LOGSHEET FOR FIELD CHANGES TO CONTROLLED DOCUMENTS

Change Number	Date	Document Number	Document Title	Section/Page Modified	Description of Change (s)	Resp. Manager Approval	Compliance Approval	ESH&Q Approval	Rad. Eng. Approval	Quality Assurance	Completion of ADM 2.01 Checklist	Completion of SES/USQ Checklist
003	3-18-98	RFI/RMRS 97-084	Final SAP for the site Characterization of the 903 Pad, RFI Area, and American Zone	i, ii, 2.1/iv	18 Revise DQOs and	M. Wood	NA	NA	[illegible]	[illegible] 3.19	yes	yes
				2.2.2/20	sampling of artificial fill beneath asphalt						↓	↓
				2.3.1/21	to the same as the							
				2.5.3/23								
				2.6.3/27	asphalt's DQO's and							
				3.1.1/38+39	sampling to meet waste Rec. Lites WAC							
				Table 2.1/22	Revise Method Quantitation	M. Wood	NA	NA	[illegible]	[illegible] 3.19	yes	yes
				Table 3.5/41	Limit for VOCs from 500 ug/kg to 740 ug/kg						↓	↓
					to match PQL of labs,							
				Table 3.7/ 3/18/98	and added RB sample containers							
					for Road 130 samples							
				3.3.1/47	Added FIDLER surveys and	M. Wood	NA	NA	[illegible]	[illegible] 3.19	yes	yes
				3.3.2/47A	modified field forms						↓	↓

M. Wood 3/19/98

C. [illegible] for C. DiFrancesco 3.19.98

Best Available Copy

ADMIN RECORD
1112-A-000110

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LIST OF ACRONYMS (Cont.)

RPD	Relative Percent Difference
SAP	Sampling and Analysis Plan
SOP	Standard Operating Procedure
SSOC	Safe Sites of Colorado, L.L.C.
ug/L	Micrograms per Liter
ug/Kg	Micrograms per Kilogram
VOC	Volatile Organic Compound

STANDARD OPERATING PROCEDURES

NUMBER	PROCEDURE TITLE
5-21000-OPS-FO.1	Air Monitoring and Particulate Control
5-21000-OPS-FO.03	Field Decontamination Procedures
4-S02-ENV-OPS-FO.04	Decontamination of Equipment at Decontamination Facilities
5-21000-OPS-FO.06	Handling of Personal Protective Equipment
5-21000-OPS-FO.07	Handling of Decontamination Water and Wash Water
4-K56-ENV-OPS-FO.08	Monitoring and Containerizing Drilling Fluids and Cuttings
4-K56-ENV-OPS-FO.09	Handling of Residual Samples
4-K55-ENV-OPS-FO.10	Receiving, Marking, and Labeling Environmental Materials Containers
5-21000-OPS-FO.11	Field Communications
5-21000-OPS-FO.12	Decontamination Facility Operations
5-21000-OPS-FO.13	Containerization, Preserving, Handling and Shipping of Soil and Water Samples
5-21000-OPS-FO.15	Photoionization Detectors and Flame Ionization Detectors
4-F99-ENV-OPS-FO.23	Management of Soil and Sediment Investigative Derived Materials
4-H46-ENV-OPS-FO.29	Disposition of Soil and Sediment Investigation Derived Materials
5-21000-OPS-GT.01	Logging Alluvial and Bedrock Material
5-21000-OPS-GT.02	Drilling and Sampling Using Hollow-Stem Auger Techniques
5-21000-OPS-GT.05	Plugging and Abandonment of Boreholes
4-E42-ER-OPS-GT.08	Surface Soil Sampling
5-21000-OPS-GT.10	Borehole Clearing
1-F20-ER-EMR-EM.001	Approval Process for Construction/Excavation Activities
4-S64-ER-GT.39	Push Subsurface Soil Sample
4-61100-REP-14.01	Operation of Gamma Ray Spectroscopy System
4-R29-REP-14.02	Routine Characterization of HPGe Detectors
4-H58-ROI-06.6	Use of Bicron FIDLER
2-S47-ER-ADM-05.14	Use of Field Logbooks and Forms
2-G32-ER-ADM-08.02	Evaluation of ERM Data for Usability in Final Reports

