TJANNSEN@SUNRISEWATER.COM

ASR License No. _____
(ASSIGNED AFTER FILING)

STATE OF OREGON
WATER RESOURCES DEPARTMENT
APPLICATION FOR LIMITED WATER USE LICENSE
FOR
AQUIFER STORAGE AND RECOVERY (ASR)

Applicant(s): Sunrise Water Authority (SWA)
Contact Person: Tim Jannsen
Mailing Address: 10602 SE 129th Avenue

Portland	Oregon	97236	503-761-0220
City	State	Zip	Phone #

1. DATE(S) OF PRE-APPLICATION CONFERENCE(S): June 29, 2006

INFORMATION REGARDING ASR TESTING UNDER A LIMITED LICENSE

2. SOURCE OF INJECTION WATER for ASR: CRW and/or NCCWC water treatment plants a tributary of Source: Clackamas R > Willamette R

3. MAXIMUM DIVERSION RATE: 3750 gpm (8.35 cfs)

4. MAXIMUM INJECTION RATE AT EACH WELL(S): up to 750 gpm (1.67 cfs)

5. MAXIMUM STORAGE VOLUME: 600 MG,

6. MAXIMUM STORAGE DURATION: typically up to 2 months; there may be year-to-year carryover of storage depending on demand for stored water

7. MAXIMUM WITHDRAWAL RATE AT EACH WELL(S): 1,100 gpm

8. LICENSE TERM OR DURATION SOUGHT (5 year maximum): 5 years

9. PROPOSED USE OR DISPOSAL OF RECOVERED WATER: Municipal water supply to be delivered into SWA's distribution system

10. IF CONTINGENCIES PRECLUDE THE USE IN ITEM 9, SPECIFY AN ALTERNATE USE OR DISPOSAL OF THE RECOVERED WATER: Contengency plan for disposal of injected water is discharge to waste.

-over-

INFORMATION REGARDING THE ULTIMATE ASR PROJECT

AS CURRENTLY ANTICIPATED

11. **SOURCE OF INJECTION WATER for ASR:** CRW and/or NCCWC water treatment plants a tributary of Source: Clackamas R > Willamette R

12. **MAXIMUM DIVERSION RATE:** 3750 gpm (8.35 cfs)

13. **MAXIMUM INJECTION RATE AT EACH WELL(S):** up to 750 gpm (1.67 cfs)

14. **MAXIMUM STORAGE VOLUME:** 600 MG

15. **MAXIMUM STORAGE DURATION:** typically up to 2 months; there may be year-to-year carryover of storage depending on demand for stored water

16. **MAXIMUM WITHDRAWAL RATE AT EACH WELL(S):** 1,100 gpm

NOTE: The materials required by rule for an ASR limited license are extensive. The items on this sheet consist of those outlined in OAR 690-350-020(2) and (3)(a)(A-E). Please consult the rule and provide as attachments to this form the other requirements in OAR 690-350-020(3)(a).

Signature of Applicant J. [illegible] P.E. **Date** 7/27/06

Title General Manager

Deep Alluvial Aquifer
Aquifer Storage and Recovery (ASR)
Feasibility Study

Prepared For
Sunrise Water Authority

Prepared By
Groundwater Solutions, Inc.
55 SW Yamhill Street, Suite 400
Portland, Oregon 97204
(503) 239-8799

July 2006

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1. Introduction

Sunrise Water Authority (SWA) plans to increase its available groundwater supply capacity to meet peak water demands in the summer by storing surplus water available in the winter from SWA's current surface water sources using aquifer storage and recovery (ASR) technology. SWA came into existence in November 2000, through the combination of the Mt. Scott Water District and the Damascus Water District, and currently serves the City of Happy Valley, City of Damascus, and urban and rural areas in north Clackamas County between Interstate 205 (I-205) to the vicinity of SE 242nd Avenue. Figure 1 is a map showing the project location and service area boundaries.

As significant growth and development pushes eastward within the SWA service area and the Metro growth boundary expands, additional water supply sources are needed. SWA estimates that during the next 20 years it will need to supply an additional 52 million gallons per day (mgd) to meet peak demands, and intends to develop an ASR system(s) to meet approximately 10 mgd of this additional demand.

SWA currently has groundwater production wells completed in three different groundwater bearing units within its service area: an upper gravel aquifer, a deep alluvial aquifer, and a basalt aquifer. This report presents an evaluation of the feasibility of ASR operations in the deep alluvial aquifer.

1.1. Purpose and Objectives

The purpose of this report is to provide information in support of SWA's application to the Oregon Water Resources Department (OWRD) for an ASR limited license, as required in Oregon Administrative Rules (OAR) 690-350-0020(3)(a)(K). The objective of this report is to summarize the hydrogeology of the local aquifers within the SWA service area and present the results of the evaluation for developing an ASR program within the deep alluvial aquifer.

SWA plans to inject treated drinking water into the ground during times of low water demand when excess water treatment plant capacity is available (typically in the winter). This will allow SWA to store or "bank" water in the ground for future use during high water demand, thereby increasing peaking capacity of its system. ASR will contribute to the long-term sustainability of the aquifer and alleviate the potential for declining water levels in the aquifer.

Although this report specifically evaluates ASR feasibility in the deep alluvial aquifer, SWA also intends to eventually develop an ASR system in one or more other aquifers within the service boundaries.

1.2. ASR Feasibility Project Scope

ASR projects commonly are divided into three phases: Phase 1 - ASR Feasibility Study, Phase 2 - ASR Pilot Testing, and Phase 3 – Expansion and Full-Scale Operation. The ASR feasibility study described in this report is designed to provide SWA with key

information needed to identify potential fatal flaws to ASR development in the deep alluvial aquifer, factors determining ultimate system capacity and key uncertainties to address. The feasibility study also provides information required by OWRD as part of the ASR permitting process and it is intended that the report be submitted to OWRD as an attachment to the ASR limited license application. SWA intends to implement an ASR pilot testing program subsequent to receiving an ASR limited license from OWRD to test and demonstrate ASR feasibility and to provide SWA with needed operational data.

The ASR feasibility study for the deep alluvial aquifer included the following elements:

Section 2 – Hydrogeologic Characterization. Construct geologic cross sections through the project area to further define the nature, extent, and character of both deep alluvial aquifer and the surrounding hydrogeologic units, and to assess how recharge water will move within the deep alluvial aquifer.

Section 3 – Aquifer Testing. Conduct an aquifer test at SWA Well 2W in the deep alluvial aquifer to measure well performance and aquifer characteristics including specific capacity, transmissivity, storativity, and boundary conditions. The test included monitored water levels in the test well (SWA Well 2W) and several nearby wells. This information was used to estimate the target recharge rate, pumping rate, and the amount of water that can be stored.

Section 4 – Source Water and Groundwater Quality Compatibility. Conduct detailed geochemical testing and geochemical modeling to predict the likelihood for reactions to occur that might clog the well or affect the taste of the recovered water. This analysis included modeling potential geochemical reactions during mixing of the deep alluvial groundwater (receiving water) with two source water options available to SWA during the recharge period.

Section 5 – Recharge Water Availability. Assess the source(s) of water, the volume of water available, and the time water is available for recharge

Section 6 –Recharge Analysis. Using the estimated aquifer parameters, predict target injection and pumping rates, target storage volume, and water levels in the aquifer and wells during injection and pumping in the deep alluvial aquifer.

Section 7 – Conclusions, Uncertainties, and Recommendations. Discuss conclusions and uncertainties associated with the ASR feasibility study and present recommendations for addressing the uncertainties and proceeding with the project.

The findings of the ASR feasibility study are presented in the following sections beginning with the hydrogeologic characterization.

2. Hydrogeologic Characterization

The OWRD water well log database was used in conjunction with various geologic maps and publications for this area to develop a conceptual geologic and hydrogeologic model for groundwater system beneath the SWA service area. The locatable water supply wells found in the project area were used in the hydrogeologic characterization. Many other water wells are present within the study area, based on OWRD records; however, the location of these additional wells is not known beyond the township, range and section number. This section summarizes the conceptual hydrogeologic model in the project area.

2.1. Physical Setting

The SWA service area is located in the southeastern portion of the Portland Metro Area east of I-205, north of the Clackamas River, and stretching east toward Boring (Figure 1). Major features in the project area are Mt. Scott (remnant of the small volcanoes in the area) on the western edge, Pleasant Valley running north-south in the middle, and the Boring Hills rising to the east of the City of Damascus (Figure 2). The land surface elevation within the project area ranges from approximately 120 to 1,050 feet mean sea level (msl).

2.2. Geologic and Hydrogeologic Units

The project area is located in a relatively complex geologic setting on the southeastern edge of the regional structure known as the Portland Basin. Alluvial sediments, including the regionally extensive Troutdale Formation, have filled the subsiding basin. The deposition of the upper portion of the Troutdale Formation was marked by the formation of numerous faults and the occurrence of small volcanic eruptive centers and lava flows in the southeastern portion of the basin, which is occupied by the SWA service district. The general geologic units present in the SWA service area are shown on the geologic map, Figure 3, and are described from youngest to oldest below.

Alluvial Deposits – Qal

This unit consists of Quaternary period river and stream deposits of sands, gravels, and silts that are largely confined to channels and floodplains of local rivers, streams, and valley bottoms.

Catastrophic Flood Deposits – Qff, Qfc

These units consist of Pleistocene age flood deposits associated with high energy, sub-fluvial deposition during catastrophic floods resulting from the Missoula flood episodes. These deposits have been divided into fine-grained (geologic map symbol Qff) and course-grained deposits (geologic map symbol Qfc). The fine-grained deposits form the surface deposit layers along the south side of Mt. Scott and throughout the Pleasant Valley.

Boring Lava – QTba

The Boring Lava intrudes the existing sediments of the basin in the SWA service area. The Boring Lava represents relatively young basalts and basaltic andesite lavas that were erupted from vents in the greater Portland area and in Clark County, Washington. The Boring Lava and associated resistant knobs of basin sediments form the range of hills characteristic of the service area.

Springwater Formation – Qts

The Springwater Formation is a Cascade-derived consolidated gravel formation that is comprised of mostly volcanoclastic material. This formation was deposited in the eastern portions of the Portland region, along the slopes of the Cascades after deposition of the Troutdale Formation.

Troutdale Formation – Ts

The Troutdale Formation includes a sequence of major sedimentary deposits that have filled the Portland Basin. The Troutdale Formation has been divided into the following hydrogeologic units within the basin (Hartford and McFarland, 1989 and Leighton and Porcello, 2001):

- Troutdale Gravel Aquifer (TGA)
- Confining Unit 1 (CU1)
- Troutdale Sand Aquifer (TSA)
- Confining Unit 2 (CU2)
- Sand and Gravel Aquifer (SGA) (Sandy River Mudstone equivalent)

The primary geologic and hydrogeologic units present beneath the SWA service area near the edges of the regional basin include the TGA, CU1, and finer-grained floodplain facies of the TSA, SGA, or Sandy River Mudstone hydrogeologic units. The lower units of the Troutdale Formation are characteristic of an alluvial big river system, with thick gravel and sand deposits in and near the channels and finer-grained deposits in the associated floodplain areas. The deeper Troutdale deposits found beneath SWA's service area consist of finer-grained floodplain deposits compared to the other portions of the basin, with occasional overbank sand deposits resulting from major flood events or local tributaries to the bigger river system. In contrast, the upper Troutdale Gravel unit appears to be more regionally present within the basin.

Columbia River Basalt Group (CRBG)

The CRBG consists of a series of Miocene age basalt flows that underlie most of the Portland Basin to thicknesses approaching 1,000 feet. Individual basalt flows can vary greatly in thickness from several feet to more than 100 feet thick. Groundwater in the basalt is predominantly derived from interflow zones, which represent the contact between individual basalt flows. These interflow zones are typically rubbly and porous, and thus can transmit water easily. Groundwater also is produced from fractured zones in the more massive interior flows, if sufficient structural deformation and/or fracturing has occurred. Tuffaceous sedimentary deposits representing sediment deposition between eruptions are also found in the interflow zones.

The OWRD water well log database was used in conjunction with various geologic maps and publications to develop geologic and hydrogeologic cross sections for groundwater system beneath the SWA service area. Figure 4 presents the cross section location map showing located water wells, and Figures 5 and 6 show the cross sections depicting the geologic and hydrogeologic units within the project area. The vertical scales of the cross sections are exaggerated to better display the subsurface conditions.

2.3. Geologic Structures

The prominent geologic structures near the SWA service area include the regional structure known as the Portland Basin, numerous structural faults, and remnant volcanic eruption centers or vents. The Portland Basin is described as a basin structure that has been filled up with sedimentary material that overlies the CRBG.

The structural faults in the project area include mostly northeast and northwest-trending faults (Figure 3). These faults cut through most sedimentary deposits that filled the Portland Basin, indicating they occurred after deposition of most of the sedimentary deposits in the project area. Faults and folds can influence groundwater flow by promoting and/or impeding both lateral and vertical groundwater flow. The hydraulic character of the faults in the project area depends on the degree of offset, as well as healing by secondary minerals, such as clays.

The remnant volcanic eruption centers or vents in the project area are thought to have occurred around the same time as the faulting. Molten rock pushing up through the sedimentary deposits in the area resulted in surface lava flows extending from the vents into the valley portions of the project area. Mt. Scott is one of the larger, well preserved, eruption centers (Figure 3 and 4). The temperature of the molten rock passing through combined with the hydrothermal alterations within the sediments likely creates a halo of reduced permeability in the adjacent sedimentary deposits near the vents and intrusions. Recent alluvial deposition has since covered many of the potential surface lava flows.

2.4. Hydrogeologic Setting

The primary aquifers used for groundwater supplies present beneath the SWA service area include:

- The upper gravel aquifer (an upper Troutdale Gravel equivalent)
- deep alluvial aquifer (a TSA or Sandy River Mudstone equivalent that is a sandy deposit within the larger fine grained floodplain deposits in this area)
- CRBG

The sedimentary units present beneath the SWA area are relatively thin and the deeper deposits are not laterally continuous due to both the extensive faulting and depositional environments of these localized deposits.

The unconfined upper gravel aquifer is relatively continuous gravel deposit that represents a typical alluvial depositional system and includes interbedded layers of conglomerate, gravel, sand, and fine-grained silts. This unit is cemented in some places.

The thickness of this hydrostratographic unit in SWA's service area ranges from 120 feet to more than 200 feet. This aquifer may be partially confined in the northern sections of Pleasant Valley where the static water level is present above the top of the gravel deposit that is capped by a distinctive, laterally continuous, Boring Lava deposit. The upper gravel aquifer is generally unconfined toward the south of the SWA service area and likely is connected to local surface water streams or discharges.

The deep alluvial aquifer is a coarser sand deposit present within the fine-grained floodplain deposits present in this area of the basin. This aquifer is a confined system that is approximately 50 feet thick (Figures 5 and 6). Limited information is available for the deep alluvial aquifer because few wells have been constructed in this unit within the service area. Based on the depositional environment of the Portland Basin during the deposition of this sand unit, structural faulting and potential system alterations associated with local volcanic activities, the deep alluvial aquifer appears to be a relatively isolated aquifer of limited areal extent. Figure 7 shows the locations of water wells that may penetrate this unit and the potential lateral extent of this deep hydrostratographic unit. The sustainable yield for this unit likely is limited by aquifer recharge conditions.

The deep alluvial aquifer is the focus of this ASR feasibility study.

2.5. Groundwater Development

Most of the water wells in the project area are completed in the upper gravel aquifer. Historically, this aquifer was the first significant groundwater producing unit that provided sufficient production for past users. Limited wells have been drilled to a depth that would encounter the deep alluvial aquifer, the target aquifer for this ASR feasibility evaluation. Because of the limited number of wells completed in the deep alluvial aquifer, limited data exist for estimating the ultimate sustainable yield of this aquifer.

SWA production well 2W is one of few water wells that is completed in the deep alluvial aquifer. Based on the production performance history of SWA Well 2W, this aquifer can yield groundwater at rates up to at least 1,200 gallons per minute (gpm) for short periods of time and wells completed in the aquifer have a specific capacity of up to at least 8 gpm /ft. However, the deep alluvial aquifer appears to be of limited areal extent, evidenced by drawdown experienced in SWA Well 2W during extended pumping. Additional details regarding the hydraulic properties of the deep alluvial aquifer are provided in Section 3 of this report.

3. Aquifer Testing

Aquifer testing was performed on the deep alluvial aquifer at SWA Well 2W to measure the aquifer hydrogeologic parameters including transmissivity and storativity, as well as the specific capacity of the well. This information is used in the ASR recharge and pumping analysis (see Section 6) to predict water level draw-up (mounding) during injection, and drawdown during pumping under several ASR injection and pumping scenarios in the deep alluvial aquifer.

Aquifer testing of the deep alluvial aquifer consisted of a step rate drawdown test and a 4-day constant rate drawdown test. The step rate drawdown test consisted of four 1-hour consecutive steps and the constant rate drawdown test consisted of pumping SWA Well 2W at a rate of 800 gpm for approximately 102 hours (4.27 days). Water levels in SWA Well 2W were monitored during pumping and also for approximately 720 hours (30 days) during recovery. Water levels in two observation wells in the deep alluvial aquifer also were measured during the pumping and recovery phases of the test. In addition, water levels in the upper gravel aquifer were monitored during aquifer testing in SWA Well 5. Appendix A contains manual water level data, water level plots, and a detailed description of the methods used to calculate aquifer parameters.

Water quality conditions in the deep alluvial aquifer at SWA Well 2W were evaluated during the aquifer testing program through water sampling and analysis and collection of field parameters. A water quality compatibility evaluation related to the ASR feasibility analysis is included in Section 4.

Water level drawdown and recovery data were used to compute transmissivity and storativity values for the deep alluvial aquifer. Transmissivity is a measure of the productivity of an aquifer in terms of thickness and permeability of the aquifer matrix. The storativity is a measure of how much water can be released from, or taken into the aquifer per unit change in the hydraulic head. Specific capacity was also computed on the basis of the constant rate drawdown test data. Specific capacity is an index for how a given well performs and it is calculated by dividing the discharge rate by the resultant drawdown (or drawup during injection). The specific capacity index takes into account both the productivity of the aquifer (transmissivity) and the efficiency of the well. Specific capacity, transmissivity, and aquifer boundary conditions are used to determine what injection and pumping rates can be sustained at an ASR well because they influence the drawdown and drawup in the well for a given storage or pumping volume. A more detailed discussion of how these aquifer and well parameters were used to calculate target ASR injection rates, pumping rates, and storage volume is presented in Section 6.

3.1. Aquifer Test Water Level Monitoring Program

Based on a review of the water well records on file with OWRD, few water wells in the study area are completed in the deep alluvial aquifer, the target aquifer for this ASR feasibility evaluation. SWA has an observation piezometer (CLAC 53331) located 17 feet

from SWA Well 2W that was used as an observation well for the aquifer testing. Two additional potential observation wells completed in the deep alluvial aquifer were identified within approximately 1 mile of SWA Well 2W for the aquifer testing: Clackamas 55211 and Clackamas 4610. SWA staff members were successful in obtaining permission to allow monitoring of water levels before and during the aquifer testing in Clackamas 55211, an irrigation well at the North Clackamas High School. The other water well, Clackamas 4610, reportedly owned by Joseph Dixon, did not have a specified street address and long-time residents in the general vicinity of the reported location did not recognize the name Joseph Dixon as a resident of the area. The State Water Well Reports for these wells are provided in Appendix B.

SWA Well 2W and the 2W piezometer were instrumented with pressure transducers and data loggers to allow automated water level monitoring. SWA Well 2W is also instrumented with a flow meter that reports the well flow through SWA's telemetry system. Because of access limitations, a pressure transducer and data logger could not be installed for the aquifer testing program in Clackamas 55211 to allow automated water level monitoring. Instead, water level measurements were made twice daily using the existing air line installed at the well. The initial and final water level measurements made using the air line were verified using an electric water level meter. Water levels in an upper gravel aquifer well, SWA Well 5, also were continuously collected with SWA's SCADA system and downloaded during the background, testing, and recovery phases of the aquifer testing program to evaluate potential vertical hydraulic communication between the two aquifers.

Water levels in SWA Well 2W and the observation wells were monitored for approximately 1 week before the start of the aquifer tests (to establish baseline condition of the aquifer), during the aquifer tests, and during the recovery period following the aquifer tests.

A summary of the aquifer tests is presented below and Appendix A provides a more detailed description of the tests.

3.2. Step Rate Drawdown Test

To determine the performance of the deep alluvial aquifer, a step rate drawdown test was completed at SWA Well 2W. This type of testing provides a baseline from which to compare future changes to well performance resulting from ASR operations at this well. A step rate drawdown test is conducted by pumping a well at successively higher pumping rates over an equal interval of time. For this test, SWA Well 2W was pumped at 400, 600, 800, and 1,000 gpm for 1-hour intervals. The step test data were used to pick a pumping rate for the constant rate drawdown test and to assess head losses in the well. Based on the step test data, laminar flow losses as a percentage of total head losses are approximately 89 percent, which indicates that the well is relatively efficient. On the basis of the step test results, a constant rate of 800 gpm was chosen for the constant rate drawdown test.

3.3. Constant Rate Drawdown Test

A constant rate drawdown test was conducted for a period of 102 hours (4.27 days) at SWA Well 2W to determine the following:

- Calculate transmissivity and storativity of the deep alluvial aquifer.
- Determine the specific capacity of the well and project the specific capacity during long-term pumping.
- Identify possible boundaries to the deep alluvial aquifer that might limit the ASR storage volume.

The initial pre-test static piezometric head in SWA Well 2W was approximately 220 feet below ground surface (bgs) (the reported static water level shortly after the well was drilled in March 1998 was also 220 feet bgs; indicating relatively stable aquifer levels). The top of the aquifer is located approximately 450 feet bgs, indicating that the aquifer is confined. The constant rate drawdown test was conducted from March 20 to 24, 2006. The well was pumped at a rate of 800 gpm and drawdown was measured in SWA Well 2W, the 2W piezometer, and Clackamas 55211. The maximum drawdown in SWA Well 2W after 102 hours (4.27 days) was approximately 140 feet. The maximum drawdown in the 2W piezometer, located approximately 17 feet away, was approximately 100 feet and the maximum drawdown in Clackamas 55211, located approximately 4,950 feet away, was 6.5 feet. Recovery data were collected from SWA Well 2W and the 2W piezometer for 720 hours (30 days) following the end of pumping. A summary of the aquifer test data interpretation is presented below.

3.4. Aquifer Test Analysis

Graphs of the aquifer test data are presented in Appendix A. A change in the water level response of the aquifer occurred approximately 130 minutes into the constant rate drawdown test (refer to Appendix A), suggesting the presence of a negative hydraulic boundary (i.e., increased rate of drawdown with time) at a distance of approximately 1,100 feet from SWA Well 2W that reduces the water yielding capacity of the aquifer. No other boundaries were encountered during the remainder of the constant rate drawdown test.

The negative aquifer boundary could be the result of a change in the hydraulic properties of the aquifer, or a change in the thickness or extent of the aquifer at some distance and direction from SWA Well 2W. It is suspected this boundary may be a result of an aquifer permeability change associated with the intrusion of the Boring Lavas that form the prominent Mt. Scott north of the SWA Well 2W.

A transmissivity of the aquifer was calculated for both early time (i.e., before the boundary was encountered) and late time (i.e., after the boundary was encountered) using the drawdown data and the recovery data from SWA Well 2W, the 2W piezometer, and the North Clackamas High School well. Calculated early time transmissivity (pre-boundary) ranged from 11,700 to 12,200 gallons per day per foot (gpd/ft) and late time (post-boundary) transmissivity ranged from 8,800 to 9,200 gpd/ft.

The storativity of the aquifer was calculated using early time data from the 2W piezometer. Calculated storativity using early time data is 3×10^{-4}. Additional details regarding the analysis of the aquifer test data are provided in Appendix A. This storativity value is representative of a confined aquifer system and supports the conceptual hydrogeologic model presented above.

The transmissivity and storativity estimates of the aquifer indicate that the formation will readily yield water to wells, but the drawdown (and drawup) effects will be large and transmitted over long distances (miles). The low storativity value and presence of at least one negative boundary also means that the aquifer is vulnerable to excessive overpumping, which can result in significant water level declines. These characteristics are further illustrated by the observation that the water level (or piezometeric head) in SWA Well 2W did not recover fully following the pumping phase of the constant rate drawdown test: 2 feet of residual drawdown in the aquifer level remained 1 month after the end of the constant rate drawdown test. This observation supports the conceptual model of a confined aquifer of limited extent with limited recharge (at least in the short term), and indicates that the volume of water pumped from the aquifer during the constant rate aquifer test was likely taken out of storage. It should be noted that ASR is particularly beneficial in this setting because ASR will augment the apparent low rate of natural groundwater recharge and reduce the potential impact of groundwater overpumping and aquifer water level declines.

4. Source Water and Groundwater Quality Compatibility

This section presents a discussion of water quality and compatibility between the native groundwater and recharge source waters for the project. This analysis was performed to assess the potential for adverse chemical reactions that could occur as a result of mixing source water with native groundwater in the aquifer. Adverse reactions that could occur include precipitation of minerals (e.g., iron or manganese hydroxides) that could clog the aquifer or well, and dissolution of minerals in the aquifer that could mobilize metals or affect taste and odor.

SWA intends to use water obtained from Clackamas River Water (CRW) and North Clackamas County Water Commission (NCCWC) plants for ASR injection. Both providers obtain their water from the Clackamas River. CRW water treatment uses direct sand filtration. NCCWC water treatment includes either slow sand filter treatment or membrane treatment, or a mixture of the two. Currently, only water from CRW is available in the pressure zone where SWA Well 2W is located. Therefore, CRW will be the source water used for injection at the start of ASR pilot testing. However, at some point in the future it is expected that water from the NCCWC plant may become available at the SWA Well 2W wellhead and may be used as the source water for injection. Consequently, this evaluation is based on sampling results for native groundwater from SWA Well 2W, and source water from both the CRW water treatment plant and the NCCWC plant.

Samples collected from SWA Well 2W, CRW, and NCCWC were tested for water quality parameters related to potability and geochemical compatibility. In addition, the samples were tested for regulated and unregulated drinking water parameters as outlined in the ASR rules. Analytical testing conducted on the samples included:

- Field parameters (pH, conductivity, oxidation-reduction potential, dissolved oxygen, and temperature)
- Geochemical constituents (anions and cations)
- Metals
- Radionuclides (gross alpha and gross beta)
- Microbiological (total and fecal coliforms)
- Disinfectants (chlorine)
- Disinfection by-products (haloacetic acids, trihalomethanes)
- Miscellaneous parameters (color, odor, etc.)

Results from the testing are presented in Table 1. The following sections present discussions of native groundwater quality, source water quality, and an evaluation of water quality compatibility.

4.1. Native Groundwater Quality

General Chemistry

Native groundwater is of good quality with a moderate amount of dissolved solids (155 mg/L TDS). The water is considered moderately hard (82.7 mg/L hardness), and an alkalinity of 105 mg/L. The pH is near-neutral (6.7), and the temperature is relatively cool (14.4 °C). The water has no color or odor and may be considered to be mildly corrosive (Langelier index = -1.2).

Figures 8 and 9 present Stiff and Piper diagrams that illustrate the chemical signatures and water types in terms of dominant ions for native groundwater and the source waters. These diagrams are commonly used to graphically illustrate the dominant cations and anions dissolved in the water and to aid in comparing the chemistry of water samples. The native groundwater is a magnesium-calcium-bicarbonate type water. As can be seen from the shape and size of the polygon on the Stiff diagram, the native groundwater is significantly more mineralized than the source waters and has a different chemical signature based on the relative proportions of dissolved cations and anions. This difference in chemical signatures between native and source waters can be used to track the recovery of stored water during ASR.

Total organic carbon was not detected (at a detection limit of 1.0 mg/L), indicating a very low potential for the formation of disinfection by-products from injection of chlorinated source water into the aquifer or after recovery and rechlorination.

Iron and manganese often are elevated in Portland Basin groundwater. The native groundwater iron concentration, measured at 0.077 mg/L, is below the secondary drinking water standard (SMCL) for iron of 0.3 mg/L, while the native groundwater manganese concentration, measured at of 0.212 mg/L, is above the SMCL (0.05 mg/L). Comparison of iron and manganese concentrations in filtered and unfiltered samples indicates that these parameters are both present in dissolved form. Manganese does not pose a risk to human health; the SMCL is an aesthetic standard based on taste and potential for staining laundry and fixtures. Figure 10 presents a plot of iron and manganese concentrations in samples collected from SWA Well 2W since 1998. Manganese has consistently been detected in excess of the SMCL. Iron concentrations exceeded its SMCL twice in six sampling events.

Low dissolved oxygen and oxidation/reduction potential indicate anaerobic and somewhat reducing conditions in the aquifer, probably related to the presence of a clay confining layer overlying the sandy water-producing unit in which SWA Well 2W is screened. This prevents mixing of deeper groundwater with relatively more oxygenated shallow groundwater. Reducing conditions are conducive to leaching of iron and manganese from the aquifer matrix, and explain the persistently elevated concentrations of manganese in the groundwater.

Drinking Water Regulated Constituents

Constituents that have regulatory standards (e.g., metals, nitrate, volatile organic compounds, pesticides, radiological) and are indicative of contamination were either not

detected or were detected at levels below the applicable drinking water regulatory criteria in the native groundwater. Unregulated organic parameters, and total and fecal coliform also were not detected in the native groundwater sample.

Mineral Stability

A geochemical speciation model (PHREEQC) was used to assess the equilibrium state of the native groundwater with respect to common minerals associated with clastic sedimentary aquifers. The analysis is used to evaluate whether the water is undersaturated, supersaturated, or at equilibrium with respect to particular minerals. The saturation index (SI) is a measure of the chemical driving force available for mineral precipitation or dissolution reactions. Undersaturation ($SI < 0$) indicates a tendency for a mineral to dissolve into the water, if present in the subsurface. Supersaturation ($SI > 0$) indicates a tendency for a mineral to precipitate out of the water. At equilibrium, the water would not tend to either dissolve or precipitate the mineral. An understanding of the equilibrium state of a natural water provides insight on the geochemical controls on water composition and possible changes to expect when recharge water and native groundwater are mixed. The calculated SI values for common rock-forming minerals are tabulated in Table 2.

Based on the modeling results, native groundwater is undersaturated (i.e., tendency to dissolve rather than precipitate) with respect to major carbonate minerals, such as calcite (calcium carbonate) and dolomite (calcium magnesium carbonate). The groundwater also is undersaturated with respect to common manganese-containing oxide and carbonate minerals (e.g., tendency to dissolve rather than precipitate), which explains the detection of elevated dissolved manganese in the groundwater. Iron oxide minerals—such as goethite, hematite, and magnetite—are supersaturated and would tend not to dissolve. Precipitation of these phases is generally very slow and typically proceeds by formation of amorphous iron oxyhydroxides, which convert to the more stable minerals over time. Thus, supersaturation with respect to these minerals is not uncommon and does not necessarily indicate that precipitation is occurring. Amorphous iron hydroxide, being more soluble, appears to be undersaturated, which suggests that iron oxide precipitation near SWA Well 2W currently is limited by the relatively low iron concentrations.

The relatively high silica content of groundwater (54.6 mg/L) is typical of the Portland Basin and is attributed to dissolution of volcanic glass present in the volcaniclastic sediments. Silica concentrations appear to be close to equilibrium with amorphous silica, but indicate supersaturation with respect to quartz, the most common and stable form of silica in sediments. Quartz is unlikely to precipitate because of extremely slow kinetics at ambient conditions. Aluminosilicate clay minerals are also common in sedimentary aquifers and often are found to regulate silica concentrations in groundwater systems; SI's for clay minerals could not be computed because aluminum was not detected (< 0.001 mg/L). The absence of detectable aluminum implies that clay minerals are stable in the aquifer and probably exert some control on silica concentrations.

4.2. Recharge Source Water Quality (CRW and NCCWC)

ASR recharge source water samples were collected in April 2006 and are representative

of typical winter water that will be used for recharge. The CRW water sample was taken from the sample tap located within the SWA Well 2W vault. The NCCWC water sample was taken from the SWA Mather Pump station, which is a representative sampling location for NCCWC treated water.

General Chemistry

The water sample collected from CRW has excellent quality, with low total dissolved solids (TDS) of 48 mg/L, which is typical of surface water origin. The water is a calcium-magnesium bicarbonate type water (Figure 8) and is considered soft (10.5 mg/L hardness), with a near-neutral pH (6.8) and an alkalinity of 17.9 mg/L. The water has no color and a threshold odor number (TON) of 3.7, which is just in excess of the secondary standard of 3.0. The odor of the CRW is known to have minor variability. Historical odor data for CRW (most recently 2004) indicates an odor detection of 1 TON. Additional sampling of CRW water is planned before and during ASR pilot testing, which will afford the opportunity of continued evaluation of odor in the CRW water.

The water sample collected from NCCWC is also of excellent quality with a low TDS of 53 mg/L, and similar to CRW water. The water is a soft (10.6 mg/L hardness), calcium-magnesium bicarbonate type water (Figure 8) with a near-neutral pH (6.78) and an alkalinity of 21.2 mg/L. The water has no color and a threshold odor number (TON) of 2.3. Historical odor data for NCCWC (April 2006) indicates that odor may be as low as <1 TON.

The TOC concentration was below detection (< 1.0 mg/L) in CRW water and very low (1.07 mg/L) in NCCWC water. The formation potential for disinfection by-products is thus expected to be low.

Suspended Sediment

Suspended solids or turbidity present in recharge source water can be a significant concern for clogging of the ASR well, which can lead to reduction of efficiency and pumping/injection capacity. Suspended solids were not detected in either source water. Turbidity was below detection (<0.2 nephelometric turbibity unit [NTU]) in CRW source water, and measured at 0.792 NTU in NCCWC source water. Historical turbidity data for the past year indicates a range of 0.02-0.09 NTU with an average of 0.05 NTU for CRW and a range of 0.05-1 NTU with an average 0.13 NTU for NCCWC.

The turbidity of ASR source water should be less than 1.0 NTU, and preferably less than 0.5 NTU. Even good quality recharge water will gradually clog an ASR well. With proper monitoring of the source water and well performance and proper design of the system, potential impacts from clogging can be effectively managed by periodic maintenance.

Drinking Water Regulated Constituents

The water sample collected from CRW has no constituent exceeding 50 percent of established regulatory levels (DHS drinking water standards in the Safe Drinking Water Act [SDWA] rules), no disinfection by-product concentrations exceeding established

regulatory levels, and no constituent besides odor exceeding applicable secondary contaminant levels for aesthetics. Iron and manganese were not detected in the CRW source water. Unregulated organic parameters and total and fecal coliform also were not detected.

The water sample collected from NCCWC has no constituent exceeding 50 percent of established regulatory levels (DHS drinking water standards in the Safe Drinking Water Act [SDWA] rules), no disinfection by-product concentrations exceeding established regulatory levels, and no constituent exceeding applicable secondary contaminant levels for aesthetics. Iron was detected at 0.0392 mg/L in NCCWC source water, with about half in dissolved form and half in particulate form. Unregulated organic parameters and total and fecal coliform also were not detected.

Mineral Stability

The geochemical modeling results show that both CRW and NCCWC source waters are undersaturated with respect to reactive calcium magnesium silicate minerals and carbonates. The source waters would tend to dissolve minerals like olivine, pyroxene, calcite, and dolomite, if these minerals are present in the aquifer. Iron was detected only in the NCCWC source water. As is to be expected for a well-oxygenated surface water, supersaturation with respect to amorphous $Fe(OH)_3$ is predicted, implying precipitation of iron oxides. This is consistent with and explains the occurrence of a significant portion (about half) of the total iron content in NCCWC water in particulate form. Silica concentrations are lower than in groundwater, and close to equilibrium with chalcedony.

4.3. Water Compatibility

An analysis of water quality compatibility between potential ASR source waters (CRW and NCCWC) and native groundwater (represented by SWA Well 2W) was conducted. The purpose of this assessment was to identify chemical reactions as a result of mixing recharge water with native groundwater that could adversely affect ASR well performance, hydraulic properties of the aquifer, or recovered water quality. The exercise involved modeling the theoretical equilibrium states of a series of mixtures between source water and native groundwater using the PHREEQC geochemical model. The modeling was performed to predict possible geochemical effects, such as mineral precipitation or dissolution that might occur when the recharge waters and native groundwater are mixed. The simulation was performed over the entire range of mixing fractions between ASR source waters and native groundwater. Two mixing simulations were performed. One between CRW source water and native groundwater, and one between NCCWC source water and native groundwater. The chemical composition, pH, and redox potential for each of the end-member solutions in the mixing analysis were taken from data in Table 1.

As recharge water is introduced into the ASR well, native groundwater will be displaced. A mixing zone will be developed at the interface between recharge and native waters. The TDS immediately adjacent to the ASR well will be approximately similar to that of recharge water. Near the outer limits of the recharge water bubble, the water quality will

gradually change from that of recharge water to native groundwater. Outside the mixed zone, further away from the ASR well, the water quality will be that of native groundwater.

Geochemical Modeling Results

The results of the mixing simulations indicate that candidate recharge source waters (CRW and NCCWC) and receiving native groundwater are chemically compatible and do not present any fatal flaws for ASR. The results of the mixing models are summarized in Appendix D in terms of the predicted saturation states of various minerals as a function of the mixing fraction of recharge water in native groundwater. The simulation results for mixing of CRW source water with native groundwater are essentially identical to those for mixing of NCCWC source water. This is to be expected given the chemical similarity between the two candidate source waters.

During mixing of oxygenated recharge water with relatively reducing native groundwater in the aquifer near the ASR well, precipitation of carbonates (calcite, dolomite) or sulfates (gypsum) that could clog the well is not predicted to occur. In fact, the modeling results indicate that these minerals will remain undersaturated for all mixtures of source and native groundwater. Chalcedony and quartz are predicted to be somewhat supersaturated, but no more than is already observed in the aquifer, which implies that silica precipitation is not likely to be a significant process because of slow kinetics. The major ion chemistry of recovered water is expected to resemble that of recharge water chemistry with each subsequent ASR cycle (injection, storage, and recovery), particularly if additional recharge water is left in the aquifer from year to year. Also, given the similarity in pH between source and native waters, no change in pH is anticipated.

The introduction of dissolved oxygen and (residual chlorine) into the aquifer is predicted to promote oxidation of iron and manganese and precipitation of iron and manganese from native groundwater. This will have the beneficial effect of improving native groundwater water quality at the edges of the stored water bubble. Modeling suggests that manganese oxidation and precipitation will be initiated by as little as 0.15 percent of source water mixing into native groundwater (0.001 mixing fraction). For iron, even smaller fractions of source water (0.0001) can drive native groundwater to supersaturation with amorphous $Fe(OH)_3$ thus providing conditions favorable for its precipitation.

There are, however, two potential limitations inherent in the modeling that make it difficult to know with certainty what will actually happen with respect to iron and manganese concentrations during ASR operation. The first is that the model assumes that all the chemical oxidant demand comes from ions dissolved in groundwater. It is likely that the aquifer matrix will also exhibit some oxidant demand, and this would compete for the oxidizing power of the source water. The implication of this is that higher mixing fractions may be required to satisfy the aquifer matrix oxidant demand and the native groundwater oxidant demand. Given the extremely small demand for dissolved iron and manganese oxidation, this does not seem to be a serious limitation. The other limitation has to do with rates of oxidation and precipitation. Although more difficult to predict

quantitatively, it is likely that manganese precipitation will take place on a timescale of days to weeks after sufficient oxidizing conditions are established.

In view of the predicted potential for iron and manganese precipitation, it is of interest to estimate the possible volume of precipitates that could form to evaluate whether this could pose a concern for clogging. The highest detected iron and manganese concentrations in SWA Well 2W were used to evaluate the worst case scenario (1 mg/L and 0.2 mg/L, respectively, Figure 9). The iron and manganese oxide precipitates with the lowest density are amorphous $Fe(OH)_3$ (3.13 g/cm^{-3}) and birnessite (3.0 g/cm^{-3}); if all the iron and manganese present in 1 liter of groundwater were to be precipitated as these oxides, they would occupy a total volume of less than 0.001 cm^{-3} (i.e., 1 million times less than the pore volume occupied by the groundwater). This suggests that the levels of iron and manganese present in groundwater have a low potential for aquifer clogging, or at the very least it may only become of concern after many ASR cycles have been completed.

Disinfection By-Products

Chlorine and disinfection by-products will be introduced into the aquifer because the source waters are disinfected. Chlorine residuals of 0.511 and 0.353 mg/L were measured in CRW and NCCWC source waters, respectively. Residual chlorine concentrations are expected to decay rapidly (hours) as the injected water comes into contact with the aquifer matrix. Disinfection by-products (DBP) are produced as a result of chemical reactions between organic carbon present in the surface water or groundwater and chlorine. Disinfection byproducts include haloacetic acids (HAA) and trihalomethanes (THM). Because the TOC of the native groundwater is very low, the potential for DBP formation after the chlorinated recharge water is introduced into the aquifer also is expected to be low. It is anticipated that HAA concentrations in source water will dissipate quickly in the aquifer (within days of storage) as a result of aerobic microbial degradation. THM concentrations may increase slightly after injection as a result of the reaction between the TOC present in the recharge water and chlorine; however, THM concentrations should decrease with time (within weeks of storage) because of anaerobic microbial activity. Dilution caused by mixing between recharge water and native groundwater also is expected to reduce DBP concentrations.

5. Recharge Water Availability

5.1. General

Water availability for recharge is one of the essential components of the ASR project. In addition, the length of continuous availability of recharge water is important because minimizing the start/stop operation of injection will minimize the potential for air intrusion into the aquifer. SWA has targeted the time period from late fall through spring for ASR injection.

5.2. Recharge Water

SWA intends to use water obtained from CRW and NCCWC for ASR injection. Both providers obtain their water from the Clackamas River. CRW's water treatment plant uses a direct sand filtration treatment that includes a pretreatment system using a coagulant, prechlorination, and sedimentation basins; a rapid sand filtration primary treatment; and finally a gas chlorination and pH adjustment (using soda ash) post filtration. NCCWC's plant includes either slow sand filter treatment or a membrane treatment, or a mixture of the two. NCCWC's slow sand treatment has no pretreatment and uses a liquid chlorination system (sodium hypochlorite) and pH adjustment (using soda ash) post treatment. NCCWC's membrane treatment, has capability of pretreatment to be used only when necessary (i.e., high turbidity events), membrane filtration and a liquid chlorination system (sodium hypochlorite), and pH adjustment (using soda ash) post filtration.

Currently, only water from CRW is available in the pressure zone where SWA Well 2W is located. Therefore, CRW will be the primary source water used for injection at the start of ASR pilot testing. However, at some point in the future it is expected that water from the NCCWC water treatment plant may become available at the SWA Well 2W wellhead and could be used as the recharge source water.

During the wetter months (October 1 through May 31), SWA has access to excess water treatment plant production capacity. Based on the existing water supply available and the water demand experience by SWA (Table 3), approximately 6.83 mgd (4,750 gpm) of water are available during non-peaking periods (SWA 2004). Although future population growth and resultant water demand are expected, continued growth of the supply capacity is planned through expanding water treatment plant capacity, and water conservation and reuse measures. Accordingly, having access to excess water treatment plant production capacity during the non-peaking months is expected to continue into the future.

6. Recharge Analysis

This section presents a detailed evaluation of ASR injection and pumping at SWA Well 2W based on aquifer test results and other data gathered during the initial ASR feasibility evaluation. The general criteria used as guidelines for evaluating the hydrogeologic feasibility of ASR for SWA Well 2W include the following:

- A confined aquifer that is not significantly bounded with adequate headroom (area above the static water level) in the aquifer.
- The target aquifer can store an adequate volume of water at the well site, can sustain reasonable injection rates during the injection period, and can support reasonable and sustainable production rates during recovery.
- The water level in the recharge well does not rise above 25 feet bgs during injection and does not drop below the minimum pumping level (pump intake plus required submergence) during recovery.
- The target aquifer does not have other large producing wells that could capture significant portions of the stored water.

6.1. Target Injection/Pumping Rates and Storage Volume

Based on discussions with SWA, the following operational scenarios for the proposed ASR project in the deep alluvial aquifer were developed and are described below. These parameters were used during the ASR evaluation process. The scenarios also include target injection/recovery rates and estimated storage volumes. In general, injection will occur during late fall through spring using treated drinking water obtained from CRW and/or NCCWC.

The recharge analysis of SWA Well 2W will be evaluated on the basis of the capacity of the deep alluvial aquifer to receive water at this location. Although SWA Well 2W originally was constructed with an existing 3-inch-diameter drop pipe inside the production casing (separate from the pump column) to be used for injection, the well may be subsequently retrofitted during full build-out of the ASR system to allow for different injection rates.

Injection Criteria

The following represents general ASR evaluation criteria for injection (recharge).

- A total of **100 to 240 days** of injection were assumed based on:
  - An injection period between October 1 and May 31 of each year.
  - A total of 20 days were assumed for shutdown due to unforeseen events.
  - Back flushing will occur for 30 minutes every 3 weeks, which results in < 1 day of lost injection time.
- An injection rate of up to 70 percent of the anticipated long-term production rate of the well.
- Recharge water turbidity is less than 0.5 NTU during injection.
- Head buildup in the well casing cannot exceed a threshold criterion of 25 feet bgs.

Pumping Criteria

The following represents general ASR evaluation criteria for pumping (recovery).

- Head buildup calculations from year-to-year assume that 100 percent of the stored water is removed each year.
- The pumping rate assumed to be constant at rates of up to 650 gpm during recovery (although the well is capable of being operated at rates up 1,200 gpm for short durations).
- The water level in the well cannot be lowered below a depth of 384 feet bgs in order to maintain the required pump submergence design criteria.

6.2. Assessment of Target Injection and Recovery Rates

ASR well injection and recovery rates are controlled by several factors including pressure available in the recharge piping, the available headroom (drawup) and drawdown in the well, aquifer transmissivity, well efficiency, and boundary conditions as they affect drawup and drawdown. Aquifer and well performance data were used to evaluate if target injection and recovery rates are feasible based on predictions of drawup and drawdown during typical ASR operations in the proposed ASR well. These drawup and drawdown predictions are based on projections of specific capacity changes and water level trends over multiple yearly cycles.

This assessment of the target injection and recovery rates in the deep alluvial aquifer evaluates a range of injection and recovery rates and varying injection periods that represents both what the aquifer conditions may allow and SWA's potential ASR operational scenarios. Predictions of the water level drawup and drawdown are presented for this range of possible operation. In addition to establishing the range of injection and recovery rates feasible within the aquifer at the pilot test location, these predictions also are used to predict when clogging at the well may require rehabilitation.

Specific capacity is the injection rate or pumping rate divided by the water level drawup or drawdown, respectively. It provides a simple and convenient index for how the well is performing and for the extent to which clogging is reducing well efficiency. For example, if the well is becoming clogged, a reduction in specific capacity will be seen over time. For the purposes of this analysis, the constant rate drawdown test data, the step rate drawdown tests data, and an assumed percentage difference between pumping specific capacity and injection specific capacity were used to estimate the specific capacity at the end of the injection period. Because SWA may operate the ASR program under a variety of injection and/or recovery scenarios, multiple scenarios are analyzed and presented. Table 4 summarizes the estimated drawup and drawdown in SWA Well 2W during the first 5 years of ASR operations. The predictions are shown graphically in Figures 11A and 11B. Scenarios A, B, and C use a stable injection and recovery rate and a variable injection period. Scenarios D, E, and F show increasing injection and recovery rates while maintaining a constant injection period. Note that these predicted water levels assume recovery phase pumping at the well is continuous pumping 24 hours a day. Appendix E presents a detailed summary of the assumptions and calculations used in the ASR evaluation.

This assessment is based on an assumed maximum water level buildup threshold of 25 feet bgs in the ASR well during injection. This threshold was used because it is assumed that injection will be driven by system pressure, and that the wellhead is not sealed to prevent water from discharging from the top of the casing. It is possible to design the wellhead for injection under pressure, but it is generally not desirable if it can be avoided because of design and construction costs. The threshold of 25 feet bgs provides a buffer between the water level in the well and the wellhead in case of unexpected fluctuations during injection.

The assessment of injection and recovery rates incorporate a number of assumptions involving short-term and long-term decreases in injection and pumping specific capacities due to head changes in the well and clogging. The key assumptions are documented in Appendix E. The most critical of these assumptions involves estimates of the injection and recovery specific capacities. The assumptions regarding differences between injection and pumping specific capacities, and reductions in specific capacity over time are based on analysis of trends observed during ASR operation of other alluvial-hosted systems (e.g., Las Vegas Valley Water District and Portland Water Bureau).

The specific capacity of an ASR well is expected to decrease with time because of clogging of the 'skin' around the borehole resulting from the introduction of suspended particulates during injection. Regular backflushing (pumping to waste) is an important operational tool for reducing the decline in specific capacity by removing particulates from the aquifer in the immediate vicinity of the well. In addition, designing an ASR cycle so that the planned recovery rate is 20 to 30 percent greater than the planned injection rate will result in some redevelopment of the well during recovery. However, declines in specific capacity can be expected even with these operational tools in place. Thus, the need to redevelop an ASR well to reverse long-term specific capacity declines should be expected as part of the operation and maintenance of an ASR system. Redevelopment entails removing the wellhead and pump assembly, and aggressively cleaning out the well by some combination of scrubbing, and zonal jetting and pumping. The interval between redevelopment episodes will depend on the initial specific capacity of the ASR well and the long-term rate of specific capacity decline resulting from residual clogging of the borehole skin.

Air entrainment is another factor that can result in loss of specific capacity of the well. At the startup of injection, as water is injected down the drop pipe, cascading water causes air to become entrained. If the entrained air is forced out into the aquifer, it can cause the formation to be air-locked and thus result in a loss of the aquifer's ability to transmit water, which is translated into a loss in specific capacity of the well. Minimizing or ideally eliminating possible air entrainment in the injection water should be a high priority in the design and operation of SWA Well 2W.

Summary

Based upon the aquifer characteristics at SWA Well 2W, our analysis indicates that ASR

operations are feasible at the targeted range of injection and recovery rates. The aquifer near SWA Well 2W appears to be capable of receiving water at a sustained rate of up to 450 gpm for the entire period of time source water is likely to be available for injection (October 1 through May 31) without exceeding the water level injection cut-off threshold until the last year of the 5-year evaluation period. Higher rates of injection may be possible, but may produce less than acceptable results with water levels exceeding injection and/or pumping cut-off thresholds within the first few years of operation.

The planned recovery rate should be approximately 650 gpm (i.e., the planned injection rate should be 70 to 80 percent of the planned recovery rate), if the well is to be pumped continuously during the recovery period. SWA Well 2W is capable of, and can be operated at rates up to 1,200 gpm during recovery; however, production at higher rates will be sustainable for shorter durations, as shown in Figure 12.

The predicted annual water level drawup and drawdown values are based on the conservative well clogging assumptions and will be updated based on the initial pilot testing data. These predicted water levels will assist SWA in optimizing ASR operating conditions, and planning of well redevelopment schedules and future expansion.

6.3. Evaluation of Available Storage Volume

Evaluation of the projected well and aquifer response during injection indicates as much as 145 million gallons (MG) can be stored in the aquifer using SWA Well 2W at an injection rate of 450 gpm sustained over the entire period that water is available for injection (October 1 through May 31). If the stored water is recovered continuously at a constant rate of 650 gpm, pumping could be sustained for 159 days without exceeding the drawdown threshold in the well. The storage analysis also indicates that this storage volume and injection/recovery rates can be achieved each year during the 5-year evaluation period, assuming the total stored volume is removed each year. If the total stored water is not removed, then it is anticipated that less water can be injected during the subsequent recharge period.

The storage volume capacity of the entire aquifer was also evaluated to develop an estimate of how much water could be feasibly stored if the system was expanded to include additional wells. The total aquifer storage volume evaluation used the aquifer testing results from SWA Well 2W and the estimated lateral extent of the aquifer. Note that the aquifer characteristics laterally may vary and as new ASR wells are added to the system, a more accurate total aquifer storage capacity will be developed. As discussed in Section 3, there were approximately 2 feet of residual drawdown in SWA Well 2W that persisted 30 days after the end of the 4-day aquifer test. Assuming the 2 feet of unrecoverable water level in the aquifer reflect the removal of 4.89 MG of water from storage (i.e., the volume of water pumped from the aquifer during the 4-day aquifer test), the deep alluvial aquifer appears to be capable of storing approximately 500 MG of water (refer to Appendix E for additional details regarding this calculation).

This total aquifer storage volume assumes that the water level in the aquifer (i.e., the post-injection equilibrated aquifer water level) could be elevated to the injection cutoff

threshold of 25 ft bgs; however, because of well inefficiencies, the water level in the injection well will reach the injection cutoff threshold substantially before the aquifer water level could reach this level. Furthermore, potential year-to-year residual clogging will reduce the specific capacity of the well, resulting in increased drawup in the well from year-to-year; hence, the water level in the well would reach the injection cutoff threshold more quickly each year with less water injected. For the purposes of this ASR feasibility study, the total aquifer storage volume of 500 MG is a reasonable total storage estimate based on the data available. Data collected during ASR pilot testing will provide additional information on and allow further evaluation of the total storage capacity of the aquifer.

The equilibrated water level in the aquifer after the first year of injection (with 145 MG in storage) is predicted to reach 162 feet bgs. Because the water level in the aquifer will be raised higher than what was recorded when the well was drilled, there is the possibility that seeps could occur along a preferential pathway (e.g., fault) that may exist between the deep alluvial aquifer and the ground surface and/or a shallower aquifer (e.g. the upper gravel aquifer). As is common in any ASR project, monitoring for the possibility of losing water through seeps will need to be done during pilot testing of the ASR system (refer to Section 7).

6.4. Capture of Stored Water by Other Wells

One water well completed in the deep alluvial aquifer that could capture stored ASR water has been identified in the general vicinity of SWA Well 2W:

- Clackamas 55211 is located approximately 4,950 feet west-southwest of SWA Well 2W and has permitted capacity of 257 gpm (Permit G-13815) for irrigation.

Clackamas 55211 was monitored during the aquifer testing of SWA Well 2W (refer to Section 3). This well is used by North Clackamas High School to irrigate the athletic fields during the summer months.

Three other wells that potentially are completed in the deep alluvial aquifer were identified in the general vicinity of SWA Well 2W:

- Clackamas 50736 (owner: Damascus Heights Community Well Association) is reportedly located approximately 9,600 feet east-northeast of SWA Well 2W. The well has a permitted capacity of 31 gpm (G-15757) for irrigation purposes. The well may also be used for domestic purposes.
- Clackamas 4610 (owner: Joesph Dixon) is reportedly located approximately 7,000 feet east of SWA Well 2W. This well is a domestic well with a reported yield of 30 gpm.
- Clackamas 4060 (owner: John Mueller) is located approximately 4,000 feet southeast of SWA Well 2W. This well is a domestic well with a reported yield of 20 gpm.

Field searches for the physical existence of the Clackamas 4610 (Joesph Dixon) well have been unsuccessful and discussions with long-time residents in the vicinity of the reported location of the well have not identified the residence of the reported well owner.

It is not known if this well still exists or if it is still in operation. Verification of the existence of Clackamas 4060 has not yet been completed.

SWA will continue efforts to locate additional water wells that are completed in the deep alluvial aquifer; however, it is realized that the likelihood of locating additional wells is low because of the overall land use transition from rural to urban during which existing wells are likely to be abandoned and construction of new water wells is unlikely.

6.5. Loss of Stored Water to Surface Streams

The deep alluvial aquifer is a rather deep aquifer (at an approximate elevation of -150 to -200 feet msl) that appears to be of limited areal extent based on the results of the aquifer testing completed at SWA Well 2W (refer to Section 3). In addition, water level monitoring in the shallower upper gravel aquifer (which is in connection with surface water) during the aquifer testing indicated there is no discernible hydraulic connection between the deep alluvial aquifer and the shallower upper gravel aquifer during the period of the test. Based on the testing data and physical conditions of the system, the deep alluvial aquifer does not appear to be directly connected to surface water streams; therefore, the potential loss of stored water to surface streams is not anticipated.

However, monitoring of water levels in the upper gravel aquifer is planned for the ASR pilot testing period to assess whether long-term injection in the deep alluvial aquifer will affect the upper gravel aquifer and hence have the potential of losing stored water to surface streams.

7. Conclusions, Uncertainties, and Recommendations

7.1. Conclusions

The analysis of the results of the aquifer tests, water quality compatibility analysis, and ASR recharge evaluation indicate that an ASR well system providing up to 0.94 mgd (650 gpm) of sustainable production capacity and up to 1.44 mgd (1200 gpm) of peaking and or emergency capacity appears to be feasible in the deep alluvial aquifer at the SWA Well 2W site. Our conclusions are based on a number of hydrogeologic factors including the following.

Aquifer Characteristics: The deep alluvial aquifer is a confined aquifer with an estimated transmissivity of 9,000 to 12,000 gpd/ft and a storativity of 3×10^{-4}. The estimated specific capacity at the end of a proposed injection period, coupled with the large available headroom in the aquifer, indicate that ASR is feasible at this site. The projected effects of aquifer boundaries observed during the aquifer test do not appear to be a significant limitation to implementing ASR in the deep alluvial aquifer.

Injection Rates, Pumping Rates, and Storage Volume: The aquifer near SWA Well 2W appears to be capable of receiving injected water and supporting recovery of stored water at adequate rates to allow storage of 145 MG. This storage volume is based on an injection rate of 450 gpm sustained over the entire period that water is available for injection (October 1 through May 31). Higher rates of injection may be possible, but water levels could exceed injection and/or pumping cut-off thresholds within the first few years of operation (as a result of assumed clogging), potentially requiring more frequent well rehabilitation activities. At the sustained recovery rate of 650 gpm, the well will provide about 159 days of peak or emergency supply. SWA Well 2W can be operated at rates up to 1,200 gpm during recovery; however, production at the higher rates likely would be sustainable for only short durations (Figure 12).

Capture of Stored Water by Other Wells: Few wells in the study area are completed in the deep alluvial aquifer; and only three wells that are completed in this aquifer were identified within 2 miles of SWA Well 2W. Two of these wells have been located by SWA and should be included in the ASR observation well network and monitored during ASR pilot testing to allow further assessment of the potential capture of stored water and head rise in the deep alluvial aquifer near these wells.

Loss of Stored Water to Surface Streams: The potential loss of stored water to surface streams appears to be unlikely because of the depth of the deep alluvial aquifer, the apparent limited recharge to the deep alluvial aquifer, and the apparent lack of hydraulic connection between the deep alluvial aquifer and the next shallowest aquifer (the upper gravel aquifer). However, to assess whether long-term injection in the deep alluvial aquifer will affect the upper gravel aquifer and hence have the potential of losing stored water to surface streams, monitoring of water levels in several wells completed in the upper gravel aquifer is planned for the ASR pilot testing period.

The overall performance and capacity of the ASR system under a long-term ASR operational scenario is subject to some uncertainties that are discussed in the following section.

7.2. Uncertainties

The results of the SWA Well 2W recharge evaluation indicate that ASR is feasible at this site; however, the recharge evaluation is based on data obtained from relatively short-term aquifer tests. Accordingly, there are still some basic uncertainties about the long-term injection and recovery capacity of the ASR system. ASR pilot testing will be required to resolve these uncertainties. The key uncertainties are listed below.

1. The ability of SWA Well 2W to maintain the target injection and pumping rates. This will depend on the well efficiency over time and the actual rate of clogging of the borehole skin caused by turbidity and possibly entrained air, as well as properties of the aquifer (see #2 below). High quality recharge water that is free of suspended sediment and air is a key factor for maintaining well efficiency. Recharge water with turbidity exceeding 0.5 NTU will clog the aquifer matrix and quickly reduce the specific capacity of the well. The result will be decreased injection and potentially decreased recovery rates. Several measures should be implemented to maintain the injection and pumping capacity including:
    - Before the initial ASR pilot testing operations, physically clean the well and well screen to remove any precipitate, solids, and other material that may have accumulated in SWA Well 2W, which has not been used on a regular basis.
    - Flush all the water lines in the system that provide injection source water to remove particulates before starting injection.
    - Closely monitor the quality of water being injected, and monitoring water levels in the well for changes in specific capacity.
    - Implement a regular program of backflushing the well and pumping it to remove particulates introduced into the well during injection.
    - Design the ASR cycle so that the target injection rates are 20 to 30 percent less than the target recovery rate, resulting in some redevelopment of the well during recovery.
    - Periodically pull the pump and aggressively redevelop the well.

2. The ASR evaluation presented in this feasibility study is based on aquifer characteristics estimated from relatively short-term aquifer tests. The aquifer characteristics at further distances from the well are uncertain and as such, the long-term ability of the deep alluvial aquifer to receive water at the target injection and pumping rates is also uncertain.

3. The data from the aquifer test at SWA Well 2W did not indicate a hydraulic response in the shallower upper gravel aquifer to production from the deep alluvial aquifer. In addition, incomplete recovery of the water level in the deep alluvial aquifer following

the aquifer tests at SWA Well 2W indicates limited recharge, which in turn indicates limited hydraulic connection with other aquifers. Observation of the water levels in the deep alluvial aquifer and the shallower upper gravel aquifer during ASR pilot testing will verify the degree to which the deep alluvial aquifer is hydraulically isolated. The water level monitoring during ASR pilot testing should include measuring water levels in SWA Well 2W and in a network of observation wells completed in both the deep alluvial aquifer and the shallower upper gravel aquifer.

4. The head rise in aquifer due to ASR injection is anticipated to raise water levels in the aquifer above historic levels, creating a condition with the potential to create or enhance seeps if preferential pathways are present between the deep alluvial aquifer and the ground surface. Monitoring the potential for surface discharge impacts during ASR pilot testing will be important. The monitoring program proposed should measure water levels in SWA Well 2W and in observation wells completed in both the deep alluvial aquifer and the shallower upper gravel aquifer. Identification of potential seep areas and periodic visual surveys of the potential seep areas should be considered if it is found that ASR injection in the deep alluvial aquifer is affecting the water level in the upper gravel aquifer. In addition, water levels in wells completed in the deep alluvial aquifer should be monitored during pilot testing to verify assumptions regarding aquifer characteristics and the potential for water levels in the aquifer to rise above land surface at these wells.

7.3. Recommendations

We did not identify any fatal flaws for implementing ASR in the deep alluvial aquifer on the basis of the technical analysis presented in this feasibility study, and thus recommend proceeding with Phase 2 of the project – ASR Pilot Testing. As previously mentioned, the ASR pilot testing program is a required element of the ASR permitting process and it is designed to demonstrate ASR feasibility and to provide SWA with needed operational data. The next steps of the project will include the following:

- File an ASR limited license application and ASR work plan with OWRD (August 2006)
- Assist SWA with the preparation of design drawings and specifications for the well improvements and submission of the designs to the Oregon Department of Human Services (DHS) Drinking Water Program for approval (Fall 2006)
- Complete well improvements (Fall 2006)
- Obtain ASR limited license after 30-day comment period (December 2006)
- Begin ASR pilot testing of SWA Well 2W (January 2007)
- Begin recovery of stored water (Summer 2007)

8. References

Hartford, S.V. and W.D. McFarland. 1989. Lithology, thickness, and extent of hydrogeologic units underlying the East Portland Area, Oregon. U.S. Geological Survey, Water-Resources Investigations Report 88-4110.

Leighton, J. and J. Porcello. 2001. Deep aquifer yield groundwater flow model – Report on model development, calibration, and testing: Portland, Oregon. Prepared by City of Portland Bureau of Water Works and CH2MHILL.

Sunrise Water Authority (SWA), 2004. Water System Master Plan. June 2004.

