East Coast Floridan Aquifer System Model Phase II Project Southeastern Florida

FINAL

Model Documentation Report

October 2008

Golder Associates

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

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REPORT ON

EAST COAST FLORIDAN AQUIFER SYSTEM MODEL, PHASE II UPPER AND LOWER EAST COAST PLANNING REGIONS SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Submitted to:

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October 30, 2008 073-82536

South Florida Water Management District
Water Supply Division
3301 Gun Club Road
West Palm Beach, Florida 33406

Attention: Mr. Simon Sunderland

RE: EAST COAST FLORIDAN AQUIFER SYSTEM PHASE II MODEL FINAL REPORT OF FINDINGS

Dear Mr. Sunderland:

Golder Associates Inc. (Golder) is pleased to submit this report documenting the development, calibration, and validation of the East Coast Floridan Aquifer System Phase 2 Model (ECFAS II Model). The final report has been prepared in accordance with the scope of work for this contract (SFWMD CONTRACT # 4600000692), contract modifications, and with instructions provided by South Florida Water Management District staff during numerous meetings and teleconferences.

We appreciate the opportunity to work with you on this project. If you have any questions or need further assistance, please contact us.

Sincerely,

GOLDER ASSOCIATES INC.

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1.0 EXECUTIVE SUMMARY

The South Florida Water Management District (SFWMD) is charged with managing water resources within its jurisdiction. The Floridan Aquifer System (FAS) is a source of groundwater that has traditionally been used in the SFWMD's Upper East Coast (UEC) region, but less so in the SFWMD's Lower East Coast (LEC) region due to its brackish water quality. The SFWMD recognized some time ago that it needed a tool to better manage this groundwater resource. Towards that end, the SFWMD started a long-term program of installing FAS monitor wells and equipping new and existing wells with water-level data recorders to develop a suitable dataset for modeling purposes several years ago. The Phase I LEC Floridan Aquifer System Model (HydroGeoLogic, 2006) was the SFWMD's first attempt at conducting model development and calibration based in part on this program. The Phase I Model used the United States Geological Survey (USGS) computer code SEAWAT 2000 (Guo and Langevin, 2002) that allows simulation of density dependent flow allowing modeling of freshwater and the brackish groundwater within the aquifer as well as the seawater boundary conditions of the Atlantic Ocean and the underlying Boulder Zone. Since that time, additional data has become available coupled with a desire to expand the model domain to include the UEC Region. The Phase II modeling effort – referred to as the East Coast Floridan Model as it now includes both the LEC and UEC regions—was undertaken by Golder Associates Inc. (Golder) on behalf of the SFWMD. The Phase II Model builds upon the Phase I modeling work completed in 2006. The tasks assigned to Golder included:

- Incorporating the calibrated Phase I Model into the new and larger model domain;
- Recalibrating the new and larger Phase II Model;
- Validating water use data for the UEC and LEC; and,
- Preparing a model documentation report of the entire effort.

The final 2005 calibrated model provides the SFWMD with a tool capable of assisting the agency with the evaluation of current and future water supply projects within the model study area.

The Phase II Model was developed in several phases in 2007 and 2008. The models that were developed cover different temporal periods of record ranging from one year to six years.

The original SFWMD scope of work called for the development and calibration of a transient model covering the period of record from 1999 through 2004. This model was to be validated using separate 2005 observed data. Golder delivered the 1999 to 2004 transient model to the SFWMD in February 2008 per the original schedule agreed upon by the parties. Golder notified the SFWMD that it had discovered numerous inconsistencies in the water supply pumping data provided to it by SFWMD. These data inconsistencies were due to missing wells, duplicate wells, incomplete pumping records, and large temporal variations in pumping rate at certain wells. Golder felt that these data deficiencies reduced the reliability of the 1999 to 2004 model considerably. In essence, Golder felt that the model was not accurately capturing the "true" water supply pumping stresses affecting the FAS. Besides the data issues, the 1999 to 2004 model required extremely long computational times (e.g., up to 7 days), especially when employing the SEAWAT coupled mode. Golder asked SFWMD to consider a contract modification to perform a more detailed analysis of the water well pumping data. SFWMD agreed but in turn asked Golder to recalibrate the model using the 2005 dataset and revalidate the model using the 2004 dataset. After some discussions, all parties agreed to the revised modeling strategy and recalibration/revalidation efforts.

First, a steady-state pre-development model was developed based upon published reports by the USGS and pre-development water surface map coverages provided by the SFWMD (Richardson personal communication, 2007). Typically, the pre-development water levels are 5 to 10 feet higher than those seen today due to increased FAS withdrawals. The steady-state pre-development model was used to adjust various hydrogeologic input parameters (e.g., hydraulic conductivity, effective porosity) and the overall Atlantic Ocean general head boundary. The parameter distribution from the steady-state model was then used as a starting point for the original 1999 to 2004 transient model and the revised 2005 transient model. In addition to providing an initial parameter distribution, steady-state concentration distributions from the original February 2008 steady-state model were also reviewed and used to provide input starting concentrations to both the original 1999 to 2004 transient model and the revised 2005 transient model.

The revised 2005 transient model was developed and focused on the period of record between January 2005 and December 2005. The revised 2005 transient model used monthly stress periods to match available well pumping histories. In this report, the transient model covers the 2005 period of record and is referred to as the "2005 transient calibration model." The revised validation model covers the 2004 period of record and is referred to as the "2004 validation model."

The domains for all models include all or parts of Okeechobee, Indian River, St. Lucie, Martin, Palm Beach, Broward, and Miami-Dade Counties, Florida. The models were constructed using hydrogeologic unit geometry and properties compiled by the USGS and the SFWMD. The models include 14 layers and simulate the FAS only. The deeper so-called "Boulder Zone" is simulated assuming constant head and constant concentration. Similarly, the Surficial Aquifer System (SAS) is simulated assuming an average aquifer head and a constant concentration. The models include specified head boundaries along the northern and western sides for all FAS aquifers and general head boundaries at the Atlantic Ocean outcrop for the same. The initial conditions for the models were established using available observation well water level and water quality data as well as results from multiple model simulations. The 2005 transient calibration model was run several times and the water levels of the last model run time-step were then imported back into the model to be used as initial heads. A similar exercise was completed for the 2004 validation model.

The model domain western specified head boundary had to be interpolated using existing well water level data available from observation wells open to the FAS. Observed water level data were used directly when it was available for the required period of record. Where the existing water level data was incomplete, powerful multiple regression techniques were used to fill in monthly values using "synthetic" data at select wells from 1999 to 2005. Once a complete set of data for the full period of record was available along the western boundary, linear contouring was used to interpolate values along the western boundary for each monthly stress period. The Atlantic Ocean boundary was assigned as a general head boundary and was established using existing tidal data corrected for vertical elevation datum plus the "geostrophic effect" that has been documented along the southeastern coast of Florida. Similar to the specified head data, the general tidal heads were assigned as monthly values. The SFWMD provided pumping well information and water use data for the entire FAS within the study area for the period of time from 1999 to 2005.

The 2005 transient calibration model was modified many times during the calibration process. The calibration process included adjustments to the horizontal and vertical hydraulic conductivity, storage coefficient, effective porosity, dispersivity, boundary conditions (including both specified head and general head boundaries), and the initial conditions. Calibration against both heads and concentrations was performed. The calibration process followed conventional calibration procedures as outlined by the American Society of Testing and Materials (ASTM) and as adopted in standard practice. The calibration process continued until both the absolute mean residual and residual mean met the target criterion, or until little further improvement was expected. For this effort, the original goals for the model were within 2.0 feet for the absolute mean residual and +/- 1 feet for the residual mean. The initial effort to calibrate the 2005 model did not achieve both of these goals but after removal of one anomalous data point, the calibration was deemed satisfactory. The 2005 transient calibration model was adjusted until it was evident that little additional improvement could be added. For this 2005 model iteration, the mean absolute error for the model was 2.28 feet and the residual mean was calculated to be -0.48 feet.

The 2005 transient calibration model was then verified using year 2004 water level, water quality, and water use data. The initial attempt at model validation resulted in an increase in the calibration criteria with a mean absolute residual of 3.4 feet and a residual mean of 2 feet. Therefore, an iterative process was begun to make additional adjustments to the calibrated model and the validated model until such a time as the model calibration criteria were met for both models or a point of diminishing returns was reached. The final calibration model includes a period of record from 2005 and has a mean absolute residual of 2.52 feet and a residual mean of 0.44 feet. The final validation model includes the period of record from 2004 and has a mean absolute residual of 2.65 feet and a residual mean of -0.60 feet.

The final 2005 calibrated model is a good first step to simulating the complex FAS in southern Florida. This model provides the SFWMD a reasonable tool for simulating current and future water supply projects within the model domain. Generally, both the 2005 transient calibrated model and the 2004 transient validation model are accurate to within approximately 2.5 feet across the model domain. The overall bias of the models is low but generally under predicts the actual water levels measured in the field. The model includes considerable uncertainty regarding the aquifer parameters of both the Avon Park Permeable Zone (APPZ) and the Lower FAS; the initial water quality in both the APPZ and Lower FAS; and the existing conditions of each aquifer unit at their respective outcrop locations beneath the Atlantic Ocean. Further field data collection investigating these issues would likely lead to further improvements in the model. Numerous model runs have shown that the model is most useful running in SEAWAT "uncoupled" mode. These model runs can be completed in approximately 30 minutes each for a one-year simulation period. The short model run time permits many sensitivity and experimental simulations to be completed in one day. Alternatively, the user can select the SEAWAT "coupled" mode. These model runs can be completed in approximately 20 hours each for a one-year simulation period. Uncoupled mode does allow the user to investigate changes in water quality over time, however, at least 30 years and possibly up to 100 years (based upon previous SFWMD modeling and 365 year long modeling completed by Golder) may be required to see these changes in the model. These long durations would be burdensome to simulate due to extremely long computational times. It is probably more useful for SFWMD to run the model in "uncoupled" mode and evaluate changes in overall model water budget. During 2005 model calibration and 2004 validation, it was noted that the flux in along the general head boundary does change with water well pumping of the FAS. Generally, more pumping leads to higher inward fluxes along the general head boundaries.

2.0 INTRODUCTION

2.1 Purpose

The South Florida Water Management District (SFWMD) retained Golder Associates Inc. (Golder) to prepare a numerical model of the FAS calibrated for the period of record of 1999 to 2005. The original scope of work called for the development and calibration of a transient model covering the period of record from 1999 through 2004. This model was proposed to be validated using separate 2005 observed data. Golder delivered the 1999 to 2004 transient model to the SFWMD in February 2008 per the original schedule agreed upon by the parties. Golder notified the SFWMD that it had discovered numerous inconsistencies in the water supply pumping data provided to it by SFWMD. These data inconsistencies were due to missing wells, duplicate wells, incomplete pumping records, and large temporal variations in pumping rate at certain wells. Golder felt that these data deficiencies reduced the reliability of the 1999 to 2004 model considerably. In essence, Golder felt that the model was not accurately capturing the "true" water supply pumping stresses affecting the Floridan Aquifer System (FAS). Besides the data issues, the 1999 to 2004 model required extremely long computational times, especially when employing the SEAWAT coupled mode. Golder asked SFWMD to consider a contract modification to perform a more detailed analysis of the water well pumping data. SFWMD agreed but in turn asked Golder to recalibrate the model using the 2005 dataset and revalidate the model using the 2004 dataset. SFWMD generally thought that the water use data for 2005 was more accurate than data for previous years and therefore would be best for calibration purposes. After some discussions, all parties agreed to the revised modeling strategy and recalibration/revalidation efforts.

The final 2005 calibrated model provides the SFWMD with a tool to evaluate current and future water supply projects within the model study area. The model domain covers the Upper East Coast (UEC) and Lower East Coast (LEC) water supply planning areas as shown on **Figure 1.** The model also includes Indian River County which is actually located within the St. Johns River Water Management District (SJRWMD). The model also includes part of the Kissimmee River planning area.

2.2 Project Description

The model domain includes the entire southeastern coast of Florida and extends to the estimated outcrop of the FAS in the Atlantic Ocean. **Figure 2** shows the actual model boundary. The model includes 14 layers representing the entire groundwater flow system in the study area. The active area of the model covers approximately 16,000 square miles with only half of this area included as the landward part of the Florida Peninsula. The remaining half is submerged beneath the Atlantic Ocean such that discharges from the FAS outlet deep below the sea.

2.3 Modeling Objective

The objective of the model development process was to provide SFWMD a model that can be utilized to make predictive assessments of future water resources alternatives that include the FAS.

2.4 Scope of Work

Golder was tasked with completing the following:

- Attending and participating in an initial orientation meeting;
- Developing GIS coverages during model development;
- Preparing a model implementation report;
- Conducting model calibration;
- Preparing a draft model documentation report;
- Preparing a final model documentation report; and
- Preparing status reports and attending meetings.

3.0 REGIONAL HYDROGEOLOGIC SETTING

3.1 Location

The study area is located along the southeastern peninsula of Florida and includes all or part of Osceola, Okeechobee, Indian River, Glades, Hendry, Collier, Monroe, St. Lucie, Martin, Palm Beach, Broward, and Miami-Dade Counties. For the most part, the model covers Okeechobee, Indian River, Martin, Palm Beach, Broward, and Miami-Dade Counties. Only small segments of the remaining counties referenced above are included within the model boundary. The study area is depicted in **Figures 1 and 2** which also show the model boundary for the project.

3.2 Description

The geology of southern Florida has been shaped by the sea. Florida's landforms show the dominant effect of marine forces in shaping the land surface (Schmidt, 1997). The Florida Platform has been sculpted by forces connected with the Atlantic Ocean. The Platform has been in existence for tens of millions of years, and throughout that history it has been alternately flooded by salt water from the Ocean or exposed as dry land (Schmidt, 1997). At the height of the last ice age, approximately 20,000 years ago, the Platform was almost twice as big as the exposed area that we see today. Over the last 20,000 years, sea level has risen approximately 300 feet, inundating much of the shallow Platform and changing the hydraulics of rivers, streams, and aquifers. South Florida is underlain by Cenozoic-age rocks to a depth of approximately 5,000 feet below land surface (bls) that are generally comprised primarily of sand, limestone, clay, silt, and dolomite (Meyer, 1989). The oldest rocks at the bottom of the stratigraphic column are of Paleocene age while the youngest rocks at the surface are of Holocene or Pleistocene age (Reese, 1994).

Within the platform, lies Lake Okeechobee, the second largest freshwater lake in the conterminous United States that is wholly within one state (Miller, 1997). Lake Okeechobee lies in a relatively stable structural area, represented by generally flat-lying sediments that accumulated in a quiet marginal-marine setting, similar to the modern-day Bahamas. Numerous wells have been constructed and tested to depths of up to approximately 3,500 feet bls in south Florida, providing rather extensive information regarding subsurface geology and hydrogeology of the area. Many of these were drilled as part of oil exploration studies while others were installed to provide hydrogeologic or water quality data (Miller, 1986).

3.3 Regional Geology

The regional geology of Florida that pertains to this modeling study includes recent age surface soils to evaporite beds of Paleocene age. **Figure 3a** provides a regional geologic/hydrogeologic cross section from Georgia to south Florida. **Figure 3b** provides a similar cross section from west to east across Palm Beach County. A brief summary of each important geologic unit follows:

3.3.1 Surface Soils and Plio-Pleistocene Series

Based upon U.S. Department of Agriculture maps from throughout the model study area, the surface soils in south Florida are quite complex due to erosion, deposition, and development. From land surface to a depth of up to 10 feet bls, soils in the northern vicinity of the Lake are characterized as poorly drained, sandy "spodosols", currently used for pastures, citrus, and urban development. To the south of the Lake are organic-rich mucky soils underlain by marl, referred to as "histosols". These soils are currently used for sugar cane, sod and pasture (USACE and SFWMD, 2004).

Below the surficial soils, Plio-Pleistocene-aged tan to gray, moderately indurated calcareous sandstone with intermittent shell beds is present to a depth of approximately 150 feet bls. Low permeability arenaceous mudstones found at 150 feet bls constitute undifferentiated Plio-Pleistocene series sediments deposited one to five million years ago.

3.3.2 Miocene Series

The Plio-Pleistocene sediments unconformably overly the dense, phosphatic clays and limey silts of the Miocene-aged Hawthorn Group. The Hawthorn Group sediments are generally encountered between 150 and 850 feet bls. The lithology of the Hawthorn Group is composed primarily of greenish-grey colored phosphatic lime mudstone with minor clay, sand, and limestone. Locally, moderately productive limestone or sand aquifers may be found.

However, recent work indicates the Peace River Formation may range in age from late Miocene to early Pliocene (Reese and Memberg, 2000). Near the base of the Hawthorn Group, the limestone and phosphate content of these sediments increases, causing the geophysical natural gamma ray log to record high emissions through this interval. This has resulted in the creation of distinctive "marker beds" that can be correlated throughout the vicinity of south Florida (Reese and Richardson, 2004). The Hawthorn is a complicated unit consisting of interbedded and intermixed carbonate and siliciclastic sediments containing varying percentages of phosphate grains (Scott, 1988). The upper portion of the Group is typically less well indurated and contains primarily interbedded sands and clays. The lower portion of the Group is more indurated and contains primarily carbonates. The carbonates are characterized as yellowish gray to light olive gray to light brown, micro to finely crystalline, poorly to well indurated, variably sandy, clayey, and phosphatic, fossiliferous limestones and dolostones. The sands are yellowish gray to olive gray, very fine to medium grained, poorly to moderately indurated, clayey, dolomitic and phosphatic. The clays are yellowish gray to light olive gray, poorly to moderately indurated, sandy, silty, phosphatic and dolomitic. Silicified carbonates and opalized claystone are locally found.

The Hawthorn Group provides an effective aquiclude or confining unit separating the SAS and deeper FAS in the model domain. According to Figure 6.1-1 of Scott (1988), the top elevation of the Hawthorn Group is approximately located at elevation of -125 to -150 feet North American Geodetic Vertical Datum 1929 (NGVD29) on the east side of Lake Okeechobee at Indiantown. Onsite boreholes installed for the Floridian Natural Gas project (east of Lake Okeechobee in Martin County) confirm this finding and show that the Hawthorn Group is probably encountered from elevation -135 to -175 feet NGVD29. Using lithologic data alone, it is difficult to determine the exact top of the Hawthorn Group due to its complex nature. Usually, gamma-gamma downhole geophysical logs are utilized to identify the exact top of the formation. Reese and Richardson (2004) identify the top of the Hawthorn Group in the Indiantown, Florida area at elevation -135 feet NGVD29. **Figure 4** depicts the top elevation of the Hawthorn Group across the entire study area as estimated by Reese and Richardson (2004).

The exact composition of the Hawthorn Group is of considerable importance to the model due to the potential for recharge or discharge (upward leakage) from the FAS. Regional lithological data downloaded from the South Florida Water Management District (SFWMD) website

(DBHYDRO Database) reveal that the entire thickness of the Hawthorn Group can be characterized as highly variable, even over relatively short distances (SFWMD website, 2007). Two deep lithologic logs were downloaded from the SFWMD website. The first log is from the Florida Power and Light facility located near Lake Okeechobee in Martin County, Florida. This log shows the following lithologic sequences for the Hawthorn Group (all referenced to feet below land surface):

- Silt and Clay: 182 to 228
- Sand: 228 to 245
- Clay: 245 to 255
- Limestone: 255 to 259
- Clay and Sand mix: 259 to 282
- Clay: 282 to 308
- Sand: 308 to 360
- Clay: 360 to 392
- Sand: 392 to 420
- Clay: 420 to bottom of hole at 445

For the portion of the Hawthorn Group characterized, clay consists of 57 percent of the section logged while sand and limestone make up the remainder. The second log is from the Allapata Property located northwest of the Indiantown area. This log shows the following lithologic sequences for the Hawthorn Group (all referenced to feet below land surface):

- Clay: 220 to 240
- Sand: 240 to 340
- Clay: 340 to 360
- Sand: 360 to 405
- Dolomite: 405 to 410
- Sand and gravel (possibly soft Dolomite): 410 to 422

- Dolomite: 422 to 430
- Micritic Limestone: 430 to 450
- Dolomite: 450 to 460
- Micritic Limestone: 460 to bottom of hole at 482

For the portion of the Hawthorn Group characterized, clay consists of 15 percent of the section logged while sand, dolomite, and micritic limestone make up the remainder of the section. Based upon the regional descriptions of the Hawthorn Group (Scott, 1988) and boring logs reviewed for this report including the two referenced above, it is clear that the Hawthorn Group is an effective confining unit for the FAS in the model domain due to its composition including low-permeability clay and micritic limestone.

3.3.3 Oligocene Series

Lying below the Hawthorn Group sediments is the Suwannee Limestone of Oligocene age. It is described by White (1970) as a "white to tan, pure to slightly argillaceous and arenaceous, coquinoid to chalky limestone, with some dolostone and dolomitic limestone present." It is regionally extensive and can attain a thickness ranging from 120 to 300 feet in south Florida (Miller, 1986). According to Randazzo and Jones (1997), the Oligocene carbonates are generally open-marine units dominated by packstones and grain-stones. The boundary between the older Ocala Limestone and the Suwannee Limestone is difficult to identify due to their similar lithologic appearance (Randazzo and Jones, 1997). Because of an influx of clastic sediments from the north (eroded from the Appalachian Mountains), the Suwannee Limestone becomes sandier toward the top of the section.

3.3.4 Eocene Series

Lying below the Hawthorn Group (or Suwannee Limestone, if present) at a depth of approximately 600 to 850 feet bls is the Eocene-age Ocala Limestone and Avon Park Formation. The Ocala Limestone consists of two units. The lower unit is characterized as partially dolomitized and reflects a peri-tidal to open-marine depositional environment (Randazzo and Jones, 1997). The upper unit of the Ocala Limestone is generally composed of white to gray formaminiferal and molluscan packstones and grainstones, with minor amounts of wackestone and mudstone. The number and diversity of the foraminifera is high and suggests open-marine, shallow water, and middle-shelf deposition during the later Eocene (Randazzo and Jones, 1997).

The Avon Park Formation is the oldest geologic unit exposed at the surface in Florida. It is unconformable with the underlying Oldsmar Formation and the boundary is generally recognized by the contrast between older, porous, foraminiferal grainstones and younger dolomitic wackestones-mudstones (Randazzo and Jones, 1997). The Avon Park Formation is a carbonate mud exhibiting significant dolomitization in places. It also contains interbedded evaporates in its lower part with fossils dominated by benthic forms with limited faunal diversity especially cone-shaped *Dictyoconus sp* (Duncan et al., 1994). Occasional seagrass beds are well preserved in certain horizons (Randazzo and Jones, 1997).

For purposes of this discussion, these formations (along with the Suwannee Limestone) are undifferentiated, although the Ocala Limestone is typically recognized as present within the uppermost 200 feet of the combined section. Below these formations is the Oldsmar Formation, consisting primarily of dolostones, limestone, anhydrite and gypsum. Below the Oldsmar Formation is the Cedar Keys Formation of Paleocene age which consists of dolomite, dolomitic limestone, and massive anhydrite beds. The massive anhydrite beds are present approximately 500 feet below the top of the Cedar Keys Formation and form the base of the Floridan Aquifer System discussed below (Reese, 2000).

3.4 Regional Hydrogeology

The hydrogeology in most of South Florida consists of a non-artesian shallow aquifer separated from a deeper artesian aquifer by several hundred feet of confining strata. The non-artesian shallow aquifer, generally known as the SAS, ranges from approximately 100 to 300 feet thick in south Florida. Low permeability sediments of Pliocene-age generally form the base of the SAS. **Figure 3** depicts the degree of aquifer confinement for the FAS in plain view while providing a hydrogeologic cross-section revealing the primary aquifer zones.

An Intermediate Confining Unit (ICU) underlies the SAS, and is mostly comprised of Hawthorn Group sediments. Confinement is provided by clays, marls, and micritic limestone that exhibit very low permeabilities, and isolate the SAS from the underlying FAS. These Miocene-age confining beds are expected to occur between approximately 150 and 850 feet bls in the study area. Locally, the ICU may contain permeable zones including the Tampa Limestone (used in southwestern Florida for water supply) and the so-called "Mid or Lower Hawthorn" Limestones.

The rocks that make up the FAS vary greatly in permeability so that the system resembles "layer cake" composed of many alternating zones of low and high permeability (Meyer, 1989). Vertical flow between permeable zones probably occurs through sinkholes and fractures; however, the vertical flow is probably small compared with the amount of horizontal flow (Meyer, 1989). Since the FAS is defined on the basis of its permeability, the top and the base of the aquifer system do not coincide everywhere with the top or base of rocks of any single geologic formation or strata of any single geologic age (Miller, 1997).

The FAS can generally be subdivided into several permeable zones, separated by low-permeability limestones. It is composed of limestone and dolostone units generally dipping to the east and south, and contains brackish to saline water. The permeable zones within the FAS are regionally grouped into upper and lower units, separated by a middle confining unit. These units are informally designated "Upper Floridan Aquifer", "Middle Floridan Confining Unit", and "Lower Floridan Aquifer".

3.4.1 Hydrogeologic Units

3.4.1.1 Upper Floridan Aquifer

The Upper Floridan Aquifer (UFA) in southern Florida chiefly consists of permeable zones in the Tampa, Suwannee, and Ocala Limestones and porous zones located in the upper part of the Avon Park Formation (Meyer, 1989). **Figure 5** depicts the top elevation of the UFAS surface in the model domain.

Two predominant permeable zones exist within the Upper Floridan Aquifer. In south Florida, the uppermost, modestly permeable zone typically lies between 500 and 1,250 feet bls, with shallower depths usually encountered in the northern portion of the study area. The most transmissive part of this upper permeable zone usually occurs near the top, coincident with an unconformity at the top of Eocene formations. The UFA exists under flowing artesian conditions, so its permeable zones can be defined in a well by using flowmeter and temperature geophysical logs (Reese, 1994). Additional permeable zones are observed with depth within the upper portions of the FAS.

A second permeable interval has been documented within the Avon Park Formation, ranging in approximate depth in south Florida from 1,000 to 1,500 feet bls (Miller, 1997). The base of the Upper Floridan Aquifer is located within the Avon Park Formation. Some investigators in south Florida have termed this the Middle Floridan Aquifer (MFA), but disagreement exists in the literature regarding this issue. Reese and Richardson (2004) were able to substantiate the presence and continuity of the unit through an extensive study of core logs, well logs, and downhole geophysical logs. The estimated top elevation of this unit within the model domain is shown on **Figure 6**. The study results included development of elevation surface maps of the various aquifers and confining units, definition of permeable zones, development of an aquifer property database, and preparation of a comprehensive report in support of the Comprehensive Everglades Restoration Plan (CERP). As a result of the study the UFA was sub-divided into two units including an upper permeable zone (UFA) and a middle permeable zone (MFA) separated by an upper middle confining unit (MCU1). Since there is still some controversy regarding the terminology for the middle permeable zone, for this report it will be called the "Avon Park Permeable Zone" of the UFA or (APPZ). The middle confining unit is discussed below.

The transmissivity estimated for the UFA ranges from values greater than 1,000,000 square feet per day (ft^2/day) where the aquifer is unconfined to less than 10,000 ft^2/day where the aquifer is thin and thickly confined (Miller, 1997).

The transmissivity of the upper portions of the FAS in south Florida ranges from about 10,000 to 60,000 ft^2/day (Bush and Johnston, 1988). Some of this variability may be due to variation in the thickness of the interval tested, as well as varying hydraulic properties. Bush and Johnston (1988) provided a range for the storage coefficient for the upper portion of the FAS from 1.0×10^{-5} to 2.0×10^{-2}, with the most common values in the range of 10^{-3} to 10^{-4}.

3.4.1.2 Middle Floridan Aquifer Confining Unit

Miller (1986) observed that portions of the lower Avon Park Formation are fine-grained and have low permeability, thereby acting as inter-aquifer confining units within the FAS. This confining sequence -- referred to as the Middle Confining Unit (MCU) -- is expected to occur between

1,400 and 1,800 feet bls. Miller (1986) reports that few differences exist in the lithologies between the MCU and the permeable units above and below. The MCU generally separates the UFA and the Lower Floridan Aquifer (LFA) but includes the APPZ within it according to Reese and Richardson (2004). Hydraulic connection across this unit has been inferred from sinkholes and fractures that transect the MCU (Meyer, 1989). The MCU is very important to the overall groundwater flow within the FAS since groundwater movement in southern Florida is thought to be mainly upward from the LFA through the MCU, then horizontally toward the ocean through the UFA (Meyer, 1989). For this study, the MCU has been sub-divided into two separate units per research by Reese and Richardson (2004); namely, the MCU1 and MCU2. The MCU1 separates the UFA from the APPZ while MCU2 separates the APPZ from the LFA.

3.4.1.3 Lower Floridan Aquifer

The LFA may also contain several permeable and less permeable zones. Three dolostone layers have been identified by Meyer (1989) within the Oldsmar Formation separated by less permeable limestone layers. Meyer (1989) reported hydraulic connection between the lower and intermediate dolostone layers, but a weak connection between the upper and intermediate layers. The lowest permeable zone is a solution-worked fracture and cavernous interval that occurs in the Oldsmar Formation, and is also known as the "Boulder Zone". The Boulder Zone typically occurs at an estimated depth of 2,500 feet bls, extending to an approximate depth of 3,500 feet bls. The transmissivity of the Boulder Zone was estimated to be 3.2×10^6 to 2.5×10^7 ft^2/day by Miller (1986) and Meyer (1989). At USGS well G-3234 in central Miami-Dade County, the thickness of the LFA was estimated to be 380 feet based upon geophysical logging (Reese, 1994). Meyer (1989) identified a LFA thickness of 650 feet at the Fort Lauderdale Wastewater Treatment plant located in eastern Broward County, Florida.

The hydrogeology conceptualized for this model report relied upon Reese and Richardson (2004) as the basis of unit surface elevations, unit geometry, aquifer parameters, and initial water quality. In fact, Golder was provided an initial version of the model for modification under this contract. **Figure 7** details the hydrogeologic correlation table adopted for this model study. Although Reese and Richardson (2004) developed the most comprehensive database of hydrogeologic and geologic data in south Florida, it should be recognized that the various unit surface maps developed (and adopted in this study) have considerable statistical error associated with them due to the kriging algorithm used to interpolate the various maps. It should also be noted that although there may be multiple permeable zones within the LFA, Reese and Richardson (2004) mapped only the highest permeable zone (LF1) and the top of the Boulder Zone. Consequently, only those two units are explicitly represented in the model, and any additional permeable zones are lumped into the Lower Floridan Confining (LC) unit.

According to Reese and Richardson (2004), kriging was utilized to fit or interpolate model surfaces using the available lithologic elevation data. In order to evaluate the model surfaces, semi-variograms were developed for each unit of interest and estimates of standard error made for each. For the UFA model surface, the standard error of estimate is less than 50 feet over most of the peninsula, and less than 20 feet over much of south Florida. The APPZ model surface, on the other hand, exhibits a much larger range of error, with standard errors less than 50 feet only in the immediate vicinity of a control point, and ranging from 100 to 200 feet over most of the peninsula. The model surface thickness of the APPZ as estimated from Reese and Richardson (2004) is in the same range as the standard error. This is generally a reflection of the paucity of data for the APPZ as compared to the UFA. The surface for the top of the UFA was generated based on over 26,000 data points, the APPZ, less than 600. **Figure 8** shows a comparison of the two model variograms as presented in Reese and Richardson (2004). The experimental semi-variogram for the model UFA surface is fitted well with a spherical model while the model APPZ surface has a relatively poor fit using an exponential model. Therefore, the figure clearly shows that the surface of the APPZ is quite uncertain.

3.4.2 Hydrogeologic Properties

The hydrogeologic properties within the FAS have been evaluated by numerous investigators. For the most part, aquifer performance tests and laboratory tests provide the best estimate of insitu hydrogeologic properties including the horizontal and vertical hydraulic conductivity, storage coefficient, and the effective porosity. Reese and Richardson (2004) and HydroGeoLogic (2006) summarize existing aquifer testing, packer testing, and laboratory hydraulic testing data available for the FAS. Typically, a majority of the data is available in the upper units of the aquifer system since water quality in this area is superior for water supply purposes. For instance, aquifer test data and lab test data was used to develop kriged contour maps of aquifer transmissivity for the UFA, APPZ, and LF1 (Reese and Richardson, 2004). For the UFA, available data included:

- 113 fully penetrating aquifer tests;
- 165 partially penetrating aquifer tests; and,
- 36 aquifer core samples tested in the laboratory.

For the APPZ, available data included:

- 26 fully penetrating aquifer tests;
- 52 partially penetrating aquifer tests that included portions of the unit;
- 9 fully penetrating aquifer tests that included portions of the unit; and,
- 8 aquifer core samples tested in the laboratory.

For LF1, available data included:

- 29 fully penetrating aquifer tests; and
- 22 aquifer core samples tested in the laboratory.

It is clear that data for the APPZ and LF1 are particularly sparse for an area that covers 16,000 square miles. For the APPZ the data density amounts to one hydraulic property test per 168 square miles. That equates to approximately 3 hydraulic property tests for all of Martin County, Florida or another county of similar size. Similar to the development of the various aquifer surface elevations discussed above, Reese and Richardson (2004) used kriging to develop transmissivity or leakance distribution maps for each aquifer and confining unit. Initially, an inverse distance weighted contouring algorithm was utilized to develop the property distribution maps. That method produced unrealistic property distribution maps so ordinary kriging was then used and ultimately adopted. The ordinary kriging maps reveal that the UFA is less permeable than the APPZ or LF1.

For the UFA, transmissivities generally range from 5,000 ft^2/day to 100,000 ft^2/day. Based upon the transmissivity values, the estimated horizontal hydraulic conductivity value for the UFAS ranges from 25 to 500 feet per day (ft/day). HydroGeoLogic (2006) calculated an average value of 180 feet per day for the UFA based upon 100 data points. Based upon the standard error of the top elevation of the hydrogeologic unit maps discussed above, the mean transmissivity could be within +/- 3,600 ft^2/day (assuming an average hydraulic conductivity of 180 feet per day and an average thickness error of 20 feet). It should be noted that two aquifer tests conducted in the UEC and discussed below under "local calibration" below, reveal that the UFA transmissivity could be almost 200,000 ft^2/day in certain portions of the study area.

In general, the APPZ is much more permeable than the UFA within the study area. For the APPZ, transmissivities generally range from 5,000 ft^2/day south and west of Palm Beach County to over 1,000,000 ft^2/day in DeSoto and Pinellas Counties, Florida. Based upon the transmissivity values, the estimated horizontal hydraulic conductivity value for the APPZ ranges from 25 to 5,000 feet per day. HydroGeoLogic (2006) calculated an average value of 1,100 ft/day for the APPZ based upon 47 data points. Although it is not clear from the HydroGeoLogic report, Golder assumes that the average referenced is the geometric mean of the data. Based upon the standard error of the top elevation of the hydrogeologic unit maps discussed above, the mean transmissivity could be within +/- 165,000 ft^2/day (assuming an average hydraulic conductivity of 1,100 feet per day and an average thickness error of 150 feet).

Only limited aquifer testing data is available for the LF1. According to Reese and Richardson (2004):

"LF1 is being increasingly utilized for water supply in Orange and Osceola counties. Ten APTs in the area indicated transmissivity ranging from a low of 82,000 to a high of 688,000 ft^2/day. East of this area, water quality deteriorates rapidly. Because of the poor water quality of the LF1 in this area (generally greater than 10,000 ppm TDS), its production capability has not been tested. Based on the hydrostratigraphic mapping, however, the LF1 appears to thin significantly towards the coast in much of the study area. On cross-section AA', LF1 looses almost 90 percent of its thickness between well OR0613 in Orange county, and W-16226 (BR1217), in central Brevard, a distance of 25 miles. It would be reasonable to expect a corresponding reduction in permeability. Model derived values for transmissivity of the lower Floridan exhibited a similar eastward decline (Sepulveda, 2002). A transmissivity of 1,360 ft^2/day, was estimated at BR1217, and used to guide the automated interpolation to a similar conclusion."

HydroGeoLogic (2006) estimates the range of hydraulic conductivity values from 9.6 to 1,700 ft/day with an average value of 820 feet/day.

Reese and Richardson (2004) provide a good overall discussion of aquifer data quality issues related to the map generation effort and how these various issues were resolved.

"Ideally, hydraulic parameter maps would be generated based solely on high quality multi-well aquifer performance tests fully penetrating a single hydrostratigraphic unit. Single-well APT tests are generally representative of a smaller portion of the aquifer and provide no storage or leakance information. Packer tests have the same problems as single-well APTs and are almost invariably partially-penetrating; their pressure response can also be overwhelmed by friction loss in the drill stem pipe. Because of technical limitations (difficulty of achieving complete seal & low pumping rates) packer tests may also produce permeability estimates that vary by an order of magnitude from APT results. Core permeability measurements represent a very small portion of the system, and tend to drastically under-estimate permeability, particularly when most of the rock permeability is due to secondary rather than primary porosity. The reliability of the input data was weighted accordingly. Priority was given to fully penetrating APTs, followed by partially-penetrating APTs. For the permeable zone maps, packer test data was used only when nothing else was available" (Reese and Richardson, 2004).

An independent evaluation of the same aquifer data completed for this report shows that there are multiple semi-variograms that can be used to krig the data. Each of these produces a slightly different distribution map. Also the error estimates for the aquifers increase with depth based upon the number of data points available. For instance, the error estimate of APPZ horizontal hydraulic conductivity ranges from 200 to 1,000 ft/day. This conclusion is similar to the evaluation made by Reese and Richardson (2004).

Hydrogeologic (2006) summarized the remaining available hydraulic parameter data in a table in their model report. That table is reproduced in this report as **Table 1**. These data were also the basis for the initial hydraulic parameter assignments during model development.

Table 1. Hydrogeologic Properties of Aquifers and Confining Units in the Study Area

Aquifer	Parameter	Number of Observations	Minimum	Maximum	Average[E]
ICU	Kh (ft/day)	33	0.0001	1,563	152[D]
ICU	Kv (ft/day)	20	1.1×10^{-5}	1.0	0.12
UFA	Kh (ft/day)	100	0.45	3,700	180
UFA	Kv (ft/day)[A]	100	0.22	1,850	90
MC1	Kh (ft/day)	12	1.1×10^{-2}	0.665	0.19
MC1	Kv (ft/day)	12	5.5×10^{-3}	0.332	9.52×10^{-2}
MF (APPZ)	Kh (ft/day)	47	3.4	10,000	1,100
MF	Kv (ft/day)[A]	47	1.7	5000	550
MC2	Kh (ft/day)	34	0.083	60	9.5
MC2	Kv (ft/day)[B]	73	1.3×10^{-2}	30	3
MC1/MC2	Kv (ft/day)from L (d^{-1})	45	5.8×10^{-4}	1.7	0.177
LF	Kh (ft/day)	14	9.6	1700	820
LF	Kv (ft/day)[B]	19	0.49	830	300
BZ	Kh (ft/day)	C	8,000	62,000	NA
ICU	Porosity	C	0.30	0.50	NA
FAS	Porosity	C	0.05	0.30	NA
IAS	Specific Storage (ft^{-1})	C	1.0×10^{-4}	5.0×10^{-4}	NA
FAS	Specific Storage (ft^{-1})	C	1.0×10^{-6}	5.0×10^{-6}	NA
FAS	α_L (ft)	C	1,250	5,000	NA
FAS	α_T (ft)	C	125	500	NA

Notes:

A Calculated using Kh and Kh / Kv ratio of 2
B Core samples that are more than an order of magnitude less than the minimum APT value calculated using a Kh/Kv of 2 were disregarded.
C Estimated from typical literature values
D Data include hydraulic conductivity values from aquifers (within the intermediate aquifer system) which comprise ICU
E Golder assumes that the average refers to the geometric mean value
NA Not Applicable

3.5 Groundwater Levels and Flow

The predominant source of groundwater flow in the FAS in south Florida is precipitation falling on the land in recharge areas north and west of the study area. **Figure 9** depicts the variation in precipitation across the study area at different gauging stations including Titusville, Fort Pierce, Moore Haven, and Miami. Much of this precipitation runs off into nearby surface water bodies while the rest percolates slowly into the ground into the SAS. According to Fernald and Purdom (1998), 1 to 45 inches of precipitation recharges into the SAS each year depending upon the topography and surface soil type. A percentage of this available recharge percolates deeper into the FAS through remnant sinkhole features or through the Hawthorn Group to the north and west of the model domain. **Figure 10** shows that only limited recharge to the FAS is expected within the model boundary. According to the literature, up to 1 inch of precipitation per year recharges the FAS in the northwestern corner of the model boundary. According to the literature, the remainder of the model study area generally discharges from the FAS to the SAS. According to **Figure 10**, up to 2 inches of equivalent precipitation discharges from the FAS through the Hawthorn Group to the SAS. **Table 2** was prepared assuming 0.01, .1, and 1 inch of diffuse discharge per year on average from the FAS into the SAS or the Atlantic Ocean across the entire 16,000 square mile active model area. These values provide a useful check on the calibrated model water budget.

Table 2. Estimates of potential vertical discharge from the FAS to the SAS/Atlantic Ocean

Amount of Equivalent Discharge from FAS (in/year)	Discharge Flow Rate (ft^3/day)	Discharge Flow Rate (Gallons per Day)
0.01	1,018,389	7,617,550
0.10	10,183,890	76,175,500
1.0	101,838,900	761,755,000

Based upon these crude estimates, it is unlikely that the FAS discharge is more than 0.10 inches per year given the enormous flow estimate using 1.0 inches per year of discharge. Therefore, it is likely that the total average vertical discharge through the Hawthorn Group from the FAS to the SAS/Atlantic Ocean is between 1,018,389 and 10,183,890 cubic feet per day (ft^3/day).

Most of the recharge to the FAS enters along a high topographic ridge located throughout Polk and Highland Counties, Florida. Evidence of this recharge to the FAS includes water quality data and groundwater age data (Hanshaw and Back, 1965 as discussed in Fetter (1988)). Chloride and total dissolved solids (TDS) data available for selected FAS wells in the recharge area clearly indicates chemical characteristics similar to precipitation. Investigators at the U.S. Army Corps of Engineers (USACE) have prepared regional water level and water quality maps for the UFAS (USACE and SFWMD, 2004). Figure 11 shows concentration of TDS within the UFA in the recharge zone along with the coarse surface topography of Florida. Although the data utilized to develop the TDS contours was incomplete within the model study area at the time, the figure clearly shows that TDS values of 250 milligrams per liter (mg/l) or less are coincident with the higher land elevations in Polk County and along the Highlands County ridge. Therefore, freshwater is recharging the FAS in this area.

3.5.1 Spatial Patterns

The recharge enters the aquifer by gravity flow such that the potentiometric surface of the FAS in the Polk County recharge area is a subdued reflection of the topography. The groundwater then flows downgradient where the head declines due to frictional losses within the FAS due to the circuitous nature of the flow. North of Lake Okeechobee the potentiometric surface of the FAS is below the ground surface, but, as the surface topography drops and flattens south of Lake Okeechobee the potentiometric surface actually rises above the ground surface. With few exceptions, this creates flowing artesian conditions throughout the FAS within the model study area. Groundwater flow in the UFA emanates from the recharge area and flows in all directions. Much of the groundwater flow exhibits a southernly direction and this water is the source of supply to the UEC and LEC of Florida. Meyer (1989) presents an estimated "pre-development" potentiometric surface map of the UFA from May 1980. This figure is approximately reproduced in this report as **Figure 12**. It can be seen in the figure that groundwater elevations in the UFA within the model boundary range from 60 to 70 feet in west-central Palm Beach County, Florida to 40 feet along the Florida east coast.

Fernald and Purdom (1998) provide a potentiometric map of the UFA for 1995 average artesian pressure. Although this figure (reproduced as **Figure 13** in this report) only provides groundwater contours for the UEC portion of the model study area, it is clear that pumping has lowered the UFA water levels by 10 feet or more in St. Lucie County. Numerous potentiometric maps have been published for the UFA over the last 20 years but there are no similar maps for the APPZ.

Using the Meyer pre-development map of the UFA as a starting point and assuming that the APPZ is significantly more permeable than the UFA within the study area, and that the upgradient direction in the APPZ is still towards the Highlands ridge recharge area, it is possible to estimate the APPZ pre-development water levels. This estimated pre-development potentiometric surface is shown as **Figure 14** of this report. Based upon this figure, it is possible that the heads in the APPZ along the western boundary of the model area were 1 to 3 feet higher than the UFA heads due to the higher aquifer permeability in the APPZ and UFA well pumping north of the model boundary. In addition, given the greater depth of the APPZ and its significant confinement within the study area, it may also be under greater artesian pressure.

3.5.2 Temporal Patterns

Water level data from FAS observation wells throughout the model study area was compiled for this report. These data were aggregated and contoured within the model boundary for the period of study from 1999 to 2005. **Figures 15 through 21** depict estimated average water levels within the UFA for December of each year. Generally, the water levels throughout the model study area do not vary much year to year. The only exception to this observation occurs within the UEC area where well pumping is variable year to year which directly affects the water levels within the UEC. **Figure 22** provides a direct comparison of water levels from December 1999 and 2005. This figure demonstrates that the water levels have been stable south of Palm Beach County. Starting in Palm Beach County and moving north into Martin, St. Lucie, Okeechobee, and Indian River Counties, water levels have declined between 1999 and 2005. Review of the 50 foot contour reveals that water levels have declined 2 to 5 feet from Palm Beach County north over the 6 year period contoured. **Figure 23** provides further evidence of the water level reductions that have occurred in the UFA. **Figure 23** provides a comparison of estimated pre-development water levels (pink contours) and December 2005 water levels (blue contours). The figure indicates that artesian water levels have declined 5 to 10 feet within the model study area. In addition to reviewing and evaluating the spatial temporal patterns within the UFA, observation well hydrographs were studied. **Figure 24** shows the location of the various wells analyzed for long-term trends.

Figures 25 depicts water level hydrographs for UFA wells Romp 28, BR0624, and IR0968. These wells are located north and northwest of the model study area. Well Romp 28 is located south of the Highlands ridge recharge area and water level data reflects regional recharge trends within the UFA. From 1998 to 2006, the mean water level at Romp 28 increased from approximately 53 feet NGVD 1929 to approximately 67 feet NGVD 1929. **Figure 26** shows the water level hydrographs and long-term trend lines of the data. The figure clearly shows a significant upward trend for all three wells, especially Romp 28. In fact the slope of the Romp 28 trend line is 0.0053 feet/day upward. Similarly, IR0968 and BR0624 have upward slopes of 0.0016 and 0.0014 feet/day, respectively. **Figures 27 and 28** depict additional well hydrographs for wells located within the northern portions of the model boundary. The hydrographs clearly show a mixed picture of long-term trends. For instance, wells IR0992, L-2, and PBF-2 have slight upward trends with slopes of 0.0004, 0.0001, and 0.0004 feet/day, respectively, while wells SLF-69 and PBF-7 have downward trends with slopes of 0.0137 and 0.0019 feet/day, respectively. Only well SLF-21 shows a more significant upward slope. None of the wells evaluated have upward slopes similar to Romp 28, IR0968 or BR0624. **Figures 29 and 30** show well hydrographs for wells located within the southern portion of the model boundary. All of these wells exhibit slopes that are only slightly upward or flat. Again, there is little similarity in the upward slopes observed in the upgradient portion of the model study area.

What do these hydrographs tell us? Certainly, as long as the wells are not near pumping stresses, the hydrographs farthest from the FAS recharge zone should exhibit the smallest changes in water level amplitude year to year as compared to the Romp 28 and in reviewing the various hydrographs, this is the case. Most of the well hydrographs mimic the water changes (e.g., the "peaks and valleys") of Romp 28. For instance, in June of 2004, Romp 28 reveals a large valley where the FAS water levels drop by 13 feet from the wet season to the dry season. This same water level drop is exhibited on all well hydrographs with the exception of SLF-69 which apparently is affected by localized pumping wells. In addition, all of the wells reveal that the bottom of the trough occurs at approximately the same time indicating that UFA is behaving as a confined aquifer with changes in pressure transmitted rapidly throughout the system. The degree of amplitude change from Romp 28 to the other wells is probably a reflection of distance and localized well pumping. Generally, the smallest changes in amplitude are observed in the far southern regions of the model domain. Although most wells replicate the water level patterns at the recharge area, many do not exhibit the long-term upward trends apparent at Romp 28. Most likely, the cause of this is a long-term decline in the water level within portions of the model study area. Without the long-term water level decline, it is likely that more wells would exhibit steeper long-term upward slopes. The long-term water level decline is likely due to increased water use within the FAS. Water use data within the study area is discussed further in later sections of this report.

3.6 Groundwater Quality

The groundwater quality of the FAS is quite complex due to the intermixing of salt-water and fresh water near the FAS outcrops plus a large vertical mixing component due to leakage between the various aquifer layers. Similar to the aquifer test data, the amount of observation well water quality data available for the FAS declines with depth, with the UFA having the most data and the LF1 having the least. The following sections discuss the spatial water quality patterns and the temporal patterns within the model study area.

3.6.1 Spatial Patterns

Figure 31 displays a contour map of total dissolved solids (TDS) within the UFA. The contour map was prepared using ordinary kriging of water quality data available for existing observation wells. Other contouring methods produced similar TDS distributions to ordinary kriging where sufficient data was available. Since not all of the water quality data is from the same time period, the figure should be considered a lumped average TDS contour map for the aquifer. As can be seen on the figure, the TDS varies from less than 2,500 mg/l in the northern and western portions of the model study area to near ocean water at the UFA outcrop. A majority of the peninsular portion of the UFA is characterized by TDS ranging from 1,000 to 5,000 mg/l. One apparent anomaly is evident in northeastern Broward County. At this location, the TDS is greater than 10,000 mg/l and the outline of the anomaly is defined by at least 3 separate wells in the area. The cause of this anomaly is unknown at this time. **Figure 32** overlays predominant groundwater flow direction from the UFA pre-development map and the December 2005 map discussed previously. It appears that the dominant flow directions have changed since pre-development time with the flows shifting northward. Increased pumping of water supply and irrigation wells in the study area may be the cause of this shift. Insufficient data was available to prepare similar TDS contour maps for the APPZ and LFA. Portions of the APPZ are slightly more brackish than the UFA due to its depth and the fact that portions of the aquifer cross the saline water zone identified by Reese (1994) and Reese and Memberg (1999). Data collected by the SFWMD indicates that the APPZ is actually less brackish than the UFA in a large area from

Coral Springs, Florida to West Palm Beach, Florida. The LFA includes mostly sea water with fresher water entering the model study area along the western boundary. The fresh water quickly mixes with the sea water most likely resulting in TDS values ranging from 10,000 to 20,000 mg/l in the western and northern areas of the study area.

3.6.2 Temporal Patterns

A number of observations wells were evaluated to determine water quality trends between 1999 and 2005. TDS concentration data was plotted versus time and then the various graphs were sorted into geographic regions. The wells evaluated are shown on **Figure 33**. With the exception of 203-1 and 2-3, all wells had open-hole intervals measuring the water quality of the UFA. Wells 203-1 and 2-3 are mostly measuring the water quality of the APPZ. **Figures 34 and 35** depict TDS trends within the northern portion of the model study area. Well OK0001 is located in northeastern Okeechobee County and probably represents a reasonable upgradient well for trend comparison purposes. OK0001 generally has a flat to slightly downward concentration gradient over time. The remaining wells shown on **Figure 35** clearly show flat to slightly upward TDS trends.

Figures 36 and 37 depict TDS trends within the central portion of the model study area. Well L2-PW2 is located in eastern Hendry County and probably represents a reasonable upgradient (compared to wells located east and south of L2) well for trend comparison purposes. L2-PW2 generally exhibits a downward concentration gradient over time. Wells located within Palm Beach County generally also exhibit slightly downward to downward concentration gradients over time. However, the two Martin County wells exhibit flat (well M-1034) to upward (well MF-35) concentration gradients over time.

Figures 38 and 39 depict TDS trends within the southern portion of the model study area. Well L2-PW2 is located in eastern Hendry County and probably represents a reasonable upgradient well for trend comparison purposes. L2-PW2 generally exhibits a downward concentration gradient over time. Wells located within Miami-Dade County generally also exhibit slightly downward to downward concentration gradients over time. However, the two eastern Broward County wells exhibit flat to upward concentration gradients over time. These data are consistent with **Figure 31** which reveals a high TDS anomaly located in northeastern Broward County. The cause of this anomaly is currently unknown. Plausible explanations could include salt-water intrusion from the Atlantic Ocean, upconing from deeper aquifers due to unregulated pumping, or the existence of trapped connate water in the UFA in this location.

Generally, the trends observed in the water quality data are consistent with the long-term water level data for the UFA. The water level data revealed a long-term increase in water level along the FAS Highlands ridge recharge zone. The water level rise was evident in most of the wells reviewed, however, the upward slopes tended to be damped. In addition, a number of wells located in St. Lucie and Martin, Counties actually showed significant water level declines. Assuming higher recharge is entering the UFA and APPZ and no other anthropogenic impacts to the aquifer, the long-term TDS concentration should be downward. However, many of the wells reviewed for this report have flat to upward concentration gradients, possibly indicating that well pumping from the UFA or APPZ is counteracting the regional recharge effect. If regional recharge declines significantly or water use continues to increase in the next few years, it is possible that UFA water quality may continue to deteriorate. The rate and magnitude of the water quality change will be controlled by the degree of aquifer confinement, aquifer transmissivity, and boundary conditions.

3.7 Water Use Data

The SFWMD provided water use data for the entire study area to Golder. The data included well ID/permit number, well location, cased depth, bottom of well elevation, source (e.g., SJRWMD, UEC estimated irrigation, public supply, LEC), and average daily pumping rate in million gallons per day (MGD). Over 1,400 pumping wells were included within the model area. **Table 3** provides a complete list of all pumping wells entered into the model. Groundwater Vistas[tm] software was utilized to automatically assign the pumping amount for each well to the proper model layer by using the cased depth and bottom elevation of the well. Visual Basic programs were developed to organize the well pumping data and create a data input format compatible with Groundwater Vistas[tm]. As part of the model revisions of the original 1999 to 2004 transient model, Golder identified data discrepancies with the water use data. As part of the revised model strategy and contract modification, Golder completed a thorough review and validation of the water use data. Golder identified duplicate wells, incomplete data sets, and anomalous information. Golder used the follow strategies to amend and validate the data for input into Groundwater Vistas[tm]:

- Duplicate wells – delete all duplicates;
- Missing water supply pumping data – Develop estimates of pumping data based upon long-term pumping averages for a given well; and,
- Anomalous information – Edited fields and data if correct information was available.

Figures 40 and 41 provide water use graphs (cubic feet per day [cfd]) by source for all pumping wells within the model boundary. The aggregated water use total graph clearly shows substantial variation year to year with a low total of 12,000,000 cfd in September 1999 to as much as 24,000,000 cfd in December of 2004. **Figure 41** includes long-term trend lines for the various water use components. All components with the exception of the LEC are generally flat to slightly downward. Since most of the components are estimated irrigation water use in the UEC, it is logical that irrigation demands could actually be shrinking due to the spread of urban development within the UEC over the last 5 years. However, the small decline in irrigation use is more than made up by the increase noted for the LEC public supply data. The mean trend water use for LEC potable supply increased from just over 4,600,000 cfd in 1999 to nearly 9,000,000 cfd in 2005. This is an increase of nearly 200% in seven years. This long-term trend could explain the long-term trends exhibited in the water level data and TDS data for the UFA, especially within the UEC portion of the model.

3.8 Conceptual Model

The groundwater flow within the FAS along the southeastern coast of Florida is likely quite complex. Limited data exists within the APPZ, LFA, and Boulder Zone portions of the aquifer complex. As discussed earlier in this report, precipitation recharges the FAS through Polk County and along the Highlands County ridge. Recharge flows downward and recharges the UFA, APPZ, and LFA. Near the recharge zone numerous karst features and preferential flow pathways have led to a highly permeable flow system. All three FAS aquifer components exhibit high transmissivities and are highly interconnected. **Figure 42** depicts water level hydrographs for four aquifer zones at the Polk County recharge area. The highest water level is found within the SAS. The water levels of the Intermediate Aquifer System (IAS), UFA, and APPZ are almost identical. Ultimately, the recharge is converted to groundwater flow and travels down gradient where the potentiometric surface gradually declines due to frictional losses within the aquifer system. The potentiometric surface declines are a function of hydraulic conductivity of the aquifer. Therefore, it is reasonable to expect that water levels would exhibit significant differences depending upon the degree of permeability of each flow zone and the overall aquifer confinement. In southern Florida, aquifer test data has revealed that the APPZ and the LFA have higher aquifer transmissivity than the UFA from approximately Palm Beach County northward and comparable values south of this area. Therefore, in portions of the model domain, the water levels within the APPZ and LFA could be higher than the UFA. Anthropogenic effects of well pumping certainly can also affect the overall water levels and vertical gradients between each aquifer zone. North of Lake Okeechobee, the UFA and APPZ are pumped heavily for potable water supply and irrigation purposes. However, within the model study area and within most of southern Florida, the UFA is the primary source of water supply due to the extra expense to install deeper wells into the APPZ. Golder has assumed that the APPZ is the primary source of water entering the model/flowing beneath south Florida and that it should have water levels 1 to 3 feet higher than the UFA for the reasons described above. This situation is also borne out by the field data observed at well nests Alligator Alley and Western Hillsboro.

Within southeastern Florida, the freshwater inflow from the FAS meets sea water from the Atlantic Ocean and results in a large mixing zone. Some freshwater will mix with the sea water while the rest will likely flow on top of the sea water due to density differences. The discharge of freshwater into the Atlantic Ocean depends upon the potentiometric head of the freshwater in the FAS and equivalent freshwater head at the Atlantic Ocean boundary. For this report, an evaluation of hydrostatic pressures and equivalent freshwater heads was completed to evaluate potential flows into or out of the various FAS units. Assuming a potentiometric head of 40 feet in the UFA along the Florida southeastern coast, the hydrostatic head difference (using equivalent freshwater heads) for the primary FAS aquifers and the Atlantic Ocean (assuming average head of 0 feet) is as follows:

- UFA + 16.5 feet from west to east (e.g., flow out to Atlantic Ocean)
- APPZ +5.9 feet from west to east (e.g., flow out to Atlantic Ocean)
- LFA -1.95 feet inward from east to west (e.g., flow from Atlantic Ocean)
- BZ -5.6 feet inward from east to west (e.g., flow from Atlantic Ocean)

Assuming a 10 foot reduction of potentiometric head to 30 feet in the UFA along the Florida southeastern coast, the hydrostatic head difference for the primary FAS aquifers and the Atlantic Ocean is as follows:

- UFA + 6.5 feet from west to east (e.g., flow out to Atlantic Ocean)
- APPZ -4.1 feet inward from east to west (e.g., flow from Atlantic Ocean)
- LFA -12 feet inward from east to west (e.g., flow from Atlantic Ocean)
- BZ -15.6 feet inward from east to west (e.g., flow from Atlantic Ocean)

It is clear that the FAS will discharge to the Atlantic Ocean if heads remain high but significant changes occur if the head is reduced 10 feet. This simplistic analysis is helpful to understanding the complex flow paths at the coast. **Figure 43** depicts the Golder conceptual groundwater flow model of the study area. This model is based upon our understanding of the flow regime as well as an analysis of equivalent heads at the FAS outcrops. Within the Boulder Zone, flow for most of southeastern Florida is likely inward towards the peninsula. Within the LFA, the flow will be inward from the Atlantic Ocean until the LFA head exceeds approximately 21 feet. Within the APPZ, the flow will be inward from the Atlantic Ocean until the head exceeds 31.5 feet. Within the UFA, the flow will be inward from the Atlantic Ocean until the UFA head exceeds 23 feet. This crude evaluation indicates that for the present, the UFA will be dominated by freshwater flow out rather than sea water intrusion inward. As the sea water travels west within the Boulder Zone or LFA, it will have a tendency to mix with the freshwater and possibly flow upwards through confining units into higher aquifer units. Vertical flow within the FAS has been studied by several notable authors (Kohout, 1965; Reese, 1994).

Kohout (1965) proposed that thermal convection within the Florida Plateau inland is causing additional cold sea water flows into the Boulder Zone and possibly the LFA. In theory, the cold salt water mixes with freshwater water and is heated by thermal convection cells emanating from deep geologic zones in the Florida Basement. The fresher and hotter water is then less dense allowing it to travel upward in the stratigraphic column into the APPZ or UFA. From there it mixes with recharge water and flows back into the Atlantic Ocean. Meyer (1989) used apparent carbon-14 age data to show that groundwater closer to the Atlantic Ocean in the Boulder Zone was younger than water located further to the west. HydroGeoLogic (2006) discusses more recent groundwater isotope and noble gas studies undertaken by SFWMD. The apparent age of groundwater along a transect from Fort Myers to West Palm Beach revealed relatively young groundwater likely due to the proximity to FAS recharge areas. Along the transect from Naples to Fort Lauderdale, SFWMD found evidence for upward movement from the LFA into the APPZ/UFA as well as inward flow from the Atlantic Ocean and Gulf of Mexico. The transect from Everglades City to Miami, the data suggests that there is upward flow from the LFA to the APPZ/UFA and inward flow from the Atlantic Ocean. This age data is consistent with the conceptual model outlined by Golder on **Figure 43**.

As part of the development of the conceptual groundwater flow model, basic water and mass budgets were completed for the FAS within the model study area. **Figures 44 and 45** outline estimated inflows along the western model boundary using existing groundwater elevation data and assuming hydraulic conductivities as shown (e.g., 50 feet/day for the UFA and 500 to 3,000 feet/day for the APPZ). The source of these recharge flows is Polk County but enter the model in a westerly fashion due to post-development pumping in the study area. The inflows from the UFA are estimated to be approximately 630,000 cfd while the inflows from the APPZ are thought to range from 6,300,000 to 37,900,000 cfd (~ 22,000,000 cfd average). Detailed analysis of the LFA was not completed since only limited water level data is available, however, the inflows into the LFA should probably be in the same order of magnitude as the APPZ since the transmissivity of the LFA is probably similar. **Figure 46** presents a plausible hypothetical water and mass budget at steady-state conditions for the FAS in the model study area of southern Florida. TDS mixing calculations reveal that average concentrations within the APPZ and UFA would be approximately 2,000 to 6,000 mg/l based upon the assumed water budget. The actual TDS concentration in the UFA and APPZ is on the same order of magnitude.

4.0 PREVIOUS MODEL STUDIES

4.1 Lower East Coast Floridan Aquifer Model - SFWMD

The Lower East Coast Floridan Aquifer Model was developed by the SFWMD in 1999 (SFWMD, 1999). The model was used to evaluate water resources issues within the Lower East Coast Water Supply Region in southeast Florida.

The model domain covered 16,434 square miles along the southeastern coast of Florida. The model grid included 91,822 cells with a cell size of 5,280 feet by 5,280 feet. The model included nine layers simulating the SAS (Layer 1), ICU (Layer 2), UFA (Layer 3), MCU (Layer 4), UFA/APPZ (Layer 5), MC2 (Layer 6), LFA (Layer 7), LC (Layer 8), and the Boulder Zone (Layer 9). The model was calibrated assuming steady-state conditions using average heads from 1995 to 1997. Water levels data was available in 26 SFWMD wells and 47 utility wells. The model used "equivalent freshwater heads" to account for the water quality gradients within the FAS. The model used general head boundaries on the exterior of the model and assumed constant head boundaries in the SAS and the Boulder Zone.

The Lower East Coast Floridan Model includes a majority of the ECFAS Phase II model domain such that there is considerable overlap in the two models. The average calibrated horizontal (Kh) and vertical (Kv) hydraulic conductivities of each layer are presented as follows:

- Layer 1 – Not applicable since it was a constant head boundary;
- Layer 2 – Kh = 0.5 ft/day and Kv = 1×10^{-5} ft/day;
- Layer 3 – Kh = 175 ft/day and Kv = 8 ft/day;
- Layer 4 – Kh = 0.09 ft/day and Kv = 7×10^{-3} ft/day;
- Layer 5 – Kh = 75 ft/day and Kv = 9 ft/day;
- Layer 6 – Kh = 9 ft/day and Kv = 2.2×10^{-3} ft/day;
- Layer 7 – Kh = 99 ft/day and Kv = 2.2×10^{-4} ft/day;
- Layer 8 – Kh = 0.9 ft/day and Kv = 1.7×10^{-3} ft/day
- Layer 9 - Not applicable since it was a constant head boundary.

These values equate to approximate aquifer transmissivities of 52,500 ft^2/day, 22,500 ft^2/day, and 29,700 ft^2/day for the UFA, UFA/MFA (APPZ), and LFA, respectively. The model results revealed that a majority of the flow in the model was vertical. Also, it was noted that approximately 90% of the inflow recharge into the UFA came from lower FAS aquifer levels.

4.2 "Mega Model" - USGS

The Peninsular Model or "Mega Model" was developed by the USGS in 2002 (Sepulveda, 2002). The model was prepared to evaluate water resources issues within the Florida peninsula. The purposes of the model are listed in the report as follows:

- Test and refine the conceptual understanding of the regional groundwater flow system;
- Develop a database to support sub regional groundwater flow modeling; and
- Evaluate effects of projected 2020 groundwater withdrawals on groundwater levels.

The model domain covers 40,800 square miles along the Florida peninsula from Georgia in the north to Lake Okeechobee in the south. The model grid includes 210 columns and 300 rows with a cell size of 5,000 feet by 5,000 feet. The model includes four layers simulating the SAS (Layer 1), IAS and ICU (Layer 2), UFA (Layer 3), and the LFA (Layer 4). The so called "APPZ", is included as part of Layer 3 in the Mega Model. The model was calibrated using average hydrologic conditions from August 1993 to July 1994. The calibration time period corresponded with a regional synoptic data collection effort carried out by the USGS that included the collection of water flow, spring flow, river/lake stage, and river base flow data in the study area.

The base of the model coincides with the 5,000 mg/l isochlor surface. Groundwater flow below this surface where chloride exceeds 5,000 mg/l was not included in the conceptualization of the flow system in the study. In addition, groundwater flow across this interface was assumed to be negligible. Multiple model variables including aquifer transmissivity, leakance, spring/riverbed conductance, and net recharge were adjusted until the calibration criteria were all met.

The Mega Model includes a portion of the ECFAS Phase II study area (current model study area) including Indian River, Okeechobee, St. Lucie, and Martin Counties, Florida. Therefore, the remaining discussion of the Mega Model will focus upon those areas where the two models overlap. The Mega Model includes figures depicting calibrated transmissivity ranges for the area of interest. For the UFA, the transmissivity is generally between:

- 10,000 and 50,000 ft^2/day for Okeechobee County;
- 50,000 to 100,000 ft^2/day for Martin County;
- 50,000 to 500,000 ft^2/day for St. Lucie County; and
- 100,000 to 500,000 ft^2/day for Indian River County.

One important distinction between the Mega Model and the ECFAS Phase II model is that the UFA in the Mega Model includes the APPZ which is a separate layer in the ECFAS Phase II model. Therefore, the total transmissivity shown for the Mega Model is not directly comparable to the ECFAS Phase II model; however, it is still useful for qualitative comparisons. One other important observation related to the UFA transmissivity distribution is that the calibrated Mega Model includes bands of low transmissivity along the Florida east coast. In the model domain that was continued to the FAS outcrop in northeastern Florida; this band has a transmissivity of 3,000 to 10,000 ft^2/day. Considering that the UFA in the Mega Model includes both the south Florida UFA and APPZ, this is significant indicating that aquifer changes may occur at the FAS outcrop beneath the Atlantic Ocean. Perhaps diagenesis or physical plugging of the outcrop has occurred in these locations.

The Mega Model includes a similar transmissivity distribution map for the LFA. For the LFA the calibrated transmissivity is generally between:

- 300,000 to 500,000 ft^2/day for Okeechobee County;
- 300,000 to 500,000 ft^2/day for Martin County;
- 300,000 to 500,000 ft^2/day for St. Lucie County; and
- 100,000 to 500,000 ft^2/day for Indian River County.

The Mega Model includes a similar map displaying leakance of the ICU. For the ICU the calibrated leakance is generally between 1.0×10^{-6} and 1.0×10^{-5} feet/day/foot for Indian River, Martin, St. Lucie, and most of Okeechobee Counties. In reviewing the estimated thickness of the ICU in Reese and Richardson (2004), the corresponding range in vertical hydraulic conductivity for the ICU would be:

- 0.0003 to 0.003 ft/day for Okeechobee County;
- 0.00055 to 0.0055 ft/day for Martin County;
- 0.000375 to 0.00375 ft/day for St. Lucie County; and
- 0.0002 to 0.002 ft/day for Indian River County.

A small part of the ICU in Okeechobee County that is located beneath a topographic surface high (probably a ridge in the SAS) has a range from 6.1 x 10^{-4} to 3.0 x 10^{-4} feet/day/foot. This would equate to a vertical hydraulic conductivity range from 0.183 to .09 ft/day.

4.3 East Coast Floridan Model Phase I - HydroGeoLogic

The East Coast Floridan Aquifer System Model was developed by HydroGeoLogic (2006) in 2006. The model was prepared to simulate the entire FAS within southeastern Florida in order to examine water resources changes and development that is imminent. The model domain covers approximately 10,500 square miles covering mostly Palm Beach, Broward, and Miami-Dade Counties, Florida. The model grid includes 51,040 cells with a cell size of 2,400 feet by 2,400 feet. The model includes 14 layers simulating the entire aquifer flow system in south Florida. The model was calibrated to pre-development conditions as well as steady-state conditions from 1999 to 2005. Calibration included a comparison of observed and simulated groundwater levels and water quality. The model employed specified head boundaries along the western and eastern boundaries. The Boulder Zone and the SAS are simulated as constant head and constant concentration boundaries.

The average calibrated horizontal (Kh) and vertical (Kv) hydraulic conductivities of each layer are presented as follows:

- Layer 1 and 14 – constant head boundaries;
- Layer 2 (ICU) – Kh = .001 and Kv = 0.0001 ft/day;
- Layer 3/4 (UFA) – Kh = 400 and Kv = 200 ft/day;

- Layer 5/6 (MCU1) - Kh =.1 and Kv = 0.01 ft/day;
- Layer 7/8 (APPZ) – Kh = 75 and Kv = 37.5 ft/day (average conditions in majority of model domain);
- Layer 7/8 (APPZ) in NE Palm Beach County – Kh = 1,200 and Kv = 600 ft/day;
- Layer 9/10/11 (MCU2) – Kh = .05 and Kv = 0.005 ft/day;
- Layer 12 (LF1) – Kh = 600 and Kv = 300 ft/day;
- Layer 13 (LFCU1) – Kh = .0002 and Kv = 0.00002 ft/day;

For the aquifers, these average values equate to 80,000 ft^2/day; 15,000 to 180,000 ft^2/day; and 120,000 ft^2/day for the UFA, APPZ, and LF1, respectively.

4.4 East-Central Floridan Aquifer Model

The East-Central Florida Aquifer Model (ECF) was developed by the SJRWMD (McGurk and Pressley, 2002). The model was prepared to simulate pre-development conditions, modern day post-development conditions, and future development conditions based upon increased water supply demands within the model study area.

The model domain covers 7,568 square miles. The model grid includes 33,757 cells with a cell size of 2,500 feet by 2,500 feet. The model includes four layers simulating the SAS (Layer 1), UFA (Layer 2), UFA/APPZ (Layer 3), and the LFA (Layer 4). Confining units were included as leakance arrays in MODFLOW. The model was calibrated assuming average 1995 steady-state conditions. Calibration included comparison of observed and simulated groundwater levels as well as stream or spring flow. The model used general head boundaries laterally around the model exterior. The bottom of the model generally coincides with the freshwater-saltwater interface.

The average calibrated horizontal (Kh) and vertical (Kv) hydraulic conductivities of each layer are presented as follows:

- Layer 1 – Kh = 20 ft/day and Kv = 0.001 to 0.1 ft/day;
- Layer 2 – Kh = 50 to 5,000 ft/day and Kv = 0.25 to 50 ft/day;

- Layer 3 – Kh = 50 to 5,000 ft/day and Kv = 0.01 to 1.5 ft/day;
- Layer 4 – Kh = 15 to 500 ft/day and Kv = 0.01 to 0.1 ft/day;

These values equate to approximate aquifer transmissivities of 15,000 to 1,500,000 ft^2/day; 15,000 to 1,500,000 ft^2/day; and 4,500 to 150,000 ft^2/day, for the UFA, APPZ, and LFA, respectively.

4.5 CERP Model – U. S. Army Corps of Engineers (USACE)

The USACE and the SFWMD are currently developing a large numerical model of the Florida peninsula from Orlando to Key West, Florida using the FEMWATER/WASH123D groundwater modeling code. The model is a finite-element formulation with a mesh spacing of approximately 5,000 feet and simulates the entire FAS (Bitner et al., 2007). This preliminary model was utilized to examine various hydrogeological conceptual models that have been put forward by various authors. The tests included the following:

- Permeable fracture zones;
- Regional horizontal anisotropy;
- Low permeability on the Ocean floor;
- Disequilibrium from past high sea level stands;
- Increase vertical hydraulic connection between aquifer units; and,
- The effects of temperature and pressure on fluid density and viscosity.

The study found that regional horizontal anisotropy and temperature/pressure effects on fluid density produced the best match to regional water levels.

5.0 MODEL DEVELOPMENT

5.1 Conceptual Model

The conceptual model discussed previously in this report and presented in **Figures 43 to 46e** was utilized as a basis for constructing the numerical model.

5.1.1 Surficial Aquifer System - SAS

The SAS is generally a discharge sink according to the conceptual model of southern Florida. Diffuse upward leakage flows from the FAS and mixes with SAS water or discharges directly into the Atlantic Ocean. A small portion of the SAS located along a topographic ridge within Okeechobee, Indian River, and St. Lucie Counties, Florida discharges water into the FAS through the ICU. The total recharge from this ridge feature is thought to be relatively small as compared to the low-rate, diffuse upward leakage from the UFA over the remaining model area. The numerical model simulates the SAS as a constant head and constant concentration boundary.

5.1.2 Intermediate Confining Unit - ICU

The ICU is substantial confining unit that separates the SAS from the FAS in the model domain. A low vertical permeability in this unit is required to maintain the high artesian pressures in the FAS throughout the model study area. Due to its lower permeability, flow through this unit is expected to be on the low side of regional estimates published in the literature.

5.1.3 Floridan Aquifer System - FAS

The FAS is the main pathway for groundwater flow below the ICU. The UFA, APPZ, and LFA all provide flow to the total aquifer system. Based upon estimated transmissivities of the aquifers, the conceptual model indicates that a majority of the flow through the aquifer system arrives by way of the APPZ and LFA, while considerably less water flows in from the UFA. However, the discharges to the Atlantic Ocean are probably controlled mostly by the UFA due vertical density stratification. In addition, geologic cross sections reveal that the projected thickness of the APPZ and LFA at the Atlantic Ocean is much less than the UFA.

5.1.4 Boulder Zone - BZ

The BZ is a paleokarst zone that is the lowermost permeable zone of the flow system in the FAS. Because of its karst nature, the BZ likely has enormous transmissivity and is believed to be hydraulically connected to the Atlantic Ocean and the Gulf of Mexico. Because of its high permeability and depth, the BZ contains predominantly seawater. Due to the cold, dense seawater and possibly convective heating, it is likely that the BZ provides some salinity to the LFA which is located above it in the FAS system.

5.2 Description of Model Codes

The numerical models developed for SFWMD and documented in this report use SEAWAT2000 which is an integrated combination of the original MODFLOW code and the MT3DMS code. All three codes are discussed further below.

5.2.1 MODFLOW

MODFLOW 2000 is a computer program that numerically solves the three-dimensional groundwater flow equation for a porous medium using a finite-difference method (McDonald and Harbaugh, 1988). It includes a number of solvers to facilitate the iterative solution process that depends upon the chosen convergence criteria. MODFLOW is a widely used program for constant-density groundwater flow problems. Key factors in MODFLOW's popularity in the modeling community are its thorough documentation, modular structure, which makes it easy to modify and enhance, and the public availability of the software and source code. It is in the public domain and has been widely used and tested.

5.2.2 MT3DMS

MT3DMS is a computer program for modeling multi-species solute transport in three-dimensional ground-water systems using multiple solution techniques, including the finite-difference method, the method of characteristics (MOC), and the total-variation-diminishing (TVD) method (Zheng and Wang, 1998). MT3DMS is one of the most common solute transport models used in the United States since it links to MODFLOW 2000 by utilizing the flow solution of MODFLOW. MT3DMS includes several contaminant transport solution algorithms including Method of Characteristics (MOC), third order total variation diminishing (TVD), and a standard finite-difference method with central-in-space or upstream weighting. MT3DMS includes the capability of modeling multiple transport processes including advection, hydrodynamic dispersion, adsorption, and chemical reactions (e.g., exponential decay). As with any solute transport code, MT3DMS is sensitive to the overall model resolution, transport time-step size, and dispersivity selected as part of the model input process.

5.2.3 SEAWAT

The SEAWAT program (Guo and Langevin, 2002) is a combination of MODFLOW and MT3DMS (Zheng and Wang, 1998) designed to simulate three-dimensional, variable-density, groundwater flow and solute-transport. The program was developed by modifying MODFLOW subroutines to solve a variable-density form of the groundwater flow equation and by combining MODFLOW and MT3DMS into a single program. SEAWAT reads and writes standard MODFLOW and MT3DMS input and output files, allowing most of the existing pre- and post-processors to facilitate application of the program to a wide range of practical problems. One advantage of SEAWAT is that because it uses MT3DMS to represent solute-transport, the program contains several diverse methods for solving the transport equation including the MOC, TVD scheme, and a standard finite-difference method with central-in-space or upstream weighting. The version of SEAWAT-2000 used for the model development effort cannot account for heat transport or for temperature-dependent fluid properties. A newly released Version 4.0 of the code does have this capability.

5.3 Model Discretization

The final numerical model grid includes 542 rows and 192 columns with 14 layers. The numerical model grid includes 1,456,896 total cells with 1,084,630 active cells. The Phase II model is about 40% larger than the HydroGeoLogic (2006) model that had 714,520 active cells, corresponding to the inclusion of the UEC Planning region into the model domain.

5.3.1 Horizontal Resolution

The model horizontal resolution is 2,400 feet by 2,400 feet for each grid cell. For the entire model domain, this covers an area of 21,501 square miles. Of this area, approximately 16,000 square miles are active including offshore cells within Layer 1 (e.g., offshore portions of the SAS). The remaining cells are set as inactive.

5.3.2 Vertical Resolution

The model includes 14 layers vertically as follows:

- Layer 1 – SAS
- Layer 2 – ICU
- Layers 3 & 4 – UFA
- Layers 5 & 6 – MCU1
- Layers 7 & 8 – APPZ
- Layers 9, 10 & 11 – MCU2
- Layer 12 – LF1
- Layer 13 – LFCU1 (composite of all confining and permeable zones between LF1 and BZ)
- Layer 14 – BZ

Based upon a bottom elevation of -3000 feet and a top elevation of 25 feet, the total model thickness is 3,025 feet on average. Each of the layers have variable thickness with the confining units typically thicker than the aquifer flow zones. The aquifer flow zones are typically 150 to 300 feet thick, making the aquifer flow zones much thinner than corresponding confining units. **Figure 46e** displays the various vertical layers along with assigned model boundary conditions for each layer.

5.3.3 Temporal Resolution

The original transient calibration model is run from 1999 to 2004 with monthly stress periods and 5 day flow time steps. Each flow time step is approximately 6 days long so that each stress period covers approximately 30 days. When running the 1999 to 2004 model using SEAWAT2000 in "uncoupled mode", the model can be run in 3.5 hours on a 3.6 Mhz Intel processor computer with 4 GB of resident memory. When running the model using SEAWAT in "coupled mode", the model runs in 6 days. It should be noted that coupled model run-times can be less than 6 days but the flow and mass balance errors are typically higher. Due to the long computational times and the incorporation of more accurate water use data, the revised modeling strategy included calibration against only 2005 water levels/TDS and validation against 2004 data. A revised steady-state model was also prepared for the project. The revised steady-state model uses pre-development boundaries and does not include any pumping wells. It runs for 365 days using constant boundary conditions. The revised steady-state model was only used to compare simulated water levels versus observed pre-development water levels since concentration changes are only manifested after a minimum of 30 years. The steady-state model takes approximately 30 minutes to run in "uncoupled mode" and 20 hours in "coupled mode." The original pre-development steady-state model ran for 365 years and was used to help with the assignment of initial concentrations in the deeper aquifers. The 2005 transient calibration model and 2004 transient validation model take approximately 30 minutes to run in "uncoupled mode" and 20 hours in "coupled mode.".

5.4 Hydraulic Properties

Golder initially used the hydraulic parameter distribution provided by the SFWMD and then adjusted the parameters during model calibration. Golder recalibrated the hydraulic parameters starting with the distribution estimated by Reese and Richardson (2004). Golder adjusted the hydraulic parameters locally and regionally. In localized regions around specific wells, Golder adjusted each hydraulic parameter (e.g., hydraulic conductivity, storage coefficient, effective porosity) within plus or minus one-third an order of magnitude of the observed field data where possible. For example, if the minimum and maximum horizontal conductivities were 10 and 100 feet per day, the calibrated range could be as low as 6.67 feet per day and as high as 333 feet per day. In addition, Golder made additional regional changes of the hydraulic parameters across the model domain. For these larger, more significant parameter changes, Golder checked to ensure that the geometric mean of calibrated values is within three standard deviations of the geometric mean of the observed field data. In this way, the calibrated model should be able to better match the field data during calibration while achieving lower residuals and mean error. For the aquifers and confining units, the ratio of vertical hydraulic conductivity to horizontal conductivity was set to 1:10 at the start of model calibration. During the model calibration process the minimum ratio permitted was 1:100 and the maximum 1:5.

During the model calibration effort, it became evident that horizontal hydraulic conductivity parameters needed to be raised outside of the ranges originally planned. This is conceptually justified by the fact that SEAWAT2000 assumes porous media conditions (laminar flow) and is incapable of simulating secondary porosity features (that may lead to turbulent flow) typically observed in limestone terrains such as Southeast Florida. Golder decided that hydraulic conductivity ranges would be maintained as closely as possible, within the UFA while the APPZ could be increased outside of those ranges in certain model areas since there considerably more uncertainty in the overall hydraulic properties. Where possible, Golder attempted to honor existing aquifer test results in the APPZ (e.g., at wells L2 and South Bay) Table 4 provides a comparison of the initial SFWMD hydraulic conductivity zones used in the model (mostly based upon literature information) and the final Golder calibrated selections. **Figures 46a, 46b, 46c and 46d** provide maps depicting the hydraulic properties of the UFA, MCU1, APPZ, and LFA, respectively. Estimates of aquifer transmissivity in each zone can be developed by assuming that the average thickness of the UFA is 200 feet, APPZ is 150 feet, and LF1 is 200 feet, respectively.

Table 4. Comparison of Initial SFWMD Hydraulic Properties and Final Golder Calibrated Values

Hydraulic Conductivity Zone Number or Layer	Kh (ft/day) SFWMD	Kv (ft/day) SFWMD	Kh (ft/day) Golder	Kv (ft/day) Golder
Layer 2	0.01	.001	0.0003 to 0.04	.000003 to .004
Layer 3/4 - Z11	75	8	55	5.5
Layer 3/4 - Z 12	20	2	20	2
Layer 3/4 - Z13	40	3	52	5.2
Layer 3/4 - Z14	80	8	90	9
Layer 3/4 - Z15	150	15	725	72.5
Layer 3/4 - Z16	150	15	3.33	.33
Layer 3/4 - Z17	75	7	5	.5
Layer 5 & 6	0.5	0.05	.00001 to 25	.000001 to 2.5
Layer 7/8 – Z1	150	15	550	55
Layer 7/8 – Z2	250	25	600	60
Layer 7/8 – Z3	50	5	450	45
Layer 7/8 – Z4	100	10	300	30
Layer 7/8 – Z5	250	25	3,500	350
Layer 7/8 – Z6	100	10	.1	.01
Layer 7/8 – Z7	20	2	15	1.5
Layer 7/8 – Z8	10	1	18	1.8
Layer 7/8 – Z9	100	100	100	100
Layer 9, 10 & 11	0.5	.05	0.018 to 0.15	0.0018 to 0.015
Layer 12 – Z18	500	50	500	50
Layer 12 – Z19	100	10	300	30
Layer 12 – Z20	100	10	450	45
Layer 12 – Z21	300	30	150	15
Layer 12 – Z22	300	30	200	20
Layer 12 - Z23	300	30	275	27.5
Layer 12 – Z24	300	30	300	30
Layer 13	1	.1	.00075 to 0.003	0.00075 to 0.0003

For the model, the mean horizontal hydraulic conductivity of the UFA is approximately 50 ft/day and 1,250 ft/day for the APPZ. These values equate to transmissivities of 10,000 ft^2/day and 187,500 ft^2/day, respectively.

5.5 Initial Conditions

The initial conditions for the 2005 transient calibration model were developed using water levels from December 2004 and average TDS concentrations from 2005 for the entire model. These values were adjusted during model calibration. Based upon the modeling results, the initial water levels for the model were updated several times to reduce the model sensitivity to them. Generally, the initial water levels were modified by importing water levels from the last model time step from the 2004 validation run. In this way, the initial heads converged to the optimal value after several iterations. The initial concentrations were based upon existing TDS data from the USGS, SFWMD, USACE, and the SJRWMD. Much of the existing field data is temporally disjointed such that the initial concentrations should be considered a crude average for each unit. Due to limited TDS data available for the APPZ and the LFA, the initial concentration of these two units were generalized. This was somewhat problematic during calibration since the model results indicated that the model was sensitive to these initial values.

5.6 Boundary Conditions

5.6.1 Specified Heads

Inland Boundary - Golder used a specified head boundary along the western and northern model boundaries. Golder used the wells shown in **Figure 47** to establish the boundary values in the UFA along the western and northern model boundaries. These wells were used to establish water levels at each boundary cell and each time step for both the calibration period and the verification period. Since some of the wells have missing data during the calibration and/or verification periods, Golder also utilized a multivariate-normal missing value imputation algorithm, which is part of a commercial statistical software package called NCSS 2000^{tm}, to fill in the missing data. This algorithm estimates missing data by regression of the observed values against available data from other wells. For this analysis, seven wells with complete or nearly complete records were used as baseline wells for the regression. The locations of these wells are shown in **Figure 48**. The hydrographs for the baseline wells and the estimated (i.e., imputed) data and the actual data for several wells are shown in **Appendix A**. Once the UFA boundary was established for the entire modeling period of record, the remaining aquifer boundaries were established.

The boundaries for the APPZ and LF1 were established as scalars of the UFA boundary. That is, each of the other aquifer boundaries was a scaled reflection of the UFA boundary. It was assumed that the APPZ had a head 1 to 3 feet higher than the UFA boundary in portions of the study area including the area south of well L2 and north of Alligator Alley. Well nests at L2 and

Alligator Alley reveal that head in the APPZ was 1 to 2 feet higher than UFA head. After a number of calibration tests, the best results were obtained using an APPZ boundary assigned as 1 feet greater (on average) than the UFA boundary. The LF1 was thought to have heads lower than the UFA due to its higher TDS concentrations and great depth. After a number of calibration tests, the best results were obtained using a LF1 boundary assigned as approximately 40 feet lower than the UFA boundary. It should be noted that during the model calibration effort, it was found that the boundary concentration for each aquifer was also very important, especially when employing SEAWAT2000 coupled mode. It was found that several combinations of boundary concentration and starting boundary heads could produce similar boundary inflows. In the UFA, where the water is generally fresher than the APPZ or LF1, this issue is less of a problem, but, it is a serious issue in the deeper aquifers since the available concentration data along the western boundary is quite limited.

For the SAS and the BZ, a constant specified head and concentration was assigned in the model. For the SAS, the specified head reflected the surface topography while the TDS was assigned a value of 350 mg/l on the landward portion of the model to reflect potable water while a value of 35,000 mg/l was utilized in the Atlantic Ocean. For the BZ, water levels and the TDS concentration were the same as the Atlantic Ocean outcrop. Initially, the BZ head was assigned a transient month to month value based on the Atlantic Ocean average monthly tidal elevation (plus adjustment for geostrophic current); however, the model was found to be unstable due to the rapidly changing pressure waves within the highly permeable BZ. Therefore, the BZ was assigned a constant head and constant concentration. In order to establish some consistency between the constant value in the BZ and the transient value along the general head boundaries for each aquifer at the Atlantic Ocean, the BZ head was chosen as the highest tidal head observed in the LF1 during the model year (either 2004 or 2005). In this way, the BZ always had the highest boundary head during the model simulation. This is likely the case anyway since the BZ also is thought to contain the coldest and densest seawater.

5.6.2 General Head Boundaries (GHB)

Ocean Boundary - the monthly tide values (relative to mean sea level) for the coastal tide stations shown in **Figure 49** were applied at the ocean boundary. The boundary water level at the various aquifer outcrops will reflect the average Atlantic Ocean tidal signature observed at the coast.

These average values were corrected to reflect values in a consistent model vertical datum (NGVD 1929). Lastly, the values were adjusted with a correction factor (< 1-foot) added to account for the effect of the geostrophic pressure gradient with the largest correction factor applied to the LF1 and the smallest UFA. These values were the basis for the general head boundary assignment at the Atlantic Ocean outcrops of the FAS. **Figure 1 in Appendix B** provides the tidal data at each station and an average for all stations. The boundaries for all layers are shown on **Figure 46e**. During model calibration, the main parameter that was adjusted for the GHB was the conductance value. For the final 2005 transient calibration model and 2004 validation model, the conductance is generally highest in the LF1, while the UFA and APPZ are variable with values ranging from .1 to 125.

5.6.3 Wells

As discussed previously, the various pumping wells were included in the model based upon data provided by the SFWMD. Each well record included a location, cased depth, well depth, and monthly pumping value. The wells were organized in a database and visual basic scripts were developed to format the input data so they could be imported into Groundwater Vistas[tm] software as "analytical wells". Using the cased depth and the total well depth as proxies for the well open interval, Groundwater Vistas[tm] automatically calculates the distribution of well pumping based upon aquifer transmissivity for the model layers within the open interval of the well. Over 1,400 separate pumping wells were included in the model and are listed on **Table 3**.

5.6.4 No Flow Boundaries

No flow boundaries were assigned in those areas of the model where the FAS does not exist in the Atlantic Ocean. Basically, in each aquifer layer all cells east of the Atlantic Ocean general head boundary were assigned as inactive cells. An exception to this is the SAS cells in the Atlantic Ocean which are constant head and concentration. This assignment permits upward leakage to occur from the UFA to the Atlantic Ocean. For each confining unit model layer, all cells east of the estimated confining unit outcrop were assigned as no flow cells. The boundaries for all layers are shown on **Figure 49e**.

6.0 MODEL CALIBRATION

Model calibration was conducted in several phases during the primary contract period and the modification period. During the original modeling effort calibration included long-term transient model runs (approaching pseudo steady-state) over a 365 year period, long-term transient model runs from 1999 to 2004, and "local-scale" calibration at six selected aquifer testing locations. Numerous groundwater observation wells were utilized during the calibration effort. **Tables 5 and 6** list all of the water level and water quality wells used during the calibration effort. After the modeling strategy was modified, Golder completed additional calibration of a new steady-state model and a revised 2005 transient model.

Figure 50 depicts water level observation well (and well cluster) locations within the model domain utilized for model calibration purposes. A review of the figure reveals that the number of wells available for calibration purposes decreases from north to south across the model domain. In addition, many of the wells in the northern portion of the model domain provide water levels that are very similar in nature. Also, a majority of the available wells are monitoring the UFA. The number of APPZ and LFA wells with available monitoring data is limited. Golder utilized all available wells within the model domain regardless of the period or record, even though many of the wells had only sparse data sets. Much of the observation well data provided to Golder does not begin until 2002. A number of wells did not begin collecting water level data until late 2004/early 2005. This is one limitation to model calibration that cannot be improved.

