

**MEMORANDUM OF UNDERSTANDING BETWEEN  
THE ST. JOHNS RIVER WATER MANAGEMENT DISTRICT  
AND CITY OF SANFORD, FLORIDA  
FOR  
AQUIFER STORAGE RECOVERY CONSTRUCTION AND TESTING**

THIS MEMORANDUM OF UNDERSTANDING (“MOU”) is made and entered into by and between the ST. JOHNS RIVER WATER MANAGEMENT DISTRICT (the “District”), whose mailing address is 4049 Reid Street, Palatka, Florida 32177, and CITY OF SANFORD, (the “City”), whose address is 300 North Park Avenue, Sanford, Florida 32772.

**WITNESSETH:**

WHEREAS, the parties to this MOU desire to design, permit, and construct an Aquifer Storage and Recovery (“ASR”) system (“Project”);

WHEREAS, the District and the City each have programmatic authority and established funding sources to cost-share this project;

WHEREAS, a goal of the Project is to demonstrate that ASR is a feasible technology for utilities in the east-Central Florida region; and

WHEREAS, the District and the City agree the District shall serve as the lead agency for the design, permitting, construction, and testing of the ASR project.

NOW THEREFORE, in consideration of the foregoing premises, which are made a part of this Memorandum of Understanding, the District and the City hereby agree to the following:

**I. AUTHORITY:**

This Memorandum of Understanding is entered into by the parties under the following authority:

- A. The District enters into this Memorandum of Understanding under the authority of Section 373.083, Florida Statutes, which authorizes the Governing Board to enter into agreements with other public agencies to accomplish the directives and goals of Chapter 373.

- B. The City enters into this Memorandum of Understanding under the authority of Sections 125.01(1)(k)1, and 125.01(1)(p), Florida Statutes, which authorize the City to enter into agreements with other public agencies to accomplish goals for providing water to its customers.

**II. STATEMENT OF WORK:**

All work shall be performed in accordance with Exhibit "A", Statement of Work. All work shall be performed by the District's Contractor under District Contract #SF409RA.

**III. EFFECTIVE DATE, TERM, AMENDMENTS, TERMINATION:**

- A. This MOU shall commence on the date of full execution as evidenced by the last date this MOU is signed, and shall remain in effect for five (5) years, in accordance with this MOU.
- B. This MOU shall be reviewed annually by the parties and may be amended upon mutual agreement of the parties. Amendments shall be in writing and approved by all parties.
- C. Termination for convenience. This MOU may be terminated for convenience by the District upon 30 days prior written notice to the City.
- D. Termination for Default. This MOU may be terminated for default in writing by either party in the event of substantial failure by the other party to fulfill its obligations under this MOU through no fault of the terminating party, provided that no termination may be effected unless the other party is given: (1) not less than ten (10) calendar days written notice, delivered by certified mail, return receipt requested, and (2) an opportunity to consult with the other party prior to termination and remedy the default.
- E. Upon termination by either party pursuant to Paragraph "D" above, the party terminating this MOU may complete the work without the assistance of the other party. The party completing the Work may fully utilize existing work product in pursuing the completion of the Work. The District shall be afforded a right-of-entry by the City for the purpose of completing the Work..

**IV. FUNDING OF THE AQUIFER STORAGE AND RECOVERY COST-SHARE PROGRAM:**

- A. The District agrees to fund the ASR Project as set forth in Exhibit "A," Statement of Work. The District's contribution is contingent upon and subject to annual budget approval by the District's Governing Board.

- B. The City agrees to contribute to the Aquifer Storage and Recovery project in the manner and the amount described in Exhibit "A," Statement of Work. The City's contribution is contingent upon and subject to annual appropriation by the City Commission.

**V. LIABILITY AND INSURANCE:**

Both the District and the City:

- A. Are responsible for all personal injury and property damage attributable to the negligent acts or omissions of that party and the officers and employees acting within the scope of their employment. In addition, each party is subject to the provisions of Section 768.28, Florida Statutes. Neither this provision nor any other in this MOU shall be construed as a waiver of sovereign immunity by either party.
- B. Both the District and the City shall acquire and maintain throughout the term of this MOU such general liability insurance, automobile insurance, and workers' compensation insurance as required by their current rules and regulations.
- C. District agrees that all contracts and subcontracts for any construction work described in the Statement of Work shall include hold harmless and indemnification provisions to protect the City and the District in a form acceptable to the City and the District. The District contractor or subcontractor shall provide the City with evidence of said hold harmless and indemnity prior to commencement of work and access to City property.

