DOE/NV--1177

National Nuclear Security Administration

Site Characterization Report for the Divine Strake Experiment at the Nevada Test Site

Revision No.: 0

December 2006

DISCLAIMER

Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof or its contractors or subcontractors.

DOE/NV--1177

SITE CHARACTERIZATION REPORT FOR THE DIVINE STRAKE EXPERIMENT AT THE NEVADA TEST SITE

U.S. Department of Energy,
National Nuclear Security Administration Nevada Site Office
Las Vegas, Nevada

Revision No.: 0

December 2006

Table of Contents

Table of Contents *(Continued)*

Table of Contents (Continued)

List of Figures

List of Tables

List of Tables *(Continued)*

List of Acronyms and Abbreviations

Ac	Actinium
Al	Aluminum
Am	Americium
Be	Beryllium
bgs	Below ground surface
Bi	Bismuth
CLP	Contract Laboratory Program
Cm	Curium
Co	Cobalt
COPC	Constituent of potential concern
Cs	Cesium
CSM	Conceptual site model
DOE	U.S. Department of Energy
DQA	Data quality assessment
DQI	Data quality indicator
DQO	Data quality objective
Eu	Europium
EPA	U.S. Environmental Protection Agency
FADL	Field activity daily log
FD	Field duplicate
FSL	Field-screening level
ft	Foot
GPS	Global positioning system
ID	Identification

Acronyms and Abbreviations (Continued)

K	Potassium
LCS	Laboratory control sample
MDC	Minimum detectable concentration
MLI	Minimum level of interest
Nb	Niobium
NCR	Nonconformance Report
ND	Not detected
NE	Not established
NIST	National Institute of Science and Technology
NTS	Nevada Test Site
PAI	Paragon Analytics, Inc.
Pb	Lead
pCi/g	Picocuries per gram
pCi/L	Picocuries per liter
Pu	Plutonium
QA	Quality assurance
QAPP	Quality Assurance Project Plan
QC	Quality control
RPD	Relative percent difference
SAP	Sampling and Analysis Plan
Sb	Antimony
SCL	Sample collection log
SDG	Sample delivery group
Sr	Strontium

Acronyms and Abbreviations (Continued)

Th	Thorium
Tl	Thallium
U	Uranium
UCI	Upper confidence interval
UCL	Upper confidence limit
VSP	Visual Sample Plan

Executive Summary

The Defense Threat Reduction Agency proposes to conduct the Divine Strake Experiment at the Nevada Test Site (NTS), located approximately 65 miles from Las Vegas, to support national security interests. As a part of pre-test planning, characterization of radiological constituents in the material potentially dispersed by the experiment was conducted to support assessment of potential impacts. This report provides the technical basis and the results of the field investigation of the radiological characterization of potentially dispersed material.

The U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office and the Defense Threat Reduction Agency conducted the field investigation to obtain information about the characteristics of radionuclides present in the material potentially dispersed by the experiment. The investigation included field inspections, sampling of environmental media, and analysis of samples in approved, accredited laboratories in accordance with an approved characterization strategy. This investigation identified targeted radionuclides present at the site without regard to source (natural or man-made, local or distant sources).

A Sampling and Analysis Plan (SAP) was developed to ensure a technically appropriate approach to data gathering and analysis based on methodologies that incorporate U.S. Environmental Protection Agency (EPA) standards for surface soil sampling. Data quality objectives (DQOs) were developed on the basis of a conceptual site model in accordance with EPA guidance for environmental sampling and characterization. This process was used to identify and define the type, amount, and quality of data needed to establish the radionuclide characteristics of the potentially dispersed material. A Data Quality Assessment was then conducted that verified that the data collected met all of the DQO requirements and that the data are appropriate for their intended use. The Data Quality Assessment evaluated the data quality indicators to determine the degree of acceptability and usability of the reported data in the decision-making process. This process ensured that the right type, quality, and quantity of data was available to characterize the target radionuclides at an appropriate level of confidence.

The experiment site is located above the U16b Tunnel Complex in Area 16 of the NTS and was never used for any type of nuclear testing activity.

The experiment site is typified by steep slopes with a thin (up to a few inches in depth) layer of soil overlying carbonate (limestone) bedrock (except in locations where bedrock is exposed). Also present at the site are significant areas of disturbed soil and excavated rock resulting from the construction and use of the U16b Tunnel and preparation of the Divine Strake Experiment Site. To increase characterization accuracy, the material potentially dispersed by the Divine Strake Experiment was divided into the following three populations:

- Undisturbed surface material - Native surface material that was exposed to atmospheric fallout and is projected to be disturbed by the experiment.
- Subsurface rock - Subsurface material that has not been exposed to atmospheric fallout.
- Disturbed material - Excavated site materials comprised of a mixture of surface and subsurface materials (used in forming graded pads, muck piles, and roadways).

Using EPA standards for soil sampling, a total of 26 samples were collected from the undisturbed surface material population and 19 samples from the disturbed material population using hand tools. A total of 11 samples were collected from the undisturbed rock population by chipping and collecting rock fragments from the face of the “high wall” in direct proximity to the experiment. In addition, three samples were collected from the locations with the three highest readings from the May 1, 2006, aerial gamma radiation survey. The results from these samples confirmed that the defined populations potentially affected by the experiment did not contain areas of radioactivity that are significantly different than the balance of the proposed experiment site.

The data were analyzed in laboratories approved by the State of Nevada and accredited by the U.S. Department of Energy. A complete validation of the analytical results was performed in accordance with EPA guidelines including a third party confirmation of 5 percent of the validated dataset.

All data collected during the investigation supported the assumptions presented in the SAP, meet the DQO requirements established in the SAP, and are of sufficient quality to support the radiological characterization of the materials potentially dispersed by the Divine Strake Experiment.

1.0 Introduction

This report presents the characterization activities and analytical results from the Divine Strake field investigation. A detailed discussion of the planning, history, and scope of the characterization activities are presented in the *Sampling and Analysis Plan* (SAP) *for the Divine Strake Experiment* (NNSA/NSO, 2006). The Divine Strake Experiment Site is located in Area 16 of the Nevada Test Site as shown in Figure 1-1.

All characterization activities were performed in accordance with the following documents:

- SAP for Divine Strake (NNSA/NSO, 2006)
- Industrial Sites Quality Assurance Project Plan (QAPP) (NNSA/NV, 2002)
- Approved contractor-specific procedures

This characterization report provides the information necessary to characterize the radionuclides of concern within the three populations as described in Section 1.1 and in the SAP.

1.1 Purpose

This report provides information to establish radionuclide characteristics of the potentially dispersed material (both man-made and naturally occurring radionuclides). This information was obtained from soil and rock samples collected and analyzed for the constituents of potential concern (COPCs) (identified in Section 3.2.2 of the SAP) from materials that could be dispersed by the experiment. To reduce the expected variability of the samples as much as possible, the material potentially dispersed by the Divine Strake Experiment was divided into three populations (see Section 3.2.4 of the SAP):

1. Undisturbed surface material (subject to atmospheric fallout)
2. Subsurface rock (material not subject to atmospheric fallout)
3. Disturbed material (excavated native soil and rock from the graded pads, muckpiles, and roadways that is a mixture of populations 1 and 2)

The Defense Threat Reduction Agency and the National Nuclear Security Administration Nevada Site Office will use this information to assess the potential impacts of materials dispersed by the experiment.

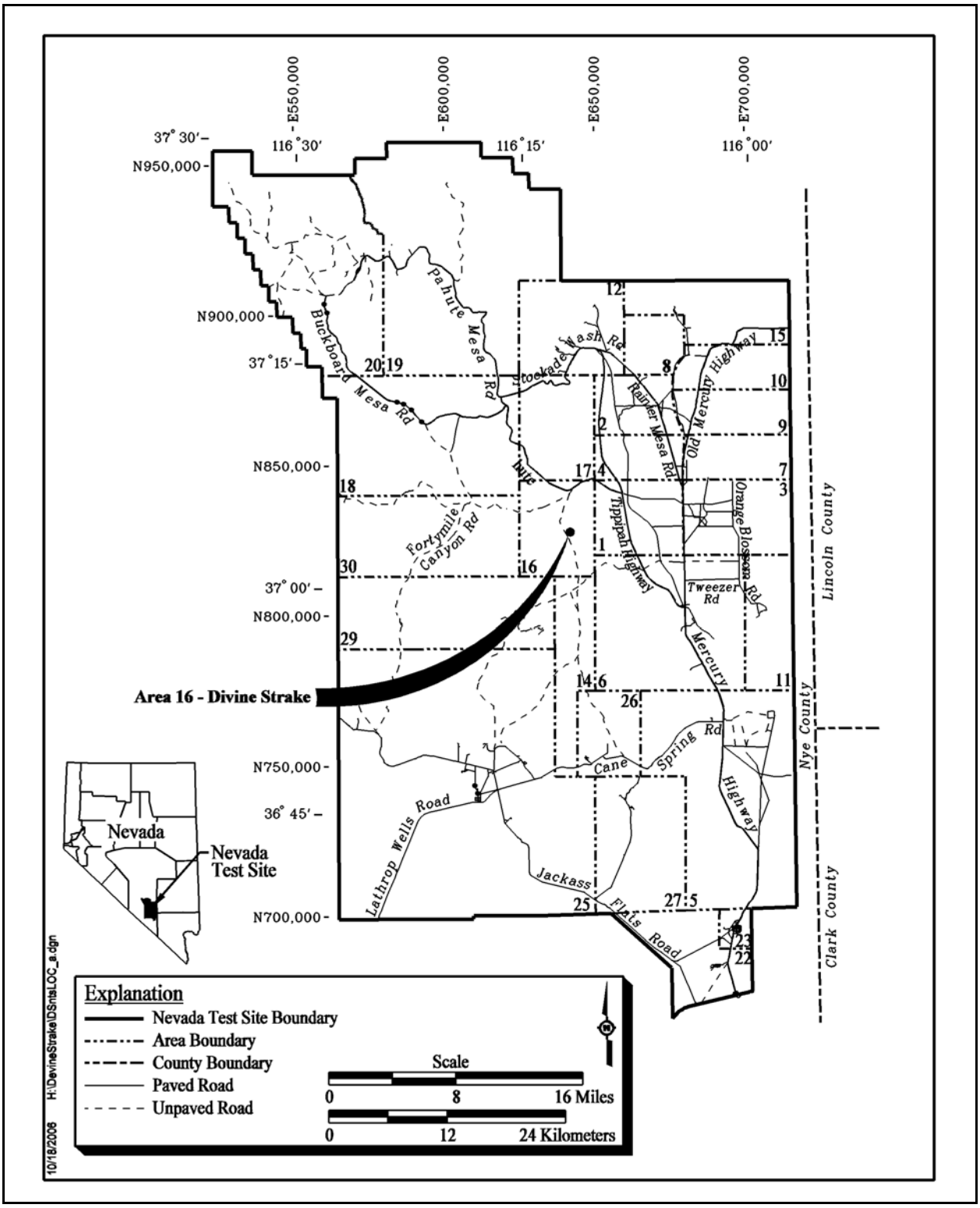

Figure 1-1
Divine Strake Experiment Site Location

1.2 Scope

This report identifies and characterizes targeted radionuclides present at the site without regard to source (natural or man-made, local or distant sources). The radionuclides were characterized for each of the three populations listed in Section 1.1. In addition, the locations with the three highest readings from the May 1, 2006, aerial gamma radiation survey were also sampled to confirm that the defined populations potentially affected by the experiment did not contain areas of radioactivity that are significantly different than the balance of the proposed experiment site. The following sections describe the specific characterization activities.

The activities conducted to accomplish this scope included:

- Field inspections
- Field screening
- Controlled statistical sampling of environmental media
- Analysis of samples in approved, accredited laboratories
- Collection of quality control (QC) samples
- Data validation
- Data quality assessment (DQA)
- Statistical analysis of the data

1.3 Report Contents

This characterization report is divided into the following sections and appendices:

- Section 1.0 - Introduction: Summarizes the purpose, scope, and contents of this characterization report.
- Section 2.0 - Field Investigation Summary: Summarizes the investigation field activities.
- Section 3.0 - Results: Presents the analytical results from the field investigation samples.
- Section 4.0 - Characterization: Presents the radiological characterization for each of the three Divine Strake investigation populations.
- Section 5.0 - Data Quality: Summarizes the DQA and discusses the data validation process, QC samples, and nonconformances.
- Section 6.0 - References: Provides a list of all referenced documents used in the preparation of this characterization report.

- Appendix A - Data Quality Assessment: Provides a DQA that reconciles data quality objective (DQO) assumptions and requirements to the characterization results.

- Appendix B - ProUCL Datasheets: Provides the printouts from the evaluation of appropriate distribution models and the calculation of upper confidence limits (UCLs) based on the recommended model.

- Appendix C - Sample Location Coordinates: Contains the coordinates of the actual sample locations.

The complete field documentation and laboratory data — including field activity daily logs (FADLs), sample collection logs (SCLs), analysis request/chain-of-custody forms, soil sample descriptions, analytical results, and surveillance results — are retained in project files as hard copy files or electronic media.

2.0 Field Investigation Summary

Field investigation and sampling activities for characterization of the Divine Strake Experiment Site were conducted on August 24 and August 25, 2006.

The investigation and sampling program was managed in accordance with the requirements set forth in the Divine Strake SAP (NNSA/NSO, 2006). Field activities were performed in compliance with a site-specific health and safety plan, which is consistent with the U.S. Department of Energy (DOE) Integrated Safety Management System. Samples were collected and documented following the SAP (NNSA/NSO, 2006). Quality control samples (i.e., field duplicate [FD] samples) were collected as required by the Industrial Sites QAPP (NNSA/NV, 2002) and the Divine Strake SAP (NNSA/NSO, 2006).

Weather conditions at the site were hot (mid- to high 90s) with scattered clouds and light winds.

The site was investigated by collecting soil and rock samples using hand tools. The soil samples were field screened for alpha and beta/gamma radiation. The field-screening results were used to ensure compliance with sample transportation requirements.

Except as noted in the following sections, the sampling locations were accessible and sampling activities at planned locations were not restricted.

2.1 Sampling Activities

A combination of judgmental and probabilistic sampling schemes was implemented to select sample locations and evaluate analytical results, as outlined in the SAP.

Probabilistic sampling was conducted using the random sample locations listed in the SAP to define site-wide contamination characteristics (e.g., average concentrations). Confidence in probabilistic sampling scheme decisions was established by the validation of the conceptual site model (CSM), justification that sampling locations were representative of site conditions, demonstration that a sufficient number of samples were collected, and that contaminant distribution assumptions are valid and appropriate to the statistical test being performed.

The average radionuclide activities resulting from the probabilistic sample results represent an estimation of the true average radionuclide activities at the site. Because the average radionuclide activities from samples is only an estimate of the true (unknown) average, an estimate of the uncertainty was calculated for each of the respective radionuclide activities. Estimates of uncertainty are provided in Section 4.0.

2.1.1 Sample Locations

Sample locations were identified using the approaches described in the SAP. The sample locations were located on the ground using a Trimble Pathfinder ProXRSTM global positioning system (GPS) instrument, and the sample location coordinates calculated and posted in the SAP. The sample location coordinates are listed in Appendix C and represented on Figures 2-1 and 2-2. Some locations were modified slightly from planned positions due to field conditions and observations as described in Section A.2.6.

2.1.2 Field Screening

Field-screening activities for alpha and beta/gamma radiation, and gamma-emitting radionuclides were performed as specified in the Divine Strake SAP. Site-specific field-screening levels (FSLs) for alpha and beta/gamma radiation were defined as the mean background activity level plus two times the standard deviation. The mean background activity and standard deviation were calculated from 10 measurements of a background sample collected from an undisturbed location close to but outside of the test area. The radiation FSLs are location and instrument-specific, and they were established each day for each instrument used and again if the sample processing location was moved.

2.1.3 Sample Collection

Sampling activities included the collection of 26 soil samples (including 2 FDs) from the undisturbed surface material, 11 subsurface rock samples (including 1 FD), 19 disturbed material soil samples (including 1 FD, and 3 biased soil samples (placed at locations identified from the flyover data as described in the SAP). The sample identification (ID) numbers, locations, types, and analyses are listed in Table 2-1. The sample locations are shown on Figure 2-1. Samples were collected using precleaned disposable scoops for the soil samples, or a hammer and chisel for the rock samples. The undisturbed and disturbed surface samples were collected from 0.0 to 0.5 feet (ft) below ground

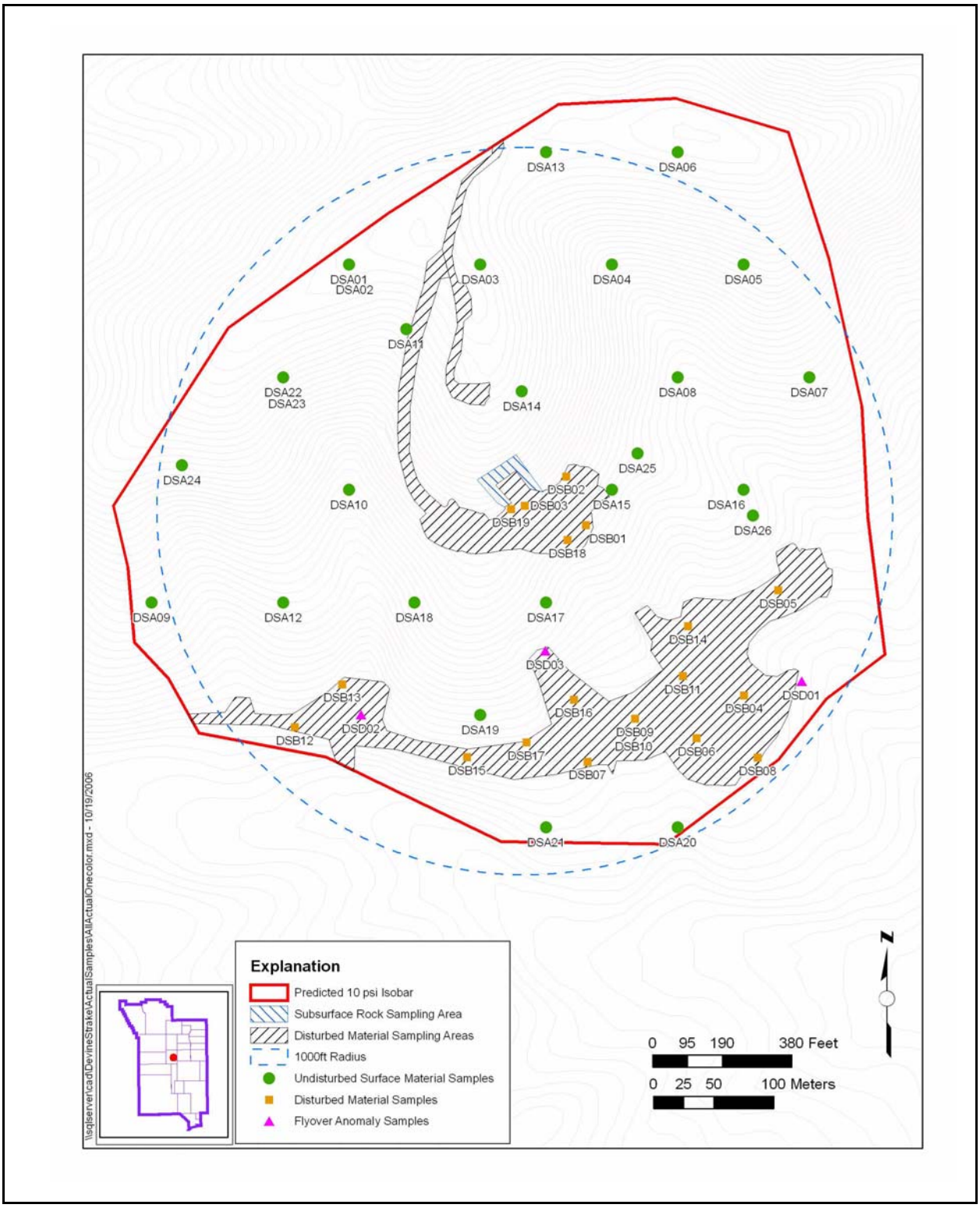

Figure 2-1
Locations of Divine Strake Experiment Undisturbed Surface Material and Disturbed Material Samples

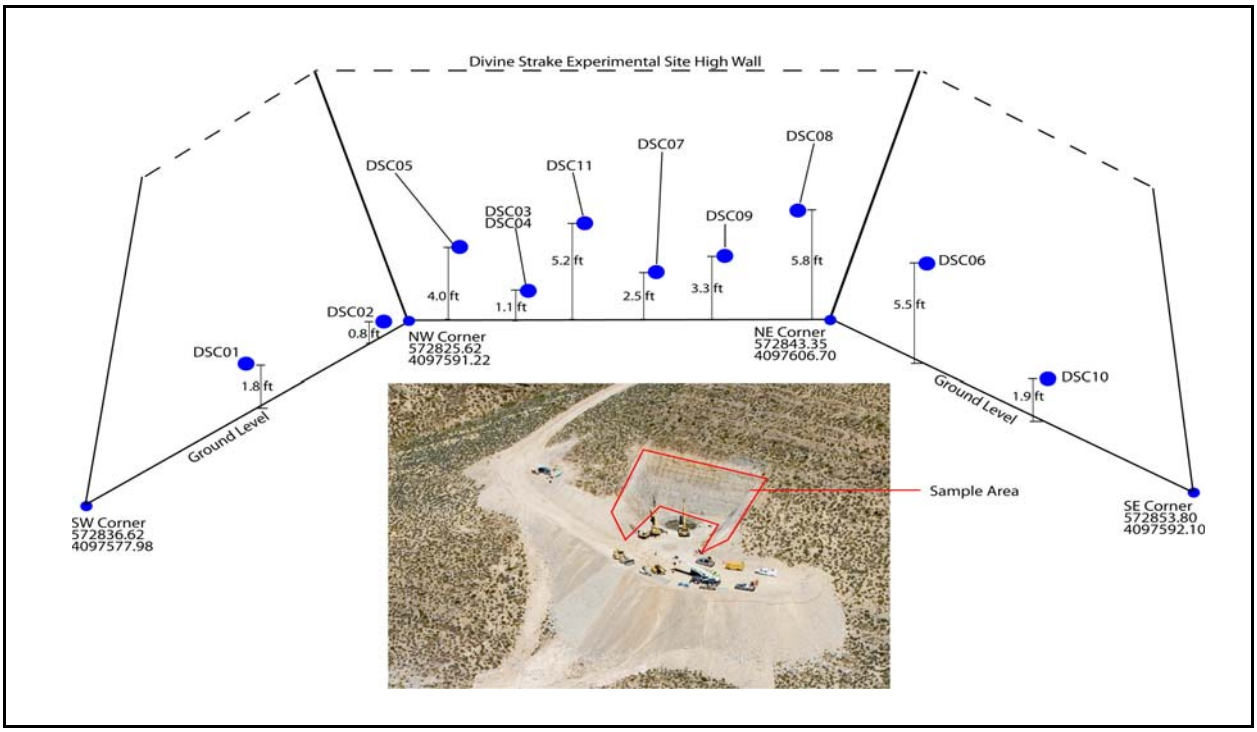

Figure 2-2
Locations of Divine Strake Experiment Subsurface Rock Samples

surface (bgs). The rock samples were collected from random locations of exposed rock within the "high wall" around the Divine Strake Experiment excavation as depicted in Figure 2-2.

2.2 Analyses

All of the samples were analyzed for gamma emitting radionuclide, isotopic plutonium, isotopic uranium, strontium (Sr)-90, and tritium. Radiological analyses were performed by Paragon Analytics, Inc., of Fort Collins, Colorado. Analytical results are reported if they were detected above the minimum detectable concentrations (MDCs). The complete laboratory data packages are available in the project files.

Only validated analytical data from the Divine Strake field investigation samples have been used to determine the concentration of radionuclides present at the Divine Strake site. The analytical results are presented in Section 3.0.

Table 2-1
Sample Numbers and Locations
(Page 1 of 3)

					Analyses					
Sample Location	**Sample Number**	**Depth (ft bgs)**	**Matrix**	**Purpose**	**Gamma**	**Plutonium**	**Strontium**	**Tritium**	**Uranium**	**Gross Alpha/Beta**
A19	DSA01	0-0.5	Soil	Regular environmental	X	X	X	X	X	X
A19	DSA02	0-0.5	Soil	Field duplicate	X	X	X	X	X	X
A20	DSA03	0-0.5	Soil	Regular environmental	X	X	X	X	X	X
A21	DSA04	0-0.5	Soil	Regular environmental	X	X	X	X	X	X
A22	DSA05	0-0.5	Soil	Regular environmental	X	X	X	X	X	X
A24	DSA06	0-0.5	Soil	Regular environmental	X	X	X	X	X	X
A18	DSA07	0-0.5	Soil	Regular environmental	X	X	X	X	X	X
A17	DSA08	0-0.5	Soil	Regular environmental	X	X	X	X	X	X
A4	DSA09	0-0.5	Soil	Regular environmental	X	X	X	X	X	X
A10	DSA10	0-0.5	Soil	Regular environmental	X	X	X	X	X	X
C21	DSA11	0-0.5	Soil	Regular environmental	X	X	X	X	X	X
A5	DSA12	0-0.5	Soil	Regular environmental	X	X	X	X	X	X
A23	DSA13	0-0.5	Soil	Regular environmental	X	X	X	X	X	X
C16	DSA14	0-0.5	Soil	Regular environmental	X	X	X	X	X	X
A12	DSA15	0-0.5	Soil	Regular environmental	X	X	X	X	X	X
A13	DSA16	0-0.5	Soil	Regular environmental	X	X	X	X	X	X
A7	DSA17	0-0.5	Soil	Regular environmental	X	X	X	X	X	X
A6	DSA18	0-0.5	Soil	Regular environmental	X	X	X	X	X	X
A3	DSA19	0-0.5	Soil	Regular environmental	X	X	X	X	X	X
A2	DSA20	0-0.5	Soil	Regular environmental	X	X	X	X	X	X
A1	DSA21	0-0.5	Soil	Regular environmental	X	X	X	X	X	X
A14	DSA22	0-0.5	Soil	Regular environmental	X	X	X	X	X	X
A14	DSA23	0-0.5	Soil	Field duplicate	X	X	X	X	X	X
C19	DSA24	0-0.5	Soil	Regular environmental	X	X	X	X	X	X
C11	DSA25	0-0.5	Soil	Regular environmental	X	X	X	X	X	X

Table 2-1
Sample Numbers and Locations
(Page 2 of 3)

					Analyses					
Sample Location	**Sample Number**	**Depth (ft bgs)**	**Matrix**	**Purpose**	**Gamma**	**Plutonium**	**Strontium**	**Tritium**	**Uranium**	**Gross Alpha/Beta**
C8	DSA26	0-0.5	Soil	Regular environmental	X	X	X	X	X	X
B1	DSB01	0-0.5	Soil	Regular environmental	X	X	X	X	X	X
D2	DSB02	0-0.5	Soil	Regular environmental	X	X	X	X	X	X
B3	DSB03	0-0.5	Soil	Regular environmental	X	X	X	X	X	X
B8	DSB04	0-0.5	Soil	Regular environmental	X	X	X	X	X	X
B13	DSB05	0-0.5	Soil	Regular environmental	X	X	X	X	X	X
B7	DSB06	0-0.5	Soil	Regular environmental	X	X	X	X	X	X
B9	DSB07	0-0.5	Soil	Regular environmental	X	X	X	X	X	X
B6	DSB08	0-0.5	Soil	Regular environmental	X	X	X	X	X	X
B10	DSB09	0-0.5	Soil	Regular environmental	X	X	X	X	X	X
B10	DSB10	0-0.5	Soil	Field duplicate	X	X	X	X	X	X
B11	DSB11	0-0.5	Soil	Regular environmental	X	X	X	X	X	X
B16	DSB12	0-0.5	Soil	Regular environmental	X	X	X	X	X	X
B17	DSB13	0-0.5	Soil	Regular environmental	X	X	X	X	X	X
D11	DSB14	0-0.5	Soil	Regular environmental	X	X	X	X	X	X
D15	DSB15	0-0.5	Soil	Regular environmental	X	X	X	X	X	X
B15	DSB16	0-0.5	Soil	Regular environmental	X	X	X	X	X	X
B14	DSB17	0-0.5	Soil	Regular environmental	X	X	X	X	X	X
D1	DSB18	0-0.5	Soil	Regular environmental	X	X	X	X	X	X
D3	DSB19	0-0.5	Soil	Regular environmental	X	X	X	X	X	X
E2	DSC01	0-0.5	Rock	Regular environmental	X	X	X	X	X	X
E1	DSC02	0-0.5	Rock	Regular environmental	X	X	X	X	X	X
E3	DSC03	0-0.5	Rock	Regular environmental	X	X	X	X	X	X
E3	DSC04	0-0.5	Rock	Field duplicate	X	X	X	X	X	X
E5	DSC05	0-0.5	Rock	Regular environmental	X	X	X	X	X	X

Table 2-1
Sample Numbers and Locations
(Page 3 of 3)

					Analyses					
Sample Location	**Sample Number**	**Depth (ft bgs)**	**Matrix**	**Purpose**	**Gamma**	**Plutonium**	**Strontium**	**Tritium**	**Uranium**	**Gross Alpha/Beta**
E10	DSC06	0-0.5	Rock	Regular environmental	X	X	X	X	X	X
E8	DSC07	0-0.5	Rock	Regular environmental	X	X	X	X	X	X
E7	DSC08	0-0.5	Rock	Regular environmental	X	X	X	X	X	X
E6	DSC09	0-0.5	Rock	Regular environmental	X	X	X	X	X	X
E11	DSC10	0-0.5	Rock	Regular environmental	X	X	X	X	X	X
E9	DSC11	0-0.5	Rock	Regular environmental	X	X	X	X	X	X
F1	DSD01	0-0.5	Soil	Regular environmental	X	X	X	X	X	X
F3	DSD02	0-0.5	Soil	Regular environmental	X	X	X	X	X	X
F2	DSD03	0-0.5	Soil	Regular environmental	X	X	X	X	X	X

3.0 Results

The results from the Divine Strake field investigation samples are presented for each population in Sections 3.1 through 3.3. The results from the additional sampling conducted at the locations with the three highest readings from the May 1, 2006, aerial gamma radiation survey (i.e., flyover anomalies) are presented in Section 3.4 (Riedhauser, 2006). This section presents results for all of the analytes reported from the analytical program as presented in Section 3.4 of the SAP for every sample submitted (including FD samples). The results tables include activity values reported by the analytical laboratory at levels that were not significantly above instrument background readings. These results are considered "non-detects" and a (U) is used to identify the results as such. Some results in the results tables have a (J) identifier signifying that the reported value is estimated. Estimated results are valid detections where there is less confidence in the reported value. Data are commonly identified as estimated when duplicate samples have significantly different results due to heterogeneity in the sampled media.

3.1 Undisturbed Surface Material Population Sample Results

Analytical results from the samples collected within the undisturbed surface material population as outlined in the SAP are presented in the following sections. As negative activities are not possible, activities reported as negative values have been listed with a value of zero.

3.1.1 Gamma-Emitting Radionuclides

Gamma-emitting radionuclides analytical results for environmental samples collected within the undisturbed surface material population are presented in Table 3-1.

