U.S. NUCLEAR REGULATORY COMMISSION
REGION I

Report No. 70-33/92-04

Docket No. 70-33

License No. SNM-23 Priority 1 Category UHFF

Licensee Texas Instruments, Incorporated
34 Forest Street
Attleboro, Massachusetts 02702

Facility Name: HFIR Project

Inspection At: Attleboro, Massachusetts

Inspection Conducted: December 14-16, 1992

Inspector: _____ 12/29/92
J. Roth, Project Engineer Date
Facilities Radiation Protection Section
Facilities Radiological Safety and Safeguards Branch
Division of Radiation Safety and Safeguards

Approved by: _____ 12/30/92
W. J. Pasciak, Chief Date
Facilities Radiation Protection Section
Facilities Radiological Safety and Safeguards Branch
Division of Radiation Safety and Safeguards

Areas Inspected: Special, announced inspection by a region-based inspector to observe a survey conducted by the NRC contractor, the Oak Ridge Institute for Science and Education (ORISE), to verify survey results provided by the licensee.

Results: Preliminary results of the ORISE survey indicated that the licensee appeared to have completed cleanup of the bottom of the excavated area in an appropriate manner. However, elevated radiation levels obtained on the walls of the excavated areas indicate that not all radioactive material, above the NRC-approved guidance values, had been removed. No safety concerns or violations of regulatory requirements were identified.

DETAILS

1.0 Individuals Contacted

M. Elliot, Manager, Environmental Engineering
M. Griffin, Project Manager
T. Gutman, Consultant
W. Lorenzen, Health Physicist
J. O'Donnell, Corporate Health Physicist
W. Schuele, Attleboro Site Manager
F. Veale, Jr., Manager, Environmental Engineering/Industrial Hygiene

Other licensee representatives, employees and remediation contractor employees were also interviewed during this inspection.

2.0 Background

On August 26, 1992, NRC issued Amendment No. 16 to Facility License SNM-23. This amendment authorized the licensee to perform remediation of the on-site low level radwaste burial site in accordance with the "Remediation Plan for the Identified Building 12 Burial Area" (Remediation Plan) and the "Radiological Health and Safety Plan dated July 30, 1992." The licensee performed the remediation activities between August 27 and November 13, 1992 and provided the NRC with the "Post Excavated Radiological Survey Report" dated November 28, 1992. This report, provided as Attachment 1, was used as the basis for preparation of the "Confirmatory Radiological Survey Plan for the Texas Instruments Incorporated Burial Site, Attleboro, Massachusetts" which was submitted to the NRC Region I office by the NRC contractor, the Oak Ridge Institute for Science and Education (ORISE) by letter dated December 10, 1992 (see Attachment 2). This plan was approved by the NRC and the confirmatory survey was conducted December 14-16, 1992.

3.0 Conduct of the Verification Survey

ORISE personnel conducted the verification survey discussed in Paragraph 2.0. Available surfaces of the excavated and adjacent areas were scanned using gamma scintillation or GM detectors. Soil samples were taken from randomly selected locations within the excavated areas. Additional soil samples also were taken within the excavated areas at locations that exhibited elevated radiation readings during the scanning, or were identified as elevated in the licensee's report. Each of these samples was split with the licensee and will be analyzed to verify the licensee's analytical ability. The results will be included in correspondence to the licensee when the analyses are compieted.

4.0 Preliminary Survey Results

Preliminary results indicated that the licensee appeared to have completed cleanup of the bottom of the excavated area in an appropriate manner. However, elevated radiation levels (ranging from 2½ to 40 times background) identified on the walls of the excavation (see Attachment 3) indicated that radioactive material, above the 30 picocuries total uranium per gram of soil guidance value contained in the NRC-approved Remediation Plan, may not have been removed from the burial site. As a result, the licensee was requested by the inspector to perform additional remediation activities.

5.0 Additional Actions Required

5.1 Licensee

Upon completion of the additional remediation activities, the licensee is expected to resurvey the excavated areas and provide the NRC with a revised final survey report of the remediated area.

5.2 NRC

Upon receipt of the licensee's final survey report, the NRC contractor will visit the site, resurvey the applicable areas and will perform final confirmatory surveys on the surface of the remediated area.

6.0 Exit Interview

The inspector met with the licensee representatives denoted in Paragraph 1.0 at the conclusion of the inspection on December 16, 1992. The ORISE team leader and the inspector summarized the results of the confirmatory survey conducted by ORISE personnel. The inspector thanked the licensee for providing the survey team logistical support and backup when required.

During the exit interview, the inspector provided the licensee with guidance in regard to soil sample result averaging. It was stated that since the soil samples were taken at the grid block intersections, the average residual uranium value for each adjacent four grid blocks also had to meet the 30 picocuries total uranium per gram of soil criteria. In addition, the licensee was reminded that the results of groundwater monitoring for total uranium had to be incorporated into the final report.

Attachment 1

TEXAS INSTRUMENTS

November 30, 1992

OVERNIGHT MAIL

Mr. Jerry Roth
U.S. Nuclear Regulatory Commission
Region I
475 Allendale Road
King of Prussia, PA 19406-1415

Dear Mr. Roth:

The attached report is being submitted to the U.S. Nuclear Regulatory Commission (NRC) by Texas Instruments Incorporated (TI), Materials & Controls Group located in Attleboro, Massachusetts. It summarizes the results of radiological surveys performed on TI property at the former burial site location near Building 12.

The radiological survey report documents the effectiveness of remediation activities carried out in accordance with a plan submitted to the NRC on July 30, 1992 and subsequently approved by the NRC on August 26, 1992.

As we discussed during a site inspection on November 3, 1992, the excavated area will remain exposed to facilitate confirmatory sampling by Oak Ridge Institute of Science and Education.

If there are any questions or concerns regarding the enclosed report, please do not hesitate to call me at (508) 699-1809.

Sincerely yours,

Michael J. Elliott
Environmental Engineering Manager

Attachment

cc: Mr. James D. Berger, ORISE
Mr. Daniel V. Bartosh, Jr., TI Dallas
Mr. Francis J. Veale, Jr., TI Attleboro

TEXAS INSTRUMENTS INCORPORATED • 34 FOREST STREET • ATTLEBORO, MA 02703
508-699-3800 • TELEX 210801 • CABLE TEXINS

POST EXCAVATION RADIOLOGICAL SURVEY REPORT

TEXAS INSTRUMENTS INCORPORATED
BURIAL SITE
Attleboro, Massachusetts

Prepared by

Creative Pollution Solutions, Inc.

11/28/92

INTRODUCTION

The post excavation survey for the Texas Instruments Incorporated Building 12 Burial Site was designed in accordance with the Remediation Plan (approved 8/29/92). The remediation of the site included at least all areas outlined in the initial plan. When necessary, additional areas were excavated. The average depth of the excavated area is approximately 1.5 meters. In many areas groundwater was reached. Excavated material was either processed to remove aggregate and/or staged for disposition. A volume of approximately 90,000 ft^3 of material was excavated of which approximately 58,000 ft^3 was sent to EnviroCare of Utah via rail for final disposition. Figure 1 in Appendix A in this report shows the area of excavation. The excavated area will not be backfilled (except around an exposed fire hydrant) until after ORISE completes necessary sampling to confirm the post excavation survey.

The post excavation survey consists of two parts: a walkover surface scan of the affected area and surface soil sampling of the excavated area.

SURFACE SOIL SAMPLING WITHIN THE EXCAVATED AREA

The soil sampling plan for the excavated area consisted of surface soil samples at each corner and in the middle of each 10 meter x 10 meter grid cell. Wherever possible surface (0-15cm) soil samples of approximately 1 kg each were collected at these points. In some cases excavation equipment had to be used to extract a sample from beneath the standing water. A map of sample locations along with sample results are shown in Appendix A. All of the samples from the excavated area were analyzed using gross alpha screening. The average of all gross alpha screening samples within the excavated area is less than 30 pCi/g (Note: 30 counts/10 min approximately equals 30 pCi/g as correlated with Babcock and Wilcox gamma spectroscopy data -- see Appendix C). The gross alpha screening methodology is described in Appendix B.

SURVEY OF AFFECTED AREA

A walkover surface scan using portable NaI(Tl) gamma scintillation detectors was conducted at 1 meter intervals over the entire affected area. The affected areas consist of any areas in the defined exclusion area (see Health and Safety Plan, 8/92). The grid system established in the ORAU Radiological Survey (1985) was used. A walkover of the excavated area was not possible because of the elevated water table and accumulation of surface water run-off in this area. The walkover survey data is provided in Appendix D.

