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LOST CREEK ISR, LLC

WYOMING OFFICE

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March 21, 2018

Attn: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

PERSONAL INFORMATION
REDACTED

**Re: Annual Report of Changes, Tests, or Experiments Pursuant to License Condition 9.4(E)
Lost Creek ISR Project
License SUA-1598 Docket 40-9068**

To Whom It May Concern:

This Annual Report for 2017 summarizes changes, tests, or experiments evaluated by the Safety and Environmental Review Panel (SERP) for the Lost Creek ISR Project (LC-ISR) provided in accordance with NRC License Condition (LC) 9.4(E). Additionally, this report is to provide any page changes that have been approved by a SERP and incorporated into the NRC License Application Technical Report (TR) and/or Environmental Report (ER).

Evaluations by the SERP were conducted according to TR Section 5.2.2 and LC-ISR Standard Operating Procedure (SOP) AD-003: *SERP*. A SERP summary table and summary reports of the SERP evaluations are included as **Attachment 1**. An index of page changes, the changed pages with edits shown, and the replacement pages are included as **Attachment 2**.

If you have any questions regarding this report or require additional information please contact me at the Casper office.

Sincerely,

Michael D. Gaither
Manager EHS and Regulatory Affairs
Ur-Energy USA, Inc

Attachments: **Attachment 1: SERP Summary and Reports**
Attachment 2: Index of Page Changes and Changed Pages

Lost Creek ISR, LLC is a wholly-owned subsidiary of Ur-Energy Inc.
TSX: URE
www.ur-energy.com

IE47
NMSS01
NMSS

Cc: Deputy Director, Division of Decommissioning
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Office of Nuclear Material Safety and Safeguards
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John Saxton, NRC (via e-mail)
Nancy Williams, WDEQ-LQD, Lander (via e-mail)
Theresa Horne, Ur-Energy, Littleton (via e-mail)

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Attachment 1: SERP Summary
2017 Annual Report of Changes, Tests, or Experiments
Lost Creek ISR Project SUA-1598

SERP ID	SERP Meeting Date	Change, Test, or Experiment	Approved by SERP	TR/ER Page Changes?	Title	Description	Comments
LC17-01	2/23/2017	Change	Y	N	RSO Approval	Approve Krista Amunsen as RSO	
LC17-02	3/6/2017	Change	Y	N	Org Chart	Revise Org Chart to reflect changes in personnel	
LC17-03	2/23/2017	Change	Y	Y	HV-1 and PR Removal	Approve the removal of HV-1 and various PR monitors	
LC17-04	4/13/2017	Change	Y	N	HPT Approval	Approve Brittany Austin as HPT	
LC17-05	4/27/2017	Change	Y	N	RSO Approval	Approve Alex Buerhle as RSO	
LC17-06	5/12/2017	Change	Y	N	Wash Pad in Ponds Area	Approve the establishment of a wash pad in the Ponds area	CANCELLED
LC17-07	6/12/2017	Change	Y	N	Engineer Qualification	Martha Caraway as Project Engineer consistent with TR requirements	
LC17-08	6/12/2017	Change	Y	N	Boneyard	Review the addition of a boneyard for potentially contaminated equipment	
LC17-09	8/11/2017	Change	Y	N	MU2 Approval	Approval of MU2	

LOST CREEK ISR PROJECT

REPORT FOR SERP LC17-01

April 11, 2017

Proposed Change: *Review credentials and install Krista Amunson as Radiation Safety Officer (RSO) and contract employee William (Bill) Kearney as Alternate RSO/Health Physics Technician (HPT) for the Lost Creek ISR Project.*

SERP MEMBERS

Management Representative: *John Cash – LCI Vice President*

Operations Representative: *Kurt Brown – Mine Manager*

Radiation Safety Officer: *Chris Pedersen - RSO*

Support: *Steve Hatten – LCI President*

Support: *Michael Gaither - Manager EHS and Regulatory Affairs*

INTRODUCTION

A SERP meeting was held on February 23, 2017 to review the credentials for Krista Amunson to qualify and install her as primary RSO. Additionally, the credentials for Bill Kearney were reviewed to qualify and install him as Alternate RSO and HPT. The qualifications for RSO are published in Lost Creek Technical Report Section 5.4.3 and NRC Regulatory Guide 8.31.

ANALYSIS, DISCUSSION, AND REVIEWS

Applicable documents reviewed include:

- NRC Regulatory Guide 8.31
- Lost Creek Technical Report Section 5.4.3
- SERP LC15-03
- Resume – Krista Amunson
- Resume – William Kearney

Qualifications for Krista as HPT had previously been reviewed and approved as detailed in SERP 15-03. Qualification applicable to appointment as RSO includes:

- Bachelor's Degree in physical science, industrial hygiene, or engineering:
 - Bachelor's Degree in Chemical Engineering
 - Master's Degree in Physical Science (Chemistry)
- At least one year work experience relevant to uranium recovery operations:
 - Krista has been working for almost two years as HPT at the Lost Creek ISR Project.
- Four weeks (20 days) classroom training in health physics:
 - Two weeks completed for HPT qualification (10 days)

- DOT Hazmat Employee Training, May 2015 (0.5 days)
- 40-hr Radiation Safety Officer Training, Jun 2015 (5 days)
- DOT Radioactive Material Shipping Training, Sep 2015 (2 days)
- 40-hr Uranium Industry RSO Refresher Training, Apr 2016 (5 days)
- Thorough knowledge of the proper application of health physics equipment, procedures, methodologies, calculations, and understanding of uranium recovery and associated hazards:
 - Direct experience by performance of duties as HPT at Lost Creek ISR Project as attested to by the previous RSO.

The basis for installation of Bill Kearney as Alternate RSO/HPT was the review of his resume and qualification for assignment as RSO on another in-situ uranium project. The Alternate RSO has full authority as RSO but is not the primary RSO. Qualifications for HPT are not addressed separately since one who qualifies as RSO already qualifies as HPT. Qualification applicable to appointment as ARSO includes:

- Bachelor's Degree in physical science, industrial hygiene, or engineering:
 - Bachelor's Degree in Watershed Science (Hydrology)
 - Bachelor's Degree in Wildlife Science (Fisheries)
 - Master's Degree level coursework in Limnology and Water Quality
- At least one year work experience relevant to uranium recovery operations:
 - 20+ years of experience working with radiation protection programs including previous qualification as RSO at other uranium recovery facilities.
- Four weeks (20 days) classroom training in health physics:
 - Health Physics Training, 1992 (5 days)
 - Radiological Surveys in Support of Decommissioning, 1998 (5 days)
 - Advanced Radiation Safety Training, 1998 (5 days)
 - Various training and refreshers including radiation protection, HAZWOPR, industrial safety, and transportation emergencies (>5 days).
- Thorough knowledge of the proper application of health physics equipment, procedures, methodologies, calculations, and understanding of uranium recovery and associated hazards:
 - Direct experience by performance of radiation protection program duties at other uranium recovery facilities for over 20 years. Recently (2016) qualified as RSO at other uranium recovery facility.

Operations/Technical Review

- The proposed change would not impact operations.
- The proposed change would not be a change to the processes used.
- No changes in SOPs are necessary.
- No change in the emergency response procedures is necessary.

Environmental/ Health Physics/Safety Review

- No changes in monitoring or record keeping are necessary.
- No additional training or training review is necessary.
- Risk assessment is not necessary.

Compliance Review

- There is no conflict with policies regarding training and safety.
- The proposed change is compliant with the Project license.
- The proposed change is compliant with NRC and State regulations.
- No change in surety is required.

All SERP questions were answered with a "no" indicating that a license/permit amendment was not determined to be necessary.

CONCLUSION

The SERP declares Krista Amunson qualified and appoints her RSO for the Lost Creek ISR Project.

The SERP declares Bill Kearney qualified and appoints him Alternate RSO/HPT during the period of time he is under contract employment for the Lost Creek ISR Project.



LOST CREEK ISR PROJECT
STANDARD FORM

SAFETY AND ENVIRONMENTAL REVIEW PANEL (SERP) FORM

Edition: 11Sep2014rev3

FORM Number: AD-003A

Approval: MDG

SERP ID Number (LCyy-##): LC17-01

Date: 2/23/2017

Proposed Change, Test, or Experiment:

-INSTALL KRISTA AMUNSON AS RSO
-INSTALL BILL KORNBY AS ARSO/HPT (ALTERNATE RSO)

I. SERP MEMBERS

NAME	TITLE	SIGNATURE/DATE
Management: John Cash	LCI Vice President	<i>John Cash</i> 2/23/17
Operations: Kurt Brown	Mine Manager	<i>Kurt Brown</i> 2/23/17
RSO: Chris Pedersen	RSO	<i>Chris Pedersen</i> 2.23.17
Other: Steve Hatten	LCI President	<i>Steve Hatten</i> 2.23.17
Other: Michael Gaither	Manager EHS and RA	<i>Michael Gaither</i> 2/23/2017
Other:		
Other:		
Other:		
Other:		

II. SERP CONCLUSION

After performing the reviews in Section III, answer the SERP questions in Section IV. If any are "YES", then NRC License amendment is required. Check the appropriate conclusion below.



APPROVED BY SERP (as signed above)



CONDITIONALLY APPROVED BY SERP (as signed above w/ conditions listed below)



NRC LICENSE AMENDMENT REQUIRED

Comments/Conditions:

The SERP is convened and conducted in accordance with License Condition 9.4, NRC License Application Technical Report Section 5.2.2, and Standard Operating Procedure AD-003.



LOST CREEK ISR PROJECT
STANDARD FORM

SAFETY AND ENVIRONMENTAL REVIEW PANEL (SERP) FORM

Edition: 11Sep2014rev3

FORM Number: AD-003A

Approval: MDG

III. SERP REVIEW ITEMS

Perform the following reviews A, B, and C referring to documents such as:

- NRC License Conditions
- NRC License Application Technical and Environmental Reports
- NRC Safety Evaluation Reports,
- Environmental Assessments or Impact Statements
- WDEQ Permit to Mine Operations Plan/Reclamation Plan
- Associated Federal and State regulations and regulatory guidance documents

A. OPERATIONS/TECHNICAL REVIEW

- N/A* ☒ Review operating criteria and critical equipment and determine if:
- The proposed change impacts the operations as described in the license application;
 - The proposed change significantly changes the processes used at the facility as described in the license application.
- ☒ Review the SOP for the proposed change and determine the impact on existing SOPs. Make the necessary changes to the existing SOPs.
- ☒ If applicable, review the emergency response plan and determine compatibility with the proposed change.

B. ENVIRONMENTAL/ HEALTH PHYSICS/ SAFETY REVIEW

- ☒ Review the proposed change to determine if any changes in monitoring and record keeping are required to ensure compliance with existing programs.
- ☒ Review the proposed changes and determine the need for additional training.
- ☒ Review key personnel training records and determine training needs as required by the proposed change.
- ☒ Perform Risk Assessment, if necessary, according to the Risk Assessment procedure.

C. COMPLIANCE REVIEW

- ☒ Review the proposed change and determine whether it will conflict with Project policies regarding training and safety.
- ☒ Review the proposed change and determine compliance with the Project license.
- ☒ Review the proposed change and determine compliance with NRC regulations and other federal and state regulations.
- ☒ Review the proposed change to determine if any adjustment to the financial surety would be necessary. Surety must be updated through a license amendment or the annual surety update before the proposed change takes place.



LOST CREEK ISR PROJECT
STANDARD FORM

SAFETY AND ENVIRONMENTAL REVIEW PANEL (SERP) FORM

Edition: 11Sep2014rev3

FORM Number: AD-003A

Approval: MDG

IV. SERP QUESTIONS

When the reviews from A, B, and C above are complete answer the following SERP questions regarding the changes, tests, or experiments and provide a conclusion:

<i>Will the proposed change, test, or experiment:</i>	YES	NO
• Result in more than a minimal increase in the frequency of occurrence of an accident previously evaluated in the license application (as updated)?		X
• Result in more than a minimal increase in the likelihood of occurrence of a malfunction of a facility structure, equipment, or monitoring system (SEMS) important to safety previously evaluated in the license application (as updated)?		X
• Result in more than a minimal increase in the consequences of an accident previously evaluated in the license application (as updated)?		X
• Result in more than a minimal increase in the consequences of a malfunction of an SEMS previously evaluated in the license application (as updated)?		X
• Create a possibility for an accident of a different type than any previously evaluated in the license application (as updated)?		X
• Create a possibility for a malfunction of an SEMS with a different result than previously evaluated in the license application (as updated)?		X
• Result in a departure from the method of evaluation described in the license application (as updated) used in establishing the final safety evaluation report (FSER), environmental impact statement (EIS), environmental assessment (EA), or other analysis and evaluations for license amendments?		X

Comments:

KRISTA AMUNSON

OBJECTIVE

Establish documented skills and knowledge sufficient for RSO role

EDUCATION

40-Hour Uranium RSO Refresher Training Fort Collins, CO	April 4-8, 2016
Radioactive Materials by Air & Ground Certification Training Casper, WY	Sept 24-25, 2015
40-Hour Radiation Safety Officer Training Dade Moeller Training Academy, Las Vegas, Nevada	June 7-12, 2015
DOT Function-Specific/DOT HAZMAT Employee Training Lost Creek Project Site, Wamsutter, WY	May 1, 2015
40-Hour Radiation Safety Officer Training Course Oak Ridge Associated Universities, Oak Ridge, TN	June 21-26, 2009
16-Hour Calibration and Repair of Ludlum Instruments Ludlum Measurements Inc, Sweetwater, TX	Mar 17-18, 2009
4-Hour Radiological Protection for Public Health Officials Wyoming Office of Homeland Security, Cheyenne, WY	Feb 3, 2009
40-Hour Introduction to Radiation Safety Oak Ridge Associated Universities, Oak Ridge, TN	Nov 9-14, 2008
Master's of Sciences of Chemistry University of Wyoming (UW) Laramie, WY	Sept 2005-Aug 2008
Bachelor of Sciences in Chemical Engineering with Chemistry University of Wyoming (UW) Laramie, WY	Sept 2001- May 2005

INSTRUMENT SKILLS

2015-Current

Ludlum 2360 α/β survey meter with 43-93 probe; Ludlum M19 Gamma detector; Protean ASC-950DP α/β counter; F&J DF-40L-8 Air samplers; F&J CD-802 V.2-1-0 Air Sampler Calibrator; Bladewerx SabreAlert2 Portable Radon CAM; F&J Econoair Model L-12P Personal Air Sampling Pump; Ludlum 3030P α/β counter; TSI Portacount Pro 8030 Respirator Fit Tester; DurrIDGE Rad7 Radon Detector

2008-2009

Canberra URAD 113 Radiation Survey Monitor; RAD0s Dosimeter; Ludlum 14-3 Geiger Counter with pancake probe; HAZmat ID

KRISTA AMUNSON

SOFTWARE

Microsoft Word, Microsoft Excel, Microsoft Access, [Ludlum], [PROTEAN], [TSI PORTACOUNT]

EXPERIENCE

UR-Energy Lost Creek Mine, Wamsutter, WY

Apr 2015- Present

Health Physics Technician (HPT)

- Performed weekly surface contamination surveys with direct surveys and swipe tests
- Collected, counted, and reported air samples
- Conducted daily and weekly inspections of restricted areas for compliance
- Maintained and/or calibrated radiological instruments
- Aided in developing methods and Standard Operating Procedures (Surveying out equipment and personnel, calibrating instruments, and general proofreading)
- Prepared and presented General Radiation Worker Training course
- Wrote Radiation Work Permits for within the plant and wellfield
- Aided in managing a bioassay program and edited the SOP
- Assisted in replacing personal and environmental dosimeters on a quarterly basis and inputting the results into a database
- Acquired and tested several effluent monitoring (stack samples) sites each quarter
- Co-wrote several monthly Radiation Safety reports

Wyoming Office of Homeland Security, Cheyenne, WY

Aug 2008-Jul 2009

WMD/Radiation Specialist

- Maintained and calibrated over 700 radiological survey and detection instruments
- Aided in regularly scheduled area surface contamination surveys
- Updated in-house manuals for calibrating dosimeters
- Became familiar with NRC, ANSI, NIST, OSHA regulations, licensing requirements, health physics practices and industry procedures

UW Dept of Chemistry, Laramie, WY

Aug 2005- Aug 2008

Graduate Student/Researcher

- Developed safe protocols for the use of all instrumentation
- Trained and guided numerous undergraduate researchers
- Maintained, organized and managed the research lab and experiments
- Oversaw and conducted the majority of research in the lab

WILLIAM F. KEARNEY



EXPERIENCE

CONSULTANT-SAFETY, ENVIRONMENT AND PERMITTING

Casper, Wyoming

April 2013-Present

Provide independent consulting services in safety, environment and permitting to uranium and other mining operations, pipeline and oil storage facilities, oil and gas, and other industrial operations. Assist clients with the development of management system components related to industrial and radiation safety, emergency response and environmental concerns. Conduct audits of company programs to ensure compliance with OSHA, MSHA, NRC, DOT, ISO 14001 and OHSAS 18001 requirements and best practices. Provide safety, emergency response and environmental training. Assist with incident investigations and loss prevention programs. Obtain regulatory permits for mining and industrial operations. Provide site safety representative services for specific construction projects.

URANIUM ONE AMERICAS INC.

Casper, Wyoming

June 2011- April 2013

Director- Safety, Health and Environment (SHE)

Develop and manage the company's safety, health and environmental policies, standards and practices to ensure that all operating facilities, joint ventures and other entities are in compliance with the corporation's safety, health and environmental policies and values. This includes ensuring compliance with applicable safety, health and environmental regulations set by the regulatory agencies and any accepted international standards adopted by the company. Responsible for the management of environmental permitting, industrial safety, radiation protection and environmental programs at an operating in situ recovery (ISR) uranium mine in Wyoming as well as properties in development. Act as the highest level company liaison with the regulatory agencies, including the WDEQ, USNRC, OSHA, and BLM. At the corporate level, assist with SHE initiatives including audits and due diligence activities at operations in Kazakhstan, Tanzania and Australia. Assure that the company's perspective and interests were advanced and protected, through activities with trade associations including the Wyoming Mining Association and the National Mining Association.

KINDER MORGAN PIPELINES (USA), INC.

Casper, Wyoming

May 2005- June 2011

Senior Health, Safety and Environmental (HSE) Specialist

Implement health, safety and environmental programs for crude oil pipeline operations in Canada and US, including pump stations and oil storage tank facilities. Facilitate USDOT emergency response plans, drills, and audits. Provide site safety and environmental oversight at high risk pipeline and terminal projects. Develop and implement environmental and safety procedures and training consistent with EPA, NRC and OSHA requirements including hazardous waste disposal, radiation protection, and emergency response. Obtain state environmental permits for pipeline maintenance and expansion projects. Conduct HSE audits of pipeline pump stations, terminals, and contractor activities to assess compliance with HSE management system requirements.

CAMECO RESOURCES USA

Smith Ranch -Highland Uranium Project
Douglas, Wyoming

November 1990- May 2005

Manager- Health, Safety and Environmental Affairs

October 2000 – May 2005

Responsible for management of safety, radiation protection and environmental programs at an operating in situ recovery (ISR) uranium mine and properties in development. Primary company liaison with the regulatory agencies, including; the WDEQ,

USNRC, OSHA and the Wyoming State Mine Inspector. Assist with development and implementation of EHS management systems. Represent the company in WDEQ and USNRC rulemaking initiatives and make presentations to government, legislative, and industry groups. Assist the company with the evaluation of properties and expansion opportunities.

Environmental Superintendent

November 1992- October 2000

Responsible for supervision of environmental and radiation safety programs at an in situ uranium mine. Ensure that Environmental and Radiation Safety programs are implemented in accordance with permit requirements and state and federal regulations. Provide hydrology related technical assistance (hydrologic tests, ground water restoration, wastewater disposal). OSHA 40-Hour HAZWOPER Training. Site Radiation Safety Officer.

Senior Environmental Coordinator/Hydrologist

November 1990 - November 1992

Responsible for state and federal environmental permitting at the Highland Uranium Project in situ leach uranium mine. Provide hydrology related technical assistance to the project. Provide regulatory, permitting and technical assistance to the Technical Services Department.

ANTELOPE COAL COMPANY

August 1986 - November 1990

Douglas, Wyoming

Mine Hydrologist

Design and construct water pollution control structures, mine dewatering program, and ground and surface water monitoring programs. Responsible for NPDES permits, hazardous waste permits and procedures, and other related environmental matters with state and federal regulatory agencies.

STATE OF WYOMING

July 1980 - August 1986

Department of Environmental Quality
Land Quality Division

Mine Operations Environmental Coordinator

June 1985 - August 1986

Liaison between various divisions of the Wyoming Department of Environmental Quality and other state and federal agencies concerning all environmental matters related to coal, uranium, and in situ mining.

Chief Hydrologist

August 1981 - June 1985

Supervised five hydrology analysts, scheduled work assignments, completed performance appraisals, and hired personnel. Coordinated environmental reviews of mine permit applications, including hydrology, vegetation, engineering, soils and overburden, and air quality. Expert witness for the Division at regulatory hearings.

Hydrology Analyst

July 1980 - August 1981

Reviewed coal, uranium, and trona in situ mining permit applications for compliance with state and federal regulations.

EDUCATION

M.S., Limnology and Water Quality, Utah State University, Logan, Utah, not completed
B.S., Watershed Science (Hydrology), Utah State University, Logan, Utah, June 1980
B.S., Wildlife Science (Fisheries), Utah State University, Logan, Utah, June 1977
A.A.S., Natural Resources, State University of N.Y., Morrisville, N.Y., June 1975

PROFESSIONAL ASSOCIATIONS

President, Wyoming Mining Association, 2002-2003
Chairman, Uranium Industry Committee, Wyoming Mining Association, 1998-2001
Chairman, Reclamation Committee, Wyoming Mining Association, 1990
Chairman, Gillette Area Groundwater Monitoring Organization (GAGMO), 1987-1988
Member (past), Society of Mining Engineers (SME)

PUBLICATIONS

Levy, D. B., and W. F. Kearney, "Irrigation of Native Rangeland Using Treated Wastewater From In Situ Uranium Processing", In Journal of Environmental Quality, Volume 28, No.1, Jan-Feb 1999.

Kearney, W.F., "Groundwater-Where's It Going?" In The Mining Claim, Wyoming Mining Association, Cheyenne, Wyoming, May 1994.

Oelklaus, W.F., and W.F. Kearney, "Analysis of a Wyoming Program Amendment Attempt for Wildlife," In Proceedings of Fifth Billings Symposium on Disturbed Land Rehabilitation, Billings, Montana, 1990.

Kearney, W.F., and W.F. Oelklaus, "Regulatory Reform Allowing Establishment of Bluffs as Final Mined Land Reclamation at Coal Mines in Wyoming," Wyoming Mining Association, Cheyenne, Wyoming, 1988.

Kearney, W.F., "Permanent Impoundments as a Part of Mine Land Reclamation," Second Hydrology Symposium on Surface Coal Mining in the Northern Great Plains, Gillette, Wyoming, 1985.

Kearney, W.F., "Channel Reconstruction Efforts to Date in Wyoming," Second Hydrology Symposium on Surface Coal Mining in the Northern Great Plains, Gillette, Wyoming, 1985.

Kearney, W.F., "Water Quality Analysis and Quality Assurance," In Proceedings of Hydrology Symposium on Surface Coal Mines in the Powder River Basin, Gillette, Wyoming, 1982.

Kearney, W.F., "Seepage from Trona Tailings Ponds - A Case History," In Proceedings of 1982 Rocky Mountain Groundwater Conference, Salt Lake City, Utah, 1982.

Kearney, W.F., and F.W. Bergstrom, "Sediment Ponds vs. Alternative Sediment Control Technologies on Surface Mined Lands of the Semiarid West," In Proceedings of the 1981 Symposium on Surface Mining Hydrology, Sedimentology, and Reclamation, University of Kentucky, Lexington, Kentucky, 1981.

Kearney, W.F., "Seepage from Trona Tailings Ponds," In Proceedings of the 1981 Rocky Mountain Groundwater Conference, University of Wyoming, Laramie, Wyoming, 1981.

Lamarra, V.A., and W.F. Kearney, "Chemical, Physical, and Biological Effects of Three Salmonid Fish Hatcheries in Northern Utah," Utah Division of Wildlife Resources, Salt Lake City, Utah, 1979.

Kearney, W.F., and P. Valcarce, "Effects of Trout Hatchery Effluents in Cache Valley, Utah," In Proceedings of the Bonneville Chapter of the American Fisheries Society, 1978.

LOST CREEK ISR PROJECT

REPORT FOR SERP LC17-02

April 13, 2017

Proposed Change: *Revise and approve the Lost Creek ISR Project (LCI) Organizational ("Org") Chart to reflect personnel changes and to compare to Technical Report Figure 5.1-1.*

SERP MEMBERS

Management Representative: *Steve Hatten – LCI President*

Operations Representative: *John Cash – LCI Vice President*

Radiation Safety Officer: *Krista Amunson - RSO*

Support: *Michael Gaither - Manager EHS and Regulatory Affairs*

Support: *Brittney Austin – Lab Manager/HPT-in-training*

INTRODUCTION

A SERP meeting was held on March 6, 2017 to review and approve the significant revisions to the Organizational Chart at the Lost Creek ISR Project. Changes to personnel had been made and the changes updated on the LCI Org Chart in February 2017.

ANALYSIS, DISCUSSION, AND REVIEWS

Applicable documents reviewed include:

- Lost Creek Technical Report Figure 5.1-1
- LCI Technical Report Section 5.1
- Lost Creek Org Chart February 2017

The February 2017 changes on the LCI Org Chart were compared with the general Org Chart in the Technical Report (TR) published as Figure 5.1-1 (Oct 2016 – See SERP 16-07 for the update approval). The SERP ensured that the adjustments in personnel still fulfilled the obligation to staff certain positions established on the NRC-approved TR Org Chart. The footnotes on the LCI Org Chart indicate the corresponding positions on the TR Figure 5.1-1 Chart to help in the correlation.

Operations/Technical Review

- No applicable review.

Environmental/ Health Physics/Safety Review

- No applicable review.

Compliance Review

- No applicable review.

The first six SERP questions were not applicable but answered with a "no" and the seventh/last SERP question was answered with a "no". The "no" answers indicated that a license/permit amendment was determined to not be necessary.

CONCLUSION

The SERP approved the revised LCI Org Chart and determined it to be consistent with the required positions on the TR Org Chart. Future minor changes to the LCI Org Chart for organizational positions not described in the TR Section 5.1 will not necessarily require the review and approval of the SERP.

LOST CREEK ISR PROJECT

REPORT FOR SERP LC17-03

May 16, 2017

Proposed Change: *To terminate operational monitoring (air particulates, passive gamma, and radon) at extraneous locations. The change would include removal of the monitoring station HV-1/PR-1 at Bairoil and to terminate operational monitoring and remove passive radiological monitoring stations PR-6 – 9, 11, and 12.*

SERP MEMBERS

Management Representative: *John Cash – LCI Vice President*

Operations Representative: *Kurt Brown – Mine Manager*

Radiation Safety Officer: *Krista Amunson - RSO*

Support: *Michael Gaither - Manager EHS and Regulatory Affairs*

INTRODUCTION

A SERP meeting was held on February 23, 2017 to review the proposed change for terminating monitoring and removing various monitoring stations. The justification for removing the station HV-1 at Bairoil was the proximity to the site, challenges in attending to the station, and the fact that it is beyond the NRC Regulatory Guide 4.14 (RG 4.14) recommended distance of 10 km. The justification for removing the various PR monitors is that they are over and above what is recommended for monitoring locations as described in RG 4.14 and the labor intensive effort it takes to change the monitors compared to the usefulness of the data at those locations. Moreover, the removal of monitoring locations was a recommendation in the 2015 Annual ALARA Report for the Lost Creek Project.

ANALYSIS, DISCUSSION, AND REVIEWS

Applicable documents reviewed include:

- NRC RG 4.14
- NRC SER for Lost Creek TR
- Lost Creek Technical Report (TR) Section 2.9
- Lost Creek TR Section 5.7.7.1
- Lost Creek TR Figure 2.9-25
- Lost Creek TR Figure 2.9-27
- Lost Creek TR Section 2.5

Reviewing the air monitoring locations (HVs), the recommendations in RG 4.14 were compared to the monitoring scheme and the description of the placement of monitors in TR 2.9.3.7. The RG recommends monitoring air for residences or occupiable structures within 10km of the

operation. Bairoil has the closest residence but is greater than 10km (approximately 26km from the Plant) from the operation but was monitored anyway to demonstrate no impact from the operation (TR 2.9.3.7). The Sweetwater Mill to the southwest (upwind) has a "resident" (security guard) and is monitored by Sweetwater and therefore does not need to be included in the Lost Creek monitoring program. Other monitors (HV-2 through HV-5) were consistent and acceptable.

