COLORADO
Colorado Water Conservation Board
Department of Natural Resources

1313 Sherman Street, Room 721
Denver, CO 80203

September 23, 2014

South Metro Water Supply Authority
Attn: Eric Hecox, Executive Director
8400 East Prentice Avenue, Suite 1500
Greenwood Village, CO 80111

RE: Notice to Proceed – WSRA Grant – Time Extension for the Aquifer Storage & Recovery Project in the Metro River Basin

Dear Eric,

This letter is to inform you that the amendment contract request for the WSRA grant to assist in the Aquifer Storage & Recovery Project in the Metro River Basin was approved on September 11, 2014.

With the executed contract, you are now able to proceed with the project and begin invoicing the State of Colorado for costs incurred through July 29, 2019. Upon receipt of your invoice(s), the State of Colorado will provide payment no later than 45 days. I wish you much success in your project.

Sincerely,

/s/

Craig Godbout
Program Manager
Colorado Water Conservation Board
Water Supply Planning Section
1313 Sherman St, Rm. 721
Denver CO 80203
(303) 866-3441, ext 3210 (office)
(303) 547-8061 (cell)
craig.godbout@state.co.us

Attachments

CONTRACT AMENDMENT

Amendment #2 C150474/CORE#2015-394	Original Contract CMS # 27637	Amendment CMS # 71965

1) PARTIES

This Amendment to the above-referenced Original Contract (hereinafter called the Contract) is entered into by and between South Metro Water Supply Authority (hereinafter called "Contractor"), and the STATE OF COLORADO (hereinafter called the "State") acting by and through the Department of Natural Resources, Colorado Water Conservation Board, (hereinafter called the "CWCB").

2) EFFECTIVE DATE AND ENFORCEABILITY

This Amendment shall not be effective or enforceable until it is approved and signed by the Colorado State Controller or designee (hereinafter called the "Effective Date"), but shall be effective and enforceable thereafter in accordance with its provisions. The State shall not be liable to pay or reimburse Contractor for any performance hereunder, including, but not limited to costs or expenses incurred, or be bound by any provision hereof prior to the Effective Date.

3) FACTUAL RECITALS

The Parties entered into the Contract for/to the water activities, which are broadly defined and include water supply and environmental projects and/or studies. This Grant is for the Aquifer Recharge Pilot Study in the Metro Basin.

4) CONSIDERATION

Consideration for this Amendment consists of the payments to be made hereunder and the obligations, promises, and agreements herein set forth.

5) LIMITS OF EFFECT

This Amendment is incorporated by reference into the Contract, and the Contract and all prior amendments thereto, if any, remain in full force and effect except as specifically modified herein.

6) MODIFICATIONS.

The Contract and all prior amendments thereto, if any, are modified as follows:

a. **5. TERM and EARLY TERMINATION is amended to read as follows:** "The Parties respective performance under this Grant shall commence on the Effective Date. This Grant shall terminate on March 31, 2019 unless sooner terminated or further extended as specified elsewhere herein.

b. **6. a. Completion:** Grantee shall complete the Work and its other obligations as described herein and in the Exhibit A on or before March 31, 2019. The State shall not be liable to compensate Grantee for any Work performed prior to the Effective Date or after the termination of this Grant.

c. **7 a. Maximum Amount:** The maximum amount payable under this Grant to Grantee by the State is $550,000, as determined by the State from available funds. Grantee agrees to provide any additional funds required for the successful completion of the Work. Payments to Grantee are limited to the unpaid obligated balance of the Grant as set forth in **Exhibit A**. The maximum amount payble by the State to Grantee during each State fiscal year of this Grant shall be:

$550,000 in FY2015, minus any funds expended in FY2011, FY2012, FY2013 and FY2014
$550,000 in FY2016, minus any funds expended in FY2011, FY2012, FY2013, FY2014 and FY2015
$550,000 in FY2017, minus any funds expended in FY2011, FY2012, FY2013, FY2014, FY2015 and FY2016
$550,000 in FY2018, minus any funds expended in FY2011, FY2012, FY2013, FY2014, FY2015, FY2016 and FY2017

7) EFFECTIVE DATE OF AMENDMENT

The effective date hereof is upon approval of the State Controller or their delegate.

8) ORDER OF PRECEDENCE

Except for the Special Provisions, in the event of any conflict, inconsistency, variance, or contradiction between the provisions of this Amendment and any of the provisions of the Contract, the provisions of this Amendment shall in all respects supersede, govern, and control. The most recent version of the Special Provisions incorporated into the Contract or any amendment shall always control other provisions in the Contract or any amendments.