The subsurface DNAPL contamination is suspected to be present directly beneath the area where drums were previously stored. The liquid contained in the drums has migrated downward towards the bedrock surface. An east-west paleo-channel (medial paleoscour, Figure 3.4) is cut into the bedrock, with the greatest depth to bedrock located toward the middle of the 903 Pad. The available subsurface and groundwater data (see Section 1.2) strongly indicates that the source for DNAPL contamination is limited to the area under the present 903 Pad. The VOC contamination east of the 903 Pad is suspected to be limited to the dissolved phase in groundwater.

2.0 DATA QUALITY OBJECTIVES

The data quality objective process consists of seven distinct steps and is designed to be iterative; the outputs of one step may influence prior steps and cause them to be refined. Each of the seven steps are described below for the Investigation Area (Figure 1.2).

2.1 State the Problem

2.1.1 Surface Soils

Previous investigations in the Lip Area and Americium Zone have revealed radiological contamination in surface soils exceeding RFCA Tier I soil action levels triggering an action. The exposure area (EA) of previous investigations were 2.5- and 10-acre plots. The purpose of this characterization effort is to further refine the volume of soils exceeding RFCA Tier I soil action levels. The volume estimate calculated from data generated from this investigation will be used for input for a remedial alternative analysis.

Asphalt and Artificial Fill - Remediation of subsurface soils at the 903 Pad may require the removal and disposal of the asphalt and artificial fill comprising the 903 Pad. Low-level waste disposal facilities require that waste be characterized, specifically that the 90% upper confidence limit of the mean be compared to waste acceptance criteria (WAC) thresholds for the contaminants of interest. No data, with the exception of a 903 Pad surface gamma survey (Rutherford, 1981), currently exists for the asphalt and artificial fill. Preliminary analytical data, specifically the mean activity and sample variance, will be required to design a statistically based sampling plan to adequately characterize the asphalt and artificial fill to meet the WAC of waste disposal facilities qualified to accept the waste.

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2.2 *Identify the Decision*

2.2.1 Soils

Decisions required to be made using the data collected for surface and subsurface soils include:

- Do activities of radiological contaminants in soils equal or exceed the RFCA Tier I Soil Action Levels, and if they do to what is the areal and vertical extent?
- Do VOCs beneath or adjacent to the 903 Pad exist at concentration equal to or exceeding the Tier I soil action levels, and if present what is the areal and vertical extent?

Actions based on the decisions include an evaluation, remedial action, or management action of soils identified as exceeding Tier I soil action levels or other action levels identified as being protective of surface water. Final remedial actions or no further action determinations will be incorporated into the Buffer Zone OU Record of Decision (ROD).

2.2.2 Asphalt and Artificial Fill

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The decisions to be made based on the asphalt and artificial fill sampling are: is the sample variance and mean values calculated from sample results collected per this SAP demonstrate adequate characterization and potential treatment of the 903 Pad asphalt and artificial fill to meet a waste disposal facilities WAC requirements.

2.3 *Identify Inputs to the Decision*

2.3.1 Soils

Inputs to the decision include radiochemical and chemical results from surface and subsurface soil samples for comparison to RFCA Tier I action levels. The parameters of interest include the activity/concentrations of the following radionuclides/contaminants in surface and subsurface soils:

- $^{239/240}Pu$;
- ^{241}Am;
- Uranium-234 (^{234}U);
- Uranium-235 (^{235}U);

- Uranium-238 (^{238}U); and
- VOCs (subsurface soils only).