Reviewing the PR locations for radon, RG 4.14 recommends operational monitoring of radon at the same locations as the air samplers (HVs). Therefore, if HV-1 is removed then PR-1 for radon is removed as well. The remaining radon monitoring locations not co-located with air monitors are not consistent with RG 4.14 and have the potential for removal. However, some of the locations may be useful to monitor concentrations of radon downwind from the operation which include PR-6 and PR-12. Additionally, PR-9 is in the center of the wellfield and could provide useful data for wellfield effluent monitoring.

Reviewing the PR locations for passive gamma, RG 4.14 recommends operational monitoring of direct radiation at the same locations as the air samplers (HVs).

Above and beyond the logistical challenges of monitoring and maintaining the locations, a review of the data was performed to determine if the data was distinguishable from background. Statistical analysis was performed on the various PR locations (PR-6, PR-7, PR-8, PR-11, and PR-12) to compare with the background data (PR-2). An F-Test was performed on the paired sets of data to determine the equality of the variances followed by the appropriate t-Test for null hypothesis testing. The null hypothesis (H_0) states that there is no significant statistical difference in the paired data sets. A summary of the statistical results is provided below:

T-Test GAMMA										
	PR-2/PR-6		PR-2/PR-7		PR-2/PR-8		PR-11/PR-2		PR-2/PR-12	
Mean	54.165	54.956	54.165	60.641	54.165	56.111	58.163	54.165	54.165	54.752
Variance	84.524	73.640	84.524	74.482	84.524	82.781	116.384	84.524	84.524	84.396
Observations	26	25	26	27	26	27	27	26	26	27
Pooled Variance	79.193		79.404		83.635		100.766		84.459	
Hypothesized Mean Difference	0		0		0		0		0	
df	49		51		51		51		51	
t Stat	-0.317		-2.645		-0.774		1.449		-0.232	
P(T<=t) one-tail	0.376		0.005		0.221		0.077		0.409	
t Critical one-tail	1.677		1.675		1.675		1.675		1.675	
P(T<=t) two-tail	0.752		0.011		0.442		0.153		0.817	
t Critical two-tail	2.010		2.008		2.008		2.008		2.008	
Conclusion	Do not reject H0		Do not reject H0		Do not reject H0		Do not reject H0		Do not reject H0	

T-Test RADON						
	PR-2/PR-7		PR-8/PR-2		PR-2/PR-11	
Mean	123.388	103.421	190.746	123.388	123.388	119.524
Variance	12352.991	5845.109	14993.387	12352.991	12352.991	7440.203
Observations	26	24	24	26	26	25
Pooled Variance			13618.181		9946.728	
Hypothesized Mean Difference	0		0		0	
df	44		48		49	
t Stat	0.745		2.039		0.138	
P(T<=t) one-tail	0.230		0.023		0.445	
t Critical one-tail	1.680		1.677		1.677	
P(T<=t) two-tail	0.460		0.047		0.891	
t Critical two-tail	2.015		2.011		2.010	
Conclusion	Do not reject H0		Reject H0 - override		Do not reject H0	

To verify the results of the T-Test, a one-way ANOVA test was performed on the data sets:

ANOVA – GAMMA (PR-2, PR6, PR-7, PR-8, PR-11, PR-12)						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	825.507	5	165.101	1.915	0.095	2.273
Within Groups	13189.583	153	86.206			
Total	14015.089	158		Do not reject H0		

ANOVA – RADON (PR-2, PR-7, PR-11 – PR-8 removed)						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	5521.160	2	2760.580	0.320	0.727	3.124
Within Groups	621827.152	72	8636.488			
Total	627348.311	74		Do not reject H0		

The radon data for PR-8 was anomalous since it had a high variability likely due to the use of the older RadTrak radon detectors. The null hypothesis was therefore not rejected since the critical value and the t-statistic were very close. The location was recommended to be removed since it could not likely be impacted by operations and the upwind data would not be significant.

Operations/Technical Review

- The proposed change would not impact operations.
- The proposed change would not be a change to the processes used.
- No changes in SOPs are necessary.
- No change in the emergency response procedures is necessary.

Environmental/ Health Physics/Safety Review

- No changes in monitoring or record keeping are necessary.

- No additional training or training review is necessary.
- Risk assessment is not necessary.

Compliance Review

- There is no conflict with policies regarding training and safety.
- The proposed change is compliant with the Project license.
- The proposed change is compliant with NRC and State regulations.
- No change in surety is required.

CONCLUSION

The SERP approved the following changes:

- Termination of monitoring for air particulates, passive gamma, and passive radon at station HV-1/PR-1 in Bairoil and eventual removal of the monitoring station.
- Termination of passive gamma monitoring at locations PR-6, PR-7, PR-8, PR-11, and PR-12.
- Termination of passive radon monitoring at locations PR-7, PR-8, PR-11.

The SERP rejected the termination of monitoring of gamma and radon at PR-9 since the location was centrally located over the ore body within the Mine Unit and would provide useful data. The SERP rejected the termination of monitoring of passive radon at locations PR-6, PR-9, and PR-12 since it could potentially provide useful downwind data for radon.

Termination of monitoring at HV-1/PR-1 will be effective immediately. Termination of monitoring at the other passive gamma and radon locations will be effective for the third quarter 2017.



LOST CREEK ISR PROJECT
STANDARD FORM

SAFETY AND ENVIRONMENTAL REVIEW PANEL (SERP) FORM

Edition: 11Sep2014rev3

FORM Number: AD-003A

Approval: MDG

SERP ID Number (LCyy-##): LC17-03

Date: 2/23/2017

Proposed Change, Test, or Experiment:

Review and approve proposed plan for cessation of monitoring at and removal of:
air monitoring station HV-1 along with the passive radiological monitoring stations PR-1 (at
HV-1), 6, 7, 8, 9, 11, and 12.

I. SERP MEMBERS

NAME	TITLE	SIGNATURE/DATE
Management: John Cash	LCI Vice President	<i>[Signature]</i> 3/24/17
Operations: Kurt Brown	Mine Manager	<i>[Signature]</i> 3/23/17
RSO: Krista Amunson	RSO	<i>[Signature]</i> 3/23/17
Other: Mike Gaither	Manager EHS and RA	<i>[Signature]</i> 3/23/2017
Other:		
Other:		
Other:		
Other:		
Other:		

II. SERP CONCLUSION

After performing the reviews in Section III, answer the SERP questions in Section IV. If any are "YES", then NRC License amendment is required. Check the appropriate conclusion below.

☐

APPROVED BY SERP (as signed above)

☒

CONDITIONALLY APPROVED BY SERP (as signed above w/ conditions listed below)

☐

NRC LICENSE AMENDMENT REQUIRED

Comments/Conditions:

ACCEPT removal of HV-1. ACCEPT removal of GAMMA AT
PR-1, PR-7, PR-8, PR-6, PR-11, PR-12. ACCEPT removal
of RADON CUPS AT PR-1, PR-7, PR-8, PR-11. HV-1/PR-1 EFFECTIVE
IMMEDIATELY - OTHERS EFFECTIVE 3RD QUARTER.

The SERP is convened and conducted in accordance with License Condition 9.4, NRC License Application Technical Report
Section 5.2.2, and Standard Operating Procedure AD-003.



LOST CREEK ISR PROJECT
STANDARD FORM

SAFETY AND ENVIRONMENTAL REVIEW PANEL (SERP) FORM

Edition: 11Sep2014rev3

FORM Number: AD-003A

Approval: MDG

III. SERP REVIEW ITEMS

Perform the following reviews A, B, and C referring to documents such as:

- NRC License Conditions
- NRC License Application Technical and Environmental Reports
- NRC Safety Evaluation Reports,
- Environmental Assessments or Impact Statements
- WDEQ Permit to Mine Operations Plan/Reclamation Plan
- Associated Federal and State regulations and regulatory guidance documents

A. OPERATIONS/TECHNICAL REVIEW

- ☒ Review operating criteria and critical equipment and determine if:
- The proposed change impacts the operations as described in the license application;
 - The proposed change significantly changes the processes used at the facility as described in the license application.
- ☒ Review the SOP for the proposed change and determine the impact on existing SOPs. Make the necessary changes to the existing SOPs.
- ☒ If applicable, review the emergency response plan and determine compatibility with the proposed change.

B. ENVIRONMENTAL/ HEALTH PHYSICS/ SAFETY REVIEW

- ☒ Review the proposed change to determine if any changes in monitoring and record keeping are required to ensure compliance with existing programs.
- ☒ Review the proposed changes and determine the need for additional training.
- ☒ Review key personnel training records and determine training needs as required by the proposed change.
- ☒ Perform Risk Assessment, if necessary, according to the Risk Assessment procedure.

C. COMPLIANCE REVIEW

- ☒ Review the proposed change and determine whether it will conflict with Project policies regarding training and safety.
- ☒ Review the proposed change and determine compliance with the Project license.
- ☒ Review the proposed change and determine compliance with NRC regulations and other federal and state regulations.
- ☒ Review the proposed change to determine if any adjustment to the financial surety would be necessary. Surety must be updated through a license amendment or the annual surety update before the proposed change takes place.



LOST CREEK ISR PROJECT
STANDARD FORM

SAFETY AND ENVIRONMENTAL REVIEW PANEL (SERP) FORM

Edition: 11Sep2014rev3

FORM Number: AD-003A

Approval: MDG

IV. SERP QUESTIONS

When the reviews from A, B, and C above are complete answer the following SERP questions regarding the changes, tests, or experiments and provide a conclusion:

<i>Will the proposed change, test, or experiment:</i>	YES	NO
• Result in more than a minimal increase in the frequency of occurrence of an accident previously evaluated in the license application (as updated)?		✓
• Result in more than a minimal increase in the likelihood of occurrence of a malfunction of a facility structure, equipment, or monitoring system (SEMS) important to safety previously evaluated in the license application (as updated)?		✓
• Result in more than a minimal increase in the consequences of an accident previously evaluated in the license application (as updated)?		✓
• Result in more than a minimal increase in the consequences of a malfunction of an SEMS previously evaluated in the license application (as updated)?		✓
• Create a possibility for an accident of a different type than any previously evaluated in the license application (as updated)?		✓
• Create a possibility for a malfunction of an SEMS with a different result than previously evaluated in the license application (as updated)?		✓
• Result in a departure from the method of evaluation described in the license application (as updated) used in establishing the final safety evaluation report (FSER), environmental impact statement (EIS), environmental assessment (EA), or other analysis and evaluations for license amendments?		✓

Comments:

LOST CREEK ISR PROJECT

REPORT FOR SERP LC17-04

May 17, 2017

Proposed Change: *Review credentials and approve the installation of Brittany Austin as Health Physics Technician (HPT) for the Lost Creek ISR Project.*

SERP MEMBERS

Management Representative: *John Cash – LCI Vice President*

Operations Representative: *Steve Hatten – LCI President*

Radiation Safety Officer: *Krista Amunson - RSO*

Support: *Michael Gaither - Manager EHS and Regulatory Affairs*

INTRODUCTION

A SERP meeting was held on April 13, 2017 to review the credentials for Brittany Austin to qualify and install her as HPT effective April 23, 2017. The qualifications for HPT are published in Lost Creek Technical Report Section 5.4.3 and NRC Regulatory Guide 8.31.

ANALYSIS, DISCUSSION, AND REVIEWS

Applicable documents reviewed include:

- NRC Regulatory Guide 8.31
- Lost Creek Technical Report Section 5.4.3
- SERP LC15-03
- Resume – Brittany Austin

Qualification applicable to appointment as HPT includes:

1. *Associate degree or two or more years of study in the physical sciences, engineering, or health related field.*
 - Bachelor of Science Degree – Animal/Dairy/Veterinary Science
 - Minor in Chemistry
2. *At least a total of four weeks of generalized training in radiation health protection applicable to uranium recovery facilities.*
 - 40 hr RSO Training 2017 (5-day)
 - Respiratory Protection Training 2017 (3-day)
 - DOT Hazmat Shipping Training 2017 (2-day)
 - On-the-job Lost Creek Radiation Safety Program (Instrumentation and surveys) training (approx. 200 hrs)
 - Lost Creek Site-Specific Radiation Safety Training 2016 (1-day)
 - Lost Creek Occupational Health and Safety Training 2016 (1-day)

3. *One year work experience using sampling and analytical laboratory procedures that involve health physics, industrial hygiene, or industrial safety measures to be applied in a uranium recovery facility.*

- Current Lost Creek laboratory experience approx. 1 year at time of review
- Qualified as HP designee

Operations/Technical Review

- The proposed change would not impact operations.
- The proposed change would not be a change to the processes used.
- No changes in SOPs are necessary.
- No change in the emergency response procedures is necessary.

Environmental/ Health Physics/Safety Review

- No changes in monitoring or record keeping are necessary.
- No additional training or training review is necessary.
- Risk assessment is not necessary.

Compliance Review

- There is no conflict with policies regarding training and safety.
- The proposed change is compliant with the Project license.
- The proposed change is compliant with NRC and State regulations.
- No change in surety is required.

Most SERP questions were not applicable but all were answered with a "no" indicating that a license/permit amendment was not determined to be necessary.

CONCLUSION

The SERP declares Brittany Austin qualified and appoints her HPT for the Lost Creek ISR Project.



LOST CREEK ISR PROJECT
STANDARD FORM

SAFETY AND ENVIRONMENTAL REVIEW PANEL (SERP) FORM

Edition: 11Sep2014rev3

FORM Number: AD-003A

Approval: MDG

SERP ID Number (LCyy-##):

LC17-04

Date:

4/13/2017

Proposed Change, Test, or Experiment:

— REVIEW AND APPROVE BRITTANY AUSTIN AS HPT FOR THE
LOST CREEK ISR PROJECT.

I. SERP MEMBERS

NAME	TITLE	SIGNATURE/DATE
Management: JOHN CASH	LCI VICE PRESIDENT	[Signature] 4/13/17
Operations: STEVE HATTEN	LCI PRESIDENT	[Signature] 4/13/17
RSO: KRISTA AMUNSON	RSO	[Signature] 4.27.17
Other: MIKE GATHER	MANAGER EHS + RA	[Signature] 4/13/2017
Other:		
Other:		
Other:		
Other:		
Other:		

II. SERP CONCLUSION

After performing the reviews in Section III, answer the SERP questions in Section IV. If any are "YES", then NRC License amendment is required. Check the appropriate conclusion below.



APPROVED BY SERP (as signed above)



CONDITIONALLY APPROVED BY SERP (as signed above w/ conditions listed below)



NRC LICENSE AMENDMENT REQUIRED

Comments/Conditions:

The SERP is convened and conducted in accordance with License Condition 9.4, NRC License Application Technical Report Section 5.2.2, and Standard Operating Procedure AD-003.



LOST CREEK ISR PROJECT
STANDARD FORM

SAFETY AND ENVIRONMENTAL REVIEW PANEL (SERP) FORM

Edition: 11Sep2014rev3

FORM Number: AD-003A

Approval: MDG

III. SERP REVIEW ITEMS

Perform the following reviews A, B, and C referring to documents such as:

- NRC License Conditions
- NRC License Application Technical and Environmental Reports
- NRC Safety Evaluation Reports,
- Environmental Assessments or Impact Statements
- WDEQ Permit to Mine Operations Plan/Reclamation Plan
- Associated Federal and State regulations and regulatory guidance documents

A. OPERATIONS/TECHNICAL REVIEW

- N/A
- ☐ Review operating criteria and critical equipment and determine if:
 - The proposed change impacts the operations as described in the license application;
 - The proposed change significantly changes the processes used at the facility as described in the license application.
 - ☐ Review the SOP for the proposed change and determine the impact on existing SOPs. Make the necessary changes to the existing SOPs.
 - ☐ If applicable, review the emergency response plan and determine compatibility with the proposed change.

B. ENVIRONMENTAL/ HEALTH PHYSICS/ SAFETY REVIEW

- ☐ Review the proposed change to determine if any changes in monitoring and record keeping are required to ensure compliance with existing programs.
- ☐ Review the proposed changes and determine the need for additional training.
- ☐ Review key personnel training records and determine training needs as required by the proposed change.
- ☐ Perform Risk Assessment, if necessary, according to the Risk Assessment procedure.

C. COMPLIANCE REVIEW

- ☐ Review the proposed change and determine whether it will conflict with Project policies regarding training and safety.
- ☐ Review the proposed change and determine compliance with the Project license.
- ☐ Review the proposed change and determine compliance with NRC regulations and other federal and state regulations.
- ☐ Review the proposed change to determine if any adjustment to the financial surety would be necessary. Surety must be updated through a license amendment or the annual surety update before the proposed change takes place.



LOST CREEK ISR PROJECT
STANDARD FORM

SAFETY AND ENVIRONMENTAL REVIEW PANEL (SERP) FORM

Edillon: 11Sep2014rev3

FORM Number: AD-003A

Approval: MDG

IV. SERP QUESTIONS

When the reviews from A, B, and C above are complete answer the following SERP questions regarding the changes, tests, or experiments and provide a conclusion:

<i>Will the proposed change, test, or experiment:</i>	YES	NO
• Result in more than a minimal increase in the frequency of occurrence of an accident previously evaluated in the license application (as updated)?		✓
• Result in more than a minimal increase in the likelihood of occurrence of a malfunction of a facility structure, equipment, or monitoring system (SEMS) important to safety previously evaluated in the license application (as updated)?		✓
• Result in more than a minimal increase in the consequences of an accident previously evaluated in the license application (as updated)?		✓
• Result in more than a minimal increase in the consequences of a malfunction of an SEMS previously evaluated in the license application (as updated)?		✓
• Create a possibility for an accident of a different type than any previously evaluated in the license application (as updated)?		✓
• Create a possibility for a malfunction of an SEMS with a different result than previously evaluated in the license application (as updated)?		✓
• Result in a departure from the method of evaluation described in the license application (as updated) used in establishing the final safety evaluation report (FSER), environmental impact statement (EIS), environmental assessment (EA), or other analysis and evaluations for license amendments?		✓

Comments:

LOST CREEK ISR PROJECT

REPORT FOR SERP LC17-05

May 18, 2017

Proposed Change: *Review credentials and install Alex Buehrle as Radiation Safety Officer (RSO).*

SERP MEMBERS

Management Representative: *Steve Hatten – LCI President*

Operations Representative: *Kurt Brown – Mine Manager*

Radiation Safety Officer: *Krista Amunson - RSO*

Support: *Michael Gaither - Manager EHS and Regulatory Affairs*

INTRODUCTION

A SERP meeting was held on April 27, 2017 to review the credentials for Alex Buehrle to qualify and install him as primary RSO. Upon approval of Alex as RSO, Krista Amunson primary RSO will be relegated to Alternate RSO (ARSO). The qualifications for RSO are published in Lost Creek Technical Report Section 5.4.3 and NRC Regulatory Guide 8.31.

ANALYSIS, DISCUSSION, AND REVIEWS

Applicable documents reviewed include:

- NRC Regulatory Guide 8.31
- Lost Creek Technical Report Section 5.4.3
- SERP LC17-01
- Resume – Alex Buehrle

Qualification applicable to appointment as RSO includes:

- *Bachelor's Degree in physical science, industrial hygiene, or engineering:*
 - Bachelor of Science – Engineering Physics
 - Minor in Mechanical Engineering
 - Certified Health Physicist
- *At least one year work experience relevant to uranium recovery (UR) operations:*
 - 9 years as TRIGA reactor operator
 - 3 years as RSO
 - 8 years as Health Physicist
- *Four weeks (20 days) classroom training in health physics applicable to UR operations:*
 - Various training during 9 years of experience:
 - DOT/IATA Class 7 (10 days total)
 - Ludlum Instrument Repair and Calibration (2 days)

- USGS Radiation Safety (2.5 days total)
 - HAZWOPR (5 days)
 - Health Physics Society PEP/CEL (3 days total)
 - Facility Decommissioning (5 days)
 - MARSSIM Training (5 days)
 - NRC RTR Inspection (5 days)
 - TRTR HP Meeting (5 days)
 - Radiochemistry APHL (5 days)
 - PHMSA Seminar (2 days)
 - GTRI Rad Response (5 days)
- *Thorough knowledge of the proper application of health physics equipment, procedures, methodologies, calculations, and understanding of uranium recovery and associated hazards:*
 - 9 years in Health Physics application for reactor operation
 - Certified Health Physicist

Operations/Technical Review

- The proposed change would not impact operations.
- The proposed change would not be a change to the processes used.
- No changes in SOPs are necessary.
- No change in the emergency response procedures is necessary.

Environmental/ Health Physics/Safety Review

- No changes in monitoring or record keeping are necessary.
- No additional training or training review is necessary.
- Risk assessment is not necessary.

Compliance Review

- There is no conflict with policies regarding training and safety.
- The proposed change is compliant with the Project license.
- The proposed change is compliant with NRC and State regulations.
- No change in surety is required.

Most SERP questions were not applicable but all were answered with a "no" indicating that a license/permit amendment was not determined to be necessary.

CONCLUSION

The SERP declares Alex Buehrle qualified but conditionally approves his appointment as RSO for the Lost Creek ISR Project upon meeting the following conditions:

- Alex will complete site-specific training under the current RSO to include:
 - Complete qualification training for Designee and HPT
 - Needs to fully understand the routine (weekly/monthly/quarterly/annual) radiation safety duties (SOPs, monitoring, and recordkeeping) with sign-off by the RSO
- Will be approved by the current RSO (Krista) prior to performing RSO duties independently
- A letter of final recommendation and transfer of primary RSO designation to Alex will be issued by the current RSO (Krista).

When the letter of transfer is issued, Alex will be primary RSO and Krista will be Alternate RSO.



LOST CREEK ISR PROJECT
STANDARD FORM

SAFETY AND ENVIRONMENTAL REVIEW PANEL (SERP) FORM

Edition: 11Sep2014rev3

FORM Number: AD-003A

Approval: MDG

SERP ID Number (LCyy-##): LC17-05

Date: 4/27/2017

Proposed Change, Test, or Experiment:

PRIMARY

To review credentials and approve Alex Buehrle as RSO for the Lost Creek ISR Project.

KRISTA AMUNSON WILL BE REBATED TO ALTERNATE RSO.

I. SERP MEMBERS

NAME	TITLE	SIGNATURE/DATE
Management: Steve Hatten	LCI President	<i>[Signature]</i> 4/27/17
Operations: Kurt Brown	Mine Manager	<i>[Signature]</i> 4/27/17
RSO: Krista Amunson	RSO	<i>[Signature]</i> 4-27-17
Other: Mike Gaither	Manager EHS and RA	<i>[Signature]</i> 4/27/2017
Other:		
Other:		
Other:		
Other:		
Other:		

II. SERP CONCLUSION

After performing the reviews in Section III, answer the SERP questions in Section IV. If any are "YES", then NRC License amendment is required. Check the appropriate conclusion below.

- ☐ APPROVED BY SERP (as signed above)
- ☒ CONDITIONALLY APPROVED BY SERP (as signed above w/ conditions listed below)
- ☐ NRC LICENSE AMENDMENT REQUIRED

Comments/Conditions:

- WILL COMPLETE ON SITE TRAINING UNDER KRISTA (RSO) TO INCLUDE:
 - DESKTOP TRAINING / HAT TRAINING
 - NEED TO FULLY UNDERSTAND WEEKLY / MONTHLY / QTR / ANNUAL RADIATION SAFETY DUTIES W/ APPROVAL BY RSO
- WILL BE APPROVED BY RSO PRIOR TO PERFORMING RSO DUTIES INDEPENDENTLY

The SERP is convened and conducted in accordance with License Condition 9.4, NRC License Application Technical Report Section 5.2.2, and Standard Operating Procedure AD-003.



LOST CREEK ISR PROJECT
STANDARD FORM

SAFETY AND ENVIRONMENTAL REVIEW PANEL (SERP) FORM

Edition: 11Sep2014rev3

FORM Number: AD-003A

Approval: MDG

III. SERP REVIEW ITEMS

Perform the following reviews A, B, and C referring to documents such as:

- NRC License Conditions
- NRC License Application Technical and Environmental Reports
- NRC Safety Evaluation Reports,
- Environmental Assessments or Impact Statements
- WDEQ Permit to Mine Operations Plan/Reclamation Plan
- Associated Federal and State regulations and regulatory guidance documents

A. OPERATIONS/TECHNICAL REVIEW

- N/A
- ☒ Review operating criteria and critical equipment and determine if:
 - The proposed change impacts the operations as described in the license application;
 - The proposed change significantly changes the processes used at the facility as described in the license application.
 - ☒ Review the SOP for the proposed change and determine the impact on existing SOPs. Make the necessary changes to the existing SOPs.
 - ☒ If applicable, review the emergency response plan and determine compatibility with the proposed change.

B. ENVIRONMENTAL/ HEALTH PHYSICS/ SAFETY REVIEW

- N/A
- ☒ Review the proposed change to determine if any changes in monitoring and record keeping are required to ensure compliance with existing programs.
 - ☒ Review the proposed changes and determine the need for additional training.
 - ☒ Review key personnel training records and determine training needs as required by the proposed change.
 - ☒ Perform Risk Assessment, if necessary, according to the Risk Assessment procedure.

C. COMPLIANCE REVIEW

- N/A
- ☒ Review the proposed change and determine whether it will conflict with Project policies regarding training and safety.
 - ☒ Review the proposed change and determine compliance with the Project license.
 - ☒ Review the proposed change and determine compliance with NRC regulations and other federal and state regulations.
 - ☒ Review the proposed change to determine if any adjustment to the financial surety would be necessary. Surety must be updated through a license amendment or the annual surety update before the proposed change takes place.



LOST CREEK ISR PROJECT
STANDARD FORM

SAFETY AND ENVIRONMENTAL REVIEW PANEL (SERP) FORM

Edition: 11Sep2014rev3

FORM Number: AD-003A

Approval: MDG

IV. SERP QUESTIONS

When the reviews from A, B, and C above are complete answer the following SERP questions regarding the changes, tests, or experiments and provide a conclusion:

<i>Will the proposed change, test, or experiment:</i>	YES	NO
• Result in more than a minimal increase in the frequency of occurrence of an accident previously evaluated in the license application (as updated)?		<input checked="" type="checkbox"/>
• Result in more than a minimal increase in the likelihood of occurrence of a malfunction of a facility structure, equipment, or monitoring system (SEMS) important to safety previously evaluated in the license application (as updated)?		<input type="checkbox"/>
• Result in more than a minimal increase in the consequences of an accident previously evaluated in the license application (as updated)?		<input type="checkbox"/>
• Result in more than a minimal increase in the consequences of a malfunction of an SEMS previously evaluated in the license application (as updated)?		<input type="checkbox"/>
• Create a possibility for an accident of a different type than any previously evaluated in the license application (as updated)?		<input type="checkbox"/>
• Create a possibility for a malfunction of an SEMS with a different result than previously evaluated in the license application (as updated)?		<input type="checkbox"/>
• Result in a departure from the method of evaluation described in the license application (as updated) used in establishing the final safety evaluation report (FSER), environmental impact statement (EIS), environmental assessment (EA), or other analysis and evaluations for license amendments?		<input checked="" type="checkbox"/>

Comments:

COLORADO OFFICE

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LOST CREEK ISR, LLC

WYOMING OFFICE

5880 ENTERPRISE DR., STE. 200
CASPER, WY 82609
TEL: (307) 265-2373
FAX: (307) 265-2801

MEMO

Date: July 13, 2017

To: File

From: Krista Amunson

Subject: RSO Alex Buehrle Approval

Alex Buehrle has been trained, briefed on, and/or participated in all the assignments designated to a Radiation Safety Officer, Health Physics Technician, and Designee at the Lost Creek Site. He has fulfilled the training requirements from TR section 5.4.3 RSO. Per the conditions of SERP LC17-05 dated April 27, 2017 Alex has completed all conditions required to be fully instated as the primary RSO; therefore, I approve him for the role of Corporate RSO effective immediately.

LOST CREEK ISR PROJECT

REPORT FOR SERP LC17-07

June 12, 2017

Proposed Change: *Martha Caraway to fill the position of Project Engineer at the Lost Creek ISR Project.*

SERP MEMBERS

Management Representative: *John Cash – LCI Vice President*

Operations Representative: *Kurt Brown – Mine Manager*

Radiation Safety Officer: *Krista Amunson – RSO*

Support: *Michael Gaither - Manager EHS and Regulatory Affairs*

INTRODUCTION

A SERP meeting was held on June 12, 2017 to discuss the proposed change. The qualifications in Section 5.4.4 of the Lost Creek Technical Report states:

"These (Department Head) positions require a bachelor's degree in engineering or associated science degree from an accredited college or university or an equivalent level of work experience, plus a minimum of two years of managerial experience in engineering, geology, or operational functions."