**VI. PROJECT MANAGEMENT:**

- A. Project Managers - Each party hereby designates the employee set forth below as its respective Project Manager. Project Managers shall assist with project coordination and shall be the party's primary contact person. Notices or reports shall be sent to the attention of the parties' Project Manager by U.S. Mail, postage prepaid, to the parties' addresses as follows:

For the District:  
Douglas Munch, P.G.  
4049 Reid Street  
Palatka, FL 32177  
Tel: (386) 329-4173

For the City:  
Bill Marcous  
300 North Park Avenue  
Sanford, FL 32772  
Tel: (407) 330-5649

- B. Either party may designate a new Project Manager at its discretion. Written notification of the new Project Manager and effective date shall be provided to the other party.

C. At a minimum, the District's Project Manager shall consult with the City's Project Manager prior to initiating each task. The District's Project Manager shall provide City's Project Manager a report as to the status of each task on a monthly basis. The District's Project Manager shall notify City's Project Manager of the completion of each task within 30 calendar days of the completion of each task.

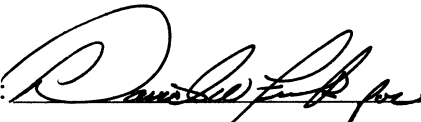
**VII. OWNERSHIP OF DOCUMENTS:**

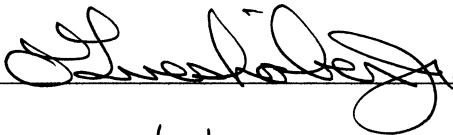
- A. Ownership and copyright to all reports and all accompanying data (in all formats) produced pursuant to work done under this MOU shall be vested in both parties to this MOU. Any source documents or any other documents or materials developed, secured or used in the performance of this MOU shall be considered property of the District and the City.
  
- B. All permits shall be in the name of the District. The District shall provide a copy of all permits, as well as design and construction plans, to the City's Project Manager. At the expiration or termination of the project, at the request of the City, the District shall transfer to the City all permits.

IN WITNESS WHEREOF, the following authorized representative of the ST. JOHNS RIVER WATER MANAGEMENT DISTRICT and the CITY OF SANFORD have executed this Memorandum of Understanding on the date signed by each party.

ST. JOHNS RIVER WATER MANAGEMENT DISTRICT

CITY OF SANFORD

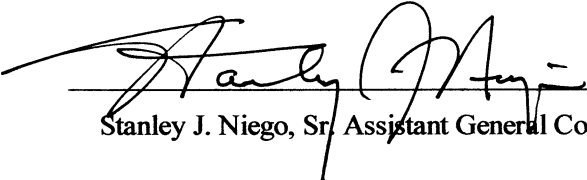
By:   
 Kirby B. Green III, Executive Director

By:   
 Al Grieshaber Jr.  
 City Manager  
 Typed Name and Title

Date: 6/15/04

Date: 6/2/04

APPROVED BY THE OFFICE OF GENERAL COUNSEL

  
 Stanley J. Niego, Sr. Assistant General Counsel

Attest: \_\_\_\_\_  
 \_\_\_\_\_  
 Typed Name and Title

**EXHIBIT A**

**ST. JOHNS RIVER WATER MANAGEMENT DISTRICT  
AND THE CITY OF SANFORD  
AQUIFER STORAGE AND RECOVERY  
CONSTRUCTION AND TESTING DEMONSTRATION PROGRAM**

**STATEMENT OF WORK**

**INTRODUCTION/BACKGROUND**

**Project Definition** - The St. Johns River Water Management (“District”) and the City of Sanford (“City”) shall jointly endeavor to design, permit, and construct a Floridan Aquifer Storage and Recovery (ASR) system, consisting of an exploratory well, monitoring wells, ASR test well, site work, and related pipelines and appurtenances, all defined to be part of the Project. References to the District herein shall refer to St. Johns River Water Management District and its employees and agents.

**Project Need** – Determine the feasibility of aquifer storage and recovery (ASR) for storing seasonally available large volumes of alternative water supplies to offset the use of potable groundwater in east Central Florida.

