

CONSUMPTIVE USE TECHNICAL STAFF REPORT

May 3, 2007

GRS App # 107643

OWNER/APPLICANT: City of Rockledge
Attn: James McKnight
1700 Jack Oates Boulevard
Rockledge, Florida 32955
(321) 690-3975

AGENT: Jones Edmunds & Associates, Inc.
730 NE Waldo Road
Gainesville, Florida 32641
Attn: Stuart Norton

COMPLIANCE CONTACT: Same as Applicant

PROJECT NAME: City of Rockledge Aquifer Storage and Recovery (ASR)

LOCATION: Brevard County
Section 9, Township 25 S, Range 36 E

WATER USE SUMMARY:
Staff Recommendation:

1,072 million gallons per year (mgy) (2.94 million gallons per day (mgd) average) of reclaimed water from the City of Rockledge Wastewater Treatment Facility (WWTF).

230 million gallons (mg) (0.32 million gallons per day (mgd)) of reclaimed water for Aquifer Storage and Recovery (ASR) testing over a two year testing period.

180 million gallons per year (mgy) (0.50 million gallons per day (mgd) average) of reclaimed water and ground water from the Floridan aquifer from the ASR facility to help meet peak dry season demands.

78 million gallons per year (mgy) (0.21 million gallons per day (mgd) average) ground water from the upper Floridan aquifer for augmentation of the City's reclaimed system.

Recommended Permit Duration and Compliance Reporting: A 20-year permit with 5-year compliance reports pursuant to section 373.236(3), Florida Statutes. In addition to submittal of the compliance reports, the permittee is also required to comply with and submit all information and data required by the limiting conditions set forth in the permit.

OBJECTORS: None

USE STATUS: This application is for a new use.

AUTHORIZATION:

The District authorizes, as limited by the attached permit conditions, the use of up to 1,072 mgd (2.94 mgd average) of reclaimed water, 230 mgd of reclaimed water for ASR testing over a two year period, 180 mgd of reclaimed water and ground water from the Floridan aquifer from the ASR facility (0.50 MGD average), and 78 mgd (0.21 mgd average) ground water from the upper Floridan aquifer for augmentation of the City's reclaimed system.

TIMEFRAMES:	Application received	September 15, 2006
	Date of 1 st RAI	October 11, 2006
	Request for Extension	February 6, 2007
	Extension Date	March 3, 2007
	Date of Response to 1 st RAI	March 5, 2007
	Additional Information Submitted	March 21, 2007
	Response completed application:	Yes
	Application complete	March 21, 2007
	90 th day	June 19, 2007

PROJECT DESCRIPTION:

Project Location

The City of Rockledge's WWTF and proposed ASR project site are located west of U.S. #1 between Barton Boulevard and Jack Oates Boulevard. The proposed location of the ASR facility is along the southern portion of the WWTF site west of the deep injection well.

Background

The City of Rockledge WWTF is permitted to treat 4.5 million gallons per day (mgd) annual average flow, with current flows averaging approximately 2.4 mgd. The facility currently supplies reclaimed water meeting public access criteria for irrigation to a local golf course, nursery, residential and commercial properties and various public areas. The WWTF includes the operation of a deep injection well for the disposal of excess reclaimed water. The injection well was constructed in 1991 and operates under FDEP permit No. 05-0195980-001, and District permit No. 05-009-0006.

The City plans on expanding the reuse distribution system. Seasonal variations in supply and demand exist, with the most critical shortages occurring in March, April and May. The proposed ASR facility will address this shortfall by expanding the City's wet season storage capabilities.

Water Reuse System Description

The WWTF treats municipal wastewater to public access reclaimed water standards under FDEP wastewater permit No. FL0021571. The public access reuse system consists of 4.36 mgd of filter capacity, a 0.75 mgd reclaimed water ground storage tank (constructed in 1989), a 2.0 mgd reclaimed water ground storage tank (constructed in 1995), a 6.0 mgd reclaimed water ground storage tank (constructed in 2006), a high service pump station at the WWTF, and a distribution system consisting of 2- through 20-inch PVC and HDPE piping.

