

Data Validation Package

**March 2010
Groundwater Sampling at the
Project Shoal Site, Nevada**

March 2011



**U.S. DEPARTMENT OF
ENERGY**

Legacy
Management

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Sampling Event Summary

Site: Project Shoal Site, Nevada

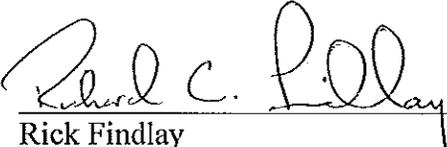
Sampling Period: March 10–12 and 24, 2010

The U.S. Department of Energy Office of Legacy Management conducted annual sampling at the Project Shoal Area (Shoal) in March 2010. Wells HC-4, HC-5, HC-7, HC-8, MV-1, MV-2, and MV-3 were sampled March 10-12, 2010, as specified in the *Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites* (LMS/PLN/S04351, continually updated). Wells HC-1, HC-2, HC-3, and HC-6 were sampled March 24, 2010, by Desert Research Institute personnel. Samples were submitted for analysis as follows:

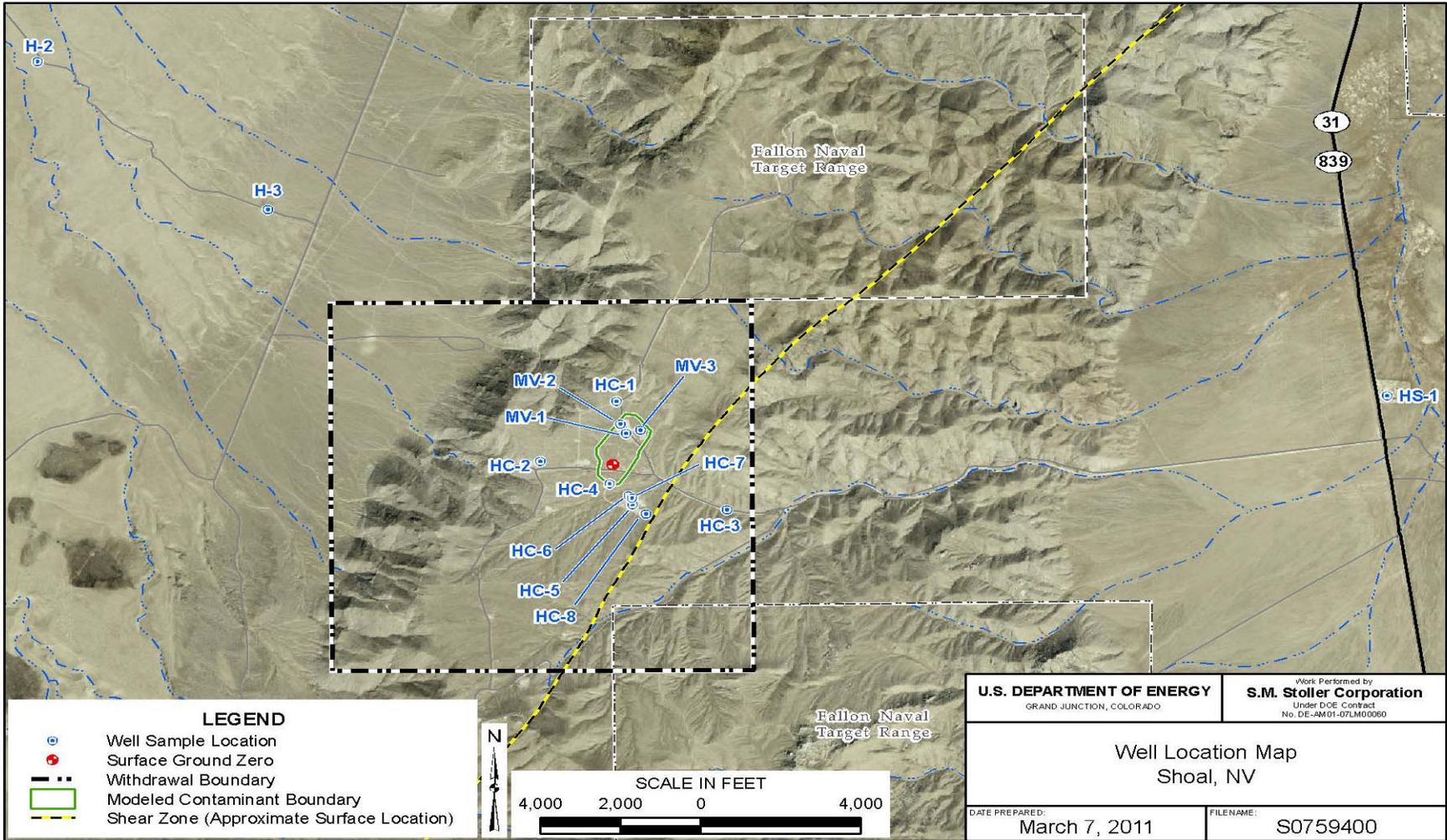
- Requisition 10032894 was submitted to ALS Laboratory Group in Fort Collins, Colorado, for the determination of gross alpha, gross beta, tritium, uranium isotopes, and total uranium. A duplicate sample from location HC-7 was included with this submittal.
- Requisition 10032895 was submitted to the University of Arizona for the determination of carbon-14 and iodine-129.

Constituent concentrations in all wells are below established regulatory levels.

Tritium was not detected in the samples from any of the wells except HC-4 where a concentration of 544 picocuries per liter was observed. This is consistent with past results. Results shown on the time-concentration plot included in this report, indicate that this is not an unusual occurrence for well HC-4. The presence of tritium in HC-4 is due to its close proximity to the nuclear detonation location. This is also evident by the elevated level of carbon-14 in HC-4 compared to levels in the other monitoring wells.


Rick Findlay
Site Lead, S.M. Stoller Corporation

3-31-2011
Date



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Project Shoal Site Sample Location Map

Data Assessment Summary

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Water Sampling Field Activities Verification Checklist

| | | | |
|--------------------------------|------------------------------|----------------------------------|---------------------------------|
| Project | <u>Project Shoal, Nevada</u> | Date(s) of Water Sampling | <u>March 10-12 and 24, 2010</u> |
| Date(s) of Verification | <u>January 14, 2011</u> | Name of Verifier | <u>Steve Donovan</u> |

| | Response (Yes, No, NA) | Comments |
|--|-----------------------------------|--|
| 1. Is the SAP the primary document directing field procedures? List other documents, SOPs, instructions. | <u>Yes</u> | <u>Work Order Letter dated February 8, 2010.</u> |
| 2. Were the sampling locations specified in the planning documents sampled? | <u>Yes</u> | |
| 3. Was a pre-trip calibration conducted as specified in the above-named documents? | <u>Yes</u> | <u>Pre-trip calibration was performed on March 9, 2010.</u> |
| 4. Was an operational check of the field equipment conducted daily? Did the operational checks meet criteria? | <u>Yes</u> <u>Yes</u> | <u>Operational checks were performed on March 10, 11, and 12, 2010. There is no documentation of the March 24, 2010, field activities.</u> |
| 5. Were the number and types (alkalinity, temperature, specific conductance, pH, turbidity, DO, ORP) of field measurements taken as specified? | <u>No</u> | <u>Dissolved oxygen, specific conductance, and turbidity were not measured in wells HC-1, HC-2, HC-3, and HC-6. pH was not measured in wells HC-1, HC-2, and HC-3.</u> |
| 6. Was the category of the well documented? | <u>No</u> | <u>There is no documentation of the March 24, 2010, field activities.</u> |
| 7. Were the following conditions met when purging a Category I well: Was one pump/tubing volume purged prior to sampling? | <u>Yes</u> | |
| Did the water level stabilize prior to sampling? | <u>NA</u> | <u>Water levels were not monitored.</u> |
| Did pH, specific conductance, and turbidity measurements stabilize prior to sampling? | <u>Yes</u> | |
| Was the flow rate less than 500 mL/min? | <u>Yes</u> | |
| If a portable pump was used, was there a 4-hour delay between pump installation and sampling? | <u>NA</u> | |

Water Sampling Field Activities Verification Checklist (continued)

| | Response (Yes, No, NA) | Comments |
|--|---------------------------|---|
| 8. Were the following conditions met when purging a Category II well: Was the flow rate less than 500 mL/min? | NA | |
| Was one pump/tubing volume removed prior to sampling? | | |
| 9. Were duplicates taken at a frequency of one per 20 samples? | Yes | A duplicate sample was collected from well HC-7. |
| 10. Were equipment blanks taken at a frequency of one per 20 samples that were collected with nondedicated equipment? | No | An equipment blank was not collected. |
| 11. Were trip blanks prepared and included with each shipment of VOC samples? | NA | |
| 12. Were QC samples assigned a fictitious site identification number? Was the true identity of the samples recorded on the Quality Assurance Sample Log or in the Field Data Collection System (FDCS) report? | Yes | Location ID 2894 was used for the duplicate sample. |
| | Yes | |
| 13. Were samples collected in the containers specified? | Yes | |
| 14. Were samples filtered and preserved as specified? | Yes | |
| 15. Were the number and types of samples collected as specified? | Yes | |
| 16. Were chain of custody records completed and was sample custody maintained? | Yes | |
| 17. Are field data sheets signed and dated by both team members (hardcopies) or are dates present for the "Date Signed" fields (FDCS)? | Yes | There were no field data sheets for the samples collected March 24, 2010. |
| 18. Was all other pertinent information documented on the field data sheets? | Yes | |
| 19. Was the presence or absence of ice in the cooler documented at every sample location? | NA | Sample chilling was not required. |
| 20. Were water levels measured at the locations specified in the planning documents? | Yes | |

Laboratory Performance Assessment

General Information

Report Number (RIN): 10032894
 Sample Event: March 10-12 and 24, 2010
 Site(s): Shoal Site, Nevada
 Laboratory: ALS Laboratory Group, Fort Collins, CO
 Work Order No.: 1004028
 Analysis: Metals and Radiochemistry
 Validator: Steve Donovan
 Review Date: May 13, 2010

This validation was performed according to the *Environmental Procedures Catalog* (LMS/PRO/S04325, continually updated), "Standard Practice for Validation of Laboratory Data." The procedure was applied at Level 3, Data Validation. See attached Data Validation Worksheets for supporting documentation on the data review and validation. All analyses were successfully completed. The samples were prepared and analyzed using accepted procedures based on methods specified by line item code, which are listed in Table 1.

