Collier County
Public Utilities Division
Pollution Control

GROWTH MANAGEMENT PLAN AMENDMENT - 2010

FUTURE LAND USE ELEMENT

MAP OF COLLIER COUNTY WELLHEAD PROTECTION AREAS, PROPOSED WELLFIELDS, AND AQUIFER STORAGE AND RECOVERY WELLS

NOVEMBER, 2010

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SUMMARY

The Collier County Pollution Control and Prevention Department (PCD) is responsible for protecting the potable groundwater resources of Collier County under the Land Development Code (LDC) Section 3.06.00, titled "Groundwater Protection." This Section of the LDC relates to public water supply wellfields permitted to withdraw a minimum of 100,000 gallons per day of groundwater from the topmost "surficial" and next lower "intermediate" freshwater aquifer systems of the county.

In addition, the PCD is responsible under Section 9J-5.006 of the Florida Administrative Code (FAC), relating to the Future Land Use Element of the Growth Management Plan, to update and make input to the county's future land use maps when appropriate.

A recent review and modeling of the municipal water supply wellfields within Collier County indicated that the existing 2007 approved "Collier County Wellhead Protection Areas, Proposed Wellfields, and Aquifer Storage and Recovery Wells (ASR's) Map" (Map) requires updating. This proposed amendment to the 2007 version will update the Map so it reflects more closely what presently exists in Collier County.

In summary, there are eight major municipal wellfields currently falling under LDC Section 3.06.00. Due to recent modifications, either to the number of wells in a field or to the permitted well pumpage rates, very minor changes are required to the computer generated shapes of the wellfield protection zones for all eight wellfields. The latest shapes of these wellfield risk management special treatment protection zones are shown on Map 1. In addition the installation three new shallow water supply wells at Port of the Islands, has resulted in this wellfield being added to the Map.

Map 1 also shows the currently approved potential future wellfield areas and the permitted ASR wells within the county, as required by FAC Section 9J-5.006.

The purpose of this Paper is to present and describe the current conditions found within the proposed Future Land Use Map as pertaining to freshwater wellfields and ASR's, and to request the appropriate committees and bodies accept and approve inclusion of the revisions into the future Land Use Map for use in the Growth Management Plan for Collier County.

1. AMENDMENT REQUEST

The PCD is pursuing an amendment to the "Collier County Wellhead Protection Areas, Proposed Wellfields, and Aquifer Storage and Recovery Wells (ASR's) Map" (Map) located within the Collier County Growth Management Plan's Future Land Use Element. This proposed amendment will update this Map so it more closely reflects what presently exists in Collier County. Through this process the public will be informed by Public Notices, and will have an opportunity to share their opinions and thoughts during public hearings held by the Collier County Environmental Advisory Council (EAC), the Collier County Planning Commission (CCPC) and, finally, the Collier County Board of County Commissioners (BCC), where the proposed amendment will be considered for adoption. If this amendment is approved, it will then be forwarded to the Florida Department of Community Affairs (DCA) for their review to determine compliance with Florida Statutes.

Following this process the PCD will then pursue the amendment of Collier County's LDC Section 3.06.00 "Groundwater Protection" to ensure the outdated wellfield risk management special treatment overlay zones are revised to reflect what presently exists. The purpose and intent of LDC Section 3.06.00 is to protect future and existing public water supply wellfields, protect natural aquifer system recharge areas, protect countywide ground water resources, and protect the public and resources from potential pollutant point sources. This regulation requires that the public water supply wellfields within the county are protected by means of "wellfield risk management special treatment overlay zones" commonly known as Wellfield Protection Zones. These zones are derived from a three-dimensional computer-modeled analysis of ground water and solute transport in the county's freshwater aquifer system. This modeling has been done by the PCD since 1989.

Following the initial setup of the model by a consultant in 1989, the model was run in 1991, 2003, 2004, 2007 and, most recently, in 2010. Each run of the model produced changes to the previous run results because of the input of new data and revised, increasingly stringent, wellfield permit conditions imposed by the South Florida Water Management District (SFWMD) (i.e., wellfield changes that occurred since the previous run of the model). The proposed map, "Map 1," reflects the results of the 2010 modeling. The reference statutory Geographic Information System (GIS) map of the Wellfield Protection Zones for each wellfield resides in the county's GIS map library.

Shown below is a summary of the historic wellfield updates and hence modeling changes between 2004, 2007, and 2010.

Wellfield	**2004 Modeling**	**2007 Modeling**	**2010 Modeling**
Immokalee	13 wells	13 wells - no change	16 wells – 3 new wells
Orangetree	2 wells	4 wells – 2 new wells	4 wells – changed pumping
Ave Maria Utility Co.	0 wells	6 new wells	6 wells – changed pumping
Florida Governmental Utility Authority (FGUA) Golden Gate City	8 wells	8 wells - greater pumping	8 wells – changed pumping
Everglades City	3 wells	3 wells – no change	3wells – changed pumping

Wellfield	**2004 Modeling**	**2007 Modeling**	**2010 Modeling**
Collier County Utilities (Golden Gate)	32 wells	34 wells - 2 new wells & greater pumping	36 wells – 2 new wells
City of Naples (Coastal Ridge)	26 wells	26 wells – no change	31 wells – 5 new wells
City of Naples (East Golden Gate)	23 wells	23 wells – no change	23 wells – changed pumping
Port of the Islands	Not modeled	Not modeled	3 new shallow wells

The impact of these changes, in either the number of wells or the pumping rate of the wells in a particular wellfield, typically reflects in a change to the Wellfield Protection Zone shapes. Some of the shape changes, especially in large wellfields with many wells, are essentially very minor – and this is the case for the Immokalee, Everglades City, Collier County (Golden Gate), City of Naples (Coastal Ridge) and City of Naples (East Golden Gate) wellfields. However, for the small Ave Maria, Orangetree, and FGUA (Golden Gate) wellfields, the changed permitted pumping rates applied in the 2010 model have, in each case, resulted in a noticeable change to the Wellfield Protection Zone shapes. Map 1 presents and the PCD requests adoption of the actual results of the 2010 modeling – whether the Wellfield Protection Zone shape change was small or large.

As required by Section 9J-5.006 of the FAC relating to the Future Land Use Element of the Growth Management Plan, also shown in Map 1 are the locations of approved potential future wellfield areas, planned surficial aquifer supply wells, and the SFWMD-permitted ASR wells in the county.

