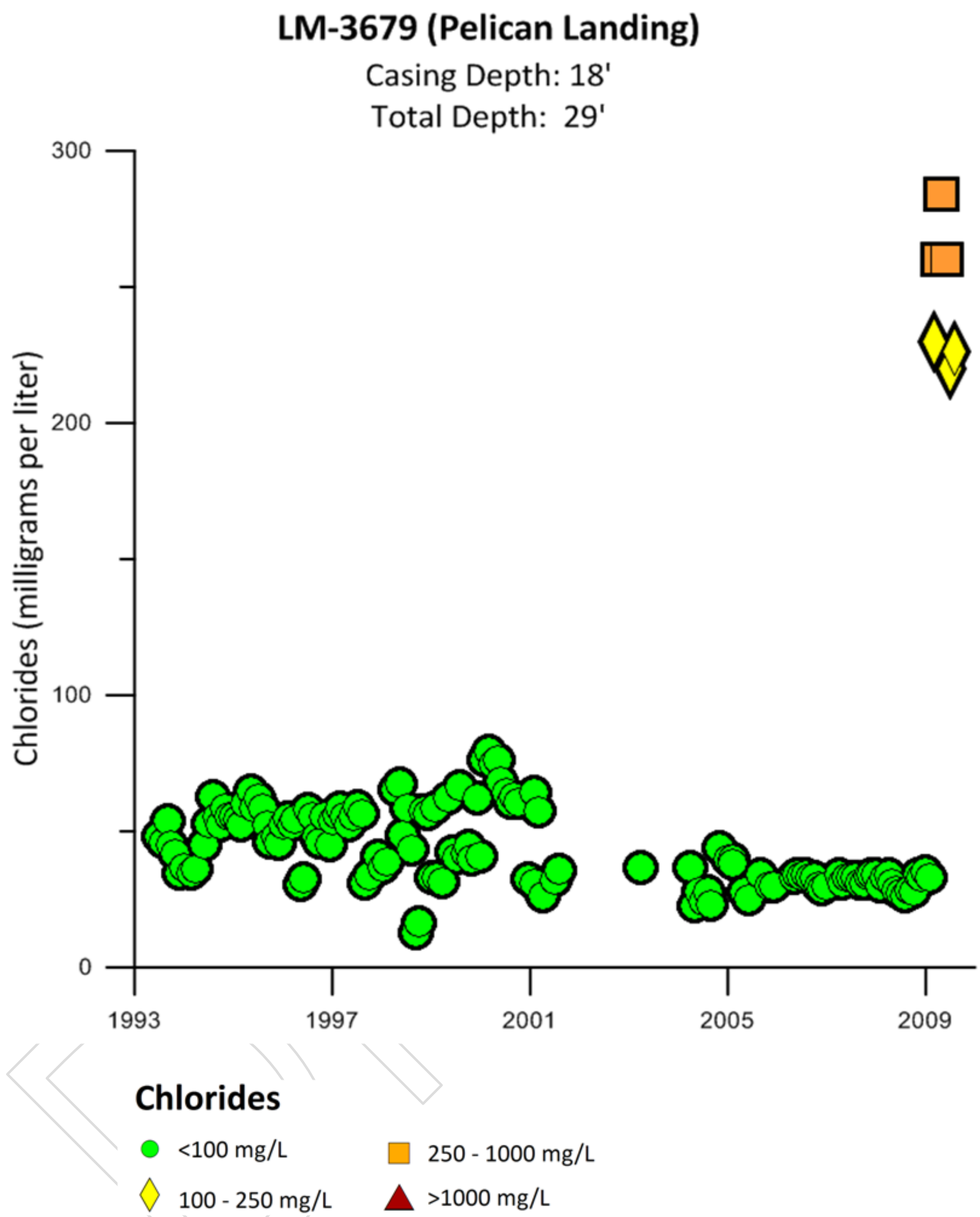

Figure F-18. Chloride levels at Pelican Landing well LM-3679.
This well is labeled 533 on **Figure F-12**.

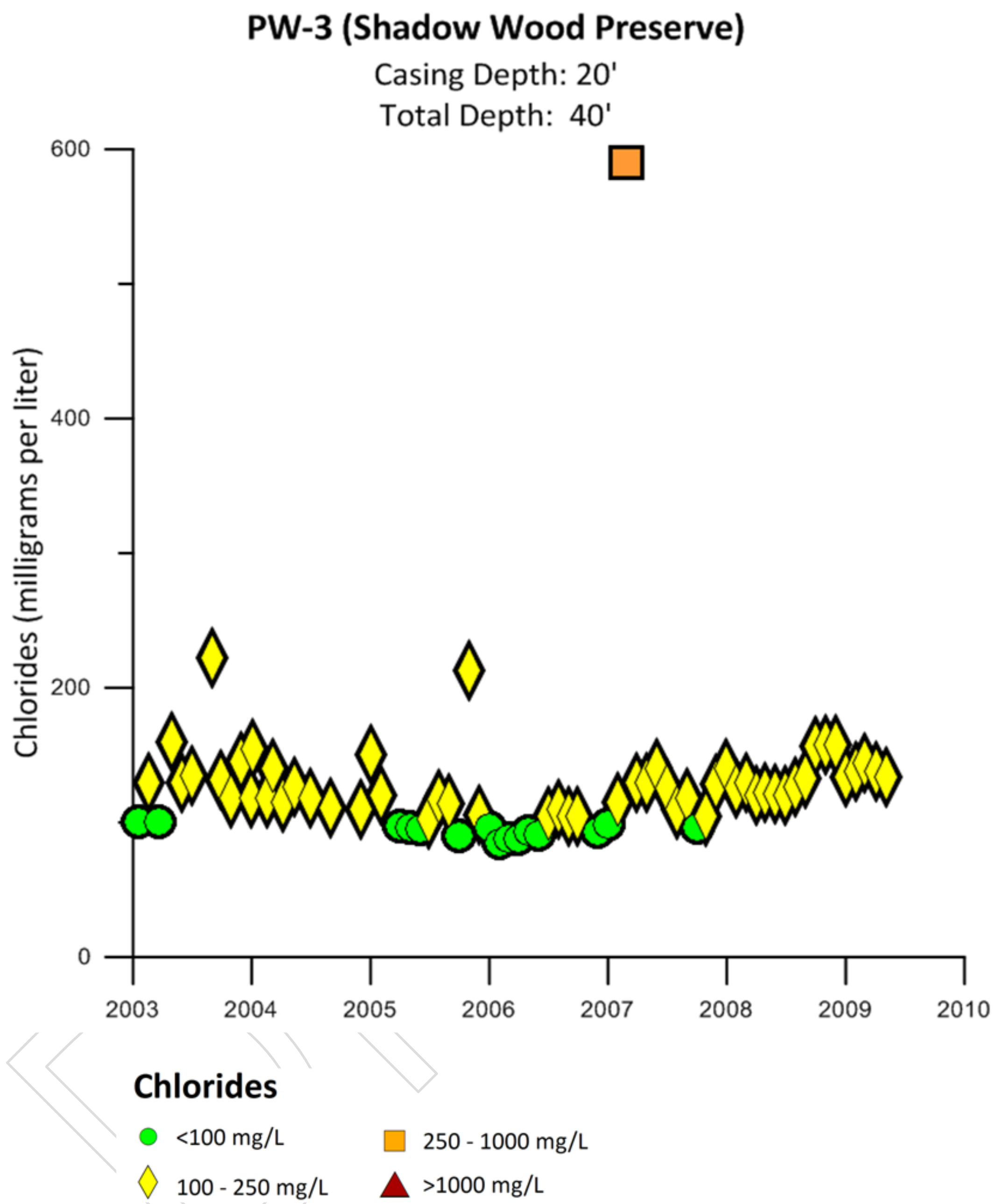

Figure F-19. Chloride levels at Shadow Wood Preserve well PW-3. This well is labeled 540 on **Figure F-12**.

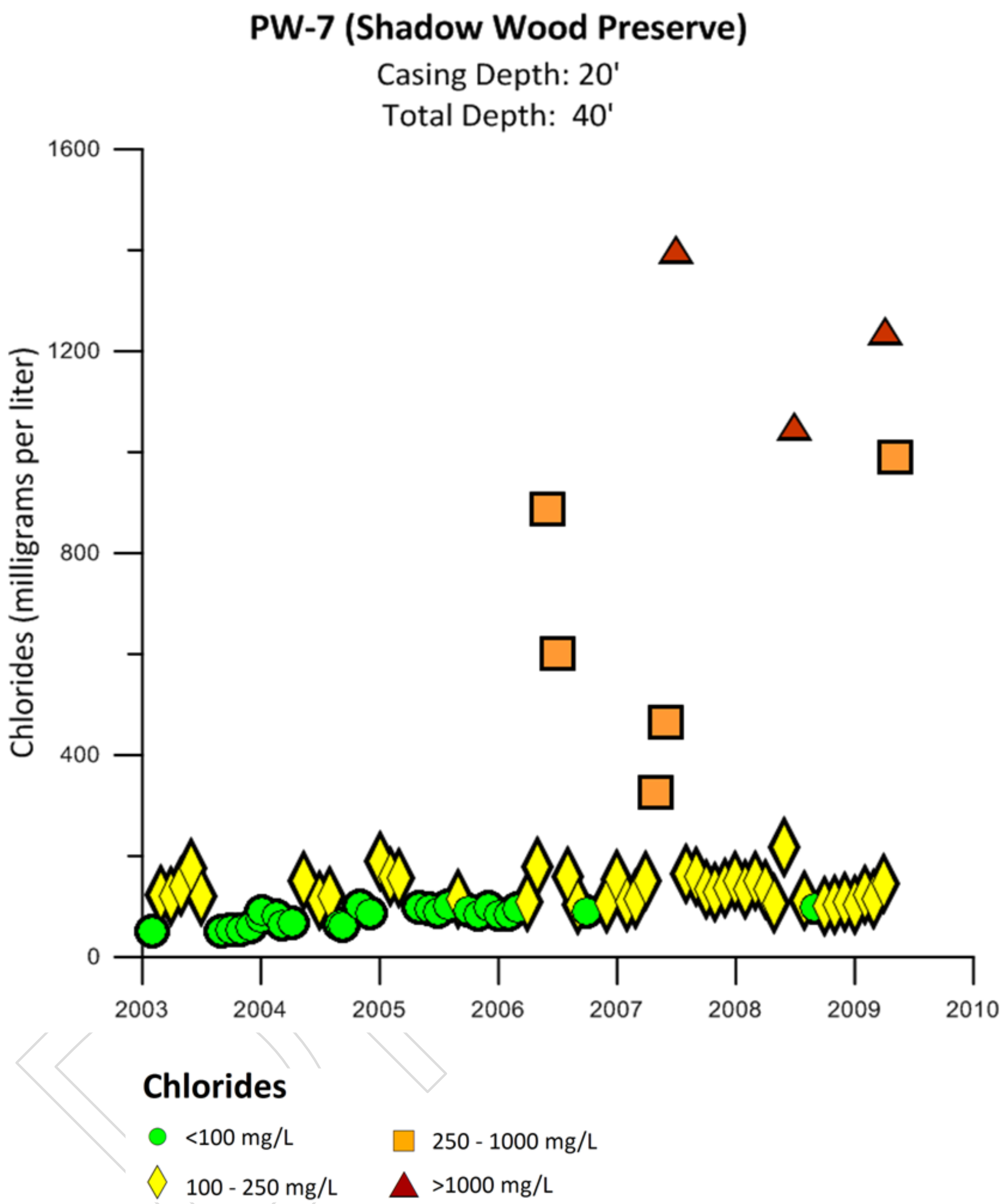

Figure F-20. Chloride levels at Shadow Wood Preserve well PW-7.
The well is labeled 541 on **Figure F-12**.

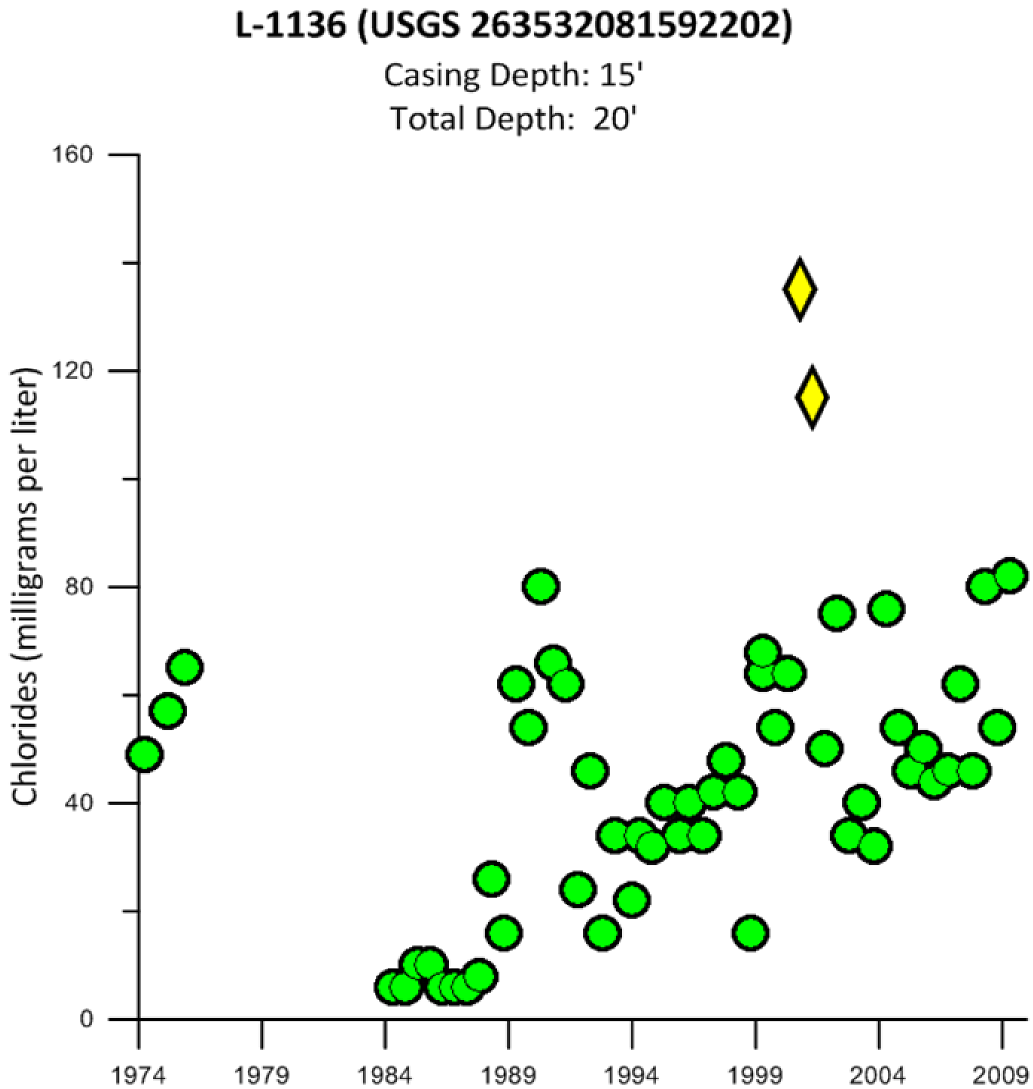

Figure F-21. Chloride levels at USGS station 263532081592202 well L-1136.
This well is labeled 550 on **Figure F-12**.

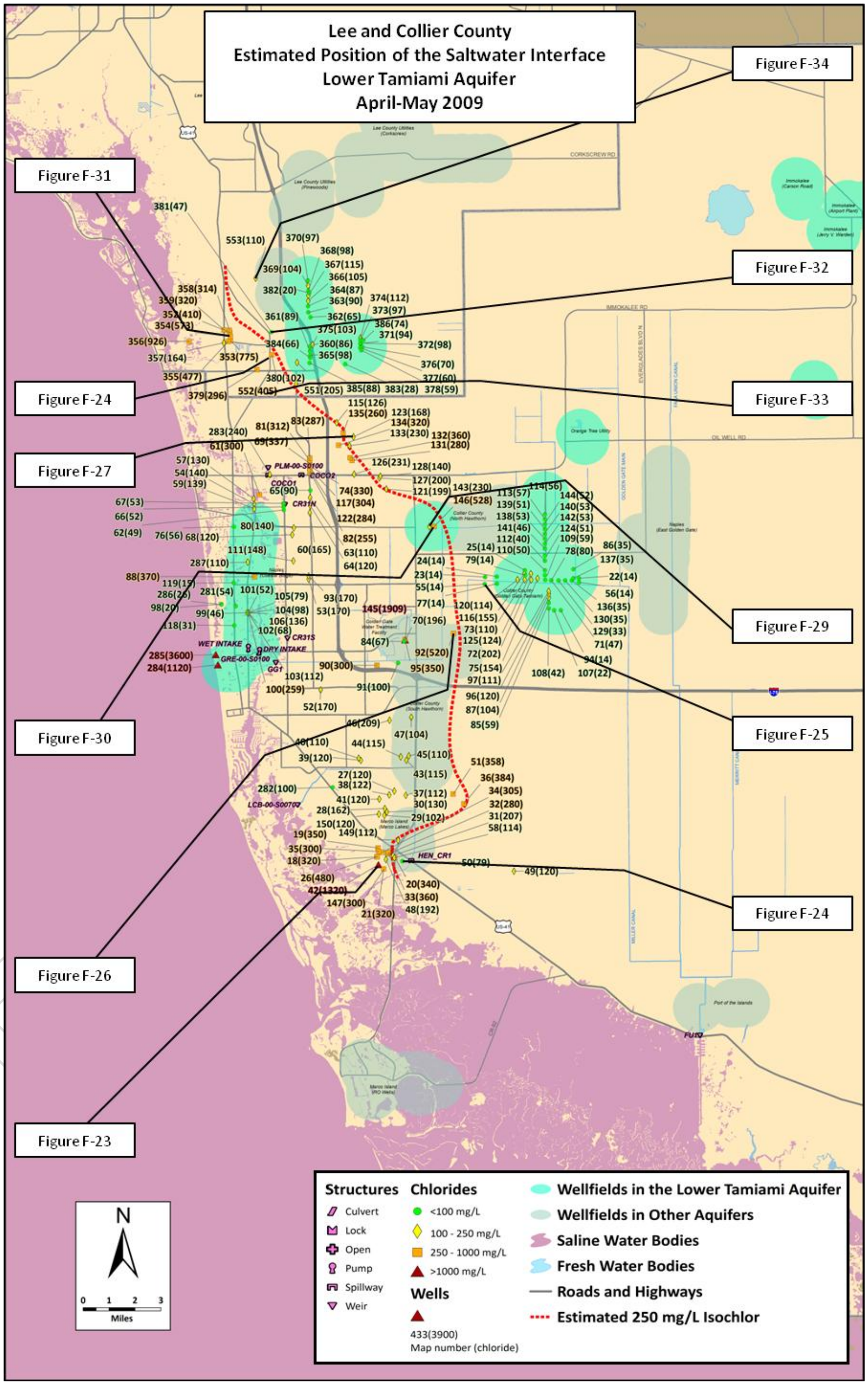

Figure F-22. Estimated position of the saltwater interface within the Lower Tamiami aquifer in Lee and Collier counties in April–May 2009. The figure number labels on the map refer to **Figure F-31** through **Figure F-24**, which show chloride levels for the indicated wells.

Table F-3. Chloride levels measured at Lower Tamiami Aquifer wells within Lee and Collier counties. The map numbers in the first column refer to the numbers on the map in **Figure F-22**.

Map Number	SFWMD Facility	Project Name	Well Name	X	Y	Casing Depth (feet bls)	Total Depth (feet bls)	Chloride (mg/L)
18	139253	Eagle Creek Country Club	ECOM594	422857	627900	4	9	320
19	139255	Eagle Creek Country Club	ECOM596	423076	629711	6	11	350
20	139250	Eagle Creek Country Club	ECOM591	426507	627696	7	12	340
21	139252	Eagle Creek Country Club	ECOM593	424244	625448	7	12	320
22	139671	Collier County Public Water Supply (PWS) – North East Regional Water Treatment Plant (NERWTP)	CC4S	463990	684610	10	15	14
23	139665	Collier County PWS – NERWTP	CC1S	444879	684853	10	15	14
24	139667	Collier County PWS – NERWTP	CC2S	447292	684927	10	15	14
25	139669	Collier County PWS – NERWTP	CC3S	452996	686219	10	15	14
26	139254	Eagle Creek Country Club	ECOM595	422930	627900	12	17	480
27	1178	Lely Estates Community	8	426378	641305	23	43	120
28	1168	Lely Estates Community	3	424454	637737	25	40	162
29	1172	Lely Estates Community	5	424360	636327	26	50	102
30	1170	Lely Estates Community	4	424871	637052	27	40	130
31	104598	Eagle Creek Country Club	Well 4	426143	628159	30	45	207
32	2808	Eagle Creek Country Club	Well 2	425113	628502	30	45	280
33	2807	Eagle Creek Country Club	Well 1	425187	628809	30	45	360
34	110948	Eagle Creek Country Club	Well 5	423961	628845	30	45	305
35	110949	Eagle Creek Country Club	Well 6	423189	628993	30	45	300
36	139349	South Naples Citrus Grove	MW-2	440589	638701	30	50	384
37	1164	Lely Estates Community	1	428741	640430	30	48	112
38	1176	Lely Estates Community	7	425356	640498	30	35	122
39	182123	Royal Wood Golf & Country Club	PW-3	419586	647536	30	40	120
40	14016	Royal Wood Golf & Country Club	PW-1	419102	647987	30	40	110
41	1166	Lely Estates Community	2	423317	639675	32	48	120
42	139257	Eagle Creek Country Club (**Figure F-23**)	ECOM598	423149	626338	35	40	1,320
43	30903	Naples Lakes Country Club	Well 3	428864	647553	35	50	115
44	30901	Naples Lakes Country Club	Lake Recharge Well 1	427694	648273	35	50	115
45	30902	Naples Lakes Country Club	Lake Recharge Well 2	429334	648486	35	50	110
46	1478	Naples Heritage Golf & Country Club	2	425395	655712	35	45	209
47	1480	Naples Heritage Golf & Country Club	1	429834	656280	35	45	104
48	139256	Eagle Creek Country Club	ECOM597	424667	627360	38	40	192
49	124409	Deseret Farms	MW 1 (aka SW#1)	450742	624990	40	80	120
50	170752	Trail Ridge (**Figure F-24**)	Well - 1	428022	627040	40	65	79
51	139348	South Naples Citrus Grove	MW-1	438387	640698	40	60	358
52	2997	Foxfire Community Association	C3	411376	661873	40	70	170
53	26038	Community School of Naples	1	408934	684400	40	100	170
54	26171	Pelican Marsh	C0-2343	397888	699670	41	70	140
55	139662	Collier County PWS – NERWTP (**Figure F-25**)	CC1D	444806	683415	42	75	14
56	139670	Collier County PWS – NERWTP	CC4D	464039	683805	42	75	14
57	26165	Pelican Marsh	C0-2342	397744	700795	42	70	130
58	139258	Eagle Creek Country Club	ECOM599	426390	627725	43	45	114
59	26174	Pelican Marsh	C0-2344	397856	698766	43	70	139
60	29368	Pelican Marsh	11	409177	697902	45	70	165
61	143697	Stonebridge Country Club	MW-1	398968	701581	45	75	300
62	26168	Pelican Marsh	C0-2422	403872	698487	46	76	49
63	26192	Pelican Marsh	9	409231	701015	46	70	110
64	26189	Pelican Marsh	10	409250	699398	47	70	120
65	26186	Pelican Marsh	8	409278	702475	47	70	90
66	26180	Pelican Marsh	C0-2421	403820	699123	48	75	52

Figure F-3. Continued.

Map Number	SFWMD Facility	Project Name	Well Name	X	Y	Casing Depth (feet bls)	Total Depth (feet bls)	Chloride (mg/L)
67	26177	Pelican Marsh	C0-2420	403759	699821	48	78	53
68	149240	Piper's Grove	MW1/PW-3	405567	693441	49	58	120
69	144266	Pelican Bay/Mule Pen Supplemental Reclaimed	CO-287	409174	707986	49	98	337
70	139079	Golden Gate Water Treatment Facility	MW-E	428583	671986	50	52	196
71	45425	Collier County PWS – NERWTP	5	458356	684162	50	108	47
72	45422	Collier County PWS – NERWTP	2	454256	684262	50	100	202
73	45421	Collier County PWS – NERWTP	1	452956	684312	50	96	110
74	144265	Pelican Bay/Mule Pen Supplemental Reclaimed	CO-80	409203	707411	50	100	330
75	45423	Collier County PWS – NERWTP	3	455556	684562	51	100	154
76	137994	Naples, City of	C-1003	393736	695077	51	61	56
77	139666	Collier County PWS – NERWTP	CC2D	447317	683488	52	100	14
78	45424	Collier County PWS – NERWTP	4	457156	684262	52	102	80
79	139668	Collier County PWS – NERWTP	CC3D	453045	685195	52	100	14
80	149241	Piper's Grove	MW2/PW-9	405887	694837	52	58	140
81	144267	Pelican Bay/Mule Pen Supplemental Reclaimed	CO-288	409177	708544	52	100	312
82	144256	Pelican Bay/Mule Pen Supplemental Reclaimed	CO-26	409230	706135	53	90	255
83	144268	Pelican Bay/Mule Pen Supplemental Reclaimed	CO-289	409190	709043	53	102	287
84	139080	Golden Gate Water Treatment Facility	MW-F	428343	671774	57	60	67
85	45444	Collier County PWS – NERWTP	24	457864	679583	58	109	59
86	110533	Collier County PWS – NERWTP	30	462891	686447	58	120	35
87	45443	Collier County PWS – NERWTP	23	457864	680682	59	111	104
88	9916	Pine Ridge Middle School	Well 1	397893	684913	59	70	370
90	110941	Forest Park	W-1	422865	666910	60	90	300
91	127691	Golden Gate High School	1	427147	667378	60	90	100
92	29501	Hideout Golf Club (**Figure F-26**)	3 (PWS)	438465	673344	60	80	520
93	214047	Community School of Naples	2R	408916	685081	60	80	170
94	45447	Collier County PWS – NERWTP	27	460321	678080	61	105	14
95	139077	Golden Gate Water Treatment Facility	MW-C	428597	672127	62	65	350
96	45442	Collier County PWS – NERWTP	22	457864	681405	62	101	120
97	45441	Collier County PWS – NERWTP	21	457846	681947	62	110	111
98	137992	Naples, City of	C-528	391180	679342	63	80	20
99	190917	Naples, City of	11S	396579	677576	64	80	46
100	190918	Naples, City of	11D	396579	677576	64	80	259
101	190919	Naples, City of	18D	396579	677576	64	80	52
102	190920	Naples, City of	23D	396579	677576	64	80	68
103	190921	Naples, City of	23S	396579	677576	64	80	112
104	190922	Naples, City of	28D	396579	677576	64	80	98
105	190923	Naples, City of	28S	396579	677576	64	80	79
106	190925	Naples, City of	18S	396579	677576	64	80	136
107	45446	Collier County PWS – NERWTP	26	458962	678080	65	106	22
108	45445	Collier County PWS – NERWTP	25	457864	678484	65	110	42
109	45426	Collier County PWS – NERWTP	6	457086	685212	65	101	59
110	45427	Collier County PWS – NERWTP	7	457086	686212	65	106	50
111	25373	Collier County PWS – NERWTP	3	405804	688129	65	85	148
112	45429	Collier County PWS – NERWTP	9	457086	688162	65	114	40
113	110534	Collier County PWS – NERWTP	31	457085	696593	65	120	57
114	110535	Collier County PWS – NERWTP	32	457085	697624	65	120	56
115	139312	Quail Creek Country Club	QCCO-110	414652	716245	65	70	126
116	110531	Collier County PWS – NERWTP	28	452903	685553	66	120	155
117	144264	Pelican Bay/Mule Pen Supplemental Reclaimed	CO-79	409207	706919	69	100	304
118	137993	Naples, City of	C-491	393795	674984	70	71	31

Figure F-3. Continued.

Map Number	SFWMD Facility	Project Name	Well Name	X	Y	Casing Depth (feet bls)	Total Depth (feet bls)	Chloride (mg/L)
119	137926	Naples, City of	C-490	393666	683668	70	71	15
120	148411	Collier County PWS – NERWTP	33	451478	684299	70	120	114
121	149546	Heritage Greens	Well A	424763	702737	70	80	199
122	144263	Pelican Bay/Mule Pen Supplemental Reclaimed	CO-75	409233	706414	70	99	284
123	139317	Quail Creek Country Club (**Figure F-27**)	QCCO-296	418046	713357	70	105	168
124	45430	Collier County PWS – NERWTP	10	457086	689152	71	112	51
125	110532	Collier County PWS – NERWTP	29	454201	685512	72	125	124
126	139583	Longshore Lake	MW-1	418205	705774	73	84	231
127	22054	Gulf Coast High & Laurel Oaks Schools	Laurel 1	423336	704991	75	90	200
128	22055	Gulf Coast High & Laurel Oaks Schools	Gulf 1	423554	705335	75	90	140
129	45440	Collier County PWS – NERWTP	17	459860	684150	78	125	33
130	45437	Collier County PWS – NERWTP	18	461189	684150	80	126	35
131	115561	Longshore Lake	2	417784	708592	80	120	280
132	115560	Longshore Lake	1	417393	709106	80	120	360
133	139318	Quail Creek Country Club	QCCO-96	417272	711556	80	85	230
134	139314	Quail Creek Country Club	QCCO-112	415054	711675	80	85	320
135	139297	Quail Creek Country Club (**Figure F-28**)	QCC2393	415992	714146	80	105	260
136	45438	Collier County PWS – NERWTP	19	462576	684150	83	128	35
137	45439	Collier County PWS – NERWTP	20	462891	684614	83	131	35
138	45433	Collier County PWS – NERWTP	13	457086	692592	84	130	53
139	45435	Collier County PWS – NERWTP	15	457086	694572	84	130	51
140	45434	Collier County PWS – NERWTP	14	457086	693582	85	131	53
141	45431	Collier County PWS – NERWTP	11	457086	690612	90	137	46
142	45432	Collier County PWS – NERWTP	12	457086	691602	90	133	53
143	159920	Collier County PWS – NERWTP (**Figure F-29**)	36	433550	695115	92	125	230
144	45436	Collier County PWS – NERWTP	16	457086	695562	92	150	52
145	139078	Golden Gate Water Treatment Facility	MW-D	428597	672071	98	101	1,909
146	159919	Collier County PWS – NERWTP (**Figure F-30**)	35	434500	695150	102	145	528
149	138874	Lely Estates Community	LRCMW-1	427138	631307	73	80	112
150	138875	Lely Estates Community	LRCMW-2	423220	636602	68	70	120
281		USGS 261156081475801	C-516	394091	678919	46	63	54
282		USGS 260549081441901	C-600	413830	642050	48	52	100
283		USGS 261620081464402	C-1004R	400993	705735	52	60	240
284		USGS 261002081483701	C-525	390447	666995	63	83	1,120
285		USGS 261018081484101	C-526	389995	669078	63	68	3,600
286		USGS 261200081483001	C-528	391178	679240	63	80	26
287		USGS 261302081473901	C-489	396514	687891	63	83	110
352	30943	Bonita Bay	T-1-1682A	392881	734632	74	125	410
353	30944	Bonita Bay	T-3-2244	393034	732934	83	120	775
354	30956	Bonita Bay (**Figure F-31**)	T-2-2242	393039	733783	80	120	573
355	140754	Bonita Bay	LM-1644	392556	732780	75	86	477
356	140755	Bonita Bay	LM-1645	384618	732780	97	104	926
357	140763	Bonita Bay	LM-3555	391637	732504	76	100	164
358	140846	Bonita Bay	LM-1677	392802	735079	70	125	314
359	140847	Bonita Bay	LM-1676	391698	735140	67	120	320
360	31449	Bonita Springs Utilities	5	409165	731734	64	80	86
361	31450	Bonita Springs Utilities	6	409206	730849	58	80	89
362	31452	Bonita Springs Utilities	8	409300	737724	70	85	65
363	31453	Bonita Springs Utilities	9	408875	738710	70	85	90
364	31454	Bonita Springs Utilities	10	408808	739968	66	90	87
365	31455	Bonita Springs Utilities	11	409239	729975	67	97	98
366	31456	Bonita Springs Utilities	12	408830	741046	70	100	105
367	31457	Bonita Springs Utilities	13	408875	742191	70	100	115
368	31458	Bonita Springs Utilities	14	408880	743103	70	100	98
369	31459	Bonita Springs Utilities	15	408826	744126	70	100	104

Figure F-3. Continued.

Map Number	SFWMD Facility	Project Name	Well Name	X	Y	Casing Depth (feet bls)	Total Depth (feet bls)	Chloride (mg/L)
370	31460	Bonita Springs Utilities	16	408799	745195	70	100	97
371	31461	Bonita Springs Utilities	17	419499	732345	73	102	94
372	31462	Bonita Springs Utilities	18	419499	732411	78	101	98
373	31463	Bonita Springs Utilities	19	419485	733081	82	110	97
374	31464	Bonita Springs Utilities	20	419489	733483	91	114	112
375	31465	Bonita Springs Utilities	21	409744	732141	80	115	103
376	31466	Bonita Springs Utilities	22	419897	731697	65	115	70
377	31467	Bonita Springs Utilities	23	419457	731521	65	115	60
378	31468	Bonita Springs Utilities	24	419651	731021	61	101	59
379	214899	Bonita Springs Utilities	MW-1	398426	727033	75	80	296
380	214900	Bonita Springs Utilities	MW-2	406558	728512	81	100	102
381	214901	Bonita Springs Utilities (**Figure F-32**)	MW-3	401337	734703	53	70	47
382	214902	Bonita Springs Utilities	MW-4	409053	742651	63	98	20
383	214903	Bonita Springs Utilities	MW-5	416400	728188	56	112	28
384	214904	Bonita Springs Utilities	MW-6	409238	729482	10	20	66
385	214905	Bonita Springs Utilities	MW-7	409146	728419	65	80	88
386	214909	Bonita Springs Utilities	MW-8	420097	733039	86	125	74
551		USGS 261926081454702	L-5745R	406382	724180	108	108	205
552		USGS 262022081464201 (**Figure F-33**)	L-738	401412	730066	61	75	405
553		USGS 262258081471802 (**Figure F-34**)	L-5747	398133	745646	59	105	110

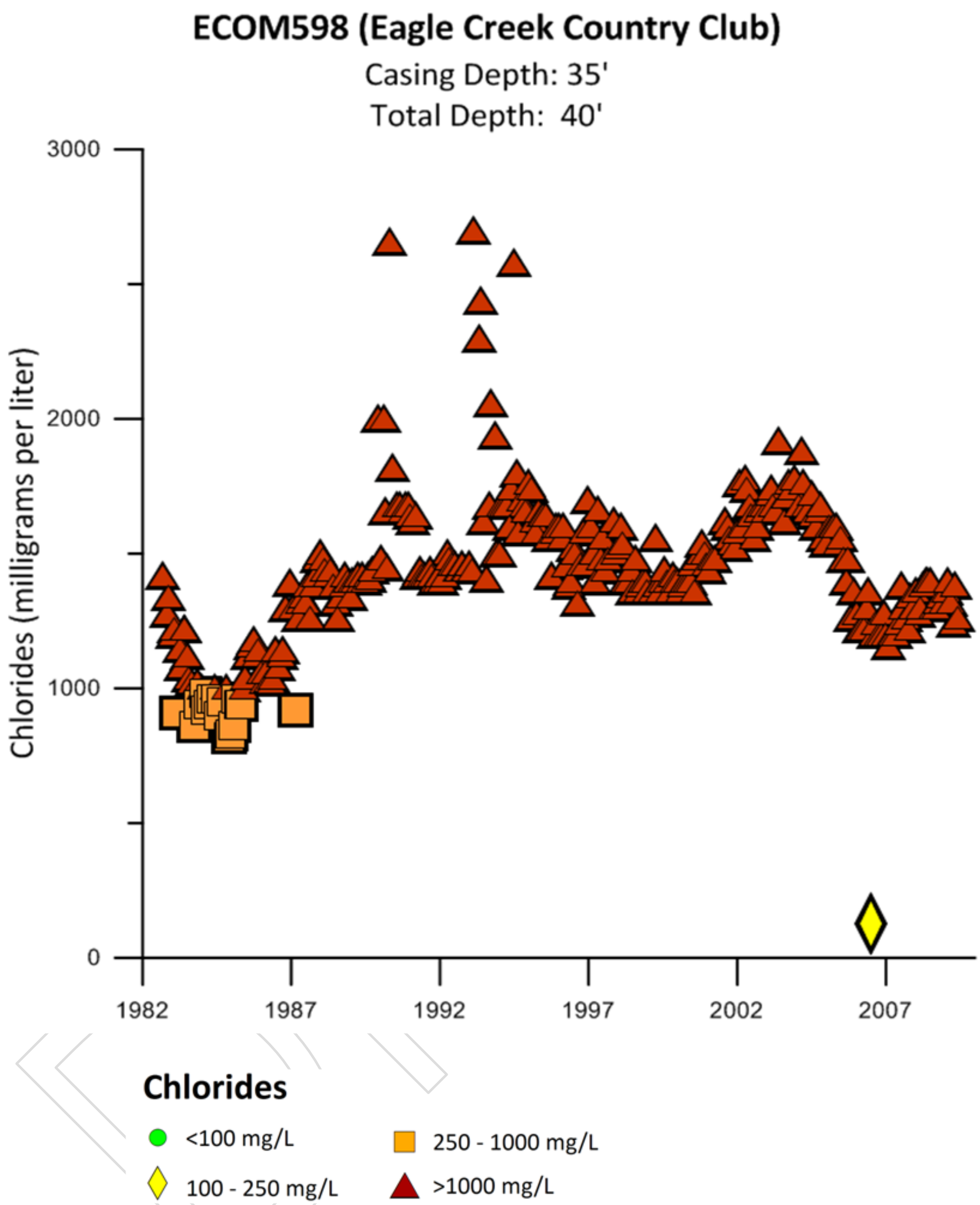

Figure F-23. Chloride levels at Eagle Creek Country Club well ECOM598.
This well is labeled 42 in **Figure F-22**.

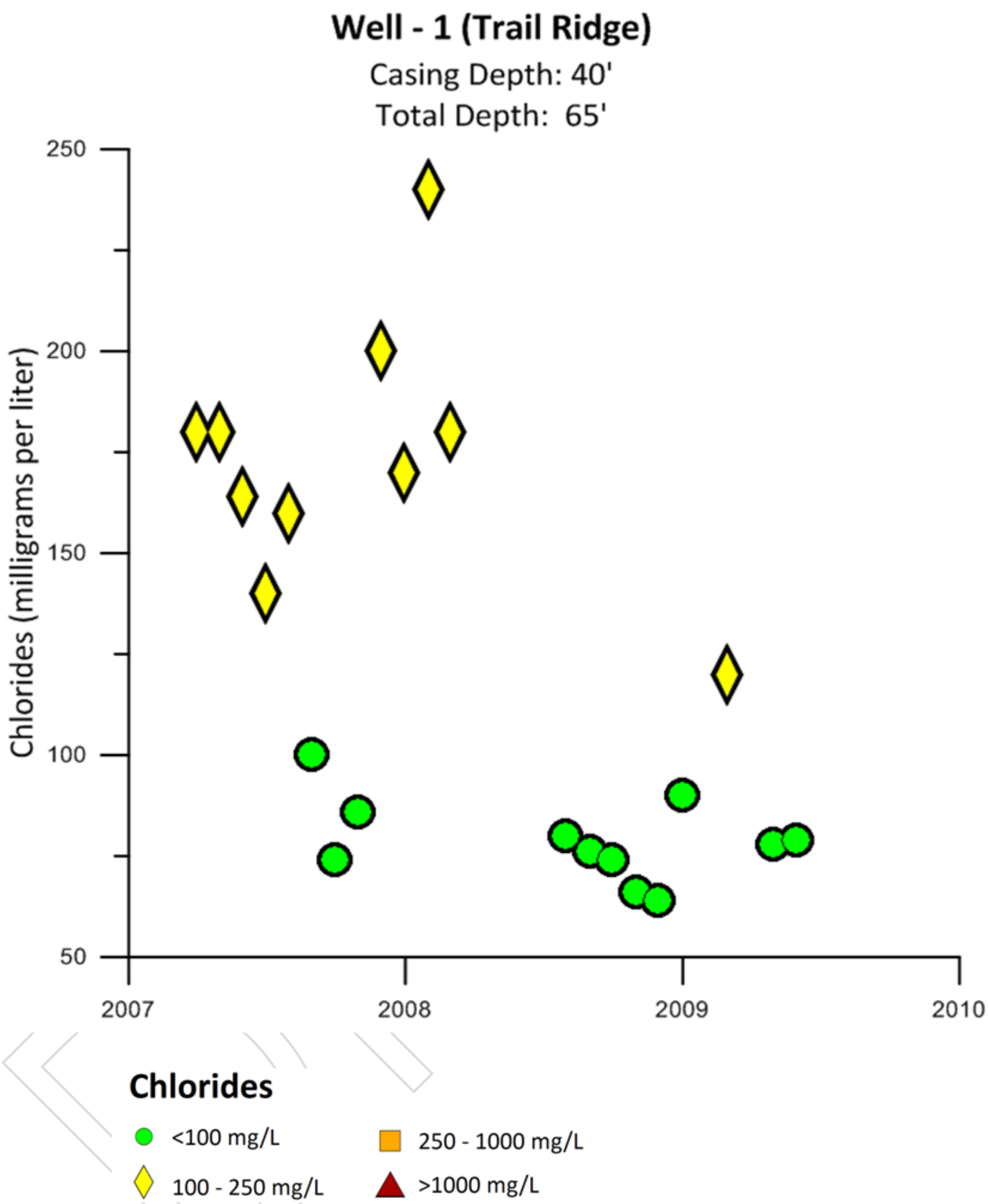

Figure F-24. Chloride levels at Trail Ridge well 1.
This well is labeled 50 in **Figure F-22**.

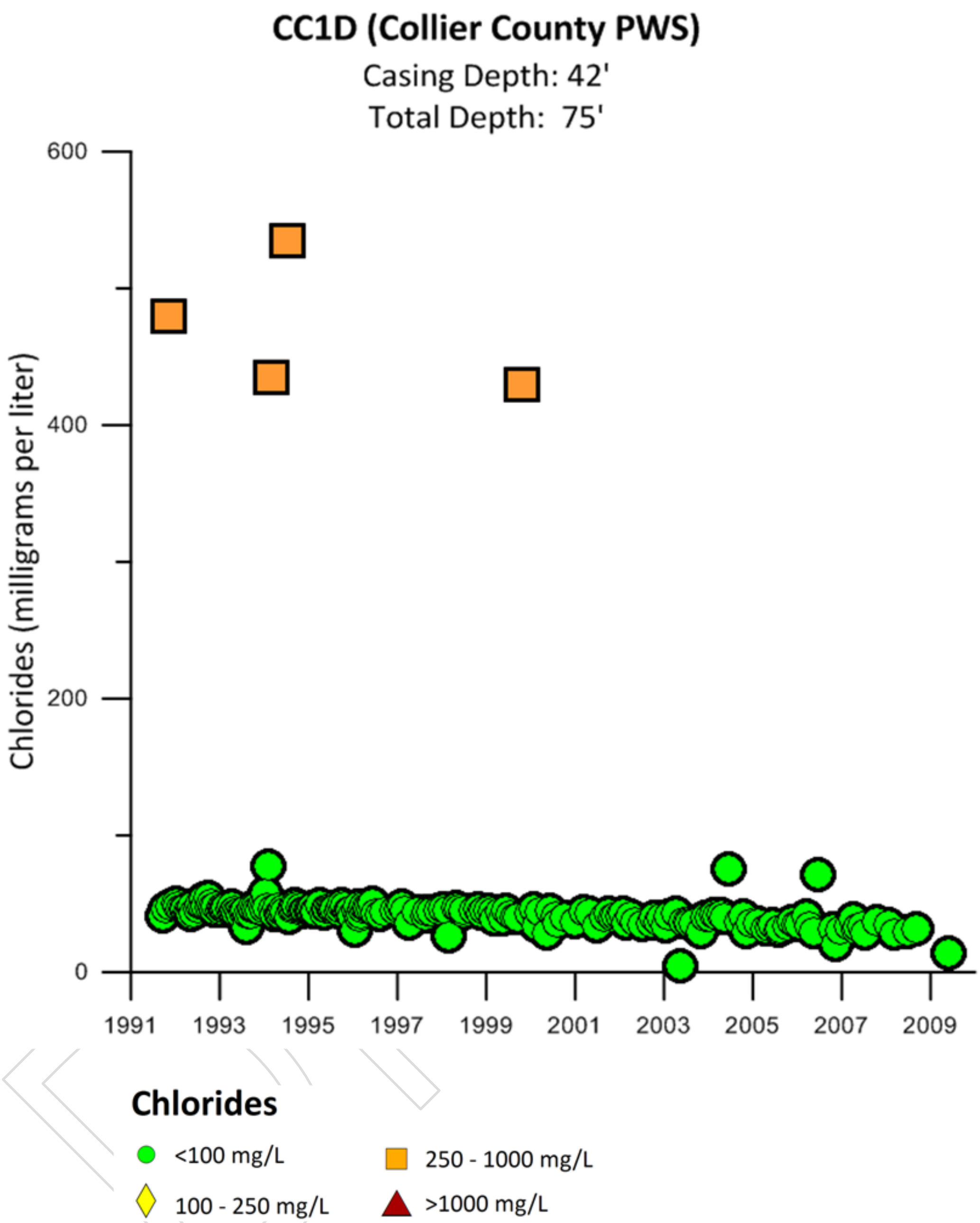

Figure F-25. Chloride levels at Collier County PWS well CC1D.
This well is labeled 55 in **Figure F-22**.

