City of Prineville

387 NE THIRD STREET • PRINEVILLE, OREGON 97754

DEPARTMENT OF PUBLIC WORKS

ENGINEERING DEPARTMENT

Phone: (541)447-2357 FAX: (541) 447-5628

EMAIL: eklann@cityofprineville.com Website: www.cityofprineville.com

Date: March 23, 2017

To: Prineville City Council

From: Eric Klann, City Engineer/Public Works Director

Staff Report: Contract Award, GSI Water Solutions Aquifer Storage and Recovery Feasibility Study

Overview:

GSI Water Solutions, Inc. (GSI) has recently completed a detailed hydrogeologic characterization of the Airport Area Aquifer and has determined that this aquifer is a good candidate for an Aquifer Storage and Recover project.

Public water providers such as the City of Prineville (City) are increasingly taking steps to prepare for long-term drought by developing water supply resiliency. Aquifer storage and recovery (ASR) is a sustainable water management tool that can help the City achieve this goal.

ASR is a method of water storage that uses the natural water storage capabilities of underground aquifers as a cost-effective, scalable, and ecologically friendly water storage alternative to traditional storage options, such as aboveground reservoirs. An ASR system enables water to be appropriated during periods of high streamflow and low demand. This approach allows for use of stored water during periods of high demand, thereby reducing stress on native water sources. In addition, it provides for a readily available "reservoir" for use in the event of drought or supply interruption.

Additionally, as part of the Crooked River Collaborative Water Security and Jobs Act of 2014 (2014 Act), the City has 5,100 acre-feet of stored water in Prineville Reservoir dedicated to mitigating the impacts from groundwater pumping as required under Oregon Water Resources Department's (OWRD) Deschutes Basin Groundwater Mitigation Program. Therefore, the source water for the potential ASR project (shallow groundwater) will be fully mitigated by the stored water under the 2014 Act, consistent with OWRD's requirements.

The scope of work for the attached ASR feasibility study will build on the hydrogeologic characterization information obtained from the recently completed Airport Area Aquifer study and will focus on regulatory fatal flaws, identification and characterization of the source water, source water treatment needs, and interactions with the target aquifer system (Airport Area Aquifer system), and project cost estimation and implementation considerations.

GSI resides within an active professional services pool with the City of Prineville to provide services related to groundwater investigations. This pool was activated in August of 2015 and runs through August of 2020. As GSI is an active participant of the pool, the City of Prineville may directly appoint work to them.

Staff Recommendation:

Staff recommends that council award a contract to GSI Water Solutions to develop an Aquifer Storage and Recover Feasibility Study as described in the attached Scope of Work.

SCOPE OF WORK
Aquifer Storage and Recovery Feasibility Study
Presented to the City of Prineville

GSI Water Solutions, Inc., and subcontractor
Newton Consultants Inc.

March 22, 2017

Public water providers such as the City of Prineville (City) are increasingly taking steps to prepare for long-term drought by developing water supply resiliency. Aquifer storage and recovery (ASR) is a sustainable water management tool that can help the City achieve this goal.

ASR is a method of water storage that uses the natural water storage capabilities of underground aquifers as a cost-effective, scalable, and ecologically friendly water storage alternative to traditional storage options, such as aboveground reservoirs. An ASR system enables water to be appropriated during periods of high streamflow and low demand. This approach allows for use of stored water during periods of high demand, thereby reducing stress on native water sources. In addition, it provides for a readily available "reservoir" for use in the event of drought or supply interruption.

GSI Water Solutions, Inc. (GSI), has already completed a detailed hydrogeologic characterization of the Airport Area Aquifer and has determined that this aquifer is a good candidate for an ASR project. Additionally, as part of the Crooked River Collaborative Water Security and Jobs Act of 2014 (2014 Act), the City has 5,100 acre-feet of stored water in Prineville Reservoir dedicated to mitigating the impacts from groundwater pumping as required under Oregon Water Resources Department's (OWRD) Deschutes Basin Groundwater Mitigation Program. Therefore, the source water for the potential ASR project (shallow groundwater) will be fully mitigated by the stored water under the 2014 Act, consistent with OWRD's requirements.