These surveys were conducted with a Ludlum model 44-2 1" by 1" NaI(Tl) probe coupled to a Ludlum model 2221 Portable Scaler/ratemeter. The purpose of these surveys was to determine and locate any radiological anomalies. The NaI type detectors are inherently highly energy

dependent, but are useful due to its general greater sensitivity. The use of such instruments are well suited for the identification of anomalies, however, care must be given when interpreting the response in terms of exposure rates (μR/h). In this regard, a linear response check was performed using a ^{60}Co Source, the results of which are included within Appendix D. The energy distribution of photons encountered in field are characterized by a much lower photon energy distribution which is further confounded by a large degradation of this spectral distribution due to the source incorporation in a soil matrix. The interpretation of exposure rate from this instrument, short of an exhaustive study, is to assume from previous studies (ORAU) that a nominal background exposure rate of 11 μR/h exists and that a the NaI(Tl) background response correlates to this value. Even under this presumption certain errors will exist such as variation of background with time. Not withstanding a response factor from 0.0039 to 0.0034 with an average of 0.0037 is established.

APPENDIX A

EXCAVATION FLOOR SAMPLING
ALPHA SCREENING RESULTS

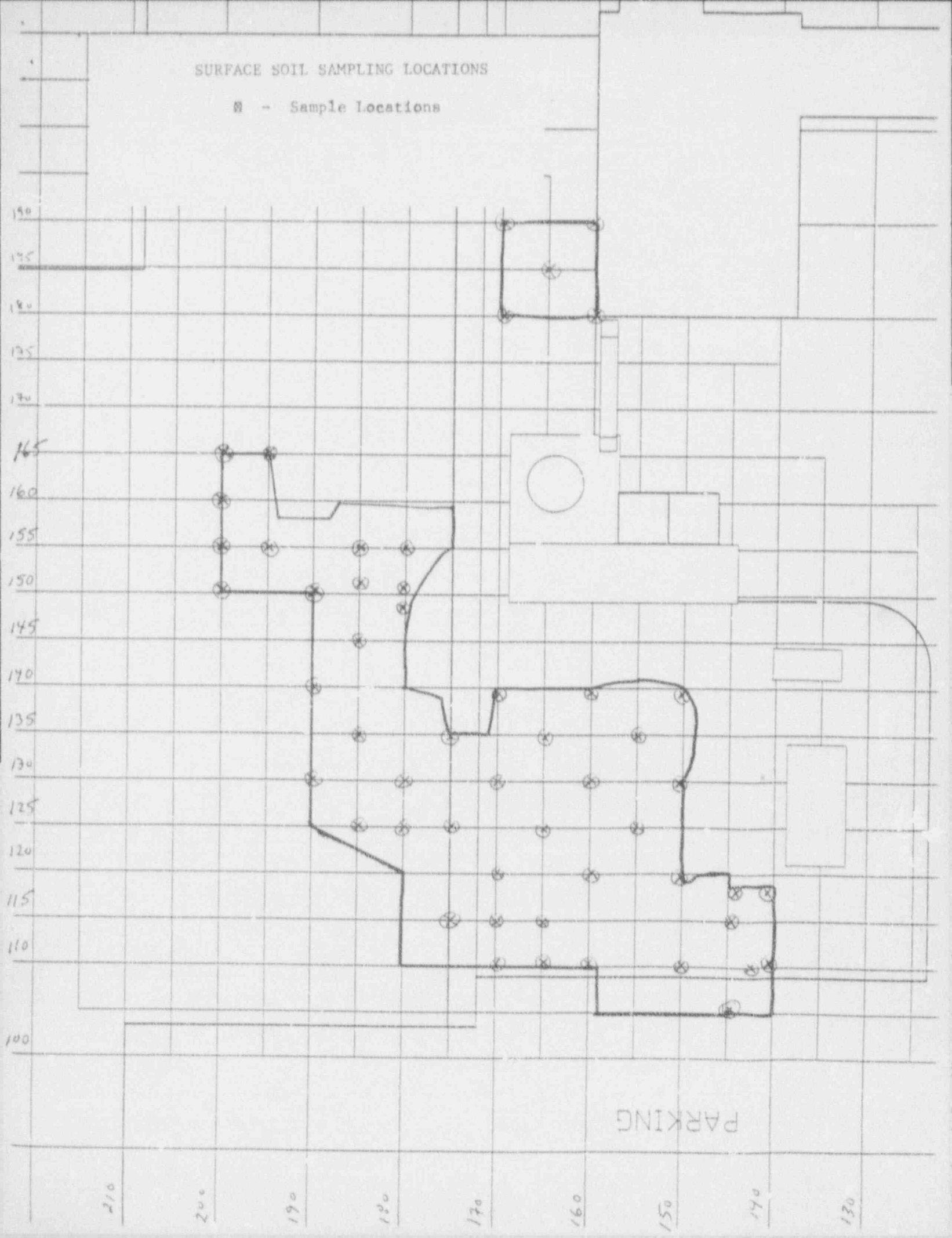
North	East	Alpha Screen (pCi/g)
200	150	29
200	155	7
200	160	16
200	165	19
195	155	11
195	165	10
190	130	17
190	140	12
190	150	28
185	125	45
185	135	50
185	145	8
185	152	50
185	155	21
180	125	15
180	130	14
180	150	4
180	152	48
180	155	11
175	115	14
175	125	12
175	135	14
170	110	53
170	115	22
170	120	34
170	130	7
170	140	16
170	180	22
170	190	46

North	East	Alpha Screen (pCi/g)
165	110	34
165	115	18
165	125	11
165	135	22
165	185	30
160	110	22
160	120	17
160	130	27
160	140	24
160	180	33
160	190	23
155	125	12
155	135	25
150	110	26
150	120	27
150	130	21
150	140	55
145	105	9
145	115	18
145	120	17
142	110	24
140	110	42
140	120	9

Average of values = 23.10 pCi/g
Standard deviation = 13.23

SURFACE SOIL SAMPLING LOCATIONS

⊠ - Sample Locations



APPENDIX B

ALPHA SCREENING METHODOLOGY

The alpha screening technique employed was gross alpha counting of a soil sample in intimate contact with a ZnS(Ag) detector. Using this method the ZnS(Ag) disc is disposable.

The method employed in the field was as follows:

1) Approximately 1 kg soil sample obtained

2) Sample homogenized by mixing (in larger container if necessary)

3) An aliquot of the homogenized sample is then (approximately 20-40 grams) dried in an oven at about 100° C for approximately 10 minutes. The sample is then allowed to cool.

4) The sample is then sieved and placed in direct contact with the phosphor side of the ZnS dish assembly.

5) The sample is then place in direct contact with a photomultiplier tube and counted for 10 minutes.

The counts obtained have been correlated to both alpha spectroscopy and gamma spectroscopy. The correlation to gamma spectroscopy is attached in Appendix C and the correlation to alpha spectroscopy has been demonstrated in previous reports.

APPENDIX C

COMPARISON OF ALPHA SCREENING AND GAMMA SPECTROSCOPY

Since the post excavation survey results were obtained using alpha screening 10 split samples were sent to both ORISE and an outside laboratory to establish a correlation between the gamma spectroscopy data and the alpha screening data. The comparison with one set of gamma spectroscopy results are shown below.