Table 1. Analytes and Methods

| Analyte | Line Item Code | Prep Method | Analytical Method |
|------------------|----------------|---------------------|---------------------|
| Gross Alpha/Beta | GPC-A-001 | EPA 900.0 | EPA 900.0 |
| Tritium | LCS-A-001 | EPA 906.0 | EPA 906.0 |
| Uranium | LMM-02 | SW-846 3005A | SW-846 6020 |
| Uranium Isotopes | ASP-A-024 | EPA 908.0, Modified | EPA 908.0, Modified |

Data Qualifier Summary

Analytical results were qualified as listed in Table 2. Refer to the sections below for an explanation of the data qualifiers applied.

Table 2. Data Qualifier Summary

| Sample Number | Location | Analyte(s) | Flag | Reason |
|---------------|----------------|-------------|------|-----------------------------------|
| 1004028-1 | HC-1 | Gross Alpha | J | Less than the determination limit |
| 1004028-1 | HC-1 | Gross Beta | J | Less than the determination limit |
| 1004028-3 | HC-3 | Gross Alpha | J | Less than the determination limit |
| 1004028-4 | HC-4 | Gross Alpha | J | Less than the determination limit |
| 1004028-4 | HC-4 | Gross Beta | J | Less than the determination limit |
| 1004028-4 | HC-4 | Tritium | J | Less than the determination limit |
| 1004028-4 | HC-4 | Uranium-235 | J | Less than the determination limit |
| 1004028-7 | HC-7 | Gross Beta | J | Less than the determination limit |
| 1004028-8 | HC-8 | Gross Beta | J | Less than the determination limit |
| 1004028-8 | HC-8 | Uranium-238 | J | Less than the determination limit |
| 1004028-11 | MV-3 | Gross Alpha | J | Less than the determination limit |
| 1004028-11 | MV-3 | Gross Beta | J | Less than the determination limit |
| 1004028-12 | HC-7 Duplicate | Gross Beta | J | Less than the determination limit |

Sample Shipping/Receiving

ALS Laboratory Group in Fort Collins, Colorado, received 12 water samples on April 2, 2010, accompanied by a Chain of Custody (COC) form. The COC form was checked to confirm that all of the samples were listed on the form with sample collection dates and times, and that signatures and dates were present indicating sample relinquishment and receipt. The COC form was complete with no errors or omissions. A copy of the air waybill label was included with the receiving documentation.

Preservation and Holding Times

The sample shipment was received intact at ambient temperature which complies with requirements. The sample was received in the correct container type and had been preserved correctly for the requested analyses. Sample analysis was completed within the applicable holding times.

Laboratory Instrument Calibration

Compliance requirements for satisfactory instrument calibration are established to ensure that the instrument is capable of producing acceptable qualitative and quantitative data for all analytes. Initial calibration demonstrates that the instrument is capable of acceptable performance in the beginning of the analytical run and of producing a linear curve. Compliance requirements for continuing calibration checks are established to ensure that the instrument continues to be capable of producing acceptable qualitative and quantitative data. All laboratory instrument calibrations were performed correctly in accordance with the cited methods.

Method SW-846 6020, Uranium

Calibration for uranium was performed on April 23 30, 2010, using four calibration standards and a blank resulting in a calibration curve with a correlation coefficient value greater than 0.995. The absolute value of the calibration curves intercept was less than 3 times the method detection limit (MDL). Calibration and laboratory spike standards were prepared from independent sources. Initial and continuing calibration verification checks were made at the required frequency, resulting in ten calibration checks. All calibration checks met the acceptance criteria. Reporting limit verification checks were made at the beginning of each analytical sequence to verify the linearity of the calibration curve near the practical quantitation limit. All results were within the acceptance range. Mass calibration and resolution verifications were performed at the beginning of each analytical run in accordance with the analytical procedure. Internal standard recoveries associated with requested analytes were stable and within acceptable ranges.

Radiochemical Analysis

Radiochemical results are qualified with a “J” flag (estimated) when the result is greater than the minimum detectable concentration (MDC), but less than Determination Limit (3 times the MDC). Radiochemical results are qualified with a “U” flag (not detected) when the result is greater than the MDC, but less than the decision level concentration estimated as the two sigma total propagated uncertainty.

Alpha Spectrometry

Alpha spectrometry calibrations were performed on April 12, 2010. Instrument background was determined on April 12, 2010. All daily instrument calibration and background checks met the acceptance criteria. The chemical recoveries met the acceptance criteria of 30 to 110 percent for all samples. The full width at half maximum was reviewed to evaluate the spectral resolution. All full width at half maximum values were below 100, demonstrating acceptable resolution. All internal standard peaks were within 50 KeV of the expected position. The regions-of-interest for analyte peaks were reviewed. No manual integrations were performed and all regions-of-interest were satisfactory.

Gross Alpha/Beta

Plateau calibrations were performed on November 16, 2009. Alpha and beta attenuation calibrations were completed on December 2, 2009, covering a range of 0 to 143.8 milligrams (mg). All standards were counted to a minimum of 10,000 counts. All calibration and background checks met acceptance criteria. The sample residual mass was between 41.4 mg and 87.4 mg for all samples.

Tritium

The tritium quench calibration curve was generated on February 20, 2010, for quench indicator values ranging from 136.6 to 254.6. Sample quench values were not within the calibration range for the original analysis. The samples were spiked with nitromethane to increase the quench to values within the calibration range and re-analyzed with acceptable results.

Method and Calibration Blanks

Method blanks are analyzed to assess any contamination that may have occurred during sample preparation. Calibration blanks are analyzed to assess instrument contamination prior to and during sample analysis.

Uranium

All method blank and initial and continuing calibration blank results associated with the samples were below the practical quantitation limits. In cases where a blank concentration exceeds the MDL, the associated sample results are qualified with a “U” flag (not detected) when the sample result is greater than the MDL but less than 5 times the blank concentration.

Radiochemical Analysis

All radiochemical method blank results were below the MDC.

Inductively Coupled Plasma (ICP) Interference Check Sample (ICS) Analysis

ICP interference check samples ICSA and ICSAB were analyzed at the required frequency to verify the instrumental interelement and background correction factors. All check sample results met the acceptance criteria.

Matrix Spike Analysis

Matrix spike samples were analyzed for gross alpha, gross beta, and tritium to determine the method performance in the sample matrix. The matrix spike recoveries were within the acceptance limit for these analytes.

Laboratory Replicate Analysis

The laboratory replicate sample results demonstrate acceptable laboratory precision. The relative percent difference values for the laboratory replicate sample results were less than 20 percent relative difference for results that were greater than 5 times the practical quantitation limit. The radiochemical relative error ratio for all laboratory replicate samples was less than three indicating acceptable precision.

Laboratory Control Sample

Laboratory control samples were analyzed at the correct frequency to provide information on the accuracy of the analytical method and the overall laboratory performance, including sample preparation. The laboratory control sample results were acceptable for all analyses.

Detection Limits/Dilutions

No dilutions were required for sample analysis. The required detection limits were achieved for the determination of uranium. All radiochemical MDCs were calculated using the following equation. All MDCs were less than the required detection limits.

$$MDC = \frac{3.29 \times \sqrt{\frac{b}{T_s} + \frac{b}{T_b}}}{K} + \frac{3}{K \times T_s}$$

Where:

- b = background count rate (cpm)
- K = Factor to convert counts per minute to activity concentration
- T_b = Count time for blanks
- T_s = Count time for sample

The calculation of the MDCs using the equation above was verified.

Completeness

Results were reported in the correct units for all analytes requested using contract-required laboratory qualifiers. Both filtered and unfiltered sample aliquots were analyzed.

Electronic Data Deliverable (EDD) File

The EDD file with the complete data arrived on May 4, 2010. The Sample Management System EDD validation module was used to verify that the EDD file was complete and in compliance with requirements. The module compares the contents of the file to the requested analyses to ensure all and only the requested data are delivered. The contents of the EDD were manually examined to verify that the sample results accurately reflect the data contained in the sample data package.

SAMPLE MANAGEMENT SYSTEM
General Data Validation Report

RIN: 10032894 Lab Code: PAR Validator: Steve Donovan Validation Date: 5/12/2010
Project: Shoal Site Analysis Type: Metals General Chem Rad Organics
of Samples: 12 Matrix: WATER Requested Analysis Completed: Yes

Chain of Custody
Present: OK Signed: OK Dated: OK

Sample
Integrity: OK Preservation: OK Temperature: OK

Select Quality Parameters

- Holding Times
- Detection Limits
- Field/Trip Blanks
- Field Duplicates

All analyses were completed within the applicable holding times.
The reported detection limits are equal to or below contract requirements.
There was 1 duplicate evaluated.

