FINAL
TECHNICAL MEMORANDUM
SUBAREA 3, ROUND 1, SOIL SAMPLE RESULTS
SANTA SUSANA FIELD LABORATORY SITE
AREA IV RADIOLOGICAL STUDY

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SUBJECT: Subarea 3, Round 1 Soil Sample Results

CONTRACT NO: EP-S7-05-05
TASK ORDER NO: 0038

1.0 INTRODUCTION

HydroGeoLogic, Inc. (HGL) is conducting a comprehensive radiological characterization study of Area IV and the Northern Buffer Zone (NBZ) at the Santa Susana Field Laboratory (SSFL) site in Ventura County, California. This work is being executed under U.S. Environmental Protection Agency (USEPA) Region 7 Architect and Engineering Services Contract EP-S7-05-05, Task Order 0038. The technical lead on the project is USEPA Region 9.

As part of the radiological study, surface and subsurface soil samples were collected from locations identified from geophysical surveys, gamma scanning, historical aerial photographs and findings of the historical site assessment. Sampling efforts in the study area were divided into Subareas. This Technical Memorandum documents the soil sampling activities, analytical results, and conclusions of the Subarea 3 round 1 soil sampling. The primary objective of the Subarea 3 soil sampling effort is to evaluate the nature of potential radionuclide contamination in soil that may have resulted from past nuclear operations. This objective was achieved through the collection and analysis of surface, subsurface, and drainage soil samples.

The approach for round 1 soil sampling was to identify potential sample locations from the lines of evidence listed above, prepare a Field Sampling Plan (FSP) Addendum for the subarea, present the FSP, and review and finalize proposed locations with USEPA's SSFL Technical Stakeholder Workgroup.

2.0 SOIL SAMPLING ACTIVITIES

2.1 Soil Sample Location Placement and Utility Clearance

A total of 15 surface and subsurface samples were proposed in the Subarea 3 FSP Addendum (HGL, 2011a). Table 1 below summarizes the proposed samples and lists the samples actually collected. Figure 1 illustrates soil sample locations (proposed and collected). Deviations from the FSP Addendum for Soil Sampling are discussed below.

Table 1
Summary of Planned and Collected Samples by Group

Group	Surface		Subsurface		Total	
	Planned	Collected	Planned	Collected	Planned	Collected
1	2	2	13	11	15	13

The proposed sampling locations were discussed during a technical review meeting held on August 17, 2011 with members of USEPA's SSFL Technical Stakeholder Workgroup consisting of representatives of Department of Energy (DOE), the State of California Department of Toxic Substances Control (DTSC), The Boeing Company, USEPA, and the community.

After the locations were finalized with the Technical Stakeholder Workgroup, proposed sampling locations were marked in the field using a SPS 852 handheld Trimble global positioning system (GPS) and magnetic survey spikes. Before sampling activities commenced, utility clearances were performed at each location by Underground Service Alert (Dig Alert) and a private utility locator.

2.2 Sample Collection

Surface soil and drainage samples were collected using a stainless steel trowel or shovel. Subsurface samples were collected using a Geoprobe™ 6600 Series direct-push technology (DPT) unit or a hand auger. Soil samples were collected in accordance with the procedures detailed in the Final FSP for Soil Sampling (HGL, 2012a), and the Subarea 3 FSP Addendum (HGL, 2011a). Soil cores were logged and the boring logs are provided in Attachment 2. A total of 13 surface, subsurface, and drainage soil samples were collected within Subarea 3 from September 26 to November 7, 2011.

During the August 17, 2011 technical review meeting recommendations and action items including those on the topic of Likely Decontamination and Decommissioning Zones (LD&DZ) and Likely Chemical Remediation Zones (LCRZ) were discussed. A small debris area south of Building 204 was identified by DOE and DTSC as a LCRZ (HGL, 2011a). USEPA understands that most, if not all, surface soil and concrete rubble may be excavated and removed from areas identified as LCRZ. Therefore, USEPA placed a reduced number of surface and subsurface samples around the perimeter of these zones to better define the

potential extent of contamination. In accordance with the USEPA's role under the Administrative Order on Consent (AOC) for Remedial Action (DTSC, 2010) agreement between DTSC and DOE for the SSFL site, USEPA will conduct confirmation soil sampling to verify that site remediation goals have been achieved at all such remediation zones. If the LCRZs will not be excavated or removed, a data gap may exist. Additional investigations in the future may be necessary to address the potential data gap. These follow-on efforts are not included in the current scope of work and will be accomplished using additional external funding.

2.3 Deviations from the Field Sampling Plan Addendum

Table 2 summarizes the deviations from the FSP Addendum and details why the planned sample was not collected. Subsurface soil samples were not collected from two locations due to insufficient soil volume as a result of shallow refusal.

Table 2
Summary of Subsurface Samples Not Collected

Sample Location	Sample Identification	Justification
3-00002	80004	Refusal at 1.33 feet bgs on sandstone with hand auger.
3-00008	80010	Refusal at 1.33 feet bgs on sandstone with Geoprobe™.

Note:
bgs – below ground surface

2.4 Soil Boring Summary

A total of 13 subsurface borings were attempted, of which one boring was advanced to the proposed depth of 10 feet below ground surface (bgs) (HGL, 2011a). Of the 12 borings that were not completed to the proposed depth, eight borings could only be advanced to a depth less than 5.0 feet bgs and four could only be advanced to a depth greater than or equal to 5.0 feet bgs but less than 10.0 feet bgs. Refusal was encountered in one of the borings due to rubble present in fill material and in 11 borings because bedrock was encountered before the proposed depth was reached. When shallow refusal was encountered two additional attempts were made, within a 5-foot radius, to get down to the proposed depth. If, after the third attempt, the proposed depth could not be reached a sample was collected where possible.

Soil samples were classified and described in accordance with the FSP for Soil Sampling (HGL, 2012a). The most common soil types observed were sand, silty sand, silt, sandy clay, silty clay, and clay. A total of seven locations encountered fill material in all or a portion of the boring. The fill material consisted of soils that exhibited a mottled texture and frequently contained anthropogenic material such as concrete, asphalt, or glass. Native soil was encountered below fill material in all seven of the borings. A total of six borings consisted of only native soil. A summary of the Boring Log information is presented in Table A.1 and the boring logs are provided in Attachment 2.

3.0 ROUND 1 SOIL ANALYTICAL RESULTS

Analyses of soil samples were conducted in accordance with the draft revised Final Quality Assurance Project Plan (QAPP) for Soil Sampling which was finalized in March 2012 (HGL, 2012b). All soil samples were analyzed for the default suite of analytes presented in Table 2.3 of the FSP for Soil Sampling (HGL, 2012a).

3.1 Radiological Trigger Levels

Analytical results were compared to the radiological trigger levels (RTL) established specifically for the Area IV SSFL Radiological Study. RTLs are reference soil concentrations for the radionuclides of concern for the Radiological Study. Analytical results below each RTL are considered uncontaminated or non-actionable, and results that exceed RTL are actionable and may represent contamination particularly for radionuclides originating from man-made sources. The process used to derive the RTLs is presented in the Technical Memorandum, Radiological Trigger Levels (HGL, 2011b), and is briefly summarized below.

During the SSFL Radiological Background Study (HGL, 2011d), soil samples were collected from off-site locations representing the two geological formations present at the SSFL Site: the Chatsworth Formation and the Santa Susana Formation. Based on the results of the background samples Background Threshold Values (BTV) were developed, which are the upper concentration limits of radionuclides of concern from off-site locations. BTVs were calculated from 149 samples. For a single sample, in many instances the laboratory minimum detectable concentrations (MDC) are greater than the respective BTV. Hence, the RTL for a particular radionuclide was established at the greater of BTV or MDC values plus an additional method uncertainty (for comparison of individual sample results to the RTL). Using this approach, it is assured that an RTL exceedance is greater than locally determined background concentrations.

3.2 Analytical Results

A total of 13 samples were collected during the Subarea 3, round 1 soil sampling event. All of the soil samples collected were analyzed for the SSFL default suite as listed in Table 2.3 of the FSP for Soil Sampling (HGL, 2012a).

Analytical results presented in the following subsections are described in three different ways:

1. The number of physical locations where a sample(s) was collected that contained at least one radionuclide that exceeded RTLs,
2. The number of samples containing radionuclides that exceeded the RTLs, and
3. The number of radionuclides that exceeded RTLs.

One location can have multiple samples containing multiple radionuclides that exceed RTLs. For example, a single physical location could have a surface sample that has three exceedances and a subsurface sample that has four exceedances. Therefore, the results would be presented as follows: one location (two samples) containing seven radionuclides that exceeded RTLs.

Analytical results of soil samples collected during the round 1 sampling event reported no site-related man-made radionuclide RTL exeedances in any of the 13 samples. There were no locations where naturally occurring radionuclides, also known as Naturally Occurring Radioactive Material (NORM), were detected above the RTLs.

Figure 1 presents the locations of all the soil samples collected during round 1. A summary of the analytical results is provided in Table A.2 (Attachment 1).

3.3 Radiological Trigger Levels Data Quality Gap Result Evaluations

A data quality gap is a sample result for which the MDC is greater than the RTL, but the reported activity is below the RTL, indicating an indeterminate result that may or may not exceed the RTL. The elevated MDC could be the result of sample matrix or spectral interference or, in some cases, laboratory issues that prevent accurate quantification of sample activity to a level low enough to support the RTLs.

The use of RTLs is predicated on the assumption that analytical results will be of known and predictable quality, with the uncertainty constrained to a level that supports direct comparison of results to RTLs. It is understood that the reported analytical uncertainty is sufficiently reliable to be considered, however the magnitude of that uncertainty may not always allow direct comparison of the activity to the RTL, as discussed above. In many cases, the reported activity is sufficiently below the RTL (more than the associated, elevated 2σ total propagated uncertainty [TPU]) to decide that the result does not represent an exceedance. For these cases, results are removed from further data quality gap assessment.

Remaining data quality gap results are evaluated on a case-by-case basis to determine whether further action is warranted or beneficial. Out of 13 samples with 588 total results, there are no such data quality gaps in Subarea 3.

4.0 QUALITY ASSURANCE/QUALITY CONTROL SAMPLES

In addition to the environmental samples collected, quality control samples were collected as described in the QAPP (HGL, 2012b). The results of the quality control samples collected and their affect on data usability are described in the following subsections.

4.1 Field Duplicates

Field duplicate soil samples were collected at a frequency of 1 per 20 samples (5 percent). One field duplicate sample was collected during the round 1 sampling event. The field duplicate evaluation criterion includes an additional 1σ uncertainty factor of 10 percent to allow for heterogeneity of co-located, but non-homogenized, field samples.

The comparability of a field duplicate result to that of the original sample is assessed by evaluating the duplicate Z-score comparison (Z_{DUP}). The Z-score is a statistical test that indicates how many standard deviations an observation is from the expected value. The Z-score is defined in the QAPP (HGL, 2012b), and the Z_{DUP} is calculated as follows:

$$Z_{DUP} = \frac{|X_s - X_d|}{\sqrt{{u_s}^2 + {u_d}^2}}$$

where:

Xs = activity of the sample
Xd = activity of the duplicate
u_s = combined standard (1σ) uncertainty of the sample
u_d = combined standard (1σ) uncertainty of the duplicate

Higher Z_{DUP} scores indicate greater disparity between the sample and the duplicate results. A Z_{DUP} score of 2.0, for example, indicates that the duplicate result differs from the sample result by twice the overall uncertainty of the two results. Hence, a Z_{DUP} score of 1.96 (the warning level) indicates that the two results are statistically equivalent, at the 95 percent confidence interval. A Z_{DUP} score of 2.58 (the exceedance level) indicates that the two results are statistically equivalent, at the 99 percent confidence interval.

A Z_{DUP} evaluation is performed on each paired set of analytes for which parent and duplicate data are reported. This quality assurance/quality control assessment is performed on the validated laboratory results approved and accepted by the project, and recorded in the project database as of May 7, 2012. Subsequent modifications to the approved data or the project database may not be reflected in this assessment.

Round 1 field duplicate sample data includes 84 results from 42 sample/duplicate result pairs. Those results included several analytes which were subsequently removed from consideration, and thus were not evaluated. In addition, any results that were rejected by data validation were removed from consideration. Finally, analytes that are simply inferred from previously reported results, such as barium (Ba)-137m, which is inferred from the reported cesium (Cs)-137 results, are considered redundant and have also been removed from consideration.

The Z_{DUP} evaluation of the remaining 37 qualified pairs follows:

- 35 results (94.6 percent) were within the expected 95 percent confidence interval for this evaluation, with Z_{DUP} less than 1.96;
- One result (2.7 percent) was between the 95 percent and 99 percent confidence interval with Z_{DUP} at or above 1.96, but below 2.58;
- One result (2.7 percent) exceeded the 99 percent confidence interval, with Z_{DUP} values at or above 2.58.

The Z_{DUP} statistical test predicts that, in a homogeneous sample/duplicate pairing, 4 percent of reported Z_{DUP} scores (approximately one result in this Z_{DUP} set) will be in the warning range between 1.96 and 2.58. In addition, 1 percent (less than one result in this Z_{DUP} set) are expected to exceed a Z_{DUP} score of 2.58.

A review of the Z_{DUP} warnings and exceedances, and the associated laboratory data, has been conducted and the following observations are made regarding the collection and analysis of field duplicate samples:

- The single exceedance, i.e. Z_{DUP} score at or above 2.58, is related to the sample/duplicate pair 80001/80016, in which the Cs-134 Z_{DUP} score is 3.81. A review of the associated gamma spectrometry data shows that no characteristic photopeak for Cs-134 is detected in either sample. The Z_{DUP} excursion is believed to be attributable to a systematic underestimate of the reported uncertainty, which has been previously observed in the project data, and which is particularly prevalent in, but not limited to, gamma spectrometry results for which the analyte of interest is not detected.
- The remaining Z_{DUP} exceedances involve Z_{DUP} scores at or below 4.81. In addition to the apparent underestimate of the reported uncertainty, discussed above, these exceedances may also indicate a degree of heterogeneity in the field that has not otherwise been accounted for in this assessment.
- The single Z_{DUP} score in the warning range, between 1.96 and 2.58, is within the expected frequency and do not appear to represent a data quality excursion.

It is observed that, in some cases, an excursion is reported when both the sample and the duplicate results are below their associated critical values (L_C), and are considered non-detects. It has been previously observed that, in some cases, the laboratory's reported uncertainty, particularly for non-detected gamma-emitting radionuclides, may be slightly underestimated.

The frequency and magnitude of the Z_{DUP} excursions, and a review of the individual results and associated laboratory data, do not indicate significant concerns regarding the quality or usability of the data. A summary of the parent and associated duplicate sample results is provided Table A.3.

4.2 Equipment Rinsate and Source Water Blanks

Equipment rinsate blanks were collected at a frequency of one per day, for each type of sampling equipment used per field team. Equipment rinsate blanks were collected in accordance with the FSP for Soil Sampling (HGL, 2012a) and the QAPP (HGL, 2012b). A total of five rinsate samples and one source water sample were collected during the round 1 sampling event. Each sample was tested for isotopic uranium, as a surrogate indicator of cross-contamination. Any results that were rejected for laboratory quality reasons would have been removed from consideration, as in the evaluation of field duplicate samples, above. In this data set, however, no sample results were rejected. Rinsate and source water samples were also analyzed for tritium (H-3) if it was included in the analytical suite for samples collected that day. This equipment rinsate assessment is performed on the validated laboratory results approved and accepted by the project, and recorded in the project database as of April 27, 2012. Subsequent modifications to the approved data or the project database may not be reflected in this assessment.

In all cases, the samples were analyzed by the laboratory as-received and the Total activity is reported.

