Kissimmee Basin Planning Area Surficial Aquifer System Test Report

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1.0 INTRODUCTION

In 2007 and 2008, the South Florida Water Management District (SFWMD or District) conducted small-scale aquifer performance tests and a records review to acquire additional hydraulic data for the surficial aquifer system (SAS) in the Kissimmee Basin Planning Area (KPA) to support development of the East Central Florida Transient (ECFT) groundwater model concurrently under development. During model development, it was determined that additional hydraulic data (e.g., hydraulic conductivity values) were needed to support calibration of the ECFT model, specifically for the SAS in the KPA. The District conducted short-term (less than 4 hours in duration) aquifer performance tests at 15 monitor wells completed in the SAS, and the results were provided to ECFT modeling personnel. In addition, published test data were reviewed and provided to the modeling group.

Fieldwork for this project was conducted by SFWMD employees John Janzen and Brian Collins from November 2007 through July 2008. The ECFT modeling group, consisting of SFWMD employees Jefferson Giddings, Hope Barton, and David Butler, provided guidance and assistance with database searches and prioritization of test sites.

In 2014, the KPA was officially divided into two basins and addressed in separate water supply plans, the Upper Kissimmee Basin (UKB) and Lower Kissimmee Basin (LKB). The UKB was subsequently included in the 2014 Central Florida Water Initiative Regional Water Supply Plan Coordination Area. The ECFT model is currently being revised to include both the UKB and LKB.

2.0 SITE DESCRIPTION

The KPA is located in Central Florida and extends from southern Orange County, south along the Kissimmee Chain of Lakes and Kissimmee River, to the north shore of Lake Okeechobee (**Figure 1**). The area includes portions of Orange, Osceola, Polk, Highlands, Okeechobee, and Glades counties. Covering approximately 3,488 square miles within the Lake Okeechobee watershed, the KPA encompasses more than two dozen lakes in the Kissimmee Chain of Lakes, their tributary streams, and associated marshes (SFWMD, 2014).

Three major hydrogeologic units underlie the KPA: the SAS, the intermediate confining unit (ICU), and the Floridan aquifer system (FAS). The unconfined SAS ranges from less than 10 to 150 feet thick within the northern part of the KPA, thickening to the south and southwest (SFWMD, 2014). The thickness of SAS sediments reaches almost 300 feet in Polk County along the Lake Wales Ridge. The SAS is primarily recharged by rainfall, and interacts with surface water features such as rivers, canals, wetlands, and lakes. The SAS consists mainly of undifferentiated fine- to medium-grained quartz sand interbedded with discontinuous beds of silt, clay, and shell that range from Pliocene to Recent in age.

