JORDAN VALLEY WATER CONSERVANCY DISTRICT

REQUEST FOR STATEMENTS OF QUALIFICATIONS TO PROVIDE PROFESSIONAL ENGINEERING SERVICES FOR THE

WELL REDEVELOPMENT AND TEST PUMPING FOR THE 8300 S ETIENNE WELL, 2129 E MURRAY HOLLADAY WELL, 987 E 7800 S WELL, & 7618 S 700 E WELL

Project #4242

October 2021

Summary

Jordan Valley Water Conservancy District (JVWCD) invites you to submit a Statement of Qualifications (SOQ) as defined in this request. SOQs shall be submitted in a sealed envelope to JVWCD's project manager, Kevin Rubow, at 8215 S.1300 W., West Jordan, UT 84088, no later than **3:00 p.m. on Tuesday, October 19, 2021,** for consideration.

Introduction

JVWCD was created under the Water Conservancy Act as a political subdivision of the State of Utah. JVWCD was organized as a regional water supply agency to develop a water supply for rapidly growing areas outside of the Salt Lake City service area. JVWCD currently serves as a wholesale supplier to 17 member agencies and also operates a retail distribution system in several parts of Salt Lake County. In 2020, JVWCD delivered approximately 100,000 acre-feet of municipal and industrial water to its wholesale and retail customers.

Project Background

JVWCD drilled four water production wells between 2006 and 2008. Due to the economy and the development of other sources, construction to equip these wells was not completed at that time. JVWCD now desires to equip these wells and feels it would be prudent to perform additional well development and test pumping due to the amount of time that has elapsed since the initial well development. This project will only include consulting and construction management services for the additional well development and test pumping. Water rights have been established with the Utah Division of Water Rights and a Preliminary Evaluation Report for these wells was prepared as required by the Utah Drinking Water Source Protection Rule.

Specific Project Information

Drilling of 8300 S Etienne well began in August 2006 and the initial development and testing was completed in January 2007. The borehole was drilled using rotary drilling methods to a depth of approximately 1,060 feet below ground surface (bgs). A twenty-four-inch diameter steel casing and 304 stainless steel screens were installed in the borehole to a depth of 1,040 feet bgs, with a total screen length of 280 feet. Following the initial development and pump testing, the pumping capacity of the well was significantly lower than the projected 10-12 cubic feet per second (cfs). Additional mechanical development was performed in 2012 and the specific capacity of the well increased by approximately 40 percent, reference Appendix A. It is believed that the capacity can be improved with additional development.

Drilling of the 2129 E Murray Holladay well began in January 2008 and the development and testing was completed in June 2008. The borehole was drilled using rotary drilling methods to a depth of approximately 1,060 feet bgs. A twenty-inch diameter steel casing and 304 stainless steel screens were installed in the borehole to a depth of 1,230 feet bgs, with a total screen length of 290 feet. The results from the pump testing, indicated the well can produce approximately 7.5 cfs.

Drilling of the 987 E 7800 S well began in January 2007 and the development and testing was completed in May 2007. The borehole was drilled using rotary drilling methods to a depth of approximately 1,144 feet bgs. A twenty-inch diameter steel casing and 304 stainless steel screens were installed in the borehole to a depth of 1,124 feet bgs, with a total screen length of 290 feet. The results from the pump testing, indicated the well can produce approximately 8.0 cfs.

Drilling of the 7618 S 700 E well began in November 2006 and the development and testing was completed in May 2007. The borehole was drilled using rotary drilling methods to a depth of approximately 1,062 feet bgs. A twenty-inch diameter steel casing and 304 stainless steel screens were installed in the borehole to a depth of 1,042 feet bgs, with a total screen length of 215 feet. The results from the pump testing, indicated the well can produce approximately 3.5 cfs.

Well Driller’s Reports of the four wells are provided in Appendix B.

Water samples were collected from the wells in March 2018 and analyzed to identify fouling and corrosion issues for the wells. The laboratory results are provided in Appendix C.

Project Objectives

1. Provide engineering design and construction management services for the redevelopment and test pumping for the wells located at 8300 South Etienne Way, 2129 East Murray Holladay, 987 East 7800 South, and 7618 South 700 East.

2. Develop strategies to further increase the specific capacity of the wells, in particular the Etienne Way well.

3. Prepare engineered drawings to include any elements needed for the Well Redevelopment and Test Pumping project. The engineer shall prepare drawings and specifications of sufficient detail to minimize uncertainties during bidding of the construction contract and to minimize claims for construction change orders.

4. Consult with JVWCD to determine best time to bid project to maximize bidders and obtain favorable bid prices. Include considerations for construction length and schedule. Adjust schedule to meet the recommended bid and construction period.

5. Construction for the Well Redevelopment and Test Pumping project to be substantially complete before September 1, 2022.

Scope of Work

The general scope of work for the Well Redevelopment and Test Pumping project includes providing expert design services for well rehabilitation to improve the specific capacity of the groundwater wells, including project management and coordination, quality control, well development methods, water quality evaluation, preliminary and final design, preparing required submittals to the Division of Drinking Water, cost estimating, and construction management and inspection.

1. Pre-Design Phase:

    A. Meet with JVWCD staff to review Well Completion Reports, water quality data, and previous development efforts. This information will be provided by JVWCD.

    B. Provide recommendations on development methods and chemical treatment options to improve the specific capacity of the wells.

    C. Review JVWCD’s design criteria applicable to this project.

D. Identify additional design criteria as applicable.

E. Meet with applicable entities affected by the project (e.g. municipalities, property owners, utility owners, regulatory agencies, etc.) during the preliminary and design phase to coordinate all aspects of the project. The following list identifies some of the key affected entities but is not meant to be all inclusive:

1. Holladay City
2. Midvale City
3. Sandy City
4. Willow Creek Country Club

F. Project Manager and/or Project Engineer will meet with appropriate representatives of the entities affected by the project as needed.

G. Prepare an estimated construction sequencing schedule for the project. Identify potential conflicts and/or critical path items in the schedule.

H. Prepare a preliminary design memo summarizing the findings and recommendations of the preliminary design effort.

2. Design Phase:

A. Using the findings of the preliminary design report, prepare drawings and specifications for construction of the Well Redevelopment and Test Pumping project.

B. Prepare site drawings indicating property boundaries, site constraints for development equipment, and discharge points for pumped water for the project.

C. Prepare Well Diagrams to illustrate as-built well construction using the data provided in the Well Completion Reports.

D. Drawings shall be 11x17, scale as required.

E. Attend and conduct design workshops with JVWCD at Preliminary Design, 60%, 90%, and 100% completion.

F. Provide an estimate of probable construction costs at the 60% and 100% submittal stage.

G. Review and become familiar with JVWCD's bidding documents, General Conditions and Supplemental General Conditions.

H. Provide drawings and technical specifications to JVWCD for incorporation into the bidding documents. JVWCD will prepare the bidding documents using its standard front end documents, General Conditions, and Supplemental General Conditions.

I. Meet with JVWCD personnel and Utah Division of Drinking Water (DDW) staff at the 90% design stage to verify compliance of the design with applicable water regulations. Respond as needed to comments from DDW staff and submit final drawings and specifications for plan approval.

J. Prepare the required documentation to discharge into the storm drain or sewer systems for the redevelopment and test pumping activities.

K. Provide assistance during the bidding period including conducting a pre-bid side visit, responding to bidders' questions, issuing Addenda, as required, etc.

L. Assist in the bid opening, review the bids, and recommend an award of contract (within three working days).

M. Prepare a conformed set of drawings and specifications which will incorporate all addenda material into a conformed drawing set for use during construction.

3. Construction Management Phase:

A. Following an award of construction contract, fulfill the duties and responsibilities of the ENGINEER as defined in JVWCD's construction contract documents.

B. Administer the construction contract:

1) Conduct pre-construction meeting.

2) Review and recommend contractor submittals to JVWCD.

3) Review and recommend contractor progress payments to JVWCD.

4) Review contractor's claims.

5) Recommend change orders, if any, to JVWCD.

6) Conduct project close-out at completion of the work.

7) Conduct a comprehensive inspection with the contractor and JVWCD at substantial completion, final completion, and just prior to warranty expiration. Prepare and deliver to JVWCD a written list of observed deficiencies.

C. Perform field services

1) Coordinate all materials testing services to be completed by an independent testing firm.

2) Designate a representative to attend weekly progress meetings which are conducted by the Contractor, and document content of progress meetings with minutes.

3) Maintain a photograph history of the project and submit periodic photos to JVWCD during construction.

4) The Engineer shall commit a Project Representative to provide on-site inspection of construction activities to verify compliance with the drawings and specifications for an ***estimated*** 24 weeks of part-time inspection.

D. Documentation and Project Close-out

1) Prepare project completion report to document the redevelopment and testing of the production wells. Recommend optimum placement of the pump bowls, pump design point, and minimum horsepower.

2) Prepare final record drawings using the contractor's record drawings. Record drawings should be prepared according to JVWCD's Guidelines for Engineering Services (Attachment B).

3) Prepare a photographic history at the end of the project according to JVWCD's Guidelines for Engineering Services.

4) Prepare an Operation and Maintenance manual according to JVWCD's Guidelines for Engineering Services.

Sample Preliminary Schedule

Award of Consulting Contract: on or after November 10, 2021.

Contract Preparation:	28 calendar days
Preliminary Design Phase:	28 calendar days
Design Phase:	
60% Design:	14 calendar days
90% Design:	14 calendar days
100% Design:	7 calendar days
DDW Approval:	during bidding
Bidding through NTP:	60 calendar days
Construction Phase:	180 calendar days
Warranty Inspection:	11 months after final completion

Proposers may revise this schedule as necessary to match their work plan.

Statement of Qualification Evaluation

SOQs shall not exceed eight (8) pages in length (excluding resumes, sample drawings, and references). Provide three (3) hard-copies and one digital copy of the SOQ for review by the evaluation committee.

The SOQ should include the following information:

- Qualifications: Identify the key members of the team listed by name including role and availability to the project in the format of a Project Team Chart. Indicate the education, experience, expertise, and location of each team member (it is acceptable to provide this in resume format in the appendix). Sample drawing(s) from applicable previous projects may be included in the appendix. Include evidence demonstrating compliance with the Minimum Qualifications section of this Request for SOQ.

- Work Plan: Include a detailed work plan which addresses the scope of the work and identifies key issues. A final agreed upon work plan will be incorporated into Schedule A of the Agreement. Include a project schedule of the key tasks and note the availability of project team members with respect to current workload and project start and completion dates.

  Include with the work plan a table showing the number of hours planned for the key positions for each major work task. Include subtotals of all labor hours for the preliminary design, design, and construction management phase. This information will be used to evaluate the work plan and the level of effort in each phase by the team and the key team members. **Do not include any billing rate or cost information in this work plan table**.

- Past Performance: Provide information about past completed projects which satisfy the Minimum Qualifications requirements. Information about additional completed projects which the Proposer feels would be relevant may also be submitted. The past project performance information shall include:

  1. Brief description of project and scope of services performed,
  2. Name of owner,
  3. Owner contact information (direct phone number preferred),
  4. Role which proposed Project Team member(s) fulfilled on past project,
  5. Original engineering fee amount,
  6. Final engineering fee amount,
  7. Original construction or equipment purchase contract amount,
  8. Final construction or equipment purchase contract amount,
  9. Completion date established in the original construction or equipment purchase contract and actual final completion date.

Incomplete projects (on-going work) may be used but may result in a lower grade for this section in the evaluation phase.

Professional Consulting Services Agreement

Comment on the acceptability of the enclosed Professional Consulting Services Agreement (Agreement) (Attachment A) with attached Schedule B-Requirements for Engineering Services (Attachment B). Any suggested changes to the Agreement must be identified with the proposal (as an attachment), although JVWCD reserves the right to reject any suggestions. No changes will be considered after the proposal due date.

Selection Method

Selection of a consultant will be done in accordance with the State of Utah's Procurement Code for Design Professional Services (Utah Code Title 63G, Chapter 6a, Part 15).

Minimum Qualifications

Proposers are required to meet the following minimum experience requirements to be considered responsive to the Request for SOQs:

- The Project Manager shall have successfully functioned as a Project Manager on at least:
  - Two culinary water well development projects with a well casing size of 18-inch or larger.
  - JVWCD's definition of a Project Manager is one who coordinated multiple disciplines on a project, IE civil, mechanical, electrical, structural, and instrumentation; one who managed legal and accounting efforts; and one who performed a quality control review of the project personally. The Project Manager shall have served as the engineer of record for the project, including stamping applicable drawings and specifications, unless this is not the policy of the engineering firm completing the project.

- The Project Manager shall be licensed as a professional engineer in Utah.

- The Project Representative shall have functioned in this role for at least:
  - Two municipal water well projects.
  - The Project Representative is the representative of the Engineer who is assigned to observe and inspect the performance of the

construction work. The Project Representative shall be the chief authorized representative of the Owner and the Engineer at the site of the work in all onsite relations with the Contractor.

- The project team and proposed work plan are responsive to the needs of the project and include all the disciplines required by the request for SOQ.

Any proposals not meeting the minimum qualifications may be deemed non-responsive and removed from further consideration.

Evaluation Criteria

An evaluation committee appointed by JVWCD's Chief Engineer including representatives from JVWCD will convene to consider all responsive SOQs submitted and to rank the SOQs based on each criterion stated in this section.

Evaluation criteria are assigned a maximum number of points for evaluation purposes with a cumulative total of 100 points. Each SOQ will be evaluated based on the following evaluation criteria:

Evaluation Criteria	**Grade**	**Weight**	**Maximum Points**
1. Demonstrated Qualifications to meet the scope of work:			
a. Firm Resources that satisfy the defined minimum qualifications. Demonstrated availability of firm resources to the project team.	0-5	1	5
b. Project Manager and key team members with the education, expertise, and experience necessary as required for the project.	0-5	5	25
c. Availability of Project Manager and key team members to the project. Current workload with JVWCD may be considered.	0-5	2	10
2. Responsiveness of Work Plan:			
a. Clearly written work plan responding to the requirements of this request which indicates an understanding of the key issues and deliverables required for this project. Higher scores may be given to SOQs which show familiarity with JVWCD facilities related to this project or which note suggested revisions to the scope of work which would lead to an enhanced outcome.	0-5	5	25
b. Project schedule which identifies completion dates for key milestones and a final completion date.	0-5	1	5
3. Past Performance:			
a. Positive verified past references for the Proposing Firm indicating successful past performance on similar projects, including projects for JVWCD.	0-5	3	15
b. Positive verified past references for the Project Manager and other key team members indicating successful past performance on similar projects, including projects for JVWCD.	0-5	3	15
Total:			100

Each criterion will be graded on a scale of 0-5 with 5 being the highest grade. The grades will be multiplied by the appropriate weight factor to determine the total score. SOQs shall have a level of effort appropriately matching the requirements, including efforts by key positions. SOQs falling short of an appropriate overall effort and/or effort by key positions may be considered non-responsive. JVWCD reserves the right to reject all SOQs.

Fee Proposal Instructions

A fee proposal will be requested from the firm receiving the highest score. The fee proposal will be due 2 days after it is requested by JVWCD. If JVWCD's procurement officer is unable to agree to a satisfactory contract with the highest scoring design professional, at a price the procurement officer determines to be fair and reasonable to the procurement unit, the procurement officer shall formally terminate discussions with that design professional, and undertake discussions with the second highest scoring, qualified design professional. For additional information, see Utah Code Title 63G, Chapter 6a, Part 15, Section 1505.

The fee proposal shall be provided in a spreadsheet format similar to the sample fee proposal template in Attachment C. If the required information is not present, the fee proposal may be considered non-responsive. The hourly billing rate for each position, number of hours per task by position, and any fees for reimbursable expenses and overhead factors shall be clearly indicated. Proposed hourly billing rate increases, if applicable for multi-year projects, should likewise be clearly indicated.

The total proposed fee for the preliminary design and design phases of the project will be considered a maximum not-to-exceed fee amount. The fees submitted for the construction management phase shall be subject to increase/decrease based upon the actual level of effort needed during construction. It has been JVWCD's experience that more detailed designs result in fewer change orders and issues during construction and thus fewer construction management hours.

Upon execution of the Agreement by both parties, the Engineer will receive authorization to proceed with only those services identified in the Agreement. The Engineer must receive prior written authorization before performing any services outside the scope and fee amount identified in the Agreement.

For purposes of preparing the fee proposal make the following assumptions:

1. Design Contingency Budget

    a. Increase by 20% the number of hours to be spent on the Pre-design and Design Phases for the purpose of establishing a Design Contingency. The increase shall be proportional for each position.

    b. This 20% increase shall be included as a separate task and released only with written authorization of the District's Engineering Department Manager in accordance with Schedule B – Requirements for Engineering Services.

2. Construction Phase Level of Effort

    a. See Scope of Work, C. Construction Management Phase, Sections B & D. Please provide comments on the adequacy of the estimated inspection hours and suggest any modifications.

CONFIDENTIALITY: All information, documents, records and paperwork, including but not limited to SOQs, bids, exhibits, or brochures (collectively, the "Paperwork") submitted to the District shall not be regarded by the District as secret or submitted in confidence, except as otherwise provided in a writing signed by the District. Please do not mark your Paperwork with legends such as "confidential," or "proprietary," or "not to be disclosed to third parties." The District is a Utah local district and is subject to the provisions of the Utah Government Records and Management Act ("GRAMA," Utah Code Ann. (1953) §§63-2-101 et seq.). Paperwork submitted to the District may be subject to disclosure to third parties under the District's interpretation of the provisions of GRAMA.

Questions or Suggestions

Proposers may ask questions or make suggestions to JVWCD on any element of this Request for SOQs. Questions or suggestions should be submitted to JVWCD's Project Manager, Kevin Rubow at 801-565-4300 or KevinR@jvwcd.org

ATTACHMENT A

PROFESSIONAL CONSULTING SERVICES AGREEMENT

PROFESSIONAL CONSULTING SERVICES AGREEMENT
FOR _____
(PROJECT NO. _____)

This Agreement is made as of _____, _____ ("Effective Date"), by and between the Jordan Valley Water Conservancy District, a water conservancy district organized under the laws of the State of Utah ("District"), and _____ a Utah corporation OPTIONAL WORDING: [a Utah _____/ a (State) _____ _____ authorized to do business and doing business in the State of Utah] ("Engineer").

