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Pinellas County UTILITIES Engineering

December 19, 2006

Mr. Darrin Herbst, P.G.
Southwest Florida Water Management District
7601 Highway 301 North
Tampa, FL. 33637

Subject: **Responses to Request for Additional Information**
Pinellas County Utilities (East Lake Woodlands Country Club)
WUP No. 20012943.000

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT RECEIVED DEC 20 2006 TAMPA

Dear Darrin:

Pinellas County Utilities has prepared the following responses to the request for additional information in the letter dated June 8, 2006 for the referenced Water Use Permit application. Please note the requested quantities have changed as a result of a reduction in the number of irrigated acres associated with the golf course, the clubhouse and an error in calculating the irrigation quantities. The requested annual average quantity is 284,256 gpd. The peak month quantity of 1.008 mgd remains the same. These changes are discussed in the items below.

Attached to this letter is a CD containing the input and output files for the groundwater modeling associated with the revised requested quantities.

The responses to the District's questions are as follows:

<u>Groundwater Quantity</u>

1. **Table C-1 includes the total irrigated acreage for each hole of the golf courses. However, the total acreage of the tees, greens, fairways, and roughs for each hole was not provided. Please provide a revised table which provides a breakdown of the tees, greens, and fairways for each hole. [Rules 40D-2.091, Florida Administrative Code (F.A.C.); 40D-2.101, F.A.C.; 40D-2.301(1)(a), F.A.C.; and Section 4.1, Basis of Review (B.O.R.)]**

   Attachment A contains **Table A-1** which provides the breakdown of the tees, greens, and fairways for each hole. The area of the tees and greens are the actual square feet of sod that was used to replace the tees and greens and are more accurate than the GIS area calculation. Also, the driving range tees are not included in the calculated tee areas as these areas were not replaced with sod. For this WUP application we are submitting the green and tee areas that were re-sodded.

PLEASE ADDRESS REPLY TO:
14 S. Ft. Harrison Avenue
Clearwater, Florida 33756
Phone: (727) 464-3588
FAX: (727) 464-3595
Website: www.pinellascounty.org

2. **Based on your response to RAI question No. 8, it appears that the revised requested annual average and peak month quantities includes quantities associated with the irrigation of landscaping in the swim area, tennis club, and clubhouse areas as well as the irrigation of clay tennis courts. Please outline the landscape areas associated with the swim area, tennis club, and clubhouse areas on an aerial photograph (Scale 1 inch = 200 feet) so the acreage may be verified. Additionally, please provide documentation which supports reasonable quantities associated with the irrigation of the clay tennis courts. Please also provide the number and size of the tennis courts and the irrigation schedule for the courts. [Rules 40D-2.091, F.A.C.; 40D-22.101, F.A.C.; 40D-2-301(1)(a), F.A.C.; and Section 4.1, B.O.R.]**

Attachment A provides an aerial photograph (**Figure A-1**) of the swim area, tennis and clubhouse. The irrigated areas are depicted on the aerial and the area of each polygon was calculated by the GIS software. Note the irrigated areas total 6.85 acres.

Attachment A also provides a portion of the maintenance manual for the clay tennis courts. If appropriate water content is not maintained in the courts, the surface will become dry. Surface material will blow away if dry and footing on the court becomes slippery and uneven. This presents a safety hazard. Based on the experience from the tennis maintenance personnel, the courts are wetted 3 times a day. There are 14 clay tennis courts. Each court has 4 sprinkler heads rated at 5 gpm/head. The irrigation cycle is 5 minutes. The total irrigation quantity is 4200 gpd.

4 heads x 5 gpm/head x 5 minutes = 100 gallons/ irrigation cycle/court
100 gallons x 14 courts = 1400 gallons/irrigation cycle.
1400 gallons x 3 /day = 4200 gpd.

There are 14 clay tennis courts and they vary slightly in size. The clay tennis courts are paired together. We calculated that 5 of the clay tennis courts pairs (10 courts) measure 120 feet by 110 feet. Another tennis court pair measures 120 feet by 120 feet and the last clay tennis court pair measures 130 feet by 130 feet.

