KERR-McGEE CHEMICAL LLC
KERR-McGEE CENTER • P.O. BOX 25861 • OKLAHOMA CITY, OKLAHOMA 73125

September 15, 2003

VIA OVERNIGHT MAIL

D. Blair Spitzberg, Ph.D., Chief
Fuel Cycle Decommissioning Branch
United States Nuclear Regulatory Commission
Region IV
611 Ryan Plaza Drive, Suite 400
Arlington, TX 76011-8064

Re: Docket No. 040-08006; License No. SUB-986
Kerr-McGee Chemical L.L.C. (KMCLLC) Technical Center
Outdoor Final Status Survey Report

Dear Dr. Spitzberg:

Attached are two copies of the above referenced report. This report documents work done on the grounds surrounding the Technical Center. Work was conducted in accordance with our approved decommissioning plan. A subsequent report for interior work will be submitted at a later date.

If you have any questions regarding this matter, please feel free to contact me at (405) 270-2665.

Sincerely yours,

Russell H. Jones
Project Manager

Attachment

cc:
Mike Broderick, ODEQ

Kerr-McGee

Technical Center Decommissioning Project

FINAL STATUS SURVEY REPORT

Outdoor Survey Units

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Kerr-McGee

Technical Center Decommissioning Project

FINAL STATUS SURVEY REPORT

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Kerr-McGee

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FINAL STATUS SURVEY REPORT

Outdoor Survey Units

1. PURPOSE

1.1. This Final Status Survey Report (FSSR) is being submitted by Kerr-McGee Chemical, LLC (KMCLLC) to the Nuclear Regulatory Commission (NRC) for the areas on the Kerr-McGee Technical Center site (KMTC) designated as Outdoor Survey Units (SU). These areas are shown on Figures 1-1 through 1-3 included in Appendix 1. This report discusses the initial characterization surveys which were performed to define the extent and magnitude of residual contamination present within the survey units. The characterization data generated during the initial surveys were utilized in designing the Final Status Survey (FSS) for these survey units. This FSS was performed in accordance with the Final Status Survey Plan (FSSP) and the KMTC Decommissioning Plan[1] (D Plan) to demonstrate that the established guidelines for unrestricted release have been met. The results of the outdoor FSS are presented in this FSSR as justification for release of these survey units from License SUB-986 for unrestricted use.

2. HISTORICAL BACKGROUND

2.1. The KMTC facility was established in 1963 to provide a dedicated research and development facility for conducting chemical and radiological analyses, doing small quantity bench and batch scale research and development studies on manufacturing processes and investigating new chemicals. The site was licensed under a source materials license, SUB-986, and a byproduct materials license, 35-12636-06. License SUB-986 authorized the receipt of small quantities of source material for research and development in designated laboratories within the KMTC facility and in immediately surrounding designated sample storage or sample preparation areas. Source materials could be in any form but were typically ores containing uranium and thorium from NRC or Agreement

[1] Decommissioning Plan for the Kerr-McGee Chemical LLC Technical Center License No. SUB-986, docket No. 040-08006, April 5, 2001.

State licensed facilities, or process stream materials from a NRC licensed natural uranium conversion facility. KMCLLC ceased radiological activities at KMTC in 1998 at which time decommissioning activities were initiated.

2.2. Decommissioning efforts concerning byproduct nuclear materials were completed in 1998 and KMCLLC applied to the NRC to terminate License 35-12636-06. After confirmation that the sealed byproduct material sources had been removed from KMTC and returned to their manufacturers sealed, with no leakage or contamination present, NRC terminated License 35-12636-06 by letter dated March 2, 1998.

2.3. Decommissioning efforts at KMTC involving characterization, decontamination and remediation were initiated in 1998. The goal of the decommissioning effort is to release the entire 160-acre site and facilities for unrestricted use.

2.4. Based upon a survey of historical information and analysis of the characterization data, an arrangement and classification of survey units was determined for KMTC and is reflected in the D Plan. Figures 1-1 through 1-3 in Appendix 1 depict the survey units. The classification (Class) of each survey unit is shown in Table 2.1 along with a description of the survey unit location and the characterization data that was used to determine the classification for each survey unit.

2.5. The characterization soil data includes all soil data not used for background measurements that were taken before August 21, 2002.[2] Characterization scan data consists of the scan data taken through August 22, 2002. Survey units which required remediation were rescanned in their entirety for the FSS. Characterization soil samples from areas which were not removed or disturbed during remediation efforts were used for the FSS.

2.6. The KMTC D Plan was submitted to NRC on April 5, 2001. The NRC approved the KMTC D Plan via license amendment No. 9 on June 5, 2003. The FSSP for the outdoor survey units was in accordance with the KMTC D Plan.

[2] Consequently, a more comprehensive characterization data set is presented in Table 2.1 than was included in the D Plan.

Table 2.1
Soil Characterization Data[a]

					Total U(pCi/g)		Nat Th(pCi/g)		Ra-226(pCi/g)		
Area Location	SSU	Sample Depth	Pts	Class	Max	Mean	Max	Mean	Max	Mean	NaI[b] Max (cpm)
U Test Pits	1	Surface	8	1	1.2	-0.4	0.1	-1.1	0.2	-0.2	870
		Depth	65		41.5	3.3	0.5	-0.2	0.5	0.0	
N of Test Pits	2	Surface	55	1	51.3	2.0	1.1	0.0	7.2	0.3	18,670
		Depth	38		10.0	0.3	0.5	0.0	0.8	0.1	
S of Test Pits	3	Surface	43	1	7..7	0.9	0.5	0.0	0.4	0.1	1,020
		Depth	10		1.1	0.8	0.1	0.0	0.2	0.2	
Buffer	4	Surface	42	2	1.3	0.4	0.5	0.0	0.3	0.1	1,670
		Depth	8		1.2	0.6	0.0	0.0	0.2	0.1	
Drain Line	5	Surface	40	1	8.4	1.0	0.8	0.0	0.6	0.1	1,670
		Depth	23		2.2	0.7	0.5	0.0	0.2	0.0	
TSSL Drain Area	6	Surface	35	1	20.3	1.1	0.0	0.0	37.4	1.2	75,670
		Depth	12		6.7	1.0	0.0	0.0	1.3	0.1	
Access Rd	7	Surface	43	1	16.6	1.0	0.0	0.0	6.8	0.3	14,670
		Depth	20		2.9	0.9	0.0	0.0	0.7	0.2	
Yard	8	Surface	33	1	0.9	0.0	0.0	0.0	0.1	0.0	870
		Depth	8		0.7	0.0	0.0	0.0	0.1	0.0	
Yard	9	Surface	35	1	1.5	0.0	0.0	0.0	0.3	0.0	1,070
		Depth	8		1.2	0.3	0.0	0.0	0.1	0.0	
Buffer	10	Surface	33	2	2.1	0.7	0.0	0.0	0.3	0.1	1,170
		Depth	8		1.0	0.2	0.0	0.0	0.1	0.0	
Storage Area	11	Surface	32	1	2.9	3.2	0.0	0.0	33.3	1.5	26,670
		Depth	12		21.6	3.3	0.0	0.0	9.6	1.2	
Storage Area	12	Surface	35	1	27.2	2.0	95.7	1.9	691.4	20.5	52,670
		Depth	16		16.4	2.6	0.0	0.0	5.9	0.6	
Storage Area	13	Surface	36	1	1.8	0.9	0.0	0.0	0.3	0.1	1,470
		Depth	12		1.2	0.4	0.0	0.0	0.2	0.0	
Storage Area	14	Surface	35	1	1.7	0.8	0.2	0.0	0.3	0.1	1,270
		Depth	8		0.4	0.2	0.0	0.0	0.2	0.0	
N/E of Bldg	15	Surface	38	2	3.9	0.7	2.0	0.0	0.3	0.0	3,370
		Depth	21		1.8	0.8	0.0	0.0	0.1	0.0	
E. Drainage	16	Surface	39	1	13.5	1.6	0.1	0.0	12.5	0.8	3,670
		Depth	11		1.5	0.6	0.0	0.0	1.0	0.2	
E. Drainage	17	Surface	50	1	291.8	28.2	5.8	0.0	119.1	9.8	51,670
		Depth	31		102.8	11.2	1.8	0.0	19.2	2.9	
E. Drainage	18	Surface	40	1	19.8	2.1	0.0	0.0	3.7	0.5	5,670
		Depth	23		5.4	0.5	0.2	0.0	1.7	0.1	
E. Drainage	19	Surface	69	1	49.3	5.0	30.3	2.0	1.9	0.3	13,670
		Depth	90		31.9	0.9	1.5	0.0	0.3	0.0	
E. Drainage	20	Surface	51	1	11.4	2.3	5.7	0.0	0.6	0.1	8,670
		Depth	58		2.7	0.1	0.4	0.0	0.3	0.0	
E. Pond	21	Surface	44	1	3.4	0.1	0.6	0.1	0.7	0.3	1,870
		Depth	20		1.0	0.0	0.4	0.0	0.4	0.1	
E. Pond	22	Surface	42	1	1.8	0.5	0.6	0.1	0.5	0.3	1,770
		Depth	14		1.5	0.1	0.5	0.0	0.4	0.2	

[a] Concentrations and data given in this table do not include the contribution from natural background. When subtraction of background produced negative numbers, the value was set to zero. Post- remediation data points are excluded.

[b] Maximum net cpm using a shielded 3"x 0.5" NaI detector.

3. SCOPE OF DECOMMISSIONING ACTIVITIES

3.1. Description of the Survey Units

3.1.1. The SU's included the former Uranium Test Pits (UTPs), a water treatment system consisting of a sediment collection tank, a limestone pit and drain lines, some storage areas, drainage areas east of the main building, some material drainage areas and buffer zones. Additionally, within these survey units are outdoor areas bordering the buildings' laboratories and plants where source and byproduct materials had been in use historically, as well as drainage and surrounding areas. Maps of the outdoor survey units covered by this FSS are presented as Figures 1-1 through 1-3 in Appendix 1.

3.2. Remediation

3.2.1. KMTC decommissioning activities resulted in the removal of the source materials from the UTPs in preparation for the future expansion of Highway 74 by the Oklahoma Department of Transportation and the resulting disposal of these materials at a licensed LLRW disposal facility. All other outdoor areas were characterized and, where necessary, remediated to meet the unrestricted release criteria.

3.3. Data Collection

3.3.1. The FSS data in this FSSR was collected in accordance with MARSSIM[3] and the KMTC D Plan. Wherever characterization data met the data quality objectives and the location of such data was not disturbed by remediation efforts, characterization data were used as FSS data.

3.4. Identification of Contaminants

3.4.1. The licensed source materials utilized at the KMTC site were natural uranium and natural thorium. Characterization and FSS have confirmed the presence of these radionuclides and associated decay products at the site.

3.5. Background Reference Levels

3.5.1. For comparison to guideline values, natural background levels for the contaminants of interest are presented in Tables 3.1 and 3.2. The soil background levels were determined by the analysis of 291 soil samples taken at 73 locations in the unaffected areas south of the main building. The asphalt background levels were determined by the analysis of asphalt samples taken from 10 locations at off-site unaffected areas.

[3] NUREG-1575, *Multi-Agency Radiation Survey and Site Investigation Manual*

Table 3.1
Soil Background Reference Data

Isotope	Mean (pCi/g)	Sigma (pCi/g)	Location	Number of Survey Points
Total Uranium	1.8	0.9	Unaffected areas (southern half of the site)	291
Natural Thorium	2.3	0.3	Unaffected areas (southern half of the site)	291
Radium 226	0.6	0.1	Unaffected areas (southern half of the site)	291

Table 3.2
Asphalt Background Reference Data

Isotope	Mean (pCi/g)	Sigma (pCi/g)	Location	Number of Survey Points
Total Uranium	0.7	0.5	Unaffected areas (Off Site)	10
Natural Thorium	0.4	0.2	Unaffected areas (Off Site)	10
Radium 226	0.3	0.1	Unaffected areas (Off Site)	10

3.5.2. Asphalt at sample locations was ground into a soil-like consistency and tested as soil. When the survey grid included asphalt areas, the background data for soil and asphalt were included in a single background data set so that the Wilcoxon rank sum test could be applied to the survey unit.

3.5.3. The background for shielded gamma measurements and scans over the materials surveyed was measured in unaffected areas, and the results are presented in Table 3.3.

Table 3.3
Shielded NaI Background Reference Data

Matrix	Mean (cpm)	Location	Number of Survey Points
Grass	3330	Unaffected areas (southern half of the site)	291
Asphalt	2160	Unaffected areas	10
Concrete	2110	Unaffected areas	10
Brick	4860	Unaffected areas	10

3.6. Radiological Release Criteria

3.6.1. Release Criteria for Radionuclides in Soil

3.6.1.1. The release criteria for uranium, radium 226 and thorium contamination in soil and paved areas are equivalent to those levels corresponding to a net dose of 25 mrem per year for an individual member of the public[4]. Table 3.4 displays the Derived Concentration Guidelines (DCGLw) for the radionuclides of interest taken from the D Plan. A survey unit is released by determining the fractional contribution from each series and applying the unity rule per Appendix D of the D Plan.

Table 3.4
Soil and Paved Areas Release Criteria

Nuclide	Surface Soil DCGLw (pCi/g)	Subsurface Soil[a] DCGLw (pCi/g)
Natural Thorium	5.3	NA
Total Uranium (to Uranium 234)	228	165
Radium 226 (Th 230 series)	3.5	NA

[a] The subsurface soil release limit applies to the Uranium Test pit. The DCGLw for the Test Pit is lower than the limit for surface soils due to ground water considerations. For other sub-surface areas which lie above the ground water, the surface soil limits were applied.

3.6.1.2. The criteria in Table 3.4 were compared with survey data net of background as described in Section 6 and Table 5.2 of the D Plan.

[4] Average member of the critical population.

3.6.1.3. Localized regions of elevated radioactivity were evaluated against the DCGL for Elevated Material Concentrations ($DCGL_{EMC}$), which is a function of area.[5] The area factor for Uranium presented in Appendix C of the D Plan was used for computation of $DCGL_{EMC}$ values. This curve was reduced to the following equation using the curve-fit algorithm provided with MS Excel ©.

a priori $DCGL_{EMC} = 11.76 * (\text{Largest Circular Area})^{-0.4223} * DCGL_w$

3.6.1.4. An "a priori $DCGL_{EMC}$" was calculated based upon the largest circular unsampled area that could be described between the grid locations in each survey unit. This value represents the lowest activity in the soil which could exceed the EMC criterion[6] in between the grid soil samples. The a priori $DCGL_{EMC}$ was compared with the scanning instruments' capability (see Section 3.7.) to make sure that any unsampled concentrations which might exceed the EMC criteria could be detected by scans.[7]

3.6.1.5. Table 3.5 provides the a priori $DCGL_{EMC}$ for each survey unit. The values in Table 3.5 are listed as a multiple of the sum of the fractions of the individual release limits.

[5] KMTC D Plan, Appendix C.
[6] Any smaller elevated areas between the grid points would have a higher EMC limit.
[7] Reduction of the grid spacing will raise the *a priori* $DCGL_{EMC}$ as required to match the detector's capability.

Table 3.5
a priori $DCGL_{EMC}$ Value

Soil Survey Unit	Largest Circular Area (m^2)	*a priori* $DCGL_{EMC}$[a] (pCi/g)	*a priori* EMC Scan Threshold[b] (cpm)
1	6.1	5.5	16,170
2	82.8	1.8	5,292
3	73.8	1.9	5,586
4	252.0	1.1	3,234
5	80.9	1.8	5,292
6	59.6	2.1	6,174
7	68.9	2.0	5,880
8	60.9	2.1	6,174
9	59.2	2.1	6,174
10	103.4	1.7	4,998
11	65.5	2.0	5,880
12	77.6	1.9	5,886
13	78.6	1.9	5,886
14	82.1	1.8	5,292
15	345.7	1.0	2,940
16	41.1	2.4	7,056
17	81.2	1.8	5,292
18	80.0	1.8	5,292
19	76.7	1.9	5,886
20	80.2	1.8	5,292
21	83.5	1.8	5,292
22	82.4	1.8	5,292
23	67.6	2.0	5,880
24	175.0	1.3	3,822

[a] With application of the unity rule $DCGL_w$ becomes 1, so the values in this column are the same as the area factors.

[b] Derived by multiplying the DCGLw for Radium 226 by the area factor and the conversion factor given in Appendix 5.

3.6.2. Action Thresholds for Shielded NaI Scans

3.6.2.1. Shielded NaI scans were performed using the action thresholds presented in Table 3.6. Areas exceeding the thresholds were sampled for further analysis.

Table 3.6
Action Threshold for Shielded 3" x 0.5" NaI Scans[8]

SU Class	Action Threshold (cpm above mean background)
1	2,500
2	2,500

3.6.3. Release Criterion for Groundwater

3.6.3.1. The release limit for groundwater is 226 pCi/L total uranium.

3.6.4. Release Criteria for Fixed Equipment.

3.6.4.1. The release criteria for building surfaces were applied to affected fixed equipment that was not expected to be removed. Some examples include drains and buried piping. These items were surveyed for release using beta instruments wherever possible. Where a direct beta measurement was not possible, shielded NaI detectors were used to provide a qualitative estimate of radioactivity.

3.6.4.2. Table 3.7 displays the release limits (DCGLw) for the radionuclides of interest[9] on building surfaces and fixed equipment. For simplicity, the most restrictive Th-232 limit was used for final status surveys.

[8] NEXTEP Tech Memo 0209, *Technical Support Document for KMTC Final Status Surveys*, A.H. Thatcher, CHP. (Appendix 5)

[9] NRC License Number SUB-986, Amendment No. 9 dated June 5, 2003.

Table 3.7
Building Surface and Fixed Equipment Release Criteria

Nuclide	$DCGL_w$ (dpm/100 cm²)[a]
Thorium-232 and progeny	12,500
Uranium series through U-234	177,300
Radium-226 and progeny	16,300

[a] The release limit in dpm/100 cm² is based upon total beta emissions and is equivalent to βpm/100cm² used elsewhere in this report.

3.7. Minimum Detectable Concentration (MDC) Requirements.[10]

3.7.1. The MDC for laboratory soil spectroscopy should be less than 50% of the release limit. Table 3.8 demonstrates compliance with this requirement.

3.7.2. The Minimum Detectable Count Rate (MDCR) for NaI gamma scans for a class 1 survey unit can be no greater than the a priori DCGLEMC converted to counts per minute for a shielded NaI detector. Table 3.9 demonstrates compliance with this requirement.

3.7.3. The MDCR for NaI gamma scans for a Class 2 SU should be no greater than the DCGLw. Table 3.9 demonstrates compliance with this requirement.

3.7.4. The MDC for beta measurements and scans on fixed equipment is compared with the corresponding MDC requirements in Table 3.10.

3.7.5. Typical MDC and MDCR values for instruments used in the KMTC FSS meet all the requirements as shown in Table 3.8 through 3.10.

3.7.6. Characterization Samples that were not remediated were included as FSS data. Characterization samples that were collected on the surface at grid locations were changed from measurement type CH (characterization) to RG (regular grid) as required to complete the grid. All FSS data not located on the grid is considered bias data although it may appear with codes CH, BI (bias), or PR (post remediation).

[10] See NEXTEP Tech Memo 0209, *Technical Support Document for KMTC Final Status Surveys,* A.H. Thatcher, CHP. (Appendix 5) for derivations.

Table 3.8
MDC for Soil Counts Gamma Spectroscopy

	Natural Thorium (pCi/g)	Total Uranium (pCi/g)	Radium 226 (pCi/g)	Count Time (min.)
Required MDC	***2.7***	***114[a]***	***1.7***	
KMTC Soil Counter (typ)	0.1	0.8	0.1	2

[a] 82 for the Uranium Test Pit (SU 1)

Table 3.9
MDCR for Outdoor Shielded 3" X 0.5" NaI Gamma Scans[11]

	Class 1 (cpm)[b]	Class 2 (cpm)[b]
Required MDCR[12]	**5,300 – 16,200[a]**	**2,940**
Shielded 3" X 0.5" NaI[7]	1,200	1,200

[a] The required MDCR for Class 1 SU's is the required MDCR for Class 2 SU's modified by the area factor and listed in Table 3.5.

[b] The required MDCR relates to the counts per minute attributable to Ra-226 at the $DCGL_w$, net of background. Ra-226 is used since it has the most restrictive count conversion rate.

Table 3.10
MDC for Fixed Equipment[13]

	MDC for Beta Direct[a]		MDC for Beta Scans[a]
	Activity (βpm /100 cm^2)	**Count Time** (min.)	(βpm/100cm^2)
Required MDC	**6,250**		**12,500**
L2224/43-89[b]	740	1	4,350

[a] The MDC relates to the counts attributed to Th-232 and progeny expressed in total beta per minute over 100 cm2.

[b] Also applies to 2360/43-89.

[11] KMTC D Plan, Appendix E contains the MDCR calculation for a shielded NaI detector.
[12] NEXTEP Tech Memo 0209 (Appendix 5), ibid.
[13] NEXTEP Tech Memo 0209 (Appendix 5), ibid.

4. FINAL STATUS SURVEY METHODS

4.1. The purpose of this section is to discuss the methods used to collect the survey data presented in this report. The FSS data were used to show that all requirements of the D Plan were met. Any characterization data taken which met quality requirements for FSS have been included as FSS data. All characterization data points that have not been removed met the quality requirements for FSS and are included in this report.

4.2. Procedures

4.2.1. Procedures: The FSS conformed to the following procedures:

- KM-CI-RP-31: Personnel Monitoring and Decontamination
- KM-CI-RP-33: Decontamination of Tools, Equipment, Materials and Surfaces
- KM-CI-RP-39: Performance of Radiation and Contamination Surveys
- KM-CI-RP-40: Survey Documentation and Review
- KM-CI-RP-62: Cimarron Soil Counter Operation
- KM-CI-RP-49: NaI 3" Detector
- KM-CI-RP-52: Ludlum 2224 Alpha-Beta Detector
- KM-CI-RP-57: Ludlum 2220/2221 43-68 Beta Probe

4.3. Instrumentation

4.3.1. Survey and soil sampling data were collected using the instrumentation listed in Table 4.1.

4.3.2. 3" x 0.5" NaI Gamma Detector - The 3" x 0.5" detector uses a sodium iodide (NaI) crystal gamma detector. The NaI detector was paired with a portable scaler/ratemeter with single channel analyzer capability. This detector was used in two configurations; shielded and unshielded.

4.3.2.1. Shielded: The NaI detector was shielded with lead around the top socket and sides to improve the directional sensing capabilities of the equipment. All characterization and investigative scans were performed with a shielded NaI detector.

4.3.2.2. Unshielded: The NaI detector was used without the lead around the top socket and sides. The detector was used in this configuration only during post remediation scans. In the unshielded configuration, the detector was used to locate local maxima above 1.5 times ambient background. The maxima were then rescanned with a shielded 3" x 0.5" NaI detector.

4.3.3. Micro-R Meter - The Micro-R meter was used as a qualitative measure of the exposure rate in an area. This instrument was not used to determine release status, since the DCGLw values incorporate ambient dose rate.

4.3.4. Soil Counters (Gamma Spectroscopy) - Soil Counter #2 was the soil counter used for Cimarron decommissioning with modified software to meet the specific conditions at KMTC. It was used for early sample counts and was replaced by Soil Counter #3 (a deep well detector which utilized the same software as Soil Counter #2). Soil Counter #3 was fully operational by late 2001.

4.3.4.1. Cimarron Soil Counter #2 consisted of a 4" x 4" x 16" sodium iodide crystal housed in a shielded chamber which was computer linked to a multi-channel analyzer (MCA). The counting system determined concentrations of Total U, Total Th, and Ra-226. Soil Counter #2 was programmed to determine the total uranium present in the soil sample by calculating the U-234 activity based upon the U-235 activity measured in the soil sample. The U-234 and U-235 activities were summed with the detected U-238 activity to obtain the total uranium activity.

4.3.4.2. Soil Counter #3 consists of a 7.5" x 7" sodium iodide crystal well detector housed in a shielded chamber and computer linked to a multi-channel analyzer (MCA). Soil Counter #3 was setup, maintained and operated at the Technical Center during the period of Final Status Survey.

Table 4.1
Cimarron / Technical Center Radiation Monitoring Instruments

Instrument Type	Number Avail.	Radiation Detected	Scale Range	BKG	Typical Efficiency	Typical MDA 95% Confidence Level
Micro-R Meter (Ludlum 19)[a] 1" x 1" NaI Detector	3	Gamma	0 – 5,000 μR/h	7 μR/h- 9 μR/h	N/A	2 μR/h
3" x ½" NaI Scintillation (43-82)[a] Digital Scaler (Ludlum 2220)	3	Gamma	0 - 500,000 cpm	3,300 cpm avg. shielded 6,500 cpm avg. unshielded	N/A N/A	300 cpm (Shielded) 500 cpm (Unshielded)
Soil Counter # 2 – Computer Linked 4" x 4" x16" NaI (Tl) Detector	1	Gamma	---	1.8 pCi/g total U 2.3 pCi/g Th (Nat) 0.6 pCi/g Ra-226	4% 15% 30%	5 pCi/g Total U (5min. count) 0.6 pCi/g Th (Nat) (5min. count) 0.3 pCi/g Th (Nat) (5min. count) 3 pCi/g Total U (15min. count) 0.3 pCi/g Th (Nat) (15min. count) 0.2 pCi/g Ra-226 (15min. count)
Soil Counter # 3 – Computer Linked 7.5" x 7" NaI Well Detector	1	Gamma	---	1.8 pCi/g U 2.3 pCi/g Th (Nat) 0.6 pCi/g Ra-226	7.3% 86% 141%	0.8 pCi/g Total U (2 min. count) 0.1 pCi/g Th (Nat) (2 min. count) 0.1 pCi/g Ra-226 (2 min count)
Tennelec Smear Counter	1	Alpha Beta	0-99E6	α< 0.8 cpm β< 3.0 cpm	α 40% β 40%	α 12 dpm β 25 dpm
L43-89 α/β Scintillator detector (paired with L2224 or L2360 Ratemeter)	5	Alpha Beta	0-5E5	α< 10 cpm β< 300 cpm	α 15% β 20%	α 100 dpm_α/100 cm^2 β 500 dpm_β/100 cm^2

[a] or equivalent

4.3.5. Ludlum 43-89 Alpha/ Beta Detector

4.3.5.1. The L43-89 is a scintillation detector with capability to detect alpha or beta emissions. The L43-89 was used in the beta configuration, window open, on fixed equipment surfaces surveyed for release. It was used in both alpha and beta configurations for transportation vehicle and container surveys.

4.3.5.2. The L43-89 was paired with either the L2224 or L2360 ratemeter, each containing a single channel analyzer, energy discriminator, and digital, analog and audio outputs. The combined instruments were used to perform direct (integrated) measurements and scan surveys.

4.3.6. Tennelec LB-5100

4.3.6.1. The LB-5100 is a computer-based, low background alpha/beta counting system used for laboratory counting of air, water (dried), and smear samples. Smears were used to characterize fixed equipment and containers used for waste transport.

4.3.7. Portable Instrument Maintenance, Calibration, and Quality Control

4.3.7.1. The instrumentation utilized to generate the FSS data was maintained in accordance with the Cimarron Radiation Protection Program procedures, which were approved by the NRC. These procedures utilized the guidance contained in ANSI N323-1978, "Radiation Protection Instrumentation Test and Calibration". As specified by the Cimarron procedures for instrumentation, requirements included traceability of calibrations to NIST standards, field checks for operability, background radioactivity checks, operation of instruments within established environmental bounds, training of individuals, scheduled performance checks, calibration using isotopes of energies similar to those to be measured, quality assurance tests, data review, and record-keeping.

4.3.7.2. Portable survey instruments were calibrated on at least a semi-annual basis. Where applicable, activities of sources utilized for on-site calibration were corrected for decay. In addition to the periodic calibration requirements, source response checks were performed on a daily basis for all instruments being utilized during FSS work.

4.3.7.3. All calibration and source check records were completed, reviewed, signed-off and retained in accordance with the Cimarron Quality Assurance Program.

4.3.7.4. Established quality assurance measures for the soil counter included Cesium-137 centroid checks, Chi-square tests, background determinations, and the counting of soil standards. All of these quality assurance controls were recorded on control charts and were trended on a continuing basis.

4.3.8. Confirmation ,Verification, Calibration and Quality Control for the Soil Counters

4.3.8.1. Standards used for calibration and quality assurance checks for the soil counter were analyzed by outside laboratories and are NIST traceable through these analyses. Comparisons were made between the standards as counted using the soil counter and two off-site laboratories. The

assigned values for the standards were the average of the results obtained from the off-site laboratories, when the standards were analyzed by more than one laboratory.

4.3.8.2. Total uranium, natural thorium, and Ra-226 activities in soil were determined based upon the evaluation of net counts from the soil counter. Activities were calculated through the use of efficiency and correction factors obtained using appropriate standards. Soil concentrations were calculated by dividing the net activity by the soil mass. Soil masses were determined on a laboratory scale which was checked on a daily basis (when in use) utilizing NIST traceable standards.

4.3.8.3. ORISE has been used by the NRC from time to time for verification of the soil counters at Cimarron and KMTC. Confirmation Surveys were taken and the results were reported as shown in Table 4.2. No significant discrepancies to date have been recorded between soil counters #2 and #3 and ORISE.

Table 4.2
Confirmation and Verification of Soil Counters

Counter #	Survey Date	Area Covered	NRC Inspection #	Results
#2	5/27/97	Cimarron Site	70 - 925/97 - 02	Agreement
#2[14]	7/9/99	Various Sites	70 – 925/99 - 01	Agreement
#3	5/9/01	UTP	40-8006/01-01	Agreement
#3	9/16/02	Neutralization Pit Sludge	40-8006/02-01	Agreement
#3	11/25/02	Remediated SU's other than SU-1	40-8006/02-02	Agreement

4.4. Use of Characterization Data

4.4.1. Characterization data in the form of scan data and soil samples were taken throughout all of the affected areas on the site. The characterization survey revealed areas of elevated radioactivity in several of the survey units. Where remediation was necessary, the elevated radioactive material was removed, the soil was re-sampled, and the entire survey unit was rescanned to ensure that the area met MARSSIM requirements. After remediation was completed, NRC confirmation surveys were requested and performed prior to backfill of excavated areas.

[14] 130 Samples from other KMC sites were analyzed on counter #3 and submitted to NRC for confirmation as part of this report.

4.4.2. Characterization samples that were not remediated were included as FSS data. When they fell in the grid locations, the measurement type[15] was changed from CH to RG. All other characterization data that remains is considered bias data although it may appear with codes indicating CH or BI.

4.5. Soil Samples

4.5.1. Systematic Sampling

4.5.1.1. A systematic grid pattern of soil samples was collected in each survey unit. Grid samples were composites from the surface to a depth of 15 cm. The minimum number of points required and their spacing were calculated in accordance with the statistical guidance given in MARSSIM Sections 5.5.2.2 and 5.5.2.5. Samples taken at depths lower than 15 cm were defined to be bias samples.

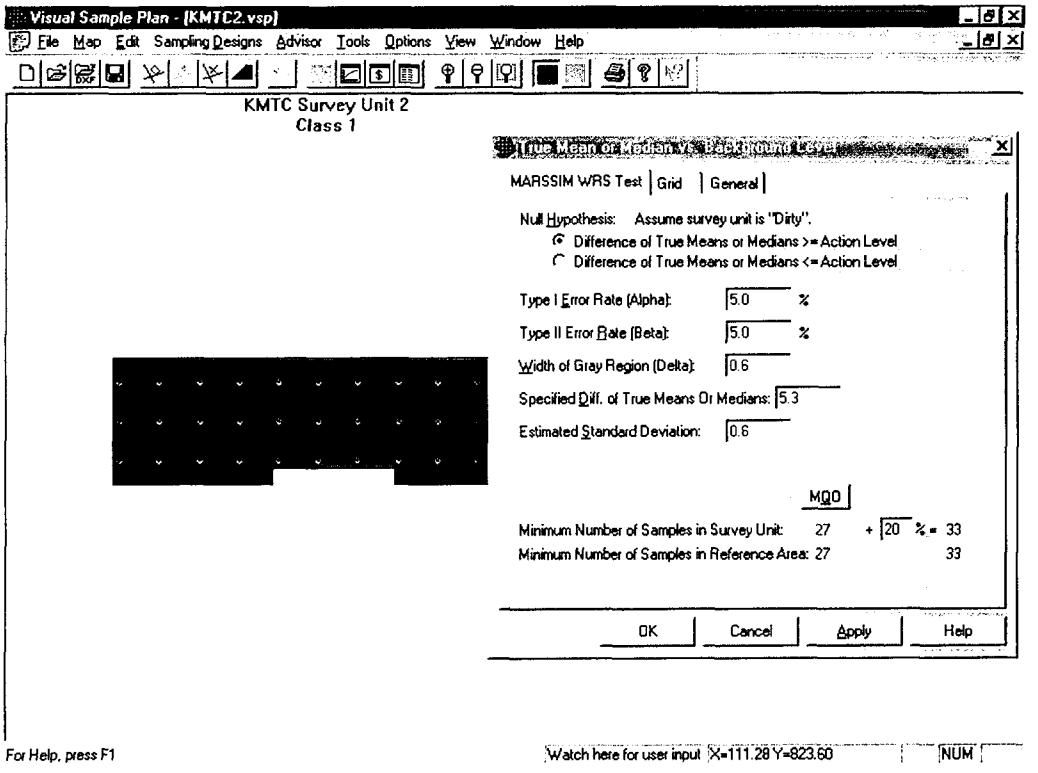
4.5.1.2. Figure 4-1 depicts the screen input and output of Visual Sample Plan© (VSP)[16], a program used to develop the grids for MARSSIM surveys which has been verified by NEXTEP in connection with other projects[17]. VSP contains the DQO input values and assumptions necessary to calculate the number of measurement points, N, required to satisfy MARSSIM statistical guidance. The calculations include 20% excess to allow for inaccessible locations. SU-2 is used here as an example because all survey units except SU-1 had the same input and output values in this program. A summary of all the input parameters used with VSP for this Plan is presented in Table 4.3[18].

[15] See Table 4.6 for measurement type codes.

[16] VSP is a software package that supports the implementation of a DQO process and the development of a technically defensible sampling scheme. The software is developed by Pacific Northwest National Laboratory and sponsored by DOE and EPA.

[17] NEXTEP Tech Memo 0008, *Verification and Validation of Applicable Portions of VSP Software,* A.H. Thatcher, CHP.

[18] Although some characterization data is available and generally serves as the basis for the lower bound for the gray region (LBGR), the actual LBGR and standard deviation for the SU are biased in order to calculate a relative shift of 1 and conservatively estimate the number of required measurement points.



Example of Visual Sample Plan Data Entry and Output

Figure 4-1

Table 4.3
VSP Input

Parameter	SU-1	SU 2-24
Type I Error Rate (%)	5	5
Type II Error Rate (%)	5	5
Width of Gray Region (pCi/g)	2.7	0.6
Specified Differential of True Means (>= Action Level) (pCi/g)	165	5.3
Estimated Standard Deviation (pCi/g)	1.8	0.6
Excess Sample Points Over Minimum (%)	20	20

4.5.1.3. A rectangular grid was used for all survey units except SU-1, which had a triangular grid. For SU's 2 through 24, the grid interval spacing, L, was calculated from the area of the total survey unit and the required number of data points, N, according to the following equation:

$$L \leq \sqrt{\frac{A}{N}}$$

For SU-1, the grid interval spacing was calculated using the following equation:

$$L \leq \sqrt{\frac{A}{0.866 \cdot N}}$$

Table 4.4 presents the calculated values for L and N for each survey unit.

4.5.1.4. In practice the number of grid points included within a survey unit will vary due to geometric considerations, the random origin requirement specified by MARSSIM, and the existence of obstacles such as trees which preclude taking a sample. This variation is acceptable provided at least the minimum number of grid points is achieved (ie. 0.80*N).

Table 4.4
Calculated Grid Point Separation

Survey Unit	Class	N, # Pts to be taken	A, Survey Unit Area (m^2)	L, Grid Spacing (m)
1	1	18	69	2.2
2	1	33	1,851	7.5
3	1	33	1,680	7.1
4	2	33	10,514	17.7
5	1	33	1,800	7.4
6	1	33	1,405	6.5
7	1	33	1,500	6.7
8	1	33	1,324	6.3
9	1	33	1,038	5.6
10	2	33	2,300	8.4
11	1	33	1,415	6.6
12	1	33	1,710	7.2
13	1	33	1,750	7.3
14	1	33	1,750	7.3
15	2	33	7,512	15.1
16	1	33	975	5.4
17	1	33	1,850	7.5
18	1	33	1,700	7.2
19	1	33	1,700	7.2
20	1	33	1,700	7.2
21	1	33	1,800	7.4
22	1	33	1,800	7.4
23	1	33	1,800	7.4
24	2	33	5,450	12.9

4.5.2. Elevated Material Concentration (EMC) Considerations

4.5.2.1. The grid spacing provided by VSP was reviewed as described in Section 3.6.1 to ensure that small areas of elevated radioactivity existing between the grid survey points which exceed the limits for EMC could be detected by scans using typical instruments and MDC's.

4.5.2.2. The KMTC D Plan[19] provides the supporting analysis to show how the spacing of the grid measurements and the Scan MDCR can adequately identify locations that exceed the DCGLw.

[19] KMTC D Plan Section 6.4.7.

4.5.3. Bias Sampling

4.5.3.1. In addition to the statistical surface samples, bias samples were taken at various locations and depths. Such samples were chosen based upon the likelihood of contamination (i.e., areas where radioactivity would be likely to accumulate due to surface topography or other factors), statistical methods, the judgment of the site RSO or senior HP technician, and according to best practices. Bias samples were also collected to examine and characterize areas with elevated levels of radioactivity in accordance with the Hot Spot Protocol presented in Appendix 6. When bias samples were taken below the surface they were usually taken as composite samples from 15 cm to 50 cm, and 50 cm to 1 m in depth from the local surface.

4.5.4. Asphalt Sample Locations

4.5.4.1. Asphalt paved surfaces were surveyed by taking composite samples from the top six inches of asphalt. The soil samples beneath the asphalt were classified as Bias (BI). Regular Grid (RG) points that fell on concrete areas were sometimes offset to the nearest soil or asphalt locations.

4.5.5. Sample Results

4.5.5.1. Figures 4-1 through 4-3 in Appendix 1, show soil sample results obtained during the Characterization phase. Appendix 1, Figures 5-2 and subsequent show the soil sample results after remediation and FSS were complete.

4.6. Scans

4.6.1. Each area to be scanned was divided into 100m^2 blocks which were scanned with a shielded 3" x 0.5" NaI detector. Shielded scan surveys were performed on 100% of all outdoor surfaces (ground surface, asphalt and concrete areas) for class 1 survey units and at least 10% of all outdoor surfaces for class 2 survey units. Characterization scan data was used for FSS in survey units where no remediation was required.

4.6.2. Scan surveys were performed utilizing both visual instrument readout and audible rate changes to provide indication of elevated areas. The action threshold for shielded NaI scan surveys is presented in Table 3.6. The results of the characterization (pre-remediation) scans are presented in Appendix 1, Figure 4-4.

4.6.3. When contaminated soils were excavated, shielded NaI scans were continuously performed to guide the excavation and, when the excavation was complete, soil samples were taken at the maximum scan value in each excavation for confirmation.

4.6.4. As an additional quality control measure, survey units which had been remediated and back-filled were scanned in their entirety with the unshielded NaI detector. Any areas that exceeded 1.5 times background were scanned again with the shielded detector using the thresholds in Table 3.6. If no unshielded readings were obtained above 1.5 times background, the area with the highest unshielded readings was re-scanned with the shielded detector for final confirmation.

4.7. Buried Piping and Other Affected Fixed Equipment

4.7.1. Bias survey measurements were obtained on all affected buried piping and other fixed equipment in specific survey units. To the extent practical, internal access points for pipes were surveyed by direct β measurement, or NaI scan to determine the potential for internal radioactivity. Sludge and removable materials at access points were collected and sent to the HP lab for analysis. Where removable contamination was measured in excess of 200 dpm/100cm^2 [20], additional characterization data was collected or the surfaces were remediated.

4.7.1.1. The radioactivity on the interior surfaces of affected pipes or drain lines were determined by making measurements at access points, provided that contamination at these locations was likely to be representative of contamination on the interior.

4.7.1.2. Discharge piping was considered contaminated if:

i.) Direct β measurements on accessible internal surfaces exceeded the DCGLw,

ii.) Sludge taken from traps or access points and analyzed at the HP lab exceeded the DCGLw for soil,

iii.) Removable contamination measured more than 200 βpm/100cm^2 above background, or

iv.) Gamma scans/measurements on external surfaces exceeded 2x background.

4.8. Measurements Exceeding Limits

4.8.1. In the event that scan measurements exceeded the Table 3.6 Action Threshold, or if soil sample results were determined to have activity exceeding the release limits, the procedures described in the D Plan and the Hot Spot Evaluation Protocol (Appendix 6), were carried out.

4.9. Data Collection and Evaluation

4.9.1. All FSS data recorded in the field was submitted to the Quality Assurance Coordinator (QAC) for processing and review. The data collection forms and annotated drawings were signed by the technician collecting the data and reviewed

[20] FC-8323 limit for the Thorium series. In this case dpm refers to β emissions (see note, Table 3.7).

by the HP supervisor overseeing the survey. After data entry and review, the QAC approved the data sheets and filed them with the permanent KMTC records. The approved forms are listed in Table 4.5 below.

Table 4.5
Approved Data Collection Forms

Form Number	Title	Purpose
QATC-017	FSS Data Collection Sheet	Collection of Soil Samples
QATC-018	FSS Outdoor Scan Measurement Survey Form	Recording data from Scans and investigation of hot spots
QATC-019	Remediation and Supplemental Data Request	Request and authorize remediation and/or supplemental data collection

4.9.2. Where post remediation or supplemental data were required, the analyst reviewing the data generated a request form with instructions for remediation (where required) and for the collection of additional data. The soil samples taken were filled out on the request. Before work proceeded to perform the remediation or collect additional samples, the request form was signed by either the RSO (Cimarron) or the RSO (Technical Center) authorizing the work.

4.9.3. The QAC was responsible for initial screening of the incoming data to ensure that SOP and FSSP requirements had been fulfilled and that the data had been legibly and accurately recorded. This process was carried out by qualified staff personnel selected by the QAC and included the following:

- Evaluating the completeness of the forms and data tables
- Verifying instrument calibration.
- Verifying survey technician training qualifications
- Making a judgment about the overall quality of the data. This was a check to identify gross errors in data recording
- Determining if data were reported in the appropriate Standard Units.
- Verifying that all the requested samples were obtained according to the FSSP.

4.9.4. The QAC was also responsible for the accurate transcription of the survey data from paper records into the project's database. Some of the checks required (such as calibration of equipment or training of the surveyor) were performed automatically within the database.

4.9.5. The QAC maintained the permanent archive files of all survey data taken in connection with the project and provided for its security, organization, and availability to authorized reviewers including the NRC.

4.9.6. Once the survey data set was complete, verified, transcribed and filed by the QAC, it was examined by an analyst and several tests were applied to the data as described in the D Plan[21].

4.10. Reports

4.10.1. All the required tests were performed on each survey unit as a part of the Threshold Comparison Test Report (TCTR) generated by the KMTC Radiation Database. All required tests have been combined into this standard database report and the calculations have been verified[22]. The output of the TCTR was used for analysis of the data in each survey unit and the results are presented in Appendix 3, Tabs 1 through 24. The TCTR was run for each individual radionuclide and for FMPC on all survey units. All four versions of the TCTR (U, Th, Ra, and FMPC) are included for SU-1. For all other survey units only the version which failed the most tests was included[23]. The TCTR is divided into sections as follows:

- General: date, survey unit number, class, and grid information.
- Survey Unit Table: survey unit coordinates and surface area of survey unit.
- Initialization Data: On startup of the analysis report program, the analyst must tell the program which parameters to use while running the tests described in this section. The *Initialization Data* section of the report output displays the options that were chosen for the run. The measurement types listed are those chosen by the analyst to be included in the report. Those types are described in Table 4.6 below. The date range chosen is also listed (the default value is "All"). The thresholds applicable to the specified nuclides are also listed. The thresholds were identified in the D Plan. The nuclides tested in the report are also listed. Usually, only the FMPC report will be included. When one of the individual nuclides fails a test other than background, the report for that nuclide is included as well.
- Survey Unit Test Status: Lists Pass/Fail status of all tests and gives a high level summary of key activity levels in the survey unit.
- Points that failed tests: Lists all points that failed each specified test.
- Points that passed Background, DCGLw, and EMC tests.

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[21] KMTC D Plan Section 6.3.

[22] NEXTEP Tech Memo 0227, *Verification of KMTC Radiation Database, Soils Portion,* B. Anderson. (Appendix 2).

[23] Each TCTR contains all the results for every data point in the data set. The nuclide selected (or FMPC) only determines the parameter on which the sort and the tests are performed.

- Wilcoxon Rank Sum (WRS) Test Results: This page lists the results of the WRS Test on the survey unit. If the Test Status line reads Pass then the survey unit passes the WRS Test, and thus may be released if all other criteria have been met. The Data Summary section lists the number of background points used on the data set, and the number of points measured in the WRS Test. Also listed are the referential value (W_r) required by the WRS Test and the critical value (W_c) representing the survey unit. The WRS Test is passed when (W_r) exceeds (W_c). If (W_c) exceeds (W_r) then the survey unit fails the WRS Test, and the survey unit requires remediation prior to release.

Table 4.6
Measurement Types

Measurement Type	Description
RG	Regular Grid
BI	Bias
PR	Post Remediation Bias
PG	Post Remediation Grid
BK	Background
CH	Characterization
QC	Quality Control

4.10.2. An abbreviated description of the tests performed on the data is presented in Table 4.7. Details of the mathematical implementation of these tests are presented in Appendix 2.

Table 4.7
MARSSIM Statistical Tests for Soil Data

Test	Test Criteria for Pass
Min/Max	Difference between minimum background measurement and maximum survey value less than $DCGL_w$
Background	All samples must be less than the background threshold[a]
$DCGL_w$	All samples must be no more than $DCGL_w$ + the background threshold[a]
$DCGL_{avg}$	The average of all net survey values must be less than $DCGL_w$
EMC	All samples must be less than $DCGL_{EMC}$ + the background threshold[a]
WRS	The Wilcoxon Rank Sum Test is described in detail in Chapter 8 of MARSSIM

[a] The background threshold (T_{bk}) is equal to the mean background value plus twice the standard deviation of the background data set (σ_{BK}). (See Appendix 2).

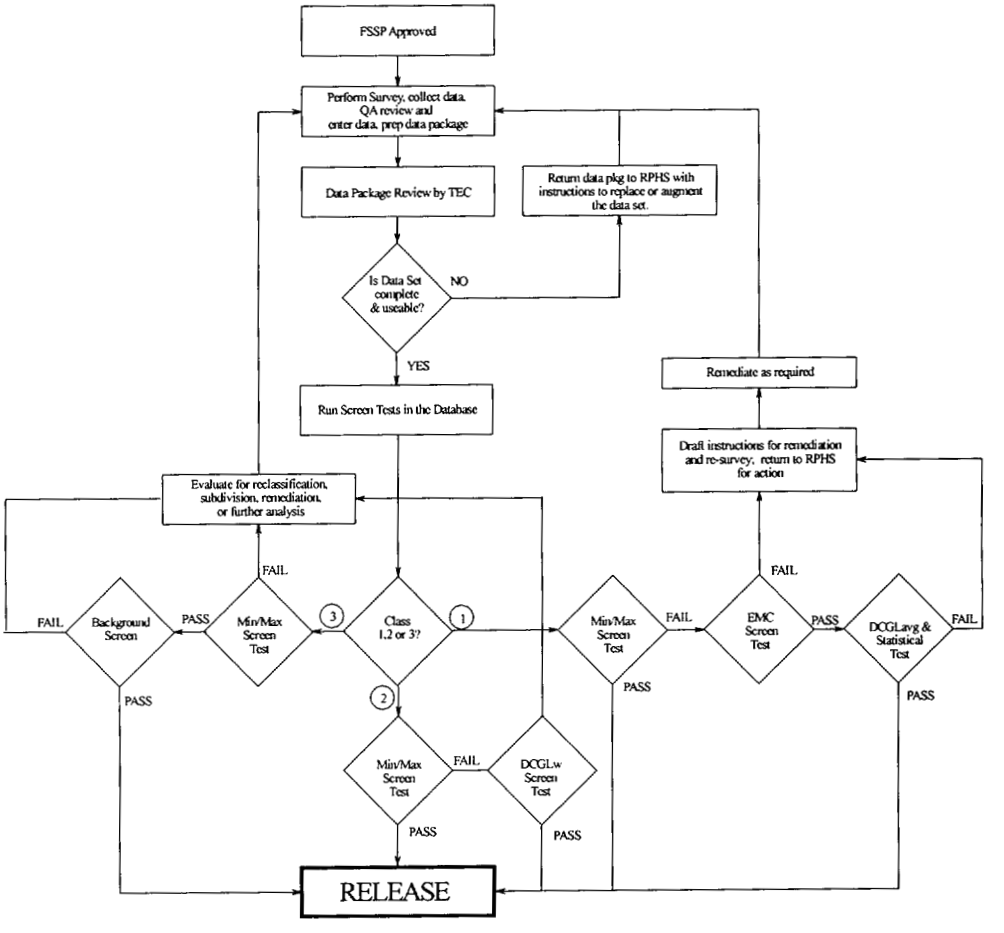
4.10.3. Provided all additional considerations such as scan data, sampling of removable contamination or sludge from traps, etc. indicate that the survey unit is clean, the release of the survey unit can be determined from the test report according to Table 4.8. If a survey unit is Class 2 and fails the min/max test, it must pass the $DCGL_w$ test to be released from the license without reclassification to Class 1 or remediation.

Table 4.8
Requirements for Survey Unit Release

Test	Class 1	Class 2	Class 3
Min/Max	not required[a]	not required[a]	PASS
Background	not required	not required	PASS
$DCGL_w$	not required	PASS	PASS
$DCGL_{avg}$	PASS	PASS	PASS
EMC	PASS	PASS	PASS
WRS	PASS	PASS	PASS

[a] Class 1 or 2 survey units which pass the Min/Max Test may be released without further consideration.

4.10.4. The flow diagram from the D Plan which depicts the decision tree for release of survey units is reproduced in Figure 4-5.



FSS Data Evaluation Process

Figure 4-5

5. RESULTS AND DISCUSSION

5.1. Survey Unit 1

5.1.1. SU-1 is a Class 1 survey unit. The survey unit is located in the northwest corner of the Kerr-McGee Technical Center site. The survey unit contains the area where the Uranium Test Pits (UTP) were located. Figure 1-1 in Appendix 1 shows the survey unit and its location at the site. This survey unit was excavated to enable extraction of the tin horns that were in the UTP.

5.1.2. SU-1 is located in the plane of the bottom of the excavation at a depth of approximately 12 feet from surface grade[24]. This level corresponds to the bottom of the tin horns as they were installed. The area included in SU-1 is 69 m^2.

5.1.3. Remediation

5.1.3.1. The tin horns and the surrounding impacted soil were removed from this survey unit in 2000, and shipped off site for disposal. Post Remediation (PR) soil samples were taken from the bottom and sides of the excavation to ensure that no areas of elevated activity remained in the soil within the excavation both inside and outside of the boundaries of SU-1. A contour map of the UTP excavation is presented in Figure 5-1of Appendix 1.

5.1.4. Groundwater

5.1.4.1. After removal of the tin horns, a groundwater survey was conducted within the UTP excavation area. Uranium levels in a seep area located at the western end of the excavation initially showed elevated levels of total uranium. General area composites, however, were below the release criteria.

5.1.4.2. The excavation initially generated an average of greater than 0.0007 gpm (1,000 gallons/day). This decreased to 0.00007 gpm (100 gallons/day) or less in August 2001.

5.1.4.3. Groundwater from the UTP excavation was analyzed for residual radioactivity both onsite and offsite. Onsite measurements using a Tennelec low-background alpha/beta proportional counter were used for qualitative field results while offsite measurements used alpha spectroscopy and/or KPA methods.

[24] All other survey units are located at ground level.

5.1.4.4. A graph showing total uranium versus time for the UTP groundwater plus a tabular listing of the independent laboratory[25] data are presented in Appendix 4.

5.1.4.5. Uranium concentrations in the seep located in the West end of the excavation continued to show a general decline until the excavation was closed.

5.1.4.6. Just prior to backfilling the excavation, independent laboratory analysis of three samples by General Engineering Laboratories and two samples by Severn Trent Labs (approximately 80 pCi/L total U) indicated concentrations well below the DCGL.

5.1.4.7. The removal of approximately 440,000 gallons of water from the UTP excavation area is believed to have effectively de-watered the area around the excavation and remediated the site, as evidenced by the reduction in both water removal volumes and total U concentration measurements. The combination of decreasing concentration and volume of water entering the excavation suggests that the remaining residual activity in the interstitial pore spaces of soils surrounding the UTP area has been substantially reduced and is below the DCGL.

5.1.5. Final Status Survey Data

5.1.5.1. **Soil Samples** - 66 soil samples were taken from the survey unit in the remediated excavation area. 21 of those samples were regular grid (RG) samples or post remediation grid (PG) samples that were collected at the bottom of the excavation (the base of the tin horns). Other locations were sampled on the pit sides and bottom. 9 locations were sampled to depth below the bottom surface of the pit. Of those, 2 locations were taken to bedrock at less than 1 meter depth and the other 7 locations were taken to a maximum depth of 1 meter from the local surface. All samples measured less than 1.0 FMPC. The data are summarized in Table 5.1.3 and mapped in Appendix 1, Figure 5-2.

[25] General Engineering Laboratories, STL and NRC

Table 5.1.3
FSS Soil Sample Data Summary[a]

Measurement Type	Max FMPC	Number of Survey Points	Uranium		Natural Th		Ra-226	
			Mean (pCi/g)	Max (pCi/g)	Mean (pCi/ g)	Max (pCi/g)	Mean (pCi/ g)	Max (pCi/g)
Grid	-0.1	21	3.0	15	-0.2	0.3	0.0	0.2
Bias	0.0	45	5.5	41.5	-0.5	0.1	0.1	0.5

[a] Activity values are net of mean background. FMPC was calculated net of mean background plus 2 sigma as described in Appendix 2.

5.1.5.2. Some soil was also removed from SU-2 and SU-3 as part of the remediation of the tin horns and surrounding impacted soil. The data gathered from the parts of this excavation that are within SU-2 and SU-3 are not included in this section except that they are summarized in Table 5.1.4 All data from this excavation that is not included in this section is evaluated and addressed in section 5.1.2 or 5.1.3 of this report.

Table 5.1.4
FSS Soil Sample Data in Other Survey Units[a]

Survey Unit	Measurement Type	# Points	Max FMPC	Uranium (pCi/g)		Natural Th (pCi/g)		Ra-226 (pCi/g)	
				Mean	Max	Mean	Max	Mean	Max
2	Bias	86	0.0	1.7	14.2	-0.4	0.3	0.1	0.8

[a] Activity values are net of mean background. FMPC was calculated net of mean background plus 2 sigma as described in Appendix 2.

5.1.5.3. All tests required by the D Plan were performed for this survey unit and all required tests passed. A summary of test results is presented in Table 5.1.5. Each Threshold Comparison Test Report (TCTR) for this survey unit includes a tabular listing of all the soil samples used for the FSS. The results of each screening test and the Wilcoxon Rank Sum test are included in four TCTRs[26] presented in Tab 1 of Appendix 3. Analysis of the soil samples in SU-1 showed that the survey unit met the criteria for release.

5.1.5.4. On May 9, 2001, representatives of NRC Region IV collected confirmation samples from the UTP under NRC inspection number 40-8006/02-02. Analysis performed by ORISE was in agreement with the data produced on site (see Table 4.2 for other confirmatory surveys).

[26] All four versions of the TCTR are included for this survey unit as described in Section 4.10.

Table 5.1.5
Threshold Comparison Test Report Results for SU-1

Test Performed	FMPC	U	Th	Ra	Must Pass
Min/Max	P	P	P	P	
Background	P	F	P	F	
DCGLw	P	P	P	P	
DCGLavg	P	P	P	P	X
EMC	P	P	P	P	X
Wilcoxon Rank Sum	P	P	P	P	X

5.1.5.5. **Scans** – A final scan of the survey unit was performed in January 2003. 100% of the survey unit was scanned after remediation was completed as described in Section 4.6. No elevated readings resulted from the scans.

Table 5.1.6
UTP Area Scan Results[a, b]

Matrix	Investigation Threshold[b]	Maximum Scan[b]	Average Scan
Remediated Pit	2,500 cpm	1,880 cpm	1,190 cpm
Grass	2,500 cpm	1,270 cpm	150 cpm

a. includes 100% of the backfilled area that was excavated during removal of the tin horns.
b. net of mean background.

5.1.6. Conclusions

5.1.6.1. All shielded NaI scans taken on the surface of SU-1 were below the investigation threshold.

5.1.6.2. After remediation, no soil samples from SU-1 exceeded the $DCGL_w$.

5.1.6.3. After remediation, no groundwater tested within SU-1 exceeded the DCGL for groundwater.

5.1.6.4. SU-1 passed all required screening tests.

5.1.6.5. SU-1 passed the statistical WRS test.

5.1.6.6. SU-1 meets all license criteria for release of a Class 1 survey unit.

5.1.7. Recommendations

5.1.7.1. SU-1 should be released from the license.

5.2. Survey Unit 2

5.2.1. SU-2 is a Class 1 survey unit. The survey unit is located in the northwest corner of the Kerr-McGee Technical Center site. The survey unit borders the north side of the area where the Uranium Test Pits (UTP) were located. Since the excavation discussed in Section 5.1 of this report extended into this survey unit, some data covered by this section is due to that excavation. The soil samples collected as a result of that excavation are summarized in Table 5.1.4. Figure 1-1 in Appendix 1 shows the survey unit and its location at the site. The area included in the survey unit is 1,851 m^2.

5.2.2. **Remediation**

5.2.2.1. Prior to excavation of the UTP, two elevated soil samples on the surface of SU-2 were remediated to avoid mixing with the debris from the UTP excavation. The locations of these samples are shown in Appendix 1, Figure 4-1. Removal of less than one cubic foot of soil was sufficient to eliminate the contamination in each case.

5.2.2.2. During the removal of the tin horns from SU-1, contaminated sand, ore, and soil were excavated from the UTP and disposed.

5.2.3. **Final Status Survey Data**

5.2.3.1. **Soil Samples** - 125 FSS soil samples were collected from this survey unit. 33 of those samples were part of the grid, and the other 92 were bias samples. All samples were less than 1.0 FMPC. The data are summarized in Table 5.2.1 and mapped in Appendix 1, Figure 5-3.

Table 5.2.1
***FSS Data*[a,b]**

			Uranium		Natural Th		Ra-226	
Measurement Type	Max FMPC	Number of Survey Points	Mean (pCi/g)	Max (pCi/g)	Mean (pCi/ g)	Max (pCi/g)	Mean (pCi/ g)	Max (pCi/g)
Grid	-0.1	33	0.3	2.0	-0.7	-0.1	0.0	0.3
Bias	0.0	92	1.3	12.9	-0.4	0.4	0.1	0.8

[a] FSS data includes characterization data
[b] Nuclide values are net of mean background. FMPC is net of mean background plus 2 sigma.

5.2.3.2. All tests required by the D Plan passed except the Background Test. All tests required for release of a Class 1 survey unit were passed as shown in 5.2.2. The Threshold Comparison Test Report (TCTR) lists all the FSS soil samples in the data set and is presented in Tab 2 of Appendix 3.

Table 5.2.2
Screen Data and Statistical Test Report

Test Performed	FMPC	Must Pass
Min/Max	Pass	
Background	Fail	
DCGLw	Pass	
DCGLavg	Pass	X
EMC	Pass	X
Wilcoxon Rank Sum	Pass	X

5.2.3.3. **Scans** – A final scan of the survey unit was performed in January 2003. 100% of the survey unit was scanned after remediation was completed as described in Section 4.6. No elevated readings resulted from the scans.

5.2.4. **Conclusions**

5.2.4.1. NaI scans taken on the surface of SU-2 after remediation revealed no elevated soil concentrations.

5.2.4.2. No FSS soil samples tested from SU-2 exceeded the $DCGL_w$.

5.2.4.3. SU-2 passed all screening tests except background.

5.2.4.4. SU-2 passed the statistical WRS test.

5.2.4.5. SU-2 meets all license criteria for release of a Class 1 survey unit.

5.2.5. **Recommendations**

5.2.5.1. SU-2 should be released from the license.

5.3. Survey Unit 3

5.3.1. SU-3 is a Class 1 survey unit. The survey unit is located in the northwest corner of the Kerr-McGee Technical Center Site. The survey unit represents the southern boundary of the Uranium Test Pit (SU-1). Since the excavation discussed in Section 5.1 of this report extended into this survey unit, some data covered by this section is due to that excavation. The soil samples collected as a result of that excavation are summarized in Table 5.1.4. Figure 1-1 in Appendix 1 shows the survey unit and its location at the site. The area included in the survey unit is 1,680 m^2.

5.3.2. **Remediation**

5.3.2.1. During the removal of the tin horns from SU-1, soil was excavated from this survey unit as part of the pit. The entire excavated area is presented in Appendix 1, Figure 5-3.

5.3.2.2. **Scans** – A final scan of the survey unit was performed in January 2003. 100% of the survey unit was scanned after remediation was completed as described in Section 4.6. No elevated readings resulted from the scans.

5.3.3. **Final Status Survey Data**

5.3.3.1. **Soil Samples** – 45 FSS soil samples were collected from this survey unit. 32 of those samples were part of the grid, and the other 13 were bias samples. All FSS samples were less than 1.0 FMPC. The data are summarized in Table 5.3.1 and mapped in Appendix 1, Figure 5-3.

Table 5.3.1
***FSS Data*[a,b]**

			Uranium		Natural Th		Ra-226	
Measurement Type	**Max FMPC**	**Number of Survey Points**	**Mean (pCi/g)**	**Max (pCi/g)**	**Mean (pCi/ g)**	**Max (pCi/g)**	**Mean (pCi/ g)**	**Max (pCi/g)**
Grid	-0.1	32	0.8	1.8	-0.2	0.0	0.2	0.4
Bias	0.0	13	1.3	7.7	-0.1	0.5	0.2	0.2

[a] FSS data includes characterization data
[b] Nuclide values are net of mean background. FMPC is net of mean background plus 2 sigma.

5.3.3.2. All tests required by the D Plan were passed except the Background Test. All tests required for release of a Class 1 survey unit were passed as shown in Table 5.3.2. The Threshold Comparison Test Report (TCTR) lists all the FSS soil samples in the data set and is presented in Tab 3 of Appendix 3.

Table 5.3.2
Screen Data and Statistical Test Report

Test Performed	FMPC	Must Pass
Min/Max	Pass	
Background	Fail	
DCGLw	Pass	
DCGLavg	Pass	X
EMC	Pass	X
Wilcoxon Rank Sum	Pass	X

5.3.4. **Conclusions**

5.3.4.1. All NaI scans taken on the surface of SU-3 revealed no elevated soil concentrations.

5.3.4.2. No FSS soil samples tested from SU-3 exceeded the $DCGL_w$.

5.3.4.3. SU-3 passed all screening tests except background.

5.3.4.4. SU-3 passed the statistical WRS test.

5.3.4.5. SU-3 meets all license criteria for release of a Class 1 survey unit.

5.3.5. **Recommendations**

5.3.5.1. SU-3 should be released from the license.

5.4. Survey Unit 4

5.4.1. SU-4 is a Class 2 survey unit. The survey unit is located in the northwest corner of the Kerr-McGee Technical Center Site. Figure 1-1 in Appendix 1 shows the survey unit and its location at the site. The survey unit borders SU-2, SU-3, SU-5, SU-6, SU-7, SU-8, part of the north border of the site and the south side of the TSSL building. The area included in the survey unit is 10,514 m^2.

5.4.2. **Final Status Survey Data**

5.4.2.1. **Soil Samples** – 59 FSS soil samples were collected from this survey unit. 35 of those samples were part of the grid, and the other 24 were bias samples. All FSS samples were less than 1.0 FMPC. The data are summarized in Table 5.4.1 and mapped in Appendix 1, Figure 5-5.

Table 5.4.1
***FSS Data*[a,b]**

			Uranium		Natural Th		Ra-226	
Measurement Type	**Max FMPC**	**Number of Survey Points**	**Mean (pCi/g)**	**Max (pCi/g)**	**Mean (pCi/ g)**	**Max (pCi/g)**	**Mean (pCi/ g)**	**Max (pCi/g)**
Regular Grid	-0.1	35	0.5	1.3	-0.4	0.0	0.1	0.2
Bias	0.3	24	1.1	11.3	-0.5	0.5	0.3	2.3

[a] FSS data includes characterization data
[b] Nuclide values are net of mean background. FMPC is net of mean background plus 2 sigma.

5.4.2.2. All tests required by the D Plan were passed except the Background Test. All tests required for release of a Class 2 survey unit were passed as shown in 5.4.2. The TCTR lists all the FSS soil samples in the data set and is presented in Tab 4 of Appendix 3.

Table 5.4.2
Screen Data and Statistical Test Report

Test Performed	FMPC	Must Pass
Min/Max	Pass	
Background	Fail	
DCGLw	Pass	X
DCGLavg	Pass	X
EMC	Pass	X
Wilcoxon Rank Sum	Pass	X

5.4.2.3. **Scans** – A final scan of the survey unit was performed in October 2000 as part of the site characterization. 100% of the survey unit was scanned with an unshielded NaI detector. The scan results are presented in Figure

4-4, Appendix 1. No scans above the investigative threshold of 2500 cpm (net of background) were detected in this survey unit.

5.4.3. Conclusions

5.4.3.1. NaI scans taken on the surface of SU-4 revealed no elevated soil concentrations.

5.4.3.2. No FSS soil samples tested from SU-4 exceeded the $DCGL_w$.

5.4.3.3. SU-4 passed all screening tests except background.

5.4.3.4. SU-4 passed the statistical WRS test.

5.4.3.5. SU-4 meets all license criteria for release of a Class 2 survey unit.

5.4.4. Recommendations

5.4.4.1. SU-4 should be released from the license.

5.5. Survey Unit 5

5.5.1. SU-5 is a Class 1 survey unit. The survey unit is located in the southwest side of the Kerr-McGee Technical Center Site. The survey unit is bordered by SU-6 to the east and by SU-4 on all other sides. Figure 1-1 in Appendix 1 shows the survey unit and its location at the site. The area included in the survey unit is 1,800 m^2.

5.5.2. **Final Status Survey Data**

5.5.2.1. **Soil Samples** - 63 FSS soil samples were collected from this survey unit. 33 of those samples were part of the grid, and the other 30 were bias samples. All FSS samples were less than 1.0 FMPC. The data are summarized in Table 5.5.1 and mapped in Appendix 1, Figure 5-6.

Table 5.5.1
***FSS Data*[a,b]**

			Uranium		Natural Th		Ra-226	
Measurement Type	**Max FMPC**	**Number of Survey Points**	**Mean (pCi/g)**	**Max (pCi/g)**	**Mean (pCi/g)**	**Max (pCi/g)**	**Mean (pCi/g)**	**Max (pCi/g)**
Grid	-0.1	33	0.9	1.9	-0.3	-0.1	0.1	0.3
Bias	0.0	30	1.0	8.4	-0.2	0.8	0.1	0.6

[a] FSS data includes characterization data.
[b] Nuclide values are net of mean background. FMPC is net of mean background plus 2 sigma.

5.5.2.2. The outfall area at the end of the buried pipe running westward from the TSSL building is located in SU-5. 5 BI soil samples were collected at the location of the outfall and the area was scanned with NaI. All of the soil samples were below 1.0 FMPC and the scan results were less than 600 cpm. The soil data are presented in Table 5.5.2, and the location of the outfall is mapped in Appendix 1, Figure 5-6.

Table 5.5.2
Pipe Outfall Soil Results – SU5

TCN	Depth (cm)	Soil FMPC
914	0 – 15	-0.19
915	15 – 50	-0.18
916	50 – 100	-0.17
917	100 – 150	-0.18
918	150 - 200	-0.19

[a] net of background

5.5.2.3. All tests required by the D Plan were passed except the Background Test. All tests required for release of a Class 1 survey unit were passed as shown in 5.5.3. The TCTR lists all the FSS soil samples in the data set and is presented in Tab 5 of Appendix 3.

Table 5.5.3
Screen Data and Statistical Test Report

Test Performed	FMPC	Must Pass
Min/Max	Pass	
Background	Fail	
DCGLw	Pass	
DCGLavg	Pass	X
EMC	Pass	X
Wilcoxon Rank Sum	Pass	X

5.5.2.4. **Scans** – A NaI scan of the survey unit was performed in October 2000 as part of the site characterization. 100% of the survey unit was scanned with an unshielded NaI detector. The scan results are presented in Figure 4-4, Appendix 1. No scans above the investigative threshold of 2500 cpm (net of background) were detected in this survey unit.

5.5.3. **Conclusions**

5.5.3.1. NaI scans taken on the surface of SU-5 revealed no elevated soil concentrations.

5.5.3.2. No FSS soil samples tested from SU-5 exceeded the $DCGL_w$.

5.5.3.3. No soil data associated with buried pipe exceeded the $DCGL_w$.

5.5.3.4. NaI scans taken on the buried pipe revealed no elevated soil or removable concentrations.

5.5.3.5. SU-5 passed all screening tests except background.

5.5.3.6. SU-5 passed the statistical WRS test.

5.5.3.7. SU-5 meets all license criteria for release of a Class 1 survey unit.

5.5.4. **Recommendations**

5.5.4.1. SU-5 should be released from the license.

5.6. Survey Unit 6

5.6.1. SU-6 is a Class 1 survey unit. The survey unit is located in the southwest side of the Kerr-McGee Technical Center Site. The survey unit is bordered by SU-5 to the west, the TSSL building to the south, and by SU-4 on all other sides. Figure 1-1 in Appendix 1 shows the survey unit and its location at the site. The area included in the survey unit is 1,405 m^2.

5.6.2. Remediation

5.6.2.1. Three areas were excavated north and northwest of the TSSL building to a maximum depth of 1.0 meter. The entire excavated area is presented in Appendix 1, Figure 5-7.

5.6.3. Final Status Survey Data

5.6.3.1. **Soil Samples** – 68 FSS samples were collected from this survey unit. 32 of those samples were part of the grid and the other 36 were bias samples. All FSS samples were less than 1.0 FMPC. The data are summarized in Table 5.6.1 and mapped in Appendix 1, Figure 5-7.

Table 5.6.1
***FSS Data*[a,b]**

			Uranium		Natural Th		Ra-226	
Measurement Type (cm)	Max FMPC	Number of Survey Points	Mean (pCi/g)	Max (pCi/g)	Mean (pCi/g)	Max (pCi/g)	Mean (pCi/g)	Max (pCi/g)
Grid	0.0	32	0.5	2.1	-0.5	-0.2	0.1	0.7
Bias	0.6	36	0.9	6.1	-0.6	-0.1	0.1	1.4

[a] FSS data includes characterization data.
[b] Nuclide values are net of mean background. FMPC is net of mean background plus 2 sigma.

5.6.3.2. All tests required by the D Plan passed except the Background Test and the Min/Max Test. All tests required for release of a Class 1 survey unit were passed as shown in Table 5.6.2. The TCTR lists all the FSS soil samples in the data set and is presented in Tab 6 of Appendix 3.

Table 5.6.2
Screen Data and Statistical Test Report

Test Performed	FMPC	Must Pass
Min/Max	Fail	
Background	Fail	
DCGLw	Pass	
DCGLavg	Pass	X
EMC	Pass	X
Wilcoxon Rank Sum	Pass	X

5.6.3.3. **Scans** – A final scan of the survey unit was performed in January 2003. 100% of the survey unit was scanned after remediation was completed as described in Section 4.6. No elevated readings resulted from the scans.

5.6.4. **Conclusions**

5.6.4.1. NaI scans taken on the surface of SU-6 after remediation revealed no elevated soil concentrations.

5.6.4.2. No FSS soil samples tested from SU-6 exceeded the $DCGL_w$.

5.6.4.3. SU-6 passed all required screening tests.

5.6.4.4. SU-6 passed the statistical WRS test.

5.6.4.5. SU-6 meets all license criteria for release of a Class 1 survey unit.

5.6.5. **Recommendations**

5.6.5.1. SU-6 should be released from the license.

5.7. Survey Unit 7

5.7.1. SU-7 is a Class 1 survey unit. The survey unit is located at the north edge of the Kerr-McGee Technical Center Site. The survey unit is bordered by SU-10 to the east and by SU-4 on all other sides. Figure 1-1 in Appendix 1 shows the survey unit and its location at the site. The area included in the survey unit is 1,500 m^2.

5.7.2. **Remediation**

5.7.2.1. An area in the haul road was excavated to a maximum depth of 0.2 meters. The entire excavated area is presented in Appendix 1, Figure 5-8.

5.7.3. **Final Status Survey Data**

5.7.3.1. **Soil Samples** - 64 samples were collected from this survey unit. 39 of those samples were part of the grid and the other 25 were bias samples. All FSS samples were less than 1.0 FMPC. The data are summarized in Table 5.7.1 and are mapped in Appendix 1, Figure 5-8.

Table 5.7.1
***FSS Data*[a,b]**

			Uranium		Natural Th		Ra-226	
Measurement Type (cm)	Max FMPC	Number of Survey Points	Mean (pCi/g)	Max (pCi/g)	Mean (pCi/g)	Max (pCi/g)	Mean (pCi/g)	Max (pCi/g)
Grid	-0.2	39	0.6	2.0	-0.5	-0.1	0.1	0.3
Bias	-0.1	25	0.5	1.4	-0.4	0.0	0.1	0.5

[a] FSS data includes characterization data.
[b] Nuclide values are net of mean background. FMPC is net of mean background plus 2 sigma.

5.7.3.2. All tests required by the D Plan were passed except the Background Test. All tests required for release of a Class 1 survey unit were passed as shown in Table 5.7.2. The TCTR lists all the FSS soil samples in the data set and is presented in Tab 7 of Appendix 3.

Table 5.7.2
Screen Data and Statistical Test Report

Test Performed	FMPC	Must Pass
Min/Max	Pass	
Background	Fail	
DCGLw	Pass	
DCGLavg	Pass	X
EMC	Pass	X
Wilcoxon Rank Sum	Pass	X

5.7.3.3. **Scans** – A final scan of the survey unit was performed in January 2003. 100% of the survey unit was scanned after remediation was completed as described in Section 4.6. No elevated readings resulted from the scans.

5.7.4. **Conclusions**

5.7.4.1. NaI scans on the surface of SU-7 after remediation revealed no elevated soil concentrations.

5.7.4.2. No FSS soil samples tested from SU-7 exceeded the $DCGL_w$.

5.7.4.3. SU-7 passed all screening tests except background.

5.7.4.4. SU-7 passed the statistical WRS test.

5.7.4.5. SU-7 meets all license criteria for release of a Class 1 survey unit.

5.7.5. **Recommendations**

5.7.5.1. SU-7 should be released from the license.

5.8. Survey Unit 8

5.8.1. SU-8 is a Class 1 survey unit. The survey unit is located in the north side of the Kerr-McGee Technical Center Site. The survey unit borders the northwest corner of the main building and is bordered by SU-7 and SU-10 on the north, and by SU-9 on the east. Appendix 1, Figure 1-2 shows the survey unit and its location at the site. The area included in the survey unit is 1,324 m^2.

5.8.2. **Final Status Survey Data**

5.8.2.1. **Soil Samples** – 60 FSS soil samples were collected from this survey unit. 33 of those samples were part of the grid, and the other 27 were bias samples. All samples were less than 1.0 FMPC. The data are summarized in Table 5.8.1 and mapped in Appendix 1, Figure 5-9.

Table 5.8.1
***FSS Data*[a,b]**

			Uranium		Natural Th		Ra-226	
Measurement Type	Max FMPC	Number of Survey Points	Mean (pCi/g)	Max (pCi/g)	Mean (pCi/ g)	Max (pCi/g)	Mean (pCi/ g)	Max (pCi/g)
Grid	-0.2	33	-0.8	0.9	-1.5	-0.4	-0.2	0.1
Bias	-0.2	27	-1.1	0.7	-1.7	-0.2	-0.3	0.1

[a] FSS data includes characterization data
[b] Nuclide values are net of mean background. FMPC is net of mean background plus 2 sigma.

5.8.2.2. All tests required by the D Plan were passed. A summary of test results is presented in Table 5.8.2. The TCTR lists all the FSS soil samples in the data set and is presented in Tab 8 of Appendix 3.