The Project Engineer is a Department Head at the Lost Creek Project. Martha Caraway qualifies for Project Engineer as follows:

- Master of Science Degree in Petroleum Engineering
- Bachelor of Science Degree in Chemical Engineering
- Performed engineering managerial duties in various capacities from May 2015 through April 2017
- Engineering experience over 10 years

ANALYSIS, DISCUSSION, AND REVIEWS

Applicable documents reviewed include:

- Martha Caraway Resume
- Technical Report Section 5.4.4
- Lost Creek Project Organizational Chart

Operations/Technical Review

- The proposed change would not impact operations.

- The proposed change would not be a change to the processes used.
- No changes in SOPs are necessary.
- No change in the emergency response procedures is necessary.

Environmental/ Health Physics/Safety Review

- No changes in monitoring or record keeping are necessary.
- No additional training or training review is necessary.
- Risk assessment is not necessary.

Compliance Review

- There is no conflict with policies regarding training and safety.
- The proposed change is compliant with the Project license.
- The proposed change is compliant with NRC and State regulations.
- No change in surety is required.

Most SERP questions were not applicable but all were answered with a "no" indicating that a license/permit amendment was not determined to be necessary.

CONCLUSION

The SERP approves Martha Caraway as Project Engineer consistent with the qualifications defined in TR 5.4.4.



Document

Personal Information			
Candidate:	Caraway, Martha	Date Created:	04/07/2017 2:56:16 PM
Social Security:	***-**-****	Date of Application:	04/06/2017 5:45:26 PM
Position:	ENG-17-00001 - Project Engineer	Application Method:	Web
Location:	Lost Creek Site	Referral Source:	Internet/Job Board, Indeed.com - AdCode: Indeed2740
Main Phone:	[REDACTED]		
Address:	[REDACTED]		
Email Address:	[REDACTED]		

Education	
Resume	
Martha Caraway	
[REDACTED]	

SUMMARY:
Objective: Seeking a position in the mining industry that allows me to support team operational, and business objectives while further developing my engineering and project management experience

EXPERIENCE:
November 2016 - April 2017
Maintenance Team Leader
Wamsutter Asset, Wyoming

- Managed a team of six construction specialists that responded to daily maintenance and repair requests and installation of production-enhancing projects
- Reduced response times from 3 days to 24 hours or less for production critical repair requests
- Reduced response times from more than a week to three days for all other repair requests
- Reduced cost of repair work by working with the production team leads to identify types of jobs that could be completed by company personnel rather than contractors
- Worked with engineering and automation team leads to develop a project management process that identified key deliverables and timing for efficient installation of compressors and pump jacks
- Supported project execution with appropriate management of change and risk identification activities

May 2015 - November 2016
Facilities Engineering and Construction Manager
Wamsutter Asset, Wyoming

- Managed a team of two engineers and a construction team lead to design and build new topsides infrastructure in support of the drilling program in the field

What Kousu? Seimans A&B

Document continued...

- Reduced material costs by 15% simplifying company requirements to align with industry standards and implementing a new-build materials strategy to reduce inventory of new parts and improve their tracking
- Reduced construction labor costs by 10% by implementing design changes that eliminated requirements for ground disturbance, reduced footprint and reduced the amount of equipment required
- Improved cost tracking accuracy by implementing the use of Open Wells software to provide weekly updates on spend and progress on location builds
- Implemented the use of new combustors on field locations to comply with OOOO(a) emissions requirements
- Supported federal and state permitting requirements by providing all necessary information for topsides permitting

September 2008 - May 2015

Facilities Engineer

Wamsutter Asset, Wyoming

- Supported the delivery of drilling targets by providing facilities design for new pad well sites, monitoring capital costs and improving equipment reliability
- Supported day-to-day field operations by providing technical input for management of change, incident investigations and risk assessments
- Evaluated and field tested new technologies for produced water treatment and disposal - led a \$1 million project for a field trial, and managed budget, site preparation, data collection and leadership review

- Resolved Process Safety Management Audit action items for the Wamsutter Stabilizer Plant - participated in the audit and directly responsible for closing 10 action items resulting from the audit - provided engineering assistance for four other action items

- Tracked and managed performance of the water disposal facilities
- Tracked the economic performance of the stabilizer plant
- Supported integrity management work for the condensate collection pipeline system

October 2007 - September 2008

Facilities Engineer; Holstein & Mad Dog Platforms

Gulf of Mexico

- Managed the select stage of a project to conduct a platform-wide replacement of cadmium-plated bolts
- Evaluated adding piping to the diesel fueling system
- Installed new relief valves on chemical tanks

September 2006 - October 2007

Facilities Engineer

Gulf of Mexico Downed Platforms

Major Project

- Managed the design and construction of a caisson that could collect and store oil in a shallow marine environment
- Coordinated the installation of additional SONAR equipment on remotely operated vehicles
- Determined the electrical area classification of the topsides of intervention vessels

2005 - September 2006

Facilities Engineer

Wamsutter Asset, Wyoming

- Developed a database on well bore corrosion events
- Evaluated a buried pipeline system for bacterial corrosion and liquid hold-up
- Produced water production and disposal tracking
- Evaluated a new disposal well's injection behavior

Document continued...

May 2004 - August 2004

Mexico

Intern, Intern

BP May 2003 - August 2003

Intern

Chocolate Bayou

Alvin, TX

Process Intern

BP May 2002 - August 2002

Intern

Texas City Refinery

Texas City, TX

Process Intern

Industry Training Courses

Discipline Specific

EDUCATION/TRAINING:

University of Houston 2013-05-01

Master of Science

Petroleum Engineering

Texas A&M University 2004-12-01

Bachelor of Science

Chemical Engineering, *Spanish*

PROFESSIONAL:

JM Campbell Gas Gathering Systems

HAZOP the BP Way

Pressure Relief Design

Modeling Flare System with Aspen Flarenet

Carbon Dioxide Corrosion

Introduction to Flow Assurance

HYSYS Modeling

JM Campbell Facilities Engineering for Production

Heat Transfer Awareness

JM Campbell Offshore Systems

Technical Broadening

Introduction to Drilling

Introduction to Electrical Engineering

Subsea Awareness

Basic Petroleum Geology

Basics of Reservoir Engineering

Commercial Broadening

ASSET Simulation

BP Core Economic Evaluation

Behaviors of Successful Negotiators

Petroleum Economics

Managing Uncertainty for Value

Project Management Essentials

Managing Risks in Projects

Document continued...

Professional Qualifications

Registered EIT in Texas since 2008 (No. 39696)

Interests

Mentoring

- Mentored three summer interns that worked on the Wamsutter team
- Determined interns' project activity set
- Provided assistance to complete their projects
- Gave performance feedback to manager and HR

Corporate Recruiting

- SPA for AIChE and Chemical Engineering Department at Texas A&M University
- Organized speaker meetings and BP-sponsored student events
- Coordinated BP-sponsored department awards and scholarships to students
- Attended SEC Annual Career Fair
- Assisted in candidate review and selection

Spanish Language

- Read, write and speak at intermediate level

SKILLS SUMMARY:

automation, budgeting, closing, data collection, database administration, delivery, engineering, inventory management, leadership, materials management, oil painting, personnel, progress, project management, safety, strategic

ADDITIONAL INFO:

Service

- Organized three BP unit team-building events, including determining logistics developing an agenda, and coordinating attendance with representatives from other teams
- September 2006 - May 2007: Volleyball coach, Katy Family YMCA

Excellent references provided upon request



LOST CREEK ISR PROJECT
STANDARD FORM

SAFETY AND ENVIRONMENTAL REVIEW PANEL (SERP) FORM

Edition: 11Sep2014rev3

FORM Number: AD-003A

Approval: MDG

SERP ID Number (LCyy-##): LC17-07

Date: 6/12/2017

Proposed Change, Test, or Experiment:

Review qualifications and approve new Project Engineer. (MARtha CARAWAY) *MDG*

I. SERP MEMBERS

NAME	TITLE	SIGNATURE/DATE
Management: JOHN CASH	LCI VICE PRESIDENT	<i>JWC</i> 6/12/17
Operations: KURT BROWN	MINE MANAGER	<i>KB</i> 6/15/17
RSO: KRISTA AMUNSON	RSO	<i>KAmunson</i> 6/15/17
Other: MIKE GANTNER	MANAGER EHS AND RA	<i>mg</i> 6/12/2017
Other:		
Other:		
Other:		
Other:		
Other:		

II. SERP CONCLUSION

After performing the reviews in Section III, answer the SERP questions in Section IV. If any are "YES", then NRC License amendment is required. Check the appropriate conclusion below.



APPROVED BY SERP (as signed above)



CONDITIONALLY APPROVED BY SERP (as signed above w/ conditions listed below)



NRC LICENSE AMENDMENT REQUIRED

Comments/Conditions:

The SERP is convened and conducted in accordance with License Condition 9.4, NRC License Application Technical Report Section 5.2.2, and Standard Operating Procedure AD-003.



LOST CREEK ISR PROJECT
STANDARD FORM

SAFETY AND ENVIRONMENTAL REVIEW PANEL (SERP) FORM

Edition: 11Sep2014rev3

FORM Number: AD-003A

Approval: MDG

III. SERP REVIEW ITEMS

Perform the following reviews A, B, and C referring to documents such as:

- NRC License Conditions
- NRC License Application Technical and Environmental Reports
- NRC Safety Evaluation Reports,
- Environmental Assessments or Impact Statements
- WDEQ Permit to Mine Operations Plan/Reclamation Plan
- Associated Federal and State regulations and regulatory guidance documents

A. OPERATIONS/TECHNICAL REVIEW

- n/A*
- ☒ Review operating criteria and critical equipment and determine if:
- The proposed change impacts the operations as described in the license application;
 - The proposed change significantly changes the processes used at the facility as described in the license application.
- ☐ Review the SOP for the proposed change and determine the impact on existing SOPs. Make the necessary changes to the existing SOPs.

- ☐ If applicable, review the emergency response plan and determine compatibility with the proposed change.

B. ENVIRONMENTAL/ HEALTH PHYSICS/ SAFETY REVIEW

- ☐ Review the proposed change to determine if any changes in monitoring and record keeping are required to ensure compliance with existing programs.
- ☐ Review the proposed changes and determine the need for additional training.
- ☐ Review key personnel training records and determine training needs as required by the proposed change.
- ☐ Perform Risk Assessment, if necessary, according to the Risk Assessment procedure.

C. COMPLIANCE REVIEW

- ☐ Review the proposed change and determine whether it will conflict with Project policies regarding training and safety.
- ☐ Review the proposed change and determine compliance with the Project license.
- ☐ Review the proposed change and determine compliance with NRC regulations and other federal and state regulations.
- ☐ Review the proposed change to determine if any adjustment to the financial surety would be necessary. Surety must be updated through a license amendment or the annual surety update before the proposed change takes place.



LOST CREEK ISR PROJECT
STANDARD FORM

SAFETY AND ENVIRONMENTAL REVIEW PANEL (SERP) FORM

Edition: 11Sep2014rev3

FORM Number: AD-003A

Approval: MDG

IV. SERP QUESTIONS

When the reviews from A, B, and C above are complete answer the following SERP questions regarding the changes, tests, or experiments and provide a conclusion:

<i>Will the proposed change, test, or experiment:</i>	YES	NO
• Result in more than a minimal increase in the frequency of occurrence of an accident previously evaluated in the license application (as updated)?		<input checked="" type="checkbox"/>
• Result in more than a minimal increase in the likelihood of occurrence of a malfunction of a facility structure, equipment, or monitoring system (SEMS) important to safety previously evaluated in the license application (as updated)?		<input type="checkbox"/>
• Result in more than a minimal increase in the consequences of an accident previously evaluated in the license application (as updated)?		<input type="checkbox"/>
• Result in more than a minimal increase in the consequences of a malfunction of an SEMS previously evaluated in the license application (as updated)?		<input type="checkbox"/>
• Create a possibility for an accident of a different type than any previously evaluated in the license application (as updated)?		<input type="checkbox"/>
• Create a possibility for a malfunction of an SEMS with a different result than previously evaluated in the license application (as updated)?		<input type="checkbox"/>
• Result in a departure from the method of evaluation described in the license application (as updated) used in establishing the final safety evaluation report (FSER), environmental impact statement (EIS), environmental assessment (EA), or other analysis and evaluations for license amendments?		<input type="checkbox"/>

Comments:

LOST CREEK ISR PROJECT

REPORT FOR SERP LC17-08

June 12, 2017

Proposed Change: *Add a Boneyard area for potentially contaminated equipment at the Lost Creek ISR Project site within the Plant fenced area.*

SERP MEMBERS

Management Representative: *John Cash – LCI Vice President*

Operations Representative: *Kurt Brown – Mine Manager*

Radiation Safety Officer: *Krista Amunson – RSO*

Support: *Michael Gaither - Manager EHS and Regulatory Affairs*

INTRODUCTION

A SERP meeting was held on June 12, 2017 to discuss the proposed change of adding an area outside of the Plant but within the fenced area for storage of materials and equipment that has been used and may again be used in the future but could potentially be contaminated from use. The boneyard differs from the laydown/staging area in that the materials in the laydown area are typically new materials used for construction.

ANALYSIS, DISCUSSION, AND REVIEWS

Applicable documents reviewed include:

- Technical Report Section 4.3

The initial discussion of the SERP focused on the scope of the boneyard siting and size. An area of approximately 250 to 300 square feet was requested by the Mine Manager with room for possible expansion in the future if needed. The site would be located at areas such as behind the construction shop, near the northwest laydown area, or within the Pond fenced area.

The boneyard should have the following characteristics:

- Area is relatively flat and easily accessible
- Not in a storm water drainage or could be affected by drainage
- Must be delineated and posted with signage such as *"this area may contain radioactive materials"*
- The area must not be allowed to come in contact with other non-contaminated materials and equipment

Operations/Technical Review

- The proposed change would not impact operations.
- The proposed change would not be a change to the processes used.
- No changes in SOPs are necessary.
- No change in the emergency response procedures is necessary.

Environmental/ Health Physics/Safety Review

- No changes in monitoring or record keeping are necessary.
- No additional training or training review is necessary.
- Risk assessment is not necessary.

Compliance Review

- There is no conflict with policies regarding training and safety.
- The proposed change is compliant with the Project license.
- The proposed change is compliant with NRC and State regulations.
- No change in surety is required.

Most SERP questions were not applicable but all were answered with a "no" indicating that a license/permit amendment was not determined to be necessary.

CONCLUSION

The SERP approved the proposed boneyard area. The areas selected are consistent with the previously stated characteristics.



LOST CREEK ISR PROJECT
STANDARD FORM

SAFETY AND ENVIRONMENTAL REVIEW PANEL (SERP) FORM

Edition: 11Sep2014rev3

FORM Number: AD-003A

Approval: MDG

SERP ID Number (LCyy-##): LC17-08

Date: 06/12/2017

Proposed Change, Test, or Experiment:

Review the addition of a boneyard at Lost Creek for equipment and materials storage.

I. SERP MEMBERS

NAME	TITLE	SIGNATURE/DATE
Management: JOHN CASH	LEE VICE PRESIDENT	J/Cash 6/12/17
Operations: KURT BROWN	MINE MANAGER	K/Brown 6/15/17
RSO: KRISTA AMUNSON	RSO	Krista Amunson 6/15/17
Other: MIKE GARDNER	MANAGER EHS AND RA	Mike Gardner 6/12/2017
Other:		
Other:		
Other:		
Other:		
Other:		

II. SERP CONCLUSION

After performing the reviews in Section III, answer the SERP questions in Section IV. If any are "YES", then NRC License amendment is required. Check the appropriate conclusion below.

- ☒ APPROVED BY SERP (as signed above)
- ☐ CONDITIONALLY APPROVED BY SERP (as signed above w/ conditions listed below)
- ☐ NRC LICENSE AMENDMENT REQUIRED

Comments/Conditions:

The SERP is convened and conducted in accordance with License Condition 9.4, NRC License Application Technical Report Section 5.2.2, and Standard Operating Procedure AD-003.



LOST CREEK ISR PROJECT
STANDARD FORM

SAFETY AND ENVIRONMENTAL REVIEW PANEL (SERP) FORM

Edition: 11Sep2014rev3

FORM Number: AD-003A

Approval: MDG

III. SERP REVIEW ITEMS

Perform the following reviews A, B, and C referring to documents such as:

- NRC License Conditions
- NRC License Application Technical and Environmental Reports
- NRC Safety Evaluation Reports,
- Environmental Assessments or Impact Statements
- WDEQ Permit to Mine Operations Plan/Reclamation Plan
- Associated Federal and State regulations and regulatory guidance documents

A. OPERATIONS/TECHNICAL REVIEW

- N/A
- ☒ Review operating criteria and critical equipment and determine if:
- The proposed change impacts the operations as described in the license application;
 - The proposed change significantly changes the processes used at the facility as described in the license application.

- N/A
- ☒ Review the SOP for the proposed change and determine the impact on existing SOPs. Make the necessary changes to the existing SOPs.

- N/A
- ☒ If applicable, review the emergency response plan and determine compatibility with the proposed change.

B. ENVIRONMENTAL/ HEALTH PHYSICS/ SAFETY REVIEW

- N/A
- ☒ Review the proposed change to determine if any changes in monitoring and record keeping are required to ensure compliance with existing programs.

- ☒ Review the proposed changes and determine the need for additional training.

- ☒ Review key personnel training records and determine training needs as required by the proposed change.

- N/A
- ☒ Perform Risk Assessment, if necessary, according to the Risk Assessment procedure.

C. COMPLIANCE REVIEW

- ☒ Review the proposed change and determine whether it will conflict with Project policies regarding training and safety.

- ☒ Review the proposed change and determine compliance with the Project license.

- ☒ Review the proposed change and determine compliance with NRC regulations and other federal and state regulations.

- ☒ Review the proposed change to determine if any adjustment to the financial surety would be necessary. Surety must be updated through a license amendment or the annual surety update before the proposed change takes place.



LOST CREEK ISR PROJECT
STANDARD FORM

SAFETY AND ENVIRONMENTAL REVIEW PANEL (SERP) FORM

Edition: 11Sep2014rev3

FORM Number: AD-003A

Approval: MDG

IV. SERP QUESTIONS

When the reviews from A, B, and C above are complete answer the following SERP questions regarding the changes, tests, or experiments and provide a conclusion:

<i>Will the proposed change, test, or experiment:</i>	YES	NO
• Result in more than a minimal increase in the frequency of occurrence of an accident previously evaluated in the license application (as updated)?		✓
• Result in more than a minimal increase in the likelihood of occurrence of a malfunction of a facility structure, equipment, or monitoring system (SEMS) important to safety previously evaluated in the license application (as updated)?		✓
• Result in more than a minimal increase in the consequences of an accident previously evaluated in the license application (as updated)?		✓
• Result in more than a minimal increase in the consequences of a malfunction of an SEMS previously evaluated in the license application (as updated)?		✓
• Create a possibility for an accident of a different type than any previously evaluated in the license application (as updated)?		✓
• Create a possibility for a malfunction of an SEMS with a different result than previously evaluated in the license application (as updated)?		✓
• Result in a departure from the method of evaluation described in the license application (as updated) used in establishing the final safety evaluation report (FSER), environmental impact statement (EIS), environmental assessment (EA), or other analysis and evaluations for license amendments?		✓

Comments:

LOST CREEK ISR, LLC
FINAL REPORT for SERP LC17-09

August 15, 2017

Change: *Startup of Mine Unit ("MU2") along with the utilization of a temporary groundwater monitoring plan around HH2-1, 2-2 and 2-3.*

OBJECTIVE

The objective of the Safety and Environmental Review Panel (SERP) was to review the startup of MU2 along with the utilization of a temporary groundwater monitoring plan around the first three header houses at the Lost Creek ISR (LC-ISR) Project under the management of Lost Creek ISR, LLC to determine if U.S. Nuclear Regulatory Commission (NRC) approval is required prior to implementing the changes. The SERP was conducted following recommendations by the NRC that the changes be reviewed by the SERP. The SERP was convened pursuant to NRC License Condition 9.4 and according to the Standard Operating Procedure SOP_LC_AD-003: SERP.

SERP MEMBERS

The following individuals comprised the SERP and participated in the meeting:

Management Representative: *Kurt Brown, Mine Manager/Safety Supervisor*

Operations Representative: *Mike Mellin, Mine Geologist*

Radiation Safety Officer: *Alex Buehrle, Corporate RSO*

Supplemental: *Kevin Shelburne, Senior Hydrogeologist*

Facilitator: *John Cash, VP of Regulatory Affairs, Ur-Energy Inc.*

INTRODUCTION

Lost Creek ISR, LLC ("LCI") desires to begin production from the second mine unit ("MU2") at the Lost Creek in situ mine. MU2 was originally proposed in the 2007 license application submitted to and approved by the U.S. NRC. MU2 is located immediately west of MU1 and the mineralization is contained within the HJ Horizon of the Battle Spring Formation. On July 12, 2017, pursuant to license condition 10.12, LCI submitted the MU2 Hydrologic Test Package (ML17094A397) to NRC for review and verification. On September 20, 2016 (ML17094A397) the NRC staff issued Lost Creek a summary of verification issues. By letter dated March 15, 2017 (ML17087A007), Lost Creek provided responses to the NRC's verification issues. On June 21, 2017, the NRC issued a letter stating the Mine Unit 2 Data Package was acceptable. NRC's position is that Lost Creek also perform a SERP to approve the startup of any mine units.

MU2 encompasses approximately 365 acres within the monitor well ring and has a pattern area of approximately 82 acres. The monitor well system consists of 31 monitor ring wells, 16 overlying wells completed in the FG Horizon, 16 underlying monitor wells completed in the KM Horizon and 31 production zone monitor wells completed in the HJ Horizon.

Initially, only header houses 2-1, 2-2, and 2-3 on the eastern side of MU2 will be started. Therefore, LCI evaluated establishing a temporary groundwater monitoring scheme around these header houses to avoid sampling monitor wells that were too far from production to provide any useful data. The attached map shows the temporary trend well ring in green. The temporary ring will include four wells (two existing wells numbered M-HJ226 and M-HJ211 and two proposed monitor wells that would need to be installed, numbered M-HJ232 and M-HJ233. The two new wells would need to be installed to properly monitor intervals 2, 3 and 4 of the HJ Horizon. The two new trend wells would be installed, mechanical integrity tested and sampled for UCL parameters (one sample round) prior to starting injection in mine unit 2. Any indication of lixiviant migrating to a trend well will be reported to LQD and NRC utilizing the excursion reporting protocol. Indication of mining solution at any of these four trend wells would not indicate an excursion since these wells are located within the permitted mine unit, but would indicate that lixiviant is migrating beyond the normal flare and that corrective action, and potentially additional monitoring as approved by the agencies, would be required.

The long-term monitor well ring would include the following wells:

M201, M202, M229, M230 and M231A

The following underlying/overlying wells would be included in the temporary monitoring plan:

M-KM213, M-FG213, M-KM214, M-FG214, M-KM215, and M-FG215

In total, 15 wells will be used to monitor the production zone. Once additional header houses are started, either the entire set of Mine Unit 2 monitor wells will be utilized or a new temporary groundwater monitoring scheme will be proposed.

The SERP meeting was held on August 11, 2017 via teleconference with John Cash and Kevin Shelburne in the Casper office and Alex Buehrle, Kurt Brown and Mike Mellin at the Lost Creek Mine.

ANALYSIS

The following SERP analyses were discussed in the meeting:

Operations/Technical Review

The startup of MU2 and utilization of a temporary groundwater monitoring plan does not create any new unassessed hazards. Kurt Brown ensured the computer systems, including the laboratory computers, have been updated to receive data from the new header houses. Prior to

starting all MU2 header houses, the Mine Manager will ensure the header house has been through a complete startup inspection.

Environmental/ Health Physics/Safety Review

The SERP discussed existing operations procedures and determined that SOP ENV-007 "Groundwater Monitoring" would need to be updated to account for the new monitor wells. John Cash was assigned the task of updating the SOP and ensuring the sampler is trained in the changes. John Cash also performed an overview of all other procedures to determine if any changes need to be made. All other procedures will remain unchanged.

Alex Buehrle, the Corporate RSO, considered health physics issues and determined that there are no new hazards to assess.

EHS concluded there was no need for a Hazard/Risk Assessment.

Compliance Review

There are several NRC license conditions ("LC") relevant to this review. Each license condition was reviewed with the following conclusions:

LC 9.5 Requires the licensee to maintain an adequate financial surety. The existing NRC approved surety includes funds for the restoration and reclamation of HH2-1, 2-2 and 2-3 and is therefore adequate.

LC 9.8 Requires a cultural resources assessment prior to disturbance. The MU2 area was studied in depth during the initial licensing action thereby satisfying this license condition.

LC 10.5 requires MIT testing of all wells prior to utilization. The Geology team verified that all wells in the first header house, HH2-2, have passed MIT tests and that testing of wells in other header houses is ongoing.

LC 10.10 Requires that an attempt be made to locate and re-abandon historic holes. The effort to locate and abandon historic holes was very successful with 137 of the 144 known historic drill holes within the MU2 boundary being located. If additional historic holes are discovered they will be abandoned following approved methods.

LC 10.11 For wellfields within 100 feet of the Lost Creek Fault, requires the licensee to submit a plan to the NRC documenting the location and screened horizon of monitoring wells to monitor potential excursions across the fault into the upper and/or lower aquifers. As previously discussed, this information was provided to the NRC with the MU2 Data Package.

LC 10.12 Requires LCI to submit a wellfield data package prior to beginning lixiviant injection in a wellfield. As discussed above, LCI submitted the MU2 Data Package in July 2016 with NRC providing verification in June 2017. Although not an NRC requirement, LCI also submitted a MU2 Data Package to the Wyoming LQD who approved the package on August 14, 2017.

LC 11.3 requires the establishment of background water quality in the ore zone, overlying and underlying aquifers. The required number of samples, along with appropriate quality control samples, were collected and submitted to an outside laboratory for approval. The results were used to calculate background water quality with the results documented in the MU2 Data Package submitted to the NRC.

LC 11.4 Requires the establishment of Upper Control Limits ("UCL"). The required samples were collected from each of the monitor ring, overlying and underlying wells. The results of the lab analysis were used to calculate UCL parameters which were subsequently reviewed by both the LQD and NRC. The established UCL values have been given to the in-house laboratory so they can monitor for trends in chemistry and excursions.

LC 12.4 and 12.15 Requires the licensee to identify and sample any wells located within 2 kilometers of any proposed production area since the application submitted to the NRC. The expansion of the facility into MU2 does not result in any BLM or public water wells being within 2 kilometers of the production area (beyond those previously identified in the original license application).

There are no conflicts with established policies/procedures regarding training and safety.

The change complies with the project NRC license since there are no deviations from established procedures or descriptions in the Technical Report. However, the change will need to be incorporated in the LQD Permit to Mine to address figure changes and additional language to provide a contingency plan for changes of this nature in the future but the change does not conflict with established procedures that exist in the Permit.

The changes do not conflict with NRC or WDEQ regulations.

John Cash stated that the existing financial surety estimates for the 2012-2013 operating year are adequate.

ADDITIONAL DISCUSSION

The following specific issues were discussed regarding the changes:

- Recalculation of UCLs
- Cross fault monitoring
- Elimination of trend well TW1-2
- Monitor well density

Recalculation of UCLs

Recalculation of UCLs will occur following well installation and well development as soon as possible to provide adequate time to establish new UCLs for the reinstalled wells. The

requirements for monitoring frequency, parameters, and UCL calculation were discussed and will be conducted as described in Technical Report **TR Section 5.7.8.2** and Operations Plan **OP Section 3.6.4.1**.

Cross Fault Monitoring

The "Cross-Stitch" profiles included in Permit to Mine **Plates D5-1a** through **f** and **Plate MU1 5-3** had been reviewed by Cal Van Holland and John Cooper to determine the adequacy of cross fault monitoring. Cal discussed the findings of his review and he concluded that there were no additional juxtaposition concerns due to the new patterns beyond what has already been recognized or monitored.

Elimination of Trend Well TW1-2

John Cooper discussed that the proposed trend well (TW1-2) was not necessary due to the fact that the reinstalled wells would be screened to cover all four mining zone subdivisions. The trend well was originally proposed to allow for the monitoring of the four horizons to monitor potential excursions in zones that were not covered by wells further than the 800 foot radius.