RECITALS:

A. The District desires to obtain professional engineering services relating to the _____;

B. Engineer represents it has the necessary expertise and experience to perform the services requested by the District and that it is properly qualified and licensed in the State of Utah for this work; and,

C. Engineer has submitted a proposal outlining its proposed scope of activities for performance and completion of the services, and the Engineer is willing to perform the services requested by the District, consistent with the terms of this Agreement.

TERMS:

The parties agree as follows:

ARTICLE I
DEFINITIONS

1.1 Unless the context requires otherwise, the terms defined in this Article shall for all purposes of this Agreement and all schedules, have the following meanings:

1.1.1 Agreement: This Professional Consulting Services Agreement, including attachments.

1.1.2 Contract: The agreement between the District and the Contractor for the provision of labor, materials and equipment for the construction of the Project.

1.1.3 Contract Documents: All documents relating to construction of the Project, issued by or through the Engineer, on behalf of the District to

the Contractor, or by the District, including the Notice Inviting Bids, Instructions to Bidders, Bid, Information Required of Bidder, Bid Bond, Agreement Performance Bond, Payment Bond, General Conditions, Supplemental General Conditions, drawings, specifications, all addenda and change orders executed pursuant to the Contract.

1.1.4 Contractor: The party contracting with the District for the provision of labor, materials and equipment for the construction and quality control of the Project.

1.1.5 Contract Time: The projected date for substantial completion of the Contract.

1.1.6 Engineer's Fee: The Engineer's compensation for performing Services.

1.1.7 Phase: A logically separate aspect of the Engineer's Services on the Project which occurs in sequence or concurrently with other such aspects to allow for the orderly progress and management of the Engineer's Services for the Project.

1.1.8 Project: The Project is described on attached Schedule A.

1.1.9 Project Manager: The individual identified in Schedule D who will administer the performance of the Engineer's Services under this Agreement.

1.1.10 Project Representative: The individual identified in Schedule D who will provide observation and inspection of the construction of the Project. The Project Representative is the sole authorized representative of the District in all on-site relations with the Contractor, except as other properly authorized agents are designated by the Engineer and approved by the District.

1.1.11 Reimbursable Expenses: Non-salary expenditures made by the Engineer, its employees or its sub-consultants when performing services for the Project. Reimbursable Expenses include:

1.1.11.1 Reasonable expenses of transportation, subsistence and lodging when traveling in connection with the performance of services for the Project.

1.1.11.2 Reasonable expenses of long distance or toll telephone calls, telegrams, messenger service, field office expenses, and fees paid for securing approval of authorities having jurisdiction over the Project.

1.1.11.3 Reasonable expenses of all reproduction, postage and handling of drawings, specifications, reports or other Project-related instruments of service of the Engineer.

1.1.11.4 Reasonable expense of computer time as described on attached Schedule E.

1.1.11.5 Other reasonable reimbursable expenses to which the parties subsequently agree.

1.1.12 Hourly Billing Rate: The hourly fee which the Engineer charges for the time expended on the Project. The hourly billing rate shall be considered full compensation for time expended on the Project. Specific hourly billing rates for the Project are identified in Schedule E.

1.1.13 Services or Engineer's Services: The Engineer's duties and responsibilities to the District for professional consulting services as set forth in Article II.

1.1.14 Sub-Consultant: Any registered professional engineer, architect or other specialist engaged by the Engineer in connection with the Project.

1.1.15 Task: An independent and defined service or collection of services to be performed by the Engineer during a Phase(s) of the Project(s), such service or services being more particularly set forth in Schedule A.

1.2 Except where the context otherwise requires, words imparting the singular number shall include the plural and vice versa.

ARTICLE II
ENGINEER'S SERVICES

2.1 Basic Services: The Engineer shall provide the following Services on the Project, as more described and set out in Schedule A.

2.1.1 Pre-design Phase: Complete applicable investigations, evaluations, analyses, surveys, and reports.

2.1.2 Design Phase: Complete all necessary drawings and technical specifications for bidding the construction of the Project.

2.1.3 Construction Phase:

2.1.3.1 The Engineer shall assist the District during bidding and contract execution, administer the Contract, provide field observation and inspection of the Project, and provide management and reporting during the construction phase of the Project.

2.1.3.2 The Engineer shall designate the individuals named in Article IV as Project Manager and Project Representative to be the representatives of the District in its relations with the Contractor, subject to the requirements and limitations set out in the Contract Documents and this Agreement. Other personnel of the Engineer shall be designated as needed to administer the Contract, as further set forth in Section 2.2 and this Agreement.

2.1.3.3 The Engineer shall provide Project representation at the site, as described in Schedule A, in order to provide experienced inspection and observation of the quality and progress of the Contract construction work to verify it complies with the requirements of the Contract Documents, and to advise the District of defects and deficiencies. The Engineer shall direct its efforts toward verifying that the means, methods, techniques or procedures that are specified in the Contract Documents are faithfully observed and followed by the Contractor during construction of the Project, and, except as hereafter provided, that the completed Project conforms to the Contract Documents. The Engineer shall not be responsible for any means, methods, techniques, or procedures of construction selected by the Contractor not specified in the Contract Documents, or for safety precautions and programs incident to the work of Contractor.

2.1.3.4 The Engineer shall have the following powers and is hereby directed to exercise them as in its professional judgment are required to accomplish the above tasks, objectives and responsibilities:

Examine, review and investigate all material, equipment, work and workmanship for compliance with the Contract Documents, including the examination and investigation of plant, mill and shop facilities; require that work done in the absence of observation and examination be removed and replaced under the proper

observation and examination; make such examination and tests, as in its professional judgment are required, to verify that the work is being accomplished in accordance with the Contract Documents; reject work which does not meet the specifications of the Contract Documents and require the Contractor remove and replace such work according to the Contract Documents.

2.1.3.5 If disputes between the Contractor and the District arise, and/or if the Contractor shall file a claim or protest against the District during construction of the Project, the Engineer shall investigate and analyze all such disputes, claims and protests, and attempt to resolve them to the mutual satisfaction of the parties, and failing such resolution, recommend a course of action for the District.

2.1.3.6 The Engineer's recommendation of any payment requested in an application for payment by the Contractor will constitute a representation by the Engineer to the District, based on the Engineer's on-site observations of the Contractor's work in progress as an experienced and qualified design professional and on the Engineer's review of the application for payment and the accompanying data and schedules, that the work has progressed to the point indicated, that to the best of the Engineer's knowledge, information and belief the performance and quality of the work is in accordance with the Contract Documents (subject to an evaluation of the work by the Engineer as a functioning Project upon Substantial Completion as defined in the Contract Documents, to the results of any subsequent tests called for in the Contract Documents, and to any qualifications stated in the recommendation), and that the Contractor is entitled to payment of the amount recommended. However, by recommending any such payment, the Engineer will not thereby be deemed to have represented that the Engineer acted or performed to a standard of care higher than that required of the Engineer under this Agreement and the Contract.

2.2 Guidelines for Basic Services: The Engineer shall perform the Services in conformance with the District's Guidelines for Engineering Services, as set forth in Schedule B, and in conformance with such other guidelines imposed by the District during the progress of the Services, so long as such guidelines are in conformance with standard professional consulting services.

2.3 Additional Services: The District and the Engineer recognize and agree that services not set forth in Schedule A are not covered by the Engineer's Fee and are considered to be additional services. No additional services may be provided by the Engineer, and no compensation shall be paid therefore by the District, except upon written confirmation by the District as an amendment to this Agreement.

Upon request by the District, the following additional services shall be provided by the Engineer:

2.3.1 Perform work resulting from changes in design criteria made in writing at the direction of the District, after acceptance of the criteria by the Engineer;

2.3.2 Prepare applications and supporting documents for government review or action, other than those which may be specified in Schedule A;

2.3.3 Provide additional services required as a result of delinquency or insolvency of one or more of the Contractors; or as a result of damage to the Project caused by fire, flood, earthquake, or other acts of God, wherein damage was not a direct or indirect result of Engineer's negligence or within Engineer's control;

2.3.4 Provide additional services required as a result of strikes, walkouts, or other acts of trade or labor unions;

2.3.5 Provide expert witness testimony or litigation support at depositions, trials, court appearances, and other similar judicial proceedings and cooperate in formulating and responding to interrogatories and other similar discovery methods; and,

2.3.6 Perform any other item of work not specifically mentioned above, and requested by the District in writing.

ARTICLE III
TIME TO COMPLETE

The Engineer's Services, as defined in Article II, shall be completed within the timeframe set forth in Schedule C. Notwithstanding any term or provision of this Agreement to the contrary, all of the Services shall be completed within ___ calendar days after the Effective Date of this Agreement.

ARTICLE IV
ENGINEER'S PERSONNEL

The key personnel identified in Schedule D shall perform the Engineer's Services in the assigned capacities, as shown. Any substitution of key personnel and/or changes in assignments from those shown must be approved by the District in writing before such substitution or change may be made by the Engineer.

ARTICLE V
DISTRICT-FURNISHED SERVICES

5.1 Information: Upon the Engineer's request, the District shall provide to the Engineer or make available for review all information and data contained in record drawings, record documents and other records routinely kept by the District pertaining to the design, construction or operation of its facilities. The District does not warrant the accuracy or completeness of such data and information originating from entities or persons other than the District.

5.2 Review of Documents: The District shall review and consider all sketches, drawings, reports, studies, model results, specifications, bids, proposals, contracts, and other documents submitted by the Engineer relative to Engineer's Services. Whenever prompt action is necessary, the District shall within a reasonable time inform the Engineer of its decision regarding the same so as to not unduly delay the Engineer in its performance according to the schedule set forth in this Agreement.

5.3 Engineer Access: The District shall, at its expense, arrange and make provision for the Engineer's entry and access to such property (public and/or private) as may be necessary to enable the Engineer to perform the Services.

5.4 District Representative: The District shall designate in writing an individual who shall be authorized by the District to act as the District's Representative. The Representative shall have authority to receive reports from the Engineer and give instructions to the Engineer.

OPTIONAL 5.4 District Representative: The District hereby designates and authorizes _____ to act as the District's Representative. The Representative shall have authority to receive reports from the Engineer and give instructions to the Engineer.

5.5 Notifications of Defects: The District shall give written notice to the Engineer whenever the District or its Representative becomes aware of any defect or deficiency in the Engineer's Services.

5.6 Construction Right-of-Way: Where, based upon the Engineer's design work, rights-of-way are required for construction, the District will, at its expense, obtain such rights-of-way, including appraisals and title searches, utilizing descriptions and maps provided by the Engineer.

5.7 Consultation with District: Employees of the District shall be available for consultation with the Engineer at all reasonable times.

5.8 Permit Fees: The District shall pay any required permit fees, charges for plan checking, and any other fees charged by any public agency having jurisdiction over any part of the Project, if such charges are made.

5.9 Legal Opinions: The District shall, at its expense, furnish legal opinions on laws and the interpretation thereof which may affect the Project, if such opinions are judged by the District to be necessary.

ARTICLE VI
COMPENSATION

6.1 Basic Services: The District shall pay to the Engineer as compensation for Services attributable to the Project, the hourly billing rates as set forth in Schedule E multiplied by the number of hours expended on the Project, together with reimbursable expenses attributable to the Project multiplied by ___.

6.1.1 Pre-design and Design Phases: In no event shall the total compensation due the Engineer for the Pre-design and Design Phases, including reimbursable expenses, exceed _____ and ___/100 Dollars ($_____).

6.1.2 Construction Phase: The budget authorized for the Engineer's Services and for reimbursable expenses in the Construction Phase is _____ and ___/100 Dollars ($_____). As work in this Phase reaches seventy-five percent (75%) of the authorized budget set forth in Schedule E, the Engineer shall notify the District, and the Engineer and the District shall thereafter mutually review the extent of work already accomplished, the extent of work remaining to be completed and the past and projected expenses related thereto. At that time, the scope of Services and corresponding compensation for Services for the Construction Phase may be adjusted by the District.

6.2 Additional Services: In the event this Agreement is amended to provide for additional services by the Engineer, the Engineer's compensation for additional services shall be the hourly billing rate multiplied by the hours expended for additional services, and reimbursable expenses attributable to the additional services multiplied by ___.

A summary showing estimated cost data for each additional service requested shall be submitted to the District for approval prior to commencement of work on that additional service. The District shall not be obligated to reimburse the Engineer for costs incurred in excess of the estimated cost set forth in that summary, and the Engineer shall not be obligated to continue work or to incur costs in excess of the estimated cost until the District notifies the Engineer in writing that the estimated cost therefore has been increased. Additional sets of Contract Documents and reduced scale drawings shall be charged at actual cost of printing and mailing.

6.3 Format for Invoices: Invoices for the Engineer's Services and expenses shall be reviewed and signed by the Engineer's Project Manager before being sent to the District. Each invoice shall include the following information:

a. Project Name.

b. Time period of Services (beginning of month to end of month).

c. Current invoice charges, separated into Pre-design, Design and Construction Phases, with the following breakdown:

(i) Charges for Services, further described by:

(1) Employee name.

(2) Hours worked.

(3) Rate charged.

(ii) Reimbursable Expenses:

(1) Description.

(2) Cost.

d. Account summary, including:

(i) Total amount authorized for the Pre-design and Design Phases under this Agreement.

(ii) Total invoiced to date for the Pre-design and Design Phases.

(iii) Total amount authorized for the Construction Phase under this agreement.

(iv) Total invoiced to date for the Construction Phase.

6.4 Progress Payments: The Engineer's invoices for Services performed and for reimbursable expenses shall be delivered to the District after the end of the first calendar month following the Effective Date of this Agreement, and monthly thereafter so long as the Engineer's Services shall continue. The compensation requested on any such invoice shall be itemized to show hourly billing rate multiplied by time charged to the Project and reimbursable expenses which actually were incurred in the month identified in the invoice.

6.5 Payment of Invoice: The amount shown on each invoice for the Engineer's Fee and expenses shall be due and payable by the District after its review and acceptance of the Services itemized in the invoice. The Engineer may levy a simple interest charge of eight percent (8%) per annum on invoice amounts accepted for payment by the District and not paid within forty-five (45) days of the date of delivery of the invoice. Late payments made by the District shall be credited first to accrued interest and then to principal.

6.6 Suspension; Termination: In the event the District fails to submit payment on an invoice within sixty (60) days of the date of delivery to the District of such invoice, the Engineer may, at its discretion and upon ten (10) days written notice to the District, suspend its services or terminate this Agreement.

ARTICLE VII
SPECIAL TERMS AND CONDITIONS

7.1 Documents: All completed original reproducible tracings, survey notes, plans, specifications, reports, engineering calculations, and other original documents prepared by the Engineer in the performance of the Engineer's Services shall be the property of the District, and the Engineer shall, upon the request of the District, deliver such documents to the District. The Engineer may retain and use copies of the documents. The District agrees to hold harmless, indemnify and defend the Engineer against all third party damages, claims, expenses and losses arising out of any reuse by the District of the plans, specifications and documents if the District does not obtain the written authorization of the Engineer for their reuse.

7.2 Governmental Immunity: Except for the District’s obligations of indemnification as set forth in paragraph 7.1, nothing in this Agreement shall adversely affect any immunity from suit, or any right, privilege, claim or defense, which the District or its employees, officers and trustees may assert under state or federal law, including but not limited to the Utah Governmental Immunity Act, Utah Code Ann. (1953)

§§ 63-30-1 et seq. (the “Act”). All claims against the District or its employees, officers and trustees are subject to the provisions of the Act, which Act controls all procedures and limitations in connection with any claim of liability.

7.3 Conflict of Interest: The Engineer shall not establish or otherwise continue any conflict of interest created by virtue of this Agreement, prohibited under state or local laws.

7.4 Termination Prior to Completion: This Agreement may be terminated at any time by the District prior to completion of the Engineer's Services upon written notice to the Engineer. Upon receipt of such notice, the Engineer shall immediately stop any further work in progress, and in such event, the Engineer shall be entitled to payment for all of its Services performed by the Engineer and accepted by the District, to the date of cancellation, and for all work required to organize and deliver to the District the materials developed in the course of the Engineer's Services. Payment shall be due to the Engineer within forty-five (45) days after delivery of such materials and receipt of a verified and itemized invoice therefore.

7.5 Construction Estimates: Estimates of contract time, construction costs and quantities prepared by the Engineer or its employees represent their best professional judgment as design professionals and are supplied for the general guidance of the District. The Engineer does not guarantee the accuracy of such estimates as the Engineer has no control over the cost of labor and material, competitive bidding, or market or other conditions.

7.6 Indemnity and Insurance: The Engineer shall indemnify, defend and hold the District harmless from any claims under the Workers’ Compensation Act, and from any claims, demands, suits, causes of action, costs, fees, judgments, liability for bodily injury and death, and damages to property, real or personal, to the extent caused by or resulting from breach of contract, negligence, recklessness or intentional misconduct by the Engineer or by the negligence of the Engineer’s subconsultants, in the performance of the Engineer's Services under this Agreement. During the course of this Agreement, and for a period of four (4) years following Substantial Completion of the Engineer’s Services under this Agreement, the Engineer shall maintain both professional errors and omissions liability insurance and general commercial liability insurance providing coverage for all liability arising out of the performance of Services in connection with the Project and this Agreement. The liability insurance required shall include "prior acts" coverage for all services rendered for the Project and shall be written with a limit of liability of $500,000.00 per claim and a Project aggregate of $1,000,000.00.

7.7 Interpretation: Except as otherwise noted, releases from liability, indemnification against liability, limitations on liability, assumptions of liability and limitations on remedies which may be expressed in this Agreement, shall apply to all possible claims and/or causes of action, including but not limited to those arising under common law, equity, statute, contract, tort or otherwise.

ARTICLE VIII
GENERAL TERMS AND CONDITIONS

8.1 Standards of Performance: The Engineer shall perform its Services in a manner consistent with the professional skill and care ordinarily provided by other design professionals with the same or similar professional license, providing the same or similar design professional service in the same or similar locality at the same or similar time under the same or similar circumstances.

8.2 Force Majeure: Neither party shall hold the other responsible for damages or delays in performance caused by acts of God, strikes, lockouts, accidents, acts of any governmental entity having jurisdiction over the parties and/or the subject matter of this Agreement (other than those governmental entities named as parties or beneficiaries to this Agreement), or other events beyond the reasonable control of the other or the other's employees and agents. In the event either party claims that performance of its obligation is prevented or delayed by such cause, that party shall promptly notify the other party of that fact and the circumstances preventing or delaying performance.