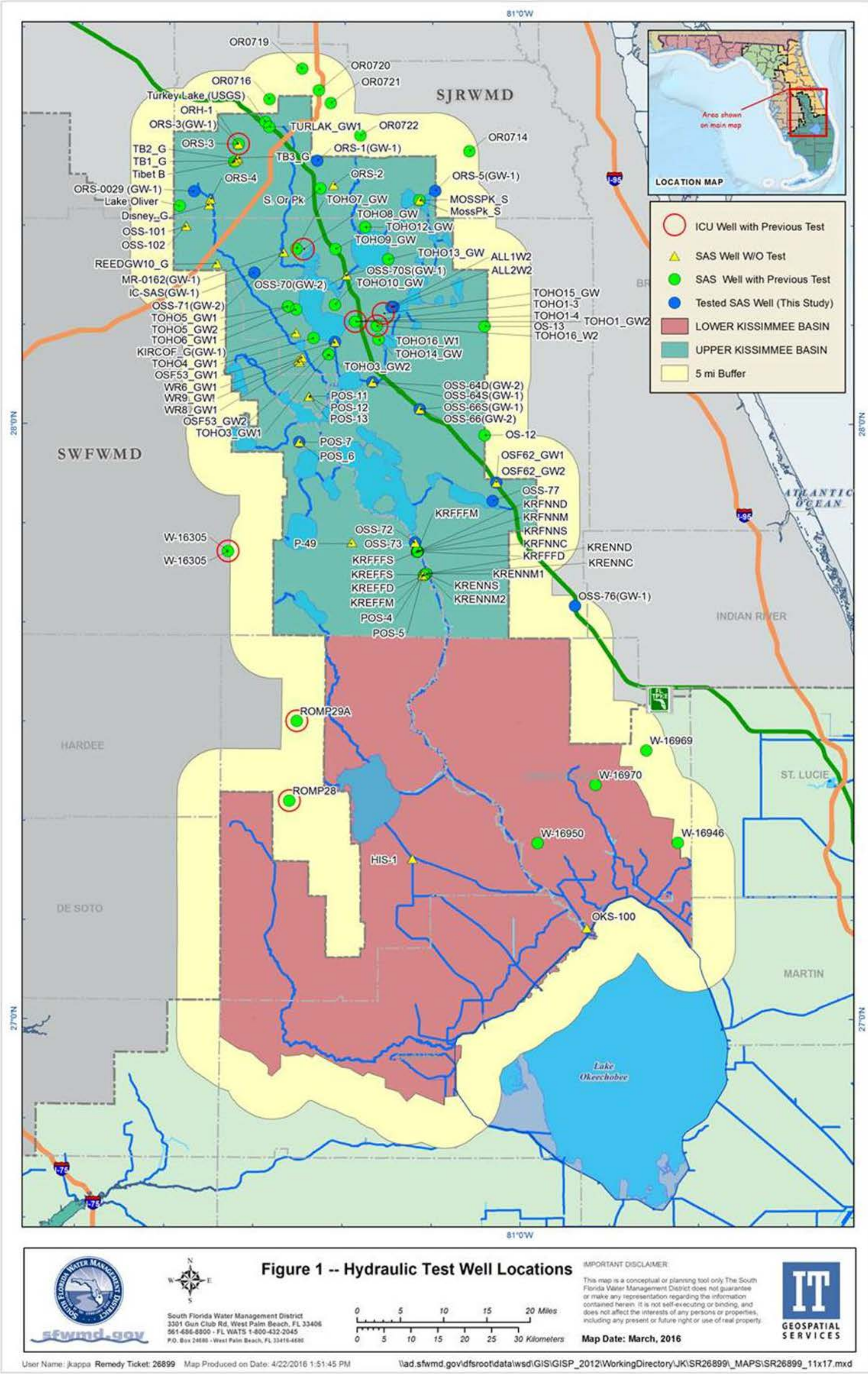

Figure 1. Kissimmee Basin Planning Area and Aquifer Test Well Locations.

3.0 WELL INVENTORY AND SITE PRIORITIZATION

The methodology used for site selection included developing an inventory of prospective test monitor wells screened in the SAS, conducting site inspections to assess suitability for conducting aquifer tests, and prioritization of candidate sites with the ECFT modeling group personnel. A monitor well inventory was developed by including wells that are part of the SFWMD "paired well program" within an area inclusive of the KPA and a 5-mile buffer zone (project area). The paired wells program includes a series of sites with multi-zoned well clusters completed in the SAS, Upper Floridan aquifer (UFA), and ICU for potential evaluation of the hydraulic connection between the aquifers. Wells were installed by the SFWMD or the United States Geological Survey (USGS), and some had Supervisory Control and Data Acquisition (SCADA) water level monitoring systems installed. A search of the District's DBHYDRO environmental database was conducted in December 2007 for paired wells in the project area and associated well characteristics, including location coordinates, depth, screened interval, casing diameter, and previous hydraulic tests. Forty-four paired well clusters with SAS wells were identified at 35 sites within the project area, with 9 sites having multiple wells completed in the SAS. Additionally, six SAS wells not included in the paired wells program were added to the site inventory by the ECFT modeling group for a total of 50 wells completed in the SAS included in the prospective test well inventory (**Table 1**).

Site visits to each well were conducted to assess suitability (based on depth, diameter, and physical locations) for aquifer tests. The site visits included a visual inspection to assess physical accessibility and to confirm well locations and construction details, including well depth. Sites with SCADA monitoring systems were noted. The site visits resulted in elimination of seven wells from the well inventory: two were not found and five were not readily available for access due to environmentally sensitive areas or access agreement requirements. Well construction details for all wells, including wells completed in the ICU and UFA, were assessed. The resulting site inventory contained 35 candidate wells at 28 sites.

Concurrent with development of the well inventory, a search of published and non-published SAS aquifer test data in DBHYDRO and the Southwest Florida Water Management District (SWFWMD) District-wide Regional Model (DWRM) database files was conducted. At the ECFT modeling group's request, the search included aquifer tests within the ICU. In addition, various publications not listed in the aforementioned databases were reviewed. Results were found for 52 tests of the SAS and 8 tests of the ICU for a total of 60 published tests. Thirteen of the tests were aquifer performance tests, 46 were slug tests, and one was a specific capacity test. Prior test results, locations, and data sources are presented in **Figure 1** and **Table 2**.

A summary of the site inventory findings, including monitor wells suitable for testing and published aquifer tests, were provided to the ECFT modeling group for test prioritization. Wells were prioritized based on spatial arrangement to minimize data gaps. Wells with screen intervals in the upper part of the SAS (less than 50 feet below ground surface) were prioritized as representative of the shallowest model layer in the SAS. Fifteen wells at 15 sites were identified for aquifer testing.

Table 1. Prospective Test Well Inventory.