Monitor Well Density

Within each mine unit interior, the monitor well density for overlying, production, and underlying zones monitors shall be at a frequency of one (1) well per four (4) acres in accordance with LQD Guideline 4 Reference Document 10. John Cooper recalculated the acreage. The footprint of acreage is currently 42 acres which would require 10.5 wells of each of the three types. There are currently 13 wells of each type within MU1 and therefore no additional monitor wells are needed.

CONCLUSION

After completing all reviews as required by SERP procedures, the final SERP questions were answered based on the review and documented on the SERP form. The change presented was approved by members without the necessity of NRC review and approval as indicated by signatures on the SERP form. NRC License amendments are not required. However, an NSR to the Permit to Mine will be submitted to WDEQ-LQD for an interim monitoring plan.



LOST CREEK ISR PROJECT
STANDARD FORM

SAFETY AND ENVIRONMENTAL REVIEW PANEL (SERP) FORM

Edition: 11Sep2014rev3

FORM Number: AD-003A

Approval: MDG

SERP ID Number (LCyy-##): LC17-09

Date: 8/18/17

Proposed Change, Test, or Experiment: Approve startup of Mine Unit Two (MU2) with a temporary monitor well ring around HH2-1, 2-2 and 2-3

I. SERP MEMBERS

NAME	TITLE	SIGNATURE/DATE
Management: Kurt Brown	Mine Manager/Safety Sup.	Kurt Brown 8/18/17
Operations: Mike Mellin	Mine Geologist	Mike Mellin 8/18/17
RSO: Alex Buehrle	Corp. RSO	Alex Buehrle 8/18/17
Other: John Cash	Vice President	John Cash 8/18/17
Other: Kevin Shelburne	Senior Hydrogeologist	Kevin Shelburne
Other:		
Other:		
Other:		
Other:		

II. SERP CONCLUSION

After performing the reviews in Section III, answer the SERP questions in Section IV. If any are "YES", then NRC License amendment is required. Check the appropriate conclusion below.

- ☐ APPROVED BY SERP (as signed above)
- ☒ CONDITIONALLY APPROVED BY SERP (as signed above w/ conditions listed below)
- ☐ NRC LICENSE AMENDMENT REQUIRED

Comments/Conditions: Approval of the startup of MU2 is contingent upon ensuring all necessary monitoring and data recording is in place and Emergency response and header house SOPs are reviewed and updated as discussed by the SERP. Finally, an operations inspection will be documented of HH2-2 prior to startup.

The SERP is convened and conducted in accordance with License Condition 9.4, NRC License Application Technical Report Section 5.2.2, and Standard Operating Procedure AD-003.



LOST CREEK ISR PROJECT
STANDARD FORM

SAFETY AND ENVIRONMENTAL REVIEW PANEL (SERP) FORM

Edition: 11Sep2014rev3

FORM Number: AD-003A

Approval: MDG

III. SERP REVIEW ITEMS

Perform the following reviews A, B, and C referring to documents such as:

- NRC License Conditions
- NRC License Application Technical and Environmental Reports
- NRC Safety Evaluation Reports,
- Environmental Assessments or Impact Statements
- WDEQ Permit to Mine Operations Plan/Reclamation Plan
- Associated Federal and State regulations and regulatory guidance documents

A. OPERATIONS/TECHNICAL REVIEW

- ☒ Review operating criteria and critical equipment and determine if:
 - The proposed change impacts the operations as described in the license application;
 - The proposed change significantly changes the processes used at the facility as described in the license application.
- ☒ Review the SOP for the proposed change and determine the impact on existing SOPs. Make the necessary changes to the existing SOPs.
- ☒ If applicable, review the emergency response plan and determine compatibility with the proposed change.

B. ENVIRONMENTAL/ HEALTH PHYSICS/ SAFETY REVIEW

- ☒ Review the proposed change to determine if any changes in monitoring and record keeping are required to ensure compliance with existing programs.
- ☒ Review the proposed changes and determine the need for additional training.
- ☒ Review key personnel training records and determine training needs as required by the proposed change.
- ☒ Perform Risk Assessment, if necessary, according to the Risk Assessment procedure.

C. COMPLIANCE REVIEW

- ☒ Review the proposed change and determine whether it will conflict with Project policies regarding training and safety.
- ☒ Review the proposed change and determine compliance with the Project license.
- ☒ Review the proposed change and determine compliance with NRC regulations and other federal and state regulations.
- ☒ Review the proposed change to determine if any adjustment to the financial surety would be necessary. Surety must be updated through a license amendment or the annual surety update before the proposed change takes place.



LOST CREEK ISR PROJECT
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IV. SERP QUESTIONS

When the reviews from A, B, and C above are complete answer the following SERP questions regarding the changes, tests, or experiments and provide a conclusion:

<i>Will the proposed change, test, or experiment:</i>	YES	NO
• Result in more than a minimal increase in the frequency of occurrence of an accident previously evaluated in the license application (as updated)?		X
• Result in more than a minimal increase in the likelihood of occurrence of a malfunction of a facility structure, equipment, or monitoring system (SEMS) important to safety previously evaluated in the license application (as updated)?		X
• Result in more than a minimal increase in the consequences of an accident previously evaluated in the license application (as updated)?		X
• Result in more than a minimal increase in the consequences of a malfunction of an SEMS previously evaluated in the license application (as updated)?		X
• Create a possibility for an accident of a different type than any previously evaluated in the license application (as updated)?		X
• Create a possibility for a malfunction of an SEMS with a different result than previously evaluated in the license application (as updated)?		X
• Result in a departure from the method of evaluation described in the license application (as updated) used in establishing the final safety evaluation report (FSER), environmental impact statement (EIS), environmental assessment (EA), or other analysis and evaluations for license amendments?		

Comments:

Table MU2 4-1 Baseline Water Quality, Ring Monitor Wells

Parameters	Units	M-201				M-202				M-203				M-204				M-205				M-206A				M-207				M-208				
		4/7/14	5/13/14	6/13/14	8/4/14	4/7/14	5/13/14	6/16/14	8/4/14	4/7/14	5/13/14	6/16/14	8/4/14	4/7/14	5/13/14	6/16/14	8/4/14	4/7/14	5/13/14	6/16/14	8/4/14	4/7/14	5/14/14	6/16/14	8/4/14	4/8/14	5/14/14	6/16/14	8/4/14	4/8/14	5/14/14	6/16/14	8/5/14	
pH	s.u.	9.4	9.2	8.3	8.7	8.5	8.4	8.4	8.4	8.4	8.5	8.3	8.3	8.8	8.4	8.4	8.3	8.4	8.3	8.3	8.3	9.3	8.6	8.8	8.5	8.2	8.3	8.4	8.3	8.2	8.2	8.3	8.3	
Electrical Conductivity	umhos/cm	423	403	415	372	470	471	421	425	437	447	426	432	323	334	324	329	385	379	337	340	323	344	322	303	386	369	329	336	546	522	466	463	
Total Dissolved Solids (180)	mg/L	250	270	300	240	290	310	320	280	270	310	320	310	190	210	240	210	240	250	250	230	200	220	220	190	260	240	230	210	360	340	360	330	
Total Dissolved Solids (Calc)	mg/L	260	250	---	---	290	290	---	---	260	270	---	---	190	200	---	---	230	220	---	---	190	210	---	---	220	220	---	---	320	340	---	---	
Total Alkalinity (as CaCO3)	mg/L	52	54	73	45	96	95	96	95	87	83	79	92	65	59	84	88	109	108	107	108	62	74	79	72	105	108	107	107	100	109	103	98	
Ammonia Nitrogen (As N)	mg/L	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05		
Silica as SiO2	mg/L	14	11	---	---	13	14	---	---	13	13	---	---	11	12	---	---	15	15	---	---	15	14	---	---	15	16	---	---	14	15	---	---	
Bicarbonate as HCO3	mg/L	41	52	88	43	111	113	114	111	106	98	95	112	72	70	100	105	130	129	128	129	57	85	86	83	128	130	128	131	122	132	126	119	
Carbonate as CO3	mg/L	12	7	2.5	6	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	9	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	
Chloride	mg/L	5	5	5	5	5	5	4	5	5	5	4	5	5	5	5	5	5	5	5	5	5	6	4	5	5	6	5	5	5	5	4	5	
Fluoride	mg/L	0.2	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.4	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	
Nitrate-Nitrite Nitrogen (as N)	mg/L	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.1	0.05	0.05	0.05	0.6	0.6	0.8	0.7	0.9	0.9	0.9	1.1	0.7	0.8	0.8	0.8	0.6	0.9	0.9	0.9	0.9	0.05	0.05	0.05	0.05
Sulfate	mg/L	127	120	126	128	121	120	105	119	105	115	118	132	65	77	61	69	63	61	56	62	68	72	58	68	61	60	51	59	142	147	123	140	
Calcium	mg/L	29	29	43	31	52	51	54	51	43	45	52	53	16	20	31	32	40	40	41	38	13	24	27	25	39	40	39	38	61	63	63	60	
Magnesium	mg/L	0.5	0.5	1	0.5	2	2	2	2	2	2	3	3	0.5	1	2	2	2	2	3	2	0.5	1	1	1	2	2	2	2	3	3	3	3	
Potassium	mg/L	14	10	7	9	3	3	3	3	4	3	3	3	11	10	8	7	2	2	2	2	11	8	8	7	3	2	2	2	2	2	2	2	
Sodium	mg/L	45	42	39	41	36	37	35	36	39	39	36	38	39	36	31	32	31	31	29	29	41	35	34	32	31	29	29	30	37	36	36	36	
Cation Sum	meq/L	3.72	3.49	---	---	4.43	4.40	---	---	4.05	4.16	---	---	2.74	2.89	---	---	3.58	3.57	---	---	2.69	2.99	---	---	3.51	3.49	---	---	4.92	4.98	---	---	
Anion Sum	meq/L	3.85	3.72	---	---	4.59	4.54	---	---	4.07	4.20	---	---	2.83	2.97	---	---	3.71	3.62	---	---	2.86	3.21	---	---	3.56	3.64	---	---	5.09	5.40	---	---	
Cation-Anion Balance	%	1.65	3.06	---	---	1.68	1.58	---	---	0.29	0.47	---	---	1.70	1.22	---	---	1.70	0.73	---	---	2.92	3.48	---	---	0.76	2.12	---	---	1.71	4.03	---	---	
Calculated TDS/TDS Ratio	dec. %	0.96	1.08	---	---	1.00	1.07	---	---	1.04	1.15	---	---	1.00	1.05	---	---	1.04	1.14	---	---	1.05	1.05	---	---	1.18	1.09	---	---	1.12	1.00	---	---	
Gross Alpha (Dissolved)	pCi/L	80.1	58.5	97.8	45.7	80.8	83.0	81.3	56.8	205	140	160	133	101	67.9	178	122	208	145	191	125	155	140	112	99.5	181	124	153	110	100	76.8	82.8	71.7	
Gross Beta (Dissolved)	pCi/L	22.4	24.0	38.6	40.4	20.3	20.6	21.5	35.2	39.9	30.4	36.2	78.5	28.1	25.0	45.6	73.9	47.9	34.7	32.9	67.7	42.1	33.7	32.3	54.6	44.6	36.3	34.9	43.1	25.9	19.4	20.7	21.8	
Radium 226 (Dissolved)	pCi/L	6.3	5.8	8.5	6.7	7.2	6.2	6.1	5.6	7.0	1.9	1.8	2.0	0.8	1.1	1.5	1.5	1.7	1.3	1.3	1.4	0.7	1.1	0.9	1.4	1.6	1.4	1.2	1.2	2.6	2.8	2.4	2.4	
Radium 228 (Dissolved)	pCi/L	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1.7	1.6	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1.8	3.2	1.1	1.7	0.5	
Dissolved Aluminum	mg/L	0.05	0.05	---	---	0.05	0.05	---	---	0.05	0.05	---	---	0.05	0.05	---	---	0.05	0.05	---	---	0.05	0.05	---	---	0.05	0.05	---	---	0.05	0.05	---	---	
Dissolved Arsenic	mg/L	0.01	0.005	0.002	0.006	0.004	0.004	0.003	0.003	0.004	0.003	0.002	0.001	0.004	0.004	0.002	0.002	0.001	0.001	0.001	0.001	0.015	0.007	0.006	0.004	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001	
Dissolved Barium	mg/L	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	
Dissolved Beryllium	mg/L	0.0005	0.0005	---	---	0.0005	0.0005	---	---	0.0005	0.0005	---	---	0.0005	0.0005	---	---	0.0005	0.0005	---	---	0.0005	0.0005	---	---	0.0005	0.0005	---	---	0.0005	0.0005	---	---	
Dissolved Boron	mg/L	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	
Dissolved Cadmium	mg/L	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	
Dissolved Chromium	mg/L	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	
Dissolved Copper	mg/L	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.00		

Table MU2 4-1 Baseline Water Quality, Ring Monitor Wells

Parameters	Units	M-209				M-210				M-211A				M-212				M-213				M-214				M-215				M-216			
		4/8/14	5/14/14	6/23/14	8/5/14	4/8/14	5/14/14	6/23/14	8/5/14	4/8/14	5/14/14	6/23/14	8/5/14	4/8/14	5/15/14	6/23/14	8/5/14	4/8/14	5/15/14	6/23/14	8/5/14	4/9/14	5/15/14	6/23/14	8/5/14	4/9/14	5/15/14	6/24/14	8/5/14	4/9/14	5/15/14	6/24/14	8/6/14
pH	s.u.	8.2	8.3	8.2	8.2	8.2	8.3	8.3	8.3	8.9	8.4	8.2	8.3	8.8	8.7	8.7	8.5	8.1	8.3	8.3	8.3	8.2	8.3	8.3	8.2	8.2	8.3	8.3	8.3	8.2	8.3	8.3	8.2
Electrical Conductivity	umhos/cm	559	542	475	484	434	425	377	379	400	407	360	393	462	496	443	445	506	486	429	427	474	494	438	432	550	555	483	483	578	579	510	508
Total Dissolved Solids (180)	mg/L	380	360	340	350	300	280	260	240	270	270	240	270	340	340	300	320	340	340	300	290	320	340	300	310	390	380	350	340	420	400	370	370
Total Dissolved Solids (Calc)	mg/L	340	340	---	---	250	260	---	---	240	260	---	---	280	300	---	---	290	310	---	---	300	300	---	---	350	340	---	---	360	370	---	---
Total Alkalinity (as CaCO3)	mg/L	99	103	102	101	103	107	105	103	52	54	55	77	58	66	74	75	102	103	103	98	97	100	100	100	99	95	96	105	103	107	101	102
Ammonia Nitrogen (As N)	mg/L	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	
Silica as SiO2	mg/L	14	15	---	---	14	15	---	---	11	11	---	---	14	15	---	---	15	15	---	---	14	15	---	---	14	15	---	---	15	15	---	---
Bicarbonate as HCO3	mg/L	121	125	125	123	126	129	128	125	53	64	67	94	63	78	80	86	125	123	125	120	118	122	122	119	121	116	117	128	125	130	124	124
Carbonate as CO3	mg/L	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	
Chloride	mg/L	5	5	5	5	5	6	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	
Fluoride	mg/L	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.2	0.2	0.1	0.2	0.1	0.1
Nitrate-Nitrite Nitrogen (as N)	mg/L	0.05	0.05	0.05	0.05	0.5	0.7	0.7	0.7	0.3	0.4	0.5	0.5	0.05	0.05	0.05	0.05	0.1	0.2	0.2	0.2	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Sulfate	mg/L	150	154	151	149	81	86	85	84	113	128	122	113	134	142	145	144	114	130	116	115	123	123	125	120	160	157	160	156	168	172	169	168
Calcium	mg/L	63	65	64	63	45	47	48	46	32	37	39	45	37	48	50	52	55	58	55	55	54	57	53	56	68	67	69	65	73	77	76	74
Magnesium	mg/L	3	3	3	3	3	3	3	3	0.5	2	2	2	2	2	2	2	3	3	2	3	3	3	2	3	3	3	3	3	3	3	3	3
Potassium	mg/L	2	2	2	2	2	2	2	2	4	3	3	3	13	8	8	6	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3
Sodium	mg/L	38	37	34	41	33	31	30	31	41	35	33	33	40	38	35	37	35	34	31	33	37	35	33	35	37	35	32	35	35	32	31	37
Cation Sum	meq/L	5.11	5.11	---	---	3.92	3.98	---	---	3.48	3.59	---	---	4.05	4.40	---	---	4.54	4.62	---	---	4.54	4.62	---	---	5.27	5.16	---	---	5.48	5.53	---	---
Anion Sum	meq/L	5.24	5.41	---	---	3.95	4.16	---	---	3.54	3.92	---	---	4.09	4.43	---	---	4.58	4.92	---	---	4.62	4.70	---	---	5.45	5.30	---	---	5.70	5.87	---	---
Cation-Anion Balance	%	1.31	2.88	---	---	0.30	2.14	---	---	0.95	4.36	---	---	0.58	0.32	---	---	0.45	3.14	---	---	0.85	0.83	---	---	1.74	1.40	---	---	1.94	2.95	---	---
Calculated TDS/TDS Ratio	dec. %	1.12	1.06	---	---	1.20	1.08	---	---	1.12	1.04	---	---	1.21	1.13	---	---	1.17	1.10	---	---	1.07	1.13	---	---	1.11	1.12	---	---	1.17	1.08	---	---
Gross Alpha (Dissolved)	pCi/L	150	124	78.0	141	158.5	152	184	147	83.3	73.0	73.5	189	137	158	109	183	175	172	186	196	247	220	236	234	98.2	92.8	88.8	63.70	134	156	185	127
Gross Beta (Dissolved)	pCi/L	38.9	29.6	31.9	32.6	48.5	35.4	41.3	43.9	25.8	20.9	35.3	55.0	45.2	46.8	52.8	51.2	49.8	51.9	60.4	61.3	79.0	50.6	75.1	67.9	26.7	23.4	22.9	33.70	36.7	43.5	53.2	63.7
Radium 226 (Dissolved)	pCi/L	14.2	17.9	14.0	44.7	1.8	2.7	1.6	2.4	0.9	1.0	1.1	1.4	2.9	2.4	2.5	2.7	4.5	4.5	4.8	5.0	18.3	14.8	13.2	10.0	2.6	2.6	2.1	2.20	99.8	88.5	90.1	88.4
Radium 228 (Dissolved)	pCi/L	0.5	2.0	0.5	0.5	0.5	1.6	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	2.4	0.5	0.5	0.5	0.5	1.8	0.5	3.1	0.5	0.5	2.5	2.8	5.6	4.5	
Dissolved Aluminum	mg/L	0.05	0.05	---	---	0.05	0.05	---	---	0.05	0.05	---	---	0.05	0.05	---	---	0.05	0.05	---	---	0.05	0.05	---	---	0.05	0.05	---	---	0.05	0.05	---	---
Dissolved Arsenic	mg/L	0.001	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.006	0.004	0.002	0.001	0.008	0.004	0.003	0.003	0.001	0.0005	0.0005	0.0005	0.001	0.001	0.0005	0.0005	0.001	0.0005	0.0005	0.0005	0.002	0.0005	0.001	0.002
Dissolved Barium	mg/L	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	
Dissolved Beryllium	mg/L	0.0005	0.0005	---	---	0.0005	0.0005	---	---	0.0005	0.0005	---	---	0.0005	0.0005	---	---	0.0005	0.0005	---	---	0.0005	0.0005	---	---	0.0005	0.0005	---	---	0.0005	0.0005	---	---
Dissolved Boron	mg/L	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	
Dissolved Cadmium	mg/L	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	
Dissolved Chromium	mg/L	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	
Dissolved Copper	mg/L	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	
Dissolved Iron	mg/L																																

Table MU2 4-1 Baseline Water Quality, Ring Monitor Wells

Parameters	Units	M-217				M-218				M-219				M-220				M-221				M-222				M-223				M-224			
		4/9/14	5/15/14	6/24/14	8/6/14	4/9/14	5/15/14	6/24/14	8/6/14	4/9/14	5/16/14	6/24/14	8/6/14	5/16/14	6/24/14	8/6/14	10/31/14	4/11/14	5/16/14	6/24/14	8/6/14	4/11/14	5/16/14	6/24/14	8/6/14	4/11/14	5/16/14	6/26/14	8/6/14	4/11/14	5/16/14	6/26/14	8/6/14
pH	s.u.	8.2	8.3	8.2	8.3	8.5	8.2	8.4	8.3	8.2	7.9	8.3	8.2	8.1	8.3	8.3	8.0	8.1	8.1	8.3	8.3	8.2	8.0	8.3	8.3	8.2	8.0	8.3	8.3	8.2	8.0	8.3	8.4
Electrical Conductivity	umhos/cm	576	580	510	501	567	588	520	515	582	512	515	515	471	481	480	624	559	507	505	496	591	523	532	524	614	550	550	544	614	549	547	549
Total Dissolved Solids (180)	mg/L	420	400	360	360	380	410	380	370	390	400	370	400	370	340	350	350	430	380	360	380	390	410	390	390	430	420	410	410	430	430	400	420
Total Dissolved Solids (Calc)	mg/L	350	380	---	---	360	380	---	---	360	---	---	---	---	---	---	---	350	---	---	---	360	---	---	---	380	---	---	---	380	---	---	---
Total Alkalinity (as CaCO3)	mg/L	107	102	108	104	85	85	97	97	110	111	109	106	107	106	103	103	112	113	119	108	117	130	116	109	119	116	121	113	122	122	121	122
Ammonia Nitrogen (As N)	mg/L	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	
Silica as SiO2	mg/L	15	16	---	---	15	16	---	---	15	16	---	---	15	---	---	---	15	16	---	---	16	16	---	---	16	16	---	---	16	16	---	---
Bicarbonate as HCO3	mg/L	131	124	132	126	100	103	114	117	134	136	132	130	131	130	125	126	136	138	144	132	142	159	142	132	145	141	146	138	148	149	147	143
Carbonate as CO3	mg/L	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	
Chloride	mg/L	5	5	5	5	5	5	6	5	5	5	5	6	5	5	5	6	5	5	5	5	6	5	5	5	5	5	5	6	5	5	6	5
Fluoride	mg/L	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.2	0.1	0.1	0.2	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Nitrate-Nitrite Nitrogen (as N)	mg/L	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	
Sulfate	mg/L	162	183	159	161	178	192	182	180	168	164	166	167	147	149	148	147	154	157	157	157	147	168	172	169	163	183	173	164	161	160	187	162
Calcium	mg/L	75	77	77	74	72	74	75	77	79	83	79	78	75	71	70	72	76	81	78	75	81	82	84	82	87	89	89	86	87	92	91	86
Magnesium	mg/L	3	3	3	3	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	4	4	4	3
Potassium	mg/L	3	3	3	2	4	4	3	4	3	3	3	3	2	2	2	2	2	2	2	2	2	2	2	2	4	4	4	3	3	3	3	3
Sodium	mg/L	34	33	30	35	35	34	33	36	33	32	29	35	33	29	31	33	30	32	28	34	31	31	28	30	31	33	33	31	30	32	32	31
Cation Sum	meq/L	5.54	5.56	---	---	5.42	5.44	---	---	5.69	---	---	---	---	---	---	---	5.44	---	---	---	5.71	---	---	---	6.04	---	---	---	6.00	---	---	---
Anion Sum	meq/L	5.66	5.98	---	---	5.56	5.84	---	---	5.84	---	---	---	---	---	---	---	5.59	---	---	---	5.56	---	---	---	5.92	---	---	---	5.94	---	---	---
Cation-Anion Balance	%	1.05	3.63	---	---	1.27	3.55	---	---	1.30	---	---	---	---	---	---	---	1.39	---	---	---	1.29	---	---	---	1.04	---	---	---	0.55	---	---	---
Calculated TDS/TDS Ratio	dec. %	1.20	1.05	---	---	1.06	1.08	---	---	1.08	---	---	---	---	---	---	---	1.23	---	---	---	1.08	---	---	---	1.13	---	---	---	1.13	---	---	---
Gross Alpha (Dissolved)	pCi/L	77.7	102	84.8	73.7	70.1	65.6	20	51.6	71.9	25.8	4.3	25.7	117	129	102	111	248	162	211	172	113	93.6	89.7	75.0	73.7	63.2	42.6	49.8	28.9	25.7	20.60	18.8
Gross Beta (Dissolved)	pCi/L	21.4	25.2	21.9	36.9	29.8	27.5	8.6	32.1	23.0	11.2	1.5	22.7	32.6	31.6	74.0	51.2	49.5	53.4	51.8	79.2	35.9	25.8	24.6	42.0	26.0	18.4	10.0	34.6	10.7	8.8	7.10	12.3
Radium 226 (Dissolved)	pCi/L	60.6	62.2	55.8	53.2	31.4	27.6	27.2	28.4	9.6	10.3	10.3	7.6	17.0	16.1	15.2	16.2	132	115	119	113	78.3	57.5	55.1	39.4	37.7	35.5	25.3	24.3	5.7	5.0	5.40	4.5
Radium 228 (Dissolved)	pCi/L	2.3	4.6	8.5	3.9	0.5	0.5	3.8	1.7	3.5	1.5	1.6	1.4	0.5	0.5	0.5	0.5	4.4	2.5	1.8	2.4	1.9	4.3	0.5	2.5	3.3	4.2	2.1	1.7	1.4	1.4	4.70	4.0
Dissolved Aluminum	mg/L	0.05	0.05	---	---	0.05	0.05	---	---	0.05	0.05	---	---	0.05	---	---	---	0.05	0.05	---	---	0.05	0.05	---	---	0.05	0.05	---	---	0.05	0.05	---	---
Dissolved Arsenic	mg/L	0.0005	0.002	0.0005	0.0005	0.003	0.003	0.002	0.002	0.001	0.007	0.001	0.001	0.002	0.001	0.001	0.001	0.0005	0.002	0.001	0.001	0.002	0.002	0.0005	0.0005	0.001	0.001	0.0005	0.0005	0.003	0.003	0.002	0.002
Dissolved Barium	mg/L	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Dissolved Beryllium	mg/L	0.0005	0.0005	---	---	0.0005	0.0005	---	---	0.0005	0.005	---	---	0.005	---	---	---	0.0005	0.005	---	---	0.0005	0.005	---	---	0.0005	0.005	---	---	0.0005	0.005	---	---
Dissolved Boron	mg/L	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Dissolved Cadmium	mg/L	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Dissolved Chromium	mg/L	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Dissolved Copper	mg/L	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	
Dissolved Iron	mg/L	0.025	0.025																														