The average annual flow to the reuse system between 2001 and 2006 was 1.56 million gallons per day (mgd), with a peak flow of 2.05 mgd in 2006, and a minimum flow of 0.87 mgd in 2001. During this 6-year period, an average of 0.43 mgd (158 mgy) was disposed via the deep injection well.

The City also operates six 4-inch diameter upper Floridan aquifer reuse augmentation wells. These wells, constructed to a depth of between 200 and 290 feet below land surface (bls), were installed in 2006. Ground water from these wells is pumped to a nearby lift station where it is routed to the head works of the WWTF. These wells have been historically operated during dry periods when reuse system demands exceed available supply. These wells did not require a permit by the District based on their size and usage.

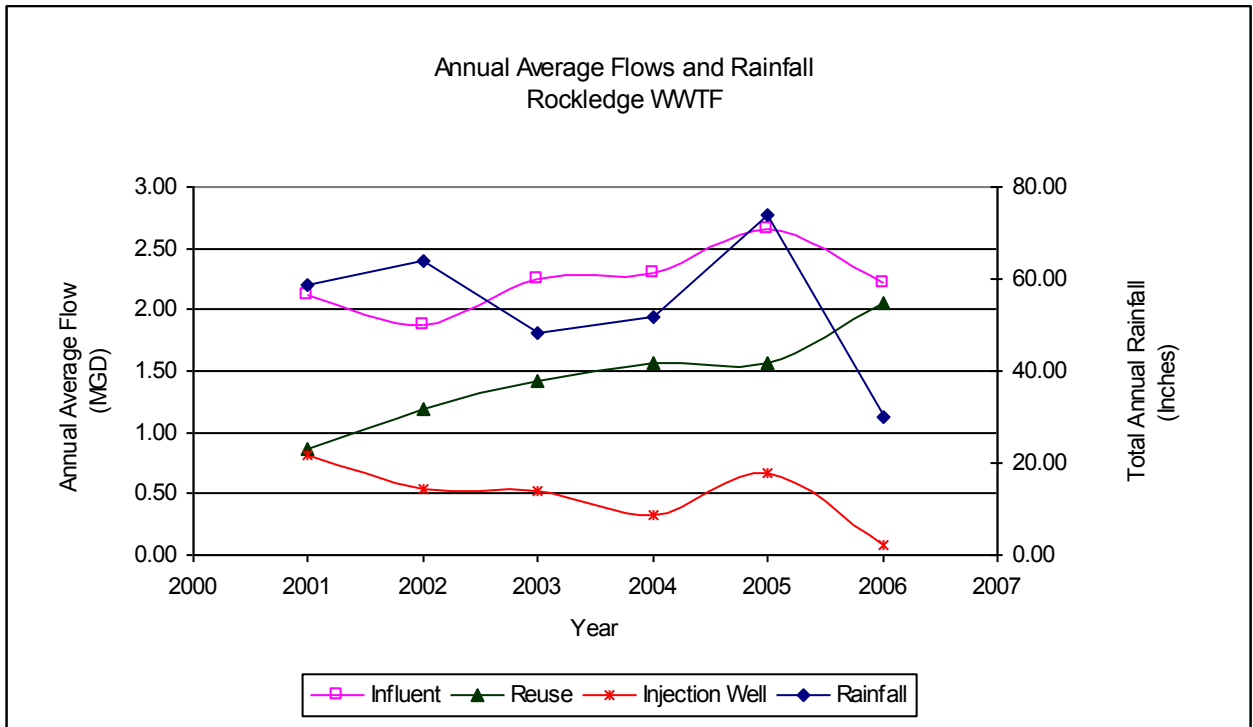
The public access service area consists of approximately 1,300 customers irrigating 180 acres, as well as a public golf course and local nursery. The City plans to gradually expand the service area to 2,000 customers irrigating 215 acres. The WWTF beneficially distributes a high annual percentage of reclaimed water (70 percent of the average wastewater flows) through the reuse distribution service area.