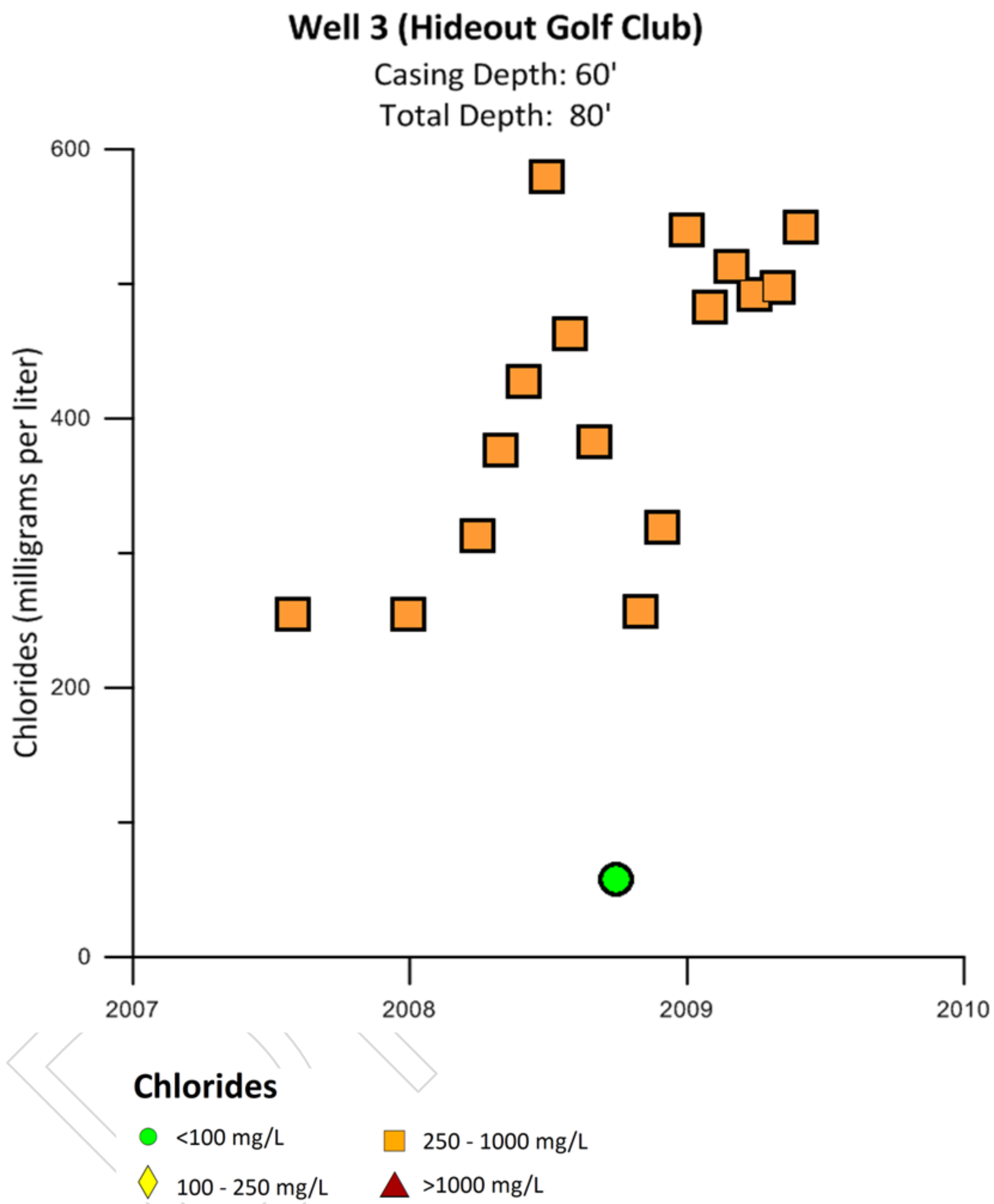

Figure F-26. Chloride levels at Hideout Golf Club well 3.
This well is labeled 92 in **Figure F-22**.

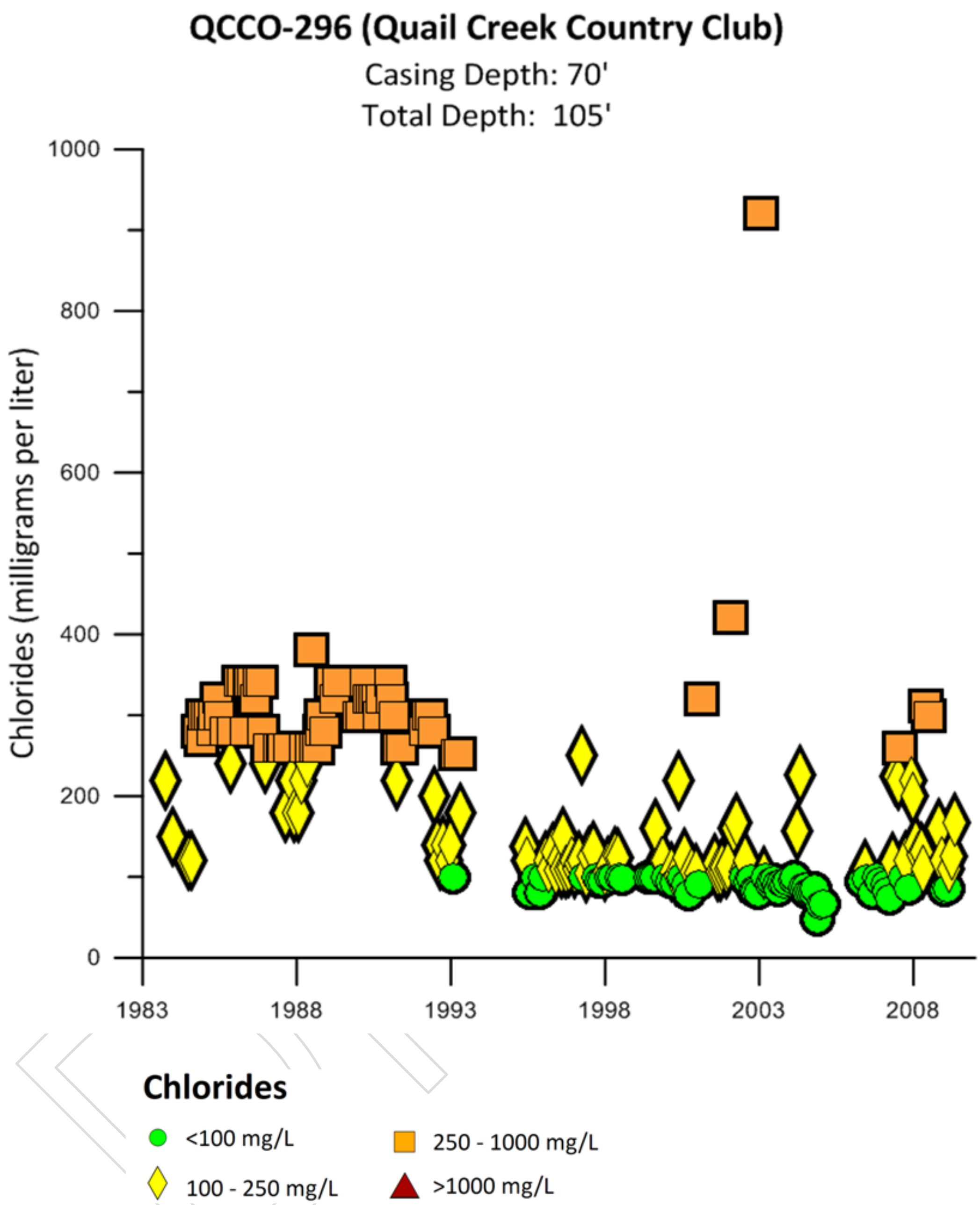

Figure F-27. Chloride levels at Quail Creek Country Club well QCCO-296.
This well is labeled 123 in **Figure F-22**.

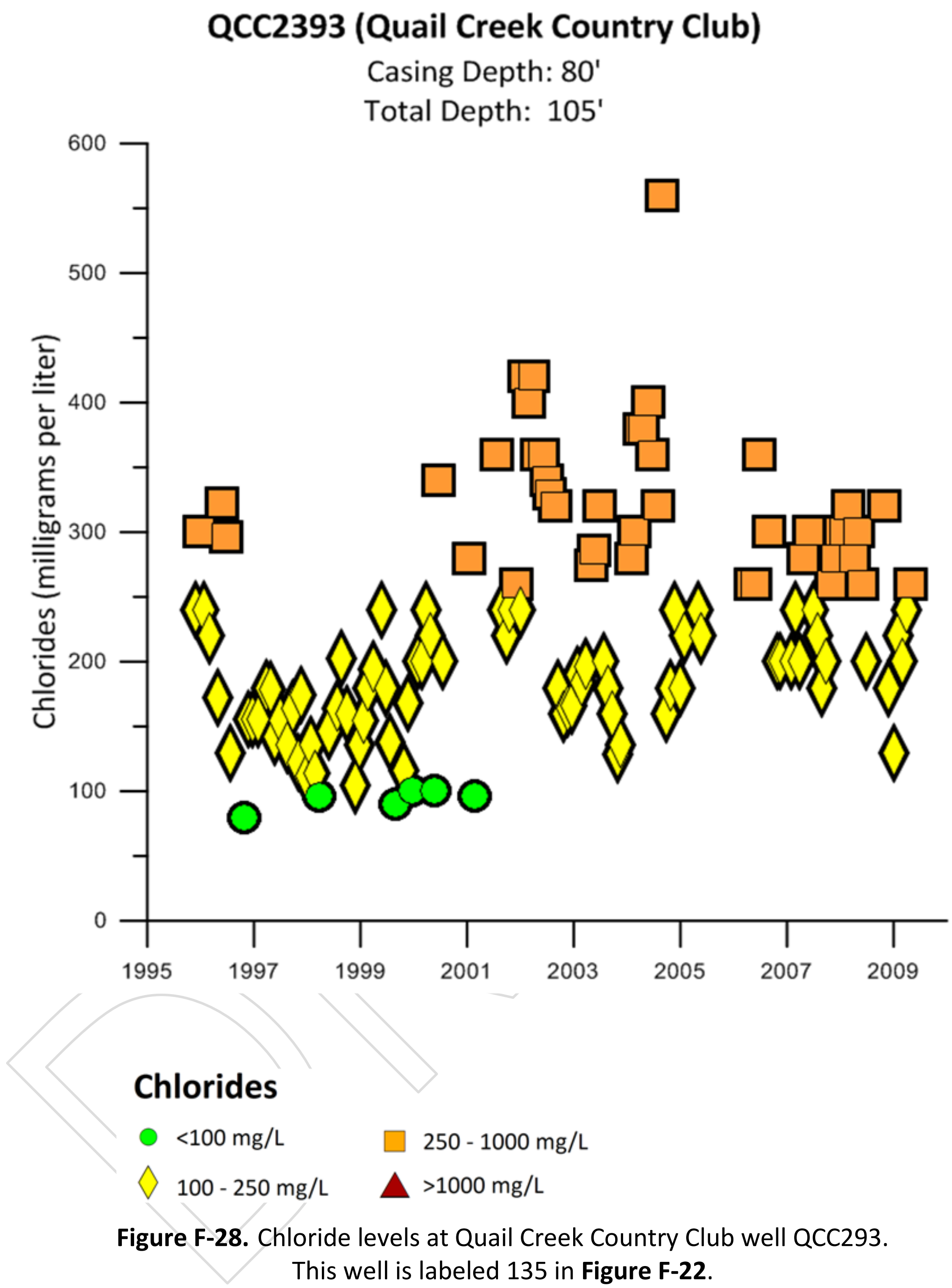

Figure F-28. Chloride levels at Quail Creek Country Club well QCC293.
This well is labeled 135 in **Figure F-22**.

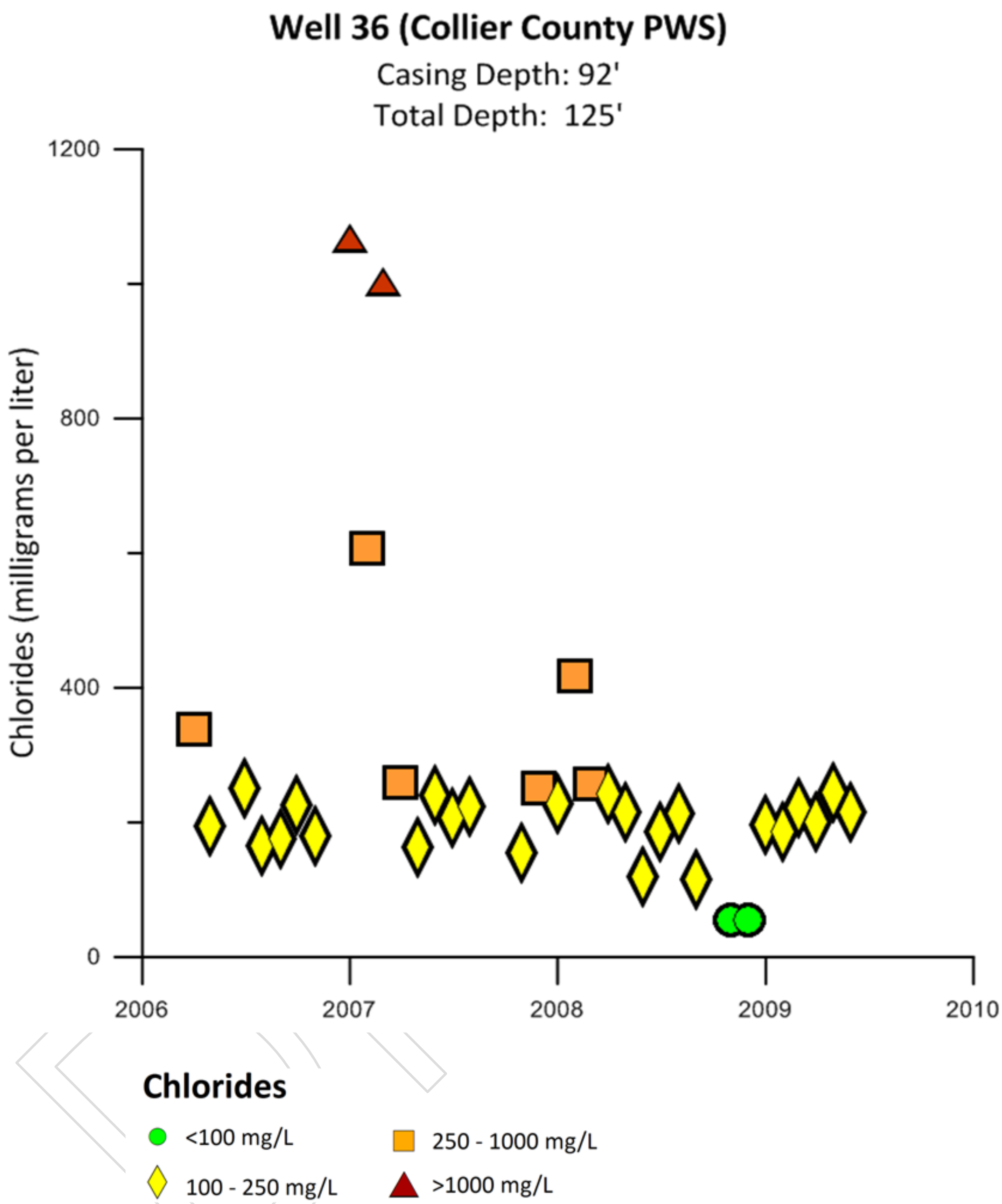

Figure F-29. Chloride levels at Collier County PWS well 36.
This well is labeled 143 in **Figure F-22**.

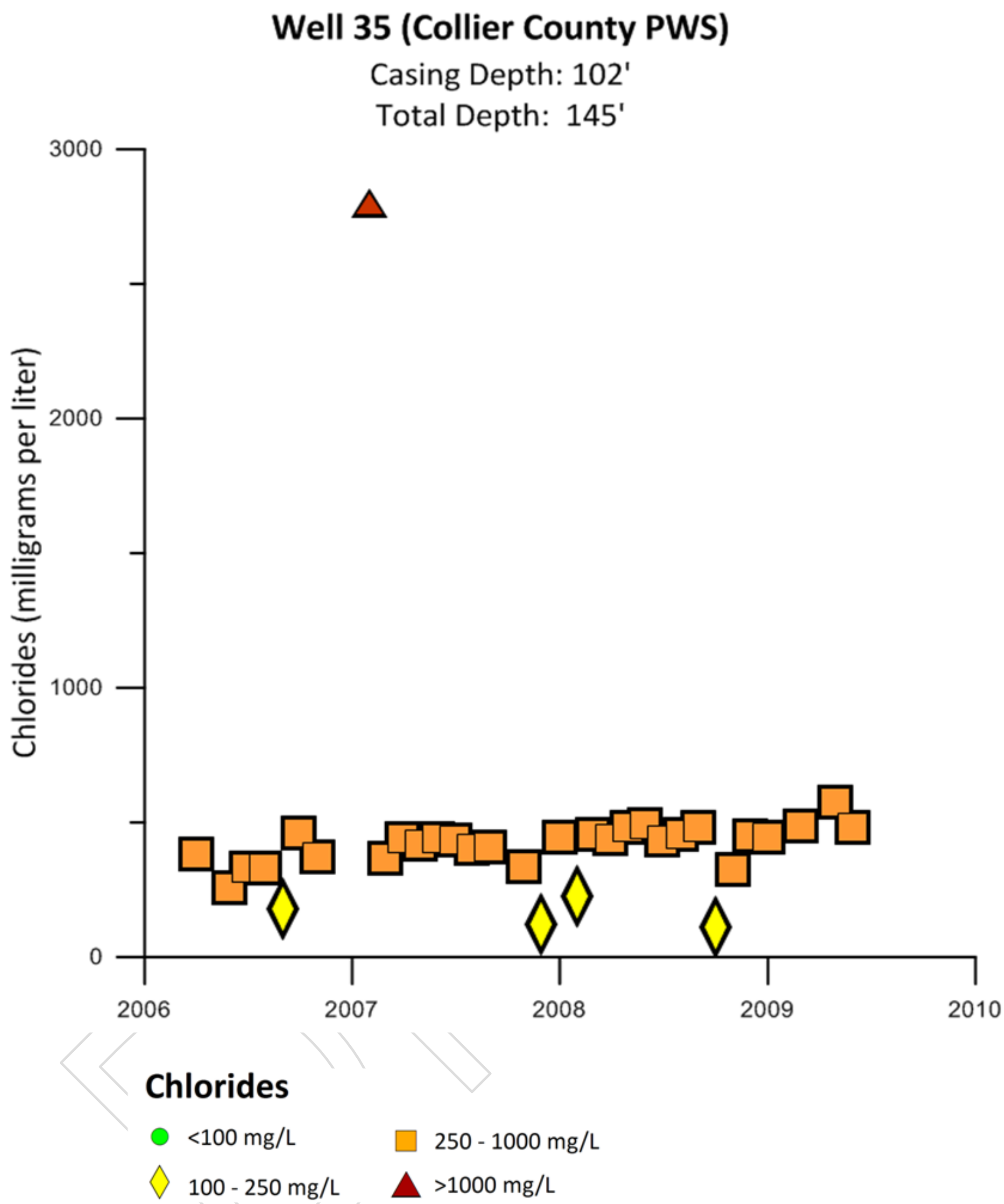

Figure F-30. Chloride levels at Collier County PWS well 35. This well is labeled 146 in **Figure F-22**.

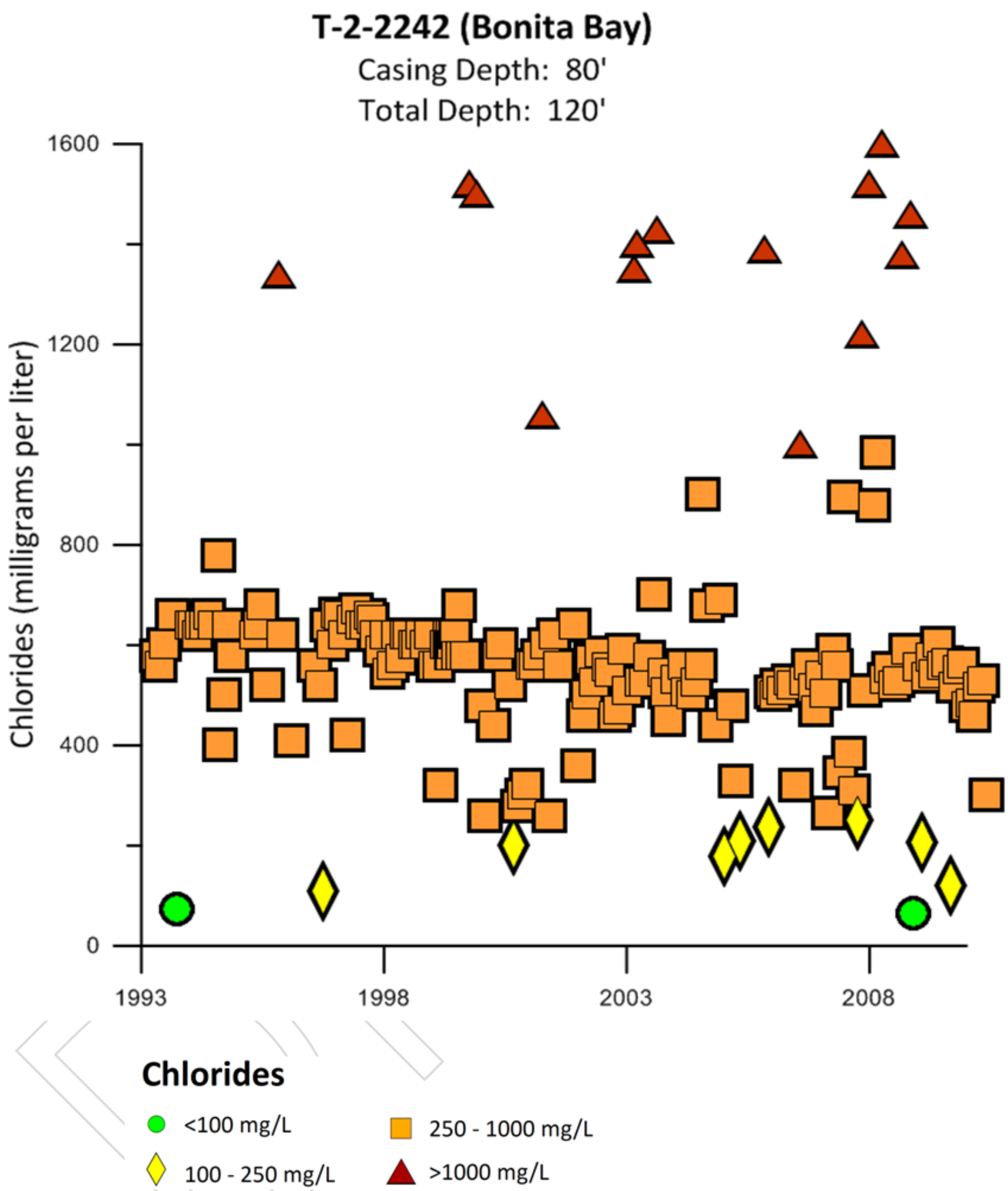

Figure F-31. Chloride levels at Bonita Bay well T-2-2242. This well is labeled 354 in **Figure F-22**.

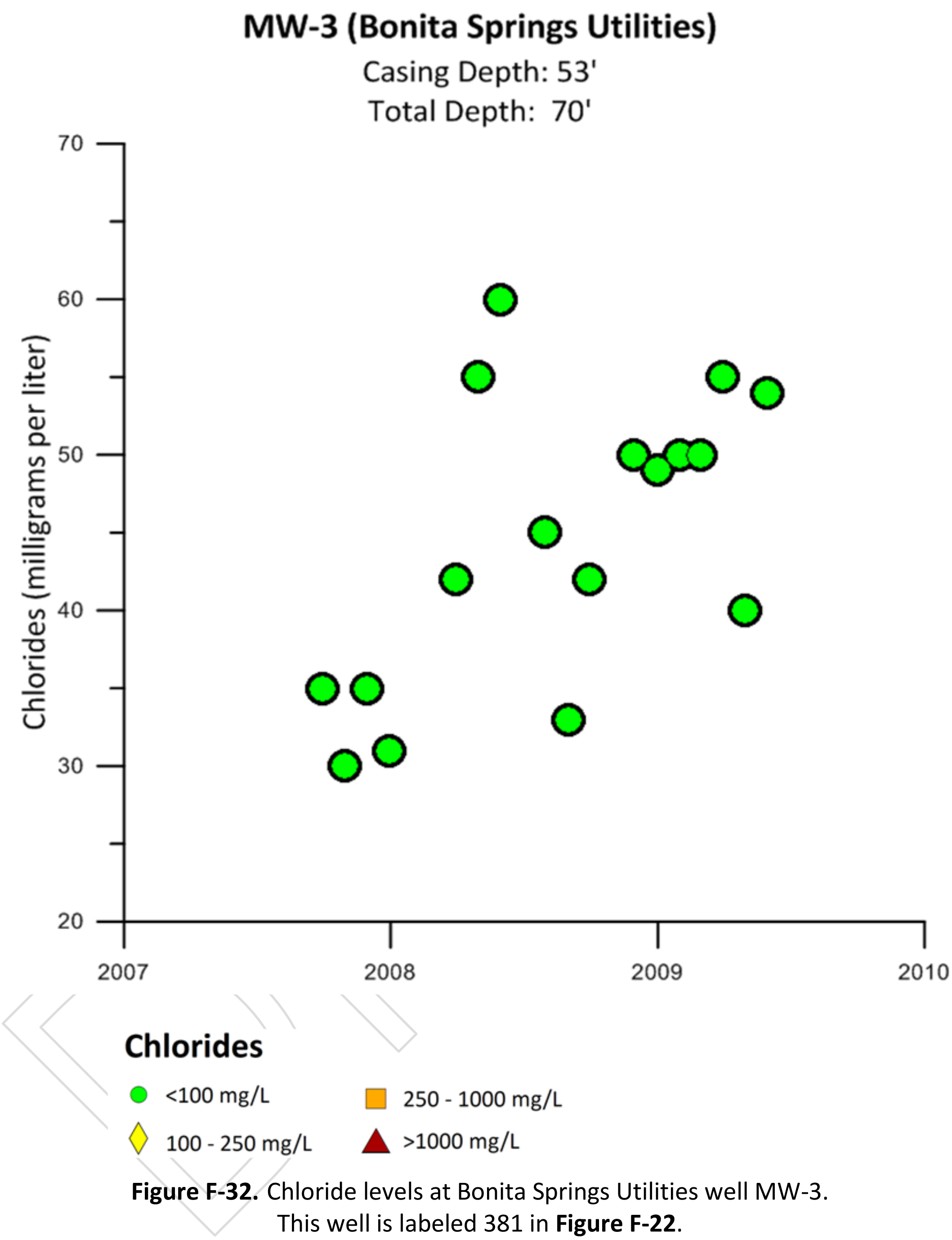

Figure F-32. Chloride levels at Bonita Springs Utilities well MW-3. This well is labeled 381 in **Figure F-22**.

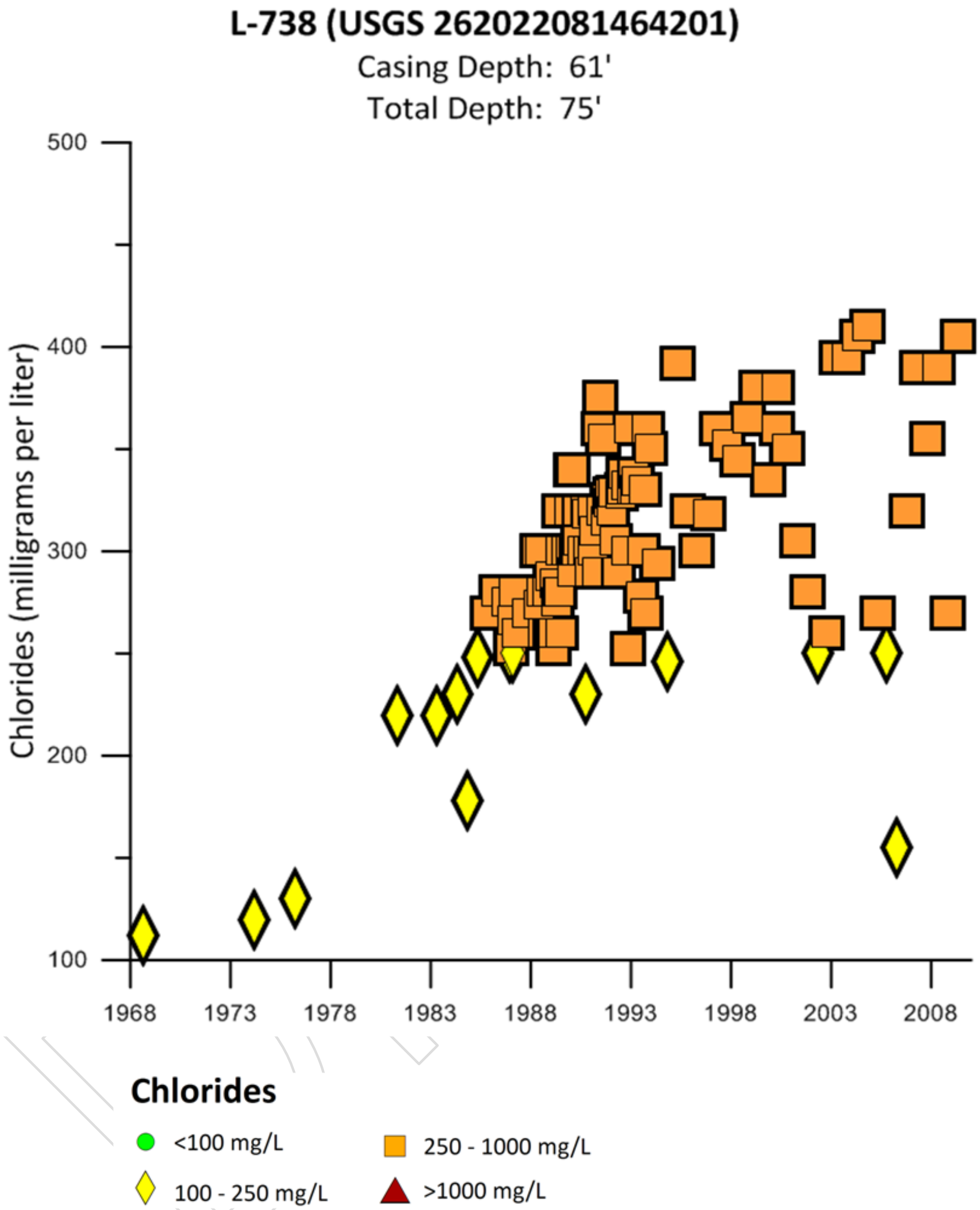

Figure F-33. Chloride levels at USGS station 262022081464201 well T-2-2242. This well is labeled 552 in **Figure F-22**.

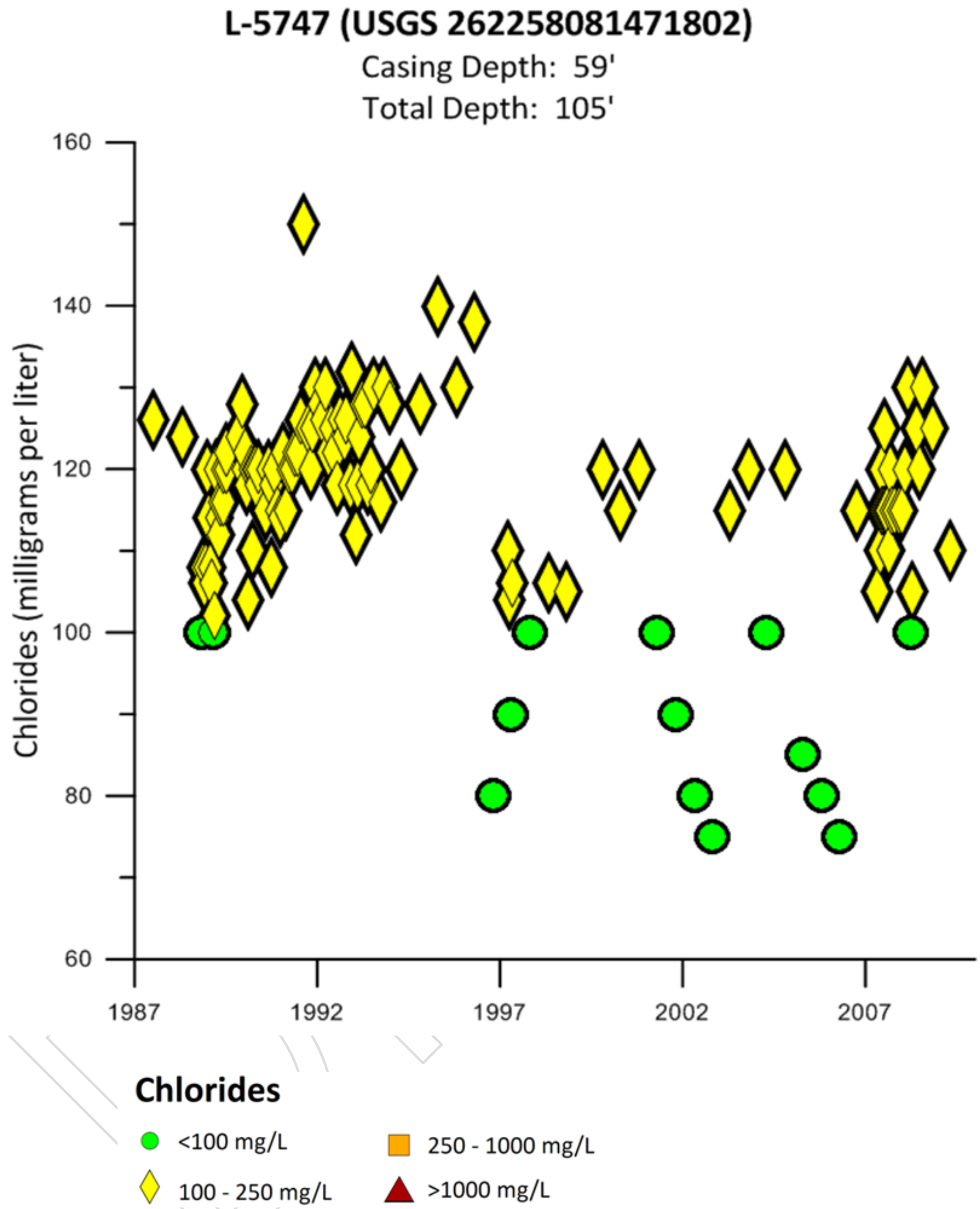

Figure F-34. Chloride levels at USGS station 262258081471802 well L-5747. This well is labeled 553 in **Figure F-22**.

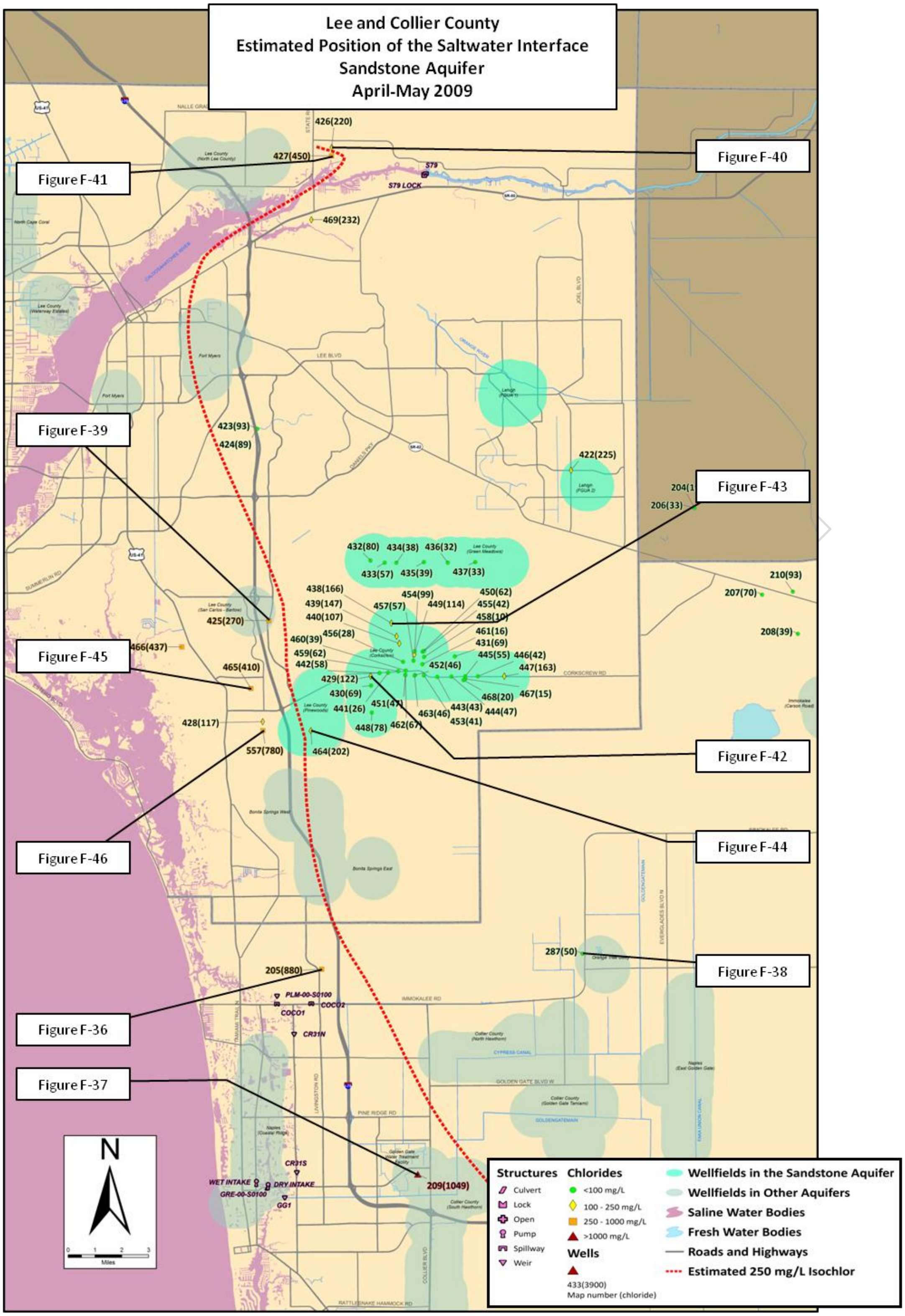

Figure F-35. Estimated position of the saltwater interface within the Sandstone aquifer in Lee and Collier counties in April–May 2009. The figure number labels refer to **Figure F-36** through **Figure F-46**, which show chloride levels for the indicated wells.

Table F-4. Chloride levels measured at Sandstone aquifer wells within Lee and Collier counties. The map numbers in the first column refer to the numbers on the map in **Figure F-35**.

Map Number	SFWMD Facility	Project Name	Well Name	X	Y	Casing Depth (feet bls)	Total Depth (feet bls)	Chloride (mg/L)
204	149449	Gator Slough Phases I-V	M-28S	482802	803151	100	140	19
205	195169	Turnberry Woods (**Figure F-36**)	Well 1	409527	712429	145	175	880
206	149454	Gator Slough Phases I-V	M-28L	482801	803151	180	200	33
207	31795	Highlands Citrus Grove	11-12	496096	786081	200	255	70
208	31803	Highlands Citrus Grove	13-17	503138	778399	218	250	39
209	193956	Golden Gate Water Treatment Facility (**Figure F-37**)	MW-G	428404	672116	230	240	1,049
210	31296	Gator Slough Phases I-V	12-1	502158	786685	232	269	93
287		USGS 261802081354801 (**Figure F-38**)	C-688	460782	715483	220	242	50
422	151463	030521-21 (Florida Government Utility Authority [FGUA] – Lehigh Acres Public Water Supply [PWS])	Chloride from well L-1963	458531	810562	68	74	225
423	195710	Arborwood Parcel A (Botanica Lakes)	SS-1	396819	818710	80	120	93
424	195711	Arborwood Parcel A (Botanica Lakes)	SS-2	396819	818710	80	120	89
425	142771	Ben Hill Griffin Parkway (**Figure F-39**)	LM-7726	399128	780993	108	108	270
426	4859	Blackburn Groves (**Figure F-40**)	Well 1	411455	874063	115	120	220
427	4860	Blackburn Groves (**Figure F-41**)	Well 2	411442	872383	115	119	450
428	114650	Colonial Oaks	PW-1	397900	761100	90	120	117
429	26834	Lee County Utilities PWS (**Figure F-42**)	25D Corkscrew	419112	770079	115	180	122
430	26835	Lee County Utilities PWS	26D Corkscrew	419232	768227	120	170	69
431	29785	Lee County Utilities PWS	1 Corkscrew	435679	773952	132	243	69
432	31366	Lee County Utilities PWS	GM-1	419090	792800	95	160	80
433	31369	Lee County Utilities PWS	GM-4	421887	792381	104	185	57
434	31370	Lee County Utilities PWS	GM-5	424184	792387	104	185	38
435	31372	Lee County Utilities PWS	GM-7	429588	792492	90	235	39
436	31373	Lee County Utilities PWS	GM-9	434292	792387	91	120	32
437	31399	Lee County Utilities PWS	GM-11	439696	792492	115	185	33
438	128364	Lee County Utilities PWS (**Figure F-43**)	29D Corkscrew	423188	780503	105	180	166
439	128366	Lee County Utilities PWS	30D Corkscrew	424218	777905	132	169	147
440	128740	Lee County Utilities PWS	31D Corkscrew	424747	776511	115	200	107
441	128742	Lee County Utilities PWS	32D Corkscrew	422552	770757	179	292	26
442	128756	Lee County Utilities PWS	33D Corkscrew	420872	770670	130	238	58
443	129342	Lee County Utilities PWS	34D Corkscrew	432247	769942	260	360	43
444	129343	Lee County Utilities PWS	35D Corkscrew	435017	769991	210	301	47
445	129344	Lee County Utilities PWS	36D Corkscrew	437727	770040	179	260	55
446	129345	Lee County Utilities PWS	37D Corkscrew	440198	770030	146	200	42
447	129347	Lee County Utilities PWS	39D Corkscrew	445419	770079	146	200	163
448	131174	Lee County Utilities PWS	28D Corkscrew	419353	762911	190	300	78
449	131175	Lee County Utilities PWS	2 Corkscrew	427713	774370	209	213	114
450	131176	Lee County Utilities PWS	3 Corkscrew	429351	774884	209	227	62

Table F-4. Continued.

Map Number	SFWMD Facility	Project Name	Well Name	X	Y	Casing Depth (feet bls)	Total Depth (feet bls)	Chloride (mg/L)
451	131177	Lee County Utilities PWS	4 Corkscrew	425952	770294	209	214	47
452	131178	Lee County Utilities PWS	5 Corkscrew	427832	770263	209	235	46
453	131179	Lee County Utilities PWS	6 Corkscrew	429594	770236	214	249	41
454	136892	Lee County Utilities PWS	LCUA-II COW AII	427787	774974	160	210	99
455	136898	Lee County Utilities PWS	LCUB-II COW B-II	429632	775018	195	284	42
456	136909	Lee County Utilities PWS	LCUD-II COW D-II	425517	772894	180	230	28
457	136915	Lee County Utilities PWS	LCUE-II COW E-II	427538	773114	170	200	57
458	136943	Lee County Utilities PWS	LCUF-II COW F-II	429661	773846	220	250	10
459	136945	Lee County Utilities PWS	LCUG-II COW G-II	424551	771064	200	260	62
460	136947	Lee County Utilities PWS	LCUH-II COW H-II	426059	771166	200	264	39
461	136948	Lee County Utilities PWS	LCUJ-II COW J-II	429310	772411	225	290	16
462	136951	Lee County Utilities PWS	LCUL-II COW L-II	425971	770273	195	285	67
463	136953	Lee County Utilities PWS	LCUM-II COW M-II	427758	770200	220	284	46
464	13599	Pinewoods PWS (**Figure F-44**)	19 (9A) SSA	407368	759307	85	171	202
465	103473	Rookery Pointe (**Figure F-45**)	MW1	395600	767650	90	100	410
466	114400	Shadow Wood Preserve	PW-4	381985	775835	120	160	437
467	108265	The Retreat	1	437733	769528	184	264	15
468	108266	The Retreat	3	437373	769291	184	264	20
469	122117	The Verandah	17	407456	859837	90	110	232
557		USGS 262513081472002 (**Figure F-46**)	L-5668R	397948	759336	155	155	780

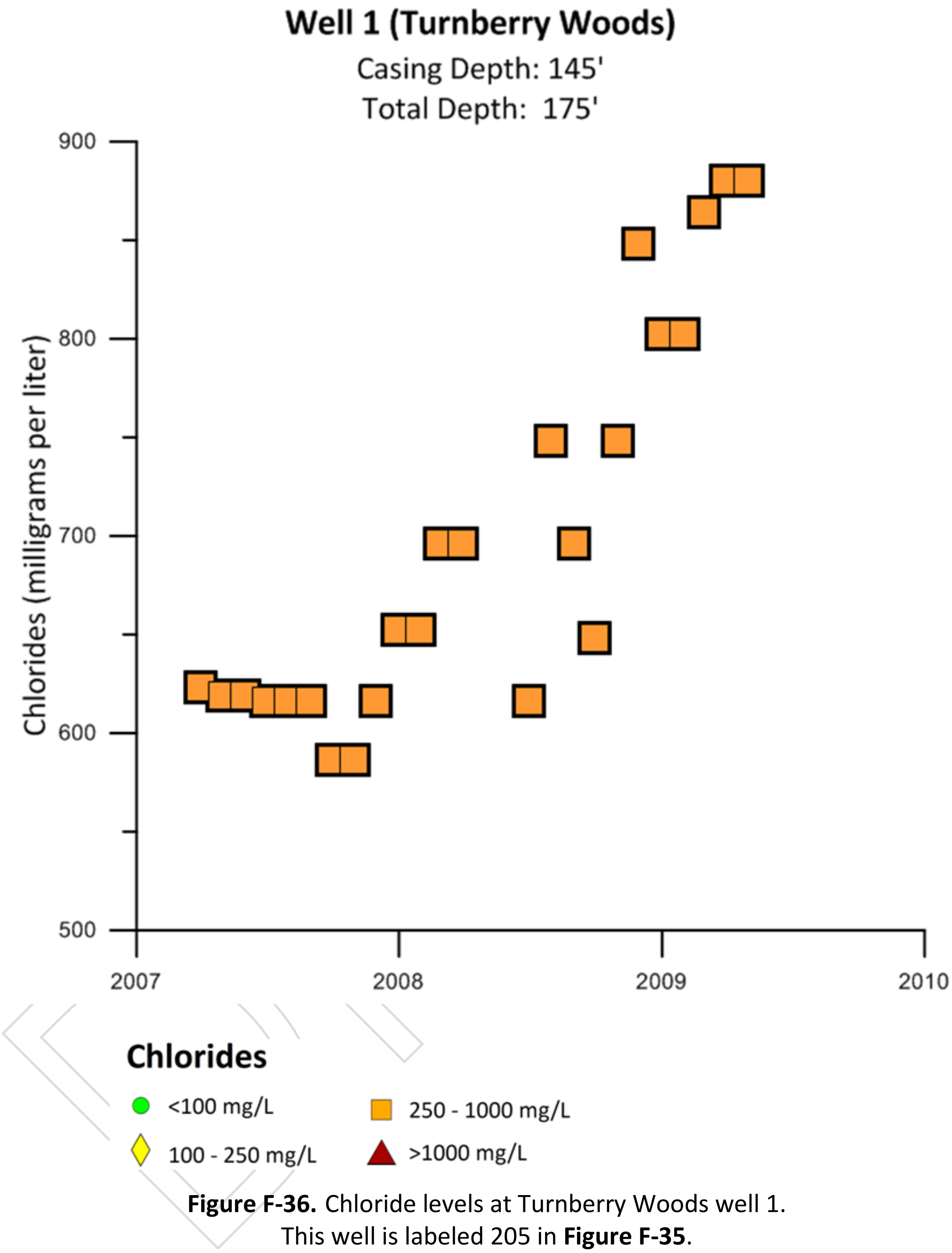

Figure F-36. Chloride levels at Turnberry Woods well 1.
This well is labeled 205 in **Figure F-35**.