Round 1 rinsate and source water samples include 30 total results, from which 15 data pairs were evaluated by Z-score duplicate comparison. The Z_{DUP} scores are summarized below.

- 14 results (93.3 percent) were within the expected 95 percent confidence interval for this evaluation, with Z_{DUP} less than 1.96;
- 1 result (6.7 percent) was between the 95 percent and 99 percent confidence interval with Z_{DUP} at or above 1.96, but below 2.58;
- Zero results (0.0 percent) exceeded the 99 percent confidence interval, with Z_{DUP} values at or above 2.58.

As with the field duplicates, the Z_{DUP} statistical test predicts that approximately 4 percent of reported Z_{DUP} scores will be in the range between 1.96 and 2.58. The one result in that warning range is within the expected frequency, given the small size of the dataset.

The evaluation of equipment blank results indicates that the decontamination of the field sampling equipment is acceptable and that there is no evidence of sample cross-contamination from the sampling equipment that would adversely affect the quality or usability of the reported field sample data. A summary of the rinsate and source water blank analytical results are provided in Table A.4 (Attachment 1).

5.0 SUMMARY OF FINDINGS

No radionuclide concentrations exceeding RTLs were detected in any of the 13 samples collected from Subarea 3. There will be no Round 2 soil sampling activities for Subarea 3.

6.0 REFERENCES

Department of Toxic Substances Control, 2010. Administrative Order On Consent For Remedial Action, Santa Susana Field Laboratory, Simi Hills, Ventura County, California. December.

HydroGeoLogic, Inc., 2011a. Subarea 3 Addendum to Field Sampling Plan for Soil Sampling, Area IV Radiological Study, Santa Susana Field Laboratory, Ventura County, California. September.

HydroGeoLogic, Inc., 2011b. Technical Memorandum, Radiological Trigger Levels, Santa Susana Field Laboratory, Area IV Radiological Study. December.

HydroGeoLogic, Inc., 2011c. Final Radiological Background Study Report, Santa Susana Field Laboratory, Ventura County. October.

HydroGeoLogic, Inc., 2012a. Final Field Sampling Plan for Soil Sampling, Area IV Radiological Study, Santa Susana Field Laboratory, Ventura County, California. March.

HydroGeoLogic, Inc., 2012b. Final Quality Assurance Project Plan for Soil Sampling, Area IV Radiological Study, Santa Susana Field Laboratory, Ventura County, California. March.

LIST OF TABLES

FIGURE

LIST OF ATTACHMENTS

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FIGURE

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HGL-Technical Memorandum, Subarea 3, Round 1,
Soil Sample Results, SSFL-Ventura County, California

Figure 1
Round 1 Sample Locations
Subarea 3, Round 1
Santa Susana Field Laboratory

U.S. EPA Region 9

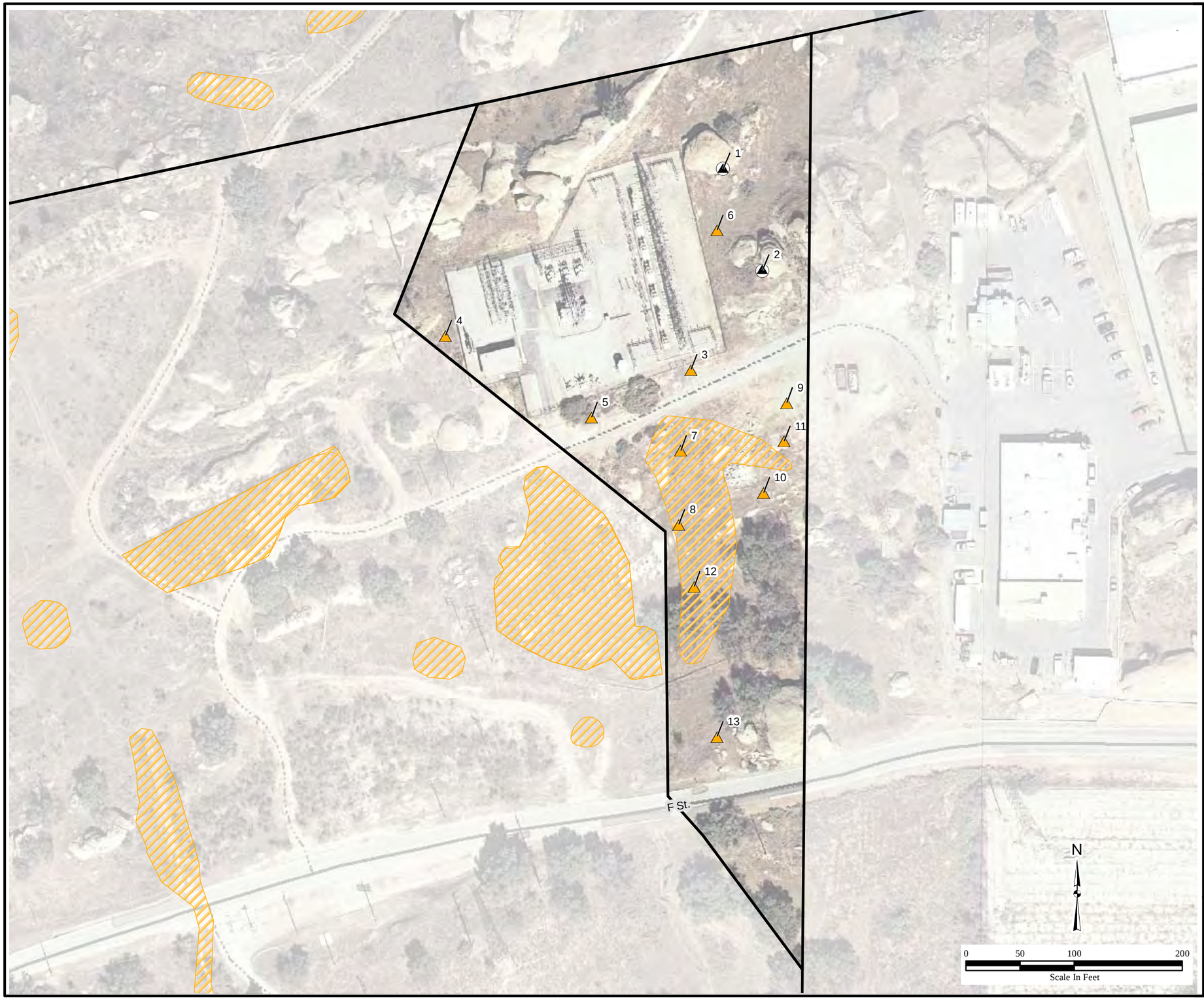
Legend

Round 1 Sample Location

- Subsurface
- Surface Subsurface

Likely Remediation Zones

- Chemical
- Subareas



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ATTACHMENT 1

Tables

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LIST OF ATTACHMENT TABLES

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Table A.1
Boring Log Summary
Subarea 3, Round 1

Sample Location	Surface Collection Interval (ft bgs)	Subsurface Collection Interval (ft bgs)	Soil Description	Total Depth (ft bgs)	Refusal Depth (ft bgs)	Northing[1]	Easting[1]
3-00001	0.0-0.5	1.0-3.3	SM	3.3	3.3	1909405.657	6349342.440
3-00002	0.0-0.5	NA	SM	1.3	1.3	1909311.875	6349378.659
3-00003	NA	1.0-2.5	SM/SP	2.5	2.5	1909220.141	6349312.681
3-00004	NA	1.0-5.0	SM/SP	8.3	8.3	1909251.570	6349085.758
3-00005	NA	1.0-5.0	SM/SP	8.5	8.5	1909176.204	6349220.590
3-00006	NA	1.0-5.0	ML/SM/SP	10.0	NA	1909349.045	6349336.805
3-00007	NA	1.0-3.5	SM/ML/SP	4.0	4.0	1909145.481	6349303.192
3-00008	NA	NA	SM	1.3	1.3	1909077.136	6349301.405
3-00009	NA	1.0-5.0	SM/SP	5.0	5.0	1909189.680	6349401.179
3-00010	NA	1.0-4.0	SM/SP	4.0	4.0	1909106.611	6349379.945
3-00011	NA	1.0-3.0	SM/ML	7.0	7.0	1909154.092	6349398.916
3-00012	NA	1.0-4.0	ML/SM	4.0	4.0	1909019.839	6349315.563
3-00013	NA	1.0-1.8	SM	1.8	1.8	1908881.337	6349336.911

Notes:

[1]Northing and easting measured using NAD83 SPZ5 US Feet

bgs-below ground surface

ft-feet

ML-silt

NA-not applicable

SM-silty sand

SP-poorly graded sand

Table A.2
Analytical Results Summary
Subarea 3, Round 1

Sample Location	Sample ID	Analyte Name	Activity	MDC	TPU	RTL	Sample Depth (feet bgs)
3-00001	80001	Ac-227	0.0659 U	0.178	0.0546	0.217	0.00 - 0.50
3-00001	80001	Am-241	-0.0024 UJ	0.0209	0.004	0.0454	0.00 - 0.50
3-00001	80001	Sb-125	0.0147 U	0.0421	0.013	0.354	0.00 - 0.50
3-00001	80001	Bi-212	0.775	0.127	0.0745	2.15	0.00 - 0.50
3-00001	80001	Bi-214	0.922	0.0273	0.0438	1.59	0.00 - 0.50
3-00001	80001	Cd-113m	11.9 U	119	38.3	3030	0.00 - 0.50
3-00001	80001	Cs-134	-0.0014 U	0.0146	0.0049	0.0864	0.00 - 0.50
3-00001	80001	Cs-137	0.101	0.0151	0.0085	0.207	0.00 - 0.50
3-00001	80001	Co-60	-0.0053 U	0.0162	0.0051	0.028	0.00 - 0.50
3-00001	80001	Cm-243/244	0.0033	0.009	0.0033	0.0443	0.00 - 0.50
3-00001	80001	Eu-152	-0.0077 U	0.042	0.0147	0.0566	0.00 - 0.50
3-00001	80001	Eu-154	-0.0731 UJ	0.0893	0.0328	0.15	0.00 - 0.50
3-00001	80001	Eu-155	0.0643 JS	0.0654	0.0252	0.231	0.00 - 0.50
3-00001	80001	Ho-166m	0.001 U	0.0234	0.0068	0.0432	0.00 - 0.50
3-00001	80001	Pb-212	1.25	0.0327	0.0794	2.69	0.00 - 0.50
3-00001	80001	Pb-214	1.03	0.0304	0.0512	1.7	0.00 - 0.50
3-00001	80001	Np-236	-0.0106 U	0.0335	0.0101	0.047	0.00 - 0.50
3-00001	80001	Np-239	-0.0214 U	0.116	0.0351	0.139	0.00 - 0.50
3-00001	80001	Nb-94	0.0028 U	0.0139	0.0041	0.0214	0.00 - 0.50
3-00001	80001	Pu-238	-0.0014 U	0.0127	0.0025	0.0415	0.00 - 0.50
3-00001	80001	Pu-239/240	0.011	0.0156	0.0057	0.0404	0.00 - 0.50
3-00001	80001	Pu-244	0.002	0.0054	0.002	0.0313	0.00 - 0.50
3-00001	80001	K-40	25.1	0.119	1.43	32.4	0.00 - 0.50
3-00001	80001	Pa-231	-0.552 UJ	0.692	0.257	0.936	0.00 - 0.50
3-00001	80001	Na-22	-0.0016 U	0.0206	0.0062	0.037	0.00 - 0.50
3-00001	80001	Sr-90	0.0252 U	0.127	0.0355	0.485	0.00 - 0.50
3-00001	80001	Tl-208	0.401	0.0156	0.0242	0.937	0.00 - 0.50
3-00001	80001	Th-228	1.25	0.114	0.122	3.98	0.00 - 0.50
3-00001	80001	Th-229	0.0215	0.0195	0.0125	0.145	0.00 - 0.50
3-00001	80001	Th-230	0.788	0.0772	0.0868	2.2	0.00 - 0.50
3-00001	80001	Th-232	1.01	0.0664	0.1	3.1	0.00 - 0.50
3-00001	80001	Th-234	1.14 J	0.262	0.126	3.19	0.00 - 0.50
3-00001	80001	Tm-171	-0.525 U	11.9	4.13	72.4	0.00 - 0.50

Table A.2
Analytical Results Summary
Subarea 3, Round 1

Sample Location	Sample ID	Analyte Name	Activity	MDC	TPU	RTL	Sample Depth (feet bgs)
3-00001	80001	Sn-126	-0.0078 U	0.0143	0.0047	0.0237	0.00 - 0.50
3-00001	80001	U-233/234	0.921	0.0464	0.0892	2.02	0.00 - 0.50
3-00001	80001	U-235/236	0.0343	0.0155	0.0142	0.151	0.00 - 0.50
3-00001	80001	U-238	0.89	0.0295	0.0866	1.8	0.00 - 0.50
3-00001	80002	Ac-227	0.0903 J	0.182	0.0573	0.217	1.00 - 3.30
3-00001	80002	Am-241	0.0022 U	0.024	0.0057	0.0454	1.00 - 3.30
3-00001	80002	Sb-125	-0.0022 U	0.0419	0.0122	0.354	1.00 - 3.30
3-00001	80002	Bi-212	0.739 J	0.126	0.0763	2.15	1.00 - 3.30
3-00001	80002	Bi-214	0.747	0.0269	0.0368	1.59	1.00 - 3.30
3-00001	80002	Cd-113m	-51.5 U	117	37.6	3030	1.00 - 3.30
3-00001	80002	Cs-134	0.0011 U	0.0142	0.0048	0.0864	1.00 - 3.30
3-00001	80002	Cs-137	0.0291	0.0175	0.0062	0.207	1.00 - 3.30
3-00001	80002	Co-60	-0.0045 U	0.0173	0.0052	0.028	1.00 - 3.30
3-00001	80002	Cm-243/244	-0.0081 U	0.0332	0.0064	0.0443	1.00 - 3.30
3-00001	80002	Eu-152	-0.0007 U	0.044	0.0152	0.0566	1.00 - 3.30
3-00001	80002	Eu-154	-0.0074 U	0.0964	0.0285	0.15	1.00 - 3.30
3-00001	80002	Eu-155	0.0866 JS	0.0639	0.0239	0.231	1.00 - 3.30
3-00001	80002	Ho-166m	-0.003 U	0.0241	0.0073	0.0432	1.00 - 3.30
3-00001	80002	Pb-212	1.14	0.032	0.0697	2.69	1.00 - 3.30
3-00001	80002	Pb-214	0.836	0.0314	0.0408	1.7	1.00 - 3.30
3-00001	80002	Np-236	-0.0105 U	0.0334	0.0106	0.047	1.00 - 3.30
3-00001	80002	Np-239	-0.0428 U	0.121	0.0376	0.139	1.00 - 3.30
3-00001	80002	Nb-94	0.0036 U	0.0143	0.0043	0.0214	1.00 - 3.30
3-00001	80002	Pu-238	0.001 U	0.0147	0.0033	0.0415	1.00 - 3.30
3-00001	80002	Pu-239/240	-0.0008 U	0.0147	0.0027	0.0404	1.00 - 3.30
3-00001	80002	Pu-244	0.0048 U	0.0147	0.0042	0.0313	1.00 - 3.30
3-00001	80002	K-40	23.7	0.131	1.49	32.4	1.00 - 3.30
3-00001	80002	Pa-231	0.242 UJ	0.74	0.243	0.936	1.00 - 3.30
3-00001	80002	Na-22	-0.0033 U	0.0225	0.0069	0.037	1.00 - 3.30
3-00001	80002	Sr-90	0.189 U	0.387	0.119	0.485	1.00 - 3.30
3-00001	80002	Tl-208	0.348	0.0165	0.0204	0.937	1.00 - 3.30
3-00001	80002	Th-228	1.26	0.0608	0.121	3.98	1.00 - 3.30
3-00001	80002	Th-229	0.0611	0.071	0.0267	0.145	1.00 - 3.30