Table 1

Summary of Native Groundwater and ASR Source Water Quality Testing

ASR Feasibility Study

	Analyte	Lowest Regulatory Standard	Units	Standard Type F = Federal; S = State	*Native Groundwater* SOC & VOC - 7/27/04 All others - 3/24/2006	*Source Water* CRW SOC & VOC - 1/26/05 All others - 4/19/06	*Source Water* NCCWC WTP SOC & VOC - 9/6/2005 All others - 4/19/06
Microrganisms							
	Total Coliforms (including fecal coliform and E. Coli) [N4, N5]	MCLG	mg/L		ND	ND	ND
	Coliform Bacteria	< 1	per 100 ml	S - MML	ND	ND	ND
	Turbidity [N3]	1	NTU	S - MML	ND	ND	0.792
Disinfection Byproducts							
	Total Haloacetic acids (HAA5) [N6]	0.06	mg/L	F - MCL	ND	0.0337	0.0172
	dichloroacetic acid	MCLG	mg/L		ND	0.0148	0.00817
	trichloroacetic acid	MCLG	mg/L		ND	0.019	0.00907
	monochloroacetic acid	None	mg/L		ND	ND	ND
	monobromoacetic acid	None	mg/L		ND	ND	ND
	dibromoacetic acid	None	mg/L		ND	ND	ND
	Total Trihalomethanes (TTHMs) [N6]	0.08	mg/L	F - MCL	ND	0.022	0.0117
	bromodichloromethane	MCLG	mg/L		ND	0.00156	0.00091
	bromoform	MCLG	mg/L		ND	ND	ND
	dibromochloromethane	MCLG	mg/L		ND	ND	ND
	chloroform	None	mg/L		ND	0.0205	0.0108
Disinfectants							
	Chlorine (as Cl2)	4	mg/L	F - MCL	ND	0.511	0.353
Geochemical							
	Bicarbonate	None	mg/L		105	17.9	21.2
	Calcium	None	mg/L		15.6	4.19	4.23
	Carbonate	None	mg/L		ND	ND	ND
	Chloride	250	mg/L	F - SMCL, S - MML	2.03	3.33	2.63
	Cyanide (as free cyanide)	0.2	mg/L	F - MCL	ND	ND	ND
	Fluoride	2	mg/L	F - SMCL, S - MML	ND	ND	ND
	Hardness (as $CaCO_3$)	None	mg/L		82.7	10.5	10.6
	Magnesium	None	mg/L		10.6	1.26	1.34
	Nitrate (measured as Nitrogen)	10	mg/L	F - MCL, S - MML	ND	0.23	0.23
	Nitrite (measured as Nitrogen)	1	mg/L	F - MCL	ND	ND	ND
	Potassium	None	mg/L		1.92	ND	ND
	Silica	None	mg/L		54.6	16.4	16.2
	Sodium	None	mg/L		10.6	4.13	4.03
	Sulfate	250	mg/L	F - SMCL, S - MML	1.25	2.21	ND
	Total Alkalinity	None	mg/L		105	17.9	21.2
	Total Organic Carbon	None	mg/L		ND	ND	1.07
Metals							
	Aluminum	0.05	mg/L	F - SMCL	ND	ND	ND
	Antimony	0.006	mg/L	F - MCL	ND	ND	ND
	Arsenic	0.01	mg/L	F - MCL	0.00503	ND	ND
	Barium	1	mg/L	S - MML	0.0354	0.00368	0.00237
	Beryllium	0.004	mg/L	F - MCL	ND	ND	ND
	Cadmium	0.005	mg/L	F - MCL	ND	ND	ND
	Chromium (total)	0.05	mg/L	S - MML	ND	ND	ND
	Copper [N8]	1	mg/L	F - SMCL, S - MML	ND	0.00158	ND
	Iron (Total)	None	mg/L		0.076	ND	0.0392
	Iron (Dissolved)	0.3	mg/L	F - SMCL, S - MML	0.0752	ND	0.0183
	Lead [N8]	0.05	mg/L	S - MML	ND	ND	ND
	Manganese (Total)	None	mg/L		0.212	ND	ND
	Manganese (Dissolved)	0.05	mg/L	F - SMCL, S - MML	0.21	ND	ND
	Mercury (inorganic)	0.002	mg/L	F - MCL, S - MML	ND	ND	ND
	Nickel	None	mg/L		ND	ND	ND
	Selenium	0.01	mg/L	S - MML	ND	ND	ND
	Silver	0.05	mg/L	S - MML	ND	ND	ND
	Thallium	0.002	mg/L	F - MCL	ND	ND	ND
	Zinc	5	mg/L	F - SMCL, S - MML	ND	ND	ND
Miscellaneous							
	Color	15	CU	F - SMCL, S - MML	ND	ND	ND
	Corrosivity	noncorrosive		F - SMCL	-1.2	-3.4	-3.3
	Foaming Agents (MBAS)	0.5	mg/L	F - SMCL, S - MML	ND	ND	ND
	Odor	3	TON	F - SMCL, S - MML	0.33	3.7	2.3
	Total Dissolved Solids	500	mg/L	F - SMCL, S - MML	155	48	53
	Total Suspended Solids	None	mg/L		ND	ND	ND
	pH	6.5-8.5	pH	F - SMCL, S - MML	6.98	6.8	6.78
	Temperature	None	°C		14.4	10.14	9.85
	Specific Conductivity	None	µs/cm		205	52	51
	Dissolved Oxygen	None	mg/L		2	205	198
	ORP	None	mV		-61.9	770	798
Synthetic Organic Compounds (SOCs)							
	Alachlor	0.002	mg/L	F - MCL	ND	ND	ND
	Atrazine	0.003	mg/L	F - MCL	ND	ND	ND
	Benzo(a)pyrene (PAHs)	0.0002	mg/L	F - MCL	ND	ND	ND
	Carbofuran	0.04	mg/L	F - MCL	ND	ND	ND
	Chlordane	0.002	mg/L	F - MCL	ND	ND	ND
	2,4-D	0.07	mg/L	F - MCL	ND	ND	ND
	Dalapon	0.2	mg/L	F - MCL	ND	ND	ND
	1,2-Dibromo-3-chloropropane (DBCP)	0.0002	mg/L	F - MCL	ND	ND	ND
	Di(2-ethylhexyl) adipate	0.4	mg/L	F - MCL	ND	ND	ND
	Di(2-ethylhexyl) phthalate	0.006	mg/L	F - MCL	ND	ND	ND
	Dinoseb	0.007	mg/L	F - MCL	ND	ND	ND
	Dioxin (2,3,7,8-TCDD)	0.00000003	mg/L	F - MCL	NA	NA	NA

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Diquat	0.02	mg/L	F - MCL	ND	ND	ND
Endothall	0.1	mg/L	F - MCL	ND	ND	ND
Endrin	0.0002	mg/L	S - MML	ND	ND	ND
Ethylene dibromide (EDB)	0.00005	mg/L	F - MCL	ND	ND	ND
Glyphosate	0.7	mg/L	F - MCL	ND	ND	ND
Heptachlor	0.0004	mg/L	F - MCL	ND	ND	ND
Heptachlor epoxide	0.0002	mg/L	F - MCL	ND	ND	ND
Hexachlorobenzene	0.001	mg/L	F - MCL	ND	ND	ND
Hexachlorocyclopentadiene	0.05	mg/L	F - MCL	ND	ND	ND
Lindane (BHC-gamma)	0.0002	mg/L	F - MCL	ND	ND	ND
Methoxychlor	0.04	mg/L	F - MCL	ND	ND	ND
Oxamyl (Vydate)	0.2	mg/L	F - MCL	ND	ND	ND
Polychlorinated biphenyls (PCBs)	0.0005	mg/L	F - MCL	ND	ND	ND
Pentachlorophenol	0.001	mg/L	F - MCL	ND	ND	ND
Picloram	0.5	mg/L	F - MCL	ND	ND	ND
Simazine	0.004	mg/L	F - MCL	ND	ND	ND
Toxaphene	0.003	mg/L	F - MCL	ND	ND	ND
2,4,5-TP (Silvex)	0.01	mg/L	S - MML	ND	ND	ND
Volatile Organic Compounds (VOCs)		mg/L				
Benzene	0.005	mg/L	F - MCL, S - MML	ND	ND	ND
Carbon tetrachloride	0.005	mg/L	F - MCL, S - MML	ND	ND	ND
Chlorobenzene (monoclorobenzene)	0.1	mg/L	F - MCL	ND	ND	ND
o-Dichlorobenzene (1,2-Diclorobenezene)	0.6	mg/L	F - MCL	ND	ND	ND
p-Dichlorobenzene (1,4-Dichlorobenzene)	0.075	mg/L	F - MCL, S - MML	ND	ND	ND
1,2-Dichloroethane	0.005	mg/L	F - MCL, S - MML	ND	ND	ND
1,1-Dichloroethylene	0.007	mg/L	F - MCL, S - MML	ND	ND	ND
cis-1,2-Dichloroethylene	0.07	mg/L	F - MCL	ND	ND	ND
trans-1,2-Dichloroethylene	0.1	mg/L	F - MCL	ND	ND	ND
Dichloromethane	0.005	mg/L	F - MCL	ND	ND	ND
1,2-Dichloropropane	0.005	mg/L	F - MCL	ND	ND	ND
Epichlorohydrin [N9]	TT	mg/L	F - MCL	NA	NA	NA
Ethylbenzene	0.7	mg/L	F - MCL	ND	ND	ND
Styrene	0.1	mg/L	F - MCL	ND	ND	ND
Tetrachloroethylene	0.005	mg/L	F - MCL, S - MML	ND	ND	ND
Toluene	1	mg/L	F - MCL	ND	ND	ND
1,2,4-Trichlorobenzene	0.07	mg/L	F - MCL	ND	ND	ND
1,1,1-Trichloroethane	0.2	mg/L	F - MCL, S - MML	ND	ND	ND
1,1,2-Trichloroethane	0.005	mg/L	F - MCL	ND	ND	ND
Trichloroethylene	0.005	mg/L	F - MCL	ND	ND	ND
Vinyl chloride	0.002	mg/L	F - MCL, S - MML	ND	ND	ND
Xylenes (total)	10	mg/L	F - MCL	ND	ND	ND
Radionuclides						
Gross Alpha	15	pCi/L	F - MCL, S - MML	ND	ND	ND
Gross Beta	50	pCi/L	S - MML	3.1	ND	ND
Radium 226 and Radium 228 (combined)	5	pCi/L	F - MCL, S - MML	1.7	ND	ND
Uranium	0.03	mg/L	F - MCL	0.00025	ND	ND
Radon	None	pCi/L		245	ND	ND

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NOTES

N1 MCL = Federal Maximum Contaminant Level - he highest level of a contaminant that is allowed in drinking water. MCLs are set as close to MCLGs as feasible using the best available treatment technology and taking cost into consideration. MCLs are enforceable standards.
SMCL = Federal Secondary Maximum Contaminant Level - non-enforcable guidelines that regulate contaminants that may cause cosmetic or aesthetic effects in drinking water. States may choose to adopt the levels as enforcable standards.
MCLG = Maximum Contaminant Level Goal - The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety and are non-enforceable public health goals.
MRDL = Maximum Residual Disinfectant Level - The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.
MRDLG = Maximum Residual Disinfectant Level Goal - The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.
TT = Treatment Technique - A required process intended to reduce the level of a contaminant in drinking water.
MML = Maximum Measureable Level - Oregon State Department of Environmental Quality established contaminant level for groundwater

N2 Units are in milligrams per liter (mg/L) unless otherwise noted. Milligrams per liter are equivalent to parts per million.
MFL = million fibers per liter
CU = color number
TON = threshold odor number
pCi/L = picocuries per liter
mrem/yr = millirems per year

N3 EPA's surface water treatment rules require systems using surface water or ground water under the direct influence of surface water to (1) disinfect their water, and (2) filter their water or meet criteria for avoiding filtration so that the following contaminants are controlled at the following levels.
- Cryptosporidium: (as of1/1/02 for systems serving >10,000 and 1/14/05 for systems serving <10,000) 99% removal.
- Giardia lamblia: 99.9% removal/inactivation
- Viruses: 99.99% removal/inactivation
- Legionella: No limit, but EPA believes that if *Giardia* and viruses are removed/inactivated, *Legionella* will also be controlled.
- Turbidity: At no time can turbidity (cloudiness of water) go above 5 nepheblometric turbidity units (NTU); systems that filter must ensure that the turbicity go no higher than 1 NTU (0.5 NTU for conventional or direct filtration) in at least 95% of the daily samples in any month. As of January 1, 2002, turbidity may never exceed 1 NTU, and must not exceed 0.3 NTU in 95% of daily
- HPC: No more than 500 bacterial colonies per milliliter.
- Long Term 1 Enhanced Surface Water Treatment (Effective Date: January 14, 2005); Surface water systems or (GWUDI) systems serving fewer than 10,000 people must comply with the applicable Long Term 1 Enhanced Surface Water Treatment Rule provisions (e.g. turbidity standards, individual filter monitoring, Cryptosporidium removal requirements, updated watershed control requirements for unfiltered systems).
- Filter Backwash Recycling; The Filter Backwash Recycling Rule requires systems that recycle to return specific recycle flows through all processes of the system's existing conventional or direct filtration system or at an alternate location approved by the state.

N4 More than 5.0% samples total coliform-positive in a month. (For water systems that collect fewer than 40 routine samples per month, no more than one sample can be total coliform-positive per month.) Every sample that has total coliform must be analyzed for either fecal coliforms or E. coli if two consecutive TC-positive samples, and one is also positive for E.coli fecal coliforms, system has an acute MCL violation.

N5 Fecal coliform and E. coli are bacteria whose presence indicates that the water may be contaminated with human or animal wastes. Disease-causing microbes (pathogens) in these wastes can cause diarrhea, cramps, nausea, headaches, or other symptoms. These pathogens may pose a special health risk for infants, young children, and people with severely compromised immune systems.

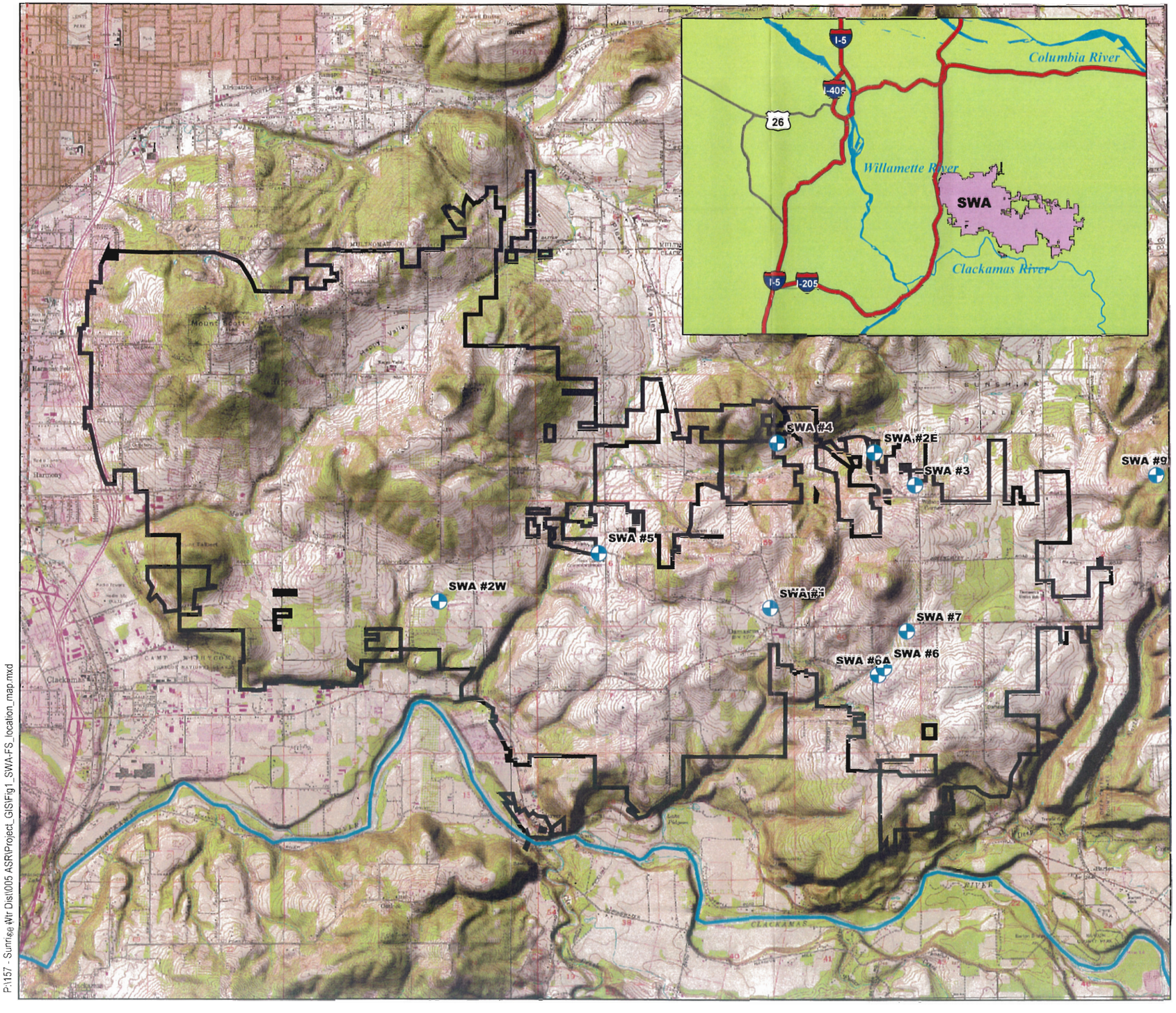
N6 Although there is no collective MCLG for this contaminant group, there are individual MCLGs for some of the individual contaminants:
- Trihalomethanes: bromodichloromethane (zero); bromoform (zero); dibromochloromethane (0.06 mg/L). Chloroform is regulated with this group but has no MCLG.

- Haloacetic acids: dichloroacetic acid (zero); trichloroacetic acid (0.3 mg/L). Monochloroacetic acid, bromoacetic acid, and dibromoacetic acid are regulated with this group but have no MCLGs.

N8 Lead and copper are regulated by a Treatment Technique that requires systems to control the corrosiveness of their water. If more than 10% of tap water samples exceed the action level, water systems must take additional steps. For copper, the action level is 1.3 mg/L, and for lead is 0.015 mg/L.

N9 Each water system must certify, in writing, to the state (using third-party or manufacturer's certification) that when acrylamide and epichlorohydrin are used in drinking water systems, the combination (or product) of dose and monomer level does not excee
Acrylamide = 0.05% dosed at 1 mg/L (or equivalent)
Epichlorohydrin = 0.01% dosed at 20 mg/L (or equivalent)

N10 Disinfectans and Disinfection Byproducts testing requirements
Bromate testing required for plants that use ozone.
Chorite testing required for plants that use chlorine dioxide.
Chorine Dioxide testing required for plants that use chlorine dioxide.



P:\157 - Sunrise Wtr Dist\005 ASR\Project_GIS\Fig1_SWA-FS_location_map.mxd

Map Date: July 20, 2006

Legend

- Service area boundary
- SWA Production Wells

Map Notes:
Map projection - UTM Zone 10 North, NAD 1927

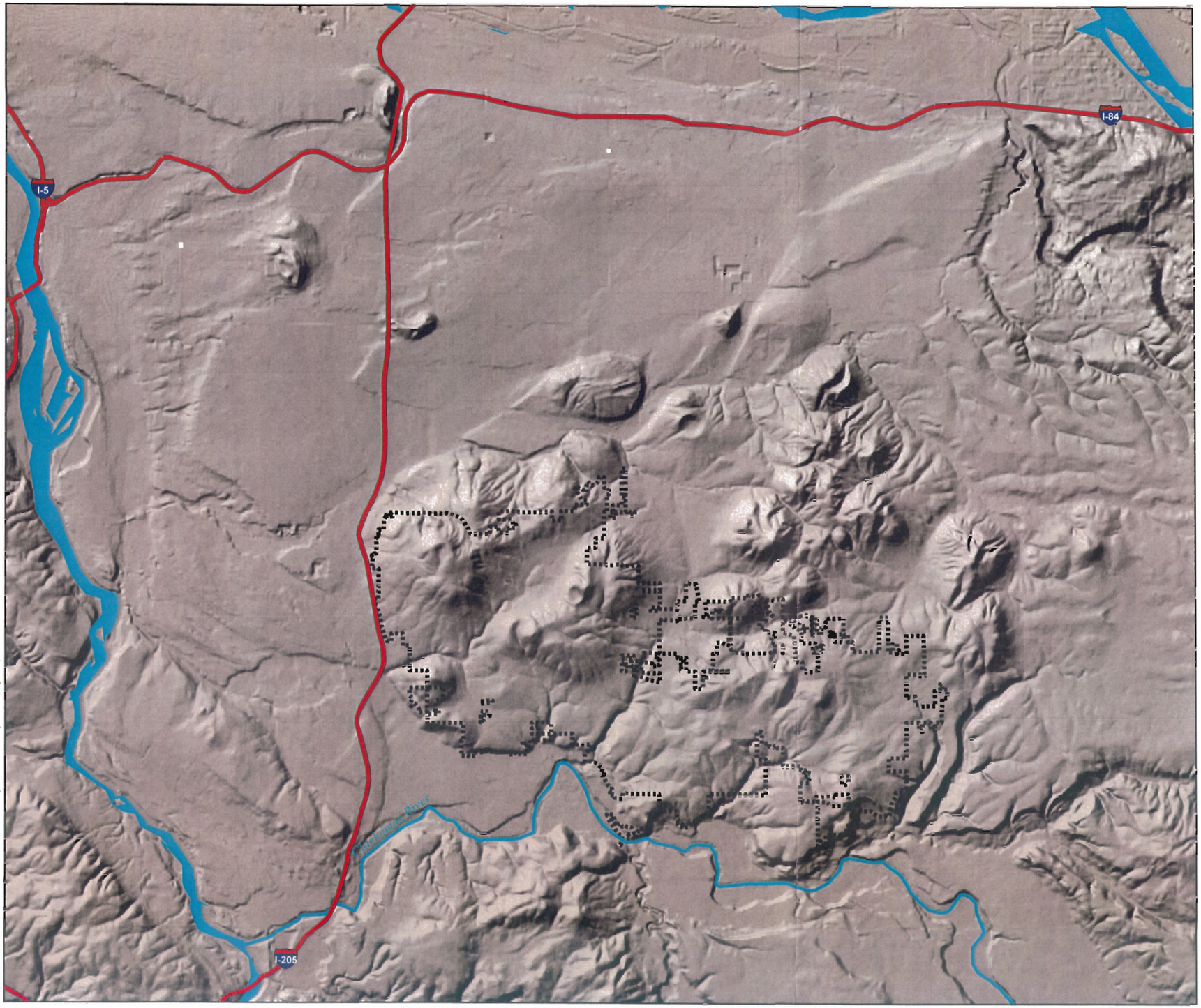
N

Scale
1:50,000

0 1 2
Miles

Figure 1
Site Location Map
Sunrise Water Authority ASR Feasibility Study

Groundwater Solutions, Inc.



Legend

Service area boundary

Map Notes:
Map projection - UTM Zone 10 North, NAD 1927

N

Scale
1:90,000

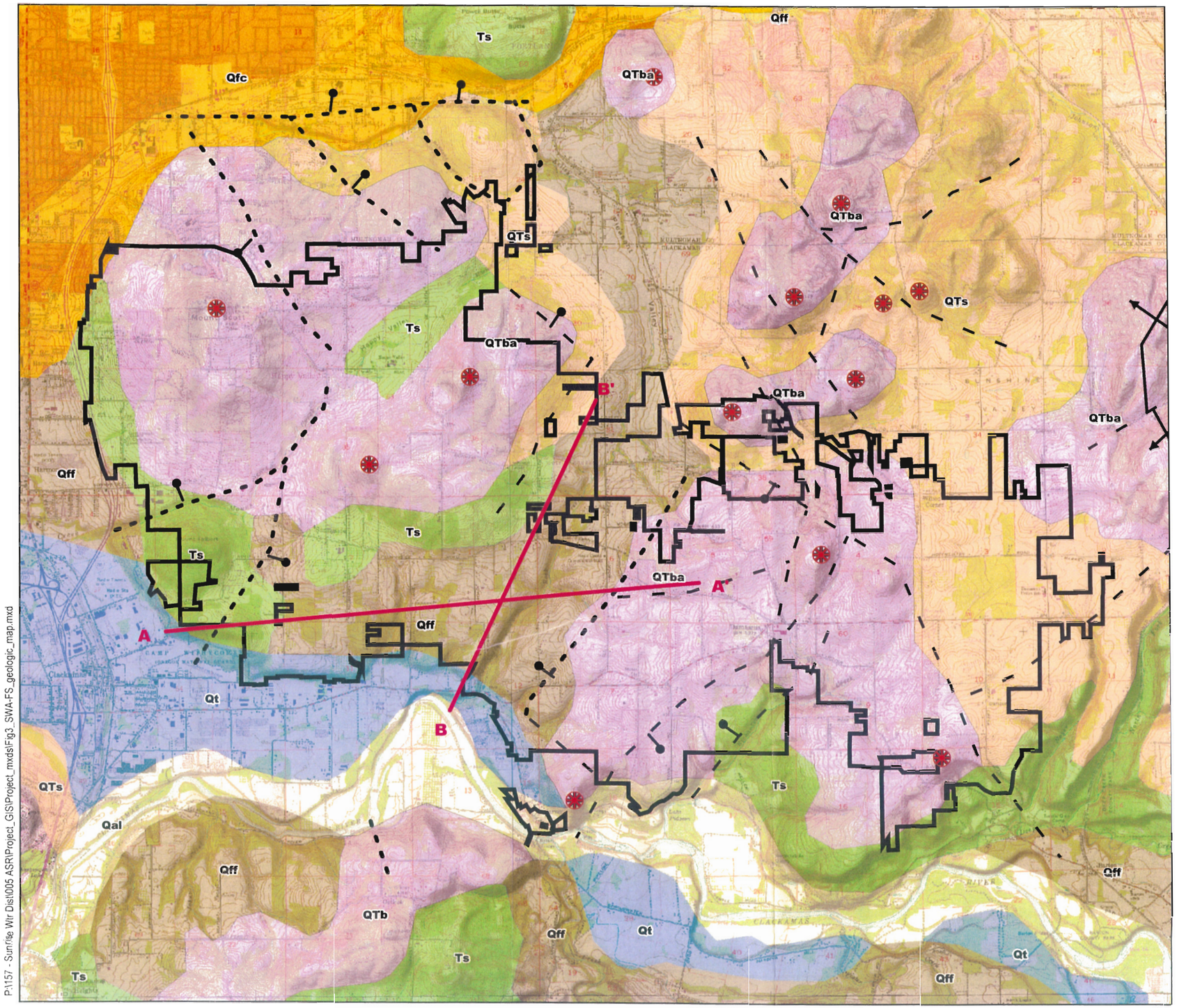
0 1 2
Miles

Figure 2
Regional Topography
Sunrise Water Authority ASR Feasibility Study

Groundwater Solutions, Inc.

P:\157 - Sunrise Wtr Dist\005 ASR\Project_GIS\Fig2_SWA-FS_regional topography.mxd

Map Date: 7/20/2006



LEGEND

- Volcanic Vents
- Service area boundary

Faults

- Approximate (dashed)
- Conceled
- Fold (solid)

Geologic Units

- Qal - Alluvial deposits
- Qt - Clackamas River terrace deposits & channel facies
- Qff - Catastrophic flood deposits, fine-grained facies
- Qfc - Catastrophic flood deposits, coarse-grained facies
- QTba - Boring Lavas
- QTs - Springwater formation (Cascade gravels)
- Ts - Troutdale formation (Gravel and Sandy River Mudstone)
- Geologic Cross-sections

Map Notes:
Map projection - UTM Zone 10 North, NAD 1927
Geologic Map - Walker et al. 1991

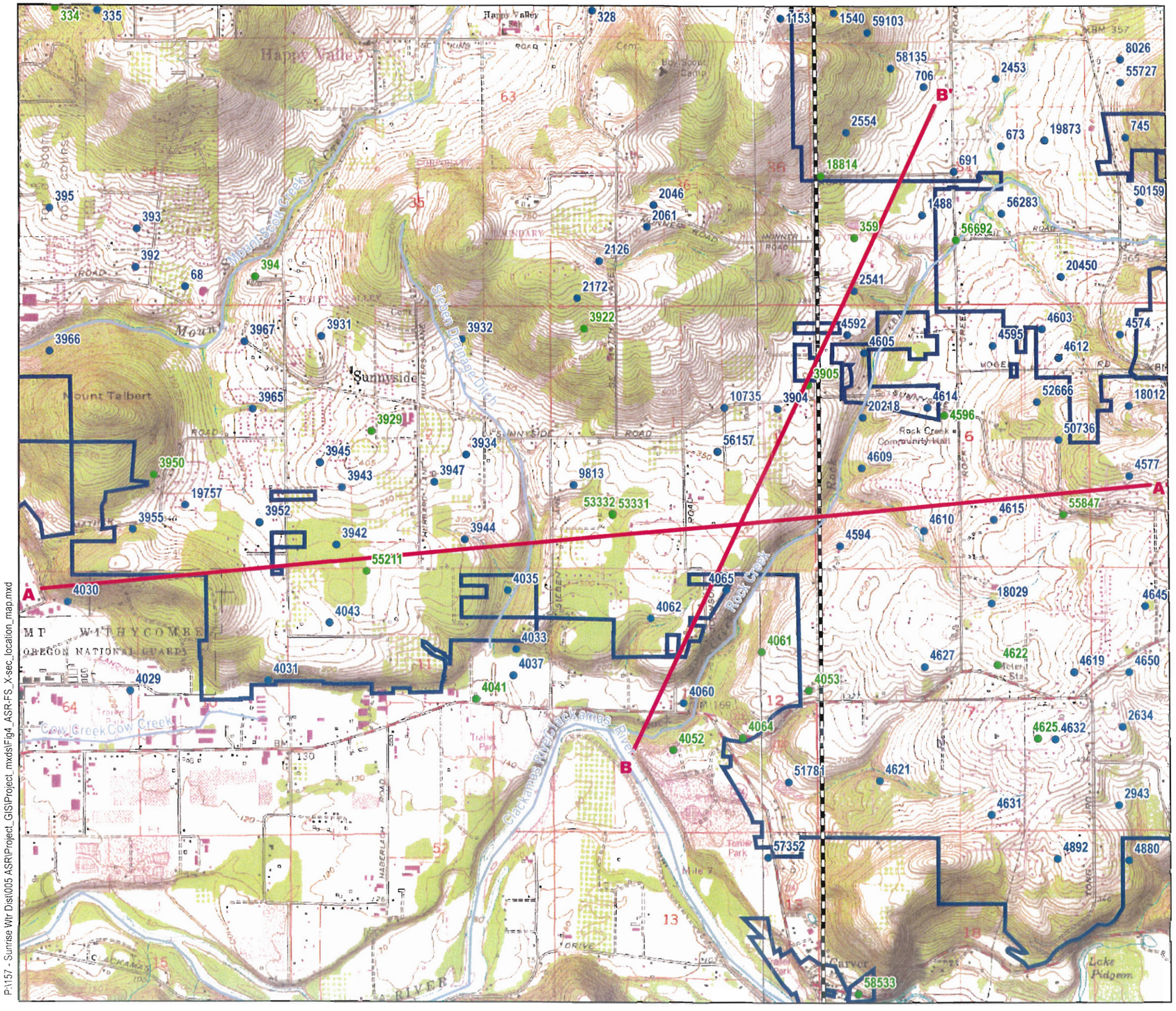
N

Scale
1:50,000

0 1 2
Miles

Figure 3
Geologic Map
Sunrise Water Authority ASR Feasbility Study

Groundwater Solutions Inc.



P:\157 - Sunrise Wtr Dist\005 ASR\Project_GIS\Project_mxds\Fig4_ASR-FS_X-sec_location_map.mxd

Map Date: July 19, 2006

LEGEND

- Service Area Boundary
- Quarter-located wells
- Address located
- Geologic Cross-sections

Map Notes:
Map projection - UTM Zone 10, NAD 1927

N

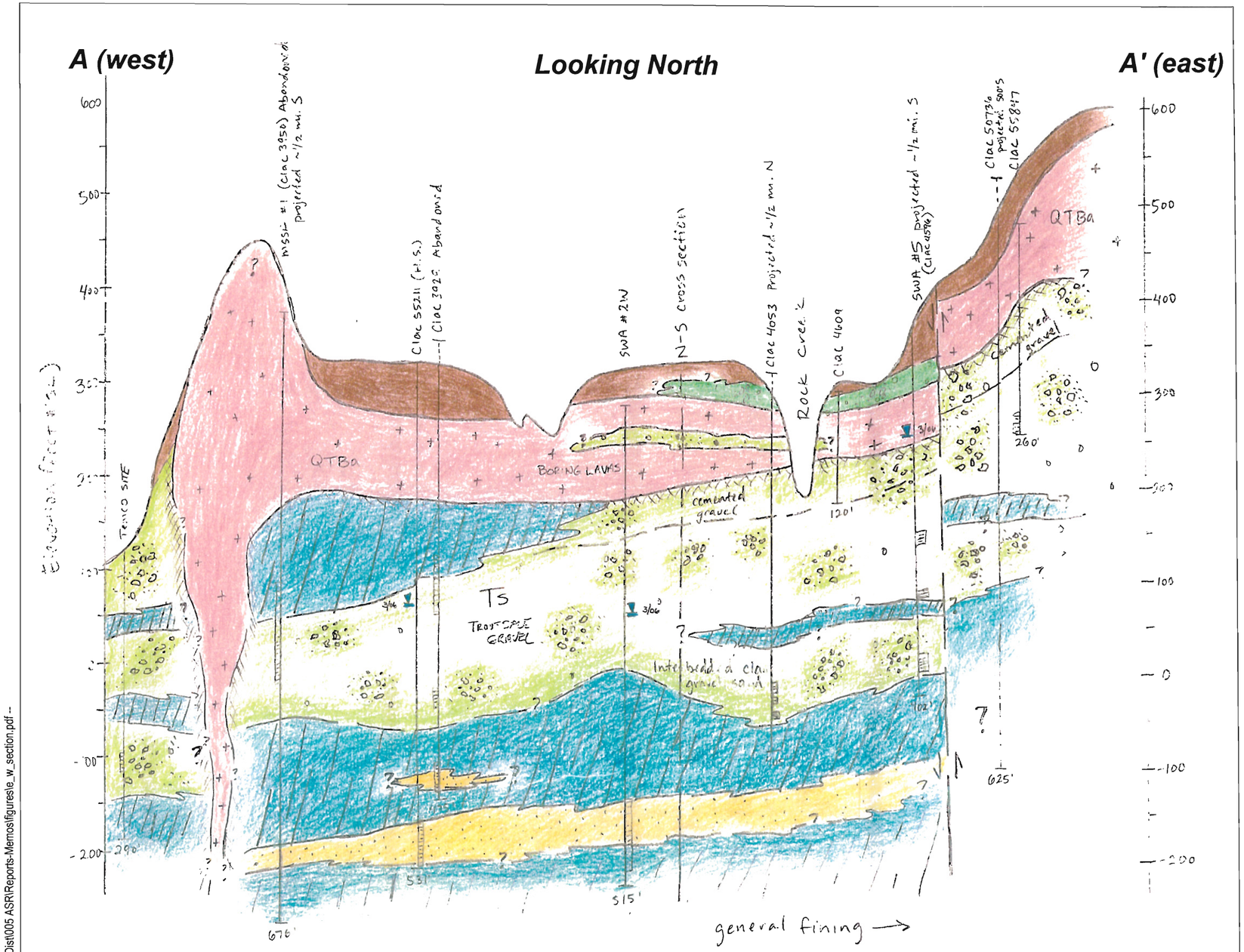
Scale
1:24,000

0 2500 5000

Feet

Figure 4
Cross Section Location Map
Sunrise Water Authority ASR Feasibility Study

Groundwater Solutions Inc.



Vertical Exaggeration: 20x

LEGEND

Geologic Units

- **Weathered Rock; Silt**
- QTBa — **Boring Lava** (⁂ represents altered material)
- Ts — **Troutdale Gravel** Cemented in places; also includes sands
- **Confining Unit** (Clay)
- **Deep Alluvial Aquifer** Black sands
- Static water level
- Fault
- Clac 4053 — Well ID

Horizontal Scale

0 2000 4000

Feet

Figure 5

Geologic Cross Section A-A'

Sunrise Water Authority ASR Feasibility Study

Groundwater Solutions Inc.

Map Date: July 18, 2006

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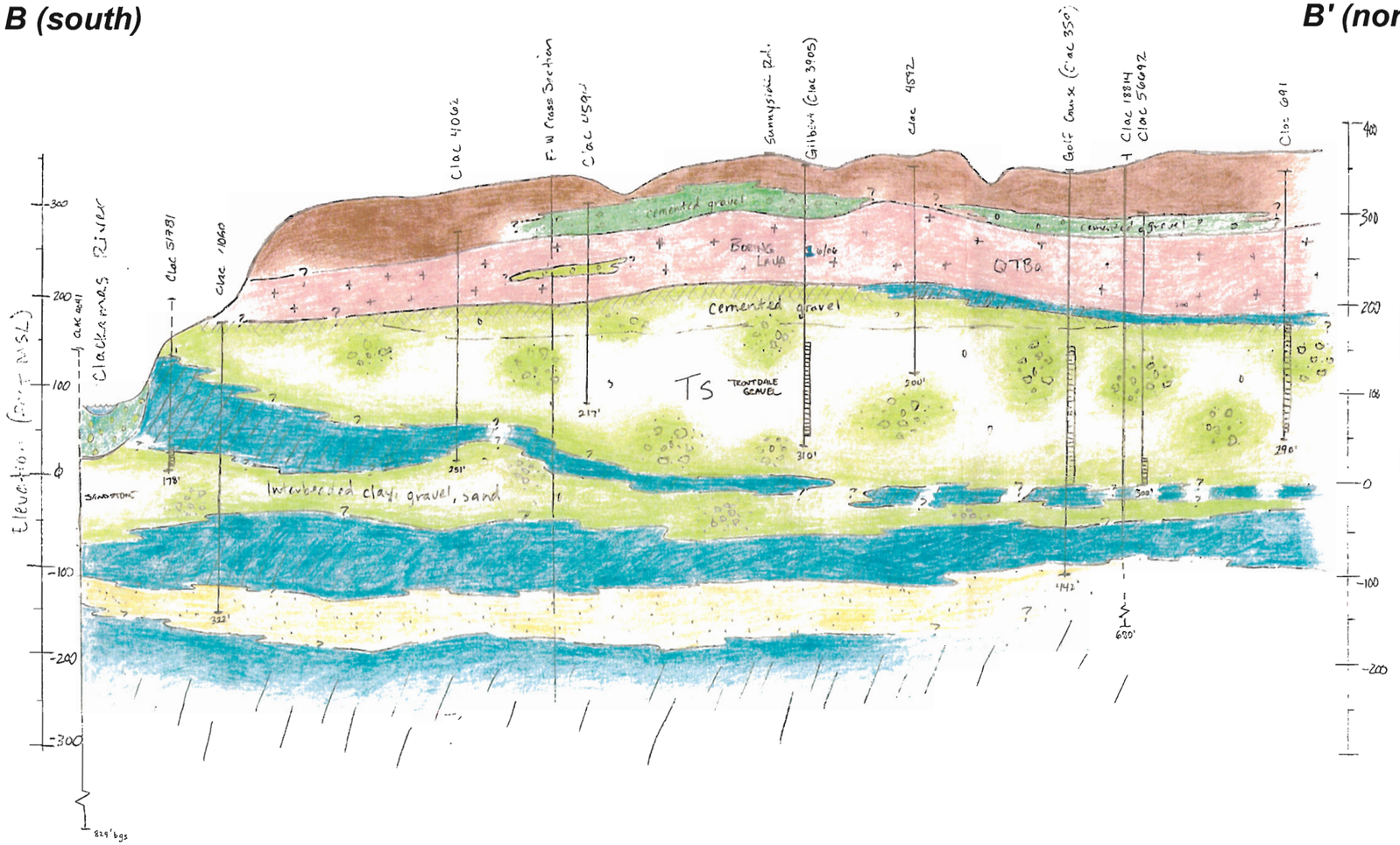
Looking West

B (south) **B' (north)**



Vertical Exaggeration: 10x

Map Date: July 18, 2006

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LEGEND

Geologic Units

- **Weathered Rock; Silt**
- QTBa — **Boring Lava** (※ represents altered material)
- Ts — **Troutdale Gravel** Cemented in places; also includes sands
- **Confining Unit** (Clay)
- **Deep Alluvial Aquifer** Black sands
- Static water level
- Clac 4062 — Well ID

Horizontal Scale

0 2000 4000

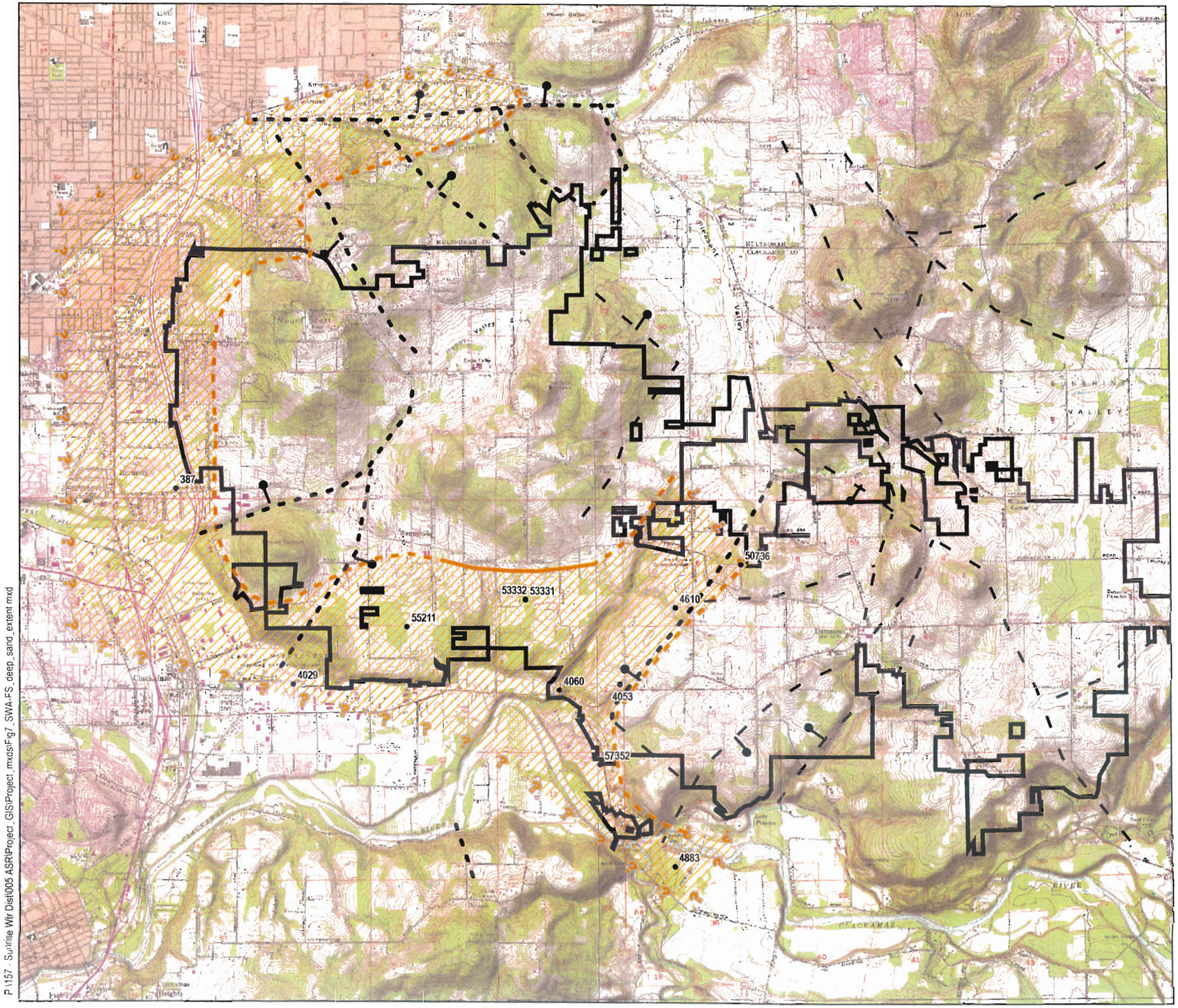
Feet

Figure 6

Geologic Cross Section B-B'

Sunrise Water Authority ASR Feasibility Study

Groundwater Solutions Inc.



P:\157 - Sunrise Wtr Dist\005 ASR\Project_GIS\Project_mxds\Fig7_SWA-FS_deep_sand_extent.mxd

Map Date: July 20, 2006

LEGEND

- Service area boundary
- Target Aquifer (Deep Alluvial Aquifer)

Faults

- Approximate (dashed)
- Conceled
- Fold (solid)
- Wells used to delineate deep alluvial aquifer

Map Notes:
Map projection - UTM Zone 10, NAD 1927

N

Scale
1:50,000

0 1 2
Miles

Figure 7
Extent of Target Aquifer for ASR
Sunrise Water Authority ASR Feasibility Study

Groundwater Solutions Inc.

Table 2
Mineral Saturation State of Native Groundwater and Source Waters

Mineral	Formula	Well 2W	CRW	NCCWC
Carbonates				
Calcite	$CaCO_3$	-1.56	-2.77	-2.71
Dolomite	$CaMg(CO_3)_2$	-3.09	-5.94	-5.81
Magnesite	$MgCO_3$	-2.08	-3.69	-3.62
Siderite	$FeCO_3$	-1.66	-	-13.02
Rhodochrosite	$MnCO_3$	-0.97	-	-
Witherite	$BaCO_3$	-3.57	-6.11	-
Sulfates				
Gypsum	$CaSO_4.2H_2O$	-3.96	-4.14	-
Barite	$BaSO_4$	-1.57	-2.04	-
Silica				
Amorphous SiO_2	SiO_2	-0.24	-0.72	-0.73
Chalcedony	SiO_2	0.64	0.24	0.17
Quartz	SiO_2	1.1	0.65	0.65
Iron Oxides				
Amorphous $Fe(OH)_3$	$Fe(OH)_3$	-1.58	-	1.63
Goethite	FeOOH	3.92	-	6.95
Hematite	Fe_2O_3	9.8	-	15.84
Magnetite	Fe_3O_4	8.85	-	4.17
Manganese Oxides				
Pyrolusite	MnO_2	-16.85	-	-
Birnessite	$Mn_8O_{19}H_{10}$	-17.31	-	-
Bixbyite	Mn_2O_3	-18.17	-	-
Hausmannite	Mn_3O_4	-21.95	-	-
Manganite	MnOOH	-8.32	-	-
Pyrochroite	$Mn(OH)_2$	-7.45	-	-
Primary Silicates				
Forsterite	Mg_2SiO_4	-12.92	-15.22	-15.27
Diopside	$CaMgSi_2O_6$	-7.16	-9.44	-9.51
Clinoenstatite	$MgSiO_3$	-5.05	-6.42	-6.44

Table 3
Projected Future Water System Demands

	Water Demand (mgd)[1]							
	Existing	**Future**						
	2003	***2004***	***2008***	***2012***	***2016***	***2020***	***2024***	***Buildout***
Average day demand	4.41	4.67	6.60	9.34	15.05	20.59	25.56	29.87
Peak day demand	10.86	11.50	16.16	21.83	33.27	44.22	54.26	63.12

Notes:

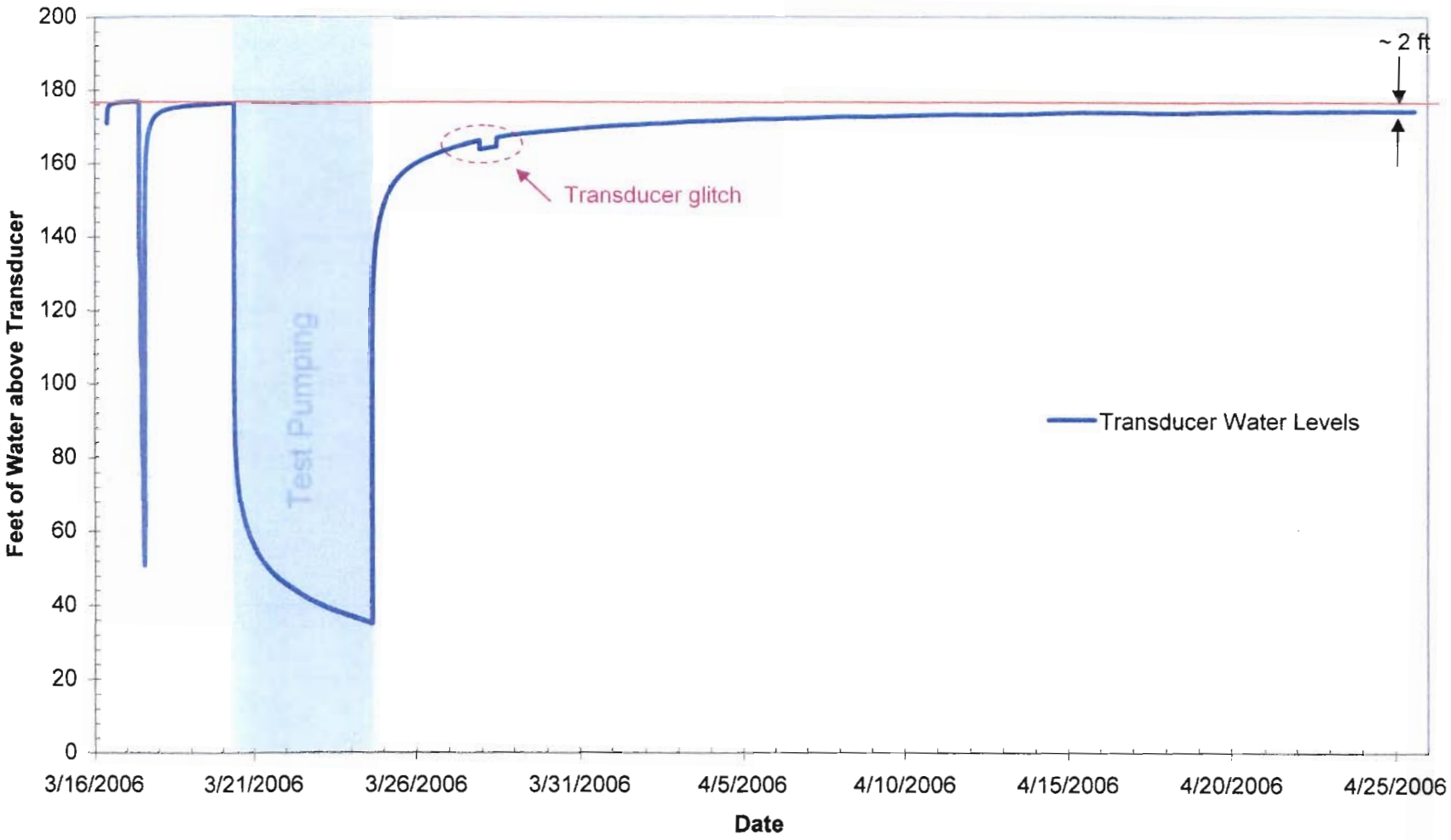
1. Future water system demands are based on projections for a 20-year planning period as detailed in the Sunrise Water Authority Water System Master Plan (SWA, 2004).

Table 4
Estimated Drawup and Drawdown During ASR Operation at SWA Well 2W

Scenario		Water Level (feet bgs)				
		Year 1	Year 2	Year 3	Year 4	Year 5
A	Injection – ***100 days*** at ***450 gpm***	109	96	82	67	50
	Recovery – 650 gpm	345	362	380	400	422
B	Injection – ***150 days*** at ***450 gpm***	104	91	77	61	43
	Recovery – 650 gpm	334	351	369	389	412
C	Injection – ***240 days*** at ***450 gpm***	100	87	72	55	37
	Recovery – 650 gpm	312	329	347	368	390
D	Injection – ***100 days*** at ***400 gpm***	123	113	101	87	73
	Recovery – 600 gpm	348	364	382	402	424
E	Injection – ***100 days*** at ***500 gpm***	95	81	65	48	29
	Recovery – 700 gpm	355	373	392	414	438
F	Injection – ***100 days*** at ***600 gpm***	66	49	30	9	-14
	Recovery – 800 gpm	375	396	419	444	472

Notes:
1. bgs = below ground surface.
2. Scenario assumes that the stored water is fully (100%) recovered each year.
3. Shading indicates the water level exceeds the established criteria (25 feet from ground surface during injection or water level above pump intake plus required submergence during pumping).

Water Level Hydrograph for SWA-2W During Aquifer Testing Period
Sunrise Water Authority

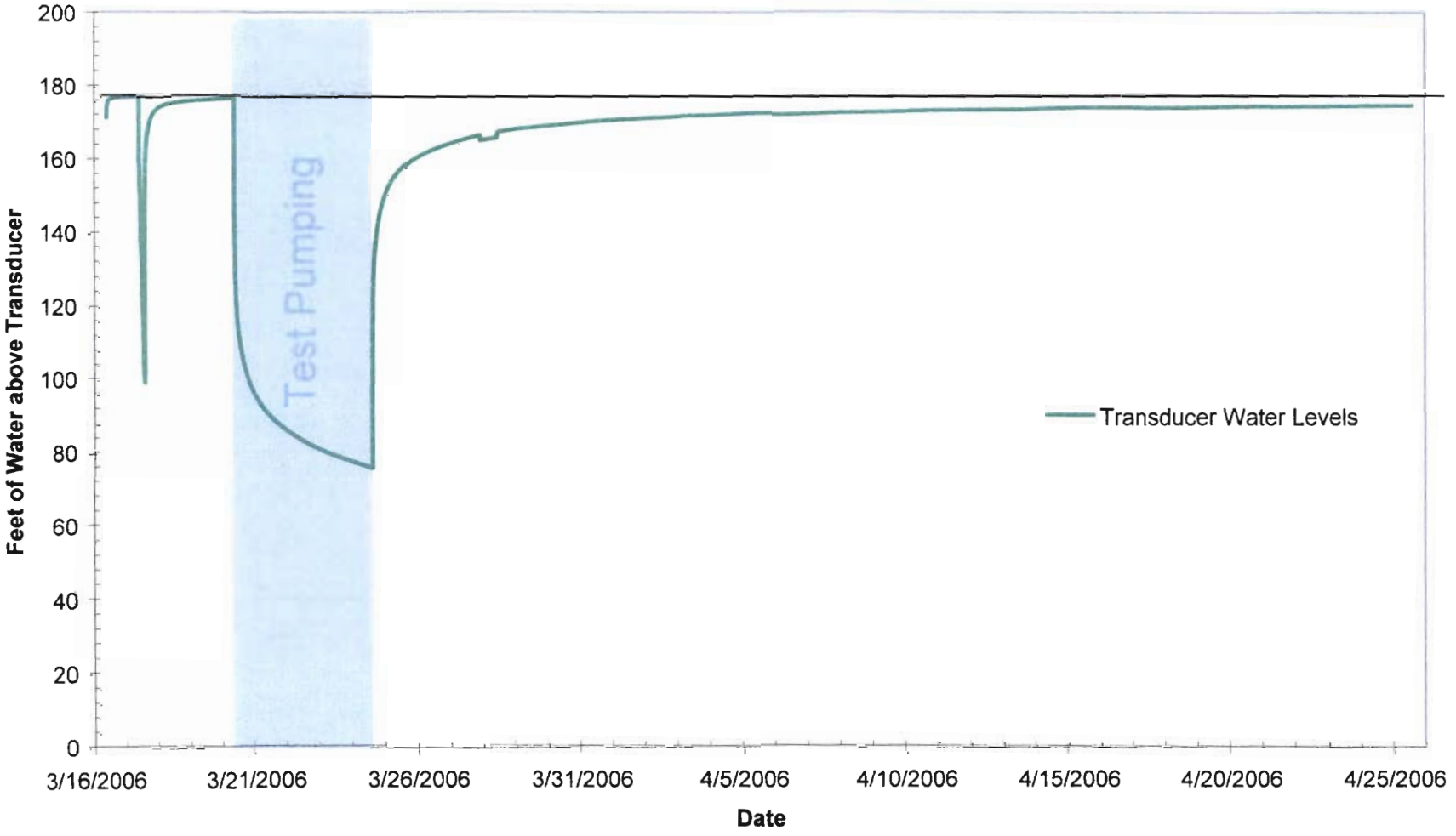


SWA ASR Feasibility Study

P:\157 - Sunrise Wtr Dist\005 ASR\Aquifer Tests\SWA-2W\Test Data\constant rate\2W constant rate test

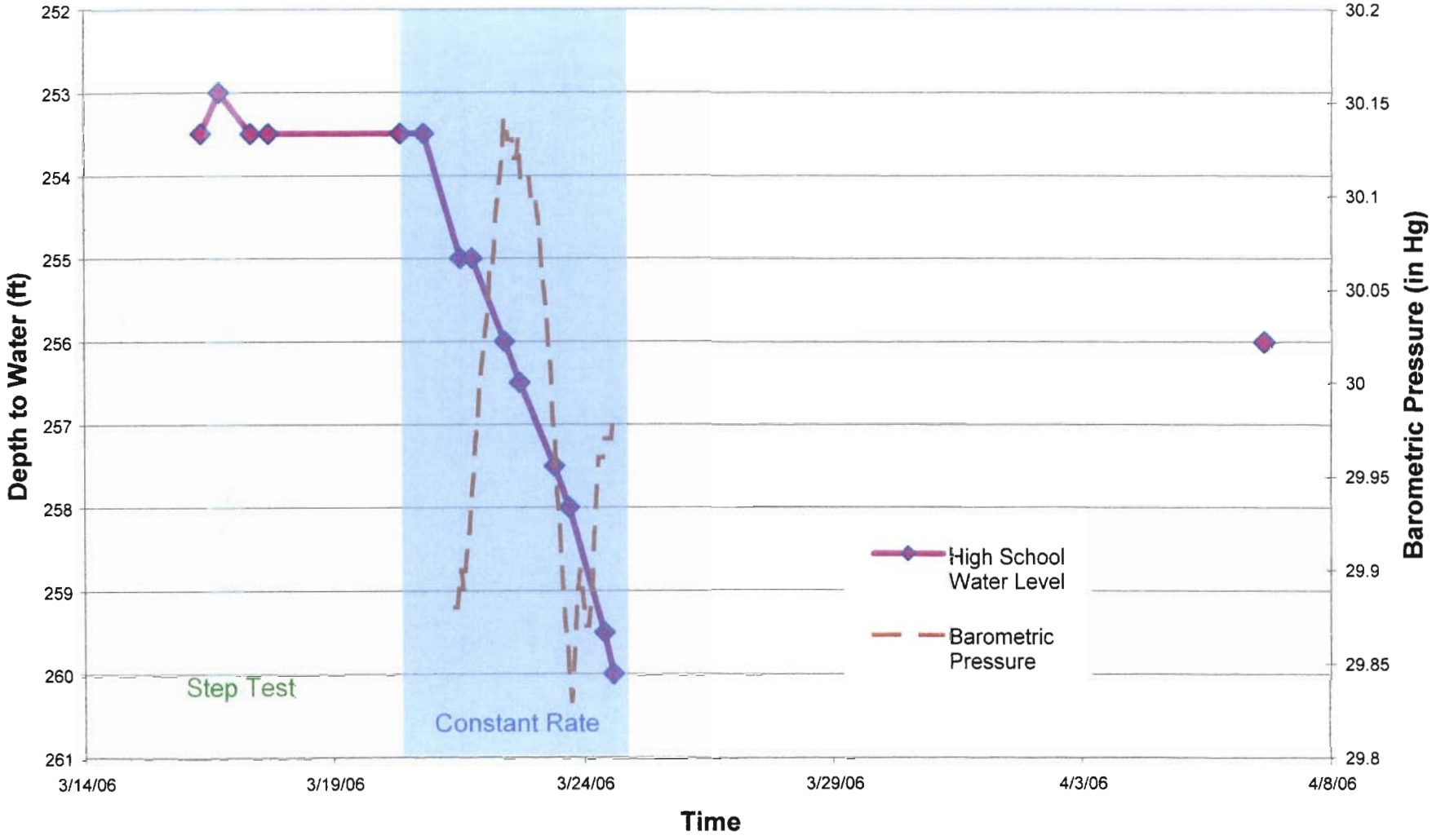
Groundwater Solutions Inc.

Water Level Hydrograph for 2W Piezometer During Aquifer Testing Period
Sunrise Water Authority



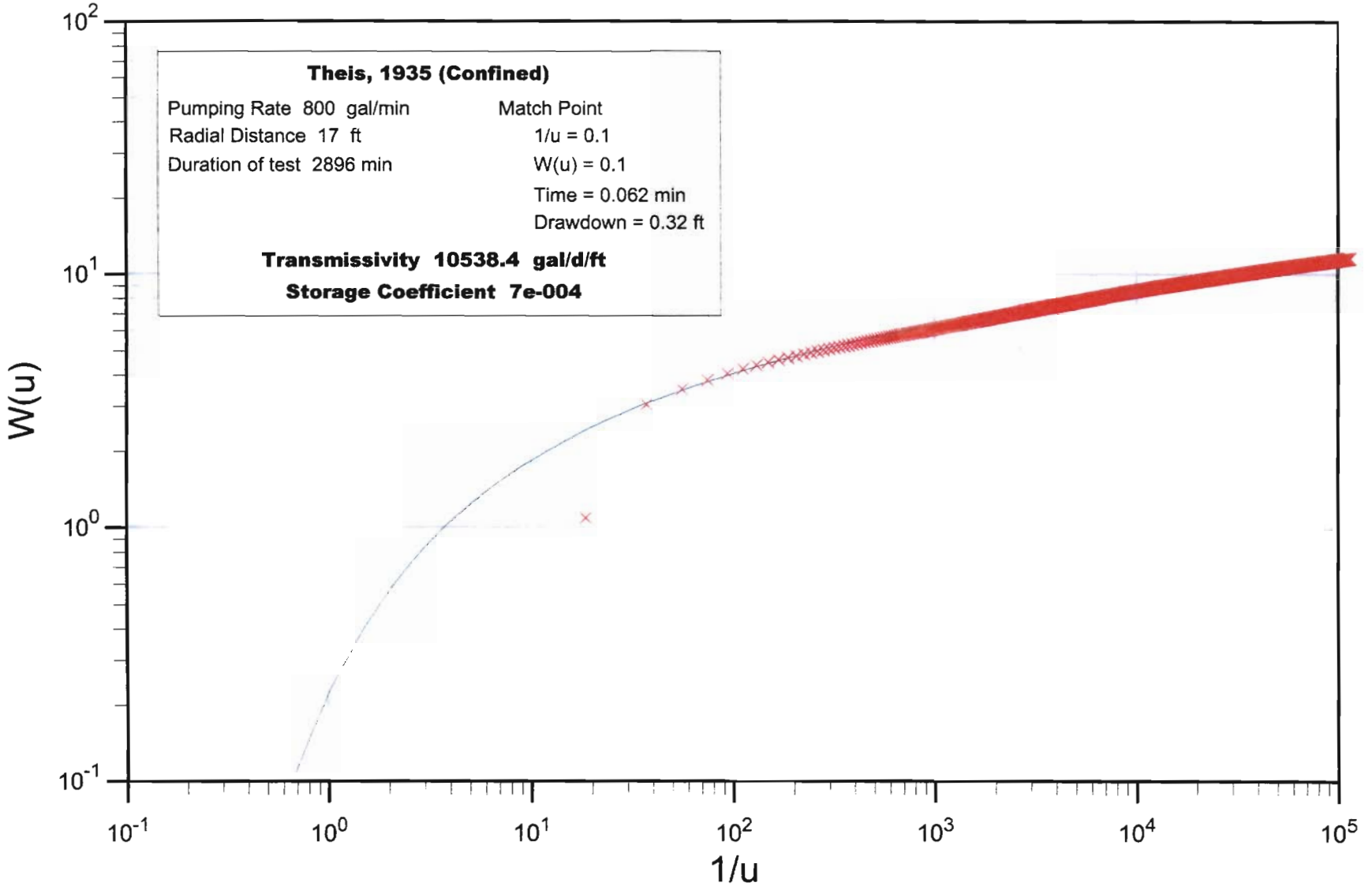
Water Level Hydrograph for High School Well During Aquifer Testing Period

Sunrise Water Authority



Sunrise Water Authority

SWA - 2W Constant Rate Pumping Test

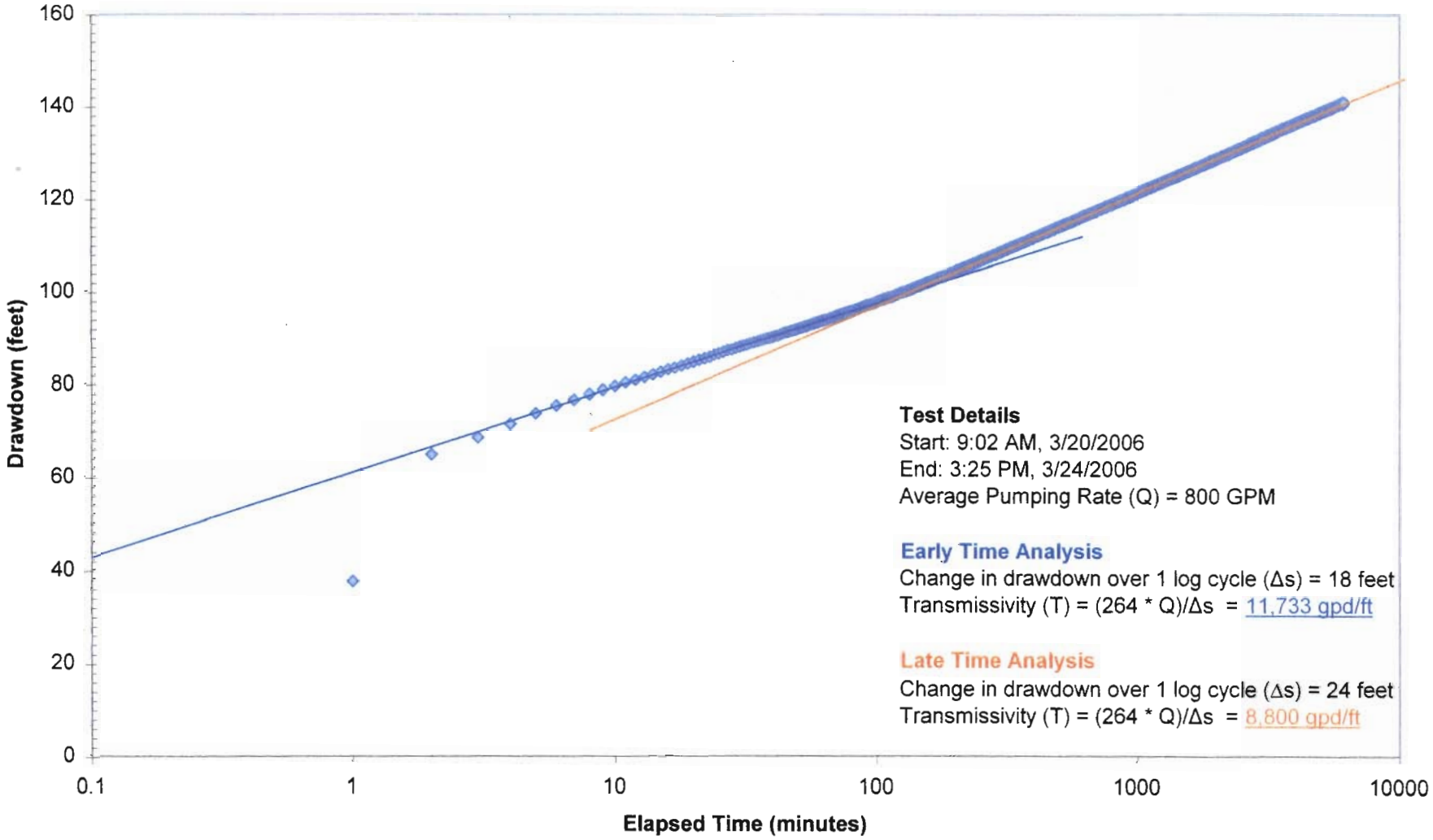


Groundwater Solutions Inc.