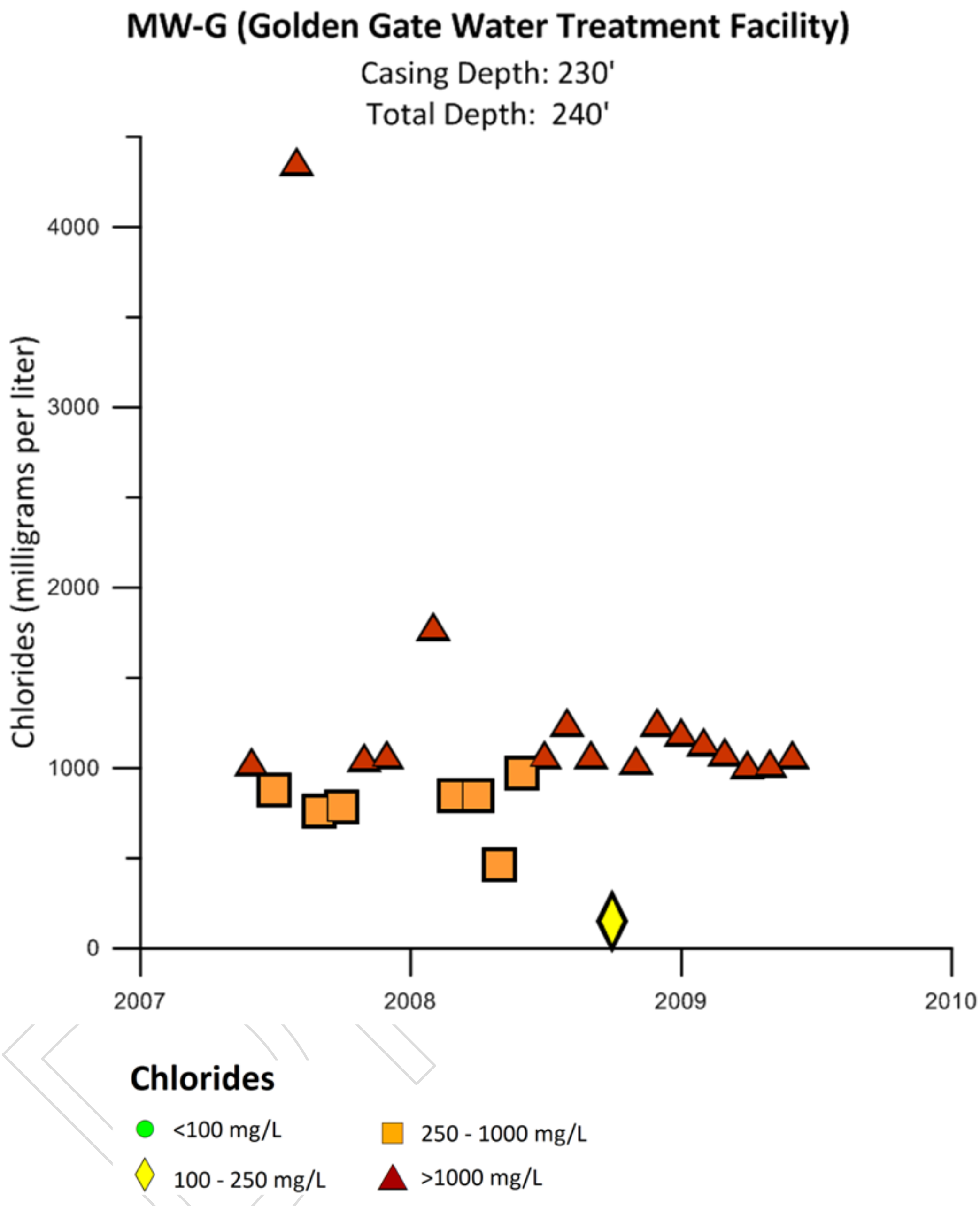

Figure F-37. Chloride levels at Golden Gate Water Treatment Facility well MW-G. This well is labeled 209 in **Figure F-35**.

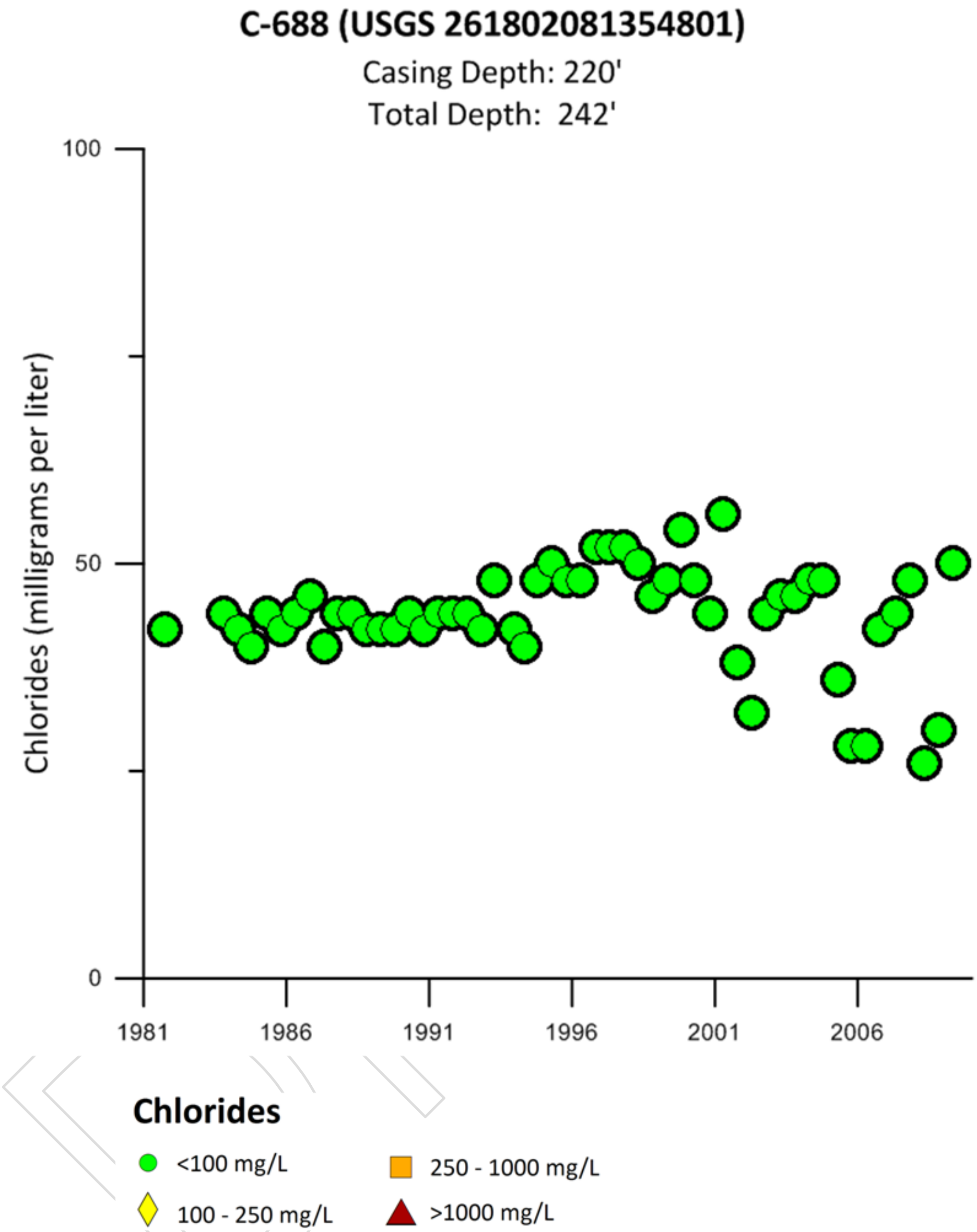

Figure F-38. Chloride levels at USGS station 261802081354801 well C-688.
This well is labeled 287 in **Figure F-35**.

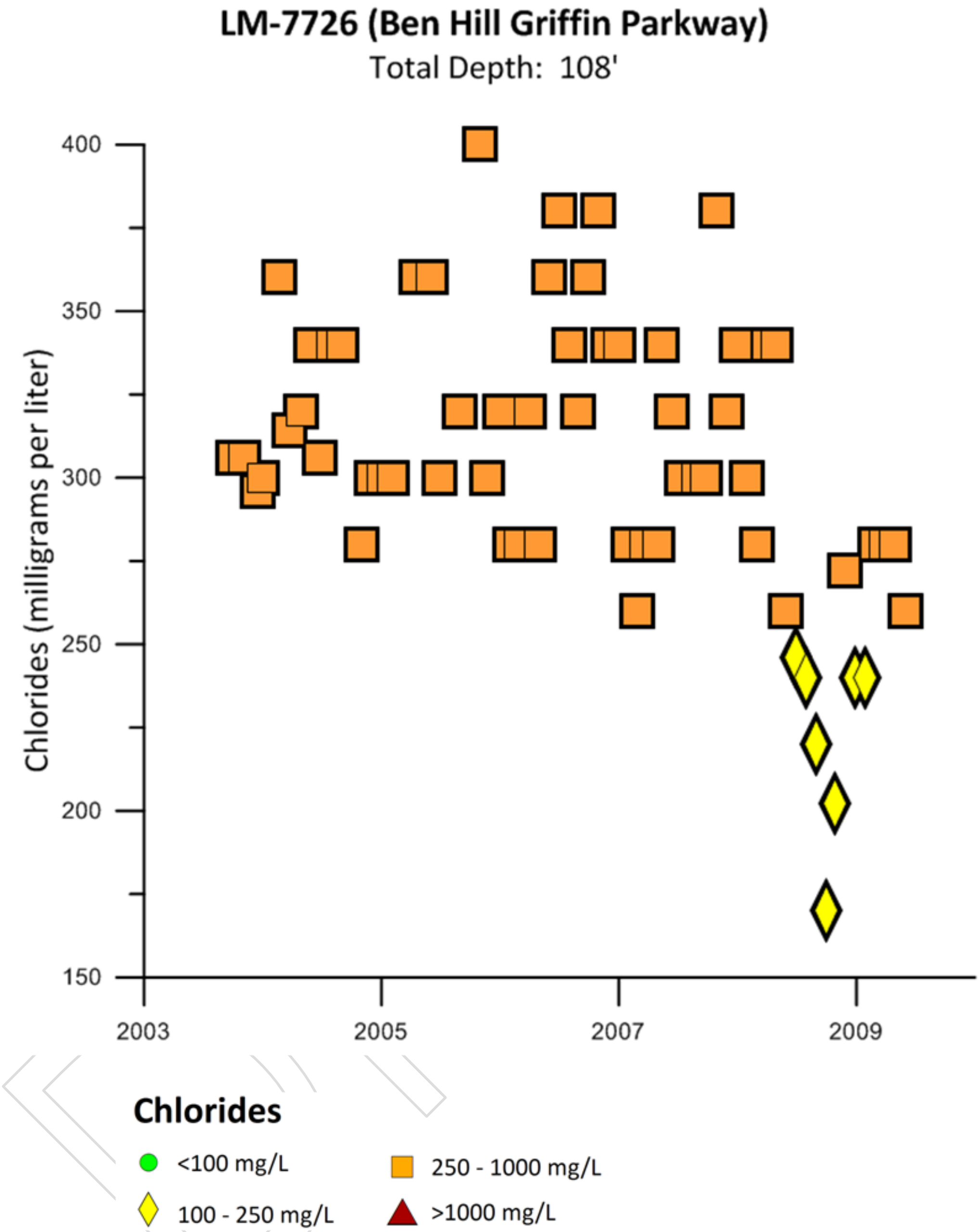

Figure F-39. Chloride levels at Ben Hill Griffen Parkway well LM-7726.
This well is labeled 425 in **Figure F-35**.

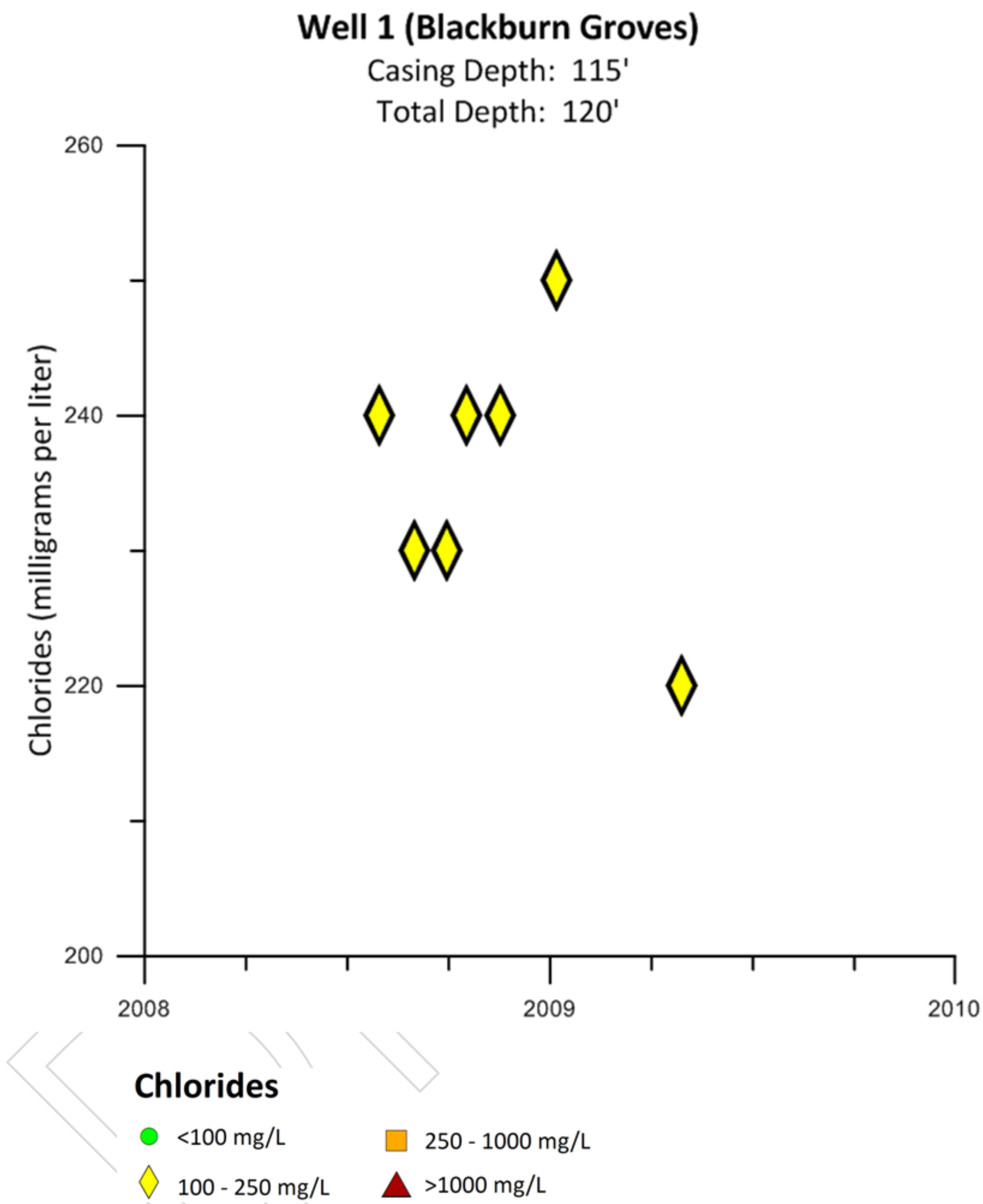

Figure F-40. Chloride levels at Blackburn Groves well 1.
This well is labeled 426 in **Figure F-35**.

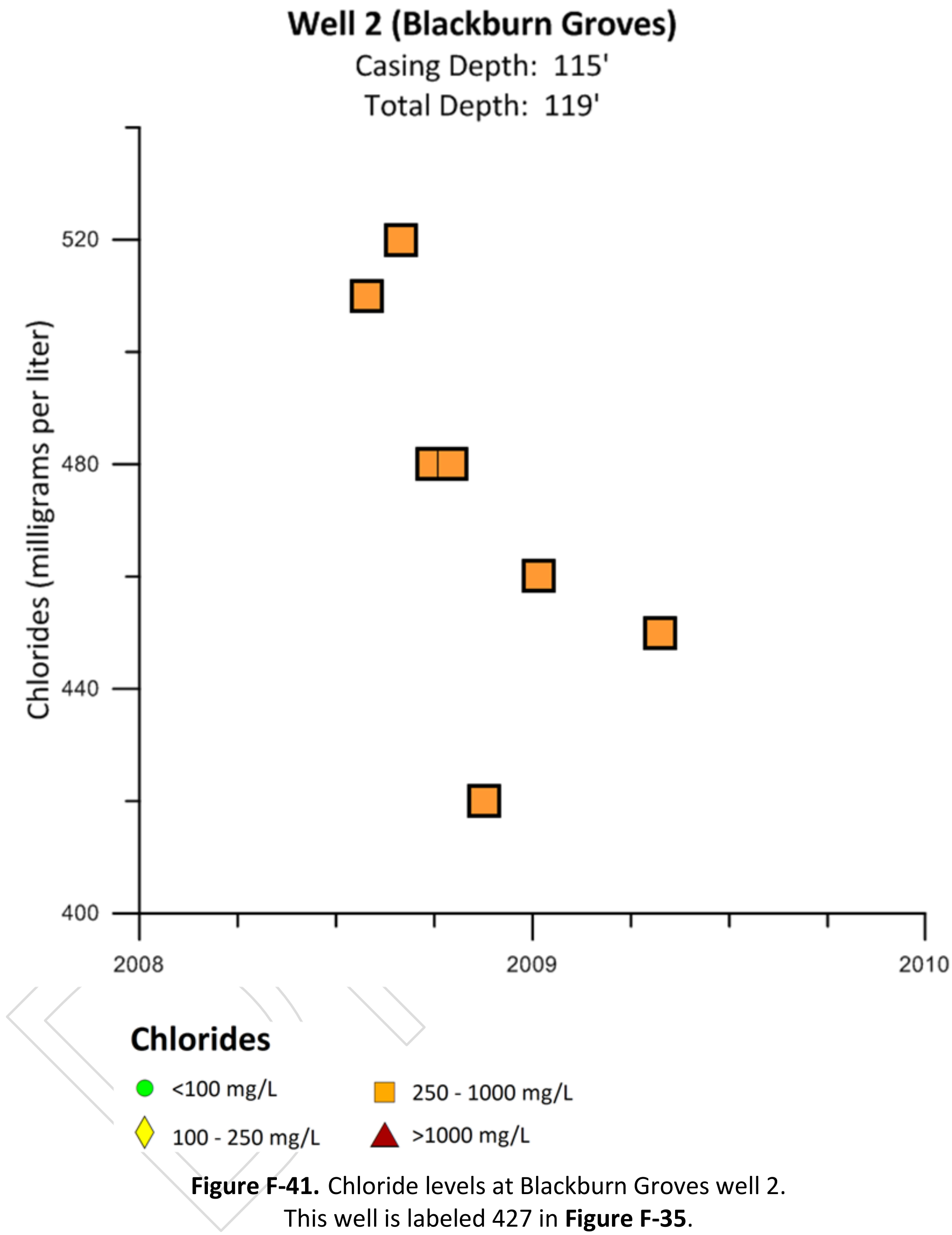

Figure F-41. Chloride levels at Blackburn Groves well 2.
This well is labeled 427 in **Figure F-35**.

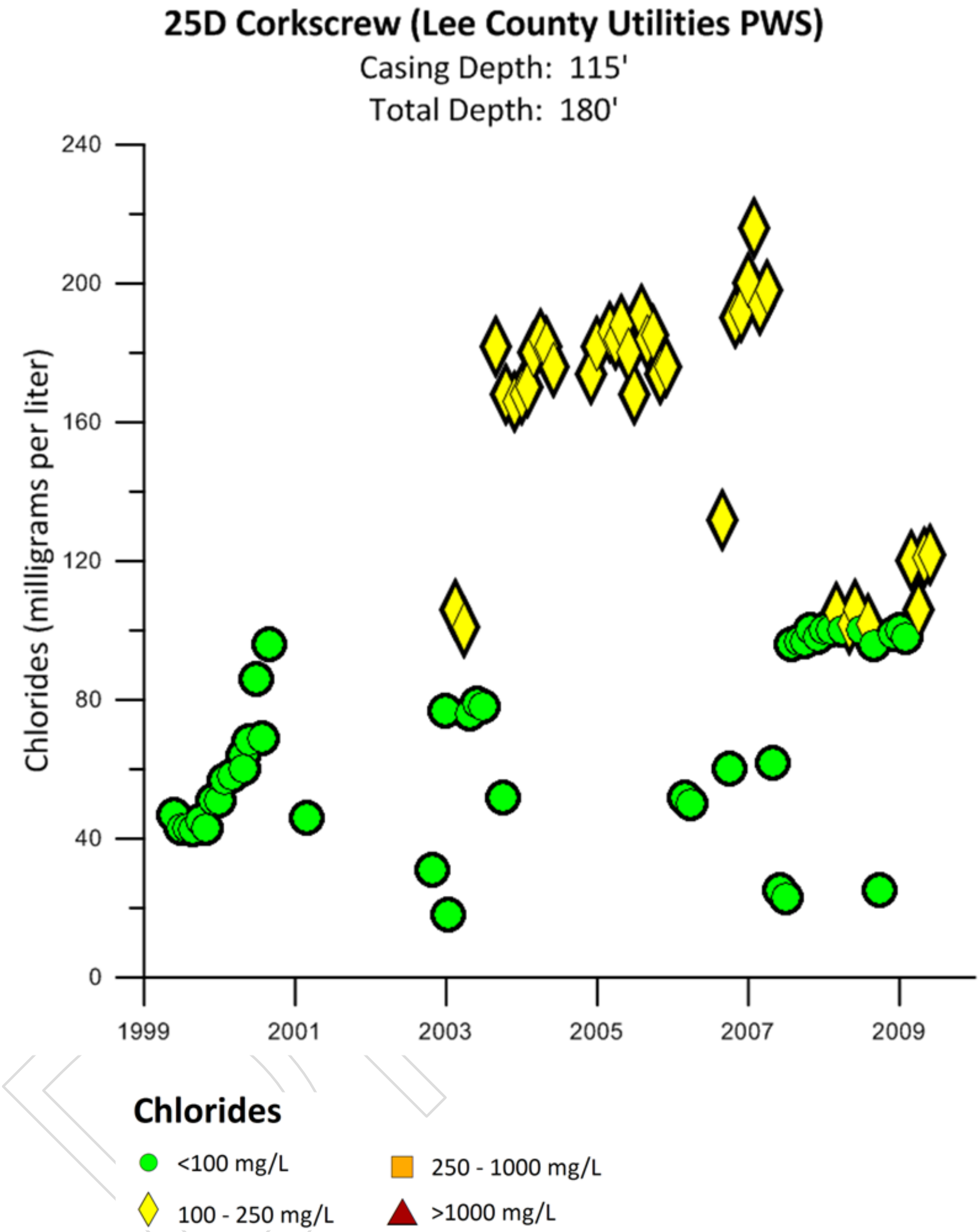

Figure F-42. Chloride levels at Lee County Utilities PWS well 25D Corkscrew. This well is labeled 429 in **Figure F-35**.

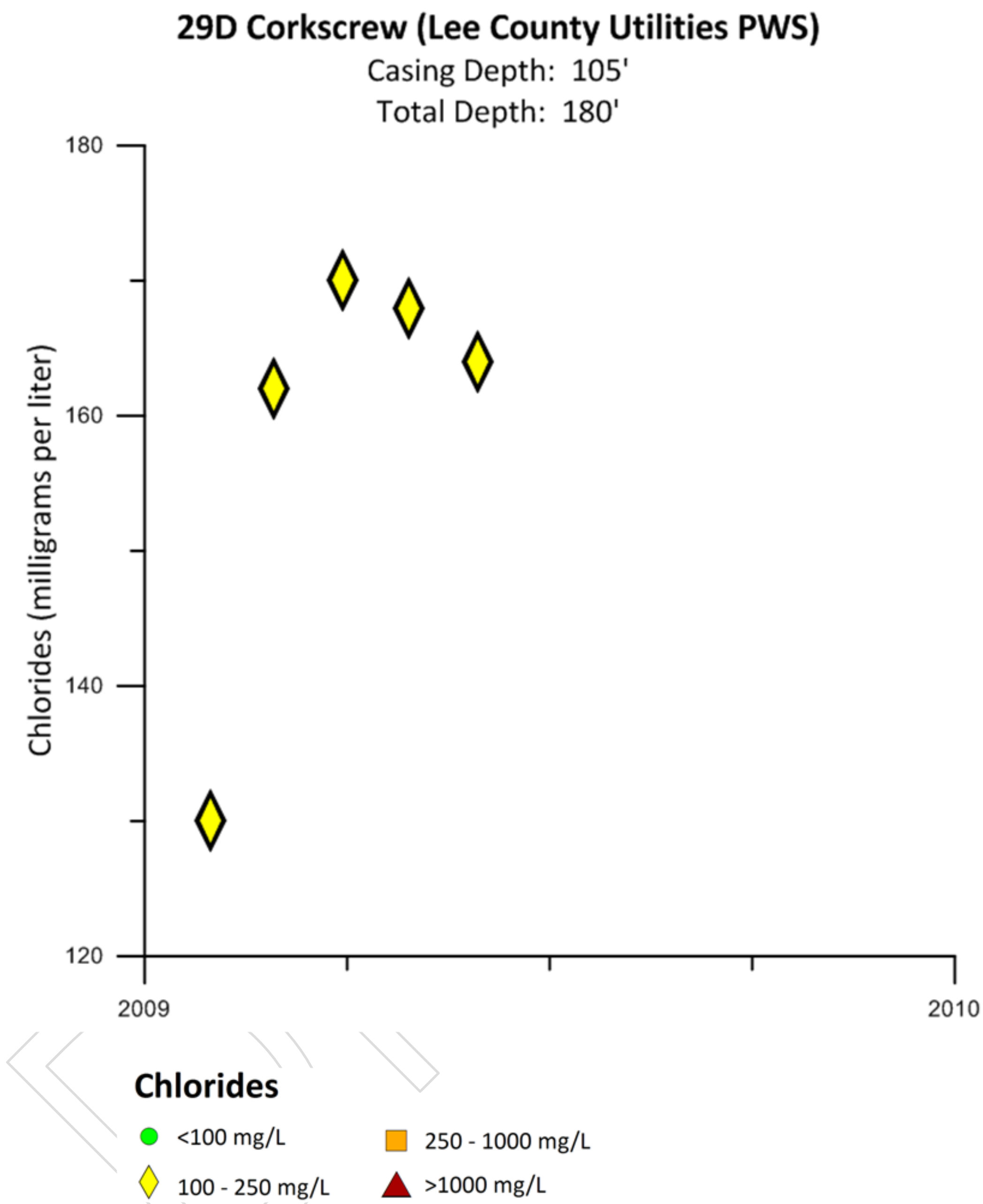

Figure F-43. Chloride levels at Lee County Utilities PWS well 29D Corkscrew. This well is labeled 438 on **Figure F-35**.

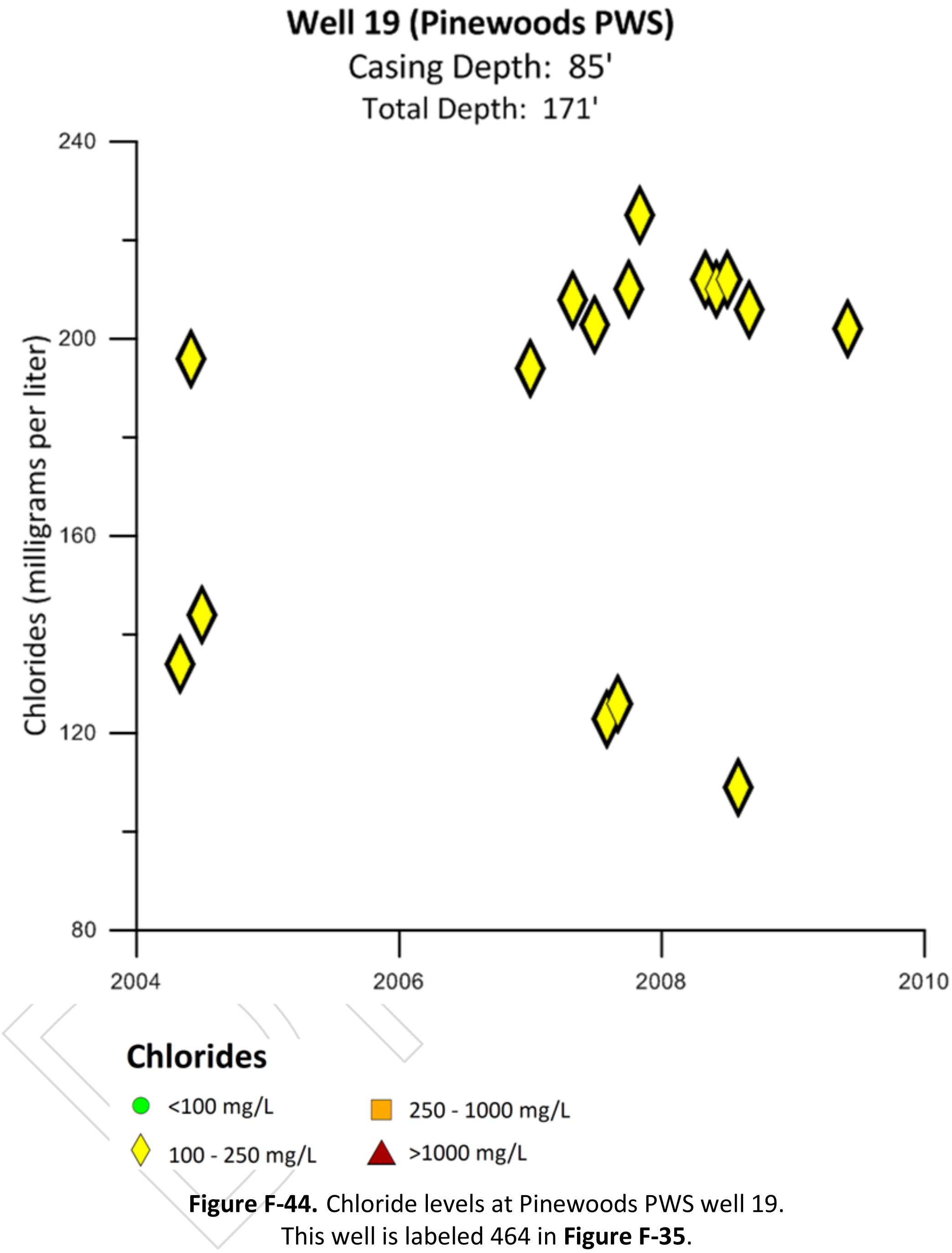

Figure F-44. Chloride levels at Pinewoods PWS well 19.
This well is labeled 464 in **Figure F-35**.

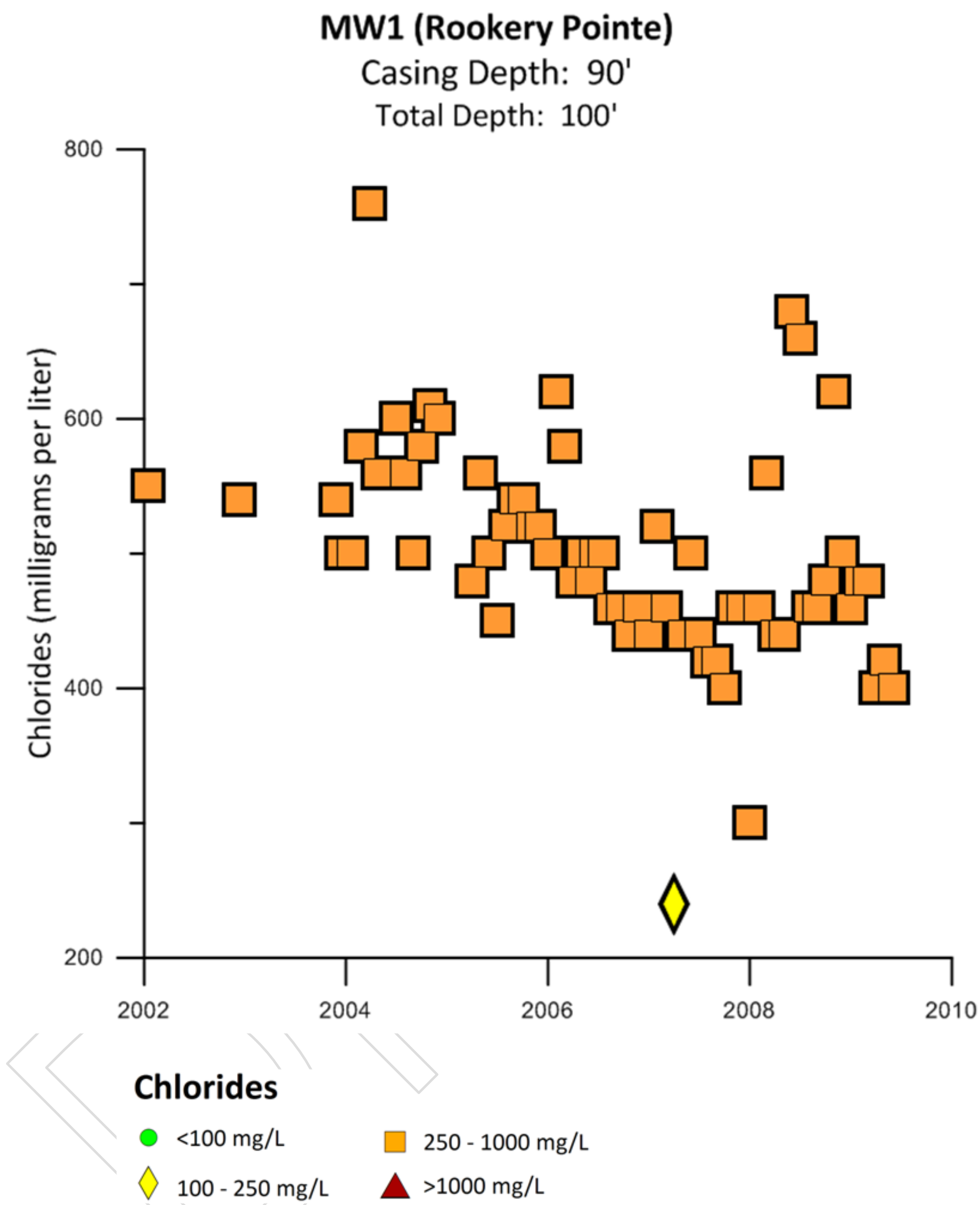

Figure F-45. Chloride levels at Rookery Pointe well MW1.
This well is labeled 465 in **Figure F-35**.

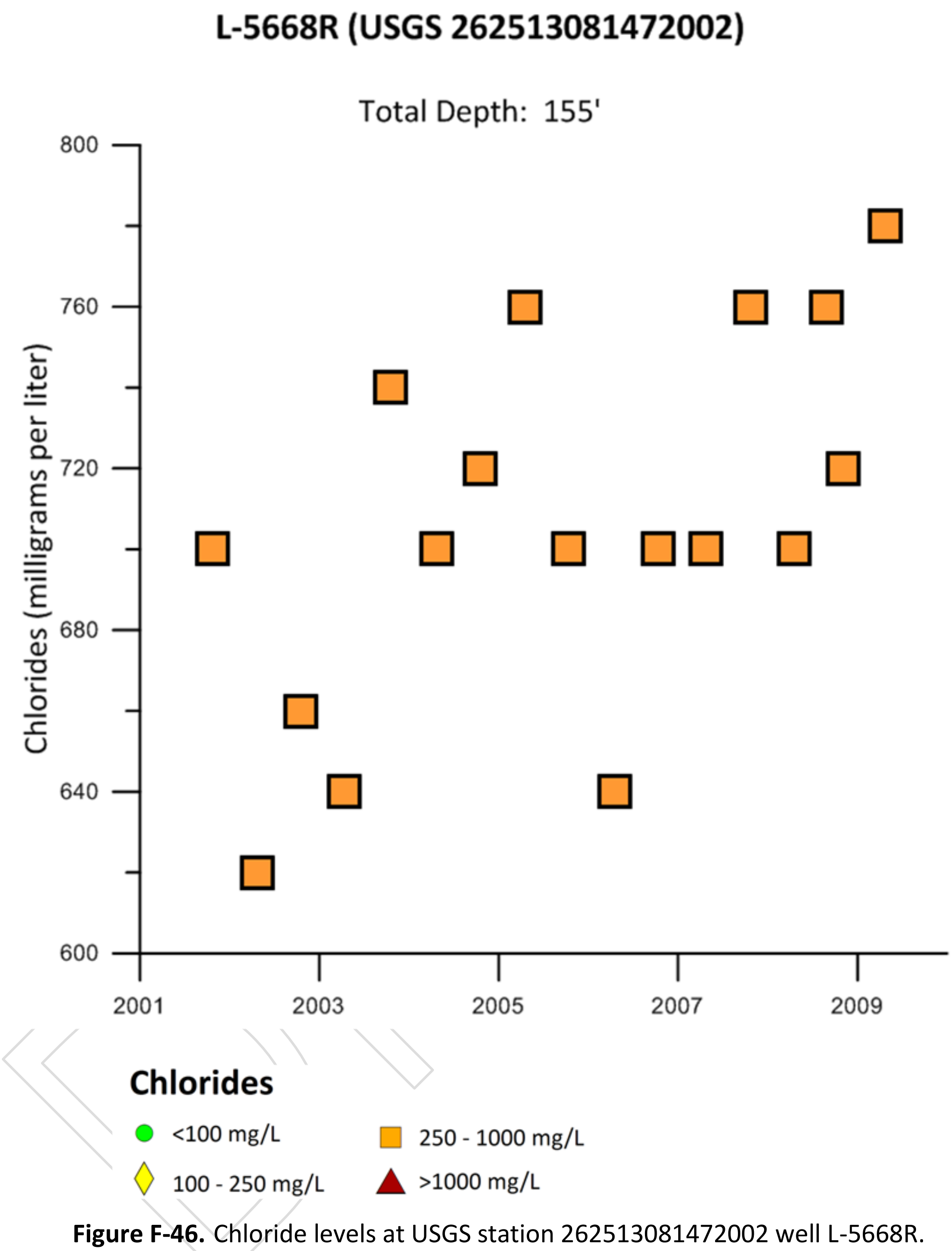

Figure F-46. Chloride levels at USGS station 262513081472002 well L-5668R. This well is labeled 557 in **Figure F-35**.

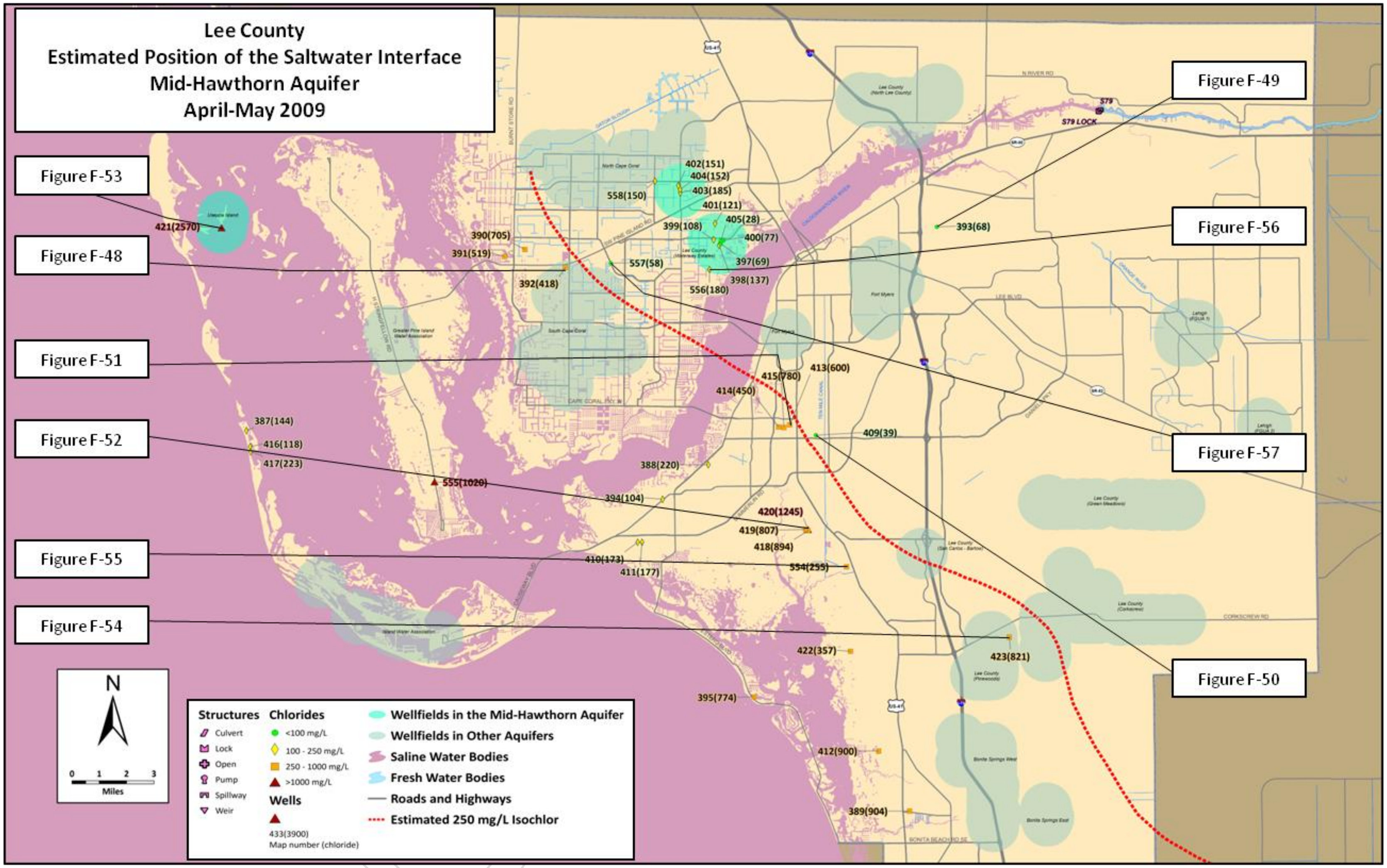

Figure F-47. Estimated position of the saltwater interface within the Mid-Hawthorn aquifer in Lee County in April–May 2009. The figure number labels refer to **Figure F-48** through **Figure F-57**, which show chloride levels for the indicated wells.

Table F-5. Chloride levels measured at Mid-Hawthorn aquifer wells within Lee County. The map numbers in the first column refer to the numbers on the map in **Figure F-47**.