9) AVAILABLE FUNDS

Financial obligations of the state payable after the current fiscal year are contingent upon funds for that purpose being appropriated, budgeted, or otherwise made available.

2015-394

CMS~~71695~~ CORE

71965

THE PARTIES HERETO HAVE EXECUTED THIS AMENDMENT

*** Persons signing for Contractor hereby swear and affirm that they are authorized to act on Contractor's behalf and acknowledge that the State is relying on their representations to that effect.**

CONTRACTOR	STATE OF COLORADO
South Metro Water Supply Authority	**John W. Hickenlooper, GOVERNOR**
By: Eric Hecox	Mike King, Department of Natural Resources
Title: Executive Director	
Eric B. Hecox	By: for
*Signature	By: Rebecca Mitchell, Section Chief, Water Supply Planning Section, CWCB
Date: 7/30/14	Signatory avers to the State Controller or delegate that Grantee has not begun performance or that a Statutory Violation waiver has been requested under Fiscal Rules
	Date: 8/28/2014

ALL CONTRACTS REQUIRE APPROVAL BY THE STATE CONTROLLER

CRS §24-30-202 requires the State Controller to approve all State Contracts. This Contract is not valid until signed and dated below by the State Controller or delegate. Contractor is not authorized to begin performance until such time. If Contractor begins performing prior thereto, the State of Colorado is not obligated to pay Contractor for such performance or for any goods and/or services provided hereunder.

STATE CONTROLLER

~~**David J. McDermott, CPA**~~ Robert Jaros, CPA, MBA, JD

By: Susan Borup

Name and Title: Susan Borup, DNR Controller

Date: 9/11/14

Scope of Work – Revised
South Metro Water Supply Authority
Aquifer Recharge Pilot Study

Revised 9/9/2014

This Scope of Work (SOW) revises tasks that can be accomplished with the remaining grant funds associated with the South Metro Water Supply Authority (SMWSA) Aquifer Recharge Pilot Study. The objective of this revised SOW is to build upon and gain additional understanding on the use of aquifer storage and recovery (ASR) as a method of meeting future water supply needs in the South Metro region. This scope describes the path forward as envisioned at this time. Prior to beginning work, the scope will be reviewed and updated if necessary.

Background

The SMWSA began the ASR pilot project in 2011 to identify existing wells to retrofit for ASR and perform pilot testing using a water supply of similar water quality to the supplies SMWSA members may receive via the Water Infrastructure and Supply Efficiency (WISE) project deliveries. In December 2012, Aurora joined the study and has become a project partner. Aurora will be supplying the water for the ASR pilot testing and in-kind contribution. An Interim Report was completed that describes the work done to date.

There is $412,071.86 remaining in the grant. Through discussions with SMWSA Staff, Members, and the South Metro Technical Advisory Team, we have identified a path forward to provide the most value in assisting South Metro entities to meet their future water supply goals and meet the intent of the original grant application. These are described in the tasks below.

Study Objectives

The objectives of the study are to:

1. Assess existing infrastructure with appropriate capabilities to deliver this water, and determine wells that could be potentially connected to this water source using existing piping, or requiring minimal new piping.

2. Identify one well within areas identified in the SMWSA Regional Aquifer Supply Assessment study, with access to infrastructure capable of delivering the source water that might be suitable for retrofitting an ASR well. Undertake the necessary evaluations, including engineering conceptual-level design for retrofit and geochemical analyses on the candidate ASR well, to identify their infrastructure and pre-treatment requirements.

3. Undertake the design and construction needed to retrofit the candidate well for ASR pilot testing and associated pretreatment.

4. Conduct pilot-scale ASR testing and evaluate the feasibility of implementing long-term ASR operations with one well.

5. Provide a review of ongoing ASR programs in the Denver Basin and provide recommendations for full-scale implementation of ASR in the South Metro area, including water pre-treatment needs, well preparation and retrofitting, and operations and maintenance (O&M).

6. Assess water quality impacts, specifically disinfection byproduct formation.

7. Assess the economics of implementing and operating ASR.

Section 1 - Revised Project Tasks

This scope is divided into the following tasks and will replace the uncompleted tasks for the original SOW. The first task will be completed upon the installation of the WISE temporary connection that is currently expected to be completed beginning in 2016.

Task 1 - Evaluate Candidate ASR Wells

The work described under this task is planned to begin in 2016. The details of this task will be refined prior to beginning work under this task.