The scope of work for the ASR feasibility study, outlined below, will build on the hydrogeologic characterization information obtained from the recently completed Airport Area Aquifer study and will focus on regulatory fatal flaws, identification and characterization of the source water, source water treatment needs, and interactions with the target aquifer system (Airport Area Aquifer system), and project cost estimation and implementation considerations.

Task 1 – Preliminary Water Quality Sampling

In a pre-scoping meeting on January 13, 2017, it was determined that a detailed water quality analysis of the ASR source water would be an initial feasibility study activity. Conducting this work up front will lead to enhanced coordination with the City's ongoing wastewater reuse project. An approximation of the water quality for the proposed ASR source water (shallow groundwater) will be developed through sampling existing similar wells. Activities under this task are expected to include:

- Collecting and analyzing water samples from the City's Fourth Street shallow well, the Crooked River, and the City's Heliport well. The samples will be analyzed for a list of constituents necessary for assessing ASR feasibility and several additional analytes provided by the wastewater reuse project team. In general, these water quality analyses are based on national and state drinking water standards, several additional inorganic constituents (calcium, potassium, etc.) to evaluate geochemical mixing during ASR storage, and a number of additional organic and inorganic constituents (ammonia, TKN, sulfur, etc.) to assess the potential range of use of the ASR source water.
- Tabulating the results and providing them to the project team.

Assumptions: The cost of analyses is assumed to be approximately $1,000 higher than the standard full drinking water suite of analyses to cover the additional analytes evaluated. .

Deliverable: Water Quality Results Tables

Schedule: Work under this task is anticipated to begin immediately and should be completed within 1½ months.

Task 2 – Regulatory and Water Supply Evaluation

We will review and assess regulatory and permitting requirements to identify and understand any challenges and/or fatal flaws. Activities under this task are expected to include:

- Evaluation of the permits required and identification of legal and regulatory fatal flaws and timing issues that would affect the permitting process. Permits to be reviewed include: water right permit for source water, ASR limited license, UIC permits, land use requirement, and Oregon Health Authority (OHA) preliminary design review. One meeting with an OWRD hydrogeologist and ASR coordinator is anticipated.
- Evaluation of source water availability from a regulatory perspective under a groundwater permit acquired under OWRD's Deschutes Basin Groundwater Mitigation Program and under a limited use license for ASR testing. The evaluation will consider existing water rights (instream and out-of-stream), studies regarding instream flow needs, Crooked River management protocols, streamflow statistics, and includes communications with local OWRD staff.
- Evaluation of local concerns and/or negative perceptions regarding development of an ASR project in this area. We anticipate one meeting with the local irrigation district representative and other local entities identified, and another meeting with the Deschutes River Conservancy.
- Summarizing the results in a phone meeting with the project team to allow for discussion about any key issues identified for the project.

Assumptions: No other assumptions.

Deliverable: Technical Memorandum summarizing the results of review.

Schedule: Work under this task is anticipated to begin immediately and should be completed within 1½ months.

Task 3 – Source Water Evaluation

The source water evaluation will investigate the quantity and quality of the proposed source water, which will likely be the shallow groundwater adjacent to the Crooked River. This effort will include identifying suitable locations for a shallow well(s) adjacent to the river, over-seeing the installation of a test well, and performing aquifer and water quality testing. Information collected will be used to understand the source water quality and quantity for evaluating source water and native groundwater interactions and water treatment requirements. Activities under this task are expected to include:

- Shallow Alluvial Aquifer Characterization:
    - Site Screening/Selection Evaluation
        - Performing an initial geologic screening desktop study to identify possible location(s) for hydrogeologic testing based on the available geologic data and ranking of the identified locations.
        - Conducting one meeting with the City to understand access issues and discuss geologic conditions prior to ranking identified locations.
        - Conducting a brief environmental review of surrounding land uses in the vicinity of the preferred location because the new water source will be in the shallow system and therefore vulnerable to surface activities. We will move to a secondary test site if necessary.

- Design Testing Program and Drilling Bid packages
  - Finalizing test well location and monitoring wells (currently assuming there will be 3 monitoring wells). This also includes preparing a preliminary design for the test well with a preliminary target pumping rate of up to 2,000 gallons per minute (gpm).
  - Preparation of bid packages.
  - Assisting the City in reviewing bids and selecting a contractor.
- Test well and Monitoring Well Installation
  - Coordinating drilling and logging the geology during drilling of the test well and monitoring wells.
  - Reviewing and modifying test well predesign based on the materials observed during drilling of the test well.
- Aquifer Testing
  - Conducting a 5-day aquifer test to evaluate hydrogeologic parameters of the aquifer at this location and to assess sustainable production rate at this location. All wells will be equipped with transducers; manual water level measurements will also be collected during the test. Additionally, we will collect sufficient recovery data as part of the test.