In order to augment the calibration data available for the full period of record, Golder used multiple regression techniques similar to those discussed previously under boundary conditions. The intent was to provide additional "synthetic" calibration data at a few wells in order to provide a better period of record for comparison against computed values in the model. The statistically generated synthetic data was not used to calculate final calibration statistics or metrics but was useful in honing the model parameters in different regions of the model domain. Golder also generated potentiometric head maps of observed data for 2004 and 2005 and used these to compare against simulated head maps.

Calibration to observed water quality data was challenging due to the paucity of long-term records. Fortunately, a review of the available data indicated that water quality changes do not occur rapidly within the FAS. Water quality comparisons between observed data and computed data were completed using contour maps and select water quality time vs. concentration graphs at those wells where a longer period of record was available. Similar to the water level data, more calibration data were available for the UFA than for the APPZ or LFA. The LFA is also problematic due to steep concentration gradients that exist in the aquifer. Since the model only simulates the LFA using one model layer, it is generally not possible to adequately match the observed concentrations in the LFA with a reasonable degree of confidence.

6.1 Calibration Strategy and Management

The calibration strategy during the modification period was multi-faceted. As described above, both long-term pre-development transient model runs and transient runs from 2005 were utilized. In addition, local-scale calibration was completed at six locations where there was available aquifer performance test information. The calibration effort was entirely iterative and hundreds of model runs were completed for the project.

Primary calibration efforts were focused upon the 2005 transient period that included over 1,400 pumping wells. The wells provide significant stress on the model and allow better time-history matching between simulated water levels and observed water levels. The calibration effort took several months to complete and during this time the overall calibration criteria steadily improved. At the same time, model runs were completed using a pre-development model run over a 1 year time period. This pre-development model was only used to compare simulated heads versus observed heads. This model supplemented results obtained from earlier calibration runs using the original 365-year pre-development steady-state model. Although the 365-year pre-development model is likely not at true steady-state since water levels at the Atlantic Ocean boundary have been increasing over the last 20,000 years, it is run long enough to approach a pseudo steady-state. This model was used to set initial concentrations for the transient model. The results from both the 1 year and 365 year model results were compared to the pre-development water level model discussed earlier in this report. The purpose was to evaluate the overall shape of the water level contours, their magnitude, and their general location.

The local-scale modeling was done to examine data previously collected by the SFWMD and confirm hydraulic parameters at the six chosen locations. In most cases, the local-scale modeling confirmed previous estimates of aquifer parameters. At two sites, Tropical Farms and Port St. Lucie, the refined local-scale modeling produced estimates of aquifer parameters greater than those previously calculated. One possible explanation for these differences is that the APT solution used in the original reports was designed for homogeneous and isotropic conditions, whereas, the actual sites may be influenced by fractured rock or karst limestone. The modeling results are discussed further below.

6.2 Calibration Targets and Criteria

Golder followed general standards recommended in the ASTM documents listed in the SFWMD scope of services and referenced in this document for the evaluation of residuals. Typically, the calibrated model residual should be a small percentage of the observed water level range across the model domain. For the Phase II model, observed heads vary from 65 to 0 feet NGVD 1929. Five percent of this observed difference would be +/- 3.25 feet. For most models, this value would be an acceptable residual. However, Golder used +/- 2 feet for both the mean residual and the mean absolute residual; similar to the Phase I model completed by HydrGeoLogic (2006). In the perfect model calibration scenario, the mean absolute residual water level would be 2 feet or less, while the mean residual would approach 0 indicating that the error between the observed and simulated water levels are equally distributed as positives and negatives around 0. **Table 5** lists all of the water level targets used for the model calibration.

Water quality data from various observation wells is generally limited to single observation events. Also, many of the observation wells have completed zones across multiple aquifers or layers within the model. **Table 6** lists all of the water quality targets used for the model calibration. Observations in the APPZ and LF1 can be variable due to proximity of underground source of drinking water (USDW defined as portions of an aquifer with TDS concentrations of less than 10,000 mg/l) boundary where concentrations of total dissolved solids increase rapidly over short horizontal and vertical distances. For these reasons, assignment of a residual target for total dissolved solids is problematic. Golder believed that data available and aquifer conditions in the UFA would permit the best calibration while the LF1 calibration will be difficult. Therefore, for water quality calibration purposes, the residual target was +/- 250 mg/l for wells screened within the UFA, +/- 500 mg/l for the APPZ, and +/- 2,500 mg/l for the LFA. After numerous modeling runs were completed it was found that these goals were likely too aggressive and unrealistic. The final calibrated model was able to achieve +/- 700 mg/l for the UFA, +/- 1,500 mg/l for the APPZ, and +/- 5,000 mg/l for the LF1.

Golder also reviewed the overall water budgets for each model run to ensure that the totals were similar in magnitude to the conceptual model values calculated and discussed earlier in this report. Some of the model runs resulted in extreme water budgets that included too much model inflow or excessive model outflow. In addition, Golder utilized other typical calibration metrics including mean error, mean absolute error, and root mean squared error to achieve the best model calibration.

6.2.1 Qualitative Targets

In addition to the quantitative target goals, other qualitative measures were assessed. These include the overall shape of the water level or water quality contours as wells as the contour gradients in different locations.

6.3 Calibration Process

Golder followed accepted calibration procedures to calibrate the model. The calibration was completed through both manual parameter adjustment and automated parameter estimation methods (e.g., PEST or UCODE). Use of automated parameter estimation methods was time consuming due to lengthy model run times. Model calibration was completed using 2005 observed data as outlined in the SFWMD scope of services for the contract modification. Golder utilized several steps in the calibration process.

Originally, Golder ran the Phase II model in pseudo steady-state mode in order to calibrate the starting water quality (e.g., TDS values across the model domain) and contaminant transport parameters. The model was run for 365 years using steady-state pre-development hydraulics (with no pumping wells included) and transient concentrations. A longer period of time was considered for this modeling scenario but due to rising Atlantic Ocean levels from 5,000 years to present, the actual boundary assignments are difficult to assess. Therefore, it was assumed that the average boundary over the last 365 years has remained relatively unchanged and it would provide a suitably long period of time to evaluate concentration changes in the FAS from seawater intrusion due to density effects. The concentration computed at the end of the model simulation period was compared to observed concentrations in 2005 to reveal net differences. Then both hydraulic parameters and contaminant transport parameters (e.g., effective porosity and dispersivity) were adjusted to achieve the best correlation to observed data. This original steady-state model was supplemented with a pre-development steady-state model that was run over a 1-year period using constant concentration and water level boundaries. This steady-state model was used more often in the process due to its relatively short model run duration.

Since neither steady-state model contained sufficient stresses from pumping wells, calibration of the hydraulic parameters focused upon the long-term transient model that was run for 2005. This model was run numerous times as various parameter adjustments were made to the model in order to obtain the best match to observed data.

The 2005 transient model results were used as the starting point for transient calibration of the hydraulics using the "uncoupled mode" of SEAWAT2000. In uncoupled mode, SEAWAT2000 calculates the density field from initial concentrations and does not adjust the density during the transient simulation. The uncoupled mode can introduce small errors into the flow field; however, the computation time is much reduced as compared to the SEAWAT2000 coupled mode. In coupled mode, SEAWAT2000 re-calculates the density field at every transport time step based upon the TDS value in each cell. Then the flow field is re-calculated in a similar fashion. Due to the transient step-wise coupling, the computational times can be extremely long. In model tests of the Phase II model provided by the SFWMD, the uncoupled run times were generally less than 30 minutes each for a 1-year simulation period, whereas, the coupled run times were longer than 20 hours each. Consequently, the number of coupled model runs was minimized. Therefore, Golder relied upon transient calibration using the uncoupled mode. A small number of coupled model runs were completed at the end of the calibration period to ensure that the best calibration was achieved and to evaluate the extent and importance of errors introduced during uncoupled operation.

Local scale calibration efforts as outlined in Task 4 of the original scope of work were performed parallel to the overall model calibration effort. The local scale modeling results were used to locally refine the model hydraulic parameters including transmissivity, storativity, and vertical hydraulic conductivity (where feasible based upon the local scale model data available). For the most part, the local scale model calibration resulted in transmissivity and storativity estimates similar to those calculated by those who conducted the original aquifer tests. Tropical Farms and Port St. Lucie modeling resulted in hydraulic property values larger than those calculated previously. Both MODFLOW modeling and newly developed analytical tools were utilized to develop final estimates at each site. The results for each site are provided as follows:

- Turkey Point — UFA T = 10,000 to 44,000 ft^2/day, S = .0008, Kv of MCU = .00022 ft/day;
- Tropical Farms — UFA/APPZ T = 185,328 ft^2/day, S = 0.000175, Kv of MCU = 0.00099 to 0.003 ft/day;
- Port St. Lucie — UFA/APPZ T = 195,000 ft^2/day, S = 0.0005, Kv of MCU = .00025 ft/day;
- Lake Lytal — UFA T = 40,000 ft^2/day, S = 0.004, Kv of MCU = 0.0018 ft/day;
- L-30 Site — UFA T = 8,000 ft^2/day, S = 0.0015, Kv of MCU = 0.000347 ft/day;
- C-13 Site — UFA T = 17,424 ft^2/day, S = 0.0001, Kv of MCU = 0.000028 ft/day;

Figures showing observed and simulated drawdown versus time are shown on **Figures 51 to 56.** **Figure 56b** shows the local calibration values for horizontal hydraulic conductivity versus the regional model calibration values. Generally, regional-scale model calibration indicated different hydraulic values than those indicated at the local-scale; however, the values usually are within the same order of magnitude. For instance, aquifer tests at Tropical Farms revealed a highly permeable zone in the UFA/APPZ with estimated hydraulic conductivity values of 707 to 1,100 feet per day whereas the calibrated model estimates the conductivity in this area to be 725 feet per day. Similarly, aquifer tests at L30 and C13 estimate conductivity values of 80 to 90 feet per day whereas the calibrated model estimates a lower value of 90 feet per day. The vertical conductivity values estimated for the underlying confining units are generally considerably higher in the regional model as compared to the local-scale modeling. This may be due to a number of circumstances including scale-effects that are likely captured in the regional model.

6.4 Calibration Results

6.4.1 Water Levels

The model calibration was completed over a period of several months and included numerous iterations. For the original six-year transient model versions started at version "A" and ended at version "S". The validation model was renamed version 1b at the end of the process. Simulated water levels were compared to observed water levels for both the pre-development pseudo steady-state model and the long-term calibration model. **Figures 57a and b** depict the final pseudo steady-state model results compared to the pre-development contours discussed earlier. The results show that the location and shape of the 60 feet contour is generally comparable while the location and shape of the 50 feet contour is not. The model results show that the simulated 50 feet contour is located further to the east than the pre-development contours developed by the USGS. A better match was obtained by lowering the horizontal hydraulic conductivity values of the UFA and APPZ; however, this resulted in poor calibration results for the 2005 transient calibration model and 2004 validation model. Although the calibration results from the steady-state models were not entirely discounted, Golder relied upon the post-development models for final calibration.

The results of the 2005 transient calibration model for December 2005 are shown on **Figure 58. Figure 59** compares all 816 out of 828 water level targets using simulated model water levels versus observed water levels. One well, WASASUH2 was removed from the analysis since the water levels appeared anomalous. The red line on the graph is the theoretical best fit 45 degree line where the slope would be equal to 1. The black line is the actual best fit line for the data with a slope of 0.986 and a R^2 coefficient of 0.89. These results are considered quite good and result in the following calibration statistics (with all wells):

- Absolute Residual Mean = 2.74 feet;
- Residual Mean = 0.86 feet;
- Standard Error = 0.046 (or 4.6%);

With well WASASUH2 removed from the analysis the following calibration statistics result:

- Absolute Residual Mean = 2.52 feet;

- Residual Mean = 0.69 feet;
- Standard Error = 0.042 (or 4.2%);

The absolute residual mean value is positive indicating that the simulated model results are typically biased low as compared to the observed results. There are a number of possible explanations for this and these are discussed below. The residual mean is close to zero indicating a small relative bias between all calibration points. **Figures 60 to 95** provide hydrographs for select wells throughout the model domain. Both the actual and simulated hydrographs are shown on these figures.

6.4.2 Water Quality

Figure 96 compares 205 water quality TDS targets for the UFA using simulated model values and the observed values with one observation well removed. The red line on the graph is the theoretical best fit 45 degree line where the slope would be equal to 1. The black line is the actual best fit line for the data. Originally with all wells the line had a slope of 1.02 and a R^2 coefficient of 0.72. In reviewing the model results, one well (CS-M2) provided a large amount of the total error. If this well is removed, the best fit slope is reduced to .95 and the R^2 coefficient becomes 0.90. These results are considered satisfactory and result in the following calibration statistics for the UFA wells:

- Absolute Residual Mean = 0.019 (665 mg/l);
- Residual Mean = -0.0039 (-137 mg/l);
- Standard Error = 0.019 (or 1.9%);

For the APPZ and LFA wells within the model domain the calibration statistics are worse as follows:

APPZ

- Absolute Residual Mean = 0.059 (2,065 mg/l);
- Residual Mean = 0.032 (1,120 mg/l);
- Standard Error = 0.059 (or 5.9%);

LFA

- Absolute Residual Mean = 0.296 (10,360 mg/l);
- Residual Mean = 0.274 (9,590 mg/l);
- Standard Error = 0.296 (or 29.6%);

A vast majority of the overall error is in the APPZ and LFA. It is assumed that the error could be reduced if the LFA was broken into additional vertical layers to allow better simulation of the brackish to saline water transition zone. Also, additional monitoring wells in the APPZ and LFA would allow preparation of a better set of initial concentrations for each aquifer.

6.5 Model Validation

Model validation was completed using 2004 observed data as outlined in the SFWMD scope of services and similar to the methods described by HydroGeoLogic (2006). The 2004 information available for calibration comparisons was not as great as 2005 but still representative. After simulating the 2005 validation period, the model calibration statistics were re-calculated and compared to the calibrated model values. The models were adjusted until both the calibrated model and validated model calibration statistics either met all requirements or until a point of "diminishing returns" was achieved. For the final validation model developed in this effort, all of the calibration criteria were not met but after numerous modeling iterations it was found that no improvements could be made. Therefore, the model was considered finished at this point of diminishing returns.

The results of the 2004 transient validation model for December 2004 are shown on **Figure 97**. Figure 97 compares all 800 out of 812 water level targets using simulated model water levels and the observed water levels. One well, WASASUH2 was removed from the analysis since the water levels appeared anomalous. The red line on the graph is the theoretical best fit 45 degree line where the slope would be equal to 1. The black line is the actual best fit line for the data with a slope of 1.02 and a R^2 coefficient of 0.80. These results are considered good and result in the following calibration statistics (with all wells):

- Absolute Residual Mean = 2.91 feet;
- Residual Mean = -0.29 feet;
- Standard Error = 0.049 (or 4.9%);

With well WASASUH2 removed from the analysis the following calibration statistics result:

- Absolute Residual Mean = 2.65 feet;
- Residual Mean = -0.6 feet;
- Standard Error = 0.044 (or 4.4%);

The water quality data was basically the same as that calculated in the calibration model runs. Figures 98 to 107 provide select well concentration versus time graphs that compare simulated TDS values and observed TDS values.

The final calibrated 2005 model had a flow mass balance error of 0.5% while it had a mass solute error of -2%. The water budget flow components (in cfd) are shown in the following:

Storage In: 2,653,872	**Storage Out: 620,835**
Well In: 0	**Well Out: 19,748,415**
Constant Head In: 39,799,025	**Constant Head Out: 21,752,938**
GHB In: 45,967	**GHB Out: 165,004**
Total In: 42,498,864	**Total Out: 42,287,192**

For the constant head inflow cells 5.6 % came in through the LF1, 80.6% came in through the APPZ, and the remainder came in from the UFA (2.9%), and the BZ/SAS (10.9%). The SAS was a constant head sink for approximately 5,673,800 cfd while the Atlantic Ocean outcrop GHB was a sink for 165,004 cfd. An important observation is that a majority of the flow within the lower layers in the model is vertical. For example, for the LF1 the constant head inflow amounts to 2,233,091 cfd while vertical inflows sum to 8,417,375 cfd. This means that the ratio of horizontal inflow to vertical inflow is 3.77. For the APPZ, the pattern is different with constant head inflow equal to 32,102,486 cfd while vertical inflows sum to 3,259,450 cfd. For the APPZ, this means that the ratio of horizontal inflow to vertical inflow is 9.85. For the UFA, horizontal constant head inflow is 1,171,717 cfd while the vertical inflows are 23,372,812 cfd. The overall conceptual model discussed previously is consistent with the model calibration results. A majority of the inflows come in through the LF1 and APPZ. Generally, much of the water that inflows into the APPZ flows upward into the UFA. Much of the inflow is withdrawn through well pumping; the remainder flows to the Atlantic Ocean or through diffuse upward leakage into the SAS or Atlantic Ocean.

6.6 Discussion of Calibration and Validation Results

During the calibration and validation process a number of issues were discovered that probably require additional evaluation. First, the calibrated model indicates that regions of the APPZ are highly permeable. The calibrated model required portions of the APPZ to have a horizontal hydraulic conductivity of 3,500 ft/day, which is much higher than field data has revealed to date. In fact, the best model calibration was arrived at by setting the maximum conductivity greater than 4,000 ft/day. Based upon the reported and estimated water use values utilized in the model and the fact that observation wells near the Atlantic Coast indicate UFA heads as high as 50 feet, Golder believes that highly permeable zones within the UFA and/or APPZ are likely. Recent aquifer performance testing at the FPL West County Energy Center (in Central Palm Beach County) revealed transmissivities greater than 300,000 ft^2/day for at least one well. Also, one well was abandoned entirely due to the presence of unstable karst zones encountered.

The second area is within southern St. Lucie and Martin Counties. In reviewing hydrographs in this model region, the simulated water levels are considerably lower than the observed water levels. The water use data in this area may not be entirely complete or correct. For instance, permitted water allocations were utilized where there was no reported pumping data. This may result in pumping in the model that is in excess of the actual pumping, resulting in "groundwater mining" of the UFA and hence, lower water levels. This area is also characterized by a temperature anomaly reported by Reese (2004). The temperature anomaly reveals that multiple UFA wells in St. Lucie and Martin Counties have water temperatures 3 to 5 degrees Celsius greater than other regional wells. Since the numerical model cannot simulate temperature effects on the density field, the predicted water levels may not be accurate in this area. During model calibration, it became evident that the apparent concentration of the APPZ in this area needed to be lowered. This change is equivalent to the actual effect of higher temperatures in this area. The actual cause of this anomaly is not entirely known but could be related to numerous flowing wells in this region. Flowing wells that have been cut off below ground may still be contributing different water quality to the UFA.

As part of the revised modeling strategy and contract modification, Golder completed a thorough review and validation of the water use data from 1999 to 2005 with a particular emphasis on 2004 and 2005. Although, Golder believes that the water use data inputs were generally improved by this effort, the data still may contain inaccuracies. Generally, for wells where only the annual water allocation is known, it is likely that the actual water use is different than assumed by Golder for the model. In essence, the model probably represents a high-bias for water well pumping in these instances. There is not an immediate way to address this issue but it is recommended that SFWMD consider additional monitoring and data collection in intensively pumped areas in Martin and St. Lucie Counties. Collecting more accurate water use information in this area would very likely improve the overall model in the future. Also, flowing wells in this region may contribute to the water use uncertainty here.

Lastly, the specified concentration boundary along the western edge of the model and the initial concentration in the APPZ and LFA are very important. Small changes in boundary concentration or initial concentration can result in large differences in the overall model water budget. Lack of data in this area is especially problematic for the APPZ and LFAS. Additional data collection in these areas is highly recommended to improve the accuracy of water quality estimates in these areas.

7.0 SENSITIVITY ANALYSIS AND REPORT

Golder performed a model sensitivity analysis as outlined in the previously submitted Model Implementation Report (Golder, 2007). The sensitivity analysis was completed in 2 phases. The initial sensitivity analysis was completed on the 1999 to 2004 transient model. The final sensitivity analysis was completed using the 2005 transient model. Both sets of sensitivity results are provided in **Appendix C**.

A full sensitivity analysis was completed as required in the SFWMD scope of services and as outlined in ASTM guidelines. Both hydraulic and contaminant transport parameters were tested for model sensitivity including:

- Horizontal hydraulic conductivity;
- Vertical hydraulic conductivity;
- Effective porosity;
- Storage coefficient; and
- Dispersivity.

Golder varied each calibrated parameter by one-half and two times such that model calibration statistics will be shown in five columns in the final report including:

- One-half calibrated parameter;
- Three-fourth calibrated parameter;
- Calibrated parameter;
- One and one-half calibrated parameter; and
- Twice calibrated parameter.

In addition to the various model parameters, the model initial conditions and boundary conditions were tested for sensitivity. The various sensitivity results are presented in **Appendix C**.

8.0 SUMMARY AND CONCLUSIONS

The Phase II modeling effort – referred to as the East Coast Floridan Model as it now includes both the LEC and UEC regions—was undertaken by Golder Associates Inc. (Golder) on behalf of the SFWMD. The Phase II Model builds upon the Phase I modeling work completed in 2006. The tasks assigned to Golder included:

- Incorporating the calibrated Phase I Model into the new and larger model domain;
- Recalibrating the new and larger Phase II Model;
- Validating water use data for the UEC and LEC; and,
- Preparing a model documentation report of the entire effort.

The final 2005 calibrated model provides the SFWMD with a tool capable of assisting the agency with the evaluation of current and future water supply projects within the model study area.

The model was calibrated using 2005 water use data and observation well data. The model simulates the actual heads within the FAS to +/- 2.5 feet. This degree of accuracy should provide the SFWMD a useful tool to simulate future water conditions within the model domain. Water use data used in the model is thought to have a high bias since estimates assumed wells were pumping even if the actual water use data was missing. Therefore, the model likely represents a conservative tool for water use planning and impact evaluation purposes.

The model can be run in either uncoupled or coupled mode. Although localized changes in water quality cannot be distinguished using uncoupled mode, regional changes in water budget can be determined. For example, comparing the Atlantic Ocean inflows for the 2005 and 2004 models is informative. For 2005, a year with high water use of almost 20,000,000 cfd, the GHB inflows are 45,967 cfd. For 2004, a year with water use at approximately 16,000,000 cfd, the GHB inflows are 28,908 cfd or only 62% of 2005 inflows. Therefore, for future water supply evaluations changes in GHB inflows might provide one good metric for comparisons. In addition, given that changes in water quality at specific pumping wells are probably due to upconing (a very localized issue), the model resolution will not permit adequate evaluations of this scenario anyway. Lastly, due to the long computational times using the coupled mode, the user cannot adequately evaluate many alternatives or sensitivity cases.

9.0 QUALIFICATIONS AND RECOMMENDATIONS

The recommendations contained in this report are based on the calibrated model, hydrogeologic characteristics described within this document, the data provided by SFWMD, and our experience with similar subsurface conditions and model development efforts.

This report has been prepared for the exclusive use of the SFWMD for its water supply program. No other warranty, expressed or implicit, is made.

We trust that this report adequately summarizes the results of the model development effort conducted for the southern Florida UEC and LEC planning areas. Should any point require additional clarification or if we can be of any further service, please do not hesitate to contact the undersigned.

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TABLE 3

FLORIDAN AQUIFER SYSTEM WATER USE DATA

East Coast Floridan Aquifer System Model, Phase II
Upper and Lower East Coast of Florida

Well ID	Permit Number	Facility ID	X Coordinate	Y Coordinate	Average Pumping Rate (cfd)	Top Layer	Bottom Layer
06-00038-W29889	06-00038-W	29889	253787	657609	20611.5	3	4
06-00038-W29891	06-00038-W	29891	252737	656809	31164.7	2	4
06-00038-W29905	06-00038-W	29905	254187	656109	25007.5	2	4
06-00082-W25926	06-00082-W	25926	270838	765209	22114.2	2	3
06-00954-W155607	06-00954-W	15560	266504	644868	12872.3	3	4
06-01634-W27346	06-01634-W	27346	276488	757776	885850.2	3	4
10524_7309	10524	7309	178437.62	1229973.5	111343.7	2	3
10524_7310	10524	7310	177814.51	1228885.9	111343.7	2	3
10524_7311	10524	7311	177807.44	1227889.7	111343.7	2	3
10524_7312	10524	7312	177821.76	1229974.3	111343.7	2	3
10524_7313	10524	7313	176812.3	1227663.4	111343.7	2	3
10524_7314	10524	7314	176583.6	1228716.5	111343.7	2	3
10524_7316	10524	7316	163176.16	1281634.3	108326.5	2	4
10524_7317	10524	7317	163183.7	1282485.4	108326.5	2	4
10524_7318	10524	7318	162665.36	1280873.8	108326.5	2	4
10705_7220	10705	7220	177071.15	1243880.6	20134.4	2	2
10705_7221	10705	7221	177181.11	1241870.8	20134.4	2	2
10705_7222	10705	7222	174863.81	1256462.5	20134.4	2	3
10705_7230	10705	7230	175428.8	1252059.8	81587.8	2	3
10705_7231	10705	7231	176052.26	1254178.9	81587.8	2	3
10705_7232	10705	7232	171825.36	1254870.8	81587.8	2	3
10705_7236	10705	7236	171631.52	1256614.2	20134.4	2	3
10705_7245	10705	7245	176779.39	1252308.7	20134.4	2	3
10705_7249	10705	7249	168615.97	1250481.9	20134.4	2	2
10705_7250	10705	7250	175177.14	1247478	20134.4	2	2
10705_7252	10705	7252	168560.33	1252547	20134.4	2	3
10705_7253	10705	7253	170474.19	1250293.4	20134.4	2	2
10705_7255	10705	7255	169174.18	1254457.9	20134.4	2	2
10705_7256	10705	7256	164608.62	1252492.4	20134.4	2	2
10705_7257	10705	7257	166503.38	1252596.2	20134.4	2	2
1-1			156375.43	1143587.3	48.5	2	4
11-1			176859	1189530.4	3.3	2	4
12-1			179733.13	1191885.6	5.1	2	4
13-00005-W121824	13-00005-W	121824	146074	446975	32152.2	2	4
13-00060-W106431	13-00060-W	106431	241832	632581	23574.7	3	4
13-00060-W106432	13-00060-W	106432	241435	632565	23574.7	3	4
13-01556-W103603	13-01556-W	103603	270892	592281	115945.8	3	4

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FLORIDAN AQUIFER SYSTEM WATER USE DATA

East Coast Floridan Aquifer System Model, Phase II
Upper and Lower East Coast of Florida

Well ID	Permit Number	Facility ID	X Coordinate	Y Coordinate	Average Pumping Rate (cfd)	Top Layer	Bottom Layer
13-1			133428.7	1092663.2	10.3	2	7
14-1			180212.77	1189932	6.3	2	4
201-1			172912	1198391.3	0.0	2	4
202-1			134766.4	1146591	4.0	2	3
202-2			136022.46	1146606.6	12.7	2	6
203-1			91622.3	1181238.9	23.6	2	5
204-1			113689.24	1111849.1	12.5	2	6
204-2			113257.22	1106733	10.8	2	6
204-3			111352.23	1109158.9	6.8	2	6
204-4			109940.75	1111746.4	7.7	2	6
205-1			103388	1197685.3	0.0	2	6
205-2			102864	1198196.3	0.0	2	6
205-3			102690	1199112	0.0	2	6
205-4			102899	1201769.9	28.8	2	6
205-5			105872	1203690.9	0.0	2	5
205-6			105050	1199962.3	0.6	2	7
205-7			106413	1199348.4	0.0	2	6
2-1			136948	1164132.8	0.0	2	4
2-2			138593.26	1164117.2	5.8	2	5
2-3			140513	1163510.3	4.1	2	7
29-10			161730	1211637.3	0.0	2	5
29-11			161901.97	1214426.5	101.6	2	5
29-12			161572.14	1214272.4	12.6	2	3
29-13			159080	1214294.2	3.2	2	3
29-14			158963.57	1214297.3	116.1	2	4
29-15			160394	1215554.2	0.0	2	3
29-1A			158921.91	1203775.9	110.2	2	5
29-2			157682.64	1206290	128.9	2	3
29-3			157703.36	1208991.2	41.1	2	5
29-4			159478	1206257.8	0.0	2	3
29-5			160347.76	1209002.8	104.8	2	3
29-6			159024.91	1209146	9.3	2	3
29-7			158946	1211657.8	0.0	2	5
29-8			159445	1211616.4	0.0	2	4
29-9			160375.06	1211642.3	44.4	2	4
3-1			137895.12	1135286	54.9	2	6
3-1			153719.34	1146113.6	54.9	2	4

TABLE 3

FLORIDAN AQUIFER SYSTEM WATER USE DATA

East Coast Floridan Aquifer System Model, Phase II
Upper and Lower East Coast of Florida

Well ID	Permit Number	Facility ID	X Coordinate	Y Coordinate	Average Pumping Rate (cfd)	Top Layer	Bottom Layer
3-2			137877.29	1133999	45.0	2	6
3-3			137885.06	1132806.6	35.7	2	2
35-1			141993.07	1125948	132.2	2	6
35-2			141482	1124542.7	2.4	2	2
36-1			133405.79	1098018	23.0	2	8
36-2			133362	1098768.2	0.0	2	8
4-1			133456.53	1090394.9	66.7	2	7
43-00028-W13273	43-00028-W	13273	131318	1021236	53111.3	2	6
43-00030-W21072	43-00030-W	21072	256509	1081490	8102.2	2	8
43-00030-W21073	43-00030-W	21073	254857	1080941	4299.2	2	4
43-00030-W21074	43-00030-W	21074	253983	1078655	18704.0	2	3
43-00039-W29691	43-00039-W	29691	93167	1062893	6.0	2	6
43-00066-W124045	43-00066-W	124045	269370	1033437	94835.7	5	7
43-00066-W124046	43-00066-W	124046	267305	1033361	37621.7	5	7
43-00071-W13329	43-00071-W	13329	129635	1020240	54674.7	5	5
43-00082-W28827	43-00082-W	28827	233952	1094667	5.6	2	3
43-00093-W23992	43-00093-W	23992	152039	1057191	114082.1	2	6
43-00093-W4183	43-00093-W	4183	163608	1084011	28520.5	2	6
43-00093-W4184	43-00093-W	4184	166968	1085026	28520.5	2	6
43-00093-W4185	43-00093-W	4185	164238	1082797	28520.5	2	6
43-00093-W4186	43-00093-W	4186	160408	1076474	28520.5	2	6
43-00093-W4187	43-00093-W	4187	150879	1069337	28520.5	2	6
43-00093-W4188	43-00093-W	4188	161378	1071352	28520.5	2	6
43-00093-W4189	43-00093-W	4189	168208	1087605	28520.5	2	6
43-00093-W5290	43-00093-W	5290	144609	1067584	114082.1	2	6
43-00093-W5291	43-00093-W	5291	149539	1061661	114082.1	2	6
43-00093-W5292	43-00093-W	5292	158408	1068410	114082.1	2	6
43-00093-W5293	43-00093-W	5293	161888	1061035	114082.1	2	6
43-00093-W5294	43-00093-W	5294	170738	1088319	114082.1	2	5
43-00093-W5295	43-00093-W	5295	172708	1086716	114082.1	2	5
43-00093-W5296	43-00093-W	5296	170858	1083986	114082.1	2	5
43-00093-W5297	43-00093-W	5297	170738	1088319	114082.1	2	5
43-00093-W5298	43-00093-W	5298	170708	1086716	114082.1	2	5
43-00093-W5299	43-00093-W	5299	170858	1083986	114082.1	2	5
43-00093-W5300	43-00093-W	5300	172788	1083761	114082.1	2	5
43-00093-W5301	43-00093-W	5301	171178	1081920	114082.1	2	5
43-00102-W45311	43-00102-W	45311	224054	1101564	141715.8	4	5

TABLE 3

FLORIDAN AQUIFER SYSTEM WATER USE DATA

East Coast Floridan Aquifer System Model, Phase II
Upper and Lower East Coast of Florida

Well ID	Permit Number	Facility ID	X Coordinate	Y Coordinate	Average Pumping Rate (cfd)	Top Layer	Bottom Layer
43-00102-W45312	43-00102-W	45312	223572	1102761	162554.4	3	5
43-00102-W45314	43-00102-W	45314	225231	1104042	120554.0	4	6
43-00102-W45315	43-00102-W	45315	225087	1103821	131773.2	4	5
43-00102-W45316	43-00102-W	45316	226735	1103338	119000.2	4	6
43-00102-W45317	43-00102-W	45317	224604	1099746	119000.2	4	6
43-00117-W13334	43-00117-W	13334	172773	1025561	10796.0	2	6
43-00117-W13335	43-00117-W	13335	184028	1045351	9402.9	2	6
43-00117-W13336	43-00117-W	13336	184053	1041364	11701.4	2	6
43-00117-W13337	43-00117-W	13337	184031	1030713	11144.2	2	6
43-00117-W25383	43-00117-W	25383	183982	1035864	11144.2	2	6
43-00122-W13338	43-00122-W	13338	152197	1010878	78680.4	2	6
43-00122-W13339	43-00122-W	13339	152110	1006806	83597.9	2	6
43-00122-W13340	43-00122-W	13340	152084	1002836	122938.1	2	6
43-00122-W13341	43-00122-W	13341	130377	1035769	137690.6	2	6
43-00122-W13342	43-00122-W	13342	141633	1017272	142608.2	2	6
43-00122-W13343	43-00122-W	13343	141435	1013938	95891.7	2	6
43-00122-W13344	43-00122-W	13344	141454	1011276	147525.7	2	6
43-00122-W13345	43-00122-W	13345	141536	1004801	125396.8	2	6
43-00122-W13346	43-00122-W	13346	152337	1014610	83597.9	2	6
43-00122-W24366	43-00122-W	24366	141573	1008725	103268.0	2	6
43-00130-W6798	43-00130-W	6798	246412	1100951	787.0	2	8
43-00130-W6799	43-00130-W	6799	244687	1101751	5621.6	2	3
43-00131-W7452	43-00131-W	7452	246335	1100925	588.4	2	8
43-00131-W7453	43-00131-W	7453	244534	1101722	4203.0	2	3
43-00146-W1187	43-00146-W	1187	256660	1077048	18328.3	2	4
43-00146-W1188	43-00146-W	1188	255905	1079948	18328.3	2	4
43-00159-W15153	43-00159-W	15153	138885	1036099	73680.0	2	7
43-00172-W13347	43-00172-W	13347	131328	1027816	72263.4	2	6
43-00190-W10285	43-00190-W	10285	119034	1066821	2871.5	2	5
43-00190-W10287	43-00190-W	10287	118710	1058185	5743.0	2	6
43-00190-W10289	43-00190-W	10289	118550	1056513	5743.0	2	5
43-00190-W10291	43-00190-W	10291	117393	1064357	3445.8	2	6
43-00260-W4790	43-00260-W	4790	154769	1027531	8939.4	2	5
43-00328-W25750	43-00328-W	25750	249401	1091924	24377.5	2	4
43-00328-W25751	43-00328-W	25751	249613	1091461	24377.5	4	4
43-00360-W26827	43-00360-W	26827	192037	1045411	67045.0	2	6
43-00360-W26828	43-00360-W	26828	192037	1041311	67045.0	2	6

TABLE 3

FLORIDAN AQUIFER SYSTEM WATER USE DATA

East Coast Floridan Aquifer System Model, Phase II
Upper and Lower East Coast of Florida

Well ID	Permit Number	Facility ID	X Coordinate	Y Coordinate	Average Pumping Rate (cfd)	Top Layer	Bottom Layer
43-00360-W26829	43-00360-W	26829	192037	1035110	67045.0	2	5
43-00360-W26830	43-00360-W	26830	192037	1037411	67045.0	2	6
43-00362-W13015	43-00362-W	13015	142672	1030496	521.7	2	6
43-00485-W25752	43-00485-W	25752	250474	1091869	13476.1	2	4
43-00485-W25753	43-00485-W	25753	249603	1091105	18866.5	2	4
43-00501-W15608	43-00501-W	15608	135887	1037705	14992.1	2	6
43-00503-W15657	43-00503-W	15657	139695	1041747	11095.0	2	5
43-00574-W8675	43-00574-W	8675	141937	1046510	2049.6	2	4
43-00625-W15725	43-00625-W	15725	145839	1033544	20131.8	2	5
43-00651-W10310	43-00651-W	10310	108506	1069860	30967.6	2	6
43-00656-W13360	43-00656-W	13360	138504	1043225	20119.5	2	6
43-00659-W8213	43-00659-W	8213	114609	1074006	1532.8	2	5
43-00734-W15828	43-00734-W	15828	254204	1078269	7066.4	2	3
43-00734-W15829	43-00734-W	15829	253936	1078053	2829.0	2	4
43-00734-W15830	43-00734-W	15830	257542	1076132	30811.1	2	4
43-00734-W24523	43-00734-W	24523	253916	1077815	28766.4	2	4
43-00751-W2098	43-00751-W	2098	249838	1090561	2205.2	2	4
43-00866-W6587	43-00866-W	6587	140830	1045911	51342.4	2	5
43-00923-W23755	43-00923-W	23755	103075	1053481	949.9	2	5
43-00923-W23756	43-00923-W	23756	104313	1053373	1361.6	2	5
43-01000-W27476	43-01000-W	27476	247072	1080975	2377.9	2	4
43-01369-W122836	43-01369-W	122836	114527	1056174	1676.0	2	4
43-01369-W122839	43-01369-W	122839	113367	1054611	1676.0	2	4
43-01369-W122840	43-01369-W	122840	111249	1056830	1676.0	2	4
43-01369-W122976	43-01369-W	122976	112308	1056880	1676.0	2	4
43-01521-W146758	43-01521-W	146758	248237	1098920	1560.3	3	3
44-00001-W4635	44-00001-W	4635	222584	404090	61639.4	2	4
44-00002-W109037	44-00002-W	109037	222192	404217	37279.0	2	2
44-00002-W3941	44-00002-W	3941	221819	404090	24627.7	2	3
44-00002-W3942	44-00002-W	3942	222004	404005	24627.7	2	4
44-00002-W3943	44-00002-W	3943	222215	404579	32836.9	2	4
44-00284-W105560	44-00284-W	105560	156799	308279	3393.4	4	5
47-00009-W10314	47-00009-W	10314	71342.87	1115109.5	48742.0	2	6
47-00009-W10315	47-00009-W	10315	71942.88	1112840.5	48742.0	2	6
47-00009-W10316	47-00009-W	10316	68176.89	1110815.5	48742.0	2	6
47-00017-W15835	47-00017-W	15835	68082	1204859	715.6	2	4
47-00017-W15835	47-00017-W	15835	68080.57	1204859.6	1297.0	2	4

TABLE 3

FLORIDAN AQUIFER SYSTEM WATER USE DATA

East Coast Floridan Aquifer System Model, Phase II
Upper and Lower East Coast of Florida

Well ID	Permit Number	Facility ID	X Coordinate	Y Coordinate	Average Pumping Rate (cfd)	Top Layer	Bottom Layer
47-00017-W15836	47-00017-W	15836	68092	1203589	715.6	2	6
47-00017-W24524	47-00017-W	24524	68111	1202281	715.6	2	4
47-00017-W24524	47-00017-W	24524	68109.57	1202281.6	1420.9	2	4
47-00023-W16963	47-00023-W	16963	72039.57	1199984.6	40137.4	3	6
47-00023-W16964	47-00023-W	16964	74565.57	1198416.6	40137.4	3	6
47-00023-W16965	47-00023-W	16965	74565.57	1196604.6	40137.4	3	6
47-00023-W16966	47-00023-W	16966	73237.57	1195122.6	40137.4	3	6
47-00023-W16967	47-00023-W	16967	74802.57	1193820.6	40137.4	3	6
47-00023-W16968	47-00023-W	16968	73387.58	1192169.6	40137.4	3	6
47-00023-W16969	47-00023-W	16969	75683.6	1185168.6	40137.4	3	6
47-00023-W16970	47-00023-W	16970	76673.61	1183780.6	40137.4	3	6
47-00023-W16971	47-00023-W	16971	76641.63	1178189.5	40137.4	3	6
47-00023-W16972	47-00023-W	16972	70082.59	1190291.6	40137.4	3	6
47-00023-W16973	47-00023-W	16973	68966.59	1191669.6	40137.4	3	6
47-00036-W10338	47-00036-W	10338	26412.76	1138460.5	62667.8	2	6
47-00038-W16397	47-00038-W	16397	22038.7	1156105.5	21306.7	2	7
47-00038-W16400	47-00038-W	16400	23239.71	1151489.5	18975.5	2	6
47-00043-W3006	47-00043-W	3006	12169.58	1193232.5	39907.1	2	2
47-00043-W3007	47-00043-W	3007	11498.59	1190058.5	39907.1	4	10
47-00043-W3008	47-00043-W	3008	13990.58	1193248.5	39907.1	3	9
47-00043-W3009	47-00043-W	3009	15027.6	1185694.5	39907.1	2	2
47-00043-W3010	47-00043-W	3010	9276.59	1188171.5	39907.1	2	2
47-00043-W3470	47-00043-W	3470	11590.59	1187916.5	39907.1	3	9
47-00043-W3471	47-00043-W	3471	14249.59	1188516.5	39907.1	3	8
47-00044-W12984	47-00044-W	12984	52617.71	1157578.5	235245.0	2	8
47-00051-W16993	47-00051-W	16993	85039	1211600	22983.1	1	6
47-00051-W16993	47-00051-W	16993	85037.56	1211600.6	44923.2	1	6
47-00051-W16994	47-00051-W	16994	85039	1208920	22983.1	2	6
47-00051-W16994	47-00051-W	16994	85037.56	1208920.6	44923.2	2	6
47-00051-W16995	47-00051-W	16995	84993	1206308	22983.1	1	6
47-00051-W16995	47-00051-W	16995	84991.56	1206308.6	44923.2	1	6
47-00051-W16996	47-00051-W	16996	84993	1203697	22983.1	2	4
47-00051-W16996	47-00051-W	16996	84991.56	1203697.6	44923.2	2	4
47-00051-W16997	47-00051-W	16997	84993	1202322	22983.1	2	4
47-00051-W16997	47-00051-W	16997	84991.56	1202322.6	44923.2	2	4
47-00051-W16999	47-00051-W	16999	80436	1211409	22983.1	2	6
47-00051-W16999	47-00051-W	16999	80434.56	1211409.6	44923.2	2	6

TABLE 3

FLORIDAN AQUIFER SYSTEM WATER USE DATA

East Coast Floridan Aquifer System Model, Phase II
Upper and Lower East Coast of Florida

Well ID	Permit Number	Facility ID	X Coordinate	Y Coordinate	Average Pumping Rate (cfd)	Top Layer	Bottom Layer
47-00051-W17003	47-00051-W	17003	79633	1211463	22983.1	2	6
47-00051-W17003	47-00051-W	17003	79631.56	1211463.6	44923.2	2	6
47-00051-W17004	47-00051-W	17004	77250	1211484	22983.1	2	6
47-00051-W17004	47-00051-W	17004	77248.57	1211484.6	44923.2	2	6
47-00051-W17005	47-00051-W	17005	79610	1209080	22983.1	2	6
47-00051-W17005	47-00051-W	17005	79608.56	1209080.6	44923.2	2	6
47-00051-W17006	47-00051-W	17006	79610	1208782	22983.1	2	6
47-00051-W17006	47-00051-W	17006	79608.56	1208782.6	44923.2	2	6
47-00051-W17007	47-00051-W	17007	79784	1203558	22983.1	2	4
47-00051-W17007	47-00051-W	17007	79782.56	1203558.6	44923.2	2	4
47-00051-W17008	47-00051-W	17008	79633	1202277	22983.1	2	4
47-00051-W17008	47-00051-W	17008	79631.56	1202277.6	44923.2	2	4
47-00051-W17010	47-00051-W	17010	75068	1208374	22983.1	2	6
47-00051-W17010	47-00051-W	17010	75066.57	1208374.6	44923.2	2	6
47-00051-W17012	47-00051-W	17012	74387	1211486	22983.1	2	6
47-00051-W17012	47-00051-W	17012	74385.57	1211486.6	44923.2	2	6
47-00051-W17014	47-00051-W	17014	74410	1208805	22983.1	2	4
47-00051-W17014	47-00051-W	17014	74408.57	1208805.6	44923.2	2	4
47-00051-W17015	47-00051-W	17015	74364	1204430	22983.1	3	4
47-00051-W17015	47-00051-W	17015	74362.57	1204430.6	44923.2	3	4
47-00051-W17016	47-00051-W	17016	72108	1203909	22983.1	2	6
47-00051-W17016	47-00051-W	17016	72106.57	1203909.6	44923.2	2	6
47-00051-W17017	47-00051-W	17017	74466	1203257	22983.1	2	4
47-00051-W17017	47-00051-W	17017	74464.57	1203257.6	44923.2	2	4
47-00051-W24036	47-00051-W	24036	86391	1209034	22983.1	1	4
47-00051-W24036	47-00051-W	24036	86389.56	1209034.6	44923.2	1	4
47-00051-W29336	47-00051-W	29336	74364	1206171	22983.1	2	7
47-00051-W29336	47-00051-W	29336	74362.57	1206171.6	44923.2	2	7
47-00059-W32024	47-00059-W	32024	43073.82	1124128.5	12022.6	3	4
47-00060-W100362	47-00060-W	100362	11308.57	1213865.5	38172.8	3	6
47-00060-W100362	47-00060-W	100362	11308.57	1213865.5	38172.8	3	6
47-00060-W26349	47-00060-W	26349	12257.57	1211691.5	38172.8	3	6
47-00060-W26349	47-00060-W	26349	12257.57	1211691.5	38172.8	3	6
47-00070-W20932	47-00070-W	20932	70668	1204296	26463.7	2	4
47-00070-W20932	47-00070-W	20932	70666.57	1204296.6	50923.3	2	4
47-00070-W20933	47-00070-W	20933	71134	1203437	26463.7	2	4
47-00070-W20933	47-00070-W	20933	71132.57	1203437.6	50923.3	2	4

TABLE 3

FLORIDAN AQUIFER SYSTEM WATER USE DATA

East Coast Floridan Aquifer System Model, Phase II
Upper and Lower East Coast of Florida

Well ID	Permit Number	Facility ID	X Coordinate	Y Coordinate	Average Pumping Rate (cfd)	Top Layer	Bottom Layer
47-00081-W25999	47-00081-W	25999	63862.79	1138741.5	42614.7	2	4
47-00081-W26002	47-00081-W	26002	58528.77	1141583.5	42614.7	2	4
47-00081-W26004	47-00081-W	26004	63136.78	1139817.5	42614.7	2	4
47-00082-W22771	47-00082-W	22771	44557.69	1162562.5	67982.9	2	7
47-00082-W22772	47-00082-W	22772	45438.65	1173932.5	67982.9	2	8
47-00082-W22773	47-00082-W	22773	34619.66	1169243.5	67982.9	2	7
47-00082-W22805	47-00082-W	22805	45333.68	1165878.5	67982.9	2	5
47-00157-W119374	47-00157-W	119374	81910.86	1112953.5	42805.3	2	5
47-00157-W119375	47-00157-W	119375	78446.87	1111442.5	42805.3	2	5
47-00157-W120744	47-00157-W	120744	81947.87	1111739.1	42805.3	2	5
47-00168-W103157	47-00168-W	103157	69978.85	1120583.5	62562.5	2	5
47-00168-W10451	47-00168-W	10451	71351.85	1120857.5	62562.5	2	4
47-00179-W10468	47-00179-W	10468	54396.65	1174322.5	22771.3	2	6
47-00256-W24967	47-00256-W	24967	87581	1198302	21968.2	3	6
47-00261-W16332	47-00261-W	16332	33535.7	1156611.5	8081.0	2	6
47-00261-W16333	47-00261-W	16333	33535.7	1156611.5	8081.0	2	6
47-00284-W15845	47-00284-W	15845	85467	1128942	43446.2	2	2
47-00284-W15845	47-00284-W	15845	85465.8	1128942.5	110707.2	2	2
47-00284-W29323	47-00284-W	29323	85438	1125529	43446.2	2	2
47-00284-W29323	47-00284-W	29323	85436.81	1125529.5	110707.2	2	2
47-00313-W13370	47-00313-W	13370	65660.96	1090538.5	9743.3	2	6
47-00313-W13371	47-00313-W	13371	67331.97	1088893.5	9743.3	3	6
47-00313-W13372	47-00313-W	13372	67762.96	1089793.5	9743.3	2	6
47-00313-W13373	47-00313-W	13373	66750.96	1091087.5	9743.3	2	6
47-00313-W13374	47-00313-W	13374	66401.96	1092241.5	9743.3	2	5
47-00313-W13375	47-00313-W	13375	68108.96	1090960.5	9743.3	2	5
47-00313-W13376	47-00313-W	13376	68643.95	1093625.5	9743.3	2	5
47-00313-W13377	47-00313-W	13377	66823.95	1094912.5	9743.3	2	5
47-00313-W13378	47-00313-W	13378	68624.95	1094735.5	9743.3	2	5
47-00313-W25384	47-00313-W	25384	68817.94	1095746.5	9743.3	2	5
47-00317-W10489	47-00317-W	10489	22694.63	1178120.5	9702.3	2	9
47-00317-W10490	47-00317-W	10490	22698.63	1178137.5	9702.3	2	9
47-00317-W10491	47-00317-W	10491	23974.63	1178294.5	9702.3	2	9
47-00320-W31256	47-00320-W	31256	31057.69	1160052.5	24014.4	4	5
47-00320-W31257	47-00320-W	31257	32839.68	1163456.5	24014.4	4	5
47-00320-W31258	47-00320-W	31258	41375.72	1152680.5	24014.4	3	5
47-00403-W2872	47-00403-W	2872	20835.63	1178391.5	10519.5	2	10

TABLE 3

FLORIDAN AQUIFER SYSTEM WATER USE DATA

East Coast Floridan Aquifer System Model, Phase II
Upper and Lower East Coast of Florida

Well ID	Permit Number	Facility ID	X Coordinate	Y Coordinate	Average Pumping Rate (cfd)	Top Layer	Bottom Layer
47-00403-W2873	47-00403-W	2873	20835.62	1179771.5	10519.5	2	10
47-00403-W2874	47-00403-W	2874	20835.61	1182111.5	10519.5	2	10
47-00421-W32159	47-00421-W	32159	53159	1157707	12401.1	2	6
47-00421-W32160	47-00421-W	32160	53512	1158866	12283.4	2	4
47-00509-W30359	47-00509-W	30359	2575.6	1185652.5	187148.9	2	7
47-00509-W30360	47-00509-W	30360	2369.58	1190701.5	187148.9	2	7
47-00519-W13532	47-00519-W	13532	67256.87	1115783.5	3856.8	2	6
47-00519-W13533	47-00519-W	13533	67006.87	1115783.5	3856.8	2	5
47-00526-W45679	47-00526-W	45679	46410.71	1155372.5	43707.5	2	5
47-00529-W100580	47-00529-W	100580	15186.67	1163819.5	47236.8	2	6
47-00529-W100581	47-00529-W	100581	23116.67	1163792.5	47236.8	2	6
47-00529-W100583	47-00529-W	100583	18451.67	1163882.5	47236.8	2	6
47-00529-W106038	47-00529-W	106038	17919.66	1166641.5	45796.7	2	6
47-00529-W106039	47-00529-W	106039	32252.67	1165049.5	47236.8	2	6
47-00529-W106040	47-00529-W	106040	26134.67	1163959.5	47236.8	2	6
47-00529-W106041	47-00529-W	106041	23200.66	1167647.5	41782.5	2	6
47-00529-W106049	47-00529-W	106049	26217.66	1169072.5	45796.7	2	6
47-00529-W106050	47-00529-W	106050	29989.66	1167312.5	47236.8	2	6
47-00529-W106051	47-00529-W	106051	34013.67	1167396.5	47236.8	2	7
47-00529-W106052	47-00529-W	106052	33258.66	1170665.5	47236.8	2	7
47-00529-W106053	47-00529-W	106053	29067.65	1170665.5	47236.8	2	7
47-00529-W106054	47-00529-W	106054	28313.65	1171587.5	47236.8	2	8
47-00529-W106055	47-00529-W	106055	22613.65	1171251.5	41761.7	2	6
47-00529-W106056	47-00529-W	106056	25212.65	1172676.5	45796.7	2	6
47-00529-W106057	47-00529-W	106057	24457.64	1175275.5	47236.8	2	7
47-00529-W106058	47-00529-W	106058	19093.63	1176113.5	41761.7	2	6
47-00529-W106069	47-00529-W	106069	28229.64	1176113.5	47236.8	2	7
47-00529-W106070	47-00529-W	106070	24876.63	1176364.5	47236.8	2	7
47-00529-W106071	47-00529-W	106071	28481.63	1178963.5	47236.8	2	7
47-00529-W106072	47-00529-W	106072	28397.62	1180807.5	47236.8	2	7
47-00529-W107391	47-00529-W	107391	23116.68	1161109.5	47236.8	2	6
47-00529-W107392	47-00529-W	107392	18590.68	1161528.5	47236.8	2	6
47-00529-W107393	47-00529-W	107393	19644.69	1158293.5	47236.8	2	6
47-00529-W107394	47-00529-W	107394	15688.63	1175184.5	41761.7	2	6
47-00529-W107395	47-00529-W	107395	10728.63	1175812.5	47236.8	2	7
47-00529-W107396	47-00529-W	107396	11921.63	1174494.5	47236.8	2	7
47-00529-W107397	47-00529-W	107397	19707.64	1172798.5	41803.4	2	6

TABLE 3

FLORIDAN AQUIFER SYSTEM WATER USE DATA

East Coast Floridan Aquifer System Model, Phase II
Upper and Lower East Coast of Florida

Well ID	Permit Number	Facility ID	X Coordinate	Y Coordinate	Average Pumping Rate (cfd)	Top Layer	Bottom Layer
47-00529-W107398	47-00529-W	107398	10728.64	1172987.5	47236.8	3	7
47-00529-W107399	47-00529-W	107399	13993.65	1168529.5	41803.4	2	6
47-00529-W107400	47-00529-W	107400	14056.65	1170663.5	41782.5	2	6
47-00529-W107401	47-00529-W	107401	15249.65	1170349.5	41782.5	2	6
47-00529-W107402	47-00529-W	107402	9221.65	1167210.5	47236.8	2	6
47-00529-W107403	47-00529-W	107403	11858.67	1164070.5	47236.8	2	6
47-00529-W107404	47-00529-W	107404	8656.67	1161182.5	47236.8	2	6
47-00529-W107405	47-00529-W	107405	11795.68	1160680.5	47236.8	2	6
47-00529-W107406	47-00529-W	107406	4888.67	1161119.5	47236.8	2	6
47-00529-W107407	47-00529-W	107407	10916.68	1158168.5	47236.8	2	6
47-00529-W107408	47-00529-W	107408	14558.68	1158168.5	47236.8	2	6
47-00529-W107409	47-00529-W	107409	6207.63	1175812.5	47236.8	2	6
47-00529-W107410	47-00529-W	107410	1497.63	1175750.5	47236.8	2	6
47-00529-W107411	47-00529-W	107411	5139.63	1174996.5	47236.8	2	6
47-00529-W107412	47-00529-W	107412	6521.64	1171919.5	47236.8	2	6
47-00529-W107413	47-00529-W	107413	1874.64	1171982.5	47236.8	2	6
47-00529-W107414	47-00529-W	107414	6332.65	1168277.5	47236.8	2	6
47-00529-W107415	47-00529-W	107415	2439.65	1168340.5	47236.8	2	6
47-00529-W107416	47-00529-W	107416	869.65	1167147.5	47236.8	2	6
47-00529-W107417	47-00529-W	107417	7211.66	1166394.5	47236.8	2	6
47-00529-W107418	47-00529-W	107418	6772.66	1163882.5	47236.8	2	6
47-00529-W107419	47-00529-W	107419	1121.66	1163694.5	47236.8	2	6
47-00539-W103189	47-00539-W	103189	1030.57	1205204.5	18288.5	4	7
47-00539-W103191	47-00539-W	103191	3364.57	1208588.5	18288.5	4	7
47-00540-W103625	47-00540-W	103625	56986.7	1160092.5	227.1	2	6
47-00556-W117078	47-00556-W	117078	37454.86	1110892.5	667.9	2	6
47-00556-W117079	47-00556-W	117079	38010.86	1110817.5	667.9	2	6
47-00579-W126803	47-00579-W	126803	20272.79	1125263.5	28313.4	2	5
47-00615-W14871	47-00615-W	14871	79920.56	1199068.6	721.4	2	2
47-00615-W14872	47-00615-W	14872	84058.56	1198529.6	721.4	2	2
47-00615-W14873	47-00615-W	14873	83518.56	1194930.6	721.4	2	2
47-00615-W14874	47-00615-W	14874	86127.58	1188904.6	721.4	2	2
47-00647-W10363	47-00647-W	10363	65512	1205065	2778.4	2	5
47-00647-W10363	47-00647-W	10363	65510.58	1205065.6	1755.8	2	5
47-00647-W152948	47-00647-W	152948	65489	1203699	2778.4	2	6
47-00647-W152948	47-00647-W	152948	65487.58	1203699.6	1755.8	2	6
47-00647-W15837	47-00647-W	15837	65187	1198733	2778.4	2	6

TABLE 3

FLORIDAN AQUIFER SYSTEM WATER USE DATA

East Coast Floridan Aquifer System Model, Phase II
Upper and Lower East Coast of Florida

Well ID	Permit Number	Facility ID	X Coordinate	Y Coordinate	Average Pumping Rate (cfd)	Top Layer	Bottom Layer
47-00647-W15837	47-00647-W	15837	65185.58	1198733.6	1755.8	2	6
47-00647-W24223	47-00647-W	24223	65512	1202404	2778.4	2	6
47-00647-W24223	47-00647-W	24223	65510.58	1202404.6	1755.8	2	6
47-00647-W30074	47-00647-W	30074	67491	1197034	2778.4	2	7
47-00647-W30074	47-00647-W	30074	67489.57	1197034.6	1755.8	2	7
47-00647-W30075	47-00647-W	30075	70159	1196356	2778.4	2	4
47-00647-W30075	47-00647-W	30075	70157.57	1196356.6	1755.8	2	4
47-00647-W32137	47-00647-W	32137	67491	1199695	2778.4	2	4
47-00647-W32137	47-00647-W	32137	67489.57	1199695.6	1755.8	2	4
47-00647-W32138	47-00647-W	32138	70741	1199719	2778.4	2	4
47-00647-W32138	47-00647-W	32138	70739.57	1199719.6	1755.8	2	4
47-00898-W10311	47-00898-W	10311	53147	1149745	9273.0	2	7
47-00898-W10312	47-00898-W	10312	53708	1146995	9273.0	2	7
47-00898-W10313	47-00898-W	10313	55455	1145096	9273.0	2	7
47-00898-W185071	47-00898-W	185071	57483	1149019	9273.0	2	7
47-00898-W24218	47-00898-W	24218	54586	1143306	9273.0	2	7
50-00010-W23565	50-00010-W	23565	273367	982776	51807.9	4	7
50-00010-W23566	50-00010-W	23566	272631	982369	101799.8	3	9
50-00010-W23567	50-00010-W	23567	271494	982327	83591.7	3	8
50-00010-W23568	50-00010-W	23568	273329	983399	71410.8	4	6
50-00010-W23569	50-00010-W	23569	266413	971079	35005.3	4	8
50-00010-W23570	50-00010-W	23570	265313	969779	35005.3	4	8
50-00010-W23571	50-00010-W	23571	263207	969320	35005.3	4	8
50-00010-W27794	50-00010-W	27794	270232	975638	46954.1	7	9
50-00010-W27795	50-00010-W	27795	271441	977057	61526.9	7	9
50-00010-W27796	50-00010-W	27796	273091	980038	112775.4	6	9
50-00010-W27797	50-00010-W	27797	268890	974047	96595.4	6	8
50-00010-W27798	50-00010-W	27798	267606	972509	97717.2	5	8
50-00010-W27799	50-00010-W	27799	272579	978585	95742.6	5	9
50-00046-W20868	50-00046-W	20868	280880	1002615	22990.0	7	10
50-00046-W20869	50-00046-W	20869	280573	1000554	22990.0	7	10
50-00046-W20870	50-00046-W	20870	281249	999428	22990.0	7	10
50-00046-W20872	50-00046-W	20872	281618	998301	22990.0	7	10
50-00046-W20873	50-00046-W	20873	279835	1003037	22990.0	7	10
50-00346-W110005	50-00346-W	110005	289819	800146	104956.0	3	4
50-00346-W110006	50-00346-W	110006	289921	800156	42833.4	3	4
50-00349-W119630	50-00349-W	119630	292337	965548	21903.6	4	5

TABLE 3

FLORIDAN AQUIFER SYSTEM WATER USE DATA

East Coast Floridan Aquifer System Model, Phase II
Upper and Lower East Coast of Florida

Well ID	Permit Number	Facility ID	X Coordinate	Y Coordinate	Average Pumping Rate (cfd)	Top Layer	Bottom Layer
50-00506-W127729	50-00506-W	127729	293378	859550	71315.3	4	6
50-00506-W127730	50-00506-W	127730	293596	859434	71315.3	4	6
50-01528-W121121	50-01528-W	121121	221722	979741	1170.9	2	5
50-01528-W121122	50-01528-W	121122	221786	979223	1493.7	2	5
50-03146-W122238	50-03146-W	122238	66944	860529	21151.8	2	5
50-03147-W6688	50-03147-W	6688	130097	950612	19237.8	3	5
50-03147-W6689	50-03147-W	6689	128851	951697	19237.8	3	5
50-03413-W30860	50-03413-W	30860	298650	904595	37303.9	5	7
50-03835-W23986	50-03835-W	23986	297008	921915	15949.5	3	8
50-04366-W30344	50-04366-W	30344	297699	910989	21160.9	5	8
50203_7287	50203	7287	144730.68	1243943.9	2993.2	2	3
50203_7288	50203	7288	144740.86	1243986.3	2993.2	2	3
5-1			153719	1146114	4.1	2	4
56-00004-W126686	56-00004-W	126686	156772	1132384	482.9	4	5
56-00008-W15854	56-00008-W	15854	158486	1182353	7296.3	2	4
56-00008-W15855	56-00008-W	15855	158224	1179717	7296.3	2	4
56-00008-W160423	56-00008-W	160423	158488	1183755	7296.3	2	4
56-00015-W15857	56-00015-W	15857	121021	1144942	244.2	2	4
56-00015-W15858	56-00015-W	15858	123352	1144902	244.2	2	4
56-00015-W183210	56-00015-W	183210	123231	1112602	244.2	2	5
56-00016-W15860	56-00016-W	15860	123079	1135042	491.3	2	3
56-00016-W15861	56-00016-W	15861	123378	1134419	491.3	2	7
56-00016-W15862	56-00016-W	15862	123020	1132391	491.3	2	7
56-00016-W15863	56-00016-W	15863	120754	1136195	491.3	2	8
56-00016-W15864	56-00016-W	15864	120708	1133577	491.3	2	8
56-00020-W164818	56-00020-W	164818	132466	1164763	8731.5	2	5
56-00020-W26954	56-00020-W	26954	134348	1164908	8731.5	2	5
56-00021-W15869	56-00021-W	15869	116818	1124861	26.5	2	5
56-00021-W15869	56-00021-W	15869	116818	1124861	26.5	2	5
56-00021-W15870	56-00021-W	15870	115226	1123524	26.5	2	3
56-00021-W15870	56-00021-W	15870	115226	1123524	26.5	2	3
56-00024-W157015	56-00024-W	157015	125679	1184988	379.3	2	6
56-00031-W144990	56-00031-W	144990	156322	1184273	95.2	2	4
56-00031-W15966	56-00031-W	15966	157470	1182809	95.2	2	4
56-00032-W15967	56-00032-W	15967	137069	1169171	568.5	2	4
56-00035-W15975	56-00035-W	15975	117837	1211411	1480.3	2	4
56-00035-W15976	56-00035-W	15976	113837	1211411	1480.3	2	4

TABLE 3

FLORIDAN AQUIFER SYSTEM WATER USE DATA

East Coast Floridan Aquifer System Model, Phase II
Upper and Lower East Coast of Florida

Well ID	Permit Number	Facility ID	X Coordinate	Y Coordinate	Average Pumping Rate (cfd)	Top Layer	Bottom Layer
56-00035-W15977	56-00035-W	15977	116437	1214611	1480.3	2	5
56-00035-W15978	56-00035-W	15978	116237	1216611	1480.3	2	5
56-00035-W15979	56-00035-W	15979	118037	1206011	1480.3	2	5
56-00035-W166104	56-00035-W	166104	119123	1199867	1480.3	2	4
56-00035-W166105	56-00035-W	166105	116432	1202628	1480.3	2	4
56-00035-W166106	56-00035-W	166106	114662	1204186	1480.3	2	4
56-00035-W166107	56-00035-W	166107	114166	1207231	1480.3	2	4
56-00035-W166108	56-00035-W	166108	118840	1203761	1480.3	2	5
56-00035-W166109	56-00035-W	166109	116645	1207302	1480.3	2	4
56-00035-W166110	56-00035-W	166110	116503	1209143	1480.3	2	5
56-00035-W166111	56-00035-W	166111	119336	1209072	1480.3	2	4
56-00035-W166112	56-00035-W	166112	120256	1209072	1480.3	2	4
56-00035-W166138	56-00035-W	166138	117565	1211834	1480.3	2	4
56-00039-W147681	56-00039-W	147681	126670	1178478	185.9	2	5
56-00040-W155675	56-00040-W	155675	131261	1112709	302.5	2	7
56-00040-W155697	56-00040-W	155697	128589	1110741	302.5	2	7
56-00044-W151826	56-00044-W	151826	120900	1129521	1.3	2	5
56-00044-W16013	56-00044-W	16013	114416	1132299	1.3	2	5
56-00044-W16014	56-00044-W	16014	113512	1134664	1.3	2	5
56-00060-W159978	56-00060-W	159978	128378	1178588	176.7	2	4
56-00060-W159979	56-00060-W	159979	128378	1178324	176.7	2	4
56-00062-W16022	56-00062-W	16022	124705	1124312	343.3	2	4
56-00062-W16023	56-00062-W	16023	124412	1122340	343.3	2	4
56-00062-W16024	56-00062-W	16024	124914	1121652	343.3	2	5
56-00065-W14817	56-00065-W	14817	155489	1094313	480.8	2	4
56-00065-W14818	56-00065-W	14818	156515	1094001	480.8	2	4
56-00067-W14822	56-00067-W	14822	122567	1127503	1834.6	2	6
56-00068-W14823	56-00068-W	14823	124556	1137508	4097.4	2	9
56-00068-W14824	56-00068-W	14824	124551	1138822	4097.4	2	9
56-00068-W14825	56-00068-W	14825	123441	1139369	4097.4	2	5
56-00070-W14827	56-00070-W	14827	115858	1121297	277.8	2	6
56-00070-W24942	56-00070-W	24942	116805	1122244	277.8	2	5
56-00071-W14828	56-00071-W	14828	137903	1135267	619.1	2	7
56-00071-W14829	56-00071-W	14829	136741	1133931	619.1	2	4
56-00071-W14830	56-00071-W	14830	137878	1132917	619.1	2	6
56-00071-W24463	56-00071-W	24463	137903	1133981	619.1	2	6
56-00072-W14831	56-00072-W	14831	190857	1214666	10649.1	4	5

TABLE 3

FLORIDAN AQUIFER SYSTEM WATER USE DATA

East Coast Floridan Aquifer System Model, Phase II
Upper and Lower East Coast of Florida

Well ID	Permit Number	Facility ID	X Coordinate	Y Coordinate	Average Pumping Rate (cfd)	Top Layer	Bottom Layer
56-00072-W14832	56-00072-W	14832	191181	1213686	10649.1	4	5
56-00074-W14801	56-00074-W	14801	142102	1094019	150.8	2	5
56-00074-W14802	56-00074-W	14802	149829	1091542	150.8	2	7
56-00074-W14803	56-00074-W	14803	144286	1091752	150.8	2	7
56-00074-W14804	56-00074-W	14804	139876	1091080	150.8	2	5
56-00074-W14805	56-00074-W	14805	149829	1096791	150.8	2	7
56-00074-W14806	56-00074-W	14806	143866	1095531	150.8	2	5
56-00074-W29296	56-00074-W	29296	140212	1093599	150.8	2	5
56-00076-W14834	56-00076-W	14834	143023	1126238	59.2	2	9
56-00076-W15336	56-00076-W	15336	148664	1147360	59.2	2	3
56-00076-W15339	56-00076-W	15339	147581	1147557	59.2	2	3
56-00076-W15340	56-00076-W	15340	147408	1145840	59.2	2	3
56-00076-W173527	56-00076-W	173527	147576	1148870	59.2	2	3
56-00078-W14838	56-00078-W	14838	133421	1123678	935.2	2	7
56-00079-W14840	56-00079-W	14840	136260	1114053	139.6	2	7
56-00079-W14841	56-00079-W	14841	134175	1117109	139.6	2	7
56-00079-W14842	56-00079-W	14842	136370	1120704	139.6	2	7
56-00079-W14843	56-00079-W	14843	134228	1124172	139.6	2	4
56-00079-W29297	56-00079-W	29297	134147	1110359	139.6	2	4
56-00080-W14845	56-00080-W	14845	121009	1123833	290.4	2	5
56-00080-W14846	56-00080-W	14846	122234	1126195	290.4	2	6
56-00080-W14847	56-00080-W	14847	121888	1123721	290.4	2	5
56-00082-W14848	56-00082-W	14848	96225	1165338	1705.3	2	4
56-00082-W14849	56-00082-W	14849	98083	1163431	1705.3	2	7
56-00082-W14850	56-00082-W	14850	99176	1171023	1705.3	2	4
56-00082-W14851	56-00082-W	14851	99800	1165716	1705.3	2	4
56-00082-W14852	56-00082-W	14852	100047	1174279	1705.3	2	7
56-00082-W14853	56-00082-W	14853	94729	1165364	1705.3	2	7
56-00082-W14854	56-00082-W	14854	100236	1164711	1705.3	2	4
56-00082-W14855	56-00082-W	14855	98029	1165660	1705.3	2	4
56-00082-W14856	56-00082-W	14856	96642	1168045	1705.3	2	4
56-00082-W14857	56-00082-W	14857	98758	1171105	1705.3	2	4
56-00082-W14858	56-00082-W	14858	96319	1167622	1705.3	2	7
56-00082-W24464	56-00082-W	24464	93945	1173497	1705.3	2	7
56-00082-W24465	56-00082-W	24465	96221	1164592	1705.3	2	4
56-00083-W14871	56-00083-W	14871	79922	1199068	718.7	2	2
56-00083-W14872	56-00083-W	14872	84060	1198529	718.7	2	2

TABLE 3

FLORIDAN AQUIFER SYSTEM WATER USE DATA

East Coast Floridan Aquifer System Model, Phase II
Upper and Lower East Coast of Florida

Well ID	Permit Number	Facility ID	X Coordinate	Y Coordinate	Average Pumping Rate (cfd)	Top Layer	Bottom Layer
56-00083-W14873	56-00083-W	14873	83520	1194930	718.7	2	2
56-00083-W14874	56-00083-W	14874	86129	1188904	718.7	2	2
56-00084-W14875	56-00084-W	14875	154792	1211811	2466.0	2	3
56-00084-W14876	56-00084-W	14876	155335	1211005	2466.0	3	3
56-00084-W14877	56-00084-W	14877	155257	1208278	2466.0	2	3
56-00084-W14878	56-00084-W	14878	151309	1205131	2466.0	3	3
56-00084-W14879	56-00084-W	14879	151469	1209979	2466.0	3	4
56-00084-W14880	56-00084-W	14880	150927	1210482	2466.0	3	4
56-00084-W14881	56-00084-W	14881	146688	1212484	2466.0	3	3
56-00084-W14882	56-00084-W	14882	144972	1216589	2466.0	3	3
56-00084-W25414	56-00084-W	25414	150788	1194074	2466.0	2	4
56-00085-W28374	56-00085-W	28374	194617	1175069	59913.6	2	4
56-00085-W28375	56-00085-W	28375	193754	1174780	64756.4	2	4
56-00085-W28376	56-00085-W	28376	192269	1177975	71896.3	3	4
56-00085-W28377	56-00085-W	28377	192261	1178646	71896.3	3	4
56-00085-W28378	56-00085-W	28378	192273	1179657	71896.3	3	4
56-00085-W28379	56-00085-W	28379	192265	1181042	71896.3	2	4
56-00085-W28380	56-00085-W	28380	192265	1181918	71896.3	2	4
56-00085-W28381	56-00085-W	28381	192273	1182885	71896.3	2	4
56-00085-W28382	56-00085-W	28382	192305	1183596	71896.3	2	4
56-00085-W28385	56-00085-W	28385	194590	1176374	71896.3	2	4
56-00085-W29395	56-00085-W	29395	193646	1176068	71896.3	3	4
56-00088-W14892	56-00088-W	14892	124888	1162147	61.0	2	5
56-00088-W24468	56-00088-W	24468	127263	1162375	61.0	2	5
56-00090-W16306	56-00090-W	16306	161557	1209193	1806.8	2	3
56-00090-W16307	56-00090-W	16307	157915	1206434	1806.8	2	3
56-00090-W16308	56-00090-W	16308	159352	1206440	1806.8	2	3
56-00090-W16309	56-00090-W	16309	159887	1205952	1806.8	2	5
56-00090-W16310	56-00090-W	16310	159777	1214539	1806.8	2	3
56-00090-W16311	56-00090-W	16311	158186	1211785	1806.8	2	5
56-00090-W16312	56-00090-W	16312	159789	1211803	1806.8	2	3
56-00090-W16313	56-00090-W	16313	160960	1211745	1806.8	2	4
56-00090-W16314	56-00090-W	16314	162262	1211731	1806.8	2	5
56-00090-W16315	56-00090-W	16315	160041	1209155	1806.8	2	3
56-00090-W24550	56-00090-W	24550	161696	1214502	1806.8	2	5
56-00090-W24551	56-00090-W	24551	157799	1208770	1806.8	2	5
56-00091-W23266	56-00091-W	23266	154811	1199845	907.7	2	4

TABLE 3

FLORIDAN AQUIFER SYSTEM WATER USE DATA

East Coast Floridan Aquifer System Model, Phase II
Upper and Lower East Coast of Florida

Well ID	Permit Number	Facility ID	X Coordinate	Y Coordinate	Average Pumping Rate (cfd)	Top Layer	Bottom Layer
56-00091-W23267	56-00091-W	23267	156250	1195534	907.7	2	4
56-00091-W23268	56-00091-W	23268	158840	1193133	907.7	2	4
56-00091-W23269	56-00091-W	23269	155951	1188918	907.7	2	4
56-00091-W23270	56-00091-W	23270	159737	1186304	907.7	2	4
56-00091-W23271	56-00091-W	23271	161979	1194417	907.7	2	4
56-00091-W23272	56-00091-W	23272	161852	1191671	907.7	2	4
56-00091-W23273	56-00091-W	23273	161836	1189422	907.7	2	4
56-00091-W23274	56-00091-W	23274	159985	1201196	907.7	2	4
56-00091-W23275	56-00091-W	23275	160020	1198486	907.7	2	4
56-00091-W23276	56-00091-W	23276	160064	1195760	907.7	2	4
56-00091-W23277	56-00091-W	23277	159865	1190261	907.7	2	4
56-00091-W23278	56-00091-W	23278	155815	1202319	907.7	2	4
56-00091-W23282	56-00091-W	23282	158867	1195755	907.7	2	3
56-00091-W29353	56-00091-W	29353	161300	1199949	907.7	2	4
56-00092-W14893	56-00092-W	14893	166745	1195708	1568.5	2	6
56-00092-W14894	56-00092-W	14894	162990	1196738	1568.5	2	5
56-00092-W14895	56-00092-W	14895	162990	1195708	1568.5	2	5
56-00092-W14896	56-00092-W	14896	164150	1195708	1568.5	2	5
56-00092-W14897	56-00092-W	14897	168080	1195708	1568.5	2	4
56-00092-W14898	56-00092-W	14898	162990	1198083	1568.5	2	4
56-00092-W14899	56-00092-W	14899	162990	1197438	1568.5	2	4
56-00092-W162846	56-00092-W	162846	165582	1196828	1568.5	2	6
56-00092-W162847	56-00092-W	162847	165580	1195708	1568.5	2	6
56-00092-W162848	56-00092-W	162848	166835	1196743	1568.5	2	6
56-00092-W162849	56-00092-W	162849	168080	1196828	1568.5	2	4
56-00092-W162850	56-00092-W	162850	171195	1199293	1568.5	2	4
56-00092-W162851	56-00092-W	162851	167480	1200288	1568.5	2	4
56-00092-W162852	56-00092-W	162852	167568	1199768	1568.5	2	4
56-00093-W14900	56-00093-W	14900	164380	1201689	3645.4	2	4
56-00093-W14901	56-00093-W	14901	164138	1203151	3645.4	2	4
56-00093-W14902	56-00093-W	14902	163042	1202169	3645.4	2	4
56-00093-W14903	56-00093-W	14903	164398	1200760	3645.4	2	4
56-00093-W14904	56-00093-W	14904	164384	1200123	3645.4	2	4
56-00093-W14905	56-00093-W	14905	163079	1199309	3645.4	2	4
56-00096-W22005	56-00096-W	22005	148593	1191058	4445.6	3	4
56-00096-W22006	56-00096-W	22006	144425	1190987	4445.6	3	4
56-00096-W22014	56-00096-W	22014	140966	1191006	4445.6	3	5

TABLE 3

FLORIDAN AQUIFER SYSTEM WATER USE DATA

East Coast Floridan Aquifer System Model, Phase II
Upper and Lower East Coast of Florida

Well ID	Permit Number	Facility ID	X Coordinate	Y Coordinate	Average Pumping Rate (cfd)	Top Layer	Bottom Layer
56-00096-W22017	56-00096-W	22017	153350	1191034	4445.6	2	4
56-00096-W25490	56-00096-W	25490	151095	1191063	4445.6	3	4
56-00098-W14906	56-00098-W	14906	94469	1216549	926.8	2	8
56-00098-W14908	56-00098-W	14908	96829	1201968	926.8	2	8
56-00098-W14909	56-00098-W	14909	95873	1203985	926.8	2	8
56-00098-W14910	56-00098-W	14910	96660	1197821	926.8	2	6
56-00098-W14911	56-00098-W	14911	94391	1212307	926.8	2	8
56-00098-W14912	56-00098-W	14912	98166	1214236	926.8	2	8
56-00098-W14913	56-00098-W	14913	97455	1211003	926.8	2	8
56-00098-W14914	56-00098-W	14914	95914	1214634	926.8	2	8
56-00098-W14915	56-00098-W	14915	95910	1208580	926.8	2	8
56-00098-W14916	56-00098-W	14916	96373	1211505	926.8	2	8
56-00098-W14917	56-00098-W	14917	97267	1206260	926.8	2	8
56-00098-W14918	56-00098-W	14918	95108	1205649	926.8	2	8
56-00099-W14919	56-00099-W	14919	175720	1189268	4065.9	2	4
56-00104-W24469	56-00104-W	24469	172199	1197655	2281.9	2	4
56-00114-W14928	56-00114-W	14928	173369	1211388	780.2	2	4
56-00114-W14929	56-00114-W	14929	172865	1211073	1248.4	2	4
56-00118-W14960	56-00118-W	14960	169774	1148836	7396.4	2	4
56-00118-W14961	56-00118-W	14961	168221	1142253	7396.4	2	4
56-00118-W14962	56-00118-W	14962	164081	1138199	7396.4	2	4
56-00123-W14988	56-00123-W	14988	167666	1211569	2602.5	2	4
56-00123-W14989	56-00123-W	14989	167255	1210659	2602.5	2	4
56-00123-W14990	56-00123-W	14990	168025	1210639	2602.5	2	4
56-00123-W14991	56-00123-W	14991	166232	1210720	2602.5	2	4
56-00123-W14992	56-00123-W	14992	166453	1210972	2602.5	2	4
56-00123-W24476	56-00123-W	24476	167471	1210681	2602.5	2	4
56-00123-W24477	56-00123-W	24477	166246	1211478	2602.5	2	4
56-00123-W25415	56-00123-W	25415	167743	1210627	2602.5	2	4
56-00127-W14995	56-00127-W	14995	178827	1189489	4097.6	2	4
56-00127-W14996	56-00127-W	14996	178710	1188834	4097.6	2	4
56-00127-W14997	56-00127-W	14997	178331	1190089	4097.6	2	4
56-00133-W154919	56-00133-W	154919	152579	1147348	1314.5	2	5
56-00133-W154920	56-00133-W	154920	154256	1147948	1314.5	2	5
56-00133-W1748	56-00133-W	1748	153333	1147827	1314.5	2	5
56-00133-W1749	56-00133-W	1749	153902	1146948	1314.5	2	5
56-00133-W1750	56-00133-W	1750	154647	1147834	1314.5	2	5

TABLE 3

FLORIDAN AQUIFER SYSTEM WATER USE DATA

East Coast Floridan Aquifer System Model, Phase II
Upper and Lower East Coast of Florida

Well ID	Permit Number	Facility ID	X Coordinate	Y Coordinate	Average Pumping Rate (cfd)	Top Layer	Bottom Layer
56-00136-W15011	56-00136-W	15011	148579	1144095	13348.5	2	4
56-00137-W15012	56-00137-W	15012	159489	1138362	3168.7	2	3
56-00137-W15013	56-00137-W	15013	159278	1138251	3168.7	2	3
56-00137-W15014	56-00137-W	15014	161893	1138188	3168.7	2	3
56-00137-W15015	56-00137-W	15015	162932	1138046	3168.7	2	4
56-00137-W15016	56-00137-W	15016	161468	1137055	3168.7	2	3
56-00137-W24479	56-00137-W	24479	162414	1138804	3168.7	2	4
56-00137-W24480	56-00137-W	24480	158898	1137062	3168.7	2	4
56-00139-W15018	56-00139-W	15018	137584	1163233	3563.1	2	3
56-00139-W15019	56-00139-W	15019	138787	1162846	3563.1	2	3
56-00139-W15020	56-00139-W	15020	137685	1162039	3563.1	2	3
56-00139-W15021	56-00139-W	15021	136476	1161002	3563.1	2	5
56-00139-W29300	56-00139-W	29300	137658	1160926	3563.1	2	3
56-00140-W167089	56-00140-W	167089	145704	1138343	2446.0	2	5
56-00142-W111081	56-00142-W	111081	193615	1123743	170055.2	3	7
56-00142-W112009	56-00142-W	112009	178850	1148538	141140.9	3	6
56-00142-W112010	56-00142-W	112010	181350	1148538	115517.8	3	6
56-00142-W112011	56-00142-W	112011	178330	1146793	107627.5	3	6
56-00142-W163474	56-00142-W	163474	178945	1144978	126286.0	3	6
56-00142-W163475	56-00142-W	163475	179890	1144643	78504.0	3	7
56-00142-W163476	56-00142-W	163476	181430	1143838	78504.0	3	7
56-00142-W163477	56-00142-W	163477	175110	1143428	78504.0	3	7
56-00142-W163478	56-00142-W	163478	171070	1140468	78504.0	3	7
56-00142-W163480	56-00142-W	163480	174500	1140673	78504.0	3	7
56-00142-W163483	56-00142-W	163483	179890	1140608	78504.0	3	7
56-00142-W163488	56-00142-W	163488	183520	1140808	78504.0	3	7
56-00142-W163489	56-00142-W	163489	168450	1137708	78504.0	3	7
56-00142-W163490	56-00142-W	163490	165750	1134948	78504.0	3	7
56-00142-W163491	56-00142-W	163491	178148	1148148	30872.3	4	6
56-00142-W27719	56-00142-W	27719	197262	1126123	126512.0	3	7
56-00142-W27720	56-00142-W	27720	198595	1124508	144183.5	3	7
56-00142-W27721	56-00142-W	27721	198018	1123559	165166.1	3	7
56-00142-W27722	56-00142-W	27722	201099	1124289	167120.0	3	6
56-00142-W27723	56-00142-W	27723	200579	1127728	183995.8	3	7
56-00144-W15028	56-00144-W	15028	179858	1180494	1145.4	2	4
56-00146-W15029	56-00146-W	15029	180144	1179920	698.5	2	3
56-00146-W25416	56-00146-W	25416	180471	1180640	218.3	2	3

TABLE 3

FLORIDAN AQUIFER SYSTEM WATER USE DATA

East Coast Floridan Aquifer System Model, Phase II
Upper and Lower East Coast of Florida

Well ID	Permit Number	Facility ID	X Coordinate	Y Coordinate	Average Pumping Rate (cfd)	Top Layer	Bottom Layer
56-00147-W101758	56-00147-W	101758	150967	1179254	53.0	2	3
56-00147-W101759	56-00147-W	101759	150967	1180741	53.0	2	3
56-00147-W101760	56-00147-W	101760	150967	1182087	53.0	2	3
56-00147-W101761	56-00147-W	101761	150953	1183350	53.0	2	3
56-00147-W15302	56-00147-W	15302	148093	1182618	53.0	2	4
56-00150-W31262	56-00150-W	31262	168875	1170229	1309.1	2	3
56-00150-W31263	56-00150-W	31263	168783	1168653	1309.1	2	3
56-00150-W31264	56-00150-W	31264	169917	1168665	1309.1	2	3
56-00150-W31265	56-00150-W	31265	172936	1168641	1309.1	2	3
56-00150-W31266	56-00150-W	31266	168661	1167540	1309.1	2	3
56-00150-W31267	56-00150-W	31267	169749	1167507	1309.1	2	3
56-00150-W31268	56-00150-W	31268	170982	1167528	1309.1	2	3
56-00150-W31269	56-00150-W	31269	173083	1167508	1309.1	2	3
56-00150-W31270	56-00150-W	31270	170448	1170193	1309.1	2	3
56-00150-W31271	56-00150-W	31271	168690	1166203	1309.1	2	3
56-00150-W31275	56-00150-W	31275	171316	1170169	1309.1	2	3
56-00150-W31276	56-00150-W	31276	172212	1170230	1309.1	2	3
56-00150-W31279	56-00150-W	31279	172776	1170236	1309.1	2	3
56-00150-W31281	56-00150-W	31281	171802	1168652	1309.1	2	3
56-00151-W15031	56-00151-W	15031	175954	1162997	787.2	3	4
56-00154-W15045	56-00154-W	15045	159689	1143621	16522.0	2	4
56-00155-W112416	56-00155-W	112416	187763	1176673	7352.8	3	4
56-00155-W112417	56-00155-W	112417	187040	1176417	7352.8	3	4
56-00156-W15061	56-00156-W	15061	145630	1180751	66.3	2	4
56-00156-W15062	56-00156-W	15062	142933	1180713	66.3	2	4
56-00156-W15063	56-00156-W	15063	142944	1181839	66.3	2	4
56-00156-W15064	56-00156-W	15064	145644	1181850	66.3	2	4
56-00157-W15067	56-00157-W	15067	148492	1174482	9816.0	2	5
56-00157-W24484	56-00157-W	24484	147506	1174566	9816.0	2	2
56-00160-W15069	56-00160-W	15069	162939	1159233	2128.0	3	4
56-00160-W15070	56-00160-W	15070	161734	1159007	2128.0	3	4
56-00167-W24486	56-00167-W	24486	188032	1171091	3816.6	2	5
56-00168-W15085	56-00168-W	15085	165010	1163157	11098.2	2	2
56-00168-W25417	56-00168-W	25417	163601	1163965	11098.2	2	2
56-00169-W15087	56-00169-W	15087	167683	1213523	13009.9	2	3
56-00170-W15088	56-00170-W	15088	177571	1200584	8522.1	4	5
56-00172-W15091	56-00172-W	15091	165851	1204999	7180.2	2	4

TABLE 3

FLORIDAN AQUIFER SYSTEM WATER USE DATA

East Coast Floridan Aquifer System Model, Phase II
Upper and Lower East Coast of Florida

Well ID	Permit Number	Facility ID	X Coordinate	Y Coordinate	Average Pumping Rate (cfd)	Top Layer	Bottom Layer
56-00172-W15092	56-00172-W	15092	166979	1206108	7180.2	2	4
56-00172-W15093	56-00172-W	15093	167639	1204980	7180.2	2	4
56-00173-W15094	56-00173-W	15094	176786	1190927	4252.4	2	4
56-00173-W15095	56-00173-W	15095	176668	1189568	4252.4	2	4
56-00174-W160922	56-00174-W	160922	164962	1210845	6379.0	2	3
56-00175-W29303	56-00175-W	29303	170666	1211912	3065.3	2	5
56-00176-W15103	56-00176-W	15103	173020	1212422	2745.2	2	3
56-00176-W15104	56-00176-W	15104	173547	1212474	2745.2	2	3
56-00176-W15105	56-00176-W	15105	173123	1214962	2745.2	2	3
56-00176-W15106	56-00176-W	15106	172277	1215406	2745.2	2	3
56-00176-W15107	56-00176-W	15107	172062	1215390	2745.2	2	3
56-00176-W15108	56-00176-W	15108	171753	1215474	2745.2	2	3
56-00176-W15109	56-00176-W	15109	171198	1215088	2745.2	2	3
56-00176-W24488	56-00176-W	24488	172356	1215286	2745.2	2	3
56-00177-W4758	56-00177-W	4758	164237	1206411	2727.7	2	5
56-00179-W15111	56-00179-W	15111	169103	1212178	5953.3	2	4
56-00180-W15112	56-00180-W	15112	162187	1208976	825.4	2	4
56-00180-W15113	56-00180-W	15113	162519	1209575	825.4	2	4
56-00180-W15114	56-00180-W	15114	162843	1210138	825.4	2	4
56-00183-W15117	56-00183-W	15117	168272	1215361	2659.0	2	3
56-00183-W15118	56-00183-W	15118	167123	1215490	2659.0	2	3
56-00183-W15119	56-00183-W	15119	166922	1215357	2659.0	2	4
56-00183-W15120	56-00183-W	15120	166069	1216046	2659.0	2	3
56-00183-W15121	56-00183-W	15121	166399	1214304	2659.0	2	3
56-00183-W15122	56-00183-W	15122	167756	1214291	2659.0	2	3
56-00183-W24489	56-00183-W	24489	165939	1215246	2659.0	2	3
56-00183-W25418	56-00183-W	25418	168188	1215095	2659.0	2	4
56-00184-W14995	56-00184-W	14995	178827	1189489	2250.4	2	4
56-00184-W14997	56-00184-W	14997	178331	1190089	2250.4	2	4
56-00184-W15126	56-00184-W	15126	176794	1192620	2250.4	2	4
56-00184-W15127	56-00184-W	15127	178224	1192550	2250.4	2	4
56-00184-W15128	56-00184-W	15128	178138	1191622	2250.4	2	4
56-00184-W15129	56-00184-W	15129	178739	1191193	2250.4	2	4
56-00184-W15130	56-00184-W	15130	178223	1190330	2250.4	2	4
56-00184-W24944	56-00184-W	24944	178308	1191366	2250.4	2	4
56-00185-W15131	56-00185-W	15131	173232	1190867	1351.1	2	3
56-00185-W15132	56-00185-W	15132	172255	1191054	1351.1	2	4

TABLE 3

FLORIDAN AQUIFER SYSTEM WATER USE DATA

East Coast Floridan Aquifer System Model, Phase II
Upper and Lower East Coast of Florida

