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# Saltstone 3QCY12 TCLP Results

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# EXECUTIVE SUMMARY

A Saltstone waste form was prepared in the Savannah River National Laboratory (SRNL) from a Tank 50H sample and Z-Area premix material for the third quarter of calendar year 2012 (3QCY12). After a 34 day cure, samples of the saltstone were collected, and the waste form was shown to meet the South Carolina Hazardous Waste Management Regulations (SCHWMR) R.61-79.261.24 and R.61-79.268.48(a) requirements for a nonhazardous waste form with respect to RCRA metals and underlying hazardous constituents. These analyses met all quality assurance specifications of USEPA SW-846.

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| | |
|---|---|
| 3QCY12 | Third Quarter Calendar Year 2012 |
| ARP | Actinide Removal Process |
| B&W TSG-RACL | B & W Technical Services Group-Radioisotope and Analytical Chemistry Laboratory |
| CVAA | Cold Vapor Atomic Absorption |
| DL | Detection Limit |
| DSS-HT | Decontaminated Salt Solution Hold Tank |
| EPA | Environmental Protection Agency |
| ESS-WP | Environmental Services Section – Waste Programs |
| ETP | Effluent Treatment Project |
| ICP-MS | Inductively Coupled Plasma – Mass Spectrometer |
| ISWLF | Industrial Solid Waste Landfill |
| LCS | Laboratory Control Sample |
| MCL | Maximum Contaminant Level |
| MCU | Modular Caustic Side Solvent Extraction Unit |
| MS | Matrix Spike |
| MSD | Matrix Spike Duplicate |
| QL | Quantitation Limit |
| RCRA | Resource Conservation and Recovery Act |
| RL | Reporting Limit |
| RPD | Relative Percent Differences |
| SCDHEC | South Carolina Department of Health and Environmental Control |
| SCHWMR | South Carolina Hazardous Waste Management Regulations |
| SDF | Saltstone Disposal Facility |
| SDG | Sample Delivery Group |
| SPF | Saltstone Production Facility |
| SRNL | Savannah River National Laboratory |
| SWLF | Solid Waste Landfill |
| TCLP | Toxic Characteristic Leaching Procedure |
| UHC | Underlying Hazardous Constituent |
| UTS | Universal Treatment Standards |

## 1.0 Introduction

The Saltstone Production Facility (SPF) receives waste from Tank 50H for treatment. Based upon a review of the daily waste transfer reports for the third quarter of the 2012 calendar year (3QCY12), Tank 50H accepted transfers of approximately 11 kgal from the Effluent Treatment Project (ETP), approximately 1.3 kgal from 211H, approximately 1.3 kgal from 221H, approximately 84 kgal from the Actinide Removal Process / Modular Caustic Side Solvent Extraction Unit (ARP/MCU) Decontaminated Salt Solution Hold Tank (DSS-HT), and approximately 12 kgal from other sources.

The Saltstone Grout Sampling plan provides the South Carolina Department of Health and Environmental Control (SCDHEC) with the chemical and physical characterization strategy for the salt solution which is to be disposed of in the Z-Area Solid Waste Landfill (SWLF) [i]. During operation, samples were collected from Tank 50H and grout samples prepared to determine the non-hazardous nature of the grout to meet the requirements of the South Carolina Hazardous Waste Management Regulations (SCHWMR) R.61-79.261.24(b) and R.61-79.268.48(a).

Savannah River National Laboratory (SRNL) was asked to prepare saltstone from samples of Tank 50H obtained July 17, 2012 during 3QCY12 to verify the non-hazardous nature of the grout. The samples were cured and shipped to Babcock & Wilcox Technical Services Group-Radioisotope and Analytical Chemistry Laboratory (B&W TSG-RACL) to perform the Toxic Characteristic Leaching Procedure (TCLP) [ii] and subsequent extract analysis on saltstone samples for the analytes required for the quarterly saltstone sample. In addition to the eight toxic metals—arsenic, barium, cadmium, chromium, mercury, lead, selenium and silver—analytes included the underlying hazardous constituents (UHC) antimony, beryllium, nickel, and thallium, which could not be eliminated from analysis by process knowledge [iii]. B&W TSG-RACL provided subsamples to GEL Laboratories, LLC for analysis for the UHCs benzene, phenols, and total and amenable cyanide.