SAMPLE MANAGEMENT SYSTEM
Metals Data Validation Worksheet

RIN: 10032894 Lab Code: PAR Date Due: 4/30/2010
 Matrix: Water Site Code: SHL01 Date Completed: 5/5/2010

| Analyte | Date Analyzed | CALIBRATION | | | | | | | Method | LCS %R | MS %R | MSD %R | Dup. RPD | ICSAB %R | Serial Dil. %R | CRI %R |
|---------|---------------|-------------|----------------|-----|-----|-----|-----|-------|--------|-----------|----------|-----------|-------------|-------------|-------------------|-----------|
| | | Int. | R ² | ICV | CCV | ICB | CCB | Blank | | | | | | | | |
| URANIUM | 04/23/2010 | 0.0000 | 1.0000 | OK | OK | OK | OK | OK | 99.0 | | | | 98.0 | | 110.0 | |
| URANIUM | 04/30/2010 | 0.0000 | 1.0000 | OK | OK | OK | OK | OK | 103.0 | | | 3.0 | 107.0 | | 98.0 | |

SAMPLE MANAGEMENT SYSTEM
Radiochemistry Data Validation Worksheet

RIN: 10032894 Lab Code: PAR Date Due: 4/30/2010
 Matrix: Water Site Code: SHL01 Date Completed: 5/5/2010

| Sample | Analyte | Date Analyzed | Result | Flag | Tracer %R | LCS %R | MS %R | Duplicate |
|----------------|-------------|---------------|---------|------|-----------|--------|-------|-----------|
| HC-1 | GROSS ALPHA | 04/14/2010 | | | | | | 0.65 |
| MV-3 | GROSS ALPHA | 04/14/2010 | | | | | | 0.34 |
| Blank | GROSS ALPHA | 04/14/2010 | 0.1670 | U | | | | |
| HC-2 | GROSS ALPHA | 04/14/2010 | | | | | 79.4 | |
| Blank_Spike | GROSS ALPHA | 04/14/2010 | | | | 78.0 | | |
| HC-1 | GROSS BETA | 04/14/2010 | | | | | | 0.76 |
| MV-3 | GROSS BETA | 04/14/2010 | | | | | | 1.47 |
| Blank | GROSS BETA | 04/14/2010 | 0.4250 | U | | 88.8 | | |
| HC-2 | GROSS BETA | 04/14/2010 | | | | | 91.0 | |
| Blank_Spike | GROSS BETA | 04/14/2010 | | | | 88.8 | | |
| HC-3 | H-3 | 04/09/2010 | | | | | | 0.31 |
| HC-4 | H-3 | 04/10/2010 | | | | | 107.0 | |
| Blank_Spike | H-3 | 04/11/2010 | | | | 100.0 | | |
| Blank | H-3 | 04/11/2010 | 89.0000 | U | | | | |
| HC-1 | U-234 | 04/14/2010 | | | 79.9 | | | |
| HC-2 | U-234 | 04/14/2010 | | | 60.4 | | | |
| HC-3 | U-234 | 04/14/2010 | | | 73.9 | | | |
| HC-4 | U-234 | 04/14/2010 | | | 80.4 | | | |
| HC-5 | U-234 | 04/14/2010 | | | 80.3 | | | |
| HC-6 | U-234 | 04/14/2010 | | | 80.6 | | | |
| HC-7 | U-234 | 04/14/2010 | | | 74.1 | | | |
| HC-8 | U-234 | 04/14/2010 | | | 83.2 | | | |
| MV-1 | U-234 | 04/14/2010 | | | 81.9 | | | |
| MV-2 | U-234 | 04/14/2010 | | | 83.0 | | | |
| MV-3 | U-234 | 04/14/2010 | | | 80.4 | | | |
| 2894 | U-234 | 04/14/2010 | | | 73.2 | | | |
| Blank_Spike | U-234 | 04/14/2010 | | | 84.7 | 92.8 | | |
| Blank_Spike_Du | U-234 | 04/14/2010 | | | 91.8 | 91.0 | | 0.15 |
| Blank | U-234 | 04/14/2010 | -0.0032 | U | 50.9 | | | |
| Blank | U-235 | 04/14/2010 | -0.0038 | U | | | | |
| Blank | U-238 | 04/14/2010 | -0.0011 | U | | | | |
| Blank_Spike | Uranium-238 | 04/14/2010 | | | | 97.1 | | |

SAMPLE MANAGEMENT SYSTEM
Radiochemistry Data Validation Worksheet

RIN: 10032894 **Lab Code:** PAR **Date Due:** 4/30/2010
Matrix: Water **Site Code:** SHL01 **Date Completed:** 5/5/2010

| Sample | Analyte | Date Analyzed | Result | Flag | Tracer %R | LCS %R | MS %R | Duplicate |
|----------------|-------------|---------------|--------|------|-----------|--------|-------|-----------|
| Blank_Spike_Du | Uranium-238 | 04/14/2010 | | | | 96.1 | | 0.08 |

General Information

Requisition No. (RIN): 10032895
Sample Event: March 10-12 and 24, 2010
Site(s): Shoal Site, Nevada
Laboratory: NSF-Arizona AMS Facility, Tucson, AZ
Analysis: Carbon-14, Iodine-129
Validator: Steve Donovan
Review Date: October 14, 2010

This validation was performed according to the *Environmental Procedures Catalog* (LMS/PRO/S04325, continually updated), "Standard Practice for Validation of Laboratory Data." The procedure was applied at Level 1, Data Deliverables Examination. All analyses were successfully completed. The samples were prepared and analyzed using accepted procedures based on methods specified by line item code, which are listed in Table 3.

Table 3. Analytes and Methods

| Analyte | Line Item Code | Prep Method | Analytical Method |
|------------|----------------|------------------|-------------------------------|
| Carbon-14 | LMR-18 | AMS Facility SOP | Accelerator Mass Spectrometry |
| Iodine-129 | LMR-19 | AMS Facility SOP | Accelerator Mass Spectrometry |

Data Qualifier Summary

None of the analytical results required qualification.

Sample Shipping/Receiving

The NSF-Arizona AMS Facility in Tucson, Arizona, received 11 water samples on April 2, 2010, submitted for the determination of carbon-14 and iodine-129. The analytical report was checked to confirm that all of the samples scheduled were received and analyzed.

Preservation and Holding Times

The sample shipment was received intact with all samples in the correct container types, preserved correctly for the requested analyses. All samples were analyzed within the applicable holding times.

Laboratory Instrument Calibration

Data for this RIN were reported at Analysis Service Level B (results only) and do not include calibration data.

Sample Analysis Description

The samples were prepared for the determination of carbon-14 using procedures developed at the NSF-Arizona AMS Laboratory. Briefly, approximately 200 milliliters (mL) of each water sample were placed in a closed flask and degassed under vacuum. The sample was then acidified

with anhydrous phosphoric acid and the evolved carbon dioxide cryogenically purified and isolated. The delta C-13 of each sample gas was measured off-line on a VG-Isotech Isotope Ratio Mass Spectrometer. Sample carbon dioxide was reduced to graphite and the 14/13 ratio measured on an NEC 2.5 MeV Accelerator mass Spectrometer. The results are expressed in Fraction Modern (F) and Radiocarbon Age BP (Before Present). These results were isotope fractionation corrected.

The samples were prepared for the determination of iodine-129 by acidification with phosphoric acid followed with an oxidation of iodide to iodine. The iodine was absorbed in 125-mesh silver powder. This powder was then packed into a sample holder and loaded into the accelerator for isotopic analysis. The isotope ratio for each sample was calculated by using the weighted average of six independent measurements. Total iodine measurements were made with an Orion iodide specific electrode and bench-top meter. The total iodine values for each sample were calculated by using a weighted average of five independent measurements. The total iodine concentration and isotopic ratio for each sample were used to obtain the sample activity in picocuries per liter (pCi/L).

Completeness

Carbon-14 and iodine-129 results were reported as requested for all samples submitted.

Sampling Quality Control Assessment

The following information summarizes and assesses quality control for this sampling event.

Sampling Protocol

Wells HC-4, HC-5, HC-7, HC-8, MV-1, MV-2, and MV-3 were sampled using dedicated high-flow submersible pumps after one well casing volume had been purged and field parameters had stabilized. Wells HC-1, HC-2, HC-3, and HC-6 were sampled using a depth-specific bailer.

Equipment Blank Assessment

An equipment blank was not collected.

Field Duplicate

Field duplicate samples are collected and analyzed as an indication of overall precision of the measurement process. The precision observed includes both field and laboratory precision and has more variability than laboratory duplicates which measure only laboratory performance. A duplicate sample was collected from location HC-7. The duplicate result met the duplicate performance criteria of having an relative error ratio of less than three for radiochemical measurements or a relative percent difference less than 20 percent indicating acceptable overall precision.

SAMPLE MANAGEMENT SYSTEM

Validation Report: Field Duplicates

RIN: 10032894 Lab Code: PAR Project: Shoal Site Validation Date: 5/12/2010

Duplicate: 2894

Sample: HC-7

| Analyte | Sample | | | | Duplicate | | | | RPD | RER | Units |
|-------------|--------|------|--------|----------|-----------|------|-------|----------|-------|-----|-------|
| | Result | Flag | Error | Dilution | Result | Flag | Error | Dilution | | | |
| GROSS ALPHA | 5.77 | | 1.68 | 1 | 7.65 | | 1.94 | 1 | | 1.4 | pCi/L |
| GROSS BETA | 6.12 | | 2.04 | 1 | 5.27 | | 2.41 | 1 | | 0.5 | pCi/L |
| H-3 | 28.8 | U | 182 | 1 | 44.4 | U | 182 | 1 | | 0.1 | pCi/L |
| U-234 | 3.43 | | 0.653 | 1 | 2.98 | | 0.579 | 1 | 14.04 | 1.0 | pCi/L |
| URANIUM | 7.4 | | | 10 | 7.3 | | | 10 | 1.36 | | UG/L |
| Uranium-235 | 0.132 | | 0.0694 | 1 | 0.242 | | 0.1 | 1 | | 1.8 | pCi/L |
| Uranium-238 | 3.08 | | 0.594 | 1 | 2.59 | | 0.511 | 1 | 17.28 | 1.2 | pCi/L |

Certification

All laboratory analytical quality control criteria were met except as qualified in this report. The data qualifiers listed on the SEEPro database reports are defined on the last page of each report. All data in this package are considered validated and available for use.

Laboratory Coordinator: Steve Donovan 3-8-2011
Steve Donovan Date

Data Validation Lead: Steve Donovan 5-8-2011
Steve Donovan Date

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Attachment 1
Assessment of Anomalous Data

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Potential Outliers Report

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Potential Outliers Report

Potential outliers are measurements that are extremely large or small relative to the rest of the data and, therefore, are suspected of misrepresenting the population from which they were collected. Potential outliers may result from transcription errors, data-coding errors, or measurement system problems. However, outliers may also represent true extreme values of a distribution and indicate more variability in the population than was expected.