Well ID	Permit Number	Facility ID	X Coordinate	Y Coordinate	Average Pumping Rate (cfd)	Top Layer	Bottom Layer
56-00185-W15133	56-00185-W	15133	172372	1190521	1351.1	2	3
56-00185-W15134	56-00185-W	15134	172707	1189612	1351.1	2	4
56-00185-W15135	56-00185-W	15135	172893	1189457	1351.1	2	4
56-00185-W15136	56-00185-W	15136	172587	1189089	1351.1	2	4
56-00186-W15137	56-00186-W	15137	170101	1198458	3328.2	2	4
56-00189-W15141	56-00189-W	15141	172456	1192228	525.6	2	3
56-00189-W15142	56-00189-W	15142	172488	1191682	525.6	2	3
56-00190-W15143	56-00190-W	15143	170097	1215841	4204.6	2	3
56-00191-W15146	56-00191-W	15146	174118	1199565	9653.5	2	4
56-00191-W24945	56-00191-W	24945	174383	1199581	9653.5	2	4
56-00192-W15147	56-00192-W	15147	168095	1199453	3681.9	2	4
56-00192-W24491	56-00192-W	24491	167056	1198973	3681.9	2	4
56-00193-W15149	56-00193-W	15149	168985	1215796	4646.0	2	3
56-00193-W15150	56-00193-W	15150	168571	1214273	4646.0	2	3
56-00193-W15151	56-00193-W	15151	169611	1214320	4646.0	2	3
56-00193-W15152	56-00193-W	15152	169014	1215439	4646.0	2	4
56-00194-W15154	56-00194-W	15154	173763	1192507	472.7	3	3
56-00194-W15155	56-00194-W	15155	174194	1192265	472.7	3	3
56-00194-W15156	56-00194-W	15156	174449	1191977	472.7	3	3
56-00194-W15157	56-00194-W	15157	173997	1190653	472.7	2	3
56-00194-W15158	56-00194-W	15158	174409	1190841	472.7	2	3
56-00197-W15161	56-00197-W	15161	172255	1187746	1569.8	2	3
56-00197-W15162	56-00197-W	15162	172693	1188231	1569.8	2	2
56-00197-W15163	56-00197-W	15163	173363	1188308	1569.8	2	3
56-00199-W15168	56-00199-W	15168	181992	1192027	4445.7	2	3
56-00199-W15169	56-00199-W	15169	183411	1193354	4445.7	2	4
56-00199-W15170	56-00199-W	15170	182208	1193811	4445.7	2	4
56-00199-W15171	56-00199-W	15171	182094	1193493	4445.7	2	3
56-00199-W15172	56-00199-W	15172	182256	1194875	4445.7	2	4
56-00200-W15174	56-00200-W	15174	171622	1212492	731.1	2	4
56-00200-W15175	56-00200-W	15175	172256	1211586	731.1	2	4
56-00200-W15176	56-00200-W	15176	173335	1211894	731.1	2	4
56-00200-W15177	56-00200-W	15177	174236	1211696	731.1	2	4
56-00200-W24492	56-00200-W	24492	172075	1211787	731.1	2	4
56-00202-W16536	56-00202-W	16536	164552	1204711	3081.6	2	5
56-00202-W167997	56-00202-W	167997	163589	1204680	3081.6	2	5
56-00202-W167998	56-00202-W	167998	162374	1204711	3081.6	2	5

TABLE 3

FLORIDAN AQUIFER SYSTEM WATER USE DATA

East Coast Floridan Aquifer System Model, Phase II
Upper and Lower East Coast of Florida

Well ID	Permit Number	Facility ID	X Coordinate	Y Coordinate	Average Pumping Rate (cfd)	Top Layer	Bottom Layer
56-00204-W29305	56-00204-W	29305	178295	1202567	8026.1	2	5
56-00205-W15182	56-00205-W	15182	174356	1198184	5863.6	2	4
56-00206-W15184	56-00206-W	15184	175696	1191179	3435.0	2	4
56-00206-W15185	56-00206-W	15185	175073	1192383	3435.0	2	3
56-00207-W147979	56-00207-W	147979	180937	1189374	2941.7	2	3
56-00209-W15186	56-00209-W	15186	180558	1190057	1888.8	2	4
56-00210-W16867	56-00210-W	16867	170584	1204387	2219.4	2	4
56-00210-W16868	56-00210-W	16868	169803	1203738	2219.4	2	4
56-00210-W16869	56-00210-W	16869	168854	1210663	2219.4	2	4
56-00210-W16870	56-00210-W	16870	170502	1209752	2219.4	2	5
56-00210-W16873	56-00210-W	16873	170401	1208543	2219.4	2	3
56-00210-W16874	56-00210-W	16874	169127	1207247	2219.4	2	3
56-00210-W16875	56-00210-W	16875	170767	1206845	2219.4	2	3
56-00210-W16876	56-00210-W	16876	168622	1205173	2219.4	2	4
56-00210-W24587	56-00210-W	24587	170805	1210588	2219.4	2	5
56-00210-W24978	56-00210-W	24978	169685	1205915	2219.4	2	3
56-00211-W15187	56-00211-W	15187	174069	1196187	4221.1	2	3
56-00211-W15188	56-00211-W	15188	175797	1196206	4221.1	2	3
56-00211-W24947	56-00211-W	24947	174387	1196540	4221.1	2	3
56-00212-W15190	56-00212-W	15190	181338	1186527	1582.6	2	3
56-00212-W15191	56-00212-W	15191	181703	1187075	1582.6	2	3
56-00212-W15192	56-00212-W	15192	182641	1186653	1582.6	2	3
56-00212-W15193	56-00212-W	15193	181719	1185967	1582.6	2	4
56-00212-W24948	56-00212-W	24948	182514	1185993	1582.6	2	3
56-00213-W15194	56-00213-W	15194	173873	1189415	1911.6	2	4
56-00213-W15195	56-00213-W	15195	173938	1189886	1911.6	2	3
56-00213-W15196	56-00213-W	15196	174392	1189367	1911.6	2	3
56-00214-W15199	56-00214-W	15199	181204	1194667	2014.8	2	4
56-00214-W15200	56-00214-W	15200	180410	1193441	2014.8	2	4
56-00214-W15202	56-00214-W	15202	181314	1195648	2014.8	2	4
56-00214-W15203	56-00214-W	15203	179437	1195337	2014.8	2	4
56-00214-W15204	56-00214-W	15204	180549	1195273	2014.8	2	4
56-00214-W15205	56-00214-W	15205	181240	1195242	2014.8	2	4
56-00214-W15206	56-00214-W	15206	180106	1194977	2014.8	2	4
56-00214-W15207	56-00214-W	15207	179361	1194719	2014.8	2	4
56-00214-W15208	56-00214-W	15208	179710	1194705	2014.8	2	4
56-00214-W15209	56-00214-W	15209	180634	1194724	2014.8	2	4

TABLE 3

FLORIDAN AQUIFER SYSTEM WATER USE DATA

East Coast Floridan Aquifer System Model, Phase II
Upper and Lower East Coast of Florida

Well ID	Permit Number	Facility ID	X Coordinate	Y Coordinate	Average Pumping Rate (cfd)	Top Layer	Bottom Layer
56-00214-W38254	56-00214-W	38254	181060	1193418	2014.8	2	4
56-00215-W15210	56-00215-W	15210	163596	1204679	1684.7	2	5
56-00215-W15211	56-00215-W	15211	162367	1204716	1684.7	2	5
56-00215-W15212	56-00215-W	15212	164454	1206397	276.2	2	5
56-00215-W24493	56-00215-W	24493	162367	1204716	690.5	2	5
56-00216-W15213	56-00216-W	15213	174087	1201049	411.8	2	4
56-00216-W15214	56-00216-W	15214	173828	1201749	411.8	2	4
56-00216-W15215	56-00216-W	15215	174237	1201799	411.8	2	4
56-00217-W15216	56-00217-W	15216	177293	1189616	1743.2	2	4
56-00217-W15217	56-00217-W	15217	176896	1189585	1743.2	2	3
56-00219-W15220	56-00219-W	15220	179163	1197149	1549.7	2	4
56-00219-W15221	56-00219-W	15221	180064	1197375	1549.7	2	4
56-00220-W29306	56-00220-W	29306	174908	1190720	2459.8	2	4
56-00222-W15239	56-00222-W	15239	179548	1193849	1346.1	2	4
56-00223-W29307	56-00223-W	29307	179753	1192059	3651.7	2	4
56-00224-W15244	56-00224-W	15244	179598	1187879	2258.1	2	4
56-00226-W15246	56-00226-W	15246	171714	1205550	850.8	2	4
56-00226-W15247	56-00226-W	15247	172296	1205564	483.4	2	4
56-00227-W15248	56-00227-W	15248	180910	1190262	2917.5	2	3
56-00227-W15249	56-00227-W	15249	180879	1190692	2917.5	2	3
56-00228-W15250	56-00228-W	15250	181214	1187631	1071.0	2	3
56-00228-W15251	56-00228-W	15251	180759	1188192	1071.0	2	3
56-00230-W15252	56-00230-W	15252	163546	1210306	1654.6	1	3
56-00230-W15253	56-00230-W	15253	163517	1211353	1654.6	1	3
56-00231-W15254	56-00231-W	15254	161990	1207526	8483.2	3	4
56-00232-W15255	56-00232-W	15255	177375	1199392	2781.9	2	4
56-00232-W15256	56-00232-W	15256	176522	1198454	2781.9	2	4
56-00232-W24497	56-00232-W	24497	177293	1200171	2781.9	2	4
56-00233-W15258	56-00233-W	15258	175116	1196956	3781.7	2	3
56-00233-W15259	56-00233-W	15259	177110	1197288	3781.7	2	3
56-00233-W154585	56-00233-W	154585	175540	1198188	3781.7	2	4
56-00233-W29363	56-00233-W	29363	175974	1197624	3781.7	2	3
56-00237-W159788	56-00237-W	159788	153975	1178688	41.6	2	4
56-00237-W159789	56-00237-W	159789	153827	1178126	41.6	2	4
56-00239-W15270	56-00239-W	15270	176375	1172954	7423.3	2	4
56-00243-W15275	56-00243-W	15275	190536	1166169	2022.3	2	3
56-00243-W15276	56-00243-W	15276	191770	1165513	2022.3	2	3

TABLE 3

FLORIDAN AQUIFER SYSTEM WATER USE DATA

East Coast Floridan Aquifer System Model, Phase II
Upper and Lower East Coast of Florida

Well ID	Permit Number	Facility ID	X Coordinate	Y Coordinate	Average Pumping Rate (cfd)	Top Layer	Bottom Layer
56-00243-W15277	56-00243-W	15277	191253	1164817	2022.3	2	3
56-00243-W15278	56-00243-W	15278	188615	1165281	2022.3	2	3
56-00243-W24498	56-00243-W	24498	189369	1165359	2022.3	2	3
56-00245-W15280	56-00245-W	15280	135841	1176510	15.1	2	3
56-00245-W15281	56-00245-W	15281	133951	1176115	15.1	3	3
56-00245-W15282	56-00245-W	15282	135237	1175818	15.1	2	3
56-00245-W15283	56-00245-W	15283	134833	1175355	15.1	3	3
56-00245-W15284	56-00245-W	15284	135187	1174902	15.1	2	3
56-00245-W15285	56-00245-W	15285	135715	1174205	15.1	2	3
56-00253-W21787	56-00253-W	21787	135210	1172806	1031.4	2	4
56-00253-W21788	56-00253-W	21788	133997	1172734	1031.4	2	4
56-00253-W21789	56-00253-W	21789	132572	1172783	1031.4	2	4
56-00253-W21790	56-00253-W	21790	131415	1172815	1031.4	2	4
56-00253-W21791	56-00253-W	21791	131548	1169961	1031.4	2	4
56-00253-W21792	56-00253-W	21792	132584	1169988	1031.4	2	4
56-00253-W21793	56-00253-W	21793	133917	1169948	1031.4	2	4
56-00253-W21794	56-00253-W	21794	135270	1169996	1031.4	2	4
56-00253-W29348	56-00253-W	29348	136342	1170003	1031.4	2	4
56-00257-W15302	56-00257-W	15302	148093	1182618	1372.8	2	4
56-00257-W15303	56-00257-W	15303	147618	1183357	1372.8	2	4
56-00259-W15305	56-00259-W	15305	139602	1172835	125.5	2	4
56-00259-W15306	56-00259-W	15306	139971	1172872	125.5	2	4
56-00262-W15311	56-00262-W	15311	151623	1145971	6050.6	2	4
56-00266-W15320	56-00266-W	15320	144744	1157942	3731.3	2	4
56-00269-W15322	56-00269-W	15322	139955	1182716	7186.9	2	5
56-00278-W15336	56-00278-W	15336	148664	1147360	4447.7	2	3
56-00278-W15337	56-00278-W	15337	149031	1145846	4447.7	2	3
56-00278-W15339	56-00278-W	15339	147581	1147557	4447.7	2	3
56-00278-W15340	56-00278-W	15340	147408	1145840	4447.7	2	3
56-00278-W173527	56-00278-W	173527	147576	1148870	4447.7	2	3
56-00282-W15358	56-00282-W	15358	201698	1142574	3331.6	2	3
56-00286-W15360	56-00286-W	15360	201034	1145408	2892.0	2	3
56-00286-W15361	56-00286-W	15361	200868	1144921	2892.0	2	3
56-00300-W26344	56-00300-W	26344	238199	1121055	5389.6	2	4
56-00300-W26347	56-00300-W	26347	238074	1121242	5389.6	2	4
56-00305-W15379	56-00305-W	15379	139702	1175847	3082.2	2	5
56-00305-W15380	56-00305-W	15380	139621	1174702	3082.2	2	5

TABLE 3

FLORIDAN AQUIFER SYSTEM WATER USE DATA

East Coast Floridan Aquifer System Model, Phase II
Upper and Lower East Coast of Florida

Well ID	Permit Number	Facility ID	X Coordinate	Y Coordinate	Average Pumping Rate (cfd)	Top Layer	Bottom Layer
56-00306-W15381	56-00306-W	15381	135204	1162098	5826.9	2	5
56-00306-W15382	56-00306-W	15382	134993	1160307	5826.9	2	6
56-00306-W15383	56-00306-W	15383	132728	1160300	5826.9	2	5
56-00307-W25421	56-00307-W	25421	144748	1173472	216.6	2	4
56-00308-W15384	56-00308-W	15384	141393	1174166	12782.2	2	5
56-00309-W15385	56-00309-W	15385	139154	1168099	2621.7	2	4
56-00312-W15387	56-00312-W	15387	138952	1175411	2872.5	2	5
56-00313-W15390	56-00313-W	15390	140588	1163699	7227.3	2	7
56-00313-W15391	56-00313-W	15391	138550	1164324	7227.3	2	5
56-00313-W15392	56-00313-W	15392	137153	1164304	7227.3	2	5
56-00315-W15394	56-00315-W	15394	148315	1168000	5713.4	2	4
56-00316-W27812	56-00316-W	27812	163112	1135418	1577.7	2	3
56-00318-W26056	56-00318-W	26056	135327	1177958	2366.8	2	6
56-00319-W15430	56-00319-W	15430	140598	1174211	312.7	2	4
56-00320-W15398	56-00320-W	15398	137869	1172240	110.8	2	4
56-00320-W25422	56-00320-W	25422	137878	1173252	110.8	2	4
56-00321-W15399	56-00321-W	15399	138994	1181911	6298.3	2	3
56-00323-W15400	56-00323-W	15400	148161	1168873	507.0	2	5
56-00323-W15403	56-00323-W	15403	148216	1171083	507.0	2	5
56-00323-W15404	56-00323-W	15404	148064	1173770	507.0	2	5
56-00323-W15405	56-00323-W	15405	151168	1173869	507.0	2	4
56-00323-W15406	56-00323-W	15406	147003	1170797	122.5	2	5
56-00323-W15407	56-00323-W	15407	149455	1170671	122.5	2	5
56-00324-W15411	56-00324-W	15411	150386	1156812	11337.4	3	4
56-00331-W15427	56-00331-W	15427	134965	1143849	0.1	5	6
56-00331-W15428	56-00331-W	15428	140540	1140838	0.1	5	6
56-00331-W24506	56-00331-W	24506	134160	1139646	0.1	5	6
56-00333-W15429	56-00333-W	15429	141466	1182288	104.3	2	4
56-00337-W15432	56-00337-W	15432	139409	1184490	4376.0	2	4
56-00337-W15433	56-00337-W	15433	139585	1182306	4376.0	2	4
56-00340-W15434	56-00340-W	15434	161650	1154957	10310.9	4	4
56-00340-W15435	56-00340-W	15435	161683	1153668	10310.9	4	4
56-00343-W15436	56-00343-W	15436	144061	1160417	1060.5	3	4
56-00343-W15437	56-00343-W	15437	142323	1156641	1060.5	3	4
56-00343-W15438	56-00343-W	15438	142166	1155545	1060.5	3	4
56-00343-W15439	56-00343-W	15439	146401	1154561	1060.5	3	4
56-00343-W15440	56-00343-W	15440	144699	1154806	1060.5	3	4

TABLE 3

FLORIDAN AQUIFER SYSTEM WATER USE DATA

East Coast Floridan Aquifer System Model, Phase II
Upper and Lower East Coast of Florida

Well ID	Permit Number	Facility ID	X Coordinate	Y Coordinate	Average Pumping Rate (cfd)	Top Layer	Bottom Layer
56-00343-W15441	56-00343-W	15441	146447	1153292	1060.5	3	4
56-00343-W15442	56-00343-W	15442	145196	1153394	1060.5	2	4
56-00343-W15443	56-00343-W	15443	146462	1151570	1060.5	3	4
56-00343-W15444	56-00343-W	15444	141614	1155046	1060.5	2	4
56-00343-W15445	56-00343-W	15445	139405	1155025	1060.5	3	4
56-00343-W15446	56-00343-W	15446	144187	1159352	1060.5	2	4
56-00343-W15447	56-00343-W	15447	140423	1154057	1060.5	2	5
56-00343-W15448	56-00343-W	15448	137930	1154036	1060.5	2	5
56-00343-W15450	56-00343-W	15450	144111	1158129	1060.5	2	4
56-00343-W15451	56-00343-W	15451	146381	1157191	1060.5	2	4
56-00343-W15452	56-00343-W	15452	146396	1155993	1060.5	2	4
56-00343-W15453	56-00343-W	15453	143306	1156641	1060.5	3	4
56-00343-W15454	56-00343-W	15454	142561	1156972	1060.5	3	4
56-00343-W24507	56-00343-W	24507	138989	1155015	1060.5	3	5
56-00343-W24508	56-00343-W	24508	146310	1158618	909.1	2	5
56-00343-W24509	56-00343-W	24509	145155	1156080	1060.5	2	4
56-00344-W15455	56-00344-W	15455	147121	1178508	48.7	2	4
56-00345-W15461	56-00345-W	15461	148137	1167157	1517.0	2	4
56-00345-W167691	56-00345-W	167691	148443	1167305	1517.0	2	4
56-00347-W15463	56-00347-W	15463	134496	1178068	937.1	2	3
56-00348-W15464	56-00348-W	15464	158356	1170719	12759.1	2	4
56-00351-W6934	56-00351-W	6934	133770	1180068	22.1	3	5
56-00355-W15479	56-00355-W	15479	148305	1184439	1115.5	2	4
56-00357-W15482	56-00357-W	15482	128548	1150530	16.6	1	3
56-00357-W15483	56-00357-W	15483	127239	1153823	16.6	2	6
56-00357-W15484	56-00357-W	15484	128770	1151539	16.6	2	8
56-00357-W15485	56-00357-W	15485	128759	1155994	16.6	2	8
56-00357-W15486	56-00357-W	15486	128460	1153919	16.6	2	8
56-00357-W25423	56-00357-W	25423	128687	1150141	16.6	2	8
56-00359-W15487	56-00359-W	15487	166548	1151049	4687.7	3	4
56-00359-W15488	56-00359-W	15488	166592	1150264	4687.7	3	4
56-00360-W15489	56-00360-W	15489	181159	1180744	1391.0	2	3
56-00360-W15490	56-00360-W	15490	180626	1181138	1391.0	2	3
56-00365-W24510	56-00365-W	24510	161319	1142752	4475.8	2	3
56-00366-W15493	56-00366-W	15493	160982	1150616	2963.1	2	2
56-00366-W15494	56-00366-W	15494	161629	1151158	2963.1	2	2
56-00366-W15495	56-00366-W	15495	158918	1150605	2963.1	2	2

TABLE 3

FLORIDAN AQUIFER SYSTEM WATER USE DATA

East Coast Floridan Aquifer System Model, Phase II
Upper and Lower East Coast of Florida

Well ID	Permit Number	Facility ID	X Coordinate	Y Coordinate	Average Pumping Rate (cfd)	Top Layer	Bottom Layer
56-00366-W15496	56-00366-W	15496	158897	1151271	2963.1	2	2
56-00366-W15497	56-00366-W	15497	159410	1152082	2963.1	2	2
56-00366-W24511	56-00366-W	24511	161108	1152106	2963.1	2	2
56-00366-W29313	56-00366-W	29313	160261	1151542	2963.1	2	2
56-00369-W15503	56-00369-W	15503	137354	1144940	4962.6	2	6
56-00369-W15504	56-00369-W	15504	137049	1144956	4962.6	2	8
56-00369-W15505	56-00369-W	15505	136557	1146520	4962.6	2	6
56-00369-W25424	56-00369-W	25424	137890	1145860	4962.6	2	8
56-00373-W15515	56-00373-W	15515	162288	1146704	4694.8	2	4
56-00378-W15516	56-00378-W	15516	169584	1152444	1780.6	3	3
56-00386-W16425	56-00386-W	16425	126710	1125500	41.1	2	7
56-00386-W16426	56-00386-W	16426	128809	1124479	41.1	2	7
56-00386-W16427	56-00386-W	16427	128738	1123345	41.1	2	7
56-00386-W165254	56-00386-W	165254	126186	1125018	41.1	2	7
56-00396-W15540	56-00396-W	15540	122116	1149456	16.8	3	6
56-00396-W15541	56-00396-W	15541	124014	1149456	16.8	3	6
56-00396-W15542	56-00396-W	15542	122116	1148122	16.8	2	5
56-00396-W15543	56-00396-W	15543	124715	1148122	16.8	2	5
56-00396-W15544	56-00396-W	15544	122089	1146802	16.8	2	5
56-00396-W24958	56-00396-W	24958	124701	1146802	16.8	2	3
56-00396-W24959	56-00396-W	24959	122116	1145633	16.8	2	6
56-00407-W15545	56-00407-W	15545	169086	1124298	543.1	2	7
56-00417-W15546	56-00417-W	15546	171006	1172290	2234.5	2	4
56-00417-W15547	56-00417-W	15547	178041	1169649	2234.5	2	3
56-00417-W15548	56-00417-W	15548	178170	1168951	2234.5	2	3
56-00428-W15564	56-00428-W	15564	156090	1119589	651.1	2	3
56-00428-W15565	56-00428-W	15565	158124	1125957	651.1	3	4
56-00428-W15566	56-00428-W	15566	163189	1119540	651.1	2	2
56-00428-W15567	56-00428-W	15567	163461	1123324	651.1	3	4
56-00428-W15568	56-00428-W	15568	163852	1123651	651.1	3	4
56-00428-W15569	56-00428-W	15569	168703	1105365	651.1	2	2
56-00429-W10675	56-00429-W	10675	89996	1103239	4448.5	2	2
56-00429-W10676	56-00429-W	10676	92342	1103346	4448.5	2	2
56-00429-W10677	56-00429-W	10677	92340	1104255	4448.5	2	2
56-00429-W10678	56-00429-W	10678	91528	1103849	4448.5	2	7
56-00429-W24253	56-00429-W	24253	90083	1104249	4448.5	2	2
56-00439-W15571	56-00439-W	15571	132784.16	1091011.8	475.0	2	7

TABLE 3

FLORIDAN AQUIFER SYSTEM WATER USE DATA

East Coast Floridan Aquifer System Model, Phase II
Upper and Lower East Coast of Florida

Well ID	Permit Number	Facility ID	X Coordinate	Y Coordinate	Average Pumping Rate (cfd)	Top Layer	Bottom Layer
56-00439-W24514	56-00439-W	24514	133538	1092773	475.0	2	7
56-00440-W15572	56-00440-W	15572	133524	1096509	588.3	2	8
56-00440-W15573	56-00440-W	15573	133530	1094793	588.3	2	8
56-00444-W15575	56-00444-W	15575	156941	1155417	4739.2	3	3
56-00444-W15576	56-00444-W	15576	156856	1154289	4739.2	3	3
56-00444-W15577	56-00444-W	15577	157280	1155159	4739.2	3	3
56-00473-W15581	56-00473-W	15581	100258	1209051	2.7	2	6
56-00473-W15582	56-00473-W	15582	110900	1186091	2.7	2	6
56-00473-W15583	56-00473-W	15583	116349	1185869	2.7	2	6
56-00473-W15584	56-00473-W	15584	116553	1197956	2.7	2	5
56-00473-W15585	56-00473-W	15585	115822	1179416	2.7	2	6
56-00473-W15586	56-00473-W	15586	120201	1179798	2.7	2	6
56-00473-W15587	56-00473-W	15587	119118	1190715	2.7	2	6
56-00473-W15588	56-00473-W	15588	122261	1183879	2.7	2	5
56-00473-W15589	56-00473-W	15589	113764	1180273	2.7	2	5
56-00473-W15590	56-00473-W	15590	123417	1179939	2.7	2	5
56-00473-W15591	56-00473-W	15591	100243	1203759	2.7	2	6
56-00473-W15592	56-00473-W	15592	113137	1181580	2.7	2	5
56-00473-W15593	56-00473-W	15593	113072	1180484	2.7	2	5
56-00473-W15594	56-00473-W	15594	100933	1196315	2.7	2	6
56-00473-W15595	56-00473-W	15595	100202	1201221	2.7	2	6
56-00473-W15596	56-00473-W	15596	100370	1206500	2.7	2	6
56-00473-W15597	56-00473-W	15597	108138	1197377	2.7	2	6
56-00473-W15598	56-00473-W	15598	113234	1177272	2.7	2	6
56-00473-W15599	56-00473-W	15599	116070	1182520	2.7	2	6
56-00473-W15600	56-00473-W	15600	102971	1205329	2.7	2	6
56-00473-W15601	56-00473-W	15601	115845	1191015	2.7	2	5
56-00473-W15602	56-00473-W	15602	116790	1194563	2.7	2	5
56-00473-W15603	56-00473-W	15603	100321	1198774	2.7	2	6
56-00473-W15604	56-00473-W	15604	113380	1197076	2.7	3	6
56-00473-W15605	56-00473-W	15605	113410	1200334	2.7	2	6
56-00473-W15606	56-00473-W	15606	110875	1189098	2.7	2	6
56-00473-W24515	56-00473-W	24515	113050	1182640	2.7	2	5
56-00473-W24516	56-00473-W	24516	101064	1198043	2.7	2	6
56-00473-W24517	56-00473-W	24517	113266	1178934	2.7	2	6
56-00473-W25425	56-00473-W	25425	105953	1199868	2.7	2	6
56-00473-W29316	56-00473-W	29316	102766	1199125	2.7	2	7

TABLE 3

FLORIDAN AQUIFER SYSTEM WATER USE DATA

East Coast Floridan Aquifer System Model, Phase II
Upper and Lower East Coast of Florida

Well ID	Permit Number	Facility ID	X Coordinate	Y Coordinate	Average Pumping Rate (cfd)	Top Layer	Bottom Layer
56-00475-W45655	56-00475-W	45655	165237	1182948	10973.6	2	2
56-00475-W45656	56-00475-W	45656	162212	1182925	10973.6	2	2
56-00482-W15609	56-00482-W	15609	181179	1169110	771.6	3	5
56-00482-W171173	56-00482-W	171173	180720	1169551	771.6	3	5
56-00482-W171174	56-00482-W	171174	180629	1169549	771.6	3	5
56-00536-W15610	56-00536-W	15610	121403	1190803	14125.9	2	4
56-00553-W157656	56-00553-W	157656	133244	1180721	8.2	2	5
56-00558-W27463	56-00558-W	27463	152798	1106395	22153.3	2	4
56-00572-W15252	56-00572-W	15252	163546	1210306	788.5	1	3
56-00572-W15253	56-00572-W	15253	163517	1211353	788.5	1	3
56-00572-W155734	56-00572-W	155734	163749	1209608	788.5	2	4
56-00572-W155735	56-00572-W	155735	164215	1209608	788.5	2	3
56-00572-W155736	56-00572-W	155736	164215	1211382	788.5	2	3
56-00572-W15630	56-00572-W	15630	164553	1212058	788.5	2	3
56-00572-W29364	56-00572-W	29364	165601	1212025	788.5	2	4
56-00574-W15633	56-00574-W	15633	136809	1166808	5688.1	2	4
56-00574-W15634	56-00574-W	15634	137874	1166438	5688.1	2	6
56-00581-W15635	56-00581-W	15635	158291	1151446	1072.3	2	5
56-00581-W24519	56-00581-W	24519	155741	1152628	1043.4	2	5
56-00585-W15641	56-00585-W	15641	152470	1162432	558.4	2	5
56-00585-W15642	56-00585-W	15642	152529	1161045	558.4	2	5
56-00587-W15654	56-00587-W	15654	154737	1159711	718.3	2	4
56-00587-W15655	56-00587-W	15655	152537	1158611	716.3	2	5
56-00587-W24520	56-00587-W	24520	153537	1158311	737.6	2	6
56-00589-W15658	56-00589-W	15658	145637	1162811	11074.5	2	4
56-00589-W15659	56-00589-W	15659	146337	1162611	9213.5	2	4
56-00591-W15669	56-00591-W	15669	147337	1140711	10349.2	2	6
56-00591-W15671	56-00591-W	15671	148037	1139811	10349.2	2	5
56-00596-W162676	56-00596-W	162676	107454	1212190	11100.5	2	4
56-00614-W157881	56-00614-W	157881	182220	1127528	34635.5	4	7
56-00614-W157882	56-00614-W	157882	182710	1127538	34635.5	4	8
56-00614-W157883	56-00614-W	157883	183600	1127998	34635.5	3	10
56-00622-W38439	56-00622-W	38439	160213	1143195	8858.2	2	4
56-00630-W15679	56-00630-W	15679	158077	1157092	12424.4	2	4
56-00640-W15688	56-00640-W	15688	127926	1164712	2705.2	2	5
56-00649-W131711	56-00649-W	131711	153727	1144532	1035.2	2	4
56-00649-W131712	56-00649-W	131712	153727	1145534	1035.2	2	5

TABLE 3

FLORIDAN AQUIFER SYSTEM WATER USE DATA

East Coast Floridan Aquifer System Model, Phase II
Upper and Lower East Coast of Florida

Well ID	Permit Number	Facility ID	X Coordinate	Y Coordinate	Average Pumping Rate (cfd)	Top Layer	Bottom Layer
56-00649-W15692	56-00649-W	15692	153374	1143397	1035.2	2	4
56-00650-W15693	56-00650-W	15693	162183	1150636	5047.8	2	4
56-00652-W24963	56-00652-W	24963	131637	1183793	6952.1	2	5
56-00662-W15697	56-00662-W	15697	143011	1174206	218.8	2	4
56-00662-W15698	56-00662-W	15698	143051	1175607	218.8	2	4
56-00663-W15699	56-00663-W	15699	161399	1143510	4899.1	2	4
56-00665-W15700	56-00665-W	15700	153445	1149443	6838.1	2	4
56-00666-W15701	56-00666-W	15701	164421	1203393	4323.2	2	4
56-00668-W162240	56-00668-W	162240	91083	1189337	22241.5	2	6
56-00669-W15703	56-00669-W	15703	179195	1189754	2002.5	2	4
56-00669-W38452	56-00669-W	38452	179172	1189132	2002.5	2	4
56-00683-W26218	56-00683-W	26218	102188	1190355	1711.2	2	7
56-00683-W26219	56-00683-W	26219	102392	1177543	1711.2	2	7
56-00683-W26220	56-00683-W	26220	107760	1188321	1711.2	2	4
56-00683-W26221	56-00683-W	26221	100092	1187872	1711.2	2	4
56-00683-W26222	56-00683-W	26222	99311	1185782	1711.2	2	4
56-00683-W26223	56-00683-W	26223	106459	1194951	1711.2	2	7
56-00683-W26224	56-00683-W	26224	104832	1192551	1711.2	2	7
56-00683-W26225	56-00683-W	26225	102066	1189704	1711.2	2	4
56-00683-W26226	56-00683-W	26226	105727	1189582	1711.2	2	4
56-00683-W26227	56-00683-W	26227	104506	1185515	1711.2	2	7
56-00683-W26228	56-00683-W	26228	101646	1182921	1711.2	2	4
56-00683-W26229	56-00683-W	26229	99312	1181628	1711.2	2	4
56-00683-W26230	56-00683-W	26230	100155	1178479	1711.2	2	7
56-00685-W26208	56-00685-W	26208	95007	1184741	4445.0	2	10
56-00685-W26209	56-00685-W	26209	94380	1183527	4445.0	2	6
56-00685-W26210	56-00685-W	26210	94216	1177266	4445.0	2	6
56-00685-W26211	56-00685-W	26211	95006	1184943	4445.0	2	10
56-00685-W26212	56-00685-W	26212	93915	1180273	4445.0	2	10
56-00690-W15706	56-00690-W	15706	172281	1186946	3268.2	3	4
56-00690-W15707	56-00690-W	15707	171469	1187245	3268.2	3	4
56-00690-W15708	56-00690-W	15708	171473	1186438	3268.2	3	4
56-00690-W15709	56-00690-W	15709	170756	1185626	3268.2	3	4
56-00690-W15710	56-00690-W	15710	170881	1186946	3268.2	2	4
56-00747-W15713	56-00747-W	15713	163439	1207730	1598.1	2	4
56-00747-W15714	56-00747-W	15714	163421	1208738	1598.1	2	4
56-00748-W131293	56-00748-W	131293	89203	1214136	3178.9	2	3

TABLE 3

FLORIDAN AQUIFER SYSTEM WATER USE DATA

East Coast Floridan Aquifer System Model, Phase II
Upper and Lower East Coast of Florida

Well ID	Permit Number	Facility ID	X Coordinate	Y Coordinate	Average Pumping Rate (cfd)	Top Layer	Bottom Layer
56-00748-W131294	56-00748-W	131294	88978	1211511	3178.9	2	3
56-00748-W131296	56-00748-W	131296	89278	1212561	3178.9	2	8
56-00748-W131297	56-00748-W	131297	91528	1213161	3178.9	2	8
56-00748-W131298	56-00748-W	131298	88753	1208211	3178.9	2	8
56-00748-W131299	56-00748-W	131299	88753	1204912	3178.9	2	8
56-00748-W131300	56-00748-W	131300	88978	1201462	3178.9	2	8
56-00753-W32194	56-00753-W	32194	107334	1131327	2023.5	2	5
56-00753-W32195	56-00753-W	32195	106295	1132095	2023.5	2	4
56-00753-W32196	56-00753-W	32196	106290	1134107	2023.5	2	5
56-00753-W32197	56-00753-W	32197	107734	1134815	2023.5	2	5
56-00753-W32198	56-00753-W	32198	107451	1136373	2023.5	2	7
56-00753-W32199	56-00753-W	32199	107423	1127224	2023.5	2	6
56-00753-W32200	56-00753-W	32200	107423	1129490	2023.5	2	6
56-00753-W32201	56-00753-W	32201	107423	1130481	2023.5	2	6
56-00753-W32203	56-00753-W	32203	105865	1133881	2023.5	2	6
56-00753-W32204	56-00753-W	32204	108414	1134305	2023.5	2	6
56-00753-W32205	56-00753-W	32205	107423	1136232	2023.5	2	6
56-00771-W15726	56-00771-W	15726	165046	1208159	2001.7	2	3
56-00771-W15727	56-00771-W	15727	165060	1209493	2001.7	2	3
56-00771-W15728	56-00771-W	15728	164691	1209564	2001.7	2	3
56-00771-W15729	56-00771-W	15729	165784	1208202	2001.7	2	4
56-00771-W15730	56-00771-W	15730	166933	1208202	2001.7	2	3
56-00771-W15731	56-00771-W	15731	166905	1208869	2001.7	2	5
56-00771-W15732	56-00771-W	15732	166153	1209521	2001.7	2	4
56-00771-W15733	56-00771-W	15733	166890	1209536	2001.7	2	4
56-00771-W15734	56-00771-W	15734	163585	1208174	2001.7	2	3
56-00785-W15737	56-00785-W	15737	100073	1118963	4881.6	2	6
56-00785-W15738	56-00785-W	15738	100466	1118998	4881.6	2	6
56-00785-W15739	56-00785-W	15739	100757	1119237	4881.6	2	6
56-00785-W15740	56-00785-W	15740	99369	1118107	4881.6	2	6
56-00788-W14691	56-00788-W	14691	145811	1183601	145.4	2	4
56-00788-W14692	56-00788-W	14692	143443	1183133	60.6	2	4
56-00789-W26321	56-00789-W	26321	182359	1180790	1628.5	2	3
56-00789-W26322	56-00789-W	26322	182644	1181318	1628.5	2	3
56-00827-W15742	56-00827-W	15742	181444	1185726	7726.2	2	4
56-00858-W15745	56-00858-W	15745	141203	1160054	2314.0	2	5
56-00858-W15746	56-00858-W	15746	141911	1160148	2314.0	3	5

TABLE 3

FLORIDAN AQUIFER SYSTEM WATER USE DATA

East Coast Floridan Aquifer System Model, Phase II
Upper and Lower East Coast of Florida

Well ID	Permit Number	Facility ID	X Coordinate	Y Coordinate	Average Pumping Rate (cfd)	Top Layer	Bottom Layer
56-00858-W15747	56-00858-W	15747	141962	1159521	2314.0	3	5
56-00858-W15748	56-00858-W	15748	141075	1158357	2314.0	3	5
56-00859-W15750	56-00859-W	15750	142353	1154574	1013.5	3	5
56-00859-W15751	56-00859-W	15751	144170	1154026	1013.5	3	5
56-00859-W15752	56-00859-W	15752	142939	1153889	1013.5	3	5
56-00859-W15753	56-00859-W	15753	141798	1153475	1013.5	3	5
56-00905-W15758	56-00905-W	15758	102750	1110054	11110.1	2	6
56-00905-W15759	56-00905-W	15759	103788	1108794	11110.1	2	6
56-00936-W15766	56-00936-W	15766	173826	1202074	1401.1	2	3
56-00936-W15767	56-00936-W	15767	174042	1202056	1401.1	2	3
56-00936-W15768	56-00936-W	15768	174556	1202053	1401.1	2	3
56-00936-W15769	56-00936-W	15769	174231	1201181	1401.1	2	3
56-00936-W15770	56-00936-W	15770	174234	1202059	1401.1	2	4
56-00972-W15771	56-00972-W	15771	131070	1124085	29.1	2	7
56-00973-W15772	56-00973-W	15772	148276	1177364	1568.7	2	4
56-01013-W15786	56-01013-W	15786	91628	1180978	19331.8	2	5
56-01067-W15792	56-01067-W	15792	172838	1102980	530.7	2	2
56-01121-W1969	56-01121-W	1969	185686	1176874	11.1	2	3
56-01138-W2255	56-01138-W	2255	199995	1144912	1169.7	2	3
56-01151-W24112	56-01151-W	24112	183037	1170051	2605.7	2	4
56-01151-W2460	56-01151-W	2460	183637	1169611	2605.7	2	4
56-01174-W15809	56-01174-W	15809	167944	1206943	6630.8	2	3
56-01174-W15810	56-01174-W	15810	167180	1206999	6630.8	2	3
56-01175-W15811	56-01175-W	15811	164238	1215615	5551.4	2	3
56-01175-W15812	56-01175-W	15812	164669	1215606	5551.4	2	3
56-01175-W15813	56-01175-W	15813	165074	1214067	5551.4	2	3
56-01175-W15814	56-01175-W	15814	166784	1194824	5551.4	2	3
56-01242-W6747	56-01242-W	6747	175517	1192991	726.3	2	4
56-01284-W166254	56-01284-W	166254	154242	1185974	19.2	2	4
56-01284-W166255	56-01284-W	166255	152953	1187458	19.2	2	4
56-01284-W166256	56-01284-W	166256	152953	1189022	19.2	2	4
56-01284-W166257	56-01284-W	166257	154456	1189777	19.2	2	3
56-01284-W166258	56-01284-W	166258	151129	1189054	19.2	3	4
56-01284-W166259	56-01284-W	166259	151129	1187516	19.2	3	4
56-01284-W28906	56-01284-W	28906	151191	1186128	19.2	3	4
56-01284-W28907	56-01284-W	28907	148565	1186180	19.2	3	4
56-01284-W28908	56-01284-W	28908	148637	1187710	19.2	3	4

TABLE 3

FLORIDAN AQUIFER SYSTEM WATER USE DATA

East Coast Floridan Aquifer System Model, Phase II
Upper and Lower East Coast of Florida

Well ID	Permit Number	Facility ID	X Coordinate	Y Coordinate	Average Pumping Rate (cfd)	Top Layer	Bottom Layer
56-01284-W28909	56-01284-W	28909	144497	1189145	19.2	3	4
56-01284-W28910	56-01284-W	28910	144567	1187617	19.2	3	4
56-01284-W28911	56-01284-W	28911	144605	1185978	19.2	3	4
56-01284-W28912	56-01284-W	28912	140972	1186048	19.2	3	5
56-01284-W28913	56-01284-W	28913	141016	1187625	19.2	3	5
56-01284-W28914	56-01284-W	28914	140897	1189163	19.2	3	5
56-01284-W28916	56-01284-W	28916	148620	1189254	19.2	3	4
56-01306-W25202	56-01306-W	25202	171006	1172284	9382.4	2	4
56-01378-W21298	56-01378-W	21298	193517	1208301	2169.8	2	4
56-01391-W29463	56-01391-W	29463	180836	1172911	112.2	2	4
56-01422-W31956	56-01422-W	31956	197835	1190411	53.5	2	4
56-01443-W104195	56-01443-W	104195	147194	1162678	1998.4	2	4
56-01504-W109885	56-01504-W	109885	170751	1151895	5493.3	2	3
56-01504-W109886	56-01504-W	109886	170751	1152337	5493.3	2	3
56-01504-W109887	56-01504-W	109887	170250	1152735	5493.3	3	4
56-01504-W109888	56-01504-W	109888	169734	1151865	5493.3	2	4
56-01539-W111910	56-01539-W	111910	185895	1154773	13843.1	2	5
56-01539-W111911	56-01539-W	111911	186488	1153406	13843.1	2	5
56-01639-W135587	56-01639-W	135587	150176	1148664	1336.6	3	3
56-01697-W131224	56-01697-W	131224	172805	1198233	6021.7	2	3
56-01783-W141279	56-01783-W	141279	178722	1183969	6135.6	2	3
56-01793-W140877	56-01793-W	140877	190169	1155977	802.0	2	2
56-01793-W140878	56-01793-W	140878	190038	1155980	802.0	2	2
56-01821-W142278	56-01821-W	142278	134483	1181272	726.2	2	4
56-01821-W142279	56-01821-W	142279	134464	1180089	719.4	2	4
56-01878-W14900	56-01878-W	14900	164380	1201689	3359.8	2	4
56-01878-W14901	56-01878-W	14901	164138	1203151	3359.8	2	4
56-01878-W14902	56-01878-W	14902	163042	1202169	3359.8	2	4
56-01878-W14903	56-01878-W	14903	164398	1200760	3359.8	2	4
56-01878-W14904	56-01878-W	14904	164384	1200123	3359.8	2	4
56-01878-W14905	56-01878-W	14905	163079	1199309	3359.8	2	4
56-01878-W15061	56-01878-W	15061	145630	1180751	3359.8	2	4
56-01878-W15062	56-01878-W	15062	142933	1180713	3359.8	2	4
56-01878-W15063	56-01878-W	15063	142944	1181839	3359.8	2	4
56-01878-W15064	56-01878-W	15064	145644	1181850	3359.8	2	4
56-01878-W15147	56-01878-W	15147	168095	1199453	3359.8	2	4
56-01878-W15641	56-01878-W	15641	152470	1162432	2932.5	2	5

TABLE 3

FLORIDAN AQUIFER SYSTEM WATER USE DATA

East Coast Floridan Aquifer System Model, Phase II
Upper and Lower East Coast of Florida

Well ID	Permit Number	Facility ID	X Coordinate	Y Coordinate	Average Pumping Rate (cfd)	Top Layer	Bottom Layer
56-01878-W15642	56-01878-W	15642	152529	1161045	2934.5	2	5
56-01878-W15644	56-01878-W	15644	153747	1157844	2926.2	2	5
56-01878-W15650	56-01878-W	15650	154329	1156712	3288.6	2	5
56-01878-W15651	56-01878-W	15651	155452	1156141.8	2924.1	2	5
56-01878-W15652	56-01878-W	15652	157089	1157707	3280.2	2	4
56-01878-W15968	56-01878-W	15968	83436	1173675	3359.8	2	4
56-01878-W15969	56-01878-W	15969	88652	1171772	3359.8	2	7
56-01878-W180304	56-01878-W	180304	142438	1182838	3359.8	2	4
56-01878-W180305	56-01878-W	180305	140632	1178609	3359.8	2	5
56-01878-W180306	56-01878-W	180306	138662	1178466	3359.8	2	5
56-01878-W180307	56-01878-W	180307	140632	1176838	3359.8	2	5
56-01878-W180345	56-01878-W	180345	144973	1179608	3359.8	2	4
56-01878-W180384	56-01878-W	180384	151586	1164158	2926.2	2	4
56-01878-W180385	56-01878-W	180385	151600	1167328	3359.8	2	4
56-01878-W180386	56-01878-W	180386	156547	1164847	2926.2	2	4
56-01878-W24491	56-01878-W	24491	167056	1198973	3359.8	2	4
56-01878-W29318	56-01878-W	29318	158885	1153018	3288.6	2	4
56-01881-W168910	56-01881-W	168910	175421	1187311	4261.2	2	3
56-01881-W168911	56-01881-W	168911	175151	1185835	4261.2	2	3
56-01890-W148742	56-01890-W	148742	174925	1211509	2961.8	2	4
56-01897-W175260	56-01897-W	175260	145810	1183609	20.1	2	4
56-01897-W175261	56-01897-W	175261	143440	1183146	20.1	2	4
56-01939-W152319	56-01939-W	152319	152125	1175175	2040.9	2	3
56-01943-W152781	56-01943-W	152781	184460	1170919	5110.7	2	5
56-01949-W153204	56-01949-W	153204	186804	1161495	917.2	4	4
56-01954-W153034	56-01954-W	153034	179421	1167207	4854.7	2	3
56-01958-W153003	56-01958-W	153003	184020	1187658	2624.0	2	3
56-01971-W154786	56-01971-W	154786	187801	1170576	1641.1	2	3
56-01982-W153640	56-01982-W	153640	158190	1166170	7430.6	2	4
56-01984-W153677	56-01984-W	153677	159621	1161401	1093.2	3	4
56-01987-W153948	56-01987-W	153948	150193	1157324	3223.2	3	4
56-01989-W154001	56-01989-W	154001	188911	1162000	1907.8	3	3
56-01996-W154359	56-01996-W	154359	157807	1164795	1334.7	2	4
56-02000-W154624	56-02000-W	154624	167570	1155620	7236.8	2	4
56-02004-W156390	56-02004-W	156390	167861	1153909	4496.1	2	3
56-02011-W14931	56-02011-W	14931	105799	1113985	60.0	2	5
56-02011-W14932	56-02011-W	14932	119255	1091083	60.0	2	5

TABLE 3

FLORIDAN AQUIFER SYSTEM WATER USE DATA

East Coast Floridan Aquifer System Model, Phase II
Upper and Lower East Coast of Florida

Well ID	Permit Number	Facility ID	X Coordinate	Y Coordinate	Average Pumping Rate (cfd)	Top Layer	Bottom Layer
56-02011-W14933	56-02011-W	14933	114989	1116234	60.0	2	7
56-02011-W14934	56-02011-W	14934	121621	1079063	60.0	2	7
56-02011-W14935	56-02011-W	14935	109916	1111622	60.0	2	6
56-02011-W14936	56-02011-W	14936	113568	1111724	60.0	2	6
56-02011-W14937	56-02011-W	14937	113183	1106578	60.0	2	6
56-02011-W14938	56-02011-W	14938	117799	1100898	60.0	2	6
56-02011-W14939	56-02011-W	14939	113250	1103540	60.0	2	6
56-02011-W14940	56-02011-W	14940	117913	1103495	60.0	2	6
56-02011-W14942	56-02011-W	14942	118238	1095877	60.0	2	2
56-02011-W14943	56-02011-W	14943	120125	1087175	60.0	2	5
56-02011-W14944	56-02011-W	14944	115078	1118255	60.0	2	4
56-02011-W14945	56-02011-W	14945	118686	1114671	60.0	2	4
56-02011-W14946	56-02011-W	14946	116985	1112327	60.0	2	4
56-02011-W14947	56-02011-W	14947	117692	1109824	60.0	2	4
56-02011-W14948	56-02011-W	14948	111162	1108842	60.0	2	6
56-02011-W14949	56-02011-W	14949	119862	1080470	60.0	2	5
56-02011-W14950	56-02011-W	14950	119838	1078986	60.0	2	5
56-02011-W14951	56-02011-W	14951	118885	1077492	60.0	2	5
56-02011-W14952	56-02011-W	14952	119825	1077018	60.0	2	5
56-02011-W14953	56-02011-W	14953	115959	1112997	60.0	2	6
56-02011-W14954	56-02011-W	14954	108708	1110830	60.0	2	6
56-02011-W14955	56-02011-W	14955	113821	1109337	60.0	2	6
56-02011-W14956	56-02011-W	14956	116524	1106331	60.0	2	6
56-02011-W15325	56-02011-W	15325	144391	1164746	60.0	2	4
56-02011-W15355	56-02011-W	15355	149460	1138403	60.0	2	4
56-02011-W15356	56-02011-W	15356	149468	1139012	60.0	2	4
56-02011-W15357	56-02011-W	15357	147848	1138337	60.0	2	3
56-02011-W15465	56-02011-W	15465	146105	1167590	60.0	2	4
56-02011-W15466	56-02011-W	15466	145001	1167555	60.0	2	4
56-02011-W15467	56-02011-W	15467	143117	1166722	60.0	2	4
56-02011-W15468	56-02011-W	15468	142704	1167684	60.0	2	4
56-02011-W15469	56-02011-W	15469	142092	1167125	60.0	2	4
56-02011-W15482	56-02011-W	15482	128548	1150530	60.0	1	3
56-02011-W15483	56-02011-W	15483	127239	1153823	60.0	2	6
56-02011-W15484	56-02011-W	15484	128770	1151539	60.0	2	8
56-02011-W15485	56-02011-W	15485	128759	1155994	60.0	2	8
56-02011-W15486	56-02011-W	15486	128460	1153919	60.0	2	8

TABLE 3

FLORIDAN AQUIFER SYSTEM WATER USE DATA

East Coast Floridan Aquifer System Model, Phase II
Upper and Lower East Coast of Florida

Well ID	Permit Number	Facility ID	X Coordinate	Y Coordinate	Average Pumping Rate (cfd)	Top Layer	Bottom Layer
56-02011-W15520	56-02011-W	15520	152522	1139318	60.0	2	4
56-02011-W15521	56-02011-W	15521	153773	1139368	60.0	2	3
56-02011-W15522	56-02011-W	15522	153432	1138089	60.0	2	4
56-02011-W15523	56-02011-W	15523	152973	1138015	60.0	2	4
56-02011-W15524	56-02011-W	15524	143023	1139357	60.0	2	3
56-02011-W15525	56-02011-W	15525	143023	1139259	60.0	2	3
56-02011-W15526	56-02011-W	15526	142810	1137040	60.0	2	3
56-02011-W15527	56-02011-W	15527	142252	1138226	60.0	2	3
56-02011-W15528	56-02011-W	15528	143134	1138168	60.0	2	6
56-02011-W15540	56-02011-W	15540	122116	1149456	60.0	3	6
56-02011-W15541	56-02011-W	15541	124014	1149456	60.0	3	6
56-02011-W15542	56-02011-W	15542	122116	1148122	60.0	2	5
56-02011-W15543	56-02011-W	15543	124715	1148122	60.0	2	5
56-02011-W15544	56-02011-W	15544	122089	1146802	60.0	2	5
56-02011-W155906	56-02011-W	155906	116834	1135549	60.0	2	6
56-02011-W156009	56-02011-W	156009	118337	1126096	60.0	2	5
56-02011-W156010	56-02011-W	156010	116252	1126045	60.0	2	5
56-02011-W15613	56-02011-W	15613	133776	1151532	60.0	2	4
56-02011-W15614	56-02011-W	15614	135841	1151532	60.0	2	4
56-02011-W15615	56-02011-W	15615	137794	1151415	60.0	2	4
56-02011-W15616	56-02011-W	15616	139326	1150214	60.0	2	4
56-02011-W15617	56-02011-W	15617	138679	1151588	60.0	2	4
56-02011-W15618	56-02011-W	15618	132781	1148166	60.0	2	5
56-02011-W15619	56-02011-W	15619	140407	1148507	60.0	2	6
56-02011-W15619	56-02011-W	15619	140407	1148507	60.0	2	6
56-02011-W15620	56-02011-W	15620	140447	1149988	60.0	2	5
56-02011-W15621	56-02011-W	15621	143790	1150200	60.0	2	4
56-02011-W15622	56-02011-W	15622	137921	1148842	60.0	2	4
56-02011-W15623	56-02011-W	15623	137188	1149996	60.0	2	4
56-02011-W15624	56-02011-W	15624	137215	1149979	60.0	2	4
56-02011-W15625	56-02011-W	15625	135147	1149889	60.0	2	6
56-02011-W15626	56-02011-W	15626	134474	1150234	60.0	2	4
56-02011-W15627	56-02011-W	15627	133398	1150239	60.0	2	4
56-02011-W15628	56-02011-W	15628	133280	1151452	60.0	2	4
56-02011-W15869	56-02011-W	15869	116818	1124861	60.0	2	5
56-02011-W15870	56-02011-W	15870	115226	1123524	60.0	2	3
56-02011-W15873	56-02011-W	15873	140610	1134720	60.0	2	5

TABLE 3

FLORIDAN AQUIFER SYSTEM WATER USE DATA

East Coast Floridan Aquifer System Model, Phase II
Upper and Lower East Coast of Florida

Well ID	Permit Number	Facility ID	X Coordinate	Y Coordinate	Average Pumping Rate (cfd)	Top Layer	Bottom Layer
56-02011-W15874	56-02011-W	15874	140610	1133335	60.0	2	5
56-02011-W15875	56-02011-W	15875	140540	1132054	60.0	2	5
56-02011-W15876	56-02011-W	15876	140505	1130669	60.0	2	5
56-02011-W15877	56-02011-W	15877	140514	1129379	60.0	2	5
56-02011-W15878	56-02011-W	15878	140529	1128066	60.0	2	5
56-02011-W15879	56-02011-W	15879	140514	1126741	60.0	2	5
56-02011-W15880	56-02011-W	15880	137803	1130749	60.0	2	5
56-02011-W169691	56-02011-W	169691	124750	1145598	60.0	2	5
56-02011-W169715	56-02011-W	169715	133704	1149616	60.0	2	5
56-02011-W169716	56-02011-W	169716	137939	1126768	60.0	2	5
56-02011-W169719	56-02011-W	169719	150206	1164875	60.0	2	5
56-02011-W169720	56-02011-W	169720	151650	1160188	60.0	2	5
56-02011-W169721	56-02011-W	169721	147348	1158336	60.0	2	5
56-02011-W169722	56-02011-W	169722	146267	1165970	60.0	2	4
56-02011-W169723	56-02011-W	169723	145068	1164151	60.0	2	4
56-02011-W169724	56-02011-W	169724	142328	1163862	60.0	2	4
56-02011-W169777	56-02011-W	169777	111779	1122552	60.0	2	4
56-02011-W169778	56-02011-W	169778	117695	1119434	60.0	2	4
56-02011-W169779	56-02011-W	169779	112238	1119342	60.0	2	4
56-02011-W169780	56-02011-W	169780	114302	1099944	60.0	2	6
56-02011-W169781	56-02011-W	169781	121593	1085683	60.0	2	5
56-02011-W169782	56-02011-W	169782	121685	1082977	60.0	2	5
56-02011-W169783	56-02011-W	169783	111182	1108939	60.0	2	5
56-02011-W169791	56-02011-W	169791	113064	1120259	60.0	2	7
56-02011-W169792	56-02011-W	169792	113706	1115949	60.0	2	7
56-02011-W169793	56-02011-W	169793	103296	1119755	60.0	2	7
56-02011-W169794	56-02011-W	169794	104488	1117508	60.0	2	6
56-02011-W169795	56-02011-W	169795	104718	1113793	60.0	2	6
56-02011-W169796	56-02011-W	169796	117971	1110125	60.0	2	4
56-02011-W169797	56-02011-W	169797	117283	1111363	60.0	2	4
56-02011-W24471	56-02011-W	24471	117739	1116196	60.0	2	7
56-02011-W24472	56-02011-W	24472	118998	1106462	60.0	2	7
56-02011-W24501	56-02011-W	24501	148854	1138451	60.0	2	4
56-02011-W24518	56-02011-W	24518	141065	1150648	60.0	2	4
56-02011-W24958	56-02011-W	24958	124701	1146802	60.0	2	3
56-02011-W24959	56-02011-W	24959	122116	1145633	60.0	2	6
56-02011-W24968	56-02011-W	24968	137967	1129407	60.0	2	5

TABLE 3

FLORIDAN AQUIFER SYSTEM WATER USE DATA

East Coast Floridan Aquifer System Model, Phase II
Upper and Lower East Coast of Florida

Well ID	Permit Number	Facility ID	X Coordinate	Y Coordinate	Average Pumping Rate (cfd)	Top Layer	Bottom Layer
56-02011-W24969	56-02011-W	24969	138060	1128149	60.0	2	5
56-02011-W25423	56-02011-W	25423	128687	1150141	60.0	2	8
56-02011-W25426	56-02011-W	25426	133731	1150027	60.0	2	5
56-02011-W29317	56-02011-W	29317	135295	1147526	60.0	2	5
56-02016-W155117	56-02016-W	155117	131347	1143768	12272.7	2	6
56-02024-W157120	56-02024-W	157120	188438	1152789	2349.4	2	3
56-02030-W156599	56-02030-W	156599	155760	1140933	755.9	2	4
56-02030-W156600	56-02030-W	156600	155158	1139649	755.9	2	4
56-02038-W160939	56-02038-W	160939	172702	1164026	44.6	2	4
56-02050-W163259	56-02050-W	163259	171070	1164794	299.4	2	4
56-02050-W163260	56-02050-W	163260	171218	1165625	299.4	2	4
56-02050-W163261	56-02050-W	163261	171088	1163843	299.4	2	4
56-02060-W14923	56-02060-W	14923	176660	1194238	3338.5	3	4
56-02060-W14924	56-02060-W	14924	176845	1193330	3338.5	3	4
56-02060-W14925	56-02060-W	14925	178192	1194144	3338.5	3	4
56-02060-W24470	56-02060-W	24470	177471	1194141	3338.5	3	4
56-02068-W159509	56-02068-W	159509	132780	1146967	21264.1	2	2
56-02085-W160703	56-02085-W	160703	146380	1170896	34.6	2	6
56-02086-W14999	56-02086-W	14999	146357	1170108	1672.4	2	6
56-02107-W157808	56-02107-W	157808	173256	1186231	2505.5	2	3
56-02119-W165587	56-02119-W	165587	214490	1179030	2254.1	3	3
56-02165-W168429	56-02165-W	168429	156505	1161073	12494.2	2	4
56-02170-W169059	56-02170-W	169059	132007	1175844	14.7	2	5
56-02193-W172733	56-02193-W	172733	177600	1199462	75.0	2	4
56-02243-W177584	56-02243-W	177584	169688	1213255	8536.8	2	4
56-02293-W186554	56-02293-W	186554	180617	1173014	315.1	2	3
6-1			128811.03	1172424.2	162.1	2	5
6-2			128775.76	1169599.4	96.1	2	5

TABLE 5

WATER LEVEL TARGETS

East Coast Floridan Aquifer System Model, Phase II
Upper and Lower East Coast of Florida

Well ID	X	Y	Aquifer	Period of Record	
				Starting Date	Ending Date
7322	714531.25	668029.48	UFMF	1/1/00	1/1/00
11-1	849060.3472	1145081.836	MF	05/28/02	12/31/05
11445/MF-37	784938	966222	MF	12/25/05	12/25/05
12-1	851934.5949	1147436.99	MF	05/28/02	12/31/05
203-1	763823.6957	1136790.354	MF	05/29/02	12/31/05
204-1	785890.4093	1067400.639	MF	05/28/02	12/31/05
205-5	778073.3133	1159242.277	MFLF	05/31/02	12/31/05
2-3	812714.398	1119061.686	MFLF	05/29/02	09/10/05
23229/PBF2_GW1	961958.88	862914.989	UF	05/24/99	11/19/01
25969/PSLLTC-MW1	850741	1104482	MC2	01/17/03	01/24/03
26220/SLF-75	821807	1092495	UF	08/17/00	11/19/01
26221/SLF-76	821840.676	1092293.325	UF	08/17/00	07/15/02
26864/CCUD-MW1U	885121.069	627681.775	MF	8/13/01	8/13/01
29-13	831281.7069	1169845.526	UF	05/28/02	12/31/05
3-3	810086.3409	1088358.144	UF	03/14/03	10/03/05
35-2	813683.4484	1080094.28	UF	05/28/02	12/31/05
4278/SLF-11	791551.495	1164690.791	UFMF	05/12/99	09/18/01
4280/SLF-14	795295.745	1092111.917	UFMF	05/13/99	09/18/01
4288/MF-3	923109.57	1047815.047	UFMF	05/26/99	09/30/04
4290/MF-31	923812.783	1023381.027	UF	05/26/99	09/30/04
4291/MF-35	824627.124	970556.949	UF	05/26/99	10/01/04
4295/SLF-50	819191.803	1092403.417	UF	05/13/99	05/19/05
4296/PBF-1_G	953367.878	959359.829	UF	05/26/99	01/05/05
4297/SLF-9	788851.744	1132077.921	UF	05/12/99	09/28/04
4299/SLF-21	850060.362	1124953.92	UF	05/17/99	09/30/04
4300/SLF-27	814069.639	1111164.762	UF	05/13/99	09/22/99
4301/SLF-46	880833.4	1152269	UF	05/26/99	09/30/04
4302/SLF-47	905882.882	1089007.175	UF	05/18/99	05/27/04
4325/OKF-31	706716.186	1052002.899	UF	05/12/99	09/28/04
4369/MF-23	798332.691	996599.682	UF	05/18/00	05/26/04
4374/MF-3A_G	923032.756	1047999.04	UF	05/26/99	05/21/02
4400/OKF-0013	742674.28	1155480.893	UFMF	5/22/00	5/22/00
4585/SLF-3	838497.519	1151155.282	UF	05/26/99	01/12/05
4586/SLF-4	823588.46	1141598.186	UF	05/12/99	05/19/04

TABLE 5

WATER LEVEL TARGETS

East Coast Floridan Aquifer System Model, Phase II
Upper and Lower East Coast of Florida

Well ID	X	Y	Aquifer	Period of Record	
				Starting Date	Ending Date
4591/SLF-40	818715.862	1121382.121	UF	05/13/99	05/19/04
4598/MF-9	829647.569	1030546.579	UF	05/26/99	10/01/04
4654/MF-2	818367.253	1028076.746	UF	05/26/99	05/26/04
4661/OKF-7	725748.214	1102434.522	UF	05/17/99	09/30/02
4663/OKF-17	682570.047	1091477.772	UF	05/12/99	05/20/03
4664/OKF-23	703526.893	1061608.102	UF	05/12/99	09/28/04
5-1	825920.6715	1101665.082	UFMF	05/28/02	12/31/05
8710/SLF-74	821840.676	1092293.325	MF	07/18/00	11/19/01
ALLYUH1	714531.246	668029.482	UF	7/25/02	12/31/05
ALLYUH2	714531.246	668029.482	UF	1/26/05	12/30/05
ALLYUH3	714531.246	668029.482	MF	7/25/02	12/31/05
ALLYUHA	714531.246	668029.482	UF	11/27/01	7/25/02
ALLYUHC	714531.246	668029.482	MF	11/27/01	7/25/02
BF1UH1	925617.304	669564.23	LF	7/25/02	12/31/05
BF1UHA	925617.304	669564.23	LF	11/21/01	7/25/02
BF4UH1	925172.703	669560.613	UF	6/25/02	12/31/05
BF4UH2	925172.703	669560.613	MF	7/25/02	12/31/05
BF4UHB	925172.703	669560.613	MF	11/21/01	7/25/02
BF-6	943223.6156	721082.5579	UF	11/21/01	12/31/05
DF-5	830914.4351	573451.9262	MF	07/25/02	12/31/05
ENP-100	787315.875	381614.2505	UF	10/10/03	12/31/05
ENP100UH	787244.43	381470.63	UF	1/25/05	12/31/05
G-3061	890514.2958	544122.8229	UF	12/20/02	12/31/05
IR0189	712816.4595	1248733.994	UF	01/26/99	12/20/05
IR0312	840602.5864	1179300.994	UF	01/01/99	12/31/05
IR0921	782272.4335	1252216.147	UF	02/23/99	12/31/05
IR0954	792659.8152	1182973.5	UF	01/01/99	12/31/05
IR0955	775452.5349	1209892.079	UF	01/25/99	12/14/05
IR0956	775452.5349	1209892.079	IA	04/26/99	12/14/05
IR0963	813598.6761	1220499.352	UF	01/25/99	12/14/05
IR0968	727890.4702	1225418.999	UF	01/01/99	12/31/05
IR1006	840789.6577	1204575.315	UF	11/19/99	12/31/05
IR1008	857806.5847	1200417.081	UF	11/23/99	12/31/05
KRMGWUH1	830843.436	573317.791	UF	1/31/05	12/31/05

TABLE 5

WATER LEVEL TARGETS

East Coast Floridan Aquifer System Model, Phase II
Upper and Lower East Coast of Florida

Well ID	X	Y	Aquifer	Period of Record	
				Starting Date	Ending Date
KRMGWUH2	830843.436	573317.791	MF	1/25/05	12/31/05
L2GWUH1	672708.954	826685.164	MF	2/2/05	12/31/05
L2GWUH2	672708.954	826685.164	UF	7/26/02	12/31/05
L2GWUHB	672708.954	826685.164	UF	2/28/02	7/26/02
L2-PW2	672778.7925	826811.8627	UF	07/26/02	12/31/05
LYTALUH1	949209.57	852482.255	UF	1/31/03	5/23/03
LYTALUH2	949209.57	852482.255	MF	1/31/03	12/31/05
LYTALUH3	949209.57	852482.255	LF	1/31/03	12/31/05
LYTALUHA	949209.57	852482.255	UF	10/3/01	1/31/03
LYTALUHB	949209.57	852482.255	MF	10/3/01	1/31/03
LYTALUHC	949209.57	852482.255	LF	10/3/01	1/31/03
MF-35B	824648.7732	966482.5926	UF	08/23/02	12/31/05
MF35BUH1	824576.586	966264.316	UF	10/23/03	12/31/05
MF37UH	784938	966222	UF	4/1/04	12/31/05
MF-52	856148.9422	1000737.527	UF	08/23/02	12/31/05
MF52+UH1	856075.054	1000618.31	UF	8/23/02	12/31/05
MF52+UHA	856075.054	1000618.31	UF	12/13/01	8/23/02
MIRFASUH	875549.45	603698.275	MF	12/20/02	12/31/05
OK0001	719453.426	1162088.457	MF	01/25/99	02/24/05
OKEEUUH1	708302.821	1041117.134	UF	8/8/05	12/31/05
OKF-100	698149.0457	1025554.59	MF	04/01/04	12/31/05
OKF100UH	698055	1025471	MF	4/1/04	12/31/05
OKF-101	708426.0692	1041217.563	UF	07/26/04	12/31/05
PB-747	936404.8475	946666.537	UF	08/20/02	12/31/05
PBF-10R	886751.6742	735709.6783	UF	07/25/02	12/31/05
PBF-2	964624.7997	867471.5728	UF	01/01/03	12/31/05
PBF-3	949285.7844	852606.5713	UF	01/31/03	12/31/05
PBF7UH1	749012.792	860161.268	UF	7/26/02	12/31/05
PBF7UH2	749012.792	860161.268	LF	7/26/02	12/31/05
PBF7UHA	749012.792	860161.268	UF	2/4/02	7/26/02
PBF7UHB	749012.792	860161.268	LF	2/4/02	7/26/02
SLF-21	850238.3963	1125459.414	UF	08/23/02	12/31/05
SLF21UH1	850164.053	1125344.558	UF	8/24/02	12/31/05
SLF21UHA	850164.053	1125344.558	UF	10/18/01	8/23/02
SLF-62B	836099.2639	1082881.489	UF	07/13/02	12/31/05

TABLE 5

WATER LEVEL TARGETS

East Coast Floridan Aquifer System Model, Phase II
Upper and Lower East Coast of Florida

Well ID	X	Y	Aquifer	Period of Record	
				Starting Date	Ending Date
SLF62BU1	836003.272	1082784.176	UF	7/11/04	11/25/05
SLF-69	836646.3271	1101868.454	UF	08/28/02	1/9/05
SLF69UH1	836548.221	1101782.466	UF	8/28/02	1/9/05
SLF69UHA	836548.221	1101782.466	UF	1/17/02	8/28/02
SLF-74	821989.3016	1092313.505	MF	08/20/02	12/31/05
SLF74UH1	821840.676	1092293.325	MF	8/20/02	12/31/05
SLF-75	821899.3016	1092312.505	UF	08/20/02	12/31/05
SLF75UH1	821825.098	1092287.505	UF	8/20/02	12/31/05
SLF-76	821989.3016	1092313.505	UF	08/20/02	12/31/05
SLF76UH1	821840.676	1092293.325	UF	8/20/02	12/31/05
TCRK+UH1	725886.339	1056130.635	MC1	2/9/05	12/31/05
TCRK+UH2	725886.339	1056130.635	MF	2/11/05	12/31/05
WASANUH1	936529.941	576847.226	UF	1/27/05	12/31/05
WASANUH2	936510.96	576823.271	MC1	4/14/05	8/3/05
WASASUH1	871467.2931	443172.182	UF	1/24/03	7/3/03
WHILLUH1	886678.707	735581.372	UF	7/25/02	12/31/05
WHILLUH2	886678.707	735581.372	MF	7/25/02	12/31/05
WHILLUH3	886678.707	735581.372	LF	7/25/02	12/31/05
WHILLUHA	886678.707	735581.372	UF	11/30/01	7/25/02
WHILLUHB	886678.707	735581.372	MF	11/30/01	7/25/02
WHILLUHC	886678.707	735581.372	LF	11/30/01	7/25/02

TABLE 6

CONCENTRATION TARGETS

East Coast Floridan Aquifer System Model, Phase II
Upper and Lower East Coast of Florida

Well ID	X	Y	Aquifer	Period of Record	
				Starting Date	Ending Date
C/11-1	849060	1145082	MF	3/6/01	11/29/05
C/11433_1090/MDWSA_FA1	874805	443121	UF	4/1/04	4/1/04
C/11433_1972/MDWSA_FA1	874805	443121	MC2	4/1/04	4/1/04
C/11434_1020/MDWSA_FA2	873227	441122	UF	4/1/04	4/1/04
C/11434_1627/MDWSA_FA2	873227	441122	MC2	4/1/04	4/1/04
C/11445_1288/MF-37	784938	966222	MC1	11/1/01	11/1/01
C/11445_1543/MF-37	784938	966222	MF	10/26/01	10/26/01
C/11445_1657/MF-37	784938	966222	MF	10/30/01	10/30/01
C/11445_1850/MF-37	784938	966222	LF1	10/23/01	10/23/01
C/11445_2046/MF-37	784938	966222	LF1	10/16/01	10/16/01
C/11445_900/MF-37	784938	966222	UF	11/13/01	11/13/01
C/11720/QO-IW4	770137	862826	LC	1/1/99	8/1/05
C/12-1	851935	1147437	MF	3/6/01	11/29/05
C/18816/MIR-MW1	875549	603698	MF	1/1/99	11/1/05
C/18817/MIR-MW1	875549	603698	MC2	1/1/99	11/1/05
C/18818/MIR-MW2	874249	603698	MF	1/1/99	11/1/05
C/18819/MIR-MW2	874249	603698	MC2	1/1/99	11/1/05
C/18937/SUN-MW3	873561	653026	MC2	1/1/99	10/1/05
C/18938/SUN-MW3	873561	653026	MC2	1/1/99	10/1/05
C/18995/PB-1181	936624	886562	LF1	1/1/99	11/1/05
C/19034/AID-MW	909414	836783	MC2	1/1/99	11/1/05
C/19035/AID-MW	909414	836783	LF1	1/1/99	11/1/05
C/19118/M-1353	899651	1045042	MF	1/1/99	11/1/05
C/19124/FTL-MW3	941340	641403	MC1	2/1/99	11/29/05
C/19125/FTL-MW3	941340	641403	LF1	2/1/99	11/29/05
C/19154/FPU-MW	878265	1135537	UF	1/1/99	12/1/05
C/19155/FPU-MW	878265	1135537	LF1	1/1/99	12/1/05
C/19157/MIR_RO-MW1	880765	594373	MF	2/1/05	11/1/05
C/19249/BCN-M3	932547	702100	MC1	12/26/00	11/28/05
C/19250/BCN-M3	932547	702100	MC2	12/26/00	11/28/05
C/19251/BCN-M4	932271	702401	MC1	12/26/00	11/28/05
C/19252/BCN-M4	932271	702401	MF	12/26/00	11/28/05
C/19253/PLTE_RO-M1	903158	651938	MF	3/29/00	12/1/05
C/19254/PLTE_RO-M1	903158	651938	MC2	3/29/00	12/1/05
C/19299/SUN-MW	875681	664309	MF	3/29/01	11/1/05

TABLE 6

CONCENTRATION TARGETS

East Coast Floridan Aquifer System Model, Phase II
Upper and Lower East Coast of Florida

Well ID	X	Y	Aquifer	Period of Record	
				Starting Date	Ending Date
C/19300/SUN-MW	875681	664309	MC2	3/29/01	11/1/05
C/19394/PB-1693	961829	867125	UF	7/1/00	5/1/04
C/19437/PB-1195	962374	792808	SU	1/1/99	7/1/05
C/20134/G-2916	948842	713346	UF	3/30/99	12/27/04
C/203-1	763824	1136790	MF	6/7/01	12/1/05
C/204-1	785890	1067401	MF	6/7/01	11/30/05
C/2042/BF-1	925617	669564	LF1	10/24/00	1/26/01
C/20540/PSLLTC-MW1	850741	1104482	MC2	4/30/03	2/3/05
C/20541/PSLLTC-MW1	850741	1104482	MC2	4/30/03	2/3/05
C/205-5	778073	1159242	MFLF	6/7/01	12/1/05
C/20811/POMP_CWMW1	944610	695379	MF	9/27/02	12/12/03
C/20812/POMP_CWMW1	944610	695379	MC2	9/27/02	12/26/03
C/20962/FPU_RO-MW1	866258	1130469	MF	1/3/03	11/1/05
C/21180/FPU_RO-MW1	866258	1130469	LF1	1/3/03	11/1/05
C/21183/PSLWPT-MW1	866387	1055180	MC2	11/25/03	11/3/05
C/21184/PSLWPT-MW1	866387	1055180	LF1	11/25/03	10/6/05
C/21301/HOL-MW1	940986	616553	UF	9/23/03	11/15/05
C/21302/HOL-MW1	940986	616553	MC2	9/16/03	11/29/05
C/21592/ENP-100	787244	381471	UF	6/14/04	10/21/04
C/22755_1447/PBF-7	749013	860161	UF	6/10/04	9/22/04
C/22755_2040/PBF-7	749013	860161	LF1	6/10/04	9/22/04
C/22773_1349/FTL-MW2	941690	641434	MC1	9/7/99	9/7/99
C/22773_2025/FTL-MW2	941690	641434	LF1	9/7/99	9/7/99
C/22777/PBC-MW	928806	785408	LF1	9/21/99	9/21/99
C/22793_1103/SCU-MW	939265	917657	UF	10/12/99	10/12/99
C/22793_2020/SCU-MW	939265	917657	LF1	10/12/99	10/12/99
C/22809_1580/PBC3-MW	936079	781079	MF	11/24/99	11/24/99
C/22809_1950/PBC3-MW	936079	781079	LF1	11/24/99	11/24/99
C/22813/RPB-MW	906290	873439	MC2	1/12/00	1/12/00
C/22824/MIR-MW1	875250	603463	MC2	2/16/00	2/16/00
C/22827_1150/PBF-13	886998	735464	UF	4/5/00	4/5/00
C/22827_1225/PBF-13	886998	735464	UF	4/5/00	11/16/00
C/2-3	812714	1119062	MFLF	3/6/01	11/28/05
C/23130/NRCS205-6	777179	1155399	MF	9/7/01	9/17/04
C/23144/SLF-62B	836003	1082784	UF	7/6/04	7/6/04

TABLE 6

CONCENTRATION TARGETS

East Coast Floridan Aquifer System Model, Phase II
Upper and Lower East Coast of Florida

Well ID	X	Y	Aquifer	Period of Record	
				Starting Date	Ending Date
C/23174/NRCS1-1	828575	1099139	UF	9/5/01	9/16/04
C/23176/NRCS2-2	810793	1119669	UF	9/5/01	9/16/04
C/23179/NRCS3-2	810077	1089551	UF	9/5/01	9/17/04
C/23181/NRCS4-1	805657	1045947	MF	9/5/01	9/14/04
C/23182/NRCS5-1	825919	1101666	UF	9/5/01	9/16/04
C/23183/NRCS6-1	801011	1127976	UF	9/6/01	9/17/04
C/23186/NRCS7-2	820523	1126953	UF	9/5/01	9/4/03
C/23191/NRCS8-4	857779	1129801	UF	9/4/01	9/3/02
C/23192/NRCS11-1	849059	1145082	UF	9/6/01	9/14/04
C/23193/NRCS12-1	852004	1147554	UF	9/6/01	9/14/04
C/23194/NRCS13-1	805629	1048215	MF	9/5/01	9/14/04
C/23195/NRCS14-1	852413	1145484	UF	9/4/01	9/14/04
C/23203/NRCS29-8	831717	1167283	UF	9/4/01	9/14/04
C/23211/NRCS35-1	814193	1081500	UF	9/5/01	9/14/04
C/23213/NRCS36-1	805606	1053571	MF	9/5/01	9/14/04
C/23215/NRCS121-1	820466	1138325	UF	9/6/01	9/6/02
C/23217/NRCS202-1	806894	1102027	UF	3/4/02	9/16/04
C/23218/NRCS202-2	808151	1102042	UF	9/5/01	9/5/01
C/23219/NRCS203-1	763751	1136675	UF	9/7/01	9/17/04
C/23220/NRCS204-1	785818	1067283	UF	6/2/03	6/2/03
C/23222/NRCS204-3	783481	1064593	UF	9/6/01	9/16/04
C/23279/BCN-M2	933485	701513	UF	9/7/99	9/7/99
C/23304/SLF-69	836548	1101782	UF	1/23/01	3/23/04
C/23340_1600/PB-1691	940194	874545	MC2	10/13/99	3/19/03
C/23340_2289/PB-1691	940194	874545	MC2	10/13/99	3/19/03
C/23393/PB-1763	938731	782344	UF	1/28/99	1/28/99
C/23802/L2-PW1	672709	826685	MF	6/22/04	10/6/04
C/23820_1075/TCRK-MW	725886	1056131	MC1	6/16/04	10/5/04
C/23820_1700/TCRK-MW	725886	1056131	MF	6/16/04	10/5/04
C/24707/USSC_ASR	830689	890903	UF	12/8/05	12/8/05
C/25772_1670/PBF-12	886679	735581	MF	8/12/99	9/23/04
C/25772_2260/PBF-12	886679	735581	LF1	8/12/99	9/23/04
C/25977/EVERCLUB	970850	860147	UF	10/9/01	10/9/01
C/25978/LAGORCECC	943094	547438	UF	12/4/01	5/7/02
C/26085/FKAAFCEW1	818318	403673	UF	10/10/03	10/10/03

TABLE 6

CONCENTRATION TARGETS

East Coast Floridan Aquifer System Model, Phase II
Upper and Lower East Coast of Florida

Well ID	X	Y	Aquifer	Period of Record	
				Starting Date	Ending Date
C/26103/MF-35B	824577	966264	UF	10/23/03	7/6/04
C/26138_1230/NMB-1F	914032	588133	UF	2/10/03	2/10/03
C/26138_1270/NMB-1F	914032	588133	MC1	2/11/03	2/11/03
C/26138_1310/NMB-1F	914032	588133	MC1	2/7/03	2/7/03
C/26138_1380/NMB-1F	914032	588133	MC1	2/4/03	2/4/03
C/26138_1490/NMB-1F	914032	588133	MC1	2/6/03	2/6/03
C/26139/NMB-2F	913635	588117	UF	6/17/03	6/17/03
C/26152/MDWNA_FA3N	936530	576847	UF	3/29/99	2/4/02
C/26188_1040/EXPM-1	784620	965030	UF	10/15/03	11/10/03
C/26188_900/EXPM-1	784620	965030	UF	10/7/03	10/7/03
C/26190/SGC_RO-F1	964537	921100	UF	6/9/04	6/9/04
C/26213_1200/HB-TPW1	962048	756175	UF	7/1/01	7/1/01
C/26213_1460/HB-TPW1	962048	756175	UFMF	7/1/01	7/1/01
C/26215/EXKR-1	691303	1025430	UF	3/12/04	3/12/04
C/26220/SLF-75	821807	1092495	UF	1/24/01	10/5/04
C/26221/SLF-76	821841	1092293	UF	1/24/01	10/5/04
C/26866_1155/JUP_RO_DZM	931130	942241	UF	7/17/01	7/17/01
C/26866_1609/JUP_RO_DZM	931130	942241	MF	7/17/01	7/17/01
C/26878/COH_F3	925987	613161	UF	2/17/05	2/17/05
C/26881/SMRU_RO2	941570	941570	MF	2/1/05	2/1/05
C/29-13	831282	1169846	UF	3/6/01	11/29/05
C/3-3	810086	1088358	UF	3/6/01	11/28/05
C/35-2	813683	1080094	UF	3/6/01	11/30/05
C/4278/SLF-11	791551	1164691	UF	7/23/01	7/6/04
C/4280/SLF-14	795296	1092112	UFMF	1/24/01	7/6/04
C/4282/SLF-62	828482	1075057	UF	1/24/01	3/23/04
C/4290/MF-31	923813	1023381	UF	1/25/01	7/6/04
C/4291/MF-35	824627	970557	UF	1/25/01	6/5/03
C/4292/MF-52	856092	1001166	UF	1/25/01	10/5/04
C/4297/SLF-9	788852	1132078	UF	1/22/01	7/6/04
C/4299/SLF-21	850060	1124954	UF	1/22/01	7/6/04
C/4303/SLF-60	786162	1071987	UF	1/24/01	7/6/04
C/4433/PBF-1	953368	959360	UF	7/13/00	7/13/00
C/4455_1510/PBF-3	949210	852482	MF	10/23/00	9/23/04
C/4455_2490/PBF-3	949210	852482	LF1	10/23/00	9/23/04

TABLE 6

CONCENTRATION TARGETS

East Coast Floridan Aquifer System Model, Phase II
Upper and Lower East Coast of Florida

Well ID	X	Y	Aquifer	Period of Record	
				Starting Date	Ending Date
C/4500/L2-PW2	672709	826685	UF	10/26/99	10/6/04
C/4598/MF-9	829648	1030547	UF	1/25/01	7/6/04
C/4649/FTL-M1	941140	641403	MC1	2/1/99	11/29/05
C/4650/FTL-M1	941140	641403	MF	2/1/99	11/29/05
C/4652/MAR-MZL2	912732	694131	MC2	2/1/99	10/1/03
C/4654/MAR-MW1	913305	693654	LF1	2/1/99	2/1/05
C/4973/SUN-MW1	873511	653626	UF	1/1/99	10/1/05
C/4974/SUN-MW1	873511	653626	MF	1/1/99	10/1/05
C/5002/PBP-MW	875725	604016	UF	1/1/99	12/1/05
C/5003/PBP-MW	875725	604016	MC2	1/1/99	12/1/05
C/5007/CS-I1	897445	695121	UF	1/1/05	11/1/05
C/5008/CS-I1	897445	695121	LF1	1/1/99	11/1/05
C/5053/PLT-M1	907027	657849	MF	1/1/99	1/1/05
C/5054/PLT-M1	907027	657849	LF1	1/1/99	1/1/05
C/5084/MAR-MZL2	912732	694131	UF	2/1/99	2/1/05
C/5-1	825921	1101665	UFMF	3/6/01	11/30/05
C/5117/CS-M2	897697	695860	MF	1/1/99	11/1/05
C/5118/CS-M2	897697	695860	UF	1/1/99	11/1/05
C/5119/BCN-M1	932413	700322	UF	1/1/99	11/28/05
C/5120/BCN-M1	932413	700322	MF	1/1/99	11/28/05
C/5121/BCN-M2	933013	700322	UF	1/1/99	11/28/05
C/5122/BCN-M2	933013	700322	MF	1/1/99	11/28/05
C/5131/PLA-MZU	906523	657665	MF	1/1/05	11/1/05
C/5132/PLA-MZL	906523	657665	LF1	1/1/05	11/1/05
C/5154/DZMW-1A	873441	653576	MC2	1/1/99	10/1/05
C/5156/SUN-MW2	874563	653557	MF	1/1/99	10/1/05
C/5157/SUN-MW2	874563	653557	MC2	1/1/99	10/1/05
C/5159/PLT-ROM1	896119	652839	MF	1/27/99	12/1/05
C/5160/PLT-ROM1	896119	652839	MC2	1/27/99	12/1/05
C/5162/MAR-MZL2	912732	694131	MF	2/1/99	2/1/05
C/5165/FTL-MW2	941690	641434	MC1	1/1/99	11/29/05
C/5166/FTL-MW2	941690	641434	LF1	1/1/99	11/29/05
C/5167/LOH_RMW-1	934417	636311	MC1	1/1/99	11/1/05
C/5168/LOH_RMW-1	934417	636311	MF	1/1/99	11/1/05
C/5176/CS-I1	897445	695121	LF1	1/1/99	11/1/05

TABLE 6

CONCENTRATION TARGETS

East Coast Floridan Aquifer System Model, Phase II
Upper and Lower East Coast of Florida

Well ID	X	Y	Aquifer	Period of Record	
				Starting Date	Ending Date
C/5871/PB-964A	940375	874647	MC2	1/1/99	12/1/05
C/5873/WPBECR_IW3	940644	875153	MC2	1/1/99	12/1/05
C/5875/WPBECR_IW5	940009	875149	LF1	1/1/99	12/1/05
C/6321/ENCON_MW2	936489	942379	MC2	1/1/99	9/1/05
C/6322/ENCON_MW2	936489	942379	LF1	1/1/99	11/1/05
C/6329/PBC3-MW	936079	781079	LF1	1/1/99	9/1/05
C/6330/PBC3-MW	936079	781079	MF	1/1/99	12/1/01
C/6339/PWU-MW	882488	934221	UF	1/1/99	10/1/05
C/6342/PWU-MW	882488	934221	LF1	1/1/99	10/1/05
C/6436/RPB-MW	906290	873439	UF	1/1/99	8/1/05
C/6437/RPB-MW	906290	873439	MC2	1/1/99	8/1/05
C/6443/SCU-MW	939265	917657	UF	1/1/99	11/1/05
C/6444/SCU-MW	939265	917657	LF1	1/1/99	11/1/05
C/6451/PB-1179	936624	886562	UF	1/1/99	11/1/05
C/6509/PAHO-MW	764969	896738	UF	1/1/99	10/1/05
C/6510/PAHO-MW	764969	896738	LF1	1/1/99	10/1/05
C/6514/PB-1690	939741	874642	UF	1/1/99	12/1/05
C/6515/PB-1690	939741	874642	MC2	1/1/99	12/1/05
C/6529/PB-1187	757542	858452	UF	1/1/99	4/1/05
C/6530/PB-1187	757542	858452	LF1	1/1/99	4/1/03
C/6531/PBC-MW	928806	785408	UF	1/1/99	9/1/05
C/6600/PB-1691	940375	874647	MC2	1/1/99	12/1/05
C/6601/PB-1691	940375	874647	MC2	1/1/99	12/1/05
C/6608/PB-1193	943504	798936	UF	1/1/99	11/1/05
C/6609/PB-1193	943504	798936	LF1	2/1/99	11/1/05
C/6610/PB-1171	936531	942315	LF1	1/1/99	11/1/05
C/6777/M-1034	899651	1045042	UF	1/1/99	11/1/05
C/6778/STU-MW	899651	1045042	LF1	1/1/99	11/1/05
C/6818/NMC-MW	895888	1057448	MF	1/1/99	11/28/05
C/6819/NMC-MW	895888	1057448	LF1	1/1/99	11/28/05
C/6906/M-1353	899651	1045042	MF	1/1/99	11/1/05
C/7206/SPSL-MW	883856	1060920	UF	1/1/99	11/1/05
C/7207/SPSL-MW	883856	1060920	MF	1/1/99	11/1/05
C/7268/NPSL-MW	866749	1092495	UF	2/1/99	11/1/05
C/7269/NPSL-MW	866749	1092495	MC2	2/1/99	10/1/05

TABLE 6

CONCENTRATION TARGETS

East Coast Floridan Aquifer System Model, Phase II
Upper and Lower East Coast of Florida