3. **Due to the fact that you reduced the tee and green acreage and added 7.2 acres of landscape irrigation/clay tennis court watering, our preliminary AGMOD indicates a demand of 292,300 gpd for the supplemental months of October, November, March, April, May, and June. Please provide revised annual average and peak month quantities as appropriate based on your responses to Questions 1 and 2. Please note that the groundwater models will need to be revised based on your response. [Rules 40D-2.091, F.A.C.; 40D-2.101; F.A.C.; 40D-2.301(1)(a), F.A.C.; and Section 4.1, B.O.R.]**

Attachment A contains **Table A-2** which provides the revised AGMOD calculations for the golf course and swim, tennis and clubhouse irrigated areas. The AGMOD output is contained in **Attachment A** for the irrigated acres. The total irrigated golf course acres remains 169.1 with 8.95 acres of greens and tees. The area irrigated around the clubhouses is 6.85 acres. **Table A-2** also provides the wetting requirements for the 14 clay tennis courts.

Included in **Table A-2** is the revised WUP requested quantities. The total requested average annual quantity of 284,256 gpd is less than the AGMOD calculated quantities. The requested peak month still remains 1.008 mgd. We made an error in calculating the irrigated acres associated with the tennis, swim and clubhouse areas and provided these quantities to the consultant for modeling purpose prior to noticing the error. Instead of re-running the model at the higher quantity we decided to stay with the 284,246 gpd. This also provides us with some cushion should there be a debate on calculating the irrigated areas or tennis court quantities.

<u>Groundwater Modeling</u>

4. **The technical memorandum from SDI Environmental Services, Inc. references locations where documentation of the model development and calibration can be found. However, documentation of the model used for this water use permit must be submitted and included in the file of record for this water use permit. Therefore, please provide copies off all supporting documentation for the model results submitted for this permit. Please also distinguish if any changes to the model have been made as part of the model for this application from the supporting documentation. [Rules 40D-2.091, Florida Administrative Code (F.A.C.); 40D-2.101, F.A.C.; 40D-2.301(1)(b)(c)(d)(f)(i)(m), F.A.C.; and Sections 4.2, 4.3, 4.5, 4.6, 4.8, and 4.13, B.O.R.]**

   Please refer to **Attachment B** which contains the technical memorandum from SDI Environmental Services Inc. and addresses this question. One hard copy of the report documentation is included with this response and 2 CD's containing the electronic version of the report.

   NOTE: The report is very large and contains 630 pages.

5. **Review of Figure 9.3 Modeled Spatial Distribution of Storativity in the East Lake WellField Area of the Memorandum dated May 26, 2006 from SDI Environmental Services, Inc. to David Slonena, P.G. reflects that the storativity values in the Upper Floridan aquifer range from 0.080 to 0.400 ft/ft. These values appear to be high as compared to values determined from aquifer performance tests results provided in the District's Aquifer Characteristics Report 99-1 dated February 2000. Please verify these storativity values and provide the basis for these values. Please note that a revised model may need to be submitted if changes are made to the model. [Rules 40D-2.091, Florida Administrative Code (F.A.C.); 40D-2.101, F.A.C.; 40D-2.301(1)(b)(c)(d)(f)(i)(m), F.A.C.; and Sections 4.2, 4.3, 4.5, 4.6, 4.8, and 4.13, B.O.R.]**

   Please refer to **Attachment B** which contains the technical memorandum from SDI Environmental Services Inc. and addresses this question.

6. **Review of Figure 9.4 Modeled Average Annual recharge Distribution in the East Lake Wellfield Area of the Memorandum dated May 26, 2006 from SDI Environmental Services, Inc. to David Slonena, P.G. reflects that the recharge values in some areas range from 10.1 to 17.3 inches/year. These values appear to be high. Please verify the areas with recharge values ranging between 10.1 to 17.3 inches/year. Was the rainfall in 1990 from which the recharge was calculated**

represented in the integrated model representative of a period of mean or median rainfall for the area? Please also provide more refinement of the recharge values in the areas shown with recharge values between 10.7 and 17.3 inches/year. Would the predicted drawdowns be affected if rainfall values from a different year were used (i.e. mean or median)? Please note that a revised model may need to be submitted if changes are made to the model. [Rules 40D-2.091, F.A.C.; 40D-2.101, F.A.C.; 40D-2.301(1)(b)(c)(d)(f)(i)(m), F.A.C.; and Sections 4.2, 4.3, 4.5, 4.6, 4.8, and 4.13, B.O.R.]

Please refer to **Attachment B** which contains the technical memorandum from SDI Environmental Services Inc. and addresses this question.