County	Station	Site Name	Paired Well	SAS Thickness (ft)	Recon. Conducted	Measured Well Depth[1] (ft)	Well Depth[2] (ft)	Top of Screen or Open Hole[1] (ft)	Well Casing Diameter [3] (in.)	Screen or Length (ft)	Test Requested[4]	Test Conducted	Comments
Highlands	HIS-1	S-82	Y	ND	Y	32.1	110.0	ND	4	ND	N	N	
Okeechobee	OKS-100	Kiss River ASR Site	Y	ND	N	NM	110.0	ND	4	40.0	N	N	
Orange	Disney_G	Disney	N	ND	Y	6.0	18.0	ND	2	ND	N	N	Water column too thin to test
Orange	MossPk_S	Moss Park	Y	ND	Y	28.5	29.0	26.0	4 (steel)	ND	N	N	Previously tested (Adamski, 2004)
Orange	ORS-1(GW-1)	Skylake	Y	31	Y	31.0	30.0	20.0	4	10.0	Y	Y	
Orange	ORS-2	AIR19	Y	ND	Y	33.0	30.0	20.0	4	10.0	N	N	On Orlando Union Commission Right-of-Way
Orange	ORS-3(GW-1)	R D Keene (ORF-61)	Y	70	Y	53.3	51.0	22.0	6	Screen	N	N	Previously tested (SFWMD, 2012)
Orange	ORS-4	Reedy Creek	Y	30	N	ND	30.0	20.0	4	10.0	N	N	
Orange	ORS-5(GW-1)	TM Ranch	Y	33	Y	32.6	30.0	20.0	4	10.0	Y	Y	
Orange	ORS-0029 (GW-1)	SW15	Y	ND	Y	22.8	30.0	ND	4	ND	Y	Y	
Orange	TB1_G	Tibet Butler	Y	30	N	ND	30.0	20.0	2	10.0	N	N	
Orange	TB2_G	Tibet Butler	Y	30	N	ND	30.0	20.0	2	10.0	N	N	
Orange	TB3_G	Tibet Butler	Y	30	N	ND	30.0	20.0	2	10.0	N	N	
Orange	TURLAK_G	Turkey Lake	Y	60	Y	56.1	ND	ND	4 (steel)	ND	Y	N	Previously tested (Adamski, 2004)
Osceola	ALL1W2	Alligator Lake	N	ND	Y	22.6	20.0	15.0	2	5.0	Y	Y	
Osceola	ALL2W2	Alligator Lake	N	ND	Y	22.5	20.0	15.0	2	5.0	Y	Y	
Osceola	IC-SAS(GW-1)	Intercession City	Y	30	Y	32.4	20.0	ND	2	ND	N	Y	
Osceola	KIRCOF_G (GW-1)	Kircoff WR	Y	ND	Y	29.1	30.0	ND	2	ND	N	N	In wildlife refuge
Osceola	MR-0162 (GW-1)	Kiss. FS	Y	ND	Y	8.7	8.0	ND	2.5 (steel)	ND	N	N	Kissimmee Field Station
Osceola	OSF53_GW1	Southport	Y	40	Y	23.1	24.4	ND	2	ND	Y	Y	Screen in upper SAS
Osceola	OSF53_GW2	Southport	Y	40	Y	55.6	57.8	ND	2	ND	N	N	Top of ICU does not appear consistent with lithology

Table 1. Prospective Test Well Inventory (Continued)

County	Station	Site Name	Paired Well	SAS Thickness (ft)	Recon. Conducted	Measured Well Depth[1] (ft)	Well Depth[2] (ft)	Top of Screen or Open Hole[1] (ft)	Well Casing Diameter [3] (in.)	Screen or Length (ft)	Test Requested[4]	Test Conducted	Comments
Osceola	OSF62_GW1	Turnpike S	Y	180	Y	26.4	28.0	ND	2	ND	Y	Y	DBHYDRO shows Plio-Pleistocene at 60 ft, Hawthorn at 180 ft
Osceola	OSF62_GW2	Turnpike S	Y	189	Y	62.8	62.9	ND	2	ND	N	N	DBHYDRO shows Plio-Pleistocene at 60 ft, Hawthorn at 180 ft
Osceola	OSS-64S (GW-1)	Cypress Ck.	Y	210	Y	22.5	29.4	ND	2	ND	Y	Y	DBHYDRO shows Plio-Pleistocene at 75 ft, Hawthorn at 210 ft
Osceola	OSS-64D (GW-2)	Cypress Ck.	Y	210	Y	99.0	102.2	ND	2	ND	N	N	DBHYDRO shows Plio-Pleistocene at 75 ft, Hawthorn at 210 ft
Osceola	OSS-66S (GW-1)	Chicken Ranch	Y	180	Y	30.8	31.2	ND	2	ND	Y	Y	DBHYDRO shows Plio-Pleistocene at 50 ft, Hawthorn at 180 ft
Osceola	OSS-66 (GW-2)	Chicken Ranch	Y	180	Y	81.0	79.2	ND	2	ND	N	N	DBHYDRO shows Plio-Pleistocene at 50 ft, Hawthorn at 180 ft
Osceola	OSS-70S (GW-1)	St. Cloud	Y	30	Y	25.3	26.5	ND	2	ND	N	N	
Osceola	OSS-70 (GW-2)	St. Cloud	Y	30	Y	26.4	55.1	ND	2	ND	N	N	Possible casing collapse?
Osceola	OSS-71 (GW-2)	Kiss. FS	Y	ND	Y	26.7	25.0	ND	4	ND	N	N	Kissimmee Field Station
Osceola	OSS-77	Lake Marian	Y	ND	Y	31.7	30.0	20.0	4	10.0	Y	Y	
Osceola	OSS-72	S65	Y	170	Y	120.0	120.0	105.0	4	15.0	N	N	Screen in lower SAS
Osceola	OSS-73	S65	Y	170	Y	29.0	27.0	14.0	4	15.0	Y	Y	Screen in upper SAS
Osceola	OSS-76 (GW-1)	Yehaw	Y	110	Y	33.0	30.0	20.0	4	10.0	Y	Y	Screen in upper SAS
Osceola	OSS-101	Oak Island	Y	ND	Y	18.7	15.0	10.0	4	5	N	N	
Osceola	OSS-102	Oak Island	Y	ND	Y	46.0	45.0	40.0	4	5	N	N	
Osceola	Poince_g	Poinciana Blvd	N	ND	N	ND	11.4	ND	ND	ND	N	N	Not able to find in field, no other info in DBHYDRO

Table 1. Prospective Test Well Inventory (Continued)