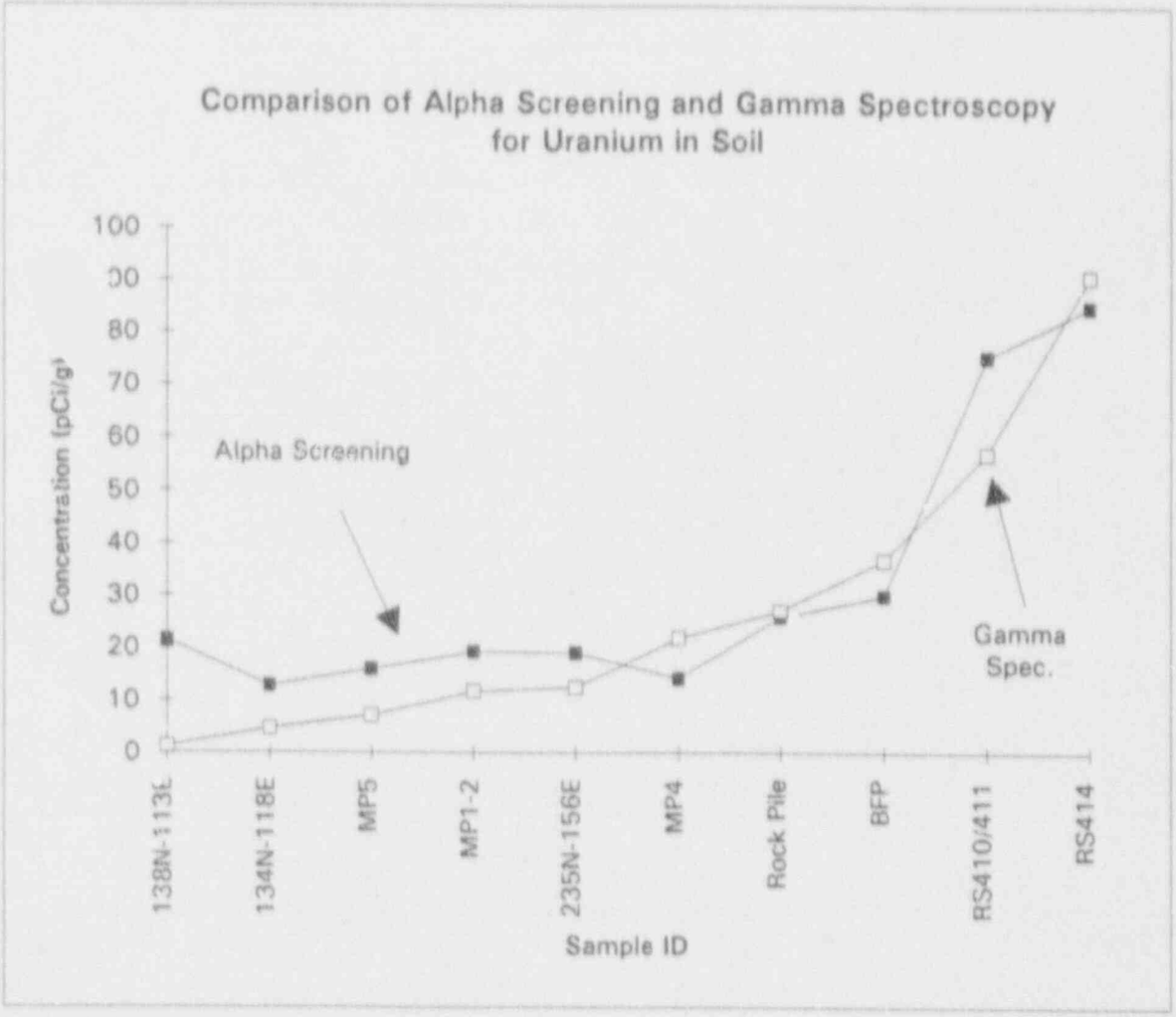
Notes regarding attached graph:

1) alpha screening result is based on an average of 5-10 samples

2) gamma spec data assumed an activity ratio (U-234/U-235) of 22.

Comparison of Alpha Screening and Gamma Spectroscopy for Uranium in Soil

SAMPLE ID	ALPHA SCREEN (TOTAL U pCi/g)	GAMMA SPEC (TOTAL U pCi/g)
138N-113E	21.4	1.25 ± 0.93
134N-118E	12.8	4.65 ± 1.13
MP5	15.9	7.1 ± 1.70
MP1-2	19.2	11.6 ± 2.35
235N-156E	19	12.4 ± 2.87
MP4	14.2	21.82 ± 4.67
Rock Pile	25.8	26.96 ± 2.51
BFP	29.9	36.76 ± 2.51
RS410/411	75.3	56.99 ± 3.22
RS414	85	90.77 ± 5.77

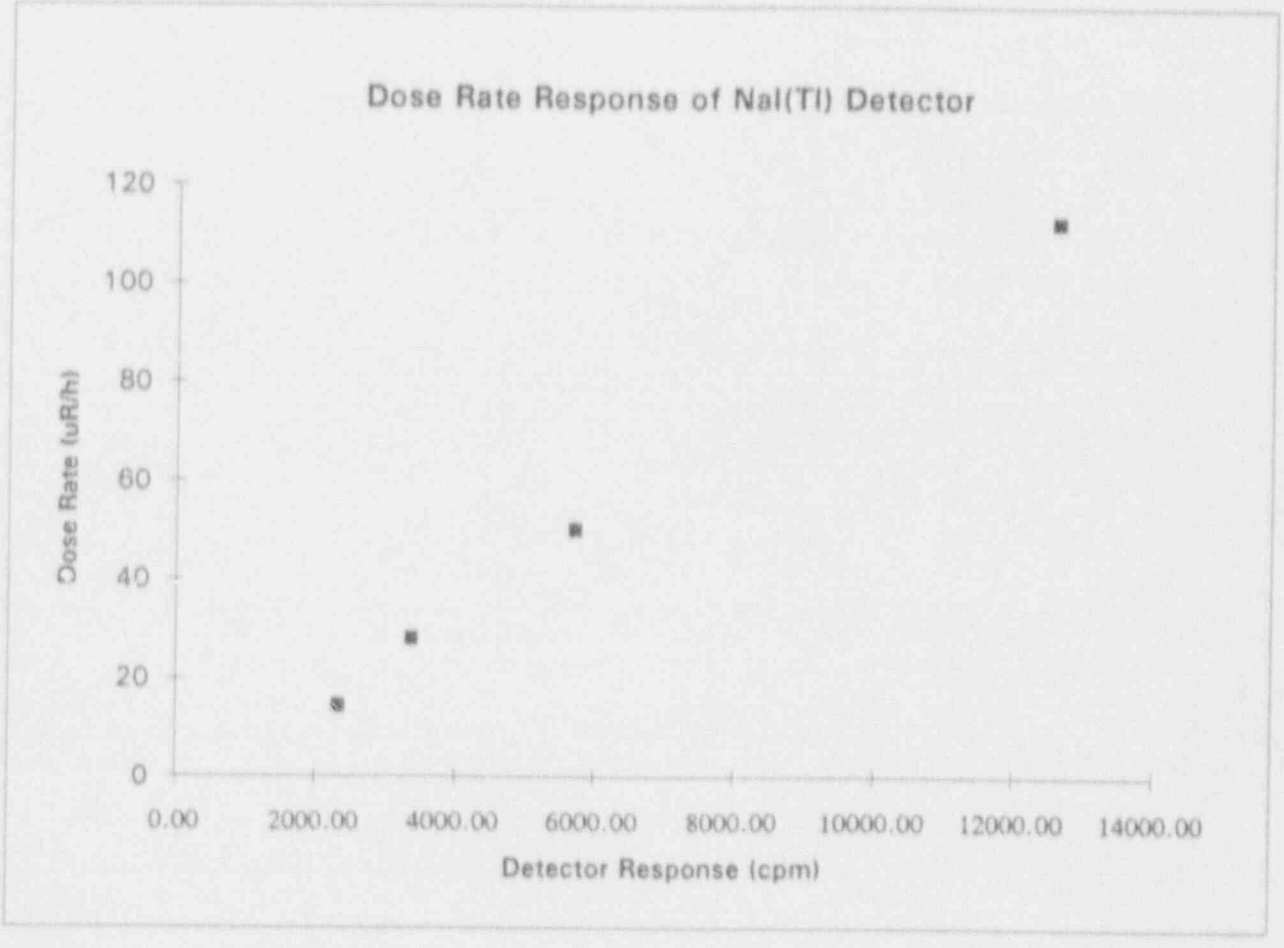


APPENDIX D

WALKOVER SURVEY RESULTS

NOTE: The attached represents the results of the walk over survey. The results presented are in the units of counts per minute (cpm)

	Bkg	2.5 meter	2.0 meter	1.5 meter	1.0 meter
1.00	5206.00	7455.00	8444.00	10938.00	17472.00
2.00	5283.00	7277.00	8564.00	10835.00	17646.00
3.00	5143.00	7441.00	8751.00	11107.00	17738.00
4.00	4959.00	7489.00	8552.00	10797.00	17744.00
5.00	5056.00	7589.00	8418.00	10864.00	17790.00
6.00	5105.00	7602.00	8334.00	10542.00	18064.00
Average	5125.33	7475.50	8510.50	10847.17	17742.33
Exp. Err	113.64	118.39	145.98	185.39	193.97
Th. Err.	71.59	86.46	92.25	104.15	133.20
Chi. Sq.	2.52	1.87	2.50	3.17	2.12
Net Response, cpm		2350.17	3385.17	5721.83	12617.00
Dose Rate, uR/h		14.58	28.13	50	112.5
Calibration Factor, uR/h/cpm		0.0062038	0.0083083	0.0087385	0.0089165



Regression Statistics

Multiple R	0.9962444
R Square	0.9925029
Adjusted R Square	-1.333333
Standard Error	75 7943
Observations	1

Analysis of Variance

	df	*Sum of Squares*	*Mean Square*	*F*
Regression	4	5590.341138	1397.58528	397.16
Residual	3	42.22788077	14.0759603	
Total	7	5632.569019		

	Coefficients	*Standard Error*	*t Statistic*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	0					
Slope	0.0087835	0.000259572	33.8385201	5E-09	0.0079575	0.00961