7. **Review of the water budget provided indicates that the model is separated into 134 zones. Please explain how this zonation is included in the model and provide a figure which spatially shows these zones. [Rules 40D-2.091, F.A.C.; 40D-2.101, F.A.C.; 40D-2.301(1)(b)(c)(d)(f)(i)(m),F.A.C.; and Sections 4.2, 4.3, 4.5, 4.6, 4.8, and 4.13, B.O.R.]**

   Please refer to **Attachment B** which contains the technical memorandum from SDI Environmental Services Inc. and addresses this question.

8. **Please provide an annual average cumulative regional model which includes all regional wellfields including the City of Oldsmar's withdrawals and the withdrawals associated with Tampa Bay Water's withdrawals from the former Carrollwood Wells Florida Government Utility Authority (FGUA). [Rules 40D-2.091, F.A.C.; 40D-2.101, F.A.C.; 40D-2.301(1)(b)(c)(d)(f)(l)(m), F.A.C.; and Sections 4.2, 4.3, 4.5, 4.6, 4.8, and 4.13, B.O.R.]**

   Please refer to **Attachment B** which contains the technical memorandum from SDI Environmental Services Inc. and addresses this question.

<u>Saline Water Intrusion</u>

9. **Table 2 included the Memorandum dated May 26, 2006 from SDI Environmental Services, Inc. to David Slonena, P.G. summarizes Long-Term (WY00-WY05) and Recent (WY03-WY05) average water levels for the saltwater intrusion wells to demonstrate that the predicted impacts in the Upper Floridan aquifer at these wells are acceptable and will not cause additional saline water intrusion. Please explain how the long term and recent average water levels were calculated and provide the database used to calculate these levels for each saltwater intrusion monitor well. Please note that District Staff recently calculated 6 and 10-year period assessments of the wells. It may be necessary to re-evaluate the impacts to these salt-water intrusion wells depending on the method of calculation used to determine the Long Term average water levels. [Rules 40D-2.091, F.A.C.; 40D-2.101, F.A.C.; 40D-2.301(1)(b)(f)(m), F.A.C.; and Section 4.5, B.O.R.]**

   Please refer to **Attachment B** which contains the technical memorandum from SDI Environmental Services Inc. and addresses this question.

10. **Review of a Annual Report for the Pinellas County Eldridge-Wilde and East Lake Road Wellfields 1990/1991 indicates that the use of the East Lake production wells ELPW-18, 19, and 20 for bacteriological sampling and emergency pumping caused an increasing chloride trend in monitoring well M-2s. The report indicates that data at that time showed moderate correlation between chloride concentrations, water levels, and pumped quantity. Please provide reasonable assurances that the reactivation of wells EL-18, 19 and 20 will not induce saline water intrusion in the vicinity of the production wells. [Rules 40D-2.091, F.A.C.; 40D-2.101, F.A.C.; 40D-2.301(1)(b)(f)(m), F.A.C.; and Section 4.5, B.O.R.]**

The 1990/1991 Annual Report indicated the bacteriological and emergency pumping from ELPW 18, 19 and 20 showed an increase in chloride in M-2s during this pumping event. However, M-2d chloride concentration declined during this same time period. M-2 monitors water quality at depths of 510 and 535 feet and the water quality is brackish with chlorides above 1500 mg/L in M-2s and very brackish water in M-2d (1900-2700 mg/L chloride). The saltwater interface depth in M-2 actually declined during the mentioned pumping episode (page 7-14 of the annual report). Section 7 of the Annual Report provides an overview of the saltwater monitoring. In well SWI-8D, which is 500 feet west of EL-19, the saltwater interface declined 14 feet while the water levels declined 2 feet during the October emergency pumping (page 7-17). Other monitor wells in the vicinity (SWI-9S & 9D and EL-9D) indicated the August and October pumping had no effect on the interface (pages 7-12 and 7-14).

The graphs showing "moderate correlation" (r = 0.474 to 0.642) between chloride, water level and pumped quantity for the production wells which were presented in the report are provided in **Attachment C**. Note the relationship between quantity pumped (MG/week) and chloride. The increase in chloride is not evident until production approaches 5 MG/week. The original pump capacity for wells EL-18, 19 and 20 were 1400 gpm. The proposed pump capacity for EL-18 and 19 is 200 gpm and 300 gpm for EL-20. Based on these pump capacities, the maximum individual production from these wells will be 2.016 MG/week for EL-18 and 19 and 3.024 MG/week for EL-20. Based on the reduced production capacities and the correlation graphs, adverse water quality changes are not anticipated.