Table A.2
Analytical Results Summary
Subarea 3, Round 1

Sample Location	Sample ID	Analyte Name	Activity	MDC	TPU	RTL	Sample Depth (feet bgs)
3-00001	80002	Th-230	0.915	0.0821	0.0973	2.2	1.00 - 3.30
3-00001	80002	Th-232	1.2	0.056	0.114	3.1	1.00 - 3.30
3-00001	80002	Th-234	1.31 J	0.276	0.162	3.19	1.00 - 3.30
3-00001	80002	Tm-171	11.6 J	14.7	5.53	72.4	1.00 - 3.30
3-00001	80002	Sn-126	-0.003 U	0.0158	0.0048	0.0237	1.00 - 3.30
3-00001	80002	U-233/234	0.706	0.0355	0.0786	2.02	1.00 - 3.30
3-00001	80002	U-235/236	0.0707	0.0438	0.0238	0.151	1.00 - 3.30
3-00001	80002	U-238	0.764	0.0355	0.0829	1.8	1.00 - 3.30
3-00002	80003	Ac-227	0.0446 U	0.194	0.0599	0.217	0.00 - 0.50
3-00002	80003	Am-241	-0.0062 U	0.0378	0.0079	0.0454	0.00 - 0.50
3-00002	80003	Sb-125	-0.0008 U	0.0452	0.0133	0.354	0.00 - 0.50
3-00002	80003	Bi-212	0.838	0.133	0.0821	2.15	0.00 - 0.50
3-00002	80003	Bi-214	0.835	0.0279	0.0403	1.59	0.00 - 0.50
3-00002	80003	Cd-113m	-37.2 U	129	40.9	3030	0.00 - 0.50
3-00002	80003	Cs-134	-0.0014 U	0.015	0.0052	0.0864	0.00 - 0.50
3-00002	80003	Cs-137	0.126	0.016	0.0099	0.207	0.00 - 0.50
3-00002	80003	Co-60	0.0018 U	0.017	0.005	0.028	0.00 - 0.50
3-00002	80003	Cm-243/244	0.0167	0.0336	0.0105	0.0443	0.00 - 0.50
3-00002	80003	Eu-152	-0.0372 UJ	0.0455	0.0181	0.0566	0.00 - 0.50
3-00002	80003	Eu-154	0.0259 U	0.0919	0.0309	0.15	0.00 - 0.50
3-00002	80003	Eu-155	0.0339 U	0.0731	0.0231	0.231	0.00 - 0.50
3-00002	80003	Ho-166m	0.0091 U	0.026	0.008	0.0432	0.00 - 0.50
3-00002	80003	Pb-212	1.5	0.0362	0.0921	2.69	0.00 - 0.50
3-00002	80003	Pb-214	0.982	0.0336	0.0474	1.7	0.00 - 0.50
3-00002	80003	Np-236	-0.0114 U	0.0375	0.0116	0.047	0.00 - 0.50
3-00002	80003	Np-239	-0.0565 U	0.13	0.0422	0.139	0.00 - 0.50
3-00002	80003	Nb-94	0.009 J	0.0149	0.0048	0.0214	0.00 - 0.50
3-00002	80003	Pu-238	0.0032	0.0087	0.0032	0.0415	0.00 - 0.50
3-00002	80003	Pu-239/240	0.0232	0.0203	0.0094	0.0404	0.00 - 0.50
3-00002	80003	Pu-244	0.0064	0.0086	0.0045	0.0313	0.00 - 0.50
3-00002	80003	K-40	23	0.123	1.39	32.4	0.00 - 0.50
3-00002	80003	Pa-231	-0.12 UJ	0.798	0.257	0.936	0.00 - 0.50
3-00002	80003	Na-22	0.0031 U	0.0207	0.0061	0.037	0.00 - 0.50

Table A.2
Analytical Results Summary
Subarea 3, Round 1

Sample Location	Sample ID	Analyte Name	Activity	MDC	TPU	RTL	Sample Depth (feet bgs)
3-00002	80003	Sr-90	-0.0768 U	0.3	0.078	0.485	0.00 - 0.50
3-00002	80003	Tl-208	0.445	0.0176	0.0252	0.937	0.00 - 0.50
3-00002	80003	Th-228	1.61	0.105	0.141	3.98	0.00 - 0.50
3-00002	80003	Th-229	0.0284	0.066	0.0201	0.145	0.00 - 0.50
3-00002	80003	Th-230	0.751	0.0192	0.0819	2.2	0.00 - 0.50
3-00002	80003	Th-232	1.13	0.052	0.106	3.1	0.00 - 0.50
3-00002	80003	Th-234	1.33 J	0.296	0.154	3.19	0.00 - 0.50
3-00002	80003	Tm-171	-5.24 U	15.7	5.45	72.4	0.00 - 0.50
3-00002	80003	Sn-126	-0.0069 U	0.0157	0.0051	0.0237	0.00 - 0.50
3-00002	80003	U-233/234	0.734	0.0548	0.0883	2.02	0.00 - 0.50
3-00002	80003	U-235/236	0.105	0.0547	0.0324	0.151	0.00 - 0.50
3-00002	80003	U-238	0.821	0.0697	0.0958	1.8	0.00 - 0.50
3-00003	80005	Ac-227	-0.0015 U	0.193	0.0592	0.217	1.00 - 2.50
3-00003	80005	Am-241	0.0173	0.0409	0.0125	0.0454	1.00 - 2.50
3-00003	80005	Sb-125	0.0066 U	0.0439	0.0129	0.354	1.00 - 2.50
3-00003	80005	Bi-212	0.801 J	0.127	0.0805	2.15	1.00 - 2.50
3-00003	80005	Bi-214	0.907	0.028	0.0423	1.59	1.00 - 2.50
3-00003	80005	Cd-113m	-27 U	126	40.8	3030	1.00 - 2.50
3-00003	80005	Cs-134	-0.0045 U	0.0141	0.0051	0.0864	1.00 - 2.50
3-00003	80005	Cs-137	-0.0082 U	0.0155	0.0051	0.207	1.00 - 2.50
3-00003	80005	Co-60	-0.0046 U	0.0159	0.0049	0.028	1.00 - 2.50
3-00003	80005	Cm-243/244	0.0122 UJ	0.0533	0.0145	0.0443	1.00 - 2.50
3-00003	80005	Eu-152	-0.0501 UJ	0.0448	0.0217	0.0566	1.00 - 2.50
3-00003	80005	Eu-154	-0.0326 U	0.0881	0.0273	0.15	1.00 - 2.50
3-00003	80005	Eu-155	0.0914 JS	0.0703	0.0264	0.231	1.00 - 2.50
3-00003	80005	Ho-166m	-0.0017 U	0.0241	0.0073	0.0432	1.00 - 2.50
3-00003	80005	Pb-212	1.54	0.0358	0.094	2.69	1.00 - 2.50
3-00003	80005	Pb-214	1.05	0.0333	0.0505	1.7	1.00 - 2.50
3-00003	80005	Np-236	-0.0189 U	0.0373	0.013	0.047	1.00 - 2.50
3-00003	80005	Np-239	0.0096 U	0.129	0.0393	0.139	1.00 - 2.50
3-00003	80005	Nb-94	0.0052 U	0.0143	0.0044	0.0214	1.00 - 2.50
3-00003	80005	Pu-238	0.0045	0.0061	0.0032	0.0415	1.00 - 2.50
3-00003	80005	Pu-239/240	0.0006 U	0.0143	0.0028	0.0404	1.00 - 2.50

Table A.2
Analytical Results Summary
Subarea 3, Round 1

Sample Location	Sample ID	Analyte Name	Activity	MDC	TPU	RTL	Sample Depth (feet bgs)
3-00003	80005	Pu-244	0.0035 U	0.0177	0.0045	0.0313	1.00 - 2.50
3-00003	80005	K-40	21	0.134	1.27	32.4	1.00 - 2.50
3-00003	80005	Pa-231	-0.32 U	0.785	0.265	0.936	1.00 - 2.50
3-00003	80005	Na-22	-0.0087 U	0.0188	0.007	0.037	1.00 - 2.50
3-00003	80005	Sr-90	0.115 U	0.346	0.102	0.485	1.00 - 2.50
3-00003	80005	Tl-208	0.453	0.0167	0.0253	0.937	1.00 - 2.50
3-00003	80005	Th-228	1.43	0.152	0.122	3.98	1.00 - 2.50
3-00003	80005	Th-229	0.0263	0.0632	0.019	0.145	1.00 - 2.50
3-00003	80005	Th-230	0.991	0.063	0.0877	2.2	1.00 - 2.50
3-00003	80005	Th-232	1.52	0.0486	0.116	3.1	1.00 - 2.50
3-00003	80005	Th-234	1.29 J	0.304	0.151	3.19	1.00 - 2.50
3-00003	80005	Tm-171	-5.68 U	15.2	5.33	72.4	1.00 - 2.50
3-00003	80005	Sn-126	-0.0054 U	0.0148	0.0047	0.0237	1.00 - 2.50
3-00003	80005	U-233/234	0.845	0.07	0.0892	2.02	1.00 - 2.50
3-00003	80005	U-235/236	0.0397	0.0179	0.0164	0.151	1.00 - 2.50
3-00003	80005	U-238	0.843	0.0341	0.0876	1.8	1.00 - 2.50
3-00004	80006	Ac-227	0.0266 U	0.172	0.0524	0.217	1.00 - 5.00
3-00004	80006	Am-241	0.0045	0.0061	0.0032	0.0454	1.00 - 5.00
3-00004	80006	Sb-125	0.0182 U	0.0411	0.0126	0.354	1.00 - 5.00
3-00004	80006	Bi-212	0.81	0.121	0.0735	2.15	1.00 - 5.00
3-00004	80006	Bi-214	0.91	0.0268	0.0426	1.59	1.00 - 5.00
3-00004	80006	Cd-113m	-3.99 U	115	40	3030	1.00 - 5.00
3-00004	80006	Cs-134	0.0036 U	0.0139	0.0048	0.0864	1.00 - 5.00
3-00004	80006	Cs-137	-0.006 U	0.0144	0.0053	0.207	1.00 - 5.00
3-00004	80006	Co-60	-0.0015 U	0.0154	0.0046	0.028	1.00 - 5.00
3-00004	80006	Cm-243/244	-0.0046 U	0.0279	0.0058	0.0443	1.00 - 5.00
3-00004	80006	Eu-152	-0.0171 U	0.041	0.0153	0.0566	1.00 - 5.00
3-00004	80006	Eu-154	-0.0418 U	0.0888	0.0285	0.15	1.00 - 5.00
3-00004	80006	Eu-155	0.0299 U	0.0611	0.0191	0.231	1.00 - 5.00
3-00004	80006	Ho-166m	0.0048 U	0.0236	0.0071	0.0432	1.00 - 5.00
3-00004	80006	Pb-212	1.3	0.031	0.0795	2.69	1.00 - 5.00
3-00004	80006	Pb-214	1.03	0.0294	0.0506	1.7	1.00 - 5.00
3-00004	80006	Np-236	-0.0146 U	0.0322	0.0101	0.047	1.00 - 5.00

Table A.2
Analytical Results Summary
Subarea 3, Round 1

Sample Location	Sample ID	Analyte Name	Activity	MDC	TPU	RTL	Sample Depth (feet bgs)
3-00004	80006	Np-239	0.0352 U	0.116	0.0358	0.139	1.00 - 5.00
3-00004	80006	Nb-94	0.0047 U	0.0138	0.0042	0.0214	1.00 - 5.00
3-00004	80006	Pu-238	-0.0037 UJ	0.0288	0.0051	0.0415	1.00 - 5.00
3-00004	80006	Pu-239/240	-0.0046 UJ	0.0251	0.0045	0.0404	1.00 - 5.00
3-00004	80006	Pu-244	0.0032	0.0086	0.0032	0.0313	1.00 - 5.00
3-00004	80006	K-40	24.8	0.119	1.47	32.4	1.00 - 5.00
3-00004	80006	Pa-231	-0.167 UJ	0.705	0.228	0.936	1.00 - 5.00
3-00004	80006	Na-22	0.0002 U	0.0193	0.0067	0.037	1.00 - 5.00
3-00004	80006	Sr-90	0.0434 U	0.426	0.12	0.485	1.00 - 5.00
3-00004	80006	Tl-208	0.354	0.0154	0.0207	0.937	1.00 - 5.00
3-00004	80006	Th-228	1.36	0.0853	0.12	3.98	1.00 - 5.00
3-00004	80006	Th-229	0.0723	0.0484	0.0239	0.145	1.00 - 5.00
3-00004	80006	Th-230	0.937	0.0482	0.0914	2.2	1.00 - 5.00
3-00004	80006	Th-232	1.14	0.0177	0.103	3.1	1.00 - 5.00
3-00004	80006	Th-234	1.44	0.254	0.137	3.19	1.00 - 5.00
3-00004	80006	Tm-171	-0.562 U	10.4	3.66	72.4	1.00 - 5.00
3-00004	80006	Sn-126	-0.0051 U	0.0146	0.0046	0.0237	1.00 - 5.00
3-00004	80006	U-233/234	0.823	0.058	0.0868	2.02	1.00 - 5.00
3-00004	80006	U-235/236	0.0479	0.0419	0.0194	0.151	1.00 - 5.00
3-00004	80006	U-238	0.856	0.0144	0.0882	1.8	1.00 - 5.00
3-00005	80007	Ac-227	0.075 U	0.157	0.0484	0.217	1.00 - 5.00
3-00005	80007	Am-241	-0.0022 U	0.0254	0.0051	0.0454	1.00 - 5.00
3-00005	80007	Sb-125	0.0022 U	0.0373	0.011	0.354	1.00 - 5.00
3-00005	80007	Bi-212	0.709	0.113	0.0655	2.15	1.00 - 5.00
3-00005	80007	Bi-214	0.761	0.0232	0.0365	1.59	1.00 - 5.00
3-00005	80007	Cd-113m	-2.64 U	103	31	3030	1.00 - 5.00
3-00005	80007	Cs-134	-0.0015 U	0.0119	0.0042	0.0864	1.00 - 5.00
3-00005	80007	Cs-137	0.0079 J	0.0138	0.0049	0.207	1.00 - 5.00
3-00005	80007	Co-60	-0.0008 U	0.0138	0.0041	0.028	1.00 - 5.00
3-00005	80007	Cm-243/244	-0.0041 U	0.0279	0.0055	0.0443	1.00 - 5.00
3-00005	80007	Eu-152	-0.0217 U	0.0367	0.013	0.0566	1.00 - 5.00
3-00005	80007	Eu-154	-0.054 U	0.0795	0.0276	0.15	1.00 - 5.00
3-00005	80007	Eu-155	0.0595 JS	0.0546	0.021	0.231	1.00 - 5.00