Table MU2 4-1 Baseline Water Quality, Ring Monitor Wells

Parameters	Units	M-225				M-226				M-227				M-228				M-229				M-230				M-231A			
		4/11/14	5/19/14	6/26/14	8/6/14	4/11/14	5/19/14	6/26/14	8/7/14	4/11/14	5/19/14	6/26/14	8/7/14	4/18/14	5/19/14	6/26/14	8/7/14	4/18/14	5/19/14	6/26/14	8/7/14	4/18/14	5/19/14	6/26/14	8/7/14	4/18/14	5/19/14	6/26/14	8/7/14
pH	s.u.	8.2	8.1	8.3	8.3	8.2	8.1	8.3	8.3	8.2	8.1	8.3	8.3	8.3	8.2	8.3	8.3	8.5	8.3	8.4	8.4	8.3	8.2	8.3	8.3	8.7	8.2	8.4	8.3
Electrical Conductivity	umhos/cm	612	554	554	560	603	543	549	545	506	472	484	479	538	470	470	472	542	473	468	473	550	485	483	481	614	540	527	529
Total Dissolved Solids (180)	mg/L	410	430	420	440	400	430	410	450	330	380	360	370	340	370	340	350	340	370	350	340	340	370	370	360	390	490	410	390
Total Dissolved Solids (Calc)	mg/L	380	---	---	---	370	---	---	---	320	---	---	---	330	---	---	---	330	---	---	---	340	---	---	---	390	---	---	---
Total Alkalinity (as CaCO3)	mg/L	123	119	121	122	124	122	122	121	93	100	106	110	107	108	108	110	103	100	101	104	111	110	112	110	117	112	116	115
Ammonia Nitrogen (As N)	mg/L	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Silica as SiO2	mg/L	16	17	---	---	16	16	---	---	14	15	---	---	15	15	---	---	14	14	---	---	16	16	---	---	15	15	---	---
Bicarbonate as HCO3	mg/L	150	145	148	149	151	149	148	143	113	122	128	130	130	132	129	130	121	122	120	122	134	135	134	132	131	137	139	135
Carbonate as CO3	mg/L	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	6	2.5	2.5	2.5
Chloride	mg/L	5	6	5	6	5	6	5	6	5	5	5	5	5	5	5	6	5	5	5	5	5	5	5	5	7	5	5	5
Fluoride	mg/L	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.2	0.2	0.1	0.1	0.2	0.2	0.1	0.2	0.2	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1
Nitrate-Nitrite Nitrogen (as N)	mg/L	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Sulfate	mg/L	162	201	170	187	155	181	180	180	143	153	155	153	140	140	147	142	143	149	149	144	146	144	152	149	170	195	176	175
Calcium	mg/L	88	88	89	88	85	86	89	86	64	69	75	72	68	66	69	67	53	56	64	63	74	71	75	72	72	71	80	76
Magnesium	mg/L	4	4	3	3	4	3	3	3	2	3	3	3	3	3	3	3	1	2	2	3	2	3	3	3	2	3	4	3
Potassium	mg/L	2	2	3	3	3	2	2	3	3	2	3	2	4	4	4	4	5	5	5	4	4	4	4	3	28	19	13	10
Sodium	mg/L	30	32	31	31	29	31	31	30	33	31	31	31	32	33	33	32	51	44	39	37	31	29	30	30	32	39	31	30
Cation Sum	meq/L	6.04	---	---	---	5.89	---	---	---	4.87	---	---	---	5.09	---	---	---	5.12	---	---	---	5.34	---	---	---	5.83	---	---	---
Anion Sum	meq/L	5.97	---	---	---	5.85	---	---	---	4.96	---	---	---	5.22	---	---	---	5.16	---	---	---	5.40	---	---	---	6.03	---	---	---
Cation-Anion Balance	%	0.63	---	---	---	0.38	---	---	---	0.88	---	---	---	1.20	---	---	---	0.45	---	---	---	0.57	---	---	---	1.68	---	---	---
Calculated TDS/TDS Ratio	dec. %	1.08	---	---	---	1.08	---	---	---	1.03	---	---	---	1.03	---	---	---	1.03	---	---	---	1.00	---	---	---	1.00	---	---	---
Gross Alpha (Dissolved)	pCi/L	32.6	24.6	20.5	18.4	52.8	38.1	36.0	36.0	79.0	75.8	59.5	62.5	120	101	92.3	63.8	36.1	29.3	22.3	23.9	39.7	33.8	25.9	27.2	53.9	43.4	27.4	23.2
Gross Beta (Dissolved)	pCi/L	12.5	9.5	8.0	12.1	15.0	13.7	8.6	16.5	24.1	27.2	14.9	28.2	28.5	33.0	19.1	34.9	13.1	11.3	7.7	15.9	12.1	12.1	8.6	13.1	45.0	27.2	15.2	21.9
Radium 226 (Dissolved)	pCi/L	11.6	10.5	8.8	8.4	16.2	18.4	13.9	17.4	20.6	19.6	18.2	19.0	2.0	1.7	1.7	1.4	1.3	1.5	1.0	1.3	14.4	14.0	43.0	12.3	11.0	11.7	28.5	9.6
Radium 228 (Dissolved)	pCi/L	3.6	1.6	2.0	3.6	1.6	0.5	2.5	0.5	0.5	0.5	1.4	2.2	1.6	2.5	1.4	0.5	0.5	0.5	0.5	0.5	1.5	1.8	1.0	0.5	2.3	3.6	3.9	3.9
Dissolved Aluminum	mg/L	0.05	0.05	---	---	0.05	0.05	---	---	0.05	0.05	---	---	0.05	0.05	---	---	0.05	0.05	---	---	0.05	0.05	---	---	0.05	0.05	---	---
Dissolved Arsenic	mg/L	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.002	0.001	0.0005	0.0005	0.002	0.002	0.002	0.001	0.010	0.008	0.007	0.006	0.001	0.0005	0.001	0.0005	0.001	0.0005	0.0005	0.0005
Dissolved Barium	mg/L	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.1	0.05	0.05	0.05
Dissolved Beryllium	mg/L	0.0005	0.0005	---	---	0.0005	0.0005	---	---	0.0005	0.0005	---	---	0.0005	0.0005	---	---	0.0005	0.0005	---	---	0.0005	0.0005	---	---	0.0005	0.0005	---	---
Dissolved Boron	mg/L	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Dissolved Cadmium	mg/L	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Dissolved Chromium	mg/L	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Dissolved Copper	mg/L	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Dissolved Iron	mg/L	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025
Dissolved Lead	mg/L	0.005	0.005	0.0025	0.0025	0.005	0.005	0.0025	0.0025	0.005	0.005	0.0025	0.0025	0.005	0.005	0.0025	0.0025	0.005	0.005	0.0025	0.0025	0.005	0.005	0.0025	0.0025	0.005	0.005	0.0025	0.0025
Dissolved Manganese	mg/L	0.02	0.02	0.01	0.01	0.02	0.02	0.01	0.01	0.02	0.01	0.01	0.01	0.04	0.04	0.04	0.03	0.005	0.005	0.01	0.01	0.005	0.005	0.01	0.01	0.005	0.005	0.01	0.01
Dissolved Mercury	mg/L	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Dissolved Molybdenum	mg/L	0.005	0.005	0.01	0.01	0.005	0.005	0.01	0.01	0.005	0.005	0.01	0.01	0.005	0.005	0.01	0.01	0.005	0.005	0.01	0.01	0.005	0.005	0.01	0.01	0.005	0.005	0.01	0.01
Dissolved Nickel	mg/L	0.025	0.025	0.005	0.005	0.025	0.025	0.005	0.005	0.025	0.025	0.005	0.005	0.025	0.025	0.005	0.005	0.025	0.025	0.005	0.005	0.025	0.025	0.005	0.005	0.025	0.025	0.005	0.005
Dissolved Selenium	mg/L	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.001	0.001	0.001	0.001	0.004	0.005	0.006	0.005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Dissolved Uranium	mg/L	0.0081	0.0074	0.0070	0.0069	0.0166	0.0152	0.0153	0.0148	0.0539	0.0630	0.0642	0.0620	0.124	0.138	0.127	0.130	0.0226	0.0216	0.0263	0.0260	0.0155	0.0156	0.0164	0.0150	0.0215	0.0220	0.0216	0.0203
Dissolved Vanadium	mg/L	0.05	0.05	0.01	0.01	0.05	0.05	0.01	0.01	0.05	0.05	0.01	0.01	0.05	0.05	0.01	0.01	0.05	0.05	0.01	0.01	0.05	0.05	0.01	0.01	0.05	0.05	0.01	0.01
Dissolved Zinc	mg/L	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Total Iron	mg/L	0.11	0.11	0.08	0.08	0.06	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.25	0.025	0.05	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.25	0.025	0.025
Total Manganese	mg/L	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.04	0.04	0.04	0.04	0.005	0.005	0.01	0.01	0.005	0.005	0.01	0.01	0.005	0.01	0.01	0.01

Result less than detection limit; half the detection limit used
Result is an outlier but left in calculations because it was assessed to be a representative reading
Result is an outlier and was removed from calculations

Table MU2 4-1 Baseline Water Quality, Ring Monitor Wells

Parameters	Units	Outlier Tolerance Interval Calculation						Values with Outliers (if any) Removed						
		No. of Obs.	Mean	TLF	Std. Dev.	Lower Range	Upper Range	No. of Obs.	Min.	Mean	Max.	Standard Deviation	Mean ± 3 Std. Dev.	
pH	s.u.	124	8.3	2.859	0.2	7.7	9.0	121	7.9	8.3	8.9	0.2	7.8	8.8
Electrical Conductivity	umhos/cm	124	479.7	2.859	78.0	256.7	702.7	124	303	480	624	78.0	245.7	713.7
Total Dissolved Solids (180)	mg/L	124	339.9	2.859	66.1	150.8	529.0	124	190	340	490	66.1	141.5	538.3
Total Dissolved Solids (Calc)	mg/L	48	304.4	3.126	59.2	119.4	489.4	48	190	304	390	59.2	126.8	481.9
Total Alkalinity (as CaCO3)	mg/L	124	99.9	2.859	18.0	48.4	151.5	124	45.0	99.9	130.0	18.0	45.8	154.0
Ammonia Nitrogen (As N)	mg/L	124	0.0	2.859	0.0	0.0	0.1	124	0.05	0.05	0.05	0.00	0.05	0.05
Silica as SiO2	mg/L	61	14.7	3.126	1.4	10.2	18.7	61	11.0	14.7	17.0	1.4	10.6	18.8
Bicarbonate as HCO3	mg/L	124	120	2.859	24.3	50.4	189.2	124	41.0	119.8	159	24.3	46.9	192.6
Carbonate as CO3	mg/L	124	2.7	2.859	1.2	-0.7	6.1	122	2.50	2.59	7	0.60	0.79	4.40
Chloride	mg/L	124	5.1	2.859	0.4	3.9	6.3	124	4.0	5.1	7.0	0.4	3.9	6.3
Fluoride	mg/L	124	0.2	2.859	0.1	0.0	0.3	123	0.10	0.16	0.30	0.05	0.00	0.32
Nitrate-Nitrite Nitrogen (as N)	mg/L	124	0.2	2.859	0.3	-0.6	1.0	123	0.05	0.18	0.90	0.26	-0.62	0.97
Sulfate	mg/L	124	137	2.859	37.0	31.6	243.0	124	51.0	137.3	201.0	37.0	26.4	248.2
Calcium	mg/L	124	62.1	2.859	19.1	7.6	116.7	124	13.0	62.1	92.0	19.1	4.9	119.4
Magnesium	mg/L	124	2.6	2.859	0.8	0.3	4.9	124	0.5	2.6	4.0	0.80	0.18	4.98
Potassium	mg/L	124	4.0	2.859	3.7	-6.4	14.5	122	2.0	3.7	14.0	2.6	-4.2	11.6
Sodium	mg/L	124	34	2.859	3.9	22.7	44.8	123	28.0	33.6	45.0	3.5	23.0	44.3
Cation Sum	meq/L	48	4.6	3.126	1.0	1.6	7.6	48	2.69	4.63	6.04	0.96	1.75	7.50
Anion Sum	meq/L	48	4.8	3.126	1.0	1.8	7.7	48	2.83	4.75	6.03	0.96	1.88	7.63
Cation-Anion Balance	%	48	1.6	3.126	1.1	-1.8	5.0	48	0.29	1.59	4.36	1.08	-1.66	4.83
Calculated TDS/TDS Ratio	dec. %	48	1.1	3.126	0.1	0.9	1.3	48	0.96	1.09	1.23	0.06	0.90	1.27
Gross Alpha (Dissolved)	pCi/L	124	100.3	2.859	59.6	-70.1	270.7	124	4.3	100.3	248.0	59.6	-78.5	279.1
Gross Beta (Dissolved)	pCi/L	124	32.7	2.859	17.7	-18.0	83.4	124	1.5	32.7	79.2	17.7	-20.5	85.9
Radium 226 (Dissolved)	pCi/L	124	18.6	2.859	27.9	-61.1	98.2	124	0.7	18.6	132	27.9	-65.1	102.2
Radium 228 (Dissolved)	pCi/L	124	1.5	2.859	1.4	-2.6	5.6	124	0.5	1.5	8.5	1.4	-2.8	5.8
Dissolved Aluminum	mg/L	61	0.050	3.066	0.00	0.05	0.05	61	0.05	0.05	0.05	0.00	0.05	0.05
Dissolved Arsenic	mg/L	124	0.0022	2.859	0.0023	-0.0044	0.0087	122	0.001	0.002	0.008	0.002	-0.004	0.008
Dissolved Barium	mg/L	124	0.05	2.859	0.00	0.04	0.06	124	0.1	0.1	0.1	0.00	0.04	0.06
Dissolved Beryllium	mg/L	61	0.001	3.066	0.0014	-0.0013	0.0024	61	0.001	0.001	0.005	0.001	-0.003	0.005
Dissolved Boron	mg/L	124	0.05	2.859	0.00	0.05	0.05	124	0.05	0.05	0.05	0.00	0.05	0.05
Dissolved Cadmium	mg/L	124	0.0005	2.859	0.0000	0.0005	0.0005	124	0.001	0.001	0.001	0.0000	0.0005	0.0005
Dissolved Chromium	mg/L	124	0.005	2.859	0.000	0.005	0.005	124	0.01	0.01	0.01	0.000	0.005	0.005
Dissolved Copper	mg/L	124	0.005	2.859	0.000	0.005	0.005	124	0.01	0.01	0.01	0.000	0.005	0.005
Dissolved Iron	mg/L	124	0.025	2.859	0.000	0.025	0.025	124	0.03	0.02	0.03	0.000	0.025	0.025
Dissolved Lead	mg/L	124	0.004	2.859	0.0012	0.0000	0.0072	124	0.003	0.004	0.005	0.0012	-0.0001	0.0074
Dissolved Manganese	mg/L	124	0.01	2.859	0.01	-0.01	0.04	124	0.01	0.01	0.04	0.008	-0.013	0.037
Dissolved Mercury	mg/L	124	0.0005	2.859	0.0000	0.0005	0.0005	124	0.001	0.001	0.001	0.0000	0.0005	0.0005
Dissolved Molybdenum	mg/L	124	0.01	2.859	0.00	0.00	0.01	124	0.01	0.01	0.01	0.00	0.00	0.02
Dissolved Nickel	mg/L	124	0.014	2.859	0.010	-0.015	0.042	124	0.01	0.01	0.03	0.010	-0.016	0.044
Dissolved Selenium	mg/L	124	0.0051	2.859	0.0069	-0.0147	0.0250	124	0.001	0.005	0.022	0.0069	-0.0157	0.0259
Dissolved Uranium	mg/L	124	0.092	2.859	0.0759	-0.1246	0.3091	124	0.0069	0.0923	0.2990	0.0759	-0.1353	0.3198
Dissolved Vanadium	mg/L	124	0.03	2.859	0.02	-0.03	0.08	124	0.01	0.03	0.05	0.02	-0.03	0.09
Dissolved Zinc	mg/L	124	0.005	2.859	0.001	0.001	0.009	124	0.01	0.01	0.02	0.001	0.001	0.009
Total Iron	mg/L	124	0.432	2.859	1.452	-3.720	4.585	120	0.03	0.19	3.96	0.512	-1.345	1.727
Total Manganese	mg/L	124	0.02	2.859	0.02	-0.03	0.06	121	0.01	0.01	0.07	0.01	-0.02	0.05

TLF = Tolerance Limit Factor

Table MU2 4-1 Baseline Water Quality, Overlying Aquifer (FG) Monitor Wells

Parameters	Units	M-FG201A				M-FG202				M-FG203				M-FG204				M-FG205				M-FG206				M-FG207			
		4/18/14	7/9/14	8/19/14	10/30/14	4/23/14	7/8/14	8/18/14	10/30/14	4/23/14	8/2/14	8/18/14	10/30/14	4/22/14	7/9/14	8/17/14	10/30/14	4/24/14	8/1/14	8/17/14	10/30/14	4/24/14	7/31/14	8/16/14	10/30/14	4/25/14	6/10/14	7/31/14	8/16/14
pH	s.u.	8.5	8.3	8.4	8.3	8.6	8.5	8.5	8.6	8.3	8.3	8.4	8.4	8.4	8.3	8.4	8.3	8.4	8.3	8.4	8.3	8.4	8.4	8.3	8.3	8.4	8.4	8.5	8.3
Electrical Conductivity	µmhos/cm	365	317	308	382	365	334	324	423	333	344	344	588	355	323	320	428	373	353	345	449	333	313	315	313	361	339	337	340
Total Dissolved Solids (180)	mg/L	210	220	210	210	230	230	230	230	330	230	240	340	220	230	220	230	250	230	250	260	220	220	210	220	240	250	210	230
Total Dissolved Solids (Calc)	mg/L	190	---	---	---	220	---	---	---	320	---	---	---	210	---	---	---	230	---	---	---	180	---	---	---	220	---	---	---
Total Alkalinity (as CaCO3)	mg/L	111	104	106	99	113	111	109	110	94	110	114	97	96	103	105	108	116	111	112	113	112	110	111	112	106	110	107	110
Ammonia Nitrogen (As N)	mg/L	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Silica as SiO2	mg/L	15	---	---	---	14	---	---	---	14	---	---	---	13	---	---	---	14	---	---	---	14	---	---	---	14	---	---	---
Bicarbonate as HCO3	mg/L	135	125	124	119	128	130	125	123	115	133	134	114	116	125	124	132	137	130	133	137	134	128	133	137	126	132	124	132
Carbonate as CO3	mg/L	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Chloride	mg/L	6	5	5	6	5	5	6	6	5	6	6	5	5	5	5	6	5	5	5	6	4	7	7	8	5	5	6	6
Fluoride	mg/L	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.2	0.2	0.2	0.2	0.2	0.2
Nitrate-Nitrite Nitrogen (as N)	mg/L	1.2	1.1	1.1	1.2	0.8	0.9	0.9	1.0	0.05	0.8	0.7	0.05	0.3	0.4	0.4	0.4	0.5	0.7	0.6	0.7	1.1	1.4	1.2	1.3	1.0	0.7	0.9	0.7
Sulfate	mg/L	31	47	45	45	51	52	54	51	143	60	62	138	60	59	61	58	65	64	65	65	26	41	40	41	58	53	61	62
Calcium	mg/L	33	35	35	31	36	38	37	35	57	41	42	58	31	37	38	38	42	42	43	42	36	38	39	37	39	41	42	43
Magnesium	mg/L	1	2	2	2	1	2	2	2	3	2	3	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Potassium	mg/L	4	4	3	4	8	6	6	6	3	3	3	4	4	3	3	2	2	2	2	2	3	2	2	2	3	2	2	2
Sodium	mg/L	31	32	30	28	31	32	31	29	35	29	31	34	32	33	31	29	29	32	30	28	26	26	29	25	29	29	28	29
Cation Sum	meq/L	3.22	---	---	---	3.44	---	---	---	4.65	---	---	---	3.15	---	---	---	3.62	---	---	---	3.16	---	---	---	3.45	---	---	---
Anion Sum	meq/L	3.11	---	---	---	3.54	---	---	---	5.01	---	---	---	3.34	---	---	---	3.87	---	---	---	2.99	---	---	---	3.56	---	---	---
Cation-Anion Balance	%	1.86	---	---	---	1.40	---	---	---	3.72	---	---	---	3.00	---	---	---	3.29	---	---	---	2.79	---	---	---	1.59	---	---	---
Calculated TDS/TDS Ratio	dec. %	1.11	---	---	---	1.05	---	---	---	1.03	---	---	---	1.05	---	---	---	1.09	---	---	---	1.22	---	---	---	1.09	---	---	---
Gross Alpha (Dissolved)	pCi/L	208	157	121	109	315	171	141	157	300	207	283	288	218	236	179	174	349	233	227	228	198	180	134	140	222	186	249	178
Gross Beta (Dissolved)	pCi/L	40.3	46.1	65.9	43.4	63.0	55.6	94.6	60.2	56.3	136	102	145	36.2	70.4	101	66.4	70.5	139	121	80.3	35.2	47.4	55.6	52.1	40.0	48.0	77.7	77.2
Radium 226 (Dissolved)	pCi/L	1.1	0.8	0.8	1.2	1.0	1.0	0.9	1.1	78.0	1.2	1.3	173	1.5	1.5	1.5	1.4	1.1	0.9	1.0	0.9	1.3	1.1	0.9	1.2	1.7	1.5	1.3	1.3
Radium 228 (Dissolved)	pCi/L	1.5	0.5	2.0	0.5	0.5	1.2	0.5	0.5	0.5	1.7	0.5	0.5	0.5	0.5	0.5	1.1	1.5	0.5	0.5	0.5	0.5	0.5	1.0	0.5	0.5	1.7	0.5	1.3
Dissolved Aluminum	mg/L	0.05	---	---	---	0.05	---	---	---	0.05	---	---	---	0.05	---	---	---	0.05	---	---	---	0.05	---	---	---	0.05	---	---	---
Dissolved Arsenic	mg/L	0.003	0.002	0.002	0.002	0.003	0.002	0.002	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.0005	0.001	0.0005	0.0005	0.0005	0.002	0.001	0.001	0.001	0.002	0.001	0.001	0.001
Dissolved Barium	mg/L	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Dissolved Beryllium	mg/L	0.0005	---	---	---	0.0005	---	---	---	0.0005	---	---	---	0.0005	---	---	---	0.0005	---	---	---	0.0005	---	---	---	0.0005	---	---	---
Dissolved Boron	mg/L	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Dissolved Cadmium	mg/L	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Dissolved Chromium	mg/L	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Dissolved Copper	mg/L	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Dissolved Iron	mg/L	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025
Dissolved Lead	mg/L	0.005	0.0025	0.0025	0.0025	0.005	0.0025	0.0025	0.0025	0.005	0.0025	0.0025	0.0025	0.005	0.0025	0.0025	0.0025	0.005	0.0025	0.0025	0.0025	0.005	0.0025	0.0025	0.0025	0.005	0.0025	0.0025	0.0025
Dissolved Manganese	mg/L	0.005	0.1	0.1	0.1	0.005	0.1	0.1	0.1	0.005	0.1	0.1	0.1	0.005	0.1	0.1	0.1	0.005	0.1	0.1	0.1	0.005	0.1	0.1	0.1	0.005	0.1	0.1	0.1
Dissolved Mercury	mg/L	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Dissolved Molybdenum	mg/L	0.005	0.1	0.1	0.1	0.005	0.1	0.1	0.1	0.005	0.1	0.1	0.1	0.005	0.1	0.1	0.1	0.005	0.1	0.1	0.1	0.005	0.1	0.1	0.1	0.005	0.1	0.1	0.1
Dissolved Nickel	mg/L	0.025	0.005	0.005	0.005	0.025	0.005	0.005	0.005	0.025	0.005	0.005	0.005	0.025	0.005	0.005	0.005	0.025	0.005	0.005	0.005	0.025	0.005	0.005	0.005	0.025	0.005	0.005	0.005
Dissolved Selenium	mg/L	0.029	0.029	0.029	0.029	0.033	0.037	0.034	0.036	0.003	0.037	0.035	0.003	0.043	0.043	0.045	0.047	0.040	0.040	0.037	0.040	0.025	0.026	0.026	0.028	0.036	0.034	0.032	0.033
Dissolved Uranium	mg/L	0.177	0.182	0.176	0.165	0.217	0.232	0.220	0.227	0.193	0.359	0.351	0.185	0.293	0.341	0.333	0.342	0.439	0.396	0.398	0.412	0.160	0.188	0.176	0.192	0.312	0.303	0.268	0.265
Dissolved Vanadium	mg/L	0.05	0.01	0.01	0.01	0.05	0.01	0.01	0.01	0.05	0.01	0.01	0.01	0.05	0.01	0.01	0.01	0.05	0.01	0.01	0.01	0.05	0.01	0.01	0.01	0.05	0.01	0.01	0.01
Dissolved Zinc	mg/L	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Total Iron	mg/L	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.14	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.09	0.07	0.025	0.025	0.25	0.07	0.025	0.025
Total Manganese	mg/L	0.005	0.01	0.01	0.01	0.005	0.01	0.01	0.01	0.005	0.01	0.01	0.01	0.005	0.01	0.01	0.01	0.005	0.01	0.01	0.01	0.005	0.01	0.01	0.01	0.005	0.01	0.01	0.01

Result less than detection limit; half the detection limit used
Result is an outlier but left in calculations because it was assessed to be a representative reading
Result is an outlier and was removed from calculations

Table MU2 4-1 Baseline Water Quality, Overlying Aquifer (FG) Monitor Wells

Parameters	Units	M-FG208				M-FG209				M-FG210				M-FG211				M-FG212				M-FG213				M-FG214				M-FG215				
		4/25/14	7/31/14	8/16/14	10/31/14	4/29/14	6/10/14	8/1/14	8/17/14	4/28/14	6/12/14	7/30/14	8/15/14	4/29/14	6/11/14	7/7/14	8/14/14	4/28/14	6/11/14	7/7/14	8/14/14	5/1/14	6/12/14	7/3/14	8/8/14	5/1/14	6/12/14	6/27/14	8/8/14	5/1/14	6/13/14	6/27/14	8/16/14	5/2/14
pH	s.u.	8.6	8.4	8.3	9.7	9.7	8.4	8.4	8.5	8.3	8.3	8.3	8.3	9.1	8.3	8.4	8.3	8.9	8.5	8.3	8.4	8.3	8.3	8.4	8.4	8.3	8.3	8.3	8.4	8.6	8.1	8.5	8.3	8.3
Electrical Conductivity	µmhos/cm	397	360	355	359	323	350	351	351	363	335	335	330	349	338	345	353	360	354	354	350	405	391	382	384	365	348	345	345	308	334	346	452	402
Total Dissolved Solids (180)	mg/L	250	240	250	280	250	220	380	250	230	250	210	230	230	240	250	240	230	250	240	230	270	290	260	280	250	260	240	260	200	230	240	260	270
Total Dissolved Solids (Calc)	mg/L	250	---	---	---	200	---	---	---	220	---	---	---	220	---	---	---	230	---	---	---	260	---	---	---	230	---	---	---	190	---	---	---	260
Total Alkalinity (as CaCO3)	mg/L	108	101	107	18	60	66	100	89	115	115	110	115	74	88	96	98	89	88	88	93	110	112	109	110	106	109	108	110	48	70	76	91	93
Ammonia Nitrogen (As N)	mg/L	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	
Silica as SiO2	mg/L	14	---	---	---	15	---	---	---	15	---	---	---	12	---	---	---	14	---	---	---	15	---	---	---	15	---	---	---	10	---	---	---	14
Bicarbonate as HCO3	mg/L	123	118	127	19	35	79	119	100	138	138	133	140	71	107	113	116	91	103	107	107	133	137	128	130	129	131	129	128	56	85	88	108	112
Carbonate as CO3	mg/L	2.5	2.5	2.5	2.5	19	2.5	2.5	2.5	2.5	2.5	2.5	2.5	9	2.5	2.5	2.5	9	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	
Chloride	mg/L	5	5	5	5	4	5	6	5	6	7	7	6	4	4	5	5	5	5	5	5	5	5	5	5	4	4	4	5	5	5	5	5	
Fluoride	mg/L	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.2	0.2	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.2	0.2	
Nitrate-Nitrite Nitrogen (as N)	mg/L	0.4	0.3	0.3	0.05	0.05	0.05	0.05	0.05	1.2	1.0	1.2	1.0	0.05	0.05	0.05	0.2	0.2	0.2	0.2	0.2	0.4	0.3	0.3	0.3	0.5	0.4	0.4	0.4	0.05	0.05	0.05	0.1	0.05
Sulfate	mg/L	79	81	79	165	75	78	162	83	52	54	53	53	79	66	80	77	78	71	86	79	83	75	83	87	69	61	71	71	85	94	101	92	96
Calcium	mg/L	43	44	46	33	13	23	71	36	39	41	41	43	21	30	38	41	36	39	40	42	49	50	50	49	42	42	44	43	19	32	37	42	44
Magnesium	mg/L	1	2	2	0.5	0.5	0.5	2	0.5	3	2	2	3	0.5	0.5	1	1	1	2	2	2	2	3	2	3	2	2	2	2	0.5	1	2	2	1
Potassium	mg/L	5	3	3	17	20	12	10	7	5	3	2	3	16	12	9	8	5	4	3	3	3	3	2	3	3	3	3	2	7	5	5	5	7
Sodium	mg/L	37	31	31	42	40	38	31	36	31	28	26	29	40	37	35	32	33	32	34	31	31	31	29	30	29	30	30	30	38	34	35	34	34
Cation Sum	meq/L	4.00	---	---	---	2.88	---	---	---	3.63	---	---	---	3.17	---	---	---	3.44	---	---	---	4.05	---	---	---	3.59	---	---	---	2.74	---	---	---	3.95
Anion Sum	meq/L	3.98	---	---	---	2.88	---	---	---	3.65	---	---	---	3.26	---	---	---	3.55	---	---	---	4.09	---	---	---	3.72	---	---	---	2.88	---	---	---	4.02
Cation-Anion Balance	%	0.23	---	---	---	0.08	---	---	---	0.24	---	---	---	1.43	---	---	---	1.56	---	---	---	0.48	---	---	---	1.70	---	---	---	2.51	---	---	---	0.90
Calculated TDS/TDS Ratio	dec. %	1.00	---	---	---	1.25	---	---	---	1.05	---	---	---	1.05	---	---	---	1.00	---	---	---	1.04	---	---	---	1.09	---	---	---	1.05	---	---	---	1.04
Gross Alpha (Dissolved)	pCi/L	357	356	287	164	186	185	315	209	297	224	143	171	111	303	288	262	339	277	277	229	312	383	245	262	234	284	268	201	102	166	233	190	279
Gross Beta (Dissolved)	pCi/L	86.7	120	159	99.4	52.6	55.6	102	108	48.6	41.5	101	67.0	41.4	83.7	126	174	68.2	70.6	98.7	145	61.4	74.5	32.6	133	55.1	59.2	68.0	91.3	30.7	60.6	67.9	114	61.6
Radium 226 (Dissolved)	pCi/L	1.4	1.5	1.5	64.2	2.4	3.6	63.8	3.3	2.1	1.6	1.4	1.2	4.4	8.0	7.8	8.3	1.7	1.5	1.2	1.3	2.6	2.3	2.3	2.0	1.8	1.4	1.4	1.4	3.3	4.4	5.1	4.1	2.4
Radium 228 (Dissolved)	pCi/L	0.5	0.5	1.0	1.6	0.5	0.5	0.5	0.5	0.5	0.5	1.1	1.6	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	2.0	0.5	0.5	1.2	0.5	0.5	
Dissolved Aluminum	mg/L	0.05	---	---	---	0.05	---	---	---	0.05	---	---	---	0.05	---	---	---	0.05	---	---	---	0.05	---	---	---	0.05	---	---	---	0.05	---	---	---	0.05
Dissolved Arsenic	mg/L	0.002	0.001	0.001	0.018	0.005	0.004	0.002	0.002	0.001	0.0005	0.0005	0.001	0.003	0.002	0.002	0.001	0.003	0.002	0.002	0.002	0.0005	0.0005	0.0005	0.0005	0.001	0.0005	0.0005	0.0005	0.004	0.002	0.002	0.001	0.003
Dissolved Barium	mg/L	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	
Dissolved Beryllium	---	0.0005	---	---	---	0.0005	---	---	---	0.0005	---	---	---	0.0005	---	---	---	0.0005	---	---	---	0.0005	---	---	---	0.0005	---	---	---	0.0005	---	---	---	0.0005
Dissolved Boron	mg/L	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	
Dissolved Cadmium	mg/L	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	
Dissolved Chromium	mg/L	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	
Dissolved Copper	mg/L	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005											