Table 5.8.2
Screen Data and Statistical Test Report

Test Performed	FMPC	Must Pass
Min/Max	Pass	
Background	Pass	
DCGLw	Pass	
DCGLavg	Pass	X
EMC	Pass	X
Wilcoxon Rank Sum	Pass	X

5.8.2.3. **Scans** – A final scan of the survey unit was performed in October 2000 as part of the site characterization. 100% of the survey unit was scanned with an unshielded NaI detector. The scan results are presented in Figure 4-4, Appendix 1. No scans above the investigative threshold of 2500 cpm (net of background) were detected in this survey unit.

5.8.3. **Conclusions**

5.8.3.1. NaI scans taken on the surface of SU-8 revealed no elevated soil concentrations.

5.8.3.2. No FSS soil samples tested from SU-8 exceeded the $DCGL_w$.

5.8.3.3. SU-8 passed all screening tests.

5.8.3.4. SU-8 passed the statistical WRS test.

5.8.3.5. SU-8 meets all license criteria for release of a Class 1 survey unit.

5.8.4. **Recommendations**

5.8.4.1. SU-8 should be released from the license.

5.9. Survey Unit 9

5.9.1. SU-9 is a Class 1 survey unit. The survey unit is located in the north side of the Kerr-McGee Technical Center Site. The survey unit borders a portion of the north side of the main building and is bordered on the west by SU-8, on the north by SU-10 and SU-11, and on the east by SU-15. Appendix 1, Figure 1-2 shows the survey unit and its location at the site. The area included in the survey unit is 1,038 m^2.

5.9.2. **Final Status Survey Data**

5.9.2.1. **Soil Samples** – 59 FSS soil samples were collected from this survey unit. 33 of those samples were part of the grid, and the other 26 were bias samples. All samples were less than 1.0 FMPC. The data are summarized in Table 5.9.1 and mapped in Appendix 1, Figure 5-10.

Table 5.9.1
***FSS Data*[a,b]**

			Uranium		Natural Th		Ra-226	
Measurement Type	Max FMPC	Number of Survey Points	Mean (pCi/g)	Max (pCi/g)	Mean (pCi/ g)	Max (pCi/g)	Mean (pCi/ g)	Max (pCi/g)
Grid	-0.2	33	-0.2	1.5	-1.3	-0.2	-0.1	0.3
Bias	-0.2	26	-0.8	1.3	-1.4	-0.2	-0.2	0.1

[a] FSS data includes characterization data
[b] Nuclide values are net of mean background. FMPC is net of mean background plus 2 sigma.

5.9.2.2. All tests required by the D Plan passed. A summary of test results is presented in Table 5.9.2. The TCTR lists all the FSS soil samples in the data set and is presented in Tab 9 of Appendix 3.

Table 5.9.2
Screen Data and Statistical Test Report

Test Performed	FMPC	Must Pass
Min/Max	Pass	
Background	Pass	
DCGLw	Pass	
DCGLavg	Pass	X
EMC	Pass	X
Wilcoxon Rank Sum	Pass	X

5.9.2.3. Scans – A scan of this survey unit was performed in October 2000 and August 2002 as part of the site characterization. 100% of the survey unit was scanned with a shielded NaI detector. No scans above the

investigative threshold of 2500 cpm (net of background) were detected in this survey unit.

5.9.3. **Conclusions**

5.9.3.1. NaI scans taken on the surface of SU-9 revealed no elevated soil concentrations.

5.9.3.2. No FSS soil samples tested from SU-9 exceeded the $DCGL_w$.

5.9.3.3. SU-9 passed all screening tests.

5.9.3.4. SU-9 passed the statistical WRS test.

5.9.3.5. SU-9 meets all license criteria for release of a Class 1 survey unit.

5.9.4. **Recommendations**

5.9.4.1. SU-9 should be released from the license.

5.10. Survey Unit 10

5.10.1. SU-10 is a Class 2 survey unit. The survey unit is located in the north side of the Kerr-McGee Technical Center Site. The survey unit is bordered on the west by SU-7, on the east by SU-11, and on the south by SU-8 and SU-9. Appendix 1, Figure 1-2 shows the survey unit and its location at the site. The area included in the survey unit is 2,300 m^2.

5.10.2. Final Status Survey Data

5.10.2.1. **Soil Samples** – 41 FSS soil samples were taken in this survey unit. 33 of those samples were part of the grid, and the other 8 were bias samples. All samples were less than 1.0 FMPC. The data are summarized in Table 5.10.1 and mapped in Appendix 1, Figure 5-11.

Table 5.10.1
***FSS Data*[a,b]**

			Uranium		Natural Th		Ra-226	
Measurement Type	**Max FMPC**	**Number of Survey Points**	**Mean (pCi/g)**	**Max (pCi/g)**	**Mean (pCi/g)**	**Max (pCi/g)**	**Mean (pCi/g)**	**Max (pCi/g)**
Grid	-0.2	33	0.7	2.1	-0.4	-0.1	0.1	0.3
Bias	-0.2	8	0.2	1	-0.4	-0.2	0.0	0.1

[a] FSS data includes characterization data
[b] Nuclide values are net of mean background. FMPC is net of mean background plus 2 sigma.

5.10.2.2. All tests required by the D Plan were passed except the Background Test. All tests required for release of a Class 2 survey unit were passed as shown in Table 5.10.2. The TCTR lists all the FSS soil samples in the data set and is presented in Tab 10 of Appendix 3.

Table 5.10.2
Screen Data and Statistical Test Report

Test Performed	FMPC	Must Pass
Min/Max	Pass	
Background	Fail	
DCGLw	Pass	X
DCGLavg	Pass	X
EMC	Pass	X
Wilcoxon Rank Sum	Pass	X

5.10.2.3. **Scans** – A final scan of the survey unit was performed in October 2000 as part of the site characterization. 100% of the survey unit was scanned with an unshielded NaI detector. The scan results are presented in Figure

4-4, Appendix 1. No scans above the investigative threshold of 2500 cpm (net of background) were detected in this survey unit.

5.10.3. **Conclusions**

5.10.3.1. NaI scans taken on the surface of SU-10 revealed no elevated soil concentrations.

5.10.3.2. No FSS soil samples tested from SU-10 exceeded the $DCGL_w$.

5.10.3.3. SU-10 passed all screening tests except background.

5.10.3.4. SU-10 passed the statistical WRS test.

5.10.3.5. SU-10 meets all license criteria for release of a Class 2 survey unit.

5.10.4. **Recommendations**

5.10.4.1. SU-10 should be released from the license.

5.11. Survey Unit 11

5.11.1. SU-11 is a Class 1 survey unit. The survey unit is located at the north edge of the Kerr-McGee Technical Center Site. The survey unit is bordered by SU-12 to the east, SU-10 to the west and by the Storage Building to the south. Appendix 1, Figure 1-2 shows the survey unit and its location at the site. The area included in the survey unit is 1,415 m^2.

5.11.2. **Remediation**

5.11.2.1. Two areas were excavated to the north of the Storage Building to a maximum depth of 0.25 meters. The entire excavated area is presented in Appendix 1, Figure 5-12.

5.11.3. **Final Status Survey Data**

5.11.3.1. **Soil Samples** - 76 samples were collected from this survey unit. 30 of those samples were part of the grid and the other 46 were bias samples. All FSS samples were less than 1.0 FMPC. The data are summarized in Table 5.11.1 and mapped in Appendix 1, Figure 5-12.

Table 5.11.1
***FSS Data*[a,b]**

			Uranium		Natural Th		Ra-226	
Measurement Type (cm)	Max FMPC	Number of Survey Points	Mean (pCi/g)	Max (pCi/g)	Mean (pCi/g)	Max (pCi/g)	Mean (pCi/g)	Max (pCi/g)
Grid	-0.1	30	0.5	2.4	-0.9	0.1	0.1	0.5
Bias	0.7	46	0.7	7.5	-0.8	0.1	0.2	3.6

[a] FSS data includes characterization data
[b] Nuclide values are net of mean background. FMPC is net of mean background plus 2 sigma.

5.11.3.2. All tests required by the D Plan were passed except the Min/Max and Background tests. All tests required for release of a Class 1 survey unit were passed as shown in Table 5.11.2. The TCTR lists all the FSS soil samples in the data set and is presented in Tab 11 of Appendix 3.

Table 5.11.2
Screen Data and Statistical Test Report

Test Performed	FMPC	Must Pass
Min/Max	Fail	
Background	Fail	
DCGLw	Pass	
DCGLavg	Pass	X
EMC	Pass	X
Wilcoxon Rank Sum	Pass	X

5.11.3.3. **Scans** – A final scan of the survey unit was performed in January 2003. 100% of the survey unit was scanned after remediation was completed as described in Section 4.6. No elevated readings resulted from the scans.

5.11.4. **Conclusions**

5.11.4.1. NaI scans taken on the surface of SU-11 after remediation revealed no elevated soil concentrations.

5.11.4.2. No FSS soil samples tested from SU-11 exceeded the $DCGL_w$.

5.11.4.3. SU-11 passed all screening tests except background and min/max.

5.11.4.4. SU-11 passed the statistical WRS test.

5.11.4.5. SU-11 meets all license criteria for release of a Class 1 survey unit.

5.11.5. **Recommendations**

5.11.5.1. SU-11 should be released from the license.

5.12. Survey Unit 12

5.12.1. SU-12 is a Class 1 survey unit. The survey unit is located at the north edge of the Kerr-McGee Technical Center Site. The survey unit is bordered by SU-13 to the east, SU-11 to the west and by Unit 400 to the south. Appendix 1, Figure 1-2 shows the survey unit and its location at the site. The area included in the survey unit is 1,710 m^2.

5.12.2. **Remediation**

5.12.2.1. Two areas were excavated to the north and to the east of Unit 400 to a maximum depth of 0.25 meters. The entire excavated area is presented in Appendix 1, Figure 5-13.

5.12.3. **Final Status Survey Data**

5.12.3.1. **Soil Samples** - 93 samples were collected from this survey unit. 32 of those samples were part of the grid, and the other 61 were bias samples. All samples were less than 1.0 FMPC. The data are summarized in Table 5.12.1 and mapped in Appendix 1, Figure 5-13.

Table 5.12.1
***FSS Data*[a]**

			Uranium		Natural Th		Ra-226	
Measurement Type (cm)	Max FMPC	Number of Survey Points	Mean (pCi/g)	Max (pCi/g)	Mean (pCi/g)	Max (pCi/g)	Mean (pCi/g)	Max (pCi/g)
Grid	-0.1	32	0.4	1.7	-0.8	0.1	0.0	0.5
Bias	0.2	61	1.3	10.7	-0.7	-0.1	0.2	1.8

[a] FSS data includes characterization data
[b] Nuclide values are net of mean background. FMPC is net of mean background plus 2 sigma.

5.12.3.2. All tests required by the D Plan were passed except the Background Test. All tests required for release of a Class 1 survey unit were passed as shown in Table 5.12.2. The TCTR lists all the FSS soil samples in the data set and is presented in Tab 12 of Appendix 3.

Table 5.12.2
Screen Data and Statistical Test Report

Test Performed	FMPC	Must Pass
Min/Max	Pass	
Background	Fail	
DCGLw	Pass	
DCGLavg	Pass	X
EMC	Pass	X
Wilcoxon Rank Sum	Pass	X

5.12.3.3. **Scans** – A final scan of the survey unit was performed in January 2003. 100% of the survey unit was scanned after remediation was completed as described in Section 4.6. No elevated readings resulted from the scans.

5.12.4. **Conclusions**

5.12.4.1. NaI scans taken on the surface of SU-12 after remediation revealed no elevated soil concentrations.

5.12.4.2. No FSS soil samples tested from SU-12 exceeded the $DCGL_w$.

5.12.4.3. SU-12 passed all screening tests except background.

5.12.4.4. SU-12 passed the statistical WRS test.

5.12.4.5. SU-12 meets all license criteria for release of a Class 1 survey unit.

5.12.5. **Recommendations**

5.12.5.1. SU-12 should be released from the license.

5.13. Survey Unit 13

5.13.1. SU-13 is a Class 1 survey unit. The survey unit is located in the northeastern portion of the Kerr-McGee Technical Center Site. The survey unit is east of Unit 400, is bounded by SU-12 to the east, by SU-14 to the west, and by SU-15 to the south. Appendix 1, Figure 1-2 shows the survey unit and its location at the site. The area included in the survey unit is 1,750 m^2.

5.13.2. **Final Status Survey Data**

5.13.2.1. **Soil Samples** - 48 soil samples were collected from in this survey unit. 35 of those samples were part of the grid samples, and the other 13 were bias samples. All FSS samples were less than 1.0 FMPC. The data are summarized in Table 5.13.1 and mapped in Appendix 1, Figure 5-14.

Table 5.13.1
***FSS Data*[a,b]**

			Uranium		Natural Th		Ra-226	
Measurement Type (cm)	Max FMPC	Number of Survey Points	Mean (pCi/g)	Max (pCi/g)	Mean (pCi/g)	Max (pCi/g)	Mean (pCi/g)	Max (pCi/g)
Grid	-0.1	35	0.9	1.8	-0.3	0.0	0.1	0.3
Bias	-0.1	13	0.5	1.2	-0.5	-0.1	0.0	0.2

[a] FSS data includes characterization data
[b] Nuclide values are net of mean background. FMPC is net of mean background plus 2 sigma.

5.13.2.2. All tests required by the D Plan were passed except the Background Test. All tests required for release of a Class 1 survey unit were passed as shown in Table 5.13.2. The TCTR lists all the FSS soil samples in the data set and is presented in Tab 13 of Appendix 3.

Table 5.13.2
Screen Data and Statistical Test Report

Test Performed	FMPC	Must Pass
Min/Max	Pass	
Background	Fail	
DCGLw	Pass	
DCGLavg	Pass	X
EMC	Pass	X
Wilcoxon Rank Sum	Pass	X

5.13.2.3. **Scans** – A final scan of the survey unit was performed in October 2000 as part of the site characterization. 100% of the survey unit was scanned with an unshielded NaI detector. The scan results are presented in Figure

4-4, Appendix 1. No scans above the investigative threshold of 2500 cpm (net of background) were detected in this survey unit.

5.13.3. **Conclusions**

5.13.3.1. NaI scans taken on the surface of SU-13 revealed no elevated soil concentrations.

5.13.3.2. No FSS soil samples tested from SU-13 exceeded the $DCGL_w$.

5.13.3.3. SU-13 passed all screening tests except background.

5.13.3.4. SU-13 passed the statistical WRS test.

5.13.3.5. SU-13 meets all license criteria for release of a Class 1 survey unit.

5.13.4. **Recommendations**

5.13.4.1. SU-13 should be released from the license.

5.14. Survey Unit 14

5.14.1. SU-14 is a Class 1 survey unit. The survey unit is located in the northeastern portion of the Kerr-McGee Technical Center Site. The survey unit is east of Unit 400, is bounded by SU-13 to the east, by SU-24 to the west, and by SU-16 to the south. Appendix 1, Figure 1-2 shows the survey unit and its location at the site. The area included in the survey unit is 1,750 m^2.

5.14.2. **Final Status Survey Data**

5.14.2.1. **Soil Samples** - 43 soil samples were collected from this survey unit. 35 of those samples were part of the grid, and the other 8 were bias samples. All FSS samples were less than 1.0 FMPC. The data are summarized in Table 5.14.1 and mapped in Appendix 1, Figure 5-15.

Table 5.14.1
***FSS Data*[a,b]**

			Uranium		Natural Th		Ra-226	
Measurement Type (cm)	Max FMPC	Number of Survey Points	Mean (pCi/g)	Max (pCi/g)	Mean (pCi/g)	Max (pCi/g)	Mean (pCi/g)	Max (pCi/g)
Grid	-0.1	35	0.8	1.7	-0.2	0.2	0.1	0.3
Bias	-0.2	8	0.2	0.4	-0.2	0.0	-0.1	0.2

[a] FSS data includes characterization data
[b] Nuclide values are net of mean background. FMPC is net of mean background plus 2 sigma.

5.14.2.2. All tests required by the D Plan were passed except the Background Test. All tests required for release of a Class 1 survey unit were passed as shown in Table 5.14.2. The TCTR lists all the FSS soil samples in the data set and is presented in Tab 14 of Appendix 3.

Table 5.14.2
Screen Data and Statistical Test Report

Test Performed	FMPC	Must Pass
Min/Max	Pass	
Background	Fail	
DCGLw	Pass	
DCGLavg	Pass	X
EMC	Pass	X
Wilcoxon Rank Sum	Pass	X

5.14.2.3. **Scans** – A final scan of the survey unit was performed in October 2000 as part of the site characterization. 100% of the survey unit was scanned with an unshielded NaI detector. The scan results are presented in Figure

4-4, Appendix 1. No scans above the investigative threshold of 2500 cpm (net of background) were detected in this survey unit.

5.14.3. **Conclusions**

5.14.3.1. NaI scans taken on the surface of SU-14 revealed no elevated soil concentrations.

5.14.3.2. No FSS soil samples tested from SU-14 exceeded the $DCGL_W$.

5.14.3.3. SU-14 passed all screening tests except background.

5.14.3.4. SU-14 passed the statistical WRS test.

5.14.3.5. SU-14 meets all license criteria for release of a Class 1 survey unit.

5.14.4. **Recommendations**

5.14.4.1. SU-14 should be released from the license.

5.15. Survey Unit 15

5.15.1. SU-15 is a Class 2 survey unit. The survey unit is located in the east area of the Kerr-McGee Technical Center Site. The survey unit borders the north and east sides of the main building, is bordered by SU-9 to the west, SU-11, 12, 13, 14, the Storage building and Unit 400 to the north and by SU-16, 17, 18, 19, and 20 to the east. Appendix 1, Figure 1-2 shows the survey unit and its location at the site. The area included in the survey unit is 7,512 m^2.

5.15.2. **Final Status Survey Data**

5.15.2.1. **Soil Samples** - 71 soil samples were taken in this survey unit. 35 of those samples were regular grid samples, and the other 36 were bias samples. All samples were less than 1.0 FMPC. The soil data are summarized in Table 5.15.1 and graphically represented in Appendix 1, Figure 5-16.

Table 5.15.1
***FSS Data*[a,b]**

			Uranium		Natural Th		Ra-226	
Measurement Type (cm)	Max FMPC	Number of Survey Points	Mean (pCi/g)	Max (pCi/g)	Mean (pCi/g)	Max (pCi/g)	Mean (pCi/g)	Max (pCi/g)
Grid	-0.2	35	0.4	2.0	-1.1	-0.4	0.0	0.3
Bias	0.2	36	0.5	3.9	-0.9	2.0	-0.1	0.2

[a] FSS data includes characterization data
[b] Nuclide values are net of mean background. FMPC is net of mean background plus 2 sigma.

5.15.2.2. **Fixed Equipment** – Manhole access to affected piping exists in two locations in this survey unit. The accessible piping near the manholes was scanned internally with NaI along with the brick housing where accessible. BI sludge samples were taken within the access points under the manholes. The sludge samples were less than 1.0 FMPC. No scan above the threshold was detected. A summary of the data taken is presented in Table 5.15.1 and a map showing the location of the manholes is presented as Appendix 1, Figure 5-16.

Table 5.15.2
SU 15 Data from Two Manholes

X (meters)	Y (meters)	Average Scan[a]	Maximum Scan[a]	Sludge FMPC
425	708	1935	7210	-0.2
452	731	988	1390	-0.4

[a] net of background

5.15.2.3. All tests required by the D Plan were passed except the Background Test. All tests required for release of a Class 2 survey unit were passed as shown in Table 5.15.3. The TCTR is presented in Tab 15 of Appendix 3.

Table 5.15.3
Screen Data and Statistical Test Report

Test Performed	FMPC	Must Pass
Min/Max	Pass	
Background	Fail	
DCGLw	Pass	X
DCGLavg	Pass	X
EMC	Pass	X
Wilcoxon Rank Sum	Pass	X

5.15.2.4. **Scans** –100% of the survey unit was scanned during characterization with a shielded detector as described in Section 4.6. One single location that exceeded the scan threshold was sampled[27] in accordance with Appendix 6. No elevated soil samples resulted from the scan survey. Since no other scans exceeded the investigative threshold and no remediation was performed in the survey unit, no further scans were performed.

5.15.3. **Conclusions**

5.15.3.1. The single NaI scan taken on the surface of SU-15 that was above the shielded scan survey threshold of 2500 cpm net of background corresponded to a soil sample that was below 1.0 FMPC.

5.15.3.2. No soil samples tested in SU-15 exceeded the $DCGL_w$.

5.15.3.3. SU-15 passed all screening tests except background.

5.15.3.4. SU-15 passed the statistical WRS test.

[27] Scan maximum of 3370cpm corresponded to Sample ID 765 which measured 0.2 FMPC.

5.15.3.5. SU-15 meets all license criteria for release of a Class 2 survey unit.

5.15.4. Recommendations

5.15.4.1. SU-15 should be released from the license.

5.16. Survey Unit 16

5.16.1. SU-16 is a Class 1 survey unit. The survey unit is located in the east area of the Kerr-McGee Technical Center Site. The survey unit is bordered by SU-14 and SU-24 to the north, SU-24 to the east, SU-15 to the west and by SU-17 to the south. Appendix 1, Figure 1-3 shows the survey unit and its location at the site. The area included in the survey unit is 975 m^2.

5.16.2. **Remediation**

5.16.2.1. The excavated area in SU-16 is part of a larger excavation extending from SU-17, and is discussed in section 5.17 of this report. The area is shown in Appendix 1, Figure 5-17.

5.16.3. **Final Status Survey Data**

5.16.3.1. **Soil Samples** – 54 FSS samples were collected from this survey unit. 37 of those samples were part of the grid samples and the other 17 were bias samples. All FSS samples were less than 1.0 FMPC. The data are summarized in Table 5.16.1 and mapped in Appendix 1, Figure 5-17.

Table 5.16.1
***FSS Data*[a,b]**

			Uranium		Natural Th		Ra-226	
Measurement Type (cm)	Max FMPC	Number of Survey Points	Mean (pCi/g)	Max (pCi/g)	Mean (pCi/g)	Max (pCi/g)	Mean (pCi/g)	Max (pCi/g)
Grid	-0.1	37	0.8	2.1	-0.3	0.1	0.2	0.4
Bias	-0.1	17	0.4	1.2	-0.5	-0.1	0.1	0.4

[a] FSS data includes characterization data
[b] Nuclide values are net of mean background. FMPC is net of mean background plus 2 sigma.

5.16.3.2. All tests required by the D Plan were passed except the Background Test. All tests required for release of a Class 1 survey unit were passed as shown in Table 5.16.2. The TCTR lists all the FSS soil samples in the data set and is presented in Tab 16 of Appendix 3.

Table 5.16.2
Screen Data and Statistical Test Report

Test Performed	FMPC	Must Pass
Min/Max	Pass	
Background	Fail	
DCGLw	Pass	
DCGLavg	Pass	X
EMC	Pass	X
Wilcoxon Rank Sum	Pass	X

5.16.3.3. **Scans** – A final scan of the survey unit was performed in January 2003. 100% of the survey unit was scanned after remediation was completed as described in Section 4.6. No elevated readings resulted from the scans.

5.16.4. **Conclusions**

5.16.4.1. NaI scans taken on the surface of SU-16 after remediation revealed no elevated soil concentrations.

5.16.4.2. No FSS soil samples tested from SU-16 exceeded the $DCGL_w$.

5.16.4.3. SU-16 passed all screening tests except background.

5.16.4.4. SU-16 passed the statistical WRS test.

5.16.4.5. SU-16 meets all license criteria for release of a Class 1 survey unit.

5.16.5. **Recommendations**

5.16.5.1. SU-16 should be released from the license.

5.17. Survey Unit 17

5.17.1. SU-17 is a Class 1 survey unit. The survey unit is located in the east area of the Kerr-McGee Technical Center Site. The survey unit is bordered by SU-24 to the east, SU-15 to the west, SU-16 to the north and by SU-18 to the south. Appendix 1, Figure 1-3 shows the survey unit and its location at the site. The area included in the survey unit is 1,850 m^2.

5.17.2. **Remediation**

5.17.2.1. An area was excavated toward the western side of this SU to a maximum depth of 1.0 meters. The entire excavated area is presented in Appendix 1, Figure 5-17.

5.17.3. **Final Status Survey Data**

5.17.3.1. **Soil Samples** - 110 FSS samples were collected from this survey unit. 38 of those samples were part of the grid and the other 72 were bias samples. All FSS samples were less than 1.0 FMPC. The data are summarized in Table 5.17.1 and mapped in Appendix 1, Figure 5-17.

Table 5.17.1
***FSS Data*[a,b]**

			Uranium		Natural Th		Ra-226	
Measurement Type (cm)	Max FMPC	Number of Survey Points	Mean (pCi/g)	Max (pCi/g)	Mean (pCi/g)	Max (pCi/g)	Mean (pCi/g)	Max (pCi/g)
Grid	-0.1	38	0.7	4.8	-0.3	0.0	0.1	0.5
Bias	0.7	72	2.4	20.5	-0.3	0.1	0.3	3.2

[a] FSS data includes characterization data
[b] Nuclide values are net of mean background. FMPC is net of mean background plus 2 sigma.

5.17.3.2. All tests required by the D Plan were passed except the Min/Max and Background tests. All tests required for release of a Class 1 survey unit were passed as shown in Table 5.17.2. The TCTR lists all the FSS soil samples in the data set and is presented in Tab 17 of Appendix 3.

Table 5.17.2
Screen Data and Statistical Test Report

Test Performed	FMPC	Must Pass
Min/Max	Fail	
Background	Fail	
DCGLw	Pass	
DCGLavg	Pass	X
EMC	Pass	X
Wilcoxon Rank Sum	Pass	X

5.17.3.3. **Scans** – A final scan of the survey unit was performed in January 2003. 100% of the survey unit was scanned after remediation was completed as described in Section 4.6. No elevated readings resulted from the scans.

5.17.4. **Conclusions**

5.17.4.1. NaI scans taken on the surface of SU-17 after remediation revealed no elevated soil concentrations.

5.17.4.2. No FSS soil samples tested from SU-17 exceeded the $DCGL_w$.

5.17.4.3. SU-17 passed all screening tests except background and min/max.

5.17.4.4. SU-17 passed the statistical WRS test.

5.17.4.5. SU-17 meets all license criteria for release of a Class 1 survey unit.

5.17.5. **Recommendations**

5.17.5.1. SU-17 should be released from the license.

5.18. Survey Unit 18

5.18.1. SU-18 is a Class 1 survey unit. The survey unit is located in the east area of the Kerr-McGee Technical Center Site. The survey unit is bordered by SU-21 to the east, SU-15 to the west, SU-17 to the north and by SU-19 to the south. Appendix 1, Figure 1-3 shows the survey unit and its location at the site. The area included in the survey unit is 1,700 m^2.

5.18.2. **Remediation**

5.18.2.1. An area of toward the eastern side of the survey unit was excavated to a maximum depth of 0.3 meters. The excavated area is shown in Appendix 1, Figure 5-18.

5.18.3. **Final Status Survey Data**

5.18.3.1. **Soil Samples** - 63 FSS samples were collected from this survey unit. 33 of those samples were part of the grid and the other 30 were bias samples. All FSS samples were less than 1.0 FMPC. The data are summarized in Table 5.18.1 and mapped in Appendix 1, Figure 5-18.

Table 5.18.1
***FSS Data*[a,b]**

			Uranium		Natural Th		Ra-226	
Measurement Type (cm)	Max FMPC	Number of Survey Points	Mean (pCi/g)	Max (pCi/g)	Mean (pCi/g)	Max (pCi/g)	Mean (pCi/g)	Max (pCi/g)
Grid	0.4	33	0.8	6.7	-0.3	0.0	0.2	2.0
Bias	0.4	30	1.4	9.1	-0.2	0.2	0.3	2.2

[a] FSS data includes characterization data
[b] Nuclide values are net of mean background. FMPC is net of mean background plus 2 sigma.

5.18.3.2. All tests required by the D were passed except the Background Test. All tests required for release of a Class 1 survey unit were passed as shown in Table 5.18.2. The TCTR lists all the FSS soil samples in the data set and is presented in Tab 18 of Appendix 3.

Table 5.18.2
Screen Data and Statistical Test Report

Test Performed	FMPC	Must Pass
Min/Max	Pass	
Background	Fail	
DCGLw	Pass	
DCGLavg	Pass	X
EMC	Pass	X
Wilcoxon Rank Sum	Pass	X

5.18.3.3. **Scans** – A final scan of the survey unit was performed in January 2003. 100% of the survey unit was scanned after remediation was completed as described in Section 4.6. No elevated readings resulted from the scans.

5.18.4. Conclusions

5.18.4.1. NaI scans taken on the surface of SU-18 after remediation revealed no elevated soil concentrations.

5.18.4.2. No FSS soil samples tested from SU-18 exceeded the $DCGL_w$.

5.18.4.3. SU-18 passed all screening tests except background.

5.18.4.4. SU-18 passed the statistical WRS test.

5.18.4.5. SU-18 meets all license criteria for release of a Class 1 survey unit.

5.18.5. Recommendations

5.18.5.1. SU-18 should be released from the license.

5.19. Survey Unit 19

5.19.1. SU-19 is a Class 1 survey unit. The survey unit is located in the east area of the Kerr-McGee Technical Center Site. The survey unit is bordered by SU-15 to the east, SU-21 to the west, SU-18 to the north and by SU-20 to the south. Appendix 1, Figure 1-3 shows the survey unit and its location at the site. The area included in the survey unit is 1,700 m^2.

5.19.2. **Remediation**

5.19.2.1. Four areas were excavated toward the center and west portions of the survey unit to a maximum depth of 0.25 meters. The entire excavated area is presented in Appendix 1, Figure 5-18.

5.19.3. **Final Status Survey Data**

5.19.3.1. **Soil Samples** – 190 FSS samples were collected from this survey unit. 33 of those samples were part of the grid, and the other 157 were bias samples. The FSS soil data are summarized in Table 5.19.1 and mapped in Appendix 1, Figure 5-18.

Table 5.19.1
***FSS Data*[a,b]**

			Uranium		Natural Th		Ra-226	
Measurement Type (cm)	Max FMPC	Number of Survey Points	Mean (pCi/g)	Max (pCi/g)	Mean (pCi/g)	Max (pCi/g)	Mean (pCi/g)	Max (pCi/g)
Grid	0.3	33	2.1	24.0	-0.2	1.9	0.1	0.5
Bias	1.4	157	2.0	32.8	0.1	5.5	0.1	1.8

[a] FSS data includes characterization data
[b] Nuclide values are net of mean background. FMPC is net of mean background plus 2 sigma.

5.19.3.2. **Elevated Samples** – A single area with elevated soil concentrations remained after remediation. 1 meter offset samples were collected to a depth of 1.0 m at the location. All offsets and depth samples were less than 1.0 FMPC. The Area Factor rule was applied and the results are listed in Table 5.19.2. This sample was not excavated.

Table 5.19.2
Area Factor for Elevated Area in SU-19

TCN	FMPC	Area (m^2)	Area Factor[28] Allowable EMC[29]
2544	1.4	1.0	12.7

5.19.3.3. The Aggregate Elevated Area Test (AEAT)[30] was also applied using the following equation. The AEAT passed and the results are presented in Table 5.19.3.

$$\frac{\delta}{DCGL_w} + \frac{\left(\overline{X}_{EMC} - \delta\right)}{AF * DCGL_w} < 0.95$$

Where:

δ = Average of the systematic measurements in the survey unit excluding those measurements within the area of elevated activity

$\overline{\chi}_{EMC}$ = Average concentration in elevated area (only the samples greater than $DCGL_w$)

AF = The area factor that corresponds to the area of elevated activity

Table 5.19.3
Aggregate Elevated Area Test (AEAT)

δ	$DCGL_w$	χ_{EMC}	AF	AEAT Result
-0.2	1	1.4	12.7	-0.1

5.19.3.4. All tests required by the D Plan were passed except the Min/max and Background Tests. All tests required for release of a Class 1 survey unit were passed as shown in Table 5.19.4. The TCTR lists all the FSS soil samples in the data set and is presented in Tab 19 of Appendix 3.

[28] NEXTEP Tech Memo 0201, *Derivation of Surface Soil DCGLs for KMTC: Table 4.* A.H. Thatcher, CHP.

[29] With application of the unity rule, the allowable EMC is equal to the Area Factor.

[30] MARSSIM, Section 8.5.2

Table 5.19.4

Screen Data and Statistical Test Report

Test Performed	FMPC	Must Pass
Min/Max	Fail	
Background	Fail	
DCGLw	Pass	
DCGLavg	Pass	X
EMC	Pass	X
Wilcoxon Rank Sum	Pass	X

5.19.3.5. **Fixed Equipment** – The limestone pit water treatment system is located in the western portion of SU-19 and consists of the sediment collection tank and the limestone filtration pit as shown in Figure 5-21.

5.19.3.6. Four sediment samples were taken from the bottom of the pit liner and 2 sediment samples were taken from the sedimentation tank. The results varied between –0.6 and 2.6 FMPC. All sediment was removed from the limestone pit and the sedimentation tank and disposed of at a LLRW facility.

5.19.3.7. The limestone from the pit was removed and surveyed with a shielded NaI detector and smear samples. The maximum NaI reading on the limestone was 1170 cpm gross and the maximum smear was 5 βpm/100 cm^2. Since all measurements were below the release criteria, the old limestone was released and disposed of on site after the analysis was complete

5.19.3.8. Removable contamination measurements were taken on accessible points in the sedimentation tank, and on the bottom of the limestone pit. The wall of the pit liner were surveyed with β direct, NaI scans and removable contamination measurements. The maximum direct measurement was 384 βpm/100 cm^2, which is much lower than the most conservative DCGLw for building surfaces (2,150 βpm/100 cm^2). The maximum removable measurement was 7 βpm/100 cm^2, much lower than the release limit of 200 βpm/100 cm^2.[31] The results are summarized in Table 5.19.5.

[31] D Plan Section 3.2.4.

Table 5.19.5

Limestone Pit Water Treatment System Survey Measurements

	# Measurements	Average	Maximum
3.5" NaI (cpm)	14	1559	2100
Beta Direct (βpm/100 $cm^{2)}$	8	201	384
Removable (βpm)	23	2	7
Sediment (FMPC)	6	0.5	2.6

5.19.3.9. **Scans** – A final scan of the survey unit was performed in January 2003. 100% of the survey unit was scanned after remediation was completed as described in Section 4.6. One soil sample above the release limit resulted from the post remediation scans and was left in place.

5.19.4. **Conclusions**

5.19.4.1. NaI scans taken on the surface of SU-19 after remediation revealed a single area of elevated soil concentration. The area was small enough to be left undisturbed.

5.19.4.2. A single post-remediation FSS soil sample exceeded the $DCGL_w$. This sample is located in an area of no more than 1 m^2, and was left in place, as the area passed the tests required for release.

5.19.4.3. SU-19 passed all screening tests except min/max and background.

5.19.4.4. Final Survey measurements, (removable, direct, and shielded NaI scans) performed on the fixed equipment in SU-19 revealed no elevated concentrations.

5.19.4.5. SU-19 passed the statistical WRS test.

5.19.4.6. SU-19 passed the AEAT.

5.19.4.7. SU-19 meets all license criteria for release of a Class 1 survey unit.

5.19.5. **Recommendations**

5.19.5.1. SU-19 should be released from the license.

5.20. Survey Unit 20

5.20.1. SU-20 is a Class 1 survey unit. The survey unit is located in the southeast area of the Kerr-McGee Technical Center Site. The survey unit is bordered by SU-19 to the north, SU-21 to the east, SU-15 to the west, and SU-24 to the south. Appendix 1, Figure 1-3 shows the survey unit and its location at the site. The area included in the survey unit is 1,700 m^2.

5.20.2. **Remediation**

5.20.2.1. Two areas were excavated to a maximum depth of 0.15 meters. The excavated areas are shown in Appendix 1, Figure 5-18. Another excavation area extending from SU-19 is discussed in section 5.19 of this report and will not be discussed here.

5.20.3. **Final Status Survey Data**

5.20.3.1. **Soil Samples** - 122 samples were taken in the soil that remained after remediation in the excavation area. 33 of those samples were part of the grid, and 89 were bias samples. The data are summarized in Table 5.20.1 and mapped in Appendix 1, Figure 5-18.

Table 5.20.1
***FSS Data*[a,b]**

			Uranium		Natural Th		Ra-226	
Measurement Type (cm)	Max FMPC	Number of Survey Points	Mean (pCi/g)	Max (pCi/g)	Mean (pCi/g)	Max (pCi/g)	Mean (pCi/g)	Max (pCi/g)
Grid	0.2	33	2.2	10.6	-0.3	1.3	0.2	0.4
Bias	0.989	89	0.7	22.7	-0.1	5.7	0.0	0.0

[a] FSS data includes characterization data
[b] Nuclide values are net of mean background. FMPC is net of mean background plus 2 sigma.

5.20.3.2. All tests required by the D Plan were passed except the Min/Max and Background tests. All tests required for release of a Class 1 survey unit were passed as shown in Table 5.20.2. The TCTR lists all the FSS soil samples in the data set and is presented in Tab 20 of Appendix 3.

Table 5.20.2
Screen Data and Statistical Test Report

Test Performed	FMPC	Must Pass
Min/Max	Fail	
Background	Fail	
DCGLw	Pass	
DCGLavg	Pass	X
EMC	Pass	X
Wilcoxon Rank Sum	Pass	X

5.20.3.3. **Scans** – A final scan of the survey unit was performed in January 2003. 100% of the survey unit was scanned after remediation was completed as described in Section 4.6. No elevated readings resulted from the scans.

5.20.3.4. **Fixed Equipment** – The water treatment system which extends into this survey unit is discussed in Section 5.19 of this report.

5.20.4. **Conclusions**

5.20.4.1. NaI scans taken on the surface of SU-20 after remediation revealed no elevated soil concentrations.

5.20.4.2. No FSS soil samples tested from SU-20 exceeded the $DCGL_w$.

5.20.4.3. SU-20 passed all screening tests except background and min/max.

5.20.4.4. SU-20 passed the statistical WRS test.

5.20.4.5. SU-20 meets all license criteria for release of a Class 1 survey unit.

5.20.5. **Recommendations**

5.20.5.1. SU-20 should be released from the license.

5.21. Survey Unit 21

5.21.1. SU-21 is a Class 1 survey unit. The survey unit is located in the eastern portion of the Kerr-McGee Technical Center Site. The survey unit is east of the water treatment system, is bounded by SU-22 to the east, by SU-16, SU-17, SU-18, SU-19, and SU-20 to the west, and by SU-24 to the north and south. Appendix 1, Figure 1-3 shows the survey unit and its location at the site. The area included in the survey unit is 1,800 m^2.

5.21.2. **Final Status Survey Data**

5.21.2.1. **Soil Samples** - 56 soil samples were collected from this survey unit. 40 of those samples were part of the grid, and the other 16 were bias samples. All samples were less than 1.0 FMPC. The data are summarized in Table 5.21.1 and mapped in Appendix 1, Figure 5-19.

Table 5.21.1
***FSS Data*[a,b]**

			Uranium		Natural Th		Ra-226	
Measurement Type (cm)	Max FMPC	Number of Survey Points	Mean (pCi/g)	Max (pCi/g)	Mean (pCi/g)	Max (pCi/g)	Mean (pCi/g)	Max (pCi/g)
Grid	0.1	40	0.7	3.4	0.1	0.3	0.3	0.7
Bias	0.0	16	-0.1	1.0	-0.1	0.6	0.1	0.4

[a] FSS data includes characterization data
[b] Nuclide values are net of mean background. FMPC is net of mean background plus 2 sigma.

5.21.2.2. All tests required by the D Plan were passed except the Background Test. All tests required for release of a Class 1 survey unit were passed as shown in Table 5.21.2. The TCTR lists all the FSS soil samples in the data set and is presented in Tab 21 of Appendix 3.

5.21.2.3. **Scans** – A final scan of the survey unit was performed in October 2000 as part of the site characterization. 100% of the survey unit was scanned with an unshielded NaI detector. The scan results are presented in Figure 4-4, Appendix 1. No scans above the investigative threshold of 2500 cpm (net of background) were detected in this survey unit.

Table 5.21.2
Screen Data and Statistical Test Report

Test Performed	FMPC	Must Pass
Min/Max	Pass	
Background	Fail	
DCGLw	Pass	
DCGLavg	Pass	X
EMC	Pass	X
Wilcoxon Rank Sum	Pass	X

5.21.3. **Conclusions**

5.21.3.1. NaI scans taken on the surface of SU-21 revealed no elevated soil concentrations.

5.21.3.2. No FSS soil samples tested from SU-21 exceeded the $DCGL_w$.

5.21.3.3. SU-21 passed all screening tests except background.

5.21.3.4. SU-21 passed the statistical WRS test.

5.21.3.5. SU-21 meets all license criteria for release of a Class 1 survey unit.

5.21.4. **Recommendations**

5.21.4.1. SU-21 should be released from the license.

5.22. Survey Unit 22

5.22.1. SU-22 is a Class 1 survey unit. The survey unit is located in the eastern portion of the Kerr-McGee Technical Center Site. The survey unit is east of the water treatment system, is bounded by SU-23 to the east, by SU-21 to the west, and by SU-24 to the north and south. Appendix 1, Figure 1-3 shows the survey unit and its location at the site. The area included in the survey unit is 1,800 m^2.

5.22.2. **Final Status Survey Data**

5.22.2.1. **Soil Samples** - 56 soil samples were taken in this survey unit. 40 of those samples were part of the grid, and the other 16 were bias samples. All FSS samples were less than 1.0 FMPC. The data are summarized in Table 5.22.1 and mapped in Appendix 1, Figure 5-19.

Table 5.22.1
***FSS Data*[a,b]**

			Uranium		Natural Th		Ra-226	
Measurement Type (cm)	Max FMPC	Number of Survey Points	Mean (pCi/g)	Max (pCi/g)	Mean (pCi/g)	Max (pCi/g)	Mean (pCi/g)	Max (pCi/g)
Grid	0.1	40	0.6	1.8	0.1	0.6	0.3	0.5
Bias	-0.1	16	0.1	1.5	0.0	0.5	0.2	0.4

[a] FSS data includes characterization data
[b] Nuclide values are net of mean background. FMPC is net of mean background plus 2 sigma.

5.22.2.2. **Scans** – A final scan of the survey unit was performed in October 2000 as part of the site characterization. 100% of the survey unit was scanned with an unshielded NaI detector. The scan results are presented in Figure 4-4, Appendix 1. No scans above the investigative threshold of 2500 cpm (net of background) were detected in this survey unit.

5.22.2.3. All tests required by the D Plan were passed except the Background Test. All tests required for release of a Class 1 survey unit were passed as shown in Table 5.22.2. The TCTR lists all the FSS soil samples in the data set and is presented in Tab 22 of Appendix 3.

Table 5.22.2
Screen Data and Statistical Test Report

Test Performed	FMPC	Must Pass
Min/Max	Pass	
Background	Fail	
DCGLw	Pass	
DCGLavg	Pass	X
EMC	Pass	X
Wilcoxon Rank Sum	Pass	X

5.22.3. **Conclusions**

5.22.3.1. NaI scans taken on the surface of SU-22 revealed no elevated soil concentrations.

5.22.3.2. No FSS soil samples tested from SU-22 exceeded the $DCGL_w$.

5.22.3.3. SU-22 passed all screening tests except background.

5.22.3.4. SU-22 passed the statistical WRS test.

5.22.3.5. SU-22 meets all license criteria for release of a Class 1 survey unit.

5.22.4. **Recommendations**

5.22.4.1. SU-22 should be released from the license.

5.23. Survey Unit 23

5.23.1. SU-23 is a Class 1 survey unit. The survey unit is located in the eastern portion of the Kerr-McGee Technical Center Site. The survey unit is east of the water treatment system, is bounded by SU-22 to the west, and by SU-24 on all other sides. This survey unit encompasses the area that contains lowland areas which occasionally fill with rain water or drainage water. Appendix 1, Figure 1-3 shows the survey unit and its location at the site. The area included in the survey unit is 1,800 m^2.

5.23.2. **Final Status Survey Data**

5.23.2.1. **Soil Samples** - 44 soil samples were collected from this survey unit. 36 of those samples were part of the grid, and the other 8 were samples. All FSS samples were less than 1.0 FMPC. The data are summarized in Table 5.23.1 and mapped in Appendix 1, Figure 5-19.

Table 5.23.1
***FSS Data*[a,b]**

			Uranium		Natural Th		Ra-226	
Measurement Type (cm)	Max FMPC	Number of Survey Points	Mean (pCi/g)	Max (pCi/g)	Mean (pCi/g)	Max (pCi/g)	Mean (pCi/g)	Max (pCi/g)
Grid	0.0	36	1.1	2.2	-0.2	0.3	0.3	0.4
Bias	-0.2	8	0.9	1.5	-0.5	-0.4	0.1	0.2

[a] FSS data includes characterization data
[b] Nuclide values are net of mean background. FMPC is net of mean background plus 2 sigma.

5.23.2.2. All tests required by the D Plan were passed except the Background Test. All tests required for release of a Class 1 survey unit were passed as shown in Table 5.23.2. The TCTR lists all the FSS soil samples in the data set and is presented in Tab 23 of Appendix 3.

Table 5.23.2
Screen Data and Statistical Test Report

Test Performed	FMPC	Must Pass
Min/Max	Pass	
Background	Fail	
DCGLw	Pass	
DCGLavg	Pass	X
EMC	Pass	X
Wilcoxon Rank Sum	Pass	X

5.23.2.3. **Scans** – A final scan of the survey unit was performed in October 2000 as part of the site characterization. 100% of the survey unit was scanned with an unshielded NaI detector. The scan results are presented in Figure 4-4, Appendix 1. No scans above the investigative threshold of 2500 cpm (net of background) were detected in this survey unit.

5.23.3. **Conclusions**

5.23.3.1. NaI scans taken on the surface of SU-23 revealed no elevated soil concentrations.

5.23.3.2. No FSS soil samples tested in SU-23 exceeded the $DCGL_W$.

5.23.3.3. SU-23 passed all screening tests except background.

5.23.3.4. SU-23 passed the statistical WRS test.

5.23.3.5. SU-23 meets all license criteria for release of a Class 1 survey unit.

5.23.4. **Recommendations**

5.23.4.1. SU-23 should be released from the license.

5.24. Survey Unit 24

5.24.1. SU-24 is a Class 2 survey unit. The survey unit is located in the eastern portion of the Kerr-McGee Technical Center Site. Appendix 1, Figure 1-3 shows the survey unit and its location at the site. The survey unit served as a buffer area to ensure that there were no areas of elevated radioactivity outside of the Class 1 areas nearby. The area included in the survey unit is 5,450 m^2.

5.24.2. **Final Status Survey Data**

5.24.2.1. **Scans** – A scan of this survey unit was performed in August 2002 as part of the site characterization. 10% of the survey unit was scanned with a shielded NaI detector. No scans above the threshold of 2500 cpm (net of background) were detected in this survey unit.

5.24.2.2. **Soil Samples** - 59 soil samples were taken in this survey unit. 49 of those samples were part of the grid, and the other 10 were bias samples. All FSS samples were less than 1.0 FMPC. The data are summarized in Table 5.24.1 and mapped in Appendix 1, Figure 5-20.

Table 5.24.1
***FSS Data*[a,b]**

			Uranium		Natural Th		Ra-226	
Measurement Type (cm)	Max FMPC	Number of Survey Points	Mean (pCi/g)	Max (pCi/g)	Mean (pCi/g)	Max (pCi/g)	Mean (pCi/g)	Max (pCi/g)
Grid	-0.1	49	0.9	1.8	-0.4	0	0.1	0.4
Bias	-0.2	10	0.9	1.3	-0.5	-0.3	0.1	0.1

[a] FSS data includes characterization data
[b] Nuclide values are net of mean background. FMPC is net of mean background plus 2 sigma.

5.24.2.3. All tests required by the D Plan were passed except the Background Test. All tests required for release of a Class 1 survey unit were passed as shown in Table 5.24.2. The TCTR lists all the FSS soil samples in the data set and is presented in Tab 24 of Appendix 3.

Table 5.24.2
Screen Data and Statistical Test Report

Test Performed	FMPC	Must Pass
Min/Max	Pass	
Background	Fail	
DCGLw	Pass	X
DCGLavg	Pass	X
EMC	Pass	X
Wilcoxon Rank Sum	Pass	X

5.24.2.4. **Scans** – A final scan of the survey unit was performed in October 2000 as part of the site characterization. 100% of the survey unit was scanned with an unshielded NaI detector. The scan results are presented in Figure 4-4, Appendix 1. No scans above the investigative threshold of 2500 cpm (net of background) were detected in this survey unit.

5.24.3. **Conclusions**

5.24.3.1. NaI scans taken on the surface of SU-24 revealed no elevated soil concentrations.

5.24.3.2. No FSS soil samples tested in SU-24 exceeded the $DCGL_w$.

5.24.3.3. SU-24 passed all screening tests except background.

5.24.3.4. SU-24 passed the statistical WRS test.

5.24.3.5. SU-24 meets all license criteria for release of a Class 1 survey unit.

5.24.4. **Recommendations**

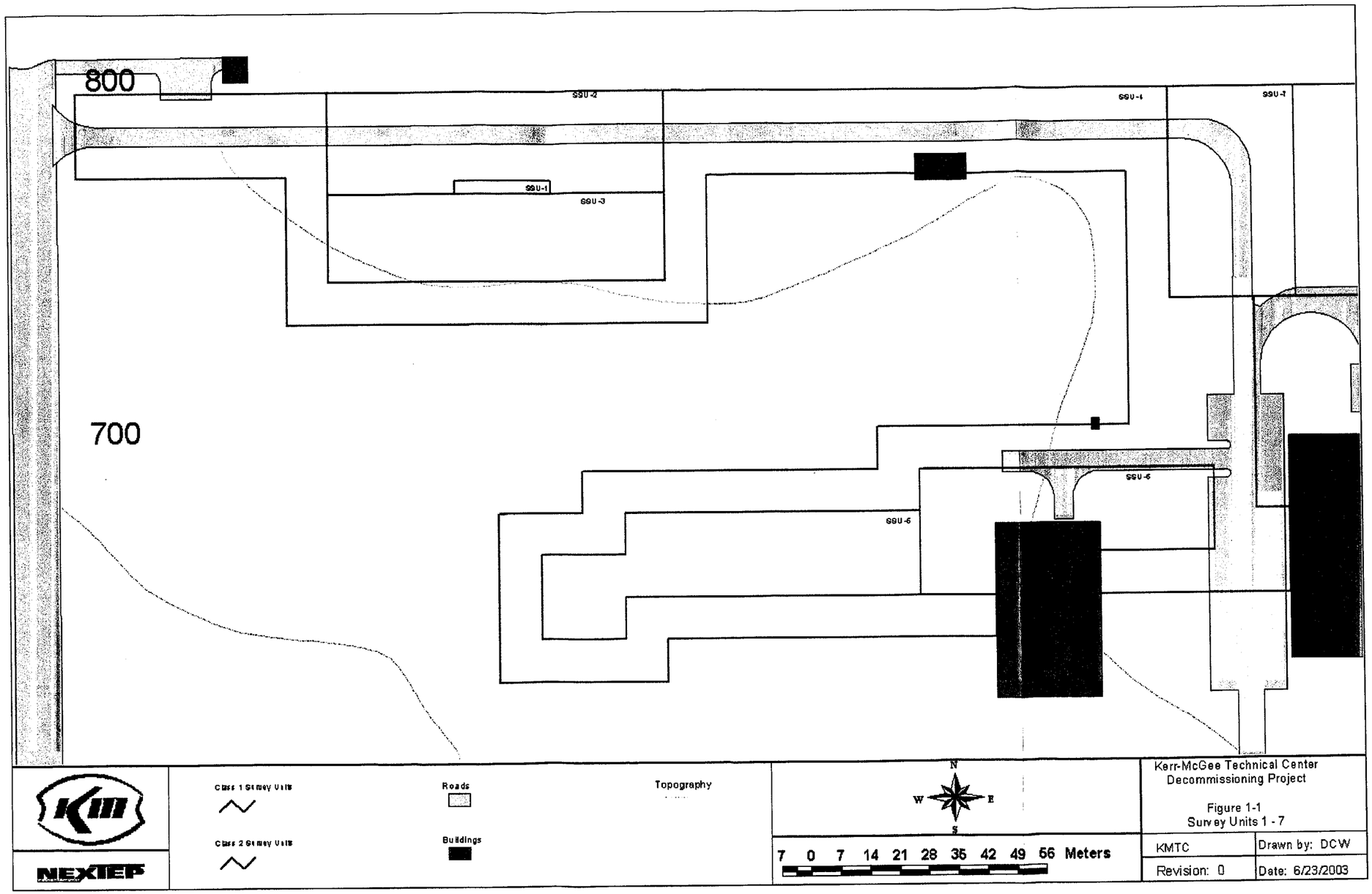
5.24.4.1. SU-24 should be released from the license.

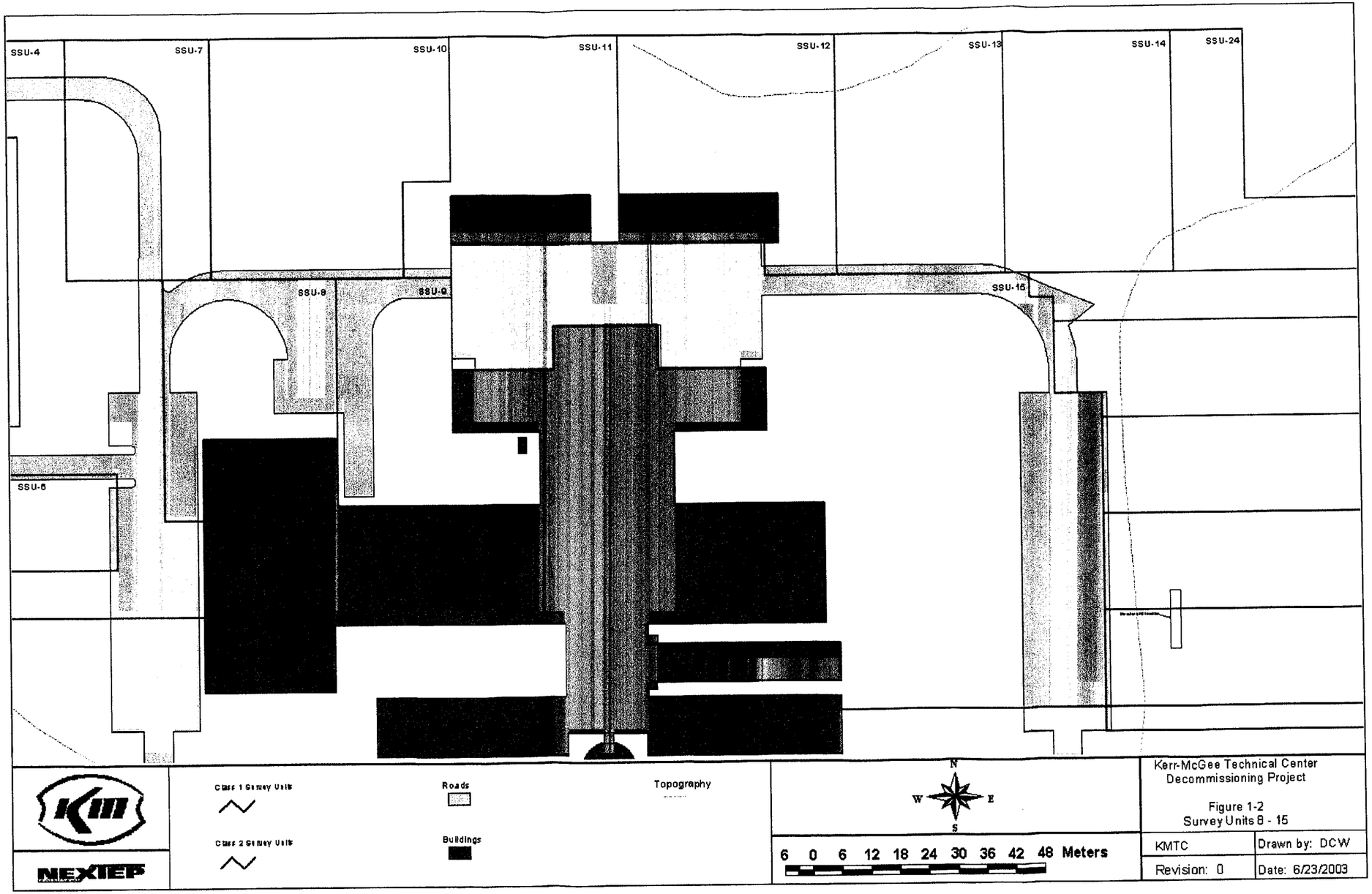
6. SUMMARY

6.1. During the period between January 1999 and January 2003, the outdoor portions of the KMTC site were surveyed and remediated as described in the KMTC D Plan under License SUB-986. All necessary scans, surveys, and soil sample measurements were taken to ensure that no areas remaining on-site exceeded the NRC-approved decommissioning criteria. Kerr-McGee therefore requests that all of the outdoor areas of the KMTC site be released for unrestricted use from license SUB-986.

Appendix 1

Figures


800
700
SSU-2
SSU-1
SSU-3
SSU-4
SSU-7
SSU-5
SSU-6
Class 1 Survey Units
Class 2 Survey Units
Roads
Buildings
Topography
N
W
E
S
7 0 7 14 21 28 35 42 49 56 Meters
Kerr-McGee Technical Center
Decommissioning Project
Figure 1-1
Survey Units 1 - 7
KMTC
Drawn by: DCW
Revision: 0
Date: 6/23/2003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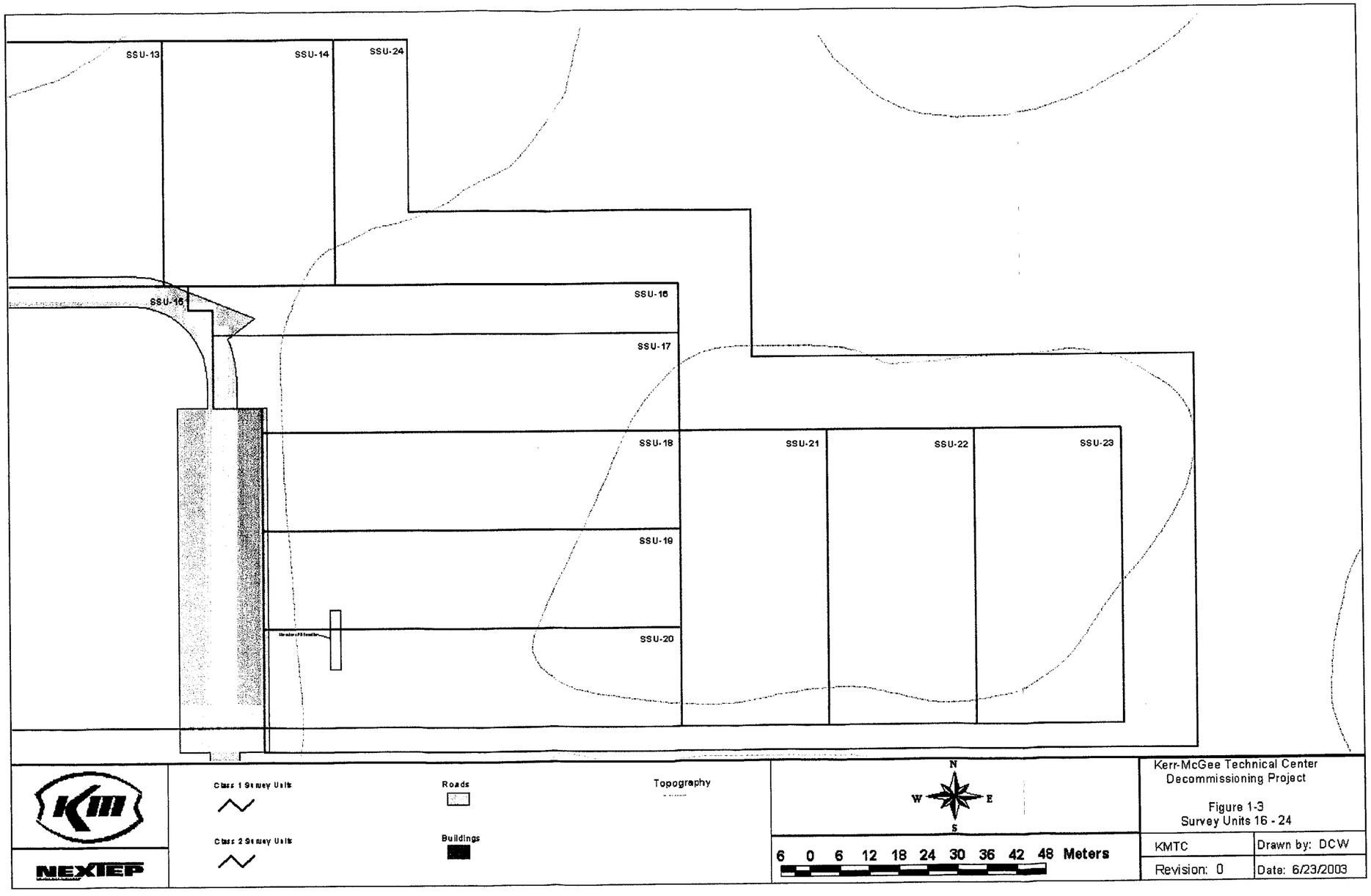
SSU-7
SSU-10
SSU-11
SSU-12
SSU-13
SSU-14
SSU-24
SSU-8
SSU-9
SSU-15
SSU-6
Class 1 Survey Units
Class 2 Survey Units
Roads
Buildings
Topography
N
W
E
S
6 0 6 12 18 24 30 36 42 48 Meters
Kerr-McGee Technical Center
Decommissioning Project
Figure 1-2
Survey Units 8 - 15
KMTC
Drawn by: DCW
Revision: 0
Date: 6/23/2003
NEXTEP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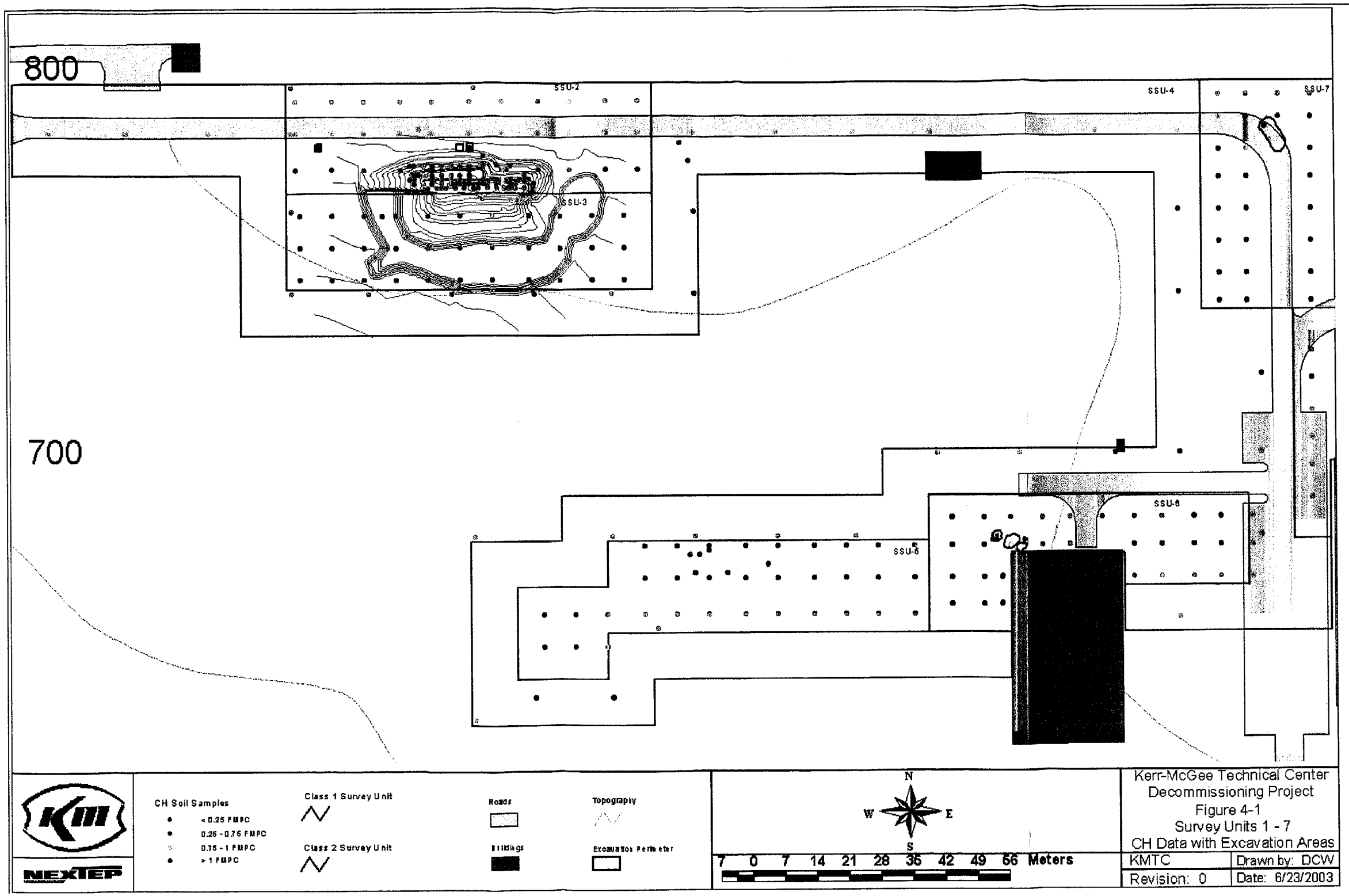
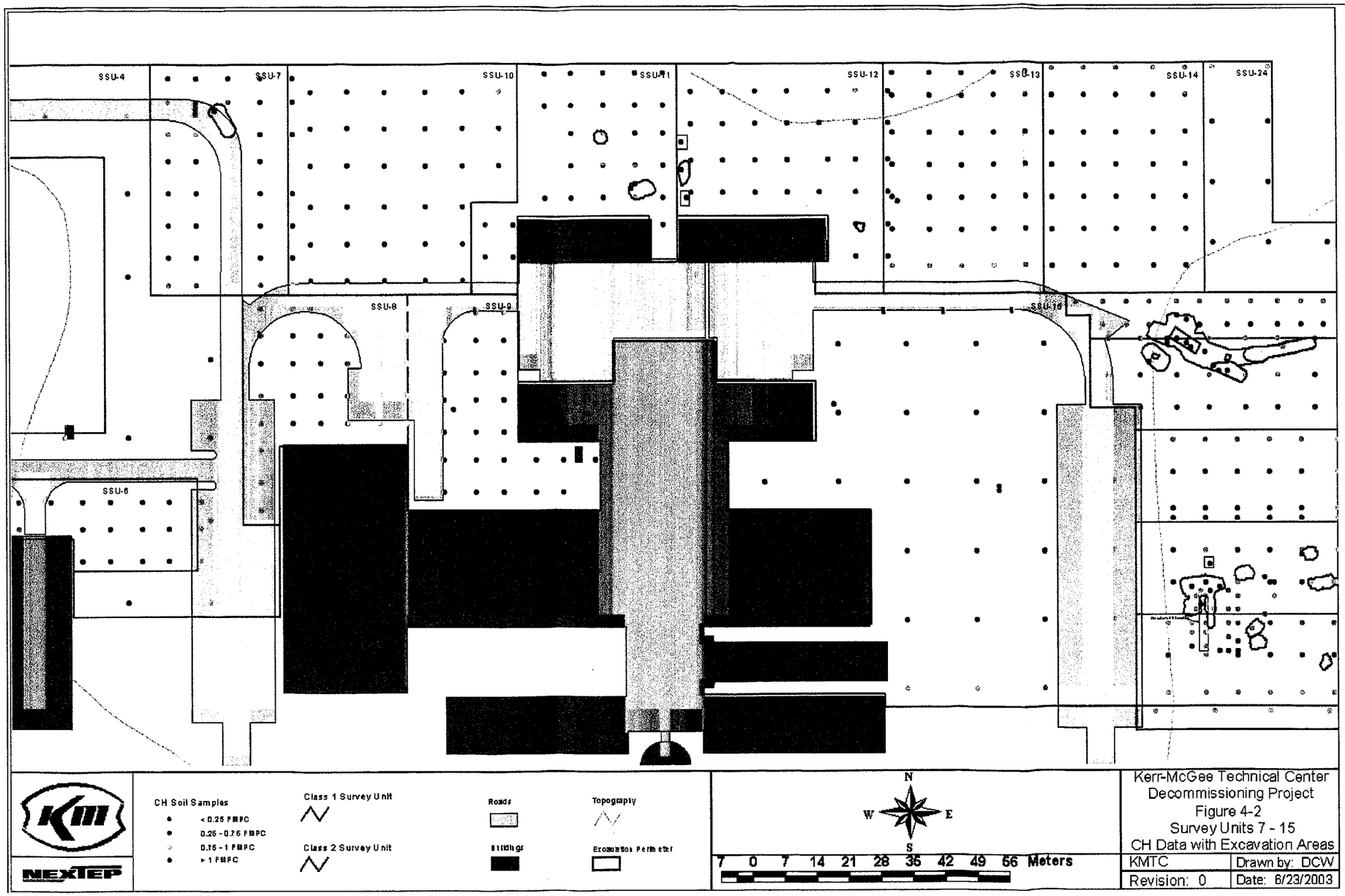
SSU-14
SSU-24
SSU-15
SSU-16
SSU-17
SSU-18
SSU-21
SSU-22
SSU-23
SSU-19
SSU-20
Class 1 Survey Units
Class 2 Survey Units
Roads
Buildings
Topography
N
W
E
S
6 0 6 12 18 24 30 36 42 48 Meters
Kerr-McGee Technical Center
Decommissioning Project
Figure 1-3
Survey Units 16 - 24
KMTC
Drawn by: DCW
Revision: 0
Date: 6/23/2003