Table A.2
Analytical Results Summary
Subarea 3, Round 1

Sample Location	Sample ID	Analyte Name	Activity	MDC	TPU	RTL	Sample Depth (feet bgs)
3-00005	80007	Ho-166m	-0.0085 U	0.0204	0.0063	0.0432	1.00 - 5.00
3-00005	80007	Pb-212	1.25	0.028	0.0735	2.69	1.00 - 5.00
3-00005	80007	Pb-214	0.846	0.0269	0.0403	1.7	1.00 - 5.00
3-00005	80007	Np-236	-0.0108 U	0.0289	0.0092	0.047	1.00 - 5.00
3-00005	80007	Np-239	0.0099 U	0.104	0.0302	0.139	1.00 - 5.00
3-00005	80007	Nb-94	0.0038 U	0.0123	0.0036	0.0214	1.00 - 5.00
3-00005	80007	Pu-238	0.002 U	0.0218	0.0051	0.0415	1.00 - 5.00
3-00005	80007	Pu-239/240	-0.0097 U	0.0297	0.0052	0.0404	1.00 - 5.00
3-00005	80007	Pu-244	-0.0045 U	0.0241	0.0042	0.0313	1.00 - 5.00
3-00005	80007	K-40	20.5	0.094	1.15	32.4	1.00 - 5.00
3-00005	80007	Pa-231	0.209 U	0.648	0.199	0.936	1.00 - 5.00
3-00005	80007	Na-22	-0.0093 U	0.0173	0.0058	0.037	1.00 - 5.00
3-00005	80007	Sr-90	0.444	0.315	0.123	0.485	1.00 - 5.00
3-00005	80007	Tl-208	0.355	0.0143	0.0206	0.937	1.00 - 5.00
3-00005	80007	Th-228	1.01	0.102	0.092	3.98	1.00 - 5.00
3-00005	80007	Th-229	0 U	0.0526	0.012	0.145	1.00 - 5.00
3-00005	80007	Th-230	0.725	0.0638	0.0702	2.2	1.00 - 5.00
3-00005	80007	Th-232	0.961	0.0637	0.0833	3.1	1.00 - 5.00
3-00005	80007	Th-234	1.15 J	0.229	0.125	3.19	1.00 - 5.00
3-00005	80007	Tm-171	3.03 U	10.5	3.55	72.4	1.00 - 5.00
3-00005	80007	Sn-126	0.0026 U	0.0138	0.004	0.0237	1.00 - 5.00
3-00005	80007	U-233/234	0.637	0.0764	0.0745	2.02	1.00 - 5.00
3-00005	80007	U-235/236	0.033	0.0179	0.0149	0.151	1.00 - 5.00
3-00005	80007	U-238	0.648	0.0341	0.0731	1.8	1.00 - 5.00
3-00006	80008	Ac-227	-0.0973 U	0.174	0.0569	0.217	1.00 - 5.00
3-00006	80008	Am-241	0.0111	0.006	0.005	0.0454	1.00 - 5.00
3-00006	80008	Sb-125	0.0086 U	0.0443	0.0134	0.354	1.00 - 5.00
3-00006	80008	Bi-212	0.742 J	0.139	0.0775	2.15	1.00 - 5.00
3-00006	80008	Bi-214	0.835	0.0291	0.0413	1.59	1.00 - 5.00
3-00006	80008	Cd-113m	57.5 U	125	38.5	3030	1.00 - 5.00
3-00006	80008	Cs-134	0.0035 U	0.0153	0.0051	0.0864	1.00 - 5.00
3-00006	80008	Cs-137	-0.0131 UJ	0.0164	0.0059	0.207	1.00 - 5.00
3-00006	80008	Co-60	0.0069 U	0.0195	0.0058	0.028	1.00 - 5.00

Table A.2
Analytical Results Summary
Subarea 3, Round 1

Sample Location	Sample ID	Analyte Name	Activity	MDC	TPU	RTL	Sample Depth (feet bgs)
3-00006	80008	Cm-243/244	0.0013 U	0.0177	0.0039	0.0443	1.00 - 5.00
3-00006	80008	Eu-152	-0.0188 U	0.0434	0.0144	0.0566	1.00 - 5.00
3-00006	80008	Eu-154	-0.0304 U	0.106	0.0322	0.15	1.00 - 5.00
3-00006	80008	Eu-155	-0.0113 U	0.0644	0.0196	0.231	1.00 - 5.00
3-00006	80008	Ho-166m	-0.0015 U	0.0269	0.008	0.0432	1.00 - 5.00
3-00006	80008	Pb-212	1.25	0.0328	0.075	2.69	1.00 - 5.00
3-00006	80008	Pb-214	0.907	0.0308	0.0448	1.7	1.00 - 5.00
3-00006	80008	Np-236	0.0004 U	0.0344	0.0104	0.047	1.00 - 5.00
3-00006	80008	Np-239	-0.0608 U	0.115	0.0369	0.139	1.00 - 5.00
3-00006	80008	Nb-94	0.0097 JS	0.0161	0.0052	0.0214	1.00 - 5.00
3-00006	80008	Pu-238	-0.0012 UJ	0.0215	0.0039	0.0415	1.00 - 5.00
3-00006	80008	Pu-239/240	-0.0032 UJ	0.0246	0.0043	0.0404	1.00 - 5.00
3-00006	80008	Pu-244	0.0112 J	0.0272	0.0082	0.0313	1.00 - 5.00
3-00006	80008	K-40	23.9	0.124	1.46	32.4	1.00 - 5.00
3-00006	80008	Pa-231	-0.355 U	0.733	0.236	0.936	1.00 - 5.00
3-00006	80008	Na-22	-0.0069 U	0.0238	0.0074	0.037	1.00 - 5.00
3-00006	80008	Sr-90	-0.0533 U	0.356	0.0915	0.485	1.00 - 5.00
3-00006	80008	Tl-208	0.394	0.017	0.0238	0.937	1.00 - 5.00
3-00006	80008	Th-228	1.08	0.101	0.0996	3.98	1.00 - 5.00
3-00006	80008	Th-229	0 U	0.0772	0.019	0.145	1.00 - 5.00
3-00006	80008	Th-230	0.792	0.0716	0.0781	2.2	1.00 - 5.00
3-00006	80008	Th-232	1.02	0.0506	0.09	3.1	1.00 - 5.00
3-00006	80008	Th-234	1.3 J	0.276	0.136	3.19	1.00 - 5.00
3-00006	80008	Tm-171	-1.28 U	14.4	4.73	72.4	1.00 - 5.00
3-00006	80008	Sn-126	0.0027 U	0.0171	0.0051	0.0237	1.00 - 5.00
3-00006	80008	U-233/234	0.714	0.0587	0.0774	2.02	1.00 - 5.00
3-00006	80008	U-235/236	0.0266	0.0396	0.0147	0.151	1.00 - 5.00
3-00006	80008	U-238	0.719	0.0136	0.0765	1.8	1.00 - 5.00
3-00007	80009	Ac-227	-0.0458 U	0.188	0.0582	0.217	1.00 - 3.50
3-00007	80009	Am-241	0.0043 U	0.0299	0.0077	0.0454	1.00 - 3.50
3-00007	80009	Sb-125	-0.0072 U	0.0454	0.0134	0.354	1.00 - 3.50
3-00007	80009	Bi-212	0.878	0.137	0.0878	2.15	1.00 - 3.50
3-00007	80009	Bi-214	0.884	0.0312	0.0425	1.59	1.00 - 3.50

Table A.2
Analytical Results Summary
Subarea 3, Round 1

Sample Location	Sample ID	Analyte Name	Activity	MDC	TPU	RTL	Sample Depth (feet bgs)
3-00007	80009	Cd-113m	60.6 U	129	42.1	3030	1.00 - 3.50
3-00007	80009	Cs-134	0.0055 U	0.0162	0.0055	0.0864	1.00 - 3.50
3-00007	80009	Cs-137	0.0929	0.0146	0.0086	0.207	1.00 - 3.50
3-00007	80009	Co-60	-0.0005 U	0.0172	0.005	0.028	1.00 - 3.50
3-00007	80009	Cm-243/244	-0.0008 U	0.0302	0.0069	0.0443	1.00 - 3.50
3-00007	80009	Eu-152	-0.0147 U	0.0462	0.0168	0.0566	1.00 - 3.50
3-00007	80009	Eu-154	0.0088 U	0.0966	0.0278	0.15	1.00 - 3.50
3-00007	80009	Eu-155	0.102 JS	0.0682	0.0298	0.231	1.00 - 3.50
3-00007	80009	Ho-166m	0.0054 U	0.0261	0.0077	0.0432	1.00 - 3.50
3-00007	80009	Pb-212	1.47	0.0344	0.086	2.69	1.00 - 3.50
3-00007	80009	Pb-214	0.954	0.0317	0.0464	1.7	1.00 - 3.50
3-00007	80009	Np-236	-0.0094 U	0.0361	0.0112	0.047	1.00 - 3.50
3-00007	80009	Np-239	0.049 U	0.129	0.0402	0.139	1.00 - 3.50
3-00007	80009	Nb-94	0.0009 U	0.0151	0.0045	0.0214	1.00 - 3.50
3-00007	80009	Pu-238	-0.0063 U	0.0264	0.0046	0.0415	1.00 - 3.50
3-00007	80009	Pu-239/240	0.002 U	0.0219	0.0052	0.0404	1.00 - 3.50
3-00007	80009	Pu-244	-0.0011 U	0.019	0.0035	0.0313	1.00 - 3.50
3-00007	80009	K-40	19.5	0.126	1.09	32.4	1.00 - 3.50
3-00007	80009	Pa-231	-0.284 U	0.773	0.28	0.936	1.00 - 3.50
3-00007	80009	Na-22	-0.0014 U	0.0216	0.0064	0.037	1.00 - 3.50
3-00007	80009	Sr-90	0.0356 U	0.255	0.0706	0.485	1.00 - 3.50
3-00007	80009	Tl-208	0.433	0.0176	0.0256	0.937	1.00 - 3.50
3-00007	80009	Th-228	1.74	0.12	0.134	3.98	1.00 - 3.50
3-00007	80009	Th-229	0.0208 U	0.0735	0.0209	0.145	1.00 - 3.50
3-00007	80009	Th-230	0.79	0.0681	0.0762	2.2	1.00 - 3.50
3-00007	80009	Th-232	1.5	0.0381	0.114	3.1	1.00 - 3.50
3-00007	80009	Th-234	1.3 J	0.288	0.136	3.19	1.00 - 3.50
3-00007	80009	Tm-171	-2.86 U	13	4.62	72.4	1.00 - 3.50
3-00007	80009	Sn-126	-0.0026 U	0.0168	0.0051	0.0237	1.00 - 3.50
3-00007	80009	U-233/234	0.674	0.0547	0.0764	2.02	1.00 - 3.50
3-00007	80009	U-235/236	0.0472	0.0183	0.0181	0.151	1.00 - 3.50
3-00007	80009	U-238	0.714	0.0148	0.0785	1.8	1.00 - 3.50
3-00009	80011	Ac-227	-0.0858 U	0.146	0.0503	0.217	1.00 - 5.00

Table A.2
Analytical Results Summary
Subarea 3, Round 1

Sample Location	Sample ID	Analyte Name	Activity	MDC	TPU	RTL	Sample Depth (feet bgs)
3-00009	80011	Am-241	-0.0032 U	0.0383	0.009	0.0454	1.00 - 5.00
3-00009	80011	Sb-125	-0.0031 U	0.0388	0.0115	0.354	1.00 - 5.00
3-00009	80011	Bi-212	0.8	0.132	0.0772	2.15	1.00 - 5.00
3-00009	80011	Bi-214	1.04	0.0268	0.0489	1.59	1.00 - 5.00
3-00009	80011	Cd-113m	-4.76 U	99.6	30.9	3030	1.00 - 5.00
3-00009	80011	Cs-134	0.008 JS	0.0142	0.0051	0.0864	1.00 - 5.00
3-00009	80011	Cs-137	0.0501	0.0148	0.0071	0.207	1.00 - 5.00
3-00009	80011	Co-60	0.0033 U	0.0176	0.0051	0.028	1.00 - 5.00
3-00009	80011	Cm-243/244	0.0151	0.0214	0.0077	0.0443	1.00 - 5.00
3-00009	80011	Eu-152	0.0097 U	0.0386	0.0114	0.0566	1.00 - 5.00
3-00009	80011	Eu-154	-0.0597 U	0.0917	0.0316	0.15	1.00 - 5.00
3-00009	80011	Eu-155	0.092 JS	0.0438	0.0201	0.231	1.00 - 5.00
3-00009	80011	Ho-166m	-0.001 U	0.0251	0.0073	0.0432	1.00 - 5.00
3-00009	80011	Pb-212	1.36	0.0259	0.076	2.69	1.00 - 5.00
3-00009	80011	Pb-214	1.09	0.0268	0.0496	1.7	1.00 - 5.00
3-00009	80011	Np-236	-0.0135 U	0.0241	0.0079	0.047	1.00 - 5.00
3-00009	80011	Np-239	-0.0252 U	0.0952	0.03	0.139	1.00 - 5.00
3-00009	80011	Nb-94	0.0048 U	0.0142	0.0042	0.0214	1.00 - 5.00
3-00009	80011	Pu-238	0.005	0.0067	0.0035	0.0415	1.00 - 5.00
3-00009	80011	Pu-239/240	0.007 UJ	0.0224	0.0063	0.0404	1.00 - 5.00
3-00009	80011	Pu-244	-0.0018 UJ	0.0158	0.0031	0.0313	1.00 - 5.00
3-00009	80011	K-40	21.2	0.13	1.15	32.4	1.00 - 5.00
3-00009	80011	Pa-231	0.021 U	0.625	0.194	0.936	1.00 - 5.00
3-00009	80011	Na-22	-0.0102 U	0.0203	0.0065	0.037	1.00 - 5.00
3-00009	80011	Sr-90	-0.0979 U	0.364	0.0921	0.485	1.00 - 5.00
3-00009	80011	Tl-208	0.441	0.0155	0.0252	0.937	1.00 - 5.00
3-00009	80011	Th-228	1.37	0.103	0.121	3.98	1.00 - 5.00
3-00009	80011	Th-229	0 U	0.0574	0.0124	0.145	1.00 - 5.00
3-00009	80011	Th-230	1.07	0.0454	0.0977	2.2	1.00 - 5.00
3-00009	80011	Th-232	1.1	0.0452	0.0992	3.1	1.00 - 5.00
3-00009	80011	Th-234	1.18	0.169	0.0985	3.19	1.00 - 5.00
3-00009	80011	Tm-171	-0.103 U	5.78	1.85	72.4	1.00 - 5.00
3-00009	80011	Sn-126	0.0072 U	0.0159	0.0048	0.0237	1.00 - 5.00