The lower production capacities will also result in reduced drawdown in the UFAS compared to the historical production from these wells and will limit saltwater intrusion in the area. The maximum drawdown in the UFAS at well M-2 is 0.25 feet for a one week modeled stress period (**Table 4.2, Attachment B**). Since no pumping is proposed during the wet season months (July-September) water levels recover quickly and the UFAS drawdown at the end of September is less than 0.03 feet at the production wells.

Figure C-1 is a recent hydrograph from well M-2. The water levels declined 0.6 feet during the 5+ day recording period and fluctuated a few tenths of a foot daily from responses to tides and other possible withdrawals in the area. When the predicted drawdown is compared to the observed water level fluctuation, it is apparent that the drawdown will be indiscernible. Based on the predicted drawdown information, the observed water level data, and the reduction from historic production capacities, it is reasonable to conclude that reactivation of the wells will not induce saline water intrusion.

To support our WUP application, Utilities proposes to sample the production wells monthly and coordinate with Tampa Bay Water and the water quality sampling associated with their Consolidated WUP. **Figure C-2 in Attachment C** depicts the locations of the saltwater monitoring wells associated with the Consolidated WUP. The monitoring network is quite comprehensive and should more than adequately detect water quality changes in the area.

<u>Alternative Water Sources</u>

11. **The District's rules require the utilization of the lowest quality water to be used for all or a portion of an applicant's use unless determined to be environmentally, economically, or technically not feasible. Therefore, please evaluate the feasibility of utilizing Lake Tarpon or the Lake Tarpon Canal as an alternative supply to meet the irrigation demand for the golf course. If the use of Lake Tarpon is not feasible, please submit documentation supporting this decision. [Rules 40D- 2.091, F.A.C.; 40D-2.101, F.A.C.; 40D-2.301(1)(e), F.A.C.; and Section 4.4, B.O.R.]**

As we discussed on least two occasions with SWFWMD senior management, Lake Tarpon is a less reliable source of water during the dry times of the year when the supplemental irrigation supply is needed. If the lake declines to extreme low levels, bass spawning beds and other aquatic species may be impacted. Residential boating access to the lake from the canals will also be affected with lowered water levels.

It is apparent to most hydrologists and water resource managers that surface water sources (lakes, streams, and rivers) are the first sources to realize impacts from declining rainfall and droughts. Without significant storage, surface water becomes less reliable as a supply source. As recent as the 2001 drought, the Hillsborough River streamflow declined to a critical stage and the City of Tampa needed additional supplies to meet its public supply demands. The only water left to meet this demand was groundwater. Groundwater remains the most reliable, cost effective source of supply.

For this hydrologic reason we do not believe Lake Tarpon can be relied upon as a dry season supply source when the water is needed to supplement the irrigation supply for the golf course. Without a reliable source of supply, the optimization of the reclaimed water system cannot be fully realized.

To complicate matters, SWFWMD routinely sprays for aquatic weeds in the lake. The herbicide used to control submerged weeds has an irrigation restriction of up to 30 days. Typically, re-treatment is needed for areas which can last another 30 days. Therefore, up to 60 days of irrigation restrictions could result from the herbicide application. In addition, the herbicide is not applied during the wet season as there are restrictions on the use of the herbicide that would prohibit the release of the herbicide from the lake. In other words, during the wet season, the lake water may be released or be discharged from the lake and would violate the herbicide application restriction. Therefore, the herbicide is typically applied during the spring months.

Finally, the cost to construct a pipeline from the lake or the outfall canal is cost prohibitive for the quantities we are requesting. The cost to permit, design and construct

the infrastructure is $763,000. The cost to connect the existing pipeline from the existing wells is $169,000. Lake Tarpon supply is not a cost effective alternative for this project.

It is for these reasons that the L. Tarpon supply alternative is not environmentally, technically and economically viable for this project.

We would like to re-iterate that when there is excess reclaimed water available we will use the reclaimed water before using the groundwater. This will also be the case when the regional reclaimed water interconnect is completed. With the regional interconnect, there will still be a need for the supplemental supply, but the quantity of supplemental supply may be reduced.