Statistical outlier tests give probabilistic evidence that an extreme value does not "fit" with the distribution of the remainder of the data and is therefore a statistical outlier. These tests should only be used to identify data points that require further investigation. The tests alone cannot determine whether a statistical outlier should be discarded or corrected within a data set.

There are three steps involved in identifying extreme values or outliers:

1. Identify extreme values that may be potential outliers by generating the Outliers Report using the Sample Management System from data in the SEEPro database. The application compares the new data set with historical data and lists the new data that fall outside the historical data range. A determination is also made if the data are normally distributed using the Shapiro-Wilk Test.
2. Apply the appropriate statistical test. Dixon's Extreme Value test is used to test for statistical outliers when the sample size is less than or equal to 25. This test considers both extreme values that are much smaller than the rest of the data (case 1) and extreme values that are much larger than the rest of the data (case 2). This test is valid only if the data without the suspected outlier are normally distributed. Rosner's Test is a parametric test that is used to detect outliers for sample sizes of 25 or more. This test also assumes that the data without the suspected outliers are normally distributed.
3. Scientifically review statistical outliers and decide on their disposition.

There were no potential outliers identified, and the data for this event are acceptable as qualified.

Data Validation Outliers Report - No Field Parameters

Comparison: All Historical Data

Laboratory: ALS Laboratory Group

RIN: 10032894

Report Date: 1/14/2011

| Site Code | Location Code | Sample ID | Sample Date | Analyte | Current | | Historical Maximum | | | Historical Minimum | | | Number of Data Points | | Statistical Outlier |
|-----------|---------------|-----------|-------------|-------------|---------|------------------------|--------------------|------------------------|--------|------------------------|----|----------------|-----------------------|---|---------------------|
| | | | | | Result | Qualifiers Lab Data | Result | Qualifiers Lab Data | Result | Qualifiers Lab Data | N | N Below Detect | | | |
| SHL01 | HC-3 | N001 | 03/24/2010 | Uranium-234 | 1.16 | | 9.78 | | | 1.4 | | | 5 | 0 | No |
| SHL01 | HC-3 | N001 | 03/24/2010 | Uranium-235 | 0.0325 | U | 0.418 | | | 0.0548 | | | 5 | 0 | No |
| SHL01 | HC-4 | 0001 | 03/11/2010 | Uranium | 0.0064 | | 0.0045 | | | 0.00069 | | | 6 | 0 | No |
| SHL01 | HC-7 | N001 | 03/11/2010 | Gross Alpha | 5.77 | | 54.5 | | | 27.6 | | | 6 | 0 | No |
| SHL01 | HC-8 | N001 | 03/10/2010 | Tritium | -74.4 | U | 79 | | | -29.5 | | | 10 | 2 | No |
| SHL01 | MV-1 | N001 | 03/11/2010 | Gross Alpha | 11.3 | | 25.6 | | | 11.8 | FQ | | 6 | 0 | No |

STATISTICAL TESTS:

The distribution of the data is tested for normality or lognormality using the Shapiro-Wilk Test

Outliers are identified using Dixon's Test when there are 25 or fewer data points.

Outliers are identified using Rosner's Test when there are 26 or more data points.

See Data Quality Assessment: Statistical Methods for Practitioners, EPA QC/G-9S, February 2006.

Attachment 2

Data Presentation

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Groundwater Quality Data

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Ground Water Quality Data by Location (USEE100) FOR SITE SHL01, Shoal Site

REPORT DATE: 3/8/2011

Location: HC-1 WELL

| Parameter | Units | Sample Date | Sample ID | Depth Range (Ft BLS) | Result | Lab | Qualifiers Data | QA | Detection Limit | Uncertainty |
|----------------------|----------|-------------|-----------|----------------------|----------------|-----|-----------------|----|-----------------|----------------|
| Carbon-14 | pMC | 03/24/2010 | N002 | 1094 - 1324.8 | 37.6 | | | # | | 0.21 |
| Gross Alpha | pCi/L | 03/24/2010 | N001 | 1094 - 1324.8 | 4.93 | | J | # | 1.7 | 1.91 |
| Gross Beta | pCi/L | 03/24/2010 | N001 | 1094 - 1324.8 | 5.38 | | J | # | 2.4 | 1.93 |
| Iodine-129 | pCi/L | 03/24/2010 | N002 | 1094 - 1324.8 | 0.000000000119 | | | # | | 0.000000000002 |
| Specific Conductance | umhos/cm | 03/24/2010 | N001 | 1094 - 1324.8 | 498 | | | # | | |
| Temperature | C | 03/24/2010 | N001 | 1094 - 1324.8 | 19.2 | | | # | | |
| Tritium | pCi/L | 03/24/2010 | N001 | 1094 - 1324.8 | 151 | U | | # | 310 | 189 |
| Uranium | mg/L | 03/24/2010 | N001 | 1094 - 1324.8 | 0.0033 | | | # | 0.000029 | |
| Uranium-234 | pCi/L | 03/24/2010 | N001 | 1094 - 1324.8 | 1.24 | | | # | 0.029 | 0.269 |
| Uranium-235 | pCi/L | 03/24/2010 | N001 | 1094 - 1324.8 | 0.0643 | | | # | 0.019 | 0.0441 |
| Uranium-238 | pCi/L | 03/24/2010 | N001 | 1094 - 1324.8 | 1.05 | | | # | 0.029 | 0.236 |

Ground Water Quality Data by Location (USEE100) FOR SITE SHL01, Shoal Site

REPORT DATE: 3/8/2011

Location: HC-2 WELL

| Parameter | Units | Sample Date | ID | Depth Range (Ft BLS) | Result | Lab | Qualifiers Data | QA | Detection Limit | Uncertainty |
|----------------------|-----------|-------------|------|----------------------|----------------|-----|-----------------|----|-----------------|----------------|
| Carbon-14 | pMC | 03/24/2010 | N002 | 955 - 1223 | 24.57 | | | # | | 0.18 |
| Gross Alpha | pCi/L | 03/24/2010 | N001 | 955 - 1223 | 63.8 | | | # | 1.4 | 10.5 |
| Gross Beta | pCi/L | 03/24/2010 | N001 | 955 - 1223 | 28.6 | | | # | 2.6 | 4.98 |
| Iodine-129 | pCi/L | 03/24/2010 | N002 | 955 - 1223 | 0.000000000025 | | | # | | 0.000000000008 |
| Specific Conductance | umhos /cm | 03/24/2010 | N001 | 955 - 1223 | 667 | | | # | | |
| Temperature | C | 03/24/2010 | N001 | 955 - 1223 | 18.7 | | | # | | |
| Tritium | pCi/L | 03/24/2010 | N001 | 955 - 1223 | 24 | U | | # | 300 | 181 |
| Uranium | mg/L | 03/24/2010 | N001 | 955 - 1223 | 0.14 | | | # | 0.000029 | |
| Uranium-234 | pCi/L | 03/24/2010 | N001 | 955 - 1223 | 45.1 | | | # | 0.065 | 7.76 |
| Uranium-235 | pCi/L | 03/24/2010 | N001 | 955 - 1223 | 2.12 | | | # | 0.053 | 0.459 |
| Uranium-238 | pCi/L | 03/24/2010 | N001 | 955 - 1223 | 45.3 | | | # | 0.062 | 7.79 |

Ground Water Quality Data by Location (USEE100) FOR SITE SHL01, Shoal Site

REPORT DATE: 3/8/2011

Location: HC-3 WELL

| Parameter | Units | Sample Date | ID | Depth Range (Ft BLS) | Result | Lab | Qualifiers Data | QA | Detection Limit | Uncertainty |
|----------------------|----------|-------------|------|----------------------|---------------|-----|-----------------|----|-----------------|--------------|
| Carbon-14 | pMC | 03/24/2010 | N002 | 1183 - 1203.5 | 24.49 | | | # | | 0.18 |
| Gross Alpha | pCi/L | 03/24/2010 | N001 | 1183 - 1203.5 | 2.57 | | J | # | 1.6 | 1.18 |
| Gross Beta | pCi/L | 03/24/2010 | N001 | 1183 - 1203.5 | 10.2 | | | # | 2 | 2.18 |
| Iodine-129 | pCi/L | 03/24/2010 | N002 | 1183 - 1203.5 | 0.00000000541 | | | # | | 0.0000000049 |
| Specific Conductance | umhos/cm | 03/24/2010 | N001 | 1183 - 1203.5 | 550 | | | # | | |
| Temperature | C | 03/24/2010 | N001 | 1183 - 1203.5 | 24.9 | | | # | | |
| Tritium | pCi/L | 03/24/2010 | N001 | 1183 - 1203.5 | 116 | U | | # | 300 | 183 |
| Uranium | mg/L | 03/24/2010 | N001 | 1183 - 1203.5 | 0.0043 | | | # | 0.000029 | |
| Uranium-234 | pCi/L | 03/24/2010 | N001 | 1183 - 1203.5 | 1.16 | | | # | 0.061 | 0.262 |
| Uranium-235 | pCi/L | 03/24/2010 | N001 | 1183 - 1203.5 | 0.0325 | U | | # | 0.06 | 0.04 |
| Uranium-238 | pCi/L | 03/24/2010 | N001 | 1183 - 1203.5 | 1.21 | | | # | 0.058 | 0.271 |