Table A.2
Analytical Results Summary
Subarea 3, Round 1

Sample Location	Sample ID	Analyte Name	Activity	MDC	TPU	RTL	Sample Depth (feet bgs)
3-00009	80011	U-233/234	0.894	0.0619	0.097	2.02	1.00 - 5.00
3-00009	80011	U-235/236	0.086	0.0486	0.0276	0.151	1.00 - 5.00
3-00009	80011	U-238	0.925	0.0167	0.0984	1.8	1.00 - 5.00
3-00010	80012	Ac-227	-0.105 U	0.23	0.0733	0.217	1.00 - 4.00
3-00010	80012	Am-241	0.0096 U	0.0308	0.0088	0.0454	1.00 - 4.00
3-00010	80012	Sb-125	0.0005 U	0.0592	0.0178	0.354	1.00 - 4.00
3-00010	80012	Bi-212	0.913 J	0.19	0.0987	2.15	1.00 - 4.00
3-00010	80012	Bi-214	0.957	0.0409	0.0507	1.59	1.00 - 4.00
3-00010	80012	Cd-113m	43.6 U	155	46.2	3030	1.00 - 4.00
3-00010	80012	Cs-134	0.0006 U	0.0206	0.0069	0.0864	1.00 - 4.00
3-00010	80012	Cs-137	0.0254	0.0243	0.0094	0.207	1.00 - 4.00
3-00010	80012	Co-60	-0.002 U	0.0234	0.0068	0.028	1.00 - 4.00
3-00010	80012	Cm-243/244	-0.0128 U	0.039	0.0074	0.0443	1.00 - 4.00
3-00010	80012	Eu-152	0.0116 U	0.0593	0.0201	0.0566	1.00 - 4.00
3-00010	80012	Eu-154	-0.0854 U	0.132	0.0463	0.15	1.00 - 4.00
3-00010	80012	Eu-155	0.0539 JS	0.0789	0.0269	0.231	1.00 - 4.00
3-00010	80012	Ho-166m	-0.0009 U	0.036	0.0106	0.0432	1.00 - 4.00
3-00010	80012	Pb-212	1.39	0.0393	0.0822	2.69	1.00 - 4.00
3-00010	80012	Pb-214	1.03	0.0415	0.052	1.7	1.00 - 4.00
3-00010	80012	Np-236	-0.0001 U	0.0409	0.0125	0.047	1.00 - 4.00
3-00010	80012	Np-239	-0.0497 U	0.15	0.0459	0.139	1.00 - 4.00
3-00010	80012	Nb-94	0.0082 U	0.022	0.0066	0.0214	1.00 - 4.00
3-00010	80012	Pu-238	-0.0008 U	0.0147	0.0027	0.0415	1.00 - 4.00
3-00010	80012	Pu-239/240	-0.0011 U	0.0203	0.0044	0.0404	1.00 - 4.00
3-00010	80012	Pu-244	0.001 U	0.0147	0.0033	0.0313	1.00 - 4.00
3-00010	80012	K-40	19.6	0.186	1.13	32.4	1.00 - 4.00
3-00010	80012	Pa-231	-0.424 UJ	0.96	0.306	0.936	1.00 - 4.00
3-00010	80012	Na-22	-0.0105 U	0.0281	0.0088	0.037	1.00 - 4.00
3-00010	80012	Sr-90	0.0616 U	0.452	0.129	0.485	1.00 - 4.00
3-00010	80012	Tl-208	0.45	0.0227	0.028	0.937	1.00 - 4.00
3-00010	80012	Th-228	1.28	0.108	0.121	3.98	1.00 - 4.00
3-00010	80012	Th-229	0.0354	0.0658	0.0213	0.145	1.00 - 4.00
3-00010	80012	Th-230	0.961	0.052	0.0961	2.2	1.00 - 4.00

Table A.2
Analytical Results Summary
Subarea 3, Round 1

Sample Location	Sample ID	Analyte Name	Activity	MDC	TPU	RTL	Sample Depth (feet bgs)
3-00010	80012	Th-232	1.37	0.0191	0.12	3.1	1.00 - 4.00
3-00010	80012	Th-234	1.38 J	0.306	0.154	3.19	1.00 - 4.00
3-00010	80012	Tm-171	4.84 U	14.2	4.86	72.4	1.00 - 4.00
3-00010	80012	Sn-126	0.0063 U	0.0236	0.0069	0.0237	1.00 - 4.00
3-00010	80012	U-233/234	0.771	0.0955	0.0909	2.02	1.00 - 4.00
3-00010	80012	U-235/236	0.0556	0.0215	0.0214	0.151	1.00 - 4.00
3-00010	80012	U-238	0.898	0.0507	0.0979	1.8	1.00 - 4.00
3-00011	80013	Ac-227	-0.0453 U	0.219	0.066	0.217	1.00 - 3.00
3-00011	80013	Am-241	0.0158	0.0224	0.0081	0.0454	1.00 - 3.00
3-00011	80013	Sb-125	-0.0011 U	0.0563	0.017	0.354	1.00 - 3.00
3-00011	80013	Bi-212	1.08 J	0.19	0.112	2.15	1.00 - 3.00
3-00011	80013	Bi-214	0.884	0.037	0.0471	1.59	1.00 - 3.00
3-00011	80013	Cd-113m	-50.7 U	148	45.8	3030	1.00 - 3.00
3-00011	80013	Cs-134	0.0036 U	0.0195	0.0065	0.0864	1.00 - 3.00
3-00011	80013	Cs-137	-0.0008 U	0.0217	0.0064	0.207	1.00 - 3.00
3-00011	80013	Co-60	-0.0054 U	0.0231	0.0069	0.028	1.00 - 3.00
3-00011	80013	Cm-243/244	0.0118	0.0289	0.0087	0.0443	1.00 - 3.00
3-00011	80013	Eu-152	0.0116 U	0.0556	0.0189	0.0566	1.00 - 3.00
3-00011	80013	Eu-154	-0.0421 U	0.129	0.0407	0.15	1.00 - 3.00
3-00011	80013	Eu-155	0.0722 JS	0.0769	0.0286	0.231	1.00 - 3.00
3-00011	80013	Ho-166m	-0.0022 U	0.0349	0.0103	0.0432	1.00 - 3.00
3-00011	80013	Pb-212	1.41	0.0408	0.0847	2.69	1.00 - 3.00
3-00011	80013	Pb-214	0.916	0.0395	0.0476	1.7	1.00 - 3.00
3-00011	80013	Np-236	-0.0126 U	0.0395	0.0126	0.047	1.00 - 3.00
3-00011	80013	Np-239	-0.035 U	0.144	0.0434	0.139	1.00 - 3.00
3-00011	80013	Nb-94	0.0067 U	0.021	0.0062	0.0214	1.00 - 3.00
3-00011	80013	Pu-238	-0.0045 U	0.0275	0.0057	0.0415	1.00 - 3.00
3-00011	80013	Pu-239/240	0.0006 U	0.0141	0.0027	0.0404	1.00 - 3.00
3-00011	80013	Pu-244	0.0028 U	0.0141	0.0035	0.0313	1.00 - 3.00
3-00011	80013	K-40	19.5	0.168	1.14	32.4	1.00 - 3.00
3-00011	80013	Pa-231	0.26 U	0.937	0.317	0.936	1.00 - 3.00
3-00011	80013	Na-22	-0.0128 U	0.0281	0.009	0.037	1.00 - 3.00
3-00011	80013	Sr-90	-0.012 U	0.256	0.0676	0.485	1.00 - 3.00

Table A.2
Analytical Results Summary
Subarea 3, Round 1

Sample Location	Sample ID	Analyte Name	Activity	MDC	TPU	RTL	Sample Depth (feet bgs)
3-00011	80013	Tl-208	0.476	0.023	0.0299	0.937	1.00 - 3.00
3-00011	80013	Th-228	0.991	0.124	0.102	3.98	1.00 - 3.00
3-00011	80013	Th-229	-0.0184 U	0.0805	0.0162	0.145	1.00 - 3.00
3-00011	80013	Th-230	0.698	0.0569	0.0754	2.2	1.00 - 3.00
3-00011	80013	Th-232	0.739	0.0567	0.0779	3.1	1.00 - 3.00
3-00011	80013	Th-234	1.4 J	0.309	0.168	3.19	1.00 - 3.00
3-00011	80013	Tm-171	-8.14 U	14	5.15	72.4	1.00 - 3.00
3-00011	80013	Sn-126	-0.0046 U	0.0225	0.0068	0.0237	1.00 - 3.00
3-00011	80013	U-233/234	0.494	0.0643	0.0622	2.02	1.00 - 3.00
3-00011	80013	U-235/236	0.0192	0.0174	0.0112	0.151	1.00 - 3.00
3-00011	80013	U-238	0.695	0.014	0.0756	1.8	1.00 - 3.00
3-00012	80014	Ac-227	-0.0081 U	0.171	0.0589	0.217	1.00 - 4.00
3-00012	80014	Am-241	0.0095 U	0.0301	0.0086	0.0454	1.00 - 4.00
3-00012	80014	Sb-125	0.0181 U	0.0418	0.0128	0.354	1.00 - 4.00
3-00012	80014	Bi-212	0.92	0.128	0.0768	2.15	1.00 - 4.00
3-00012	80014	Bi-214	1.04	0.0269	0.0482	1.59	1.00 - 4.00
3-00012	80014	Cd-113m	11 U	118	37.9	3030	1.00 - 4.00
3-00012	80014	Cs-134	-0.0011 U	0.0146	0.005	0.0864	1.00 - 4.00
3-00012	80014	Cs-137	-0.0011 U	0.0151	0.0052	0.207	1.00 - 4.00
3-00012	80014	Co-60	-0.0064 U	0.0168	0.0054	0.028	1.00 - 4.00
3-00012	80014	Cm-243/244	-0.0034 U	0.0304	0.0064	0.0443	1.00 - 4.00
3-00012	80014	Eu-152	-0.007 U	0.0429	0.0131	0.0566	1.00 - 4.00
3-00012	80014	Eu-154	0.0148 U	0.0908	0.0305	0.15	1.00 - 4.00
3-00012	80014	Eu-155	0.0774 JS	0.0661	0.0263	0.231	1.00 - 4.00
3-00012	80014	Ho-166m	0.0052 U	0.0244	0.0074	0.0432	1.00 - 4.00
3-00012	80014	Pb-212	1.52	0.0326	0.0908	2.69	1.00 - 4.00
3-00012	80014	Pb-214	1.21	0.0296	0.0564	1.7	1.00 - 4.00
3-00012	80014	Np-236	-0.0076 U	0.0331	0.0104	0.047	1.00 - 4.00
3-00012	80014	Np-239	-0.0129 U	0.118	0.0361	0.139	1.00 - 4.00
3-00012	80014	Nb-94	-0.0013 U	0.0139	0.0043	0.0214	1.00 - 4.00
3-00012	80014	Pu-238	0	0.0085	0.0031	0.0415	1.00 - 4.00
3-00012	80014	Pu-239/240	0.0071	0.0198	0.0059	0.0404	1.00 - 4.00
3-00012	80014	Pu-244	0.0049 UJ	0.0246	0.0063	0.0313	1.00 - 4.00

Table A.2
Analytical Results Summary
Subarea 3, Round 1

Sample Location	Sample ID	Analyte Name	Activity	MDC	TPU	RTL	Sample Depth (feet bgs)
3-00012	80014	K-40	20.9	0.127	1.19	32.4	1.00 - 4.00
3-00012	80014	Pa-231	-0.311 U	0.702	0.232	0.936	1.00 - 4.00
3-00012	80014	Na-22	-0.005 U	0.0205	0.0064	0.037	1.00 - 4.00
3-00012	80014	Sr-90	0.159 U	0.366	0.111	0.485	1.00 - 4.00
3-00012	80014	Tl-208	0.471	0.0156	0.0268	0.937	1.00 - 4.00
3-00012	80014	Th-228	1.5	0.15	0.133	3.98	1.00 - 4.00
3-00012	80014	Th-229	0.037 U	0.0926	0.0276	0.145	1.00 - 4.00
3-00012	80014	Th-230	0.978	0.0739	0.0935	2.2	1.00 - 4.00
3-00012	80014	Th-232	1.39	0.057	0.116	3.1	1.00 - 4.00
3-00012	80014	Th-234	1.5	0.261	0.15	3.19	1.00 - 4.00
3-00012	80014	Tm-171	6.23 U	13.1	4.7	72.4	1.00 - 4.00
3-00012	80014	Sn-126	0.0007 U	0.0156	0.0047	0.0237	1.00 - 4.00
3-00012	80014	U-233/234	0.948	0.0562	0.0949	2.02	1.00 - 4.00
3-00012	80014	U-235/236	0.0446	0.0173	0.0171	0.151	1.00 - 4.00
3-00012	80014	U-238	1.11	0.0467	0.106	1.8	1.00 - 4.00
3-00013	80015	Ac-227	-0.0067 U	0.132	0.0401	0.217	1.00 - 1.83
3-00013	80015	Am-241	0.0082	0.0228	0.0067	0.0454	1.00 - 1.83
3-00013	80015	Sb-125	0.0138 U	0.031	0.0095	0.354	1.00 - 1.83
3-00013	80015	Bi-212	0.754	0.0928	0.0639	2.15	1.00 - 1.83
3-00013	80015	Bi-214	0.939	0.0207	0.0422	1.59	1.00 - 1.83
3-00013	80015	Cd-113m	-22.4 U	87.5	28.2	3030	1.00 - 1.83
3-00013	80015	Cs-134	0.0037 U	0.0108	0.0038	0.0864	1.00 - 1.83
3-00013	80015	Cs-137	0.0354	0.0116	0.0051	0.207	1.00 - 1.83
3-00013	80015	Co-60	0 U	0.0126	0.0037	0.028	1.00 - 1.83
3-00013	80015	Cm-243/244	-0.0116 UJ	0.0516	0.011	0.0443	1.00 - 1.83
3-00013	80015	Eu-152	-0.0123 U	0.0324	0.0119	0.0566	1.00 - 1.83
3-00013	80015	Eu-154	-0.0039 U	0.0698	0.0205	0.15	1.00 - 1.83
3-00013	80015	Eu-155	0.0592 JS	0.0477	0.0185	0.231	1.00 - 1.83
3-00013	80015	Ho-166m	-0.0035 U	0.018	0.0055	0.0432	1.00 - 1.83
3-00013	80015	Pb-212	1.33	0.0229	0.0769	2.69	1.00 - 1.83
3-00013	80015	Pb-214	1.01	0.023	0.046	1.7	1.00 - 1.83
3-00013	80015	Np-236	-0.0176 U	0.0252	0.0088	0.047	1.00 - 1.83
3-00013	80015	Np-239	0.0256 U	0.0889	0.0274	0.139	1.00 - 1.83

Table A.2
Analytical Results Summary
Subarea 3, Round 1

Sample Location	Sample ID	Analyte Name	Activity	MDC	TPU	RTL	Sample Depth (feet bgs)
3-00013	80015	Nb-94	0.0027 U	0.0107	0.0032	0.0214	1.00 - 1.83
3-00013	80015	Pu-238	-0.0076 U	0.0231	0.004	0.0415	1.00 - 1.83
3-00013	80015	Pu-239/240	-0.0013 U	0.0231	0.005	0.0404	1.00 - 1.83
3-00013	80015	Pu-244	0.0091	0.0135	0.005	0.0313	1.00 - 1.83
3-00013	80015	K-40	21.2	0.0883	1.17	32.4	1.00 - 1.83
3-00013	80015	Pa-231	-0.263 UJ	0.544	0.185	0.936	1.00 - 1.83
3-00013	80015	Na-22	0.0047 U	0.0152	0.0053	0.037	1.00 - 1.83
3-00013	80015	Sr-90	0.0847 U	0.318	0.0931	0.485	1.00 - 1.83
3-00013	80015	Tl-208	0.416	0.0118	0.0227	0.937	1.00 - 1.83
3-00013	80015	Th-228	1.45	0.0691	0.128	3.98	1.00 - 1.83
3-00013	80015	Th-229	0.0206 U	0.0741	0.0207	0.145	1.00 - 1.83
3-00013	80015	Th-230	0.858	0.0506	0.0885	2.2	1.00 - 1.83
3-00013	80015	Th-232	1.07	0.0504	0.101	3.1	1.00 - 1.83
3-00013	80015	Th-234	1.34	0.197	0.118	3.19	1.00 - 1.83
3-00013	80015	Tm-171	-1.72 U	8.82	3.13	72.4	1.00 - 1.83
3-00013	80015	Sn-126	0.0002 U	0.0118	0.0035	0.0237	1.00 - 1.83
3-00013	80015	U-233/234	0.811	0.0251	0.0767	2.02	1.00 - 1.83
3-00013	80015	U-235/236	0.0501	0.031	0.0168	0.151	1.00 - 1.83
3-00013	80015	U-238	0.955	0.0251	0.0865	1.8	1.00 - 1.83

Notes:

Refer to Table 2.1 of the Final Field Sampling Plan for Soil Sampling (HGL, 2012a) for a definition of radionuclide symbols.

Reporting units in picocuries per gram.

bgs - below ground surface

ID - Identification

MDC - minimum detectable concentration

RTL - radiological trigger level

TPU - total propagated uncertainty

J - The analyte was detected at the reported concentration; the quantitation is an estimate.

S - Analyte result is subject to spectral interference. Unless otherwise qualified, the data is believed to be consistent with the background study results and may be used for its intended purpose.

U - Not considered detected. The associated number is the reported concentration.

