SEC

V-40 FINAL REPORT FOR THE SMC NEWFIELD FACILITY V-40-03

APRIL 4, 1994

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TABLE OF CONTENTS

1.0 SCOPE 1

2.0 APPROACH 1
- 2.1 Background 1
- 2.2 Work Plan 2
  - 2.2.1 Slag Operation 2
  - 2.2.2 Radiological Health and Safety 3
- 2.3 Instrumentation 3
  - 2.3.1 Airborne Radiological Particulate Sampling 3
  - 2.3.2 Fixed alpha and beta/gamma monitoring 4

3.0 FINDINGS 6
- 3.1 FeV crushed slag radiological analysis 6
- 3.2 Contamination/Release Surveys 6
- 3.3 Area Air Monitoring 7
- 3.4 Personnel Monitoring 7
  - 3.4.1 Thermoluminescent Dosimetry (TLD) 7
  - 3.4.2 Urinalysis (Bioassay) 7

4.0 SUMMARY 8

5.0 REFERENCES 8

GLOSSARY

Ac	Actinium
CFR	Code of Federal Regulations
Ci	curie, 3.7×10^{10} disintegrations per second
cm	centimeter
cpm	counts per minute
DAC	Derived Air Concentration
dpm	disintegrations per minute
E	Exponential Notation
FeV	Ferrovanadium
g	gram
keV	kilo (1000) electron volts
l	liter
LiF	Lithium Floride
ml	milliliter (1×10^{-3} liters)
mRem	millirem (1/1000 of a Rotengen)
MPC	Maximum Permissible Concentrations
NRC	Nuclear Regulatory Commission
p	pico (1×10^{-12})
RAS	Radiological Air Sampling
RCA	Radiological Control Area
SAC	Scintillation Alpha Counter
SEC	Safety and Ecology Consultants, Inc.
slag	the dross of flux and impurities that rise to the surface of molten metal during melting and refining
SMC	Shieldalloy Metallurgical Company
SrY	Strontium/Yttrium
Th	Thorium
TLD	Thermoluminescent Dosimeter
U	Uranium
μ	micro (1×10^{-6})
%	Percent

1.0 SCOPE

Safety and Ecology Consultants, Inc. (SEC) was contracted by Shieldalloy Metallurgical Corporation (SMC) to perform health physics (HP) support services which included ferrovanadium (FeV) slag radiological analyses, radiological contamination surveys, personnel monitoring, and area air particulate sampling during the production of a SMC product known as V-40. Because the processing of V-40 was conducted in an area used to store radioactive material, the purpose of the HP support services was to ensure FeV slag contained no appreciable radioactive contamination from source material and to ensure the project workers health and safety. Source material is defined by the NRC as: (i) Uranium (U) or Thorium (Th), or any combination thereof, in any physical or chemical form; or (ii) ores which contain by weight one-twentieth of one percent (0.05%) or more of uranium, thorium, or any combination thereof.

In addition to the FeV slag sampling, a radiological monitoring program to ensure worker health and safety was incorporated for the project duration. This internal and external radiological monitoring included initial and exit urinalysis samples, thermoluminescent dosimeter (TLD) monitoring, and air sampling for airborne radiological particulates. SEC also performed direct and transferable contamination surveys of work area surfaces and equipment to ensure no contamination during work activities.

2.0 APPROACH

2.1 Background

SMC has in place a radiological monitoring program associated with the provisions of NRC regulations and SMC's NRC license. Employment of radiological monitoring ensures the distinction between FeV and Ferrocolumbium (FeCb) slag stockpiles in the source material storage yard (SMSY). FeCb is defined as a source material by the NRC and therefore is restricted from off-site shipments. Prior to crushing operations the FeV slag is deposited in a predetermined laydown area where gamma radiation screening is performed to locate any radiation source at two times the background level. Previous analyses of slag samples for FeCb reported radioactive concentrations of ^{232}Th and ^{238}U of 220 to 610 pCi/g, and 180 to 320 pCi/g, respectively (Reference 5.1). Concentrations of these elements in the FeV slag, range from reported levels of ^{232}Th at 5 to 7 pCi/g and ^{238}U of 7 to 9 pCi/g (Reference 5.2). The detection of gamma radiation allows the distinction of FeCb and FeV slag to be made. This screening process has been proven to be effective as demonstrated in previous V-40 projects at the Newfield site.

Additional monitoring of the slag material was performed with verification sampling and isotopic analysis of individual FeV slag piles. Each of the eleven piles, containing approximately 1000 tons of materials, had 4 representative samples taken and analyzed by gamma spectroscopy for ^{238}U and ^{232}Th concentrations.

This radiological sampling provides the basis for the determination that the V-40 product is non-source material and contains no appreciable contamination from source material or other licensed material thus ensuring the slag is available for release from the site. This status enables SMC to market the FeV material as a product known as V-40.

2.2 *Work Plan*

2.2.1 *Slag Screening Operation*

The general work area was located at the eastern end of the SMSY and extends from the western limits of the FeV slag stockpiles to the site security fence. The work area was adjacent to the radiological controlled area (RCA) associated with the FeCb source material slag piles. Because of the close proximity of respective slag piles, the entire work area was established as an RCA.