The seasonal demand on reclaimed water for irrigation creates difficulty in providing a constant supply for customers. The City anticipates the beneficial reuse percentage would increase to 85 percent with additional wet-season storage capacity. To achieve the additional volume of storage required to meet seasonal demand, the City proposes to use aquifer storage and recovery (ASR) technology in association with their existing above ground storage tanks (8.75 mg total). The additional storage will provide for seasonal supply/demand management; excess reclaimed water will be stored during wet-weather periods of low demand, and later recovered during dry-weather periods of high demand. Currently, excess reclaimed water is disposed of using the deep injection well during periods of wet-weather and low demand.

Reclaimed Water Supply and Water Use Description

The projected average daily wastewater disposal for the City of Rockledge through the year 2025 is 3.67 mgd, which is an increase of approximately 38 percent over current average. This is based on an approximate increase of 2 percent per year. The projected percentage of beneficial reuse by the year 2025 is 85 percent with the remaining 15 percent disposed via injection well.

The City of Rockledge WWTF has sufficient permitted capacity for expansion of their reuse system. The permitted wastewater flow is 4.5 mgd and the current flows average 2.65 mgd. The permitted public access reuse is 4.36 mgd and the reuse flows have averaged 1.56 mgd (2001 through 2006), with a peak flow of 2.05 mgd. The permitted disposal in the deep injection well is 4.5 mgd, the wastewater and excess reclaimed water flows to the injection well have averaged 0.43 mgd. The annual average wastewater, reclaimed, and injection well flows as well as rainfall data from 2001 through 2006 are presented in the following figure:



ASR System Testing

The applicant previously applied for and was granted a District 40C-5 Artificial Recharge permit (#105846, issued October 10, 2006). This permit grants the construction of two aquifer storage and recovery wells for underground storage of reclaimed water and four monitor wells, one that will serve as an exploratory well during construction. The second ASR well is included if the well yield is low in ASR-1 (i.e., < 2 mgd). The preferred storage zone is within the Avon Park formation between 400 and 510 feet bls. An alternative storage zone within the Ocala formation (145 and 300 feet bls) is proposed if the Avon Park formation is not suitable for storage. In event, the first ASR well does not provide the expected yield, a second ASR well is proposed.

An aquifer performance test (48 hour constant rate test and 10-hour step test) will be conducted in accordance with District guidelines. The test will be initiated upon well completion activities with flows directed to the head works of the WWTF. Water level data will be recorded in the ASR well and monitor wells (Attachment 1, Well Information). Data collected during the APT will better define the aquifer characteristics and potential performance of the ASR well (Other Condition 10).

A cycle testing program will be required to determine the injection, storage and recovery capabilities of the system. Reclaimed water from the WWTF will be used during cycle testing.

The following table is a summary of the operational cycle testing program for the Rockledge ASR system.

City of Rockledge Reclaimed ASR Cycle Test Schedule									
Activity	Recharge			Storage (days)	Recovery			Est. Loss (MG)	Cum. Duration (days)
	Volume (MG)	Avg. Rate (MGD)	Est. Duration (days)		Volume (MG)	Avg. Rate (MGD)	Est. Duration (days)		
Cycle 1	10	1	10	0	10	1	10	0	20
Cycle 2	20	1	20	7	20	1	20	0	67
Cycle 3	40	1	40	28	40	1	40	0	175
Cycle 4	80	1	80	120	60	1	60	20	435
Cycle 5	80	1	80	150	60	1	60	20	725

Note: Volumes, rates and durations will be adjusted as necessary following well construction and initial testing (APT) to accommodate well hydraulics and WWTF operational constraints.

A total of up to five cycle tests will be performed on the ASR well. Water that is recovered during cycle testing will be sent to the WWTF or the injection well for disposal. The time required to complete the cycle testing program will be dependent upon reclaimed availability for recharge and the yield of the ASR well. The proposed permit includes an allocation for up to 230 mg over a two-year period to conduct the cycle testing program that should start in early 2009.