County	Station	Site Name	Paired Well	SAS Thickness (ft)	Recon. Conducted	Measured Well Depth[1] (ft)	Well Depth[2] (ft)	Top of Screen or Open Hole[1] (ft)	Well Casing Diameter [3] (in.)	Screen or Length (ft)	Test Requested[4]	Test Conducted	Comments
Osceola	REEDGW10_G	Reedy Ck near CR532	N	ND	N	NM	ND	ND	ND	ND	Y	N	Not found, no construction info found
Osceola	WR6_GW1	Walker Ranch	Y	ND	N	NM	19.6	ND	ND	ND	N	N	In Disney World Nature Center, postponed site visit for access
Osceola	WR8_GW1	Walker Ranch	Y	ND	N	NM	23.0	ND	ND	ND	N	N	In Disney World Nature Center, postponed site visit for access
Osceola	WR9_GW1	Walker Ranch	Y	ND	N	NM	21.9	ND	ND	ND	N	N	In Disney World Nature Center, postponed site visit for access
Polk	P-49	Near Frostproof	N	ND	Y	10.8	17.0	ND	6 (steel)	ND	Y	N	Water column too shallow to test
Polk	POS-2	S65A	Y	70	N	NM	30.0	20.0	4	10.0	N	N	
Polk	POS-4	River Ranch	Y	ND	Y	NM	18.8	9.00	4	10.0	Y	Y	
Polk	POS-5	River Ranch	Y	ND	Y	NM	117.0	97.0	4	20.0	N	N	
Polk	POS_6	Snively	Y	ND	Y	38.7	38.0	29.0	4	10.0	Y	Y	
Polk	POS-7	Snively	Y	ND	Y	111.0	100.0	101.0	4	10.0	N	N	
Polk	POS-11	Walker Ranch	Y	ND	N	NM	10.0	5.0	2	5.0	N	N	In Disney World Nature Center, postponed site visit for access
Polk	POS-12	Walker Ranch	Y	ND	N	NM	36.0	26.0	2	10.0	N	N	In Disney World Nature Center, postponed site visit for access
Polk	POS-13	Walker Ranch	Y	ND	N	NM	122.0	108.0	2	14.0	N	N	In Disney World Nature Center, postponed site visit for access

[1] All depths are from top of casing.
[2] Data from DBHYDRO.
[3] PVC unless noted otherwise.
[4] Test requested by ECFT modeling group.
ND = no data; NM = not measured.

Table 2. Prior Test Results.

County	Station	Site Name	X Coordinates (ft)	Y Coordinates (ft)	Paired Well	Hydraulic Conductivity (ft/d)	Transmissivity (ft²/d)	Storativity	Test Type	Duration of Test (hr)	Analysis Method	SAS Thickness (ft)	Top Screen*	Bottom Screen*	Reference	Comments
Wells Screened in the Surficial Aquifer System																
Osceola	N/A	OS-12	493608.651	3096433.848	N	20	400	ND	AP	14	Jacob (1946)	87	70	90	Planert and Aucott (1985)	Test result was previously included in ECFT Model
Osceola	N/A	OS-13	493238.097	3116034.750	N	100	2000	0.0001	AP	ND	Jacob (1946)	75	55	75	Planert and Aucott (1985)	Test result was previously included in ECFT Model
Okeechobee	W-16946	OKS82	752582.557	1077750.605	N	26	1578	0.0001318	AP	ND	Average of 3 solution methods	158-178	117	178	DBHYDRO	One monitor well, report not found
Okeechobee	W-16950	OKS83	666880.919	1077536.373	N	8	82	0.000015026	AP	ND	Average of 5 solution methods	ND	128	138	DBHYDRO	One monitor well, report not found
Okeechobee	W-16970	OKS90	702383.885	1113206.040	N	28	847	0.0000729	AP	ND	Average of 5 solution methods	ND	170	200	DBHYDRO	Two monitor wells, report not found
Okeechobee	W-16969	OKS95	733349.674	1134155.958	N	43	2926	0.0001122	AP	ND	Average of 6 solution methods	ND	167	237	DBHYDRO	Two monitor wells, report not found
Highlands	ROMP28	W-17000	515233.035	1103529.156	N	38	7720	ND	AP	20	ND	203	40	200	DeWitt et al. (1998)	3 monitor wells
Highlands	ROMP29A	W-18535	519839.061	1152171.933	N	ND	8300	ND	AP	ND	Neuman (1974)	190	35	200	Mallams (2004)	
Polk	W-16305	ROMP55	477890.053	1255949.720	N	ND	1900	0.29	AP	ND	ND	97	0	109	Decker (1988)	2 monitor wells
Polk	KREFFD	KREFFD	597669.418	1241470.254	N	ND	514.9	0.00000008	S	N/A	Cooper et al (1967)	ND	105	115	Butler (1999)	Old well name is PZ-KRR96-E-FD
Polk	KREFFM	KREFFM	597673.631	1241463.482	N	6.05	ND	ND	S	N/A	Bouwer and Rice (1976)	ND	20	35	Butler (1999)	Old well name is PZ-KRR96-E-FS
Polk	KREFFS	KREFFS	597659.024	1241489.153	N	14.88	ND	ND	S	N/A	Bouwer and Rice (1976)	ND	10	15	Butler (1999)	Old well name is PZ-KRR96-E-F15
Polk	KRENNC	KRENNC	598889.41	1242081.749	N	0.07	ND	ND	S	N/A	Bouwer and Rice (1976)	ND	40	50	Butler (1999)	Old well name is PZ-KRR96-E-NMDC
Polk	KRENND	KRENND	598893.622	1242073.866	N	ND	1004	0.00000008	S	N/A	Cooper et al (1967)	ND	100	110	Butler (1999)	Old well name is PZ-KRR96-E-ND
Polk	KRENNM1	KRENNM1	598884.662	1242090.642	N	14.73	ND	ND	S	N/A	Bouwer and Rice (1976)	ND	15	30	Butler (1999)	Old well name is PZ-KRR96-E-NS
Polk	KRENNM2	KRENNM2	598895.855	1242064.775	N	ND	299	0.00001	S	N/A	Cooper et al (1967)	ND	66	76	Butler (1999)	Old well name is PZ-KRR96-E-NM
Polk	KRENNS	KRENNS	598881.261	1242099.836	N	24.45	ND	ND	S	N/A	Bouwer and Rice (1976)	ND	10	15	Butler (1999)	Old well name is PZ-KRR96-E-N15
Polk	KRFFFD	KRFFFD	593384.019	1255485.447	N	ND	56.4	0.082	S	N/A	Cooper et al (1967))	ND	93	108	Butler (1999)	Old well name is PZ-KRR96-F-FD
Polk	KRFFFM	KRFFFM	593375.498	1255492.63	N	5.72	ND	ND	S	N/A	Bouwer and Rice (1976)	ND	15	30	Butler (1999)	Old well name is PZ-KRR96-F-FMD
Polk	KRFFFS	KRFFFS	593369.224	1255500.517	N	12.81	ND	ND	S	N/A	Bouwer and Rice (1976)	ND	10	15	Butler (1999)	Old well name is PZ-KRR96-F-FS
Polk	KRFNNC	KRFNNC	593828.103	1255811.774	N	0.06	ND	ND	S	N/A	Bouwer and Rice (1976)	ND	15	30	Butler (1999)	Old well name is PZ-KRR96-F-FNMD, test report labeled KRRFNC