8.3 Assignment: Neither the District nor the Engineer shall delegate and/or assign their respective duties and/or rights under this Agreement without the prior written consent of the other. The Engineer may subcontract, however, portions of the Services as it deems necessary to efficiently accomplish the Basic Services. Nothing in this paragraph shall release the Engineer from full compliance with the terms and conditions of Article IV.

8.4 Severability; Waiver: In the event a court, governmental agency or regulatory agency with proper jurisdiction determines that any provision of this Agreement is unlawful, that provision shall terminate. If a provision is terminated, but the parties can legally, commercially and practicably continue to perform this Agreement without the terminated provision, the remainder of this Agreement shall continue in effect. One or more waivers by either party of any provision, term, condition or covenant shall not be construed by the other party as a waiver of any subsequent breach of the same by the other party.

8.5 Governing Law: This Agreement shall be governed by, construed and enforced according to the laws of the State of Utah.

8.6 Merger; Amendments: This Agreement and the Contract Documents, including all amendments, represents the entire and integrated agreement between the District and the Engineer, and supersedes all prior negotiations, representations or agreements, whether written or oral, regarding the subject matter contained in this Agreement. The Agreement may be amended only by written instrument executed by all parties.

8.7 Attorney's Fees: In the event of a default or breach of this Agreement, the defaulting party agrees to pay all costs incurred by the non-defaulting party in enforcing this Agreement or in obtaining damages, including reasonable attorney's fees, whether incurred through legal proceedings or otherwise.

8.8 Notice: Any formal notice required to be given under this Agreement shall be deemed given when hand-delivered or when sent by registered or certified mail, return receipt requested, to the parties at their respective addresses stated below or to any other address after notice of such change of address has been given to the parties.

8.9 Third Party Beneficiaries: Nothing contained in this Agreement shall create a contractual relationship with a cause of action in favor of a third party against either the District or the Engineer. The Engineer's Services under this Agreement are being performed solely for the District's benefit, and no other entity shall have any claim against the Engineer because of this Agreement or the performance or non-performance of Services hereunder. The District agrees to use reasonable efforts to include a provision in all contracts with other contractors and other entities involved in the Project to carry out the intent of this paragraph.

"District":	"Engineer":
Jordan Valley Water Conservancy District 8215 South 1300 West West Jordan, Utah 84088	_____ _____ _____
By: _____ Barton A. Forsyth Its General Manager/CEO	By: _____ [Name] Its _____

SCHEDULE A

SCOPE OF WORK

SCHEDULE B

GUIDELINES FOR ENGINEERING SERVICES

SCHEDULE C

TIME TO COMPLETE

SCHEDULE D

ENGINEER'S PERSONNEL

SCHEDULE E

COMPENSATION

SCHEDULE B

GUIDELINES FOR ENGINEERING SERVICES

ATTACHMENT B

SCHEDULE B - GUIDELINES FOR ENGINEERING SERVICES

SCHEDULE B
REQUIREMENTS FOR ENGINEERING SERVICES

1. CONTINGENCY FUNDS

A. Design Contingency funds shall not be utilized without prior authorization by the District. The use of Design Contingency funds shall be authorized in writing by District management on a task by task basis.

2. PRE-DESIGN/DESIGN PHASE

B. DRAWINGS

1.1 Computer-Aided Drafting (CAD) shall be used to prepare construction drawings. The drawings shall be delivered to the District in electronic form (AutoCAD 2016 or more recent) and hard copy on 11 x 17 paper.

1.2 Document Format:

a. Electronic documents shall be prepared in the following versions:

i. Spreadsheets in Excel version 2013

ii. Word processing in Word version 2013

iii. Presentations in PowerPoint version 2013

1.3 The cover sheet shall not include approval signatures from the District, although names of District officers may be printed.

1.4 The drawings shall be submitted to the District for its review and comment in accordance with paragraph E of this schedule, “Review of Contract Documents.”

1.5 All drawings shall show the District’s assigned Project number in the lower, right hand corner of the sheet.

2.1 Bidding and Contractual Documents: The Engineer shall provide Project-specific information to the District for completion of the District's standard bidding and contractual documents identified below. The Engineer shall provide the bid schedule to the District in hard copy and electronic format (Microsoft Word). The District shall print the documents. The following paper colors and format shall be used by the District when printing these documents:

2.1.1	Title Page	Single, Sided, White
2.1.2	Table of Contents	Double-Sided, Yellow
2.1.3	Notice Inviting Bids	Double-Sided, White
2.1.4	Instructions of Bidders	Double-Sided, White
2.1.5	Bid	Single-Sided, Blue
2.1.6	Bid Bond	Single-Sided, Blue
2.1.1	Information Required of Bidder	Single-Sided, Blue
2.1.2	Agreement	Double-Sided, White
2.1.3	Performance Bond	Single-Sided, White
2.1.4	Payment Bond	Single-Sided, White
2.1.5	Notice of Award	Single-Sided, White
2.1.6	Notice to Proceed	Single-Sided, White
2.1.7	Payment Application	Single-Sided, White
2.1.8	Change Order	Single-Sided, White
2.1.9	Contractor's Certificate of Substantial Completion	Single-Sided, Purple
2.1.10	Contractor's Certificate of Final Completion	Single-Sided, Purple
2.1.11	Consent of Surety for Final Payment	Single-Sided, Purple
2.1.12	Affidavit of Payment	Single-Sided, Purple

2.2 General and Supplemental Conditions: The District will provide General and Supplemental General Conditions; to be printed on green and yellow paper, respectively.

2.3 Technical Specifications:

2.3.1 The Engineer shall prepare technical specifications in electronic form (Microsoft Word). The technical specifications shall be delivered to the District prior to the bidding in electronic form and single-sided on 8 ½ x 11 white paper.

2.3.2 The draft sets of technical specifications shall be submitted to the District for its review and comment in accordance with paragraph E of this Schedule.

2.3.3 The technical specifications shall include, but not be limited to, the following General "Divisions."

2.3.3.1 General Requirements of the Work.

2.3.3.2 Contract Submittals – Include Submittal procedures requirements for equipment shop-drawings, record drawings, and submission of technical O&M manuals, spare parts lists, etc., prior to final payment.

2.3.3.3 Quality Control, Inspection, Testing.

2.3.3.4 Protection and Restoration of Existing Facilities.

2.3.3.5 Equipment Testing and Startup – Include requirements for testing, startup, certification of installation, and training of District personnel by manufacturer's representative for complex equipment.

2.3.3.6 Project Closeout Procedures and Requirements – These procedures and requirements must match the requirements, in the District's General Conditions.

2.3.3.7 Measurement and Payment – This should be explained in a separate section, or in each work item section of the technical specification.

2.3.3.8 Field Staking and Surveying – Include defining whether the Engineer or Contractor shall be responsible for field surveying and staking.

2.4 Addenda: If addenda are to be issued, each addendum will be prepared by the Engineer. The addendum will be approved, signed, and delivered by the District.

C. DOCUMENT BINDING REQUIREMENTS

3.1 With the exception of 11x17 drawings, all documents produced by the Engineer shall be bound in a three ring binder. This shall include pre-design reports, final reports, operation and maintenance manuals, etc. Drawings may be comb-bound during bidding and construction. As-constructed drawings shall be (1) comb-bound and (2) folded and included in three ring bound operation and maintenance manuals.

D. DESIGN REQUIREMENTS

4.1 All engineering designs shall include the following elements.

4.1.1 Adequate seismic bracing/anchorage of piping and equipment.

4.1.2 Provision of flexibility for differential settlement where buried piping and/or electrical conduit penetrates concrete vaults or basements.

4.1.3 All other standard engineering design issues shall be addressed.

E. REVIEW OF DRAWINGS AND TECHNICAL SPECIFICATIONS

5.1 The Engineer shall prepare one electronic set (PDF) and one photo copy ready paper set of drawings and technical specifications for review by the District.

5.1.1 Review documents shall be provided at the following minimum progress landmarks: ten percent (10%), thirty percent (30%), fifty percent (50%), ninety percent (90%) and one hundred percent (100%). If specified in the Scope of Work (Exhibit A) more landmarks may be required. A two-week minimum review period shall be allowed for review of the drawings and technical specifications at each progress landmark. At each progress landmark the Engineer shall

meet with the District for two to four hours to receive its comments and direction.

5.1.2 The Engineer shall return to the District, with each subsequent specification to be reviewed, all documents reviewed by the District during the previous submittal.

F. RIGHT-OF-WAY DESCRIPTIONS

Unless otherwise specified by the District, the Engineer will prepare legal descriptions for right-of-way to be acquired by the District from ownership plats and deeds, rather than by the actual survey. The District will prepare easement and other documents, utilizing legal descriptions prepared by the Engineer. Legal descriptions shall be in a metes and bounds format acceptable to the local County Recorder, which may record the document(s).

3. CONSTRUCTION SERVICES PHASE

A. PROJECT PERSONNEL

1.1 Engineer: The Engineer shall represent and perform Engineering Services for the District within the scope of authority delegated to it by the District as described in this Schedule B.

1.2 The Engineer will appoint, subject to the District's approval, the following personnel:

1.2.1 Project Manager: The individual designated by the Engineer and approved by the District to oversee and manage the administration of the Contract. The Project Manager shall supervise the Project Representative; alternatively, the Project Representative may also serve as the Project Manager as provided in Article IV of the Agreement.

1.2.2 Project Representative: The individual of the Engineer's firm appointed as Project Representative will be the Engineer's chief representative in all construction site relations with the Contractor and will have all authority and responsibility as set forth in the District's General Conditions of the Contract.

1.2.3 Other Personnel: The Project Manager may assign, and will supervise, such portions of contract administration

duties as he deems necessary, such as reviewing submittals, performing design changes, and substituting for the Project Representative on the construction site during brief absences of the appointed Project Representative. During brief absences of the assigned Project Representative the Project Manager will first send written notice to the Contractor and will notify the District.

B. CONTRACT EXECUTION ASSISTANCE

2.1 The District will issue the Notice of Award and Notice to Proceed to the Contractor.

2.2 Following Contract execution by the District, fully executed Contracts will be distributed by the District as follows:

District	One (1) Set
Contractor:	One (1) Set
Engineer:	One (1) Set

These three (3) sets will be bound in three-ring binders.

C. PRE-CONSTRUCTION CONFERENCE

3.1 The Project Manager and Project Representative shall familiarize themselves with the District's General Conditions of the Contract.

3.2 The Project Manager will prepare a Pre-Construction Conference agenda, and conduct such a conference with the Contractor and applicable third parties at the District's office or on-site. The Project Representative and District Representative shall be present. The agenda should cover the key points of the Contract Documents, including the General Conditions of the Contract, as well as other Project administration matters.

D. SUBMITTAL/SUBSTITUTIONS

4.1 The Project Manager shall review, process, and recommend approval/disapproval of Contractor submittals and substitution requests. Copies of each Contractor submittal and substitution request shall be sent to the District, together with the Project Manager's recommend action.

The District will direct the Engineer to approve/disapprove each submittal and substitution request.

E. INSPECTION/TESTING

5.1 The Project Representative will make all on-site inspections, with the general frequency and duration as directed by the District.

5.2 The Project Representative is authorized to order such tests as he deems necessary for proper administration and inspection of the Project, however, with respect to any such test to be performed by independent firms presently contracting directly with the District, the firm so contracting will be designated by the District to perform the tests. Reports of all test results, or test summaries, shall be submitted to the District by the Project Representative.

5.3 The Project Representative shall keep a daily written log of construction activities at the site during each visit. Copies of the daily log shall be sent to the District on a monthly basis.

5.4 The Project Representative's daily log shall include a comment of whether or not any event or circumstance has developed in the Contract or Project, which in the Project Representative's professional judgment may lead to a claim or protest from the Contractor. The Project Representative shall notify the District immediately of such an event or circumstance, receipt of a written claim or protest, or his becoming aware of events which may lead to such a claim, from the Contractor.

5.5 The Project Representative shall send to the District copies of notes from telephone calls or meetings with the Contractor that, in the opinion of the Project Manager, are significant.

5.6 The Project Representative shall take digital photographs of the construction in progress during each phase of the work. The Project Manager shall prepare a photographic history of the work as described in paragraph 10.3. The format of the digital photographs shall be in accordance with paragraph 10.3. Photographs shall be submitted periodically to the District during the construction phase of the work.

F. CHANGES IN THE WORK

6.1 Field Order: The Project Representative is authorized to, and shall issue all field orders in writing, as described in Article 1.14 of the General Conditions of the Contract. The Project Representative shall submit a copy of each field order to the District.

6.2 Change Orders: The Project Representative and Project Manager are not authorized to approve Change Orders. Change orders may be initiated by the District, by recommendation from the Project

Manager, or by claim of changed conditions by the Contractor. Change orders will be initially reviewed by the Project Manager, then forwarded with a recommendation to the District. The District shall consider if the recommendation is consistent with the Contract Documents, and if acceptable, the District will prepare the change order form for approval by the authorized District staff.

6.3 Emergencies: The District acknowledges that in emergencies immediately affecting the safety or protection of persons or property affected by the construction activities, the Contractor, without special instruction or authorization from the Project Representative or the District, is obligated to act to prevent threatened damage, injury or loss. The Contractor shall give the Project Representative prompt written notice of any significant changes in the Contract construction or deviations from the Contract Documents caused thereby.

G. PROGRESS MEETINGS

7.1 The Project Representative and/or the Project Manager shall attend progress meetings conducted by the Contractor, and shall document the content of the meetings with minutes. Progress meetings will be scheduled at a location and frequency suitable to the project needs. A District Representative will normally attend these meetings.

H. PROGRESS PAYMENTS

8.1 The Project Representative shall receive applications for payment from the Contractor, review and recommend the applications by signature. The Project Representative's signature recommending a progress payment shall constitute the verification of the representations required by the Agreement and the Contract.

8.2 The Project Manager will review the applications, approve them by signature, and submit them to the District within five business days of receipt from the Contractor.

8.3 Each application for payment shall contain the Contractor's certification and signature substantially in conformance with the following:

CONTRACTOR'S CERTIFICATION

The undersigned Contractor certifies that: (1) all previous progress payments received from Owner on account of Work done under the

Contract referred to herein have been applied to discharge in full all obligations of Contractor incurred in connection with Work covered by prior Applications for Payment numbered 1 though ____ inclusive; and (2) title to all materials and equipment incorporated in said Work or otherwise listed in or covered by this Application for Payment will pass to Owner at time of payment free and clear of all liens, claims, security interests and encumbrances (except such as covered by bond acceptable to Owner).

_____

Contractor (Name of Sole Ownership, Corporation or Partnership)

_____

Signature of Authorized Representative

_____ _____

Title Date

8.4 In accordance with State Law, the District will retain 5% of progress payments until the final payment and final completion of the Project.

4. PROJECT CLOSEOUT

1.1 The Project Manager shall be responsible to see that closeout procedures and documents, as specified in the District's General Conditions, are carefully observed. The following standard District forms, or similar forms of the Engineer acceptable to the District, will be used.

1.1.1 Contractor's Certificate of Substantial Completion

1.1.2 Engineer's Notice of Substantial Completion

1.1.3 Contractor's Certificate of Final Completion

1.1.4 Engineer's Notice of Final Completion

1.1.5 Consent of Surety for Final Payment

1.1.6 Affidavit of Payment (from Contractor)

1.2 The Project Manager will submit original copies of the Contractor's Certificates of Substantial and Final Completion to the District.

1.3 The Project Manager shall prepare and sign the Engineer's Certificate of Substantial Completion, a copy of which is attached.

1.4 The Project Manager will prepare, sign and submit the Engineer's Notice of Final Completion, together with the Final Payment application and all submittals required from the Contractor, when he is satisfied the work is complete. A copy of the Engineer's Notice of Completion is attached. The District's acceptance, as Owner, of the Notice of Final Completion will be evidenced by its making final payment.

5. OPERATION AND MAINTENANCE MANUAL

1.1 The Project Manager shall prepare an Operation and Maintenance Manual ("O&M Manual") for the Project. The O&M Manual shall be completed within seven (7) calendar days of Substantial Completion of the work. The intent for the O&M Manual is to be a reference for unfamiliar users of the Project facilities to become familiar with the operation of the facilities, receive direction on how and when to maintain the facilities, and be able to locate technical support reference when necessary.

The District wishes to have the O&M Manual in electronic format as much as possible. Although certain formats of electronic documents are defined in this Agreement, the District recognizes that technology will change and improve over time and encourages the Project Manager to look for creative ways of providing O&M Manuals in electronic versions as much as possible. For example, the Project Manager could require the Contractor to submit O&M Manual information in HTML, PDF or another universal standard electronic format that could be easily accessed by the District in the future.

The format of the O&M Manual shall be as follows:

<u>Volume I (By Engineer)</u>:

Section 1: Description of Facilities, Typical Operating Conditions, Standard Operating Procedures
Section 2: Description of Proper Maintenance Activities
Section 3: List of Equipment and Suppliers
Section 4: Contract Documents and Specifications
Section 5: Record Drawings (see 10.2)
Section 6: Project Photo Log (see 10.3)
Section 7: Other Pertinent Documents
Section 8: Compact Disc

Volume II (By Contractor):

Section 7: Shop Drawings
Section 8: Manufacturer's Literature and Operations & Maintenance Manuals

All the information in Volume I shall be in an electronic format as well as in paper format.

Unless specifically identified in the request for proposal, the Project Manager shall supply four (4) copies of the O&M Manual complete with electronic versions of information contained in the O&M Manual and one (1) additional copy of the electronic information.

1.2 The Project Manager will revise the original drawings to reflect record conditions, from the Contractor's marked-up record drawings and the Project Representative's inspection notes, sign and stamp them as follows:

JVWCD RECORD DRAWINGS:

Revisions drawn by _____ Date: _____

This record drawing has been prepared to reflect conditions as actually constructed, from records compiled during construction by the Contractor and the Engineer.

_____ _____
Project Manager Date

The record drawings are not intended to show in detail the exact location of minor/latent detail of construction. Instead, they are intended to represent as-built conditions in as much detail as practical and available, and to document substantial changes from the original design. The District recognizes that much of the information required to prepare the record drawings is compiled by the Contractor or others during construction, and therefore holds the Engineer harmless from any errors or omissions which may be incorporated into the drawings as a result.

The record drawings will be delivered to the District following Project completion. The record drawings shall be submitted in electronic ((a) AutoCAD 2016 or more recent and (b) PDF format) and (c) paper (11x17) format.

1.3 The Project Manager shall submit the complete photo history of the Project compiled during construction. The photo history shall be in electronic and paper formats. Both versions shall contain all photographs in chronological order with a date and caption below each photo.