ASR System Storage

The CUP allocation request for the ASR system is for a maximum of 180 mg. The design capacity of the ASR well and wellhead facilities is 2 mgd. Based on wet year flows (combined reuse and injection well flows), there is more than 180 mg available for storage in ASR. For an assumed capacity and rate of 2 mgd for 90-days, the ASR well will yield 180 mg. The 90-day recovery duration was chosen as the City typically experiences low flow conditions during March, April, and May. Typical recovery from ASR wells around the stated is 120-160 mg.

Recovery efficiency is difficult to estimate since it is a function of aquifer properties, system operation, and physiochemical forces. Therefore, the recovery efficiency of the ASR facility cannot be determined until the system has been constructed and cycle testing is completed.

PERMIT APPLICATION REVIEW:

Section 373.223, Florida Statutes (F.S.), and Section 40C-2.301, Florida Administrative Code (F.A.C.), require an applicant to establish that the proposed use of water:

- (a) is a reasonable-beneficial use;
- (b) will not interfere with any presently existing legal use of water; and,
- (c) is consistent with the public interest.

In addition, the above requirements are detailed further in the District's Applicant's Handbook: Consumptive Uses of Water, February 15, 2006. District staff has reviewed the consumptive use permit application pursuant to the above-described requirements and have determined that the application meets the conditions for issuance of this permit. A summary of the staff review is provided below.

Reasonable-Beneficial Use:

District staff evaluated whether the use of water proposed in this application meets District reasonable-beneficial use criteria. In performing the evaluation, District staff evaluated whether the proposed use meets all the applicable criteria set forth in Section 10.3 of the CUP Applicant's Handbook. District staff specifically reviewed and considered use of lowest quality water, reuse demand in the service area, modeling results associated with use of the proposed ASR system, and water conservation procedures employed to encourage more efficient use of reclaimed water consumption. Based on the review of the above information and associated evaluation, District staff have concluded that the applicant has provided reasonable assurance that the proposed use of water meets the District's reasonable-beneficial use criteria.

Lowest Quality Water Source

The application proposes to maximize the use of lower quality sources within the City's service area. The City will use reclaimed water generated at the WWTF. During low demand periods reclaimed water will be stored in the Floridan aquifer and retrieved via the ASR well. An ancillary means to augment the system is with six 4-inch diameter upper Floridan aquifer wells. This existing supplemental water source has been below District permitting thresholds prior to this application for ASR capability.

The requested allocation of 1,072 million gallons per year (mgy) (2.94 mgd average) of reclaimed water was based on current reclaimed demand plus projected demand due to system expansions for this service area in 2025.

Additionally, the ASR requested allocation of 180 mgy was based on a 90-day dry weather demand period. The additional storage of reclaimed water will allow the City to better meet the system demand during dry weather periods. Without the proposed ASR storage, the City will have difficulties expanding their reuse system due to high, seasonal demand. The use of reclaimed water replaces the use of other sources of water (e.g., potable water and ground water) that would otherwise be used for irrigation of golf course and urban landscape.

Reuse Demand

The City modeled the reuse distribution system using Water CAD, a distribution pipe model, to determine system demands and to plan for future improvements. The results are included in the City's Reuse System Master Plan Update completed in 2004. Existing conditions in the reuse system were evaluated and a multi-phase program of improvements was developed. The model was developed as a steady-state pressure-based hydraulic model of the City's existing reuse system and included planned future expansions. A pressure-based model was used in lieu of a flow-based model to better identify flow demands based on the associated pressures. The distribution system demand is based on peak flow conditions to allow the system to operate optimally during the dry season. The model was calibrated using field data collected by the City during the spring of 2004. The model was then expanded to include new service areas identified by the City to determine system performance and necessary improvements to provide peak flows at adequate pressures. Additional storage, upgrades to pumping facilities, additional pipe looping, and augmentation sources were all evaluated.

Without the additional system storage provided by the proposed ASR facility, it would not be possible for the City to both expand the reuse system and meet peak dry season demands.