Map Number	SFWMD Facility	Project Name	Well Name	X	Y	Casing Depth (feet bls)	Total Depth (feet bls)	Chloride (mg/L)
387	186122	050630-52 (South Seas Resort)	MH Well	264655	806719	350	420	144
388	132950	Asbury	Monitor Well	354035	800055	145	200	220
389	30945	Bonita Bay	H-1-LM-3554	393034	732934	238	271	904
390	213122	Cape Coral Charter School N & Neighborhood Park 5, City of	#1	318581	841814	240	400	705
391	195484	Cape Coral Neighborhood Park Four, City of	Well 1	314638	840458	240	400	519
392	30872	Coral Ridge Funeral Home & Cemetery, Inc. (**Figure F-48**)	1	326405	838360	140	220	418
393	133167	Cypress Woods RV Resort (**Figure F-49**)	1	398300	846200	180	250	68
394	197375	Faith United Methodist Church Expansion	Well-1	345207	793380	180	240	104
395	4792	Fort Myers Beach Golf Club	1273	362957	755058	178	265	774
397	30814	Lee County Utilities North System	N-3	356489	842936	130	130	69
398	30815	Lee County Utilities North System	N-6	356145	842591	124	205	137
399	30817	Lee County Utilities North System	N-11	355084	843715	130	230	108
400	30818	Lee County Utilities North System	N-14	357031	843596	136	230	77
401	30819	Lee County Utilities North System	N-15	355370	846872	160	208	121
402	30820	Lee County Utilities North System	NC-1	348273	854228	140	240	151
403	30821	Lee County Utilities North System	NC-2	348638	852865	140	240	185
404	30822	Lee County Utilities North System	NC-9	348590	853459	164	225	152
405	30826	Lee County Utilities North System	N-10	356481	843536	134	235	28
406	128760	Lee County Utilities Public Water Supply (PWS)	MH ASR#2 Corkscrew	425807	774493	337	397	56
407	128761	Lee County Utilities PWS	MH ASR#3 Corkscrew	424279	777794	285	347	54
408	128763	Lee County Utilities PWS	MH ASR#5 Corkscrew	423688	779149	253	291	56
409	27382	Madison at the Ashlar (**Figure F-50**)	Well A	374886	805811	200	225	39
410	127614	Mastique	Well #1	340373	785033	130	190	173
411	127615	Mastique	Well #2	341232	785038	130	190	177
412	32898	Pelican's Nest Golf Club	LM-2333 Well 3	387053	744574	217	320	900
413	2312	Seven Lakes (**Figure F-51**)	Well 1 (Condo 2/3)	369830	807823	140	225	600
414	2317	Seven Lakes	Well 6 (Condo 8)	367684	807415	140	220	450
415	2320	Seven Lakes	Well 9 (Condo 4/5)	368718	807285	390	440	780

Table F-5. Continued.

Map Number	SFWMD Facility	Project Name	Well Name	X	Y	Casing Depth (feet bls)	Total Depth (feet bls)	Chloride (mg/L)
416	11926	South Seas Resort	North End	265413	803588	372	420	118
417	186171	South Seas Resort	South End-A	265488	802601	360	420	223
418	4722	The Forest Country Club	Bear Well 1	373375	787285	180	250	894
419	4723	The Forest Country Club	BC Well	372917	787515	180	250	807
420	117327	The Forest Country Club (**Figure F-52**)	Bear Well 2	373349	787528	180	250	1,245
421	25277	Useppa Island PWS (**Figure F-53**)	Well 1	259848	846032	280	320	2,570
422	191792	West Bay	TP-1	381612	763901	200	220	357
423	138611	Wildcat Run (**Figure F-54**)	4	412333	766658	320	420	821
554		USGS 262839081503100 (**Figure F-55**)	L-735	380815	780278	223	270	255
555		USGS 263117082051002	L-2821	301083	796803	290	340	1,020
556		USGS 263813081552801 (**Figure F-56**)	L-2640	354286	837916	128	180	180
557		USGS 263819081585801 (**Figure F-57**)	L-2701	335192	839169	175	206	58
558		USGS 264053081572501	L-4820	343751	855059	128	190	150

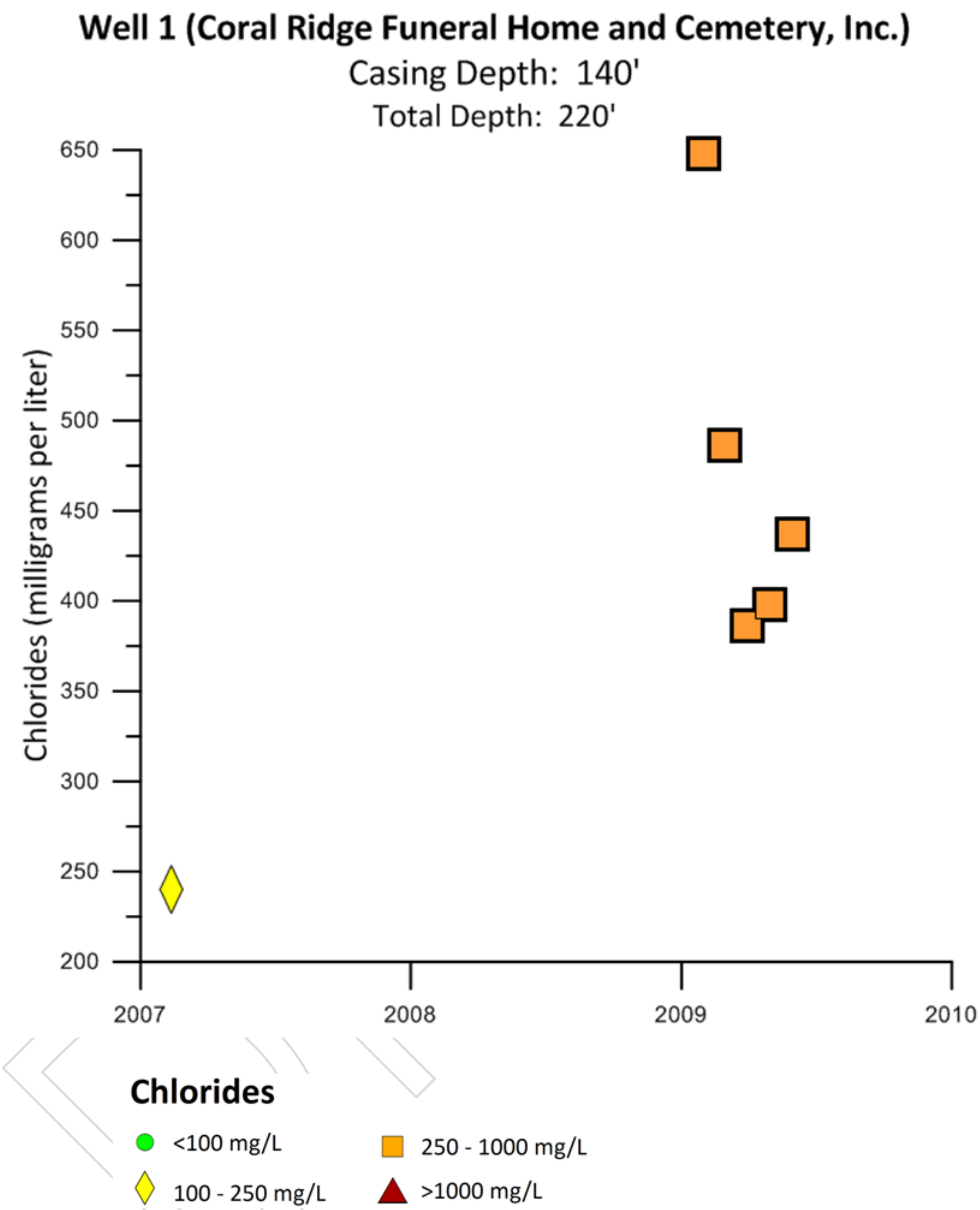

Figure F-48. Chloride levels at Coral Ridge Funeral Home and Cemetery, Inc. This well is labeled 392 in **Figure F-47**.

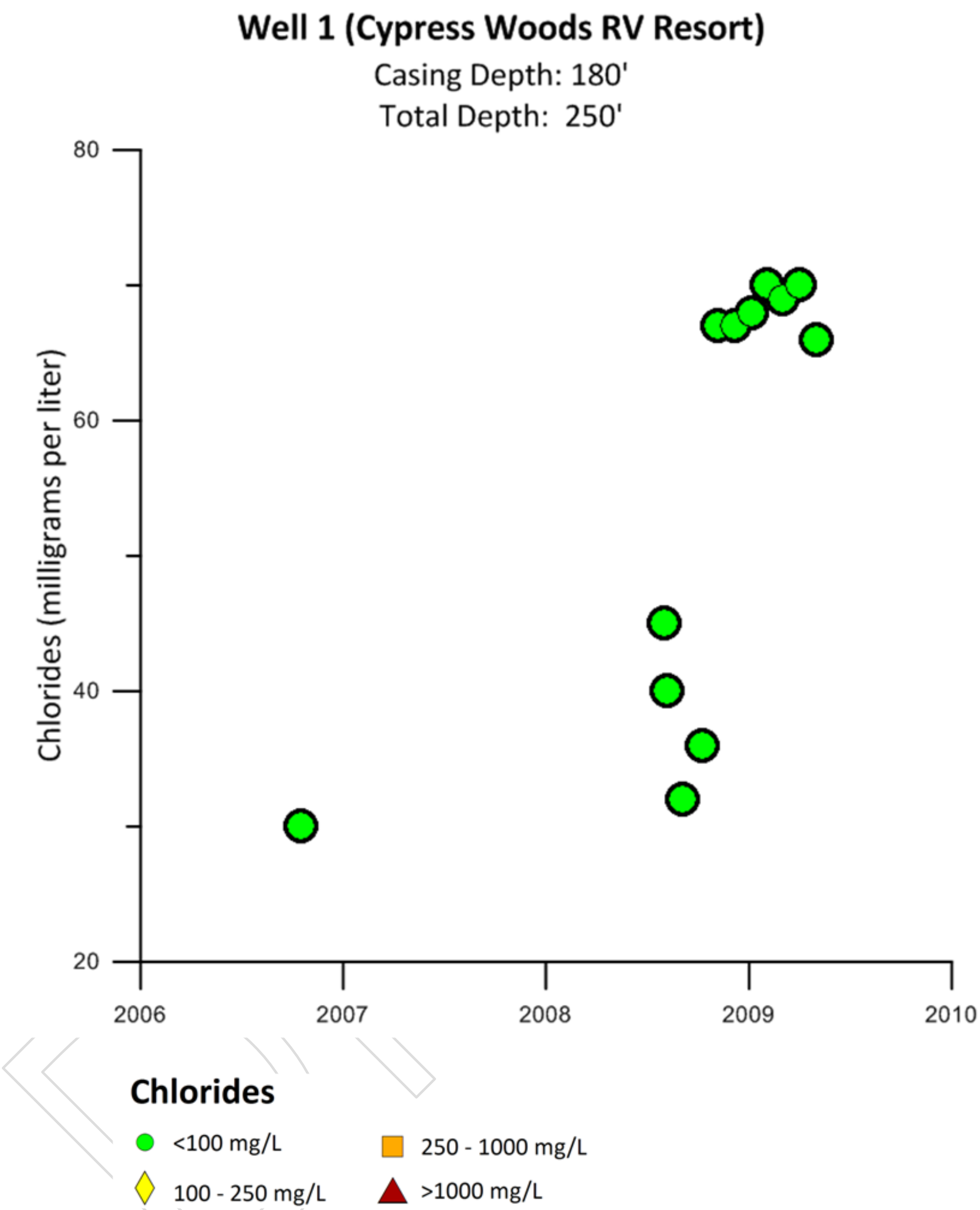

Figure F-49. Chloride levels at Cypress Woods RV Resort well 1. This well is labeled 393 in **Figure F-47**.

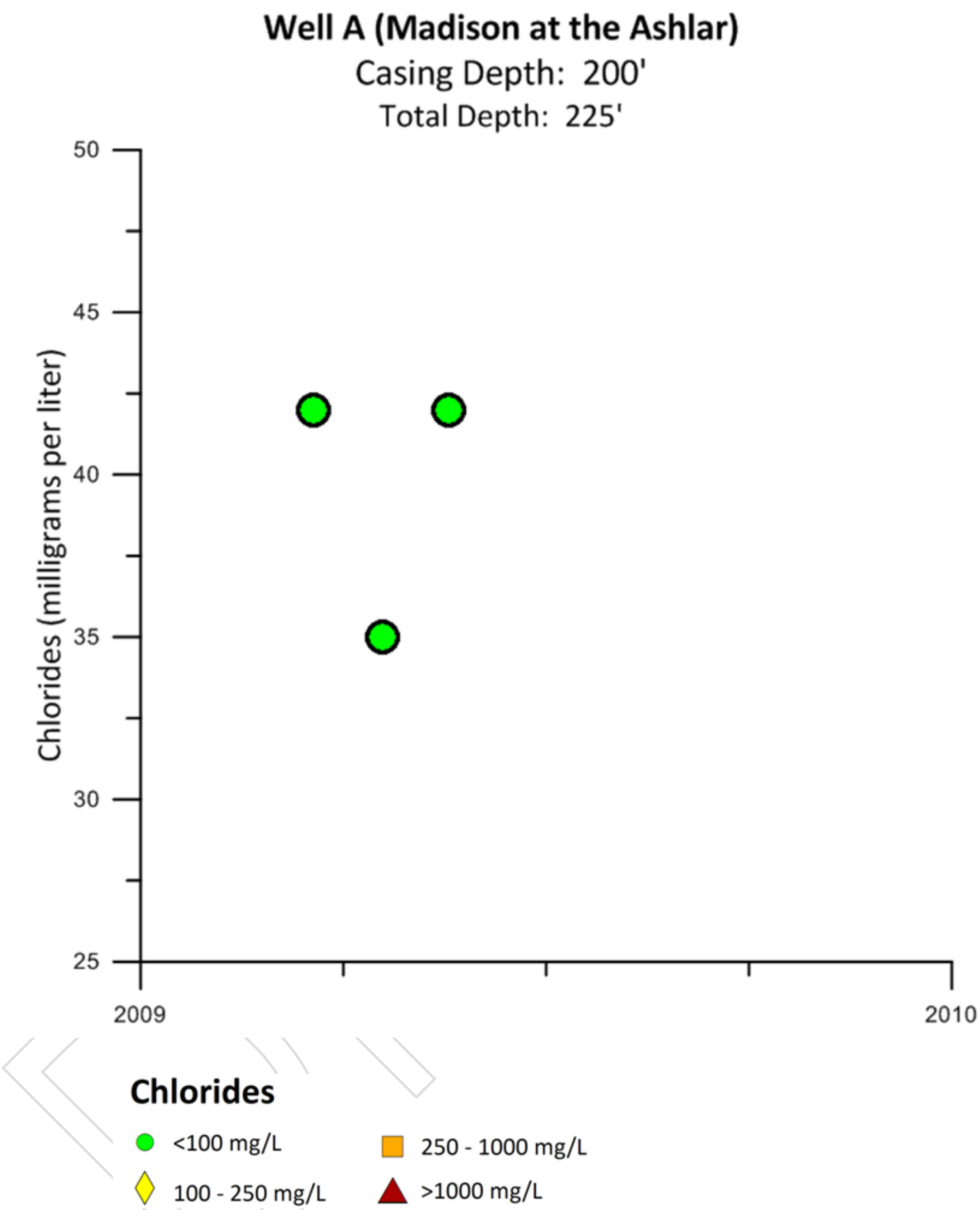

Figure F-50. Chloride levels at Madison at the Ashlar well A.
This well is labeled 409 in **Figure F-47**.

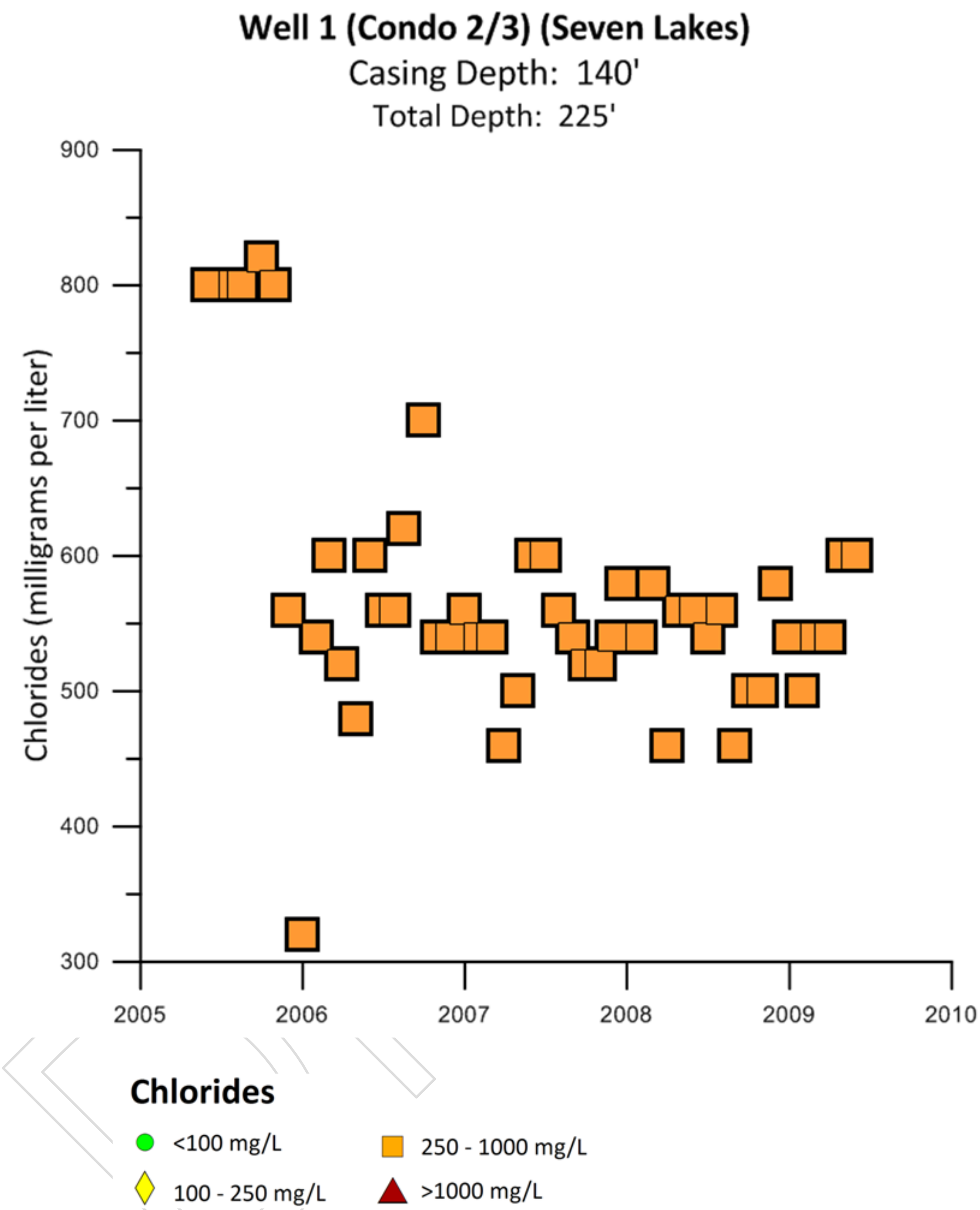

Figure F-51. Chloride levels at Seven Lakes well 1 (Condo 2/3).
This well is labeled 413 in **Figure F-47**.

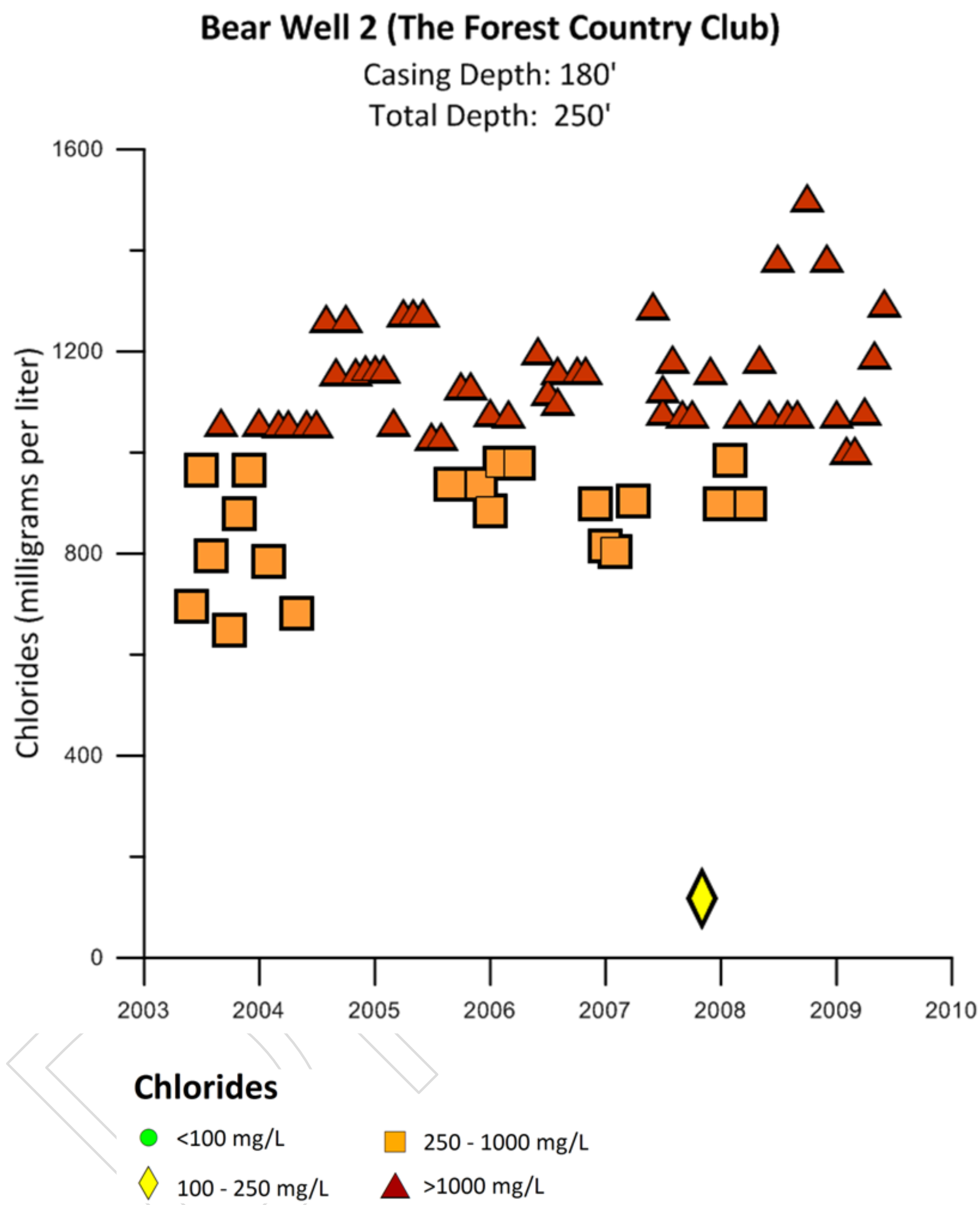

Figure F-52. Chloride levels at The Forest Country Club well Bear Well 2.
This well is labeled 420 in **Figure F-47**.

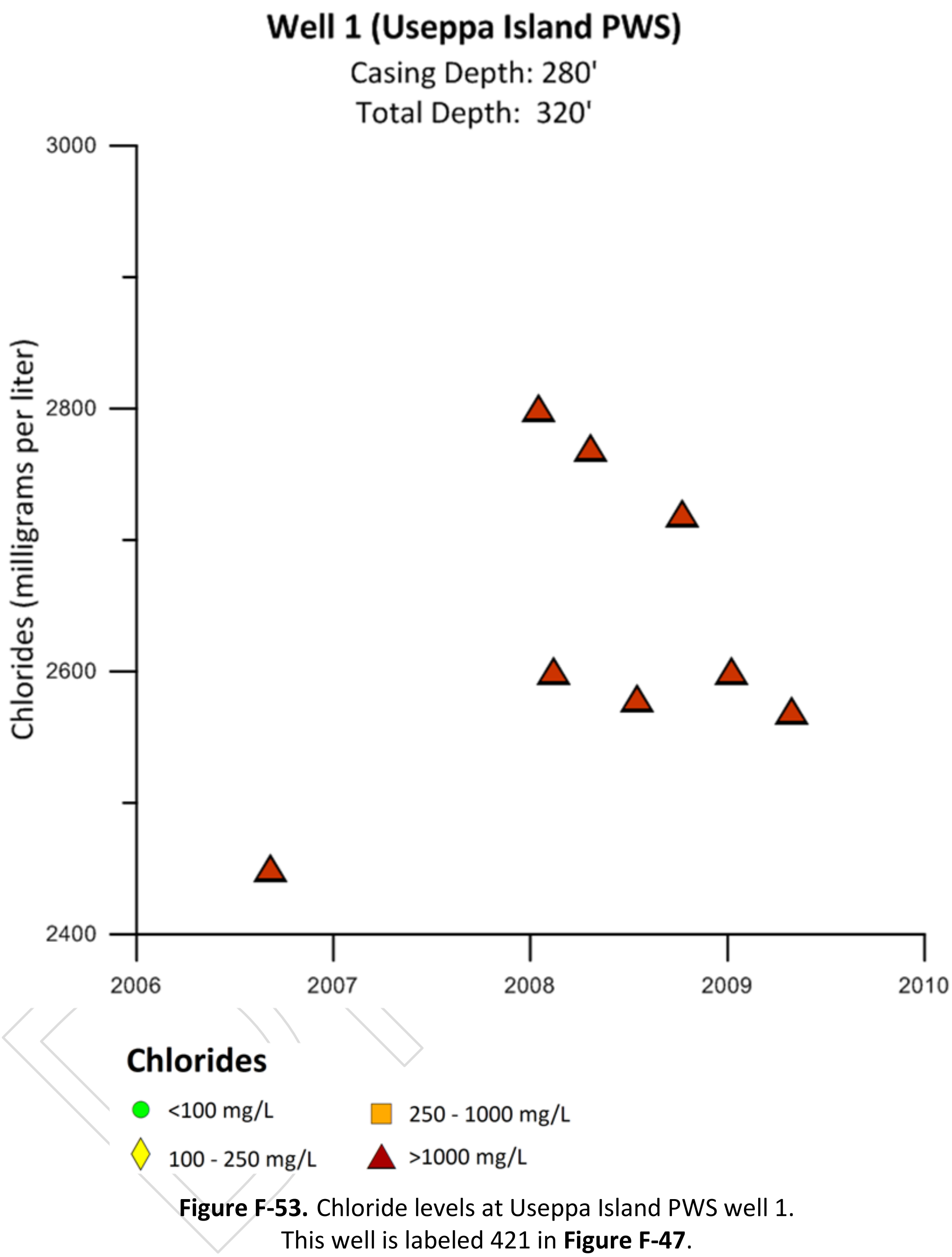

Figure F-53. Chloride levels at Useppa Island PWS well 1.
This well is labeled 421 in **Figure F-47**.

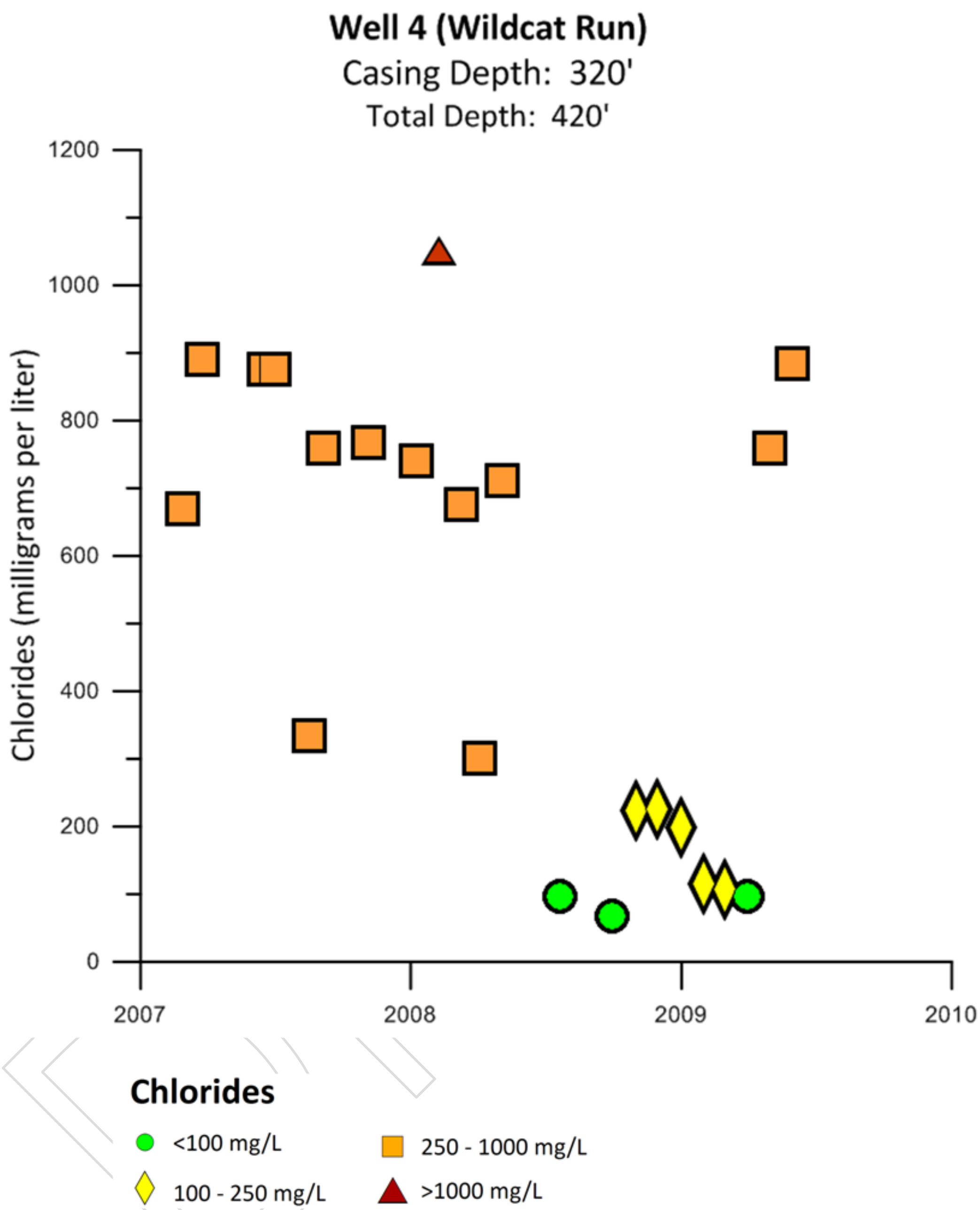

Figure F-54. Chloride levels at Wildcat Run well 4.
This figure is labeled 423 in **Figure F-47**.

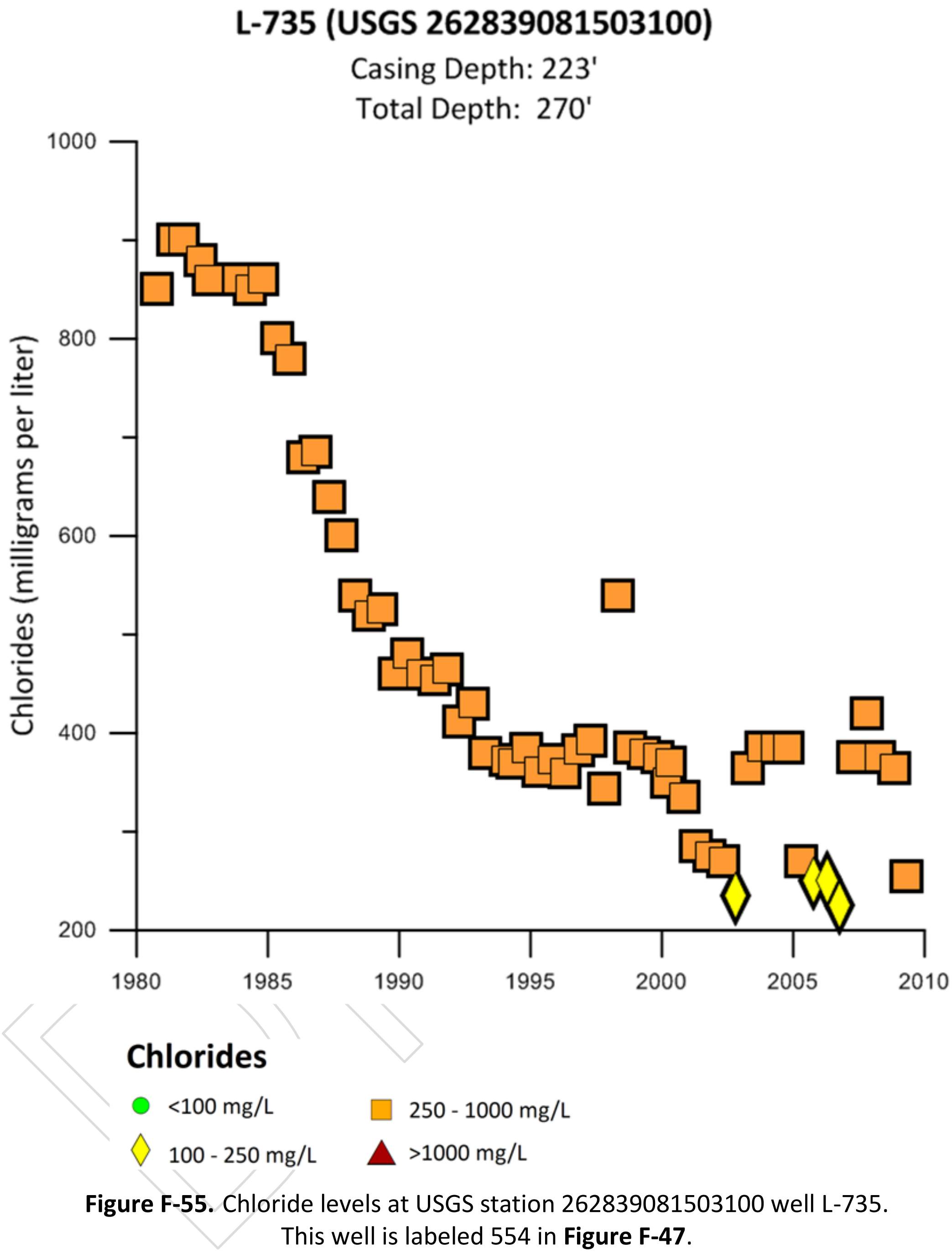

Figure F-55. Chloride levels at USGS station 262839081503100 well L-735.
This well is labeled 554 in **Figure F-47**.

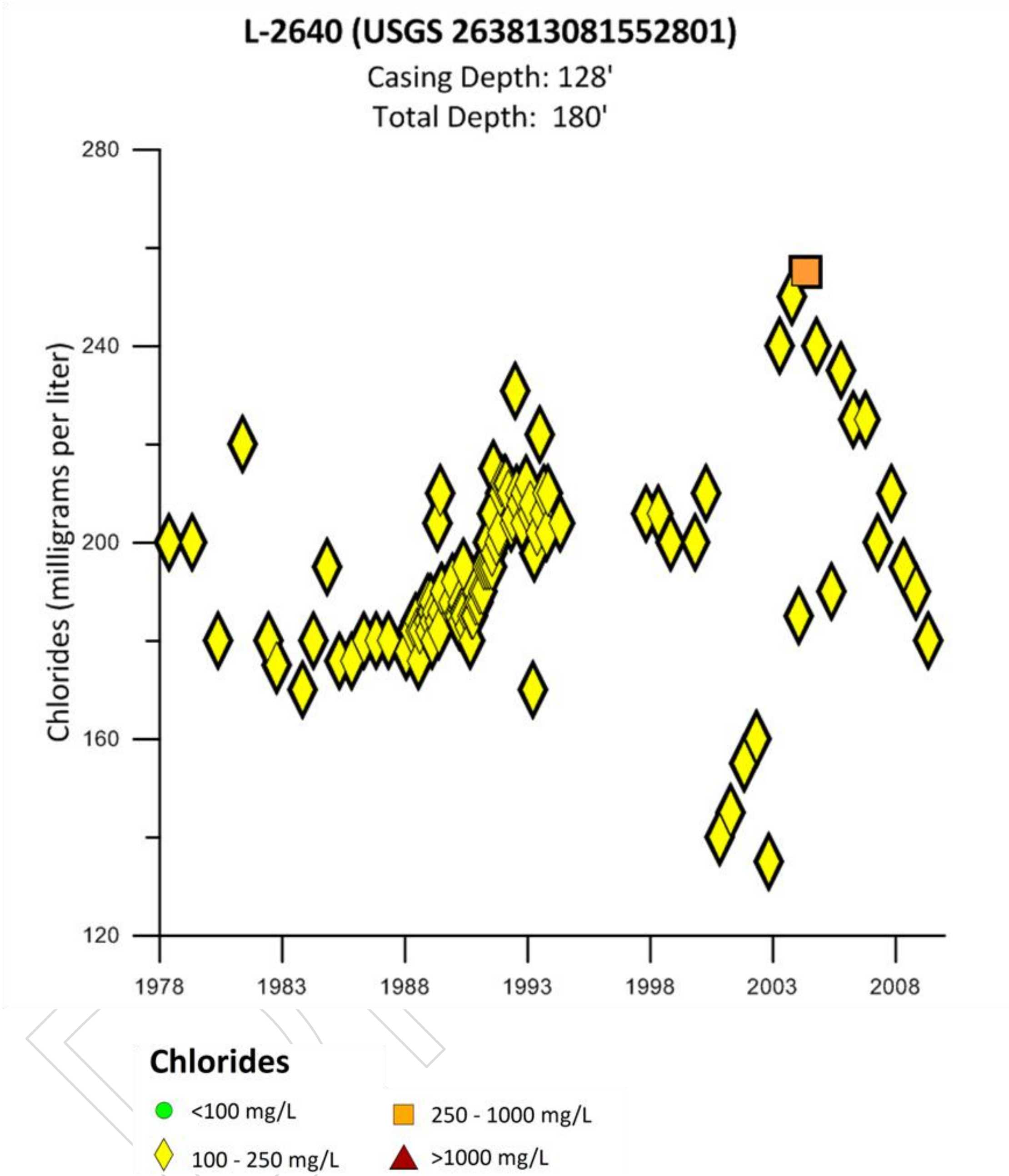

Figure F-56. Chloride levels at USGS station 263813081552801 well L-2640.
This figure is labeled 556 in **Figure F-47**.

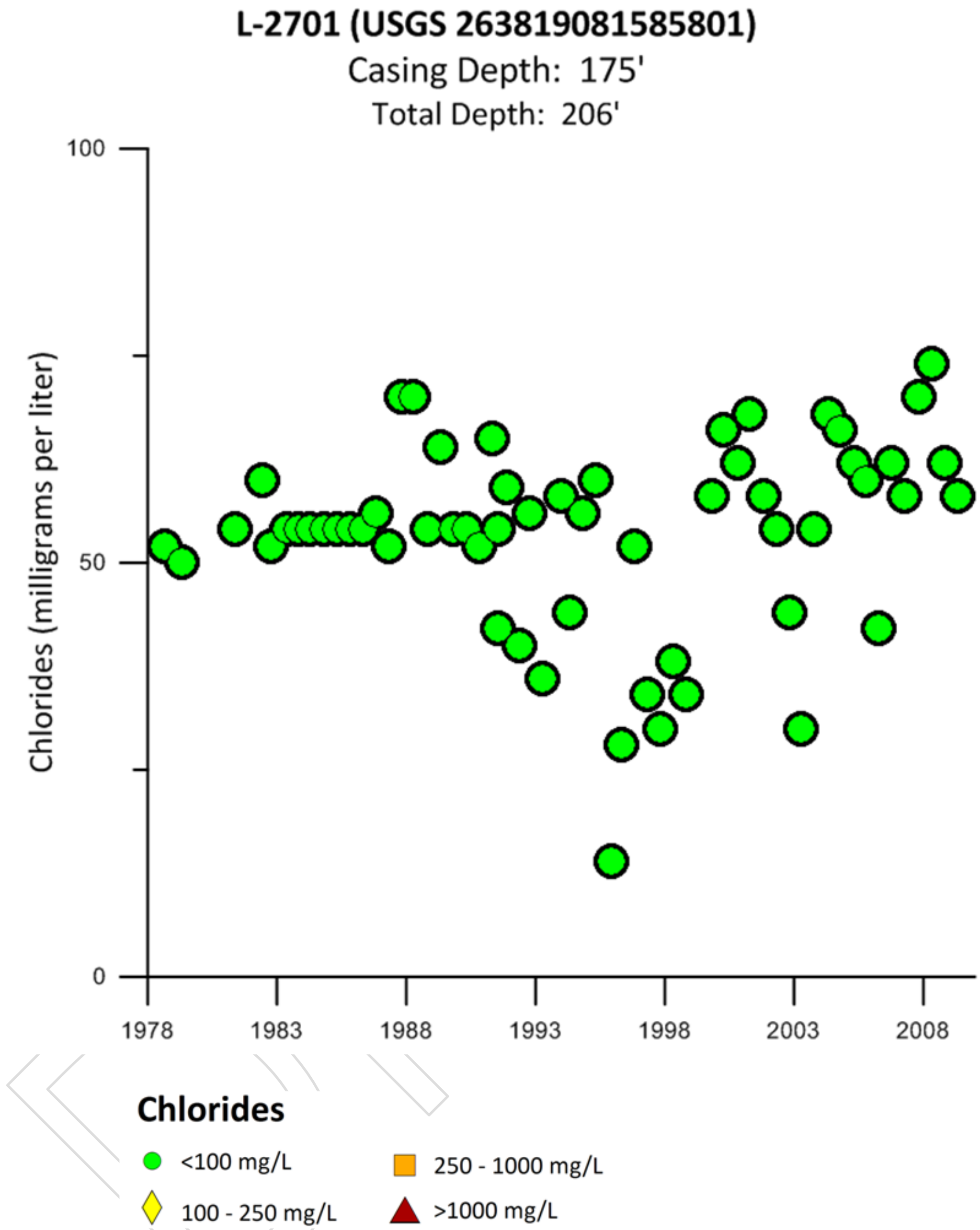

Figure F-57. Chloride levels at USGS station 263819081585801 well L-2701. This well is labeled 557 in **Figure F-47**.

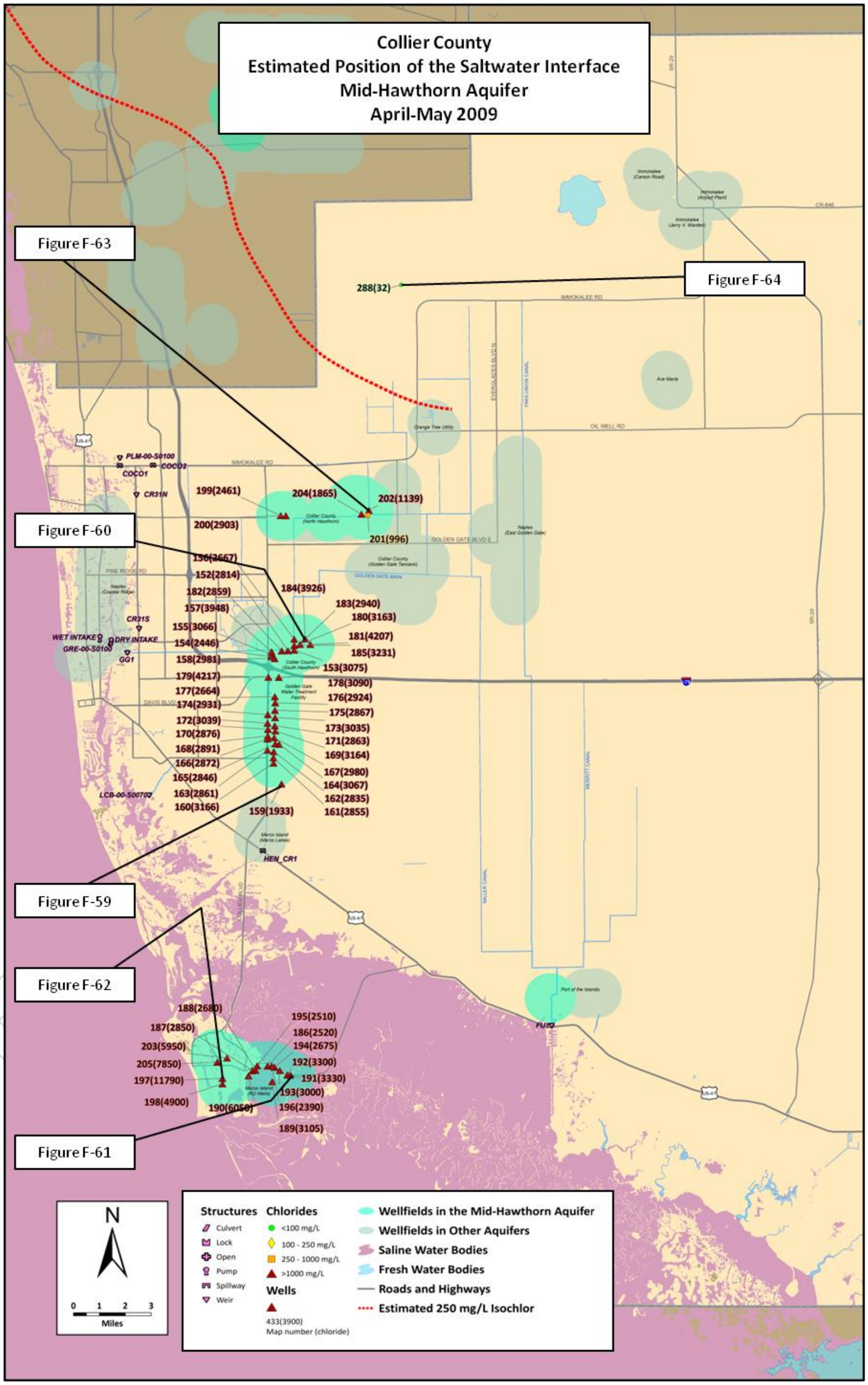

Figure F-58. Estimated position of the saltwater interface within the Mid-Hawthorn aquifer in Collier County in April–May 2009. The figure number labels on the map refer to **Figure F-59** through **Figure F-64** below, which show chloride levels for the wells indicated on this map.