800
700
SSU-2
SSU-3
SSU-4
SSU-7
SSU-6
SSU-5
CH Soil Samples
< 0.25 FMPC
0.26 - 0.75 FMPC
0.76 - 1 FMPC
> 1 FMPC
Class 1 Survey Unit
Class 2 Survey Unit
Roads
Buildings
Topography
Excavation Perimeter
N
W
E
S
7 0 7 14 21 28 35 42 49 56 Meters
Kerr-McGee Technical Center
Decommissioning Project
Figure 4-1
Survey Units 1 - 7
CH Data with Excavation Areas
KMTC
Drawn by: DCW
Revision: 0
Date: 6/23/2003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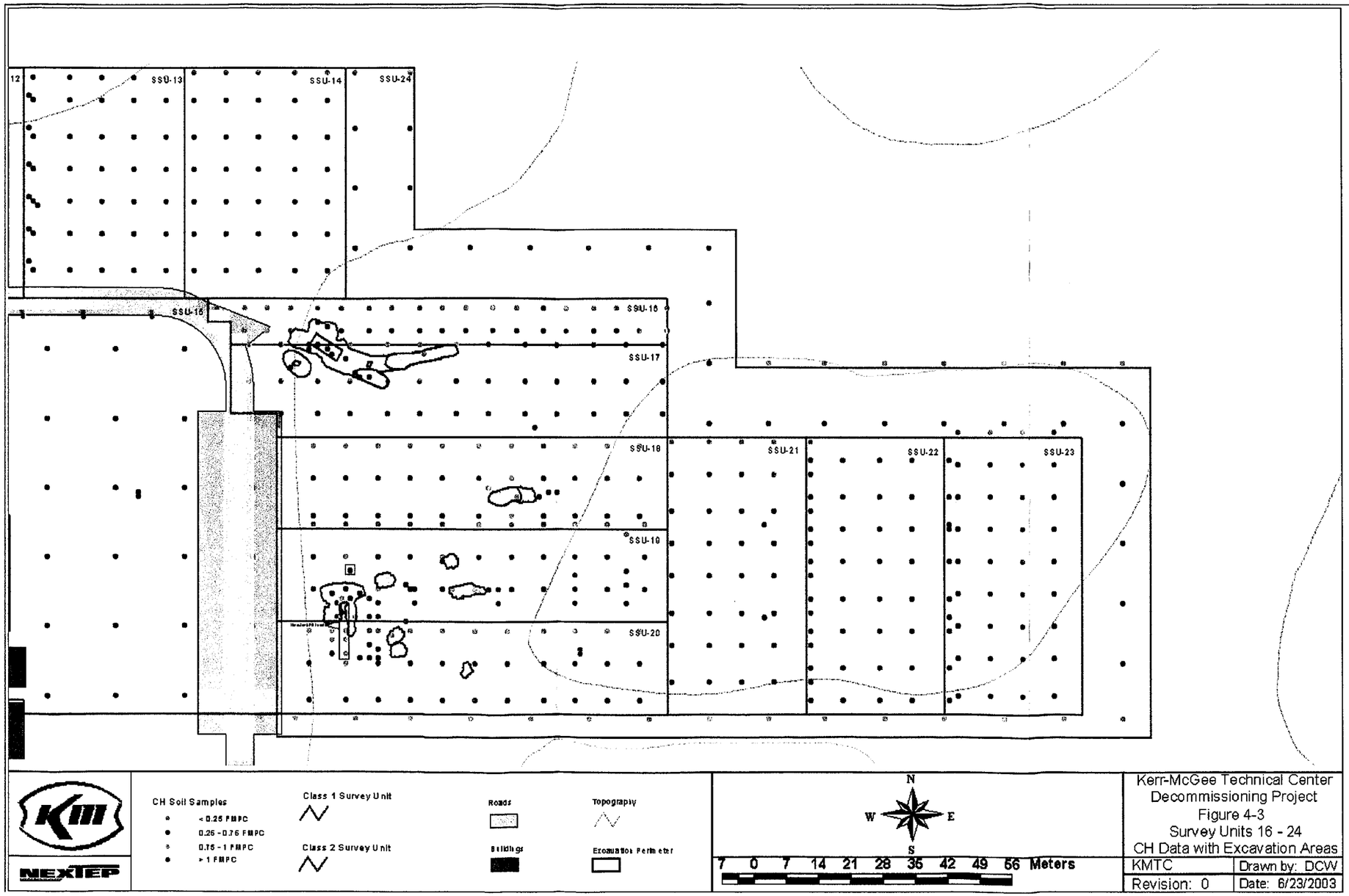
SSU-7
SSU-10
SSU-11
SSU-12
SSU-13
SSU-14
SSU-24
SSU-8
SSU-9
SSU-16
SSU-6
CH Soil Samples
< 0.25 FMPC
0.25 - 0.75 FMPC
0.75 - 1 FMPC
> 1 FMPC
Class 1 Survey Unit
Class 2 Survey Unit
Roads
Buildings
Topography
Excavation Perimeter
N
W
E
S
7 0 7 14 21 28 35 42 49 56 Meters
Kerr-McGee Technical Center
Decommissioning Project
Figure 4-2
Survey Units 7 - 15
CH Data with Excavation Areas
KMTC
Drawn by: DCW
Revision: 0
Date: 6/23/2003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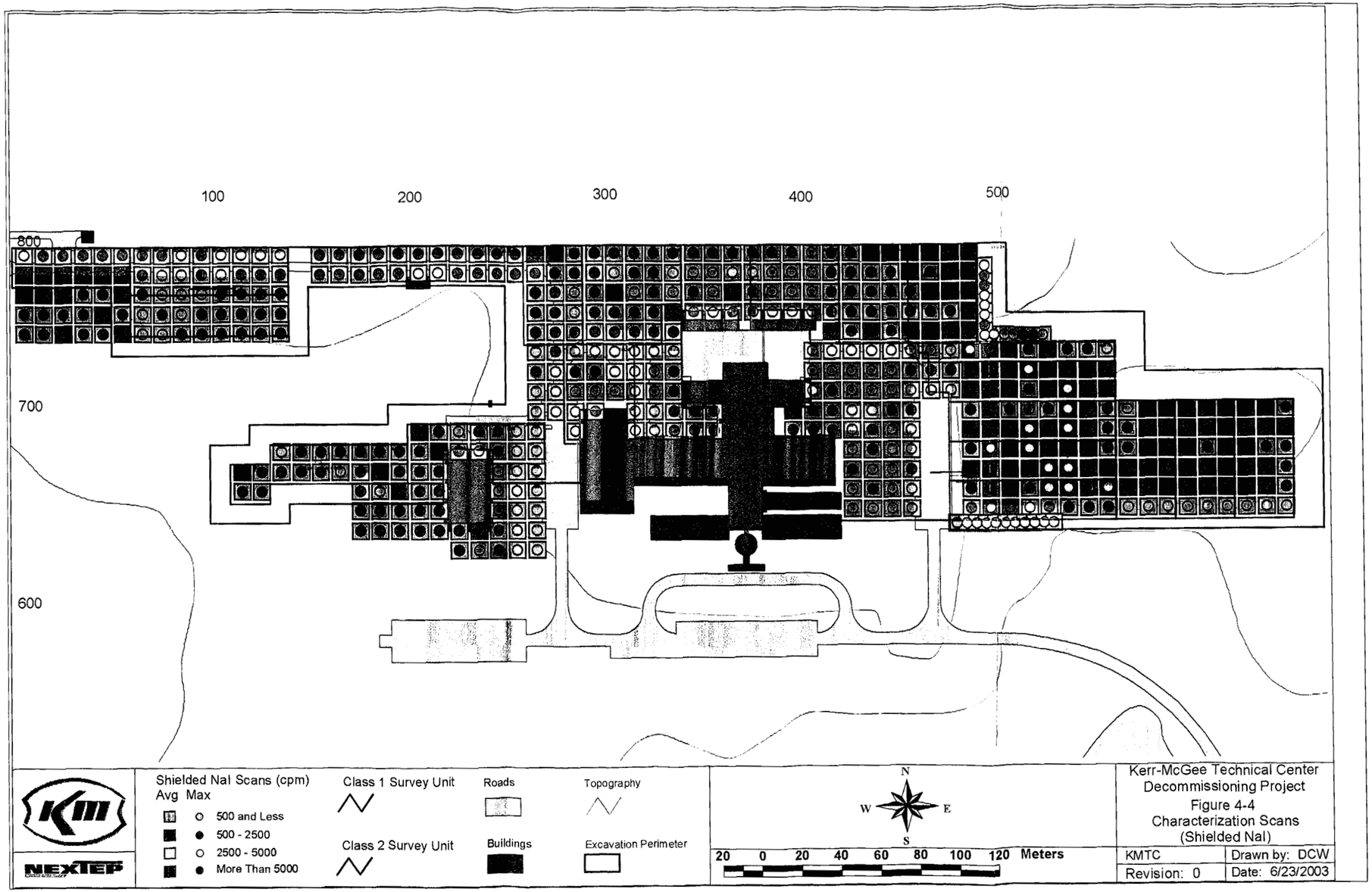
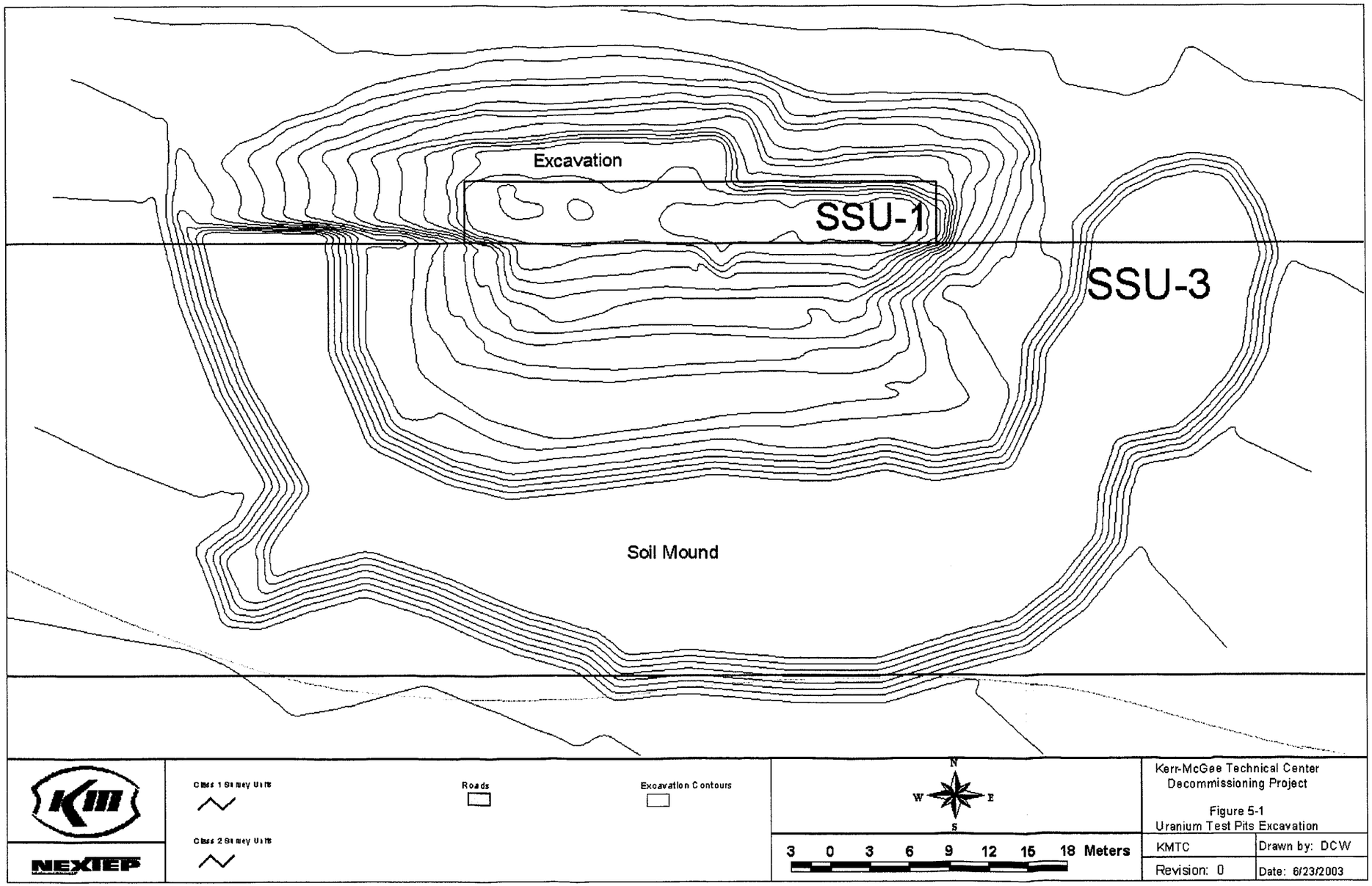
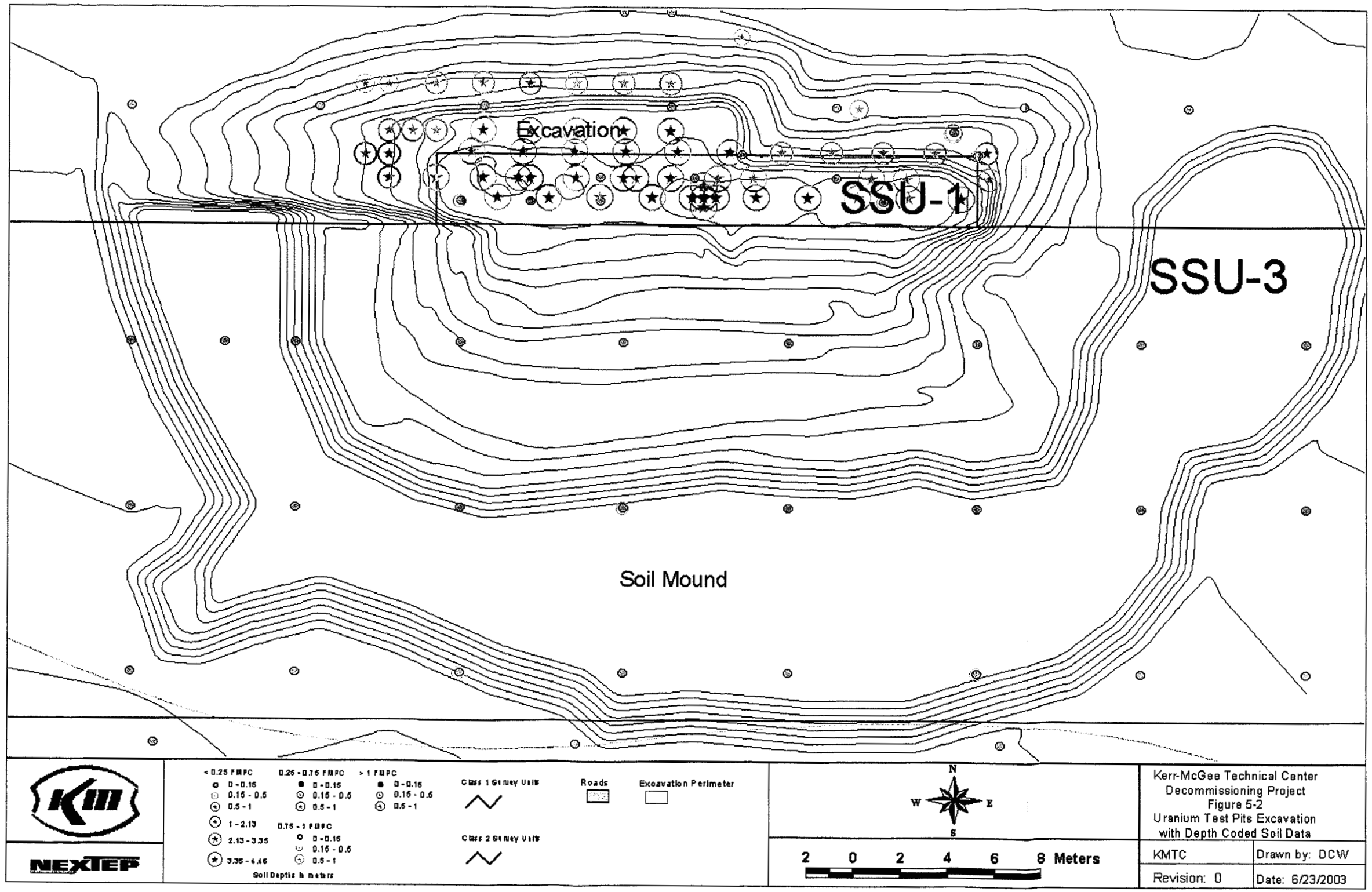
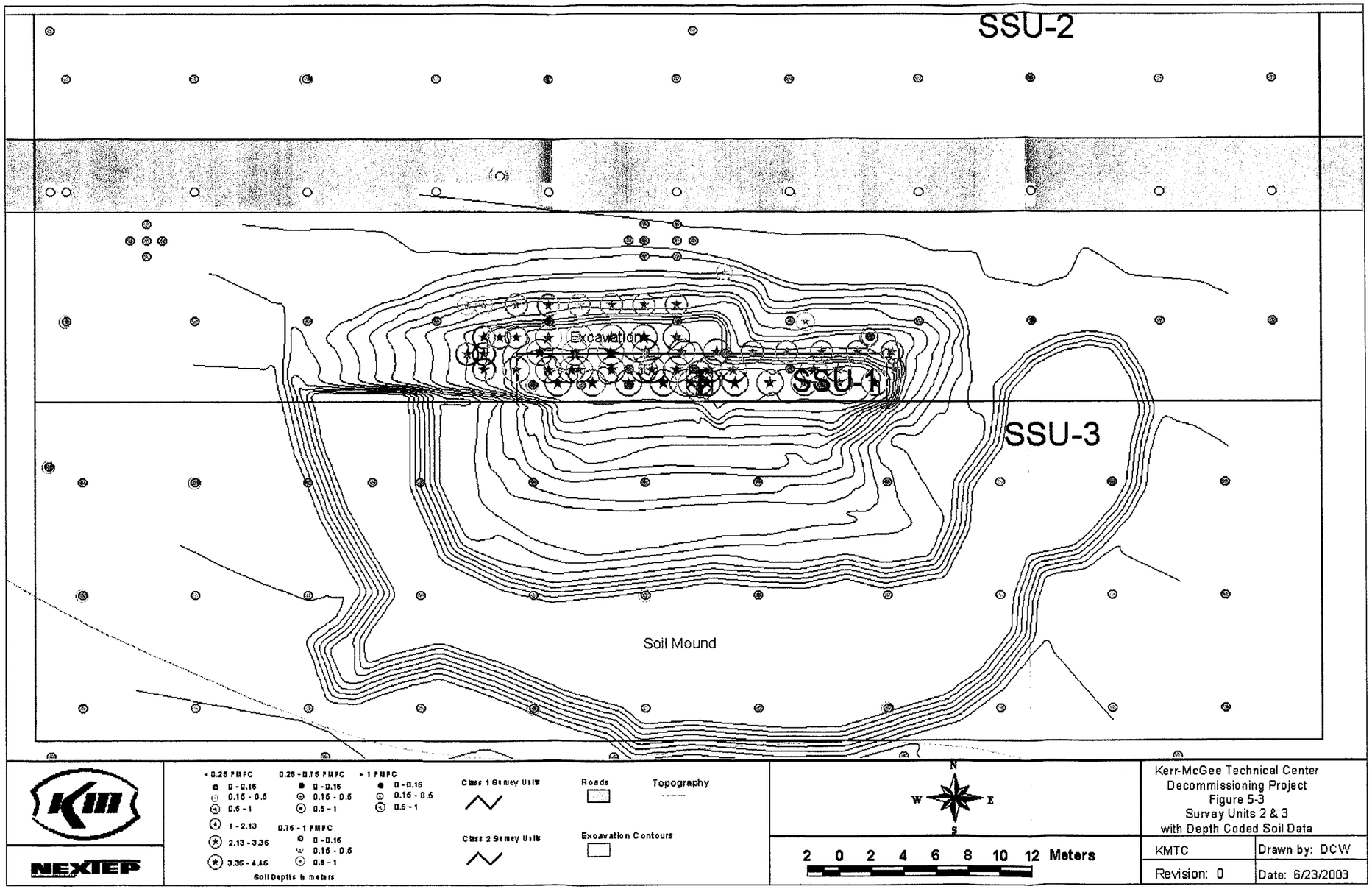
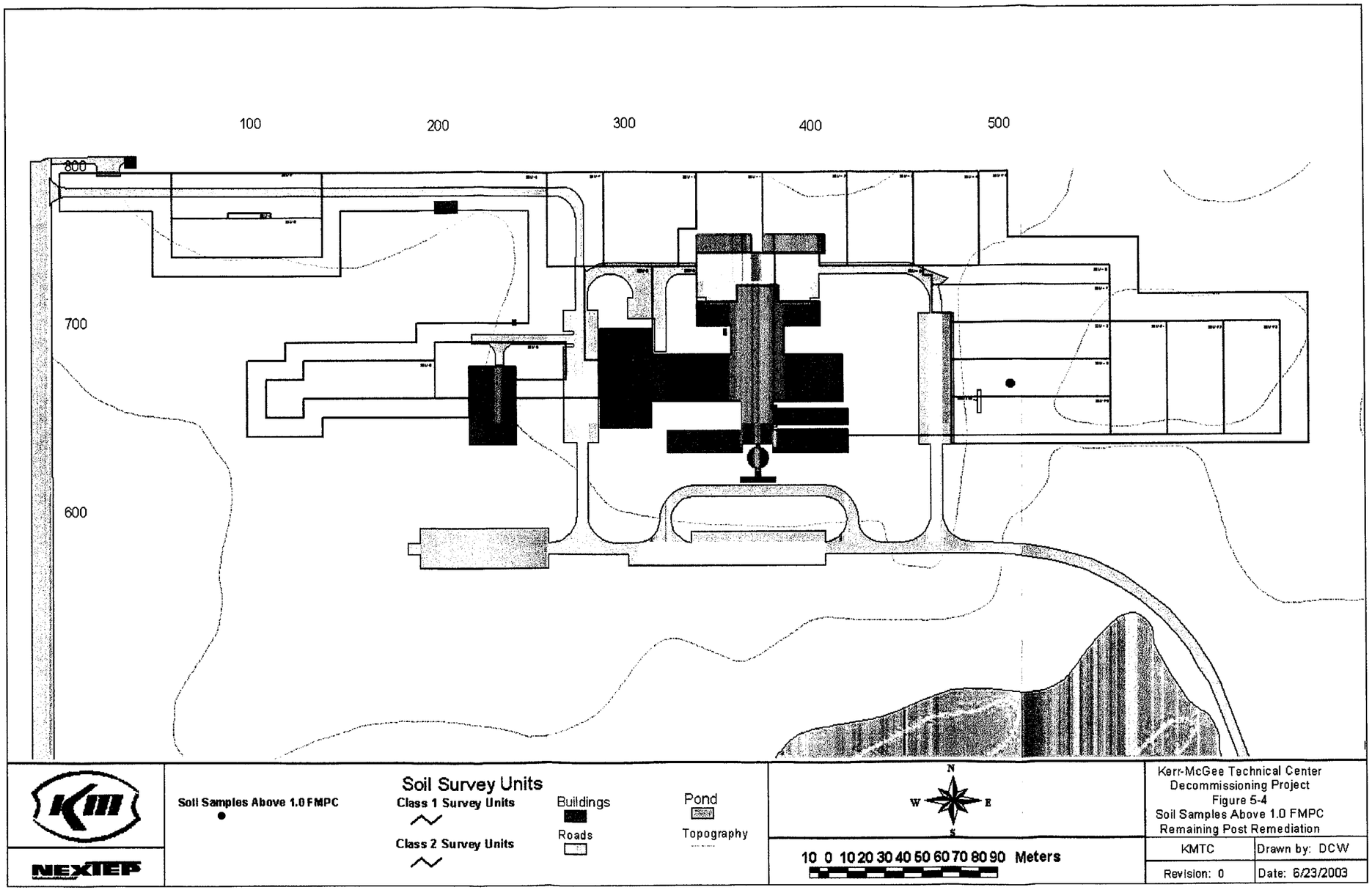
SSU-13
SSU-14
SSU-24
SSU-15
SSU-16
SSU-17
SSU-18
SSU-21
SSU-22
SSU-23
SSU-19
SSU-20
CH Soil Samples
< 0.25 FMPC
0.26 - 0.75 FMPC
0.75 - 1 FMPC
> 1 FMPC
Class 1 Survey Unit
Class 2 Survey Unit
Roads
Buildings
Topography
Excavation Perimeter
N
W
E
S
7 0 7 14 21 28 35 42 49 56 Meters
Kerr-McGee Technical Center
Decommissioning Project
Figure 4-3
Survey Units 16 - 24
CH Data with Excavation Areas
KMTC
Drawn by: DCW
Revision: 0
Date: 6/23/2003

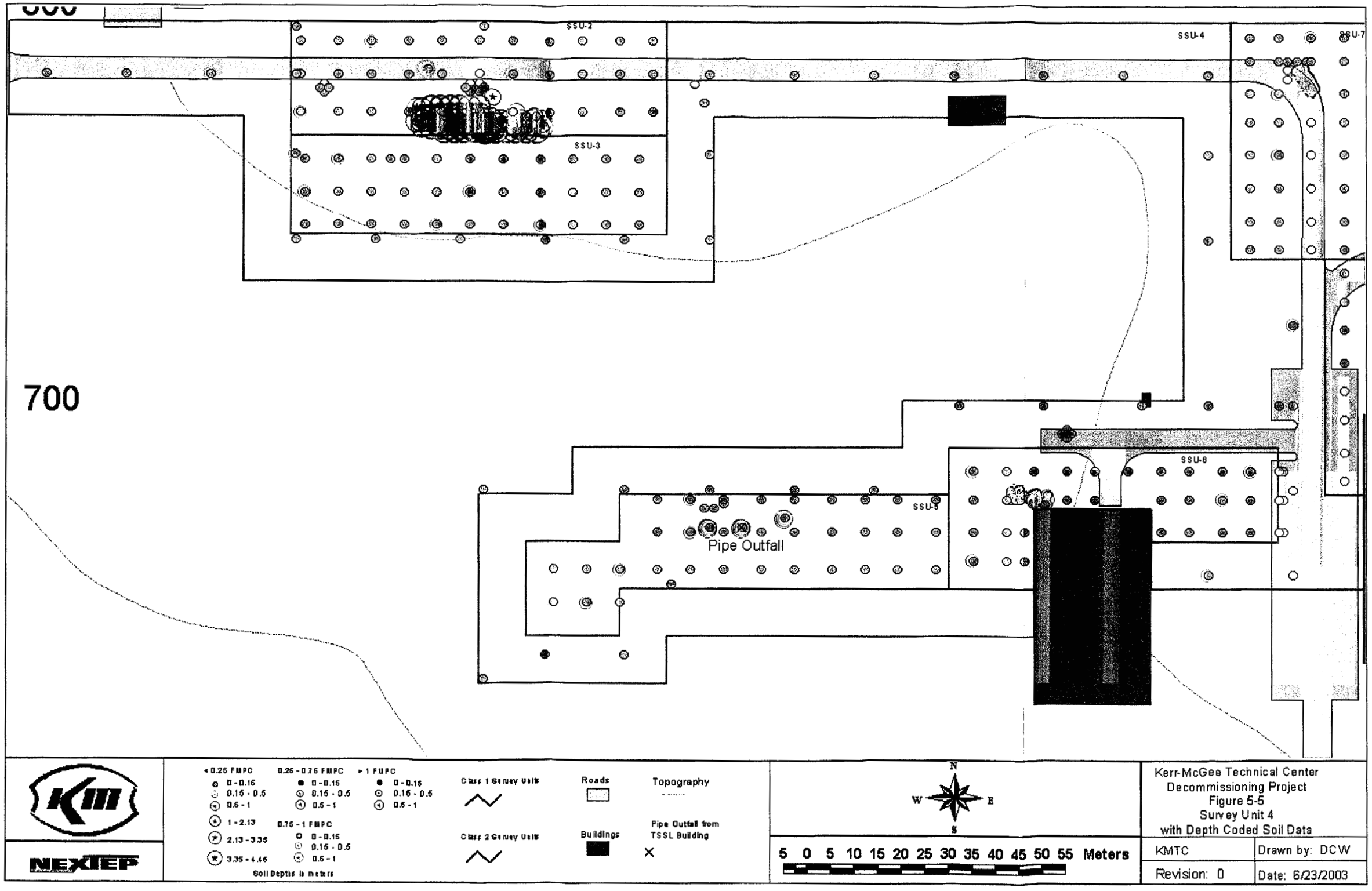

100
200
300
400
500
800
700
600
Shielded NaI Scans (cpm)
Avg Max
500 and Less
500 - 2500
2500 - 5000
More Than 5000
Class 1 Survey Unit
Class 2 Survey Unit
Roads
Buildings
Topography
Excavation Perimeter
N
W
E
S
20 0 20 40 60 80 100 120 Meters
Kerr-McGee Technical Center
Decommissioning Project
Figure 4-4
Characterization Scans
(Shielded NaI)
KMTC
Drawn by: DCW
Revision: 0
Date: 6/23/2003

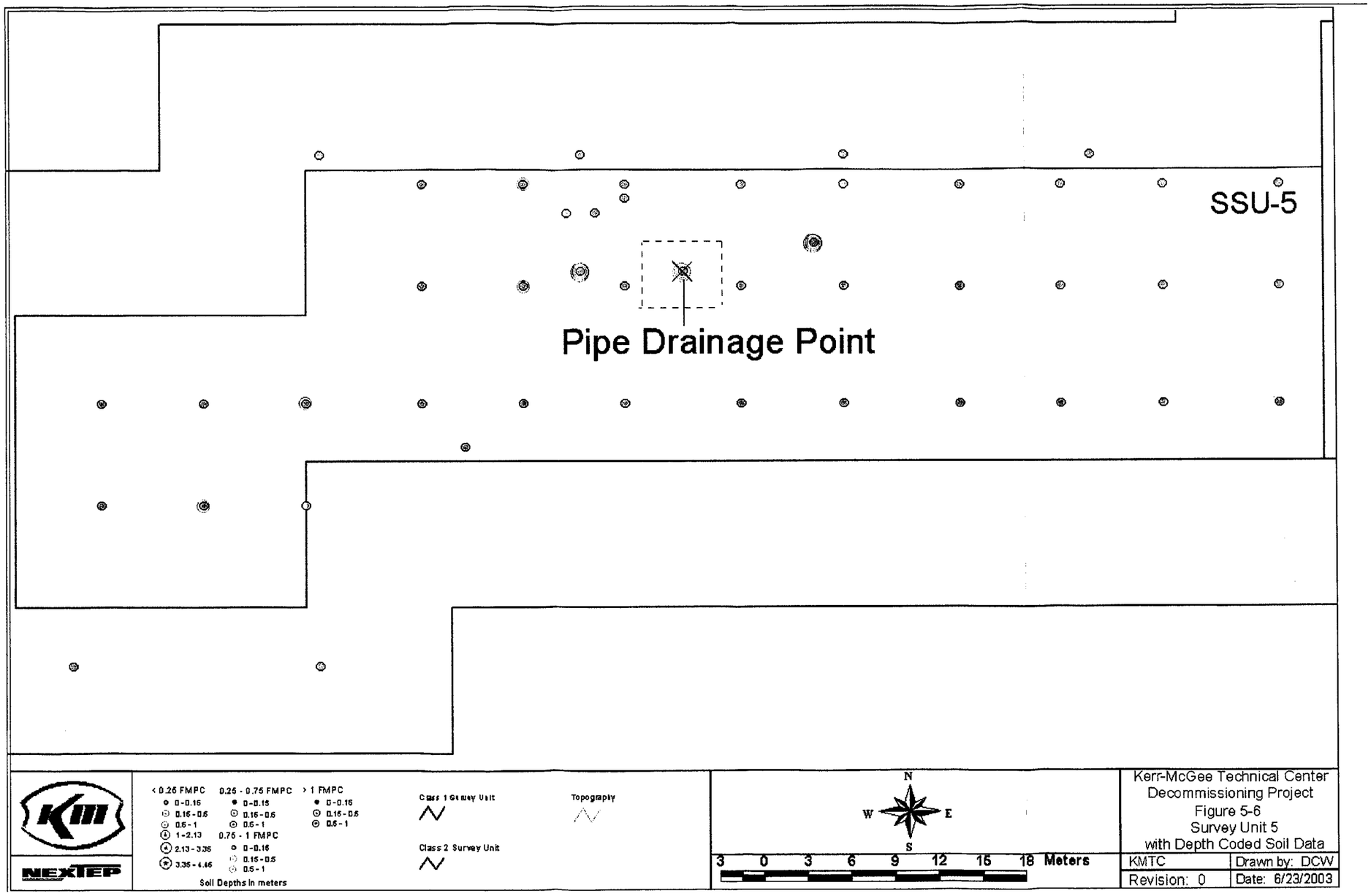

Excavation
SSU-1
SSU-3
Soil Mound
Class 1 Survey Units
Class 2 Survey Units
Roads
Excavation Contours
N
W
E
S
3 0 3 6 9 12 15 18 Meters
Kerr-McGee Technical Center
Decommissioning Project
Figure 5-1
Uranium Test Pits Excavation
KMTC
Drawn by: DCW
Revision: 0
Date: 6/23/2003

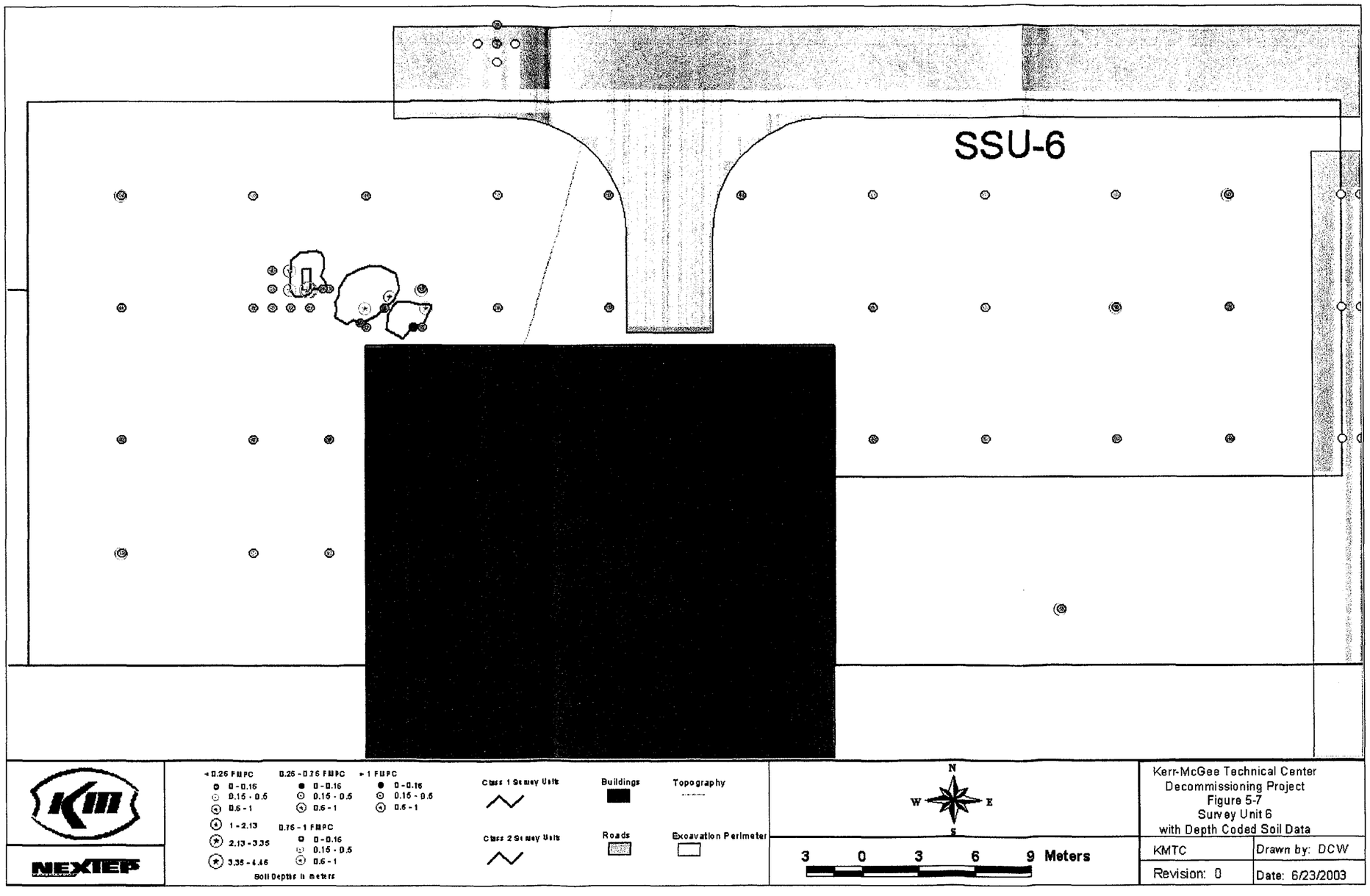

Excavation
SSU-1
SSU-3
Soil Mound
< 0.25 FMPC
0.25 - 0.75 FMPC
> 1 FMPC
0 - 0.15
0.15 - 0.5
0.5 - 1
1 - 2.13
2.13 - 3.35
3.35 - 4.46
0.75 - 1 FMPC
Soil Depths in meters
Class 1 Survey Units
Class 2 Survey Units
Roads
Excavation Perimeter
N
W
E
S
2 0 2 4 6 8 Meters
Kerr-McGee Technical Center
Decommissioning Project
Figure 5-2
Uranium Test Pits Excavation
with Depth Coded Soil Data
KMTC
Drawn by: DCW
Revision: 0
Date: 6/23/2003

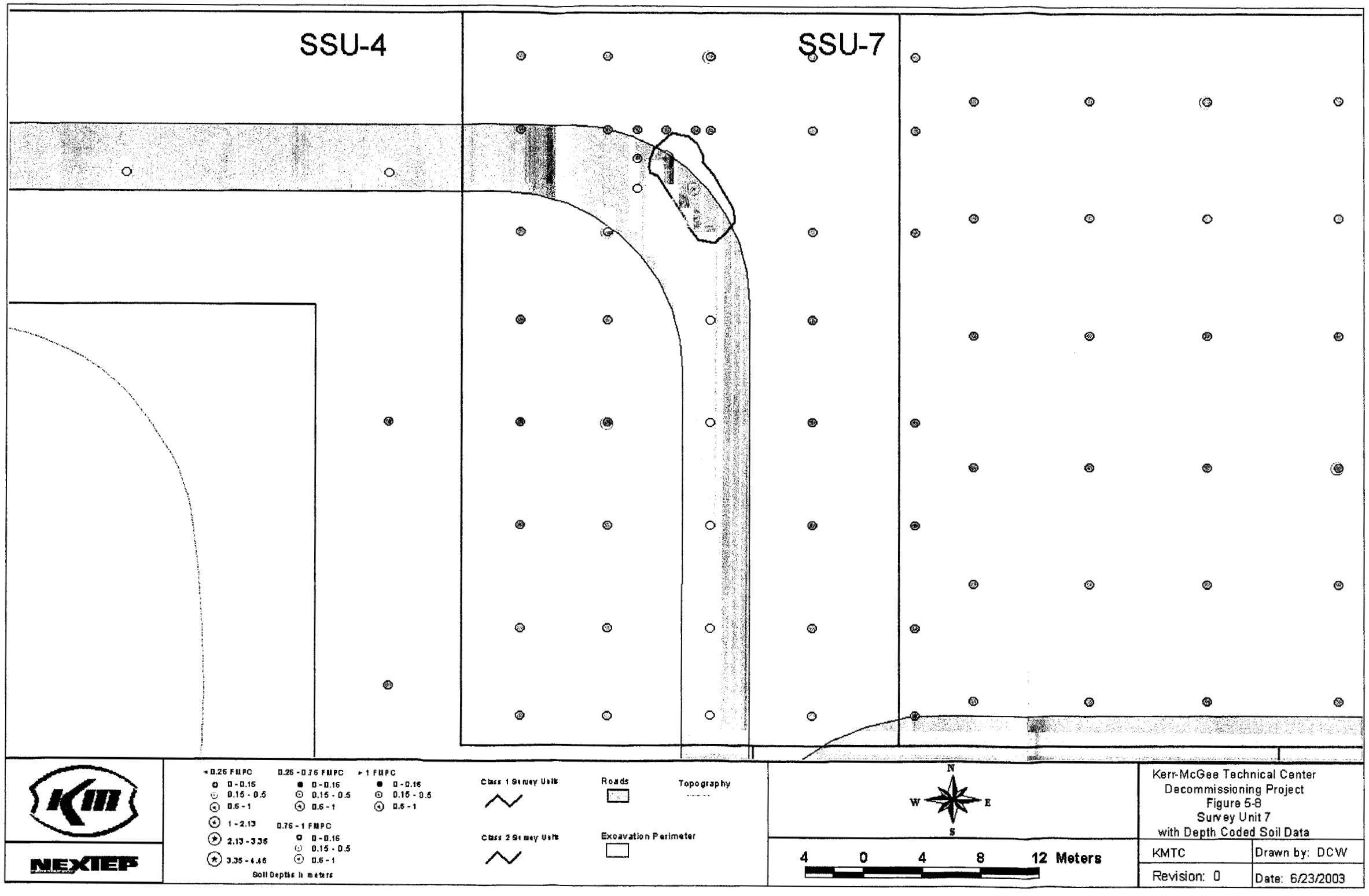

SSU-2
Excavation
SSU-1
SSU-3
Soil Mound
< 0.25 PMPC
0 - 0.15
0.15 - 0.5
0.5 - 1
1 - 2.13
2.13 - 3.36
3.36 - 4.46
0.25 - 0.75 PMPC
0 - 0.15
0.15 - 0.5
0.5 - 1
0.75 - 1 PMPC
0 - 0.15
0.15 - 0.5
0.5 - 1
> 1 PMPC
0 - 0.15
0.15 - 0.5
0.5 - 1
Soil Depths in meters
Class 1 Survey Units
Class 2 Survey Units
Roads
Topography
Excavation Contours
N
W
E
S
2 0 2 4 6 8 10 12 Meters
NEXTEP
Kerr-McGee Technical Center
Decommissioning Project
Figure 5-3
Survey Units 2 & 3
with Depth Coded Soil Data
KMTC
Drawn by: DCW
Revision: 0
Date: 6/23/2003

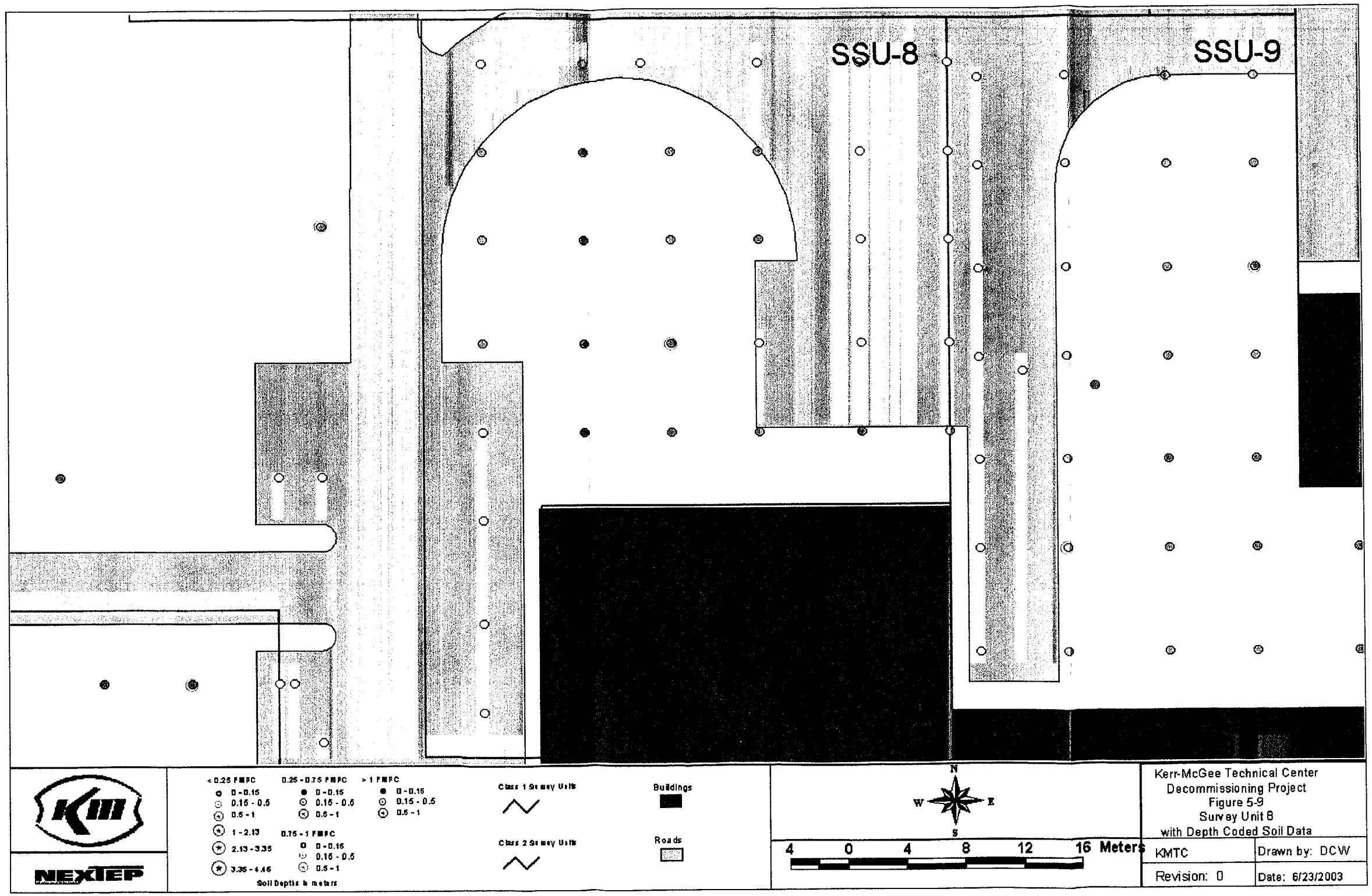

100
200
300
400
500
800
700
600
Soil Survey Units
Soil Samples Above 1.0 FMPC
Class 1 Survey Units
Class 2 Survey Units
Buildings
Roads
Pond
Topography
N
W
E
S
10 0 10 20 30 40 50 60 70 80 90 Meters
Kerr-McGee Technical Center
Decommissioning Project
Figure 5-4
Soil Samples Above 1.0 FMPC
Remaining Post Remediation
KMTC
Drawn by: DCW
Revision: 0
Date: 6/23/2003
NEXTEP

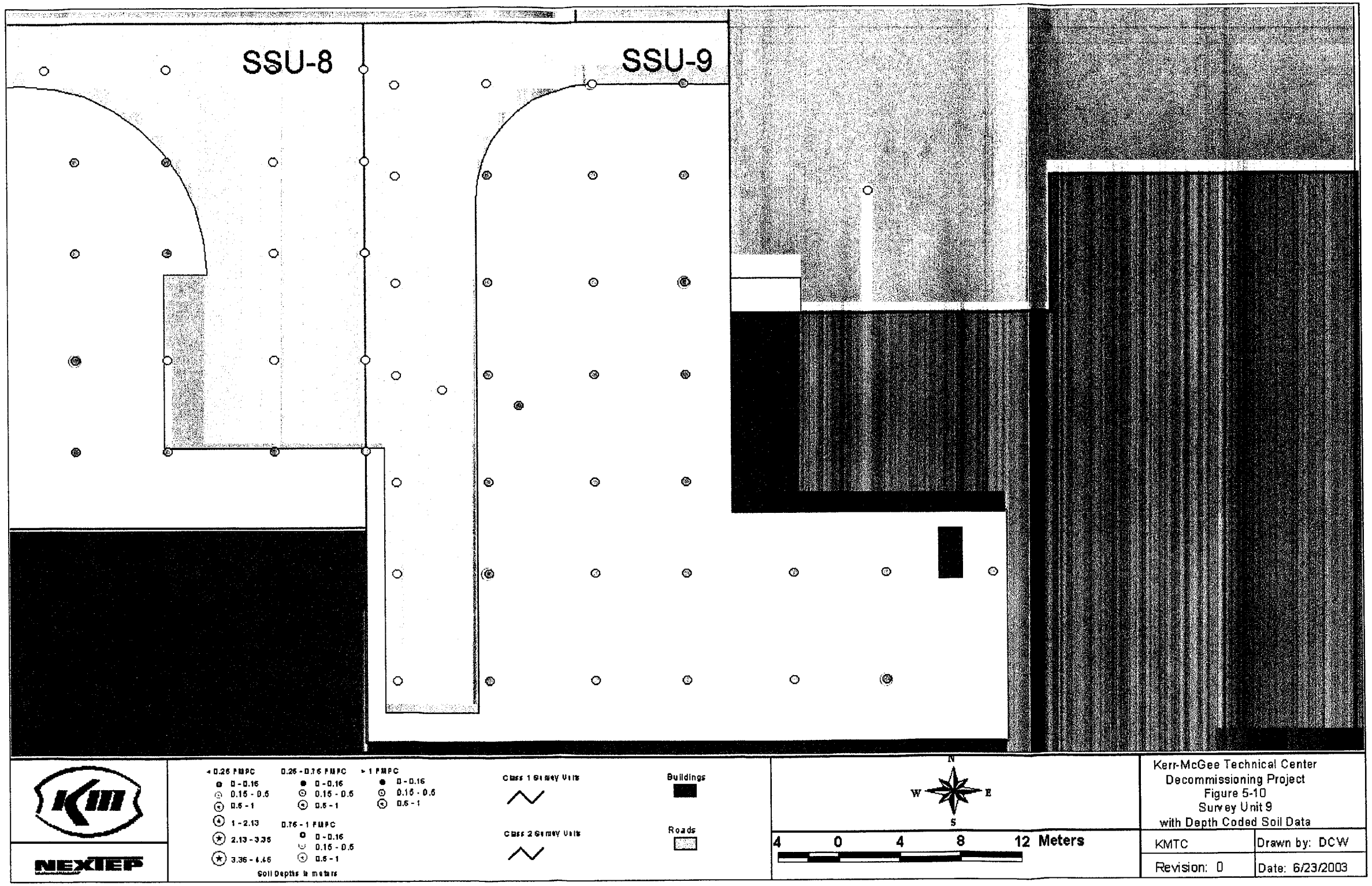

SSU-2
SSU-3
SSU-4
SSU-7
SSU-6
SSU-5
700
Pipe Outfall
< 0.25 FMPC
0.25 - 0.75 FMPC
> 1 FMPC
0 - 0.15
0.15 - 0.5
0.5 - 1
1 - 2.13
2.13 - 3.35
3.35 - 4.46
0.75 - 1 FMPC
Soil Depths in meters
Class 1 Survey Units
Class 2 Survey Units
Roads
Buildings
Topography
Pipe Outfall from TSSL Building
N
W
E
S
5 0 5 10 15 20 25 30 35 40 45 50 55 Meters
NEXTEP
Kerr-McGee Technical Center
Decommissioning Project
Figure 5-5
Survey Unit 4
with Depth Coded Soil Data
KMTC
Drawn by: DCW
Revision: 0
Date: 6/23/2003

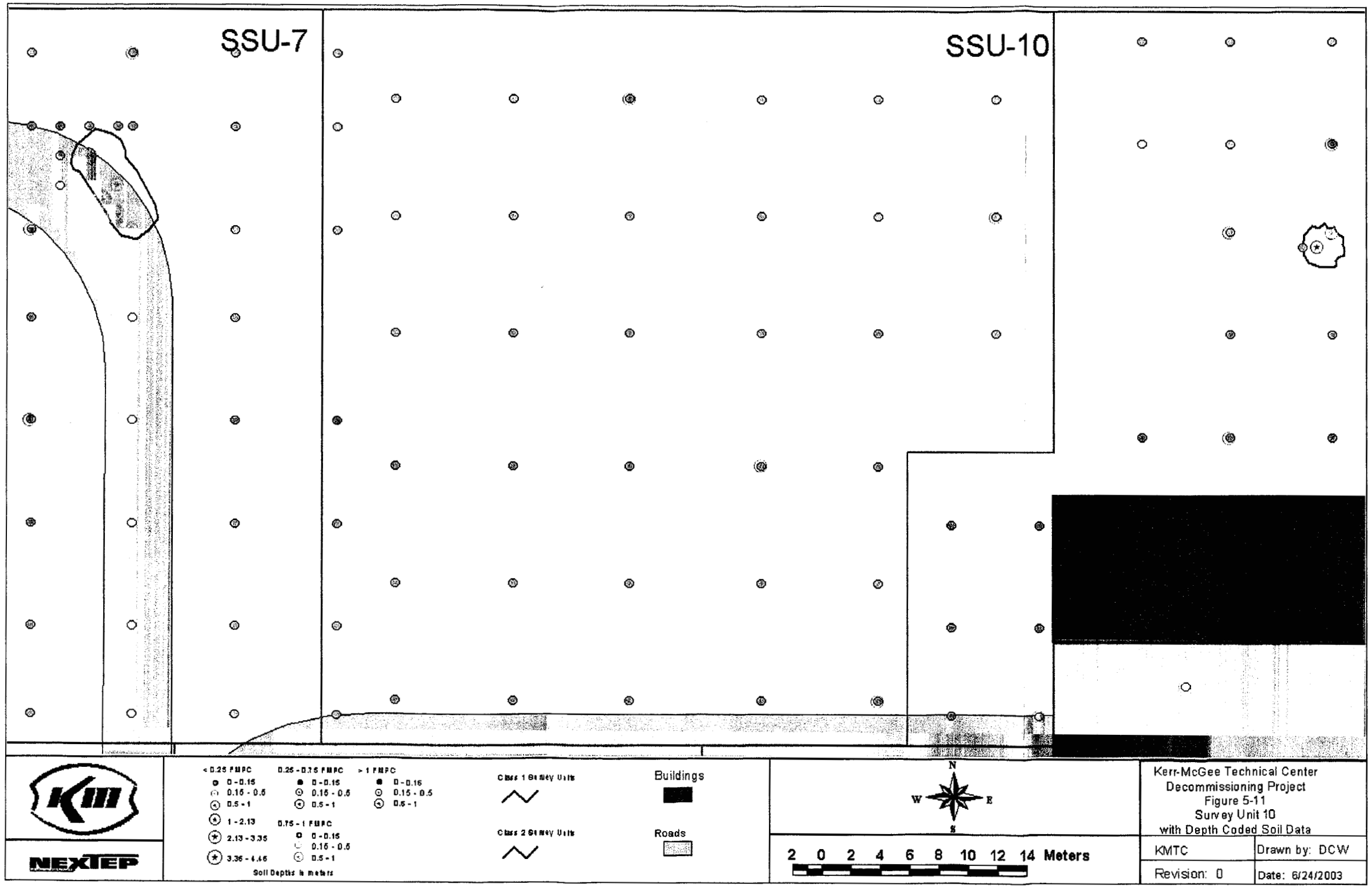

SSU-5
Pipe Drainage Point
< 0.25 FMPC
0 - 0.15
0.15 - 0.5
0.5 - 1
1 - 2.13
2.13 - 3.35
3.35 - 4.46
0.25 - 0.75 FMPC
0 - 0.15
0.15 - 0.5
0.5 - 1
0.75 - 1 FMPC
0 - 0.15
0.15 - 0.5
0.5 - 1
> 1 FMPC
0 - 0.15
0.15 - 0.5
0.5 - 1
Soil Depths in meters
Class 1 Survey Unit
Class 2 Survey Unit
Topography
N
W
E
S
3 0 3 6 9 12 15 18 Meters
Kerr-McGee Technical Center
Decommissioning Project
Figure 5-6
Survey Unit 5
with Depth Coded Soil Data
KMTC
Drawn by: DCW
Revision: 0
Date: 6/23/2003

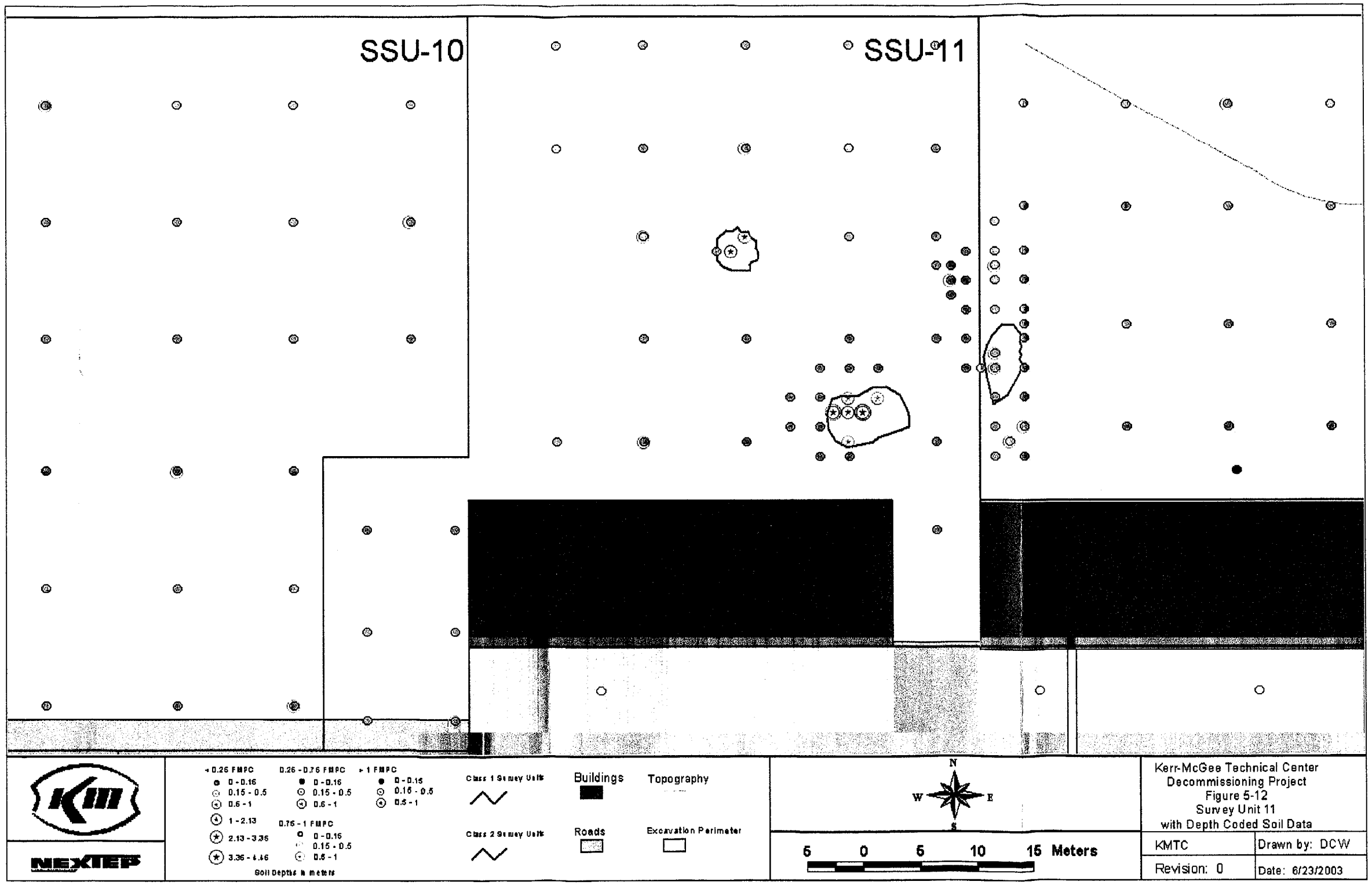

SSU-6
0.26 FMPC
0 - 0.15
0.15 - 0.5
0.5 - 1
1 - 2.13
2.13 - 3.35
3.35 - 4.46
Soil Depths in meters
0.25 - 0.75 FMPC
0 - 0.15
0.15 - 0.5
0.5 - 1
0.75 - 1 FMPC
0 - 0.15
0.15 - 0.5
0.5 - 1
1 FMPC
0 - 0.15
0.15 - 0.5
0.5 - 1
Class 1 Survey Units
Class 2 Survey Units
Buildings
Roads
Topography
Excavation Perimeter
N
W
E
S
3 0 3 6 9 Meters
Kerr-McGee Technical Center
Decommissioning Project
Figure 5-7
Survey Unit 6
with Depth Coded Soil Data
KMTC
Drawn by: DCW
Revision: 0
Date: 6/23/2003

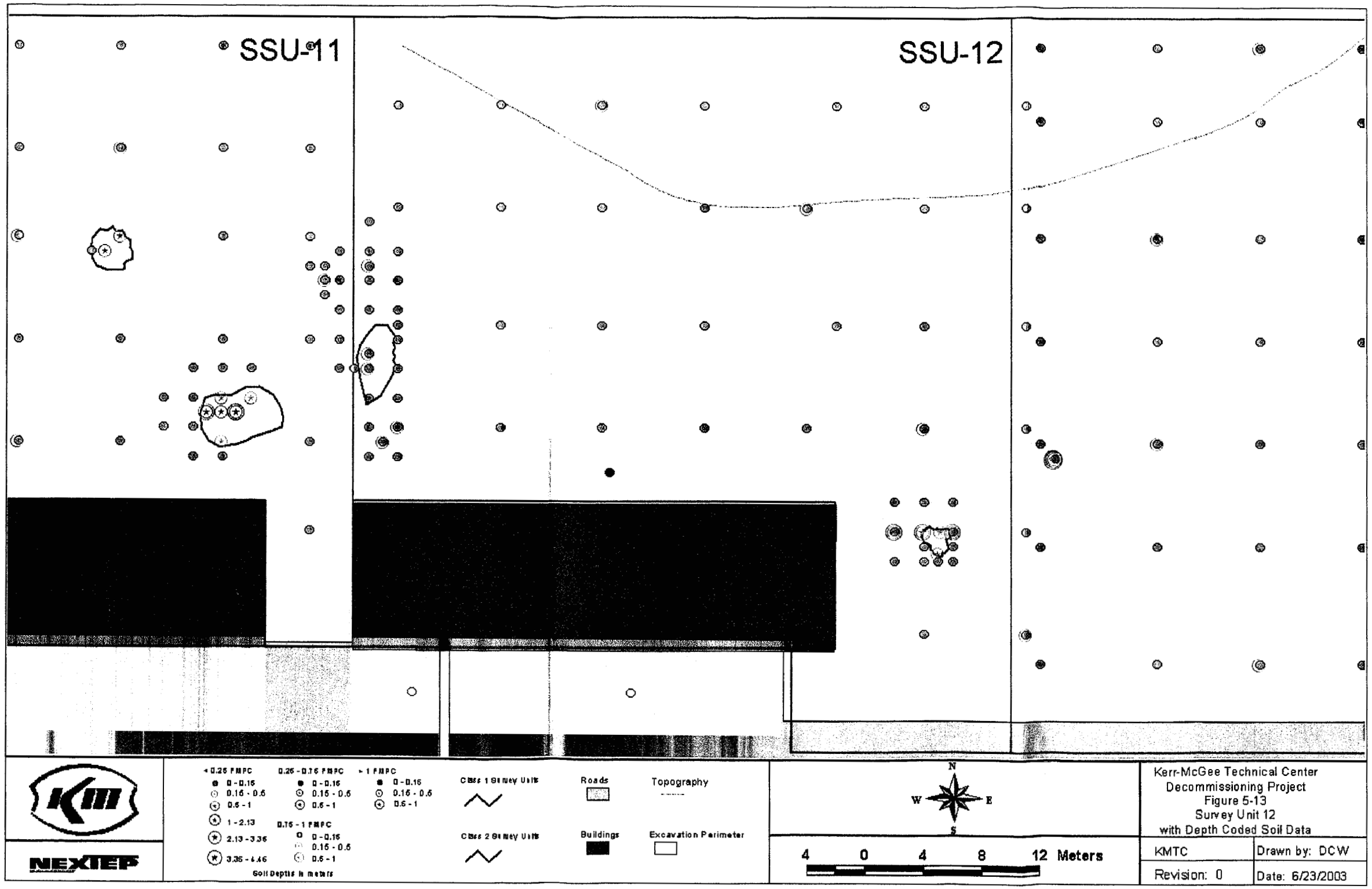

SSU-4
SSU-7
< 0.25 FMPC
0 - 0.15
0.15 - 0.5
0.5 - 1
1 - 2.13
2.13 - 3.35
3.35 - 4.46
0.25 - 0.75 FMPC
0 - 0.15
0.15 - 0.5
0.5 - 1
0.75 - 1 FMPC
0 - 0.15
0.15 - 0.5
0.5 - 1
> 1 FMPC
0 - 0.15
0.15 - 0.5
0.5 - 1
Soil Depths in meters
Class 1 Survey Units
Class 2 Survey Units
Roads
Excavation Perimeter
Topography
N
W
E
S
4 0 4 8 12 Meters
Kerr-McGee Technical Center
Decommissioning Project
Figure 5-8
Survey Unit 7
with Depth Coded Soil Data
KMTC
Drawn by: DCW
Revision: 0
Date: 6/23/2003
NEXTEP

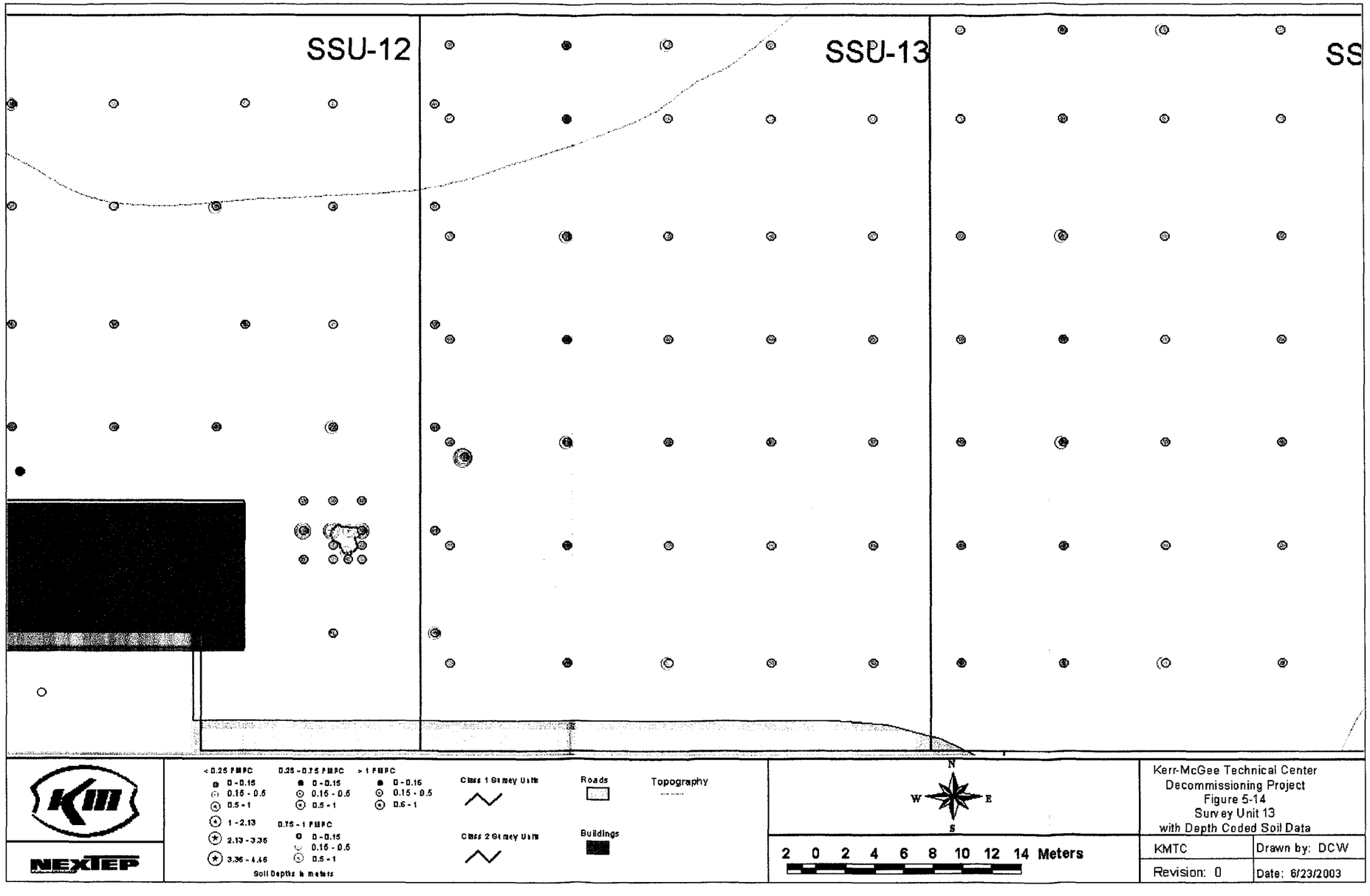

SSU-8
SSU-9
< 0.25 FMPC
0 - 0.15
0.15 - 0.5
0.5 - 1
1 - 2.13
2.13 - 3.35
3.35 - 4.46
0.25 - 0.75 FMPC
0 - 0.15
0.15 - 0.5
0.5 - 1
0.75 - 1 FMPC
0 - 0.15
0.15 - 0.5
0.5 - 1
> 1 FMPC
0 - 0.15
0.15 - 0.5
0.5 - 1
Soil Depths in meters
Class 1 Survey Units
Class 2 Survey Units
Buildings
Roads
N
W
E
S
4 0 4 8 12 16 Meters
Kerr-McGee Technical Center
Decommissioning Project
Figure 5-9
Survey Unit 8
with Depth Coded Soil Data
KMTC
Drawn by: DCW
Revision: 0
Date: 6/23/2003

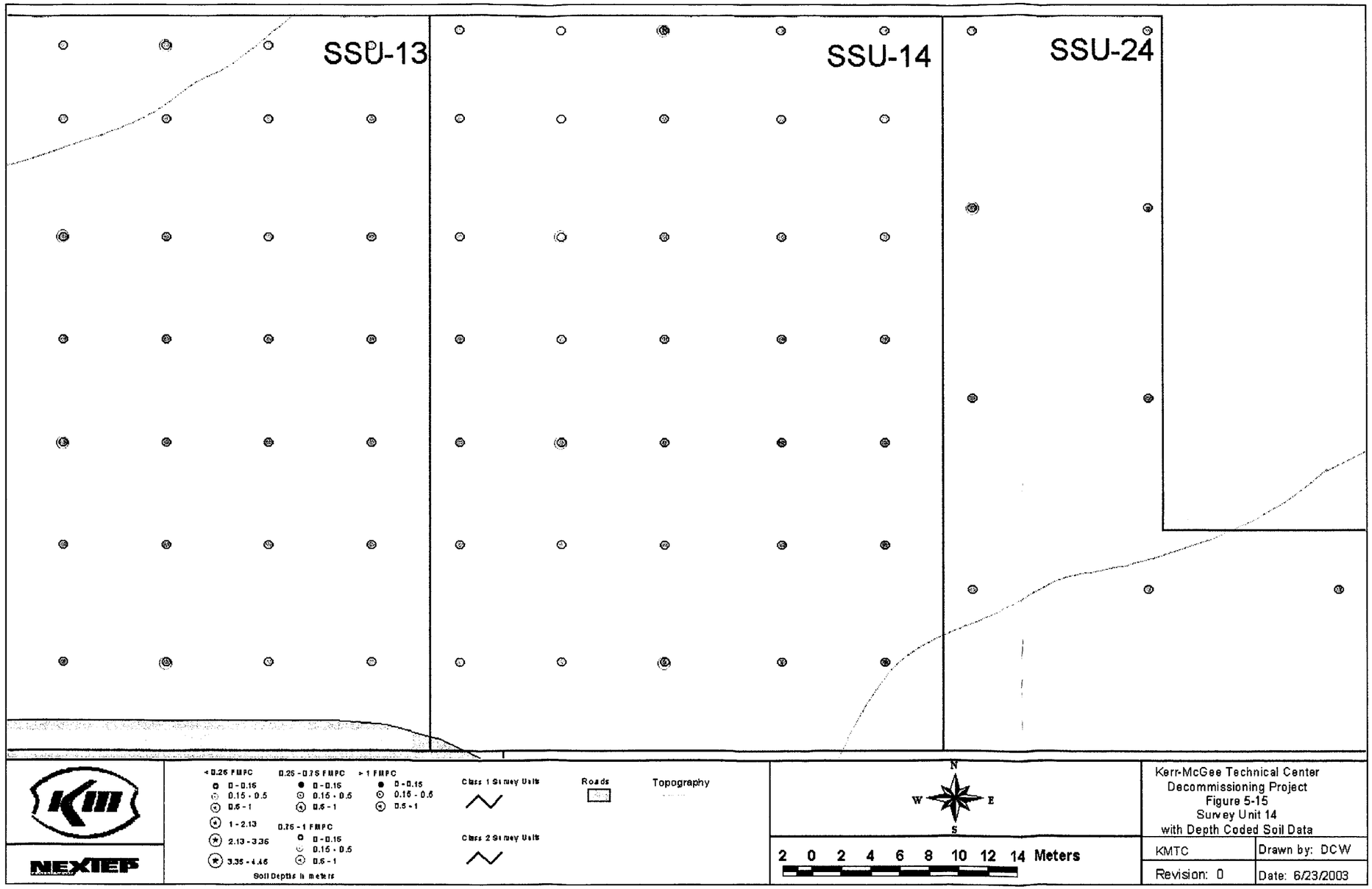

SSU-8
SSU-9
< 0.26 PMPC
0 - 0.15
0.15 - 0.5
0.5 - 1
1 - 2.13
2.13 - 3.35
3.35 - 4.45
0.26 - 0.76 PMPC
0 - 0.15
0.15 - 0.5
0.5 - 1
0.76 - 1 PMPC
0 - 0.15
0.15 - 0.5
0.5 - 1
> 1 PMPC
0 - 0.15
0.15 - 0.5
0.5 - 1
Soil Depths in meters
Class 1 Survey Units
Class 2 Survey Units
Buildings
Roads
N
W
E
S
4 0 4 8 12 Meters
Kerr-McGee Technical Center
Decommissioning Project
Figure 5-10
Survey Unit 9
with Depth Coded Soil Data
KMTC
Drawn by: DCW
Revision: 0
Date: 6/23/2003

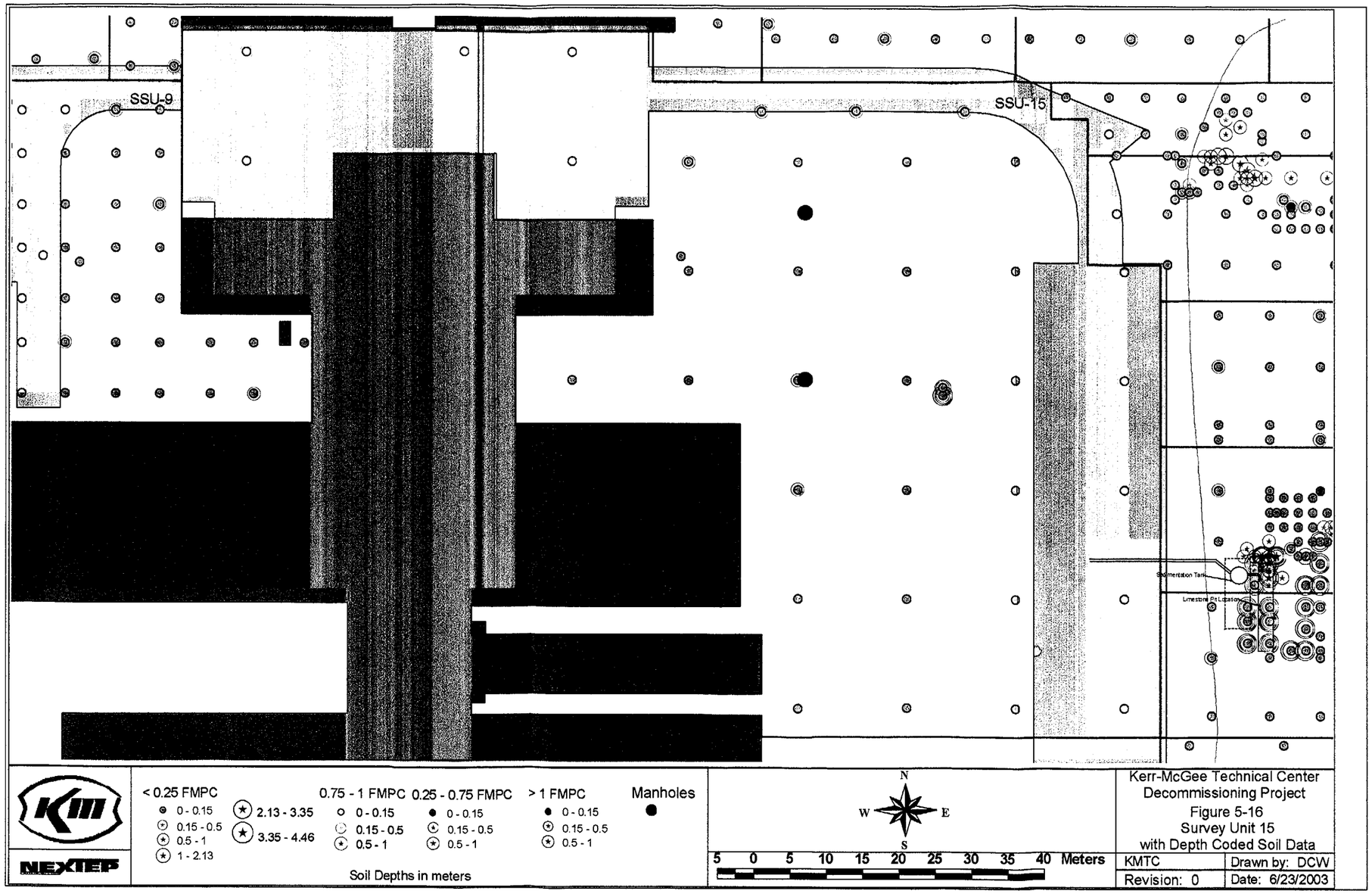

SSU-7
SSU-10
< 0.25 PMPC
0 - 0.15
0.15 - 0.5
0.5 - 1
1 - 2.13
2.13 - 3.35
3.35 - 4.45
0.25 - 0.75 PMPC
0 - 0.15
0.15 - 0.5
0.5 - 1
0.75 - 1 PMPC
0 - 0.15
0.15 - 0.5
0.5 - 1
> 1 PMPC
0 - 0.15
0.15 - 0.5
0.5 - 1
Soil Depths in meters
Class 1 Survey Units
Class 2 Survey Units
Buildings
Roads
N
W
E
S
2 0 2 4 6 8 10 12 14 Meters
Kerr-McGee Technical Center
Decommissioning Project
Figure 5-11
Survey Unit 10
with Depth Coded Soil Data
KMTC
Drawn by: DCW
Revision: 0
Date: 6/24/2003

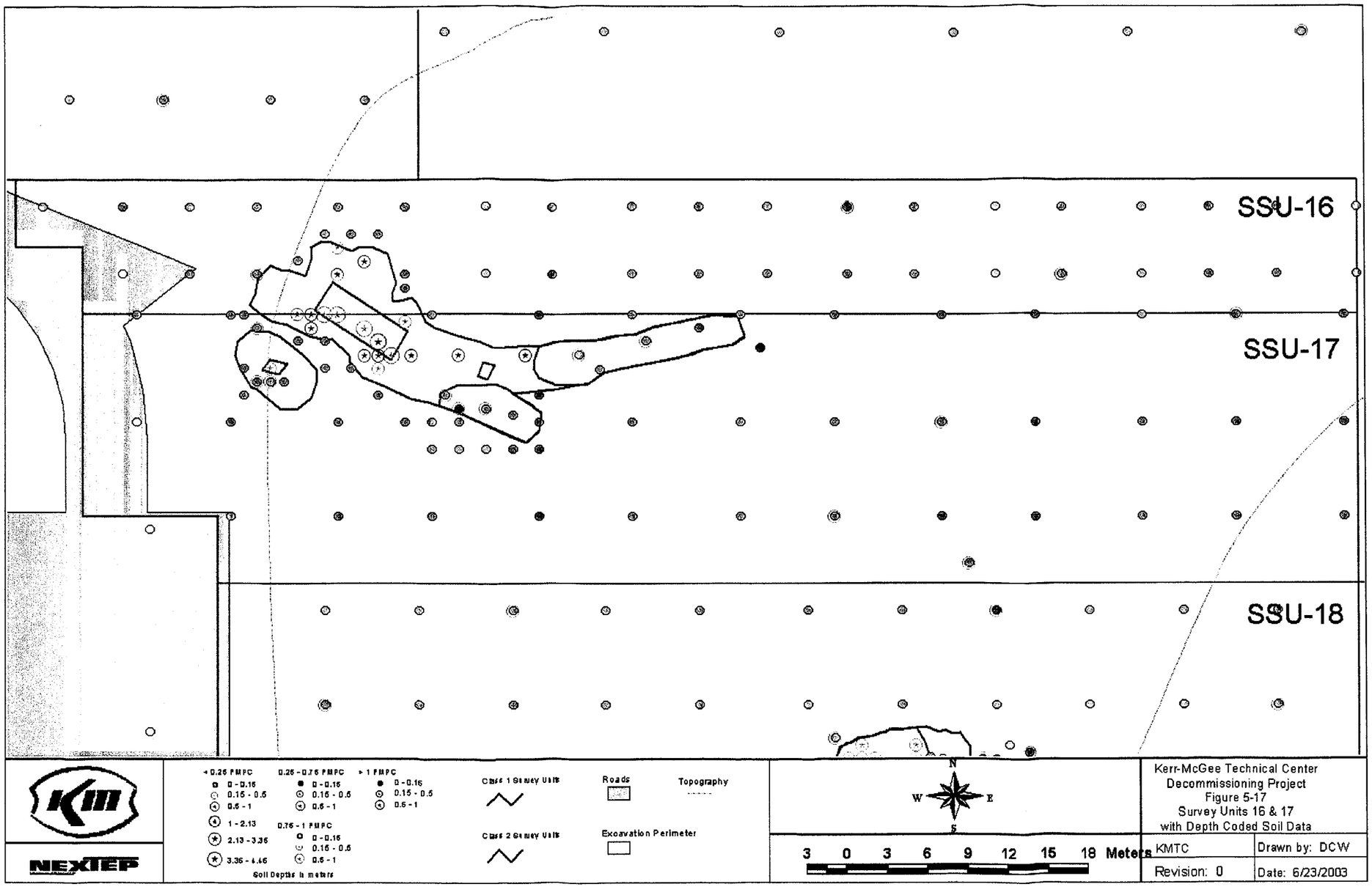

SSU-10
SSU-11
< 0.25 FMPC
0 - 0.15
0.15 - 0.5
0.5 - 1
1 - 2.13
2.13 - 3.36
3.36 - 4.46
0.25 - 0.75 FMPC
0 - 0.15
0.15 - 0.5
0.5 - 1
0.75 - 1 FMPC
0 - 0.15
0.15 - 0.5
0.5 - 1
Soil Depths in meters
Class 1 Survey Units
Class 2 Survey Units
Buildings
Roads
Topography
Excavation Perimeter
N
W
E
S
5 0 5 10 15 Meters
Kerr-McGee Technical Center
Decommissioning Project
Figure 5-12
Survey Unit 11
with Depth Coded Soil Data
KMTC
Drawn by: DCW
Revision: 0
Date: 6/23/2003