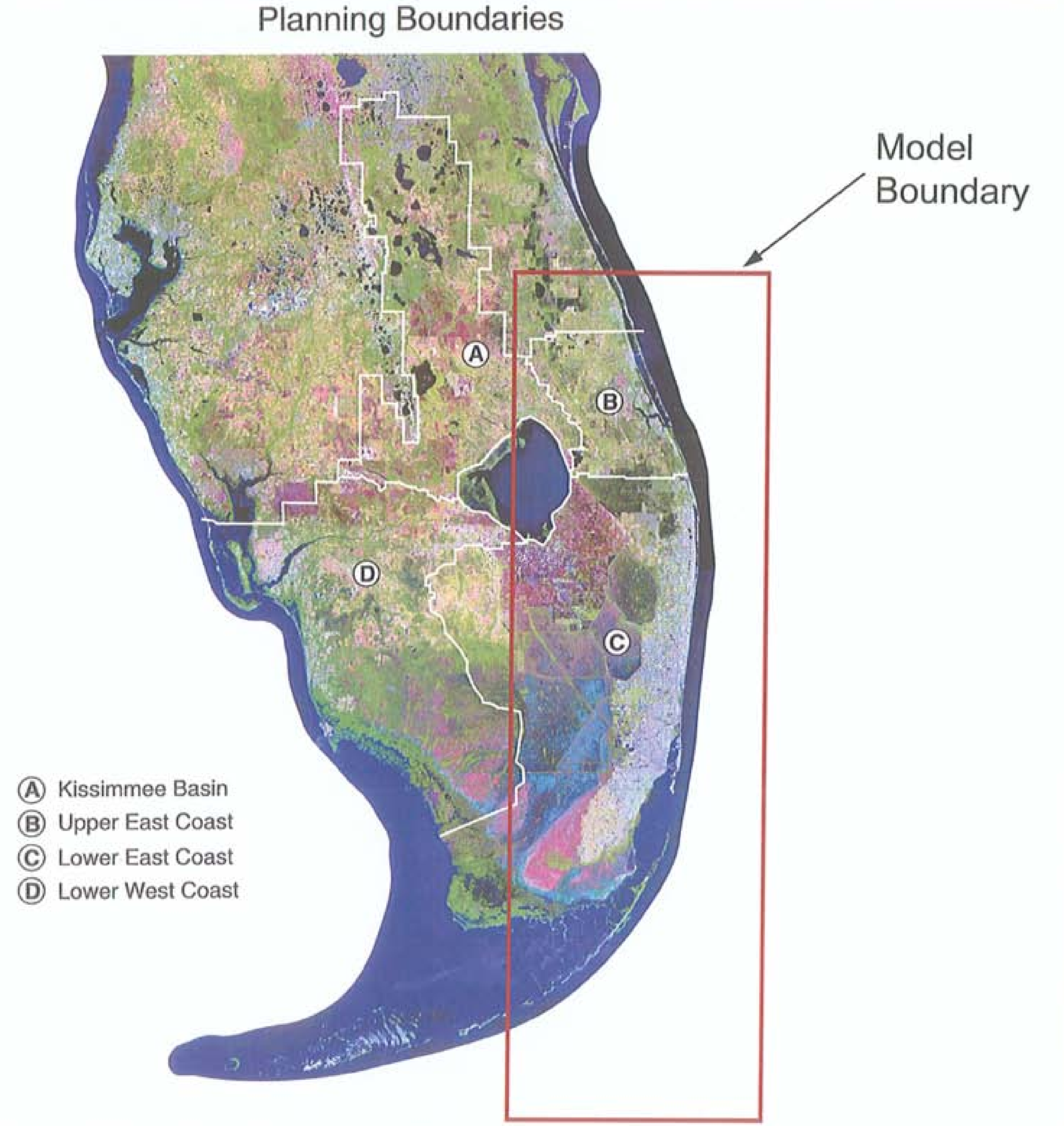
Well ID	X	Y	Aquifer	Period of Record	
				Starting Date	Ending Date
C/7319/PBF-10R	886679	735581	UF	8/9/00	9/23/04
C/7322_1052/G-2296	714531	668029	UF	6/7/04	9/22/04
C/7322_1726/G-2296	714531	668029	MF	6/9/04	9/22/04
C/7439/STL-386	883761	1060835	MC2	2/1/99	11/1/05
C/7851/BF-3	925364	669470	UF	10/24/00	10/24/00
C/8710/SLF-74	821841	1092293	MF	1/24/01	10/5/04
C/AID-MZL	906851	837085	LF1	9/21/99	9/21/99
C/AID-MZU	906851	837085	MC2	9/21/99	9/21/99
C/BF-1	925471	669440	LF1	10/24/00	1/26/01
C/BF-3	925365	669470	UF	10/24/00	10/24/00
C/FPU-MZL	878267	1135536	LF1	3/9/00	3/9/00
C/IR0312	840709	1179441	UF	1/17/99	7/31/05
C/IR0313	840790	1204575	UF	1/17/99	7/29/00
C/IR0921	782346	1252326	UF	1/17/99	7/31/05
C/IR0954	792733	1183086	UF	1/17/99	7/31/05
C/IR0955	775467	1209892	UF	1/17/99	7/31/05
C/IR0963	813640	1220628	UF	1/17/99	7/31/05
C/IR0968	727962	1225532	UF	1/17/99	7/31/05
C/IR1000	849493	1245820	UF	7/12/99	1/30/05
C/IR1006	840862	1204688	UF	1/24/00	7/31/05
C/L2-PW2	672688	826682	UF	10/26/99	10/26/99
C/MAR-MZL2	912733	694130	MC2	9/7/99	9/7/99
C/MF-31	923814	1023380	UF	1/25/01	4/25/01
C/MF-35	824581	970728	UF	1/25/01	4/24/01
C/MF-52	856000	1001365	UF	1/25/01	4/25/01
C/MF-9	829647	1030546	UF	1/25/01	4/24/01
C/MIR-MZL	875251	603463	MC2	2/16/00	2/16/00
C/NPSL-MZL	866676	1092378	LF1	11/17/99	11/17/99
C/OK0001	719434	1162203	MF	4/22/00	7/31/05
C/PAHO-MZL	762523	897034	LF1	7/14/99	7/14/99
C/PBC-MZL	928807	785408	LF1	9/21/99	9/21/99
C/PBF-10R	886678	735580	UF	8/9/00	8/9/00
C/PBF-11	887028	735250	MF	8/12/99	8/12/99
C/PBF-12	887028	735250	MF	8/12/99	8/12/99
C/PBF-13	886999	735464	UF	4/5/00	11/16/00

TABLE 6

CONCENTRATION TARGETS

East Coast Floridan Aquifer System Model, Phase II
Upper and Lower East Coast of Florida

Well ID	X	Y	Aquifer	Period of Record	
				Starting Date	Ending Date
C/PBF-5	949210	852482	LF1	10/23/00	10/23/00
C/PBF-7L	748906	860161	LF1	1/19/00	1/19/00
C/PBF-7U	749014	860161	UF	1/19/00	1/19/00
C/PBP-MZL	875651	603882	LF1	8/3/99	8/3/99
C/PWU-MZL	882413	934098	UF	10/13/99	1/17/01
C/RPB-MZL	906290	873438	LF1	1/12/00	1/12/00
C/SCU-MZL	939265	917656	LF1	10/12/99	10/12/99
C/SLF-11	791553	1164690	UF	1/22/01	4/23/01
C/SLF-14	795297	1092112	UFMF	1/24/01	4/24/01
C/SLF-21	850062	1124953	UF	1/22/01	4/23/01
C/SLF-60	786163	1071987	UF	1/24/01	4/24/01
C/SLF-69	836548	1101790	UF	1/23/01	4/24/01
C/SLF-74	821737	1092196	MF	1/24/01	4/25/01
C/SLF-75	821826	1092499	UF	1/24/01	4/24/01
C/SLF-76	821826	1092499	UF	1/24/01	4/25/01
C/SLF-9	788853	1132077	UF	1/22/01	4/23/01



Source: Fernald and Purdom (1998)

Not to Scale

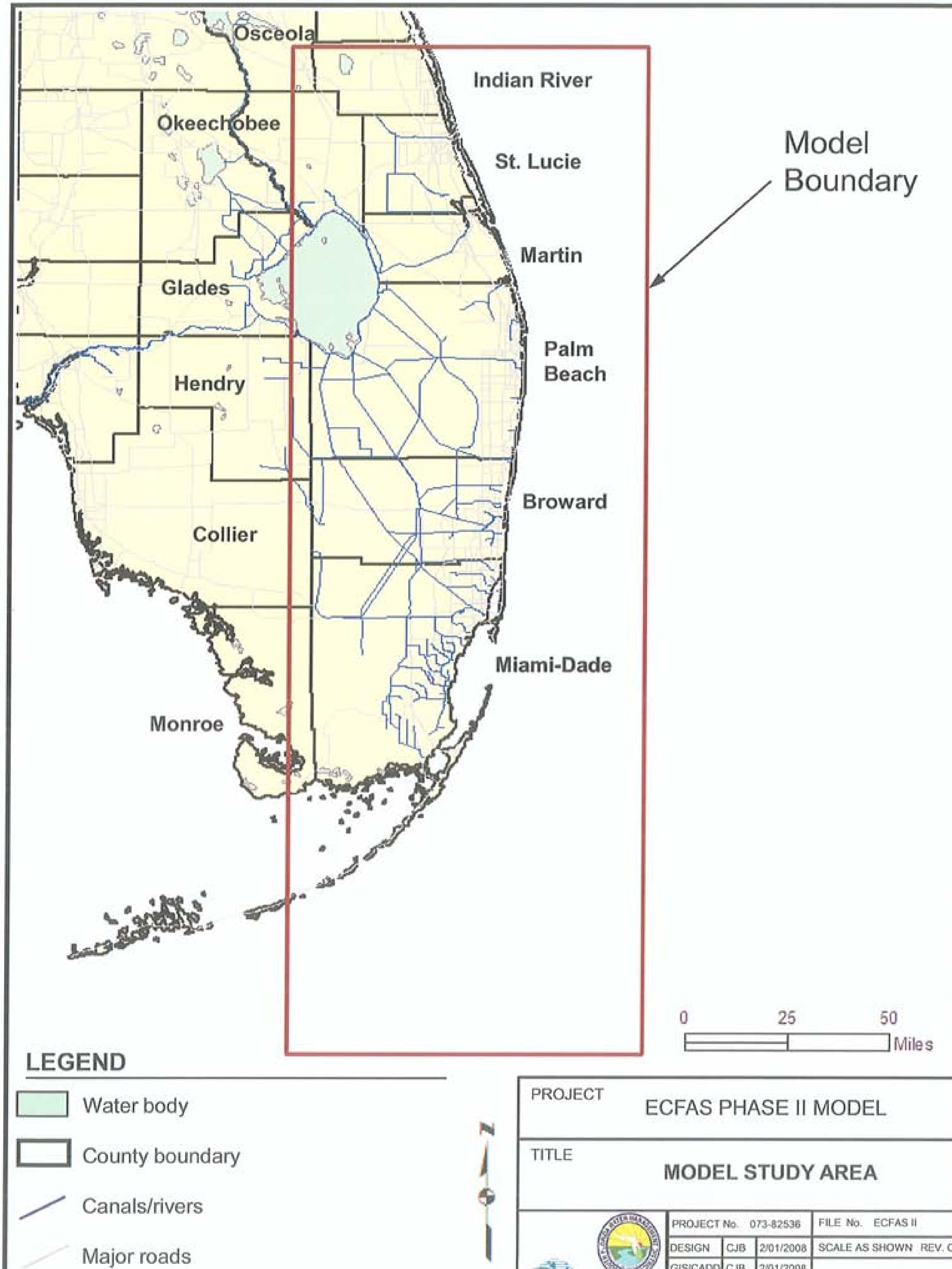
LEGEND

Water body

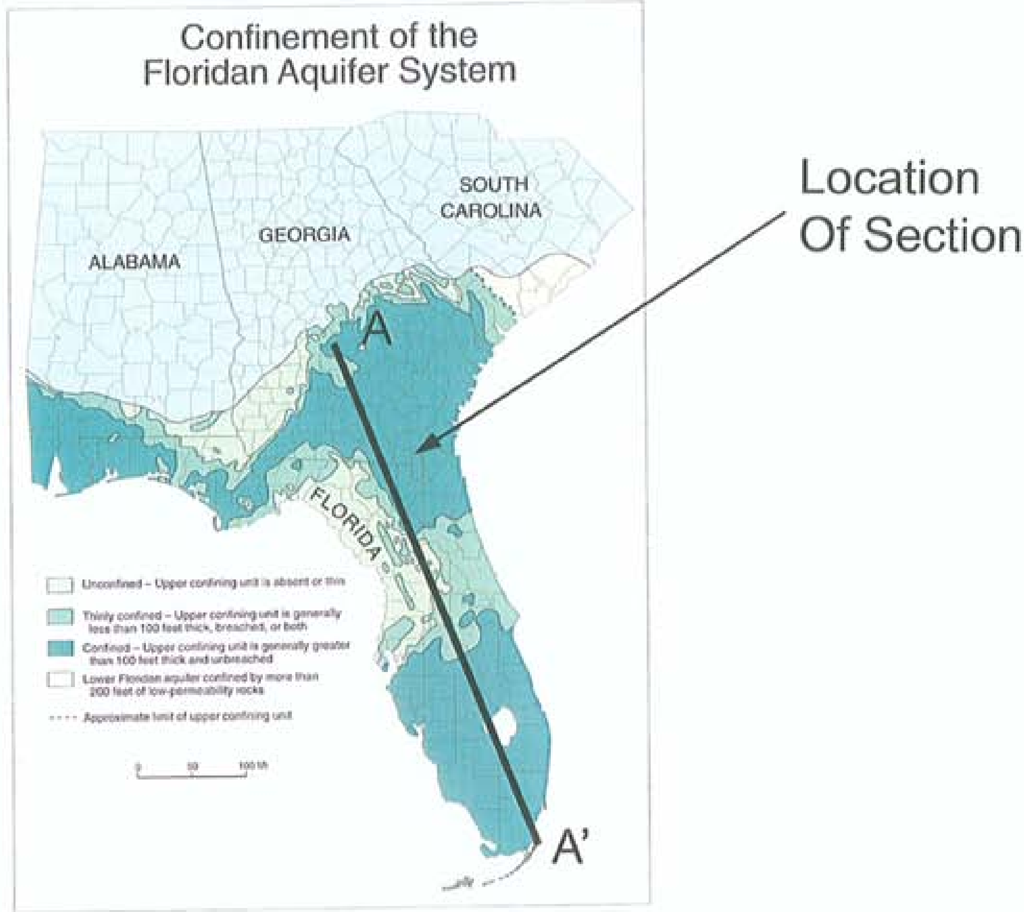
Planning boundary (in white outline)

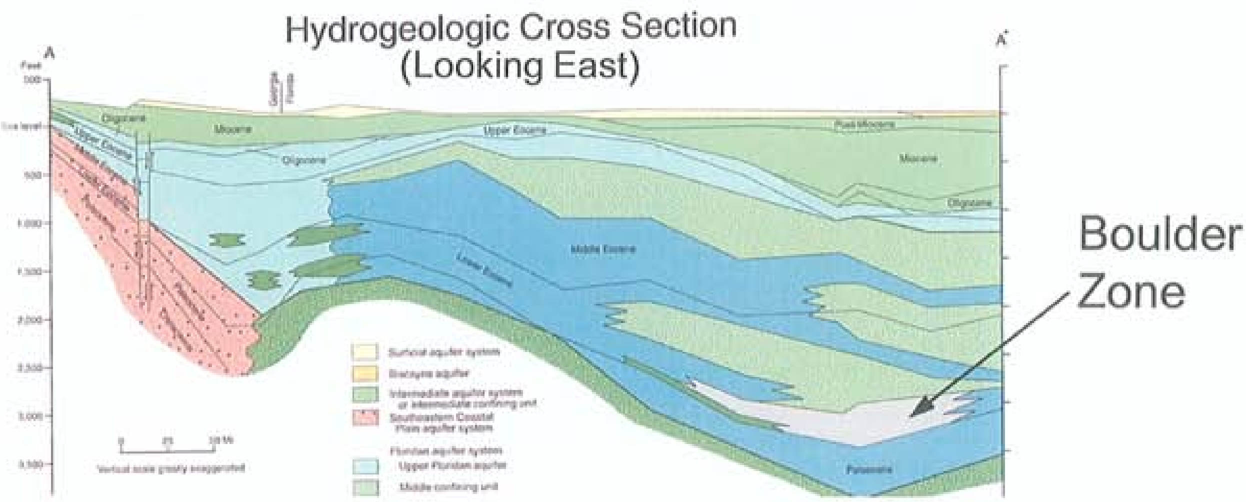
N

PROJECT	ECFAS PHASE II MODEL			
TITLE	**SFWMD WATER SUPPLY PLANNING REGIONS**			
Golder Associates	PROJECT No. 073-82536			FILE No. ECFAS II
	DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
	GIS/CADD	CJB	2/01/2008	**FIGURE 1**
	CHECK	GMP	2/02/2008	
	REVIEW	JS		



PROJECT	ECFAS PHASE II MODEL			
TITLE	MODEL STUDY AREA			
Golder Associates	PROJECT No. 073-82536			FILE No. ECFAS II
	DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
	GIS/CADD	CJB	2/01/2008	FIGURE 2
	CHECK	GMP	2/02/2008	
	REVIEW	JS		





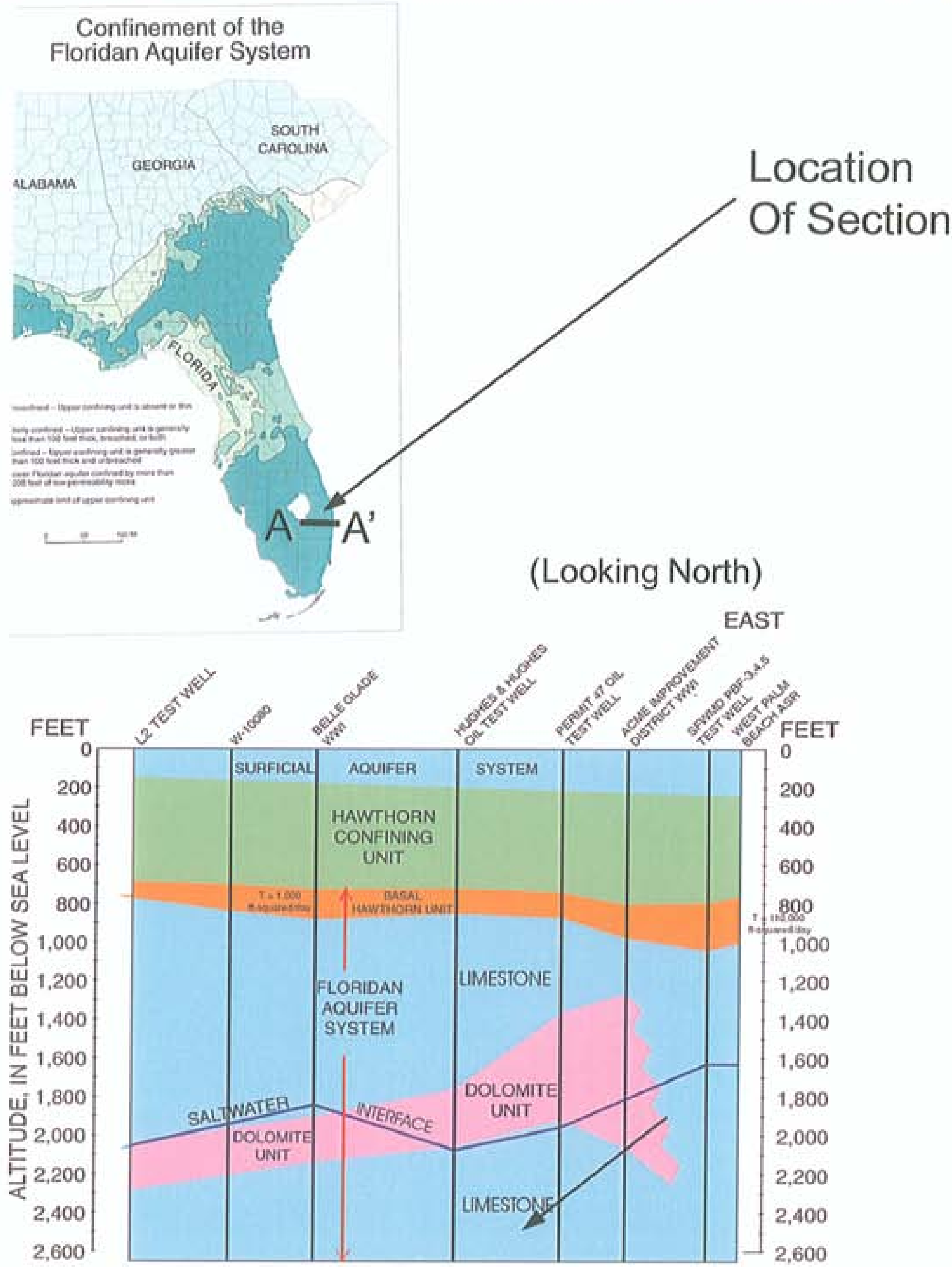
Source: Fernald and Purdom (1998)

LEGEND

Water body

County boundary

PROJECT	ECFAS PHASE II MODEL			
TITLE	**REGIONAL HYDROGEOLOGIC CROSS SECTION OF FLORIDA**			
Golder Associates	PROJECT No. 073-82536			FILE No. ECFAS II
	DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
	GIS/CADD	CJB	2/01/2008	**FIGURE 3a**
	CHECK	GMP	2/02/2008	
	REVIEW	JS		



WEST TO EAST CROSS-SECTION THROUGH CENTRAL PALM BEACH COUNTY

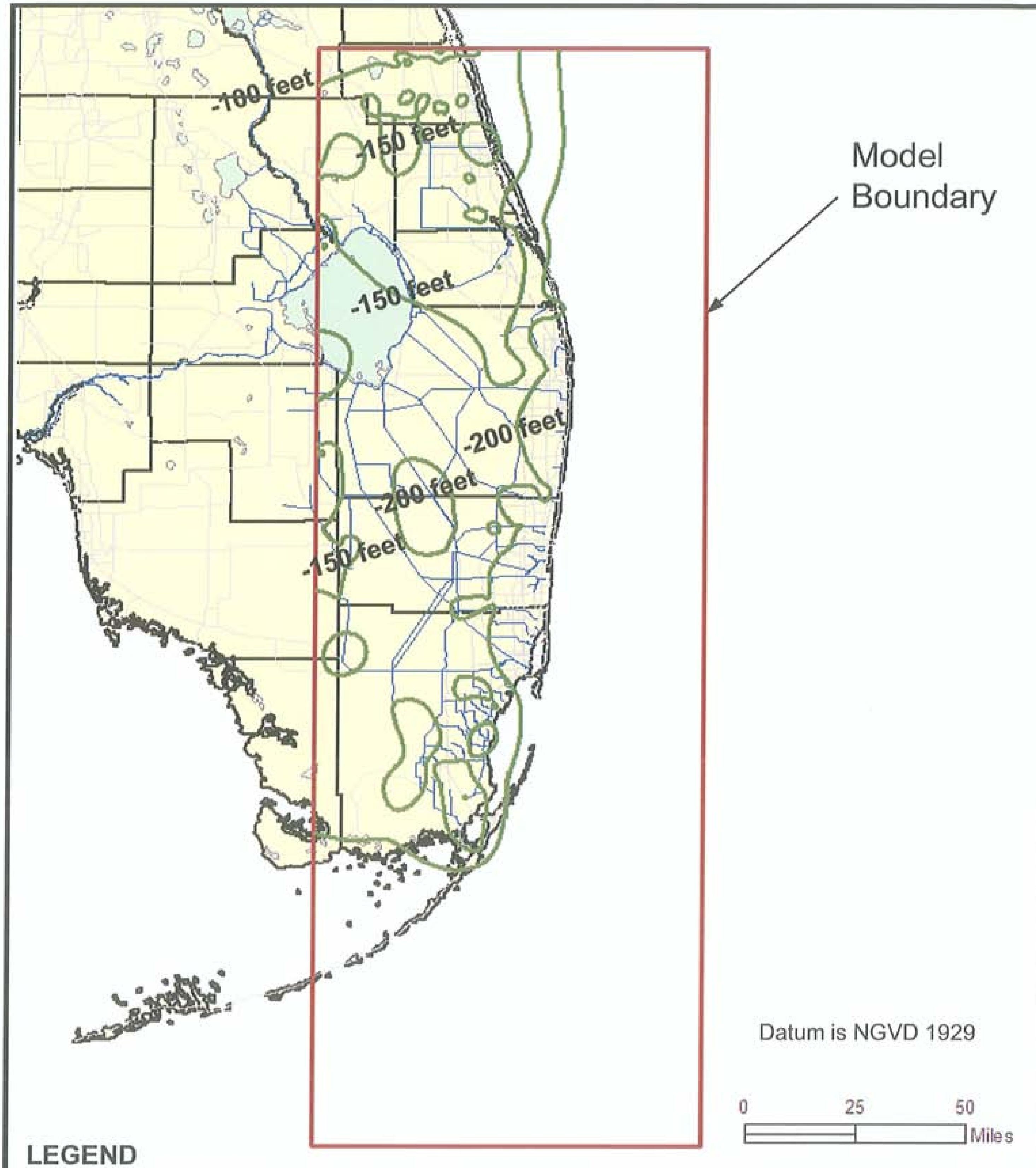
Source: Fernald and Purdom (1998) and Reese and Memberg (2000)

LEGEND

Water body

County boundary

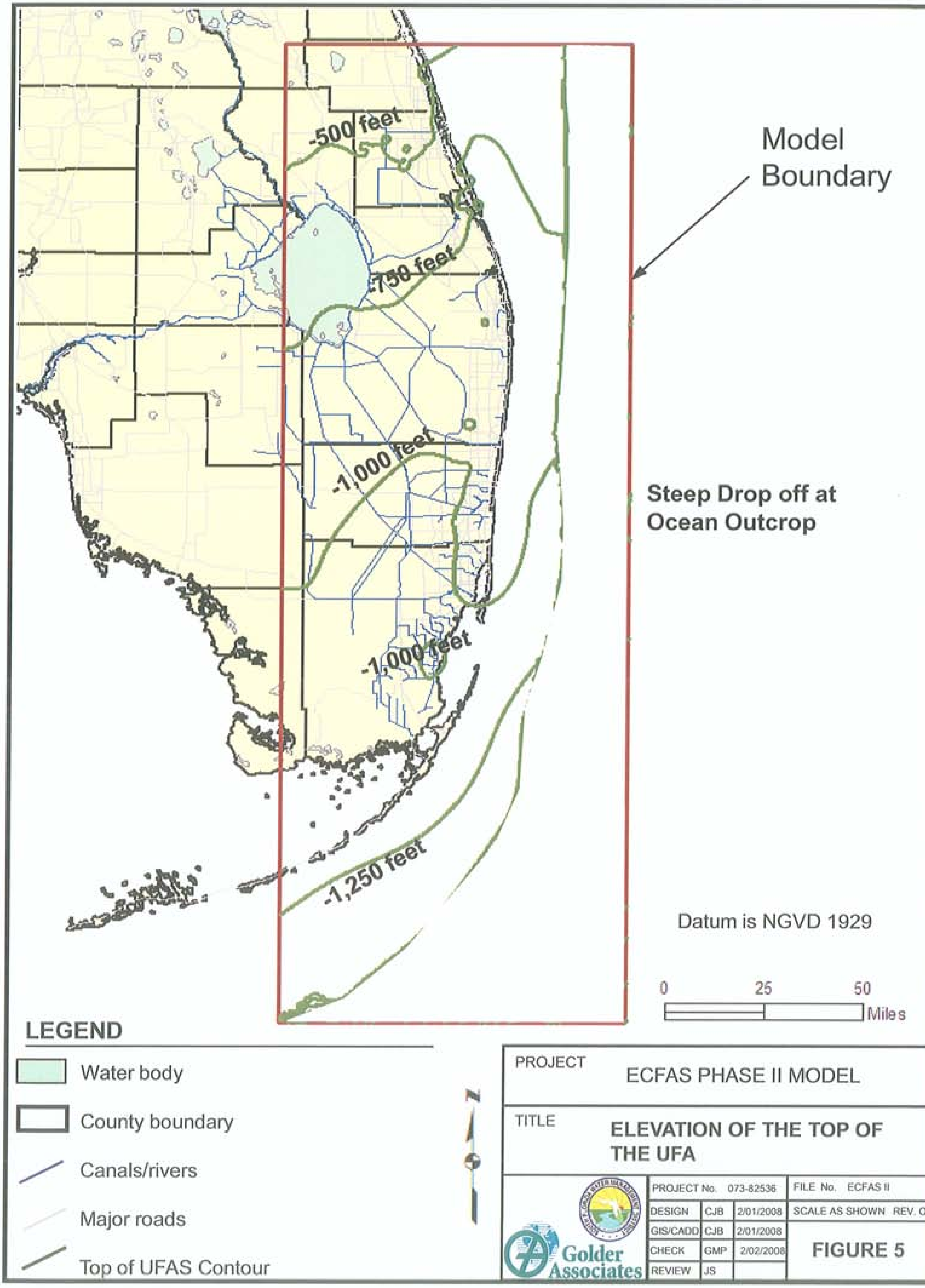
PROJECT	ECFAS PHASE II MODEL			
TITLE	**REGIONAL HYDROGEOLOGIC CROSS SECTION OF FLORIDA**			
Golder Associates	PROJECT No. 073-82536			FILE No. ECFAS II
	DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
	GIS/CADD	CJB	2/01/2008	**FIGURE 3b**
	CHECK	GMP	2/02/2008	
	REVIEW	JS		



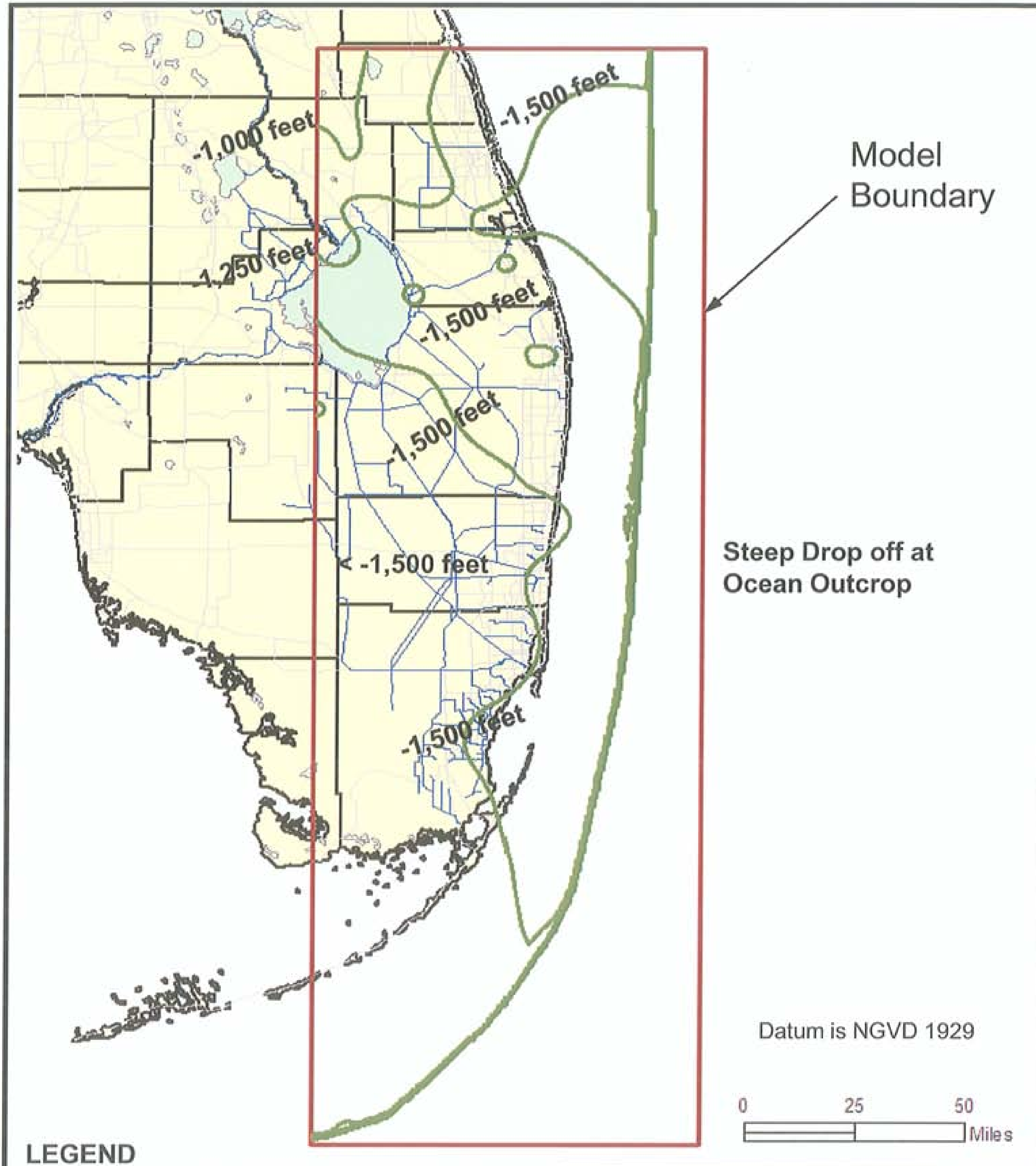
LEGEND

- Water body
- County boundary
- Canals/rivers
- Major roads
- Top of Hawthorn Group Contour

PROJECT	ECFAS PHASE II MODEL			
TITLE	**ELEVATION OF THE TOP OF THE HAWTHORN GROUP**			
Golder Associates	PROJECT No.	073-82536		FILE No. ECFAS II
	DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
	GIS/CADD	CJB	2/01/2008	
	CHECK	GMP	2/02/2008	**FIGURE 4**
	REVIEW	JS		



PROJECT	ECFAS PHASE II MODEL			
TITLE	ELEVATION OF THE TOP OF THE UFA			
Golder Associates	PROJECT No. 073-82536			FILE No. ECFAS II
	DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
	GIS/CADD	CJB	2/01/2008	FIGURE 5
	CHECK	GMP	2/02/2008	
	REVIEW	JS		



LEGEND

- Water body
- County boundary
- Canals/rivers
- Major roads
- Top of MFAS Contour

PROJECT	ECFAS PHASE II MODEL
TITLE	ELEVATION OF THE TOP OF THE APPZ

PROJECT No.	073-82536		FILE No. ECFAS II
DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
GIS/CADD	CJB	2/01/2008	
CHECK	GMP	2/02/2008	FIGURE 6
REVIEW	JS		

Golder Associates

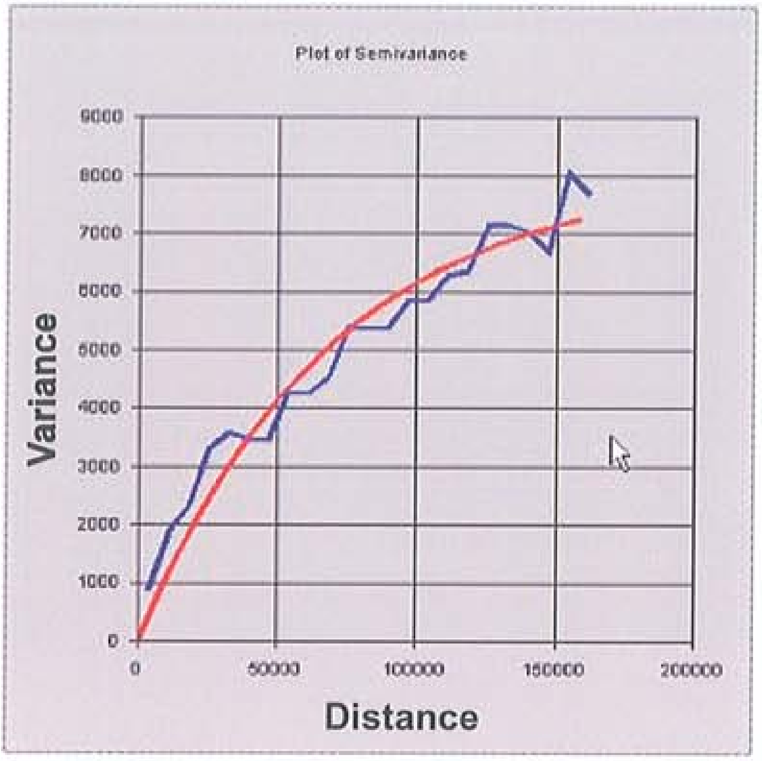
Series		Geologic Unit		Lithology	Hydrogeologic unit		Approximate thickness (feet)
HOLOCENE TO PLIOCENE		UNDIFFERENTIATED		Quartz sand, silt, clay, and shell	SURFICIAL AQUIFER SYSTEM	WATER-TABLE / BISCAYNE AQUIFER	20-300
		TAMIAMI FORMATION		Silt, sandy clay, micritic limestone, sandy, shelly limestone, calcareous sandstone, and quartz sand		CONFINING BEDS LOWER TAMIAMI AQUIFER	
MIOCENE AND LATE OLIGOCENE		HAWTHORN GROUP	PEACE RIVER FORMATION	Interbedded sand, silt, gravel, clay, carbonate, and phosphatic sand	INTERMEDIATE AQUIFER SYSTEM OR CONFINING UNIT	CONFINING UNIT SANDSTONE AQUIFER CONFINING UNIT	250-750
			ARCADIA FORMATION	Sandy micritic limestone, marlstone, shell beds, dolomite,phosphatic sand and carbonate, sand, silt, and clay		MID-HAWTHORN AQUIFER CONFINING UNIT	
					FLORIDAN AQUIFER SYSTEM	LOWER HAWTHORN PRODUCING ZONE	0-300
EARLY OLIGOCENE		SUWANNEE LIMESTONE		Fossiliferous, calcarenitic limestone		UPPER FLORIDAN AQUIFER (UF)	100-700
EOCENE	LATE	OCALA LIMESTONE		Chalky to fossiliferous, calcarenitic limestone		MIDDLE CONFINING UNIT	500-1,300
	MIDDLE	AVON PARK FORMATION		Fine-grained, micritic to fossiliferous limestone, dolomitic limestone, dolostone, and anhydrite/ gypsum		APPZ	0-400
		?				LOWER FLORIDAN AQUIFER LF1	1,400-1,800
	EARLY	OLDSMAR FORMATION				BZ	200-700
PALEOCENE		CEDAR KEYS FORMATION		Dolomite and dolomitic limestone			
				Massive anhydrite beds		SUB-FLORIDAN CONFINING UNIT	1,200?

Source: Reese and Richardson (2004)

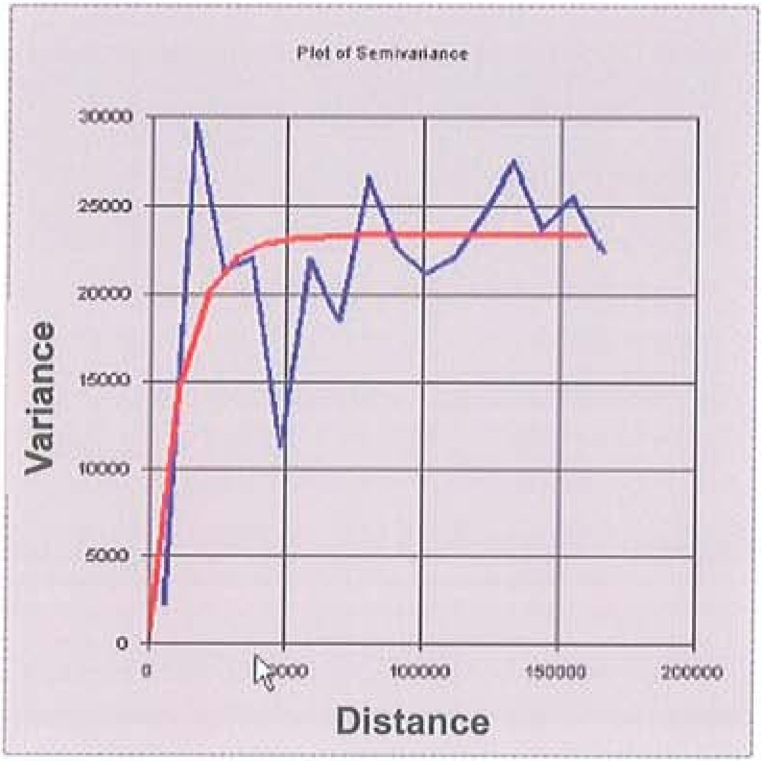
PROJECT	ECFAS PHASE II MODEL
TITLE	**HYDROGEOLOGIC CORRELATION CHART USED FOR THIS STUDY**

Golder Associates

PROJECT No.	073-82536		FILE No. ECFAS II
DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
GIS/CADD	CJB	2/01/2008	**FIGURE 7**
CHECK	GMP	2/01/2008	
REVIEW	JS	10/14/08	



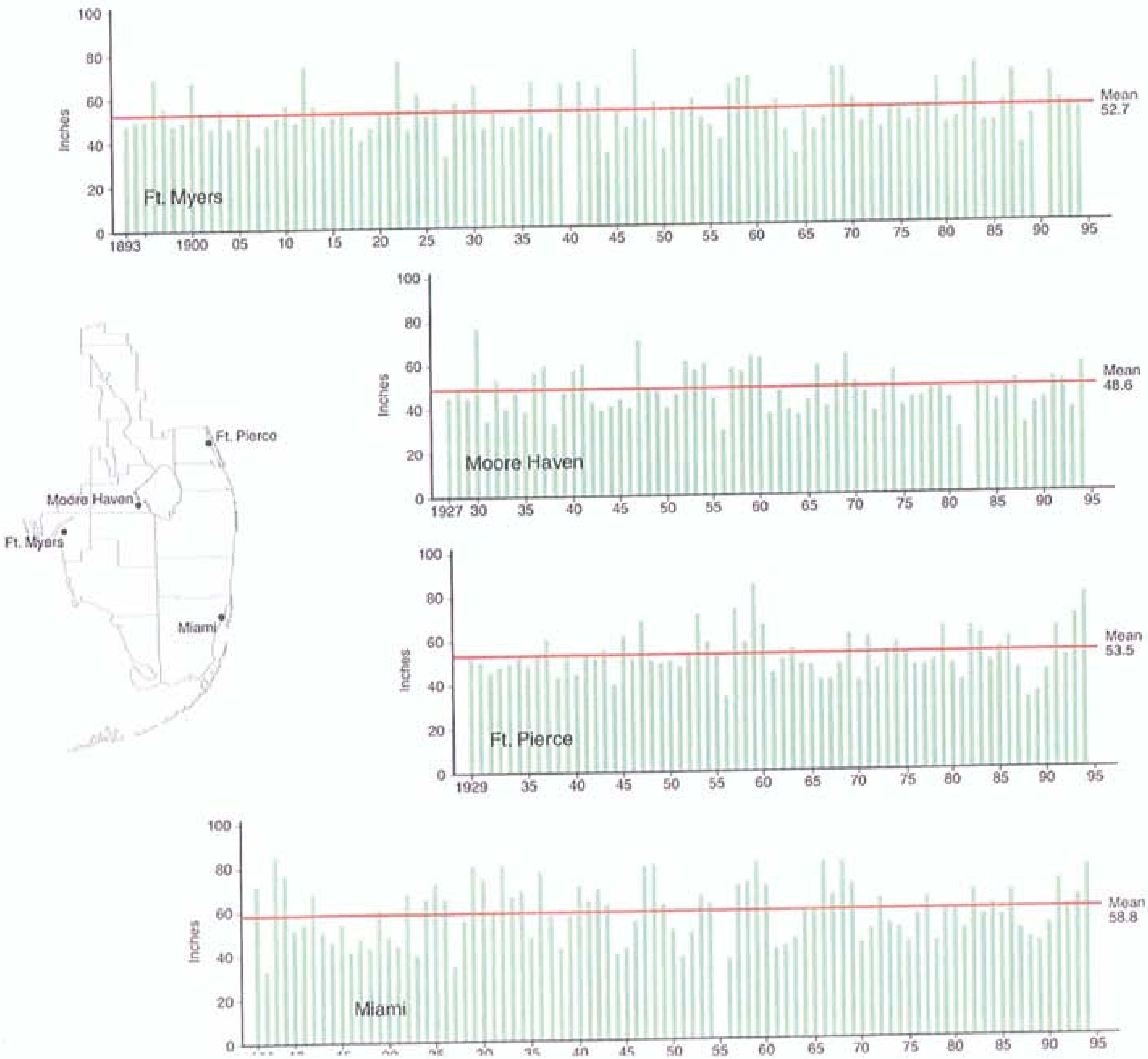
UFA uncertainty



APPZ uncertainty

Source: Reese and Richardson (2004)

PROJECT	ECFAS PHASE II MODEL			
TITLE	SEMI-VARIOGRAMS OF UFA AND APPZ SURFACE ELEV MODELS			
Golder Associates	PROJECT No. 073-82536			FILE No. ECFAS II
	DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. 0
	GIS/CADD	CJB	2/01/2008	
	CHECK	GMP	2/01/2008	FIGURE 8
	REVIEW	JS	10/14/08	



LEGEND

County boundary

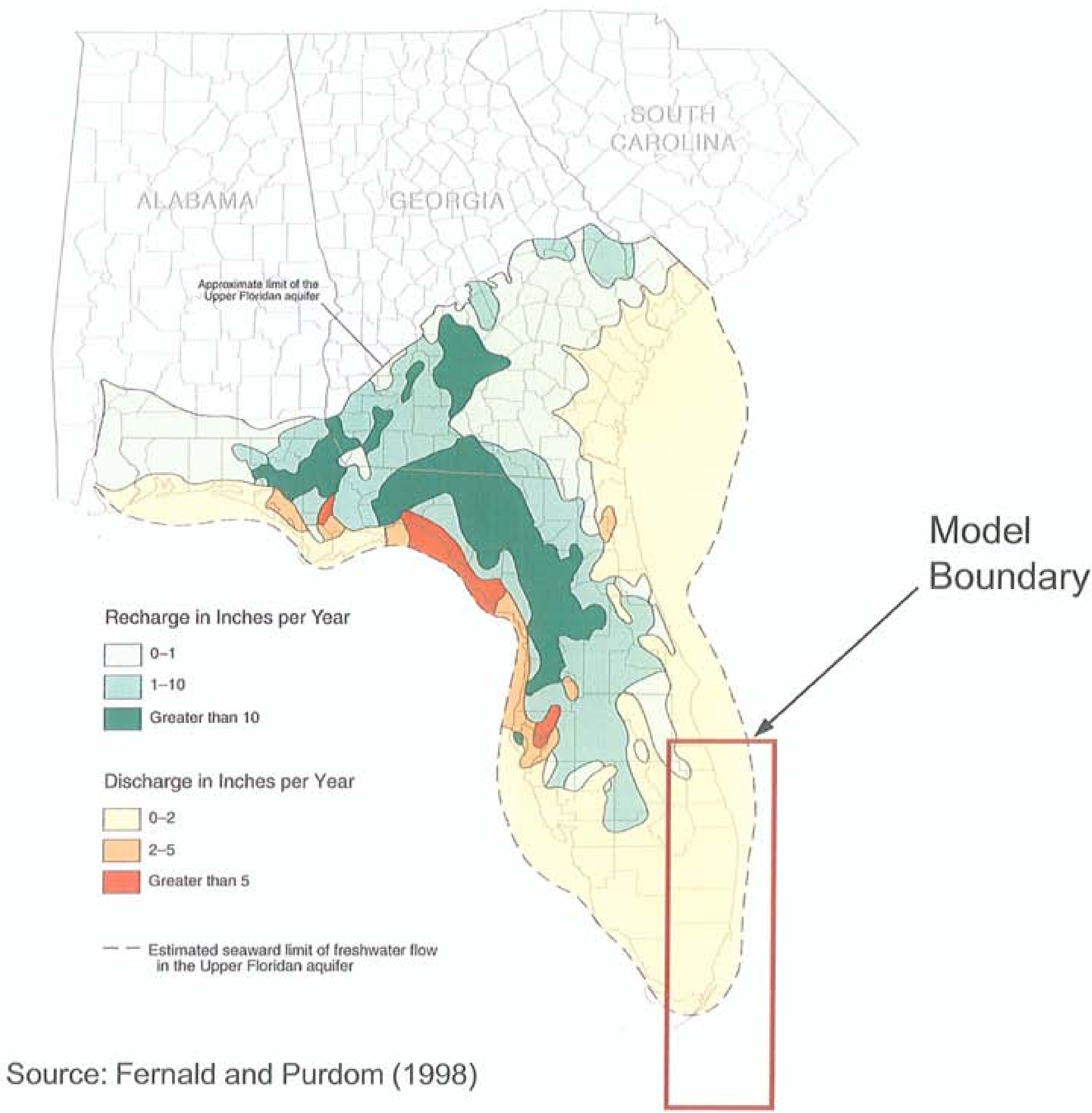
Source: Fernald and Purdom (1998)

PROJECT	ECFAS PHASE II MODEL		
TITLE	**ANNUAL PRECIPITATION IN STUDY AREA**		
PROJECT No.	073-82536	FILE No.	ECFAS II
DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
GIS/CADD	CJB	2/01/2008	
CHECK	GMP	2/01/2008	**FIGURE 9**
REVIEW	JS	10/14/08	

Golder Associates

Recharge and Discharge

Upper Floridan Aquifer



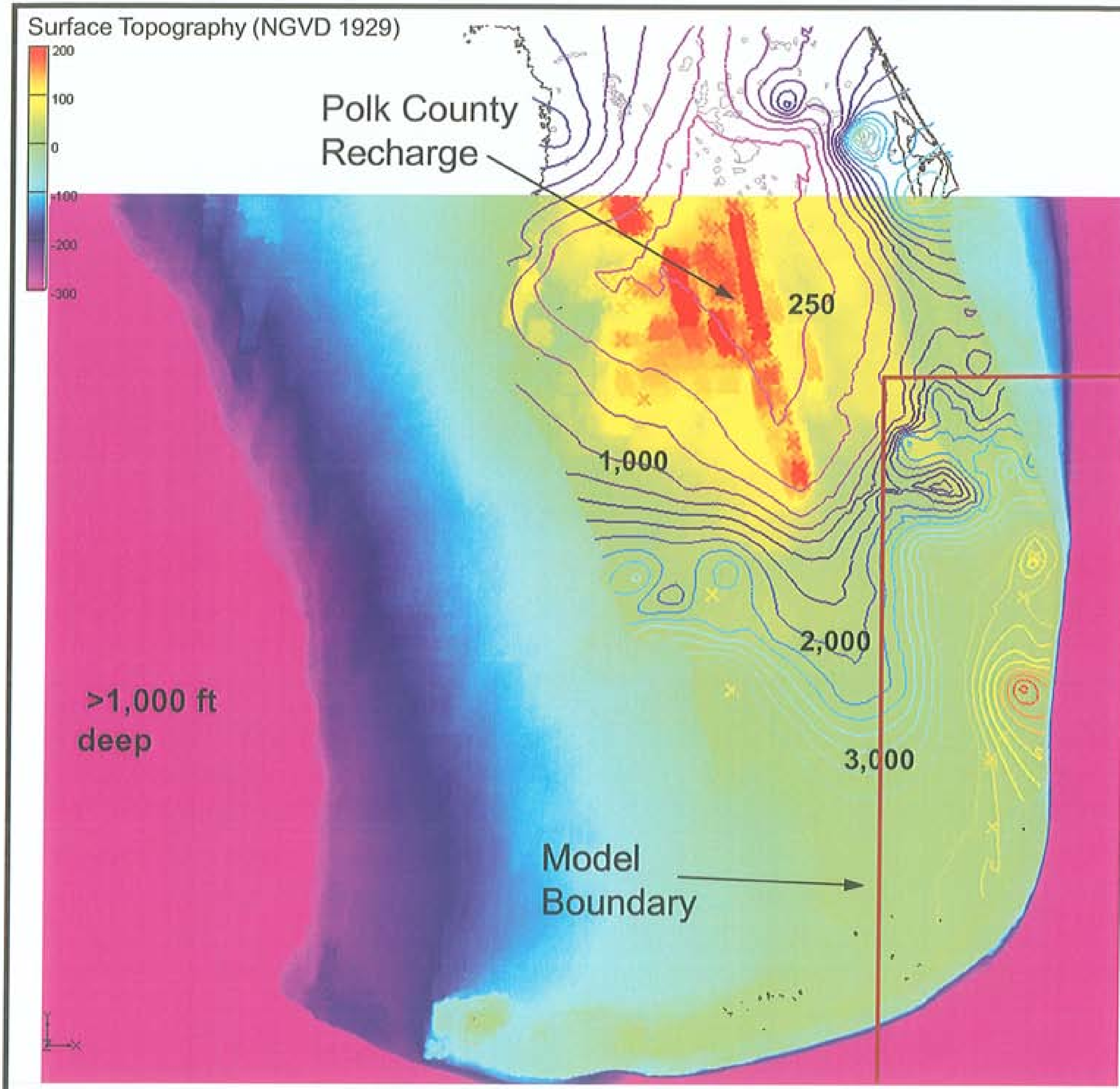
Not to Scale

LEGEND

- Water body
- County boundary

PROJECT	ECFAS PHASE II MODEL			
TITLE	**RECHARGE TO AND FROM THE UFA to the SAS**			
PROJECT No.	073-82536		FILE No. ECFAS II	
DESIGN	CJB	2/01/2008	SCALE AS SHOWN	REV. O
GIS/CADD	CJB	2/01/2008		
CHECK	GMP	2/01/2008	**FIGURE 10**	
REVIEW	JS	10/14/08		

Golder Associates



Source: USACE (2004)

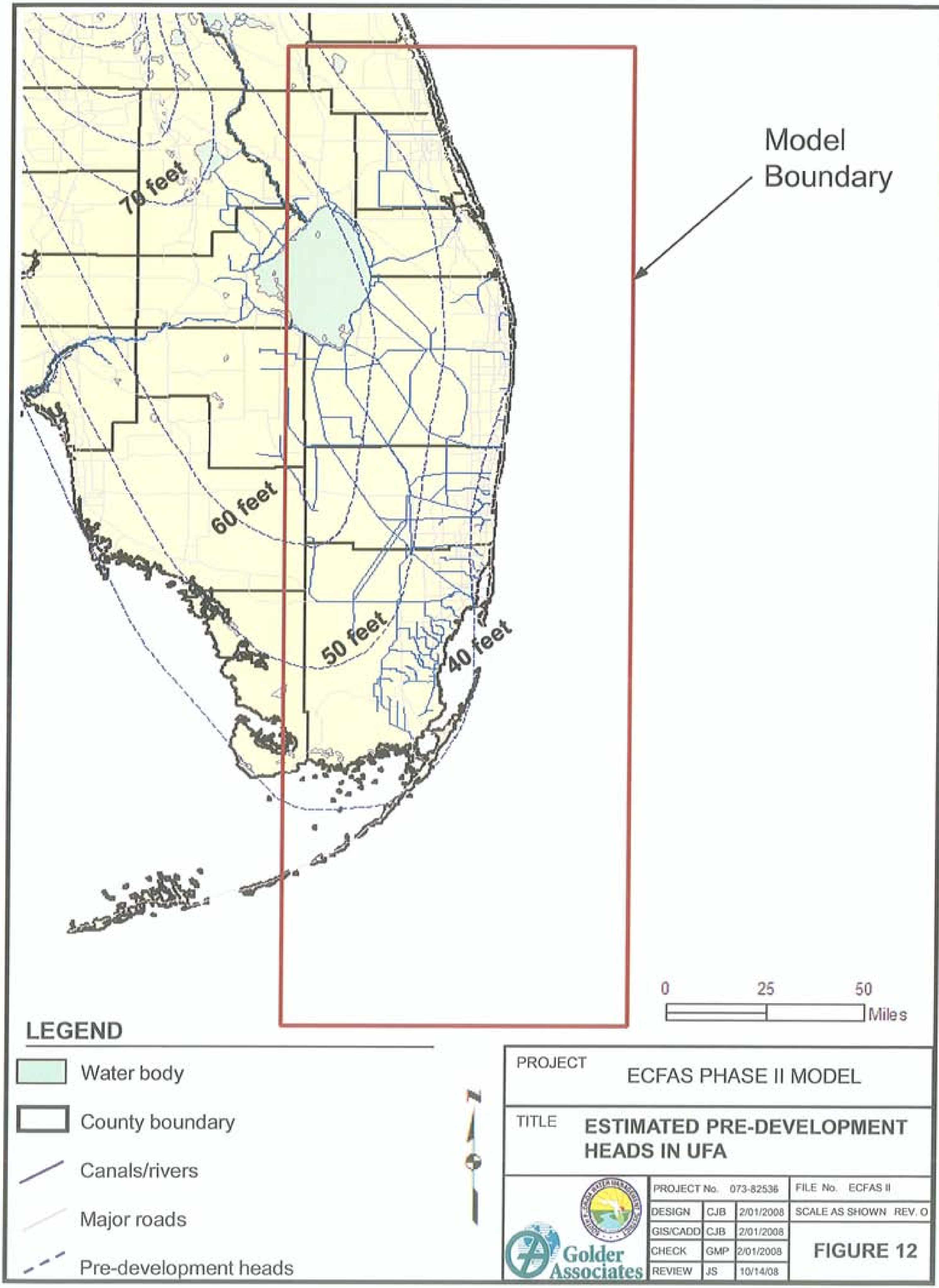
Not to Scale

LEGEND

- 250 mg/l Total Dissolved Solids (TDS)
- 1,000 mg/l TDS
- 3,000 mg/l TDS

** Topography as shown on legend bar At top left hand side of figure

PROJECT	ECFAS PHASE II MODEL			
TITLE	ESTIMATED TDS CONCENTRATION IN UFA AT RECHARGE AREA AND DOWNGRADIENT			
Golder Associates	PROJECT No. 073-82536			FILE No. ECFAS II
	DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
	GIS/CADD	CJB	2/01/2008	
	CHECK	GMP	2/01/2008	FIGURE 11
	REVIEW	JS	10/14/08	

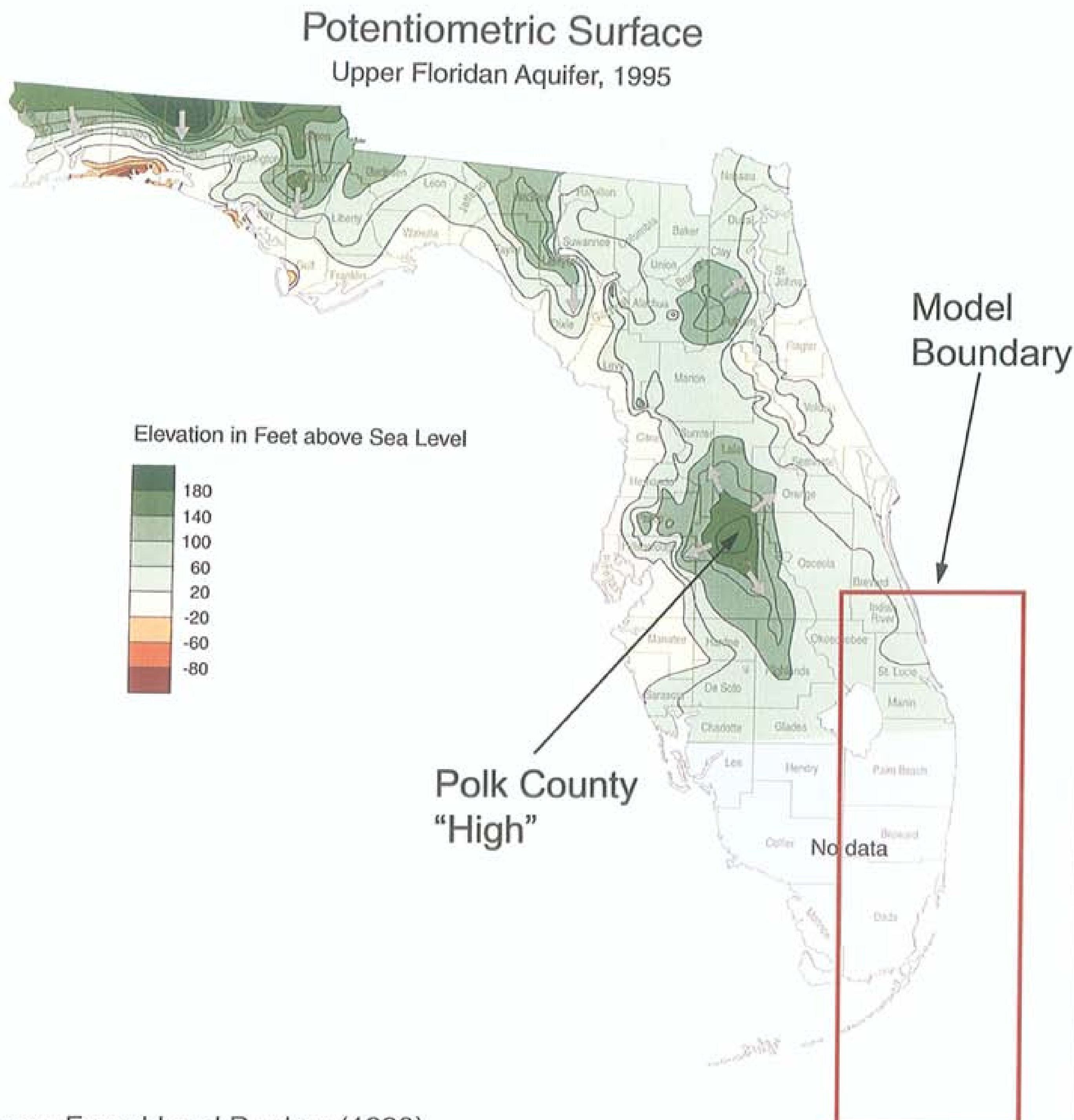


PROJECT: ECFAS PHASE II MODEL

TITLE: **ESTIMATED PRE-DEVELOPMENT HEADS IN UFA**

Golder Associates

PROJECT No. 073-82536			FILE No. ECFAS II
DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
GIS/CADD	CJB	2/01/2008	**FIGURE 12**
CHECK	GMP	2/01/2008	
REVIEW	JS	10/14/08	



Source: Fernald and Purdom (1998)

Not to Scale

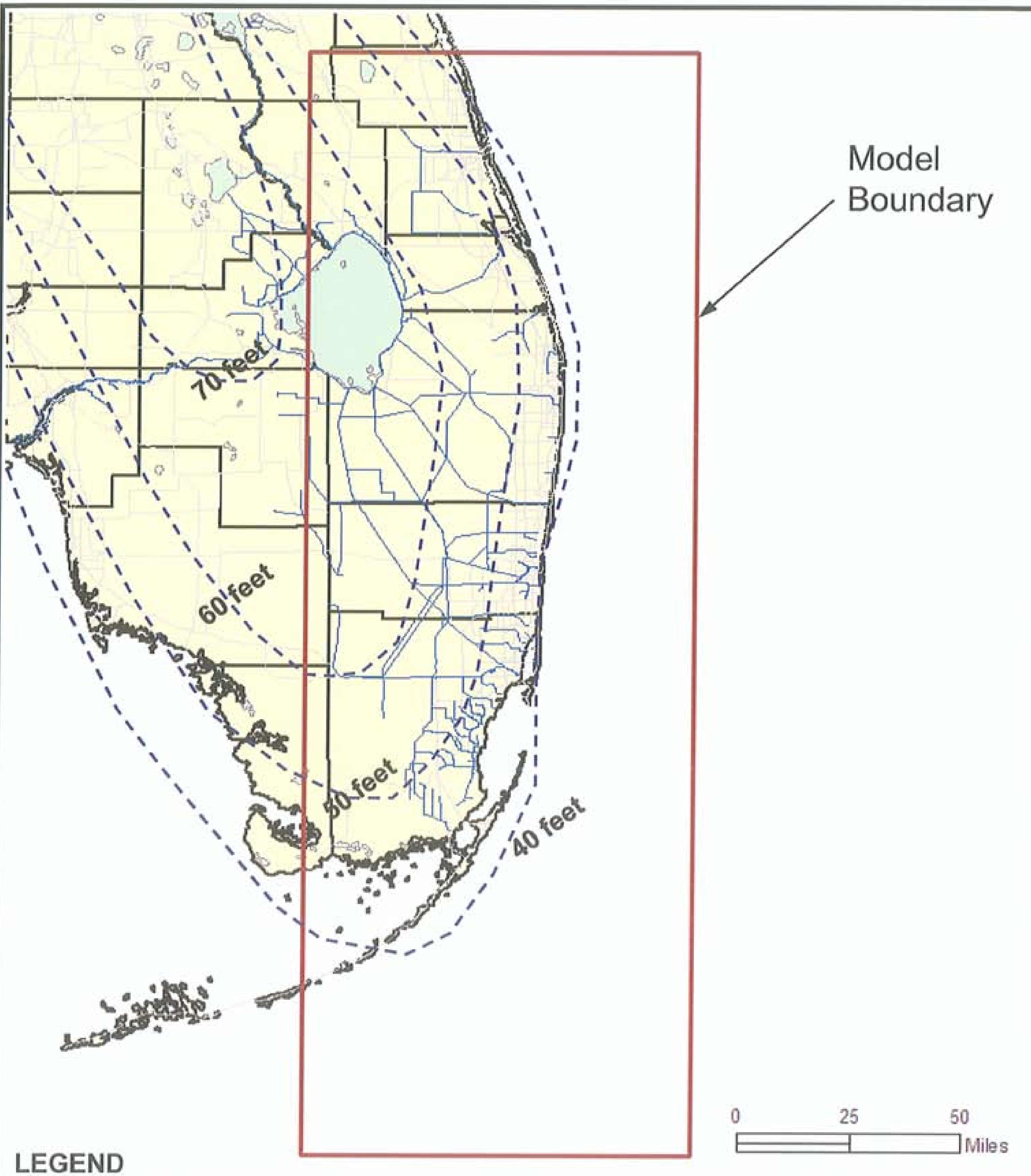
LEGEND

Water body

County boundary

PROJECT	ECFAS PHASE II MODEL			
TITLE	**UFA POTENTIOMETRIC SURFACE 1995**			
PROJECT No.	073-82536		FILE No. ECFAS II	
DESIGN	CJB	2/01/2008	SCALE AS SHOWN	REV. O
GIS/CADD	CJB	2/01/2008	**FIGURE 13**	
CHECK	GMP	2/01/2008		
REVIEW	JS	10/14/08		

Golder Associates



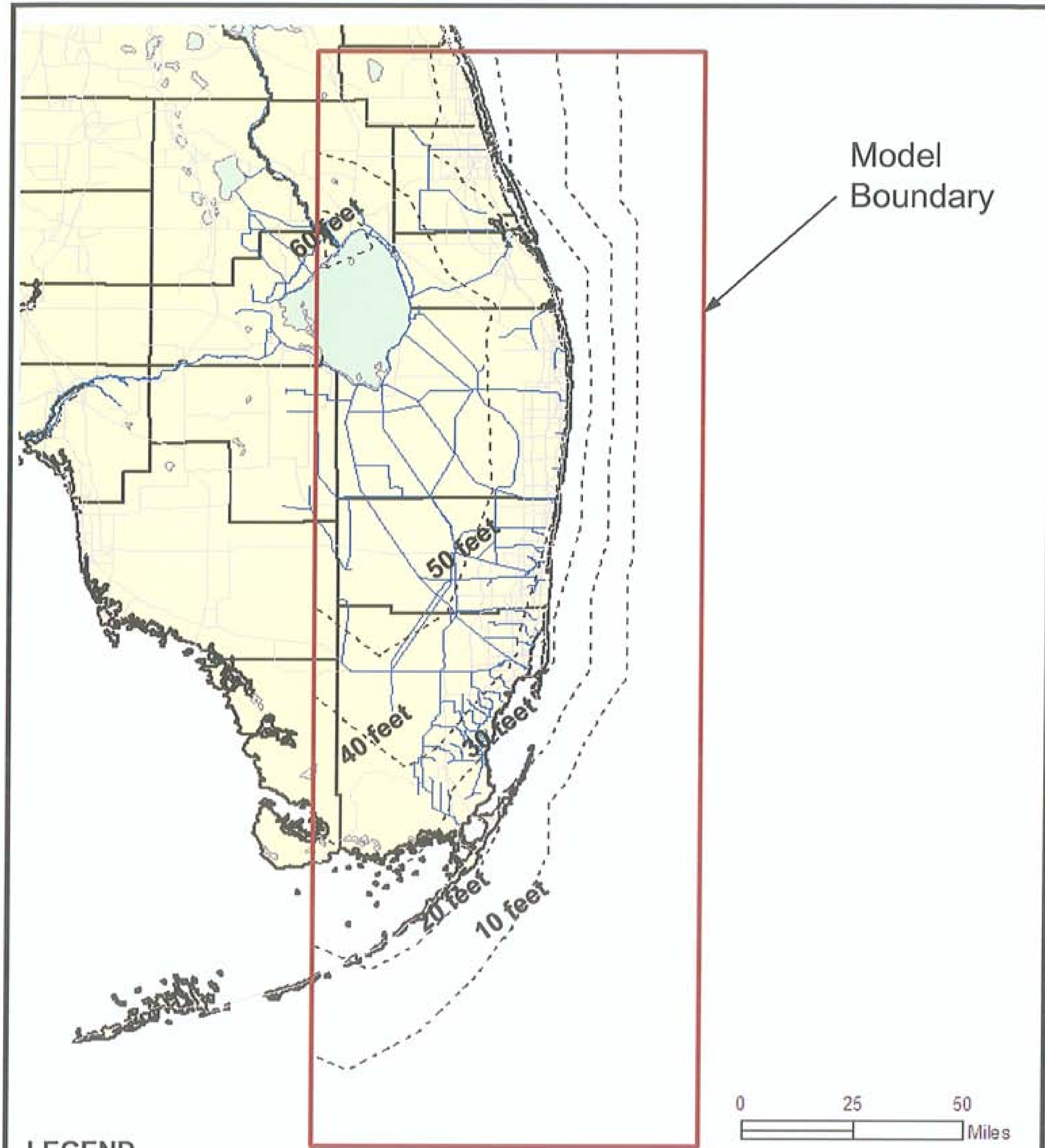
LEGEND

- Water body
- County boundary
- Canals/rivers
- Major roads
- Pre-development heads

PROJECT	ECFAS PHASE II MODEL
TITLE	**ESTIMATED PRE-DEVELOPMENT HEADS IN APPZ**

Golder Associates

PROJECT No.	073-82536		FILE No. ECFAS II
DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
GIS/CADD	CJB	2/01/2008	
CHECK	GMP	2/01/2008	**FIGURE 14**
REVIEW	JS	10/14/08	

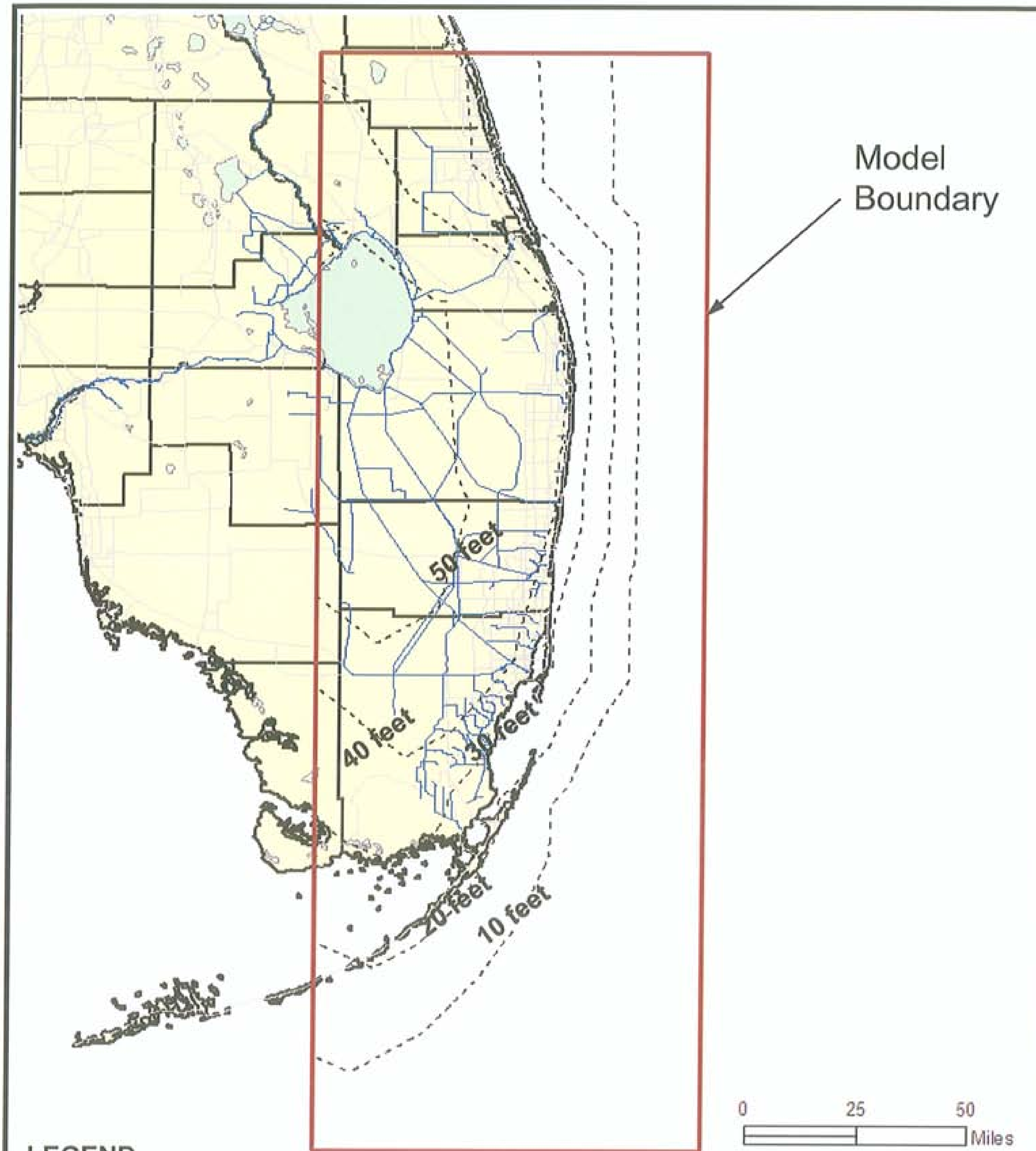


LEGEND

- Water body
- County boundary
- Canals/rivers
- Major roads
- Water Levels

PROJECT	ECFAS PHASE II MODEL			
TITLE	**UFA WATER LEVELS IN DECEMBER 1999**			
PROJECT No. 073-82536			FILE No. ECFAS II	
DESIGN	CJB	2/01/2008	SCALE AS SHOWN	REV. O
GIS/CADD	CJB	2/01/2008	**FIGURE 15**	
CHECK	GMP	2/01/2008		
REVIEW	JS	10/14/08		

Golder Associates

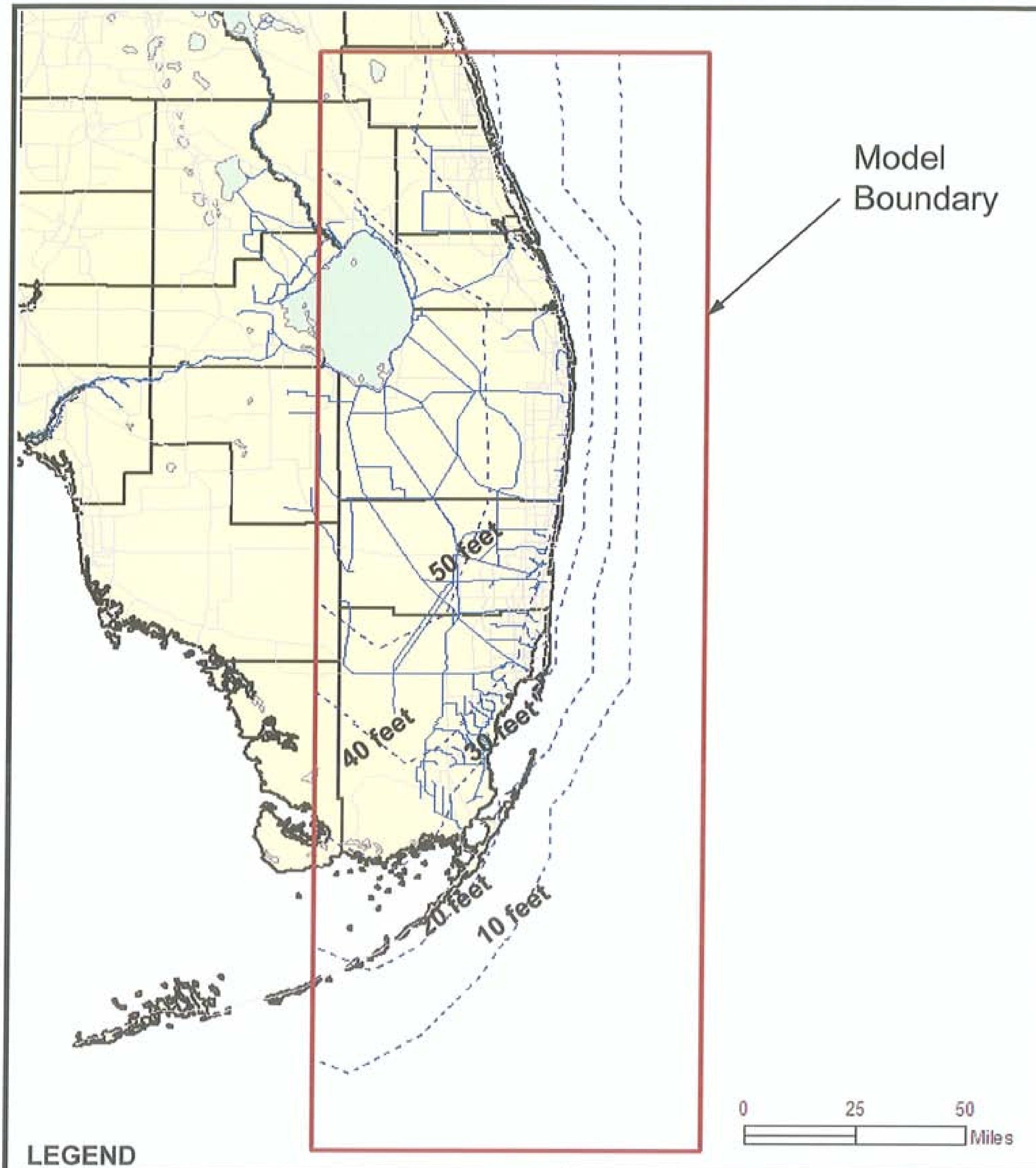


LEGEND

- Water body
- County boundary
- Canals/rivers
- Major roads
- Water Levels

PROJECT	ECFAS PHASE II MODEL		
TITLE	UFA WATER LEVELS IN DECEMBER 2000		
PROJECT No. 073-82536			FILE No. ECFAS II
DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
GIS/CADD	CJB	2/01/2008	
CHECK	GMP	2/01/2008	FIGURE 16
REVIEW	JS	10/14/08	

Golder Associates

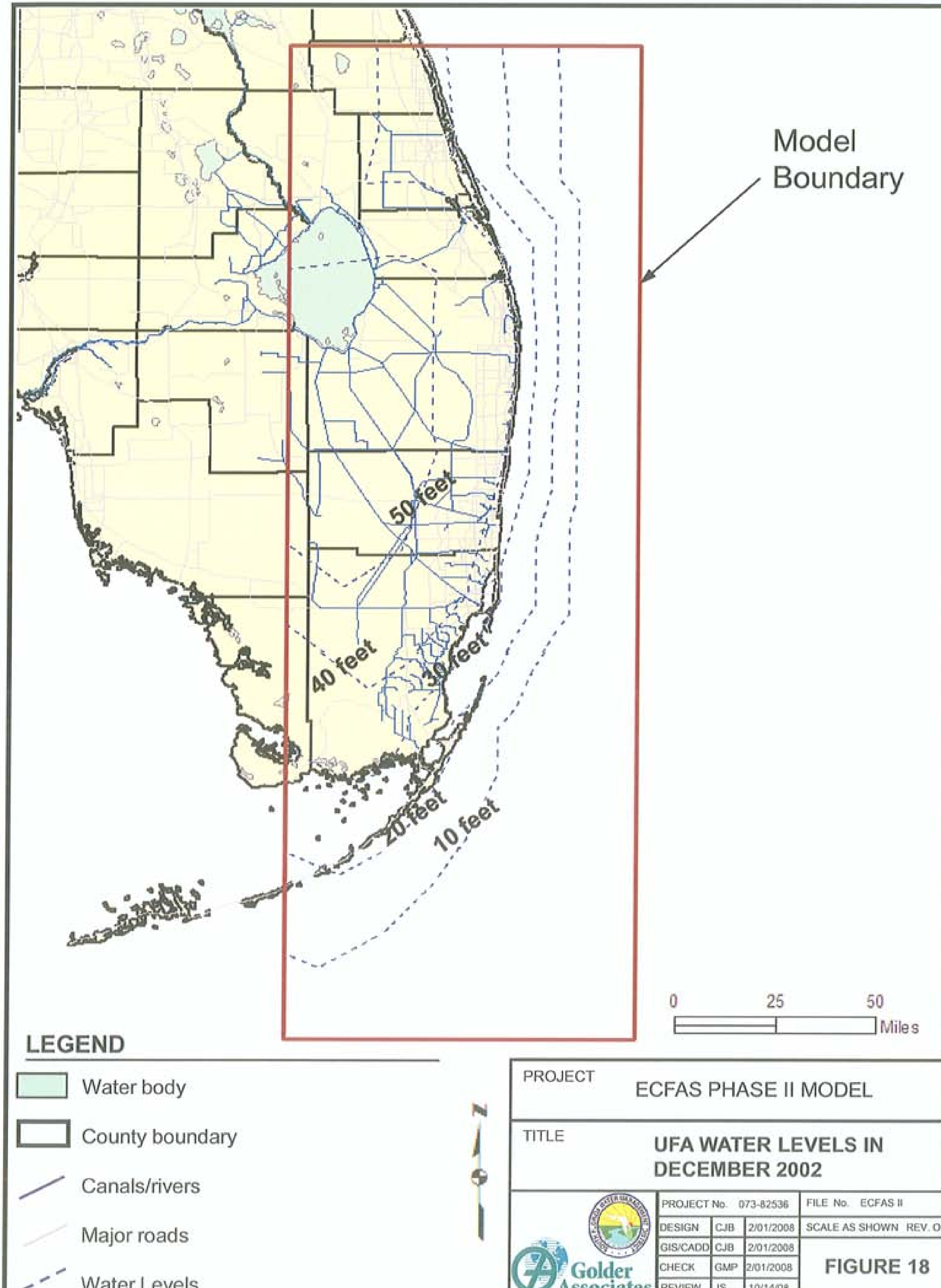


LEGEND

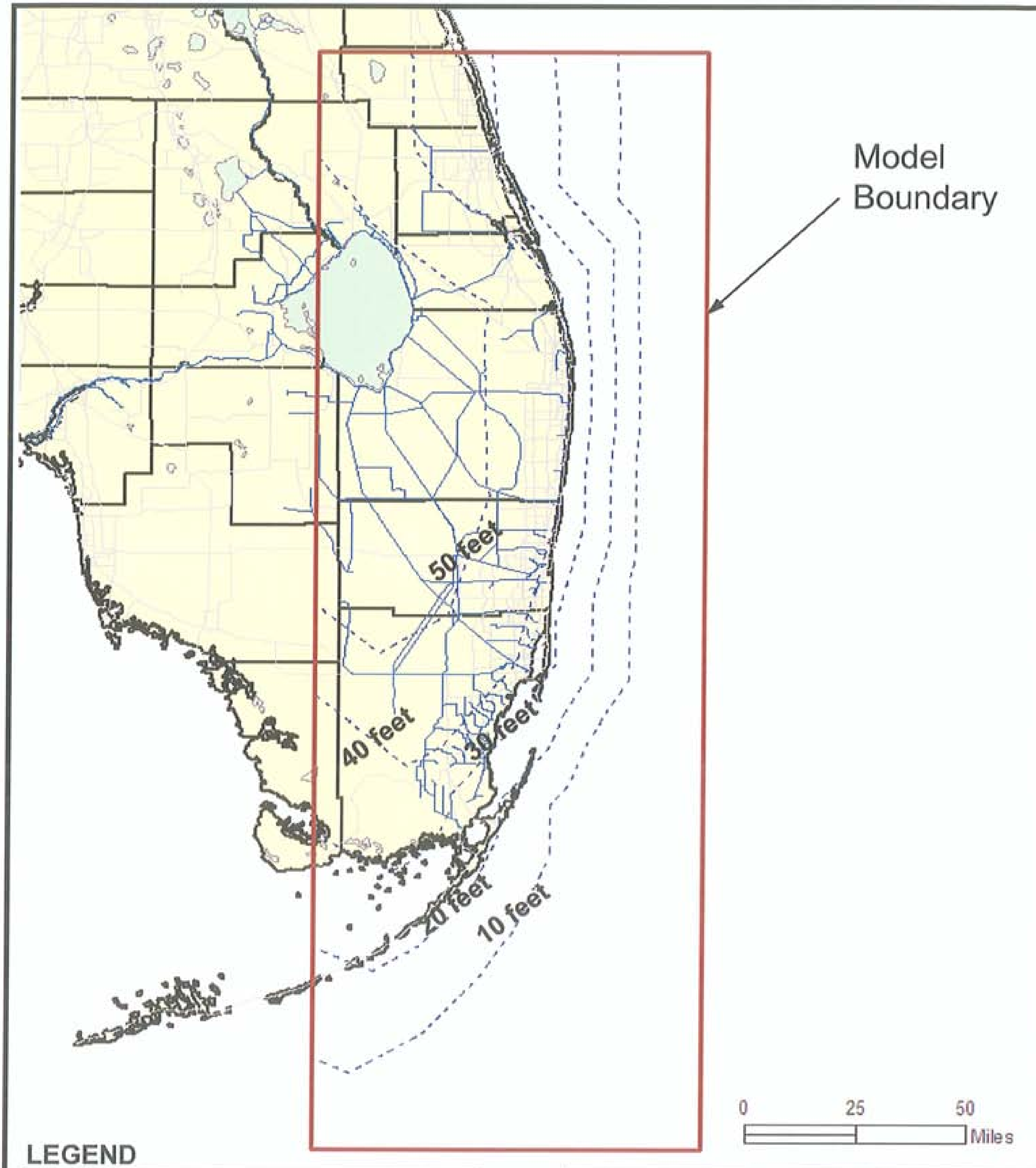
- Water body
- County boundary
- Canals/rivers
- Major roads
- Water Levels

PROJECT	ECFAS PHASE II MODEL			
TITLE	**UFA WATER LEVELS IN DECEMBER 2001**			
PROJECT No. 073-82536			FILE No. ECFAS II	
DESIGN	CJB	2/01/2008	SCALE AS SHOWN	REV. O
GIS/CADD	CJB	2/01/2008	**FIGURE 17**	
CHECK	GMP	2/01/2008		
REVIEW	JS	10/14/08		

Golder Associates



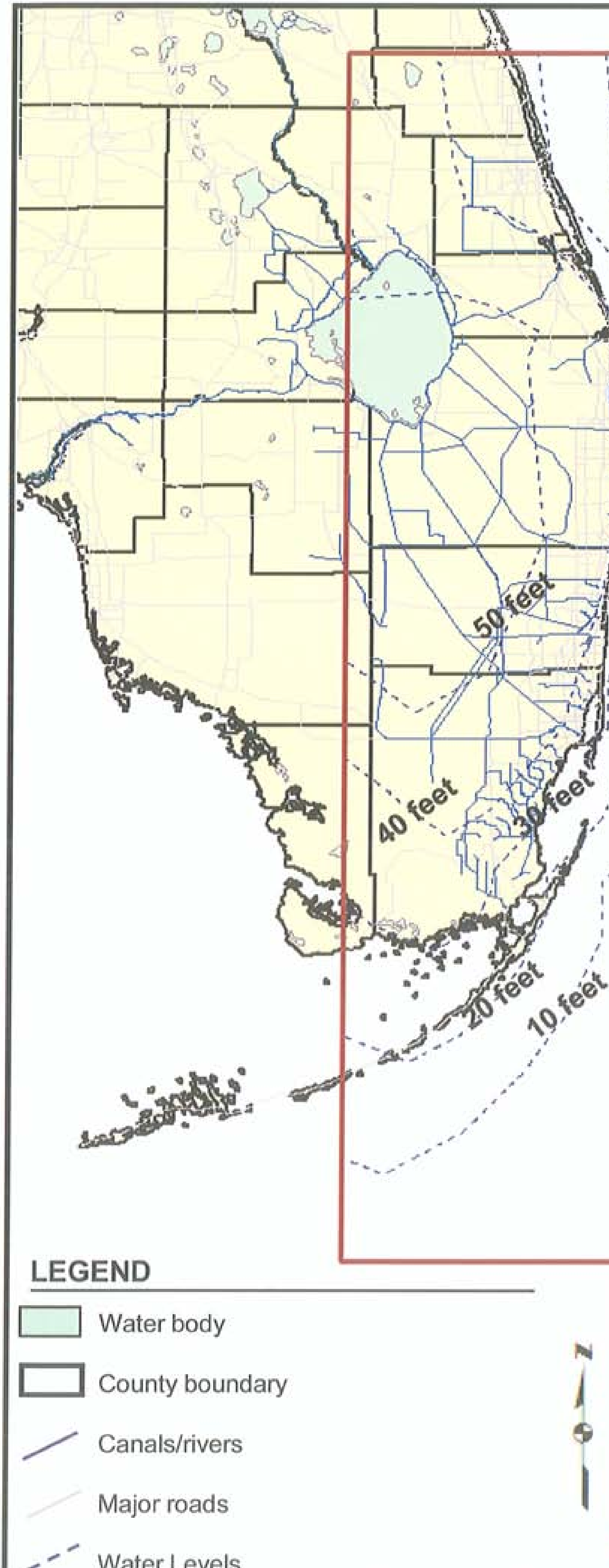
Model Boundary
50 feet
40 feet
30 feet
20 feet
10 feet
0
25
50
Miles
LEGEND
Water body
County boundary
Canals/rivers
Major roads
Water Levels
N
PROJECT
ECFAS PHASE II MODEL
TITLE
UFA WATER LEVELS IN DECEMBER 2002
Golder Associates
PROJECT No. 073-82536
FILE No. ECFAS II
DESIGN CJB 2/01/2008
SCALE AS SHOWN REV. O
GIS/CADD CJB 2/01/2008
CHECK GMP 2/01/2008
REVIEW JS 10/14/08
FIGURE 18



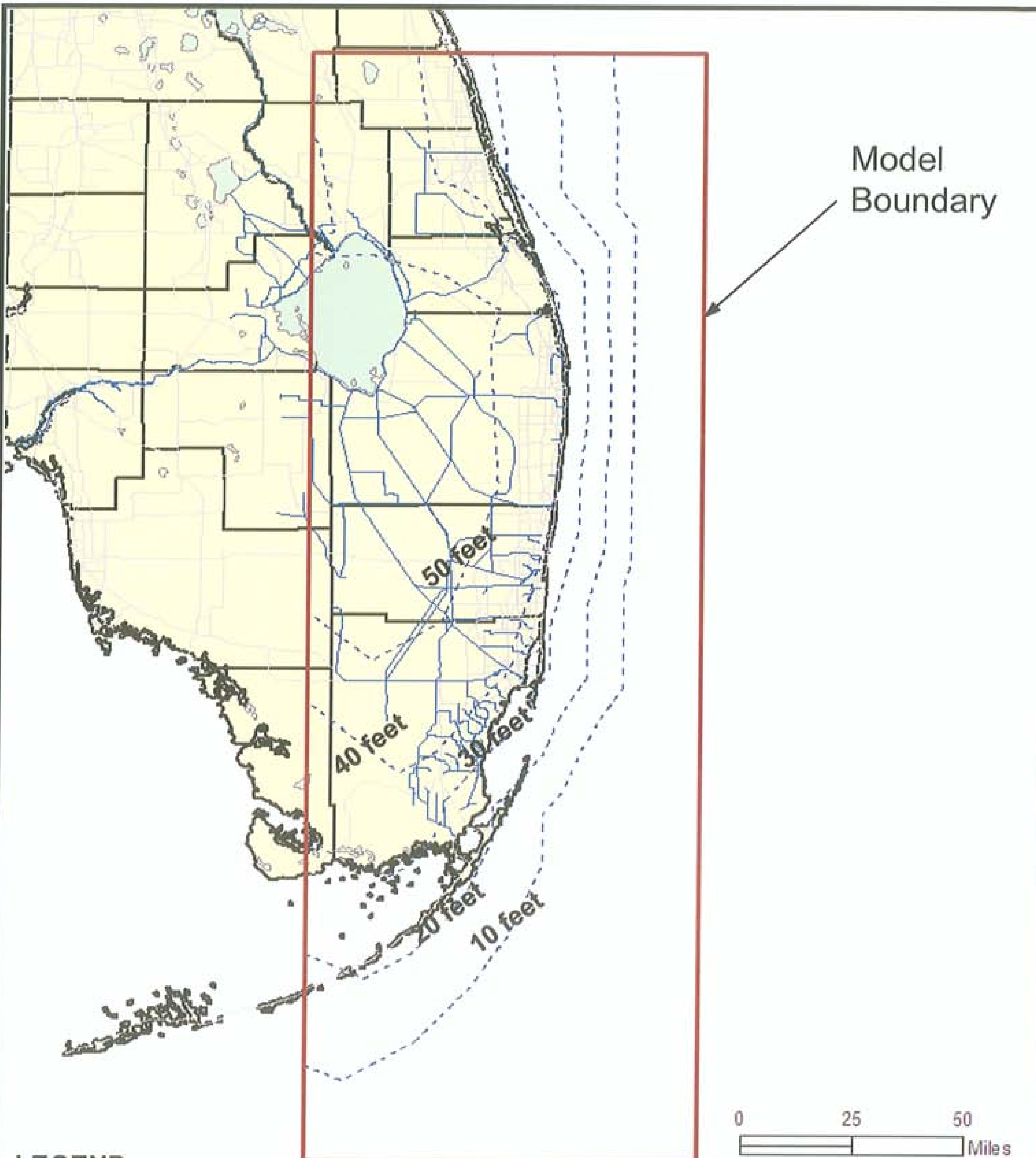
LEGEND

- Water body
- County boundary
- Canals/rivers
- Major roads
- Water Levels

PROJECT	ECFAS PHASE II MODEL			
TITLE	**UFA WATER LEVELS IN DECEMBER 2003**			
Golder Associates	PROJECT No. 073-82536			FILE No. ECFAS II
	DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
	GIS/CADD	CJB	2/01/2008	
	CHECK	GMP	2/01/2008	**FIGURE 19**
	REVIEW	JS	10/14/08	



PROJECT	ECFAS PHASE II MODEL			
TITLE	**UFA WATER LEVELS IN DECEMBER 2004**			
Golder Associates	PROJECT No.	073-82536		FILE No. ECFAS II
	DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
	GIS/CADD	CJB	2/01/2008	**FIGURE 20**
	CHECK	GMP	2/01/2008	
	REVIEW	JS	10/14/08	