**Contract’s Goals** – Demonstrate the feasibility of ASR technology for utilities in the east Central Florida region. The District seeks to complete this cooperative project with the City and shall require its Contractor, under the District’s Contract SF409RA, to prepare the design of the Project in accordance with the requirements of regulatory agencies, the City, and the District and to permit and construct the system in accordance with such design.

**Consistency With the DISTRICT’s Mission And Goals** – This project is included in the Water Resource Development Work Program, dated September 2003, as required by Section 373.536(6)(a) 4, Florida Statutes. The design shall be consistent with the District’s report entitled “City of Sanford Desktop Assessment of Aquifer Storage and Recovery”, prepared by Camp Dresser & McKee (CDM), dated October, 2003.

**Location Of The Work** – The project will be located at the City’s Auxiliary Water Treatment Plant site, or a different site if mutually agreed upon by both parties.

**OBJECTIVES**

**Statements Of The Results To Be Achieved** – The project will be implemented with design features approved by the District and the City, in sequential order to provide for maximum benefit of expended funds. Sequential progress will be based on exploration, permitting, and construction. The ASR Test Well will be drilled in accordance with Florida Department of Environmental Protection (FDEP) Underground Injection Control (UIC) requirements, and successfully cycle-tested with potable water, to demonstrate feasibility for water storage and recovery.

**SCOPE OF WORK**

**Outline Of Extent Of Work**

Note: Tasks 1 and 2 are included herein as reference only, as these tasks have been completed prior to the issuance of this MOU. Task 3 will be completed with execution of this Memorandum of Understanding.

Task 1 - Report titled “St. Johns River Water Management District Aquifer Storage and Recovery Construction and Testing Program Plan - FY2002”, dated April, 2002, prepared by Barnes Ferland & Associates.

Task 2 - Report titled “City of Sanford Desktop Assessment of Aquifer Storage and Recovery”, dated October 2003, prepared by CDM.

Task 3 - Preparation and approval of a City Memorandum of Understanding (MOU) and Statement of Work (SOW)

The following Tasks 4 through 10 are an outline of the extent of work to be performed under this MOU between the District and the City:

Task 4 — Site-Specific Data Collection and Preliminary System Design

Task 5 — ASR Pilot Project Design

Task 6 — Regulatory Permitting

Task 7 — ASR Facilities Construction, Monitoring, and Testing

Task 8 — Startup and Training

Task 9 — Large Cycle Operational Monitoring and Evaluations

Task 10 — Peer Review

## **Overview Of The Steps Of Project**

The District will prepare a preliminary design plan for the ASR system, including an exploratory well. Based on the results of the exploratory well, final design of the ASR system will be conducted and coordinated with FDEP UIC permitting requirements. Once the design and permit are approved, the District will begin construction of the ASR Test Well and related appurtenances. After completion of drilling and verification of project requirements, cycle testing will be performed by the District to measure storage and recovery. If at any time the project is deemed infeasible, the District will coordinate with the City the salvage of any constructed wells for monitoring purposes, or the District will provide abandonment and decommissioning services, as required. Upon successful demonstration of feasibility, as mutually agreed on by the District and the City, the completed project will be transferred to the City for operation and ownership, including any transfer of the existing UIC permit that may be required, at no cost to the City.

## **Description Of The Methodology To Be Used**

The District will utilize methodologies accepted in the professional practices of engineering and geology. Methodologies shall incorporate FDEP UIC permitting requirements and provide sufficient milestones for review, comment, and approval by the District and the City. Construction methods shall be in accordance with the General Conditions provided for in the District's Contract #SF409RA, incorporated herein by reference, including conformance with the City's local codes and requirements.

**Description Of Location Of Work** - The project will be located at the Auxiliary Water Treatment Plant site. The exact project location at the site will be determined based on preliminary design and coordinated with the location of potable source water and discharge facilities. The proposed potable water supply is the Auxiliary Water Treatment Plant. The proposed recovered water discharge is to the Auxiliary Water Treatment Plant.

## **TASK IDENTIFICATION**

The following Tasks 4 through 10 are summarized from the District's Contract #SF409RA. These tasks will be performed on a work-order basis as each individual task is successfully completed or be grouped together where appropriate.