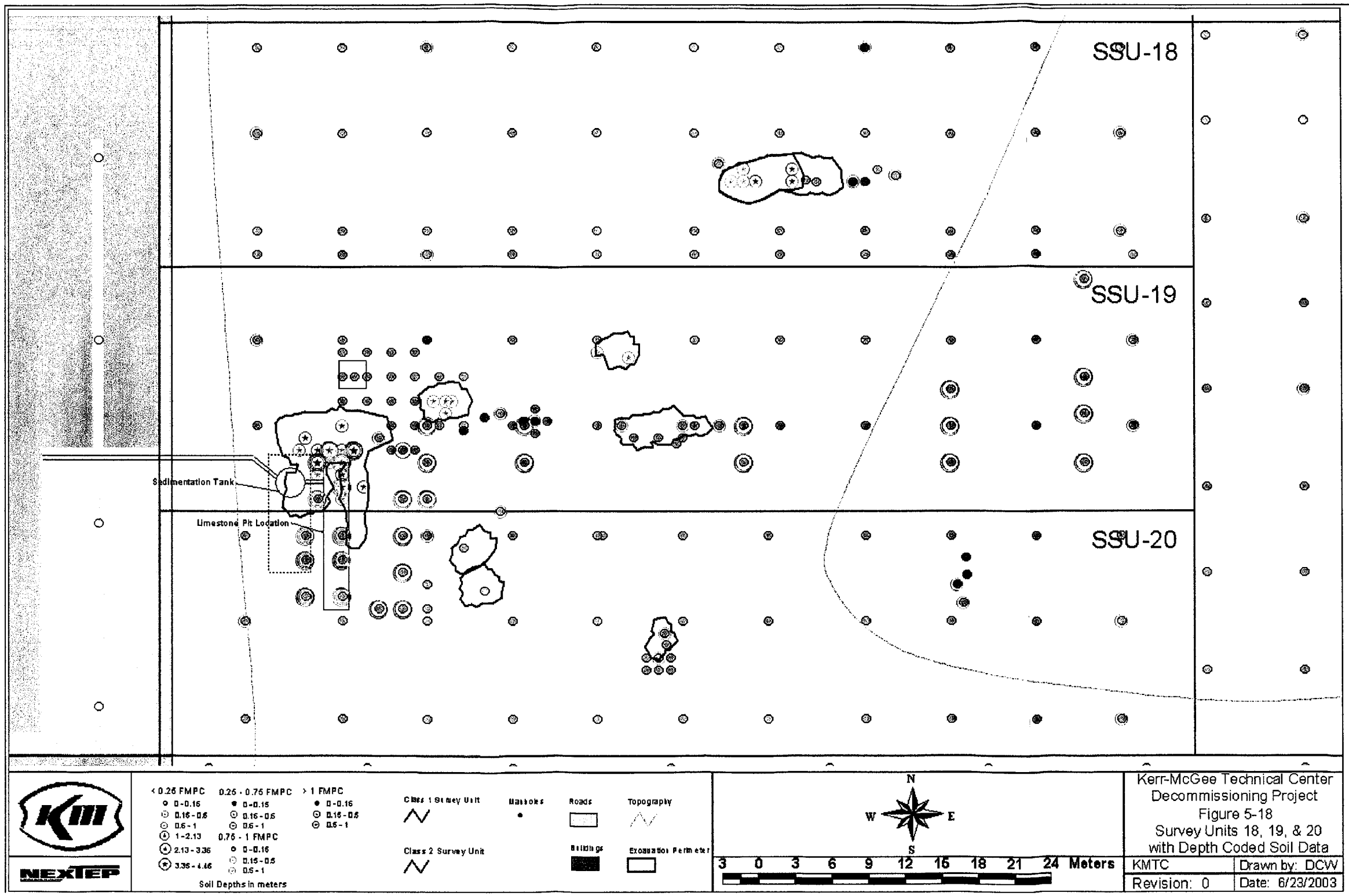

SSU-11
SSU-12
< 0.25 PMPC
0.25 - 0.75 PMPC
> 1 PMPC
0 - 0.15
0.15 - 0.5
0.5 - 1
1 - 2.13
2.13 - 3.35
3.35 - 4.46
0.75 - 1 PMPC
Soil Depths in meters
Class 1 Survey Units
Class 2 Survey Units
Roads
Buildings
Topography
Excavation Perimeter
N
W
E
S
4 0 4 8 12 Meters
NEXTEP
Kerr-McGee Technical Center
Decommissioning Project
Figure 5-13
Survey Unit 12
with Depth Coded Soil Data
KMTC
Drawn by: DCW
Revision: 0
Date: 6/23/2003

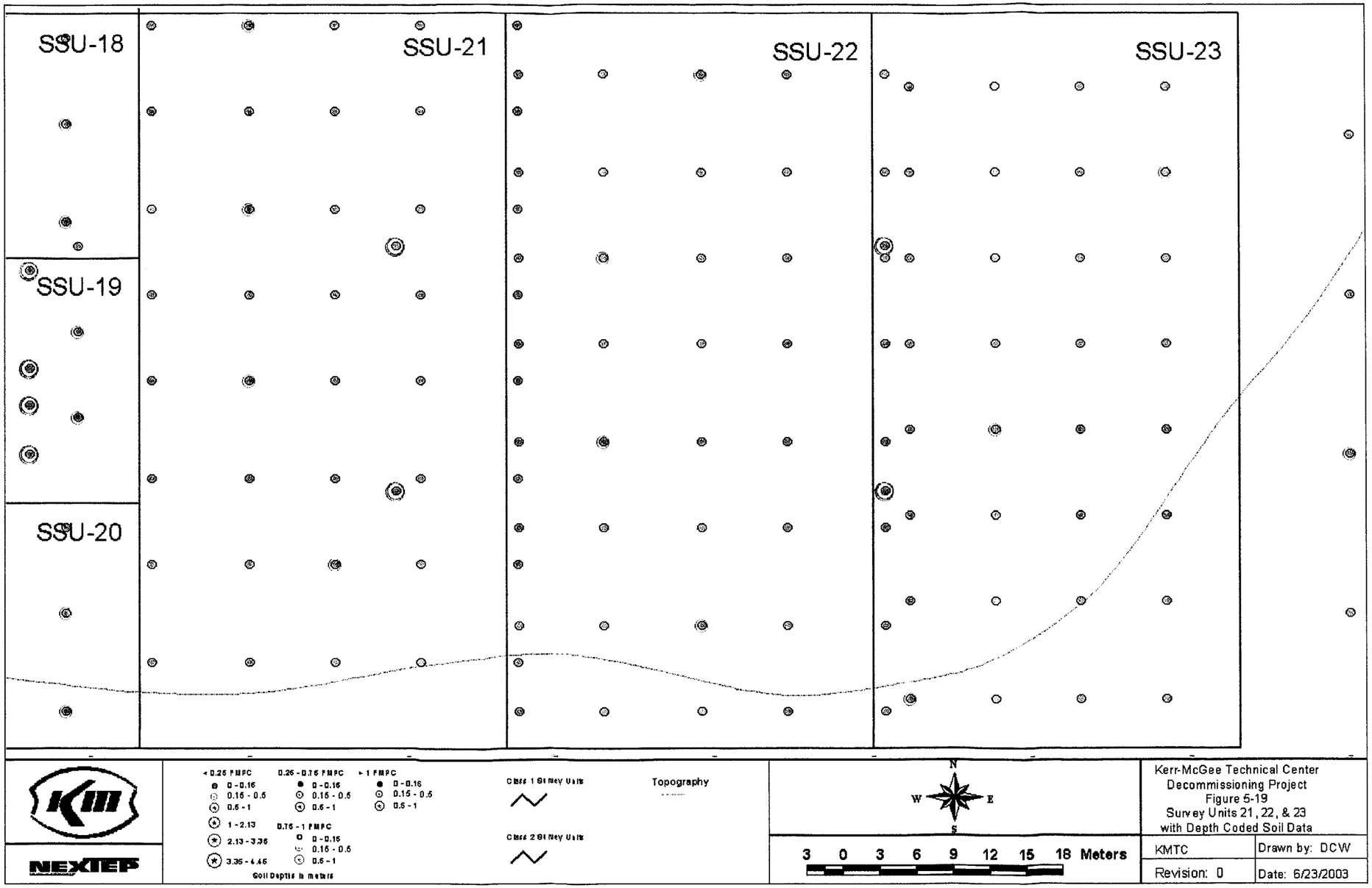

SSU-12
SSU-13
SS
< 0.25 PMRC
0 - 0.15
0.15 - 0.5
0.5 - 1
1 - 2.13
2.13 - 3.36
3.36 - 4.46
0.25 - 0.75 PMRC
0 - 0.15
0.15 - 0.5
0.5 - 1
0.75 - 1 PMRC
0 - 0.15
0.15 - 0.5
0.5 - 1
> 1 PMRC
0 - 0.15
0.15 - 0.5
0.5 - 1
Soil Depths in meters
Class 1 Survey Units
Class 2 Survey Units
Roads
Buildings
Topography
N
W
E
S
2 0 2 4 6 8 10 12 14 Meters
Kerr-McGee Technical Center
Decommissioning Project
Figure 5-14
Survey Unit 13
with Depth Coded Soil Data
KMTC
Drawn by: DCW
Revision: 0
Date: 6/23/2003

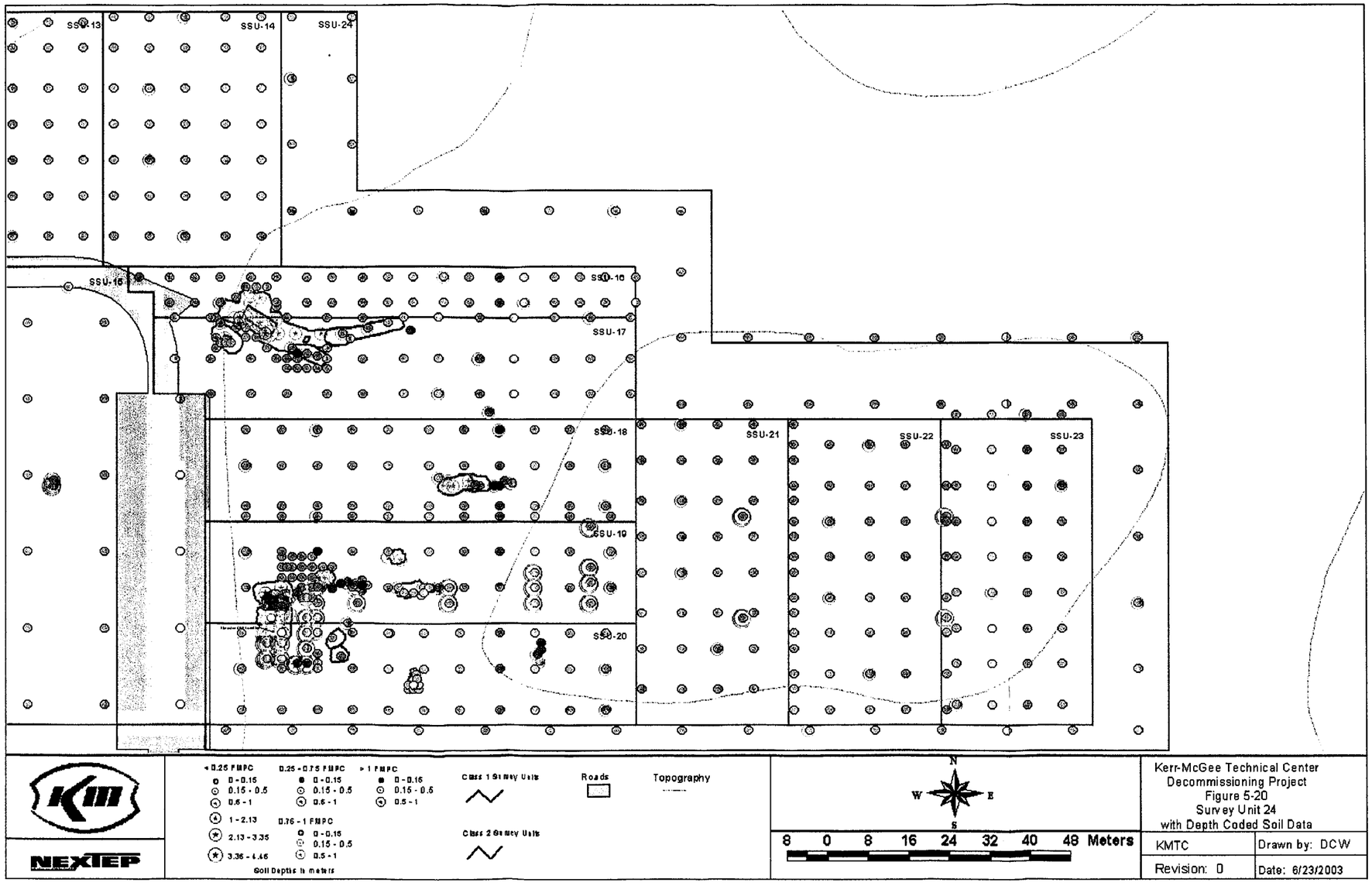

SSU-13
SSU-14
SSU-24
< 0.25 FMPC
0 - 0.15
0.15 - 0.5
0.5 - 1
1 - 2.13
2.13 - 3.36
3.35 - 4.46
0.25 - 0.75 FMPC
0 - 0.15
0.15 - 0.5
0.5 - 1
0.75 - 1 FMPC
0 - 0.15
0.15 - 0.5
0.5 - 1
> 1 FMPC
0 - 0.15
0.15 - 0.5
0.5 - 1
Soil Depths in meters
Class 1 Survey Units
Class 2 Survey Units
Roads
Topography
N
W
E
S
2 0 2 4 6 8 10 12 14 Meters
Kerr-McGee Technical Center
Decommissioning Project
Figure 5-15
Survey Unit 14
with Depth Coded Soil Data
KMTC
Drawn by: DCW
Revision: 0
Date: 6/23/2003
NEXTEP

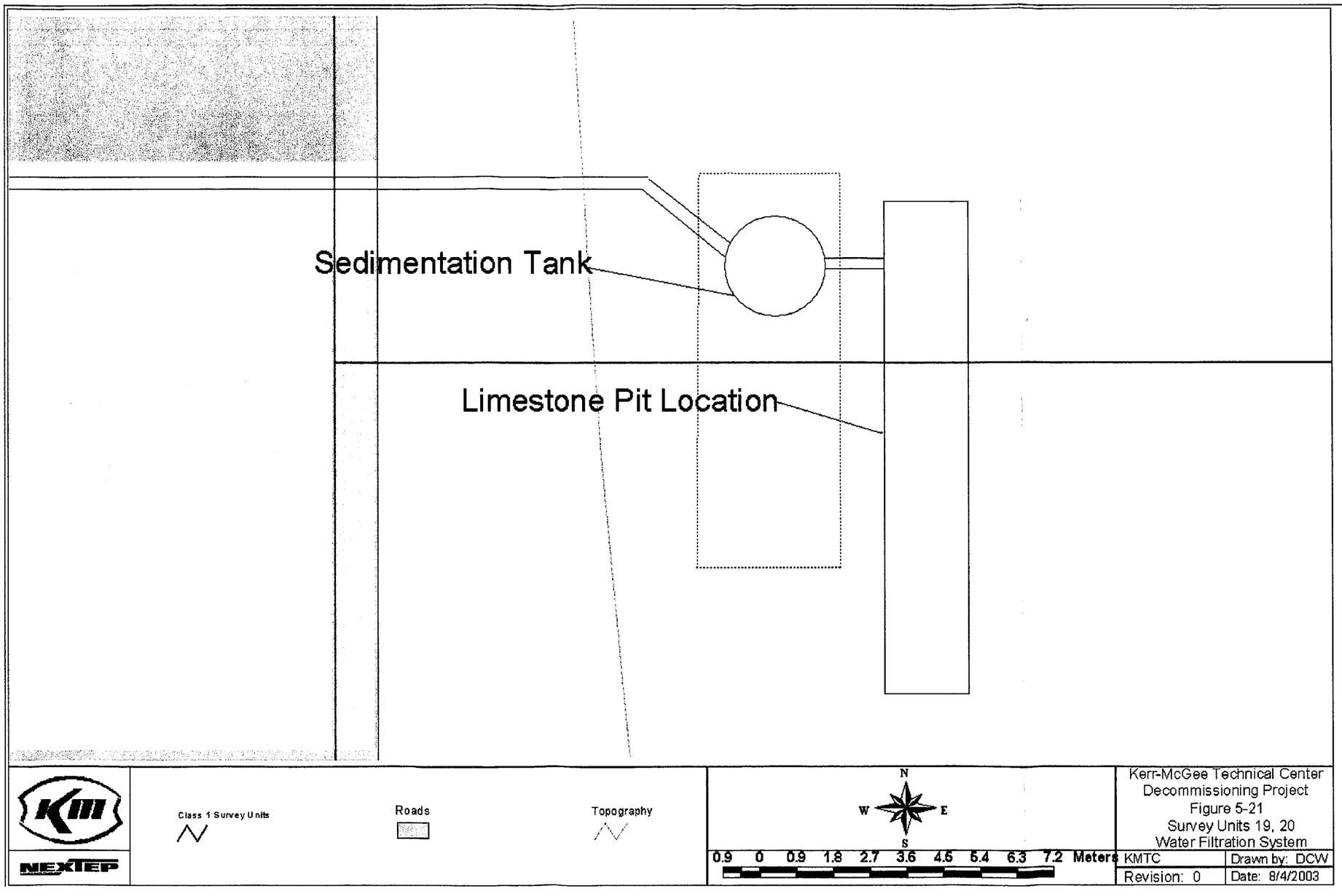

SSU-9
SSU-15
Sedimentation Tank
Limestone Pit Location
< 0.25 FMPC
0 - 0.15
0.15 - 0.5
0.5 - 1
1 - 2.13
2.13 - 3.35
3.35 - 4.46
0.75 - 1 FMPC
0 - 0.15
0.15 - 0.5
0.5 - 1
0.25 - 0.75 FMPC
0 - 0.15
0.15 - 0.5
0.5 - 1
> 1 FMPC
0 - 0.15
0.15 - 0.5
0.5 - 1
Manholes
Soil Depths in meters
N
W
E
S
5 0 5 10 15 20 25 30 35 40 Meters
KM
NEXTEP
Kerr-McGee Technical Center
Decommissioning Project
Figure 5-16
Survey Unit 15
with Depth Coded Soil Data
KMTC
Drawn by: DCW
Revision: 0
Date: 6/23/2003


SSU-16
SSU-17
SSU-18
< 0.25 PMPC
0 - 0.15
0.15 - 0.5
0.5 - 1
1 - 2.13
2.13 - 3.35
3.35 - 4.46
0.25 - 0.75 PMPC
0 - 0.15
0.15 - 0.5
0.5 - 1
0.75 - 1 PMPC
0 - 0.15
0.15 - 0.5
0.5 - 1
> 1 PMPC
0 - 0.15
0.15 - 0.5
0.5 - 1
Soil Depths in meters
Class 1 Survey Units
Class 2 Survey Units
Roads
Topography
Excavation Perimeter
N
W
E
S
3 0 3 6 9 12 15 18 Meters
Kerr-McGee Technical Center
Decommissioning Project
Figure 5-17
Survey Units 16 & 17
with Depth Coded Soil Data
KMTC
Drawn by: DCW
Revision: 0
Date: 6/23/2003


SSU-18
SSU-19
SSU-20
Sedimentation Tank
Limestone Pit Location
< 0.25 FMPC
0.25 - 0.75 FMPC
> 1 FMPC
0 - 0.15
0.15 - 0.5
0.5 - 1
1 - 2.13
2.13 - 3.35
3.35 - 4.45
0.75 - 1 FMPC
Soil Depths in meters
Class 1 Survey Unit
Class 2 Survey Unit
Manholes
Roads
Topography
Buildings
Excavation Perimeter
N
W
E
S
3 0 3 6 9 12 15 18 21 24 Meters
Kerr-McGee Technical Center
Decommissioning Project
Figure 5-18
Survey Units 18, 19, & 20
with Depth Coded Soil Data
KMTC
Drawn by: DCW
Revision: 0
Date: 6/23/2003


SSU-18
SSU-19
SSU-20
SSU-21
SSU-22
SSU-23
< 0.25 PMPC
0 - 0.15
0.15 - 0.5
0.5 - 1
1 - 2.13
2.13 - 3.36
3.36 - 4.46
0.25 - 0.75 PMPC
0 - 0.15
0.15 - 0.5
0.5 - 1
0.75 - 1 PMPC
0 - 0.15
0.15 - 0.5
0.5 - 1
> 1 PMPC
0 - 0.15
0.15 - 0.5
0.5 - 1
Soil Depths in meters
Class 1 Survey Units
Class 2 Survey Units
Topography
N
W
E
S
3 0 3 6 9 12 15 18 Meters
NEXTEP
Kerr-McGee Technical Center
Decommissioning Project
Figure 5-19
Survey Units 21, 22, & 23
with Depth Coded Soil Data
KMTC
Drawn by: DCW
Revision: 0
Date: 6/23/2003


SSU-13
SSU-14
SSU-24
SSU-15
SSU-16
SSU-17
SSU-18
SSU-21
SSU-22
SSU-23
SSU-19
SSU-20
< 0.25 PMPC
0.25 - 0.75 PMPC
> 1 PMPC
0 - 0.15
0.15 - 0.5
0.5 - 1
1 - 2.13
2.13 - 3.35
3.35 - 4.46
0.75 - 1 PMPC
Soil Depths in meters
Class 1 Survey Units
Class 2 Survey Units
Roads
Topography
N
W
E
S
8 0 8 16 24 32 40 48 Meters
NEXTEP
Kerr-McGee Technical Center
Decommissioning Project
Figure 5-20
Survey Unit 24
with Depth Coded Soil Data
KMTC
Drawn by: DCW
Revision: 0
Date: 6/23/2003


Sedimentation Tank
Limestone Pit Location
Class 1 Survey Units
Roads
Topography
N
W
E
S
0.9 0 0.9 1.8 2.7 3.6 4.5 5.4 6.3 7.2 Meters
Kerr-McGee Technical Center
Decommissioning Project
Figure 5-21
Survey Units 19, 20
Water Filtration System
KMTC
Drawn by: DCW
Revision: 0
Date: 8/4/2003

Appendix 2

NEXTEP Technical Memorandum 02-27

Verification of KMTC Radiation Database, Soils Portion

NEXTEP Environmental

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Suite 201
Louisville, KY 40222

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TECHNICAL MEMORANDUM 02-27

June 20, 2003

Originator: Barton P. Anderson

Subject: Verification of KMTC Radiation Database, Soils Portion

Revision: 0

ENDORSEMENT: This document contains the results of research and technical analysis which have been reviewed and approved for publication by the Technical Director, NEXTEP Environmental, Inc.

Harry J. Newman, CHP, Technical Director Date

Introduction

The purpose of this paper is to document the results of verification testing of the Kerr-McGee Technical Center (KMTC) Radiation Database (RDB). The RDB has been developed for the storage, analysis and reporting of radiological survey data connected with the characterization and final status survey of various sites served by NEXTEP Environmental. It has been adapted and refined especially for the KMTC site.

The database covers both indoor surface radiation measurements and outdoor soil concentration measurements. The system was developed in Microsoft Access, a commonly available database prototyping tool, and is split into front and back ends. The back end consists of a single file, KMTC_Data.mdb, which resides on the web server at NEXTEP's headquarters and contains all of the data tables necessary for the storage and complete definition of the radiological survey data from KMTC. The front end consists of a single file, RDTS.mdb, which is the general Radiation Data Tracking System developed by NEXTEP and contains input/output forms, routines and queries plus the various standard reports used by the system. This allows the developer modify the front end without ever disturbing the data tables which contain the KMTC data.

The primary analysis tool is a detailed report developed and controlled within the database front end for the purpose of performing the tests and calculations required by the D Plan and MARSSIM as part of the FSS. One of these comprehensive reports exists for soil concentrations and one for indoor surface activity measurements.

Data are entered into the database tables via the Internet using the web interface scripts developed for KMTC. This feature allows the data to be entered from any location having a browser and access to the internet. The web interface is limited only to data entry, quality control verification (QCV) reporting, and QC locking. However, the QCV report is versatile enough to enable anyone with a password to access the data and print out data sets based upon a wide variety of criteria. These data can be copied from the browser directly into a spreadsheet and manipulated further at the user's discretion. Only personnel with QC privileges may lock or unlock the records and, once locked, they may only be viewed, not changed, by other personnel accessing the files.

Verification tests of the web interface will be limited only to confirming the safety interlocks which are built into the system for data entry. The QCV reports which are produced for each survey data sheet entered into the system are a continual verification that the data entered from the original data sheet are correctly stored and returned by the system.

The rest of this verification report is concerned primarily with the analysis report for soils and will confirm that activity values are properly manipulated, screened and reported in accordance with the D Plan and MARSSIM requirements.

Methods

A test Soil Survey Unit (SU) was created which encompassed a rectangle defined by coordinates (10,600) and (50,550)[32]. Attachment A contains the last page of a report which defines all the survey units in the database. The portion within the box shows the boundaries of the test SU.

A test data set was created which was distributed across all the boundaries necessary to validate the software. These boundaries included NS and EW geographical boundaries of the test survey unit and measurements straddling the test values for background, DCGLw and EMC Thresholds for each nuclide. A spreadsheet containing all the data in this data set is presented in Attachment B. Elements of the data set which straddle the boundary conditions are highlighted in yellow.

Web Interface Evaluation

Data were entered on the web to confirm three safety interlocks.

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[32] All coordinates at KMTC are referenced in meters east (x) and north (y) from the SW corner of the site. All KMTC survey units are made up of rectangles defined by opposite corner coordinates. In the case of large, complex SUs a large number of adjacent rectangles are used. This design allows the system to pick out data points within each survey unit without going to a geographic information system (GIS) such as ArcView© to select the points within each polygon.

- No data point can be entered which used an instrument out of calibration.
- Duplicate data points may not be entered.
- Data may not be changed once they have been locked by QC.

Each of these interlocks have been demonstrated on the web and they have functioned correctly in normal use. This has been especially helpful in forcing careful consideration of instrument calibration status.

A sample of a QCV report is presented in Attachment C for a portion of the data in SU-22[33]. Since the user logged in has a QC clearance, the buttons for locking and unlocking the dataset are shown in the Attachment. These are not present for non-QC users.

These tests plus the continual use of the QCV reports to review all data entry by QC confirms that the web interface is accurate and suitable for data entry, review and QC reporting.

Analysis Computations Evaluation

GENERAL

Attachment D contains the specification for calculation of nuclide fractional concentrations and performance of each of the tests specified in the D Plan. Each of these equations were programmed into the report scripts according to Attachment D.

Attachment E contains the output of the soil Threshold Comparison Test Report (TCTR)for the test data set. This report was run for SU-99 using selected data points of type RG (regular grid) and BI (bias). The output type selected was SOF (sum of the fractions[34]) and the denominator concentrations used were the Derived Concentration Guideline (DCGLw) default values listed in Table 1.

Table 1

Default DCGLw Values[35]

Nuclide	DCGLw (pCi/g)
U	228
Th	5.3
Ra	3.5

[33] The test data could not be shown since the web interface points to the live database file which does not contain the test data set.

[34] SOF is also referred to as FMPC: Fractional Material Permissible Concentration.

[35] Used in the denominator terms of the FMPC equations (see Attachment D). Obtained from Appendix C of the D Plan

A complete listing of all the data samples taken within the survey unit is produced by the report sorted by tests failed. The Wilcoxon rank sum test output can include all the data points used for the computation if requested by the user. However for this report, and most of the time, the complete data listing is suppressed and only the summary test results are shown.

Attachment F contains the output of the soil TCTR for the test data set with output selected based upon thorium concentrations. In this report the screening tests are performed only on the thorium concentrations although all three nuclides plus FMPC are listed.

By inspection of these reports all the essential computations and screening or statistical tests may be verified. The following paragraphs discuss each element of the verification.

SU DATA SELECTION

Comparison of the test data set provided in Attachment B with Attachment E shows that, at the western boundary of the survey unit, sample ID (SID) 9900 was excluded while SID 9901, which lay on the western boundary, was included. To the east, SID 9902 was included but SID 9903, which lay on the eastern boundary was excluded[36]. Similarly for the northern and southern boundaries, SID's 9928, 9931, and 9932 were all excluded. The point on the southern boundary, SID 9929, was included while SID 9931, located on the northern boundary, was excluded. All the data points in the test data set except these 5 were included in the report (28 points selected).

Within the scope of these tests, the TCTR correctly identifies all survey data points that lie within a given survey unit's boundaries.

BACKGROUND CALCULATIONS AND THRESHOLD SUMMARY

Page 4 of Attachment E shows the summary of background data used for the report and the thresholds calculated for each nuclide. The average and standard deviation values were verified using the entire background data set of 291 soil measurements copied from the database into a spreadsheet. This data set is presented in Attachment G. The values were calculated using the Average and StDev functions within Excel and the results are presented in Table 2. The value for the background threshold (T_{BK}) is also calculated and shown in Table 2.

Table 2
Background Calculations

	U	Th	Ra
Average	1.760	2.289	0.644
Sigma	0.901	0.260	0.109
T_{BK}	3.562	2.809	0.862

[36] The software is written to include the western and southern boundaries within each survey unit. The other two boundaries belong to the adjacent survey units.

The DCGLw Threshold (T_d) is defined as the DCGLw value entered into the report setup screen plus T_{BK}. Similarly, the EMC threshold, (T_e) is obtained by adding the EMC value from the setup screen to T_{BK}.

The sigma multiplier was set to a value of 2.0 on the TCTR setup screen, DCGLw was set to 1, and EMC was set to 3. T_{BK}, T_d and T_e were calculated as shown in Attachment D. Inspection of page 4 of Attachment E shows that the values for average, sigma and all three thresholds are correct.[37]

Within the scope of these tests, the KMTC RDB correctly calculates background mean and standard deviation and all associated thresholds needed for the threshold tests.

CALCULATION OF FMPC

Calculations of FMPC were verified manually. One example is provided as follows for SID 9927 (the first data point listed on page 2 of Attachment E).

$$FMPCs = \frac{690-(3.562)}{228} + \frac{20-(2.809)}{5.3} + \frac{15.7-(0.862)}{3.5} = 10.494$$

Comparison with page 2 of Attachment E shows that the KMTC RDB calculates the values for FMPC correctly.

THRESHOLD SCREEN TESTS (Background, DCGLw, and EMC)

Attachment E shows the results of the analysis for the sum of the fractions, or FMPC. The background test is failed whenever a value for FMPC exceeds zero (i.e. the survey value lies above the background threshold).

The default value for DCGLw used in the FMPC version of the TCTR is always 1.0 since, by definition, FMPC=1.0 occurs when the combined residual contamination of all three nuclides is one DCGL above the background threshold. The default limit for EMC is set arbitrarily at 3.0.

Inspection of the TCTR in Attachment E shows that the system has sorted the values correctly for the FMPC version of the report.

On the boundary of each threshold manual calculations confirmed the computer sort. Manual calculations for SID 9913 yield a value for FMPC=1.029 which correctly shows as having failed the DCGLw Test. Similarly, SID 9909 calculated to 0.008 FMPC and therefore appears correctly in the list of points that failed background.

[37] The threshold calculations are carried out correctly to 10 decimal places in the computer. However, because each result is displayed to two decimal places, the results may appear to add incorrectly in some cases.

Attachment F shows the results of the analysis for the radionuclide, thorium. Using values for DCGLw and EMC of 5.3 and 15.9 respectively, the thresholds for thorium are calculated and presented in Table 3.

Table 3

Thorium Thresholds (pCi/g)

DCGLw	5.300
EMC	15.900
TBk	2.809
Td	8.109
Te	18.709

Inspection of the TCTR in Attachment F shows that it has correctly sorted the data points at each threshold. A similar inspection of the remaining two nuclides was conducted and the results were satisfactory. Within the scope of these tests, the TCTR correctly applied the screening tests to FMPC values and to each radionuclide's activity.

DCGL AVERAGE TEST

The DCGLavg test was examined for all three nuclides. The full data set of points included in SU-99 was copied to an Excel spreadsheet which is presented in Attachment J. All the necessary calculations were programmed into the spreadsheet and the results are presented in Table 4.

Table 4

DCGLavg Test Results

	U	Th	Ra	FMPCm
Average	174.40	6.05	5.88	2.96
Avg BK	1.76	2.289	0.644	NA
DCGLw	228.00	5.30	3.50	1.00
Sum	229.80	7.59	4.14	1.00
Test	P	P	F	F

The value for average activity in the summary page of Attachment F shows that the SU passed the DCGLavg test and that the average value of the survey measurements was 6.1 pCi/g. Both other nuclides were examined and showed similar agreement with Table 3 with radium being the only nuclide to fail the test.

For the FMPC report in Attachment E, the DCGLavg test is based upon FMPCm (see Attachment B) and the data in Table 4 show that the survey unit fails. Attachment E shows the average activity and fail status correctly.

Within the scope of these tests the KMTC RDB correctly computes the DCGLavg tests for all three radionuclides and the FMPC.

MIN/MAX TEST

The value for average activity on the summary page of Attachment F (Thorium TCTR) shows that the survey unit fails this test because the maximum survey value minus the minimum background value is greater than the DCGLw. An inspection of the data set in the report and Attachment G shows that the maximum and minimum values are stated correctly and that the fail status is correct. Similar comparisons were made for the remaining nuclides.

Attachment E shows that the survey unit fails based upon the values for maximum survey FMPCg and minimum background FMPCg. Manual calculations for these values are shown in Attachments G and J for comparison.

Within the scope of these tests the KMTC RDB correctly calculates and applies the Min/Max test as described in the D Plan and the specification (Attachment D).

OHER SUMMARY VALUES

Additional summary data are displayed on the first page of the report. By inspection, the borders of the survey unit match those input into the system and the area calculated is correct.

The filters applied to the data by measurement type and date are faithfully represented and properly carried out in both Attachments E and F.

Each of the tests performed show the correct pass/fail status.

The maximum survey values, minimum background and difference are correctly shown as discussed under Min/Max test.

The average activity for the survey unit is correctly shown as discussed under DCGL-average test.

WILCOXON RANK SUM TEST

For soils at KMTC only the Wilcoxon test will be performed. This test is described in detail in chapter 8 of MARSSIM[38]. The critical value for the test is given in tabular form in Appendix I of MARSSIM or it may be calculated using the following equation[39]:

[38] NUREG-1575, Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)

[39] MARSSIM Appendix I pg I-10

Where:

m = the number of background points

n = the number of survey points

z = 1.645 (corresponds to alpha = 0.05)

In the examples shown in Attachments E and F there are 291 background points and 24 survey points. This can be confirmed by counting the points labeled RG in the report.[40] The number 291 is the count of all the background points in the database tested and is confirmed in both Attachment G and the background summary portion of the TCTR. Substituting these values into the above equation, a hand calculation yields a critical value of 46,683 which is confirmed at the end of both Attachments E and F.

By inspection it can be seen that the statistical test module correctly filters out only the regular grid data points for inclusion in the rank sum test.

All 313 data points used in this test are stored within the database in a temporary table for use in the computations. For the thorium TCTR (Attachment F), this table was copied onto an Excel spreadsheet. Then the ranks were calculated separately using the formula:

Rank = RANK(X,Range,1)+((COUNTIF(Range, X)-1)/2)

This formula ranks duplicate values in the way specified by MARSSIM.

The spreadsheet results were compared with those in the temporary Wilcoxon table produced by the database and the comparison is presented in Attachment H. The center portion of the spreadsheet is hidden for brevity. The columns shaded in green are those calculated by the spreadsheet and the others are from the temporary table in the database. Inspection of the table shows that the ranks calculated by the spreadsheet are the same as those produced by the report. Duplicates are handled in accordance with MARSSIM guidance.

The leftmost green column simply deletes all the ranks that do not correspond to background points and the sum of these ranks is shown at the bottom. This value, 46,508, is the same as the value calculated at the end of the report. The report correctly evaluates the comparison between the rank sum, Wr, and the critical value, Wc, and fails the test.

Within the scope of these tests, the KMTC RDB correctly applies the Wilcoxon Rank Sum Test to the data set and correctly reports Pass or Fail.

REMEDIATED DATA POINTS

When samples have been removed due to remediation, the letter R is applied to the field RESOLUTION and the report may be run excluding these data. This allows the user to keep all

[40] The Wilcoxon test applies only to systematic grid data points (RG or PG). The survey unit has only 24 such points.

the data intact and report on conditions before or after remediation at will. The data set for SU-99 was modified to remove all data points above FMPC = 1.0 and the FMPC report was run again. The results are presented in Attachment I.

Attachment I shows that all the points coded R have been removed and all tests except Min/Max and Background have passed. The screens are correctly applied and the Wilcoxon shows that the survey unit now passes.

Within the scope of these tests, the removal of remediated data points is correctly performed and reflected in the Threshold Comparison Test Report.

Conclusions

1. The KMTC Radiation Database System web interface has been shown to accurately record soil data from the KMTC decommissioning project and report the same data in accurate Quality Control Verification reports.
2. The calculations and tests called for in the D Plan and Attachment D are correctly performed including Min/Max, EMC, DCGLw, Background, DCGLavg, and Wilcoxon Rank Sum tests. All the supplementary data reported on the TCTR summary sheet are accurate and complete.

Recommendations

1. The KMTC RDB Soil Threshold Comparison Test Report should be used as the primary vehicle for analysis of KMTC soil data and Final Status Survey reporting and evaluation for release.

Distribution: NEXTEP; KMTC; Cimarron

Attachment A

SU Summary Report

SU **22**

X1	Y1	X2	Y2	*Area*	*Class*	*Remarks*
590	660	620	720	1,806	1	
	Total SU			**1,806** *Sq. M*		

SU **23**

X1	Y1	X2	Y2	*Area*	*Class*	*Remarks*
620	660	650	720	1,797	1	
	Total SU			**1,797** *Sq. M*		

SU **24**

X1	Y1	X2	Y2	*Area*	*Class*	*Remarks*
490	765	505	800	525	2	
490	750	575	765	1,275		
560	720	575	750	449		
575	720	665	735	1,350		
650	660	665	720	901		
475	655	665	660	950		
	Total SU			**5,450** *Sq. M*		

SU **99**

X1	Y1	X2	Y2	*Area*	*Class*	*Remarks*
10	600	50	550	2,000	1	
	Total SU			**2,000** *Sq. M*		

Attachment B

Test Data Set

Date	X	Y	D1	D2	Type	Inst	Person	Matrix	Survey	UCon	THCon	RACon	KCon	SampleID
01-Sep-02	9	575	0	0.15	BI	36	15	6	SS	1.0	1.0	1.0	1.0	9900
01-Sep-02	10	575	0	0.15	BI	36	15	6	SS	1.0	1.0	1.0	1.0	9901
01-Sep-02	49	575	0	0.15	BI	36	15	6	SS	1.0	1.0	1.0	1.0	9902
01-Sep-02	50	575	0	0.15	BI	36	15	6	SS	1.0	1.0	1.0	1.0	9903
01-Sep-02	15	595	0	0.15	RG	36	15	6	SS	1.0	0.1	0.2	1.0	9904
01-Sep-02	25	595	0	0.15	RG	36	15	6	SS	1.5	0.4	0.5	1.0	9905
01-Sep-02	35	595	0	0.15	RG	36	15	6	SS	1.8	0.7	0.8	1.0	9906
01-Sep-02	45	595	0	0.15	RG	36	15	6	SS	2.1	1.0	0.9	1.0	9907
01-Sep-02	15	585	0	0.15	RG	36	15	6	SS	2.4	1.3	1.0	1.0	9908
01-Sep-02	25	585	0	0.15	RG	36	15	6	SS	2.7	1.6	1.7	1.0	9909
01-Sep-02	35	585	0	0.15	RG	36	15	6	SS	3.0	1.9	2.0	1.0	9910
01-Sep-02	45	585	0	0.15	RG	36	15	6	SS	3.5	2.2	2.3	1.0	9911
01-Sep-02	15	575	0	0.15	RG	36	15	6	SS	3.6	2.8	4.3	1.0	9912
01-Sep-02	25	575	0	0.15	RG	36	15	6	SS	3.7	2.9	4.4	1.0	9913
01-Sep-02	35	575	0	0.15	RG	36	15	6	SS	4.2	3.1	4.5	1.0	9914
01-Sep-02	45	575	0	0.15	RG	36	15	6	SS	4.5	3.4	5.0	1.0	9915
01-Sep-02	15	565	0	0.15	RG	36	15	6	SS	222.0	3.7	5.3	1.0	9916
01-Sep-02	25	565	0	0.15	RG	36	15	6	SS	224.0	4.0	6.2	1.0	9917
01-Sep-02	35	565	0	0.15	RG	36	15	6	SS	226.0	8.0	8.1	1.0	9918
01-Sep-02	45	565	0	0.15	RG	36	15	6	SS	228.0	8.1	9.5	1.0	9919
01-Sep-02	15	560	0	0.15	RG	36	15	6	SS	230.0	8.2	10.0	1.0	9920
01-Sep-02	25	560	0	0.15	RG	36	15	6	SS	231.0	9.0	11.0	1.0	9921
01-Sep-02	35	560	0	0.15	RG	36	15	6	SS	232.0	12.0	12.0	1.0	9922
01-Sep-02	45	560	0	0.15	RG	36	15	6	SS	500.0	15.0	12.7	1.0	9923
01-Sep-02	15	555	0	0.15	RG	36	15	6	SS	686.0	18.6	13.4	1.0	9924
01-Sep-02	25	555	0	0.15	RG	36	15	6	SS	687.0	18.7	14.2	1.0	9925
01-Sep-02	35	555	0	0.15	RG	36	15	6	SS	688.0	18.8	14.9	1.0	9926
01-Sep-02	45	555	0	0.15	RG	36	15	6	SS	690.0	20.0	15.7	1.0	9927
02-Sep-02	25	549	0	0.15	BI	36	15	6	SS	1.0	1.0	1.0	1.0	9928
01-Sep-02	25	550	0	0.15	BI	36	15	6	SS	1.0	1.0	1.0	1.0	9929
01-Sep-02	25	599	0	0.15	BI	36	15	6	SS	1.0	1.0	1.0	1.0	9930
01-Sep-02	25	600	0	0.15	BI	36	15	6	SS	1.0	1.0	1.0	1.0	9931
01-Sep-02	25	601	0	0.15	BI	36	15	6	SS	1.0	1.0	1.0	1.0	9932

Attachment C

Web QCV Report Screen

NEXTEP ENVIRONMENTAL

Radiation Data Tracking System

Soil Survey Data

Quality Verification Report

Report Date: Wednesday, November 13, 2002
Survey Unit: 22

TCN	Date	Meas.Type	East	North	Depth	U	Th	Ra	K	Instr.	Name	Lock
479	9/25/2000	CH	620	700	0.00 - 0.15	1.1	2.8	0.7	17.7	2	Cochran	☑
480	9/25/2000	CH	620	700	0.15 - 1.00	1.6	2.3	0.7	15.1	2	Cochran	☑
481	9/25/2000	CH	620	700	1.00 - 2.00	1.9	2.5	0.6	15.0	2	Cochran	☑
482	9/25/2000	CH	620	700	2.00 - 3.00	0.4	2.8	0.6	17.5	2	Cochran	☑
483	9/25/2000	CH	620	680	0.00 - 0.15	1.8	2.6	0.8	20.3	2	Cochran	☑
1428	7/20/2001	RG	590	714	0.00 - 0.15	1.5	2.5	0.8	0.0	3	Cochran	☑
1429	7/20/2001	RG	597	714	0.00 - 0.15	2.1	2.3	0.8	0.0	3	Cochran	☑
1473	7/20/2001	RG	605	662	0.00 - 0.15	2.4	2.1	0.6	0.0	3	Cochran	☑
1474	7/20/2001	RG	612	662	0.00 - 0.15	2.2	2.2	0.7	0.0	3	Cochran	☑
1475	7/20/2001	RG	620	662	0.00 - 0.15	2.6	1.8	0.8	0.0	3	Cochran	☑

Save Locks

Lock all Points Unlock all Points

Reviewed By_____ **Date**_____

Document Control_____ **Date**_____

Return to main menu

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M E M O R A N D U M

DATE: June 19, 2003

TO: Toni Steinhauer

FROM: Bart Anderson

RE: Specification for KMTC Database Threshold Comparison Screening Report (TCTR) - Revision 2

CC: Harry Newman; Drew Thatcher

This Specification Modification will clarify and document the calculations that go into the subject report which is generated by our Radiation Tracking Database System (RDTS) for the KMTC project. It will also specify certain minor changes to the output.

1. Fractional concentration data will be calculated in three ways according to the three following equations:

   a. $$FMPCs = \frac{U_s - (\overline{U}_b + 2*\sigma_{U_b})}{228} + \frac{Th_s - (\overline{Th}_b + 2*\sigma_{Th_b})}{5.3} + \frac{Ra_s - (\overline{Ra}_b + 2*\sigma_{Ra_b})}{3.5}$$

   b. $$FMPCm = \frac{U_s - \overline{U}_b}{228} + \frac{Th_s - \overline{Th}_b}{5.3} + \frac{Ra_s - \overline{Ra}_b}{3.5}$$

   c. $$FMPCg = \frac{U_s}{228} + \frac{Th_s}{5.3} + \frac{Ra_s}{3.5}$$

2. The variables in the equations are defined as follows:

a. FMPC is the Fractional Material Permissible Concentration. Subscript s means calculated including the $2*\sigma$ term in the background. Subscript m means calculated using mean background only. Subscript g means no background data were included in the calculation (gross value).

b. U_s is the survey value for uranium in pCi/g. Likewise for Thorium and Radium.

c. $\overline{U}_b$ refers to the mean value for the background uranium concentrations in the data set for the applicable matrix.

d. σ_{Ub} refers to the standard deviation of the background uranium concentrations in the data set for the applicable matrix.

e. Items b,c, and d apply similarly for thorium and radium.

f. The terms in parentheses in equation 1.a are the calculated background thresholds for each nuclide which are reported in the background report as Tbk_U, Tbk_{Th}, and Tbk_{Ra}.

g. The numbers in the denominators are the Derived Concentration Guidelines (DCGL's) for each nuclide as reported in the D Plan.

3. The screening tests which are conducted by the report software will be performed as follows:

a. EMC Screen: Each data point will be tested. The data record and the survey unit fail if either of the following equations are true (Only U is shown for the single nuclide tests. The equation applies to the other nuclides as well).

i. $U_s > DCGL_{EMC} + Tbk_U$ (See par. 2.f.)

ii. $FMPC_s > FMPC_{EMC}$ where $FMPC_{EMC}$ is the a priori maximum FMPC established for EMC. (Default in the report setup will be 3).

b. $DCGL_w$ Screen: Each data point will be tested. The data record and the survey unit fail if either of the following equations are true:

i. $U_s > DCGLw + Tbk_U$

ii. $FMPC_s > DCGLw$ Default DCGLw for the FMPC report[41] will be set to 1.0 but should be changeable.

c. Background Screen: Each data point will be tested. The data record and the survey unit fail if either of the following equations are true:

i. $U_s > Tbk_U$

ii. $FMPC_s > 0.0$

d. Min/Max Test: The survey unit fails the test if the following equation is true of the data set:

i. $Maximum\,(U_s) > DCGL_w + Minimum\,(U_b)$

ii. $Maximum\,(FMPC_g) > DCGL_w + Minimum\,(FMPCg_{BK})$

[41] Also referred to in the database as Sum of Fractions (SOF) Report.

Where $FMPCg_{BK}$ refers to the value for FMPCg calculated over the background data set applicable to the Survey Unit.

e. $DCGL_{avg}$ Test: The survey unit fails the test if the following equation is true of the data set:

   i. $\overline{U}_s > DCGLw + \overline{U}_b$ where $\overline{U}_s$ is the average of all the survey values in the data set.

   ii. $FMPC_m > DCGLw$ [42]

f. Wilcoxon Statistical Test: For the FMPC report, this test will be performed on the survey unit data set selected using only grid points (RG,PG) and on all the background data points in the table for the applicable matrix (at present it is always soil). For both survey and background data points use $FMPC_g$. Create the "adjusted background" values by adding 1.0 ($DCGL_w$ value) to the value for background $FMPC_g$. The rest of the calculations are the same as for a single nuclide report.

4. Report Setup. In the report setup screen always set the three $DCGL_w$ values to the defaults shown in the denominators of equations 1a,1b, and 1c above but allow them to be changed by the user. Always open the report in the FMPC mode (formerly SOF) and set $DCGL_w$ and EMC defaults to 1.0 and 3.0 respectively. Allow these also to be changed. When the radio button is pressed for any of the single nuclide reports, automatically load the $DCGL_w$ with the default value for the selected nuclide. Default the EMC to three times the $DCGL_w$ value. Allow these to be changed as well.

5. Adjust the body of the report to show the values for $FMPC_s$ under the column heading FMPC. Add a footnote to the report which states, "All concentrations shown include background. FMPC is calculated net of background plus 2 sigma."

6. Background Report. Alter the format of the background report that prints at the end of each run. Include a line for each of the three nuclides listing the thresholds for each as well. Add a line for FMPC and show the mean value of $FMPC_g$ and sigma only. Threshold values in this case would be meaningless. These four lines should be repeated for each matrix in the database. (For soil there will rarely, if ever, be more than one).

[42] Default DCGLw for SOF report is 1.0.

Attachment E

Soil Threshold Comparison Test Report (FMPC)

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

Run Thursday, June 19, 2003

Survey Unit 99 Class: 1 Data FMPC Grid R Spacing 0 m.

SURVEY UNIT TABLE

Borders N	S	E	W	Surface Area Included (sq. m)	Remarks
600.0	550.0	50.0	10.0	2000	
		Total area		2000	

INITIALIZATION DATA

Measurement Types Selected: RG, BI

Date Range: All

*** Report includes Remediated data points ***

Thresholds:

EMC: 3.0 DCGLw: 1.0 Nuclides Tested: FMPC

SURVEY UNIT TEST STATUS

Test Performed	Status
Min/Max	Fail
Background	Fail
DCGLw	Fail
DCGLavg	Fail
EMC	Fail
Wilcoxon Rank Sum	Fail
Sign Test for Paired Data:	N/A

	Mtx	(pCi/g)
Maximum Survey	S	11.3
Minimum Background	S	0.3
Difference		11.0
Average Activity	3.0	(pCi/g)

***** PRELIMINARY DATA ONLY. These data have not been fully reviewed. *****

KERR-MCGEE TECHNICAL CENTER
DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

THE FOLLOWING DATA POINTS FAILED THE EMC TEST:

Survey Unit # 99

X (m)	Y (m)	D1 (m)	D2 (m)	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC* pCi/g	Remarks	TCN	Exc.	Res.
45.0	555.0	0.0	0.1	S	RG	690	20.0	15.7	10.5		992	A	R
35.0	555.0	0.0	0.1	S	RG	688	18.8	14.9	10.0		992	A	R
25.0	555.0	0.0	0.1	S	RG	687	18.7	14.2	9.8		992	A	R
15.0	555.0	0.0	0.1	S	RG	686	18.6	13.4	9.6		992	A	R
45.0	560.0	0.0	0.1	S	RG	500	15.0	12.7	7.9		992	A	R
35.0	560.0	0.0	0.1	S	RG	232	12.0	12.0	5.9		992	A	R
25.0	560.0	0.0	0.1	S	RG	231	9.0	11.0	5.1		992	A	R
15.0	560.0	0.0	0.1	S	RG	230	8.2	10.0	4.6		992	A	R
45.0	565.0	0.0	0.1	S	RG	228	8.1	9.5	4.5		991	A	R
35.0	565.0	0.0	0.1	S	RG	226	8.0	8.1	4.0		991	A	R

* All concentrations shown include background. FMPC is calculated net of Background Threshold.

THE FOLLOWING DATA POINTS FAILED THE DCGLw TEST:

Survey Unit # 99

X (m)	Y (m)	D1 (m)	D2 (m)	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC* pCi/g	Remarks	TCN	Exc.	Res.
25.0	565.0	0.0	0.1	S	RG	224	4.0	6.2	2.7		9917	B	R
15.0	565.0	0.0	0.1	S	RG	222	3.7	5.3	2.4		9916	B	R
45.0	575.0	0.0	0.1	S	RG	4.5	3.4	5.0	1.3		9915	B	R
35.0	575.0	0.0	0.1	S	RG	4.2	3.1	4.5	1.1		9914	B	R
25.0	575.0	0.0	0.1	S	RG	3.7	2.9	4.4	1.0		9913	B	R

* All concentrations shown include background. FMPC is calculated net of Background Threshold.

THE FOLLOWING DATA POINTS FAILED THE BACKGROUND TEST:

Survey Unit # 99

X (m)	Y (m)	D1 (m)	D2 (m)	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC* pCi/g	Remarks	TCN	Exc.	Res.
15.0	575.0	0.0	0.1	S	RG	3.6	2.8	4.3	1.0		9912	C	
45.0	585.0	0.0	0.1	S	RG	3.5	2.2	2.3	0.3		9911	C	
35.0	585.0	0.0	0.1	S	RG	3	1.9	2.0	0.2		9910	C	
25.0	585.0	0.0	0.1	S	RG	2.7	1.6	1.7	0.0		9909	C	

* All concentrations shown include background. FMPC is calculated net of Background Threshold.

KERR-MCGEE TECHNICAL CENTER
DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

THE FOLLOWING DATA POINTS PASSED BACKGROUND, DCGLw, AND EMC SCREENING TESTS:

Survey Unit # 99

X (m)	Y (m)	D1 (m)	D2 (m)	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC* pCi/g	Remarks	TCN Exc. Res.
15.0	585.0	0.0	0.1	S	RG	2.4	1.3	1.0	-0.3		9908
25.0	599.0	0.0	0.1	S	BI	1	1.0	1.0	-0.3		9930
25.0	550.0	0.0	0.1	S	BI	1	1.0	1.0	-0.3		9929
49.0	575.0	0.0	0.1	S	BI	1	1.0	1.0	-0.3		9902
10.0	575.0	0.0	0.1	S	BI	1	1.0	1.0	-0.3		9901
45.0	595.0	0.0	0.1	S	RG	2.1	1.0	0.9	-0.3		9907
35.0	595.0	0.0	0.1	S	RG	1.8	0.7	0.8	-0.4		9906
25.0	595.0	0.0	0.1	S	RG	1.5	0.4	0.5	-0.6		9905
15.0	595.0	0.0	0.1	S	RG	1	0.1	0.2	-0.7		9904

* All concentrations shown include background. FMPC is calculated net of Background Threshold.

KERR-MCGEE TECHNICAL CENTER
DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

Summary of Background Data and Thresholds Used in this Analysis

***** PRELIMINARY DATA ONLY. These data have not been fully reviewed. *****

Measurement Type: BK *DCGL:* 1.0 *EMC:* 3.0 *Nuclides:* FMPC

Matrix	*Nuclide*	*Number of Data Points*	*Average Background* (pCi/g)	*Sigma* (pCi/g)	*Background Threshold (Tbk)* (pCi/g)	*DCGLw Threshold (Td)* (pCi/g)	*EMC Threshold (Te)* (pCi/g)
S	U	291	1.8	0.9	3.6	4.6	6.6
S	Th	291	2.3	0.3	2.8	3.8	5.8
S	Ra	291	0.6	0.1	0.9	1.9	3.9
S	FMPC	291	0.6	0.1			

KERR-MCGEE TECHNICAL CENTER
DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

STATISTICAL TEST

Run Date: 6/19/2003 6:16:47

Survey Unit Number: 99 Class 1

Selected Test: WILCOXON RANK SUM TEST

Test : *Fail*

Thresholds:

EMC 3.0 DCGL 1.0 Nuclide Tested FMPC

DATA SUMMARY

291 Background Points 24 Survey points processed

Wr = 44814 Wc 46683

****** The survey unit has NOT passed the WILCOXON RANK SUM TEST. Further action is required ******

Attachment F

Soil Threshold Comparison Test Report (Thorium)

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

Run Thursday, June 19, 2003

Survey Unit Number: 99 Class: 1 Data Points: Th Grid Type: R Spacing: 0 m.

SURVEY UNIT TABLE

Borders				Surface Area Included	
N	S	E	W	(sq. m)	Remarks
600.	550.	50.0	10.0	2000	
		Total		2000	

INITIALIZATION DATA

Measurement Types Selected: RG, BI

Date Range: All

*** Report includes Remediated data points ***

Thresholds:

EMC: 15.9 DCGLw: 5.3 Nuclides Tested: Th

SURVEY UNIT TEST STATUS

Test Performed	Status
Min/Max	Fail
Background	Fail
DCGLw	Fail
DCGLavg	Pass
EMC	Fail
Wilcoxon Rank Sum	Fail
Sign Test for Paired Data:	N/A

	Mtx	(pCi/g)
Maximum Survey	S	20.0
Minimum Background	S	1.1
Difference		18.9
Average Activity	6.1	(pCi/g)

***** PRELIMINARY DATA ONLY. These data have not been fully reviewed. *****

KERR-MCGEE TECHNICAL CENTER
DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

THE FOLLOWING DATA POINTS FAILED THE EMC TEST:

Survey Unit # 99

X (m)	Y (m)	D1 (m)	D2 (m)	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC* pCi/g	Remarks	TCN	Exc.	Res.
45.0	555.0	0.0	0.1	S	RG	690	20.0	15.7	10.5		992	A	R
35.0	555.0	0.0	0.1	S	RG	688	18.8	14.9	10.0		992	A	R

* All concentrations shown include background. FMPC is calculated net of Background Threshold.

THE FOLLOWING DATA POINTS FAILED THE DCGLw TEST:

Survey Unit # 99

X (m)	Y (m)	D1 (m)	D2 (m)	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC* pCi/g	Remarks	TCN	Exc.	Res.
25.0	555.0	0.0	0.1	S	RG	687	18.7	14.2	9.8		9925	B	R
15.0	555.0	0.0	0.1	S	RG	686	18.6	13.4	9.6		9924	B	R
45.0	560.0	0.0	0.1	S	RG	500	15.0	12.7	7.9		9923	B	R
35.0	560.0	0.0	0.1	S	RG	232	12.0	12.0	5.9		9922	B	R
25.0	560.0	0.0	0.1	S	RG	231	9.0	11.0	5.1		9921	B	R
15.0	560.0	0.0	0.1	S	RG	230	8.2	10.0	4.6		9920	B	R

* All concentrations shown include background. FMPC is calculated net of Background Threshold.

THE FOLLOWING DATA POINTS FAILED THE BACKGROUND

Survey Unit # 99

X (m)	Y (m)	D1 (m)	D2 (m)	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC* pCi/g	Remarks	TCN	Exc.	Res.
45.0	565.0	0.0	0.1	S	RG	228	8.1	9.5	4.5		9919	C	R
35.0	565.0	0.0	0.1	S	RG	226	8.0	8.1	4.0		9918	C	R
25.0	565.0	0.0	0.1	S	RG	224	4.0	6.2	2.7		9917	C	R
15.0	565.0	0.0	0.1	S	RG	222	3.7	5.3	2.4		9916	C	R
45.0	575.0	0.0	0.1	S	RG	4.5	3.4	5.0	1.3		9915	C	R
35.0	575.0	0.0	0.1	S	RG	4.2	3.1	4.5	1.1		9914	C	R
25.0	575.0	0.0	0.1	S	RG	3.7	2.9	4.4	1.0		9913	C	R

* All concentrations shown include background. FMPC is calculated net of Background Threshold.

KERR-MCGEE TECHNICAL CENTER
DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

THE FOLLOWING DATA POINTS PASSED BACKGROUND, DCGLw, AND EMC SCREENING TESTS:

Survey Unit # 99

X (m)	Y (m)	D1 (m)	D2 (m)	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC* pCi/g	Remarks	TCN Exc. Res.
15.0	575.0	0.0	0.1	S	RG	3.6	2.8	4.3	1.0		9912
45.0	585.0	0.0	0.1	S	RG	3.5	2.2	2.3	0.3		9911
35.0	585.0	0.0	0.1	S	RG	3	1.9	2.0	0.2		9910
25.0	585.0	0.0	0.1	S	RG	2.7	1.6	1.7	0.0		9909
15.0	585.0	0.0	0.1	S	RG	2.4	1.3	1.0	-0.3		9908
25.0	599.0	0.0	0.1	S	BI	1	1.0	1.0	-0.3		9930
25.0	550.0	0.0	0.1	S	BI	1	1.0	1.0	-0.3		9929
49.0	575.0	0.0	0.1	S	BI	1	1.0	1.0	-0.3		9902
10.0	575.0	0.0	0.1	S	BI	1	1.0	1.0	-0.3		9901
45.0	595.0	0.0	0.1	S	RG	2.1	1.0	0.9	-0.3		9907
35.0	595.0	0.0	0.1	S	RG	1.8	0.7	0.8	-0.4		9906
25.0	595.0	0.0	0.1	S	RG	1.5	0.4	0.5	-0.6		9905
15.0	595.0	0.0	0.1	S	RG	1	0.1	0.2	-0.7		9904

* All concentrations shown include background. FMPC is calculated net of Background Threshold.

KERR-MCGEE TECHNICAL CENTER
DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

Summary of Background Data and Thresholds Used in this Analysis

***** PRELIMINARY DATA ONLY. These data have not been fully reviewed. *****

Measurement Type: BK *DCGL:* 5.3 *EMC:* 15.9 *Nuclides:* Th

Matrix	*Nuclide*	*Number of Data Points*	*Average Background* (pCi/g)	*Sigma* (pCi/g)	*Background Threshold (Tbk)* (pCi/g)	*DCGLw Threshold (Td)* (pCi/g)	*EMC Threshold (Te)* (pCi/g)
S	U	291	1.8	0.9	3.6	8.9	19.5
S	Th	291	2.3	0.3	2.8	8.1	18.7
S	Ra	291	0.6	0.1	0.9	6.2	16.8
S	FMPC	291	0.6	0.1			

KERR-MCGEE TECHNICAL CENTER
DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

STATISTICAL TEST

Run Date: 6/19/2003 6:17:46

Survey Unit Number: 99 Class: 1

Selected Test: WILCOXON RANK SUM TEST

Test Status: Fail

Thresholds:

EMC 15.9 DCGL 5.3 Nuclide Tested Th

DATA SUMMARY

291 Background Points 24 Survey points processed

Wr = 46580 Wc 46683

****** The survey unit has NOT passed the WILCOXON RANK SUM TEST. Further action is required ******

Attachment G

Soil Background Data

SID	UCon	THCon	RACon	FMPCg	SID	UCon	THCon	RACon	FMPCg	SID	UCon	THCon	RACon	FMPCg
234	1.5	2.3	0.6	0.61	292	1.3	2.4	0.8	0.69	193	3	2.2	0.7	0.63
1	2.6	2	0.7	0.59	97	2.6	2.3	0.6	0.62	194	2.1	2.3	0.6	0.61
2	0.2	2.3	0.5	0.58	98	1.2	2.3	0.5	0.58	195	0.8	2.5	0.6	0.65
3	1.9	2.1	0.6	0.58	99	1.6	2.6	0.5	0.64	196	1.7	2.3	0.7	0.64
4	1.1	2.2	0.6	0.59	100	1.6	2.6	0.5	0.64	197	2	2.3	0.7	0.64
5	1.7	2.3	0.5	0.58	101	3.8	2.3	0.6	0.62	198	2	2.5	0.4	0.59
6	0.4	2.1	0.8	0.63	102	0.2	2.5	0.6	0.64	199	1.2	2.7	0.5	0.66
7	0.3	2.6	0.7	0.66	103	0.6	2.5	0.6	0.65	200	1.7	2.8	0.5	0.68
8	0.5	2.7	0.6	0.68	104	1.4	2.2	0.6	0.59	201	1.1	2.5	0.7	0.68
9	1.4	2.3	0.6	0.61	105	1.7	2.2	0.7	0.62	202	3	2.3	0.4	0.56
10	0.2	2.8	0.6	0.70	106	0.6	2.3	0.6	0.61	203	2.1	2.4	0.5	0.60
11	0	2.7	0.7	0.71	107	0.5	2.4	0.6	0.63	204	2.4	2.6	0.5	0.64
12	1.8	2.4	0.7	0.66	108	0.5	2.3	0.8	0.66	205	2.3	2.6	0.6	0.67
13	1.4	2.5	0.6	0.65	109	2.5	2.4	0.6	0.64	206	1.4	2.3	0.6	0.61
14	1.7	2.3	0.6	0.61	110	1.9	2.1	0.6	0.58	207	1.1	2.4	0.7	0.66
15	2.3	2	0.5	0.59	111	1.7	2.3	0.6	0.61	208	1	2.7	0.7	0.71
16	0.9	2.1	0.6	0.57	112	0.3	2.8	0.7	0.73	209	1.3	2.3	0.5	0.58
17	1.6	2.4	0.7	0.66	113	1.2	2.2	0.7	0.62	210	1.5	2	0.6	0.56
18	1.6	2.3	0.6	0.61	114	2.3	2.3	0.6	0.62	211	2.4	2.5	0.5	0.63
19	2.5	1.9	0.6	0.54	115	1.7	2.1	0.8	0.63	212	2.2	2.6	0.6	0.67
20	0.4	2.6	0.7	0.69	116	0.7	2.6	0.7	0.69	213	1.6	1.9	0.7	0.57
21	0.6	2.2	0.8	0.65	117	2.2	2.2	0.7	0.62	214	1.2	2.3	0.6	0.61
22	0.8	2.3	0.8	0.67	118	2.1	2.1	0.5	0.55	215	0.6	2.6	0.5	0.64
23	1.9	2.5	0.8	0.71	119	2.5	1.8	0.7	0.55	216	1	2.7	0.6	0.69
24	1.4	2.9	0.6	0.72	120	1.5	2.4	0.7	0.66	217	1	2.4	0.7	0.66
25	2.3	2.3	0.7	0.64	121	1.4	2.3	0.8	0.67	218	2.1	2.3	0.7	0.64
26	2.1	2.5	0.5	0.62	122	1.8	2.2	0.7	0.62	219	1.5	2.8	0.8	0.76
27	0.4	2.6	0.7	0.69	123	1.4	2.4	0.8	0.69	220	2.4	2.6	0.7	0.70
28	1.3	2.7	0.6	0.69	124	1.1	2.1	0.8	0.63	221	1.9	2	0.6	0.56
29	2.6	2.3	0.6	0.62	125	1.6	2.7	0.6	0.69	222	4.5	1.9	0.7	0.58
30	2.4	2.3	0.7	0.64	126	1.5	2.4	0.7	0.66	223	1.2	2.2	0.9	0.68
31	2.5	2.2	0.8	0.65	127	1.9	2.2	0.7	0.62	224	3.8	2	0.6	0.57
32	1.3	2.2	0.6	0.59	128	2	2	0.7	0.59	225	2.4	2.2	0.7	0.63
33	1.6	2.4	0.6	0.63	129	1	2.5	0.6	0.65	226	0.4	2.4	0.8	0.68
34	3.7	2.3	0.5	0.59	130	2.7	2.3	0.7	0.65	227	1.9	2.1	0.9	0.66
35	1.8	2.3	0.6	0.61	131	2	2.3	0.7	0.64	228	3.2	2.1	0.6	0.58
36	3.2	2.4	0.5	0.61	132	2	2.3	0.8	0.67	229	2.8	2	0.7	0.59
37	3.5	2.4	0.5	0.61	133	1.3	2.2	0.7	0.62	230	2	2.1	0.7	0.60
38	2.4	1.9	0.7	0.57	134	1.2	2.3	0.9	0.70	231	2	2.2	0.6	0.60
39	1.5	2.3	0.6	0.61	135	1.1	2.4	0.7	0.66	232	2.4	2.3	0.6	0.62
40	1.7	2.3	0.6	0.61	136	1.2	2.3	0.8	0.67	233	2	2	0.8	0.61
41	2.4	2.4	0.4	0.58	137	0.7	2.5	0.9	0.73	235	1.1	2.6	0.4	0.61
42	3.9	2.1	0.7	0.61	138	1.7	2.1	0.7	0.60	236	1.7	2.3	0.7	0.64
43	0.7	1.8	0.6	0.51	139	1.2	1.8	0.8	0.57	237	1.5	2.6	0.6	0.67
44	1.9	2	0.7	0.59	140	1.6	2.6	0.6	0.67	238	2.4	2.3	0.5	0.59
45	2.1	2.2	0.7	0.62	141	1.2	2.5	0.8	0.71	239	3	2.3	0.7	0.65
46	0.7	2.6	0.6	0.67	142	1.5	2.7	0.7	0.72	240	1.5	2.2	0.7	0.62
47	1.7	2.6	0.6	0.67	143	1.1	2	0.7	0.58	241	0.9	2.4	0.6	0.63
48	2	2	0.7	0.59	144	1	2.4	0.7	0.66	242	1.7	2.4	0.5	0.60
49	1.6	2.4	0.6	0.63	145	3.4	2.3	0.7	0.65	243	0.8	2.1	0.7	0.60
50	1.8	2.4	0.7	0.66	146	1.2	2.4	0.5	0.60	244	0.3	1.8	0.7	0.54
51	1.5	2.5	0.6	0.65	147	0.5	2.4	0.6	0.63	245	0.8	2.6	0.5	0.64
52	0.4	2.2	0.6	0.59	148	0.1	2.8	0.5	0.67	246	2.3	2.3	0.8	0.67
53	1.3	2.1	0.6	0.57	149	1.8	2	0.5	0.53	247	2.6	2.3	0.6	0.62
54	2.7	2.2	0.7	0.63	150	0.7	1.8	0.6	0.51	248	2.6	2.1	0.6	0.58
55	1.2	2.5	0.8	0.71	151	1.5	1.7	0.8	0.56	249	2.8	2.3	0.8	0.67
56	3	2.7	0.8	0.75	152	0.4	1.9	0.8	0.59	250	3.5	2	0.7	0.59
57	0.6	1.9	0.7	0.56	153	1.7	2.5	0.6	0.65	251	2	2.1	0.8	0.63
58	3	2.4	0.5	0.61	154	1	2.4	0.6	0.63	252	3.1	1.7	0.7	0.53
59	1.8	2.3	0.7	0.64	155	1.3	2.6	0.4	0.61	253	0.4	2.5	0.9	0.73
60	0.6	2.3	0.6	0.61	156	0.5	2.7	0.5	0.65	254	4.4	2	0.8	0.63
61	1.6	2.1	0.5	0.55	157	2	2.5	0.6	0.65	255	2.9	2	0.7	0.59
62	1	1.6	0.6	0.48	158	2.3	2	0.6	0.56	256	3.2	2	0.7	0.59
63	1.2	2.2	0.5	0.56	159	2	1.6	0.5	0.45	257	2.1	2.2	0.7	0.62
64	1.2	2.4	0.5	0.60	160	1.9	2.3	0.5	0.59	258	3.8	2	0.7	0.59
65	2.7	2.1	0.6	0.58	161	1.5	2.3	0.6	0.61	259	3.2	2	0.7	0.59
66	1.8	2.3	0.6	0.61	162	1.5	2.5	0.5	0.62	260	3.8	2.2	0.8	0.66
67	2.6	2.3	0.7	0.65	163	2.4	2.6	0.6	0.67	261	1.9	2.5	0.7	0.68
68	1.3	2.3	0.8	0.67	164	1.2	2.4	0.6	0.63	262	1.4	2.3	0.8	0.67
69	2.7	1.9	0.7	0.57	165	2.9	2.3	0.5	0.59	263	2.3	2.3	0.7	0.64
70	3.3	2	0.7	0.59	166	3	2	0.6	0.56	264	1.6	2.6	0.7	0.70
71	1.4	2.2	0.6	0.58	167	2.8	2.4	0.6	0.64	265	1.7	2.5	0.6	0.65
72	0.7	2.6	0.7	0.69	168	1.9	2.5	0.6	0.65	266	5	2.2	0.8	0.67
73	0.6	2.4	0.4	0.57	169	0.8	1.5	0.5	0.43	267	3.1	2	0.7	0.59
74	2.3	2.2	0.6	0.60	170	3.1	1.1	0.3	0.31	268	4	2.3	0.7	0.65
75	1.8	2.5	0.5	0.62	171	1.7	2.1	0.6	0.58	269	2.5	2.2	0.6	0.60
76	2.1	2.7	0.7	0.72	172	2.2	1.9	0.6	0.54	270	2.5	2.6	0.6	0.67
77	0.5	1.8	0.3	0.43	173	0.8	2.8	0.6	0.70	271	1.7	2.6	0.7	0.70
78	1.2	2.3	0.6	0.61	174	1.3	2.6	0.6	0.67	272	0.9	2.7	0.5	0.66
79	1.5	2.2	0.5	0.56	175	2.1	2	0.8	0.62	273	3	2	0.7	0.59
80	1.2	2.7	0.5	0.66	176	1.3	2.1	0.7	0.60	274	2.4	2.1	0.6	0.58
81	2.4	2.4	0.5	0.61	177	2.4	2	0.6	0.58	275	0.4	2.1	0.6	0.57
82	1.5	1.9	0.5	0.51	178	0.5	2.4	0.6	0.63	277	1.2	1.9	0.7	0.56
83	0.7	2.2	0.6	0.58	179	2	2.3	0.7	0.64	278	1.9	2	0.5	0.53
84	1.6	2.3	0.5	0.58	180	2.8	2.1	0.6	0.58	279	2	2.4	0.6	0.63
85	0.6	2.3	0.5	0.58	181	1.4	2.4	0.6	0.63	280	2.7	2.4	0.5	0.61
86	2.8	2.1	0.6	0.58	182	2.1	2.2	0.7	0.62	281	2.1	1.9	0.8	0.60
87	1.9	2.6	0.5	0.64	183	0.7	2.3	0.7	0.64	282	1.9	2.6	0.7	0.70
88	1.1	2.7	0.8	0.74	184	1.9	2.1	0.7	0.60	283	1.7	2.8	0.7	0.74
89	0.9	2.5	0.7	0.68	185	1.2	2.4	0.7	0.66	284	2.1	2.3	0.7	0.64
90	1.7	1.8	0.6	0.52	186	3.1	2.2	0.7	0.63	285	3.7	2.1	0.6	0.58
91	0.5	2.3	0.6	0.61	187	2.1	2.2	0.7	0.62	286	1.1	2.3	0.9	0.70
92	1.6	2.3	0.6	0.61	188	0.7	2.5	0.6	0.65	287	1.9	2.5	0.8	0.71
93	0.9	2.4	0.5	0.60	189	2.2	2.3	0.6	0.62	288	1.8	2.3	0.8	0.67
94	1.8	2.2	0.7	0.62	190	4.1	2.2	0.6	0.60	289	3.6	2.3	0.7	0.65
95	1.3	2.4	0.7	0.66	191	0.7	2.2	0.7	0.62	290	0.5	2	0.9	0.64
96	1.7	2.6	0.8	0.73	192	2.3	2.3	0.8	0.67	291	0.8	1.7	0.9	0.58

Average:	1.760	2.289	0.644	
Sigma:	0.901	0.260	0.109	
Min.	-	1.10	0.30	0.31

Attachment H

Wilcoxon Rank Sum Confirmation

SID	TYPE	DataValue	AdjData	AdjRank	BKRank	Rank	BK Rank	Rank
2516	RG	0.10	0.10	1.00	-	1.0		1.0
2517	RG	0.40	0.40	2.00	-	2.0		2.0
2518	RG	0.70	0.70	3.00	-	3.0		3.0
2519	RG	1.00	1.00	4.00	-	4.0		4.0
2520	RG	1.30	1.30	5.00	-	5.0		5.0
2521	RG	1.60	1.60	6.00	-	6.0		6.0
2522	RG	1.90	1.90	7.00	-	7.0		7.0
2523	RG	2.20	2.20	8.00	-	8.0		8.0
2524	RG	2.80	2.80	9.00	-	9.0		9.0
2525	RG	2.90	2.90	10.00	-	10.0		10.0
2526	RG	3.10	3.10	11.00	-	11.0		11.0
2527	RG	3.40	3.40	12.00	-	12.0		12.0
2528	RG	3.70	3.70	13.00	-	13.0		13.0
2529	RG	4.00	4.00	14.00	-	14.0		14.0
462	BK	1.10	6.40	15.00	15.0	15.0	15.0	15.0
461	BK	1.50	6.80	16.00	16.0	16.0	16.0	16.0
345	BK	1.60	6.90	17.50	17.5	17.0	17.5	17.5
449	BK	1.60	6.90	17.50	17.5	17.0	17.5	17.5
440	BK	1.70	7.00	20.00	20.0	19.0	20.0	20.0
549	BK	1.70	7.00	20.00	20.0	19.0	20.0	20.0
587	BK	1.70	7.00	20.00	20.0	19.0	20.0	20.0
326	BK	1.80	7.10	25.00	25.0	22.0	25.0	25.0
360	BK	1.80	7.10	25.00	25.0	22.0	25.0	25.0
374	BK	1.80	7.10	25.00	25.0	22.0	25.0	25.0
405	BK	1.80	7.10	25.00	25.0	22.0	25.0	25.0
293	BK	2.70	8.00	291.00	291.0	284.0	291.0	291.0
311	BK	2.70	8.00	291.00	291.0	284.0	291.0	291.0
339	BK	2.70	8.00	291.00	291.0	284.0	291.0	291.0
359	BK	2.70	8.00	291.00	291.0	284.0	291.0	291.0
363	BK	2.70	8.00	291.00	291.0	284.0	291.0	291.0
371	BK	2.70	8.00	291.00	291.0	284.0	291.0	291.0
412	BK	2.70	8.00	291.00	291.0	284.0	291.0	291.0
430	BK	2.70	8.00	291.00	291.0	284.0	291.0	291.0
446	BK	2.70	8.00	291.00	291.0	284.0	291.0	291.0
496	BK	2.70	8.00	291.00	291.0	284.0	291.0	291.0
505	BK	2.70	8.00	291.00	291.0	284.0	291.0	291.0
513	BK	2.70	8.00	291.00	291.0	284.0	291.0	291.0
569	BK	2.70	8.00	291.00	291.0	284.0	291.0	291.0
2530	RG	8.00	8.00	291.00	-	284.0		291.0
292	BK	2.80	8.10	302.50	302.5	299.0	302.5	302.5
398	BK	2.80	8.10	302.50	302.5	299.0	302.5	302.5
437	BK	2.80	8.10	302.50	302.5	299.0	302.5	302.5
465	BK	2.80	8.10	302.50	302.5	299.0	302.5	302.5
497	BK	2.80	8.10	302.50	302.5	299.0	302.5	302.5
516	BK	2.80	8.10	302.50	302.5	299.0	302.5	302.5
579	BK	2.80	8.10	302.50	302.5	299.0	302.5	302.5
2531	RG	8.10	8.10	302.50	-	299.0		302.5
306	BK	2.90	8.20	307.50	307.5	307.0	307.5	307.5
2532	RG	8.20	8.20	307.50	-	307.0		307.5
2533	RG	9.00	9.00	309.00	-	309.0		309.0
2534	RG	12.00	12.00	310.00	-	310.0		310.0
2535	RG	15.00	15.00	311.00	-	311.0		311.0
2536	RG	18.60	18.60	312.00	-	312.0		312.0
2537	RG	18.70	18.70	313.00	-	313.0		313.0
2538	RG	18.80	18.80	314.00	-	314.0		314.0
2539	RG	20.00	20.00	315.00	-	315.0		315.0
					46,580.0		46,580.0	

Attachment I

Soil Threshold Comparison Test Report (Remediated)

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

Run Thursday, June 19, 2003

Survey Unit Number: 99 Class: 1 Data Points: FMPC Grid Type: R Spacing: 0 m.