Table 3-1
Gamma-Emitting Radionuclide Activities Reported from Undisturbed Surface Material Population Samples

Sample Number	Sample Location	Depth (ft bgs)	Ac-228 (pCi/g)	Al-26 (pCi/g)	Am-241 (pCi/g)	Be-7 (pCi/g)	Bi-212 (pCi/g)	Bi-214 (pCi/g)	Cm-243 (pCi/g)	Co-58 (pCi/g)	Co-60 (pCi/g)	Cs-134 (pCi/g)	Cs-137 (pCi/g)	Eu-152 (pCi/g)	Eu-154 (pCi/g)	Eu-155 (pCi/g)	K-40 (pCi/g)	Nb-94 (pCi/g)	Pb-212 (pCi/g)	Pb-214 (pCi/g)	Sb-125 (pCi/g)	Th-227 (pCi/g)	Th-234 (pCi/g)	Tl-208 (pCi/g)	U-235 (pCi/g)
DSA01	A19	0-0.5	1.12	0(U)	0.779(U)	0.229(U)	1.33(U)	1.13(J)	0.0648(U)	0(U)	0(U)	0.138(U)	1.06	0(U)	0.055(U)	0.0181(U)	17.2	0(U)	1.16(J)	1.22(J)	0(U)	0(U)	1.87(U)	0.343	0(U)
DSA02	A19	0-0.5	1.05	0.0128(U)	0.757(J)	0(U)	2.19(U)	1.04(J)	0.209(U)	0(U)	0(U)	0(U)	0.973	0.198(U)	0(U)	0.0877(U)	15.9	0(U)	1.24(J)	1.18(J)	0(U)	0.762(U)	1.51(J)	0.361	0.00884(U)
DSA03	A20	0-0.5	1.11	0.0197(U)	0.382(U)	0(U)	0.781(U)	1.07(J)	0.171(U)	0(U)	0(U)	0.0184(U)	0.516	0.0427(U)	0(U)	0(U)	16.9	0.0248(U)	1.36(J)	1.25(J)	0.0963(U)	2.01(U)	1.55(U)	0.395	0.0642(U)
DSA04	A21	0-0.5	1.02	0.00205(U)	0.107(U)	0.0427(U)	0.717(U)	0.887(J)	0.257(U)	0(U)	0(U)	0.0219(U)	0.386	0.00959(U)	0(U)	0.134(U)	12.6	0(U)	1.1(J)	1.18(J)	0.116(U)	0.0899(U)	1.42(U)	0.378	0.1(U)
DSA05	A22	0-0.5	1.25	0(U)	0.343(U)	0.186(U)	0.923(U)	1.34(J)	0(U)	0(U)	0.0192(U)	0.035(U)	0.39	0.114(U)	0.115(U)	0.0262(U)	16.3	0.0116(U)	1.44(J)	1.51(J)	0.0314(U)	0(U)	1.94(U)	0.391	0(U)
DSA06	A24	0-0.5	1.03	0.0344(U)	0.0268(U)	0.1(U)	0.661(U)	1.12(J)	0.0947(U)	0(U)	0(U)	0.0549(U)	0.372	0(U)	0.206(U)	0.0788(U)	15.9	0.00364(U)	1.2(J)	1.14(J)	0.0274(U)	0.821(U)	1.37(U)	0.361	0.065(U)
DSA07	A18	0-0.5	0.983	0(U)	0.135(U)	0.0871(U)	0.74(U)	1.1(J)	0.158(U)	0(U)	0(U)	0(U)	0.25	0.0145(U)	0(U)	0.015(U)	14.6	0(U)	1.22(J)	1.35(J)	0(U)	0.224(U)	1.61(J)	0.35	0(U)
DSA08	A17	0-0.5	0.51(U)	0(U)	0.223(U)	0.0177(U)	0.399(U)	1.21(J)	0.0113(U)	0(U)	0(U)	0.0146(U)	0.354	0.0427(U)	0(U)	0.0048(U)	6.98	0(U)	0.556(J)	1.11(J)	0(U)	0(U)	0.898(U)	0.149	0.184(U)
DSA09	A4	0-0.5	1.06	0.0251(U)	0.86(U)	0.0908(U)	0.966(U)	1.43(J)	0.245(U)	0(U)	0(U)	0.0653(U)	0.439	0.122(U)	0(U)	0.0279(U)	18.5	0.0211(U)	1.21(J)	1.34(J)	0.12(U)	0(U)	1.34(U)	0.349	0(U)
DSA10	A10	0-0.5	0.995	0(U)	0(U)	0(U)	0.728(U)	1.18(J)	0.0784(U)	0(U)	0.0303(U)	0.0182(U)	0.455	0(U)	0.207(U)	0.0428(U)	13.5	0(U)	0.87(J)	1.15(J)	0.0188(U)	0(U)	0.719(U)	0.302	0(U)
DSA11	C21	0-0.5	0.874	0(U)	0(U)	0.165(U)	1.03(U)	1.05(J)	0.129(U)	0.0283(U)	0(U)	0(U)	0.164(U)	0(U)	0(U)	0.0138(U)	14.4	0(U)	1.03(J)	1.21(J)	0.123(U)	0.232(U)	1.33(U)	0.329	0.19(U)
DSA12	A12	0-0.5	1.06	0(U)	0.674(U)	0(U)	1.2(U)	1.55(J)	0.309(U)	0(U)	0(U)	0(U)	0.505	0(U)	0(U)	0.0836(U)	19.5	0(U)	1.38(J)	1.72(J)	0.224(U)	0(U)	2.17(U)	0.441	0(U)
DSA13	A23	0-0.5	1.1	0(U)	0.309(U)	0(U)	0.681(U)	1.08(J)	0.0582(U)	0(U)	0.0254(U)	0.0297(U)	0.998	0.115(U)	0.00696(U)	0(U)	14	0.0473(U)	1.08(J)	1.15(J)	0(U)	0.216(U)	1.41(U)	0.285	0.173(U)
DSA14	C16	0-0.5	1.23	0.0254(U)	0(U)	0(U)	1.13(U)	1.1(J)	0.488(U)	0(U)	0(U)	0(U)	0.479	0.245(U)	0.0246(U)	0.0912(U)	17.8	0(U)	1.43(J)	1.37(J)	0.0787(U)	0(U)	1.44(U)	0.393	0(U)
DSA15	A12	0-0.5	1.05	0.0483(U)	0.192(U)	0(U)	0.785(U)	1.63(J)	0.198(U)	0(U)	0(U)	0(U)	0.286	0.211(U)	0(U)	0.0644(U)	15.7	0.0335(U)	1.3(J)	1.47(J)	0(U)	0(U)	1.75(U)	0.314	0.0714(U)
DSA16	A13	0-0.5	1.05	0.00901(U)	0(U)	0(U)	0.98(U)	1.51(J)	0.142(U)	0(U)	0.0111(U)	0(U)	0.29	0.043(U)	0(U)	0.147(U)	16.8	0.0231(U)	1.21(J)	1.51(J)	0.108(U)	0.0436(U)	1.39(U)	0.358	0.252(U)
DSA17	A7	0-0.5	0.482(U)	0.0198(U)	0.0394(U)	0(U)	0.715(U)	1.6(J)	0(U)	0.00588(U)	0.0107(U)	0(U)	0(U)	0.13(U)	0(U)	0.11(U)	11.6	0(U)	0.503(J)	1.94(J)	0.0232(U)	0.195(U)	2.34(J)	0.201	0.253(U)
DSA18	A6	0-0.5	1.03	0.0446(U)	0(U)	0(U)	1.06(U)	1.4(J)	0.232(U)	0(U)	0(U)	0(U)	0.278	0(U)	0(U)	0(U)	13.6	0(U)	1.09(J)	1.41(J)	0.0523(U)	0(U)	1.79(U)	0.298	0(U)
DSA19	A3	0-0.5	1.08	0(U)	1.01(U)	0.107(U)	1.1(U)	1.77(J)	0.385(U)	0.00429(U)	0.0103(U)	0(U)	0.563	0.0529(U)	0(U)	0.111(U)	15.4	0.0428(U)	0.988(J)	1.77(J)	0.0515(U)	0.261(U)	1.32(U)	0.329	0.247(U)
DSA20	A2	0-0.5	0.693	0(U)	0.316(J)	0.205(U)	0.785(U)	1.13(J)	0(U)	0(U)	0(U)	0.0222(U)	0.683	0.2(U)	0(U)	0(U)	12	0.0183(U)	0.706(J)	1.32(J)	0.0888(U)	0(U)	1.67(J)	0.219	0.258(U)
DSA21	A1	0-0.5	0.911	0.00427(U)	0.125(U)	0.247(U)	0.71(U)	1.69(J)	0.262(U)	0(U)	0.052(U)	0(U)	0.378	0.0351(U)	0(U)	0.0352(U)	15.9	0(U)	1.19(J)	1.61(J)	0(U)	1.01(U)	1.9(J)	0.34	0.073(U)
DSA22	A14	0-0.5	1.09	0(U)	0.44(U)	0.21(U)	1.2(U)	1.06(J)	0.17(U)	0(U)	0.033(U)	0.26(U)	0.61	0(U)	0(U)	0.06(U)	17.2	0.071(U)	1.33(J)	1.26(J)	0.04(U)	0.7(U)	1.3(U)	0.37	0(U)
DSA23	A14	0-0.5	1.3	0.064(U)	0.33(U)	0.04(U)	1.6(U)	1.25(J)	0.04(U)	0(U)	0.037(U)	0.025(U)	0.61	0(U)	0(U)	0.04(U)	17.1	0.064(U)	1.41(J)	1.37(J)	0(U)	0.41(U)	0.4(U)	0.25	0(U)
DSA24	C19	0-0.5	1.07	0(U)	0.35(U)	0(U)	1.41(U)	1.08(J)	0.38(U)	0(U)	0(U)	0(U)	0.75	0.32(U)	0(U)	0(U)	19.5	0(U)	1.45(J)	1.51(J)	0.11(U)	0(U)	1.3(U)	0.29	0.15(U)
DSA25	C11	0-0.5	1.41	0.028(U)	0.02(U)	0.02(U)	0.4(U)	1.31(J)	0.05(U)	0.069(U)	0.003(U)	0(U)	0.45	0(U)	0(U)	0.07(U)	20.3	0.014(U)	1.77(J)	1.69(J)	0.31(U)	0(U)	0.3(U)	0.44	0.22(U)
DSA26	C8	0-0.5	1.3	0(U)	0.45(U)	0.21(U)	1.6(U)	1.23(J)	0.29(U)	0.023(U)	0.04(U)	0.006(U)	0.081(U)	0.27(U)	0.22(U)	0.18(U)	17.1	0.03(U)	1.28(J)	1.54(J)	0(U)	0.1(U)	1.7(U)	0.36	0.2(U)

(J) = Estimated
(U) = Not detected

3.1.2 Plutonium Isotopes

Analytical results for plutonium isotopes from environmental samples collected within the undisturbed surface material population are presented in Table 3-2.

Table 3-2
Plutonium Isotopes Activities Reported from Undisturbed Surface Material Population
(Page 1 of 2)

Sample Number	Sample Location	Depth (ft bgs)	Pu-238 (pCi/g)	Pu-239 (pCi/g)
DSA01	A19	0-0.5	0.037	2.39
DSA02	A19	0-0.5	0.04(U)	2.38
DSA03	A20	0-0.5	0.006(U)	1.25
DSA04	A21	0-0.5	0.008(U)	0.66
DSA05	A22	0-0.5	0.025(U)	0.52
DSA06	A24	0-0.5	0.015(U)	0.78
DSA07	A18	0-0.5	0.147	11.1
DSA08	A17	0-0.5	0.003(U)	0.48
DSA09	A4	0-0.5	0.011(U)	0.7
DSA10	A10	0-0.5	0.025(U)	0.7
DSA11	C21	0-0.5	0.016(U)	0.253(J)
DSA12	A12	0-0.5	0.048	1.99(J)
DSA13	A23	0-0.5	0.025(U)	1.33(J)
DSA14	C16	0-0.5	0.022(U)	0.57(J)
DSA15	A12	0-0.5	0.115	8.3(J)
DSA16	A13	0-0.5	0.012(U)	0.37(J)
DSA17	A7	0-0.5	0(U)	0.002(U)
DSA18	A6	0-0.5	0.009(U)	0.27(J)
DSA19	A3	0-0.5	0.046	1.28(J)
DSA20	A2	0-0.5	0.085	4.5(J)
DSA21	A1	0-0.5	0.008(U)	0.48(J)
DSA22	A14	0-0.5	0.039(U)	0.63
DSA23	A14	0-0.5	0.057(U)	1.12

Table 3-2
Plutonium Isotopes Activities Reported from
Undisturbed Surface Material Population
(Page 2 of 2)

Sample Number	Sample Location	Depth (ft bgs)	Pu-238 (pCi/g)	Pu-239 (pCi/g)
DSA24	C19	0-0.5	0.015(U)	0.51
DSA25	C11	0-0.5	0.043	2.42
DSA26	C8	0-0.5	0(U)	0.077

(J) = Estimated
(U) = Not detected

3.1.3 Uranium Isotopes

Analytical results for uranium isotopes from environmental samples collected within the undisturbed surface material population are presented in Table 3-3.

Table 3-3
Uranium Isotopes Activities Reported from
Undisturbed Surface Material Population
(Page 1 of 2)

Sample Number	Sample Location	Depth (ft bgs)	U-234 (pCi/g)	U-235 (pCi/g)	U-238 (pCi/g)
DSA01	A19	0-0.5	0.73	0.051	0.93
DSA02	A19	0-0.5	0.98	0.044(U)	1.01
DSA03	A20	0-0.5	0.68	0.051	0.8
DSA04	A21	0-0.5	0.87	0.061	0.88
DSA05	A22	0-0.5	0.95	0.047(U)	1.02
DSA06	A24	0-0.5	0.78	0.055	0.93
DSA07	A18	0-0.5	0.94	0.07	1.03
DSA08	A17	0-0.5	1.11	0.05(U)	1.1
DSA09	A4	0-0.5	0.98	0.047	0.95
DSA10	A10	0-0.5	0.91	0.05	0.96
DSA11	C21	0-0.5	0.97	0.039(U)	0.98
DSA12	A12	0-0.5	0.99	0.063	1.1
DSA13	A23	0-0.5	0.7	0.041	0.7

Table 3-3
Uranium Isotopes Activities Reported from Undisturbed Surface Material Population
(Page 2 of 2)

Sample Number	Sample Location	Depth (ft bgs)	U-234 (pCi/g)	U-235 (pCi/g)	U-238 (pCi/g)
DSA14	C16	0-0.5	0.85	0.069	0.98
DSA15	A12	0-0.5	0.94	0.05	0.97
DSA16	A13	0-0.5	1.04	0.09	1.11
DSA17	A7	0-0.5	1.84	0.179	2.01
DSA18	A6	0-0.5	0.99	0.07(J)	1.07
DSA19	A3	0-0.5	1.22	0.122	1.45
DSA20	A2	0-0.5	1.34	0.103(J)	1.48
DSA21	A1	0-0.5	1.11	0.085	1.04
DSA22	A14	0-0.5	0.83	0.019(U)	0.79
DSA23	A14	0-0.5	0.8	0.039(U)	0.77
DSA24	C19	0-0.5	0.84	0.076	0.93
DSA25	C11	0-0.5	0.84	0.043(U)	0.86
DSA26	C8	0-0.5	0.93	0.064	1.09

(J) = Estimated
(U) = Not detected

3.1.4 Strontium-90

Analytical results for Strontium (Sr)-90 from environmental samples collected within the undisturbed surface material population are presented in Table 3-4.

Table 3-4
Strontium-90 Activities Reported from Undisturbed Surface Material Population
(Page 1 of 2)

Sample Number	Sample Location	Depth (ft bgs)	Sr-90 (pCi/g)
DSA01	A19	0-0.5	0.234
DSA02	A19	0-0.5	0.241
DSA03	A20	0-0.5	0.18
DSA04	A21	0-0.5	0.166

Table 3-4
Strontium-90 Activities Reported from Undisturbed Surface Material Population
(Page 2 of 2)

Sample Number	Sample Location	Depth (ft bgs)	Sr-90 (pCi/g)
DSA05	A22	0-0.5	0.161
DSA06	A24	0-0.5	0.107(U)
DSA07	A18	0-0.5	0.149
DSA08	A17	0-0.5	0.079(U)
DSA09	A4	0-0.5	0.15
DSA10	A10	0-0.5	0.111(U)
DSA11	C21	0-0.5	0.135
DSA12	A12	0-0.5	0.127(U)
DSA13	A23	0-0.5	0.309
DSA14	C16	0-0.5	0.132
DSA15	A12	0-0.5	0.083(U)
DSA16	A13	0-0.5	0.115(U)
DSA17	A7	0-0.5	0.026(U)
DSA18	A6	0-0.5	0.162
DSA19	A3	0-0.5	0.137
DSA20	A2	0-0.5	0.157
DSA21	A1	0-0.5	0.118
DSA22	A14	0-0.5	0.097(U)
DSA23	A14	0-0.5	0.095(U)
DSA24	C19	0-0.5	0.181
DSA25	C11	0-0.5	0.16
DSA26	C8	0-0.5	0.048(U)

(U) = Not detected

3.1.5 Tritium

Analytical results for tritium from environmental samples collected within the undisturbed surface material population are presented in Table 3-5.

Table 3-5
Tritium Activities Reported from Undisturbed Surface Material Population

Sample Number	Sample Location	Depth (ft bgs)	Tritium (pCi/L)
DSA01	A19	0-0.5	400(U)
DSA02	A19	0-0.5	400(U)
DSA03	A20	0-0.5	0(U)
DSA04	A21	0-0.5	400(U)
DSA05	A22	0-0.5	300(U)
DSA06	A24	0-0.5	1,000(U)
DSA07	A18	0-0.5	100(U)
DSA08	A17	0-0.5	0(U)
DSA09	A4	0-0.5	400(U)
DSA10	A10	0-0.5	1,300(U)
DSA11	C21	0-0.5	0(U)
DSA12	A12	0-0.5	0(U)
DSA13	A23	0-0.5	600(U)
DSA14	C16	0-0.5	1,200(U)
DSA15	A12	0-0.5	0(U)
DSA16	A13	0-0.5	700(U)
DSA17	A7	0-0.5	12,000(U)
DSA18	A6	0-0.5	2,900(U)
DSA19	A3	0-0.5	0(U)
DSA20	A2	0-0.5	1,100(U)
DSA21	A1	0-0.5	0(U)
DSA22	A14	0-0.5	0(U)
DSA23	A14	0-0.5	100(U)
DSA24	C19	0-0.5	500(U)
DSA25	C11	0-0.5	0(U)
DSA26	C8	0-0.5	0(U)

(U) = Not detected

3.1.6 Gross Alpha/Beta

Analytical results for gross alpha and gross beta from environmental samples collected within the undisturbed surface material population are presented in Table 3-6.

Table 3-6
Gross Alpha/Beta Activities Reported from Undisturbed Surface Material Population
(Page 1 of 2)

Sample Number	Sample Location	Depth (ft bgs)	Gross Alpha (pCi/g)	Gross Beta (pCi/g)
DSA01	A19	0-0.5	4.6	7.2
DSA02	A19	0-0.5	5.7	7.8
DSA03	A20	0-0.5	6.4	5.8
DSA04	A21	0-0.5	6.4	6.7
DSA05	A22	0-0.5	5.5	8.6
DSA06	A24	0-0.5	4.6	6.6
DSA07	A18	0-0.5	7.3	6.8
DSA08	A17	0-0.5	4.3	4.7
DSA09	A4	0-0.5	5.2	7.7
DSA10	A10	0-0.5	6	4.6(U)
DSA11	C21	0-0.5	5	5.1
DSA12	A12	0-0.5	6.2	9.2
DSA13	A23	0-0.5	3.3	8.9
DSA14	C16	0-0.5	5.7	7.1
DSA15	A12	0-0.5	5.3	7.2
DSA16	A13	0-0.5	11.4	9.1
DSA17	A7	0-0.5	6.3	7.6
DSA18	A6	0-0.5	7.5	7.3
DSA19	A3	0-0.5	6.8	8.4
DSA20	A2	0-0.5	4.8	4.9
DSA21	A1	0-0.5	18.9	3.7(U)
DSA22	A14	0-0.5	5.6	5.2(U)
DSA23	A14	0-0.5	5.6	6.4
DSA24	C19	0-0.5	5.7	7.1

Table 3-6
Gross Alpha/Beta Activities Reported from
Undisturbed Surface Material Population
(Page 2 of 2)

Sample Number	Sample Location	Depth (ft bgs)	Gross Alpha (pCi/g)	Gross Beta (pCi/g)
DSA25	C11	0-0.5	6.8	8.2
DSA26	C8	0-0.5	5.2	8.1

(U) = Not detected

3.2 Disturbed Material Population Sample Results

Analytical results from the samples collected within the disturbed material population as outlined in the SAP are presented in the following sections. As negative activities are not possible, activities reported as negative values have been listed with a value of zero.

3.2.1 Gamma-Emitting Radionuclides

Gamma-emitting radionuclides analytical results for environmental samples collected within the disturbed material population are presented in Table 3-7.

Table 3-7
Gamma-Emitting Radionuclides Activities Reported from Disturbed Material Population Samples

Sample Number	Sample Location	Depth (ft bgs)	Ac228 (pCi/g)	Al-26 (pCi/g)	Am241 (pCi/g)	Be-7 (pCi/g)	Bi-212 (pCi/g)	Bi-214 (pCi/g)	Cm-243 (pCi/g)	Co-58 (pCi/g)	Co-60 (pCi/g)	Cs-134 (pCi/g)	Cs-137 (pCi/g)	Eu-152 (pCi/g)	Eu-154 (pCi/g)	Eu-155 (pCi/g)	K-40 (pCi/g)	Nb-94 (pCi/g)	Pb-212 (pCi/g)	Pb-214 (pCi/g)	Sb-125 (pCi/g)	Th-227 (pCi/g)	Th-234 (pCi/g)	Tl-208 (pCi/g)	U-235 (pCi/g)
DSB01	B1	0-0.5	0.57(U)	0.013(U)	0(U)	0(U)	1.34(U)	1.37(J)	0.17(U)	0.051(U)	0.057(U)	0.01(U)	0.005(U)	0.44(U)	0(U)	0.03(U)	11	0(U)	0.64(J)	1.62(J)	0(U)	0.16(U)	1.76(U)	0.21(U)	0.22(U)
DSB02	D2	0-0.5	0.57(U)	0.047(U)	0.1(U)	0(U)	1.5(U)	1.82(J)	0.05(U)	0(U)	0(U)	0(U)	0(U)	0.32(U)	0(U)	0.13(U)	13.5	0.014(U)	0.75(J)	2.43(J)	0.07(U)	0(U)	1.7(U)	0.188(U)	0.06(U)
DSB03	B3	0-0.5	0.52(U)	0.044(U)	0(U)	0.1(U)	0.73(U)	1.56(J)	0.21(U)	0.003(U)	0(U)	0.14(U)	0(U)	0(U)	0(U)	0.05(U)	10	0(U)	0.54	1.73(J)	0.01(U)	0(U)	1.51(U)	0.161(U)	0(U)
DSB04	B8	0-0.5	0.43(U)	0.016(U)	0.17(U)	0.35(U)	0.48(U)	2.38(J)	0.14(U)	0(U)	0(U)	0.12(U)	0(U)	0.13(U)	0.14(U)	0.06(U)	9.5	0.082(U)	0.44	2.36(J)	0.11(U)	0(U)	2.33	0.146(U)	0.05(U)
DSB05	B13	0-0.5	0.81(U)	0(U)	0.33(U)	0(U)	0.4(U)	1.71(J)	0.04(U)	0.022(U)	0.008(U)	0.28(U)	0.093(U)	0.47(U)	0.13(U)	0.03(U)	12.5	0.054(U)	0.97(J)	1.93(J)	0(U)	0(U)	2.4(U)	0.138(U)	0.27(U)
DSB06	B7	0-0.5	0.43(U)	0.08(U)	0(U)	0.27(U)	0.9(U)	1.5(J)	0.2(U)	0(U)	0.041(U)	0.25(U)	0.009(U)	0.19(U)	0.11(U)	0(U)	9.5	0(U)	0.49	1.65(J)	0.01(U)	0(U)	2.08(U)	0.157	0.23(U)
DSB07	B9	0-0.5	0.72(U)	0.002(U)	0(U)	0.01(U)	0.8(U)	2.4(J)	0(U)	0.014(U)	0.11(U)	0.018(U)	0(U)	0.11(U)	0(U)	0(U)	12.8	0(U)	0.82	2.84(J)	0.06(U)	0.16(U)	1.9(U)	0.214	0.13(U)
DSB08	B6	0-0.5	0.57(U)	0.097(U)	0(U)	0.15(U)	1.33(U)	0.92(J)	0.1(U)	0.03(U)	0(U)	0.023(U)	0(U)	0(U)	0(U)	0.04(U)	8.4	0.003(U)	0.56(J)	0.98(J)	0.06(U)	0(U)	0.8(U)	0.169(U)	0.15(U)
DSB09	B10	0-0.5	0.5(U)	0.066(U)	0(U)	0.11(U)	0.53(U)	1.83(J)	0.06(U)	0(U)	0.011(U)	0(U)	0(U)	0.05(U)	0(U)	0.02(U)	8.1	0.039(U)	0.42	2.11(J)	0.02(U)	0(U)	1.5(U)	0.121(U)	0.05(U)
DSB10	B10	0-0.5	0.49(U)	0(U)	0.15(U)	0.07(U)	0.39(U)	2.11(J)	0.18(U)	0(U)	0(U)	0(U)	0(U)	0.08(U)	0(U)	0.13(U)	8.9	0.035(U)	0.54	2.17(J)	0.01(U)	0(U)	2.5(U)	0.141(U)	0.22(U)
DSB11	B11	0-0.5	0.58(U)	0(U)	0.31(U)	0.11(U)	1.1(U)	2.02(J)	0.18(U)	0(U)	0.034(U)	0.009(U)	0(U)	0(U)	0.12(U)	0.17(U)	10.6	0(U)	0.64	2.21(J)	0(U)	0(U)	3	0.182(U)	0.07(U)
DSB12	B16	0-0.5	0.52(U)	0.013(U)	0.05(U)	0.04(U)	1.53(U)	2.09(J)	0.2(U)	0(U)	0.028(U)	0.34(U)	0(U)	0(U)	0(U)	0.06(U)	10.6	0(U)	0.63	2.45(J)	0.05(U)	0.36(U)	3.2	0.166(U)	0.01(U)
DSB13	B17	0-0.5	0.48(U)	0(U)	0(U)	0.1(U)	0.84(U)	2.24(J)	0.11(U)	0(U)	0(U)	0(U)	0(U)	0(U)	0.04(U)	0.06(U)	10.6	0.007(U)	0.63	2.47(J)	0.01(U)	0.02(U)	1.3(U)	0.141(U)	0.18(U)
DSB14	D11	0-0.5	0.71	0.032(U)	0.7(U)	0(U)	1.14(U)	1.74(J)	0(U)	0(U)	0.011(U)	0.11(U)	0(U)	0.25(U)	0.16(U)	0.04(U)	13.2	0(U)	0.94(J)	1.97(J)	0.01(U)	0(U)	1(U)	0.39	0.26(U)
DSB15	D15	0-0.5	0.6(U)	0(U)	0.05(U)	0.1(U)	0.59(U)	2.05(J)	0(U)	0(U)	0.031(U)	0.043(U)	0(U)	0.14(U)	0(U)	0(U)	10.3	0(U)	0.51(J)	2.25(J)	0.15(U)	0(U)	1.67(U)	0.179(U)	0.33(U)
DSB16	B15	0-0.5	0.99	0.013(U)	0.04(U)	0(U)	1.39(U)	1.62(J)	0.19(U)	0(U)	0(U)	0(U)	0(U)	0(U)	0(U)	0.01(U)	14	0.051(U)	1.27(J)	1.75(J)	0(U)	0.27(U)	1.8(U)	0.38	0.22(U)
DSB17	B14	0-0.5	0.77	0.04(U)	0.8(U)	0(U)	1.41(U)	2.65(J)	0.08(U)	0(U)	0.036(U)	0.017(U)	0(U)	0.08(U)	0.27(U)	0.02(U)	11.2	0(U)	0.75(J)	2.99(J)	0.02(U)	0(U)	3.9(U)	0.212(U)	0.15(U)
DSB18	D1	0-0.5	0.69	0(U)	0(U)	0.02(U)	0.47(U)	2.03(J)	0.19(U)	0(U)	0(U)	0.003(U)	0(U)	0.33(U)	0(U)	0.13(U)	12	0(U)	0.5(J)	1.99(J)	0(U)	0.13(U)	1.9(U)	0.16(U)	0.09(U)
DSB19	D3	0-0.5	0.36(U)	0.04(U)	0(U)	0(U)	0.9(U)	1.12(J)	0.15(U)	0(U)	0(U)	0.034(U)	0(U)	0(U)	0.05(U)	0.04(U)	7.6	0(U)	0.41(J)	1.28(J)	0.13(U)	0(U)	1.8(U)	0.121(U)	0.15(U)

(J) = Estimated
(U) = Not detected

3.2.2 Plutonium Isotopes

Analytical results for plutonium isotopes from environmental samples collected within the disturbed material population are presented in Table 3-8.

Table 3-8
Plutonium Isotopes Activities Reported from
Disturbed Material Population

Sample Number	Sample Location	Depth (ft bgs)	Pu-238 (pCi/g)	Pu-239 (pCi/g)
DSB01	B1	0-0.5	0.002(U)	0.076
DSB02	D2	0-0.5	0(U)	0(U)
DSB03	B3	0-0.5	0(U)	0.001(U)
DSB04	B8	0-0.5	0(U)	0(U)
DSB05	B13	0-0.5	0.003(U)	0.082
DSB06	B7	0-0.5	0(U)	0.006(U)
DSB07	B9	0-0.5	0(U)	0.015(U)
DSB08	B6	0-0.5	0.001(U)	0.003(U)
DSB09	B10	0-0.5	0.001(U)	0.005(U)
DSB10	B10	0-0.5	0(U)	0.002(U)
DSB11	B11	0-0.5	0.002(U)	0.007(U)
DSB12	B16	0-0.5	0(U)	0(U)
DSB13	B17	0-0.5	0(U)	0.002(U)
DSB14	D11	0-0.5	0(U)	0(U)
DSB15	D15	0-0.5	0(U)	0.001(U)
DSB16	B15	0-0.5	0.001(U)	0.005(U)
DSB17	B14	0-0.5	0(U)	0.029
DSB18	D1	0-0.5	0(U)	0.003(U)
DSB19	D3	0-0.5	0(U)	0.006(U)

(U) = Not detected

3.2.3 Uranium Isotopes

Analytical results for uranium isotopes from environmental samples collected within the disturbed material population are presented in Table 3-9.

Table 3-9
Uranium Isotopes Activities Reported from Disturbed Material Population

Sample Number	Sample Location	Depth (ft bgs)	U-234 (pCi/g)	U-235 (pCi/g)	U-238 (pCi/g)
DSB01	B1	0-0.5	1.56	0.072	1.64
DSB02	D2	0-0.5	1.93	0.159	2.15
DSB03	B3	0-0.5	1.65	0.107	1.63
DSB04	B8	0-0.5	2.8	0.137	3.09
DSB05	B13	0-0.5	1.76	0.094	2.01
DSB06	B7	0-0.5	1.94	0.128	2.1
DSB07	B9	0-0.5	2.59	0.12	3.03
DSB08	B6	0-0.5	1.47	0.083	1.33
DSB09	B10	0-0.5	1.97	0.114	2.07
DSB10	B10	0-0.5	2.07	0.121	2.23
DSB11	B11	0-0.5	2.2	0.138	2.45
DSB12	B16	0-0.5	2.18	0.153	2.51
DSB13	B17	0-0.5	2.44	0.169	2.67
DSB14	D11	0-0.5	1.63	0.084(J)	1.78
DSB15	D15	0-0.5	1.74	0.106(J)	1.96
DSB16	B15	0-0.5	1.51	0.078(J)	1.65
DSB17	B14	0-0.5	2.67	0.148(J)	2.91
DSB18	D1	0-0.5	1.78	0.122(J)	1.94
DSB19	D3	0-0.5	1.19	0.051(U)	1.21

(J) = Estimated
(U) = Not detected

3.2.4 Strontium-90

Analytical results for Sr-90 from environmental samples collected within the disturbed material population are presented in Table 3-10.

Table 3-10
Strontium Activities Reported from Disturbed Material Population

Sample Number	Sample Location	Depth (ft bgs)	Sr-90 (pCi/g)
DSB01	B1	0-0.5	0.02(U)
DSB02	D2	0-0.5	0.024(U)
DSB03	B3	0-0.5	0.019(U)
DSB04	B8	0-0.5	0.04(U)
DSB05	B13	0-0.5	0.034(U)
DSB06	B7	0-0.5	0(U)
DSB07	B9	0-0.5	0(U)
DSB08	B6	0-0.5	0.003(U)
DSB09	B10	0-0.5	0.001(U)
DSB10	B10	0-0.5	0.013(U)
DSB11	B11	0-0.5	0(U)
DSB12	B16	0-0.5	0(U)
DSB13	B17	0-0.5	0(U)
DSB14	D11	0-0.5	0.004(U)
DSB15	D15	0-0.5	0.064(U)
DSB16	B15	0-0.5	0.011(U)
DSB17	B14	0-0.5	0.089(U)
DSB18	D1	0-0.5	0(U)
DSB19	D3	0-0.5	0(U)

(U) = Not detected

3.2.5 Tritium

Analytical results for tritium from environmental samples collected within the disturbed material population are presented in Table 3-11.

Table 3-11
Tritium Activities Reported from Disturbed Material Population

Sample Number	Sample Location	Depth (ft bgs)	Tritium (pCi/L)
DSB01	B1	0-0.5	0(U)
DSB02	D2	0-0.5	0(U)
DSB03	B3	0-0.5	400(U)
DSB04	B8	0-0.5	800(U)
DSB05	B13	0-0.5	0(U)
DSB06	B7	0-0.5	0(U)
DSB07	B9	0-0.5	0(U)
DSB08	B6	0-0.5	3,100(U)
DSB09	B10	0-0.5	200(U)
DSB10	B10	0-0.5	0(U)
DSB11	B11	0-0.5	0(U)
DSB12	B16	0-0.5	0(U)
DSB13	B17	0-0.5	0(U)
DSB14	D11	0-0.5	360(U)
DSB15	D15	0-0.5	1,000(U)
DSB16	B15	0-0.5	300(U)
DSB17	B14	0-0.5	1,800(U)
DSB18	D1	0-0.5	11,000(U)
DSB19	D3	0-0.5	4,000(U)

(U) = Not detected

3.2.6 Gross Alpha/Beta

Analytical results for gross alpha and gross beta from environmental samples collected within the disturbed material population are presented in Table 3-12.

Table 3-12
Gross Alpha Beta Activities Reported from Disturbed Material Population

Sample Number	Sample Location	Depth (ft bgs)	Gross Alpha (pCi/g)	Gross Beta (pCi/g)
DSB01	B1	0-0.5	6.2	2.4(U)
DSB02	D2	0-0.5	7.4	5.7
DSB03	B3	0-0.5	6.7	4.6(U)
DSB04	B8	0-0.5	11.4	6.1
DSB05	B13	0-0.5	6.7	6
DSB06	B7	0-0.5	7.6	3.8(U)
DSB07	B9	0-0.5	9.4	6.7
DSB08	B6	0-0.5	3.5	3.8(U)
DSB09	B10	0-0.5	8.1	4.8(U)
DSB10	B10	0-0.5	7.9	5.2(U)
DSB11	B11	0-0.5	13.8	8
DSB12	B16	0-0.5	8.9	6.7
DSB13	B17	0-0.5	9.2	6.3
DSB14	D11	0-0.5	6.6	5.6
DSB15	D15	0-0.5	8.2	5.4
DSB16	B15	0-0.5	4.5(U)	3.2(U)
DSB17	B14	0-0.5	7.3	9.1
DSB18	D1	0-0.5	8	6.3
DSB19	D3	0-0.5	8.1	2.4(U)

(U) = Not detected

3.3 Subsurface Rock Population Sample Results

Analytical results from the samples collected within the subsurface rock population as outlined in the SAP are presented in the following sections. As negative activities are not possible, activities reported as negative values have been listed with a value of zero.