P:\157 - Sunrise Wtr Dist\005 ASR\Aquifer Tests\SWA-2W\Test Data\constant rate\SWA_2W Theis.aqw

Drawdown in SWA-2W During Constant Rate Aquifer Test

Sunrise Water Authority



Drawdown in 2W Piezometer During Constant Rate Aquifer Test

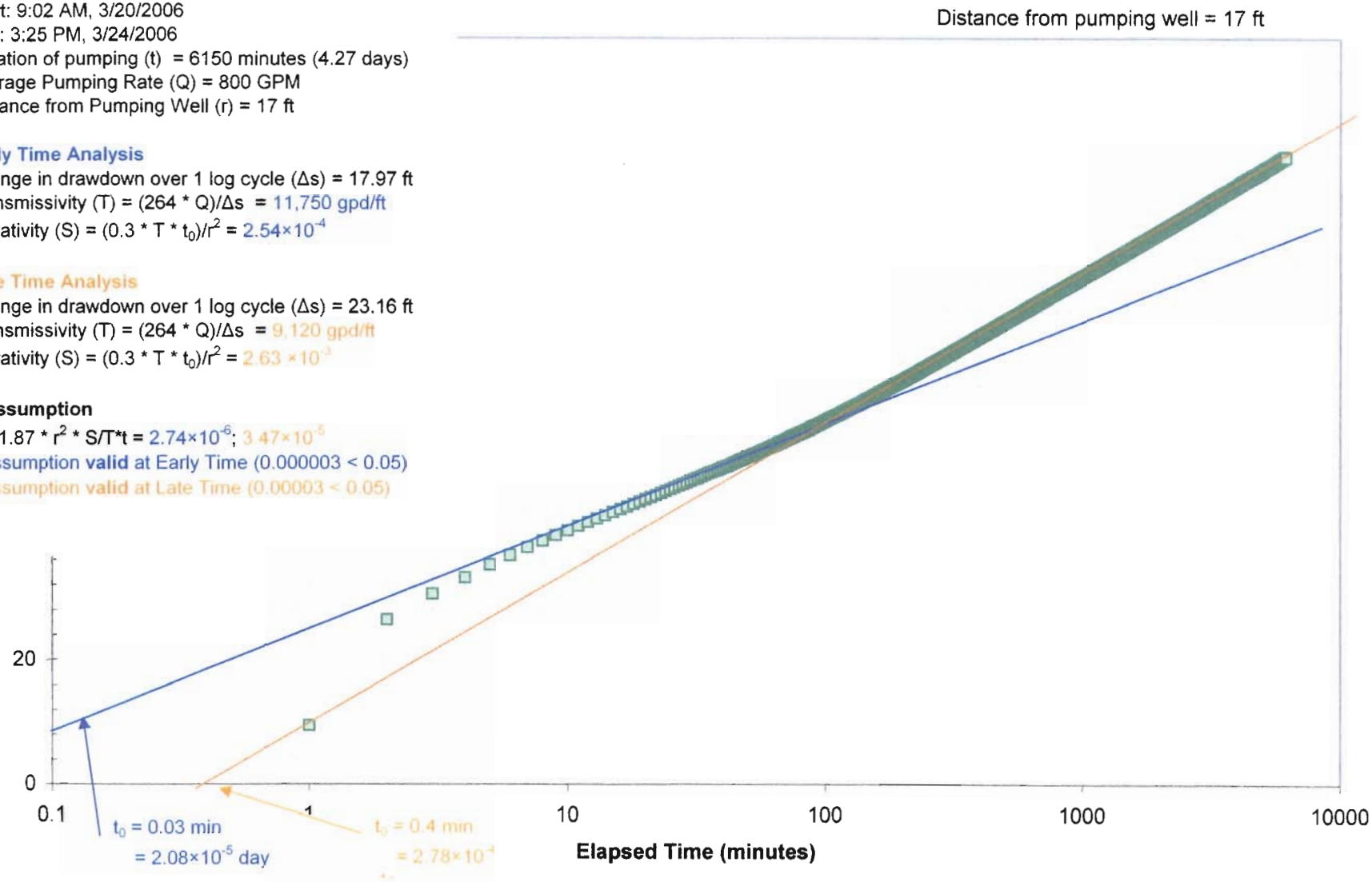
Sunrise Water Authority

Test Details
Start: 9:02 AM, 3/20/2006
End: 3:25 PM, 3/24/2006
Duration of pumping (t) = 6150 minutes (4.27 days)
Average Pumping Rate (Q) = 800 GPM
Distance from Pumping Well (r) = 17 ft

Early Time Analysis
Change in drawdown over 1 log cycle (Δs) = 17.97 ft
Transmissivity (T) = (264 * Q)/Δs = 11,750 gpd/ft
Storativity (S) = $(0.3 * T * t_0)/r^2$ = 2.54×10^{-4}

Late Time Analysis
Change in drawdown over 1 log cycle (Δs) = 23.16 ft
Transmissivity (T) = (264 * Q)/Δs = 9,120 gpd/ft
Storativity (S) = $(0.3 * T * t_0)/r^2$ = 2.63×10^{-3}

u Assumption
$u = 1.87 * r^2 * S/T*t$ = 2.74×10^{-6}; 3.47×10^{-5}
u assumption **valid** at Early Time (0.000003 < 0.05)
u assumption **valid** at Late Time (0.00003 < 0.05)



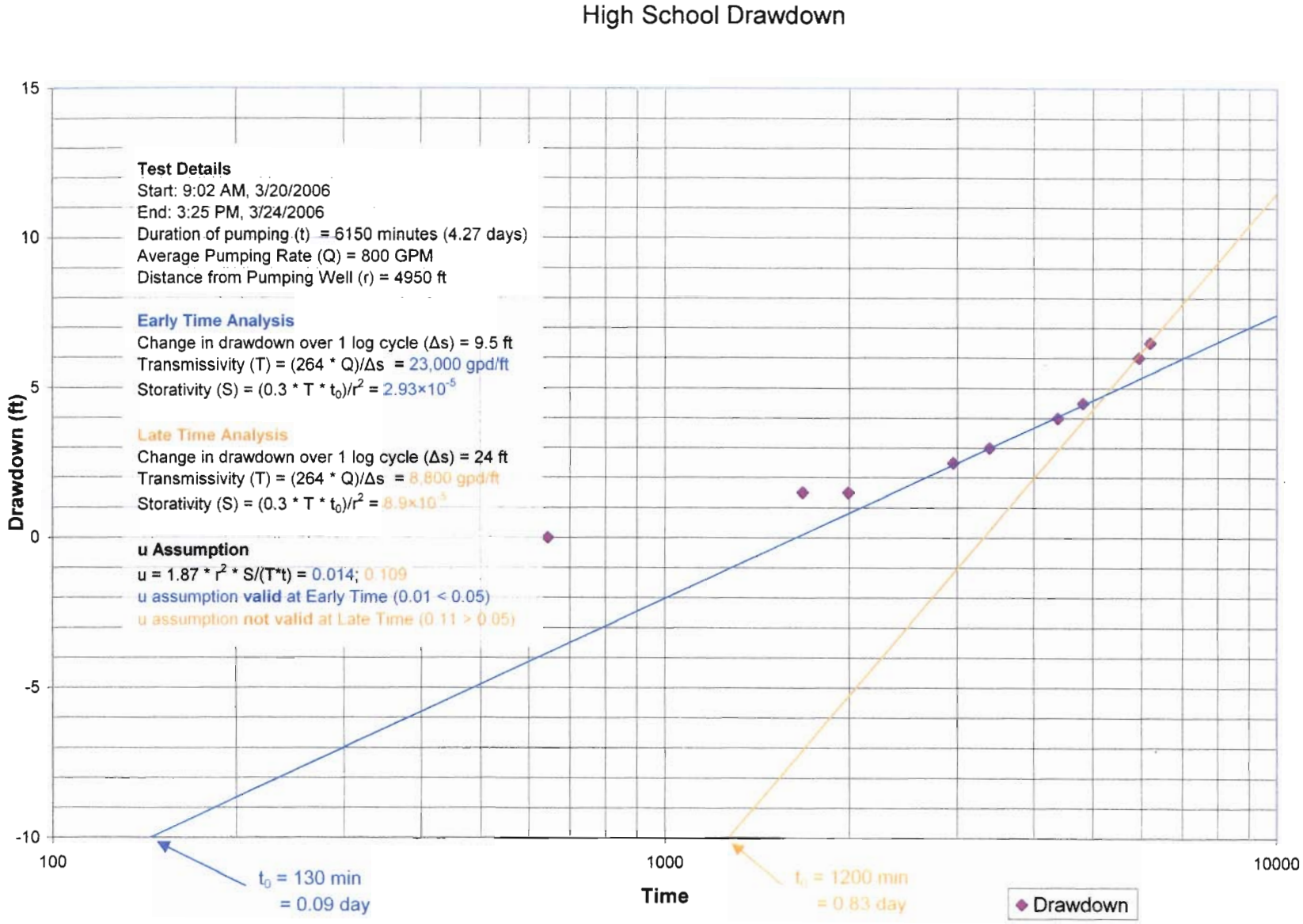


Figure
SWA ASR Feasibility Study

P:\157 - Sunrise Wtr Dist\005 ASR\Aquifer Tests\SWA-2W\Test Data\constant rate\2W constant rate test

Groundwater Solutions, Inc

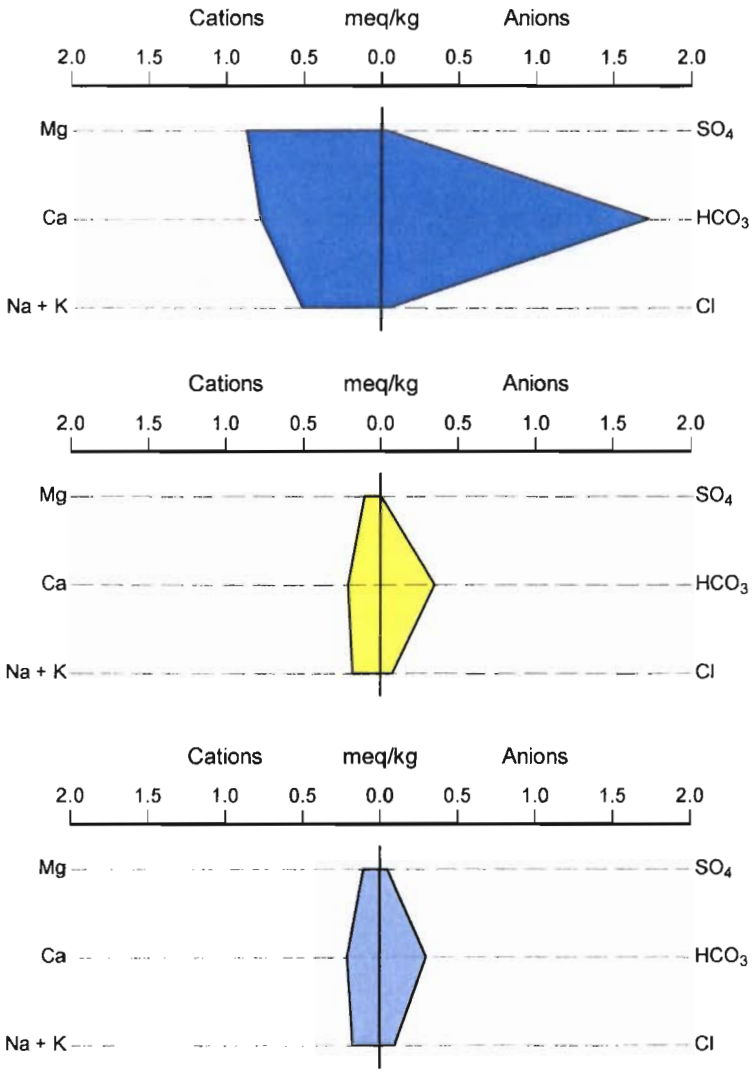


Figure 8
Stiff Diagrams
Sunrise Water Authority Feasibility Study

Groundwater Solutions, Inc.

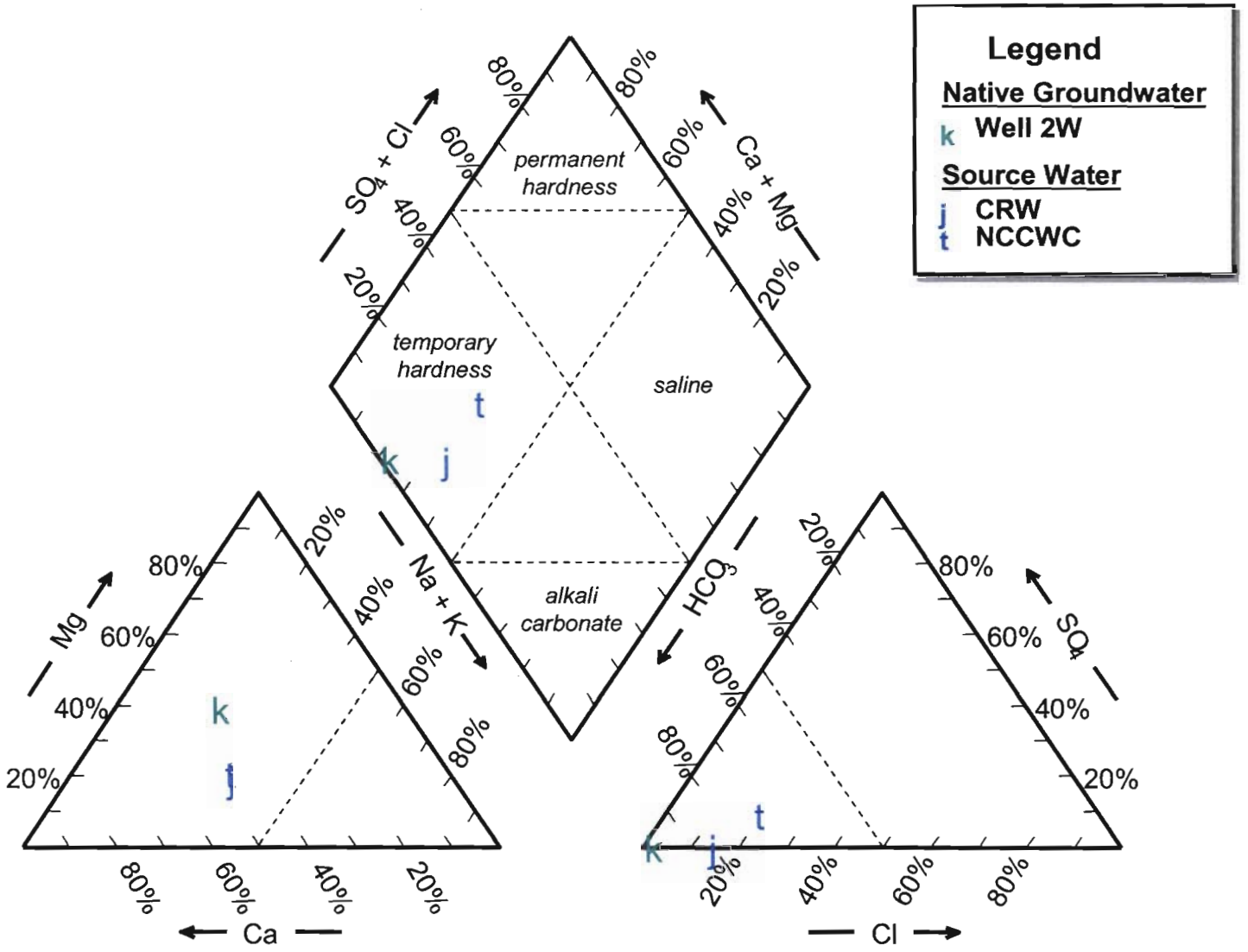


Figure 9
Piper Diagram
Sunrise Water Authority Feasibility Study

Groundwater Solutions, Inc.

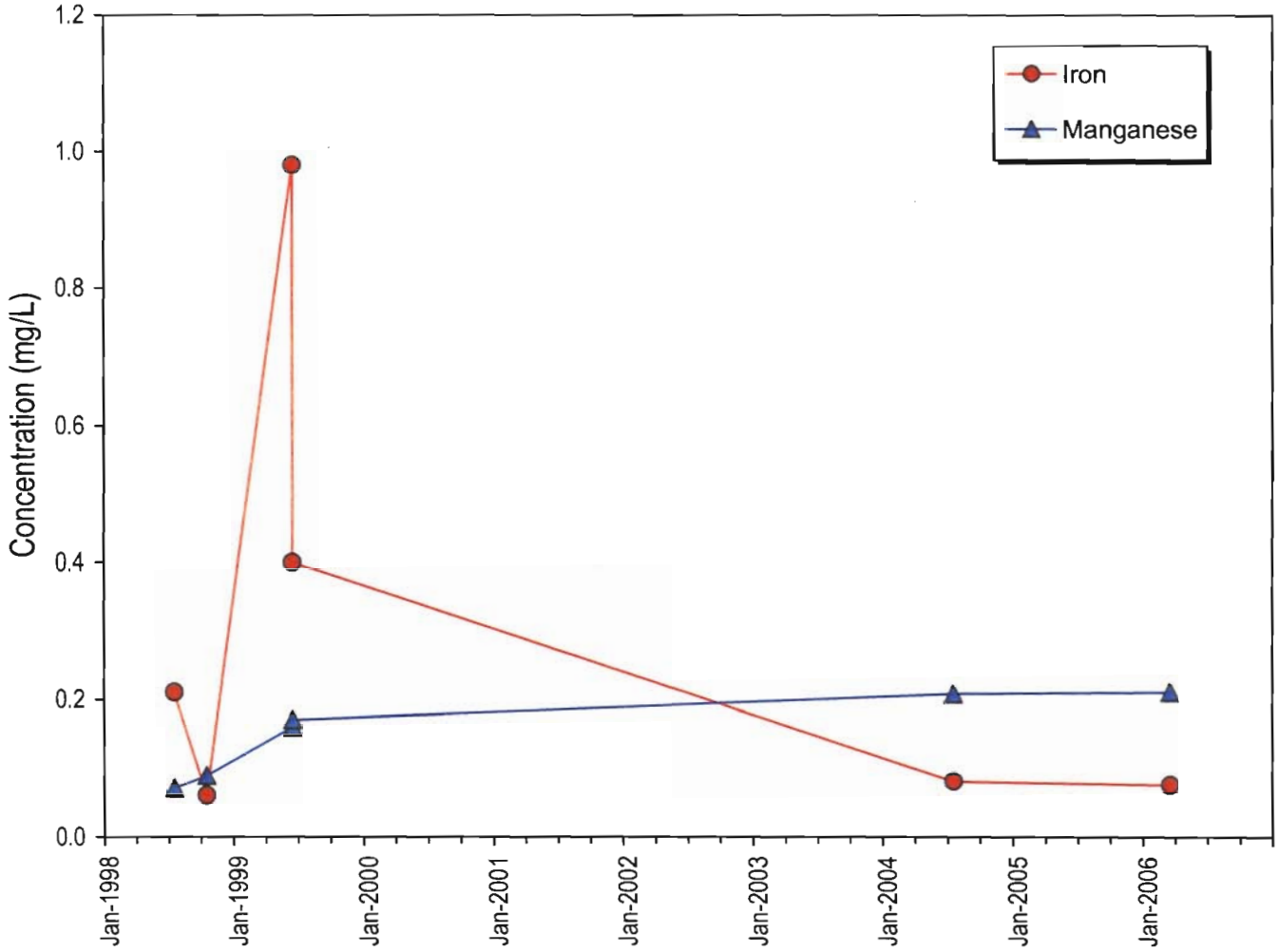


Figure 10
Iron and Manganese in Native Groundwater
Sunrise Water Authority Feasibility Study

Groundwater Solutions, Inc.

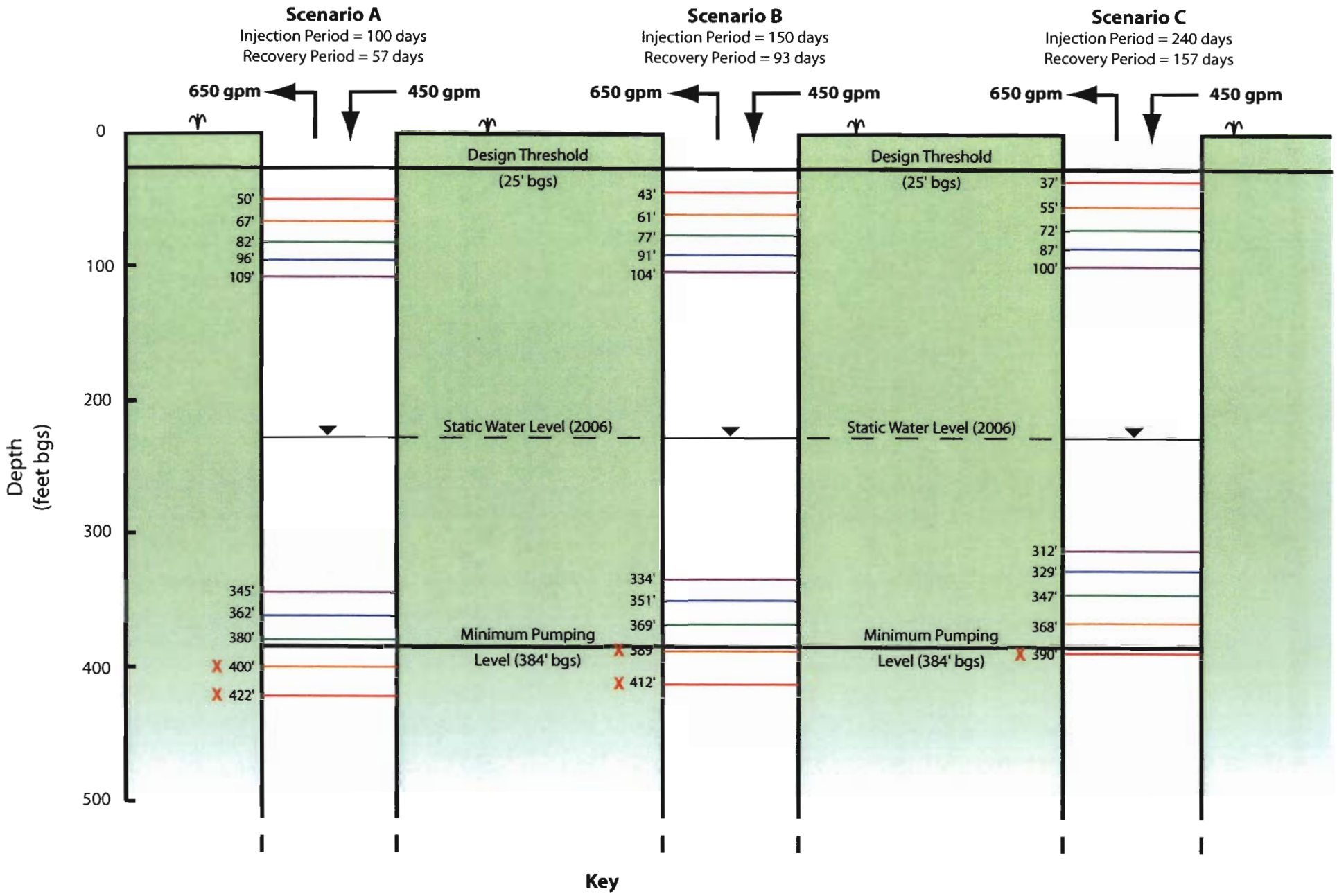


Figure 11A
Assesment of Target Injection and Recovery Rates
Water Level Predictions for ASR Well
Sunrise Water Authority ASR Feasibility Study

Groundwater Solutions, Inc.

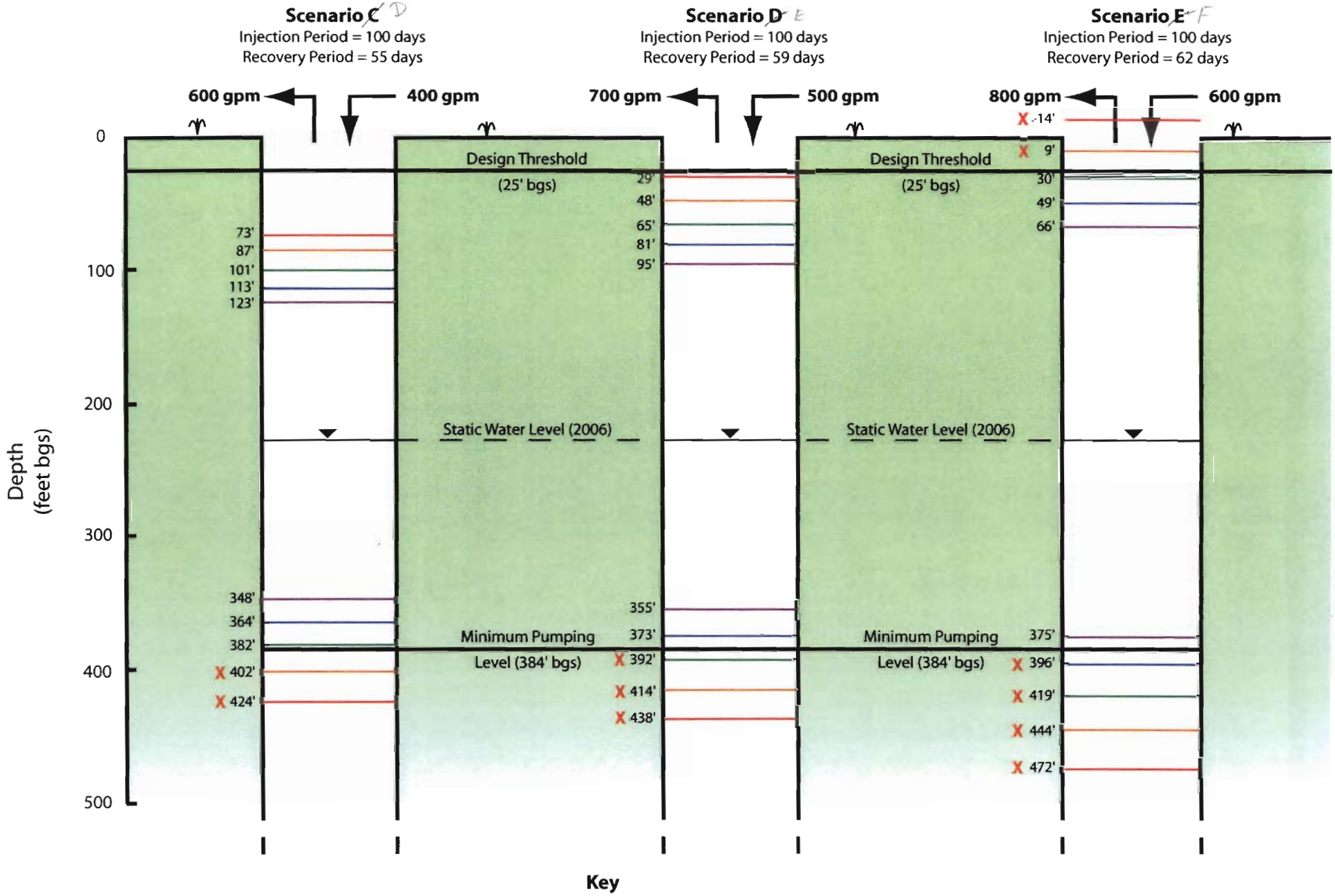


Figure 11B
Assesment of Target Injection and Recovery Rates
Water Level Predictions for ASR Well
Sunrise Water Authority ASR Feasibility Study

Groundwater Solutions, Inc.

Projected Water Level Drawdown at Selected Production Rates (Current Conditions)
Sunrise Water Authority

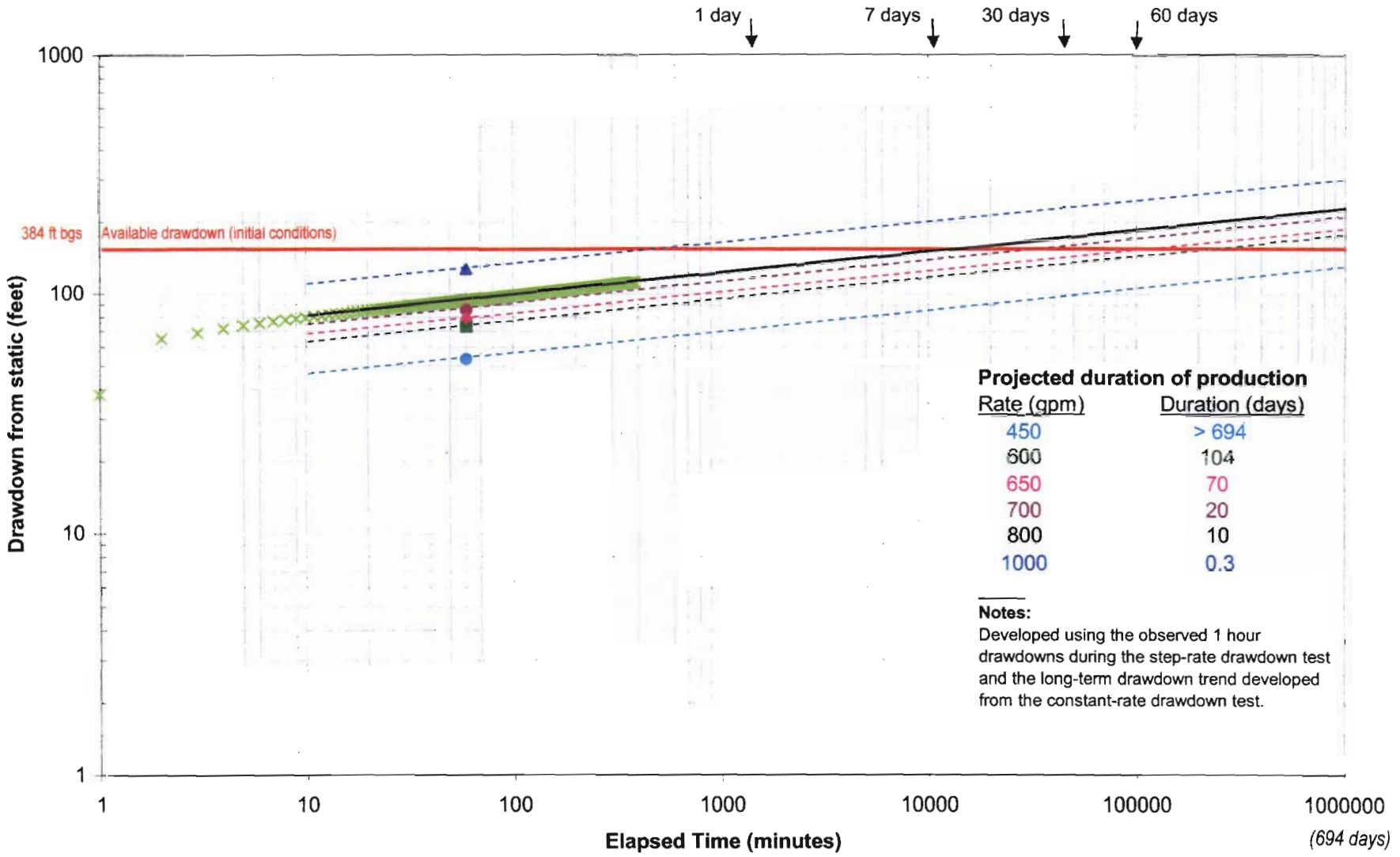
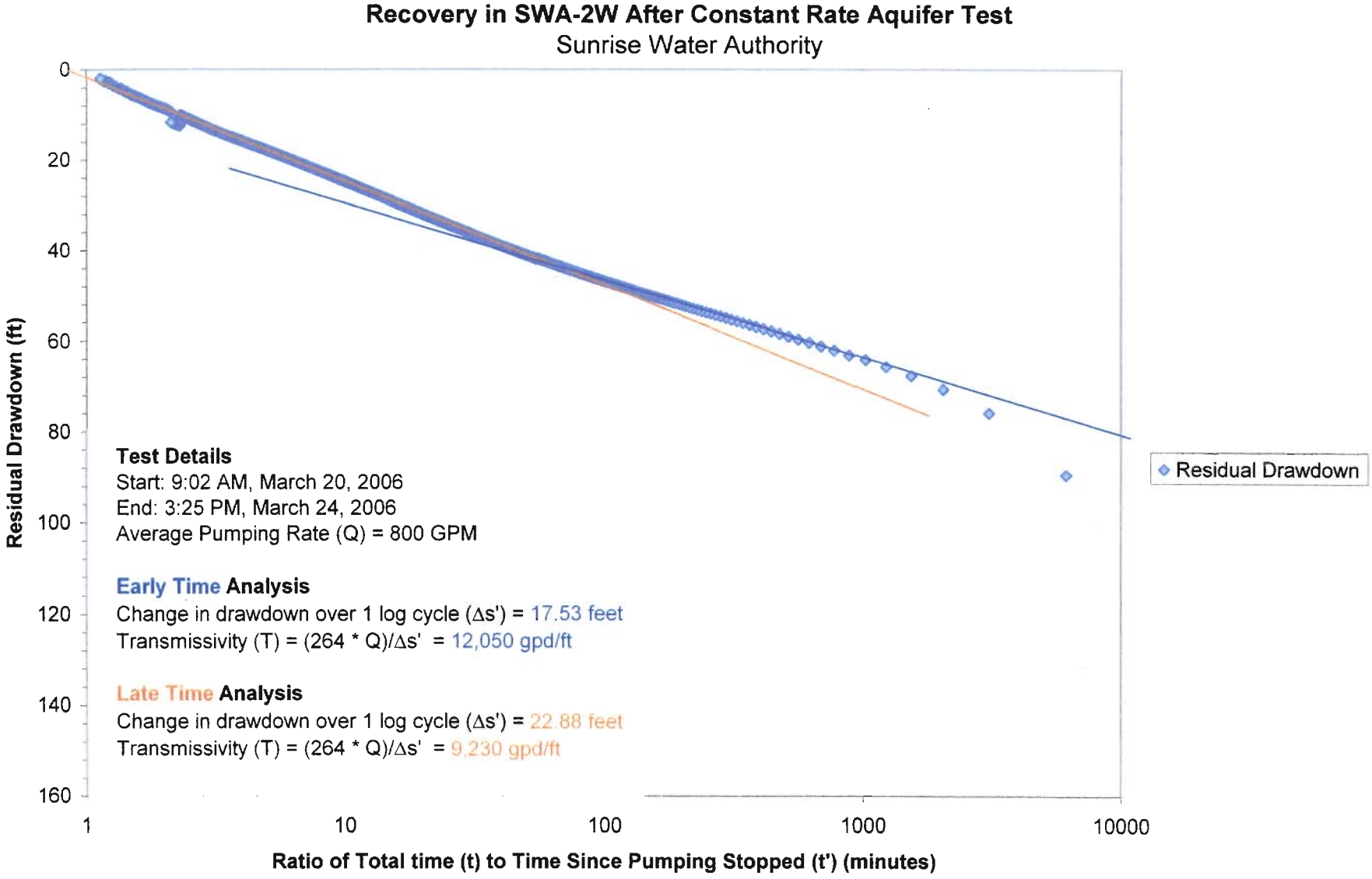


Figure 12
SWA ASR Feasibility Study

P:\157 - Sunrise Wtr Dist\005 ASR\Reports-Memos\2W Feasibility Study\ASR Evaluation

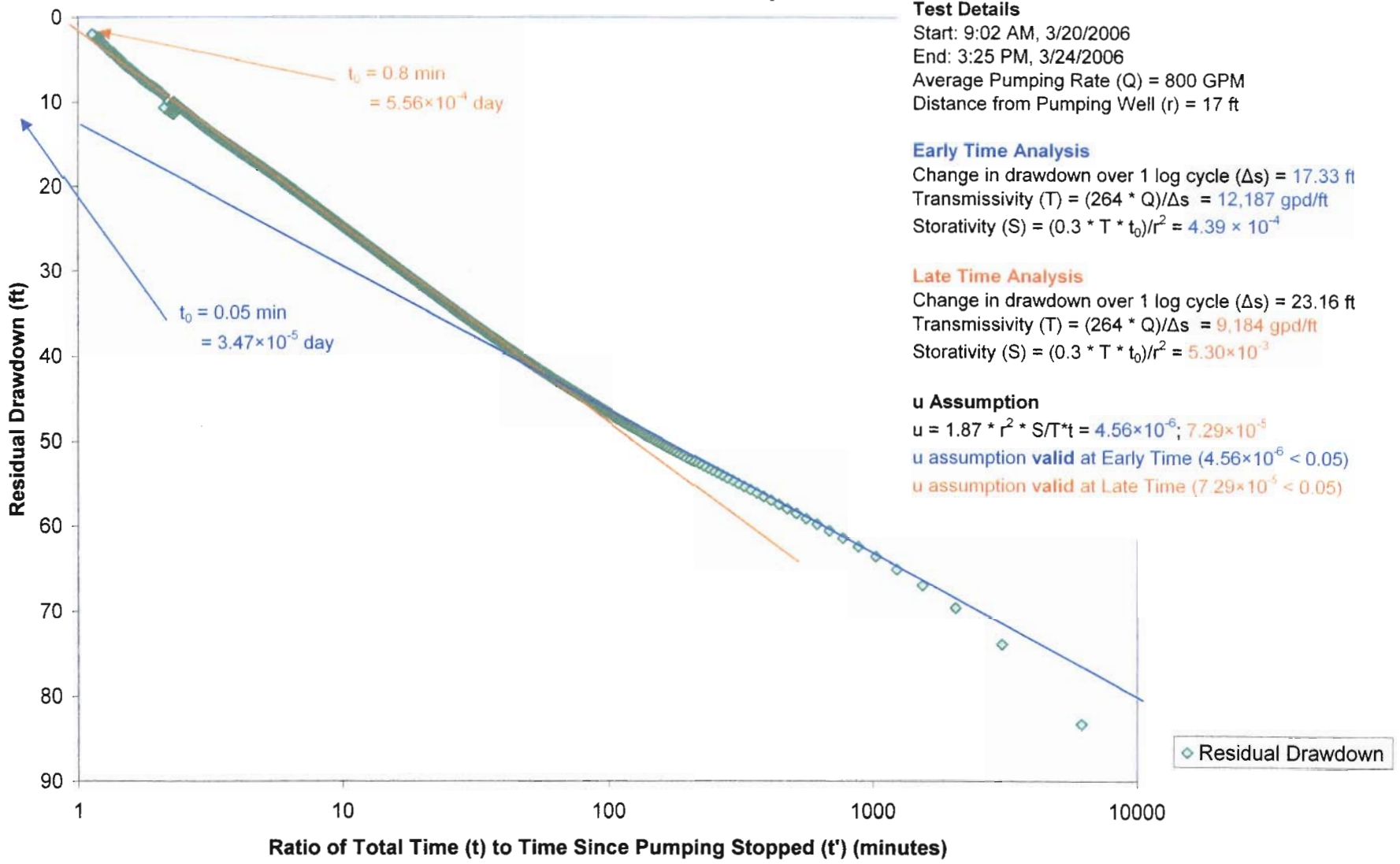
Groundwater Solutions Inc.

Appendix A: SWA Well 2W Aquifer Test Results


Recovery in SWA-2W After Constant Rate Aquifer Test
Sunrise Water Authority
Residual Drawdown (ft)
0
20
40
60
80
100
120
140
160
1
10
100
1000
10000
Ratio of Total time (t) to Time Since Pumping Stopped (t') (minutes)
Residual Drawdown
Test Details
Start: 9:02 AM, March 20, 2006
End: 3:25 PM, March 24, 2006
Average Pumping Rate (Q) = 800 GPM
Early Time Analysis
Change in drawdown over 1 log cycle (Δs') = 17.53 feet
Transmissivity (T) = (264 * Q)/Δs' = 12,050 gpd/ft
Late Time Analysis
Change in drawdown over 1 log cycle (Δs') = 22.88 feet
Transmissivity (T) = (264 * Q)/Δs' = 9,230 gpd/ft

Recovery in SWA-2W Piezometer After Constant Rate Aquifer Test

Sunrise Water Authority



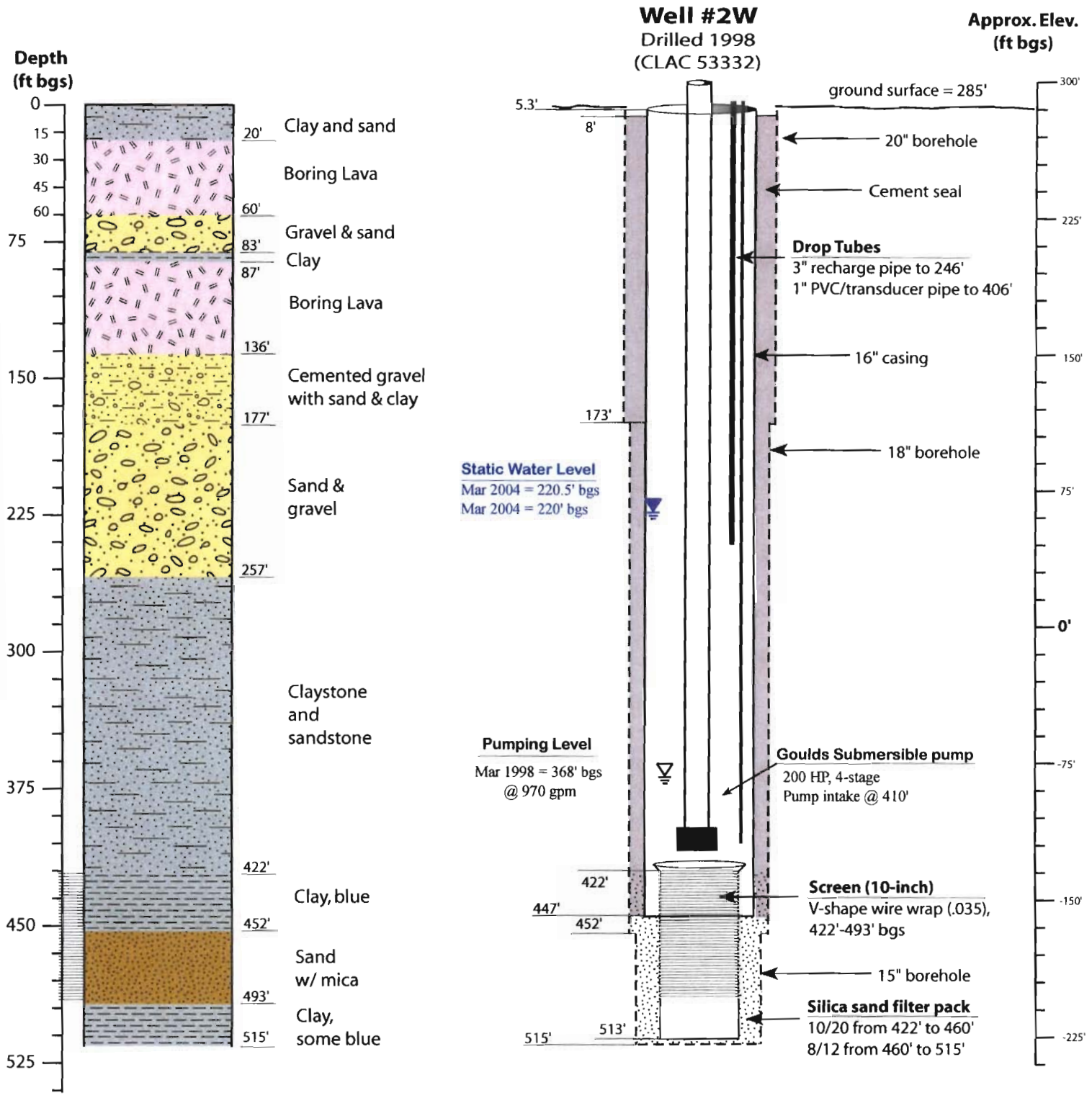
Test Details
Start: 9:02 AM, 3/20/2006
End: 3:25 PM, 3/24/2006
Average Pumping Rate (Q) = 800 GPM
Distance from Pumping Well (r) = 17 ft

Early Time Analysis
Change in drawdown over 1 log cycle (Δs) = 17.33 ft
Transmissivity (T) = (264 * Q)/Δs = 12,187 gpd/ft
Storativity (S) = $(0.3 * T * t_0)/r^2$ = 4.39 × 10^{-4}

Late Time Analysis
Change in drawdown over 1 log cycle (Δs) = 23.16 ft
Transmissivity (T) = (264 * Q)/Δs = 9,184 gpd/ft
Storativity (S) = $(0.3 * T * t_0)/r^2$ = 5.30×10^{-3}

u Assumption
u = $1.87 * r^2 * S/T*t$ = 4.56×10^{-6}; 7.29×10^{-5}
u assumption **valid** at Early Time (4.56×10^{-6} < 0.05)
u assumption **valid** at Late Time (7.29×10^{-5} < 0.05)

Appendix B: Water Well Logs



WELL LOCATION:
2S/2E-1 SE/SW
14701 Territory Drive

SWA Well No. 2W
Lithology and Construction
Sunrise Water Authority

Groundwater Solutions Inc.

RECEIVED

JUN - 2 1998

WATER RESOURCES DEPT.
SALEM, OREGON

Clac 58331

Label L14914

(START CARD) # 87136

STATE OF OREGON
WATER SUPPLY WELL REPORT
(as required by ORS 537.765)

Instructions for completing this report are on the last page of this form.

(1) OWNER: Well Number

Name Mt. Scott Water District

Address 10602 SE 129th Ave.

City Portland State OR Zip 97236

(2) TYPE OF WORK

[X] New Well [ ] Deepening [ ] Alteration (repair/recondition) [ ] Abandonment

(3) DRILL METHOD:

[X] Rotary Air [ ] Rotary Mud [ ] Cable [ ] Auger

[X] Other Reverse Circulation Ratary

(4) PROPOSED USE:

[ ] Domestic [X] Community [ ] Industrial [ ] Irrigation

[ ] Thermal [ ] Injection [ ] Livestock [X] Other ASR ~~Piezometer~~

(5) BORE HOLE CONSTRUCTION:

Special Construction approval [X] Yes [ ] No Depth of Completed Well 511 ft.

Explosives used [ ] Yes [X] No Type _____ Amount _____

HOLE Diameter	From	To	SEAL Material	From	To	Sacks or pounds
12	0	35	cement	*	428	511 sks
10	35	423	*bottom of vault (approx 8' bgs)			
8	423	541	bentonite	5.8	8±	1 sk**
			** between 8" & 4"			

How was seal placed: Method [ ] A [ ] B [X] C [ ] D [ ] E

[ ] Other

Backfill placed from 511 ft. to 541 ft. Material slough

Gravel placed from 428 ft. to 451± ft. Size of gravel Sandcssi 10-20 & mason

(6) CASING/LINER:

	Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing:	8	5.8	451	.250	[X]	[ ]	[XX]	[ ]
	4	5.3	454	sch40	[X]	[ ]	[XX]	[ ]
	shale traps on 4" @ 451'				[ ]	[ ]	[ ]	[ ]
					[ ]	[ ]	[ ]	[ ]
Liner:					[ ]	[ ]	[ ]	[ ]
	5	501	511	sch40	[ ]	[X]	[ ]	[X]

Final location of shoe(s) liner has pvc threaded plug in bottom

(7) PERFORATIONS/SCREENS:

[X] Perforations Method Air Rotary (4rows)

[X] Screens * Type see below Material PVC sch40

From	To	Slot size	Number	Diameter	Tele/pipe size	Casing	Liner
9	430	.2x1	8600	8	ps	[X]	[ ]
			factory			[ ]	[ ]
*441	451	.020	slotted	6	ps	[ ]	[ ]
*451	501	.010	cont	5	ps	[ ]	[ ]
			v-shape			[ ]	[ ]

(8) WELL TESTS: Minimum testing time is 1 hour

[X] Pump [ ] Bailer [ ] Air [ ] Flowing Artesian

Yield gal/min	Drawdown	Drill stem at	Time
200	34'		4 hr.

Temperature of water 50°F± Depth Artesian Flow Found _____

Was a water analysis done? [ ] Yes By whom _____

Did any strata contain water not suitable for intended use? [ ] Too little

[ ] Salty [ ] Muddy [ ] Odor [ ] Colored [ ] Other _____

Depth of strata: _____ SEI 9811

(9) LOCATION OF WELL by legal description:

County Clack Latitude _____ Longitude _____

Township 2S N or S Range 2E E or W. WM.

Section 1 SE 1/4 SW 1/4

Tax Lot 11200 Lot _____ Block _____ Subdivision _____

Street Address of Well (or nearest address) 14701 Territory Drive Clackamas, OR. 97015

(10) STATIC WATER LEVEL:

200 ft. below land surface. Date 3/13/98

Artesian pressure _____ lb. per square inch. Date _____

(11) WATER BEARING ZONES:

Depth at which water was first found 89

From	To	Estimated Flow Rate	SWL
89	119	10?	78
140	227	20?	78±
232	252	20 ?	110±
298	417 small lenses	10?	150±
451	495	see (8)	see (10)

(12) WELL LOG:

Ground Elevation approx. 300'

Material	From	To	SWL
see attached log			

Date started 3/19/96 Completed 5/19/98

(unbonded) Water Well Constructor Certification:

I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon water supply well construction standards. Materials used and information reported above are true to the best of my knowledge and belief.

Signed _____ WWC Number 1367

Date 5/28/98

(bonded) Water Well Constructor Certification:

I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon water supply well construction standards. This report is true to the best of my knowledge and belief.

Signed _____ WWC Number 649

Date 5/28/98

ORIGINAL & FIRST COPY-WATER RESOURCES DEPARTMENT SECOND COPY-CONSTRUCTOR THIRD COPY-CUSTOMER

MT. SCOTT WATER DISTRICT PIEZOMETER WELL

Label #L14914 - Start Card No.87136
by Schneider Drilling Co.

Depth From	To	Description
0	3	Top soil, brown
3	20	Clay, brown, fine, sandy
20	24	Basalt, black, soft
24	30	Basalt, black, med, broken
30	35	Basalt, brown, soft, broken
35	60	Basalt, black, brown, & red, soft
60	70	Gravel 1"-, sluffing
70	75	Gravel 2"-, & sand, brown, med
75	84	Gravel 2"-
84	89	Clay, brown
89	97	Basalt, black, cindery
97	114	Basalt, black, vesicular, soft, w/claystone, brown
114	119	Basalt, black & gray, vesicular
119	133	Basalt, black, fractured, med-hard
133	137	Basalt, brown, broken, & claystone, brown
137	140	Clay, brown
140	145	Gravel & sand, brown, cemented
145	156	Gravel 2"-, & sand, brown, med
156	169	Gravel 2"-, & sand, brown, w/clay, brown
169	177	Sand, cemented & clay, hard, brown
177	181	Sand, brown, med-fine, some cemented
181	199	Sand, brown, med-course, & gravel, 2"-
199	206	Sand, brown, med-course, w/gravel
206	213	Gravel 2"-, & sand, med-course
213	225	Gravel 2"-, sand, med, cemented
225	227	Sand, brown, cemented
227	229	Clay, brown
229	232	Clay, gray
232	236	Gravel 1"-, sand, black
236	248	Gravel & sand, cemented, w/some claystone
248	252	Gravel & hard clay, brown
252	256	Claystone, brown

256	259	Sandstone, brown
259	275	Claystone, sandstone & clay lenses, brown
275	283	Claystone & siltstone, dark gray
283	296	Sandstone, black
296	298	Clay, blue-gray
298	305	Sandstone & claystone, brown, w/some gravel
305	307	Clay & claystone, gray
307	317	Sandstone & claystone, brown, w/some gravel
317	319	Claystone & clay, brown
319	322	Clay, gray & sandstone
322	327	Sandstone, brown
327	332	Sandstone & claystone, brown
332	336	Clay, gray
336	345	Sandstone, gray
345	347	Sand, black, w/some gravel & wood
347	354	Clay, blue
354	357	Claystone & sandstone, black
357	363	Clay, dark brown & claystone, sand, fine
363	372	Sandstone, clay & siltstone, black
372	380	Claystone & siltstone, dark gray
380	390	Sandstone & claystone, black
390	393	Claystone, gray
393	398	Clay, blue
398	411	Clay w/sand, green, dry
411	417	Sandstone, green-blue
417	421	Clay, blue, sticky
421	425	Clay, brown, sticky
425	430	Clay, gray, sticky
430	443	Clay, blue, sticky
443	445	Sand, dark gray, fine
445	451	Clay, blue
451	495	Sand, silty, gray, w/wood
495	497	Clay, blue
497	505	Clay, gray, sticky
505	515	Clay, brown, sticky
515	527	Clay, gray, sticky
527	541	Claystone, siltstone & clay, multi-colored

STATE OF OREGON

WATER SUPPLY WELL REPORT

(as required by ORS 537.765)

Instructions for completing this report are on the last page of this form.

CLAC 55211

Received Date 11/16/1999
Well ID Tag # L 33632
Start Card # 124777

(1) OWNER

Well Number

Name: NORTH CLACKAMAS SCHOOL DISTRICT

Street: 4444 SE LAKE RD

City: MILWAUKIE State: OR Zip: 97222

(2) TYPE OF WORK

☒ New ☐ Alter (Recondition) ☐ Alter (Repair)
☐ Deepening ☐ Abandonment

(3) DRILL METHOD

☒ Rotary Air ☐ Rotary Mud ☐ Cable ☐ Auger

Other

(4) PROPOSED USE

☐ Domestic ☐ Community ☐ Industrial ☒ Irrigation ☐ Injection
☐ Livestock ☐ Thermal Other

(5) BORE HOLE CONSTRUCTION

Special Standards ☐ Depth of completed well 531 ft.

Explosives Used ☐ Amount Type

Diameter	From	To
20.00	0.00	143
17.00	143.00	288
12.00	288.00	531

Material	Begin Depth	End Depth	Material	Units
Cement	0.00	143.00	176.00	S
Cement	43.00	288.00	88.00	S

How as seal placed: Method C Other

Backfill placed from ft. TO ft. Material

Filter pack from ft. TO ft. Size in.

(6) CASING/LINER

Casing or Liner	Diameter	Begin Depth	End Depth	Gauge	Material	Construction: Welded	Construction: Threaded	Location Of Shoe
C	12.00	0.00	481.00	375	S	☒	☐	481

(7) PERFORATION/SCREENS

☐ Perforations Method
☐ Screens Type Material

Diameter	From	To	Gauge	Material	Type	Slot Size
12.00	481	491	S		T	.016
12.00	491	516	S		T	.008
12.00	516	522	S		T	.020

(8) WELL TESTS (Minimum testing time is 1 hour)

Type	Yield	Units	Drawdown	Stem at	Duration
Air	720.0	G		530	1.0
Air	600.0	G		480	1.0
Air	300.0	G		350	1.0

Temperature of water 54 °F/C Depth artesian flow found ft.

Was water analysis done? ☐ By Whom?

Did any strata contain water not suitable for intended use? ☐ Too Little ☐ Salty ☐ Muddy ☐ Odor ☐ Colored Other

Depth of strata ft.

(9) LOCATION OF HOLE By legal description

County Latitude Longitude

Township 2.00 S Range 2.00 E Subdivision

Tax lot 2300 Lot Block

Section 2 SE 1/4 SW 1/4

Street Address of Well (or nearest address)

14486 SE 122ND AVE

MAP with location indentified must be attached

(10) STATIC WATER LEVEL

260.0 Ft. below land surface. Date 11/03/1999

Artesian Pressure lb/sq. in. Date

(11) WATER BEARING ZONES

Depth at which water was first found 260 ft.

From	To	Est. Flow Rate	SWL
253	265	25	190
325	363	25	260
476	531	720	260

(12) WELL LOG

Ground Elevation ft.

Material	From	To	SWL
SILTY CLAY BROWN	0	32	
CLAY & GRAVELS	32	46	
BASALT WEATHERED	46	49	
BASALT GREY MED	49	134	
CLAY W/GRAVELS	134	174	
CLAY BROWN	174	178	
GRAVELS WITH CLAY	178	247	
CLAY STICKY GREY	247	249	
CLAY SILTY GREY	249	253	
SAND, GRAVELS	253	255	
GRAVELS CEMENTED	255	284	
CLAY BLUE GREY	285	284	
GRAVELS CEMENTED	284	313	
CLAY STICKY	313	325	
SILTY CLAY	325	331	
SILT AND SANDSTONE	331	361	
SAND LOOSE FINE BROWN	361	363	
SILTSTONE	363	408	
SAND FINE BLACK	408	412	
SILTY CLAY GREEN	412	440	
SAND FINE BLACK	440	443	
CLAY GREY	443	471	
SAND FINE BROWN	471	475	
SAND FINE BROWN	475	475	
SAND FINE BLACK	475	521	
SILTSTONE	521	531	

Date started 09/28/1999 Completed 11/03/1999

(unbonded) Water Well Constructor Certification:

I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon well construction standards. Materials used and information reported above are true to the best knowledge and belief.

Signed By TERRY M MCCOY JR

(bonded) Water Well Constructor Certification: WWC Number 1672

I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon well construction standards. This report is true to the best of my knowledge and belief.

WWC Number 1484

Signed By GREG MCINNIS GEO-TECH EXPLORATIONS

CLAC

File Original and First Copy with the STATE ENGINEER, SALEM, OREGON

WATER WELL REPORT

CLAC 04060

STATE OF OREGON

State Well No. 2/2-12

State Permit No. .....

(1) OWNER:

Name John Mueller

Address Rt # Clackamas Ore. Box 124 Rt # 1

(2) LOCATION OF WELL:

County Clackamas Owner's number, if any—

¼ ¼ Section T. R. W.M.

Bearing and distance from section or subdivision corner

Tax Lot 38; - 14.54 Acres; Acct No 64-22387
Lot - 12
Blk - 25
[redacted]t - 25
Code Area - 6402

(3) TYPE OF WORK (check):

New Well ☐ Deepening ☐ Reconditioning ☐ Abandon ☐

If abandonment, describe material and procedure in Item 11.

(4) PROPOSED USE (check):

Domestic ☐ Industrial ☐ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☐

(5) TYPE OF WELL:

Rotary ☐ Driven ☐
Cable ☐ Jetted ☐
Dug ☐ Bored ☐

(6) CASING INSTALLED:

Threaded ☐ Welded ☐

..... " Diam. from ..... ft. to ..... ft. Gage .....
..... " Diam. from ..... ft. to ..... ft. Gage .....
..... " Diam. from ..... ft. to ..... ft. Gage .....

(7) PERFORATIONS:

Perforated? ☐ Yes ☐ No

Type of perforator used

SIZE of perforations ..... in. by ..... in.

..... perforations from ..... ft. to ..... ft.
..... perforations from ..... ft. to ..... ft.
..... perforations from ..... ft. to ..... ft.
..... perforations from ..... ft. to ..... ft.
..... perforations from ..... ft. to ..... ft.

(8) SCREENS:

Well screen installed ☐ Yes ☐ No

Manufacturer's Name .....

Type ..... Model No. .....

[redacted] ..... Slot size ..... Set from ..... ft. to ..... ft.
Diam. ..... Slot size ..... Set from ..... ft. to ..... ft.

(9) CONSTRUCTION:

Was well gravel packed? ☐ Yes ☐ No Size of gravel: .....

Gravel placed from ..... ft. to ..... ft.

Was a surface seal provided? ☐ Yes ☐ No To what depth? ..... ft.

Material used in seal—

Did any strata contain unusable water? ☐ Yes ☐ No

Type of water? Depth of strata

Method of sealing strata off

(10) WATER LEVELS:

Static level 90 ft. below land surface Date Nov-3-60

Artesian pressure ..... lbs. per square inch Date .....

Log Accepted by:

[Signed] ..... Date ....., 19....
(Owner)

(11) WELL TESTS:

Drawdown is amount water level is lowered below static level

Was a pump test made? ☐ Yes ☐ No If yes, by whom? -

Yield: ..... gal./min. with ..... ft. drawdown after ..... hrs.
" " " "
" " " "

Bailer test 20 gal./min. with 200 ft. drawdown after 2 hrs.

Artesian flow ..... g.p.m. Date .....

Temperature of water Was a chemical analysis made? ☐ Yes ☐ No

(12) WELL LOG:

Diameter of well 8 inches.

Depth drilled 322 ft. Depth of completed well 322 ft.

Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

MATERIAL	FROM	TO
soil	0	25
soap stone	25	40
gravel	40	62
gravel & bolders	62	82
hard cement gravel	82	105
" "	105	120
sandy clay	105	145
yellow clay	145	195
quick sand	195	200
blue clay Pipe drives hard	200	245
" "	245	295
Coures black sand washed small gravels	295	322

Work started Oct 1 1960. Completed Nov 3 1960

(13) PUMP:

Manufacturer's Name .....

Type: ..... H.P. .....

Well Driller's Statement:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Barron & Strayer
(Person, firm, or corporation) (Type or print)

Address Rt # 1 Box 254 Beaverton Ore

Driller's well number .....

[Signed] Lance Strayer
(Well Driller)

License No. 35 Date Nov 3 60, 19....

(USE ADDITIONAL SHEETS IF NECESSARY)

NOTICE TO WATER WELL CONTRACTOR
The original and first copy of this report are to be filed with the WATER RESOURCES DEPARTMENT, SALEM, OREGON 97310 within 30 days from the date of well completion.

RECEIVED
AUG 12 1980
WATER RESOURCES DEPT
SALEM, OREGON

WATER WELL REPORT
STATE OF OREGON
(Please type or print)
(Do not write above this line)

CLAC 04053

State Well No. 2S/2E-12 aa
State Permit No.

(1) OWNER:
Name Lee Schweitzer
Address 16109 S.E. Hyw 212 Clackamas, Oregon

(2) TYPE OF WORK (check):
New Well [X] Deepening [ ] Reconditioning [ ] Abandon [ ]
If abandonment, describe material and procedure in Item 12.

(3) TYPE OF WELL:
Rotary [X] Driven [ ]
[ ] Jetted [ ]
[ ] Bored [ ]

(4) PROPOSED USE (check):
Domestic [ ] Industrial [ ] Municipal [ ]
Irrigation [X] Test Well [ ] Other [ ]

(5) CASING INSTALLED: Threaded [ ] Welded [X]
8" Diam. from +2 ft. to 333 ft. Gage .250
4" Diam. from 300 ft. to 405 ft. Gage

(6) PERFORATIONS: Perforated? [ ] Yes [X] No
Type of perforator used
Size of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

(7) SCREENS: Well screen installed? [X] Yes [ ] No
Manufacturer's Name Johnson
Type STAINLESS Model No. V-A
Diam. 8 Slot size 15 Set from 335 ft. to 345 ft.
Diam. 8 Slot size 15 Set from 350 ft. to 355 ft.
8 15 365 370

(8) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? [X] Yes [ ] No If yes, by whom?
Yield: 165 gal./min. with 55 ft. drawdown after 8 hrs.
" " " "
" " " "
Bailer test Blow 100 gal./min. with 145 ft. drawdown after 1 hrs.
Artesian flow g.p.m.
Temperature of water Depth artesian flow encountered ft.

(9) CONSTRUCTION:
Well seal—Material used Cement 4% Bent.
Well sealed from land surface to 80 ft.
Diameter of well bore to bottom of seal 12 in.
Diameter of well bore below seal 8 in.
Number of sacks of cement used in well seal 36 sacks
How was cement grout placed? Grout Pumped
Was a drive shoe used? [X] Yes [ ] No Plugs Size: location ft.
Did any strata contain unusable water? [ ] Yes [X] No
Type of water? depth of strata
Method of sealing strata off
Was well gravel packed? [ ] Yes [X] No Size of gravel:
Gravel placed from ft. to ft.

(10) LOCATION OF WELL:
County Clack Driller's well number
NE¼ NE¼ Section 12 T. 2S R. 2E W.M.
Bearing and distance from section or subdivision corner

(11) WATER LEVEL: Completed well.
Depth at which water was first found 330 ft.
Static level 255 ft. below land surface. Date 5/2/80
Artesian pressure lbs. per square inch. Date

(12) WELL LOG: Diameter of well below casing None
Depth drilled 405 ft. Depth of completed well 405 ft.
Formation: Describe color, texture, grain size and structure of materials; and show thickness and nature of each stratum and aquifer penetrated, with at least one entry for each change of formation. Report each change in position of Static Water Level and indicate principal water-bearing strata.

MATERIAL	From	To	SWL
Top Soil	0	3	
Red Clay	3	8	
Black Rock	8	17	
Gravel & Boulders	17	95	
Cement Gravel	95	180	
Loose Gravel	180	212	
Cemented Gravel	212	232	
Clay Brown Gray Blue	232	335	
Fine Black Sand	335	345	w/B
Coarse Sand & very	345		
Fined Gravel		359	w/B
Fine Black Sand	359	370	w/B
Black Sand Stone	370	395	
Blue Clay	395	405	
80 FT Screen used			
7" Black Pik 300 335/Sc. 335 345/Bla 345-350/Sc. 350 355/Bl. 355 365/Sc. 365 370			

Work started 4/29 1980 Completed 5/2 1980
Date well drilling machine moved off of well 5/2 1980

Drilling Machine Operator's Certification:
This well was constructed under my direct supervision. Materials used and information reported above are true to my best knowledge and belief.
[Signed] Tom Bullion (Drilling Machine Operator) Date 5/2, 1980
Drilling Machine Operator's License No. 1147

Water Well Contractor's Certification:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
Name Ted Pullman Well Drilling (Person, firm or corporation) (Type or print)
Address 18211 S.E. Powell Gresham
[Signed] Ted Pullman (Water Well Contractor)
Contractor's License No. CCB Date 5/2, 1980

(USE ADDITIONAL SHEETS IF NECESSARY)

SP*45656-119

NOTICE TO WATER WELL CONTRACTOR
The original and first copy of this report are to be filed with the
STATE ENGINEER, SALEM, OREGON 97310 within 30 days from the date of well completion.

CLAC C4610

WATER WELL REPORT
STATE OF OREGON
(Please type or print)
(Do not write above this line)

RECEIVED JUL 25 1973 STATE ENGINEER SALEM OREGON

State Well No. 2S/3E-6 C
State Permit No.

(1) OWNER:
Name Joesph R. Dixon
Address 320 High St. Oregon City, Ore. 97045

(2) TYPE OF WORK (check):
New Well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 12.

(3) TYPE OF WELL:
Rotary ☒ Driven ☐
Cable ☐ Jetted ☐
Dug ☐ Bored ☐

(4) PROPOSED USE (check):
Domestic ☒ Industrial ☐ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☐

(5) CASING INSTALLED:
Threaded ☐ Welded ☒
6" Diam. from 0 ft. to 390 ft. Gage .250
" Diam. from ft. to ft. Gage
5 9/16 Diam. from 385 ft. to 627 ft. Gage .188

(6) PERFORATIONS:
Perforated? ☐ Yes ☒ No
Type of perforator used
Size of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

(7) SCREENS:
Well screen installed? ☐ Yes ☒ No
Manufacturer's Name
Type Model No.
Diam. Slot size Set from ft. to ft.
Diam. Slot size Set from ft. to ft.