SURVEY UNIT TABLE

Borders				Surface Area Included	
N	S	E	W	(sq. m)	Remarks
600.	550.	50.0	10.0	2000	
		Total		2000	

INITIALIZATION DATA

Measurement Types Selected: RG, BI

Date Range: All

*** Report does not include Remediated data points ***

Thresholds:

EMC: 3.0 DCGLw 1.0 Nuclides Tested: FMPC

SURVEY UNIT TEST STATUS

Test Performed	Status		Mtx	FMPC
Min/Max	Fail	Maximum Survey	S	1.8
Background	Fail	Minimum	S	0.3
DCGLw	Pass	Difference		1.5
DCGLavg	Pass			
EMC	Pass			
		Average Activity	0.0	FMPC
		Wilcoxon Rank Sum	Pass	

Sign Test for Paired Data: N/A

***** PRELIMINARY DATA ONLY. These data have not been fully reviewed. *****

KERR-MCGEE TECHNICAL CENTER
DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

THE FOLLOWING DATA POINTS FAILED THE EMC TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE DCGLw TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE BACKGROUND TEST:

Survey Unit # 99

X (m)	Y (m)	D1 (m)	D2 (m)	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC* pCi/g	Remarks	TCN	Exc. Res.
15.0	575.0	0.0	0.1	S	RG	3.6	2.8	4.3	1.0		9912	C
45.0	585.0	0.0	0.1	S	RG	3.5	2.2	2.3	0.3		9911	C
35.0	585.0	0.0	0.1	S	RG	3	1.9	2.0	0.2		9910	C
25.0	585.0	0.0	0.1	S	RG	2.7	1.6	1.7	0.0		9909	C

* All concentrations shown include background. FMPC is calculated net of Background Threshold.

THE FOLLOWING DATA POINTS PASSED BACKGROUND, DCGLw, AND EMC SCREENING TESTS:

Survey Unit # 99

X (m)	Y (m)	D1 (m)	D2 (m)	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC* pCi/g	Remarks	TCN	Exc. Res.
15.0	585.0	0.0	0.1	S	RG	2.4	1.3	1.0	-0.3		9908	
25.0	599.0	0.0	0.1	S	BI	1	1.0	1.0	-0.3		9930	
25.0	550.0	0.0	0.1	S	BI	1	1.0	1.0	-0.3		9929	
49.0	575.0	0.0	0.1	S	BI	1	1.0	1.0	-0.3		9902	
10.0	575.0	0.0	0.1	S	BI	1	1.0	1.0	-0.3		9901	
45.0	595.0	0.0	0.1	S	RG	2.1	1.0	0.9	-0.3		9907	
35.0	595.0	0.0	0.1	S	RG	1.8	0.7	0.8	-0.4		9906	
25.0	595.0	0.0	0.1	S	RG	1.5	0.4	0.5	-0.6		9905	
15.0	595.0	0.0	0.1	S	RG	1	0.1	0.2	-0.7		9904	

* All concentrations shown include background. FMPC is calculated net of Background Threshold.

KERR-MCGEE TECHNICAL CENTER
DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

Summary of Background Data and Thresholds Used in this Analysis

***** PRELIMINARY DATA ONLY. These data have not been fully reviewed. *****

Measurement Type: BK *DCGL:* 5.3 *EMC:* 15.9 *Nuclides:* Th

Matrix	*Nuclide*	*Number of Data Points*	*Average Background* (pCi/g)	*Sigma* (pCi/g)	*Background Threshold (Tbk)* (pCi/g)	*DCGLw Threshold (Td)* (pCi/g)	*EMC Threshold (Te)* (pCi/g)
S	U	291	1.8	0.9	3.6	4.6	6.6
S	Th	291	2.3	0.3	2.8	3.8	5.8
S	Ra	291	0.6	0.1	0.9	1.9	3.9
S	FMPC	291	0.6	0.1			

KERR-MCGEE TECHNICAL CENTER
DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

STATISTICAL TEST

Run Date: 6/19/2003 10:15:05

Survey Unit Number: 99 Class 1

Selected Test: WILCOXON RANK SUM TEST

Test Status: Pass

Thresholds:

EMC: 3.0 DCGL: 1.0 Nuclide Tested: FMPC

DATA SUMMARY

291 Background Points 9 Survey points processed

Wr = 44814 Wc 44217

****** The survey unit has passed the WILCOXON RANK SUM TEST ******

Attachment J

DCGLavg Calculations

SoilDataPtID	SurveyDate	oordin	oordin	Coordi	Coordi	ireme	rumer	ersonI	MatrixID	urveyTyp	UCon	THCon	RACon	KCon	solutionReg	Lock	SID	FMPCm	FMPCg
2480	01-Sep-02	10	575	0	0.15	BI	36	15	6	SS	1.0	1.0	1.0	1.0		FALSE	9901	(0.14)	0.48
2481	01-Sep-02	49	575	0	0.15	BI	36	15	6	SS	1.0	1.0	1.0	1.0		FALSE	9902	(0.14)	0.48
2483	01-Sep-02	15	595	0	0.15	RG	36	15	6	SS	1.0	0.1	0.2	1.0		FALSE	9904	(0.54)	0.08
2484	01-Sep-02	25	595	0	0.15	RG	36	15	6	SS	1.5	0.4	0.5	1.0		FALSE	9905	(0.40)	0.22
2485	01-Sep-02	35	595	0	0.15	RG	36	15	6	SS	1.8	0.7	0.8	1.0		FALSE	9906	(0.26)	0.37
2486	01-Sep-02	45	595	0	0.15	RG	36	15	6	SS	2.1	1.0	0.9	1.0		FALSE	9907	(0.17)	0.46
2487	01-Sep-02	15	585	0	0.15	RG	36	15	6	SS	2.4	1.3	1.0	1.0		FALSE	9908	(0.08)	0.54
2488	01-Sep-02	25	585	0	0.15	RG	36	15	6	SS	2.7	1.6	1.7	1.0		FALSE	9909	0.18	0.80
2489	01-Sep-02	35	585	0	0.15	RG	36	15	6	SS	3.0	1.9	2.0	1.0		FALSE	9910	0.32	0.94
2490	01-Sep-02	45	585	0	0.15	RG	36	15	6	SS	3.5	2.2	2.3	1.0		FALSE	9911	0.46	1.09
2491	01-Sep-02	15	575	0	0.15	RG	36	15	6	SS	3.6	2.8	4.3	1.0		FALSE	9912	1.15	1.77
2492	01-Sep-02	25	575	0	0.15	RG	36	15	6	SS	3.7	2.9	4.4	1.0		FALSE	9913	1.20	1.82
2493	01-Sep-02	35	575	0	0.15	RG	36	15	6	SS	4.2	3.1	4.5	1.0		FALSE	9914	1.27	1.89
2494	01-Sep-02	45	575	0	0.15	RG	36	15	6	SS	4.5	3.4	5.0	1.0		FALSE	9915	1.47	2.09
2495	01-Sep-02	15	565	0	0.15	RG	36	15	6	SS	222.0	3.7	5.3	1.0		FALSE	9916	2.56	3.19
2496	01-Sep-02	25	565	0	0.15	RG	36	15	6	SS	224.0	4.0	6.2	1.0		FALSE	9917	2.88	3.51
2497	01-Sep-02	35	565	0	0.15	RG	36	15	6	SS	226.0	8.0	8.1	1.0		FALSE	9918	4.19	4.81
2498	01-Sep-02	45	565	0	0.15	RG	36	15	6	SS	228.0	8.1	9.5	1.0		FALSE	9919	4.62	5.24
2499	01-Sep-02	15	560	0	0.15	RG	36	15	6	SS	230.0	8.2	10.0	1.0		FALSE	9920	4.79	5.41
2500	01-Sep-02	25	560	0	0.15	RG	36	15	6	SS	231.0	9.0	11.0	1.0		FALSE	9921	5.23	5.85
2501	01-Sep-02	35	560	0	0.15	RG	36	15	6	SS	232.0	12.0	12.0	1.0		FALSE	9922	6.09	6.71
2502	01-Sep-02	45	560	0	0.15	RG	36	15	6	SS	500.0	15.0	12.7	1.0		FALSE	9923	8.03	8.65
2503	01-Sep-02	15	555	0	0.15	RG	36	15	6	SS	686.0	18.6	13.4	1.0		FALSE	9924	9.72	10.35
2504	01-Sep-02	25	555	0	0.15	RG	36	15	6	SS	687.0	18.7	14.2	1.0		FALSE	9925	9.97	10.60
2505	01-Sep-02	35	555	0	0.15	RG	36	15	6	SS	688.0	18.8	14.9	1.0		FALSE	9926	10.20	10.82
2506	01-Sep-02	45	555	0	0.15	RG	36	15	6	SS	690.0	20.0	15.7	1.0		FALSE	9927	10.66	11.29
2508	01-Sep-02	25	550	0	0.15	BI	36	15	6	SS	1.0	1.0	1.0	1.0		FALSE	9929	(0.14)	0.48
2509	01-Sep-02	25	599	0	0.15	BI	36	15	6	SS	1.0	1.0	1.0	1.0		FALSE	9930	(0.14)	0.48

	U	Th	Ra	FMPCm
Average	174.4	6.05	5.88	2.96
Avg BK:	1.8	2.29	0.64	NA
DCGL	228.0	5.30	3.50	1.00
Sum	229.8	7.59	4.14	1.00
Test	P	P	F	F

Excluded Points:

2479	01-Sep-02	9	575	0	0.15	BI	36	15	6	SS	1.0	1.0	1.0	1.0		FALSE		
2482	01-Sep-02	50	575	0	0.15	BI	36	15	6	SS	1.0	1.0	1.0	1.0		FALSE		
2507	02-Sep-02	25	549	0	0.15	BI	36	15	6	SS	1.0	1.0	1.0	1.0		FALSE		
2510	01-Sep-02	25	600	0	0.15	BI	36	15	6	SS	1.0	1.0	1.0	1.0		FALSE		
2511	01-Sep-02	25	601	0	0.15	BI	36	15	6	SS	1.0	1.0	1.0	1.0		FALSE		

Appendix 3

Threshold Comparison Test Reports

KERR-MCGEE TECHNICAL CENTER

Decommissioning Project

Threshold Comparison Test Report - Soils

Run Date: Friday, August 08, 2003

Survey Unit Number: 01 Class: 1 Data Poinys: FMPC Grid Type: R Spacing: 2 m.

SURVEY UNIT TABLE

Borders				Surface Area Included	
N	S	E		(sq. m)	Remarks
779.	776.	113.	90.0	69	
		Total		69	

INITIALIZATION DATA

Measurement Types Selected: RG, PR, PG, BI, CH

Date Range: All

*** Report does not include Remediated data points ***

Thresholds:

EMC: 3.0 DCGLw 1.0 Nuclides FMPC

SURVEY UNIT TEST STATUS

Test Performed	Status
Min/Max	Pass
Background	Pass
DCGLw	Pass
DCGLavg	Pass
EMC	Pass
Wilcoxon Rank Sum	Pass
Sign Test for Paired Data:	N/A

	Mtx	FMPC
Maximum Survey Value	S	0.8
Minimum Background	S	0.3
Difference		0.5
Average Activity	0.0	FMPC

KERR-MCGEE TECHNICAL CENTER

Decommissioning Project

Threshold Comparison Test Report - Soils

THE FOLLOWING DATA POINTS FAILED THE EMC TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE DCGLw TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE BACKGROUND TEST:

NONE

THE FOLLOWING DATA POINTS PASSED BACKGROUND, DCGLw, AND EMC SCREENING TESTS:

Survey Unit # 01

X (m)	Y (m)	D1 (m)	D2 (m)	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC* pCi/g	Remarks	TCN Exc. Res.
100.4	776.7	3.0	3.2	S	PR	18.3	2.1	1.0	0.0		593
90.5	778.1	3.8	4.2	S	BI	43.3	1.8	0.8	0.0		607
102.5	777.0	3.7	3.8	S	BI	0.8	2.3	1.1	0.0		571
90.5	778.1	4.2	4.7	S	BI	32.7	1.7	1.0	0.0		608
100.4	776.2	3.0	3.2	S	PR	15.6	2.2	0.9	-0.1		592
100.9	776.2	2.7	2.9	S	BI	17.8	2.2	0.8	-0.1		596
94.9	778.1	3.7	3.8	S	RG	12.2	2.5	0.6	-0.1		550
99.9	776.2	2.7	2.9	S	BI	7.8	2.1	0.9	-0.1		595
108.0	778.1	4.0	4.1	S	RG	2.8	2.5	0.7	-0.1		556
99.3	778.1	4.0	4.1	S	RG	10.4	2.6	0.5	-0.1		552
106.9	776.2	3.0	3.2	S	RG	1.1	2.5	0.7	-0.1		566
100.4	776.2	3.0	3.2	S	RG	16.8	2.1	0.7	-0.1		563
109.0	777.0	3.7	3.8	S	BI	1.9	2.4	0.7	-0.1		574
110.2	778.1	4.0	4.1	S	RG	1.5	2.4	0.7	-0.1		557
101.5	778.1	4.0	4.1	S	RG	1.5	2.2	0.7	-0.2		553
107.5	777.0	3.7	3.8	S	BI	2.2	2.0	0.8	-0.2		572

KERR-MCGEE TECHNICAL CENTER

Decommissioning Project

Threshold Comparison Test Report - Soils

X (m)	Y (m)	D1 (m)	D2 (m)	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC* pCi/g	Remarks	TCN Exc. Res.
91.6	776.2	3.0	3.2	S	RG	6.6	2.2	0.6	-0.2		559
102.5	777.0	3.8	4.2	S	BI	3.9	2.1	0.7	-0.2		604
97.1	778.1	3.7	3.8	S	RG	3.8	2.1	0.7	-0.2		551
96.0	776.2	3.0	3.2	S	RG	1.5	2.3	0.6	-0.2		561
104.8	776.2	3.0	3.2	S	RG	0.8	2.3	0.6	-0.2		565
94.9	778.1	3.7	3.8	S	BI	17	1.9	0.6	-0.2		597
99.3	778.1	4.0	4.1	S	BI	12.4	2.0	0.6	-0.2		600
105.8	778.1	4.0	4.1	S	RG	1.9	2.2	0.6	-0.2		555
90.5	778.1	3.7	3.8	S	BI	14.8	1.9	0.6	-0.2		606
93.8	776.2	3.0	3.2	S	RG	5.7	2.1	0.6	-0.2		560
93.0	776.0	0.0	0.1	S	PR	2.08	2.0	0.7	-0.2		1953
91.0	777.0	2.7	2.9	S	PR	6.6	1.9	0.7	-0.2		665
102.5	777.0	3.7	3.8	S	BI	3.4	2.4	0.4	-0.2		603
90.0	776.0	0.0	0.1	S	PR	2.83	2.0	0.7	-0.2		1950
90.0	776.0	0.1	0.5	S	PR	3.33	1.9	0.7	-0.2		1951
109.1	776.2	3.0	3.2	S	RG	2.4	2.1	0.6	-0.2		567
102.6	776.2	3.0	3.2	S	RG	1.8	1.8	0.8	-0.2		564
112.5	777.0	1.5	1.7	S	BI	1.9	1.9	0.7	-0.2		573
90.0	776.0	0.5	1.0	S	PR	2.8	1.7	0.8	-0.2		1952
100.0	777.0	0.0	0.1	S	PR	2.88	2.0	0.6	-0.2		1959
92.5	777.0	3.4	3.5	S	BI	7.2	1.6	0.8	-0.2		569
112.0	778.0	0.0	0.1	S	PR	2.3	1.9	0.7	-0.2		1962
103.7	778.1	4.0	4.1	S	RG	2.8	2.0	0.6	-0.2		554
96.0	777.0	0.0	0.1	S	PR	2.15	1.9	0.7	-0.2		1958
112.0	778.0	0.1	0.5	S	PR	1.4	1.8	0.7	-0.2		1963
92.7	778.1	3.7	3.8	S	RG	7.9	2.1	0.4	-0.2		549
102.0	778.0	0.0	0.1	S	PR	2	1.7	0.7	-0.2		1961
96.0	776.0	0.0	0.1	S	PR	2.83	1.9	0.6	-0.2		1954
108.0	776.0	0.5	1.0	S	PR	1.59	1.8	0.7	-0.3		1957
90.5	778.1	3.7	3.8	S	RG	3.9	1.7	0.7	-0.3	Uranium tes	548
112.0	778.0	0.5	1.0	S	PR	2.16	1.8	0.6	-0.3		1964
94.9	778.1	4.2	4.7	S	BI	4.7	1.2	1.0	-0.3		599
108.0	776.0	0.1	0.5	S	PR	2.61	1.8	0.6	-0.3		1956
108.0	776.0	0.0	0.1	S	PR	1.72	1.9	0.6	-0.3		1955
111.3	776.2	1.8	2.0	S	RG	2.8	1.8	0.6	-0.3		568
102.5	777.0	4.2	4.7	S	BI	4.8	1.9	0.5	-0.3		605
98.2	776.2	3.0	3.2	S	RG	9.1	1.8	0.5	-0.3		562
99.3	778.1	4.1	4.5	S	BI	9	1.6	0.6	-0.3		601
94.9	778.1	3.8	4.2	S	BI	9.4	1.4	0.7	-0.3		598
106.0	777.0	0.0	0.1	S	PR	1.83	1.7	0.6	-0.3		1960
112.4	778.1	3.0	3.2	S	RG	2.6	1.8	0.5	-0.3		558
99.3	778.1	4.5	5.0	S	BI	6.1	1.4	0.7	-0.3		602
95.0	777.0	3.4	3.5	S	PR	3.9	1.5	0.6	-0.3		667
99.0	777.0	3.4	3.5	S	PR	11.9	1.3	0.6	-0.3		669
101.0	777.0	3.7	3.8	S	PR	7.4	1.4	0.6	-0.3		670
93.0	777.0	3.5	3.9	S	PR	6	1.5	0.5	-0.3		686
93.0	777.0	3.4	3.5	S	PR	8.6	1.4	0.5	-0.3		666
97.0	777.0	3.4	3.5	S	PR	5.4	1.0	0.6	-0.4		668
91.0	777.0	2.9	3.2	S	PR	6.1	0.9	0.6	-0.4		685
97.5	777.0	3.4	3.5	S	BI	4.9	0.4	0.4	-0.6		570

* All concentrations shown include background. FMPC is calculated net of Background Threshold.

KERR-MCGEE TECHNICAL CENTER

Decommissioning Project

Threshold Comparison Test Report - Soils

Summary of Background Data and Thresholds Used in this Analysis

Measurement Type: BK ***DCGL:*** 1.0 ***EMC:*** 3.0 ***Nuclides:*** FMPC

Matrices: S

Nuclide	*Number of Data Points*	*Average Background*	*Sigma*	*Background Threshold (Tbk)*	*DCGLw Threshold (Td)*	*EMC Threshold (Tc)*
		(pCi/g)	*(pCi/g)*	*(pCi/g)*	*(pCi/g)*	*(pCi/g)*
U	291	1.76	0.90	3.56	4.56	6.56
Th	291	2.29	0.26	2.81	3.81	5.81
Ra	291	0.64	0.11	0.86	1.86	3.86
FMPC	291	0.62	0.05			

KERR-MCGEE TECHNICAL CENTER

Decommissioning Project

Threshold Comparison Test Report - Soils

STATISTICAL TEST

Run Date: 8/8/2003 3:36:12 PM

Survey Unit Number: 01 Class 1

Selected Test: WILCOXON RANK SUM TEST

Test Status: Pass

Thresholds:

EMC 3.0 DCGL 1.0 Nuclide Tested FMPC

DATA SUMMARY

291 Background Points 21 Survey points processed

Wr = 48597 **Wc =** 46198

******** The survey unit has passed the WILCOXON RANK SUM TEST ********

KERR-MCGEE TECHNICAL CENTER

Decommissioning Project

Threshold Comparison Test Report - Soils

Run Date: Friday, August 08, 2003

Survey Unit Number: 01 Class: 1 Data Points: U Grid Type: R Spacing: 2 m.

SURVEY UNIT TABLE

Borders				Surface Area Included (sq. m)	Remarks
N	S	E			
779.0	776.0	113.0	90.0	69	
			Total Area	69	

INITIALIZATION DATA

Measurement Types Selected: RG, PR, PG, BI, CH

Date Range: All

*** Report does not include Remediated data points ***

Thresholds:

EMC: 684.0 DCGLw 228.0 Nuclides U

SURVEY UNIT TEST STATUS

Test Performed	Status		Mtx	(pCi/g)
Min/Max	Pass	Maximum Survey Value	S	43.3
Background	Fail	Minimum Background	S	0.0
DCGLw	Pass	Difference		43.3
DCGLavg	Pass			
EMC	Pass			
		Average Activity	6.5	(pCi/g)
Wilcoxon Rank Sum	Pass			
Sign Test for Paired Data:	N/A			

KERR-MCGEE TECHNICAL CENTER

Decommissioning Project

Threshold Comparison Test Report - Soils

THE FOLLOWING DATA POINTS FAILED THE EMC TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE DCGLw TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE BACKGROUND TEST:

Survey Unit 01

X (m)	Y (m)	D1 (m)	D2 (m)	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC* pCi/g	Remarks	TCN	Exc. Res.
100.4	776.7	3.0	3.2	S	PR	18.3	2.1	1.0	0.0		593	C
90.5	778.1	3.8	4.2	S	BI	43.3	1.8	0.8	0.0		607	C
90.5	778.1	4.2	4.7	S	BI	32.7	1.7	1.0	0.0		608	C
100.4	776.2	3.0	3.2	S	PR	15.6	2.2	0.9	-0.1		592	C
100.9	776.2	2.7	2.9	S	BI	17.8	2.2	0.8	-0.1		596	C
94.9	778.1	3.7	3.8	S	RG	12.2	2.5	0.6	-0.1		550	C
99.9	776.2	2.7	2.9	S	BI	7.8	2.1	0.9	-0.1		595	C
99.3	778.1	4.0	4.1	S	RG	10.4	2.6	0.5	-0.1		552	C
100.4	776.2	3.0	3.2	S	RG	16.8	2.1	0.7	-0.1		563	C
91.6	776.2	3.0	3.2	S	RG	6.6	2.2	0.6	-0.2		559	C
102.5	777.0	3.8	4.2	S	BI	3.9	2.1	0.7	-0.2		604	C
97.1	778.1	3.7	3.8	S	RG	3.8	2.1	0.7	-0.2		551	C
94.9	778.1	3.7	3.8	S	BI	17	1.9	0.6	-0.2		597	C
99.3	778.1	4.0	4.1	S	BI	12.4	2.0	0.6	-0.2		600	C
90.5	778.1	3.7	3.8	S	BI	14.8	1.9	0.6	-0.2		606	C
93.8	776.2	3.0	3.2	S	RG	5.7	2.1	0.6	-0.2		560	C
91.0	777.0	2.7	2.9	S	PR	6.6	1.9	0.7	-0.2		665	C
92.5	777.0	3.4	3.5	S	BI	7.2	1.6	0.8	-0.2		569	C
92.7	778.1	3.7	3.8	S	RG	7.9	2.1	0.4	-0.2		549	C
90.5	778.1	3.7	3.8	S	RG	3.9	1.7	0.7	-0.3	Uranium te	548	C
94.9	778.1	4.2	4.7	S	BI	4.7	1.2	1.0	-0.3		599	C
102.5	777.0	4.2	4.7	S	BI	4.8	1.9	0.5	-0.3		605	C
98.2	776.2	3.0	3.2	S	RG	9.1	1.8	0.5	-0.3		562	C
99.3	778.1	4.1	4.5	S	BI	9	1.6	0.6	-0.3		601	C

KERR-MCGEE TECHNICAL CENTER

Decommissioning Project

Threshold Comparison Test Report - Soils

X (m)	Y (m)	D1 (m)	D2 (m)	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC* pCi/g	Remarks	TCN	Exc. Res.
94.9	778.1	3.8	4.2	S	BI	9.4	1.4	0.7	-0.3		598	C
99.3	778.1	4.5	5.0	S	BI	6.1	1.4	0.7	-0.3		602	C
95.0	777.0	3.4	3.5	S	PR	3.9	1.5	0.6	-0.3		667	C
99.0	777.0	3.4	3.5	S	PR	11.9	1.3	0.6	-0.3		669	C
101.0	777.0	3.7	3.8	S	PR	7.4	1.4	0.6	-0.3		670	C
93.0	777.0	3.5	3.9	S	PR	6	1.5	0.5	-0.3		686	C
93.0	777.0	3.4	3.5	S	PR	8.6	1.4	0.5	-0.3		666	C
97.0	777.0	3.4	3.5	S	PR	5.4	1.0	0.6	-0.4		668	C
91.0	777.0	2.9	3.2	S	PR	6.1	0.9	0.6	-0.4		685	C
97.5	777.0	3.4	3.5	S	BI	4.9	0.4	0.4	-0.6		570	C

* All concentrations shown include background. FMPC is calculated net of Background Threshold.

THE FOLLOWING DATA POINTS PASSED BACKGROUND, DCGLw, AND EMC SCREENING TESTS:

Survey Unit # 01

X (m)	Y (m)	D1 (m)	D2 (m)	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC* pCi/g	Remarks	TCN	Exc. Res.
102.5	777.0	3.7	3.8	S	BI	0.8	2.3	1.1	0.0		571	
108.0	778.1	4.0	4.1	S	RG	2.8	2.5	0.7	-0.1		556	
106.9	776.2	3.0	3.2	S	RG	1.1	2.5	0.7	-0.1		566	
109.0	777.0	3.7	3.8	S	BI	1.9	2.4	0.7	-0.1		574	
110.2	778.1	4.0	4.1	S	RG	1.5	2.4	0.7	-0.1		557	
101.5	778.1	4.0	4.1	S	RG	1.5	2.2	0.7	-0.2		553	
107.5	777.0	3.7	3.8	S	BI	2.2	2.0	0.8	-0.2		572	
96.0	776.2	3.0	3.2	S	RG	1.5	2.3	0.6	-0.2		561	
104.8	776.2	3.0	3.2	S	RG	0.8	2.3	0.6	-0.2		565	
105.8	778.1	4.0	4.1	S	RG	1.9	2.2	0.6	-0.2		555	
93.0	776.0	0.0	0.1	S	PR	2.08	2.0	0.7	-0.2		1953	
102.5	777.0	3.7	3.8	S	BI	3.4	2.4	0.4	-0.2		603	
90.0	776.0	0.0	0.1	S	PR	2.83	2.0	0.7	-0.2		1950	
90.0	776.0	0.1	0.5	S	PR	3.33	1.9	0.7	-0.2		1951	
109.1	776.2	3.0	3.2	S	RG	2.4	2.1	0.6	-0.2		567	
102.6	776.2	3.0	3.2	S	RG	1.8	1.8	0.8	-0.2		564	
112.5	777.0	1.5	1.7	S	BI	1.9	1.9	0.7	-0.2		573	
90.0	776.0	0.5	1.0	S	PR	2.8	1.7	0.8	-0.2		1952	
100.0	777.0	0.0	0.1	S	PR	2.88	2.0	0.6	-0.2		1959	
112.0	778.0	0.0	0.1	S	PR	2.3	1.9	0.7	-0.2		1962	
103.7	778.1	4.0	4.1	S	RG	2.8	2.0	0.6	-0.2		554	
96.0	777.0	0.0	0.1	S	PR	2.15	1.9	0.7	-0.2		1958	
112.0	778.0	0.1	0.5	S	PR	1.4	1.8	0.7	-0.2		1963	
102.0	778.0	0.0	0.1	S	PR	2	1.7	0.7	-0.2		1961	
96.0	776.0	0.0	0.1	S	PR	2.83	1.9	0.6	-0.2		1954	
108.0	776.0	0.5	1.0	S	PR	1.59	1.8	0.7	-0.3		1957	
112.0	778.0	0.5	1.0	S	PR	2.16	1.8	0.6	-0.3		1964	
108.0	776.0	0.1	0.5	S	PR	2.61	1.8	0.6	-0.3		1956	
108.0	776.0	0.0	0.1	S	PR	1.72	1.9	0.6	-0.3		1955	
111.3	776.2	1.8	2.0	S	RG	2.8	1.8	0.6	-0.3		568	
106.0	777.0	0.0	0.1	S	PR	1.83	1.7	0.6	-0.3		1960	
112.4	778.1	3.0	3.2	S	RG	2.6	1.8	0.5	-0.3		558	

* All concentrations shown include background. FMPC is calculated net of Background Threshold.

KERR-MCGEE TECHNICAL CENTER

Decommissioning Project

Threshold Comparison Test Report - Soils

Summary of Background Data and Thresholds Used in this Analysis

Measurement Type: BK ***DCGL:*** 228.0 ***EMC:*** 684.0 ***Nuclides:*** U

Matrices: S

Nuclide	*Number of Data Points*	*Average Background*	*Sigma*	*Background Threshold (Tbk)*	*DCGLw Threshold (Td)*	*EMC Threshold (Tc)*
		(pCi/g)	*(pCi/g)*	*(pCi/g)*	*(pCi/g)*	*(pCi/g)*
U	291	1.76	0.90	3.56	231.56	687.56
Th	291	2.29	0.26	2.81	230.81	686.81
Ra	291	0.64	0.11	0.86	228.86	684.86
FMPC	291	0.62	0.05			

KERR-MCGEE TECHNICAL CENTER

Decommissioning Project

Threshold Comparison Test Report - Soils

STATISTICAL TEST

Run Date: 8/8/2003 3:39:04 PM

Survey Unit Number: 01 Class 1

Selected Test: WILCOXON RANK SUM TEST

Test Status: Pass

Thresholds:

EMC 684.0 DCGL 228.0 Nuclide Tested: U

DATA SUMMARY

291 Background Points 21 Survey points processed

Wr = 48597 **Wc =** 46198

******** The survey unit has passed the WILCOXON RANK SUM TEST ********

KERR-MCGEE TECHNICAL CENTER

Decommissioning Project

Threshold Comparison Test Report - Soils

Run Date: Friday, August 08, 2003

Survey Unit Number: 01 Class: 1 Data Points: Th Grid Type: R Spacing: 2 m.

SURVEY UNIT TABLE

Borders				Surface Area Included (sq. m)	Remarks
N	S	E			
779.0	776.0	113.0	90.0	69	
			Total Area	69	

INITIALIZATION DATA

Measurement Types Selected: RG, PR, PG, BI, CH

Date Range: All

*** Report does not include Remediated data points ***

Thresholds:

EMC: 15.9 DCGLw 5.3 Nuclides Th

SURVEY UNIT TEST STATUS

Test Performed	Status		Mtx	(pCi/g)
Min/Max	Pass	Maximum Survey Value	S	2.6
Background	Pass	Minimum Background	S	1.1
DCGLw	Pass	Difference		1.5
DCGLavg	Pass			
EMC	Pass			
		Average Activity	1.9	(pCi/g)
Wilcoxon Rank Sum	Pass			
Sign Test for Paired Data:	N/A			

KERR-MCGEE TECHNICAL CENTER

Decommissioning Project

Threshold Comparison Test Report - Soils

THE FOLLOWING DATA POINTS FAILED THE EMC TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE DCGLw TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE BACKGROUND TEST:

NONE

THE FOLLOWING DATA POINTS PASSED BACKGROUND, DCGLw, AND EMC SCREENING TESTS:

Survey Unit 01

X (m)	Y (m)	D1 (m)	D2 (m)	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC* pCi/g	Remarks	TCN Exc. Res.
100.4	776.7	3.0	3.2	S	PR	18.3	2.1	1.0	0.0		593
90.5	778.1	3.8	4.2	S	BI	43.3	1.8	0.8	0.0		607
102.5	777.0	3.7	3.8	S	BI	0.8	2.3	1.1	0.0		571
90.5	778.1	4.2	4.7	S	BI	32.7	1.7	1.0	0.0		608
100.4	776.2	3.0	3.2	S	PR	15.6	2.2	0.9	-0.1		592
100.9	776.2	2.7	2.9	S	BI	17.8	2.2	0.8	-0.1		596
94.9	778.1	3.7	3.8	S	RG	12.2	2.5	0.6	-0.1		550
99.9	776.2	2.7	2.9	S	BI	7.8	2.1	0.9	-0.1		595
108.0	778.1	4.0	4.1	S	RG	2.8	2.5	0.7	-0.1		556
99.3	778.1	4.0	4.1	S	RG	10.4	2.6	0.5	-0.1		552
106.9	776.2	3.0	3.2	S	RG	1.1	2.5	0.7	-0.1		566
100.4	776.2	3.0	3.2	S	RG	16.8	2.1	0.7	-0.1		563
109.0	777.0	3.7	3.8	S	BI	1.9	2.4	0.7	-0.1		574
110.2	778.1	4.0	4.1	S	RG	1.5	2.4	0.7	-0.1		557
101.5	778.1	4.0	4.1	S	RG	1.5	2.2	0.7	-0.2		553
107.5	777.0	3.7	3.8	S	BI	2.2	2.0	0.8	-0.2		572

KERR-MCGEE TECHNICAL CENTER

Decommissioning Project

Threshold Comparison Test Report - Soils

X (m)	Y (m)	D1 (m)	D2 (m)	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC* pCi/g	Remarks	TCN	Exc. Res.
91.6	776.2	3.0	3.2	S	RG	6.6	2.2	0.6	-0.2		559	
102.5	777.0	3.8	4.2	S	BI	3.9	2.1	0.7	-0.2		604	
97.1	778.1	3.7	3.8	S	RG	3.8	2.1	0.7	-0.2		551	
96.0	776.2	3.0	3.2	S	RG	1.5	2.3	0.6	-0.2		561	
104.8	776.2	3.0	3.2	S	RG	0.8	2.3	0.6	-0.2		565	
94.9	778.1	3.7	3.8	S	BI	17	1.9	0.6	-0.2		597	
99.3	778.1	4.0	4.1	S	BI	12.4	2.0	0.6	-0.2		600	
105.8	778.1	4.0	4.1	S	RG	1.9	2.2	0.6	-0.2		555	
90.5	778.1	3.7	3.8	S	BI	14.8	1.9	0.6	-0.2		606	
93.8	776.2	3.0	3.2	S	RG	5.7	2.1	0.6	-0.2		560	
93.0	776.0	0.0	0.1	S	PR	2.08	2.0	0.7	-0.2		1953	
91.0	777.0	2.7	2.9	S	PR	6.6	1.9	0.7	-0.2		665	
102.5	777.0	3.7	3.8	S	BI	3.4	2.4	0.4	-0.2		603	
90.0	776.0	0.0	0.1	S	PR	2.83	2.0	0.7	-0.2		1950	
90.0	776.0	0.1	0.5	S	PR	3.33	1.9	0.7	-0.2		1951	
109.1	776.2	3.0	3.2	S	RG	2.4	2.1	0.6	-0.2		567	
102.6	776.2	3.0	3.2	S	RG	1.8	1.8	0.8	-0.2		564	
112.5	777.0	1.5	1.7	S	BI	1.9	1.9	0.7	-0.2		573	
90.0	776.0	0.5	1.0	S	PR	2.8	1.7	0.8	-0.2		1952	
100.0	777.0	0.0	0.1	S	PR	2.88	2.0	0.6	-0.2		1959	
92.5	777.0	3.4	3.5	S	BI	7.2	1.6	0.8	-0.2		569	
112.0	778.0	0.0	0.1	S	PR	2.3	1.9	0.7	-0.2		1962	
103.7	778.1	4.0	4.1	S	RG	2.8	2.0	0.6	-0.2		554	
96.0	777.0	0.0	0.1	S	PR	2.15	1.9	0.7	-0.2		1958	
112.0	778.0	0.1	0.5	S	PR	1.4	1.8	0.7	-0.2		1963	
92.7	778.1	3.7	3.8	S	RG	7.9	2.1	0.4	-0.2		549	
102.0	778.0	0.0	0.1	S	PR	2	1.7	0.7	-0.2		1961	
96.0	776.0	0.0	0.1	S	PR	2.83	1.9	0.6	-0.2		1954	
108.0	776.0	0.5	1.0	S	PR	1.59	1.8	0.7	-0.3		1957	
90.5	778.1	3.7	3.8	S	RG	3.9	1.7	0.7	-0.3	Uranium tes	548	
112.0	778.0	0.5	1.0	S	PR	2.16	1.8	0.6	-0.3		1964	
94.9	778.1	4.2	4.7	S	BI	4.7	1.2	1.0	-0.3		599	
108.0	776.0	0.1	0.5	S	PR	2.61	1.8	0.6	-0.3		1956	
108.0	776.0	0.0	0.1	S	PR	1.72	1.9	0.6	-0.3		1955	
111.3	776.2	1.8	2.0	S	RG	2.8	1.8	0.6	-0.3		568	
102.5	777.0	4.2	4.7	S	BI	4.8	1.9	0.5	-0.3		605	
98.2	776.2	3.0	3.2	S	RG	9.1	1.8	0.5	-0.3		562	
99.3	778.1	4.1	4.5	S	BI	9	1.6	0.6	-0.3		601	
94.9	778.1	3.8	4.2	S	BI	9.4	1.4	0.7	-0.3		598	
106.0	777.0	0.0	0.1	S	PR	1.83	1.7	0.6	-0.3		1960	
112.4	778.1	3.0	3.2	S	RG	2.6	1.8	0.5	-0.3		558	
99.3	778.1	4.5	5.0	S	BI	6.1	1.4	0.7	-0.3		602	
95.0	777.0	3.4	3.5	S	PR	3.9	1.5	0.6	-0.3		667	
99.0	777.0	3.4	3.5	S	PR	11.9	1.3	0.6	-0.3		669	
101.0	777.0	3.7	3.8	S	PR	7.4	1.4	0.6	-0.3		670	
93.0	777.0	3.5	3.9	S	PR	6	1.5	0.5	-0.3		686	
93.0	777.0	3.4	3.5	S	PR	8.6	1.4	0.5	-0.3		666	
97.0	777.0	3.4	3.5	S	PR	5.4	1.0	0.6	-0.4		668	
91.0	777.0	2.9	3.2	S	PR	6.1	0.9	0.6	-0.4		685	
97.5	777.0	3.4	3.5	S	BI	4.9	0.4	0.4	-0.6		570	

* All concentrations shown include background. FMPC is calculated net of Background Threshold.

KERR-MCGEE TECHNICAL CENTER

Decommissioning Project

Threshold Comparison Test Report - Soils

Summary of Background Data and Thresholds Used in this Analysis

Measurement Type: BK *DCGL:* 5.3 *EMC:* 15.9 *Nuclides:* Th

Matrices: S

Nuclide	*Number of Data Points*	*Average Background* (pCi/g)	*Sigma* (pCi/g)	*Background Threshold (Tbk)* (pCi/g)	*DCGLw Threshold (Td)* (pCi/g)	*EMC Threshold (Tc)* (pCi/g)
U	291	1.76	0.90	3.56	8.86	19.46
Th	291	2.29	0.26	2.81	8.11	18.71
Ra	291	0.64	0.11	0.86	6.16	16.76
FMPC	291	0.62	0.05			

KERR-MCGEE TECHNICAL CENTER

Decommissioning Project

Threshold Comparison Test Report - Soils

STATISTICAL TEST

Run Date: 8/8/2003 3:39:56 PM

Survey Unit Number: 01 Class 1

Selected Test: WILCOXON RANK SUM TEST

Test Status: Pass

Thresholds:

EMC 15.9 DCGL 5.3 Nuclide Th

DATA SUMMARY

291 Background Points 21 Survey points processed

Wr = 48597 **Wc =** 46198

******** The survey unit has passed the WILCOXON RANK SUM TEST ********

KERR-MCGEE TECHNICAL CENTER

Decommissioning Project

Threshold Comparison Test Report - Soils

Run Date: Friday, August 08, 2003

Survey Unit Number: 01 Class: 1 Data Points: RA Grid Type: R Spacing: 2 m.

SURVEY UNIT TABLE

Borders				Surface Area Included (sq. m)	Remarks
N	S	E			
779.	776.	113.	90.0	69	
			Total Area	69	

INITIALIZATION DATA

Measurement Types Selected: RG, PR, PG, BI, CH

Date Range: All

*** Report does not include Remediated data points ***

Thresholds:

EMC: 10.5 DCGLw 3.5 Nuclides Ra

SURVEY UNIT TEST STATUS

Test Performed	Status		Mtx	(pCi/g)
Min/Max	Pass	Maximum Survey Value	S	1.1
Background	Fail	Minimum Background	S	0.3
DCGLw	Pass	Difference		0.8
DCGLavg	Pass			
EMC	Pass			
		Average Activity	0.7	(pCi/g)
Wilcoxon Rank Sum	Pass			
Sign Test for Paired Data:	N/A			

KERR-MCGEE TECHNICAL CENTER

Decommissioning Project

Threshold Comparison Test Report - Soils

THE FOLLOWING DATA POINTS FAILED THE EMC TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE DCGLw TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE BACKGROUND TEST:

Survey Unit 01

X (m)	Y (m)	D1 (m)	D2 (m)	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC* pCi/g	Remarks	TCN	Exc.	Res.
100.4	776.7	3.0	3.2	S	PR	18.3	2.1	1.0	0.0		593	C	
102.5	777.0	3.7	3.8	S	BI	0.8	2.3	1.1	0.0		571	C	
90.5	778.1	4.2	4.7	S	BI	32.7	1.7	1.0	0.0		608	C	
100.4	776.2	3.0	3.2	S	PR	15.6	2.2	0.9	-0.1		592	C	
99.9	776.2	2.7	2.9	S	BI	7.8	2.1	0.9	-0.1		595	C	
94.9	778.1	4.2	4.7	S	BI	4.7	1.2	1.0	-0.3		599	C	

* All concentrations shown include background. FMPC is calculated net of Background Threshold.

THE FOLLOWING DATA POINTS PASSED BACKGROUND, DCGLw, AND EMC SCREENING TESTS:

Survey Unit 01

X (m)	Y (m)	D1 (m)	D2 (m)	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC* pCi/g	Remarks	TCN	Exc.	Res.
90.5	778.1	3.8	4.2	S	BI	43.3	1.8	0.8	0.0		607		
100.9	776.2	2.7	2.9	S	BI	17.8	2.2	0.8	-0.1		596		
94.9	778.1	3.7	3.8	S	RG	12.2	2.5	0.6	-0.1		550		
108.0	778.1	4.0	4.1	S	RG	2.8	2.5	0.7	-0.1		556		
99.3	778.1	4.0	4.1	S	RG	10.4	2.6	0.5	-0.1		552		
106.9	776.2	3.0	3.2	S	RG	1.1	2.5	0.7	-0.1		566		
100.4	776.2	3.0	3.2	S	RG	16.8	2.1	0.7	-0.1		563		

KERR-MCGEE TECHNICAL CENTER

Decommissioning Project

Threshold Comparison Test Report - Soils

109.0	777.0	3.7	3.8	S	BI	1.9	2.4	0.7	-0.1		574
110.2	778.1	4.0	4.1	S	RG	1.5	2.4	0.7	-0.1		557
101.5	778.1	4.0	4.1	S	RG	1.5	2.2	0.7	-0.2		553
107.5	777.0	3.7	3.8	S	BI	2.2	2.0	0.8	-0.2		572
91.6	776.2	3.0	3.2	S	RG	6.6	2.2	0.6	-0.2		559
102.5	777.0	3.8	4.2	S	BI	3.9	2.1	0.7	-0.2		604
97.1	778.1	3.7	3.8	S	RG	3.8	2.1	0.7	-0.2		551
96.0	776.2	3.0	3.2	S	RG	1.5	2.3	0.6	-0.2		561
104.8	776.2	3.0	3.2	S	RG	0.8	2.3	0.6	-0.2		565
94.9	778.1	3.7	3.8	S	BI	17	1.9	0.6	-0.2		597
99.3	778.1	4.0	4.1	S	BI	12.4	2.0	0.6	-0.2		600
105.8	778.1	4.0	4.1	S	RG	1.9	2.2	0.6	-0.2		555
90.5	778.1	3.7	3.8	S	BI	14.8	1.9	0.6	-0.2		606
93.8	776.2	3.0	3.2	S	RG	5.7	2.1	0.6	-0.2		560
93.0	776.0	0.0	0.1	S	PR	2.08	2.0	0.7	-0.2		1953
91.0	777.0	2.7	2.9	S	PR	6.6	1.9	0.7	-0.2		665
102.5	777.0	3.7	3.8	S	BI	3.4	2.4	0.4	-0.2		603
90.0	776.0	0.0	0.1	S	PR	2.83	2.0	0.7	-0.2		1950
90.0	776.0	0.1	0.5	S	PR	3.33	1.9	0.7	-0.2		1951
109.1	776.2	3.0	3.2	S	RG	2.4	2.1	0.6	-0.2		567
102.6	776.2	3.0	3.2	S	RG	1.8	1.8	0.8	-0.2		564
112.5	777.0	1.5	1.7	S	BI	1.9	1.9	0.7	-0.2		573
90.0	776.0	0.5	1.0	S	PR	2.8	1.7	0.8	-0.2		1952
100.0	777.0	0.0	0.1	S	PR	2.88	2.0	0.6	-0.2		1959
92.5	777.0	3.4	3.5	S	BI	7.2	1.6	0.8	-0.2		569
112.0	778.0	0.0	0.1	S	PR	2.3	1.9	0.7	-0.2		1962
103.7	778.1	4.0	4.1	S	RG	2.8	2.0	0.6	-0.2		554
96.0	777.0	0.0	0.1	S	PR	2.15	1.9	0.7	-0.2		1958
112.0	778.0	0.1	0.5	S	PR	1.4	1.8	0.7	-0.2		1963
92.7	778.1	3.7	3.8	S	RG	7.9	2.1	0.4	-0.2		549
102.0	778.0	0.0	0.1	S	PR	2	1.7	0.7	-0.2		1961
96.0	776.0	0.0	0.1	S	PR	2.83	1.9	0.6	-0.2		1954
108.0	776.0	0.5	1.0	S	PR	1.59	1.8	0.7	-0.3		1957
90.5	778.1	3.7	3.8	S	RG	3.9	1.7	0.7	-0.3	Uranium tes	548
112.0	778.0	0.5	1.0	S	PR	2.16	1.8	0.6	-0.3		1964
108.0	776.0	0.1	0.5	S	PR	2.61	1.8	0.6	-0.3		1956
108.0	776.0	0.0	0.1	S	PR	1.72	1.9	0.6	-0.3		1955
111.3	776.2	1.8	2.0	S	RG	2.8	1.8	0.6	-0.3		568
102.5	777.0	4.2	4.7	S	BI	4.8	1.9	0.5	-0.3		605
98.2	776.2	3.0	3.2	S	RG	9.1	1.8	0.5	-0.3		562
99.3	778.1	4.1	4.5	S	BI	9	1.6	0.6	-0.3		601
94.9	778.1	3.8	4.2	S	BI	9.4	1.4	0.7	-0.3		598
106.0	777.0	0.0	0.1	S	PR	1.83	1.7	0.6	-0.3		1960
112.4	778.1	3.0	3.2	S	RG	2.6	1.8	0.5	-0.3		558
99.3	778.1	4.5	5.0	S	BI	6.1	1.4	0.7	-0.3		602
95.0	777.0	3.4	3.5	S	PR	3.9	1.5	0.6	-0.3		667
99.0	777.0	3.4	3.5	S	PR	11.9	1.3	0.6	-0.3		669
101.0	777.0	3.7	3.8	S	PR	7.4	1.4	0.6	-0.3		670
93.0	777.0	3.5	3.9	S	PR	6	1.5	0.5	-0.3		686
93.0	777.0	3.4	3.5	S	PR	8.6	1.4	0.5	-0.3		666
97.0	777.0	3.4	3.5	S	PR	5.4	1.0	0.6	-0.4		668
91.0	777.0	2.9	3.2	S	PR	6.1	0.9	0.6	-0.4		685
97.5	777.0	3.4	3.5	S	BI	4.9	0.4	0.4	-0.6		570

* All concentrations shown include background. FMPC is calculated net of Background Threshold.

KERR-MCGEE TECHNICAL CENTER

Decommissioning Project

Threshold Comparison Test Report - Soils

Summary of Background Data and Thresholds Used in this Analysis

Measurement Type: BK *DCGL:* 3.5 *EMC:* 10.5 *Nuclides:* Ra

Matrices: S

Nuclide	*Number of Data Points*	*Average Background*	*Sigma*	*Background Threshold (Tbk)*	*DCGLw Threshold (Td)*	*EMC Threshold (Tc)*
		(pCi/g)	*(pCi/g)*	*(pCi/g)*	*(pCi/g)*	*(pCi/g)*
U	291	1.76	0.90	3.56	7.06	14.06
Th	291	2.29	0.26	2.81	6.31	13.31
Ra	291	0.64	0.11	0.86	4.36	11.36
FMPC	291	0.62	0.05			

KERR-MCGEE TECHNICAL CENTER

Decommissioning Project

Threshold Comparison Test Report - Soils

STATISTICAL TEST

Run Date: 8/8/2003 3:40:45 PM

Survey Unit Number: 01 Class: 1

Selected Test: WILCOXON RANK SUM TEST

Test Status: Pass

Thresholds:

EMC 10.5 DCGL 3.5 Nuclide Ra

DATA SUMMARY

291 Background Points 21 Survey points processed

Wr = 48597 **Wc =** 46198

****** The survey unit has passed the WILCOXON RANK SUM TEST ******

KERR-MCGEE TECHNICAL CENTER
DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

Run Date Monday, June 30, 2003

Survey Unit 02 Class: 1 Data Points FMPC Grid Type R Spacing 8 m.

SURVEY UNIT TABLE

Borders				Surface Area Included	
N	S	E	W	(sq. m)	Remarks
800.	776.	90.0	60.1	718	
800.	779.	113.	90.0	483	
800.	776.	140.	113.	648	
		Total		1849	

INITIALIZATION DATA

Measurement Types Selected: RG, PR, PG, BI, CH
Date Range: All
*** Report does not include Remediated data points ***

Thresholds:
EMC: 3.0 DCGLw 1.0 Nuclides FMPC

SURVEY UNIT TEST STATUS

Test Performed	Status		Mtx	FMPC
Min/Max	Pass	Maximum Survey Value	S	0.8
Background	Fail	Minimum Background	S	0.3
DCGLw	Pass	Difference		0.5
DCGLavg	Pass			
EMC	Pass	Average Activity	-0.1	FMPC
Wilcoxon Rank Sum	Pass			
Sign Test for Paired Data:	N/A			

KERR-MCGEE TECHNICAL CENTER
DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

THE FOLLOWING DATA POINTS FAILED THE EMC TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE DCGLw TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE BACKGROUND TEST:

Survey Unit 02

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
88.0	779.0	2.7	2.9	S	BI	2.4	2.2	1.4	0.0		577	C	

* All concentrations shown include background. FMPC is calculated net of Background Threshold.

THE FOLLOWING DATA POINTS PASSED BACKGROUND, DCGLw, AND EMC SCREENING TESTS:

Survey Unit 02

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
100.0	798.0	0.0	0.1	S	CH	1.7	2.9	0.8	0.0		500		
111.0	779.0	0.0	0.1	S	CH	2.2	2.6	0.8	-0.1		330		
102.0	783.0	2.1	2.3	S	BI	2.4	2.4	0.9	-0.1		578		
111.0	779.0	0.1	1.0	S	CH	0.4	2.7	0.7	-0.1		331		
89.0	779.0	3.4	3.5	S	PR	13.6	2.2	0.8	-0.1		657		
107.0	780.0	3.4	3.5	S	BI	0.7	2.6	0.7	-0.1		575		
61.0	780.0	0.1	0.5	S	BI	2.1	2.3	0.9	-0.1		1893		
129.0	780.0	0.0	0.1	S	RG	3.76	2.2	0.9	-0.1		1905		
93.0	779.0	4.1	4.5	S	PR	5.2	2.6	0.6	-0.1		680		
87.0	778.0	1.8	2.0	S	BI	0.9	2.5	0.7	-0.1		576		
66.0	785.0	0.1	0.5	S	PR	3.17	2.2	0.9	-0.1		2367		
61.0	780.0	0.5	1.0	S	BI	1.86	2.3	0.8	-0.1		1894		

KERR-MCGEE TECHNICAL CENTER
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Threshold Comparison Test Report - Soils

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
66.0	786.0	0.1	0.5	S	PR	3	2.1	0.9	-0.1		2368		
67.0	785.0	0.1	0.5	S	PR	2.37	2.1	0.8	-0.1		2374		
93.0	781.0	3.5	3.9	S	PR	0.1	2.4	0.7	-0.1		674		
86.0	778.0	2.0	2.1	S	BI	6	2.1	0.8	-0.1	sidewall	711		
136.0	780.0	0.0	0.1	S	RG	3.44	2.0	0.9	-0.1		1906		
66.0	784.0	0.0	0.1	S	PR	2.84	2.1	0.8	-0.1		2370		
99.0	779.0	4.1	4.5	S	PR	0.2	2.5	0.6	-0.1		683		
93.0	781.0	3.4	3.5	S	PR	3	2.1	0.8	-0.2		652		
89.0	777.0	1.5	1.7	S	PR	15.4	1.8	0.8	-0.2		664		
97.0	779.0	3.8	4.2	S	PR	0.2	2.0	0.9	-0.2		682		
111.0	779.0	1.0	2.0	S	CH	1.4	2.1	0.8	-0.2		332		
121.0	780.0	0.0	0.1	S	RG	3.2	2.1	0.8	-0.2		1904		
66.0	786.0	0.0	0.1	S	PR	2.4	2.1	0.8	-0.2		2369		
97.0	779.0	3.7	3.8	S	PR	2.9	2.2	0.7	-0.2		661		
97.0	781.0	3.9	4.3	S	PR	1.7	2.2	0.7	-0.2		692		
88.0	789.0	2.0	3.0	S	CH	1.4	2.5	0.5	-0.2		297		
66.0	785.0	0.0	0.1	S	PR	2.53	2.1	0.8	-0.2		2366		
88.0	789.0	0.1	1.0	S	CH	3.2	2.3	0.6	-0.2		295		
65.0	785.0	0.1	0.5	S	PR	2.23	2.1	0.8	-0.2		2372		
76.0	795.0	0.5	1.0	S	BI	2.7	2.1	0.7	-0.2		1870		
67.0	785.0	0.0	0.1	S	PR	2.62	1.9	0.8	-0.2		2375		
111.0	779.0	2.0	3.0	S	CH	1.1	2.3	0.6	-0.2		333		
86.0	781.0	1.4	1.5	S	BI	2.9	2.1	0.7	-0.2	sidewall	712		
88.0	789.0	1.0	2.0	S	CH	0.5	2.3	0.6	-0.2		296		
95.0	781.0	3.5	3.9	S	PR	0.3	2.3	0.6	-0.2		675		
95.0	779.0	4.1	4.5	S	PR	2	2.1	0.7	-0.2		681		
95.0	779.0	4.0	4.1	S	PR	4.2	2.2	0.6	-0.2		660		
89.0	781.0	3.2	3.5	S	PR	2.7	2.2	0.6	-0.2		672		
86.0	781.0	2.0	2.1	S	BI	3.5	2.3	0.5	-0.2	sidewall	713		
99.0	781.0	3.4	3.5	S	PR	1.4	2.0	0.7	-0.2		655		
106.0	788.0	0.5	1.0	S	BI	2.9	1.9	0.7	-0.2		1887		
93.0	779.0	4.0	4.1	S	PR	11.3	1.6	0.8	-0.2		659		
76.0	795.0	0.1	0.5	S	BI	2.2	2.0	0.7	-0.2		1869		
114.0	795.0	0.0	0.1	S	RG	2.24	1.8	0.8	-0.2		1875		
91.0	780.0	0.0	0.1	S	PG	2.74	2.0	0.7	-0.2		1898		
97.0	781.0	3.5	3.9	S	PR	2.1	2.1	0.6	-0.2		676		
106.0	780.0	0.0	0.1	S	PG	2.3	1.9	0.7	-0.2		1902		
99.0	795.0	0.0	0.1	S	RG	2.66	1.9	0.7	-0.2		1873		
91.0	780.0	0.1	0.5	S	PR	2.66	1.9	0.7	-0.2		1899		
87.0	781.0	2.4	2.6	S	BI	2.5	2.2	0.5	-0.2		649		
69.0	788.0	0.0	0.1	S	RG	2.71	1.8	0.8	-0.2		1880		
96.0	785.0	0.0	0.1	S	PR	2.42	2.0	0.7	-0.2		2382		
106.0	795.0	0.0	0.1	S	RG	2.27	2.0	0.6	-0.2		1874		
95.0	781.0	3.4	3.5	S	PR	1.7	2.2	0.5	-0.2		653		
84.0	780.0	0.0	0.1	S	PG	2.66	1.8	0.8	-0.2		1897		
91.0	780.0	0.5	1.0	S	PR	2.82	1.9	0.7	-0.2		1900		
99.0	780.0	0.0	0.1	S	PG	2.29	1.8	0.8	-0.2		1901		
99.0	779.0	4.0	4.1	S	PR	2.8	1.7	0.8	-0.2		662		
97.0	786.0	0.0	0.1	S	PR	2.06	1.8	0.7	-0.2		2378		
97.0	785.0	0.1	0.5	S	PR	1.9	1.9	0.7	-0.2		2376		
86.0	778.0	1.4	1.5	S	BI	5.2	1.9	0.6	-0.2	sidewall	710		
91.0	781.0	3.5	3.9	S	PR	3.1	2.1	0.5	-0.2		673		
99.0	781.0	3.9	4.3	S	PR	0.7	2.0	0.6	-0.2		693		
99.0	784.0	0.0	0.1	S	PR	2.12	1.9	0.6	-0.2		2388		
100.0	785.0	0.1	0.5	S	PR	3.02	1.8	0.7	-0.2		2391		

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Threshold Comparison Test Report - Soils

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
97.0	781.0	3.4	3.5	S	PR	4	1.9	0.6	-0.2		654		
97.0	784.0	0.0	0.1	S	PR	2.49	1.8	0.7	-0.2		2380		
114.0	780.0	0.0	0.1	S	PG	1.83	1.9	0.7	-0.2		1903		
100.0	785.0	0.0	0.1	S	PR	2.06	1.8	0.7	-0.3		2390		
69.0	780.0	0.0	0.1	S	RG	2.68	1.7	0.7	-0.3		1895		
96.0	785.0	0.1	0.5	S	PR	2.09	1.9	0.6	-0.3		2383		
61.0	795.0	0.0	0.1	S	RG	2.63	1.8	0.7	-0.3		1866		
99.0	786.0	0.0	0.1	S	PR	2.58	1.7	0.8	-0.3		2386		
65.0	785.0	0.0	0.1	S	PR	2.59	1.7	0.7	-0.3		2373		
97.0	784.0	0.1	0.5	S	PR	2.2	1.9	0.6	-0.3		2381		
99.0	784.0	0.1	0.5	S	PR	1.99	1.8	0.7	-0.3		2389		
99.0	781.0	3.5	3.9	S	PR	2.7	1.7	0.7	-0.3		677		
99.0	785.0	0.0	0.1	S	PR	2.25	1.8	0.6	-0.3		2384		
121.0	795.0	0.0	0.1	S	RG	1.71	1.9	0.6	-0.3		1876		
89.0	781.0	3.5	4.0	S	PR	1.4	1.7	0.7	-0.3		688		
84.0	795.0	0.0	0.1	S	RG	2.35	1.7	0.7	-0.3		1871		
87.0	779.0	2.4	2.6	S	PR	0.7	2.0	0.5	-0.3		656		
95.0	781.0	3.9	4.3	S	PR	2.2	1.8	0.6	-0.3		691		
66.0	784.0	0.1	0.5	S	PR	2.88	1.6	0.8	-0.3		2371		
129.0	795.0	0.0	0.1	S	RG	1.97	1.6	0.7	-0.3		1877		
89.0	781.0	3.0	3.2	S	BI	1.7	1.8	0.6	-0.3		650		
93.0	779.0	4.5	5.0	S	PR	3.6	1.6	0.7	-0.3		694		
99.0	785.0	0.1	0.5	S	PR	2.04	1.7	0.6	-0.3		2385		
106.0	788.0	0.1	0.5	S	BI	1.81	1.8	0.6	-0.3		1886		
99.0	786.0	0.1	0.5	S	PR	1.92	1.6	0.7	-0.3		2387		
99.0	779.0	4.5	5.0	S	PR	3.5	1.7	0.6	-0.3		697		
97.0	785.0	0.0	0.1	S	PR	2.66	1.6	0.7	-0.3		2377		
87.0	781.0	2.9	3.4	S	PR	2.8	1.7	0.6	-0.3		687		
136.0	795.0	0.0	0.1	S	RG	2.28	1.6	0.7	-0.3		1878		
91.0	795.0	0.0	0.1	S	RG	2.36	1.6	0.7	-0.3		1872		
76.0	788.0	0.0	0.1	S	RG	2.05	1.7	0.6	-0.3		1881		
76.0	780.0	0.0	0.1	S	RG	2.01	1.5	0.7	-0.3		1896		
87.0	777.0	1.1	1.4	S	PR	11.8	1.4	0.6	-0.3		684		
69.0	795.0	0.0	0.1	S	RG	2.41	1.7	0.6	-0.3		1867		
88.0	789.0	0.0	0.1	S	CH	3	1.6	0.6	-0.3		294		
97.0	786.0	0.1	0.5	S	PR	2.23	1.6	0.6	-0.3		2379		
61.0	780.0	0.0	0.1	S	RG	2.34	1.5	0.7	-0.3		1892		
114.0	788.0	0.0	0.1	S	RG	1.64	1.6	0.6	-0.3		1888		
91.0	779.0	4.0	4.1	S	PR	8.1	1.6	0.5	-0.3		658		
91.0	781.0	3.9	4.3	S	PR	1	1.6	0.6	-0.3		689		
91.0	781.0	3.4	3.5	S	PR	3.2	1.7	0.5	-0.3		651		
87.0	777.0	0.9	1.1	S	PR	16	1.2	0.6	-0.3		663		
95.0	779.0	4.5	5.0	S	PR	2.6	1.2	0.8	-0.3		695		
76.0	795.0	0.0	0.1	S	RG	1.58	1.5	0.6	-0.3		1868		
87.0	781.0	2.6	2.9	S	PR	3.2	1.6	0.5	-0.3		671		
97.0	779.0	4.2	4.7	S	PR	4.7	1.5	0.5	-0.3		696		
87.0	779.0	2.6	2.9	S	PR	1	1.2	0.7	-0.4		678		
93.0	781.0	3.9	4.3	S	PR	3.2	1.3	0.6	-0.4		690		
129.0	788.0	0.0	0.1	S	RG	1.4	1.4	0.5	-0.4		1890		
136.0	788.0	0.0	0.1	S	RG	1.55	1.4	0.5	-0.4		1891		
61.0	788.0	0.0	0.1	S	RG	1.57	1.3	0.6	-0.4		1879		
91.0	779.0	4.1	4.5	S	PR	4.1	1.1	0.5	-0.4		679		
106.0	788.0	0.0	0.1	S	RG	0.95	1.1	0.5	-0.4		1885		
99.0	788.0	0.0	0.1	S	RG	1.54	0.8	0.5	-0.5		1884		
121.0	788.0	0.0	0.1	S	RG	1.01	0.7	0.4	-0.5		1889		
84.0	788.0	0.0	0.1	S	RG	0.8	0.4	0.3	-0.6		1882		
91.0	788.0	0.0	0.1	S	RG	0.65	0.3	0.4	-0.6		1883		

* All concentrations shown include background. FMPC is calculated net of Background Threshold.

KERR-MCGEE TECHNICAL CENTER

DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

Summary of Background Data and Thresholds Used in this Analysis

Measurement BK *DCGL:* 1.0 *EMC:* 3.0 *Nuclides* FMPC

Matrices S

Nuclide	*Number of Data Points*	*Average Background*	*Sigma*	*Background Threshold (Tbk)*	*DCGLw Threshold (Td)*	*EMC Threshold (Tc)*
		(pCi/g)	*(pCi/g)*	*(pCi/g)*	*(pCi/g)*	*(pCi/g)*
U	291	1.76	0.90	3.56	4.56	6.56
Th	291	2.29	0.26	2.81	3.81	5.81
Ra	291	0.64	0.11	0.86	1.86	3.86
FMPC	291	0.62	0.05			

KERR-MCGEE TECHNICAL CENTER

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Threshold Comparison Test Report - Soils

STATISTICAL TEST

Run Date: 6/30/2003 9:59:55

Survey Unit : 02 Class 1

Selected Test: WILCOXON RANK SUM TEST

Test Result: Pass

Thresholds:

EMC 3.0 DCGL 1.0 Nuclide FMPC

DATA SUMMARY

291 Background Points 33 Survey points processed

Wr = 52089 **Wc =** 48126

******** The survey unit has passed the WILCOXON RANK SUM TEST ********

KERR-MCGEE TECHNICAL CENTER

DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

Run Date: Monday, June 30, 2003

Survey Unit : 03 Class: 1 Data Points: U Grid Type: R Spacing: 7 m.

SURVEY UNIT TABLE

Borders				*Surface Area Included*	
N	S	E	W	*(sq. m)*	*Remarks*
776.	755.	140.	60.1	1678	
		Total		1678	

INITIALIZATION DATA

Measurement Types Selected: RG, PR, PG, BI, CH
Date Range: All
*** Report does not include Remediated data points ***

Thresholds:
EMC: 684.0 DCGLw 228.0 Nuclides U

SURVEY UNIT TEST STATUS

Test Performed	Status		Mtx	(pCi/g)
Min/Max	Pass	Maximum Survey Value	S	9.5
Background	Fail	Minimum Background	S	0.0
DCGLw	Pass	Difference		9.5
DCGLavg	Pass			
EMC	Pass	Average Activity	2.7	(pCi/g)
Wilcoxon Rank Sum	Pass			
Sign Test for Paired Data:	N/A			

KERR-MCGEE TECHNICAL CENTER

DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

THE FOLLOWING DATA POINTS FAILED THE EMC TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE DCGLw TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE BACKGROUND TEST:

Survey Unit 03

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
100.4	775.8	2.7	2.9	S	BI	9.5	2.5	0.8	0.0		594	C	
97.0	756.0	0.0	0.1	S	RG	3.59	2.1	0.9	-0.1		1942	C	

* All concentrations shown include background. FMPC is calculated net of Background Threshold.

THE FOLLOWING DATA POINTS PASSED BACKGROUND, DCGLw, AND EMC SCREENING TESTS:

Survey Unit 03

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
80.0	770.0	0.0	0.1	S	CH	1.1	2.8	0.7	-0.1		495		
97.0	763.0	0.0	0.1	S	RG	2.82	2.2	1.0	-0.1		1927		
69.0	770.0	0.1	0.5	S	BI	2.13	2.4	0.8	-0.1		1909		
126.0	756.0	0.0	0.1	S	RG	2.89	2.2	0.9	-0.1		1948		
119.0	763.0	0.0	0.1	S	RG	2.88	2.3	0.8	-0.1		1932		
69.0	770.0	0.0	0.1	S	RG	2.96	2.2	0.8	-0.1		1908		
104.0	763.0	0.0	0.1	S	RG	1.96	2.2	0.8	-0.1		1930		
133.0	763.0	0.0	0.1	S	RG	2.78	2.3	0.8	-0.1		1934		
126.0	770.0	0.0	0.1	S	RG	2.31	2.3	0.8	-0.1		1918		
119.0	756.0	0.0	0.1	S	RG	2.46	2.1	0.9	-0.1		1947		
83.0	756.0	0.0	0.1	S	RG	2.53	2.2	0.8	-0.1		1938		

KERR-MCGEE TECHNICAL CENTER
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Threshold Comparison Test Report - Soils

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
126.0	763.0	0.0	0.1	S	RG	2.15	2.3	0.7	-0.1		1933		
62.0	763.0	0.5	1.0	S	BI	2.09	2.1	0.8	-0.1		1922		
133.0	756.0	0.0	0.1	S	CH	3.46	2.2	0.8	-0.1		1949		
69.0	770.0	0.5	1.0	S	BI	2.36	2.2	0.8	-0.1		1910		
97.0	763.0	0.1	0.5	S	BI	2.81	2.1	0.8	-0.1		1928		
76.0	770.0	0.0	0.1	S	RG	2.6	2.1	0.8	-0.1		1911		
76.0	756.0	0.0	0.1	S	RG	2.61	2.2	0.8	-0.1		1937		
119.0	770.0	0.0	0.1	S	RG	2.48	2.2	0.7	-0.2		1917		
90.0	756.0	0.0	0.1	S	RG	2.61	2.2	0.8	-0.2		1939		
90.0	756.0	0.1	0.5	S	BI	2.59	2.1	0.8	-0.2		1940		
69.0	763.0	0.0	0.1	S	RG	2.38	2.1	0.8	-0.2		1923		
112.0	756.0	0.0	0.1	S	RG	2.58	2.2	0.7	-0.2		1944		
69.0	756.0	0.0	0.1	S	RG	2.99	2.0	0.8	-0.2		1936		
62.0	756.0	0.0	0.1	S	RG	1.9	2.1	0.8	-0.2		1935		
62.0	770.0	0.0	0.1	S	RG	2.81	2.0	0.8	-0.2		1907		
112.0	756.0	0.1	0.5	S	BI	2.6	2.1	0.8	-0.2		1945		
104.0	756.0	0.0	0.1	S	RG	2.57	2.1	0.8	-0.2		1943		
97.0	763.0	0.5	1.0	S	BI	2.71	2.0	0.8	-0.2		1929		
90.0	756.0	0.5	1.0	S	BI	2.72	2.0	0.8	-0.2		1941		
62.0	763.0	0.0	0.1	S	RG	3.25	2.1	0.7	-0.2		1920		
133.0	770.0	0.0	0.1	S	RG	3.2	2.1	0.7	-0.2		1919		
76.0	763.0	0.0	0.1	S	RG	3.01	1.9	0.8	-0.2		1924		
112.0	763.0	0.0	0.1	S	RG	2.65	2.1	0.7	-0.2		1931		
112.0	756.0	0.5	1.0	S	BI	2.6	2.0	0.8	-0.2		1946		
112.0	770.0	0.0	0.1	S	PG	1.89	2.0	0.7	-0.2		1916		
62.0	763.0	0.1	0.5	S	BI	2.93	2.0	0.7	-0.2		1921		
97.0	770.0	0.0	0.1	S	PG	1.97	2.0	0.7	-0.2		1914		
83.0	770.0	0.0	0.1	S	RG	2.86	1.9	0.7	-0.2		1912		
90.0	763.0	0.0	0.1	S	RG	2.66	1.9	0.7	-0.2		1926		
83.0	763.0	0.0	0.1	S	RG	2.95	1.7	0.7	-0.2		1925		
90.0	770.0	0.0	0.1	S	PG	1.63	1.9	0.6	-0.3		1913		
104.0	770.0	0.0	0.1	S	PG	1.97	1.8	0.6	-0.3		1915		

* All concentrations shown include background. FMPC is calculated net of Background Threshold.

KERR-MCGEE TECHNICAL CENTER

DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

Summary of Background Data and Thresholds Used in this Analysis

Measurement BK *DCGL:* 228.0 *EMC:* 684.0 *Nuclides* U

Matrices S

Nuclide	*Number of Data Points*	*Average Background*	*Sigma*	*Background Threshold (Tbk)*	*DCGLw Threshold (Td)*	*EMC Threshold (Tc)*
		(pCi/g)	*(pCi/g)*	*(pCi/g)*	*(pCi/g)*	*(pCi/g)*
U	291	1.76	0.90	3.56	231.56	687.56
Th	291	2.29	0.26	2.81	230.81	686.81
Ra	291	0.64	0.11	0.86	228.86	684.86
FMPC	291	0.62	0.05			

KERR-MCGEE TECHNICAL CENTER

DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

STATISTICAL TEST

Run Date: 7/1/2003 1:25:17 AM

Survey Unit 03 Class 1

Selected Test: WILCOXON RANK SUM TEST

Test Result: Pass

Thresholds:

EMC 684.0 DCGL 228.0 Nuclide U

DATA SUMMARY

291 Background Points 32 Survey points processed

Wr = 51798 Wc 47967

****** The survey unit has passed the WILCOXON RANK SUM TEST ******

KERR-MCGEE TECHNICAL CENTER
DECOMMISSIONING PROJECT
Threshold Comparison Test Report - Soils

Run Date Monday, June 30, 2003

Survey Unit : 04 Class: 2 Data Points: FMPC Grid Type: R Spacing: 18 m.

SURVEY UNIT TABLE

Borders				Surface Area Included	
N	S	E	W	(sq. m)	Remarks
800.	755.	60.1	50.0	454	
800.	755.	150.	140.	450	
800.	780.	260.	150.	2200	
755.	745.	150.	50.0	1000	
700.	690.	288.	270.	179	
710.	700.	280.	270.	99	
750.	720.	280.	260.	600	
780.	720.	260.	250.	600	
700.	660.	110.	100.	401	
670.	660.	140.	110.	300	
680.	670.	218.	130.	880	
700.	690.	120.	110.	101	
710.	700.	200.	120.	800	
720.	710.	280.	190.	900	
800.	780.	50.0	0.0	1000	
690.	680.	288.	243.	450	
700.	690.	130.	120.	100	
		Total		10514	

INITIALIZATION DATA

Measurement Types Selected: RG, PR, PG, BI, CH

Date Range: All

*** Report does not include Remediated data points ***

Thresholds:

EMC: 3.0 DCGLw 1.0 Nuclides FMPC

SURVEY UNIT TEST STATUS

Test Performed	Status		Mtx	FMPC
Min/Max	Pass	Maximum Survey value	S	1.2
Background	Fail	Minimum Background	S	0.3
DCGLw	Pass	Difference		0.9
DCGLavg	Pass			
EMC	Pass	Average Activity	-0.1	FMPC
Wilcoxon Rank Sum	Pass			
Sign Test for Paired Data:	N/A			

KERR-MCGEE TECHNICAL CENTER

DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

THE FOLLOWING DATA POINTS FAILED THE EMC TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE DCGLw TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE BACKGROUND TEST:

Survey Unit 04

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
224.0	712.0	0.0	0.1	S	BI	13.0	1.6	2.9	0.4	NRC -	2287	C	
225.0	712.0	0.0	0.1	S	BI	5.83	1.7	2.1	0.2	NRC -	2295	C	

* All concentrations shown include background. FMPC is calculated net of Background Threshold.