## 2.0 Experimental Procedure

This section is a summary of the approach taken to prepare and characterize the saltstone samples. The saltstone sample preparation was performed at SRNL. Saltstone sample characterization was performed at both the B&W TSG-RACL facility in Lynchburg, Virginia and the GEL laboratory facility in Charleston, South Carolina. Figure 2-1 is a flowchart of the steps taken to prepare and characterize the saltstone samples.

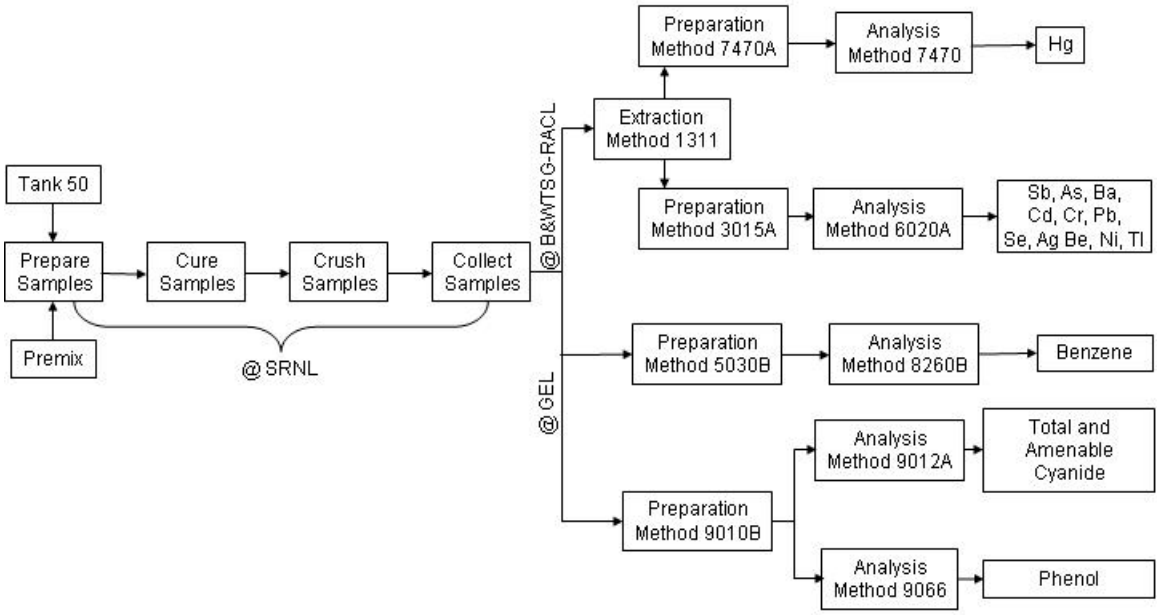


**Figure 2-1 Flowchart of Saltstone Preparation and Analysis**

2.1 Saltstone Preparation

Saltstone preparation was performed at SRNL. The weight percent solids data used for the TCLP sample were taken from the quarterly Waste Acceptance Criteria (WAC) analyses performed on Tank 50H [iv]. Table 2-1 lists the concentrations of TCLP metals of interest in the salt solution from the WAC analysis [iv] for the sample. As shown in Table 2-1, the contents of Tank 50H exceed the regulatory limits for antimony, cadmium, chromium, mercury, and phenol, and therefore must be treated and disposed of in a non-hazardous waste form. Table 2-2 contains the parameters used to prepare the TCLP sample[v].