### **Task 4 — Site-Specific Data Collection and Preliminary System Design**

Prepare a data collection plan for the project site based on a review of existing information and coordination with FDEP. In particular, the plan shall address the need for initial exploratory testing as the basis of development of ASR well design.

To the extent possible based on FDEP guidelines, the District proposes to gather hydrogeologic information from the construction and testing of an initial exploratory well at the project site, which would then be converted to an observation well for the ASR construction and testing program. Based on site conditions and availability of funding, a second exploratory well may be constructed at a separate location through mutual agreement by both parties. The data collection plan will be implemented, the data will be evaluated, and a preliminary system design will be developed for one project site. The City will provide the District access to project site for exploration well drilling and data collection. If the site is deemed to be infeasible for any reason, the District and the City shall endeavor to locate an alternative site for the ASR construction and testing program, through mutual agreement by both parties.

**Task 5 — ASR Pilot Project Design**

This task includes the design of well and wellhead facilities at the selected site, including supporting infrastructure such as pipelines, electrical service, and incidental site work. The design shall also specify the proposed data collection and monitoring programs. The City will be provided with design documents for review, comments and approval.

**Task 6 — Regulatory Permitting**

The District, the City, and the District's Contractor, will adhere to the necessary regulatory permitting requirements, including preparation of permit applications, and responses to requests for information from regulatory agencies. The primary permitting effort will be through the FDEP Underground Injection Control (UIC) program, although other ancillary permits may be required from local government. The District will provide services to support the cost of preparation of a) Well Construction permit applications, b) local government permit applications, as required, c) Florida Department of Environmental Protection (FDEP) Underground Injection Control (UIC) permit application, d) District Consumptive Use Permit (CUP) application for testing water, e) FDEP Drinking Water System extension permit application, f) FDEP NPDES permit for discharging brackish water obtained during the construction process, g) other FDEP water system permits, if required, and h) project reports.

The District's Agreement or contract work order with its third-party Contractor shall include site improvements required by the project and mutually agreed upon by the parties. The City will be responsible for processing and resolving any zoning or land use issues that may arise with regard to the Project. The City will be the Owner for well construction, FDEP UIC, FDEP water main extension construction and any other project related permit applications. The District or the District's Contractor will act as applicant and pay application fees.

**Task 7 — ASR Facilities Construction, Monitoring, and Testing**

Construct ASR well and monitor wells, and associated pipelines, electrical service, incidental site work, and wellhead facilities. Conduct initial hydraulic and water quality testing, in addition to geophysical logging, geochemical modeling, and evaluation of any additional pretreatment requirements. A series of ASR “small cycle” test cycles will be conducted to evaluate the project site.

The District will stake and define the boundaries of construction within the Auxiliary Water Treatment Plant site, based on property documents furnished by the City. The District shall be responsible for construction, inspection, testing, and progress reporting for the Project. The City shall allow the District full site access to conduct and inspect construction of the project. The City shall alert the District of any problems it knows of and the District, when appropriate, shall require its Contractor to correct any problems or non-conforming work discovered by the District’s inspection or the City’s observation.

**Task 8 — Startup and Training**

The District’s Contractor will provide operational training of the City’s staff to ensure a smooth transition from the test program into full operations. The final training plan will be developed subsequent to analysis of the small cycle testing program results.

**Task 9 — Large Cycle Operational Monitoring and Evaluations**

Conduct operational monitoring and evaluation of ASR system performance during the first two to three years of operations, making any needed adjustments to improve system performance. The City will operate the system during this period. The District will conduct periodic site visits and evaluate collected data to monitor large cycle performance and provide technical assistance to the City, as necessary. A preliminary plan outline of The City’s responsibilities for conducting Large Cycle operation and monitoring is provided in Attachment 1. This plan outline will be developed further when permit conditions are known and the City and the District are implementing Task 9, for review and approval by the City and the District.

**Task 10 — Peer Review of the District Contractor’s Work**

This task includes the review of work products produced by the District Contractor, by other District ASR team members and City.

## **TIMEFRAMES AND DELIVERABLES**

### **Timeframe For Completion Of Entire Project**

Successive task completion without major disruption will require a minimum of three (3) years, and up to five (5) years for final completion, in accordance with the Memorandum of Understanding.. Specific timeframes will be established after the District and the City have signed a Memorandum of Understanding (MOU).