THE FOLLOWING DATA POINTS PASSED BACKGROUND, DCGLw, AND EMC SCREENING TESTS:

Survey Unit 04

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
147.0	782.0	0.0	0.1	S	CH	2.6	2.7	0.9	0.0		520		
224.0	712.0	0.1	0.5	S	BI	5.79	1.9	1.3	0.0	NRC -	2292		
145.0	786.0	0.0	0.1	S	CH	2.1	2.8	0.7	-0.1		519		
60.0	798.0	0.0	0.1	S	CH	2.7	2.8	0.6	-0.1		497		
100.0	700.0	0.0	0.1	S	CH	1	2.8	0.5	-0.1		492		
100.0	660.0	0.0	0.1	S	CH	1	2.6	0.6	-0.1		493		
224.0	712.0	0.5	1.0	S	BI	2.58	2.1	0.9	-0.1	NRC -	2293		
42.0	788.0	0.5	1.0	S	BI	3	2.2	0.8	-0.1		859		
166.0	788.0	0.0	0.1	S	RG	2.05	2.2	0.8	-0.1		862		
95.0	753.0	0.0	0.1	S	RG	2.2	2.3	0.7	-0.1		845		
130.0	753.0	0.0	0.1	S	RG	1.89	2.3	0.7	-0.1		847		

KERR-MCGEE TECHNICAL CENTER

DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
148.0	753.0	0.0	0.1	S	RG	2.24	2.3	0.7	-0.1		848		
201.0	718.0	0.0	0.1	S	RG	1.89	2.3	0.7	-0.1		835		
42.0	788.0	0.1	0.5	S	BI	2.08	2.1	0.8	-0.2		858		
223.0	712.0	0.0	0.1	S	BI	4.81	1.8	0.9	-0.2	NRC -	2297		
60.0	753.0	0.0	0.1	S	RG	2.5	2.1	0.8	-0.2		843		
59.9	771.0	0.0	0.1	S	RG	2.93	2.1	0.8	-0.2		850		
113.0	753.0	0.0	0.1	S	RG	2.35	2.2	0.7	-0.2		846		
148.0	771.0	0.0	0.1	S	RG	1.87	2.3	0.7	-0.2		853		
219.0	718.0	0.0	0.1	S	RG	2.34	2.1	0.7	-0.2		836		
77.0	753.0	0.0	0.1	S	RG	2.95	2.1	0.7	-0.2		844		
59.9	771.0	0.5	1.0	S	BI	2.73	2.0	0.8	-0.2		852		
254.0	682.0	0.1	0.5	S	BI	2.15	2.0	0.8	-0.2		827		
148.0	700.0	0.0	0.1	S	RG	2.99	2.1	0.8	-0.2		831		
240.0	718.0	0.0	0.1	S	RG	2.51	2.0	0.8	-0.2		837		
254.0	682.0	0.0	0.1	S	RG	2.24	2.1	0.7	-0.2		826		
130.0	700.0	0.0	0.1	S	RG	2.96	2.0	0.7	-0.2		830		
60.0	788.0	0.0	0.1	S	RG	2.45	2.0	0.7	-0.2		860		
42.0	788.0	0.0	0.1	S	RG	2.71	2.0	0.7	-0.2		857		
254.0	753.0	0.0	0.1	S	RG	2.43	2.0	0.7	-0.2		849		
254.0	788.0	0.0	0.1	S	RG	2.23	2.0	0.7	-0.2		867		
59.9	771.0	0.1	0.5	S	BI	2.27	2.1	0.7	-0.2		851		
130.0	665.0	0.0	0.1	S	RG	2.82	1.8	0.8	-0.2		825		
113.0	665.0	0.0	0.1	S	RG	1.94	2.0	0.7	-0.2		824		
254.0	718.0	0.0	0.1	S	RG	2.67	1.9	0.7	-0.2		838		
254.0	682.0	0.5	1.0	S	BI	2.26	2.0	0.6	-0.2		828		
272.0	735.0	0.5	1.0	S	BI	2.58	2.0	0.6	-0.2		842		
236.0	788.0	0.0	0.1	S	RG	1.69	2.0	0.6	-0.2		866		
254.0	771.0	0.0	0.1	S	RG	2.66	1.9	0.6	-0.2		854		
183.0	700.0	0.0	0.1	S	RG	2.61	1.8	0.7	-0.3		833		
224.0	713.0	0.0	0.1	S	BI	2.99	1.9	0.6	-0.3	NRC -	2294		
148.0	788.0	0.0	0.1	S	RG	2.81	1.6	0.8	-0.3		861		
272.0	735.0	0.1	0.5	S	BI	2.05	1.8	0.7	-0.3		841		
183.0	788.0	0.0	0.1	S	RG	2.12	1.9	0.6	-0.3		863		
7.0	788.0	0.0	0.1	S	RG	3.09	1.7	0.6	-0.3		855		
166.0	700.0	0.0	0.1	S	RG	2.59	1.7	0.7	-0.3		832		
224.0	711.0	0.0	0.1	S	BI	3.37	1.4	0.8	-0.3	NRC -	2296		
24.0	788.0	0.0	0.1	S	RG	1.78	1.7	0.6	-0.3		856		
272.0	735.0	0.0	0.1	S	RG	2.1	1.7	0.5	-0.3		840		
200.0	788.0	0.0	0.1	S	RG	1.94	1.6	0.4	-0.4		864		
272.0	682.0	0.0	0.1	S	BI	1.41	1.4	0.5	-0.4	Asphalt	829		
219.0	788.0	0.0	0.1	S	RG	2.49	1.5	0.4	-0.4		865		
272.0	682.0	0.0	0.1	S	RG	0.79	0.3	0.3	-0.6	Asphalt	2003		
272.0	700.0	0.0	0.1	S	BI	0.31	0.2	0.3	-0.7	Asphalt	834		
272.0	718.0	0.0	0.1	S	BI	0.15	0.1	0.3	-0.7	Asphalt	839		
269.0	718.0	0.0	0.1	S	BI	0.61	0.1	0.3	-0.7	Asphalt	2017		
272.0	700.0	0.0	0.1	S	RG	0.23	0.1	0.3	-0.7	Asphalt	2007		

* All concentrations shown include background. FMPC is calculated net of Background Threshold.

KERR-MCGEE TECHNICAL CENTER

DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

Summary of Background Data and Thresholds Used in this Analysis

Measurement BK *DCGL:* 1.0 *EMC:* 3.0 *Nuclides* FMPC

Matrices S

Nuclide	*Number of Data Points*	*Average Background*	*Sigma*	*Background Threshold (Tbk)*	*DCGLw Threshold (Td)*	*EMC Threshold (Tc)*
		(pCi/g)	*(pCi/g)*	*(pCi/g)*	*(pCi/g)*	*(pCi/g)*
U	291	1.76	0.90	3.56	4.56	6.56
Th	291	2.29	0.26	2.81	3.81	5.81
Ra	291	0.64	0.11	0.86	1.86	3.86
FMPC	291	0.62	0.05			

KERR-MCGEE TECHNICAL CENTER

DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

STATISTICAL TEST

Run Date: 7/1/2003 1:33:02 AM

Survey Unit 04 Class 2

Selected Test: WILCOXON RANK SUM TEST

Test Pass

Thresholds:

EMC 3.0 DCGL 1.0 Nuclide FMPC

DATA SUMMARY

291 Background Points 35 Survey points processed

Wr = 52671 Wc 48445

****** The survey unit has passed the WILCOXON RANK SUM TEST ******

KERR-MCGEE TECHNICAL CENTER

DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

Run Date Monday, June 30, 2003

Survey Unit 05 Class: 1 Data Points FMPC Grid Type R Spacing 8 m.

SURVEY UNIT TABLE

Borders				Surface Area Included	
N	S	E	W	(sq. m)	Remarks
690.	670.	130.	110.	400	
700.	680.	200.	130.	1400	
		Total		1800	

INITIALIZATION DATA

Measurement Types Selected: RG, PR, PG, BI, CH

Date Range: All

*** Report does not include Remediated data points ***

Thresholds:

EMC: 3.0 DCGLw 1.0 Nuclides FMPC

SURVEY UNIT TEST STATUS

Test Performed	Status		Mtx	FMPC
Min/Max	Pass	Maximum Survey Value	S	1.0
Background	Fail	Minimum Background	S	0.3
DCGLw	Pass	Difference		0.7
DCGLavg	Pass			
EMC	Pass	Average Activity	0.0	FMPC
Wilcoxon Rank Sum	Pass			
Sign Test for Paired Data:	N/A			

KERR-MCGEE TECHNICAL CENTER

DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

THE FOLLOWING DATA POINTS FAILED THE EMC TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE DCGLw TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE BACKGROUND TEST:

Survey Unit 05

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
151.0	697.0	0.0	0.1	S	CH	10.2	3.1	1.2	0.2		501	C	

* All concentrations shown include background. FMPC is calculated net of Background Threshold.

THE FOLLOWING DATA POINTS PASSED BACKGROUND, DCGLw, AND EMC SCREENING TESTS:

Survey Unit 05

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
147.0	696.0	0.0	0.1	S	CH	1.1	2.7	0.9	0.0		503		
140.0	680.0	0.0	0.1	S	CH	1.2	2.7	0.7	-0.1		494		
147.0	696.0	0.1	1.0	S	CH	0.3	2.8	0.6	-0.1		504		
149.0	696.0	0.1	1.0	S	CH	2.2	2.6	0.7	-0.1		506		
149.0	696.0	0.0	0.1	S	CH	1.6	2.6	0.7	-0.1		505		
151.0	698.0	0.0	0.1	S	RG	2.8	2.2	0.8	-0.1		902		
144.0	698.0	0.1	0.5	S	BI	2.55	2.1	0.8	-0.1		900		
151.0	697.0	0.1	1.0	S	CH	2	2.5	0.6	-0.1		502		
137.0	698.0	0.0	0.1	S	RG	2.43	2.1	0.8	-0.1		898		
159.0	698.0	0.0	0.1	S	RG	2.66	2.1	0.8	-0.1		903		
137.0	691.0	0.0	0.1	S	RG	2.85	2.1	0.8	-0.2		887		
144.0	691.0	0.0	0.1	S	RG	2.48	1.9	0.9	-0.2		888		

KERR-MCGEE TECHNICAL CENTER

DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
122.0	683.0	0.0	0.1	S	RG	2.5	2.1	0.8	-0.2		874		
155.0	692.0	0.0	0.1	S	BI	4.49	1.8	0.9	-0.2		914		
144.0	698.0	0.0	0.1	S	RG	3.1	2.1	0.8	-0.2		899		
129.0	683.0	0.0	0.1	S	RG	3.08	2.0	0.8	-0.2		875		
166.0	691.0	0.0	0.1	S	RG	2.48	2.1	0.8	-0.2		893		
151.0	691.0	0.0	0.1	S	RG	3.67	2.1	0.7	-0.2		891		
144.0	683.0	0.0	0.1	S	RG	2.71	2.1	0.7	-0.2		879		
137.0	683.0	0.0	0.1	S	RG	2.87	2.1	0.7	-0.2		878		
151.0	683.0	0.0	0.1	S	RG	2.82	2.1	0.7	-0.2		880		
164.0	694.0	0.1	0.5	S	BI	2.24	2.1	0.8	-0.2		920		
129.0	676.0	0.0	0.1	S	RG	2.85	2.0	0.8	-0.2		872		
159.0	683.0	0.0	0.1	S	RG	2.47	2.0	0.8	-0.2		881		
122.0	676.0	0.0	0.1	S	RG	2.15	2.1	0.7	-0.2		869		
159.0	691.0	0.0	0.1	S	RG	2.35	2.0	0.8	-0.2		892		
115.0	683.0	0.0	0.1	S	RG	2.93	2.0	0.7	-0.2		873		
155.0	692.0	0.1	0.5	S	BI	2.5	1.9	0.8	-0.2		915		
115.0	676.0	0.0	0.1	S	RG	2.91	2.0	0.8	-0.2		868		
148.0	692.0	0.0	0.1	S	BI	3.34	2.0	0.7	-0.2		909		
144.0	691.0	0.1	0.5	S	BI	3.01	2.0	0.7	-0.2		889		
148.0	692.0	0.1	0.5	S	BI	3.11	2.0	0.7	-0.2		910		
164.0	694.0	0.0	0.1	S	BI	2.63	1.9	0.8	-0.2		919		
166.0	683.0	0.0	0.1	S	RG	3.02	2.0	0.7	-0.2		882		
166.0	698.0	0.0	0.1	S	RG	2.68	2.0	0.7	-0.2		904		
164.0	694.0	1.0	1.5	S	BI	2.7	2.1	0.7	-0.2		922		
174.0	698.0	0.0	0.1	S	RG	2.69	1.9	0.8	-0.2		905		
155.0	692.0	0.5	1.0	S	BI	3.22	1.9	0.7	-0.2		916		
188.0	698.0	0.0	0.1	S	RG	2.45	1.9	0.7	-0.2		907		
188.0	691.0	0.0	0.1	S	RG	2.52	1.9	0.7	-0.2		896		
155.0	692.0	1.0	1.5	S	BI	2.71	1.9	0.7	-0.2		917		
181.0	698.0	0.0	0.1	S	RG	2.36	1.8	0.7	-0.2		906		
164.0	694.0	0.5	1.0	S	BI	2.37	2.0	0.6	-0.2		921		
148.0	692.0	1.0	1.5	S	BI	2.71	1.9	0.7	-0.2		912		
122.0	676.0	0.5	1.0	S	BI	2.5	1.9	0.7	-0.2		871		
155.0	692.0	1.5	2.0	S	BI	4.03	1.8	0.7	-0.2		918		
129.0	683.0	0.1	0.5	S	BI	2.5	2.0	0.6	-0.2		876		
148.0	692.0	1.5	2.0	S	BI	2.48	1.9	0.6	-0.2		913		
174.0	691.0	0.0	0.1	S	RG	2.6	1.8	0.7	-0.3		894		
144.0	691.0	0.5	1.0	S	BI	3.02	1.9	0.6	-0.3		890		
196.0	691.0	0.0	0.1	S	RG	2.94	1.8	0.7	-0.3		897		
181.0	691.0	0.0	0.1	S	RG	2.48	1.9	0.6	-0.3		895		
174.0	683.0	0.0	0.1	S	RG	2.85	1.9	0.6	-0.3		883		
148.0	692.0	0.5	1.0	S	BI	2.38	2.0	0.5	-0.3		911		
196.0	698.0	0.0	0.1	S	RG	2.7	1.8	0.6	-0.3		908		
144.0	698.0	0.5	1.0	S	BI	2.23	1.9	0.6	-0.3		901		
188.0	683.0	0.0	0.1	S	RG	2.53	1.8	0.6	-0.3		885		
181.0	683.0	0.0	0.1	S	RG	2.72	1.8	0.6	-0.3		884		
122.0	676.0	0.1	0.5	S	BI	2.3	1.9	0.6	-0.3		870		
196.0	683.0	0.0	0.1	S	RG	2.34	1.8	0.6	-0.3		886		
129.0	683.0	0.5	1.0	S	BI	1.76	2.0	0.5	-0.3		877		
164.0	694.0	1.5	2.0	S	BI	2.48	1.9	0.5	-0.3		923		

* All concentrations shown include background. FMPC is calculated net of Background Threshold.

KERR-MCGEE TECHNICAL CENTER

DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

Summary of Background Data and Thresholds Used in this Analysis

Measurement BK *DCGL:* 1.0 *EMC:* 3.0 *Nuclides* FMPC

Matrices S

Nuclide	*Number of Data Points*	*Average Background*	*Sigma*	*Background Threshold (Tbk)*	*DCGLw Threshold (Td)*	*EMC Threshold (Tc)*
		(pCi/g)	*(pCi/g)*	*(pCi/g)*	*(pCi/g)*	*(pCi/g)*
U	291	1.76	0.90	3.56	4.56	6.56
Th	291	2.29	0.26	2.81	3.81	5.81
Ra	291	0.64	0.11	0.86	1.86	3.86
FMPC	291	0.62	0.05			

KERR-MCGEE TECHNICAL CENTER
DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

STATISTICAL TEST

Run Date: 7/1/2003 1:33:35 AM

Survey Unit 05 Class 1

Selected Test: WILCOXON RANK SUM TEST

Test Pass

Thresholds:

EMC 3.0 DCGL 1.0 Nuclide FMPC

DATA SUMMARY

291 Background Points 33 Survey points processed

Wr = 52089 Wc 48126

****** The survey unit has passed the WILCOXON RANK SUM TEST ******

KERR-MCGEE TECHNICAL CENTER
DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

Run Date Monday, June 30, 2003

Survey Unit 06 Class: 1 Data Points FMPC Grid Type R Spacing 7 m.

SURVEY UNIT TABLE

Borders				Surface Area Included	
N	S	E	W	(sq. m)	Remarks
710.	680.	218.	200.	540	
710.	697.	243.	218.	325	
710.	690.	270.	243.	542	
		Total		1407	

INITIALIZATION DATA

Measurement Types Selected: RG, PR, PG, BI, CH
Date Range: All
*** Report does not include Remediated data points ***

Thresholds:
EMC: 3.0 DCGLw 1.0 Nuclides FMPC

SURVEY UNIT TEST STATUS

Test Performed	Status		Mtx	FMPC
Min/Max	Fail	Maximum Survey Value	S	1.4
Background	Fail	Minimum Background	S	0.3
DCGLw	Pass	Difference		1.1
DCGLavg	Pass			
EMC	Pass	Average Activity	-0.1	FMPC
Wilcoxon Rank Sum	Pass			
Sign Test for Paired Data:	N/A			

KERR-MCGEE TECHNICAL CENTER
DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

THE FOLLOWING DATA POINTS FAILED THE EMC TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE DCGLw TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE BACKGROUND TEST:

Survey Unit 06

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
219.5	697.0	0.0	0.1	S	BI	6.7	1.7	3.8	0.6	Hot Spots	2528	C	
220.0	697.0	0.0	0.1	S	BI	7.85	2.0	2.0	0.2	Hot Spots	2361	C	

* All concentrations shown include background. FMPC is calculated net of Background Threshold.

THE FOLLOWING DATA POINTS PASSED BACKGROUND, DCGLw, AND EMC SCREENING TESTS:

Survey Unit 06

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
217.0	697.0	0.0	0.1	S	BI	4.05	1.9	1.4	0.0	Hot Spots -	2358		
211.0	698.0	0.0	0.1	S	RG	3.88	2.0	1.3	0.0		938		
220.2	698.0	0.2	0.3	S	PR	2.99	1.9	1.1	-0.1	NRC -	2491		
220.2	698.0	0.2	0.3	S	PR	2.65	1.8	1.1	-0.1		2484		
220.0	699.0	0.0	0.1	S	BI	2.68	1.9	1.0	-0.1		951		
213.0	700.0	0.2	0.3	S	PR	2.58	2.0	0.9	-0.2		2486		
204.0	704.0	0.0	0.1	S	RG	3.01	2.1	0.8	-0.2		956		
257.0	691.0	0.0	0.1	S	RG	2.15	1.9	0.9	-0.2		934		
257.0	698.0	0.0	0.1	S	RG	1.87	2.0	0.8	-0.2		944		
204.0	685.0	0.5	1.0	S	BI	1.5	2.1	0.8	-0.2		926		
204.0	698.0	0.0	0.1	S	RG	2.22	2.0	0.8	-0.2		937		

KERR-MCGEE TECHNICAL CENTER
DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
237.0	704.0	0.0	0.1	S	RG	1.95	2.1	0.7	-0.2		963		
250.0	698.0	0.0	0.1	S	RG	2.32	2.1	0.7	-0.2		943		
250.0	704.0	0.0	0.1	S	RG	2.61	2.1	0.7	-0.2		965		
213.0	698.0	0.0	0.1	S	BI	2.45	1.9	0.8	-0.2	SDR-0005	2301		
211.0	704.0	0.0	0.1	S	RG	2.98	2.0	0.8	-0.2		959		
215.0	699.0	0.0	0.1	S	BI	2.64	2.0	0.8	-0.2	Hot Spots -	2352		
215.0	691.0	0.0	0.1	S	RG	2.72	2.0	0.8	-0.2		931		
224.0	704.0	0.0	0.1	S	RG	2.73	2.0	0.8	-0.2		961		
263.0	691.0	0.0	0.1	S	RG	2.69	1.9	0.8	-0.2		935		
257.0	704.0	0.0	0.1	S	RG	2.97	2.1	0.7	-0.2		966		
250.0	691.0	0.0	0.1	S	RG	2.59	2.0	0.7	-0.2		933		
218.0	698.0	0.0	0.1	S	BI	4	1.8	0.8	-0.2	Hot Spots -	2359		
263.0	704.0	0.1	0.5	S	BI	2.4	2.0	0.8	-0.2		968		
244.0	691.0	0.0	0.1	S	RG	2.11	2.0	0.7	-0.2		932		
217.0	698.0	0.5	1.0	S	BI	2.78	2.2	0.5	-0.2	Hot Spots -	2356		
244.0	704.0	0.0	0.1	S	RG	2.44	2.0	0.7	-0.2		964		
263.0	698.0	0.0	0.1	S	RG	3	1.9	0.7	-0.2		947		
257.0	698.0	0.1	0.5	S	BI	2.76	2.0	0.7	-0.2		945		
263.0	704.0	0.0	0.1	S	RG	2.39	2.0	0.7	-0.2		967		
214.0	698.0	0.0	0.1	S	BI	2.95	1.9	0.7	-0.2	SDR-0005	2304		
218.3	698.6	0.3	0.5	S	PR	3.6	1.8	0.8	-0.2		2483		
230.0	704.0	0.0	0.1	S	RG	2.36	1.9	0.7	-0.2		962		
212.0	699.0	0.0	0.1	S	BI	2.53	1.8	0.8	-0.2	SDR-0005	2299		
212.0	698.0	0.0	0.1	S	BI	2.29	2.1	0.6	-0.2	SDR-0005	2298		
230.0	698.0	0.0	0.1	S	RG	2.7	1.9	0.7	-0.2		941		
204.0	704.0	0.5	1.0	S	BI	2.29	2.0	0.6	-0.2		958		
213.9	699.0	1.0	1.1	S	PR	3.4	1.9	0.7	-0.2	NRC -	2490		
212.0	700.0	0.0	0.1	S	BI	2.69	2.0	0.6	-0.2	SDR-0005	2300		
204.0	685.0	0.0	0.1	S	RG	1.87	2.0	0.6	-0.2		924		
217.0	698.0	0.3	0.5	S	PG	3.33	2.0	0.6	-0.2		2510		
217.0	704.0	0.0	0.1	S	RG	2.57	1.9	0.7	-0.2		960		
214.7	699.0	0.0	0.1	S	PR	2.74	1.9	0.7	-0.2		2481		
224.0	698.0	0.0	0.1	S	RG	2.39	1.8	0.8	-0.2		940		
204.0	704.0	0.1	0.5	S	BI	2.24	2.0	0.6	-0.2		957		
213.9	699.0	1.0	1.1	S	PR	2.67	1.9	0.6	-0.2		2480		
213.0	699.0	0.2	0.3	S	PR	2.39	1.9	0.6	-0.2		2485		
244.0	698.0	0.0	0.1	S	RG	2.58	2.0	0.6	-0.2		942		
211.0	691.0	0.0	0.1	S	RG	2.73	1.9	0.6	-0.2		930		
215.0	685.0	0.0	0.1	S	RG	2.33	1.9	0.6	-0.2		928		
263.0	704.0	0.5	1.0	S	BI	2.9	1.9	0.6	-0.3		969		
211.0	685.0	0.0	0.1	S	RG	1.89	1.9	0.6	-0.3		927		
257.0	698.0	0.5	1.0	S	BI	2.2	2.0	0.5	-0.3		946		
204.0	691.0	0.0	0.1	S	RG	1.96	1.8	0.6	-0.3		929		
214.0	699.0	1.0	1.1	S	PR	2.32	1.9	0.6	-0.3		2487		
204.0	685.0	0.1	0.5	S	BI	2.43	1.9	0.5	-0.3		925		
216.7	697.2	0.0	0.1	S	PR	3.17	1.8	0.6	-0.3		2482		
217.0	698.0	0.3	0.5	S	PR	2.14	1.8	0.6	-0.3		2488		
220.0	699.0	0.5	1.0	S	BI	2.62	1.2	0.5	-0.4		953		
220.0	699.0	0.1	0.5	S	BI	1.68	1.0	0.4	-0.5		952		
270.0	704.0	0.0	0.1	S	BI	0.66	0.2	0.3	-0.7	Asphalt	970		
269.0	698.0	0.0	0.1	S	RG	0	0.3	0.2	-0.7	Asphalt	2006		
270.0	698.0	0.0	0.1	S	BI	0.5	0.2	0.3	-0.7	Asphalt	948		
269.0	704.0	0.0	0.1	S	RG	0.29	0.2	0.2	-0.7	Asphalt	2009		
270.0	691.0	0.0	0.1	S	BI	0.49	0.2	0.2	-0.7	Asphalt	936		
269.0	691.0	0.0	0.1	S	RG	0.46	0.1	0.3	-0.7	Asphalt	2004		

* All concentrations shown include background. FMPC is calculated net of Background Threshold.

KERR-MCGEE TECHNICAL CENTER

DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

Summary of Background Data and Thresholds Used in this Analysis

Measurement BK ***DCGL:*** 1.0 ***EMC:*** 3.0 ***Nuclides*** FMPC

Matrices S

Nuclide	*Number of Data Points*	*Average Background*	*Sigma*	*Background Threshold (Tbk)*	*DCGLw Threshold (Td)*	*EMC Threshold (Tc)*
		(pCi/g)	*(pCi/g)*	*(pCi/g)*	*(pCi/g)*	*(pCi/g)*
U	291	1.76	0.90	3.56	4.56	6.56
Th	291	2.29	0.26	2.81	3.81	5.81
Ra	291	0.64	0.11	0.86	1.86	3.86
FMPC	291	0.62	0.05			

KERR-MCGEE TECHNICAL CENTER

DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

STATISTICAL TEST

Run Date: 7/1/2003 1:35:40 AM

Survey Unit 06 Class 1

Selected Test: WILCOXON RANK SUM TEST

Test Pass

Thresholds:

EMC 3.0 DCGL 1.0 Nuclide FMPC

DATA SUMMARY

291 Background Points 32 Survey points processed

Wr = 51798 Wc 47967

****** The survey unit has passed the WILCOXON RANK SUM TEST ******

KERR-MCGEE TECHNICAL CENTER

DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

Run Date Monday, June 30, 2003

Survey Unit 07 Class: 1 Data Points U Grid Type R Spacing 7 m.

SURVEY UNIT TABLE

Borders				Surface Area Included	
N	S	E	W	(sq. m)	Remarks
800.	750.	290.	260.	1505	
		Total		1505	

INITIALIZATION DATA

Measurement Types Selected: RG, PR, PG, BI, CH
Date Range: All
*** Report does not include Remediated data points ***

Thresholds:
EMC: 684.0 DCGLw 228.0 Nuclides U

SURVEY UNIT TEST STATUS

Test Performed	Status		Mtx	(pCi/g)
Min/Max	Pass	Maximum Survey Value	S	3.8
Background	Fail	Minimum Background	S	0.0
DCGLw	Pass	Difference		3.8
DCGLavg	Pass			
EMC	Pass	Average Activity	2.3	(pCi/g)
Wilcoxon Rank Sum	Pass			
Sign Test for Paired Data:	N/A			

KERR-MCGEE TECHNICAL CENTER

DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

THE FOLLOWING DATA POINTS FAILED THE EMC TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE DCGLw TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE BACKGROUND TEST:

Survey Unit 07

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
283.0	778.0	0.0	0.1	S	RG	3.8	2.2	0.6	-0.2		998	C	
283.0	771.0	0.0	0.1	S	RG	3.67	2.0	0.7	-0.2		993	C	
283.0	764.0	0.0	0.1	S	RG	3.62	1.9	0.7	-0.2		986	C	

* All concentrations shown include background. FMPC is calculated net of Background Threshold.

THE FOLLOWING DATA POINTS PASSED BACKGROUND, DCGLw, AND EMC SCREENING TESTS:

Survey Unit 07

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
274.0	786.0	1.0	1.5	S	BI	3	2.0	1.1	-0.1		1015		
273.0	789.0	0.5	1.0	S	BI	3.08	2.0	1.1	-0.1		1019		
269.0	784.0	0.1	0.5	S	BI	2.23	2.2	0.9	-0.1		1002		
273.0	789.0	0.2	0.3	S	PR	1.97	2.2	0.9	-0.1		2461		
273.0	789.0	1.5	2.0	S	BI	2.02	2.1	0.9	-0.1		1021		
290.0	784.0	0.0	0.1	S	RG	2.42	2.0	0.9	-0.2		1006		
276.0	784.0	0.2	0.3	S	PG	2.91	2.1	0.8	-0.2		2511		
275.0	785.0	0.5	1.0	S	BI	2.52	2.0	0.8	-0.2		1009		
290.0	757.0	0.0	0.1	S	RG	2.64	2.1	0.8	-0.2		982		
263.0	784.0	0.0	0.1	S	RG	2.16	2.0	0.8	-0.2		1000		

KERR-MCGEE TECHNICAL CENTER

DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
276.0	796.0	0.0	0.1	S	RG	3.1	2.1	0.8	-0.2		1029		
275.0	787.0	0.2	0.3	S	PR	2.51	2.0	0.8	-0.2		2462		
275.0	787.0	0.5	1.0	S	BI	2.73	2.2	0.7	-0.2	Hot Spots -	2346		
274.0	786.0	0.5	1.0	S	BI	2.61	2.1	0.8	-0.2		1014		
263.0	778.0	0.0	0.1	S	RG	3.51	2.0	0.8	-0.2		995		
290.0	796.0	0.0	0.1	S	RG	2.61	1.9	0.9	-0.2		1033		
273.0	789.0	1.0	1.5	S	BI	2.4	2.2	0.7	-0.2		1020		
283.0	796.0	0.0	0.1	S	RG	2.79	2.1	0.7	-0.2		1032		
269.0	784.0	0.5	1.0	S	BI	2.53	2.1	0.7	-0.2		1003		
283.0	784.0	0.0	0.1	S	RG	2.49	2.0	0.7	-0.2		1005		
275.0	785.0	1.0	1.5	S	BI	2.32	2.0	0.7	-0.2		1010		
275.0	785.0	1.5	2.0	S	BI	1.33	2.3	0.6	-0.2		1011		
269.0	784.0	0.0	0.1	S	RG	2.4	2.0	0.7	-0.2		1001		
290.0	771.0	0.0	0.1	S	RG	3.32	2.0	0.7	-0.2		994		
276.0	796.0	0.5	1.0	S	BI	2.59	2.1	0.7	-0.2		1031		
274.0	786.0	1.5	2.0	S	BI	2.12	2.1	0.6	-0.2		1016		
276.0	796.0	0.1	0.5	S	BI	3.1	1.9	0.7	-0.2		1030		
269.0	764.0	0.0	0.1	S	RG	2.07	2.2	0.6	-0.2		984		
269.0	796.0	0.0	0.1	S	RG	2.26	2.1	0.6	-0.2		1028		
290.0	764.0	0.0	0.1	S	RG	2.6	2.0	0.7	-0.2		987		
269.0	771.0	0.1	0.5	S	BI	3.15	2.0	0.6	-0.2		990		
271.0	787.0	0.0	0.1	S	BI	2.37	2.0	0.6	-0.2	SDR-0007	2330		
269.0	778.0	0.0	0.1	S	RG	2.17	1.9	0.7	-0.2		996		
283.0	791.0	0.0	0.1	S	RG	1.35	1.9	0.7	-0.2		1025		
269.0	771.0	0.0	0.1	S	RG	2.15	1.7	0.7	-0.2		989		
271.0	789.0	0.0	0.1	S	BI	1.88	1.9	0.7	-0.2	SDR-0007	2331		
263.0	796.0	0.0	0.1	S	RG	1.82	1.9	0.6	-0.2		1027		
283.0	757.0	0.0	0.1	S	RG	3.3	1.7	0.7	-0.3		981		
283.0	751.0	0.0	0.1	S	RG	2.35	1.8	0.7	-0.3		974		
276.0	757.0	0.1	0.5	S	BI	1.67	1.9	0.6	-0.3		979		
269.0	757.0	0.0	0.1	S	RG	2.21	1.8	0.6	-0.3		977		
263.0	757.0	0.0	0.1	S	RG	2.77	1.7	0.7	-0.3		976		
276.0	757.0	0.5	1.0	S	BI	2.71	1.8	0.6	-0.3		980		
269.0	771.0	0.5	1.0	S	BI	3.11	1.9	0.5	-0.3		991		
290.0	791.0	0.0	0.1	S	RG	2.01	1.8	0.6	-0.3	ROADWAY	1026		
263.0	771.0	0.0	0.1	S	RG	2.76	1.7	0.6	-0.3		988		
269.0	751.0	0.0	0.1	S	RG	2.25	1.6	0.6	-0.3		972		
290.0	751.0	0.0	0.1	S	RG	3.05	1.6	0.6	-0.3		975		
263.0	764.0	0.0	0.1	S	RG	3.06	1.8	0.5	-0.3		983		
276.0	778.0	0.0	0.1	S	RG	1.73	1.6	0.7	-0.3	ROADWAY	997		
263.0	751.0	0.0	0.1	S	RG	2.41	1.6	0.6	-0.3		971		
276.0	771.0	0.0	0.1	S	RG	2.17	1.5	0.6	-0.3	ROADWAY	992		
276.0	791.0	0.0	0.1	S	RG	1.77	1.5	0.6	-0.3	ROADWAY	1024		
263.0	791.0	0.0	0.1	S	RG	0.44	1.3	0.5	-0.4	ROADWAY	1022		
276.0	764.0	0.0	0.1	S	RG	1.48	1.2	0.5	-0.4	ROADWAY	985		
275.0	791.0	0.0	0.1	S	BI	0.92	1.0	0.5	-0.5	SDR-0007	2338		
269.0	791.0	0.0	0.1	S	RG	1.01	1.0	0.5	-0.5	ROADWAY	1023		
273.0	791.0	0.0	0.1	S	BI	0.98	0.9	0.5	-0.5	SDR-0007	2335		
276.0	757.0	0.0	0.1	S	RG	0.58	0.8	0.4	-0.5	ROADWAY	978		
271.0	791.0	0.0	0.1	S	BI	0.54	0.5	0.5	-0.5	SDR-0007	2332		
276.0	751.0	0.0	0.1	S	RG	1.09	0.4	0.4	-0.6	ROADWAY	973		

* All concentrations shown include background. FMPC is calculated net of Background Threshold.

KERR-MCGEE TECHNICAL CENTER

DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

Summary of Background Data and Thresholds Used in this Analysis

Measurement BK *DCGL:* 228.0 *EMC:* 684.0 *Nuclides* U

Matrices S

Nuclide	*Number of Data Points*	*Average Background*	*Sigma*	*Background Threshold (Tbk)*	*DCGLw Threshold (Td)*	*EMC Threshold (Tc)*
		(pCi/g)	*(pCi/g)*	*(pCi/g)*	*(pCi/g)*	*(pCi/g)*
U	291	1.76	0.90	3.56	231.56	687.56
Th	291	2.29	0.26	2.81	230.81	686.81
Ra	291	0.64	0.11	0.86	228.86	684.86
FMPC	291	0.62	0.05			

KERR-MCGEE TECHNICAL CENTER

DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

STATISTICAL TEST

Run Date: 7/1/2003 1:36:46 AM

Survey Unit 07 Class 1

Selected Test: WILCOXON RANK SUM TEST

Test Pass

Thresholds:

EMC 684.0 DCGL 228.0 Nuclide U

DATA SUMMARY

291 Background Points 39 Survey points processed

Wr = 53835 Wc 49081

****** The survey unit has passed the WILCOXON RANK SUM TEST ******

KERR-MCGEE TECHNICAL CENTER

DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

Run Date Monday, June 30, 2003

Survey Unit 08 Class: 1 Data Points FMPC Grid Type R Spacing 7 m.

SURVEY UNIT TABLE

Borders				Surface Area Included	
N	S	E	W	(sq. m)	Remarks
717.	700.	288.	280.	136	
750.	717.	316.	280.	1188	
		Total		1324	

INITIALIZATION DATA

Measurement Types Selected: RG, PR, PG, BI, CH

Date Range: All

*** Report does not include Remediated data points ***

Thresholds:

EMC: 3.0 DCGLw 1.0 Nuclides FMPC

SURVEY UNIT TEST STATUS

Test Performed	Status		Mtx	FMPC
Min/Max	Pass	Maximum Survey Value	S	0.6
Background	Pass	Minimum Background	S	0.3
DCGLw	Pass	Difference		0.3
DCGLavg	Pass			
EMC	Pass	Average Activity	-0.4	FMPC
Wilcoxon Rank Sum	Pass			
Sign Test for Paired Data:	N/A			

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DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

THE FOLLOWING DATA POINTS FAILED THE EMC TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE DCGLw TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE BACKGROUND TEST:

NONE

THE FOLLOWING DATA POINTS PASSED BACKGROUND, DCGLw, AND EMC SCREENING TESTS:

Survey Unit 08

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
296.0	727.0	0.5	1.0	S	BI	2.09	2.1	0.7	-0.2		1090		
296.0	727.0	0.1	0.5	S	BI	2.46	1.9	0.7	-0.2		1089		
283.0	708.0	0.5	1.0	S	BI	1.53	2.1	0.5	-0.2	Asphalt	1078		
302.0	734.0	0.0	0.1	S	RG	2.16	1.9	0.6	-0.2		1097		
290.0	746.0	0.5	1.0	S	BI	1.76	2.0	0.6	-0.2	Asphalt	1111		
309.0	740.0	0.5	1.0	S	BI	2.24	1.9	0.5	-0.3		1106		
296.0	740.0	0.0	0.1	S	RG	2.28	1.8	0.6	-0.3		1102		
283.0	734.0	0.0	0.1	S	RG	1.98	1.7	0.6	-0.3		1094		
296.0	727.0	0.0	0.1	S	RG	2.37	1.5	0.7	-0.3		1088		
283.0	727.0	0.0	0.1	S	RG	2.11	1.7	0.6	-0.3		1086		
302.0	727.0	0.0	0.1	S	RG	1.87	1.7	0.5	-0.3		1091		
290.0	734.0	0.0	0.1	S	RG	1.59	1.5	0.7	-0.3		1095		
290.0	721.0	0.0	0.1	S	RG	2.29	1.6	0.5	-0.3		1081		
296.0	721.0	0.0	0.1	S	RG	2.04	1.5	0.6	-0.3		1082		
302.0	740.0	0.0	0.1	S	RG	2.1	1.5	0.5	-0.4		1103		
290.0	727.0	0.0	0.1	S	RG	2.68	1.5	0.5	-0.4		1087		

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DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
290.0	740.0	0.0	0.1	S	RG	2.35	1.4	0.6	-0.4		1101		
302.0	721.0	0.0	0.1	S	RG	1.67	1.5	0.5	-0.4		1083		
283.0	708.0	0.1	0.5	S	BI	1.89	1.5	0.5	-0.4	Asphalt	1077		
296.0	734.0	0.0	0.1	S	RG	1.84	1.4	0.5	-0.4		1096		
290.0	746.0	0.1	0.5	S	BI	0.77	1.0	0.5	-0.5	Asphalt	1110		
309.0	740.0	0.1	0.5	S	BI	1.14	0.9	0.3	-0.5		1105		
283.0	702.0	0.0	0.1	S	BI	0	0.2	0.3	-0.7	Asphalt	1075		
283.0	708.0	0.0	0.1	S	BI	0.41	0.2	0.3	-0.7	Asphalt	1076		
290.0	746.0	0.0	0.1	S	BI	0.36	0.3	0.2	-0.7	Asphalt	1109		
315.0	740.0	0.0	0.1	S	BI	0.5	0.3	0.2	-0.7	Asphalt	1107		
315.0	727.0	0.0	0.1	S	BI	0.32	0.2	0.3	-0.7	Asphalt	1093		
309.0	746.0	0.0	0.1	S	BI	0	0.2	0.3	-0.7	Asphalt	1114		
315.0	746.0	0.0	0.1	S	BI	0.16	0.3	0.2	-0.7	Asphalt	1115		
283.0	740.0	0.0	0.1	S	BI	0.03	0.3	0.2	-0.7	Asphalt	1100		
283.0	721.0	0.0	0.1	S	BI	0.21	0.2	0.2	-0.7	Asphalt	1080		
290.0	746.0	0.0	0.1	S	RG	0	0.2	0.2	-0.7	Asphalt	2051		
302.0	746.0	0.0	0.1	S	BI	0.04	0.2	0.3	-0.7	Asphalt	1113		
315.0	734.0	0.0	0.1	S	BI	0.04	0.1	0.3	-0.7	Asphalt	1099		
309.0	740.0	0.0	0.1	S	BI	0.29	0.2	0.2	-0.7	Asphalt	1104		
283.0	715.0	0.0	0.1	S	BI	0.16	0.3	0.2	-0.7	Asphalt	1079		
309.0	721.0	0.0	0.1	S	RG	0.09	0.2	0.2	-0.7	Asphalt	2021		
309.0	721.0	0.0	0.1	S	BI	0.11	0.2	0.3	-0.7	Asphalt	1084		
315.0	721.0	0.0	0.1	S	BI	0.27	0.2	0.3	-0.7	Asphalt	1085		
309.0	727.0	0.0	0.1	S	BI	0.13	0.1	0.3	-0.7	Asphalt	1092		
283.0	740.0	0.0	0.1	S	RG	0.17	0.3	0.2	-0.7	Asphalt	2037		
309.0	734.0	0.0	0.1	S	BI	0.5	0.2	0.3	-0.7	Asphalt	1098		
283.0	702.0	0.0	0.1	S	RG	0.09	0.2	0.2	-0.7	Asphalt	2008		
283.0	746.0	0.0	0.1	S	RG	0.04	0.1	0.3	-0.7	Asphalt	2050		
294.0	746.0	0.0	0.1	S	BI	0.21	0.2	0.2	-0.7	Asphalt	1112		
315.0	721.0	0.0	0.1	S	RG	0.08	0.1	0.3	-0.7	Asphalt	2022		
283.0	708.0	0.0	0.1	S	RG	0.4	0.2	0.2	-0.7	Asphalt	2012		
283.0	715.0	0.0	0.1	S	RG	0.63	0.1	0.2	-0.7	Asphalt	2016		
315.0	727.0	0.0	0.1	S	RG	0.64	0.1	0.3	-0.7	Asphalt	2026		
315.0	746.0	0.0	0.1	S	RG	0.43	0.1	0.3	-0.7	Asphalt	2046		
309.0	740.0	0.0	0.1	S	RG	0.19	0.2	0.2	-0.7	Asphalt	2036		
309.0	734.0	0.0	0.1	S	RG	0.09	0.1	0.3	-0.7	Asphalt	2029		
315.0	734.0	0.0	0.1	S	RG	0.26	0.1	0.2	-0.7	Asphalt	2030		
283.0	721.0	0.0	0.1	S	RG	0.26	0.2	0.2	-0.7	Asphalt	2020		
294.0	746.0	0.0	0.1	S	RG	0.34	0.2	0.2	-0.7	Asphalt	2049		
283.0	746.0	0.0	0.1	S	BI	0.69	0.1	0.2	-0.7	Asphalt	1108		
315.0	740.0	0.0	0.1	S	RG	0.24	0.1	0.2	-0.7	Asphalt	2035		
309.0	727.0	0.0	0.1	S	RG	0.5	0.1	0.2	-0.7	Asphalt	2025		
309.0	746.0	0.0	0.1	S	RG	0.4	0.2	0.2	-0.7	Asphalt	2047		
302.0	746.0	0.0	0.1	S	RG	0.41	0.1	0.3	-0.7	Asphalt	2048		

* All concentrations shown include background. FMPC is calculated net of Background Threshold.

KERR-MCGEE TECHNICAL CENTER

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Threshold Comparison Test Report - Soils

Summary of Background Data and Thresholds Used in this Analysis

Measurement BK *DCGL:* 1.0 *EMC:* 3.0 *Nuclides* FMPC

Matrices S

Nuclide	*Number of Data Points*	*Average Background*	*Sigma*	*Background Threshold (Tbk)*	*DCGLw Threshold (Td)*	*EMC Threshold (Tc)*
		(pCi/g)	*(pCi/g)*	*(pCi/g)*	*(pCi/g)*	*(pCi/g)*
U	291	1.76	0.90	3.56	4.56	6.56
Th	291	2.29	0.26	2.81	3.81	5.81
Ra	291	0.64	0.11	0.86	1.86	3.86
FMPC	291	0.62	0.05			

KERR-MCGEE TECHNICAL CENTER

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Threshold Comparison Test Report - Soils

STATISTICAL TEST

Run Date: 7/1/2003 1:38:01 AM

Survey Unit 08 Class 1

Selected Test: WILCOXON RANK SUM TEST

Test Pass

Thresholds:

EMC 3.0 DCGL 1.0 Nuclide FMPC

DATA SUMMARY

291 Background Points 33 Survey points processed

Wr = 52089 Wc 48126

****** The survey unit has passed the WILCOXON RANK SUM TEST ******

KERR-MCGEE TECHNICAL CENTER

DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

Run Date Monday, June 30, 2003

Survey Unit 09 Class: 1 Data Points FMPC Grid Type R Spacing 6 m.

SURVEY UNIT TABLE

Borders				Surface Area Included	
N	S	E	W	(sq. m)	Remarks
718.	703.	358.	316.	630	
750.	718.	340.	316.	768	
		Total		1398	

INITIALIZATION DATA

Measurement Types Selected: RG, PR, PG, BI, CH
Date Range: All
*** Report does not include Remediated data points ***

Thresholds:
EMC: 3.0 DCGLw 1.0 Nuclides FMPC

SURVEY UNIT TEST STATUS

Test Performed	Status		Mtx	FMPC
Min/Max	Pass	Maximum Survey Value	S	0.6
Background	Pass	Minimum Background	S	0.3
DCGLw	Pass	Difference		0.3
DCGLavg	Pass			
EMC	Pass	Average Activity	-0.3	FMPC
Wilcoxon Rank Sum	Pass			
Sign Test for Paired Data:	N/A			

KERR-MCGEE TECHNICAL CENTER

DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

THE FOLLOWING DATA POINTS FAILED THE EMC TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE DCGLw TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE BACKGROUND TEST:

NONE

THE FOLLOWING DATA POINTS PASSED BACKGROUND, DCGLw, AND EMC SCREENING TESTS:

Survey Unit 09

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
330.0	739.0	0.0	0.1	S	RG	3.09	2.1	0.8	-0.2		1197		
349.0	706.0	0.5	1.0	S	BI	2.36	2.1	0.7	-0.2		1171		
336.0	726.0	0.0	0.1	S	RG	2.44	1.8	0.9	-0.2		1188		
336.0	739.0	0.0	0.1	S	RG	2.73	2.0	0.7	-0.2		1198		
325.0	724.0	0.0	1.0	S	BI	2.53	1.9	0.7	-0.2		1968		
343.0	706.0	0.0	0.1	S	RG	3.25	2.0	0.7	-0.2		1168		
320.0	725.0	0.0	1.0	S	BI	1.38	2.1	0.6	-0.2		1969		
336.0	732.0	0.5	1.0	S	BI	2.42	2.1	0.6	-0.2		1194		
323.0	713.0	0.5	1.0	S	BI	2.03	2.1	0.6	-0.2		1175		
349.0	706.0	0.1	0.5	S	BI	3.05	2.0	0.6	-0.2		1170		
330.0	745.0	0.5	1.0	S	BI	1.62	2.0	0.7	-0.2	Asphalt	1203		
343.0	713.0	0.0	0.1	S	RG	2.93	2.0	0.6	-0.2		1178		
349.0	713.0	0.0	0.1	S	RG	2.83	1.9	0.6	-0.2		1179		
356.0	713.0	0.0	0.1	S	RG	2.89	1.8	0.7	-0.2		1180		
330.0	732.0	0.0	0.1	S	RG	2.72	1.7	0.7	-0.2		1191		
336.0	706.0	0.0	0.1	S	RG	2.82	1.9	0.6	-0.2		1167		

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Threshold Comparison Test Report - Soils

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
336.0	732.0	0.1	0.5	S	BI	2.67	2.0	0.6	-0.2		1193		
336.0	732.0	0.0	0.1	S	RG	3.23	1.6	0.8	-0.3		1192		
330.0	745.0	0.1	0.5	S	BI	1.48	1.8	0.7	-0.3	Asphalt	1202		
336.0	713.0	0.0	0.1	S	RG	2.58	1.8	0.6	-0.3		1177		
330.0	706.0	0.0	0.1	S	RG	2.85	1.8	0.6	-0.3		1166		
336.0	719.0	0.0	0.1	S	RG	3.02	1.8	0.6	-0.3		1184		
349.0	706.0	0.0	0.1	S	RG	2.75	1.7	0.5	-0.3		1169		
330.0	719.0	0.0	0.1	S	RG	2.38	1.6	0.6	-0.3		1183		
330.0	713.0	0.0	0.1	S	RG	1.81	1.7	0.5	-0.3		1176		
330.0	726.0	0.0	0.1	S	RG	2.43	1.5	0.6	-0.3		1187		
323.0	713.0	0.1	0.5	S	BI	0.96	0.9	0.4	-0.5		1174		
320.0	731.0	0.0	0.1	S	BI	2.26	0.8	0.4	-0.5		2397		X
330.0	745.0	0.0	0.1	S	BI	0.62	0.3	0.3	-0.6	Asphalt	1201		
336.0	745.0	0.0	0.1	S	BI	0.28	0.2	0.3	-0.7	Asphalt	1204		
317.0	745.0	0.0	0.1	S	BI	0.72	0.2	0.3	-0.7	Asphalt	1199		
323.0	706.0	0.0	0.1	S	BI	0.29	0.2	0.3	-0.7	Asphalt	1165		
317.0	713.0	0.0	0.1	S	RG	0.19	0.2	0.2	-0.7	Asphalt	2014		
323.0	732.0	0.0	0.1	S	BI	0.46	0.1	0.3	-0.7	Asphalt	1190		
317.0	713.0	0.0	0.1	S	BI	0.06	0.2	0.2	-0.7	Asphalt	1172		
323.0	719.0	0.0	0.1	S	BI	0.3	0.2	0.2	-0.7	Asphalt	1182		
317.0	732.0	0.0	0.1	S	BI	0.5	0.2	0.3	-0.7	Asphalt	1189		
323.0	745.0	0.0	0.1	S	BI	0.17	0.2	0.3	-0.7	Asphalt	1200		
317.0	719.0	0.0	0.1	S	BI	0.35	0.3	0.2	-0.7	Asphalt	1181		
323.0	739.0	0.0	0.1	S	BI	0.34	0.2	0.3	-0.7	Asphalt	1196		
323.0	726.0	0.0	0.1	S	BI	0.34	0.3	0.2	-0.7	Asphalt	1186		
317.0	706.0	0.0	0.1	S	BI	0.11	0.2	0.3	-0.7	Asphalt	1164		
323.0	706.0	0.0	0.1	S	RG	0.55	0.2	0.2	-0.7	Asphalt	2011		
317.0	726.0	0.0	0.1	S	RG	0.39	0.1	0.3	-0.7	Asphalt	2023		
323.0	745.0	0.0	0.1	S	RG	0.33	0.2	0.2	-0.7	Asphalt	2040		
317.0	719.0	0.0	0.1	S	RG	0.46	0.3	0.2	-0.7	Asphalt	2018		
317.0	726.0	0.0	0.1	S	BI	0.31	0.2	0.2	-0.7	Asphalt	1185		
323.0	713.0	0.0	0.1	S	BI	0.23	0.2	0.2	-0.7	Asphalt	1173		
336.0	745.0	0.0	0.1	S	RG	0.14	0.2	0.2	-0.7	Asphalt	2042		
323.0	739.0	0.0	0.1	S	RG	0.24	0.1	0.3	-0.7	Asphalt	2033		
317.0	739.0	0.0	0.1	S	BI	0.42	0.2	0.2	-0.7	Asphalt	1195		
323.0	732.0	0.0	0.1	S	RG	0.31	0.2	0.2	-0.7	Asphalt	2028		
323.0	719.0	0.0	0.1	S	RG	0.13	0.1	0.3	-0.7	Asphalt	2019		
330.0	745.0	0.0	0.1	S	RG	0.36	0.1	0.2	-0.7	Asphalt	2041		
323.0	713.0	0.0	0.1	S	RG	0.3	0.1	0.2	-0.7	Asphalt	2015		
317.0	739.0	0.0	0.1	S	RG	0.35	0.2	0.2	-0.7	Asphalt	2034		
323.0	726.0	0.0	0.1	S	RG	0.55	0.2	0.2	-0.7	Asphalt	2024		
317.0	745.0	0.0	0.1	S	RG	0.54	0.2	0.2	-0.7	Asphalt	2039		
317.0	732.0	0.0	0.1	S	RG	0.4	0.1	0.3	-0.7	Asphalt	2027		
317.0	706.0	0.0	0.1	S	RG	0.66	0.1	0.2	-0.7	Asphalt	2010		

* All concentrations shown include background. FMPC is calculated net of Background Threshold.

KERR-MCGEE TECHNICAL CENTER

DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

Summary of Background Data and Thresholds Used in this Analysis

Measurement BK *DCGL:* 1.0 *EMC:* 3.0 *Nuclides* FMPC

Matrices S

Nuclide	*Number of Data Points*	*Average Background*	*Sigma*	*Background Threshold (Tbk)*	*DCGLw Threshold (Td)*	*EMC Threshold (Tc)*
		(pCi/g)	*(pCi/g)*	*(pCi/g)*	*(pCi/g)*	*(pCi/g)*
U	291	1.76	0.90	3.56	4.56	6.56
Th	291	2.29	0.26	2.81	3.81	5.81
Ra	291	0.64	0.11	0.86	1.86	3.86
FMPC	291	0.62	0.05			

KERR-MCGEE TECHNICAL CENTER

DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

STATISTICAL TEST

Run Date: 7/1/2003 1:39:00 AM

Survey Unit 09 Class 1

Selected Test: WILCOXON RANK SUM TEST

Test Pass

Thresholds:

EMC 3.0 DCGL 1.0 Nuclide FMPC

DATA SUMMARY

291 Background Points 33 Survey points processed

Wr = 52089 Wc 48126

****** The survey unit has passed the WILCOXON RANK SUM TEST ******

KERR-MCGEE TECHNICAL CENTER

DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

Run Date Monday, June 30, 2003

Survey Unit 10 Class: 2 Data Points U Grid Type R Spacing 9 m.

SURVEY UNIT TABLE

Borders				Surface Area Included	
N	S	E	W	(sq. m)	Remarks
770.	750.	330.	290.	798	
800.	770.	340.	290.	1497	
		Total		2295	

INITIALIZATION DATA

Measurement Types Selected: RG, PR, PG, BI, CH
Date Range: All
*** Report does not include Remediated data points ***

Thresholds:
EMC: 684.0 DCGLw 228.0 Nuclides U

SURVEY UNIT TEST STATUS

Test Performed	Status		Mtx	(pCi/g)
Min/Max	Pass	Maximum Survey Value	S	3.9
Background	Fail	Minimum Background	S	0.0
DCGLw	Pass	Difference		3.9
DCGLavg	Pass			
EMC	Pass	Average Activity	2.4	(pCi/g)
Wilcoxon Rank Sum	Pass			
Sign Test for Paired Data:	N/A			

KERR-MCGEE TECHNICAL CENTER

DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

THE FOLLOWING DATA POINTS FAILED THE EMC TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE DCGLw TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE BACKGROUND TEST:

Survey Unit 10

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
302.0	760.0	0.0	0.1	S	RG	3.85	2.0	0.8	-0.2		1042	C	

* All concentrations shown include background. FMPC is calculated net of Background Threshold.

THE FOLLOWING DATA POINTS PASSED BACKGROUND, DCGLw, AND EMC SCREENING TESTS:

Survey Unit 10

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
310.0	768.0	0.0	0.1	S	RG	2.45	2.2	0.8	-0.2		1048		
319.0	760.0	0.0	0.1	S	RG	2.92	2.1	0.8	-0.2		1044		
327.0	777.0	0.0	0.1	S	RG	2.41	2.1	0.8	-0.2		1057		
310.0	760.0	0.0	0.1	S	RG	2.43	2.0	0.8	-0.2		1043		
319.0	785.0	0.0	0.1	S	RG	3.01	2.1	0.8	-0.2		1062		
319.0	768.0	0.1	0.5	S	BI	2.49	2.1	0.7	-0.2		1050		
310.0	785.0	0.0	0.1	S	RG	3.42	2.0	0.8	-0.2		1061		
302.0	777.0	0.0	0.1	S	RG	2.69	1.9	0.9	-0.2		1054		
327.0	760.0	0.0	0.1	S	RG	2.76	2.1	0.7	-0.2		1045		
319.0	768.0	0.0	0.1	S	RG	2.71	2.1	0.8	-0.2		1049		
319.0	777.0	0.0	0.1	S	RG	2.64	2.0	0.8	-0.2		1056		
335.0	785.0	0.0	0.1	S	RG	2.06	2.0	0.8	-0.2		1064		

KERR-MCGEE TECHNICAL CENTER

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Threshold Comparison Test Report - Soils

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
302.0	768.0	0.0	0.1	S	RG	2.86	2.0	0.8	-0.2		1047		
310.0	793.0	0.1	0.5	S	BI	1.72	2.1	0.7	-0.2	Roadway	1070		
310.0	777.0	0.0	0.1	S	RG	2.88	2.2	0.6	-0.2		1055		
327.0	785.0	0.0	0.1	S	RG	2.54	2.0	0.8	-0.2		1063		
327.0	768.0	0.0	0.1	S	RG	2.6	2.1	0.7	-0.2		1052		
302.0	785.0	0.0	0.1	S	RG	3.24	2.0	0.8	-0.2		1060		
310.0	793.0	0.5	1.0	S	BI	2.16	2.0	0.7	-0.2	Roadway	1071		
294.0	777.0	0.0	0.1	S	RG	2.52	2.0	0.8	-0.2		1053		
294.0	785.0	0.0	0.1	S	RG	3.31	1.9	0.8	-0.2		1059		
294.0	752.0	0.0	0.1	S	RG	2.5	2.0	0.7	-0.2		1034		
335.0	777.0	0.0	0.1	S	RG	2.51	2.0	0.7	-0.2		1058		
310.0	793.0	0.0	0.1	S	RG	2.91	1.9	0.8	-0.2	Roadway	1069		
335.0	785.0	0.1	0.5	S	BI	1.72	2.0	0.7	-0.2		1065		
294.0	760.0	0.0	0.1	S	RG	2.24	1.9	0.7	-0.2		1041		
319.0	768.0	0.5	1.0	S	BI	2.77	2.0	0.6	-0.2		1051		
294.0	793.0	0.0	0.1	S	RG	1.93	1.8	0.8	-0.2	Roadway	1067		
294.0	768.0	0.0	0.1	S	RG	2.45	1.8	0.8	-0.2		1046		
327.0	752.0	0.5	1.0	S	BI	2.45	2.0	0.5	-0.2		1040		
335.0	785.0	0.5	1.0	S	BI	1.86	1.9	0.6	-0.3		1066		
302.0	752.0	0.0	0.1	S	RG	2.94	1.6	0.7	-0.3		1035		
319.0	793.0	0.0	0.1	S	RG	1.87	1.6	0.6	-0.3	Roadway	1072		
302.0	793.0	0.0	0.1	S	RG	1.54	1.5	0.7	-0.3	Roadway	1068		
319.0	752.0	0.0	0.1	S	RG	1.9	1.5	0.6	-0.3		1037		
327.0	793.0	0.0	0.1	S	RG	1.49	1.4	0.6	-0.3	Roadway	1073		
310.0	752.0	0.0	0.1	S	RG	1.57	1.4	0.6	-0.4		1036		
327.0	752.0	0.0	0.1	S	RG	1.49	1.4	0.5	-0.4		1038		
327.0	752.0	0.1	0.5	S	BI	1.04	1.2	0.4	-0.4		1039		
335.0	793.0	0.0	0.1	S	RG	0.97	1.1	0.4	-0.5	Roadway	1074		

* All concentrations shown include background. FMPC is calculated net of Background Threshold.

KERR-MCGEE TECHNICAL CENTER

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Threshold Comparison Test Report - Soils

Summary of Background Data and Thresholds Used in this Analysis

Measurement BK ***DCGL:*** 228.0 ***EMC:*** 684.0 ***Nuclides*** U

Matrices S

Nuclide	*Number of Data Points*	*Average Background*	*Sigma*	*Background Threshold (Tbk)*	*DCGLw Threshold (Td)*	*EMC Threshold (Tc)*
		(pCi/g)	*(pCi/g)*	*(pCi/g)*	*(pCi/g)*	*(pCi/g)*
U	291	1.76	0.90	3.56	231.56	687.56
Th	291	2.29	0.26	2.81	230.81	686.81
Ra	291	0.64	0.11	0.86	228.86	684.86
FMPC	291	0.62	0.05			

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Threshold Comparison Test Report - Soils

STATISTICAL TEST

Run Date: 7/1/2003 1:39:53 AM

Survey Unit 10 Class 2

Selected Test: WILCOXON RANK SUM TEST

Test Pass

Thresholds:

EMC 684.0 DCGL 228.0 Nuclide U

DATA SUMMARY

291 Background Points 33 Survey points processed

Wr = 52089 Wc 48126

****** The survey unit has passed the WILCOXON RANK SUM TEST ******

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Threshold Comparison Test Report - Soils

Run Date Monday, June 30, 2003

Survey Unit 11 Class: 1 Data Points FMPC Grid Type R Spacing 7 m.

SURVEY UNIT TABLE

Borders				Surface Area Included	
N	S	E	W	(sq. m)	Remarks
770.	750.	340.	330.	200	
800.	767.	375.	340.	1155	
767.	757.	375.	369.	60	
		Total		1415	

INITIALIZATION DATA

Measurement Types Selected: RG, PR, PG, BI, CH

Date Range: All

*** Report does not include Remediated data points ***

Thresholds:

EMC: 3.0 DCGLw 1.0 Nuclides FMPC

SURVEY UNIT TEST STATUS

Test Performed	Status		Mtx	FMPC
Min/Max	Fail	Maximum Survey Value	S	1.5
Background	Fail	Minimum Background	S	0.3
DCGLw	Pass	Difference		1.2
DCGLavg	Pass			
EMC	Pass			
		Average Activity	-0.1	FMPC
Wilcoxon Rank Sum	Pass			
Sign Test for Paired Data:	N/A			

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Threshold Comparison Test Report - Soils

THE FOLLOWING DATA POINTS FAILED THE EMC TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE DCGLw TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE BACKGROUND TEST:

Survey Unit 11

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
364.0	772.0	0.5	1.0	S	BI	9.32	1.6	4.2	0.7		1856	C	
365.0	772.0	0.3	0.4	S	PR	3.71	1.7	1.8	0.1		2479	C	

* All concentrations shown include background. FMPC is calculated net of Background Threshold.

THE FOLLOWING DATA POINTS PASSED BACKGROUND, DCGLw, AND EMC SCREENING TESTS:

Survey Unit 11

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
372.0	781.0	0.5	1.0	S	BI	5.82	1.8	1.5	0.0	SDR-0003	2264		
358.0	784.0	0.3	0.4	S	PG	2.71	2.4	0.9	-0.1		2512		
365.0	773.0	0.5	1.0	S	BI	3.69	2.0	1.2	-0.1		1859		
357.0	783.0	0.5	1.0	S	BI	2.82	2.4	0.8	-0.1	SDR-0004	2244		
332.0	764.0	0.0	0.1	S	RG	2.79	2.3	0.8	-0.1		1845		
364.0	772.0	0.3	0.4	S	PR	3.11	1.9	1.0	-0.1	NRC -	2492		
356.0	783.0	0.0	0.1	S	BI	2.37	2.2	0.8	-0.1	SDR-0004	2246		
363.0	775.0	0.0	0.1	S	BI	2.23	1.9	0.9	-0.2	SDR-0004	2203		
351.0	784.0	0.0	0.1	S	RG	2.52	2.3	0.7	-0.2	Gravel	1828		
338.0	764.0	0.0	0.1	S	RG	3.33	2.0	0.8	-0.2		1846		
367.0	773.0	0.3	0.4	S	PR	2.28	2.0	0.8	-0.2		2473		
364.0	772.0	0.3	0.4	S	PR	2.55	1.9	0.9	-0.2		2469		
366.0	772.0	0.3	0.4	S	PR	2.31	2.1	0.7	-0.2		2476		
357.0	783.0	0.3	0.4	S	PR	1.99	2.1	0.7	-0.2		2475		
366.0	772.0	0.4	0.8	S	PR	2.68	2.0	0.8	-0.2		2477		
358.0	797.0	0.0	0.1	S	RG	2.99	2.0	0.8	-0.2		1818		
365.0	797.0	0.0	0.1	S	RG	2.65	2.0	0.8	-0.2		1819		
365.0	773.0	0.3	0.4	S	PR	2.21	2.0	0.8	-0.2		2472		
361.0	773.0	0.0	0.1	S	BI	3.13	1.6	1.0	-0.2	SDR-0004	2199		
351.0	784.0	0.1	0.5	S	BI	2.42	2.1	0.7	-0.2	Gravel	1829		

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DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
338.0	757.0	0.0	0.1	S	RG	4.15	2.0	0.7	-0.2		1849		
364.0	772.0	0.4	0.8	S	PR	2.7	1.9	0.8	-0.2		2470		
338.0	751.0	0.0	0.1	S	RG	2.75	2.0	0.7	-0.2		1851		
365.0	770.0	0.3	0.4	S	PG	3.38	2.1	0.7	-0.2		2513		
351.0	770.0	0.1	0.5	S	BI	3.24	2.0	0.7	-0.2	Gravel	1840		
358.0	790.0	0.1	0.5	S	BI	1.85	2.0	0.7	-0.2	Gravel	1824		
345.0	797.0	0.0	0.1	S	RG	1.67	2.0	0.7	-0.2		1816		
364.0	772.0	0.8	1.3	S	PR	3.15	1.9	0.7	-0.2		2471		
338.0	751.0	0.1	0.5	S	BI	2.68	1.8	0.8	-0.2		1852		
367.0	775.0	0.0	0.1	S	BI	3.47	1.2	1.2	-0.2	SDR-0004	2213		
351.0	784.0	0.5	1.0	S	BI	2.27	2.0	0.6	-0.2	Gravel	1830		
332.0	757.0	0.0	0.1	S	RG	3.59	1.7	0.8	-0.2		1848		
364.0	772.0	0.5	1.0	S	BI	3.68	2.0	0.6	-0.2	SDR-0004	2206		
363.0	773.0	0.0	0.1	S	BI	2.61	1.4	1.0	-0.2	SDR-0004	2202		
358.0	790.0	0.5	1.0	S	BI	2.52	1.9	0.6	-0.2	Gravel	1825		
365.0	775.0	0.0	0.1	S	BI	3.3	1.4	1.0	-0.2	SDR-0004	2210		
366.0	772.0	0.8	1.3	S	PR	1.8	2.2	0.4	-0.3		2478		
351.0	797.0	0.0	0.1	S	RG	2.32	1.8	0.7	-0.3		1817		
338.0	751.0	0.5	1.0	S	BI	2.13	1.9	0.6	-0.3		1853		
351.0	770.0	0.5	1.0	S	BI	2.95	1.9	0.6	-0.3	Gravel	1841		
358.0	777.0	0.0	0.1	S	RG	3.16	1.4	0.8	-0.3	Gravel	1835		
372.0	781.0	0.1	0.5	S	BI	1.71	1.7	0.6	-0.3	SDR-0003	2263		
361.0	771.0	0.0	0.1	S	BI	3.85	1.1	0.9	-0.3	SDR-0004	2198		
351.0	790.0	0.0	0.1	S	RG	2.69	1.5	0.7	-0.3	Gravel	1822		
371.0	797.0	0.0	0.1	S	RG	2.28	1.5	0.7	-0.3		1820		
351.0	777.0	0.0	0.1	S	RG	2.82	0.7	1.1	-0.3	Gravel	1834		
371.0	764.0	0.0	0.1	S	RG	2.12	1.5	0.5	-0.4	Gravel	1847		
363.0	769.0	0.0	0.1	S	BI	2.04	1.1	0.7	-0.4	SDR-0004	2200		
345.0	770.0	0.0	0.1	S	RG	1.72	1.1	0.7	-0.4		1838		
332.0	751.0	0.0	0.1	S	RG	1.93	1.3	0.6	-0.4		1850		
365.0	777.0	0.0	0.1	S	RG	2.65	0.9	0.8	-0.4	Gravel	1836		
363.0	771.0	0.0	0.1	S	BI	2.26	1.2	0.6	-0.4	SDR-0004	2201		
371.0	790.0	0.0	0.1	S	RG	1.81	1.3	0.6	-0.4	Gravel	1827		
351.0	770.0	0.0	0.1	S	RG	2.39	0.8	0.8	-0.4	Gravel	1839		
373.0	777.0	0.0	0.1	S	BI	2.08	0.5	1.0	-0.4	SDR-0003	2215		
373.0	781.0	0.0	0.1	S	BI	1.66	0.8	0.8	-0.4	SDR-0003	2217		
345.0	790.0	0.0	0.1	S	RG	2.08	0.7	0.8	-0.4	Gravel	1821		
373.0	779.0	0.0	0.1	S	BI	1.02	0.7	0.8	-0.4	SDR-0003	2216		
371.0	770.0	0.0	0.1	S	RG	1.73	0.8	0.6	-0.5	Gravel	1844		
358.0	770.0	0.0	0.1	S	RG	1.55	0.6	0.6	-0.5	Gravel	1842		
373.0	783.0	0.0	0.1	S	BI	1.33	0.7	0.6	-0.5	SDR-0003	2218		
374.0	775.0	0.0	0.1	S	BI	1.7	0.7	0.6	-0.5	SDR-0003	2259		
373.0	781.0	0.0	0.1	S	BI	1.51	0.8	0.5	-0.5	SDR-0003	2267		
365.0	790.0	0.0	0.1	S	RG	1.2	0.8	0.4	-0.5	Gravel	1826		
365.0	784.0	0.0	0.1	S	RG	1.58	0.4	0.6	-0.5	Gravel	1832		
373.0	775.0	0.0	0.1	S	BI	1.07	0.6	0.5	-0.5	SDR-0003	2214		
371.0	784.0	0.0	0.1	S	RG	0.92	0.6	0.5	-0.5	Gravel	1833		
365.0	769.0	0.0	0.1	S	BI	1.19	0.5	0.6	-0.5	SDR-0004	2207		
372.0	780.0	0.0	0.1	S	BI	1.28	0.7	0.4	-0.5	SDR-0003	2266		
371.0	777.0	0.0	0.1	S	RG	1.47	0.4	0.6	-0.6	Gravel	1837		
372.0	782.0	0.0	0.1	S	BI	0.57	0.6	0.4	-0.6	SDR-0003	2265		
358.0	790.0	0.0	0.1	S	RG	0.84	0.5	0.4	-0.6	Gravel	1823		
371.0	782.0	0.0	0.1	S	BI	0.61	0.6	0.4	-0.6	SDR-0003	2268		
372.0	781.0	0.0	0.1	S	BI	0.47	0.3	0.4	-0.6	SDR-0003	2262		

* All concentrations shown include background. FMPC is calculated net of Background Threshold.

KERR-MCGEE TECHNICAL CENTER

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Threshold Comparison Test Report - Soils

Summary of Background Data and Thresholds Used in this Analysis

Measurement BK *DCGL:* 1.0 *EMC:* 3.0 *Nuclides* FMPC

Matrices S

Nuclide	*Number of Data Points*	*Average Background*	*Sigma*	*Background Threshold (Tbk)*	*DCGLw Threshold (Td)*	*EMC Threshold (Tc)*
		(pCi/g)	*(pCi/g)*	*(pCi/g)*	*(pCi/g)*	*(pCi/g)*
U	291	1.76	0.90	3.56	4.56	6.56
Th	291	2.29	0.26	2.81	3.81	5.81
Ra	291	0.64	0.11	0.86	1.86	3.86
FMPC	291	0.62	0.05			

KERR-MCGEE TECHNICAL CENTER

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Threshold Comparison Test Report - Soils

STATISTICAL TEST

Run Date: 7/1/2003 1:40:56 AM

Survey Unit 11 Class 1

Selected Test: WILCOXON RANK SUM TEST

Test Pass

Thresholds:

EMC 3.0 DCGL 1.0 Nuclide FMPC

DATA SUMMARY

291 Background Points 30 Survey points processed

Wr = 51216 Wc 47647

****** The survey unit has passed the WILCOXON RANK SUM TEST ******

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Threshold Comparison Test Report - Soils

Run Date Monday, June 30, 2003

Survey Unit 12 Class: 1 Data Points FMPC Grid Type R Spacing 7 m.

SURVEY UNIT TABLE

Borders				Surface Area Included	
N	S	E	W	(sq. m)	Remarks
800.	767.	420.	375.	1488	
757.	750.	420.	405.	106	
767.	757.	420.	408.	121	
		Total		1715	

INITIALIZATION DATA

Measurement Types Selected: RG, PR, PG, BI, CH

Date Range: All

*** Report does not include Remediated data points ***

Thresholds:

EMC: 3.0 DCGLw 1.0 Nuclides FMPC

SURVEY UNIT TEST STATUS

Test Performed	Status		Mtx	FMPC
Min/Max	Pass	Maximum Survey Value	S	1.1
Background	Fail	Minimum Background	S	0.3
DCGLw	Pass	Difference		0.8
DCGLavg	Pass			
EMC	Pass	Average Activity	-0.1	FMPC
Wilcoxon Rank Sum	Pass			
Sign Test for Paired Data:	N/A			

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Threshold Comparison Test Report - Soils

THE FOLLOWING DATA POINTS FAILED THE EMC TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE DCGLw TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE BACKGROUND TEST:

Survey Unit 12

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
391.5	768.0	0.0	0.1	S	BI	2.1	2.1	2.3	0.3	Hot Spots	2529	C	
414.2	764.0	0.3	0.4	S	PR	10.2	1.7	2.4	0.2	NRC -	2493	C	
376.0	770.0	0.1	0.5	S	BI	5.61	1.3	2.3	0.1		1810	C	
375.0	776.0	0.1	0.5	S	BI	8.07	1.7	1.9	0.1	SDR-000	2224	C	
413.0	764.0	0.5	1.0	S	BI	12.5	2.0	1.4	0.0		1803	C	

* All concentrations shown include background. FMPC is calculated net of Background Threshold.