Table MU2 4-1 Baseline Water Quality, Overlying Aquifer (FG) Monitor Wells

Parameters	Units	M-FG216			LC21M				Outlier Tolerance Interval Calculation					Values with Outliers (if any) Removed						
		6/13/14	6/27/14	8/8/14	1/3/15	2/2/15	2/18/15	3/18/15	No. of Obs.	Mean	TLF	Std. Dev.	Lower Range	Upper Range	No. of Obs.	Min.	Mean	Max.	Standard Deviation	Mean ± 3 Std. Dev.
pH	s.u.	8.4	8.4	8.5	8.3	8.3	8.4	8.3	68	8.4	3.021	0.3	7.6	9.2	66	8.1	8.4	9.1	0.1	8.0 8.8
Electrical Conductivity	µmhos/cm	376	383	376	360	376	351	364	68	359.3	3.021	41.4	221.9	493.1	67	308.0	355.8	452.0	30.6	264.1 447.6
Total Dissolved Solids (180)	mg/L	270	260	280	230	220	230	230	68	243.8	3.021	30.5	151.8	335.9	67	200.0	241.8	340.0	25.6	164.9 318.7
Total Dissolved Solids (Calc)	mg/L	---	---	---	---	---	---	---	16	226.9	3.812	34.2	96.5	357.2	16	180.0	226.9	320.0	34.2	124.3 329.5
Total Alkalinity (as CaCO3)	mg/L	93	102	95	110	109	108	107	68	100.2	3.021	17.2	48.3	152.1	67	48.0	101.4	116.0	14.0	59.5 143.4
Ammonia Nitrogen (As N)	mg/L	0.05	0.05	0.05	0.005	0.005	0.005	0.005	68	0.0	3.021	0.0	0.0	0.1	68	0.0	0.0	0.1	0.0	0.0 0.1
Silica as SiO2	mg/L	---	---	---	---	---	---	---	16	13.9	3.812	1.3	8.9	18.9	16	10.0	13.9	15.0	1.3	9.9 17.8
Bicarbonate as HCO3	mg/L	110	119	109	132	130	127	129	68	117.9	3.021	23.1	48.2	187.7	67	35.0	119.4	140.0	19.8	60.1 178.7
Carbonate as CO3	mg/L	2.5	2.5	2.5	2.5	2.5	2.5	2.5	68	2.9	3.021	2.3	-3.9	9.8	67	2.5	2.7	9.0	1.1	-0.6 6.0
Chloride	mg/L	5	5	5	6	7	6	6	68	5.3	3.021	0.8	2.9	7.8	68	4.0	5.3	8.0	0.8	2.9 7.8
Fluoride	mg/L	0.2	0.2	0.2	0.2	0.2	0.2	0.3	68	0.2	3.021	0.0	0.1	0.3	68	0.1	0.2	0.3	0.0	0.1 0.3
Nitrate-Nitrite Nitrogen (as N)	mg/L	0.05	0.2	0.05	1.1	1	0.8	1	68	0.5	3.021	0.4	-0.7	1.8	68	0.1	0.5	1.4	0.4	-0.7 1.8
Sulfate	mg/L	91	97	98	57	57	53	56	68	71.5	3.021	26.3	-8.0	151.1	66	26.0	68.8	143.0	21.1	5.3 132.2
Calcium	mg/L	42	49	45	38	39	38	39	68	39.7	3.021	8.3	14.5	64.9	67	13.0	39.2	58.0	7.5	16.9 61.6
Magnesium	mg/L	1	2	2	2	3	2	2	68	1.8	3.021	0.7	-0.2	3.9	68	0.5	1.8	3.0	0.7	-0.2 3.9
Potassium	mg/L	7	5	5	2	2	2	2	68	4.7	3.021	3.7	-6.4	15.8	67	2.0	4.4	17.0	3.2	-5.1 14.0
Sodium	mg/L	32	33	33	32	32	30	30	68	31.6	3.021	3.4	21.4	41.8	68	25.0	31.6	42.0	3.4	21.4 41.8
Cation Sum	meq/L	---	---	---	---	---	---	---	16	3.5	3.812	0.5	1.7	5.4	16	2.7	3.5	4.7	0.5	2.1 5.0
Anion Sum	meq/L	---	---	---	---	---	---	---	16	3.6	3.812	0.5	1.5	5.7	16	2.9	3.6	5.0	0.5	2.0 5.2
Cation-Anion Balance	%	---	---	---	---	---	---	---	16	1.7	3.812	1.1	-2.7	6.0	16	0.1	1.7	3.7	1.1	-1.7 5.1
Calculated TDS/TDS Ratio	dec. %	---	---	---	---	---	---	---	16	1.1	3.812	0.1	0.8	1.3	16	1.0	1.1	1.3	0.1	0.9 1.3
Gross Alpha (Dissolved)	pCi/L	217	315	183	149	147	135	138	68	223.7	3.021	69.1	15.0	432.4	68	102.0	223.7	383.0	69.1	16.4 431.0
Gross Beta (Dissolved)	pCi/L	69.0	86.4	99.4	43.3	43.4	56.9	52.7	68	77.0	3.021	33.6	-24.4	178.4	68	30.7	77.0	174.0	33.6	-23.7 177.7
Radium 226 (Dissolved)	pCi/L	2.5	2.7	2.3	2.1	1.9	1.7	1.4	68	7.5	3.021	24.7	-67.0	82.1	68	0.8	7.5	173.0	24.7	-66.5 81.6
Radium 228 (Dissolved)	pCi/L	0.5	0.5	0.5	0.5	0.5	0.5	0.5	68	0.7	3.021	0.4	-0.6	2.0	68	0.5	0.7	2.0	0.4	-0.6 2.0
Dissolved Aluminum	mg/L	---	---	---	0.05	0.05	0.05	0.05	20	0.05	3.812	0.000	0.050	0.050	20	0.050	0.050	0.050	0.000	0.1 0.1
Dissolved Arsenic	mg/L	0.002	0.002	0.001	0.001	0.001	0.001	0.0005	68	0.0017	3.021	0.0022	-0.0050	0.0084	67	0.0005	0.0015	0.0050	0.0010	-0.0014 0.0044
Dissolved Barium	mg/L	0.05	0.05	0.05	0.05	0.05	0.05	0.05	68	0.050	3.021	0.000	0.050	0.050	68	0.050	0.050	0.050	0.000	0.050 0.050
Dissolved Beryllium	mg/L	---	---	---	0.005	0.005	0.005	0.005	20	0.001	3.812	0.000	0.000	0.001	20	0.001	0.001	0.005	0.002	-0.004 0.007
Dissolved Boron	mg/L	0.05	0.05	0.05	0.05	0.05	0.05	0.05	68	0.050	3.021	0.000	0.050	0.050	68	0.050	0.050	0.050	0.000	0.050 0.050
Dissolved Cadmium	mg/L	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	68	0.0005	3.021	0.0000	0.0005	0.0005	68	0.0005	0.0005	0.0005	0.0000	0.0005 0.0005
Dissolved Chromium	mg/L	0.005	0.005	0.005	0.005	0.005	0.005	0.005	68	0.005	3.021	0.000	0.005	0.005	68	0.005	0.005	0.005	0.000	0.005 0.005
Dissolved Copper	mg/L	0.005	0.005	0.005	0.005	0.005	0.005	0.005	68	0.005	3.021	0.000	0.005	0.005	68	0.005	0.005	0.005	0.000	0.005 0.005
Dissolved Iron	mg/L	0.025	0.025	0.025	0.025	0.025	0.025	0.025	68	0.025	3.021	0.000	0.025	0.025	68	0.025	0.025	0.025	0.000	0.025 0.025
Dissolved Lead	mg/L	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	68	0.0031	3.021	0.0011	-0.0001	0.0063	68	0.0025	0.0031	0.0050	0.0011	-0.0001 0.0063
Dissolved Manganese	mg/L	0.1	0.1	0.1	0.005	0.005	0.005	0.005	68	0.072	3.021	0.044	-0.060	0.204	68	0.005	0.072	0.100	0.044	-0.059 0.203
Dissolved Mercury	mg/L	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	68	0.0005	3.021	0.0000	0.0005	0.0005	68	0.0005	0.0005	0.0005	0.0000	0.0005 0.0005
Dissolved Molybdenum	mg/L	0.1	0.1	0.1	0.005	0.005	0.005	0.005	68	0.072	3.021	0.044	-0.060	0.204	68	0.005	0.072	0.100	0.044	-0.059 0.203
Dissolved Nickel	mg/L	0.005	0.005	0.005	0.005	0.005	0.005	0.005	68	0.010	3.021	0.009	-0.016	0.036	68	0.005	0.010	0.025	0.009	-0.016 0.035
Dissolved Selenium	mg/L	0.026	0.035	0.037	0.029	0.032	0.037	0.036	68	0.030	3.021	0.010	-0.002	0.062	68	0.001	0.030	0.047	0.010	-0.002 0.061
Dissolved Uranium	mg/L	0.324	0.546	0.420	0.204	0.231	0.217	0.221	68	0.314	3.021	0.127	-0.070	0.697	68	0.053	0.314	0.548	0.127	-0.067 0.695
Dissolved Vanadium	mg/L	0.01	0.01	0.01	0.01	0.01	0.01	0.01	68	0.019	3.021	0.017	-0.032	0.071	68	0.010	0.019	0.050	0.017	-0.032 0.071
Dissolved Zinc	mg/L	0.005	0.005	0.005	0.005	0.005	0.005	0.005	68	0.005	3.021	0.000	0.005	0.005	68	0.005	0.005	0.005	0.000	0.005 0.005
Total Iron	mg/L	0.025	0.025	0.025	0.025	0.025	0.025	0.025	68	0.054	3.021	0.088	-0.213	0.321	66	0.025	0.042	0.340	0.054	-0.120 0.204
Total Manganese	mg/L	0.01	0.01	0.01	0.01	0.01	0.01	0.01	68	0.009	3.021	0.002	0.002	0.015	68	0.005	0.009	0.010	0.002	0.002 0.015

TLF = Tolerance Limit Factor

ss than detection limit; half the detection limit used
an outlier but left in calculations because it was assessed to be a representative reading
an outlier and was removed from calculations

Table MU2 4-1 Baseline Water Quality, Ore Horizon (HJ) Monitor Wells

Parameters	Units	M-HJ201				M-HJ202				M-HJ203				M-HJ204				M-HJ205				M-HJ206				M-HJ207				M-HJ208A				
		4/22/14	5/27/14	8/1/14	8/19/14	4/23/14	7/8/14	8/18/14	10/31/14	4/22/14	5/27/14	7/9/14	8/19/14	5/5/14	6/10/14	8/1/14	8/17/14	5/5/14	5/28/14	8/1/14	8/17/14	4/24/14	5/28/14	7/31/14	8/16/14	4/25/14	6/10/14	7/31/14	8/16/14	4/25/14	5/28/14	7/31/14	8/16/14	
pH	s.u.	10.2	10.1	9.3	10.0	10.9	9.8	9.2	8.2	8.4	8.2	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.4	8.4	10.8	9.4	8.6	8.4	8.4	8.4	8.3	8.6	8.4	8.5	8.3	8.4	8.3
Electrical Conductivity	umhos/cm	360	330	268	250	268	508	470	555	390	449	452	443	531	496	488	489	516	491	497	497	584	478	450	439	461	473	475	482	552	506	498	499	
Total Dissolved Solids (180)	mg/L	200	180	130	180	350	300	290	240	250	350	330	320	370	380	360	360	360	370	370	360	290	260	250	290	290	350	350	360	370	380	360	370	
Total Dissolved Solids (Calc)	mg/L	210	---	---	---	340	---	---	---	230	---	---	---	350	---	---	---	340	---	---	---	310	---	---	---	290	---	---	---	360	---	---	---	
Total Alkalinity (as CaCO3)	mg/L	64	57	52	62	83	26	27	101	116	99	96	97	105	104	99	105	94	102	101	103	97	30	38	57	56	82	97	106	113	52	106	139	
Ammonia Nitrogen (As N)	mg/L	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05		
Silica as SiO2	mg/L	11	---	---	---	20	---	---	---	14	---	---	---	15	---	---	---	15	---	---	---	12	---	---	---	12	---	---	---	15	---	---	---	
Bicarbonate as HCO3	mg/L	13	15	49	27	23	8	20	123	139	121	115	118	128	125	119	124	114	124	119	122	30	24	44	68	66	100	110	123	128	63	124	166	
Carbonate as CO3	mg/L	32	27	7	24	2.5	12	6	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	6	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5		
Chloride	mg/L	6	4	4	4	5	5	5	6	6	5	5	5	5	5	5	5	5	5	5	5	4	5	5	5	5	5	5	5	5	5	5		
Fluoride	mg/L	0.4	0.4	0.4	0.4	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.3	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.1		
Nitrate-Nitrite Nitrogen (as N)	mg/L	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.2	0.6	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05		
Sulfate	mg/L	78	51	39	34	142	157	164	77	64	136	137	132	151	136	154	163	153	155	159	163	114	132	130	132	145	132	156	159	156	169	162	159	
Calcium	mg/L	17	9	6	12	47	32	32	45	39	61	61	60	67	69	69	72	61	67	67	70	27	11	20	31	39	57	65	67	72	48	74	76	
Magnesium	mg/L	0.5	0.5	0.5	0.5	0.5	0.5	0.5	2	2	3	2	3	2	3	3	3	2	2	2	3	0.5	0.5	0.5	1	0.5	1	2	2	2	1	2	3	
Potassium	mg/L	20	18	13	13	33	21	19	3	4	3	3	3	6	5	4	4	8	6	5	4	48	33	24	21	13	9	5	5	9	11	5	5	
Sodium	mg/L	36	31	28	27	46	44	43	32	30	35	38	35	37	35	32	33	40	38	37	39	48	43	42	44	44	40	36	39	37	40	31	35	
Cation Sum	meq/L	2.88	---	---	---	5.15	---	---	---	3.56	---	---	---	5.28	---	---	---	5.15	---	---	---	4.60	---	---	---	4.17	---	---	---	5.59	---	---	---	
Anion Sum	meq/L	3.08	---	---	---	4.75	---	---	---	3.87	---	---	---	5.38	---	---	---	5.20	---	---	---	4.45	---	---	---	4.27	---	---	---	5.64	---	---	---	
Cation-Anion Balance	%	3.25	---	---	---	4.01	---	---	---	4.16	---	---	---	0.92	---	---	---	0.56	---	---	---	1.68	---	---	---	1.14	---	---	---	0.42	---	---	---	
Calculated TDS/TDS Ratio	dec. %	0.95	---	---	---	1.03	---	---	---	1.09	---	---	---	1.06	---	---	---	1.06	---	---	---	0.94	---	---	---	1.00	---	---	---	1.03	---	---	---	
Gross Alpha (Dissolved)	pCi/L	411	1,656	3730	2550	75.8	200	171	246	319	241	283	183	464	816	411	470	998	1,072	1,110	1,040	729	744	872	641	521	933	778	689	578	38.7	680	563	
Gross Beta (Dissolved)	pCi/L	106	527	2580	1600	49.0	103	106	96.5	43.6	65.6	115	107	93.2	264	180	249	159	257	234	418	228	265	398	442	200	376	278	393	189	23.1	229	306	
Radium 226 (Dissolved)	pCi/L	0.8	2.6	1.3	21.6	67.8	54.6	83.0	1.4	1.8	84.3	77.4	84.7	301	336	287	304	657	724	684	613	81.0	96.9	139	173	241	381	415	391	447	9.8	321	385	
Radium 228 (Dissolved)	pCi/L	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1.4	0.5	0.5	4.0	3.0	0.5	1.9	3.6	2.4	5.0	5.3	0.5	0.5	1.4	1.2	0.5	1.8	4.8	2.9	1.4	0.5	7.9	4.3	
Dissolved Aluminum	mg/L	0.20	---	---	---	0.1	---	---	---	0.05	---	---	---	0.05	---	---	---	0.05	---	---	---	0.3	---	---	---	0.05	---	---	---	0.05	---	---	---	
Dissolved Arsenic	mg/L	0.069	0.066	0.062	0.069	0.024	0.016	0.014	0.001	0.001	0.001	0.001	0.004	0.004	0.003	0.003	0.002	0.008	0.006	0.005	0.005	0.048	0.033	0.027	0.024	0.016	0.010	0.005	0.005	0.004	0.002	0.002	0.002	
Dissolved Barium	mg/L	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05		
Dissolved Beryllium	mg/L	0.0005	---	---	---	0.0005	---	---	---	0.0005	---	---	---	0.0005	---	---	---	0.0005	---	---	---	0.0005	---	---	---	0.0005	---	---	---	0.0005	---	---	---	
Dissolved Boron	mg/L	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05		
Dissolved Cadmium	mg/L	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	
Dissolved Chromium	mg/L	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	
Dissolved Copper	mg/L	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	
Dissolved Iron	mg/L	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	
Dissolved Lead	mg/L	0.005	0.0025	0.0025	0.0025																													

Table MU2 4-1 Baseline Water Quality, Ore Horizon (HJ) Monitor Wells

Parameters	Units	M-HJ209				M-HJ210				M-HJ211				M-HJ212				M-HJ213A				M-HJ214A				M-HJ215				M-HJ216				
		4/29/14	6/10/14	8/1/14	8/17/14	4/28/14	6/12/14	7/29/14	8/15/14	4/29/14	6/11/14	7/7/14	8/14/14	4/28/14	6/11/14	7/29/14	8/15/14	5/7/14	6/12/14	7/3/14	8/8/14	5/1/14	6/13/14	6/27/14	8/8/14	5/1/14	6/13/14	6/27/14	8/8/14	9/14/15	9/28/15	10/12/15	10/28/15	
pH	s.u.	8.8	8.5	8.6	8.4	8.7	8.2	8.3	8.3	8.6	8.5	8.4	8.3	8.9	8.5	8.4	8.4	8.4	8.4	8.7	8.4	8.2	8.4	8.3	8.3	8.4	8.1	8.4	8.3	8.4	8.4	8.3	8.4	
Electrical Conductivity	umhos/cm	554	518	507	503	460	459	460	460	505	464	447	455	541	483	485	374	471	463	456	466	558	497	502	564	463	447	430	435	474	510	483	489	
Total Dissolved Solids (180)	mg/L	390	390	230	380	300	330	290	310	340	350	330	320	360	370	330	320	320	350	330	340	390	370	370	460	310	320	310	330	280	310	320	320	
Total Dissolved Solids (Calc)	mg/L	380	---	---	---	290	---	---	---	330	---	---	---	350	---	---	---	300	---	---	---	370	---	---	---	300	---	---	---	---	280	290	290	290
Total Alkalinity (as CaCO3)	mg/L	114	108	69	106	65	61	71	75	106	104	96	103	99	101	101	102	74	85	79	89	107	108	109	129	103	121	106	102	93	100	99	100	
Ammonia Nitrogen (As N)	mg/L	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05		
Silica as SiO2	mg/L	15	---	---	---	13	---	---	---	14	---	---	---	13	---	---	---	14	---	---	---	15	---	---	---	12	---	---	---	---	13	13	13	13
Bicarbonate as HCO3	mg/L	122	126	78	126	71	74	87	91	120	121	114	121	111	118	119	119	87	100	88	104	130	126	133	153	122	148	126	120	104	118	121	120	
Carbonate as CO3	mg/L	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5		
Chloride	mg/L	8	5	5	6	5	5	5	5	5	5	5	5	5	5	5	5	5	4	5	5	17	9	10	15	5	5	5	5	5	5	5		
Fluoride	mg/L	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	
Nitrate-Nitrite Nitrogen (as N)	mg/L	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	
Sulfate	mg/L	160	157	85	168	139	123	140	141	134	119	136	132	155	132	150	147	140	128	143	148	154	142	154	148	125	121	129	130	113	116	115	116	
Calcium	mg/L	67	70	30	74	38	39	45	47	57	58	59	60	62	65	66	67	43	52	47	52	73	68	71	84	49	55	59	57	48	55	51	51	
Magnesium	mg/L	2	2	0.5	3	1	1	2	2	1	1	2	2	0.5	1	2	2	2	2	2	2	3	3	3	4	0.5	1	2	2	2	2	2	2	
Potassium	mg/L	23	14	8	8	18	16	13	12	18	13	10	6	14	8	6	5	16	14	13	11	4	4	4	4	12	7	5	5	9	8	7	6	
Sodium	mg/L	38	33	35	32	42	39	37	40	39	37	37	34	39	36	35	35	42	41	39	40	37	36	37	40	40	37	35	36	35	34	35	31	
Cation Sum	meq/L	5.70	---	---	---	4.23	---	---	---	5.09	---	---	---	5.13	---	---	---	4.46	---	---	---	5.59	---	---	---	4.47	---	---	---	4.25	4.57	4.43	4.22	
Anion Sum	meq/L	5.86	---	---	---	4.33	---	---	---	5.05	---	---	---	5.35	---	---	---	4.52	---	---	---	5.81	---	---	---	4.81	---	---	---	4.37	4.54	4.5	4.57	
Cation-Anion Balance	%	1.37	---	---	---	1.20	---	---	---	0.40	---	---	---	2.11	---	---	---	0.60	---	---	---	1.95	---	---	---	3.70	---	---	---	1.35	0.34	0.8	3.96	
Calculated TDS/TDS Ratio	dec. %	1.03	---	---	---	1.03	---	---	---	1.03	---	---	---	1.03	---	---	---	1.07	---	---	---	1.05	---	---	---	1.03	---	---	---	1	1.07	1.1	1.1	
Gross Alpha (Dissolved)	pCi/L	349	374	248	262	865	1,027	487	568	330	263	270	229	667	647	472	478	60.4	61.4	39.2	48.0	322	338	376	2150	550	552	502	319	1080	984	877	1040	
Gross Beta (Dissolved)	pCi/L	105	135	80.5	151	282	386	136	261	88.3	65.5	92.9	184	151	223	179	260	21.6	23.6	15.5	29.9	72.8	70.2	72.4	1050	210	204	205	129	591	370	335	383	
Radium 226 (Dissolved)	pCi/L	155	173	77.6	172	376	373	386	367	20.0	19.2	19.1	20.4	357	316	344	285	3.7	3.3	0.5	3.3	216	207	194	257	246	234	221	260	30	31	34	33	
Radium 228 (Dissolved)	pCi/L	1.5	0.5	2.2	3.0	1.8	0.5	3.7	3.2	0.5	0.5	0.5	2.3	6.2	7.5	1.7	3.4	2.9	1.5	2.1	0.5	1.2	0.5	0.5	2.8	0.5	0.5	1.3	0.5	0.5	5	3	0.5	
Dissolved Aluminum	mg/L	0.05	---	---	---	0.1	---	---	---	0.05	---	---	---	0.05	---	---	---	0.05	---	---	---	0.05	---	---	---	0.05	---	---	---	0.05	0.05	0.05	0.05	
Dissolved Arsenic	mg/L	0.003	0.003	0.003	0.002	0.019	0.017	0.011	0.010	0.012	0.010	0.009	0.006	0.015	0.009	0.006	0.005	0.002	0.002	0.002	0.002	0.003	0.002	0.002	0.002	0.001	0.0005	0.0005	0.0005	0.004	0.003	0.003	0.004	
Dissolved Barium	mg/L	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05		
Dissolved Beryllium	mg/L	0.0005	---	---	---	0.0005	---	---	---	0.0005	---	---	---	0.0005	---	---	---	0.0005	---	---	---	0.0005	---	---	---	0.0005	---	---	---	0.0005	0.0005	0.0005	0.0005	
Dissolved Boron	mg/L	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05		
Dissolved Cadmium	mg/L	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005		
Dissolved Chromium	mg/L	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005		
Dissolved Copper	mg/L	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005		
Dissolved Iron	mg/L	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025				