(8) WELL TESTS:
Drawdown is amount water level is lowered below static level
Was a pump test made? ☐ Yes ☒ No If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
rotary 30 " Total " 1 "
" " " "
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m.
Temperature of water Depth artesian flow encountered ft.

(9) CONSTRUCTION:
Well seal—Material used Bentonite-puddled clay
Well sealed from land surface to 50 ft.
Diameter of well bore to bottom of seal 9 in.
Diameter of well bore below seal 6 in.
Number of sacks of cement used in well seal sacks
Number of sacks of bentonite used in well seal 20 sacks
Brand name of bentonite Wilbur Ellis
Number of pounds of bentonite per 100 gallons of water lbs./100 gals.
Was a drive shoe used? ☐ Yes ☒ No Plugs Size: location ft.
Did any strata contain unusable water? ☐ Yes ☒ No
Type of water? depth of strata
Method of sealing strata off
Was well gravel packed? ☐ Yes ☒ No Size of gravel:
Gravel placed from ft. to ft.

(10) LOCATION OF WELL:
County Clackamas Driller's well number
S.W. ¼ ¼ Section 6 T. 2S R. 3E W.M.
Bearing and distance from section or subdivision corner

(11) WATER LEVEL: Completed well.
Depth at which water was first found 29 ft.
Static level 40 ft. below land surface. Date 7-12-73
Artesian pressure lbs. per square inch. Date

(12) WELL LOG:
Diameter of well below casing 6"
Depth drilled 627 ft. Depth of completed well 600 ft.

Formation: Describe color, texture, grain size and structure of materials; and show thickness and nature of each stratum and aquifer penetrated, with at least one entry for each change of formation. *Report each change in position of Static Water Level and indicate principal water-bearing strata.*

MATERIAL	From	To	SWL
Topsoil	0	2	
Boulders set in clay-red	2	8	
Clay-brown	8	18	
Clay-light br	18	26	
Clay-yellow-sticky	26	29	
Clay-br-sandy	29	42	
Clay-gray-sand trace	42	67	
Clay-blue-sand trace	67	84	
Clay-blue-hard	84	102	
Sand-brown-compacted	102	149	
Clay-blue	149	200	
Sand-gray-compacted	200	306	
Sand-comp.-hard-w/seams clay-blue	306	379	
Claystone-blue	379	520	
Claystone-blue-w/seams sand-gray	520	600	
Sand-blk-fine-water	600	627	

Work started 7-4 19 73 Completed 7-12 1973
Date well drilling machine moved off of well 7-12 1973

Drilling Machine Operator's Certification:
This well was constructed under my direct supervision. Materials used and information reported above are true to my best knowledge and belief.
[Signed] Walter Mace (Drilling Machine Operator) Date 7-20, 1973
Drilling Machine Operator's License No. 595

Water Well Contractor's Certification:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
Name S & M Drilling & Supply, Inc. (Person, firm or corporation) (Type or print)
Address 399 S.E. Walnut, Canby, Ore. 97013
[Signed] Walter Mace (Water Well Contractor)
Contractor's License No. 497 Date 7-20, 1973

(USE ADDITIONAL SHEETS IF NECESSARY)

SP*45656-119

CLAC 50736

STATE OF OREGON

State Permit No. .....

File Original and First Copy with the STATE ENGINEER, SALEM, OREGON

Application No. G-12300
Permit No.

(1) OP

(2) LOCATION OF WELL:

County Jackson Owner's number, if any—

NE ¼ SE ¼ Section 16 T. 25 R. 3E W.M.

Bearing and distance from section or subdivision corner

25 S. + 620' W. from E¼ corner of Section 16

(3) TYPE OF WORK (check):

New Well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐

If abandonment, describe material and procedure in Item 11.

(4) PROPOSED USE (check):

Domestic ☐ Industrial ☐ Municipal ☐

Irrigation ☐ Test Well ☐ Other ☒

(5) TYPE OF WELL:

Rotary ☐ Driven ☐

Cable ☑ Jetted ☐

Dug ☐ Bored ☐

(6) CASING INSTALLED:

Threaded ☐ Welded ☐

8 " Diam. from ..... ft. to 521 ft. Gage .280

..... " Diam. from ..... ft. to ..... ft. Gage .....

..... " Diam. from ..... ft. to ..... ft. Gage .....

(7) PERFORATIONS:

Perforated? ☐ Yes ☐ No

Type of perforator used KNIFE

SIZE of perforations ..... in. by ..... in.

..... perforations from ..... ft. to ..... ft.

..... perforations from ..... ft. to ..... ft.

..... perforations from ..... ft. to ..... ft.

..... perforations from ..... ft. to ..... ft.

..... perforations from ..... ft. to ..... ft.

(8) SCREENS:

Well screen installed ☐ Yes ☐ No

Manufacturer's Name .....

Type ..... Model No. .....

Diam. ..... Slot size ..... Set from ..... ft. to ..... ft.

Diam. ..... Slot size ..... Set from ..... ft. to ..... ft.

(9) CONSTRUCTION:

Was well gravel packed? ☐ Yes ☐ No Size of gravel: .....

Gravel placed from ..... ft. to ..... ft.

Was a surface seal provided? ☐ Yes ☐ No To what depth? 300 ft.

Material used in seal— CLAY

Did any strata contain unusable water? ☐ Yes ☐ No

Type of water? ..... Depth of strata .....

Method of sealing strata off .....

(10) WATER LEVELS:

Static level 27.5 ft. below land surface Date MARCH

Artesian pressure ..... lbs. per square inch Date .....

Log Accepted by:

[Signed] ..... Date ....., 19.....
(Owner)

(11) WELL TESTS:

Drawdown is amount water level is lowered below static level

Was a pump test made? ☐ Yes ☐ No If yes, by whom? .....

Yield: 40 gal./min. with ..... ft. drawdown after ..... hrs.

" " " "

" " " "

Bailer test ..... gal./min. with ..... ft. drawdown after ..... hrs.

Artesian flow ..... g.p.m. Date .....

Temperature of water ..... Was a chemical analysis made? ☐ Yes ☐ No

(12) WELL LOG:

Diameter of well 8 inches.

Depth drilled 625 ft. Depth of completed well 625 ft.

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

MATERIAL	FROM	TO
TOP SOIL	0	2
RED CLAY	2	30
Boulders	30	80
red organic rock	80	215
gravel & clay	215	225
SLIGHTLY dry clay & gravel	225	290
Blue clay	290	325
Blue sand (water)	325	340
blue clay	340	410
brown clay	410	415
gray clay	415	420
blue clay	420	440
Fine yellow sand water	440	450
topping		
clay	450	455
yellow sand	455	458
sand clay mix	458	465
blue clay	465	500
blue clay, dry sand, shale	500	625

Work started ..... 19 Completed 19

(13) PUMP:

Manufacturer's Name Jacuzzi

Type: Submersible H.P. 10

Well Driller's Statement:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME ..... (Person, firm, or corporation) (Type or print)

Address .....

Driller's well number .....

[Signed] ..... (Well Driller)

License No. ..... Date ....., 19.....

1962

(USE ADDITIONAL SHEETS IF NECESSARY)

Olsen Well Drilling

Damascus Heights Community
Well Association
c/o Secretary/Treasurer
Donna Bauld
13530 SE 180th Avenue
Boring, OR 97009

CLAC
50736

Appendix C: Laboratory Data Reports

SWA Well 2W
Native Water
Laboratory Data Reports

TestAmerica
ANALYTICAL TESTING CORPORATION

PORTLAND, OR 9405 S.W. NIMBUS AVENUE
BEAVERTON, OR 97008-7132
ph: (503) 906.9200 fax: (503) 906.9210

May 08, 2006

Ted Ressler
Ground Water Solutions
55 SW Yamhill St, Suite 400
Portland, OR 97204

RE: Sunrise Water Authority

Enclosed are the results of analyses for samples received by the laboratory on 03/23/06 15:35. The following list is a summary of the Work Orders contained in this report, generated on 05/08/06 17:24.

If you have any questions concerning this report, please feel free to contact me.

Work Order	Project	ProjectNumber
P6C0992	Sunrise Water Authority	na

Sarah Rockwell

Sarah Rockwell, Project Manager

TestAmerica
ANALYTICAL TESTING CORPORATION

PORTLAND, OR 9405 S.W. NIMBUS AVENUE
BEAVERTON, OR 97008-7132
ph: (503) 906.9200 fax: (503) 906.9210

Ground Water Solutions	Project Name:	**Sunrise Water Authority**	
55 SW Yamhill St, Suite 400	Project Number:	na	Report Created:
Portland, OR 97204	Project Manager:	Ted Ressler	05/08/06 17:24

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
SWA-2W-GW	P6C0992-01	Water	03/23/06 14:10	03/23/06 15:35

Sarah Rockwell

Sarah Rockwell, Project Manager

TestAmerica
ANALYTICAL TESTING CORPORATION

PORTLAND, OR 9405 S.W. NIMBUS AVENUE
BEAVERTON, OR 97008-7132
ph: (503) 906.9200 fax: (503) 906.9210

Ground Water Solutions	Project Name:	**Sunrise Water Authority**	
55 SW Yamhill St, Suite 400	Project Number:	na	Report Created:
Portland, OR 97204	Project Manager:	Ted Ressler	05/08/06 17:24

Analytical Case Narrative

North Creek Analytical - Portland

P6C0992

Report is not complete without data from Neilson Research Corporation and Severn Trent Laboratories.

Sarah Rockwell

Sarah Rockwell, Project Manager

TestAmerica
ANALYTICAL TESTING CORPORATION

PORTLAND, OR 9405 S.W. NIMBUS AVENUE
BEAVERTON, OR 97008-7132
ph: (503) 906.9200 fax: (503) 906.9210

Ground Water Solutions	Project Name:	**Sunrise Water Authority**	
55 SW Yamhill St, Suite 400	Project Number:	na	Report Created:
Portland, OR 97204	Project Manager:	Ted Ressler	05/08/06 17:24

Total Metals per EPA 200 Series Methods

TestAmerica - Portland, OR

Analyte	Method	Result	MDL*	MRL	Units	Dil	Batch	Prepared	Analyzed	Notes
P6C0992-01 (SWA-2W-GW)		**Water**		**Sampled: 03/23/06 14:10**						
Aluminum	EPA 200.7	ND	-----	0.100	mg/l	1x	6040018	04/02/06 22:12	04/03/06 13:18	
Antimony	EPA 200.8	ND	-----	0.00100	"	"	6031490	03/31/06 10:19	04/01/06 15:43	
Arsenic	"	**0.00503**	-----	0.00100	"	"	"	03/31/06 10:19	"	
Barium	"	**0.0354**	-----	0.00100	"	"	"	03/31/06 10:19	"	
Beryllium	"	ND	-----	0.000500	"	"	"	03/31/06 10:19	"	
Cadmium	"	ND	-----	0.000500	"	"	"	03/31/06 10:19	"	
Calcium	EPA 200.7	**15.6**	-----	0.100	"	"	6040018	04/02/06 22:12	04/03/06 13:18	
Chromium	EPA 200.8	ND	-----	0.00100	"	"	6031490	03/31/06 10:19	04/01/06 15:43	
Copper	"	ND	-----	0.00100	"	"	"	03/31/06 10:19	"	
Iron	EPA 200.7	**0.0760**	-----	0.0100	"	"	6040018	04/02/06 22:12	04/03/06 13:18	
Lead	EPA 200.8	ND	-----	0.000500	"	"	6031490	03/31/06 10:19	04/01/06 15:43	
Magnesium	EPA 200.7	**10.6**	-----	0.100	"	"	6040018	04/02/06 22:12	04/03/06 13:18	
Manganese	EPA 200.8	**0.212**	-----	0.00200	"	"	6031490	03/31/06 10:19	04/01/06 15:43	
Nickel	EPA 200.7	ND	-----	0.0500	"	"	6040018	04/02/06 22:12	04/03/06 13:18	
Potassium	"	**1.92**	-----	1.00	"	"	"	04/02/06 22:12	"	
Selenium	EPA 200.8	ND	-----	0.00100	"	"	6031490	03/31/06 10:19	04/04/06 13:24	
Silver	"	ND	-----	0.00100	"	"	"	03/31/06 10:19	04/01/06 15:43	
Sodium	EPA 200.7	**10.6**	-----	1.00	"	"	6040018	04/02/06 22:12	04/03/06 13:18	
Thallium	EPA 200.8	ND	-----	0.00100	"	"	6031490	03/31/06 10:19	04/01/06 15:43	
Zinc	"	ND	-----	0.00500	"	"	"	03/31/06 10:19	"	

Sarah Rockwell

Sarah Rockwell, Project Manager

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PORTLAND, OR 9405 S.W. NIMBUS AVENUE
BEAVERTON, OR 97008-7132
ph: (503) 906.9200 fax: (503) 906.9210

Ground Water Solutions	Project Name:	**Sunrise Water Authority**	
55 SW Yamhill St, Suite 400	Project Number:	na	Report Created:
Portland, OR 97204	Project Manager:	Ted Ressler	05/08/06 17:24

Dissolved Metals per EPA 200 Series Methods

TestAmerica - Portland, OR

Analyte	Method	Result	MDL*	MRL	Units	Dil	Batch	Prepared	Analyzed	Notes
P6C0992-01 (SWA-2W-GW)		**Water**		**Sampled: 03/23/06 14:10**						
Iron	EPA 200.7	**0.0752**	-----	0.0100	mg/l	1x	6040019	04/02/06 22:17	04/03/06 13:50	
Manganese	"	**0.210**	-----	0.0100	"	"	"	04/02/06 22:17	"	

Sarah Rockwell

Sarah Rockwell, Project Manager

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Total Mercury per EPA Method 245.1

TestAmerica - Portland, OR

Analyte	Method	Result	MDL*	MRL	Units	Dil	Batch	Prepared	Analyzed	Notes
P6C0992-01 (SWA-2W-GW)		**Water**		**Sampled: 03/23/06 14:10**						
Mercury	EPA 245.1	ND	-----	0.000200	mg/l	1x	6040195	04/05/06 16:19	04/05/06 23:38	

Sarah Rockwell

Sarah Rockwell, Project Manager

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BEAVERTON, OR 97008-7132
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Ground Water Solutions	Project Name:	**Sunrise Water Authority**	
55 SW Yamhill St, Suite 400	Project Number:	na	Report Created:
Portland, OR 97204	Project Manager:	Ted Ressler	05/08/06 17:24

Conventional Chemistry Parameters per APHA/EPA Methods

TestAmerica - Portland, OR

Analyte	Method	Result	MDL*	MRL	Units	Dil	Batch	Prepared	Analyzed	Notes
P6C0992-01 (SWA-2W-GW)		**Water**		**Sampled: 03/23/06 14:10**						
Bicarbonate Alkalinity	SM 2320B	**105**	-----	5.00	mg/l	1x	6031439	03/30/06 10:05	03/30/06 17:39	
Carbonate Alkalinity	"	ND	-----	5.00	"	"	"	03/30/06 10:05	"	
Chlorine Residual (Total)	SM 4500-Cl G	ND	-----	0.100	"	"	6031136	03/24/06 08:09	03/24/06 08:30	
Color	EPA 110.2	ND	-----	5.00	Color Units	"	6031150	03/24/06 09:22	03/24/06 09:45	
Cyanide (total)	EPA 335.4	ND	-----	0.00500	mg/l	"	6031229	03/27/06 08:52	03/28/06 13:36	
Hardness (Ca)	SM 2340B-Ca	**82.7**	-----	0.250	"	"	6040018	04/02/06 22:12	04/03/06 13:18	
Silica (SiO2)	SM 4500-Si F	**54.6**	-----	1.00	"	2x	6031213	03/27/06 07:32	03/27/06 11:44	
Threshold Odor Number	EPA 140.1	**0.33**	-----	0.20	TON	1x	6031184	03/24/06 14:49	03/24/06 14:55	
Total Alkalinity	SM 2320B	**105**	-----	5.00	mg/L as CaCO3	"	6031439	03/30/06 10:05	03/30/06 17:39	
Total Dissolved Solids	SM 2540C	**155**	-----	10.0	mg/l	"	6031226	03/27/06 08:35	03/27/06 13:46	
Total Suspended Solids	EPA 160.2	ND	-----	10.0	"	"	6031227	03/27/06 08:40	03/27/06 16:20	
Turbidity	EPA 180.1	ND	-----	0.200	NTU	"	6031152	03/24/06 09:23	03/24/06 09:30	
Total Organic Carbon	SM 5310C	ND	-----	1.00	mg/l	"	6040002	04/01/06 11:19	04/01/06 15:31	

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Sarah Rockwell, Project Manager

TestAmerica
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BEAVERTON, OR 97008-7132
ph: (503) 906.9200 fax: (503) 906.9210

Ground Water Solutions	Project Name:	**Sunrise Water Authority**	
55 SW Yamhill St, Suite 400	Project Number:	na	Report Created:
Portland, OR 97204	Project Manager:	Ted Ressler	05/08/06 17:24

Anions per EPA Method 300.0

TestAmerica - Portland, OR

Analyte	Method	Result	MDL*	MRL	Units	Dil	Batch	Prepared	Analyzed	Notes
P6C0992-01 (SWA-2W-GW)		**Water**		**Sampled: 03/23/06 14:10**						
Chloride	EPA 300.0	**2.03**	-----	0.500	mg/l	1x	6031146	03/24/06 08:53	03/24/06 12:05	
Nitrate/Nitrite-Nitrogen	"	ND	-----	0.200	"	"	"	03/24/06 08:53	"	
Nitrate-Nitrogen	"	ND	-----	0.100	"	"	"	03/24/06 08:53	"	
Nitrite-Nitrogen	"	ND	-----	0.100	"	"	"	03/24/06 08:53	"	
Sulfate	"	**1.25**	-----	1.00	"	"	"	03/24/06 08:53	"	

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Ground Water Solutions	Project Name:	**Sunrise Water Authority**	
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Portland, OR 97204	Project Manager:	Ted Ressler	05/08/06 17:24

Disinfection By-Products in Drinking Water per EPA 552.2

TestAmerica - Portland, OR

Analyte	Method	Result	MDL*	MRL	Units	Dil	Batch	Prepared	Analyzed	Notes
P6C0992-01RE3 (SWA-2W-GW)		**Water**		**Sampled: 03/23/06 14:10**						
Monochloroacetic acid (MCAA)	EPA 552.2	ND	-----	0.00150	mg/l	1x	6040250	04/06/06 11:42	04/07/06 03:19	
Monobromoacetic acid (MBAA)	"	ND	-----	0.00100	"	"	"	04/06/06 11:42	"	
Dibromoacetic acid (DBAA)	"	ND	-----	0.000500	"	"	"	04/06/06 11:42	"	
Dichloroacetic acid (DCAA)	"	ND	-----	0.00150	"	"	"	04/06/06 11:42	"	
Trichloroacetic acid (TCAA)	"	ND	-----	0.000500	"	"	"	04/06/06 11:42	"	
Total Haloacetic Acids (HAA5)	"	ND	-----	0.00150	"	"	"	04/06/06 11:42	"	
Surrogate(s): 2,3-Dibromopropionic acid		*85.6%*			*70 - 130 %*	"			"	

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ph: (503) 906.9200 fax: (503) 906.9210

Ground Water Solutions	Project Name:	**Sunrise Water Authority**	
55 SW Yamhill St, Suite 400	Project Number:	na	Report Created:
Portland, OR 97204	Project Manager:	Ted Ressler	05/08/06 17:24

Total Trihalomethanes in Drinking Water per EPA 524.2

TestAmerica - Portland, OR

Analyte	Method	Result	MDL*	MRL	Units	Dil	Batch	Prepared	Analyzed	Notes
P6C0992-01 (SWA-2W-GW)		**Water**		**Sampled: 03/23/06 14:10**						
Bromodichloromethane	EPA 524.2	ND	-----	0.000500	mg/l	1x	6031297	03/28/06 08:54	03/28/06 19:07	
Bromoform	"	ND	-----	0.000500	"	"	"	03/28/06 08:54	"	
Chloroform	"	ND	-----	0.000500	"	"	"	03/28/06 08:54	"	
Dibromochloromethane	"	ND	-----	0.000500	"	"	"	03/28/06 08:54	"	
Total Trihalomethanes	"	ND	-----	0.000500	"	"	"	03/28/06 08:54	"	
Surrogate(s): Dibromofluoromethane		*108%*			*70 - 130 %*	"			"	
1,2-DCA-d4		*103%*			*70 - 130 %*	"			"	
Toluene-d8		*102%*			*70 - 130 %*	"			"	
4-BFB		*93.8%*			*70 - 130 %*	"			"	

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Sarah Rockwell, Project Manager

TestAmerica
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BEAVERTON, OR 97008-7132
ph: (503) 906.9200 fax: (503) 906.9210

Ground Water Solutions	Project Name:	**Sunrise Water Authority**	
55 SW Yamhill St, Suite 400	Project Number:	na	Report Created:
Portland, OR 97204	Project Manager:	Ted Ressler	05/08/06 17:24

Physical Parameters per APHA/ASTM/EPA Methods

TestAmerica - Portland, OR

Analyte	Method	Result	MDL*	MRL	Units	Dil	Batch	Prepared	Analyzed	Notes
P6C0992-01 (SWA-2W-GW)		**Water**		**Sampled: 03/23/06 14:10**						
Corrosivity	EPA 9040A	**7.34**	----		pH Units	1x	6031151	03/24/06 09:22	03/24/06 09:30	

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55 SW Yamhill St, Suite 400	Project Number:	na	Report Created:
Portland, OR 97204	Project Manager:	Ted Ressler	05/08/06 17:24

Microbiological Parameters per APHA Standard Methods

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Analyte	Method	Result	MDL*	MRL	Units	Dil	Batch	Prepared	Analyzed	Notes
P6C0992-01 (SWA-2W-GW)		**Water**		**Sampled: 03/23/06 14:10**						
Total Coliforms	SM 9223	ND	-----	1.00	/100 ml	1x	6031168	03/24/06 11:43	03/26/06 11:05	
E. Coli	"	ND	-----	1.00	"	"	"	03/24/06 11:43	"	

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Ground Water Solutions	Project Name:	**Sunrise Water Authority**	
55 SW Yamhill St, Suite 400	Project Number:	na	Report Created:
Portland, OR 97204	Project Manager:	Ted Ressler	05/08/06 17:24

Total Metals per EPA 200 Series Methods - Laboratory Quality Control Results

TestAmerica - Portland, OR

QC Batch: 6031490 **Water Preparation Method: EPA 200/3005**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Blank (6031490-BLK1)							**Extracted: 03/31/06 10:19**							
Antimony	EPA 200.8	ND	---	0.00100	mg/l	1x	--	--	--	--	--	--	04/01/06 15:16	
Arsenic	"	ND	---	0.00100	"	"	--	--	--	--	--	--	"	
Barium	"	ND	---	0.00100	"	"	--	--	--	--	--	--	"	
Beryllium	"	ND	---	0.000500	"	"	--	--	--	--	--	--	"	
Cadmium	"	ND	---	0.000500	"	"	--	--	--	--	--	--	"	
Chromium	"	ND	---	0.00100	"	"	--	--	--	--	--	--	"	
Copper	"	ND	---	0.00100	"	"	--	--	--	--	--	--	"	
Lead	"	ND	---	0.000500	"	"	--	--	--	--	--	--	"	
Manganese	"	ND	---	0.00200	"	"	--	--	--	--	--	--	"	
Selenium	"	ND	---	0.00100	"	"	--	--	--	--	--	--	04/04/06 13:09	
Silver	"	ND	---	0.00100	"	"	--	--	--	--	--	--	04/01/06 15:16	
Thallium	"	ND	---	0.00100	"	"	--	--	--	--	--	--	"	
Zinc	"	ND	---	0.00500	"	"	--	--	--	--	--	--	"	
LCS (6031490-BS1)							**Extracted: 03/31/06 10:19**							
Antimony	EPA 200.8	0.0524	---	0.00100	mg/l	1x	--	0.0500	105%	(85-115)	--	--	04/01/06 15:30	
Arsenic	"	0.0996	---	0.00100	"	"	--	0.100	99.6%	"	--	--	"	
Barium	"	0.102	---	0.00100	"	"	--	"	102%	"	--	--	"	
Beryllium	"	0.0607	---	0.000500	"	"	--	0.0500	121%	"	--	--	"	BS-1
Cadmium	"	0.109	---	0.000500	"	"	--	0.100	109%	"	--	--	"	
Chromium	"	0.107	---	0.00100	"	"	--	"	107%	"	--	--	"	
Copper	"	0.108	---	0.00100	"	"	--	"	108%	"	--	--	"	
Lead	"	0.106	---	0.000500	"	"	--	"	106%	"	--	--	"	
Manganese	"	0.104	---	0.00200	"	"	--	"	104%	"	--	--	"	
Selenium	"	0.0476	---	0.00100	"	"	--	0.0500	95.2%	"	--	--	04/04/06 13:16	
Silver	"	0.0503	---	0.00100	"	"	--	"	101%	"	--	--	04/01/06 15:30	
Thallium	"	0.0500	---	0.00100	"	"	--	"	100%	"	--	--	"	
Zinc	"	0.102	---	0.00500	"	"	--	0.100	102%	"	--	--	"	
Duplicate (6031490-DUP1)							**QC Source: P6C0992-01**						**Extracted: 03/31/06 10:19**	
Antimony	EPA 200.8	ND	---	0.00100	mg/l	1x	ND	--	--	--	NR	(30)	04/01/06 15:57	
Arsenic	"	0.00481	---	0.00100	"	"	0.00503	--	--	--	4.47%	"	"	
Barium	"	0.0350	---	0.00100	"	"	0.0354	--	--	--	1.14%	"	"	
Beryllium	"	ND	---	0.000500	"	"	ND	--	--	--	NR	"	"	
Cadmium	"	ND	---	0.000500	"	"	ND	--	--	--	NR	"	"	
Chromium	"	ND	---	0.00100	"	"	ND	--	--	--	NR	"	"	
Copper	"	ND	---	0.00100	"	"	ND	--	--	--	NR	"	"	
Lead	"	ND	---	0.000500	"	"	ND	--	--	--	6.95%	"	"	
Manganese	"	0.204	---	0.00200	"	"	0.212	--	--	--	3.85%	"	"	

Sarah Rockwell

Sarah Rockwell, Project Manager

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BEAVERTON, OR 97008-7132
ph: (503) 906.9200 fax: (503) 906.9210

Ground Water Solutions	Project Name:	**Sunrise Water Authority**	
55 SW Yamhill St, Suite 400	Project Number:	na	Report Created:
Portland, OR 97204	Project Manager:	Ted Ressler	05/08/06 17:24

Total Metals per EPA 200 Series Methods - Laboratory Quality Control Results

TestAmerica - Portland, OR

QC Batch: 6031490 **Water Preparation Method: EPA 200/3005**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Duplicate (6031490-DUP1)				QC Source: P6C0992-01				Extracted: 03/31/06 10:19						
Selenium	EPA 200.8	ND	---	0.00100	mg/l	1x	ND	--	--	--	NR	(30)	04/04/06 13:32	
Silver	"	ND	---	0.00100	"	"	ND	--	--	--	NR	"	04/01/06 15:57	
Thallium	"	ND	---	0.00100	"	"	ND	--	--	--	NR	"	"	
Zinc	"	ND	---	0.00500	"	"	ND	--	--	--	7.49%	"	"	
Matrix Spike (6031490-MS1)				QC Source: P6C0992-01				Extracted: 03/31/06 10:19						
Antimony	EPA 200.8	0.0491	---	0.00100	mg/l	1x	ND	0.0500	98.2%	(70-130)	--	--	04/01/06 16:25	
Arsenic	"	0.104	---	0.00100	"	"	0.00503	0.100	99.0%	"	--	--	"	
Barium	"	0.130	---	0.00100	"	"	0.0354	"	94.6%	"	--	--	"	
Beryllium	"	0.0582	---	0.000500	"	"	ND	0.0500	116%	"	--	--	"	
Cadmium	"	0.104	---	0.000500	"	"	ND	0.100	104%	"	--	--	"	
Chromium	"	0.102	---	0.00100	"	"	ND	"	102%	"	--	--	"	
Copper	"	0.102	---	0.00100	"	"	ND	"	102%	"	--	--	"	
Lead	"	0.0982	---	0.000500	"	"	0.000134	"	98.1%	"	--	--	"	
Manganese	"	0.311	---	0.00200	"	"	0.212	"	99.0%	"	--	--	"	
Selenium	"	0.0486	---	0.00100	"	"	ND	0.0500	97.2%	"	--	--	04/04/06 13:47	
Silver	"	0.0468	---	0.00100	"	"	ND	"	93.6%	"	--	--	04/01/06 16:25	
Thallium	"	0.0475	---	0.00100	"	"	0.0000331	"	94.9%	"	--	--	"	
Zinc	"	0.101	---	0.00500	"	"	0.00291	0.100	98.1%	"	--	--	"	
Matrix Spike (6031490-MS2)				QC Source: P6C1044-01				Extracted: 03/31/06 10:19						
Antimony	EPA 200.8	0.0495	---	0.00100	mg/l	1x	0.000291	0.0500	98.4%	(70-130)	--	--	04/01/06 18:13	
Arsenic	"	0.0978	---	0.00100	"	"	ND	0.100	97.8%	"	--	--	"	
Barium	"	0.0995	---	0.00100	"	"	0.00690	"	92.6%	"	--	--	"	
Beryllium	"	0.0553	---	0.000500	"	"	ND	0.0500	111%	"	--	--	"	
Cadmium	"	0.104	---	0.000500	"	"	ND	0.100	104%	"	--	--	"	
Chromium	"	0.101	---	0.00100	"	"	0.000343	"	101%	"	--	--	"	
Copper	"	0.107	---	0.00100	"	"	0.00572	"	101%	"	--	--	"	
Lead	"	0.0960	---	0.000500	"	"	0.000466	"	95.5%	"	--	--	"	
Manganese	"	0.266	---	0.00200	"	"	0.175	"	91.0%	"	--	--	"	
Selenium	"	0.0502	---	0.00100	"	"	0.000365	0.0500	99.7%	"	--	--	04/04/06 14:48	
Silver	"	0.0490	---	0.00100	"	"	0.00144	"	95.1%	"	--	--	04/01/06 18:13	
Thallium	"	0.0464	---	0.00100	"	"	ND	"	92.8%	"	--	--	"	
Zinc	"	0.116	---	0.00500	"	"	0.0195	0.100	96.5%	"	--	--	"	

Sarah Rockwell

Sarah Rockwell, Project Manager

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BEAVERTON, OR 97008-7132
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Ground Water Solutions	Project Name:	**Sunrise Water Authority**	
55 SW Yamhill St, Suite 400	Project Number:	na	Report Created:
Portland, OR 97204	Project Manager:	Ted Ressler	05/08/06 17:24

Total Metals per EPA 200 Series Methods - Laboratory Quality Control Results

TestAmerica - Portland, OR

QC Batch: 6040018 **Water Preparation Method: EPA 200/3005**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Blank (6040018-BLK1)								Extracted: 04/02/06 22:12						
Aluminum	EPA 200.7	ND	---	0.100	mg/l	1x	--	--	--	--	--	--	04/03/06 13:38	
Calcium	"	ND	---	0.100	"	"	--	--	--	--	--	--	"	
Iron	"	ND	---	0.0100	"	"	--	--	--	--	--	--	"	
Magnesium	"	ND	---	0.100	"	"	--	--	--	--	--	--	"	
Nickel	"	ND	---	0.0500	"	"	--	--	--	--	--	--	"	
Potassium	"	ND	---	1.00	"	"	--	--	--	--	--	--	"	
Sodium	"	ND	---	1.00	"	"	--	--	--	--	--	--	"	
LCS (6040018-BS1)								Extracted: 04/02/06 22:12						
Aluminum	EPA 200.7	10.6	---	0.100	mg/l	1x	--	10.0	106%	(85-115)	--	--	04/03/06 13:31	
Calcium	"	9.67	---	0.100	"	"	--	"	96.7%	"	--	--	"	
Iron	"	10.6	---	0.0100	"	"	--	"	106%	"	--	--	"	
Magnesium	"	10.4	---	0.100	"	"	--	"	104%	"	--	--	"	
Nickel	"	0.408	---	0.0500	"	"	--	0.400	102%	"	--	--	"	
Potassium	"	10.2	---	1.00	"	"	--	10.0	102%	"	--	--	"	
Sodium	"	10.1	---	1.00	"	"	--	"	101%	"	--	--	"	
Duplicate (6040018-DUP1)						QC Source: P6C0992-01		Extracted: 04/02/06 22:12						
Aluminum	EPA 200.7	ND	---	0.100	mg/l	1x	ND	--	--	--	NR	(20)	04/03/06 12:56	
Calcium	"	15.6	---	0.100	"	"	15.6	--	--	--	0.00%	(30)	"	
Iron	"	0.0739	---	0.0100	"	"	0.0760	--	--	--	2.80%	(20)	"	
Magnesium	"	10.7	---	0.100	"	"	10.6	--	--	--	0.939	(30)	"	
Nickel	"	ND	---	0.0500	"	"	ND	--	--	--	NR	(20)	"	
Potassium	"	1.94	---	1.00	"	"	1.92	--	--	--	1.04%	(30)	"	
Sodium	"	10.6	---	1.00	"	"	10.6	--	--	--	0.00%	"	"	
Matrix Spike (6040018-MS1)						QC Source: P6C0992-01		Extracted: 04/02/06 22:12						
Aluminum	EPA 200.7	2.31	---	0.111	mg/l	1x	ND	2.21	105%	(75-125)	--	--	04/03/06 13:03	
Calcium	"	26.6	---	0.111	"	"	15.6	11.1	99.1%	(80-120)	--	--	"	
Iron	"	4.72	---	0.0111	"	"	0.0760	4.42	105%	(75-125)	--	--	"	
Magnesium	"	21.9	---	0.111	"	"	10.6	11.1	102%	(80-120)	--	--	"	
Nickel	"	0.523	---	0.0556	"	"	ND	0.556	94.1%	(75-125)	--	--	"	
Potassium	"	16.0	---	1.11	"	"	1.92	11.1	127%	(80-120)	--	--	"	Q-02
Sodium	"	21.9	---	1.11	"	"	10.6	"	102%	"	--	--	"	

Sarah Rockwell

Sarah Rockwell, Project Manager

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ANALYTICAL TESTING CORPORATION

PORTLAND, OR 9405 S.W. NIMBUS AVENUE
BEAVERTON, OR 97008-7132
ph: (503) 906.9200 fax: (503) 906.9210

Ground Water Solutions	Project Name:	**Sunrise Water Authority**	
55 SW Yamhill St, Suite 400	Project Number:	na	Report Created:
Portland, OR 97204	Project Manager:	Ted Ressler	05/08/06 17:24

Dissolved Metals per EPA 200 Series Methods - Laboratory Quality Control Results

TestAmerica - Portland, OR

QC Batch: 6040019 **Water Preparation Method: EPA 200/3005 Diss**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Blank (6040019-BLK1)								Extracted: 04/02/06 22:17						
Iron	EPA 200.7	ND	---	0.0100	mg/l	1x	--	--	--	--	--	--	04/03/06 14:54	
Manganese	"	ND	---	0.0100	"	"	--	--	--	--	--	--	"	
LCS (6040019-BS1)								Extracted: 04/02/06 22:17						
Iron	EPA 200.7	10.7	---	0.0100	mg/l	1x	--	10.0	107%	(85-115)	--	--	04/03/06 14:48	
Manganese	"	0.429	---	0.0100	"	"	--	0.400	107%	"	--	--	"	
Duplicate (6040019-DUP1)					QC Source: P6C0992-01			Extracted: 04/02/06 22:17						
Iron	EPA 200.7	0.0792	---	0.0100	mg/l	1x	0.0752	--	--	--	5.18%	(20)	04/03/06 13:25	
Manganese	"	0.212	---	0.0100	"	"	0.210	--	--	--	0.948	"	"	
Matrix Spike (6040019-MS1)					QC Source: P6C0992-01			Extracted: 04/02/06 22:17						
Iron	EPA 200.7	4.81	---	0.0111	mg/l	1x	0.0752	4.42	107%	(75-125)	--	--	04/03/06 13:44	
Manganese	"	0.771	---	0.0111	"	"	0.210	0.556	101%	"	--	--	"	

Sarah Rockwell

Sarah Rockwell, Project Manager

TestAmerica
ANALYTICAL TESTING CORPORATION

PORTLAND, OR 9405 S.W. NIMBUS AVENUE
BEAVERTON, OR 97008-7132
ph: (503) 906.9200 fax: (503) 906.9210

Ground Water Solutions	Project Name:	**Sunrise Water Authority**	
55 SW Yamhill St, Suite 400	Project Number:	na	Report Created:
Portland, OR 97204	Project Manager:	Ted Ressler	05/08/06 17:24

Total Mercury per EPA Method 245.1 - Laboratory Quality Control Results

TestAmerica - Portland, OR

QC Batch: 6040195 **Water Preparation Method: EPA 245.1**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Blank (6040195-BLK1)								**Extracted: 04/05/06 16:19**						
Mercury	EPA 245.1	ND	---	0.000200	mg/l	1x	--	--	--	--	--	--	04/05/06 23:23	
LCS (6040195-BS1)								**Extracted: 04/05/06 16:19**						
Mercury	EPA 245.1	0.00507	---	0.000200	mg/l	1x	--	0.00500	101%	(85-115)	--	--	04/05/06 23:26	
LCS Dup (6040195-BSD1)								**Extracted: 04/05/06 16:19**						
Mercury	EPA 245.1	0.00518	---	0.000200	mg/l	1x	--	0.00500	104%	(85-115)	2.15%	(20)	04/05/06 23:28	
Duplicate (6040195-DUP1)				**QC Source: P6C1261-01**				**Extracted: 04/05/06 16:19**						
Mercury	EPA 245.1	ND	---	0.000200	mg/l	1x	ND	--	--	--	NR	(30)	04/05/06 23:31	
Matrix Spike (6040195-MS1)				**QC Source: P6C1261-01**				**Extracted: 04/05/06 16:19**						
Mercury	EPA 245.1	0.00531	---	0.000200	mg/l	1x	ND	0.00500	106%	(75-125)	--	--	04/05/06 23:33	
Matrix Spike Dup (6040195-MSD1)				**QC Source: P6C1261-01**				**Extracted: 04/05/06 16:19**						
Mercury	EPA 245.1	0.00516	---	0.000200	mg/l	1x	ND	0.00500	103%	(75-125)	2.87%	(20)	04/05/06 23:36	

Sarah Rockwell, Project Manager

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ANALYTICAL TESTING CORPORATION

PORTLAND, OR 9405 S.W. NIMBUS AVENUE
BEAVERTON, OR 97008-7132
ph: (503) 906.9200 fax: (503) 906.9210

Ground Water Solutions	Project Name:	**Sunrise Water Authority**	
55 SW Yamhill St, Suite 400	Project Number:	na	Report Created:
Portland, OR 97204	Project Manager:	Ted Ressler	05/08/06 17:24

Conventional Chemistry Parameters per APHA/EPA Methods - Laboratory Quality Control Results

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QC Batch: 6031136 **Water Preparation Method: General Preparation**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Blank (6031136-BLK1)								Extracted: 03/24/06 08:09						
Chlorine Residual (Total)	SM 4500-Cl G	ND	---	0.100	mg/l	1x	--	--	--	--	--	--	03/24/06 08:30	
LCS (6031136-BS1)								Extracted: 03/24/06 08:09						
Chlorine Residual (Total)	SM 4500-Cl G	0.869	---	0.100	mg/l	1x	--	1.00	86.9%	(85-115)	--	--	03/24/06 08:30	
Duplicate (6031136-DUP1)							QC Source: P6C0992-01	Extracted: 03/24/06 08:09						
Chlorine Residual (Total)	SM 4500-Cl G	ND	---	0.100	mg/l	1x	ND	--	--	--	NR	(30)	03/24/06 08:30	

QC Batch: 6031150 **Water Preparation Method: General Preparation**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Blank (6031150-BLK1)								Extracted: 03/24/06 09:22						
Color	EPA 110.2	ND	---	5.00	Color Units	1x	--	--	--	--	--	--	03/24/06 09:45	
LCS (6031150-BS1)								Extracted: 03/24/06 09:22						
Color	EPA 110.2	20.0	---	5.00	Color Units	1x	--	20.0	100%	(80-120)	--	--	03/24/06 09:45	
Duplicate (6031150-DUP1)							QC Source: P6C0992-01	Extracted: 03/24/06 09:22						
Color	EPA 110.2	ND	---	5.00	Color Units	1x	ND	--	--	--		(30)	03/24/06 09:45	

QC Batch: 6031152 **Water Preparation Method: General Preparation**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Blank (6031152-BLK1)								Extracted: 03/24/06 09:23						
Turbidity	EPA 180.1	ND	---	0.200	NTU	1x	--	--	--	--	--	--	03/24/06 09:30	
LCS (6031152-BS1)								Extracted: 03/24/06 09:23						
Turbidity	EPA 180.1	18.9	---	0.200	NTU	1x	--	20.0	94.5%	(85-115)	--	--	03/24/06 09:30	
Duplicate (6031152-DUP1)							QC Source: P6C0992-01	Extracted: 03/24/06 09:23						
Turbidity	EPA 180.1	ND	---	0.200	NTU	1x	ND	--	--	--	4.38%	(30)	03/24/06 09:30	

Sarah Rockwell, Project Manager

TestAmerica
ANALYTICAL TESTING CORPORATION

PORTLAND, OR 9405 S.W. NIMBUS AVENUE
BEAVERTON, OR 97008-7132
ph: (503) 906.9200 fax: (503) 906.9210

Ground Water Solutions	Project Name:	**Sunrise Water Authority**	
55 SW Yamhill St, Suite 400	Project Number:	na	Report Created:
Portland, OR 97204	Project Manager:	Ted Ressler	05/08/06 17:24

Conventional Chemistry Parameters per APHA/EPA Methods - Laboratory Quality Control Results

TestAmerica - Portland, OR

QC Batch: 6031184 **Water Preparation Method: General Preparation**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Blank (6031184-BLK1)								Extracted: 03/24/06 14:49						
Threshold Odor Number	EPA 140.1	ND	---	0.20	TON	1x	--	--	--	--	--	--	03/24/06 14:55	

QC Batch: 6031213 **Water Preparation Method: General Preparation**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Blank (6031213-BLK1)								Extracted: 03/27/06 07:32						
Silica (SiO2)	SM 4500-Si F	ND	---	0.500	mg/l	1x	--	--	--	--	--	--	03/27/06 11:44	
LCS (6031213-BS1)								Extracted: 03/27/06 07:32						
Silica (SiO2)	SM 4500-Si F	41.9	---	0.500	mg/l	1x	--	40.0	105%	(85-115)	--	--	03/27/06 11:44	
Duplicate (6031213-DUP1)					QC Source: P6C0613-01			Extracted: 03/27/06 07:32						
Silica (SiO2)	SM 4500-Si F	1.67	---	0.500	mg/l	1x	1.40	--	--	--	17.6%	(20)	03/27/06 11:44	
Matrix Spike (6031213-MS1)					QC Source: P6C0613-01			Extracted: 03/27/06 07:32						
Silica (SiO2)	SM 4500-Si F	11.4	---	0.500	mg/l	1x	1.40	10.0	100%	(75-125)	--	--	03/27/06 11:44	

QC Batch: 6031226 **Water Preparation Method: General Preparation**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Blank (6031226-BLK1)								Extracted: 03/27/06 08:35						
Total Dissolved Solids	SM 2540C	ND	---	10.0	mg/l	1x	--	--	--	--	--	--	03/27/06 13:46	
LCS (6031226-BS1)								Extracted: 03/27/06 08:35						
Total Dissolved Solids	SM 2540C	102	---	10.0	mg/l	1x	--	100	102%	(85-115)	--	--	03/27/06 13:46	
Duplicate (6031226-DUP1)					QC Source: P6C0992-01			Extracted: 03/27/06 08:35						
Total Dissolved Solids	SM 2540C	154	---	10.0	mg/l	1x	155	--	--	--	0.647	(30)	03/27/06 13:46	

Sarah Rockwell, Project Manager

TestAmerica
ANALYTICAL TESTING CORPORATION

PORTLAND, OR 9405 S.W. NIMBUS AVENUE
BEAVERTON, OR 97008-7132
ph: (503) 906.9200 fax: (503) 906.9210

Ground Water Solutions	Project Name:	**Sunrise Water Authority**	
55 SW Yamhill St, Suite 400	Project Number:	na	Report Created:
Portland, OR 97204	Project Manager:	Ted Ressler	05/08/06 17:24

Conventional Chemistry Parameters per APHA/EPA Methods - Laboratory Quality Control Results

TestAmerica - Portland, OR

QC Batch: 6031227 **Water Preparation Method: General Preparation**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Blank (6031227-BLK1)								Extracted: 03/27/06 08:40						
Total Suspended Solids	EPA 160.2	ND	---	10.0	mg/l	1x	--	--	--	--	--	--	03/27/06 16:20	
LCS (6031227-BS1)								Extracted: 03/27/06 08:40						
Total Suspended Solids	EPA 160.2	49.0	---	10.0	mg/l	1x	--	50.0	98.0%	(80-120)	--	--	03/27/06 16:20	
Duplicate (6031227-DUP1)				QC Source: P6C0992-01				Extracted: 03/27/06 08:40						
Total Suspended Solids	EPA 160.2	ND	---	10.0	mg/l	1x	ND	--	--	--	NR	(20)	03/27/06 16:20	

QC Batch: 6031229 **Water Preparation Method: General Preparation**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Blank (6031229-BLK1)								Extracted: 03/27/06 08:52						
Cyanide (total)	EPA 335.4	ND	---	0.00500	mg/l	1x	--	--	--	--	--	--	03/28/06 13:36	
LCS (6031229-BS1)								Extracted: 03/27/06 08:52						
Cyanide (total)	EPA 335.4	0.414	---	0.00500	mg/l	1x	--	0.400	104%	(90-110)	--	--	03/28/06 13:36	
Duplicate (6031229-DUP1)				QC Source: P6C1068-03				Extracted: 03/27/06 08:52						
Cyanide (total)	EPA 335.4	0.0241	---	0.00500	mg/l	1x	0.0257	--	--	--	6.43%	(30)	03/28/06 13:36	
Matrix Spike (6031229-MS1)				QC Source: P6C1068-03				Extracted: 03/27/06 08:52						
Cyanide (total)	EPA 335.4	0.418	---	0.00500	mg/l	1x	0.0257	0.400	98.1%	(80-120)	--	--	03/28/06 13:36	
Matrix Spike Dup (6031229-MSD1)				QC Source: P6C1068-03				Extracted: 03/27/06 08:52						
Cyanide (total)	EPA 335.4	0.438	---	0.00500	mg/l	1x	0.0257	0.400	103%	(80-120)	4.67%	(20)	03/28/06 13:36	

Sarah Rockwell, Project Manager

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ANALYTICAL TESTING CORPORATION

PORTLAND, OR 9405 S.W. NIMBUS AVENUE
BEAVERTON, OR 97008-7132
ph: (503) 906.9200 fax: (503) 906.9210

Ground Water Solutions	Project Name:	**Sunrise Water Authority**	
55 SW Yamhill St, Suite 400	Project Number:	na	Report Created:
Portland, OR 97204	Project Manager:	Ted Ressler	05/08/06 17:24

Conventional Chemistry Parameters per APHA/EPA Methods - Laboratory Quality Control Results

TestAmerica - Portland, OR

QC Batch: 6031439 **Water Preparation Method: General Preparation**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Blank (6031439-BLK1)								Extracted: 03/30/06 10:05						
Total Alkalinity	SM 2320B	ND	---	5.00	mg/L as CaCO3	1x	--	--	--	--	--	--	03/30/06 17:39	
Carbonate Alkalinity	"	ND	---	5.00	mg/l	"	--	--	--	--	--	--	"	
Bicarbonate Alkalinity	"	ND	---	5.00	"	"	--	--	--	--	--	--	"	
LCS (6031439-BS1)								Extracted: 03/30/06 10:05						
Total Alkalinity	SM 2320B	196	---	5.00	mg/L as CaCO3	1x	--	200	98.0%	(85-115)	--	--	03/30/06 17:39	
Duplicate (6031439-DUP1)							QC Source: P6C0992-01		Extracted: 03/30/06 10:05					
Bicarbonate Alkalinity	SM 2320B	105	---	5.00	mg/l	1x	105	--	--	--	0.00%	(20)	03/30/06 17:39	
Total Alkalinity	"	105	---	5.00	mg/L as CaCO3	"	105	--	--	--	0.00%	(30)	"	
Carbonate Alkalinity	"	ND	---	5.00	mg/l	"	ND	--	--	--	NR	(20)	"	

QC Batch: 6040002 **Water Preparation Method: General Preparation**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Blank (6040002-BLK1)								Extracted: 04/01/06 11:19						
Total Organic Carbon	SM 5310C	ND	---	1.00	mg/l	1x	--	--	--	--	--	--	04/01/06 14:07	
LCS (6040002-BS1)								Extracted: 04/01/06 11:19						
Total Organic Carbon	SM 5310C	21.7	---	1.00	mg/l	1x	--	20.0	108%	(85-115)	--	--	04/01/06 14:22	
Duplicate (6040002-DUP1)							QC Source: P6C0992-01		Extracted: 04/01/06 11:19					
Total Organic Carbon	SM 5310C	ND	---	1.00	mg/l	1x	ND	--	--	--	0.00%	(30)	04/01/06 14:35	
Matrix Spike (6040002-MS1)							QC Source: P6C0992-01		Extracted: 04/01/06 11:19					
Total Organic Carbon	SM 5310C	28.3	---	1.01	mg/l	1x	0.730	25.3	109%	(80-130)	--	--	04/01/06 15:18	

Sarah Rockwell

Sarah Rockwell, Project Manager

TestAmerica
ANALYTICAL TESTING CORPORATION

PORTLAND, OR 9405 S.W. NIMBUS AVENUE
BEAVERTON, OR 97008-7132
ph: (503) 906.9200 fax: (503) 906.9210

Ground Water Solutions	Project Name:	**Sunrise Water Authority**	
55 SW Yamhill St, Suite 400	Project Number:	na	Report Created:
Portland, OR 97204	Project Manager:	Ted Ressler	05/08/06 17:24

Conventional Chemistry Parameters per APHA/EPA Methods - Laboratory Quality Control Results

TestAmerica - Portland, OR

QC Batch: 6040018 **Water Preparation Method: EPA 200/3005**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Blank (6040018-BLK1)								Extracted: 04/02/06 22:12						
Hardness (Ca)	SM 2340B-Ca	ND	---	0.250	mg/l	1x	--	--	--	--	--	--	04/03/06 13:38	
LCS (6040018-BS1)								Extracted: 04/02/06 22:12						
Hardness (Ca)	SM 2340B-Ca	66.8	---	0.250	mg/l	1x	--	25.0	267%	(85-115)	--	--	04/03/06 13:31	
Duplicate (6040018-DUP1)				QC Source: P6C0992-01				Extracted: 04/02/06 22:12						
Hardness (Ca)	SM 2340B-Ca	83.0	---	0.250	mg/l	1x	82.7	--	--	--	0.362	(20)	04/03/06 12:56	
Matrix Spike (6040018-MS1)				QC Source: P6C0992-01				Extracted: 04/02/06 22:12						
Hardness (Ca)	SM 2340B-Ca	157	---	0.278	mg/l	1x	82.7	27.8	267%	(75-125)	--	--	04/03/06 13:03	

Sarah Rockwell

Sarah Rockwell, Project Manager

TestAmerica
ANALYTICAL TESTING CORPORATION

PORTLAND, OR 9405 S.W. NIMBUS AVENUE
BEAVERTON, OR 97008-7132
ph: (503) 906.9200 fax: (503) 906.9210

Ground Water Solutions	Project Name:	**Sunrise Water Authority**	
55 SW Yamhill St, Suite 400	Project Number:	na	Report Created:
Portland, OR 97204	Project Manager:	Ted Ressler	05/08/06 17:24

Anions per EPA Method 300.0 - Laboratory Quality Control Results

TestAmerica - Portland, OR

QC Batch: 6031146 **Water Preparation Method: Wet Chem**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Blank (6031146-BLK1)								Extracted: 03/24/06 08:53						
Sulfate	EPA 300.0	ND	---	1.00	mg/l	1x	--	--	--	--	--	--	03/24/06 10:23	
Nitrate/Nitrite-Nitrogen	"	ND	---	0.200	"	"	--	--	--	--	--	--	"	
Chloride	"	ND	---	0.500	"	"	--	--	--	--	--	--	"	
Nitrite-Nitrogen	"	ND	---	0.100	"	"	--	--	--	--	--	--	"	
Nitrate-Nitrogen	"	ND	---	0.100	"	"	--	--	--	--	--	--	"	
LCS (6031146-BS1)								Extracted: 03/24/06 08:53						
Sulfate	EPA 300.0	31.4	---	1.00	mg/l	1x	--	30.0	105%	(90-110)	--	--	03/24/06 10:38	
Nitrite-Nitrogen	"	5.02	---	0.100	"	"	--	5.00	100%	"	--	--	"	
Nitrate-Nitrogen	"	5.12	---	0.100	"	"	--	"	102%	"	--	--	"	
Chloride	"	10.2	---	0.500	"	"	--	10.0	102%	"	--	--	"	
Duplicate (6031146-DUP1)					QC Source: P6C0972-03			Extracted: 03/24/06 08:53						
Nitrate/Nitrite-Nitrogen	EPA 300.0	ND	---	0.200	mg/l	1x	ND	--	--	--	0.00%	(30)	03/24/06 10:53	
Sulfate	"	11.8	---	1.00	"	"	11.9	--	--	--	0.844	"	"	
Chloride	"	17.0	---	0.500	"	"	17.0	--	--	--	0.00%	"	"	
Nitrate-Nitrogen	"	0.150	---	0.100	"	"	0.150	--	--	--	0.00%	"	"	
Nitrite-Nitrogen	"	ND	---	0.100	"	"	ND	--	--	--	NR	"	"	
Matrix Spike (6031146-MS1)					QC Source: P6C0972-03			Extracted: 03/24/06 08:53						
Chloride	EPA 300.0	19.2	---	0.556	mg/l	1x	17.0	2.22	99.1%	(80-120)	--	--	03/24/06 11:07	
Sulfate	"	16.4	---	1.11	"	"	11.9	4.44	101%	"	--	--	"	
Nitrate-Nitrogen	"	2.40	---	0.111	"	"	0.150	2.22	101%	"	--	--	"	
Nitrite-Nitrogen	"	2.18	---	0.111	"	"	ND	"	98.2%	"	--	--	"	
Matrix Spike (6031146-MS2)					QC Source: P6C0992-01			Extracted: 03/24/06 08:53						
Chloride	EPA 300.0	4.19	---	0.556	mg/l	1x	2.03	2.22	97.3%	(80-120)	--	--	03/24/06 12:20	
Sulfate	"	5.60	---	1.11	"	"	1.25	4.44	98.0%	"	--	--	"	
Nitrite-Nitrogen	"	2.19	---	0.111	"	"	ND	2.22	98.6%	"	--	--	"	
Nitrate-Nitrogen	"	2.28	---	0.111	"	"	ND	"	103%	"	--	--	"	
Matrix Spike Dup (6031146-MSD1)					QC Source: P6C0972-03			Extracted: 03/24/06 08:53						
Chloride	EPA 300.0	19.3	---	0.556	mg/l	1x	17.0	2.22	104%	(80-120)	0.519	(20)	03/24/06 11:22	
Nitrate-Nitrogen	"	2.42	---	0.111	"	"	0.150	"	102%	"	0.830	"	"	
Nitrite-Nitrogen	"	2.18	---	0.111	"	"	ND	"	98.2%	"	0.00%	"	"	
Sulfate	"	16.5	---	1.11	"	"	11.9	4.44	104%	"	0.608	"	"	

Sarah Rockwell

Sarah Rockwell, Project Manager

TestAmerica
ANALYTICAL TESTING CORPORATION

PORTLAND, OR 9405 S.W. NIMBUS AVENUE
BEAVERTON, OR 97008-7132
ph: (503) 906.9200 fax: (503) 906.9210

Ground Water Solutions	Project Name:	**Sunrise Water Authority**	
55 SW Yamhill St, Suite 400	Project Number:	na	Report Created:
Portland, OR 97204	Project Manager:	Ted Ressler	05/08/06 17:24

Disinfection By-Products in Drinking Water per EPA 552.2 - Laboratory Quality Control Results

TestAmerica - Portland, OR

QC Batch: 6040250 **Water Preparation Method: Micro Liq/Liq Shake**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Blank (6040250-BLK1)									Extracted: 04/06/06 11:42					
Monochloroacetic acid (MCAA)	EPA 552.2	ND	---	0.00150	mg/l	1x	--	--	--	--	--	--	04/07/06 00:34	
Monobromoacetic acid (MBAA)	"	ND	---	0.00100	"	"	--	--	--	--	--	--	"	
Dibromoacetic acid (DBAA)	"	ND	---	0.000500	"	"	--	--	--	--	--	--	"	
Dichloroacetic acid (DCAA)	"	ND	---	0.00150	"	"	--	--	--	--	--	--	"	
Trichloroacetic acid (TCAA)	"	ND	---	0.000500	"	"	--	--	--	--	--	--	"	
Total Haloacetic Acids (HAA5)	"	ND	---	0.00150	"	"	--	--	--	--	--	--	"	
Surrogate(s): 2,3-Dibromopropionic acid		*Recovery: 72.6%*			*Limits: 70-130%*	"							*04/07/06 00:34*	
LCS (6040250-BS1)									Extracted: 04/06/06 11:42					
Monochloroacetic acid (MCAA)	EPA 552.2	0.00850	---	0.00150	mg/l	1x	--	0.00750	113%	(70-130)	--	--	04/07/06 00:00	
Monobromoacetic acid (MBAA)	"	0.00559	---	0.00100	"	"	--	0.00500	112%	"	--	--	"	
Dibromoacetic acid (DBAA)	"	0.00295	---	0.000500	"	"	--	0.00250	118%	"	--	--	"	
Dichloroacetic acid (DCAA)	"	0.00871	---	0.00150	"	"	--	0.00750	116%	"	--	--	"	
Trichloroacetic acid (TCAA)	"	0.00274	---	0.000500	"	"	--	0.00250	110%	"	--	--	"	
Surrogate(s): 2,3-Dibromopropionic acid		*Recovery: 96.4%*			*Limits: 70-130%*	"							*04/07/06 00:00*	
LCS (6040250-BS3)									Extracted: 04/06/06 11:42					
Monochloroacetic acid (MCAA)	EPA 552.2	0.00163	---	0.00150	mg/l	1x	--	0.00150	109%	(70-130)	--	--	04/11/06 16:41	
Monobromoacetic acid (MBAA)	"	0.000748	---	0.00100	"	"	--	0.00100	74.8%	"	--	--	"	
Dibromoacetic acid (DBAA)	"	0.000414	---	0.000500	"	"	--	0.000500	82.8%	"	--	--	"	
Dichloroacetic acid (DCAA)	"	0.00134	---	0.00150	"	"	--	0.00150	89.3%	"	--	--	"	
Trichloroacetic acid (TCAA)	"	0.000348	---	0.000500	"	"	--	0.000500	69.6%	"	--	--	"	
Surrogate(s): 2,3-Dibromopropionic acid		*Recovery: 176%*			*Limits: 70-130%*	"							*04/11/06 16:41*	
LCS (6040250-BS4)									Extracted: 04/06/06 11:42					
Monochloroacetic acid (MCAA)	EPA 552.2	0.00168	---	0.00150	mg/l	1x	--	0.00150	112%	(70-130)	--	--	04/11/06 17:15	
Monobromoacetic acid (MBAA)	"	0.000858	---	0.00100	"	"	--	0.00100	85.8%	"	--	--	"	
Dibromoacetic acid (DBAA)	"	0.000493	---	0.000500	"	"	--	0.000500	98.6%	"	--	--	"	
Dichloroacetic acid (DCAA)	"	0.00156	---	0.00150	"	"	--	0.00150	104%	"	--	--	"	
Trichloroacetic acid (TCAA)	"	0.000450	---	0.000500	"	"	--	0.000500	90.0%	"	--	--	"	
Surrogate(s): 2,3-Dibromopropionic acid		*Recovery: 185%*			*Limits: 70-130%*	"							*04/11/06 17:15*	

Sarah Rockwell, Project Manager

TestAmerica
ANALYTICAL TESTING CORPORATION

PORTLAND, OR 9405 S.W. NIMBUS AVENUE
BEAVERTON, OR 97008-7132
ph: (503) 906.9200 fax: (503) 906.9210

Ground Water Solutions	Project Name:	**Sunrise Water Authority**	
55 SW Yamhill St, Suite 400	Project Number:	na	Report Created:
Portland, OR 97204	Project Manager:	Ted Ressler	05/08/06 17:24

Disinfection By-Products in Drinking Water per EPA 552.2 - Laboratory Quality Control Results

TestAmerica - Portland, OR

QC Batch: 6040250 **Water Preparation Method: Micro Liq/Liq Shake**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Matrix Spike (6040250-MS1)					**QC Source: PPD0171-01**				**Extracted: 04/06/06 11:42**					
Monochloroacetic acid (MCAA)	EPA 552.2	0.00648	---	0.00150	mg/l	1x	ND	0.00750	86.4%	(70-130)	--	--	04/07/06 01:40	
Monobromoacetic acid (MBAA)	"	0.00455	---	0.00100	"	"	0.000158	0.00500	87.8%	"	--	--	"	
Dibromoacetic acid (DBAA)	"	0.00255	---	0.000500	"	"	0.000254	0.00250	91.8%	"	--	--	"	
Dichloroacetic acid (DCAA)	"	0.00752	---	0.00150	"	"	0.00289	0.00750	61.7%	"	--	--	"	MS-2
Trichloroacetic acid (TCAA)	"	0.00250	---	0.000500	"	"	0.00228	0.00250	8.80%	"	--	--	"	MS-2
Surrogate(s): 2,3-Dibromopropionic acid		*Recovery: 81.6%*			*Limits: 70-130%*	"							*04/07/06 01:40*	
Matrix Spike Dup (6040250-MSD1)					**QC Source: PPD0171-01**				**Extracted: 04/06/06 11:42**					
Monochloroacetic acid (MCAA)	EPA 552.2	0.00659	---	0.00150	mg/l	1x	ND	0.00750	87.9%	(70-130)	1.68%	(30)	04/07/06 02:13	
Monobromoacetic acid (MBAA)	"	0.00441	---	0.00100	"	"	0.000158	0.00500	85.0%	"	3.13%	"	"	
Dibromoacetic acid (DBAA)	"	0.00257	---	0.000500	"	"	0.000254	0.00250	92.6%	"	0.781	"	"	
Dichloroacetic acid (DCAA)	"	0.00787	---	0.00150	"	"	0.00289	0.00750	66.4%	"	4.55%	"	"	MS-2
Trichloroacetic acid (TCAA)	"	0.00256	---	0.000500	"	"	0.00228	0.00250	11.2%	"	2.37%	"	"	MS-2
Surrogate(s): 2,3-Dibromopropionic acid		*Recovery: 71.6%*			*Limits: 70-130%*	"							*04/07/06 02:13*	

Sarah Rockwell

Sarah Rockwell, Project Manager

TestAmerica
ANALYTICAL TESTING CORPORATION

PORTLAND, OR 9405 S.W. NIMBUS AVENUE
BEAVERTON, OR 97008-7132
ph: (503) 906.9200 fax: (503) 906.9210

Ground Water Solutions	Project Name:	**Sunrise Water Authority**
55 SW Yamhill St, Suite 400	Project Number:	na
Portland, OR 97204	Project Manager:	Ted Ressler
		Report Created: 05/08/06 17:24

Total Trihalomethanes in Drinking Water per EPA 524.2 - Laboratory Quality Control Results

TestAmerica - Portland, OR

QC Batch: 6031297 **Water Preparation Method: EPA 5030B**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Blank (6031297-BLK1)								Extracted: 03/28/06 08:54						
Bromodichloromethane	EPA 524.2	ND	---	0.000500	mg/l	1x	--	--	--	--	--	--	03/28/06 11:50	
Bromoform	"	ND	---	0.000500	"	"	--	--	--	--	--	--	"	
Chloroform	"	ND	---	0.000500	"	"	--	--	--	--	--	--	"	
Dibromochloromethane	"	ND	---	0.000500	"	"	--	--	--	--	--	--	"	
Total Trihalomethanes	"	ND	---	0.000500	"	"	--	--	--	--	--	--	"	
Surrogate(s): Dibromofluoromethane		*Recovery: 120%*			*Limits: 70-130%*	"							*03/28/06 11:50*	
1,2-DCA-d4		*117%*			*70-130%*	"							"	
Toluene-d8		*98.0%*			*70-130%*	"							"	
4-BFB		*73.0%*			*70-130%*	"							"	
LCS (6031297-BS1)								Extracted: 03/28/06 08:54						
Bromodichloromethane	EPA 524.2	0.00588	---	0.000500	mg/l	1x	--	0.00500	118%	(70-130)	--	--	03/28/06 10:53	
Bromoform	"	0.00478	---	0.000500	"	"	--	"	95.6%	"	--	--	"	
Chloroform	"	0.00578	---	0.000500	"	"	--	"	116%	"	--	--	"	
Dibromochloromethane	"	0.00519	---	0.000500	"	"	--	"	104%	"	--	--	"	
Surrogate(s): Dibromofluoromethane		*Recovery: 112%*			*Limits: 70-130%*	"							*03/28/06 10:53*	
1,2-DCA-d4		*105%*			*70-130%*	"							"	
Toluene-d8		*99.6%*			*70-130%*	"							"	
4-BFB		*106%*			*70-130%*	"							"	
Matrix Spike (6031297-MS1)					QC Source: P6C0983-12			Extracted: 03/28/06 08:54						
Bromodichloromethane	EPA 524.2	0.0261	---	0.000500	mg/l	1x	ND	0.0250	104%	(70-130)	--	--	03/28/06 21:01	
Bromoform	"	0.0169	---	0.000500	"	"	ND	"	67.6%	"	--	--	"	MS-2
Chloroform	"	0.0265	---	0.000500	"	"	ND	"	106%	"	--	--	"	
Dibromochloromethane	"	0.0223	---	0.000500	"	"	ND	"	89.2%	"	--	--	"	
Surrogate(s): Dibromofluoromethane		*Recovery: 107%*			*Limits: 70-130%*	"							*03/28/06 21:01*	
1,2-DCA-d4		*101%*			*70-130%*	"							"	
Toluene-d8		*98.0%*			*70-130%*	"							"	
4-BFB		*100%*			*70-130%*	"							"	
Matrix Spike Dup (6031297-MSD1)					QC Source: P6C0983-12			Extracted: 03/28/06 08:54						
Bromodichloromethane	EPA 524.2	0.0259	---	0.000500	mg/l	1x	ND	0.0250	104%	(70-130)	0.769	(30)	03/28/06 21:29	
Bromoform	"	0.0169	---	0.000500	"	"	ND	"	67.6%	"	0.00%	"	"	MS-2
Chloroform	"	0.0258	---	0.000500	"	"	ND	"	103%	"	2.68%	"	"	
Dibromochloromethane	"	0.0223	---	0.000500	"	"	ND	"	89.2%	"	0.00%	"	"	
Surrogate(s): Dibromofluoromethane		*Recovery: 110%*			*Limits 70-130%*	"							*03/28/06 21:29*	
1,2-DCA-d4		*99.2%*			*70-130%*	"							"	
Toluene-d8		*99.8%*			*70-130%*	"							"	
4-BFB		*98.8%*			*70-130%*	"							"	

Sarah Rockwell

Sarah Rockwell, Project Manager

TestAmerica
ANALYTICAL TESTING CORPORATION

PORTLAND, OR 9405 S.W. NIMBUS AVENUE
BEAVERTON, OR 97008-7132
ph: (503) 906.9200 fax: (503) 906.9210

Ground Water Solutions	Project Name:	**Sunrise Water Authority**	
55 SW Yamhill St, Suite 400	Project Number:	na	Report Created:
Portland, OR 97204	Project Manager:	Ted Ressler	05/08/06 17:24

Physical Parameters per APHA/ASTM/EPA Methods - Laboratory Quality Control Results

TestAmerica - Portland, OR

QC Batch: 6031151 **Water Preparation Method: General Preparation**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Duplicate (6031151-DUP1)				**QC Source: P6C0992-01**				**Extracted: 03/24/06 09:22**						
Corrosivity	EPA 9040A	7.32	---		pH Units	1x	7.34	--	--	--	0.273	(30)	03/24/06 09:30	

Sarah Rockwell

Sarah Rockwell, Project Manager

TestAmerica
ANALYTICAL TESTING CORPORATION

PORTLAND, OR 9405 S.W. NIMBUS AVENUE
BEAVERTON, OR 97008-7132
ph: (503) 906.9200 fax: (503) 906.9210

Ground Water Solutions	Project Name:	**Sunrise Water Authority**	
55 SW Yamhill St, Suite 400	Project Number:	na	Report Created:
Portland, OR 97204	Project Manager:	Ted Ressler	05/08/06 17:24

Notes and Definitions

Report Specific Notes:

BS-1 - Laboratory Control Sample and/or Laboratory Control Sample Duplicate recovery was above the laboratory control limits. Analyte not detected, data not impacted.