Walk Over Surface Scan

Coordinates East / North	105	106	107	108	109	110	111	112	113
120									
121									
122									
123									
124									
125									
126									
127									
128							3200	3200	2500
129						2600	2800	2800	2500
130						2700	2600	2700	3500
131						3000	2800	2800	2900
132				2800	2500	2500	2500	2500	2500
133				2500	2600	3100	3100	3200	2900
134	tar	tar	tar	3000	3000	2800	3000	2800	2800
135	tar	3200	2500	3200	3100	3000	3100	3200	3000
136	tar	2900	3000	3300	3000	3000	3300	3100	3100
137	tar	3000	2900	3000	3100	3000	2900	3300	3200
138	2900	2900	3100	3100	3200	3100	3000	3000	3100
139	3500	3200	3000	3300	3000	3200	3000	3200	3200
140	3300	2800	3600	3900	3300	3300	3200	3300	3300
141	3300	3500	3500	3500	3700	3300	3800	3700	3700
142	tar	3300	3500	4000	3300	3000	3200	3100	3200
143	tar								
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157	tar								
158	tar								
159	3200	3500	4000	3200	5500	5000			
160		3600	3900	4000	3900	3500			
161		3700	3800	4000	4000				
162		4100	4500	4000	3900				
163		3500	4000	3700	4000				
164		3900	3900	3900	3800				
165		3500	4000	3900	4100				
166		4000	3900	3500	3800				
167		3500	4200	3800	4000	3800			
168		3700	3800	3700	3800	3200			

Walk Over Surface Scan

Coordinates East / North	105	106	107	108	109	110	111	112	113
169				4100	4200	4100			
170				3900	3900	3900			
171				3400	3500	3700			
172				3600	3900	3700			
173				3400	3500	3600			
174				3300	3400	3500			
175				3200	3300	3400			
176				3100	3200	3200			
177				3300	3500	3500	3200		
178				3500	3500	3300	3500	3500	
179				3400	3200	3100	3300	3300	3200
180						3000	3600	3500	3400
181						3200	3200	3100	3700
182							3300	3400	3400
183									4000
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Walk Over Surface Scan

Walk Over Surface Scan

Coordinates East / North	114	115	116	117	118	119	120	121	122
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125									
126									
127									
128	2500	2400	2500	2500					
129	2500	2900	2500	2800					
130	2600	2600	2500	2500	2500	2500	2400		
131	2500	2800	2500	2500	2400	2300	3000		
132	2500	2800	2800	2600	2500	2500	2500		
133	2900	3000	3100	2900	2500	2500	2500		
134	2700	2500	2700	2500	2500	2500	2500		
135	2800	3000	3000	3000	2900	2800	2800		
136	3300	3100	rock	rock	3200	2900	2900		
137	3200	3500	rock	rock	3100	3200	3000		
138	3100	3200	3100	2900	3000	3000	2900		
139	3100	3200	3100	3200	2500	3000	3000		
140	3500	3400	3400	3100	3000	3000	3000		
141	3800	3600	3300	3200	3500	3200	3300		
142	3400	3300	3000	3200	2900	2900			
143					2800	2800			
144						2900	2900	2700	2800
145						2800	3000	3100	3000
146						2900	3200	3000	3200
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Walk Over Surface Scan

Coordinates East / North	114	115	116	117	118	119	120	121	122
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179	3200	3200	3300	3500	3500	3300	3400		
180	3400	3400	3000	3000	3000	3300	3500	3400	
181	3300	3200	3600	3200	3200	3000	3500	3600	3400
182	3300	3400	3400	3100	3000	3000	3200	3500	3200
183	3300	3300	3100	3200	3100	3000	3100	3300	3200
184	3100	3400	3000	3100	3200	3100	3100	3300	3200
185		3500	3200	3100	3300	3000	3200	3500	3200
186		3400	3100	3200	3300	3200	2900	3500	3500
187		3400	3200	3100	3500	3000	3000	3500	3200
188		3200	3100	3300	3500	3200	3000	3200	3400
189		3300	3200	3100	3000	3200	3200	3200	3200
190		3500	3200	3100	3000	3200	3000	3200	3700
191		3500	3200	3100	3200	3100	3500	3200	3700
192		3400	3200	3000	3500	3200	3200	3500	3700
193		3300	3400	3200	3500	3100	3200	3500	3700
194		3400	3400	3100	3200	3200	3400	3500	3400
195		3400	3400	3100	3000	3200	3500	3300	3300
196		3400	3200	3000	3100	3300	3500	3000	3500
197		3400	3400	3100	3100	3600	3500	3100	3500
198		3200	3300	3300	3400	3000	3100	3100	3300
199		3300	3300	3200	3300	3100	3100	3000	3300
200		3400	3100	3000	3000	3100	3300	3300	3400
201							3300	3400	3300
202							3200	3100	3400
203							3100	3200	3200
204							3200	3200	3100
205							3200	3100	3400
206							3100	3100	3200
207							3000	3100	3500
208							3000	3300	3500
209							3000	3200	3600
210							3500	3300	3200
211							3400	3200	3200
212		3300	3200	4400	3600	3400	3400	3500	3200
213		3200	3200	3700	3600	3300	3400	3300	3100
214		3400	3100	3600	3700	3500	3300	3200	3100
215		3300	3800	3600	4600	3400	3300	3300	3400
216		3300	3500	3800	3600	3800	3400	3400	3600
217		3900	4100	3900	3600	4000	4000	3800	3600

218		4100	4300	4100	4000	3800	3800	4000	3600
219		4000	3800	4200	4100	3800	3900	3800	3600
220		4000	4200	4600	4100	3800	3900	3600	3700

Walk Over Surface Scan

Coordinates East / North	123	124	125	126	127	128	129	130	131
120									
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142									
143									
144	2900	3000	3000	3000	3000	3000	3000	2900	
145	3000	3200	3200						3000
146	3400	3400	3500						
147	3000	3100							
148									
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Walk Over Surface Scan

Coordinates East / North	123	124	125	126	127	128	129	130	131
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182	3100								
183	3400								
184	3500	3200							
185	3700	3200							
186	3400	3600							
187	3500	3700	3400						
188	3500	3200	3400						
189	3400	3400	3700	3200					
190	3700	3400	3200	3600	3600				
191	3600	3600	3200	3700	3800	3700	3600	3700	4500
192	3500	3600	3600	3700	4300	3800	4000	5000	6500
193	3500	3900	3700	3600	4100	3800	4000	4500	3700
194	3300	3700	3600	3600	3600	3600	3500	4000	3600
195	3200	3500	3600	3300	3400	3600	3500	3700	3700
196	3500	3300	3100	3300	3400	3600	3400	3500	3700
197	3500	3700	3500	3300	3200	3700	3100	3500	3600
198	3500	3600	3400	3500	3400	3200	3100	3700	3600
199	3200	3200	3000	3300	3300	3200	3100	3600	3500
200	3300	3400	3200	3500	3300	3400	3400	3600	3400
201	3200	3400	3200	3400	3500	3400	3400	3700	3200
202	3300	3300	3800	3100	3600	3200	3200	3900	3100
203	3500	3100	3400	3200	3300	3000	3400	3300	3000
204	3300	3100	3500	3300	3400	3000	3500	3300	3400
205	3200	3200	3500	3400	3600	3200	3500	3600	3500
206	3100	3500	3400	3400	3100	3700	3400	3400	3600
207	3400	3300	3300	3400	3300	3500	3500	3600	3600
208	3400	3200	3400	3200	3700	3400	3400	3400	3200
209	3200	3300	3400	3300	3200	3500	3300	3200	3100
210	3300	3300	3400	3500	3200	3300	3200	3200	3100
211	3200	3200	3100	3200	3500	3600	3200	3300	3100
212	3200	3200	3300	3300	3300	3500	3100	3400	3200
213	3300	3300	3300	3200	3700	3500	3500	3300	3200
214	3300	3600	3300	3500	3200	3400	3500	3200	3400
215	3300	3700	3600	3700	3500	3600	3600	3600	3500
216	3800	3800	3500	3600	3500	3800	3600	3800	3500
217	4200	4000	3800	4000	3800	4000	4100	3800	3500

218	4000	3600	4000	3900	3600	3800	4000	3700	3500
219	4000	3600	3800	4200	3600	3800	3700	4600	3600
220	3600	3800	3600	3400	3600	3400	3600	3300	3100

Walk Over Surface Scar

Coordinates East / North	132	133	134	135	136	137	138	139	140
120									
121									
122									
123									
124									
125									
126									
127									
128									
129									
130									
131									
132									
133									
134									
135									
136									
137									
138									
139									
140									
141									
142									
143									
144									
145	3000	3000	2900	2900	3000	3000	3000	2900	3000
146	3000	3000	3000	2900	2900	3000	3000	2800	3000
147	3000	3000	2800	3000	3000	3000	3000	3000	3000
148	3000	3000	3000	3000	3100	3000	3200	2900	3000
149	3200						3200	3000	3000
150							3300	3200	3200
151									
152									
153									
154									
155									
156									
157									
158									
159									
160									
161									
162									
163									
164									
165									
166									
167									
168									