<u>Environmental Considerations</u>

12. **Figure 11.2, Simulated UFAS Drawdown after One Year Due to 0.294 mgd Average Annual Pumpage shows predicted drawdowns at stressed lakes (Buck Lake), Chapter 40D-8F.A.C. minimum flows and levels sites (Garden Lake, Jackson Lake, Sunset Lake, and Echo Lake), and Tampa Bay Water Consolidated Water Use permit Phase 1 Mitigation Areas. Please provide reasonable assurance that the following will not be impacted by the proposed withdrawals: [Rules 40D-2.091, F.A.C.; 40D-2.101, F.A.C.; 40D-2.301(1)(c)(d), F.A.C.; and Sections 4.2 and 4.3, B.O.R.]**

    a. **Wet season water levels shall not deviate from their normal range.**

    b. **Wetland hydroperiods shall not deviate from their normal range and duration to the extent that wetlands plant species composition and community zonation are adversely impacted.**

    c. **Wetland habitat functions, such as providing cover, breeding, and feeding areas for obligate and facultative wetland animals shall be temporally and spatially maintained, and not adversely impacted as result of withdrawals.**

    d. **Habitat for threatened or endangered species shall not be altered to the extent that utilization by those species is impaired.**

    e. **Water withdrawals must not cause lake and wetland water levels to be reduced below the applicable minimum water level established in Rule 40D-8, F.A.C.**

    f. **Water withdrawals must not cause potentiometric surface or water table levels to be reduced below minimum regulatory level established in Rule 40D-8, F.A.C.**

Please note that if the groundwater models are changed then the impacts will need to be reassessed.

To evaluate the potential impacts from the proposed withdrawals for the lakes and wetlands identified above, the groundwater model was run at the lower requested

quantities of 284,256 gpd. Both the degree and extent of the drawdown in both aquifers are less as compared to the previous model run with higher withdrawal quantities. **Figures 4.1** and **4.2** in **Attachment B** show the predicted drawdown contour maps from the SAS and UFAS at the end of September.

The 0.0-foot drawdown in the UFAS no longer intersects Buck Lake, Jackson Lake, Sunset Lake, Echo Lake or the Phase I mitigation sites. The water levels recover quickly in the UFAS after the pumping ceases in June. The 0.03 feet of drawdown in the UFAS at the end of September is limited to a very small area in the wellfield.

Please note the 0.0-foot drawdown in the SAS does not intercept MFL lakes, stressed lakes or the Phase 1 mitigation sites. Therefore, based on the predicted drawdown results from revised requested quantities and the seasonal operation of the wells, reasonable assurance can be provided that the conditions outlined above will not be impacted from the proposed withdrawals.

13. **Figure 11.1, Simulated SAS Drawdown after One Year Due to 0.294 mgd Average Annual Pumpage shows predicted drawdowns at the nearby wetlands. Please provide reasonable assurance that the following will not be impacted by the proposed withdrawals: [Rules 40D-2.091, F.A.C.; 40D-2.101, F.A.C.; 40D-2.301(1)(c)(d), F.A.C.; and Sections 4.2 and 4.3, B.O.R.]**

a. **Wet season water levels shall not deviate from their normal range.**

b. **Wetland hydroperiods shall not deviate from their normal range and duration to the extent that wetlands plant species composition and community zonation are adversely impacted.**

c. **Wetland habitat functions, such as providing cover, breeding, and feeding areas for obligate and facultative wetland animals shall be temporally and spatially maintained, and not adversely impacted as a result of withdrawals.**

d. **Habitat for threatened or endangered species shall not be altered to the extent that utilization by those species is impaired.**

Please note that if the groundwater models are changed then the impacts will need to be reassessed.

Observed water levels in the surficial aquifer and predicted drawdown in the SAS were used to evaluate the potential impacts from the proposed withdrawals. **Attachment B** contains **Figures 4.1** and **4.2** which show the predicted drawdown in the SAS and UFAS at the end of September from the proposed annual withdrawal of 284,256 gpd. Note the largest drawdown contour in the SAS 0.1 feet.

Attachment D contains **Figure D-1** which depicts the observed surficial aquifer water levels for wells ELMW-7s, ELMW-9s, 19.1 and SM-37 which are located near the production wells. See **Appendix F** from the original application for these well locations. The SAS water levels can fluctuate as much as 4+ feet as indicated in WY 1994. The

average water level fluctuation for all four wells for WY 94-96 is 3.1 feet. During wet years (WY95-96) the water level fluctuations averaged 2.4 feet.