Once a connection and WISE supplies are available, potential wells will be identified for the ASR pilot testing. Depending on the location identified for piloting ASR, a design for the temporary piping connecting the water supply with the well will be prepared and constructed. Evaluation criteria for selection of candidate wells within target areas will include but are not limited to:

- Location that will provide beneficial information to the project partners;
- The aquifer in which the well is completed and well construction details;
- Condition of the well, pump, and piping;
- Availability of monitoring wells;
- Ease of retrofitting for ASR operations (if not already equipped);
- Ease of connecting to and/or isolating from other water supplies during test period;
- Potential benefit to the aquifer in terms of water level recovery;

- Geochemical modeling to identify potential reactions between source water and formation water and the associated source water pre-treatment requirements;
- Site ownership, access, security, and cooperation of the well owner;
- Regulatory and pilot testing permit requirements.

These and possibly other criteria will be used to evaluate and screen candidate wells so that one well will be selected for ASR pilot testing. The results of this task will be documented in a technical memorandum that will include discussion of the site selection criteria and screening, results of geochemical modeling, and identification of the target wells that will undergo pilot testing.

Task 2 - Design and Construction

This task is optional based on the ASR well(s) chosen for the study and may not be necessary if the well is already equipped with ASR capability and connected to the WISE system. Some valving, metering, and connections may be necessary to isolate chosen well from other water sources during testing. Possible tasks include the preparation of engineering criteria, drawings, and specifications needed to implement the ASR Pilot testing program. Specific elements may include:

- Design documents and technical specifications for piping connections and pumping facilities from recharge water source to pilot treatment unit and from pilot treatment unit to pilot recharge well site, including process schematics and unit treatment process sizing for up to a 0.5 million gallon per day flow rate (350 gallons per minute);
- Develop a water quality control plan: 1) Evaluate the need for water pretreatment to meet recharge injection well regulatory requirements and to maximize geochemical compatibility with native groundwater; 2) Identify potential water quality impacts and identify measures to mitigate any adverse impacts (taste and odor, disinfection byproducts, etc.);
- Develop conceptual layouts, including a piping and pumping schematic, considering relative locations and infrastructure of pilot water source and pilot recharge well;
- Prepare design documents for ASR injection/pumping, conveyance, and treatment units;
- Identify field parameters to be monitored and frequency of monitoring in injection water and in recovered water throughout the operational testing period;
- Obtain permits necessary for construction of the source water piping and pumping and operation of the injection well as may be required by the Colorado Division of Water Resources (DWR);

- Procure construction subcontractors for the source water conveyance to the injection well, pumping and pre-treatment infrastructure, and provide engineering guidance and inspection during construction;

- Prepare a plan by which the water pumped from the ASR well can be used by the entity during the pilot testing period or discharged to a nearby watershed.

The results of this task will include engineering designs and specifications appropriate for the infrastructure and water quality treatment requirements for each pilot test well, subcontractor bid packages and contracts, and permits as necessary for SMWSA's desired delivery method.

SMWSA entities and their respective consultants will provide detailed drawings, data, and oversight for retrofitting existing water supply wells as a part of the in-kind contribution. To the extent possible the project will leverage existing infrastructure and connections to supply water to the ASR pilot site(s) within or under the $25,000 budget to complete this task.

This task will include:

- Obtaining permits necessary for construction of the temporary source water piping (if required) and permits necessary for the operation of the injection well as may be required by the DWR;

- Identifying field parameters to be monitored and frequency of monitoring in injection water and in recovered water throughout the operational testing period;

- Preparing a plan by which the water pumped from the ASR well can be used by the entity during the pilot testing period.

Task 3 - Pilot ASR Testing and Regional Evaluation

The pilot testing will be conducted at one or more locations using a well completed in a single Denver Basin aquifer, and the results from the pilot test will be evaluated under this task. Previous experience in the region has shown the benefit of conducting multiple cycles of injection and recovery. The pilot test for this study is anticipated to undergo three cycles of injection and withdrawal, with the duration of the injection cycles to be approximately 1, 2, and 4 months. The recharged water will stay in the aquifer for up to twice the duration as the recharge cycle and then will be fully extracted prior to the next injection cycle. Aquifer hydraulics testing will also be conducted during each injection/recovery cycle by analyzing pumping rates and water levels. Water quality sampling will be conducted at beginning, middle, and end of each recovery cycle for a full suite of drinking water parameters and for other constituents that will provide insight on chemical and biological reactions that may be occurring in the subsurface. The feasibility of higher rate injection will be tested, if the

well and infrastructure are suitable, since limited injection rates is one of the limitations for ASR implementation.