Walk Over Surface Scan

Coordinates East / North	132	133	134	135	136	137	138	139	140
169									
170									4100
171									4200
172						SW	SW	SW	SW
173						SW	SW	SW	SW
174						SW	SW	SW	SW
175								3500	3400
176								3200	3400
177								3200	3500
178								3400	3500
179								3500	3600
180								3500	3700
181									
182									
183									
184									
185									
186									
187									
188									
189									
190			3800	4300	5500	3900	3700	4000	3700
191	4500	5500	3800	5500	4800	3400	3700	3900	4000
192	6100	7000	4100	3500	3800	3200	3700	3500	4000
193	5700	10000	3800	3400	3200	3400	3400	3500	3400
194	4400	4100	3700	3300	3200	3200	3200	3300	3500
195	3300	3400	3700	3200	3000	3300	3200	3400	3500
196	3200	3500	3500	3300	3000	3100	3100	3500	3400
197	3200	3100	3300	3500	3000	3200	3200	3300	3200
198	3500	3300	3400	3600	3200	3200	3300	3100	3300
199	3600	3300	3400	3500	3000	3900	3200	3200	3500
200	3500	3400	3400	3800	3700	3500	3200	3400	3200
201	3400	3400	3000	4000	3500	3300	3400	3100	3300
202	3600	3700	3400	3800	3400	3500	3400	3400	3300
203	3500	3600	3700	3900	3700	3200	3400	3400	3500
204	3500	3600	3800	4400	3500	3300	5800	3200	3400
205	3500	3600	4100	3600	3900	3500	3400	3500	3400
206	3700	3500	3800	3500	3700	3100	3100	3600	3500
207	3800	3700	3500	3400	3500	3200	3100	3400	3500
208	3400	3100	3200	3300	3200	3100	3300	3300	3300
209	3100	3200	3300	3500	3400	3300	3500	3400	3400
210	3300	3300	3400	3500	3300	3100	3300	3500	3500
211	3100	3100	3100	3200	3200	3200	3200	3200	3300
212	3100	3100	3300	3400	3300	3400	3600	3200	3400
213	3600	3200	3500	3600	3600	3400	3600	3300	3600
214	3500	3200	4000	3500	3800	3800	3800	3300	3600
215	3600	3400	4000	3600	3800	4000	3800	3500	3600
216	3700	4100	3700	4000	3900	4400	4100	3800	3800
217	3800	3800	3700	3900	3800	4200	4300	4000	

Walk Over Surface Scan

218	3500	3600	3400	3900	3200	4200	4200			
219	3600	3400	3200	3400	3000	3600				
220	3300	3100	3300	3100						

Walk Over Surface Scan

Coordinates East / North	141	142	143	144	145	146	147	148	149
120									
121									
122									
123									
124									
125									
126									
127									
128									
129									
130									
131									
132									
133									
134									
135									
136									
137									
138									
139									
140									
141									
142									
143									
144									
145	2800	2900	3100	3100	3100	3000	3300	3200	3100
146	2700	3000	3300	3400	2900	3200	3700	3000	3200
147	2800	3000	3400	3500	2800	3400	3800	3300	3200
148	2800	3200	3300	3300	3100	3900	3700	3400	3300
149	2900	3000	3200	3300	3100	3500	3200	3500	3200
150	3200	3400	3200	3100	3000	3500	3500	3200	3000
151			3200	3200	3200	3000	2900	3200	3100
152			3000	3400	3200	3100	3000	3400	3100
153			3200	3200	3200	3100	3000	3200	3000
154			3500	3200	3300	3200	3400	3100	3900
155			3400	3200	3000	3200	3400	3100	3000
156			3300	3100	2700	3100	3200	3000	3000
157			3200	3200	2900	3100	3000	3000	3100
158			3400	3000	3000	3000	3000	3000	3200
159			3300	3000	3000	3000	3000	3100	3000
160			3200	3000	3200	3200	3100	3000	3900
161			3400	2900	3000	3100	3000	2900	3000
162			3500	3000	2900	3200	3000	3000	3000
163			3400	3000	3100	3200	3200	2900	3000
164			3500	3100	3000	3300	3400	3000	3200
165			3500	3300	3000	3300	3300	3200	3300
166			3200	3200	3000	3400	3200	3000	3300
167			3200	3300	3300	3200	3100	3000	3200
168			3000	3100	3200	3200	3200	3200	3000

Walk Over Surface Scan

Coordinates East / North	141	142	143	144	145	146	147	148	149
169			3000	3000	3100	3200	3300	3400	3300
170	3400	3300	3500	3200	3000	3100	3200	3000	2500
171	3800	3600	3500	3500	3000	3000	3200	3000	2900
172	sw	sw	sw	sw	sw	sw	sw	sw	sw
173	sw	sw	sw	sw	sw	sw	sw	sw	sw
174	sw	sw	sw	sw	sw	sw	sw	sw	sw
175	3400	3500	3400	4000	3400	3700	3500	3500	3400
176	3400	3500	3700	3500	3300	3500	3500	3400	3400
177	3500	3500	3600	3500	3300	3800	3500	4000	3900
178	3200	3700	3500	3800	9300	4000	3500	3800	3900
179	3700	3800	3500	3800	6500	4000	4200	3600	3500
180	3800	4000							
181									
182									
183									
184									
185									
186									
187									
188									
189									
190	3400	3600	3600	3600	3300	3200	3400		
191	3600	3700	3800	3400	3300	3400	3600		
192	3400	3600	3400	3600	3500	3500	3600		
193	3700	3600	3200	3500	3700	3700	3500		
194	3600	3600	3500	3600	3600	3400	3900		
195	3200	3700	3500	3500	3800	3600	4700		
196	3300	3500	5700	3500	3900	4200	3800		
197	3400	3300	3200	3600	3700	4800	3600		
198	3500	3300	3200	3400	3300	3700	3500	3600	3500
199	3500	3500	3300	3400	3400	3800	3200	3400	3400
200	3200	3200	3000	3300	3500	3200	3200	3400	3500
201	3200	3300	3200	3200	3500	3100	3500	3500	3300
202	3000	3400	3200	3100	3400	3200	3400	3300	3600
203	3300	3000	3200	3100	3300	3000	3400	3400	3500
204	3300	3300	3300	3100	3300	3200	3400	3600	3500
205	3400	3400	3400	3400	3400	3500	3700	3400	3000
206	3400	3500	3300	3400	3500	4500	3600	3500	3500
207	3300	3400	3500	3400	3500	3400	3600	3600	3500
208	3500	3400	3600	3600	3300	3200	3700	3600	3500
209	3600	3600	4200	3600	3500	3400	3700	3500	3400
210	3400	3600	3400	3700	3500	3700	3700	3500	3500
211	3200	3500	3400	3500	3500	3500	3400	3200	3300
212	3200	3300	3600	3600	3400	3400	3400		
213	3400	3300	3500	3400	3300	3600			
214	3200	3500	3600						
215	3300	3600							
216	3600								
217									

Walk Over Surface Scan

Walk Over Surface Scan

Coordinates East / North	150	151	152	153	154	155	156	157	158
120									
121									
122									
123									
124									
125									
126									
127									
128									
129									
130									
131									
132									
133									
134									
135									
136									
137									
138									
139									
140									
141									
142									
143									
144									
145	drive	drive	drive	drive	drive	drive	drive	bldg	bldg
146	drive	drive	drive	drive	drive	drive	drive	bldg	bldg
147	drive	drive	drive	drive	drive	drive	drive	bldg	bldg
148	drive	drive	drive	drive	drive	drive	drive	bldg	bldg
149	drive	drive	drive	drive	drive	drive	drive	bldg	bldg
150	drive	drive	drive	drive	drive	drive	drive	bldg	bldg
151	drive	drive	drive	drive	drive	drive	drive	bldg	bldg
152	drive	drive	drive	drive	drive	drive	drive	bldg	bldg
153	drive	drive	drive	drive	drive	drive	drive	bldg	bldg
154	drive	drive	drive	drive	drive	drive	drive	bldg	bldg
155	drive	drive	drive	drive	drive	drive	drive	bldg	bldg
156	drive	drive	drive	drive	drive	drive	drive	tank	tank
157	drive	drive	drive	drive	drive	drive	drive	tank	tank
158	drive	drive	drive	drive	drive	drive	drive	tank	tank
159	drive	drive	drive	drive	drive	drive	drive	tank	tank
160	drive	drive	drive	drive	drive	drive	drive	tank	tank
161	drive	drive	drive	drive	drive	drive	drive	tank	tank
162	drive	drive	drive	drive	drive	drive	drive	tank	tank
163	drive	drive	drive	drive	drive	drive	drive	tank	tank
164	drive	drive	drive	drive	drive	drive	drive	tank	tank
165	drive	drive	drive	drive	drive	drive	drive	tank	tank
166	drive	drive	drive	drive	drive	drive	drive	tank	tank
167	drive	drive	drive	drive	drive	drive	drive	tank	tank
168	drive	drive	drive	drive	drive	drive	drive	tank	tank