The electronic version shall contain 4” x 6” photos in a JPEG format with a resolution of 150 dots per inch (DPI) or higher. If compressed the compression must be a high quality compression.

The paper version shall contain thumbnail-size photographs with no more than twelve (12) photos per 8-1/2” x 11” page.

ENGINEER'S NOTICE OF SUBSTANTIAL COMPLETION

OWNER ENGINEER

TO: Jordan Valley Water
Conservancy District
8215 South 1300 West
P. O. Box 70
West Jordan, UT 84088-0070

PROJECT NAME: _____

Date of Notice to Proceed: _____ Contract Time: _____
Calendar Days _____

In response to Contractor's Certificate of Substantial Completion dated: _____

This Certification of Substantial Completion applies to all work under the Contract Documents or to the following specified parts thereof:

The work to which this Certificate applies has been inspected by authorized representatives of Owner, Contractor and Engineer, and that work is hereby declared to be substantially complete in accordance with the Contract Documents on:

Date of Substantial Completion: _____, 20___.

A list of items to be completed or corrected is attached hereto. This list may not be all-inclusive, and the failure to include an item in it does not alter the responsibility of the Contractor to complete all the work in accordance with the Contract Documents. In accordance with the General Conditions, the items in the list shall be completed or corrected by the Contractor within 45 days of the above date of Substantial Completion.

Marked-up record drawings and operation and Maintenance technical information has been received from the Contractor.

The recommended responsibilities between the Owner and the Contractor for security, operation, safety, maintenance, heat, utilities and insurance, if any, shall be as follows:

Owner: _____
_____
_____

Contractor: _____
_____

ENGINEER'S NOTICE OF SUBSTANTIAL COMPLETION (Continued)

The following documents are attached to and made a part of this Certificate:

_____

_____

Execution of this Certificate by the Engineer extends the Contractor's release of claims against the Owner to the date of execution hereof, in accordance with Article 14.08 of the General Conditions, except for written claims filed prior to date of execution, of which the following, if any, are known to the Engineer:

_____

_____

Executed by the Engineer on _____, 20___.

_____	_____
Project Representative	Signature
_____	_____
Project Manager	Signature

The Contractor hereby acknowledges receiving this Certificate of Substantial Completion.

_____

Contractor (Name of Sole Ownership, Corporation or Partnership)

_____

Signature of Authorized Representative

_____	_____
Title	Date

(Engineer shall submit to the Owner a copy with the Contractor's signature following the Contractor's receipt.)

JORDAN VALLEY WATER CONSERVANCY DISTRICT

ENGINEER'S NOTICE OF FINAL COMPLETION

OWNER ENGINEER

TO: Jordan Valley Water
Conservancy District
8215 South 1300 West
West Jordan, UT 84088

PROJECT NAME: _____

Date of Notice to Proceed: _____

In response to Contractor's Certificate of Final Completion dated: _____

On the basis of our observation of the work during construction and final inspection, and on our review of the Contractor's application for final payment and accompanying documentation, we are satisfied that the Contractor has fulfilled all his obligations under the Contract Documents requisite to final payment.

The following remaining minor deficiencies in the work are recommended to be exempt from final payment, in accordance with Article 14.09 of the General Conditions of the Contract. Recommended completion time limits, extended warranty requirements, and the value of these exempt deficiencies are listed below:

DEFICIENCY	COMPLETION TIME	VALUE

The Contractor's application for final payment together with the following contractor submittals, which comprise all final submittal requirements under the Contract Documents, are submitted herewith:

1. Affidavit of Payment from the Contractor.

2. Consent of Surety for final payment.

The date of our satisfactory final inspection was _____, 20___. This date marks the beginning of the one-year Maintenance and Guarantee period, in accordance with Article 13.01(B) of the General Conditions of the Contract.

Acceptance of final payment by the Contractor shall be a release of claims against the Owner in accordance with Article 14.12 of the General Conditions of the Contract. Acceptance of this Notice of Completion by the Owner makes the Contractor's release effective on the date of execution hereof by the Engineer, excepting written claims filed by the Contractor prior to said date of execution of which the following are known to the Engineer:

_____

_____

Is the Engineer aware of any unresolved liens against the Contractor from suppliers or subcontractors?

☐ Yes ☐ No

Unresolved Liens (If Applicable):

_____

_____

_____

Executed by the Engineer on _____, 20___.

_____	_____
Project Representative	Signature
_____	_____
Project Manager	Signature

ATTACHMENT C

SAMPLE FEE PROPOSAL

Project Name
Fee Proposal Template Example

Client: Jordan Valley Water Conservancy District ***Firm Name:***

Date:

Tasks	Project Manager (Name)	Project Engineer (Name)	Project Rep. (Name)				Total Hours	Cost By Task
Team Member	$_____/hr	$_____/hr	$_____hr	$_____/hr	$_____/hr	$_____/hr		
Pre-Design Phase								
1.								
2.								
							Subtotal:	
Design Phase								
1.								
2.								
							Subtotal:	
Total Hours by Team Member								
							TOTAL PRE-DESIGN/DESIGN COST	$
							20% CONTINGENCY	$
Construction Phase								
1. Bidding Support								
2. Construction Management								
3. Documentation								
							Subtotal:	
Total Hours by Team Member								
							TOTAL CONSTRUCTION MANAGEMENT COST	$
Direct Charges:								
							TOTAL DIRECT CHARGES	$
							TOTAL FEE	$

_____
Principal's Name

_____
Principal's Signature

_____
Date

APPENDIX A

ETIENNE WAY REDEVELOPMENT RESULTS

HANSEN ALLEN & LUCE inc
ENGINEERS

TECHNICAL MEMORANDUM

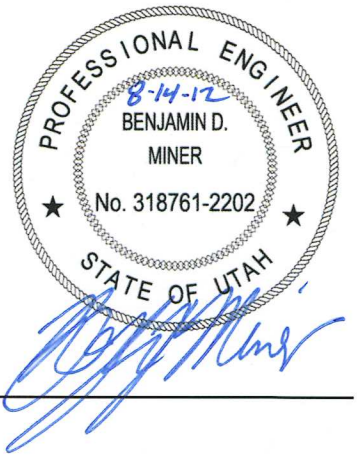
DATE: August 14, 2012

TO: Mr. Shane Swenson, P.E.
Jordan Valley Water Conservancy District (District)
8215 South 1300 West
West Jordan, Utah 84084

FROM: Benjamin D. Miner, P.E.
Hansen, Allen & Luce, Inc. (HAL)
6771 South 900 East
Midvale, Utah 84047

PROJECT: 2776 East Etienne Way Production Well
Redevelopment Results

PROJECT NO: 127.23.300



INTRODUCTION

The Etienne Way Well is a District well that was constructed in 2006 and completed in 2007. During test pumping, it was noted that the well's performance was less than expected, in that the available flowrate was less than predicted for the resulting drawdown. The original pump test data is included in the report titled *Jordan Valley Water Conservancy District – Drilling of Two Production Wells … Etienne Way Well – Well Drilling Summary Report, HAL, 2009.* A description of additional analyses and recommendations was included in a letter to the District dated March 27, 2007. This letter suggested that during construction drilling fluids may have entered the aquifer, causing it to partially plug. The letter recommended that additional well development methods be applied to the well to attempt removal of these drilling fluids.

Additional well development and aquifer pumping tests have now been performed. Development included horizontal jetting with drilling fluid dispersant, dual swab surging with a cable tool rig, and development by pumping, with chlorine and drilling mud dispersant. The District requested that HAL evaluate the 2012 test pump data to identify changes in well performance.

CONSTANT RATE TEST PUMPING

A constant rate test pump was performed on June 6 & 7, 2012. The pumping rate was 4,000 gpm. The static water level, as reported by the well development and test pumping contractor, Widdison Turbine Service, prior to the test was 402.08 feet below ground surface (bgs). After pumping for 24 hours, the water level was reported as 546.55 feet bgs, for a drawdown of 144.47 feet. Occasional water level measurements were taken by the contractor at the nearby

monitoring well. A chart showing the water level with respect to time is attached.

RESULTS

Specific Capacity

A comparison of the specific capacity before and after the recent well development work is possible. In 2007, a step test was performed wherein the well was pumped at 4,000 gpm for three hours. A comparison is made with the 2012 constant rate test after three hours. The results are included in Table 1, as follows:

TABLE 1. SPECIFIC CAPACITY AT 4,000 GPM

YEAR	SPECIFIC CAPACITY AT 4,000 GPM (gpm/ft drawdown)
2007	21.3
2012	30.4

As shown in Table 1, the specific capacity of the 2012 test is 43% higher than the specific capacity of the 2007 test. This improvement indicates that the well development activities performed were very effective at improving well efficiency.

Pumping Rates and Pumping Water Levels

Improvements in well efficiency can also be observed by looking at the pumping water levels in the 2007 and 2012 constant rate tests. The production flowrates and pumping water levels are provided in Table 2.

TABLE 2. FLOWRATE AND PUMPING WATER LEVELS

YEAR	PRODUCTION FLOWRATE (gpm)	PUMPING WATER LEVEL (ft bgs)
2007	3,000	582
2012	4,000	547

Note: The highest screened zone starts at 535 feet bgs.

It may be observed from the information provided in Table 2 that the pumping water levels were similar during the 2007 and 2012 tests, but that the latter flowrate is 1,000 gpm higher. This indicates an improvement in available flowrate of over 33%.

Well Losses

While improvements have been made to the Etienne Way Well efficiencies, it appears that significant losses remain at the well. At the end of the 2012 constant rate test, the water level in the monitoring well was 396.4 feet bgs, while the water level in the Etienne Way Well was 546.6 feet bgs. Therefore, the water level in the Etienne Way Well was approximately 150 feet lower than the monitoring well, which is only about 40 feet away. This information indicates that a steep groundwater gradient remains between the two wells.

A hydraulic model of the two wells was created using the Theis Equation for Confined Aquifers. This model predicted that the theoretical water level in the Etienne Way Well could be around 30 feet lower than the monitoring well (rather than 150 feet), although turbulence losses and casing losses would be in addition to indicated prediction and could be significant.

Another possible indicator of high well loss is the occurrence of rapid drawdown at startup and a rapid recovery once the pump is shut-down. This shows that the aquifer has the capacity to respond quickly, suggesting that losses may be due to the well rather than the aquifer. The Etienne Way Well demonstrated both a quick drawdown and recovery. In particular, the well recovery was over 80% complete in less than 1.5 minutes.

CONCLUSION

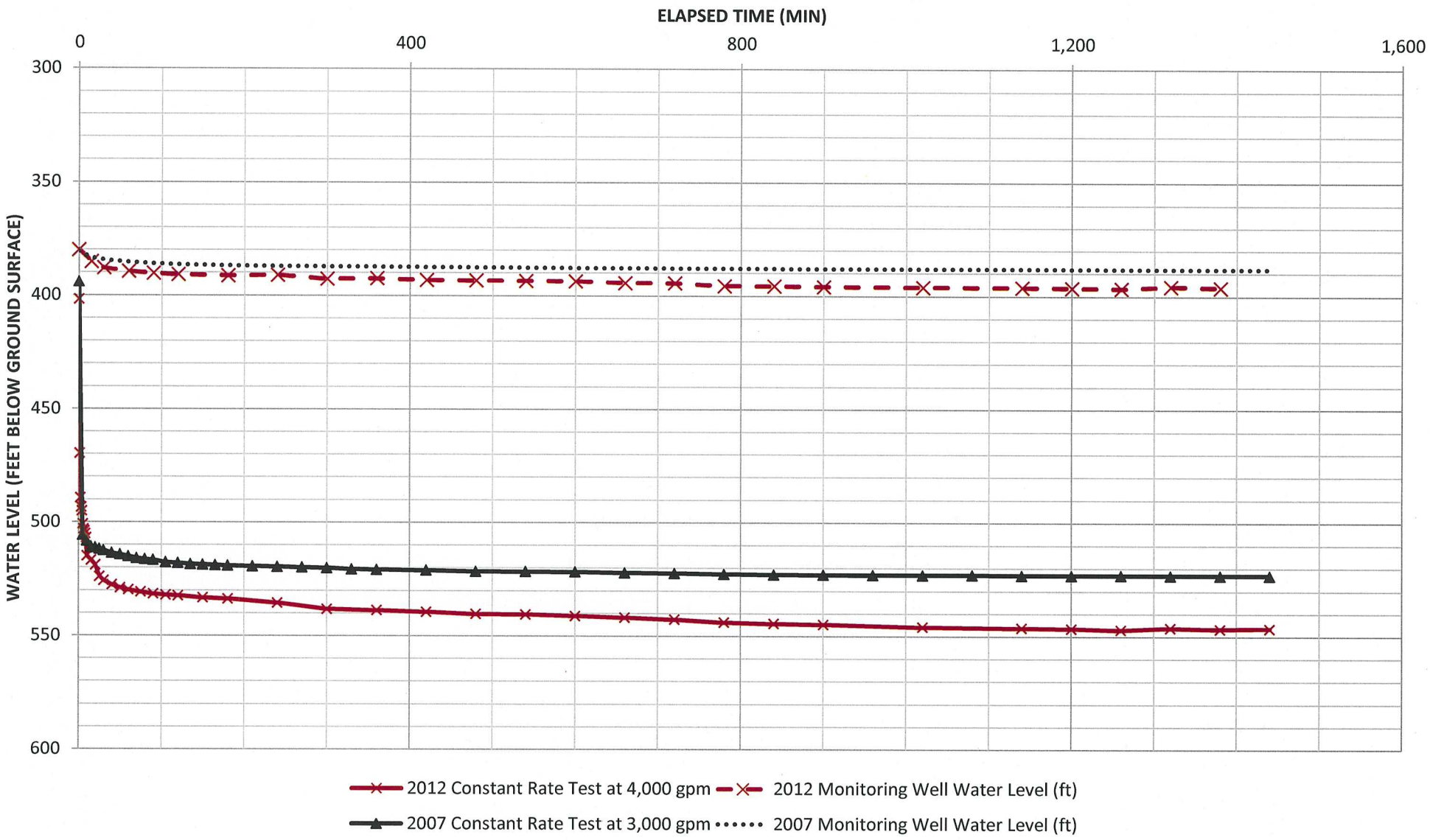
Significant efficiency and capacity improvements have occurred as a result of development efforts at the Etienne Way Well. The flowrate for a given drawdown has improved by over 33%, and the specific capacity has increased by 43%. However, it appears that losses at the well remain high. Further improvement is likely possible with additional development. The degree of improvement that is achievable by the methods used previously will likely be similar to or less than the improvements that have been seen to date for comparable levels of development effort. If the District pursues additional development of the Etienne Way Well, efficiency and capacity evaluations should be made periodically to assess the level of improvement.

Attachments:

- 2007 & 2012 Test Pump Graph

JVWCD - ETIENNE WAY WELL REDEVELOPMENT

24 HR CONSTANT RATE TESTS - 2007 & 2012



APPENDIX B

WELL DRILLER'S REPORTS

8300 S ETIENNE WAY

WELL DRILLER'S REPORT

WELL DRILLER'S REPORT
State of Utah
Division of Water Rights

RECEIVED
JUN 01 2007
WATER RIGHTS
SALT LAKE
WIN: 19785

For additional space, use "Additional Well Data Form" and attach

Well Identification

Change Application: a22152 (57-3016)

Owner *Note any changes*

Jordan Valley Water Conservancy District
P.O. Box 70
West Jordan UT 84084-0070

Contact Person/Engineer: Shane Swensen (Tyler Shelley / Hansen, Allen + Luce Inc.)

Well Location *Note any changes*

S 850 W 465 from the W4 corner of section 35, Township 2S, Range 1E, SL B&M

Location Description: (address, proximity to buildings, landmarks, ground elevation,local well #)

Drillers Activity Start Date: 7-25-2006 Completion Date: 1-22-07

Check all that apply: [X] New [ ] Repair [ ] Deepen [ ] Clean [ ] Replace [ ] Public Nature of Use:

If a replacement well, provide location of new well. _____ feet north/south and _____ feet east/west of the existing well.

DEPTH (feet) FROM	TO	BOREHOLE DIAMETER (in)	DRILLING METHOD	DRILLING FLUID
0	260	48	~~Reverse~~ Bucket Auger ~~Circulation~~ Rotary	~~Bentonite Mud~~ None
260	1050	32	Reverse Circulation Rotary	Bentonite Mud

Well Log

DEPTH (feet) FROM	TO	WATER	PERMEABLE High	PERMEABLE Low	UNCONSOLIDATED CLAY	SILT	SAND	GRAVEL	COBBLES	BOULDER	OTHER	CONSOLIDATED ROCK TYPE	COLOR	DESCRIPTION AND REMARKS (e.g., relative %, grain size, sorting, angularity, bedding, grain composition density, plasticity, shape, cementation, consistancy, water bearing, odor, fracturing, minerology, texture,degree of weathering, hardness, water quality, etc.)
0	80						X						White	Sand
80	110						X							Sand
110	125							X						Gravel, Rock, Sand
125	130						X							sand
130	140				X									Clay, Gravel, Sand
140	155													Rock, Sand, Gravel
155	200							X						Gravel, Sand
200	335				X									Clay
335	345				X									Clay, Rock, Sand
345	440				X									Clay, Gravel

Static Water Level

Date 1-22-07 Water Level 392 feet Flowing? [ ] Yes [X] No

Method of Water Level Measurement Electric Sounder If Flowing, Capped Pressure _____ PSI

Point to Which Water Level Measurement was Referenced _____ Elevation _____

Height of Water Level reference point above ground surface _____ feet Temperature 40 degrees [ ] C [X] F

Well Log

WELL DRILLER'S REPORT ADDTIONAL DATA FORM
State of Utah
Division of Water Rights

RECEIVED
JUN 0 1 2007
WATER RIGHTS
SALT LAKE

Well Identification

Change Application: a22152 (57-3016)

Owner *Note any changes*

Jordan Valley Water Conservancy District
P.O. Box 70
West Jordan UT 84084-0070

Contact Person/Engineer: Shane Swensen

Well Location *Note any changes*

S 850 W 465 from the W4 corner of section 35, Township 2S, Range 1E, SL B&M

Location Description: (address, proximity to buildings, landmarks, ground elevation,local well #)

Well Log

DEPTH (feet) FROM	TO	WATER	PERMEABLE High	PERMEABLE Low	UNCONSOLIDATED CLAY	SILT	SAND	GRAVEL	COBBLES	BOULDER	OTHER	CONSOLIDATED ROCK TYPE	COLOR	DESCRIPTION AND REMARKS (e.g., relative %, grain size, sorting, angularity, bedding, grain composition density, plasticity, shape, cementation, consistancy, water bearing, odor, fracturing, minerology, texture,degree of weathering, hardness, water quality, etc.)
440	500				X									Clay, Sand, Gravel
500	530						X							Sand, Gravel
530	560						X							Sand, Clay, Pepples
560	580				X									Clay, Sand
580	615				X									Clay, Sand, Gravel
615	650				X									Clay
650	685				X									Clay, Gravel
685	695													Rock, Gravel
695	705				X									Clay, Gravel
705	710				X									Clay, Sand
710	725				X									Clay, Gravel
725	745				X									Clay, Sand
745	795				X									Clay, Gravel
795	810				X									Clay
810	825				X									Clay, Sand
825	855				X									Clay
855	870						X							Sand, Clay
870	890				X									Clay, Gravel
890	900						X							Sand, Clay
900	915							X						Gravel, Clay
915	920						X							Sand, Clay

WELL DRILLER'S REPORT
State of Utah
Division of Water Rights

RECEIVED
JUN 01 2007
WATER RIGHTS
SALT LAKE

pg 3 of 3

For additional space, use "Additional Well Data Form" and attach

Well Identification

Change Application: a22152 (57-3016) WIN: 19785

Owner *Note any changes*

Jordan Valley Water Conservancy District
P.O. Box 70
West Jordan UT 84084-0070

Contact Person/Engineer: Shane Swensen

Well Location *Note any changes*

S 850 W 465 from the W4 corner of section 35, Township 2S, Range 1E, SL B&M

Location Description: (address, proximity to buildings, landmarks, ground elevation,local well #)

Drillers Activity Start Date:_____ Completion Date:_____

Check all that apply: [X] New [ ] Repair [ ] Deepen [ ] Clean [ ] Replace [ ] Public Nature of Use:_____

If a replacement well, provide location of new well. _____ feet north/south and _____ feet east/west of the existing well.