Table F-6. Chloride levels measured at Mid-Hawthorn aquifer wells within Collier County. The map numbers in the first column refer to the numbers on the map in **Figure F-58**.

Map Number	SFWMD Facility	Project Name	Well Name	X	Y	Casing Depth (feet bls)	Total Depth (feet bls)	Chloride (mg/L)
152	109712	Collier County Public Water Supply (PWS) - North East Regional Water Treatment Plant (NERWTP)	RO-2S	434927	667897	292	400	2,814
153	109713	Collier County PWS - NERWTP	RO-3S	436249	668017	293	403	3,075
154	109709	Collier County PWS - NERWTP	RO-15S	431595	666679	295	402	2,446
155	115849	Collier County PWS - NERWTP	RO-13S	431600	667080	295	400	3,066
156	109715	Collier County PWS - NERWTP	RO-5S	436202	670259	297	402	2,667
157	109708	Collier County PWS - NERWTP	RO-14S	431611	667706	298	422	3,948
158	109710	Collier County PWS - NERWTP	RO-12S	432233	666306	299	422	2,981
159	122874	Veronawalk (**Figure F-59**)	4	433644	640783	300	350	1,933
160	190652	Collier County PWS - NERWTP	RO-37S	432015	645040	300	420	3,166
161	190651	Collier County PWS - NERWTP	RO-36S	432015	646130	300	420	2,855
162	190649	Collier County PWS - NERWTP	RO-34S	432070	647380	300	420	2,835
163	190646	Collier County PWS - NERWTP	RO-31S	430750	647670	300	420	2,861
164	190650	Collier County PWS - NERWTP	RO-35S	433160	648860	300	420	3,067
165	190648	Collier County PWS - NERWTP	RO-33S	432350	648940	300	420	2,846
166	190644	Collier County PWS - NERWTP	RO-29S	430800	649930	300	420	2,872
167	190642	Collier County PWS - NERWTP	RO-27S	432170	650215	300	420	2,980
168	190643	Collier County PWS - NERWTP	RO-28S	430850	650550	300	420	2,891
169	190641	Collier County PWS - NERWTP	RO-26S	432380	651570	300	420	3,164
170	190880	Collier County PWS - NERWTP	RO-24S	430877	651891	300	420	2,876
171	190640	Collier County PWS - NERWTP	RO-25S	432275	652630	300	420	2,863
172	190879	Collier County PWS - NERWTP	RO-23S	430778	653138	300	420	3,039
173	190877	Collier County PWS - NERWTP	RO-21S	432321	654287	300	420	3,035
174	190878	Collier County PWS - NERWTP	RO-22S	430844	654910	300	420	2,931
176	190876	Collier County PWS - NERWTP	RO-20S	432288	655764	300	420	2,867
177	190875	Collier County PWS - NERWTP	RO-19S	432354	657306	300	420	2,924
177	190639	Collier County PWS - NERWTP	RO-18S	432280	658535	300	420	2,664
178	190637	Collier County PWS - NERWTP	RO-16S	433080	662490	300	420	3,090
179	190638	Collier County PWS - NERWTP	RO-17S	430950	662510	300	420	4,217
180	190471	Collier County PWS - NERWTP	RO-39S	437425	669195	300	400	3,163
181	190473	Collier County PWS - NERWTP	RO-41S	439505	669195	300	400	4,207
182	109711	Collier County PWS - NERWTP	RO-1S	433681	667877	312	420	2,859
183	109716	Collier County PWS - NERWTP (**Figure F-60**)	RO-6S	438460	670306	317	421	2,940

Table F-6. Continued

Map Number	SFWMD Facility	Project Name	Well Name	X	Y	Casing Depth (feet bls)	Total Depth (feet bls)	Chloride (mg/L)
184	109717	Collier County PWS – NERWTP	RO-7S	438430	670290	328	442	3,926
185	109714	Collier County PWS – NERWTP	RO-4S	436234	668983	331	402	3,231
186	28471	Marco Island Utilities PWS	14 (RO 14)	430815	583391	336	460	2,520
187	28469	Marco Island Utilities PWS	12 (RO 12)	427705	582423	341	498	2,850
188	28470	Marco Island Utilities PWS	13 (RO 13)	428326	582500	345	508	2,680
189	142963	Marco Island Utilities PWS	19 (RO 19)	431758	580188	350	500	3,105
190	28473	Marco Island Utilities PWS	11 (RO 11)	426901	581378	350	500	6,050
191	142967	Marco Island Utilities PWS (**Figure F-61**)	21 (RO 21)	435462	581508	350	500	3,330
192	142964	Marco Island Utilities PWS	20 (RO 20)	434835	581582	350	500	3,300
193	28476	Marco Island Utilities PWS	18 (RO 18)	433295	582452	350	500	3,000
194	28475	Marco Island Utilities PWS	17 (RO 17)	432225	583112	350	500	2,675
195	28474	Marco Island Utilities PWS	16 (RO 16)	428695	583412	350	500	2,510
196	28472	Marco Island Utilities PWS	15 (RO 15)	431648	583359	352	507	2,390
197	28489	Marco Island Utilities PWS (**Figure F-62**)	5 (RO 5)	421598	580872	390	540	11,790
198	28487	Marco Island Utilities PWS	1 (RO 1)	421608	579750	395	574	4,900
199	167304	Collier County PWS – NERWTP	RO-101N	433463	695415	397	512	2,461
200	167313	Collier County PWS – NERWTP	RO-102N	434530	695390	400	500	2,903
201	167357	Collier County PWS – NERWTP	RO-115N	451202	695432	400	500	996
202	167358	Collier County PWS – NERWTP (**Figure F-63**)	RO-116N	451442	696456	400	500	1,139
203	28492	Collier County PWS – NERWTP	10 (RO 10)	422544	585014	410	580	5,950
204	167356	Collier County PWS – NERWTP	RO-114N	449908	695694	412	514	1,865
205	29397	Marco Island Utilities PWS	7 (RO 7)	420558	584137	415	573	7,850
288		USGS 262228081361902 (**Figure F-64**)	C-1080	458060	742383	238	309	32

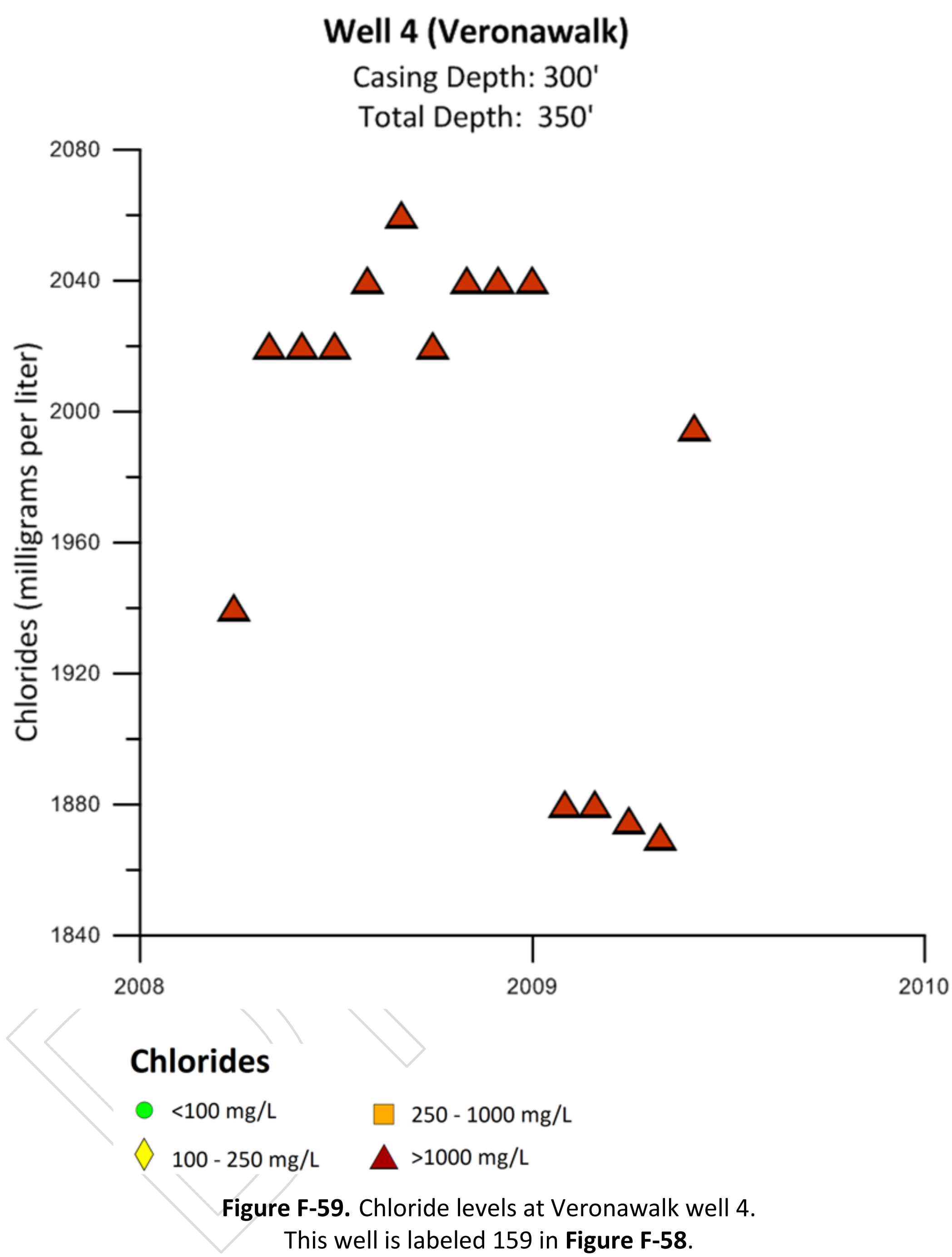

Figure F-59. Chloride levels at Veronawalk well 4.
This well is labeled 159 in **Figure F-58**.

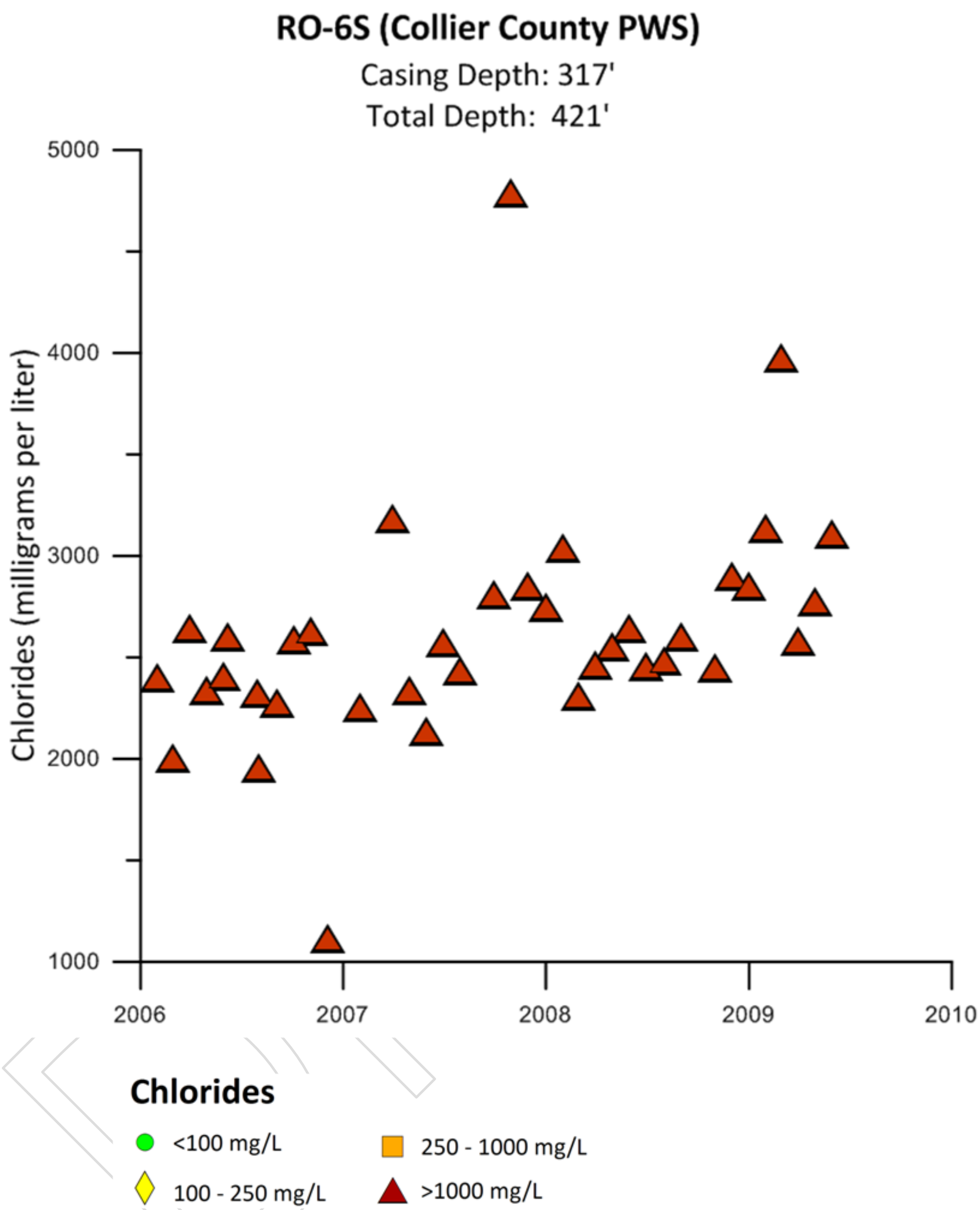

Figure F-60. Chloride levels at Collier County PWS well RO-6S.
This well is labeled 183 in **Figure F-58**.

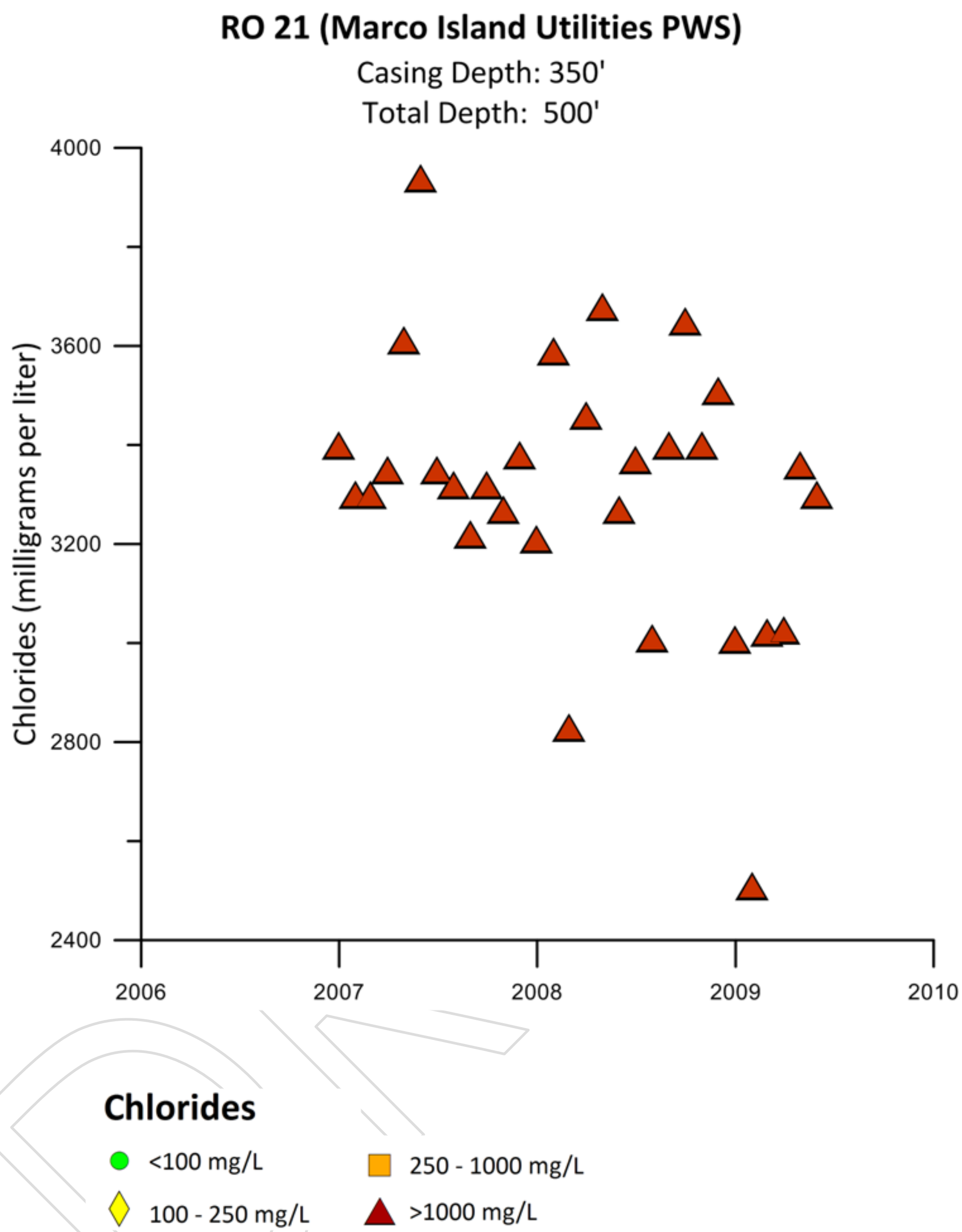

Figure F-61. Chloride levels at Marco Island Utilities PWS well RO 21.
This well is labeled 191 in **Figure F-58**.

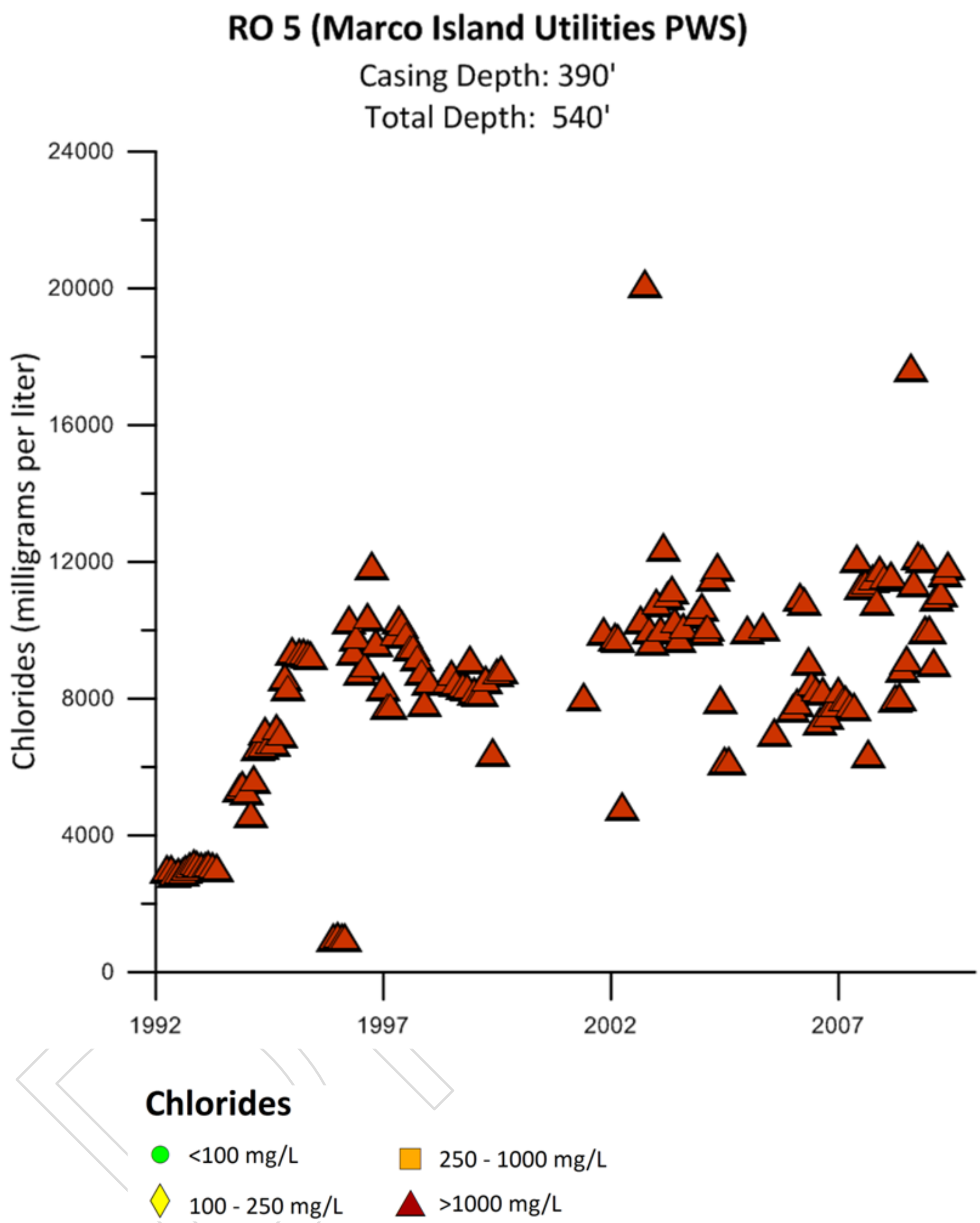

Figure F-62. Chloride levels at Marco Island Utilities PWS well RO 5. This well is labeled 167 in **Figure F-58**.

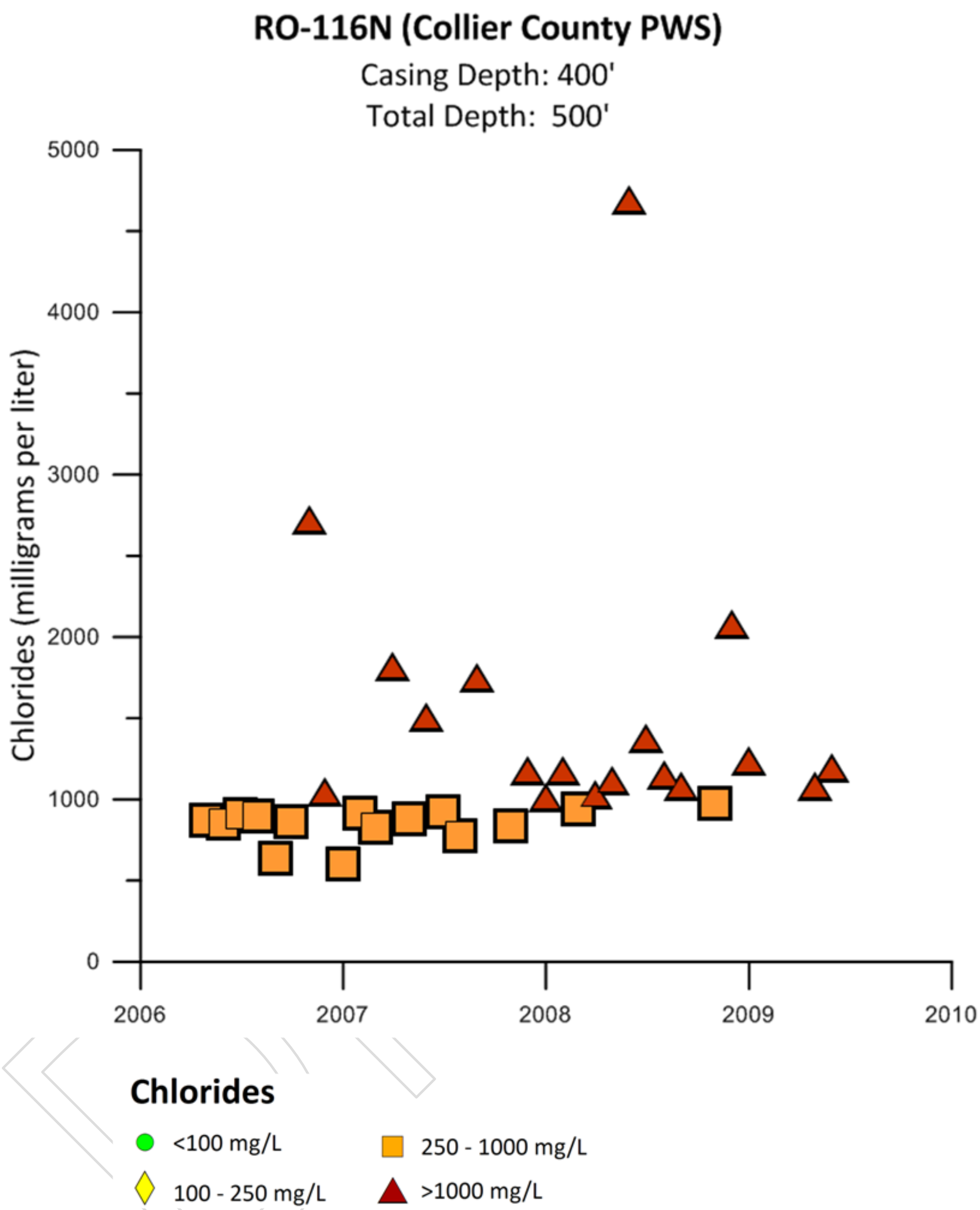

Figure F-63. Chloride levels at Collier County PWS well RO-116N. This well is labeled 202 in **Figure F-58**.

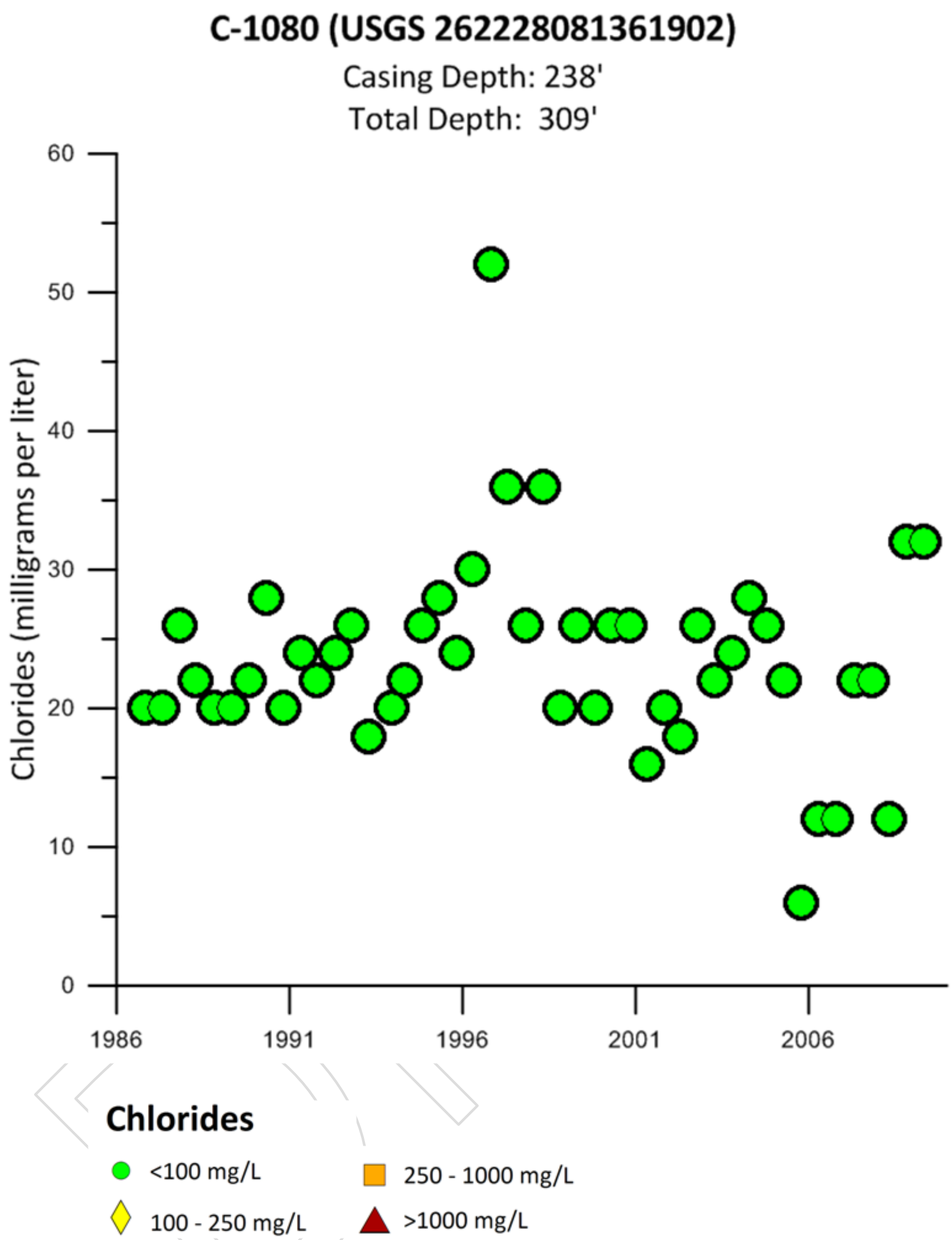

Figure F-64. Chloride levels at USGS station 262228081361902 well C-1080. This well is labeled 288 in **Figure F-58**.

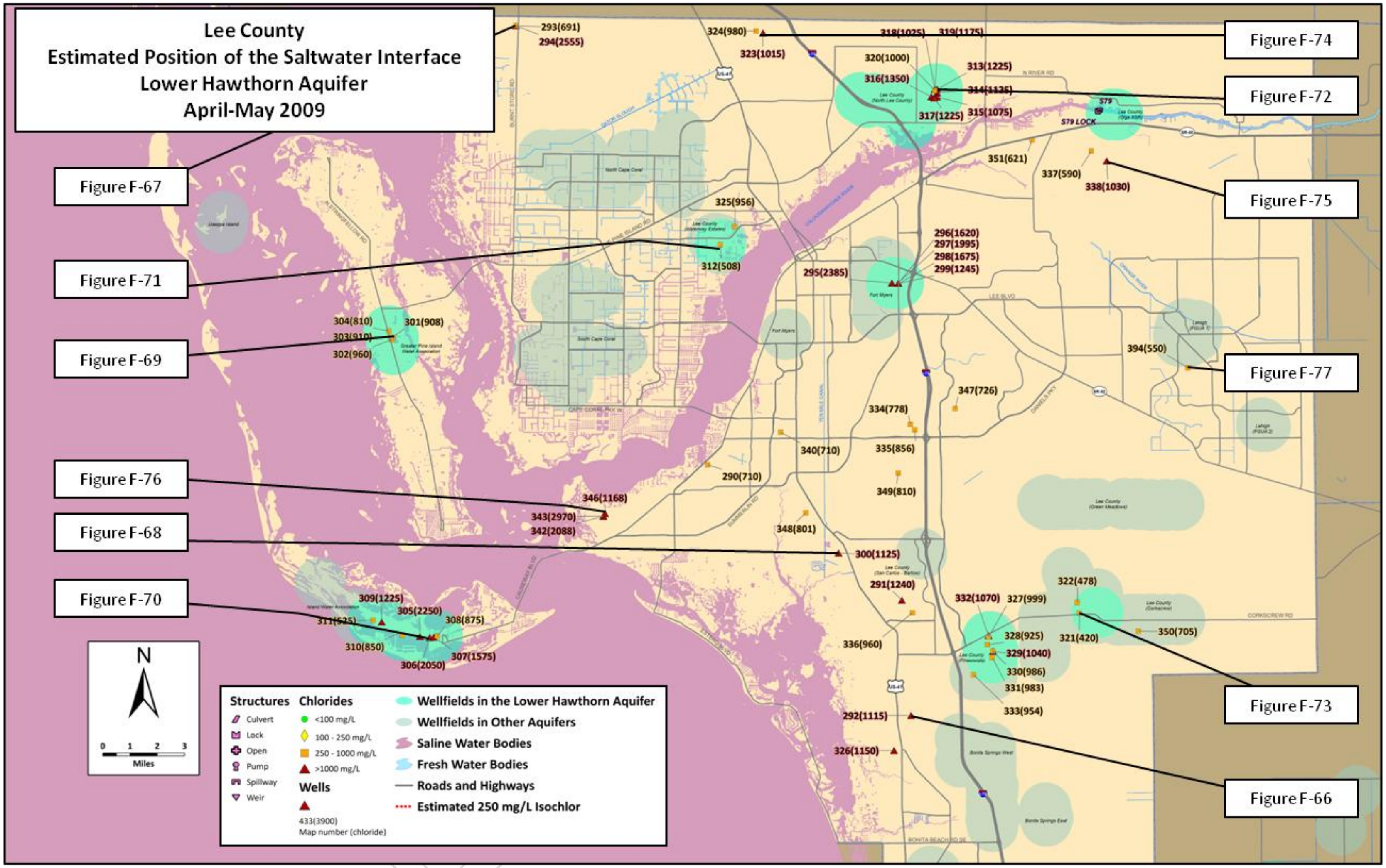

Figure F-65. Estimated position of the saltwater interface within the Lower Hawthorn aquifer in Lee County in April–May 2009. The figure number labels on the map refer to **Figure F-66** through **Figure F-77,** which show chloride levels for the indicated wells.

Table F-7. Chloride levels measured at Lower Hawthorn aquifer wells within Lee County. The map numbers in the first column refer to the numbers on the map in **Figure F-65**.

Map Number	SFWMD Facility	Project Name	Well Name	X	Y	Casing Depth (feet bls)	Total Depth (feet bls)	Chloride (mg/L)
290	189297	Asbury	PW-2	354037	800057	500	700	710
291	120625	Belle Lago	LHW-1	391659	773816	340	600	1,240
292	32598	Bonita Bay (**Figure F-66**)	LH-2	393444	751465	360	750	1,115
293	2120	Burnt Store Marina & Country Club (**Figure F-67**)	2	316883	885191	300	750	691
294	2121	Burnt Store Marina & Country Club	1	316883	885191	300	900	2,555
295	194016	Fort Myers, City of	P-13	389700	835330	575	700	2,385
296	194020	Fort Myers, City of	P-14	390950	835266	440	680	1,620
297	195923	Fort Myers, City of	P-17	390950	835266	460	720	1,995
298	198263	Fort Myers, City of	P-15	390950	835266	460	720	1,675
299	198265	Fort Myers, City of	P-16	390950	835266	460	720	1,245
300	156486	Emerson Square (**Figure F-68**)	Well #1	379391	782987	500	550	1,125
301	22056	Greater Pine Island Water Association RO Wellfield (**Figure F-69**)	RO-4	293103	824786	583	739	908
302	22057	Greater Pine Island Water Association RO Wellfield	RO-5	292839	824315	563	770	960
303	22058	Greater Pine Island Water Association RO Wellfield	RO-6	292666	824791	598	737	910
304	22059	Greater Pine Island Water Association RO Wellfield	RO-7	292295	826006	598	783	810
305	25662	Island Water Association Inc.	H6	298291	766790	647	700	2,250
306	25664	Island Water Association Inc. (**Figure F-70**)	H8	300220	766597	508	678	2,050
307	25665	Island Water Association Inc.	H9	300958	766661	504	675	1,575
308	25666	Island Water Association Inc.	H10	301653	766847	500	625	875
309	25667	Island Water Association Inc.	H12	290920	769595	610	650	1,225
310	25668	Island Water Association Inc.	H13	294916	767082	502	588	850
311	25669	Island Water Association Inc.	H14	289247	769923	505	605	525
312	30823	Lee County Utilities North System (**Figure F-71**)	N-1D	356497	842755	300	600	508
313	142438	Lee County Utilities North System (**Figure F-72**)	PW-1	398500	872900	500	637	1,225
314	142439	Lee County Utilities North System	PW-2	398500	872200	493	700	1,125
315	142440	Lee County Utilities North System	PW-3	398500	871400	441	592	1,075
316	142441	Lee County Utilities North System	PW-5	397350	871440	500	670	1,350
317	142443	Lee County Utilities North System	PW-8	397920	871240	470	600	1,225
318	142449	Lee County Utilities North System	PW-7	398050	872900	475	700	1,025
319	142450	Lee County Utilities North System	PW-4	398050	872900	475	700	1,175
320	142805	Lee County Utilities North System	MW-1	398050	872650	487	700	1,000
321	131208	Lee County Utilities Public Water Supply (PWS)(**Figure F-73**)	40 Corkscrew	426046	771300	707	827	420

Table F-7. Continued.

Map Number	SFWMD Facility	Project Name	Well Name	X	Y	Casing Depth (feet bls)	Total Depth (feet bls)	Chloride (mg/L)
322	131213	Lee County Utilities PWS	41 Corkscrew	425622	773364	599	810	478
323	181802	Magnolia Landing (**Figure F-74**)	PW-6	364780	883788	460	620	1,015
324	181803	Magnolia Landing	PW-8	363430	884168	460	620	980
325	193701	Palm Island Phase 2	W-1	359298	846267	382	604	956
326	23675	Pelican Landing	LH-1	390135	744685	500	650	1,150
327	154018	Pinewoods PWS	23 (RO-1) LHA	408432	766684	603	651	999
328	154058	Pinewoods PWS	24 (RO-2) LHA	408232	765189	550	700	925
329	154059	Pinewoods PWS	25 (RO-3) LHA	409300	763928	550	700	1,040
330	154060	Pinewoods PWS	26 (RO-4) LHA	409300	763928	550	700	986
331	154061	Pinewoods PWS	27 (RO-5) LHA	409150	762678	550	700	983
332	154064	Pinewoods PWS	28	408432	766980	580	647	1,070
333	156917	Pinewoods PWS	29	405539	759345	550	650	954
334	111684	Renaissance	4	393298	807941	300	600	778
335	111692	Renaissance	2	394145	806854	300	600	856
336	165539	Reserve at Estero	Well #2	393727	771364	500	660	960
337	193394	River Hall	11 (LH1-1)	428344	860910	350	620	590
338	193397	River Hall (**Figure F-75**)	14 (LH2-2)	431333	858985	350	620	1,030
340	2321	Seven Lakes	Well 10 (Condo 41)	368175	806365	300	600	710
342	149306	Shell Point (**Figure F-76**)	W-2	333821	790064	360	565	2,088
343	149328	Shell Point	W-2A	333833	790112	300	565	2,970
346	150972	Shell Point	W-2C	334171	790614	312	420	1,168
347	229958	Somerset Golf Course	LH-1	401987	810979	549	653	726
348	116894	The Forest Country Club	Well No. 6	373065	790745	400	700	801
347	26906	The Legends Golf & Country Club	LH-1	390970	798490	475	625	810
350	108267	The Retreat	2	437487	767812	522	601	705
351	167619	The Verandah	18	416893	863035	500	600	621
394	198027	The Grove (**Figure F-77**)	PW-1	447064	818874	480	682	550

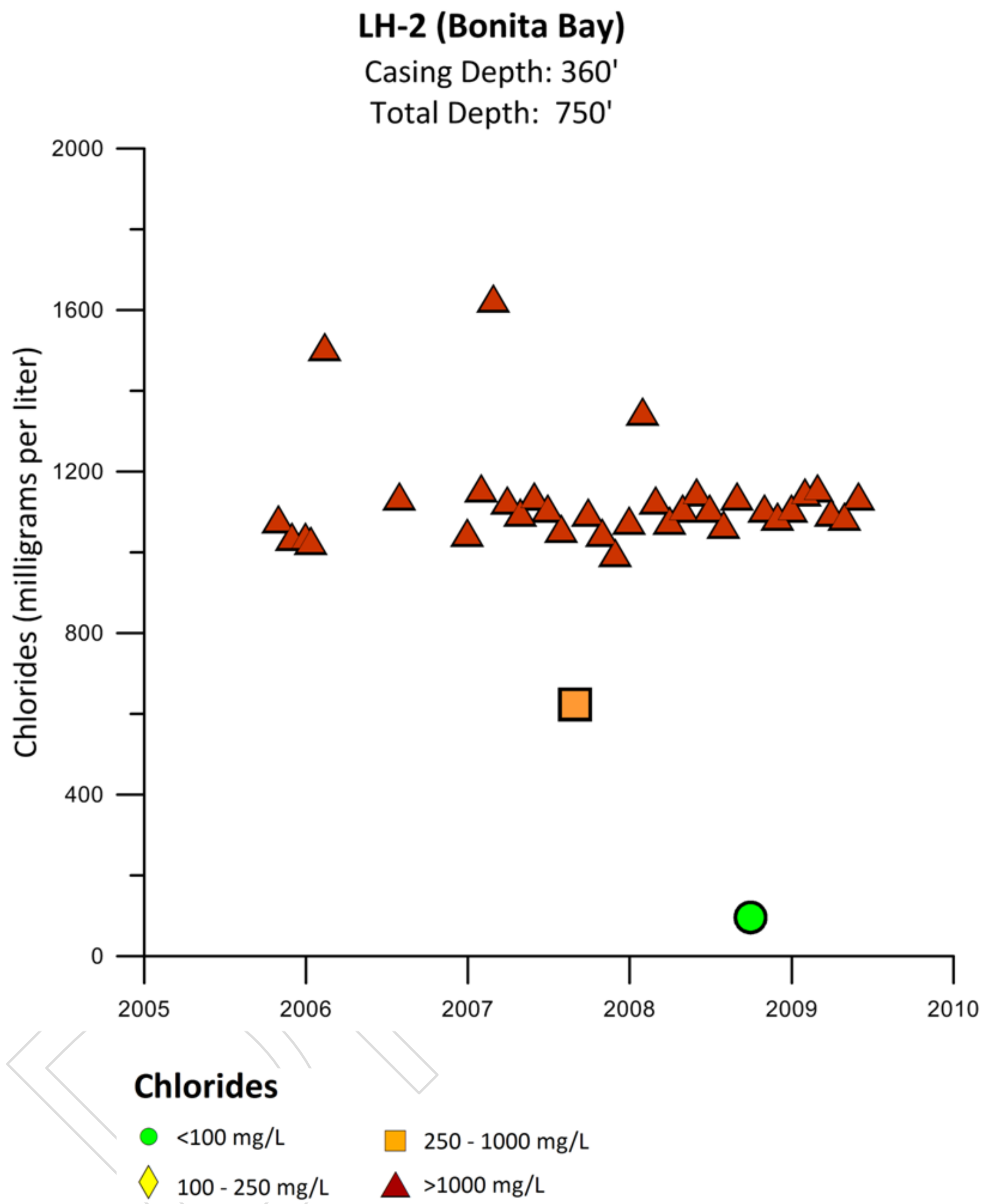

Figure F-66. Chloride levels at Bonita Bay well LH-2.
This well is labeled 292 in **Figure F-65**.

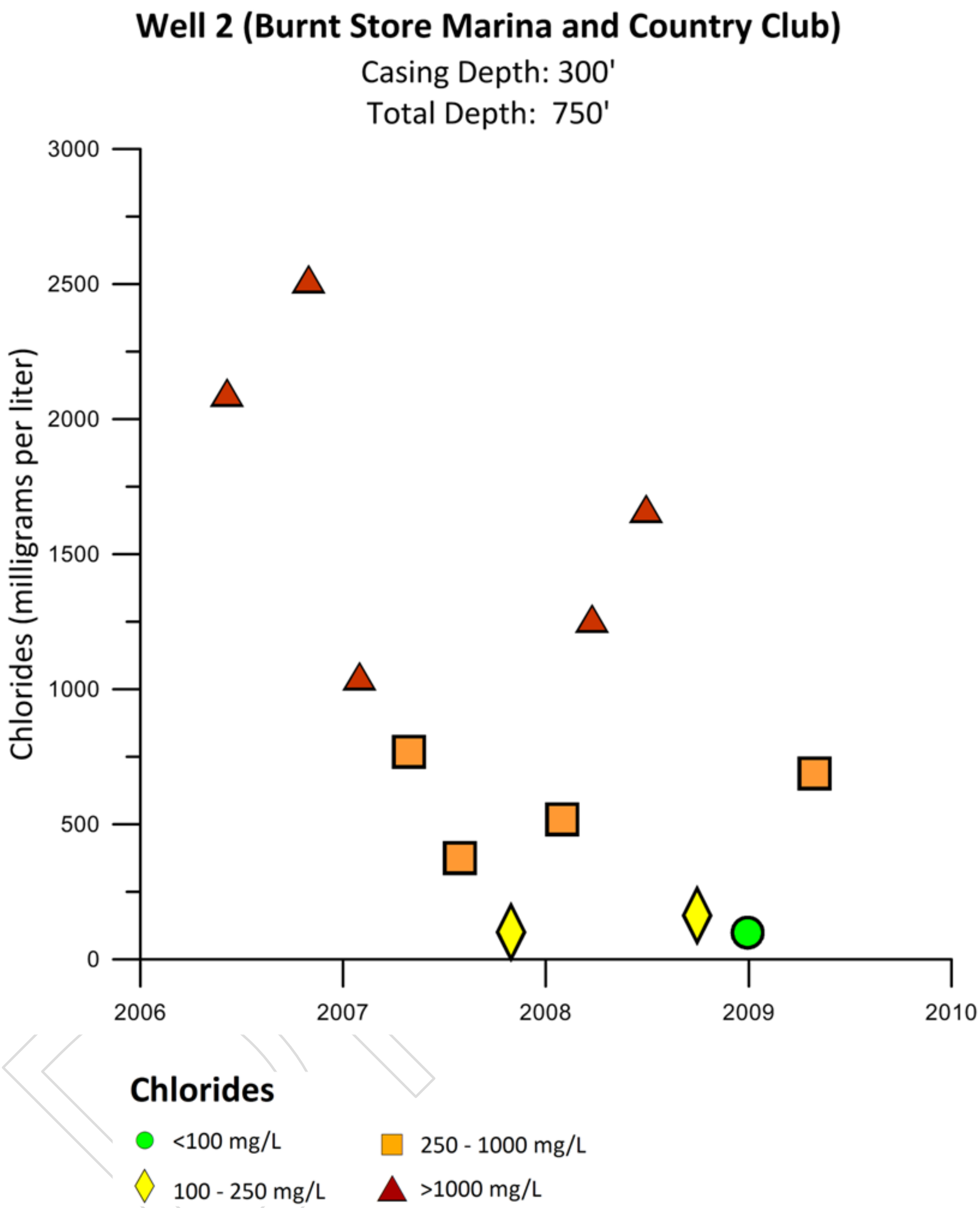

Figure F-67. Chloride levels at Brunt Store Marina and Country Club well 2.
This well is labeled 293 in **Figure F-65**.