Walk Over Surface Scan

Coordinates East / North	150	151	152	153	154	155	156	157	158
169	drive	drive	drive	drive	drive	drive	drive	tank	tank
170	2800	2800	2900	2900	3000	3300	3300	3200	3200
171	2900	3000	3100	3000	3200	3200	3200	3000	3000
172	sw	sw	sw	sw	sw	sw	sw	sw	sw
173	sw	sw	sw	sw	sw	sw	sw	sw	sw
174	sw	sw	sw	sw	sw	sw	sw	sw	sw
175	3600	3400	3300	3500	3700	3800	3300	3200	3300
176	3300	3600	3400	3500	3500	3500			
177	3400	3900	3400	3700	3500	3500			
178	3700	3700	3500	3600					
179	3600								
180									
181									
182									
183									
184									
185									
186									
187									
188									
189									
190									
191									
192									
193									
194									
195									
196									
197									
198									
199	3500	3700					4500	4300	
200	3700	3800	3600	7000	3800	5500	4600	4100	4200
201	3700	4500	4000	3700	4000	4100	4900	4200	4400
202	3500	3900	4100	3700	4100	4100	3500	4000	4200
203	3800	4200	4000	4100	3600	4200	3800	3600	4200
204	3900	3900	3900	5100	3800	4000	3900	3600	3600
205	3700	3600	3700	4000	4000	3900	3600	3700	3900
206	3500	3600	4200	3600	4600	3800	3600	3400	3600
207	3200	3800	3600	3600	3900	3400	4100	3300	3900
208	3200	3400	3600	3700	4000	3500	4100	3700	
209	3400	3600	3700	3700	3900	rockpile			
210	3200	3300	3700	3900	rockpile				
211	3200	3600	4000						
212									
213									
214									
215									
216									
217									

Walk Over Surface Scan

Wall: Over Surface Scan

Coordinates East / North	159	160	161	162	163	164	165	166	167
120									
121									
122									
123									
124									
125									
126									
127									
128									
129									
130									
131									
132									
133									
134									
135									
136									
137									
138									
139									
140									
141									
142									
143									
144									
145	bldg	bldg	bldg	bldg	bldg	bldg	bldg	bldg	
146	bldg	bldg	bldg	bldg	bldg	bldg	bldg	bldg	
147	bldg	bldg	bldg	bldg	bldg	bldg	bldg	bldg	
148	bldg	bldg	bldg	bldg	bldg	bldg	bldg	bldg	
149	bldg	bldg	bldg	bldg	bldg	bldg	bldg	bldg	
150	bldg	bldg	bldg	bldg	bldg	bldg	bldg	bldg	
151	bldg	bldg	bldg	bldg	bldg	bldg	bldg	bldg	
152	bldg	bldg	bldg	bldg	bldg	bldg	bldg	bldg	
153	bldg	bldg	bldg	bldg	bldg	bldg	bldg	bldg	
154	bldg	bldg	bldg	bldg	bldg	bldg	bldg	bldg	
155	bldg	bldg	bldg	bldg	bldg	bldg	bldg	bldg	
156	tank	tank	tank	tank	tank	tank	tank	tank	
157	tank	tank	tank	tank	tank	tank	tank	tank	
158	tank	tank	tank	tank	tank	tank	tank	tank	
159	tank	tank	tank	tank	tank	tank	tank	tank	
160	tank	tank	tank	tank	tank	tank	tank	tank	tar
161	tank	tank	tank	tank	tank	tank	tank	tank	3700
162	tank	tank	tank	tank	tank	tank	tank	tank	3900
163	tank	tank	tank	tank	tank	tank	tank	tank	4400
164	tank	tank	tank	tank	tank	tank	tank	tank	5500
165	tank	tank	tank	tank	tank	tank	tank	tank	8200
166	tank	tank	tank	tank	tank	tank	tank	tank	4700
167	tank	tank	tank	tank	tank	tank	tank	tank	4000
168	tank	tank	tank	tank	tank	tank	tank	tank	4000

Walk Over Surface Scan

Coordinates East / North	159	160	161	162	163	164	165	166	167
169	tank	tank	tank	tank	tank	tank	tank	tank	4700
170	3500	3300	3300	3400	3800	3500	3500	3500	3500
171	3500	3400	3400	3200	3800	3300	3400	3600	3200
172	sw	sw	sw	sw	sw	sw	sw	sw	sw
173	sw	sw	sw	sw	sw	sw	sw	sw	sw
174	sw	sw	sw	sw	sw	sw	sw	sw	sw
175	3500	3200	3500	3400	3200	3200	3200	3600	3200
176	3600	3500	3700	3200	3000	2200	3300	3400	3200
177	3300	3500	3400	3400	3000	3300	3300	3500	3500
178	3500	3700	3300	3500	3300	3400	3400	3500	3900
179	3200	3500	3500	3800	3300	3400	3400	3500	4100
180	3200	3400	3600	3400	3300	3500	3500	4200	3800
181	3200	3500	3300	3400	3300	3500	3500	3600	3700
182	3400	3500	3500	3300	3400	3500	3500	3700	3500
183	3500	3400	3400	3800	3400	3400	3500	3500	3500
184	3500	3400	3500	3500	3500	3700	3500	3500	3500
185	3400	3400	3400	3500	3600	3500	3400	3500	3500
186	3300	3300	3700	4000	3700	3600	3500	3600	3700
187	3200	3500	3800	4000	3500	3700	3400	3700	3700
188	3200	4000	3700	4000	4000	3700	3300	3800	4000
189	3400	3900	4000	4100	3500	3800	3500	3800	3500
190	4000	3600	3500	3600	4000	3800	4100	3900	4100
191							4200	4100	4100
192							3800	4100	4100
193							3800	3800	4000
194							3400	3700	4200
195							3800	4100	4100
196							4300	3900	4200
197							4600	4000	4900
198							4100	3900	4300
199							3800	3900	4100
200	4600	4200	4100	4000	4100	3800	4100	3600	4200
201	4500	5000	3700	3200	3700	3500	3500	3000	3500
202	4300	4200	3700	3200	3600	3500	3500	3500	3700
203	3800	3400	3500	3300	3300	3500	3300	3300	
204	3600	3600	3600	3300	3300	3400	3400		
205	3600	3300	3400	3300	3400	3500			
206	3500	3600	3300	3500	3400	3600			
207	3500	3800			3500	3400			
208									
209									
210									
211									
212									
213									
214									
215									
216									
217									

Walk Over Surface Scan

Walk Over Surface Scan

Coordinates East / North	168	169	170	171	172	173	174	175	176
120									
121									
122									
123									
124									
125									
126									
127									
128									
129									
130									
131									
132									
133									
134									
135									
136									
137									
138									
139									
140									
141									
142									
143									
144									
145									
146									
147									
148									
149									
150									
151									
152									
153									
154									
155									
156									
157									
158									
159									
160	tar	tar	tar	tar	tar	tar	sw	sw	sw
161	3200	3200	3000	3000	3200	3000	sw	sw	sw
162	3400	3500	3200	3200	3500	3100	sw	sw	sw
163	3400	3500	3700	3400	3500	3200	sw	sw	sw
164	3300	3700	3200	3500	3500	3000	sw	sw	sw
165	3500	3600	3200	3400	3600	3500	sw	sw	sw
166	3800	3600	3500	3600	4000	3800	sw	sw	sw
167	3600	3600	3400	3800	3600	3800	sw	sw	sw
168	3600	3600	3200	3700	3900	3300	sw	sw	sw