Saltstone samples for TCLP were prepared with the Tank 50H blended salt solution and a premix of cement, slag, and fly ash. Figure 2-2 shows the formulation used to prepare these samples. The admixtures were added to the salt solution first and then the dry feeds were added to the liquid. The salt solution, admixtures and premix materials were mixed for approximately three minutes using a paddle blade mixer. The mixing was paused for approximately five seconds after the initial 30 seconds of mixing to allow entrained air to escape from the grout. After the saltstone slurry was mixed, it was cast into a polyethylene zip top bag. The bag was laid flat and the air was expelled prior to sealing. The sample was cured flat in a polypropylene bag to facilitate the size reduction step needed to conform to the particle size requirements of the TCLP method.

After curing for not less than 28 days[i]— 34 days for the 3QCY12 sample, the saltstone was removed from the container and a portion of the saltstone was crushed and sieved to particles less than 0.9 centimeters (3/8 inch) as prescribed by Section 7.13 of the TCLP method [ii]. The crushed saltstone was packaged into containers provided by Environmental Services Section – Waste Programs (ESS-WP). After the saltstone has been crushed, sieved and packaged, the sample is deemed "collected." [vi] ESS-WP retrieved the samples from SRNL and transported them to B&W TSG-RACL for extraction and analysis. B&W TSG-RACL repackaged a portion of the sample

and shipped the subsample to GEL Laboratories to perform analysis for the UHCs benzene, phenol and total and amenable cyanide.

**Table 2-1.** Sample Results of TCLP Metals from Tank 50H WAC Analysis

| - | **Sample Results (mg/L)** [iv] | **Regulatory Limits (mg/L)** |
|---|---|---|
| - | **3Q12** | **Toxicity**[a] |
| **As** | <0.0936 | 5 |
| **Ba** | <0.826 | 100 |
| **Cd** | <1.13 | 1 |
| **Cr** | 40.9 | 5 |
| **Pb** | 0.185 | 5 |
| **Hg** | 31.0 | 0.2 |
| **Se** | <0.187 | 1 |
| **Ag** | <1.48 | 5 |
| **--** | -- | **UHC**[b] |
| **Sb** | <30.8 | 1.15 |
| **Be** | <0.204 | 1.22 |
| **Ni** | <3.15 | 11 |
| **Tl** | <0.0484 | 0.20 |
| **--** | **(mg/kg)** | **(mg/kg)** |
| **benzene** | <0.150 | 10 |
| **phenol** | <10.0 | 6.2 |
| **cyanide (total)** | NM | 590 |
| **cyanide (amenable)** | NM | 30 |

NM – Not Measured
[a] SCHWMR R.61-79.261.24(b) "Characteristic of Toxicity."
[b] SCHWMR R.61-79.268.48 "Universal Treatment Standards."

**Table 2-2** Customer Recommended Values for Preparation of TCLP Sample

| **Parameter** | **3QCY12** |
|---|---|
| **Water-to-Premix ratio** | 0.59 |
| **(Daratard 17) gal/Ton premix** | 0 |
| **(Dow Corning Q2-3183A) gal/Ton premix** | 0.20 |

**Saltstone Mix Data Sheet**

| MIX # 0142 | | | Date: 8/13/2012 |
|---|---|---|---|
| **Material** | **%** | **WT%** | **Grams** |
| **Waste Solution:** Tank 50 7/17/12 3Q12<br>**Wt% Solids #** 27.38<br>**Grams Water** 181.62 | | 44.89 | 250.10 |
| **Admixture:** Q2 Antifoam* | | 0.03 | 0.08 |
| **Admixture:** | | | 0.00 |
| **Admixture:** | | | |
| **Premix** | | 55.10 | 307.00 |
| **Cement (% of Premix)** | 10 | 5.51 | 30.70 |
| **Slag (% of Premix)** | 45 | 24.79 | 138.15 |
| **Fly Ash (% of Premix)** | 45 | 24.79 | 138.15 |
| **Total** | 100 | 100.01 | 557.18 |
| **Water to Premix Ratio** | 0.59 | | |

**Calculations:**
Use CBO fly ash

**From customer:**
0.59 W/P
0.11 gpm Q2
33 TPH Dry Feeds
NO Daratard

Q2 is diluted Q2 amount . In plant, diluted 1:4 in water.
* Actual amount of Q2 added to sample is 0.078 g. Q2 was diluted to a 1:4 in water and 100 uL pipette was used to add the diluted Q2 to the sample.