Table MU2 4-1 Baseline Water Quality, Ore Horizon (HJ) Monitor Wells

Parameters	Units	M-HJ217				M-HJ218				M-HJ219				M-HJ220				M-HJ221				M-HJ222				M-HJ223				M-HJ224			
		9/14/15	9/28/15	10/12/15	10/28/15	9/15/15	10/1/15	10/12/15	10/28/15	9/15/15	10/1/15	10/12/15	10/29/15	9/15/15	9/28/15	10/12/15	10/28/15	9/15/15	9/28/15	10/14/15	10/28/15	9/14/15	9/28/15	10/14/15	10/28/15	9/15/15	9/28/15	10/14/15	10/28/15	9/16/15	9/29/15	10/14/15	10/29/15
pH	s.u.	8.3	8.2	8.2	8.3	8.6	8.4	8.4	8.3	9.1	9.3	9.1	8.4	8.4	8.2	8.2	8.3	8.5	8.4	8.3	8.3	8.6	8.5	8.5	8.4	8.4	8.3	8.3	8.3	8.4	8.3	8.3	8.3
Electrical Conductivity	umhos/crr	509	566	541	533	448	520	495	500	374	462	438	459	499	564	535	546	471	509	548	550	504	557	542	530	489	545	535	524	466	507	474	409
Total Dissolved Solids (180)	mg/L	340	350	360	350	310	300	330	320	240	250	300	280	330	350	360	350	310	310	350	350	330	340	360	340	310	330	330	330	320	300	290	270
Total Dissolved Solids (Calc)	mg/L	320	320	310	320	280	290	290	300	240	240	260	270	320	320	320	320	300	290	320	330	330	320	340	320	300	310	310	310	300	280	280	260
Total Alkalinity (as CaCO3)	mg/L	106	104	104	106	57	67	69	71	63	63	65	75	96	97	100	102	79	65	88	96	88	87	88	89	93	93	99	101	110	106	107	109
Ammonia Nitrogen (As N)	mg/L	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	
Silica as SiO2	mg/L	14	15	14	14	12	11	13	13	12	11	12	12	13	14	13	13	12	12	13	13	14	15	14	14	13	14	14	13	14	13	14	13
Bicarbonate as HCO3	mg/L	129	127	127	127	63	76	83	86	61	58	60	90	114	118	122	124	93	76	106	116	97	101	101	105	109	114	119	122	127	129	129	133
Carbonate as CO3	mg/L	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	8	9	10	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	6	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Chloride	mg/L	5	5	5	5	5	5	5	5	4	4	4	4	5	5	5	5	6	5	6	5	5	5	5	5	4	5	5	5	4	4	4	4
Fluoride	mg/L	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.2	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nitrate-Nitrite Nitrogen (as N)	mg/L	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.4	0.4	0.2	0.2	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Sulfate	mg/L	138	139	134	139	142	143	141	145	102	105	114	122	141	144	138	142	139	145	144	151	151	149	163	148	131	136	130	133	115	108	109	93
Calcium	mg/L	54	55	51	55	43	47	47	47	25	22	30	38	56	57	59	56	60	50	61	63	62	58	59	58	52	52	54	54	55	52	47	45
Magnesium	mg/L	2	2	2	3	2	2	2	2	1	1	1	2	2	3	3	3	2	2	3	3	2	2	2	3	3	3	3	3	3	2	2	2
Potassium	mg/L	4	5	4	5	10	8	7	7	18	19	18	12	6	5	5	5	6	5	5	4	5	4	4	4	8	6	7	6	6	6	5	4
Sodium	mg/L	42	40	41	39	36	36	39	34	36	38	39	34	38	36	39	36	32	30	32	29	35	32	36	31	36	35	35	34	38	33	35	31
Cation Sum	meq/L	4.79	4.82	4.57	4.73	4.13	4.32	4.38	4.19	3.35	3.28	3.75	3.83	4.79	4.74	4.98	4.69	4.68	4.1	4.78	4.75	4.94	4.58	4.84	4.54	4.56	4.47	4.6	4.59	4.72	4.37	4.16	3.87
Anion Sum	meq/L	5.13	5.1	5.02	5.14	4.23	4.46	4.44	4.58	3.53	3.59	3.82	4.2	4.99	5.08	5	5.13	4.64	4.46	4.92	5.21	5.05	4.98	5.31	4.99	4.72	4.84	4.82	4.92	4.71	4.48	4.53	4.22
Cation-Anion Balance	%	3.46	2.85	4.62	4.18	1.09	1.54	0.71	4.42	2.66	4.47	0.89	4.6	2	3.39	0.17	4.46	0.38	4.2	1.44	4.6	1.06	4.15	4.66	4.78	1.72	3.97	2.35	3.43	0.16	1.25	4.2	4.24
Calculated TDS/TDS Ratio	dec. %	1.06	1.09	1.16	1.09	1.11	1.03	1.14	1.07	1	1.04	1.15	1.04	1.03	1.09	1.12	1.09	1.03	1.07	1.09	1.06	1	1.06	1.06	1.06	1.03	1.06	1.06	1.07	1.07	1.04	1.04	
Gross Alpha (Dissolved)	pCi/L	387	382	382	382	504	422	476	560	774	720	510	766	153	151	142	165	540	598	505	621	334	355	315	320	385	360	366	376	144	163	153	147
Gross Beta (Dissolved)	pCi/L	143	132	172	151	257	233	255	289	426	263	236	323	82	78	83	78	235	238	180	174	155	152	109	136	177	158	152	121	69	65	60	68
Radium 226 (Dissolved)	pCi/L	194	179	183	219	156	185	182	208	69	92	89	110	30	36	43	52	117	122	171	202	151	167	173	176	109	116	111	136	52	53	57	52
Radium 228 (Dissolved)	pCi/L	3	5	3	2	2	0.5	0.5	0.5	2	1	0.5	0.5	0.5	2	1	3	2	0.5	4	2	2	0.5	2	5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Dissolved Aluminum	mg/L	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Dissolved Arsenic	mg/L	0.003	0.003	0.002	0.003	0.006	0.003	0.003	0.003	0.008	0.007	0.005	0.006	0.002	0.002	0.003	0.002	0.015	0.011	0.014	0.013	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.002	0.0005	0.001	0.002	0.002
Dissolved Barium	mg/L	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Dissolved Beryllium	mg/L	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Dissolved Boron	mg/L	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Dissolved Cadmium	mg/L	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Dissolved Chromium	mg/L	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005								

Table MU2 4-1 Baseline Water Quality, Ore Horizon (HJ) Monitor Wells

Parameters	Units	M-HJ225				M-HJ226				M-HJ227A				M-HJ228				M-HJ229				M-HJ231B				LC22MA			
		9/15/15	9/28/15	10/14/15	10/29/15	9/15/15	9/29/15	10/14/15	10/29/15	9/15/15	9/29/15	10/14/15	10/29/15	9/14/15	9/28/15	10/12/15	10/28/15	9/15/15	9/29/15	10/14/15	10/29/15	9/16/15	9/29/15	10/14/15	10/29/15	1/13/15	2/2/15	2/18/15	3/18/15
pH	s.u.	8.4	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.4	8.3	8.3	8.2	8.3	8.2	8.2	8.3	8.3	8.3	8.3	8.5	8.3	8.3	8.2	8.2	8.9	8.9	8.4	8.3
Electrical Conductivity	umhos/cm	499	553	532	515	520	571	563	513	480	539	537	518	503	562	543	557	482	547	534	519	510	559	552	529	492	519	493	498
Total Dissolved Solids (180)	mg/L	330	340	340	340	340	350	350	350	310	330	330	340	330	350	360	360	310	330	350	340	350	330	360	350	330	330	340	350
Total Dissolved Solids (Calc)	mg/L	320	310	330	320	330	320	330	320	300	310	310	320	320	330	330	330	310	310	330	320	330	320	320	310	---	---	---	---
Total Alkalinity (as CaCO3)	mg/L	102	102	103	107	105	102	105	106	78	84	90	96	79	80	86	89	96	98	103	107	104	96	107	109	87	87	88	90
Ammonia Nitrogen (As N)	mg/L	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.1	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.005	0.005	0.005	0.005	
Silica as SiO2	mg/L	14	15	14	14	13	13	14	13	12	12	13	13	13	14	13	13	14	13	14	14	14	13	14	14	---	---	---	---
Bicarbonate as HCO3	mg/L	120	124	124	131	126	125	128	130	92	102	108	116	96	98	105	108	115	120	123	130	115	117	129	133	88	88	103	109
Carbonate as CO3	mg/L	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	6	2.5	2.5	2.5	9	9	2.5	2.5	
Chloride	mg/L	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	4	5	6	6	5	6	
Fluoride	mg/L	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.1	0.2	0.2	0.2	0.2	
Nitrate-Nitrite Nitrogen (as N)	mg/L	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Sulfate	mg/L	133	136	147	136	146	144	141	137	141	142	139	146	157	161	154	158	132	133	147	136	141	141	135	127	145	145	145	151
Calcium	mg/L	61	58	60	59	65	61	65	68	53	56	54	56	54	58	58	60	56	55	59	59	64	58	62	61	57	57	59	67
Magnesium	mg/L	3	3	3	3	3	3	3	3	3	3	3	3	2	3	3	3	3	3	3	3	3	3	3	3	2	2	2	3
Potassium	mg/L	5	3	3	3	2	2	2	2	7	7	7	6	8	9	8	7	6	6	5	4	5	4	3	3	6	6	4	3
Sodium	mg/L	33	31	35	35	32	31	32	33	34	33	33	32	34	34	37	34	32	33	36	35	38	34	34	33	40	40	36	38
Cation Sum	meq/L	4.82	4.54	4.82	4.76	4.96	4.7	4.93	5.12	4.51	4.63	4.55	4.62	4.59	4.82	4.88	4.83	4.54	4.51	4.83	4.75	5.17	4.66	4.91	4.75	---	---	---	---
Anion Sum	meq/L	4.95	5.01	5.27	5.12	5.27	5.18	5.18	5.11	4.64	4.77	4.81	5.09	4.98	5.09	5.06	5.2	4.81	4.89	5.26	5.14	5.16	5.01	5.07	4.97	---	---	---	---
Cation-Anion Balance	%	1.39	4.97	4.44	3.59	3.05	4.84	2.37	0.09	1.42	1.44	2.72	4.75	4.13	2.74	1.86	3.73	2.87	4.08	4.26	3.85	0.03	3.54	1.56	2.29	---	---	---	---
Calculated TDS/TDS Ratio	dec. %	1.03	1.1	1.03	1.06	1.03	1.09	1.06	1.09	1.03	1.06	1.06	1.06	1.03	1.06	1.09	1.09	1	1.06	1.06	1.06	1.06	1.03	1.12	1.13	---	---	---	---
Gross Alpha (Dissolved)	pCi/L	443	440	430	445	414	342	399	462	403	351	402	351	337	456	362	364	287	252	216	222	262	226	288	272	1050	1050	883	1410
Gross Beta (Dissolved)	pCi/L	203	219	195	261	144	97	138	190	215	168	196	141	164	220	164	165	115	70	100	108	131	104	116	123	503	503	416	809
Radium 226 (Dissolved)	pCi/L	312	301	316	338	283	288	300	271	144	166	192	204	146	141	144	152	126	125	134	142	184	179	188	205	487	487	550	594
Radium 228 (Dissolved)	pCi/L	0.5	0.5	2	5	6	4	5	2	4	2	4	3	0.5	3	1	3	0.5	4	2	2	3	2	3	3	0.5	0.5	0.5	1.5
Dissolved Aluminum	mg/L	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.1	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Dissolved Arsenic	mg/L	0.001	0.002	0.002	0.001	0.003	0.002	0.002	0.002	0.002	0.001	0.002	0.0005	0.003	0.003	0.003	0.004	0.002	0.001	0.003	0.001	0.001	0.0005	0.0005	0.0005	0.019	0.019	0.008	0.008
Dissolved Barium	mg/L	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Dissolved Beryllium	mg/L	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.005	0.005	0.005	0.005
Dissolved Boron	mg/L	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Dissolved Cadmium	mg/L	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.001	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Dissolved Chromium	mg/L	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Dissolved Copper	mg/L	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Dissolved Iron	mg/L	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.12	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025
Dissolved Lead	mg/L	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Dissolved Manganese	mg/L	0.005	0.005	0.005	0.005	0.01	0.01	0.01	0.01	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.01	0.02	0.02	0.01	0.01	0.005	0.005	0.005	0.005	0.01	0.01	0.01	0.01
Dissolved Mercury	mg/L	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Dissolved Molybdenum	mg/L	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.01	0.01	0.01	0.01
Dissolved Nickel	mg/L	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.005	0.005	0.005	0.005
Dissolved Selenium	mg/L	0.012	0.012	0.013	0.01	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.001	0.0005	0.002	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Dissolved Uranium	mg/L	0.097	0.101	0.109	0.090	0.130	0.094	0.084	0.073	0.115	0.102	0.152	0.114	0.112	0.129	0.122	0.140	0.146	0.103	0.108	0.071	0.035	0.033	0.044	0.036	0.258	0.258	0.142	0.174
Dissolved Vanadium	mg/L	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.01	0.01	0.01	0.01	
Dissolved Zinc	mg/L	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Total Iron	mg/L	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.89	0.76	0.59	0.55	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025
Total Manganese	mg/L	0.005	0.005	0.005	0.005	0.01	0.01	0.01	0.01	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.01	0.02	0.02	0.02	0.02	0.005	0.005	0.005	0.005	0.01	0.01	0.01	0.01

Result below detection limit; detection limit shown

Result is an outlier but left in calculations because it was assessed to be a representative reading

Result is an outlier and was removed from calculations

Table MU2 4-1 Baseline Water Quality, Ore Horizon (HJ) Monitor Wells

Parameters	Units	Outlier Tolerance Interval Calculation						Values with Outliers (if any) Removed						Statistical Analysis				
		No. of Obs.	Mean	TLF	Std. Dev.	Lower Range	Upper Range	No. of Obs.	Min.	Mean	Max.	Standard Deviation	Mean ± 3 Std. Dev.	Data Distribution	UTL Method (ProUCL or other)	ProUCL 95% UTL (99%)	10 CFR 40 Max Conc.	Proposed TRV
pH	s.u.	124	8.5	2.859	0.48	7.15	9.87	122	8.1	8.5	10.2	0.37	7.4 9.6	Approx Norm	95% UTL Norm	9.45	---	9.5
Electrical Conductivity	umhos/cm	124	494.3	2.859	56.56	332.61	656.02	124	250.0	491.3	584.0	58.45	315.9 666.6	Approx Norm	95% UTL Norm	643.6	---	643.6
Total Dissolved Solids (180)	mg/L	124	327.0	2.859	44.87	198.74	455.29	123	180.0	328.6	460.0	41.34	204.6 452.6	Approx Norm	95% UTL Norm	437.8	---	437.8
Total Dissolved Solids (Calc)	mg/L	75	309.3	3.002	29.29	221.42	397.25	75	210.0	309.3	380.0	29.29	N/A N/A	N/A	N/A	N/A	---	N/A
Total Alkalinity (as CaCO3)	mg/L	124	91.0	2.859	19.96	33.89	148.04	124	26.0	91.0	139.0	19.96	31.1 150.9	Approx Norm	95% UTL Norm	143.7	---	143.7
Ammonia Nitrogen (As N)	mg/L	124	0.0	2.859	0.01	0.02	0.08	124	0.0	0.0	0.1	0.009	0.0 0.08	Undefined	Non-Para/Max Detect	0.1	---	0.1
Silica as SiO2	mg/L	75	13.4	3.002	1.25	9.65	17.17	74	11.0	13.3	15.0	0.99	10.3 16.3	Approx Norm	95% UTL Norm	16.1	---	16.1
Bicarbonate as HCO3	mg/L	124	104.5	2.859	30.95	16.00	192.95	121	20.0	106.8	166.0	27.61	23.9 189.6	Approx Norm	95% UTL Norm	179.8	---	179.8
Carbonate as CO3	mg/L	124	3.6	2.859	4.19	-8.37	15.57	123	2.5	3.4	27.0	3.32	-6.6 13.3	Undefined	Non-Para/Max Detect	27.0	---	27.0
Chloride	mg/L	124	5.2	2.859	1.59	0.67	9.78	122	4.0	5.0	10.0	0.78	2.7 7.4	Approx Norm	95% UTL Norm	7.11	---	7.1
Fluoride	mg/L	124	0.2	2.859	0.06	0.02	0.35	124	0.1	0.2	0.4	0.06	0.0 0.4	Approx Norm	95% UTL Norm	0.339	---	0.3
Nitrate-Nitrite Nitrogen (as N)	mg/L	124	0.1	2.859	0.07	-0.13	0.26	123	0.05	0.06	0.40	0.05	-0.09 0.21	Undefined	Non-Para/Max Detect	0.4	---	0.40
Sulfate	mg/L	124	135.5	2.859	23.63	67.92	203.06	120	77.0	138.4	169.0	17.35	86.4 190.5	Approx Norm	95% UTL Norm	184.3	---	184.3
Calcium	mg/L	124	53.7	2.859	14.48	12.24	95.06	122	11.0	54.4	84.0	13.32	14.4 94.4	Approx Norm	95% UTL Norm	89.6	---	89.6
Magnesium	mg/L	124	2.1	2.859	0.86	-0.35	4.59	124	0.5	2.1	4.0	0.86	-0.5 4.7	Approx Norm	95% UTL Norm	4.4	---	4.4
Potassium	mg/L	124	8.6	2.859	6.94	-11.27	28.41	121	2.0	7.8	24.0	5.09	-7.4 23.1	Lognormal	95% UTL Lognorm	31.0	---	31.0
Sodium	mg/L	124	36.1	2.859	3.78	25.29	46.92	124	27.0	36.1	48.0	3.78	24.8 47.5	Normal	95% UTL Norm	46.1	---	46.1
Cation Sum	meq/L	75	4.6	3.002	0.49	3.13	6.06	75	2.9	4.6	5.7	0.49	N/A N/A	N/A	N/A	N/A	---	N/A
Anion Sum	meq/L	75	4.8	3.002	0.49	3.36	6.28	75	3.1	4.8	5.9	0.49	N/A N/A	N/A	N/A	N/A	---	N/A
Cation-Anion Balance	%	75	2.6	3.002	1.55	-2.03	7.25	75	0.0	2.6	5.0	1.55	N/A N/A	N/A	N/A	N/A	---	N/A
Calculated TDS/TDS Ratio	dec. %	75	1.1	3.002	0.04	0.94	1.18	75	0.9	1.1	1.2	0.04	N/A N/A	N/A	N/A	N/A	---	N/A
Gross Alpha (Dissolved)	pCi/L	124	535.7	2.859	475.93	-824.98	1896.36	121	38.7	479	1656	297	-412.7 1371.3	Lognormal	95% UTL Lognorm	2535	15.0	2535.0
Gross Beta (Dissolved)	pCi/L	124	231.2	2.859	288.63	-593.95	1056.42	122	15.5	201	1050	151	-250.9 652.5	Lognormal	95% UTL Lognorm	1070	---	1070.0
Radium 226 (Dissolved)	pCi/L	124	193.5	2.859	156.53	-254.05	641.00	124	0.5	193	724	157	-276.1 663.1	Undefined	Non-Para/Max Detect	724	5.0*	724.0
Radium 228 (Dissolved)	pCi/L	124	1.9	2.859	1.68	-2.87	6.74	124	0.5	1.9	7.9	1.68	-3.1 7.0	Lognormal	95% UTL Lognorm	10.3	5.0*	10.3
Dissolved Aluminum	mg/L	79	0.057	2.986	0.034	-0.044	0.158	79	0.050	0.057	0.300	0.034	-0.044 0.158	Undefined	Non-Para/Max Detect	0.3	---	0.300
Dissolved Arsenic	mg/L	124	0.008	2.859	0.013	-0.029	0.045	124	0.001	0.008	0.069	0.013	-0.031 0.046	Lognormal	95% UTL Lognorm	0.0728	0.050	0.073
Dissolved Barium	mg/L	124	0.050	2.859	0.00	0.05	0.05	124	0.050	0.050	0.050	0.000	0.050 0.050	Undefined	Non-Para/DL	0.1	1.000	1.000
Dissolved Beryllium	mg/L	79	0.001	2.986	0.0010	-0.0022	0.0037	79	0.001	0.001	0.005	0.001	-0.002 0.004	Undefined	Non-Para/DL	0.01	---	0.01
Dissolved Boron	mg/L	124	0.050	2.859	0.00	0.05	0.05	124	0.050	0.050	0.050	0.000	0.050 0.050	Undefined	Non-Para/DL	0.1	---	0.1
Dissolved Cadmium	mg/L	124	0.001	2.859	0.0000	0.0004	0.0006	124	0.001	0.001	0.001	0.000	0.000 0.001	Undefined	Non-Para/Max Detect	0.001	0.010	0.010
Dissolved Chromium	mg/L	124	0.005	2.859	0.000	0.005	0.005	124	0.005	0.005	0.005	0.000	0.005 0.005	Undefined	Non-Para/DL	0.01	0.050	0.050
Dissolved Copper	mg/L	124	0.005	2.859	0.000	0.005	0.005	124	0.005	0.005	0.005	0.000	0.005 0.005	Undefined	Non-Para/DL	0.01	---	0.01
Dissolved Iron	mg/L	124	0.027	2.859	0.017	-0.022	0.076	124	0.025	0.027	0.190	0.017	-0.024 0.078	Undefined	Non-Para/Max Detect	0.19	---	0.19
Dissolved Lead	mg/L	124	0.003	2.859	0.0008	0.0005	0.0051	124	0.003	0.003	0.005	0.0008	0.000 0.005	Undefined	Non-Para/Max DL	0.01	0.050	0.050
Dissolved Manganese	mg/L	124	0.008	2.859	0.003	-0.001	0.017	124	0.005	0.008	0.020	0.003	-0.001 0.017	Undefined	Non-Para/Max Detect	0.02	---	0.02
Dissolved Mercury	mg/L	124	0.001	2.859	0.0000	0.0005	0.0005	124	0.001	0.001	0.001	0.000	0.000 0.001	Undefined	Non-Para/Max DL	0.002	0.002	0.002
Dissolved Molybdenum	mg/L	124	0.007	2.859	0.003	-0.002	0.016	124	0.005	0.007	0.030	0.003	-0.002 0.017	Undefined	Non-Para/Max Detect	0.03	---	0.03
Dissolved Nickel	mg/L	124	0.017	2.859	0.010	-0.011	0.045	124	0.005	0.017	0.025	0.010	-0.012 0.047	Undefined	Non-Para/Max DL	0.05	---	0.05
Dissolved Selenium	mg/L	124	0.003	2.859	0.0059	-0.0143	0.0196	121	0.001	0.002	0.022	0.0036	-0.009 0.013	Lognormal	95% UTL Lognorm	0.0748	0.010	0.0748
Dissolved Uranium	mg/L	124	0.398	2.859	0.945	-2.305	3.100	122	0.006	0.299	4.270	0.546	-1.339 1.937	Lognormal	95% UTL Lognorm	2.51	---	2.51
Dissolved Vanadium	mg/L	124	0.034	2.859	0.020	-0.022	0.090	124	0.010	0.034	0.050	0.020	-0.025 0.093	Undefined	Non-Para/Max DL	0.1	---	0.1
Dissolved Zinc	mg/L	124	0.005	2.859	0.000	0.005	0.005	124	0.005	0.005	0.005	0.000	0.005 0.005	Undefined	Non-Para/DL	0.01	---	0.01
Total Iron	mg/L	124	0.144	2.859	0.359	-0.884	1.171	122	0.025	0.111	1.370	0.250	-0.639 0.861	Undefined	Non-Para/Max Detect	1.37	---	1.37
Total Manganese	mg/L	124	0.039	2.859	0.044	-0.087	0.165	124	0.005	0.039	0.100	0.044	-0.093 0.171	Undefined	Non-Para/Max Detect	0.1	---	0.1

TLF = Tolerance Limit Factor

*Ra-226 and Ra-228 combined

Table MU2 4-1 Baseline Water Quality, Underlying (KM) Monitor Wells

Parameters	Units	M-KM201A				M-KM202A				M-KM203D				M-KM204				M-KM205				M-KM206				M-KM207				M-KM208			
		4/18/14	5/27/14	8/1/14	8/19/14	4/23/14	5/27/14	7/8/14	8/18/14	4/22/14	5/27/14	7/8/14	8/18/14	4/24/14	5/28/14	8/1/14	8/17/14	4/24/14	5/28/14	8/1/14	8/17/14	4/24/14	5/28/14	7/31/14	8/16/14	4/25/14	6/10/14	7/31/14	8/16/14	4/25/14	8/1/14	8/17/14	10/30/14
pH	s.u.	8.5	8.3	8.3	8.3	8.5	8.3	8.2	8.4	8.4	8.3	8.2	8.4	8.7	8.4	8.3	8.4	8.4	8.3	8.3	8.3	8.7	8.3	8.5	8.4	8.3	8.3	8.5	8.4	8.3	8.3	8.4	8.7
Electrical Conductivity	µmhos/cm	510	447	441	440	506	472	466	462	517	460	434	453	474	455	467	463	489	479	476	474	453	440	445	438	476	462	460	467	493	488	473	483
Total Dissolved Solids (180)	mg/L	310	360	330	320	350	360	340	340	350	360	340	340	330	410	340	370	340	360	340	360	320	320	320	320	310	360	330	330	320	360	360	370
Total Dissolved Solids (Calc)	mg/L	320	---	---	---	340	---	---	---	320	---	---	---	310	---	---	---	320	---	---	---	290	---	---	---	300	---	---	---	320	---	---	---
Total Alkalinity (as CaCO3)	mg/L	80	77	79	94	94	95	94	98	85	85	85	88	45	109	68	70	81	89	88	96	65	66	83	84	70	86	87	91	64	88	92	96
Ammonia Nitrogen (As N)	mg/L	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	
Silica as SiO2	mg/L	16	---	---	---	15	---	---	---	14	---	---	---	13	---	---	---	13	---	---	---	13	---	---	---	14	---	---	---	14	---	---	---
Bicarbonate as HCO3	mg/L	98	94	97	114	110	115	115	114	100	104	104	103	51	127	81	83	96	108	107	115	72	79	93	98	85	105	99	107	77	105	109	101
Carbonate as CO3	mg/L	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	8	
Chloride	mg/L	6	5	5	5	5	5	5	5	6	5	4	5	5	5	5	5	4	5	5	5	4	5	5	5	5	5	5	5	7	5	5	6
Fluoride	mg/L	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1
Nitrate-Nitrite Nitrogen (as N)	mg/L	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	
Sulfate	mg/L	143	143	140	137	161	148	151	157	154	152	152	157	168	158	168	174	151	154	155	164	138	147	143	145	144	130	150	152	155	161	164	160
Calcium	mg/L	47	49	51	54	59	63	64	64	55	59	60	61	43	75	55	57	56	65	63	66	39	40	50	53	48	57	58	62	45	63	66	62
Magnesium	mg/L	1	1	1	2	2	2	2	2	2	2	2	2	1	2	2	2	0.5	1	2	2	0.5	0.5	1	1	1	2	2	2	0.5	2	2	2
Potassium	mg/L	8	7	4	3	3	2	2	2	5	5	4	4	16	7	8	7	6	4	3	3	13	10	6	5	8	6	6	5	18	9	8	9
Sodium	mg/L	47	41	40	40	40	37	40	38	38	38	41	39	42	32	42	39	39	38	37	38	46	45	43	44	41	40	38	39	43	36	38	35
Cation Sum	meq/L	4.71	---	---	---	4.92	---	---	---	4.66	---	---	---	4.43	---	---	---	4.64	---	---	---	4.29	---	---	---	4.49	---	---	---	4.55	---	---	---
Anion Sum	meq/L	4.74	---	---	---	5.38	---	---	---	5.07	---	---	---	4.53	---	---	---	4.90	---	---	---	4.30	---	---	---	4.54	---	---	---	4.72	---	---	---
Cation-Anion Balance	%	0.36	---	---	---	4.46	---	---	---	4.16	---	---	---	1.08	---	---	---	2.71	---	---	---	0.06	---	---	---	0.58	---	---	---	1.80	---	---	---
Calculated TDS/TDS Ratio	dec. %	0.97	---	---	---	1.03	---	---	---	1.09	---	---	---	1.06	---	---	---	1.06	---	---	---	1.10	---	---	---	1.03	---	---	---	1.00	---	---	---
Gross Alpha (Dissolved)	pCi/L	18.5	14.8	12.9	15.2	74.0	87.0	87.9	243	488	470	651	194	20.8	582	41.5	28.1	270	283	246	291	18.1	18.7	28.7	16.3	30.2	32.6	42.7	26.4	50.6	44.6	28.2	43.5
Gross Beta (Dissolved)	pCi/L	13.5	8.6	10.4	14.3	23.3	23.5	30.6	93.1	110	139	265	110	17.0	189	27.0	20.6	79.9	76.4	124	130	17.3	14.8	13.5	11.7	13.7	16.3	15.7	16.4	22.7	17.2	19.3	22.7
Radium 226 (Dissolved)	pCi/L	1.8	1.7	45.0	1.4	37.9	39.5	39.7	116	236	245	230	230	11.1	410	9.4	9.1	15.2	154	138	148	3.1	3.3	3.3	2.9	10.9	8.7	9.1	7.5	4.1	3.8	4.1	5.2
Radium 228 (Dissolved)	pCi/L	0.5	0.5	0.5	0.5	2.5	3.3	0.5	0.5	2.4	0.5	0.5	1.3	0.5	5.4	0.5	1.8	2.8	2.4	4.6	5.6	1.3	2.1	1.6	1.7	0.5	1.1	0.5	1.1	2.4	0.5	3.0	2.0
Dissolved Aluminum	mg/L	0.05	---	---	---	0.05	---	---	---	0.05	---	---	---	0.05	---	---	---	0.05	---	---	---	0.05	---	---	---	0.05	---	---	---	0.05	---	---	---
Dissolved Arsenic	mg/L	0.003	0.003	0.002	0.002	0.001	0.0005	0.0005	0.0005	0.003	0.003	0.002	0.002	0.002	0.004	0.002	0.003	0.010	0.005	0.004	0.003	0.005	0.004	0.003	0.002	0.006	0.005	0.004	0.005	0.003	0.002	0.002	0.002
Dissolved Barium	mg/L	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	
Dissolved Beryllium	mg/L	0.0005	---	---	---	0.0005	---	---	---	0.0005	---	---	---	0.0005	---	---	---	0.0005	---	---	---	0.0005	---	---	---	0.0005	---	---	---	0.0005	---	---	---
Dissolved Boron	mg/L	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	
Dissolved Cadmium	mg/L	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	
Dissolved Chromium	mg/L	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	
Dissolved Copper	mg/L	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	
Dissolved Iron	mg/L	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	
Dissolved Lead	mg/L	0.005	0.0025	0.0025	0.0025	0.005	0.0025	0.0025	0.0025	0.005	0.0025	0.0025	0.0025	0.005	0.0025	0.0025	0.0025	0.005	0.0025	0.0025	0.0025	0											