MS-2 - The Matrix Spike and/or Matrix Spike Duplicate were below the acceptance limits due to sample matrix interference. See Laboratory Control Sample.

Q-02 - The matrix spike recovery, and/or RPD, for this QC sample is outside of established control limits due to sample matrix interference.

Laboratory Reporting Conventions:

DET - Analyte DETECTED at or above the Reporting Limit. Qualitative Analyses only.

ND - Analyte NOT DETECTED at or above the reporting limit (MDL or MRL, as appropriate).

NR/NA - Not Reported / Not Available

dry - Sample results reported on a Dry Weight Basis. Results and Reporting Limits have been corrected for Percent Dry Weight.

wet - Sample results and reporting limits reported on a Wet Weight Basis (as received). Results with neither 'wet' or 'dry' are reported on a Wet Weight Basis.

RPD - RELATIVE PERCENT DIFFERENCE (RPDs calculated using Results, not Percent Recoveries).

MRL - METHOD REPORTING LIMIT. Reporting Level at, or above, the lowest level standard of the Calibration Table.

MDL* - METHOD DETECTION LIMIT. Reporting Level at, or above, the statistically derived limit based on 40CFR, Part 136, Appendix B. *MDLs are listed on the report only if the data has been evaluated below the MRL. Results between the MDL and MRL are reported as Estimated Results.

Dil - Dilutions are calculated based on deviations from the standard dilution performed for an analysis, and may not represent the dilution found on the analytical raw data.

Reporting Limits - Reporting limits (MDLs and MRLs) are adjusted based on variations in sample preparation amounts, analytical dilutions and percent solids, where applicable.

Electronic Signature - Electronic Signature added in accordance with TestAmerica's *Electronic Reporting and Electronic Signatures Policy*. Application of electronic signature indicates that the report has been reviewed and approved for release by the laboratory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

-Sarah Rockwell

Sarah Rockwell, Project Manager

NEILSON RESEARCH CORPORATION
Environmental Testing Laboratory

03/30/06

Sarah Rockwell
North Creek Analytical - Portland
9405 SW Nimbus Avenue
Beaverton, OR 97008

TEL: (503) 906-9200
FAX (503) 906-9210

RE: P6C0992-01

Order No.: 0603540

Dear Sarah Rockwell:

Neilson Research Corporation received 1 sample(s) on 03/24/06 for the analyses presented in the following report.

The results relate only to the parameters tested or to the sample as received by the laboratory. This report shall not be reproduced except in full, without the written approval of Neilson Research Corporation. If you have any questions regarding these test results, please feel free to call.

Sincerely,
Neilson Research Corporation

Fay Fowler

Fay L. Fowler
Project Manager

245 South Grape Street ▵ Medford, OR 97501-3123 ▵ (541) 770-5678 ▵ fax (541) 770-2901

Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

Analysis Report

ORELAP 100016
EPA OR00028

CLIENT: North Creek Analytical - Portland
Project: P6C0992-01
Lab Order: 0603540

Date: 30-Mar-06

CASE NARRATIVE

The analyses were performed according to the guidelines in the Neilson Research Corporation Quality Assurance Program. This report contains analytical results for the sample(s) as received by the laboratory.

Neilson Research Corporation certifies that this report is in compliance with the requirements of NELAP. No unusual difficulties were experienced during analysis of this batch except as noted below or qualified with data flags on the reports.

Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

Analysis Report ORELAP 100016 EPA OR00028

North Creek Analytical - Portland
9405 SW Nimbus Avenue
Beaverton, OR 97008

Lab Order: **0603540**
NRC Sample ID: **0603540-01A**
Collection Date: **03/23/06 2:10:00 PM**
Received Date: **03/24/06 8:28:00 AM**
Reported Date: **03/30/06 12:23:41 PM**

Sample Information:

P6C0992-01

Client Sample ID: P6C0992-01
Collectors Name: Client
Sample Location: SWA-2W-GW
Source:

ANALYTICAL RESULTS

Analyses	Method	NELAC Accredited	Result	Qual	MRL	Units	EPA Limit	Date Analyzed	Analyst
MBAS	SM 5540C	A	**ND**		0.2	mg/L	0.5	03/24/06	KLT

Notes: ND - Not Detected at the MRL N.L. - No Limit MRL - Minimum Reporting Limit

Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

Analysis Report ORELAP 100016 EPA OR00028

North Creek Analytical - Portland
9405 SW Nimbus Avenue
Beaverton, OR 97008

Lab Order: **0603540**
NRC Sample ID: **0603540-01B**
Collection Date: **03/23/06 2:10:00 PM**
Received Date: **03/24/06 8:28:00 AM**
Reported Date: **03/30/06 12:23:41 PM**

Sample Information:

P6C0992-01

Client Sample ID: P6C0992-01
Collectors Name: Client
Sample Location: SWA-2W-GW
Source:

ANALYTICAL RESULTS

Analyses	Method	NELAC Accredited	Result	Qual	MRL	Units	EPA Limit	Date Analyzed	Analyst
Fluoride	EPA 300.0	A	**ND**		0.2	mg/L	2 - 4	03/24/06	KRM

Notes: ND - Not Detected at the MRL N.L. - No Limit MRL - Minimum Reporting Limit

2

Neilson Research Corporation

Date: 30-Mar-06

CLIENT: North Creek Analytical - Portland
Work Order: 0603540
Project: P6C0992-01

ANALYTICAL QC SUMMARY REPORT

TestCode: EPA300_W

Sample ID	MB	SampType:	MBLK	TestCode:	EPA300_W	Units:	mg/L	Prep Date:		RunNo:	29156
Client ID:	ZZZZZ	Batch ID:	R29156	TestNo:	EPA 300.0			Analysis Date:	03/24/06	SeqNo:	437970

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Fluoride	ND	0.200									

Sample ID	LCS2	SampType:	LCS	TestCode:	EPA300_W	Units:	mg/L	Prep Date:		RunNo:	29156
Client ID:	ZZZZZ	Batch ID:	R29156	TestNo:	EPA 300.0			Analysis Date:	03/24/06	SeqNo:	437971

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Fluoride	2.454	0.200	2.5	0	98.2	90	110				

Sample ID	0603565-01BMS	SampType:	MS	TestCode:	EPA300_W	Units:	mg/L	Prep Date:		RunNo:	29156
Client ID:	ZZZZZ	Batch ID:	R29156	TestNo:	EPA 300.0			Analysis Date:	03/24/06	SeqNo:	437983

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Fluoride	3.887	0.200	3.75	0.1407	99.9	80	120				

Sample ID	0603565-01BMSD	SampType:	MSD	TestCode:	EPA300_W	Units:	mg/L	Prep Date:		RunNo:	29156
Client ID:	ZZZZZ	Batch ID:	R29156	TestNo:	EPA 300.0			Analysis Date:	03/24/06	SeqNo:	437984

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Fluoride	3.703	0.200	3.75	0.1407	95.0	80	120	3.887	4.85	20	

NRC - Page 5 of 7

Qualifiers:

E	Value above quantitation range	H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Minimum Reporting Limit	R	RPD outside accepted recovery limits	S	Spike Recovery outside accepted recovery limits

CLIENT: North Creek Analytical - Portland
Work Order: 0603540
Project: P6C0992-01

ANALYTICAL QC SUMMARY REPORT

TestCode: MBAS

Sample ID **MBLK**	SampType: **MBLK**	TestCode: **MBAS**	Units: **mg/L**	Prep Date:	RunNo: **29150**
Client ID: **ZZZZZ**	Batch ID: **R29150**	TestNo: **SM 5540C**		Analysis Date: **03/24/06**	SeqNo: **437873**

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
MBAS	ND	0.20									

Sample ID **LCS**	SampType: **LCS**	TestCode: **MBAS**	Units: **mg/L**	Prep Date:	RunNo: **29150**
Client ID: **ZZZZZ**	Batch ID: **R29150**	TestNo: **SM 5540C**		Analysis Date: **03/24/06**	SeqNo: **437874**

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
MBAS	0.4200	0.20	0.482	0	87.1	80	120				

Sample ID **0603540-01AMS**	SampType: **MS**	TestCode: **MBAS**	Units: **mg/L**	Prep Date:	RunNo: **29150**
Client ID: **P6C0992-01**	Batch ID: **R29150**	TestNo: **SM 5540C**		Analysis Date: **03/24/06**	SeqNo: **437876**

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
MBAS	0.4440	0.20	0.5	0	88.8	80	120				

Sample ID **0603540-01AMSD**	SampType: **MSD**	TestCode: **MBAS**	Units: **mg/L**	Prep Date:	RunNo: **29150**
Client ID: **P6C0992-01**	Batch ID: **R29150**	TestNo: **SM 5540C**		Analysis Date: **03/24/06**	SeqNo: **437877**

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
MBAS	0.4600	0.20	0.5	0	92.0	80	120	0.444	3.54	15	

Qualifiers:

E	Value above quantitation range	H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Minimum Reporting Limit	R	RPD outside accepted recovery limits	S	Spike Recovery outside accepted recovery limits

SUBCONTRACT ORDER

North Creek Analytical - Portland

P6C0992

SENDING LABORATORY:	RECEIVING LABORATORY:
North Creek Analytical - Portland	Neilson Research Corp.
9405 SW Nimbus Ave.	245 S. Grape St.
Beaverton, OR 97008	Medford, OR 97501
Phone: (503) 906-9200	Phone :541-770-5678
Fax: (503) 906-9210	Fax: 541-770-2901
Project Manager: Sarah Rockwell	

Analysis	Due	Expires	Laboratory ID	Comments
Sample ID: P6C0992-01	**Water**	**Sampled:03/23/06 14:10**	[redacted]	0603540
DW MBAS - SUB	04/05/06 23:59	03/25/06 14:10		01A
DW IC Fluoride (300)	04/05/06 23:59	04/20/06 14:10		01B
Containers Supplied:				
1L Poly - Unpres (AB)	250 mL Poly - Unpres. (A			

3.9°C Cooler w/ Gel Packs

Released By	Date	Received By	Date
[signature]	3/23/06	M. Sday	3/24/06 8:28
Released By	Date	Received By	Date

SEVERN TRENT **STL**

STL Richland
2800 George Washington Way
Richland, WA 99352
(509) 375-3131
ORELAP ID No. WA100002

System ID#:	Source ID:	Source Name(s):
Water System:		
Address:		
City:	State: **OR**	Zip:

Sample Identification

Single Sample ☒ Four Year Resample ☐ Composite of Quarterly Samples ☐

Sampled at:	Sampled by:
Date(s) Collected: **3/23/06**	Time Collected: **14:10 pm**
Date Received: **3/24/06**	Date Analyzed: **5/1/06**

Sample Characteristic: Raw or Treated Water ☒ From Source or Distribution ☒ Single or Combined Source ☒

Lab Sample ID #: **P6C0992-01; STL Lot#: J6C240224, J6C240298 SDG#: 31201, 31196/HNMJ9, H10DP, H1XQW**

Contaminant	Code	MCL pCi/l	Analysis pCi/l	Method	Analyst
Gross Alpha	4000	15	ND @ 1.6	EPA 900.0	PA
Combined Radium 226/228	4010	5	1.7 @ 0.8	EPA 903.0 & 904.0	PA
Combined Uranium	4006	30	0.25 @ 0.07 ug/L	ASTM D5174	ML
Gross Beta	4100	50	3.1 @ 2.5	EPA 900.0	PA

ND=MDA Indicates the analyte was measured and was not detected at a level greater than or equal to the Minimum Detectable Amount (MDA).

See comments on back.

Comments

Gross Beta Analysis:
The initial analysis and rerun both had a high blank. A third analysis was started when the tech noticed that another sampled popped into these samples causing contamination. There was no more sample for reanalysis. The sample must be called failed.

Radon 222 Analysis:

The sample had a result of 245 pCi/L with an MDX of 36.9 pCi/L.

I certify that this Certificate of Analysis is in compliance with the SOW, both technically and for completeness, for other than the conditions detailed above. The Laboratory Manager or a designee, as verified by the following signature has authorized release of the data contained in this hard copy data package.

Reviewed and approved:

Sherryl A. Adam
Project Manager

CRW
Source Water
Laboratory Data Reports

TestAmerica
ANALYTICAL TESTING CORPORATION

PORTLAND, OR 9405 S.W. NIMBUS AVENUE
BEAVERTON, OR 97008-7132
ph: (503) 906.9200 fax: (503) 906.9210

June 05, 2006

Ted Ressler
Ground Water Solutions
55 SW Yamhill St, Suite 400
Portland, OR 97204

RE: Sunrise Water Authority

Enclosed are the results of analyses for samples received by the laboratory on 04/19/06 12:40. The following list is a summary of the Work Orders contained in this report, generated on 06/05/06 11:53.

If you have any questions concerning this report, please feel free to contact me.

Work Order	Project	ProjectNumber
PPD0805	Sunrise Water Authority	157:005

Sarah Rockwell

Sarah Rockwell, Project Manager

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ANALYTICAL TESTING CORPORATION

PORTLAND, OR 9405 S.W. NIMBUS AVENUE
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ph: (503) 906.9200 fax: (503) 906.9210

Ground Water Solutions	Project Name:	**Sunrise Water Authority**	
55 SW Yamhill St, Suite 400	Project Number:	157:005	Report Created:
Portland, OR 97204	Project Manager:	Ted Ressler	06/05/06 11:53

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
SWA-SW-CRW	PPD0805-01	Water	04/19/06 11:30	04/19/06 12:40

Sarah Rockwell

Sarah Rockwell, Project Manager

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Ground Water Solutions	Project Name:	**Sunrise Water Authority**	
55 SW Yamhill St, Suite 400	Project Number:	157:005	Report Created:
Portland, OR 97204	Project Manager:	Ted Ressler	06/05/06 11:53

Total Metals per EPA 200 Series Methods

TestAmerica - Portland, OR

Analyte	Method	Result	MDL*	MRL	Units	Dil	Batch	Prepared	Analyzed	Notes
PPD0805-01 (SWA-SW-CRW)		**Water**			**Sampled: 04/19/06 11:30**					
Aluminum	EPA 200.7	ND	—	0.100	mg/l	1x	6040892	04/19/06 15:33	04/20/06 13:36	
Antimony	EPA 200.8	ND	—	0.00100	"	"	6040893	04/19/06 15:40	04/29/06 11:48	
Arsenic	"	ND	—	0.00100	"	"	"	"	"	
Barium	"	**0.00368**	—	0.00100	"	"	"	"	05/02/06 11:18	
Beryllium	"	ND	—	0.000500	"	"	"	"	04/29/06 11:48	
Cadmium	"	ND	—	0.000500	"	"	"	"	"	
Calcium	EPA 200.7	**4.19**	—	0.100	"	"	6040892	04/19/06 15:33	04/20/06 13:36	
Chromium	EPA 200.8	ND	—	0.00100	"	"	6040893	04/19/06 15:40	04/29/06 11:48	
Copper	"	**0.00158**	—	0.00100	"	"	"	"	"	
Iron	EPA 200.7	ND	—	0.0100	"	"	6040892	04/19/06 15:33	04/20/06 13:36	
Lead	EPA 200.8	ND	—	0.000500	"	"	6040893	04/19/06 15:40	04/29/06 11:48	
Magnesium	EPA 200.7	**1.26**	—	0.100	"	"	6040892	04/19/06 15:33	04/20/06 13:36	
Manganese	EPA 200.8	ND	—	0.00200	"	"	6040893	04/19/06 15:40	04/29/06 11:48	
Nickel	EPA 200.7	ND	—	0.0500	"	"	6040892	04/19/06 15:33	04/20/06 13:36	
Potassium	"	ND	—	1.00	"	"	"	"	"	
Selenium	EPA 200.8	ND	—	0.00100	"	"	6040893	04/19/06 15:40	04/29/06 11:48	
Silver	"	ND	—	0.00100	"	"	"	"	"	
Sodium	EPA 200.7	**4.13**	—	1.00	"	"	6040892	04/19/06 15:33	04/20/06 13:36	
Thallium	EPA 200.8	ND	—	0.00100	"	"	6040893	04/19/06 15:40	04/29/06 11:48	
Zinc	"	ND	—	0.00500	"	"	"	"	"	

Sarah Rockwell

Sarah Rockwell, Project Manager

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BEAVERTON, OR 97008-7132
ph: (503) 906.9200 fax: (503) 906.9210

Ground Water Solutions	Project Name:	**Sunrise Water Authority**	
55 SW Yamhill St, Suite 400	Project Number:	157:005	Report Created:
Portland, OR 97204	Project Manager:	Ted Ressler	06/05/06 11:53

Dissolved Metals per EPA 200 Series Methods

TestAmerica - Portland, OR

Analyte	Method	Result	MDL*	MRL	Units	Dil	Batch	Prepared	Analyzed	Notes
PPD0805-01 (SWA-SW-CRW)		**Water**			**Sampled: 04/19/06 11:30**					**M-04**
Iron	EPA 200.7	ND	—	0.0100	mg/l	1x	6041222	04/27/06 10:07	05/01/06 21:29	
Manganese	"	ND	—	0.0100	"	"	"	"	"	

Sarah Rockwell

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Ground Water Solutions	Project Name:	**Sunrise Water Authority**	
55 SW Yamhill St, Suite 400	Project Number:	157:005	Report Created:
Portland, OR 97204	Project Manager:	Ted Ressler	06/05/06 11:53

Total Mercury per EPA Method 245.1

TestAmerica - Portland, OR

Analyte	Method	Result	MDL*	MRL	Units	Dil	Batch	Prepared	Analyzed	Notes
PPD0805-01 (SWA-SW-CRW)		**Water**					**Sampled: 04/19/06 11:30**			
Mercury	EPA 245.1	ND	—	0.000200	mg/l	1x	6041059	04/24/06 10:21	04/24/06 13:44	

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Ground Water Solutions	Project Name:	**Sunrise Water Authority**	
55 SW Yamhill St, Suite 400	Project Number:	157.005	Report Created:
Portland, OR 97204	Project Manager:	Ted Ressler	06/05/06 11:53

Conventional Chemistry Parameters per APHA/EPA Methods

TestAmerica - Portland, OR

Analyte	Method	Result	MDL*	MRL	Units	Dil	Batch	Prepared	Analyzed	Notes
PPD0805-01 (SWA-SW-CRW)		**Water**			**Sampled: 04/19/06 11:30**					
Bicarbonate Alkalinity	SM 2320B	**17.9**	—	5.00	mg/l	1x	6040896	04/19/06 15:53	04/20/06 17:50	
Carbonate Alkalinity	"	ND	—	5.00	"	"	"	"	"	
Chlorine Residual (Total)	SM 4500-Cl G	**0.511**	—	0.100	"	"	6040905	04/19/06 21:00	04/19/06 21:21	
Color	EPA 110.2	ND	—	5.00	Color Units	"	6040904	04/19/06 20:39	04/19/06 20:41	
Cyanide (total)	EPA 335.4	ND	—	0.00500	mg/l	"	6041172	04/26/06 10:29	04/28/06 16:56	
Hardness (Ca)	SM 2340B-Ca	**10.5**	—	0.250	"	"	6040892	04/19/06 15:33	04/27/06 13:52	
Silica (SiO2)	SM 4500-Si F	**16.4**	—	0.500	"	"	6041037	04/24/06 07:53	04/24/06 12:18	
Threshold Odor Number	EPA 140.1	**3.7**	—	0.20	TON	"	6040932	04/20/06 11:16	04/20/06 12:00	
Total Alkalinity	SM 2320B	**17.9**	—	5.00	mg/L as CaCO3	"	6040896	04/19/06 15:53	04/20/06 17:50	
Total Dissolved Solids	SM 2540C	**48.0**	—	10.0	mg/l	"	6041047	04/24/06 08:57	04/24/06 13:35	
Total Suspended Solids	EPA 160.2	ND	—	10.0	"	"	6041048	04/24/06 09:02	04/24/06 15:25	
Turbidity	EPA 180.1	ND	—	0.200	NTU	"	6040899	04/19/06 16:08	04/19/06 16:15	
Total Organic Carbon	SM 5310C	ND	—	1.00	mg/l	"	6041023	04/21/06 22:05	04/22/06 00:45	

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BEAVERTON, OR 97008-7132
ph: (503) 906.9200 fax: (503) 906.9210

Ground Water Solutions	Project Name:	**Sunrise Water Authority**	
55 SW Yamhill St, Suite 400	Project Number:	157:005	Report Created:
Portland, OR 97204	Project Manager:	Ted Ressler	06/05/06 11:53

Anions per EPA Method 300.0

TestAmerica - Portland, OR

Analyte	Method	Result	MDL*	MRL	Units	Dil	Batch	Prepared	Analyzed	Notes
PPD0805-01 (SWA-SW-CRW)		**Water**			**Sampled: 04/19/06 11:30**					
Chloride	EPA 300.0	**3.33**	—	0.500	mg/l	1x	6040844	04/19/06 16:00	04/19/06 20:25	
Nitrate/Nitrite-Nitrogen	"	**0.230**	—	0.200	"	"	"	"	"	
Nitrate-Nitrogen	"	**0.230**	—	0.100	"	"	"	"	"	
Nitrite-Nitrogen	"	ND	—	0.100	"	"	"	"	"	
Sulfate	"	**2.21**	—	1.00	"	"	"	"	"	

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ANALYTICAL TESTING CORPORATION

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BEAVERTON, OR 97008-7132
ph: (503) 906.9200 fax: (503) 906.9210

Ground Water Solutions	Project Name:	**Sunrise Water Authority**	
55 SW Yamhill St, Suite 400	Project Number:	157.005	Report Created:
Portland, OR 97204	Project Manager:	Ted Ressler	06/05/06 11:53

Disinfection By-Products in Drinking Water per EPA 552.2

TestAmerica - Portland, OR

Analyte	Method	Result	MDL*	MRL	Units	Dil	Batch	Prepared	Analyzed	Notes
PPD0805-01 (SWA-SW-CRW)		**Water**			**Sampled: 04/19/06 11:30**					
Monochloroacetic acid (MCAA)	EPA 552.2	ND	——	0.00150	mg/l	1x	6041285	04/28/06 10:03	05/02/06 17:19	
Monobromoacetic acid (MBAA)	"	ND	——	0.00100	"	"	"	"	"	
Dibromoacetic acid (DBAA)	"	ND	——	0.000500	"	"	"	"	"	
Dichloroacetic acid (DCAA)	"	**0.0148**	——	0.00150	"	"	"	"	"	
Trichloroacetic acid (TCAA)	"	**0.0190**	——	0.000500	"	"	"	"	"	
Total Haloacetic Acids (HAA5)	"	**0.0337**	——	0.00150	"	"	"	"	"	
Surrogate(s): 2,3-Dibromopropionic acid		*99.8%*			*70 - 130 %*	"			"	

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Ground Water Solutions	Project Name:	**Sunrise Water Authority**	
55 SW Yamhill St, Suite 400	Project Number:	157:005	Report Created:
Portland, OR 97204	Project Manager:	Ted Ressler	06/05/06 11:53

Total Trihalomethanes in Drinking Water per EPA 524.2

TestAmerica - Portland, OR

Analyte	Method	Result	MDL*	MRL	Units	Dil	Batch	Prepared	Analyzed	Notes
PPD0805-01 (SWA-SW-CRW)		**Water**			**Sampled: 04/19/06 11:30**					
Bromodichloromethane	EPA 524.2	**0.00156**	——	0.000500	mg/l	1x	6041116	04/25/06 10:04	04/25/06 15:57	
Bromoform	"	ND	——	0.000500	"	"	"	"	"	
Chloroform	"	**0.0205**	——	0.000500	"	"	"	"	"	
Dibromochloromethane	"	ND	——	0.000500	"	"	"	"	"	
Total Trihalomethanes	"	**0.0220**	——	0.000500	"	"	"	"	"	
Surrogate(s): Dibromofluoromethane		*112%*			*70 - 130 %*	"			"	
1,2-DCA-d4		*111%*			*70 - 130 %*	"			"	
Toluene-d8		*94.2%*			*70 - 130 %*	"			"	
4-BFB		*85.2%*			*70 - 130 %*	"			"	

Sarah Rockwell, Project Manager

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BEAVERTON, OR 97008-7132
ph: (503) 906.9200 fax: (503) 906.9210

Ground Water Solutions	Project Name:	**Sunrise Water Authority**	
55 SW Yamhill St, Suite 400	Project Number:	157.005	Report Created:
Portland, OR 97204	Project Manager:	Ted Ressler	06/05/06 11:53

Physical Parameters per APHA/ASTM/EPA Methods

TestAmerica - Portland, OR

Analyte	Method	Result	MDL*	MRL	Units	Dil	Batch	Prepared	Analyzed	Notes
PPD0805-01 (SWA-SW-CRW)		**Water**			**Sampled: 04/19/06 11:30**					
Corrosivity	EPA 9040A	**7.27**	----		pH Units	1x	6040891	04/19/06 15:23	04/19/06 15:30	

Sarah Rockwell

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Ground Water Solutions	Project Name:	**Sunrise Water Authority**	
55 SW Yamhill St, Suite 400	Project Number:	157:005	Report Created:
Portland, OR 97204	Project Manager:	Ted Ressler	06/05/06 11:53

Microbiological Parameters per APHA Standard Methods

TestAmerica - Portland, OR

Analyte	Method	Result	MDL*	MRL	Units	Dil	Batch	Prepared	Analyzed	Notes
PPD0805-01 (SWA-SW-CRW)		**Water**			**Sampled: 04/19/06 11:30**					
Total Coliforms	SM 9223	ND	----	1.00	/100 ml	1x	6040885	04/19/06 14:34	04/20/06 15:00	
E. Coli	"	ND	----	1.00	"	"	"	"	"	

Sarah Rockwell

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Ground Water Solutions	Project Name:	**Sunrise Water Authority**	
55 SW Yamhill St, Suite 400	Project Number:	157.005	Report Created:
Portland, OR 97204	Project Manager:	Ted Ressler	06/05/06 11:53

Total Metals per EPA 200 Series Methods - Laboratory Quality Control Results

TestAmerica - Portland, OR

QC Batch: 6040892 **Water Preparation Method: EPA 200/3005**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Blank (6040892-BLK1)								Extracted: 04/19/06 15:33						
Aluminum	EPA 200.7	ND	---	0.100	mg/l	1x	--	--	--	--	--	--	04/20/06 13:55	
Calcium	"	ND	---	0.100	"	"	--	--	--	--	--	--	"	
Iron	"	ND	---	0.0100	"	"	--	--	--	--	--	--	"	
Magnesium	"	ND	---	0.100	"	"	--	--	--	--	--	--	"	
Nickel	"	ND	---	0.0500	"	"	--	--	--	--	--	--	"	
Potassium	"	ND	---	1.00	"	"	--	--	--	--	--	--	"	
Sodium	"	ND	---	1.00	"	"	--	--	--	--	--	--	"	
LCS (6040892-BS1)								Extracted: 04/19/06 15:33						
Aluminum	EPA 200.7	9.78	---	0.100	mg/l	1x	--	10.0	97.8%	(85-115)	--	--	04/20/06 13:48	
Calcium	"	10.4	---	0.100	"	"	--	"	104%	"	--	--	"	
Iron	"	10.0	---	0.0100	"	"	--	"	100%	"	--	--	"	
Magnesium	"	10.2	---	0.100	"	"	--	"	102%	"	--	--	"	
Nickel	"	0.392	---	0.0500	"	"	--	0.400	98.0%	"	--	--	"	
Potassium	"	9.35	---	1.00	"	"	--	10.0	93.5%	"	--	--	"	
Sodium	"	10.0	---	1.00	"	"	--	"	100%	"	--	--	"	
Duplicate (6040892-DUP1)					QC Source: PPD0806-01				Extracted: 04/19/06 15:33					
Aluminum	EPA 200.7	ND	---	0.100	mg/l	1x	ND	--	--	--	1.45%	(20)	04/20/06 14:01	
Calcium	"	4.25	---	0.100	"	"	4.23	--	--	--	0.472%	(30)	"	
Iron	"	0.0391	---	0.0100	"	"	0.0392	--	--	--	0.255%	(20)	"	
Magnesium	"	1.34	---	0.100	"	"	1.34	--	--	--	0.00%	(30)	"	
Nickel	"	ND	---	0.0500	"	"	ND	--	--	--	NR	(20)	"	
Potassium	"	ND	---	1.00	"	"	ND	--	--	--	0.00%	(30)	"	
Sodium	"	4.07	---	1.00	"	"	4.03	--	--	--	0.988%	"	"	
Matrix Spike (6040892-MS1)					QC Source: PPD0806-01				Extracted: 04/19/06 15:33					
Aluminum	EPA 200.7	2.23	---	0.111	mg/l	1x	0.0624	2.21	98.1%	(75-125)	--	--	04/20/06 14:08	
Calcium	"	15.9	---	0.111	"	"	4.23	11.1	105%	(80-120)	--	--	"	
Iron	"	4.49	---	0.0111	"	"	0.0392	4.42	101%	(75-125)	--	--	"	
Magnesium	"	12.5	---	0.111	"	"	1.34	11.1	101%	(80-120)	--	--	"	
Nickel	"	0.544	---	0.0556	"	"	ND	0.556	97.8%	(75-125)	--	--	"	
Potassium	"	11.1	---	1.11	"	"	0.477	11.1	95.7%	(80-120)	--	--	"	
Sodium	"	15.4	---	1.11	"	"	4.03	"	102%	"	--	--	"	

Sarah Rockwell

Sarah Rockwell, Project Manager

TestAmerica
ANALYTICAL TESTING CORPORATION

PORTLAND, OR 9405 S.W. NIMBUS AVENUE
BEAVERTON, OR 97008-7132
ph: (503) 906.9200 fax: (503) 906.9210

Ground Water Solutions	Project Name:	**Sunrise Water Authority**	
55 SW Yamhill St, Suite 400	Project Number:	157:005	Report Created:
Portland, OR 97204	Project Manager:	Ted Ressler	06/05/06 11:53

Total Metals per EPA 200 Series Methods - Laboratory Quality Control Results

TestAmerica - Portland, OR

QC Batch: 6040893 **Water Preparation Method: EPA 200/3005**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Blank (6040893-BLK1)								Extracted: 04/19/06 15:40						
Antimony	EPA 200.8	ND	---	0.00100	mg/l	1x	--	--	--	--	--	--	04/29/06 07:44	
Arsenic	"	ND	---	0.00100	"	"	--	--	--	--	--	--	"	
Barium	"	ND	---	0.00100	"	"	--	--	--	--	--	--	05/02/06 07:09	
Beryllium	"	ND	---	0.000500	"	"	--	--	--	--	--	--	04/29/06 07:44	
Cadmium	"	ND	---	0.000500	"	"	--	--	--	--	--	--	"	
Chromium	"	ND	---	0.00100	"	"	--	--	--	--	--	--	"	
Copper	"	ND	---	0.00100	"	"	--	--	--	--	--	--	"	
Lead	"	ND	---	0.000500	"	"	--	--	--	--	--	--	"	
Manganese	"	ND	---	0.00200	"	"	--	--	--	--	--	--	"	
Selenium	"	ND	---	0.00100	"	"	--	--	--	--	--	--	"	
Silver	"	ND	---	0.00100	"	"	--	--	--	--	--	--	"	
Thallium	"	ND	---	0.00100	"	"	--	--	--	--	--	--	"	
Zinc	"	ND	---	0.00500	"	"	--	--	--	--	--	--	"	
LCS (6040893-BS1)								Extracted: 04/19/06 15:40						
Antimony	EPA 200.8	0.0569	---	0.00100	mg/l	1x	--	0.0500	114%	(85-115)	--	--	04/29/06 08:01	
Arsenic	"	0.106	---	0.00100	"	"	--	0.100	106%	"	--	--	"	
Barium	"	0.0995	---	0.00100	"	"	--	"	99.5%	"	--	--	05/02/06 07:25	
Beryllium	"	0.0531	---	0.000500	"	"	--	0.0500	106%	"	--	--	04/29/06 08:01	
Cadmium	"	0.107	---	0.000500	"	"	--	0.100	107%	"	--	--	"	
Chromium	"	0.118	---	0.00100	"	"	--	"	118%	"	--	--	"	BS-1
Copper	"	0.113	---	0.00100	"	"	--	"	113%	"	--	--	"	
Lead	"	0.110	---	0.000500	"	"	--	"	110%	"	--	--	"	
Manganese	"	0.113	---	0.00200	"	"	--	"	113%	"	--	--	"	
Selenium	"	0.0490	---	0.00100	"	"	--	0.0500	98.0%	"	--	--	"	
Silver	"	0.0522	---	0.00100	"	"	--	"	104%	"	--	--	"	
Thallium	"	0.0500	---	0.00100	"	"	--	"	100%	"	--	--	"	
Zinc	"	0.115	---	0.00500	"	"	--	0.100	115%	"	--	--	"	
Duplicate (6040893-DUP1)						QC Source: PPD0802-01			Extracted: 04/19/06 15:40					
Antimony	EPA 200.8	ND	---	0.00100	mg/l	1x	ND	--	--	--		(30)	04/29/06 11:00	
Arsenic	"	0.0185	---	0.00100	"	"	0.0205	--	--	--	10.3%	"	"	
Barium	"	0.155	---	0.00100	"	"	0.159	--	--	--	2.55%	"	05/02/06 10:31	
Beryllium	"	ND	---	0.000500	"	"	ND	--	--	--	NR	"	04/29/06 11:00	
Cadmium	"	ND	---	0.000500	"	"	ND	--	--	--	NR	"	"	
Chromium	"	ND	---	0.00100	"	"	ND	--	--	--	5.90%	"	"	
Copper	"	ND	---	0.00100	"	"	ND	--	--	--	2.50%	"	"	
Lead	"	ND	---	0.000500	"	"	ND	--	--	--	1.54%	"	"	
Manganese	"	0.608	---	0.00200	"	"	0.619	--	--	--	1.79%	"	"	

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Ground Water Solutions	Project Name:	**Sunrise Water Authority**	
55 SW Yamhill St, Suite 400	Project Number:	157.005	Report Created:
Portland, OR 97204	Project Manager:	Ted Ressler	06/05/06 11:53

Total Metals per EPA 200 Series Methods - Laboratory Quality Control Results

TestAmerica - Portland, OR

QC Batch: 6040893 **Water Preparation Method: EPA 200/3005**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Duplicate (6040893-DUP1)				QC Source: PPD0802-01					Extracted: 04/19/06 15:40					
Selenium	EPA 200.8	ND	---	0.00100	mg/l	1x	ND	--	--	--	NR	(30)	04/29/06 11:00	
Silver	"	ND	---	0.00100	"	"	ND	--	--	--	NR	"	"	
Thallium	"	ND	---	0.00100	"	"	ND	--	--	--	NR	"	"	
Zinc	"	0.0117	---	0.00500	"	"	0.0128	--	--	--	8.98%	"	"	
Matrix Spike (6040893-MS1)				QC Source: PPD0802-01					Extracted: 04/19/06 15:40					
Antimony	EPA 200.8	0.0638	---	0.00100	mg/l	1x	ND	0.0500	128%	(70-130)	--	--	04/29/06 11:33	
Arsenic	"	0.131	---	0.00100	"	"	0.0205	0.100	110%	"	--	--	"	
Barium	"	0.257	---	0.00100	"	"	0.159	"	98.0%	"	--	--	05/02/06 11:02	
Beryllium	"	0.0531	---	0.000500	"	"	ND	0.0500	106%	"	--	--	04/29/06 11:33	
Cadmium	"	0.109	---	0.000500	"	"	ND	0.100	109%	"	--	--	"	
Chromium	"	0.130	---	0.00100	"	"	0.000214	"	130%	"	--	--	"	
Copper	"	0.112	---	0.00100	"	"	0.000930	"	111%	"	--	--	"	
Lead	"	0.0989	---	0.000500	"	"	0.000129	"	98.8%	"	--	--	"	
Manganese	"	0.775	---	0.00200	"	"	0.619	"	156%	"	--	--	"	Q-03
Selenium	"	0.0504	---	0.00100	"	"	ND	0.0500	101%	"	--	--	"	
Silver	"	0.0540	---	0.00100	"	"	ND	"	108%	"	--	--	"	
Thallium	"	0.0450	---	0.00100	"	"	ND	"	90.0%	"	--	--	"	
Zinc	"	0.123	---	0.00500	"	"	0.0128	0.100	110%	"	--	--	"	

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Ground Water Solutions	Project Name:	**Sunrise Water Authority**	
55 SW Yamhill St, Suite 400	Project Number:	157:005	Report Created:
Portland, OR 97204	Project Manager:	Ted Ressler	06/05/06 11:53

Dissolved Metals per EPA 200 Series Methods - Laboratory Quality Control Results

TestAmerica - Portland, OR

QC Batch: 6041222 **Water Preparation Method: EPA 200/3005 Diss**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Blank (6041222-BLK1)								Extracted: 04/27/06 10:07						
Iron	EPA 200.7	ND	---	0.0100	mg/l	1x	--	--	--	--	--	--	05/01/06 20:51	
Manganese	"	ND	---	0.0100	"	"	--	--	--	--	--	--	"	
LCS (6041222-BS1)								Extracted: 04/27/06 10:07						
Iron	EPA 200.7	3.68	---	0.0100	mg/l	1x	--	3.98	92.5%	(85-115)	--	--	05/01/06 20:58	
Manganese	"	0.461	---	0.0100	"	"	--	0.500	92.2%	"	--	--	"	
Duplicate (6041222-DUP1)					QC Source: PPD0737-02			Extracted: 04/27/06 10:07						
Iron	EPA 200.7	1.85	---	0.0100	mg/l	1x	1.82	--	--	--	1.63%	(20)	05/01/06 21:10	
Manganese	"	26.7	---	0.200	"	20x	26.4	--	--	--	1.13%	"	05/02/06 16:25	
Matrix Spike (6041222-MS1)					QC Source: PPD0737-02			Extracted: 04/27/06 10:07						
Iron	EPA 200.7	5.32	---	0.0100	mg/l	1x	1.82	3.98	87.9%	(75-125)	--	--	05/01/06 21:17	
Manganese	"	26.4	---	0.200	"	20x	26.4	0.500	0.00%	"	--	--	05/02/06 16:31	MS-4
Matrix Spike (6041222-MS2)					QC Source: PPD0846-01			Extracted: 04/27/06 10:07						
Iron	EPA 200.7	852	---	0.100	mg/l	10x	831	3.98	528%	(75-125)	--	--	05/02/06 17:36	MS-4
Manganese	"	34.7	---	0.100	"	"	34.1	0.500	120%	"	--	--	"	

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Portland, OR 97204	Project Manager:	Ted Ressler	06/05/06 11:53

Total Mercury per EPA Method 245.1 - Laboratory Quality Control Results

TestAmerica - Portland, OR

QC Batch: 6041059 **Water Preparation Method: EPA 245.1**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Blank (6041059-BLK1)								Extracted: 04/24/06 10:21						
Mercury	EPA 245.1	ND	---	0.000200	mg/l	1x	--	--	--	--	--	--	04/24/06 13:16	
LCS (6041059-BS1)								Extracted: 04/24/06 10:21						
Mercury	EPA 245.1	0.00549	---	0.000200	mg/l	1x	--	0.00500	110%	(85-115)	--	--	04/24/06 13:18	
LCS Dup (6041059-BSD1)								Extracted: 04/24/06 10:21						
Mercury	EPA 245.1	0.00522	---	0.000200	mg/l	1x	--	0.00500	104%	(85-115)	5.04%	(20)	04/24/06 13:21	
Duplicate (6041059-DUP1)					QC Source: PPD0802-01			Extracted: 04/24/06 10:21						
Mercury	EPA 245.1	ND	---	0.000200	mg/l	1x	ND	--	--	--	NR	(30)	04/24/06 13:24	
Matrix Spike (6041059-MS1)					QC Source: PPD0802-01			Extracted: 04/24/06 10:21						
Mercury	EPA 245.1	0.00513	---	0.000200	mg/l	1x	ND	0.00500	103%	(75-125)	--	--	04/24/06 13:26	
Matrix Spike Dup (6041059-MSD1)					QC Source: PPD0802-01			Extracted: 04/24/06 10:21						
Mercury	EPA 245.1	0.00507	---	0.000200	mg/l	1x	ND	0.00500	101%	(75-125)	1.18%	(20)	04/24/06 13:29	

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Portland, OR 97204	Project Manager:	Ted Ressler	06/05/06 11:53

Conventional Chemistry Parameters per APHA/EPA Methods - Laboratory Quality Control Results

TestAmerica - Portland, OR

QC Batch: 6040892 **Water Preparation Method: EPA 200/3005**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Blank (6040892-BLK1)								Extracted: 04/19/06 15:33						
Hardness (Ca)	SM 2340B-Ca	ND	---	0.250	mg/l	1x	--	--	--	--	--	--	04/27/06 13:52	
LCS (6040892-BS1)								Extracted: 04/19/06 15:33						
Hardness (Ca)	SM 2340B-Ca	26.0	---	0.250	mg/l	1x	--	25.0	104%	(85-115)	--	--	04/27/06 13:52	
Duplicate (6040892-DUP1)					QC Source: PPD0806-01			Extracted: 04/19/06 15:33						
Hardness (Ca)	SM 2340B-Ca	10.6	---	0.250	mg/l	1x	10.6	--	--	--	0.00%	(20)	04/27/06 13:52	
Matrix Spike (6040892-MS1)					QC Source: PPD0806-01			Extracted: 04/19/06 15:33						
Hardness (Ca)	SM 2340B-Ca	39.7	---	0.278	mg/l	1x	10.6	27.8	105%	(75-125)	--	--	04/27/06 13:52	

QC Batch: 6040896 **Water Preparation Method: General Preparation**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Blank (6040896-BLK1)								Extracted: 04/19/06 15:53						
Total Alkalinity	SM 2320B	ND	---	5.00	mg/L as CaCO3	1x	--	--	--	--	--	--	04/20/06 17:50	
Bicarbonate Alkalinity	"	ND	---	5.00	mg/l	"	--	--	--	--	--	--	"	
Carbonate Alkalinity	"	ND	---	5.00	"	"	--	--	--	--	--	--	"	
LCS (6040896-BS1)								Extracted: 04/19/06 15:53						
Total Alkalinity	SM 2320B	185	---	5.00	mg/L as CaCO3	1x	--	200	92.5%	(85-115)	--	--	04/20/06 17:50	
LCS (6040896-BS2)								Extracted: 04/19/06 15:53						
Total Alkalinity	SM 2320B	100	---	5.00	mg/L as CaCO3	1x	--	100	100%	(85-115)	--	--	04/20/06 17:50	
Duplicate (6040896-DUP1)					QC Source: PPD0515-01			Extracted: 04/19/06 15:53						
Carbonate Alkalinity	SM 2320B	ND	---	5.00	mg/l	1x	ND	--	--	--	NR	(20)	04/20/06 17:50	
Total Alkalinity	"	75.3	---	5.00	mg/L as CaCO3	"	75.6	--	--	--	0.398%	(30)	"	
Bicarbonate Alkalinity	"	75.3	---	5.00	mg/l	"	75.6	--	--	--	0.398%	(20)	"	

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Conventional Chemistry Parameters per APHA/EPA Methods - Laboratory Quality Control Results

TestAmerica - Portland, OR

QC Batch: 6040899 **Water Preparation Method: General Preparation**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Blank (6040899-BLK1)								Extracted: 04/19/06 16:08						
Turbidity	EPA 180.1	ND	---	0.200	NTU	1x	--	--	--	--	--	--	04/19/06 16:15	
LCS (6040899-BS1)								Extracted: 04/19/06 16:08						
Turbidity	EPA 180.1	19.8	---	0.200	NTU	1x	--	20.0	99.0%	(85-115)	--	--	04/19/06 16:15	
Duplicate (6040899-DUP1)				QC Source: PPD0746-01				Extracted: 04/19/06 16:08						
Turbidity	EPA 180.1	1.98	---	0.200	NTU	1x	2.00	--	--	--	1.01%	(30)	04/19/06 16:15	

QC Batch: 6040904 **Water Preparation Method: General Preparation**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Blank (6040904-BLK1)								Extracted: 04/19/06 20:39						
Color	EPA 110.2	ND	---	5.00	Color Units	1x	--	--	--	--	--	--	04/19/06 20:41	
LCS (6040904-BS1)								Extracted: 04/19/06 20:39						
Color	EPA 110.2	20.0	---	5.00	Color Units	1x	--	20.0	100%	(80-120)	--	--	04/19/06 20:41	
Duplicate (6040904-DUP1)				QC Source: PPD0797-01				Extracted: 04/19/06 20:39						
Color	EPA 110.2	ND	---	5.00	Color Units	1x	ND	--	--	--		(30)	04/19/06 20:41	

QC Batch: 6040905 **Water Preparation Method: General Preparation**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Blank (6040905-BLK1)								Extracted: 04/19/06 21:00						
Chlorine Residual (Total)	SM 4500-Cl G	ND	---	0.100	mg/l	1x	--	--	--	--	--	--	04/19/06 21:21	
LCS (6040905-BS1)								Extracted: 04/19/06 21:00						
Chlorine Residual (Total)	SM 4500-Cl G	0.942	---	0.100	mg/l	1x	--	1.00	94.2%	(85-115)	--	--	04/19/06 21:21	
Duplicate (6040905-DUP1)				QC Source: PPD0805-01				Extracted: 04/19/06 21:00						
Chlorine Residual (Total)	SM 4500-Cl G	0.500	---	0.100	mg/l	1x	0.511	--	--	--	2.18%	(30)	04/19/06 21:21	

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Conventional Chemistry Parameters per APHA/EPA Methods - Laboratory Quality Control Results

TestAmerica - Portland, OR

QC Batch: 6040932 **Water Preparation Method: General Preparation**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Blank (6040932-BLK1)								Extracted: 04/20/06 11:16						
Threshold Odor Number	EPA 140.1	ND	---	0.20	TON	1x	--	--	--	--	--	--	04/20/06 12:00	

QC Batch: 6041023 **Water Preparation Method: General Preparation**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Blank (6041023-BLK1)								Extracted: 04/21/06 22:05						
Total Organic Carbon	SM 5310C	ND	---	1.00	mg/l	1x	--	--	--	--	--	--	04/21/06 23:34	
LCS (6041023-BS1)								Extracted: 04/21/06 22:05						
Total Organic Carbon	SM 5310C	17.5	---	1.00	mg/l	1x	--	20.0	87.5%	(85-115)	--	--	04/21/06 23:48	
Duplicate (6041023-DUP1)				QC Source: PPD0510-01				Extracted: 04/21/06 22:05						
Total Organic Carbon	SM 5310C	ND	---	1.00	mg/l	1x	ND	--	--	--	NR	(30)	04/22/06 00:04	
Matrix Spike (6041023-MS1)				QC Source: PPD0510-01				Extracted: 04/21/06 22:05						
Total Organic Carbon	SM 5310C	24.8	---	1.01	mg/l	1x	0.510	25.3	96.0%	(80-130)	--	--	04/22/06 00:19	

QC Batch: 6041037 **Water Preparation Method: General Preparation**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Blank (6041037-BLK1)								Extracted: 04/24/06 07:53						
Silica (SiO2)	SM 4500-Si F	ND	---	0.500	mg/l	1x	--	--	--	--	--	--	04/24/06 12:18	
LCS (6041037-BS1)								Extracted: 04/24/06 07:53						
Silica (SiO2)	SM 4500-Si F	42.7	---	0.500	mg/l	1x	--	40.0	107%	(85-115)	--	--	04/24/06 12:18	
Duplicate (6041037-DUP1)				QC Source: PPD0570-08				Extracted: 04/24/06 07:53						
Silica (SiO2)	SM 4500-Si F	55.9	---	1.00	mg/l	2x	55.6	--	--	--	0.538%	(20)	04/24/06 12:18	
Matrix Spike (6041037-MS1)				QC Source: PPD0570-08				Extracted: 04/24/06 07:53						
Silica (SiO2)	SM 4500-Si F	75.8	---	1.00	mg/l	2x	55.6	20.0	101%	(75-125)	--	--	04/24/06 12:18	

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Ground Water Solutions	Project Name:	**Sunrise Water Authority**	
55 SW Yamhill St, Suite 400	Project Number:	157.005	Report Created:
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Conventional Chemistry Parameters per APHA/EPA Methods - Laboratory Quality Control Results

TestAmerica - Portland, OR

QC Batch: 6041047 **Water Preparation Method: General Preparation**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Blank (6041047-BLK1)								Extracted: 04/24/06 08:57						
Total Dissolved Solids	SM 2540C	ND	---	10.0	mg/l	1x	--	--	--	--	--	--	04/24/06 13:35	
LCS (6041047-BS1)								Extracted: 04/24/06 08:57						
Total Dissolved Solids	SM 2540C	102	---	10.0	mg/l	1x	--	100	102%	(85-115)	--	--	04/24/06 13:35	
Duplicate (6041047-DUP1)					QC Source: PPD0805-01			Extracted: 04/24/06 08:57						
Total Dissolved Solids	SM 2540C	48.0	---	10.0	mg/l	1x	48.0	--	--	--	0.00%	(30)	04/24/06 13:35	

QC Batch: 6041048 **Water Preparation Method: General Preparation**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Blank (6041048-BLK1)								Extracted: 04/24/06 09:02						
Total Suspended Solids	EPA 160.2	ND	---	10.0	mg/l	1x	--	--	--	--	--	--	04/24/06 15:25	
LCS (6041048-BS1)								Extracted: 04/24/06 09:02						
Total Suspended Solids	EPA 160.2	50.0	---	10.0	mg/l	1x	--	50.0	100%	(80-120)	--	--	04/24/06 15:25	
Duplicate (6041048-DUP1)					QC Source: PPD0805-01			Extracted: 04/24/06 09:02						
Total Suspended Solids	EPA 160.2	ND	---	10.0	mg/l	1x	ND	--	--	--	NR	(20)	04/24/06 15:25	

QC Batch: 6041172 **Water Preparation Method: General Preparation**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Blank (6041172-BLK1)								Extracted: 04/26/06 10:29						
Cyanide (total)	EPA 335.4	ND	---	0.00500	mg/l	1x	--	--	--	--	--	--	04/28/06 16:56	
LCS (6041172-BS1)								Extracted: 04/26/06 10:29						
Cyanide (total)	EPA 335.4	0.422	---	0.00500	mg/l	1x	--	0.400	106%	(90-110)	--	--	04/28/06 16:56	
Duplicate (6041172-DUP1)					QC Source: PPD0800-01			Extracted: 04/26/06 10:29						
Cyanide (total)	EPA 335.4	ND	---	0.00500	mg/l	1x	ND	--	--	--		(30)	04/28/06 16:56	
Matrix Spike (6041172-MS1)					QC Source: PPD0800-01			Extracted: 04/26/06 10:29						
Cyanide (total)	EPA 335.4	0.282	---	0.00500	mg/l	1x	ND	0.400	70.5%	(80-120)	--	--	04/28/06 16:56	Q-01
Matrix Spike Dup (6041172-MSD1)					QC Source: PPD0800-01			Extracted: 04/26/06 10:29						

Sarah Rockwell

Sarah Rockwell, Project Manager

TestAmerica
ANALYTICAL TESTING CORPORATION

PORTLAND, OR 9405 S.W. NIMBUS AVENUE
BEAVERTON, OR 97008-7132
ph: (503) 906.9200 fax: (503) 906.9210

Ground Water Solutions	Project Name:	**Sunrise Water Authority**	
55 SW Yamhill St, Suite 400	Project Number:	157.005	Report Created:
Portland, OR 97204	Project Manager:	Ted Ressler	06/05/06 11:53

Conventional Chemistry Parameters per APHA/EPA Methods - Laboratory Quality Control Results

TestAmerica - Portland, OR

QC Batch: 6041172 **Water Preparation Method: General Preparation**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Matrix Spike Dup (6041172-MSD1)				**QC Source: PPD0800-01**				**Extracted: 04/26/06 10:29**						
Cyanide (total)	EPA 335.4	0.309	--	0.00500	mg/l	1x	ND	0.400	77.2%	(80-120)	9.14%	(20)	04/28/06 16:56	Q-01

Sarah Rockwell

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Ground Water Solutions	Project Name:	**Sunrise Water Authority**	
55 SW Yamhill St, Suite 400	Project Number:	157:005	Report Created:
Portland, OR 97204	Project Manager:	Ted Ressler	06/05/06 11:53

Anions per EPA Method 300.0 - Laboratory Quality Control Results

TestAmerica - Portland, OR

QC Batch: 6040844 **Water Preparation Method: Wet Chem**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Blank (6040844-BLK1)								Extracted: 04/19/06 08:33						
Nitrate/Nitrite-Nitrogen	EPA 300.0	ND	---	0.200	mg/l	1x	--	--	--	--	--	--	04/19/06 10:48	
Sulfate	"	ND	---	1.00	"	"	--	--	--	--	--	--	"	
Chloride	"	ND	---	0.500	"	"	--	--	--	--	--	--	"	
Nitrite-Nitrogen	"	ND	---	0.100	"	"	--	--	--	--	--	--	"	
Nitrate-Nitrogen	"	ND	---	0.100	"	"	--	--	--	--	--	--	"	
LCS (6040844-BS1)								Extracted: 04/19/06 08:33						
Sulfate	EPA 300.0	32.0	---	1.00	mg/l	1x	--	30.0	107%	(90-110)	--	--	04/19/06 11:04	
Chloride	"	10.4	---	0.500	"	"	--	10.0	104%	"	--	--	"	
Nitrite-Nitrogen	"	5.09	---	0.100	"	"	--	5.00	102%	"	--	--	"	
Nitrate-Nitrogen	"	5.16	---	0.100	"	"	--	"	103%	"	--	--	"	
Duplicate (6040844-DUP1)					QC Source: PPD0570-08			Extracted: 04/19/06 08:33						
Sulfate	EPA 300.0	20.7	---	1.00	mg/l	1x	20.7	--	--	--	0.00%	(30)	04/19/06 11:19	
Nitrate/Nitrite-Nitrogen	"	8.02	---	0.200	"	"	8.03	--	--	--	0.125%	"	"	
Nitrite-Nitrogen	"	ND	---	0.100	"	"	ND	--	--	--	NR	"	"	
Nitrate-Nitrogen	"	8.02	---	0.100	"	"	8.03	--	--	--	0.125%	"	"	
Chloride	"	11.8	---	0.500	"	"	11.8	--	--	--	0.00%	"	"	
Matrix Spike (6040844-MS1)					QC Source: PPD0570-08			Extracted: 04/19/06 08:33						
Chloride	EPA 300.0	14.2	---	0.556	mg/l	1x	11.8	2.22	108%	(80-120)	--	--	04/19/06 11:35	
Sulfate	"	25.4	---	1.11	"	"	20.7	4.44	106%	"	--	--	"	
Nitrate-Nitrogen	"	10.4	---	0.111	"	"	8.03	2.22	107%	"	--	--	"	
Nitrite-Nitrogen	"	2.23	---	0.111	"	"	ND	"	100%	"	--	--	"	
Matrix Spike (6040844-MS2)					QC Source: PPD0805-01			Extracted: 04/19/06 08:33						
Chloride	EPA 300.0	5.71	---	0.556	mg/l	1x	3.33	2.22	107%	(80-120)	--	--	04/19/06 20:40	
Nitrate-Nitrogen	"	2.56	---	0.111	"	"	0.230	"	105%	"	--	--	"	
Nitrite-Nitrogen	"	2.03	---	0.111	"	"	ND	"	91.4%	"	--	--	"	
Sulfate	"	6.56	---	1.11	"	"	2.21	4.44	98.0%	"	--	--	"	
Matrix Spike Dup (6040844-MSD1)					QC Source: PPD0570-08			Extracted: 04/19/06 08:33						
Nitrate-Nitrogen	EPA 300.0	10.4	---	0.111	mg/l	1x	8.03	2.22	107%	(80-120)	0.00%	(20)	04/19/06 11:50	
Chloride	"	14.2	---	0.556	"	"	11.8	"	108%	"	0.00%	"	"	
Sulfate	"	25.5	---	1.11	"	"	20.7	4.44	108%	"	0.393%	"	"	
Nitrite-Nitrogen	"	2.23	---	0.111	"	"	ND	2.22	100%	"	0.00%	"	"	

Sarah Rockwell

Sarah Rockwell, Project Manager

TestAmerica
ANALYTICAL TESTING CORPORATION

PORTLAND, OR 9405 S.W. NIMBUS AVENUE
BEAVERTON, OR 97008-7132
ph: (503) 906.9200 fax: (503) 906.9210

Ground Water Solutions	Project Name:	**Sunrise Water Authority**	
55 SW Yamhill St, Suite 400	Project Number:	157:005	Report Created:
Portland, OR 97204	Project Manager:	Ted Ressler	06/05/06 11:53

Disinfection By-Products in Drinking Water per EPA 552.2 - Laboratory Quality Control Results

TestAmerica - Portland, OR

QC Batch: 6041285 **Water Preparation Method: Micro Liq/Liq Shake**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Blank (6041285-BLK1)								Extracted: 04/28/06 10:03						
Monochloroacetic acid (MCAA)	EPA 552.2	ND	---	0.00150	mg/l	1x	--	--	--	--	--	--	05/02/06 15:06	
Monobromoacetic acid (MBAA)	"	ND	---	0.00100	"	"	--	--	--	--	--	--	"	
Dibromoacetic acid (DBAA)	"	ND	---	0.000500	"	"	--	--	--	--	--	--	"	
Dichloroacetic acid (DCAA)	"	ND	---	0.00150	"	"	--	--	--	--	--	--	"	
Trichloroacetic acid (TCAA)	"	ND	---	0.000500	"	"	--	--	--	--	--	--	"	
Total Haloacetic Acids (HAA5)	"	ND	---	0.00150	"	"	--	--	--	--	--	--	"	
Surrogate(s): 2,3-Dibromopropionic acid		*Recovery: 96.2%*			*Limits: 70-130%*	"							*05/02/06 15:06*	
LCS (6041285-BS1)								Extracted: 04/28/06 10:03						
Monochloroacetic acid (MCAA)	EPA 552.2	0.00790	---	0.00150	mg/l	1x	--	0.00750	105%	(70-130)	--	--	05/02/06 14:33	
Monobromoacetic acid (MBAA)	"	0.00491	---	0.00100	"	"	--	0.00500	98.2%	"	--	--	"	
Dibromoacetic acid (DBAA)	"	0.00277	---	0.000500	"	"	--	0.00250	111%	"	--	--	"	
Dichloroacetic acid (DCAA)	"	0.00873	---	0.00150	"	"	--	0.00750	116%	"	--	--	"	
Trichloroacetic acid (TCAA)	"	0.00301	---	0.000500	"	"	--	0.00250	120%	"	--	--	"	
Surrogate(s): 2,3-Dibromopropionic acid		*Recovery: 125%*			*Limits: 70-130%*	"							*05/02/06 14:33*	
Matrix Spike (6041285-MS1)							QC Source: PPD0800-01	Extracted: 04/28/06 10:03						
Monochloroacetic acid (MCAA)	EPA 552.2	0.00762	---	0.00150	mg/l	1x	ND	0.00750	102%	(70-130)	--	--	05/02/06 16:12	
Monobromoacetic acid (MBAA)	"	0.00559	---	0.00100	"	"	ND	0.00500	112%	"	--	--	"	
Dibromoacetic acid (DBAA)	"	0.00282	---	0.000500	"	"	0.000147	0.00250	107%	"	--	--	"	
Dichloroacetic acid (DCAA)	"	0.0104	---	0.00150	"	"	0.00286	0.00750	101%	"	--	--	"	
Trichloroacetic acid (TCAA)	"	0.00485	---	0.000500	"	"	0.00211	0.00250	110%	"	--	--	"	
Surrogate(s): 2,3-Dibromopropionic acid		*Recovery: 105%*			*Limits 70-130%*	"							*05/02/06 16:12*	
Matrix Spike Dup (6041285-MSD1)							QC Source: PPD0800-01	Extracted: 04/28/06 10:03						
Monochloroacetic acid (MCAA)	EPA 552.2	0.00737	---	0.00150	mg/l	1x	ND	0.00750	98.3%	(70-130)	3.34%	(30)	05/02/06 16:45	
Monobromoacetic acid (MBAA)	"	0.00524	---	0.00100	"	"	ND	0.00500	105%	"	6.46%	"	"	
Dibromoacetic acid (DBAA)	"	0.00271	---	0.000500	"	"	0.000147	0.00250	103%	"	3.98%	"	"	
Dichloroacetic acid (DCAA)	"	0.0102	---	0.00150	"	"	0.00286	0.00750	97.9%	"	1.94%	"	"	
Trichloroacetic acid (TCAA)	"	0.00448	---	0.000500	"	"	0.00211	0.00250	94.8%	"	7.93%	"	"	
Surrogate(s): 2,3-Dibromopropionic acid		*Recovery: 105%*			*Limits: 70-130%*	"							*05/02/06 16:45*	

Sarah Rockwell

Sarah Rockwell, Project Manager

TestAmerica
ANALYTICAL TESTING CORPORATION

PORTLAND, OR 9405 S.W. NIMBUS AVENUE
BEAVERTON, OR 97008-7132
ph: (503) 906.9200 fax: (503) 906.9210

Ground Water Solutions	Project Name:	**Sunrise Water Authority**	
55 SW Yamhill St, Suite 400	Project Number:	157:005	Report Created:
Portland, OR 97204	Project Manager:	Ted Ressler	06/05/06 11:53

Total Trihalomethanes in Drinking Water per EPA 524.2 - Laboratory Quality Control Results

TestAmerica - Portland, OR

QC Batch: 6041116 **Water Preparation Method: EPA 5030B**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Blank (6041116-BLK1)								Extracted: 04/25/06 10:04						
Bromodichloromethane	EPA 524.2	ND	---	0.000500	mg/l	1x	--	--	--	--	--	--	04/25/06 13:59	
Bromoform	"	ND	---	0.000500	"	"	--	--	--	--	--	--	"	
Chloroform	"	ND	---	0.000500	"	"	--	--	--	--	--	--	"	
Dibromochloromethane	"	ND	---	0.000500	"	"	--	--	--	--	--	--	"	
Total Trihalomethanes	"	ND	---	0.000500	"	"	--	--	--	--	--	--	"	
Surrogate(s): Dibromofluoromethane		*Recovery: 104%*			*Limits: 70-130%*	"							*04/25/06 13:59*	
1,2-DCA-d4		*112%*			*70-130%*	"							"	
Toluene-d8		*97.0%*			*70-130%*	"							"	
4-BFB		*78.0%*			*70-130%*	"							"	
LCS (6041116-BS1)								Extracted: 04/25/06 10:04						
Bromodichloromethane	EPA 524.2	0.00557	---	0.000500	mg/l	1x	--	0.00500	111%	(70-130)	--	--	04/25/06 12:34	
Bromoform	"	0.00496	---	0.000500	"	"	--	"	99.2%	"	--	--	"	
Chloroform	"	0.00551	---	0.000500	"	"	--	"	110%	"	--	--	"	
Dibromochloromethane	"	0.00508	---	0.000500	"	"	--	"	102%	"	--	--	"	
Surrogate(s): Dibromofluoromethane		*Recovery: 101%*			*Limits: 70-130%*	"							*04/25/06 12:34*	
1,2-DCA-d4		*101%*			*70-130%*	"							"	
Toluene-d8		*99.6%*			*70-130%*	"							"	
4-BFB		*110%*			*70-130%*	"							"	
Matrix Spike (6041116-MS1)					QC Source: PPD0615-01			Extracted: 04/25/06 10:04						
Bromodichloromethane	EPA 524.2	0.0272	---	0.000500	mg/l	1x	ND	0.0250	109%	(70-130)	--	--	04/25/06 20:42	
Bromoform	"	0.0218	---	0.000500	"	"	ND	"	87.2%	"	--	--	"	
Chloroform	"	0.0270	---	0.000500	"	"	ND	"	108%	"	--	--	"	
Dibromochloromethane	"	0.0246	---	0.000500	"	"	ND	"	98.4%	"	--	--	"	
Surrogate(s): Dibromofluoromethane		*Recovery: 101%*			*Limits: 70-130%*	"							*04/25/06 20:42*	
1,2-DCA-d4		*97.2%*			*70-130%*	"							"	
Toluene-d8		*101%*			*70-130%*	"							"	
4-BFB		*106%*			*70-130%*	"							"	
Matrix Spike Dup (6041116-MSD1)					QC Source: PPD0615-01			Extracted: 04/25/06 10:04						
Bromodichloromethane	EPA 524.2	0.0264	---	0.000500	mg/l	1x	ND	0.0250	106%	(70-130)	2.99%	(30)	04/25/06 21:10	
Bromoform	"	0.0206	---	0.000500	"	"	ND	"	82.4%	"	5.66%	"	"	
Chloroform	"	0.0258	---	0.000500	"	"	ND	"	103%	"	4.55%	"	"	
Dibromochloromethane	"	0.0243	---	0.000500	"	"	ND	"	97.2%	"	1.23%	"	"	
Surrogate(s): Dibromofluoromethane		*Recovery: 103%*			*Limits: 70-130%*	"							*04/25/06 21:10*	
1,2-DCA-d4		*101%*			*70-130%*	"							"	
Toluene-d8		*103%*			*70-130%*	"							"	
4-BFB		*102%*			*70-130%*	"							"	

Sarah Rockwell

Sarah Rockwell, Project Manager

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Ground Water Solutions	Project Name:	**Sunrise Water Authority**	
55 SW Yamhill St, Suite 400	Project Number:	157:005	Report Created:
Portland, OR 97204	Project Manager:	Ted Ressler	06/05/06 11:53

Physical Parameters per APHA/ASTM/EPA Methods - Laboratory Quality Control Results

TestAmerica - Portland, OR

QC Batch: 6040891 **Water Preparation Method: General Preparation**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Duplicate (6040891-DUP1)					**QC Source: PPD0798-01**				**Extracted: 04/19/06 15:23**					
Corrosivity	EPA 9040A	7.15	---		pH Units	1x	7.20	--	--	--	0.697%	(30)	04/19/06 15:30	

Sarah Rockwell

Sarah Rockwell, Project Manager

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Ground Water Solutions	Project Name:	**Sunrise Water Authority**	
55 SW Yamhill St, Suite 400	Project Number:	157:005	Report Created:
Portland, OR 97204	Project Manager:	Ted Ressler	06/05/06 11:53

Notes and Definitions

Report Specific Notes:

BS-1	-	Laboratory Control Sample and/or Laboratory Control Sample Duplicate recovery was above the laboratory control limits. Analyte not detected, data not impacted.
M-04	-	Sample Filtered through 0.45 micron filter in Laboratory prior to analysis.
MS-4	-	Due to high levels of analyte in the sample, the Matrix Spike/Matrix Spike Duplicate calculation does not provide useful spike recovery information. See Laboratory Control Sample.
Q-01	-	The matrix spike recovery, and/or RPD, for this QC sample is outside of established control limits. Failure of a matrix spike QC sample does not represent an out-of-control condition for the batch.
Q-03	-	The matrix spike recovery, and/or RPD, for this QC sample cannot be accurately calculated due to the high concentration of analyte already present in the source sample.