Walk Over Surface Scan

Coordinates East / North	168	169	170	171	172	173	174	175	176
169	3500	3500	3200	3200	3500	3200	sw	sw	sw
170	3200	3400	3400	3000	3200	3200	sw	sw	sw
171	3200	3100	3500	3100	3300	3000	sw	sw	sw
172	sw	sw	sw	sw	sw	sw	sw	sw	sw
173	sw	sw	sw	sw	sw	sw	sw	sw	sw
174	sw	sw	sw	sw	sw	sw	sw	sw	sw
175	3000	3000	3000	2900	3100	3000	3200	3700	3000
176	2900	3000	3000	2900	3200	3000	3300	3200	3000
177	3000	3500	3000	3200	3200	3200	3200	3300	3400
178	3000	3700	3000	3200	3200	3800	3300	3700	4000
179	3200	3800	3200	3300	3400	3900	3700	3500	3400
180	4000	4500	3900	4000	3200	3400	3400	3500	3800
181	3500	4000	3700	3600	3200	3600	3700	4000	3900
182	3500	4000	3700	4000	3400	3600	3500	3600	4000
183	3500	4000	3500	3500	3400	3800	4000	4000	3800
184	3700	3600	3400	3400	3700	4200	3900	4100	3700
185	3900	3500	3500	3400	3900	3900	3800	4100	3900
186	4000	3600	3400	3800	5300	3800	4000	3800	3700
187	4100	3700	3300	3800	4000	3800	3800	3600	3500
188	4000	3700	4000	4000	4000	4000	3500	3700	4400
189	4200	3800	3900	3800	3900	3800	5500	3800	7500
190	3800	4400	3900	4100	3800	3900	3800	4000	3700
191	8000	4000	4000	3900	3900	3900	3800	3900	3900
192	4400	3900	3800	3700	3800	3800	3900	4100	4100
193	4000	3900	3900	3700	3800	3900	4200	4200	3800
194	4100	4000	4000	3400	3700	3800	3900	4000	3900
195	3800	3900	4000	3500	3700	3400	3700	3700	3800
196	3900	4200	3900	3400	3600	3900	3600	3600	4100
197	3900	4000	3600	3400	3400	3400	3800	3400	3800
198	3300	3500	3300	3900	3800	3600	3800	3600	rockpile
199	3400	3300	3100	rockpile	3700	3600	rockpile	rockpile	rockpile
200	3300	3200	3300	rockpile	4000	rockpile	rockpile	rockpile	
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Walk Over Surface Scan

Walk Over Surface Scan

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160	3000	3200	3400	3300	3400	3500	3300	3500	3500
161	3300	3100	3200	3200	3300	3300	3400	3700	3600
162	3000	3000	pit	pit	pit	pit	pit	pit	pit
163	3200	3000	pit	pit	pit	pit	pit	pit	pit
164	3000	3000	pit	pit	pit	pit	pit	pit	pit
165	3200	3000	pit	pit	pit	pit	pit	pit	pit
166	3200	3200	pit	pit	pit	pit	pit	pit	pit
167	3400	3200	pit	pit	pit	pit	pit	pit	pit
168	3000	3000	pit	pit	pit	pit	pit	pit	pit

Walk Over Surface Scan

Coordinates East / North	177	178	179	180	181	182	183	184	185
169	3000	3000	pit	pit	pit	pit	pit	pit	pit
170	3100	3500	pit	pit	pit	pit	pit	pit	pit
171	3000	3400	pit	pit	pit	pit	pit	pit	pit
172	sw	sw	sw	sw	sw	sw	sw	sw	sw
173	sw	sw	sw	sw	sw	sw	sw	sw	sw
174	sw	sw	sw	sw	sw	sw	sw	sw	sw
175	3000	3000	3200	3000	3100	3200	3000	3200	3200
176	3000	3000	3300	3100	3100	3000	3000	3400	3100
177	3000	3300	3000	3200	3200	3200	3100	3500	3000
178	3100	3500	3500	3200	3300	3500	3100	3300	3200
179	3100	3500	3500	3400	3200	3400	3000	3500	3300
180	3800	4100	3600	3400	3400	3500	3400	3400	3700
181	4100	4200	4000	4000	3400	3300	3500	3400	3200
182	3700	4100	4400	4400	3500	3300	3500	3500	3200
183	3900	4100	4200	4200	3800	3300	3400	3400	3200
184	3900	3800	3800	4000	3700	3300	3400	3000	3300
185	4200	3800	3700	3800	3200	3500	3300	3200	3200
186	3800	3800	3800	3700	3300	3300	3300	3400	3300
187	3900	3800	3800	3900	3500	3400	3300	3600	3200
188	4200	4100	4000	4100	3500	3500	3400	3600	3200
189	4400	4400	4100	4000	3500	3600	3200	3500	3200
190	4000	4200	4400	4200	3500	3400	3400	3300	3300
191	4000	4100	3800	4000	3700	3500	3500	3300	3200
192	4000	4100	4000	4600	3700	3500	3200	3500	
193	4400	4000	3800	4100	3400	3500	3200	3500	
194	4200	3800	4200	3800	3500	3500			
195	3900	3900	4500	3500	3700				
196	3600	3700	3900	3700					
197	3700	3600	rockpile	rockpile					
198	rockpile	rockpile	rockpile	rockpile					
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160	3300	3200	3300	3700	4400	3200	3200	3200	3200
161	3400	3200	3100	3000	3200	3100	3300	3300	3100
162	pit	pit	pit	3000	3200	3000	3400	3400	3000
163	pit	pit	pit	3000	3300	3200	3400	3400	3000
164	pit	pit	pit	3200	3500	3200	3000	3500	3400
165	pit	pit	pit	3300	3300	3200	3100	3500	3300
166	pit	pit	pit	3200	3400	3400	3200	3100	3400
167	pit	pit	pit	3100	3400	3700	3400	3200	3400
168	pit	pit	pit	3200	3300	3400	3300	3200	3300

Walk Over Surface Scan

Coordinates East / North	186	187	188	189	190	191	192	193	194
169	pit	pit	pit	3200	3300	3400	3300	3300	3200
170	pit	pit	pit	3400	3000	3400	3200	3300	3100
171	pit	pit	pit	3200	3200	3000	3500	3400	3300
172	sw	sw	sw	sw	sw	sw	sw	sw	sw
173	sw	sw	sw	sw	sw	sw	sw	sw	sw
174	sw	sw	sw	sw	sw	sw	sw	sw	sw
175	3000	3000	3000	3000	3200	3000	3000	3300	3000
176	3000	3000	3200	3000	3000	3300	3200	3400	3000
177	3000	3000	3200	3000	3000	2900	3300	3700	3000
178	3200	3000	3000	3000	3100	2900	3400	3400	3200
179	3300	3100	3000	3000	3000	3000	3300	3300	3100
180	3500	3200	3100	3000	3000	3000	3000	3500	3200
181	3900	3000	3000	3000	3100	2900	3000	3500	3200
182	3900	3100	3300	2900	3000	2800	3000	3300	3300
183	3500	3200	3200	2900	3000	3000	3000	3000	3000
184	3200	4500	3400	3000	3000	3000	3200	3000	3000
185	3300	3900	3500	3000	3000	3100	3100	3000	2800
186	3500	3900	3400	3000	3200	3200	3200	3000	2800
187	3000	3500	3100	3200	3200	3200	3400	3000	3200
188	3000	3200	3200	3200	3000	3200	3300	3100	
189	3200	3000	3300	3300					
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161	3500	3500	3500	3500	3700	3700	3700		
162	3500	3300	3400	3500	3200	3500	4000	4000	
163	3200	3400	3500	3400	3400	4000	3900	3500	3500
164	3000	3500	3500	3300	3500	4000	3500	3500	3800
165	3000	3400	3400	3300	3400	3900	3500	3500	3800
166	3200	3300	3300	3400	3300	3500	3500	3600	3500
167	3100	3500	3800	3300	3300	3500	3600	3300	3300
168	3200	3500	3400	3100	3200	3000	3200	3400	3400

Walk Over Surface Scan

Coordinates East / North	195	196	197	198	199	200	201	202	203
169	3000	3500	3300	3000	3200	3400	3000	3400	3200
170	3100	3400	3300	3300	3100	3200	3100	3300	3200
171	3200	3200	3300	3200	3000	3200	3200	3100	3200
172	sw	sw	sw	sw	sw	sw	sw	sw	sw
173	sw	sw	sw	sw	sw	sw	sw	sw	sw
174	sw	sw	sw	sw	sw	sw	sw	sw	sw
175	3200	3000	3100	3000	3100		163000	3000	
176	3000	3000	3200	3000	3100		3000	3000	
177	3100	2800	3000	3200	3200		3100	4000	
178	3100	3000	3000	3000	3200		3100		
179	3200	3000	3000	3100	3000		3200		
180	3200	3200	3200	3000	3000	3100	3200	3200	
181	3200	3300	3100	3400	2800	3200	3100		
182	3200	3500	3300	3300	3000	3200			
183	3100	3400	3200	3200	3300				
184	3100	3400	3200	3500					
185	3200	3200	3200						
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169	3300	3000
170	3200	3200
171	3200	3300
172	sw	sw
173	sw	sw
174	sw	sw
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Attachment 2

ORISE
OAK RIDGE INSTITUTE FOR SCIENCE AND EDUCATION
ENERGY/ENVIRONMENT SYSTEMS DIVISION

December 10, 1992

Mr. Jerome Roth
Region I
U.S. Nuclear Regulatory Commission
475 Allendale Road
King of Prussia, PA 19406

SUBJECT: CONFIRMATORY RADIOLOGICAL SURVEY PLAN FOR THE TEXAS INSTRUMENTS INCORPORATED BURIAL SITE, ATTLEBORO, MASSACHUSETTS

Dear Mr. Roth:

Enclosed is a copy of the subject document. As discussed in our earlier phone conversation, on-site activities have been scheduled for December 15-16, 1992.