### **DISTRICT Contractor Deliverables and Responsibilities**

Contractor deliverables defined in the work orders shall be governed by the District's Contract #SF409RA and shall include both hard copy and electronic versions. All deliverables shall be provided to the District and the City's Project Manager and shall generally include the following items, by task. Other elements of the project may be added as mutually agreed upon by both parties.

**Task 4**, Site-Specific Data Collection and Preliminary System Design: As defined in the work order, to include the following.

- Data Collection Plan
- Preliminary Design Report
  - Exploratory Well Construction Plan
  - Exploratory Well Construction Specifications
  - Exploratory Well Contractor's Safety Plan
  - Exploratory Well Construction Schedule
  - Exploratory Well Sampling and Testing Plan
- Exploratory Well Construction Permit Application
- Well Salvage for Monitoring, or Abandonment if Site is Infeasible
- Completed Exploratory Well
- Water Quality Sampling and Testing
- Exploratory Well Project Report
- Construction security plan, including access provisions, work hours and construction site security facilities. The City, prior to commencement of any construction activities shall review and approve the plan.
- Project Schedule

**Task 5, ASR Pilot Project Design:** As defined in the work order, to include the following.

- ASR System Construction Plans
- ASR System Construction Specifications
- ASR System Construction Cost Estimate
- ASR System Construction Phase Services Plan
- ASR System Contractor's Safety Plan
- ASR System Construction Schedule
- ASR System Final Project Report

**Task 6, Regulatory Permitting:** DISTRICT to pay for all permit application fees. One or more of the following deliverables will apply to the project, as required:

- Well Construction Permit Application(s)
- Local Government Permit Application(s)
- FDEP Underground Injection Control (UIC) Permit Application
- Consumptive Use Permit (CUP) Application For Testing Water
- FDEP Drinking Water System Extension Permit Application
- FDEP NPDES Permit Application
- Other FDEP Water System Permit(s)
- Permitting Condition Progress Report(s)
- Permitting Condition Sampling And Testing Report(s)

**Task 7, ASR Facilities Construction, Monitoring, and Testing:** As defined in the work order, to include the following.

- Payment and Performance Bond
- Construction Survey Layout and Control
- Shop Drawings
- Updated ASR System Contractor's Safety Plan
- Updated ASR System Construction Schedule
- Monthly ASR System Project Progress Reports
- Laboratory Reports
- Well Testing Discharge Plan
- Initial (start-up) cycle testing
- Construction Inspection and Testing Records
- Completed ASR System
- Site Restoration
- Construction Record Drawings
- Certifications of Completion
- Releases for Final Payment
- Final Construction Report
- Startup and Training Plan

**Task 8, Startup and Training:** As defined in the work order, to include the following.

- Operation and Maintenance Manuals
- Training Instruction
- Operating Guidelines
- Large Cycle Operation and Monitoring Plan  
(Preliminary plan provided as Attachment 1)

**Task 9, Large Cycle Operational Monitoring and Evaluations:** Large Cycle Evaluation Reports as defined in the work order. The District shall provide technical oversight and assistance as required during this task.

**Task 10, Peer Review:** As defined in the work order.

### **CITY Deliverables and Responsibilities**

The City shall deliver the following items and “like kind services” through staff and ongoing operations, according to the time they are needed as jointly determined by the City and the District during the course of the work:

1. CITY to provide project site and associated access for the project. The City shall provide evidence of ownership or easements providing access and control of facilities expected to be installed on the property.
2. Timely review comments on Contractor submittals.
3. Execution of permit applications, as project owner.
4. Relevant records pertaining to, or affecting, the project which may consist of, but not be limited to, survey data and legal descriptions, easement documents, soils data, water facilities record drawings, site plans, right of way use requirements, and other technical information pertaining to the planning, design, and construction of the ASR facility at the proposed site.
5. Unique construction requirements not covered under local permits or codes, such as site lighting requirements, site access constraints, other, and any limitations on construction activities.
6. Electrical power service to the site, as required during Task 7 described above, including offsite extensions, material purchases, new equipment, lighting, metering, and individual well service connections, in accordance with local power company requirements. The not to exceed capital cost to the City is \$30,000 for the furnishing of labor, equipment, and materials to install the electrical service.
7. Water quality sampling and testing during large cycle operation phase of project, as required during Task 9 described above, after the City assumes ownership of project. The not to exceed cost to the City is \$25,000 for this water quality sampling and testing. This analytical work shall be consistent with regulatory agency permitting and monitoring requirements. For estimated testing parameters, see Table 1 ASR Large Cycle Water Quality Testing Plan in Attachment 1.