Table 2. Prior Test Results (Continued)

County	Station	Site Name	X Coordinates (ft)	Y Coordinates (ft)	Paired Well	Hydraulic Conductivity (ft/d)	Transmissivity (ft^2/d)	Storativity	Test Type	Duration of Test (hr)	Analysis Method	SAS Thickness (ft)	Top Screen*	Bottom Screen*	Reference	Comments
Polk	KRFNND	KRFNND	593855.11	1255783.011	N	ND	315	0.00005	S	N/A	Cooper et al (1967)	ND	60	65	Butler (1999)	Old well name is PZ-KRR96-F-F-ND
Polk	KRFNNM	KRFNNM	593849.923	1255797.157	N	8.98	ND	ND	S	N/A	Bouwer and Rice (1976)	ND	95	110	Butler (1999)	Old well name is PZ-KRR96-F-FNM
Polk	KRFNNS	KRFNNS	593846.078	1255807.665	N	13.42	ND	ND	S	N/A	Bouwer and Rice (1976)	ND	10	15	Butler (1999)	Old well name is PZ-KRR96-F-F-NS
Orange	N/A	Lake Oliver	1466874.64	448447.6022	N	4	ND	ND	S	N/A	ND	63	33	38	Adamski and German (2004)	
Orange	MOSSPK_S	Moss Pk.	594783	1470305	Y	0.2	ND	ND	S	N/A	ND	51	26	29	Adamski and German (2004)	
Orange	N/A	OR0714	1500364.147	625443.694	N	20	ND	ND	S	N/A	ND	54*	20	30	Adamski and German (2004)	
Orange	N/A	OR0716	1532165.691	503290.3121	N	3	ND	ND	S	N/A	ND	69*	35	45	Adamski and German (2004)	
Orange	N/A	OR0719	1550674.543	523331.4057	N	6	ND	ND	S	N/A	ND	34*	22	32	Adamski and German (2004)	
Orange	N/A	OR0720	1537511.38	533451.2468	N	3	ND	ND	S	N/A	ND	34*	22	32	Adamski and German (2004)	
Orange	N/A	OR0721	1529712.163	540739.7367	N	30	ND	ND	S	N/A	ND	69*	15	25	Adamski and German (2004)	
Orange	N/A	OR0722	1509867.378	558794.5386	N	4	ND	ND	S	N/A	ND	45*	20	30	Adamski and German (2004)	
Orange	ORS-3	RD KEENE (ORF-61)	484300.536	1504606.531	Y	ND	22.8	0.05753	AP	4.5	Theis (1935)	55	20	50	SFWMD (2012)	1 monitor well
Orange	N/A	S. or Pk	1477618.74	534421.4966	N	0.4	ND	ND	S	N/A	ND	35*	19	29	Adamski and German (2004)	
Orange	N/A	Tibet B	1493877.807	481891.6014	N	3	ND	ND	S	N/A	ND	50*	14	24	Adamski and German (2004)	
Orange	TURLAK_GW1	Turkey Lake	503052.186	1515110.072	Y	0.05	ND	ND	S	N/A	ND	60	44	54	Adamski and German (2004)	
Orange	N/A	Turkey Lake (USGS)	1518238.417	500736.9344	N	20	ND	ND	S	N/A	ND	27	19	29		
Osceola	N/A	TOHO1-3	555547.647	1396041.739	N	7.2	ND	0.011	AP	72	Hantush (1961)	110	74	84	Valdez (2000)	
Osceola	N/A	TOHO1-4	555547.647	1396041.739	N	8	570	ND	SC	ND	Specific Capacity	ND	20	30	Valdez (2000)	SC estimated during development
Osceola	TOHO3_GW1	TOHO3	539245.271	1376074.83	N	1.8	ND	ND	S	N/A	Bouwer and Rice (1976)	ND	36	46	Valdez (2000)	
Osceola	TOHO3_GW2	TOHO3	539245.271	1376074.83	N	0.6	32	ND	S	N/A	Bouwer and Rice (1976)	ND	20	30	Valdez (2000)	
Osceola	TOHO4_GW1	TOHO4	530178.158	1386181.118	N	1.6	ND	ND	S	N/A	Bouwer and Rice (1976)	ND	20	30	Valdez (2000)	
Osceola	TOHO5_GW2	TOHO5	514587.761	1405459.133	N	0.9	ND	ND	S	N/A	Bouwer and Rice (1976)	ND	24	34	Valdez (2000)	