If there are any questions, please direct them to me at (615) 576-3355 or Michele Landis at (615) 576-2908.

Sincerely,

Armin Jaberaboansari
Project Leader
Environmental Survey and
Site Assessment Program

AJ:ttc

cc: J. Parrott, NRC/NMSS, 6H3
T. Mo, NRC/NMSS, 6H3
D. Tiktinsky, NRC/NMSS, 6H3
J. Swift/F. Brown, NRC/NMSS, 6H3
J. Kinneman, NRC/Region I
M. Landis, ORISE
J. Berger, ORISE
PMDA, 6E6
File/205

CONFIRMATORY SURVEY PLAN FOR THE TEXAS INSTRUMENTS INCORPORATED BURIAL SITE, ATTLEBORO, MASSACHUSETTS

SITE HISTORY AND DESCRIPTION

The Texas Instruments Incorporated site at Attleboro, Massachusetts, was owned and operated by Metals and Controls (M&C) until 1959, at which time M&C merged with Texas Instruments, Inc. The General Plate Division of M&C began processing nuclear materials in 1952, and between 1952 and 1959 fabricated uranium foils for reactor experiments and fuel components and complete reactor fuel cores for the U.S. Navy. Source material license D-549 was issued permitting acquisition and title to not more than 22.7 kg (50 pounds) of refined source material for use in the production of uranium foils; additional source material was acquired and used under contract with U.S. Government. Special nuclear materials license No. SNM-23 was issued, permitting acquisition and title to 110 kg of enriched uranium for fabrication of the fuel components and cores. After the merger in 1959, Texas Instruments continued fabricating reactor fuel cores, primarily for research and production reactors. Also, source materials, i.e., natural uranium and thorium, were still being fabricated for sale to various corporations.

A 1964 Texas Instruments health and safety manual states that uranium- and thorium-contaminated noncombustible scrap material and machinery were collected in 55-gallon steel drums and were disposed of through authorized agencies, or were buried on-site in compliance with 10CFR20.304. Burials were made from 1958 to 1961, and the burial site was closed in 1967. Records indicate two known burials, one in 1958 of contaminated ductwork, and one in 1961 of 28.4 mCi of enriched uranium noncombustible scrap. Work with nuclear materials was gradually reduced beginning in 1968 and was terminated in 1974. The interior of the facility was decontaminated and released for unrestricted use by the Nuclear Regulatory Commission (NRC) in 1983.

Prepared by the Environmental Survey and Site Assessment Program of Oak Ridge Institute for Science and Education, Oak Ridge, TN, under interagency agreement (NRC Fin. A-9076) between the U.S. Nuclear Regulatory Commission and the U.S. Department of Energy.

The Texas Instruments Inc. Facility, Attleboro, MA is located in North Attleboro, approximately 48 kilometers south of Boston. The Radiological Site Assessment Program, predecessor to the Environmental Survey and Site Assessment Program, of the Oak Ridge Associated Universities (ORAU) conducted a radiological survey of portions of the facility's outdoor areas during April and May, 1984. The results of that survey indicated several areas with surface and/or subsurface uranium concentrations in excess of guidelines.[1]

Texas Instruments Inc. has completed the cleanup and final survey activities at the burial site located between Buildings 11 and 12. The excavated area at the burial site is approximately 1600 m^2 and the average depth of the excavated area is approximately 1.5 meters. The U.S. Nuclear Regulatory Commission, Region I Office, has requested that the Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education (ORISE) perform an independent confirmatory survey of the excavated area at the burial site.

OBJECTIVE

The objective of a confirmatory survey is to provide independent document reviews and radiological data, for use by the NRC in evaluating the adequacy and accuracy of the licensee's radiological status report, relative to established guidelines.

RESPONSIBILITY

Work described in this survey plan will be performed under the direction of Michele Landis, Project Manager and Armin Jaberaboansari, Project Leader with ESSAP. The cognizant site supervisor has the authority to make appropriate changes to the survey procedures as deemed necessary. After consultation with the NRC site representative, the scope of the survey plan may be altered. Deviations to the survey plan or procedures will be documented in the site log book.

DOCUMENT REVIEW

ESSAP will review the licensee's radiological survey data. Procedures and methods utilized by the licensee will be reviewed for adequacy and appropriateness. The post-remedial action data will be reviewed for accuracy, completeness and compliance with guidelines.

PROCEDURES

Survey activities will be conducted in accordance with the ORISE ESSAP Survey Procedures Manual. Specific procedures applicable to this survey are listed on page 4 of this survey plan.

REFERENCE GRID

A 10 m grid was established during ESSAP's radiological survey of the area in 1984 which was subsequently used by the licensee.[2] The same reference grid will be used in this survey.

SURFACE SCANS

Surface scans of the excavated and the surrounding area (approximately 10,000 m^2) will be performed using NaI detectors coupled to countrate meters with audible indicators. Areas of elevated direct radiation will be noted for further investigation.

SOIL SAMPLING

Surface soil samples will be obtained from ten randomly selected grid line intersections. Ten to fifteen samples will be obtained from the overburden piles. Additional soil samples will be obtained from locations of elevated direct radiation, identified by surface scans, or at specific locations based on previous ESSAP and/or licensee's survey results.

SAMPLE ANALYSIS AND DATA INTERPRETATION

Samples and data will be returned to ORISE's ESSAP laboratory in Oak Ridge, TN for analysis and interpretation. Soil samples will be analyzed by gamma spectrometry. Approximately 10% of the soil samples will be analyzed by alpha spectroscopy for isotopic uranium.

The data generated will be compared with the licensee's documentation and NRC guidelines established for release to unrestricted use. Results will be presented in a report and provided to the NRC for review and comment. Data and samples collected as a part of this survey will be archived by ESSAP.

GUIDELINES

The soil concentration guideline, for enriched uranium, is 30 pCi/g.[3]

TENTATIVE SCHEDULE

Measurement and Sampling	December 14-15, 1992
Sample Analysis	January, 1993
Draft Report	April, 1993

LIST OF CURRENT PROCEDURES

Applicable procedures from ORISE ESSAP Survey Procedures Manual include:

Section 5.0 Instrument Calibration and Operational Check-Out

- 5.1 General Information
- 5.2 Electronic Calibration of Ratemeters
- 5.3 Gamma Scintillation Detector Check-Out and Cross Calibration
- 5.4 Alpha Scintillation Detector Calibration and Check-Out

REFERENCES

1. "Radiological Survey of the Texas Instruments Site, Attleboro, Massachusetts," Oak Ridge Associated Universities, January, 1985.

2. "Post Excavation Radiological Survey Report, Texas Instruments Incorporated Burial Site, Attleboro, Massachusetts," Creative Pollution Solutions, Inc., November 28, 1992.

3. "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source or Special Nuclear Material," U.S. Nuclear Regulatory Commission, Division of Fuel Cycle and Material Safety, Washington D.C., August 1987.

APPENDIX A
COST ESTIMATE*
CONFIRMATORY SURVEY
FOR THE TEXAS INSTRUMENTS
INCORPORATED BURIAL SITE,
ATTLEBORO, MASSACHUSETTS

Plan Preparation - $4,300

Plan preparation includes the following activities: document reviews, survey plans, trip planning and the cost and time estimates.

On-Site Activities - $18,300

On-site activities will include 6 man-days at the site performing the following: gamma scans and soil sampling.

The on-site expenses also include trip preparation (equipment calibration and packing), travel to and from the site (airlines and rental vehicles), hotel expenses, and per diem, unpacking equipment, and logging in samples.

Sample Analysis - $6,600

Includes analysis of soil samples by gamma spectrometry and analysis of selected samples by alpha spectroscopy for isotopic uranium.

Report Preparation - $7,700

The report preparation will include the following activities: tabulation of data, illustration, and writing and reviewing the final draft, final or interim report, word processing and reproduction.

Total Cost Estimate - $36,900

**Estimates are for survey of all areas listed in the NRC Request for Technical Assistance received by ESSAP. Reduction or increase in the number of areas being surveyed would result in changes to the original estimate in the "on-site activities" and "sample analyses" categories. Due to the nature of the survey, this estimate is a best guess site and weather conditions and survey findings may change the scope of the survey and increase or decrease the cost estimate. The NRC site representative will be notified if major changes to the scope of the survey need to be taken.*

EXCAVATION AREA AS OF 11/6/92

APPROXIMATE ELEVATIONS SHOWN

Attachment 3