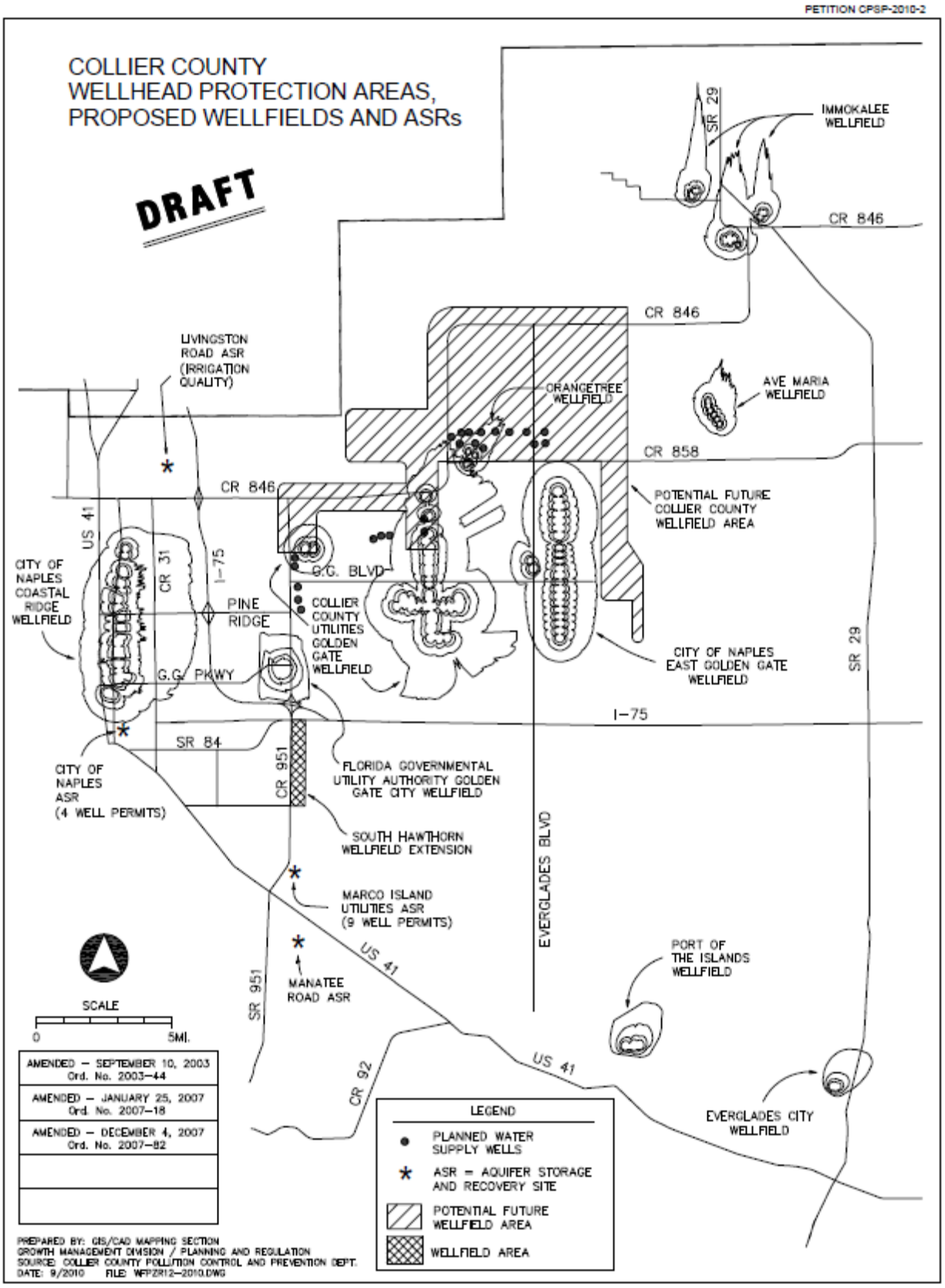
The potential future wellfield areas and the planned surficial aquifer supply wells shown on Map1 are extracted from Figure 5-1of the 10-Year Water Supply Work Plan. The original approval of this potential future wellfield area resulted when the BCC approved a comprehensive plan amendment to adopt the 10-Year Water Supply Work Plan on February 24, 2009, by Ordinance No. 09-04 (DCA 09-RWSPI).

The ASR's shown on Map 1 are those documented as having received SFWMD ASR Permits within the county. The Map shows four sites at which ASR well permits have been issued to county wellfield stakeholders: Marco Island (9 Wells), City of Naples (4 Wells), Manatee Road (1 Well), and Livingston Road (1 Irrigation Quality Well). The Carica Road ASR shown in the 2007 Map is withdrawn because following completion of a test well at the site no ASR was installed.

The following Sections and Appendices provide supplementary details of the proposed and historic amendments, an explanation and intent of the model, the stakeholders who were contacted, and the wellfield data collected during this consultative process.

The PCD requests the adoption of Map 1 as the Future Land Use Map relating to the wellfield protection areas, proposed surficial aquifer wells, and current ASR's for incorporation into the Growth Management Plan of Collier County.

MAP 1. PROPOSED FUTURE LAND USE MAP IN THE GROWTH MANAGEMENT PLAN



2. HISTORICAL WELLFIELD PROTECTION MODELING IN COLLIER COUNTY

2.1 INITIATION OF MODELING IN 1989

The following are extracted portions from the 1989 and 1991 reports that described the initial motives, directives, setup and running of a wellfield protection zone model in Collier County. Some of the concepts and opinions expressed at that time may not be valid now or may have been overtaken by events; they are provided to record the development of this modeling within the county.

Chapter 163.3203, F.S, mandates the adoption of Land Development Regulations that "...provide for protection of potable water wellfields". The Collier County Growth Management Plan translates this mandate into a series of Goals, Objectives, and Policies for implementation of ground water quality protection in Collier County. The goals state that the County shall: (1) identify and protect natural ground water aquifer recharge areas from activities that could degrade and/or contaminate the quality of ground water; (2) protect natural ground water aquifer recharge areas from activities that unacceptably alter the ground water recharge; (3) protect the County's ground water resources to ensure the highest water quality practical; and (4) conserve, protect, and appropriately manage the County's fresh water resources.

Objectives and Policies included in these goals are: (1) to develop and maintain a 3-dimensional computer ground water flow model for existing and planned wellfields; (2) to amend the Comprehensive Plan to include modeled areas as "environmentally sensitive areas"; (3) to develop an ordinance to provide for an appropriate level of protection for all Collier County ground water; (4) to develop an ordinance(s) that will address well construction, rock mining and excavation, blasting, and confining units; (5) to develop an ordinance that will address both existing and future land use and surface activities relative to petroleum storage tanks, stormwater, regulated substances, industrial and domestic wastes; (6) to develop a ground water protection ordinance to protect existing and future wellfields; and (7) to develop technical criteria for determining what areas are critical to the County's long-term ground water needs, e.g., Natural Aquifer Recharge areas.

The citizens of Collier County derive their potable water largely from the Surficial Aquifer System via either the permitted public water supply wellfields or the private and household water wells. Water consumption from these sources are divided into three main use areas; potable water, agricultural use, and recreational uses.

The Surficial Aquifer System in Collier County is composed of the unconfined water table aquifer and the underlying, semi-confined Lower Tamiami Aquifer, both of which are recharged by direct infiltration of precipitation that accumulates on the surface. The water table of this aquifer system lies at or within a very few feet of the ground surface, being visible in such situations as canals, ponds and lakes, wetland areas, and wet retention stormwater areas. The unsaturated soil or rock above the water table is commonly only a few inches to a few feet thick and provides little attenuation of most contaminants or pollutants passing from the surface downward to the water table. Thus, the Surficial Aquifer System is very susceptible to contamination resulting from land use activities.

The sedimentary rock units underlying Collier County represent several millions of years of mixed carbonate and siliciclastic marine shelf and coastal deposition under subtropical to tropical

climatic conditions. These rock units exhibit generally unpredictable vertical and lateral microlithologic as well as permeability and porosity variations with some generally recognized laterally extensive zones of relatively low permeability separating other zones of relatively high permeability. These latter zones or aquifers contain producible water and are separated by zones of lower permeability, i.e., aquitards. Nearly all of the potable water in Collier County is obtained from two permeable zones of the Surficial Aquifer System. This System is unconfined and is recharged directly from the surface. Hence, accurate knowledge of ground water flow directions and recharge characteristics is extremely important when attempting to predict ground water movement.