- Water Quality Sampling and Analysis
  - Water quality samples will be collected at the beginning and end of the test. In addition, general chemistry samples will be collected every 24 hours, and field parameters will be monitored throughout the test. This will allow the team to look for water quality changes/differences from the new source. The following water quality samples will be collected from the test well:
    - General chemistry (for mixing modeling and treatment evaluation), collected every 24 hours during the test.
    - Drinking water constituents per the ASR limited license requirements (2 samples).
    - Microscopic particulate analysis (MPA) as needed for the ASR limited license (only completed at the end of the aquifer test).
    - Other laboratory analyses that may inform the potential range of uses for the ASR source water. This will supplement the previously submitted water quality results to the wastewater reuse project team under Task 1 and provide water chemistry for the new source.
- Data Analysis and Reporting
  - Developing and summarizing aquifer parameters from the aquifer test results.
  - Reviewing the data to understand which source water collection system will be most efficient to meet the City's production target for this new source and if any water treatment is necessary.
  - Preparation of a memorandum summarizing the results of Task 2 (portions will be incorporated directly into the Feasibility Report).
  - Summarizing results in a phone meeting with the project team to allow for discussion of any key issues or identified fatal flaws in this stage of the project.

Assumptions:

- The City will contract directly with the driller for drilling and aquifer testing.
- The City will provide digital maps, including water system components, tax lot ownership information, and locations of preferred sites.
- Drilling and well construction will require no more than 4 weeks to complete.
- The pump contractor will be the primary person present during the aquifer test.

- The City will provide a discharge location and equipment for the water from the 5-day aquifer test (assume up to 2000 gpm for days). Disposal methods might include temporary piping to a storm sewer system or to the Ochoco Irrigation District (OID) canal, or use of a series of hand-line irrigation systems to water an adjacent field.

Deliverable: Source Water Evaluation Technical Memorandum (to be incorporated into the Feasibility Study Report).

Schedule: Work under this task is anticipated to begin immediately and should be completed within 4 to 5 months.

Task 4 – Hydrogeologic Evaluation: Airport Aquifer System Response to Recharge

The hydrogeologic feasibility evaluation will use the aquifer characterization information collected from previous studies and from the Airport Area Aquifer study. Under this task, GSI will examine the response of the target aquifer system to recharge and recovery of water under different ASR operational scenarios. Findings developed under this task will form the backbone of the ASR limited license application package (see Task 1). Activities under this task are expected to include:

- Conceptual Hydrogeologic Model
    - The previous work completed by the City will be used to summarize the target aquifer, ancestral canyon setting, geologic and hydrogeologic units, structures, aquifer testing, and resulting hydrogeologic characteristics.
- Aquifer ASR Capacity Evaluation
    - Conducting an aquifer capacity evaluation using the characteristics of the target aquifer to determine the following:
        - Assessment of potential ASR storage volume
        - Sustainable recharge rates
        - Sustainable recovery rates

      This task will be completed using analytical calculation techniques and will be double-checked using the existing groundwater model.
- Water Quality Compatibility
    - Evaluating the native groundwater quality and recharge source water testing results previously collected in Tasks 1 and 3 for ASR project requirements.
    - Completing a geochemical compatibility evaluation of source water and receiving native groundwater using a geochemical mixing model. The results of the modeling will provide an understanding of the water chemical compatibility and predict potential impacts and reactions from mixing during ASR operations. This modeling will use the detailed water quality test results collected for the two water sources collected in Task 1 and 4.
- Recharge Analysis
    - Conducting a recharge analysis to assess the target groundwater aquifer's physical hydraulic response to ASR operations. This task will include analytical evaluations and use of the groundwater model to understand the impacts associated with recharge activities. Activities will include evaluation of the following:
        - Estimation of the area affected by the ASR program
        - Estimation of groundwater level changes during recharge and recovery
        - Water loss evaluation

        - Impacts to nearby groundwater users and surface water
- Data Analysis and Reporting
    - Preparation of a draft and final Feasibility Study Report summarizing the results of Tasks 1 through 4.
    - Presentation of the findings of the Feasibility Study to the project team in a meeting with the City. In addition, the team will discuss any key issues, next steps, and any schedule constraints on moving forward with an ASR project.