Table MU2 4-1 Baseline Water Quality, Underlying (KM) Monitor Wells

Parameters	Units	M-KM209A				M-KM210				M-KM211B				M-KM212A				M-KM213				M-KM214				M-KM215				M-KM216				LC23M				
		4/29/14	6/10/14	8/1/14	8/17/14	4/28/14	6/12/14	7/30/14	8/15/14	4/29/14	6/11/14	7/7/14	8/14/14	4/28/14	6/11/14	7/29/14	8/15/14	5/1/14	6/12/14	7/3/14	8/8/14	5/1/14	6/13/14	6/27/14	8/16/14	5/1/14	6/13/14	6/27/14	8/16/14	4/29/14	6/11/14	8/1/14	8/17/14	1/14/15	1/29/15	2/18/15	3/18/15	
pH	s.u.	8.5	8.2	8.3	8.3	8.3	8.3	8.3	8.2	8.7	8.4	8.3	8.4	8.9	8.5	8.3	8.3	8.4	8.4	8.6	8.4	8.2	8.3	8.4	8.3	8.3	8.3	8.3	8.2	8.8	8.4	8.3	8.5	8.2	8.2	8.4	8.3	
Electrical Conductivity	µmhos/cm	555	495	495	492	476	443	425	428	478	462	454	454	492	438	444	453	452	452	441	440	456	446	445	455	460	451	448	441	482	488	478	477	466	526	505	505	
Total Dissolved Solids (180)	mg/L	410	390	380	380	320	340	300	320	330	340	330	320	390	330	310	360	300	350	320	340	320	310	320	350	320	320	320	340	360	350	350	370	350	350	370		
Total Dissolved Solids (Calc)	mg/L	380	---	---	---	300	---	---	---	310	---	---	---	310	---	---	---	300	---	---	---	290	---	---	---	300	---	---	---	320	---	---	---	---	---	---	---	
Total Alkalinity (as CaCO3)	mg/L	92	88	85	91	98	99	92	95	91	92	87	94	111	104	96	101	77	95	97	98	78	97	85	96	97	108	106	105	84	93	88	102	90	90	91	93	
Ammonia Nitrogen (As N)	mg/L	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.005	0.005	0.005	0.005			
Silica as SiO2	mg/L	16	---	---	---	16	---	---	---	14	---	---	---	12	---	---	---	15	---	---	---	12	---	---	---	15	---	---	---	15	---	---	---	---	---	---	---	
Bicarbonate as HCO3	mg/L	106	107	103	111	119	120	112	116	101	109	106	110	120	122	115	120	92	114	110	114	95	119	101	114	119	131	129	128	87	110	108	116	110	109	108	112	
Carbonate as CO3	mg/L	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	8	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	7	2.5	2.5	2.5	2.5	2.5	2.5	2.5		
Chloride	mg/L	5	5	5	5	5	5	5	5	5	4	5	5	5	5	5	5	5	4	5	5	5	5	5	5	5	5	5	5	4	5	5	5	5	5	5		
Fluoride	mg/L	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1		
Nitrate-Nitrite Nitrogen (as N)	mg/L	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05			
Sulfate	mg/L	182	154	175	179	125	115	128	129	137	124	143	140	120	106	121	121	136	118	132	136	133	135	142	146	124	123	133	130	141	128	151	151	149	161	152	153	
Calcium	mg/L	71	70	69	71	55	56	56	57	55	56	56	59	43	45	51	56	41	53	56	56	45	53	56	59	56	60	62	61	48	58	58	65	61	59	60	65	
Magnesium	mg/L	2	2	2	2	2	2	2	2	2	2	2	2	1	1	2	2	1	2	2	2	1	2	2	2	2	2	2	3	1	2	2	2	2	2	2		
Potassium	mg/L	8	5	4	4	3	2	2	2	8	6	5	4	11	7	5	4	17	11	8	7	9	7	7	4	4	2	3	3	19	11	9	7	2	2	2	2	
Sodium	mg/L	38	37	35	36	39	38	36	38	37	38	38	36	50	47	38	38	39	38	36	37	39	39	38	36	34	33	33	34	40	37	35	36	39	37	39	41	
Cation Sum	meq/L	5.55	---	---	---	4.63	---	---	---	4.70	---	---	---	4.67	---	---	---	4.29	---	---	---	4.26	---	---	---	4.54	---	---	---	4.71	---	---	---	---	---	---	---	
Anion Sum	meq/L	5.75	---	---	---	4.70	---	---	---	4.81	---	---	---	4.86	---	---	---	4.51	---	---	---	4.48	---	---	---	4.67	---	---	---	4.75	---	---	---	---	---	---	---	
Cation-Anion Balance	%	1.76	---	---	---	0.70	---	---	---	1.18	---	---	---	1.96	---	---	---	2.56	---	---	---	2.46	---	---	---	1.36	---	---	---	0.45	---	---	---	---	---	---	---	
Calculated TDS/TDS Ratio	dec. %	1.08	---	---	---	1.07	---	---	---	1.06	---	---	---	1.26	---	---	---	1.00	---	---	---	1.10	---	---	---	1.07	---	---	---	1.06	---	---	---	---	---	---	---	
Gross Alpha (Dissolved)	pCi/L	29.4	28.2	24.8	17.4	8.0	8.2	8.5	7.2	219	263	255	190	23.0	14.7	16.2	14.0	29.7	26.1	18.3	14.5	25.0	26.5	22.8	24.3	20.6	19.7	22.6	11.2	35.9	22.9	27.5	17.9	31.8	31.6	32.5	36.0	
Gross Beta (Dissolved)	pCi/L	12.9	12.8	12.1	12.1	6.0	6.6	6.8	8.3	68.6	71.9	96.1	89	10.6	7.4	8.5	11.3	21.3	16.5	10.7	15.3	14.1	13.7	12.3	13.9	11.5	8.3	10.2	12.2	20.0	17.5	20.9	17.1	9.1	13.8	12.7	11.9	
Radium 226 (Dissolved)	pCi/L	5.3	6.0	3.7	4.1	3.6	1.8	2.4	1.8	344	120	109	112	1.6	0.5	1.5	0.9	6.0	5.6	3.5	4.8	6.9	7.7	7.9	8.6	6.7	5.9	5.5	6.4	5.5	6.9	5.3	6.5	3.0	2.9	3.8	4.0	
Radium 228 (Dissolved)	pCi/L	1.9	2.3	0.5	4.2	1.4	2.8	1.7	3.5	2.8	1.5	1.9	0.5	0.5	0.5	0.5	0.5	2.2	2.4	0.5	0.5	2.9	1.4	1.5	3.1	1.2	2.2	2.5	3.4	2.7	4.5	3.5	7.5	3.3	0.5	0.5	0.5	
Dissolved Aluminum	mg/L	0.05	---	---	---	0.05	---	---	---	0.05	---	---	---	0.6	---	---	---	0.05	---	---	---	0.05	---	---	---	0.05	---	---	---	0.05	---	---	---	---	0.05	0.05	0.05	0.05
Dissolved Arsenic	mg/L	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.002	0.004	0.002	0.003	0.002	0.003	0.003	0.002	0.002	0.012	0.009	0.007	0.005	0.003	0.002	0.002	0.0005	0.001	0.0005	0.0005	0.001	0.0005	0.001	0.001	0.001	0.002	0.001	0.001	0.001	
Dissolved Barium	mg/L	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05		
Dissolved Beryllium	mg/L	0.0005	---	---	---	0.0005	---	---	---	0.0005	---	---	---	0.500	---	---	---	0.0005	---	---	---	0.0005	---	---	---	0.0005	---	---	---	0.0005	---	---	---	---	0.005	0.005	0.005	0.005
Dissolved Boron	mg/L	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.5	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05		
Dissolved Cadmium	mg/L	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005		
Dissolved Chromium	mg/L	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.5	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005		
Dissolved Copper	mg/L	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005		
Dissolved Iron	mg/L	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.5	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025		
Dissolved Lead	mg/L	0.005	0.0025	0.0025	0.0025	0.005	0.0025	0.0025	0.0025	0.005	0.0025	0.0025	0.0025	0.005	0.0025	0.0025	0.0025	0.005	0.0025	0.0025	0.0025	0.005	0.0025	0.0025	0.0025	0.005	0.0025	0.0025	0.0025	0.005	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	
Dissolved Manganese	mg/L	0.02	0.01	0.01	0.02	0.02	0.01	0.01	0.01	0.005	0.01	0.01	0.01	0.005	0.01	0.01	0.01	0.005	0.01	0.01	0.01	0.005	0.01	0.01	0.01	0.005	0.01	0.01	0.01	0.005	0.01	0.01	0.01	0.01	0.01	0.01	0.01	
Dissolved Mercury	mg/L	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005		
Dissolved Molybdenum	mg/L	0.05	0.01	0.01	0.01	0.05	0.01	0.01	0.01	0.05	0.01	0.01	0.01	0.05	0.01	0.01	0.01	0.05	0.01	0.01	0.01	0.05	0.01	0.01	0.01	0.05	0.01	0.01	0.01	0.05	0.01	0.01	0.01	0.01	0.01	0.01	0.01	
Dissolved Nickel	mg/L	0.025	0.005	0.005	0.005	0.025	0.005	0.005	0.005	0.025	0.005	0.005	0.005	0.49	0.005	0.005	0.005	0.025	0.005	0.005	0.005	0.025																

Result less than detection limit; half the detection limit used

Result is an outlier but left in calculations because it was assessed to be a representative reading

Result is an outlier and was removed from calculations

Table MU2 4-1 Baseline Water Quality, Underlying (KM) Monitor Wells

Parameters	Units	Outlier Tolerance Interval Calculation						Values with Outliers (if any) Removed						
		No. of Obs.	Mean	TLF	Std. Dev.	Lower Range	Upper Range	No. of Obs.	Min.	Mean	Max.	Standard Deviation	Mean ± 3 Std. Dev.	
pH	s.u.	68	8.4	3.021	0.1	7.9	8.8	68	8.2	8.4	8.9	0.1	7.9	8.8
Electrical Conductivity	µmhos/cm	68	467	3.021	25	391	543	68	425	467	555	25	392	542
Total Dissolved Solids (180)	mg/L	68	342	3.021	24	268	416	68	300	342	410	24	269	415
Total Dissolved Solids (Calc)	mg/L	16	314.4	3.812	21.9	230.9	397.9	16	290.0	314.4	380.0	21.9	248.7	380.1
Total Alkalinity (as CaCO3)	mg/L	68	89	3.021	12	54	124	67	64	90	111	10	59	121
Ammonia Nitrogen (As N)	mg/L	68	0.047	3.021	0.011	0.015	0.080	68	0.01	0.05	0.05	0.01	0.02	0.08
Silica as SiO2	mg/L	16	14.2	3.812	1.3	9.1	19.2	16	12.0	14.2	16.0	1.3	10.2	18.2
Bicarbonate as HCO3	mg/L	68	106	3.021	14	63	148	68	51	106	131	14	63	148
Carbonate as CO3	mg/L	68	2.7	3.021	1.1	-0.5	6.0	68	2.5	2.7	8.0	1.1	-0.5	5.9
Chloride	mg/L	68	5	3.021	0.4	3.7	6.3	68	4.0	5.0	7.0	0.4	3.7	6.3
Fluoride	mg/L	68	0.1	3.021	0.0	0.0	0.2	68	0.1	0.1	0.2	0.0	0.0	0.2
Nitrate-Nitrite Nitrogen (as N)	mg/L	68	0.05	3.021	0.00	0.05	0.05	68	0.05	0.05	0.05	0.00	0.05	0.05
Sulfate	mg/L	68	145	3.021	16	96	193	68	106	145	182	16	97	193
Calcium	mg/L	68	57	3.021	8	34	80	68	39	57	75	8	34	80
Magnesium	mg/L	68	1.7	3.021	0.5	0.2	3.3	68	0.5	1.7	3.0	0.5	0.2	3.3
Potassium	mg/L	68	6.2	3.021	3.9	-5.6	18.0	68	2.0	6.2	19.0	3.9	-5.6	18.0
Sodium	mg/L	68	39	3.021	3	29	49	68	32	39	50	3	29	49
Cation Sum	meq/L	16	4.6	3.812	0.3	3.5	5.8	16	4.3	4.6	5.6	0.3	3.7	5.5
Anion Sum	meq/L	16	4.8	3.812	0.4	3.4	6.2	16	4.3	4.8	5.8	0.4	3.7	5.9
Cation-Anion Balance	%	16	1.7	3.812	1.3	-3.2	6.7	16	0.1	1.7	4.5	1.3	-2.2	5.6
Calculated TDS/TDS Ratio	dec. %	16	1.1	3.812	0.1	0.8	1.3	16	1.0	1.1	1.3	0.1	0.9	1.3
Gross Alpha (Dissolved)	pCi/L	68	90.0	3.021	141.4	-337.0	517.1	68	7.2	90.0	651.0	141.4	-334.0	514.1
Gross Beta (Dissolved)	pCi/L	68	35.7	3.021	48.2	-109.9	181.4	68	6.0	35.7	265.0	48.2	-108.9	180.4
Radium 226 (Dissolved)	pCi/L	68	44.4	3.021	86.3	-216.5	305.2	68	0.5	44.4	410.0	86.3	-214.7	303.4
Radium 228 (Dissolved)	pCi/L	68	1.9	3.021	1.5	-2.6	6.4	68	0.5	1.9	7.5	1.5	-2.6	6.3
Dissolved Aluminum	mg/L	20	0.08	3.615	0.12	-0.37	0.52	20	0.05	0.08	0.60	0.12	-0.29	0.45
Dissolved Arsenic	mg/L	68	0.003	3.021	0.002	-0.004	0.009	68	0.001	0.003	0.012	0.002	-0.004	0.009
Dissolved Barium	mg/L	68	0.05	3.021	0.00	0.05	0.05	68	0.05	0.05	0.05	0.00	0.05	0.05
Dissolved Beryllium	mg/L	20	0.026	3.615	0.111	-0.377	0.429	20	0.001	0.026	0.500	0.111	-0.308	0.361
Dissolved Boron	mg/L	68	0.06	3.021	0.05	-0.11	0.22	67	0.05	0.05	0.05	0.00	0.05	0.05
Dissolved Cadmium	mg/L	68	0.0005	3.021	0.0000	0.0005	0.0005	68	0.0005	0.0005	0.0005	0.0000	0.0005	0.0005
Dissolved Chromium	mg/L	68	0.012	3.021	0.060	-0.169	0.194	67	0.005	0.005	0.005	0.000	0.005	0.005
Dissolved Copper	mg/L	68	0.005	3.021	0.000	0.005	0.005	68	0.005	0.005	0.005	0.000	0.005	0.005
Dissolved Iron	mg/L	68	0.032	3.021	0.058	-0.142	0.206	67	0.025	0.025	0.025	0.000	0.025	0.025
Dissolved Lead	mg/L	68	0.0031	3.021	0.0011	-0.0001	0.0063	68	0.0025	0.0031	0.0050	0.0011	-0.0001	0.0063
Dissolved Manganese	mg/L	68	0.01	3.021	0.00	0.00	0.02	68	0.01	0.01	0.02	0.00	0.00	0.02
Dissolved Mercury	mg/L	68	0.0005	3.021	0.000	0.000	0.001	67	0.0005	0.0005	0.0005	0.0000	0.0005	0.0005
Dissolved Molybdenum	mg/L	68	0.02	3.021	0.02	-0.03	0.07	68	0.01	0.02	0.05	0.02	-0.03	0.07
Dissolved Nickel	mg/L	68	0.02	3.021	0.06	-0.16	0.19	67	0.01	0.01	0.03	0.01	-0.02	0.03
Dissolved Selenium	mg/L	68	0.0005	3.021	0.0002	-0.0001	0.0011	68	0.0005	0.0005	0.0020	0.0002	-0.0001	0.0011
Dissolved Uranium	mg/L	68	0.0208	3.021	0.049	-0.127	0.169	68	0.002	0.021	0.407	0.049	-0.126	0.168
Dissolved Vanadium	mg/L	68	0.02	3.021	0.02	-0.03	0.07	68	0.01	0.02	0.05	0.02	-0.03	0.07
Dissolved Zinc	mg/L	68	0.012	3.021	0.059	-0.166	0.190	67	0.005	0.005	0.005	0.000	0.005	0.005
Total Iron	mg/L	68	0.405	3.021	1.376	-3.751	4.562	66	0.025	0.188	2.860	0.563	-1.500	1.875
Total Manganese	mg/L	68	0.02	3.021	0.03	-0.06	0.10	66	0.01	0.01	0.07	0.01	-0.02	0.04

TLF = Tolerance Limit Factor

Attachment 2: Index of Page Changes
2017 Annual Report of Changes, Tests, or Experiments
Lost Creek ISR Project SUA-1598

No.	Date of Change	Document	Pages to be Removed	Pages to be Added	Description of Change	Source of Change	Comments
1	May 2017	Technical Report Section 5	Pages 5-62, 5-63, 5-64 (Rev2 Apr10)	Pages 5-62, 5-63, 5-64 (Rev3 Mar18)	Edited language for removal of sample locations HV-1 and various PR locations	SERP LC17-03	Changes incorporated in TR March 2018
2	May 2017	Technical Report Section 5	N/A	Add new Figure 5.7-2 "Radiological Air Particulate, Radon, and Passive Gamma Sample Locations" (Mar18)	Provided current radiological air particulate and passive radiological sample locations	SERP LC17-03	Changes incorporated in TR March 2018

- Land Use Survey;
- Environmental Monitoring Data;
- Corrective Action Reports; and
- SERP Information.

5.7.7 Airborne Effluent and Environmental Monitoring Programs

As noted in Title 10 CFR Part 20, Subpart L, Section 20.2103, "Records of Surveys", the Airborne Effluent and Environmental Monitoring Program will:

- maintain records showing the results of surveys and calibrations required by Title 10 CFR Part 20, Subpart L, Sections 20.1501 and 20.1906, and
- retain these records until license termination.

These retained records will include:

- the results of surveys to determine the dose from external sources and used in the assessment of individual dose equivalents;
- the results of measurements and calculations used to determine individual intakes of radioactive material and used in the assessment of internal dose;
- the records showing the results of air sampling, surveys, and bioassays required pursuant to Title 10 CFR Part 20, Subpart L, Sections 20.1703(c)(1) and (2); and
- the results of measurements and calculations used to evaluate the release of radioactive effluents to the environment.

5.7.7.1 Operational Radiation Monitoring

Airborne Effluent

Airborne effluent and environmental monitoring programs is conducted as recommended in the NRC RG 4.14. Air particulate samples are collected continuously at the four Air Particulate Sampling Locations and used to determine U-nat, Th-230, Ra-226, and Pb-210. Air filters are collected weekly, as feasible or as soon as possible thereafter, and analyzed quarterly.

In agreement with RG 4.14, during operations LC ISR, LLC monitors passive gamma radiation and/or radon gas at a majority of the locations as in the 2010-11 radon and passive gamma baseline monitoring (**Section 2.9.4** and **Figure 2.9-27**). Of the 2010-11 radon and passive gamma sampling sites, four (PR-2, -3, -5, and -10) are co-located with

radiological air particulate samplers; one (PR-9) are located at a 2006-08 radon and gamma site not associated with air particulate samplers in MU1; and three additional sites (PR-4, -6, -12) are sampled based on 2007-08 and 2009 MILDOS analyses or on-site wind pattern (refer to **Section 2.9.4** for a discussion of these locations). Thus, there are a total of eight locations, **Figure 5.7-2**, with direct passive gamma radiation and/or radon gas measurement.

Radon gas is monitored continuously with quarterly analysis using alpha track etch detectors or equivalent. The device shall be able to accurately detect at 0.33 pCi/L or less based on a 90-day sample. At least one location shall have two monitoring devices as part of QA/QC.

Passive gamma is measured continuously with quarterly analysis using passive integrating devices or an equivalent. The device shall have a range of at least one mrem to 500 rem with an accuracy of at least plus or minus 15 percent. At least one location shall have two monitoring devices as part of QA/QC.

Operational sampling is periodically assessed to determine if additional sampling locations will improve LC ISR, LLC's ability to comply with regulatory intents. Background conditions will be considered to be primarily represented by monitoring at HV-3 (**Figure 5.7-2**), but also HV-5 (upwind but closer proximity to plant site).

Vegetation

With regard to RG 4.14, Footnote O to Tables 1 and 2, operational vegetation samples will not be taken since according to BLM guidance it takes approximately 144 acres annually at this location to support one head of livestock. Such sparseness of forage cannot conceivably result in significant cattle exposure through this pathway. Additionally, there are no cattle on these acreages used for human consumable milk production, so that the milk consumption pathway is not a consideration. The well pattern area as well as the plant will be fenced off from cattle, so cattle exposure through spillage is also of negligible concern. Baseline vegetation sampling, as described in **Section 2.9.3.2** has been conducted to facilitate final site restoration.

Soils

There will be no significant release of airborne particulate radionuclides during production since the LC ISR, LLC facility will not have the types of operations that have the potential to produce dust effluent (i.e., ore crushing and grinding). However, the decay of radon attributable to the facility may result in deposition of a very small amount of radon decay products, including short-lived Po-214, on surface soils. Po-214 will decay rapidly to Pb-210. The 2009 'near Plant' MILDOS analysis (**Section 2.9.3.1**)

indicates that the maximum approximate LC ISR, LLC Permit Boundary surface contamination of 5,000 pCi/m² is at a point 200 m north of the Plant center. The estimated increase in the average Pb-210 activity concentration in the top 5 cm (2 inches) of soil would be approximately 0.06 pCi/g, assuming a bulk soil density at that depth of 1.6 g/cm³. This incremental concentration would be indistinguishable from background. Background Pb-210 concentrations range from non-detect at a detection limit of 0.1 pCi/g to 4.9 pCi/g (**Table 2.9-1**).

Nevertheless, soil sampling is conducted annually during operations at the four Air Particulate Sampling Locations and analyzed for U-nat, Th-230, Ra-226 and Pb-210 per RG 4.14. Radionuclide particulates including the long lived radon progeny Pb-210 that are detected will be compared to baseline values to assess impacts and/or undesirable trends. As described in **Section 2.9.1.1**, during the preoperational radiological baseline characterization program, surface soil sample analyses were conducted per RG 4.14 recommendations. Those recommendations indicate that, in addition to Ra-226 analysis for all soil samples, ten percent of samples should be analyzed for U-nat, Th-230, and Pb-210. All ten of the correlation grid samples were analyzed for these additional radionuclides, providing a reasonably representative characterization across the Permit Area, including baseline concentrations of Pb-210. Per RG 4.14, soil sampling is conducted annually at each of the four air particulate monitoring locations, which have already been placed in service, for monitoring of Pb-210 deposition and in anticipation of a yellowcake dryer amendment request.

Public Doses

Calculations performed in accordance with existing NRC guidance will be used to estimate radionuclide source terms (including radon) and calculate off-site dose to the public. For example, Section 2.6 in Regulatory Guide 3.59 provides methods acceptable to NRC for estimating the radon source term during ISR operations. Additionally, NUREG 1569, Appendix D, provides the MILDOS AREA methodology acceptable to the NRC, which includes expressions for calculating the annual Rn-222 source terms from various aspects of ISR operations.

LC ISR, LLC believes the requirements for providing a semi-annual report to NRC per 10 CFR 40.65 of the quantity of each of the principal radionuclides released to unrestricted areas can be met through these methods since 10 CFR 40.65 does not specifically require "measurement". Furthermore, the disperse and diffuse nature of potential radon releases from multiple locations at ISRs makes empirical measurement impractical. Throughout the 30 years of ISR operational experience in the US there is no evidence of public exposure from radon releases in excess of public exposure criteria. For

- Land Use Survey;
- Environmental Monitoring Data;
- Corrective Action Reports; and
- SERP Information.

5.7.7 Airborne Effluent and Environmental Monitoring Programs

As noted in Title 10 CFR Part 20, Subpart L, Section 20.2103, "Records of Surveys", the Airborne Effluent and Environmental Monitoring Program will:

- maintain records showing the results of surveys and calibrations required by Title 10 CFR Part 20, Subpart L, Sections 20.1501 and 20.1906, and
- retain these records until license termination.

These retained records will include:

- the results of surveys to determine the dose from external sources and used in the assessment of individual dose equivalents;
- the results of measurements and calculations used to determine individual intakes of radioactive material and used in the assessment of internal dose;
- the records showing the results of air sampling, surveys, and bioassays required pursuant to Title 10 CFR Part 20, Subpart L, Sections 20.1703(c)(1) and (2); and
- the results of measurements and calculations used to evaluate the release of radioactive effluents to the environment.

5.7.7.1 Operational Radiation Monitoring

Airborne Effluent

Airborne effluent and environmental monitoring programs ~~will be carried out~~ is conducted as recommended in the NRC RG 4.14. Air particulate samples ~~will be~~ are collected continuously at the ~~five-four~~ Air Particulate Sampling Locations and used to determine U-nat, Th-230, Ra-226, and Pb-210. Air filters ~~will be~~ are collected weekly, as feasible or as soon as possible thereafter, and analyzed quarterly. ~~As a result, should yellowcake drying and packaging operations be initiated at the plant, air particulate monitoring stations are already established.~~

In agreement with RG 4.14, during operations LC ISR, LLC ~~will monitor~~ passive gamma radiation and/or radon gas ~~and passive gamma radiation at a majority of~~ the same locations as in the 2010-11 radon and passive gamma baseline monitoring (**Section 2.9.4** and **Figure 2.9-27**). Of the 2010-11 radon and passive gamma sampling sites, ~~five-four~~ (PR-1, -2, -3, -5, and -10) ~~will be~~ co-located with radiological air particulate samplers; ~~four-one~~ (PR-7, -8, -9, and -11) ~~will be~~ located at ~~a the~~ 2006-08 radon and gamma sites not associated with air particulate samplers in MUI; and three additional sites (PR-4, -6, -12) ~~will be~~ sampled based on 2007-08 and 2009 MILDOS analyses or on-site wind pattern (refer to **Section 2.9.4** for a discussion of these locations). Thus, there ~~will be~~ a total of ~~twelve-eight~~ locations, **Figure 2.9-275.7-2**, with ~~radon gas and~~ direct passive gamma radiation and/or radon gas measurement.

Radon gas ~~will be~~ monitored continuously with quarterly analysis using alpha track etch detectors or equivalent. The device shall be able to accurately detect ~~down to~~ 0.33 pCi/L or less based on a 90-day sample. At least one location shall have two monitoring devices as part of QA/QC.

Passive gamma ~~will be~~ measured continuously with quarterly analysis using passive integrating devices or an equivalent. The device shall have a range of at least one mrem to 500 rem with an accuracy of at least plus or minus 15 percent. At least one location shall have two monitoring devices as part of QA/QC.

Operational sampling ~~will be~~ periodically assessed to determine if additional sampling locations will improve LC ISR, LLC's ability to comply with regulatory intents. Background conditions will be considered to be primarily represented by monitoring at HV-3 ~~and PR-7~~ (**Figure 2.9-275.7-2**), but also HV-5 (upwind but closer proximity to plant site).

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~~four~~ Air Particulate Sampling Locations and analyzed for U-nat, Th-230, Ra-226 and Pb-210 per RG 4.14. Radionuclide particulates including the long lived radon progeny Pb-210 that are detected will be compared to baseline values to assess impacts and/or undesirable trends. As described in **Section 2.9.1.1**, during the preoperational radiological baseline characterization program, surface soil sample analyses were conducted per RG 4.14 recommendations. Those recommendations indicate that, in addition to Ra-226 analysis for all soil samples, ten percent of samples should be analyzed for U-nat, Th-230, and Pb-210. All ten of the correlation grid samples were analyzed for these additional radionuclides, providing a reasonably representative characterization across the Permit Area, including baseline concentrations of Pb-210. Per RG 4.14, soil sampling ~~will be~~is conducted annually at each of the ~~five~~
~~four~~ air particulate monitoring locations, which have already been placed in service, for monitoring of Pb-210 deposition and in anticipation of a yellowcake dryer amendment request.

Public Doses

Calculations performed in accordance with existing NRC guidance will be used to estimate radionuclide source terms (including radon) and calculate off-site dose to the public. For example, Section 2.6 in Regulatory Guide 3.59 provides methods acceptable to NRC for estimating the radon source term during ISR operations. Additionally, NUREG 1569, Appendix D, provides the MILDOS AREA methodology acceptable to the NRC, which includes expressions for calculating the annual Rn-222 source terms from various aspects of ISR operations.

LC ISR, LLC believes the requirements for providing a semi-annual report to NRC per 10 CFR 40.65 of the quantity of each of the principal radionuclides released to unrestricted areas can be met through these methods since 10 CFR 40.65 does not specifically require "measurement". Furthermore, the disperse and diffuse nature of potential radon releases from multiple locations at ISRs makes empirical measurement impractical. Throughout the 30 years of ISR operational experience in the US there is no evidence of public exposure from radon releases in excess of public exposure criteria. For