Potential ground water contaminants from land use activities are introduced into aquifer systems via moving water. This movement may be in vertical and/or lateral directions. The conventional wisdom is that with increasing distance traveled in heterogeneous soils/rocks, the more attenuated or "diluted" a pollutant will become. However, even extremely minute amounts of some contaminants have high toxicity levels. Natural attenuation processes include filtration, sorption, chemical processes, dilution, and microbiological decomposition. The thin, sandy soils of Collier County are less capable of providing extensive natural attenuation of many pollutants generated by land use activities as compared to thicker, more heterogeneous soils. Hence, contaminant-generating land use activities should be regulated in order to reduce the potential for introduction of pollutants into the ground water system.

Potential ground water contaminants are as numerous and as varied as the land use activities that produce them. In addition, each contaminant (e.g., bacteria, dissolved solids, petroleum products, pesticides, fertilizers, septic or sewage waste) behaves differently in the water system in terms of its residence time, movement with other pore fluids, reactivity with or to pore fluids and soil/rock, and reactivity to/with other chemicals within the aquifer system.

Because of the lack of a complete understanding of contaminant behavior in the aquifer system, combined with only a very general knowledge of local soil/rock characteristics affecting this behavior, it is difficult to predict with a high degree of certainty exactly how far or in what direction a particular contaminant will travel in a given time. Numerous studies have been conducted in attempts to estimate travel characteristics, travel times, and residence times of commonly introduced contaminants in aquifer systems. Because of the inhomogeneity of the soil/rock and aquifer systems, most of these estimates provide either ranges of values for velocity, distance, and residence time for the contaminants or present some minimum setback distances based on risk potential to human health and welfare. Hence, rate, distance and longevity of contaminant data for an aquifer system should be recognized as a range of values when considered in the light of risk analysis. In order to develop an effective ground water protection program, an effort must be made to establish a minimum County—wide water quality baseline applicable to all potable water wells and against which to compare suspected contaminated areas. In addition, areas around public water supply wellfields should be provided protection in the form of land use restrictions and prohibitions. The extent of such areas should be predicated on geologic and hydrogeologic data as well as knowledge of the behavior of contaminants in these systems.

Wellfield protection zones are in reality risk management zones. Such zones must be based on the best available regional and local geologic and hydrogeologic information; historic and projected water demands; evaluation of contaminant behavior in the ground water systems; natural attenuation processes; remediation time and technology; and establishment of specific contaminant targets and thresholds. Computer models can evaluate data and generate projections of ground

water flow, contaminant travel, and drawdown characteristics within some confidence limits, but it still remains a policy decision of "how much risk is too much risk".

The three-dimensional ground water flow model for wellfields employed as a predictor in this study was programmed with a 20-year planning horizon. Input such as that mentioned above was then used to define a 20-year risk management zone around each public water supply wellfield. All ground water within this zone has the potential to reach the wellhead within 20 years, and numerous pathways were modeled to illustrate this. Within this zone, three additional zones were established. Zone 1 is defined as that area closest to the wellhead which contains five percent of the total ground water within the 20-year planning zone that will generally reach the wellhead within one year. The rationale for this zone is one of sanitary hazard versus natural attenuation and risk limits for most contaminants related to sanitary systems. Zone 2 is defined as that area closest to the wellhead, but outside of Zone 1, that contains ten percent of the total ground water within the 20-year planning zone. The model indicates that water in this zone will generally reach the wellhead within 2 years. The establishment of zones 2 and 3 is predicated on travel times, natural attenuation, and remediation time concerns for contaminants in the regulated or hazardous products and wastes categories. Zone-3 is defined as that area within the 20-year planning horizon in which 25 percent of the ground water will reach the wellhead within approximately five years. Zone 4 is defined as the remainder of the 20-year planning zone and is the immediate Zone of Contribution for these wellfields within the planning horizon time frame.

Significant contamination of ground water has occurred in every state of this nation, and is being detected with increasing frequency in urban and rural areas; in industrial as well as in agricultural regions, and is adversely effecting development and quality of life in many regions of the world (e.g., Love Canal). In Collier County, the water table is generally within six feet of the surface and the main potable water aquifers are recharged from infiltration through thin soils and semi-consolidated rock units. Natural attenuation of contaminants is not as effective as in other areas where there are thick soil horizons and the where the water table lies deeper beneath the surface. In addition, development in Collier County exposes the water table directly to land use pollutants via quarries, landscaping, stormwater retention/detention systems, accidental/incidental surficial pollution and poorly constructed and maintained wells.

The only long term approach to maintaining an acceptable level of ground water quality is to reduce the possibilities for ground water contamination rather than to depend on remediation. This approach must be based on the acquisition and analysis of accurate hydrologic and geologic data, understanding of the nature and reactions of contaminants in the ground water system, knowledge of background water quality levels, and realistic projections of future demands. From this data can be developed a comprehensive ground water protection program that addresses overall water quality across the County as well as that in the zones of contribution for public water supply wellfields.

2.2 MODELING OF 2003

The purpose of the 2003 modeling and reporting by the PCD's consultant, Dr. M.L. Voorhees, was to update the methodologies and results of the initial Collier County regional three-dimensional ground water flow model, and the subsequent wellfield submodel transport simulations performed by Voorhees et al, August 1989. The 2003 report describes an updated computer model of the aquifer system in Collier County, Florida, with a concentration on the simulation of wellfield

protection areas and efforts in the determination of wellfield protection regions. The following is largely extracted from the Voorhees 2003 report.

The purpose of the 2003 Voorhees investigation in Collier County was as follows:

(1) To update a wellfield protection computer model of the aquifer system in Collier County;
(2) To describe the effects of future ground water withdrawals on ground water flow in the vicinity of each study wellfields;
(3) To describe the one (1), two (2), five (5), and twenty (20)-year diversion area (i.e., protection zones or travel times) associated with the annual permitted allocation rate for each study wellfleld; and
(4) Provide extensive software development and training on this software to enable County staff the ability to update wellfield protection zones frequently.

The diversion area is defined as the area, in plan view, through which ground water moves within the aquifer system to a production well in a prescribed number of years. All analyses were performed assuming steady-state conditions. The term "Study Area," as it was used in this 2003 report, refers to a 2,220 square-mile area included in the model and enclosed by the regional model grid. In addition, seven separate study wellfields were investigated as follows:

City of Naples (East Golden Gate) – SFWMD Permit No. 1100018W;
City of Naples (Coastal Ridge) – SFWMD Permit No. 1100017W;
Collier County Utilities – SFWMD Permit No. 1100249W;
Immokalee – SFWMD Permit No. 1100013W;
Florida Cities Utilities (now Florida Governmental Utility Authority) – SFWMD Permit No. 1100148W;
Everglades City – SFWMD Permit No. 1100160W; and
Orangetree – SFWMD Permit No. 1100419W.

The extent of the 2,220 square-mile study area encompasses approximately the western two thirds of Collier County, the southern third of Lee County, and a small part of southern Hendry County in south Florida. The north boundary divides the topographic high about 7 miles north of Lake Trafford. The south boundary is south of the major portion of Lower Tamiami Canal. The east boundary is located far east in Big Cypress Swamp to minimize boundary effects on regional flow. The west boundary is the Gulf of Mexico.