Field sampling techniques and analytical methods were selected to collect the necessary data to compare to RFCA Tier I action levels. Methods with quantitation limits (organics) and minimum detectable activities (MDA) below action level thresholds were selected. Table 2.1 provides mid-range quantitation limits and Tier I soil action levels for VOCs suspected to be present within the Investigation Area. Table 2.2 provides the MDAs, and RFCA Tier I soil action levels for radionuclides. The direct method (HPGe) MDA for $^{239/240}$Pu exceeds the action level threshold, however, indirect methods (calculated from the ^{241}Am activity) will allow detection of $^{239/240}$Pu to approximately 7 pCi/g (assuming a $^{239/240}$Pu to ^{241}Am activity ration of 7.0). In addition, due to masking of the ^{234}U activity by ^{238}U, the ^{234}U activity will be estimated from the ^{238}U activity (assuming equilibrium/activity ratio of 1.0). Therefore ^{234}U will have a estimated MDA equal to ^{238}U at 5 pCi/g.

Sample quantities and analytical methods are provided in Tables 3.2 through 3.5. Land survey data will also be used to control sample locations.

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Asphalt and Artificial Fill - Inputs to the decision include radiochemical data to include the activities of the following radionuclides:

- ^{241}Am;
- $^{239/240}$Pu;
- $^{233/234}$U:
- ^{235}U; and
- ^{238}U.

2.4 Define the Investigation Boundaries

The investigation boundaries and rationale for the boundaries selected are detailed in Section 1.1.3 and in Figures 1.1, 1.2, 1.4, 3.1, 3.2, and 3.4.

Table 2.1 Analytical Quantitation Limits - VOCs

Compound	Tier I Action Level (mg/kg)	Method 8260B Quantitation Limit (ug/kg)
Carbon Tetrachloride	11.00	740
Chloroform	152.00	740
cis-1,2-dichloroethene	9.51	740
Methylene Chloride	5.77	740
Tetrachloroethene (PCE)	11.50	740
Trichloroethene (TCE)	9.27	740

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Table 2.2 Minimum Detectable Activity - Radionuclides

Radionuclide	Tier I Soil Action Level (pCi/g)	HPGe MDA[1] (pCi/g)	Alpha Spectrometry MDA (pCi/g)
Am-241	215	1	0.3
Pu-239/240	1,429	3,500[2]	0.3
U-234	1,738	250[3]	1.0
U-235	135	0.5	1.0
U-238	586	5	1.0

[1] Minimum detectable activity of direct reading (based on 15 minute count time and a bare 75% N-type HPGe).

[2] Indirect methods (estimated from ^{241}Am) will allow detection of $^{239/240}$Pu to approximately 7 pCi/g

[3] Indirect methods (estimated from ^{238}U) will allow detection of ^{234}U to approximately 5 pCi/g

2.5 Develop a Decision Rule

2.5.1 Radionuclides

The decision level is based on a summary evaluation of activities of radionuclides in surface and subsurface soils as defined in RFCA (DOE, 1996). If a mixture of radionuclide contaminants a, b, c are present in the soil with activities a_a, a_b, and a_c, and if the applicable action level of

radionuclide in soil, as stated in RFCA, is A_a, A_b, and A_c respectively, then the activity in the soil shall be limited so that the following relationship exists:

$$\frac{a_a}{A_a} + \frac{a_b}{A_b} + \frac{a_c}{A_c} \leq 1 \qquad \text{(Eq. 2.1)}$$

Table 2.2 provides the Tier I radionuclide soil action levels for Open Space Use (DOE, 1996a). The Tier I soil action level sum of ratios equation (in units of pCi/g) is provided below as equation 2.2.

$$\frac{\text{Am-241}}{215} + \frac{\text{Pu-239/240}}{1429} + \frac{\text{U-234}}{1738} + \frac{\text{U-235}}{135} + \frac{\text{U-238}}{586} = \text{Sum of Ratio of Tier I Action Level} \qquad \text{(Eq. 2.2)}$$

If individual radionuclide activities in surface or subsurface soils equal or exceed the RFCA Tier I soil action levels, or the sum of their respective ratios exceed 1, an evaluation, remedial action, or management action is required. If individual radionuclide activities are below the Tier I soil action levels or the sum of ratios is less than 1, or below other action levels identified as being protective of surface water, the soils will not require an accelerated action and will be addressed under the Buffer Zone OU ROD.