Ground Water Quality Data by Location (USEE100) FOR SITE SHL01, Shoal Site

REPORT DATE: 3/8/2011

Location: HC-4 WELL

| Parameter | Units | Sample Date | ID | Depth Range (Ft BLS) | | Result | Lab | Qualifiers Data | QA | Detection Limit | Uncertainty |
|-------------------------------|----------|-------------|------|----------------------|--------|----------------|-----|-----------------|----|-----------------|---------------|
| Carbon-14 | pMC | 03/11/2010 | N002 | 1013 | - 1294 | 2436 | | | # | | 7.7 |
| Dissolved Oxygen | mg/L | 03/11/2010 | N001 | 1013 | - 1294 | 0.42 | | | # | | |
| Gross Alpha | pCi/L | 03/11/2010 | 0001 | 1013 | - 1294 | 1.79 | | J | # | 1.6 | 1.08 |
| Gross Beta | pCi/L | 03/11/2010 | 0001 | 1013 | - 1294 | 5.21 | | J | # | 2.3 | 1.7 |
| Iodine-129 | pCi/L | 03/11/2010 | N002 | 1013 | - 1294 | 0.000000000387 | | | # | | 0.00000000032 |
| Oxidation Reduction Potential | mV | 03/11/2010 | N001 | 1013 | - 1294 | -233 | | | # | | |
| pH | s.u. | 03/11/2010 | N001 | 1013 | - 1294 | 6.89 | | | # | | |
| Specific Conductance | umhos/cm | 03/11/2010 | N001 | 1013 | - 1294 | 767 | | | # | | |
| Temperature | C | 03/11/2010 | N001 | 1013 | - 1294 | 21.2 | | | # | | |
| Tritium | pCi/L | 03/11/2010 | 0001 | 1013 | - 1294 | 544 | | J | # | 300 | 213 |
| Turbidity | NTU | 03/11/2010 | N001 | 1013 | - 1294 | 17 | | | # | | |
| Uranium | mg/L | 03/11/2010 | 0001 | 1013 | - 1294 | 0.0064 | | | # | 0.000029 | |
| Uranium-234 | pCi/L | 03/11/2010 | 0001 | 1013 | - 1294 | 2.27 | | | # | 0.05 | 0.444 |
| Uranium-235 | pCi/L | 03/11/2010 | 0001 | 1013 | - 1294 | 0.0753 | | J | # | 0.041 | 0.05 |
| Uranium-238 | pCi/L | 03/11/2010 | 0001 | 1013 | - 1294 | 1.95 | | | # | 0.048 | 0.39 |

Ground Water Quality Data by Location (USEE100) FOR SITE SHL01, Shoal Site

REPORT DATE: 3/8/2011

Location: HC-5 WELL

| Parameter | Units | Sample Date | ID | Depth Range (Ft BLS) | | Result | Lab | Qualifiers Data | QA | Detection Limit | Uncertainty |
|-------------------------------|----------|-------------|------|----------------------|-----------|----------------|-----|-----------------|----|-----------------|----------------|
| Carbon-14 | pMC | 03/11/2010 | N002 | 3385.03 | - 3530.63 | 8.76 | | | # | | 0.13 |
| Dissolved Oxygen | mg/L | 03/11/2010 | N001 | 3385.03 | - 3530.63 | 0.95 | | | # | | |
| Gross Alpha | pCi/L | 03/11/2010 | N001 | 3385.03 | - 3530.63 | 0.825 | U | | # | 1.5 | 0.931 |
| Gross Beta | pCi/L | 03/11/2010 | N001 | 3385.03 | - 3530.63 | 1.16 | U | | # | 2.7 | 1.66 |
| Iodine-129 | pCi/L | 03/11/2010 | N002 | 3385.03 | - 3530.63 | 0.000000000011 | | | # | | 0.000000000002 |
| Oxidation Reduction Potential | mV | 03/11/2010 | N001 | 3385.03 | - 3530.63 | -261 | | | # | | |
| pH | s.u. | 03/11/2010 | N001 | 3385.03 | - 3530.63 | 7.85 | | | # | | |
| Specific Conductance | umhos/cm | 03/11/2010 | N001 | 3385.03 | - 3530.63 | 977 | | | # | | |
| Temperature | C | 03/11/2010 | N001 | 3385.03 | - 3530.63 | 29.7 | | | # | | |
| Tritium | pCi/L | 03/11/2010 | N001 | 3385.03 | - 3530.63 | -16.1 | U | | # | 300 | 177 |
| Turbidity | NTU | 03/11/2010 | N001 | 3385.03 | - 3530.63 | 1.44 | | | # | | |
| Uranium | mg/L | 03/11/2010 | N001 | 3385.03 | - 3530.63 | 0.00048 | | | # | 0.000029 | |
| Uranium-234 | pCi/L | 03/11/2010 | N001 | 3385.03 | - 3530.63 | 0.295 | | | # | 0.04 | 0.101 |
| Uranium-235 | pCi/L | 03/11/2010 | N001 | 3385.03 | - 3530.63 | -0.00902 | U | | # | 0.051 | 0.0272 |
| Uranium-238 | pCi/L | 03/11/2010 | N001 | 3385.03 | - 3530.63 | 0.173 | | | # | 0.04 | 0.0738 |

Ground Water Quality Data by Location (USEE100) FOR SITE SHL01, Shoal Site

REPORT DATE: 3/8/2011

Location: HC-6 WELL

| Parameter | Units | Sample Date | ID | Depth Range (Ft BLS) | Result | Lab | Qualifiers Data | QA | Detection Limit | Uncertainty |
|----------------------|-----------|-------------|------|----------------------|----------------|-----|-----------------|----|-----------------|----------------|
| Carbon-14 | pMC | 03/24/2010 | N002 | 1115.98 - 1232.3 | 17.49 | | | # | | 0.15 |
| Gross Alpha | pCi/L | 03/24/2010 | N001 | 1115.98 - 1232.3 | 25.7 | | | # | 1.8 | 4.62 |
| Gross Beta | pCi/L | 03/24/2010 | N001 | 1115.98 - 1232.3 | 9.57 | | | # | 3 | 2.49 |
| Iodine-129 | pCi/L | 03/24/2010 | N002 | 1115.98 - 1232.3 | 0.000000000056 | | | # | | 0.000000000014 |
| pH | s.u. | 03/24/2010 | N001 | 1115.98 - 1232.3 | 7.22 | | | # | | |
| Specific Conductance | umhos /cm | 03/24/2010 | N001 | 1115.98 - 1232.3 | 965 | | | # | | |
| Temperature | C | 03/24/2010 | N001 | 1115.98 - 1232.3 | 21.1 | | | # | | |
| Tritium | pCi/L | 03/24/2010 | N001 | 1115.98 - 1232.3 | 14.2 | U | | # | 300 | 177 |
| Uranium | mg/L | 03/24/2010 | N001 | 1115.98 - 1232.3 | 0.035 | | | # | 0.000029 | |
| Uranium-234 | pCi/L | 03/24/2010 | N001 | 1115.98 - 1232.3 | 14.4 | | | # | 0.048 | 2.47 |
| Uranium-235 | pCi/L | 03/24/2010 | N001 | 1115.98 - 1232.3 | 0.736 | | | # | 0.052 | 0.195 |
| Uranium-238 | pCi/L | 03/24/2010 | N001 | 1115.98 - 1232.3 | 12.2 | | | # | 0.048 | 2.11 |

Ground Water Quality Data by Location (USEE100) FOR SITE SHL01, Shoal Site

REPORT DATE: 3/8/2011

Location: HC-7 WELL

| Parameter | Units | Sample Date | ID | Depth Range (Ft BLS) | Result | Lab | Qualifiers Data | QA | Detection Limit | Uncertainty |
|-------------------------------|----------|-------------|------|----------------------|---------------|-----|-----------------|----|-----------------|----------------|
| Carbon-14 | pMC | 03/11/2010 | N002 | 1106.47 - 1223.6 | 10.96 | | | # | | 0.13 |
| Dissolved Oxygen | mg/L | 03/11/2010 | N001 | 1106.47 - 1223.6 | 2.05 | | | # | | |
| Gross Alpha | pCi/L | 03/11/2010 | N001 | 1106.47 - 1223.6 | 5.77 | | | # | 1.9 | 1.68 |
| Gross Alpha | pCi/L | 03/11/2010 | N003 | 1106.47 - 1223.6 | 7.65 | | | # | 1.7 | 1.94 |
| Gross Beta | pCi/L | 03/11/2010 | N001 | 1106.47 - 1223.6 | 6.12 | | J | # | 2.8 | 2.04 |
| Gross Beta | pCi/L | 03/11/2010 | N003 | 1106.47 - 1223.6 | 5.27 | | J | # | 3.6 | 2.41 |
| Iodine-129 | pCi/L | 03/11/2010 | N002 | 1106.47 - 1223.6 | 0.00000000003 | | | # | | 0.000000000013 |
| Oxidation Reduction Potential | mV | 03/11/2010 | N001 | 1106.47 - 1223.6 | -313 | | | # | | |
| pH | s.u. | 03/11/2010 | N001 | 1106.47 - 1223.6 | 8.03 | | | # | | |
| Specific Conductance | umhos/cm | 03/11/2010 | N001 | 1106.47 - 1223.6 | 1080 | | | # | | |
| Temperature | C | 03/11/2010 | N001 | 1106.47 - 1223.6 | 21.1 | | | # | | |
| Tritium | pCi/L | 03/11/2010 | N001 | 1106.47 - 1223.6 | 28.8 | U | | # | 300 | 182 |
| Tritium | pCi/L | 03/11/2010 | N003 | 1106.47 - 1223.6 | 44.4 | U | | # | 300 | 182 |
| Turbidity | NTU | 03/11/2010 | N001 | 1106.47 - 1223.6 | 2.53 | | | # | | |
| Uranium | mg/L | 03/11/2010 | N001 | 1106.47 - 1223.6 | 0.0074 | | | # | 0.000029 | |
| Uranium | mg/L | 03/11/2010 | N003 | 1106.47 - 1223.6 | 0.0073 | | | # | 0.000029 | |
| Uranium-234 | pCi/L | 03/11/2010 | N001 | 1106.47 - 1223.6 | 3.43 | | | # | 0.051 | 0.653 |