UJ - Not considered detected. The associated number is the reported concentration, which may be inaccurate.

Table A.3
Parent and Field Duplicate Results Summary
Subarea 3, Round 1

Sample Location	Parent Sample					Field Duplicate Sample				
	Sample ID	Analyte Name	Activity	MDC	TPU	Sample ID	Analyte Name	Activity	MDC	TPU
3-00001	80001	Ac-227	0.0659 U	0.178	0.0546	80016	Ac-227	0.033 U	0.193	0.0582
3-00001	80001	Ac-228	1.11	0.0915	0.0548	80016	Ac-228	1.17	0.0895	0.0588
3-00001	80001	Am-241	-0.00236 UJ	0.0209	0.00404	80016	Am-241	-0.00424 UJ	0.0331	0.00584
3-00001	80001	Bi-212	0.775	0.127	0.0745	80016	Bi-212	0.879	0.133	0.0754
3-00001	80001	Bi-214	0.922	0.0273	0.0438	80016	Bi-214	0.993	0.0266	0.0448
3-00001	80001	Cd-113m	11.9 U	119	38.3	80016	Cd-113m	-164 UJ	130	61.2
3-00001	80001	Cm-243/244	0.00332	0.00899	0.00332	80016	Cm-243/244	-0.0133 UJ	0.0403	0.00701
3-00001	80001	Co-60	-0.00526 U	0.0162	0.00512	80016	Co-60	0.00303 U	0.016	0.00474
3-00001	80001	Cs-134	-0.00144 U	0.0146	0.00489	80016	Cs-134	0.172 JS	0.0223	0.0411
3-00001	80001	Cs-137	0.101	0.0151	0.00848	80016	Cs-137	0.096	0.0148	0.0083
3-00001	80001	Eu-152	-0.0077 U	0.042	0.0147	80016	Eu-152	-0.0181 U	0.0468	0.0305
3-00001	80001	Eu-154	-0.0731 UJ	0.0893	0.0328	80016	Eu-154	0.0041 U	0.0885	0.0261
3-00001	80001	Eu-155	0.0643 JS	0.0654	0.0252	80016	Eu-155	0.0366 U	0.0738	0.0219
3-00001	80001	Ho-166m	0.000974 U	0.0234	0.00681	80016	Ho-166m	-0.00804 U	0.023	0.00728
3-00001	80001	K-40	25.1	0.119	1.43	80016	K-40	26.2	0.107	1.71
3-00001	80001	Na-22	-0.00164 U	0.0206	0.00622	80016	Na-22	-0.0114 U	0.0198	0.00661
3-00001	80001	Nb-94	0.00279 U	0.0139	0.00406	80016	Nb-94	0.0117 J	0.0135	0.00484
3-00001	80001	Np-236	-0.0106 U	0.0335	0.0101	80016	Np-236	0.00986 U	0.0385	0.0141
3-00001	80001	Np-239	-0.0214 U	0.116	0.0351	80016	Np-239	-0.0337 U	0.129	0.0448
3-00001	80001	Pa-231	-0.552 UJ	0.692	0.257	80016	Pa-231	-0.543 UJ	0.799	0.337
3-00001	80001	Pb-212	1.25	0.0327	0.0794	80016	Pb-212	1.41	0.0352	0.0933
3-00001	80001	Pb-214	1.03	0.0304	0.0512	80016	Pb-214	1.1	0.0323	0.0542
3-00001	80001	Pu-238	-0.00143 U	0.0127	0.00245	80016	Pu-238	-0.00192 UJ	0.017	0.00329

Table A.3
Parent and Field Duplicate Results Summary
Subarea 3, Round 1

Sample Location	Parent Sample					Field Duplicate Sample				
	Sample ID	Analyte Name	Activity	MDC	TPU	Sample ID	Analyte Name	Activity	MDC	TPU
3-00001	80001	Pu-239/240	0.011	0.0156	0.00565	80016	Pu-239/240	0.0034 UJ	0.0169	0.00422
3-00001	80001	Pu-244	0.00198	0.00537	0.00199	80016	Pu-244	-0.00308 UJ	0.0241	0.00425
3-00001	80001	Sb-125	0.0147 U	0.0421	0.013	80016	Sb-125	0.022 JS	0.0441	0.0141
3-00001	80001	Sn-126	-0.00779 U	0.0143	0.00468	80016	Sn-126	-0.00831 U	0.0147	0.00495
3-00001	80001	Sr-90	0.0252 U	0.127	0.0355	80016	Sr-90	0.0226 U	0.133	0.0366
3-00001	80001	Th-228	1.25	0.114	0.122	80016	Th-228	1.2	0.0209	0.113
3-00001	80001	Th-229	0.0215	0.0195	0.0125	80016	Th-229	0.0273	0.0503	0.0168
3-00001	80001	Th-230	0.788	0.0772	0.0868	80016	Th-230	0.893	0.0502	0.09
3-00001	80001	Th-232	1.01	0.0664	0.1	80016	Th-232	0.992	0.0891	0.0978
3-00001	80001	Tl-208	0.401	0.0156	0.0242	80016	Tl-208	0.409	0.0159	0.0229
3-00001	80001	Tm-171	-0.525 U	11.9	4.13	80016	Tm-171	-5.85 U	17	10.7
3-00001	80001	U-233/234	0.921	0.0464	0.0892	80016	U-233/234	0.912	0.03	0.0886
3-00001	80001	U-235/236	0.0343	0.0155	0.0142	80016	U-235/236	0.0557	0.046	0.0205
3-00001	80001	U-238	0.89	0.0295	0.0866	80016	U-238	0.863	0.0128	0.085

Notes:

Refer to Table 2.1 of the Final Field Sampling Plan for Soil Sampling (HGL, 2012a) for a definition of radionuclide symbols.

Reporting units in picocuries per gram.

ID - Identification

MDC - minimum detectable concentration

TPU - total propagated uncertainty

J - The analyte was detected at the reported concentration; the quantitation is an estimate.

S - Analyte result is subject to spectral interference. Unless otherwise qualified, the data is believed to be consistent with the background study results and may be used for its

U - Not considered detected. The associated number is the reported concentration.

U J - Not considered detected. The associated number is the reported concentration, which may be inaccurate.

Table A.4
Rinsate and Source Comparison Summary
Subarea 3, Round 1

Sample Type	Sample ID	U-233/U-234			U-235/U-236			U-238		
		Activity	MDC	TPU	Activity	MDC	TPU	Activity	MDC	TPU
Rinsate	R0279	-0.0251 U	0.0873	0.0153	-0.00775 U	0.0685	0.0133	0 J	0.0236	0.00872
Source	S0278	0.0143 U	0.0593	0.0159	0.00227 U	0.0516	0.01	0.0131 J	0.0178	0.00931
Rinsate	R0438	-0.0374 U	0.11	0.0198	0.0343 J	0.0465	0.0244	0.0178 U	0.0885	0.0221
Source	S0278	0.0143 U	0.0593	0.0159	0.00227 U	0.0516	0.01	0.0131 J	0.0178	0.00931
Rinsate	R0440	-0.00435 U	0.0643	0.0125	0.0176 J	0.0238	0.0125	0.0111 U	0.056	0.0143
Source	S0278	0.0143 U	0.0593	0.0159	0.00227 U	0.0516	0.01	0.0131 J	0.0178	0.00931
Rinsate	R0442	0.0233 U	0.0797	0.0224	0.00275 U	0.0626	0.0121	0.00222 U	0.0506	0.0098
Source	S0278	0.0143 U	0.0593	0.0159	0.00227 U	0.0516	0.01	0.0131 J	0.0178	0.00931
Rinsate	R0464	0.00584 U	0.0452	0.0102	0.0263 J	0.0238	0.0153	0.0142 J	0.0192	0.0101
Source	S0278	0.0143 U	0.0593	0.0159	0.00227 U	0.0516	0.01	0.0131 J	0.0178	0.00931

Notes:

Refer to Table 2.1 of the Final Field Sampling Plan for Soil Sampling (HGL, 2012a) for a definition of radionuclide symbols.

Reporting units in picocuries per liter.

ID - Identification

MDC - minimum detectable concentration

TPU - total propagated uncertainty

J - The analyte was detected at the reported concentration; the quantitation is an estimate.

U - Not considered detected. The associated number is the reported concentration.

ATTACHMENT 2

Boring Logs

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HGL HydroGeoLogic, Inc. Exceeding Expectations

SSFL BORING LOG

3_001 eet _1_ of _1_

Project Name: SSFL Area IV Radiological Study	Project Number: EP038.01.22.04.03	Subarea: 3	Group: 1	Location ID: 1
Drilling Company: HGL	Driller: L. Speranza	Ground Elevation: NA		Total Depth Drilled: 0.5 ft bgs
Drilling Equipment: stainless steel shovel	Borehole Diameter: n/a	Date/Time Drilling Started: 9-26-11/0743		Date/Time Total Depth Reached: 9-26-11/ 0751
Type of Sampling Device: stainless steel shovel/ trowel		Samples Collected: Field DUP: 80016 (NT) One 1/2 Gallon Bag (Appox 8 lbs.) (# 80001) (0750)		
Geologist: Chelsea Carmichael		Checked By / Date: JoAnn Rollins Goldman 10/27/11		
Radiological Background: 25, 112	Radiological Equipment Used: (Micro R) Downhole (Pancake Meters)	PID Used: Mini Rae 2000 - Background: 0.0 ppm		

Depth (ft bgs)	Interval	Recovery	PID	Radiological	Description (Include lithology, grain size, sorting, angularity, Munsell color name & notation, minerology, bedding, plasticity, density, consistency, etc., as applicable)	USCS Symbol	Feet bgs.	Borehole Gamma Readings (CPM)
0.5			0.0	24/112	Silt with rock fragments, (10YR, 4/4) brown, 80% silt, 15% sandstone rock fragments, 5% fine sand, dry, soft, common rootlets, very low hardness, no plasticity, no odor.	ML	1	
1.0								
2.0					No GW reached.		2	
3.0							3	
4.0							4	
5.0							5	
6.0							6	

HGL HydroGeoLogic, Inc
Exceeding Expectations

SSFL BORING LOG

Sheet 1 of 1

Project Name: SSFL Area IV Radiological Study	Project Number: EP038.01.22.04.03	Subarea: 3	Group: 1	Location ID: 1
Drilling Company: HGL	Driller: Tim Morse/James Harris	Ground Elevation: NA		Total Depth Drilled: 3ft 4in ft bgs.
Drilling Equipment: Hand Auger	Borehole Diameter: 2.75 inches	Date/Time Drilling Started: 11/7/11 0836		Date/Time Total Depth Reached: 11/7/11 0906
Type of Sampling Device: 2.75" Hand Auger		Samples Collected: 80002 - 0915 (1) 1/2 Gallon Bag (Appox 8 lbs.)		
Geologist: Ian Stone		Checked By / Date: Cliff Knight 1-5-12		
Radiological Background: 16 / 3992 / 92	Radiological Equipment Used: Micro R / Downhole / Pancake Meters	PID Used: Mini Rae 2000 - Background: 0.0 ppm		

Depth (ft bgs)	Interval	Recovery	PID	Radiological	Description (Include lithology, grain size, sorting, angularity, Munsell color name & notation, minerology, bedding, plasticity, density, consistency, etc., as applicable)	USCS Symbol	Feet bgs.	Borehole Gamma Readings 0.5' = 4439 (CPM)
			0.0	63	Silty Sand, Brown (4/3 10YR)			4755
0.5			0.0	99	60% fine subrounded sand, 40% silt, trace gravel, trace roots (max gravel size = 1.5"), dry, low dense, slow dilatency, no odor or staining	SM		5394
1.0			0.0	104			1	5348
			0.0	119				5495
2.0			0.0	113			2	5389
	3ft 4in		0.0	97				5124
3.0			0.0	94	Silty Sand, Yellowish Brown (5/4 10YR) 75% fine subrounded sand, 25% silt, trace gravel (max size = 1.0"), dry, low dense, no odor or staining.	SM	3	5019
4.0					TD = 3ft 4in. bgs Refusal on sandstone boulder/cobbles No gw encountered		4	
5.0							5	
6.0							6	

3_002

HGL HydroGeoLogic, Inc. Exceeding Expectations

SSFL BORING LOG

Sheet _1_ of _1_

Project Name: SSFL Area IV Radiological Study	Project Number: EP038.01.22.04.03	Subarea: 3	Group: 1	Location ID: 2
Drilling Company: HGL	Driller: L. Speranza	Ground Elevation: NA		Total Depth Drilled: 0.5 ft bgs
Drilling Equipment: stainless steel shovel	Borehole Diameter: n/a	Date/Time Drilling Started: 9-26-11/ 0808		Date/Time Total Depth Reached: 9-26-11 / 0816
Type of Sampling Device: stainless steel shovel/ trowel		Samples Collected: One 1/2 Gallon Bag (Appox 8 lbs.) (# 80003) (0815)		
Geologist: Chelsea Carmichael		Checked By / Date: Jul Dean Rogers Feldner 10/27/11		
Radiological Background: 24, 102	Radiological Equipment Used: (Micro R) Downhole / (Pancake Meters)	PID Used: Mini Rae 2000 - Background: 0.0 ppm		

Depth (ft bgs)	Interval	Recovery	PID	Radiological	Description (Include lithology, grain size, sorting, angularity, Munsell color name & notation, minerology, bedding, plasticity, density, consistency, etc., as applicable)	USCS Symbol	Feet bgs.	Borehole Gamma Readings (CPM)
0.5			0.0	129 / 22	Sandy silt, (10 YR, 4/3), brown, ~~75~~ 65% silt, 30% fine to medium grained sand, 5% sandstone rock fragments, dry, soft, some rootlets, no plasticity, hardness or odor.	ML	1	
1.0					No GW reached.			
2.0							2	
3.0							3	
4.0							4	
5.0							5	
6.0							6	

HGL HydroGeoLogic, Inc
Exceeding Expectations

SSFL BORING LOG

Sheet 1 of 1

Project Name: SSFL Area IV Radiological Study	Project Number: EP038.01.22.04.03	Subarea: 3	Group: 1	Location ID: 2
Drilling Company: HGL	Driller: Tim Morse/James Harris	Ground Elevation: NA		Total Depth Drilled: 1ft 4in ft bgs.
Drilling Equipment: Hand Auger	Borehole Diameter: 2.75 inches	Date/Time Drilling Started: 11/7/11 1000		Date/Time Total Depth Reached: 11/7/11 1008
Type of Sampling Device: 2.75" Hand Auger		Samples Collected: 80004 - no sample (1) 1/2 Gallon Bag (Appox 8 lbs.)		
Geologist: Ian Stone		Checked By / Date: Cliff Knight / 1-5-12		

Radiological Background: 16 / 3710 / 90
Radiological Equipment Used: Micro R / Downhole / Pancake Meters
PID Used: Mini Rae 2000 - Background: 0.0 ppm

Depth (ft bgs)	Interval	Recovery	PID	Radiological	Description (Include lithology, grain size, sorting, angularity, Munsell color name & notation, minerology, bedding, plasticity, density, consistency, etc., as applicable)	USCS Symbol	Feet bgs.	Borehole Gamma Readings NM (CPM)
			0.0	72	Silty Sand, Brown (4/3 10YR)			NM
0.5			0.0	84	60% fine subrounded sand, 40% silt, trace gravel (max size = 0.75"), trace roots, dry, low density, no odor or staining	SM		NM
1.0			0.0	86			1	NM
					TD = 1ft 4 in bgs no gw encountered refusal on sandstone			
2.0							2	
3.0							3	
4.0							4	
5.0							5	
5.0							6	