**Figure 2-2** Data sheet for the Saltstone mix used to prepare the 3QCY12 TCLP sample [v]

2.2 Saltstone Testing

Saltstone testing was performed by B&W TSG-RACL and GEL Laboratories, LLC. Activities associated with the 3QCY12 saltstone samples were:

At B&W TSG-RACL,

- TCLP extraction,
- TCLP leachate digestion, and
- digested leachate analysis.

At GEL

- extraction of solid subsamples shipped from B&W TSG-RACL and
- extract analyses.

2.2.1 *B&W TSG-RACL*

The samples arrived at B&W TSG-RACL on September 21, 2012 for analysis. Shipping container temperatures were documented to be 15 ºC. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage.

The Metals method 6020A analysis was performed on an X-7 Series Inductively Coupled Plasma – Mass Spectrometer (ICP-MS). The Metals method 7470A analysis was performed on a Leman PC 200 II instrument which consists of a cold vapor atomic absorption spectrometer (CVAA) set to detect mercury at a wavelength of 253.7 nm.

A portion of the leachate from the third quarter sample was used as the quality control sample (matrix spike) for the ICP-MS and CVAA.

2.2.2 *GEL Laboratories, LLC*

The subsamples arrived at GEL Laboratories, LLC on September 27, 2012 for analysis. Shipping container temperatures were documented to be within EPA specifications. All sample containers arrived without any visible signs of tampering or breakage. The chain of custody documentation was not relinquished. The method 8260B analysis was performed with an HP6890/HP5973 gas chromatograph/mass spectrometer using a Restek RTX-624 column. Methods 9012A and 9066 were performed using a Lachat QuickChem FIA+ 8000 Series.

## 3.0 Results and Discussion

The results summarized in the following tables are from the data package for these analyses.[vii] Data are presented in these results as reported by the vendors.

3.1 B&W TSG-RACL

Analytes detected but at concentrations too low to determine quantitatively have been flagged with the “B” qualifier. Analytes that were not detected have been flagged with the “U” qualifier. In addition to the results, Detection Limits (DLs) have been given. The DL is the minimum concentration of an analyte that can be identified, measured, and reported with 99% confidence that the concentration is above zero. The DL values given in the table are the results from this study adjusted for sample dilution. The Quantitation Limit (QL) is the lowest level at which an analyte may be accurately and reproducibly measured.

Results in Table 3-1, when compared with the DLs and QLs, can be organized into three groups:

- Beryllium, silver, cadmium, and thallium were not detected in the leachate.
- Antimony, nickel, and lead were detected below the QLs.
- Arsenic, barium, chromium, mercury, and selenium were detected in the leachates at concentrations above the QLs.

**Table 3-1** TCLP Leachates RCRA Metal Concentrations, DLs, and QLs

| - | Methods | Sample Limits (µg/L) | Sample Limits (µg/L) | Sample Results (µg/L) | Footnotes |
|---|---|---|---|---|---|
| **SRS ID** | - | - | - | **3Q12** | - |
| **B&W ID** | - | **DL** | **QL** | **1209013-01REI-A** | - |
| **Sb** | 3015, 6020A | 0.556 | 10.000 | 8.44 | B |
| **As** | 3015, 6020A | 0.556 | 5.000 | 43.9 | - |
| **Ba** | 3015, 6020A | 5.56 | 50.000 | 212 | - |
| **Cd** | 3015, 6020A | 0.556 | 5.000 | 0.556 | U |
| **Cr** | 3015, 6020A | 0.556 | 10.000 | 11.5 | - |
| **Pb** | 3015, 6020A | 0.556 | 5.000 | 1.13 | B |
| **Hg** | 7470A | 0.029 | 0.200 | 11.6 | - |
| **Se** | 3015, 6020A | 5.56 | 25.000 | 62.4 | - |
| **Ag** | 3015, 6020A | 0.556 | 5.000 | 0.556 | U,N |
| **Be** | 3015, 6020A | 0.556 | 5.000 | 0.556 | U |
| **Ni** | 3015, 6020A | 0.556 | 5.000 | 1.88 | B |
| **Tl** | 3015, 6020A | 0.556 | 5.000 | 0.556 | U |