Ground Water Quality Data by Location (USEE100) FOR SITE SHL01, Shoal Site

REPORT DATE: 3/8/2011

Location: HC-7 WELL

| Parameter | Units | Sample | | Depth Range (Ft BLS) | Result | Qualifiers | | | Detection Limit | Uncertainty |
|-------------|-------|------------|------|-------------------------|--------|------------|------|----|--------------------|-------------|
| | | Date | ID | | | Lab | Data | QA | | |
| Uranium-234 | pCi/L | 03/11/2010 | N003 | 1106.47 - 1223.6 | 2.98 | | | # | 0.048 | 0.579 |
| Uranium-235 | pCi/L | 03/11/2010 | N001 | 1106.47 - 1223.6 | 0.132 | | | # | 0.022 | 0.0694 |
| Uranium-235 | pCi/L | 03/11/2010 | N003 | 1106.47 - 1223.6 | 0.242 | | | # | 0.052 | 0.1 |
| Uranium-238 | pCi/L | 03/11/2010 | N001 | 1106.47 - 1223.6 | 3.08 | | | # | 0.044 | 0.594 |
| Uranium-238 | pCi/L | 03/11/2010 | N003 | 1106.47 - 1223.6 | 2.59 | | | # | 0.034 | 0.511 |

Ground Water Quality Data by Location (USEE100) FOR SITE SHL01, Shoal Site

REPORT DATE: 3/8/2011

Location: HC-8 WELL

| Parameter | Units | Sample Date | ID | Depth Range (Ft BLS) | | Result | Lab | Qualifiers Data | QA | Detection Limit | Uncertainty |
|-------------------------------|----------|-------------|------|----------------------|-----------|----------------|-----|-----------------|----|-----------------|---------------|
| Carbon-14 | pMC | 03/10/2010 | N002 | 2294.44 | - 2410.92 | 12.26 | | | # | | 0.14 |
| Dissolved Oxygen | mg/L | 03/10/2010 | N001 | 2294.44 | - 2410.92 | 0.14 | | | # | | |
| Gross Alpha | pCi/L | 03/10/2010 | N001 | 2294.44 | - 2410.92 | 0.324 | U | | # | 1.3 | 0.753 |
| Gross Beta | pCi/L | 03/10/2010 | N001 | 2294.44 | - 2410.92 | 3.67 | | J | # | 2.2 | 1.51 |
| Iodine-129 | pCi/L | 03/10/2010 | N002 | 2294.44 | - 2410.92 | 0.000000000013 | | | # | | 0.00000000011 |
| Oxidation Reduction Potential | mV | 03/10/2010 | N001 | 2294.44 | - 2410.92 | -200 | | | # | | |
| pH | s.u. | 03/10/2010 | N001 | 2294.44 | - 2410.92 | 7.82 | | | # | | |
| Specific Conductance | umhos/cm | 03/10/2010 | N001 | 2294.44 | - 2410.92 | 830 | | | # | | |
| Temperature | C | 03/10/2010 | N001 | 2294.44 | - 2410.92 | 27.6 | | | # | | |
| Tritium | pCi/L | 03/10/2010 | N001 | 2294.44 | - 2410.92 | -74.4 | U | | # | 300 | 177 |
| Turbidity | NTU | 03/10/2010 | N001 | 2294.44 | - 2410.92 | 1.72 | | | # | | |
| Uranium | mg/L | 03/10/2010 | N001 | 2294.44 | - 2410.92 | 0.00025 | | | # | 0.000029 | |
| Uranium-234 | pCi/L | 03/10/2010 | N001 | 2294.44 | - 2410.92 | 0.187 | | | # | 0.05 | 0.0785 |
| Uranium-235 | pCi/L | 03/10/2010 | N001 | 2294.44 | - 2410.92 | 0 | U | | # | 0.021 | 0.0273 |
| Uranium-238 | pCi/L | 03/10/2010 | N001 | 2294.44 | - 2410.92 | 0.101 | | J | # | 0.044 | 0.056 |

Ground Water Quality Data by Location (USEE100) FOR SITE SHL01, Shoal Site

REPORT DATE: 3/8/2011

Location: MV-1 WELL

| Parameter | Units | Sample Date | ID | Depth Range (Ft BLS) | | Result | Lab | Qualifiers Data | QA | Detection Limit | Uncertainty |
|-------------------------------|----------|-------------|------|----------------------|-----------|----------------|-----|-----------------|----|-----------------|---------------|
| Carbon-14 | pMC | 03/11/2010 | N002 | 1572.73 | - 1726.54 | 23.52 | | | # | | 0.17 |
| Dissolved Oxygen | mg/L | 03/11/2010 | N001 | 1572.73 | - 1726.54 | 0.3 | | | # | | |
| Gross Alpha | pCi/L | 03/11/2010 | N001 | 1572.73 | - 1726.54 | 11.3 | | | # | 1.4 | 2.29 |
| Gross Beta | pCi/L | 03/11/2010 | N001 | 1572.73 | - 1726.54 | 10.1 | | | # | 2.6 | 2.35 |
| Iodine-129 | pCi/L | 03/11/2010 | N002 | 1572.73 | - 1726.54 | 0.000000000078 | | | # | | 0.00000000012 |
| Oxidation Reduction Potential | mV | 03/11/2010 | N001 | 1572.73 | - 1726.54 | -245 | | | # | | |
| pH | s.u. | 03/11/2010 | N001 | 1572.73 | - 1726.54 | 7.67 | | | # | | |
| Specific Conductance | umhos/cm | 03/11/2010 | N001 | 1572.73 | - 1726.54 | 730 | | | # | | |
| Temperature | C | 03/11/2010 | N001 | 1572.73 | - 1726.54 | 22.2 | | | # | | |
| Tritium | pCi/L | 03/11/2010 | N001 | 1572.73 | - 1726.54 | 1.81 | U | | # | 300 | 181 |
| Turbidity | NTU | 03/11/2010 | N001 | 1572.73 | - 1726.54 | 1.74 | | | # | | |
| Uranium | mg/L | 03/11/2010 | N001 | 1572.73 | - 1726.54 | 0.021 | | | # | 0.000029 | |
| Uranium-234 | pCi/L | 03/11/2010 | N001 | 1572.73 | - 1726.54 | 9.06 | | | # | 0.046 | 1.57 |
| Uranium-235 | pCi/L | 03/11/2010 | N001 | 1572.73 | - 1726.54 | 0.454 | | | # | 0.041 | 0.139 |
| Uranium-238 | pCi/L | 03/11/2010 | N001 | 1572.73 | - 1726.54 | 7.64 | | | # | 0.056 | 1.34 |

Ground Water Quality Data by Location (USEE100) FOR SITE SHL01, Shoal Site

REPORT DATE: 3/8/2011

Location: MV-2 WELL

| Parameter | Units | Sample Date | ID | Depth Range (Ft BLS) | | Result | Lab | Qualifiers Data | QA | Detection Limit | Uncertainty |
|-------------------------------|-----------|-------------|------|----------------------|-----------|----------------|-----|-----------------|----|-----------------|---------------|
| Carbon-14 | pMC | 03/11/2010 | N002 | 1819.87 | - 1990.64 | 32.9 | | | # | | 0.2 |
| Dissolved Oxygen | mg/L | 03/11/2010 | N001 | 1819.87 | - 1990.64 | 0.31 | | | # | | |
| Gross Alpha | pCi/L | 03/11/2010 | N001 | 1819.87 | - 1990.64 | 13.8 | | | # | 1 | 2.62 |
| Gross Beta | pCi/L | 03/11/2010 | N001 | 1819.87 | - 1990.64 | 9.16 | | | # | 1.9 | 1.99 |
| Iodine-129 | pCi/L | 03/11/2010 | N002 | 1819.87 | - 1990.64 | 0.000000000165 | | | # | | 0.00000000019 |
| Oxidation Reduction Potential | mV | 03/11/2010 | N001 | 1819.87 | - 1990.64 | -195 | | | # | | |
| pH | s.u. | 03/11/2010 | N001 | 1819.87 | - 1990.64 | 7.65 | | | # | | |
| Specific Conductance | umhos /cm | 03/11/2010 | N001 | 1819.87 | - 1990.64 | 497 | | | # | | |
| Temperature | C | 03/11/2010 | N001 | 1819.87 | - 1990.64 | 22.5 | | | # | | |
| Tritium | pCi/L | 03/11/2010 | N001 | 1819.87 | - 1990.64 | 20.9 | U | | # | 300 | 182 |
| Turbidity | NTU | 03/11/2010 | N001 | 1819.87 | - 1990.64 | 2.08 | | | # | | |
| Uranium | mg/L | 03/11/2010 | N001 | 1819.87 | - 1990.64 | 0.021 | | | # | 0.000029 | |
| Uranium-234 | pCi/L | 03/11/2010 | N001 | 1819.87 | - 1990.64 | 9.66 | | | # | 0.058 | 1.66 |
| Uranium-235 | pCi/L | 03/11/2010 | N001 | 1819.87 | - 1990.64 | 0.347 | | | # | 0.063 | 0.116 |
| Uranium-238 | pCi/L | 03/11/2010 | N001 | 1819.87 | - 1990.64 | 8.32 | | | # | 0.051 | 1.44 |