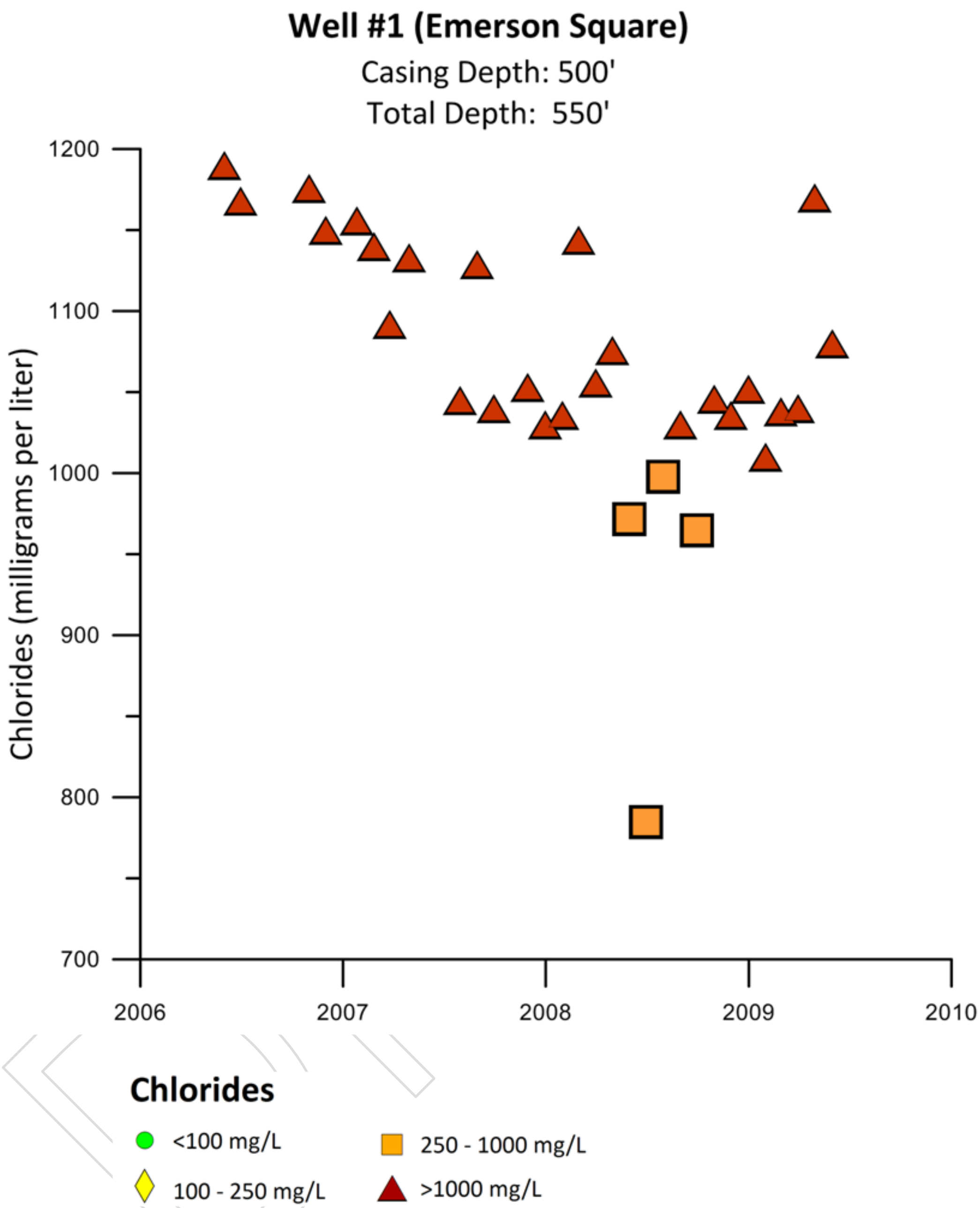

Figure F-68. Chloride levels at Emerson Square well #1.
This well is labeled 300 in **Figure F-65**.

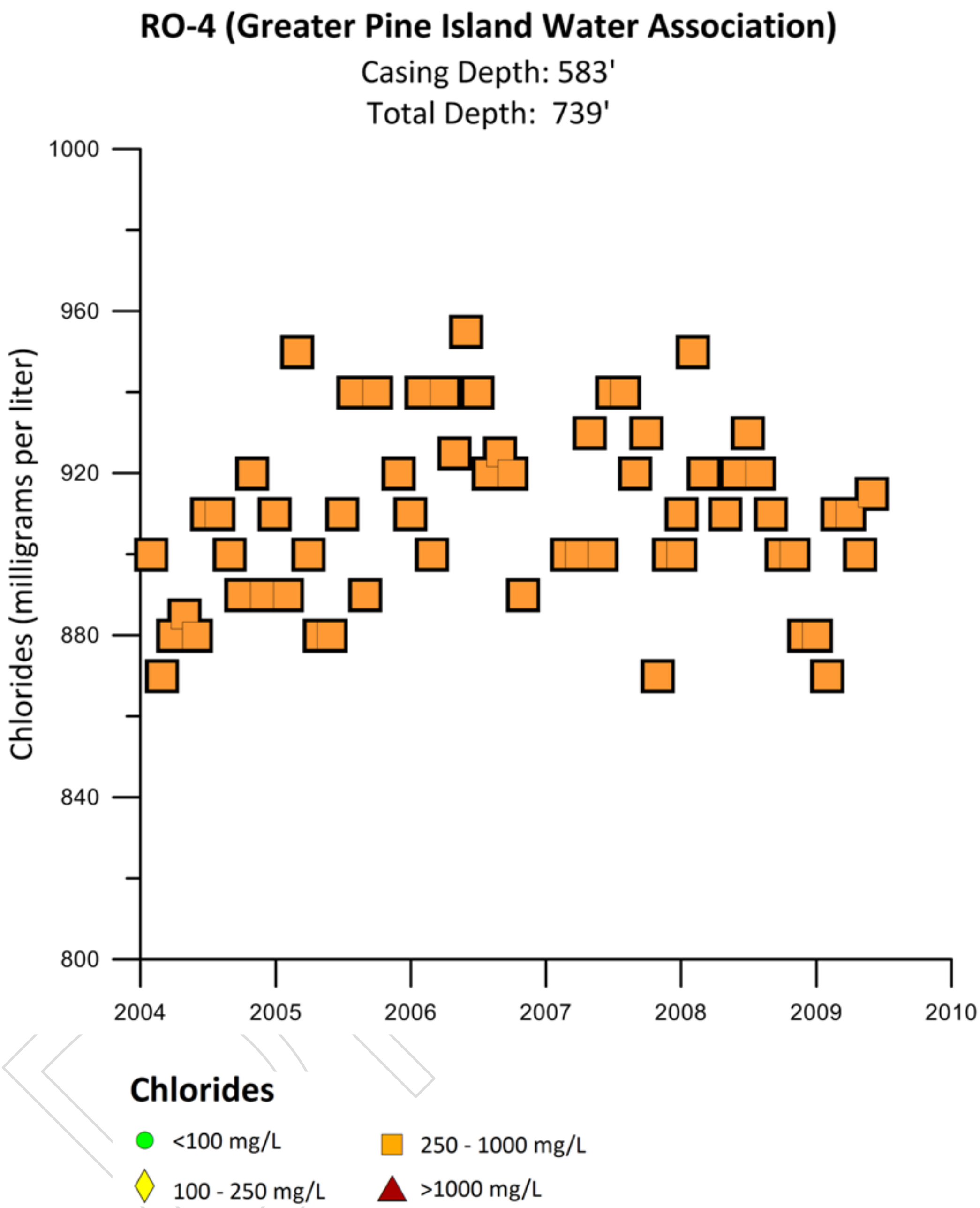

Figure F-69. Chloride levels at Greater Pine Island Water Association well RO-4. This well is labeled 301 in **Figure F-65**.

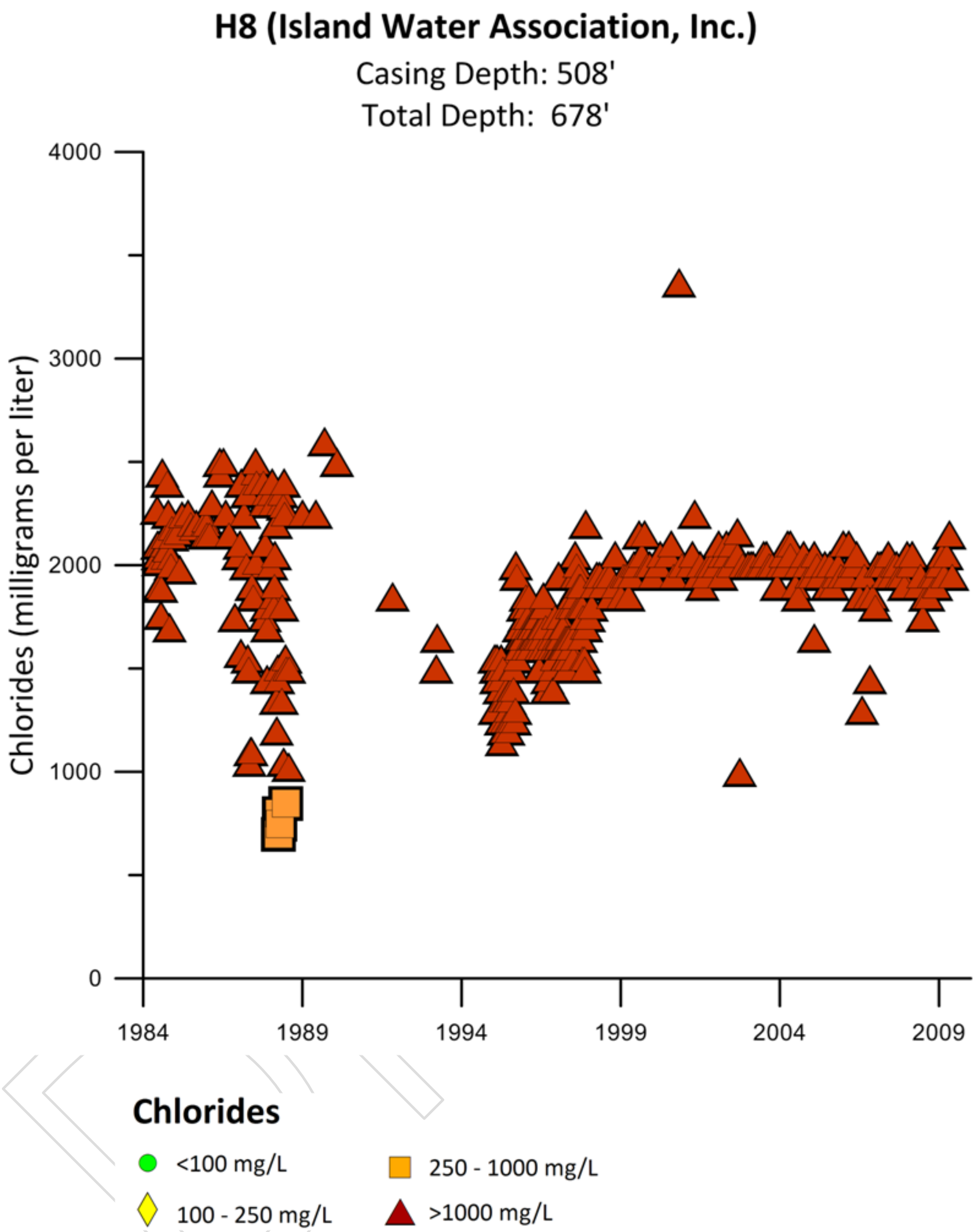

Figure F-70. Chloride levels at Island Water Association, Inc. well H8.
This well is labeled 306 in **Figure F-65**.

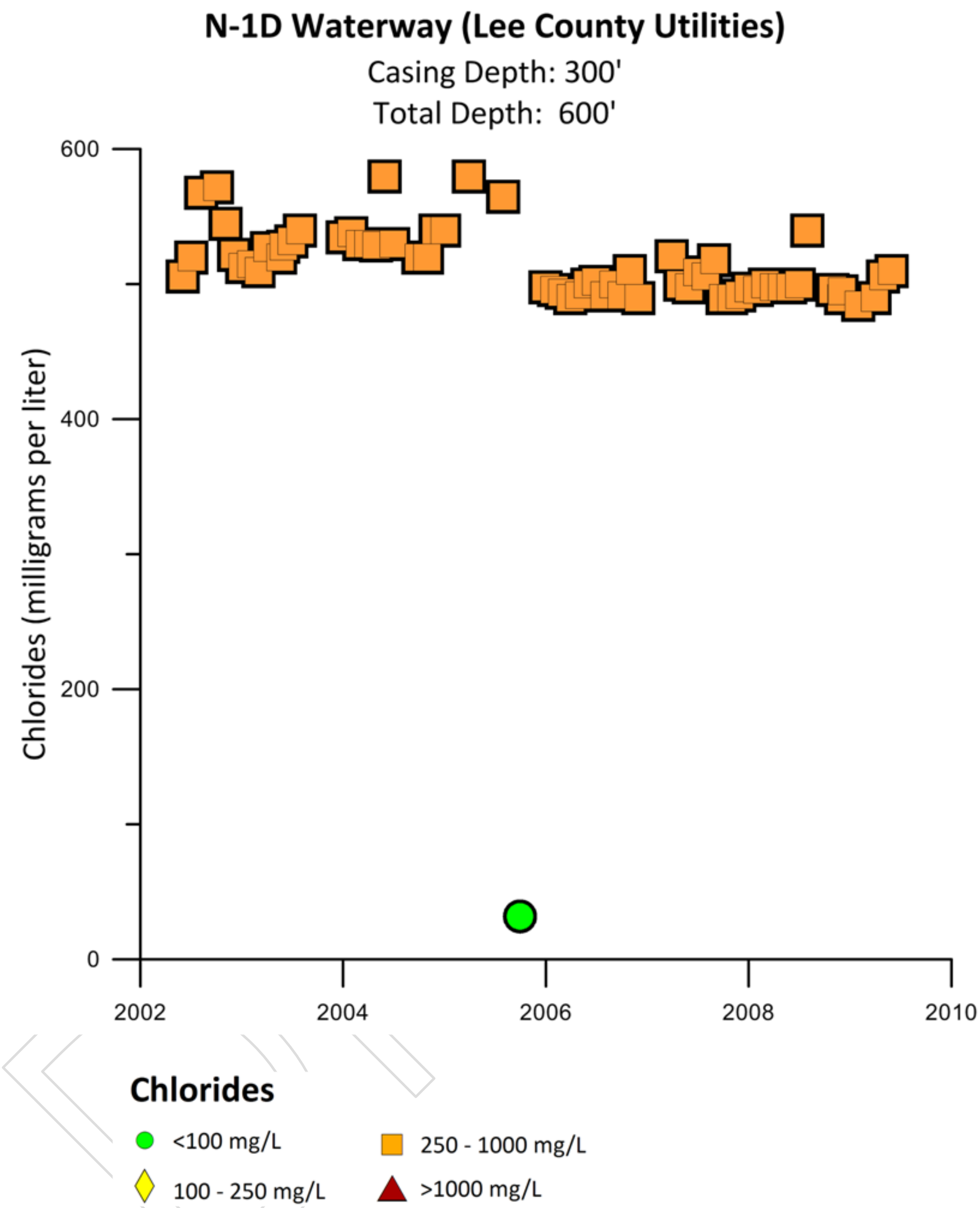

Figure F-71. Chloride levels at Lee County Utilities well N-1D Waterway. This well is labeled 312 in **Figure F-65**.

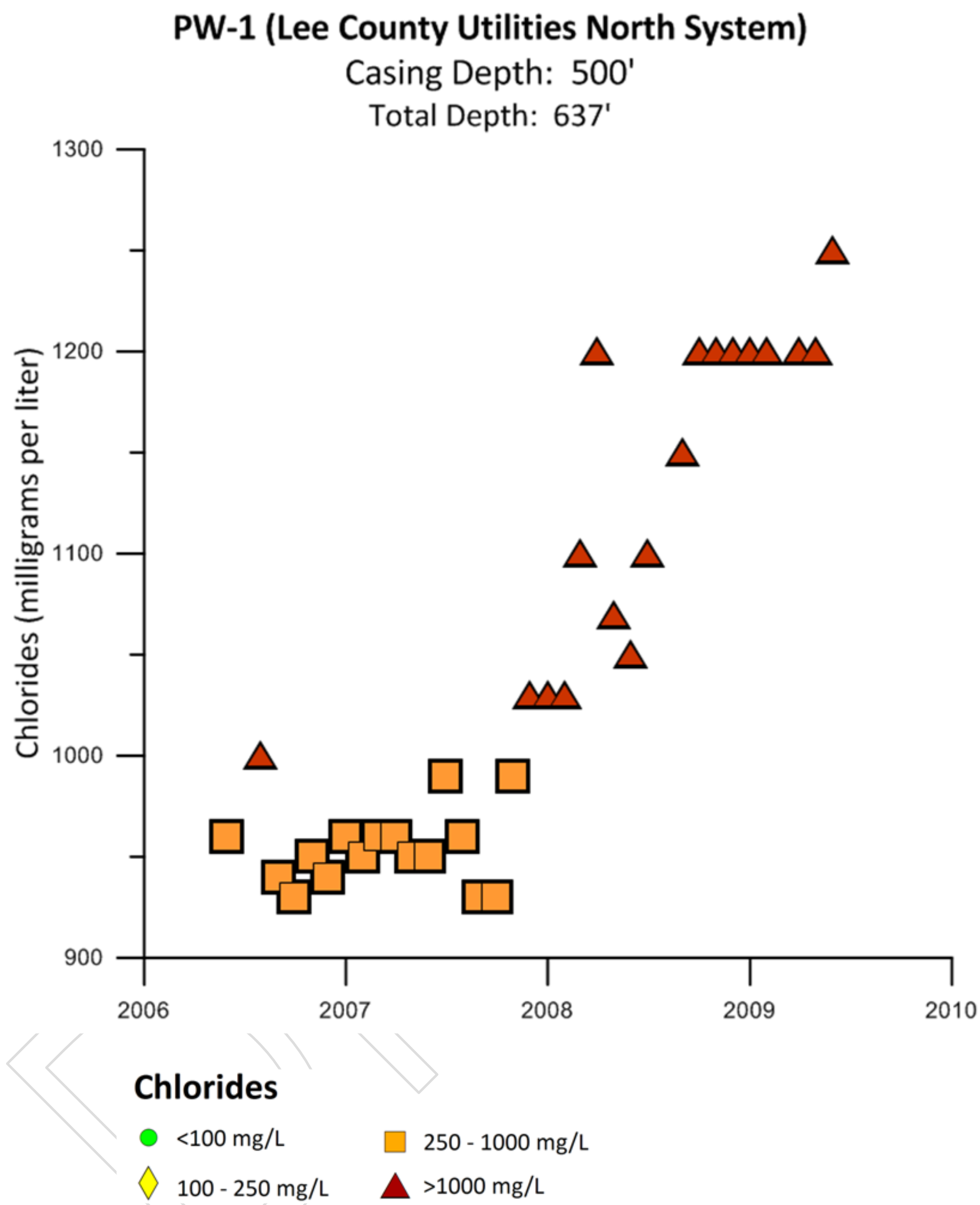

Figure F-72. Chloride levels at Lee County Utilities North System well PW-1. This well is labeled as 313 in **Figure F-65**.

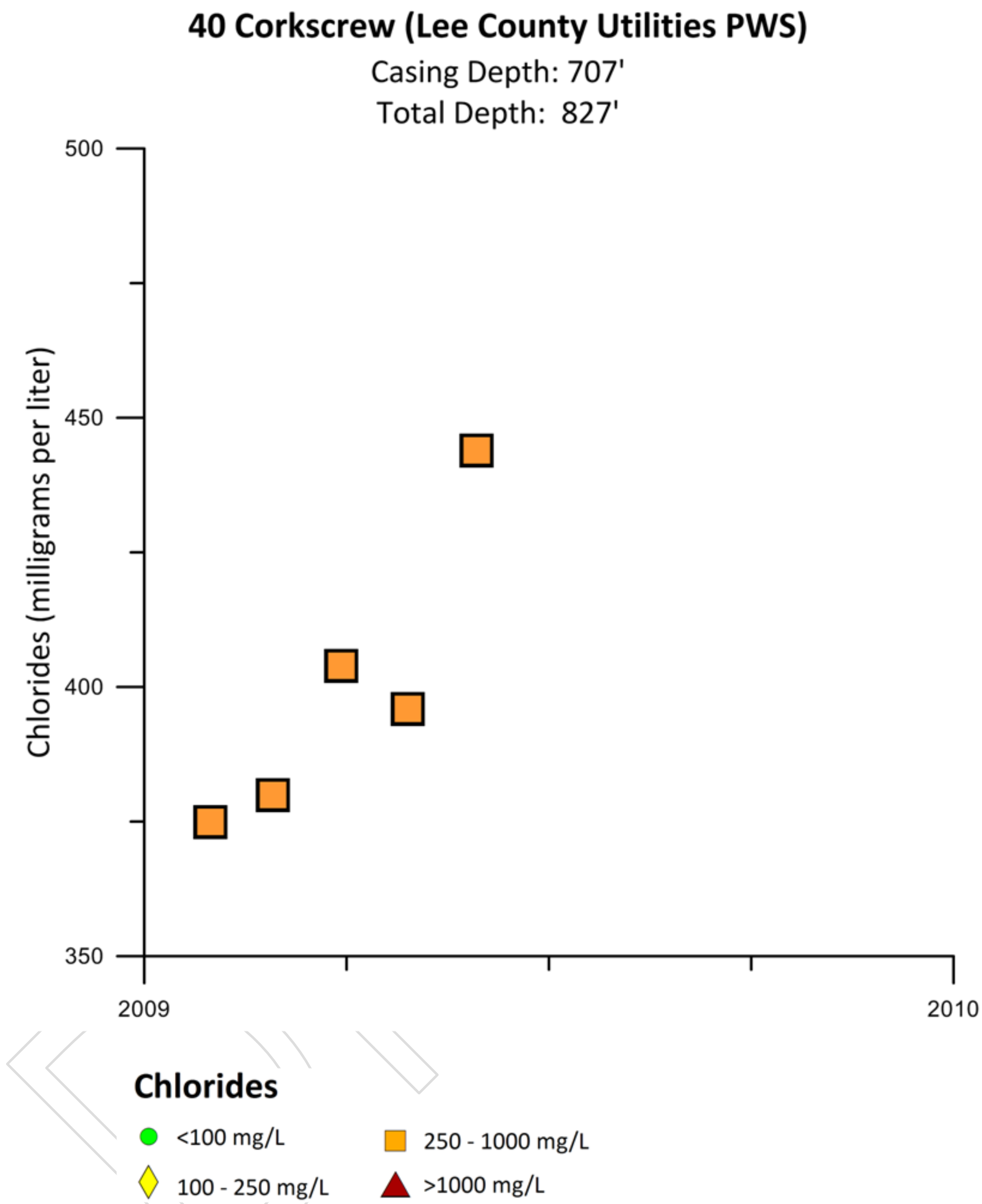

Figure F-73. Chloride levels at Lee County Utilities PWS well 40 Corkscrew. This well is labeled 321 in **Figure F-65**.

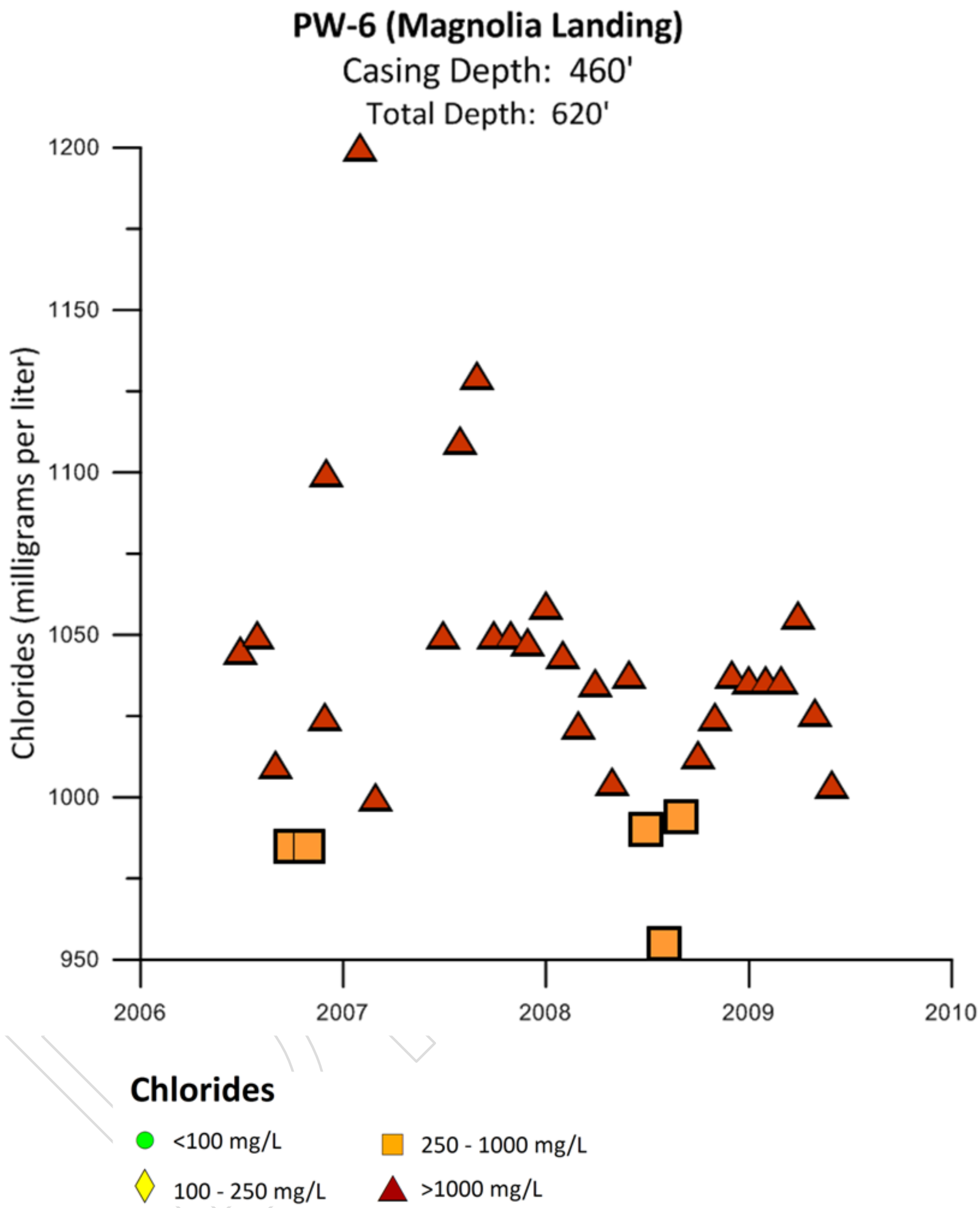

Figure F-74. Chloride levels at Magnolia Landing well PW-6.
This well is labeled 323 in **Figure F-65**.

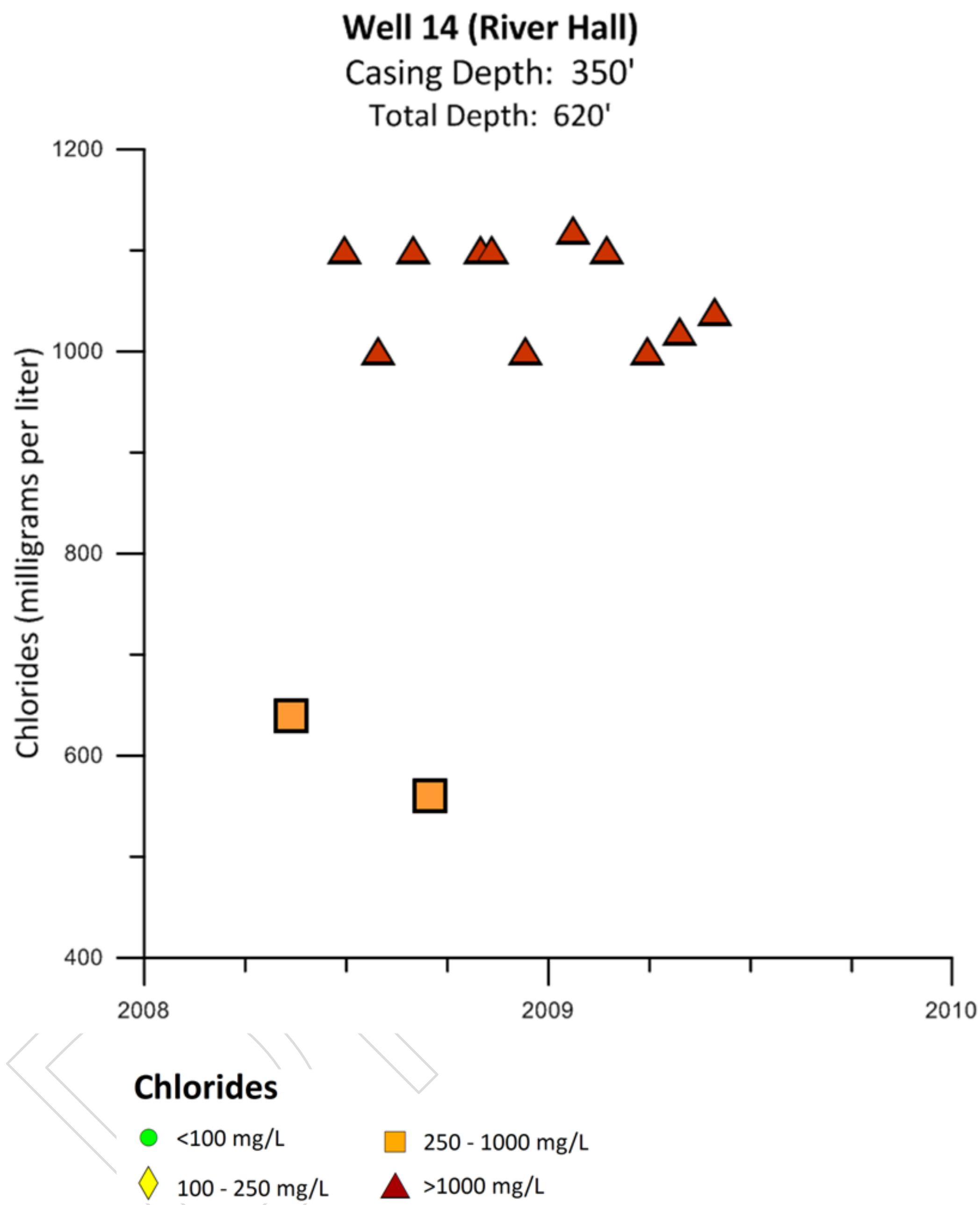

Figure F-75. Chloride levels at River Hall well 14.
This well is labeled 338 in **Figure F-65**.

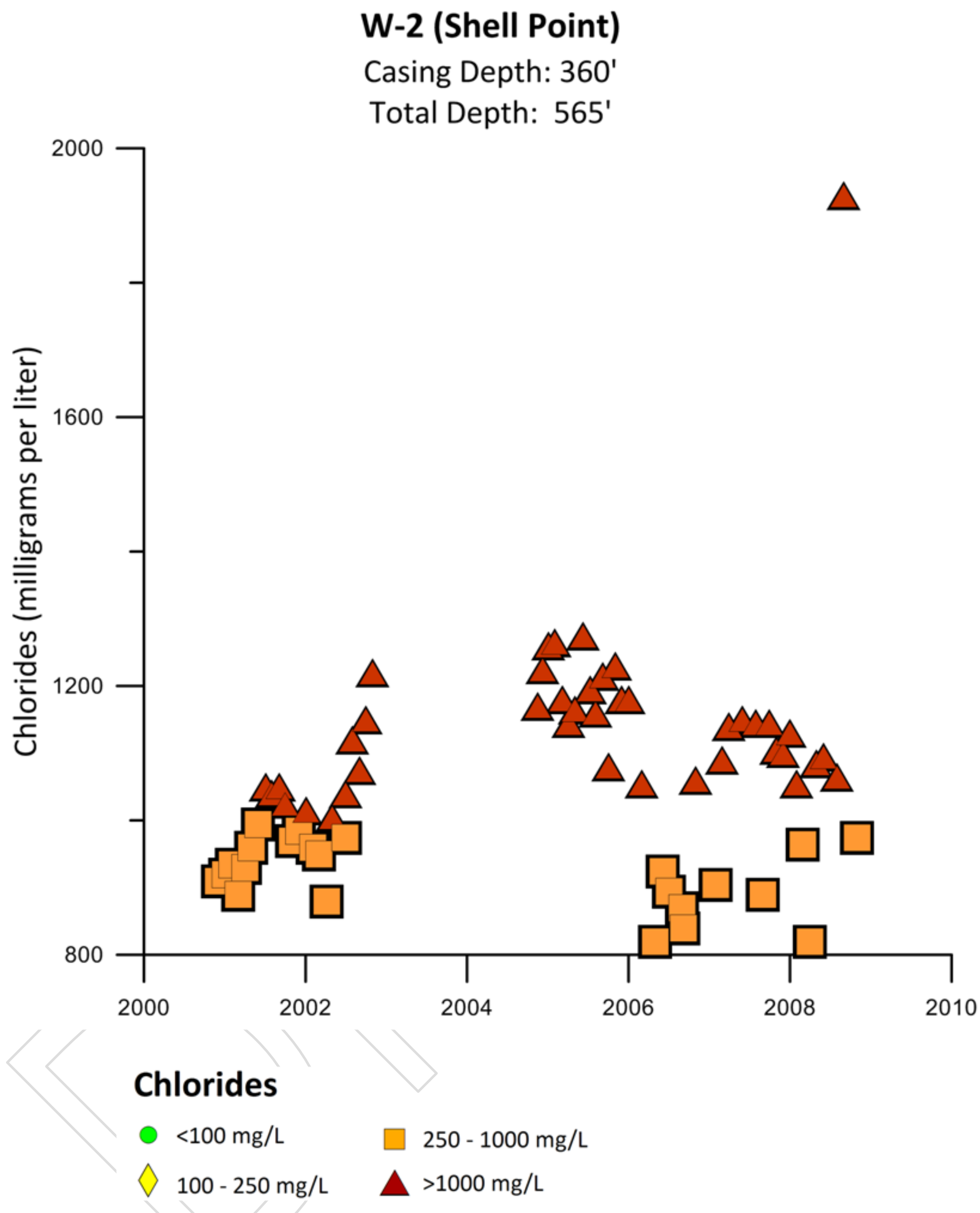

Figure F-76. Chloride levels at Shell Point well W-2.
This well is labeled 342 in **Figure F-65**.

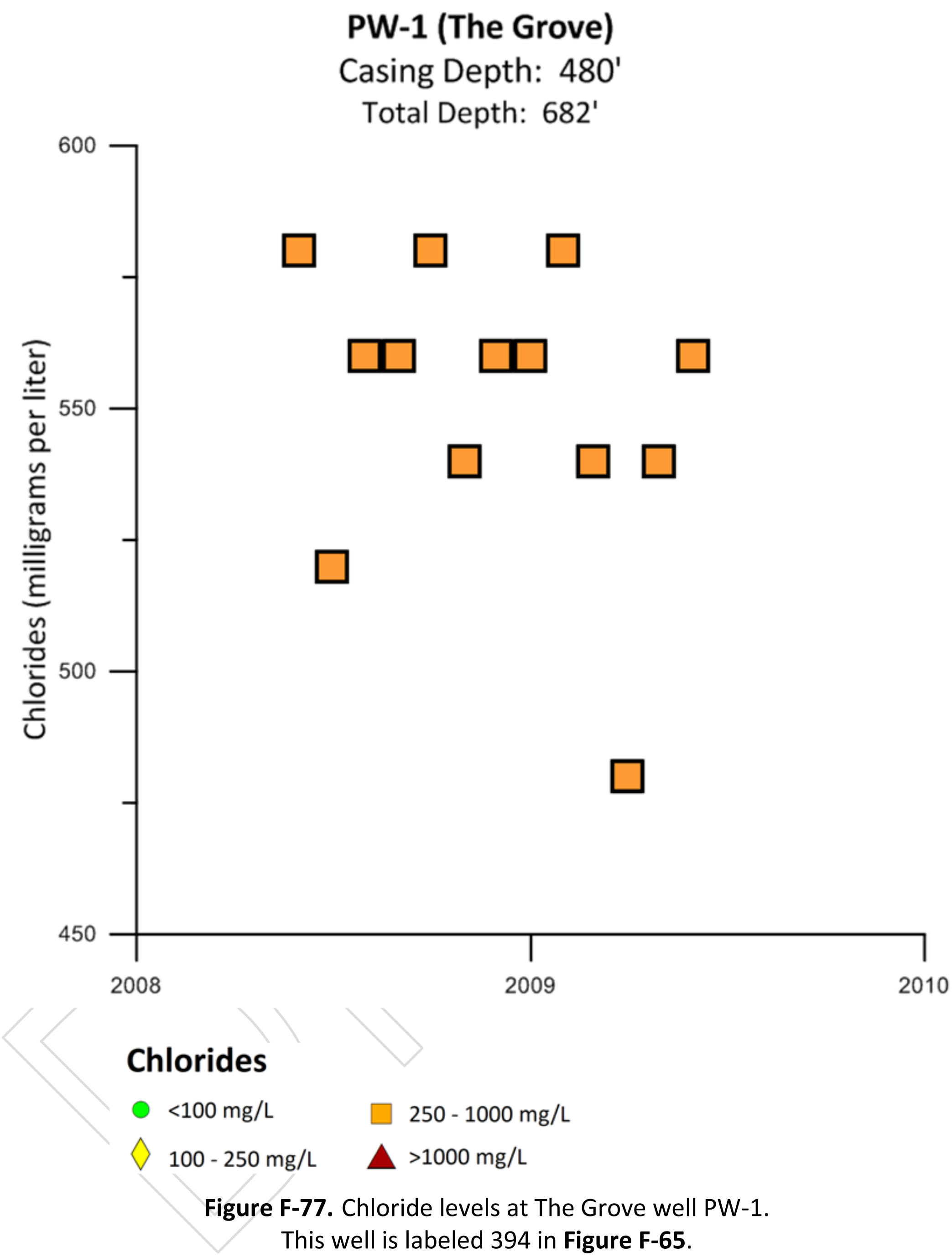

Figure F-77. Chloride levels at The Grove well PW-1.
This well is labeled 394 in **Figure F-65**.

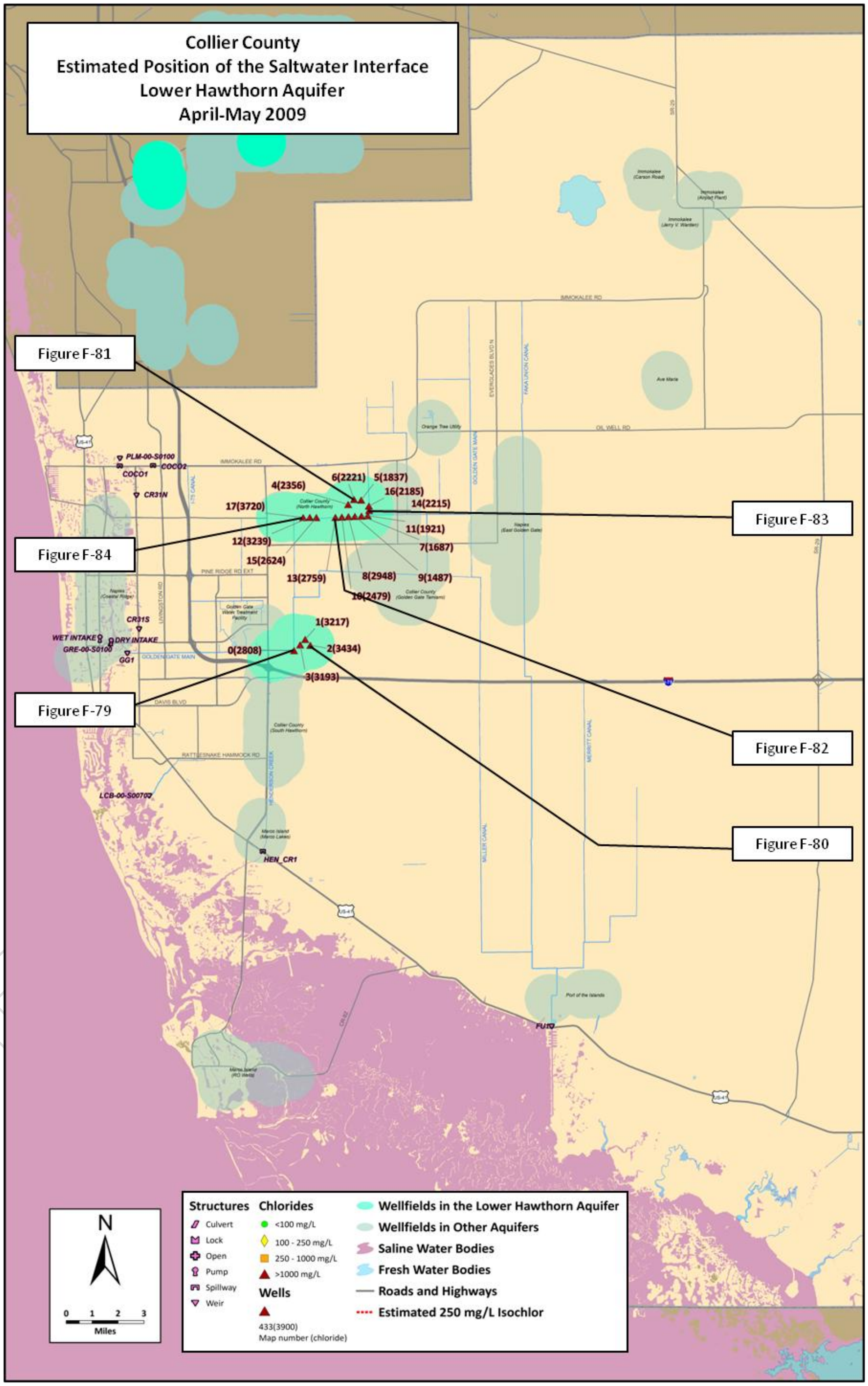

Figure F-78. Estimated position of the saltwater interface within the Lower Hawthorn aquifer in Collier County in April–May 2009. The figure number labels on the map refer to **Figure F-79** through **Figure F-84**, which show chloride levels for the indicated wells.

Table F-8. Chloride levels measured at Lower Hawthorn aquifer wells within Collier County. The map numbers in the first column refer to the numbers on the map in **Figure F-78**.