An extensive general description of the study area hydrogeology is provided by Knapp et al, 1986, Bennett, 1992, and Voorhees et al, 1989. The reader should review Voorhees et al, 1989, Section 3, and Bennett, 1992 for details associated with hydrogeologic data for the study area. The rock units from which most potable water is withdrawn in Collier County are grouped according to previously defined stratigraphic units and by their hydraulic properties.

The sources of geologic and hydrologic data for Collier County, Florida as used in the model to the present are as follows:

Information	Source
Canal system	Collier County U.S. Geological Survey Bennett, 1992
Geologic structure	Knapp et al, 1986 Lee County study (Voorhees et al, 1988) Bennett, 1992
Hydraulic aquifer characteristics	Knapp et al, 1986 Lee County study (Voorhees et al, 1988) Collier County County utilities Bennett, 1992
Canal topology	U.S. Geological Survey topographic maps
Municipal pumping well topology	Collier County South Florida Water Management District Burns and Shih, 1984 Knapp et al, 1986 County utilities
Municipal wellfield pumpages	South Florida Water Management District Collier County Knapp et al, 1986 County utilities
Agricultural pumpage	Knapp et al, 1986 Collier County Collier County Agricultural Extension South Florida Water Management District
Hydrologic investigations	Knapp et al, 1986 Burns and Shih, 1984 Jacob, 1983 Gee & Jensen, 1980 Swayze and McPherson, 1977 Bennett et al, 1992 Voorhees et al, August 1989

Calibration of the ground water model is critically important to modeling studies such as being described. For the 2003 modeling work the regional model calibration was performed by combining the calibration results from reports from Voorhees et al, 1989 and Bennett, April 1992 (SFWMD). Voorhees et al, 1989 calibrated a regional model to a course grid and used the regional model to establish boundary conditions for several wellfield submodels. The technique of computerized optimization was used to achieve calibration. Bennett, April 1992 used a coarse grid in manually calibrating a regional model, which extended in depth vertically to the Hawthorn aquifer. By

combining the calibrated parameters from these two studies and performing detailed grid optimization to place model nodes as close as possible near wells in a single regional model, the original Voorhees et al, 1989 study with wellfield submodels has now been replaced with a single regional model. This provided a unified, streamlined, and easier wellfield protection modeling update procedure for Collier County staff. The deeper Hawthorn aquifer is now included in this model, which is an update as it was not part of the 1989 study, and as in the SFWMD model, the Hawthorn aquifer is configured as a fixed head boundary condition. Due to artesian conditions and extensive confining units above the Hawthorn aquifer, pumpage in the Hawthorn is assumed to not require wellfield protection analysis.

The theory associated with the delineation of wellfield protection zones is presented by Voorhees et al, 1989; Section 5 p29, and Section 11 p85. The reader is referred to that discussion for details of the procedure. The only departure in 2003 from that documented procedure is the initial placement of travel time particles at a production well over the entire producing aquifer, vertically. In the prior study by Voorhees et al, 1989 particles were placed at the vertical midpoint of the producing aquifer. The result of this procedural enhancement has been made possible by the availability of more accurate travel time delineation and more powerful computing resources.

Running of the model and hence delineation of the wellfield protection zones can be determined very easily by data entry of a few values that include the following:

(1) an exactly two character wellfield identifier for the well -- user selected;
(2) an exactly three character well identifier -- user selected;
(3) the SFWMD permitted wellfield average annual allocation in MGD for the well -- obtained from utilities with confirmation from SFWMD;
(4) the NAD83 Easterly and Northerly State Planar well coordinates in feet for the well -- based on GPS measurement by County or utility staff;
(5) the aquifer from which the well pumps -- obtained from utilities;
(6) the well pump capacity in GPM -- obtained from utilities with confirmation from SFWMD; and
(7) comment regarding the well -- user selected.

The item numbers coincide with the well data entry sequence for the software developed for this study. The wellfield protection pumpage for each well is then computed by the software developed for this project using the formula:

$$Qi = Qwa(Qci/\Sigma iQci)/1440 \qquad \text{(Eq 1)}$$

where:

Qi is the wellfield protection pumpage for well in gallons per minute (GPM);

Qwa is the SFWMD permitted wellfield average annual allocation in Millions of Gallons per Day (MGD);

Qci is the pump capacity of well in the wellfield, gallons per minute (GPM); and

$\Sigma iQci$ is the summation of all well capacities in the wellfield.

For this study these data were obtained from the various utilities by County staff and are presented in Appendix "B" with cross-references to the numbered items (1) through (7) listed above. For all wellfield protection simulations a conservative transport porosity of 0.15 was used to generate all ground water flow path lines. The methodologies used in the 2003 study are consistent with those previously applied by Voorhees et al, 1989 and the guidelines published for determination of wellhead protection areas (U.S. Environmental Protection Agency, 1987). The use of wellfield protection zones provides a consistent planning tool for the County and the extensive software development performed for the project provides a user-friendly system for County staff to update and change wellfield protection areas. Significant improvement of computational resources since the Voorhees et al, 1989 study provided improved accuracy for the determination of wellfield protection areas based on three dimensional ground water flow and the development of an integrated system which is more accessible by County staff.

2.3 MODELING OF 2004

The wellfield protection modeling undertaken in 2004 was carried out by Collier County staff; primarily Mr. Michael Lucas, Environmental Specialist. This modeling followed the methods described above and set up at that time on the county computers by the PCD's consultant, Dr. M.L.Voorhees.

The data collection phase of the work took place between approximately May and September 2004, and the computer modeling was completed by November 2004.

As described above the specially designed program suite comprises two linked computer codes:

- a hydrogeological model, and
- a freeware CAD program called IntelliCAD (a clone of AutoCAD).

The wellfields covered in the 2004 modeling exercise included:

Immokalee Wellfield
Orangetree Wellfield
Florida Governmental Utility Authority Golden Gate City Wellfield
Everglades City Wellfield
Collier County Utilities Wellfield - Golden Gate Wellfield
City of Naples - East Golden Gate Wellfield
City of Naples - Coastal Ridge Wellfield

The results of the modeling provided the LDC required W-1, W-2, W-3, and W-4 protection zones for each wellfield. These zones were included in Collier County Ordinance No. 05-27 as Sub Section 3.0. Amendments to Section 3.06.06 Regulated Wellfields**.**

2.4 MODELING OF 2007

The necessary raw data for the 2007 modeling exercise was gathered from the public water supply wellfield owners and stakeholders in October and November 2006. The wellfield protection modeling undertaken in 2007 was carried out by PCD staff member Dr. Alister Burnett, Environmental Specialist.

The wellfields modeled in 2007 included:

Immokalee Wellfield
Orangetree Wellfield
Ave Maria Utility Co. Wellfield
City of Naples - Coastal Ridge Wellfield
Everglades City Wellfield
Collier County Utilities Wellfield
City of Naples - East Golden Gate Wellfield
Florida Governmental Utility Authority Golden Gate City Wellfield

For the Everglades City Wellfield where there was no change in the input data from that used in 2004, the 2007 modeling resulted in exactly the same time path flowlines and, hence, the same one, two, five, and twenty year special treatment overlay Wellfield Protection Zones as the 2004 model.

For the extensive City of Naples Coastal Ridge and East Golden Gate Wellfields, and the Immokalee Wellfield, although minor model input changes were applied because of minor well or pumping changes, the resulting Wellfield Protection Zones are unchanged from the 2004 modeling.