Modeling of Recovery Operations in the Proposed ASR Well

A nonsteady-state two-layer aquifer drawdown model was used to simulate the drawdown in the proposed ASR well during recovery operations. Aquifer parameters used in the model were primarily obtained from the District's East Central Regional Model. The model was run at a 2 mgd pumping rate for a 60-day recovery period. The estimated drawdown in the surficial aquifer was 0.03 ft at the ASR well and the 1-ft drawdown contour in the Floridan aquifer occurred at a maximum distance of 1,250 feet from the well. The projected drawdowns will not result in any adverse impacts to the resource or existing legal users.

Conservation

The City has developed water conservation procedures to minimize reclaimed water consumption. These water conservation measures include:

- Public education program that includes providing all property owners and residents of rented property with a reclaimed water information packet.
- Reclaimed water restrictions that include an odd-even irrigation schedule for reclaimed water users.
- An ordinance that includes an increasing rate structure for all metered users and a requirement for meters for all new reclaimed customers.
- A plan to retrofit existing reclaimed customers with meter (contingent upon availability of capital funds, which is based on the successful completion of the ASR project).

Interference with Existing Legal Uses of Water:

Staff evaluated whether the proposed reclaimed water ASR project will adversely affect existing beneficial uses of water. As previously discussed, the applicant performed an analytical drawdown model to evaluate the potential impact to existing legal uses of water during recovery operation. The model showed minimal drawdown within the surficial aquifer (0.03 ft at the well) and minimal drawdown within the Floridan aquifer (1 ft at max. distance of 1,250 feet from the well).

The applicant conducted a well inventory in the vicinity of the proposed ASR facility. District, USGS, FGS, FDEP, and Brevard County Health Department records were researched to determine locations, use, and permitting status (where applicable). The closest Floridan aquifer CUP well is approximately 1.5 miles from the proposed ASR well, which is well beyond the 1ft drawdown contour in the Floridan Aquifer. Surficial aquifer wells are not of concern due to the minimal drawdown modeled during well recovery operations.

Staff concludes that reasonable assurance has been provided that the project will not cause an interference with an existing legal user of water at the time of permit application

pursuant to sections 9.2.1, 9.2.2 and 9.4.4, A.H., provided the permittee complies with the conditions recommended for this permit.

Public Interest:

Staff evaluated whether the proposed use is consistent with the public interest. The 2005 District Water Supply Plan Identifies the Rockledge Reclaimed Water ASR project as one that could be implemented to achieve a water resource benefit using additional reclaimed water. The proposed use will further maximize the beneficial reuse of reclaimed water and reduce the water demand on the local water supply and the Priority Resource Water Caution Area. The use will not adversely affect water resources, and qualifies as a reasonable-beneficial use based on the factors listed in 40C-2.301(4)(a),(b),(c), (d),(e), (f),(g),(h),(i),(j),(k),(l), F.A.C., and none of the reasons for denial relating to salt water intrusion, water use reservations, minimum flows and levels, and water table/surface water levels apply to the proposed use. Therefore, Staff concluded that reasonable assurances have been provided that the proposed use is consistent with the public interest pursuant to section 9.3, A.H., provided the permittee complies with the conditions recommended for this permit.

Reasons for Recommendation for Denial:

District staff evaluated whether any of the Reasons for Denial set forth in Section 9.4 of the CUP Applicant's Handbook apply to this application and have concluded that none of these criteria apply to this application.

It is not anticipated that use of the ASR well will cause significant upconing of saline water. The proposed storage zone is located in the upper Floridan aquifer above the brackish zone in the lower Floridan aquifer and separated by a semi-confining unit. As previously stated, modeling results show the 1-ft drawdown contour in the Floridan aquifer is 1,250 feet from the well. Injection of reclaimed water during wet season periods will help offset the nominal drawdown influence during dry periods.

The use of the ASR well will not cause or contribute to any flood damage. Recovered water from the APT, cycle testing, and ASR well and pipeline purge water will be directed to the head works of the WWTF or to the deep injection well.