Map Number	SFWMD Facility	Project Name	Well Name	X	Y	Casing Depth (feet bls)	Total Depth (feet bls)	Chloride (mg/L)
0	109719	Collier County Public Water Supply (PWS) - North East Regional Water Treatment Plant (NERWTP) (**Figure F-79**)	RO-9S	436171	668017	630	682	2,808
1	109718	Collier County PWS - NERWTP	RO-8S	438459	670290	660	982	3,217
2	190462	Collier County PWS - NERWTP (**Figure F-80**)	RO-42S	439505	669100	700	1000	3,434
3	190472	Collier County PWS - NERWTP	RO-40S	437425	669195	700	1000	3,193
4	162997	Collier County PWS - NERWTP	RO-20N	447212	697744	700	1000	2,356
5	162993	Collier County PWS - NERWTP	RO-18N	449854	698660	700	1000	1,837
6	162995	Collier County PWS - NERWTP (**Figure F-81**)	RO-19N	448398	698768	700	1000	2,221
7	30294	Collier County PWS - NERWTP	RO-14N	449911	695387	713	950	1,687
8	30292	Collier County PWS - NERWTP	RO-12N	447266	695262	730	891	2,948
9	30293	Collier County PWS - NERWTP	RO-13N	448586	695332	731	925	1,487
10	30290	Collier County PWS - NERWTP	RO-11N	445911	695187	735	951	2,479
11	115850	Collier County PWS - NERWTP	RO-15N	451201	695452	737	957	1,921
12	30285	Collier County PWS - NERWTP	RO-6N	439403	695111	740	975	3,239
13	30289	Collier County PWS - NERWTP (**Figure F-82**)	RO-10N	444621	695132	750	1011	2,759
14	118340	Collier County PWS - NERWTP (**Figure F-83**)	RO-16N	451495	696540	751	989	2,215
15	30286	Collier County PWS - NERWTP	RO-7N	440730	695085	775	977	2,624
16	118339	Collier County PWS - NERWTP	RO-17N	451450	697420	780	996	2,185
17	30284	Collier County PWS - NERWTP (**Figure F-84**)	RO-5N	438045	695085	790	1070	3,720

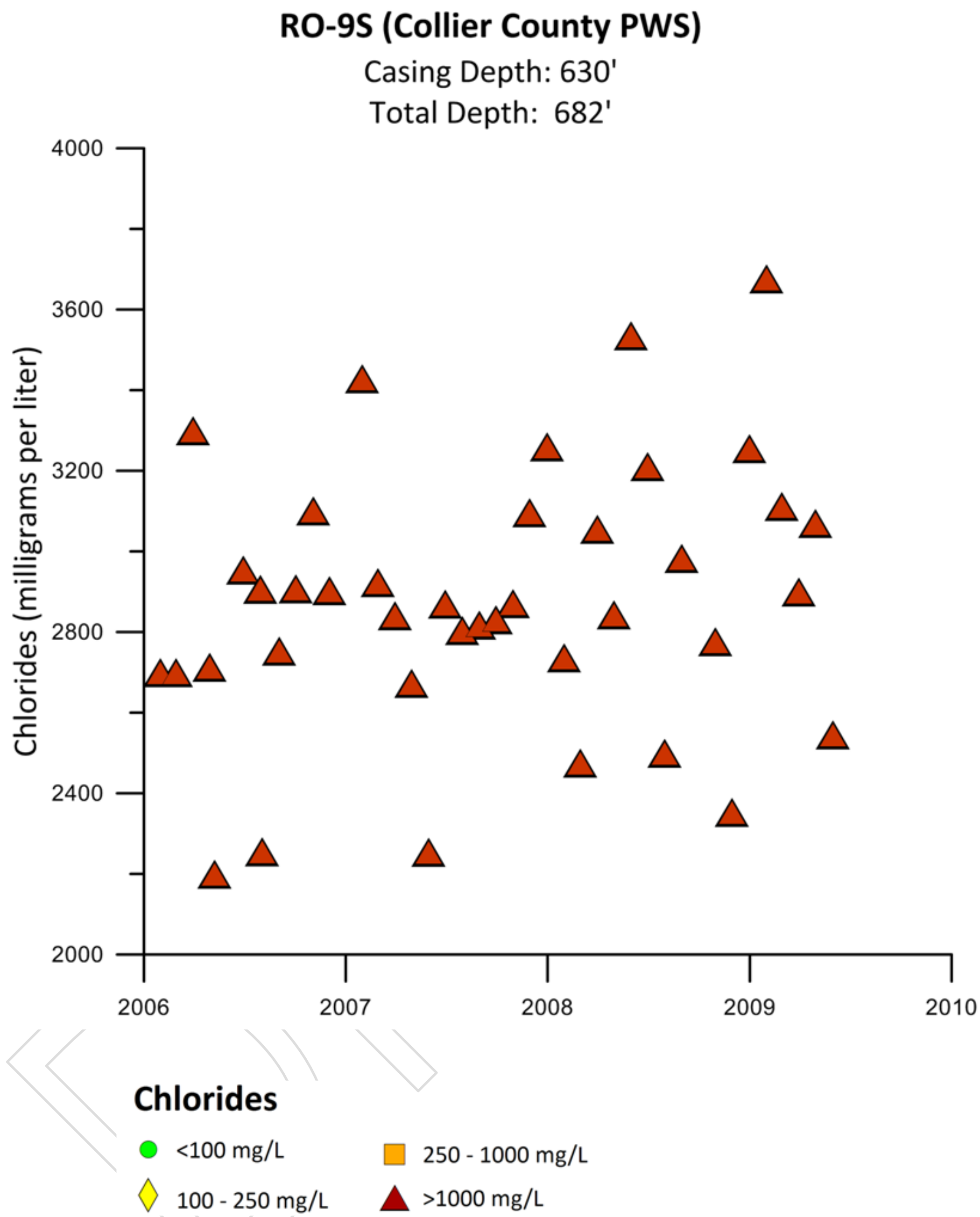

Figure F-79. Chloride levels at Collier County PWS well RO-9S.
This well is labeled 0 in **Figure F-78**.

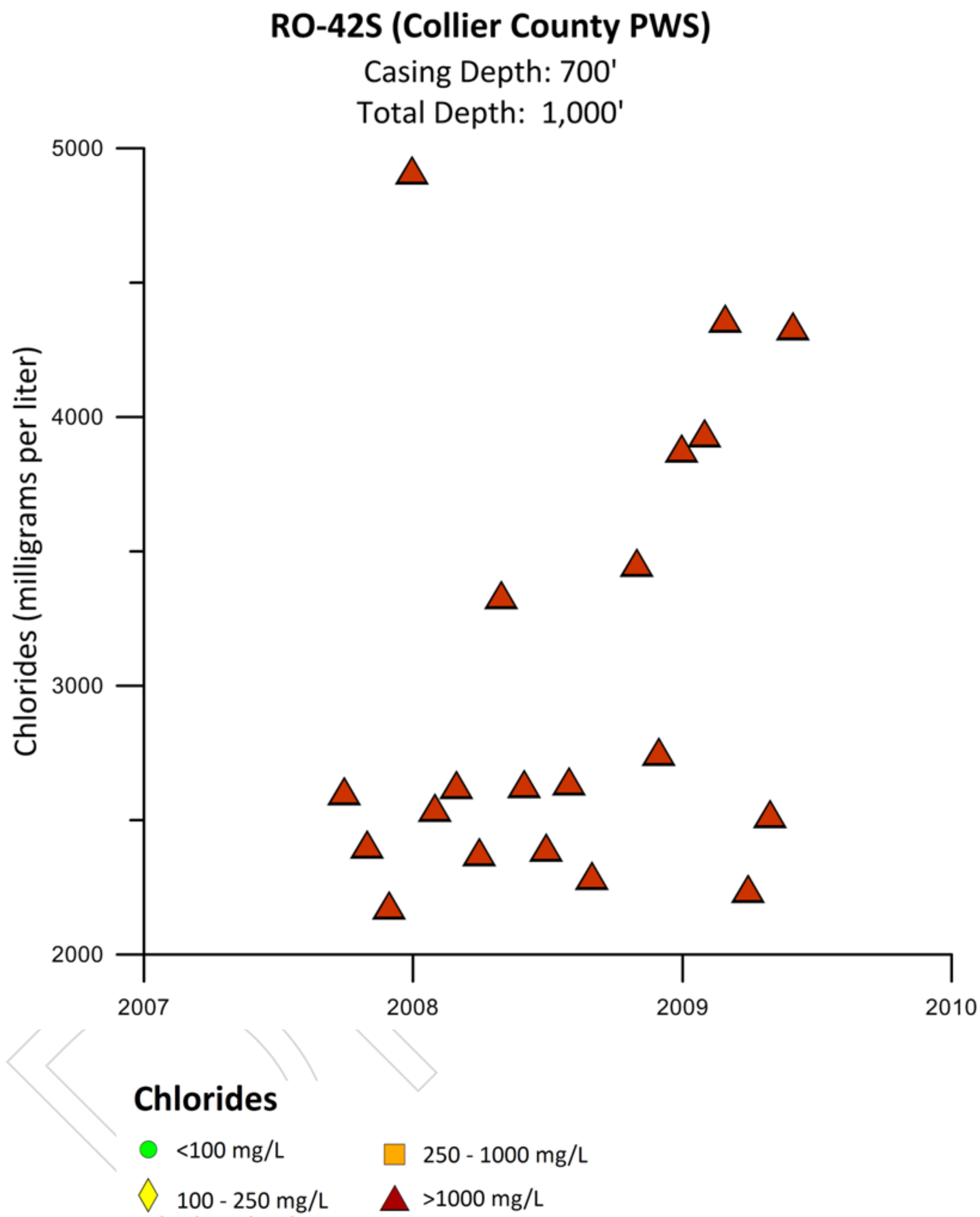

Figure F-80. Chloride levels at Collier County PWS well RO-42S.
This well is labeled 2 in **Figure F-78**.

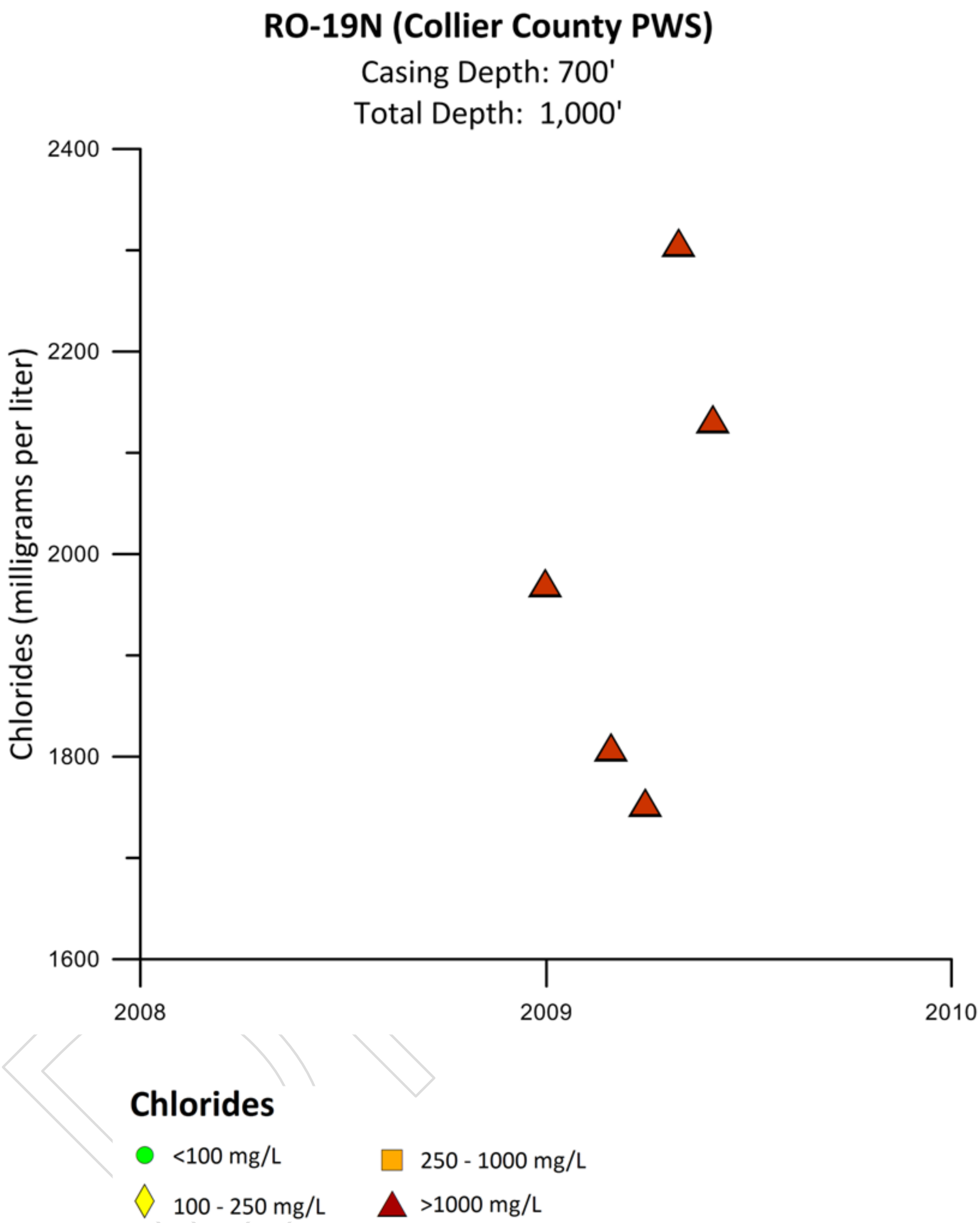

Figure F-81. Chloride levels at Collier County PWS well RO-19N.
This well is labeled 6 in **Figure F-78**.

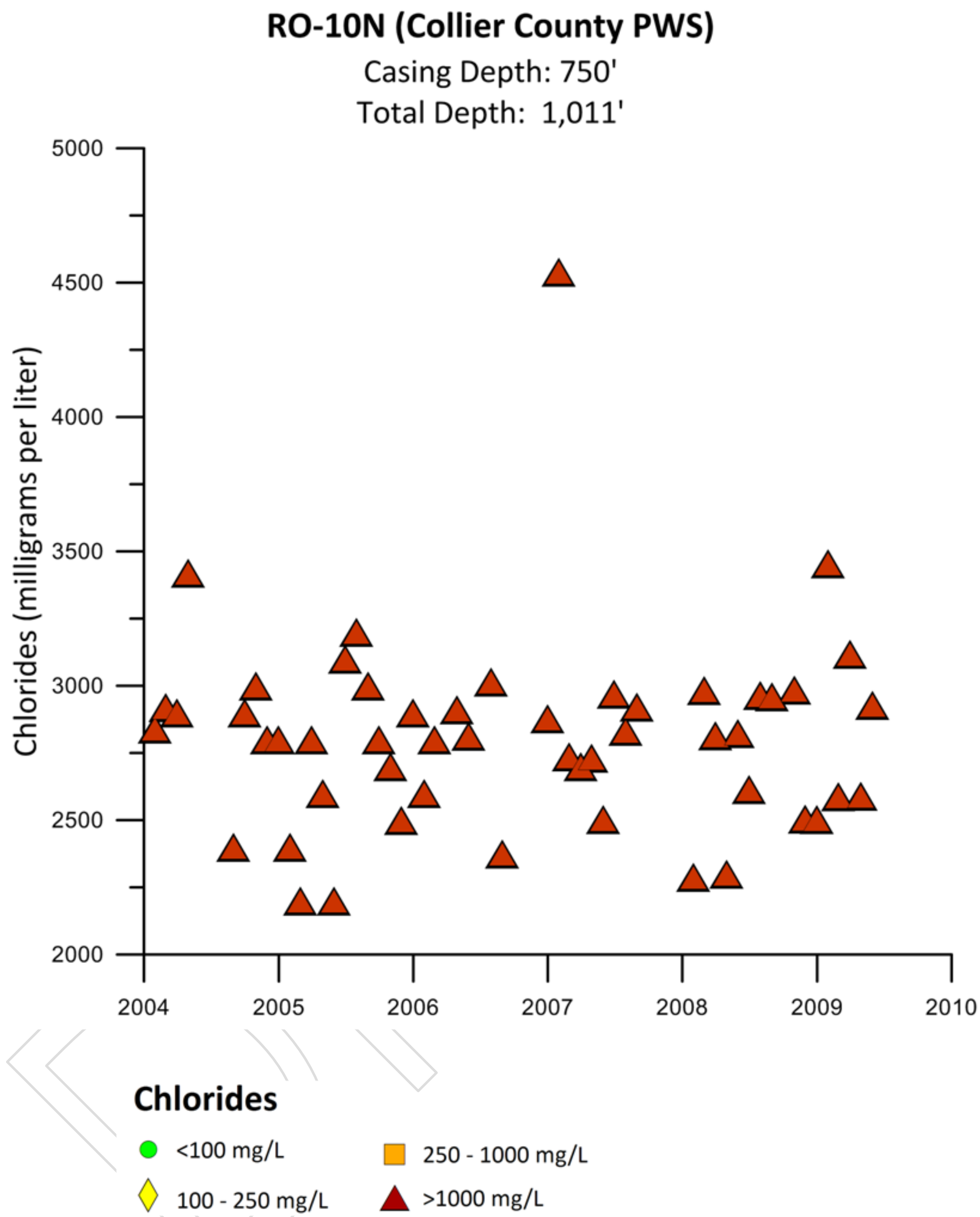

Figure F-82. Chloride levels at Collier County PWS well RO-10N.
This well is labeled 13 in **Figure F-78**.

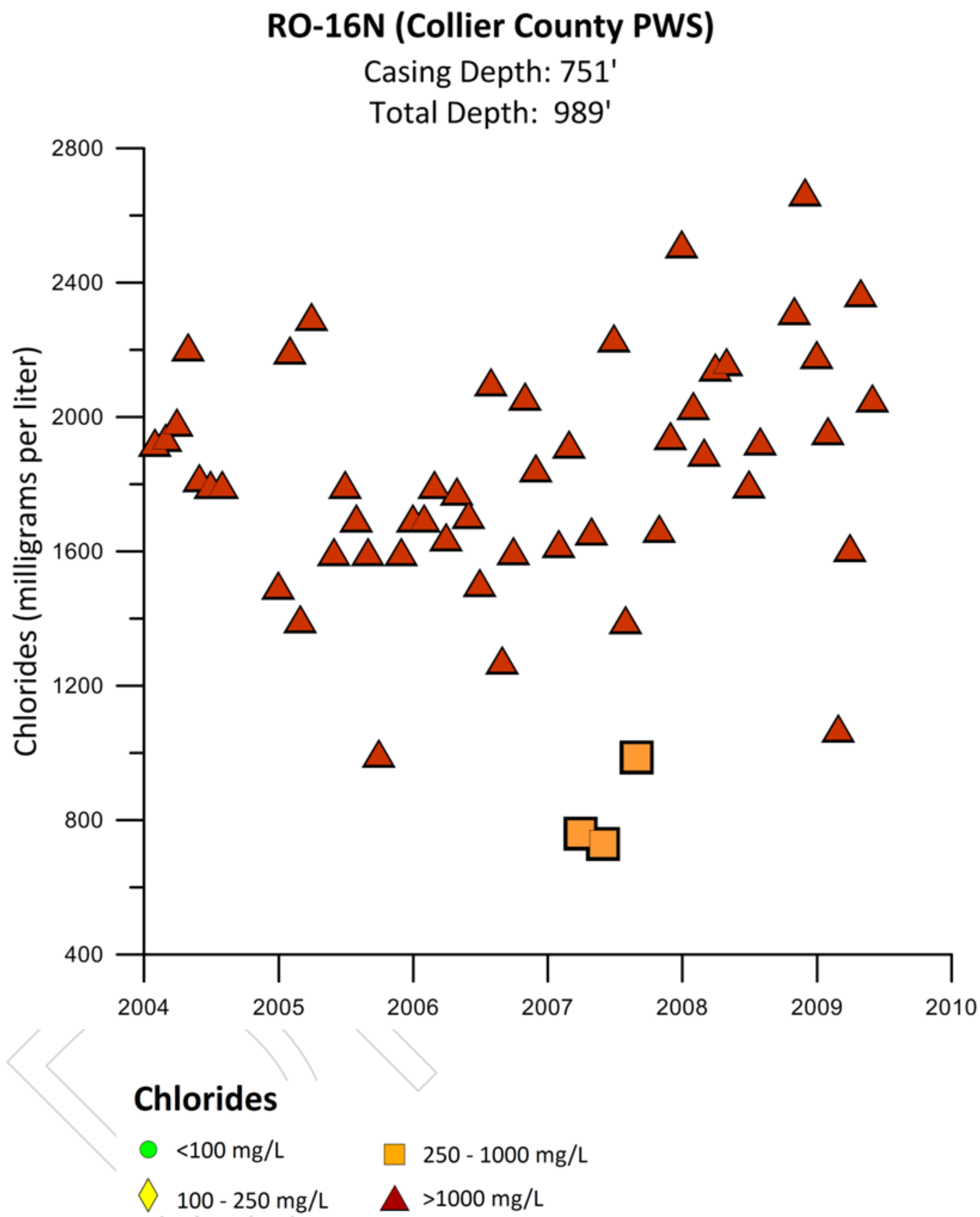

Figure F-83. Chloride levels at Collier County PWS well RO-16N.
This well is labeled 14 in **Figure F-78**.

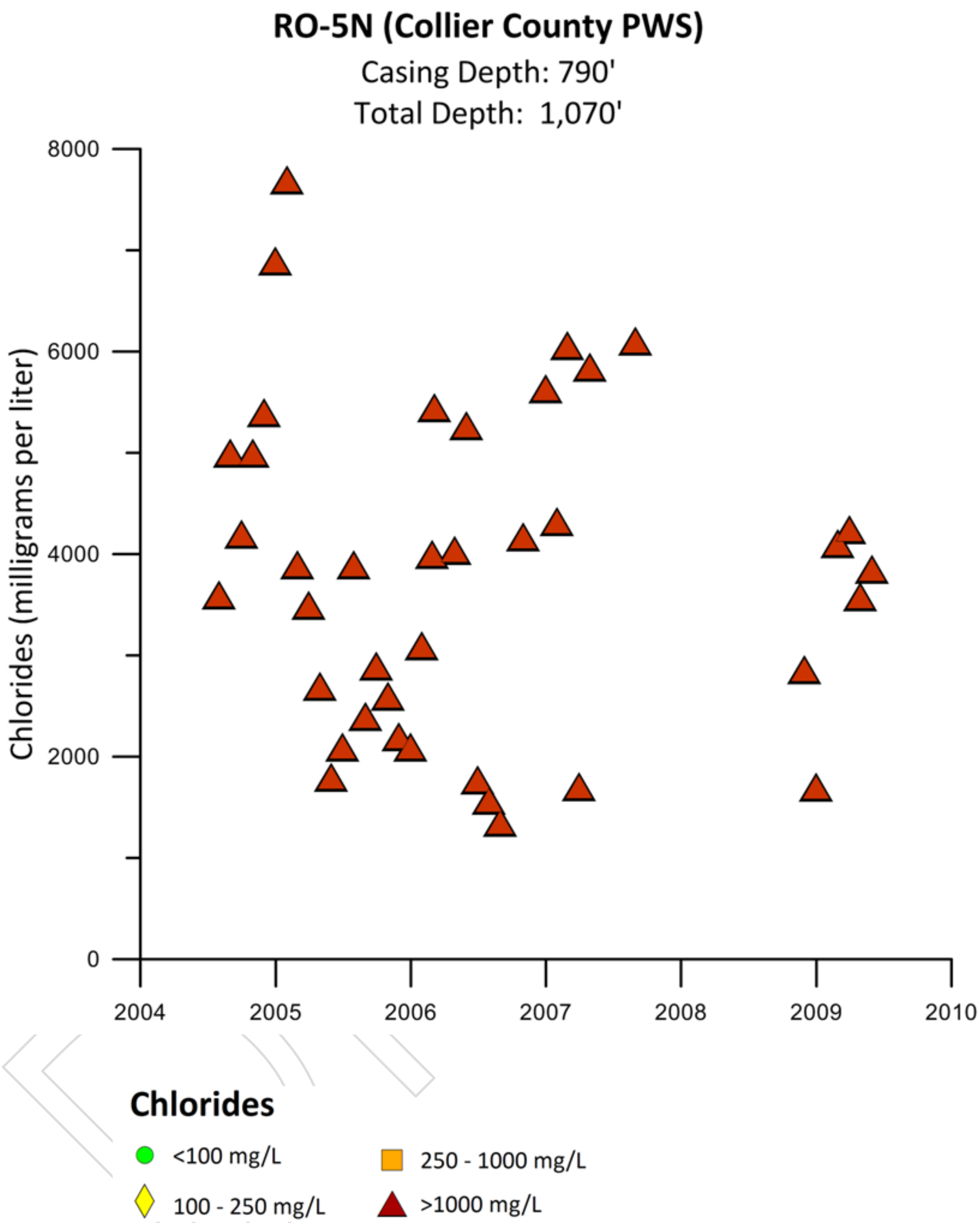

Figure F-84. Chloride levels at Collier County PWS well RO-5N.
This well is labeled 17 in **Figure F-78**.

POTENTIOMETRIC SURFACE MAPS

Figure F-85 is a modified version of the predevelopment potentiometric surface map for the Upper Floridan aquifer developed by the USGS (Johnston and Bush 1988). The map depicts the approximate water level elevation in south Florida prior to development and illustrates how artesian pressure places water levels well above land surface throughout south Florida. If wells are not capped, they naturally flow at the surface. The predevelopment potentiometric surface was developed from a collection of historical water level observations, professional judgment, and use of subjective hand contouring.

Figure F-86 is a potentiometric surface map of 2004 average annual levels in the Upper Floridan aquifer. This map is a product of recorded 2004 levels from monitor wells and use of geostatistical methods to represent the spatial distribution of average water levels in the Upper Floridan in 2004.

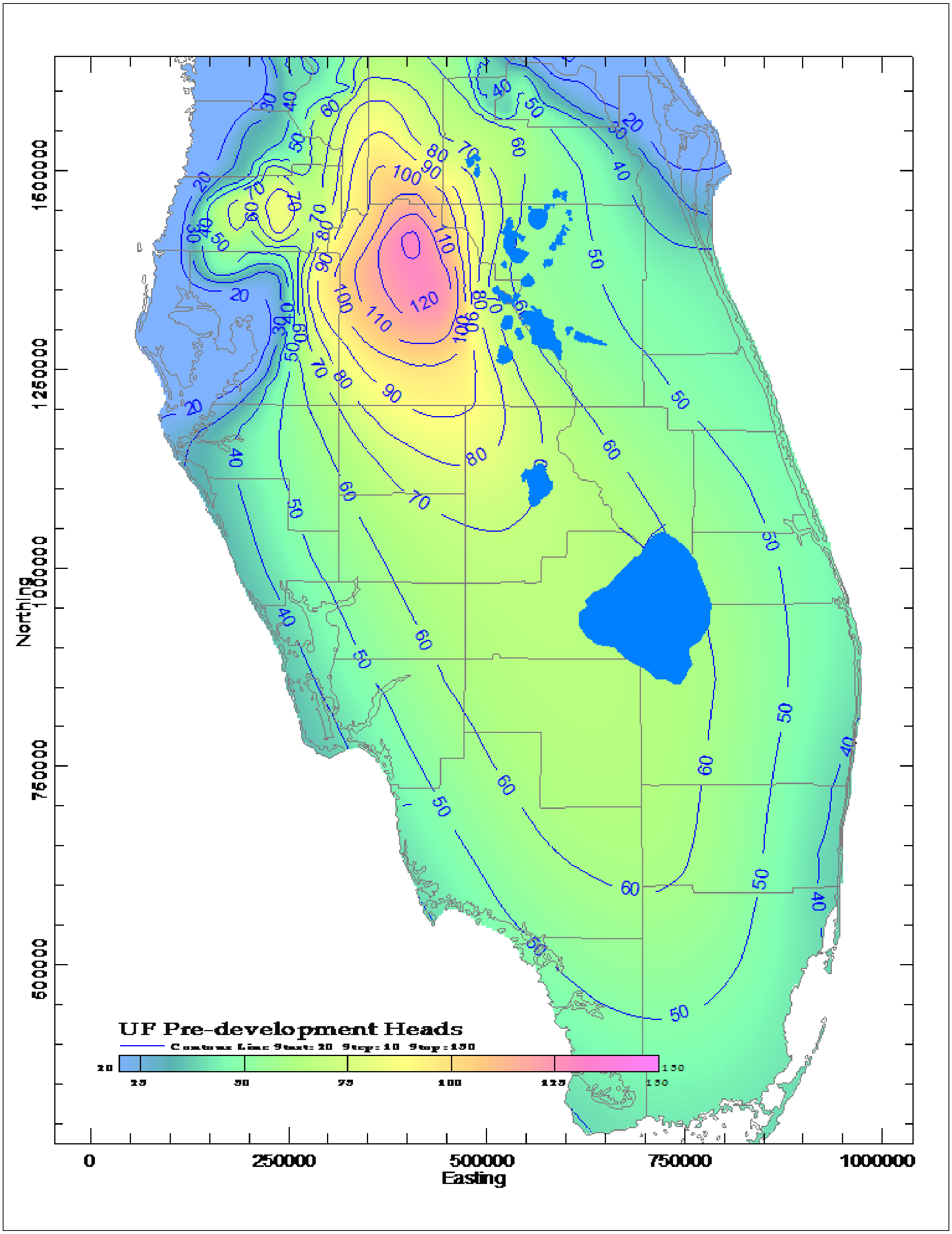

Figure F-85. Pre-development potentiometric surface of the Upper Floridan aquifer. Contour interval of 10 feet National Geodetic Vertical Datum (NGVD). After Johnston and Bush (1988).

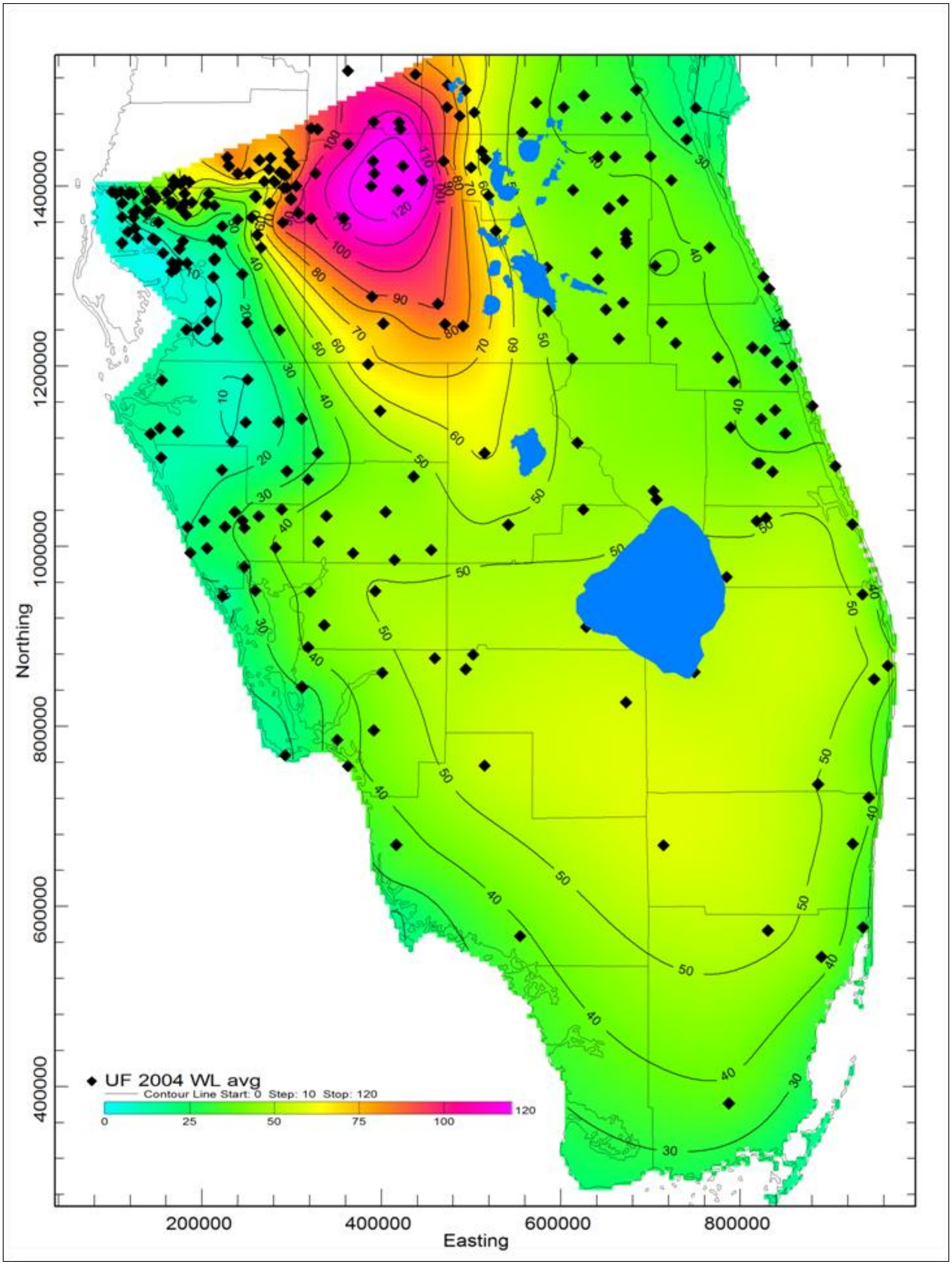

Figure F-86. 2004 annual average potentiometric surface of the Upper Floridan aquifer. Contour interval of 10 feet NGVD.
Source: FAU and SFWMD (2008).

REFERENCES

FAU and SFWMD. 2008. *A Density-Dependent Groundwater Flow Model of the Lower West Coast Florida Aquifer System*. Florida Atlantic University, Boca Raton, FL, and South Florida Water Management District, West Palm Beach, FL.

Johnston R.H. and P.W. Bush. 1988. *Summary of the Hydrology of the Floridan Aquifer System in Florida and in Parts of Georgia, South Carolina, and Alabama*. United States Geological Survey, Washington, DC. Professional Paper 1403-A.

G

Minimum Flows and Levels Criteria, and Recovery and Prevention Strategies

This appendix provides an update to information provided in the *2005–2006 Lower East Water Supply Plan Update* (2005–2006 LWC Plan Update; SFWMD 2006) regarding the Caloosahatchee River Minimum Flow and Level (MFL) and the Lower West Coast (LWC) aquifers MFL, as well as associated recovery and prevention strategies. This document was prepared to be read within the context of this entire plan update. A general description of MFLs and recovery and prevention strategies is provided in **Chapter 3** of the Planning Document.

HISTORY OF ALTERATIONS WITHIN THE CALOOSAHATCHEE WATERSHED

Alterations to the Caloosahatchee Watershed-Freshwater Section (Upstream of the S-79 Structure)

The Caloosahatchee watershed is a system that has been highly altered from its natural state by human intervention to meet multiple objectives. The Caloosahatchee River originally was a natural watercourse originating from Lake Flirt (near La Belle) to San Carlos Bay (**Figure G-1**). The river was sinuous, with many natural oxbows providing diversity of habitat. Man-made alterations to the river began as early as 1884, when private interests constructed a canal between the river headwaters and Lake Okeechobee for water control and navigation. Once the alterations were completed in the late 1880s, the straightening shortened the river by 8.2 miles and resulted in the loss of 76 river bends (Antonini et al. 2002). Dredging alterations continued and, by 1918, three combination lock and spillway structures had been constructed at Moore Haven, Citrus Center, and Fort Thompson (USACE 1957, Section 6.B.6).

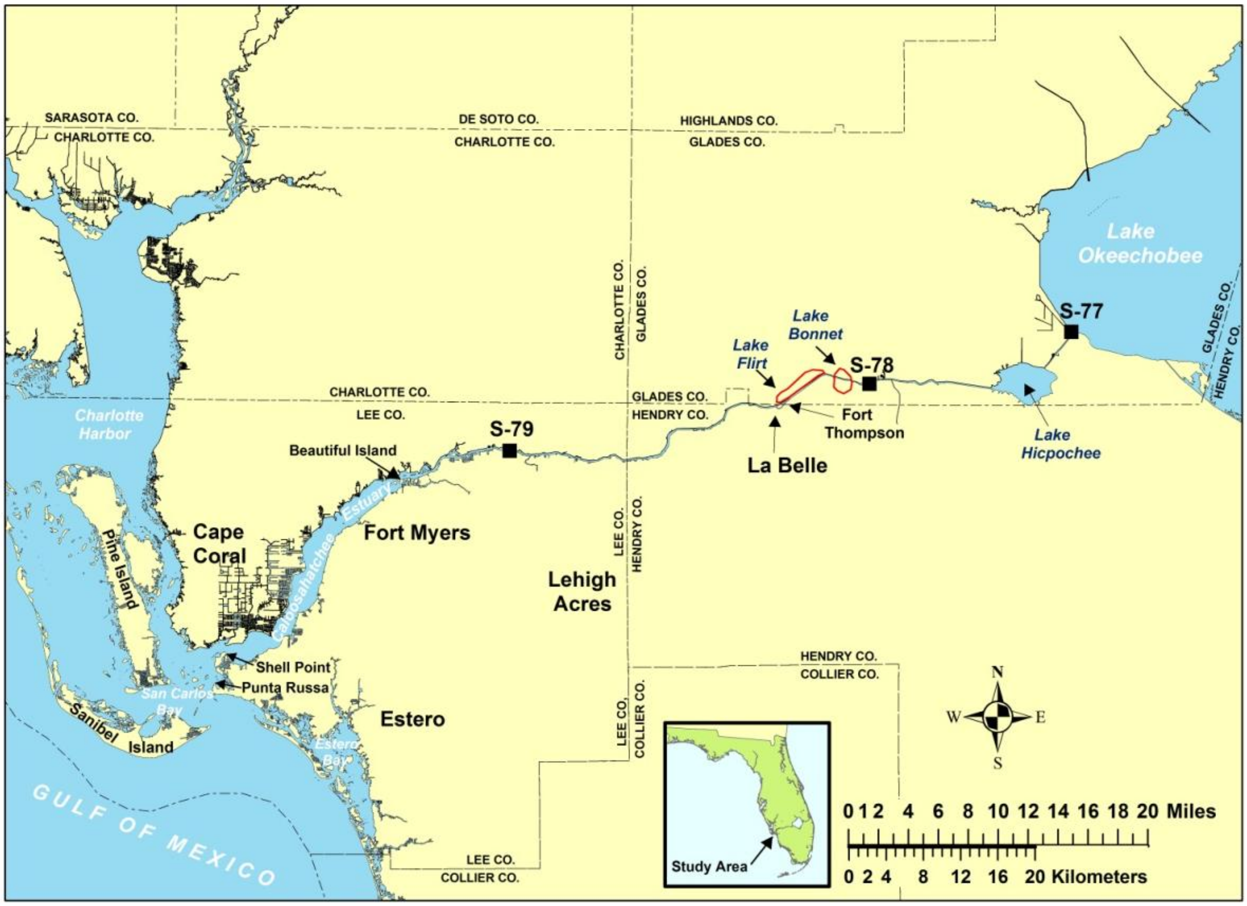

Figure G-1. Caloosahatchee River and Estuary showing water control structures, connection to Lake Okeechobee, and historical headwaters at Lake Flirt and Lake Bonnet.

In 1930, the first federal effort at flood control in Florida occurred with the passage of the River and Harbor Act of July 3, 1930, which authorized improvement of the Caloosahatchee River and Canal (now the C-43 Canal) (U.S. Congress 1930). By 1937, the Caloosahatchee River was improved to provide a navigable channel at least 6 feet deep and 80 feet wide, with locks and water control structures at Ortona and Moore Haven. In 1945, the C-43 Canal was improved again for navigation purposes (8 feet deep and 90 feet wide) and the three locks and spillways were abandoned for navigation channel improvements (U.S. Congress 1945; USACE 1957, Section 6.B.6).

In 1957, the United States Army Corps of Engineers (USACE) prepared a report that focused specifically on the drainage, water control, and navigation needs of the Caloosahatchee River Basin (U.S. Congress 1948; U.S. Congress 1954). The report recommended a plan for improvement of the C-43 Canal and construction of three structures in the main canal (S-77, S-78, and S-79) for water control and regulation (USACE 1957, Section I.41). The purposes and objectives for these additional improvements as envisioned in the general design memoranda were to provide 1) capacity for the watershed, 2) water control to prevent excessive depletion of groundwater during normal or dry periods, 3) regulatory discharge capacity for Lake Okeechobee, 4) adequate capacity so that existing navigation locks would not have to be used for flood or regulatory discharges, and 5) protection to prevent saltwater encroachment and maintenance of water supplies in the lower reaches of the C-43 Canal (USACE 1957).

Original Purpose of the S-79 Structure

The purpose and need for the S-79 structure are tied to the alterations made to the Caloosahatchee River (C-43 Canal) as described in the previous section. The key objectives in the design and construction of the S-79 structure were to 1) eliminate undesirable salinity in the lower river, 2) prevent the rapid depletion of water supplies, and 3) raise the prevailing dry weather water table levels (USACE 1958, 2D Endorsement, paragraph 9). During the wet season, S-79 was designed to be a spillway structure to pass permissible releases from Lake Okeechobee, which at the time were between 4,200 to 9,300 cubic feet per second (cfs) (USACE 1957, Section F.29). During the dry season, S-79 was designed to address the lack of freshwater supply for irrigation in the lower river basin. Under conditions existing at the time, freshwater supply was depleted by uncontrolled downstream discharges to such an extent that the water table as measured in wells near the river were as much as 10 feet below ground surface (a depth of 2 or 3 feet was considered optimum) (USACE 1957, Section G.32.d). To this day, S-79 is operated per federal regulations and in accordance with Central and Southern Florida Flood Control Project (C&SF Project) purposes.

In a report prepared by the United States Fish and Wildlife Service (USFWS) to analyze the environmental impacts of C-43 Canal improvements and S-79 structure construction, the USFWS concluded that existing fisheries of the river and estuary are of relatively low quality and value due to adverse effects on the natural environment caused by past construction works including channelization (USACE 1957, Appendix A). In addition, past regulatory and flood control discharges through the river have had adverse effects on the sport and commercial fisheries of the tidally influenced areas. The report also concluded that these poor conditions are likely to persist and may be worsened by the deepening of the channel (C-43 Canal) and the installation of the S-79 structure, and that these negative effects may be extended over a greater area, including inshore waters.

The S-79 structure was completed in the early to mid-1960s. It was rededicated as the Franklin Lock in 1969. The lock and dam artificially sets the eastern limit of the Gulf of Mexico's tidal influence and consequently resulted in a truncated system that prevents saltwater from moving upstream of S-79. These alterations also allowed development in the watershed. A network of secondary and tertiary canals now overlays the Caloosahatchee watershed. This canal network provides conveyance for both drainage and irrigation to accommodate both agricultural and urban development (Flaig and Capece 1998).

The USACE performed additional dredging of the C-43 Canal until the passage of the Clean Water Act in 1972, which limited such activities. Since that time, no additional capital improvements by the USACE have been made that improve the artificial limits set on the Caloosahatchee River by the construction of the S-79 structure. In summary, to effect a change to the existing salinity regime created by the history of alterations to the

Caloosahatchee River, substantial additional supplies of fresh water during the dry season, such as water identified from the Comprehensive Everglades Restoration Plan (CERP) Caloosahatchee River (C-43) West Basin Storage Reservoir Project, are needed.

Estuarine Section – Downstream of S-79

The estuarine portion of the Caloosahatchee River downstream or west of the S-79 structure has also been significantly altered (Chamberlain and Doering 1998a). Early descriptions of the tidally influenced sections of the Caloosahatchee characterize it as barely navigable, owing to extensive shoals and oyster bars (Sackett 1888). A navigation channel has been dredged and a causeway was built across the mouth of San Carlos Bay in the 1960s. Historical oyster bars upstream of Shell Point have been mined and removed to be used in the construction of roads. Seven automobile bridges and one railroad bridge connect the north and south shores of the estuary.

The changes to the Caloosahatchee watershed, combined with population growth, have had major effects on the tidal sections of Caloosahatchee River downstream of the S-79 structure. First, the delivery of freshwater downstream of S-79 has been altered. For a watershed characterized by extensive drainage features (Hopkinson and Vallino 1995), runoff is more variable with higher wet season discharges and lower dry season discharges. Large volumes of fresh water during the wet season can flush all salt water from the tidally influenced sections of the water body. By contrast, inflow at S-79 can stop entirely during the dry season. Salt water intrudes to S-79, sometimes reaching a salinity of 20 parts per thousand (Chamberlain and Doering 1998a, 1998b). Fluctuations of this magnitude at the head and mouth of the system cause mortality of organisms at both ends of the salinity gradient (Doering et al. 2002).

Alterations to the delivery of fresh water, combined with structural changes to the tidally influenced sections of the water body, are thought to have had lasting ecological consequences. The Sanibel Causeway, which crosses the mouth of San Carlos Bay at Punta Rassa, may have influenced the seaward end of the system. The USFWS predicted that this barrier would restrict exchange with the gulf, retain fresh water, and lower the salinity in southern Charlotte Harbor (USFWS 1960). Reductions in salinity were predicted to adversely affect a flourishing bay scallop fishery, which collapsed after the construction of the causeway. Twenty years later, the Florida Department of Natural Resources reported a significant decline in seagrass cover in deeper areas and attributed this, in part, to an increased amount of colored freshwater (Harris et al. 1983). Additionally, development of areas such as the canal drainage network in and around Cape Coral has increased the amount of freshwater seepage and reduced the surface water salinities.

In summary, a multitude of previous alterations were completed between the S-79 structure and Lake Okeechobee to meet multiple objectives. These dredging alterations caused degradation of habitat that resulted in low habitat values and functions. Problems associated with construction of the S-79 structure, combined with structural alterations downstream, between S-79 and San Carlos Bay, were not only predicted (USFWS 1960), but were later documented to have occurred (e.g., Harris et al 1983).

SUMMARY OF INFORMATION LEADING TO ADOPTION OF THE CALOOSAHATCHEE RIVER MFL

A 1995 study prepared by the South Florida Water Management District (SFWMD) identified that the optimum inflows to the Caloosahatchee Estuary should have mean monthly values that range between 300 and 2,800 cfs. (Chamberlain and Doering 1995). SFWMD's efforts were to develop flow scenarios based on historical and future conditions to improve operations of the C&SF Project, which assumed infrastructure changes to the system based on the construction of additional storage features. These efforts were integrated into the *Central and South Florida Comprehensive Review Study Final Integrated Feasibility Report and Programmatic Environmental Impact Statement*,, which included performance measures to achieve targets that would support optimum hydrologic conditions for the estuary (USACE and SFWMD 1999). The CERP was authorized based on this document.

The period of record from January 1988 to June 1999, under the former Lake Okeechobee regulation schedule, showed flows at the S-79 structure ranging from 0 to 17,283 cfs (SFWMD 2000c). This data establishes that the flows through S-79 were irregular and dependent on upstream hydrologic conditions. System performance will continue to be affected by the historical alterations to the Caloosahatchee River until completion of the CERP and other infrastructure projects, which are intended to create a new water delivery regime to improve the performance of the currently altered system.

CALOOSAHATCHEE RIVER MINIMUM FLOWS AND LEVELS

Criteria

Minimum flow criteria were established in 2001 for the Caloosahatchee River. Analysis completed for the *2000 Lower East Coast Regional Water Supply Plan* (SFWMD 2000a) demonstrated that long-term regional storage was necessary to achieve proposed MFL criteria, and that the MFL violations were projected to occur prior to implementation of a recovery strategy. As a result, the SFWMD projected that a recovery strategy based on construction of regional storage would be necessary to achieve the MFL.

Rule 40E-8.221(2), Florida Administrative Code (F.A.C.), contains the MFL criteria for the Caloosahatchee River as follows:

> *A minimum mean monthly flow of 300 CFS is necessary to maintain sufficient salinities at S-79 in order to prevent a MFL exceedance. A MFL exceedance occurs during a 365 day period, when: (a) A 30-day average salinity concentration exceeds 10 parts per thousand at the Ft. Myers salinity station*

or (b) A single, daily average salinity exceeds a concentration of 20 parts per thousand at the Ft. Myers salinity station. Exceedance of either paragraph (a) or (b), for two consecutive years is a violation of the MFL.