DEPTH (feet) FROM	TO	BOREHOLE DIAMETER (in)	DRILLING METHOD	DRILLING FLUID

Well Log

DEPTH (feet) FROM	TO	WATER	PERMEABLE High	PERMEABLE Low	UNCONSOLIDATED CLAY	SILT	SAND	GRAVEL	COBBLES	BOULDER	OTHER	CONSOLIDATED ROCK TYPE	COLOR	DESCRIPTION AND REMARKS (e.g., relative %, grain size, sorting, angularity, bedding, grain composition density, plasticity, shape, cementation, consistancy, water bearing, ordor, fracturing, minerology, texture,degree of weathering, hardness, water quality, etc.)
920	940						X							Sand, Gravel, Clay
940	950						X							Sand, Clay
950	970				X									Clay, Sand
970	990						X							Sand, Clay, Gravel
990	1000				X									Clay, Gravel, and
1000	1040						X							Sand, Gravel, Clay
1040	1050							X						Gravel, Clay

Static Water Level

Date_____ Water Level_____ feet Flowing? [ ] Yes [ ] No

Method of Water Level Measurement_____ If Flowing, Capped Pressure_____ PSI

Point to Which Water Level Measurement was Referenced_____ Elevation_____

Height of Water Level reference point above ground surface_____ feet Temperature_____ degrees [ ] C [ ] F

Construction Information

DEPTH (feet) FROM	TO	CASING TYPE AND MATERIAL/GRADE	WALL THICK (in)	NOMINAL DIAM. (in)
0	260	Mild Steel Conducter	.500	40
-2	535	Mild Steel Blank	.500	24
605	630	Mild Steel Blank	.500	24
650	720	Mild Steel Blank	.500	24
760	790	Mild Steel Blank	.500	24

DEPTH (feet) FROM	TO	☒SCREEN ☐PERFORATIONS ☐OPEN BOTTOM SCREEN SLOT SIZE OR PERF SIZE (in)	SCREEN DIAM. OR PERF LENGTH (in)	SCREEN TYPE OR NUMBER PERF (per round/interval)
535	605	.070	24	304 S.S. CWW
630	650	.070	24	304 S.S. CWW
720	760	.070	24	304 S.S. CWW
790	900	.070	24	304 S.S. CWW
980	1020	.070	24	304 S.S. CWW

Well Head Configuration: Cover Plate Access Port Provided? ☐Yes ☒No

Casing Joint Type: Collar Perforator Used:

Was a Surface Seal Installed? ☒Yes ☐No Depth of Surface Seal: 260 feet Drive Shoe? ☐Yes ☒No

Surface Seal Material Placement Method:

Was a temporary surface casing used? ☐Yes ☒No If yes, depth of casing: feet diameter: inches

DEPTH (feet) FROM	TO	SURFACE SEAL / INTERVAL SEAL / FILTER PACK / PACKER INFORMATION SEAL MATERIAL, FILTER PACK and PACKER TYPE and DESCRIPTION	**Quantity** of Material Used (if applicable)	GROUT DENSITY (lbs./gal., # bag mix, gal./sack etc.)
0	260	Conductor Cement Grout (outside conductor)		
260	1050	Filter Pack 6x9 Colorado Silica		
0	260	Inside Conductor is empty		

Well Development and Well Yield Test Information

DATE	METHOD	YIELD	Units Check One GPM	CFS	DRAWDOWN (ft)	TIME PUMPED (hrs & min)
1-19-07	Development	4700	X		392	91hrs 30min
1-20-07	Step Drawdown	4100	X		183	12 hrs
1-22-07	Constant Rate	3000	X		129	24 hrs

Pump (Permanent)

Pump Description: Horsepower: Pump Intake Depth: feet

Approximate Maximum Pumping Rate: Well Disinfected upon Completion? ☒Yes ☐No

Comments

Description of construction activity, additional materials used, problems encountered, extraordinary Circumstances, abandonment procedures. *Use additional well data form for more space.*

Well Driller Statement

This well was drilled and constructed under my supervision, according to applicable rules and regulations, and this report is complete and correct to the best of my knowledge and belief.

Name LAYNE CHRISTENSEN COMPANY (Person, Firm, or Corporation - Print or Type) License No. 188

Signature Larry E Krall (Licensed Well Driller) Date 5/25/07

Construction Information (con't)

DEPTH (feet)		CASING			DEPTH (feet)		☐SCREEN ☐PERFORATIONS ☐OPEN BOTTOM		
FROM	TO	CASING TYPE AND MATERIAL/GRADE	WALL THICK (in)	NOMINAL DIAM. (in)	FROM	TO	SCREEN SLOT SIZE OR PERF SIZE (in)	SCREEN DIAM. OR PERF LENGTH (in)	SCREEN TYPE OR NUMBER PERF (per round/interval)
900	980	Mild Steel Blank	.500	24					
1020	1040	Mild Steel Blank	.500	24					

DEPTH (feet)		SURFACE SEAL / INTERVAL SEAL / FILTER PACK / PACKER INFORMATION		
FROM	TO	SEAL MATERIAL, FILTER PACK and PACKER TYPE and DESCRIPTION	**Quantity** of Material Used (if applicable)	GROUT DENSITY (lbs./gal., # bag mix, gal./sack etc.)

Comments (con't)

Well Driller Statement

This well was drilled and constructed under my supervision, according to applicable rules and regulations, and this report is complete and correct to the best of my knowledge and belief.

Name LAYNE CHRISTENSEN COMPANY (Person, Firm, or Corporation - Print or Type) **License No.** 188

Signature Larry G Knoll (Licensed Well Driller) **Date** 5/25/07

2129 E MURRAY HOLLADAY

WELL DRILLER'S REPORT

WELL DRILLER'S REPORT
State of Utah
Division of Water Rights

For additional space, use "Additional Well Data Form" and attach

Well Identification

Change Application: a27153 (57-7401) WIN: 430898

Owner *Note any changes*

Jordan Valley Water Conservancy District
8215 South 3140 West
P.O. Box 70
West Jordan UT 84088-0070

AMENDED WELL LOG

Contact Person/Engineer: Bill Bigalo HANSEN ALLEN & LUCE

Well Location *Note any changes*

S 455 E 1130 from the NW corner of section 10, Township 2S, Range 1E, SL B&M

Location Description: (address, proximity to buildings, landmarks, ground elevation,local well #)

Drillers Activity Start Date: 1-3-08 Completion Date: 6-12-08

Check all that apply: [X] New [ ] Repair [ ] Deepen [ ] Clean [ ] Replace [ ] Public Nature of Use:

If a replacement well, provide location of new well. _____ feet north/south and _____ feet east/west of the existing well.

DEPTH (feet) FROM	TO	BOREHOLE DIAMETER (in)	DRILLING METHOD	DRILLING FLUID
0	40	42	Auger	None
40'	300	34	Reverse Circ	water only
300	1230	28		

Well Log

DEPTH (feet) FROM	TO	WATER	PERMEABLE High	PERMEABLE Low	UNCONSOLIDATED CLAY	SILT	SAND	GRAVEL	COBBLES	BOULDER	OTHER	CONSOLIDATED ROCK TYPE	COLOR	DESCRIPTION AND REMARKS (e.g., relative %, grain size, sorting, angularity, bedding, grain composition density, plasticity, shape, cementation, consistancy, water bearing, odor, fracturing, minerology, texture,degree of weathering, hardness, water quality, etc.)
0'	40'				X								TAN	
40'	300'						X	X	X					
300'	340'						X							
340'	400'						X	X						
400'	600'						X		X			River Rock	River Rock	
600'	700'				X		X							
700'	735'					X								
735'	800'					X	X							
800'	840'				X									
840'	860'					X	X							

RECEIVED
OCT 21 2009
WATER RIGHTS
SALT LAKE

RECEIVED
JUL 07 2008 AA
WATER RIGHTS
SALT LAKE

Static Water Level

Date 6-19-08 Water Level 35.9 feet Flowing? [ ] Yes [X] No

Method of Water Level Measurement Electric Sounder If Flowing, Capped Pressure _____ PSI

Point to Which Water Level Measurement was Referenced Ground level Elevation _____

Height of Water Level reference point above ground surface _____ feet Temperature _____ degrees [ ] C [ ] F

Well Log

2129 W 4800 S

WELL DRILLER'S REPORT ADDTIONAL DATA FORM
State of Utah
Division of Water Rights

Well Identification

Change Application: a27153 (57-7401)

Owner *Note any changes*

Jordan Valley Water Conservancy District
8215 South 3140 West
P.O. Box 70
West Jordan UT 84088-0070

Contact Person/Engineer: _____

Well Location *Note any changes*

S 455 E 1130 from the NW corner of section 10, Township 2S, Range 1E, SL B&M

Location Description: (address, proximity to buildings, landmarks, ground elevation,local well #)

Well Log

DEPTH (feet) FROM	TO	WATER	PERMEABLE High	PERMEABLE Low	UNCONSOLIDATED CLAY	SILT	SAND	GRAVEL	COBBLES	BOULDER	OTHER	CONSOLIDATED ROCK TYPE	COLOR	DESCRIPTION AND REMARKS (e.g., relative %, grain size, sorting, angularity, bedding, grain composition density, plasticity, shape, cementation, consistancy, water bearing, odor, fracturing, minerology, texture,degree of weathering, hardness, water quality, etc.)
860'	900'						X	X						
900'	1000'				X		X	X						
1000'	1100'						X	X						
1800'	1200				X		X	X						
1200'	1225'				X									

Construction Information (con't)

DEPTH (feet) FROM	TO	CASING: CASING TYPE AND MATERIAL/GRADE	WALL THICK (in)	NOMINAL DIAM. (in)
+0'	40 ~~717~~'	Conductor Csgw	.375	36"
+2'	717	Well Csgw	.375	20"
745'	840'	Well Csgw	.375	20"
880'	955'	Well Csgw	.375	20"
1115'	1140'	Well Csgw	.375	20"
1200'	1220'	Well Csgw	.375	20"
0'	130'	Gravel Feed tube	Sch40	3"

DEPTH (feet) FROM	TO	☐SCREEN ☐PERFORATIONS ☐OPEN BOTTOM: SCREEN SLOT SIZE OR PERF SIZE (in)	SCREEN DIAM. OR PERF LENGTH (in)	SCREEN TYPE OR NUMBER PERF (per round/interval)
715'	745	.070	20"	Continuous Wire Wrap
840'	880'	.070	20"	CWW
955'	1115'	.070	20"	CWW
1140'	1200'	.070	20"	CWW

DEPTH (feet) FROM	TO	SURFACE SEAL / INTERVAL SEAL / FILTER PACK / PACKER INFORMATION: SEAL MATERIAL, FILTER PACK and PACKER TYPE and DESCRIPTION	Quantity of Material Used (if applicable)	GROUT DENSITY (lbs./gal., # bag mix, gal./sack etc.)
0	300'	15 SACK SAND slury	83 yards	16.7 165 Gallon
300	1220'	6-9 Colorado Silica	275 tons	

Comments (con't)

Well Driller Statement

This well was drilled and constructed under my supervision, according to applicable rules and regulations, and this report is complete and correct to the best of my knowledge and belief.

Name ZIM INDUSTRIES INC (Person, Firm, or Corporation - Print or Type) License No. 697

Signature Richard Sam Albert J Zimmerer (Licensed Well Driller) Date 6-21-08

Construction Information

DEPTH (feet) FROM	TO	CASING: CASING TYPE AND MATERIAL/GRADE	WALL THICK (in)	NOMINAL DIAM. (in)	DEPTH (feet) FROM	TO	☐SCREEN ☐PERFORATIONS ☐OPEN BOTTOM: SCREEN SLOT SIZE OR PERF SIZE (in)	SCREEN DIAM. OR PERF LENGTH (in)	SCREEN TYPE OR NUMBER PERF (per round/interval)

Well Head Configuration: _____ Access Port Provided? ☐Yes ☑No

Casing Joint Type: Butt welded Joints Perforator Used: NO

Was a Surface Seal Installed? ☑Yes ☐No Depth of Surface Seal: 0' to 300' feet Drive Shoe? ☐Yes ☑No

Surface Seal Material Placement Method: Grout Pump Trimmie Pipe

Was a temporary surface casing used? ☐Yes ☐No If yes, depth of casing: _____ feet diameter: _____ inches

DEPTH (feet) FROM	TO	SURFACE SEAL / INTERVAL SEAL / FILTER PACK / PACKER INFORMATION: SEAL MATERIAL, FILTER PACK and PACKER TYPE and DESCRIPTION	**Quantity** of Material Used (if applicable)	GROUT DENSITY (lbs./gal., # bag mix, gal./sack etc.)

Well Development and Well Yield Test Information

DATE	METHOD	YIELD	Units Check One GPM	CFS	DRAWDOWN (ft)	TIME PUMPED (hrs & min)
6-11-08	Turbine Pump	3400	3400		283.57	24 HR

Pump (Permanent)

Pump Description: _____ Horsepower: 300 Pump Intake Depth: 500 feet

Approximate Maximum Pumping Rate: _____ Well Disinfected upon Completion? ☑Yes ☐No

Comments

Description of construction activity, additional materials used, problems encountered, extraordinary Circumstances, abandonment procedures. *Use additional well data form for more space.*

ATTACHED METTROC

Well Driller Statement

This well was drilled and constructed under my supervision, according to applicable rules and regulations, and this report is complete and correct to the best of my knowledge and belief.

Name ZIM INDUSTRIES INC (Person, Firm, or Corporation - Print or Type) License No. 697

Signature Richard Gene Hurt Jr (Licensed Well Driller) Date 6-21-08

987 E 7800 S

WELL DRILLER'S REPORT

WELL DRILLER'S REPORT
State of Utah
Division of Water Rights

For additional space, use "Additional Well Data Form" and attach

RECEIVED
JUN 01 2007
WATER RIGHTS
SALT LAKE

Well Identification

Change Application: a27572 (57-3018)

WIN: 428733

Owner *Note any changes*

Jordan Valley Water Conservancy District
P.O. Box 70
West Jordan UT 84084-0070

Contact Person/Engineer: Shane Swensen (Chris Mikell/ Bowen Collins & Associates)

Well Location *Note any changes*

N 300 W 290 from the S4 corner of section 29, Township 2S, Range 1E, SL B&M

Location Description: (address, proximity to buildings, landmarks, ground elevation,local well #)

Drillers Activity Start Date: 11-16-2006 Completion Date: 4-31-2007

Check all that apply: [X] New [ ] Repair [ ] Deepen [ ] Clean [ ] Replace [ ] Public Nature of Use:

If a replacement well, provide location of new well. _____ feet north/south and _____ feet east/west of the existing well.