8. Information regarding features and items that are required to comply with zoning and land development codes.
9. Necessary testing water; permission to use city drainage easements and rights of way for recovered water discharge purposes; and appurtenant operational requirements for the Project; including necessary coordination and related services from the City's staff. The City does not have an adequate allocation of water under existing consumptive use permits for the cycle testing. The District Contractor will be responsible for preparing the permit application necessary for the District review and approval of a separate (or additional) allocation of water sufficient for this purpose.
10. CITY will accept responsibility for operation and maintenance of completed project. The City agrees to assume total responsibility of ownership for continued operation, maintenance, and data collection for the ASR facilities following completion of the project, in perpetuity, but reserves the right to re-permit, modify, abandon, or decommission the project in accordance with applicable rules and regulations.

### **Comment And Review Time**

Major milestone submittals defined in the work orders shall generally include four (4) weeks for review and comment by the District and the City. Review and comment for lesser submittals may be reduced to three (3) weeks, as mutually agreed.

Construction-phase data that must be reviewed and approved in a shorter timeframe to facilitate Contractor's activities shall be specified in the work order or determined by the the District Project Manager, and agreed to by the City.

The District will compile review comments from the District's staff and the City's project representatives into one document for transmittal to the District's Contractor. The City shall be available for explanation, discussion, and resolution of review comments.

### **CONTRACT BUDGET**

The District will be responsible for all costs of the project with the exception of capital costs listed below and in-kind services as described in this Statement of Work. The estimated cost for the District's Contractor to implement the project is within the cost range estimated in the District report entitled "City of Sanford Desktop Assessment of Aquifer Storage and Recovery", prepared by CDM, and dated October 2003.

The City will be responsible for certain other costs for the project, as defined in the City Deliverables and Responsibilities section of this Statement of Work.

The District and the City estimated project capital costs are as follows:

The District Work by Contractor	
Using Current Florida Forever Funding *	\$1,499,000
CITY Capital-related Cost Items:	
Task 7, Electrical Service	\$ 30,000
Task 9, Water Quality Sampling and Analysis	\$ <u>25,000</u>
Sub Total CITY	\$ 55,000
 TOTAL	 \$1,554,000

\* Includes an allowance of \$300,000, as estimated by CDM, for a second exploratory well as described in Task 4.

End of Exhibit A Statement of Work.

**ATTACHMENT 1**

**ST. JOHNS RIVER WATER MANAGEMENT THE DISTRICT  
AND THE CITY OF SANFORD  
AQUIFER STORAGE AND RECOVERY  
CONSTRUCTION AND TESTING DEMONSTRATION PROGRAM**

**PRELIMINARY OUTLINE for LARGE CYCLE TESTING PLAN**

**BASIS OF PLAN:**

ASR Well: 1 to 5 MGD Capacity

Monitoring Wells: 1 Background, 2 Down Gradient

Cycle: 90 Days Storage  
90 Days Dormant  
90 Days Recovery  
2 Cycles to be tested (270 Days/ Cycle)

**CITY OPERATIONAL REQUIREMENTS:**

1. During well operation (Storage & Recovery Phases):
  - a. Daily inspections and routine maintenance of mechanical equipment and instrumentation.
  - b. Daily Recording of:
    - Well Head Pressure \*
    - Water Level at ASR and Monitoring Wells \*
    - Flow (Storage or Recovery)\*
    - Operation of Valves and Well Pump as necessary for storage or recovery

\*These functions may be performed with continuous read instrumentation.

2. Flow meter annual calibration
3. Instrument calibration, as required (i.e. water level monitors, pressure monitors, etc)
4. Collection and analysis of water quality samples, See Table 1.