THE FOLLOWING DATA POINTS PASSED BACKGROUND, DCGLw, AND EMC SCREENING TESTS:

Survey Unit 12

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
375.0	776.0	0.5	1.0	S	BI	4.72	1.9	1.4	0.0	SDR-0003	2225		
375.0	775.0	0.1	0.5	S	BI	5.22	1.8	1.3	-0.1	SDR-0003	2257		
420.0	793.0	0.0	0.1	S	RG	1.98	2.4	0.8	-0.1		1773		
376.0	770.0	0.5	1.0	S	BI	3.66	1.8	1.1	-0.1		1811		
420.0	764.0	0.0	0.1	S	RG	3.02	1.8	1.1	-0.1		1804		
375.0	782.0	0.1	0.5	S	BI	3.15	2.0	0.9	-0.1		1813		
375.0	773.0	0.1	0.3	S	PR	4.26	0.9	1.6	-0.1		2474		
414.0	762.5	0.3	0.4	S	PR	6.43	2.0	0.8	-0.2		2463		

KERR-MCGEE TECHNICAL CENTER

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Threshold Comparison Test Report - Soils

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
375.0	782.0	0.1	0.5	S	BI	2.62	2.2	0.7	-0.2	SDR-0003	2230		
377.0	771.0	0.1	0.5	S	BI	3.26	2.0	0.8	-0.2		1791		
391.0	793.0	0.1	0.5	S	BI	1.65	1.9	0.8	-0.2		1768		
413.0	757.0	0.0	0.1	S	RG	2.86	2.0	0.7	-0.2		1805		
377.0	769.0	0.0	0.1	S	BI	3.22	1.3	1.2	-0.2	SDR-0003	2234		
420.0	786.0	0.0	0.1	S	RG	2.22	2.1	0.7	-0.2		1782		
420.0	757.0	0.5	1.0	S	BI	2.17	2.2	0.6	-0.2		1808		
420.0	757.0	0.0	0.1	S	RG	3.26	1.9	0.7	-0.2		1806		
375.0	775.0	0.5	1.0	S	BI	3.6	1.7	0.8	-0.2	SDR-0003	2258		
420.0	778.0	0.0	0.1	S	RG	2.47	2.0	0.7	-0.2		1789		
415.0	764.0	0.5	1.0	S	BI	2.68	2.2	0.6	-0.2	SDR-0006	2284		
415.0	764.0	0.1	0.5	S	BI	3.13	2.2	0.5	-0.2	SDR-0006	2283		
413.0	786.0	0.0	0.1	S	RG	2.08	2.0	0.7	-0.2		1781		
375.0	776.0	0.1	0.3	S	PR	6.99	1.2	1.1	-0.2		2468		
377.0	771.0	0.5	1.0	S	BI	2.42	2.0	0.6	-0.2		1792		
376.0	770.0	0.0	0.1	S	PR	2.47	1.3	1.1	-0.2		2466		
420.0	757.0	0.1	0.5	S	BI	2.31	2.1	0.6	-0.2		1807		
398.0	771.0	0.0	0.1	S	RG	2.92	2.0	0.6	-0.2		1795		
375.0	782.0	0.5	1.0	S	BI	2.87	1.9	0.6	-0.2		1814		
405.0	786.0	0.5	1.0	S	BI	2.45	2.0	0.6	-0.2		1780		
377.0	793.0	0.0	0.1	S	RG	2.02	1.8	0.7	-0.2		1765		
413.0	771.0	0.1	0.5	S	BI	3.11	1.8	0.6	-0.3		1798		
413.0	763.0	0.0	0.1	S	BI	2.95	1.6	0.8	-0.3	SDR-0006	2288		
413.0	793.0	0.0	0.1	S	RG	3.46	1.9	0.6	-0.3		1772		
375.0	782.0	0.5	1.0	S	BI	2.02	1.9	0.5	-0.3	SDR-0003	2231		
420.0	771.0	0.0	0.1	S	RG	2.63	1.9	0.6	-0.3		1800		
391.0	793.0	0.5	1.0	S	BI	2.43	1.7	0.6	-0.3		1769		
405.0	786.0	0.1	0.5	S	BI	2.62	1.7	0.6	-0.3		1779		
413.0	762.0	0.0	0.1	S	BI	2.99	1.7	0.6	-0.3	SDR-0006	2275		
413.0	764.0	1.0	2.0	S	BI	2.26	2.0	0.5	-0.3	SDR-0006	2279		
411.0	762.0	0.0	0.1	S	BI	2.91	1.8	0.5	-0.3	SDR-0006	2269		
415.0	764.0	1.0	2.0	S	BI	2.01	1.9	0.5	-0.3	SDR-0006	2285		
413.0	764.0	0.4	0.9	S	PR	2.22	1.6	0.6	-0.3		2465		
377.0	779.0	0.0	0.1	S	BI	2.26	1.6	0.7	-0.3	SDR-0003	2239		
377.0	783.0	0.0	0.1	S	BI	1.85	1.8	0.5	-0.3	SDR-0003	2241		
377.0	771.0	0.0	0.1	S	RG	2.75	1.1	1.0	-0.3		1790		
384.0	771.0	0.0	0.1	S	RG	2.27	1.8	0.5	-0.3		1793		
413.0	778.0	0.0	0.1	S	RG	2.82	1.7	0.6	-0.3		1788		
411.0	764.0	0.1	0.5	S	BI	4.05	1.6	0.6	-0.3	SDR-0006	2271		
375.0	771.0	0.0	0.1	S	BI	2.4	1.0	1.0	-0.3	SDR-0003	2220		
413.0	764.0	0.5	1.0	S	BI	2.23	1.9	0.4	-0.3	SDR-0006	2278		
411.0	764.0	1.0	2.0	S	BI	2.59	1.8	0.4	-0.3	SDR-0006	2273		
391.0	771.0	0.0	0.1	S	RG	2.27	1.6	0.6	-0.3		1794		
413.0	771.0	0.5	1.0	S	BI	2.55	1.7	0.5	-0.3		1799		
391.0	786.0	0.0	0.1	S	RG	2.57	1.3	0.8	-0.3		1776		
375.0	769.0	0.0	0.1	S	BI	1.73	1.0	1.0	-0.3	SDR-0003	2219		
413.0	766.0	0.0	0.1	S	BI	2.68	1.6	0.6	-0.3	SDR-0006	2280		
413.0	771.0	0.0	0.1	S	RG	2.2	1.7	0.5	-0.3		1797		
377.0	771.0	0.0	0.1	S	BI	2.14	1.1	0.9	-0.3	SDR-0003	2235		
411.0	764.0	0.5	1.0	S	BI	2.05	1.6	0.6	-0.3	SDR-0006	2272		
413.0	764.0	0.3	0.4	S	PG	2.2	1.7	0.5	-0.3		2464		
375.0	779.0	0.0	0.1	S	BI	1.95	1.3	0.7	-0.3	SDR-0003	2227		
377.0	775.0	0.0	0.1	S	BI	1.86	1.3	0.8	-0.3	SDR-0003	2237		
377.0	781.0	0.0	0.1	S	BI	2.35	1.6	0.5	-0.3	SDR-0003	2240		
398.0	786.0	0.0	0.1	S	RG	3.45	1.3	0.7	-0.3		1777		
375.0	785.0	0.0	0.1	S	BI	2.05	1.5	0.5	-0.3	SDR-0003	2233		

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Threshold Comparison Test Report - Soils

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
375.0	781.0	0.0	0.1	S	BI	2.1	1.6	0.5	-0.4	SDR-0003	2228		
377.0	777.0	0.0	0.1	S	BI	1.77	1.3	0.6	-0.4	SDR-0003	2238		
411.0	764.0	0.0	0.1	S	BI	3.77	1.4	0.5	-0.4	SDR-0006	2270		
377.0	773.0	0.0	0.1	S	BI	2.08	1.1	0.7	-0.4	SDR-0003	2236		
384.0	778.0	0.0	0.1	S	RG	1.87	1.3	0.6	-0.4		1784		
375.0	782.0	0.0	0.1	S	PR	1.29	1.3	0.6	-0.4		2467		
407.0	793.0	0.0	0.1	S	RG	1.87	1.3	0.6	-0.4		1771		
377.0	778.0	0.0	0.1	S	RG	2.18	1.1	0.7	-0.4		1783		
414.0	762.0	0.0	0.1	S	BI	2.88	1.2	0.6	-0.4	SDR-0006	2290		
415.0	762.0	0.0	0.1	S	BI	2.21	1.4	0.4	-0.4	SDR-0006	2281		
375.0	783.0	0.0	0.1	S	BI	1.34	1.3	0.6	-0.4	SDR-0003	2232		
415.0	766.0	0.0	0.1	S	BI	2.25	1.4	0.4	-0.4	SDR-0006	2286		
398.0	793.0	0.0	0.1	S	RG	1.12	1.1	0.6	-0.4		1770		
384.0	793.0	0.0	0.1	S	RG	1.83	1.2	0.5	-0.4		1766		
411.0	766.0	0.0	0.1	S	BI	2.09	1.4	0.3	-0.4	SDR-0006	2274		
405.0	771.0	0.0	0.1	S	RG	2.18	1.1	0.6	-0.4		1796		
415.0	763.0	0.0	0.1	S	BI	2.41	1.2	0.4	-0.4	SDR-0006	2291		
407.0	778.0	0.0	0.1	S	RG	2.16	1.1	0.5	-0.4		1787		
405.0	786.0	0.0	0.1	S	RG	1.54	1.0	0.6	-0.4		1778		
391.0	793.0	0.0	0.1	S	RG	0.76	1.0	0.5	-0.4		1767		
377.0	786.0	0.0	0.1	S	RG	1.53	1.0	0.5	-0.5		1774		
398.0	778.0	0.0	0.1	S	RG	1.35	0.6	0.7	-0.5		1786		
415.0	764.0	0.0	0.1	S	BI	1.82	1.2	0.4	-0.5	SDR-0006	2276		
384.0	786.0	0.0	0.1	S	RG	1.01	0.7	0.4	-0.6		1775		
391.0	778.0	0.0	0.1	S	RG	0.94	0.5	0.4	-0.6		1785		

* All concentrations shown include background. FMPC is calculated net of Background Threshold.

KERR-MCGEE TECHNICAL CENTER

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Threshold Comparison Test Report - Soils

Summary of Background Data and Thresholds Used in this Analysis

Measurement BK *DCGL:* 1.0 *EMC:* 3.0 *Nuclides* FMPC

Matrices S

Nuclide	*Number of Data Points*	*Average Background*	*Sigma*	*Background Threshold (Tbk)*	*DCGLw Threshold (Td)*	*EMC Threshold (Tc)*
		(pCi/g)	*(pCi/g)*	*(pCi/g)*	*(pCi/g)*	*(pCi/g)*
U	291	1.76	0.90	3.56	4.56	6.56
Th	291	2.29	0.26	2.81	3.81	5.81
Ra	291	0.64	0.11	0.86	1.86	3.86
FMPC	291	0.62	0.05			

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Threshold Comparison Test Report - Soils

STATISTICAL TEST

Run Date: 7/1/2003 1:41:56 AM

Survey Unit 12 Class 1

Selected Test: WILCOXON RANK SUM TEST

Test Pass

Thresholds:

EMC 3.0 DCGL 1.0 Nuclide FMPC

DATA SUMMARY

291 Background Points 32 Survey points processed

Wr = 51798 Wc 47967

****** The survey unit has passed the WILCOXON RANK SUM TEST ******

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Threshold Comparison Test Report - Soils

Run Date Monday, June 30, 2003

Survey Unit 13 Class: 1 Data Points U Grid Type R Spacing 7 m.

SURVEY UNIT TABLE

Borders				Surface Area Included	
N	S	E	W	(sq. m)	Remarks
800.	750.	455.	420.	1745	
		Total		1745	

INITIALIZATION DATA

Measurement Types Selected: RG, PR, PG, BI, CH
Date Range: All
*** Report does not include Remediated data points ***

Thresholds:
EMC: 684.0 DCGLw 228.0 Nuclides U

SURVEY UNIT TEST STATUS

Test Performed	Status		Mtx	(pCi/g)
Min/Max	Pass	Maximum Survey Value	S	3.6
Background	Fail	Minimum Background	S	0.0
DCGLw	Pass	Difference		3.6
DCGLavg	Pass			
EMC	Pass	Average Activity	2.6	(pCi/g)
Wilcoxon Rank Sum	Pass			
Sign Test for Paired Data:	N/A			

KERR-MCGEE TECHNICAL CENTER

DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

THE FOLLOWING DATA POINTS FAILED THE EMC TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE DCGLw TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE BACKGROUND TEST:

Survey Unit 13

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
450.0	797.0	0.0	0.1	S	RG	3.64	2.2	0.9	-0.1		1158	C	

* All concentrations shown include background. FMPC is calculated net of Background Threshold.

THE FOLLOWING DATA POINTS PASSED BACKGROUND, DCGLw, AND EMC SCREENING TESTS:

Survey Unit 13

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
429.0	797.0	0.0	0.1	S	RG	3.16	2.3	0.9	-0.1		1153		
421.0	797.0	0.0	0.1	S	RG	2.67	2.1	0.9	-0.1		1152		
436.0	797.0	0.0	0.1	S	RG	3.16	2.2	0.9	-0.1		1154		
436.0	797.0	0.1	0.5	S	BI	2.99	2.2	0.8	-0.1		1155		
450.0	792.0	0.0	0.1	S	RG	1.91	2.3	0.7	-0.1		1151		
436.0	792.0	0.0	0.1	S	RG	3.14	2.1	0.8	-0.1		1149		
443.0	797.0	0.0	0.1	S	RG	3.3	2.2	0.8	-0.1		1157		
436.0	797.0	0.5	1.0	S	BI	2.45	2.1	0.8	-0.1		1156		
443.0	755.0	0.0	0.1	S	RG	3.19	2.0	0.9	-0.1		1121		
450.0	784.0	0.0	0.1	S	RG	3.38	2.1	0.8	-0.2		1146		
450.0	755.0	0.0	0.1	S	RG	2.99	2.0	0.8	-0.2		1122		
429.0	792.0	0.0	0.1	S	RG	2.33	2.3	0.6	-0.2		1148		

KERR-MCGEE TECHNICAL CENTER

DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
421.0	763.0	0.0	0.1	S	RG	2.44	1.9	0.9	-0.2		1123		
421.0	755.0	0.0	0.1	S	RG	2.78	1.8	0.9	-0.2		1116		
443.0	792.0	0.0	0.1	S	RG	3.48	2.1	0.7	-0.2		1150		
436.0	763.0	0.0	0.1	S	RG	2.58	2.1	0.7	-0.2		1125		
450.0	763.0	0.0	0.1	S	RG	2.08	2.1	0.7	-0.2		1127		
443.0	784.0	0.0	0.1	S	RG	2.45	2.0	0.7	-0.2		1145		
421.0	792.0	0.0	0.1	S	RG	3.07	2.1	0.7	-0.2		1147		
429.0	770.0	0.0	0.1	S	RG	2.27	2.0	0.7	-0.2		1129		
429.0	763.0	0.0	0.1	S	RG	3.05	2.0	0.7	-0.2		1124		
436.0	755.0	0.0	0.1	S	RG	2.67	1.8	0.8	-0.2		1118		
443.0	763.0	0.0	0.1	S	RG	2.77	2.1	0.6	-0.2		1126		
436.0	784.0	0.0	0.1	S	RG	2.31	2.0	0.7	-0.2		1144		
429.0	777.0	0.0	0.1	S	RG	2.17	2.1	0.6	-0.2		1136		
443.0	770.0	0.0	0.1	S	RG	2.66	1.7	0.8	-0.2		1133		
436.0	777.0	0.0	0.1	S	RG	2.06	2.1	0.6	-0.2		1137		
422.0	769.0	0.1	0.5	S	BI	2.62	2.1	0.6	-0.2		1160		
436.0	770.0	0.0	0.1	S	RG	2.04	2.0	0.6	-0.2		1132		
429.0	784.0	0.0	0.1	S	RG	2.41	1.8	0.8	-0.2		1141		
436.0	755.0	0.1	0.5	S	BI	2.98	1.9	0.7	-0.2		1119		
429.0	755.0	0.0	0.1	S	RG	2.36	1.7	0.8	-0.2		1117		
443.0	777.0	0.0	0.1	S	RG	2.87	1.8	0.7	-0.2		1138		
421.0	784.0	0.0	0.1	S	RG	2.3	1.9	0.6	-0.2		1140		
436.0	755.0	0.5	1.0	S	BI	1.69	1.9	0.6	-0.3		1120		
422.0	769.0	0.0	0.1	S	BI	2.98	1.7	0.7	-0.3		1159		
429.0	784.0	0.1	0.5	S	BI	1.67	1.9	0.6	-0.3		1142		
429.0	784.0	0.5	1.0	S	BI	1.64	2.0	0.5	-0.3		1143		
421.0	770.0	0.0	0.1	S	RG	2.66	1.8	0.6	-0.3		1128		
421.0	777.0	0.0	0.1	S	RG	2.9	1.8	0.5	-0.3		1135		
422.0	769.0	0.5	1.0	S	BI	2.12	1.8	0.5	-0.3		1161		
450.0	777.0	0.0	0.1	S	RG	2.47	1.7	0.5	-0.3		1139		
429.0	770.0	0.5	1.0	S	BI	2.45	1.6	0.5	-0.3		1131		
429.0	770.0	0.1	0.5	S	BI	2.52	1.6	0.5	-0.3		1130		
450.0	770.0	0.0	0.1	S	RG	2.6	1.6	0.4	-0.3		1134		
422.0	769.0	1.5	2.0	S	BI	1.68	1.6	0.4	-0.4		1163		
422.0	769.0	1.0	1.5	S	BI	1.51	1.6	0.3	-0.4		1162		

* All concentrations shown include background. FMPC is calculated net of Background Threshold.

KERR-MCGEE TECHNICAL CENTER

DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

Summary of Background Data and Thresholds Used in this Analysis

Measurement BK *DCGL:* 228.0 *EMC:* 684.0 *Nuclides* U

Matrices S

Nuclide	*Number of Data Points*	*Average Background*	*Sigma*	*Background Threshold (Tbk)*	*DCGLw Threshold (Td)*	*EMC Threshold (Tc)*
		(pCi/g)	*(pCi/g)*	*(pCi/g)*	*(pCi/g)*	*(pCi/g)*
U	291	1.76	0.90	3.56	231.56	687.56
Th	291	2.29	0.26	2.81	230.81	686.81
Ra	291	0.64	0.11	0.86	228.86	684.86
FMPC	291	0.62	0.05			

KERR-MCGEE TECHNICAL CENTER

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Threshold Comparison Test Report - Soils

STATISTICAL TEST

Run Date: 7/1/2003 1:43:08 AM

Survey Unit 13 Class 1

Selected Test: WILCOXON RANK SUM TEST

Test Pass

Thresholds:

EMC 684.0 DCGL 228.0 Nuclide U

DATA SUMMARY

291 Background Points 35 Survey points processed

Wr = 52671 Wc 48445

****** The survey unit has passed the WILCOXON RANK SUM TEST ******

KERR-MCGEE TECHNICAL CENTER

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Threshold Comparison Test Report - Soils

Run Date Monday, June 30, 2003

Survey Unit 14 Class: 1 Data Points RA Grid Type R Spacing 7 m.

SURVEY UNIT TABLE

Borders				Surface Area Included	
N	S	E	W	(sq. m)	Remarks
800.	750.	490.	455.	1750	
		Total		1750	

INITIALIZATION DATA

Measurement Types Selected: RG, PR, PG, BI, CH
Date Range: All
*** Report does not include Remediated data points ***

Thresholds:
EMC: 10.5 DCGLw 3.5 Nuclides Ra

SURVEY UNIT TEST STATUS

Test Performed	Status		Mtx	(pCi/g)
Min/Max	Pass	Maximum Survey Value	S	0.9
Background	Fail	Minimum Background	S	0.3
DCGLw	Pass	Difference		0.6
DCGLavg	Pass			
EMC	Pass			
		Average Activity	0.7	(pCi/g)
Wilcoxon Rank Sum	Pass			
Sign Test for Paired Data:	N/A			

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Threshold Comparison Test Report - Soils

THE FOLLOWING DATA POINTS FAILED THE EMC TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE DCGLw TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE BACKGROUND TEST:

Survey Unit 14

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
470.0	798.0	0.0	0.1	S	RG	2.84	2.5	0.9	-0.1		1243	C	
456.0	798.0	0.0	0.1	S	RG	2.92	2.4	0.9	-0.1		1241	C	
463.0	798.0	0.0	0.1	S	RG	3.16	2.4	0.9	-0.1		1242	C	
456.0	792.0	0.0	0.1	S	RG	2.86	2.3	0.9	-0.1		1236	C	
485.0	792.0	0.0	0.1	S	RG	3.52	2.2	0.9	-0.1		1240	C	
478.0	792.0	0.0	0.1	S	RG	2.53	2.2	0.9	-0.1		1239	C	

* All concentrations shown include background. FMPC is calculated net of Background Threshold.

THE FOLLOWING DATA POINTS PASSED BACKGROUND, DCGLw, AND EMC SCREENING TESTS:

Survey Unit 14

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
485.0	798.0	0.0	0.1	S	RG	2.42	2.5	0.8	-0.1		1247		
478.0	798.0	0.0	0.1	S	RG	2.88	2.5	0.8	-0.1		1246		
470.0	792.0	0.0	0.1	S	RG	3.05	2.3	0.8	-0.1		1238		
470.0	755.0	0.0	0.1	S	RG	2.05	2.2	0.8	-0.1		1209		
463.0	792.0	0.0	0.1	S	RG	2.84	2.1	0.8	-0.1		1237		
478.0	784.0	0.0	0.1	S	RG	2.67	2.1	0.8	-0.1		1234		
478.0	755.0	0.0	0.1	S	RG	1.92	2.3	0.7	-0.1		1210		

KERR-MCGEE TECHNICAL CENTER

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Threshold Comparison Test Report - Soils

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
470.0	798.0	0.1	0.5	S	BI	2.24	2.1	0.8	-0.2		1244		
456.0	784.0	0.0	0.1	S	RG	3.19	2.3	0.7	-0.2		1229		
456.0	770.0	0.0	0.1	S	RG	2.52	2.1	0.8	-0.2		1217		
470.0	784.0	0.0	0.1	S	RG	2.73	2.2	0.7	-0.2		1233		
485.0	784.0	0.0	0.1	S	RG	2.7	2.1	0.8	-0.2		1235		
485.0	777.0	0.0	0.1	S	RG	2.24	2.2	0.7	-0.2		1228		
456.0	755.0	0.0	0.1	S	RG	2.7	2.1	0.7	-0.2		1205		
470.0	763.0	0.0	0.1	S	RG	1.63	2.2	0.7	-0.2		1214		
463.0	763.0	0.0	0.1	S	RG	2.62	2.1	0.7	-0.2		1213		
456.0	763.0	0.0	0.1	S	RG	3.04	2.0	0.8	-0.2		1212		
478.0	777.0	0.0	0.1	S	RG	2.07	2.3	0.5	-0.2		1227		
463.0	784.0	0.0	0.1	S	RG	2.09	2.2	0.6	-0.2		1230		
478.0	770.0	0.0	0.1	S	RG	2.99	2.1	0.7	-0.2		1222		
463.0	770.0	0.0	0.1	S	RG	2.51	1.9	0.7	-0.2		1218		
470.0	798.0	0.5	1.0	S	BI	2.13	2.3	0.5	-0.2		1245		
463.0	777.0	0.0	0.1	S	RG	2.79	1.9	0.7	-0.2		1225		
463.0	755.0	0.0	0.1	S	RG	2.65	2.0	0.7	-0.2		1206		
470.0	777.0	0.0	0.1	S	RG	3	2.0	0.6	-0.2		1226		
456.0	777.0	0.0	0.1	S	RG	2.51	1.9	0.7	-0.2		1224		
463.0	784.0	0.1	0.5	S	BI	1.82	2.1	0.5	-0.2		1231		
470.0	755.0	0.1	0.5	S	BI	1.78	2.2	0.5	-0.2		1208		
485.0	770.0	0.0	0.1	S	RG	2.45	2.0	0.6	-0.2		1223		
478.0	763.0	0.0	0.1	S	RG	2.54	1.9	0.6	-0.2		1215		
485.0	763.0	0.0	0.1	S	RG	2.42	1.7	0.7	-0.3		1216		
463.0	784.0	0.5	1.0	S	BI	1.99	2.2	0.4	-0.3		1232		
485.0	755.0	0.0	0.1	S	RG	2.13	2.0	0.5	-0.3		1211		
463.0	770.0	0.5	1.0	S	BI	2.09	1.9	0.5	-0.3		1220		
470.0	755.0	0.5	1.0	S	BI	2.18	1.9	0.5	-0.3		1207		
463.0	770.0	0.1	0.5	S	BI	2.04	2.0	0.5	-0.3		1219		
470.0	770.0	0.0	0.1	S	RG	2.23	1.7	0.5	-0.3		1221		

* All concentrations shown include background. FMPC is calculated net of Background Threshold.

KERR-MCGEE TECHNICAL CENTER

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Threshold Comparison Test Report - Soils

Summary of Background Data and Thresholds Used in this Analysis

Measurement BK ***DCGL:*** 3.5 ***EMC:*** 10.5 ***Nuclides*** Ra

Matrices S

Nuclide	*Number of Data Points*	*Average Background*	*Sigma*	*Background Threshold (Tbk)*	*DCGLw Threshold (Td)*	*EMC Threshold (Tc)*
		(pCi/g)	*(pCi/g)*	*(pCi/g)*	*(pCi/g)*	*(pCi/g)*
U	291	1.76	0.90	3.56	7.06	14.06
Th	291	2.29	0.26	2.81	6.31	13.31
Ra	291	0.64	0.11	0.86	4.36	11.36
FMPC	291	0.62	0.05			

KERR-MCGEE TECHNICAL CENTER

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Threshold Comparison Test Report - Soils

STATISTICAL TEST

Run Date: 7/1/2003 1:44:04 AM

Survey Unit 14 Class 1

Selected Test: WILCOXON RANK SUM TEST

Test Pass

Thresholds:

EMC 10.5 DCGL 3.5 Nuclide Ra

DATA SUMMARY

291 Background Points 35 Survey points processed

Wr = 52671 Wc 48445

****** The survey unit has passed the WILCOXON RANK SUM TEST ******

KERR-MCGEE TECHNICAL CENTER

Threshold Comparison Test Report -

Run Date Monday, June 30, 2003
Survey Unit 15 Class: 2 Data Points FMPC Grid Type R Spacing 15 m.

SURVEY UNIT TABLE

Borders				Surface Area Included	
N	S	E	W	(sq. m)	Remarks
757.	731.	361.	340.	546	
757.	740.	383.	361.	374	
757.	731.	405.	383.	572	
718.	703.	405.	386.	285	
750.	703.	460.	405.	2585	
745.	703.	465.	460.	210	
725.	703.	475.	465.	220	
703.	674.	475.	417.	1682	
674.	660.	475.	420.	770	
678.	674.	417.	380.	148	
666.	663.	420.	380.	120	
		Total		7512	

INITIALIZATION DATA

Measurement Types Selected: RG, PR, PG, BI, CH
Date Range: All
*** Report does not include Remediated data points ***

Thresholds:
EMC: 3.0 DCGLw 1.0 Nuclides FMPC

SURVEY UNIT TEST STATUS

Test Performed	Status		Mtx	FMPC
Min/Max	Pass	Maximum Survey Value	S	1.0
Background	Fail	Minimum Background	S	0.3
DCGLw	Pass	Difference		0.7
DCGLavg	Pass			
EMC	Pass	Average Activity	-0.2	FMPC
Wilcoxon Rank Sum	Pass			
Sign Test for Paired Data:	N/A			

KERR-MCGEE TECHNICAL CENTER

DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

THE FOLLOWING DATA POINTS FAILED THE EMC TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE DCGLw TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE BACKGROUND TEST:

Survey Unit 15

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
408.0	725.0	0.0	0.1	S	BI	5.73	4.3	0.4	0.2		765	C	

* All concentrations shown include background. FMPC is calculated net of Background Threshold.

THE FOLLOWING DATA POINTS PASSED BACKGROUND, DCGLw, AND EMC SCREENING TESTS:

Survey Unit 15

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
424.0	693.0	0.0	0.1	S	RG	3.5	1.9	0.9	-0.2		774		
348.0	753.0	0.5	1.0	S	BI	2.4	2.3	0.6	-0.2		803		
409.0	723.0	0.0	0.1	S	RG	3.8	1.8	0.8	-0.2		788		
424.0	738.0	0.0	0.1	S	RG	3.3	1.8	0.8	-0.2		798		
444.0	707.0	0.0	0.1	S	BI	3.1	1.8	0.8	-0.2		820		
439.0	723.0	0.0	0.1	S	RG	2.4	1.8	0.8	-0.2		790		
424.0	678.0	0.0	0.1	S	RG	2.8	1.9	0.7	-0.2		770		
409.0	708.0	0.0	0.1	S	RG	3.2	1.7	0.8	-0.2		781		
439.0	663.0	0.0	0.1	S	RG	3.2	1.7	0.8	-0.2		767		
444.0	706.0	1.5	2.0	S	BI	2.8	2.0	0.6	-0.2		819		
425.0	708.0	0.0	0.1	S	BI	2.16	1.1	1.2	-0.2		2393		X
348.0	753.0	0.1	0.5	S	BI	2.9	1.8	0.7	-0.2		802		
439.0	738.0	0.0	0.1	S	RG	2.8	1.8	0.7	-0.2		799		
439.0	693.0	0.0	0.1	S	RG	3.3	1.7	0.7	-0.3		777		
409.0	738.0	0.1	0.5	S	BI	3	1.7	0.7	-0.3		796		

KERR-MCGEE TECHNICAL CENTER
DECOMMISSIONING PROJECT
Threshold Comparison Test Report - Soils

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
439.0	708.0	0.0	0.1	S	RG	2.7	1.7	0.7	-0.3		785		
444.0	706.0	1.0	1.5	S	BI	2.2	2.0	0.5	-0.3		818		
454.0	723.0	0.0	0.1	S	RG	3.1	1.8	0.6	-0.3		791		
424.0	693.0	0.1	0.5	S	BI	3	1.8	0.6	-0.3		775		
419.0	745.0	0.5	1.0	S	BI	3	1.8	0.6	-0.3		808		
447.0	745.0	0.1	0.5	S	BI	2.8	1.8	0.6	-0.3		813		
439.0	678.0	0.0	0.1	S	RG	3.4	1.6	0.7	-0.3		771		
409.0	738.0	0.0	0.1	S	RG	3.4	1.6	0.7	-0.3		795		
454.0	738.0	0.0	0.1	S	RG	2.7	1.6	0.7	-0.3		800		
454.0	693.0	0.0	0.1	S	RG	2.6	1.6	0.7	-0.3		778		
424.0	723.0	0.0	0.1	S	RG	3.4	1.4	0.8	-0.3		789		
424.0	708.0	0.0	0.1	S	RG	3.1	1.7	0.6	-0.3		782		
444.0	706.0	0.0	0.1	S	BI	2.8	1.7	0.6	-0.3		815		
424.0	708.0	0.1	0.5	S	BI	2.8	1.7	0.6	-0.3		783		
444.0	707.0	0.5	1.0	S	BI	2.6	1.7	0.6	-0.3		822		
454.0	708.0	0.0	0.1	S	RG	3.3	1.5	0.7	-0.3		786		
447.0	745.0	0.5	1.0	S	BI	2.5	1.8	0.5	-0.3		814		
444.0	706.0	0.5	1.0	S	BI	2.3	1.8	0.5	-0.3		817		
424.0	663.0	0.0	0.1	S	RG	3	1.6	0.6	-0.3		766		
454.0	663.0	0.0	0.1	S	RG	3	1.6	0.6	-0.3		768		
432.0	745.0	0.5	1.0	S	BI	2.9	1.6	0.6	-0.3		811		
444.0	706.0	0.1	0.5	S	BI	2.8	1.6	0.6	-0.3		816		
424.0	708.0	0.5	1.0	S	BI	2.4	1.6	0.6	-0.3		784		
419.0	745.0	0.1	0.5	S	BI	2.4	1.6	0.6	-0.3		807		
469.0	723.0	0.0	0.1	S	RG	2.7	1.4	0.7	-0.3		792		
409.0	738.0	0.5	1.0	S	BI	2.9	1.5	0.6	-0.3		797		
424.0	693.0	0.5	1.0	S	BI	3.6	1.6	0.5	-0.3		776		
444.0	707.0	0.1	0.5	S	BI	2.1	1.6	0.5	-0.3		821		
444.0	707.0	1.0	1.5	S	BI	2.1	1.6	0.5	-0.3		823		
454.0	678.0	0.0	0.1	S	RG	2	1.6	0.5	-0.3		772		
452.0	731.0	0.0	0.1	S	BI	2.37	1.4	0.6	-0.4		2394		X
432.0	745.0	0.1	0.5	S	BI	2.1	1.3	0.5	-0.4		810		
447.0	745.0	0.0	0.1	S	BI	1.5	0.8	0.5	-0.5		812		
348.0	753.0	0.0	0.1	S	BI	2.3	0.9	0.4	-0.5		801		
393.0	753.0	0.0	0.1	S	BI	1.4	0.6	0.5	-0.5		805		
419.0	745.0	0.0	0.1	S	BI	1.4	0.5	0.5	-0.5		806		
432.0	745.0	0.0	0.1	S	BI	1.4	0.5	0.4	-0.6		809		
393.0	738.0	0.0	0.1	S	BI	1.3	0.4	0.4	-0.6		794		
469.0	708.0	0.0	0.1	S	BI	1.2	0.4	0.4	-0.6		787		
469.0	663.0	0.0	0.1	S	BI	1.2	0.4	0.4	-0.6		769		
378.0	753.0	0.0	0.1	S	BI	1.1	0.4	0.4	-0.6		804		
469.0	678.0	0.0	0.1	S	BI	1.2	0.5	0.3	-0.6		773		
447.0	745.0	0.0	0.1	S	RG	1.28	0.3	0.4	-0.6	Asphalt	2045		
469.0	663.0	0.0	0.1	S	RG	1.24	0.3	0.4	-0.6	Asphalt	2001		
419.0	745.0	0.0	0.1	S	RG	0.16	0.4	0.3	-0.6	Asphalt	2043		
469.0	693.0	0.0	0.1	S	BI	1.2	0.3	0.4	-0.6		779		
348.0	738.0	0.0	0.1	S	BI	0.8	0.3	0.4	-0.6		793		
432.0	745.0	0.0	0.1	S	RG	1.21	0.3	0.3	-0.6	Asphalt	2044		
393.0	708.0	0.0	0.1	S	RG	1.7	0.4	0.3	-0.6		780		
469.0	708.0	0.0	0.1	S	RG	0.61	0.4	0.3	-0.6	Asphalt	2013		
469.0	678.0	0.0	0.1	S	RG	0.2	0.3	0.3	-0.6	Asphalt	2002		
469.0	693.0	0.0	0.1	S	RG	0.93	0.3	0.4	-0.6	Asphalt	2005		
348.0	753.0	0.0	0.1	S	RG	0.14	0.3	0.3	-0.6	Asphalt	2052		
378.0	753.0	0.0	0.1	S	RG	0.37	0.3	0.3	-0.6	Asphalt	2053		
393.0	753.0	0.0	0.1	S	RG	0.45	0.1	0.4	-0.7	Asphalt	2054		
393.0	738.0	0.0	0.1	S	RG	0.1	0.2	0.3	-0.7	Asphalt	2031		
348.0	738.0	0.0	0.1	S	RG	0.45	0.2	0.3	-0.7	Asphalt	2032		

* All concentrations shown include background. FMPC is calculated net of Background Threshold.

KERR-MCGEE TECHNICAL CENTER

DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

Summary of Background Data and Thresholds Used in this Analysis

Measurement BK *DCGL:* 1.0 *EMC:* 3.0 *Nuclides* FMPC

Matrices S

Nuclide	*Number of Data Points*	*Average Background*	*Sigma*	*Background Threshold (Tbk)*	*DCGLw Threshold (Td)*	*EMC Threshold (Tc)*
		(pCi/g)	*(pCi/g)*	*(pCi/g)*	*(pCi/g)*	*(pCi/g)*
U	291	1.76	0.90	3.56	4.56	6.56
Th	291	2.29	0.26	2.81	3.81	5.81
Ra	291	0.64	0.11	0.86	1.86	3.86
FMPC	291	0.62	0.05			

KERR-MCGEE TECHNICAL CENTER

DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

STATISTICAL TEST

Run Date: 7/1/2003 1:44:54 AM

Survey Unit 15 Class 2

Selected Test: WILCOXON RANK SUM TEST

Test Pass

Thresholds:

EMC 3.0 DCGL 1.0 Nuclide FMPC

DATA SUMMARY

291 Background Points 35 Survey points processed

Wr = 52671 Wc 48445

****** The survey unit has passed the WILCOXON RANK SUM TEST ******

KERR-MCGEE TECHNICAL CENTER

DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

Run Date Monday, June 30, 2003

Survey Unit 16 Class: 1 Data Points U Grid Type R Spacing 6 m.

SURVEY UNIT TABLE

Borders				Surface Area Included	
N	S	E	W	(sq. m)	Remarks
750.	745.	465.	460.	25	
750.	740.	560.	465.	950	
		Total		975	

INITIALIZATION DATA

Measurement Types Selected: RG, PR, PG, BI, CH

Date Range: All

*** Report does not include Remediated data points ***

Thresholds:

EMC: 684.0 DCGLw 228.0 Nuclides U

SURVEY UNIT TEST STATUS

Test Performed	Status		Mtx	(pCi/g)
Min/Max	Pass	Maximum Survey Value	S	3.9
Background	Fail	Minimum Background	S	0.0
DCGLw	Pass	Difference		3.9
DCGLavg	Pass			
EMC	Pass	Average Activity	2.5	(pCi/g)
Wilcoxon Rank Sum	Pass			
Sign Test for Paired Data:	N/A			

KERR-MCGEE TECHNICAL CENTER

DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

THE FOLLOWING DATA POINTS FAILED THE EMC TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE DCGLw TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE BACKGROUND TEST:

Survey Unit 16

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
494.0	742.0	0.0	0.1	S	RG	3.75	2.2	1.0	-0.1		1483	C	
510.0	742.0	0.0	0.1	S	RG	3.86	2.1	0.9	-0.1		1486	C	

* All concentrations shown include background. FMPC is calculated net of Background Threshold.

THE FOLLOWING DATA POINTS PASSED BACKGROUND, DCGLw, AND EMC SCREENING TESTS:

Survey Unit 16

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
494.0	747.0	0.0	0.1	S	RG	2.96	2.3	1.0	-0.1		1511		
515.0	747.0	0.0	0.1	S	RG	1.82	2.4	0.9	-0.1		1515		
499.0	747.0	0.0	0.1	S	RG	2.98	2.4	0.8	-0.1		1512		
510.0	747.0	0.0	0.1	S	RG	2.83	2.2	0.9	-0.1		1514		
499.0	742.0	0.0	0.1	S	RG	2.92	2.2	0.9	-0.1		1484		
505.0	742.0	0.0	0.1	S	RG	3.01	2.3	0.8	-0.1		1485		
526.0	747.0	0.0	0.1	S	RG	2.67	2.2	0.9	-0.1		1519		
488.0	742.0	0.0	0.1	S	RG	3.05	2.1	0.9	-0.1		1482		
488.0	747.0	0.0	0.1	S	RG	1.76	2.3	0.8	-0.1		1510		
505.0	747.0	0.0	0.1	S	RG	2.29	2.2	0.8	-0.1		1513		
483.0	744.0	0.5	1.0	S	BI	2.55	2.2	0.8	-0.1		1503		

KERR-MCGEE TECHNICAL CENTER

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Threshold Comparison Test Report - Soils

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
515.0	742.0	0.0	0.1	S	RG	2.61	2.2	0.8	-0.1		1487		
521.0	747.0	0.0	0.1	S	RG	2.16	2.1	0.9	-0.1		1516		
532.0	742.0	0.0	0.1	S	RG	2.51	2.2	0.8	-0.2		1490		
521.0	747.0	0.1	0.5	S	BI	1.79	1.8	1.0	-0.2		1517		
488.0	741.0	0.0	0.1	S	BI	2.67	2.0	0.9	-0.2	SDR-0002	2107		
532.0	747.0	0.0	0.1	S	RG	3.15	2.1	0.8	-0.2		1520		
521.0	747.0	0.5	1.0	S	BI	2.19	2.1	0.8	-0.2		1518		
548.0	742.0	0.0	0.1	S	RG	2.58	2.0	0.8	-0.2		1495		
548.0	747.0	0.0	0.1	S	RG	2.57	2.2	0.7	-0.2		1523		
521.0	742.0	0.0	0.1	S	RG	3.25	2.0	0.8	-0.2		1488		
483.0	747.0	0.0	0.1	S	RG	1.91	2.2	0.7	-0.2		1509		
477.0	742.0	0.1	0.5	S	BI	2.32	2.1	0.7	-0.2		1479		
526.0	742.0	0.0	0.1	S	RG	3.17	1.9	0.8	-0.2		1489		
543.0	747.0	0.0	0.1	S	RG	2.92	1.9	0.8	-0.2		1522		
553.0	747.0	0.0	0.1	S	RG	2.55	2.1	0.7	-0.2		1524		
483.0	742.0	0.3	0.5	S	PG	1.54	2.2	0.6	-0.2		2439		
543.0	742.0	0.0	0.1	S	RG	1.92	2.0	0.7	-0.2		1494		
537.0	747.0	0.0	0.1	S	RG	2.07	2.0	0.7	-0.2		1521		
553.0	742.0	0.0	0.1	S	RG	2.41	1.9	0.8	-0.2		1496		
559.0	742.0	0.0	0.1	S	RG	2.55	1.8	0.8	-0.2		1497		
467.0	747.0	0.0	0.1	S	RG	3.36	1.9	0.8	-0.2		1505		
485.0	743.0	0.5	1.0	S	BI	2.55	2.1	0.6	-0.2		1500		
537.0	742.0	0.0	0.1	S	RG	2.53	1.9	0.7	-0.2		1491		
461.0	747.0	0.0	0.1	S	RG	2.87	1.9	0.7	-0.2		1504		
480.0	743.0	0.0	0.1	S	BI	2.42	1.9	0.7	-0.2	SDR-0002	2080		
477.0	742.0	0.0	0.1	S	RG	2.89	1.6	0.9	-0.2		1478		
477.0	742.0	0.5	1.0	S	BI	1.71	2.1	0.6	-0.2		1480		
477.0	747.0	0.0	0.1	S	RG	2.81	1.8	0.7	-0.2		1508		
484.0	745.0	0.0	0.1	S	BI	3.02	1.8	0.7	-0.2	SDR-0002	2092		
559.0	747.0	0.0	0.1	S	RG	3.08	1.8	0.6	-0.3		1525		
537.0	742.0	0.1	0.5	S	BI	2.19	1.8	0.6	-0.3		1492		
485.0	743.0	0.3	0.5	S	PR	1.91	1.9	0.5	-0.3		2443		
483.0	744.0	0.3	0.5	S	PR	1.8	1.8	0.6	-0.3		2440		
537.0	742.0	0.5	1.0	S	BI	2.27	1.8	0.6	-0.3		1493		
482.0	745.0	0.0	0.1	S	BI	1.77	1.6	0.6	-0.3	SDR-0002	2086		
486.0	745.0	0.0	0.1	S	BI	2.16	1.5	0.6	-0.3	SDR-0002	2101		
472.0	747.0	0.0	0.1	S	RG	2.49	1.3	0.7	-0.3		1506		
472.0	747.0	0.1	0.5	S	BI	2.39	1.4	0.5	-0.4		1507		
472.0	742.0	0.0	0.1	S	RG	2.65	1.2	0.6	-0.4		1477		
467.0	742.0	0.0	0.1	S	BI	2.51	0.9	0.7	-0.4		1476		
467.0	742.0	0.0	0.1	S	RG	0.71	0.3	0.3	-0.6	Asphalt	2038		

* All concentrations shown include background. FMPC is calculated net of Background Threshold.

KERR-MCGEE TECHNICAL CENTER

DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

Summary of Background Data and Thresholds Used in this Analysis

Measurement BK *DCGL:* 228.0 *EMC:* 684.0 *Nuclides* U

Matrices S

Nuclide	*Number of Data Points*	*Average Background*	*Sigma*	*Background Threshold (Tbk)*	*DCGLw Threshold (Td)*	*EMC Threshold (Tc)*
		(pCi/g)	*(pCi/g)*	*(pCi/g)*	*(pCi/g)*	*(pCi/g)*
U	291	1.76	0.90	3.56	231.56	687.56
Th	291	2.29	0.26	2.81	230.81	686.81
Ra	291	0.64	0.11	0.86	228.86	684.86
FMPC	291	0.62	0.05			

KERR-MCGEE TECHNICAL CENTER

DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

STATISTICAL TEST

Run Date: 7/1/2003 1:46:08 AM

Survey Unit 16 Class 1

Selected Test: WILCOXON RANK SUM TEST

Test Pass

Thresholds:

EMC 684.0 DCGL 228.0 Nuclide U

DATA SUMMARY

291 Background Points 37 Survey points processed

Wr = 53253 Wc 48763

****** The survey unit has passed the WILCOXON RANK SUM TEST ******

KERR-MCGEE TECHNICAL CENTER

DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

Run Date Monday, June 30, 2003

Survey Unit 17 Class: 1 Data Points FMPC Grid Type R Spacing 8 m.

SURVEY UNIT TABLE

Borders				Surface Area Included	
N	S	E	W	(sq. m)	Remarks
740.	725.	475.	465.	150	
740.	720.	560.	475.	1700	
		Total		1850	

INITIALIZATION DATA

Measurement Types Selected: RG, PR, PG, BI, CH

Date Range: All

*** Report does not include Remediated data points ***

Thresholds:

EMC: 3.0 DCGLw 1.0 Nuclides FMPC

SURVEY UNIT TEST STATUS

Test Performed	Status		Mtx	FMPC
Min/Max	Fail	Maximum Survey Value	S	1.5
Background	Fail	Minimum Background	S	0.3
DCGLw	Pass	Difference		1.2
DCGLavg	Pass			
EMC	Pass	Average Activity	0.0	FMPC
Wilcoxon Rank Sum	Pass			
Sign Test for Paired Data:	N/A			

KERR-MCGEE TECHNICAL CENTER

DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

THE FOLLOWING DATA POINTS FAILED THE EMC TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE DCGLw TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE BACKGROUND TEST:

Survey Unit 17

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
486.0	736.0	0.5	1.0	S	BI	22.2	1.8	3.8	0.7	Hot Spot	2060	C	
514.5	736.5	0.0	0.1	S	BI	9	1.7	3.8	0.6	Hot Spots	2530	C	
492.0	732.0	0.1	0.5	S	BI	13.1	1.9	3.4	0.6		1556	C	
481.0	739.0	0.5	1.0	S	BI	19.5	2.1	2.7	0.5	Hot Spot	2063	C	
481.0	738.0	0.5	1.0	S	BI	9.95	2.2	2.8	0.5		1572	C	
494.0	732.0	0.5	1.0	S	BI	5.49	1.9	2.3	0.2		1560	C	
478.0	734.0	0.1	0.5	S	BI	8.25	1.9	2.1	0.2	Hot Spot	2056	C	
477.0	734.0	0.5	1.0	S	BI	4.44	2.0	1.6	0.1		1563	C	
482.0	737.0	0.0	0.1	S	BI	4.01	1.8	1.6	0.0		2082	C	
530.0	720.5	0.0	0.1	S	BI	3.79	2.2	1.3	0.0		747	C	
491.0	733.0	0.1	0.5	S	BI	5.53	2.3	1.2	0.0		1565	C	

* All concentrations shown include background. FMPC is calculated net of Background Threshold.

THE FOLLOWING DATA POINTS PASSED BACKGROUND, DCGLw, AND EMC SCREENING TESTS:

Survey Unit 17

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
491.0	733.0	0.5	1.0	S	BI	2.89	2.0	1.3	0.0		1566		
492.0	732.0	0.5	1.0	S	BI	4.34	2.1	1.1	-0.1		1557		
513.0	739.0	0.0	0.1	S	RG	3.15	2.2	1.1	-0.1		1581		
498.0	739.0	0.0	0.1	S	RG	2.7	2.2	1.1	-0.1		1579		
478.0	734.0	0.5	1.0	S	BI	4.34	2.0	1.2	-0.1	Hot Spot	2057		
502.6	734.9	0.1	0.3	S	PR	4.62	2.0	1.1	-0.1	NRC -	2495		

KERR-MCGEE TECHNICAL CENTER

DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
528.0	731.0	0.0	0.1	S	RG	1.95	2.2	0.9	-0.1		1548		
528.0	739.0	0.0	0.1	S	RG	2.31	2.2	0.9	-0.1		1583		
488.5	736.0	0.5	1.0	S	BI	2.29	2.2	0.8	-0.1		740		
505.0	739.0	0.0	0.1	S	RG	3.37	2.1	0.8	-0.1		1580		
480.0	737.0	0.0	0.1	S	BI	3.83	1.7	1.1	-0.1	SDR-0002	2077		
543.0	731.0	0.0	0.1	S	RG	3.52	2.2	0.8	-0.1		1552		
490.0	739.0	0.0	0.1	S	RG	2.32	2.1	0.8	-0.2		1578		
485.0	736.0	0.3	0.5	S	PR	2.4	2.2	0.7	-0.2		2441		
501.0	736.0	0.5	1.0	S	BI	1.86	2.4	0.6	-0.2		743		
480.0	739.0	0.3	0.5	S	PR	17.4	2.2	0.5	-0.2		2434		
498.0	733.0	0.0	0.1	S	BI	3.5	1.9	0.9	-0.2	SDR-0002	2128		
486.0	735.0	0.3	0.5	S	PR	1.93	1.9	0.9	-0.2		2444		
486.0	737.0	1.0	1.1	S	PR	9.5	2.4	0.5	-0.2		2446		
535.0	724.0	0.0	0.1	S	RG	2.01	2.2	0.7	-0.2		1536		
481.0	739.0	0.3	0.5	S	PR	13.0	2.3	0.5	-0.2		2436		
528.0	724.0	0.0	0.1	S	RG	2.19	2.2	0.7	-0.2		1535		
530.0	720.5	0.1	0.5	S	BI	2.57	2.1	0.7	-0.2		748		
550.0	731.0	0.0	0.1	S	RG	2.55	2.3	0.6	-0.2		1553		
481.0	738.0	0.3	0.5	S	PR	11.1	2.3	0.5	-0.2		2435		
520.0	724.0	0.1	0.5	S	BI	1.92	2.2	0.6	-0.2		1533		
513.0	731.0	0.0	0.1	S	RG	2.55	2.0	0.8	-0.2		1546		
506.0	737.0	0.1	0.5	S	BI	1.95	2.2	0.6	-0.2		745		
550.0	724.0	0.0	0.1	S	RG	2.1	2.1	0.7	-0.2		1538		
490.0	739.0	0.0	0.1	S	BI	2.35	2.1	0.7	-0.2	SDR-0002	2113		
520.0	724.0	0.5	1.0	S	BI	1.76	2.2	0.6	-0.2		1534		
543.0	724.0	0.0	0.1	S	RG	1.87	2.1	0.6	-0.2		1537		
528.0	731.0	0.1	0.5	S	BI	1.86	2.4	0.5	-0.2		1549		
496.0	731.5	0.1	0.3	S	PR	3.01	2.2	0.6	-0.2		2454		
535.0	739.0	0.0	0.1	S	RG	1.89	2.1	0.6	-0.2		1584		
485.0	738.0	1.0	1.1	S	PR	14.5	2.2	0.4	-0.2		2442		
498.0	731.0	0.1	0.3	S	PG	5.65	2.1	0.6	-0.2		2514		
482.0	739.0	1.0	1.1	S	PR	4.41	2.3	0.5	-0.2		2437		
482.0	735.0	0.0	0.1	S	BI	3.17	1.3	1.1	-0.2	SDR-0002	2081		
486.0	736.0	0.3	0.5	S	PR	2.25	2.3	0.5	-0.2		2445		
498.0	724.0	0.0	0.1	S	RG	0.93	2.0	0.7	-0.2		1529		
483.0	739.0	1.0	1.1	S	PG	6.57	2.3	0.4	-0.2		2438		
488.5	736.0	0.3	0.5	S	PR	1.68	2.2	0.5	-0.2		2449		
494.0	732.0	0.1	0.3	S	PR	2.37	2.2	0.6	-0.2		2453		
501.0	736.0	0.1	0.3	S	PR	2.67	2.2	0.5	-0.2		2456		
506.0	737.0	0.5	1.0	S	BI	1.95	2.1	0.6	-0.2		746		
558.0	724.0	0.0	0.1	S	RG	3.15	1.9	0.7	-0.2		1539		
520.0	731.0	0.0	0.1	S	RG	1.58	1.9	0.7	-0.2		1547		
558.0	731.0	0.0	0.1	S	RG	2.84	2.0	0.6	-0.2		1554		
505.0	731.0	0.0	0.1	S	RG	2.23	1.9	0.7	-0.2		1545		
550.0	739.0	0.0	0.1	S	RG	2.01	2.0	0.7	-0.2		1586		
490.0	724.0	0.0	0.1	S	RG	2.17	2.1	0.6	-0.2		1528		
488.0	738.5	0.3	0.5	S	PR	2.88	2.3	0.4	-0.2		2448		
468.0	731.0	0.0	0.1	S	RG	2.36	1.9	0.7	-0.2		1540		
477.0	738.0	0.1	0.5	S	BI	2.12	2.0	0.6	-0.2	SDR-0002	2069		
487.0	736.0	1.0	1.1	S	PR	3.61	2.2	0.5	-0.2		2447		
501.0	736.0	0.1	0.5	S	BI	2.36	2.1	0.6	-0.2		742		
479.0	734.0	0.1	0.3	S	PR	2.95	2.1	0.5	-0.2		2433		

KERR-MCGEE TECHNICAL CENTER

DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
510.0	738.0	0.1	0.3	S	PR	1.76	2.0	0.7	-0.2		2458		
497.0	736.0	0.3	0.5	S	PR	1.14	2.3	0.4	-0.2		2455		
477.0	738.0	0.5	1.0	S	BI	2.56	2.1	0.5	-0.2	SDR-0002	2070		
478.0	735.0	0.2	0.3	S	PR	2.99	2.2	0.5	-0.2		2432		
558.0	739.0	0.0	0.1	S	RG	1.85	2.0	0.6	-0.2		1589		
506.0	737.0	0.1	0.3	S	PR	2.77	2.0	0.6	-0.2		2457		
543.0	739.0	0.0	0.1	S	RG	1.8	2.1	0.6	-0.2		1585		
476.0	733.0	0.0	0.1	S	BI	2.48	1.9	0.7	-0.2	SDR-0002	2064		
530.0	720.5	0.5	1.0	S	BI	2.16	2.2	0.5	-0.2		749		
478.0	734.0	0.1	0.3	S	PR	3.54	2.2	0.5	-0.2		2431		
491.0	733.0	0.1	0.3	S	PR	1.73	2.0	0.6	-0.2		2450		
513.0	724.0	0.0	0.1	S	RG	2.55	1.9	0.6	-0.2		1531		
528.0	731.0	0.5	1.0	S	BI	1.77	2.0	0.6	-0.2		1550		
492.0	736.0	0.3	0.5	S	PR	2.39	2.0	0.6	-0.2		2452		
475.0	731.0	0.0	0.1	S	RG	2.34	2.0	0.6	-0.2		1541		
505.0	724.0	0.0	0.1	S	RG	1.49	1.9	0.6	-0.2		1530		
476.0	735.0	0.1	0.3	S	PR	1.98	1.9	0.6	-0.2		2429		
520.0	739.0	0.0	0.1	S	RG	2.07	1.8	0.6	-0.3		1582		
483.0	731.0	0.0	0.1	S	RG	1.5	2.0	0.5	-0.3		1542		
520.0	724.0	0.0	0.1	S	RG	2.1	1.7	0.7	-0.3		1532		
550.0	739.0	0.1	0.5	S	BI	2.12	2.0	0.5	-0.3		1587		
484.0	735.0	0.0	0.1	S	BI	3.49	1.6	0.8	-0.3	SDR-0002	2087		
477.0	734.0	0.1	0.3	S	PR	2.75	1.9	0.5	-0.3		2430		
475.0	724.0	0.0	0.1	S	RG	2.78	1.8	0.6	-0.3		1526		
483.0	724.0	0.0	0.1	S	RG	3.05	1.7	0.6	-0.3		1527		
490.0	731.0	0.0	0.1	S	RG	2.17	1.9	0.5	-0.3		1543		
550.0	739.0	0.5	1.0	S	BI	1.52	1.8	0.6	-0.3		1588		
477.0	738.0	0.0	0.1	S	BI	1.84	1.7	0.6	-0.3	SDR-0002	2068		
535.0	731.0	0.0	0.1	S	RG	1.68	1.7	0.6	-0.3		1551		
475.0	739.0	0.0	0.1	S	RG	2.46	1.6	0.7	-0.3		1574		
492.0	732.0	0.1	0.3	S	PR	1.33	1.9	0.5	-0.3		2451		
486.0	733.0	0.0	0.1	S	BI	2.86	1.4	0.7	-0.3	SDR-0002	2093		
498.0	729.0	0.0	0.1	S	BI	1.93	1.6	0.5	-0.3	SDR-0002	2126		
490.0	729.0	0.0	0.1	S	BI	1.4	1.4	0.7	-0.3	SDR-0002	2108		
492.0	731.0	0.0	0.1	S	BI	1.83	1.4	0.6	-0.3	SDR-0002	2115		
476.0	739.0	0.0	0.1	S	BI	1.86	1.3	0.7	-0.3	SDR-0002	2067		
468.0	739.0	0.0	0.1	S	RG	1.91	1.4	0.6	-0.3		1573		
496.0	729.0	0.0	0.1	S	BI	1.34	1.3	0.7	-0.4	SDR-0002	2123		
490.0	731.0	0.0	0.1	S	BI	1.78	1.4	0.6	-0.4	SDR-0002	2109		
488.0	731.0	0.0	0.1	S	BI	2.01	1.2	0.6	-0.4	SDR-0002	2102		
494.0	729.0	0.0	0.1	S	BI	1.03	1.1	0.6	-0.4	SDR-0002	2119		
492.0	729.0	0.0	0.1	S	BI	1.25	0.8	0.5	-0.5	SDR-0002	2114		

* All concentrations shown include background. FMPC is calculated net of Background Threshold.

KERR-MCGEE TECHNICAL CENTER

DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

Summary of Background Data and Thresholds Used in this Analysis

Measurement BK *DCGL:* 1.0 *EMC:* 3.0 *Nuclides* FMPC

Matrices S

Nuclide	*Number of Data Points*	*Average Background*	*Sigma*	*Background Threshold (Tbk)*	*DCGLw Threshold (Td)*	*EMC Threshold (Tc)*
		(pCi/g)	*(pCi/g)*	*(pCi/g)*	*(pCi/g)*	*(pCi/g)*
U	291	1.76	0.90	3.56	4.56	6.56
Th	291	2.29	0.26	2.81	3.81	5.81
Ra	291	0.64	0.11	0.86	1.86	3.86
FMPC	291	0.62	0.05			

KERR-MCGEE TECHNICAL CENTER

DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

STATISTICAL TEST

Run Date: 7/1/2003 1:47:00 AM

Survey Unit 17 Class 1

Selected Test: WILCOXON RANK SUM TEST

Test Pass

Thresholds:

EMC 3.0 DCGL 1.0 Nuclide FMPC

DATA SUMMARY

291 Background Points 38 Survey points processed

Wr = 53544 Wc 48922

****** The survey unit has passed the WILCOXON RANK SUM TEST ******

KERR-MCGEE TECHNICAL CENTER

DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

Run Date Monday, June 30, 2003

Survey Unit 18 Class: 1 Data Points FMPC Grid Type R Spacing 8 m.

SURVEY UNIT TABLE

Borders				Surface Area Included	
N	S	E	W	(sq. m)	Remarks
720.	700.	560.	475.	1692	
		Total		1692	

INITIALIZATION DATA

Measurement Types Selected: RG, PR, PG, BI, CH
Date Range: All
*** Report does not include Remediated data points ***

Thresholds:
EMC: 3.0 DCGLw 1.0 Nuclides FMPC

SURVEY UNIT TEST STATUS

Test Performed	Status		Mtx	FMPC
Min/Max	Fail	Maximum Survey Value	S	1.3
Background	Fail	Minimum Background	S	0.3
DCGLw	Pass	Difference		1.0
DCGLavg	Pass			
EMC	Pass	Average Activity	0.0	FMPC
Wilcoxon Rank Sum	Pass			
Sign Test for Paired Data:	N/A			

KERR-MCGEE TECHNICAL CENTER

DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

THE FOLLOWING DATA POINTS FAILED THE EMC TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE DCGLw TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE BACKGROUND TEST:

Survey Unit 18

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
532.0	706.0	0.0	0.1	S	BI	12.5	2.7	2.7	0.5	Hot Spots	2531	C	
531.0	706.0	0.0	0.1	S	BI	10.9	1.9	2.8	0.4		1606	C	
532.0	717.0	0.0	0.1	S	RG	8.45	2.3	2.6	0.4		1636	C	
528.0	706.0	0.1	0.3	S	PR	6.23	1.9	1.7	0.1		2428	C	
533.0	707.0	0.0	0.1	S	BI	6.42	1.9	1.6	0.1		753	C	
534.5	706.5	0.0	0.1	S	BI	6.63	1.8	1.6	0.0		756	C	
527.1	706.1	0.1	0.3	S	PR	5.53	2.0	1.5	0.0	NRC -	2497	C	

* All concentrations shown include background. FMPC is calculated net of Background Threshold.

THE FOLLOWING DATA POINTS PASSED BACKGROUND, DCGLw, AND EMC SCREENING TESTS:

Survey Unit 18

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
523.0	706.0	0.3	0.5	S	PR	4.44	2.1	1.3	0.0		2426		
526.0	707.0	0.3	0.5	S	PR	3.67	2.1	1.2	0.0		2427		
539.0	702.0	0.0	0.1	S	RG	2.9	1.9	1.2	-0.1		1598		
522.0	706.0	0.3	0.5	S	PR	2.95	2.5	0.7	-0.1		2425		
526.0	706.0	0.5	1.0	S	BI	2.33	2.3	0.8	-0.1		1605		
503.0	710.0	0.0	0.1	S	RG	2.15	2.2	0.9	-0.1		1617		

KERR-MCGEE TECHNICAL CENTER

DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
532.0	702.0	0.0	0.1	S	RG	2.88	1.9	1.1	-0.1		1597		
496.0	702.0	0.0	0.1	S	RG	2.15	2.2	0.9	-0.1		1592		
531.0	706.0	0.1	0.5	S	BI	2.79	2.1	0.9	-0.1		1607		
521.0	706.0	0.3	0.5	S	PR	2.28	2.5	0.7	-0.1		2424		
496.0	717.0	0.0	0.1	S	RG	2.57	2.2	0.8	-0.1		1629		
503.0	702.0	0.0	0.1	S	RG	2.7	2.3	0.8	-0.1		1593		
525.0	702.0	0.0	0.1	S	RG	2.88	2.2	0.8	-0.1		1596		
532.0	710.0	0.0	0.1	S	RG	2.85	2.0	0.9	-0.1		1621		
546.0	717.0	0.0	0.1	S	RG	2.45	2.3	0.7	-0.1		1640		
525.0	710.0	0.0	0.1	S	RG	2.73	2.1	0.8	-0.1		1620		
546.0	710.0	0.0	0.1	S	RG	2.79	2.1	0.8	-0.2		1623		
522.0	707.0	0.5	1.0	S	BI	3.12	2.1	0.8	-0.2		1611		
539.0	717.0	0.0	0.1	S	RG	2.45	2.1	0.8	-0.2		1639		
489.0	717.0	0.0	0.1	S	RG	2.07	2.1	0.8	-0.2		1628		
523.0	706.0	0.5	1.0	S	BI	2.9	2.2	0.7	-0.2	SDR-0009	2328		
553.0	710.0	0.0	0.1	S	RG	2.56	2.1	0.8	-0.2		1624		
539.0	710.0	0.0	0.1	S	RG	3.66	1.9	0.9	-0.2		1622		
520.0	707.5	0.0	0.1	S	BI	3.85	1.8	0.9	-0.2		750		
518.0	702.0	0.0	0.1	S	RG	3.69	2.0	0.8	-0.2		1595		
510.0	702.0	0.0	0.1	S	RG	1.98	2.0	0.8	-0.2		1594		
553.0	710.0	0.1	0.5	S	BI	2.63	2.3	0.6	-0.2		1625		
503.0	717.0	0.0	0.1	S	RG	2.89	2.0	0.8	-0.2		1632		
531.0	706.0	0.5	1.0	S	BI	2.21	2.1	0.7	-0.2		1608		
532.0	717.0	0.1	0.5	S	BI	2.07	2.1	0.7	-0.2		1637		
553.0	710.0	0.5	1.0	S	BI	2.27	2.0	0.8	-0.2		1626		
546.0	702.0	0.0	0.1	S	RG	2.65	1.8	0.9	-0.2		1599		
489.0	702.0	0.0	0.1	S	RG	1.89	2.0	0.7	-0.2		1591		
533.0	707.0	0.1	0.5	S	BI	1.81	2.2	0.6	-0.2		754		
553.0	717.0	0.0	0.1	S	RG	2.62	2.0	0.7	-0.2		1641		
510.0	710.0	0.0	0.1	S	RG	1.75	2.0	0.8	-0.2		1618		
553.0	702.0	0.0	0.1	S	RG	1.74	2.0	0.7	-0.2		1600		
520.0	707.5	0.1	0.5	S	BI	1.12	2.2	0.6	-0.2		751		
534.5	706.5	0.5	1.0	S	BI	1.64	2.1	0.6	-0.2		758		
496.0	717.0	0.1	0.5	S	BI	2.14	2.3	0.5	-0.2		1630		
534.5	706.5	0.1	0.5	S	BI	1.2	2.0	0.7	-0.2		757		
482.0	710.0	0.0	0.1	S	RG	2.54	2.0	0.6	-0.2		1612		
532.0	717.0	0.5	1.0	S	BI	3.1	1.9	0.7	-0.2		1638		
520.0	707.5	0.5	1.0	S	BI	2.17	2.1	0.6	-0.2		752		
496.0	717.0	0.5	1.0	S	BI	1.34	2.1	0.5	-0.2		1631		
510.0	717.0	0.0	0.1	S	RG	1.47	2.0	0.6	-0.2		1633		
482.0	702.0	0.0	0.1	S	RG	2.93	1.8	0.7	-0.2		1590		
489.0	710.0	0.0	0.1	S	RG	2.47	1.9	0.7	-0.2		1615		
496.0	710.0	0.0	0.1	S	RG	2.51	1.9	0.6	-0.2		1616		
553.0	702.0	0.1	0.5	S	BI	1.32	1.9	0.6	-0.3		1601		
518.0	710.0	0.0	0.1	S	RG	2.59	1.7	0.7	-0.3		1619		
518.0	717.0	0.0	0.1	S	RG	2.02	1.7	0.7	-0.3		1634		
553.0	702.0	0.5	1.0	S	BI	1.93	1.9	0.6	-0.3		1602		
482.0	710.0	0.1	0.5	S	BI	2	1.8	0.5	-0.3		1613		
482.0	710.0	0.5	1.0	S	BI	1.76	1.7	0.5	-0.3		1614		
482.0	717.0	0.0	0.1	S	RG	2.74	1.4	0.5	-0.4		1627		
525.0	717.0	0.0	0.1	S	RG	0.38	1.0	0.5	-0.5		1635		

* All concentrations shown include background. FMPC is calculated net of Background Threshold.

KERR-MCGEE TECHNICAL CENTER

DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

Summary of Background Data and Thresholds Used in this Analysis

Measurement BK *DCGL:* 1.0 *EMC:* 3.0 *Nuclides* FMPC

Matrices S

Nuclide	*Number of Data Points*	*Average Background*	*Sigma*	*Background Threshold (Tbk)*	*DCGLw Threshold (Td)*	*EMC Threshold (Tc)*
		(pCi/g)	*(pCi/g)*	*(pCi/g)*	*(pCi/g)*	*(pCi/g)*
U	291	1.76	0.90	3.56	4.56	6.56
Th	291	2.29	0.26	2.81	3.81	5.81
Ra	291	0.64	0.11	0.86	1.86	3.86
FMPC	291	0.62	0.05			

KERR-MCGEE TECHNICAL CENTER

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Threshold Comparison Test Report - Soils

STATISTICAL TEST

Run Date: 7/1/2003 1:48:08 AM

Survey Unit 18 Class 1

Selected Test: WILCOXON RANK SUM TEST

Test Pass

Thresholds:

EMC 3.0 DCGL 1.0 Nuclide FMPC

DATA SUMMARY

291 Background Points 33 Survey points processed

Wr = 52089 Wc 48126

****** The survey unit has passed the WILCOXON RANK SUM TEST ******

KERR-MCGEE TECHNICAL CENTER

DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

Run Date Monday, June 30, 2003

Survey Unit 19 Class: 1 Data Points FMPC Grid Type R Spacing 7 m.

SURVEY UNIT TABLE

Borders				Surface Area Included	
N	S	E	W	(sq. m)	Remarks
700.	680.	560.	475.	1708	
		Total		1708	

INITIALIZATION DATA

Measurement Types Selected: RG, PR, PG, BI, CH
Date Range: All
*** Report does not include Remediated data points ***

Thresholds:
EMC: 3.0 DCGLw 1.0 Nuclides FMPC

SURVEY UNIT TEST STATUS

Test Performed	Status		Mtx	FMPC
Min/Max	Fail	Maximum Survey Value	S	2.2
Background	Fail	Minimum Background	S	0.3
DCGLw	Fail	Difference		1.9
DCGLavg	Pass			
EMC	Pass	Average Activity	0.0	FMPC
Wilcoxon Rank Sum	Pass			
Sign Test for Paired Data:	N/A			

KERR-MCGEE TECHNICAL CENTER

DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

THE FOLLOWING DATA POINTS FAILED THE EMC TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE DCGLw TEST:

Survey Unit 19

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
504.8	686.4	0.0	0.1	S	BI	17.6	7.8	2.4	1.4		2544	B	

* All concentrations shown include background. FMPC is calculated net of Background Threshold.

THE FOLLOWING DATA POINTS FAILED THE BACKGROUND TEST:

Survey Unit 19

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
504.8	686.4	0.0	0.1	S	BI	12.6	5.8	2.0	0.9	Hot Spots	2534	C	
489.0	682.0	0.3	0.4	S	PR	10.8	5.6	1.4	0.7		2404	C	
499.0	685.6	0.0	0.1	S	BI	8.66	4.5	1.5	0.5	Hot Spots	2532	C	
500.7	686.7	0.0	0.1	S	BI	10.4	4.5	1.3	0.5	Hot Spots	2533	C	
496.0	693.0	0.0	0.1	S	RG	4.31	4.2	0.9	0.3		1741	C	
490.0	684.0	0.3	0.4	S	PR	4.07	4.1	0.8	0.2		2408	C	
487.0	680.0	0.0	0.1	S	BI	7.91	2.9	1.5	0.2		2146	C	
495.0	688.0	0.0	0.1	S	BI	5.01	3.4	1.1	0.2		2176	C	
489.0	683.0	0.5	1.0	S	BI	4.7	3.8	0.7	0.1		1706	C	
520.0	686.0	0.0	0.1	S	BI	34.6	2.6	0.9	0.1		1721	C	
503.8	686.4	0.0	0.1	S	BI	6.15	3.0	1.0	0.1		2547	C	
505.8	686.4	0.0	0.1	S	BI	4.57	2.7	1.1	0.1		2550	C	
493.0	690.0	0.0	0.1	S	BI	2.69	3.1	0.8	0.1		2172	C	
504.8	687.4	0.0	0.1	S	BI	4.57	2.8	1.0	0.0		2549	C	
495.0	690.0	0.0	0.1	S	BI	3	3.2	0.8	0.0		2177	C	
504.0	686.0	0.0	0.1	S	CH	2.6	3.2	0.7	0.0		423	C	
495.0	692.0	0.0	0.1	S	BI	3.07	3.0	0.8	0.0		2178	C	
496.5	688.0	0.3	0.4	S	PR	2.8	3.0	0.8	0.0		2411	C	

* All concentrations shown include background. FMPC is calculated net of Background Threshold.