For comparison purposes, **Figures D-2** and **D-3** depict the observed water levels in the SAS at two nearby monitor wells (ELMW-7s and SM-37) with the 52 week simulated drawdown superimposed on the hydrograph. The transient modeling uses the proposed monthly withdrawal quantities (allocated into the weekly time steps). The maximum weekly drawdown in the surficial aquifer during the model simulation is 0.21 feet. The maximum drawdown in the SAS at well SM-37 is 0.13 feet and the maximum drawdown in the SAS at well ELMW-7S is 0.16 feet. See **Table 4.2 in Attachment B**.

Based on the groundwater modeling, the simulated drawdown is relatively small. The observed water level change in the SAS overwhelms any impacts that may result from this proposed withdrawal, by an order of magnitude. Furthermore, the proposed withdrawals will also be seasonal in nature, allowing the wetland systems to recover in the wet season.

This information should provide reasonable assurance that the conditions identified in 13 a-d above will not be adversely impacted from the proposed withdrawals. We are also unaware of any data or a reference that indicates this small amount of drawdown will cause those conditions identified above to be adversely impaired or impacted.

In addition, as another level of protection, an EMP is proposed which should detect any adverse impacts to the wetlands. See **Attachment E** for the proposed EMP.

14. **Per Chapter 40D-2, F.A.C., <u>Basis</u> <u>of</u> <u>Review</u>, an environmental monitoring plan (EMP) is necessary when there is potential for withdrawals to cause significant adverse impacts to environment. Please provide an EMP for the proposed withdrawals. If assistance is required, please contact Senior Environmental Scientist Patricia Frantz at (813) 985-7481 extension 2054. [[Rules 40D-2.091, F.A.C., 40D-2.101, F.A.C., 40D-2.301(1)(c)(d), F.A.C., and Section 4.2 and 4.3, B.O.R.]**

Attachment E contains the proposed environmental monitoring plan (EMP). Three wetlands in close proximity to the production wells will be selected for monitoring. We suggest wetland sites 2, 3 and 4 as shown on **Figure 2** in **Attachment E** as the EMP wetlands. A control site outside the 0.1 ft. SAS drawdown contour is also included in the EMP.

15. **Please provide the wetland assessments for the adjacent wetlands. Please include percent cover of wetland plants, species composition, water levels, and hydrology. [Rules 40D-2.091, F.A.C., 40D-2.101, F.A.C., 40D-2.301(1)(c)(d) and Sections 4.2 and 4.3, B.O.R.]**

Attachment E contains **Figure 2** in the EMP and identifies five wetlands in which an assessment for the requested information will be collected.

Table A-2: Revised Requested Quantities

Water Year Month	Golf Course AGMOD Quantities (Gallons)	Clubhouses AGMOD 6.85 acres (Gallons)	Tennis Courts (@ 4200 gpd) (Gallons)	Total Quantites (Gallons)	Total Quantites (GPD)	Requested Quantities (Gallons)	Requested Quantities (GPD)
October	15,354,000	576,000	130,200	16,060,200	518,071	15,549,391	501,593
November	11,347,000	425,000	126,000	11,898,000	396,600	11,519,885	383,996
December	0	0	0	0	0	0	0
January	0	0	0	0	0	0	0
February	0	0	0	0	0	0	0
March	13,900,000	512,000	130,200	14,542,200	469,103	14,092,118	454,584
April	20,990,000	820,000	126,000	21,936,000	731,200	21,199,734	706,658
May	25,271,000	973,000	130,200	26,374,200	850,781	25,506,687	822,796
June	15,689,000	549,000	126,000	16,364,000	545,467	15,885,668	529,522
July	0	0	0	0	0	0	0
August	0	0	0	0	0	0	0
September	0	0	0	0	0	0	0
Total Gallons	102,551,000	3,855,000	768,600	107,174,600		103,753,484	
Average (GPD)	280,962	10,562	2,106	293,629		284,256	

Requested Average Annual Quantity (gpd)
AGMOD Peak Month (May) = 1.05 mgd
Requested Peak Month = 700 gpm (1.008 mgd)
Proposed Supplemental Supply Withdrawal Months

SDI Environmental Services, Inc.
3903 Premier North Drive, Tampa, FL 33618; (813) 961-1935