3.3.1 Gamma-Emitting Radionuclides

Gamma-emitting radionuclides analytical results for environmental samples collected within the subsurface rock population are presented in Table 3-13.

Table 3-13
Gamma-Emitting Radionuclides Activities Reported from Subsurface Rock Population Samples

Sample Number	Sample Location	Depth (ft bgs)	Ac-228 (pCi/g)	Al-26 (pCi/g)	Am-241 (pCi/g)	Be-7 (pCi/g)	Bi-212 (pCi/g)	Bi-214 (pCi/g)	Cm-243 (pCi/g)	Co-58 (pCi/g)	Co-60 (pCi/g)	Cs-134 (pCi/g)	Cs-137 (pCi/g)	Eu-152 (pCi/g)	Eu-154 (pCi/g)	Eu-155 (pCi/g)	K-40 (pCi/g)	Nb-94 (pCi/g)	Pb-212 (pCi/g)	Pb-214 (pCi/g)	Sb-125 (pCi/g)	Th-227 (pCi/g)	Th-234 (pCi/g)	Tl-208 (pCi/g)	U-235 (pCi/g)
DSC01	E2	0-0.5	0.42(U)	0.026(U)	0.24(U)	0.13(U)	0.33(U)	2.07(J)	0(U)	0(U)	0(U)	0.016(U)	0(U)	0.19(U)	0(U)	0.05(U)	11.4	0.045(U)	0.5	2.44(J)	0(U)	0(U)	1.1(U)	0.112(U)	0.16(U)
DSC02	E1	0-0.5	0.91	0(U)	0.02(U)	0(U)	1.54(U)	2.68(J)	0.16(U)	0(U)	0.03(U)	0.006(U)	0(U)	0.43(U)	0(U)	0.08(U)	21.1	0.012(U)	1.09(J)	2.76(J)	0(U)	0.17(U)	3.58(J)	0.279	0.44(U)
DSC03	E3	0-0.5	0.86	0(U)	0(U)	0(U)	0.71(U)	2.06(J)	0.35(U)	0(U)	0(U)	0.04(U)	0(U)	0.1(U)	0(U)	0.25(U)	15.6	0(U)	0.71(J)	2.22(J)	0.04(U)	0(U)	1.2(U)	0.261	0.02(U)
DSC04	E3	0-0.5	0.67	0.017(U)	0.01(U)	0(U)	0.31(U)	2.03(J)	0.08(U)	0.03(U)	0.039(U)	0.003(U)	0(U)	0.17(U)	0(U)	0.11(U)	16.7	0(U)	0.64(J)	2.06(J)	0.02(U)	0(U)	1.95(U)	0.237	0(U)
DSC05	E5	0-0.5	0.58(U)	0.048(U)	0(U)	0.34(U)	0.72(U)	2.56(J)	0(U)	0(U)	0(U)	0(U)	0(U)	0.28(U)	0(U)	0.08(U)	15.9	0.048(U)	0.94(J)	2.53(J)	0.03(U)	0(U)	2.4(J)	0.282	0.48(U)
DSC06	E10	0-0.5	0.31(U)	0.005(U)	0.09(U)	0.13(U)	0.59(U)	2.63(J)	0.05(U)	0(U)	0(U)	0.003(U)	0(U)	0.1(U)	0(U)	0.08(U)	13	0.04(U)	0.65(J)	2.78(J)	0(U)	0(U)	2.54(J)	0.194	0(U)
DSC07	E8	0-0.5	0.65	0.053(U)	0.2(U)	0(U)	0.96(U)	1.99(J)	0.48(U)	0(U)	0.032(U)	0(U)	0(U)	0(U)	0(U)	0.12(U)	15.2	0.01(U)	0.77(J)	2(J)	0(U)	0(U)	1.7(U)	0.236	0.12(U)
DSC08	E7	0-0.5	0.41(U)	0.002(U)	0.055(U)	0(U)	0.02(U)	1.47(J)	0.18(U)	0(U)	0.006(U)	0(U)	0(U)	0.14(U)	0(U)	0(U)	8.5	0(U)	0.56(J)	1.65(J)	0.032(U)	0(U)	0.96(U)	0.106(U)	0.1(U)
DSC09	E6	0-0.5	0.53(U)	0(U)	0.025(U)	0.19(U)	0.88(U)	1.72(J)	0.18(U)	0.011(U)	0.03(U)	0.016(U)	0.007(U)	0.14(U)	0(U)	0(U)	13.5	0(U)	0.52(J)	1.76(J)	0.04(U)	0.26(U)	2.01(J)	0.189	0.15(U)
DSC10	E11	0-0.5	0.27(U)	0(U)	0(U)	0(U)	0.28(U)	1.48(J)	0.03(U)	0(U)	0(U)	0.03(U)	0.01(U)	0.03(U)	0(U)	0(U)	5.5	0.021(U)	0.306(J)	1.64(J)	0.04(U)	0.14(U)	0.8(U)	0.085(U)	0(U)
DSC11	E9	0-0.5	0.35(U)	0(U)	0.024(U)	0(U)	0.77(U)	1.03(J)	0.1(U)	0.003(U)	0.008(U)	0.024(U)	0(U)	0.16(U)	0.02(U)	0(U)	8.1	0(U)	0.36	1.13(J)	0(U)	0.03(U)	0.9(U)	0.103(U)	0.26(U)

(J) = Estimated
(U) = Not detected

3.3.2 Plutonium Isotopes

Analytical results for plutonium isotopes from environmental samples collected within the subsurface rock population are presented in Table 3-14.

Table 3-14
Plutonium Activities Reported from Subsurface Rock Population

Sample Number	Sample Location	Depth (ft bgs)	Pu-238 (pCi/g)	Pu-239 (pCi/g)
DSC01	E2	0-0.5	0(U)	0.005(U)
DSC02	E1	0-0.5	0.002(U)	0(U)
DSC03	E3	0-0.5	0.007(U)	0(U)
DSC04	E3	0-0.5	0.006(U)	0.005(U)
DSC05	E5	0-0.5	0(U)	0(U)
DSC06	E10	0-0.5	0(U)	0(U)
DSC07	E8	0-0.5	0(U)	0(U)
DSC08	E7	0-0.5	0(U)	0(U)
DSC09	E6	0-0.5	0(U)	0(U)
DSC10	E11	0-0.5	0.002(U)	0(U)
DSC11	E9	0-0.5	0(U)	0(U)

(U) = Not detected

3.3.3 Uranium Isotopes

Analytical results for uranium isotopes from environmental samples collected within the subsurface rock population are presented in Table 3-15.

Table 3-15
Uranium Activities Reported from Subsurface Rock Population
(Page 1 of 2)

Sample Number	Sample Location	Depth (ft bgs)	U-234 (pCi/g)	U-235 (pCi/g)	U-238 (pCi/g)
DSC01	E2	0-0.5	1.83	0.087(J)	2.2
DSC02	E1	0-0.5	3	0.119(J)	3.38
DSC03	E3	0-0.5	2.15	0.143(J)	2.39
DSC04	E3	0-0.5	1.92	0.141(J)	2.12

Table 3-15
Uranium Activities Reported from Subsurface Rock Population
(Page 2 of 2)

Sample Number	Sample Location	Depth (ft bgs)	U-234 (pCi/g)	U-235 (pCi/g)	U-238 (pCi/g)
DSC05	E5	0-0.5	2.26	0.134(J)	2.54
DSC06	E10	0-0.5	2.43	0.109(J)	2.53
DSC07	E8	0-0.5	1.98	0.156(J)	2.16
DSC08	E7	0-0.5	1.59	0.079(J)	1.49
DSC09	E6	0-0.5	1.76	0.081(J)	1.92
DSC10	E11	0-0.5	1.29	0.052(J)	1.39
DSC11	E9	0-0.5	1.22	0.071(J)	1.29

(J) = Estimated

3.3.4 Strontium-90

Analytical results for Sr-90 from environmental samples collected within the subsurface rock population are presented in Table 3-16

Table 3-16
Strontium Activities Reported from Subsurface Rock Population

Sample Number	Sample Location	Depth (ft bgs)	Sr-90 (pCi/g)
DSC01	E2	0-0.5	0(U)
DSC02	E1	0-0.5	0.022(U)
DSC03	E3	0-0.5	0.06(U)
DSC04	E3	0-0.5	0.002(U)
DSC05	E5	0-0.5	0.025(U)
DSC06	E10	0-0.5	0.029(U)
DSC07	E8	0-0.5	0.022(U)
DSC08	E7	0-0.5	0.022(U)
DSC09	E6	0-0.5	0.008(U)
DSC10	E11	0-0.5	0.022(U)
DSC11	E9	0-0.5	0.045(U)

(U) = Not detected

3.3.5 Tritium

Analytical results for tritium from environmental samples collected within the subsurface rock population are presented in Table 3-17.

Table 3-17
Tritium Activities Reported from Subsurface Rock Population

Sample Number	Sample Location	Depth (ft bgs)	Tritium (pCi/L)
DSC01	E2	0-0.5	0(U)
DSC02	E1	0-0.5	800(U)
DSC03	E3	0-0.5	2,000(U)
DSC04	E3	0-0.5	0(U)
DSC05	E5	0-0.5	4,700(U)
DSC06	E10	0-0.5	2,800(U)
DSC07	E8	0-0.5	3,300(U)
DSC08	E7	0-0.5	1,000(U)
DSC09	E6	0-0.5	1,500(U)
DSC10	E11	0-0.5	1,500(U)
DSC11	E9	0-0.5	6,000(U)

(U) = Not detected

3.3.6 Gross Alpha/Beta

Analytical results for gross alpha and gross beta from environmental samples collected within the subsurface rock population are presented in Table 3-18.

Table 3-18
Gross Alpha Beta Activities Reported from Subsurface Rock Population
(Page 1 of 2)

Sample Number	Sample Location	Depth (ft bgs)	Gross Alpha (pCi/g)	Gross Beta (pCi/g)
DSC01	E2	0-0.5	9.8	7.4
DSC02	E1	0-0.5	10.3	9.8
DSC03	E3	0-0.5	6.5	8.3
DSC04	E3	0-0.5	8.2	6.2

Table 3-18
Gross Alpha Beta Activities Reported from Subsurface Rock Population
(Page 2 of 2)

Sample Number	Sample Location	Depth (ft bgs)	Gross Alpha (pCi/g)	Gross Beta (pCi/g)
DSC05	E5	0-0.5	7.7	8.9
DSC06	E10	0-0.5	10.1	6.8
DSC07	E8	0-0.5	8.6	5.1
DSC08	E7	0-0.5	6.7	3.4(U)
DSC09	E6	0-0.5	6.2	4.1(U)
DSC10	E11	0-0.5	5.2	0.4(U)
DSC11	E9	0-0.5	3.7	2.4(U)

(U) = Not detected

3.4 Flyover Anomaly Sample Results

Analytical results from the samples collected from the locations with the three highest readings from the May 1, 2006, aerial gamma radiation survey (Riedhauser, 2006) as outlined in the SAP are presented in Table 3-19. As negative activities are not possible, activities reported as negative values have been listed with a value of zero.

Table 3-19
Flyover Anomaly Sample Activities
(Page 1 of 2)

Analyte	DSD01 (pCi/g)	DSD02 (pCi/g)	DSD03 (pCi/g)
Ac-228	1.17	0.33(U)	0.62
Al-26	0.016(U)	0(U)	0(U)
Am-241	0.4(U)	0.025(U)	0.007(U)
Be-7	0.39(U)	0(U)	0(U)
Bi-212	1.62(U)	0(U)	0.47(U)
Bi-214	1.85(J)	1.94(J)	2.2(J)
Cm-243	0(U)	0(U)	0.22(U)
Co-58	0(U)	0(U)	0.011(U)
Co-60	0.067(U)	0(U)	0.032(U)

Table 3-19
Flyover Anomaly Sample Activities
(Page 2 of 2)

Analyte	DSD01 (pCi/g)	DSD02 (pCi/g)	DSD03 (pCi/g)
Cs-134	0(U)	0(U)	0(U)
Cs-137	0.37	0(U)	0.022(U)
Eu-152	0.15(U)	0.29(U)	0.25(U)
Eu-154	0(U)	0(U)	0(U)
Eu-155	0(U)	0(U)	0.06(U)
K-40	19	7.5	11.8
Nb-94	0(U)	0.006(U)	0.003(U)
Pb-212	1.23(J)	0.39(J)	0.59(J)
Pb-214	1.97(J)	2.12(J)	2.44(J)
Sb-125	0.13(U)	0(U)	0.05(U)
Th-227	0(U)	0.35(U)	0(U)
Th-234	1.7(U)	1.49(U)	2.35(J)
Tl-208	0.36	0.129(U)	0.16
U-235 Gamma	0.67(U)	0(U)	0.19(U)
Pu-238	0.026(U)	0(U)	0(U)
Pu-239	0.264	0(U)	0.006(U)
U-234	0.8	1.91	2.39
U-235 Iso U	0.049(J)	0.081(J)	0.165(J)
U-238	0.93	2.2	2.51
SR-90	0.141(U)	0.005(U)	0.022(U)
Tritium	100(U)	0(U)	1,800(U)
Gross Alpha	8.6	4.8	5.8
Gross Beta	8.2	3.7(U)	6.9

(J) = Estimated
(U) = Not detected

4.0 Characterization

This section presents the radiological characterization for each of the three Divine Strake sampling populations. The calculation of radiological characteristics presented in this section followed the following protocols:

- Field duplicate data were excluded. This was done so that locations where duplicates were taken would have an equal effect on the results as other locations.
- All activities reported as negative values were assigned an activity of zero before the calculation of analyte averages. Although this may bias the results upwards, negative activities are not possible.
- Reported activities below the MDC were included in the statistical calculations. Although there is lower confidence in reported activities below the MDC, use of the reported values provides better information than the methods that substitute the MDC or one-half of the MDC. As confidence in the resulting characteristic is higher when more of the data are above the MDC, the number of results above the MDC (i.e., detects), is reported for each calculated characteristic. Care should be taken when using a characteristic based on no, or even a small number of, detections.

The tables in this section present the following characteristics for each analyte and population:

- **Number of Detects –** The number of samples with results greater than the MDC.
- **Lower Confidence Interval –** The distribution-independent lower confidence interval values as discussed in Section A.2.4.2
- **Average Reported Activity –** The average of all reported activities.
- **Upper Confidence Interval –** The distribution-independent upper confidence interval values as discussed in Section A.2.4.2
- **Upper Confidence Limit –** The 95th percent UCL as determined by the ProUCL software package. This parameter was calculated for only those analytes with at least one reported activity greater than the MDC.
- **Maximum Reported Activity –** The maximum reported activity reported for the analyte.
- **Maximum MDC –** The maximum reported MDC reported for the analyte. For analytes with reported activities below the MDC, this is the maximum possible activity present for the analyte.

The Average Reported Activity is the best estimate of the true radiological activities at the site. However, due to the uncertainty of the estimation of true site characteristics (as discussed in Section 2.1), the UCI, UCL, Maximum Reported Activity, and the Maximum MDC are also presented to provide conservative (upper bound) estimates of the true average radiological activities at the site.

4.1 Undisturbed Surface Material

The radiological characteristics of reported analytes within the undisturbed surface material population are presented in Table 4-1.

Table 4-1
Radionuclide Characteristics of the Undisturbed Surface Material Population (pCi/g)
(Page 1 of 2)

Analyte	Number of Detects	Lower Confidence Interval	Average Reported Activity	Upper Confidence Interval	Upper Confidence Limit	Maximum Reported Activity	Maximum MDC
Ac-228	22	0.778	1.02	1.27	1.1	1.41	0.58
Al-26	0	0.00019	0.0109	0.05		0.0483	0.176
Am-241	1	0.0299	0.282	0.719	0.546	1.01	1.87
Be-7	0	0	0.0799	0.437		0.247	1.22
Bi-212	0	0.188	0.918	1.71		1.6	2
Bi-214	24	1.04	1.28	1.51	1.36	1.77	0.31
Cm-243	0	0.0117	0.174	0.436		0.488	0.7306
Co-58	0	0	0.00544	0.0402		0.069	0.159
Co-60	0	0	0.00979	0.0588		0.052	0.167
Cs-134	0	0.000801	0.0285	0.17		0.26	0.8854
Cs-137	21	0.346	0.447	0.55	0.535	1.06	0.13
Eu-152	0	0	0.0819	0.341		0.32	0.77
Eu-154	0	0	0.0348	0.247		0.22	0.8
Eu-155	0	0.0019	0.0547	0.218		0.18	0.4363
Tritium[a]	0	41.7	954	4,020		12,000	18,000
K-40	24	13.1	15.6	18.1	18.6	20.3	2.3
Nb-94	0	0.000167	0.0142	0.0589		0.071	0.161
Pb-212	24	0.965	1.16	1.36	1.26	1.77	0.24

Table 4-1
Radionuclide Characteristics of the Undisturbed Surface Material Population (pCi/g)
(Page 2 of 2)

Analyte	Number of Detects	Lower Confidence Interval	Average Reported Activity	Upper Confidence Interval	Upper Confidence Limit	Maximum Reported Activity	Maximum MDC
Pb-214	24	1.18	1.41	1.63	1.48	1.94	0.28
Pu-238	7	0.0139	0.0317	0.0515	0.0664	0.147	0.037
Pu-239	23	1.41	1.73	2.05	2.82	11.1	0.03
Sb-125	0	0.00778	0.0675	0.183		0.31	0.35
Sr-90	15	0.0825	0.139	0.195	0.159	0.309	0.088
Th-227	0	0	0.246	4.23		2.01	19
Th-234	4	0.484	1.49	2.58	1.65	2.34	2.966
Tl-208	24	0.245	0.333	0.421	0.357	0.441	0.15
U-234	24	0.78	0.974	1.17	1.06	1.84	0.04
U-235	19	0.0338	0.0665	0.0992	0.094	0.179	0.03
U-238	24	0.843	1.05	1.25	1.14	2.01	0.03

[a]All tritium values are expressed in units of picocuries per liter

4.2 Disturbed Material

The radiological characteristics of reported analytes within the disturbed material population are presented in Table 4-2.

Table 4-2
Radionuclide Characteristics of the Disturbed Material Population (pCi/g)
(Page 1 of 2)

Analyte	Number of Detects	Lower Confidence Interval	Average Reported Activity	Upper Confidence Interval	Upper Confidence Limit	Maximum Reported Activity	Maximum MDC
Ac-228	4	0.348	0.601	0.854	0.665	0.99	0.6
Al-26	0	0.00317	0.0279	0.0803		0.097	0.156
Am-241	0	0	0.142	0.516		0.8	2.1
Be-7	0	0	0.0756	0.531		0.35	1.09
Bi-212	0	0.216	0.966	1.86		1.53	2
Bi-214	18	1.52	1.84	2.15	2.02	2.65	0.3

Table 4-2
Radionuclide Characteristics of the Disturbed Material Population (pCi/g)
(Page 2 of 2)

Analyte	Number of Detects	Lower Confidence Interval	Average Reported Activity	Upper Confidence Interval	Upper Confidence Limit	Maximum Reported Activity	Maximum MDC
Cm-243	0	0	0.115	0.387		0.21	0.82
Co-58	0	0	0.00667	0.0385		0.051	0.157
Co-60	0	0.00139	0.0204	0.0763		0.11	0.156
Cs-134	0	0	0.0776	0.362		0.34	1.17
Cs-137	0	0.00117	0.00594	0.0488		0.093	0.134
Eu-152	0	0.00722	0.139	0.452		0.47	0.8
Eu-154	0	0	0.0567	0.351		0.27	0.79
Eu-155	0	0.00167	0.0494	0.217		0.17	0.49
Tritium[a]	0	0	1,280	4,610		11,000	19,000
K-40	18	8.74	10.9	13	13.4	14	2.2
Nb-94	0	0.00117	0.0139	0.0616		0.082	0.131
Pb-212	18	0.509	0.662	0.814	0.758	1.27	0.24
Pb-214	18	1.75	2.06	2.36	2.27	2.99	0.26
Pu-238	0	0	0.000556	0.0109		0.003	0.026
Pu-239	3	0.0055	0.0134	0.0276	0.039	0.082	0.024
Sb-125	0	0.000556	0.0394	0.166		0.15	0.34
Sr-90	0	0.00239	0.0172	0.0583		0.089	0.142
Th-227	0	0	0.0611	0.659		0.36	13.3
Th-234	3	0.941	1.98	3.02	2.29	3.9	2.7
Tl-208	4	0.107	0.191	0.274	0.222	0.39	0.16
U-234	18	1.59	1.95	2.3	2.13	2.8	0.05
U-235	17	0.0698	0.115	0.159	0.125	0.169	0.029
U-238	18	1.74	2.12	2.5	2.35	3.09	0.03

[a]All tritium values are expressed in units of picocuries per liter

4.3 Subsurface Rock

The radiological characteristics of reported analytes within the subsurface rock population are presented in Table 4-3.

Table 4-3
Radionuclide Characteristics of the Subsurface Rock Population (pCi/g)
(Page 1 of 2)

Analyte	Number of Detects	Lower Confidence Interval	Average Reported Activity	Upper Confidence Interval	Upper Confidence Limit	Maximum Reported Activity	Maximum MDC
Ac-228	3	0.311	0.529	0.747	0.658	0.91	0.45
Al-26	0	0	0.0134	0.0577		0.053	0.118
Am-241	0	0	0.0654	0.486		0.24	1.9
Be-7	0	0	0.079	0.428		0.34	1
Bi-212	0	0.091	0.68	1.49		1.54	1.57
Bi-214	10	1.65	1.97	2.29	2.29	2.68	0.23
Cm-243	0	0.008	0.153	0.418		0.48	0.71
Co-58	0	0	0.0014	0.0402		0.011	0.133
Co-60	0	0	0.0106	0.0522		0.032	0.146
Cs-134	0	0	0.0135	0.134		0.04	1.29
Cs-137	0	0	0.0017	0.0255		0.01	0.132
Eu-152	0	0.01	0.157	0.447		0.43	0.64
Eu-154	0	0	0.002	0.209		0.02	0.76
Eu-155	0	0	0.066	0.216		0.25	0.44
Tritium[a]	0	100	2,360	8,190		6,000	18,000
K-40	10	10.5	12.8	15	14.8	21.1	1.3
Nb-94	0	0	0.0176	0.0678		0.048	0.115
Pb-212	10	0.499	0.641	0.782	0.783	1.09	0.18
Pb-214	10	1.78	2.09	2.4	2.41	2.78	0.24
Pu-238	0	0	0.0011	0.012		0.007	0.031
Pu-239	0	0	0.0005	0.0109		0.005	0.028
Sb-125	0	0	0.0182	0.128		0.04	0.32
Sr-90	0	0.0001	0.0255	0.0814		0.06	0.14
Th-227	0	0	0.06	0.349		0.26	0.98

Table 4-3
Radionuclide Characteristics of the Subsurface Rock Population (pCi/g)
(Page 2 of 2)

Analyte	Number of Detects	Lower Confidence Interval	Average Reported Activity	Upper Confidence Interval	Upper Confidence Limit	Maximum Reported Activity	Maximum MDC
Th-234	4	0.898	1.72	2.62	2.25	3.58	2.2
Tl-208	6	0.113	0.185	0.257	0.23	0.282	0.108
U-234	10	1.6	1.95	2.3	2.26	3	0.04
U-235	10	0.0618	0.103	0.144	0.118	0.156	0.024
U-238	10	1.75	2.13	2.51	2.5	3.38	0.03

[a]All tritium values are expressed in units of picocuries per liter

5.0 Data Quality

Rigorous QC was implemented for all laboratory samples including documentation, verification and validation of analytical results, and affirmation of data quality indicator (DQI) requirements related to laboratory analysis. The following sections discuss the DQA, data validation process, QC samples, and nonconformances as prescribed in *Data Quality Assessment: A Reviewer's Guide* (EPA, 2006a). Detailed information regarding the quality assurance (QA) program is contained in the Industrial Sites QAPP (NNSA/NV, 2002).

5.1 Data Quality Assessment Summary

The DQA is presented in Appendix A and includes an evaluation of the DQIs to determine the degree of acceptability and usability of the reported data in the decision-making process as prescribed in *Data Quality Assessment: A Reviewer's Guide* (EPA, 2006a). The DQO process ensures that the right type, quality, and quantity of data will be available to support the resolution of those decisions at an appropriate level of confidence (EPA, 2006b). Using both the DQO and DQA processes help to ensure that DQO decisions are sound and defensible.

A detailed evaluation of the DQIs is presented in Appendix A as part of the DQA. The DQA process as presented in Appendix A is comprised of the following steps:

- Step 1: Review DQOs and Sampling Design
- Step 2: Conduct a Preliminary Data Review
- Step 3: Select the Test
- Step 4: Verify the Assumptions
- Step 5: Draw Conclusions from the Data

Based on the results of the DQA presented in Appendix A, the datasets are of sufficient quality to develop the characteristics of the materials potentially dispersed by the Divine Strake Experiment. The DQA also determined that information generated during the investigation support the CSM assumptions, and the data collected met the DQOs and support their intended use.

5.2 Data Validation

Data validation was performed in accordance with the Industrial Sites QAPP (NNSA/NV, 2002) and approved protocols and procedures. All laboratory data from samples collected and analyzed for Divine Strake were evaluated for data quality in a tiered process. Data were reviewed to ensure that samples were appropriately processed and analyzed, and the results were evaluated using validation criteria. Documentation of the data qualifications resulting from these reviews is retained in project files as a hard copy and electronic media.

One hundred percent of the data used in this characterization report were subjected to Tier I and Tier II evaluations. A Tier III evaluation was performed on three samples or approximately 5 percent of the data analyzed.

5.2.1 Tier I Evaluation

Tier I evaluation for radiochemical analysis examines, but is not limited to:

- Sample count/type consistent with chain of custody
- Analysis count/type consistent with chain of custody
- Correct sample matrix
- Significant problems stated in cover letter or case narrative
- Completeness of certificates of analysis
- Completeness of Contract Laboratory Program (CLP) or CLP-like packages
- Completeness of signatures, dates, and times on chain of custody
- Condition-upon-receipt variance form included
- Requested analyses performed on all samples
- Date received/analyzed given for each sample
- Correct concentration units indicated
- Electronic data transfer supplied
- Results reported for field and laboratory QC samples
- Whether or not the deliverable met the overall objectives of the project

5.2.2 Tier II Evaluation

Tier II evaluation examined:

- Correct detection limits achieved
- Blank contamination evaluated and, if significant, qualifiers are applied to sample results

- Certificate of Analysis consistent with data package documentation
- Quality control sample results (duplicates, laboratory control samples, laboratory blanks) evaluated and used to determine laboratory result qualifiers
- Sample results, uncertainty, and MDC evaluated
- Detector system calibrated with National Institute for Standards and Technology (NIST)-traceable sources
- Calibration sources preparation was documented, demonstrating proper preparation and appropriateness for sample matrix, emission energies, and concentrations
- Detector system response to daily or weekly background and calibration checks for peak energy, peak centroid, peak full-width half-maximum, and peak efficiency, depending on the detection system
- Tracers NIST-traceable, appropriate for the analysis performed, and recoveries that met QC requirements
- Documentation of all QC sample preparation complete and properly performed
- Spectra lines, photon emissions, particle energies, peak areas, and background peak areas support the identified radionuclide and its concentration

5.2.3 Tier III Evaluation

The Tier III review is an independent examination of the Tier II evaluation. A Tier III review of three samples was performed by TechLaw, Inc., of Lakewood, Colorado. Tier II and Tier III results were compared and where differences are noted, data were reviewed and changes were made accordingly. This review included the following additional evaluations:

- QC sample results (e.g., calibration source concentration, percent recovery, and relative percent difference [RPD]) verified.
- Radionuclides and their concentration validated as appropriate considering their decay schemes, half-lives, and process knowledge and history of the facility and site.
- Each identified line in spectra verified against emission libraries and calibration results.
- Independent identification of spectra lines, area under the peaks, and quantification of radionuclide concentration in a random number of sample results.

5.3 Field Quality Control Samples

Field QC samples consisted of three field duplicates collected and submitted for analysis by the laboratory analytical methods listed in Table 2-1 as prescribed in the SAP. The QC samples were assigned individual sample numbers and sent to the laboratory "blind." For these samples, the duplicate results precision (i.e., RPDs between the environmental sample results and their corresponding field duplicate sample results) were evaluated in Section A.2.3.2.1. Additional samples were selected by the laboratory to be analyzed as laboratory duplicates.

5.3.1 Laboratory Quality Control Samples

The laboratory included a preparation blank, laboratory control sample, and a laboratory duplicate sample with each batch of field samples analyzed for radionuclides. The results of these analyses were used to qualify associated environmental sample results. Documentation of data qualifications resulting from the application of these guidelines is retained in project files as both hard copy and electronic media.

5.4 Field Nonconformances

There were no field nonconformances identified for the field investigation.

5.5 Laboratory Nonconformances

Laboratory nonconformances are generally due to inconsistencies in the analytical instrumentation operation, sample preparation, processing recoveries and results not meeting requirements. One nonconformance was issued by the laboratory that resulted in qualifying data as estimated.

Nonconformance Report (NCR) #008166 was issued by Paragon Analytics, Inc., for isotopic uranium data in Sample Delivery Group (SDG) 0608198. The NCR was issued because the spectral quality for samples DSA18 and DSA20 exceeded the control limit. This could cause uranium (U)-235 to be biased high. Paragon qualified the U-235 results as estimated. This laboratory nonconformance has been evaluated and resolved during the data qualification process.

A review of the uranium results for these two samples indicates that it is representative of natural uranium (when the associated uncertainties are considered) and no further action was necessary.

6.0 References

EPA, see U.S. Environmental Protection Agency.

NNSA/NSO, see U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office.

NNSA/NV, see U.S. Department of Energy, National Nuclear Security Administration Nevada Operations Office.

Riedhauser, S. (Bechtel Nevada). 2006. Email to L. Kidman (SNJV) entitled, "FW: Area 16 Shapefiles," 17 July. Las Vegas, NV.

U.S. Department of Energy, National Nuclear Security Administration Nevada Operations Office. 2002. *Industrial Sites Quality Assurance Project Plan, Nevada Test Site, Nevada*, Rev. 3, DOE/NV--372. Las Vegas, NV.

U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office. 2006. *Sampling and Analysis Plan for the Divine Strake Experiment, Nevada Test Site, Nevada*, DOE/NV--1139. Las Vegas, NV.

U.S. Environmental Protection Agency. 2006a. *Data Quality Assessment: A Reviewer's Guide*, EPA QA/G-9R. Washington, DC.

U.S. Environmental Protection Agency. 2006b. *Guidance on Systematic Planning Using the Data Quality Objectives Process*, EPA QA/G4. Washington, DC.

Appendix A

Data Quality Assessment

A.1.0 Introduction

The DQA for the Divine Strake site characterization activity follows the process prescribed in *Data Quality Assessment: A Reviewer's Guide* (EPA, 2006a). The DQOs presented in the SAP were based on the *Guidance on Systematic Planning Using the Data Quality Objectives Process* (EPA, 2006b).

The DQA process is the scientific evaluation of the actual investigation results to determine whether the DQO criteria established in the SAP for the Divine Strake Experiment (NNSA/NSO, 2006) were met and whether the right type, quality, and quantity of data are available to support the resolution of the DQO problem statement at the desired level of confidence.

The DQA involves five steps that begin with a review of the DQOs and end with resolution of the DQOs. The five steps are briefly summarized as follows:

Step 1: Review DQOs and Sampling Design - Review the outputs from the DQO process. Confirm the limits on errors. Review the sampling design, and note any special features or potential problems.

Step 2: Conduct a Preliminary Data Review - Review QA reports. Look for problems or anomalies in the implementation of the sample collection and analysis procedures. Inspect the data both numerically and graphically, validate and verify the data to ensure that the measurement systems performed in accordance with the criteria specified, and use the validated dataset to determine whether the quality of the data is satisfactory.

Step 3: Select the Statistical Method - Select the statistical method based on the data user's objectives and the results of the preliminary data review. Identify the assumptions underlying the statistical method. List the key underlying assumptions of the statistical procedure, such as distributional form, dispersion, independence, and similar items. Note any sensitive assumptions where relatively small deviations could jeopardize the validity of the results.

Step 4: Verify the Assumptions of the Statistical Test - Identify any strong graphical evidence from the preliminary data review. Review the statistical model for the data. Perform tests of assumptions. Adjust for distributional assumption if warranted. Perform the calculations required for the tests. If necessary, determine corrective actions. Determine whether data transformations will correct the

problem. If data are missing, explore the feasibility of using theoretical justification or of collecting new data.

Step 5: Draw Conclusions from the Data - Perform the calculations for the statistical method. If anomalies or outliers are present in the dataset, perform the calculations with and without the questionable data. Evaluate the results and draw conclusions. Interpret the results of the confidence interval.

A.2.0 Review DQOs and Sampling Design

This section contains a review of the outputs from the DQO process presented in the SAP including the limits on errors and deviations to the sampling design.

The information from the Divine Strake field investigation sample results that satisfy the DQO data needs are discussed in Section A.2.1. The SAP defined the following three types of errors and stipulated requirements for their control:

- Sampling error
- Measurement error
- Data reduction error

Assessments of controls for these errors are provided in Sections A.2.2 through A.2.4. Section A.2.5 assesses completion of DQO sampling requirements, and Section A.2.6 presents deviations to the sampling design and the associated impacts to data assessment.