The MFL is based on salinity tolerances of the submersed aquatic vegetation *Vallisneria americana* (commonly known as tape grass or eel grass) (SFWMD 2000c). It is widely recognized that submersed aquatic vegetation are important in estuaries because their presence indicates a variety of favorable conditions, such as appropriate water clarity and habitat for important commercial fish and invertebrates. *Vallisneria* beds in the fresh-brackish waters (low salinity) portion of the upper estuary are sensitive to increased salinity values that result from reduced or low volumes of freshwater inflow.

The MFL is intended to provide suitable salinity conditions for a sustainable population of *Vallisneria* in the estuarine area located between 15 and 19 miles upstream of Shell Point. The information on which the MFL is based can be found in the *Technical Documentation to Support Development of Minimum Flows and Levels for the Caloosahatchee River and Estuary (Draft), Status Update Report 2003* (SFWMD 2003).

Updating the Caloosahatchee River and Estuary MFL Criteria

The SFWMD plans to conduct several activities over the next five years to gain an improved understanding of the relationship between freshwater inflow and salinity regime and the effects of minimum flows on biological resources in the Caloosahatchee Estuary. The SFWMD will evaluate the new information to determine if a revision of the MFL is necessary. To achieve these objectives, a timetable was developed as follows. These activities require funds to be budgeted each fiscal year:

- Quantify the habitat value of *Vallisneria* in 2014.
- Continue data collection and its analysis for the tidal basin through 2014, including the tributaries, and develop and apply a model to improve estimates for the surface water contributions to the estuary from the tidal Caloosahatchee Basin.
- Investigate effects of MFL flows on oysters, benthic macrofauna zooplankton, icthyoplankton, and phytoplankton through 2015.
- Apply hydrodynamic/salinity/*Vallisneria* models and develop a return frequency to improve the existing MFL criteria for the Caloosahatchee River and Estuary through 2015.
- Complete technical analysis and its documentation in 2016.
- Complete peer review in 2017.
- Submit rule to Office of Fiscal Accountability and Regulatory Reform for review per Executive Order Number 11-72 in 2017.
- Present draft rule to Governing Board to consider for adoption in 2017.

The SFWMD will also consider changes and structural alterations to the Caloosahatchee River and its watershed, the effects such changes or alterations have had, and the constraints such changes or alterations have placed on the hydrology of the Caloosahatchee River and its watershed. Rule development will be consistent with Section 120.54, Florida Statues (F.S.), and other procedures required by the state.

Recovery Strategy

CERP Caloosahatchee River (C-43) West Basin Storage Reservoir Project

The purpose of the CERP Caloosahatchee River (C-43) West Basin Storage Reservoir Project is to improve the quantity, timing, and distribution of freshwater flows to the Caloosahatchee River and Estuary (Figure G-2). This planned reservoir project will capture and store surface water runoff from the C-43 Basin and Lake Okeechobee to provide a more natural and consistent flow of fresh water to the estuary. After construction and flow-through testing, operation of this project is expected to improve the Caloosahatchee Estuary's salinity balance by reducing a portion of the peak discharges during the wet season and providing essential flows during the dry season.

The recommended plan includes an above-ground reservoir located south of the Caloosahatchee River and west of the Ortona Lock (S-78) on a 10,700-acre parcel west of LaBelle formerly known as Berry Groves. The reservoir will provide a total storage capacity of approximately 170,000 acre-feet of above-ground storage volume in a two-cell reservoir. Normal pool depths when the reservoir is full vary from 15 feet at the southeast corner to 25 feet at the northwest corner. Project features include external and internal embankments, canals, two pump stations, 16 internal control and outflow water control structures, and environmental features to provide fish and wildlife habitat (**Figure G-3**).

The SFWMD is the state-designated local sponsor of this project with the USACE. Further information on the CERP Caloosahatchee River (C-43) West Basin Storage Reservoir Project is available at http://www.evergladesplan.org in the *Caloosahatchee River (C-43) West Basin Storage Reservoir Project Final Integrated Project Implementation Report and Final Environmental Impact Statement* (USACE and SFWMD 2010). The project is awaiting congressional authorization and appropriation of funds to start construction. The USACE anticipates project authorization to occur in August 2013 with appropriation of funding to follow at a later date. Once congressional funding has been appropriated, a timetable for the completion of the reservoir will be developed.

Water Reservation Rule for the CERP Caloosahatchee River (C-43) West Basin Storage Reservoir Project

The SFWMD initiated rule development for a Water Reservation for the CERP Caloosahatchee River (C-43) West Basin Storage Reservoir Project in December 2009. The purpose of the Water Reservation is to identify and reserve water from consumptive use to ensure the project provides the intended benefits to the natural system.

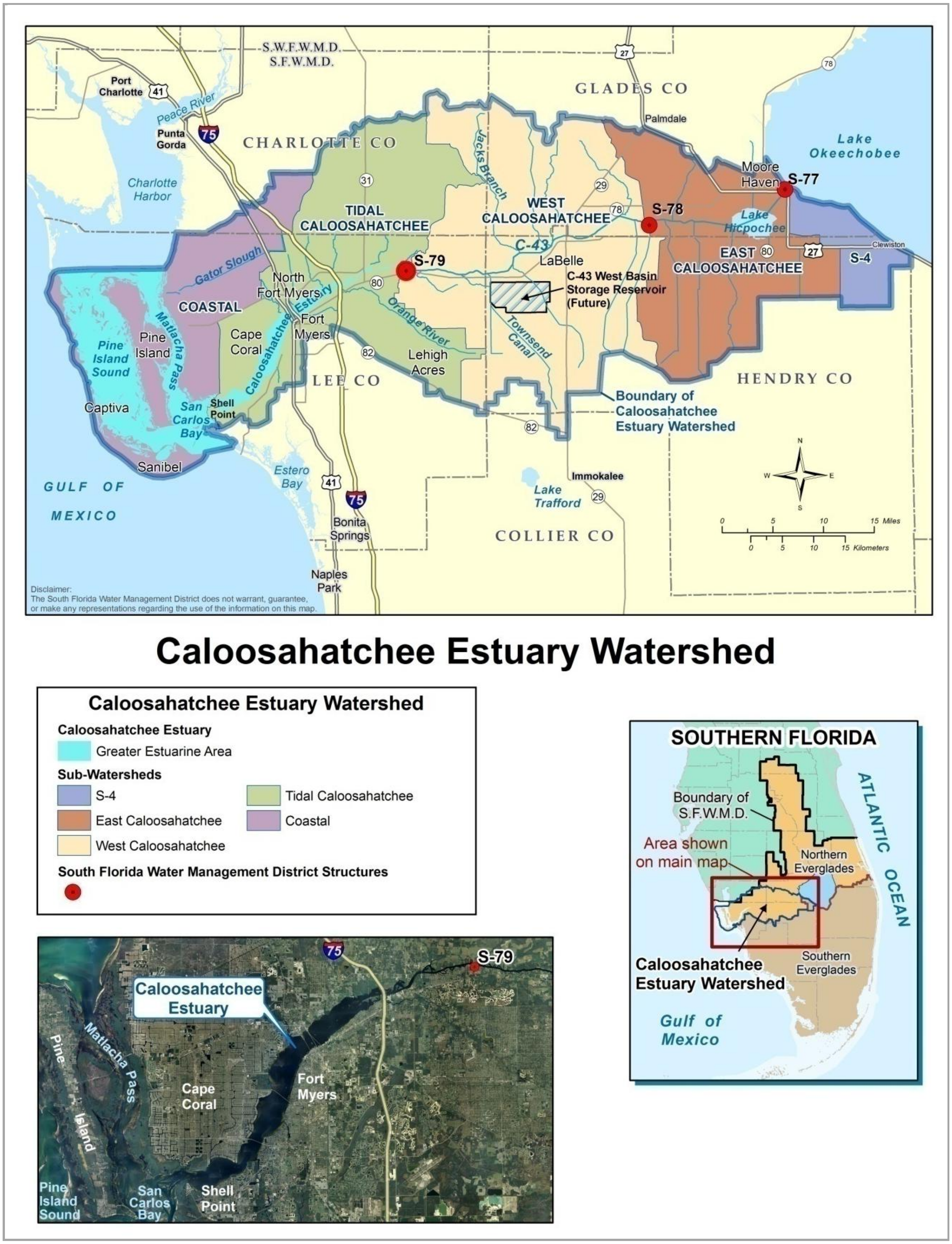

Figure G-2. Caloosahatchee Estuary watershed showing the location of the CERP Caloosahatchee River (C-43) West Basin Storage Reservoir Project.

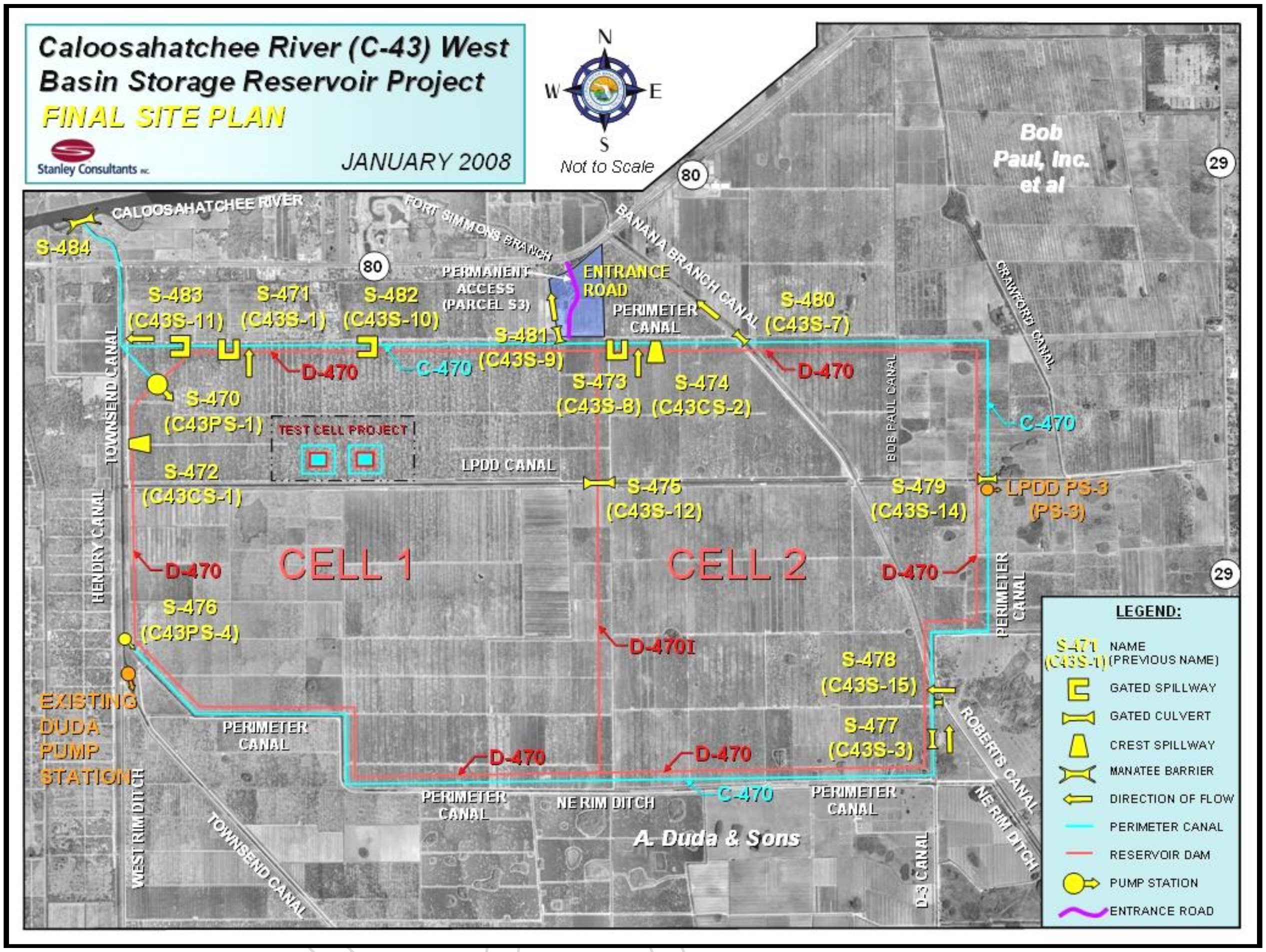

Figure G-3. General site plan for the CERP Caloosahatchee River (C-43) West Basin Storage Reservoir Project**.**

The SFWMD may reserve water from use by consumptive use permittees in such locations and quantities, and for such seasons of the year as in its judgment may be required for the protection of fish and wildlife or the public health and safety (Subsection 373.223(4), F.S.). All of the water made available by the CERP Caloosahatchee River (C-43) West Basin Storage Reservoir Project will be reserved. The SFWMD's objective is to ensure that all water contained in the reservoir is protected for the natural system.

The quantity of water to be reserved will be presented to the SFWMD's Governing for consideration and incorporated into SFWMD's rules. Based on the current schedule for rule development (Table G-1), the SFWMD anticipates its Governing Board could consider adopting the Water Reservation rule in 2013. See Chapter 5A of the *2011 South Florida Environmental Report – Volume II* (Martin 2011) available online at http://www.sfwmd.gov/sfer, and future annual reports for updates. The options for phases of water resource protection for the Caloosahatchee River will be determined at a future date. The Water Reservation is also discussed in **Chapter 3** of the Planning Document.

Table G-1. Planned Water Reservation schedule for the CERP Caloosahatchee River (C-43) West Basin Storage Reservoir (updated October 23, 2012).

Activity Name	Finish Date
Water Resources Advisory Commission (WRAC) Meeting - Briefing for Proposed Rulemaking	November 3, 2011
Governing Board Meeting - Briefing for Proposed Rulemaking	November 10, 2011
Governing Board Meeting – Direction on Scope of C-43 Water Reservation	December 15, 2011
First Public Workshop	February 27, 2012
Second Public Workshop	March 29, 2012
Completion of Technical Analysis	July 31, 2012
Develop Technical Report	November 2012
Third Public Workshop	December 2012
Rule Development Process	January 2013
Finalize Draft Rule Language	January–February 2013
Governing Board Meeting – Notice of Proposed Rule	March 2013
Governing Board Meeting – Notice of Rule Adoption	May 2013
Effective Date of Rule [a]	July 2013

a. Effective date of rule may be subject to legislative ratification.

Previously Considered CERP Caloosahatchee River ASR Project (Removed from Strategy)

The CERP Caloosahatchee River Aquifer Storage and Recovery (ASR) Project was originally part of the recovery strategy for the Caloosahatchee River and Estuary MFL, as described in the 2005–2006 LWC Plan Update. The project was co-located with the reservoir project as a complementary system for water storage. The results of a CERP feasibility study for installing ASR at the CERP Caloosahatchee River (C-43) West Basin Storage Reservoir site have led the SFWMD to remove the project from the MFL recovery strategy.

A pilot project was conducted to evaluate the technical feasibility of constructing up to 43 high capacity ASR wells in the Caloosahatchee River basin. See the *Central and Southern Florida Project Comprehensive Review Study Final Integrated Feasibility Report and Programmatic Environmental Impact Statement* (USACE and SFWMD 1999), which contains the original CERP. In 2004, an exploratory well was constructed on the Berry Groves site. The findings indicated the Upper Floridan aquifer at this location is composed of unconsolidated sand, which is not conducive to high capacity ASR as envisioned by the developers of the original CERP. Subsequent hydrogeologic studies indicate similar unfavorable conditions present across the entire Berry Groves site. Due to these site conditions, no further explorations at Berry Groves will be conducted, nor will co-location of ASR with the reservoir be pursued at the site.

LOWER WEST COAST AQUIFERS MINIMUM FLOWS AND LEVELS

Minimum aquifer levels for three LWC Planning Area aquifers were developed to prevent significant harm to the resource. The SFWMD Governing Board adopted specific MFL criteria (SFWMD 2000b) in 2001. The criteria specify that the minimum levels for the Lower Tamiami, Sandstone, and Mid-Hawthorn aquifers must equal the structural top of the aquifer. A violation of the criteria occurs when water levels drop below the top of the uppermost geologic strata that comprises the aquifer at any point in time. Water level measurements to monitor the conditions of the aquifers for the purpose of this rule will be located no closer than 50 feet from any existing pumping well (Rule 40E-8.331, F.A.C.).

Prevention Strategy

Current water levels maintained within the three previously mentioned aquifers remain well above the established MFL criteria for several reasons as described in the following section. The maximum developable limits (MDLs) represent a key prevention strategy for keeping aquifer water levels compliant with the MFLs established for these three aquifers.

Maximum Developable Limit

In 2003, the SFWMD adopted MDL rules requiring that consumptive use permittees not cause harmful drawdowns that will deplete (or overdraw) semi-confined freshwater aquifers within the LWC Planning Area. These rules are described in Section 3.2.4 of the *Basis of Review for Water Use Permit Applications within the South Florida Water Management District*, referred to as simply the Basis of Review (SFWMD 2010). These are permitting constraints within the LWC Planning Area that prevent the region's aquifers from experiencing harm due to consumptive use withdrawals. The criteria prohibit uses from allowing the potentiometric heads within the Lower Tamiami, Sandstone, and Mid-Hawthorn aquifers to drop to less than 20 feet above the top of the uppermost geologic strata that comprises the aquifers at any point during a 1-in-10 year drought condition.

Two areas identified in the 2005–2006 LWC Plan Update where MDLs may be reached are in northern Cape Coral (Mid-Hawthorn aquifer) and southern Lehigh Acres (Sandstone aquifer) in Lee County. Increased demands from Domestic Self-Supply (DSS) in these areas and record low water levels recorded in area monitor wells indicate that the freshwater aquifers are stressed. Alternatives to the continued development of these resources for DSS must be considered and implemented in the near term. Accelerating the extension of Public Water Supply (PWS) lines to these communities is part of the solution (see **Chapter 6** of the Planning Document). In other areas, regulatory criteria regarding potential wetland impacts, saltwater intrusion, and interference with existing legal users may be more limiting than the aquifer MDL.

Sandstone Aquifer

Declining trends in Sandstone aquifer water levels are documented in a United States Geological Survey study (Prinos et al. 2002). In addition, water levels below sea level (0.0 feet National Geodetic Vertical Datum of 1929 [NGVD]) have been recorded during spring dry periods. The water level declines are the result of drought conditions and cumulative drawdowns from Agricultural (AGR) Self-Supply, PWS, and DSS withdrawals. The top of the Sandstone aquifer is shallow in the Lehigh Acres area due to a structural high in the underlying Peace River Formation. Water levels in 2007 and 2009 approached estimated MDLs at two locations in the Lehigh Acres area. Consumptive use permit applicants may be required to identify site-specific data in areas that lack sufficient data on a application-by-application basis.

In addition to water use regulation, efforts to minimize the potential for exceeding the MDL include expansion of utility service to reduce the number of existing and future DSS wells and expansion of wastewater/reclaimed water service to increase availability of reclaimed water for Recreational (REC) Self-Supply irrigation. As stated previously, future potable water supply for PWS will generally come from the brackish Floridan aquifer system, which is not hydraulically connected to the overlying Sandstone aquifer. In addition, the East County Water Control District, which serves Lehigh Acres, plans to improve its canal system to retain more storm water. More surface water storage will provide groundwater recharge to the surficial aquifer system (SAS) and indirectly to the Sandstone aquifer.

Mid-Hawthorn Aquifer

Similar to the Lehigh Acres area, the northern Cape Coral area has experienced increased water use since 2000. Potentiometric levels in the Mid-Hawthorn aquifer have declined significantly. These declines are illustrated by recorded water levels in monitor well L-4820, which seasonally varied around -10.0 feet NGVD from the period of 1990 to 1995 reaching a record low of -76.14 feet NGVD on June 4, 2007 (see Figure 4 in **Chapter 3** of the Planning Document). The top of the Mid-Hawthorn aquifer ranges from -100 to -180 feet NGVD. The aquifer is vulnerable to stress from current and potential future users because it receives minimal recharge from overlying and underlying aquifers and has low yields. The City of Cape Coral has proposed to provide utility service to the northern portion of its service area. This should reduce stress on the Mid-Hawthorn aquifer. The city withdraws water from the brackish Floridan aquifer system (FAS), which is not hydraulically connected to the overlying Mid-Hawthorn aquifer.

Lower Tamiami Aquifer

The Lower Tamiami aquifer is a productive, semi-confined aquifer within the SAS. It is typically found in Collier County and southern Lee and Hendry counties. This aquifer is locally recharged by overlying portions of the SAS. Record low water levels in the aquifer have occurred in areas of concentrated pumping stress, such as PWS wellfields and areas with multiple users of the Lower Tamiami aquifer. Recharge sources, such as canals or wetlands, are potentially influenced by withdrawals from the Lower Tamiami aquifer. As such, future proposed withdrawals may be limited by more restrictive regulatory criteria than the aquifer MDL. Additional information about aquifer resources is available in the *2011–2012 Water Supply Plan Support Document* (SFWMD 2012).

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Changes Outside of the Recovery Strategy Affecting Water Availability

Since completion of the *2005–2006 Lower West Coast Water Supply Plan Update* (2005–2006 LWC Plan Update; SFWMD 2006b), several significant changes have occurred that affect the water available today and in the future to meet the needs of the Caloosahatchee River and Estuary. These include operational, regulatory, and planning changes for the management of Lake Okeechobee. These issues will be discussed in more detail in the next update of the Lower East Coast Water Supply Plan currently being developed and expected to be published no later than 2013.

2008 LAKE OKEECHOBEE REGULATION SCHEDULE

Lake Okeechobee is a central component of the Central and Southern Florida Flood Control Project (C&SF Project) and an interconnected regional aquatic ecosystem. It serves multiple functions including flood control, agricultural and urban water supply, fulfilling Seminole Tribe of Florida water rights, navigation, recreation, and fish and wildlife preservation and enhancement. As such, operation of the lake affects a wide range of environmental and economic issues. Lake operations must carefully consider the entire and sometimes conflicting purposes of the C&SF Project.

In 2008, the United States Army Corps of Engineers (USACE) implemented an interim regulation schedule for Lake Okeechobee that addressed concerns about the integrity of the Herbert Hoover Dike. The dike provides key flood control for developed areas around the lake. The 2008 Lake Okeechobee Regulation Schedule (2008 LORS) regulates the lake approximately one foot lower than previous regulation schedules. Additional information regarding 2008 LORS can be found in the *Central and Southern Florida Project Water Control Plan for Lake Okeechobee and Everglades Agricultural Area* (USACE 2008a) and the *Draft Supplemental Environmental Impact Statement on the Lake Okeechobee Regulation Schedule, Lake Okeechobee, Florida* (USACE 2008b).

ADAPTIVE PROTOCOLS FOR LAKE OKEECHOBEE OPERATIONS

The South Florida Water Management District (SFWMD) first developed a set of "adaptive protocols" to provide guidance when making recommendations to the USACE when the Water Supply and Environment Regulation Schedule was in effect from 2000 to 2008. Recently, the protocols were modified for use with the 2008 LORS to allow for operational flexibility. The SFWMD Governing Board concurred with these protocols on September 9, 2010. The *Final Adaptive Protocols for Lake Okeechobee Operations* document (SFWMD 2010a) was finalized on September 16, 2010.

The adaptive protocols are intended to provide operational guidance to SFWMD staff and Governing Board. As local sponsor for the C&SF Project, the agency interacts with the USACE on Lake Okeechobee operations within the confines of the federally adopted lake regulation schedule and water control plan (USACE 2008a). Lake Okeechobee is a central component of the C&SF Project and an interconnected regional aquatic ecosystem. As described previously, the lake has multiple functions and its operations must carefully consider the entire and sometimes conflicting needs of the C&SF Project. A key goal of implementing adaptive protocols for Lake Okeechobee operations is to improve water supply, flood protection, and ecosystem benefits within the constraints of the approved lake regulation schedule and water control plan.

The adaptive protocols are used when the lake stage in the Low, Baseflow, and Beneficial Use sub-bands to provide guidance for discretionary releases to water managers for ecosystem benefits or to improve conditions related to the C&SF Project purposes. Adaptive protocols represent a scientifically-based method to clarify the lake release amounts that are most beneficial when the regulation schedule does not suggest specific release amounts. The SFWMD provides recommendations developed through the adaptive protocols to the USACE for consideration in optimizing lake operations within the constraints of existing authorizations and infrastructure. The USACE carefully considers various competing uses and needs of the water resources. As stated in the *Central and Southern Florida Project Water Control Plan for Lake Okeechobee and Everglades Agricultural Area* (USACE 2008a), the USACE retains full discretion to operate the C&SF Project. The USACE is not mandated to follow the SFWMD's recommendations per the *Final Supplemental Environmental Impact Statement Including Appendices A through G – Lake Okeechobee Regulation Schedule* (USACE 2007).

Central to the adaptive protocols process is a set of ecosystem and water supply performance measures. The performance measures are used to identify the environmental need for water released from the lake and the risk to water supply uses of the lake resources. Overall, adaptive protocols are intended to use operational flexibility to facilitate environmental benefits without impacting other lake uses.

The adaptive protocols will be periodically assessed and adjusted, as necessary, to address potential issues and reflect knowledge gained as the protocols are implemented. Overall, inherent uncertainties in how the system will be operated may require adjustments to the application of the adaptive protocol guidance.

RESTRICTED ALLOCATION AREA FOR THE LAKE OKEECHOBEE SERVICE AREA

During the analysis for 2008 LORS, it was determined that the Lake Okeechobee MFL criteria would be exceeded. Therefore, a recovery strategy was required.[2] In August 2008, the SFWMD Governing Board amended Appendix H of the *2005–2006 Lower East Coast Water Supply Plan Update* (SFWMD 2006a) and adopted the Lake Okeechobee MFL recovery strategy, which will be described in the Lower East Coast Water Supply Plan Update currently being developed. The recovery strategy is composed of three components: 1) environmental enhancement projects to be implemented during extreme low lake stages, 2) regulatory constraints on consumptive use of lake water, and 3) capital projects that improve storage capacity both within and adjacent to Lake Okeechobee.

To implement the regulatory component of the recovery strategy, Restricted Allocation Criteria were developed for the Lake Okeechobee Service Area. The criteria are described in Section 3.2.1.G of the *Basis of Review for Water Use Permit Application within the South Florida Water Management District* (SFWMD 2010b). Generally, the rule limits allocations from Lake Okeechobee and integrated conveyance canal systems that are hydraulically connected to and receive surface water from Lake Okeechobee, including the C-43 Canal and the C-44 Canal, to those water uses that occurred from April 1, 2001 to January 1, 2008.

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[2] Based on the previous lake regulation schedule (Water Supply and Environment), the lake was not expected to violate its MFL within the next 20 years. Therefore, the SFWMD had adopted and implemented a prevention strategy.

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Other Non-MFL Planned Improvements for the Planning Area

In addition to the MFL criteria and recovery and prevention strategies, several other programs and projects are under way that may improve water regimes and ecosystem health, or both, in the Caloosahatchee Estuary watershed. These programs and projects include the Dispersed Water Management Program, Caloosahatchee Storage/Treatment Project, Comprehensive Everglades Restoration Plan (CERP), Northern Everglades and Estuaries Protection Program (NEEPP), and other smaller projects.

DISPERSED WATER MANAGEMENT PROGRAM

Dispersed Water Management

The Dispersed Water Management Program works cooperatively with public, private, and tribal landowners to retain excess storm water on the landscape rather than discharging it downstream. Without significant alterations, shallow water is distributed and retained across the land using relatively simple structures or operational changes. To date, through a combination or public and private projects, this program has made 138,016 acre-feet of landscape water storage available throughout the Everglades system, including the Caloosahatchee Estuary and St. Lucie Estuary watersheds, and sites north and south of Lake Okeechobee. The program is implemented through independent and combined efforts among multiple local, state, and federal agencies.

The focus of this program is to retain runoff during the rainy season for the benefit of the local waterways, wetlands, and the coastal estuaries. Locally, there will be some water supply benefits into the early dry season because of the retention and higher water table.

However, because this is shallow storage, the volume of water is insufficient to be considered a water source during the dry season.

The Dispersed Water Management Program uses three different approaches: cooperative projects, easements, and payment for environmental services. All components alter the hydrologic regime by retaining excess water on site and facilitating recharge of groundwater. Not only do these projects achieve water storage, improve water quality, and enhance habitat, they benefit fish and wildlife dependent on wetlands and surface water.

The United States Department of Agriculture–Natural Resources Conservation Service (USDA-NRCS) Wetland Reserve Program uses dispersed water management, focusing on obtaining easements over private lands. The restoration design of these projects is to rehydrate drained wetlands and retain more water on the landscape. The South Florida Water Management District (SFWMD) has executed an agreement with USDA–NRCS staff to assist in expediting these projects.

The objective of the Northern Everglades Payment for Environmental Services component is to implement a market-based approach to obtain water and nutrient retention services. The SFWMD implements the program in collaboration with the Florida Department of Agriculture and Consumer Services (FDACS), the Florida Department of Environmental Protection (FDEP), and USDA–NRCS through a solicitation and contracting process. Currently, $10.5 million is planned for project costs within SFWMD's Fiscal Year (FY) 2012 through 2016 budgets. Although none of the initial projects submitted in response to the SFWMD's first solicitation (summer 2011) are located directly within the Caloosahatchee Estuary watershed, the projects north of Lake Okeechobee help reduce excess and regulatory releases to the estuaries. The SFWMD anticipates future solicitations will include sites within the Caloosahatchee Estuary watershed. The program will expand based on initial solicitation results.

Another aspect of the Northern Everglades Payment for Environmental Services is "water farming" on agricultural cropland (fallow land). The utilization of fallow/out-of-production lands to store stormwater, reduce nutrients and recharge the aquifer is known as water farming and has been identified as a practical water management and land practice alternative. Water farming can potentially reduce environmental impacts and provides an opportunity to improve water quality for the Caloosahatchee Estuary.

Sites within the Caloosahatchee and St. Lucie estuary watersheds are being assessed for retention of excess storm water on fallow/out of production lands. The costs and benefits of this type of payment for services are being evaluated as another potential approach to reduce excess water and improve the quality of water reaching the estuaries.

The SFWMD is funding a pilot water farming study in the planning region to assess the overall feasibility of water farming citrus lands that are currently fallow. Primary goals are to identify costs associated with on-site construction, infrastructure improvements, environmental assessments, and facility maintenance. The objective is to determine the cost benefits and other benefits associated with water farming as a means of increasing local/regional storage and improving water quality to benefit both the natural system and the agricultural industry. This study will be done with the Gulf Citrus Growers Association in coordination with other state and federal agencies and will assist in determining if water farming appears to be a cost-effective approach to reducing discharges to the Caloosahatchee Estuary and conserving stormwater. The draft report will be delivered to the SFWMD by June 2013.

Currently, six dispersed water management cooperative projects are occurring within the Caloosahatchee watershed: 1) Nicodemus Slough Water Retention Project, 2) South Lake Hicpochee, 3) BOMA Site Interim Project, 4) C-43 Reservoir Site Interim Project, 5) Caloosahatchee Estuary water farming pilot projects (locations to be determined), and 6) Northern Everglades Payment for Environmental Services Solicitation projects (locations to be determined). **Figure I-1** shows the locations of the first four projects listed above.

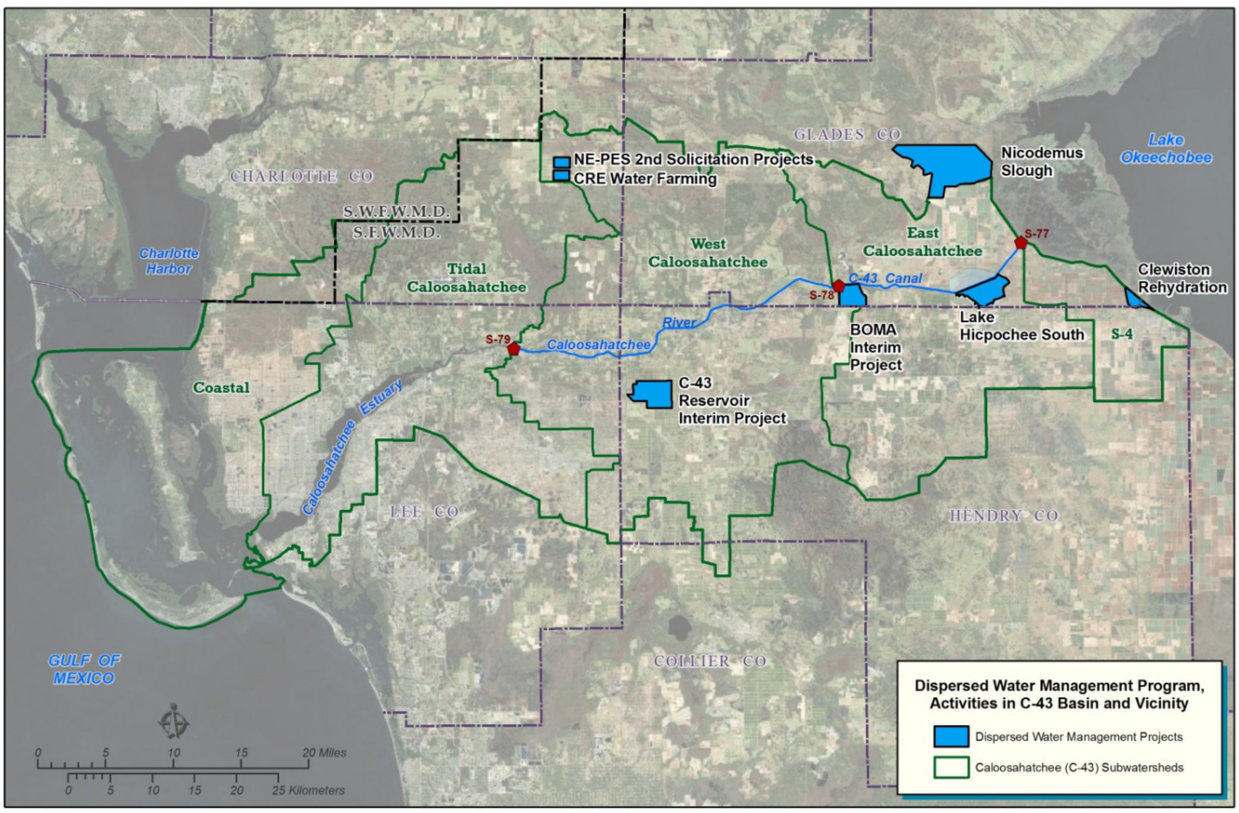


Figure I-1. Dispersed Water Management Program projects located within the Caloosahatchee Basin.

CALOOSAHATCHEE BASIN STORAGE/ TREATMENT PROJECTS

As part of a five-year reserve spend-down plan to dedicate accumulated reserves and cash balances toward restoration and water supply priorities, the SFWMD has identified $19 million available from FY 2012 to FY 2016 to fund the design and construction of facilities that will provide stormwater storage or treatment on publicly-owned lands within the Caloosahatchee Basin. The projects build on concepts identified in prior planning studies and design plans. In coordination with stakeholders, several options were identified and are undergoing further evaluation and design. Each of these options can be independently implemented and include those listed below. FY 2012 activities will include identification of projects in collaboration with stakeholders and completion of basis of design reports and preliminary design for the selected projects.

East County Water Control District's Mirror Lakes Stormwater Retention Facility. The purpose of this project is to better manage the hydrology of Lee County's Lehigh Acres area. Objectives include stormwater peak flow discharge reduction, groundwater recharge increase, and water quality improvement. This project element has three phases collectively intended to rehydrate Mirror Lakes, alleviate flooding along the Orange River, and restore flows to the headwaters of the Estero River near Lee County's Green Meadows wellfield.

Lake Hicpochee Habitat Restoration. The goal of this project is to restore the hydrology of the northern part of Lake Hicpochee through shallow water storage while attaining incidental habitat restoration and water quality treatment benefits. The SFWMD is currently in the process of securing a consultant to provide surveying and geotechnical investigation services in support of the project's design.

COMPREHENSIVE EVERGLADES RESTORATION PLAN

The CERP provides a framework and guide to restore, protect, and preserve the Everglades. The United States Congress approved the restoration plan in the Water Resources Development Act of 2000. The project footprint spreads across 18,000 square miles. For annual updates of CERP implementation, see the CERP website, http://www.evergladesplan.org or the SFWMD's *South Florida Environmental Report* (Caffie-Simpson 2011, Caffie-Simpson et al. 2011, 2012, Williams 2008, Williams et al. 2009a, 2009b, 2010a, 2010b) at http://www.sfwmd.gov/sfer. CERP projects in the Lower West Coast (LWC) Planning Area include the following:

- CERP Caloosahatchee River (C-43) West Basin Storage Reservoir
- Picayune Strand Restoration Project
- Southwest Florida Comprehensive Watershed Plan (formerly known as Southwest Florida Feasibility Study)

Picayune Strand Restoration Project

The goal of the Picayune Strand Restoration Project is to restore over 55,000 acres of public lands by reducing over-drainage and returning natural and beneficial sheet flow of water to the project site and adjacent areas including the Fakahatchee Strand Preserve State Park, Florida Panther National Wildlife Refuge, Ten Thousand Islands National Wildlife Refuge, Collier-Seminole State Park, and related estuaries. Since the filling of the Prairie Canal and removal of eastern roads, the hydrology has been partially restored to the eastern areas of Picayune Strand and western areas of Fakahatchee Strand. The clearing and leveling of the logging trams east of Faka Union Canal is complete. The roads in the Merritt Canal phase have been removed with the exception of some that were left off the final plan and those needed to complete work on the pump station. Work during 2012–2013 will focus on the Merritt Canal and include the filling of the north–south portion of the Merritt Canal and completion of the pump station.

A Water Reservation rule limits surface and groundwater withdrawals from Picayune Strand and the Fakahatchee Estuary associated with CERP project implementation. Uses of less than 100,000 gallons per day for land management or public access/recreation are still allowed. Proposed uses in the southern portion of Collier County located near the project may receive additional allocations of surface water and groundwater if they can demonstrate they are not withdrawing reserved water, as well as the other conditions of issuance. Water supply development from deeper groundwater sources, such as the Sandstone and Mid- Hawthorn aquifers, or the Floridan aquifer system (FAS) are not restricted by the Water Reservation and may be possible as long as other conditions of issuance are met.

Southwest Florida Comprehensive Watershed Plan

Congress authorized the Southwest Florida Feasibility Study (now known as the Southwest Florida Comprehensive Watershed Plan) in the Water Resources Development Act of 2000 as part of the CERP to perform a comprehensive assessment of all watersheds in southwest Florida and develop a regional restoration plan that addresses all water resource issues within these watersheds. The study area includes all of Lee County, most of Collier and Hendry counties, and portions of Charlotte, Glades, and Monroe counties. It encompasses approximately 4,300 square miles and two major drainage basins. Issues addressed by the study include loss of natural ecosystems, fragmentation of natural areas, degradation of wildlife habitat, alteration of natural freshwater flows to wetlands and estuaries, and water quality degradation in surface waters. Due to the complexity of the planning effort, detailed designs will not be developed under the study. Staff is currently working on a draft plan.

NORTHERN EVERGLADES AND ESTUARIES PROTECTION PROGRAM

In 2007, the Florida legislature authorized the NEEPP (Section 373.4595, Florida Statutes [F.S.]) that expanded the existing Lake Okeechobee Protection Act. The NEEPP includes the Lake Okeechobee Watershed Protection Program and a river watershed protection program for the Caloosahatchee and St. Lucie Rivers. The legislation required the completion of three watershed protection plans: *Caloosahatchee River Watershed Protection Plan* (SFWMD et al. 2009a, Balci and Bertolotti 2012), *St. Lucie River Watershed Protection Plan* (SFWMD et al. 2009b, Bertolotti and Balci 2012), and *Lake Okeechobee Watershed Protection Plan* (SFWMD et al. 2004, 2007, 2008, 2011). These plans build on existing approaches and consolidate restoration efforts throughout the entire Northern Everglades system.

Lake Okeechobee Watershed Protection Plan

The NEEPP mandated the SFWMD, FDEP, and FDACS develop a Lake Okeechobee Watershed Protection Plan. The plan was initially developed in 2004 (SFWMD et al. 2004) and was updated in 2007, 2008, and 2011 (SFWMD et al. 2007, 2008, 2011). The plan includes source controls (e.g., best management practices [BMPs]) and several subregional and regional technologies, such as stormwater treatment areas (STAs) and alternative treatment technologies, to improve the quality of water within the watershed and of that delivered to Lake Okeechobee. Several measures are also included in the plan to improve both water levels within the lake and the quantity and timing of discharges from Lake Okeechobee to the northern estuaries to achieve more desirable salinity ranges. These measures include reservoirs, Dispersed Water Management Program projects, aquifer storage and recovery, and deep well injection.

Caloosahatchee River Watershed Protection Plan

The Caloosahatchee River Watershed Protection Plan was submitted to the Florida legislature on January 1, 2009 (SFWMD et al. 2009a). It identified major influences that negatively affect the Caloosahatchee Estuary's ecological health (primarily water quality, timing, distribution, and quantity) and proposed strategies to minimize those stressors. The plan was updated in 2012 (Balci and Bertolotti 2012). The plan contains three main components: the Pollutant Control Program, the Construction Project, and the Research and Water Quality Monitoring Program.

- **Pollutant Control Program.** This program is a multifaceted approach to reducing pollutant loads by improving the management of pollutant sources within the watershed. It comprises source control programs implemented by the coordinating agencies including BMPs, on-site treatment technologies, stormwater and wastewater infrastructure upgrades and master planning, and regulatory programs focused on water quality and quantity.

- **Construction Project.** This component identifies water quality and storage projects to improve hydrology, water quality, and aquatic habitats within the watershed. It includes regional-, subregional-, and local-scale water quality and quantity projects (e.g., reservoirs, STAs, chemical treatment, and local stormwater projects).
- **Research and Water Quality Monitoring Program.** This program builds upon the SFWMD's existing research program. It is intended to carry out, comply with, or assess the plans, programs, and other responsibilities created by the Caloosahatchee River Watershed Protection Plan. The program will also conduct an assessment of the water volumes and timing from the Lake Okeechobee and Caloosahatchee River watersheds and their relative contributions to the estuary. The primary purpose of this component is to track progress toward achieving the water quality and storage targets.

More details about specific projects and activities for both watershed protection programs are included in annual updates in the *South Florida Environmental Report – Volume I*, available from http://www.sfwmd.gov/sfer. Information about the NEEPP background and implementation is also available from http://www.sfwmd.gov/northerneverglades.

VALLISNERIA SEED SOURCES

Recent drought conditions in southwest Florida have caused lethal salinities in the upper Caloosahatchee Estuary where *Vallisneria americana* once thrived. To establish a potential seed source for future populations in the upper estuary, *Vallisneria* was replanted upstream of the S-79 structure at two locations. *Vallisneria* planted at the end of the 2011 dry season will remain protected from grazers through the end of the 2013 dry season to determine if the transplanted plants can establish large, sustainable grass beds.

YUCCA PENS HYDROLOGIC RESTORATION RECONNAISSANCE STUDY

The SFWMD began conducting a reconnaissance study of the water characteristics of the Yucca Pens Unit in the Babcock/Webb Wildlife Management Area in April 2009. Yucca Pens is located in northwestern Lee County and is part of the Charlotte Harbor Flatwoods area. The reconnaissance study is expected to provide recommendations for long- and short-term restoration efforts that will benefit the natural system, and possibly the water supply in the Cape Coral area.

ESTERO BAY/SOUTHERN CORKSCREW REGIONAL ECOSYSTEM WATERSHED

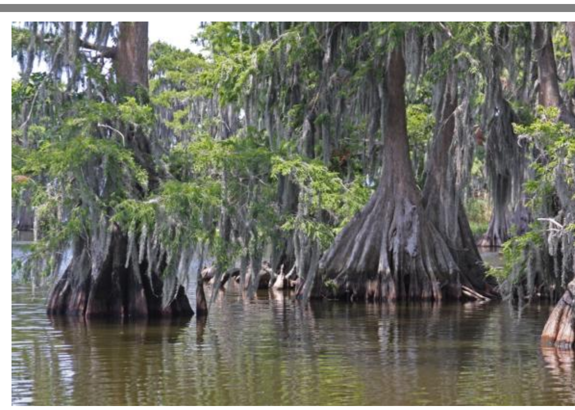
Estero Bay is a state aquatic preserve located in Lee County between Bonita Springs and Fort Myers Beach. In 1990, the tributaries to Estero Bay were designated as Outstanding Florida Waters by the FDEP because of their "exceptional ecological significance." Many partners, including universities and local governments, are involved in restoration projects in this area. The SFWMD's Southern Corkscrew Regional Ecosystem Watershed Land Acquisition Project to restore the natural flow-way to headwaters of the Estero Bay Basin is ongoing.

NAPLES BAY

Naples Bay and its watershed, located in western Collier County, are typical of estuarine systems along the coast of Florida because they have been heavily altered by drainage and land development. The *Naples Bay Surface Water Improvement and Management Plan* (SFWMD 2007) was prepared to identify stormwater quantity and water quality improvements, and to provide strategies for ecosystem protection and restoration. In addition, the relocation of Golden Gate Canal Weir Number 3 is expected to attenuate freshwater discharges that affect the health of Naples Bay (Alleman 2011).

BIG CYPRESS BASIN CAPITAL IMPROVEMENT PROGRAM

The SFWMD Big Cypress Basin Board is responsible for the operation, maintenance, planning and capital improvements of over 160 miles of canals and more than 40 water control structures within Collier County and part of Monroe County. The southwest Florida representative on the SFWMD Governing Board serves as the chair of the Big Cypress Basin Board.



Big Cypress Swamp

The Big Cypress Basin Capital Improvement Program (FY 2005–FY 2014) includes projects on the Golden Gate Canal System, Naples Bay, Henderson Creek, and Barron River. These projects provide water resource benefits through reduction of over-drainage and restoring groundwater and surface water levels to more natural conditions. Additionally, these improvements enhance water supply opportunities by increasing groundwater storage and improving the timing and duration of surface water discharges.

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