For wellfields with new or significantly altered input data, new timeline flow path shapes files were generated resulting in new one, two, five, and twenty year Wellfield Protection Zones. This was the case for the Orangetree Wellfield, FGUA (Golden Gate) Wellfield, and Collier County Golden Gate Wellfield.

The entirely new Ave Maria Wellfield input data was compiled and applied to the model, which then generated new one, two, five, and twenty year timelines; i.e., special treatment overlay Wellfield Protection Zones ST/W-1, ST/W-2, ST/W-3, and ST/W-4.

A summary of the changes between the 2004 and 2007 modeling, which gave rise to the previous request for Amendments to the "Collier County Wellhead Protection Areas and Proposed Wellfields and ASRs Map" located within the Collier County Growth Management Plan's Future Land Use Element, are listed below.

Wellfield	**2004 Modeling**	**2007 Modeling**
Immokalee	13 wells	13 wells - no change
Orangetree	2 wells	4 wells – 2 new wells
Ave Maria Utility Co.	0 wells	6 new wells
Florida Governmental Utility Authority Golden Gate City	8 wells	8 wells - greater pumping
Everglades City	3 wells	3 wells – no change
Collier County Utilities (Golden Gate)	32 wells	34 wells - 2 new wells & greater pumping
City of Naples (Coastal Ridge)	26 wells	26 wells – no change

Wellfield	2004 Modeling	2007 Modeling
City of Naples (East Golden Gate)	23 wells	23 wells – no change
Port of the Islands	Not modeled	Not modeled

3. MODELING OF 2010 LEADING TO 2010 LDC AMENDMENT REQUEST

3.1 STAKEHOLDERS

The necessary raw data for the 2010 modeling was gathered from the public water supply wellfield owners and stakeholders in November 2009 and the wellfield protection modeling was carried out in early 2010 by PCD staff member Dr. Alister Burnett, Environmental Specialist.

The wellfields modeled in 2010 included:

Immokalee Wellfield
Orangetree Wellfield
Ave Maria Utility Co.Wellfield
Port of the Islands Wellfield
Florida Governmental Utility Authority Golden Gate City Wellfield
Everglades City Wellfield
Collier County Utilities Wellfield
City of Naples - East Golden Gate Wellfield
City of Naples - Coastal Ridge Wellfield

The full listing of organizations and personnel that were the primary contacts for the 2010 modeling is provided as Appendix A.

3.2 METHODS

The purpose of the 2010 modeling was, as before, to establish areas of increasing vulnerability surrounding each public wellfield that needed special protection from pollution. The methods used were exactly as described and used previously: collecting the relatively limited amount of input data; keying this data into the software; running the modeling software; generating the one, two, five, and twenty year particle flow path lines; drawing the shapes/polygons that surround each of these flow path shapes; and, copying and superimposing these zone shapes onto a base map of the county. These Wellfield Protection Zone maps then form the basis of the LDC content.

3.3 RESULTS

An important issue that became clear with this modeling was that every wellfield experienced some change since the 2007 modeling. Many of the changes were relatively minor; e.g., one or two wells abandoned or new wells drilled, new pumps with changed capacities installed, SFWMD annual withdrawal allocation changes, revisions to provided well coordinates, etc. There was no wellfield with exactly the same Wellfield Protection Zone as for the 2007 modeling.

Since 2007 the new shallow Port of the Islands Wellfield input data was compiled and applied to the model which then generated new one, two, five, and twenty year timelines; i.e., special treatment ovelay Wellfield Protection Zones ST/W-1, ST/W-2, ST/W-3, and ST/W-4. This new wellfield is included in Map 1 for the first time.

A summary of the changes between the 2004, 2007, and 2010 modeling, which gives rise to this request for Amendments to the "Collier County Wellhead Protection Areas and Proposed Wellfields and ASRs Map" located within the Collier County Growth Management Plan's Future Land Use Element, is listed below.

Wellfield	**2004 Modeling**	**2007 Modeling**	**2010 Modeling**
Immokalee	13 wells	13 wells - no change	16 wells – 3 new wells
Orangetree	2 wells	4 wells – 2 new wells	4 wells – changed pumping
Ave Maria Utility Co.	0 wells	6 new wells	6 wells – changed pumping
Florida Governmental Utility Authority Golden Gate City	8 wells	8 wells - greater pumping	8 wells – changed pumping
Everglades City	3 wells	3 wells – no change	3wells – changed pumping
Collier County Utilities (Golden Gate)	32 wells	34 wells - 2 new wells & greater pumping	36 wells – 2 new wells
City of Naples (Coastal Ridge)	26 wells	26 wells – no change	31 wells – 5 new wells
City of Naples (East Golden Gate)	23 wells	23 wells – no change	23 wells – changed pumping
Port of the Islands	Not modeled	Not modeled	3 new shallow wells

Detailed model input data for each wellfield is attached in Appendix B.

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APPENDIX A: TABLE OF OWNERS AND STAKEHOLDERS FOR THE 2010 WELLFIELD PROTECTION ZONE MODELING

Organization	Role	Contact Person(s)	Address of Contact	Contact Telephone #	Contact Email
Collier County Pollution Control & Prevention Dept	Project Coordinator Supervisor	Dr. Alister Burnett Rob Ward	3301 Tamiami Trail East Health & Comm. Bldg. 3rd Floor Naples, FL 34113	239 732-2502 ext 5087 239 732-2502 ext 5388	AlisterBurnett@colliergov.net RobWard@colliergov.net
Independent Consultant	Wellfield Model Program Designer	Dr. Michael Voorhees	C/o Hazlett-Kincaid Inc 15 Rockhill Drive, Broomall, PA 19008	610 325-2174	mvoorc@rnichaellvoorhees.com
Everglades City	Everglades City Wellfield Owner/Operator	Dottie Joiner Scott Tim Stevens	City Clerk Everglades City 102 Broadway Avenue E., Everglades City FL 34139	239 695-3781 239 253-9714	dsmallwood@cityofeverglades.com
Florida Government Utility Authority	Golden Gate City Wellfield Owner/Operator	Robert Dick (Severn Trent)	FL Government Utilities Authority 4300 Golden Gate Pkwy Naples, FL 34116	239 455-4704 239 707-4275	rdick@stes.com
Immokalee City	Immokalee Wellfield Owner/Operator	Jerry Warden	Immokalee Water & Sewer District 1020 Sanitation Road Immokalee, FL 34142	239 658-3630	jerrywarden@IW-SD.com
Orange Tree Utility Co.	Orange Tree Wellfield Owner/Operator	Kimberly Retallic William Murchie	Orange Tree Utility Co Inc., 4500 Executive Drive # 110, Naples FL 34119	239 596-4088	wmurchie@gmail.com
Collier County Utilities	Golden Gate Wellfield Owner/Operator	Steve Lang	Principal Environmental Specialist Collier County, Water Administration 4370 Mercantile Ave. Naples, FL 34104	239 252-6113	stevelang@colliergov.net
City of Naples	East Golden Gate Wellfield Owner/Operator	Bobb Reeder	Dept of Public Works, Utilities 380 Riverside Circle, Naples, FL 34102	239 213-3005 239 213-3001 Fax	breeder@naplesgov.com
Barron Collier Companies Water Utilities	Ave Maria Wellfield Owner/Operator	David Genson David Hoffman	Ave Maria Water Utilities 2600 Golden Gate Pkwy, Naples, FL 34142 Johnson Engineering, 2122 Johnson Street, Ft. Myers, FL 34105	239 262-2600 813 874-0777	Dgenson@barroncollier.com dhoffman@johnsonengineering