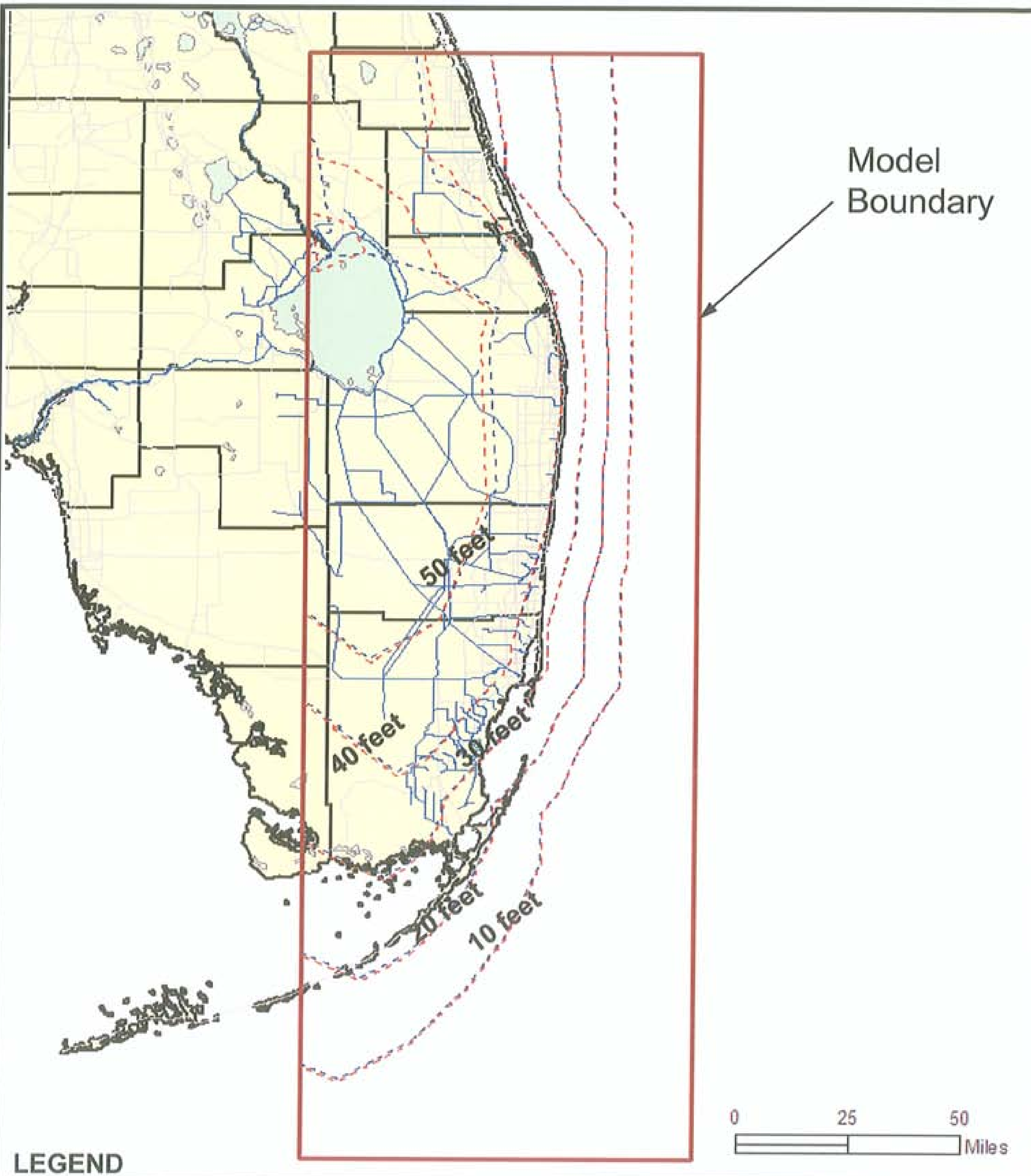


LEGEND

- Water body
- County boundary
- Canals/rivers
- Major roads
- Water Levels

PROJECT	ECFAS PHASE II MODEL			
TITLE	**UFA WATER LEVELS IN DECEMBER 2005**			
PROJECT No. 073-82536			FILE No. ECFAS II	
DESIGN	CJB	2/01/2008	SCALE AS SHOWN	REV. O
GIS/CADD	CJB	2/01/2008		
CHECK	GMP	2/01/2008	**FIGURE 21**	
REVIEW	JS	10/14/08		

Golder Associates

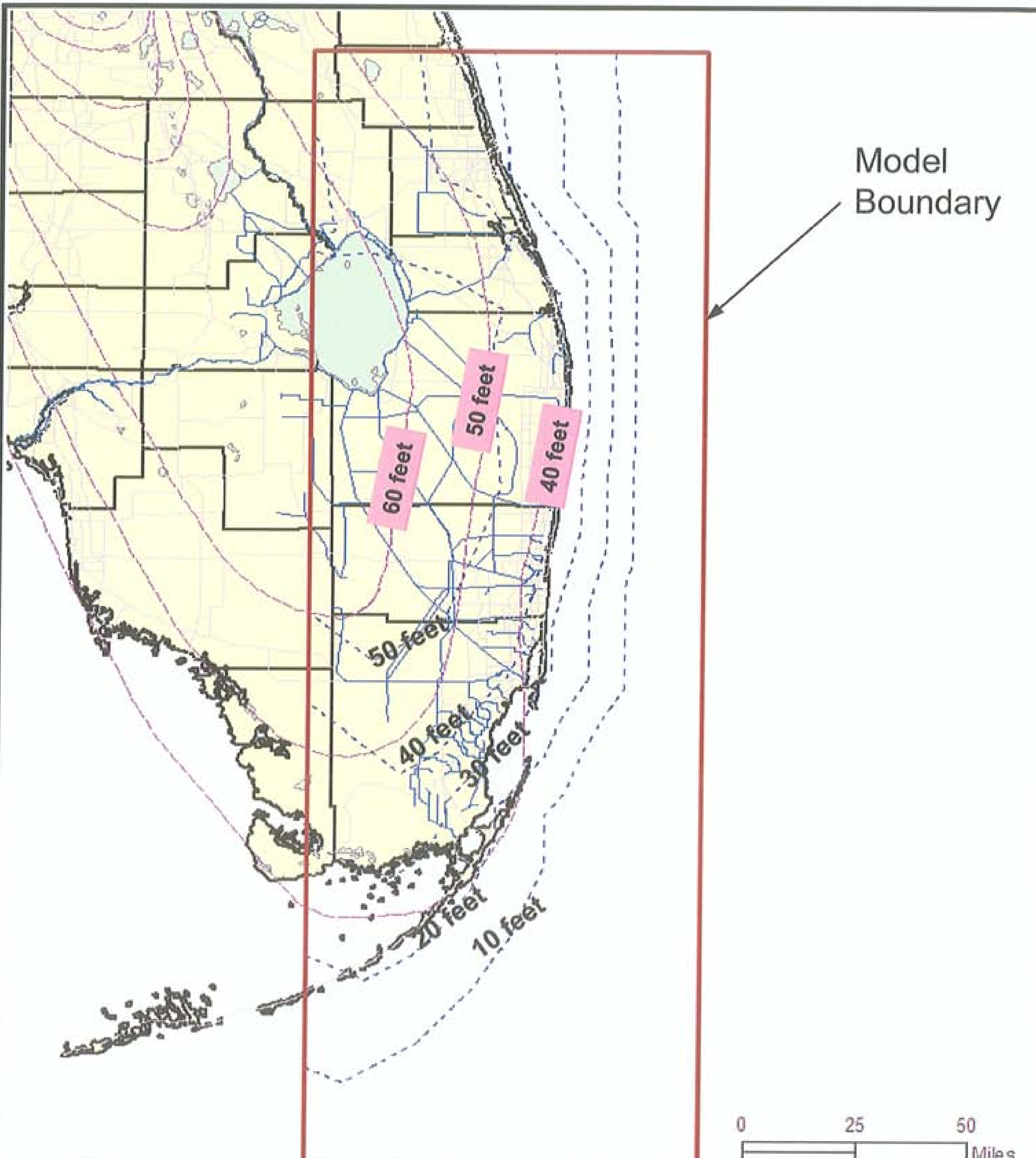


LEGEND

- Water body
- County boundary
- Canals/rivers
- Major roads
- Water Levels 1999/2005

PROJECT	ECFAS PHASE II MODEL		
TITLE	**UFA WATER LEVELS IN DECEMBER 1999 & 2005**		
PROJECT No. 073-82536			FILE No. ECFAS II
DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
GIS/CADD	CJB	2/01/2008	
CHECK	GMP	2/01/2008	**FIGURE 22**
REVIEW	JS	10/14/08	

Golder Associates

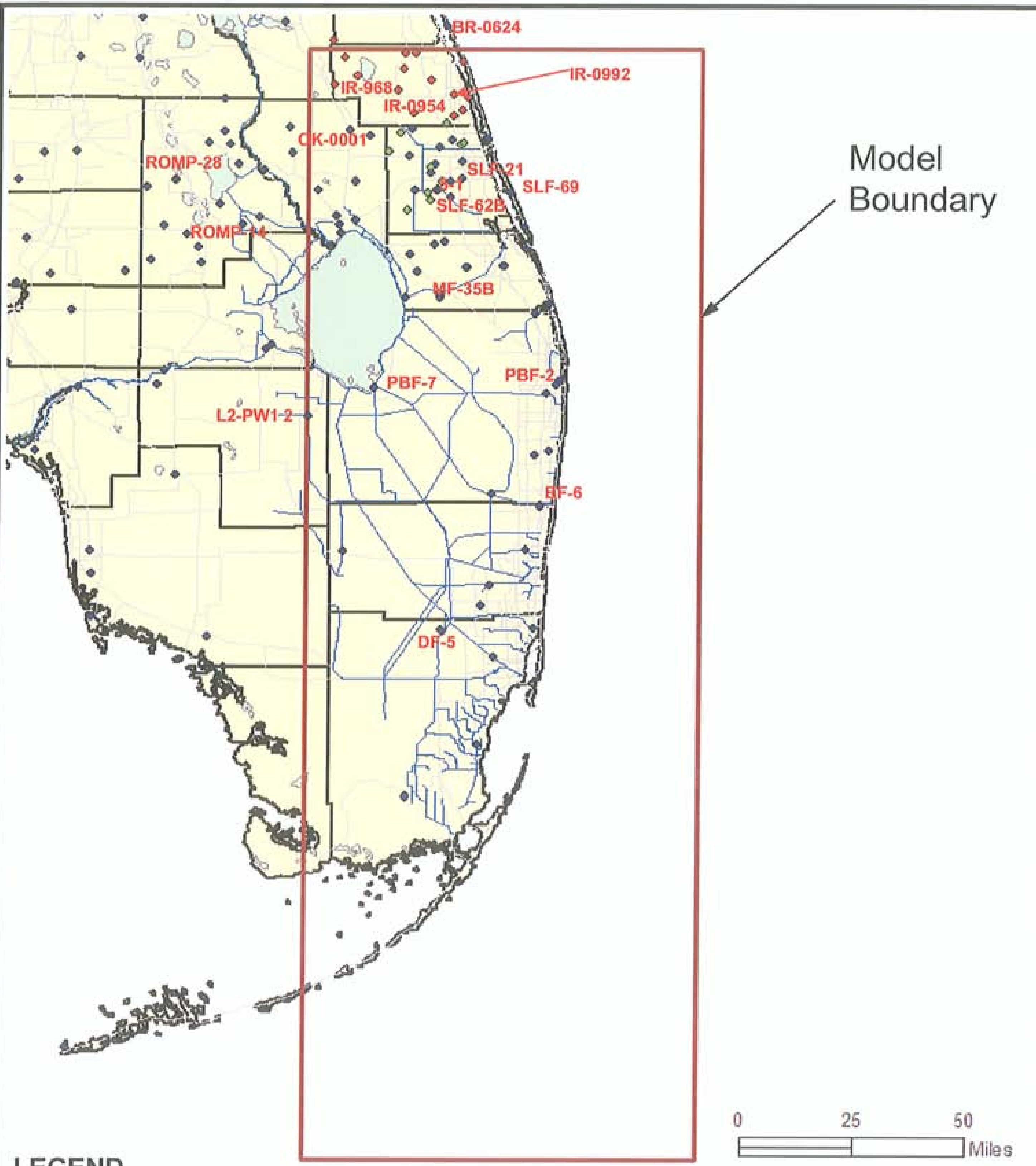


LEGEND

- Water body
- County boundary
- Canals/rivers
- Major roads
- Water Levels Pre-Development/2005

N

PROJECT	ECFAS PHASE II MODEL			
TITLE	**UFA WATER LEVELS IN PRE-DEVELOPMENT/DEC 2005**			
Golder Associates	PROJECT No.	073-82536		FILE No. ECFAS II
	DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
	GIS/CADD	CJB	2/01/2008	
	CHECK	GMP	2/01/2008	**FIGURE 23**
	REVIEW	JS	10/14/08	

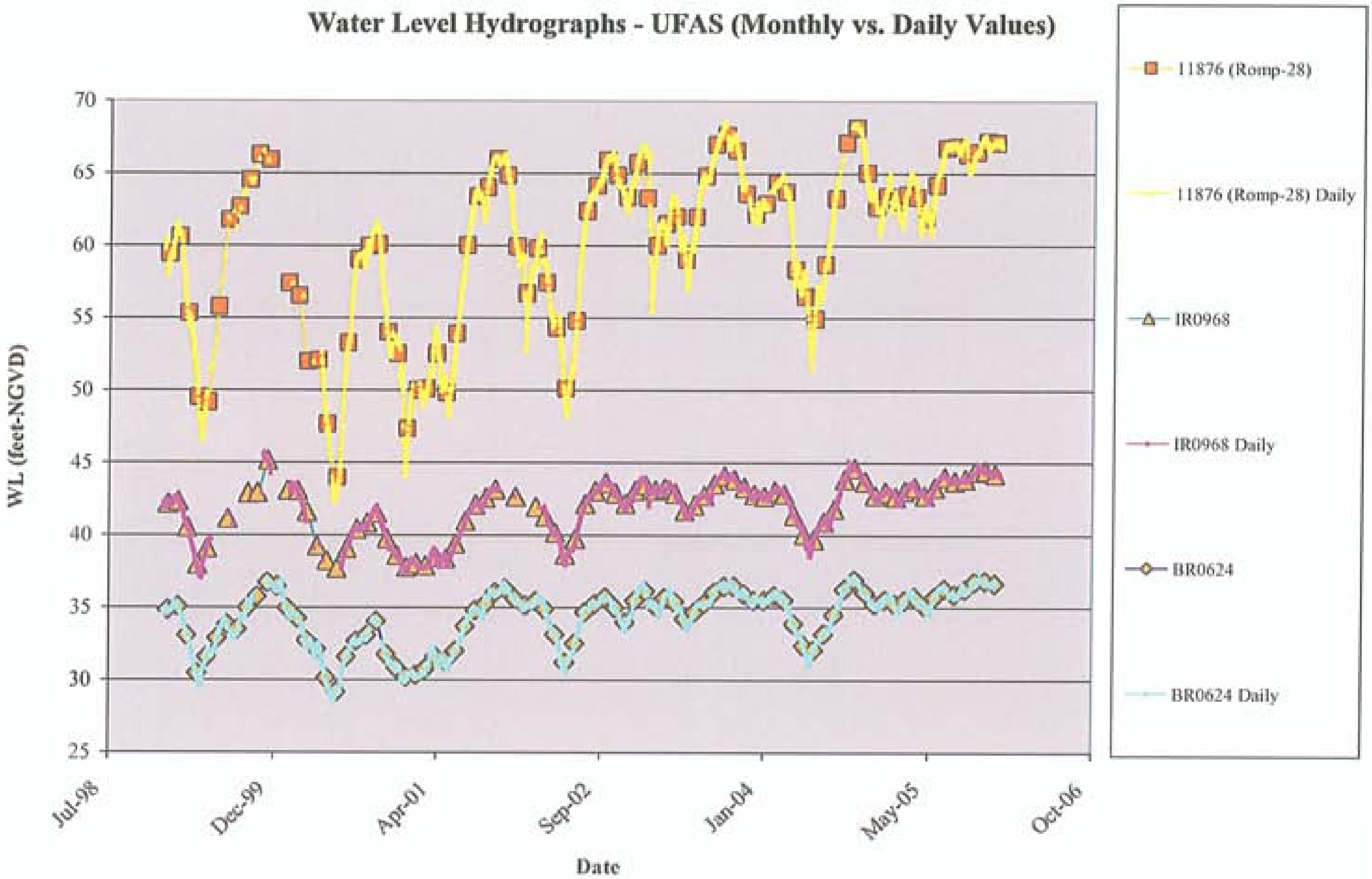


LEGEND

- Water body
- County boundary
- Canals/rivers
- Major roads
- SFWMD Database
- SJRWMD Database
- NRCS Data

PROJECT	ECFAS PHASE II MODEL			
TITLE	LOCATION OF WELLS WITH HYDROGRAPHS EVALUATED			
PROJECT No. 073-82536			FILE No. ECFAS II	
DESIGN	CJB	2/01/2008	SCALE AS SHOWN	REV. O
GIS/CADD	CJB	2/01/2008	FIGURE 24	
CHECK	GMP	2/01/2008		
REVIEW	JS	10/14/08		

Golder Associates



LEGEND

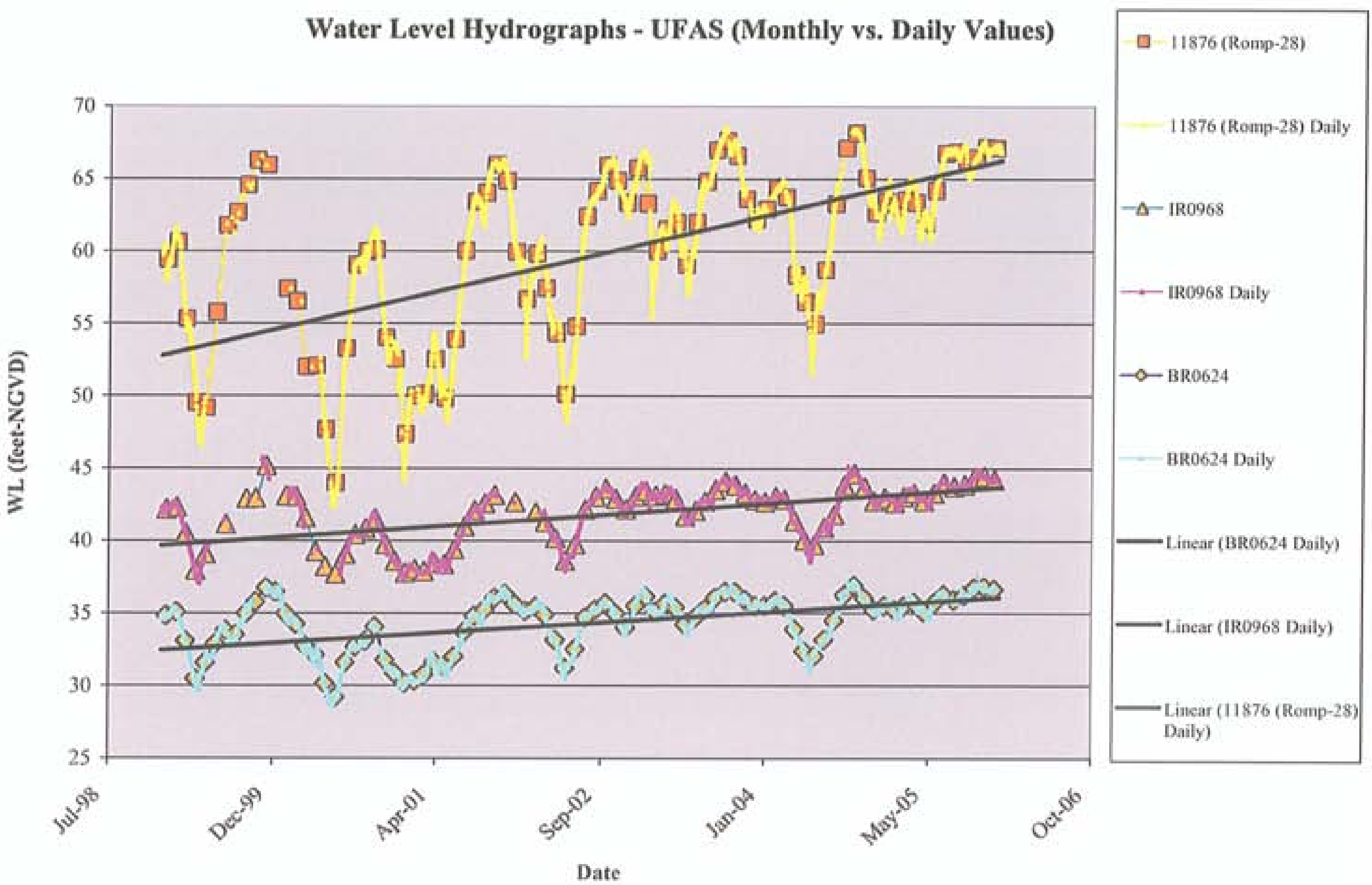
Daily water levels

Average monthly water levels

PROJECT	ECFAS PHASE II MODEL			
TITLE	UFA HYDROGRAPH – WELLS ROMP 28, BR0624, IR0968			
PROJECT No.	073-82536		FILE No. ECFAS II	
DESIGN	CJB	2/01/2008	SCALE AS SHOWN	REV. O
GIS/CADD	CJB	2/01/2008	FIGURE 25	
CHECK	GMP	2/01/2008		
REVIEW	JS	10/14/08		

Golder Associates

Upward regional trends north and northwest of the model study area



LEGEND

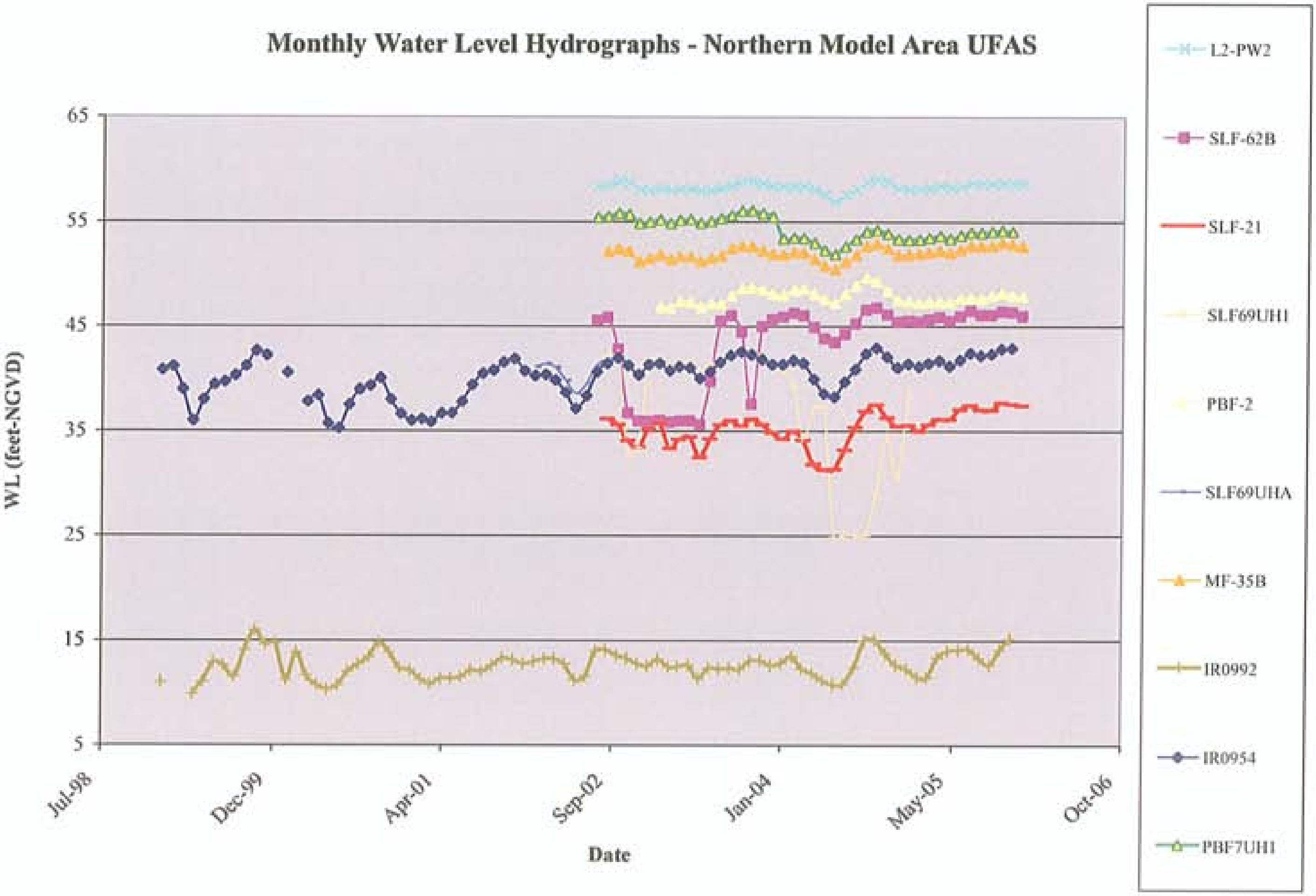
Daily water levels

Average monthly water levels

PROJECT	ECFAS PHASE II MODEL
TITLE	**UFA HYDROGRAPH WL TRENDS ROMP 28, BR0624, IR0968**

PROJECT No.	073-82536		FILE No. ECFAS II
DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
GIS/CADD	CJB	2/01/2008	
CHECK	GMP	2/01/2008	**FIGURE 26**
REVIEW	JS	10/14/08	

Golder Associates



LEGEND

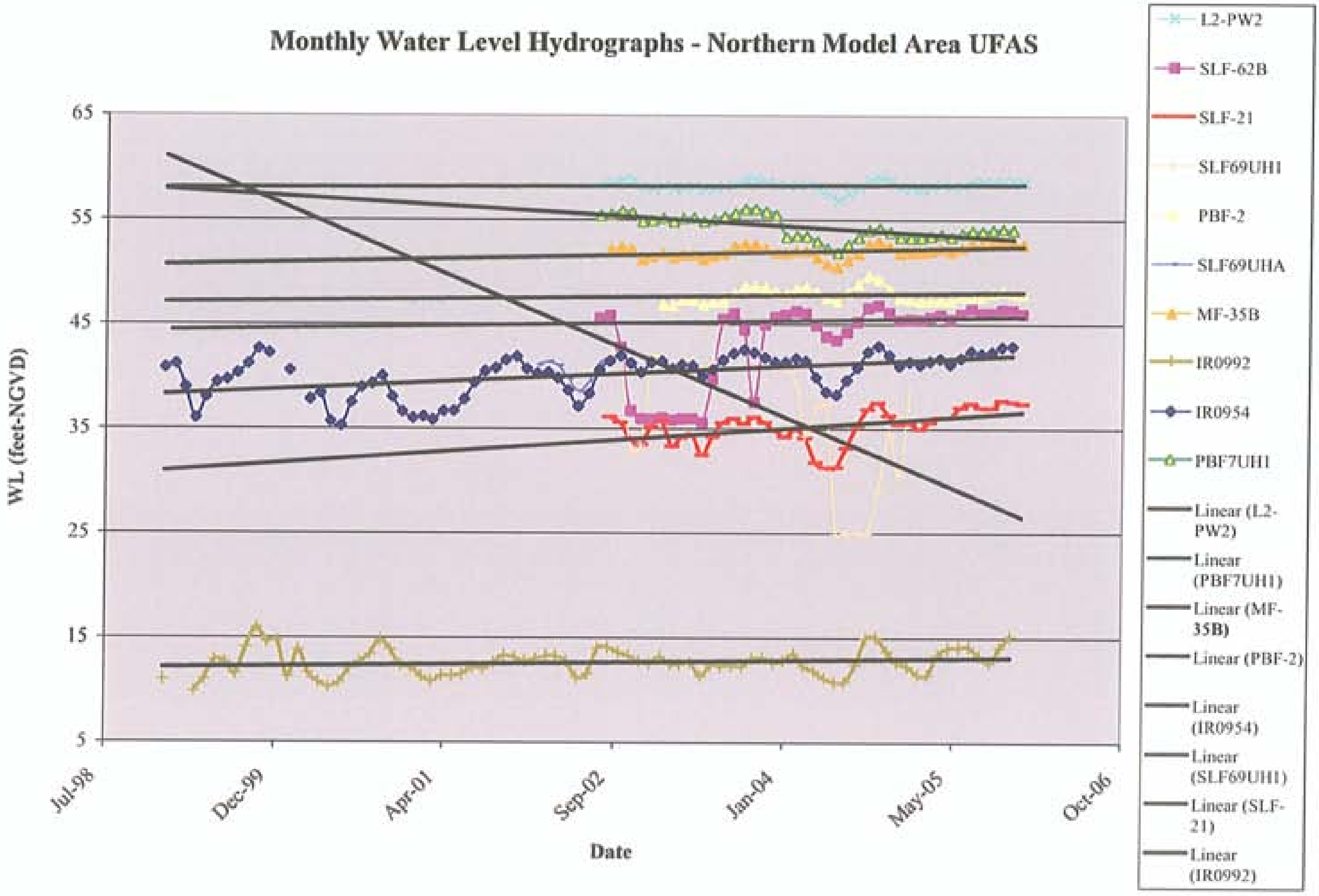
Average monthly water levels

PROJECT	ECFAS PHASE II MODEL
TITLE	**UFA HYDROGRAPH – WELLS L-2, SLF62B, SLF21, SLF69, PBF2, MF35B, IRO002, IRO954, PBF7**

PROJECT No.	073-82536		FILE No. ECFAS II
DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
GIS/CADD	CJB	2/01/2008	**FIGURE 27**
CHECK	GMP	2/01/2008	
REVIEW	JS	10/14/08	

Golder Associates

Mixed regional trends within the northern model study area



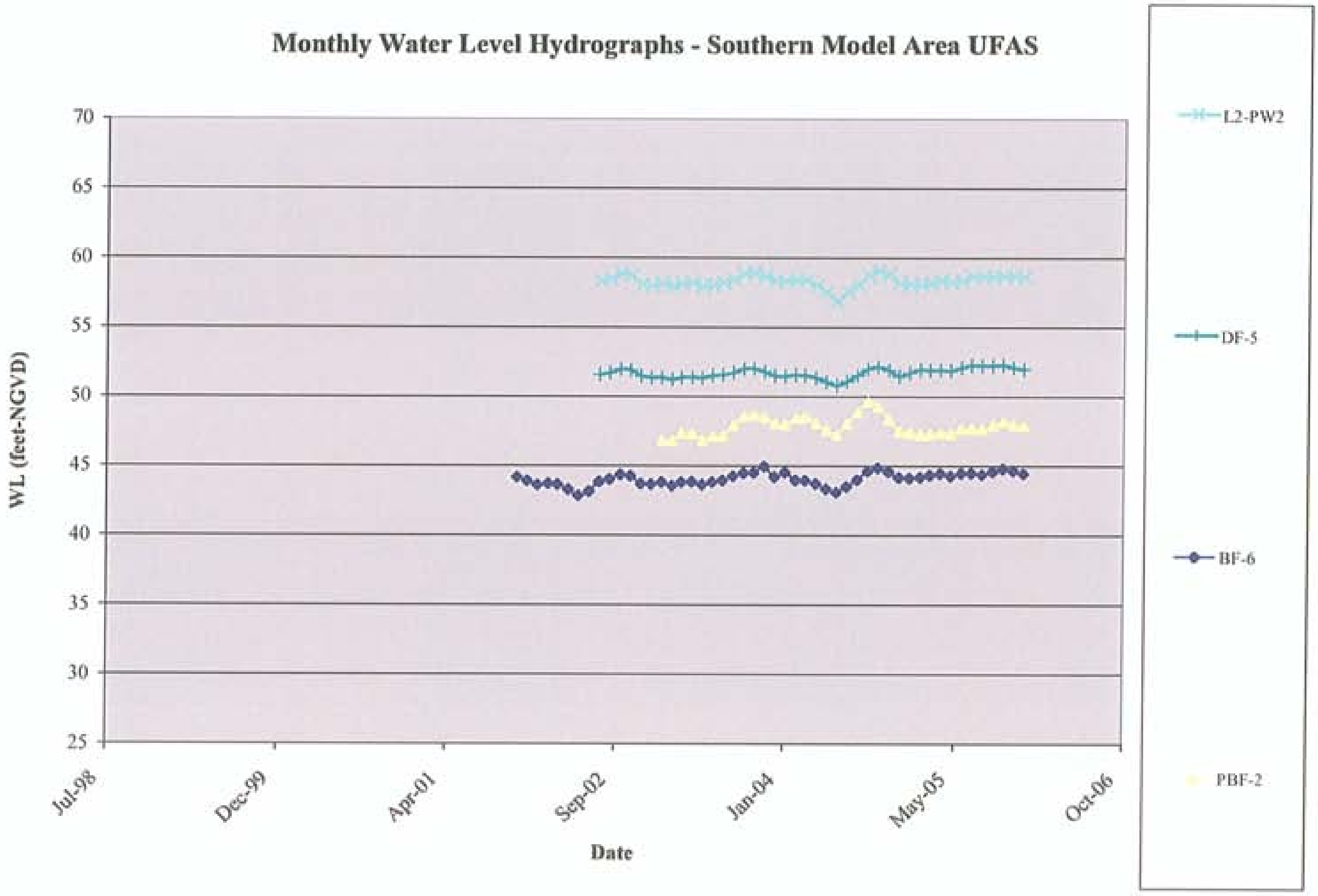
LEGEND

Average monthly water levels

PROJECT	ECFAS PHASE II MODEL
TITLE	UFA HYDROGRAPH – WL TRENDS L-2, SLF62B, SLF21, SLF69, PBF2, MF35B, IRO002, IRO954, PBF7

Golder Associates

PROJECT No. 073-82536			FILE No. ECFAS II
DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
GIS/CADD	CJB	2/01/2008	
CHECK	GMP	2/01/2008	FIGURE 28
REVIEW	JS	10/14/08	

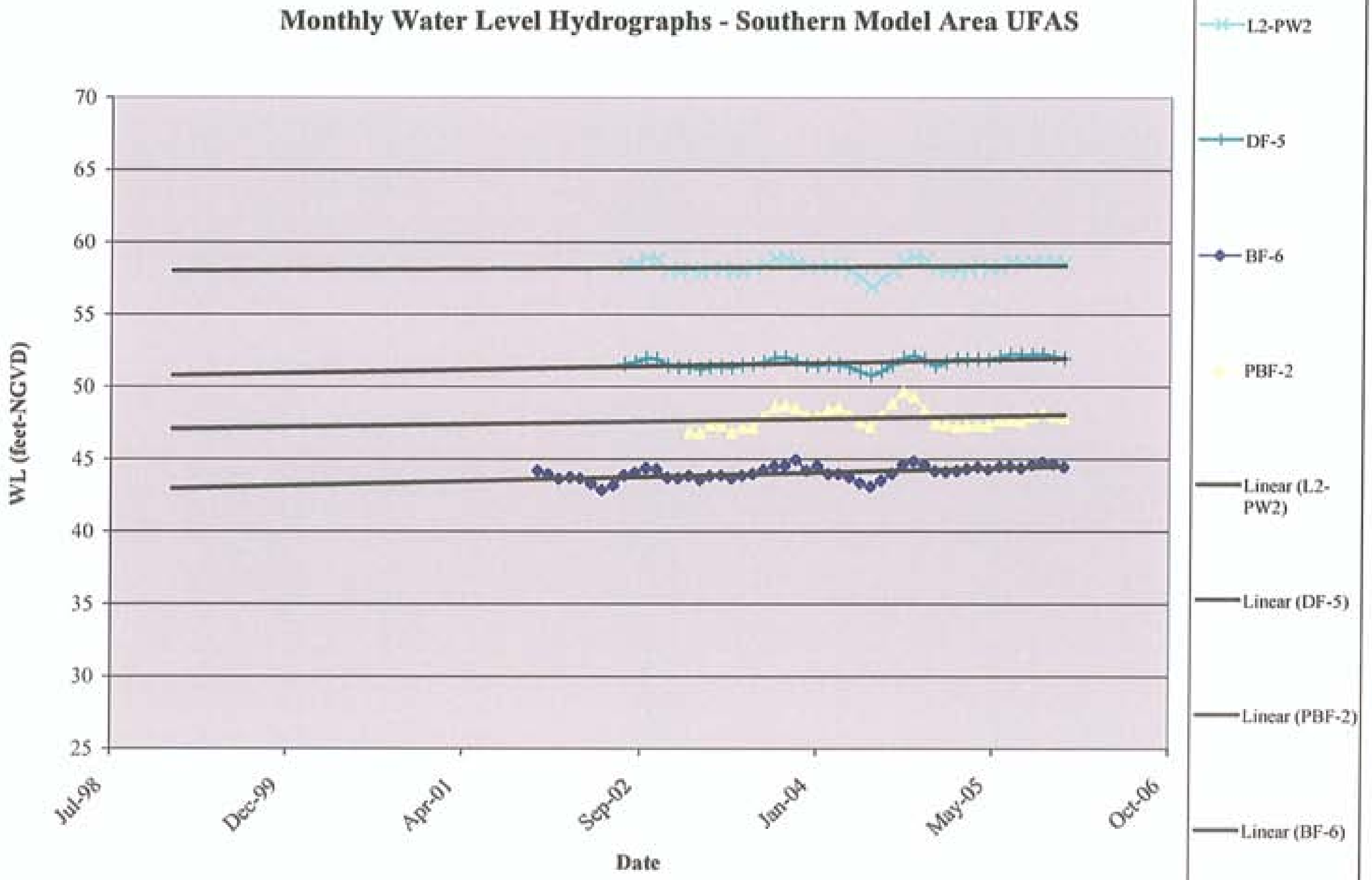


LEGEND

Average monthly water levels

PROJECT	ECFAS PHASE II MODEL			
TITLE	UFA HYDROGRAPH – WELLS L-2, PBF2, DF5, BF-6			
Golder Associates	PROJECT No. 073-82536			FILE No. ECFAS II
	DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
	GIS/CADD	CJB	2/01/2008	
	CHECK	GMP	2/01/2008	FIGURE 29
	REVIEW	JS	10/14/08	

Flat to slightly upward regional trends within the southern model study area

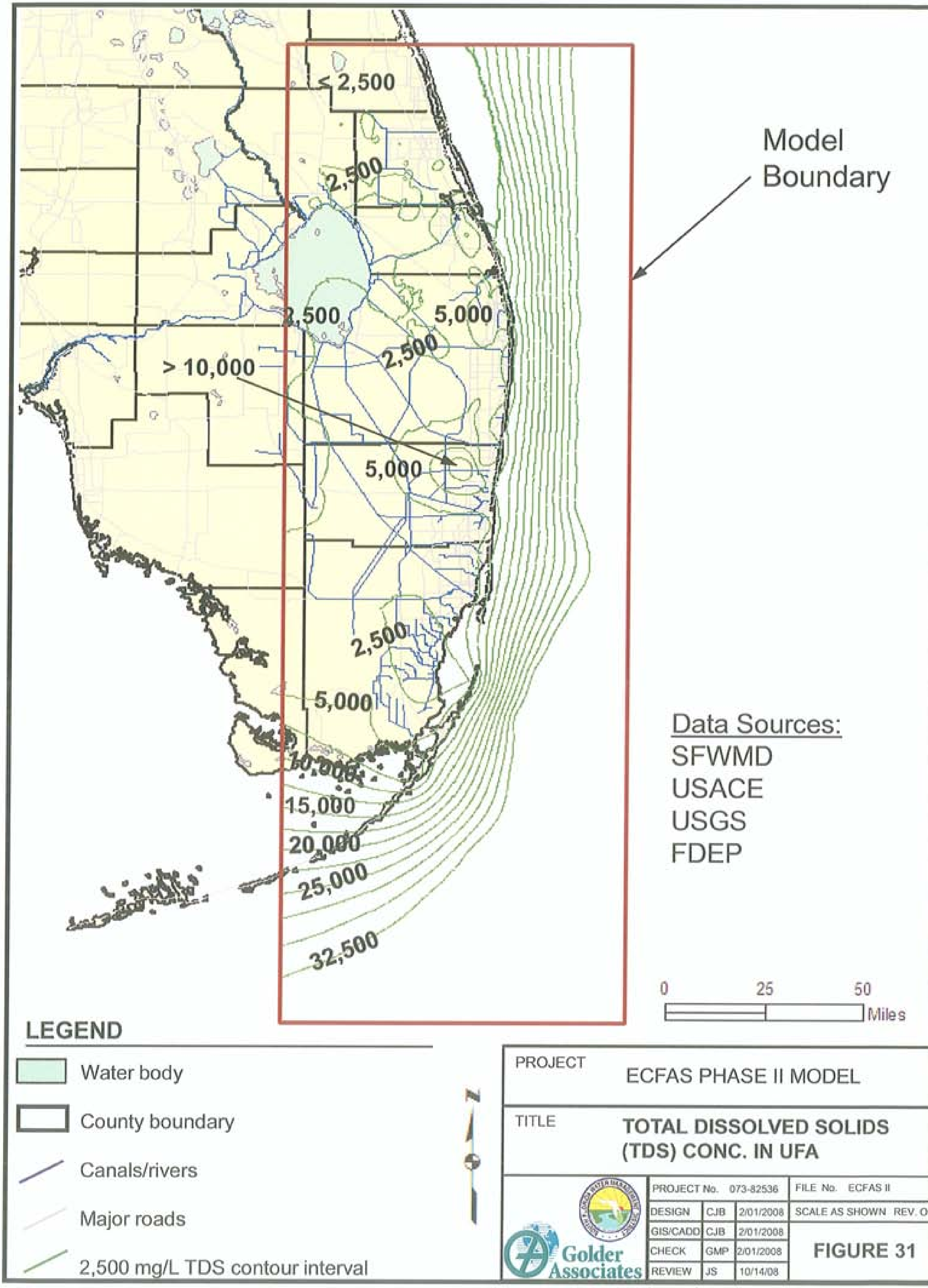


LEGEND

Average monthly water levels

PROJECT	ECFAS PHASE II MODEL			
TITLE	UFA HYDROGRAPH – WL TRENDS L-2, PBF2, DF5, BF-6			
PROJECT No. 073-82536			FILE No. ECFAS II	
DESIGN	CJB	2/01/2008	SCALE AS SHOWN	REV. O
GIS/CADD	CJB	2/01/2008	FIGURE 30	
CHECK	GMP	2/01/2008		
REVIEW	JS	10/14/08		

Golder Associates

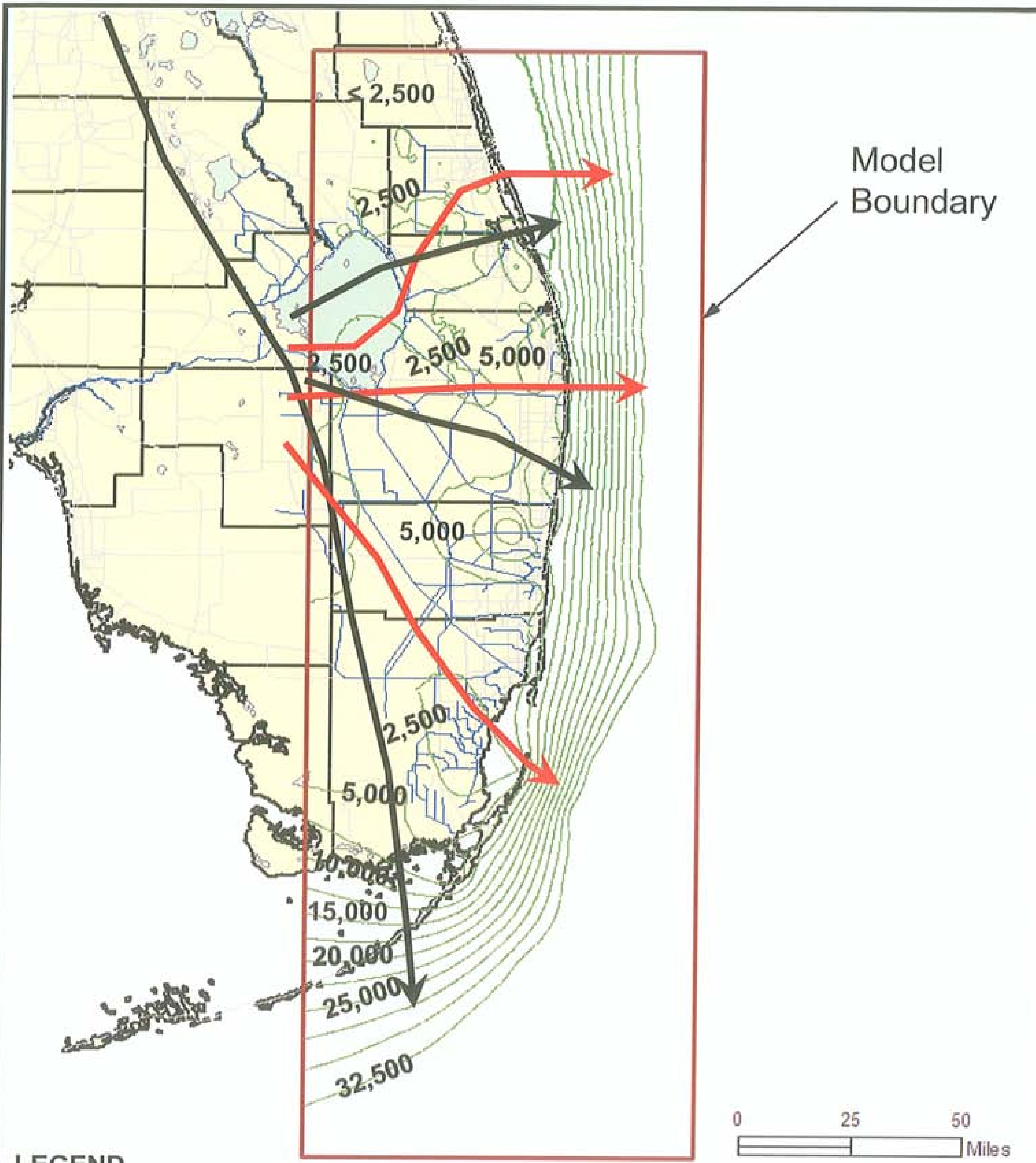


PROJECT ECFAS PHASE II MODEL

TITLE **TOTAL DISSOLVED SOLIDS (TDS) CONC. IN UFA**

PROJECT No. 073-82536			FILE No. ECFAS II
DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
GIS/CADD	CJB	2/01/2008	**FIGURE 31**
CHECK	GMP	2/01/2008	
REVIEW	JS	10/14/08	

Golder Associates



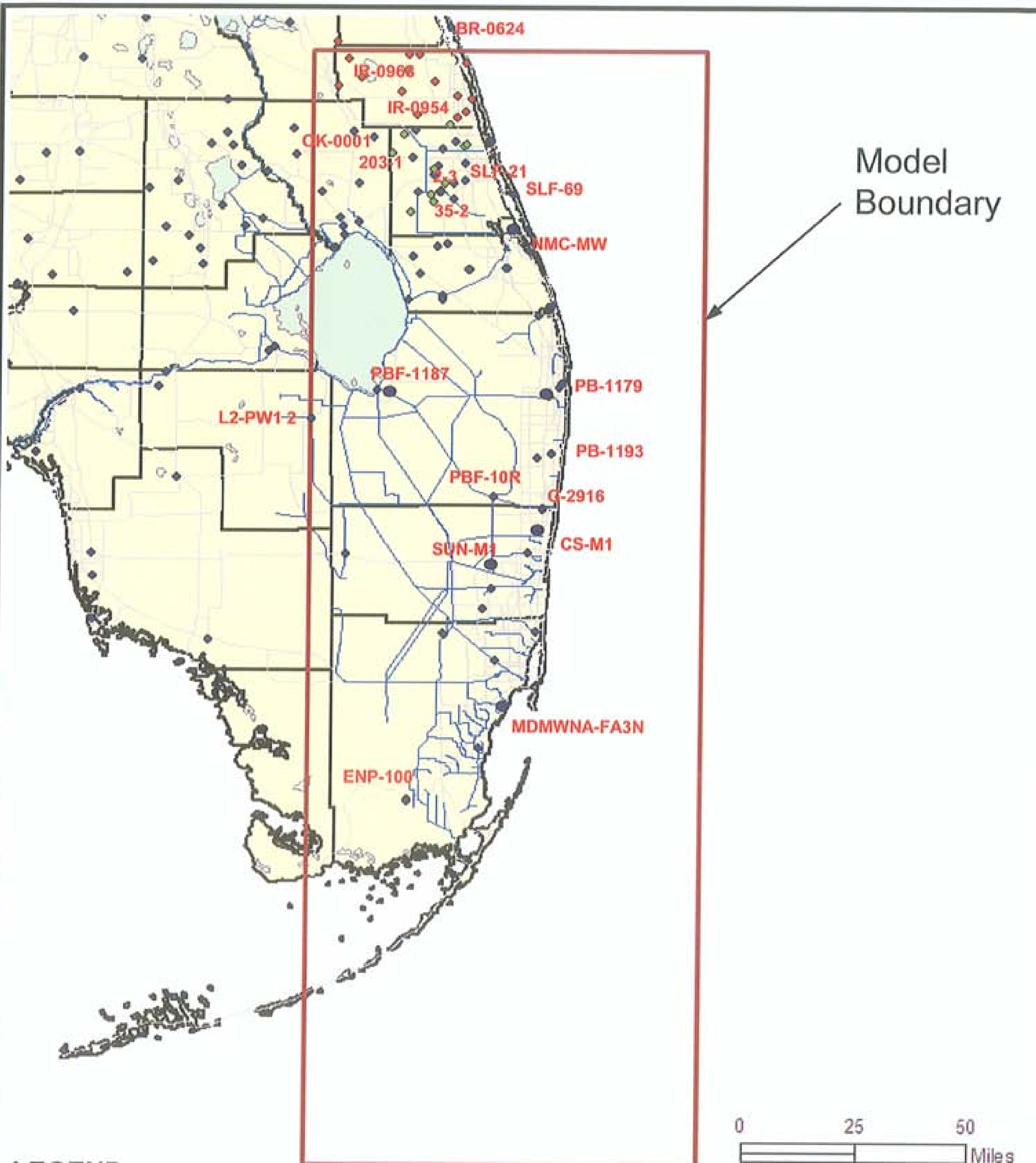
LEGEND

- Water body
- County boundary
- Canals/rivers
- Major roads
- 2,500 mg/L TDS contour interval
- Pre-Develop Flow
- Est. Dec 2005 Flow

PROJECT	ECFAS PHASE II MODEL
TITLE	COMPARISON OF FLOW DIRECTION PRE-DEVELOPMENT VS. DEC 2005 WITH UFA TDS DATA

PROJECT No.	073-82536		FILE No. ECFAS II
DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
GIS/CADD	CJB	2/01/2008	
CHECK	GMP	2/01/2008	FIGURE 32
REVIEW	JS	10/14/08	

Golder Associates



LEGEND

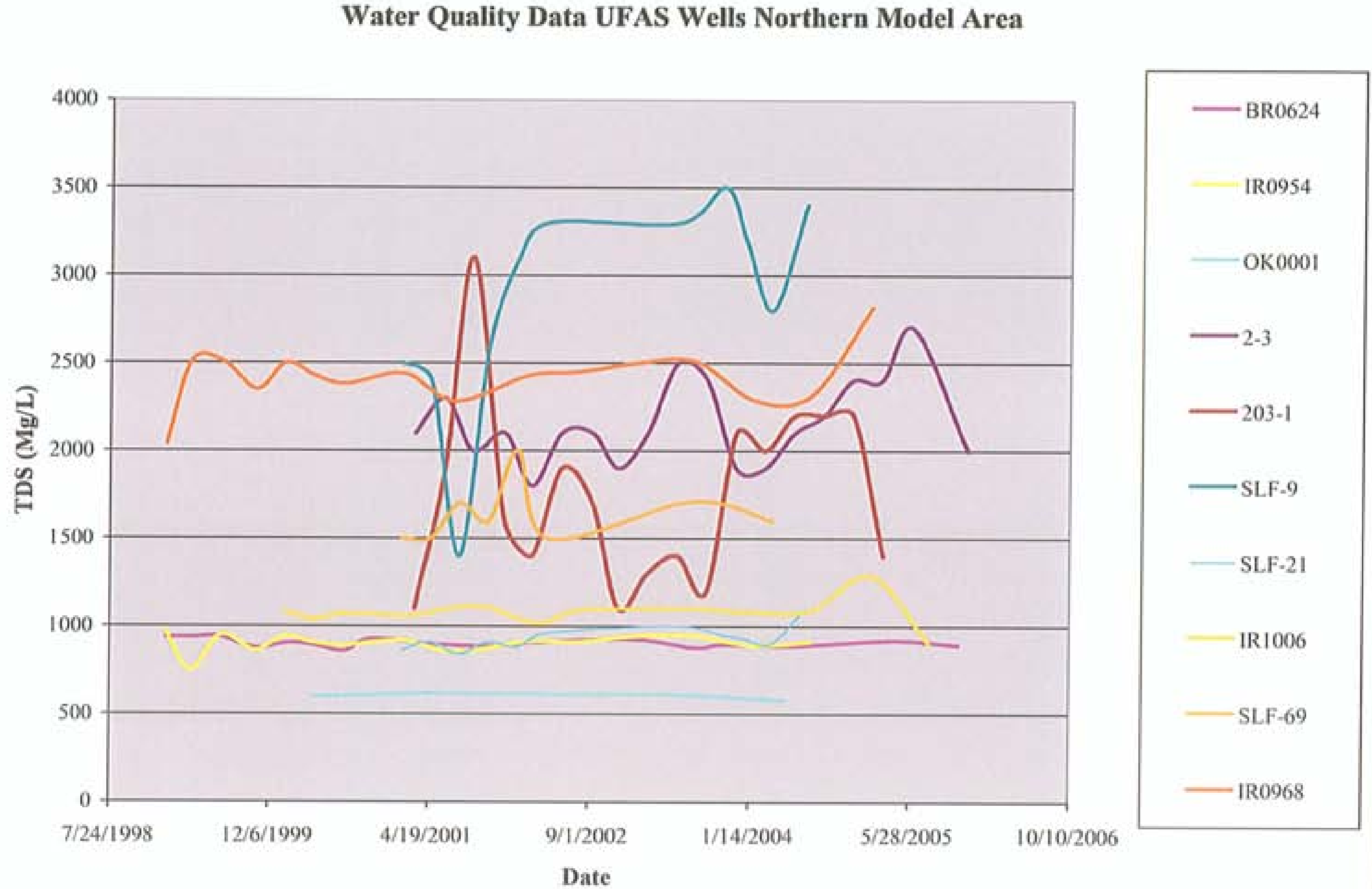
Water body	SFWMD Database
County boundary	SJRWMD Database
Canals/rivers	NRCS Data
Major roads	

PROJECT: ECFAS PHASE II MODEL

TITLE: **LOCATION OF UFA WELLS WITH CONC HYDROGRAPHS EVALUATED**

Golder Associates

PROJECT No.	073-82536		FILE No. ECFAS II
DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
GIS/CADD	CJB	2/01/2008	**FIGURE 33**
CHECK	GMP	2/01/2008	
REVIEW	JS	10/14/08	

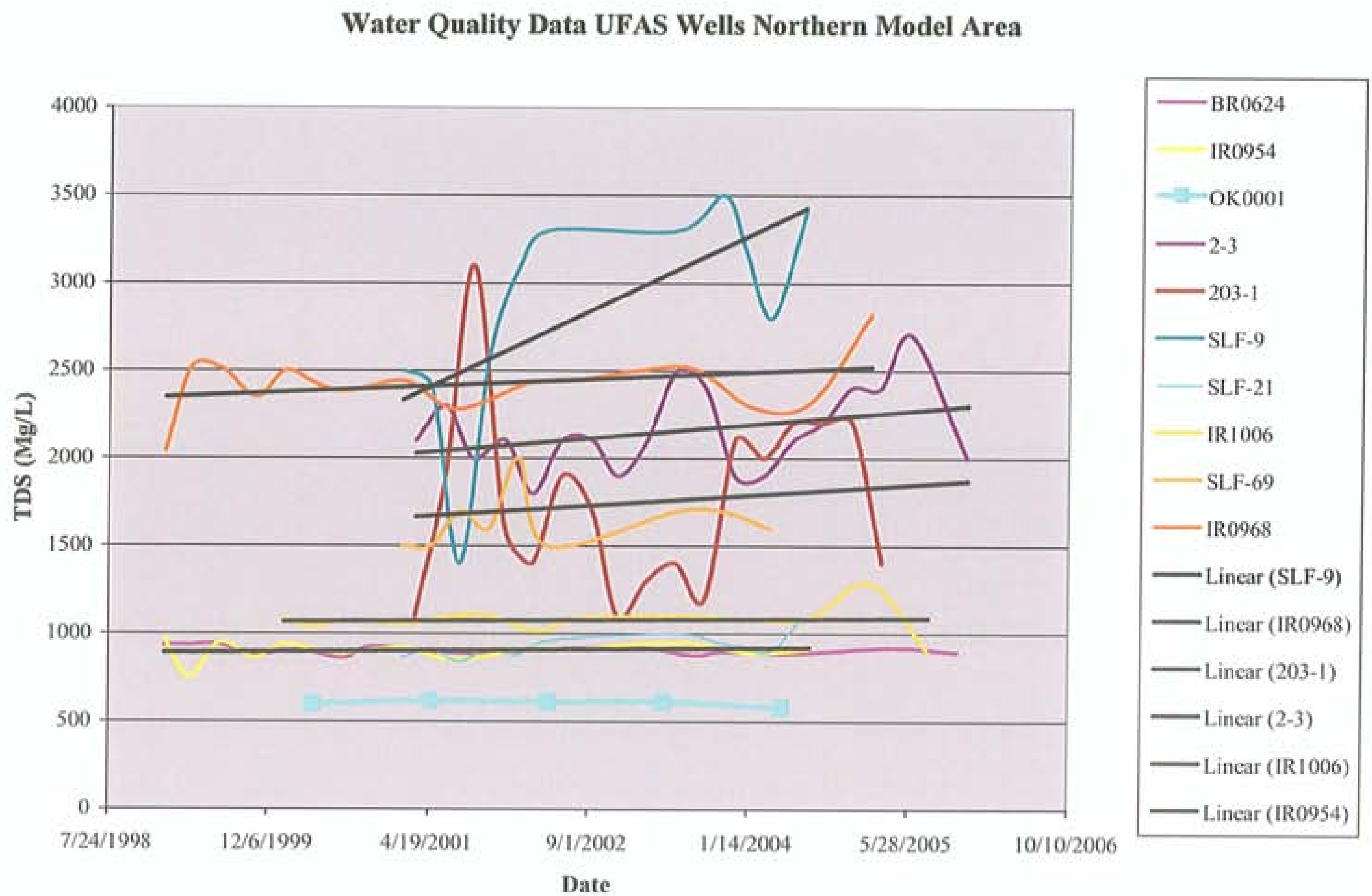


LEGEND

Observed TDS Concentrations

PROJECT	ECFAS PHASE II MODEL			
TITLE	UFA CONC HYDROGRAPH – WELLS BR0624, IR0954, OK0001, 2-3, 203-1, SLF9, SLF21, IR1006, SLF-69, IR0968			
Golder Associates	PROJECT No.	073-82536		FILE No. ECFAS II
	DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
	GIS/CADD	CJB	2/01/2008	
	CHECK	GMP	2/01/2008	FIGURE 34
	REVIEW	JS	10/14/08	

Flat to upward regional trends within the northern model study area



LEGEND

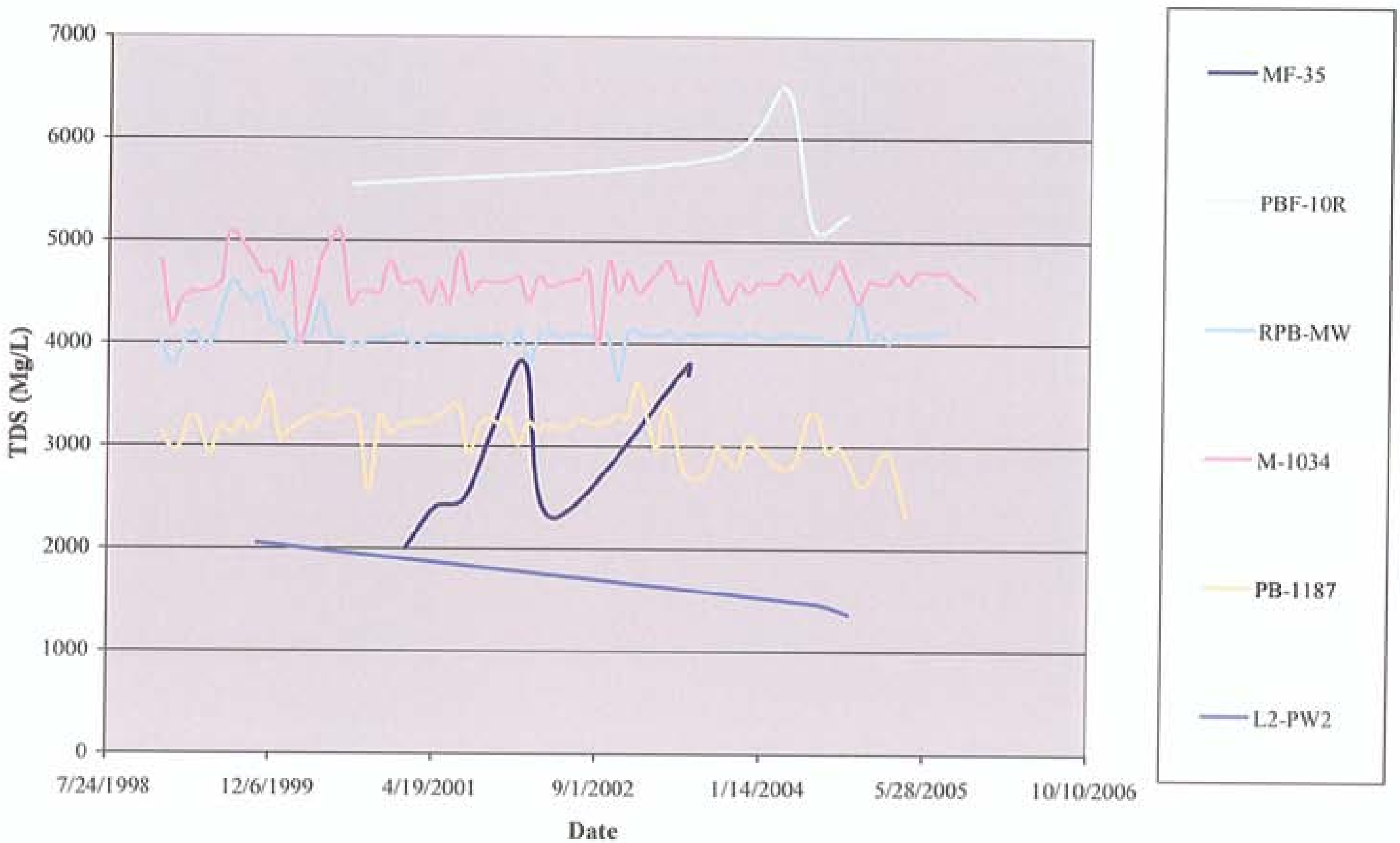
Observed TDS Concentrations

PROJECT	ECFAS PHASE II MODEL
TITLE	**UFA CONC TDS TRENDS – WELLS BR0624, IR0954, OK0001, 2-3, 203-1, SLF9, SLF21, IR1006, SLF-69, IR0968**

Golder Associates

PROJECT No.	073-82536		FILE No. ECFAS II
DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
GIS/CADD	CJB	2/01/2008	
CHECK	GMP	2/01/2008	**FIGURE 35**
REVIEW	JS	10/14/08	

Water Quality Data UFAS Wells Central Model Area

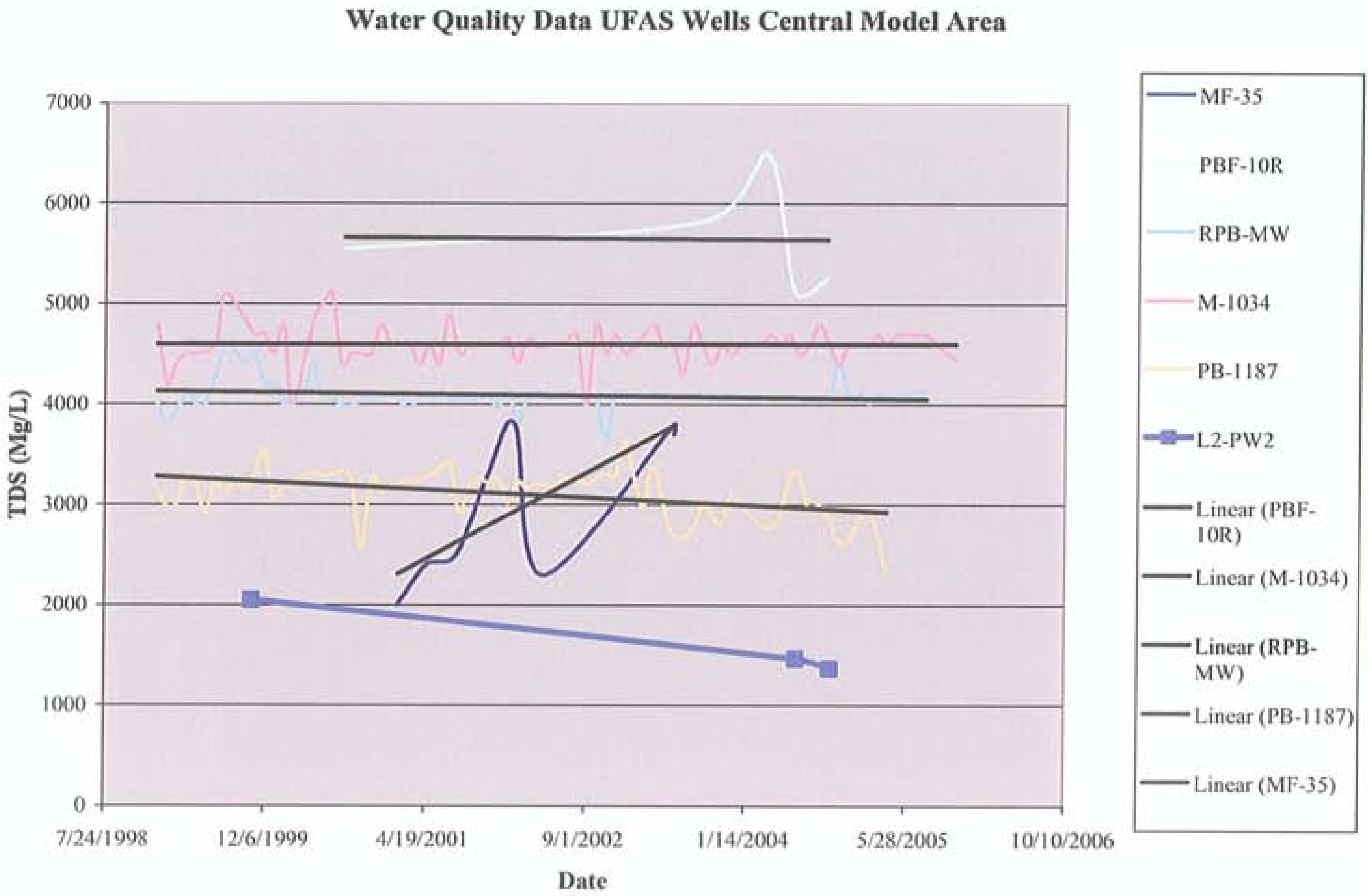


LEGEND

Observed TDS Concentrations

PROJECT	ECFAS PHASE II MODEL			
TITLE	**UFA CONC HYDROGRAPH – WELLS MF35, PBF-10R, RPBMW, M-1034, PB-1187, L2-PW2**			
Golder Associates	PROJECT No. 073-82536			FILE No. ECFAS II
	DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
	GIS/CADD	CJB	2/01/2008	
	CHECK	GMP	2/01/2008	**FIGURE 36**
	REVIEW	JS	10/14/08	

Mixed regional trends within the central model study area

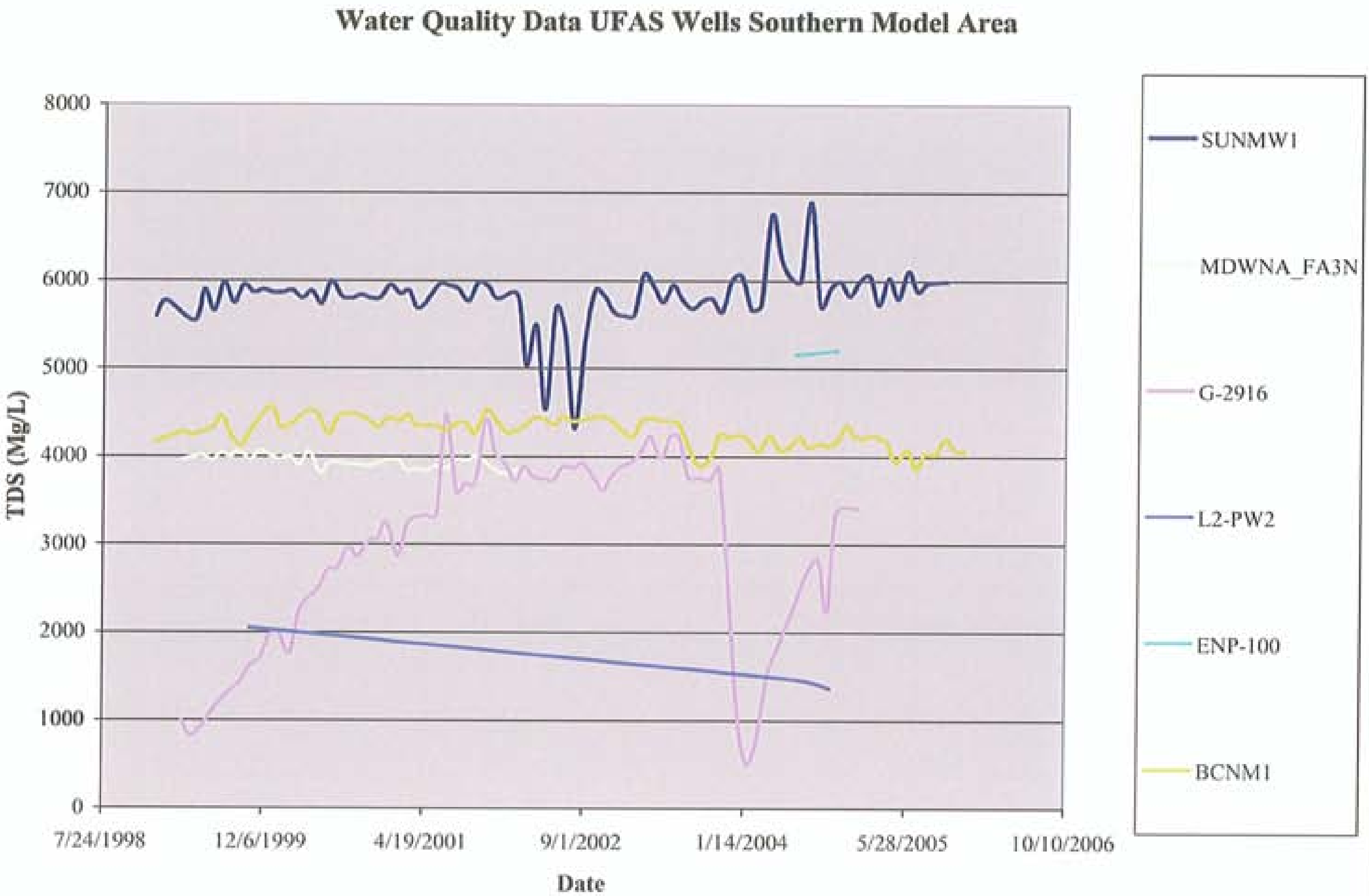


LEGEND

Observed TDS Concentrations

PROJECT	ECFAS PHASE II MODEL
TITLE	**UFA CONC TDS TRENDS – WELLS MF35, PBF-10R, RPBMW, M-1034, PB-1187, L2-PW2**

Golder Associates	PROJECT No.	073-82536		FILE No. ECFAS II
	DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
	GIS/CADD	CJB	2/01/2008	
	CHECK	GMP	2/01/2008	**FIGURE 37**
	REVIEW	JS	10/14/08	



LEGEND

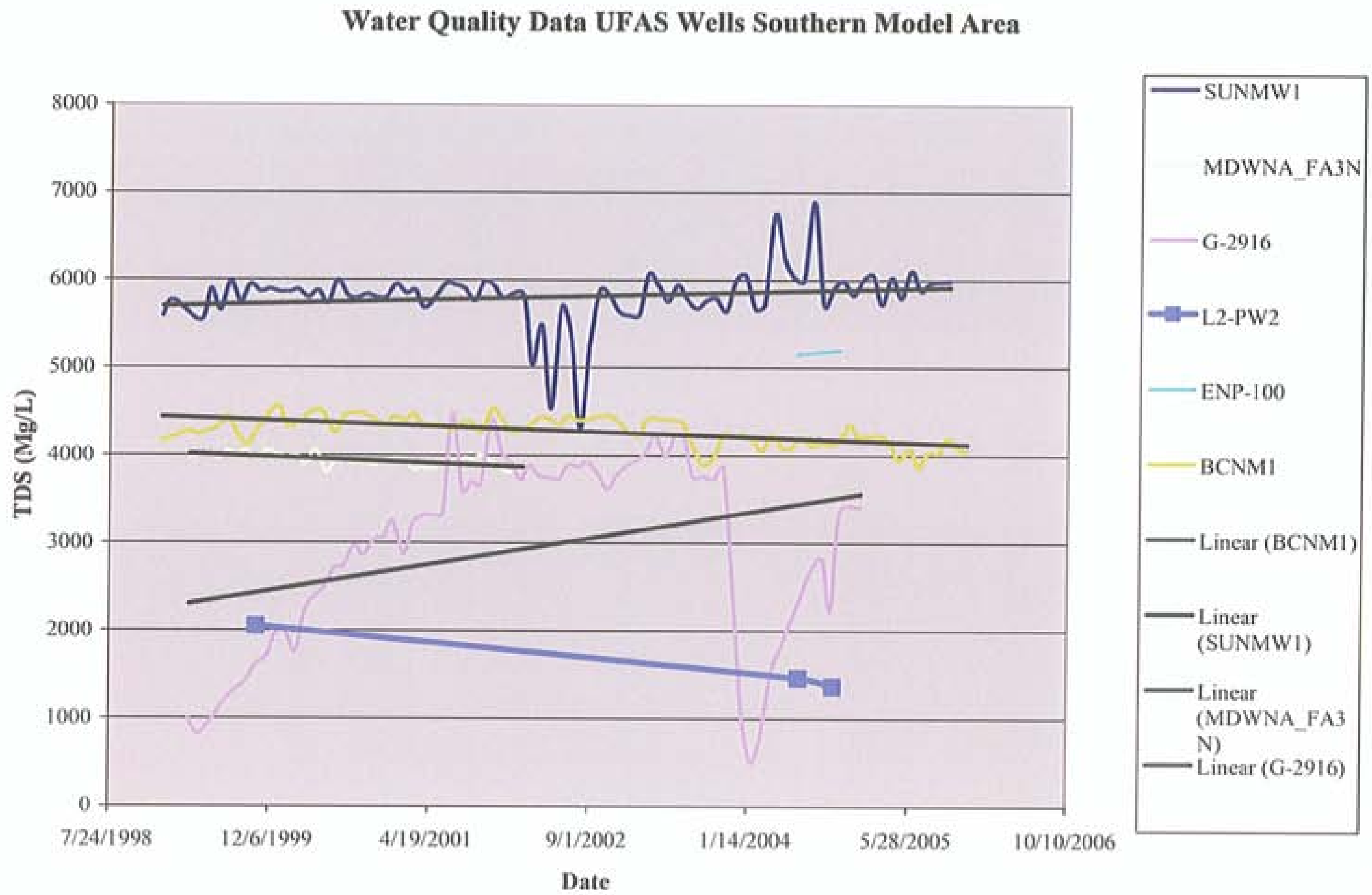
Observed TDS Concentrations

PROJECT	ECFAS PHASE II MODEL
TITLE	UFA CONC HYDROGRAPH – WELLS SUNMW1, MDWNAFA3N, G-2916 ENP-100, BCNM1, L2-PW2

Golder Associates

PROJECT No. 073-82536			FILE No. ECFAS II
DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
GIS/CADD	CJB	2/01/2008	FIGURE 38
CHECK	GMP	2/01/2008	
REVIEW	JS	10/14/08	

Mixed regional trends within the southern model study area



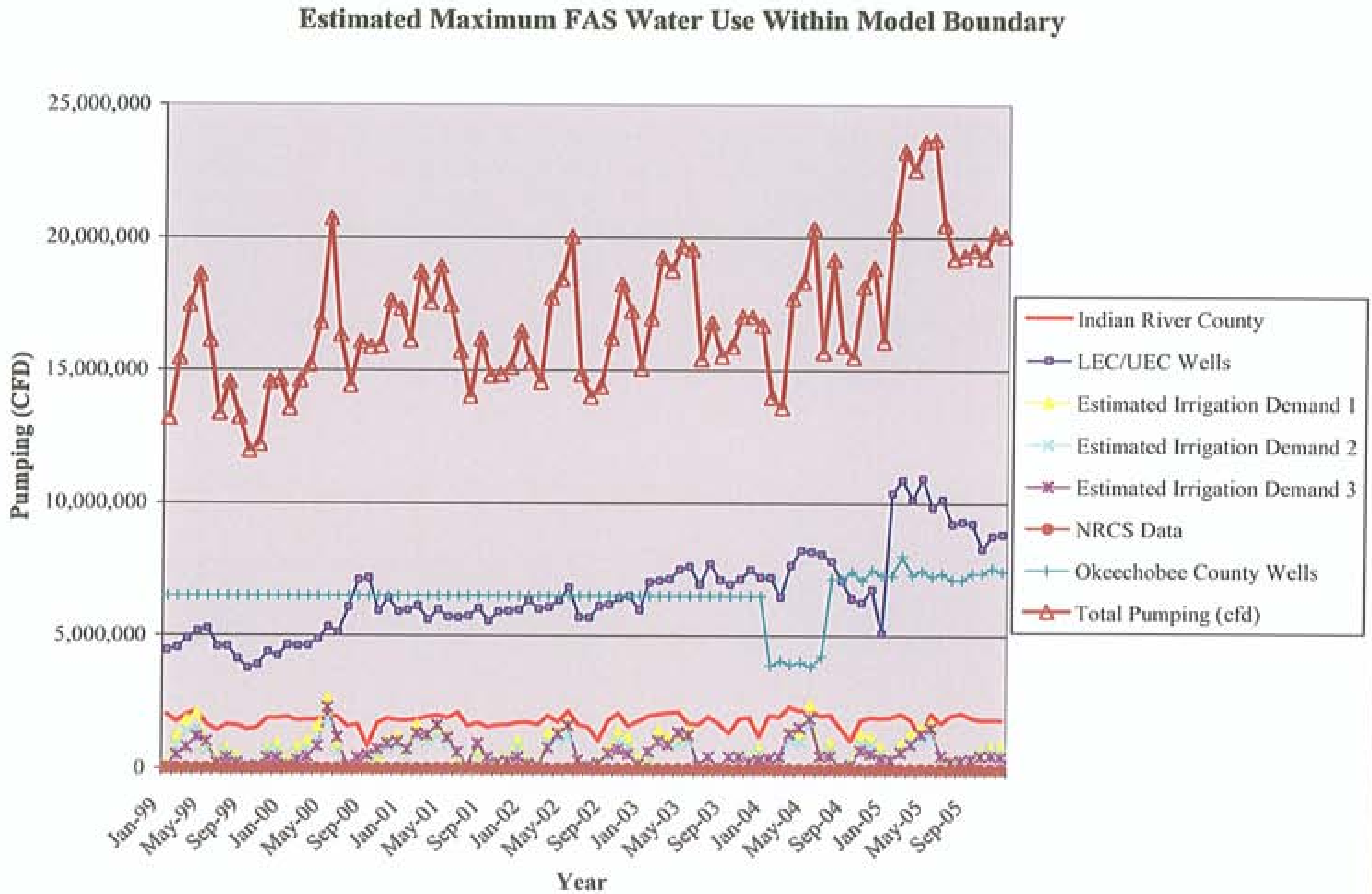
LEGEND

Observed TDS Concentrations

PROJECT	ECFAS PHASE II MODEL
TITLE	UFA CONC TDS TRENDS – WELLS SUNMW1, MDWNAFA3N, G-2916 ENP-100, BCNM1, L2-PW2

Golder Associates				
PROJECT No. 073-82536			FILE No. ECFAS II	
DESIGN	CJB	2/01/2008	SCALE AS SHOWN	REV. O
GIS/CADD	CJB	2/01/2008	FIGURE 39	
CHECK	GMP	2/01/2008		
REVIEW	JS	10/14/08		

Model-wide Water Use Information
January 1999 to December 2005

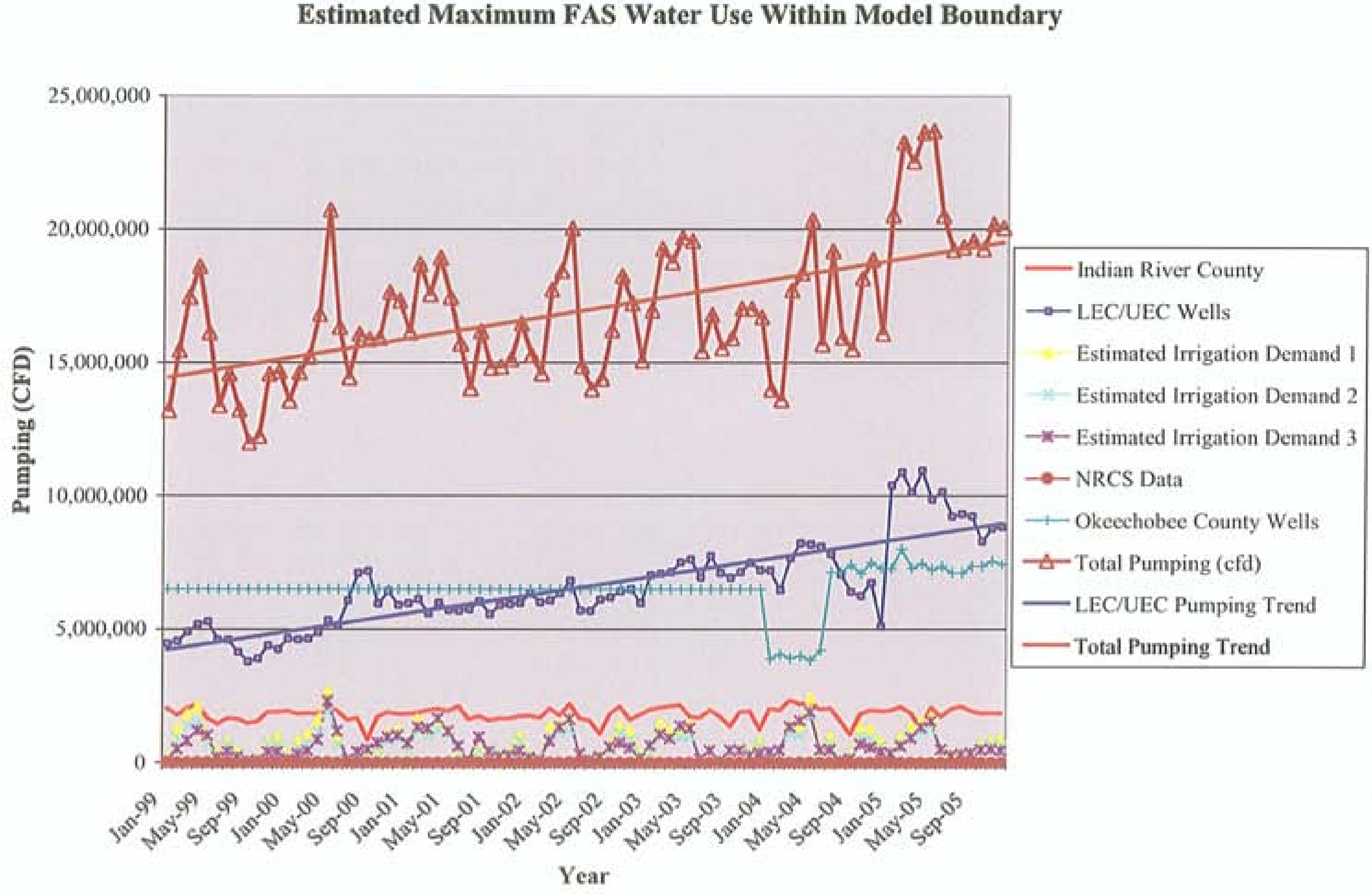


LEGEND

Water Use Data by Source

PROJECT	ECFAS PHASE II MODEL			
TITLE	FAS WATER USE DATA FOR ALL PUMPING WELLS WITHIN THE MODEL BOUNDARY			
Golder Associates	PROJECT No. 073-82536			FILE No. ECFAS II
	DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
	GIS/CADD	CJB	2/01/2008	FIGURE 40
	CHECK	GMP	2/01/2008	
	REVIEW	JS	10/14/08	

Model-wide Water Use Trends
January 1999 to December 2005



Note: Okeechobee County well pumping estimated from 1999 To 2003 using average of 2004 to 2005 data.