- Indicates a location in the table for which an entry would not be appropriate.
[U] Final concentration of the analyte was found to be below the DL.
[B] Analyte is present at a concentration above the DL but less than the QL
[N] Associated Matrix Spike is outside percent recovery quality control criteria.

3.1.1 *Comparison of Results to Regulatory Limits*

Results from the TCLP leachate analyses from Table 3-1 are replicated in Table 3-2 — with units changed from µg/L to mg/L—along with the regulatory limits that may be applied to the Saltstone waste form. Table 3-2 includes the SCHWMR R.61-79.261.24(b) limits above which a waste is to be considered characteristically hazardous for toxicity and the SCHWMR R.61-79.268.48 Universal Treatment Standards (UTS) for hazardous constituents. In addition, Maximum Contaminant Levels (MCL's) from the State Primary Drinking Water Regulations [i] also have been included in Table 3-2. By comparing the sample results and the regulatory limits the following conclusions can be made:

- The saltstone waste form was not characteristically hazardous for toxicity.
- The leachate metals concentrations were below the Nonwastewater Standard for all of the metals.
- Barium, beryllium, cadmium, chromium, lead, silver, and thallium were below the MCL's.
- Antimony, arsenic, mercury, and selenium exceeded the MCL.
- Nickel does not have a MCL.

The MCL is the limit for a constituent in drinking water. The MCL is used to determine the class of landfill required. At 10x MCL, a Class 3 landfill is required. The SDF vaults are permitted as a Class 3 landfill. None of the analyses were greater than 10x the MCL.

**Table 3-2** Saltstone TCLP Results and Corresponding Regulatory Limits

| - | Sample Results (mg/L) | Footnotes | Regulatory Limits | | |
|---|---|---|---|---|---|
| **SRS ID** | **3QCY12** | | **Toxicity[a]** | **UTS[b]** | **MCL[c]** |
| **B&W ID** | **1209013-01RE1-A** | | **(mg/L)** | **Nonwastewater Standard (mg/L TCLP)** | **(mg/L)** |
| **Sb** | 8.44E-03 | B | - | 1.15 | 0.006 |
| **As** | 4.39E-02 | - | 5 | 5 | 0.010 |
| **Ba** | 2.12E-01 | - | 100 | 21 | 2 |
| **Cd** | 5.56E-04 | U | 1 | 0.11 | 0.005 |
| **Cr** | 1.15E-02 | - | 5 | 0.6 | 0.1 |
| **Pb** | 1.13E-03 | B | 5 | 0.75 | 0.015[d] |
| **Hg** | 1.16E-02 | - | 0.2 | 0.025 | 2E-03 |
| **Se** | 6.24E-02 | - | 1 | 5.7 | 0.05 |
| **Ag** | 5.56E-04 | U,N | 5 | 0.14 | 0.1[e] |
| **Be** | 5.56E-04 | U | - | 1.22 | 4E-03 |
| **Ni** | 1.88E-03 | B | - | 11 | - |
| **Tl** | 5.56E-04 | U | - | 0.20 | 2E-03 |

- Indicates a location in the table for which an entry would not be appropriate.
[U] Final concentration of the analyte was found to be below the DL.
[B] Analyte is present at a concentration above the DL but less than the QL.
[N] Associated Matrix Spike is outside percent recovery quality control criteria
[a] R.61-79.261.24(b) "Characteristic of Toxicity."
[b] R.61-79.268.48 "Universal Treatment Standards."
[c] SCDHEC State Primary Drinking Water Regulation Maximum Contaminant Levels.
[d] Lead action level from SCDHEC 61-58.11.B.
[e] Secondary drinking water parameter.