Assumptions:

- The previously completed work for the City's Airport Area Aquifer will be used for developing the hydrogeologic conceptual site model.
- The existing groundwater model for the Prineville area will be used to assist the evaluation of the aquifer ASR capacity and recharge analyses.

Deliverable: Hydrogeologic Feasibility Study Report (one of two required supporting documents for an ASR limited license application)

Schedule: Work under this task is anticipated to begin during the late stages of the test well's aquifer test and is estimated to be completed during months 5 and 6 of the project.

Task 5 – Project Cost Estimation and Implementation Plan

The implementation plan will be developed by GSI and will be used to provide a summary of the anticipated costs for various project elements. It will present a timeline for developing the ASR system from concept through testing, final construction, and start of ASR operation (recharge and recovery). Activities under this task are expected to include:

- Preparation of capital and operation/maintenance cost estimates for GSI-specific project elements.
- Preparation of a project implementation plan that includes a detailed description of additional work needed to finalize an ASR application and advance the project to ASR operation. Project implementation plan will include a schedule that presents a timeframe to develop the ASR system that includes design, permitting, construction, startup of proposed facilities, and general long-term requirements for running an ASR program.
- Presentation of the implementation plan to the project team in a meeting with the City. In addition, the team will discuss next steps and any schedule constraints on moving forward with an ASR project.
- Presentation of the results to the City Council.

Assumptions:

- GSI will focus its cost estimations and implementation plan on overall ASR project development.

Deliverable: Project Cost Estimate and Implementation Plan Memorandum

Schedule: Work under this task is anticipated to begin once Task 3 is completed and the team has determined there are no fatal flaws. Work will continue forward and is estimated to be completed during months 7 and 8 of the project.

Task 6 – Project Management

Throughout this project, our team will provide effective management of budget, schedule and project deliverables. Emphasis will be placed on clear communication with the project team and internal GSI staff that are providing support. As part of this task, we will develop clear and timely invoices and progress reports each

month. Client communications, meetings and presentations will be conducted at strategic points in the process. Finally, GSI will ensure project deliverables go through a quality assurance/quality control review process.

BUDGET

We estimate a project budget of not to exceed $256,360 for the tasks identified above. This work will be conducted on a time and materials basis. This budget will not be exceeded without prior approval from the City. The budget is further described in the following table. GSI's 2017 labor fees are attached.

City of Prineville
ASR Feasibility Study Budget Estimate

Task	Task Description	GSI	Newton	Laboratory Costs	TASK TOTAL
1	Preliminary Water Quality Sampling	$4,550	$0	$10,500	$15,050
2	Regulatory & Water Supply Evaluation	$25,910	$0	$0	$25,910
3	Source Water Evaluation	$28,850	$61,640	$11,000	$101,500
4	Hydrogeologic Evaluation - Airport Aquifer System Response to Recharge	$55,600	$0	$0	$55,600
5	Project Cost Estimation & Implementation Plan	$38,100	$0	$0	$38,100
6	Project Management	$20,210	$0	$0	$20,210
	Totals	**$173,220**	**$61,640**	**$21,500**	**$256,360**

Total Estimated Project Costs	**$256,360**
Estimated Drilling Costs	**$111,000**

Subcontractors:

Task 4 GSI fees includes a subcontractor for geochmical modeling

SCHEDULE

A detailed summary of the schedule is attached. We anticipate that activities under this scope of work will take approximately 7 to 8 months once notice to proceed is provided. At the conclusion of each task, we anticipate conducting a project team meeting to present the results of the task, discuss possible project obstacles, and allow the City the opportunity to assess the information and the overall feasibility of continuing to move forward with the project. The proposed schedule is dependent upon the driller selection process as well as the availability of the driller once selected. We have estimated timeframes for these activities; however, because many of the tasks are tied to the information and outcomes of the well drilling and testing, the overall project schedule is sensitive to this portion of the project. As needed, the City and GSI can develop specific detailed schedules for individual subtasks.