KERR-MCGEE TECHNICAL CENTER
DECOMMISSIONING PROJECT

Threshold Comparison Test Report – Soils

THE FOLLOWING DATA POINTS PASSED BACKGROUND, DCGLw, AND EMC SCREENING TESTS:

Survey Unit 19

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
496.0	686.0	0.0	0.1	S	RG	8.02	2.3	1.1	0.0		1711		
502.0	687.0	0.0	0.1	S	BI	4.07	2.7	0.9	0.0		1731		
499.0	690.0	0.0	0.1	S	BI	4.31	2.8	0.8	0.0	SDR-0001	2184		
504.0	683.0	0.0	0.1	S	CH	2.7	3.0	0.7	0.0		419		
499.0	686.0	0.0	0.1	S	BI	4.03	2.6	0.9	0.0	SDR-0001	2182		
516.5	684.5	0.0	0.1	S	PR	28.4	2.3	0.8	0.0		2422		
522.0	683.0	0.0	0.1	S	CH	2	2.8	0.8	0.0		427		
497.0	690.0	0.0	0.1	S	BI	1.68	2.8	0.8	0.0	SDR-0001	2181		
489.0	682.0	0.5	1.0	S	BI	5.58	2.6	0.8	0.0	SDR-0001	2186		
518.0	686.0	0.1	0.3	S	PG	25.8	2.3	0.7	-0.1		2515		
504.0	686.0	0.1	1.0	S	CH	1.5	2.8	0.7	-0.1		424		
510.0	693.0	0.0	0.1	S	RG	4.18	2.6	0.8	-0.1		1743		
496.0	680.0	0.0	0.1	S	CH	4.4	2.7	0.7	-0.1		407		
493.0	692.0	0.0	0.1	S	BI	2.44	2.7	0.7	-0.1	SDR-0001	2173		
496.0	686.0	0.0	0.1	S	CH	1.9	2.6	0.8	-0.1		415		
492.0	685.0	0.0	0.1	S	PR	4.92	2.4	0.9	-0.1		2410		
550.0	698.0	0.0	0.1	S	CH	2.8	2.4	0.9	-0.1		459		
550.0	683.0	1.0	2.0	S	CH	0.9	2.7	0.7	-0.1		449		
522.0	686.0	0.1	1.0	S	CH	0.7	2.7	0.7	-0.1		432		
504.8	685.4	0.0	0.1	S	BI	3.78	2.3	0.9	-0.1		2548		
494.0	680.0	0.0	0.1	S	CH	4.5	2.6	0.7	-0.1		394		
510.0	692.0	0.5	1.0	S	BI	4.1	2.6	0.7	-0.1		1736		
522.0	686.0	0.0	0.1	S	CH	3.6	2.6	0.7	-0.1		431		
550.0	687.0	2.0	3.0	S	CH	0.9	2.8	0.6	-0.1		454		
513.0	685.0	0.1	0.3	S	PR	32.0	1.8	0.8	-0.1		2420		
539.0	689.0	0.0	0.1	S	CH	2.4	2.6	0.7	-0.1		443		
494.0	680.0	2.0	3.0	S	CH	0.3	2.8	0.6	-0.1		397		
550.0	683.0	2.0	3.0	S	CH	1.3	2.6	0.7	-0.1		450		
539.0	686.0	0.0	0.1	S	CH	1	2.6	0.7	-0.1		439		
496.0	683.0	1.0	2.0	S	CH	0	2.6	0.7	-0.1		413		
550.0	683.0	0.0	0.1	S	CH	0	2.6	0.7	-0.1		447		
496.0	683.0	0.0	0.1	S	CH	1.7	2.7	0.6	-0.1		411		
539.0	683.0	0.0	0.1	S	CH	1.2	2.7	0.6	-0.1		435		
539.0	686.0	2.0	3.0	S	CH	0.8	2.4	0.8	-0.1		442		
510.0	692.0	0.2	0.3	S	PR	1.92	2.5	0.7	-0.1		2418		
497.0	686.0	0.0	0.1	S	BI	3.94	2.0	1.0	-0.1	SDR-0001	2179		
494.0	684.0	0.0	0.1	S	CH	3.3	2.6	0.6	-0.1		398		
496.0	683.0	2.0	3.0	S	CH	0.6	2.5	0.7	-0.1		414		
550.0	690.0	2.0	3.0	S	CH	0.5	2.5	0.7	-0.1		458		
495.0	686.0	0.0	0.1	S	BI	3.12	2.0	1.0	-0.1		2175		
503.0	693.0	0.0	0.1	S	RG	2.72	2.3	0.8	-0.1		1742		
496.0	686.0	0.1	1.0	S	CH	1.7	2.3	0.8	-0.1		416		
496.0	680.0	2.0	3.0	S	CH	1.5	2.6	0.6	-0.1		410		
539.0	689.0	2.0	3.0	S	CH	0.5	2.3	0.8	-0.1		446		
489.0	700.0	0.0	0.1	S	RG	2.19	2.4	0.7	-0.1		1753		
497.5	688.0	0.5	1.0	S	BI	3.48	2.3	0.8	-0.1	SDR-0001	2191		
504.0	683.0	1.0	2.0	S	CH	1.6	2.7	0.5	-0.1		421		
539.0	683.0	0.1	1.0	S	CH	1.1	2.1	0.9	-0.1		436		
522.0	686.0	1.0	2.0	S	CH	0.9	2.4	0.7	-0.1		433		
515.0	685.0	0.1	0.3	S	PR	12.5	2.0	0.8	-0.1	NRC -	2496		
518.0	693.0	0.0	0.1	S	RG	3.43	2.4	0.7	-0.1		1744		

KERR-MCGEE TECHNICAL CENTER
DECOMMISSIONING PROJECT

Threshold Comparison Test Report – Soils

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc Res.
522.0	683.0	0.1	1.0	S	CH	0.2	2.4	0.7	-0.1		428	
496.0	686.0	2.0	3.0	S	CH	2.4	2.5	0.6	-0.1		418	
525.0	700.0	0.0	0.1	S	RG	2.99	2.1	0.9	-0.1		1760	
515.0	685.0	0.1	0.3	S	PR	11.1	2.1	0.7	-0.1		2421	
490.8	681.0	0.3	0.4	S	PR	3.99	2.4	0.6	-0.1	NRC -	2494	
550.0	698.0	1.0	2.0	S	CH	0.9	2.5	0.6	-0.1		461	
525.0	693.0	0.0	0.1	S	RG	2.46	2.1	0.9	-0.1		1745	
550.0	687.0	0.0	0.1	S	CH	1.7	2.3	0.7	-0.2		451	
504.0	683.0	2.0	3.0	S	CH	1.6	2.3	0.7	-0.2		422	
539.0	686.0	1.0	2.0	S	CH	1.3	2.6	0.5	-0.2		441	
550.0	690.0	1.0	2.0	S	CH	1.1	2.3	0.7	-0.2		457	
546.0	693.0	0.0	0.1	S	RG	2.31	2.1	0.8	-0.2		1748	
550.0	690.0	0.0	0.1	S	CH	0.9	2.3	0.7	-0.2		455	
522.0	686.0	2.0	3.0	S	CH	1	2.6	0.5	-0.2		434	
517.0	685.0	0.0	0.1	S	PR	10.8	2.2	0.6	-0.2		2423	
550.0	687.0	1.0	2.0	S	CH	0.5	2.3	0.7	-0.2		453	
504.8	686.4	0.1	0.5	S	BI	3.42	2.0	0.8	-0.2		2545	
488.0	684.0	2.0	3.0	S	CH	0.5	2.6	0.5	-0.2		373	
550.0	683.0	0.1	1.0	S	CH	1.8	2.4	0.6	-0.2		448	
490.0	690.0	0.0	0.1	S	PR	1.99	2.2	0.7	-0.2		2409	
550.0	698.0	0.1	1.0	S	CH	1.4	2.1	0.8	-0.2		460	
489.0	684.0	0.3	0.4	S	PR	1.75	2.4	0.6	-0.2		2406	
491.0	690.0	0.0	0.1	S	BI	2.96	2.2	0.7	-0.2	SDR-0001	2164	
517.0	686.0	0.5	1.0	S	BI	7.7	2.1	0.7	-0.2		1719	
554.0	686.0	0.0	0.1	S	RG	2.63	2.2	0.7	-0.2		1728	
498.0	688.0	0.3	0.4	S	PR	1.35	2.2	0.7	-0.2		2413	
490.0	684.0	2.0	3.0	S	CH	1	2.4	0.6	-0.2		377	
489.0	686.0	0.3	0.4	S	PG	7.8	2.1	0.7	-0.2		2407	
539.0	689.0	0.1	1.0	S	CH	0.8	2.4	0.6	-0.2		444	
550.0	698.0	2.0	3.0	S	CH	0.6	2.1	0.8	-0.2		462	
550.0	687.0	0.1	1.0	S	CH	0.4	2.1	0.8	-0.2		452	
546.0	700.0	0.0	0.1	S	RG	5.67	1.8	0.9	-0.2		1763	
496.0	700.0	0.0	0.1	S	RG	2.56	2.1	0.7	-0.2		1754	
504.0	683.0	0.1	1.0	S	CH	0.4	2.4	0.6	-0.2		420	
489.0	693.0	0.0	0.1	S	RG	2.85	2.1	0.7	-0.2		1740	
522.0	683.0	1.0	2.0	S	CH	0.1	2.4	0.6	-0.2		429	
490.0	684.0	1.0	2.0	S	CH	1.9	2.5	0.5	-0.2		376	
482.0	686.0	0.0	0.1	S	RG	3.28	2.2	0.7	-0.2		1709	
539.0	683.0	2.0	3.0	S	CH	1.3	2.2	0.7	-0.2		438	
512.0	686.0	0.5	1.0	S	BI	9	2.0	0.7	-0.2		1716	
539.0	683.0	1.0	2.0	S	CH	0.3	2.5	0.5	-0.2		437	
550.0	690.0	0.1	1.0	S	CH	2.2	2.3	0.6	-0.2		456	
539.0	686.0	0.1	1.0	S	CH	2	2.3	0.6	-0.2		440	
494.0	684.0	1.0	2.0	S	CH	1.8	2.3	0.6	-0.2		400	
489.0	683.0	2.0	3.0	S	BI	1.7	2.3	0.6	-0.2		1708	
525.0	686.0	0.0	0.1	S	RG	6.13	2.1	0.7	-0.2		1724	
539.0	686.0	0.0	0.1	S	RG	2.93	2.0	0.7	-0.2		1726	
489.0	690.0	0.0	0.1	S	BI	2.93	2.1	0.7	-0.2	SDR-0001	2156	
522.0	683.0	2.0	3.0	S	CH	1.1	2.3	0.6	-0.2		430	
489.0	680.0	0.3	0.4	S	PR	3.07	2.3	0.6	-0.2		2403	
488.0	683.0	0.3	0.4	S	PR	3.16	2.1	0.7	-0.2		2402	
491.0	692.0	0.0	0.1	S	BI	2.66	2.1	0.7	-0.2	SDR-0001	2165	
532.0	693.0	0.0	0.1	S	RG	1.93	2.0	0.8	-0.2		1746	
510.0	700.0	0.0	0.1	S	RG	1.56	2.3	0.6	-0.2		1758	
502.0	687.0	0.1	0.5	S	BI	3.1	1.9	0.8	-0.2		1732	
493.0	688.0	0.0	0.1	S	BI	1.98	2.0	0.8	-0.2	SDR-0001	2171	
489.0	681.0	2.0	3.0	S	BI	0.76	2.2	0.6	-0.2		1698	
487.0	684.0	0.3	0.4	S	PR	1.53	2.3	0.6	-0.2		2401	

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Threshold Comparison Test Report – Soils

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc Res.
539.0	689.0	1.0	2.0	S	CH	0.2	2.4	0.5	-0.2		445	
532.0	686.0	0.0	0.1	S	RG	2.42	2.1	0.6	-0.2		1725	
493.0	684.0	0.0	0.1	S	BI	3.04	2.1	0.6	-0.2	SDR-0001	2169	
503.0	686.0	0.0	0.1	S	RG	2.96	2.0	0.7	-0.2		1712	
489.0	688.0	0.0	0.1	S	BI	2.4	2.0	0.7	-0.2	SDR-0001	2155	
518.0	700.0	0.0	0.1	S	RG	2.59	1.8	0.8	-0.2		1759	
491.0	688.0	0.0	0.1	S	BI	2.06	2.1	0.6	-0.2	SDR-0001	2163	
503.0	700.0	0.0	0.1	S	RG	2.75	2.0	0.7	-0.2		1757	
520.0	686.0	0.5	1.0	S	BI	6.9	2.0	0.6	-0.2		1723	
494.0	680.0	1.0	2.0	S	CH	0.5	2.3	0.5	-0.2		396	
546.0	686.0	0.0	0.1	S	RG	2.14	2.0	0.7	-0.2		1727	
496.0	680.0	1.0	2.0	S	CH	1.3	2.1	0.6	-0.2		409	
512.0	686.0	0.1	0.5	S	BI	31.3	1.4	0.6	-0.2		1715	
539.0	693.0	0.0	0.1	S	RG	2.26	1.8	0.8	-0.2		1747	
493.0	686.0	0.0	0.1	S	BI	3.5	1.9	0.7	-0.2	SDR-0001	2170	
482.0	700.0	0.0	0.1	S	RG	2.55	2.1	0.6	-0.2		1752	
495.0	684.0	0.0	0.1	S	BI	1.99	2.0	0.6	-0.2	SDR-0001	2174	
488.0	684.0	1.0	2.0	S	CH	0.1	2.1	0.6	-0.2		372	
497.5	687.0	0.3	0.4	S	PR	1.56	1.9	0.7	-0.2		2412	
510.0	686.0	0.0	0.1	S	RG	2.25	1.9	0.7	-0.2		1713	
554.0	693.0	0.0	0.1	S	RG	2.7	1.9	0.7	-0.2		1749	
482.0	693.0	0.0	0.1	S	RG	2.69	1.9	0.7	-0.2		1737	
520.0	686.0	0.1	0.5	S	BI	16.7	1.5	0.7	-0.2		1722	
487.0	680.0	0.5	1.0	S	BI	2.8	2.0	0.6	-0.2		1691	
496.0	686.0	1.0	2.0	S	CH	1.2	2.0	0.6	-0.2		417	
489.0	692.0	0.0	0.1	S	BI	2.01	1.9	0.6	-0.2	SDR-0001	2157	
532.0	700.0	0.0	0.1	S	RG	2.47	1.9	0.6	-0.2		1761	
539.0	700.0	0.0	0.1	S	RG	2.47	1.9	0.6	-0.2		1762	
554.0	686.0	0.1	0.5	S	BI	2.43	1.9	0.6	-0.2		1729	
517.0	686.0	0.1	0.5	S	BI	33.7	1.2	0.6	-0.2		1718	
554.0	693.0	0.5	1.0	S	BI	1.78	1.9	0.7	-0.2		1751	
494.0	680.0	0.1	1.0	S	CH	0.5	2.1	0.5	-0.3		395	
496.0	700.0	0.5	1.0	S	BI	2.1	1.9	0.6	-0.3		1756	
554.0	700.0	0.0	0.1	S	RG	3.06	1.8	0.7	-0.3		1764	
502.0	687.0	0.5	1.0	S	BI	3.5	1.7	0.7	-0.3		1733	
512.6	691.6	0.2	0.3	S	PR	2.46	1.8	0.7	-0.3		2419	
494.0	684.0	0.1	1.0	S	CH	0.7	1.9	0.6	-0.3		399	
487.0	682.0	0.3	0.4	S	PR	1.38	2.1	0.5	-0.3		2400	
490.0	690.0	0.1	0.5	S	BI	1.14	2.0	0.5	-0.3	SDR-0001	2159	
554.0	686.0	0.5	1.0	S	BI	2.79	1.9	0.6	-0.3		1730	
489.0	683.0	1.0	2.0	S	BI	2.1	2.0	0.5	-0.3		1707	
554.0	693.0	0.1	0.5	S	BI	2.23	1.8	0.6	-0.3		1750	
489.0	681.0	1.0	2.0	S	BI	0.92	2.0	0.5	-0.3		1697	
487.0	680.0	1.0	2.0	S	BI	2.12	1.8	0.6	-0.3		1692	
504.8	686.4	0.5	1.0	S	BI	2.7	1.8	0.6	-0.3		2546	
482.0	693.0	0.1	0.5	S	BI	2.2	2.0	0.5	-0.3		1738	
482.0	693.0	0.5	1.0	S	BI	2.14	1.9	0.5	-0.3		1739	
486.0	685.0	0.3	0.4	S	PR	1.34	1.8	0.6	-0.3		2399	
487.0	683.0	2.0	3.0	S	BI	2.35	1.6	0.7	-0.3		1703	
487.0	683.0	0.5	1.0	S	BI	1.83	1.8	0.5	-0.3		1701	
496.0	700.0	0.1	0.5	S	BI	2.73	1.7	0.6	-0.3		1755	
485.5	684.0	0.3	0.4	S	PR	1.45	1.8	0.5	-0.3		2398	
487.0	680.0	2.0	3.0	S	BI	2.1	1.7	0.5	-0.3		1693	
489.0	683.0	0.3	0.4	S	PR	2.09	1.8	0.5	-0.3		2405	
487.0	683.0	1.0	2.0	S	BI	2.93	1.6	0.6	-0.3		1702	
492.0	685.0	0.1	0.5	S	BI	1.96	1.6	0.5	-0.3	SDR-0001	2167	
496.0	680.0	0.1	1.0	S	CH	0.4	1.5	0.6	-0.3		408	
492.0	685.0	0.5	1.0	S	BI	2.14	1.5	0.5	-0.4	SDR-0001	2168	

KERR-MCGEE TECHNICAL CENTER
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Threshold Comparison Test Report – Soils

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc Res.
496.0	683.0	0.1	1.0	S	CH	2.4	1.6	0.4	-0.4		412	
489.0	681.0	0.5	1.0	S	BI	1.95	1.5	0.5	-0.4		1696	
504.0	686.0	1.0	2.0	S	CH	7.8	1.3	0.4	-0.4		425	
504.0	686.0	2.0	3.0	S	CH	3	0.9	0.4	-0.5		426	

* All concentrations shown include background. FMPC is calculated net of Background Threshold.

KERR-MCGEE TECHNICAL CENTER

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Threshold Comparison Test Report - Soils

Summary of Background Data and Thresholds Used in this Analysis

Measurement BK *DCGL:* 1.0 *EMC:* 3.0 *Nuclides* FMPC

Matrices S

Nuclide	*Number of Data Points*	*Average Background*	*Sigma*	*Background Threshold (Tbk)*	*DCGLw Threshold (Td)*	*EMC Threshold (Tc)*
		(pCi/g)	*(pCi/g)*	*(pCi/g)*	*(pCi/g)*	*(pCi/g)*
U	291	1.76	0.90	3.56	4.56	6.56
Th	291	2.29	0.26	2.81	3.81	5.81
Ra	291	0.64	0.11	0.86	1.86	3.86
FMPC	291	0.62	0.05			

KERR-MCGEE TECHNICAL CENTER

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Threshold Comparison Test Report - Soils

STATISTICAL TEST

Run Date: 7/1/2003 1:54:17 AM

Survey Unit 19 Class 1

Selected Test: WILCOXON RANK SUM TEST

Test Pass

Thresholds:

EMC 3.0 DCGL 1.0 Nuclide FMPC

DATA SUMMARY

291 Background Points 33 Survey points processed

Wr = 52089 Wc 48126

****** The survey unit has passed the WILCOXON RANK SUM TEST ******

KERR-MCGEE TECHNICAL CENTER

DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

Run Date Monday, June 30, 2003

Survey Unit 20 Class: 1 Data Points FMPC Grid Type R Spacing 7 m.

SURVEY UNIT TABLE

Borders				Surface Area Included	
N	S	E	W	(sq. m)	Remarks
680.	660.	560.	475.	1700	
		Total		1700	

INITIALIZATION DATA

Measurement Types Selected: RG, PR, PG, BI, CH
Date Range: All
*** Report does not include Remediated data points ***

Thresholds:
EMC: 3.0 DCGLw 1.0 Nuclides FMPC

SURVEY UNIT TEST STATUS

Test Performed	Status		Mtx	FMPC
Min/Max	Fail	Maximum Survey Value	S	1.8
Background	Fail	Minimum Background	S	0.3
DCGLw	Pass	Difference		1.5
DCGLavg	Pass			
EMC	Pass	Average Activity	0.0	FMPC
Wilcoxon Rank Sum	Pass			
Sign Test for Paired Data:	N/A			

KERR-MCGEE TECHNICAL CENTER

DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

THE FOLLOWING DATA POINTS FAILED THE EMC TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE DCGLw TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE BACKGROUND TEST:

Survey Unit 20

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
515.0	667.0	0.0	0.1	S	BI	6.32	8.0	0.8	1.0		1320	C	
539.5	673.0	0.0	0.1	S	BI	5.31	5.2	0.8	0.5		762	C	
540.3	673.8	0.0	0.1	S	BI	9.37	4.5	0.9	0.4	Hot Spots	2537	C	
540.2	675.2	0.0	0.1	S	BI	5.84	4.3	0.8	0.3	Hot Spots	2536	C	
496.0	677.0	0.0	0.1	S	RG	6.15	3.6	0.9	0.2		1369	C	
510.4	677.0	0.0	0.1	S	BI	24.5	2.7	1.1	0.1	Hot Spots	2535	C	
502.0	679.0	0.0	0.1	S	BI	13.1	2.7	0.8	0.0		1686	C	

* All concentrations shown include background. FMPC is calculated net of Background Threshold.

THE FOLLOWING DATA POINTS PASSED BACKGROUND, DCGLw, AND EMC SCREENING TESTS:

Survey Unit 20

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
510.0	677.0	0.0	0.1	S	RG	12.4	2.4	0.9	0.0		1373		
515.0	667.0	0.1	0.3	S	PR	3.08	3.2	0.5	0.0		2416		
496.0	670.0	0.0	0.1	S	RG	6.91	2.2	1.0	0.0		1327		
492.0	671.0	0.1	1.0	S	CH	0.9	2.6	0.8	-0.1		379		
494.0	677.0	0.0	0.1	S	CH	1.9	2.8	0.6	-0.1		390		
494.0	674.0	2.0	3.0	S	CH	0.9	2.6	0.7	-0.1		389		

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
494.0	671.0	2.0	3.0	S	CH	1.2	2.5	0.7	-0.1		385		
546.0	677.0	0.0	0.1	S	RG	5.93	2.1	0.9	-0.1		1378		
553.0	677.0	0.0	0.1	S	RG	7.33	2.0	0.9	-0.1		1379		
489.0	672.0	0.0	0.1	S	CH	2.9	2.7	0.5	-0.1		366		
517.0	677.0	0.0	0.1	S	RG	5.66	2.3	0.7	-0.1		1374		
496.0	671.0	0.0	0.1	S	CH	2	2.4	0.7	-0.1		401		
539.5	673.0	0.1	0.5	S	BI	2.91	2.7	0.5	-0.1		763		
492.0	671.0	2.0	3.0	S	CH	1.3	2.1	0.9	-0.1		381		
539.0	677.0	0.0	0.1	S	RG	4.51	2.0	0.9	-0.1		1377		
524.0	677.0	0.0	0.1	S	RG	2.57	2.0	0.9	-0.1		1375		
494.0	671.0	0.0	0.1	S	CH	2	2.5	0.6	-0.1		382		
496.0	673.0	0.0	0.1	S	CH	1.2	2.5	0.6	-0.1		403		
494.0	677.0	2.0	3.0	S	CH	1.2	2.5	0.6	-0.1		393		
494.0	677.0	1.0	2.0	S	CH	0.9	2.5	0.6	-0.1		392		
510.0	670.0	0.0	0.1	S	RG	3.14	2.2	0.8	-0.1		1329		
524.0	670.0	0.0	0.1	S	RG	4.74	2.0	0.8	-0.1		1331		
496.0	677.0	0.0	0.1	S	CH	1.8	2.3	0.7	-0.1		405		
486.0	677.0	0.0	0.1	S	BI	3.46	2.2	0.8	-0.2		1358		
494.0	674.0	0.0	0.1	S	CH	1.7	2.4	0.6	-0.2		386		
516.0	667.0	0.0	0.1	S	BI	2.64	2.4	0.6	-0.2	SDR-0008	2323		
489.0	672.0	0.0	0.1	S	BI	6.27	2.1	0.7	-0.2		1343		
503.0	677.0	0.0	0.1	S	RG	6.8	2.0	0.8	-0.2		1372		
553.0	662.0	0.5	1.0	S	BI	1.85	2.1	0.8	-0.2		1319		
481.0	677.0	0.0	0.1	S	RG	2.11	2.1	0.7	-0.2		1363		
532.0	670.0	0.0	0.1	S	RG	5.27	2.0	0.8	-0.2		1332		
489.0	672.0	0.1	1.0	S	CH	2.1	2.1	0.7	-0.2		367		
539.5	673.0	0.5	1.0	S	BI	1.86	2.3	0.6	-0.2		764		
489.0	675.0	0.0	0.1	S	BI	5.85	1.9	0.8	-0.2		1353		
515.6	668.1	0.1	0.3	S	PR	2.47	2.2	0.6	-0.2		2417		
496.0	677.0	0.1	1.0	S	CH	0.6	2.1	0.7	-0.2		406		
489.0	677.0	2.0	3.0	S	BI	1.41	2.0	0.7	-0.2		1368		
481.0	662.0	0.0	0.1	S	RG	2.75	2.0	0.7	-0.2		1307		
492.0	671.0	0.0	0.1	S	CH	2.5	1.7	0.9	-0.2		378		
492.0	671.0	1.0	2.0	S	CH	0.5	2.5	0.4	-0.2		380		
503.0	670.0	0.0	0.1	S	RG	3.25	2.0	0.7	-0.2		1328		
539.0	662.0	0.0	0.1	S	RG	2.98	1.8	0.8	-0.2		1315		
553.0	662.0	0.0	0.1	S	RG	1	1.9	0.8	-0.2		1317		
532.0	662.0	0.0	0.1	S	RG	2.84	1.8	0.8	-0.2		1314		
553.0	670.0	0.1	0.5	S	BI	3.47	1.9	0.7	-0.2		1336		
553.0	662.0	0.1	0.5	S	BI	2.51	1.9	0.8	-0.2		1318		
496.0	662.0	0.0	0.1	S	RG	2.23	1.8	0.8	-0.2		1309		
481.0	670.0	0.0	0.1	S	RG	3.81	1.8	0.8	-0.2		1323		
515.0	667.0	0.1	0.5	S	BI	2.58	2.0	0.6	-0.2		1321		
515.0	667.0	0.5	1.0	S	BI	1.78	2.2	0.5	-0.2		1322		
502.0	679.0	0.1	0.5	S	BI	4.53	2.0	0.6	-0.2		1687		
540.0	671.5	0.0	0.1	S	BI	3.29	2.0	0.6	-0.2		759		
515.0	666.0	0.0	0.1	S	BI	2.44	1.9	0.7	-0.2	SDR-0008	2319		
494.0	674.0	1.0	2.0	S	CH	0.6	2.2	0.5	-0.2		388		
494.0	674.0	0.1	1.0	S	CH	0.4	2.2	0.5	-0.2		387		
540.0	671.5	0.1	0.5	S	BI	3.46	2.0	0.6	-0.2		760		
546.0	662.0	0.0	0.1	S	RG	2.46	1.9	0.7	-0.2		1316		
496.0	677.0	0.5	1.0	S	BI	2.89	2.1	0.5	-0.2		1371		
515.5	669.0	0.1	0.5	S	BI	1.07	2.3	0.4	-0.2	Hot Spots -	2340		
524.0	662.0	0.0	0.1	S	RG	2.48	1.7	0.8	-0.2		1313		
502.0	679.0	0.5	1.0	S	BI	3.7	2.0	0.5	-0.2		1688		
553.0	670.0	0.5	1.0	S	BI	2.61	1.9	0.6	-0.2		1337		
532.0	677.0	0.0	0.1	S	RG	1.49	1.9	0.6	-0.2		1376		
517.0	662.0	0.0	0.1	S	RG	2.64	1.8	0.7	-0.2		1312		
515.5	669.0	0.5	1.0	S	BI	1.58	2.2	0.4	-0.2	Hot Spots -	2341		

KERR-MCGEE TECHNICAL CENTER
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Threshold Comparison Test Report - Soils

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
499.0	676.0	0.1	1.0	S	CH	1	1.8	0.7	-0.2		510		
489.0	670.0	0.0	0.1	S	RG	7.16	1.6	0.7	-0.2		1326		
516.0	666.0	0.0	0.1	S	BI	2.38	1.7	0.7	-0.3	SDR-0008	2322		
494.0	671.0	1.0	2.0	S	CH	0.2	2.1	0.5	-0.3		384		
489.0	672.0	0.5	1.0	S	BI	4.25	1.8	0.6	-0.3		1345		
486.0	675.0	0.0	0.1	S	BI	2.3	1.9	0.6	-0.3		1348		
489.0	672.0	0.1	0.5	S	BI	3.39	1.9	0.6	-0.3		1344		
489.0	662.0	0.0	0.1	S	RG	2.83	1.8	0.6	-0.3		1308		
539.0	670.0	0.0	0.1	S	RG	4.1	1.8	0.7	-0.3		1333		
510.0	662.0	0.0	0.1	S	RG	1.98	1.8	0.7	-0.3		1311		
546.0	670.0	0.0	0.1	S	RG	2.33	1.8	0.6	-0.3		1334		
489.0	677.0	1.0	2.0	S	BI	1.16	1.9	0.6	-0.3		1367		
514.0	666.0	0.0	0.1	S	BI	2.64	1.9	0.6	-0.3	SDR-0008	2316		
540.0	671.5	0.5	1.0	S	BI	2.03	2.2	0.4	-0.3		761		
489.0	675.0	2.0	3.0	S	BI	2.32	1.9	0.6	-0.3		1357		
514.0	667.0	0.0	0.1	S	BI	1.93	1.9	0.6	-0.3	SDR-0008	2317		
489.0	675.0	0.5	1.0	S	BI	2.71	1.7	0.7	-0.3		1355		
553.0	670.0	0.0	0.1	S	RG	4.47	1.7	0.7	-0.3		1335		
489.0	675.0	0.1	0.5	S	BI	3.38	1.8	0.6	-0.3		1354		
517.0	670.0	0.0	0.1	S	RG	2.01	1.8	0.6	-0.3		1330		
503.0	662.0	0.0	0.1	S	RG	2.36	1.8	0.6	-0.3		1310		
486.0	672.0	0.0	0.1	S	BI	2.6	1.8	0.6	-0.3		1338		
486.0	677.0	0.5	1.0	S	BI	2.24	1.8	0.6	-0.3		1360		
499.0	676.0	0.1	0.3	S	PR	1.59	1.8	0.6	-0.3		2414		
486.0	675.0	1.0	2.0	S	BI	1.62	1.7	0.6	-0.3		1351		
486.0	675.0	2.0	3.0	S	BI	1.62	1.7	0.6	-0.3		1352		
486.0	672.0	0.5	1.0	S	BI	1.5	1.9	0.5	-0.3		1340		
489.0	677.0	0.0	0.1	S	RG	3.31	1.9	0.5	-0.3		1364		
486.0	677.0	2.0	3.0	S	BI	1.87	1.8	0.6	-0.3		1362		
496.0	671.0	0.1	1.0	S	CH	0.6	1.9	0.5	-0.3		402		
489.0	672.0	2.0	3.0	S	BI	2.19	1.7	0.6	-0.3		1347		
489.0	672.0	1.0	2.0	S	BI	2.18	1.7	0.6	-0.3		1346		
489.0	677.0	0.1	0.5	S	BI	2.59	1.7	0.6	-0.3		1365		
486.0	677.0	1.0	2.0	S	BI	2.31	1.7	0.6	-0.3		1361		
489.0	672.0	1.0	2.0	S	CH	0.8	1.8	0.5	-0.3		368		
486.0	672.0	1.0	2.0	S	BI	2.48	1.7	0.6	-0.3		1341		
481.0	670.0	0.1	0.5	S	BI	1.33	1.7	0.6	-0.3		1324		
496.0	673.0	0.1	1.0	S	CH	0.4	1.8	0.5	-0.3		404		
489.0	675.0	1.0	2.0	S	BI	2.56	1.8	0.5	-0.3		1356		
496.0	677.0	0.1	0.5	S	BI	1.59	1.6	0.6	-0.3		1370		
486.0	675.0	0.1	0.5	S	BI	2.11	1.7	0.5	-0.3		1349		
486.0	677.0	0.1	0.5	S	BI	1.81	1.6	0.6	-0.3		1359		
486.0	675.0	0.5	1.0	S	BI	1.92	1.6	0.5	-0.3		1350		
486.0	672.0	2.0	3.0	S	BI	1.73	1.6	0.6	-0.3		1342		
489.0	677.0	0.5	1.0	S	BI	1.46	1.5	0.6	-0.3		1366		
500.7	672.5	0.1	0.3	S	PR	1.03	1.7	0.5	-0.3		2415		
486.0	672.0	0.1	0.5	S	BI	1.77	1.6	0.5	-0.4		1339		
481.0	670.0	0.5	1.0	S	BI	2.4	1.6	0.4	-0.4		1325		
494.0	677.0	0.1	1.0	S	CH	0.2	1.4	0.6	-0.4		391		
494.0	671.0	0.1	1.0	S	CH	1.4	1.5	0.4	-0.4		383		

* All concentrations shown include background. FMPC is calculated net of Background Threshold.

KERR-MCGEE TECHNICAL CENTER

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Threshold Comparison Test Report - Soils

Summary of Background Data and Thresholds Used in this Analysis

Measurement BK *DCGL:* 1.0 *EMC:* 3.0 *Nuclides* FMPC

Matrices S

Nuclide	*Number of Data Points*	*Average Background*	*Sigma*	*Background Threshold (Tbk)*	*DCGLw Threshold (Td)*	*EMC Threshold (Tc)*
		(pCi/g)	*(pCi/g)*	*(pCi/g)*	*(pCi/g)*	*(pCi/g)*
U	291	1.76	0.90	3.56	4.56	6.56
Th	291	2.29	0.26	2.81	3.81	5.81
Ra	291	0.64	0.11	0.86	1.86	3.86
FMPC	291	0.62	0.05			

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Threshold Comparison Test Report - Soils

STATISTICAL TEST

Run Date: 7/1/2003 1:55:26 AM

Survey Unit 20 Class 1

Selected Test: WILCOXON RANK SUM TEST

Test Pass

Thresholds:

EMC 3.0 DCGL 1.0 Nuclide FMPC

DATA SUMMARY

291 Background Points 33 Survey points processed

Wr = 52089 Wc 48126

****** The survey unit has passed the WILCOXON RANK SUM TEST ******

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Threshold Comparison Test Report - Soils

Run Date Monday, June 30, 2003

Survey Unit 21 Class: 1 Data Points FMPC Grid Type R Spacing 8 m.

SURVEY UNIT TABLE

Borders				Surface Area Included	
N	S	E	W	(sq. m)	Remarks
720.	660.	590.	560.	1800	
		Total		1800	

INITIALIZATION DATA

Measurement Types Selected: RG, PR, PG, BI, CH
Date Range: All
*** Report does not include Remediated data points ***

Thresholds:
EMC: 3.0 DCGLw 1.0 Nuclides FMPC

SURVEY UNIT TEST STATUS

Test Performed	Status		Mtx	FMPC
Min/Max	Pass	Maximum Survey Value	S	0.9
Background	Fail	Minimum Background	S	0.3
DCGLw	Pass	Difference		0.6
DCGLavg	Pass			
EMC	Pass	Average Activity	0.1	FMPC
Wilcoxon Rank Sum	Pass			
Sign Test for Paired Data:	N/A			

KERR-MCGEE TECHNICAL CENTER

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Threshold Comparison Test Report - Soils

THE FOLLOWING DATA POINTS FAILED THE EMC TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE DCGLw TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE BACKGROUND TEST:

Survey Unit 21

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
575.0	689.0	0.0	0.1	S	RG	4.04	2.5	1.3	0.1		1399	C	
560.0	696.0	0.0	0.1	S	RG	4.61	2.4	1.3	0.0		1408	C	
560.0	681.0	0.0	0.1	S	RG	5.15	2.6	1.1	0.0		1396	C	
560.0	689.0	0.0	0.1	S	RG	2.91	2.4	1.2	0.0		1403	C	

* All concentrations shown include background. FMPC is calculated net of Background Threshold.

THE FOLLOWING DATA POINTS PASSED BACKGROUND, DCGLw, AND EMC SCREENING TESTS:

Survey Unit 21

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
560.0	674.0	0.0	0.1	S	RG	3.81	2.5	1.0	0.0		1391		
580.0	680.0	0.0	0.1	S	CH	0.9	2.9	0.8	0.0		463		
582.0	696.0	0.0	0.1	S	RG	1.75	2.6	1.0	0.0		1405		
589.9	681.0	0.0	0.1	S	RG	2.75	2.4	1.1	0.0		1392		
589.9	703.0	0.0	0.1	S	RG	2.49	2.6	0.9	0.0		1409		
568.0	674.0	0.0	0.1	S	RG	3.67	2.5	1.0	0.0		1390		
575.0	674.0	0.0	0.1	S	RG	2.46	2.5	0.9	0.0		1387		
568.0	681.0	0.0	0.1	S	RG	2.24	2.6	0.9	0.0		1395		
582.0	681.0	0.0	0.1	S	RG	2.79	2.2	1.1	0.0		1393		

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Threshold Comparison Test Report - Soils

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
582.0	689.0	0.0	0.1	S	RG	2.31	2.5	0.9	0.0		1398		
575.0	681.0	0.0	0.1	S	RG	2.27	2.4	1.0	-0.1		1394		
575.0	666.0	0.0	0.1	S	RG	2	2.6	0.8	-0.1		1382		
568.0	703.0	0.0	0.1	S	RG	2.71	2.4	1.0	-0.1		1412		
582.0	674.0	0.0	0.1	S	RG	2.43	2.5	0.9	-0.1		1386		
589.9	696.0	0.0	0.1	S	RG	2.16	2.4	0.9	-0.1		1404		
589.9	674.0	0.0	0.1	S	RG	2.45	2.4	0.9	-0.1		1385		
575.0	674.0	0.1	0.5	S	BI	2.82	2.3	1.0	-0.1		1388		
589.9	711.0	0.0	0.1	S	RG	2.91	2.4	0.9	-0.1		1416		
575.0	703.0	0.0	0.1	S	RG	2.01	2.5	0.8	-0.1		1411		
582.0	703.0	0.0	0.1	S	RG	1.85	2.3	1.0	-0.1		1410		
568.0	689.0	0.0	0.1	S	RG	2.81	2.3	0.9	-0.1		1400		
560.0	703.0	0.0	0.1	S	RG	2.19	2.4	0.9	-0.1		1415		
582.0	718.0	0.0	0.1	S	RG	1.72	2.3	0.9	-0.1		1422		
575.0	696.0	0.0	0.1	S	RG	2.96	2.3	0.9	-0.1		1406		
589.9	689.0	0.0	0.1	S	RG	2.07	2.5	0.8	-0.1		1397		
568.0	703.0	0.1	0.5	S	BI	1.98	2.4	0.8	-0.1		1413		
568.0	711.0	0.0	0.1	S	RG	2.1	2.3	0.9	-0.1		1419		
582.0	711.0	0.0	0.1	S	RG	2.85	2.5	0.8	-0.1		1417		
568.0	696.0	0.0	0.1	S	RG	3.19	2.2	0.9	-0.1		1407		
568.0	718.0	0.0	0.1	S	RG	2.22	2.3	0.9	-0.1		1424		
568.0	703.0	0.5	1.0	S	BI	1.9	2.4	0.8	-0.1		1414		
568.0	689.0	0.1	0.5	S	BI	2.72	2.3	0.9	-0.1		1401		
575.0	711.0	0.0	0.1	S	RG	2.54	2.5	0.8	-0.1		1418		
580.0	700.0	0.0	0.1	S	CH	1.6	2.7	0.6	-0.1		467		
580.0	680.0	0.1	1.0	S	CH	1.8	2.2	0.9	-0.1		464		
560.0	711.0	0.0	0.1	S	RG	1.55	2.3	0.8	-0.1		1420		
575.0	718.0	0.0	0.1	S	RG	2.61	2.3	0.8	-0.1		1423		
589.9	666.0	0.0	0.1	S	RG	1.95	2.2	0.8	-0.1		1380		
589.9	718.0	0.0	0.1	S	RG	1.86	2.2	0.8	-0.1		1421		
580.0	700.0	2.0	3.0	S	CH	2.1	2.5	0.6	-0.1		470		
580.0	680.0	2.0	3.0	S	CH	1.3	2.5	0.6	-0.1		466		
580.0	700.0	0.1	1.0	S	CH	0.2	2.5	0.6	-0.1		468		
568.0	718.0	0.1	0.5	S	BI	1.76	2.1	0.8	-0.2		1425		
580.0	700.0	1.0	2.0	S	CH	0.8	2.4	0.6	-0.2		469		
560.0	718.0	0.0	0.1	S	RG	2.17	2.2	0.7	-0.2		1427		
582.0	666.0	0.0	0.1	S	RG	1.73	2.2	0.7	-0.2		1381		
568.0	689.0	0.5	1.0	S	BI	2.39	2.1	0.7	-0.2		1402		
580.0	680.0	1.0	2.0	S	CH	1.2	2.3	0.6	-0.2		465		
575.0	674.0	0.5	1.0	S	BI	2.41	2.0	0.8	-0.2		1389		
568.0	666.0	0.0	0.1	S	RG	1.75	2.0	0.7	-0.2		1383		
560.0	666.0	0.0	0.1	S	RG	1.72	1.9	0.7	-0.2		1384		
568.0	718.0	0.5	1.0	S	BI	1.8	2.0	0.6	-0.2		1426		

* All concentrations shown include background. FMPC is calculated net of Background Threshold.

KERR-MCGEE TECHNICAL CENTER

DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

Summary of Background Data and Thresholds Used in this Analysis

Measurement BK *DCGL:* 1.0 *EMC:* 3.0 *Nuclides* FMPC

Matrices S

Nuclide	*Number of Data Points*	*Average Background*	*Sigma*	*Background Threshold (Tbk)*	*DCGLw Threshold (Td)*	*EMC Threshold (Tc)*
		(pCi/g)	*(pCi/g)*	*(pCi/g)*	*(pCi/g)*	*(pCi/g)*
U	291	1.76	0.90	3.56	4.56	6.56
Th	291	2.29	0.26	2.81	3.81	5.81
Ra	291	0.64	0.11	0.86	1.86	3.86
FMPC	291	0.62	0.05			

KERR-MCGEE TECHNICAL CENTER

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Threshold Comparison Test Report - Soils

STATISTICAL TEST

Survey Unit 21 Class 1

Selected Test: WILCOXON RANK SUM TEST

Test Pass

Thresholds:

EMC 3.0 DCGL 1.0 Nuclide FMPC

DATA SUMMARY

291 Background Points 40 Survey points processed

Wr = 54126 Wc 49240

****** The survey unit has passed the WILCOXON RANK SUM TEST ******

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Threshold Comparison Test Report - Soils

Run Date Monday, June 30, 2003

Survey Unit 22 Class: 1 Data Points FMPC Grid Type R Spacing 8 m.

SURVEY UNIT TABLE

Borders				Surface Area Included	
N	S	E	W	(sq. m)	Remarks
720.	660.	620.	590.	1806	
		Total		1806	

INITIALIZATION DATA

Measurement Types Selected: RG, PR, PG, BI, CH
Date Range: All
*** Report does not include Remediated data points ***

Thresholds:
EMC: 3.0 DCGLw 1.0 Nuclides FMPC

SURVEY UNIT TEST STATUS

Test Performed	Status		Mtx	FMPC
Min/Max	Pass	Maximum Survey Value	S	0.8
Background	Fail	Minimum Background	S	0.3
DCGLw	Pass	Difference		0.5
DCGLavg	Pass			
EMC	Pass	Average Activity	0.1	FMPC
Wilcoxon Rank Sum	Pass			
Sign Test for Paired Data:	N/A			

KERR-MCGEE TECHNICAL CENTER

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Threshold Comparison Test Report - Soils

THE FOLLOWING DATA POINTS FAILED THE EMC TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE DCGLw TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE BACKGROUND TEST:

Survey Unit 22

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
605.0	699.0	0.0	0.1	S	RG	1.8	2.9	1.0	0.1		1444	C	
620.0	706.0	0.0	0.1	S	RG	2.2	2.7	1.0	0.0		1439	C	
620.0	692.0	0.0	0.1	S	RG	1.82	2.5	1.1	0.0		1451	C	

* All concentrations shown include background. FMPC is calculated net of Background Threshold.

THE FOLLOWING DATA POINTS PASSED BACKGROUND, DCGLw, AND EMC SCREENING TESTS:

Survey Unit 22

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
605.0	669.0	0.0	0.1	S	RG	2.35	2.7	1.0	0.0		1466		
620.0	677.0	0.0	0.1	S	RG	3.55	2.6	1.0	0.0		1463		
590.0	699.0	0.0	0.1	S	RG	1.79	2.9	0.8	0.0		1440		
612.0	706.0	0.0	0.1	S	RG	2.47	2.6	0.9	0.0		1438		
590.0	669.0	0.0	0.1	S	RG	3.6	2.5	1.0	0.0		1464		
612.0	669.0	0.0	0.1	S	RG	2.42	2.5	0.9	0.0		1469		
590.0	706.0	0.0	0.1	S	RG	3.02	2.6	0.9	0.0		1435		
620.0	684.0	0.0	0.1	S	RG	1.87	2.4	1.0	0.0		1458		
620.0	699.0	0.0	0.1	S	RG	2.84	2.5	0.9	0.0		1446		
605.0	706.0	0.0	0.1	S	RG	1.77	2.5	1.0	0.0		1437		

KERR-MCGEE TECHNICAL CENTER

DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
612.0	677.0	0.0	0.1	S	RG	2.87	2.6	0.9	0.0		1462		
590.0	692.0	0.0	0.1	S	RG	3	2.5	0.9	0.0		1447		
597.0	684.0	0.1	0.5	S	BI	2.88	2.3	1.0	-0.1		1454		
620.0	700.0	0.0	0.1	S	CH	1.1	2.8	0.7	-0.1		479		
597.0	684.0	0.0	0.1	S	RG	2.04	2.3	1.0	-0.1		1453		
590.0	677.0	0.0	0.1	S	RG	2.06	2.4	0.9	-0.1		1459		
620.0	680.0	0.0	0.1	S	CH	1.8	2.6	0.8	-0.1		483		
612.0	692.0	0.0	0.1	S	RG	2.77	2.2	1.0	-0.1		1450		
605.0	692.0	0.0	0.1	S	RG	3.28	2.5	0.8	-0.1		1449		
605.0	677.0	0.0	0.1	S	RG	2.29	2.5	0.8	-0.1		1461		
597.0	692.0	0.0	0.1	S	RG	2.47	2.3	1.0	-0.1		1448		
590.0	714.0	0.0	0.1	S	RG	1.47	2.5	0.8	-0.1		1428		
605.0	684.0	0.0	0.1	S	RG	3.34	2.4	0.9	-0.1		1456		
612.0	714.0	0.0	0.1	S	RG	2.19	2.4	0.9	-0.1		1433		
612.0	699.0	0.0	0.1	S	RG	1.6	2.6	0.8	-0.1		1445		
620.0	669.0	0.0	0.1	S	RG	2.76	2.2	1.0	-0.1		1470		
597.0	677.0	0.0	0.1	S	RG	2.52	2.4	0.9	-0.1		1460		
620.0	700.0	2.0	3.0	S	CH	0.4	2.8	0.6	-0.1		482		
620.0	714.0	0.0	0.1	S	RG	1.36	2.4	0.8	-0.1		1434		
605.0	714.0	0.0	0.1	S	RG	2.28	2.3	0.9	-0.1		1430		
590.0	684.0	0.0	0.1	S	RG	1.9	2.4	0.8	-0.1		1452		
597.0	699.0	0.0	0.1	S	RG	1.89	2.5	0.8	-0.1		1441		
605.0	669.0	0.1	0.5	S	BI	3.3	2.3	0.8	-0.1		1467		
597.0	669.0	0.0	0.1	S	RG	1.88	2.4	0.8	-0.1		1465		
620.0	680.0	1.0	2.0	S	CH	1.4	2.5	0.7	-0.1		485		
620.0	680.0	2.0	3.0	S	CH	1.2	2.5	0.7	-0.1		486		
597.0	684.0	0.5	1.0	S	BI	1.39	2.1	1.0	-0.1		1455		
597.0	706.0	0.0	0.1	S	RG	1.95	2.4	0.7	-0.1		1436		
597.0	714.0	0.0	0.1	S	RG	2.06	2.3	0.8	-0.1		1429		
620.0	680.0	0.1	1.0	S	CH	1	2.4	0.7	-0.1		484		
620.0	700.0	1.0	2.0	S	CH	1.9	2.5	0.6	-0.1		481		
620.0	700.0	0.1	1.0	S	CH	1.6	2.3	0.7	-0.2		480		
597.0	699.0	0.1	0.5	S	BI	2.3	2.1	0.8	-0.2		1442		
605.0	714.0	0.5	1.0	S	BI	2.36	2.1	0.8	-0.2		1432		
597.0	699.0	0.5	1.0	S	BI	1.76	2.1	0.8	-0.2		1443		
612.0	662.0	0.0	0.1	S	RG	2.2	2.2	0.7	-0.2		1474		
612.0	684.0	0.0	0.1	S	RG	2.54	2.0	0.9	-0.2		1457		
605.0	714.0	0.1	0.5	S	BI	2.38	2.1	0.7	-0.2		1431		
590.0	662.0	0.0	0.1	S	RG	2.46	2.1	0.7	-0.2		1471		
605.0	669.0	0.5	1.0	S	BI	2.96	1.8	0.8	-0.2		1468		
597.0	662.0	0.0	0.1	S	RG	2.5	1.8	0.8	-0.2		1472		
620.0	662.0	0.0	0.1	S	RG	2.6	1.8	0.8	-0.2		1475		
605.0	662.0	0.0	0.1	S	RG	2.44	2.1	0.6	-0.2		1473		

* All concentrations shown include background. FMPC is calculated net of Background Threshold.

KERR-MCGEE TECHNICAL CENTER

DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

Summary of Background Data and Thresholds Used in this Analysis

Measurement BK *DCGL:* 1.0 *EMC:* 3.0 *Nuclides* FMPC

Matrices S

Nuclide	*Number of Data Points*	*Average Background*	*Sigma*	*Background Threshold (Tbk)*	*DCGLw Threshold (Td)*	*EMC Threshold (Tc)*
		(pCi/g)	*(pCi/g)*	*(pCi/g)*	*(pCi/g)*	*(pCi/g)*
U	291	1.76	0.90	3.56	4.56	6.56
Th	291	2.29	0.26	2.81	3.81	5.81
Ra	291	0.64	0.11	0.86	1.86	3.86
FMPC	291	0.62	0.05			

KERR-MCGEE TECHNICAL CENTER

DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

STATISTICAL TEST

Run Date: 7/1/2003 1:57:18 AM

Survey Unit 22 Class 1

Selected Test: WILCOXON RANK SUM TEST

Test Pass

Thresholds:

EMC 3.0 DCGL 1.0 Nuclide FMPC

DATA SUMMARY

291 Background Points 40 Survey points processed

Wr = 54126 Wc 49240

****** The survey unit has passed the WILCOXON RANK SUM TEST ******

KERR-MCGEE TECHNICAL CENTER

DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

Run Date Monday, June 30, 2003

Survey Unit 23 Class: 1 Data Points U Grid Type R Spacing 7 m.

SURVEY UNIT TABLE

Borders				Surface Area Included	
N	S	E	W	(sq. m)	Remarks
720.	660.	650.	620.	1797	
		Total		1797	

INITIALIZATION DATA

Measurement Types Selected: RG, PR, PG, BI, CH
Date Range: All
*** Report does not include Remediated data points ***

Thresholds:
EMC: 684.0 DCGLw 228.0 Nuclides U

SURVEY UNIT TEST STATUS

Test Performed	Status		Mtx	(pCi/g)
Min/Max	Pass	Maximum Survey Value	S	4.0
Background	Fail	Minimum Background	S	0.0
DCGLw	Pass	Difference		4.0
DCGLavg	Pass			
EMC	Pass	Average Activity	2.9	(pCi/g)
Wilcoxon Rank Sum	Pass			
Sign Test for Paired Data:	N/A			

KERR-MCGEE TECHNICAL CENTER

DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

THE FOLLOWING DATA POINTS FAILED THE EMC TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE DCGLw TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE BACKGROUND TEST:

Survey Unit 23

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
622.0	671.0	0.0	0.1	S	RG	3.7	2.3	1.0	-0.1		1676	C	
622.0	685.0	0.0	0.1	S	RG	3.88	2.4	0.9	-0.1		1666	C	
629.0	692.0	0.0	0.1	S	RG	4.01	2.2	1.0	-0.1		1663	C	
629.0	706.0	0.0	0.1	S	RG	3.66	2.1	0.9	-0.1		1653	C	
643.0	663.0	0.0	0.1	S	RG	3.6	1.9	0.7	-0.2		1685	C	

* All concentrations shown include background. FMPC is calculated net of Background Threshold.

THE FOLLOWING DATA POINTS PASSED BACKGROUND, DCGLw, AND EMC SCREENING TESTS:

Survey Unit 23

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
622.0	678.0	0.0	0.1	S	RG	2.92	2.6	1.0	0.0		1672		
629.0	678.0	0.0	0.1	S	RG	2.76	2.4	1.0	0.0		1673		
622.0	699.0	0.0	0.1	S	RG	2.92	2.2	1.0	-0.1		1658		
636.0	699.0	0.0	0.1	S	RG	2.05	2.3	0.9	-0.1		1660		
636.0	720.0	0.0	0.1	S	RG	2.07	2.3	0.9	-0.1		1644		
643.0	699.0	0.0	0.1	S	RG	3.36	2.3	0.9	-0.1		1661		
643.0	713.0	0.0	0.1	S	RG	2.48	2.2	1.0	-0.1		1651		
643.0	678.0	0.0	0.1	S	RG	2.76	2.2	0.9	-0.1		1675		

KERR-MCGEE TECHNICAL CENTER

DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
636.0	692.0	0.0	0.1	S	RG	2.49	2.4	0.8	-0.1		1664		
636.0	678.0	0.0	0.1	S	RG	3.5	2.4	0.8	-0.1		1674		
622.0	713.0	0.0	0.1	S	RG	3.28	2.2	0.9	-0.1		1648		
636.0	706.0	0.0	0.1	S	RG	2.31	2.1	0.9	-0.1		1654		
622.0	720.0	0.0	0.1	S	RG	2.01	2.3	0.8	-0.1		1642		
629.0	699.0	0.0	0.1	S	RG	3.21	2.2	0.8	-0.1		1659		
622.0	692.0	0.0	0.1	S	RG	3.25	2.1	0.9	-0.1		1662		
643.0	671.0	0.0	0.1	S	RG	2.82	2.2	0.8	-0.1		1679		
629.0	685.0	0.0	0.1	S	RG	3.03	2.3	0.8	-0.1		1667		
629.0	671.0	0.0	0.1	S	RG	2.75	2.2	0.8	-0.1		1677		
643.0	685.0	0.0	0.1	S	RG	2.34	2.1	0.9	-0.1		1671		
622.0	706.0	0.0	0.1	S	RG	1.99	2.2	0.8	-0.1		1652		
643.0	692.0	0.0	0.1	S	RG	2.42	2.1	0.9	-0.1		1665		
636.0	671.0	0.0	0.1	S	RG	3.22	2.1	0.8	-0.1		1678		
629.0	713.0	0.0	0.1	S	RG	3.08	2.1	0.8	-0.2		1649		
643.0	720.0	0.0	0.1	S	RG	3.18	2.0	0.8	-0.2		1647		
636.0	685.0	0.0	0.1	S	RG	3.12	1.9	0.9	-0.2		1670		
643.0	706.0	0.0	0.1	S	RG	3.07	2.0	0.8	-0.2		1655		
629.0	720.0	0.0	0.1	S	RG	3.35	1.9	0.8	-0.2		1643		
622.0	663.0	0.5	1.0	S	BI	3.19	1.9	0.7	-0.2		1682		
622.0	663.0	0.0	0.1	S	RG	2.58	1.9	0.7	-0.2		1680		
622.0	663.0	0.1	0.5	S	BI	2.53	1.8	0.8	-0.2		1681		
643.0	706.0	0.5	1.0	S	BI	2.56	1.9	0.7	-0.2		1657		
629.0	685.0	0.5	1.0	S	BI	2.31	1.8	0.7	-0.2		1669		
636.0	713.0	0.0	0.1	S	RG	2.6	1.9	0.7	-0.2		1650		
643.0	706.0	0.1	0.5	S	BI	3.05	1.6	0.8	-0.2		1656		
636.0	663.0	0.0	0.1	S	RG	2.86	1.7	0.7	-0.2		1684		
629.0	685.0	0.1	0.5	S	BI	3.26	1.8	0.7	-0.2		1668		
636.0	720.0	0.1	0.5	S	BI	2.16	1.9	0.6	-0.3		1645		
636.0	720.0	0.5	1.0	S	BI	2.6	1.7	0.7	-0.3		1646		
629.0	663.0	0.0	0.1	S	RG	2.48	1.4	0.7	-0.3		1683		

* All concentrations shown include background. FMPC is calculated net of Background Threshold.

KERR-MCGEE TECHNICAL CENTER

DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

Summary of Background Data and Thresholds Used in this Analysis

Measurement BK ***DCGL:*** 228.0 ***EMC:*** 684.0 ***Nuclides*** U

Matrices S

Nuclide	*Number of Data Points*	*Average Background*	*Sigma*	*Background Threshold (Tbk)*	*DCGLw Threshold (Td)*	*EMC Threshold (Tc)*
		(pCi/g)	*(pCi/g)*	*(pCi/g)*	*(pCi/g)*	*(pCi/g)*
U	291	1.76	0.90	3.56	231.56	687.56
Th	291	2.29	0.26	2.81	230.81	686.81
Ra	291	0.64	0.11	0.86	228.86	684.86
FMPC	291	0.62	0.05			

KERR-MCGEE TECHNICAL CENTER

DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

STATISTICAL TEST

Run Date: 7/1/2003 1:58:07 AM

Survey Unit 23 Class 1

Selected Test: WILCOXON RANK SUM TEST

Test Pass

Thresholds:

EMC 684.0 DCGL 228.0 Nuclide U

DATA SUMMARY

291 Background Points 36 Survey points processed

Wr = 52962 Wc 48604

****** The survey unit has passed the WILCOXON RANK SUM TEST ******

KERR-MCGEE TECHNICAL CENTER

DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

Run Date Monday, June 30, 2003

Survey Unit 24 Class: 2 Data Points U Grid Type R Spacing 13 m.

SURVEY UNIT TABLE

Borders				Surface Area Included	
N	S	E	W	(sq. m)	Remarks
800.	765.	505.	490.	525	
765.	750.	575.	490.	1275	
750.	720.	575.	560.	449	
735.	720.	665.	575.	1350	
720.	660.	665.	650.	901	
660.	655.	665.	475.	950	
		Total		5450	

INITIALIZATION DATA

Measurement Types Selected: RG, PR, PG, BI, CH

Date Range: All

*** Report does not include Remediated data points ***

Thresholds:

EMC: 684.0 DCGLw 228.0 Nuclides U

SURVEY UNIT TEST STATUS

Test Performed	Status		Mtx	(pCi/g)
Min/Max	Pass	Maximum Survey Value	S	3.6
Background	Fail	Minimum Background	S	0.0
DCGLw	Pass	Difference		3.6
DCGLavg	Pass			
EMC	Pass			
		Average Activity	2.7	(pCi/g)
Wilcoxon Rank Sum	Pass			
Sign Test for Paired Data:	N/A			

KERR-MCGEE TECHNICAL CENTER

DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

THE FOLLOWING DATA POINTS FAILED THE EMC TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE DCGLw TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE BACKGROUND TEST:

Survey Unit 24

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
503.0	798.0	0.0	0.1	S	RG	3.6	2.2	0.9	-0.1		1306	C	
658.0	696.0	0.0	0.1	S	RG	3.6	1.6	0.7	-0.3		1269	C	

* All concentrations shown include background. FMPC is calculated net of Background Threshold.

THE FOLLOWING DATA POINTS PASSED BACKGROUND, DCGLw, AND EMC SCREENING TESTS:

Survey Unit 24

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
491.0	786.0	0.0	0.1	S	RG	3	2.1	1.0	-0.1		1301		
503.0	786.0	0.0	0.1	S	RG	3	2.2	0.8	-0.1		1304		
491.0	798.0	0.0	0.1	S	RG	3.2	2.3	0.7	-0.1		1305		
619.0	658.0	0.0	0.1	S	RG	2.6	2.1	0.8	-0.2		1261		
491.0	658.0	0.0	0.1	S	RG	3.4	2.0	0.8	-0.2		1249		
491.0	773.0	0.0	0.1	S	RG	2.6	2.0	0.8	-0.2		1299		
516.0	760.0	0.0	0.1	S	RG	2.5	2.0	0.8	-0.2		1292		
542.0	760.0	0.0	0.1	S	RG	2.2	2.0	0.8	-0.2		1294		
503.0	773.0	0.0	0.1	S	RG	3.3	2.1	0.7	-0.2		1300		
503.0	760.0	0.0	0.1	S	RG	3.1	2.1	0.7	-0.2		1291		
478.0	658.0	0.0	0.1	S	RG	2.9	2.1	0.7	-0.2		1248		

KERR-MCGEE TECHNICAL CENTER

DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

X	Y	D1	D2	Mtx	Meas. Type	U pCi/g	Th pCi/g	Ra pCi/g	FMPC*	Remark	TCN	Exc	Res.
632.0	735.0	0.0	0.1	S	RG	2.1	2.1	0.7	-0.2		1284		
632.0	658.0	0.0	0.1	S	RG	2.9	1.9	0.8	-0.2		1262		
568.0	760.0	0.0	0.1	S	RG	2.8	1.9	0.8	-0.2		1296		
658.0	683.0	0.0	0.1	S	RG	2.7	1.9	0.8	-0.2		1266		
555.0	658.0	0.0	0.1	S	RG	2.7	1.9	0.8	-0.2		1254		
645.0	722.0	0.0	0.1	S	RG	2.5	1.9	0.8	-0.2		1277		
555.0	760.0	0.0	0.1	S	RG	2.7	2.0	0.7	-0.2		1295		
645.0	658.0	0.0	0.1	S	RG	2.5	2.0	0.7	-0.2		1263		
568.0	722.0	0.0	0.1	S	RG	3.4	1.8	0.8	-0.2		1271		
658.0	735.0	0.0	0.1	S	RG	3.3	1.9	0.7	-0.2		1286		
581.0	658.0	0.0	0.1	S	RG	3	1.9	0.7	-0.2		1256		
658.0	735.0	0.5	1.0	S	BI	3	1.9	0.7	-0.2		1288		
581.0	722.0	0.0	0.1	S	RG	2.9	1.9	0.7	-0.2		1272		
568.0	658.0	0.0	0.1	S	RG	2.8	1.9	0.7	-0.2		1255		
568.0	735.0	0.0	0.1	S	RG	2.7	1.9	0.7	-0.2		1279		
658.0	658.0	0.0	0.1	S	RG	2.6	1.9	0.7	-0.2		1264		
555.0	760.0	0.1	0.5	S	BI	2.6	1.9	0.7	-0.2		1297		
593.0	658.0	0.1	0.5	S	BI	2.6	1.9	0.7	-0.2		1258		
658.0	722.0	0.0	0.1	S	RG	2.5	1.9	0.7	-0.2		1278		
593.0	658.0	0.0	0.1	S	RG	1.3	1.9	0.7	-0.2		1257		
491.0	786.0	0.1	0.5	S	BI	3	2.0	0.6	-0.2		1302		
491.0	760.0	0.0	0.1	S	RG	2.5	2.0	0.6	-0.2		1290		
645.0	735.0	0.0	0.1	S	RG	2.1	2.0	0.6	-0.2		1285		
658.0	735.0	0.1	0.5	S	BI	3.1	1.8	0.7	-0.2		1287		
632.0	722.0	0.0	0.1	S	RG	3	1.8	0.7	-0.2		1276		
555.0	760.0	0.5	1.0	S	BI	2.9	1.8	0.7	-0.2		1298		
568.0	748.0	0.0	0.1	S	RG	2.8	1.8	0.7	-0.2		1289		
658.0	709.0	0.0	0.1	S	RG	2.7	1.8	0.7	-0.2		1270		
503.0	658.0	0.0	0.1	S	RG	2.7	1.8	0.7	-0.2		1250		
658.0	683.0	0.1	0.5	S	BI	2.4	1.8	0.7	-0.2		1267		
658.0	683.0	0.5	1.0	S	BI	2.3	1.8	0.7	-0.2		1268		
529.0	760.0	0.0	0.1	S	RG	1.8	1.8	0.7	-0.2		1293		
619.0	722.0	0.0	0.1	S	RG	3.2	1.9	0.6	-0.2		1275		
593.0	735.0	0.0	0.1	S	RG	3.1	1.9	0.6	-0.2		1281		
606.0	722.0	0.0	0.1	S	RG	2.5	1.9	0.6	-0.3		1274		
606.0	735.0	0.0	0.1	S	RG	2.4	1.9	0.6	-0.3		1282		
593.0	722.0	0.0	0.1	S	RG	1.9	1.9	0.6	-0.3		1273		
516.0	658.0	0.0	0.1	S	RG	2.6	1.7	0.7	-0.3		1251		
593.0	658.0	0.5	1.0	S	BI	2.6	1.7	0.7	-0.3		1259		
619.0	735.0	0.0	0.1	S	RG	2.6	1.7	0.7	-0.3		1283		
658.0	670.0	0.0	0.1	S	RG	2.2	1.7	0.7	-0.3		1265		
581.0	735.0	0.0	0.1	S	RG	3.1	1.8	0.6	-0.3		1280		
606.0	658.0	0.0	0.1	S	RG	2.7	1.8	0.6	-0.3		1260		
542.0	658.0	0.0	0.1	S	RG	2.4	1.8	0.6	-0.3		1253		
491.0	786.0	0.5	1.0	S	BI	2.1	1.8	0.6	-0.3		1303		
529.0	658.0	0.0	0.1	S	RG	2.9	1.9	0.5	-0.3		1252		

* All concentrations shown include background. FMPC is calculated net of Background Threshold.

KERR-MCGEE TECHNICAL CENTER

DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

Summary of Background Data and Thresholds Used in this Analysis

Measurement BK ***DCGL:*** 228.0 ***EMC:*** 684.0 ***Nuclides*** U

Matrices S

Nuclide	*Number of Data Points*	*Average Background*	*Sigma*	*Background Threshold (Tbk)*	*DCGLw Threshold (Td)*	*EMC Threshold (Tc)*
		(pCi/g)	*(pCi/g)*	*(pCi/g)*	*(pCi/g)*	*(pCi/g)*
U	291	1.76	0.90	3.56	231.56	687.56
Th	291	2.29	0.26	2.81	230.81	686.81
Ra	291	0.64	0.11	0.86	228.86	684.86
FMPC	291	0.62	0.05			

KERR-MCGEE TECHNICAL CENTER

DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Soils

STATISTICAL TEST

Run Date: 7/1/2003 1:58:59 AM

Survey Unit 24 Class 2

Selected Test: WILCOXON RANK SUM TEST

Test Pass

Thresholds:

EMC 684.0 DCGL 228.0 Nuclide U

DATA SUMMARY

291 Background Points 49 Survey points processed

Wr = 56745 Wc 50663

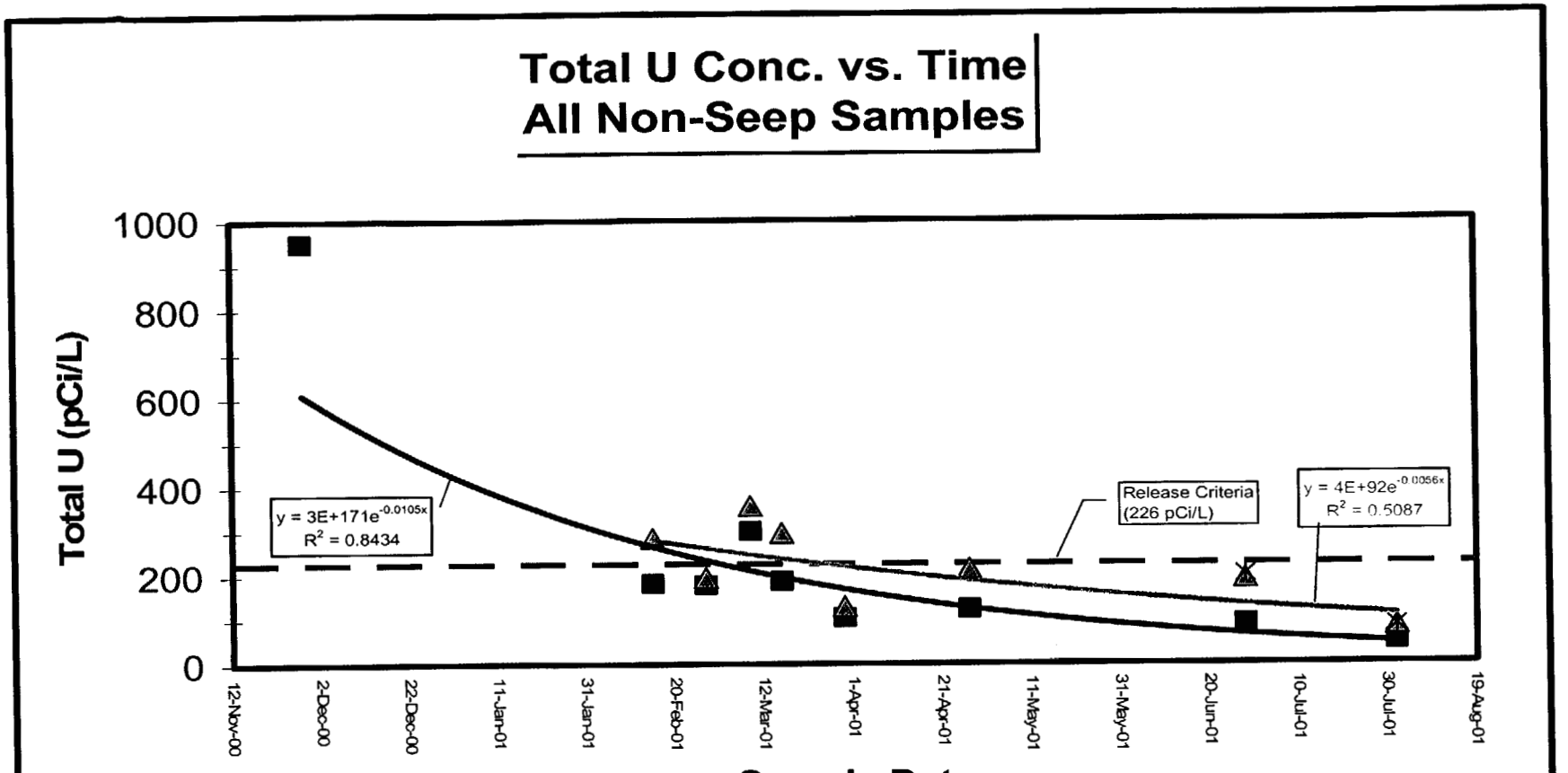
****** The survey unit has passed the WILCOXON RANK SUM TEST ******

Appendix 4

Test Pit Composite

&

West Seep Water Data


Total U Conc. vs. Time
All Non-Seep Samples
Total U (pCi/L)
1000
800
600
400
200
0
y = 3E+171e-0.0105x
R2 = 0.8434
Release Criteria
(226 pCi/L)
y = 4E+92e-0.0056x
R2 = 0.5087
12-Nov-00
2-Dec-00
22-Dec-00
11-Jan-01
31-Jan-01
20-Feb-01
12-Mar-01
1-Apr-01
21-Apr-01
11-May-01
31-May-01
20-Jun-01
10-Jul-01
30-Jul-01
19-Aug-01
Sample Date
Cushing Lab Data
GEL Data
STL Richland Data
Release Criteria (226 pCi/L)
Exponential Fit (GEL Data)
Exponential Fit (Cushing Lab Data)

Lab Results

West Seep

Sample #	Date	Cushing	GEL	NRC	Location
44/44/44/44N	2/6/01	610	1309	2820	West Seep
59/59/59	2/19/01	398			West Seep
63/63/63	2/21/01	642			West Seep
87/88/89	3/09/01	438	992		West Seep
90/91	3/09/01	285			West Seep
111/111/117	3/30/01	281	792		West Seep
114	3/30/01				West Seep
141A/141B/141C	4/27/01	438	732		West Seep
142A	4/27/01		923		West Seep

Lab Results

UTP Composite Samples

Sample #	Date	Cushing	GEL	STL	Location
9/9A	11/28/00	951			Composite
55/55/55	2/15/01	182	285		Composite
72/72/72	2/27/01	178	195		Composite
81/82/83	3/09/01	197	332		Composite
84/85/86	03/09/01	403	381		Composite
97/97/97	3/16/01	187	295		Composite
109/109/115	3/30/01	108	128		Composite
110/110/116	3/30/01	100	130		Composite
139A/139B/139C	4/27/01	123	192		Composite
140A/143	4/27/01		236		Composite
182/182A182B/182D	6/28/01	90	191	199	Composite
182D	6/28/01			209	Composite
182D	6/28/01			202	Composite
182D	6/28/01			192	Composite
197/197A/197B/197D	8/01/01	49	81	83	Composite
197A/197D	8/01/01		85	84	Composite
197D	8/01/01			84	Composite
197D	8/01/01			86	Composite

Appendix 5

NEXTEP Technical Memorandum 02-09

Technical Support Document for KMTC Outdoor Final Status Survey

NEXTEP Environmental

808 Lyndon Lane, Suite 201
Louisville, KY 40222

Phone: (502) 339-9767
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TECHNICAL MEMORANDUM 02-09

September 5, 2003

Originator: A.H. Thatcher, CHP, Senior HP Scientist

Subject: Technical Support Document for KMTC Outdoor Final Status Survey

Revision: 2

ENDORSEMENT: This document contains the results of research and technical analysis which have been reviewed and approved for publication by the Technical Director, NEXTEP Environmental, Inc.

Harry J. Newman, CHP, Technical Director — Date

INTRODUCTION:

This document provides the technical basis for calculations for the Final Status Survey Plan for Outdoor Survey Units (FSSP). This document specifically addresses the following issues:

- Scan MDC for outdoor gamma measurements
- Investigation level for gamma scans
- MDC for direct beta measurements
- Scan MDC for beta measurements

Scan MDC for Outdoor Gamma Measurements

The required scan MDC for Outdoor Gamma Measurements should be 100% of the release limit converted to counts per minute for a typical 3 inch NaI detector in the **shielded** configuration. For the three radionuclide groups of interest, uranium, thorium, and radium, Ra-226 provides the most conservative combination of release limit and counts per unit concentration conversion factor. The conversion factor is obtained from the D Plan[43].

[43] Appendix E of D Plan: Derivation of Outdoor Scan Thresholds and MDCR for KMTC.

The calculation of required MDCR for gamma scans is as follows:

$$\text{Required MDCR} = [(3.5\text{pCi/g}) * (840\text{cpm/pCi/g})]$$

Where: 3.5 pCi/g = DCGLw for Ra-226
810 cpm/pCi/g = Conversion factor

Required MDCR = 2940 cpm above background.

The calculation of actual instrument MDCR for the same instrument is fully explained in Appendix E of the D Plan. The calculated value given by the D Plan is:

MDCR = 1200 cpm

Investigation Level for Gamma Scans (Shielded NaI detector)

Using the same conversion factor and the $DCGL_w$ for Ra-226, the release limit is

$$DCGL_w \text{ (Ra 226)} = 2940 \text{ cpm}$$

The investigation threshold for shielded NaI scans is set to 2500 cpm. This is below the $DCGL_w$ yet sufficiently above the MDCR.

MDC for Direct Beta Measurements

The required MDC for direct beta measurements is one half of the $DCGL_w$, or 6,250 βpm/100 cm². The formula for calculating the MDC for a Ludlum 43-89 detector is given by equation 1:

$$MDC = \frac{3 + 4.65\sqrt{B_r}}{\varepsilon * t * \frac{A_c}{100cm^2}}$$

Equation 1

Where:

B_r = Background count = 700 counts[44]

ε = Instrument efficiency = 0.17[45]

t = count time (minutes) = 1 m

A_c = effective probe area (cm²) = 110 cm²

[44] Average of open window counts for brick matrix from the KMTC database.
[45] Efficiency for Ludlum 2224 for brick matrix taken on 11/9/2000.

The resulting MDC for beta measurements is 670 βpm/100 cm² and is less than the required MDC.

Scan MDC for Beta Measurements

The required MDC for beta scan measurements should be equal to the $DCGL_w$, or 12,500 βpm/100 cm² . The formula for calculating the Scan MDC[1] for the same detector is given by equation 2:

$$ScanMDC = \frac{1.38\sqrt{\frac{B_r}{\frac{60}{i}}} * \frac{60}{i}}{\sqrt{p} * \varepsilon_i * \varepsilon_s * \frac{A_e}{100cm^2}}$$

Equation 2

Where:

B_r = Background count rate (cpm) = 700 cpm

i = probe observation interval (seconds)

p = surveyor efficiency = 0.5

ε_i = Instrument efficiency = 0.17

ε_s = Surface efficiency = 0.3[46]

A_e= effective probe area (cm²) = 110 cm²

Given a worst case probe observation interval of 1 second (representing a first pass scan), the corresponding Scan MDC equals 7,130 βpm/100cm² and is significantly less than the required Scan MDC of 12,500 βpm/100 cm².

Conclusions and Recommendations

The table summarizes the information calculated above. In all cases, the calculated value is less than the required for a given measurement as shown in Table 1.

[46] NUREG 1570 Table 5.3 for a distributed source on sealed concrete.

Table 1

Summary of Calculations

Measurement of Interest	Calculated Value[a]	Required Value[a]
MDCR for Outdoor Gamma Scans with shielded 3" x ½" NaI	1,200 cpm	2,940 cpm
Investigation Threshold for Outdoor Gamma Scans with shielded 3" x ½" NaI	2,500 cpm	2,940 cpm
MDC for Direct Beta Measurements	670 βpm/100 cm²	6,250 βpm/100 cm².
MDC for Beta Scans	7,130 βpm/100 cm²	12,500 βpm/100 cm².

[a] All values are net above background.

Appendix 6
Hot Spot Evaluation Protocol

HOT SPOT EVALUATION PROTOCOL

1. There are four general conditions where a result will require further investigation to determine the depth, extent and character of the radioactivity present. They are:
   a. A NaI scan survey discovers an area which exceeds the specified threshold for the survey.
   b. An isolated soil sample location exceeds the release criteria and is surrounded by points which do not.
   c. Several adjacent soil samples (separated by a distance less than or equal to the grid spacing) exceed the release criteria.
   d. Elevated measurements are obtained on contaminated buried piping or equipment.
2. SCANS. When a scan survey encounters readings in excess of the survey threshold:
   a. Conduct an investigation with the scan instrument to determine the extent of the elevated area and mark the locations where the reading falls off to the threshold or below.
   b. Record the X and Y location of the peak value.
   c. Record the maximum reading at the same peak location.
   d. Record the maximum distance across the affected area in meters.
   e. For soil locations:
      i.) Take three soil samples at the location of the peak scan reading (depths 0-0.15, 0.15-0.50, and 0.50-1.00 meters).
      ii.) If the area of elevated activity is less than one meter across, no further action is required.
      iii.) If the area is more extensive, take surface soil samples to cover the entire elevated area on a rectangular grid oriented NSEW with spacing appropriate to cover the area. The outer samples of the pattern should all be beyond the elevated area marked off by scans.
   f. For concrete, either obtain a core sample for analysis or remediate the concrete surface to eliminate the hot spot. Document the readings before and after remediating

3. SINGLE SOIL SAMPLE. When soil analysis results produce a single, isolated data point which exceeds the release limit:
   a. Calculate the EMC limit using the area rule by inscribing the largest possible circle around the hot spot which does not intersect the neighboring points.
   b. If the hot spot is acceptable according to MARSSIM criteria:
      i.) Resample the same location at the same three depths mentioned above to determine the vertical extent of the contamination.
      ii.) Scan the immediate area surrounding the hot spot and respond to other localized maxima as described in Section 2.
   c. If the hot spot exceeds EMC criteria:
      i.) Resample the location at three depths down to 1 meter.

ii.) Take surface samples to the N, S, E, and W of the hot spot at a distance appropriate to the situation but not greater than half the grid spacing.

iii.) Scan the area surrounding the hot spot out to the offset points and respond to other localized maxima as described in par. 2.

4. SEVERAL ADJACENT SOIL SAMPLES (separated by a distance less than or equal to the grid spacing) exceed the release criteria.
   a. Calculate the EMC limit using the area rule by inscribing the largest possible polygon around the elevated area which does not intersect the neighboring points which are below the release criteria.
   b. If the hot spot is acceptable according to MARSSIM criteria:
      i.) Resample at least one of the elevated locations at the same three depths mentioned above to determine the vertical extent of the contamination. Resample other locations to depth if needed to cover the area adequately.
      ii.) Scan the entire elevated area surrounding the hot spot and respond to other localized maxima as described in par. 2.
   c. If the hot spot exceeds EMC criteria:
      i.) Resample at least one of the elevated locations at the same three depths mentioned above to determine the vertical extent of the contamination. Resample more to depth needed to cover the area adequately.
      ii.) Cover the entire area of elevated activity with a grid of surface soil samples oriented NSEW and spaced to provide a resolution adequate to characterize the area with a reasonable number of samples. Ensure that the entire perimeter of the grid contains samples outside of the elevated area.
      iii.) Scan the area surrounding the hot spot out to the offset points and respond to other localized maxima as described in par. 2.

5. CONTAMINATED BURIED PIPING.
   a. Discharge piping will be considered contaminated if:
      v.) Direct β measurements on accessible internal surfaces exceed the DCGLw, or
      vi.) Sludge taken from traps or access points and analyzed at the HP lab exceeds the DCGLw
      vii.) Removable contamination measures more than 200 dpm/100cm^2 above background, or
      viii.) Gamma scans/measurements on external surfaces exceed 2x background.

   b. In the event that an elevated location is identified, the RSO will decide whether to:
      i.) Perform isotopic analysis to determine the specific radionuclide contributors and derive a specific release limit for the buried piping, or
      ii.) Remove the contaminated piping.

6. GENERAL CONSIDERATIONS

6.1. Elevated scan readings will be investigated as they are obtained. The maximum and average scan readings will be recorded for each area scanned on the FSS Scan Measurement Form (see Attachment A). When a reading above the threshold is obtained, the details discussed in Paragraph 2 will be recorded in the section titled "Hot Spot Information" on the same form. The soil samples which are taken to characterize the spot will be recorded on the Sample Collection Form as Bias (BI) samples. In the remarks note that these samples are hot spot characterization and, on the scan form, list the sample ID numbers for the soil samples collected as part of the investigation.

6.2. Elevated soil sample results will not normally be investigated in the field during the collection process since laboratory analysis is first required. Once the soil results are entered into the database, the analyst assigned to the survey unit will evaluate the hot spots in accordance with Paragraphs 3 and 4 above and prepare a Supplemental Data Request using the form supplied in Attachment B. The locations and depths of the required data points will be filled in by the analyst and iSUed to operations for collection. This form will also serve as the data collection form for the soil samples. Special instructions will be included at the bottom. Any required scans that are conducted will be recorded on copies of Attachment C and attached to the Supplemental Data Request.

6.3. The guidelines given in Paragraphs 3 and 4 may be varied as necessary by the analyst when requesting remediation or supplemental data. (It may, for example, be advisable to remediate on the basis of an initial scan reading when the area is very small rather than expending time and effort collecting additional samples to further characterize the spot. The post remediation data points will cover all the necessary characterization after the spot has been removed.) Where depth data already exists for a hot-spot, the measurements need not be repeated.

6.4. After remediation of an affected area, supplemental data will be taken to obtain replacement data points and confirmation that the area is clean. Before backfilling or re-paving, data points (i.e soil samples) will be taken at the bottom of the remediated area. The regular grid points will be replaced as a minimum. All of these data points will be of type PR (post remediation) or PG (post remediation grid).

6.5. The RSO will determine whether NRC should be notified before authorizing any backfilling operations. Bias measurements will be collected on top of backfill material unless that material has already been characterized elsewhere.

6.6. Any survey unit that contains elevated measurements will have a scan survey re-performed over the entire survey unit after all necessary remediation has been performed to ensure that no other areas of elevated activity were missed.

6.7. When the data forms are submitted to Quality Assurance for processing, the Quality Control Coordinator will ensure that they are fully reviewed and will confirm that all the requested data were obtained and that no scan levels exist above thresholds which have not been processed in accordance with this protocol.