HGL HydroGeoLogic, Inc. Exceeding Expectations

SSFL BORING LOG

Project Name: SSFL Area IV Radiological Study	Project Number: EP038.01.22.04.03	Subarea: 3 / Group: 1	Location ID: 3
Drilling Company: Bort Longyear	Driller: Don Hansen	Ground Elevation: NA	Total Depth Drilled: 2.5 ft bgs.
Drilling Equipment: Geoprobe 6600	Borehole Diameter: 1.75 inches	Date/Time Drilling Started: 10/13/11 1010	Date/Time Total Depth Reached: 10/13/11 1050
Type of Sampling Device: 1.75 inch Macrocore		Samples Collected: One 1/2 Gallon Bag (Appox 8 lbs.) 80005 (1020)	
Geologist: C. Knight		Checked By / Date: [signature] 10/25/11	
Radiological Background: 15μR/3014/51	Radiological Equipment Used: Micro R / Downhole / Pancake Meters	PID Used: Mini Rae 2000 - Background: 0.0 ppm	

Depth (ft bgs)	PID	Radiological	Description Af: Artificial Fill (Include lithology, grain size, sorting, angularity, Munsell color name & notation, minerology, bedding, plasticity, density, consistency, etc., as applicable)	USCS Symbol	Borehole Gamma Readings (CPM)
			Surface: Asphalt		to 0.5' 2961
	0.0	60	2" Asphalt		3355
0.5	0.0	62	Fill: Silty Sand: Dark yellowish brown (10YR 5/6), moist, medium dense, no odor, 20% silt, 10% medium sand, 70% fine sand, mottled	Af / SM	5343
1.0	0.0	64	8" Poorly graded Sand with silt: Pale yellow (2.5Y 7/4), dry, medium dense, no odor, 10% silt, 90% fine sand.	SP	5661
	0.0	58			5986
2.0	0.0	59	1'7" Weathered Sandstone: Pale yellow (2.5Y 7/4), dry, dense, no odor, mechanically weathered to SP, fine grained sandstone	[illegible]	5751
	0.0	66	2'3" Siltstone Beds: light olive brown (2.5Y 5/6), dry, hard, no odor, interbedded siltstone beds 1-2mm thick		5475
3.0			Refusal on siltstone at 2.5' bgs		
			No GW encountered		
4.0					
5.0					
6.0					

3_004

HGL HydroGeoLogic, Inc
Exceeding Expectations

SSFL BORING LOG

Sheet 1 of 2

Project Name: SSFL Area IV Radiological Study	Project Number: EP038.01.22.04.03	Subarea: 3	Group: 1	Location ID: 4
Drilling Company: HGL	Driller: Tim Morse/James Harris	Ground Elevation: NA		Total Depth Drilled: 8ft 3.0 ft bgs.
Drilling Equipment: Hand Auger	Borehole Diameter: 2.75 inches	Date/Time Drilling Started: 11/7/11 1431		Date/Time Total Depth Reached: 11/7/11 1532
Type of Sampling Device: 2.75" Hand Auger		Samples Collected: 80006 - 1540 (1) 1/2 Gallon Bag (Appox 8 lbs.)		
Geologist: Ian Stone		Checked By / Date: Cliff Knight 1-5-12		

Radiological Background: 12 / 3048 / 81
Radiological Equipment Used: Micro R / Downhole / Pancake Meters
PID Used: Mini Rae 2000 - Background: 0.0 ppm

Depth (ft bgs)	Interval	Recovery	PID	Radiological	Description (Include lithology, grain size, sorting, angularity, Munsell color name & notation, minerology, bedding, plasticity, density, consistency, etc., as applicable)	USCS Symbol	Feet bgs.	Borehole Gamma Readings 0.5' = 2932 (CPM)
			0.0	95	Silty Sand, Dark Yellowish Brown (4/4 10YR)			3236
0.5			0.0	82	65% fine subrounded sand, 35% silt, trace gravel (max size = 1.25"), dry, low-med dense, slow dilatancy, no odor or staining	SM		4817
1.0			0.0	80			1	5553
			0.0	93				5812
2.0			0.0	82			2	5943
					Artificial Fill			
			0.0	97	Silty Sand, Dark Yellowish brown (4/4 10YR)			6019
3.0			0.0	94	75% fine subrounded sand, 25% silt, trace gravel (max size = 1"), dry, med dense, no odor or staining	Sm	3	5922
	8-13'		0.0	96				5856
4.0			0.0	100			4	5764
			0.0	82				5723
5.0			0.0	97			5	5799
			0.0	99				5824
5.0			0.0	89	Same as above	Sm	6	5952
					Artificial Fill			

HydroGeoLogic, Inc.
Exceeding Expectations

SSFL BORING LOG (cont'd)

Project Name:	Project Number:	Subarea:	Group:	Location ID:
SSFL Area IV Radiological Study	EP038.01.22.04.03	3	1	4

Radiological Background:	Radiological Equipment Used:	PID Used:
12 / 3048 / 81	Micro R / Downhole / Pancake Meters	Mini Rae 2000 - Background: 0.0 ppm

Depth (ft bgs)	Interval	Recovery	PID	Radiological	Description (Include lithology, grain size, sorting, angularity, Munsell color name & notation, minerology, bedding, plasticity, density, consistency, etc., as applicable)	USCS Symbol	Feet bgs.	Borehole Gamma Readings (CPM)
6.0			0.0	89	Silty Sand, same as above	SM	6	5952
			0.0	90	artificial fill			5670
7.0			0.0	65	Silty Sand, Yellowish Brown (5/6 10YR) 80% fine subrounded sand, 20% silt, dry, med dense, no odor or staining	SM	7	5688
			0.0	79				5486
8.0			0.0	88	Sand (weathered sandstone), Brownish Yellow (6/6 10YR) 95% fine subrounded sand, 5% silt, dry, med dense, no odor or staining	SP / Bedrock	8	5148
					TD = 8ft 3in bgs no gw encountered refusal on sandstone no gamma anomalies			
9.0							9	
10.0							10	
11.0							11	
12.0							12	
13.0							13	

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HGL HydroGeoLogic, Inc. Exceeding Expectations

SSFL BORING LOG

Sheet 1 of 2

Project Name: SSFL Area IV Radiological Study	Project Number: EP038.01.22.04.03	Subarea: 3	Group: 1	Location ID: 5
Drilling Company: Bort Longyear	Driller: Don Hansen	Ground Elevation: NA		Total Depth Drilled: 8.5 ft bgs.
Drilling Equipment: Geoprobe 6600	Borehole Diameter: 1.75 inches	Date/Time Drilling Started: 10/13/11 1115		Date/Time Total Depth Reached: 10/13/11 1215
Type of Sampling Device: 1.75 inch Macrocore		Samples Collected: One 1/2 Gallon Bag (Appox 8 lbs.) 80007 (1120)		
Geologist: C. Knight		Checked By / Date: [illegible] 10/27/11		
Radiological Background: 13nR/26 cpm / 58 cpm	Radiological Equipment Used: Micro R / Downhole / Pancake Meters	PID Used: Mini Rae 2000 - Background: 0.0 ppm		

Depth (ft bgs)	Interval	Recovery	PID	Radiological	Description (Include lithology, grain size, sorting, angularity, Munsell color name & notation, minerology, bedding, plasticity, density, consistency, etc., as applicable)	USCS Symbol	Feet bgs.	Borehole Gamma Readings (CPM)
					Surface: Soil and grass			3808
0.5			0.0	52	Silty Sand: Yellowish brown (10YR 5/4), dry, medium dense, no odor, 30% silt, 10% medium sand, 60% fine sand, trace clay	SM		4854
1.0			0.0	56			1	5319
			0.0	60				5201
			0.0	67				4953
2.0			0.0	73			2	
			0.0	76				5029
3.0			0.0	75	2'8" — — — — — — — Silty Sand: Light olive brown (2.5Y 5/4), moist, medium dense, no odor, 15% silt, 85% fine sand, rapid dilatancy	SM	3	5062
			0.0	71				5042
4.0			0.0	69			4	5125
			0.0	68				5201 ~~5105~~ (DC)
5.0			0.1	61			5	5239
			0.0	75	Poorly graded Sand: Yellowish brown (10YR 5/4), moist, medium dense, no odor, 5% silt, 95% fine sand, trace iron oxide staining	SP		5038
6.0			0.0	84			6	5183

HydroGeoLogic, Inc.
exceeding expectations

SSFL BORING LOG (cont'd)

Project Name:	Project Number:	Subarea:	Group:	Location ID:
SSFL Area IV Radiological Study	EP038.01.22.04.03	3	1	5

Radiological Background:	Radiological Equipment Used:	PID Used:
Bkgr/261bcpm/58	Micro R / Downhole / Pancake Meters	Mini Rae 2000 - Background: 0.0 ppm

Depth (ft bgs)	Interval	Recovery	PID	Radiological	Description (Include lithology, grain size, sorting, angularity, Munsell color name & notation, minerology, bedding, plasticity, density, consistency, etc., as applicable)	USCS Symbol	Feet bgs.	Borehole Gamma Readings (CPM)
6.0			0.0	84	Same as above: Poorly graded Sand		6	5183
			0.0	82		SP		5210
7.0			0.0	73			7	5116
			0.0	76				5261
					7'7" — Poorly graded Sand: light yellowish brown (2.5Y 6/4), wet, dense, no odor, fine grained sand (100%)	SP		
8.0			0.0	72			8	5201
					8'1" — Weathered Sandstone: light brownish gray (2.5Y 6/2), very moist, very dense, no odor, fine grained sandstone, 10% medium sand, 90% fine sand	Bedrock		
			0.0	70				5312
9.0							9	
					- No GW encountered, very moist to wet on top of Bedrock			
					- Refusal on Sandstone at 8.5' bgs			
10.0							10	
11.0							11	
12.0							12	
13.0							13	

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HGL HydroGeoLogic, Inc Exceeding Expectations

SSFL BORING LOG

Sheet 1 of 2

Project Name: SSFL Area IV Radiological Study	Project Number: EP038.01.22.04.03	Subarea: 3	Group: 1	Location ID: 6
Drilling Company: Bort Longyear	Driller: Don Hansen	Ground Elevation: NA		Total Depth Drilled: 10.0 ft bgs.
Drilling Equipment: Geoprobe 6600	Borehole Diameter: 1.75 inches	Date/Time Drilling Started: 10/13/11 1435		Date/Time Total Depth Reached: 10/13/11 1515
Type of Sampling Device: 1.75 inch Macrocore		Samples Collected: One 1/2 Gallon Bag (Appox 8 lbs.) 8 COC08 (1440)		
Geologist: C. Knight		Checked By / Date: [illegible] Robbins M. Odman 10/27/11		
Radiological Background: 13nR/2733/49	Radiological Equipment Used: Micro R / Downhole / Pancake Meters	PID Used: Mini Rae 2000 - Background: 0.0 ppm		

Depth (ft bgs)	Interval	Recovery	PID	Radiological	Description (Include lithology, grain size, sorting, angularity, Munsell color name & notation, minerology, bedding, plasticity, density, consistency, etc., as applicable)	USCS Symbol	Feet bgs.	Borehole Gamma Readings +0.5' 311 (CPM)
					Surface: Soil and grass			
			0.0	49	Sandy Silt: Brown (10YR 5/3), dry, medium stiff,	ML		3835
0.5			0.0	47	no odor, 35% fine sand, 65% silt, cohesive, low plasticity,			4994
1.0			0.0	53	low toughness		1	5257
			0.0	55				8181
2.0			0.0	56			2	8129
			0.0	61	2'5"			5325
3.0			0.0	71	Silty Sand: Yellowish brown (10YR 5/6), moist, medium dense, no odor, 25% silt, 5% medium sand, 70% fine sand	SM	3	5261
			0.0	77				5095
4.0			0.0	82			4	5094
			0.0	83				5214
5.0			0.0	77			5	5408
			0.0	77	Poorly Graded Sand with Silt: Yellowish brown (10YR 5/4), moist, medium dense, no odor, 10% silt, 5% medium sand, 85% fine sand, some iron oxide staining	SP		5208
6.0			0.0	73			6	5162

HydroGeoLogic, Inc
Exceeding Expectations

SSFL BORING LOG (cont'd)

Project Name:	Project Number:	Subarea:	Group:	Location ID:
SSFL Area IV Radiological Study	EP038.01.22.04.03	3	1	6

Radiological Background: 13μR / 2733 / 49

Radiological Equipment Used: Micro R / Downhole / Pancake Meters

PID Used: Mini Rae 2000 - Background: 0.0 ppm

Depth (ft bgs)	Interval	Recovery	PID	Radiological	Description (Include lithology, grain size, sorting, angularity, Munsell color name & notation, minerology, bedding, plasticity, density, consistency, etc., as applicable)	USCS Symbol	Feet bgs.	Borehole Gamma Readings (CPM)
6.0			0.0	73	Same as above; Poorly graded Sand with silt	SP	6	5162
			0.0	75				5097
7.0			0.0	77			7	5130
			0.0	80				5297
8.0			0.0	75			8	5199
			0.0	70				5107
9.0			0.0	75	Same as above	SP	9	5167
			0.0	66	9'6" Weathered Sandstone Bedrock: Pale yellow (10YR 2.5Y 8/3), moist, very dense, no odor, fine grained sandstone, trace silt	Bedrock		5102
10.0			0.0	72			10	5239
					Total Depth: 10.0' bgs			
					No GW encountered			
11.0							11	
12.0							12	
13.0							13	

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HGL HydroGeoLogic, Inc Exceeding Expectations

SSFL BORING LOG

Sheet 1 of 1

Project Name: SSFL Area IV Radiological Study	Project Number: EP038.01.22.04.03	Subarea: 3	Group: 1	Location ID: 7
Drilling Company: Bort Longyear	Driller: Don Hansen	Ground Elevation: NA		Total Depth Drilled: 4.0 ft bgs.
Drilling Equipment: Geoprobe 6600	Borehole Diameter: 1.75 inches	Date/Time Drilling Started: 10/12/11 1125		Date/Time Total Depth Reached: 10/12/11 1210
Type of Sampling Device: 1.75 inch Macrocore		Samples Collected: One 1/2 Gallon Bag (Appox 8 lbs.) 80009 (1130)		
Geologist: C. Knight		Checked By / Date: Andrea Rollins Feldman 10/27/11		
Radiological Background: BmR/2603/49	Radiological Equipment Used: Micro R / Downhole / Pancake Meters	PID Used: Mini Rae 2000 - Background: 0.0 ppm		

Depth (ft bgs)	Interval	Recovery	PID	Radiological	Description (Include lithology, grain size, sorting, angularity, Munsell color name & notation, minerology, bedding, plasticity, density, consistency, etc., as applicable)	USCS Symbol	Feet bgs.	Borehole Gamma Readings +0.5' 2951 (CPM)
					Surface: Soil and debris			
			0.1	66	Fill: Silty Sand: Brown (10YR 5/3), dry, medium dense, no odor, 40% silt, 5% medium sand, 5% fine subangular gravel (Fill rock), 50% fine sand, mottled	Af / SM		3127
0.5			0.1	68				4539
1.0			0.1	67			1	4642
			0.1	66	Fill: Sandy Silt: Very dark grayish brown (10YR 3/2), moist, medium stiff, no odor, 5% medium sand, 5% subangular gravel, 30% fine sand, 60% silt, cohesive, low plasticity, low toughness, some charcoal, some gypsum drywall, mottled	Af / ML		4511
2.0			0.1	65	Poorly graded Sand with silt: Fill: Light yellowish brown (2.5Y 6/3), moist, medium dense, no odor, 5% medium sand, 10% silt, 85% fine sand, mottled	Af / SP	2	4465
			0.1	65	2'6"			4747
3.0			0.1	67	Sandstone: Light olive brown (2.5Y 5/4), moist, dense, no odor, 5% silt, 5% medium sand, 90% fine sand, mechanically weathered to SP, fine grained sandstone	Bedrock or Boulder	3	5273
			0.1	87				5250
4.0		NR	0.1	51	No Recovery		4	5103
5.0					Refusal at 4.0' bgs on Sandstone No GW encountered		5	
6.0							6	