A.2.1 DQO Outputs

The DQOs identified the following outputs (data needs) from the characterization activities:

- Radiological data from each of the defined populations
- Radiological data from the three highest readings of the May 1, 2006, aerial gamma radiation survey
- For each detected analyte and population:
  - the estimated average
  - the standard error of the estimated average
  - the 95 percent confidence limits for the estimated average
  - the number of samples

Sampling activities included the collection of 26 soil samples (including 2 FDs) from the undisturbed surface material, 11 subsurface rock samples (including 1 FD), 19 disturbed material soil samples (including 1 FD), and 3 biased soil samples at locations identified from the flyover data as described in the SAP. Statistical results from the analytical samples are presented in Section A.3.0.

A.2.2 Sampling Error

Sampling error was controlled by collecting, managing, and transporting samples following approved standard quality procedures. Sampling error was also controlled by:

- Collecting a sufficient number of samples (addressed in Section A.2.2.1)
- Taking samples from locations that are representative of the populations of interest (addressed in Section A.2.2.2)

A.2.2.1 Sample Size

The minimum number of samples was calculated from the field investigation sample results for each significant analyte at each population to verify that sufficient samples were collected. For the purposes of determining sample size requirements, significant analytes are considered to be the analytes that are detected above the minimum levels of interest (MLIs) as defined in Section 3.3 of the SAP or the analyte detected at a concentration closest to its respective MLI (if no analytes are detected above the MLIs). The Visual Sample Plan (VSP) software was used to calculate final minimum sample sizes using the following inputs (PNNL, 2005):

- A two-sided 95 percent confidence interval
- The maximum acceptable half-width of confidence interval for each population-specific significant analyte as listed in Table A.2-1 (set to half of the MLI)
- The calculated standard deviation for each population-specific significant analyte as listed in Table A.2-1

The minimum number of samples for each significant analyte and population are listed in Table A.2-1.

Table A.2-1
Minimum Sample Size Calculation

Population	Significant Analyte	½ width of Confidence Interval	Standard Deviation	Minimum Required Number of Samples	Number of Samples Collected
Undisturbed Surface Material	Pu-239	1.565	2.68	14	24
	Sr-90	0.0755	0.0577	5	24
Disturbed Material	Sr-90	0.0755	0.0254	3	18
Subsurface Rock	U-238	3.35	0.681	3[a]	10

[a] Three samples is the minimum number required to generate statistics.

A.2.2.2 Sampling Locations

The VSP software (described in Section 3.1 of the SAP) was used to define the primary and alternate sample locations for the undisturbed surface material population and the disturbed material population as described in the SAP. The sample locations were located in the field with GPS equipment using the coordinates as listed in the SAP. Samples were collected from these locations except as noted in Section A.2.6.

A.2.3 Measurement Error

Measurement error was controlled by ensuring that all analyte measurements were capable of detecting concentrations equal to or less than their corresponding MLIs as defined in Section 3.3 of the SAP. This is addressed under the assessment of sensitivity in Section A.2.3.1. Measurement error is also evaluated in the assessment of the DQI parameters in Section A.2.3.2.

A.2.3.1 Sensitivity

Sample results were assessed against the acceptance criterion for the DQI of sensitivity as defined in the Industrial Sites QAPP (NNSA/NV, 2002). The sensitivity acceptance criterion defined in the SAP is that analytical detection limits are less than the corresponding MLIs. This criterion was achieved for all of the analytical results.

A.2.3.2 Data Quality Indicators

The entire dataset was assessed against the acceptance criteria for the DQIs of precision, accuracy, representativeness, comparability, and completeness as defined in the Industrial Sites QAPP (NNSA/NV, 2002). The DQI acceptance criteria are presented in Table 6-1 of the SAP. As presented in Sections A.2.3.2.1 through A.2.3.2.5, the DQI acceptance criteria were met for all of the Divine Strake field investigation sample results.

A.2.3.2.1 Precision

Precision was evaluated as described in Section 6.2 of the SAP. Table A.2-2 provides the radiological precision analysis results for all constituents that were qualified for precision. The radionuclides qualified for precision were Pu-239 and U-235.

As shown in Table A.2-2, the precision rate for Pu-239 was above the SAP acceptance criterion of 80 percent. The precision rate for U-235 of 67.8 percent is below the acceptance criterion. The precision rate for all other constituents is 100 percent.

Table A.2-2
Precision Measurements

Analyte	CAS Number	Number of Analytes Qualified	Number of Measurements Performed	Percent within Criteria
Pu-239	15117-48-3	10	59	83.1
U-235	15117-96-1	19	59	67.8

CAS = Chemical Abstract Service

The lower precision rate for U-235 can be attributed to the following factors:

- The RPD comparison for U-235 in one FD sample pair exceeded the control limit. This one exceedance caused all 19 samples in that batch to be qualified for precision.
- The U-235 in the duplicate pair is present at very low activities (0.109 and 0.166 pCi/g compared to an MLI of 2.27 pCi/g); therefore, slight differences in activities result in larger percent differences
- The U-235 measurement spectral interval is between two intervals ascribed to U-234 and U-238. Both U-234 and U-238 are present in natural activities roughly 20 times that of U-235

resulting in a U-235 spectral peak between two relatively large spectral peaks. This makes precise measurements of natural U-235 more difficult.

All the measurement information for the samples in the batch was acceptable, and the U-235 results can be considered usable for decision making.

All constituents other than U-235 exceed the acceptance criteria for precision, and the dataset is determined to be acceptable for the DQI of precision.

A.2.3.2.2 Accuracy

Accuracy was evaluated as described in Section 6.2 of the SAP. There were no radiological data qualified for accuracy.

A.2.3.2.3 Representativeness

The DQO process as identified in Appendix A of the SAP (NNSA/NSO, 2006) was used to address sampling and analytical requirements. During this process, random locations were selected that enabled the samples collected to be representative of the populations being characterized. Therefore, the analytical data acquired from the Divine Strake field investigation samples are considered representative of the population parameters.

A.2.3.2.4 Comparability

Field sampling, as described in the SAP (NNSA/NSO, 2006), was performed and documented in accordance with approved procedures that are comparable to standard industry practices. Approved analytical methods and procedures per DOE were used to analyze, report, and validate the data. These methods are comparable to other methods used in industry and government practices, and the resulting data are comparable to results from other investigations conducted using these methods. Therefore, the datasets are considered comparable to other datasets generated using these same standardized procedures, thereby meeting DQO requirements.

A.2.3.2.5 Completeness

The SAP (NNSA/NSO, 2006) defines acceptable criteria for completeness to be having valid analytical results for the minimum number of samples required in Section A.7.2 of the SAP. Also, the dataset must be sufficiently complete to establish appropriate confidence intervals.

There were no rejected data (either qualified as rejected or data that failed the criterion of sensitivity) in the Divine Strake field investigation dataset.

A.2.4 Data Reduction Error

The data reduction error was controlled by ensuring the appropriate statistical distribution model is used in calculating the statistics for each analyte and population dataset. This was accomplished by ensuring that each dataset reasonably "fits" a standard population distribution type. If a distribution model "fit" cannot be established, a non-parametric model was used. For some analytes in each population, most of the activities were reported as not detected. As explained in Section A.2.4.2, this may lead to errors in determining the appropriate distribution model (and the associated UCL). To address this problem, an alternative estimate of the confidence limits to the analyte averages was developed (Section A.2.4.2).

A.2.4.1 Distribution Model Determination

ProUCL software was used to determine the appropriate probability distribution (e.g., normal, lognormal, gamma) and/or a suitable nonparametric distribution-free method using the field investigation sample results for each analyte. The sample data were tested for goodness-of-fit to all of the parametric and nonparametric UCL computation methods described in the U.S. Environmental Protection Agency Guidance Document *Calculating the Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites* (OSWER, 2002). The appropriate distributions for calculating UCLs of each detected analyte for each population are listed in Table A.2-3. Complete results of these tests are provided in Appendix B.

Table A.2-3
Distributions for Calculating Upper Confidence Limits

Detected Analyte	Undisturbed Surface Material (24 samples)		Disturbed Material (18 samples)		Subsurface Rock (10 samples)	
	Distribution	Number of Detections	Distribution	Number of Detections	Distribution	Number of Detections
Ac-228	Non-parametric	22	Normal	4	Normal	3
Am-241	Non-parametric	1	ND	0	ND	0
Bi-214	Normal	24	Normal	18	Normal	10
Cs-137	Normal	21	ND	0	ND	0
Pb-212	Normal	24	Gamma	18	Normal	10
Pb-214	Normal	24	Normal	18	Normal	10
Pu-238	Non-parametric	7	ND	0	ND	0
Pu-239	Gamma	23	Non-parametric	3	ND	0
Sr-90	Normal	15	ND	0	ND	0
Th-234	Normal	4	Normal	3	Normal	4
Tl-208	Normal	24	Non-parametric	4	Normal	6
U-234	Lognormal	24	Normal	18	Normal	10
U-235	Normal	14	Non-parametric	7	Non-parametric	6
U-238	Non-parametric	24	Normal	18	Normal	10

The data used to calculate radionuclide UCLs were limited to those analytes that were detected in at least one sample in each population. The FD sample results were also excluded from the calculations to avoid potential bias. All reported concentrations (includung the reported activities below the reported detection limit) were used in the calculation of UCLs, averages, and in the determination of the appropriate distribution model.

A.2.4.2 Distribution-Independent Confidence Intervals

For datasets that are significantly censored (comprised mostly of non-detects), the determination of the appropriate distribution model cannot be determined with confidence. To address this problem, another estimate of the UCL was developed based on the 95th percent confidence interval of each radiological activity measurement. The upper 95th percent confidence interval (UCI) for each

measurement was obtained by adding the 95th percent confidence interval to the measured value (i.e., reported activity) for each analytical result. An estimate of the UCI for each analyte and population was then obtained by averaging the UCI activities (with negative values truncated to zero). The lower 95th percent confidence interval was obtained similarly by subtracting the 95th percent confidence interval from the measured value (i.e., reported activity) for each analytical result and averaging the resulting values for each analyte and population.

A.2.5 Sampling Design

The SAP (NNSA/NSO, 2006) made the following commitments for sampling and analysis design.

Commitment: Laboratory analysis of the samples will be performed by a Nevada-certified and DOE-accredited laboratory for radiological constituents.

Result: All samples were performed by Paragon Analytics, Inc., of Fort Collins, Colorado, a Nevada-certified and DOE-accredited laboratory for radiological constituents.

Commitment: Independent validation, interpretation, and analysis of the results will be performed.

Result: A Tier III review of three samples was performed by TechLaw, Inc., of Lakewood, Colorado. Independent reviews were conducted on the results, and comments were incorporated into this report.

Commitment: Samples will be submitted for the analytical methods listed in Table 3-2 and gross alpha and beta analysis.

Result: All samples were submitted for the required analyses.

Commitment: The analytical methods are sufficient to provide the MDCs, no greater than the MLIs.

Result: All of the MDCs for every non-detected result in every sample were less than the corresponding MLIs established in the SAP. This commitment was met and is discussed in Section A.2.3.1.

Commitment: A total of 25 samples will be collected from the undisturbed surface material population, 19 samples will be collected from the disturbed material population, and 11 samples will be collected from the undisturbed rock population.

Result: An extra FD was collected from the undisturbed surface material population for a total of 26 samples. Otherwise, all samples were collected as required by the SAP.

Commitment: The minimum sample number goals for each COPC and population will be recalculated following the field investigation using actual sample results to validate the sample size selections. If this number is greater than the number of samples collected, additional samples will be collected or the characterization objectives will be reassessed.

Result: The minimum sample size for each population was recalculated as described in Section A.2.2.1. The required sample sizes were all less than the number of actual samples collected. No additional samples were necessary.

Commitment: An FD and laboratory QC sample will be collected for each sampling population.

Result: Two FD and laboratory QC samples were submitted from the undisturbed material population, and one FD and laboratory QC sample was submitted from the disturbed material sampling population and from the undisturbed rock sampling population.

Commitment: The field QC samples shall be analyzed using the same analytical procedures implemented for associated environmental samples.

Result: All field QC samples were submitted for the required analyses.

Commitment: Rigorous QA/QC will be implemented for all laboratory samples including documentation, data verification and validation of analytical results, and an assessment of DQIs as they relate to laboratory analysis.

Result: This requirement was completed and documented in Section 5.0 and Section A.2.0.

Commitment: At least 80 percent of the sample results for each measured constituent are not qualified for precision based on the criteria for each analytical method-specific and laboratory-specific criteria presented in Section 6.2.3 of the SAP, or for the FD criteria of 80 percent RPD or 2 percent normalized difference.

Result: This commitment was met and is discussed in Section A.2.3.2.1.

Commitment: At least 80 percent of the sample results for each measured constituent are not qualified for accuracy based on the method-specific and laboratory-specific criteria presented in Section 6.2.4 of the SAP.

Result: This commitment was met and is discussed in Section A.2.3.2.2.

Commitment: Sampling, handling, preparation, analysis, reporting, and data validation are performed using standard methods and procedures.

Result: All methods and procedures used were consistent with industry standards.

Commitment: Samples contain constituents that are representative of the environmental media from which they were collected.

Result: No patterns or trends were observed that indicate that the defined populations are not sufficiently uniform to establish unique radiological characteristics.

Commitment: Eighty percent of the sample results for each measured constituent have valid results.

Result: Valid results were obtained for 100 percent of the measured constituents.

A.2.6 Deviations to the Sampling Design

The sampling at the Divine Strake Experiment Site was completed with no deviations from the plan. All of the samples were collected from either the primary or alternate locations listed in the SAP.

Of the 24 primary locations for the undisturbed surface material population samples, 5 were not sampled and alternates were selected. Two of the locations were on outcrops, two were on the road, and one was in a disturbed area. Table A.2-4 shows the alternate locations where the samples were collected.

Table A.2-4
Undisturbed Surface Material Population Sample Locations

Soil Sample Points		
Primary Location	**Comment**	**Alternate Location**
A1	Sampled	Not sampled
A2	Sampled	Not sampled
A3	Sampled	Not sampled
A4	Sampled	Not sampled
A5	Sampled	Not sampled
A6	Sampled	Not sampled
A7	Sampled	Not sampled
A8	Point on the road	C8
A9	Point in an outcrop	C19
A10	Sampled	Not sampled
A11	Point in a disturbed area	C11
A12	Sampled	Not sampled
A13	Sampled	Not sampled
A14	Sampled	Not sampled
A15	Point on the road	C21
A16	Point on an outcrop	C16
A17	Sampled	Not sampled
A18	Sampled	Not sampled
A19	Sampled	Not sampled
A20	Sampled	Not sampled
A21	Sampled	Not sampled
A22	Sampled	Not sampled
A23	Sampled	Not sampled
A24	Sampled	Not sampled

Of the 18 primary locations for the disturbed material population samples, 5 were not sampled and alternates were selected. Four of the samples did not fall in disturbed areas, and one was under a building. Table A.2-5 shows the alternate locations where the samples were collected.

Table A.2-5
Disturbed Material Population Sample Locations

Disturbed Soil Sample Points		
Primary Location	**Comment**	**Alternate Location**
B1	Sampled	Not sampled
B2	Point not in disturbed area	D1
B3	Sampled	Not sampled
B4	Point not in disturbed area	D2
B5	Point not in disturbed area	D3
B6	Sampled	Not sampled
B7	Sampled	Not sampled
B8	Sampled	Not sampled
B9	Sampled	Not sampled
B10	Sampled	Not sampled
B11	Sampled	Not sampled
B12	Point not in disturbed area	D11
B13	Sampled	Not sampled
B14	Sampled	Not sampled
B15	Sampled	Not sampled
B16	Sampled	Not sampled
B17	Sampled	Not sampled
B18	Point under a building	D15

All of the undisturbed rock samples and flyover anomaly samples were collected from the locations described in the SAP.

A.3.0 Conduct a Preliminary Data Review

A preliminary data review was conducted by reviewing QA reports and inspecting the data. The contract analytical laboratories generate a QA NCR when data quality does not meet contractual requirements. All data received from the analytical laboratories met contractual requirements, and one QA NCR was generated as discussed in Section 5.5. Data were validated and verified to ensure that the measurement systems performed in accordance with the criteria specified as discussed in Section 5.2. The validated dataset quality was found to be satisfactory.

A.4.0 Select the Test and Identify Key Assumptions

The key assumptions that could impact a DQO are:

- The man-made radionuclides present at the site are consistent with surface deposition of airborne releases from nuclear activities.
- The defined populations do not contain anomalous areas of elevated radioactivity.

A.5.0 Verify the Assumptions

The results of the characterization activities support the first key assumption as demonstrated in Table A.5-1. The detected man-made radionuclides were almost exclusively limited to the undisturbed surface material.

Table A.5-1
Average Detected Man-Made Radionuclide Activities from Each Population

Analyte	Undisturbed Surface Material (pCi/g)	Disturbed Material (pCi/g)	Subsurface Rock (pCi/g)
Am-241	0.282	ND	ND
Cs-137	0.447	ND	ND
Pu-238	0.0317	ND	ND
Pu-239	1.73	0.0134	ND
Sr-90	0.139	ND	ND

As required by the SAP, the results from each of the flyover anomaly samples were evaluated to determine whether the radioactivity of each sample is within the expected activity range of the population from which the sample was collected. The individual detected analyte results from samples were compared to the 99 percent UCL of the average radioactivity of the population from which each sample was collected (i.e., undisturbed surface material or disturbed material) as shown in Table A.5-2. The analytical results for Ac-228, Bi-214, and Pb-214 from sample DSD01 and the analytical results for Bi-214, Pb-214, Th-234, and the uranium isotopes from sample DSD03 exceeded the 99 percent UCL values for the undisturbed surface material population. No analytical results from sample DSD02 exceeded the UCLs for the disturbed material 99 percent UCL.

Table A.5-2
Comparison of Flyover Anomaly Detected Radionuclide Activities to Dataset

Analyte	Sample DSD01 (pCi/g)	Sample DSD03 (pCi/g)	Undisturbed Surface Material 99% UCL
Undisturbed Surface Material Population			
Ac-228	**1.17**	0.062	1.13
Bi-214	**1.85(J)**	**2.2(J)**	1.4
Cs-137	0.37	0.022(U)	0.575
K-40	19.0	11.8	18.6
Pb-212	1.23(J)	0.59(J)	1.31
Pb-214	**1.97(J)**	**2.44(J)**	1.52
Pu-239	0.264	0.006(U)	3.49
Th-234	1.7(U)	**2.35(J)**	1.72
Tl-208	0.36	0.16	0.368
U-234	0.8	**2.39**	1.1
U-235	0.049(J)	**0.165(J)**	0.164
U-238	0.93	**2.51**	1.19
Disturbed Material Population			
Analyte	**Sample DSD02 (pCi/g)**	**Disturbed Material 99% UCL**	
Bi-214	1.94(J)	2.11	
K-40	7.5	13.4	
Pb-212	0.39(J)	0.8	
Pb-214	2.12(J)	2.37	
U-234	1.91	2.22	
U-235	0.081(J)	0.271	
U-238	2.2	2.46	

Although the ProUCL software did produce values for 99 percent UCLs (as shown in Table A.5-2), it did not recommend them for use at this level of confidence. Due to the inability to generate recommended 99 percent UCLs, additional assessments were conducted to determine if the individual radionuclide activities that exceeded the criteria are anomalous to other corresponding reported activities from the site (as stipulated in Section A.6.2 of the SAP). This was done by producing ranked data plots (Figures A.5-1 through A.5-7) as specified in *Data Quality Assessment: A Reviewer's Guide* (EPA, 2006a) for the detected analytical results that exceeded the 99 percent UCL criteria. These plots show the activity values for the flyover anomaly analytes are not anomalous to the distribution of analytical results from the Divine Strake Experiment Site. Therefore, the areas from which the flyover anomaly samples were collected do not contain anomalous radionuclide activities.

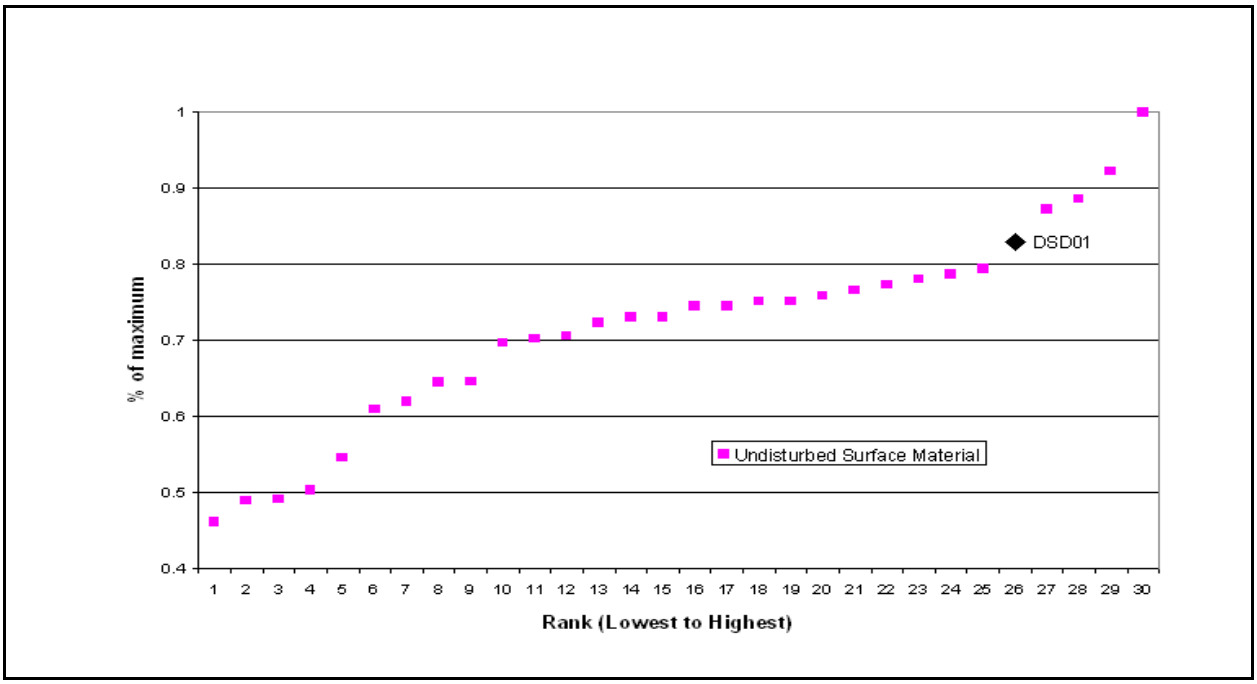

Figure A.5-1
Distribution of Ac-228 Activities at the Divine Strake Experiment Site

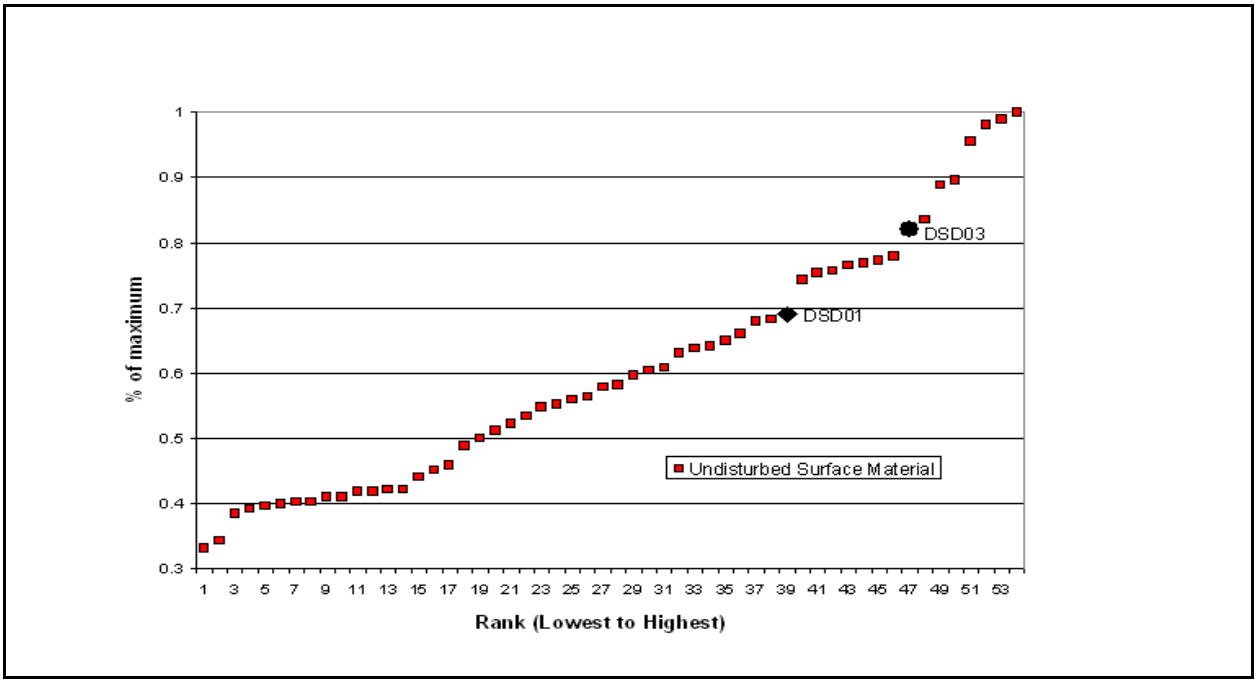

Figure A.5-2
Distribution of Bi-214 Activities at the Divine Strake Experiment Site

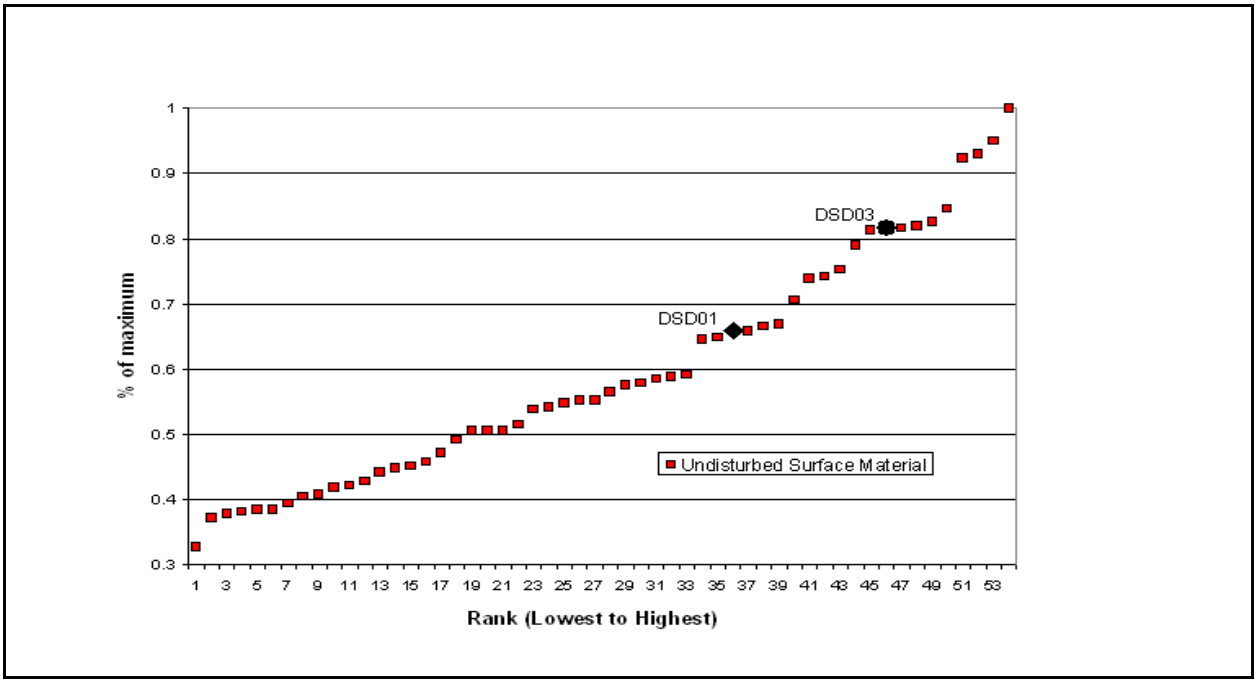

Figure A.5-3
Distribution of Pb-214 Activities at the Divine Strake Experiment Site

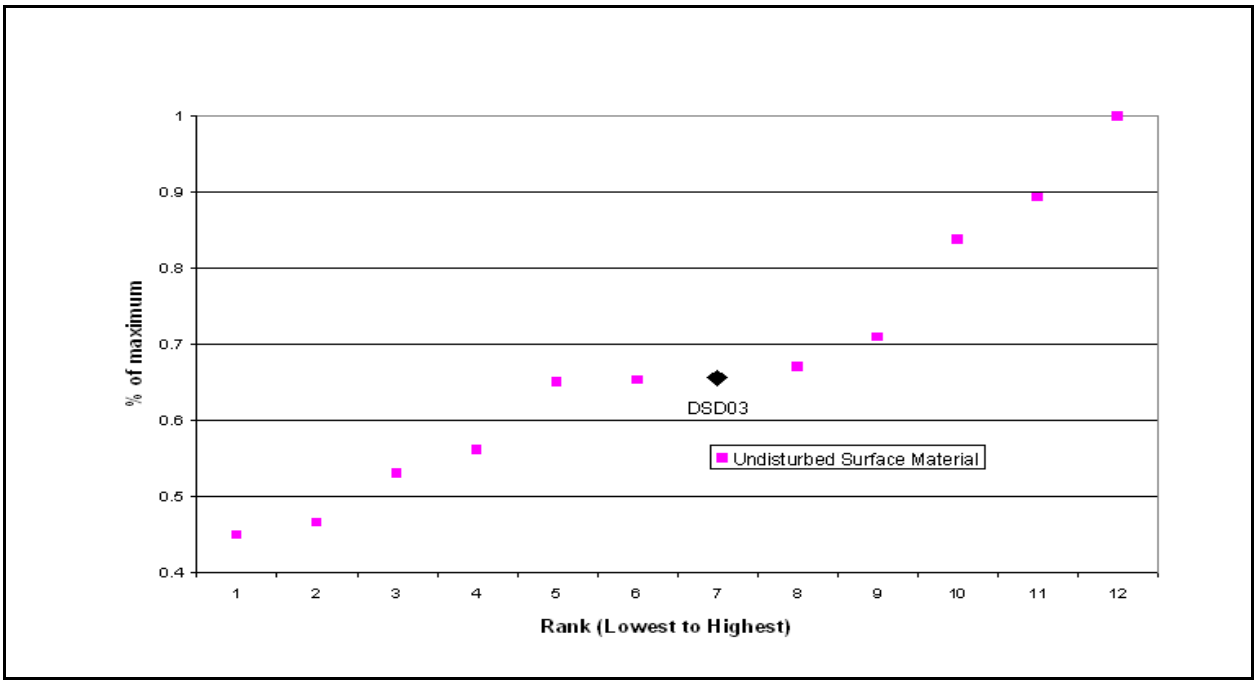

Figure A.5-4
Distribution of Th-234 Activities at the Divine Strake Experiment Site

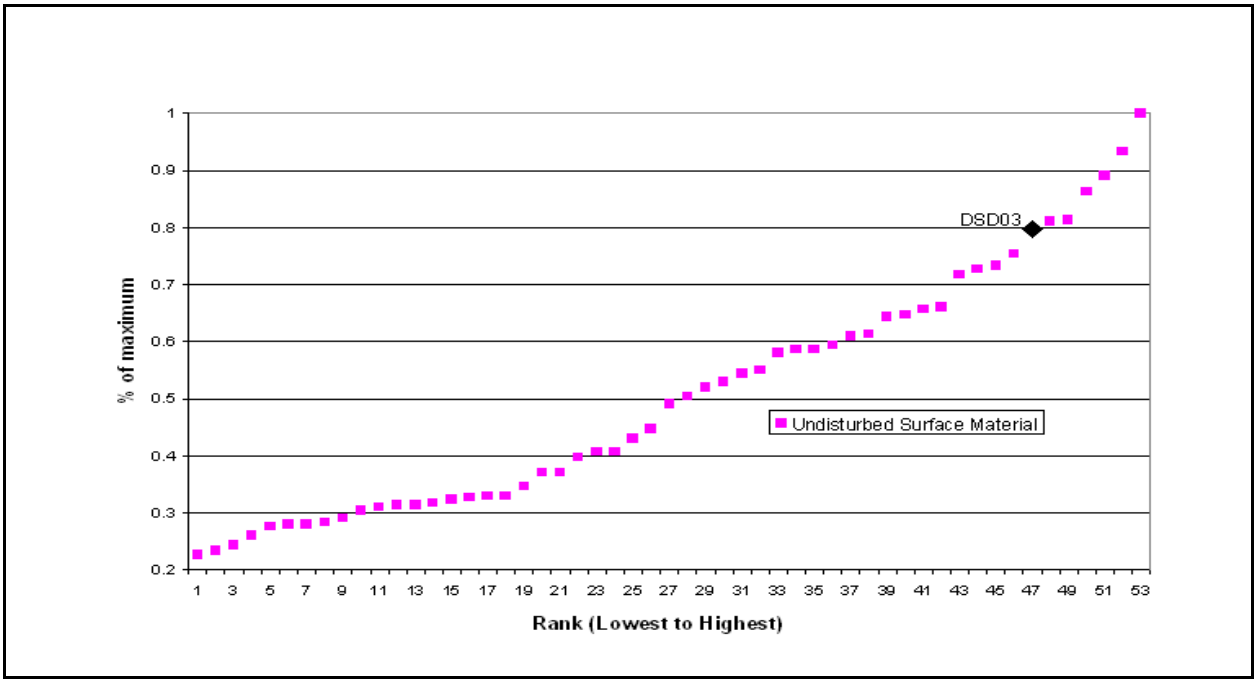

Figure A.5-5
Distribution of U-234 Activities at the Divine Strake Experiment Site