MEMORANDUM

TO: Dave Slonena, Pinellas County Utilities

FROM: Cathleen Beaudoin Jonas

SUBJECT: **Responses to June 8, 2006 RAI for East Lake Permit No. 20012943.000**

DATE: December 18, 2006

Groundwater Modeling

4. *The technical memorandum from SDI Environmental Services, Inc. references locations where documentation of the model development and calibration can be found. However, documentation of the model used for this water use permit must be submitted and included in the file of record for this water use permit. Therefore, please provide copies of all supporting documentation for the model results submitted for this permit. Please also distinguish if any changes to the model have been made as part of the model for this application, from the supporting documentation.*

The 1999 report titled "Water Resource Evaluation and Cone Ranch Integrated Hydrologic Model" is attached as the documentation of the development of the model used for this WUP submitted. The model was originally developed as a regional integrated surface and groundwater model calibrated for the 1971-2000 period using the ISGW software. ISGW combines the surface water model HSPF with the groundwater flow model MODFLOW. For this submittal, the model was decoupled and only the MODFLOW portion for the 1990 period was used.

The model simulates both the surficial aquifer system (SAS) and the upper Floridan aquifer system (UFAS). The model has 52 weekly time steps and includes all 1990 reported or estimated water use permit pumpage in the model area from the District. In order to be conservative in this analysis, 1990 was selected because it was a dry year.

In order to evaluate the potential impacts to the groundwater system, a transient one-year simulation with the proposed monthly East Lake Wellfield pumpage shown in Table 4.1 was made.

Table 4.1 Proposed Monthly Pumpage for East Lake Wellfield

Month	Proposed Quantity (gpd)	Month	Proposed Quantity (gpd)
January	0	July	0
February	0	August	0
March	454,584	September	0
April	706,658	October	501,593
May	822,796	November	383,996
June	529,522	December	0
		Average	284,256

Figure 4.1 is a contour map of the simulated SAS drawdown at the end of September. As seen in Figure 4.1, the closest Tampa Bay Water candidate sites, as well as Garden Lake and Buck Lake are outside the 0.0-foot drawdown contour. Figure 4.2 illustrates that the largest simulated UFAS drawdown at the end of September in the model cell at production well EL-20 is 0.03 feet. As noted in Table 4.1, there is no proposed pumpage for the wet season months of July through September. Table 4.2 lists the maximum drawdown in the 52-week simulation of transient East Lake Wellfield pumpage at the model cells for the EL-20 production well and selected monitor wells.

Table 4.2 Maximum Drawdown in Model Cells During 52-Week Simulation.

Well Location	SAS	UFAS
EL-20	0.21	0.84
SM-37/UF-33	0.13	0.48
ELMW-7s/ELMW-7d	0.16	0.55
M2	0.05	0.25

Figure 4.3 illustrates the transient simulated water levels in the UFAS at the model cell containing EL-20 for the base and pumping scenarios. Figure 4.4 illustrates the transient water levels at monitor well pair SM-37 and UF-33. See Figures 4.1 and 4.2 for monitor well locations. The largest drawdown is simulated at the end of the peak pumpage month of May. Water levels in the UFAS recover to 0.0 during the wet-season months of July through September when there is no proposed pumpage.

5. *Review of Figure 9.3 Modeled Spatial Distribution of Storativity in the East Lake Wellfield Area of the Memorandum dated May 26, 2006 from SDI Environmental Services, Inc. to David Slonena, P.G. reflects that the storativity values in the Upper Floridan aquifer range from 0.080 to 0.400 ft/ft. These values appear to be high as compared to values determined from aquifer performance tests results provided in the District's Aquifer Characteristics Report 99-1 dated February 2000. Please verify these storativity values and provide the basis for these values. Please note that a revised model may need to be submitted if changes are made to the model.*

Figure 9.3 referenced above should be more clearly titled "Model Spatial Distribution of Specific Yield (secondary storativity) of the SAS in the East Lake Wellfield Area."

6. *Review of Figure 9.4 Modeled Average Annual Recharge Distribution in the East Lake Wellfield Area of the Memorandum dated May 26, 2006 from SDI Environmental Services, Inc. to David Slonena, P.G. reflects that the recharge values in some areas range from 10.1 to 17.3 inches/year. These values appear to be high. Please verify the areas with recharge values ranging between 10.1 to 17.3 inches/year. Was the rainfall in 1990 from which the recharge was calculated represented in the integrated model representative of a period of mean or median rainfall for the area? Please also provide more refinement of the recharge values in the area shown with recharge values between 10.7 and 17.3 inches/year. Would the predicted drawdowns be affected if rainfall values from a different year were used (i.e., mean or median)?*

Please note that a revised model may need to be submitted if changes are made to the model.