It is not anticipated that the water quality of the source of water will be harmed by this project. The project includes two storage zone monitor wells, one water table monitor well, and one shallow monitor well. The monitor wells will be sampled in accordance with the schedule provided in the CUP application.

This project will not cause or contribute to the violation of state water quality standards in receiving waters of the state. The water recovered from the ASR well during the step-drawdown test, the APT, cycle testing, and the ASR well pipeline purge water will be routed to the WWTF head works, if possible, or the injection well.

Proposed withdrawals for the ASR from the Lower Floridan aquifer do not appear to lead to any of the conditions that would warrant a recommendation for denial. The use will not adversely affect water resources, and qualifies as a reasonable-beneficial use based on the factors listed in 40C-2.301 (4)(a),(b),(c),(d),(e),(f),(g),(h),(i),(j),(k),(l), F.A.C., and none of the reasons for denial relating to salt water intrusion, water use reservations, minimum flows and levels, and water table/surface water levels apply to the proposed use. As documented in items above, District Staff has determined that this continuing use of

ground water from the Floridan aquifer will not result in any future conditions, which may lead to denial of this permit, as provided for in Section 9.4 of the Applicants Handbook, dated February 15, 2006.

In conclusion, District staff evaluated whether the proposed use of water meets District reasonable-beneficial use criteria and has concluded that there is reasonable assurance that the proposed use does meet District criteria for the recommended duration or the permit as conditioned.

GENERAL CONDITIONS: 1-5, 7 and 8

OTHER CONDITIONS:

1. All submittals made to demonstrate compliance with this permit must include the CUP number 107643 plainly labeled.

2. This permit will expire on June 13, 2027.

3. The annual reclaimed water allocation is:

847.0 million gallons (2.32 million gallons per day (mgd) average) in 2007
858.3 million gallons (2.35 million gallons per day (mgd) average) in 2008
869.5 million gallons (2.38 million gallons per day (mgd) average) in 2009
880.8 million gallons (2.41 million gallons per day (mgd) average) in 2010
892.0 million gallons (2.44 million gallons per day (mgd) average) in 2011
903.3 million gallons (2.47 million gallons per day (mgd) average) in 2012
914.5 million gallons (2.51 million gallons per day (mgd) average) in 2013
925.8 million gallons (2.54 million gallons per day (mgd) average) in 2014
937.0 million gallons (2.57 million gallons per day (mgd) average) in 2015
948.3 million gallons (2.60 million gallons per day (mgd) average) in 2016
959.5 million gallons (2.63 million gallons per day (mgd) average) in 2017
970.8 million gallons (2.66 million gallons per day (mgd) average) in 2018
982.0 million gallons (2.69 million gallons per day (mgd) average) in 2019
993.3 million gallons (2.72 million gallons per day (mgd) average) in 2020
1004.5 million gallons (2.75 million gallons per day (mgd) average) in 2021
1015.8 million gallons (2.78 million gallons per day (mgd) average) in 2022
1027.0 million gallons (2.81 million gallons per day (mgd) average) in 2023
1038.3 million gallons (2.84 million gallons per day (mgd) average) in 2024
1049.5 million gallons (2.88 million gallons per day (mgd) average) in 2025
1060.8 million gallons (2.91 million gallons per day (mgd) average) in 2026
1072.0 million gallons (2.94 million gallons per day (mgd) average) in 2027

These amounts may be exceeded if additional reclaimed water is generated.

4. Maximum allocation of 230 million gallons (0.32 million gallons per day (average)) of reclaimed water for Aquifer Storage and Recovery (ASR) testing over a two year testing period. The testing will occur during a two-year period commencing on January 1, 2009, or a later date as notified by the applicant to the District. If the applicant selects a later date, it shall be no later than June 1, 2009 so that the allocation for ASR testing water will terminate no later than June 1, 2011.