Organization	**Role**	**Contact Person(s)**	**Address of Contact**	**Contact Telephone #**	**Contact Email**
South Florida Water Management District	Water Use Permitting Authority	Jennifer Drozd (Water Use Regulation) Donna Rickabus (Water Use)	Water Use Regulation Dept SFWMD, Gun Club Road West Palm Beach, FL	561 682-2055 561 682-2729	jdrozd@sfwmd.gov drickabu@sfwmd.gov
Port of the Islands	Port of the Islands Wellfield	Robert Dick (Severn Trent) Ronald Benson (Hole Montes)	5726 Corporation Circle, Ft. Myers, FL 33905 Hole Montes, 950 Encore Way, Naples, FL 34110	239 707-4275 239 254-2000	rdick@stes.com RonBenson@hmeng.com
City of Marco Island	Marco Lakes Water Utility Owner/Operator	Bruce Weinstein	Water Utilities Department 50 Bald Eagle Drive, City of Marco Island, FL 34145	239 389-5182	bweinstein@cityofmarcoisland.com

APPENDIX B: 2010 WELLFIELD MODELING DATA

IMMOKALEE WELLFIELD (SFWMD Permit 11-00013-W)

Description (Comment) (7)	Wellfield ID 1	Well ID 2	AVERAGE Allocation (MGD) 3	NAD83 Easterly (ft) 4	NAD83 Northerly (ft) 4	Producing Aquifer 5	Well Capacity (GPM) 6	Modeled Discharge (GPM) (Eq. 1)
well 201 INE Immokalee	IU	201	3.363	522288	760414	Lower Tamiami	350	163
well 202 INE Immokalee	IU	202	3.363	522653	760419	Lower Tamiami	350	163
well 203 INE Immokalee	IU	203	3.363	521933	759759	Lower Tamiami	350	163
well 107 INW Immokalee	IU	107	3.363	508669	763988	Lower Tamiami	250	116
well 103 INW Immokalee	IU	103	3.363	509043	764583	Lower Tamiami	200	93
well 104 INW Immokalee	IU	104	3.363	509462	764641	Lower Tamiami	350	163
well 105 INW Immokalee	IU	105	3.363	508507	764029	Lower Tamiami	350	163
well 106 INW Immokalee	IU	106	3.363	508552	763898	Lower Tamiami	350	163
well 7 SE Immokalee	IU	007	3.363	516219	754970	Lower Tamiami	400	186
well 8 SE Immokalee	IU	008	3.363	516483	755326	Lower Tamiami	200	93
well 9 SE Immokalee	IU	009	3.363	515837	754728	Lower Tamiami	225	105

Description Comment (7)	Wellfield ID 1	Well ID 2	AVERAGE Allocation (MGD) 3	NAD83 Easterly (ft) 4	NAD83 Northerly (ft) 4	Producing Aquifer 5	Well Capacity (GPM) 6	Modeled Discharge (GPM) (Eq. 1)
well 10B SE Immokalee	IU	10B	3.363	516766	755265	Lower Tamiami	350	163
well 11 SE Immokalee	IU	011	3.363	516703	755040	Lower Tamiami	250	116
well 12 SE Immokalee	IU	I12	3.363	515837	755399	Lower Tamiami	350	163
well 13 SE Immokalee	IU	I13	3.363	515253	755094	Lower Tamiami	350	163
well 14 SE Immokalee	IU	I14	3.363	515231	755376	Lower Tamiami	350	163

Comment for all the following tables:

1 An exactly two character well field identifier.

2 An exactly three character well identifier.

3 The South Florida Water Management District (SFWMD) permitted well field average annual allocation in MGD for the well.

4 The NAD83 Easterly and Northerly State Planar coordinates in feet for the well.

5 The producing aquifer from which the well draws.

6 The well pump capacity in GPM.

7 Comment regarding the well.

The item numbers coincide with the well data entry sequence for the software developed for this study.

The well field protection pumpage for each well is then computed by the software developed for this project using the formula:

(Eq. 1) $Q_i = Q_{wa}(Q_{ci}/\sum_i Q_{ci})/1440$

where;

Q_i - is the well field protection pumpage for well *(i)*in gallons per minute (GPM);

Q_{wa} - is the SFWMD permitted well field average annual allocation in Gallons per Day;

Q_{ci} - is the pump capacity of well *(i)*in the well field, gallons per minute (GPM); and

$\sum_i Q_{ci}$ - is the summation of all well capacities in the wellfield.

ORANGETREE WELLFIELD (SFWMD Permit 11-00419-W)

Description (Comment) (7)	Wellfield ID 1	Well ID 2	AVERAGE Allocation (MGD) 3	NAD83 Easterly (ft) 4	NAD83 Northerly (ft) 4	Producing Aquifer 5	Well Capacity (GPM) 6	Modeled Discharge (GPM) (Eq. 1)
Orangetree well OT1	OT	OT1	0.860	466038	713260	Lower Tamiami	300	149
Orangetree well OT2	OT	OT2	0.860	464959	713814	Lower Tamiami	300	149
Orangetree well OT3	OT	OT3	0.860	465006	712047	Lower Tamiami	300	149
Orangetree well OT4	OT	OT4	0.860	464627	711612	Lower Tamiami	300	149

AVE MARIA UTILITY CO. WELLFIELD (SFWMD Permit 11-02298-W)

Description (Comment) (7)	Wellfield ID 1	Well ID 2	AVERAGE Allocation (MGD) 3	NAD83 Easterly (ft) 4	NAD83 Northerly (ft) 4	Producing Aquifer 5	Well Capacity (GPM) 6	Modeled Discharge (GPM) (Eq. 1)
Ave Maria Utility (AV) well PWS-1	AV	A01	1.260	511739	723678	Lower Tamiami	700	146
Ave Maria Utility (AV) well PWS-2	AV	A02	1.260	511839	722914	Lower Tamiami	700	146
Ave Maria Utility (AV) well PWS-3	AV	A03	1.260	512239	722023	Lower Tamiami	700	146
Ave Maria Utility (AV) well 4	AV	A04	1.260	512894	721212	Lower Tamiami	700	146
Ave Maria Utility (AV) well 5	AV	A05	1.260	513480	720338	Lower Tamiami	700	146
Ave Maria Utility (AV) well 6	AV	A06	1.260	513896	719472	Lower Tamiami	700	146

FLORIDA GOVERNMENTAL UTILITY AUTHORITY GOLDEN GATE CITY WELLFIELD (SFWMD Permit 11-00148-W)

Description (Comment) (7)	Wellfield ID 1	Well ID 2	AVERAGE Allocation (MGD) 3	NAD83 Easterly (ft) 4	NAD83 Northerly (ft) 4	Producing Aquifer 5	Well Capacity (GPM) 6	Modeled Discharge (GPM) (Eq. 1)
FGUA well 1	FG	J01	1.923	428360	672103	Water Table	200	132
FGUA well 2A	FG	J02	1.923	428341	672024	Water Table	250	164