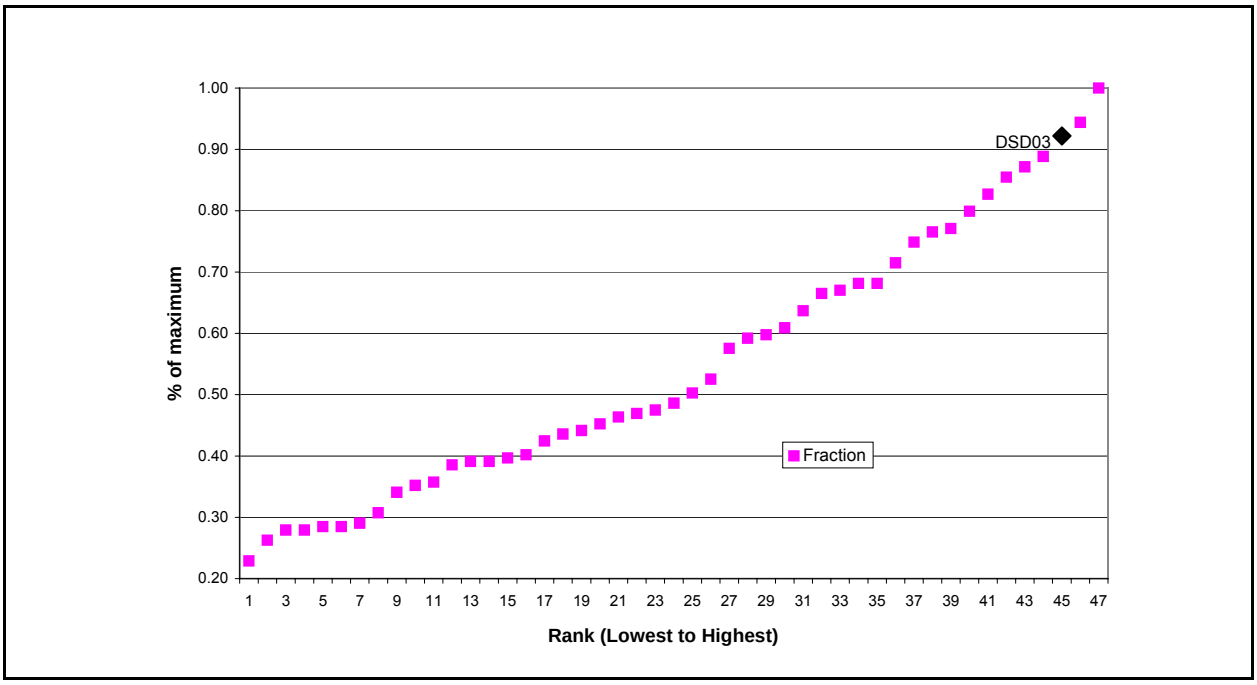

Figure A.5-6
Distribution of U-235 Activities at the Divine Strake Experiment Site

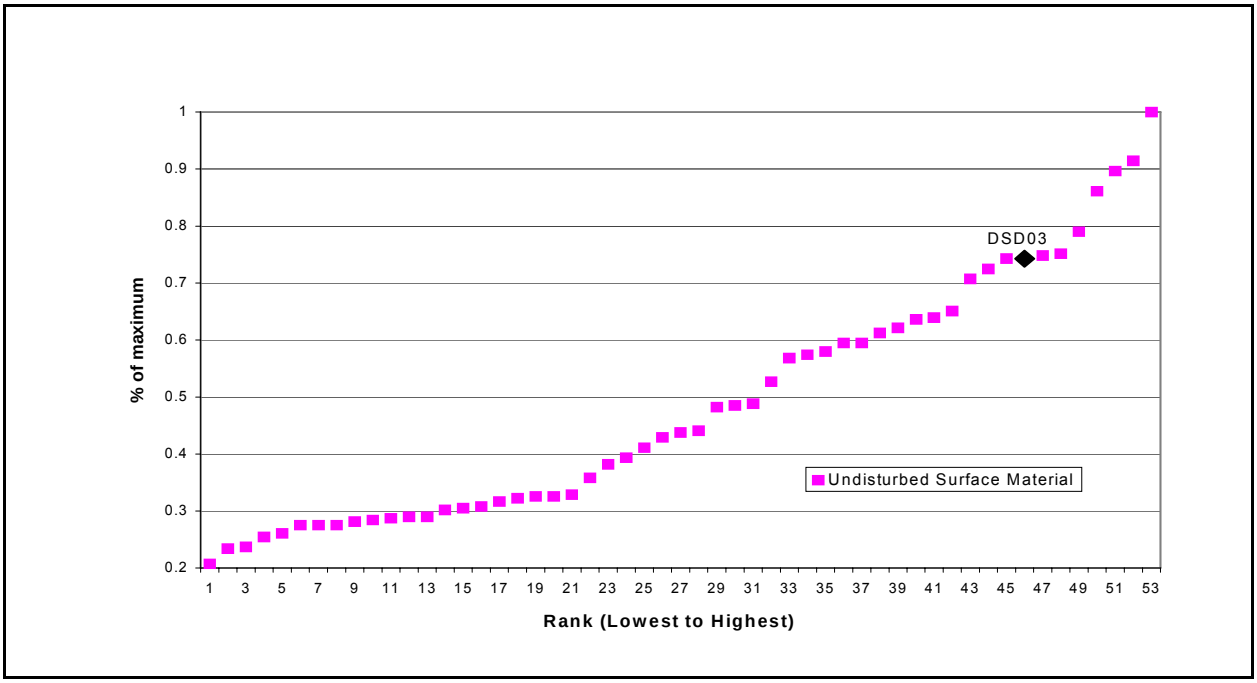

Figure A.5-7
Distribution of U-238 Activities at the Divine Strake Experiment Site

A.6.0 Draw Conclusions from the Data

All data collected during the field investigation supported the CSM presented in the SAP, and field investigation results did not reveal any necessity to revise the CSM. All data generated as a result of the Divine Strake field investigation meet the quality requirements established in the SAP and are of sufficient quality to develop the characteristics of the materials potentially dispersed by the Divine Strake Experiment.

A.7.0 References

EPA, see U.S. Environmental Protection Agency.

NNSA/NSO, see U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office.

NNSA/NV, see U.S. Department of Energy, National Nuclear Security Administration Nevada Operations Office.

OWSER, see Office of Emergency and Remedial Response, U.S. Environmental Protection Agency.

Office of Emergency and Remedial Response, U.S. Environmental Protection Agency. 2002. *Calculating the Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites,* OSWER 9285.670. December. Washington, DC.

PNNL, see Pacific Northwest National Laboratory.

Pacific Northwest National Laboratory. 2005. *Visual Sample Plan Version 4.0, User's Guide,* PNNL-14002. Richland, WA.

U.S. Department of Energy, National Nuclear Security Administration Nevada Operations Office. 2002. *Industrial Sites Quality Assurance Project Plan, Nevada Test Site, Nevada,* Rev. 3, DOE/NV--372. Las Vegas, NV.

U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office. 2006. *Sampling and Analysis Plan for the Divine Strake Experiment, Nevada Test Site, Nevada,* DOE/NV--1139. Las Vegas, NV.

U.S. Environmental Protection Agency. 2006a. *Data Quality Assessment: A Reviewer's Guide,* EPA QA/G-9R. Washington, DC.

U.S. Environmental Protection Agency. 2006b. *Guidance on Systematic Planning Using the Data Quality Objectives Process,* EPA QA/G4. Washington, DC.

Appendix B

ProUCL Datasheets

(55 Pages)

General Statistics

Data File	G:\divine strake\Report\UCLs\DIST UCL.xls	Variable:	D-AC-228	
Raw Statistics		Normal Distribution Test		
Number of Valid Samples	18	Shapiro-Wilk Test Statisitic		0.948703
Number of Unique Samples	14	Shapiro-Wilk 5% Critical Value		0.897
Minimum	0.36	Data are normal at 5% significance level		
Maximum	0.99			
Mean	0.601111	95% UCL (Assuming Normal Distribution)		
Median	0.57	Student's-t UCL		0.665204
Standard Deviation	0.156314			
Variance	0.024434	Gamma Distribution Test		
Coefficient of Variation	0.260041	A-D Test Statistic		0.244343
Skewness	0.838698	A-D 5% Critical Value		0.73938
		K-S Test Statistic		0.136962
Gamma Statistics		K-S 5% Critical Value		0.203325
k hat	16.55523	Data follow gamma distribution		
k star (bias corrected)	13.83306	at 5% significance level		
Theta hat	0.036309			
Theta star	0.043455	95% UCLs (Assuming Gamma Distribution)		
nu hat	595.9884	Approximate Gamma UCL		0.669335
nu star	497.9903	Adjusted Gamma UCL		0.676311
Approx.Chi Square Value (.05)	447.2313			
Adjusted Level of Significance	0.03574	Lognormal Distribution Test		
Adjusted Chi Square Value	442.6184	Shapiro-Wilk Test Statisitic		0.984206
		Shapiro-Wilk 5% Critical Value		0.897
Log-transformed Statistics		Data are lognormal at 5% significance level		
Minimum of log data	-1.021651			
Maximum of log data	-0.01005	95% UCLs (Assuming Lognormal Distribution)		
Mean of log data	-0.539481	95% H-UCL		0.673152
Standard Deviation of log data	0.252673	95% Chebyshev (MVUE) UCL		0.758305
Variance of log data	0.063844	97.5% Chebyshev (MVUE) UCL		0.826429
		99% Chebyshev (MVUE) UCL		0.960244
		95% Non-parametric UCLs		
		CLT UCL		0.661713
		Adj-CLT UCL (Adjusted for skewness)		0.669496
		Mod-t UCL (Adjusted for skewness)		0.666418
		Jackknife UCL		0.665204
		Standard Bootstrap UCL		0.658771
		Bootstrap-t UCL		0.671534
RECOMMENDATION		Hall's Bootstrap UCL		0.686072
Data are normal (0.05)		Percentile Bootstrap UCL		0.658889
		BCA Bootstrap UCL		0.683889
Use Student's-t UCL		95% Chebyshev (Mean, Sd) UCL		0.761708
		97.5% Chebyshev (Mean, Sd) UCL		0.831199
		99% Chebyshev (Mean, Sd) UCL		0.967699

General Statistics

Data File	G:\divine strake\Report\UCLs\DIST UCL.xls	Variable:	D-BI-214	
Raw Statistics		Normal Distribution Test		
Number of Valid Samples	18	Shapiro-Wilk Test Statisitic		0.987203
Number of Unique Samples	18	Shapiro-Wilk 5% Critical Value		0.897
Minimum	0.92	Data are normal at 5% significance level		
Maximum	2.65			
Mean	1.836111	95% UCL (Assuming Normal Distribution)		
Median	1.825	Student's-t UCL		2.020869
Standard Deviation	0.450596			
Variance	0.203037	Gamma Distribution Test		
Coefficient of Variation	0.245408	A-D Test Statistic		0.250594
Skewness	-0.234724	A-D 5% Critical Value		0.739354
		K-S Test Statistic		0.124716
Gamma Statistics		K-S 5% Critical Value		0.203341
k hat	15.76038	Data follow gamma distribution		
k star (bias corrected)	13.17068	at 5% significance level		
Theta hat	0.116502			
Theta star	0.139409	95% UCLs (Assuming Gamma Distribution)		
nu hat	567.3736	Approximate Gamma UCL		2.050144
nu star	474.1446	Adjusted Gamma UCL		2.072064
Approx.Chi Square Value (.05)	424.6445			
Adjusted Level of Significance	0.03574	Lognormal Distribution Test		
Adjusted Chi Square Value	420.1522	Shapiro-Wilk Test Statisitic		0.945648
		Shapiro-Wilk 5% Critical Value		0.897
Log-transformed Statistics		Data are lognormal at 5% significance level		
Minimum of log data	-0.083382			
Maximum of log data	0.97456	95% UCLs (Assuming Lognormal Distribution)		
Mean of log data	0.575589	95% H-UCL		2.080174
Standard Deviation of log data	0.270249	95% Chebyshev (MVUE) UCL		2.356906
Variance of log data	0.073035	97.5% Chebyshev (MVUE) UCL		2.580372
		99% Chebyshev (MVUE) UCL		3.019329
		95% Non-parametric UCLs		
		CLT UCL		2.010805
		Adj-CLT UCL (Adjusted for skewness)		2.004527
		Mod-t UCL (Adjusted for skewness)		2.019889
		Jackknife UCL		2.020869
		Standard Bootstrap UCL		2.005759
		Bootstrap-t UCL		2.022123
RECOMMENDATION		Hall's Bootstrap UCL		2.008964
Data are normal (0.05)		Percentile Bootstrap UCL		2.005
		BCA Bootstrap UCL		2.059444
Use Student's-t UCL		95% Chebyshev (Mean, Sd) UCL		2.299055
		97.5% Chebyshev (Mean, Sd) UCL		2.499371
		99% Chebyshev (Mean, Sd) UCL		2.892853

General Statistics

Data File	G:\divine strake\Report\UCLs\DIST UCL.xls	Variable:	D-BI-214		
Raw Statistics			Normal Distribution Test		
Number of Valid Samples	18		Shapiro-Wilk Test Statisitic		0.987203
Number of Unique Samples	18		Shapiro-Wilk 5% Critical Value		0.897
Minimum	0.92		Data are normal at 5% significance level		
Maximum	2.65				
Mean	1.836111		99% UCL (Assuming Normal Distribution)		
Median	1.825		Student's-t UCL		2.108736
Standard Deviation	0.450596				
Variance	0.203037		Gamma Distribution Test		
Coefficient of Variation	0.245408		A-D Test Statistic		0.250594
Skewness	-0.234724		A-D 5% Critical Value		0.739354
			K-S Test Statistic		0.124716
Gamma Statistics			K-S 5% Critical Value		0.203341
k hat	15.76038		Data follow gamma distribution		
k star (bias corrected)	13.17068		at 5% significance level		
Theta hat	0.116502				
Theta star	0.139409		99% UCLs (Assuming Gamma Distribution)		
nu hat	567.3736		Approximate Gamma UCL		2.147212
nu star	474.1446		Adjusted Gamma UCL		2.196005
Approx.Chi Square Value (.01)	405.4477				
Adjusted Level of Significance	0.00398		Lognormal Distribution Test		
Adjusted Chi Square Value	396.4391		Shapiro-Wilk Test Statisitic		0.945648
			Shapiro-Wilk 5% Critical Value		0.897
Log-transformed Statistics			Data are lognormal at 5% significance level		
Minimum of log data	-0.083382				
Maximum of log data	0.97456		99% UCLs (Assuming Lognormal Distribution)		
Mean of log data	0.575589		99% H-UCL		N/A
Standard Deviation of log data	0.270249		95% Chebyshev (MVUE) UCL		2.356906
Variance of log data	0.073035		97.5% Chebyshev (MVUE) UCL		2.580372
			99% Chebyshev (MVUE) UCL		3.019329
			99% Non-parametric UCLs		
			CLT UCL		2.083184
			Adj-CLT UCL (Adjusted for skewness)		2.071605
			Mod-t UCL (Adjusted for skewness)		2.107757
			Jackknife UCL		2.108736
			Standard Bootstrap UCL		2.080103
			Bootstrap-t UCL		2.091667
			Hall's Bootstrap UCL		2.083657
			Percentile Bootstrap UCL		2.081667
			BCA Bootstrap UCL		2.121111
NO RECOMMENDATION AVAILABLE			95% Chebyshev (Mean, Sd) UCL		2.299055
			97.5% Chebyshev (Mean, Sd) UCL		2.499371
Select 95% Confidence Coefficient			99% Chebyshev (Mean, Sd) UCL		2.892853

General Statistics

Data File	G:\divine strake\Report\UCLs\DIST UCL.xls	Variable:	D-K-40		
Raw Statistics		Normal Distribution Test			
Number of Valid Samples	19	Shapiro-Wilk Test Statisitic			0.815917
Number of Unique Samples	16	Shapiro-Wilk 5% Critical Value			0.901
Minimum	0	Data not normal at 5% significance level			
Maximum	14				
Mean	10.28421	99% UCL (Assuming Normal Distribution)			
Median	10.6	Student's-t UCL			12.08947
Standard Deviation	3.082975				
Variance	9.504737				
Coefficient of Variation	0.299778				
Skewness	-2.08233				
Gamma Statistics Not Available					
Lognormal Statistics Not Available					
		99% Non-parametric UCLs			
		CLT UCL			11.9296
		Adj-CLT UCL (Adjusted for skewness)			11.26375
		Mod-t UCL (Adjusted for skewness)			12.03315
		Jackknife UCL			12.08947
		Standard Bootstrap UCL			11.86855
		Bootstrap-t UCL			11.62166
		Hall's Bootstrap UCL			11.57305
		Percentile Bootstrap UCL			11.66842
		BCA Bootstrap UCL			12.17368
NO RECOMMENDATION AVAILABLE		95% Chebyshev (Mean, Sd) UCL			13.36719
		97.5% Chebyshev (Mean, Sd) UCL			14.70119
Select 95% Confidence Coefficient		99% Chebyshev (Mean, Sd) UCL			17.32159

General Statistics

Data File	G:\divine strake\Report\UCLs\DIST UCL.xls	Variable:	D-K-40		
Raw Statistics		Normal Distribution Test			
Number of Valid Samples	19	Shapiro-Wilk Test Statisitic			0.815917
Number of Unique Samples	16	Shapiro-Wilk 5% Critical Value			0.901
Minimum	0	Data not normal at 5% significance level			
Maximum	14				
Mean	10.28421	95% UCL (Assuming Normal Distribution)			
Median	10.6	Student's-t UCL			11.51068
Standard Deviation	3.082975				
Variance	9.504737				
Coefficient of Variation	0.299778				
Skewness	-2.08233				
Gamma Statistics Not Available					
Lognormal Statistics Not Available					
		95% Non-parametric UCLs			
		CLT UCL			11.44759
		Adj-CLT UCL (Adjusted for skewness)			11.08656
		Mod-t UCL (Adjusted for skewness)			11.45437
		Jackknife UCL			11.51068
		Standard Bootstrap UCL			11.42283
		Bootstrap-t UCL			11.25826
RECOMMENDATION		Hall's Bootstrap UCL			11.19461
Data are Non-parametric (0.05)		Percentile Bootstrap UCL			11.33158
		BCA Bootstrap UCL			11.53684
Use 95% Chebyshev (Mean, Sd) UCL		95% Chebyshev (Mean, Sd) UCL			13.36719
		97.5% Chebyshev (Mean, Sd) UCL			14.70119
		99% Chebyshev (Mean, Sd) UCL			17.32159

General Statistics

Data File	G:\divine strake\Report\UCLs\DIST UCL.xls	Variable:	D-PB-212

Raw Statistics	
Number of Valid Samples	18
Number of Unique Samples	15
Minimum	0.41
Maximum	1.27
Mean	0.661667
Median	0.63
Standard Deviation	0.225029
Variance	0.050638
Coefficient of Variation	0.340095
Skewness	1.304904

Gamma Statistics	
k hat	10.55867
k star (bias corrected)	8.835929
Theta hat	0.062666
Theta star	0.074884
nu hat	380.1121
nu star	318.0935
Approx.Chi Square Value (.05)	277.7652
Adjusted Level of Significance	0.03574
Adjusted Chi Square Value	274.1507

Log-transformed Statistics	
Minimum of log data	-0.891598
Maximum of log data	0.239017
Mean of log data	-0.461095
Standard Deviation of log data	0.311093
Variance of log data	0.096779

RECOMMENDATION

Data follow gamma distribution (0.05)

Use Approximate Gamma UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.888149
Shapiro-Wilk 5% Critical Value	0.897
Data not normal at 5% significance level	
95% UCL (Assuming Normal Distribution)	
Student's-t UCL	0.753935

Gamma Distribution Test	
A-D Test Statistic	0.384329
A-D 5% Critical Value	0.739188
K-S Test Statistic	0.168463
K-S 5% Critical Value	0.203439
Data follow gamma distribution	
at 5% significance level	
95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	0.757733
Adjusted Gamma UCL	0.767723

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.956151
Shapiro-Wilk 5% Critical Value	0.897
Data are lognormal at 5% significance level	
95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	0.761903
95% Chebyshev (MVUE) UCL	0.873908
97.5% Chebyshev (MVUE) UCL	0.966462
99% Chebyshev (MVUE) UCL	1.148268

95% Non-parametric UCLs	
CLT UCL	0.74891
Adj-CLT UCL (Adjusted for skewness)	0.766341
Mod-t UCL (Adjusted for skewness)	0.756654
Jackknife UCL	0.753935
Standard Bootstrap UCL	0.747225
Bootstrap-t UCL	0.78308
Hall's Bootstrap UCL	0.796247
Percentile Bootstrap UCL	0.753889
BCA Bootstrap UCL	0.788333
95% Chebyshev (Mean, Sd) UCL	0.892862
97.5% Chebyshev (Mean, Sd) UCL	0.992901
99% Chebyshev (Mean, Sd) UCL	1.189407

General Statistics

Data File	G:\divine strake\Report\UCLs\DIST UCL.xls	Variable:	D-PB-212		
Raw Statistics			Normal Distribution Test		
Number of Valid Samples	18		Shapiro-Wilk Test Statisitic		0.888149
Number of Unique Samples	15		Shapiro-Wilk 5% Critical Value		0.897
Minimum	0.41		Data not normal at 5% significance level		
Maximum	1.27				
Mean	0.661667		99% UCL (Assuming Normal Distribution)		
Median	0.63		Student's-t UCL		0.797817
Standard Deviation	0.225029				
Variance	0.050638		Gamma Distribution Test		
Coefficient of Variation	0.340095		A-D Test Statistic		0.384329
Skewness	1.304904		A-D 5% Critical Value		0.739188
			K-S Test Statistic		0.168463
Gamma Statistics			K-S 5% Critical Value		0.203439
k hat	10.55867		Data follow gamma distribution		
k star (bias corrected)	8.835929		at 5% significance level		
Theta hat	0.062666				
Theta star	0.074884		99% UCLs (Assuming Gamma Distribution)		
nu hat	380.1121		Approximate Gamma UCL		0.802217
nu star	318.0935		Adjusted Gamma UCL		0.824815
Approx.Chi Square Value (.01)	262.3626				
Adjusted Level of Significance	0.00398		Lognormal Distribution Test		
Adjusted Chi Square Value	255.1746		Shapiro-Wilk Test Statisitic		0.956151
			Shapiro-Wilk 5% Critical Value		0.897
Log-transformed Statistics			Data are lognormal at 5% significance level		
Minimum of log data	-0.891598				
Maximum of log data	0.239017		99% UCLs (Assuming Lognormal Distribution)		
Mean of log data	-0.461095		99% H-UCL		N/A
Standard Deviation of log data	0.311093		95% Chebyshev (MVUE) UCL		0.873908
Variance of log data	0.096779		97.5% Chebyshev (MVUE) UCL		0.966462
			99% Chebyshev (MVUE) UCL		1.148268
			99% Non-parametric UCLs		
			CLT UCL		0.785056
			Adj-CLT UCL (Adjusted for skewness)		0.817204
			Mod-t UCL (Adjusted for skewness)		0.800536
			Jackknife UCL		0.797817
			Standard Bootstrap UCL		0.780873
			Bootstrap-t UCL		0.857905
			Hall's Bootstrap UCL		0.988497
			Percentile Bootstrap UCL		0.781667
			BCA Bootstrap UCL		0.833889
NO RECOMMENDATION AVAILABLE			95% Chebyshev (Mean, Sd) UCL		0.892862
			97.5% Chebyshev (Mean, Sd) UCL		0.992901
Select 95% Confidence Coefficient			99% Chebyshev (Mean, Sd) UCL		1.189407

General Statistics

Data File	G:\divine strake\Report\UCLs\DIST UCL.xls	Variable:	D-PB-214	
Raw Statistics		Normal Distribution Test		
Number of Valid Samples	18	Shapiro-Wilk Test Statisitic		0.984276
Number of Unique Samples	18	Shapiro-Wilk 5% Critical Value		0.897
Minimum	0.98	Data are normal at 5% significance level		
Maximum	2.99			
Mean	2.056111	95% UCL (Assuming Normal Distribution)		
Median	2.05	Student's-t UCL		2.265956
Standard Deviation	0.511781			
Variance	0.261919	Gamma Distribution Test		
Coefficient of Variation	0.248907	A-D Test Statistic		0.272511
Skewness	-0.202539	A-D 5% Critical Value		0.739338
		K-S Test Statistic		0.103658
Gamma Statistics		K-S 5% Critical Value		0.20335
k hat	15.24362	Data follow gamma distribution		
k star (bias corrected)	12.74005	at 5% significance level		
Theta hat	0.134883			
Theta star	0.16139	95% UCLs (Assuming Gamma Distribution)		
nu hat	548.7701	Approximate Gamma UCL		2.300173
nu star	458.6418	Adjusted Gamma UCL		2.325198
Approx.Chi Square Value (.05)	409.9772			
Adjusted Level of Significance	0.03574	Lognormal Distribution Test		
Adjusted Chi Square Value	405.5648	Shapiro-Wilk Test Statisitic		0.938939
		Shapiro-Wilk 5% Critical Value		0.897
Log-transformed Statistics		Data are lognormal at 5% significance level		
Minimum of log data	-0.020203			
Maximum of log data	1.095273	95% UCLs (Assuming Lognormal Distribution)		
Mean of log data	0.687657	95% H-UCL		2.3365
Standard Deviation of log data	0.275652	95% Chebyshev (MVUE) UCL		2.651878
Variance of log data	0.075984	97.5% Chebyshev (MVUE) UCL		2.907301
		99% Chebyshev (MVUE) UCL		3.409032
		95% Non-parametric UCLs		
		CLT UCL		2.254526
		Adj-CLT UCL (Adjusted for skewness)		2.248373
		Mod-t UCL (Adjusted for skewness)		2.264996
		Jackknife UCL		2.265956
		Standard Bootstrap UCL		2.249948
		Bootstrap-t UCL		2.261985
RECOMMENDATION		Hall's Bootstrap UCL		2.265206
Data are normal (0.05)		Percentile Bootstrap UCL		2.242778
		BCA Bootstrap UCL		2.31
Use Student's-t UCL		95% Chebyshev (Mean, Sd) UCL		2.581916
		97.5% Chebyshev (Mean, Sd) UCL		2.809432
		99% Chebyshev (Mean, Sd) UCL		3.256343

General Statistics

Data File	G:\divine strake\Report\UCLs\DIST UCL.xls	Variable:	D-PB-214		
Raw Statistics			Normal Distribution Test		
Number of Valid Samples	18		Shapiro-Wilk Test Statisitic		0.984276
Number of Unique Samples	18		Shapiro-Wilk 5% Critical Value		0.897
Minimum	0.98		Data are normal at 5% significance level		
Maximum	2.99				
Mean	2.056111		99% UCL (Assuming Normal Distribution)		
Median	2.05		Student's-t UCL		2.365755
Standard Deviation	0.511781				
Variance	0.261919		Gamma Distribution Test		
Coefficient of Variation	0.248907		A-D Test Statistic		0.272511
Skewness	-0.202539		A-D 5% Critical Value		0.739338
			K-S Test Statistic		0.103658
Gamma Statistics			K-S 5% Critical Value		0.20335
k hat	15.24362		Data follow gamma distribution		
k star (bias corrected)	12.74005		at 5% significance level		
Theta hat	0.134883				
Theta star	0.16139		99% UCLs (Assuming Gamma Distribution)		
nu hat	548.7701		Approximate Gamma UCL		2.411034
nu star	458.6418		Adjusted Gamma UCL		2.466804
Approx.Chi Square Value (.01)	391.1261				
Adjusted Level of Significance	0.00398		Lognormal Distribution Test		
Adjusted Chi Square Value	382.2835		Shapiro-Wilk Test Statisitic		0.938939
			Shapiro-Wilk 5% Critical Value		0.897
Log-transformed Statistics			Data are lognormal at 5% significance level		
Minimum of log data	-0.020203				
Maximum of log data	1.095273		99% UCLs (Assuming Lognormal Distribution)		
Mean of log data	0.687657		99% H-UCL		N/A
Standard Deviation of log data	0.275652		95% Chebyshev (MVUE) UCL		2.651878
Variance of log data	0.075984		97.5% Chebyshev (MVUE) UCL		2.907301
			99% Chebyshev (MVUE) UCL		3.409032
			99% Non-parametric UCLs		
			CLT UCL		2.336733
			Adj-CLT UCL (Adjusted for skewness)		2.325385
			Mod-t UCL (Adjusted for skewness)		2.364795
			Jackknife UCL		2.365755
			Standard Bootstrap UCL		2.33248
			Bootstrap-t UCL		2.344749
			Hall's Bootstrap UCL		2.365751
			Percentile Bootstrap UCL		2.316111
			BCA Bootstrap UCL		2.361667
NO RECOMMENDATION AVAILABLE			95% Chebyshev (Mean, Sd) UCL		2.581916
			97.5% Chebyshev (Mean, Sd) UCL		2.809432
Select 95% Confidence Coefficient			99% Chebyshev (Mean, Sd) UCL		3.256343

General Statistics

Data File	G:\divine strake\Report\UCLs\DIST UCL.xls	Variable:	D-PU-239	

Raw Statistics		Normal Distribution Test	
Number of Valid Samples	18	Shapiro-Wilk Test Statisitic	0.566483
Number of Unique Samples	11	Shapiro-Wilk 5% Critical Value	0.897
Minimum	0	Data not normal at 5% significance level	
Maximum	0.082		
Mean	0.013389	95% UCL (Assuming Normal Distribution)	
Median	0.004	Student's-t UCL	0.023596
Standard Deviation	0.024893		
Variance	0.00062		
Coefficient of Variation	1.859231		
Skewness	2.371872		

Gamma Statistics Not Available

Lognormal Statistics Not Available

95% Non-parametric UCLs	
CLT UCL	0.02304
Adj-CLT UCL (Adjusted for skewness)	0.026545
Mod-t UCL (Adjusted for skewness)	0.024142
Jackknife UCL	0.023596
Standard Bootstrap UCL	0.022655
Bootstrap-t UCL	0.04387
Hall's Bootstrap UCL	0.058794
Percentile Bootstrap UCL	0.023444
BCA Bootstrap UCL	0.029889
95% Chebyshev (Mean, Sd) UCL	0.038964
97.5% Chebyshev (Mean, Sd) UCL	0.05003
99% Chebyshev (Mean, Sd) UCL	0.071768

RECOMMENDATION

Data are Non-parametric (0.05)

Use 95% Chebyshev (Mean, Sd) UCL

General Statistics

Data File	G:\divine strake\Report\UCLs\DIST UCL.xls	Variable:	D-TH-234	

Raw Statistics	
Number of Valid Samples	18
Number of Unique Samples	16
Minimum	0.8
Maximum	3.9
Mean	1.975
Median	1.8
Standard Deviation	0.770433
Variance	0.593568
Coefficient of Variation	0.390093
Skewness	1.018196

Gamma Statistics	
k hat	7.368775
k star (bias corrected)	6.177683
Theta hat	0.268023
Theta star	0.319699
nu hat	265.2759
nu star	222.3966
Approx.Chi Square Value (.05)	188.8733
Adjusted Level of Significance	0.03574
Adjusted Chi Square Value	185.9097

Log-transformed Statistics	
Minimum of log data	-0.223144
Maximum of log data	1.360977
Mean of log data	0.611183
Standard Deviation of log data	0.386429
Variance of log data	0.149328

RECOMMENDATION

Data are normal (0.05)

Use Student's-t UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.921684
Shapiro-Wilk 5% Critical Value	0.897
Data are normal at 5% significance level	
95% UCL (Assuming Normal Distribution)	
Student's-t UCL	2.2909

Gamma Distribution Test	
A-D Test Statistic	0.354676
A-D 5% Critical Value	0.741186
K-S Test Statistic	0.159032
K-S 5% Critical Value	0.203787
Data follow gamma distribution	
at 5% significance level	
95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	2.325544
Adjusted Gamma UCL	2.362616

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.970189
Shapiro-Wilk 5% Critical Value	0.897
Data are lognormal at 5% significance level	
95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	2.378031
95% Chebyshev (MVUE) UCL	2.778157
97.5% Chebyshev (MVUE) UCL	3.124939
99% Chebyshev (MVUE) UCL	3.806126

95% Non-parametric UCLs	
CLT UCL	2.273694
Adj-CLT UCL (Adjusted for skewness)	2.32026
Mod-t UCL (Adjusted for skewness)	2.298164
Jackknife UCL	2.2909
Standard Bootstrap UCL	2.266852
Bootstrap-t UCL	2.366419
Hall's Bootstrap UCL	2.376008
Percentile Bootstrap UCL	2.278889
BCA Bootstrap UCL	2.438333
95% Chebyshev (Mean, Sd) UCL	2.766545
97.5% Chebyshev (Mean, Sd) UCL	3.109047
99% Chebyshev (Mean, Sd) UCL	3.781827

General Statistics

Data File	G:\divine strake\Report\UCLs\DIST UCL.xls	Variable:	D-TL-208

Raw Statistics	
Number of Valid Samples	18
Number of Unique Samples	17
Minimum	0.121
Maximum	0.39
Mean	0.190833
Median	0.1675
Standard Deviation	0.075982
Variance	0.005773
Coefficient of Variation	0.398161
Skewness	2.041601

Gamma Statistics	
k hat	9.026305
k star (bias corrected)	7.558958
Theta hat	0.021142
Theta star	0.025246
nu hat	324.947
nu star	272.1225
Approx.Chi Square Value (.05)	234.9122
Adjusted Level of Significance	0.03574
Adjusted Chi Square Value	231.596