The net recharge used for this groundwater model was derived from the ISGW integrated model which uses observed hourly rainfall as input. Nineteen Ninety (1990) rainfall at the Tarpon Springs gage was 41 inches representing a dry year. The mean rainfall at the Tarpon Springs gage for 1945 through 1995 was 52.9 inches. The rainfall is subjected to all of the major hydrologic processes such as runoff and evapotranspiration. The net recharge to the SAS is calculated for each cell for each of the 52 weeks in the simulation. Figure 6.1 is the modeled average annual recharge distribution for each model cell in the East Lake Wellfield area. Additional color classes have been added. As seen in Figure 6.1, only a few cells are above 12 inches per year (in/yr). The location of the wells simulated in the model is also shown for reference. Some of the highest recharge rates are in areas of pumpage such as the Eldridge-Wilde Wellfield. Since ET is simulated in the ISGW model, the recharge rates include induced recharge from pumpage. The net recharge rates also include groundwater baseflow. Other areas with higher rates are around lakes and streams and in areas of higher elevation such as east of Lake Tarpon.

The groundwater model is used in an impact mode with only East Lake Wellfield pumpage changing. Since the MODFLOW ET package is not used and induced recharge from pumpage is not simulated in the East Lake Wellfield pumping scenario, the predicted drawdowns would not be affected if rainfall values from another year were used.

7. *Review of the water budget provided indicates that the model is separated into 134 zones. Please explain how this zonation is included in the model and provide a figure which spatially shows these zones.*

The 134 zones represent the 134 surface water subbasins simulated in the ISGW integrated model.

8. *Please provide an annual average cumulative regional model which includes all regional wellfields including the City of Oldsmar's withdrawals and the withdrawals associated with Tampa Bay Water's withdrawals from the former Carrollwood Wells Florida Government Utility Authority (FGUA).*

A cumulative drawdown model that includes the East Lake Wellfield area was prepared in 2005 by Water Resource Solutions (subcontractor to Boyle) in support of the City of Oldsmar WUP application. The City of Oldsmar submitted the evaluation of cumulative pumping impacts associated with groundwater withdrawals from the proposed new wellfield and existing regional pumpage as part of their response to a June 13, 2005 District RAI. Cosme, Eldridge-Wilde, and NW Regional wellfields in northwest Hillsborough and northeast Pinellas counties are simulated at average 2004 rates of 5.2, 12.8, and 8.2 mgd, respectively. The Oldsmar Wellfield is simulated at the requested 2.7 mgd annual average rate. The cumulative impact model is reported to simulate average annual pumping under transient pumping conditions for a period of 365 days.

Figures 8.1 and 8.2 are the resulting simulated cumulative SAS and UFAS (referred to as PZ lower A) drawdown contours, which include the proposed 2.7 mgd annual Oldsmar pumpage. The simulated cumulative drawdown is between 0.1 and 0.2 feet for the SAS at the East Lake Wellfield (Figure 8.1). The cumulative drawdown in the UFAS is less than 0.5 feet

(Figure 8.2). Figures 8.3 and 8.4 illustrate the predicted drawdown in the SAS and UFAS, respectively, of the Oldsmar Wellfield pumping at the 2.7 mgd average annual rate for 365 days. The East Lake Wellfield is outside of the 0.0 drawdown contour for both the SAS and the UFAS.

<u>Saline Water Intrusion</u>

9. *Table 2 included the Memorandum dated May 26, 2006 from SDI Environmental Services, Inc. to David Slonena, P.G. summarizes Long-Term (WY00-WY05) and Recent (WY03-WY05) average water levels for the saltwater intrusion wells to demonstrate that the predicted impacts in the Upper Floridan aquifer at these wells are acceptable and will not cause additional saline water intrusion. Please explain how the long term and recent average water levels were calculated and provide the database used to calculate these levels for each saltwater intrusion monitor well. Please note that District Staff recently calculated 6 and 10-year period assessments of the wells. It may be necessary to re-evaluate the impacts to these salt-water intrusion wells depending on the method of calculation used to determine the Long Term average water levels.*

With the revised East Lake Wellfield pumpage (284,256 gpd average), there are no longer any predicted impacts at the saltwater intrusion monitoring wells.