### 3.1.2 *Quality Assurance*

The following subsections include summaries of results from blanks, laboratory control samples, matrix spikes, and matrix spike duplicates. The data package also includes data for calibration verifications, interference checks, and serial dilutions. [vii]

*Blanks*

Blank concentrations are given in Table 3-3. In the TCLP Blank, nickel, and selenium were present at levels above the quantitation limit. Arsenic, barium, chromium, and lead were present at levels above their respective DLs, but below their respective QLs. Antimony, beryllium, cadmium, mercury, silver, and thallium were found to be below the DLs.

**Table 3-3** TCLP Blank

| Analyte | TCLP Blank (µg/L) | Footnotes |
|---|---|---|
| **Sb** | 0.556 | U |
| **As** | 2.89 | B |
| **Ba** | 6.42 | B |
| **Cd** | 0.556 | U |
| **Cr** | 1.68 | B |
| **Pb** | 2.97 | B |
| **Hg** | 0.029 | U |
| **Se** | 34.4 | - |
| **Ag** | 0.556 | U,N |
| **Be** | 0.556 | U |
| **Ni** | 11.3 | - |
| **Tl** | 0.556 | U |

[B] Analyte is present at a concentration above the DL but less than the QL.
[U] Final concentration of the analyte was found to be below the DL.

*Laboratory Control Samples*

Results from the Laboratory Control Sample (LCS) are given in Table 3-4. The LCS post spike recoveries met USEPA SW-846 acceptance limits for all elements except for mercury. Laboratory Control Samples are clean aqueous solutions analyzed to assure integrity of the analytical technique exclusive of matrix effects.

**Table 3-4** RCRA Metal Laboratory Control Sample

| Analyte | Laboratory Control (µg /L) | | Recovery (%) |
|---|---|---|---|
| - | **True** | **Measured** | (80 – 120) |
| **Sb** | 273 | 248 | 91 |
| **As** | 386 | 352 | 91 |
| **Ba** | 1440 | 1300 | 90 |
| **Cd** | 350 | 310 | 89 |
| **Cr** | 79 | 74 | 94 |
| **Pb** | 1480 | 1350 | 91 |
| **Hg** | 6.2 | 9.15 | 147.6 |
| **Se** | 747 | 654 | 88 |
| **Ag** | 286 | 261 | 91 |
| **Be** | 177 | 156 | 88 |
| **Ni** | 2370 | 2190 | 92 |
| **Tl** | 822 | 704 | 86 |

*Matrix Spikes*

Results from analysis of the matrix spike (MS) and matrix spike duplicates (MSD) are given in Table 3-5. The initial concentrations in the second column are reproduced from Table 3-1. These results show that:

- The percent recoveries (%R) obtained from the MS analyses met the recommended quality control acceptance criteria for percent recoveries (75 – 125%) for all applicable analytes except silver.
- The percent recoveries (%R) obtained from the MSD analyses met the recommended quality control acceptance criteria for percent recoveries (75 – 125%) for all applicable analytes except silver.
- The RPD(s) between the MS and MSD met the acceptance limits (0 – 20%).