5. Maximum annual withdrawals of 180 million gallons (0.50 million gallons per day (mgd) average) of reclaimed water and ground water from the Floridan aquifer system from the ASR facility (well station IDs 92617 [ASR-1] and 92618 [ASR-2]).
6. Maximum annual allocation of 78 million gallons per year (0.21 million gallons per day (mgd) average) ground water from the upper Floridan aquifer for augmentation of the City's reclaimed system.
7. ASR Wells (station IDs 92617 and 92618) must have totalizing flowmeters installed after construction and must continue to be monitored with the totalizing flowmeters. The meters must maintain 95% accuracy, be verifiable and be installed according to the manufacturer's specifications.
8. Total withdrawals from and injections into the ASR Wells (station IDs 92617 and 92618) and reuse flows from the city of Rockledge WWTF must be recorded continuously, totaled monthly, and reported to the District at least every six months from the initiation of the monitoring using Form No. EN-50. The reporting dates each year will be as follows:

<u>Reporting Period</u>	<u>Report Due Date</u>
January – June	July 31
July – December	January 31

9. The permittee must maintain all flowmeters. In case of failure or breakdown of any meter, the District must be notified in writing within 5 days of its discovery. A defective meter must be repaired or replaced within 30 days of its discovery.
10. The permittee must have all flowmeters checked for accuracy at least once every 3 years within 30 days of the anniversary date of permit issuance, and recalibrated if the difference between the actual flow and the meter reading is greater than 5%. District Form No. EN-51 must be submitted to the District within 10 days of the inspection/calibration.
11. The permittee must conduct a District approved aquifer performance test (APT) at the ASR site. The permittee must submit an APT plan three months prior to testing for approval. This test is to include water quality monitoring and must be performed and the results submitted to the District within two years of permit issuance.
12. The permittee must notify the District at least 48 hours prior to discharging any ASR water to the WWTF or injection well during APT or cycle testing.
13. Landscape irrigation is prohibited between the hours of 10:00 a.m. and 4:00 p.m., except as follows:
 - (a) Irrigation using a micro-irrigation system is allowed anytime.
 - (b) The use of reclaimed water for irrigation is allowed anytime.

- (c) Irrigation of new landscape is allowed any time of day for the initial 30-day period provided that the irrigation is limited to the amount necessary for landscape establishment.
- (d) Watering in of chemicals, including insecticides, pesticides, fertilizers, fungicides, and herbicides when required by law, the manufacturer, or best management practices is allowed anytime within 24 hours of application.
- (e) Irrigation systems may be operated anytime for maintenance and repair purposes not to exceed ten minutes per hour per zone.
- (f) Irrigation using a hand-held hose equipped with an automatic shut-off nozzle is allowed anytime.
- (g) Discharge of water from a water-to-air conditioning unit or other water dependent cooling system is not limited.

14. The permittee's consumptive use shall not adversely impact wetlands, lakes, and spring flows or cause or contribute to a violation of minimum flows and levels adopted in Chapter 40C-8, F.A.C., except as authorized by an SJRWMD-approved minimum flow or level (MFL) recovery strategy. If unanticipated significant adverse impacts occur, the SJRWMD shall revoke the permit in whole or in part to curtail or abate the adverse impacts, unless the impacts can be mitigated by the permittee.

REVIEWER:

Torpy, Burklew

STATION INFORMATION:

SITE NAME: City of Rockledge ASR

Well Information:

Well No.	GRS Station No.	Casing Diameter (inches)	Well Depth (feet)	Status	Source
ASR-1	92617	20	300	Proposed	Floridan Aquifer
ASR-2	92618	20	300	Proposed	Floridan Aquifer
SZMW-1	92619	6	300	Proposed	Floridan Aquifer
SZMW-2	92620	6	300	Proposed	Floridan Aquifer
WTMW-1	92621	2	25	Proposed	Surficial Aquifer
SMW-1	92622	6	110	Proposed	Floridan Aquifer
LS-46	92623	4	290	Active	Floridan Aquifer
LS-52	92624	4	280	Active	Floridan Aquifer
LS-47	92625	4	260	Active	Floridan Aquifer
LS-44	92626	4	240	Active	Floridan Aquifer
LS-11	92627	4	260	Active	Floridan Aquifer
LS-17	92628	4	220	Active	Floridan Aquifer