DEPTH (feet) FROM	TO	BOREHOLE DIAMETER (in)	DRILLING METHOD	DRILLING FLUID
0	40	40	Bucket Auger	None
0	1140	28	Reverse Rotary	Bentenite Mud

Well Log

DEPTH (feet) FROM	TO	WATER	PERMEABLE High	PERMEABLE Low	UNCONSOLIDATED CLAY	SILT	SAND	GRAVEL	COBBLES	BOULDER	OTHER	CONSOLIDATED ROCK TYPE	COLOR	DESCRIPTION AND REMARKS (e.g., relative %, grain size, sorting, angularity, bedding, grain composition density, plasticity, shape, cementation, consistancy, water bearing, odor, fracturing, minerology, texture,degree of weathering, hardness, water quality, etc.)
0	115						X							Fine Sand; well Graded
115	135						X							Fine Sand, poorly sorted very fine sand
135	150				X								Brown	Clay, Grains under 2mm diameter
150	185						X							sand, clay, some gravel
185	195						X							Fine Sand
195	200						X							Sand, Gravelly sand up to 5mm diameter
200	260				X									Clay, some sand
260	300						X							very Fine Sand
300	310				X									Clay, Fine Sand, silt
310	330						X							Fine Sand, Clay streamers

Static Water Level

Date 4-30-2007 Water Level 200 feet Flowing? [ ] Yes [X] No

Method of Water Level Measurement Electric Sounder If Flowing, Capped Pressure _____ PSI

Point to Which Water Level Measurement was Referenced _____ Elevation _____

Height of Water Level reference point above ground surface _____ feet Temperature 70 degrees [ ] C [X] F

WELL DRILLER'S REPORT ADDTIONAL DATA FORM

State of Utah
Division of Water Rights

RECEIVED
JUN 0 1 2007
WATER RIGHTS
SALT LAKE

Well Identification

Change Application: a27572 (57-3018)

Owner *Note any changes*

Jordan Valley Water Conservancy District
P.O. Box 70
West Jordan UT 84084-0070

Contact Person/Engineer: Shane Swensen

Well Location *Note any changes*

N 300 W 290 from the S4 corner of section 29, Township 2S, Range 1E, SL B&M

Location Description: (address, proximity to buildings, landmarks, ground elevation,local well #)

Well Log

DEPTH (feet) FROM	TO	WATER	PERMEABLE High	PERMEABLE Low	UNCONSOLIDATED CLAY	SILT	SAND	GRAVEL	COBBLES	BOULDER	OTHER	CONSOLIDATED ROCK TYPE	COLOR	DESCRIPTION AND REMARKS (e.g., relative %, grain size, sorting, angularity, bedding, grain composition density, plasticity, shape, cementation, consistancy, water bearing, odor, fracturing, minerology, texture,degree of weathering, hardness, water quality, etc.)
330	335				X									Clay, Gravel up to 30mm diameter
335	340						X							Fine Sand, clay, 50mm dia cobbles
340	360				X									Clay, Gravel
360	365						X						Gray	Sand, Clay, Gravel
365	395				X								Brown/Tan	Clay. little to no Grit
395	415				X								Tan	Clay, Fine Sand
415	435						X						Tan	Fine Sand w/ stringers of Tan Clay
435	445							X						Gravel, Poorly sorted subangular
445	450				X									Clay, Poorly Sorted Gravel
450	495						X							Fine Sand, stringers of Pebbles
495	505						X							Fine Sand, Gravelly
505	515				X									Clay
515	520							X						Gravel, Cobbles up to 50 mm dia
520	580				X									Clay, Sand
580	610							X						Gravel, pebbles, Sand
610	615				X									Clay, Sand, Gravel to 20mm dia
615	620							X						Gravel, Clay, Gravel to 50 mm dia
620	650				X									Clay, Sand
650	695				X									Clay, Gravel to 10 to 20 mm dia
695	695							X						Gravel, Grains to 20 to 40mm dia
695	790				X									Clay, stringers of sand w/ grains to 2mm

WELL DRILLER'S REPORT ADDTIONAL DATA FORM

State of Utah
Division of Water Rights

RECEIVED
JUN 01 2007
WATER RIGHTS
SALT LAKE

Well Identification

Change Application: a27572 (57-3018)

Owner *Note any changes*

Jordan Valley Water Conservancy District
P.O. Box 70
West Jordan UT 84084-0070

Contact Person/Engineer: Shane Swensen

Well Location *Note any changes*

N 300 W 290 from the S4 corner of section 29, Township 2S, Range 1E, SL B&M

Location Description: (address, proximity to buildings, landmarks, ground elevation,local well #)

Well Log

DEPTH (feet) FROM	TO	WATER	PERMEABLE High	PERMEABLE Low	UNCONSOLIDATED CLAY	SILT	SAND	GRAVEL	COBBLES	BOULDER	OTHER	CONSOLIDATED ROCK TYPE	COLOR	DESCRIPTION AND REMARKS (e.g., relative %, grain size, sorting, angularity, bedding, grain composition density, plasticity, shape, cementation, consistancy, water bearing, odor, fracturing, minerology, texture,degree of weathering, hardness, water quality, etc.)
790	795				X									Clay, Gravel, Poorly sorted
795	860						X							Sandy Clay
860	890				X									Clay, Gravel up to 20mm dia
890	910						X							Sand, Clay, Gravel
910	930							X						Gravel, 40 to 60mm dia
930	940						X							Sand, Fine, w/ cobbles to 40mm dia
940	960							X						Gravel, Coarse, 30mm
960	975							X						Gravel, 30 to 40 mm
975	980				X									Clay, Subrounded, well graded gravel 40mm
980	985						X							Fine Sand, Clay, Gravel 30mm
985	990				X									Clay, Gravel 60mm
990	995							X						Gravel, Clay, 30mm dia Gravel
995	1020						X							Sand, Fine to Coarse
1020	1030							X						Gravel, Clay
1030	1040				X									Clay, Gravel 20mm dia
1040	1060							X						Gravel, Clay
1060	1080				X									Clay, Gravel to 10mm, clay stringers
1080	1085							X						Gravel 30mm w/ Clay
1085	1100				X									Clay, Gravel
1100	1120							X						Gravel, Moducately Graded, 10mm dia
1120	1140				X									Clay, Gravel

WELL DRILLER'S REPORT ADDTIONAL DATA FORM

State of Utah
Division of Water Rights

RECEIVED JUN 0 1 2007
WATER RIGHTS
SALT LAKE

Well Identification

Change Application: a27572 (57-3018)

Owner *Note any changes*

Jordan Valley Water Conservancy District
P.O. Box 70
West Jordan UT 84084-0070

Contact Person/Engineer: Shane Swensen

Well Location *Note any changes*

N 300 W 290 from the S4 corner of section 29, Township 2S, Range 1E, SL B&M

Location Description: (address, proximity to buildings, landmarks, ground elevation,local well #)

Well Log

DEPTH (feet) FROM	TO	WATER	PERMEABLE High	PERMEABLE Low	UNCONSOLIDATED CLAY	SILT	SAND	GRAVEL	COBBLES	BOULDER	OTHER	CONSOLIDATED ROCK TYPE	COLOR	DESCRIPTION AND REMARKS (e.g., relative %, grain size, sorting, angularity, bedding, grain composition density, plasticity, shape, cementation, consistancy, water bearing, odor, fracturing, minerology, texture,degree of weathering, hardness, water quality, etc.)

Construction Information

DEPTH (feet) FROM	TO	CASING TYPE AND MATERIAL/GRADE	WALL THICK (in)	NOMINAL DIAM. (in)
0	40	conductor Mild steel	.312	30
+8	392	Blank Mild steel	.375	20
392	395	Blank Mild steel	.500	20
455	465	Blank Mild steel	.500	20
475	479	Blank Mild steel	.500	20

DEPTH (feet) FROM	TO	☒SCREEN ☐PERFORATIONS ☐OPEN BOTTOM SCREEN SLOT SIZE OR PERF SIZE (in)	SCREEN DIAM. OR PERF LENGTH (in)	SCREEN TYPE OR NUMBER PERF (per round/interval)
395	455	.050	20	304 SS CWW
465	475	.050	20	304 SS CWW
523	528	.050	20	304 SS CWW
553	568	.050	20	304 SS CWW
585	590	.050	20	304 SS CWW

Well Head Configuration: Cover Plate

Casing Joint Type: Collar Access Port Provided? ☐Yes ☒No

Perforator Used:

Was a Surface Seal Installed? ☒Yes ☐No Depth of Surface Seal: 300 feet Drive Shoe? ☐Yes ☐No

Surface Seal Material Placement Method: Tremie

Was a temporary surface casing used? ☐Yes ☒No If yes, depth of casing: feet diameter: inches

DEPTH (feet) FROM	TO	SURFACE SEAL / INTERVAL SEAL / FILTER PACK / PACKER INFORMATION SEAL MATERIAL, FILTER PACK and PACKER TYPE and DESCRIPTION	**Quantity** of Material Used (if applicable)	GROUT DENSITY (lbs./gal., # bag mix, gal./sack etc.)
0	40	Conductor Cement Grout		
0	300	Annular Seal Cement Grout		
300	1140	Gravel Pack		

Well Development and Well Yield Test Information

DATE	METHOD	YIELD	Units Check One GPM	CFS	DRAWDOWN (ft)	TIME PUMPED (hrs & min)
4-23-2007	Development	4510	X		142.5	80 hr
4-26-2007	Step Test	4570	X		151.6	10 hr
4-31-2007	Constant Rate	4536	X		164.4	24 hr

Pump (Permanent)

Pump Description: Horsepower: Pump Intake Depth: feet

Approximate Maximum Pumping Rate: Well Disinfected upon Completion? ☒Yes ☐No

Comments

Description of construction activity, additional materials used, problems encountered, extraordinary Circumstances, abandonment procedures. *Use additional well data form for more space.*

Well Driller Statement

This well was drilled and constructed under my supervision, according to applicable rules and regulations, and this report is complete and correct to the best of my knowledge and belief.

Name LAYNE CHRISTENSEN COMPANY (Person, Firm, or Corporation - Print or Type) **License No.** 188

Signature Larry G Rvall (Licensed Well Driller) **Date** 5/25/07

Construction Information (con't)

DEPTH (feet)		CASING			DEPTH (feet)		☒SCREEN ☐PERFORATIONS ☐OPEN BOTTOM		
FROM	TO	CASING TYPE AND MATERIAL/GRADE	WALL THICK (in)	NOMINAL DIAM. (in)	FROM	TO	SCREEN SLOT SIZE OR PERF SIZE (in)	SCREEN DIAM. OR PERF LENGTH (in)	SCREEN TYPE OR NUMBER PERF (per round/interval)
479	519	Blank Mild Steel	.375	20	599	619	.050	20	304 SS CWW
519	523	Blank Mild Steel	.500	20	650	680	.050	20	304SS CWW
528	531	Blank Mild Steel	.500	20	690	695	.050	20	304 SS CWW
531	550	Blank Mild Steel	.375	20	730	760	.050	20	304 SS CWW
550	553	Blank Mild Steel	.500	20	773	778	.050	20	304 SS CWW
568	571	Blank Mild Steel	.500	20	795	810	.050	20	304 SS CWW
571	582	Blank Mild Steel	.375	20	825	830	.050	20	304 SS CWW
582	585	Blank Mild Steel	.500	20	869	874	.050	20	304 SS CWW
590	599	Blank Mild Steel	.500	20	883	888	.050	20	304 SS CWW

DEPTH (feet)		SURFACE SEAL / INTERVAL SEAL / FILTER PACK / PACKER INFORMATION		
FROM	TO	SEAL MATERIAL, FILTER PACK and PACKER TYPE and DESCRIPTION	**Quantity** of Material Used (if applicable)	GROUT DENSITY (lbs./gal., # bag mix, gal./sack etc.)

Comments (con't)

Well Driller Statement This well was drilled and constructed under my supervision, according to applicable rules and regulations, and this report is complete and correct to the best of my knowledge and belief.

Name LAYNE CHRISTENSEN COMPANY (Person, Firm, or Corporation - Print or Type) **License No.** 188

Signature Larry C. Krall (Licensed Well Driller) **Date** 5/25/07

Construction Information (con't)

DEPTH (feet) FROM	TO	CASING: CASING TYPE AND MATERIAL/GRADE	WALL THICK (in)	NOMINAL DIAM. (in)
619	622	Blank Mild Steel	.500	20
622	647	Blank Mild Steel	.375	20
647	650	Blank Mild Steel	.500	20
680	690	Blank Mild Steel	.500	20
695	698	Blank Mild Steel	.500	20
698	727	Blank Mild Steel	.375	20
727	730	Blank Mild Steel	.500	20
760	773	Blank Mild Steel	.500	20
778	781	Blank Mild Steel	.500	20

DEPTH (feet) FROM	TO	☒SCREEN ☐PERFORATIONS ☐OPEN BOTTOM: SCREEN SLOT SIZE OR PERF SIZE (in)	SCREEN DIAM. OR PERF LENGTH (in)	SCREEN TYPE OR NUMBER PERF (per round/interval)
895	900	.050	20	304 SS CWW
907	912	.050	20	304 SS CWW
928	943	.050	20	304 SS CWW
959	969	.050	20	304 SS CWW
1016	1026	.050	20	304 SS CWW
1039	1044	.050	20	304 SS CWW
1053	1063	.050	20	304 SS CWW
1089	1104	.050	20	304 SS CWW

DEPTH (feet) FROM	TO	SURFACE SEAL / INTERVAL SEAL / FILTER PACK / PACKER INFORMATION: SEAL MATERIAL, FILTER PACK and PACKER TYPE and DESCRIPTION	Quantity of Material Used (if applicable)	GROUT DENSITY (lbs./gal., # bag mix, gal./sack etc.)

Comments (con't)

Well Driller Statement

This well was drilled and constructed under my supervision, according to applicable rules and regulations, and this report is complete and correct to the best of my knowledge and belief.

Name LAYNE CHRISTENSEN COMPANY
(Person, Firm, or Corporation - Print or Type)

License No. 188

Signature Larry C Krall
(Licensed Well Driller)

Date 5/25/07

Construction Information (con't)

DEPTH (feet)		CASING		
FROM	TO	CASING TYPE AND MATERIAL/GRADE	WALL THICK (in)	NOMINAL DIAM. (in)
781	792	Blank Mild Steel	.375	20
792	795	Blank Mild Steel	.500	20
810	825	Blank Mild Steel	.500	20
830	833	Blank Mild Steel	.500	20
833	866	Blank Mild Steel	.375	20
866	869	Blank Mild Steel	.500	20
874	883	Blank Mild Steel	.500	20
888	895	Blank Mild Steel	.500	20
900	907	Blank Mild Steel	.500	20

Blank (cont.)

DEPTH (feet)		Material	Wall Thick	Nom Diam.
		~~SCREEN~~ ~~PERFORATIONS~~ ~~OPEN BOTTOM~~		
FROM	TO	~~SCREEN~~ SLOT SIZE OR ~~PERF~~ SIZE (in)	~~SCREEN~~ DIAM OR ~~PERF~~ LENGTH (in)	SCREEN TYPE OR ~~NUMBER PERF~~ (per round/interval)
912	915	Mild Steel	.500	20
915	925	Mild Steel	.375	20
925	928	Mild Steel	.500	20
943	946	Mild Steel	.500	20
946	956	Mild Steel	.375	20
956	959	Mild Steel	.500	20
969	973	Mild Steel	.500	20
973	1013	Mild Steel	.375	20
1013	1016	Mild Steel	.500	20

DEPTH (feet)		Blank (continued) ~~SURFACE SEAL / INTERVAL SEAL / FILTER PACK / PACKER INFORMATION~~		
FROM	TO	Material ~~SEAL MATERIAL, FILTER PACK and PACKER TYPE and DESCRIPTION~~	~~Quantity of Material Used (if applicable)~~ Wall Thk	Nom ~~GROUT DENSITY~~ Diam. (lbs./gal., # bag mix, gal./sack etc.)
1026	1039	Blank Mild Steel	.500	20
1044	1053	Blank Mild Steel	.500	20
1063	1066	Blank Mild Steel	.500	20
1066	1086	Blank Mild Steel	.375	20
1086	1089	Blank Mild Steel	.500	20
1104	1107	Blank Mild Steel	.500	20
1107	1124	Blank Mild Steel	.375	20

Comments (con't)

Well Driller Statement

This well was drilled and constructed under my supervision, according to applicable rules and regulations, and this report is complete and correct to the best of my knowledge and belief.

Name LAYNE CHRISTENSEN COMPANY (Person, Firm, or Corporation - Print or Type)

License No. 188

Signature Larry G Krall (Licensed Well Driller)

Date 5/25/07

7618 S 700 E

WELL DRILLER'S REPORT

RECEIVED
MAY 17 2007CH
WATER RIGHTS
SALT LAKE

WELL DRILLER'S REPORT
State of Utah
Division of Water Rights

For additional space, use "Additional Well Data Form" and attach

Well Identification

Change Application: a27572 (57-3018) WIN: 428732

Owner *Note any changes*

Jordan Valley Water Conservancy District
P.O. Box 70
West Jordan UT 84084-0070

Contact Person/Engineer: Shane Swensen (Chris Mikell/ Bowen Collins)

Well Location *Note any changes*

N 1090 W 98 from the SE corner of section 30, Township 2S, Range 1E, SL B&M

Location Description: (address, proximity to buildings, landmarks, ground elevation,local well #)

Drillers Activity Start Date: 11-13-2006 Completion Date: 4-3-2007

Check all that apply: [X] New [ ] Repair [ ] Deepen [ ] Clean [ ] Replace [ ] Public Nature of Use:

If a replacement well, provide location of new well. _____ feet north/south and _____ feet east/west of the existing well.