Laboratory Reporting Conventions:

DET	-	Analyte DETECTED at or above the Reporting Limit. Qualitative Analyses only.
ND	-	Analyte NOT DETECTED at or above the reporting limit (MDL or MRL, as appropriate).
NR/NA	-	Not Reported / Not Available
dry	-	Sample results reported on a Dry Weight Basis. Results and Reporting Limits have been corrected for Percent Dry Weight.
wet	-	Sample results and reporting limits reported on a Wet Weight Basis (as received). Results with neither 'wet' nor 'dry' are reported on a Wet Weight Basis.
RPD	-	RELATIVE PERCENT DIFFERENCE (RPDs calculated using Results, not Percent Recoveries).
MRL	-	METHOD REPORTING LIMIT. Reporting Level at, or above, the lowest level standard of the Calibration Table.
MDL*	-	METHOD DETECTION LIMIT. Reporting Level at, or above, the statistically derived limit based on 40CFR, Part 136, Appendix B. *MDLs are listed on the report only if the data has been evaluated below the MRL. Results between the MDL and MRL are reported as Estimated Results.
Dil	-	Dilutions are calculated based on deviations from the standard dilution performed for an analysis, and may not represent the dilution found on the analytical raw data.
Reporting Limits	-	Reporting limits (MDLs and MRLs) are adjusted based on variations in sample preparation amounts, analytical dilutions and percent solids, where applicable.
Electronic Signature	-	Electronic Signature added in accordance with TestAmerica's *Electronic Reporting and Electronic Signatures Policy.* Application of electronic signature indicates that the report has been reviewed and approved for release by the laboratory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Sarah Rockwell

Sarah Rockwell, Project Manager

NEILSON RESEARCH CORPORATION
Environmental Testing Laboratory

04/25/06

Sarah Rockwell
North Creek Analytical - Portland
9405 SW Nimbus Avenue
Beaverton, OR 97008

TEL: (503) 906-9200
FAX (503) 906-9210

RE: NCA # PPD0805-01

Order No.: 0604394

Dear Sarah Rockwell:

Neilson Research Corporation received 1 sample(s) on 04/20/06 for the analyses presented in the following report.

The results relate only to the parameters tested or to the sample as received by the laboratory. This report shall not be reproduced except in full, without the written approval of Neilson Research Corporation. If you have any questions regarding these test results, please feel free to call.

Sincerely,
Neilson Research Corporation

Fay L. Fowler
Project Manager

245 South Grape Street ▵ Medford, OR 97501-3123 ▵ (541) 770-5678 ▵ fax (541) 770-2901

Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

Analysis Report

ORELAP 100016
EPA OR00028

North Creek Analytical - Portland
9405 SW Nimbus Avenue
Beaverton, OR 97008

Lab Order: **0604394**
NRC Sample ID: **0604394-01B**
Collection Date: **04/19/06 11:30:00 AM**
Received Date: **04/20/06 8:50:00 AM**
Reported Date: **04/25/06 11:52:35 AM**

Sample Information:

NCA # PPD0805-01

Client Sample ID: PPD0805-01
Collectors Name: Client
Sample Location: SWA-SW-CRW
Source: Sunrise ASR

ANALYTICAL RESULTS

Analyses	Method	NELAC Accredited	Result	Qual	MRL	Units	EPA Limit	Date Analyzed	Analyst
Fluoride	EPA 300.0	A	**ND**		0.2	mg/L	2 - 4	04/20/06	KRM

Notes: ND - Not Detected at the MRL N.L. - No Limit MRL - Minimum Reporting Limit

2

Neilson Research Corporation

Date: 25-Apr-06

CLIENT: North Creek Analytical - Portland
Work Order: 0604394
Project: NCA # PPD0805-01

ANALYTICAL QC SUMMARY REPORT

TestCode: EPA300_W

Sample ID	MB	SampType:	MBLK	TestCode:	EPA300_W	Units:	mg/L	Prep Date:		RunNo:	29474
Client ID:	ZZZZZ	Batch ID:	R29474	TestNo:	EPA 300.0			Analysis Date:	04/20/06	SeqNo:	442763

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Fluoride	ND	0.200									

Sample ID	LCS	SampType:	LCS	TestCode:	EPA300_W	Units:	mg/L	Prep Date:		RunNo:	29474
Client ID:	ZZZZZ	Batch ID:	R29474	TestNo:	EPA 300.0			Analysis Date:	04/20/06	SeqNo:	442764

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Fluoride	2.607	0.200	2.5	0	104	90	110				

Sample ID	0604405-01AMS	SampType:	MS	TestCode:	EPA300_W	Units:	mg/L	Prep Date:		RunNo:	29474
Client ID:	ZZZZZ	Batch ID:	R29474	TestNo:	EPA 300.0			Analysis Date:	04/20/06	SeqNo:	442786

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Fluoride	4.801	0.200	3.75	1.13	97.9	80	120				

Sample ID	0604405-01AMSD	SampType:	MSD	TestCode:	EPA300_W	Units:	mg/L	Prep Date:		RunNo:	29474
Client ID:	ZZZZZ	Batch ID:	R29474	TestNo:	EPA 300.0			Analysis Date:	04/20/06	SeqNo:	442787

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Fluoride	4.934	0.200	3.75	1.13	101	80	120	4.801	2.74	20	

Qualifiers:

E	Value above quantitation range	H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Minimum Reporting Limit	R	RPD outside accepted recovery limits	S	Spike Recovery outside accepted recovery limits

Neilson Research Corporation

Date: 25-Apr-06

CLIENT: North Creek Analytical - Portland
Work Order: 0604394
Project: NCA # PPD0805-01

ANALYTICAL QC SUMMARY REPORT

TestCode: MBAS

Sample ID	MBLK	SampType:	MBLK	TestCode:	MBAS	Units:	mg/L	Prep Date:		RunNo:	29500
Client ID:	ZZZZZ	Batch ID:	R29500	TestNo:	SM 5540C			Analysis Date:	04/20/06	SeqNo:	443217

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
MBAS	ND	0.10									

Sample ID	LCS	SampType:	LCS	TestCode:	MBAS	Units:	mg/L	Prep Date:		RunNo:	29500
Client ID:	ZZZZZ	Batch ID:	R29500	TestNo:	SM 5540C			Analysis Date:	04/20/06	SeqNo:	443218

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
MBAS	0.5010	0.10	0.482	0	104	80	120				

Sample ID	0604394-01AMS	SampType:	MS	TestCode:	MBAS	Units:	mg/L	Prep Date:		RunNo:	29500
Client ID:	PPD0805-01	Batch ID:	R29500	TestNo:	SM 5540C			Analysis Date:	04/20/06	SeqNo:	443221

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
MBAS	0.5170	0.10	0.5	0.0284	97.7	80	120				

Sample ID	0604394-01AMSD	SampType:	MSD	TestCode:	MBAS	Units:	mg/L	Prep Date:		RunNo:	29500
Client ID:	PPD0805-01	Batch ID:	R29500	TestNo:	SM 5540C			Analysis Date:	04/20/06	SeqNo:	443222

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
MBAS	0.5560	0.10	0.5	0.0284	106	80	120	0.517	7.27	15	

Qualifiers:

E	Value above qua..titation range	H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Minimum r.eporting Limit	R	RPD outside accepted recovery limits	S	Spike Recovery outside accepted recovery limits

SUBCONTRACT ORDER

North Creek Analytical - Portland

PPD0805

SENDING LABORATORY:

North Creek Analytical - Portland
9405 SW Nimbus Ave.
Beaverton, OR 97008
Phone: (503) 906-9200
Fax: (503) 906-9210
Project Manager: Sarah Rockwell

RECEIVING LABORATORY:

Neilson Research Corp.
245 S. Grape St.
Medford, OR 97501
Phone :541-770-5678
Fax: 541-770-2901

Analysis	Due	Expires	Laboratory ID	Comments
				06043924
Sample ID: PPD0805-01	**Water**	**Sampled:04/19/06 11:30**	[redacted]	
DW MBAS - SUB	05/02/06 23:59	04/21/06 11:30	01A	
DW IC Fluoride (300)	05/02/06 23:59	05/17/06 11:30	01B	
Containers Supplied:				
1L Poly - Unpres (W)	250 mL Poly - Unpres. (X			

2.1°C cooler w/ ice

Released By	Date	Received By	Date
[signature]	4.19.06	[signature]	4/20/06 8:50
Released By	Date	Received By	Date

Analytical Data Package Prepared For

North Creek Analytical

Radiochemical Analysis By

STL Richland

2800 G.W. Way, Richland Wa, 99354, (509)-375-3131.

Assigned Laboratory Code:

Data Package Contains 19 Pages

Report No.: 32207

SDG No.	Order No.	Client Sample ID (List Order)	Lot-Sa No.	Work Order	Report DB ID	Batch No.
31430		PPD0805-01	J6D200273-2	H3PNP1AA	9H3PNP10	6110559
		PPD0805-01	J6D200273-1	H3PM51AE	9H3PM510	6114557
		PPD0805-01	J6D200273-1	H3PM51AD	9H3PM510	6114559
		PPD0805-01	J6D200273-1	H3PM51AA	9H3PM510	6114561
		PPD0805-01	J6D200273-1	H3PM51AC	9H3PM510	6114562
		PPD0806-01	J6D200273-3	H3PNR1AA	9H3PNR10	6110559
		PPD0806-01	J6D200273-4	H3PN21AE	9H3PN210	6114557
		PPD0806-01	J6D200273-4	H3PN21AD	9H3PN210	6114559
		PPD0806-01	J6D200273-4	H3PN21AA	9H3PN210	6114561
		PPD0806-01	J6D200273-4	H3PN21AC	9H3PN210	6114562

SEVERN TRENT STL

Certificate of Analysis

STL Richland
2800 George Washington Way
Richland, WA 99352

Tel: 509 375 3131 Fax: 509 375 5590
www.stl-inc.com

May 26, 2006

North Creek Analytical – Portland
9405 SW Nimbus Ave.
Beaverton, OR 97008

Attention: Sarah Rockwell

Date Received	:	April 20, 2006
Sample Number/Matrix	:	Two (2) Waters
SDG Number	:	31430
Project Number	:	PPD0805-01, PPD0806-01

CASE NARRATIVE

I. Introduction

On April 20, 2006, two water samples were received at the STL Richland (STLR) laboratory for radiochemical analysis. Upon receipt, the samples were assigned the STLR identification numbers as described on the cover page of the Analytical Data Package. These samples were assigned to Lot Number J6D200276.

II. Sample Receipt

The samples were received in good condition and no anomalies were noted during check-in.

III. Analytical Results/Methodology

The analytical results for this report are presented by laboratory sample ID. Each set of data includes sample identification information; analytical results and the appropriate associated statistical uncertainties.

The analyses requested were:

Gas Proportional Counting
Gross Alpha by method RICH-RC-5014 (EPA 900.0)
Gross Beta by method RICH-RC-5014 (EPA 900.0)
Radium-228 by method STL RICH-RC-5005 (EPA 904.0)
Liquid Scintillation Counting
Radon-222 by Method RICHRC-5082 (EPA 913.0)
Alpha Scintillation
Radium-226 by method RICH-RC-5005 (EPA 903.1)

IV. Quality Control

The analytical result for each analysis performed includes a minimum of one laboratory control sample (LCS), and one reagent blank sample analysis. Any exceptions have been noted in the "Comments" section.

V. Comments

Gross Alpha by method RICH-RC-5014:

The LCS, batch blank, matrix spike, sample, and sample duplicate results are within acceptance limits.

Gross Beta by method RICH-RC-5014:

The LCS, batch blank, matrix spike, sample, and sample duplicate results are within acceptance limits.

Radium-228 Analysis:

The LCS, batch blank, sample and sample duplicate results are within acceptance limits.

Radium-226 by method RICH-RC-5005:

The LCS, batch blank, sample, and sample duplicate results are within acceptance limits.

Radon-222 by Method EPA 913.0:

The LCS has a 147% recovery. All the sample results are below CRDL. The samples cannot be reanalyzed due to holding time violations. Data accepted. Except as noted, the LCS, batch blank, sample and sample duplicate results are within acceptance limits.

I certify that this Certificate of Analysis is in compliance with the SOW, both technically and for completeness, for other than the conditions detailed above. The Laboratory Manager or a designee, as verified by the following signature has authorized release of the data contained in this hard copy data package.

Reviewed and approved:

Sherryl A. Adam
Project Manager

Drinking Water Method Cross References

	DRINKING WATER ASTM METHOD CROSS REFERENCES	
Referenced Method	**Isotope(s)**	**STL Richland's SOP number**
EPA 901.1	Cs-134, I-131	RICH-RC-5017
EPA 900.0	Alpha & Beta	RICH-RC-5014
EPA 903.1	Ra-226	RICH-RC-5005
EPA 904.0	Ra-228	RICH-RC-5005
EPA 905.0	Sr89/90	RICH-RC-5006
ASTM D2460	Total Radium	RICH-RC-5027
Standard Method 7500-U-C & ASTM D5174	Uranium	RICH-RC-5058
EPA 906.0	Tritium	RICH-RC-5007
NOTE:		
The Gross Alpha LCS is prepared with Am-241 (unless otherwise specified in the case narrative)		
The Gross Beta LCS is prepared with Sr/Y-90 (unless otherwise specified in the case narrative)		

Uncertainty Estimation

STL Richland has adopted the internationally accepted approach to estimating uncertainties described in "NIST Technical Note 1297, 1994 Edition". The approach, "Law of Propagation of Errors", involves the identification of all variables in an analytical method which are used to derive a result. These variables are related to the analytical result (R) by some functional relationship, R = constants * f(x,y,z,...). The components (x,y,z) are evaluated to determine their contribution to the overall method uncertainty. The individual component uncertainties (u_i) are then combined using a statistical model that provides the most probable overall uncertainty value. All component uncertainties are categorized as type A, evaluated by statistical methods, or type B, evaluated by other means. Uncertainties not included in the components, such as sample homogeneity, are combined with the component uncertainty as the square root of the sum-of-the-squares of the individual uncertainties. The uncertainty associated with the derived result is the combined uncertainty (u_c) multiplied by the coverage factor (1,2, or 3).

When three or more sample replicates are used to derive the analytical result, the type A uncertainty is the standard deviation of the mean value (S/vn), where S is the standard deviation of the derived results. The type B uncertainties are all other random or non-random components that are not included in the standard deviation.

The derivation of the general "Law of Propagation of Errors" equations and specific example are available on request.

Report Definitions

Action Lev	An agreed upon activity level used to trigger some action when the final result is greater than or equal to the Action Level. Often the Action Level is related to the Decision Limit.
Batch	The QC preparation batch number that relates laboratory samples to QC samples that were prepared and analyzed together.
Bias	Defined by the equation (Result/Expected)-1 as defined by ANSI N13.30.
COC No	Chain of Custody Number assigned by the Client or STL Richland.
Count Error (#s)	Poisson counting statistics of the gross sample count and background. The uncertainty is absolute and in the same units as the result. For Liquid Scintillation Counting (LSC) the batch blank count is the background.
Total Uncert (#s) u_c - *Combined Uncertainty.*	All known uncertainties associated with the preparation and analysis of the sample are propagated to give a measure of the uncertainty associated with the result, u_c *the combined uncertainty.* The uncertainty is absolute and in the same units as the result.
(#s), Coverage Factor	The coverage factor defines the width of the confidence interval, 1, 2 or 3 standard deviations.
CRDL (RL)	Contractual Required Detection Limit as defined in the Client's Statement Of Work or STL Richland "default" nominal detection limit. Often referred to the reporting level (RL)
Lc	Decision Level based on instrument background or blank, adjusted by the Efficiency, Chemical Yield, and Volume associated with the sample. The Type I error probability is approximately 5%. Lc=(1.645 * Sqrt(2*(BkgrndCnt/BkgrndCntMin)/SCntMin)) * (ConvFct/(Eff*Yld*Abn*Vol) * IngrFct). For LSC methods the batch blank is used as a measure of the background variability. Lc cannot be calculated when the background count is zero.
Lot-Sample No	The number assigned by the LIMS software to track samples received on the same day for a given client. The sample number is a sequential number assigned to each sample in the Lot.
MDC|MDA	Detection Level based on instrument background or blank, adjusted by the Efficiency, Chemical Yield, and Volume with a Type I and II error probability of approximately 5%. MDC = (4.65 * Sqrt((BkgrndCnt/BkgrndCntMin)/SCntMin) + 2.71/SCntMin) * (ConvFct/(Eff * Yld * Abn * Vol) * IngrFct). For LSC methods the batch blank is used as a measure of the background variability.
Primary Detector	The instrument identifier associated with the analysis of the sample aliquot.
Ratio U-234/U-238	The U-234 result divided by the U-238 result. The U-234/U-238 ratio for natural uranium in NIST SRM 4321C is 1.038.
Rst/MDC	Ratio of the Result to the MDC. A value greater than 1 may indicate activity above background at a high level of confidence. Caution should be used when applying this factor and it should be used in concert with the qualifiers associated with the result.
Rst/TotUcert	Ratio of the Result to the Total Uncertainty. If the uncertainty has a coverage factor of 2 a value greater than 1 may indicate activity above background at approximately the 95% level of confidence assuming a two-sided confidence interval. Caution should be used when applying this factor and it should be used in concert with the qualifiers associated with the result.
Report DB No	Sample Identifier used by the report system. The number is based upon the first five digits of the **Work Order** Number.
RER	The equation Replicate Error Ratio = (S-D)/[sqrt($TPUs^2 + TPUd^2$)] as defined by ICPT BOA where S is the original sample result, D is the result of the duplicate, TPUs is the total uncertainty of the original sample and TPUd is the total uncertainty of the duplicate sample.
SDG	Sample Delivery Group Number assigned by the Client or assigned by STL Richland upon sample receipt.
Sum Rpt Alpha Spec Rst(s)	The sum of the reported alpha spec results for tests derived from the same sample excluding duplicate result where the results are in the same units.
Work Order	The LIMS software assign test specific identifier.
Yield	The recovery of the tracer added to the sample such as Pu-242 used to trace a Pu-239/40 method.

Sample Results Summary

STL Richland

Ordered by Method, Batch No., Client Sample ID.

Date: 26-May-06

Report No. : 32207

SDG No: 31393

Batch / Client Id / Work Order	Parameter	Result +- Uncertainty (2s)	Qual	Units	Yield	MDC or MDA	CRDL	RER2
6114557 RICHRC5014								
1-1 DUP								
H3G3D1AE	ALPHA	0.852 +- 0.812	U	pCi/L	100%	1.28	3.0	1.3
PPD0805-01								
H3PM51AE	ALPHA	-0.1970 +- 0.264	U	pCi/L	100%	1.2	3.0	
PPD0806-01								
H3PN21AE	ALPHA	-0.0881 +- 0.273	U	pCi/L	100%	1.1	3.0	
6114559 RICHRC5014								
PPD0805-01								
H3PM51AD	BETA	1.18 +- 1.33	U	pCi/L	100%	2.75	4.0	
PPD0805-01 DUP								
H3PM51AF	BETA	1.03 +- 1.16	U	pCi/L	100%	2.37	4.0	0.2
PPD0806-01								
H3PN21AD	BETA	1.45 +- 1.30	U	pCi/L	100%	2.62	4.0	
6114562 RICHRC5005								
PPD0805-01								
H3PM51AC	RA-228	0.0326 +- 0.164	U	pCi/L	88%	0.407	1.0	
PPD0805-01 DUP								
H3PM51AH	RA-228	0.306 +- 0.179	U	pCi/L	96%	0.343	1.0	2.2
PPD0806-01								
H3PN21AC	RA-228	0.385 +- 0.216	U	pCi/L	89%	0.407	1.0	
6110559 EITR								
PPD0805-01								
H3PNP1AA	RN-222	-10.800 +- 22.4	U	pCi/L	100%	34.8	50.0	
PPD0805-01 DUP								
H3PNP1AC	RN-222	-6.3100 +- 22.6	U	pCi/L	100%	34.8	50.0	0.3
PPD0806-01								
H3PNR1AA	RN-222	-7.6700 +- 22.6	U	pCi/L	100%	34.8	50.0	
6114561 RICHRC5005								
PPD0805-01								
H3PM51AA	RA-226	-0.0473 +- 0.111	U	pCi/L	100%	0.233	1.0	
PPD0805-01 DUP								
H3PM51AG	RA-226	0.0971 +- 0.157	U	pCi/L	108%	0.271	1.0	
PPD0806-01								
H3PN21AA	RA-226	0.0822 +- 0.124	U	pCi/L	100%	0.214	1.0	

No. of Results: 15

STL Richland

rptSTLRchSaSummary2 V4.15.0 A97

RER2 - Replicate Error Ratio = (S-D)/[sqrt(sq(TPUs)+sq(TPUd))] as defined by ICPT BOA.

U Qual - Analyzed for but not detected above limiting criteria. Limit criteria is less than the Mdc/Mda or Total Uncert or not identified by gamma scan software.

QC Results Summary

STL Richland

Ordered by Method, Batch No, QC Type,.

Date: 26-May-06

Report No. : 32207

SDG No.: 31393

Batch / Work Order	Parameter	Result +- Uncertainty (2s)	Qual	Units	Yield	Recovery	Bias	MDC|MDA
RICHRC5014								
6114557 MATRIX SPIKE								
H3G3D1AD	ALPHA	29.2 +- 8.43		pCi/L	100%	72%	-0.3	1.01
6114557 BLANK QC								
H30NP1AA	ALPHA	-0.0346 +- 0.344	U	pCi/L	100%			1.13
6114557 LCS								
H30NP1AC	ALPHA	43.3 +- 12.0		pCi/L	100%	106%	0.1	1.04
RICHRC5014								
6114559 BLANK QC								
H30N11AA	BETA	0.731 +- 1.25	U	pCi/L	100%			2.66
6114559 LCS								
H30N11AC	BETA	36.2 +- 6.27		pCi/L	100%	90%	-0.1	2.74
6114559 MATRIX SPIKE								
H3PN21AF	BETA	111.0 +- 15.2		pCi/L	100%	98%	0.0	2.66
RICHRC5005								
6114562 BLANK QC								
H30N71AA	RA-228	0.0260 +- 0.0197	U	pCi/L	87%			0.0405
6114562 LCS								
H30N71AC	RA-228	5.19 +- 0.773		pCi/L	89%	102%	0.0	0.341
EITR								
6110559 BLANK QC								
H3P341AA	RN-222	-17.300 +- 18.2	U	pCi/L	100%			29.0
6110559 LCS								
H3P341AC	RN-222	9950.0 +- 1110.0		pCi/L	100%	147%	0.5	29.0
RICHRC5005								
6114561 BLANK QC								
H30N51AA	RA-226	0.126 +- 0.0905		pCi/L	99%			0.118
6114561 LCS								
H30N51AC	RA-226	1.37 +- 0.374		pCi/L	99%	100%	0.0	0.149

No. of Results: 12

STL Richland

rptSTLRchQcSummary V4.15.0 A97

Bias - (Result/Expected)-1 as defined by ANSI N13.30.

U Qual - Analyzed for but not detected above limiting criteria. Limit criteria is less than the Mdc/Mda or Total Uncert or not identified by gamma scan software.

FORM I

SAMPLE RESULTS

Date: 26-May-06

Lab Name: STL Richland
SDG: 31430
Collection Date: 4/19/2006 11:30:00 AM
Lot-Sample No.: J6D200273-1
Report No. : 32207
Received Date: 4/20/2006 10:30:00 AM
Client Sample ID: PPD0805-01
COC No. :
Matrix: WATER

Ordered by Client Sample ID, Batch No.

Parameter	Result	Qual	Count Error (2 s)	Total Uncert(2 s)	MDC|MDA, Action Lev	Rpt Unit, Lc	Yield CRDL(RL)	Rst/MDC, Rst/TotUcert	Analysis, Prep Date	Total Sa Size	Aliquot Size	Primary Detector
Batch: 6114557	RICHRC5014			Work Order: H3PM51AE		Report DB ID: 9H3PM510						
ALPHA	-0.1970	U	0.26	0.26	1.2	pCi/L	100%	*-0.16*	5/16/06 09:14 a		0.2016	GPC10D
						0.442	3.0	*-(1.5)*			L	
Batch: 6114559	RICHRC5014			Work Order: H3PM51AD		Report DB ID: 9H3PM510						
BETA	1.18	U	1.3	1.3	2.75	pCi/L	100%	*0.43*	5/15/06 01:42 p		0.1982	GPC27A
						1.31	4.0	*(1.8)*			L	
Batch: 6114561	RICHRC5005			Work Order: H3PM51AA		Report DB ID: 9H3PM510						
RA-226	-0.0473	U	0.11	0.11	0.233	pCi/L	100%	*-0.2*	5/25/06 12:57 p		0.9996	ASC2RC
						0.102	1.0	*-0.85*			L	
Batch: 6114562	RICHRC5005			Work Order: H3PM51AC		Report DB ID: 9H3PM510						
RA-228	0.0326	U	0.13	0.16	0.407	pCi/L	88%	*0.08*	5/26/06 08:52 a		0.9996	GPC2A
						0.175	1.0	*0.4*			L	

No. of Results: 4 Comments:

STL Richland
rptSTLRchSample
V4.15.0 A97

MDC|MDA,Lc - Detection, Decision Level based on instrument background or blank, adjusted by the sample Efficiency, Yield, and Volume.
U Qual - Analyzed for but not detected above limiting criteria. Limit criteria is less than the Mdc/Mda or Total Uncert or not identified by gamma scan software.

FORM I

Date: 26-May-06

SAMPLE RESULTS

Lab Name: STL Richland
SDG: 31430
Collection Date: 4/19/2006 11:30:00 AM

Lot-Sample No.: J6D200273-2
Report No. : 32207
Received Date: 4/20/2006 10:30:00 AM

Client Sample ID: PPD0805-01
COC No. :
Matrix: WATER

Ordered by Client Sample ID, Batch No.

Parameter	Result	Qual	Count Error (2 s)	Total Uncert(2 s)	MDC|MDA, Action Lev	Rpt Unit, Lc	Yield CRDL(RL)	Rst/MDC, Rst/TotUcert	Analysis, Prep Date	Total Sa Size	Aliquot Size	Primary Detector
Batch: 6110559 EITR				Work Order: H3PNP1AA		Report DB ID: 9H3PNP10						
RN-222	-10.800	U	14.0	22.0	34.8	pCi/L	100%	*-0.31*	4/22/06 06:22 p		0.01	LSC7
						16.8	50.0	*-0.97*			L	

No. of Results: 1 Comments:

MDC|MDA,Lc - Detection, Decision Level based on instrument background or blank, adjusted by the sample Efficiency, Yield, and Volume.
U Qual - Analyzed for but not detected above limiting criteria. Limit criteria is less than the Mdc/Mda or Total Uncert or not identified by gamma scan software.

FORM I

SAMPLE RESULTS

Date: 26-May-06

Lab Name:	STL Richland	SDG:	31430	**Collection Date:**	4/19/2006 11:30:00 AM
Lot-Sample No.:	J6D200273-3	Report No. :	32207	**Received Date:**	4/20/2006 10:30:00 AM
Client Sample ID:	PPD0806-01	COC No. :		**Matrix:**	WATER

Ordered by Client Sample ID, Batch No.

Parameter	Result	Qual	Count Error (2 s)	Total Uncert(2 s)	MDC|MDA, Action Lev	Rpt Unit, Lc	Yield CRDL(RL)	Rst/MDC, Rst/TotUcert	Analysis, Prep Date	Total Sa Size	Aliquot Size	Primary Detector
Batch: 6110559 EITR				Work Order: H3PNR1AA		Report DB ID: 9H3PNR10						
RN-222	-7.6700	U	14.0	23.0	34.8	pCi/L	100%	*-0.22*	4/22/06 06:22 p		0.01	LSC7
						16.8	50.0	*-0.68*			L	

No. of Results: 1 **Comments:**

10

STL Richland
rptSTLRchSample
V4.15.0 A97

MDC|MDA,Lc - Detection, Decision Level based on instrument background or blank, adjusted by the sample Efficiency, Yield, and Volume.
U Qual - Analyzed for but not detected above limiting criteria. Limit criteria is less than the Mdc/Mda or Total Uncert or not identified by gamma scan software.

FORM I

SAMPLE RESULTS

Date: 26-May-06

Lab Name: STL Richland
Lot-Sample No.: J6D200273-4
Client Sample ID: PPD0806-01

SDG: 31430
Report No. : 32207
COC No. :

Collection Date: 4/19/2006 11:30:00 AM
Received Date: 4/20/2006 10:30:00 AM
Matrix: WATER

Ordered by Client Sample ID, Batch No.

Parameter	Result	Qual	Count Error (2 s)	Total Uncert(2 s)	MDC|MDA, Action Lev	Rpt Unit, Lc	Yield CRDL(RL)	Rst/MDC, Rst/TotUcert	Analysis, Prep Date	Total Sa Size	Aliquot Size	Primary Detector
Batch: 6114557	RICHRC5014			Work Order: H3PN21AE		Report DB ID: 9H3PN210						
ALPHA	-0.0881	U	0.27	0.27	1.1	pCi/L	100%	*-0.08*	5/16/06 09:14 a		0.1984	GPC10E
						0.382	3.0	*-0.65*			L	
Batch: 6114559	RICHRC5014			Work Order: H3PN21AD		Report DB ID: 9H3PN210						
BETA	1.45	U	1.3	1.3	2.62	pCi/L	100%	*0.55*	5/15/06 01:42 p		0.2003	GPC27C
						1.24	4.0	*(2.2)*			L	
Batch: 6114561	RICHRC5005			Work Order: H3PN21AA		Report DB ID: 9H3PN210						
RA-226	0.0822	U	0.12	0.12	0.214	pCi/L	100%	*0.38*	5/25/06 12:53 p		1.0054	ASC9RA
						0.0941	1.0	*(1.3)*			L	
Batch: 6114562	RICHRC5005			Work Order: H3PN21AC		Report DB ID: 9H3PN210						
RA-228	0.385	U	0.20	0.22	0.407	pCi/L	89%	*0.95*	5/26/06 08:52 a		1.0055	GPC2C
						0.175	1.0	*(3.6)*			L	

No. of Results: 4 Comments:

MDC|MDA,Lc - Detection, Decision Level based on instrument background or blank, adjusted by the sample Efficiency, Yield, and Volume.
U Qual - Analyzed for but not detected above limiting criteria. Limit criteria is less than the Mdc/Mda or Total Uncert or not identified by gamma scan software.

FORM II

Date: 26-May-06

DUPLICATE RESULTS

Lab Name:	STL Richland	SDG:	31393	**Collection Date:**	4/12/2006
Lot-Sample No.:	J6D180205-1	Report No. :	32207	**Received Date:**	4/14/2006 10:00:00 AM
Client Sample ID:	1-1 DUP	COC No. :		**Matrix:**	WATER

Parameter	Result, Orig Rst	Qual	Count Error (2 s)	Total Uncert(2 s)	MDC|MDA, Action Lev	Rpt Unit, CRDL	Yield	Rst/MDC, Rst/TotUcert	Analysis, Prep Date	Total Sa Size	Aliquot Size	Primary Detector
Batch: 6114557	RICHRC5014			Work Order: H3G3D1AE		Report DB ID: H3G3D1ER			Orig Sa DB ID: 9H3G3D10			
ALPHA	0.852	U	0.79	0.81	1.28	pCi/L	100%	0.67	5/16/06 09:14 a		0.2003	GPC10C
	0.209	U	RER2 1.3			3.0		(2.1)			L	

No. of Results: 1 Comments:

12

STL Richland
rptSTLRchDupV4.1
5.0 A97

RER2 - Replicate Error Ratio = (S-D)/[sqrt(sq(TPUs)+sq(TPUd))] as defined by ICPT BOA.
MDC|MDA,Lc - Detection, Decision Level based on instrument background or blank, adjusted by the sample Efficiency, Yield, and Volume.
U Qual - Analyzed for but not detected above limiting criteria. Limit criteria is less than the Mdc/Mda or Total Uncert or not identified by gamma scan software.

FORM II

Date: 26-May-06

DUPLICATE RESULTS

Lab Name:	STL Richland	SDG:	31430	Collection Date:	4/19/2006 11:30:00 AM
Lot-Sample No.:	J6D200273-2	Report No. :	32207	Received Date:	4/20/2006 10:30:00 AM
Client Sample ID:	PPD0805-01 DUP	COC No. :		Matrix:	WATER

Parameter	Result, Orig Rst	Qual	Count Error (2 s)	Total Uncert(2 s)	MDC|MDA, Action Lev	Rpt Unit, CRDL	Yield	Rst/MDC, Rst/TotUcert	Analysis, Prep Date	Total Sa Size	Aliquot Size	Primary Detector
Batch: 6110559	EITR			Work Order: H3PNP1AC		Report DB ID: H3PNP1CR			Orig Sa DB ID: 9H3PNP10			
RN-222	-6.3100	U	14.0	23.0	34.8	pCi/L	100%	-0.18	4/22/06 06:22 p		0.01	LSC7
	-10.8	U	RER2 0.3			50.0		-0.56			L	
Batch: 6114559	RICHRC5014			Work Order: H3PM51AF		Report DB ID: H3PM51FR			Orig Sa DB ID: 9H3PM510			
BETA	1.03	U	1.1	1.2	2.37	pCi/L	100%	0.43	5/15/06 01:42 p		0.2014	GPC27B
	1.18	U	RER2 0.2			4.0		(1.8)			L	
Batch: 6114561	RICHRC5005			Work Order: H3PM51AG		Report DB ID: H3PM51GR			Orig Sa DB ID: 9H3PM510			
RA-226	0.0971	U	0.16	0.16	0.271	pCi/L	108%	0.36	5/25/06 12:56 p		1.0034	ASC4HB
	-0.0473	U	RER2 1.5			1.0		(1.2)			L	
Batch: 6114562	RICHRC5005			Work Order: H3PM51AH		Report DB ID: H3PM51HR			Orig Sa DB ID: 9H3PM510			
RA-228	0.306	U	0.17	0.18	0.343	pCi/L	96%	0.89	5/26/06 08:52 a		1.0034	GPC2B
	0.0326	U	RER2 2.2			1.0		(3.4)			L	

No. of Results: 4 Comments:

RER2 - Replicate Error Ratio = (S-D)/[sqrt(sq(TPUs)+sq(TPUd))] as defined by ICPT BOA.

MDC|MDA,Lc - Detection, Decision Level based on instrument background or blank, adjusted by the sample Efficiency, Yield, and Volume.

U Qual - Analyzed for but not detected above limiting criteria. Limit criteria is less than the Mdc/Mda or Total Uncert or not identified by gamma scan software.

FORM II

BLANK RESULTS

Date: 26-May-06

Lab Name: STL Richland
Matrix: WATER

SDG: 31393
Report No. : 32207

Parameter	Result	Qual	Count Error (2 s)	Total Uncert(2 s)	MDC|MDA, Lc	Rpt Unit, CRDL	Yield	Rst/MDC, Rst/TotUcert	Analysis, Prep Date	Total Sa Size	Aliquot Size	Primary Detector
Batch: 6114557	RICHRC5014			Work Order:	H30NP1AA		Report DB ID:	H30NP1AB				
ALPHA	-0.0346	U	0.34	0.34	1.13	pCi/L	100%	-0.03	5/16/06 10:18 a		0.2009	GPC10A
					0.407	3.0		-0.2			L	
Batch: 6114559	RICHRC5014			Work Order:	H30N11AA		Report DB ID:	H30N11AB				
BETA	0.731	U	1.2	1.3	2.66	pCi/L	100%	0.27	5/15/06 01:42 p		0.2006	GPC28B
					1.26	4.0		(1.2)			L	
Batch: 6114562	RICHRC5005			Work Order:	H30N71AA		Report DB ID:	H30N71AB				
RA-228	0.0260	U	0.019	0.020	0.0405	pCi/L	87%	0.64	5/26/06 08:52 a		10.0006	GPC2D
					0.0174	3.0		(2.6)			L	
Batch: 6114561	RICHRC5005			Work Order:	H30N51AA		Report DB ID:	H30N51AB				
RA-226	0.126		0.087	0.090	0.118	pCi/L	99%	(1.1)	5/25/06 12:54 p		1.0006	ASCPMA
					0.0469			(2.8)			L	
Batch: 6110559	EITR			Work Order:	H3P341AA		Report DB ID:	H3P341AB				
RN-222	-17.300	U	11.0	18.0	29.0	pCi/L	100%	-0.6	4/22/06 06:22 p		0.01	LSC7
					14.0	50.0		-(1.9)			L	

No. of Results: 5 Comments:

STL Richland
rptSTLRchBlank
V4.15.0 A97

MDC|MDA,Lc - Detection, Decision Level based on instrument background or blank, adjusted by the sample Efficiency, Yield, and Volume.
U Qual - Analyzed for but not detected above limiting criteria. Limit criteria is less than the Mdc/Mda or Total Uncert or not identified by gamma scan software.

FORM II

Date: 26-May-06

LCS RESULTS

Lab Name: STL Richland

Matrix: WATER

SDG: 31393

Report No. : 32207

Parameter	Result	Qual	Count Error (2 s)	Total Uncert(2 s)	MDC|MDA	Report Unit	Yield	Expected	Expected Uncert	Recovery, Bias	Analysis, Prep Date	Aliquot Size	Primary Detector
Batch: 6114557	RICHRC5014			Work Order:	H30NP1AC		Report DB ID:	H30NP1CS					
ALPHA	43.3		4.7	12.0	1.04	pCi/L	100%	40.6	1.4	106%	5/16/06 10:18 a	0.1998	GPC10B
							Rec Limits:	75	125	0.1		L	
Batch: 6114559	RICHRC5014			Work Order:	H30N11AC		Report DB ID:	H30N11CS					
BETA	36.2		3.0	6.3	2.74	pCi/L	100%	40.4	0.32	90%	5/15/06 01:42 p	0.2003	GPC28C
							Rec Limits:	70	130	-0.1		L	
Batch: 6114562	RICHRC5005			Work Order:	H30N71AC		Report DB ID:	H30N71CS					
RA-228	5.19		0.50	0.77	0.341	pCi/L	89%	5.10	0.022	102%	5/26/06 08:53 a	1.0002	GPC3A
							Rec Limits:	70	130	0.0		L	
Batch: 6114561	RICHRC5005			Work Order:	H30N51AC		Report DB ID:	H30N51CS					
RA-226	1.37		0.24	0.37	0.149	pCi/L	99%	1.37	0.35	100%	5/25/06 12:55 p	1.0002	ASCASA
							Rec Limits:			0.0		L	
Batch: 6110559	EITR			Work Order:	H3P341AC		Report DB ID:	H3P341CS					
RN-222	9950.0		120.0	1100.0	29.0	pCi/L	100%	6770.0	170.0	147%	4/22/06 06:22 p	0.01	LSC7
							Rec Limits:	70	130	0.5		L	

No. of Results: 5 Comments:

STL Richland Bias - (Result/Expected)-1 as defined by ANSI N13.30.

rptSTLRchLcs
V4.15.0 A97

FORM II

Date: 26-May-06

MATRIX SPIKE RESULTS

Lab Name: STL Richland SDG: 31393

Lot-Sample No.: J6D180205-1 Report No. : 32207 Matrix: WATER

Parameter	SpikeResult, Orig Rst	Qual	Count Error (2 s)	Total Uncert(2 s)	MDC|MDA	Rpt Unit, CRDL	Yield	Rec-overy	Exp-ected	Exp Uncert	Analysis, Prep Date	Aliquot Size	Analy Method, Primary Detector
Batch: 6114557	Work Order: H3G3D1AD			Report DB ID: H3G3D1DW			Orig Sa DB ID: 9H3G3D10						
ALPHA	29.2		3.9	8.4	1.01	pCi/L	100%	71.84%	40.6	1.3	5/16/06 09:14 a	0.2001	RICHRC5014
	0.209											L	GPC10B

Number of Results: 1

Comments:

16

STL Richland
rptSTLRchMs
V4.15.0 A97

RER - Replicate Error Ratio = (S-D)/[sqrt(sq(TPUs)+sq(TPUd))] as defined by ICPT BOA.

Bias - (Result/Expected)-1 as defined by ANSI N13.30.

FORM II

Date: 26-May-06

MATRIX SPIKE RESULTS

Lab Name: STL Richland SDG: 31430

Lot-Sample No.: J6D200273-4 Report No. : 32207 Matrix: WATER

Parameter	SpikeResult, Orig Rst	Qual	Count Error (2 s)	Total Uncert(2 s)	MDC|MDA	Rpt Unit, CRDL	Yield	Rec-overy	Exp-ected	Exp Uncert	Analysis, Prep Date	Aliquot Size	Analy Method, Primary Detector
Batch: 6114559	Work Order: H3PN21AF			Report DB ID: H3PN21FW			Orig Sa DB ID: 9H3PN210						
BETA	111.0		5.0	15.0	2.66	pCi/L	100%	98.06%	114.0	0.88	5/15/06 01:42 p	0.1981	RICHRC5014
	1.45											L	GPC27D

Number of Results: 1

Comments:

STL Richland
rptSTLRchMs
V4.15.0 A97

RER - Replicate Error Ratio = (S-D)/[sqrt(sq(TPUs)+sq(TPUd))] as defined by ICPT BOA.

Bias - (Result/Expected)-1 as defined by ANSI N13.30.

SUBCONTRACT ORDER J6D200273

North Creek Analytical - Portland 31430

PPD0805

SENDING LABORATORY:	RECEIVING LABORATORY:
North Creek Analytical - Portland	Severn Trent Laboratories - Richland
9405 SW Nimbus Ave.	2800 George Washington Way
Beaverton, OR 97008	Richland, WA 99354-1613
Phone: (503) 906-9200	Phone :509-375-3131
Fax: (503) 906-9210	Fax: 509-375-5590
Project Manager: Sarah Rockwell	

Analysis	Due	Expires	Laboratory ID	Comments
Sample ID: PPD0805-01	**Water**	**Sampled:04/19/06 11:30**		
Subcontract Outside3	05/02/06 23:59	04/20/06 11:30		DW-Oregon Radon
Subcontract Outside2	05/02/06 23:59	04/20/06 11:30		DW-Oregon Radium 226/228, Uranium
Subcontract Outside	05/02/06 23:59	10/16/06 11:30		DW-Oregon Gross Alpha/Beta
Containers Supplied:				
1L Poly - Unpres (R)	1L Poly - Unpres (S)	1L Poly - Unpres (T)	1L Poly - Unpres (U)	60 ml Amber Glass - Unpr

H3PM5 H3PNP

Released By	Date	Received By	Date
[signature]	4.19.06	S. Welch	4.20.06
Released By	Date	Received By	Date

SUBCONTRACT ORDER

North Creek Analytical - Portland

PPD0806

J6D200273
31430

SENDING LABORATORY:

North Creek Analytical - Portland
9405 SW Nimbus Ave.
Beaverton, OR 97008
Phone: (503) 906-9200
Fax: (503) 906-9210
Project Manager: Sarah Rockwell

RECEIVING LABORATORY:

Severn Trent Laboratories - Richland
2800 George Washington Way
Richland, WA 99354-1613
Phone :509-375-3131
Fax: 509-375-5590

Analysis	Due	Expires	Laboratory ID	Comments
Sample ID: PPD0806-01	**Water**	**Sampled:04/19/06 10:20**		
Subcontract Outside3	05/02/06 23:59	04/20/06 10:20		DW-Oregon Radon
Subcontract Outside2	05/02/06 23:59	04/20/06 10:20		DW-Oregon Radium 226/228, Uranium
Subcontract Outside	05/02/06 23:59	10/16/06 10:20		DW-Oregon Gross Alpha/Beta

Containers Supplied:

1L Poly - Unpres (AA) 1L Poly - Unpres (AB) 1L Poly - Unpres (AC) 60 ml Amber Glass - Unpı 1L Poly - Unpres (Z)

H3PN2 H3PNR

4-19-06

Released By Date Received By Date

Released By Date Received By Date

NCCWC
Source Water
Laboratory Data Reports

TestAmerica
ANALYTICAL TESTING CORPORATION

PORTLAND, OR 9405 S.W. NIMBUS AVENUE
BEAVERTON, OR 97008-7132
ph: (503) 906.9200 fax: (503) 906.9210

June 05, 2006

Ted Ressler
Ground Water Solutions
55 SW Yamhill St, Suite 400
Portland, OR 97204

RE: Sunrise Water Authority

Enclosed are the results of analyses for samples received by the laboratory on 04/19/06 12:40. The following list is a summary of the Work Orders contained in this report, generated on 06/05/06 11:29.

If you have any questions concerning this report, please feel free to contact me.

Work Order	Project	ProjectNumber
PPD0806	Sunrise Water Authority	157:005

Sarah Rockwell

Sarah Rockwell, Project Manager

TestAmerica
ANALYTICAL TESTING CORPORATION

PORTLAND, OR 9405 S.W. NIMBUS AVENUE
BEAVERTON, OR 97008-7132
ph: (503) 906.9200 fax: (503) 906.9210

Ground Water Solutions	Project Name:	**Sunrise Water Authority**	
55 SW Yamhill St, Suite 400	Project Number:	157:005	Report Created:
Portland, OR 97204	Project Manager:	Ted Ressler	06/05/06 11:29

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
SWA-SW-NCCWCWTP	PPD0806-01	Water	04/19/06 10:20	04/19/06 12:40

Sarah Rockwell

Sarah Rockwell, Project Manager

TestAmerica
ANALYTICAL TESTING CORPORATION

PORTLAND, OR 9405 S.W. NIMBUS AVENUE
BEAVERTON, OR 97008-7132
ph: (503) 906.9200 fax: (503) 906.9210

Ground Water Solutions	Project Name:	**Sunrise Water Authority**	
55 SW Yamhill St, Suite 400	Project Number:	157:005	Report Created:
Portland, OR 97204	Project Manager:	Ted Ressler	06/05/06 11:29

Total Metals per EPA 200 Series Methods

TestAmerica - Portland, OR

Analyte	Method	Result	MDL*	MRL	Units	Dil	Batch	Prepared	Analyzed	Notes
PPD0806-01 (SWA-SW-NCCWCWTP)		**Water**				**Sampled: 04/19/06 10:20**				
Aluminum	EPA 200.7	ND	----	0.100	mg/l	1x	6040892	04/19/06 15:33	04/20/06 13:42	
Antimony	EPA 200.8	ND	----	0.00100	"	"	6040893	04/19/06 15:40	04/29/06 12:05	
Arsenic	"	ND	----	0.00100	"	"	"	"	"	
Barium	"	**0.00237**	----	0.00100	"	"	"	"	05/02/06 11:33	
Beryllium	"	ND	----	0.000500	"	"	"	"	04/29/06 12:05	
Cadmium	"	ND	----	0.000500	"	"	"	"	"	
Calcium	EPA 200.7	**4.23**	----	0.100	"	"	6040892	04/19/06 15:33	04/20/06 13:42	
Chromium	EPA 200.8	ND	----	0.00100	"	"	6040893	04/19/06 15:40	04/29/06 12:05	
Copper	"	ND	----	0.00100	"	"	"	"	"	
Iron	EPA 200.7	**0.0392**	----	0.0100	"	"	6040892	04/19/06 15:33	04/20/06 13:42	
Lead	EPA 200.8	ND	----	0.000500	"	"	6040893	04/19/06 15:40	04/29/06 12:05	
Magnesium	EPA 200.7	**1.34**	----	0.100	"	"	6040892	04/19/06 15:33	04/20/06 13:42	
Manganese	EPA 200.8	ND	----	0.00200	"	"	6040893	04/19/06 15:40	04/29/06 12:05	
Nickel	EPA 200.7	ND	----	0.0500	"	"	6040892	04/19/06 15:33	04/20/06 13:42	
Potassium	"	ND	----	1.00	"	"	"	"	"	
Selenium	EPA 200.8	ND	----	0.00100	"	"	6040893	04/19/06 15:40	04/29/06 12:05	
Silver	"	ND	----	0.00100	"	"	"	"	"	
Sodium	EPA 200.7	**4.03**	----	1.00	"	"	6040892	04/19/06 15:33	04/20/06 13:42	
Thallium	EPA 200.8	ND	----	0.00100	"	"	6040893	04/19/06 15:40	04/29/06 12:05	
Zinc	"	ND	----	0.00500	"	"	"	"	"	

Sarah Rockwell

Sarah Rockwell, Project Manager

TestAmerica
ANALYTICAL TESTING CORPORATION

PORTLAND, OR 9405 S.W. NIMBUS AVENUE
BEAVERTON, OR 97008-7132
ph: (503) 906.9200 fax: (503) 906.9210

Ground Water Solutions	Project Name:	**Sunrise Water Authority**	
55 SW Yamhill St, Suite 400	Project Number:	157.005	Report Created:
Portland, OR 97204	Project Manager:	Ted Ressler	06/05/06 11:29

Dissolved Metals per EPA 200 Series Methods

TestAmerica - Portland, OR

Analyte	Method	Result	MDL*	MRL	Units	Dil	Batch	Prepared	Analyzed	Notes
PPD0806-01 (SWA-SW-NCCWCWTP)		**Water**			**Sampled: 04/19/06 10:20**					**M-04**
Iron	EPA 200.7	**0.0183**	—	0.0100	mg/l	1x	6041222	04/27/06 10:07	05/01/06 21:36	
Manganese	"	ND	—	0.0100	"	"	"	"	"	

Sarah Rockwell

Sarah Rockwell, Project Manager

TestAmerica
ANALYTICAL TESTING CORPORATION

PORTLAND, OR 9405 S.W. NIMBUS AVENUE
BEAVERTON, OR 97008-7132
ph: (503) 906.9200 fax: (503) 906.9210

Ground Water Solutions	Project Name:	**Sunrise Water Authority**	
55 SW Yamhill St, Suite 400	Project Number:	157:005	Report Created:
Portland, OR 97204	Project Manager:	Ted Ressler	06/05/06 11:29

Total Mercury per EPA Method 245.1

TestAmerica - Portland, OR

Analyte	Method	Result	MDL*	MRL	Units	Dil	Batch	Prepared	Analyzed	Notes
PPD0806-01 (SWA-SW-NCCWCWTP)	**Water**				**Sampled: 04/19/06 10:20**					
Mercury	EPA 245.1	ND	—	0.000200	mg/l	1x	6041059	04/24/06 10:21	04/24/06 13:46	

Sarah Rockwell

Sarah Rockwell, Project Manager

TestAmerica
ANALYTICAL TESTING CORPORATION

PORTLAND, OR 9405 S.W. NIMBUS AVENUE
BEAVERTON, OR 97008-7132
ph: (503) 906.9200 fax: (503) 906.9210

Ground Water Solutions	Project Name:	**Sunrise Water Authority**	
55 SW Yamhill St, Suite 400	Project Number:	157.005	Report Created:
Portland, OR 97204	Project Manager:	Ted Ressler	06/05/06 11:29

Conventional Chemistry Parameters per APHA/EPA Methods

TestAmerica - Portland, OR

Analyte	Method	Result	MDL*	MRL	Units	Dil	Batch	Prepared	Analyzed	Notes
PPD0806-01 (SWA-SW-NCCWCWTP)		**Water**				**Sampled: 04/19/06 10:20**				
Bicarbonate Alkalinity	SM 2320B	**21.2**	—	5.00	mg/l	1x	6040896	04/19/06 15:53	04/20/06 17:50	
Carbonate Alkalinity	"	ND	—	5.00	"	"	"	"	"	
Chlorine Residual (Total)	SM 4500-Cl G	**0.353**	—	0.100	"	"	6040905	04/19/06 21:00	04/19/06 21:21	
Color	EPA 110.2	ND	—	5.00	Color Units	"	6040904	04/19/06 20:39	04/19/06 20:41	
Cyanide (total)	EPA 335.4	ND	—	0.00500	mg/l	"	6041172	04/26/06 10:29	04/28/06 16:56	
Hardness (Ca)	SM 2340B-Ca	**10.6**	—	0.250	"	"	6040892	04/19/06 15:33	04/27/06 13:52	
Silica (SiO2)	SM 4500-Si F	**16.2**	—	0.500	"	"	6041037	04/24/06 07:53	04/24/06 12:18	
Threshold Odor Number	EPA 140.1	**2.3**	—	0.20	TON	"	6040932	04/20/06 11:16	04/20/06 12:00	
Total Alkalinity	SM 2320B	**21.2**	—	5.00	mg/L as CaCO3	"	6040896	04/19/06 15:53	04/20/06 17:50	
Total Dissolved Solids	SM 2540C	**53.0**	—	10.0	mg/l	"	6041047	04/24/06 08:57	04/24/06 13:35	
Total Suspended Solids	EPA 160.2	ND	—	10.0	"	"	6041048	04/24/06 09:02	04/24/06 15:25	
Turbidity	EPA 180.1	**0.792**	—	0.200	NTU	"	6040899	04/19/06 16:08	04/19/06 16:15	
Total Organic Carbon	SM 5310C	**1.07**	—	1.00	mg/l	"	6041023	04/21/06 22:05	04/22/06 00:58	

Sarah Rockwell

Sarah Rockwell, Project Manager

TestAmerica
ANALYTICAL TESTING CORPORATION

PORTLAND, OR 9405 S.W. NIMBUS AVENUE
BEAVERTON, OR 97008-7132
ph: (503) 906.9200 fax: (503) 906.9210

Ground Water Solutions	Project Name:	**Sunrise Water Authority**	
55 SW Yamhill St, Suite 400	Project Number:	157.005	Report Created:
Portland, OR 97204	Project Manager:	Ted Ressler	06/05/06 11:29

Anions per EPA Method 300.0

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Analyte	Method	Result	MDL*	MRL	Units	Dil	Batch	Prepared	Analyzed	Notes
PPD0806-01 (SWA-SW-NCCWCWTP)		**Water**				**Sampled: 04/19/06 10:20**				
Chloride	EPA 300.0	**2.63**	——	0.500	mg/l	1x	6040844	04/19/06 16:00	04/19/06 20:56	
Nitrate/Nitrite-Nitrogen	"	**0.230**	——	0.200	"	"	"	"	"	
Nitrate-Nitrogen	"	**0.230**	——	0.100	"	"	"	"	"	
Nitrite-Nitrogen	"	ND	——	0.100	"	"	"	"	"	
Sulfate	"	ND	——	1.00	"	"	"	"	"	

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Ground Water Solutions	Project Name:	**Sunrise Water Authority**	
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Portland, OR 97204	Project Manager:	Ted Ressler	06/05/06 11:29

Disinfection By-Products in Drinking Water per EPA 552.2

TestAmerica - Portland, OR

Analyte	Method	Result	MDL*	MRL	Units	Dil	Batch	Prepared	Analyzed	Notes
PPD0806-01 (SWA-SW-NCCWCWTP)		**Water**				**Sampled: 04/19/06 10:20**				
Monochloroacetic acid (MCAA)	EPA 552.2	ND	—	0.00150	mg/l	1x	6041285	04/28/06 10:03	05/02/06 17:52	
Monobromoacetic acid (MBAA)	"	ND	—	0.00100	"	"	"	"	"	
Dibromoacetic acid (DBAA)	"	ND	—	0.000500	"	"	"	"	"	
Dichloroacetic acid (DCAA)	"	**0.00817**	—	0.00150	"	"	"	"	"	
Trichloroacetic acid (TCAA)	"	**0.00907**	—	0.000500	"	"	"	"	"	
Total Haloacetic Acids (HAA5)	"	**0.0172**	—	0.00150	"	"	"	"	"	
Surrogate(s): 2,3-Dibromopropionic acid		*91.8%*			*70 - 130 %*	"			"	

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Sarah Rockwell, Project Manager

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BEAVERTON, OR 97008-7132
ph: (503) 906.9200 fax: (503) 906.9210

Ground Water Solutions	Project Name:	**Sunrise Water Authority**	
55 SW Yamhill St, Suite 400	Project Number:	157:005	Report Created:
Portland, OR 97204	Project Manager:	Ted Ressler	06/05/06 11:29

Total Trihalomethanes in Drinking Water per EPA 524.2

TestAmerica - Portland, OR

Analyte	Method	Result	MDL*	MRL	Units	Dil	Batch	Prepared	Analyzed	Notes
PPD0806-01 (SWA-SW-NCCWCWTP)		**Water**				**Sampled: 04/19/06 10:20**				
Bromodichloromethane	EPA 524.2	**0.000910**	—	0.000500	mg/l	1x	6041116	04/25/06 10:04	04/25/06 16:26	
Bromoform	"	ND	—	0.000500	"	"	"	"	"	
Chloroform	"	**0.0108**	—	0.000500	"	"	"	"	"	
Dibromochloromethane	"	ND	—	0.000500	"	"	"	"	"	
Total Trihalomethanes	"	**0.0117**	—	0.000500	"	"	"	"	"	
Surrogate(s): Dibromofluoromethane		*112%*			*70 - 130 %*	"			"	
1,2-DCA-d4		*112%*			*70 - 130 %*	"			"	
Toluene-d8		*91.2%*			*70 - 130 %*	"			"	
4-BFB		*74.2%*			*70 - 130 %*	"			"	

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BEAVERTON, OR 97008-7132
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Ground Water Solutions	Project Name:	**Sunrise Water Authority**	
55 SW Yamhill St, Suite 400	Project Number:	157:005	Report Created:
Portland, OR 97204	Project Manager:	Ted Ressler	06/05/06 11:29

Physical Parameters per APHA/ASTM/EPA Methods

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Analyte	Method	Result	MDL*	MRL	Units	Dil	Batch	Prepared	Analyzed	Notes
PPD0806-01 (SWA-SW-NCCWCWTP)		**Water**			**Sampled: 04/19/06 10:20**					
Corrosivity	EPA 9040A	**7.48**	-----		pH Units	1x	6040891	04/19/06 15:23	04/19/06 15:30	

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BEAVERTON, OR 97008-7132
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Ground Water Solutions	Project Name:	**Sunrise Water Authority**	
55 SW Yamhill St, Suite 400	Project Number:	157:005	Report Created:
Portland, OR 97204	Project Manager:	Ted Ressler	06/05/06 11:29

Microbiological Parameters per APHA Standard Methods

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Analyte	Method	Result	MDL*	MRL	Units	Dil	Batch	Prepared	Analyzed	Notes
PPD0806-01 (SWA-SW-NCCWCWTP)		**Water**			**Sampled: 04/19/06 10:20**					
Total Coliforms	SM 9223	ND	—	1.00	/100 ml	1x	6040885	04/19/06 14:34	04/20/06 15:00	
E. Coli	"	ND	—	1.00	"	"	"	"	"	

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ANALYTICAL TESTING CORPORATION

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ph: (503) 906.9200 fax: (503) 906.9210

Ground Water Solutions	Project Name:	**Sunrise Water Authority**	
55 SW Yamhill St, Suite 400	Project Number:	157.005	Report Created:
Portland, OR 97204	Project Manager:	Ted Ressler	06/05/06 11:29

Total Metals per EPA 200 Series Methods - Laboratory Quality Control Results

TestAmerica - Portland, OR

QC Batch: 6040892 **Water Preparation Method: EPA 200/3005**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Blank (6040892-BLK1)								Extracted: 04/19/06 15:33						
Aluminum	EPA 200.7	ND	---	0.100	mg/l	1x	--	--	--	--	--	--	04/20/06 13:55	
Calcium	"	ND	---	0.100	"	"	--	--	--	--	--	--	"	
Iron	"	ND	---	0.0100	"	"	--	--	--	--	--	--	"	
Magnesium	"	ND	---	0.100	"	"	--	--	--	--	--	--	"	
Nickel	"	ND	---	0.0500	"	"	--	--	--	--	--	--	"	
Potassium	"	ND	---	1.00	"	"	--	--	--	--	--	--	"	
Sodium	"	ND	---	1.00	"	"	--	--	--	--	--	--	"	
LCS (6040892-BS1)								Extracted: 04/19/06 15:33						
Aluminum	EPA 200.7	9.78	---	0.100	mg/l	1x	--	10.0	97.8%	(85-115)	--	--	04/20/06 13:48	
Calcium	"	10.4	---	0.100	"	"	--	"	104%	"	--	--	"	
Iron	"	10.0	---	0.0100	"	"	--	"	100%	"	--	--	"	
Magnesium	"	10.2	---	0.100	"	"	--	"	102%	"	--	--	"	
Nickel	"	0.392	---	0.0500	"	"	--	0.400	98.0%	"	--	--	"	
Potassium	"	9.35	---	1.00	"	"	--	10.0	93.5%	"	--	--	"	
Sodium	"	10.0	---	1.00	"	"	--	"	100%	"	--	--	"	
Duplicate (6040892-DUP1)				QC Source: PPD0806-01				Extracted: 04/19/06 15:33						
Aluminum	EPA 200.7	ND	---	0.100	mg/l	1x	ND	--	--	--	1.45%	(20)	04/20/06 14:01	
Calcium	"	4.25	---	0.100	"	"	4.23	--	--	--	0.472%	(30)	"	
Iron	"	0.0391	---	0.0100	"	"	0.0392	--	--	--	0.255%	(20)	"	
Magnesium	"	1.34	---	0.100	"	"	1.34	--	--	--	0.00%	(30)	"	
Nickel	"	ND	---	0.0500	"	"	ND	--	--	--	NR	(20)	"	
Potassium	"	ND	---	1.00	"	"	ND	--	--	--	0.00%	(30)	"	
Sodium	"	4.07	---	1.00	"	"	4.03	--	--	--	0.988%	"	"	
Matrix Spike (6040892-MS1)				QC Source: PPD0806-01				Extracted: 04/19/06 15:33						
Aluminum	EPA 200.7	2.23	---	0.111	mg/l	1x	0.0624	2.21	98.1%	(75-125)	--	--	04/20/06 14:08	
Calcium	"	15.9	---	0.111	"	"	4.23	11.1	105%	(80-120)	--	--	"	
Iron	"	4.49	---	0.0111	"	"	0.0392	4.42	101%	(75-125)	--	--	"	
Magnesium	"	12.5	---	0.111	"	"	1.34	11.1	101%	(80-120)	--	--	"	
Nickel	"	0.544	---	0.0556	"	"	ND	0.556	97.8%	(75-125)	--	--	"	
Potassium	"	11.1	---	1.11	"	"	0.477	11.1	95.7%	(80-120)	--	--	"	
Sodium	"	15.4	---	1.11	"	"	4.03	"	102%	"	--	--	"	

Sarah Rockwell

Sarah Rockwell, Project Manager

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ANALYTICAL TESTING CORPORATION