Description (Comment) (7)	Wellfield ID 1	Well ID 2	AVERAGE Allocation (MGD) 3	NAD83 Easterly (ft) 4	NAD83 Northerly (ft) 4	Producing Aquifer 5	Well Capacity (GPM) 6	Modeled Discharge (GPM) (Eq. 1)
FGUA well 3	FG	J03	1.923	428673	672057	Water Table	180	118
FGUA well 4	FG	J04	1.923	428577	672050	Water Table	200	132
FGUA well 5	FG	J05	1.923	428603	672144	Water Table	250	164
FGUA well 8	FG	J08	1.923	428648	671962	Water Table	250	164
FGUA well 10	FG	J10	1.923	428423	671993	Water Table	350	230
FGUA well 11	FG	J11	1.923	428540	671974	Water Table	350	230

EVERGLADES CITY WELLFIELD (SFWMD Permit 11-00160-W)

Description (Comment) (7)	Wellfield ID 1	Well ID 2	AVERAGE Allocation (MGD) 3	NAD83 Easterly (ft) 4	NAD83 Northerly (ft) 4	Producing Aquifer 5	Well Capacity (GPM) 6	Modeled Discharge (GPM) (Eq. 1)
Everglades City well EC1	EC	EC1	0.289	536019	590264	Water Table	220	67
Everglades City well EC2	EC	EC2	0.289	536398	590230	Water Table	220	67
Everglades City well EC3	EC	EC3	0.289	536823	590233	Water Table	220	67

COLLIER COUNTY UTILITIES GOLDEN GATE WELLFIELD (SFWMD Permit 11-00249-W)

Description (Comment) (7)	Wellfield ID 1	Well ID 2	AVERAGE Allocation (MGD) 3	NAD83 Easterly (ft) 4	NAD83 Northerly (ft) 4	Producing Aquifer 5	Well Capacity (GPM) 6	Modeled Discharge (GPM) (Eq. 1)
Collier County CGG well 1	CC	001	26.501	452696	684329	Lower Tamiami	700	418
Collier County CGG well 2	CC	002	26.501	453992	683964	Lower Tamiami	700	418
Collier County CGG well 3	CC	003	26.501	455312	684026	Lower Tamiami	700	418
Collier County CGG well 4	CC	004	26.501	456661	683855	Lower Tamiami	700	418
Collier County CGG well 5	CC	005	26.501	458020	683818	Lower Tamiami	700	418
Collier County CGG well 6	CC	006	26.501	457272	685070	Lower Tamiami	700	418
Collier County CGG well 7	CC	007	26.501	457256	686049	Lower Tamiami	700	418
Collier County CGG well 9	CC	009	26.501	457239	688013	Lower Tamiami	700	418
Collier County CGG well 10	CC	010	26.501	457230	689001	Lower Tamiami	700	418
Collier County CGG well 11	CC	011	26.501	457226	690352	Lower Tamiami	700	418
Collier County CGG well 12	CC	012	26.501	457210	691367	Lower Tamiami	700	418
Collier County CGG well 13	CC	013	26.501	457202	692450	Lower Tamiami	700	418
Collier County CGG well 14	CC	014	26.501	457204	693358	Lower Tamiami	700	418

Description (Comment) (7)	Wellfield ID 1	Well ID 2	AVERAGE Allocation (MGD) 3	NAD83 Easterly (ft) 4	NAD83 Northerly (ft) 4	Producing Aquifer 5	Well Capacity (GPM) 6	Modeled Discharge (GPM) (Eq. 1)
Collier County CGG well 15	CC	015	26.501	457185	694327	Lower Tamiami	700	418
Collier County CGG well 16	CC	016	26.501	457178	695328	Lower Tamiami	1000	598
Collier County CGG well 17	CC	017	26.501	459945	683749	Lower Tamiami	1000	598
Collier County CGG well 18	CC	018	26.501	461252	683766	Lower Tamiami	1000	598
Collier County CGG well 19	CC	019	26.501	462584	683766	Lower Tamiami	1000	598
Collier County CGG well 20	CC	020	26.501	462742	684758	Lower Tamiami	1000	598
Collier County CGG well 21	CC	021	26.501	457821	682202	Lower Tamiami	1000	598
Collier County CGG well 22	CC	022	26.501	457821	681282	Lower Tamiami	1000	598
Collier County CGG well 23	CC	023	26.501	457824	680193	Lower Tamiami	1000	598
Collier County CGG well 24	CC	024	26.501	457825	679542	Lower Tamiami	1000	598
Collier County CGG well 25	CC	025	26.501	457834	678232	Lower Tamiami	1000	598
Collier County CGG well 26	CC	026	26.501	459136	678097	Lower Tamiami	1000	598
Collier County CGG well 27	CC	027	26.501	460464	678044	Lower Tamiami	1000	598
Collier County CGG well 28	CC	C28	26.501	452685	685170	Lower Tamiami	1000	598

Description (Comment) (7)	Wellfield ID 1	Well ID 2	AVERAGE Allocation (MGD) 3	NAD83 Easterly (ft) 4	NAD83 Northerly (ft) 4	Producing Aquifer 5	Well Capacity (GPM) 6	Modeled Discharge (GPM) (Eq. 1)
Collier County CGG well 29	CC	C29	26.501	453981	684772	Lower Tamiami	1000	598
Collier County CGG well 30	CC	C30	26.501	462649	685209	Lower Tamiami	1000	598
Collier County CGG well 31	CC	C31	26.501	456861	696390	Lower Tamiami	1000	598
Collier County CGG well 32	CC	C32	26.501	457158	697703	Lower Tamiami	1000	598
Collier County CGG well 33	CC	C33	26.501	451507	684037	Lower Tamiami	1000	598
Collier County CGG well 34	CC	C34	25.501	456661	705126	Lower Tamiami	999	594
Collier County CGG well 35	CC	D35	26.501	434546	695012	Lower Tamiami	1000	598
Collier County CGG well 36	CC	D36	26.501	433377	695041	Lower Tamiami	1000	598
Collier County CGG well 37	CC	D37	26.501	457107	701327	Lower Tamiami	1000	592

CITY OF NAPLES COASTAL RIDGE WELLFIELD (SFWMD Permit 11-00017-W)

Description (Comment) (7)	Wellfield ID 1	Well ID 2	AVERAGE Allocation (MGD) 3	NAD83 Easterly (ft) 4	NAD83 Northerly (ft) 4	Producing Aquifer 5	Well Capacity (GPM) 6	Modeled Discharge (GPM) (Eq. 1)
Coastal Ridge well 301	CR	1	18.422	396597	669462	Lower Tamiami	350	402

Description (Comment) (7)	Wellfield ID 1	Well ID 2	AVERAGE Allocation (MGD) 3	NAD83 Easterly (ft) 4	NAD83 Northerly (ft) 4	Producing Aquifer 5	Well Capacity (GPM) 6	Modeled Discharge (GPM) (Eq. 1)
Coastal Ridge well 302	CR	2	18.422	397189	670330	Lower Tamiami	350	402
Coastal Ridge well 303	CR	3	18.422	398109	670327	Lower Tamiami	350	402
Coastal Ridge well 304	CR	4	18.422	396577	670500	Lower Tamiami	350	402
Coastal Ridge well 305	CR	5	18.422	396572	671579	Lower Tamiami	350	402
Coastal Ridge well 306	CR	6	18.422	396562	672621	Lower Tamiami	350	402
Coastal Ridge well 307	CR	7	18.422	396608	674016	Lower Tamiami	350	402
Coastal Ridge well 308	CR	8	18.422	396591	674837	Lower Tamiami	350	402
Coastal Ridge well 309	CR	9	18.422	396571	675695	Lower Tamiami	350	402
Coastal Ridge well 310	CR	10	18.422	396638	677293	Lower Tamiami	350	402
Coastal Ridge well 311	CR	11	18.422	397158	678280	Lower Tamiami	350	402
Coastal Ridge well 312	CR	12	18.422	397149	679281	Lower Tamiami	350	402
Coastal Ridge well 313	CR	13	18.422	397123	680335	Lower Tamiami	350	402
Coastal Ridge well 314	CR	14	18.422	396941	681507	Lower Tamiami	350	402
Coastal Ridge well 315	CR	15	18.422	396953	682625	Lower Tamiami	350	402