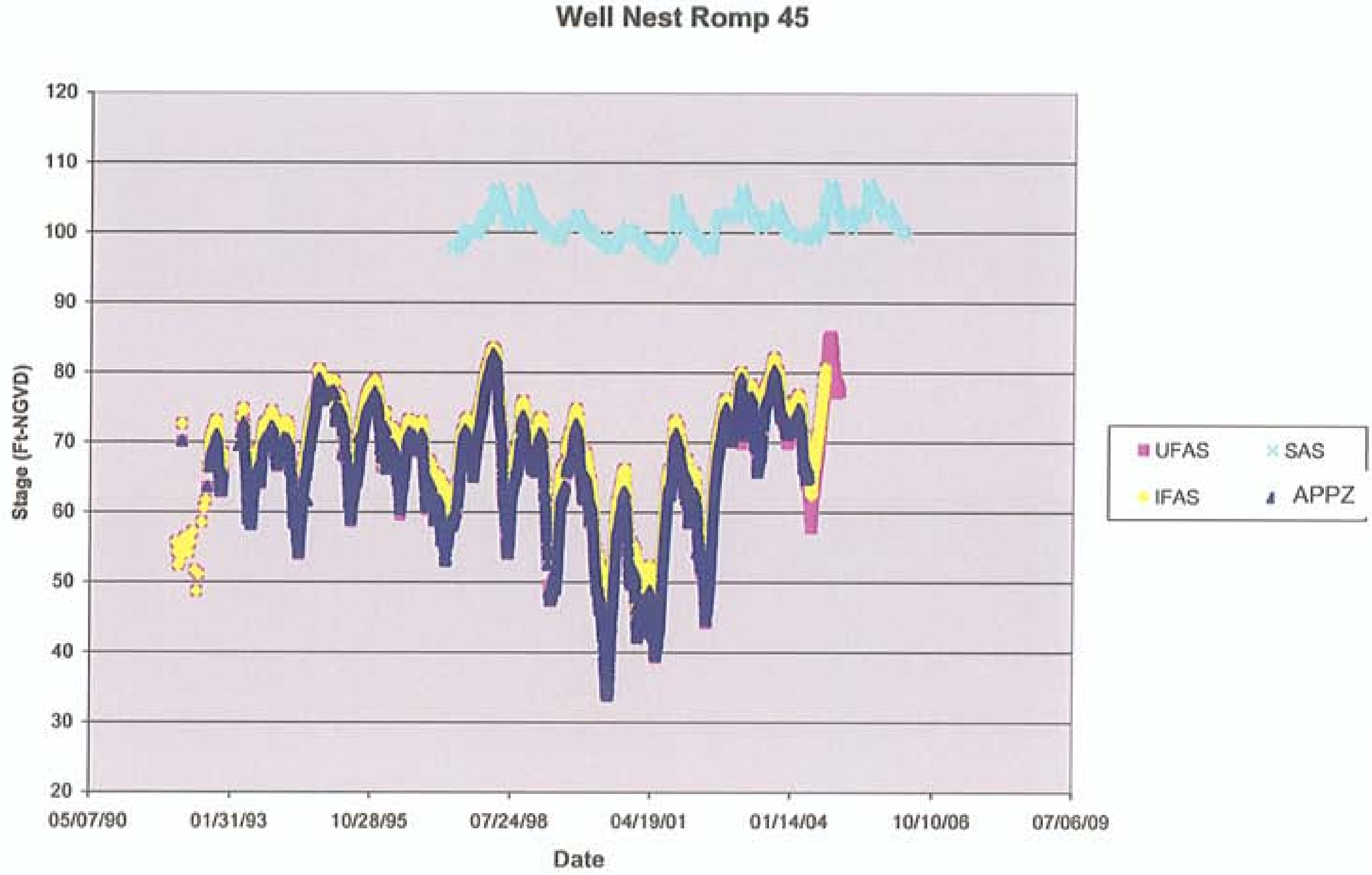
LEGEND

Water Use Data by Source

PROJECT	ECFAS PHASE II MODEL			
TITLE	FAS WATER USE DATA FOR ALL PUMPING WELLS WITHIN THE MODEL BOUNDARY – Long-term Trends			
PROJECT No.	073-82536		FILE No.	ECFAS II
DESIGN	CJB	2/01/2008	SCALE AS SHOWN	REV. O
GIS/CADD	CJB	2/01/2008		
CHECK	GMP	2/01/2008	FIGURE 41	
REVIEW	JS	10/14/08		

Golder Associates

Well Cluster Located at Polk County Recharge Zone



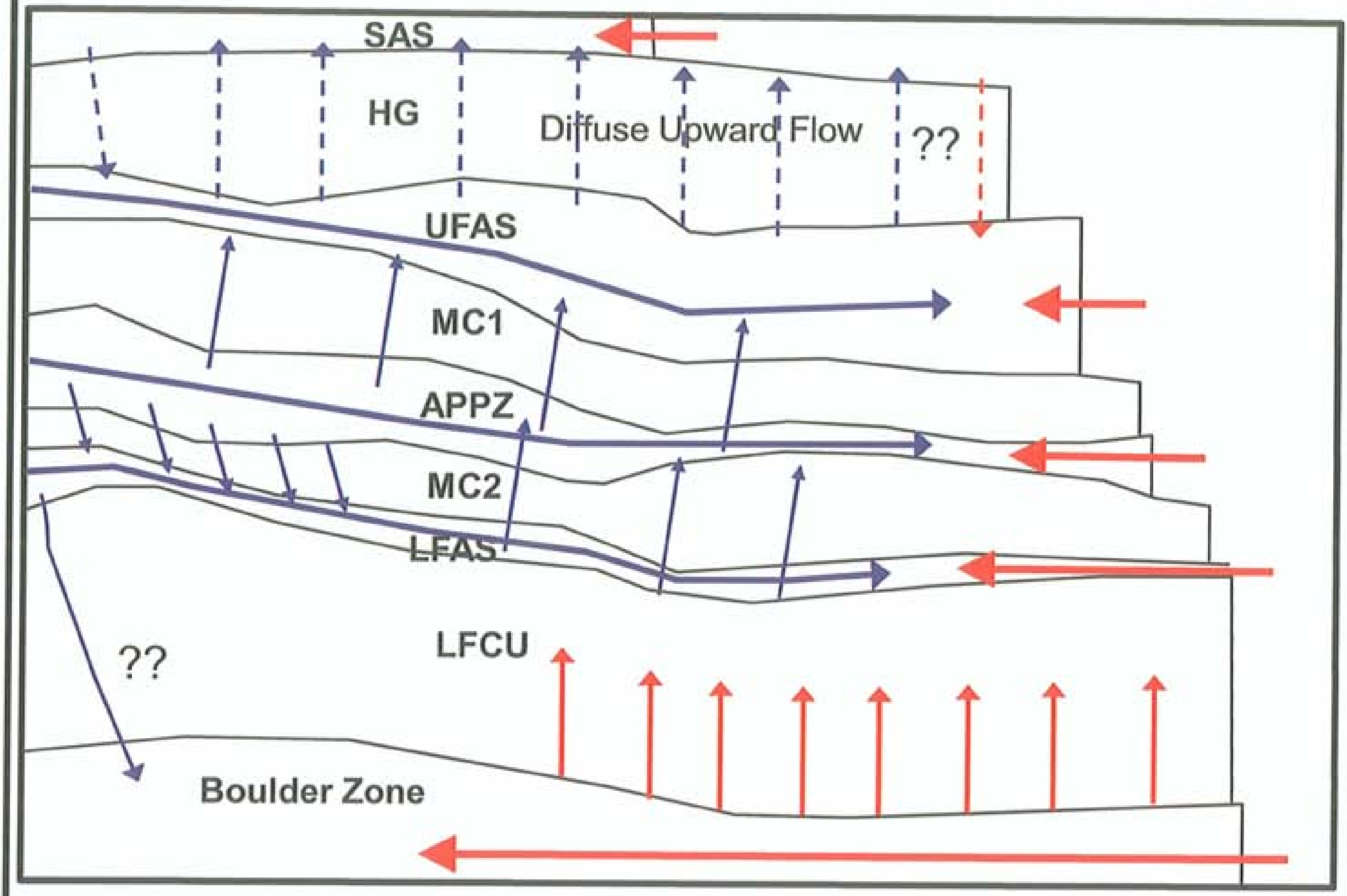
LEGEND

Aquifer Hydrographs

SAS = SURFICAL AQ
IFAS = INTERMEDIATE AQ
UFAS = UPPER FLORIDAN AQ
MFAS = MIDDLE FLORIDAN AQ

PROJECT	ECFAS PHASE II MODEL		
TITLE	**FAS WATER LEVELS WITHIN POLK COUNTY RECHARGE ZONE – Long-term Trends**		
PROJECT No. 073-82536			FILE No. ECFAS II
DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
GIS/CADD	CJB	2/01/2008	
CHECK	GMP	2/01/2008	**FIGURE 42**
REVIEW	JS	10/14/08	

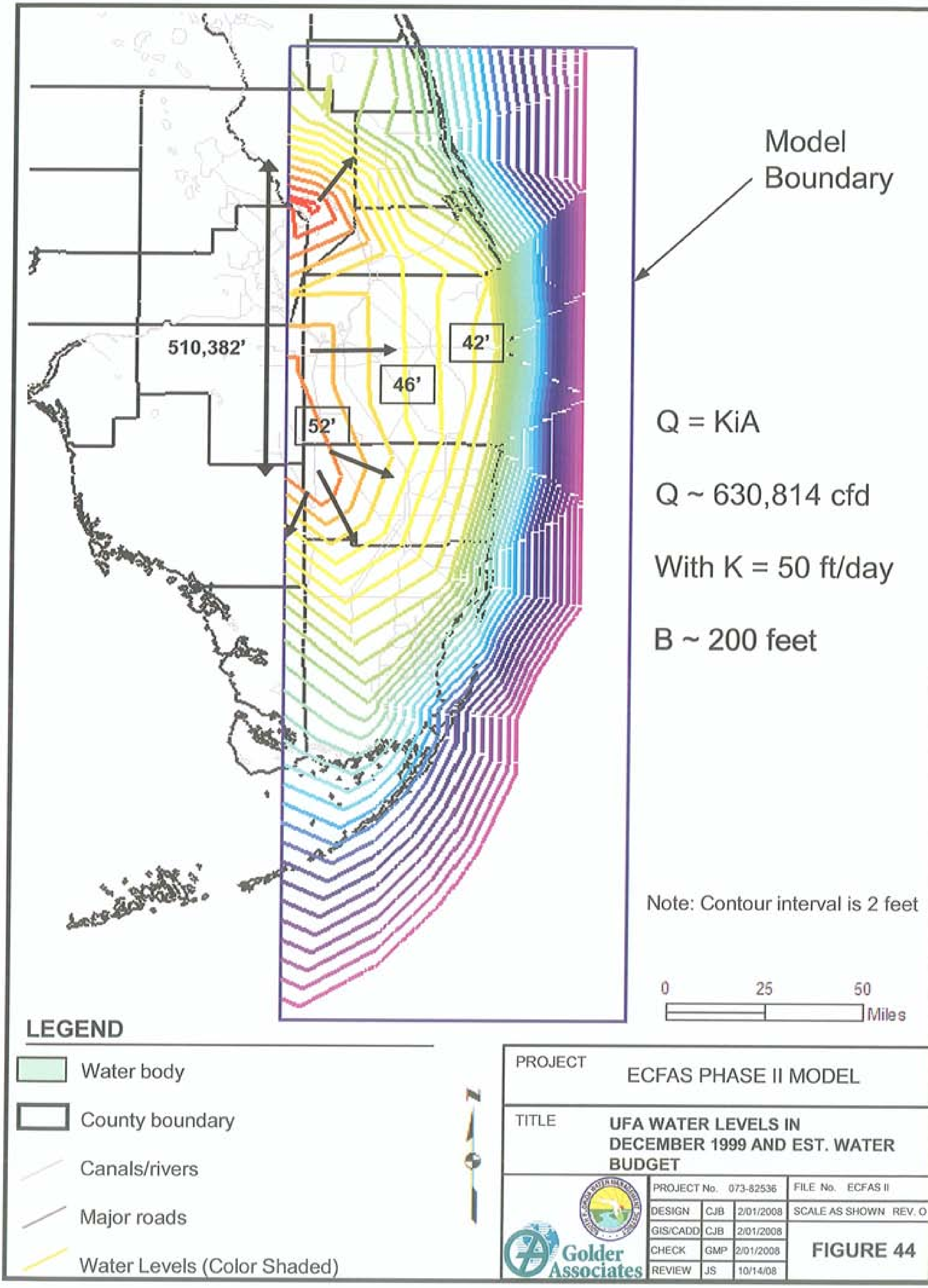
Golder Associates



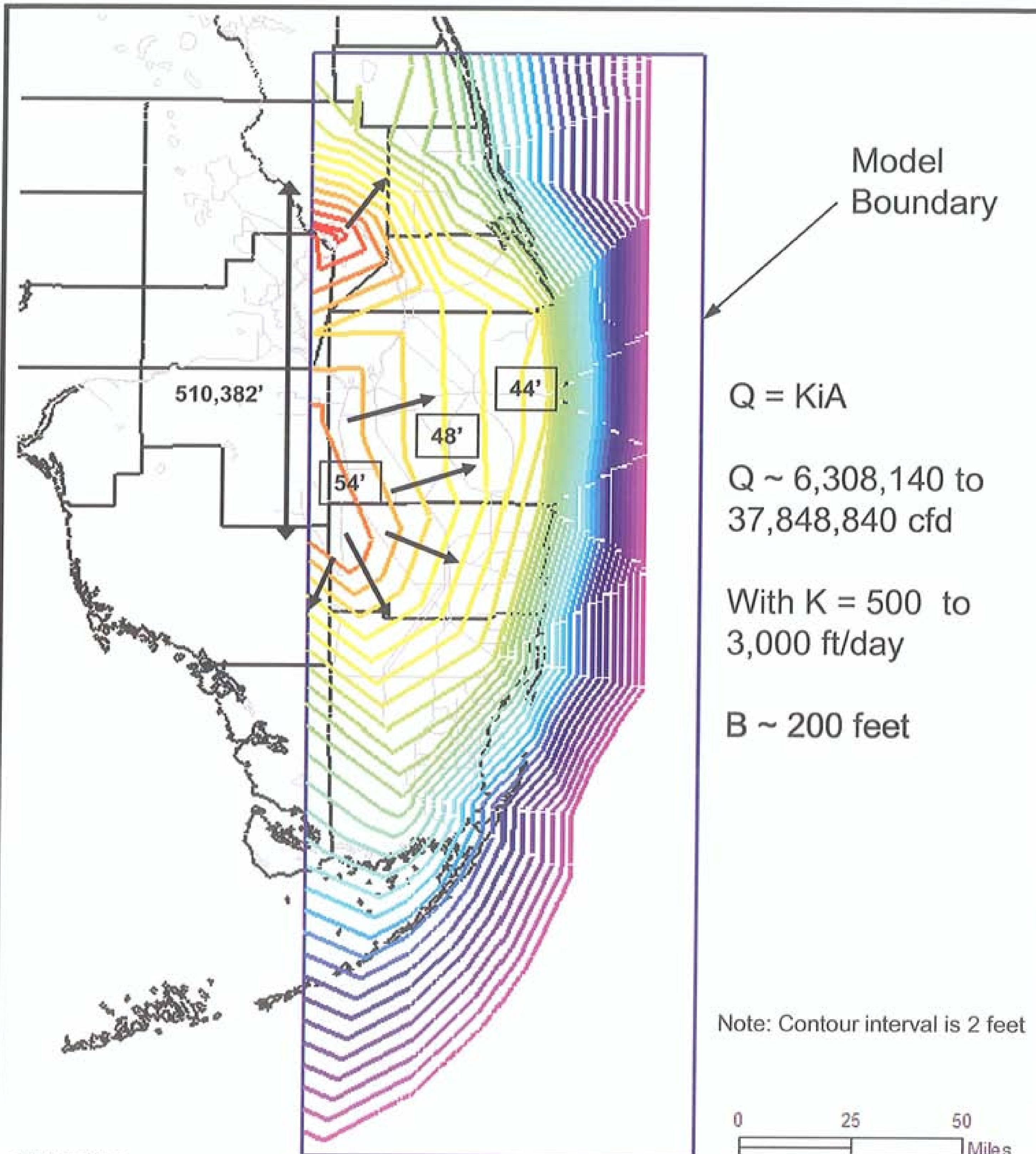
LEGEND

PROJECT	ECFAS PHASE II MODEL			
TITLE	CONCEPTUAL GROUNDWATER FLOW IN FAS			
PROJECT No. 073-82536			FILE No. ECFAS II	
DESIGN	CJB	2/01/2008	SCALE AS SHOWN	REV. O
GIS/CADD	CJB	2/01/2008	FIGURE 43	
CHECK	GMP	2/01/2008		
REVIEW	JS	10/14/08		

Golder Associates



Model Boundary
510,382'
42'
46'
52'
Q = KiA
Q ~ 630,814 cfd
With K = 50 ft/day
B ~ 200 feet
Note: Contour interval is 2 feet
0
25
50
Miles
LEGEND
Water body
County boundary
Canals/rivers
Major roads
Water Levels (Color Shaded)
N
PROJECT
ECFAS PHASE II MODEL
TITLE
UFA WATER LEVELS IN DECEMBER 1999 AND EST. WATER BUDGET
PROJECT No. 073-82536
FILE No. ECFAS II
DESIGN CJB 2/01/2008
SCALE AS SHOWN REV. O
GIS/CADD CJB 2/01/2008
CHECK GMP 2/01/2008
REVIEW JS 10/14/08
FIGURE 44
Golder Associates



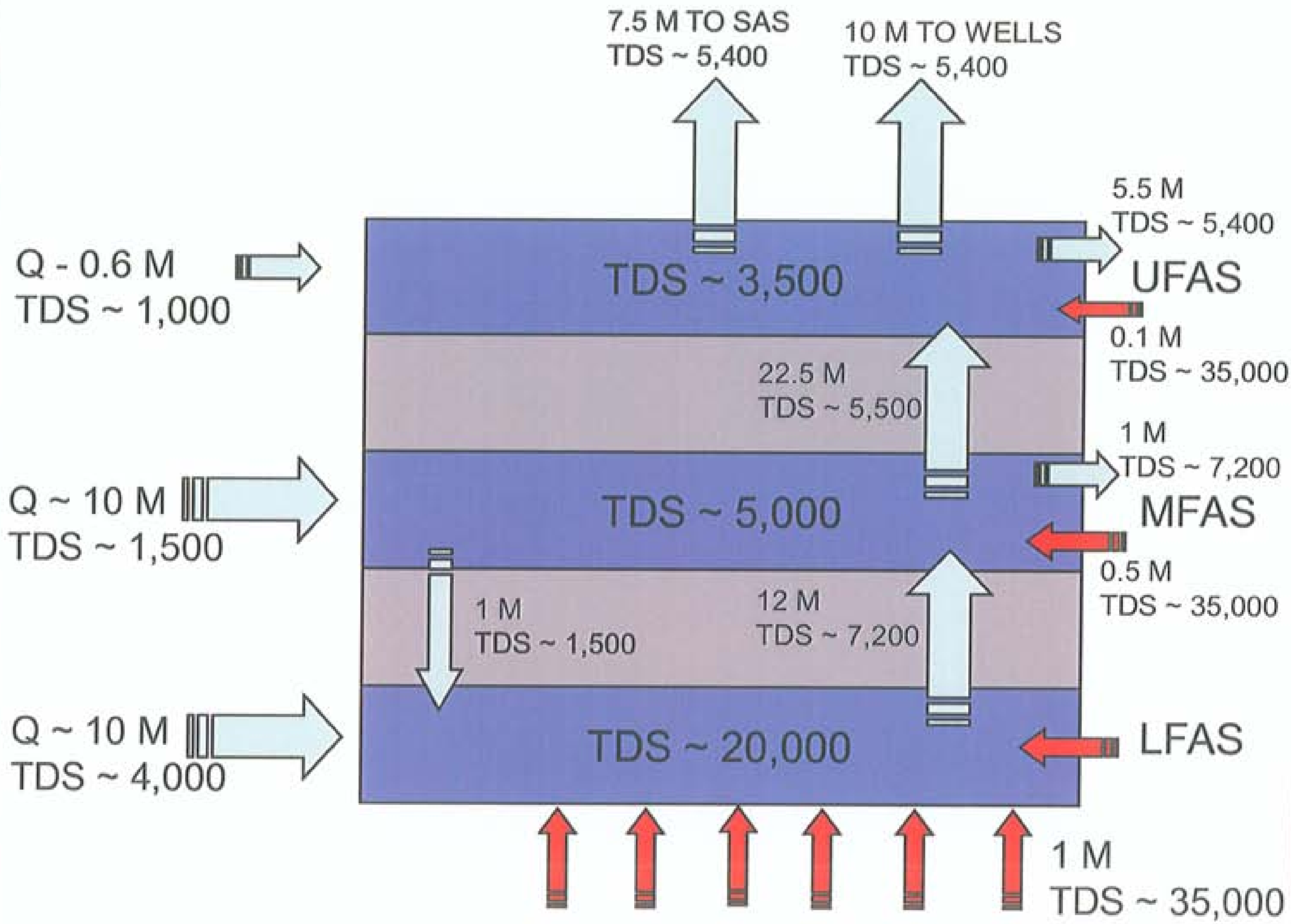
LEGEND

- Water body
- County boundary
- Canals/rivers
- Major roads
- Water Levels (Color Shaded)

N

PROJECT	ECFAS PHASE II MODEL			
TITLE	EST. APPZ WATER LEVELS IN DECEMBER 1999 AND EST. WATER BUDGET			
PROJECT No.	073-82536		FILE No. ECFAS II	
DESIGN	CJB	2/01/2008	SCALE AS SHOWN	REV. O
GIS/CADD	CJB	2/01/2008	FIGURE 45	
CHECK	GMP	2/01/2008		
REVIEW	JS	10/14/08		

Golder Associates



Note: M = million
Mass flux from storage not considered

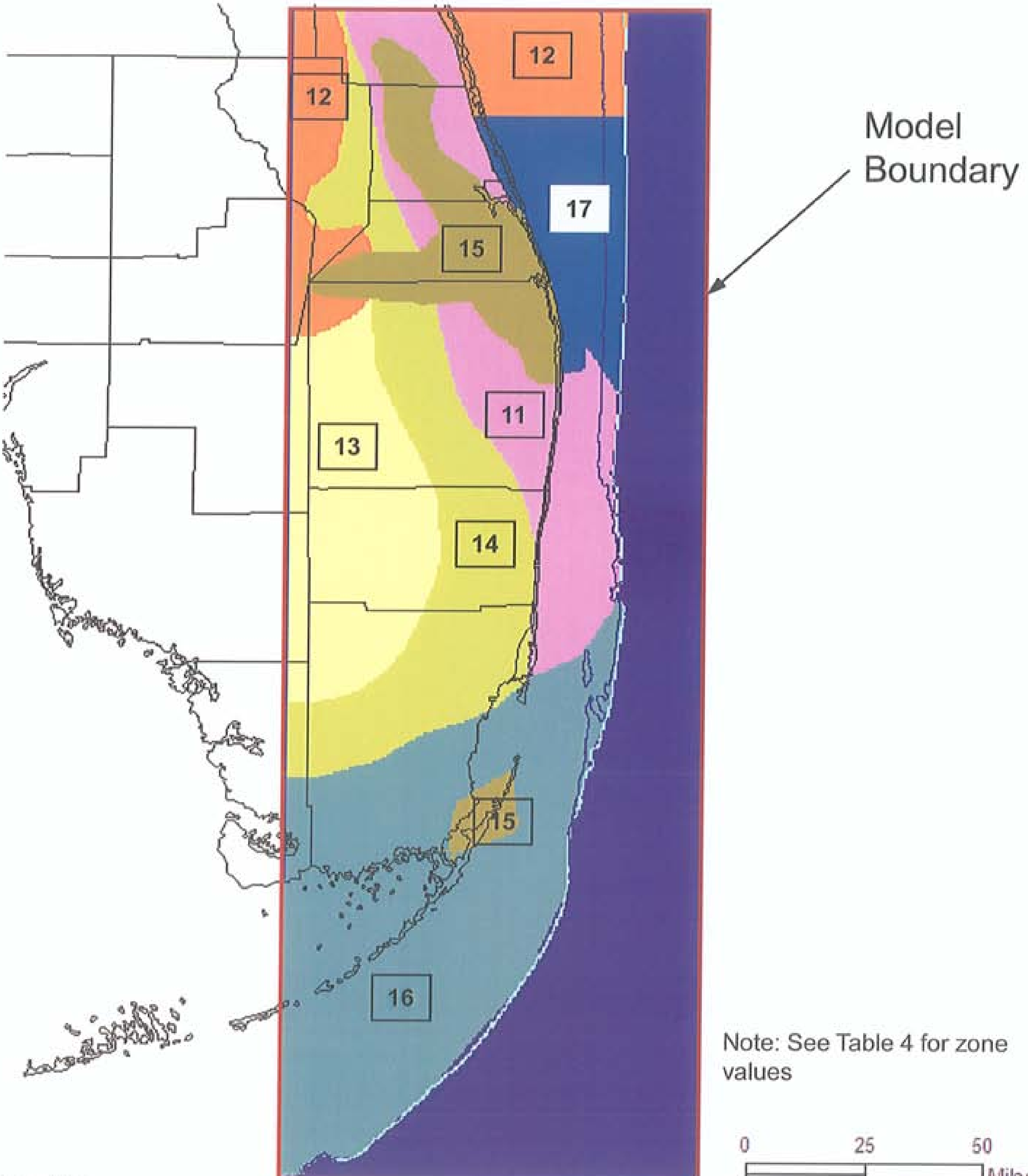
LEGEND

Hydrogeologic Unit boundary

Freshwater Flow

Salt-water Flow

PROJECT	ECFAS PHASE II MODEL			
TITLE	**CONCEPTUAL GROUNDWATER FLOW IN FAS – HYPOTHETICAL MASS BUDGET**			
Golder Associates	PROJECT No.	073-82536		FILE No. ECFAS II
	DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
	GIS/CADD	CJB	2/01/2008	**FIGURE 46**
	CHECK	GMP	2/01/2008	
	REVIEW	JS	10/14/08	



LEGEND

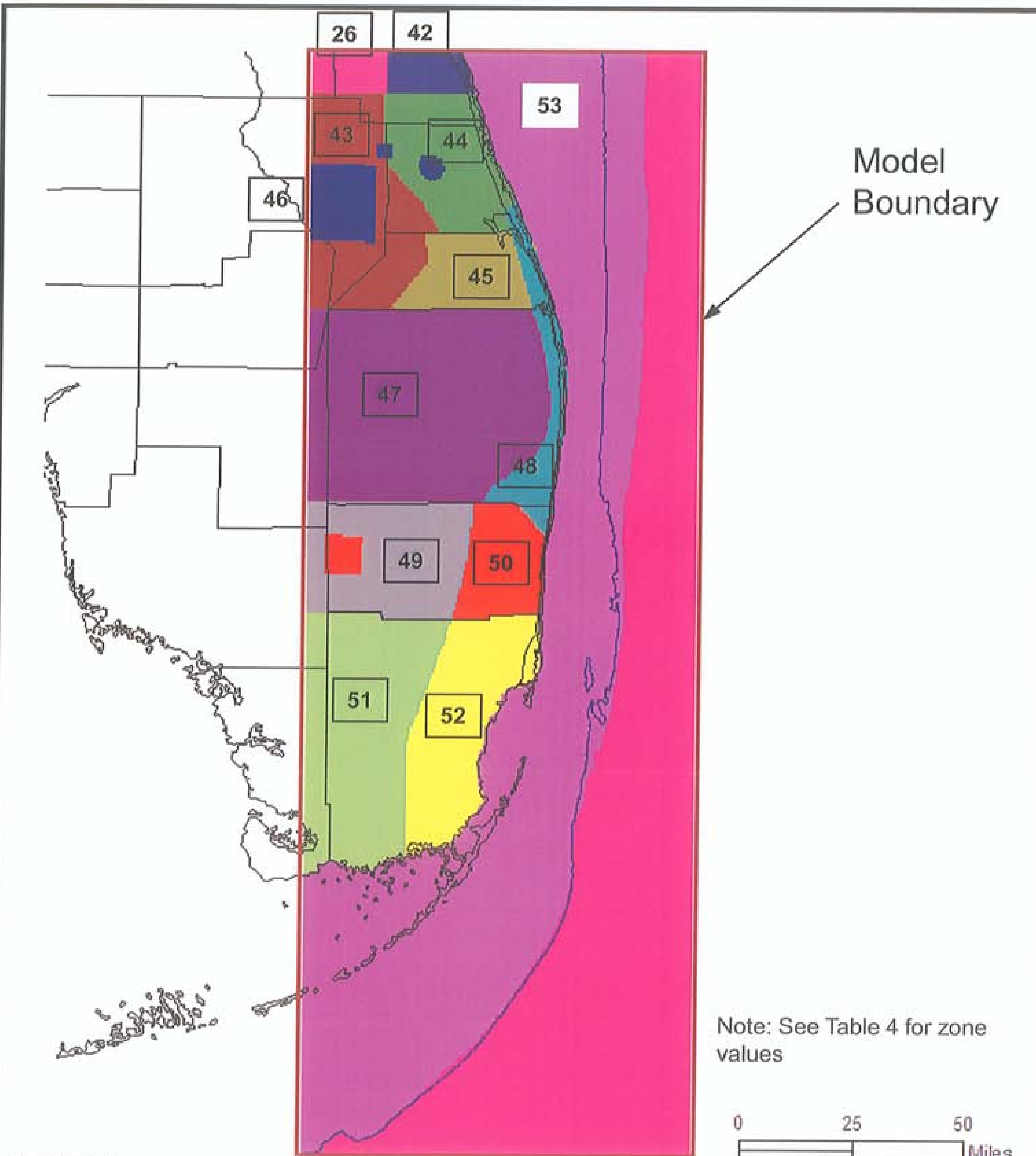
- Water body
- County boundary
- 10 Hydraulic Conductivity Zones

N

PROJECT	ECFAS PHASE II MODEL
TITLE	**Hydrogeologic Properties of UFA – Calibrated Model**

Golder Associates

PROJECT No.	073-82536		FILE No. ECFAS II
DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
GIS/CADD	CJB	2/01/2008	
CHECK	GMP	2/01/2008	**FIGURE 46a**
REVIEW	JS	10/14/08	

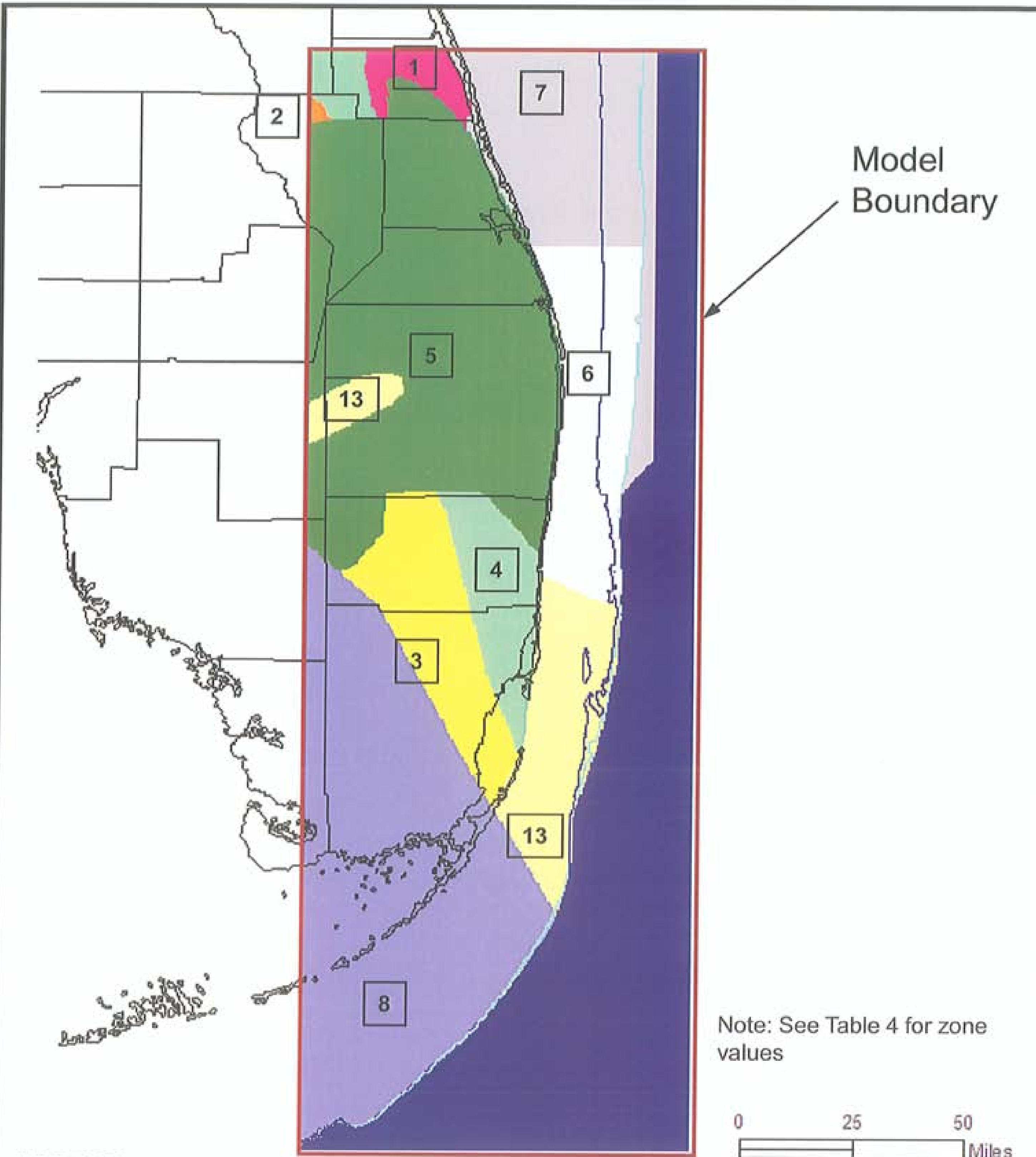


LEGEND

- Water body
- County boundary
- 10 — Hydraulic Conductivity Zones

PROJECT	ECFAS PHASE II MODEL			
TITLE	**Hydrogeologic Properties of MCU1 – Calibrated Model**			
PROJECT No.	073-82536		FILE No. ECFAS II	
DESIGN	CJB	2/01/2008	SCALE AS SHOWN	REV. O
GIS/CADD	CJB	2/01/2008	**FIGURE 46b**	
CHECK	GMP	2/01/2008		
REVIEW	JS	10/14/08		

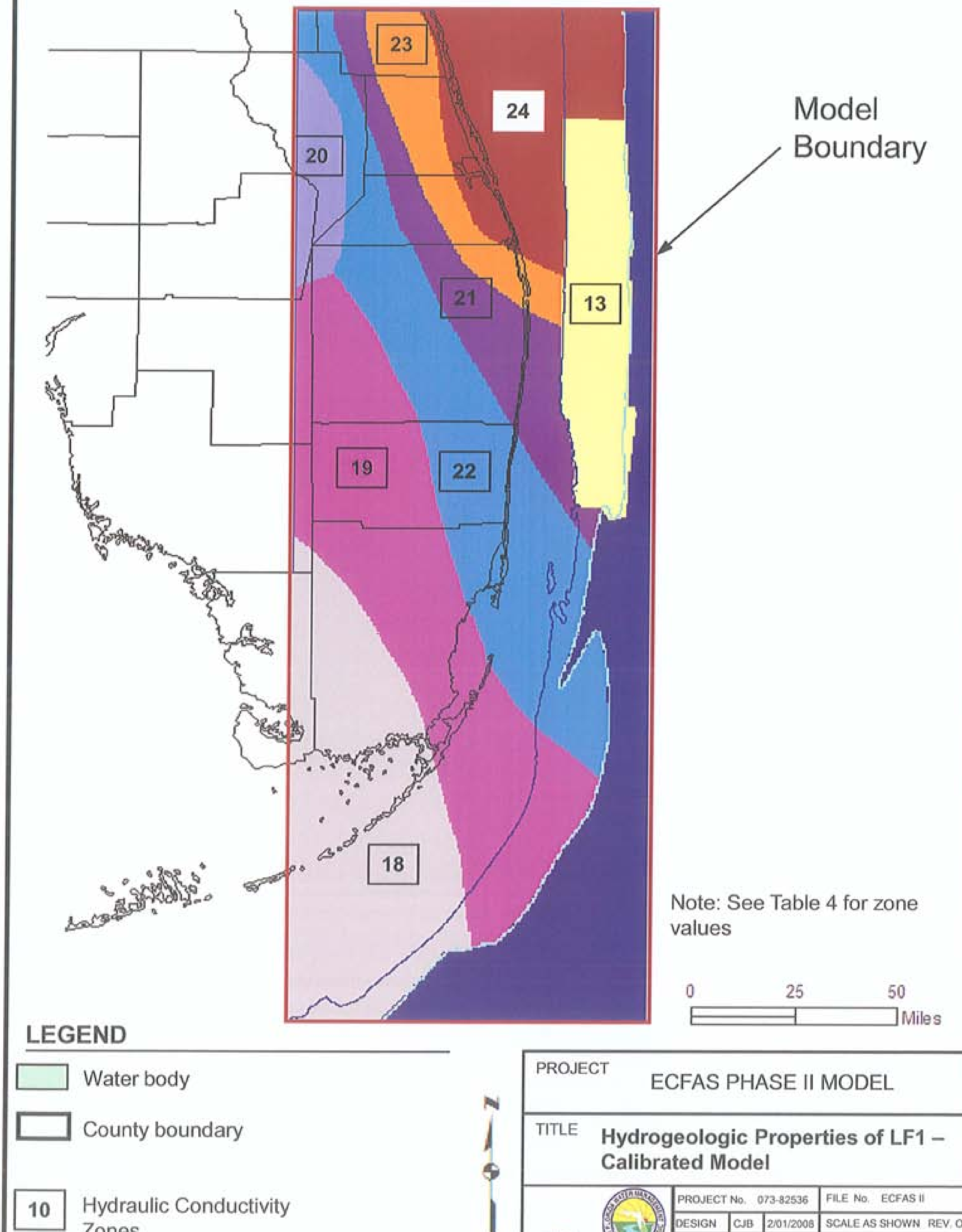
Golder Associates



LEGEND

- Water body
- County boundary
- 10 Hydraulic Conductivity Zones

PROJECT	ECFAS PHASE II MODEL		
TITLE	**Hydrogeologic Properties of APPZ – Calibrated Model**		
Golder Associates	PROJECT No. 073-82536		FILE No. ECFAS II
	DESIGN CJB	2/01/2008	SCALE AS SHOWN REV. O
	GIS/CADD CJB	2/01/2008	
	CHECK GMP	2/01/2008	**FIGURE 46c**
	REVIEW JS	10/14/08	



PROJECT	ECFAS PHASE II MODEL			
TITLE	**Hydrogeologic Properties of LF1 – Calibrated Model**			
PROJECT No.	073-82536		FILE No. ECFAS II	
DESIGN	CJB	2/01/2008	SCALE AS SHOWN	REV. O
GIS/CADD	CJB	2/01/2008		
CHECK	GMP	2/01/2008	**FIGURE 46d**	
REVIEW	JS	10/14/08		

Golder Associates

Western and Northern Boundaries	Hydrogeologic Unit	Eastern Boundary
CHD	SAS (Layer 1)	CHD
NF	ICU (Layer 2)	NF
CHD	UFA (Layers 3 & 4)	GHB
NF	MCU1 (Layers 5 & 6)	NF
CHD	SPZUFA (Layers 7 & 8)	GHB
NF	MCU2 (Layers 9, 10 & 11)	NF
CHD	LF1 (Layer 12)	GHB
NF	MCU2 (Layer 13)	NF
CHD	BZ (Layer 14)	CHD

LEGEND

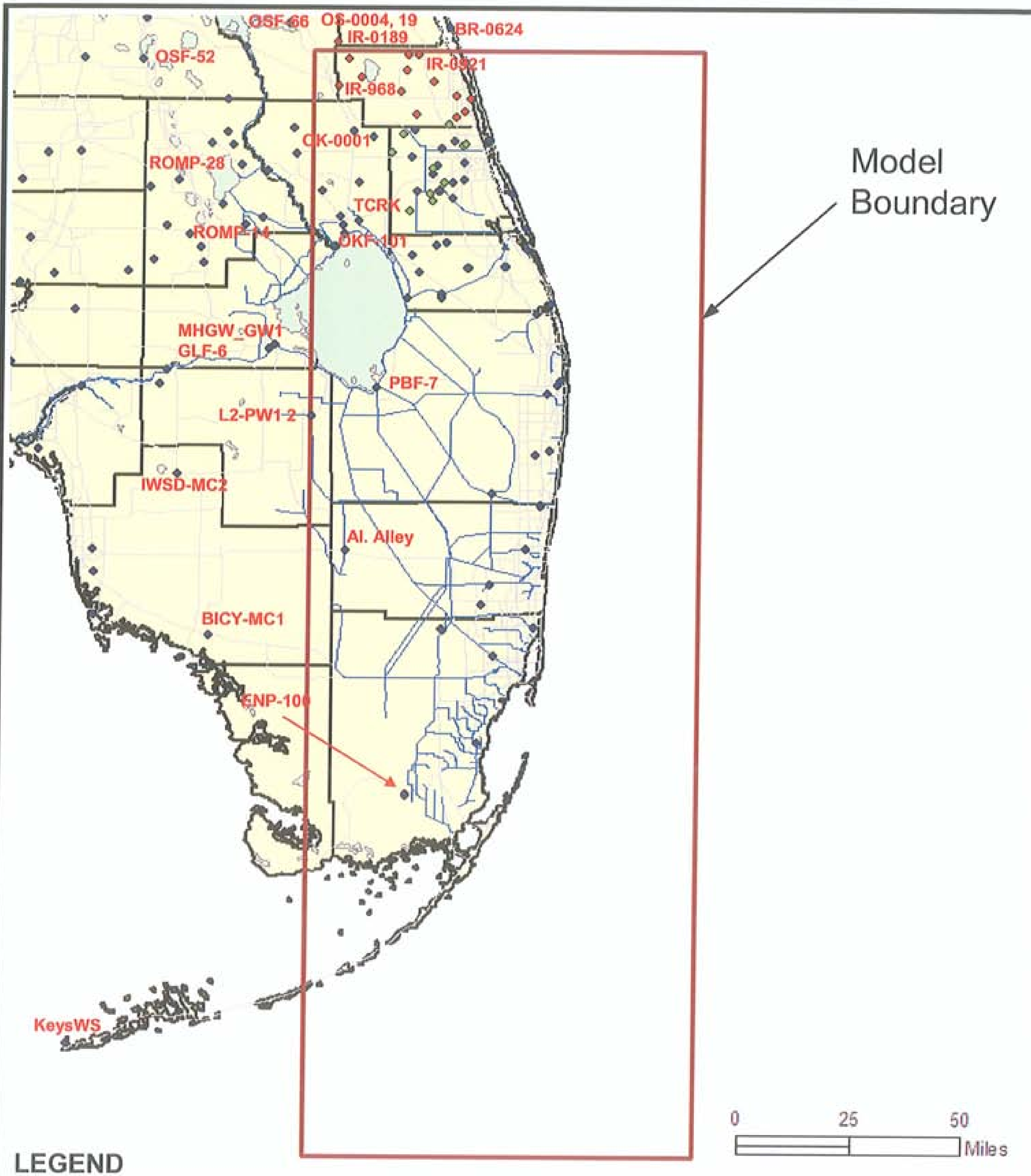
- ▭ Hydrogeologic Unit boundary
- CHD Constant Head Boundary
- GHB General Head Boundary
- NF No Flow Boundary

N

PROJECT	ECFAS PHASE II MODEL
TITLE	**Model Boundary Type for Each Model Layer**

PROJECT No.	073-82536		FILE No. ECFAS II
DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
GIS/CADD	CJB	2/01/2008	
CHECK	GMP	2/01/2008	**FIGURE 46e**
REVIEW	JS	10/14/08	

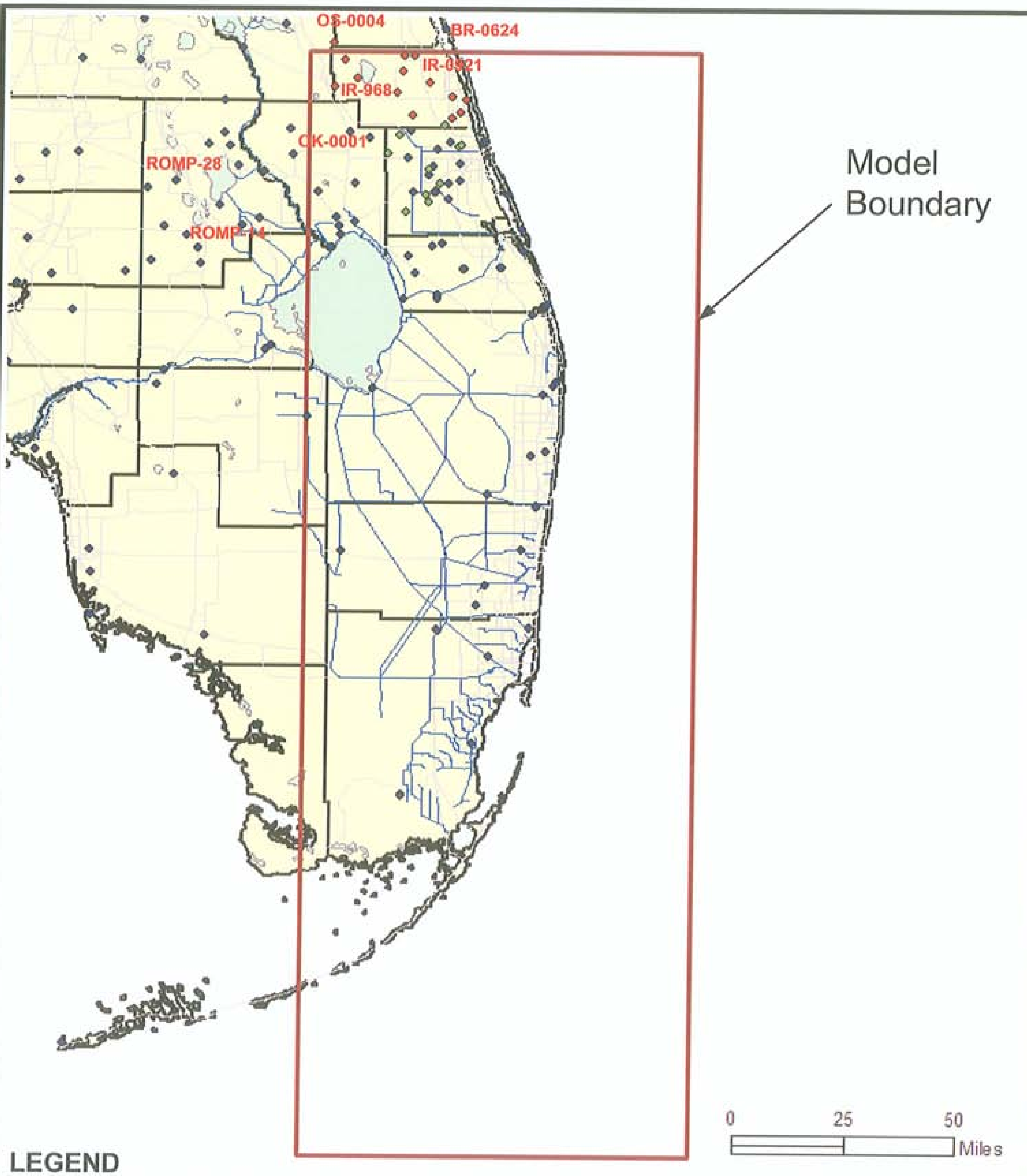
Golder Associates



LEGEND

- Water body
- County boundary
- Canals/rivers
- Major roads
- SFWMD Database
- SJRWMD Database
- NRCS Data

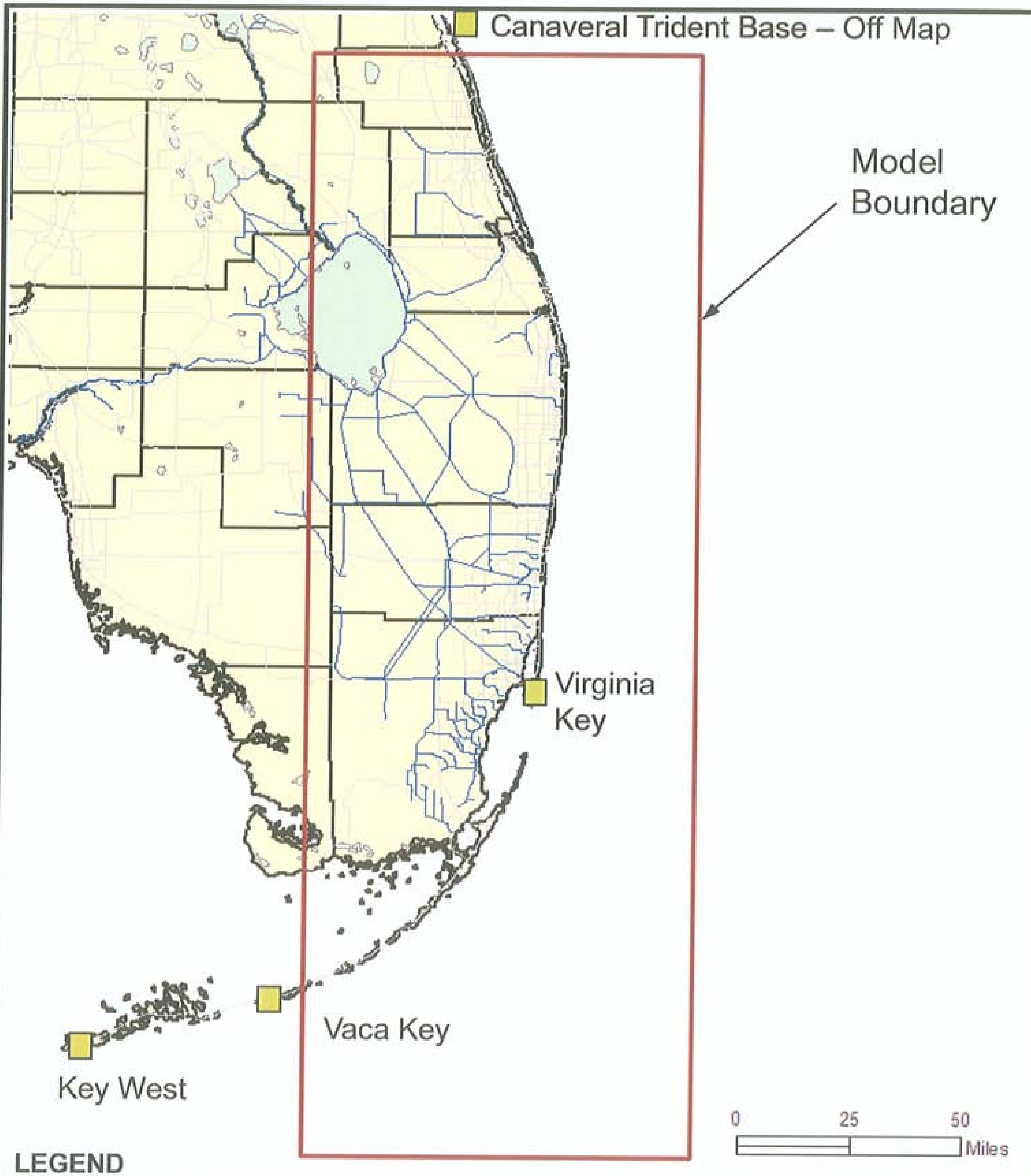
PROJECT	ECFAS PHASE II MODEL			
TITLE	**PRIMARY WELLS USED FOR BOUNDARY DEVELOPMENT**			
Golder Associates	PROJECT No. 073-82536			FILE No. ECFAS II
	DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
	GIS/CADD	CJB	2/01/2008	
	CHECK	GMP	2/01/2008	**FIGURE 47**
	REVIEW	JS	10/14/08	



LEGEND

Water body
County boundary
Canals/rivers
Major roads
SFWMD Database
SJRWMD Database
NRCS Data

PROJECT	ECFAS PHASE II MODEL			
TITLE	**PRIMARY WELLS USED FOR BASELINE REGRESSION**			
Golder Associates	PROJECT No.	073-82536		FILE No. ECFAS II
	DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
	GIS/CADD	CJB	2/01/2008	
	CHECK	GMP	2/01/2008	**FIGURE 48**
	REVIEW	JS	10/14/08	



LEGEND

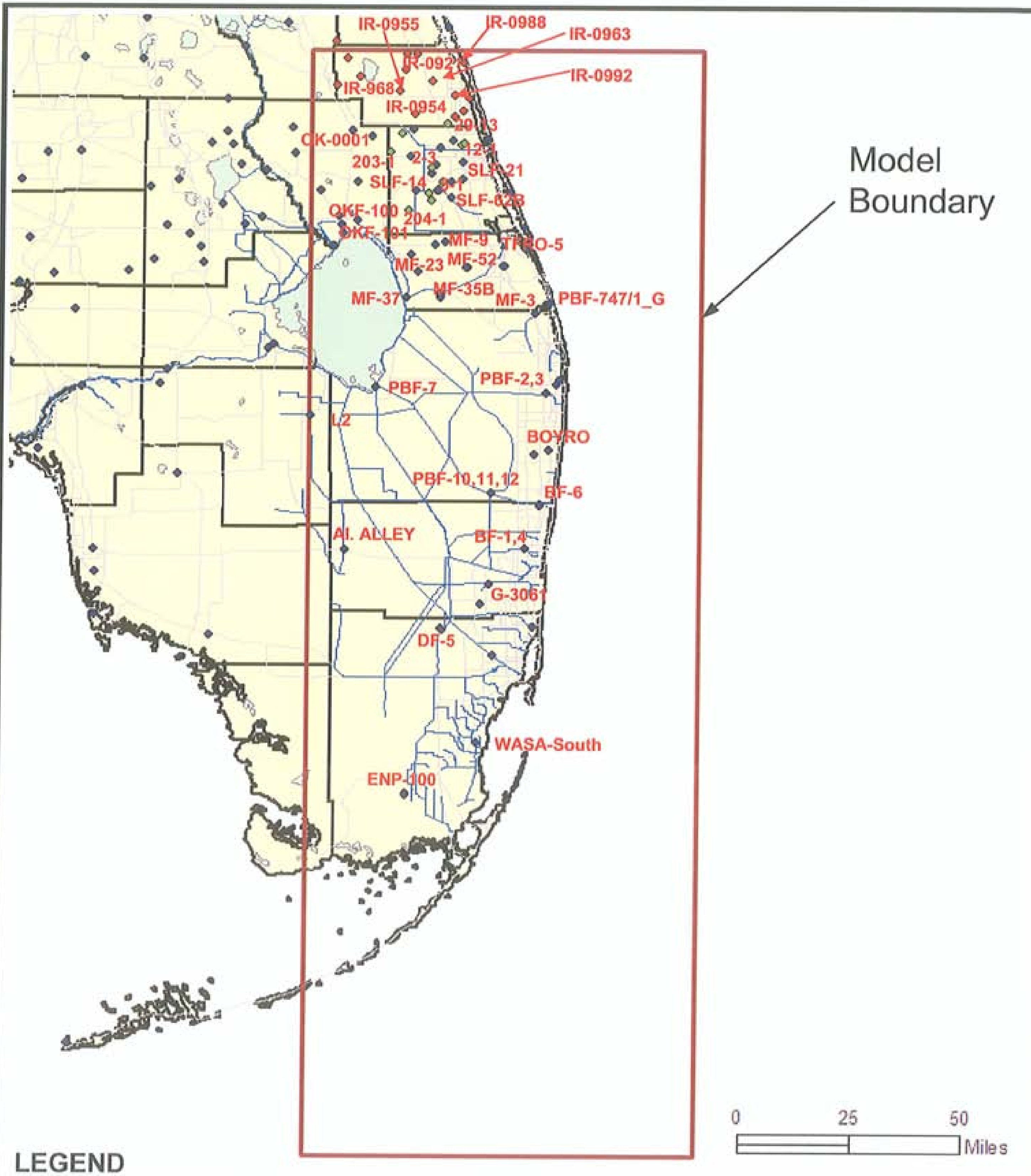
- Water body
- County boundary
- Canals/rivers
- Major roads
- Tidal Gage Location

PROJECT: ECFAS PHASE II MODEL

TITLE: **LOCATION OF TIDAL GAGES**

Golder Associates

PROJECT No.	073-82536		FILE No. ECFAS II
DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
GIS/CADD	CJB	2/01/2008	
CHECK	GMP	2/01/2008	**FIGURE 49**
REVIEW	JS	10/14/08	

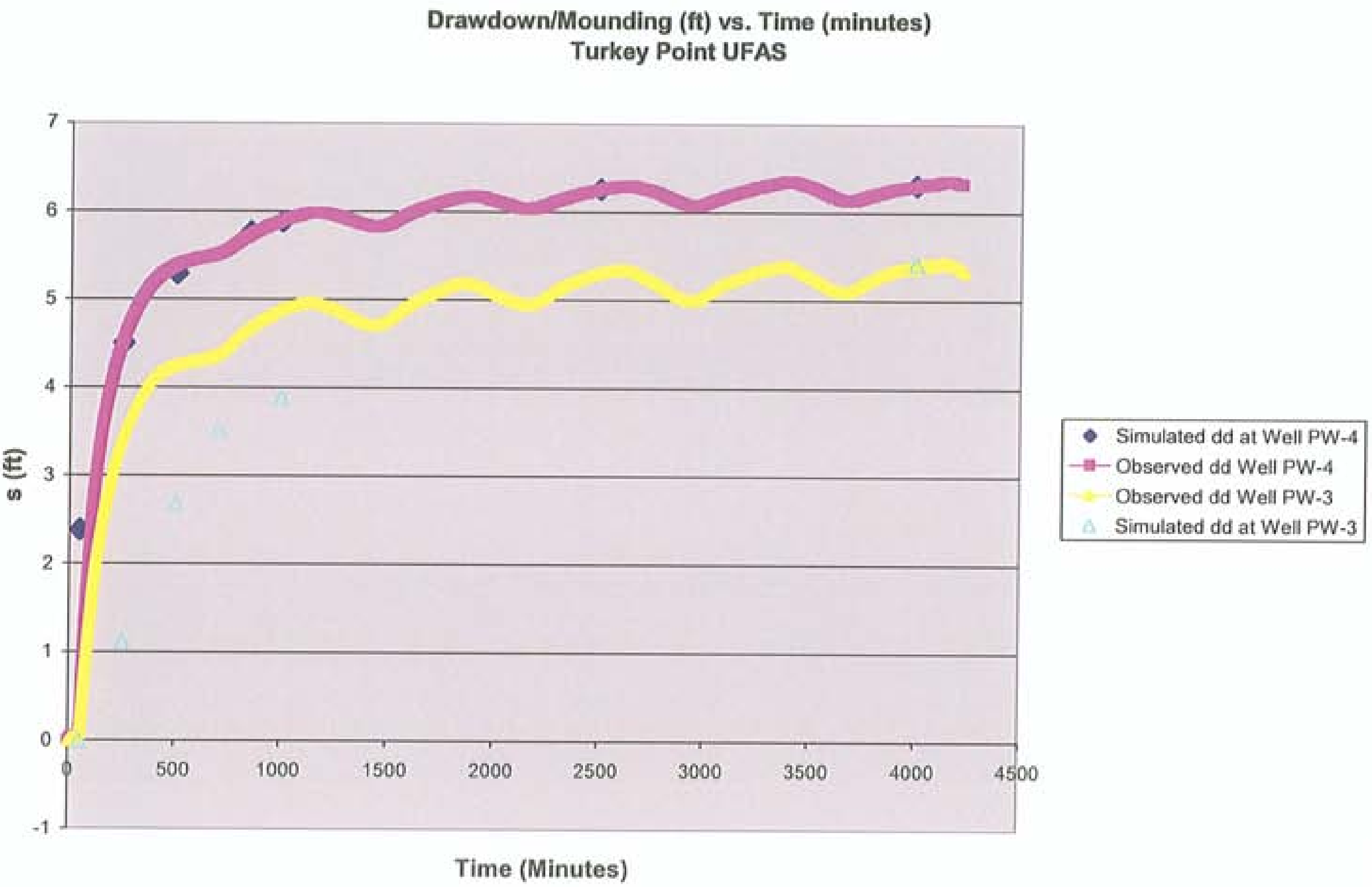


LEGEND

- Water body
- County boundary
- Canals/rivers
- Major roads
- SFWMD Database
- SJRWMD Database
- NRCS Data

PROJECT	ECFAS PHASE II MODEL		
TITLE	PRIMARY WELLS USED FOR MODEL CALIBRATION		
PROJECT No. 073-82536			FILE No. ECFAS II
DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
GIS/CADD	CJB	2/01/2008	FIGURE 50
CHECK	GMP	2/01/2008	
REVIEW	JS	10/14/08	

Golder Associates

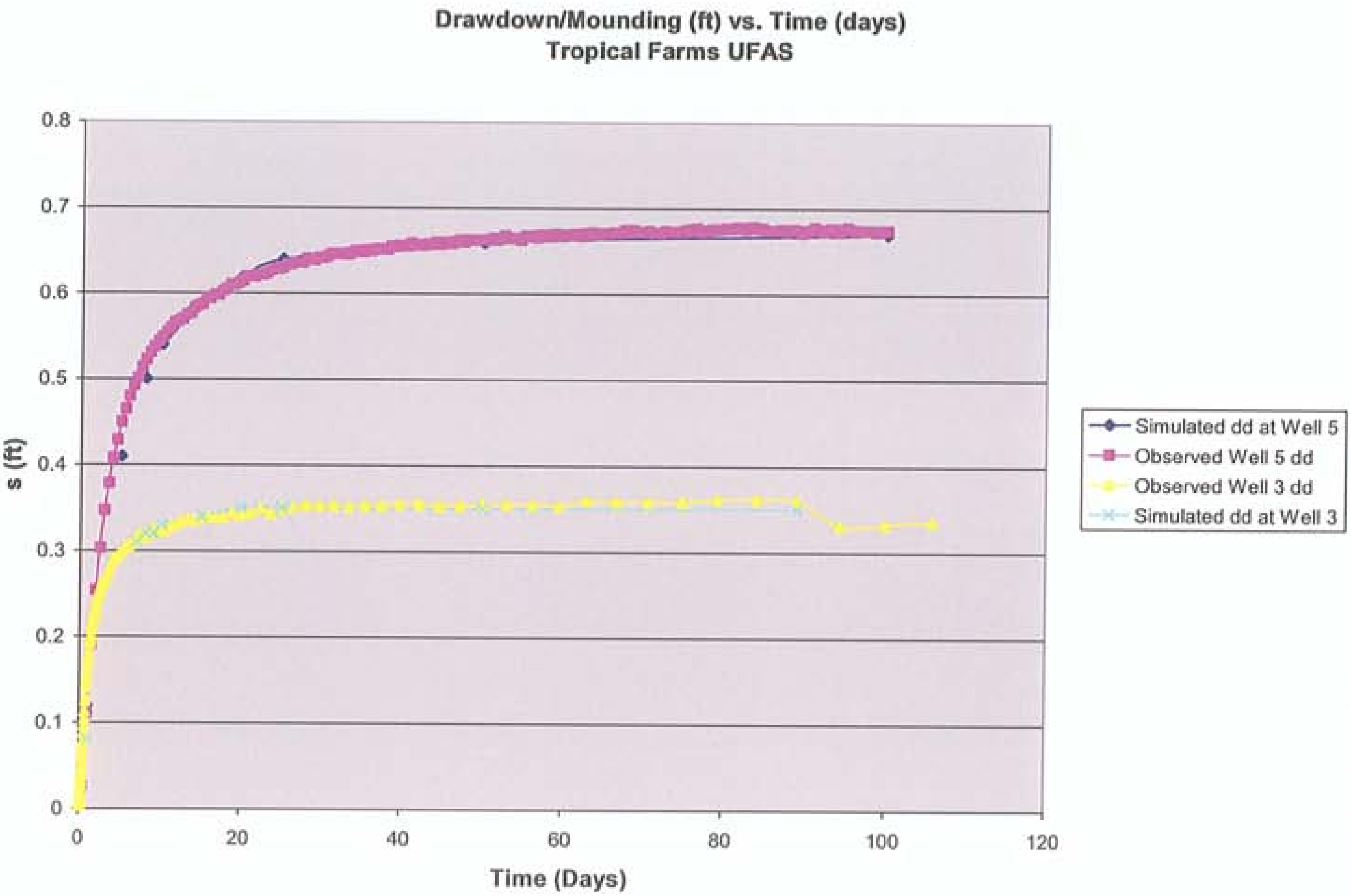


LEGEND

Observation well PW-4

Observation well PW-3

PROJECT	ECFAS PHASE II MODEL			
TITLE	LOCAL SCALE CALIBRATION RESULTS			
Golder Associates	PROJECT No.	073-82536		FILE No. ECFAS II
	DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
	GIS/CADD	CJB	2/01/2008	FIGURE 51
	CHECK	GMP	2/01/2008	
	REVIEW	JS	10/14/08	



LEGEND

Observation well MW-3

Observation well MW-5

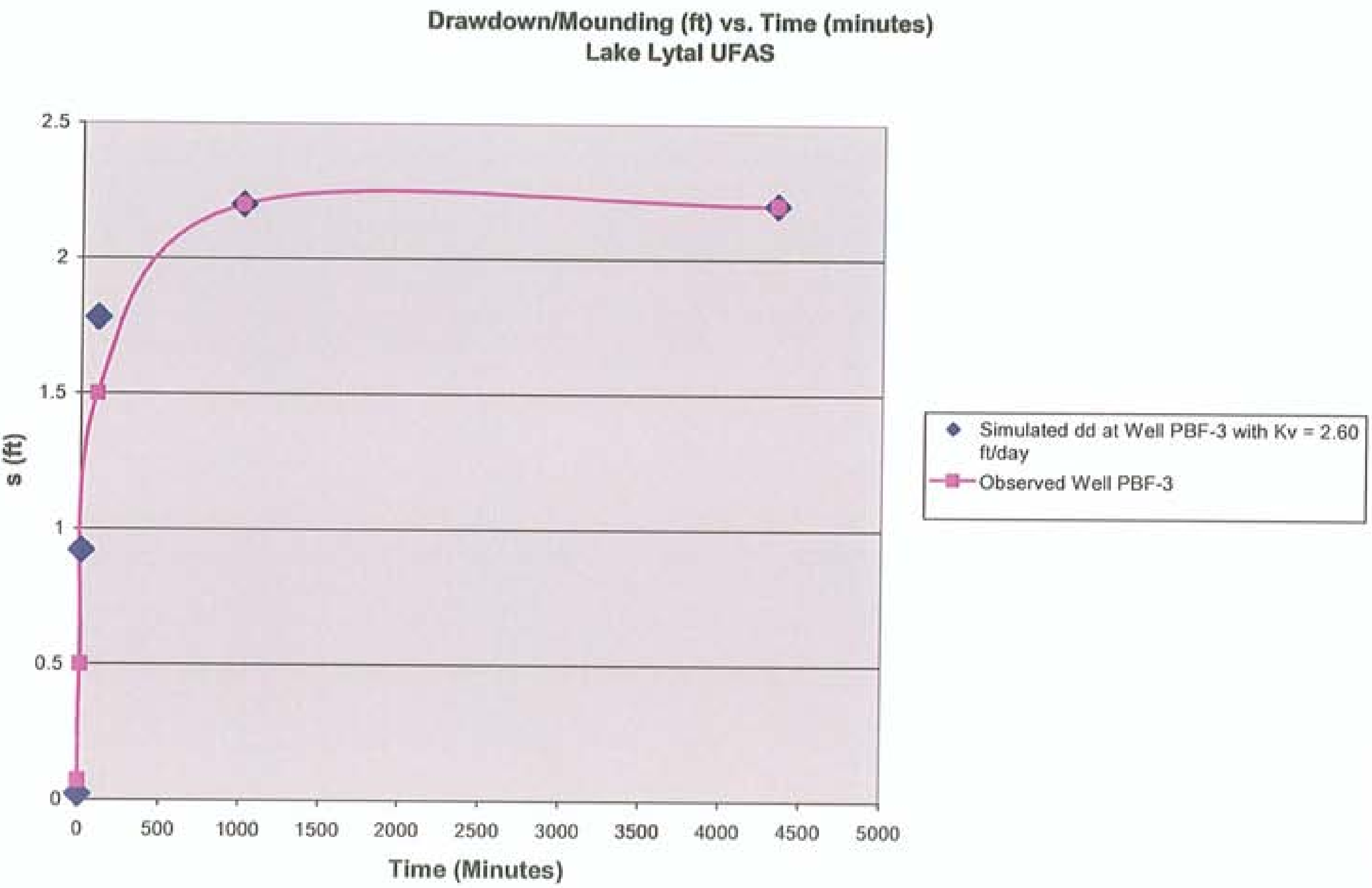
PROJECT	ECFAS PHASE II MODEL			
TITLE	LOCAL SCALE CALIBRATION RESULTS			
PROJECT No.	073-82536		FILE No. ECFAS II	
DESIGN	CJB	2/01/2008	SCALE AS SHOWN	REV. O
GIS/CADD	CJB	2/01/2008		
CHECK	GMP	2/01/2008	FIGURE 52	
REVIEW	JS	10/14/08		

Golder Associates

LEGEND

Observation well EW-2

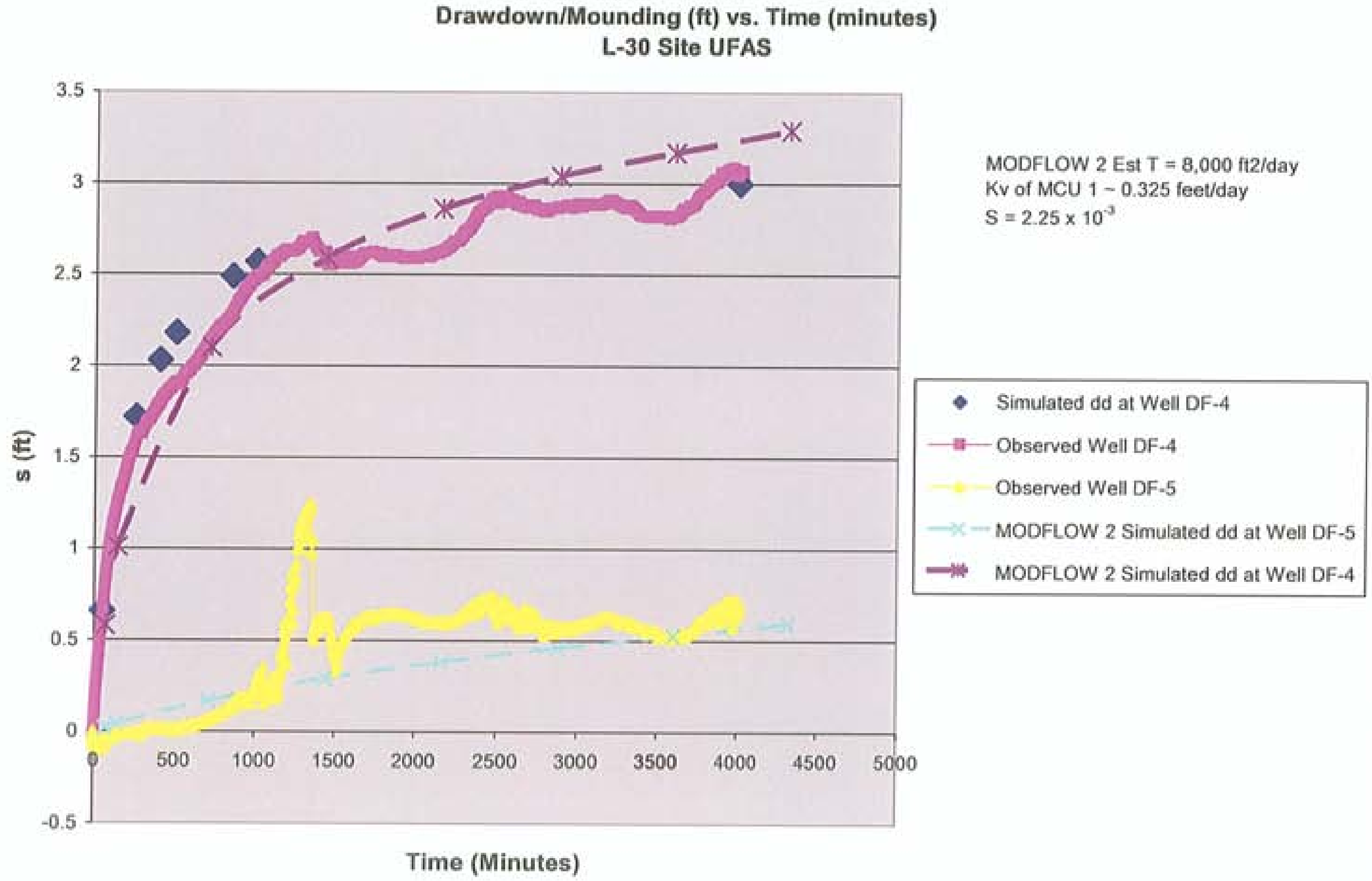
PROJECT	ECFAS PHASE II MODEL			
TITLE	LOCAL SCALE CALIBRATION RESULTS			
Golder Associates	PROJECT No. 073-82536			FILE No. ECFAS II
	DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
	GIS/CADD	CJB	2/01/2008	FIGURE 53
	CHECK	GMP	2/01/2008	
	REVIEW	JS	10/14/08	



LEGEND

Observation well PBF-3

PROJECT	ECFAS PHASE II MODEL			
TITLE	**LOCAL SCALE CALIBRATION RESULTS**			
Golder Associates	PROJECT No.	073-82536		FILE No. ECFAS II
	DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
	GIS/CADD	CJB	2/01/2008	
	CHECK	GMP	2/01/2008	**FIGURE 54**
	REVIEW	JS	10/14/08	



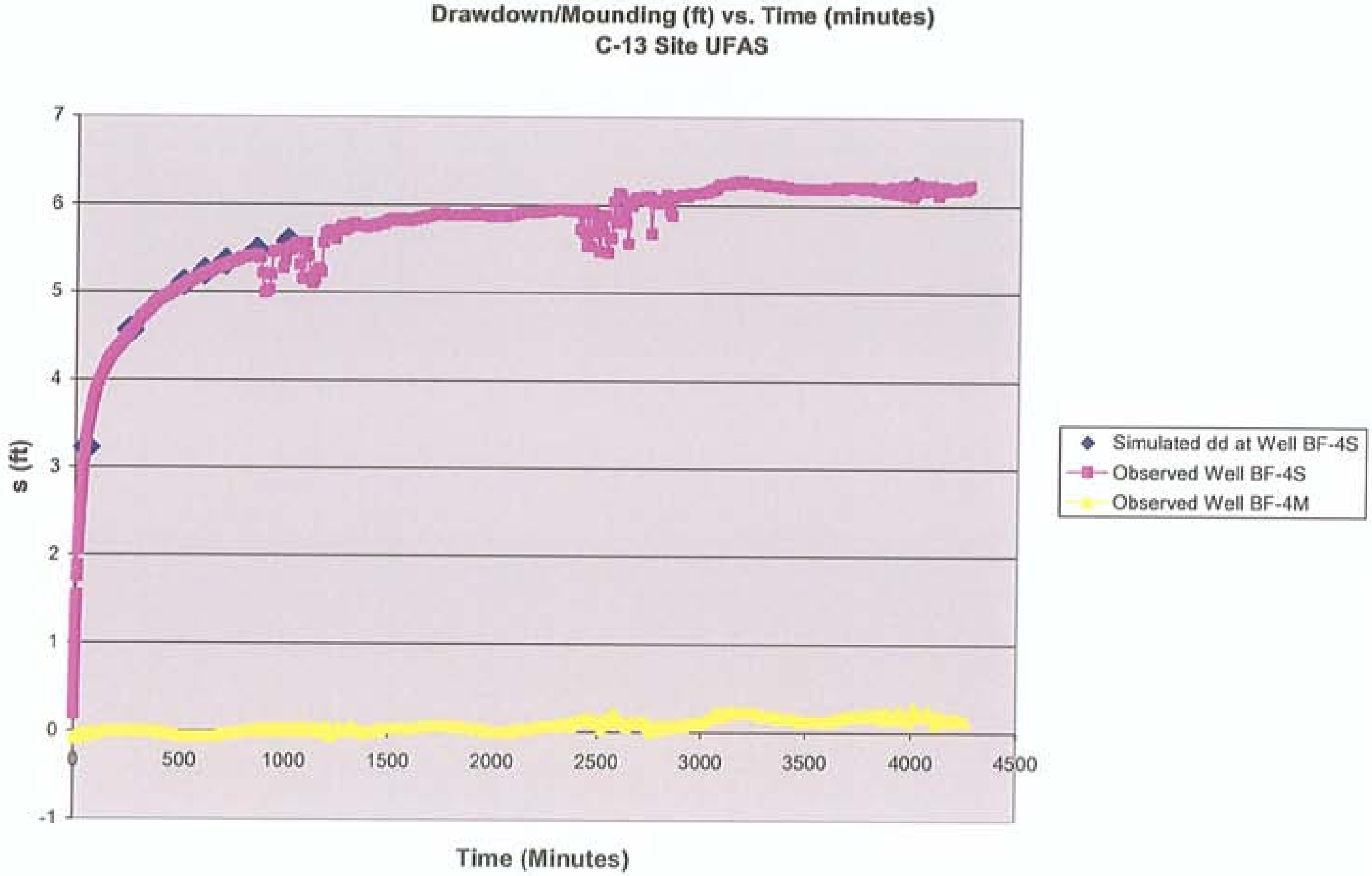
LEGEND

Observation well DF-5

Observation well DF-4

PROJECT	ECFAS PHASE II MODEL
TITLE	LOCAL SCALE CALIBRATION RESULTS

Golder Associates	PROJECT No. 073-82536			FILE No. ECFAS II
	DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
	GIS/CADD	CJB	2/01/2008	FIGURE 55
	CHECK	GMP	2/01/2008	
	REVIEW	JS	10/14/08	

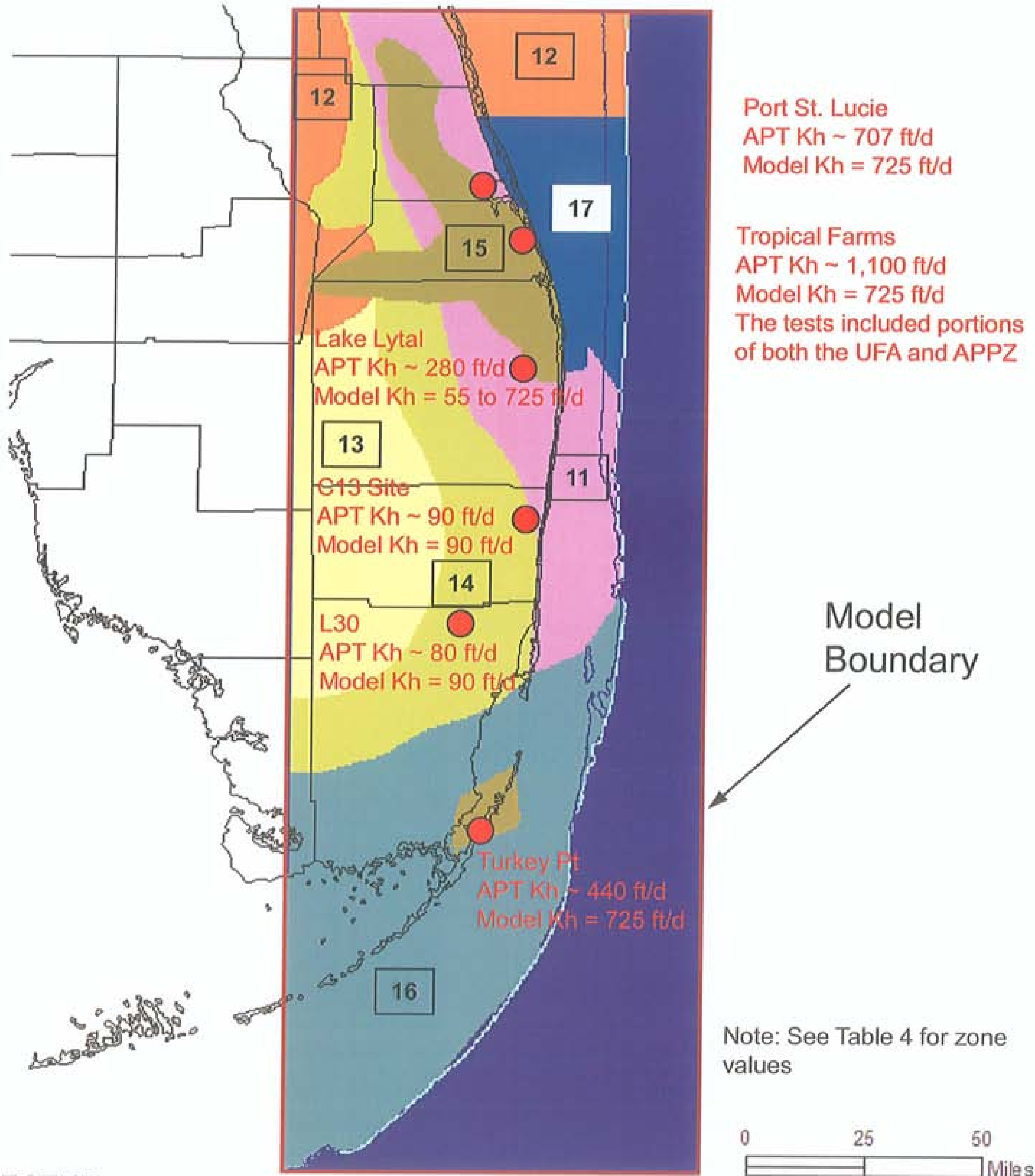


LEGEND

Observation well BF-4S

Observation well BF-4M

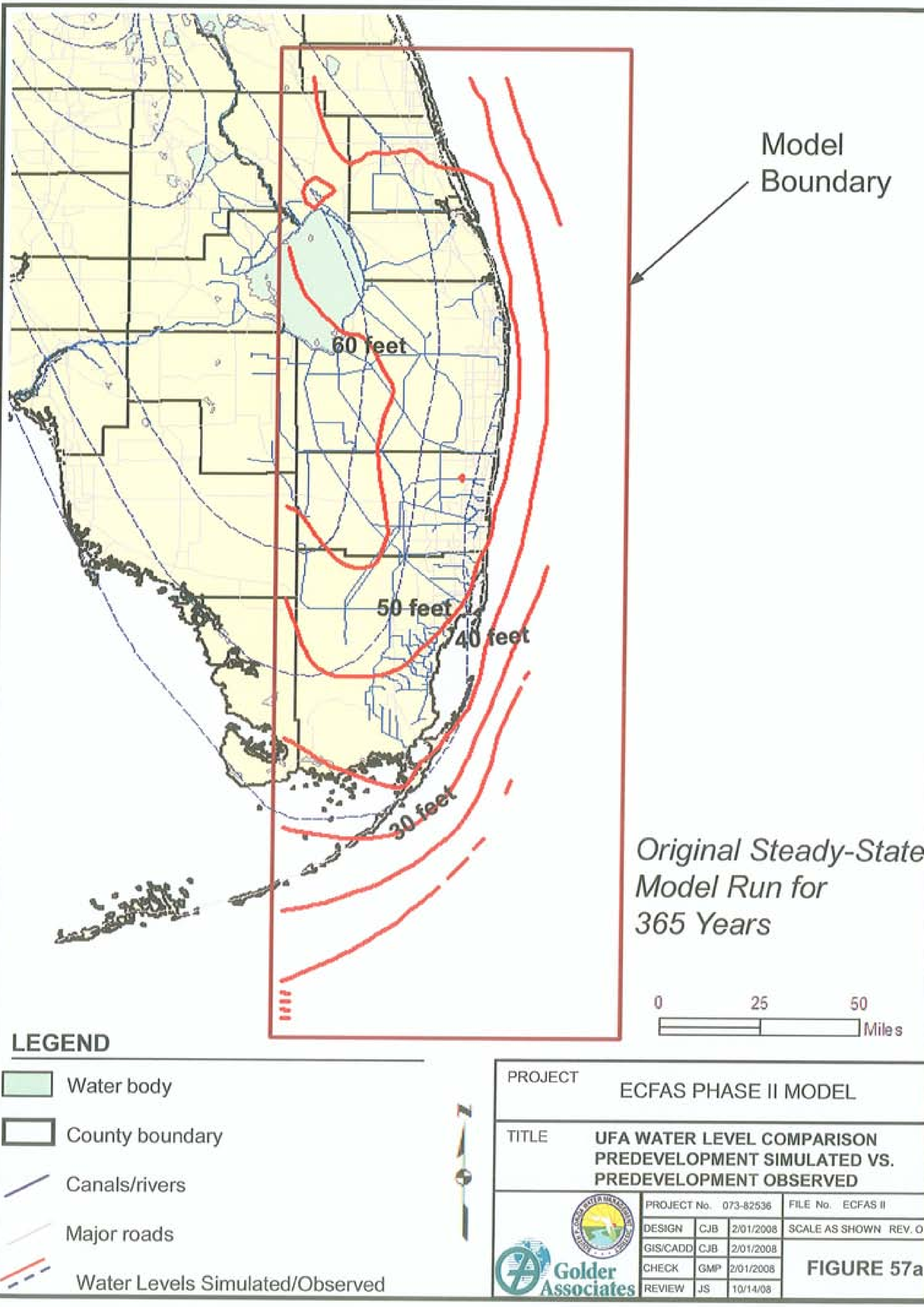
PROJECT	ECFAS PHASE II MODEL			
TITLE	LOCAL SCALE CALIBRATION RESULTS			
Golder Associates	PROJECT No. 073-82536			FILE No. ECFAS II
	DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
	GIS/CADD	CJB	2/01/2008	FIGURE 56
	CHECK	GMP	2/01/2008	
	REVIEW	JS	10/14/08	



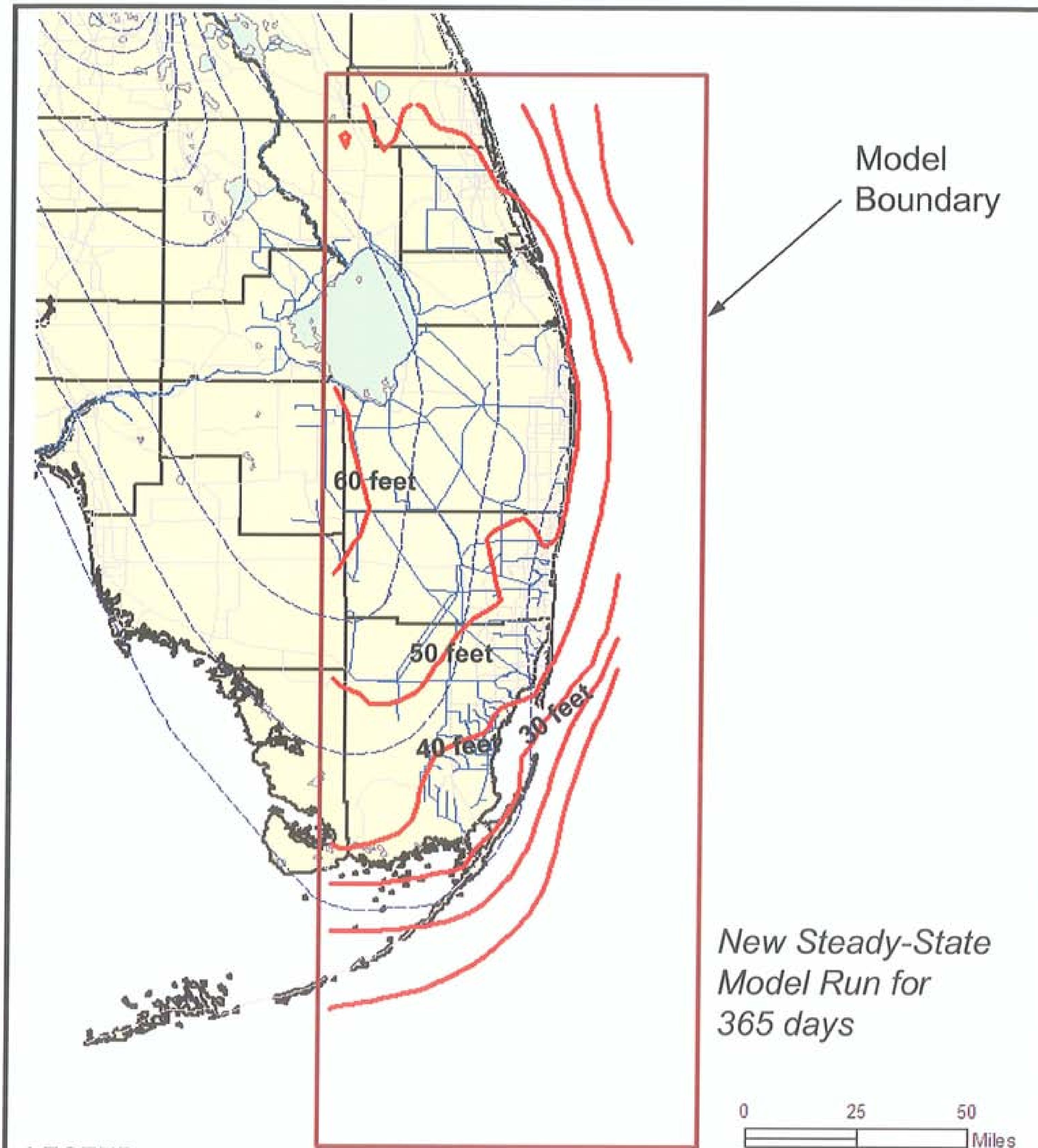
LEGEND

- Water body
- County boundary
- Approx. Location of APT Test
- 10 Hydraulic Conductivity Zones

PROJECT	ECFAS PHASE II MODEL			
TITLE	**Local Scale Conductivity Vs. Regional Scale Conductivity for UFA**			
Golder Associates	PROJECT No. 073-82536			FILE No. ECFAS II
	DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
	GIS/CADD	CJB	2/01/2008	**FIGURE 56b**
	CHECK	GMP	2/01/2008	
	REVIEW	JS	10/14/08	



PROJECT	ECFAS PHASE II MODEL			
TITLE	UFA WATER LEVEL COMPARISON PREDEVELOPMENT SIMULATED VS. PREDEVELOPMENT OBSERVED			
Golder Associates	PROJECT No. 073-82536			FILE No. ECFAS II
	DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
	GIS/CADD	CJB	2/01/2008	FIGURE 57a
	CHECK	GMP	2/01/2008	
	REVIEW	JS	10/14/08	

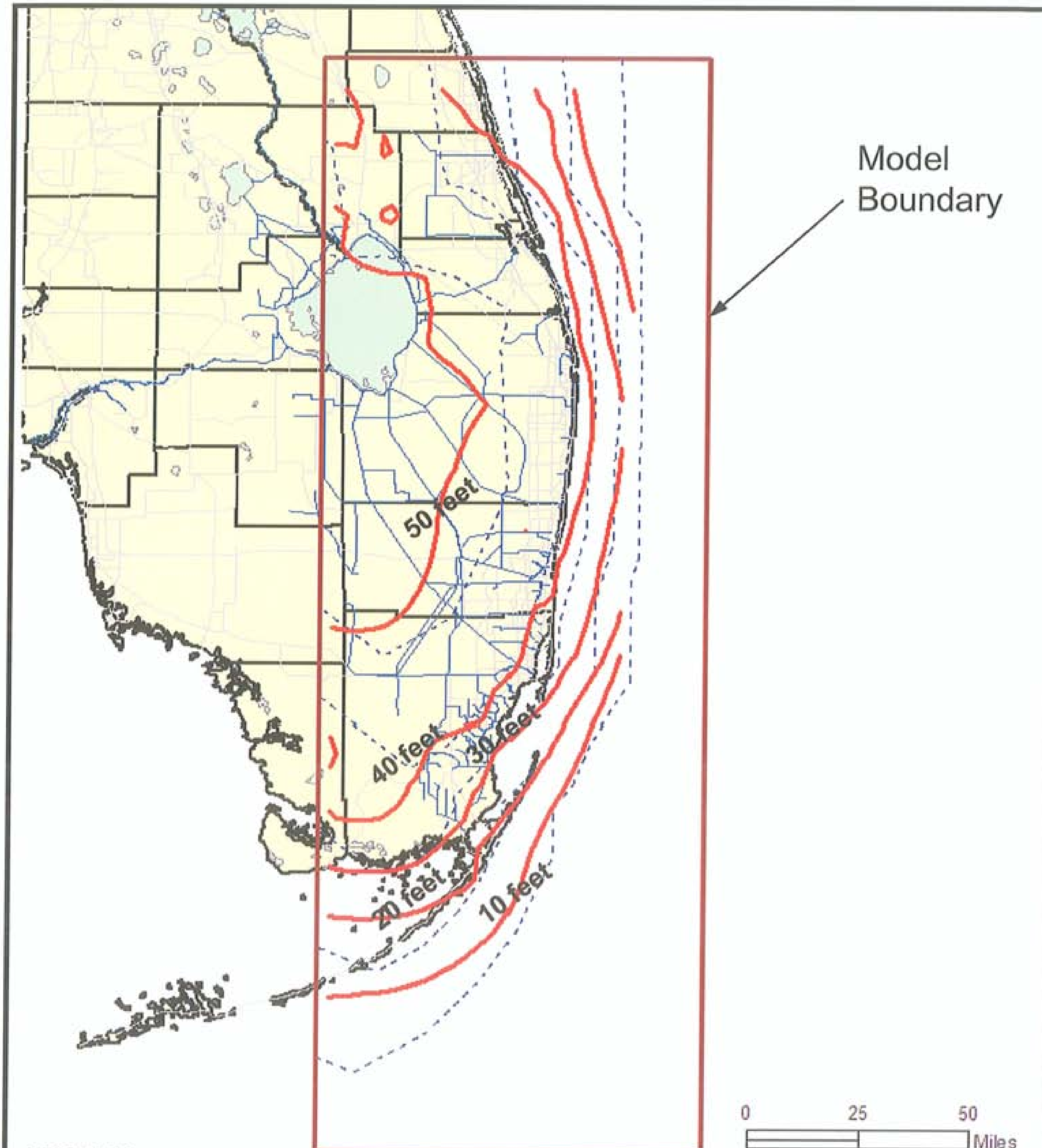


LEGEND

- Water body
- County boundary
- Canals/rivers
- Major roads
- Water Levels Simulated/Observed

PROJECT	ECFAS PHASE II MODEL		
TITLE	UFA WATER LEVEL COMPARISON PREDEVELOPMENT SIMULATED VS. PREDEVELOPMENT OBSERVED		
PROJECT No.	073-82536		FILE No. ECFAS II
DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
GIS/CADD	CJB	2/01/2008	
CHECK	GMP	2/01/2008	FIGURE 57b
REVIEW	JS	10/14/08	

Golder Associates

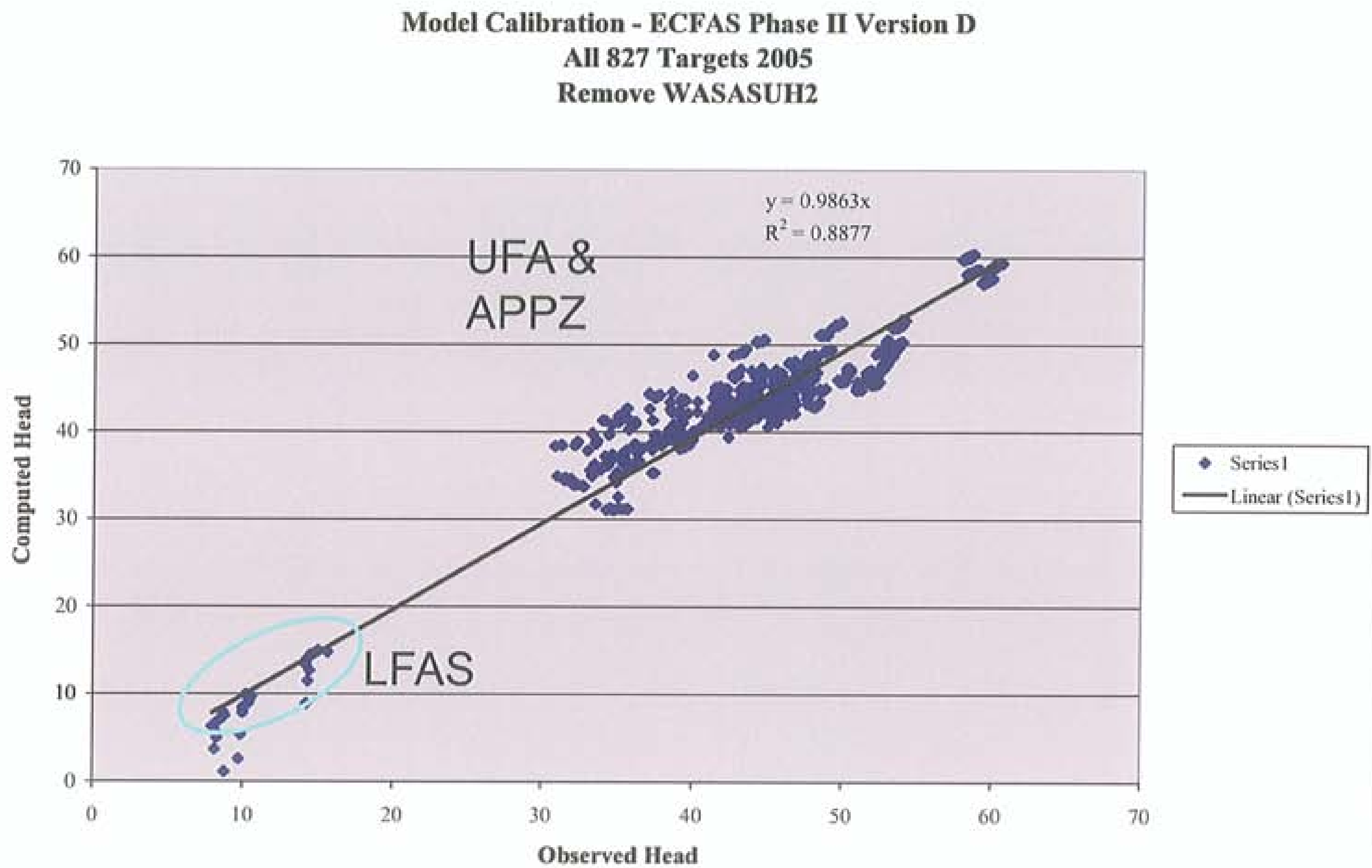


LEGEND

- Water body
- County boundary
- Canals/rivers
- Major roads
- Water Levels Simulated/Observed