DEPTH (feet) FROM	TO	BOREHOLE DIAMETER (in)	DRILLING METHOD	DRILLING FLUID
0	40	40	Bucket Auger	None
40	1050	28	Reverse Rotary	Bentonite Mud

Well Log

DEPTH (feet) FROM	TO	WATER	PERMEABLE High	PERMEABLE Low	UNCONSOLIDATED CLAY	SILT	SAND	GRAVEL	COBBLES	BOULDER	OTHER	CONSOLIDATED ROCK TYPE	COLOR	DESCRIPTION AND REMARKS (e.g., relative %, grain size, sorting, angularity, bedding, grain composition density, plasticity, shape, cementation, consistancy, water bearing, odor, fracturing, minerology, texture,degree of weathering, hardness, water quality, etc.)
0	55						X							Sand, moderately Graded
55	60				X								Gray	Clay, Heavy
60	75							X						Gravel, Fine, Sands
75	85						X							Well Graded Sand, Gravelly Sand
85	110				X								Gray	Clay, high plasticity
110	140						X						Gray	Sand, Medium
140	150				X								Gray/Brown	Clay, Gravel
150	205						X							Fine Sand, silt, Clay
205	290				X								Gray	Clay
290	315						X							Sand, Clay

Static Water Level

Date 3/24/2007 Water Level 1566 feet Flowing? [ ] Yes [X] No

Method of Water Level Measurement Electric Sounder If Flowing, Capped Pressure _____ PSI

Point to Which Water Level Measurement was Referenced _____ Elevation _____

Height of Water Level reference point above ground surface _____ feet Temperature 70 degrees [ ] C [X] F

Well Log

WELL DRILLER'S REPORT ADDTIONAL DATA FORM
State of Utah
Division of Water Rights

Well Identification

Change Application: a27572 (57-3018)

RECEIVED
MAY 1 / 2007
WATER RIGHTS
SALT LAKE

Owner *Note any changes*

Jordan Valley Water Conservancy District
P.O. Box 70
West Jordan UT 84084-0070

Contact Person/Engineer: Shane Swensen

Well Location *Note any changes*

N 1090 W 98 from the SE corner of section 30, Township 2S, Range 1E, SL B&M

Location Description: (address, proximity to buildings, landmarks, ground elevation,local well #)

Well Log

DEPTH (feet) FROM	TO	WATER	PERMEABLE High	PERMEABLE Low	UNCONSOLIDATED CLAY	SILT	SAND	GRAVEL	COBBLES	BOULDER	OTHER	CONSOLIDATED ROCK TYPE	COLOR	DESCRIPTION AND REMARKS (e.g., relative %, grain size, sorting, angularity, bedding, grain composition density, plasticity, shape, cementation, consistancy, water bearing, odor, fracturing, minerology, texture,degree of weathering, hardness, water quality, etc.)
315	350				X								Gray/Brown	Clay, Sand
350	375						X							Sand, Well Graded, Gravel
375	405				X									Clay, Sand
405	410						X							Sand, Well Graded, Gravel
410	425				X									Fine Sandy Clay
425	470						X							Sand, Well Graded
470	500				X								Brown	Clay, Sand
500	520					X								Silt, Clay
520	530													Clay, Silt
530	550													Fine Sand, Clay, Silt
550	565													Sand, Gravel
565	570						X						Light Brown	Sand, Silt, Clay
570	605						X							Sand, Poorly Graded
605	655						X							Sand, well sorted, Silt
655	690					X								Silt, Sand
690	700						X							Sand, Well Graded
700	710					X								Silty Sand, Moderately Graded
710	735				X								Light Brown	Clay, Sand
735	740							X						Gravel, Clay, Sand
740	750				X								Light Brown	Clay, Sand
750	760						X							Sand, Well Graded, Fine Gravel

WELL DRILLER'S REPORT ADDTIONAL DATA FORM
State of Utah
Division of Water Rights

Well Identification

Change Application: a27572 (57-3018)

RECEIVED
MAY 17 2007
WATER RIGHTS
SALT LAKE

Owner *Note any changes*

Jordan Valley Water Conservancy District
P.O. Box 70
West Jordan UT 84084-0070

Contact Person/Engineer: Shane Swensen

Well Location *Note any changes*

N 1090 W 98 from the SE corner of section 30, Township 2S, Range 1E, SL B&M

Location Description: (address, proximity to buildings, landmarks, ground elevation,local well #)

Well Log

DEPTH (feet) FROM	TO	WATER	PERMEABLE High	PERMEABLE Low	UNCONSOLIDATED CLAY	SILT	SAND	GRAVEL	COBBLES	BOULDER	OTHER	CONSOLIDATED ROCK TYPE	COLOR	DESCRIPTION AND REMARKS (e.g., relative %, grain size, sorting, angularity, bedding, grain composition density, plasticity, shape, cementation, consistancy, water bearing, odor, fracturing, minerology, texture,degree of weathering, hardness, water quality, etc.)
760	780				X								Light Brown	Clay, Sand
780	825						X							Sand, Well Graded, Gravel
825	835						X							Sand, Moderately to Poor Graded, Clay
835	925						X							Sand, Clay, some Gravel
925	945				X								Light Brown	Clay, Sand
945	965						X							Sand, Clay
965	975						X							Sand, Fine Gravel
975	1000						X							Sand, Clay
1000	1030						X							Sand, Fine and coarse Gravel

WELL DRILLER'S REPORT ADDTIONAL DATA FORM
State of Utah
Division of Water Rights

RECEIVED
MAY 17 2007
WATER RIGHTS
SALT LAKE

Well Identification

Change Application: a27572 (57-3018)

Owner *Note any changes*

Jordan Valley Water Conservancy District
P.O. Box 70
West Jordan UT 84084-0070

Contact Person/Engineer: _____

Well Location *Note any changes*

N 1090 W 98 from the SE corner of section 30, Township 2S, Range 1E, SL B&M

Location Description: (address, proximity to buildings, landmarks, ground elevation,local well #)

Well Log

DEPTH (feet) FROM	TO	WATER	PERMEABLE High	PERMEABLE Low	UNCONSOLIDATED CLAY	SILT	SAND	GRAVEL	COBBLES	BOULDER	OTHER	CONSOLIDATED ROCK TYPE	COLOR	DESCRIPTION AND REMARKS (e.g., relative %, grain size, sorting, angularity, bedding, grain composition density, plasticity, shape, cementation, consistancy, water bearing, odor, fracturing, minerology, texture,degree of weathering, hardness, water quality, etc.)

WELL DRILLER'S REPORT ADDTIONAL DATA FORM
State of Utah
Division of Water Rights

Well Identification

Change Application: a27572 (57-3018)

RECEIVED
MAY 17 2007
WATER RIGHTS
SALT LAKE

Owner *Note any changes*

Jordan Valley Water Conservancy District
P.O. Box 70
West Jordan UT 84084-0070

Contact Person/Engineer:

Well Location *Note any changes*

N 1090 W 98 from the SE corner of section 30, Township 2S, Range 1E, SL B&M

Location Description: (address, proximity to buildings, landmarks, ground elevation,local well #)

Well Log

DEPTH (feet) FROM	TO	WATER	PERMEABLE High	PERMEABLE Low	UNCONSOLIDATED CLAY	SILT	SAND	GRAVEL	COBBLES	BOULDER	OTHER	CONSOLIDATED ROCK TYPE	COLOR	DESCRIPTION AND REMARKS (e.g., relative %, grain size, sorting, angularity, bedding, grain composition density, plasticity, shape, cementation, consistancy, water bearing, odor, fracturing, minerology, texture,degree of weathering, hardness, water quality, etc.)

Construction Information

DEPTH (feet) FROM	TO	CASING: CASING TYPE AND MATERIAL/GRADE	WALL THICK (in)	NOMINAL DIAM. (in)
0	40	Conductor	.312	30
+8	339	Blank Mild Steel	.375	20
339	342	Blank Mild Steel	.500	20
352	358	Blank Mild Steel	.500	20
368	371	Blank Mild Steel	.500	20

DEPTH (feet) FROM	TO	☒SCREEN ☐PERFORATIONS ☐OPEN BOTTOM: SCREEN SLOT SIZE OR PERF SIZE (in)	SCREEN DIAM. OR PERF LENGTH (in)	SCREEN TYPE OR NUMBER PERF (per round/interval)
342	352	.060	20	304 SS CWW
358	368	.060	20	304 SS CWW
400	405	.060	20	304 SS CWW
422	432	.060	20	304 SS CWW
443	463	.060	20	304 SS CWW

Well Head Configuration: Cover Plate Access Port Provided? ☐Yes ☒No

Casing Joint Type: Collar Perforator Used:

Was a Surface Seal Installed? ☒Yes ☐No Depth of Surface Seal: 200 feet Drive Shoe? ☐Yes ☒No

Surface Seal Material Placement Method: Tremie

Was a temporary surface casing used? ☐Yes ☒No If yes, depth of casing: feet diameter: inches

DEPTH (feet) FROM	TO	SURFACE SEAL / INTERVAL SEAL / FILTER PACK / PACKER INFORMATION: SEAL MATERIAL, FILTER PACK and PACKER TYPE and DESCRIPTION	Quantity of Material Used (if applicable)	GROUT DENSITY (lbs./gal., # bag mix, gal./sack etc.)
0	40	Conductor Cement Grout		
0	200	Annular Seal Cement Grout		
200	1050	Gravel Pack		

Well Development and Well Yield Test Information

DATE	METHOD	YIELD	Units Check One GPM	CFS	DRAWDOWN (ft)	TIME PUMPED (hrs & min)
3-30-07	Development	2249	X		162.2	30
3-31-07	Step Test	2366	X		163.4	10
4-3-07	Constant Rate	2310	X		175.4	24

Pump (Permanent)

Pump Description: Horsepower: Pump Intake Depth: feet

Approximate Maximum Pumping Rate: Well Disinfected upon Completion? ☒Yes ☐No

Comments

Description of construction activity, additional materials used, problems encountered, extraordinary Circumstances, abandonment procedures. *Use additional well data form for more space.*

Well Driller Statement

This well was drilled and constructed under my supervision, according to applicable rules and regulations, and this report is complete and correct to the best of my knowledge and belief.

Name LAYNE CHRISTENSEN COMPANY (Person, Firm, or Corporation - Print or Type) License No. 188

Signature Larry G Krall (Licensed Well Driller) Date 5/11/07

Construction Information (con't)

DEPTH (feet)		CASING			DEPTH (feet)		☑ SCREEN ☐ PERFORATIONS ☐ OPEN BOTTOM		
FROM	TO	CASING TYPE AND MATERIAL/GRADE	WALL THICK (in)	NOMINAL DIAM. (in)	FROM	TO	SCREEN SLOT SIZE OR PERF SIZE (in)	SCREEN DIAM. OR PERF LENGTH (in)	SCREEN TYPE OR NUMBER PERF (per round/interval)
371	397	mild steel	.375	20	534	554	.050	20	304 S.S. CWW
397	400	mild steel	.500	20	582	587	.050	20	304 SS CWW
405	422	mild steel	.500	20	613	623	.050	20	304 SS CWW
432	443	mild steel	.500	20	640	645	.050	20	304 SS CWW
463	466	mild steel	.500	20	686	696	.050	20	304 SS CWW
466	531	mild steel	.375	20	707	712	.050	20	304 SS CWW
531	534	mild steel	.500	20	747	757	.050	20	304 SS CWW
554	557	mild steel	.500	20	780	815	.050	20	304 SS CWW
557	579	mild steel	.375	20	875	885	.050	20	304 SS CWW

DEPTH (feet)		SURFACE SEAL / INTERVAL SEAL / FILTER PACK / PACKER INFORMATION		
FROM	TO	SEAL MATERIAL, FILTER PACK and PACKER TYPE and DESCRIPTION	**Quantity** of Material Used (if applicable)	GROUT DENSITY (lbs./gal., # bag mix, gal./sack etc.)

Comments (con't)

Well Driller Statement

This well was drilled and constructed under my supervision, according to applicable rules and regulations, and this report is complete and correct to the best of my knowledge and belief.

Name LAYNE CHRISTENSEN COMPANY (Person, Firm, or Corporation - Print or Type) **License No.** 188

Signature Larry G Krall (Licensed Well Driller) **Date** 5/11/07

Construction Information (con't)

DEPTH (feet)		CASING			DEPTH (feet)		☒ SCREEN ☐ PERFORATIONS ☐ OPEN BOTTOM		
FROM	TO	CASING TYPE AND MATERIAL/GRADE	WALL THICK (in)	NOMINAL DIAM. (in)	FROM	TO	SCREEN SLOT SIZE OR PERF SIZE (in)	SCREEN DIAM. OR PERF LENGTH (in)	SCREEN TYPE OR NUMBER PERF (per round/interval)
579	582	mild steel	.500	20	902	917	.050	20	304 SS CWW
587	590	mild steel	.500	20	967	992	.050	20	304 SS CWW
590	610	Mild steel	.375	20	1012	1022	.050	20	304 SS CWW
610	613	Mild steel	.500	20					
623	640	mild steel	.500	20					
645	648	mild steel	.500	20					
648	683	mild steel	.375	20					
683	696	mild steel	.500	20					
696	707	mild steel	.500	20					

DEPTH (feet)		SURFACE SEAL / INTERVAL SEAL / FILTER PACK / PACKER INFORMATION		
FROM	TO	SEAL MATERIAL, FILTER PACK and PACKER TYPE and DESCRIPTION	**Quantity** of Material Used (if applicable)	GROUT DENSITY (lbs./gal., # bag mix, gal./sack etc.)

Comments (con't)

Well Driller Statement

This well was drilled and constructed under my supervision, according to applicable rules and regulations, and this report is complete and correct to the best of my knowledge and belief.

Name LAYNE CHRISTENSEN COMPANY (Person, Firm, or Corporation - Print or Type)

License No. 188

Signature Larry G Krall (Licensed Well Driller)

Date 5/11/07

Construction Information (con't)

DEPTH (feet) FROM	TO	CASING TYPE AND MATERIAL/GRADE	WALL THICK (in)	NOMINAL DIAM. (in)
712	715	mild steel	.500	20
715	744	mild steel	.375	20
744	747	mild steel	.500	20
757	780	mild steel	.500	20
815	832	mild steel	.500	20
832	872	mild steel	.375	20
872	875	mild steel	.500	20
885	907	Mild steel	.500	20
917	922	mild steel	.500	20

CASING

DEPTH (feet) FROM	TO	☐SCREEN ☐PERFORATIONS ☐OPEN BOTTOM SCREEN SLOT SIZE OR PERF SIZE (in)	SCREEN DIAM. OR PERF LENGTH (in)	SCREEN TYPE OR NUMBER PERF (per round/interval)

DEPTH (feet) FROM	TO	SURFACE SEAL / INTERVAL SEAL / FILTER PACK / PACKER INFORMATION SEAL MATERIAL, FILTER PACK and PACKER TYPE and DESCRIPTION	**Quantity** of Material Used (if applicable)	GROUT DENSITY (lbs./gal., # bag mix, gal./sack etc.)

Comments (con't)

Well Driller Statement This well was drilled and constructed under my supervision, according to applicable rules and regulations, and this report is complete and correct to the best of my knowledge and belief.

Name LAYNE CHRISTENSEN COMPANY (Person, Firm, or Corporation - Print or Type) **License No.** 188

Signature Larry G Krasel (Licensed Well Driller) **Date** 5/11/07

Construction Information (con't)

DEPTH (feet) FROM	TO	CASING: CASING TYPE AND MATERIAL/GRADE	WALL THICK (in)	NOMINAL DIAM (in)	DEPTH (feet) FROM	TO	☐SCREEN ☐PERFORATIONS ☐OPEN BOTTOM: SCREEN SLOT SIZE OR PERF SIZE (in)	SCREEN DIAM OR PERF LENGTH (in)	SCREEN TYPE OR NUMBER PERF (per mandinterval)
922	962	mild steel	.375	20					
962	967	mild steel	.500	20					
992	1012	mild steel	.500	20					
1022	1042	mild steel	.500	20					

DEPTH (feet) FROM	TO	SURFACE SEAL / INTERVAL SEAL / FILTER PACK / PACKER INFORMATION: SEAL MATERIAL, FILTER PACK and PACKER TYPE and DESCRIPTION	**Quantity** of Material Used (if applicable)	GROUT DENSITY (lbs./gal., # bag mix, gal./sack etc.)

Comments (con't)

Well Driller Statement

This well was drilled and constructed under my supervision, according to applicable rules and regulations, and this report is complete and correct to the best of my knowledge and belief.

Name LAYNE CHRISTENSEN COMPANY (Person, Firm, or Corporation - Print or Type) **License No.** 188

Signature Larry G Knoll (Licensed Well Driller) **Date** 5/11/07

APPENDIX C

WELL SAMPLES

Water Systems Engineering, Inc.

Date: March 1, 2018

Lab Report No. 21097

Carter Hatch
CRS Engineers
4246 Riverboat Rd., Suite 200
Salt Lake City, UT 84123

Project Description: JVWCD, 987 E 7750 S, 7618 S 700 E, Cottonwood St., Etienne Way
Murray-Holladay; Complete Well Profiles
PO#20181882

Test Description:

The Complete Well Profile analysis is designed for comparative analysis of two samples, typically one static and one pumping sample. The Complete Well Profile utilizes a series of inorganic chemical and microbiological tests to identify fouling and corrosion issues with potential impacts on the operation of the sampled well. The tests include a number of inorganic chemical parameters such as pH, total dissolved solids/conductivity, hardness, alkalinity, oxidation reduction potential (ORP), bicarbonate, carbonates, silica, sodium, potassium, chloride, iron, manganese, phosphate, nitrate, sulfate, and total organic carbon (TOC). Biological assessment is designed to quantify the total bacterial population, identify two dominant populations of bacteria, assess anaerobic conditions, and identify the presence of iron related bacteria and sulfate reducing organisms. Also included are tests for Adenosine triphosphate (ATP), heterotrophic plate count (HPC), total coliform and E. coli coliform, and a microscopic evaluation.

Testing Procedures:

All laboratory testing procedures are performed according to the guidelines set forth in *Standard Methods for the Examination of Water and Wastewater* as established by the American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF). Corrosion analyses are performed in accordance with the guidelines as set forth by the National Association of Corrosion Engineers (NACE). In general, these methods are approved by both the Environmental Protection Agency (EPA) and AWWA for the reporting of water and/or wastewater data.

Sample collection and shipment is the responsibility of the customer, performed according to protocol and procedures defined by the laboratory in advance of the sampling event with regards to the specific project and nature of the problem.

Disclaimer:

The data and interpretations presented are based on an evaluation of the samples and submitted data. Conclusions reached in this report are based upon the data available at the time of submittal and the accuracy of the report depends upon the validity of information submitted. Any recommendations presented are based on laboratory and field evaluations of similar fouling occurrences within potable water systems. Further investigative efforts, such as efficiency testing, site inspection, video survey, or other evaluation methods may offer additional insight into the system's condition and the degree of fouling present.