PORTLAND, OR 9405 S.W. NIMBUS AVENUE
BEAVERTON, OR 97008-7132
ph: (503) 906.9200 fax: (503) 906.9210

Ground Water Solutions	Project Name:	**Sunrise Water Authority**	
55 SW Yamhill St, Suite 400	Project Number:	157:005	Report Created:
Portland, OR 97204	Project Manager:	Ted Ressler	06/05/06 11:29

Total Metals per EPA 200 Series Methods - Laboratory Quality Control Results

TestAmerica - Portland, OR

QC Batch: 6040893 **Water Preparation Method: EPA 200/3005**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Blank (6040893-BLK1)								Extracted: 04/19/06 15:40						
Antimony	EPA 200.8	ND	---	0.00100	mg/l	1x	--	--	--	--	--	--	04/29/06 07:44	
Arsenic	"	ND	---	0.00100	"	"	--	--	--	--	--	--	"	
Barium	"	ND	---	0.00100	"	"	--	--	--	--	--	--	05/02/06 07:09	
Beryllium	"	ND	---	0.000500	"	"	--	--	--	--	--	--	04/29/06 07:44	
Cadmium	"	ND	---	0.000500	"	"	--	--	--	--	--	--	"	
Chromium	"	ND	---	0.00100	"	"	--	--	--	--	--	--	"	
Copper	"	ND	---	0.00100	"	"	--	--	--	--	--	--	"	
Lead	"	ND	---	0.000500	"	"	--	--	--	--	--	--	"	
Manganese	"	ND	---	0.00200	"	"	--	--	--	--	--	--	"	
Selenium	"	ND	---	0.00100	"	"	--	--	--	--	--	--	"	
Silver	"	ND	---	0.00100	"	"	--	--	--	--	--	--	"	
Thallium	"	ND	---	0.00100	"	"	--	--	--	--	--	--	"	
Zinc	"	ND	---	0.00500	"	"	--	--	--	--	--	--	"	
LCS (6040893-BS1)								Extracted: 04/19/06 15:40						
Antimony	EPA 200.8	0.0569	---	0.00100	mg/l	1x	--	0.0500	114%	(85-115)	--	--	04/29/06 08:01	
Arsenic	"	0.106	---	0.00100	"	"	--	0.100	106%	"	--	--	"	
Barium	"	0.0995	---	0.00100	"	"	--	"	99.5%	"	--	--	05/02/06 07:25	
Beryllium	"	0.0531	---	0.000500	"	"	--	0.0500	106%	"	--	--	04/29/06 08:01	
Cadmium	"	0.107	---	0.000500	"	"	--	0.100	107%	"	--	--	"	
Chromium	"	0.118	---	0.00100	"	"	--	"	118%	"	--	--	"	BS-1
Copper	"	0.113	---	0.00100	"	"	--	"	113%	"	--	--	"	
Lead	"	0.110	---	0.000500	"	"	--	"	110%	"	--	--	"	
Manganese	"	0.113	---	0.00200	"	"	--	"	113%	"	--	--	"	
Selenium	"	0.0490	---	0.00100	"	"	--	0.0500	98.0%	"	--	--	"	
Silver	"	0.0522	---	0.00100	"	"	--	"	104%	"	--	--	"	
Thallium	"	0.0500	---	0.00100	"	"	--	"	100%	"	--	--	"	
Zinc	"	0.115	---	0.00500	"	"	--	0.100	115%	"	--	--	"	
Duplicate (6040893-DUP1)							QC Source: PPD0802-01		Extracted: 04/19/06 15:40					
Antimony	EPA 200.8	ND	---	0.00100	mg/l	1x	ND	--	--	--		(30)	04/29/06 11:00	
Arsenic	"	0.0185	---	0.00100	"	"	0.0205	--	--	--	10.3%	"	"	
Barium	"	0.155	---	0.00100	"	"	0.159	--	--	--	2.55%	"	05/02/06 10:31	
Beryllium	"	ND	---	0.000500	"	"	ND	--	--	--	NR	"	04/29/06 11:00	
Cadmium	"	ND	---	0.000500	"	"	ND	--	--	--	NR	"	"	
Chromium	"	ND	---	0.00100	"	"	ND	--	--	--	5.90%	"	"	
Copper	"	ND	---	0.00100	"	"	ND	--	--	--	2.50%	"	"	
Lead	"	ND	---	0.000500	"	"	ND	--	--	--	1.54%	"	"	
Manganese	"	0.608	---	0.00200	"	"	0.619	--	--	--	1.79%	"	"	

Sarah Rockwell

Sarah Rockwell, Project Manager

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Ground Water Solutions	Project Name:	**Sunrise Water Authority**	
55 SW Yamhill St, Suite 400	Project Number:	157:005	Report Created:
Portland, OR 97204	Project Manager:	Ted Ressler	06/05/06 11:29

Total Metals per EPA 200 Series Methods - Laboratory Quality Control Results

TestAmerica - Portland, OR

QC Batch: 6040893 **Water Preparation Method: EPA 200/3005**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Duplicate (6040893-DUP1)				QC Source: PPD0802-01					Extracted: 04/19/06 15:40					
Selenium	EPA 200.8	ND	---	0.00100	mg/l	1x	ND	--	--	--	NR	(30)	04/29/06 11:00	
Silver	"	ND	---	0.00100	"	"	ND	--	--	--	NR	"	"	
Thallium	"	ND	---	0.00100	"	"	ND	--	--	--	NR	"	"	
Zinc	"	0.0117	---	0.00500	"	"	0.0128	--	--	--	8.98%	"	"	
Matrix Spike (6040893-MS1)				QC Source: PPD0802-01					Extracted: 04/19/06 15:40					
Antimony	EPA 200.8	0.0638	---	0.00100	mg/l	1x	ND	0.0500	128%	(70-130)	--	--	04/29/06 11:33	
Arsenic	"	0.131	---	0.00100	"	"	0.0205	0.100	110%	"	--	--	"	
Barium	"	0.257	---	0.00100	"	"	0.159	"	98.0%	"	--	--	05/02/06 11:02	
Beryllium	"	0.0531	---	0.000500	"	"	ND	0.0500	106%	"	--	--	04/29/06 11:33	
Cadmium	"	0.109	---	0.000500	"	"	ND	0.100	109%	"	--	--	"	
Chromium	"	0.130	---	0.00100	"	"	0.000214	"	130%	"	--	--	"	
Copper	"	0.112	---	0.00100	"	"	0.000930	"	111%	"	--	--	"	
Lead	"	0.0989	---	0.000500	"	"	0.000129	"	98.8%	"	--	--	"	
Manganese	"	0.775	---	0.00200	"	"	0.619	"	156%	"	--	--	"	Q-03
Selenium	"	0.0504	---	0.00100	"	"	ND	0.0500	101%	"	--	--	"	
Silver	"	0.0540	---	0.00100	"	"	ND	"	108%	"	--	--	"	
Thallium	"	0.0450	---	0.00100	"	"	ND	"	90.0%	"	--	--	"	
Zinc	"	0.123	---	0.00500	"	"	0.0128	0.100	110%	"	--	--	"	

Sarah Rockwell, Project Manager

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ANALYTICAL TESTING CORPORATION

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BEAVERTON, OR 97008-7132
ph: (503) 906.9200 fax: (503) 906.9210

Ground Water Solutions	Project Name:	**Sunrise Water Authority**	
55 SW Yamhill St, Suite 400	Project Number:	157:005	Report Created:
Portland, OR 97204	Project Manager:	Ted Ressler	06/05/06 11:29

Dissolved Metals per EPA 200 Series Methods - Laboratory Quality Control Results

TestAmerica - Portland, OR

QC Batch: 6041222 **Water Preparation Method: EPA 200/3005 Diss**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Blank (6041222-BLK1)								Extracted: 04/27/06 10:07						
Iron	EPA 200.7	ND	---	0.0100	mg/l	1x	--	--	--	--	--	--	05/01/06 20:51	
Manganese	"	ND	---	0.0100	"	"	--	--	--	--	--	--	"	
LCS (6041222-BS1)								Extracted: 04/27/06 10:07						
Iron	EPA 200.7	3.68	---	0.0100	mg/l	1x	--	3.98	92.5%	(85-115)	--	--	05/01/06 20:58	
Manganese	"	0.461	---	0.0100	"	"	--	0.500	92.2%	"	--	--	"	
Duplicate (6041222-DUP1)					QC Source: PPD0737-02			Extracted: 04/27/06 10:07						
Iron	EPA 200.7	1.85	---	0.0100	mg/l	1x	1.82	--	--	--	1.63%	(20)	05/01/06 21:10	
Manganese	"	26.7	---	0.200	"	20x	26.4	--	--	--	1.13%	"	05/02/06 16:25	
Matrix Spike (6041222-MS1)					QC Source: PPD0737-02			Extracted: 04/27/06 10:07						
Iron	EPA 200.7	5.32	---	0.0100	mg/l	1x	1.82	3.98	87.9%	(75-125)	--	--	05/01/06 21:17	
Manganese	"	26.4	---	0.200	"	20x	26.4	0.500	0.00%	"	--	--	05/02/06 16:31	MS-4
Matrix Spike (6041222-MS2)					QC Source: PPD0846-01			Extracted: 04/27/06 10:07						
Iron	EPA 200.7	852	---	0.100	mg/l	10x	831	3.98	528%	(75-125)	--	--	05/02/06 17:36	MS-4
Manganese	"	34.7	---	0.100	"	"	34.1	0.500	120%	"	--	--	"	

Sarah Rockwell

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ANALYTICAL TESTING CORPORATION

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BEAVERTON, OR 97008-7132
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Ground Water Solutions	Project Name:	**Sunrise Water Authority**	
55 SW Yamhill St, Suite 400	Project Number:	157:005	Report Created:
Portland, OR 97204	Project Manager:	Ted Ressler	06/05/06 11:29

Total Mercury per EPA Method 245.1 - Laboratory Quality Control Results

TestAmerica - Portland, OR

QC Batch: 6041059 **Water Preparation Method: EPA 245.1**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Blank (6041059-BLK1)								Extracted: 04/24/06 10:21						
Mercury	EPA 245.1	ND	---	0.000200	mg/l	1x	--	--	--	--	--	--	04/24/06 13:16	
LCS (6041059-BS1)								Extracted: 04/24/06 10:21						
Mercury	EPA 245.1	0.00549	---	0.000200	mg/l	1x	--	0.00500	110%	(85-115)	--	--	04/24/06 13:18	
LCS Dup (6041059-BSD1)								Extracted: 04/24/06 10:21						
Mercury	EPA 245.1	0.00522	---	0.000200	mg/l	1x	--	0.00500	104%	(85-115)	5.04%	(20)	04/24/06 13:21	
Duplicate (6041059-DUP1)				QC Source: PPD0802-01				Extracted: 04/24/06 10:21						
Mercury	EPA 245.1	ND	---	0.000200	mg/l	1x	ND	--	--	--	NR	(30)	04/24/06 13:24	
Matrix Spike (6041059-MS1)				QC Source: PPD0802-01				Extracted: 04/24/06 10:21						
Mercury	EPA 245.1	0.00513	---	0.000200	mg/l	1x	ND	0.00500	103%	(75-125)	--	--	04/24/06 13:26	
Matrix Spike Dup (6041059-MSD1)				QC Source: PPD0802-01				Extracted: 04/24/06 10:21						
Mercury	EPA 245.1	0.00507	---	0.000200	mg/l	1x	ND	0.00500	101%	(75-125)	1.18%	(20)	04/24/06 13:29	

Sarah Rockwell

Sarah Rockwell, Project Manager

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PORTLAND, OR 9405 S.W. NIMBUS AVENUE
BEAVERTON, OR 97008-7132
ph: (503) 906.9200 fax: (503) 906.9210

Ground Water Solutions	Project Name:	**Sunrise Water Authority**	
55 SW Yamhill St, Suite 400	Project Number:	157:005	Report Created:
Portland, OR 97204	Project Manager:	Ted Ressler	06/05/06 11:29

Conventional Chemistry Parameters per APHA/EPA Methods - Laboratory Quality Control Results

TestAmerica - Portland, OR

QC Batch: 6040892 **Water Preparation Method: EPA 200/3005**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Blank (6040892-BLK1)								**Extracted: 04/19/06 15:33**						
Hardness (Ca)	SM 2340B-Ca	ND	---	0.250	mg/l	1x	--	--	--	--	--	--	04/27/06 13:52	
LCS (6040892-BS1)								**Extracted: 04/19/06 15:33**						
Hardness (Ca)	SM 2340B-Ca	26.0	---	0.250	mg/l	1x	--	25.0	104%	(85-115)	--	--	04/27/06 13:52	
Duplicate (6040892-DUP1)				**QC Source: PPD0806-01**				**Extracted: 04/19/06 15:33**						
Hardness (Ca)	SM 2340B-Ca	10.6	---	0.250	mg/l	1x	10.6	--	--	--	0.00%	(20)	04/27/06 13:52	
Matrix Spike (6040892-MS1)				**QC Source: PPD0806-01**				**Extracted: 04/19/06 15:33**						
Hardness (Ca)	SM 2340B-Ca	39.7	---	0.278	mg/l	1x	10.6	27.8	105%	(75-125)	--	--	04/27/06 13:52	

QC Batch: 6040896 **Water Preparation Method: General Preparation**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Blank (6040896-BLK1)								**Extracted: 04/19/06 15:53**						
Total Alkalinity	SM 2320B	ND	---	5.00	mg/L as CaCO3	1x	--	--	--	--	--	--	04/20/06 17:50	
Carbonate Alkalinity	"	ND	---	5.00	mg/l	"	--	--	--	--	--	--	"	
Bicarbonate Alkalinity	"	ND	---	5.00	"	"	--	--	--	--	--	--	"	
LCS (6040896-BS1)								**Extracted: 04/19/06 15:53**						
Total Alkalinity	SM 2320B	185	---	5.00	mg/L as CaCO3	1x	--	200	92.5%	(85-115)	--	--	04/20/06 17:50	
LCS (6040896-BS2)								**Extracted: 04/19/06 15:53**						
Total Alkalinity	SM 2320B	100	---	5.00	mg/L as CaCO3	1x	--	100	100%	(85-115)	--	--	04/20/06 17:50	
Duplicate (6040896-DUP1)				**QC Source: PPD0515-01**				**Extracted: 04/19/06 15:53**						
Carbonate Alkalinity	SM 2320B	ND	---	5.00	mg/l	1x	ND	--	--	--	NR	(20)	04/20/06 17:50	
Bicarbonate Alkalinity	"	75.3	---	5.00	"	"	75.6	--	--	--	0.398%	"	"	
Total Alkalinity	"	75.3	---	5.00	mg/L as CaCO3	"	75.6	--	--	--	0.398%	(30)	"	

Sarah Rockwell, Project Manager

TestAmerica
ANALYTICAL TESTING CORPORATION

PORTLAND, OR 9405 S.W. NIMBUS AVENUE
BEAVERTON, OR 97008-7132
ph: (503) 906.9200 fax: (503) 906.9210

Ground Water Solutions	Project Name:	**Sunrise Water Authority**	
55 SW Yamhill St, Suite 400	Project Number:	157.005	Report Created:
Portland, OR 97204	Project Manager:	Ted Ressler	06/05/06 11:29

Conventional Chemistry Parameters per APHA/EPA Methods - Laboratory Quality Control Results

TestAmerica - Portland, OR

QC Batch: 6040899 **Water Preparation Method: General Preparation**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Blank (6040899-BLK1)								Extracted: 04/19/06 16:08						
Turbidity	EPA 180.1	ND	---	0.200	NTU	1x	--	--	--	--	--	--	04/19/06 16:15	
LCS (6040899-BS1)								Extracted: 04/19/06 16:08						
Turbidity	EPA 180.1	19.8	---	0.200	NTU	1x	--	20.0	99.0%	(85-115)	--	--	04/19/06 16:15	
Duplicate (6040899-DUP1)					QC Source: PPD0746-01			Extracted: 04/19/06 16:08						
Turbidity	EPA 180.1	1.98	---	0.200	NTU	1x	2.00	--	--	--	1.01%	(30)	04/19/06 16:15	

QC Batch: 6040904 **Water Preparation Method: General Preparation**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Blank (6040904-BLK1)								Extracted: 04/19/06 20:39						
Color	EPA 110.2	ND	---	5.00	Color Units	1x	--	--	--	--	--	--	04/19/06 20:41	
LCS (6040904-BS1)								Extracted: 04/19/06 20:39						
Color	EPA 110.2	20.0	---	5.00	Color Units	1x	--	20.0	100%	(80-120)	--	--	04/19/06 20:41	
Duplicate (6040904-DUP1)					QC Source: PPD0797-01			Extracted: 04/19/06 20:39						
Color	EPA 110.2	ND	---	5.00	Color Units	1x	ND	--	--	--		(30)	04/19/06 20:41	

QC Batch: 6040905 **Water Preparation Method: General Preparation**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Blank (6040905-BLK1)								Extracted: 04/19/06 21:00						
Chlorine Residual (Total)	SM 4500-Cl G	ND	---	0.100	mg/l	1x	--	--	--	--	--	--	04/19/06 21:21	
LCS (6040905-BS1)								Extracted: 04/19/06 21:00						
Chlorine Residual (Total)	SM 4500-Cl G	0.942	---	0.100	mg/l	1x	--	1.00	94.2%	(85-115)	--	--	04/19/06 21:21	
Duplicate (6040905-DUP1)					QC Source: PPD0805-01			Extracted: 04/19/06 21:00						
Chlorine Residual (Total)	SM 4500-Cl G	0.500	---	0.100	mg/l	1x	0.511	--	--	--	2.18%	(30)	04/19/06 21:21	

Sarah Rockwell

Sarah Rockwell, Project Manager

TestAmerica
ANALYTICAL TESTING CORPORATION

PORTLAND, OR 9405 S.W. NIMBUS AVENUE
BEAVERTON, OR 97008-7132
ph: (503) 906.9200 fax: (503) 906.9210

Ground Water Solutions	Project Name:	**Sunrise Water Authority**	
55 SW Yamhill St, Suite 400	Project Number:	157:005	Report Created:
Portland, OR 97204	Project Manager:	Ted Ressler	06/05/06 11:29

Conventional Chemistry Parameters per APHA/EPA Methods - Laboratory Quality Control Results

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QC Batch: 6040932 **Water Preparation Method: General Preparation**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Blank (6040932-BLK1)													Extracted: 04/20/06 11:16	
Threshold Odor Number	EPA 140.1	ND	---	0.20	TON	1x	--	--	--	--	--	--	04/20/06 12:00	

QC Batch: 6041023 **Water Preparation Method: General Preparation**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Blank (6041023-BLK1)													Extracted: 04/21/06 22:05	
Total Organic Carbon	SM 5310C	ND	---	1.00	mg/l	1x	--	--	--	--	--	--	04/21/06 23:34	
LCS (6041023-BS1)													Extracted: 04/21/06 22:05	
Total Organic Carbon	SM 5310C	17.5	---	1.00	mg/l	1x	--	20.0	87.5%	(85-115)	--	--	04/21/06 23:48	
Duplicate (6041023-DUP1)					QC Source: PPD0510-01								Extracted: 04/21/06 22:05	
Total Organic Carbon	SM 5310C	ND	---	1.00	mg/l	1x	ND	--	--	--	NR	(30)	04/22/06 00:04	
Matrix Spike (6041023-MS1)					QC Source: PPD0510-01								Extracted: 04/21/06 22:05	
Total Organic Carbon	SM 5310C	24.8	---	1.01	mg/l	1x	0.510	25.3	96.0%	(80-130)	--	--	04/22/06 00:19	

QC Batch: 6041037 **Water Preparation Method: General Preparation**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Blank (6041037-BLK1)													Extracted: 04/24/06 07:53	
Silica (SiO2)	SM 4500-Si F	ND	---	0.500	mg/l	1x	--	--	--	--	--	--	04/24/06 12:18	
LCS (6041037-BS1)													Extracted: 04/24/06 07:53	
Silica (SiO2)	SM 4500-Si F	42.7	---	0.500	mg/l	1x	--	40.0	107%	(85-115)	--	--	04/24/06 12:18	
Duplicate (6041037-DUP1)					QC Source: PPD0570-08								Extracted: 04/24/06 07:53	
Silica (SiO2)	SM 4500-Si F	55.9	---	1.00	mg/l	2x	55.6	--	--	--	0.538%	(20)	04/24/06 12:18	
Matrix Spike (6041037-MS1)					QC Source: PPD0570-08								Extracted: 04/24/06 07:53	
Silica (SiO2)	SM 4500-Si F	75.8	---	1.00	mg/l	2x	55.6	20.0	101%	(75-125)	--	--	04/24/06 12:18	

Sarah Rockwell

Sarah Rockwell, Project Manager

TestAmerica
ANALYTICAL TESTING CORPORATION

PORTLAND, OR 9405 S.W. NIMBUS AVENUE
BEAVERTON, OR 97008-7132
ph: (503) 906.9200 fax: (503) 906.9210

Ground Water Solutions	Project Name:	**Sunrise Water Authority**	
55 SW Yamhill St, Suite 400	Project Number:	157.005	Report Created:
Portland, OR 97204	Project Manager:	Ted Ressler	06/05/06 11:29

Conventional Chemistry Parameters per APHA/EPA Methods - Laboratory Quality Control Results

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QC Batch: 6041047 **Water Preparation Method: General Preparation**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Blank (6041047-BLK1)								Extracted: 04/24/06 08:57						
Total Dissolved Solids	SM 2540C	ND	---	10.0	mg/l	1x	--	--	--	--	--	--	04/24/06 13:35	
LCS (6041047-BS1)								Extracted: 04/24/06 08:57						
Total Dissolved Solids	SM 2540C	102	---	10.0	mg/l	1x	--	100	102%	(85-115)	--	--	04/24/06 13:35	
Duplicate (6041047-DUP1)				QC Source: PPD0805-01				Extracted: 04/24/06 08:57						
Total Dissolved Solids	SM 2540C	48.0	---	10.0	mg/l	1x	48.0	--	--	--	0.00%	(30)	04/24/06 13:35	

QC Batch: 6041048 **Water Preparation Method: General Preparation**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Blank (6041048-BLK1)								Extracted: 04/24/06 09:02						
Total Suspended Solids	EPA 160.2	ND	---	10.0	mg/l	1x	--	--	--	--	--	--	04/24/06 15:25	
LCS (6041048-BS1)								Extracted: 04/24/06 09:02						
Total Suspended Solids	EPA 160.2	50.0	---	10.0	mg/l	1x	--	50.0	100%	(80-120)	--	--	04/24/06 15:25	
Duplicate (6041048-DUP1)				QC Source: PPD0805-01				Extracted: 04/24/06 09:02						
Total Suspended Solids	EPA 160.2	ND	---	10.0	mg/l	1x	ND	--	--	--	NR	(20)	04/24/06 15:25	

QC Batch: 6041172 **Water Preparation Method: General Preparation**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Blank (6041172-BLK1)								Extracted: 04/26/06 10:29						
Cyanide (total)	EPA 335.4	ND	---	0.00500	mg/l	1x	--	--	--	--	--	--	04/28/06 16:56	
LCS (6041172-BS1)								Extracted: 04/26/06 10:29						
Cyanide (total)	EPA 335.4	0.422	---	0.00500	mg/l	1x	--	0.400	106%	(90-110)	--	--	04/28/06 16:56	
Duplicate (6041172-DUP1)				QC Source: PPD0800-01				Extracted: 04/26/06 10:29						
Cyanide (total)	EPA 335.4	ND	---	0.00500	mg/l	1x	ND	--	--	--		(30)	04/28/06 16:56	
Matrix Spike (6041172-MS1)				QC Source: PPD0800-01				Extracted: 04/26/06 10:29						
Cyanide (total)	EPA 335.4	0.282	---	0.00500	mg/l	1x	ND	0.400	70.5%	(80-120)	--	--	04/28/06 16:56	Q-01
Matrix Spike Dup (6041172-MSD1)				QC Source: PPD0800-01				Extracted: 04/26/06 10:29						

Sarah Rockwell, Project Manager

TestAmerica
ANALYTICAL TESTING CORPORATION

PORTLAND, OR 9405 S.W. NIMBUS AVENUE
BEAVERTON, OR 97008-7132
ph: (503) 906.9200 fax: (503) 906.9210

Ground Water Solutions	Project Name:	**Sunrise Water Authority**	
55 SW Yamhill St, Suite 400	Project Number:	157:005	Report Created:
Portland, OR 97204	Project Manager:	Ted Ressler	06/05/06 11:29

Conventional Chemistry Parameters per APHA/EPA Methods - Laboratory Quality Control Results

TestAmerica - Portland, OR

QC Batch: 6041172 **Water Preparation Method: General Preparation**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Matrix Spike Dup (6041172-MSD1)					**QC Source: PPD0800-01**				**Extracted: 04/26/06 10:29**					
Cyanide (total)	EPA 335.4	0.309	---	0.00500	mg/l	1x	ND	0.400	77.2%	(80-120)	9.14%	(20)	04/28/06 16:56	Q-01

Sarah Rockwell

Sarah Rockwell, Project Manager

TestAmerica
ANALYTICAL TESTING CORPORATION

PORTLAND, OR 9405 S.W. NIMBUS AVENUE
BEAVERTON, OR 97008-7132
ph: (503) 906.9200 fax: (503) 906.9210

Ground Water Solutions	Project Name:	**Sunrise Water Authority**	
55 SW Yamhill St, Suite 400	Project Number:	157:005	Report Created:
Portland, OR 97204	Project Manager:	Ted Ressler	06/05/06 11:29

Anions per EPA Method 300.0 - Laboratory Quality Control Results

TestAmerica - Portland, OR

QC Batch: 6040844 **Water Preparation Method: Wet Chem**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Blank (6040844-BLK1)								Extracted: 04/19/06 08:33						
Nitrite-Nitrogen	EPA 300.0	ND	---	0.100	mg/l	1x	--	--	--	--	--	--	04/19/06 10:48	
Sulfate	"	ND	---	1.00	"	"	--	--	--	--	--	--	"	
Nitrate/Nitrite-Nitrogen	"	ND	---	0.200	"	"	--	--	--	--	--	--	"	
Chloride	"	ND	---	0.500	"	"	--	--	--	--	--	--	"	
Nitrate-Nitrogen	"	ND	---	0.100	"	"	--	--	--	--	--	--	"	
LCS (6040844-BS1)								Extracted: 04/19/06 08:33						
Sulfate	EPA 300.0	32.0	---	1.00	mg/l	1x	--	30.0	107%	(90-110)	--	--	04/19/06 11:04	
Nitrite-Nitrogen	"	5.09	---	0.100	"	"	--	5.00	102%	"	--	--	"	
Nitrate-Nitrogen	"	5.16	---	0.100	"	"	--	"	103%	"	--	--	"	
Chloride	"	10.4	---	0.500	"	"	--	10.0	104%	"	--	--	"	
Duplicate (6040844-DUP1)				QC Source: PPD0570-08				Extracted: 04/19/06 08:33						
Chloride	EPA 300.0	11.8	---	0.500	mg/l	1x	11.8	--	--	--	0.00%	(30)	04/19/06 11:19	
Sulfate	"	20.7	---	1.00	"	"	20.7	--	--	--	0.00%	"	"	
Nitrate-Nitrogen	"	8.02	---	0.100	"	"	8.03	--	--	--	0.125%	"	"	
Nitrate/Nitrite-Nitrogen	"	8.02	---	0.200	"	"	8.03	--	--	--	0.125%	"	"	
Nitrite-Nitrogen	"	ND	---	0.100	"	"	ND	--	--	--	NR	"	"	
Matrix Spike (6040844-MS1)				QC Source: PPD0570-08				Extracted: 04/19/06 08:33						
Sulfate	EPA 300.0	25.4	---	1.11	mg/l	1x	20.7	4.44	106%	(80-120)	--	--	04/19/06 11:35	
Chloride	"	14.2	---	0.556	"	"	11.8	2.22	108%	"	--	--	"	
Nitrite-Nitrogen	"	2.23	---	0.111	"	"	ND	"	100%	"	--	--	"	
Nitrate-Nitrogen	"	10.4	---	0.111	"	"	8.03	"	107%	"	--	--	"	
Matrix Spike (6040844-MS2)				QC Source: PPD0805-01				Extracted: 04/19/06 08:33						
Nitrate-Nitrogen	EPA 300.0	2.56	---	0.111	mg/l	1x	0.230	2.22	105%	(80-120)	--	--	04/19/06 20:40	
Chloride	"	5.71	---	0.556	"	"	3.33	"	107%	"	--	--	"	
Sulfate	"	6.56	---	1.11	"	"	2.21	4.44	98.0%	"	--	--	"	
Nitrite-Nitrogen	"	2.03	---	0.111	"	"	ND	2.22	91.4%	"	--	--	"	
Matrix Spike Dup (6040844-MSD1)				QC Source: PPD0570-08				Extracted: 04/19/06 08:33						
Chloride	EPA 300.0	14.2	---	0.556	mg/l	1x	11.8	2.22	108%	(80-120)	0.00%	(20)	04/19/06 11:50	
Sulfate	"	25.5	---	1.11	"	"	20.7	4.44	108%	"	0.393%	"	"	
Nitrate-Nitrogen	"	10.4	---	0.111	"	"	8.03	2.22	107%	"	0.00%	"	"	
Nitrite-Nitrogen	"	2.23	---	0.111	"	"	ND	"	100%	"	0.00%	"	"	

Sarah Rockwell

Sarah Rockwell, Project Manager

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BEAVERTON, OR 97008-7132
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Ground Water Solutions	Project Name:	**Sunrise Water Authority**	
55 SW Yamhill St, Suite 400	Project Number:	157:005	Report Created:
Portland, OR 97204	Project Manager:	Ted Ressler	06/05/06 11:29

Disinfection By-Products in Drinking Water per EPA 552.2 - Laboratory Quality Control Results

TestAmerica - Portland, OR

QC Batch: 6041285 **Water Preparation Method: Micro Liq/Liq Shake**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Blank (6041285-BLK1)								Extracted: 04/28/06 10:03						
Monochloroacetic acid (MCAA)	EPA 552.2	ND	---	0.00150	mg/l	1x	--	--	--	--	--	--	05/02/06 15:06	
Monobromoacetic acid (MBAA)	"	ND	---	0.00100	"	"	--	--	--	--	--	--	"	
Dibromoacetic acid (DBAA)	"	ND	---	0.000500	"	"	--	--	--	--	--	--	"	
Dichloroacetic acid (DCAA)	"	ND	---	0.00150	"	"	--	--	--	--	--	--	"	
Trichloroacetic acid (TCAA)	"	ND	---	0.000500	"	"	--	--	--	--	--	--	"	
Total Haloacetic Acids (HAA5)	"	ND	---	0.00150	"	"	--	--	--	--	--	--	"	
Surrogate(s): 2,3-Dibromopropionic acid		*Recovery: 96.2%*			*Limits: 70-130%*	"							*05/02/06 15:06*	
LCS (6041285-BS1)								Extracted: 04/28/06 10:03						
Monochloroacetic acid (MCAA)	EPA 552.2	0.00790	---	0.00150	mg/l	1x	--	0.00750	105%	(70-130)	--	--	05/02/06 14:33	
Monobromoacetic acid (MBAA)	"	0.00491	---	0.00100	"	"	--	0.00500	98.2%	"	--	--	"	
Dibromoacetic acid (DBAA)	"	0.00277	---	0.000500	"	"	--	0.00250	111%	"	--	--	"	
Dichloroacetic acid (DCAA)	"	0.00873	---	0.00150	"	"	--	0.00750	116%	"	--	--	"	
Trichloroacetic acid (TCAA)	"	0.00301	---	0.000500	"	"	--	0.00250	120%	"	--	--	"	
Surrogate(s): 2,3-Dibromopropionic acid		*Recovery: 125%*			*Limits: 70-130%*	"							*05/02/06 14:33*	
Matrix Spike (6041285-MS1)							QC Source: PPD0800-01	Extracted: 04/28/06 10:03						
Monochloroacetic acid (MCAA)	EPA 552.2	0.00762	---	0.00150	mg/l	1x	ND	0.00750	102%	(70-130)	--	--	05/02/06 16:12	
Monobromoacetic acid (MBAA)	"	0.00559	---	0.00100	"	"	ND	0.00500	112%	"	--	--	"	
Dibromoacetic acid (DBAA)	"	0.00282	---	0.000500	"	"	0.000147	0.00250	107%	"	--	--	"	
Dichloroacetic acid (DCAA)	"	0.0104	---	0.00150	"	"	0.00286	0.00750	101%	"	--	--	"	
Trichloroacetic acid (TCAA)	"	0.00485	---	0.000500	"	"	0.00211	0.00250	110%	"	--	--	"	
Surrogate(s): 2,3-Dibromopropionic acid		*Recovery: 105%*			*Limits: 70-130%*	"							*05/02/06 16:12*	
Matrix Spike Dup (6041285-MSD1)							QC Source: PPD0800-01	Extracted: 04/28/06 10:03						
Monochloroacetic acid (MCAA)	EPA 552.2	0.00737	---	0.00150	mg/l	1x	ND	0.00750	98.3%	(70-130)	3.34%	(30)	05/02/06 16:45	
Monobromoacetic acid (MBAA)	"	0.00524	---	0.00100	"	"	ND	0.00500	105%	"	6.46%	"	"	
Dibromoacetic acid (DBAA)	"	0.00271	---	0.000500	"	"	0.000147	0.00250	103%	"	3.98%	"	"	
Dichloroacetic acid (DCAA)	"	0.0102	---	0.00150	"	"	0.00286	0.00750	97.9%	"	1.94%	"	"	
Trichloroacetic acid (TCAA)	"	0.00448	---	0.000500	"	"	0.00211	0.00250	94.8%	"	7.93%	"	"	
Surrogate(s): 2,3-Dibromopropionic acid		*Recovery: 105%*			*Limits: 70-130%*	"							*05/02/06 16:45*	

Sarah Rockwell

Sarah Rockwell, Project Manager

TestAmerica
ANALYTICAL TESTING CORPORATION

PORTLAND, OR 9405 S.W. NIMBUS AVENUE
BEAVERTON, OR 97008-7132
ph: (503) 906.9200 fax: (503) 906.9210

Ground Water Solutions	Project Name:	**Sunrise Water Authority**	
55 SW Yamhill St, Suite 400	Project Number:	157.005	Report Created:
Portland, OR 97204	Project Manager:	Ted Ressler	06/05/06 11:29

Total Trihalomethanes in Drinking Water per EPA 524.2 - Laboratory Quality Control Results

TestAmerica - Portland, OR

QC Batch: 6041116 **Water Preparation Method: EPA 5030B**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Blank (6041116-BLK1)								Extracted: 04/25/06 10:04						
Bromodichloromethane	EPA 524.2	ND	---	0.000500	mg/l	1x	--	--	--	--	--	--	04/25/06 13:59	
Bromoform	"	ND	---	0.000500	"	"	--	--	--	--	--	--	"	
Chloroform	"	ND	---	0.000500	"	"	--	--	--	--	--	--	"	
Dibromochloromethane	"	ND	---	0.000500	"	"	--	--	--	--	--	--	"	
Total Trihalomethanes	"	ND	---	0.000500	"	"	--	--	--	--	--	--	"	
Surrogate(s): Dibromofluoromethane		*Recovery: 104%*			*Limits: 70-130%*	"							*04/25/06 13:59*	
1,2-DCA-d4		*112%*			*70-130%*	"							"	
Toluene-d8		*97.0%*			*70-130%*	"							"	
4-BFB		*78.0%*			*70-130%*	"							"	
LCS (6041116-BS1)								Extracted: 04/25/06 10:04						
Bromodichloromethane	EPA 524.2	0.00557	---	0.000500	mg/l	1x	--	0.00500	111%	(70-130)	--	--	04/25/06 12:34	
Bromoform	"	0.00496	---	0.000500	"	"	--	"	99.2%	"	--	--	"	
Chloroform	"	0.00551	---	0.000500	"	"	--	"	110%	"	--	--	"	
Dibromochloromethane	"	0.00508	---	0.000500	"	"	--	"	102%	"	--	--	"	
Surrogate(s): Dibromofluoromethane		*Recovery: 101%*			*Limits: 70-130%*	"							*04/25/06 12:34*	
1,2-DCA-d4		*101%*			*70-130%*	"							"	
Toluene-d8		*99.6%*			*70-130%*	"							"	
4-BFB		*110%*			*70-130%*	"							"	
Matrix Spike (6041116-MS1)					QC Source: PPD0615-01			Extracted: 04/25/06 10:04						
Bromodichloromethane	EPA 524.2	0.0272	---	0.000500	mg/l	1x	ND	0.0250	109%	(70-130)	--	--	04/25/06 20:42	
Bromoform	"	0.0218	---	0.000500	"	"	ND	"	87.2%	"	--	--	"	
Chloroform	"	0.0270	---	0.000500	"	"	ND	"	108%	"	--	--	"	
Dibromochloromethane	"	0.0246	---	0.000500	"	"	ND	"	98.4%	"	--	--	"	
Surrogate(s): Dibromofluoromethane		*Recovery: 101%*			*Limits: 70-130%*	"							*04/25/06 20:42*	
1,2-DCA-d4		*97.2%*			*70-130%*	"							"	
Toluene-d8		*101%*			*70-130%*	"							"	
4-BFB		*106%*			*70-130%*	"							"	
Matrix Spike Dup (6041116-MSD1)					QC Source: PPD0615-01			Extracted: 04/25/06 10:04						
Bromodichloromethane	EPA 524.2	0.0264	---	0.000500	mg/l	1x	ND	0.0250	106%	(70-130)	2.99%	(30)	04/25/06 21:10	
Bromoform	"	0.0206	---	0.000500	"	"	ND	"	82.4%	"	5.66%	"	"	
Chloroform	"	0.0258	---	0.000500	"	"	ND	"	103%	"	4.55%	"	"	
Dibromochloromethane	"	0.0243	---	0.000500	"	"	ND	"	97.2%	"	1.23%	"	"	
Surrogate(s): Dibromofluoromethane		*Recovery: 103%*			*Limits: 70-130%*	"							*04/25/06 21:10*	
1,2-DCA-d4		*101%*			*70-130%*	"							"	
Toluene-d8		*103%*			*70-130%*	"							"	
4-BFB		*102%*			*70-130%*	"							"	

Sarah Rockwell

Sarah Rockwell, Project Manager

TestAmerica
ANALYTICAL TESTING CORPORATION

PORTLAND, OR 9405 S.W. NIMBUS AVENUE
BEAVERTON, OR 97008-7132
ph: (503) 906.9200 fax: (503) 906.9210

Ground Water Solutions	Project Name:	**Sunrise Water Authority**	
55 SW Yamhill St, Suite 400	Project Number:	157:005	Report Created:
Portland, OR 97204	Project Manager:	Ted Ressler	06/05/06 11:29

Physical Parameters per APHA/ASTM/EPA Methods - Laboratory Quality Control Results

TestAmerica - Portland, OR

QC Batch: 6040891 **Water Preparation Method: General Preparation**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Duplicate (6040891-DUP1)				**QC Source: PPD0798-01**				**Extracted: 04/19/06 15:23**						
Corrosivity	EPA 9040A	7.15	---		pH Units	1x	7.20	--	--	--	0.697%	(30)	04/19/06 15:30	

Sarah Rockwell

Sarah Rockwell, Project Manager

TestAmerica
ANALYTICAL TESTING CORPORATION

PORTLAND, OR 9405 S.W. NIMBUS AVENUE
BEAVERTON, OR 97008-7132
ph: (503) 906.9200 fax: (503) 906.9210

Ground Water Solutions	Project Name:	**Sunrise Water Authority**	
55 SW Yamhill St, Suite 400	Project Number:	157:005	Report Created:
Portland, OR 97204	Project Manager:	Ted Ressler	06/05/06 11:29

Notes and Definitions

Report Specific Notes:

BS-1	-	Laboratory Control Sample and/or Laboratory Control Sample Duplicate recovery was above the laboratory control limits. Analyte not detected, data not impacted.
M-04	-	Sample Filtered through 0.45 micron filter in Laboratory prior to analysis.
MS-4	-	Due to high levels of analyte in the sample, the Matrix Spike/Matrix Spike Duplicate calculation does not provide useful spike recovery information. See Laboratory Control Sample.
Q-01	-	The matrix spike recovery, and/or RPD, for this QC sample is outside of established control limits. Failure of a matrix spike QC sample does not represent an out-of-control condition for the batch.
Q-03	-	The matrix spike recovery, and/or RPD, for this QC sample cannot be accurately calculated due to the high concentration of analyte already present in the source sample.

Laboratory Reporting Conventions:

DET	-	Analyte DETECTED at or above the Reporting Limit. Qualitative Analyses only.
ND	-	Analyte NOT DETECTED at or above the reporting limit (MDL or MRL, as appropriate).
NR/NA	-	Not Reported / Not Available
dry	-	Sample results reported on a Dry Weight Basis. Results and Reporting Limits have been corrected for Percent Dry Weight.
wet	-	Sample results and reporting limits reported on a Wet Weight Basis (as received). Results with neither 'wet' nor 'dry' are reported on a Wet Weight Basis.
RPD	-	RELATIVE PERCENT DIFFERENCE (RPDs calculated using Results, not Percent Recoveries).
MRL	-	METHOD REPORTING LIMIT. Reporting Level at, or above, the lowest level standard of the Calibration Table.
MDL*	-	METHOD DETECTION LIMIT. Reporting Level at, or above, the statistically derived limit based on 40CFR, Part 136, Appendix B. *MDLs are listed on the report only if the data has been evaluated below the MRL. Results between the MDL and MRL are reported as Estimated Results.
Dil	-	Dilutions are calculated based on deviations from the standard dilution performed for an analysis, and may not represent the dilution found on the analytical raw data.
Reporting Limits	-	Reporting limits (MDLs and MRLs) are adjusted based on variations in sample preparation amounts, analytical dilutions and percent solids, where applicable.
Electronic Signature	-	Electronic Signature added in accordance with TestAmerica's *Electronic Reporting and Electronic Signatures Policy*. Application of electronic signature indicates that the report has been reviewed and approved for release by the laboratory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

-Sarah Rockwell

Sarah Rockwell, Project Manager

NEILSON RESEARCH CORPORATION
Environmental Testing Laboratory

04/25/06

Sarah Rockwell
North Creek Analytical - Portland
9405 SW Nimbus Avenue
Beaverton, OR 97008

TEL: (503) 906-9200
FAX (503) 906-9210

RE: NCA # PPD0806-01

Order No.: 0604393

Dear Sarah Rockwell:

Neilson Research Corporation received 1 sample(s) on 04/20/06 for the analyses presented in the following report.

The results relate only to the parameters tested or to the sample as received by the laboratory. This report shall not be reproduced except in full, without the written approval of Neilson Research Corporation. If you have any questions regarding these test results, please feel free to call.

Sincerely,
Neilson Research Corporation

Fay L. Fowler
Project Manager

245 South Grape Street ▵ Medford, OR 97501-3123 ▵ (541) 770-5678 ▵ fax (541) 770-2901

Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

Analysis Report

ORELAP 100016
EPA OR00028

CLIENT:	North Creek Analytical - Portland	**Date:** 25-Apr-06	
Project:	NCA # PPD0806-01	**CASE NARRATIVE**	
Lab Order:	0604393		

The analyses were performed according to the guidelines in the Neilson Research Corporation Quality Assurance Program. This report contains analytical results for the sample(s) as received by the laboratory.

Neilson Research Corporation certifies that this report is in compliance with the requirements of NELAP. No unusual difficulties were experienced during analysis of this batch except as noted below or qualified with data flags on the reports.

Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

Analysis Report

ORELAP 100016
EPA OR00028

North Creek Analytical - Portland
9405 SW Nimbus Avenue
Beaverton, OR 97008

Lab Order: **0604393**
NRC Sample ID: **0604393-01A**
Collection Date: **04/19/06 10:20:00 AM**
Received Date: **04/20/06 8:50:00 AM**
Reported Date: **04/25/06 11:48:27 AM**

Sample Information:

NCA # PPD0806-01

Client Sample ID: PPD0806-01
Collectors Name: Client
Sample Location: SWA-SW-CRW
Source: Sunrise AST

ANALYTICAL RESULTS

Analyses	Method	NELAC Accredited	Result	Qual	MRL	Units	EPA Limit	Date Analyzed	Analyst
MBAS	SM 5540C	A	**ND**		0.04	mg/L	0.5	04/20/06	KRM

Notes: ND - Not Detected at the MRL N.L. - No Limit MRL - Minimum Reporting Limit

Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

Analysis Report ORELAP 100016 EPA OR00028

North Creek Analytical - Portland
9405 SW Nimbus Avenue
Beaverton, OR 97008

Lab Order: **0604393**
NRC Sample ID: **0604393-01B**
Collection Date: **04/19/06 10:20:00 AM**
Received Date: **04/20/06 8:50:00 AM**
Reported Date: **04/25/06 11:48:27 AM**

Sample Information:

NCA # PPD0806-01

Client Sample ID: PPD0806-01
Collectors Name: Client
Sample Location: SWA-SW-CRW
Source: Sunrise AST

ANALYTICAL RESULTS

Analyses	Method	NELAC Accredited	Result	Qual	MRL	Units	EPA Limit	Date Analyzed	Analyst
Fluoride	EPA 300.0	A	**ND**		0.2	mg/L	2 - 4	04/20/06	KRM

Notes: ND - Not Detected at the MRL N.L. - No Limit MRL - Minimum Reporting Limit

2

CLIENT: North Creek Analytical - Portland
Work Order: 0604393
Project: NCA # PPD0806-01

ANALYTICAL QC SUMMARY REPORT

TestCode: EPA300_W

Sample ID	MB	SampType:	MBLK	TestCode:	EPA300_W	Units:	mg/L	Prep Date:		RunNo:	29474
Client ID:	ZZZZZ	Batch ID:	R29474	TestNo:	EPA 300.0			Analysis Date:	04/20/06	SeqNo:	442763

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Fluoride	ND	0.200									

Sample ID	LCS	SampType:	LCS	TestCode:	EPA300_W	Units:	mg/L	Prep Date:		RunNo:	29474
Client ID:	ZZZZZ	Batch ID:	R29474	TestNo:	EPA 300.0			Analysis Date:	04/20/06	SeqNo:	442764

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Fluoride	2.607	0.200	2.5	0	104	90	110				

Sample ID	0604405-01AMS	SampType:	MS	TestCode:	EPA300_W	Units:	mg/L	Prep Date:		RunNo:	29474
Client ID:	ZZZZZ	Batch ID:	R29474	TestNo:	EPA 300.0			Analysis Date:	04/20/06	SeqNo:	442786

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Fluoride	4.801	0.200	3.75	1.13	97.9	80	120				

Sample ID	0604405-01AMSD	SampType:	MSD	TestCode:	EPA300_W	Units:	mg/L	Prep Date:		RunNo:	29474
Client ID:	ZZZZZ	Batch ID:	R29474	TestNo:	EPA 300.0			Analysis Date:	04/20/06	SeqNo:	442787

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Fluoride	4.934	0.200	3.75	1.13	101	80	120	4.801	2.74	20	

Qualifiers:

E	Value above quantitation range	H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Minimum Reporting Limit	R	RPD outside accepted recovery limits	S	Spike Recovery outside accepted recovery limits

CLIENT: North Creek Analytical - Portland
Work Order: 0604393
Project: NCA # PPD0806-01

ANALYTICAL QC SUMMARY REPORT

TestCode: MBAS

Sample ID	MBLK	SampType:	MBLK	TestCode:	MBAS	Units:	mg/L	Prep Date:		RunNo:	29500
Client ID:	ZZZZZ	Batch ID:	R29500	TestNo:	SM 5540C			Analysis Date:	04/20/06	SeqNo:	443217

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
MBAS	ND	0.10									

Sample ID	LCS	SampType:	LCS	TestCode:	MBAS	Units:	mg/L	Prep Date:		RunNo:	29500
Client ID:	ZZZZZ	Batch ID:	R29500	TestNo:	SM 5540C			Analysis Date:	04/20/06	SeqNo:	443218

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
MBAS	0.5010	0.10	0.482	0	104	80	120				

Sample ID	0604394-01AMS	SampType:	MS	TestCode:	MBAS	Units:	mg/L	Prep Date:		RunNo:	29500
Client ID:	ZZZZZ	Batch ID:	R29500	TestNo:	SM 5540C			Analysis Date:	04/20/06	SeqNo:	443221

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
MBAS	0.5170	0.10	0.5	0.0284	97.7	80	120				

Sample ID	0604394-01AMSD	SampType:	MSD	TestCode:	MBAS	Units:	mg/L	Prep Date:		RunNo:	29500
Client ID:	ZZZZZ	Batch ID:	R29500	TestNo:	SM 5540C			Analysis Date:	04/20/06	SeqNo:	443222

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
MBAS	0.5560	0.10	0.5	0.0284	106	80	120	0.517	7.27	15	

Qualifiers:

E	Value above quantitation range	H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Minimum Reporting Limit	R	RPD outside accepted recovery limits	S	Spike Recovery outside accepted recovery limits

SUBCONTRACT ORDER

North Creek Analytical - Portland

PPD0806

SENDING LABORATORY:

North Creek Analytical - Portland
9405 SW Nimbus Ave.
Beaverton, OR 97008
Phone: (503) 906-9200
Fax: (503) 906-9210
Project Manager: Sarah Rockwell

RECEIVING LABORATORY:

Neilson Research Corp.
245 S. Grape St.
Medford, OR 97501
Phone :541-770-5678
Fax: 541-770-2901

Analysis	Due	Expires	Laboratory ID	Comments
				0604393
Sample ID: PPD0806-01	**Water**	**Sampled:04/19/06 10:20**	[redacted]	
DW MBAS - SUB	05/02/06 23:59	04/21/06 10:20	01A	
DW IC Fluoride (300)	05/02/06 23:59	05/17/06 10:20	01B	
Containers Supplied:				
1L Poly - Unpres (X)	250 mL Poly - Unpres. (Y			

2.1°C cool w/ ice

Released By	Date	Received By	Date
		M. Sidley	4/20/06 8:50
Released By	Date	Received By	Date

Analytical Data Package Prepared For

North Creek Analytical

Radiochemical Analysis By

STL Richland

2800 G.W. Way, Richland Wa, 99354, (509)-375-3131.

Assigned Laboratory Code:

Data Package Contains 19 Pages

Report No.: 32207

SDG No.	Order No.	Client Sample ID (List Order)	Lot-Sa No.	Work Order	Report DB ID	Batch No.
31430		PPD0805-01	J6D200273-2	H3PNP1AA	9H3PNP10	6110559
		PPD0805-01	J6D200273-1	H3PM51AE	9H3PM510	6114557
		PPD0805-01	J6D200273-1	H3PM51AD	9H3PM510	6114559
		PPD0805-01	J6D200273-1	H3PM51AA	9H3PM510	6114561
		PPD0805-01	J6D200273-1	H3PM51AC	9H3PM510	6114562
		PPD0806-01	J6D200273-3	H3PNR1AA	9H3PNR10	6110559
		PPD0806-01	J6D200273-4	H3PN21AE	9H3PN210	6114557
		PPD0806-01	J6D200273-4	H3PN21AD	9H3PN210	6114559
		PPD0806-01	J6D200273-4	H3PN21AA	9H3PN210	6114561
		PPD0806-01	J6D200273-4	H3PN21AC	9H3PN210	6114562

SEVERN TRENT STL

Certificate of Analysis

STL Richland
2800 George Washington Way
Richland, WA 99352

Tel: 509 375 3131 Fax: 509 375 5590
www.stl-inc.com

May 26, 2006

North Creek Analytical – Portland
9405 SW Nimbus Ave.
Beaverton, OR 97008

Attention: Sarah Rockwell

Date Received	:	April 20, 2006
Sample Number/Matrix	:	Two (2) Waters
SDG Number	:	31430
Project Number	:	PPD0805-01, PPD0806-01

CASE NARRATIVE

I. Introduction

On April 20, 2006, two water samples were received at the STL Richland (STLR) laboratory for radiochemical analysis. Upon receipt, the samples were assigned the STLR identification numbers as described on the cover page of the Analytical Data Package. These samples were assigned to Lot Number J6D200276.

II. Sample Receipt

The samples were received in good condition and no anomalies were noted during check-in.

III. Analytical Results/Methodology

The analytical results for this report are presented by laboratory sample ID. Each set of data includes sample identification information; analytical results and the appropriate associated statistical uncertainties.

The analyses requested were:

Gas Proportional Counting
Gross Alpha by method RICH-RC-5014 (EPA 900.0)
Gross Beta by method RICH-RC-5014 (EPA 900.0)
Radium-228 by method STL RICH-RC-5005 (EPA 904.0)
Liquid Scintillation Counting
Radon-222 by Method RICHRC-5082 (EPA 913.0)
Alpha Scintillation
Radium-226 by method RICH-RC-5005 (EPA 903.1)

IV. Quality Control

The analytical result for each analysis performed includes a minimum of one laboratory control sample (LCS), and one reagent blank sample analysis. Any exceptions have been noted in the "Comments" section.

V. Comments

Gross Alpha by method RICH-RC-5014:

The LCS, batch blank, matrix spike, sample, and sample duplicate results are within acceptance limits.

Gross Beta by method RICH-RC-5014:

The LCS, batch blank, matrix spike, sample, and sample duplicate results are within acceptance limits.

Radium-228 Analysis:

The LCS, batch blank, sample and sample duplicate results are within acceptance limits.

Radium-226 by method RICH-RC-5005:

The LCS, batch blank, sample, and sample duplicate results are within acceptance limits.

Radon-222 by Method EPA 913.0:

The LCS has a 147% recovery. All the sample results are below CRDL. The samples cannot be reanalyzed due to holding time violations. Data accepted. Except as noted, the LCS, batch blank, sample and sample duplicate results are within acceptance limits.

I certify that this Certificate of Analysis is in compliance with the SOW, both technically and for completeness, for other than the conditions detailed above. The Laboratory Manager or a designee, as verified by the following signature has authorized release of the data contained in this hard copy data package.

Reviewed and approved:

Sherryl A. Adam
Project Manager

Drinking Water Method Cross References

	DRINKING WATER ASTM METHOD CROSS REFERENCES	
Referenced Method	**Isotope(s)**	**STL Richland's SOP number**
EPA 901.1	Cs-134, I-131	RICH-RC-5017
EPA 900.0	Alpha & Beta	RICH-RC-5014
EPA 903.1	Ra-226	RICH-RC-5005
EPA 904.0	Ra-228	RICH-RC-5005
EPA 905.0	Sr89/90	RICH-RC-5006
ASTM D2460	Total Radium	RICH-RC-5027
Standard Method 7500-U-C & ASTM D5174	Uranium	RICH-RC-5058
EPA 906.0	Tritium	RICH-RC-5007
NOTE:		
The Gross Alpha LCS is prepared with Am-241 (unless otherwise specified in the case narrative)		
The Gross Beta LCS is prepared with Sr/Y-90 (unless otherwise specified in the case narrative)		

Uncertainty Estimation

STL Richland has adopted the internationally accepted approach to estimating uncertainties described in "NIST Technical Note 1297, 1994 Edition". The approach, "Law of Propagation of Errors", involves the identification of all variables in an analytical method which are used to derive a result. These variables are related to the analytical result (R) by some functional relationship, R = constants * f(x,y,z,...). The components (x,y,z) are evaluated to determine their contribution to the overall method uncertainty. The individual component uncertainties (u_i) are then combined using a statistical model that provides the most probable overall uncertainty value. All component uncertainties are categorized as type A, evaluated by statistical methods, or type B, evaluated by other means. Uncertainties not included in the components, such as sample homogeneity, are combined with the component uncertainty as the square root of the sum-of-the-squares of the individual uncertainties. The uncertainty associated with the derived result is the combined uncertainty (u_c) multiplied by the coverage factor (1,2, or 3).

When three or more sample replicates are used to derive the analytical result, the type A uncertainty is the standard deviation of the mean value ($S/\sqrt{n}$), where S is the standard deviation of the derived results. The type B uncertainties are all other random or non-random components that are not included in the standard deviation.

The derivation of the general "Law of Propagation of Errors" equations and specific example are available on request.

Report Definitions

Action Lev	An agreed upon activity level used to trigger some action when the final result is greater than or equal to the Action Level. Often the Action Level is related to the Decision Limit.
Batch	The QC preparation batch number that relates laboratory samples to QC samples that were prepared and analyzed together.
Bias	Defined by the equation (Result/Expected)-1 as defined by ANSI N13.30.
COC No	Chain of Custody Number assigned by the Client or STL Richland.
Count Error (#s)	Poisson counting statistics of the gross sample count and background. The uncertainty is absolute and in the same units as the result. For Liquid Scintillation Counting (LSC) the batch blank count is the background.
Total Uncert (#s) *u_c - Combined Uncertainty.*	All known uncertainties associated with the preparation and analysis of the sample are propagated to give a measure of the uncertainty associated with the result, *u_c the combined uncertainty*. The uncertainty is absolute and in the same units as the result.
(#s), Coverage Factor	The coverage factor defines the width of the confidence interval, 1, 2 or 3 standard deviations.
CRDL (RL)	Contractual Required Detection Limit as defined in the Client's Statement Of Work or STL Richland "default" nominal detection limit. Often referred to the reporting level (RL)
Lc	Decision Level based on instrument background or blank, adjusted by the Efficiency, Chemical Yield, and Volume associated with the sample. The Type I error probability is approximately 5%. Lc=(1.645 * Sqrt(2*(BkgrndCnt/BkgrndCntMin)/SCntMin)) * (ConvFct/(Eff*Yld*Abn*Vol) * IngrFct). For LSC methods the batch blank is used as a measure of the background variability. Lc cannot be calculated when the background count is zero.
Lot-Sample No	The number assigned by the LIMS software to track samples received on the same day for a given client. The sample number is a sequential number assigned to each sample in the Lot.
MDC|MDA	Detection Level based on instrument background or blank, adjusted by the Efficiency, Chemical Yield, and Volume with a Type I and II error probability of approximately 5%. MDC = (4.65 * Sqrt((BkgrndCnt/BkgrndCntMin)/SCntMin) + 2.71/SCntMin) * (ConvFct/(Eff * Yld * Abn * Vol) * IngrFct). For LSC methods the batch blank is used as a measure of the background variability.
Primary Detector	The instrument identifier associated with the analysis of the sample aliquot.
Ratio U-234/U-238	The U-234 result divided by the U-238 result. The U-234/U-238 ratio for natural uranium in NIST SRM 4321C is 1.038.
Rst/MDC	Ratio of the Result to the MDC. A value greater than 1 may indicate activity above background at a high level of confidence. Caution should be used when applying this factor and it should be used in concert with the qualifiers associated with the result.
Rst/TotUcert	Ratio of the Result to the Total Uncertainty. If the uncertainty has a coverage factor of 2 a value greater than 1 may indicate activity above background at approximately the 95% level of confidence assuming a two-sided confidence interval. Caution should be used when applying this factor and it should be used in concert with the qualifiers associated with the result.
Report DB No	Sample Identifier used by the report system. The number is based upon the first five digits of the **Work Order** Number.
RER	The equation Replicate Error Ratio = (S-D)/[sqrt($TPUs^2 + TPUd^2$)] as defined by ICPT BOA where S is the original sample result, D is the result of the duplicate, TPUs is the total uncertainty of the original sample and TPUd is the total uncertainty of the duplicate sample.
SDG	Sample Delivery Group Number assigned by the Client or assigned by STL Richland upon sample receipt.
Sum Rpt Alpha Spec Rst(s)	The sum of the reported alpha spec results for tests derived from the same sample excluding duplicate result where the results are in the same units.
Work Order	The LIMS software assign test specific identifier.
Yield	The recovery of the tracer added to the sample such as Pu-242 used to trace a Pu-239/40 method.

Sample Results Summary

STL Richland

Ordered by Method, Batch No., Client Sample ID.

Date: 26-May-06

Report No. : 32207 **SDG No:** 31393

Batch	Client Id / Work Order	Parameter	Result +- Uncertainty (2s)	Qual	Units	Yield	MDC or MDA	CRDL	RER2
6114557 RICHRC5014									
	1-1 DUP								
	H3G3D1AE	ALPHA	0.852 +- 0.812	U	pCi/L	100%	1.28	3.0	1.3
	PPD0805-01								
	H3PM51AE	ALPHA	-0.1970 +- 0.264	U	pCi/L	100%	1.2	3.0	
	PPD0806-01								
	H3PN21AE	ALPHA	-0.0881 +- 0.273	U	pCi/L	100%	1.1	3.0	
6114559 RICHRC5014									
	PPD0805-01								
	H3PM51AD	BETA	1.18 +- 1.33	U	pCi/L	100%	2.75	4.0	
	PPD0805-01 DUP								
	H3PM51AF	BETA	1.03 +- 1.16	U	pCi/L	100%	2.37	4.0	0.2
	PPD0806-01								
	H3PN21AD	BETA	1.45 +- 1.30	U	pCi/L	100%	2.62	4.0	
6114562 RICHRC5005									
	PPD0805-01								
	H3PM51AC	RA-228	0.0326 +- 0.164	U	pCi/L	88%	0.407	1.0	
	PPD0805-01 DUP								
	H3PM51AH	RA-228	0.306 +- 0.179	U	pCi/L	96%	0.343	1.0	2.2
	PPD0806-01								
	H3PN21AC	RA-228	0.385 +- 0.216	U	pCi/L	89%	0.407	1.0	
6110559 EITR									
	PPD0805-01								
	H3PNP1AA	RN-222	-10.800 +- 22.4	U	pCi/L	100%	34.8	50.0	
	PPD0805-01 DUP								
	H3PNP1AC	RN-222	-6.3100 +- 22.6	U	pCi/L	100%	34.8	50.0	0.3
	PPD0806-01								
	H3PNR1AA	RN-222	-7.6700 +- 22.6	U	pCi/L	100%	34.8	50.0	
6114561 RICHRC5005									
	PPD0805-01								
	H3PM51AA	RA-226	-0.0473 +- 0.111	U	pCi/L	100%	0.233	1.0	
	PPD0805-01 DUP								
	H3PM51AG	RA-226	0.0971 +- 0.157	U	pCi/L	108%	0.271	1.0	
	PPD0806-01								
	H3PN21AA	RA-226	0.0822 +- 0.124	U	pCi/L	100%	0.214	1.0	

No. of Results: 15

STL Richland

rptSTLRchSaSummary2 V4.15.0 A97

RER2 - Replicate Error Ratio = (S-D)/[sqrt(sq(TPUs)+sq(TPUd))] as defined by ICPT BOA.

U Qual - Analyzed for but not detected above limiting criteria. Limit criteria is less than the Mdc/Mda or Total Uncert or not identified by gamma scan software.

QC Results Summary
STL Richland

Ordered by Method, Batch No, QC Type,.

Date: 26-May-06

Report No. : 32207 **SDG No.:** 31393

Batch / Work Order	Parameter	Result +- Uncertainty (2s)	Qual	Units	Yield	Recovery	Bias	MDC|MDA
RICHRC5014								
6114557 MATRIX SPIKE								
H3G3D1AD	ALPHA	29.2 +- 8.43		pCi/L	100%	72%	-0.3	1.01
6114557 BLANK QC								
H30NP1AA	ALPHA	-0.0346 +- 0.344	U	pCi/L	100%			1.13
6114557 LCS								
H30NP1AC	ALPHA	43.3 +- 12.0		pCi/L	100%	106%	0.1	1.04
RICHRC5014								
6114559 BLANK QC								
H30N11AA	BETA	0.731 +- 1.25	U	pCi/L	100%			2.66
6114559 LCS								
H30N11AC	BETA	36.2 +- 6.27		pCi/L	100%	90%	-0.1	2.74
6114559 MATRIX SPIKE								
H3PN21AF	BETA	111.0 +- 15.2		pCi/L	100%	98%	0.0	2.66
RICHRC5005								
6114562 BLANK QC								
H30N71AA	RA-228	0.0260 +- 0.0197	U	pCi/L	87%			0.0405
6114562 LCS								
H30N71AC	RA-228	5.19 +- 0.773		pCi/L	89%	102%	0.0	0.341
EITR								
6110559 BLANK QC								
H3P341AA	RN-222	-17.300 +- 18.2	U	pCi/L	100%			29.0
6110559 LCS								
H3P341AC	RN-222	9950.0 +- 1110.0		pCi/L	100%	147%	0.5	29.0
RICHRC5005								
6114561 BLANK QC								
H30N51AA	RA-226	0.126 +- 0.0905		pCi/L	99%			0.118
6114561 LCS								
H30N51AC	RA-226	1.37 +- 0.374		pCi/L	99%	100%	0.0	0.149

No. of Results: 12

STL Richland

rptSTLRchQcSummary V4.15.0 A97

Bias - (Result/Expected)-1 as defined by ANSI N13.30.

U Qual - Analyzed for but not detected above limiting criteria. Limit criteria is less than the Mdc/Mda or Total Uncert or not identified by gamma scan software.

FORM I

SAMPLE RESULTS

Date: 26-May-06

Lab Name: STL Richland | SDG: 31430 | **Collection Date:** 4/19/2006 11:30:00 AM

Lot-Sample No.: J6D200273-1 | Report No. : 32207 | **Received Date:** 4/20/2006 10:30:00 AM

Client Sample ID: PPD0805-01 | COC No. : | **Matrix:** WATER

Ordered by Client Sample ID, Batch No.

Parameter	Result	Qual	Count Error (2 s)	Total Uncert(2 s)	MDC|MDA, Action Lev	Rpt Unit, Lc	Yield CRDL(RL)	Rst/MDC, Rst/TotUcert	Analysis, Prep Date	Total Sa Size	Allquot Size	Primary Detector
Batch: 6114557	RICHRC5014			Work Order: H3PM51AE		Report DB ID: 9H3PM510						
ALPHA	-0.1970	U	0.26	0.26	1.2	pCi/L	100%	*-0.16*	5/16/06 09:14 a		0.2016	GPC10D
						0.442	3.0	*-(1.5)*			L	
Batch: 6114559	RICHRC5014			Work Order: H3PM51AD		Report DB ID: 9H3PM510						
BETA	1.18	U	1.3	1.3	2.75	pCi/L	100%	*0.43*	5/15/06 01:42 p		0.1982	GPC27A
						1.31	4.0	*(1.8)*			L	
Batch: 6114561	RICHRC5005			Work Order: H3PM51AA		Report DB ID: 9H3PM510						
RA-226	-0.0473	U	0.11	0.11	0.233	pCi/L	100%	*-0.2*	5/25/06 12:57 p		0.9996	ASC2RC
						0.102	1.0	*-0.85*			L	
Batch: 6114562	RICHRC5005			Work Order: H3PM51AC		Report DB ID: 9H3PM510						
RA-228	0.0326	U	0.13	0.16	0.407	pCi/L	88%	*0.08*	5/26/06 08:52 a		0.9996	GPC2A
						0.175	1.0	*0.4*			L	

No. of Results: 4 Comments:

STL Richland
rptSTLRchSample
V4.15.0 A97

MDC|MDA,Lc - Detection, Decision Level based on instrument background or blank, adjusted by the sample Efficiency, Yield, and Volume.
U Qual - Analyzed for but not detected above limiting criteria. Limit criteria is less than the Mdc/Mda or Total Uncert or not identified by gamma scan software.