PROJECT	ECFAS PHASE II MODEL			
TITLE	**UFA WATER LEVEL COMPARISON DECEMBER 2005, SIMULATED VS. OBSERVED**			
Golder Associates	PROJECT No.	073-82536		FILE No. ECFAS II
	DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
	GIS/CADD	CJB	2/01/2008	**FIGURE 58**
	CHECK	GMP	2/01/2008	
	REVIEW	JS	10/14/08	

Model Calibration Results

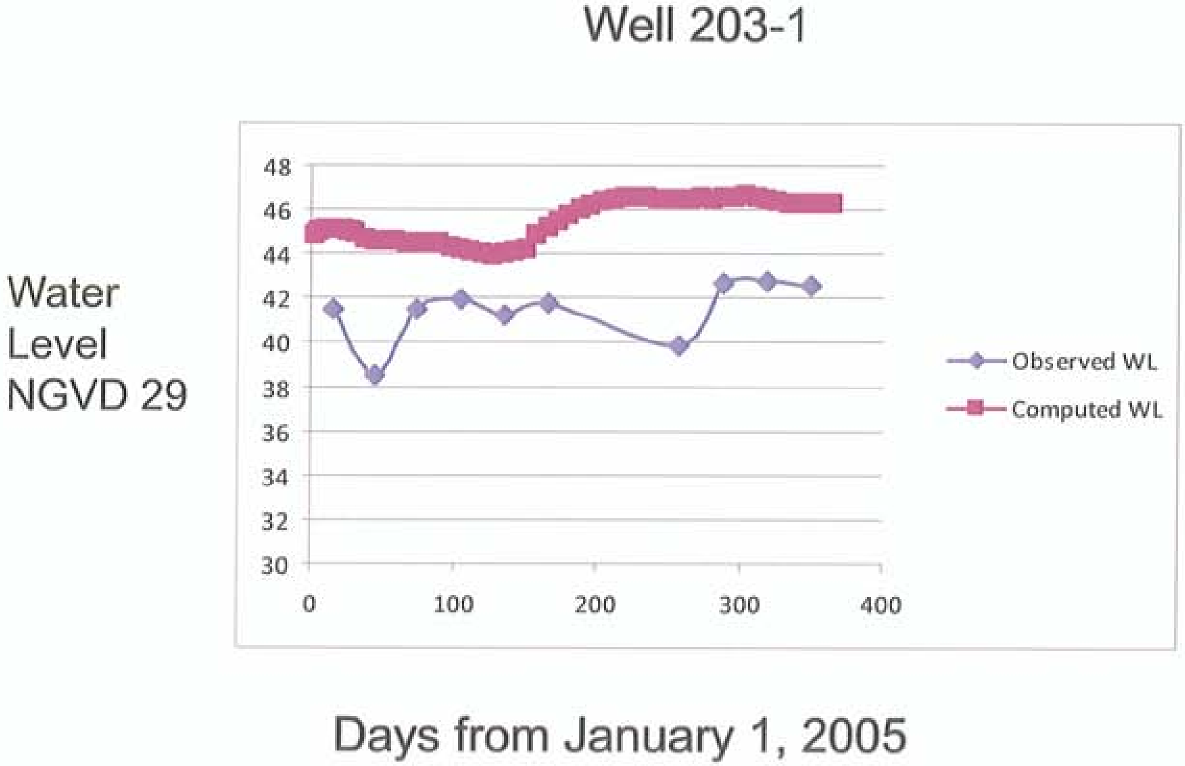


LEGEND

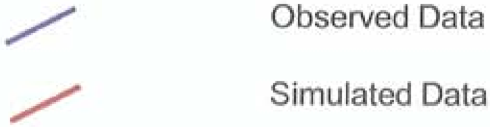
PROJECT	ECFAS PHASE II MODEL			
TITLE	**MODEL CALIBRATION RESULTS VERSION 2D OBSERVED VS. SIMULATED WATER LEVELS**			
PROJECT No.	073-82536		FILE No. ECFAS II	
DESIGN	CJB	2/01/2008	SCALE AS SHOWN	REV. O
GIS/CADD	CJB	2/01/2008	**FIGURE 59**	
CHECK	GMP	2/01/2008		
REVIEW	JS	10/14/08		

Golder Associates

Model Calibration Results

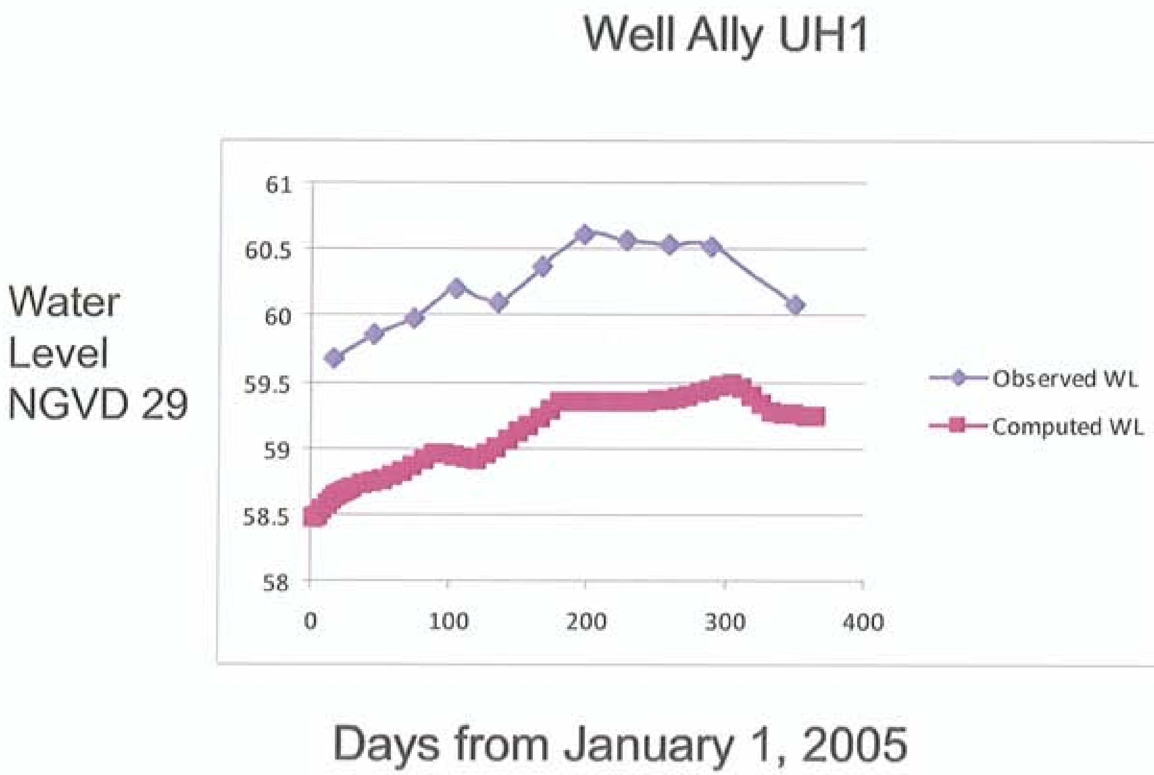


LEGEND



PROJECT	ECFAS PHASE II MODEL			
TITLE	MODEL CALIBRATION WATER LEVEL RESULTS SELECT OBSERVATION WELLS WELL NAMES AS SHOWN ON THE GRAPHS			
Golder Associates	PROJECT No. 073-82536			FILE No. ECFAS II
	DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
	GIS/CADD	CJB	2/01/2008	FIGURE 60
	CHECK	GMP	2/01/2008	
	REVIEW	JS	10/14/08	

Model Calibration Results



LEGEND

Observed Data

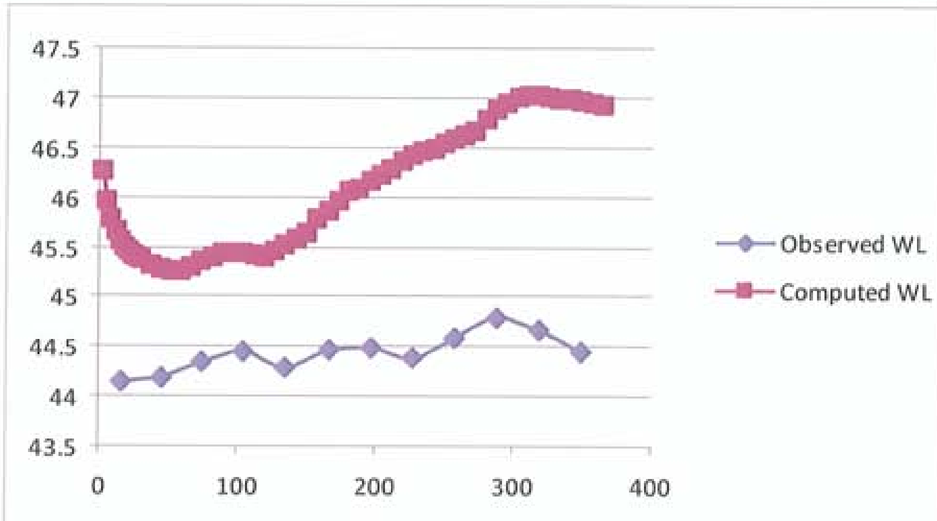
Simulated Data

PROJECT	ECFAS PHASE II MODEL			
TITLE	MODEL CALIBRATION WATER LEVEL RESULTS SELECT OBSERVATION WELLS WELL NAMES AS SHOWN ON THE GRAPHS			
Golder Associates	PROJECT No. 073-82536			FILE No. ECFAS II
	DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
	GIS/CADD	CJB	2/01/2008	
	CHECK	GMP	2/01/2008	FIGURE 61
	REVIEW	JS	10/14/08	

Model Calibration Results

Well BF-6

Water Level NGVD 29



Days from January 1, 2005

LEGEND

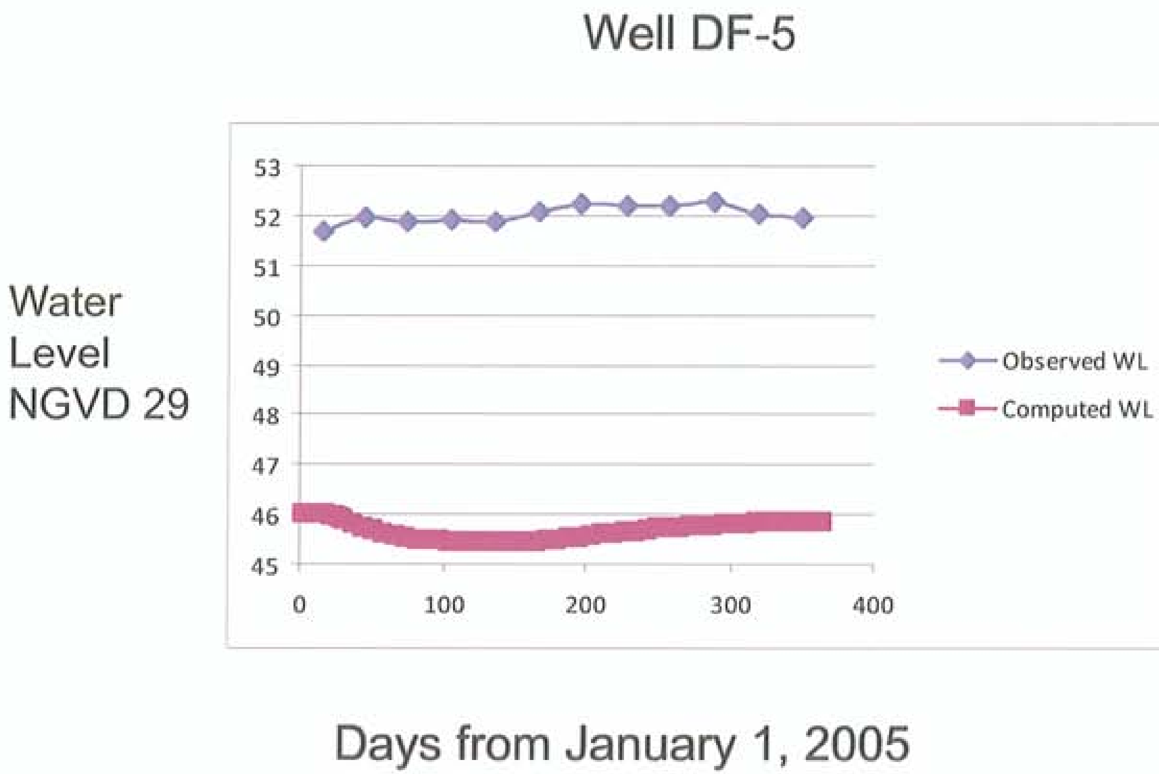
Observed Data

Simulated Data

PROJECT	ECFAS PHASE II MODEL		
TITLE	**MODEL CALIBRATION WATER LEVEL RESULTS SELECT OBSERVATION WELLS WELL NAMES AS SHOWN ON THE GRAPHS**		
PROJECT No. 073-82536			FILE No. ECFAS II
DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
GIS/CADD	CJB	2/01/2008	
CHECK	GMP	2/01/2008	**FIGURE 62**
REVIEW	JS	10/14/08	

Golder Associates

Model Calibration Results



LEGEND

Observed Data

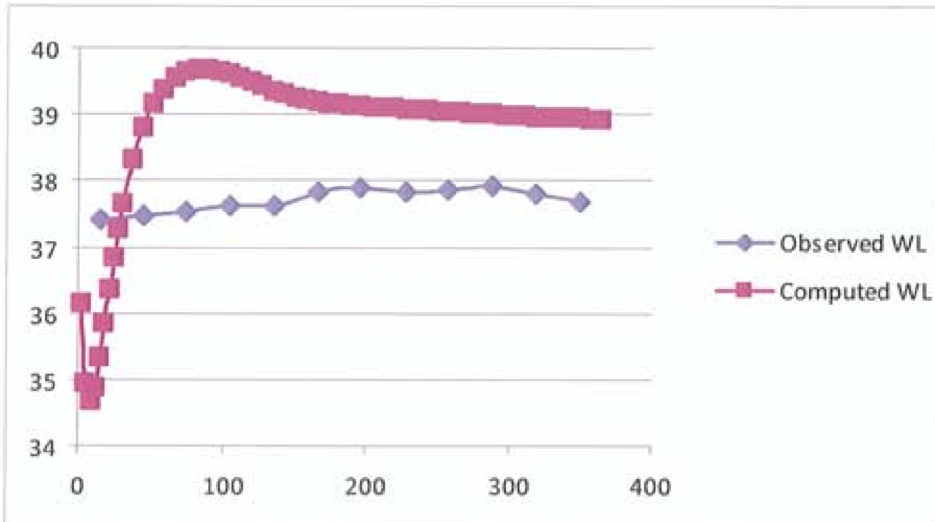
Simulated Data

PROJECT	ECFAS PHASE II MODEL			
TITLE	MODEL CALIBRATION WATER LEVEL RESULTS SELECT OBSERVATION WELLS WELL NAMES AS SHOWN ON THE GRAPHS			
	PROJECT No. 073-82536			FILE No. ECFAS II
	DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
	GIS/CADD	CJB	2/01/2008	
	CHECK	GMP	2/01/2008	FIGURE 63
Golder Associates	REVIEW	JS	10/14/08	

Model Calibration Results

Well ENP-100

Water Level NGVD 29



Days from January 1, 2005

LEGEND

Observed Data

Simulated Data

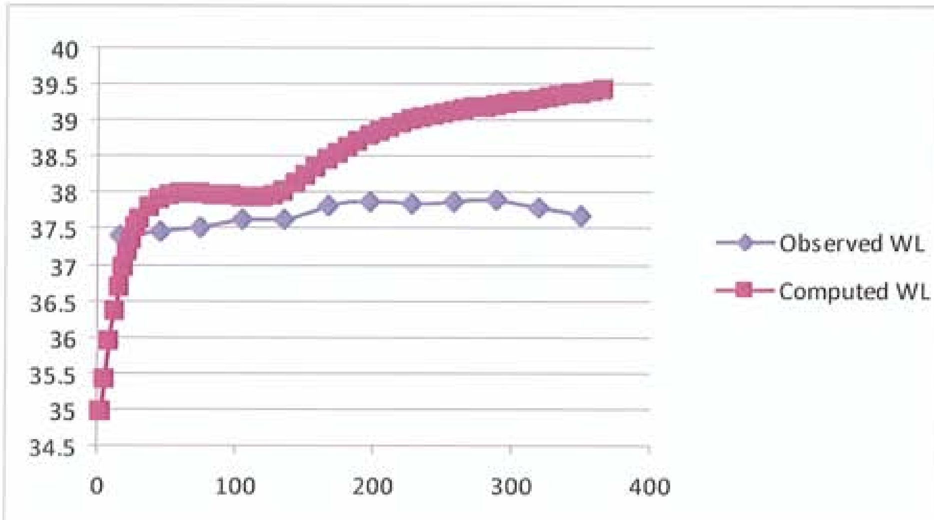
PROJECT	ECFAS PHASE II MODEL		
TITLE	MODEL CALIBRATION WATER LEVEL RESULTS SELECT OBSERVATION WELLS WELL NAMES AS SHOWN ON THE GRAPHS		
PROJECT No.	073-82536		FILE No. ECFAS II
DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
GIS/CADD	CJB	2/01/2008	
CHECK	GMP	2/01/2008	**FIGURE 64**
REVIEW	JS	10/14/08	

Golder Associates

Model Calibration Results

Well G-3061

Water Level NGVD 29



Days from January 1, 2005

LEGEND

Observed Data

Simulated Data

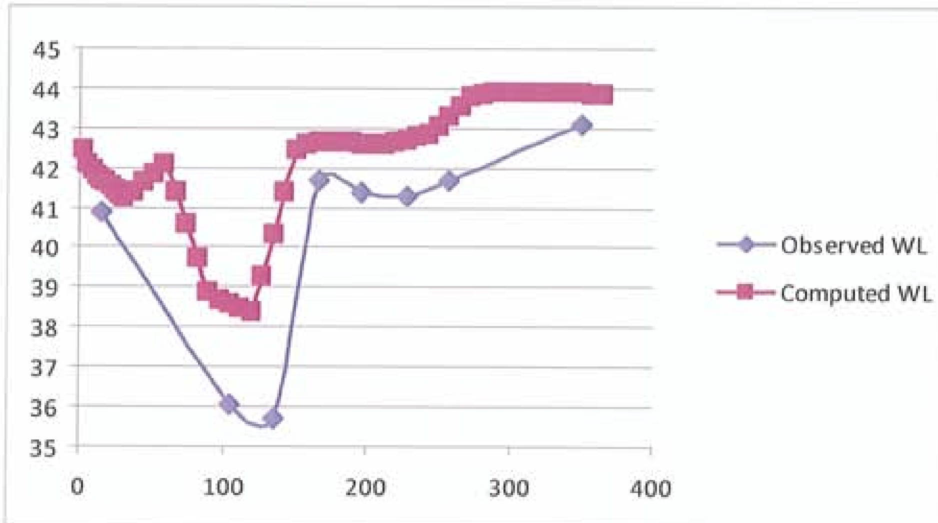
PROJECT	ECFAS PHASE II MODEL		
TITLE	**MODEL CALIBRATION WATER LEVEL RESULTS SELECT OBSERVATION WELLS WELL NAMES AS SHOWN ON THE GRAPHS**		
PROJECT No. 073-82536			FILE No. ECFAS II
DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
GIS/CADD	CJB	2/01/2008	
CHECK	GMP	2/01/2008	**FIGURE 65**
REVIEW	JS	10/14/08	

Golder Associates

Model Calibration Results

Well IR0189

Water Level NGVD 29



Days from January 1, 2005

LEGEND

Observed Data

Simulated Data

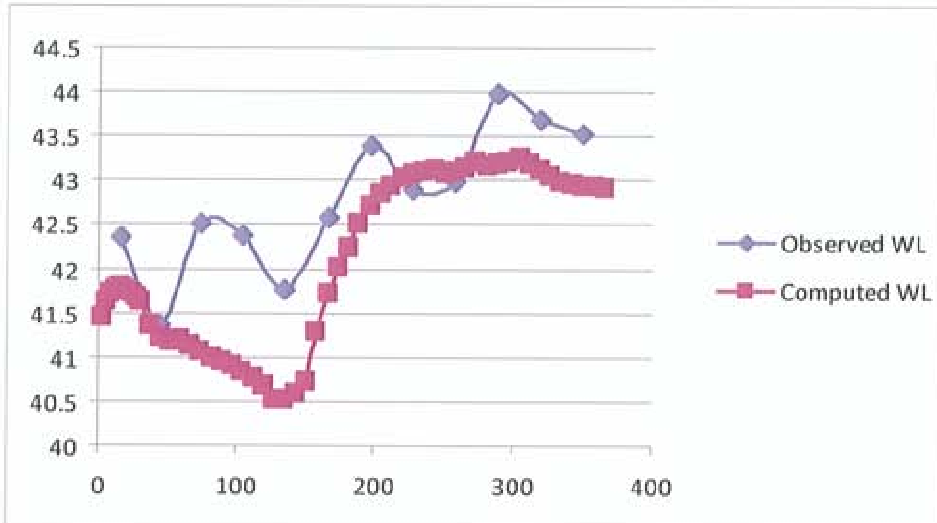
PROJECT	ECFAS PHASE II MODEL		
TITLE	**MODEL CALIBRATION WATER LEVEL RESULTS SELECT OBSERVATION WELLS WELL NAMES AS SHOWN ON THE GRAPHS**		
PROJECT No. 073-82536			FILE No. ECFAS II
DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
GIS/CADD	CJB	2/01/2008	
CHECK	GMP	2/01/2008	**FIGURE 66**
REVIEW	JS	10/14/08	

Golder Associates

Model Calibration Results

Well IR0955

Water Level NGVD 29



Days from January 1, 2005

LEGEND

Observed Data

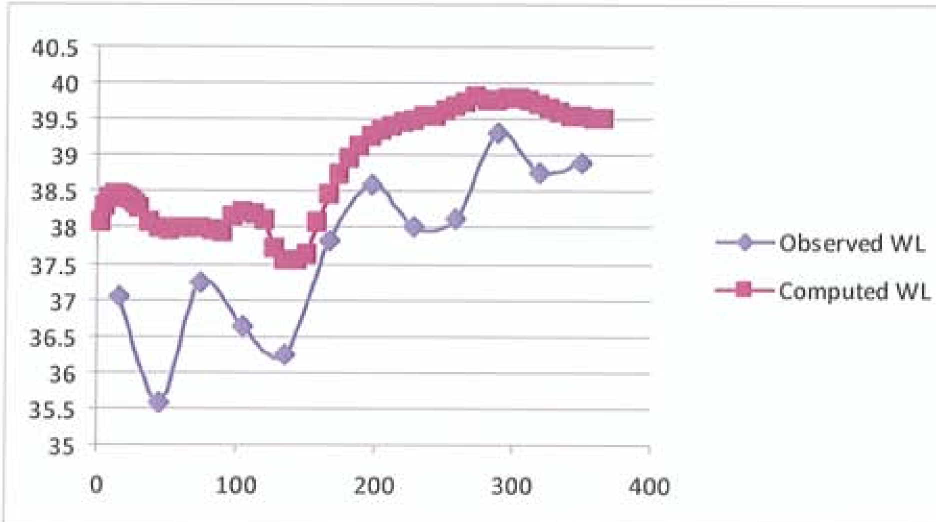
Simulated Data

PROJECT	ECFAS PHASE II MODEL			
TITLE	**MODEL CALIBRATION WATER LEVEL RESULTS SELECT OBSERVATION WELLS WELL NAMES AS SHOWN ON THE GRAPHS**			
Golder Associates	PROJECT No. 073-82536			FILE No. ECFAS II
	DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
	GIS/CADD	CJB	2/01/2008	**FIGURE 67**
	CHECK	GMP	2/01/2008	
	REVIEW	JS	10/14/08	

Model Calibration Results

Well IR0963

Water Level NGVD 29



Days from January 1, 2005

LEGEND

Observed Data

Simulated Data

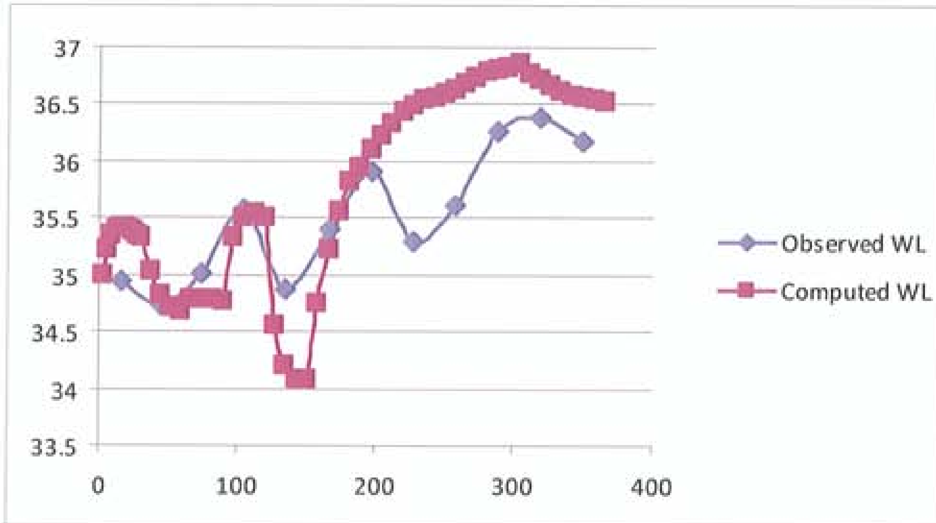
PROJECT	ECFAS PHASE II MODEL		
TITLE	**MODEL CALIBRATION WATER LEVEL RESULTS SELECT OBSERVATION WELLS WELL NAMES AS SHOWN ON THE GRAPHS**		
PROJECT No.	073-82536		FILE No. ECFAS II
DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
GIS/CADD	CJB	2/01/2008	
CHECK	GMP	2/01/2008	**FIGURE 68**
REVIEW	JS	10/14/08	

Golder Associates

Model Calibration Results

Well IR1008

Water Level NGVD 29



Days from January 1, 2005

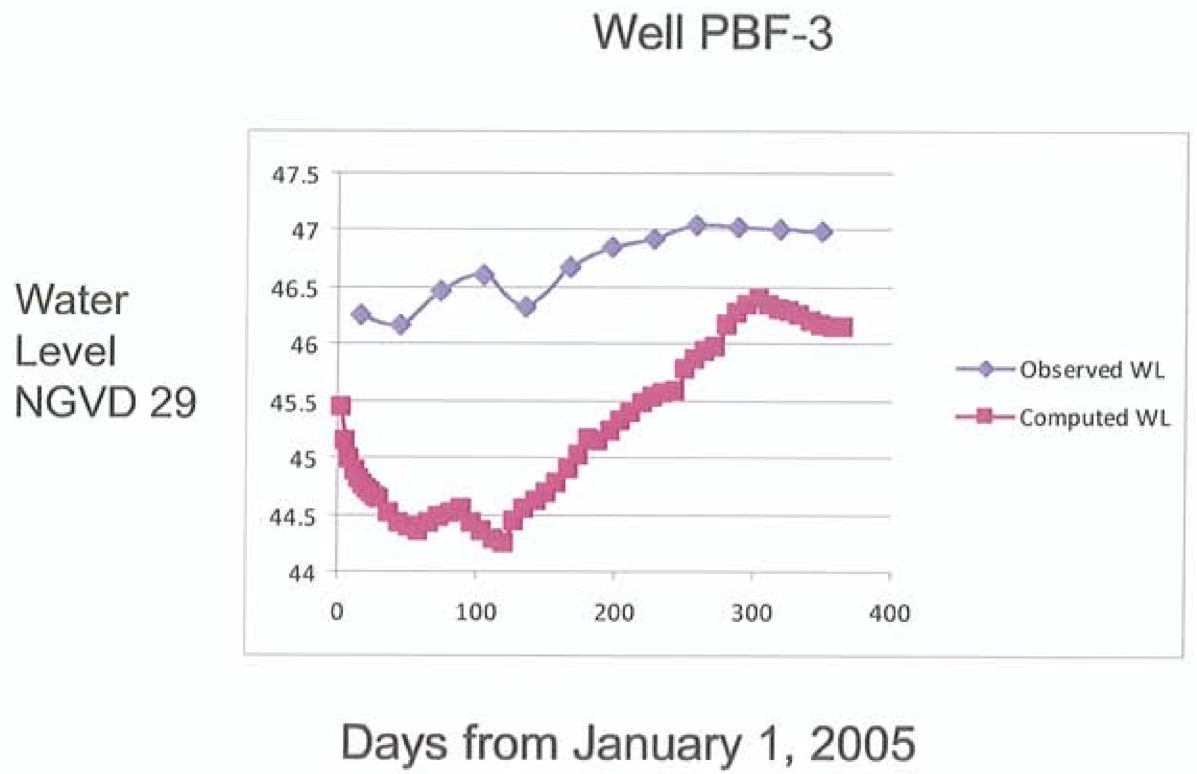
LEGEND

Observed Data

Simulated Data

PROJECT	ECFAS PHASE II MODEL			
TITLE	MODEL CALIBRATION WATER LEVEL RESULTS SELECT OBSERVATION WELLS WELL NAMES AS SHOWN ON THE GRAPHS			
Golder Associates	PROJECT No. 073-82536			FILE No. ECFAS II
	DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
	GIS/CADD	CJB	2/01/2008	FIGURE 69
	CHECK	GMP	2/01/2008	
	REVIEW	JS	10/14/08	

Model Calibration Results



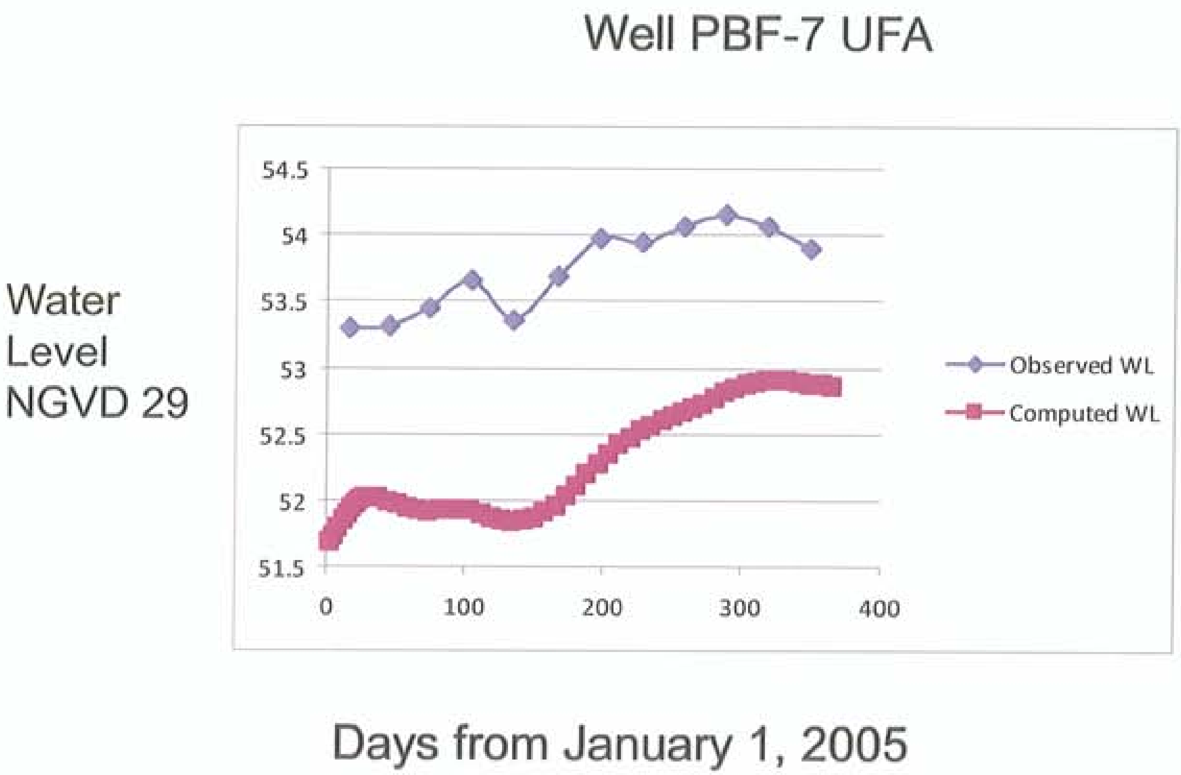
LEGEND

Observed Data	
Simulated Data	

PROJECT	ECFAS PHASE II MODEL		
TITLE	MODEL CALIBRATION WATER LEVEL RESULTS SELECT OBSERVATION WELLS WELL NAMES AS SHOWN ON THE GRAPHS		
PROJECT No. 073-82536			FILE No. ECFAS II
DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
GIS/CADD	CJB	2/01/2008	
CHECK	GMP	2/01/2008	FIGURE 70
REVIEW	JS	10/14/08	

Golder Associates

Model Calibration Results



LEGEND

Observed Data

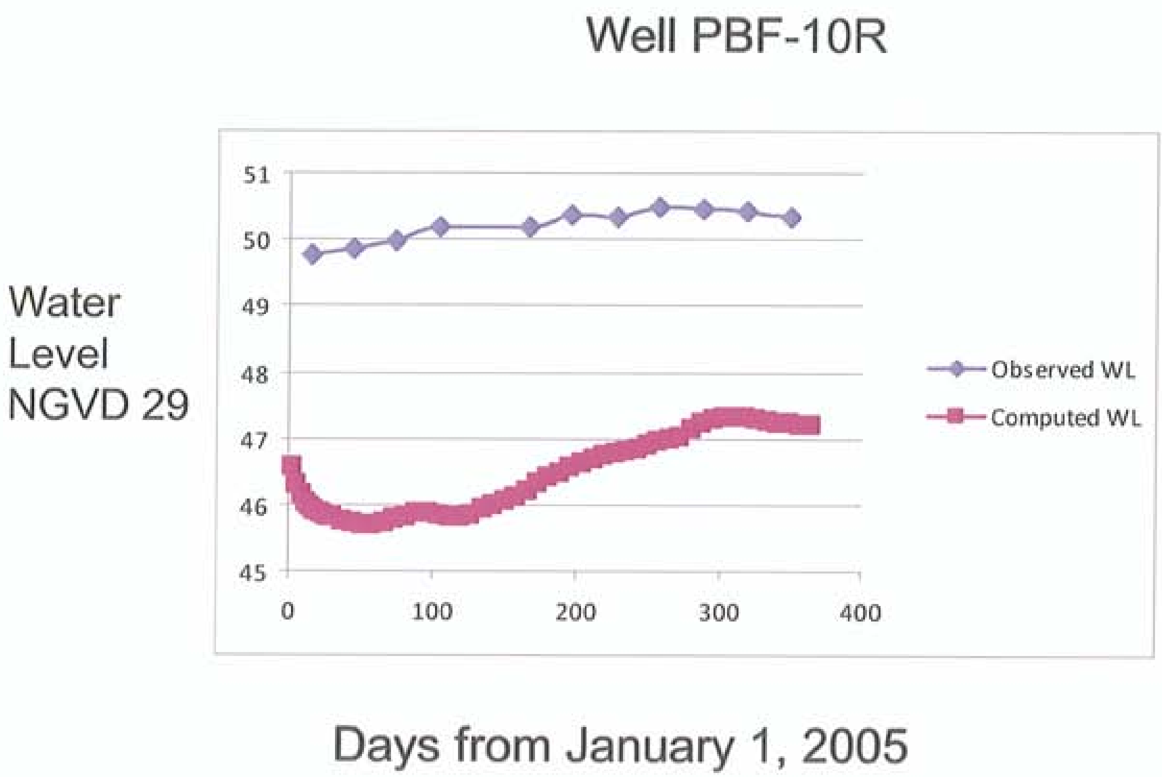
Simulated Data

PROJECT	ECFAS PHASE II MODEL
TITLE	**MODEL CALIBRATION WATER LEVEL RESULTS SELECT OBSERVATION WELLS WELL NAMES AS SHOWN ON THE GRAPHS**

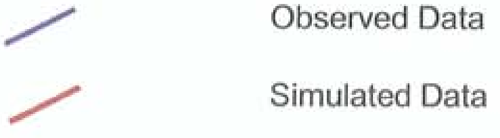
Golder Associates

PROJECT No.	073-82536		FILE No. ECFAS II
DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
GIS/CADD	CJB	2/01/2008	
CHECK	GMP	2/01/2008	**FIGURE 71**
REVIEW	JS	10/14/08	

Model Calibration Results



LEGEND



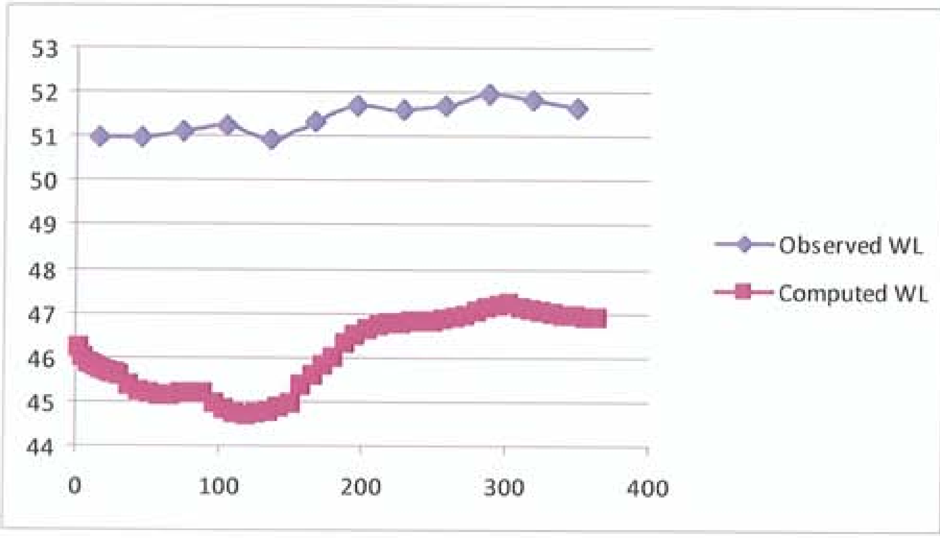
PROJECT	ECFAS PHASE II MODEL		
TITLE	MODEL CALIBRATION WATER LEVEL RESULTS SELECT OBSERVATION WELLS WELL NAMES AS SHOWN ON THE GRAPHS		
PROJECT No. 073-82536			FILE No. ECFAS II
DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. 0
GIS/CADD	CJB	2/01/2008	
CHECK	GMP	2/01/2008	FIGURE 72
REVIEW	JS	10/14/08	

Golder Associates

Model Calibration Results

Well MF-52

Water Level NGVD 29



Days from January 1, 2005

LEGEND

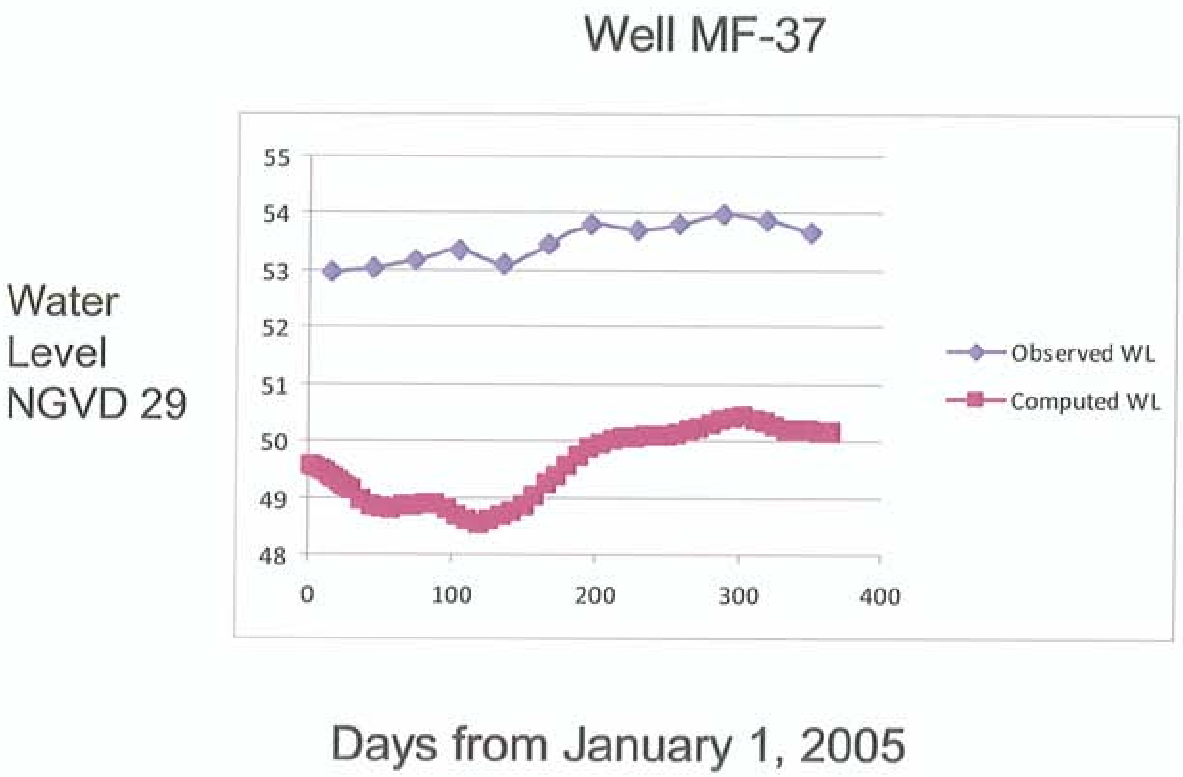
Observed Data

Simulated Data

PROJECT	ECFAS PHASE II MODEL			
TITLE	MODEL CALIBRATION WATER LEVEL RESULTS SELECT OBSERVATION WELLS WELL NAMES AS SHOWN ON THE GRAPHS			
PROJECT No.	073-82536		FILE No. ECFAS II	
DESIGN	CJB	2/01/2008	SCALE AS SHOWN	REV. O
GIS/CADD	CJB	2/01/2008	FIGURE 73	
CHECK	GMP	2/01/2008		
REVIEW	JS	10/14/08		

Golder Associates

Model Calibration Results



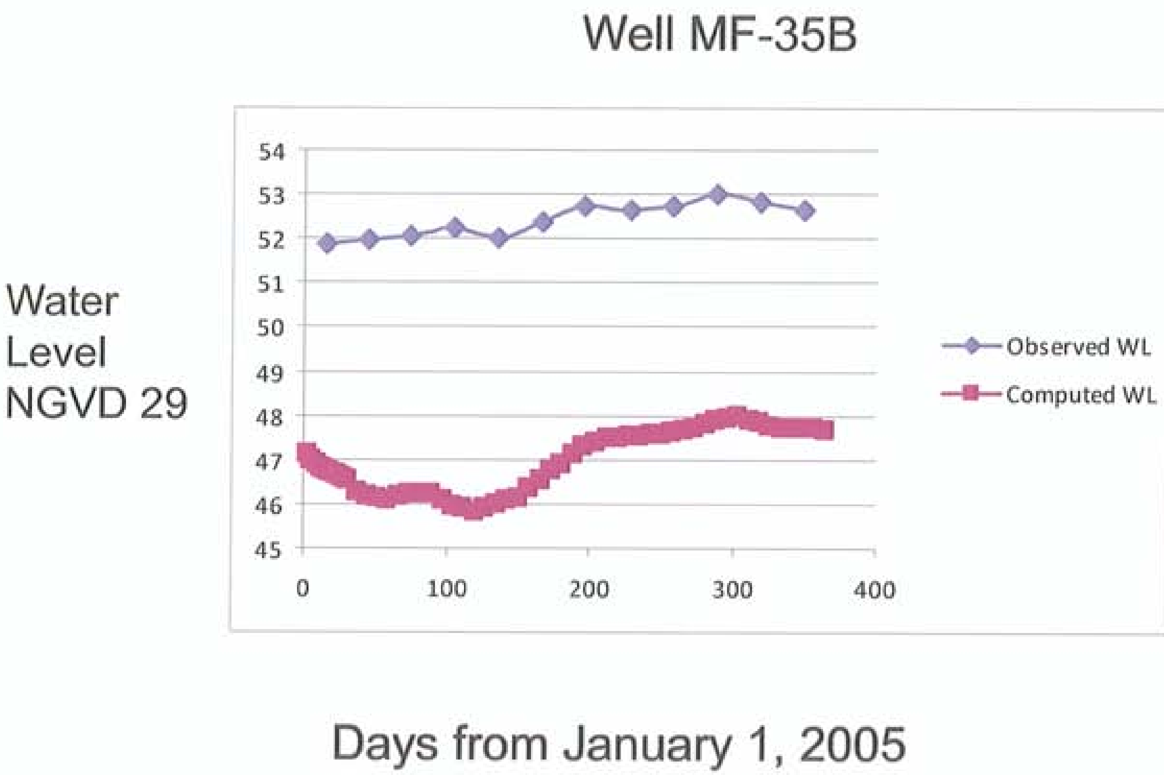
LEGEND

Observed Data

Simulated Data

PROJECT	ECFAS PHASE II MODEL			
TITLE	MODEL CALIBRATION WATER LEVEL RESULTS SELECT OBSERVATION WELLS WELL NAMES AS SHOWN ON THE GRAPHS			
Golder Associates	PROJECT No. 073-82536			FILE No. ECFAS II
	DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
	GIS/CADD	CJB	2/01/2008	
	CHECK	GMP	2/01/2008	FIGURE 74
	REVIEW	JS	10/14/08	

Model Calibration Results



LEGEND

Observed Data

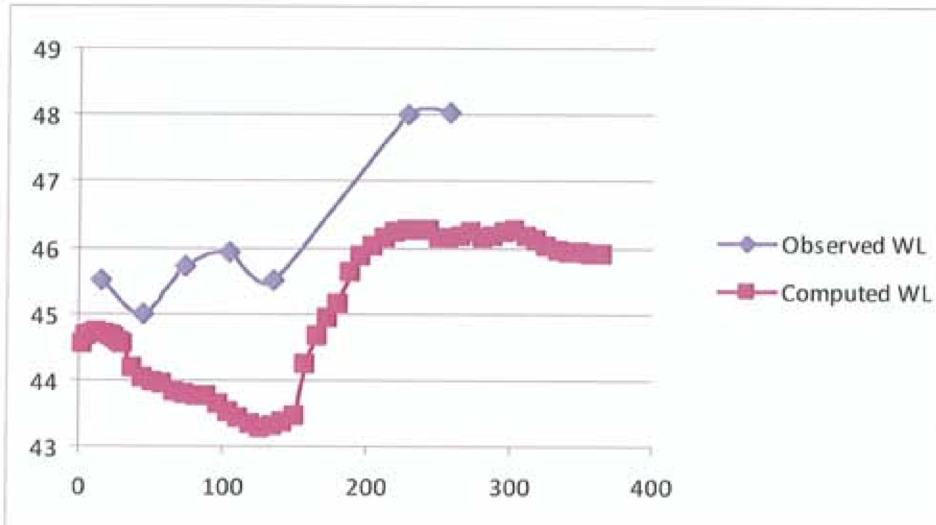
Simulated Data

PROJECT	ECFAS PHASE II MODEL				
TITLE	MODEL CALIBRATION WATER LEVEL RESULTS SELECT OBSERVATION WELLS WELL NAMES AS SHOWN ON THE GRAPHS				
Golder Associates	PROJECT No.	073-82536		FILE No. ECFAS II	
	DESIGN	CJB	2/01/2008	SCALE AS SHOWN	REV. O
	GIS/CADD	CJB	2/01/2008		
	CHECK	GMP	2/01/2008	FIGURE 75	
	REVIEW	JS	10/14/08		

Model Calibration Results

Well 2-3

Water Level NGVD 29



Days from January 1, 2005

LEGEND

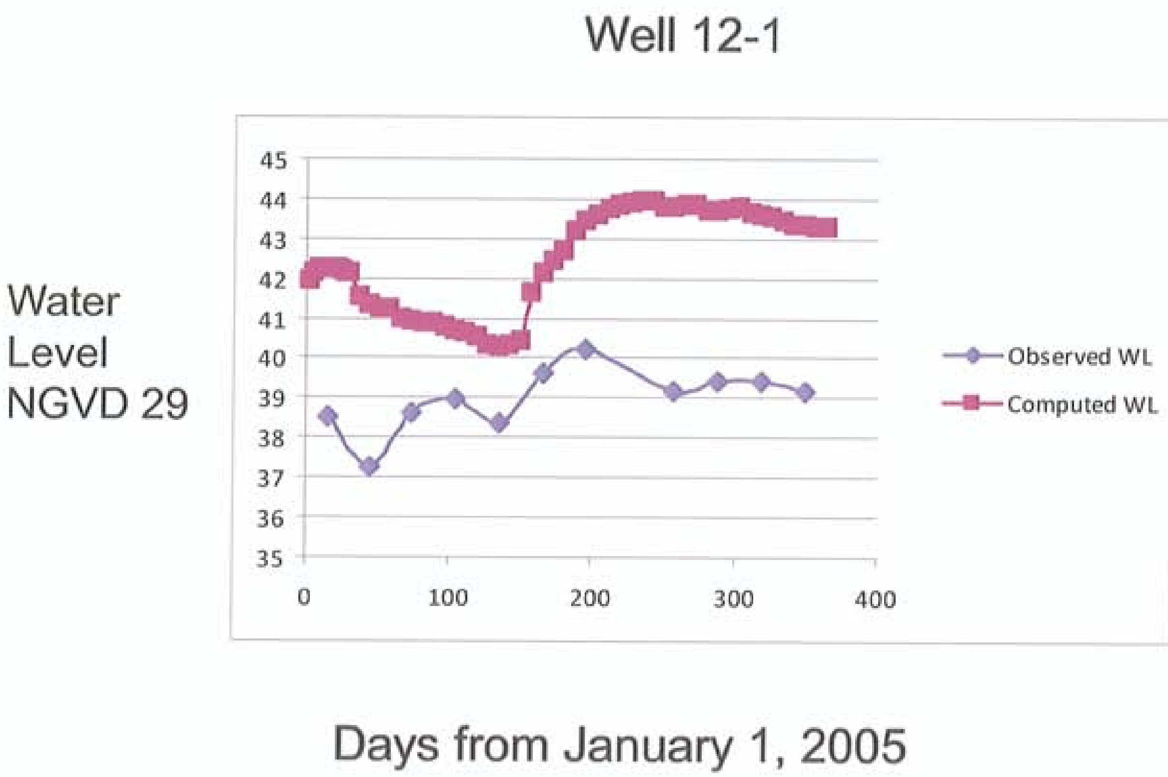
Observed Data

Simulated Data

PROJECT	ECFAS PHASE II MODEL		
TITLE	**MODEL CALIBRATION WATER LEVEL RESULTS SELECT OBSERVATION WELLS WELL NAMES AS SHOWN ON THE GRAPHS**		
PROJECT No.	073-82536		FILE No. ECFAS II
DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
GIS/CADD	CJB	2/01/2008	
CHECK	GMP	2/01/2008	**FIGURE 76**
REVIEW	JS	10/14/08	

Golder Associates

Model Calibration Results



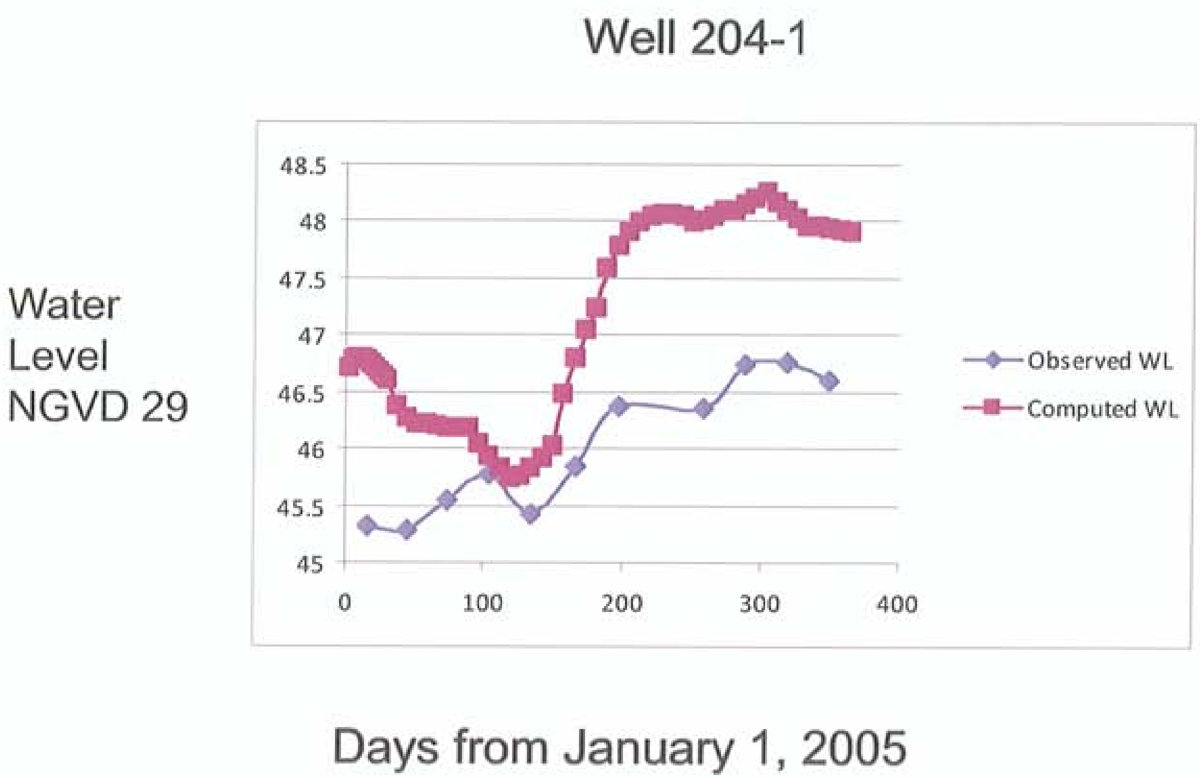
LEGEND

Observed Data

Simulated Data

PROJECT	ECFAS PHASE II MODEL			
TITLE	MODEL CALIBRATION WATER LEVEL RESULTS SELECT OBSERVATION WELLS WELL NAMES AS SHOWN ON THE GRAPHS			
Golder Associates	PROJECT No.	073-82536		FILE No. ECFAS II
	DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
	GIS/CADD	CJB	2/01/2008	
	CHECK	GMP	2/01/2008	FIGURE 77
	REVIEW	JS	10/14/08	

Model Calibration Results



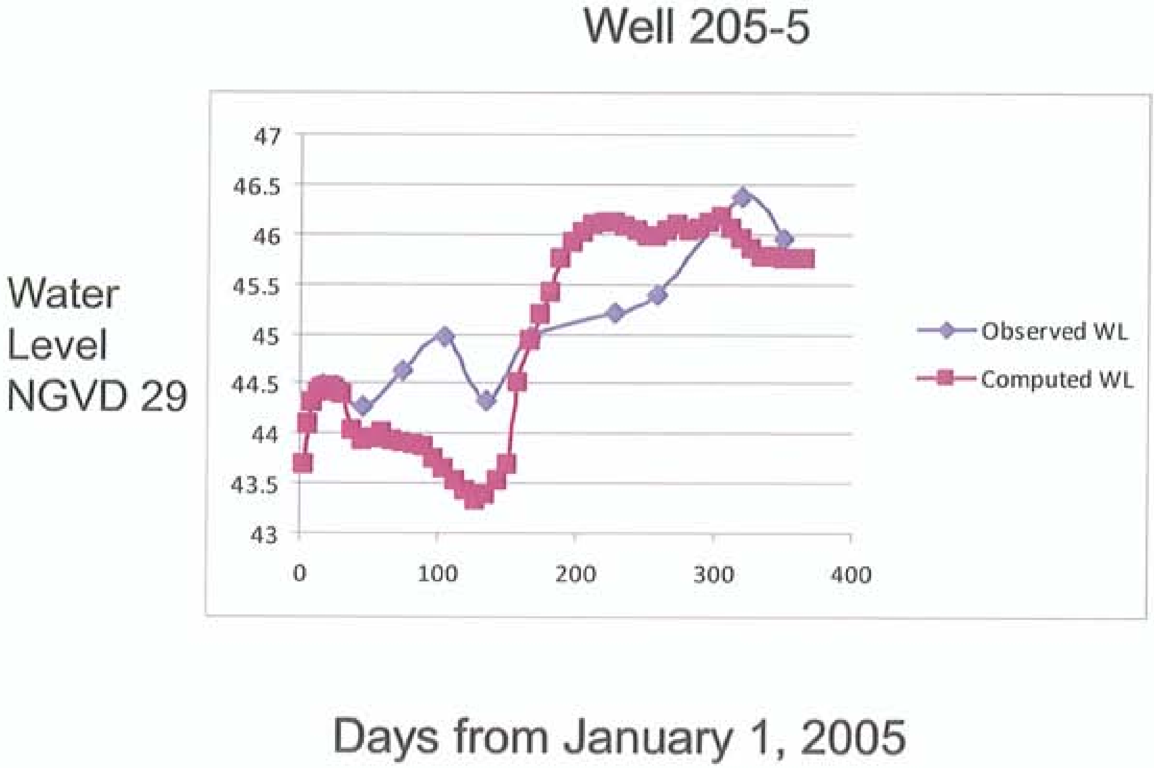
LEGEND

Observed Data

Simulated Data

PROJECT	ECFAS PHASE II MODEL				
TITLE	**MODEL CALIBRATION WATER LEVEL RESULTS SELECT OBSERVATION WELLS WELL NAMES AS SHOWN ON THE GRAPHS**				
Golder Associates	PROJECT No. 073-82536			FILE No. ECFAS II	
	DESIGN	CJB	2/01/2008	SCALE AS SHOWN	REV. O
	GIS/CADD	CJB	2/01/2008	**FIGURE 78**	
	CHECK	GMP	2/01/2008		
	REVIEW	JS	10/14/08		

Model Calibration Results



LEGEND

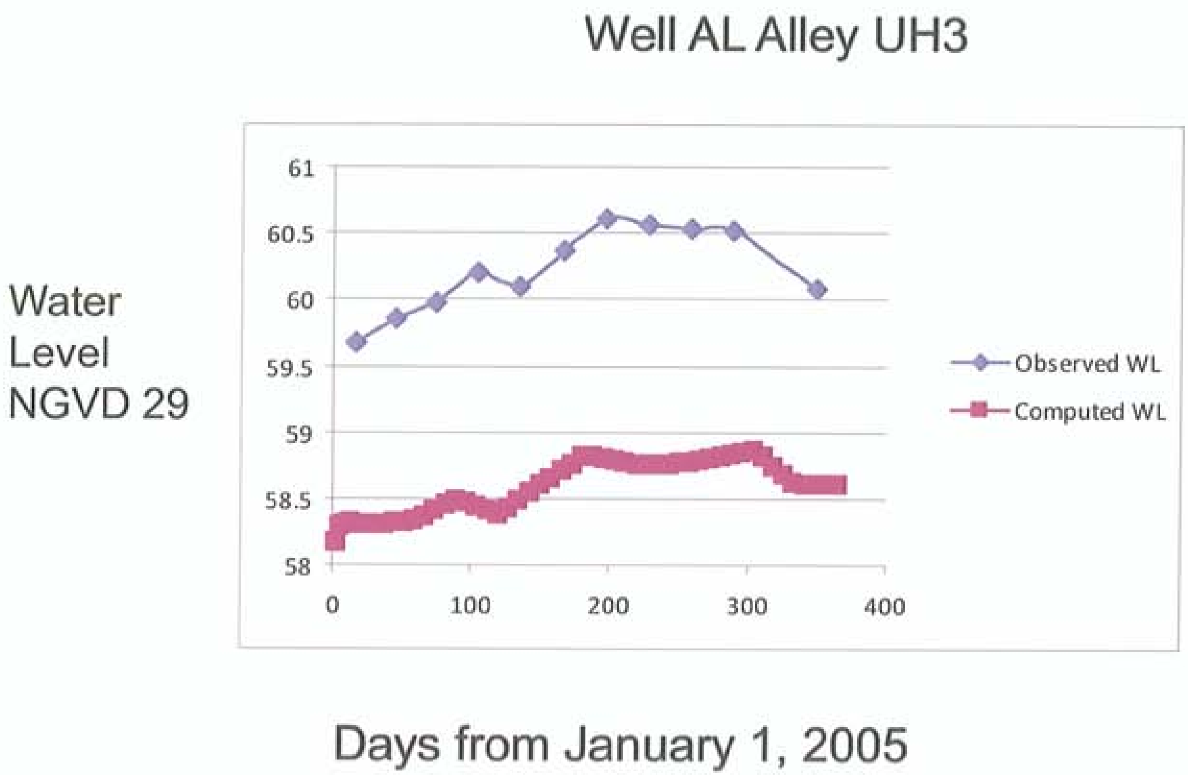
Observed Data

Simulated Data

PROJECT	ECFAS PHASE II MODEL			
TITLE	**MODEL CALIBRATION WATER LEVEL RESULTS SELECT OBSERVATION WELLS WELL NAMES AS SHOWN ON THE GRAPHS**			
PROJECT No.	073-82536		FILE No. ECFAS II	
DESIGN	CJB	2/01/2008	SCALE AS SHOWN	REV. O
GIS/CADD	CJB	2/01/2008	**FIGURE 79**	
CHECK	GMP	2/01/2008		
REVIEW	JS	10/14/08		

Golder Associates

Model Calibration Results



LEGEND

Observed Data

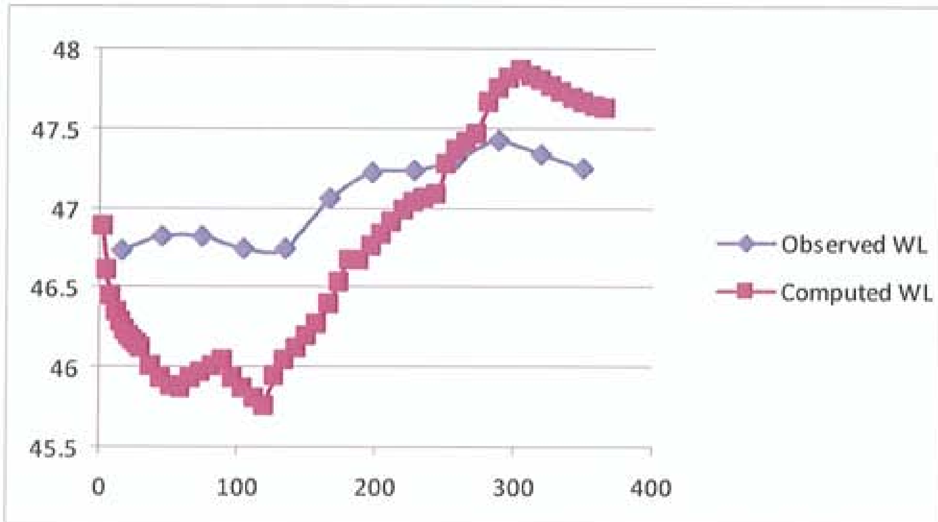
Simulated Data

PROJECT	ECFAS PHASE II MODEL				
TITLE	**MODEL CALIBRATION WATER LEVEL RESULTS SELECT OBSERVATION WELLS WELL NAMES AS SHOWN ON THE GRAPHS**				
Golder Associates	PROJECT No.	073-82536		FILE No. ECFAS II	
	DESIGN	CJB	2/01/2008	SCALE AS SHOWN	REV. O
	GIS/CADD	CJB	2/01/2008	**FIGURE 80**	
	CHECK	GMP	2/01/2008		
	REVIEW	JS	10/14/08		

Model Calibration Results

Well Lake Lytal UH2

Water Level NGVD 29



Days from January 1, 2005

LEGEND

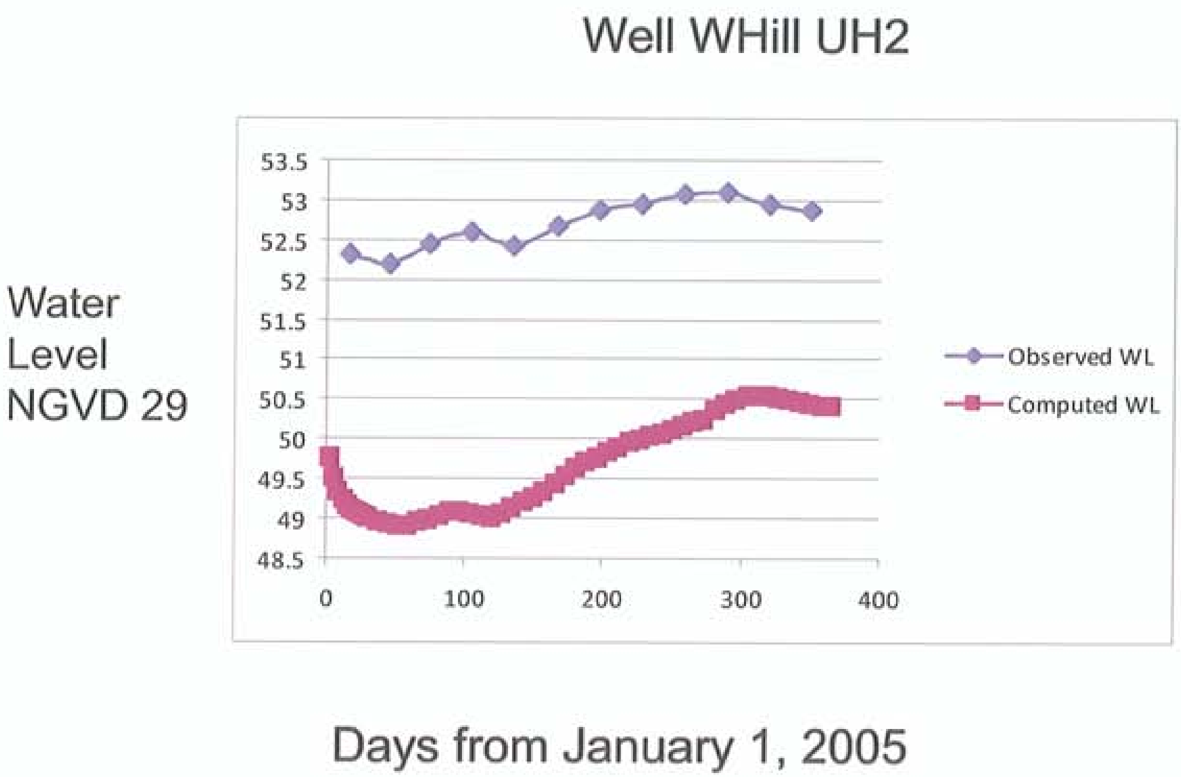
Observed Data

Simulated Data

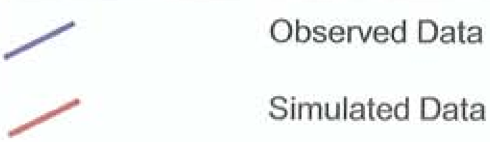
PROJECT	ECFAS PHASE II MODEL		
TITLE	MODEL CALIBRATION WATER LEVEL RESULTS SELECT OBSERVATION WELLS WELL NAMES AS SHOWN ON THE GRAPHS		
PROJECT No. 073-82536			FILE No. ECFAS II
DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
GIS/CADD	CJB	2/01/2008	
CHECK	GMP	2/01/2008	FIGURE 81
REVIEW	JS	10/14/08	

Golder Associates

Model Calibration Results

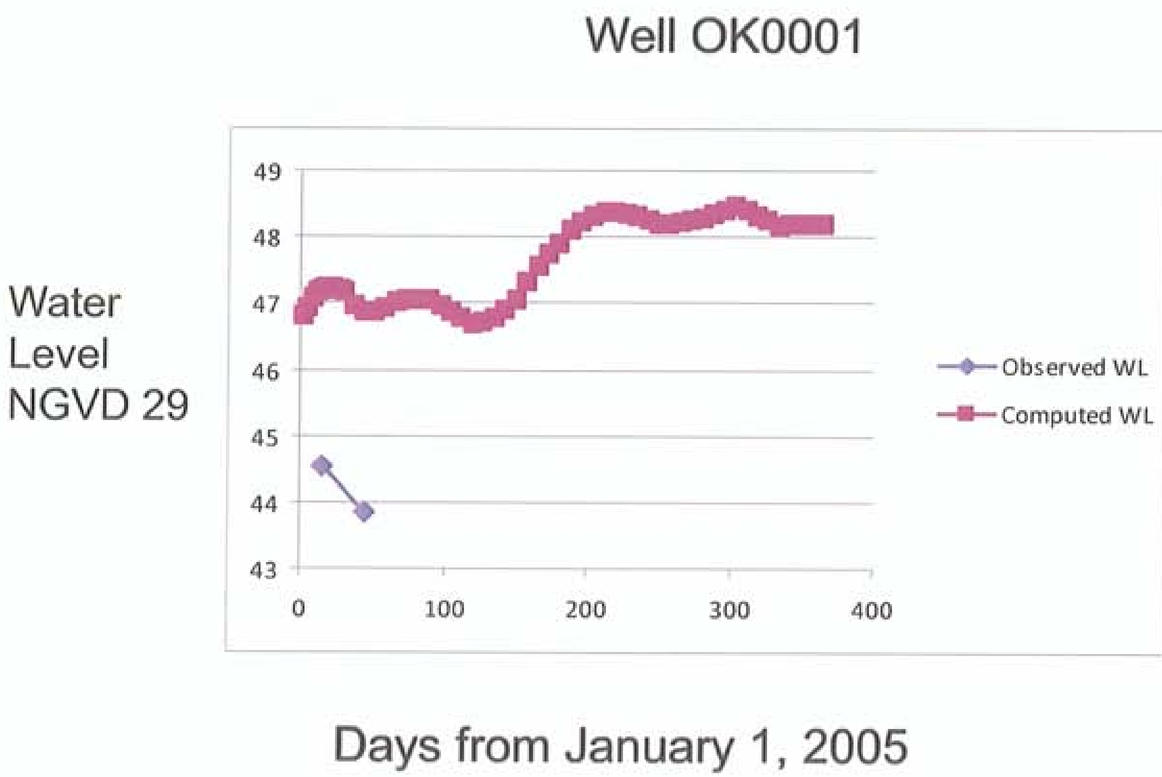


LEGEND

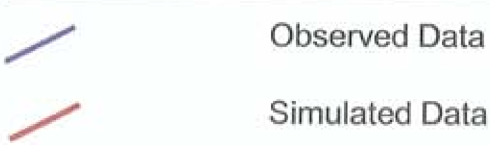


PROJECT	ECFAS PHASE II MODEL				
TITLE	MODEL CALIBRATION WATER LEVEL RESULTS SELECT OBSERVATION WELLS WELL NAMES AS SHOWN ON THE GRAPHS				
Golder Associates	PROJECT No.	073-82536		FILE No.	ECFAS II
	DESIGN	CJB	2/01/2008	SCALE AS SHOWN	REV. O
	GIS/CADD	CJB	2/01/2008	FIGURE 82	
	CHECK	GMP	2/01/2008		
	REVIEW	JS	10/14/08		

Model Calibration Results

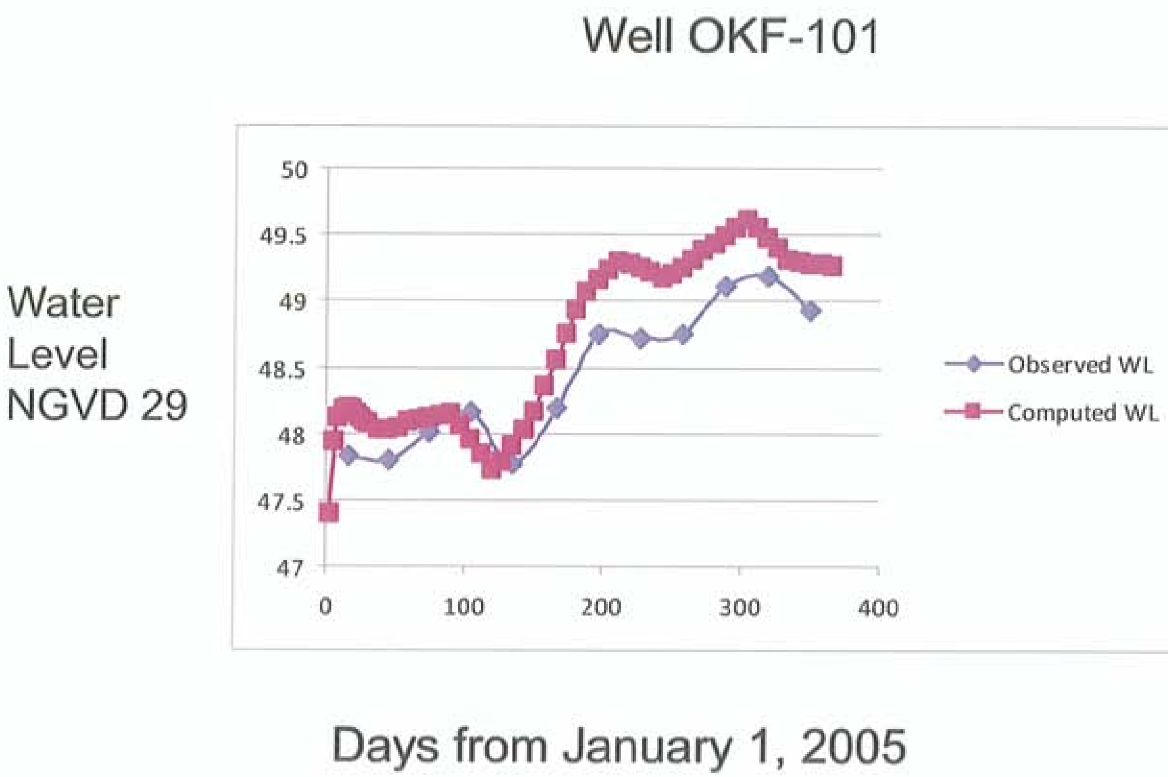


LEGEND



PROJECT	ECFAS PHASE II MODEL				
TITLE	MODEL CALIBRATION WATER LEVEL RESULTS SELECT OBSERVATION WELLS WELL NAMES AS SHOWN ON THE GRAPHS				
Golder Associates	PROJECT No.	073-82536		FILE No. ECFAS II	
	DESIGN	CJB	2/01/2008	SCALE AS SHOWN	REV. O
	GIS/CADD	CJB	2/01/2008	FIGURE 83	
	CHECK	GMP	2/01/2008		
	REVIEW	JS	10/14/08		

Model Calibration Results



LEGEND

Observed Data

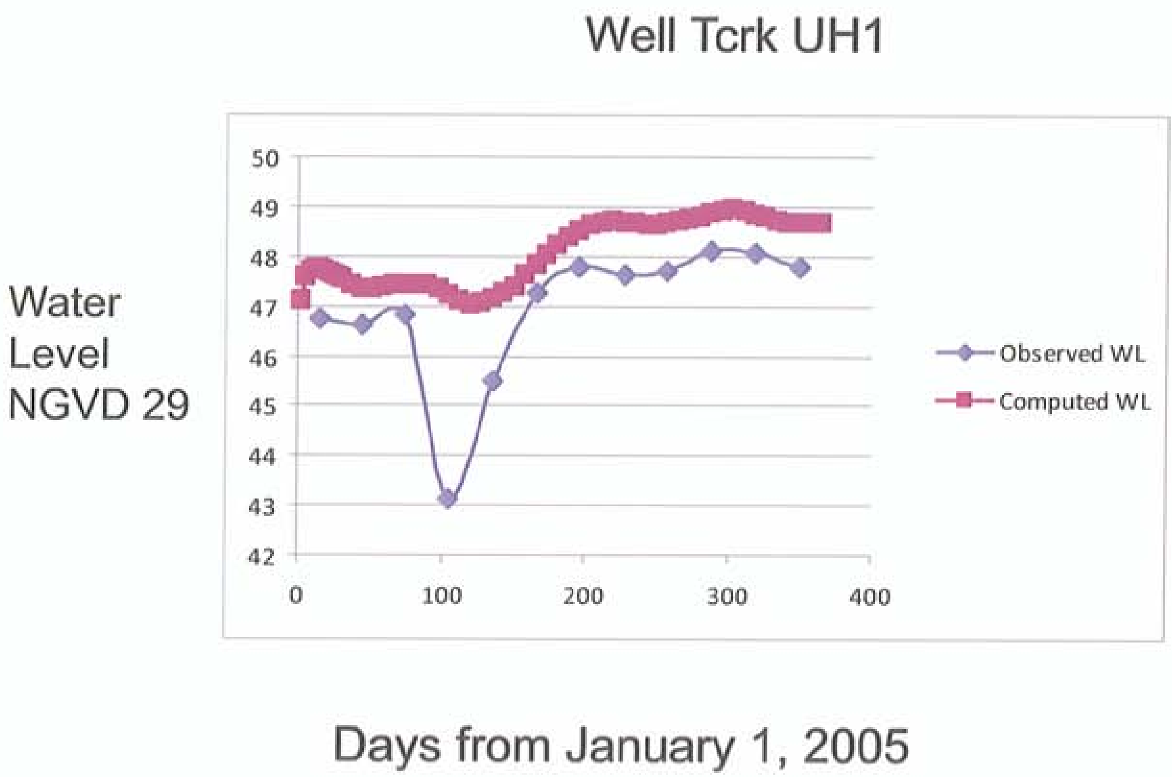
Simulated Data

PROJECT	ECFAS PHASE II MODEL
TITLE	**MODEL CALIBRATION WATER LEVEL RESULTS SELECT OBSERVATION WELLS WELL NAMES AS SHOWN ON THE GRAPHS**

PROJECT No.	073-82536		FILE No. ECFAS II
DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
GIS/CADD	CJB	2/01/2008	**FIGURE 84**
CHECK	GMP	2/01/2008	
REVIEW	JS	10/14/08	

Golder Associates

Model Calibration Results

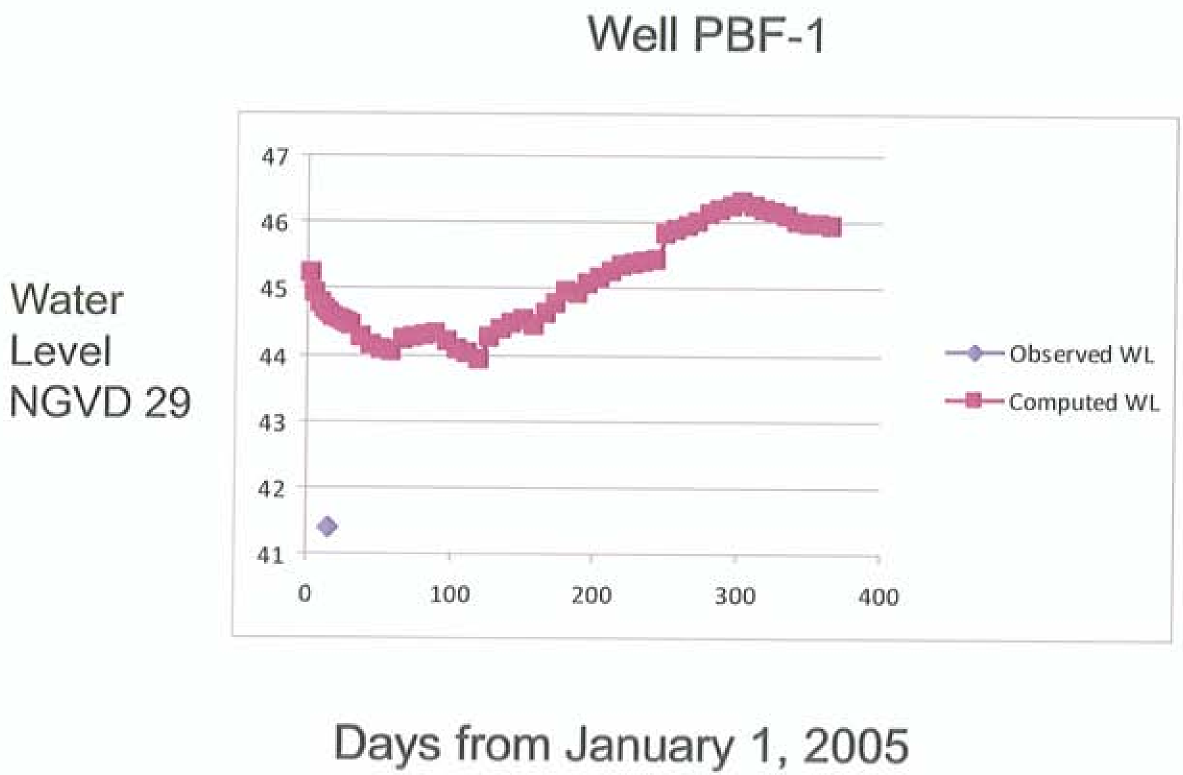


LEGEND

(blue line)	Observed Data
(red line)	Simulated Data

PROJECT	ECFAS PHASE II MODEL			
TITLE	MODEL CALIBRATION WATER LEVEL RESULTS SELECT OBSERVATION WELLS WELL NAMES AS SHOWN ON THE GRAPHS			
Golder Associates	PROJECT No. 073-82536			FILE No. ECFAS II
	DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
	GIS/CADD	CJB	2/01/2008	
	CHECK	GMP	2/01/2008	**FIGURE 85**
	REVIEW	JS	10/14/08	

Model Calibration Results



LEGEND

Observed Data

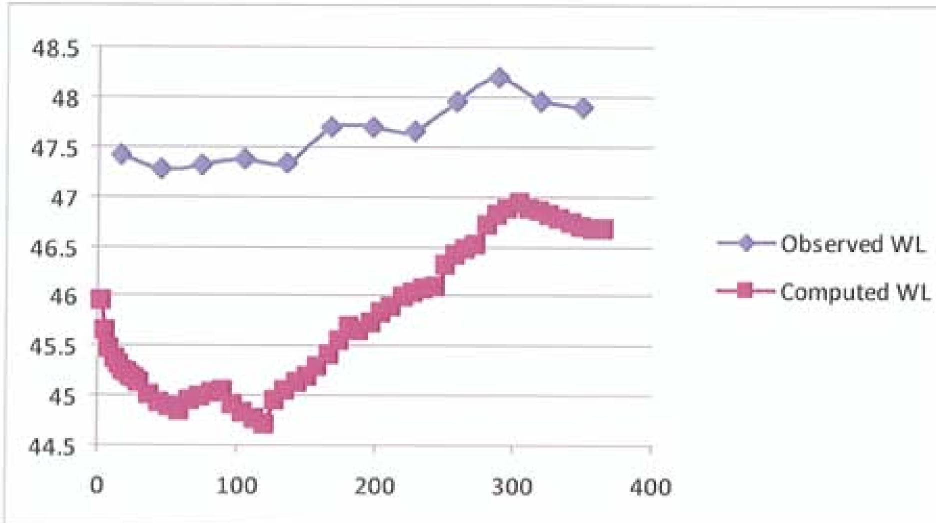
Simulated Data

PROJECT	ECFAS PHASE II MODEL					
TITLE	**MODEL CALIBRATION WATER LEVEL RESULTS SELECT OBSERVATION WELLS WELL NAMES AS SHOWN ON THE GRAPHS**					
Golder Associates	PROJECT No.	073-82536		FILE No. ECFAS II		
	DESIGN	CJB	2/01/2008	SCALE AS SHOWN	REV. O	
	GIS/CADD	CJB	2/01/2008	**FIGURE 86**		
	CHECK	GMP	2/01/2008			
	REVIEW	JS	10/14/08			

Model Calibration Results

Well PBF-2

Water Level NGVD 29



Days from January 1, 2005

LEGEND

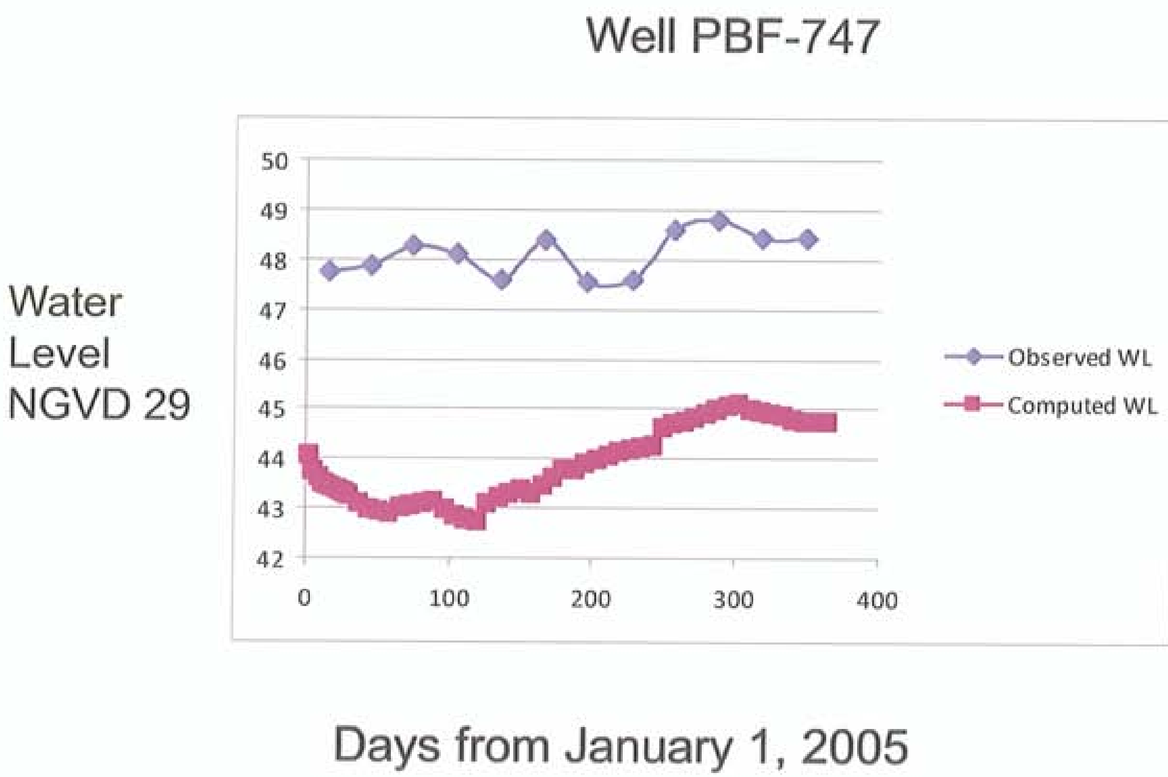
Observed Data

Simulated Data

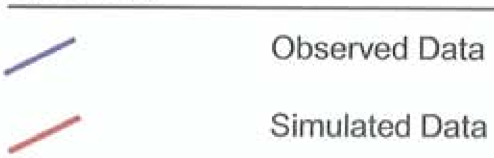
PROJECT	ECFAS PHASE II MODEL		
TITLE	**MODEL CALIBRATION WATER LEVEL RESULTS SELECT OBSERVATION WELLS WELL NAMES AS SHOWN ON THE GRAPHS**		
PROJECT No. 073-82536			FILE No. ECFAS II
DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
GIS/CADD	CJB	2/01/2008	
CHECK	GMP	2/01/2008	**FIGURE 87**
REVIEW	JS	10/14/08	

Golder Associates

Model Calibration Results



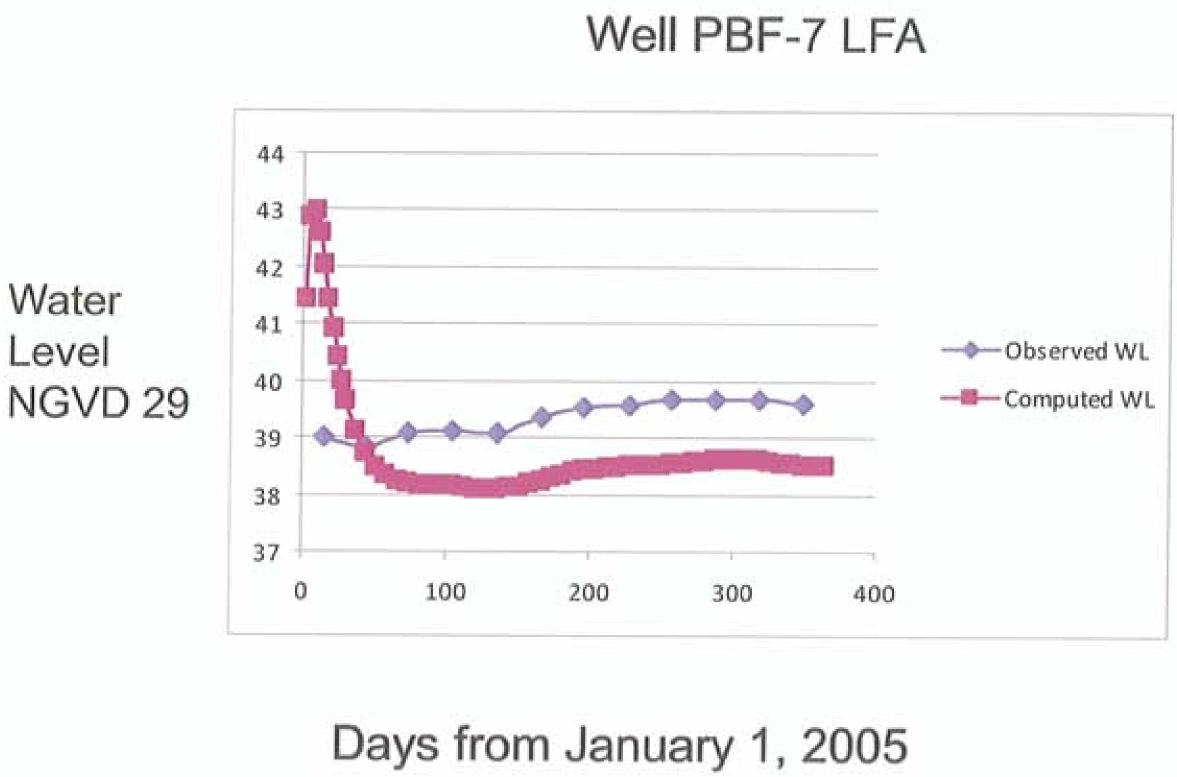
LEGEND



PROJECT	ECFAS PHASE II MODEL		
TITLE	MODEL CALIBRATION WATER LEVEL RESULTS SELECT OBSERVATION WELLS WELL NAMES AS SHOWN ON THE GRAPHS		
PROJECT No. 073-82536			FILE No. ECFAS II
DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
GIS/CADD	CJB	2/01/2008	
CHECK	GMP	2/01/2008	FIGURE 88
REVIEW	JS	10/14/08	