**Table 3-5** TCLP Leachates RCRA Metal Matrix Spike and Duplicate Results

| Analyte | Initial Concentrations (µg /L) | | | Spiked Sample (µg /L) | | Recovery (%) | | RPD (%) |
|---|---|---|---|---|---|---|---|---|
| - | B&W ID 1112002-01RE1-A | Footnotes | Spike Added | Spike | Spike Duplicate | Spike | Spike Duplicate | - |
| **Sb** | 8.44 | B | 978 | 993 | 992 | 101 | 101 | 0.10 |
| **As** | 43.9 | - | 490 | 565 | 559 | 106 | 105 | 1.07 |
| **Ba** | 212 | - | 2450 | 2760 | 2780 | 104 | 105 | 0.72 |
| **Cd** | 0.556 | U | 245 | 221 | 222 | 90 | 91 | 0.45 |
| **Cr** | 11.5 | - | 978 | 957 | 962 | 97 | 97 | 0.52 |
| **Pb** | 1.13 | B | 490 | 542 | 541 | 110 | 110 | 0.18 |
| **Hg** | 11.6 | - | 4.90 | 16.7 | 16.9 | 104.1 | 108.2 | 1.2 |
| **Se** | 62.4 | - | 245 | 310 | 315 | 101 | 103 | 1.60 |
| **Ag** | 0.556 | U | 245 | 69 | 60 | 28 | 24 | 13.95 |
| **Be** | 0.556 | U | 245 | 227 | 227 | 93 | 93 | 0.00 |
| **Ni** | 1.88 | B | 978 | 874 | 878 | 89 | 90 | 0.46 |
| **Tl** | 0.556 | U | 245 | 262 | 262 | 107 | 107 | 0.00 |

[U] Final concentration of the analyte was found to be below the DL.
[B] Analyte is present at a concentration above the DL but less than the QL.

*Calibration Information*

- All initial calibration requirements have been met for this sample delivery group (SDG).
- All Contract Required Reporting Limit requirement(s) met the referenced advisory control limits with the exception of selenium.
- All interference check samples associated with this SDG met the established acceptance criteria.

- All continuing calibration blanks bracketing this batch met the established acceptance criteria except for thallium and selenium which were >3 times the current IDL.

- All continuing calibration verifications bracketing this SDG met the acceptance criteria.

3.2 GEL Laboratories, LLC

GEL reports general chemistry analyses on the organics in the sample. If the concentrations of benzene, phenol, and cyanide are not detected or are below the detection limit (<MDL) the result is reported as "ND". Analytes detected but at concentrations too low to determine quantitatively have been flagged with the "J" qualifier. Analytes that were not detected have been flagged with the "U" qualifier. In addition to the results, Detection Limits (DLs) and Reporting Limits (RLs) have been given. The DL is the minimum concentration of an analyte that can be identified, measured, and reported with 99% confidence that the concentration is above zero. The DL values given in Table 3-6 are the results from this study adjusted for sample dilution. The RL is the lowest level at which an analyte may be accurately and reproducibly quantitated.

**Table 3-6** Total Concentrations, DLs, and RLs

| - | **Methods** | **Sample Limits (µg/kg)** | **Sample Limits (µg/kg)** | **Sample Results* (µg/kg)** |
|---|---|---|---|---|
| **SRS ID** | **-** | **-** | **-** | **3QCY12** |
| **GEL ID** | **-** | **DL** | **RL** | **312044001** |
| **Benzene** | 5030, 8260B | 30.0 | 100 | $^{U}$ND |
| **Phenol** | 9010B, 9066 | 78.6 | 236 | $^{J}$82.1 |
| **Cyanide (total)** | 9010B, 9012A | 75.9 | 227 | 7860 |
| **Cyanide (amenable)** | 9012A | 159 | 477 | $^{U}$ND |

- Indicates a location in the table for which an entry would not be appropriate.
$^{J}$ Analyte is present at a concentration above the DL but less than the RL.
$^{U}$ Final concentration of the analyte was found to be below the DL.

3.2.1 *Comparison of Results to Regulatory Limits*

Results from the analyses from Table 3-6 are replicated in Table 3-7 — with units changed from µg/kg to mg/kg — along with the regulatory limits that may be applied to the Saltstone waste form. Table 3-7 includes the SCHWMR R.61-79.268.48 Universal Treatment Standards (UTS) for hazardous constituents. By comparing the sample results and the regulatory limits in Table 3-7, it can be concluded that for all of the analytes, the concentrations were below the Nonwastewater Standard.