FORM I

Date: 26-May-06

SAMPLE RESULTS

Lab Name:	STL Richland	SDG:	31430	**Collection Date:**	4/19/2006 11:30:00 AM
Lot-Sample No.:	J6D200273-2	Report No. :	32207	**Received Date:**	4/20/2006 10:30:00 AM
Client Sample ID:	PPD0805-01	COC No. :		**Matrix:**	WATER

Ordered by Client Sample ID, Batch No.

Parameter	Result	Qual	Count Error (2 s)	Total Uncert(2 s)	MDC|MDA, Action Lev	Rpt Unit, Lc	Yield CRDL(RL)	Rst/MDC, Rst/TotUcert	Analysis, Prep Date	Total Sa Size	Aliquot Size	Primary Detector
Batch: 6110559 EITR				Work Order: H3PNP1AA			Report DB ID: 9H3PNP10					
RN-222	-10.800	U	14.0	22.0	34.8	pCi/L	100%	*-0.31*	4/22/06 06:22 p		0.01	LSC7
						16.8	50.0	*-0.97*			L	

No. of Results: 1 Comments:

6

STL Richland
rptSTLRchSample
V4.15.0 A97

MDC|MDA,Lc - Detection, Decision Level based on instrument background or blank, adjusted by the sample Efficiency, Yield, and Volume.
U Qual - Analyzed for but not detected above limiting criteria. Limit criteria is less than the Mdc/Mda or Total Uncert or not identified by gamma scan software.

FORM I

SAMPLE RESULTS

Date: 26-May-06

Lab Name:	STL Richland	SDG:	31430	**Collection Date:**	4/19/2006 11:30:00 AM
Lot-Sample No.:	J6D200273-3	Report No. :	32207	**Received Date:**	4/20/2006 10:30:00 AM
Client Sample ID:	PPD0806-01	COC No. :		**Matrix:**	WATER

Ordered by Client Sample ID, Batch No.

Parameter	Result	Qual	Count Error (2 s)	Total Uncert(2 s)	MDC|MDA, Action Lev	Rpt Unit, Lc	Yield CRDL(RL)	Rst/MDC, Rst/TotUcert	Analysis, Prep Date	Total Sa Size	Aliquot Size	Primary Detector
Batch: 6110559 EITR				Work Order: H3PNR1AA			Report DB ID: 9H3PNR10					
RN-222	-7.6700	U	14.0	23.0	34.8	pCi/L	100%	*-0.22*	4/22/06 06:22 p		0.01	LSC7
						16.8	50.0	*-0.68*			L	

No. of Results: 1 Comments:

10

STL Richland
rptSTLRchSample
V4.15.0 A97

MDC|MDA,Lc - Detection, Decision Level based on instrument background or blank, adjusted by the sample Efficiency, Yield, and Volume.
U Qual - Analyzed for but not detected above limiting criteria. Limit criteria is less than the Mdc/Mda or Total Uncert or not identified by gamma scan software.

FORM I

SAMPLE RESULTS

Date: 26-May-06

Lab Name: STL Richland
Lot-Sample No.: J6D200273-4
Client Sample ID: PPD0806-01

SDG: 31430
Report No. : 32207
COC No. :

Collection Date: 4/19/2006 11:30:00 AM
Received Date: 4/20/2006 10:30:00 AM
Matrix: WATER

Ordered by Client Sample ID, Batch No.

Parameter	Result	Qual	Count Error (2 s)	Total Uncert(2 s)	MDC|MDA, Action Lev	Rpt Unit, Lc	Yield CRDL(RL)	Rst/MDC, Rst/TotUcert	Analysis, Prep Date	Total Sa Size	Aliquot Size	Primary Detector
Batch: 6114557	RICHRC5014			Work Order: H3PN21AE		Report DB ID: 9H3PN210						
ALPHA	-0.0881	U	0.27	0.27	1.1	pCi/L	100%	*-0.08*	5/16/06 09:14 a		0.1984	GPC10E
						0.382	3.0	*-0.65*			L	
Batch: 6114559	RICHRC5014			Work Order: H3PN21AD		Report DB ID: 9H3PN210						
BETA	1.45	U	1.3	1.3	2.62	pCi/L	100%	*0.55*	5/15/06 01:42 p		0.2003	GPC27C
						1.24	4.0	*(2.2)*			L	
Batch: 6114561	RICHRC5005			Work Order: H3PN21AA		Report DB ID: 9H3PN210						
RA-226	0.0822	U	0.12	0.12	0.214	pCi/L	100%	*0.38*	5/25/06 12:53 p		1.0054	ASC9RA
						0.0941	1.0	*(1.3)*			L	
Batch: 6114562	RICHRC5005			Work Order: H3PN21AC		Report DB ID: 9H3PN210						
RA-228	0.385	U	0.20	0.22	0.407	pCi/L	89%	*0.95*	5/26/06 08:52 a		1.0055	GPC2C
						0.175	1.0	*(3.6)*			L	

No. of Results: 4 Comments:

MDC|MDA,Lc - Detection, Decision Level based on instrument background or blank, adjusted by the sample Efficiency, Yield, and Volume.
U Qual - Analyzed for but not detected above limiting criteria. Limit criteria is less than the Mdc/Mda or Total Uncert or not identified by gamma scan software.

FORM II

Date: 26-May-06

DUPLICATE RESULTS

Lab Name:	STL Richland	SDG:	31393	**Collection Date:**	4/12/2006
Lot-Sample No.:	J6D180205-1	Report No. :	32207	**Received Date:**	4/14/2006 10:00:00 AM
Client Sample ID:	1-1 DUP	COC No. :		**Matrix:**	WATER

Parameter	Result, Orig Rst	Qual	Count Error (2 s)	Total Uncert(2 s)	MDC|MDA, Action Lev	Rpt Unit, CRDL	Yield	Rst/MDC, Rst/TotUcert	Analysis, Prep Date	Total Sa Size	Aliquot Size	Primary Detector
Batch: 6114557	RICHRC5014			Work Order: H3G3D1AE		Report DB ID: H3G3D1ER			Orig Sa DB ID: 9H3G3D10			
ALPHA	0.852	U	0.79	0.81	1.28	pCi/L	100%	0.67	5/16/06 09:14 a		0.2003	GPC10C
	0.209	U	RER2 1.3			3.0		(2.1)			L	

No. of Results: 1 Comments:

12

STL Richland
rptSTLRchDupV4.1
5.0 A97

RER2 - Replicate Error Ratio = (S-D)/[sqrt(sq(TPUs)+sq(TPUd))] as defined by ICPT BOA.
MDC|MDA,Lc - Detection, Decision Level based on instrument background or blank, adjusted by the sample Efficiency, Yield, and Volume.
U Qual - Analyzed for but not detected above limiting criteria. Limit criteria is less than the Mdc/Mda or Total Uncert or not identified by gamma scan software.

FORM II

Date: 26-May-06

DUPLICATE RESULTS

Lab Name:	STL Richland	SDG:	31430	Collection Date:	4/19/2006 11:30:00 AM
Lot-Sample No.:	J6D200273-2	Report No. :	32207	Received Date:	4/20/2006 10:30:00 AM
Client Sample ID:	PPD0805-01 DUP	COC No. :		Matrix:	WATER

Parameter	Result, Orig Rst	Qual	Count Error (2 s)	Total Uncert(2 s)	MDC|MDA, Action Lev	Rpt Unit, CRDL	Yield	Rst/MDC, Rst/TotUcert	Analysis, Prep Date	Total Sa Size	Aliquot Size	Primary Detector
Batch: 6110559	EITR			Work Order:	H3PNP1AC	Report DB ID:	H3PNP1CR		Orig Sa DB ID: 9H3PNP10			
RN-222	-6.3100	U	14.0	23.0	34.8	pCi/L	100%	-0.18	4/22/06 06:22 p		0.01	LSC7
	-10.8	U	RER2 0.3			50.0		-0.56			L	
Batch: 6114559	RICHRC5014			Work Order:	H3PM51AF	Report DB ID:	H3PM51FR		Orig Sa DB ID: 9H3PM510			
BETA	1.03	U	1.1	1.2	2.37	pCi/L	100%	0.43	5/15/06 01:42 p		0.2014	GPC27B
	1.18	U	RER2 0.2			4.0		(1.8)			L	
Batch: 6114561	RICHRC5005			Work Order:	H3PM51AG	Report DB ID:	H3PM51GR		Orig Sa DB ID: 9H3PM510			
RA-226	0.0971	U	0.16	0.16	0.271	pCi/L	108%	0.36	5/25/06 12:56 p		1.0034	ASC4HB
	-0.0473	U	RER2 1.5			1.0		(1.2)			L	
Batch: 6114562	RICHRC5005			Work Order:	H3PM51AH	Report DB ID:	H3PM51HR		Orig Sa DB ID: 9H3PM510			
RA-228	0.306	U	0.17	0.18	0.343	pCi/L	96%	0.89	5/26/06 08:52 a		1.0034	GPC2B
	0.0326	U	RER2 2.2			1.0		(3.4)			L	

No. of Results: 4 Comments:

RER2 - Replicate Error Ratio = (S-D)/[sqrt(sq(TPUs)+sq(TPUd))] as defined by ICPT BOA.

MDC|MDA,Lc - Detection, Decision Level based on instrument background or blank, adjusted by the sample Efficiency, Yield, and Volume.

U Qual - Analyzed for but not detected above limiting criteria. Limit criteria is less than the Mdc/Mda or Total Uncert or not identified by gamma scan software.

FORM II

BLANK RESULTS

Date: 26-May-06

Lab Name: STL Richland

Matrix: WATER

SDG: 31393

Report No. : 32207

Parameter	Result	Qual	Count Error (2 s)	Total Uncert(2 s)	MDC|MDA, Lc	Rpt Unit, CRDL	Yield	Rst/MDC, Rst/TotUcert	Analysis, Prep Date	Total Sa Size	Aliquot Size	Primary Detector
Batch: 6114557	RICHRC5014			Work Order: H30NP1AA		Report DB ID: H30NP1AB						
ALPHA	-0.0346	U	0.34	0.34	1.13	pCi/L	100%	-0.03	5/16/06 10:18 a		0.2009	GPC10A
					0.407	3.0		-0.2			L	
Batch: 6114559	RICHRC5014			Work Order: H30N11AA		Report DB ID: H30N11AB						
BETA	0.731	U	1.2	1.3	2.66	pCi/L	100%	0.27	5/15/06 01:42 p		0.2006	GPC28B
					1.26	4.0		(1.2)			L	
Batch: 6114562	RICHRC5005			Work Order: H30N71AA		Report DB ID: H30N71AB						
RA-228	0.0260	U	0.019	0.020	0.0405	pCi/L	87%	0.64	5/26/06 08:52 a		10.0006	GPC2D
					0.0174	3.0		(2.6)			L	
Batch: 6114561	RICHRC5005			Work Order: H30N51AA		Report DB ID: H30N51AB						
RA-226	0.126		0.087	0.090	0.118	pCi/L	99%	(1.1)	5/25/06 12:54 p		1.0006	ASCPMA
					0.0469			(2.8)			L	
Batch: 6110559	EITR			Work Order: H3P341AA		Report DB ID: H3P341AB						
RN-222	-17.300	U	11.0	18.0	29.0	pCi/L	100%	-0.6	4/22/06 06:22 p		0.01	LSC7
					14.0	50.0		-(1.9)			L	

No. of Results: 5 Comments:

STL Richland
rptSTLRchBlank
V4.15.0 A97

MDC|MDA,Lc - Detection, Decision Level based on instrument background or blank, adjusted by the sample Efficiency, Yield, and Volume.
U Qual - Analyzed for but not detected above limiting criteria. Limit criteria is less than the Mdc/Mda or Total Uncert or not identified by gamma scan software.

FORM II

Date: 26-May-06

LCS RESULTS

Lab Name: STL Richland

SDG: 31393

Matrix: WATER

Report No. : 32207

Parameter	Result	Qual	Count Error (2 s)	Total Uncert(2 s)	MDC|MDA	Report Unit	Yield	Expected	Expected Uncert	Recovery, Bias	Analysis, Prep Date	Aliquot Size	Primary Detector
Batch: 6114557	RICHRC5014			Work Order:	H30NP1AC		Report DB ID:	H30NP1CS					
ALPHA	43.3		4.7	12.0	1.04	pCi/L	100%	40.6	1.4	106%	5/16/06 10:18 a	0.1998	GPC10B
							Rec Limits:	75	125	0.1		L	
Batch: 6114559	RICHRC5014			Work Order:	H30N11AC		Report DB ID:	H30N11CS					
BETA	36.2		3.0	6.3	2.74	pCi/L	100%	40.4	0.32	90%	5/15/06 01:42 p	0.2003	GPC28C
							Rec Limits:	70	130	-0.1		L	
Batch: 6114562	RICHRC5005			Work Order:	H30N71AC		Report DB ID:	H30N71CS					
RA-228	5.19		0.50	0.77	0.341	pCi/L	89%	5.10	0.022	102%	5/26/06 08:53 a	1.0002	GPC3A
							Rec Limits:	70	130	0.0		L	
Batch: 6114561	RICHRC5005			Work Order:	H30N51AC		Report DB ID:	H30N51CS					
RA-226	1.37		0.24	0.37	0.149	pCi/L	99%	1.37	0.35	100%	5/25/06 12:55 p	1.0002	ASCASA
							Rec Limits:			0.0		L	
Batch: 6110559	EITR			Work Order:	H3P341AC		Report DB ID:	H3P341CS					
RN-222	9950.0		120.0	1100.0	29.0	pCi/L	100%	6770.0	170.0	147%	4/22/06 06:22 p	0.01	LSC7
							Rec Limits:	70	130	0.5		L	

No. of Results: 5 Comments:

STL Richland Bias - (Result/Expected)-1 as defined by ANSI N13.30.

rptSTLRchLcs
V4.15.0 A97

FORM II

Date: 26-May-06

MATRIX SPIKE RESULTS

Lab Name: STL Richland SDG: 31393

Lot-Sample No.: J6D180205-1 Report No. : 32207 **Matrix:** WATER

Parameter	SpikeResult, Orig Rst	Qual	Count Error (2 s)	Total Uncert(2 s)	MDC|MDA	Rpt Unit, CRDL	Yield	Rec-overy	Exp-ected	Exp Uncert	Analysis, Prep Date	Aliquot Size	Analy Method, Primary Detector
Batch: 6114557	Work Order: H3G3D1AD			Report DB ID: H3G3D1DW			Orig Sa DB ID: 9H3G3D10						
ALPHA	29.2		3.9	8.4	1.01	pCi/L	100%	71.84%	40.6	1.3	5/16/06 09:14 a	0.2001	RICHRC5014
	0.209											L	GPC10B

Number of Results: 1

Comments:

STL Richland
rptSTLRchMs
V4.15.0 A97

RER - Replicate Error Ratio = (S-D)/[sqrt(sq(TPUs)+sq(TPUd))] as defined by ICPT BOA.

Bias - (Result/Expected)-1 as defined by ANSI N13.30.

FORM II

Date: 26-May-06

MATRIX SPIKE RESULTS

Lab Name: STL Richland SDG: 31430

Lot-Sample No.: J6D200273-4 Report No. : 32207 Matrix: WATER

Parameter	SpikeResult, Orig Rst	Qual	Count Error (2 s)	Total Uncert(2 s)	MDC|MDA	Rpt Unit, CRDL	Yield	Rec-overy	Exp-ected	Exp Uncert	Analysis, Prep Date	Aliquot Size	Analy Method, Primary Detector
Batch: 6114559	Work Order: H3PN21AF			Report DB ID: H3PN21FW			Orig Sa DB ID: 9H3PN210						
BETA	111.0		5.0	15.0	2.66	pCi/L	100%	98.06%	114.0	0.88	5/15/06 01:42 p	0.1981	RICHRC5014
	1.45											L	GPC27D

Number of Results: 1

Comments:

STL Richland
rptSTLRchMs
V4.15.0 A97

RER - Replicate Error Ratio = (S-D)/[sqrt(sq(TPUs)+sq(TPUd))] as defined by ICPT BOA.

Bias . - (Result/Expected)-1 as defined by ANSI N13.30.

SUBCONTRACT ORDER J6D200273

North Creek Analytical - Portland 31430

PPD0805

SENDING LABORATORY:

North Creek Analytical - Portland
9405 SW Nimbus Ave.
Beaverton, OR 97008
Phone: (503) 906-9200
Fax: (503) 906-9210
Project Manager: Sarah Rockwell

RECEIVING LABORATORY:

Severn Trent Laboratories - Richland
2800 George Washington Way
Richland, WA 99354-1613
Phone :509-375-3131
Fax: 509-375-5590

Analysis	Due	Expires	Laboratory ID	Comments
Sample ID: PPD0805-01	**Water**	**Sampled:04/19/06 11:30**		
Subcontract Outside3	05/02/06 23:59	04/20/06 11:30		DW-Oregon Radon
Subcontract Outside2	05/02/06 23:59	04/20/06 11:30		DW-Oregon Radium 226/228, Uranium
Subcontract Outside	05/02/06 23:59	10/16/06 11:30		DW-Oregon Gross Alpha/Beta

Containers Supplied:

1L Poly - Unpres (R) 1L Poly - Unpres (S) 1L Poly - Unpres (T) 1L Poly - Unpres (U) 60 ml Amber Glass - Unpr

H3PM5 H3PNP

Released By	Date	Received By	Date
	4.19.06	S. Welch	4.20.06
Released By	Date	Received By	Date

SUBCONTRACT ORDER

North Creek Analytical - Portland

PPD0806

JGD200273
31430

SENDING LABORATORY:

North Creek Analytical - Portland
9405 SW Nimbus Ave.
Beaverton, OR 97008
Phone: (503) 906-9200
Fax: (503) 906-9210
Project Manager: Sarah Rockwell

RECEIVING LABORATORY:

Severn Trent Laboratories - Richland
2800 George Washington Way
Richland, WA 99354-1613
Phone :509-375-3131
Fax: 509-375-5590

Analysis	Due	Expires	Laboratory ID	Comments
Sample ID: PPD0806-01	**Water**	**Sampled:04/19/06 10:20**		
Subcontract Outside3	05/02/06 23:59	04/20/06 10:20		DW-Oregon Radon
Subcontract Outside2	05/02/06 23:59	04/20/06 10:20		DW-Oregon Radium 226/228, Uranium
Subcontract Outside	05/02/06 23:59	10/16/06 10:20		DW-Oregon Gross Alpha/Beta

Containers Supplied:

1L Poly - Unpres (AA) | 1L Poly - Unpres (AB) | 1L Poly - Unpres (AC) | 60 ml Amber Glass - Unpr | 1L Poly - Unpres (Z)

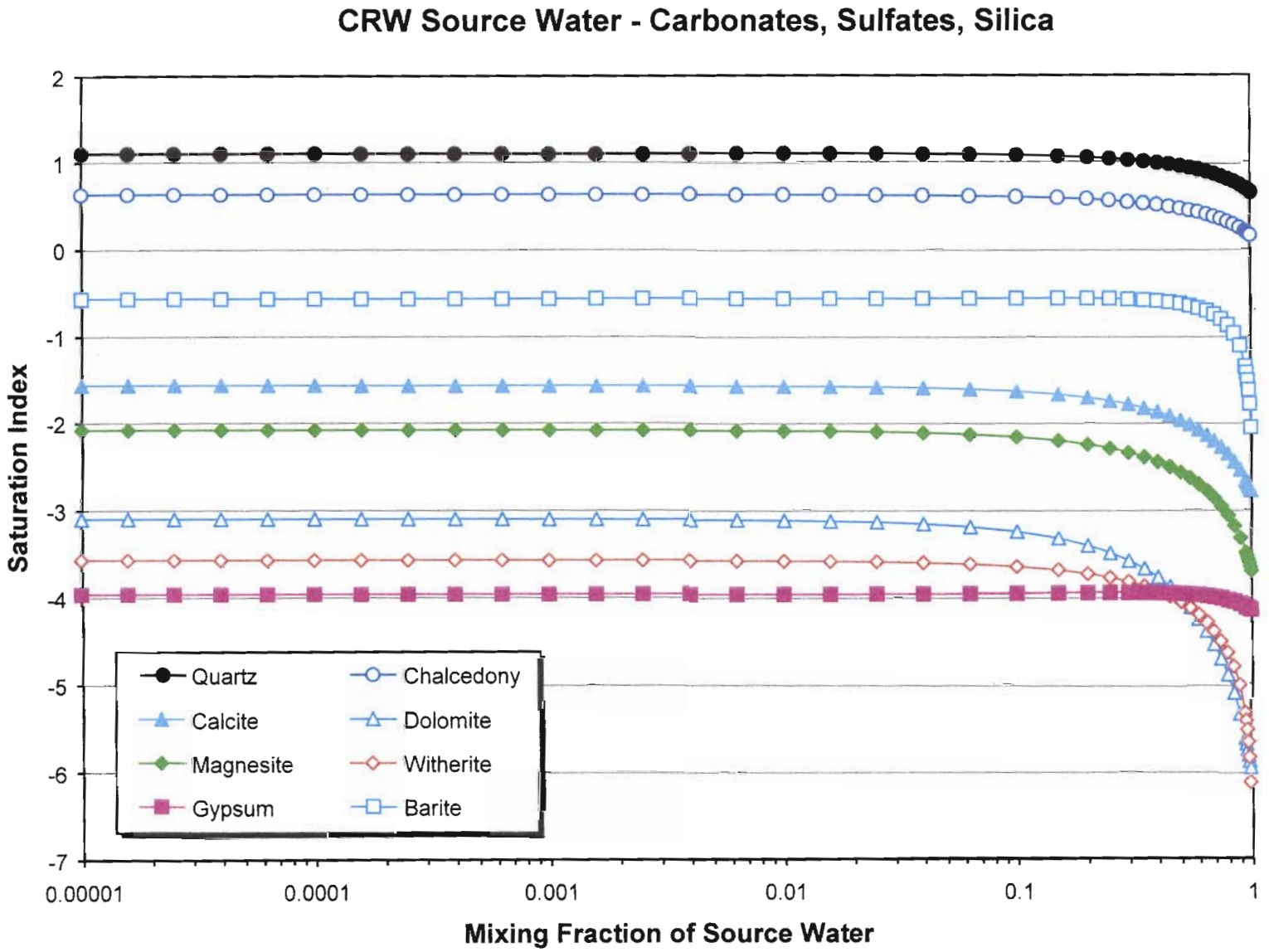
H3PN2 | H3PNR

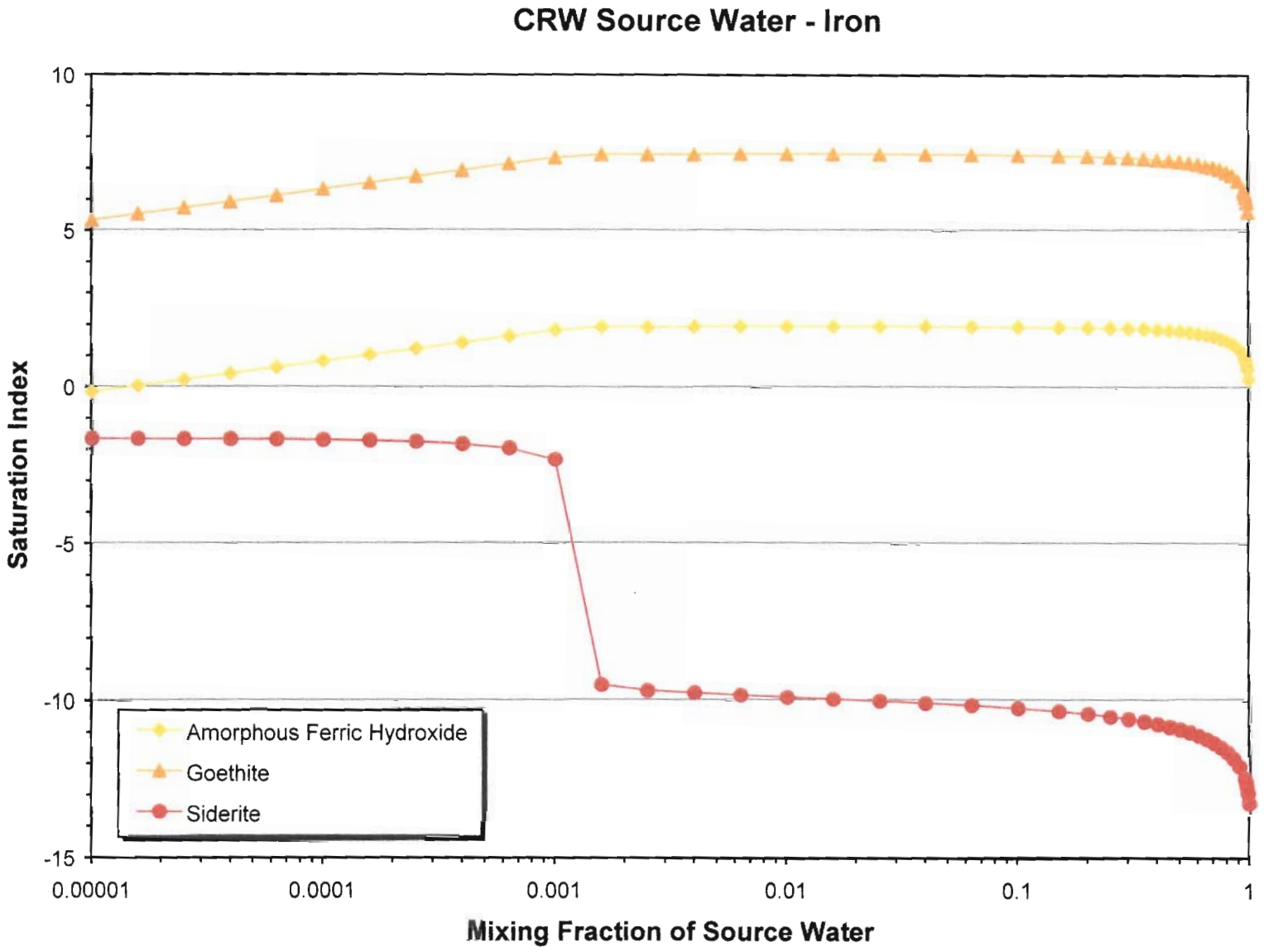
4-19-06

Released By | Date | Received By | Date

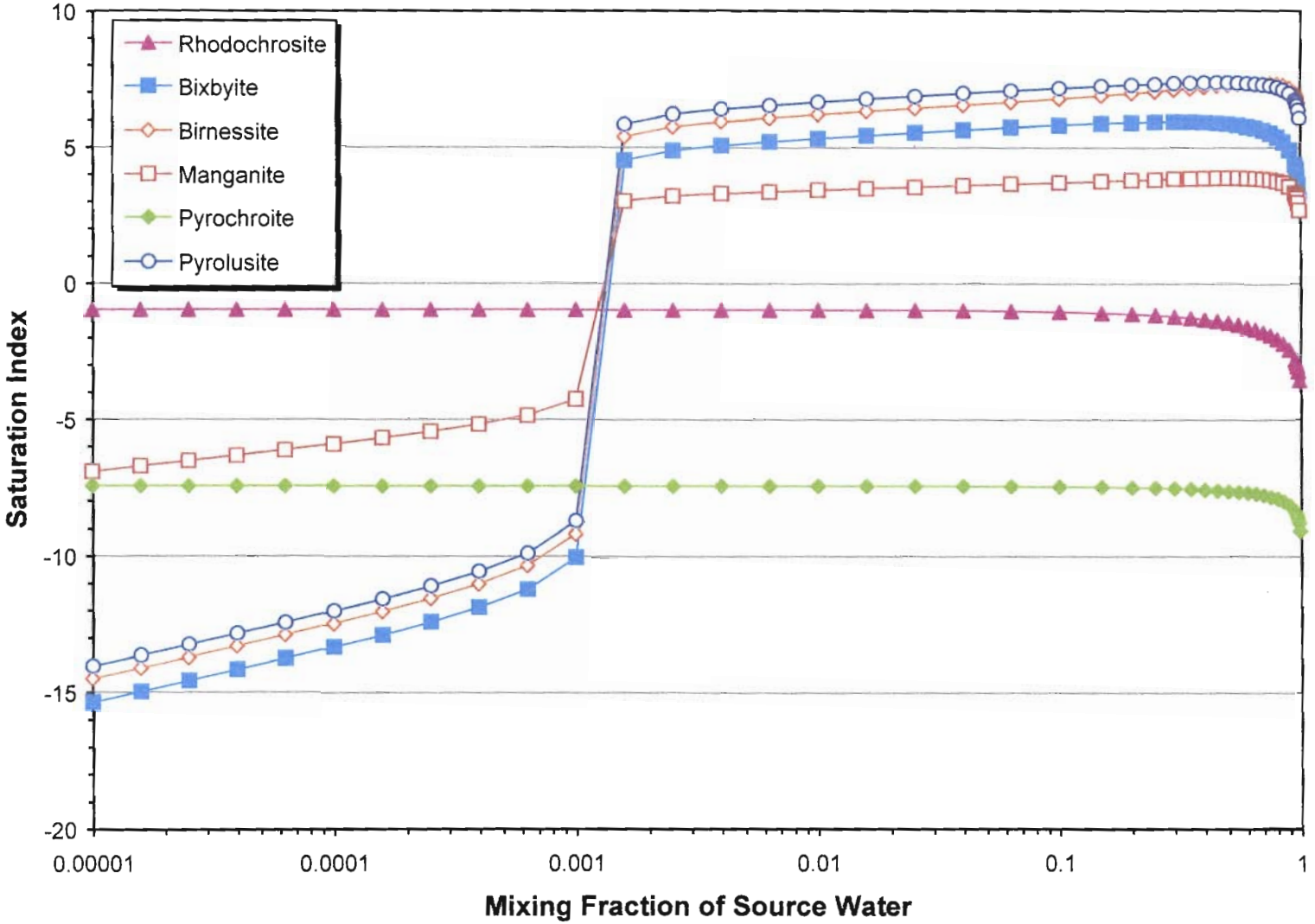
Released By | Date | Received By | Date

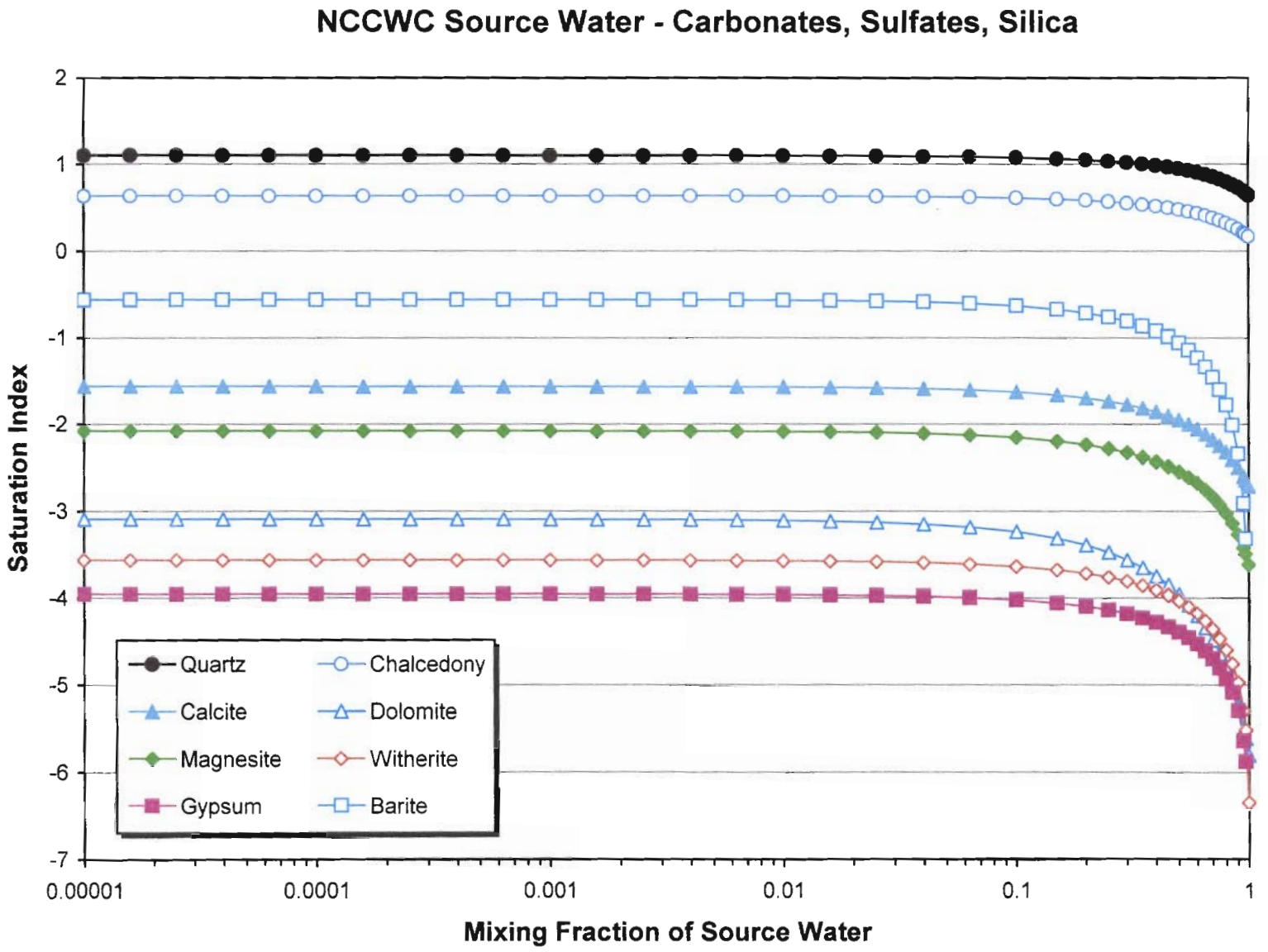
Appendix D: Geochemical Mixing Analysis

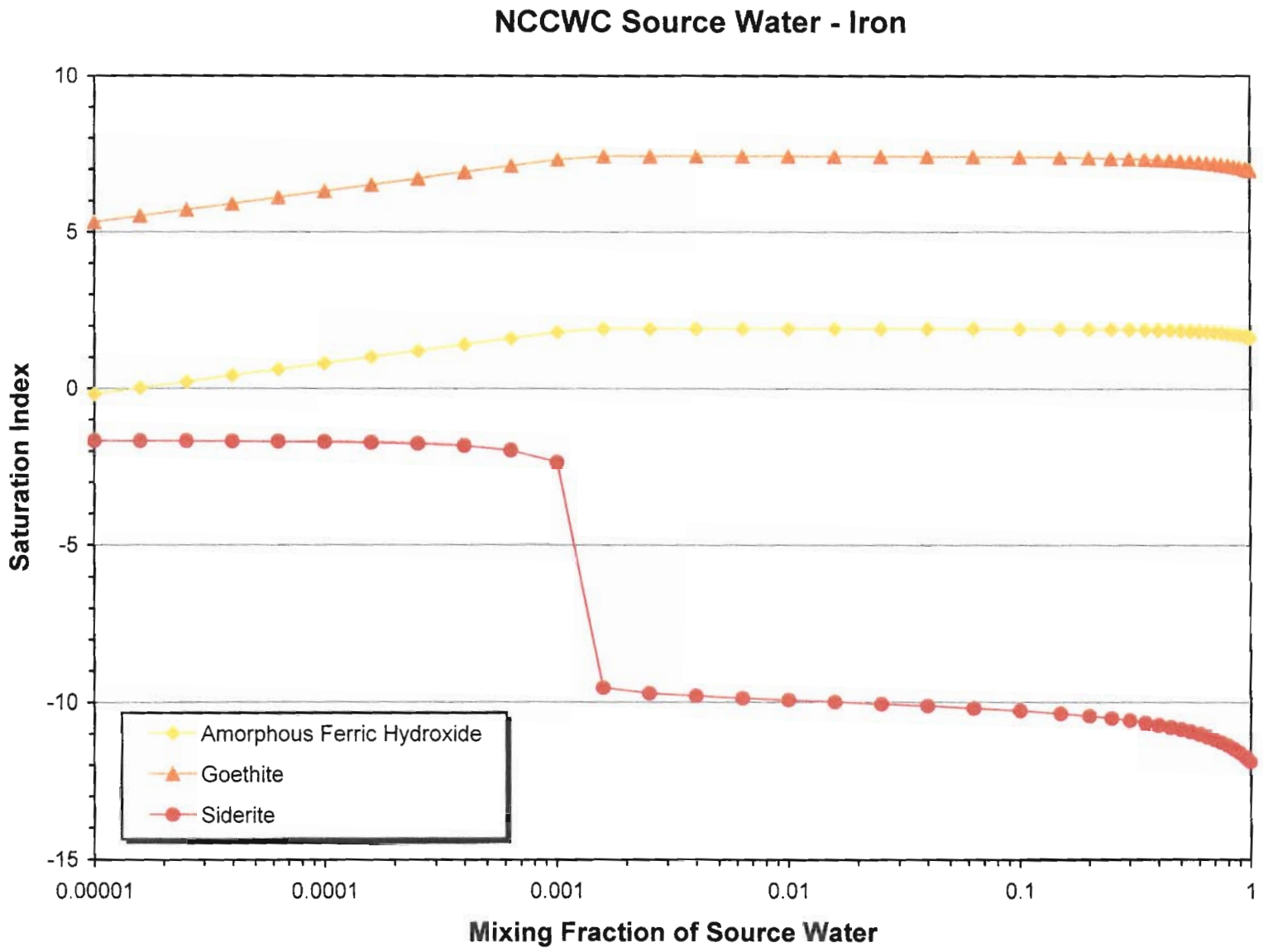

CRW Source Water - Carbonates, Sulfates, Silica
Saturation Index
2
1
0
-1
-2
-3
-4
-5
-6
-7
0.00001
0.0001
0.001
0.01
0.1
1
Mixing Fraction of Source Water
Quartz
Chalcedony
Calcite
Dolomite
Magnesite
Witherite
Gypsum
Barite

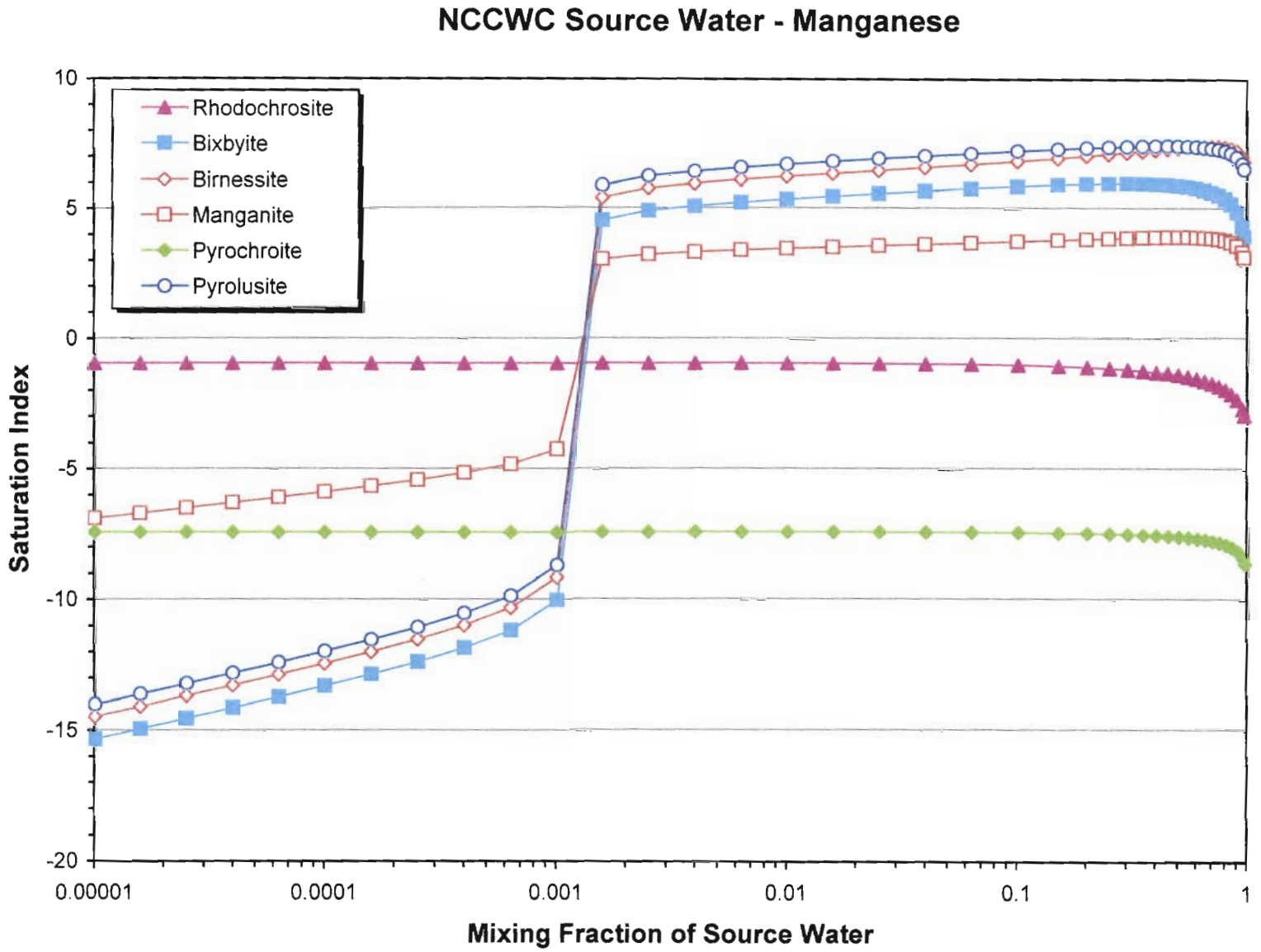

CRW Source Water - Iron
10
5
0
-5
-10
-15
Saturation Index
0.00001
0.0001
0.001
0.01
0.1
1
Mixing Fraction of Source Water
Amorphous Ferric Hydroxide
Goethite
Siderite

CRW Source Water - Manganese




NCCWC Source Water - Carbonates, Sulfates, Silica
Saturation Index
2
1
0
-1
-2
-3
-4
-5
-6
-7
0.00001
0.0001
0.001
0.01
0.1
1
Mixing Fraction of Source Water
Quartz
Chalcedony
Calcite
Dolomite
Magnesite
Witherite
Gypsum
Barite


NCCWC Source Water - Iron
Saturation Index
10
5
0
-5
-10
-15
0.00001
0.0001
0.001
0.01
0.1
1
Mixing Fraction of Source Water
Amorphous Ferric Hydroxide
Goethite
Siderite


NCCWC Source Water - Manganese
Rhodochrosite
Bixbyite
Birnessite
Manganite
Pyrochroite
Pyrolusite
Saturation Index
10
5
0
-5
-10
-15
-20
0.00001
0.0001
0.001
0.01
0.1
1
Mixing Fraction of Source Water

Appendix E: ASR Assumptions and Calculations

Assumptions
ASR Head Buildup/Drawdown Calculations

Operational Assumptions

General

- **No preconceived ASR injection volume target established prior to ASR evaluation. Target volume and injection/recovery rates based on the capacity of the target aquifer.**

Injection

- **Injection period: between October 1st to May 30th**
- **Assume 20 days of lost injection time due to turbidity events.**
- **Assume 30 minutes of back flushing the well will take place every 3 weeks during injection (loss of < 1 day of injection time**
- **Assume injection rate will be at most 70% of the projected long term (70-100 days) sustainable recovery rate of the well.**

Storage

- **Assume a 30 day storage period: June 1st to June 31st**

Recovery

- **Assume 100% of the stored water is removed from storage**
- **Recovery period: July 1st to September 31st**
- **Assume 650 gpm for the typical recovery rate (i.e., long term sustainable recovery rate)**

Conservative Assumptions

1. Aquifer characteristics further away from the well are uncertain. We have assumed no aquifer boundaries (e.g., faults or heterogeneities in aquifer hydraulic properties that could limit or affect storage) other than the one identified by the constant rate test data.
2. Since there was 2 feet of residual drawdown after the constant rate test, assumed that all of the water pumped (4.9 MG) was taken out of storage.
3. Assume a well efficiency of 80% based on step test data.
4. Assume back flushing will help control the head buildup in the ASR well.

5. The specific capacity at the end of an injection period is based on the drawdown trend established during the constant rate test (Q = 800 gpm) adjusted to the target injection rate using the step test data, the Bierschenk equation, and the assumed 15% difference between the specific capacity during pumping and during injection.
6. Threshold water level rise in ASR well during injection to be maintained 25 feet below ground surface (bgs).
7. Assume the head rise in the aquifer at the end of injection is the same from year to year, which is based on the assumption that the same volume of water is injected each year and all of the stored water is removed each year.
8. The specific capacity at the end of a recovery period is based on the drawdown trend established during the constant rate test (Q = 800 gpm) adjusted to the target recovery rate using the step test data and the Bierschenk equation.
9. Assume a 15% difference in specific capacity between injection and pumping.
10. Assume a 10% reduction in specific capacity at the well (both injection and recovery) from year-to-year due to residual clogging effects.
11. Assume no change in the specific capacity of the aquifer outside the borehole skin.
12. Assume the static water level in the aquifer returns to the pre-ASR static water level after recovery each year of operation, which is based on the assumption that all of the stored water is removed. No reduction in aquifer specific capacity beyond the borehole skin.
13. Drawdown during recovery is based on the equilibrated aquifer level after 30 days of storage, based on the assumption of 1 ft of aquifer rise for every 2.5 MG water injected (see #2).

Sunrise Head Buildup Calculations

Assumptions

SWL				220	SWL bgs
Start Injection		1-Dec	Each year		
Stop Injection		1-Apr	Each year		
Total Days		100	days		
Back flush 30 minutes every 3 weeks		-0.10	days		
NTU events greater than 0.5					
1 events at 20 days per		-20	days		
	Total Days	**80**		80	days
Assume well efficiency based on step test data		80	%	0.8	well efficiency
Injection rate				450	gpm injection rate
Injection volume				52	MG
Maintain head buildup in well at 25 bgs -- threshold				25	bgs threshold
Recovery rate				650	gpm pumping rate
Days to recover injected volume				57	days
Minimum pumping level allowed given required pump submergence				384	ft bgs
Pumping SC after ***80 days*** of pumping at 800 gpm (extrapolated from constant rate test)				4.36	gpm/ft
Projected SC after ***80 days*** of pumping at 650 gpm is 2.1% greater than at 800 gpm (based on step test data)				4.45	gpm/ft
Pumping SC after ***57 days*** of pumping at 800 gpm (extrapolated from constant rate test)				4.52	gpm/ft
Projected SC after ***57 days*** of pumping at 450 gpm is 5.1% greater than at 800 gpm (based on step test data)				4.75	gpm/ft
Assume difference of ***15%*** between Pumping SC and Injection SC				4.04	gpm/ft
Assumed percentage reduction in SC between successive years				10%	

Head Buildup

		Well Casing			***Water Level Outside Borehole in Aquifer***			
	Year 1	111.45	ft of head buildup		At end of Injection [1, 2]		After Equilabration [3]	
SC yr 1	4.0	WL	108.55	bgs	131	bgs	199	bgs
	Year 2	123.83	ft of head buildup					
SC yr 2	3.63	WL	96.17	bgs	131	bgs	199	bgs
	Year 3	137.59	ft of head buildup					
SC yr 3	3.27	WL	82.41	bgs	131	bgs	199	bgs
	Year 4	152.88	ft of head buildup					
SC yr 4	2.94	WL	67.12	bgs	131	bgs	199	bgs
	Year 5	169.87	ft of head buildup					
SC yr 5	2.65	WL	50.13	bgs	131	bgs	199	bgs

Drawdown Estimates

		Well Casing			***Water Level Outside Borehole in Aquifer***	
	Year 1	146.03	ft drawdown		At end of Recovery [1, 2]	
SC yr 1	4.45	WL	345.27	bgs	316	bgs
	Year 2	162.25	ft drawdown			
SC yr 2	4.01	WL	361.50	bgs	316	bgs
	Year 3	180.28	ft drawdown			
SC yr 3	3.61	WL	379.53	bgs	316	bgs
	Year 4	200.31	ft drawdown			
SC yr 4	3.24	WL	399.56	bgs	316	bgs
	Year 5	222.57	ft drawdown			
SC yr 5	2.92	WL	421.82	bgs	316	bgs

Notes:

Drawup/drawdown criteria exceeded

1 Drawup in the aquifer estimated using projected water level in the well and the estimated well efficiency

2 Drawup/drawdown in aquifer is the same each year because the same volume of water is injected/recovered AND the year-to-year residual clogging is limited to the borehole skin.

3 Assumes 2 ft of rise for every 2.5 MG of water injected (based on residual drawdown after constant rate drawdown test)

Sunrise Head Buildup Calculations

Assumptions

SWL						220	SWL bgs
Start Injection			1-Dec	Each year			
Stop Injection			1-Apr	Each year			
Total Days			150	days			
Back flush 30 minutes every 3 weeks			-0.15	days			
NTU events greater than 0.5							
1 events at 20 days per			-20	days			
		Total Days	130			130	days
Assume well efficiency based on step test data			80	%		0.8	well efficiency
Injection rate						450	gpm injection rate
Injection volume						84	MG
Maintain head buildup in well at 25 bgs – threshold						25	bgs threshold
Recovery rate						650	gpm pumping rate
Days to recover injected volume						93	days
Minimum pumping level allowed given required pump submergence						384	ft bgs
Pumping SC after ***130 days*** of pumping at 800 gpm (extrapolated from constant rate test)						4.30	gpm/ft
Projected SC after ***130 days*** of pumping at 650 gpm is 2.1% greater than at 800 gpm (based on step test data)						4.39	gpm/ft
Pumping SC after ***93 days*** of pumping at 800 gpm (extrapolated from constant rate test)						4.34	gpm/ft
Projected SC after ***93 days*** of pumping at 450 gpm is 5.1% greater than at 800 gpm (based on step test data)						4.56	gpm/ft
Assume difference of ***15%*** between Pumping SC and Injection SC						3.88	gpm/ft
Assumed percentage reduction in SC between successive years						10%	

Head Buildup

		Well Casing			***Water Level Outside Borehole in Aquifer***			
	Year 1	115.98	ft of head buildup		At end of Injection [1, 2]		After Equilabration [3]	
SC yr 1	3.9	WL	104.02	bgs	127	bgs	186	bgs
	Year 2	128.87	ft of head buildup					
SC yr 2	3.49	WL	91.13	bgs	127	bgs	186	bgs
	Year 3	143.19	ft of head buildup					
SC yr 3	3.14	WL	76.81	bgs	127	bgs	186	bgs
	Year 4	159.10	ft of head buildup					
SC yr 4	2.83	WL	60.90	bgs	127	bgs	186	bgs
	Year 5	176.77	ft of head buildup					
SC yr 5	2.55	WL	43.23	bgs	127	bgs	186	bgs

Drawdown Estimates

		Well Casing			***Water Level Outside Borehole in Aquifer***	
	Year 1	148.10	ft drawdown		At end of Recovery [1, 2]	
SC yr 1	4.39	WL	334.37	bgs	305	bgs
	Year 2	164.55	ft drawdown			
SC yr 2	3.95	WL	350.83	bgs	305	bgs
	Year 3	182.83	ft drawdown			
SC yr 3	3.56	WL	369.11	bgs	305	bgs
	Year 4	203.15	ft drawdown			
SC yr 4	3.20	WL	389.43	bgs	305	bgs
	Year 5	225.72	ft drawdown			
SC yr 5	2.88	WL	412.00	bgs	305	bgs

Notes:

Drawup/drawdown criteria exceeded

1 Drawup in the aquifer estimated using projected water level in the well and the estimated well efficiency

2 Drawup/drawdown in aquifer is the same each year because the same volume of water is injected/recovered AND the year-to-year residual clogging is limited to the borehole skin.

3 Assumes 2 ft of rise for every 2.5 MG of water injected (based on residual drawdown after constant rate drawdown test)

Sunrise Head Buildup Calculations

Assumptions

SWL					220	SWL bgs
Start Injection		1-Dec	Each year			
Stop Injection		1-Apr	Each year			
Total Days		240	days			
Back flush 30 minutes every 3 weeks		-0.24	days			
NTU events greater than 0.5						
1 events at 20 days per		-20	days			
	Total Days	220			220	days
Assume well efficiency based on step test data		80	%		0.8	well efficiency
Injection rate					450	gpm injection rate
Injection volume					143	MG
Maintain head buildup in well at 25 bgs -- threshold					25	bgs threshold
Recovery rate					650	gpm pumping rate
Days to recover injected volume					157	days
Minimum pumping level allowed given required pump submergence					384	ft bgs
Pumping SC after 157 days of pumping at 800 gpm (extrapolated from constant rate test)					4.27	gpm/ft
Projected SC after 157 days of pumping at 650 gpm is 2.1% greater than at 800 gpm (based on step test data)					4.36	gpm/ft
Pumping SC after 220 days of pumping at 800 gpm (extrapolated from constant rate test)					4.19	gpm/ft
Projected SC after 220 days of pumping at 450 gpm is 5.1% greater than at 800 gpm (based on step test data)					4.41	gpm/ft
Assume difference of 15% between Pumping SC and Injection SC					3.75	gpm/ft
Assumed percentage reduction in SC between successive years					10%	

Head Buildup

		Well Casing			*Water Level Outside Borehole in Aquifer*			
	Year 1	120.14	ft of head buildup		At end of Injection [1, 2]		After Equilabration [3]	
SC yr 1	3.7	WL	99.86	bgs	124	bgs	163	bgs
	Year 2	133.49	ft of head buildup					
SC yr 2	3.37	WL	86.51	bgs	124	bgs	163	bgs
	Year 3	148.32	ft of head buildup					
SC yr 3	3.03	WL	71.68	bgs	124	bgs	163	bgs
	Year 4	164.80	ft of head buildup					
SC yr 4	2.73	WL	55.20	bgs	124	bgs	163	bgs
	Year 5	183.11	ft of head buildup					
SC yr 5	2.46	WL	36.89	bgs	124	bgs	163	bgs

Drawdown Estimates

		Well Casing			*Water Level Outside Borehole in Aquifer*	
	Year 1	149.24	ft drawdown		At end of Recovery [1, 2]	
SC yr 1	4.36	WL	312.17	bgs	282	bgs
	Year 2	165.82	ft drawdown			
SC yr 2	3.92	WL	328.75	bgs	282	bgs
	Year 3	184.25	ft drawdown			
SC yr 3	3.53	WL	347.18	bgs	282	bgs
	Year 4	204.72	ft drawdown			
SC yr 4	3.18	WL	367.65	bgs	282	bgs
	Year 5	227.47	ft drawdown			
SC yr 5	2.86	WL	390.40	bgs	282	bgs

Notes:

Drawup/drawdown criteria exceeded

1 Drawup in the aquifer estimated using projected water level in the well and the estimated well efficiency

2 Drawup/drawdown in aquifer is the same each year because the same volume of water is injected/recovered AND the year-to-year residual clogging is limited to the borehole skin.

3 Assumes 1.96 ft of rise for every 2.5 MG of water injected (based on residual drawdown after constant rate drawdown test)

Sunrise Head Buildup Calculations

Assumptions

SWL			220	SWL bgs
Start Injection	1-Dec	Each year		
Stop Injection	1-Apr	Each year		
Total Days	100	days		
Back flush 30 minutes every 3 weeks	-0.10	days		
NTU events greater than 0.5				
1 events at 20 days per	-20	days		
Total Days	**80**		80	days
Assume well efficiency based on step test data	80	%	0.8	well efficiency
Injection rate			400	gpm injection rate
Injection volume			46	MG
Maintain head buildup in well at 25 bgs -- threshold			25	bgs threshold
Recovery rate			650	gpm pumping rate
Days to recover injected volume			51	days
Minimum pumping level allowed given required pump submergence			384	ft bgs
Pumping SC after ***80 days*** of pumping at 800 gpm (extrapolated from constant rate test)			4.36	gpm/ft
Projected SC after ***80 days*** of pumping at 650 gpm is 2.1% greater than at 800 gpm (based on step test data)			4.45	gpm/ft
Pumping SC after ***51 days*** of pumping at 800 gpm (extrapolated from constant rate test)			4.60	gpm/ft
Projected SC after ***51 days*** of pumping at 400 gpm is 5.8% greater than at 800 gpm (based on step test data)			4.86	gpm/ft
Assume difference of ***15%*** between Pumping SC and Injection SC			4.13	gpm/ft
Assumed percentage reduction in SC between successive years			10%	

Head Buildup

		Well Casing			***Water Level Outside Borehole in Aquifer***			
	Year 1	96.74	ft of head buildup		At end of Injection [1, 2]		After Equilabration [3]	
SC yr 1	4.1	WL	123.26	bgs	143	bgs	202	bgs
	Year 2	107.49	ft of head buildup					
SC yr 2	3.72	WL	112.51	bgs	143	bgs	202	bgs
	Year 3	119.43	ft of head buildup					
SC yr 3	3.35	WL	100.57	bgs	143	bgs	202	bgs
	Year 4	132.70	ft of head buildup					
SC yr 4	3.01	WL	87.30	bgs	143	bgs	202	bgs
	Year 5	147.45	ft of head buildup					
SC yr 5	2.71	WL	72.55	bgs	143	bgs	202	bgs

Drawdown Estimates

		Well Casing			***Water Level Outside Borehole in Aquifer***	
	Year 1	146.03	ft drawdown		At end of Recovery [1, 2]	
SC yr 1	4.45	WL	347.58	bgs	318	bgs
	Year 2	162.25	ft drawdown			
SC yr 2	4.01	WL	363.81	bgs	318	bgs
	Year 3	180.28	ft drawdown			
SC yr 3	3.61	WL	381.83	bgs	318	bgs
	Year 4	200.31	ft drawdown			
SC yr 4	3.24	WL	401.86	bgs	318	bgs
	Year 5	222.57	ft drawdown			
SC yr 5	2.92	WL	424.12	bgs	318	bgs

Notes:

Drawup/drawdown criteria exceeded

1 Drawup in the aquifer estimated using projected water level in the well and the estimated well efficiency

2 Drawup/drawdown in aquifer is the same each year because the same volume of water is injected/recovered AND the year-to-year residual clogging is limited to the borehole skin.

3 Assumes 2 ft of rise for every 2.5 MG of water iniected (based on residual drawdown after constant rate drawdown test)

Sunrise Head Buildup Calculations

Assumptions

SWL			220	SWL bgs
Start Injection	1-Dec	Each year		
Stop Injection	1-Apr	Each year		
Total Days	100	days		
Back flush 30 minutes every 3 weeks	-0.10	days		
NTU events greater than 0.5				
1 events at 20 days per	-20	days		
Total Days	**80**		80	days
Assume well efficiency based on step test data	80	%	0.8	well efficiency
Injection rate			500	gpm injection rate
Injection volume			58	MG
Maintain head buildup in well at 25 bgs -- threshold			25	bgs threshold
Recovery rate			700	gpm pumping rate
Days to recover injected volume			59	days
Minimum pumping level allowed given required pump submergence			384	ft bgs
Pumping SC after ***80 days*** of pumping at 800 gpm (extrapolated from constant rate test)			4.36	gpm/ft
Projected SC after ***80 days*** of pumping at 700 gpm is 1.4% greater than at 800 gpm (based on step test data)			4.42	gpm/ft
Pumping SC after ***59 days*** of pumping at 800 gpm (extrapolated from constant rate test)			4.49	gpm/ft
Projected SC after ***59 days*** of pumping at 500 gpm is 4.3% greater than at 800 gpm (based on step test data)			4.69	gpm/ft
Assume difference of ***15%*** between Pumping SC and Injection SC			3.98	gpm/ft
Assumed percentage reduction in SC between successive years			10%	

Head Buildup

		Well Casing			***Water Level Outside Borehole in Aquifer***			
	Year 1	125.49	ft of head buildup		At end of Injection [1, 2]		After Equilabration [3]	
SC yr 1	4.0	WL	94.51	bgs	120	bgs	197	bgs
	Year 2	139.43	ft of head buildup					
SC yr 2	3.59	WL	80.57	bgs	120	bgs	197	bgs
	Year 3	154.92	ft of head buildup					
SC yr 3	3.23	WL	65.08	bgs	120	bgs	197	bgs
	Year 4	172.14	ft of head buildup					
SC yr 4	2.90	WL	47.86	bgs	120	bgs	197	bgs
	Year 5	191.26	ft of head buildup					
SC yr 5	2.61	WL	28.74	bgs	120	bgs	197	bgs

Drawdown Estimates

		Well Casing			***Water Level Outside Borehole in Aquifer***		
	Year 1	158.35	ft drawdown		At end of Recovery [1, 2]		
SC yr 1	4.42	WL	355.29	bgs	324	bgs	
	Year 2	175.94	ft drawdown				
SC yr 2	3.98	WL	372.88	bgs	324	bgs	
	Year 3	195.49	ft drawdown				
SC yr 3	3.58	WL	392.43	bgs	324	bgs	
	Year 4	217.21	ft drawdown				
SC yr 4	3.22	WL	414.15	bgs	324	bgs	
	Year 5	241.34	ft drawdown				
SC yr 5	2.90	WL	438.28	bgs	324	bgs	

Notes:

Drawup/drawdown criteria exceeded

1 Drawup in the aquifer estimated using projected water level in the well and the estimated well efficiency

2 Drawup/drawdown in aquifer is the same each year because the same volume of water is injected/recovered AND the year-to-year residual clogging is limited to the borehole skin.

3 Assumes 2 ft of rise for every 2.5 MG of water injected (based on residual drawdown after constant rate drawdown test)

Sunrise Head Buildup Calculations

Assumptions

SWL			220	SWL bgs
Start Injection	1-Dec	Each year		
Stop Injection	1-Apr	Each year		
Total Days	100	days		
Back flush 30 minutes every 3 weeks	-0.10	days		
NTU events greater than 0.5				
1 events at 20 days per	-20	days		
Total Days	**80**		80	days
Assume well efficiency based on step test data	80	%	0.8	well efficiency
Injection rate			600	gpm injection rate
Injection volume			69	MG
Maintain head buildup in well at 25 bgs -- threshold			25	bgs threshold
Recovery rate			800	gpm pumping rate
Days to recover injected volume			62	days
Minimum pumping level allowed given required pump submergence			384	ft bgs
Pumping SC after ***80 days*** of pumping at 800 gpm (extrapolated from constant rate test)			4.36	gpm/ft
~~Projected SC after 80 days of pumping at 650 gpm is 2.1% greater than at 800 gpm (based on step test data)~~			4.36	gpm/ft
Pumping SC after ***62 days*** of pumping at 800 gpm (extrapolated from constant rate test)			4.47	gpm/ft
Projected SC after ***62 days*** of pumping at 600 gpm is 2.8% greater than at 800 gpm (based on step test data)			4.59	gpm/ft
Assume difference of ***15%*** between Pumping SC and Injection SC			3.91	gpm/ft
Assumed percentage reduction in SC between successive years			10%	

Head Buildup

		Well Casing			*Water Level Outside Borehole in Aquifer*			
	Year 1	153.64	ft of head buildup		At end of Injection [1, 2]		After Equilabration [3]	
SC yr 1	3.9	WL	66.36	bgs	97	bgs	192	bgs
	Year 2	170.71	ft of head buildup					
SC yr 2	3.51	WL	49.29	bgs	97	bgs	192	bgs
	Year 3	189.68	ft of head buildup					
SC yr 3	3.16	WL	30.32	bgs	97	bgs	192	bgs
	Year 4	210.75	ft of head buildup					
SC yr 4	2.85	WL	9.25	bgs	97	bgs	192	bgs
	Year 5	234.17	ft of head buildup					
SC yr 5	2.56	WL	-14.17	bgs	97	bgs	192	bgs

Drawdown Estimates

		Well Casing			*Water Level Outside Borehole in Aquifer*	
	Year 1	183.50	ft drawdown		At end of Recovery [1, 2]	
SC yr 1	4.36	WL	375.83	bgs	339	bgs
	Year 2	203.89	ft drawdown			
SC yr 2	3.92	WL	396.22	bgs	339	bgs
	Year 3	226.54	ft drawdown			
SC yr 3	3.53	WL	418.87	bgs	339	bgs
	Year 4	251.71	ft drawdown			
SC yr 4	3.18	WL	444.04	bgs	339	bgs
	Year 5	279.68	ft drawdown			
SC yr 5	2.86	WL	472.01	bgs	339	bgs

Notes:

Drawup/drawdown criteria exceeded

1. Drawup in the aquifer estimated using projected water level in the well and the estimated well efficiency
2. Drawup/drawdown in aquifer is the same each year because the same volume of water is injected/recovered AND the year-to-year residual clogging is limited to the borehole skin.
3. Assumes 2 ft of rise for every 2.5 MG of water injected (based on residual drawdown after constant rate drawdown test)

SWA Total Aquifer Storage Volume Estimate

Volume removed during constant rate test @ 800 gpm for 4.27 days:		4.896 MG
Residual drawdown of aquifer level remaining following recovery period (see residual drawdown curve from constant rate aquifer test of SWA well 2W)		1.96 ft
Assuming all water pumped during constant rate test was from storage, the gallons pumped per foot of drawdown is		2.498 MG/ft
Current static water level in the target aquifer	SWL 2006	220 ft bgs
Injection cut-off water level threshold		25 ft bgs
	Difference	195 ft

Assumes that the water level in the aquifer (i.e., the post-injection equilibrated aquifer water level) could be elevated to the injection cutoff threshold of 25 ft bgs.

Available storage volume based on 2000 swl level is:	487 MG