Table 2. Prior Test Results (Continued)

County	Station	Site Name	X Coordinates (ft)	Y Coordinates (ft)	Paired Well	Hydraulic Conductivity (ft/d)	Transmissivity (ft^2/d)	Storativity	Test Type	Duration of Test (hr)	Analysis Method	SAS Thickness (ft)	Top Screen*	Bottom Screen*	Reference	Comments
Osceola	TOHO5_GW1	TOHO5	514587.761	1405459.133	N	0.3	ND	ND	S	N/A	Bouwer and Rice (1976)	ND	74	84	Valdez (2000)	
Osceola	TOHO6_GW1	TOHO6	519440.85	1403599.79	N	1.3	ND	ND	S	N/A	Bouwer and Rice (1976)	ND	20	30	Valdez (2000)	
Osceola	TOHO7_GW	TOHO7	519679.682	1440603.499	N	0.5	ND	ND	S	N/A	Bouwer and Rice (1976)	ND	20	30	Valdez (2000)	
Osceola	TOHO9_GW	TOHO9	543543.118	1440509.124	N	0.8	ND	ND	S	N/A	Bouwer and Rice (1976)	ND	20	30	Valdez (2000)	
Osceola	TOHO10_GW	TOHO10	543295.397	1406485.471	N	2.8	ND	ND	S	N/A	Bouwer and Rice (1976)	ND	16	26	Valdez (2000)	
Osceola	TOHO12_GW	TOHO12	561669.444	1453805.971	N	1.1	ND	ND	S	N/A	Bouwer and Rice (1976)	ND	20	30	Valdez (2000)	
Osceola	TOHO13_GW	TOHO13	575792.782	1434265.951	N	0.8	ND	ND	S	N/A	Bouwer and Rice (1976)	ND	20	30	Valdez (2000)	
Osceola	TOHO14_GW	TOHO14	569848.856	1385256.092	N	3.4	ND	ND	S	N/A	Bouwer and Rice (1976)	ND	20	30	Valdez (2000)	
Osceola	TOHO16_W1	TOHO16	568717.724	1393533.633	N	1.0	ND	ND	S	N/A	Bouwer and Rice (1976)	48	15	25	Valdez (2000)	
Wells Screened in the Intermediate Confining Unit																
Highlands	ROMP28	W-17000	515233.035	1103529.156	N	ND	162	0.0002	AP	35	ND	203	370	430	DeWitt et al. (1998)	ICU Test
Highlands	ROMP29A	W-18535	519839.061	1152171.933	N	0.038	N/A	N/A	S	N/A	Butler (1999)	190	Various	Various	Mallams (2004)	ICU-Average of 3 tests, DBHYDRO notes results should not be used quantitatively
Orange	ORH-1	RD KEENE (ORF-61)	484377.191	1504604.675	N	0.038	N/A	N/A	S	NA	Bouwer and Rice (1976)	55	60	92	SFWMD (2012)	
Osceola	TOHO1_GW2	TOHO1	555547.647	1396041.739	N	9.4	ND	0.0091	AP	72	Hantush (1961)	ND	108	118	Valdez (2000)	Completed in ICU according to DBHYDRO
Osceola	TOHO8_GW	TOHO8	523957	1440281	N	0.3	ND	ND	S	N/A	Bouwer and Rice (1976)	ND	53	63	Valdez (2000)	Completed in ICU according to DBHYDRO
Osceola	TOHO15_GW	TOHO15	572732.818	1401045.647	N	1.0	ND	ND	S	N/A	Bouwer and Rice (1976)	ND	66	76	Valdez (2000)	Completed in ICU according to DBHYDRO
Osceola	TOHO16_W2	TOHO16-2	568717.724	1393533.633	N	1.0	ND	ND	S	N/A	Bouwer and Rice (1976)	ND	65	75	Valdez (2000)	Completed in ICU according to DBHYDRO
Polk	W-16305	ROMP55	477890.053	1255949.720	N	0.000405	5013	0.00013	AP	36	ND	97	109	205	Decker (1988)	ICU Test

* All depths are in feet below top of casing.
AP = aquifer performance test, single well or multiple wells; bls = below land surface; HK = hydraulic conductivity (estimate based on an aquifer thickness of 50 feet); N/A = not applicable; ND = no data; S = slug; SC = specific conductivity test; T = transmissivity.