**Table 3-7** Saltstone Total Results and Corresponding Regulatory Limits

| - | Sample Results (mg/kg) | Regulatory Limits (mg/kg) |
|---|---|---|
| **SRS ID** | 3QCY12 | **UTS[b]** |
| **GEL ID** | 312044001 | |
| **Benzene** | [U]ND | 10 |
| **Phenol** | [J]0.0821 | 6.2 |
| **Cyanide (total)** | 7.860 | 590 |
| **Cyanide (amenable)** | [U]ND | 30 |

- Indicates a location in the table for which an entry would not be appropriate.
[J] Analyte is present at a concentration above the DL but less than the RL.
[U] Final concentration of the analyte was found to be below the DL.
[b] R.61-79.268.48 "Universal Treatment Standards".
ND – Not Detectable

3.2.2 Quality Assurance

The following subsections include summaries of results from blanks, laboratory control samples, matrix spikes, and matrix spike duplicates. The data package for this task also includes data for calibration verifications, interference checks, and serial dilutions.

*Blanks*

Blank concentrations are given in Table 3-8. Amenable to chlorination cyanide is determined by subtracting the results determined in the chlorinated cyanide test from those determined in the total cyanide test. The Method Blanks analyzed with this Sample Delivery Group (SDG) met the acceptance criteria.

**Table 3-8** Method Blank

| Analyte | Method Blank (µg/kg) |
|---|---|
| **Benzene** | [U]ND |
| **Phenol** | [U]ND |
| **Cyanide (total)** | [U]ND |
| **Cyanide (amenable)** | -- |

- Indicates a location in the table for which an entry would not be appropriate.
[U] Final concentration of the analyte was found to be below the DL.
ND – Not Detectable

*Laboratory Control Samples*

Results from the Laboratory Control Sample (LCS) are given in Table 3-9. All LCS recoveries met the vendor laboratory acceptance. Laboratory Control Samples are clean aqueous solutions analyzed to assure integrity of the analytical technique exclusive of matrix effects.

**Table 3-9** Laboratory Control Sample

| Analyte | Laboratory Control (µg /kg) | | | Recovery (%) | |
|---|---|---|---|---|---|
| - | True | Measured | | - | |
| **Benzene** | 50.0 | 44.1 | | 88.2 | |
| **Phenol** | 2500 | 2530 | 2310 | 101 | 92.2 |
| **Cyanide (total)** | 28100 | 29500 | 30800 | 105 | 109 |
| **Cyanide (amenable)** | -- | -- | | -- | |

- Indicates a location in the table for which an entry would not be appropriate.

*Matrix Spikes*

Total cyanide is the only method where a matrix spike would be applicable. However, GEL reported that due to the highly radioactive and/or hazardous matrix of samples in the batch, matrix QC was not performed.

*Calibration Information*

- All initial calibration requirements have been met for this sample delivery group (SDG).
- All Contract Required Detection Limit standard(s) met the referenced advisory control limits.
- All interference check samples associated with this SDG met the established acceptance criteria.
- All continuing calibration blanks bracketing this batch met the established acceptance criteria.
- All continuing calibration verifications bracketing this SDG met the acceptance criteria.

## 4.0 Conclusions

Preparation of the 3QCY12 saltstone samples and the subsequent TCLP analyses showed that:

- The saltstone waste form disposed of in the Saltstone Disposal Facility in 3QCY12 was not characteristically hazardous for toxicity.
- The concentrations of the eight RCRA metals and UHCs identified as possible in the saltstone waste form were present at levels below the UTS.
- Analyses met all quality assurance specifications of USEPA SW-846.

The saltstone waste form placed in the Saltstone Disposal Facility in 3QCY12 met the SCHWMR R.61-79.261.24(b) RCRA metals requirements for a nonhazardous waste form. The TCLP leachate concentrations were less than 10x the MCLs in SCDHEC Regulations R.61-107.19, Part I C.

The saltstone waste form placed in the Saltstone Disposal Facility in 3QCY12 met the R.61-79.268.48(a) non wastewater treatment standards.

Analyses met all USEPA SW-846 quality assurance requirements. All other limits on holding times, laboratory control sample recoveries, matrix spike recoveries, serial dilution results when

applicable, calibration verification, and interference checks were within the quality assurance requirements

## 5.0 References

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