Ground Water Quality Data by Location (USEE100) FOR SITE SHL01, Shoal Site

REPORT DATE: 3/8/2011

Location: MV-3 WELL

| Parameter | Units | Sample Date | ID | Depth Range (Ft BLS) | | Result | Lab | Qualifiers Data | QA | Detection Limit | Uncertainty |
|-------------------------------|-----------|-------------|------|----------------------|-----------|----------------|-----|-----------------|----|-----------------|----------------|
| Carbon-14 | pMC | 03/12/2010 | N002 | 1463.59 | - 1634.75 | 21.96 | | | # | | 0.17 |
| Dissolved Oxygen | mg/L | 03/12/2010 | N001 | 1463.59 | - 1634.75 | 0.26 | | | # | | |
| Gross Alpha | pCi/L | 03/12/2010 | N001 | 1463.59 | - 1634.75 | 2.63 | | J | # | 1.2 | 1.03 |
| Gross Beta | pCi/L | 03/12/2010 | N001 | 1463.59 | - 1634.75 | 4.12 | | J | # | 2.1 | 1.52 |
| Iodine-129 | pCi/L | 03/12/2010 | N002 | 1463.59 | - 1634.75 | 0.000000000065 | | | # | | 0.000000000016 |
| Oxidation Reduction Potential | mV | 03/12/2010 | N001 | 1463.59 | - 1634.75 | -263 | | | # | | |
| pH | s.u. | 03/12/2010 | N001 | 1463.59 | - 1634.75 | 7.72 | | | # | | |
| Specific Conductance | umhos /cm | 03/12/2010 | N001 | 1463.59 | - 1634.75 | 753 | | | # | | |
| Temperature | C | 03/12/2010 | N001 | 1463.59 | - 1634.75 | 21.9 | | | # | | |
| Tritium | pCi/L | 03/12/2010 | N001 | 1463.59 | - 1634.75 | -75.5 | U | | # | 300 | 178 |
| Turbidity | NTU | 03/12/2010 | N001 | 1463.59 | - 1634.75 | 1.76 | | | # | | |
| Uranium | mg/L | 03/12/2010 | N001 | 1463.59 | - 1634.75 | 0.0042 | | | # | 0.000029 | |
| Uranium-234 | pCi/L | 03/12/2010 | N001 | 1463.59 | - 1634.75 | 1.7 | | | # | 0.046 | 0.349 |
| Uranium-235 | pCi/L | 03/12/2010 | N001 | 1463.59 | - 1634.75 | 0.0502 | U | | # | 0.05 | 0.0435 |
| Uranium-238 | pCi/L | 03/12/2010 | N001 | 1463.59 | - 1634.75 | 1.42 | | | # | 0.054 | 0.302 |

SAMPLE ID CODES: 000X = Filtered sample (0.45 µm). N00X = Unfiltered sample. X = replicate number.

LAB QUALIFIERS:

- * Replicate analysis not within control limits.
- > Result above upper detection limit.
- A TIC is a suspected aldol-condensation product.

B Inorganic: Result is between the IDL and CRDL. Organic: Analyte also found in method blank.
C Pesticide result confirmed by GC-MS.
D Analyte determined in diluted sample.
E Inorganic: Estimate value because of interference, see case narrative. Organic: Analyte exceeded calibration range of the GC-MS.
H Holding time expired, value suspect.
I Increased detection limit due to required dilution.
J Estimated
N Inorganic or radiochemical: Spike sample recovery not within control limits. Organic: Tentatively identified compound (TIC).
P > 25% difference in detected pesticide or Aroclor concentrations between 2 columns.
U Analytical result below detection limit.
W Post-digestion spike outside control limits while sample absorbance < 50% of analytical spike absorbance.
X,Y,Z Laboratory defined qualifier, see case narrative.

DATA QUALIFIERS:

| | | | | | |
|---|--|---|---|---|------------------|
| F | Low flow sampling method used. | G | Possible grout contamination, pH > 9. | J | Estimated value. |
| L | Less than 3 bore volumes purged prior to sampling. | Q | Qualitative result due to sampling technique. | R | Unusable result. |
| U | Parameter analyzed for but was not detected. | X | Location is undefined. | | |

QA QUALIFIER:

Validated according to quality assurance guidelines.

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Static Water Level Data

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STATIC WATER LEVELS (USEE700) FOR SITE SHL01, Shoal Site
REPORT DATE: 1/14/2011

| Location Code | Flow Code | Top of Casing Elevation (Ft) | Measurement Date | Time | Depth From Top of Casing (Ft) | Water Elevation (Ft) |
|---------------|-----------|------------------------------|------------------|------|-------------------------------|----------------------|
| HC-1 | | 5309.21 | 03/24/2010 | | 1063.35 | 4245.86 |
| HC-2 | | 5347.12 | 03/24/2010 | | 1086.15 | 4260.97 |
| HC-3 | | 5081.52 | 03/24/2010 | | 1179.35 | 3902.17 |
| HC-4 | | 5260.9 | 03/11/2010 | | 1011.8 | 4249.1 |
| HC-5 | | 5247.37 | 03/11/2010 | | 1367.8 | 3879.57 |
| HC-6 | | 5228.68 | 03/24/2010 | | 970.05 | 4258.63 |
| HC-7 | | 5229.72 | 03/11/2010 | | 970.02 | 4259.7 |
| HC-8 | | 5259.91 | 03/10/2010 | | 1370.79 | 3889.12 |
| MV-1 | | 5257.54 | 03/11/2010 | | 993.25 | 4264.29 |
| MV-2 | | 5266.62 | 03/11/2010 | | 1002.29 | 4264.33 |
| MV-3 | | 5261.5 | 03/12/2010 | | 976.4 | 4285.1 |

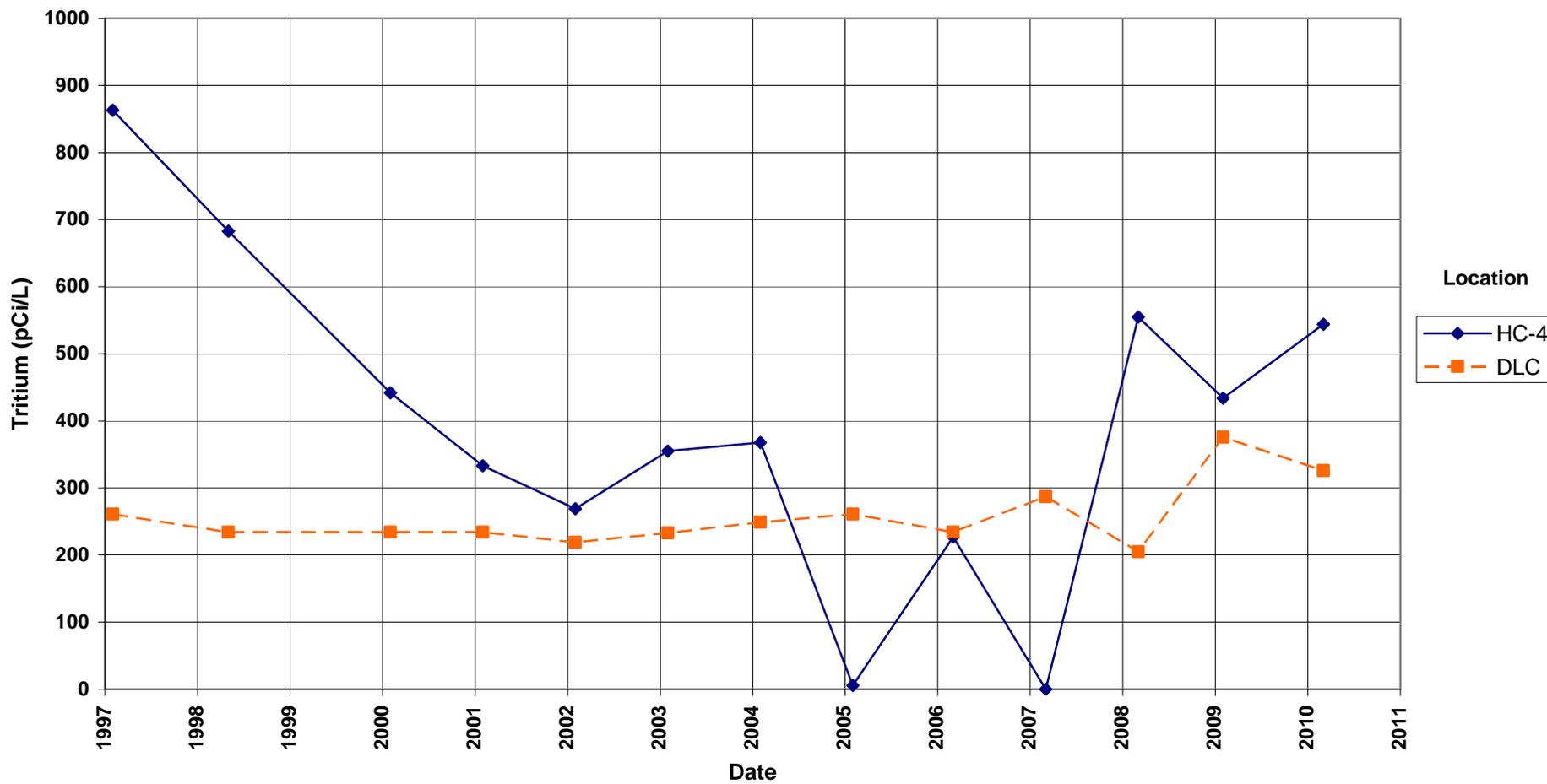
FLOW CODES: B BACKGROUND C CROSS GRADIENT D DOWN GRADIENT F OFF SITE
 N UNKNOWN O ON SITE U UPGRADIENT