2.5.2 Volatile Organic Compounds

The decision level is based on concentration of volatile organic compounds in soils as defined in RFCA (DOE, 1996). If the concentration of VOCs in soils equal or exceed the RFCA Tier I soil action levels for subsurface soils, an action must be taken. Table 2.1 provides the Tier I soil action levels for VOCs suspected to be present in soils at the 903 Pad.

2.5.3 Asphalt and Artificial Fill

Waste disposal facility's WAC require generators to adequately characterize waste shipments with respect to their WAC. This sampling effort is designed to collect preliminary characterization data. These data will be evaluated statistically to determine the total number of samples required to characterize the asphalt and artificial fill. After evaluating the characterization data, additional waste characterization samples, if required, will be collected during the remediation of the 903 Pad.

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Table 2.4 Circular Contamination Geometry - Subsurface Investigation[1]

Area	Grid (ft)	Diameter (ft)	L (ft)	S	L/G	Beta Error
903 Pad	75	82	41	1	0.55	10%
Lip Area	151	166	83	1	0.55	10%

S = (length of short axis)/(length of long axis)
L = ½ length of long axis of ellipse
G - Grid Space
[1]Calculations based on Chapter 10, Gilbert, 1987.

Because higher concentrations and occurrences of radionuclides in the subsurface beneath the 903 Pad are anticipated (DOE, 1996, RMRS, 1997), the grid sample density for the 903 Pad is twice that of the outlying Lip Area. The radionuclide sampling program is based on the placement of 25 boreholes on a grid spacing of 75 feet over the 3.4 acre area of the 903 Pad. Consumer's risk (Beta error) is set at 10% for all grid spacing evaluations.

VOC borehole location placement is based on a subjective, or "judgment", sampling design on the basis of groundwater data and areas of drum storage from aerial photographs. All areas of interest are completely accessible so that location bias is not a problem; the locations were chosen for their unique value and representation, especially groundwater contamination, rather than for drawing inferences about a wider population.

The quality control (QC) samples for the project will include a 1 in 20 frequency for duplicate samples and equipment rinsates; a trip blank will be provided for each sample shipment for VOC analysis. Relative percent difference (RPD) goals for soils will be 40% for non-organics and 30% for organics. The duplicated error ratio for radionuclides shall be 1.42. A completion goal for the project will be 90%. The completion goal means that 90% of the data collected, analyzed, and verified will be of acceptable quality for decision making. Twenty-five percent of the total analytical data will undergo validation by a third party. The remaining 75% of the data will be verified.

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2.6.3 Asphalt and Artificial Fill

There will be no limits on decision errors for the asphalt and artificial fill sampling.

Table 3.2 provide the results of these calculations and the weighting factors per sample will be used to calculate the weighted statistical data. Table 3.3 provides the analytical program for surface soil samples. The results of the HPGe measurements and soil samples will be utilized to establish the correlation between the two methods to estimate $^{239/240}Pu$ activities at locations where only HPGe measurements are obtained.

Table 3.2 Surface Soil Samples, Weighted Average Calculations

No. of Subsamples	Horizontal Distance from Point Under Detector (m)	Weight (per circle)
1	0	0.1
2	1	0.36
3	3	0.54
6	Totals	1.00

Table 3.3 Surface Soil/Asphalt/Artificial Fill - Analytical Program

Analytical Methods	Analytes	Container	Preservative	Holding Time
Radiological Screen	Gross Alpha/Gross Beta	125-ml wide mouth glass or poly jar	None	6 months
Alpha Spectroscopy	Plutonium-239/240, Americium-^{241}, Uranium Isotopes	125-ml wide mouth glass or poly jar	None	6 months

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Surface soil sampling locations will be selected based on the HPGe results obtained in the field. Ranges for HPGe concentrations are based on the previous HPGe ^{241}Am activities from the Americium Zone. The first sample will be collected from directly below the HPGe tripod setup location. Sampling will then proceed radially outward in the pattern as shown on Figure 3.2.