Client: CRS
Date: March 1, 2018
Lab Report No. 21097

Re: JVWCD, 987 E 7750 S, 7618 S 700 E, Cottonwood St., Etienne Way
Murray-Holladay, Complete Well Profiles

ND - Not Detected NA - Not Applicable * as $CaCO_3$	**987 E 7750 S** mg/l	**7618 S 700 E** mg/l	**Detection Limits**
pH Value	8.22	8.10	NA
Phenolphthalein Alkalinity*	ND	ND	4 mg/l
Total Alkalinity*	232	96	4 mg/l
Hydroxide Alkalinity	ND	ND	4 mg/l
Carbonate Alkalinity	ND	ND	4 mg/l
Bicarbonate Alkalinity	232	96	4 mg/l
Total Dissolved Solids	195	150	1.0 mg/l
Conductivity (µm or µS/cm)	271	209	NA
ORP (mV)	198.7	193.9	NA
Langelier Saturation Index (at 16°C)	+ 0.72	+ 0.26	NA
Total Hardness*	184	124	4 mg/l
Carbonate Hardness	184	96	4 mg/l
Non Carbonate Hardness	ND	28	4 mg/l
Calcium*	76	80	4 mg/l
Magnesium*	108	44	4 mg/l
Sodium (as Na)	10.70	9.02	0.02 mg/l
Potassium (as K)	25.00	2.20	0.1 mg/l
Phosphate (as PO_4)	0.36	0.89	0.06 mg/l
Chlorides (as Cl)	26.8	27.2	2 mg/l
Nitrate (Nitrogen)	0.6	0.5	0.3 mg/l
Chlorine (as Cl)	ND	ND	0.02 mg/l
Dissolved Iron (as Fe^{2+})	ND	ND	0.02 mg/l
Suspended Iron (as Fe^{3+})	0.04	ND	0.02 mg/l
Iron Total (as Fe)	0.04	ND	0.02 mg/l
Iron (resuspended)	0.27	0.13	0.02 mg/l
Copper (as Cu)	ND	ND	0.04 mg/l
Manganese (as Mn)	ND	ND	0.1 mg/l
Sulfate (as SO_4)	22	25	2 mg/l
Silica (as SiO_2)	7.4	9.5	1.0 mg/l
Tannin/Lignin	ND	ND	0.1 mg/l
Total Organic Carbon (C)	0.0	1.0	0.0 mg/l

Client: CRS
Date: March 1, 2018
Lab Report No. 21097

Re: Cottonwood St., Etienne Way Wells
Complete Well Profiles

ND - Not Detected NA - Not Applicable * as $CaCO_3$	**Cottonwood St.** mg/l	**Etienne Way** mg/l	**Detection Limits**
pH Value	8.35	7.34	NA
Phenolphthalein Alkalinity*	ND	ND	4 mg/l
Total Alkalinity*	120	136	4 mg/l
Hydroxide Alkalinity	ND	ND	4 mg/l
Carbonate Alkalinity	ND	ND	4 mg/l
Bicarbonate Alkalinity	120	136	4 mg/l
Total Dissolved Solids	543	379	1.0 mg/l
Conductivity (µm or µS/cm)	755	526	NA
ORP (mV)	211.7	209.6	NA
Langelier Saturation Index (at 16°C)	+ 0.39	- 0.13	NA
Total Hardness*	104	220	4 mg/l
Carbonate Hardness	104	136	4 mg/l
Non Carbonate Hardness	ND	84	4 mg/l
Calcium*	64	160	4 mg/l
Magnesium*	40	60	4 mg/l
Sodium (as Na)	118.00	15.10	0.02 mg/l
Potassium (as K)	2.30	4.40	0.1 mg/l
Phosphate (as PO_4)	0.68	0.06	0.06 mg/l
Chlorides (as Cl)	112.4	65.2	2 mg/l
Nitrate (Nitrogen)	ND	1.5	0.3 mg/l
Chlorine (as Cl)	ND	ND	0.02 mg/l
Dissolved Iron (as Fe^{2+})	ND	ND	0.02 mg/l
Suspended Iron (as Fe^{3+})	0.23	0.04	0.02 mg/l
Iron Total (as Fe)	0.23	0.04	0.02 mg/l
Iron (resuspended)	0.72	0.66	0.02 mg/l
Copper (as Cu)	ND	ND	0.04 mg/l
Manganese (as Mn)	ND	ND	0.1 mg/l
Sulfate (as SO_4)	105	41	2 mg/l
Silica (as SiO_2)	13.0	17.8	1.0 mg/l
Tannin/Lignin	ND	ND	0.1 mg/l
Total Organic Carbon (C)	1.1	0.8	0.0 mg/l

Client: CRS

Date: March 1, 2018

Lab Report No. 21097

Re: Murray-Holladay Well
Complete Well Profile

ND - Not Detected NA - Not Applicable * as $CaCO_3$	**Murray-Holladay** mg/l	**Detection Limits**
pH Value	9.40	NA
Phenolphthalein Alkalinity*	12	4 mg/l
Total Alkalinity*	128	4 mg/l
Hydroxide Alkalinity	ND	4 mg/l
Carbonate Alkalinity	24	4 mg/l
Bicarbonate Alkalinity	104	4 mg/l
Total Dissolved Solids	271	1.0 mg/l
Conductivity (µm or µS/cm)	377	NA
ORP (mV)	180.3	NA
Langelier Saturation Index (at 16°C)	+ 1.60	NA
Total Hardness*	176	4 mg/l
Carbonate Hardness	128	4 mg/l
Non Carbonate Hardness	48	4 mg/l
Calcium*	68	4 mg/l
Magnesium*	108	4 mg/l
Sodium (as Na)	11.60	0.02 mg/l
Potassium (as K)	2.20	0.1 mg/l
Phosphate (as PO_4)	ND	0.06 mg/l
Chlorides (as Cl)	57.2	2 mg/l
Nitrate (Nitrogen)	ND	0.3 mg/l
Chlorine (as Cl)	ND	0.02 mg/l
Dissolved Iron (as Fe^{2+})	ND	0.02 mg/l
Suspended Iron (as Fe^{3+})	0.05	0.02 mg/l
Iron Total (as Fe)	0.05	0.02 mg/l
Iron (resuspended)	0.17	0.02 mg/l
Copper (as Cu)	ND	0.04 mg/l
Manganese (as Mn)	ND	0.1 mg/l
Sulfate (as SO_4)	15	2 mg/l
Silica (as SiO_2)	1.7	1.0 mg/l
Tannin/Lignin	ND	0.1 mg/l
Total Organic Carbon (C)	0.7	0.0 mg/l

Biological Analysis:

	987 E 7750 S	7618 S 700 E	Detection Limit
Plate Count (colonies/ml)	0	0	NA
Anaerobic Growth (%)	<10	<10	NA
Sulfate Reducing Bacteria	Negative	Negative	NA
Fe/Mn Oxidizing Bacteria	Positive	Negative	NA
ATP (cells per ml) Initial	46,000	51,000	NA
ATP (cells per ml) 24 Hour	164,000	93,000	NA
Total Coliform	Negative	Negative	NA
E. Coli	Negative	Negative	NA
Bacterial Identification	*Gallionella*	-	NA

	Cottonwood St.	Etienne Way	Detection Limit
Plate Count (colonies/ml)	19	0	NA
Anaerobic Growth (%)	<10	<10	NA
Sulfate Reducing Bacteria	Negative	Negative	NA
Fe/Mn Oxidizing Bacteria	Negative	Positive	NA
ATP (cells per ml) Initial	80,000	25,000	NA
ATP (cells per ml) 24 Hour	4,000	117,000	NA
Total Coliform	Negative	Negative	NA
E. Coli	Negative	Negative	NA
Bacterial Identification	*Exiguobacterium undae*	*Gallionella*	NA

	Murray-Holladay	Detection Limit
Plate Count (colonies/ml)	0	NA
Anaerobic Growth (%)	<10	NA
Sulfate Reducing Bacteria	Negative	NA
Fe/Mn Oxidizing Bacteria	Positive	NA
ATP (cells per ml) Initial	303,000	NA
ATP (cells per ml) 24 Hour	420,000	NA
Total Coliform	Negative	NA
E. Coli	Negative	NA
Bacterial Identification	*Gallionella*	NA

Microscopic Evaluation:

987 E: No visible bacterial activity, trace of plant particulate matter, low to moderate iron oxide, minor iron oxide entrained biomass with low number of *Gallionella*.

7618 S: No visible bacterial activity, minor iron oxide with trace of iron oxide entrained biomass.

Cottonwood: No visible bacterial activity, trace of plant particulate matter, minor iron oxide with trace of iron oxide entrained biomass.

Etienne: No visible bacterial activity, low to moderate iron oxide, moderate iron oxide entrained biomass with moderate number of *Gallionella*.

Murray: No visible bacterial activity, trace of crystalline debris, very low iron oxide, minor iron oxide entrained biomass with trace of *Gallionella*.

Observations:

A single sample, representative of static conditions, was collected from each well and submitted for laboratory testing with regards to fouling potential. It was reported that each of the wells had experienced an extended period of inactivity following completion. When received in the lab, each of the samples was relatively clear (visually) with only minor amounts of sediment observed in the Cottonwood St. and Etienne Way well samples. Each of the wells displayed slightly elevated pH levels which were consistently above the neutral point of 7.0. The Murray-Holladay sample recorded the highest pH of 9.40. Alkalinity levels were also varied between 232 mg/l recorded in the 987 E 7750 S sample and 96 mg/l recorded in the 7618 S 700 E sample. Higher alkalinity levels typically indicate a greater buffering capacity against acidic conditions with lower levels resulting in a reduced ability to guard against chemical corrosion.

Conductivity and total dissolved solids levels were low to moderate in each sample except for elevated levels recorded in the Cottonwood St. sample. Higher levels such as these indicate a more congested ionic environment and exceed the EPA Secondary Drinking Water level of 500 mg/l preferred for domestic water supplies. A high oxidation-reduction potential (ORP) was recorded for each sample indicating oxidative conditions with a tendency for metallic oxide deposition in the presence of metal ions.

Calculation of the Langelier Saturation Index (LSI) yielded a positive value in all samples except the Etienne Way sample. Positive values indicate that the water is supersaturated with respect to calcium carbonate ($CaCO_3$) and scale forming may occur when idle. Conversely, the slightly negative value recorded in the Etienne Way sample suggests the groundwater exhibits a lesser potential for scale formation and is more corrosive at this site. The observable differences within the two values are reflective of the changes in conductivity, pH, and alkalinity, three significant components of the LSI.

Hardness levels varied considerably between the samples, with highest levels reported in the Etienne Way Well at 220 mg/l and lowest levels recorded in the Cottonwood St. Well at just 104 mg/l. The majority of the hardness reported in each sample was represented as carbonate hardness. Corresponding calcium and magnesium concentrations, as a predominant scale forming ions, also varied in each sample. Chlorides, potassium, sulfate and sodium levels, representing other scale forming ions, were well within more acceptable levels in each well

except the Cottonwood St. Well. The elevated sodium and chlorides levels in the Cottonwood St. sample were well above levels observed in each of the other wells and may indicate a high salt influence within the formation occurring at this location.

Testing for iron, as evaluated in multiple forms, generally identified relatively low levels. Suspended iron, generally reflective of active corrosion, was at low or non-detectable levels in each sample. Dissolved iron reflecting background iron, was absent in all samples. Resuspended iron, representing chemically and biologically mobilized iron, was moderate in the Cottonwood St. and Etienne Way Wells, with low levels recorded in each of the other samples As a point of reference, levels above 1.0 mg/l are typically associated with more significant iron presence and the potential for accumulation. Manganese, a mineral which is often viewed similarly to iron in its function as a fouling mechanism, was absent in all the samples.

The silica level, as a reflection of possible formation influence which can result in physical or mechanical fouling within the well and near-well formation, was not considered to be problematic in any of the wells. No chlorine or copper was detected in any of the samples.

Phosphate levels, a micro nutrient to bacteria, fluctuated between samples but were observed to be especially high in the 987 E 7750 S, 7618 S 700 E, and Cottonwood St. wells. Although phosphate is commonly found in groundwater, it rarely exceeds a background level of 0.20 mg/l.

The total organic carbon (TOC) result, often used as a non-specific indicator of water quality and a general indicator of potential biological growth and activity, was moderate in the Cottonwood St., Etienne, and Murray-Holladay samples with highest levels recorded in the Cottonwood St. sample. TOC levels were minimal in the other sampled wells. Other organic parameters, tannin and lignin were absent in all samples.

Biological analysis identified various degrees of biological influence in each of the wells. Quantification of the bacterial populations showed low counts in each of the wells with the exception of the Murray-Holladay Well. Adenosine triphosphate (ATP) analysis, a quantification method of measuring of the total population un-reliant on culturing bacteria, showed moderate bacterial counts in each of the samples, outside of elevated levels recorded in the Murray-Holladay Well. As a point of reference, clean, active well systems typically exhibit ATP values of 10,000 to 70,000 cells per milliliter (cpm), with levels exceeding 100,000 cpm more commonly associated with biofouling. Monitoring over a 24 hour period showed an increase in ATP levels, except the Cottonwood St. Well, indicating a strong growth potential. Heterotrophic plate growth, a more traditional quantification test, was low in all the samples with only the Cottonwood St. Well displaying any recognizable colony growth over the testing period.

Anaerobic bacterial growth, reported as a function of the total population, was very low in each well, at less than ten percent. Testing for sulfate reducing bacteria (SRB's), a specific species of anaerobic bacteria known for hydrogen sulfide (H_2S) gas production, was negative in all samples. Testing for coliform bacteria, including both environmental and E. Coli specific species, was negative in all samples.

Identification of the dominant bacteria found *Gallionella* in 3 of the wells (987 E 7750 S, Etienne Way, and Murray-Holladay). *Gallionella* are naturally occurring, iron-oxidizing chemolithotrophic bacteria that have been identified in a variety of different aquatic habitats, including groundwater. *Gallionella* are a generally aerobic group of bacteria that utilize iron as an energy source and secrete an iron-oxy-hydroxide byproduct. This secretion is often responsible for accumulations of iron oxide in wells and piping systems. In addition to fouling concerns, *Gallionella* are a chief form of microbial induced corrosion (MIC).

Additionally, *Exiguobacterium undae* was also identified in the Cottonwood St. sample. *Exiguobacterium undae i*s a gram positive, non-spore forming, facultative anaerobic bacterium. Catalase positive and oxidase negative, these bacteria are thermos-tolerant and found across a wide range of temperatures. Known for dense biomass formation, Exiguobacterium are found in soils, surface water environments, and associated with dairy and potato production.

A portion of each sample was extracted, centrifuged, and subjected to microscopic evaluation. Observations of the samples showed no visible bacterial activity. Low amounts of iron oxide were noted in each sample. Minor amounts of iron oxide entrained biomass were also observed in the samples, with more moderate levels noted in the Etienne Way sample. Traces of plant particulate matter were also found in the 987 E 7750 S and Cottonwood St. samples which are typically representative of surface water influences or rapid recharging of the aquifer. Trace amounts of crystalline debris were also observed in the Murray-Holladay sample.

Interpretations:

Although comparisons between active and static pumping conditions were not possible, each of the sampled wells is likely prone to mineral accumulation, and in some cases varying levels of biofouling. Some wells may also be subject to insufficient development during the drilling process.

The formation water chemistry in each of the wells is over saturated in most cases, indicating a potential for mineral accumulation. Given the Langelier Saturation Index results, varying levels of deposition may be expected with a higher potential for more accelerated accumulation identified in the 987 E 7750 S and Murray-Holladay Wells. Elevated sodium and chlorides levels in the Cottonwood St. sample may indicate a high salt influence within the formation occurring at this location and would also be expected to play a role in scale formation.

While the overall bacterial populations were within acceptable limits in all samples except the Murray-Holladay sample, the presence of iron oxidizing bacteria was confirmed in three of the wells (987 E 7750 S, Etienne Way, and Murray-Holladay). The role of iron bacteria and the entrainment of iron oxide within biomass is significant, increasing the occurrence of chemical and microbial influenced corrosion and aiding in the mobilization of additional iron within well systems. *Gallionella*, an iron oxidizing bacteria, are often identified in wells containing prolific bacterial growth. Although not true biofilm producing bacteria, these bacteria utilize iron as an energy source and secrete a gelatinous stalk of iron-oxy-hydroxide, often far larger than the bacterium itself. These stalks are often responsible for accumulations of iron oxide in well and piping systems. Furthermore, the stalked nature of the bacteria rapidly clogs well screens and pump intakes, reducing flow into and out of wells.

Elevated phosphate levels within the 987 E 7750 S, 7618 S 700 E, and Cottonwood St. samples is also worth noting as elevated phosphate levels such as these could indicate the presence of remnant drilling fluids or the introduction of water treatment chemicals within the well environment. Given the prolonged inactive status of the wells following their installation, either scenario is possible.

Recommendations:

The wells appear to be affected by varying combinations of aquifer conditions and fouling mechanisms that include mineral scale development, biofouling due to iron oxidizing bacteria, and possible insufficient development during the drilling process. Given these concerns identified during laboratory testing, the wells should, at a minimum, undergo a pH balanced

chlorination treatment for disinfection to reduce the identified bacteria and the fouling potential they pose. A video survey of the wells is also strongly encouraged as it would likely be a valuable tool in locating areas of heavier fouling as well as identifying any areas of mineral scaling. Should significant mineral deposits be identified within the wells during further investigations, more aggressive cleaning techniques utilizing acid based, and possibly re-development treatments may also be warranted.

Prior to chemical treatment, the wells should be thoroughly agitated to remove fouling that has accumulated on the casing and within the production zone. The agitation should utilize a stiff nylon brush to disrupt and dislodge biological growth within the cased portion of the well column. The tool used should complement the inner diameter of the wells in size, allowing sufficient tool material to contact the well structure and aid in removal of accumulated material. Immediately following the pretreatment agitation efforts, it is very important to thoroughly purge the wells of debris and disrupted material, beginning at the very bottom of the wells and working upwards until thoroughly evacuated.

Following the removal of the accumulated debris within the borehole, a disinfection treatment can be used to further clean the well column, as well as extending into the near-well formation and surrounding gravel pack. The use of chlorine enhancing products designed to control pH levels and provide maximum efficiency of the disinfection solution is also recommended. Such products should also contain surface acting agents to assist in penetrating sediment, deposits and the surrounding formation providing increased effectiveness against hidden or protected bacteria. Disinfection should utilize a pH-adjusted chlorination treatment of a 300 ppm chlorine level in a pH range of 6.5 to 7.0.

The volume of the disinfection solution should be equivalent to 3 times the standing well volume. This larger volume is utilized to flood the borehole with the disinfection solution in order to increase the effectiveness of treatment, as well as increasing the treatment area. Utilization of NSF approved chlorine enhancing chemicals, such as Layne's Oximate or Johnson Screen's NW-410 product, is strongly encouraged to aid in both effective disinfection as well as to increase the treatment area.

The disinfection solution should be blended above ground and dispersed evenly into the wells by a tremie pipe or similar treatment line. Once the solution is placed into the wells, it should be lightly agitated with a single disc surge block, to supply agitation and dispersion throughout the well column and borehole. Following agitation, check the chlorine residual within the well to ensure sufficient strength is present. If the chlorine residual has diminished below 150 ppm, add additional sodium hypochlorite to raise it to that level.

Allow the chlorine solution to remain downhole 12 to 24 hours. Following this period, begin evacuation of the well from the bottom, working upwards, until a minor residual (~ 50 ppm) is present and all debris has been evacuated from the wells, as identified by visible turbidity. At this time, the permanent pump and column pipe can be placed into the wells and utilized to purge the remaining chlorine solution from the well.

Once disinfection efforts are completed, the wells should operate on an active, consistent schedule with very little down time. If left idle, the nature of the source water and *Gallionella* presence will contribute to re-establishment of the fouling mechanisms identified. Follow up sampling of the well to evaluate cleaning efforts and to establish a new baseline could aid in establishing long term well operation and maintenance procedures.

With regard to long term well health, the well should maintain a routine and active operating schedule to help lessen the possibility for the build-up of bacteria populations and mineral scale. An annual monitoring program for chemical congestion and bacterial fouling can help ensure the long-term operating efficiency of any well, and identify fouling before it reaches severe levels. Early identification of problems and pro-active maintenance procedures will help keep well fouling mechanisms such as corrosion, scale forming chemistry, and bacterial growth in check.

If you have any questions of the report or require additional information, please feel free to contact our office.

Eric Duderstadt
Chemist/Biologist