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HGL HydroGeoLogic, Inc Exceeding Expectations

SSFL BORING LOG

Sheet 1 of 1

Project Name: SSFL Area IV Radiological Study	Project Number: EP038.01.22.04.03	Subarea: 3	Group: 1	Location ID: 8
Drilling Company: Bort Longyear	Driller: Don Hansen	Ground Elevation: NA		Total Depth Drilled: 1'4" ~~7~~ clr ft bgs.
Drilling Equipment: Geoprobe 6600	Borehole Diameter: 1.75 inches	Date/Time Drilling Started: 10/12/11 1405		Date/Time Total Depth Reached: 10/12/11 1418
Type of Sampling Device: 1.75 inch Macrocore		Samples Collected: One 1/2 Gallon Bag (Appox 8 lbs.) 80010 (NO SAMPLE)		
Geologist: C. Knight		Checked By / Date: [illegible] 10/27/11		
Radiological Background: 13mR / 2579 / 70	Radiological Equipment Used: Micro R / Downhole / Pancake Meters	PID Used: Mini Rae 2000 - Background: 0.0 ppm		

Depth (ft bgs)	Interval	Recovery	PID	Radiological	Description (Include lithology, grain size, sorting, angularity, Munsell color name & notation, minerology, bedding, plasticity, density, consistency, etc., as applicable)	USCS Symbol	Feet bgs.	Borehole Gamma Readings (CPM)
0.5			0.0	58	AF: 50% Sand: Dark yellowish brown (10YR 4/4), dry, loose, no odor, 30% silt, 5% coarse sand, 5% medium sand, 60% fine sand, some charcoal/asphalt and glass	AF/SM	1	No ~~data~~ downhole Gamma corrected due to shallow refusal
			0.0	60				
1.0			0.0	65	Sandstone Bedrock: Olive yellow (2.5Y 6/8), dry, very dense, no odor, 10% medium sand, 90% fine sand, fine grained sandstone (1'2"–1'4")	Bedrock	2	
2.0					NO GW encountered Refusal on sandstone at 1'4" bgs		3	
3.0							4	
4.0							5	
5.0							6	
6.0								

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HGL HydroGeoLogic, Inc Exceeding Expectations

SSFL BORING LOG

Sheet 1 of 1

Project Name: SSFL Area IV Radiological Study	Project Number: EP038.01.22.04.03	Subarea: CK 3	Group: 1	Location ID: 9
Drilling Company: Bort Longyear	Driller: Don Hansen	Ground Elevation: NA		Total Depth Drilled: 5.0 ft bgs.
Drilling Equipment: Geoprobe 6600	Borehole Diameter: 1.75 inches	Date/Time Drilling Started: 10/11/11 1445		Date/Time Total Depth Reached: 10/11/11 1540
Type of Sampling Device: 1.75 inch Macrocore		Samples Collected: One 1/2 Gallon Bag (Approx 8 lbs.)		8001 1 C 1450 2
Geologist: C. Knight		Checked By / Date:		10/27/11
Radiological Background: 12μR / 2564 / 50	Radiological Equipment Used: Micro R / Downhole / Pancake Meters	PID Used: Mini Rae 2000 - Background: 0.0		ppm

Depth (ft bgs)	Interval	Recovery	PID	Radiological	Description (Include lithology, grain size, sorting, angularity, Munsell color name & notation, minerology, bedding, plasticity, density, consistency, etc., as applicable)	USCS Symbol	Feet bgs.	Borehole Gamma Readings +0.5' 2720 (CPM)
					Surface: Soil			
			0.0	56	Fill: Silty Sand with gravel: light yellowish brown (10YR 6/4), moist, medium dense, no odor, 10% subangular granitic gravel (fine), 20% silt, 10% medium sand, 60% fine sand	AF/SM		2955
0.5			0.0	65				4816
1.0			0.0	71			1	5287
					- trace bentonite (hydrated) chips			
			0.0	77	- trace fibrous moist cloth			5181
					Same as above: Silty Sand w/ gravel	AF/SM		
2.0			0.0	78			2	5403
					2'4"			
			0.0	84	6" thick asphalt layer	AC/AB		5446
					2'10"			
					Poorly graded Sand with silt: Yellowish brown (10YR 5/4),	AF/SP		5567
3.0			0.0	76	moist, medium dense, no odor, 10% silt, 90% fine sand, mottled		3	
			0.0	64				5632
					4'9" bedrock contact 4'9"			
					Sandstone Bedrock: Light olive brown (10YR 2.5Y 5/6),	Bedrock		5486
4.0			0.0	72	moist, very dense, no odor, mechanically weathered to SP, fine grained sandstone		4	
			0.0	76				5504
					5'0" Refusal at 5.0' bgs on Sandstone			
5.0			0.0	73			5	5356
					No GW encountered			
6.0							6	

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SSFL BORING LOG

HGL HydroGeoLogic, Inc — Exceeding Expectations

Sheet 1 of 1

Project Name: SSFL Area IV Radiological Study	Project Number: EP038.01.22.04.03	Subarea: 3	Group: i	Location ID: 10
Drilling Company: HGL	Driller: Tim Morse/James Harris	Ground Elevation: NA	Total Depth Drilled: 4 ft bgs.	
Drilling Equipment: Hand Auger	Borehole Diameter: 2.75 inches	Date/Time Drilling Started: 11/7/11 1034	Date/Time Total Depth Reached: 11/7/11 1116	
Type of Sampling Device: 2.75" Hand Auger		Samples Collected: (1) 1/2 Gallon Bag (Appox 8 lbs.) 80012 - 1125		
Geologist: Ian Stone		Checked By / Date: [signature] 1-5-12		
Radiological Background: 12 / 3329 / 76	Radiological Equipment Used: Micro R / Downhole / Pancake Meters	PID Used: Mini Rae 2000 - Background: 0.0 ppm		

Depth (ft bgs)	PID	Radiological	Description (Include lithology, grain size, sorting, angularity, Munsell color name & notation, minerology, bedding, plasticity, density, consistency, etc., as applicable)	USCS Symbol	Feet bgs.	Borehole Gamma Readings 0.5' = 3328 (CPM)
	0.0	96	Silty Sand, Yellowish brown (5/4 10YR) 65% fine subrounded sand, 35% silt, trace gravel, trace asphault, dry, slow dilatancy, low dense, no odor or staining. Artificial Fill	SM		4061
0.5	0.0	93				5062
1.0	0.0	82			1	5642
	0.0	78				5850
2.0	0.0	56	Silty Sand, Dark yellowish brown (4/4 10YR) 55% fine subrounded sand, 45% silt, trace gravel (max size = 1.5"), dry, slow dilatancy, low dense, no odor or staining. Artificial Fill	SM	2	5738
	0.0	92				5720
3.0	0.0	92			3	5635
	0.0	109	Sand (Weathered sandstone), brownish yellow (6/6 10YR) 95% fine sand, 5% silt, dry, med high dense, no odor or staining			5437
4.0	0.0	83		SM/Bedrock		5472
			TD= 4ft bgs; no gw encountered; Refusal on sandstone; no gamma anomalies			
5.0					5	
6.0					6	

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HGL HydroGeoLogic, Inc. Exceeding Expectations

SSFL BORING LOG

Sheet 1 of 2

Project Name: SSFL Area IV Radiological Study	Project Number: EP038.01.22.04.03	Subarea: 3	Group: 1	Location ID: 11
Drilling Company: Bort Longyear	Driller: Don Hansen	Ground Elevation: NA		Total Depth Drilled: 7.0 ft bgs.
Drilling Equipment: Geoprobe 6600	Borehole Diameter: 1.75 inches	Date/Time Drilling Started: 10/12/11 0835		Date/Time Total Depth Reached: 10/12/11 1045
Type of Sampling Device: 1.75 inch Macrocore		Samples Collected: One 1/2 Gallon Bag (Approx. 8 lbs.) 9003 (0840)		
Geologist: C. Knight		Checked By / Date: Jillian Robbins / Jedman 10/27/11		
Radiological Background: 14uR/2447/40	Radiological Equipment Used: Micro R / Downhole / Pancake Meters	PID Used: Mini Rae 2000 - Background: 0.0 ppm		

Depth (ft bgs)	Interval	Recovery	PID	Radiological	Description (Include lithology, grain size, sorting, angularity, Munsell color name & notation, minerology, bedding, plasticity, density, consistency, etc., as applicable)	USCS Symbol	Feet bgs.	Borehole Gamma Readings +0.5" 3185 (CPM)
					Af: Artificial Fill			
					Surface Soil			4527
0.5			0.0	61	Fill: Silty Sand with gravel: Yellowish brown (10YR 5/4), dry, medium dense, no odor, 10% subangular fine gravel (1/8" to 3/4") fill rock, 30% silt, 5% coarse sand, 10% medium sand, 45% fine sand, mottled, trace rootlets	Af/SM		5311
			0.0	67				
1.0			0.0	74			1	5631
			0.0	82				5703
2.0			0.0	87			2	5598
			0.0	71	Same as above: Fill: Silty Sand with gravel	Af/SM		5736
					2'7" Concrete Debris	Af	3	5502
3.0			0.0	69				
		NR	0.0	NM	No Recovery 3-5' bgs, concrete in shoe			5219
		NR					4	4890
4.0			0.0	NM				
		NR	0.0	NM	Fill: Silty Sand: Light yellowish brown (10YR 6/4), dry, medium dense, no odor, 40% silt, 5% ~~fine~~ CK sand, 5% subangular gravel (fill rock + concrete), 10% medium sand, 40% fine sand, mottled			4749
		NR		78			5	NM
5.0			0.0	AA CH	concrete debris ~1" thick			
			0.0	45	5'7" 5'11" Concrete debris	Af/SM		NM
6.0			0.0	54		Af	6	NM

HydroGeoLogic, Inc
Exceeding Expectations

SSFL BORING LOG (cont'd)

Project Name:	Project Number:	Subarea:	Group:	Location ID:
SSFL Area IV Radiological Study	EP038.01.22.04.03	3	1	11

Radiological Background:	Radiological Equipment Used:	PID Used:
14uR/2447/40	Micro R / Downhole / Pancake Meters	Mini Rae 2000 - Background: 0.0 ppm

Depth (ft bgs)	Interval	Recovery	PID	Radiological	Description (Include lithology, grain size, sorting, angularity, Munsell color name & notation, minerology, bedding, plasticity, density, consistency, etc., as applicable)	USCS Symbol	Feet bgs.	Borehole Gamma Readings (CPM)
6.0			0.0	54	Same as above: Concrete debris	Af	6	NM
			0.6	47	6'6" Fill: Sandy Silt: Dark yellowish brown (10YR 3/6), moist, medium stiff, no odor, 35% fine sand, 5% medium sand, 60% silt, cohesive, low plasticity, low toughness	Af (QC)		NM
7.0			0.6	52	7'0" Sandstone Bedrock: Light olive brown (2.5Y 6/6), moist, dense, no odor, 5% coarse, 10% medium 85% fine sand, fine grained sandstone	ML	7	NM
8.0					- Refusal on Bedrock Sandstone at 7' bgs - No GW encountered - Only able to widen boring to 4.5' for down hole gamma logging due to fill material / concrete encountered at that depth on 3 attempts. - NM = not measured		8	
9.0							9	
10.0							10	
11.0							11	
12.0							12	
13.0							13	

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HGL HydroGeoLogic, Inc
Exceeding Expectations

SSFL BORING LOG

Sheet 1 of 1

Project Name: SSFL Area IV Radiological Study	Project Number: EP038.01.22.04.03	Subarea: 3	Group: 1	Location ID: 12
Drilling Company: Bort Longyear	Driller: Don Hansen	Ground Elevation: NA		Total Depth Drilled: 4.0 ft bgs.
Drilling Equipment: Geoprobe 6600	Borehole Diameter: 1.75 inches	Date/Time Drilling Started: 10/12/11 1425		Date/Time Total Depth Reached: 10/12/11 1530
Type of Sampling Device: 1.75 inch Macrocore		Samples Collected: One 1/2 Gallon Bag (Appox 8 lbs.)		80014 (9435)
Geologist: C. Knight		Checked By / Date:		Jean Robins Goldman 10/27/11
Radiological Background: 13uR/27cB/44	Radiological Equipment Used: Micro R / Downhole / Pancake Meters	PID Used: Mini Rae 2000 - Background: 0.0		ppm

Depth (ft bgs)	Interval	Recovery	PID	Radiological	Description (Include lithology, grain size, sorting, angularity, Munsell color name & notation, minerology, bedding, plasticity, density, consistency, etc., as applicable)	USCS Symbol	Feet bgs.	Borehole Gamma Readings +0.5 3087 (CPM)
					surface: soil and grass			
			0.0	49	Sandy silt: Dark yellowish brown (10YR 4/4),	ML		4161
0.5			0.0	54	dry, medium stiff, no odor, 5% medium sand, 30% fine sand, 65% silt, cohesive, low plasticity, low toughness,			5373
1.0			0.0	55	trace rootlets		1	5584
			0.0	65				5856
					1'9" root 1" diameter			
2.0			0.0	74			2	5902
					2'4"			
			0.0	68	Silty Sand: Light yellowish brown (10YR 6/4), dry,	SM		5842
					medium dense, no odor, 20% silt, 5% medium sand, 75% fine sand, some pin hole pores, trace iron oxide staining		3	5980
3.0			0.0	73				
			0.0	73				5896
					Sandstone Bedrock: Olive yellow (2.5Y 6/8),			
					3'11" dry, dense, no odor, fine grained sandstone, some iron oxide staining			
4.0			0.0	69		Bedrock	4	5800
					Refusal on sandstone at 4' bgs			
					No GW encountered			
5.0							5	
6.0							6	

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HGL HydroGeoLogic, Inc
Exceeding Expectations

SSFL BORING LOG

Sheet 1 of 1

Project Name: SSFL Area IV Radiological Study	Project Number: EP038.01.22.04.03	Subarea: 3	Group: 1	Location ID: 13
Drilling Company: HGL	Driller: Tim Morse/James Harris	Ground Elevation: NA		Total Depth Drilled: 1ft. 10in ft bgs.
Drilling Equipment: Hand Auger	Borehole Diameter: 2.75 inches	Date/Time Drilling Started: 11/7/11 1319		Date/Time Total Depth Reached: 11/7/11 1345
Type of Sampling Device: 2.75" Hand Auger		Samples Collected: 80015 - 1350 (1) 1/2 Gallon Bag (Appox 8 lbs.)		
Geologist: Ian Stone		Checked By / Date: Cliff Knight 1-5-12		

Radiological Background: 13 / 3455 / 69
Radiological Equipment Used: Micro R / Downhole / Pancake Meters
PID Used: Mini Rae 2000 - Background: 0.0 ppm

Depth (ft bgs)	Interval	Recovery	PID	Radiological	Description (Include lithology, grain size, sorting, angularity, Munsell color name & notation, minerology, bedding, plasticity, density, consistency, etc., as applicable)	USCS Symbol	Feet bgs.	Borehole Gamma Readings 0.5' = 3304 (CPM)
0.5			0.0	82	Silty Sand, Brown (4/3 10YR), 55% fine subrounded sand, 45% silt, trace gravel (max size = 1.25"), trace roots, dry, low dense, slow dilatency, no odor or staining	SM	0.5	3422
1.0			0.0	89			1	4691
2.0			0.0	88			2	5034
3.0			0.0	82			3	5207
4.0					TD = 1ft 10in bgs no gw encountered refusal on sandstone no anomalies		4	
5.0							5	
6.0							6	