Sample locations will be pre-surveyed with the FIDLER and results recorded in the sample collection log or field logbook. Samples will be collected per GT.08, Surface Soil Sampling, Section 4.3, Grab Sampling, with the following modifications. Samples will be collected from 0 to 5 cm (2 in) depth using a 7.6 cm (3 in) diameter, polybutyrate or brass liner with or without a split barrel sampler, as conditions require, with a drive hammer. Individual samples will include organic material and will include coarse material (gravel size fraction or larger). Samples will be prepared in the laboratory by crushing to promote homogeneity and representativeness of the sample prior to alpha spectroscopy analysis. Soil moisture measurements will be collected from

each surface soil sampling area with a moisture-density gauge operated in accordance with the manufacture's specifications. A single soil and air temperature measurement will be recorded for each surface soil sampling area.

Sample locations will be identified with the unique location number assigned, with indelible ink or paint pen either on a wooden lathe or pin flag. Sample locations will be surveyed for location and elevation using standard land surveying techniques or GPS receivers operated in accordance with the manufacturer's specifications.

Asphalt and Artificial Fill Samples - Asphalt and artificial fill samples from the 903 Pad will be collected to obtain preliminary estimates of the samples variance and mean for waste characterization purposes. Random sampling techniques are appropriate methods for estimating the population mean and determination of total amount of contaminants present as well as calculating the standard errors of these two estimates. A minimum of nine asphalt and artificial fill samples will be collected from sample locations randomly selected from the twenty-five 903 Pad subsurface soil sampling locations as shown in Figure 3.3. Table 3.2 provides the analytical program for asphalt and artificial fill samples.

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3.1.2 Subsurface Soil Investigation

The depth of radiological contamination is required to estimate the volume of soil requiring remedial action. The depth of radiological contamination will be investigated at the: 903 Pad; Lip Area; and Americium Zone where the HPGe has identified surface soils equal to or greater than the Tier I soil action levels.

Table 3.4 provides an estimate of the number of boreholes and samples required to complete the subsurface soil investigation program. Table 3.5 provides the subsurface soil investigation analytical program. Figure 3.3 provides the radiological subsurface sampling locations for the 903 Pad and Lip Area.

903 Pad - Twenty-five shallow boreholes are proposed for the characterization of radionuclide contamination beneath the 903 Pad. Twenty-five boreholes over the 3.4-acre 903 Pad represents a borehole completed at each node of a 23 m by 23 m (75 ft by 75 ft) grid. Table 2.4 shows the diameter and error associated with detecting circular areas of contamination.

Table 3.4 Subsurface Soil - Field Program

Area	Number of Boreholes	REAL Samples	Duplicate Samples	Rinse Samples	Trip Blanks (VOC only)	Total Samples
903 Pad	25 - Radiological Investigation	150	8	8	0	166
903 Pad	12- VOC Investigation	72 (rad) [1] 72 (VOC)[2]	4 4	4 4	0 12 (est.)	80 92
Lip Area	25-Radiological Investigation	100	5	5	0	110
Lip Area	1 - VOC Investigation	6 (rad) [1] 6 (VOC) [2]	1 1	1 1	0 1	8 9
Americium Zone	TBD[3] - Borings based on results of HPGe survey	TBD	TBD	TBD	TBD	TBD

[1] - Borehole samples collected for radiochemistry during the VOC investigation.
(est.) - estimated
[2] - Boreholes samples collected for VOC analysis during the VOC investigation.
[3] - TBD - To be determined following analysis of HPGe survey data
Approximately 373 samples will be collected for radiological screening analysis for Department of Transportation shipping requirements.

Table 3.5 Subsurface Soil - Analytical Program

Analytical Method	Analytes	Container	Preservative	Holding Time
Radiological Screen	Gross Alpha/Gross Beta	125-ml wide mouth glass or poly jar for soil, 40-ml glass for water	None	6 months
Alpha Spectroscopy	Plutonium-239/240, Americium-241, Uranium Isotopes	125-ml wide mouth glass or poly jar for soil, 1-gl poly for water	None for soil, HNO_3 for water	6 months
SW-846 Method 8260A	Volatile Organic Compounds	120-ml capped core, 125-ml wide mouth glass jar. Teflon lined closure.	Cool, 4° C	14 days
SW-846 Method 8260A (DNAPL, Trip and Rinse Blanks)	Volatile Organic Compounds	3 x 40-mL glass, Teflon lined septa cap.	Cool, 4° C HCl, pH<2	14 days

SW-846 (EPA, 1986), Test Methods for Evaluating Solid Waste.