Log-transformed Statistics	
Minimum of log data	-2.111965
Maximum of log data	-0.941609
Mean of log data	-1.71277
Standard Deviation of log data	0.323917
Variance of log data	0.104922

RECOMMENDATION

Data are Non-parametric (0.05)

Use Student's-t UCL

or Modified-t UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.721634
Shapiro-Wilk 5% Critical Value	0.897
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	0.221988

Gamma Distribution Test	
A-D Test Statistic	1.220656
A-D 5% Critical Value	0.739916
K-S Test Statistic	0.211256
K-S 5% Critical Value	0.203575
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	0.221061
Adjusted Gamma UCL	0.224227

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.854223
Shapiro-Wilk 5% Critical Value	0.897
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	0.220253
95% Chebyshev (MVUE) UCL	0.253521
97.5% Chebyshev (MVUE) UCL	0.281222
99% Chebyshev (MVUE) UCL	0.335635

95% Non-parametric UCLs	
CLT UCL	0.220291
Adj-CLT UCL (Adjusted for skewness)	0.2295
Mod-t UCL (Adjusted for skewness)	0.223425
Jackknife UCL	0.221988
Standard Bootstrap UCL	0.219362
Bootstrap-t UCL	0.260271
Hall's Bootstrap UCL	0.399313
Percentile Bootstrap UCL	0.220889
BCA Bootstrap UCL	0.2385
95% Chebyshev (Mean, Sd) UCL	0.268898
97.5% Chebyshev (Mean, Sd) UCL	0.302676
99% Chebyshev (Mean, Sd) UCL	0.369028

General Statistics

Data File	G:\divine strake\Report\UCLs\DIST UCL.xls	Variable:	D-U-234

Raw Statistics	
Number of Valid Samples	18
Number of Unique Samples	18
Minimum	1.19
Maximum	2.8
Mean	1.945
Median	1.855
Standard Deviation	0.45125
Variance	0.203626
Coefficient of Variation	0.232005
Skewness	0.483982

Gamma Statistics	
k hat	20.06974
k star (bias corrected)	16.76182
Theta hat	0.096912
Theta star	0.116037
nu hat	722.5108
nu star	603.4257
Approx.Chi Square Value (.05)	547.4316
Adjusted Level of Significance	0.03574
Adjusted Chi Square Value	542.3176

Log-transformed Statistics	
Minimum of log data	0.173953
Maximum of log data	1.029619
Mean of log data	0.640142
Standard Deviation of log data	0.230686
Variance of log data	0.053216

RECOMMENDATION

Data are normal (0.05)

Use Student's-t UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.952295
Shapiro-Wilk 5% Critical Value	0.897
Data are normal at 5% significance level	
95% UCL (Assuming Normal Distribution)	
Student's-t UCL	2.130026

Gamma Distribution Test	
A-D Test Statistic	0.277102
A-D 5% Critical Value	0.739487
K-S Test Statistic	0.124123
K-S 5% Critical Value	0.20326
Data follow gamma distribution	
at 5% significance level	
95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	2.143944
Adjusted Gamma UCL	2.164162

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.972792
Shapiro-Wilk 5% Critical Value	0.897
Data are lognormal at 5% significance level	
95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	2.15541
95% Chebyshev (MVUE) UCL	2.409516
97.5% Chebyshev (MVUE) UCL	2.610533
99% Chebyshev (MVUE) UCL	3.005391

95% Non-parametric UCLs	
CLT UCL	2.119948
Adj-CLT UCL (Adjusted for skewness)	2.132912
Mod-t UCL (Adjusted for skewness)	2.132048
Jackknife UCL	2.130026
Standard Bootstrap UCL	2.111784
Bootstrap-t UCL	2.155417
Hall's Bootstrap UCL	2.149678
Percentile Bootstrap UCL	2.115556
BCA Bootstrap UCL	2.197222
95% Chebyshev (Mean, Sd) UCL	2.408615
97.5% Chebyshev (Mean, Sd) UCL	2.609222
99% Chebyshev (Mean, Sd) UCL	3.003275

General Statistics

Data File	G:\divine strake\Report\UCLs\DIST UCL.xls	Variable:	D-U-234		
Raw Statistics			Normal Distribution Test		
Number of Valid Samples	18		Shapiro-Wilk Test Statisitic		0.952295
Number of Unique Samples	18		Shapiro-Wilk 5% Critical Value		0.897
Minimum	1.19		Data are normal at 5% significance level		
Maximum	2.8				
Mean	1.945		99% UCL (Assuming Normal Distribution)		
Median	1.855		Student's-t UCL		2.218021
Standard Deviation	0.45125				
Variance	0.203626		Gamma Distribution Test		
Coefficient of Variation	0.232005		A-D Test Statistic		0.277102
Skewness	0.483982		A-D 5% Critical Value		0.739487
			K-S Test Statistic		0.124123
Gamma Statistics			K-S 5% Critical Value		0.20326
k hat	20.06974		Data follow gamma distribution		
k star (bias corrected)	16.76182		at 5% significance level		
Theta hat	0.096912				
Theta star	0.116037		99% UCLs (Assuming Gamma Distribution)		
nu hat	722.5108		Approximate Gamma UCL		2.233221
nu star	603.4257		Adjusted Gamma UCL		2.277857
Approx.Chi Square Value (.01)	525.5472				
Adjusted Level of Significance	0.00398		Lognormal Distribution Test		
Adjusted Chi Square Value	515.2487		Shapiro-Wilk Test Statisitic		0.972792
			Shapiro-Wilk 5% Critical Value		0.897
Log-transformed Statistics			Data are lognormal at 5% significance level		
Minimum of log data	0.173953				
Maximum of log data	1.029619		99% UCLs (Assuming Lognormal Distribution)		
Mean of log data	0.640142		99% H-UCL		N/A
Standard Deviation of log data	0.230686		95% Chebyshev (MVUE) UCL		2.409516
Variance of log data	0.053216		97.5% Chebyshev (MVUE) UCL		2.610533
			99% Chebyshev (MVUE) UCL		3.005391
			99% Non-parametric UCLs		
			CLT UCL		2.192432
			Adj-CLT UCL (Adjusted for skewness)		2.216342
			Mod-t UCL (Adjusted for skewness)		2.220043
			Jackknife UCL		2.218021
			Standard Bootstrap UCL		2.188434
			Bootstrap-t UCL		2.282788
			Hall's Bootstrap UCL		2.276085
			Percentile Bootstrap UCL		2.183333
			BCA Bootstrap UCL		2.278333
NO RECOMMENDATION AVAILABLE			95% Chebyshev (Mean, Sd) UCL		2.408615
			97.5% Chebyshev (Mean, Sd) UCL		2.609222
Select 95% Confidence Coefficient			99% Chebyshev (Mean, Sd) UCL		3.003275

General Statistics

Data File	G:\divine strake\Report\UCLs\DIST UCL.xls	Variable:	D-U-235		
Raw Statistics		Normal Distribution Test			
Number of Valid Samples	19	Shapiro-Wilk Test Statisitic			0.951091
Number of Unique Samples	19	Shapiro-Wilk 5% Critical Value			0.901
Minimum	0	Data are normal at 5% significance level			
Maximum	0.169				
Mean	0.108579	95% UCL (Assuming Normal Distribution)			
Median	0.114	Student's-t UCL			0.12508
Standard Deviation	0.041479				
Variance	0.00172				
Coefficient of Variation	0.382014				
Skewness	-0.892456				
Gamma Statistics Not Available					
Lognormal Statistics Not Available					
		95% Non-parametric UCLs			
		CLT UCL			0.124231
		Adj-CLT UCL (Adjusted for skewness)			0.122149
		Mod-t UCL (Adjusted for skewness)			0.124755
		Jackknife UCL			0.12508
		Standard Bootstrap UCL			0.123802
		Bootstrap-t UCL			0.12369
RECOMMENDATION		Hall's Bootstrap UCL			0.122773
Data are normal (0.05)		Percentile Bootstrap UCL			0.123211
		BCA Bootstrap UCL			0.126684
Use Student's-t UCL		95% Chebyshev (Mean, Sd) UCL			0.150058
		97.5% Chebyshev (Mean, Sd) UCL			0.168005
		99% Chebyshev (Mean, Sd) UCL			0.203261

General Statistics

Data File	G:\divine strake\Report\UCLs\DIST UCL.xls	Variable:	D-U-235		
Raw Statistics		Normal Distribution Test			
Number of Valid Samples	19	Shapiro-Wilk Test Statisitic			0.951091
Number of Unique Samples	19	Shapiro-Wilk 5% Critical Value			0.901
Minimum	0	Data are normal at 5% significance level			
Maximum	0.169				
Mean	0.108579	99% UCL (Assuming Normal Distribution)			
Median	0.114	Student's-t UCL			0.132867
Standard Deviation	0.041479				
Variance	0.00172				
Coefficient of Variation	0.382014				
Skewness	-0.892456				
Gamma Statistics Not Available					
Lognormal Statistics Not Available					
		99% Non-parametric UCLs			
		CLT UCL			0.130716
		Adj-CLT UCL (Adjusted for skewness)			0.126877
		Mod-t UCL (Adjusted for skewness)			0.132542
		Jackknife UCL			0.132867
		Standard Bootstrap UCL			0.129465
		Bootstrap-t UCL			0.130777
		Hall's Bootstrap UCL			0.128301
		Percentile Bootstrap UCL			0.128474
		BCA Bootstrap UCL			0.133789
NO RECOMMENDATION AVAILABLE		95% Chebyshev (Mean, Sd) UCL			0.150058
		97.5% Chebyshev (Mean, Sd) UCL			0.168005
Select 95% Confidence Coefficient		99% Chebyshev (Mean, Sd) UCL			0.203261

General Statistics

Data File	G:\divine strake\Report\UCLs\DIST UCL.xls	Variable:	D-U-238	

Raw Statistics	
Number of Valid Samples	18
Number of Unique Samples	18
Minimum	1.21
Maximum	3.09
Mean	2.118333
Median	2.04
Standard Deviation	0.557813
Variance	0.311156
Coefficient of Variation	0.263327
Skewness	0.311889

Gamma Statistics	
k hat	15.09481
k star (bias corrected)	12.61604
Theta hat	0.140335
Theta star	0.167908
nu hat	543.413
nu star	454.1775
Approx.Chi Square Value (.05)	405.7562
Adjusted Level of Significance	0.03574
Adjusted Chi Square Value	401.3671

Log-transformed Statistics	
Minimum of log data	0.19062
Maximum of log data	1.128171
Mean of log data	0.71714
Standard Deviation of log data	0.268907
Variance of log data	0.072311

RECOMMENDATION

Data are normal (0.05)

Use Student's-t UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.956482
Shapiro-Wilk 5% Critical Value	0.897
Data are normal at 5% significance level	
95% UCL (Assuming Normal Distribution)	
Student's-t UCL	2.347053

Gamma Distribution Test	
A-D Test Statistic	0.235351
A-D 5% Critical Value	0.739333
K-S Test Statistic	0.109569
K-S 5% Critical Value	0.203353
Data follow gamma distribution	
at 5% significance level	
95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	2.371127
Adjusted Gamma UCL	2.397056

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.96652
Shapiro-Wilk 5% Critical Value	0.897
Data are lognormal at 5% significance level	
95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	2.394037
95% Chebyshev (MVUE) UCL	2.711355
97.5% Chebyshev (MVUE) UCL	2.967409
99% Chebyshev (MVUE) UCL	3.470378

95% Non-parametric UCLs	
CLT UCL	2.334595
Adj-CLT UCL (Adjusted for skewness)	2.344923
Mod-t UCL (Adjusted for skewness)	2.348664
Jackknife UCL	2.347053
Standard Bootstrap UCL	2.324376
Bootstrap-t UCL	2.358696
Hall's Bootstrap UCL	2.345009
Percentile Bootstrap UCL	2.34
BCA Bootstrap UCL	2.401111
95% Chebyshev (Mean, Sd) UCL	2.691432
97.5% Chebyshev (Mean, Sd) UCL	2.939413
99% Chebyshev (Mean, Sd) UCL	3.426522

General Statistics

Data File	G:\divine strake\Report\UCLs\DIST UCL.xls	Variable:	D-U-238		
Raw Statistics			Normal Distribution Test		
Number of Valid Samples	18		Shapiro-Wilk Test Statisitic		0.956482
Number of Unique Samples	18		Shapiro-Wilk 5% Critical Value		0.897
Minimum	1.21		Data are normal at 5% significance level		
Maximum	3.09				
Mean	2.118333		99% UCL (Assuming Normal Distribution)		
Median	2.04		Student's-t UCL		2.455828
Standard Deviation	0.557813				
Variance	0.311156		Gamma Distribution Test		
Coefficient of Variation	0.263327		A-D Test Statistic		0.235351
Skewness	0.311889		A-D 5% Critical Value		0.739333
			K-S Test Statistic		0.109569
Gamma Statistics			K-S 5% Critical Value		0.203353
k hat	15.09481		Data follow gamma distribution		
k star (bias corrected)	12.61604		at 5% significance level		
Theta hat	0.140335				
Theta star	0.167908		99% UCLs (Assuming Gamma Distribution)		
nu hat	543.413		Approximate Gamma UCL		2.486008
nu star	454.1775		Adjusted Gamma UCL		2.543814
Approx.Chi Square Value (.01)	387.0057				
Adjusted Level of Significance	0.00398		Lognormal Distribution Test		
Adjusted Chi Square Value	378.2113		Shapiro-Wilk Test Statisitic		0.96652
			Shapiro-Wilk 5% Critical Value		0.897
Log-transformed Statistics			Data are lognormal at 5% significance level		
Minimum of log data	0.19062				
Maximum of log data	1.128171		99% UCLs (Assuming Lognormal Distribution)		
Mean of log data	0.71714		99% H-UCL		N/A
Standard Deviation of log data	0.268907		95% Chebyshev (MVUE) UCL		2.711355
Variance of log data	0.072311		97.5% Chebyshev (MVUE) UCL		2.967409
			99% Chebyshev (MVUE) UCL		3.470378
			99% Non-parametric UCLs		
			CLT UCL		2.424197
			Adj-CLT UCL (Adjusted for skewness)		2.443243
			Mod-t UCL (Adjusted for skewness)		2.457439
			Jackknife UCL		2.455828
			Standard Bootstrap UCL		2.412226
			Bootstrap-t UCL		2.469067
			Hall's Bootstrap UCL		2.463153
			Percentile Bootstrap UCL		2.418333
			BCA Bootstrap UCL		2.508889
NO RECOMMENDATION AVAILABLE			95% Chebyshev (Mean, Sd) UCL		2.691432
			97.5% Chebyshev (Mean, Sd) UCL		2.939413
Select 95% Confidence Coefficient			99% Chebyshev (Mean, Sd) UCL		3.426522

General Statistics

Data File	G:\divine strake\Report\UCLs\ROCK UCL.xls	Variable:	R-AC-228	

Raw Statistics	
Number of Valid Samples	10
Number of Unique Samples	10
Minimum	0.27
Maximum	0.91
Mean	0.529
Median	0.475
Standard Deviation	0.222384
Variance	0.049454
Coefficient of Variation	0.420385
Skewness	0.718351

Gamma Statistics	
k hat	6.594799
k star (bias corrected)	4.683026
Theta hat	0.080215
Theta star	0.112961
nu hat	131.896
nu star	93.66051
Approx.Chi Square Value (.05)	72.33704
Adjusted Level of Significance	0.0267
Adjusted Chi Square Value	69.08709

Log-transformed Statistics	
Minimum of log data	-1.309333
Maximum of log data	-0.094311
Mean of log data	-0.714496
Standard Deviation of log data	0.414679
Variance of log data	0.171958

RECOMMENDATION

Data are normal (0.05)

Use Student's-t UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.913741
Shapiro-Wilk 5% Critical Value	0.842
Data are normal at 5% significance level	
95% UCL (Assuming Normal Distribution)	
Student's-t UCL	0.657912

Gamma Distribution Test	
A-D Test Statistic	0.256871
A-D 5% Critical Value	0.72805
K-S Test Statistic	0.169313
K-S 5% Critical Value	0.267175
Data follow gamma distribution	
at 5% significance level	
95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	0.684938
Adjusted Gamma UCL	0.717159

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.957601
Shapiro-Wilk 5% Critical Value	0.842
Data are lognormal at 5% significance level	
95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	0.713717
95% Chebyshev (MVUE) UCL	0.834518
97.5% Chebyshev (MVUE) UCL	0.966917
99% Chebyshev (MVUE) UCL	1.226991

95% Non-parametric UCLs	
CLT UCL	0.644672
Adj-CLT UCL (Adjusted for skewness)	0.661742
Mod-t UCL (Adjusted for skewness)	0.660574
Jackknife UCL	0.657912
Standard Bootstrap UCL	0.637601
Bootstrap-t UCL	0.682337
Hall's Bootstrap UCL	0.687564
Percentile Bootstrap UCL	0.643
BCA Bootstrap UCL	0.696
95% Chebyshev (Mean, Sd) UCL	0.835535
97.5% Chebyshev (Mean, Sd) UCL	0.968172
99% Chebyshev (Mean, Sd) UCL	1.228714

General Statistics

Data File	G:\divine strake\Report\UCLs\ROCK UCL.xls	Variable:	R-BI-214

Raw Statistics	
Number of Valid Samples	10
Number of Unique Samples	10
Minimum	1.03
Maximum	2.68
Mean	1.969
Median	2.025
Standard Deviation	0.552015
Variance	0.304721
Coefficient of Variation	0.280353
Skewness	-0.188345

Gamma Statistics	
k hat	12.82672
k star (bias corrected)	9.045371
Theta hat	0.153508
Theta star	0.21768
nu hat	256.5344
nu star	180.9074
Approx.Chi Square Value (.05)	150.7915
Adjusted Level of Significance	0.0267
Adjusted Chi Square Value	146.0135

Log-transformed Statistics	
Minimum of log data	0.029559
Maximum of log data	0.985817
Mean of log data	0.638038
Standard Deviation of log data	0.305841
Variance of log data	0.093539

RECOMMENDATION

Data are normal (0.05)

Use Student's-t UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.939948
Shapiro-Wilk 5% Critical Value	0.842
Data are normal at 5% significance level	
95% UCL (Assuming Normal Distribution)	
Student's-t UCL	2.288993

Gamma Distribution Test	
A-D Test Statistic	0.321271
A-D 5% Critical Value	0.724916
K-S Test Statistic	0.158627
K-S 5% Critical Value	0.2665
Data follow gamma distribution	
at 5% significance level	
95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	2.362247
Adjusted Gamma UCL	2.439546

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.923252
Shapiro-Wilk 5% Critical Value	0.842
Data are lognormal at 5% significance level	
95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	2.427785
95% Chebyshev (MVUE) UCL	2.811988
97.5% Chebyshev (MVUE) UCL	3.174663
99% Chebyshev (MVUE) UCL	3.887069

95% Non-parametric UCLs	
CLT UCL	2.25613
Adj-CLT UCL (Adjusted for skewness)	2.245021
Mod-t UCL (Adjusted for skewness)	2.28726
Jackknife UCL	2.288993
Standard Bootstrap UCL	2.241826
Bootstrap-t UCL	2.266922
Hall's Bootstrap UCL	2.232932
Percentile Bootstrap UCL	2.236
BCA Bootstrap UCL	2.33
95% Chebyshev (Mean, Sd) UCL	2.729901
97.5% Chebyshev (Mean, Sd) UCL	3.059143
99% Chebyshev (Mean, Sd) UCL	3.705876

General Statistics

Data File	G:\divine strake\Report\UCLs\ROCK UCL.xls	Variable:	R-K-40		
Raw Statistics		Normal Distribution Test			
Number of Valid Samples	11	Shapiro-Wilk Test Statisitic			0.968466
Number of Unique Samples	11	Shapiro-Wilk 5% Critical Value			0.85
Minimum	0	Data are normal at 5% significance level			
Maximum	21.1				
Mean	11.61818	95% UCL (Assuming Normal Distribution)			
Median	13	Student's-t UCL			14.79028
Standard Deviation	5.804622				
Variance	33.69364				
Coefficient of Variation	0.499615				
Skewness	-0.513557				
Gamma Statistics Not Available					
Lognormal Statistics Not Available					
		95% Non-parametric UCLs			
		CLT UCL			14.49694
		Adj-CLT UCL (Adjusted for skewness)			14.20737
		Mod-t UCL (Adjusted for skewness)			14.74511
		Jackknife UCL			14.79028
		Standard Bootstrap UCL			14.354
		Bootstrap-t UCL			14.40716
RECOMMENDATION		Hall's Bootstrap UCL			14.35171
Data are normal (0.05)		Percentile Bootstrap UCL			14.3
		BCA Bootstrap UCL			15.05455
Use Student's-t UCL		95% Chebyshev (Mean, Sd) UCL			19.24695
		97.5% Chebyshev (Mean, Sd) UCL			22.54792
		99% Chebyshev (Mean, Sd) UCL			29.03205

General Statistics

Data File	G:\divine strake\Report\UCLs\ROCK UCL.xls	Variable:	R-PB-212	

Raw Statistics	
Number of Valid Samples	10
Number of Unique Samples	10
Minimum	0.306
Maximum	1.09
Mean	0.6406
Median	0.605
Standard Deviation	0.246024
Variance	0.060528
Coefficient of Variation	0.384053
Skewness	0.517542

Gamma Statistics	
k hat	7.413833
k star (bias corrected)	5.25635
Theta hat	0.086406
Theta star	0.121872
nu hat	148.2767
nu star	105.127
Approx.Chi Square Value (.05)	82.46189
Adjusted Level of Significance	0.0267
Adjusted Chi Square Value	78.97905

Log-transformed Statistics	
Minimum of log data	-1.18417
Maximum of log data	0.086178
Mean of log data	-0.514305
Standard Deviation of log data	0.398279
Variance of log data	0.158626

RECOMMENDATION

Data are normal (0.05)

Use Student's-t UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.966138
Shapiro-Wilk 5% Critical Value	0.842
Data are normal at 5% significance level	
95% UCL (Assuming Normal Distribution)	
Student's-t UCL	0.783216

Gamma Distribution Test	
A-D Test Statistic	0.145273
A-D 5% Critical Value	0.727331
K-S Test Statistic	0.103876
K-S 5% Critical Value	0.267044
Data follow gamma distribution	
at 5% significance level	
95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	0.816672
Adjusted Gamma UCL	0.852686

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.977676
Shapiro-Wilk 5% Critical Value	0.842
Data are lognormal at 5% significance level	
95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	0.853909
95% Chebyshev (MVUE) UCL	0.998443
97.5% Chebyshev (MVUE) UCL	1.152735
99% Chebyshev (MVUE) UCL	1.455812

95% Non-parametric UCLs	
CLT UCL	0.768569
Adj-CLT UCL (Adjusted for skewness)	0.782174
Mod-t UCL (Adjusted for skewness)	0.785338
Jackknife UCL	0.783216
Standard Bootstrap UCL	0.763241
Bootstrap-t UCL	0.800939
Hall's Bootstrap UCL	0.819934
Percentile Bootstrap UCL	0.772
BCA Bootstrap UCL	0.8276
95% Chebyshev (Mean, Sd) UCL	0.979721
97.5% Chebyshev (Mean, Sd) UCL	1.126459
99% Chebyshev (Mean, Sd) UCL	1.414698

General Statistics

Data File	G:\divine strake\Report\UCLs\ROCK UCL.xls	Variable:	R-PB-214	

Raw Statistics	
Number of Valid Samples	10
Number of Unique Samples	10
Minimum	1.13
Maximum	2.78
Mean	2.091
Median	2.11
Standard Deviation	0.546981
Variance	0.299188
Coefficient of Variation	0.261588
Skewness	-0.29387

Gamma Statistics	
k hat	14.66302
k star (bias corrected)	10.33078
Theta hat	0.142604
Theta star	0.202405
nu hat	293.2605
nu star	206.6157
Approx.Chi Square Value (.05)	174.3474
Adjusted Level of Significance	0.0267
Adjusted Chi Square Value	169.195

Log-transformed Statistics	
Minimum of log data	0.122218
Maximum of log data	1.022451
Mean of log data	0.703156
Standard Deviation of log data	0.285883
Variance of log data	0.081729

RECOMMENDATION

Data are normal (0.05)

Use Student's-t UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.945909
Shapiro-Wilk 5% Critical Value	0.842
Data are normal at 5% significance level	
95% UCL (Assuming Normal Distribution)	
Student's-t UCL	2.408074

Gamma Distribution Test	
A-D Test Statistic	0.305202
A-D 5% Critical Value	0.724822
K-S Test Statistic	0.155755
K-S 5% Critical Value	0.266416
Data follow gamma distribution	
at 5% significance level	
95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	2.478002
Adjusted Gamma UCL	2.553464

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.922217
Shapiro-Wilk 5% Critical Value	0.842
Data are lognormal at 5% significance level	
95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	2.537114
95% Chebyshev (MVUE) UCL	2.926599
97.5% Chebyshev (MVUE) UCL	3.286199
99% Chebyshev (MVUE) UCL	3.992563

95% Non-parametric UCLs	
CLT UCL	2.375511
Adj-CLT UCL (Adjusted for skewness)	2.358336
Mod-t UCL (Adjusted for skewness)	2.405395
Jackknife UCL	2.408074
Standard Bootstrap UCL	2.361703
Bootstrap-t UCL	2.378958
Hall's Bootstrap UCL	2.340367
Percentile Bootstrap UCL	2.352
BCA Bootstrap UCL	2.446
95% Chebyshev (Mean, Sd) UCL	2.844961
97.5% Chebyshev (Mean, Sd) UCL	3.1712
99% Chebyshev (Mean, Sd) UCL	3.812034

General Statistics

Data File	G:\divine strake\Report\UCLs\ROCK UCL.xls	Variable:	R-TH-234	

Raw Statistics	
Number of Valid Samples	10
Number of Unique Samples	10
Minimum	0.8
Maximum	3.58
Mean	1.719
Median	1.45
Standard Deviation	0.908606
Variance	0.825566
Coefficient of Variation	0.528567
Skewness	0.962698

Gamma Statistics	
k hat	4.335537
k star (bias corrected)	3.101543
Theta hat	0.396491
Theta star	0.55424
nu hat	86.71075
nu star	62.03086
Approx.Chi Square Value (.05)	44.91213
Adjusted Level of Significance	0.0267
Adjusted Chi Square Value	42.39102

Log-transformed Statistics	
Minimum of log data	-0.223144
Maximum of log data	1.275363
Mean of log data	0.422006
Standard Deviation of log data	0.51152
Variance of log data	0.261653

RECOMMENDATION

Data are normal (0.05)

Use Student's-t UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.892266
Shapiro-Wilk 5% Critical Value	0.842
Data are normal at 5% significance level	
95% UCL (Assuming Normal Distribution)	
Student's-t UCL	2.245702

Gamma Distribution Test	
A-D Test Statistic	0.364756
A-D 5% Critical Value	0.72941
K-S Test Statistic	0.205718
K-S 5% Critical Value	0.267689
Data follow gamma distribution	
at 5% significance level	
95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	2.374215
Adjusted Gamma UCL	2.515416

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.936833
Shapiro-Wilk 5% Critical Value	0.842
Data are lognormal at 5% significance level	
95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	2.544965
95% Chebyshev (MVUE) UCL	2.944112
97.5% Chebyshev (MVUE) UCL	3.476612
99% Chebyshev (MVUE) UCL	4.522607

95% Non-parametric UCLs	
CLT UCL	2.19161
Adj-CLT UCL (Adjusted for skewness)	2.285075
Mod-t UCL (Adjusted for skewness)	2.260281
Jackknife UCL	2.245702
Standard Bootstrap UCL	2.170998
Bootstrap-t UCL	2.449868
Hall's Bootstrap UCL	2.289513
Percentile Bootstrap UCL	2.177
BCA Bootstrap UCL	2.36
95% Chebyshev (Mean, Sd) UCL	2.971427
97.5% Chebyshev (Mean, Sd) UCL	3.513354
99% Chebyshev (Mean, Sd) UCL	4.577863

General Statistics

Data File	G:\divine strake\Report\UCLs\ROCK UCL.xls	Variable:	R-TL-208	

Raw Statistics	
Number of Valid Samples	10
Number of Unique Samples	10
Minimum	0.085
Maximum	0.282
Mean	0.1847
Median	0.1915
Standard Deviation	0.078182
Variance	0.006112
Coefficient of Variation	0.423293
Skewness	-0.019832

Gamma Statistics	
k hat	5.614323
k star (bias corrected)	3.996693
Theta hat	0.032898
Theta star	0.046213
nu hat	112.2865
nu star	79.93385
Approx.Chi Square Value (.05)	60.33023
Adjusted Level of Significance	0.0267
Adjusted Chi Square Value	57.37863

Log-transformed Statistics	
Minimum of log data	-2.465104
Maximum of log data	-1.265848
Mean of log data	-1.780716
Standard Deviation of log data	0.465436
Variance of log data	0.21663

RECOMMENDATION

Data are normal (0.05)

Use Student's-t UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.876151
Shapiro-Wilk 5% Critical Value	0.842
Data are normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	0.230021

Gamma Distribution Test	
A-D Test Statistic	0.611389
A-D 5% Critical Value	0.728911
K-S Test Statistic	0.22838
K-S 5% Critical Value	0.267332
Data follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	0.244716
Adjusted Gamma UCL	0.257305

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.868664
Shapiro-Wilk 5% Critical Value	0.842
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	0.26307
95% Chebyshev (MVUE) UCL	0.306579
97.5% Chebyshev (MVUE) UCL	0.35892
99% Chebyshev (MVUE) UCL	0.461735

95% Non-parametric UCLs	
CLT UCL	0.225366
Adj-CLT UCL (Adjusted for skewness)	0.225201
Mod-t UCL (Adjusted for skewness)	0.229995
Jackknife UCL	0.230021
Standard Bootstrap UCL	0.22305
Bootstrap-t UCL	0.228974
Hall's Bootstrap UCL	0.217545
Percentile Bootstrap UCL	0.2229
BCA Bootstrap UCL	0.2372
95% Chebyshev (Mean, Sd) UCL	0.292467
97.5% Chebyshev (Mean, Sd) UCL	0.339097
99% Chebyshev (Mean, Sd) UCL	0.430695

General Statistics

Data File	G:\divine strake\Report\UCLs\ROCK UCL.xls	Variable:	R-U-234	

Raw Statistics	
Number of Valid Samples	10
Number of Unique Samples	10
Minimum	1.22
Maximum	3
Mean	1.951
Median	1.905
Standard Deviation	0.539392
Variance	0.290943
Coefficient of Variation	0.276469
Skewness	0.501298

Gamma Statistics	
k hat	14.61012
k star (bias corrected)	10.29375
Theta hat	0.133538
Theta star	0.189532
nu hat	292.2024
nu star	205.875
Approx.Chi Square Value (.05)	173.6669
Adjusted Level of Significance	0.0267
Adjusted Chi Square Value	168.5249

Log-transformed Statistics	
Minimum of log data	0.198851
Maximum of log data	1.098612
Mean of log data	0.633729
Standard Deviation of log data	0.27904
Variance of log data	0.077863

RECOMMENDATION

Data are normal (0.05)

Use Student's-t UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.970203
Shapiro-Wilk 5% Critical Value	0.842
Data are normal at 5% significance level	
95% UCL (Assuming Normal Distribution)	
Student's-t UCL	2.263675

Gamma Distribution Test	
A-D Test Statistic	0.148451
A-D 5% Critical Value	0.724825
K-S Test Statistic	0.117628
K-S 5% Critical Value	0.266418
Data follow gamma distribution	
at 5% significance level	
95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	2.312831
Adjusted Gamma UCL	2.3834

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.977627
Shapiro-Wilk 5% Critical Value	0.842
Data are lognormal at 5% significance level	
95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	2.350305
95% Chebyshev (MVUE) UCL	2.706849
97.5% Chebyshev (MVUE) UCL	3.033641
99% Chebyshev (MVUE) UCL	3.675558

95% Non-parametric UCLs	
CLT UCL	2.231564
Adj-CLT UCL (Adjusted for skewness)	2.260456
Mod-t UCL (Adjusted for skewness)	2.268182
Jackknife UCL	2.263675
Standard Bootstrap UCL	2.21188
Bootstrap-t UCL	2.301598
Hall's Bootstrap UCL	2.326041
Percentile Bootstrap UCL	2.219
BCA Bootstrap UCL	2.326
95% Chebyshev (Mean, Sd) UCL	2.6945
97.5% Chebyshev (Mean, Sd) UCL	3.016213
99% Chebyshev (Mean, Sd) UCL	3.648156

General Statistics

Data File	G:\divine strake\Report\UCLs\ROCK UCL.xls	Variable:	R-U-235		
Raw Statistics		Normal Distribution Test			
Number of Valid Samples	11	Shapiro-Wilk Test Statisitic			0.959436
Number of Unique Samples	11	Shapiro-Wilk 5% Critical Value			0.85
Minimum	0	Data are normal at 5% significance level			
Maximum	0.156				
Mean	0.093727	95% UCL (Assuming Normal Distribution)			
Median	0.087	Student's-t UCL			0.118329
Standard Deviation	0.045018				
Variance	0.002027				
Coefficient of Variation	0.480308				
Skewness	-0.62588				
Gamma Statistics Not Available					
Lognormal Statistics Not Available					
		95% Non-parametric UCLs			
		CLT UCL			0.116054
		Adj-CLT UCL (Adjusted for skewness)			0.113317
		Mod-t UCL (Adjusted for skewness)			0.117902
		Jackknife UCL			0.118329
		Standard Bootstrap UCL			0.115144
		Bootstrap-t UCL			0.115511
RECOMMENDATION		Hall's Bootstrap UCL			0.11454
Data are normal (0.05)		Percentile Bootstrap UCL			0.115727
		BCA Bootstrap UCL			0.120364
Use Student's-t UCL		95% Chebyshev (Mean, Sd) UCL			0.152892
		97.5% Chebyshev (Mean, Sd) UCL			0.178493
		99% Chebyshev (Mean, Sd) UCL			0.228781