4.0 WELL DEVELOPMENT

Well development was conducted prior to testing to remove any excess sediment that accumulated inside the well casings and within filter packs, and to assess pumping equipment most suitable for aquifer tests. Prior development information on wells selected for testing was not available, and several of the wells were found to have substantial sediment accumulation at the bottom of the well casing during the site visits. The field team mobilized to sites with pumping equipment suitable for a variety of well production capabilities, including the following:

- Geotech Geopump 2 peristaltic pump (battery powered), which generally pumped 0.25 to 2 gallons per minute (gpm);
- Geotech Geosquirt purge pump (downhole, battery powered), which pumped 1 to 3 gpm;
- Grundfos Ready Flow 2 (downhole electrical), which pumped 2 to 10 gpm**;**
- Honda WX15 centrifugal pump (gasoline), which pumped 2 to 20 gpm; and
- Honda WB20X centrifugal pump (gasoline), which pumped 20 to 50 gpm.

At most sites, well development was performed during separate site visits prior to pump tests to optimize field logistics, and allow for water table recovery prior to the aquifer tests.

Well development generally consisted of alternately pumping wells at the pump's highest rate and surging with a rubber gasket on a polyvinylchloride (PVC) surge rod. Wells were pumped for approximately 5 minutes followed by 5 minutes of surging, for three cycles, and then pumped for periods of 1 to 2 hours, with the exception of wells that were pumped dry. Wells with low production that quickly pumped dry and wells with relatively good water quality were not surged. For wells that were not pumped dry, development was deemed complete when development parameters, including specific conductance (SPC), pH, and temperature were stabilized, and turbidity was less than 50 nephelometric turbidity units (NTU).

5.0 AQUIFER PERFORMANCE TESTS

SFWMD staff performed short-term aquifer performance tests on the 15 selected wells from April 16, 2008 through July 31, 2008. For each test, an In-Situ Hermit 3000 data logger recorded the results from PXD-261 pressure transducers, which were installed in each well to continuously collect water level data during each test. PXD-261 pressure transducers also were installed in paired wells completed in adjacent aquifers if available. Static water levels were measured manually before and after each test. Drawdown tests were performed for a minimum of 1 hour and until the drawdown curves leveled off, after which pumps were turned off and the recovery test initiated. Recovery data were recorded until each well neared background conditions after pumping, typically within 30 minutes to 2 hours after turning off the pump. Three wells (OSS-53, OSF-62, and OSS-66) did not have usable drawdown curves due to pump cavitation, and the drawdown test was not run for the entire period. A summary of test parameters, including pumping rates, well drawdowns, test duration, and well development details, is presented in **Table 3**.

Table 3. Aquifer Test Parameters.

Well	Site	Test Date	Well Diameter (in.)	Screen Int.* (ft)	Depth to Water* (ft)	Pump Rate (gpm)	Pump Type	Feet of Drawdown	Drawdown Time (min.)	Recovery Time (min.)	Development Comments
ALL1W2	Alligator Lake	5/14/2008	2	13-23	7.31	4.3	Small G 400 Hz	1.813	103	104	Developed 1:51 until clear on 4/29/2008
ALL2W2	Alligator Lake	6/24/2008	2	12-22	8.01	5.3	Small G 400 Hz	4.124	102	73	Developed 1:43 until clear on 5/07/2008
IC-SAS	Intercession City	7/30/2008	2	23-33	4.45	18.8	Small C	9.7	101	103	Pumped and surged for 1:32 on 7/29/2008
ORS-1	Skylake	6/10/2008	4	21-31	13.22	1.5	Whaler	6.4	104	108	Pumped and surged for 1:20 on 6/5/2008
ORS-5	TM Ranch	5/15/2008	4	23-33	10.41	46	Small C	13.04	102	105	Pumped and surged for 1:09 on 5/29/2008
ORS-29	SW15	6/11/2008	4	13-23	12.14	0.25	Peristaltic	3.8	102	103	Pumped dry in 3 minutes at 1 gpm on 5/21/2008
OSF-53	Southport	6/27/2008	2	18-28	12.48	9.4	Small C	8	22	58	Pumped and surged for 1:19 on 5/22/2008. Much cavitation during drawdown test.
OSF-62	South Turnpike	7/29/2008	2	16-26	4.7	1.6	Small C	13.42	N/A	31	Pumped and surged for 1:25 on 5/23/2008. Much cavitation during drawdown test.
OSS-64	Cypress Lake	6/23/2008	2	13-23	15.19	1.74	Small G 225Hz	3.85	101	78	Pumped dry in 8 minutes at 2.5 gpm on 4/30/2008
OSS-66	Chicken Ranch	7/30/2008	2	21-31	6.93	2.8	Small C	17	N/A	104	Pumped and surged for 1:34 on 5/15/2008. Much cavitation during drawdown test.
OSS-73	S65	7/31/2008	4	?-27	11.28	16.7	Small C	11.5	101	103	Pumped dry in 12 minutes at 20 gpm on 4/21/2008
OSS-76	Yeehaw	4/16/2008	4	20-30	4.32	50	Large C	10.9	109	104	Pumped dry in 9 minutes at 13 gpm on 1/30/2008
OSS-77	Lake Marian	5/18/2008	4	22-32	9.21	18	Small C	14.4	101	80	Pumped and surged for 1 hour on 4/30/2008
POS-4	River Ranch	6/24/2008	4	9-19	6.66	2.6	Small G 225 Hz	4.3	101	15	Pumped 17 minutes at 1 gpm on 4/9/2008
POS-6	Snively	4/24/2008	4	29-39	8.23	30	Small C	8.77	40	32	Pumped 30 minutes on 4/24/2008

* In feet below top of casing.
N/A = not applicable; Small C = small centrifugal; Large C = large centrifugal: Small G = small Grundfos.