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utilizing the RF method, as modified by this SAP (Section 3.1.1), identified in GT.08, Surface Soil Sampling.

Subsurface Soils - The vertical extent of contamination shall be investigated through the completion of boreholes. Borehole locations shall be cleared according to GT.10, Borehole Clearing. Pre-work FIDLER surveys will be performed at borehole locations in the Lip Area per ROI Manual, 4-H58-ROI-06.6, Use of Bicron FIDLER Borehole locations in the Lip Area may be adjusted on the basis of the pre-work FIDLER surveys with greater than 10,000 cpm. Boreholes will be completed by procedure GT.02, Drilling and Sampling Using Hollow-Stem Auger Techniques, or by GT.39, Push Subsurface Soil Sample. If hollow-stem auger techniques are selected, soil samples will be collected utilizing either continuous core auger sampling or continuous drive sampling, depending on which method provides the best percentage of core recovery. Soil cores will be screened with field instruments per FO.15, Photoionization Detectors and Flame Ionization Detectors. A modified field form has been generated (Appendix A, Form ALLSURV5.XLS) which combines "Daily Field Activity Report" per GT.39, Push Subsurface Soil Sample, and Field Monitoring Results of Cuttings or Core (Form FO.8A) per FO.08, Monitoring and Containerization Drilling Fluids and Cuttings, to accommodate the additional field readings required. Boreholes will be logged according to procedure GT.01, Logging Alluvial and Bedrock Material. Boreholes will be abandoned by procedure GT.05, Plugging and Abandonment of Boreholes, except that geoprobe boreholes will be backfilled with powdered or granular bentonite from ground surface and not tremmied. Boring locations will be identified with their unique location number assigned and surveyed for location and elevation using GPS receivers or equivalent equipment.

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3.3.2 Sample Handling

The location and depth interval of surface or subsurface media, either soil or water, recovered during the course of this investigation will be recorded in the field log book. RFEDS location codes will be cross indexed to appropriate sample location designations in the field logbook. Soil core and other material that is subject to only field screening will be identified by the sample location code and depth interval where the sample is obtained. Samples undergoing VOC or radioisotope analysis will have Kaiser Hill-Analytical Services Division (KH-ASD) sample numbers and labels applied to the container in the field. A sample collection form was prepared

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(Appendix A, Form ER-IHSS-112/155-LB-98-381) to facilitate the documentation and correlation of the type of sample analysis, quality control samples, and radiological screening samples. A block of location codes will be of sufficient size to include the entire number of possible locations scheduled and an additional twenty percent for potential additional locations. The KH-ASD database system (AST) will be used to manage the analytical data from the laboratories which in turn will be accessed by the RMRS Soil and Water Database for management and archival. Sample collection and handling will follow procedure 5-21000-OPS-FO.13, Containerization, Preserving, Handling, and Shipping Soil and Water Samples. Radioactive samples (equal to or greater than 2 nCi/g) will be transported to offsite laboratories in accordance with hazardous waste transportation shipping requirements (49CFR 172, 172.101, 173.403, and 173.421) with the appropriate shipping memo. Soil samples with greater than 6,000 to 8,000 cpm on the FIDLER are suspected to be characterized as US Department of Transportation radioactive material (potentially greater than 2,000 pCi/g gross alpha/beta total activity). Approximately 30 grams of soil sample will be collected for isotopic analysis and placed into pre-weighed sample container. The sample container containing the soil will be weighed to confirm approximately 30 grams of soil in the sample container. A FIDLER reading of the soil sample in the sample container will be recorded in the field logbook to confirm the radiological screen and isotopic results.