Description (Comment) (7)	Wellfield ID 1	Well ID 2	AVERAGE Allocation (MGD) 3	NAD83 Easterly (ft) 4	NAD83 Northerly (ft) 4	Producing Aquifer 5	Well Capacity (GPM) 6	Modeled Discharge (GPM) (Eq. 1)
Coastal Ridge well 316	CR	16	18.422	396617	683001	Lower Tamiami	350	402
Coastal Ridge well 317	CR	17	18.422	396597	683912	Lower Tamiami	350	402
Coastal Ridge well 318	CR	18	18.422	396718	684917	Lower Tamiami	350	402
Coastal Ridge well 319	CR	19	18.422	396836	685908	Lower Tamiami	350	402
Coastal Ridge well 320	CR	20	18.422	396970	686865	Lower Tamiami	350	402
Coastal Ridge well 321	CR	21	18.422	397104	687872	Lower Tamiami	350	402
Coastal Ridge well 322	CR	22	18.422	397218	688878	Lower Tamiami	350	402
Coastal Ridge well 323	CR	23	18.422	397353	689884	Lower Tamiami	350	402
Coastal Ridge well 324	CR	24	18.422	397488	690885	Lower Tamiami	350	402
Coastal Ridge well 327	CR	27	18.422	397876	693875	Lower Tamiami	350	402
Coastal Ridge well 328	CR	28	18.422	398004	694918	Lower Tamiami	350	402
Coastal Ridge well 306A	CR	6A	18.422	396554	673100	Lower Tamiami	500	574
Coastal Ridge well 309A	CR	9A	18.422	396491	676799	Lower Tamiami	500	574
Coastal Ridge well 335 - previously 1A	CR	335	18.422	394679	667183	Lower Tamiami	350	402

Description (Comment) (7)	Wellfield ID 1	Well ID 2	AVERAGE Allocation (MGD) 3	NAD83 Easterly (ft) 4	NAD83 Northerly (ft) 4	Producing Aquifer 5	Well Capacity (GPM) 6	Modeled Discharge (GPM) (Eq. 1)
Coastal Ridge well 336 - previously 2A	CR	336	18.422	394988	667210	Lower Tamiami	350	402
Coastal Ridge well 340 - previously 6A	CR	340	18.422	395523	666902	Lower Tamiami	350	402

CITY OF NAPLES EAST GOLDEN GATE WELLFIELD (SFWMD Permit 11-00017-W)

Description (Comment) (7)	Wellfield ID 1	Well ID 2	AVERAGE Allocation (MGD) 3	NAD83 Easterly (ft) 4	NAD83 Northerly (ft) 4	Producing Aquifer 5	Well Capacity (GPM) 6	Modeled Discharge (GPM) (Eq. 1)
City of Naples Golden Gate well 401	EG	G01	18.839	482701	695225	Lower Tamiami	500	377
City of Naples Golden Gate well 402	EG	G02	18.839	482704	693920	Lower Tamiami	500	377
City of Naples Golden Gate well 403	EG	G03	18.839	482691	692590	Lower Tamiami	500	377
City of Naples Golden Gate well 404	EG	G04	18.839	482758	691174	Lower Tamiami	700	528
City of Naples Golden Gate well 405	EG	G05	18.839	482736	689963	Lower Tamiami	900	679
City of Naples Golden Gate well 406	EG	G06	18.839	482746	688590	Lower Tamiami	500	377
City of Naples Golden Gate well 407	EG	G07	18.839	482749	687262	Lower Tamiami	900	679
City of Naples Golden Gate well 408	EG	G08	18.839	482756	685936	Lower Tamiami	900	679

Description (Comment) (7)	Wellfield ID 1	Well ID 2	AVERAGE Allocation (MGD) 3	NAD83 Easterly (ft) 4	NAD83 Northerly (ft) 4	Producing Aquifer 5	Well Capacity (GPM) 6	Modeled Discharge (GPM) (Eq. 1)
City of Naples Golden Gate well 409	EG	G09	18.839	482764	684619	Lower Tamiami	700	528
City of Naples Golden Gate well 410	EG	G10	18.839	482775	683302	Lower Tamiami	700	528
City of Naples Golden Gate well 411	EG	G11	18.839	482781	681984	Lower Tamiami	600	452
City of Naples Golden Gate well 412	EG	G12	18.839	482794	680670	Lower Tamiami	700	528
City of Naples Golden Gate well 413	EG	G13	18.839	482801	679348	Lower Tamiami	700	528
City of Naples Golden Gate well 414	EG	G14	18.839	482806	678021	Lower Tamiami	700	528
City of Naples Golden Gate well 416	EG	G16	18.839	482671	697908	Lower Tamiami	1000	754
City of Naples Golden Gate well 417	EG	G17	18.839	482654	699276	Lower Tamiami	1000	754
City of Naples Golden Gate well 418	EG	G18	18.839	482643	700542	Lower Tamiami	1000	754
City of Naples Golden Gate well 419	EG	G19	18.839	482657	701810	Lower Tamiami	1000	754
City of Naples Golden Gate well 420	EG	G20	18.839	482639	703184	Lower Tamiami	1000	754
City of Naples Golden Gate well 421	EG	G21	18.839	482493	704438	Lower Tamiami	700	528
City of Naples Golden Gate well 425	EG	G25	18.839	482471	705842	Lower Tamiami	1000	754
City of Naples Golden Gate well 423	EG	G23	18.839	477755	691318	Lower Tamiami	750	566

Description (Comment) (7)	Wellfield ID 1	Well ID 2	AVERAGE Allocation (MGD) 3	NAD83 Easterly (ft) 4	NAD83 Northerly (ft) 4	Producing Aquifer 5	Well Capacity (GPM) 6	Modeled Discharge (GPM) (Eq. 1)
City of Naples Golden Gate well 424	EG	G24	18.839	477245	692616	Lower Tamiami	400	302

PORT OF THE ISLANDS WELLFIELD (SFWMD Permit 11-00372-W)

Description (Comment) (7)	Wellfield ID 1	Well ID 2	AVERAGE Allocation (MGD) 3	NAD83 Easterly (ft) 4	NAD83 Northerly (ft) 4	Producing Aquifer 5	Well Capacity (GPM) 6	Modeled Discharge (GPM) (Eq. 1)
Port of the Islands well EW2	PI	EW2	0.548	498102	598211	Water Table	300	127
Port of the Islands well PW1	PI	PW1	0.548	495674	598160	Water Table	300	127
Port of the Islands well EW1	PI	EW1	0.548	497107	598185	Water Table	300	127