6.0 AQUIFER TEST ANALYSIS AND RESULTS

Once the field component of the task was complete, data were downloaded and graphed; displacement and drawdown data were formatted for input into Aqtesolv Pro (Version 4.5) for analysis. Various analytical solutions appropriate for single well tests with unconfined aquifers and wells with full or partial penetration were used, including Moench (1997), Cooper-Jacob (1946), and Neuman (1974). The solution with the best curve fit was chosen for the final test result. All of the final solutions selected were analyzed using the Moench (1997) solution for partially penetrating wells. In general, the curve fits were good and there was consistency between the drawdown and recovery curves, with high confidence in most tests results. The three wells mentioned earlier (OSS-53, OSF-62, and OSS-66) did not have usable drawdown curves due to pump cavitation, and the recovery curve was used for analysis. Four wells (ORS-5, ORS-29, OSS-64, and OSS-77) only had one usable curve, either drawdown or recovery. Test results, including estimated transmissivity, drawdown and recovery times, test used, and final hydraulic conductivity, are shown **Table 4**.

Lithology logs of 7 of the 15 tested wells were available for review. Five of the borings described the tested intervals as quartz sand, one as medium to coarse sand, and one as medium to fine sand. Lithology descriptions were not available for the two tests with lowest hydraulic conductivity results (ORS-29 and ORS-1).

7.0 SUMMARY AND CONCLUSIONS

In 2007 and 2008, an aquifer testing program was conducted for the SAS in the KPA and a 5-mile buffer zone to provide hydraulic data in support of developing the ECFT model. Site accessibility and well construction at 50 monitor wells were evaluated for suitability for testing; of those, 15 were prioritized for testing based on spatial arrangement to minimize data gaps and screen intervals. Fifteen short-term aquifer tests were conducted and analyzed using Aqtesolv Pro (Version 4.5) software. Transmissivity values ranging from 21 to 2,085 square feet per day were obtained. Using an average aquifer thickness of 50 feet, calculated hydraulic conductivity estimates ranged from 0.4 to 39 feet per day. The best drawdown and recovery curve matches were found with the Moench (1997) solution method, which was used to provide final transmissivity estimates. Additionally, published test data were provided for 52 monitor wells completed in the SAS and 8 monitor wells completed in the ICU.

Table 4. Aquifer Test Results.

Well	Site	b	Drawdown Analysis Method	Recovery Analysis Method	Drawdown Transmissivity (ft^2/d)	Recovery Transmissivity (ft^2/d)	Final Transmissivity (ft^2/d)	Final Hydraulic Conductivity (K) (ft/d)	Comments
All1W2	Alligator Lake	50	Moench[1]	Moench	1,970	1,935	1,935	39	Recovery is best fit
ALL2W2	Alligator Lake	50	Moench	Moench	927	1134	927	19	Drawdown is best fit
IC-SAS	Intercession City	50	Moench	Moench	484	630	630	13	Good drawdown and recovery match
ORS-1	Skylake	50	Moench	Moench	63	64	63	1.3	Good drawdown and recovery match
ORS-5	TM Ranch	50	Moench	ND	2,085	1,326	2,085	42	Drawdown has good fit, recovery poor fit
ORS-29	SW15	50	Moench	ND	21	ND	21	0.4	Recovery curve is poor fit
OSF-53	Southport	50	N/A	Moench	N/A	1,123	1,123	22	Good recovery match, drawdown not used due to cavitation
OSF-62	South Turnpike	50	N/A	Moench	N/A	117	117	2.3	Good recovery match, drawdown not used due to cavitation
OSS-64	Cypress Lake	50	Moench	N/A	146	N/A	146	2.9	Failed recovery test
OSS-66	Chicken Ranch	50	N/A	Moench	N/A	188	188	3.8	Good recovery curve, cavitation during pump test Well too sandy for downhole pumps
OSS-73	S65	50	Moench	Moench	386	357	386	7.1	Good drawdown and recovery match
OSS-76	Yeehaw	50	Moench	Moench	1,498	1,112	1,498	30	Drawdown is best fit
OSS-77	Lake Marian	50	Neuman[2]	Moench	282	430	430	8.6	Good recovery curve, poor drawdown curve
POS-4	River Ranch	50	Moench	Moench	316	310	310	6.2	Good drawdown and recovery match
POS-6	Snively	50	Moench	Moench	1,307	1,275	1,307	26	Drawdown is best fit, good drawdown and recovery match

b = saturated thickness of SAS; N/A = not applicable; ND = no data.
Note: Hydraulic conductivity estimates shown are calculated using an assumed aquifer thickness of 50 feet.
[1] Moench (1997) solution used for unconfined aquifers. Assumes full or partial penetration, homogeneous, isotropic aquifer. Includes wellbore storage and skin effect estimation.
[2] Neuman (1974) solution used for unconfined aquifers. Assumes partial penetration, homogeneous, isotropic aquifer.

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