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APPENDIX A

FIELD FORMS

ROJECT NAME : _____ GEOLOGIST: _____ DRIVING METHOD : _____

.OCATION CODE : _____ TOTAL DEPTH (FT) : _____ DRILLING FLUID : _____

DRIVING CO : _____ SUBCONTRACTOR : _____ BIT DIAMETER (IN.) : _____ ALLSURV5.XLS

DRIVER : _____ RIG TYPE : _____ CREW MEMBER (S) : _____

WIND DIRECTION	WIND SPEED MPH	BORE HOLE#	TIME	TYPE OR EQUIPMENT	ACTUAL DEPTH IN FEET	ACTUAL CORE RECOVERY IN FEET	BKG MINI RAE (11.7) PPM	BZ MINI RAE (11.7) PPM	DIRECT READ MINI RAE (11.7) PPM	FOXBRO TVA BKG PID(10.6) READ PPM	FOXBRO TVA HEAD SPACE PID(10.6) READ PPM	FOXBRO TVA DIRECT PID(10.6) READ PPM	MINI RAM DUST	ELECTRA DIRECT ALPHA CPM FIXED	ELECTRA DIRECT BETA GAMMA CPM FIXED	FIDLER CPM	OUTSIDE TEMP	HEAT STRESS WBGT OR WIND CHILL
				GEOPROBE ROD	0.0-0.5													
				ROD	0.5-1.0													
				CUTTING SHOE	1.0-1.5													
					1.5-2.0													
					2.0-2.5													
					2.5-3.0													
					3.0-3.5													
					3.5-4.0													
					4.0-4.5													
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					14.0-14.5													
					14.5-15.0													
					15.0-15.5													
					15.5-16.0													

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END OF THE DAY STATUS: IN PROGRESS _____ DRILLING COMPLETED _____

CHRONOLOGICAL RECORD OF ACTIVITIES AND COMMENTS

WAS THERE FLUID IN HOLE AT THE BEGINNING OF THE DAILY OPERATIONS ?

IF YES, WHAT WAS WATER LEVEL ? _____ Ft. YES _____

WEATHER : _____ NO _____

COMPLETED BY : _____ DATE: _____

PRINT NAME SIGNATURE

CHECKED BY: _____ DATE: _____

PRINT NAME SIGNATURE

Manufacture and Model #	Serial #	Probe Type	Probe #	Cal Due
MINI RAM PDM3	5345	N/A	N/A	8/4/98
MINI RAE 11.7 (E)	OOO120	N/A	N/A	2/5/99
MINI RAE 11.7		N/A	N/A	
FOXBORO PID/FID	17102120	N/A	N/A	12/5/98
BICRON ANALYST	A851M	FIDLER	A851M	6/26/98
BICRON ANALYST	BO89G	FIDLER	B481G	11/13/98
LUDLUM 2929	99057	43-10-1	97836	7/28/98
LUDLUM 2929	99042	43-10-1	97837	7/28/98
LUDLUM 2929	111573	43-10-1	114341	7/8/98
ELECTRA 1B	1648	DP6B	1630	4/9/98
ELECTRA 1B	1271	DP6B	1038	5/18/98
ELECTRA 1B	1261	DP6B	1023	7/15/98

IHSS 112/155 SAMPLE COLLECTION FORM LOGBOOK: ER-IHSS-112/155-LB-98-381

DATE:________ INVESTIGATION AREA:________
RIN#: 98A________ SAMPLERS:________ QC/PEER REVIEW:________ ________
Print/Sign/Date

Time	Event	Bottle	Analysis	Location Code	QC	Assoc. RadS Event/Bottle	Assoc. QC Event/Bottle	Empty WT	Full WT	Sample Weight	Total Activity
			VOA Rad RadS		Real TB Rns DUP						
			VOA Rad RadS		Real TB Rns DUP						
			VOA Rad RadS		Real TB Rns DUP						
			VOA Rad RadS		Real TB Rns DUP						
			VOA Rad RadS		Real TB Rns DUP						
			VOA Rad RadS		Real TB Rns DUP						
			VOA Rad RadS		Real TB Rns DUP						
			VOA Rad RadS		Real TB Rns DUP						
			VOA Rad RadS		Real TB Rns DUP						
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