Golder Associates

Model Calibration Results



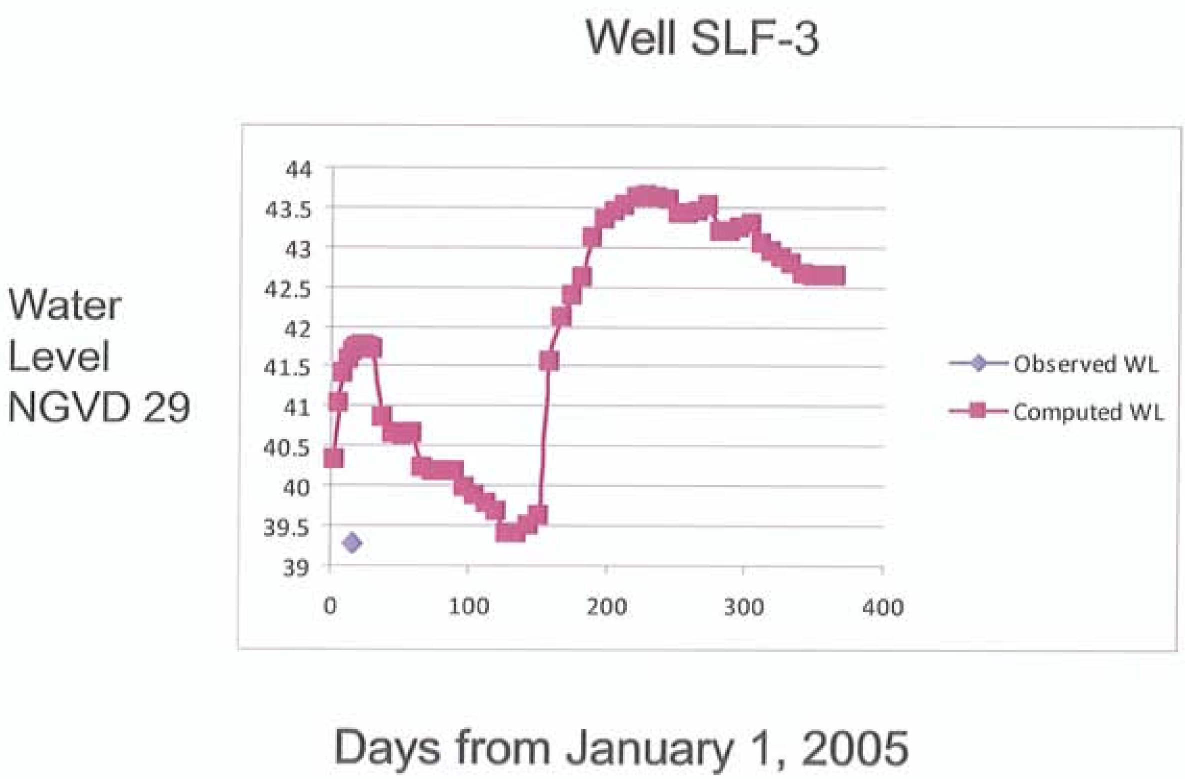
LEGEND

Observed Data

Simulated Data

PROJECT	ECFAS PHASE II MODEL			
TITLE	MODEL CALIBRATION WATER LEVEL RESULTS SELECT OBSERVATION WELLS WELL NAMES AS SHOWN ON THE GRAPHS			
Golder Associates	PROJECT No. 073-82536			FILE No. ECFAS II
	DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
	GIS/CADD	CJB	2/01/2008	
	CHECK	GMP	2/01/2008	FIGURE 89
	REVIEW	JS	10/14/08	

Model Calibration Results



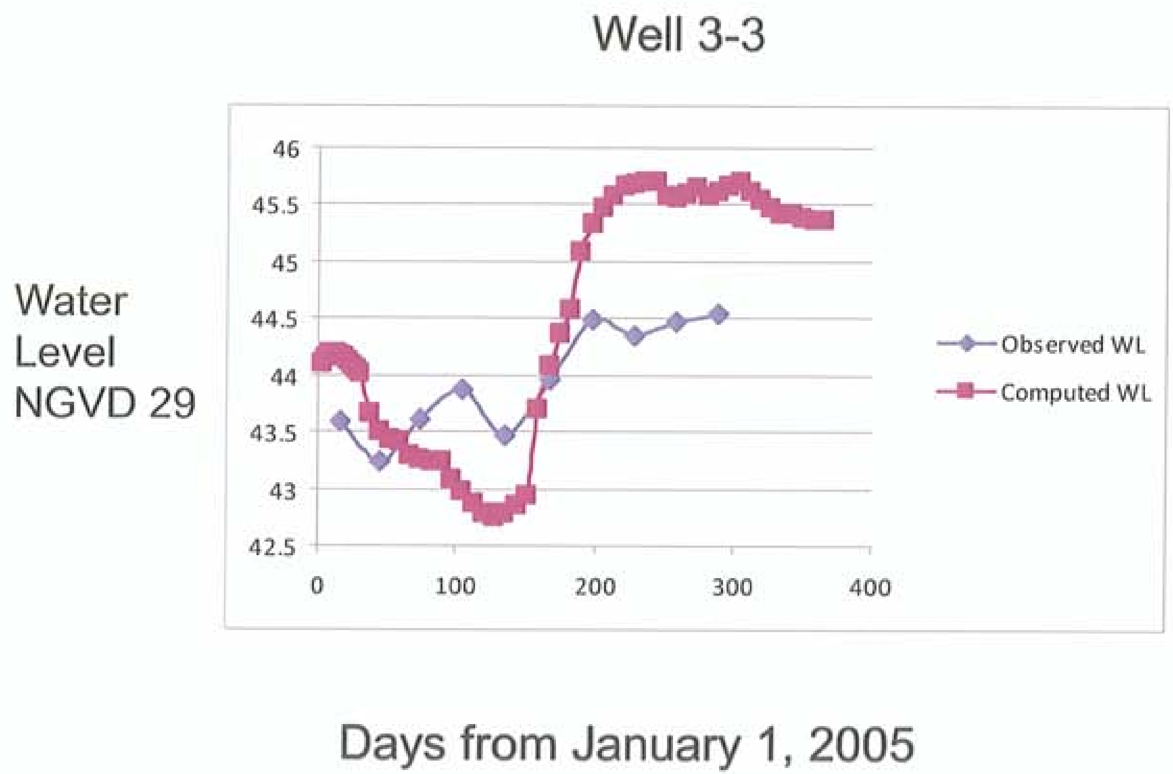
LEGEND

Observed Data

Simulated Data

PROJECT	ECFAS PHASE II MODEL			
TITLE	MODEL CALIBRATION WATER LEVEL RESULTS SELECT OBSERVATION WELLS WELL NAMES AS SHOWN ON THE GRAPHS			
Golder Associates	PROJECT No. 073-82536			FILE No. ECFAS II
	DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
	GIS/CADD	CJB	2/01/2008	FIGURE 90
	CHECK	GMP	2/01/2008	
	REVIEW	JS	10/14/08	

Model Calibration Results



LEGEND

Observed Data

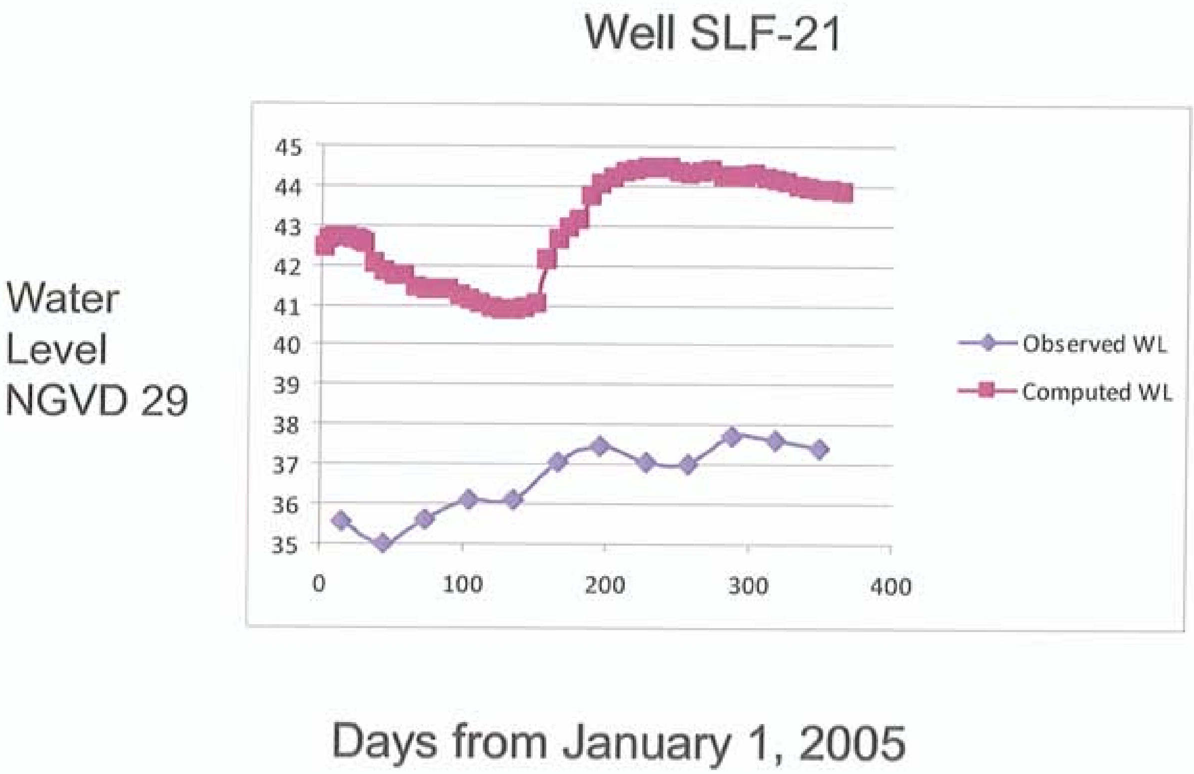
Simulated Data

PROJECT	ECFAS PHASE II MODEL
TITLE	MODEL CALIBRATION WATER LEVEL RESULTS SELECT OBSERVATION WELLS WELL NAMES AS SHOWN ON THE GRAPHS

PROJECT No.	073-82536		FILE No. ECFAS II
DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
GIS/CADD	CJB	2/01/2008	
CHECK	GMP	2/01/2008	FIGURE 91
REVIEW	JS	10/14/08	

Golder Associates

Model Calibration Results



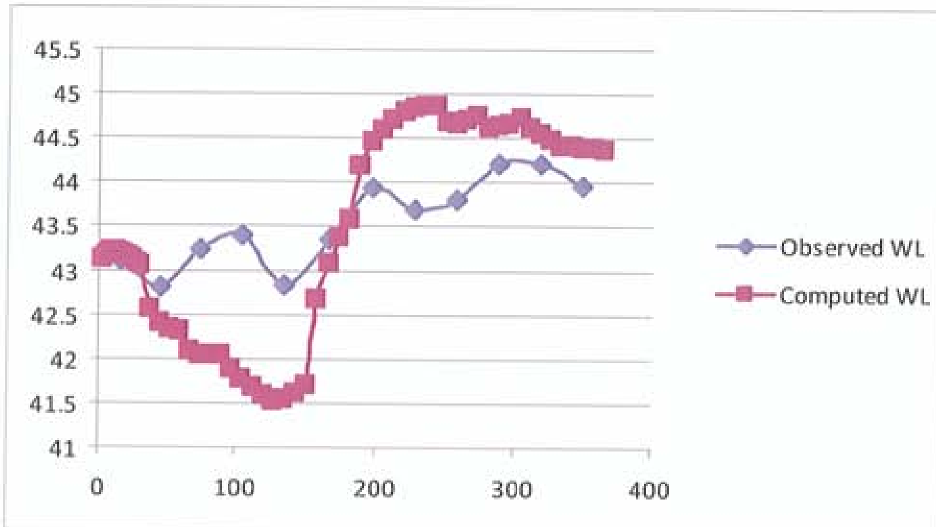
LEGEND

PROJECT	ECFAS PHASE II MODEL			
TITLE	**MODEL CALIBRATION WATER LEVEL RESULTS SELECT OBSERVATION WELLS WELL NAMES AS SHOWN ON THE GRAPHS**			
Golder Associates	PROJECT No. 073-82536			FILE No. ECFAS II
	DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
	GIS/CADD	CJB	2/01/2008	**FIGURE 92**
	CHECK	GMP	2/01/2008	
	REVIEW	JS	10/14/08	

Model Calibration Results

Well 5-1

Water Level NGVD 29



Days from January 1, 2005

LEGEND

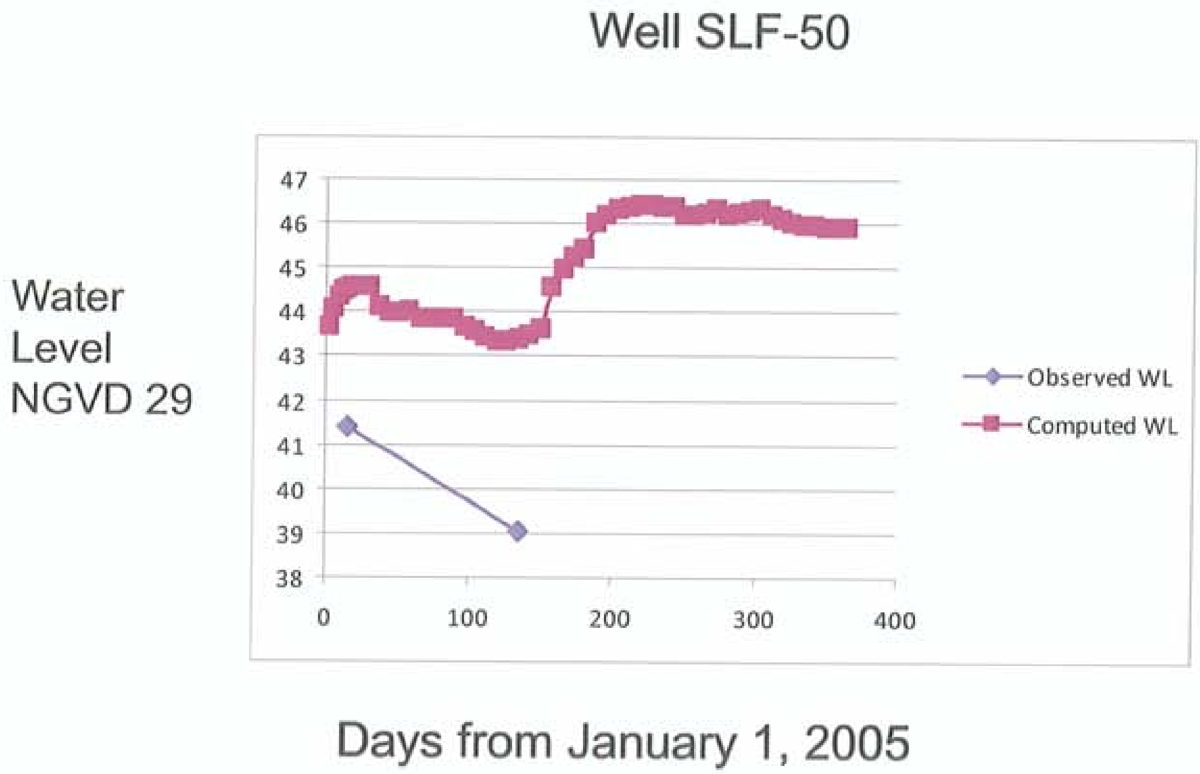
Observed Data

Simulated Data

PROJECT	ECFAS PHASE II MODEL		
TITLE	**MODEL CALIBRATION WATER LEVEL RESULTS SELECT OBSERVATION WELLS WELL NAMES AS SHOWN ON THE GRAPHS**		
PROJECT No.	073-82536		FILE No. ECFAS II
DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
GIS/CADD	CJB	2/01/2008	
CHECK	GMP	2/01/2008	**FIGURE 93**
REVIEW	JS	10/14/08	

Golder Associates

Model Calibration Results



LEGEND

Observed Data

Simulated Data

PROJECT	ECFAS PHASE II MODEL
TITLE	**MODEL CALIBRATION WATER LEVEL RESULTS SELECT OBSERVATION WELLS WELL NAMES AS SHOWN ON THE GRAPHS**

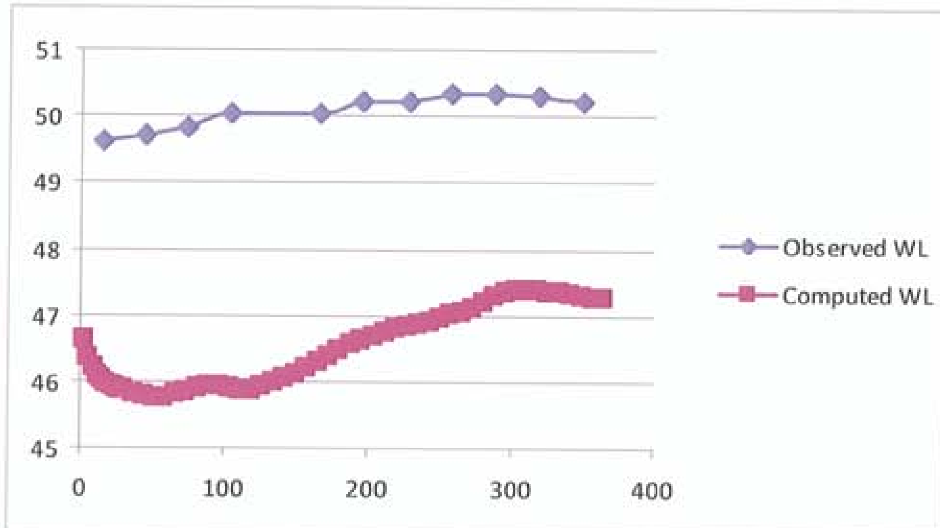
Golder Associates

PROJECT No.	073-82536		FILE No. ECFAS II
DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
GIS/CADD	CJB	2/01/2008	**FIGURE 94**
CHECK	GMP	2/01/2008	
REVIEW	JS	10/14/08	

Model Calibration Results

Well WHill UH1

Water Level NGVD 29



Days from January 1, 2005

LEGEND

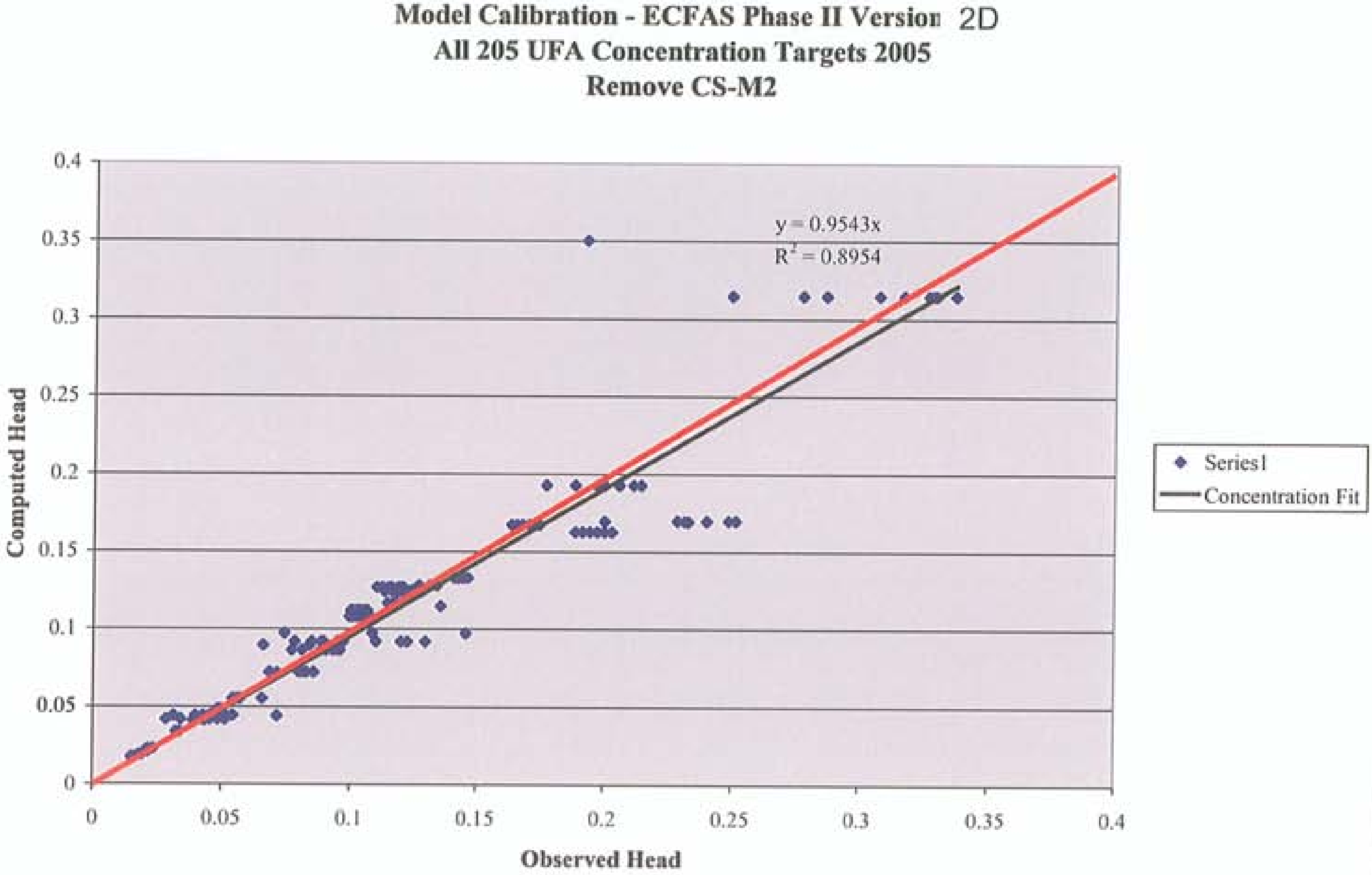
Observed Data

Simulated Data

PROJECT	ECFAS PHASE II MODEL		
TITLE	**MODEL CALIBRATION WATER LEVEL RESULTS SELECT OBSERVATION WELLS WELL NAMES AS SHOWN ON THE GRAPHS**		
PROJECT No. 073-82536			FILE No. ECFAS II
DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
GIS/CADD	CJB	2/01/2008	
CHECK	GMP	2/01/2008	**FIGURE 95**
REVIEW	JS	10/14/08	

Golder Associates

Model Calibration Results



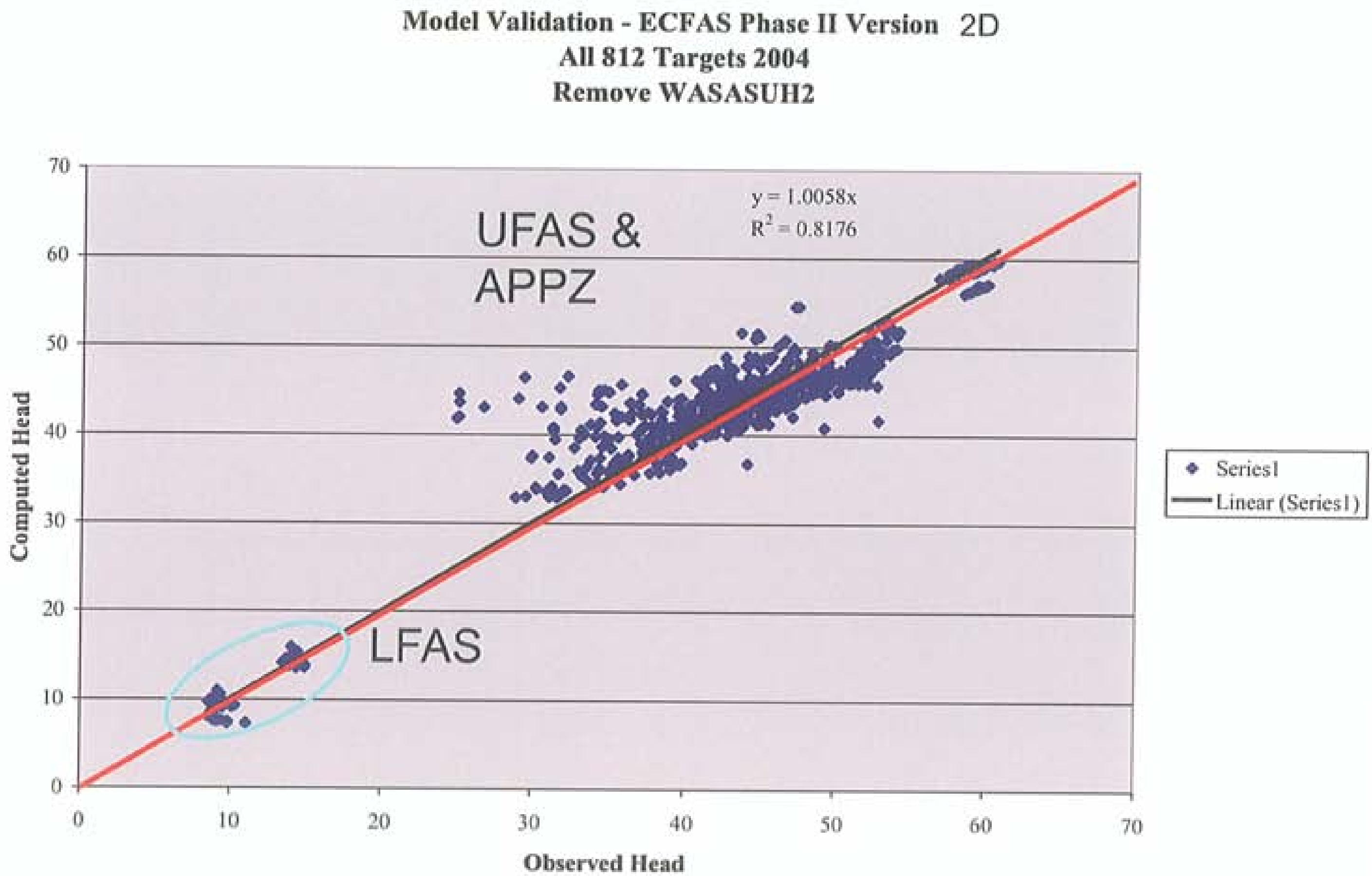
LEGEND

Theoretical Best Fit Line

Actual Best Fit Line

PROJECT	ECFAS PHASE II MODEL			
TITLE	**MODEL CALIBRATION RESULTS VERSION 2D OBSERVED VS. SIMULATED TDS LEVELS FOR UFA**			
Golder Associates	PROJECT No. 073-82536			FILE No. ECFAS II
	DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
	GIS/CADD	CJB	2/01/2008	
	CHECK	GMP	2/01/2008	**FIGURE 96**
	REVIEW	JS	10/14/08	

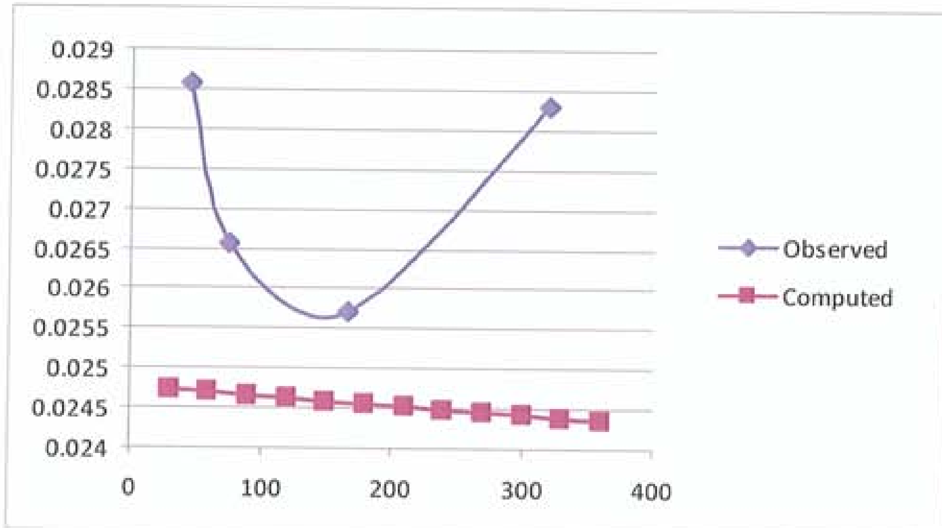
Model Validation Results



LEGEND

PROJECT	ECFAS PHASE II MODEL			
TITLE	MODEL VALIDATION RESULTS VERSION 2D OBSERVED VS. SIMULATED WATER LEVELS			
Golder Associates	PROJECT No. 073-82536			FILE No. ECFAS II
	DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
	GIS/CADD	CJB	2/01/2008	FIGURE 97
	CHECK	GMP	2/01/2008	
	REVIEW	JS	10/14/08	

Model Calibration Results 12-1



Days from January 1, 2005

Vertical scale is 0.001 increments normalized
To 35,000 mg/l TDS

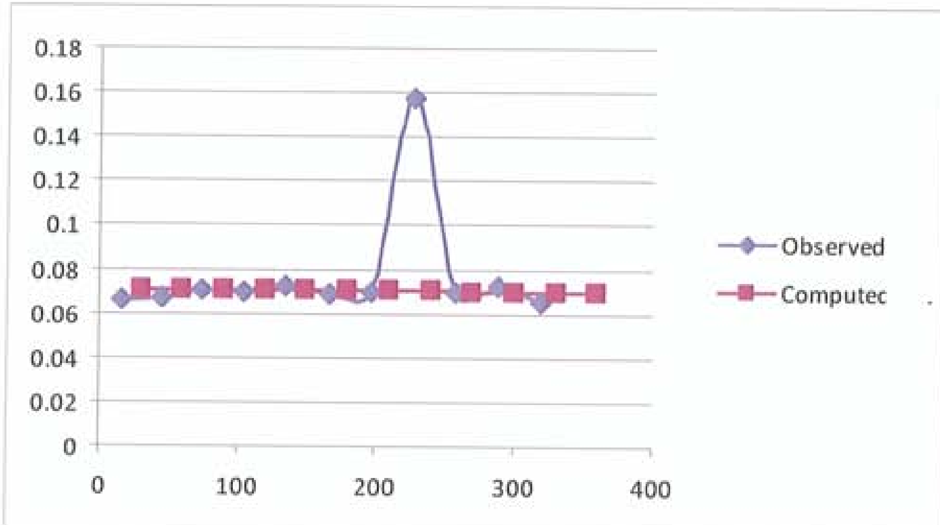
LEGEND

Observed Data

Simulated Data

PROJECT	ECFAS PHASE II MODEL			
TITLE	**MODEL CALIBRATION WATER QUALITY RESULTS SELECT OBSERVATION WELLS WELL NAMES AS SHOWN ON THE GRAPHS**			
Golder Associates	PROJECT No. 073-82536			FILE No. ECFAS II
	DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
	GIS/CADD	CJB	2/01/2008	**FIGURE 98**
	CHECK	GMP	2/01/2008	
	REVIEW	JS	10/14/08	

Model Calibration Results NMC-MW



Days from January 1, 2005

Vertical scale is 0.001 increments normalized
To 35,000 mg/l TDS

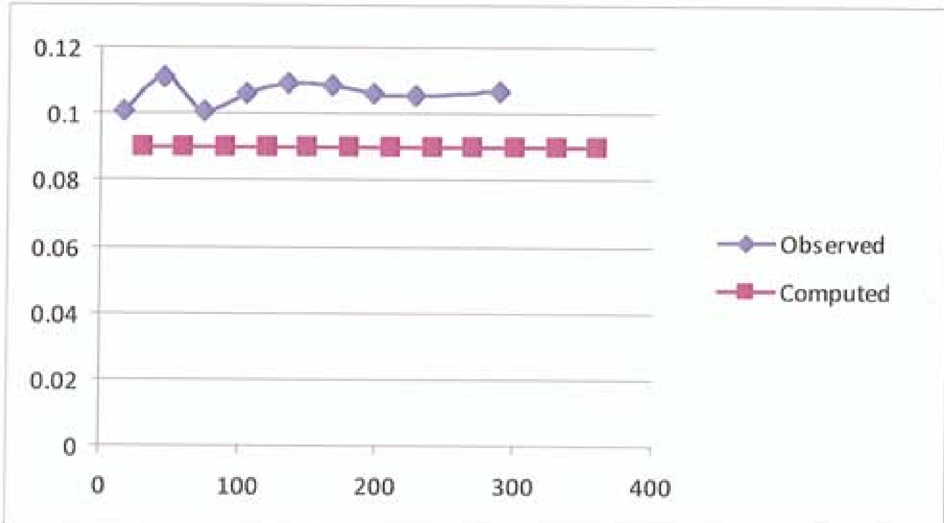
LEGEND

Observed Data

Simulated Data

PROJECT	ECFAS PHASE II MODEL			
TITLE	MODEL CALIBRATION WATER QUALITY RESULTS SELECT OBSERVATION WELLS WELL NAMES AS SHOWN ON THE GRAPHS			
Golder Associates	PROJECT No. 073-82536			FILE No. ECFAS II
	DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
	GIS/CADD	CJB	2/01/2008	
	CHECK	GMP	2/01/2008	FIGURE 99
	REVIEW	JS	10/14/08	

Model Calibration Results SUN-MW



Days from January 1, 2005

Vertical scale is 0.001 increments normalized
To 35,000 mg/l TDS

LEGEND

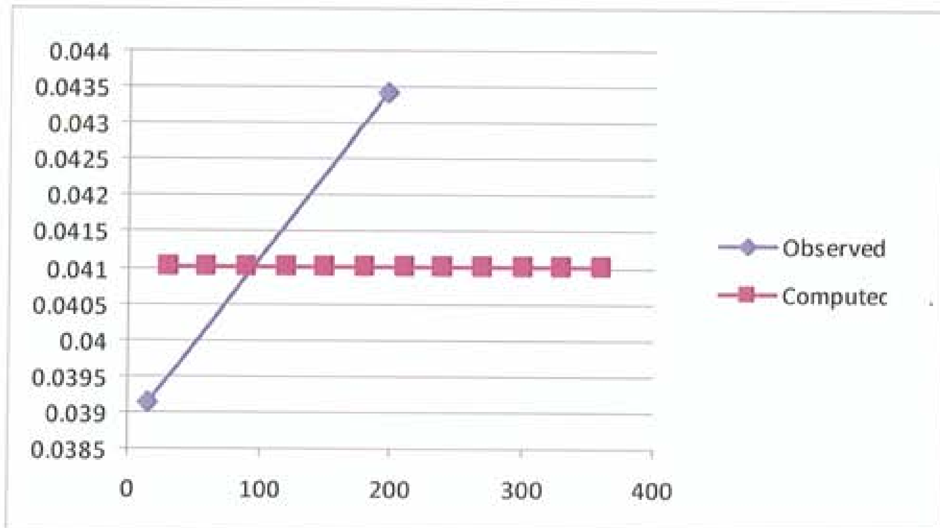

Observed Data


Simulated Data

PROJECT	ECFAS PHASE II MODEL		
TITLE	MODEL CALIBRATION WATER QUALITY RESULTS SELECT OBSERVATION WELLS WELL NAMES AS SHOWN ON THE GRAPHS		
PROJECT No. 073-82536			FILE No. ECFAS II
DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
GIS/CADD	CJB	2/01/2008	
CHECK	GMP	2/01/2008	FIGURE 100
REVIEW	JS	10/14/08	

Golder Associates

Model Calibration Results IR0968



Days from January 1, 2005

Vertical scale is 0.001 increments normalized
To 35,000 mg/l TDS

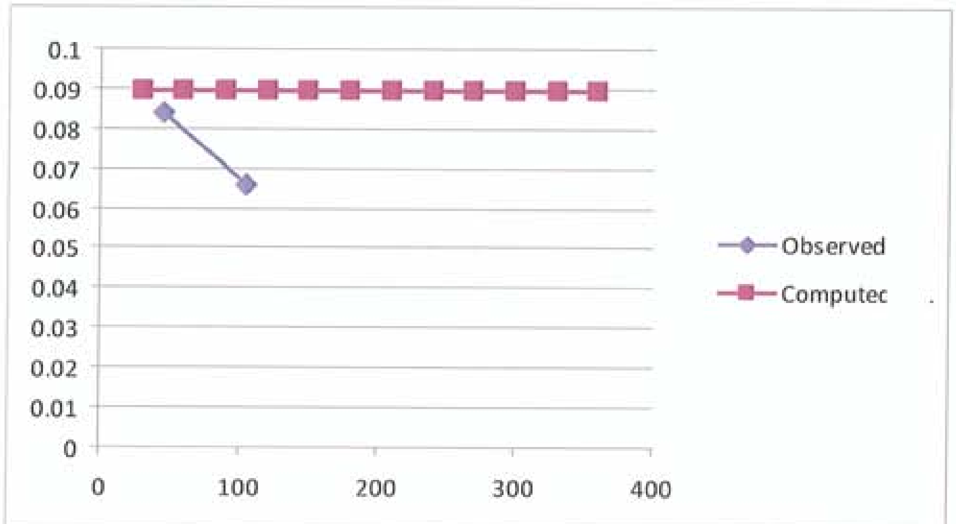
LEGEND

Observed Data

Simulated Data

PROJECT	ECFAS PHASE II MODEL			
TITLE	MODEL CALIBRATION WATER QUALITY RESULTS SELECT OBSERVATION WELLS WELL NAMES AS SHOWN ON THE GRAPHS			
Golder Associates	PROJECT No. 073-82536			FILE No. ECFAS II
	DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. 0
	GIS/CADD	CJB	2/01/2008	FIGURE 101
	CHECK	GMP	2/01/2008	
	REVIEW	JS	10/14/08	

Model Calibration Results PB-1187



Days from January 1, 2005

Vertical scale is 0.001 increments normalized
To 35,000 mg/l TDS

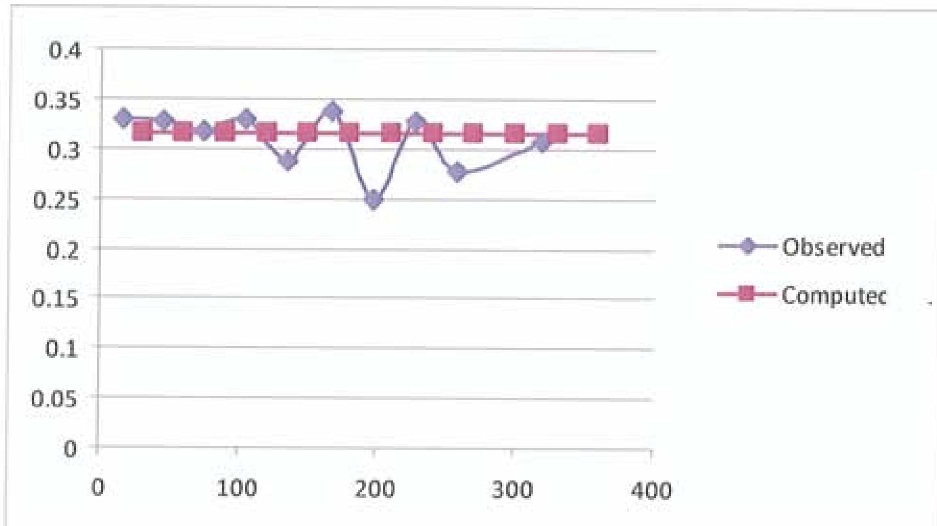
LEGEND

Observed Data

Simulated Data

PROJECT	ECFAS PHASE II MODEL			
TITLE	**MODEL CALIBRATION WATER QUALITY RESULTS SELECT OBSERVATION WELLS WELL NAMES AS SHOWN ON THE GRAPHS**			
Golder Associates	PROJECT No. 073-82536			FILE No. ECFAS II
	DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
	GIS/CADD	CJB	2/01/2008	**FIGURE 102**
	CHECK	GMP	2/01/2008	
	REVIEW	JS	10/14/08	

Model Calibration Results CS-I1



Days from January 1, 2005

Vertical scale is 0.001 increments normalized
To 35,000 mg/l TDS

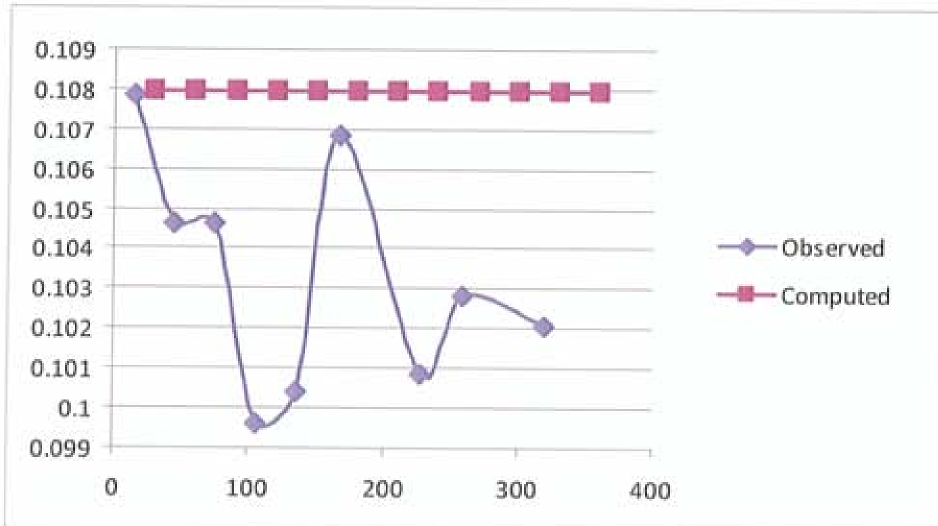
LEGEND

Observed Data

Simulated Data

PROJECT	ECFAS PHASE II MODEL			
TITLE	**MODEL CALIBRATION WATER QUALITY RESULTS SELECT OBSERVATION WELLS WELL NAMES AS SHOWN ON THE GRAPHS**			
Golder Associates	PROJECT No. 073-82536			FILE No. ECFAS II
	DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
	GIS/CADD	CJB	2/01/2008	**FIGURE 103**
	CHECK	GMP	2/01/2008	
	REVIEW	JS	10/14/08	

Model Calibration Results PB-1193



Days from January 1, 2005

Vertical scale is 0.001 increments normalized
To 35,000 mg/l TDS

LEGEND

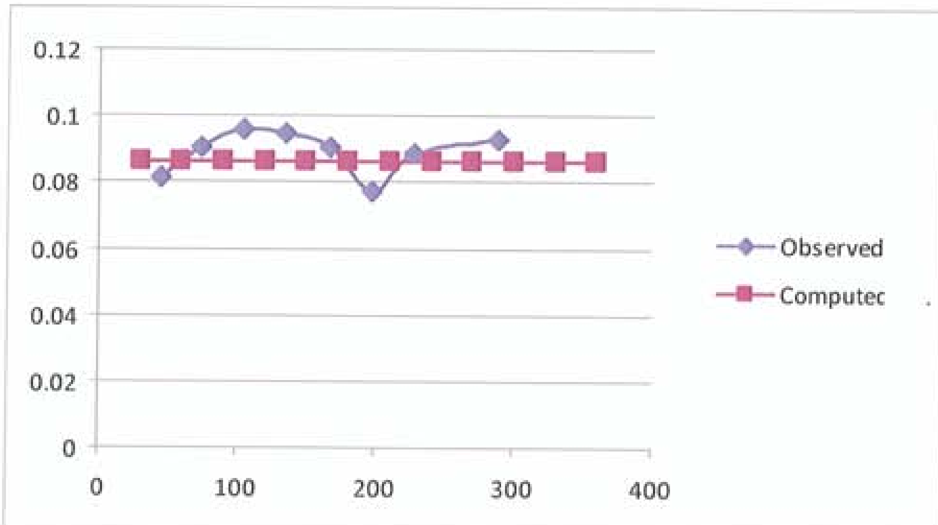
Observed Data

Simulated Data

PROJECT	ECFAS PHASE II MODEL		
TITLE	**MODEL CALIBRATION WATER QUALITY RESULTS SELECT OBSERVATION WELLS WELL NAMES AS SHOWN ON THE GRAPHS**		
PROJECT No. 073-82536			FILE No. ECFAS II
DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
GIS/CADD	CJB	2/01/2008	**FIGURE 104**
CHECK	GMP	2/01/2008	
REVIEW	JS	10/14/08	

Golder Associates

Model Calibration Results PWU-MW



Days from January 1, 2005

Vertical scale is 0.001 increments normalized
To 35,000 mg/l TDS

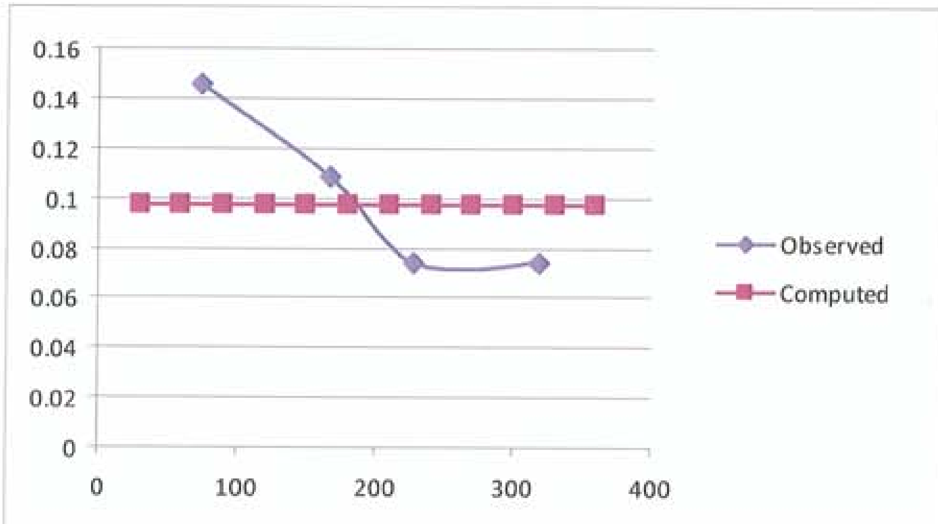
LEGEND

Observed Data

Simulated Data

PROJECT	ECFAS PHASE II MODEL			
TITLE	**MODEL CALIBRATION WATER QUALITY RESULTS SELECT OBSERVATION WELLS WELL NAMES AS SHOWN ON THE GRAPHS**			
Golder Associates	PROJECT No. 073-82536			FILE No. ECFAS II
	DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
	GIS/CADD	CJB	2/01/2008	**FIGURE 105**
	CHECK	GMP	2/01/2008	
	REVIEW	JS	10/14/08	

Model Calibration Results 35-2



Days from January 1, 2005

Vertical scale is 0.001 increments normalized
To 35,000 mg/l TDS

LEGEND

Observed Data

Simulated Data

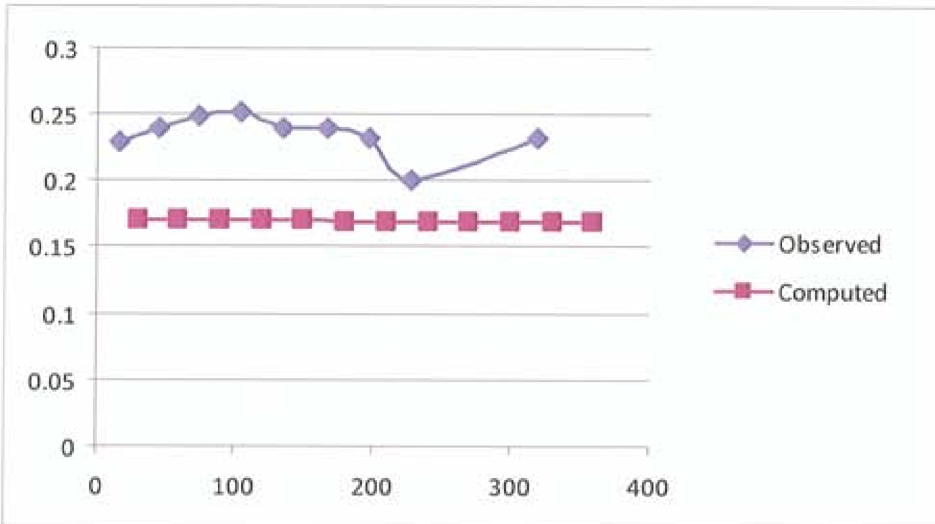
PROJECT ECFAS PHASE II MODEL

TITLE **MODEL CALIBRATION WATER QUALITY RESULTS SELECT OBSERVATION WELLS WELL NAMES AS SHOWN ON THE GRAPHS**

PROJECT No. 073-82536			FILE No. ECFAS II
DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
GIS/CADD	CJB	2/01/2008	
CHECK	GMP	2/01/2008	**FIGURE 106**
REVIEW	JS	10/14/08	

Golder Associates

Model Calibration Results PB-1179



Days from January 1, 2005

Vertical scale is 0.001 increments normalized
To 35,000 mg/l TDS

LEGEND

Observed Data

Simulated Data

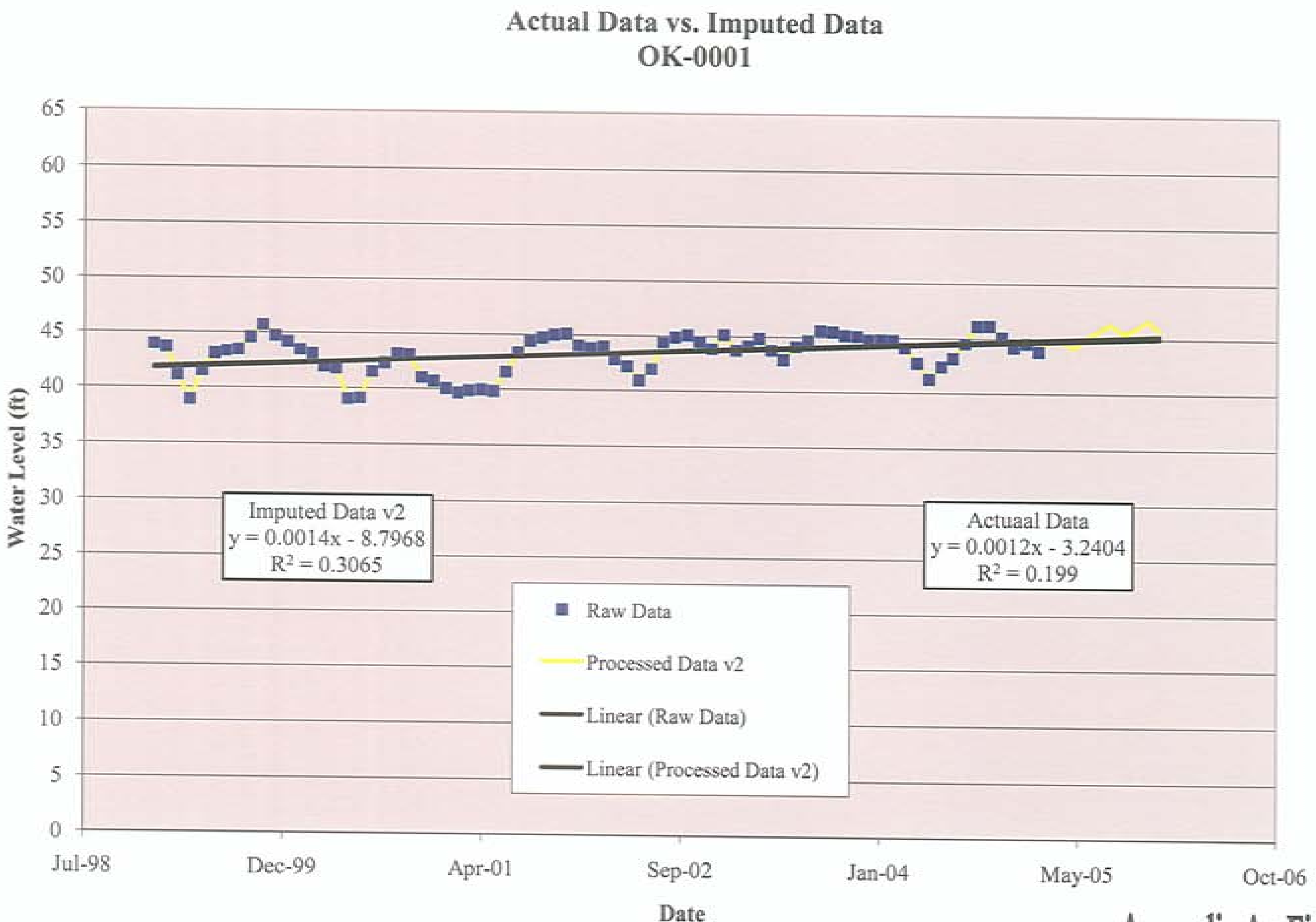
PROJECT	ECFAS PHASE II MODEL		
TITLE	MODEL CALIBRATION WATER QUALITY RESULTS SELECT OBSERVATION WELLS WELL NAMES AS SHOWN ON THE GRAPHS		
PROJECT No.	073-82536		FILE No. ECFAS II
DESIGN	CJB	2/01/2008	SCALE AS SHOWN REV. O
GIS/CADD	CJB	2/01/2008	
CHECK	GMP	2/01/2008	FIGURE 107
REVIEW	JS	10/14/08	

Golder Associates

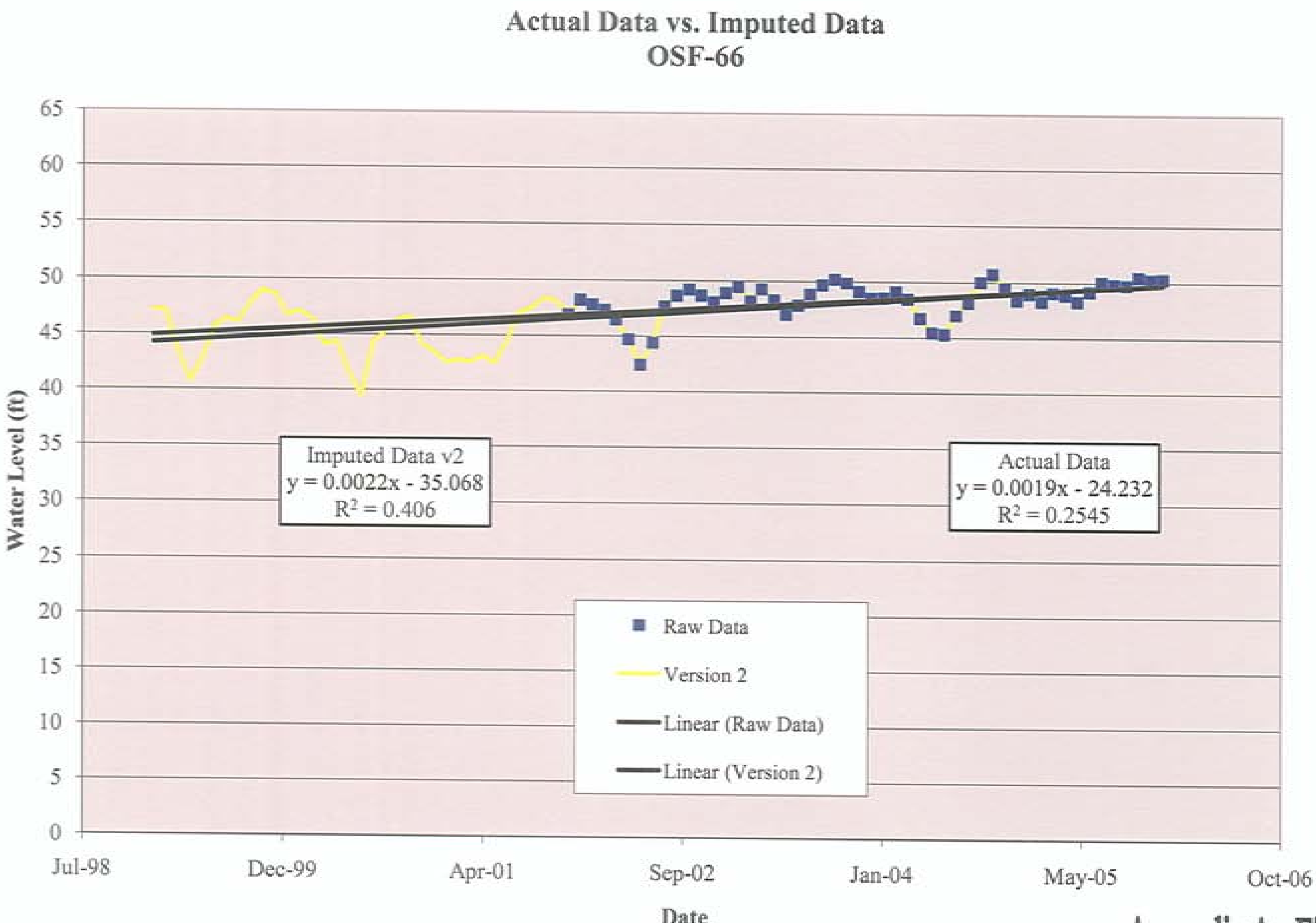
APPENDIX A

Boundary Regression Graphs and Figures

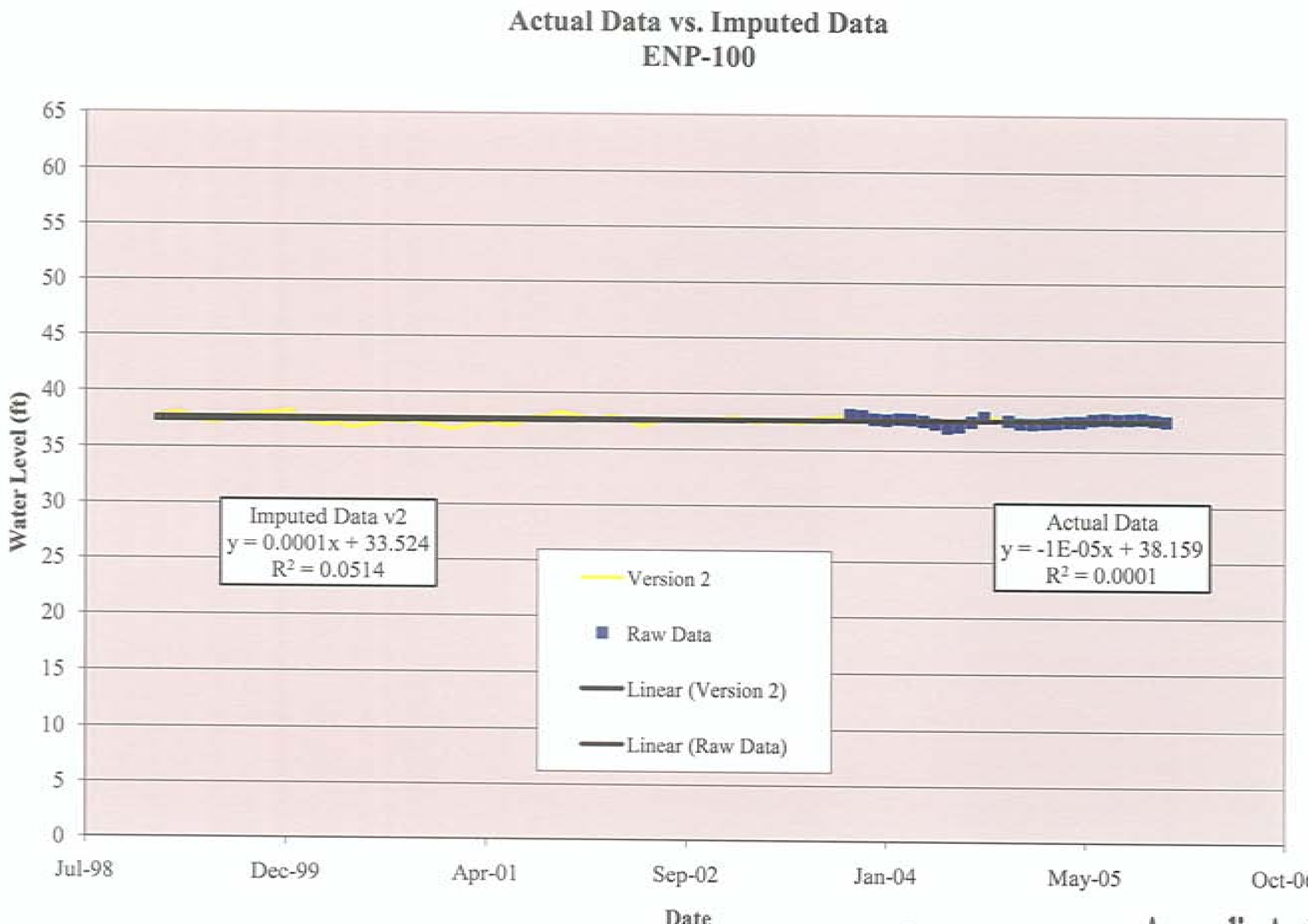
Appendix A - Figure 1



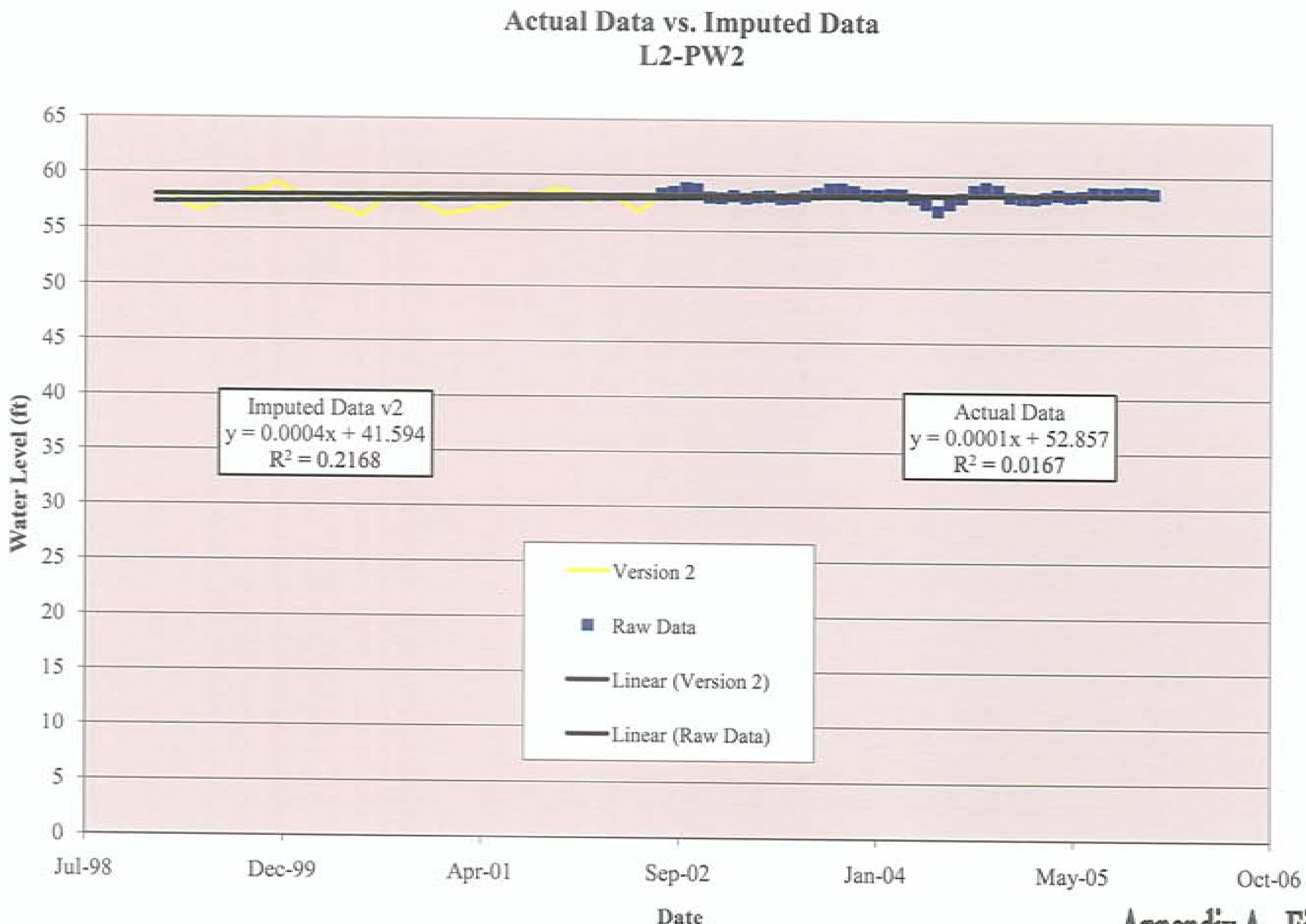
Appendix A - Figure 2



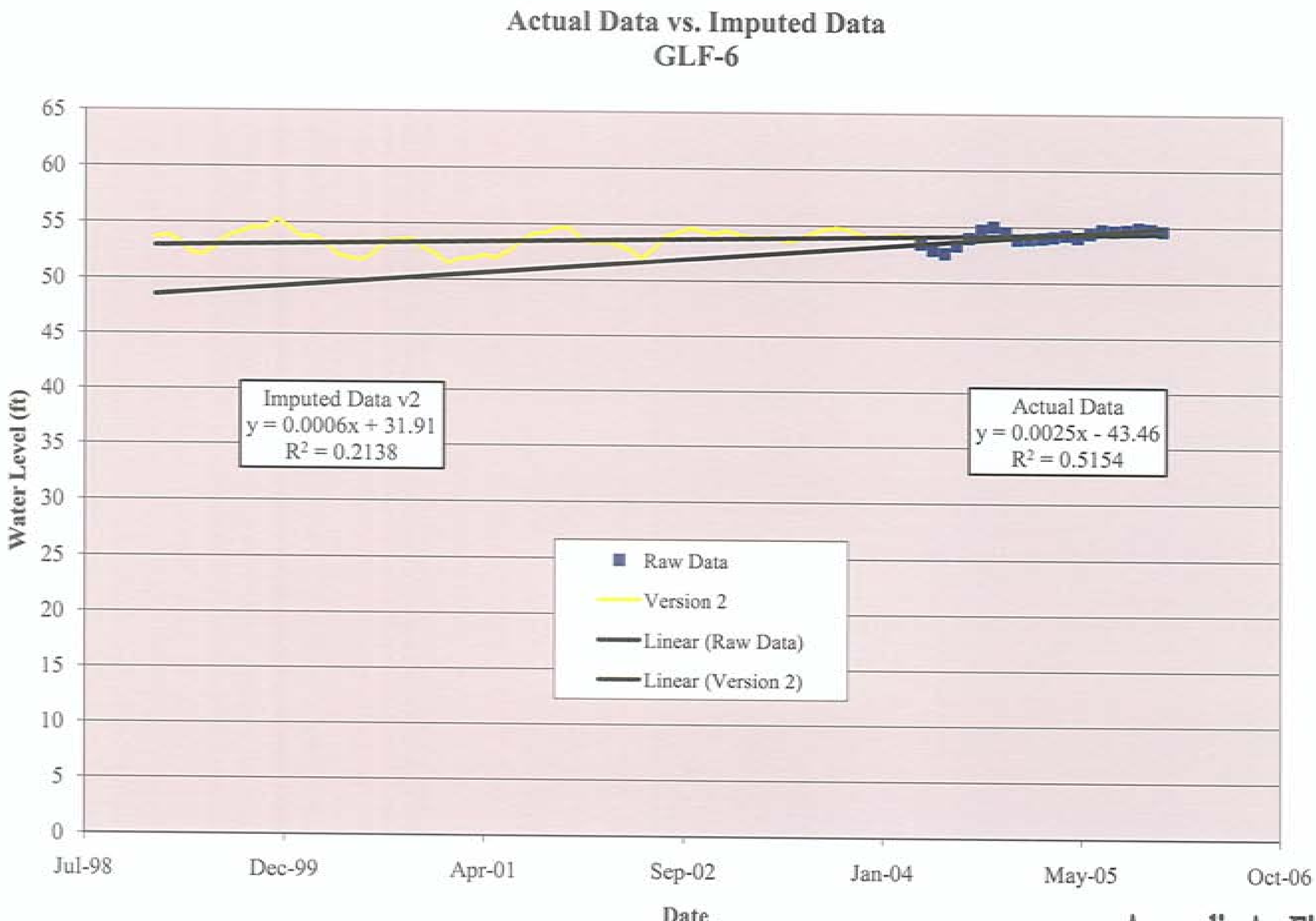
Appendix A - Figure 3



Appendix A - Figure 4

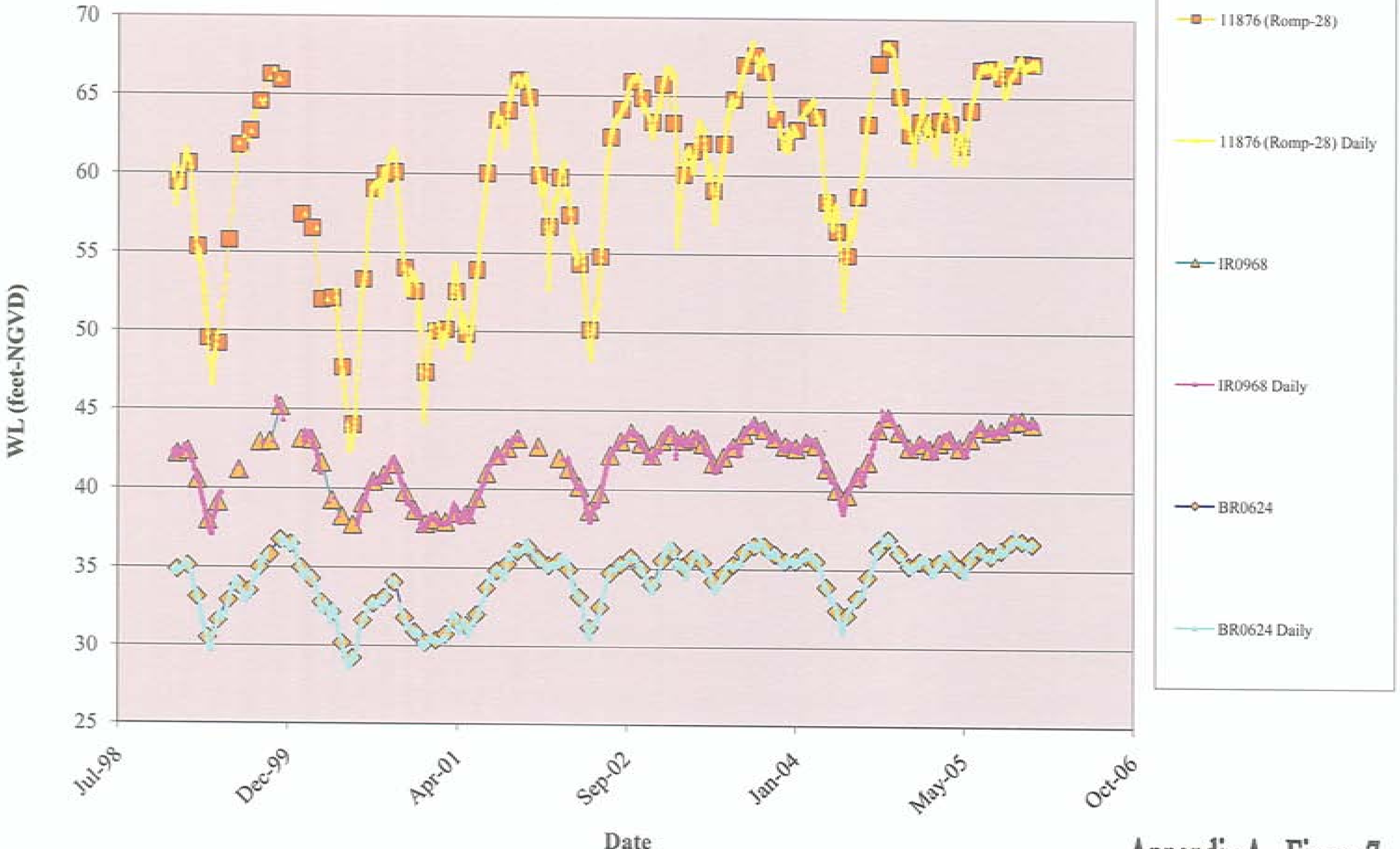


Appendix A - Figure 5



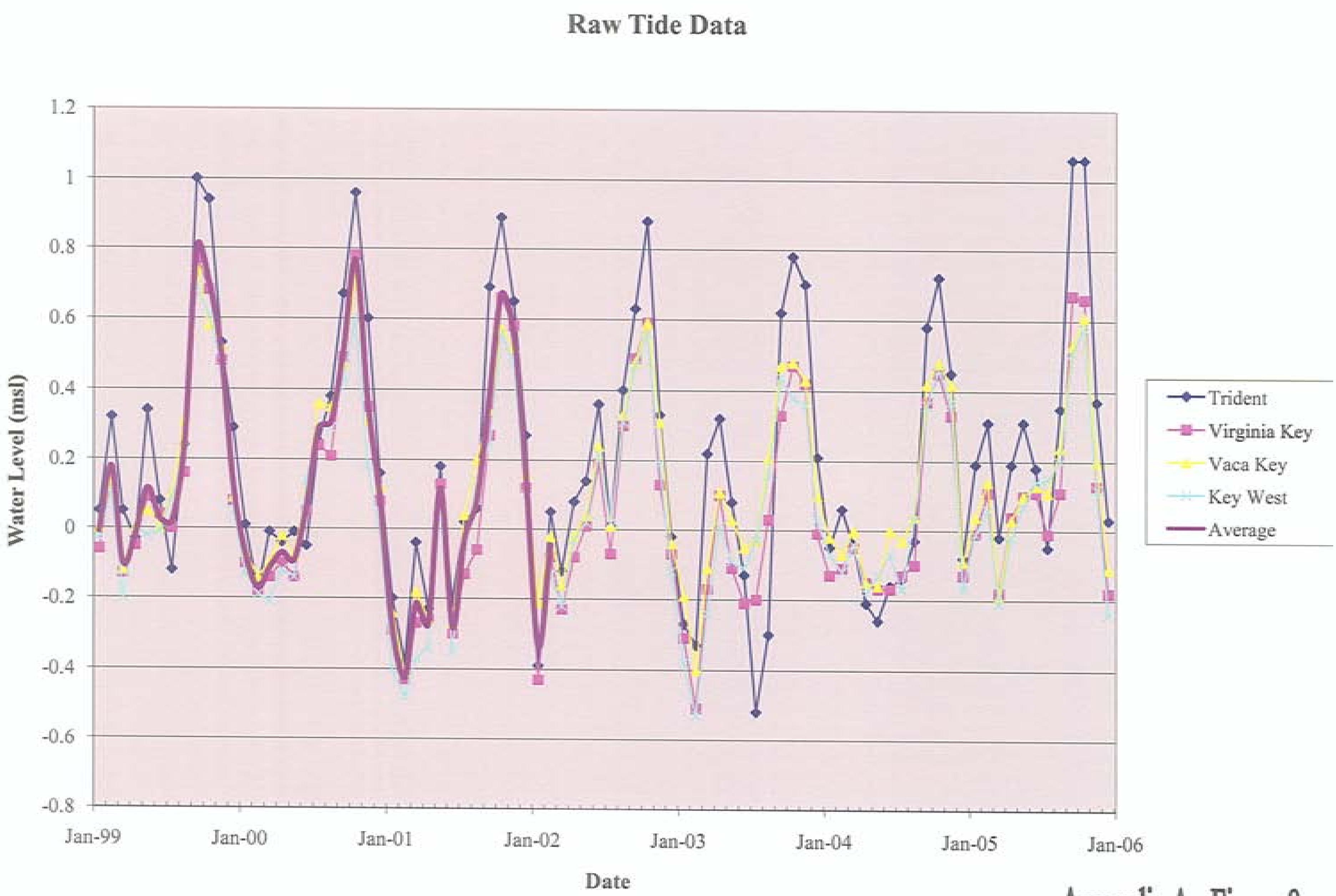
Appendix A - Figure 6

Water Level Hydrographs - UFAS (Monthly vs. Daily Values)



Appendix A - Figure 7

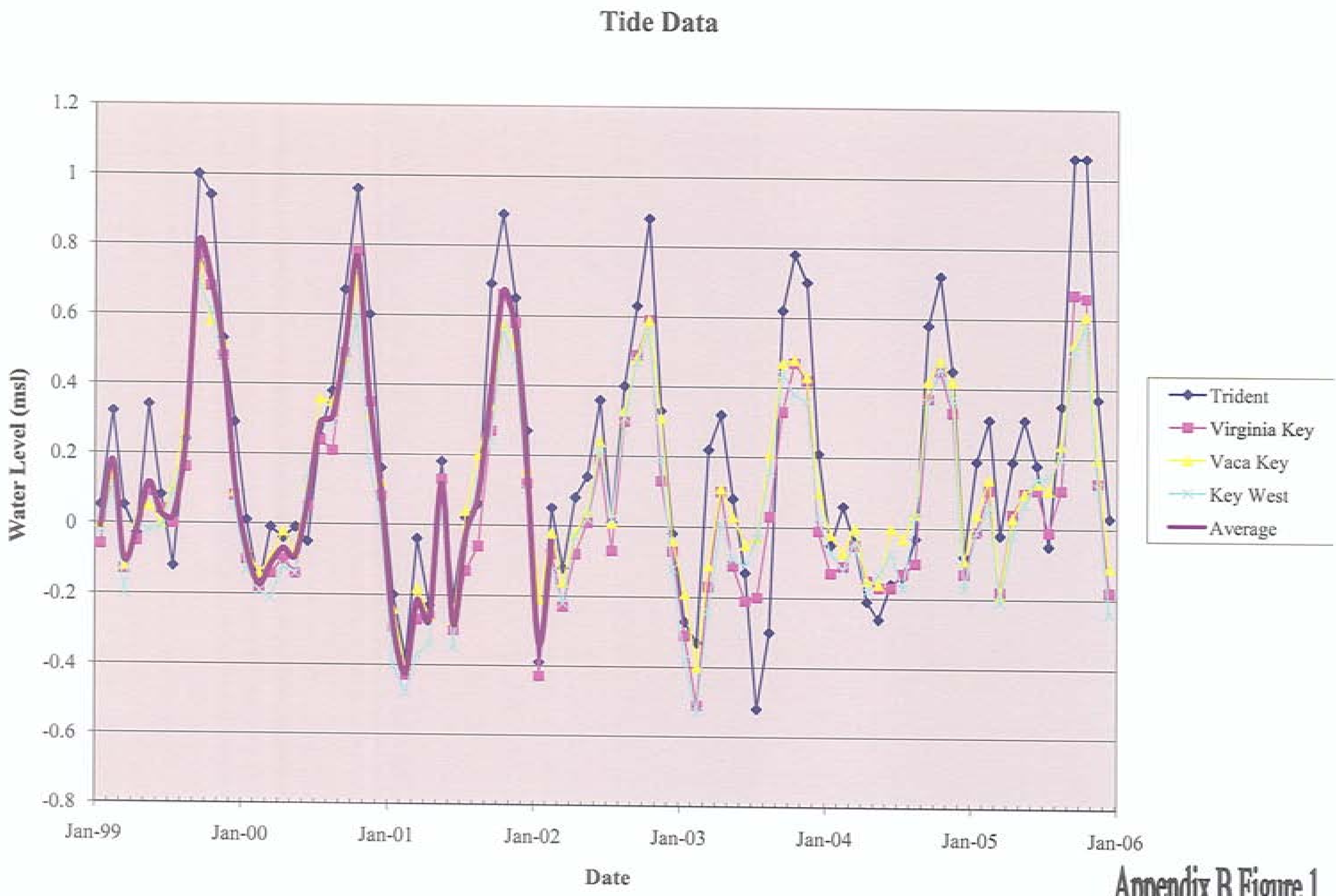
Golder Associates



Appendix A - Figure 8

APPENDIX B

Tidal Data for General Head Boundary



Appendix B Figure 1

APPENDIX C

Sensitivity Report

Sensitivity Report - Transient Calibration Model Version 2C 2005 only

Variable	Change Made	File Name	Residual Mean	Absolute Residual Mean	Mass Balance Error (%)
		Calibrated Model =	**0.24 feet**	**2.73 feet**	**0.60%**
Kh	Increase Kh for all layers by 2	2005CalModel_v2C.gwv	-1.39	3.27	-0.31
Kh	Decrease Kh for all layers by 2	2005CalModel_v2C.gwv	3.07	3.72	2.93
Kh	Increase Kh for layers 3 and 4 by 2	2005CalModel_v2C.gwv	0.17	2.76	0.88
Kh	Decrease Kh for layers 3 and 4 by 2	2005CalModel_v2C.gwv	0.25	2.76	1.36
Kh	Increase Kh for layers 7 and 8 by 2	2005CalModel_v2C.gwv	-2.21	3.69	-3.92
Kh	Decrease Kh for layers 7 and 8 by 2	2005CalModel_v2C.gwv	3.59	4.14	3.25
Kh	Increase Zone 5 by 1.25 and decrease Zone 6 by 4	2005CalModel_v2C.gwv	-0.61	2.98	-0.11
Kv	Increase Kv for layer 2 by 10	2005CalModel_v2C.gwv	6.36	6.72	5.8
Kv	Decrease Kv for layer 2 by 10	2005CalModel_v2C.gwv	-0.89	2.81	-0.93
Kv	Increase Kv for layers 5 and 6 by 10	2005CalModel_v2C.gwv	-0.17	2.67	0.92
Kv	Decrease Kv for layers 5 and 6 by 10	2005CalModel_v2C.gwv	2.05	3.71	-0.22
Kv	Increase Kv for layers 9, 10 and 11 by 10	2005CalModel_v2C.gwv	0.58	2.72	5.62
Kv	Decrease Kv for layers 9, 10 and 11 by 10	2005CalModel_v2C.gwv	0.17	3.01	-1.78
Kv	Increase Kv for layers 5 and 6 by 2 AND decrease Kv for layers 9, 10, and 11 by 2	2005CalModel_v2C.gwv	-0.02	2.75	-0.25
Kv	Increase Kv for layers 5 and 6 by 2 AND decrease Kv for layers 9, 10, and 11 by 2; reduce Z44 and Z48 by 2	2005CalModel_v2C.gwv	0.02	2.71	-0.21
IC Boundary	Increase IC on boundary by 25%	2005CalModel_v2C.gwv	0.02	2.71	-0.21
IC Boundary	Decrease IC on boundary by 25%	2005CalModel_v2C.gwv	0.02	2.71	-0.21
Kh and Kv	Increase Kv for layers 5 and 6 by 2 AND decrease Kv for layers 9, 10, and 11 by 2; reduce Z44 and Z48 by 2; Add Lower Kh zone 3 to Layer 7 and expand Zone 8;	2005CalModel_v2C.gwv	0.3	2.74	-0.39

Kh and Kv	Increase Kv for layers 5 and 6 by 2 AND decrease Kv for layers 9, 10, and 11 by 2; reduce Z44 and Z48 by 2; Add Lower Kh zone 3 to Layer 7 and expand Zone 8; Reduce Z5 to 3,500 fpd; Increase Zone 13 to 52 fpd; Increase Zone 14 to 90 fpd.	2005CalModel_v2C.gwv	0.79	2.72	0.63

Sensitivity Report - Transient Calibration Model Version N 2004 Data Only

Sensitivity Analysis - Constant Head Boundary Conditions (UFAS and MFAS)

ID	File Name	Residual Mean	Residual Standard Dev	Residual Sum of Squares	Absolute Residual Mean	Minimum Residual	Maximum Residual	Observed Range in Head	Res Std Dev/Range
22	2004CalModel_v1n.gwv	0.01	4.57	1.67E+04	2.85	-15.97	24.08	52.17	0.088
23	2004SenModel_v1_CH_UF_+1.gwv	-0.08	4.57	1.67E+04	2.85	-15.98	24.07	52.17	0.088
24	2004SenModel_v1_CH_UF_-1.gwv	0.1	4.58	1.68E+04	2.89	-15.96	24.1	52.17	0.088
25	2004SenModel_v1_CH_MF_+1.gwv	-0.09	4.57	1.67E+04	2.85	-16.06	23.64	52.17	0.088
26	2004SenModel_v1_CH_MF_-1.gwv	0.11	4.57	1.67E+04	2.84	-15.88	24.52	52.17	0.088

Sensitivity Analysis - Effective Porosity

ID	File Name	Residual Mean	Residual Standard Dev	Residual Sum of Squares	Absolute Residual Mean	Minimum Residual	Maximum Residual	Observed Range in Head	Res Std Dev/Range
22	2004CalModel_v1n.gwv	0.01	4.57	1.67E+04	2.85	-15.97	24.08	52.17	0.088
23	2004SenModel_v1_ep_UF_double.gwv	0.01	4.57	1.67E+04	2.85	-15.97	24.08	52.17	0.088
24	2004SenModel_v1_ep_UF_half.gwv	0.01	4.57	1.67E+04	2.85	-15.97	24.08	52.17	0.088
25	2004SenModel_v1_ep_MF_double.gwv	0.01	4.57	1.67E+04	2.85	-15.97	24.09	52.17	0.088
26	2004SenModel_v1_ep_MF_half.gwv	0.01	4.57	1.67E+04	2.85	-15.97	24.08	52.17	0.088

Sensitivity Analysis - General Head Boundary

ID	File Name	Residual Mean	Residual Standard Dev	Residual Sum of Squares	Absolute Residual Mean	Minimum Residual	Maximum Residual	Observed Range in Head	Res Std Dev/Range
22	2004CalModel_v1n.gwv	0.01	4.57	1.67E+04	2.85	-15.97	24.08	52.17	0.088
23	2004SenModel_v1_GHB_UF_+1.gwv	0.01	4.57	1.67E+04	2.85	-15.97	24.08	52.17	0.088
24	2004SenModel_v1_GHB_UF_-1.gwv	0.01	4.57	1.67E+04	2.85	-15.97	24.08	52.17	0.088
25	2004SenModel_v1_GHB_MF_+1.gwv	0.01	4.57	1.67E+04	2.85	-15.97	24.08	52.17	0.088
26	2004SenModel_v1_GHB_MF_-1.gwv	0.01	4.57	1.67E+04	2.85	-15.97	24.08	52.17	0.088

Sensitivity Analysis - Horizontal Hydraulic Conductivity

ID	File Name	Residual Mean	Residual Standard Dev	Residual Sum of Squares	Absolute Residual Mean	Minimum Residual	Maximum Residual	Observed Range in Head	Res Std Dev/Range
22	2004CalModel_v1n.gwv	0.01	4.57	1.67E+04	2.85	-15.97	24.08	52.17	0.088
23	2004SenModel_v1_hhc_MCU_double.gwv	0.01	4.57	1.67E+04	2.85	-15.97	24.09	52.17	0.088
24	2004SenModel_v1_hhc_MCU_half.gwv	0.01	4.57	1.67E+04	2.85	-15.97	24.08	52.17	0.088
25	2004SenModel_v1_hhc_ICU_double.gwv	0.01	4.57	1.67E+04	2.85	-15.97	24.08	52.17	0.088
26	2004SenModel_v1_hhc_ICU_half.gwv	0.01	4.57	1.67E+04	2.85	-15.97	24.08	52.17	0.088
27	2004SenModel_v1_hhc_UF_double.gwv	0.03	4.59	1.68E+04	2.87	-15.88	24.23	52.17	0.088
28	2004SenModel_v1_hhc_UF_half.gwv	-0.03	4.6	1.69E+04	2.9	-16.28	23.98	52.17	0.088

29	2004SenModel_v1_hhc_MF_double.gwv	-1.09	4.61	1.80E+04	2.95	-18.34	23.91	52.17	0.088
30	2004SenModel_v1_hhc_MF_half.gwv	0.72	4.63	1.76E+04	3.01	-14.9	23.97	52.17	0.089
31	2004SenModel_v1_hhc_LF_double.gwv	-0.15	4.48	1.61E+04	2.82	-16.14	22.83	52.17	0.086
32	2004SenModel_v1_hhc_LF_half.gwv	0.1	4.62	1.70E+04	2.86	-15.86	24.78	52.17	0.088
33	2004SenModel_v1_hhc_LCU_double.gwv	0.01	4.57	1.67E+04	2.85	-15.98	24.08	52.17	0.088
34	2004SenModel_v1_hhc_LCU_half.gwv	0.01	4.57	1.67E+04	2.85	-15.97	24.09	52.17	0.088
35	2004SenModel_v1_hhc_Layer13_double.gwv	0.01	4.57	1.67E+04	2.85	-15.97	24.08	52.17	0.088
36	2004SenModel_v1_hhc_Layer13_half.gwv	0.01	4.57	1.67E+04	2.85	-15.97	24.08	52.17	0.088
43	2004SenModel_v1_hhc_UF_three-fourth.gwv	-0	4.58	1.68E+04	2.86	-16.1	24.04	52.17	0.088
44	2004SenModel_v1_hhc_UF_1.5.gwv	0.03	4.57	1.67E+04	2.85	-15.83	24.16	52.17	0.088
45	2004SenModel_v1_hhc_MF_three-fourth.gwv	0.35	4.59	1.69E+04	2.89	-15.46	24.06	52.17	0.088
46	2004SenModel_v1_hhc_MF_1.5.gwv	-0.58	4.57	1.70E+04	2.85	-17.2	24.03	52.17	0.088

Sensitivity Analysis - Vertical Hydraulic Conductivity

ID	File Name	Residual Mean	Residual Standard Dev	Residual Sum of Squares	Absolute Residual Mean	Minimum Residual	Maximum Residual	Observed Range in Head	Res Std Dev/Range
22	2004CalModel_v1n.gwv	0.01	4.57	1.67E+04	2.85	-15.97	24.08	52.17	0.088
23	2004SenModel_v1_vhc_MCU_double.gwv	-0.22	4.63	1.72E+04	2.91	-16.31	24.42	52.17	0.089
24	2004SenModel_v1_vhc_MCU_half.gwv	0.17	4.56	1.67E+04	2.86	-15.54	24	52.17	0.087
25	2004SenModel_v1_vhc_ICU_double.gwv	0.61	4.63	1.75E+04	2.96	-15.25	24.08	52.17	0.089
26	2004SenModel_v1_vhc_ICU_half.gwv	-0.33	4.58	1.69E+04	2.86	-16.43	24.09	52.17	0.088
27	2004SenModel_v1_vhc_UF_double.gwv	0.01	4.57	1.67E+04	2.85	-15.97	24.08	52.17	0.088
28	2004SenModel_v1_vhc_UF_half.gwv	0.01	4.57	1.67E+04	2.84	-15.97	24.08	52.17	0.088
29	2004SenModel_v1_vhc_MF_double.gwv	0.01	4.57	1.67E+04	2.85	-15.98	24.08	52.17	0.088
30	2004SenModel_v1_vhc_MF_half.gwv	0.02	4.57	1.67E+04	2.85	-15.96	24.08	52.17	0.088
31	2004SenModel_v1_vhc_LF_double.gwv	0.01	4.57	1.67E+04	2.85	-15.97	24.08	52.17	0.088
32	2004SenModel_v1_vhc_LF_half.gwv	0.01	4.57	1.67E+04	2.85	-15.97	24.08	52.17	0.087
33	2004SenModel_v1_vhc_LCU_double.gwv	-0.01	4.6	1.70E+04	2.89	-16.12	24.33	52.17	0.088
34	2004SenModel_v1_vhc_LCU_half.gwv	0.14	4.52	1.64E+04	2.83	-15.77	23.48	52.17	0.087

35	2004SenModel_v1_vhc_Layer13_double.gwv	0.01	4.57	1.67E+04	2.85	-15.97	24.1	52.17	0.088
36	2004SenModel_v1_vhc_Layer13_half.gwv	0.01	4.57	1.67E+04	2.85	-15.97	24.08	52.17	0.088
43	2004SenModel_v1_vhc_MCU_three-fourth.gwv	0.07	4.56	1.67E+04	2.85	-15.83	24.05	52.17	0.087
44	2004SenModel_v1_vhc_MCU_1.5.gwv	-0.06	4.58	1.68E+04	2.85	-16.1	24.13	52.17	0.088
45	2004SenModel_v1_vhc_ICU_three-fourth.gwv	-0.15	4.57	1.67E+04	2.85	-16.17	24.09	52.17	0.088
46	2004SenModel_v1_vhc_ICU_1.5.gwv	0.32	4.59	1.69E+04	2.88	-15.6	24.08	52.17	0.088
47	2004SenModel_v1_vhc_LCU_three-fourth.gwv	0.06	4.55	1.66E+04	2.84	-15.89	23.88	52.17	0.087
48	2004SenModel_v1_vhc_LCU_1.5.gwv	-0.05	4.59	1.69E+04	2.87	-16.06	24.26	52.17	0.088
49	2004SenModel_v1_vhc_MCU_0.1.gwv	0.82	4.82	1.91E+04	3.36	-14.16	23.79	52.17	0.092
50	2004SenModel_v1_vhc_MCU_10.gwv	-0.27	4.66	1.74E+04	2.97	-16.15	24.25	52.17	0.089

Sensitivity Analysis - Specific Storage

ID	File Name	Residual Mean	Residual Standard Dev	Residual Sum of Squares	Absolute Residual Mean	Minimum Residual	Maximum Residual	Observed Range in Head	Res Std Dev/Range
22	2004CalModel_v1n.gwv	0.01	4.57	1.67E+04	2.85	-15.97	24.08	52.17	0.088
23	2004SenModel_v1_ss_UF_double.gwv	-0.02	4.58	1.68E+04	2.86	-16.1	24.11	52.17	0.088
24	2004SenModel_v1_ss_UF_half.gwv	0	4.56	1.66E+04	2.84	-15.87	24.04	52.17	0.087
25	2004SenModel_v1_ss_MF_double.gwv	0.01	4.57	1.67E+04	2.85	-15.97	24.09	52.17	0.088
26	2004SenModel_v1_ss_MF_half.gwv	0.01	4.57	1.67E+04	2.85	-15.97	24.08	52.17	0.088