General Statistics

Data File	G:\divine strake\Report\UCLs\ROCK UCL.xls	Variable:	R-U-238	

Raw Statistics	
Number of Valid Samples	10
Number of Unique Samples	10
Minimum	1.29
Maximum	3.38
Mean	2.129
Median	2.18
Standard Deviation	0.638652
Variance	0.407877
Coefficient of Variation	0.299978
Skewness	0.450896

Gamma Statistics	
k hat	12.26036
k star (bias corrected)	8.648919
Theta hat	0.173649
Theta star	0.246158
nu hat	245.2072
nu star	172.9784
Approx.Chi Square Value (.05)	143.5568
Adjusted Level of Significance	0.0267
Adjusted Chi Square Value	138.8996

Log-transformed Statistics	
Minimum of log data	0.254642
Maximum of log data	1.217876
Mean of log data	0.714317
Standard Deviation of log data	0.306046
Variance of log data	0.093664

RECOMMENDATION

Data are normal (0.05)

Use Student's-t UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.942142
Shapiro-Wilk 5% Critical Value	0.842
Data are normal at 5% significance level	
95% UCL (Assuming Normal Distribution)	
Student's-t UCL	2.499215

Gamma Distribution Test	
A-D Test Statistic	0.313899
A-D 5% Critical Value	0.724945
K-S Test Statistic	0.160263
K-S 5% Critical Value	0.266526
Data follow gamma distribution	
at 5% significance level	
95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	2.565332
Adjusted Gamma UCL	2.651346

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.944059
Shapiro-Wilk 5% Critical Value	0.842
Data are lognormal at 5% significance level	
95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	2.620795
95% Chebyshev (MVUE) UCL	3.035659
97.5% Chebyshev (MVUE) UCL	3.427369
99% Chebyshev (MVUE) UCL	4.196808

95% Non-parametric UCLs	
CLT UCL	2.461194
Adj-CLT UCL (Adjusted for skewness)	2.491963
Mod-t UCL (Adjusted for skewness)	2.504014
Jackknife UCL	2.499215
Standard Bootstrap UCL	2.439689
Bootstrap-t UCL	2.52825
Hall's Bootstrap UCL	2.539699
Percentile Bootstrap UCL	2.468
BCA Bootstrap UCL	2.589
95% Chebyshev (Mean, Sd) UCL	3.009321
97.5% Chebyshev (Mean, Sd) UCL	3.390237
99% Chebyshev (Mean, Sd) UCL	4.138472

General Statistics

Data File	G:\divine strake\Report\UCLs\SOIL UCL.xls	Variable:	S-AC-228	

Raw Statistics	
Number of Valid Samples	24
Number of Unique Samples	21
Minimum	0.482
Maximum	1.41
Mean	1.021167
Median	1.055
Standard Deviation	0.214662
Variance	0.04608
Coefficient of Variation	0.210212
Skewness	-1.082313

Gamma Statistics	
k hat	18.6358
k star (bias corrected)	16.3341
Theta hat	0.054796
Theta star	0.062517
nu hat	894.5185
nu star	784.037
Approx.Chi Square Value (.05)	720.0459
Adjusted Level of Significance	0.0392
Adjusted Chi Square Value	715.744

Log-transformed Statistics	
Minimum of log data	-0.729811
Maximum of log data	0.34359
Mean of log data	-0.006124
Standard Deviation of log data	0.254586
Variance of log data	0.064814

RECOMMENDATION

Data are Non-parametric (0.05)

Use Student's-t UCL

or Modified-t UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.876354
Shapiro-Wilk 5% Critical Value	0.916
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	1.096264

Gamma Distribution Test	
A-D Test Statistic	1.83675
A-D 5% Critical Value	0.74256
K-S Test Statistic	0.25746
K-S 5% Critical Value	0.177551
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	1.111919
Adjusted Gamma UCL	1.118602

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.778082
Shapiro-Wilk 5% Critical Value	0.916
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	1.129139
95% Chebyshev (MVUE) UCL	1.259986
97.5% Chebyshev (MVUE) UCL	1.361575
99% Chebyshev (MVUE) UCL	1.561127

95% Non-parametric UCLs	
CLT UCL	1.09324
Adj-CLT UCL (Adjusted for skewness)	1.082897
Mod-t UCL (Adjusted for skewness)	1.094651
Jackknife UCL	1.096264
Standard Bootstrap UCL	1.092879
Bootstrap-t UCL	1.085565
Hall's Bootstrap UCL	1.087351
Percentile Bootstrap UCL	1.086292
BCA Bootstrap UCL	1.072375
95% Chebyshev (Mean, Sd) UCL	1.212163
97.5% Chebyshev (Mean, Sd) UCL	1.294808
99% Chebyshev (Mean, Sd) UCL	1.457147

General Statistics

Data File	G:\divine strake\Report\UCLs\SOIL UCL.xls	Variable:	S-AC-228	

Raw Statistics		Normal Distribution Test	
Number of Valid Samples	24	Shapiro-Wilk Test Statisitic	0.876354
Number of Unique Samples	21	Shapiro-Wilk 5% Critical Value	0.916
Minimum	0.482	Data not normal at 5% significance level	
Maximum	1.41		
Mean	1.021167	99% UCL (Assuming Normal Distribution)	
Median	1.055	Student's-t UCL	1.130705
Standard Deviation	0.214662		
Variance	0.04608	Gamma Distribution Test	
Coefficient of Variation	0.210212	A-D Test Statistic	1.83675
Skewness	-1.082313	A-D 5% Critical Value	0.74256
		K-S Test Statistic	0.25746
Gamma Statistics		K-S 5% Critical Value	0.177551
k hat	18.6358	Data do not follow gamma distribution	
k star (bias corrected)	16.3341	at 5% significance level	
Theta hat	0.054796		
Theta star	0.062517	99% UCLs (Assuming Gamma Distribution)	
nu hat	894.5185	Approximate Gamma UCL	1.152236
nu star	784.037	Adjusted Gamma UCL	1.167138
Approx.Chi Square Value (.01)	694.8511		
Adjusted Level of Significance	0.00508	Lognormal Distribution Test	
Adjusted Chi Square Value	685.9793	Shapiro-Wilk Test Statisitic	0.778082
		Shapiro-Wilk 5% Critical Value	0.916
Log-transformed Statistics		Data not lognormal at 5% significance level	
Minimum of log data	-0.729811		
Maximum of log data	0.34359	99% UCLs (Assuming Lognormal Distribution)	
Mean of log data	-0.006124	99% H-UCL	N/A
Standard Deviation of log data	0.254586	95% Chebyshev (MVUE) UCL	1.259986
Variance of log data	0.064814	97.5% Chebyshev (MVUE) UCL	1.361575
		99% Chebyshev (MVUE) UCL	1.561127
		99% Non-parametric UCLs	
		CLT UCL	1.123102
		Adj-CLT UCL (Adjusted for skewness)	1.104025
		Mod-t UCL (Adjusted for skewness)	1.129091
		Jackknife UCL	1.130705
		Standard Bootstrap UCL	1.119782
		Bootstrap-t UCL	1.114024
		Hall's Bootstrap UCL	1.109491
		Percentile Bootstrap UCL	1.1135
		BCA Bootstrap UCL	1.089958
NO RECOMMENDATION AVAILABLE		95% Chebyshev (Mean, Sd) UCL	1.212163
		97.5% Chebyshev (Mean, Sd) UCL	1.294808
Select 95% Confidence Coefficient		99% Chebyshev (Mean, Sd) UCL	1.457147

General Statistics

Data File	G:\divine strake\Report\UCLs\SOIL UCL.xls	Variable:	S-AM-241		
Raw Statistics		Normal Distribution Test			
Number of Valid Samples	24	Shapiro-Wilk Test Statisitic			0.861302
Number of Unique Samples	20	Shapiro-Wilk 5% Critical Value			0.916
Minimum	0	Data not normal at 5% significance level			
Maximum	1.01				
Mean	0.28255	95% UCL (Assuming Normal Distribution)			
Median	0.2075	Student's-t UCL			0.386147
Standard Deviation	0.296124				
Variance	0.08769				
Coefficient of Variation	1.048042				
Skewness	1.085965				
Gamma Statistics Not Available					
Lognormal Statistics Not Available					
		95% Non-parametric UCLs			
		CLT UCL			0.381975
		Adj-CLT UCL (Adjusted for skewness)			0.396292
		Mod-t UCL (Adjusted for skewness)			0.38838
		Jackknife UCL			0.386147
		Standard Bootstrap UCL			0.379281
		Bootstrap-t UCL			0.409944
RECOMMENDATION		Hall's Bootstrap UCL			0.4061
Data are Non-parametric (0.05)		Percentile Bootstrap UCL			0.382425
		BCA Bootstrap UCL			0.361842
Use 95% Chebyshev (Mean, Sd) UCL		95% Chebyshev (Mean, Sd) UCL			0.546029
		97.5% Chebyshev (Mean, Sd) UCL			0.660036
		99% Chebyshev (Mean, Sd) UCL			0.883981

General Statistics

Data File	G:\divine strake\Report\UCLs\SOIL UCL.xls	Variable:	S-BI-214	
Raw Statistics		Normal Distribution Test		
Number of Valid Samples	24	Shapiro-Wilk Test Statisitic		0.916558
Number of Unique Samples	21	Shapiro-Wilk 5% Critical Value		0.916
Minimum	0.887	Data are normal at 5% significance level		
Maximum	1.77			
Mean	1.277375	95% UCL (Assuming Normal Distribution)		
Median	1.195	Student's-t UCL		1.36159
Standard Deviation	0.240722			
Variance	0.057947	Gamma Distribution Test		
Coefficient of Variation	0.188451	A-D Test Statistic		0.795733
Skewness	0.602366	A-D 5% Critical Value		0.742216
		K-S Test Statistic		0.185503
Gamma Statistics		K-S 5% Critical Value		0.177477
k hat	30.65277	Data do not follow gamma distribution		
k star (bias corrected)	26.84895	at 5% significance level		
Theta hat	0.041672			
Theta star	0.047576	95% UCLs (Assuming Gamma Distribution)		
nu hat	1471.333	Approximate Gamma UCL		1.364596
nu star	1288.75	Adjusted Gamma UCL		1.370947
Approx.Chi Square Value (.05)	1206.377			
Adjusted Level of Significance	0.0392	Lognormal Distribution Test		
Adjusted Chi Square Value	1200.788	Shapiro-Wilk Test Statisitic		0.935844
		Shapiro-Wilk 5% Critical Value		0.916
Log-transformed Statistics		Data are lognormal at 5% significance level		
Minimum of log data	-0.11991			
Maximum of log data	0.57098	95% UCLs (Assuming Lognormal Distribution)		
Mean of log data	0.228407	95% H-UCL		1.366638
Standard Deviation of log data	0.183512	95% Chebyshev (MVUE) UCL		1.486739
Variance of log data	0.033677	97.5% Chebyshev (MVUE) UCL		1.577483
		99% Chebyshev (MVUE) UCL		1.755731
		95% Non-parametric UCLs		
		CLT UCL		1.358198
		Adj-CLT UCL (Adjusted for skewness)		1.364654
		Mod-t UCL (Adjusted for skewness)		1.362597
		Jackknife UCL		1.36159
		Standard Bootstrap UCL		1.35443
		Bootstrap-t UCL		1.36865
RECOMMENDATION		Hall's Bootstrap UCL		1.365682
Data are normal (0.05)		Percentile Bootstrap UCL		1.358208
		BCA Bootstrap UCL		1.40375
Use Student's-t UCL		95% Chebyshev (Mean, Sd) UCL		1.491559
		97.5% Chebyshev (Mean, Sd) UCL		1.584237
		99% Chebyshev (Mean, Sd) UCL		1.766284

General Statistics

Data File	G:\divine strake\Report\UCLs\SOIL UCL.xls	Variable:	S-BI-214	

Raw Statistics	
Number of Valid Samples	24
Number of Unique Samples	21
Minimum	0.887
Maximum	1.77
Mean	1.277375
Median	1.195
Standard Deviation	0.240722
Variance	0.057947
Coefficient of Variation	0.188451
Skewness	0.602366

Gamma Statistics	
k hat	30.65277
k star (bias corrected)	26.84895
Theta hat	0.041672
Theta star	0.047576
nu hat	1471.333
nu star	1288.75
Approx.Chi Square Value (.01)	1173.571
Adjusted Level of Significance	0.00508
Adjusted Chi Square Value	1161.976

Log-transformed Statistics	
Minimum of log data	-0.11991
Maximum of log data	0.57098
Mean of log data	0.228407
Standard Deviation of log data	0.183512
Variance of log data	0.033677

NO RECOMMENDATION AVAILABLE

Select 95% Confidence Coefficient

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.916558
Shapiro-Wilk 5% Critical Value	0.916
Data are normal at 5% significance level	
99% UCL (Assuming Normal Distribution)	
Student's-t UCL	1.400211

Gamma Distribution Test	
A-D Test Statistic	0.795733
A-D 5% Critical Value	0.742216
K-S Test Statistic	0.185503
K-S 5% Critical Value	0.177477
Data do not follow gamma distribution	
at 5% significance level	
99% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	1.402741
Adjusted Gamma UCL	1.416739

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.935844
Shapiro-Wilk 5% Critical Value	0.916
Data are lognormal at 5% significance level	
99% UCLs (Assuming Lognormal Distribution)	
99% H-UCL	N/A
95% Chebyshev (MVUE) UCL	1.486739
97.5% Chebyshev (MVUE) UCL	1.577483
99% Chebyshev (MVUE) UCL	1.755731

99% Non-parametric UCLs	
CLT UCL	1.391685
Adj-CLT UCL (Adjusted for skewness)	1.403591
Mod-t UCL (Adjusted for skewness)	1.401218
Jackknife UCL	1.400211
Standard Bootstrap UCL	1.389422
Bootstrap-t UCL	1.409004
Hall's Bootstrap UCL	1.394573
Percentile Bootstrap UCL	1.388083
BCA Bootstrap UCL	1.449583
95% Chebyshev (Mean, Sd) UCL	1.491559
97.5% Chebyshev (Mean, Sd) UCL	1.584237
99% Chebyshev (Mean, Sd) UCL	1.766284

General Statistics

Data File	G:\divine strake\Report\UCLs\SOIL UCL.xls	Variable:	S-CS-137		
Raw Statistics		Normal Distribution Test			
Number of Valid Samples	24	Shapiro-Wilk Test Statisitic			0.942996
Number of Unique Samples	24	Shapiro-Wilk 5% Critical Value			0.916
Minimum	0	Data are normal at 5% significance level			
Maximum	1.06				
Mean	0.447375	95% UCL (Assuming Normal Distribution)			
Median	0.4145	Student's-t UCL			0.534729
Standard Deviation	0.249694				
Variance	0.062347				
Coefficient of Variation	0.558131				
Skewness	0.791966				
Gamma Statistics Not Available					
Lognormal Statistics Not Available					
		95% Non-parametric UCLs			
		CLT UCL			0.531211
		Adj-CLT UCL (Adjusted for skewness)			0.540015
		Mod-t UCL (Adjusted for skewness)			0.536102
		Jackknife UCL			0.534729
		Standard Bootstrap UCL			0.526561
		Bootstrap-t UCL			0.545749
RECOMMENDATION		Hall's Bootstrap UCL			0.551782
Data are normal (0.05)		Percentile Bootstrap UCL			0.530917
		BCA Bootstrap UCL			0.571583
Use Student's-t UCL		95% Chebyshev (Mean, Sd) UCL			0.669542
		97.5% Chebyshev (Mean, Sd) UCL			0.765673
		99% Chebyshev (Mean, Sd) UCL			0.954506

General Statistics

Data File	G:\divine strake\Report\UCLs\SOIL UCL.xls	Variable:	S-CS-137		
Raw Statistics			Normal Distribution Test		
Number of Valid Samples	24		Shapiro-Wilk Test Statisitic		0.942996
Number of Unique Samples	24		Shapiro-Wilk 5% Critical Value		0.916
Minimum	0		Data are normal at 5% significance level		
Maximum	1.06				
Mean	0.447375		99% UCL (Assuming Normal Distribution)		
Median	0.4145		Student's-t UCL		0.57479
Standard Deviation	0.249694				
Variance	0.062347				
Coefficient of Variation	0.558131				
Skewness	0.791966				
Gamma Statistics Not Available					
Lognormal Statistics Not Available					
			99% Non-parametric UCLs		
			CLT UCL		0.565946
			Adj-CLT UCL (Adjusted for skewness)		0.582183
			Mod-t UCL (Adjusted for skewness)		0.576163
			Jackknife UCL		0.57479
			Standard Bootstrap UCL		0.564437
			Bootstrap-t UCL		0.596391
			Hall's Bootstrap UCL		0.653703
			Percentile Bootstrap UCL		0.569125
			BCA Bootstrap UCL		0.625625
NO RECOMMENDATION AVAILABLE			95% Chebyshev (Mean, Sd) UCL		0.669542
			97.5% Chebyshev (Mean, Sd) UCL		0.765673
Select 95% Confidence Coefficient			99% Chebyshev (Mean, Sd) UCL		0.954506

General Statistics

Data File	G:\divine strake\Report\UCLs\SOIL UCL.xls	Variable:	S-K-40		
Raw Statistics			Normal Distribution Test		
Number of Valid Samples	25		Shapiro-Wilk Test Statisitic		0.827893
Number of Unique Samples	25		Shapiro-Wilk 5% Critical Value		0.918
Minimum	0		Data not normal at 5% significance level		
Maximum	20.3				
Mean	14.931		99% UCL (Assuming Normal Distribution)		
Median	15.86		Student's-t UCL		17.05441
Standard Deviation	4.260171				
Variance	18.14906				
Coefficient of Variation	0.285324				
Skewness	-2.01767				
Gamma Statistics Not Available					
Lognormal Statistics Not Available					
			99% Non-parametric UCLs		
			CLT UCL		16.91313
			Adj-CLT UCL (Adjusted for skewness)		16.23558
			Mod-t UCL (Adjusted for skewness)		16.9971
			Jackknife UCL		17.05441
			Standard Bootstrap UCL		16.84191
			Bootstrap-t UCL		16.59421
			Hall's Bootstrap UCL		16.41212
			Percentile Bootstrap UCL		16.6708
			BCA Bootstrap UCL		16.0856
NO RECOMMENDATION AVAILABLE			95% Chebyshev (Mean, Sd) UCL		18.64493
			97.5% Chebyshev (Mean, Sd) UCL		20.25195
Select 95% Confidence Coefficient			99% Chebyshev (Mean, Sd) UCL		23.40863

General Statistics

Data File	G:\divine strake\Report\UCLs\SOIL UCL.xls	Variable:	S-K-40

Raw Statistics		Normal Distribution Test	
Number of Valid Samples	25	Shapiro-Wilk Test Statisitic	0.827893
Number of Unique Samples	25	Shapiro-Wilk 5% Critical Value	0.918
Minimum	0	Data not normal at 5% significance level	
Maximum	20.3		
Mean	14.931	95% UCL (Assuming Normal Distribution)	
Median	15.86	Student's-t UCL	16.38873
Standard Deviation	4.260171		
Variance	18.14906		
Coefficient of Variation	0.285324		
Skewness	-2.01767		
Gamma Statistics Not Available			
Lognormal Statistics Not Available			
		95% Non-parametric UCLs	
		CLT UCL	16.33247
		Adj-CLT UCL (Adjusted for skewness)	15.96509
		Mod-t UCL (Adjusted for skewness)	16.33143
		Jackknife UCL	16.38873
		Standard Bootstrap UCL	16.26259
		Bootstrap-t UCL	16.10591
RECOMMENDATION		Hall's Bootstrap UCL	16.06718
Data are Non-parametric (0.05)		Percentile Bootstrap UCL	16.2228
		BCA Bootstrap UCL	15.9012
Use 95% Chebyshev (Mean, Sd) UCL		95% Chebyshev (Mean, Sd) UCL	18.64493
		97.5% Chebyshev (Mean, Sd) UCL	20.25195
		99% Chebyshev (Mean, Sd) UCL	23.40863

General Statistics

Data File	G:\divine strake\Report\UCLs\SOIL UCL.xls	Variable:	S-PB-212	

Raw Statistics	
Number of Valid Samples	24
Number of Unique Samples	23
Minimum	0.503
Maximum	1.77
Mean	1.160542
Median	1.205
Standard Deviation	0.288772
Variance	0.083389
Coefficient of Variation	0.248826
Skewness	-0.614116

Gamma Statistics	
k hat	13.71954
k star (bias corrected)	12.03237
Theta hat	0.08459
Theta star	0.096452
nu hat	658.5379
nu star	577.554
Approx.Chi Square Value (.05)	522.799
Adjusted Level of Significance	0.0392
Adjusted Chi Square Value	519.1437

Log-transformed Statistics	
Minimum of log data	-0.687165
Maximum of log data	0.57098
Mean of log data	0.112
Standard Deviation of log data	0.295756
Variance of log data	0.087472

RECOMMENDATION

Data are normal (0.05)

Use Student's-t UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.942272
Shapiro-Wilk 5% Critical Value	0.916
Data are normal at 5% significance level	
95% UCL (Assuming Normal Distribution)	
Student's-t UCL	1.261567

Gamma Distribution Test	
A-D Test Statistic	1.05363
A-D 5% Critical Value	0.743567
K-S Test Statistic	0.181489
K-S 5% Critical Value	0.177664
Data do not follow gamma distribution	
at 5% significance level	
95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	1.28209
Adjusted Gamma UCL	1.291117

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.855207
Shapiro-Wilk 5% Critical Value	0.916
Data not lognormal at 5% significance level	
95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	1.307173
95% Chebyshev (MVUE) UCL	1.477743
97.5% Chebyshev (MVUE) UCL	1.612501
99% Chebyshev (MVUE) UCL	1.877207

95% Non-parametric UCLs	
CLT UCL	1.257498
Adj-CLT UCL (Adjusted for skewness)	1.249603
Mod-t UCL (Adjusted for skewness)	1.260335
Jackknife UCL	1.261567
Standard Bootstrap UCL	1.256757
Bootstrap-t UCL	1.253846
Hall's Bootstrap UCL	1.249262
Percentile Bootstrap UCL	1.252375
BCA Bootstrap UCL	1.233083
95% Chebyshev (Mean, Sd) UCL	1.417479
97.5% Chebyshev (Mean, Sd) UCL	1.528656
99% Chebyshev (Mean, Sd) UCL	1.747041

General Statistics

Data File	G:\divine strake\Report\UCLs\SOIL UCL.xls	Variable:	S-PB-212	

Raw Statistics	
Number of Valid Samples	24
Number of Unique Samples	23
Minimum	0.503
Maximum	1.77
Mean	1.160542
Median	1.205
Standard Deviation	0.288772
Variance	0.083389
Coefficient of Variation	0.248826
Skewness	-0.614116

Gamma Statistics	
k hat	13.71954
k star (bias corrected)	12.03237
Theta hat	0.08459
Theta star	0.096452
nu hat	658.5379
nu star	577.554
Approx.Chi Square Value (.01)	501.4275
Adjusted Level of Significance	0.00508
Adjusted Chi Square Value	493.9234

Log-transformed Statistics	
Minimum of log data	-0.687165
Maximum of log data	0.57098
Mean of log data	0.112
Standard Deviation of log data	0.295756
Variance of log data	0.087472

NO RECOMMENDATION AVAILABLE

Select 95% Confidence Coefficient

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.942272
Shapiro-Wilk 5% Critical Value	0.916
Data are normal at 5% significance level	
99% UCL (Assuming Normal Distribution)	
Student's-t UCL	1.307897

Gamma Distribution Test	
A-D Test Statistic	1.05363
A-D 5% Critical Value	0.743567
K-S Test Statistic	0.181489
K-S 5% Critical Value	0.177664
Data do not follow gamma distribution	
at 5% significance level	
99% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	1.336734
Adjusted Gamma UCL	1.357043

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.855207
Shapiro-Wilk 5% Critical Value	0.916
Data not lognormal at 5% significance level	
99% UCLs (Assuming Lognormal Distribution)	
99% H-UCL	N/A
95% Chebyshev (MVUE) UCL	1.477743
97.5% Chebyshev (MVUE) UCL	1.612501
99% Chebyshev (MVUE) UCL	1.877207

99% Non-parametric UCLs	
CLT UCL	1.297669
Adj-CLT UCL (Adjusted for skewness)	1.283108
Mod-t UCL (Adjusted for skewness)	1.306666
Jackknife UCL	1.307897
Standard Bootstrap UCL	1.293247
Bootstrap-t UCL	1.286354
Hall's Bootstrap UCL	1.289211
Percentile Bootstrap UCL	1.295417
BCA Bootstrap UCL	1.258
95% Chebyshev (Mean, Sd) UCL	1.417479
97.5% Chebyshev (Mean, Sd) UCL	1.528656
99% Chebyshev (Mean, Sd) UCL	1.747041

General Statistics

Data File	G:\divine strake\Report\UCLs\SOIL UCL.xls	Variable:	S-PB-214	

Raw Statistics	
Number of Valid Samples	24
Number of Unique Samples	21
Minimum	1.11
Maximum	1.94
Mean	1.405417
Median	1.36
Standard Deviation	0.225388
Variance	0.0508
Coefficient of Variation	0.160371
Skewness	0.658966

Gamma Statistics	
k hat	42.3121
k star (bias corrected)	37.05086
Theta hat	0.033215
Theta star	0.037932
nu hat	2030.981
nu star	1778.442
Approx.Chi Square Value (.05)	1681.473
Adjusted Level of Significance	0.0392
Adjusted Chi Square Value	1674.862

Log-transformed Statistics	
Minimum of log data	0.10436
Maximum of log data	0.662688
Mean of log data	0.32847
Standard Deviation of log data	0.156028
Variance of log data	0.024345

RECOMMENDATION

Data are normal (0.05)

Use Student's-t UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.941394
Shapiro-Wilk 5% Critical Value	0.916
Data are normal at 5% significance level	
95% UCL (Assuming Normal Distribution)	
Student's-t UCL	1.484267

Gamma Distribution Test	
A-D Test Statistic	0.369035
A-D 5% Critical Value	0.742146
K-S Test Statistic	0.115872
K-S 5% Critical Value	0.177431
Data follow gamma distribution	
at 5% significance level	
95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	1.486466
Adjusted Gamma UCL	1.492333

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.95686
Shapiro-Wilk 5% Critical Value	0.916
Data are lognormal at 5% significance level	
95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	1.487746
95% Chebyshev (MVUE) UCL	1.601014
97.5% Chebyshev (MVUE) UCL	1.685773
99% Chebyshev (MVUE) UCL	1.852266

95% Non-parametric UCLs	
CLT UCL	1.481092
Adj-CLT UCL (Adjusted for skewness)	1.487704
Mod-t UCL (Adjusted for skewness)	1.485298
Jackknife UCL	1.484267
Standard Bootstrap UCL	1.480065
Bootstrap-t UCL	1.495179
Hall's Bootstrap UCL	1.485867
Percentile Bootstrap UCL	1.481667
BCA Bootstrap UCL	1.46625
95% Chebyshev (Mean, Sd) UCL	1.605957
97.5% Chebyshev (Mean, Sd) UCL	1.692731
99% Chebyshev (Mean, Sd) UCL	1.863182

General Statistics

Data File	G:\divine strake\Report\UCLs\SOIL UCL.xls	Variable:	S-PB-214	

Raw Statistics		Normal Distribution Test	
Number of Valid Samples	24	Shapiro-Wilk Test Statisitic	0.941394
Number of Unique Samples	21	Shapiro-Wilk 5% Critical Value	0.916
Minimum	1.11	Data are normal at 5% significance level	
Maximum	1.94		
Mean	1.405417	99% UCL (Assuming Normal Distribution)	
Median	1.36	Student's-t UCL	1.520428
Standard Deviation	0.225388		
Variance	0.0508	Gamma Distribution Test	
Coefficient of Variation	0.160371	A-D Test Statistic	0.369035
Skewness	0.658966	A-D 5% Critical Value	0.742146
		K-S Test Statistic	0.115872
Gamma Statistics		K-S 5% Critical Value	0.177431
k hat	42.3121	Data follow gamma distribution	
k star (bias corrected)	37.05086	at 5% significance level	
Theta hat	0.033215		
Theta star	0.037932	99% UCLs (Assuming Gamma Distribution)	
nu hat	2030.981	Approximate Gamma UCL	1.521623
nu star	1778.442	Adjusted Gamma UCL	1.534475
Approx.Chi Square Value (.01)	1642.622		
Adjusted Level of Significance	0.00508	Lognormal Distribution Test	
Adjusted Chi Square Value	1628.864	Shapiro-Wilk Test Statisitic	0.95686
		Shapiro-Wilk 5% Critical Value	0.916
Log-transformed Statistics		Data are lognormal at 5% significance level	
Minimum of log data	0.10436		
Maximum of log data	0.662688	99% UCLs (Assuming Lognormal Distribution)	
Mean of log data	0.32847	99% H-UCL	N/A
Standard Deviation of log data	0.156028	95% Chebyshev (MVUE) UCL	1.601014
Variance of log data	0.024345	97.5% Chebyshev (MVUE) UCL	1.685773
		99% Chebyshev (MVUE) UCL	1.852266
		99% Non-parametric UCLs	
		CLT UCL	1.512445
		Adj-CLT UCL (Adjusted for skewness)	1.524641
		Mod-t UCL (Adjusted for skewness)	1.52146
		Jackknife UCL	1.520428
		Standard Bootstrap UCL	1.510953
		Bootstrap-t UCL	1.533808
		Hall's Bootstrap UCL	1.52975
		Percentile Bootstrap UCL	1.514583
		BCA Bootstrap UCL	1.48375
NO RECOMMENDATION AVAILABLE		95% Chebyshev (Mean, Sd) UCL	1.605957
		97.5% Chebyshev (Mean, Sd) UCL	1.692731
Select 95% Confidence Coefficient		99% Chebyshev (Mean, Sd) UCL	1.863182

General Statistics

Data File	G:\divine strake\Report\UCLs\SOIL UCL.xls	Variable:	S-PU-238	

Raw Statistics		Normal Distribution Test	
Number of Valid Samples	23	Shapiro-Wilk Test Statisitic	0.752616
Number of Unique Samples	19	Shapiro-Wilk 5% Critical Value	0.914
Minimum	0	Data not normal at 5% significance level	
Maximum	0.147		
Mean	0.033043	95% UCL (Assuming Normal Distribution)	
Median	0.022	Student's-t UCL	0.046197
Standard Deviation	0.036736		
Variance	0.001349		
Coefficient of Variation	1.111733		
Skewness	2.017926		
Gamma Statistics Not Available			
Lognormal Statistics Not Available			
		95% Non-parametric UCLs	
		CLT UCL	0.045643
		Adj-CLT UCL (Adjusted for skewness)	0.049087
		Mod-t UCL (Adjusted for skewness)	0.046734
		Jackknife UCL	0.046197
		Standard Bootstrap UCL	0.045593
		Bootstrap-t UCL	0.053221
RECOMMENDATION		Hall's Bootstrap UCL	0.057581
Data are Non-parametric (0.05)		Percentile Bootstrap UCL	0.045957
		BCA Bootstrap UCL	0.044043
Use 95% Chebyshev (Mean, Sd) UCL		95% Chebyshev (Mean, Sd) UCL	0.066432
		97.5% Chebyshev (Mean, Sd) UCL	0.080879
		99% Chebyshev (Mean, Sd) UCL	0.109258

General Statistics

Data File	G:\divine strake\Report\UCLs\SOIL UCL.xls	Variable:	S-PU-239	

Raw Statistics	
Number of Valid Samples	24
Number of Unique Samples	22
Minimum	0.002
Maximum	11.1
Mean	1.73175
Median	0.68
Standard Deviation	2.677525
Variance	7.169141
Coefficient of Variation	1.546138
Skewness	2.702767

Gamma Statistics	
k hat	0.674759
k star (bias corrected)	0.618192
Theta hat	2.566472
Theta star	2.801315
nu hat	32.38843
nu star	29.67321
Approx.Chi Square Value (.05)	18.23411
Adjusted Level of Significance	0.0392
Adjusted Chi Square Value	17.6034

Log-transformed Statistics	
Minimum of log data	-6.214608
Maximum of log data	2.406945
Mean of log data	-0.351148
Standard Deviation of log data	1.675194
Variance of log data	2.806275

RECOMMENDATION

Assuming gamma distribution (0.05)

Use Approximate Gamma UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.597445
Shapiro-Wilk 5% Critical Value	0.916
Data not normal at 5% significance level	
95% UCL (Assuming Normal Distribution)	
Student's-t UCL	2.668462

Gamma Distribution Test	
A-D Test Statistic	0.987356
A-D 5% Critical Value	0.789658
K-S Test Statistic	0.185078
K-S 5% Critical Value	0.1859
Data follow approximate gamma distibution	
at 5% significance level	
95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	2.818156
Adjusted Gamma UCL	2.919127

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.845625
Shapiro-Wilk 5% Critical Value	0.916
Data not lognormal at 5% significance level	
95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	9.772984
95% Chebyshev (MVUE) UCL	7.261189
97.5% Chebyshev (MVUE) UCL	9.307095
99% Chebyshev (MVUE) UCL	13.32588