CYCLE OPERATIONAL PLAN:

1. Storage
  - a. Open ASR well inlet valve to allow 1-5 MG volume into aquifer over 16 to 24 hour period.
  - b. Shut/ throttle inlet valve as required during distribution system peak demand periods.
  - c. Record flow, pressure and water levels on daily basis (or continuously, if equipped with instrumentation) for ASR and monitoring wells
  - d. Collect water quality samples from storage source water, ASR well, and monitoring wells in accordance with frequency and chemical parameters shown in Table 1.
  - e. Back flush ASR well to waste, as necessary, based on storage rate and well head pressure.
2. Dormant Phase
  - a. Collect water quality samples and water levels from ASR well and monitoring wells – See Tables 1 for frequency and chemical Parameters.
  - b. Periodic inspection of well equipment.
3. Recovery
  - a. Open ASR discharge valve; Operate pump to discharge 1- 5 MGD on daily basis.
  - b. Record flow, Pressure and water levels from ASR and monitoring wells.
  - c. Collect water quality samples from ASR well and monitoring wells – See Table 1.
  - d. Close ASR well on daily basis when target recovery volumes achieved.

Table 1. ASR Large Cycle Water Quality Testing Plan

Cycle Phase	No. of Samples	Frequency	Parameters for Storage Source Water	Parameters for ASR Well Ground water	Monitoring Wells (3)
Storage	2	At start of phase, before storage begins	Primary & Secondary Drinking Water Standards, pH, temp, D.O., Eh, Specific Conductance, Ca, Mg, K, Si, HCO <sub>3</sub> , Total/non-carbonate/calcium hardness, Phosphate, Ammonia, H <sub>2</sub> S, TOC, U.	Primary & Secondary Drinking Water Standards, pH, temp, D.O., Eh, Specific Conductance, Ca, Mg, K, Si, HCO <sub>3</sub> , Total/non-carbonate/calcium hardness, Phosphate, Ammonia, H <sub>2</sub> S, TOC, U.	
	60	Storage source water and ASR ground water- Daily for 1st 30 Days.	Cl, F, SO <sub>4</sub> , TDS, pH, Temp., D.O., Eh, Specific Conductance	Cl, F, SO <sub>4</sub> , TDS, pH, Temp., D.O., Eh, Specific Conductance	
	20	Every 3 Days for Days 31-60			
	8	Weekly for Days 61-90			
	4	Monthly	Na, Ca, Mn, Fe, Mg, Sr, K, Al, Si, Cu, Zn, Cd, Se, As, HCO <sub>3</sub> , Total/non-carbonate/calcium hardness, Phosphate, Ammonia, H <sub>2</sub> S, TOC, THM Species.	Na, Ca, Mn, Fe, Mg, Sr, K, Al, Si, Cu, Zn, Cd, Se, As, HCO <sub>3</sub> , Total/non-carbonate/calcium hardness, Phosphate, Ammonia, H <sub>2</sub> S, TOC, THM Species.	
	39	Weekly			Cl, F, SO <sub>4</sub> , TDS, pH, Temp., D.O., Eh, Specific Conductance
Dormant	1	At Day 45 of Dormant Phase			
	2	Monthly		Cl, F, SO <sub>4</sub> , TDS, pH, Temp., D.O., Eh, Specific Conductance	

Cycle Phase	No. of Samples	Frequency	Parameters for Storage Source Water	Parameters for ASR Well Ground water	Monitoring Wells (3)
	6	Monthly			Cl, F, SO4, TDS,pH, Temp., D.O., Eh, Specific Conductance
Recovery	1	At start of phase, before recovery begins		Primary & Secondary Drinking Water Standards, pH, temp,D.O., Eh, Specific Conductance, Ca, Mg, K, Si, HCO <sub>3</sub> , Total/non-carbonate/calcium hardness, Phosphate, Ammonia, H <sub>2</sub> S, TOC, U.	Cl, F, SO4, TDS,pH, Temp., D.O., Eh, Specific Conductance
	30	ASR ground water-Daily for 1st 30 Days.			
	10	Every 3 Days for Days 31-60		Cl, F, SO4, TDS,pH, Temp., D.O., Eh, Specific Conductance	
	4	Weekly for Days 61-90			
	2	Monthly		Na, Ca, Mn, Fe, Mg, Sr, K, Al, Si, Cu, Zn, Cd, Se, As, HCO <sub>3</sub> , Total/non-carbonate/calcium hardness, Phosphate, Ammonia, H <sub>2</sub> S, TOC, THM Species.	
	39	Weekly			Cl, F, SO4, TDS,pH, Temp., D.O., Eh, Specific Conductance