The water quality and hydraulic test data and trends will be evaluated for the pilot test well relative to pre-ASR test conditions and trends prior to its conversion to an ASR well and pilot operations. The analyses will be documented in a report (Task 4) that:

- Describes the pilot testing observed conditions and trends;
- Identifies additional locations within the South Metro area in which ASR operations will be beneficial;
- Estimates operational rates, storage and recovery volumes available, and ASR costs for each area tested;
- Evaluates infrastructure, treatment, and O&M requirements for successful ASR in the pilot test areas.

In addition, in this task ASR well performance data from CWSD and potentially from other entities will be obtained to evaluate the potential for ASR in the South Metro Region. This will include the analysis of readily available data such as trends in specific injectivity and specific capacity over time, analysis of water quality trends, and maintenance history for ASR wells. Geophysical logs will be examined to assess lithologic characteristics and their relationship to the productivity trends for wells to assist in identifying criteria for selecting candidate wells for ASR.

The data collected from this pilot-scale ASR test and previous ASR testing in the area will be used to assess ASR potential in the region to manage existing and future water supplies. The opportunities and challenges of implementing a regional ASR program, as stated in the SMWSA Water Master Plan, will be discussed.

Task 4 - Evaluate Economics of ASR

This task is optional and will be completed based on information available from studies being performed by Colorado State University and Colorado School of Mines. If an economic tool has been developed, the tool will be used to evaluate the economics of implementing ASR in the Denver Basin for SMWSA members.

If an economic tool has not yet been developed, a tool to assess the economics of implementing ASR at the entity level will be developed. This economic tool will provide a way for water providers to evaluate the planning level costs and tradeoffs of implementing ASR in their respective systems based on specific information entered by the user. During the formulation of an economic tool, experts at Colorado State University and Colorado School of Mines will be contacted to collaborate and build upon existing efforts to develop an economic tool for assessing ASR costs.

The economic tool may include items such as:

- Typical costs to retrofit existing wells for ASR;
- Costs for required instrumentation;
- Costs to collect and analyze water quality data;
- Ongoing O&M costs associated with ASR, such as energy demands and well rehabilitation;
- Costs to develop equivalent surface water storage; and
- Ability to evaluate various levels of production, including benefits of injection rates significantly higher than production rates when water is available.

In addition, this tool would include the economics of surface water storage based on user provided inputs to assist in comparison of ASR with surface water storage.

Task 5 - Reporting and Communications

A final report will be developed summarizing the ASR projects in the Denver Metro region and the information learned about each through the proposed tasks including additional data collected and analyzed. The report will be supplied to all participating entities for review and comment. All participants will receive both electronic scans and hard copies of the final report.

This report will include documentation for the plans, specifications, and operations needed to implement ASR projects elsewhere in the Denver Basin bedrock aquifers, thus serving as valuable guidance. This report will provide valuable planning information for SMWSA members, and others wishing to pursue ASR as a method to meet their future water resources needs.

SMWSA Staff and Engineering Support Team

The following SMWSA staff and support team Engineers/Geologists will be contributing to this project:

- Eric Hecox
- Rick Marseick
- Mark Palumbo
- Curtis Wells
- Courtney Hemenway
- John Halepaska
- Bruce Lytle
- Scott Mefford
- Chris Sanchez

It is anticipated the people listed above will provide expertise, data, and analysis as requested by the consultant during the study as a part of SMWSA's in-kind contribution.

Aurora Water Staff and Engineering Support Team

Aurora Water will provide the necessary management, engineering, operations, and water quality staff to assist SMWSA in the effort described herein.

Section 2 - Budget

The budget for the revised scope is based on the budget remaining from the original SOW. An initial breakdown of the proposed task budgets is provided below. The individual tasks undertaken will be evaluated to remain within this guideline budget and will not exceed the total budget. These budgets do not include the in-kind contributions of the individual cooperating entities.

Task 1 - $20,000
Task 2 - $0 to $25,000
Task 3 - $270,000 to $315,000
Task 4 - $5,000 to $25,000
Task 5 - $30,000
Sub-Total - $370,000
Work completed but not yet invoiced - $42,000
Total - $412,000

Section 3 - Project Schedule

The proposed project schedule is presented below. The schedule is presented as of notice to proceed on the amended scope. It is anticipated that the project will be completed within approximately 4 years, depending on the availability of water for the pilot testing.

SMWSA Aquifer Recharge Pilot Study Schedule

Task	State Date	End Date
Review Scope Proceed with Project Tasks	Jan 2016	
1. Evaluate Candidate ASR Wells	Jan 2016	Jun 2016
2. Design and Construction	Jun 2016	Oct 2018
3. Pilot ASR Testing & Regional Evaluation	Oct 2018	Dec 2018
4. Evaluate Economics of ASR	Jun 2016	Feb 2019
5. Reporting and Communication	Oct 2018	Mar 2019