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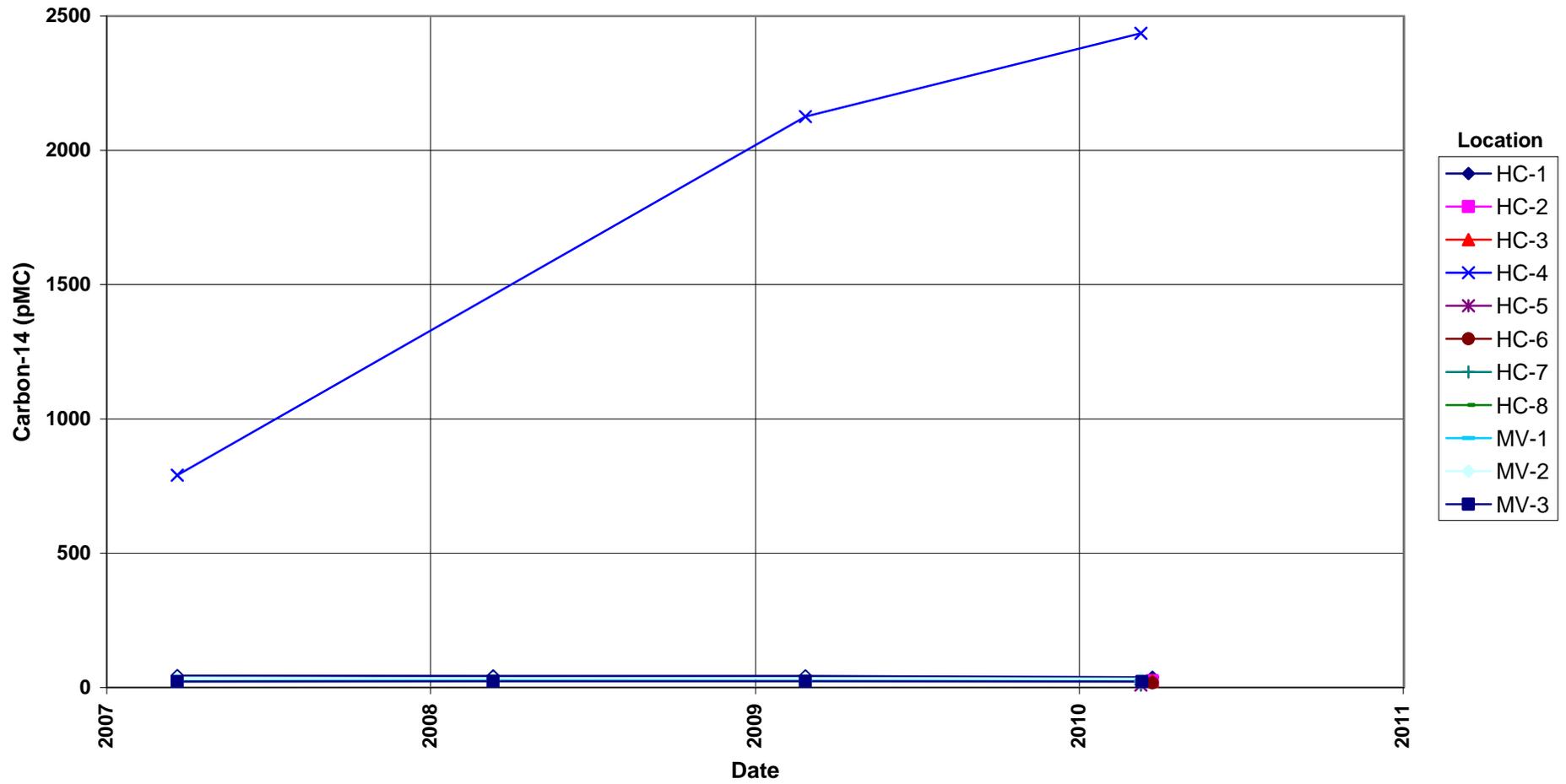
Time-Concentration Graphs

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Shoal Site
Tritium Concentration
DLC - Decision Level Concentration



Shoal Site Carbon-14 Concentration



Attachment 3
Sampling and Analysis Work Order

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established 1959

Task Order LM00-502
Control Number 10-0357

February 8, 2010

U.S. Department of Energy
Office of Legacy Management
ATTN: Mark Kautsky
Site Manager
2597 B ¼ Road
Grand Junction, CO 81503

SUBJECT: Contract No. DE-AM01-07LM00060, Stoller
February 2010 Environmental Sampling at Shoal, Nevada

REFERENCE: Task Order LM00-502-07-621-402, Shoal, NV Site

Dear Mr. Kautsky:

The purpose of this letter is to inform you of the upcoming sampling event at Shoal, Nevada. Enclosed are the map and tables specifying sample locations and analytes for routine monitoring at the Shoal site. Water quality data will be collected from monitor wells at this site as part of the routine environmental sampling currently scheduled to begin the week of March 8, 2010.

The following list shows the locations scheduled for sampling during this event.

Monitor Wells

| | | | | | | |
|------|------|------|------|------|------|------|
| HC-1 | HC-3 | HC-5 | HC-7 | MV-1 | MV-2 | MV-3 |
| HC-2 | HC-4 | HC-6 | HC-8 | | | |

All samples will be collected as directed in the *Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites*.

If you have any questions, please call me at (970) 248-6419.

Sincerely,

Rick Findlay
Site Lead

RF/lcg/dc
Enclosures (3)

Mark Kautsky
Control Number 10-0357
Page 2

cc: rc-grand.junction

cc: (electronic)
Cheri Bahrke, Stoller
Steve Donovan, Stoller
Bev Gallagher, Stoller
Lauren Goodknight, Stoller
EDD Delivery

Sampling Frequencies for Locations at Shoal, Nevada

| Location ID | Quarterly | Semiannually | Annually | Biennially | Not Sampled | Notes |
|-------------------------|-----------|--------------|----------|------------|-------------|----------------------|
| Monitoring Wells | | | | | | |
| H-2 | | | | | X | Download transducers |
| H-3 | | | | | X | Download transducers |
| HC-1 | | | X | | | Download transducers |
| HC-2 | | | X | | | Download transducers |
| HC-3 | | | X | | | Download transducers |
| HC-4 | | | X | | | Download transducers |
| HC-5 | | | X | | | Download transducers |
| HC-6 | | | X | | | Download transducers |
| HC-7 | | | X | | | Download transducers |
| HC-8 | | | X | | | Download transducers |
| MV-1 | | | X | | | Download transducers |
| MV-2 | | | X | | | Download transducers |
| MV-3 | | | X | | | Download transducers |
| Piezometers | | | | | | |
| MV-1PZ | | | | | X | Download transducers |
| MV-2PZ | | | | | X | |
| MV-3PZ | | | | | X | Download transducers |

Sampling conducted in March

Constituent Sampling Breakdown

| Site | Shoal Site | | Required Detection Limit (mg/L) | Analytical Method | Line Item Code |
|------------------------------------|-------------|------------------|---------------------------------------|----------------------------------|-------------------|
| Analyte | Groundwater | Surface Water | | | |
| Approx. No. Samples/yr | 11 | | | | |
| <i>Field Measurements</i> | | | | | |
| Alkalinity | | | | | |
| Dissolved Oxygen | X | | | | |
| Redox Potential | X | | | | |
| pH | X | | | | |
| Specific Conductance | X | | | | |
| Turbidity | X | | | | |
| Temperature | X | | | | |
| <i>Laboratory Measurements</i> | | | | | |
| Aluminum | | | | | |
| Ammonia as N (NH3-N) | | | | | |
| Bromide | | | | | |
| Calcium | | | | | |
| Carbon-14 | X | | NA | Accelerator Mass Spectrometry | LMR-16 |
| Chloride | | | | | |
| Chromium | | | | | |
| Gross Alpha | X | | 2 pCi/L | EPA 900.0 | GPC-A-001 |
| Gross Beta | | | | | |
| Iodine-129 | X | | NA | Accelerator Mass Spectrometry | LMR-17 |
| Iron | | | | | |
| Lead | | | | | |
| Magnesium | | | | | |
| Manganese | | | | | |
| Molybdenum | | | | | |
| Nitrate + Nitrite as N (NO3+NO2)-N | | | | | |
| Potassium | | | | | |
| Radium-226 | | | | | |
| Radium-228 | | | | | |
| Selenium | | | | | |
| Silica | | | | | |
| Sodium | | | | | |
| Strontium | | | | | |
| Total Dissolved Solids | | | | | |
| Total Organic Carbon | | | | | |
| Tritium | X | | 400 pCi/L | Liquid Scintillation | LSC-A-001 |
| Tritium, enriched | | | | | |
| Uranium-234, -235, -238 | X | | 1 pCi/L | Alpha Spectrometry | ASP-A-024 |
| Uranium | X | | 0.0001 | SW-846 6020 | LMM-02 |
| Vanadium | | | | | |
| Zinc | | | | | |
| Total No. of Analytes | 6 | 0 | | | |

Note: All analyte samples are considered unfiltered unless stated otherwise. All private well samples are to be unfiltered. The total number of analytes does not include field parameters.

Attachment 4 Trip Report

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Memorandum

Control Number N/A

DATE: April 12, 2010
TO: Rick Findlay
FROM: Jeff Price
SUBJECT: Trip Report (LTHMP Sampling)

Site: Shoal, Nevada

Dates of Sampling Event: March 9-12, 24, 2010

Team Members: Joe Trevino, Jeff Price (March 9-12), Brad Lyles and John Healey (DRI March 4).

Number of Locations Sampled: 11 on-site wells.

Locations Not Sampled/Reason: None.

Quality Control Sample Cross Reference: The following is the false identification assigned to the quality control sample (no QC for RIN 10032895):

| False Id | True Id | Sample Type | Associated Matrix | Ticket Number |
|----------|---------|-------------|-------------------|---------------|
| 2894 | HC-7 | Duplicate | Groundwater | IEW-283 |

RIN Number Assigned: Samples were assigned to RIN 10032895 (U of A), RIN 10032894 (ALS).

Sample Shipment: Samples were shipped on April 1, 2010.

Trip Summary: Joe Trevino and Jeff Price drove from the Grand Junction office to Fallon on March 9, 2010. Sampling activities began on March 10, which included a round of site-wide water level measurements. Wells HC-4, HC-5, HC-7, HC-8, MV-1, MV-2, and MV-3 were sampled during the period of March 10-12. Wells HC-1, HC-2, HC-3, and HC-6 were sampled on March 24 by Brad Lyles and John Healey.

All samples will be analyzed for tritium, carbon-14, iodine-129, total uranium, isotopic uranium, and gross alpha/beta. The total uranium, tritium, isotopic uranium, and gross alpha/beta are analyzed by ALS Laboratory Group; the carbon-14 and iodine-129 are analyzed by the University of Arizona.

(JP/lcg)

cc: (electronic)

Mark Kautsky, DOE

Paul Darr, Stoller

Steve Donovan, Stoller

Jack Duray, Stoller

Rex Hodges, Stoller

Mark Plessinger, Stoller

EDD Delivery

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