95% Non-parametric UCLs	
CLT UCL	2.630741
Adj-CLT UCL (Adjusted for skewness)	2.95293
Mod-t UCL (Adjusted for skewness)	2.718717
Jackknife UCL	2.668462
Standard Bootstrap UCL	2.617786
Bootstrap-t UCL	4.053565
Hall's Bootstrap UCL	6.247206
Percentile Bootstrap UCL	2.641417
BCA Bootstrap UCL	3.424167
95% Chebyshev (Mean, Sd) UCL	4.114096
97.5% Chebyshev (Mean, Sd) UCL	5.144938
99% Chebyshev (Mean, Sd) UCL	7.169829

General Statistics

Data File	G:\divine strake\Report\UCLs\SOIL UCL.xls	Variable:	S-PU-239	

Raw Statistics		Normal Distribution Test	
Number of Valid Samples	24	Shapiro-Wilk Test Statisitic	0.597445
Number of Unique Samples	22	Shapiro-Wilk 5% Critical Value	0.916
Minimum	0.002	Data not normal at 5% significance level	
Maximum	11.1		
Mean	1.73175	99% UCL (Assuming Normal Distribution)	
Median	0.68	Student's-t UCL	3.098046
Standard Deviation	2.677525		
Variance	7.169141	Gamma Distribution Test	
Coefficient of Variation	1.546138	A-D Test Statistic	0.987356
Skewness	2.702767	A-D 5% Critical Value	0.789658
		K-S Test Statistic	0.185078
Gamma Statistics		K-S 5% Critical Value	0.1859
k hat	0.674759	Data follow approximate gamma distibution	
k star (bias corrected)	0.618192	at 5% significance level	
Theta hat	2.566472		
Theta star	2.801315	99% UCLs (Assuming Gamma Distribution)	
nu hat	32.38843	Approximate Gamma UCL	3.490116
nu star	29.67321	Adjusted Gamma UCL	3.780632
Approx.Chi Square Value (.01)	14.72346		
Adjusted Level of Significance	0.00508	Lognormal Distribution Test	
Adjusted Chi Square Value	13.59206	Shapiro-Wilk Test Statisitic	0.845625
		Shapiro-Wilk 5% Critical Value	0.916
Log-transformed Statistics		Data not lognormal at 5% significance level	
Minimum of log data	-6.214608		
Maximum of log data	2.406945	99% UCLs (Assuming Lognormal Distribution)	
Mean of log data	-0.351148	99% H-UCL	N/A
Standard Deviation of log data	1.675194	95% Chebyshev (MVUE) UCL	7.261189
Variance of log data	2.806275	97.5% Chebyshev (MVUE) UCL	9.307095
		99% Chebyshev (MVUE) UCL	13.32588
		99% Non-parametric UCLs	
		CLT UCL	3.00321
		Adj-CLT UCL (Adjusted for skewness)	3.597415
		Mod-t UCL (Adjusted for skewness)	3.148301
		Jackknife UCL	3.098046
		Standard Bootstrap UCL	2.953671
		Bootstrap-t UCL	6.052968
		Hall's Bootstrap UCL	7.778147
		Percentile Bootstrap UCL	3.127167
		BCA Bootstrap UCL	3.655417
NO RECOMMENDATION AVAILABLE		95% Chebyshev (Mean, Sd) UCL	4.114096
		97.5% Chebyshev (Mean, Sd) UCL	5.144938
Select 95% Confidence Coefficient		99% Chebyshev (Mean, Sd) UCL	7.169829

General Statistics

Data File	G:\divine strake\Report\UCLs\SOIL UCL.xls	Variable:	S-SR-90	

Raw Statistics	
Number of Valid Samples	24
Number of Unique Samples	24
Minimum	0.026
Maximum	0.309
Mean	0.1385
Median	0.136
Standard Deviation	0.05774
Variance	0.003334
Coefficient of Variation	0.416896
Skewness	0.824484

Gamma Statistics	
k hat	5.179163
k star (bias corrected)	4.559545
Theta hat	0.026742
Theta star	0.030376
nu hat	248.5998
nu star	218.8582
Approx.Chi Square Value (.05)	185.6123
Adjusted Level of Significance	0.0392
Adjusted Chi Square Value	183.4619

Log-transformed Statistics	
Minimum of log data	-3.649659
Maximum of log data	-1.174414
Mean of log data	-2.076521
Standard Deviation of log data	0.50048
Variance of log data	0.25048

RECOMMENDATION

Data are normal (0.05)

Use Student's-t UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.936072
Shapiro-Wilk 5% Critical Value	0.916
Data are normal at 5% significance level	
95% UCL (Assuming Normal Distribution)	
Student's-t UCL	0.1587

Gamma Distribution Test	
A-D Test Statistic	0.645684
A-D 5% Critical Value	0.746104
K-S Test Statistic	0.134007
K-S 5% Critical Value	0.17829
Data follow gamma distribution	
at 5% significance level	
95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	0.163307
Adjusted Gamma UCL	0.165222

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.882292
Shapiro-Wilk 5% Critical Value	0.916
Data not lognormal at 5% significance level	
95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	0.174544
95% Chebyshev (MVUE) UCL	0.206719
97.5% Chebyshev (MVUE) UCL	0.235038
99% Chebyshev (MVUE) UCL	0.290665

95% Non-parametric UCLs	
CLT UCL	0.157886
Adj-CLT UCL (Adjusted for skewness)	0.160006
Mod-t UCL (Adjusted for skewness)	0.159031
Jackknife UCL	0.1587
Standard Bootstrap UCL	0.15749
Bootstrap-t UCL	0.161076
Hall's Bootstrap UCL	0.166222
Percentile Bootstrap UCL	0.158167
BCA Bootstrap UCL	0.16625
95% Chebyshev (Mean, Sd) UCL	0.189875
97.5% Chebyshev (Mean, Sd) UCL	0.212104
99% Chebyshev (Mean, Sd) UCL	0.255771

General Statistics

Data File	G:\divine strake\Report\UCLs\SOIL UCL.xls	Variable:	S-TH-234	

Raw Statistics	
Number of Valid Samples	24
Number of Unique Samples	23
Minimum	0.3
Maximum	2.34
Mean	1.492792
Median	1.43
Standard Deviation	0.442337
Variance	0.195662
Coefficient of Variation	0.296315
Skewness	-0.664954

Gamma Statistics	
k hat	8.064754
k star (bias corrected)	7.084437
Theta hat	0.185101
Theta star	0.210714
nu hat	387.1082
nu star	340.053
Approx.Chi Square Value (.05)	298.3153
Adjusted Level of Significance	0.0392
Adjusted Chi Square Value	295.571

Log-transformed Statistics	
Minimum of log data	-1.203973
Maximum of log data	0.850151
Mean of log data	0.33737
Standard Deviation of log data	0.416142
Variance of log data	0.173175

RECOMMENDATION

Data are normal (0.05)

Use Student's-t UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.945404
Shapiro-Wilk 5% Critical Value	0.916
Data are normal at 5% significance level	
95% UCL (Assuming Normal Distribution)	
Student's-t UCL	1.64754

Gamma Distribution Test	
A-D Test Statistic	1.222853
A-D 5% Critical Value	0.745042
K-S Test Statistic	0.27056
K-S 5% Critical Value	0.177967
Data do not follow gamma distribution	
at 5% significance level	
95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	1.70165
Adjusted Gamma UCL	1.71745

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.759374
Shapiro-Wilk 5% Critical Value	0.916
Data not lognormal at 5% significance level	
95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	1.802263
95% Chebyshev (MVUE) UCL	2.101702
97.5% Chebyshev (MVUE) UCL	2.352505
99% Chebyshev (MVUE) UCL	2.84516

95% Non-parametric UCLs	
CLT UCL	1.641308
Adj-CLT UCL (Adjusted for skewness)	1.628213
Mod-t UCL (Adjusted for skewness)	1.645497
Jackknife UCL	1.64754
Standard Bootstrap UCL	1.637504
Bootstrap-t UCL	1.642152
Hall's Bootstrap UCL	1.635228
Percentile Bootstrap UCL	1.632
BCA Bootstrap UCL	1.59875
95% Chebyshev (Mean, Sd) UCL	1.886364
97.5% Chebyshev (Mean, Sd) UCL	2.056662
99% Chebyshev (Mean, Sd) UCL	2.391182

General Statistics

Data File	G:\divine strake\Report\UCLs\SOIL UCL.xls	Variable:	S-TH-234	

Raw Statistics	
Number of Valid Samples	24
Number of Unique Samples	23
Minimum	0.3
Maximum	2.34
Mean	1.492792
Median	1.43
Standard Deviation	0.442337
Variance	0.195662
Coefficient of Variation	0.296315
Skewness	-0.664954

Gamma Statistics	
k hat	8.064754
k star (bias corrected)	7.084437
Theta hat	0.185101
Theta star	0.210714
nu hat	387.1082
nu star	340.053
Approx.Chi Square Value (.01)	282.3298
Adjusted Level of Significance	0.00508
Adjusted Chi Square Value	276.752

Log-transformed Statistics	
Minimum of log data	-1.203973
Maximum of log data	0.850151
Mean of log data	0.33737
Standard Deviation of log data	0.416142
Variance of log data	0.173175

NO RECOMMENDATION AVAILABLE

Select 95% Confidence Coefficient

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.945404
Shapiro-Wilk 5% Critical Value	0.916
Data are normal at 5% significance level	
99% UCL (Assuming Normal Distribution)	
Student's-t UCL	1.718509

Gamma Distribution Test	
A-D Test Statistic	1.222853
A-D 5% Critical Value	0.745042
K-S Test Statistic	0.27056
K-S 5% Critical Value	0.177967
Data do not follow gamma distribution	
at 5% significance level	
99% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	1.797997
Adjusted Gamma UCL	1.834235

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.759374
Shapiro-Wilk 5% Critical Value	0.916
Data not lognormal at 5% significance level	
99% UCLs (Assuming Lognormal Distribution)	
99% H-UCL	N/A
95% Chebyshev (MVUE) UCL	2.101702
97.5% Chebyshev (MVUE) UCL	2.352505
99% Chebyshev (MVUE) UCL	2.84516

99% Non-parametric UCLs	
CLT UCL	1.702841
Adj-CLT UCL (Adjusted for skewness)	1.67869
Mod-t UCL (Adjusted for skewness)	1.716466
Jackknife UCL	1.718509
Standard Bootstrap UCL	1.70351
Bootstrap-t UCL	1.692685
Hall's Bootstrap UCL	1.698969
Percentile Bootstrap UCL	1.680833
BCA Bootstrap UCL	1.627333
95% Chebyshev (Mean, Sd) UCL	1.886364
97.5% Chebyshev (Mean, Sd) UCL	2.056662
99% Chebyshev (Mean, Sd) UCL	2.391182

General Statistics

Data File	G:\divine strake\Report\UCLs\SOIL UCL.xls	Variable:	S-TL-208

Raw Statistics	
Number of Valid Samples	24
Number of Unique Samples	23
Minimum	0.149
Maximum	0.441
Mean	0.332708
Median	0.346
Standard Deviation	0.069518
Variance	0.004833
Coefficient of Variation	0.208945
Skewness	-0.965655

Gamma Statistics	
k hat	19.33907
k star (bias corrected)	16.94947
Theta hat	0.017204
Theta star	0.019629
nu hat	928.2755
nu star	813.5744
Approx.Chi Square Value (.05)	748.3671
Adjusted Level of Significance	0.0392
Adjusted Chi Square Value	743.98

Log-transformed Statistics	
Minimum of log data	-1.903809
Maximum of log data	-0.81871
Mean of log data	-1.126566
Standard Deviation of log data	0.248356
Variance of log data	0.061681

RECOMMENDATION

Data are normal (0.05)

Use Student's-t UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.927999
Shapiro-Wilk 5% Critical Value	0.916
Data are normal at 5% significance level	
95% UCL (Assuming Normal Distribution)	
Student's-t UCL	0.357029

Gamma Distribution Test	
A-D Test Statistic	1.04439
A-D 5% Critical Value	0.742415
K-S Test Statistic	0.177342
K-S 5% Critical Value	0.177535
Data follow approximate gamma distibution	
at 5% significance level	
95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	0.361698
Adjusted Gamma UCL	0.363831

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.839798
Shapiro-Wilk 5% Critical Value	0.916
Data not lognormal at 5% significance level	
95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	0.366751
95% Chebyshev (MVUE) UCL	0.408402
97.5% Chebyshev (MVUE) UCL	0.440658
99% Chebyshev (MVUE) UCL	0.504019

95% Non-parametric UCLs	
CLT UCL	0.356049
Adj-CLT UCL (Adjusted for skewness)	0.353061
Mod-t UCL (Adjusted for skewness)	0.356562
Jackknife UCL	0.357029
Standard Bootstrap UCL	0.355553
Bootstrap-t UCL	0.353764
Hall's Bootstrap UCL	0.35365
Percentile Bootstrap UCL	0.35475
BCA Bootstrap UCL	0.349792
95% Chebyshev (Mean, Sd) UCL	0.394562
97.5% Chebyshev (Mean, Sd) UCL	0.421327
99% Chebyshev (Mean, Sd) UCL	0.4739

General Statistics

Data File	G:\divine strake\Report\UCLs\SOIL UCL.xls	Variable:	S-TL-208	

Raw Statistics		Normal Distribution Test	
Number of Valid Samples	24	Shapiro-Wilk Test Statisitic	0.927999
Number of Unique Samples	23	Shapiro-Wilk 5% Critical Value	0.916
Minimum	0.149	Data are normal at 5% significance level	
Maximum	0.441		
Mean	0.332708	99% UCL (Assuming Normal Distribution)	
Median	0.346	Student's-t UCL	0.368182
Standard Deviation	0.069518		
Variance	0.004833	Gamma Distribution Test	
Coefficient of Variation	0.208945	A-D Test Statistic	1.04439
Skewness	-0.965655	A-D 5% Critical Value	0.742415
		K-S Test Statistic	0.177342
Gamma Statistics		K-S 5% Critical Value	0.177535
k hat	19.33907	Data follow approximate gamma distibution	
k star (bias corrected)	16.94947	at 5% significance level	
Theta hat	0.017204		
Theta star	0.019629	99% UCLs (Assuming Gamma Distribution)	
nu hat	928.2755	Approximate Gamma UCL	0.37456
nu star	813.5744	Adjusted Gamma UCL	0.379311
Approx.Chi Square Value (.01)	722.6688		
Adjusted Level of Significance	0.00508	Lognormal Distribution Test	
Adjusted Chi Square Value	713.6168	Shapiro-Wilk Test Statisitic	0.839798
		Shapiro-Wilk 5% Critical Value	0.916
Log-transformed Statistics		Data not lognormal at 5% significance level	
Minimum of log data	-1.903809		
Maximum of log data	-0.81871	99% UCLs (Assuming Lognormal Distribution)	
Mean of log data	-1.126566	99% H-UCL	N/A
Standard Deviation of log data	0.248356	95% Chebyshev (MVUE) UCL	0.408402
Variance of log data	0.061681	97.5% Chebyshev (MVUE) UCL	0.440658
		99% Chebyshev (MVUE) UCL	0.504019
		99% Non-parametric UCLs	
		CLT UCL	0.36572
		Adj-CLT UCL (Adjusted for skewness)	0.360208
		Mod-t UCL (Adjusted for skewness)	0.367716
		Jackknife UCL	0.368182
		Standard Bootstrap UCL	0.365318
		Bootstrap-t UCL	0.363159
		Hall's Bootstrap UCL	0.361493
		Percentile Bootstrap UCL	0.363042
		BCA Bootstrap UCL	0.354042
NO RECOMMENDATION AVAILABLE		95% Chebyshev (Mean, Sd) UCL	0.394562
		97.5% Chebyshev (Mean, Sd) UCL	0.421327
Select 95% Confidence Coefficient		99% Chebyshev (Mean, Sd) UCL	0.4739

General Statistics

Data File	G:\divine strake\Report\UCLs\SOIL UCL.xls	Variable:	S-U-234	

Raw Statistics	
Number of Valid Samples	24
Number of Unique Samples	20
Minimum	0.68
Maximum	1.84
Mean	0.974167
Median	0.94
Standard Deviation	0.241083
Variance	0.058121
Coefficient of Variation	0.247476
Skewness	2.162872

Gamma Statistics	
k hat	20.93953
k star (bias corrected)	18.34986
Theta hat	0.046523
Theta star	0.053088
nu hat	1005.097
nu star	880.7935
Approx.Chi Square Value (.05)	812.8983
Adjusted Level of Significance	0.0392
Adjusted Chi Square Value	808.3231

Log-transformed Statistics	
Minimum of log data	-0.385662
Maximum of log data	0.609766
Mean of log data	-0.050241
Standard Deviation of log data	0.215062
Variance of log data	0.046252

RECOMMENDATION

Data are lognormal (0.05)

Use Student's-t UCL

Use Modified-t UCL

Use H-UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.810881
Shapiro-Wilk 5% Critical Value	0.916
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	1.058508

Gamma Distribution Test	
A-D Test Statistic	0.743445
A-D 5% Critical Value	0.742274
K-S Test Statistic	0.191644
K-S 5% Critical Value	0.177516
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	1.055531
Adjusted Gamma UCL	1.061506

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.919383
Shapiro-Wilk 5% Critical Value	0.916
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	1.053665
95% Chebyshev (MVUE) UCL	1.159809
97.5% Chebyshev (MVUE) UCL	1.240948
99% Chebyshev (MVUE) UCL	1.400328

95% Non-parametric UCLs	
CLT UCL	1.055111
Adj-CLT UCL (Adjusted for skewness)	1.078326
Mod-t UCL (Adjusted for skewness)	1.062129
Jackknife UCL	1.058508
Standard Bootstrap UCL	1.053465
Bootstrap-t UCL	1.095516
Hall's Bootstrap UCL	1.384175
Percentile Bootstrap UCL	1.06125
BCA Bootstrap UCL	1.099583
95% Chebyshev (Mean, Sd) UCL	1.188672
97.5% Chebyshev (Mean, Sd) UCL	1.281488
99% Chebyshev (Mean, Sd) UCL	1.463809

General Statistics

Data File	G:\divine strake\Report\UCLs\SOIL UCL.xls	Variable:	S-U-234		
Raw Statistics			Normal Distribution Test		
Number of Valid Samples	24		Shapiro-Wilk Test Statisitic		0.810881
Number of Unique Samples	20		Shapiro-Wilk 5% Critical Value		0.916
Minimum	0.68		Data not normal at 5% significance level		
Maximum	1.84				
Mean	0.974167		99% UCL (Assuming Normal Distribution)		
Median	0.94		Student's-t UCL		1.097187
Standard Deviation	0.241083				
Variance	0.058121		Gamma Distribution Test		
Coefficient of Variation	0.247476		A-D Test Statistic		0.743445
Skewness	2.162872		A-D 5% Critical Value		0.742274
			K-S Test Statistic		0.191644
Gamma Statistics			K-S 5% Critical Value		0.177516
k hat	20.93953		Data do not follow gamma distribution		
k star (bias corrected)	18.34986		at 5% significance level		
Theta hat	0.046523				
Theta star	0.053088		99% UCLs (Assuming Gamma Distribution)		
nu hat	1005.097		Approximate Gamma UCL		1.091533
nu star	880.7935		Adjusted Gamma UCL		1.104814
Approx.Chi Square Value (.01)	786.0871				
Adjusted Level of Significance	0.00508		Lognormal Distribution Test		
Adjusted Chi Square Value	776.637		Shapiro-Wilk Test Statisitic		0.919383
			Shapiro-Wilk 5% Critical Value		0.916
Log-transformed Statistics			Data are lognormal at 5% significance level		
Minimum of log data	-0.385662				
Maximum of log data	0.609766		99% UCLs (Assuming Lognormal Distribution)		
Mean of log data	-0.050241		99% H-UCL		N/A
Standard Deviation of log data	0.215062		95% Chebyshev (MVUE) UCL		1.159809
Variance of log data	0.046252		97.5% Chebyshev (MVUE) UCL		1.240948
			99% Chebyshev (MVUE) UCL		1.400328
			99% Non-parametric UCLs		
			CLT UCL		1.088648
			Adj-CLT UCL (Adjusted for skewness)		1.131463
			Mod-t UCL (Adjusted for skewness)		1.100808
			Jackknife UCL		1.097187
			Standard Bootstrap UCL		1.085973
			Bootstrap-t UCL		1.164281
			Hall's Bootstrap UCL		1.588849
			Percentile Bootstrap UCL		1.090833
			BCA Bootstrap UCL		1.167083
NO RECOMMENDATION AVAILABLE			95% Chebyshev (Mean, Sd) UCL		1.188672
			97.5% Chebyshev (Mean, Sd) UCL		1.281488
Select 95% Confidence Coefficient			99% Chebyshev (Mean, Sd) UCL		1.463809

General Statistics

Data File	G:\divine strake\Report\UCLs\SOIL UCL.xls	Variable:	S-U-235		
Raw Statistics		Normal Distribution Test			
Number of Valid Samples	25	Shapiro-Wilk Test Statisitic			0.871049
Number of Unique Samples	20	Shapiro-Wilk 5% Critical Value			0.918
Minimum	0	Data not normal at 5% significance level			
Maximum	0.179				
Mean	0.0638	95% UCL (Assuming Normal Distribution)			
Median	0.055	Student's-t UCL			0.075649
Standard Deviation	0.034628				
Variance	0.001199				
Coefficient of Variation	0.542755				
Skewness	1.535961				
Gamma Statistics Not Available					
Lognormal Statistics Not Available					
		95% Non-parametric UCLs			
		CLT UCL			0.075192
		Adj-CLT UCL (Adjusted for skewness)			0.077465
		Mod-t UCL (Adjusted for skewness)			0.076003
		Jackknife UCL			0.075649
		Standard Bootstrap UCL			0.074659
		Bootstrap-t UCL			0.079251
RECOMMENDATION		Hall's Bootstrap UCL			0.08736
Data are Non-parametric (0.05)		Percentile Bootstrap UCL			0.07548
		BCA Bootstrap UCL			0.0798
Use 95% Chebyshev (Mean, Sd) UCL		95% Chebyshev (Mean, Sd) UCL			0.093988
		97.5% Chebyshev (Mean, Sd) UCL			0.10705
		99% Chebyshev (Mean, Sd) UCL			0.132708

General Statistics

Data File	G:\divine strake\Report\UCLs\SOIL UCL.xls	Variable:	S-U-235		
Raw Statistics			Normal Distribution Test		
Number of Valid Samples	24		Shapiro-Wilk Test Statisitic		0.977116
Number of Unique Samples	23		Shapiro-Wilk 5% Critical Value		0.916
Minimum	0.01		Data are normal at 5% significance level		
Maximum	0.26				
Mean	0.133042		99% UCL (Assuming Normal Distribution)		
Median	0.129		Student's-t UCL		0.163512
Standard Deviation	0.059712				
Variance	0.003566		Gamma Distribution Test		
Coefficient of Variation	0.448822		A-D Test Statistic		0.530406
Skewness	0.279167		A-D 5% Critical Value		0.749622
			K-S Test Statistic		0.123581
Gamma Statistics			K-S 5% Critical Value		0.178896
k hat	3.620156		Data follow gamma distribution		
k star (bias corrected)	3.195415		at 5% significance level		
Theta hat	0.03675				
Theta star	0.041635		99% UCLs (Assuming Gamma Distribution)		
nu hat	173.7675		Approximate Gamma UCL		0.176538
nu star	153.3799		Adjusted Gamma UCL		0.182042
Approx.Chi Square Value (.01)	115.5896				
Adjusted Level of Significance	0.00508		Lognormal Distribution Test		
Adjusted Chi Square Value	112.0945		Shapiro-Wilk Test Statisitic		0.801078
			Shapiro-Wilk 5% Critical Value		0.916
Log-transformed Statistics			Data not lognormal at 5% significance level		
Minimum of log data	-4.60517				
Maximum of log data	-1.347074		99% UCLs (Assuming Lognormal Distribution)		
Mean of log data	-2.16152		99% H-UCL		N/A
Standard Deviation of log data	0.657904		95% Chebyshev (MVUE) UCL		0.229754
Variance of log data	0.432838		97.5% Chebyshev (MVUE) UCL		0.267964
			99% Chebyshev (MVUE) UCL		0.343018
			99% Non-parametric UCLs		
			CLT UCL		0.161397
			Adj-CLT UCL (Adjusted for skewness)		0.162765
			Mod-t UCL (Adjusted for skewness)		0.163627
			Jackknife UCL		0.163512
			Standard Bootstrap UCL		0.161587
			Bootstrap-t UCL		0.167896
			Hall's Bootstrap UCL		0.164251
			Percentile Bootstrap UCL		0.163292
			BCA Bootstrap UCL		0.154
NO RECOMMENDATION AVAILABLE			95% Chebyshev (Mean, Sd) UCL		0.186171
			97.5% Chebyshev (Mean, Sd) UCL		0.20916
Select 95% Confidence Coefficient			99% Chebyshev (Mean, Sd) UCL		0.254317

General Statistics

Data File	G:\divine strake\Report\UCLs\SOIL UCL.xls	Variable:	S-U-238	

Raw Statistics		Normal Distribution Test	
Number of Valid Samples	24	Shapiro-Wilk Test Statisitic	0.767825
Number of Unique Samples	20	Shapiro-Wilk 5% Critical Value	0.916
Minimum	0.7	Data not normal at 5% significance level	
Maximum	2.01		
Mean	1.048333	95% UCL (Assuming Normal Distribution)	
Median	0.98	Student's-t UCL	1.142702
Standard Deviation	0.269745		
Variance	0.072762	Gamma Distribution Test	
Coefficient of Variation	0.257308	A-D Test Statistic	1.302736
Skewness	2.274372	A-D 5% Critical Value	0.742304
		K-S Test Statistic	0.245017
Gamma Statistics		K-S 5% Critical Value	0.177523
k hat	19.883	Data do not follow gamma distribution	
k star (bias corrected)	17.42541	at 5% significance level	
Theta hat	0.052725		
Theta star	0.060161	95% UCLs (Assuming Gamma Distribution)	
nu hat	954.3842	Approximate Gamma UCL	1.138338
nu star	836.4195	Adjusted Gamma UCL	1.144955
Approx.Chi Square Value (.05)	770.2866		
Adjusted Level of Significance	0.0392	Lognormal Distribution Test	
Adjusted Chi Square Value	765.8348	Shapiro-Wilk Test Statisitic	0.881198
		Shapiro-Wilk 5% Critical Value	0.916
Log-transformed Statistics		Data not lognormal at 5% significance level	
Minimum of log data	-0.356675		
Maximum of log data	0.698135	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	0.021844	95% H-UCL	1.135287
Standard Deviation of log data	0.219195	95% Chebyshev (MVUE) UCL	1.251509
Variance of log data	0.048046	97.5% Chebyshev (MVUE) UCL	1.340491
		99% Chebyshev (MVUE) UCL	1.515279
		95% Non-parametric UCLs	
		CLT UCL	1.138901
		Adj-CLT UCL (Adjusted for skewness)	1.166215
		Mod-t UCL (Adjusted for skewness)	1.146962
		Jackknife UCL	1.142702
		Standard Bootstrap UCL	1.135013
		Bootstrap-t UCL	1.205466
RECOMMENDATION		Hall's Bootstrap UCL	1.553394
Data are Non-parametric (0.05)		Percentile Bootstrap UCL	1.140833
		BCA Bootstrap UCL	1.19
Use Student's-t UCL		95% Chebyshev (Mean, Sd) UCL	1.288341
or Modified-t UCL		97.5% Chebyshev (Mean, Sd) UCL	1.392192
		99% Chebyshev (Mean, Sd) UCL	1.596188

General Statistics

Data File	G:\divine strake\Report\UCLs\SOIL UCL.xls	Variable:	S-U-238		
Raw Statistics			Normal Distribution Test		
Number of Valid Samples	24		Shapiro-Wilk Test Statisitic		0.767825
Number of Unique Samples	20		Shapiro-Wilk 5% Critical Value		0.916
Minimum	0.7		Data not normal at 5% significance level		
Maximum	2.01				
Mean	1.048333		99% UCL (Assuming Normal Distribution)		
Median	0.98		Student's-t UCL		1.18598
Standard Deviation	0.269745				
Variance	0.072762		Gamma Distribution Test		
Coefficient of Variation	0.257308		A-D Test Statistic		1.302736
Skewness	2.274372		A-D 5% Critical Value		0.742304
			K-S Test Statistic		0.245017
Gamma Statistics			K-S 5% Critical Value		0.177523
k hat	19.883		Data do not follow gamma distribution		
k star (bias corrected)	17.42541		at 5% significance level		
Theta hat	0.052725				
Theta star	0.060161		99% UCLs (Assuming Gamma Distribution)		
nu hat	954.3842		Approximate Gamma UCL		1.178232
nu star	836.4195		Adjusted Gamma UCL		1.192962
Approx.Chi Square Value (.01)	744.2051				
Adjusted Level of Significance	0.00508		Lognormal Distribution Test		
Adjusted Chi Square Value	735.0161		Shapiro-Wilk Test Statisitic		0.881198
			Shapiro-Wilk 5% Critical Value		0.916
Log-transformed Statistics			Data not lognormal at 5% significance level		
Minimum of log data	-0.356675				
Maximum of log data	0.698135		99% UCLs (Assuming Lognormal Distribution)		
Mean of log data	0.021844		99% H-UCL		N/A
Standard Deviation of log data	0.219195		95% Chebyshev (MVUE) UCL		1.251509
Variance of log data	0.048046		97.5% Chebyshev (MVUE) UCL		1.340491
			99% Chebyshev (MVUE) UCL		1.515279
			99% Non-parametric UCLs		
			CLT UCL		1.176425
			Adj-CLT UCL (Adjusted for skewness)		1.2268
			Mod-t UCL (Adjusted for skewness)		1.19024
			Jackknife UCL		1.18598
			Standard Bootstrap UCL		1.175089
			Bootstrap-t UCL		1.302172
			Hall's Bootstrap UCL		1.809424
			Percentile Bootstrap UCL		1.185
			BCA Bootstrap UCL		1.25
NO RECOMMENDATION AVAILABLE			95% Chebyshev (Mean, Sd) UCL		1.288341
			97.5% Chebyshev (Mean, Sd) UCL		1.392192
Select 95% Confidence Coefficient			99% Chebyshev (Mean, Sd) UCL		1.596188

Appendix C

Sample Location Coordinates

C.1.0 Sample Locations

Table C.1-1 lists the actual sample location coordinates for the undisturbed surface material population samples.

Table C.1-1
Actual Sample Location Coordinates
Undisturbed Surface Material Population

Easting	Northing	Label	Sample No.
572869.32	4097303.91	A1	DSA21
572978.78	4097303.91	A2	DSA20
572814.58	4097398.71	A3	DSA19
572540.92	4097493.51	A4	DSA09
572650.38	4097493.51	A5	DSA12
572759.85	4097493.51	A6	DSA18
572869.32	4097493.51	A7	DSA17
573041.41	4097566.54	C8	DSA26
572566.16	4097609.04	C19	DSA24
572705.12	4097588.31	A10	DSA10
572945.23	4097618.81	C11	DSA25
572924.05	4097588.31	A12	DSA15
573033.52	4097588.31	A13	DSA16
572650.38	4097683.11	A14	DSA22
572752.87	4097723.35	C21	DSA11
572849.05	4097671.08	C16	DSA14
572978.78	4097683.11	A17	DSA08
573088.25	4097683.11	A18	DSA07
572705.12	4097777.91	A19	DSA01
572814.58	4097777.91	A20	DSA03
572924.05	4097777.91	A21	DSA04
573033.52	4097777.91	A22	DSA05
572869.32	4097872.71	A23	DSA13
572978.78	4097872.71	A24	DSA06

Table C.1-2 lists the actual sample location coordinates for the disturbed material population samples.

Table C.1-2
Actual Sample Location Coordinates
Disturbed Material Population

Easting	Northing	Label	Sample No.
572902.48	4097558.39	B1	DSB01
572887.01	4097545.82	D1	DSB18
572851.43	4097574.67	B3	DSB03
572886.09	4097599.39	D2	DSB02
572840.15	4097571.80	D3	DSB19
573045.50	4097362.76	B6	DSB08
572994.45	4097379.05	B7	DSB06
573034.08	4097415.12	B8	DSB04
572903.78	4097359.26	B9	DSB07
572943.41	4097395.33	B10	DSB09
572983.03	4097431.40	B11	DSB11
572987.21	4097473.34	D11	DSB14
573062.28	4097503.53	B13	DSB05
572852.73	4097375.54	B14	DSB17
572892.36	4097411.61	B15	DSB16
572659.96	4097388.32	B16	DSB12
572699.59	4097424.39	B17	DSB13
572803.48	4097362.98	D15	DSB15

Table C.1-3 lists the actual sample location coordinates for the subsurface rock population samples.

Table C.1-3
Actual Sample Location Coordinates
Subsurface Rock Population

Easting	Northing	Elevation	Points	Sample No.
572850.38	4097596.89	1579.99	E11	DSC10
572829.81	4097587.24	1580.72	E2	DSC01
572825.79	4097591.10	1581.73	E1	DSC02
572826.39	4097591.75	1581.91	E5	DSC05
572827.17	4097592.52	1581.07	E3	DSC03
572828.44	4097593.85	1581.53	E9	DSC11
572833.13	4097597.36	1580.34	E8	DSC07
572836.53	4097600.65	1579.77	E6	DSC09
572839.26	4097602.98	1579.63	E7	DSC08
572847.45	4097600.85	1579.50	E10	DSC06

Table C.1-4 lists the actual sample location coordinates for the flyover anomaly samples.

Table C.1-4
Actual Sample Location Coordinates
Flyover Anomaly Samples

Easting	Northing	Label	Sample No.
573081.90	4097427.17	F1	DSD01
572868.61	4097452.93	F2	DSD03
572715.16	4097399.07	F3	DSD02