Work activities involved removal of FeV slag from existing stockpiles to a laydown area where initial gamma radiation screening surveys of the material were performed. The FeV slag was transferred to the laydown area where it was physically screened to remove unwanted soils displaced during slag movement. FeV slag was also visually screened to identify and remove any unwanted debris from being included in the V-40 product. If any unwanted item was detected from the surveys, the object was marked with orange spray paint and removed from the laydown area. Radiation surveys were continued throughout the V-40 project to confirm and maintain the FeV slag integrity. A measurement criteria of twice background on the gamma detectors was used as the in-situ screening method.

Once the FeV slag was screened for unwanted material, it was run through an impactor to crush the material to the desired size of less than 6 inches. Because the impactor created crushed, fine material, these fines were sampled during the generation of every 250 tons of V-40. Following

crushing, the V-40 material was placed in discrete 1000 ton piles. Ten 1000 ton and one 750 ton piles were created and identified for later disposition.

2.2.2 *Radiological Health and Safety*

2.2.2.1 In compliance with 10 CFR 19, the project workers were instructed in the health and safety concerns of handling of radioactive materials. Included in the training were explanations of the internal and external monitoring requirements for workers to participate in a radiation dosimetry program such as the use of thermoluminescent dosimeters (TLD) and a bioassay (urinalysis) program prior to the start of work. ALARA procedures were also discussed in detail.

2.2.2.2 Routine direct radiation and contamination surveys were performed during the FeV slag screening and crushing operations. Surveys were routinely performed on the construction equipment, personnel gloves and boots, and break areas.

2.2.2.3 Continuous air sampling was performed downwind of the crushing operations during the crushing phase of the project. Air samples were then analyzed for gross alpha levels to determine compliance with the maximum permissible concentration (MPC) for ^{232}Th.

2.2.2.4 Analysis of personnel Thermoluminescent Dosimeters (TLD), bioassays, and gamma spectroscopy of slag samples was performed by contract laboratories. Bioassays were collected in accordance with the V-40 work plan (Reference 5.5) and analyzed, along with slag samples, by Shealy Environmental Laboratory. TLD's were issued daily to respective project workers and were analyzed by TMA Eberline after work was completed. A control dosimeter was maintained with the batch of dosimeters to ensure the quality control of TLD results. The control dosimeter is

representative of conditions which the batch is exposed to during transfer to and from the site and background conditions while at SMC.

2.3 *Instrumentation*

SEC HP technicians were trained in accordance with SEC Standard Procedures for Health Physics Operations. The technicians employed the following equipment procedures and methodology to perform the radiological surveys and air monitoring.

2.3.1 *Airborne Radiological Particulate Sampling*

2.3.1.1 *Area - Eberline RAS-1 Low Volume Air Sampler*

1. The RAS-1 is supplied with a three-point flow calibration using a mass flowmeter.
2. A glass fiber sampling filter was used which is 47 mm in diameter and 0.45 micron pore size.
3. Sampling at 37.5 liters/minute ($\pm 8\%$) maintained for 8 hours each sampling point.
4. Filters were analyzed using the Eberline SAC-4 Scintillation Alpha Counter to determine gross alpha radiation levels.

2.3.1.2 *Eberline SAC-4 Scintillation Alpha Counter*

1. The SAC-4 counters were source checked using with known activity ^{230}Th alpha source in accordance with SEC procedure.
2. The filter was placed in a 2-inch planchet and inserted in the sample tray.
3. Counting time was set for 50 minutes.
4. Timer and scaler was reset to zero.
5. Counting was initiated.
6. Results were documented on Air Particulate Sample Reporting Log (see Table 4).

2.3.2 *Fixed alpha and beta/gamma monitoring*

2.3.2.1

Fixed alpha monitoring was performed using an Eberline AC-3 probe coupled with an Eberline ESP-1 scaler.

1. A five minute background count was taken, not to exceed 1 cpm, to insure the detector was not contaminated, in accordance with SEC procedure.
2. Efficiency was determined by taking a five minute count at the top and bottom of the probe face using a ^{230}Th source, and averaging the readings not to exceed value in accordance with SEC procedure.
3. The probe was held as close as possible to the surface surveyed, not to exceed one-quarter inch.
4. Fixed point measurements had a count-time of 1.0 minutes.
5. Survey scanning speed was approximately one-half inch per second.
6. Results were recorded in the Radiological Contamination Survey Log (see Table 3).

2.3.2.2 Fixed beta/gamma monitoring was performed using an Eberline HP-210 probe coupled with an Eberline ESP-1 Scaler.

1. A five minute background count was taken, not to exceed 50 cpm, to insure the detector was not contaminated, in accordance with SEC procedure.
2. Efficiency was determined by taking a five minute count in a low background area using a ^{90}SrY beta source in SH-4A geometry, not to exceed ± 3 sigma from the calibrated value, in accordance with SEC procedure.
3. The probe was held as close as possible to the surface surveyed, not to exceed one-quarter inch.
4. Fixed point measurements had a minimum count time of 1.0 minutes.
5. Survey scanning speed was approximately one inch per second.
6. Results were recorded in the Radiological Contamination Survey Log (see Table 3).

2.3.3 *Removable alpha contamination*

Removable alpha contamination was surveyed using smear samples wiped over a 100 cm^2 area. The samples were analyzed using the Eberline SAC-4 Scintillation Alpha Counter to determine removable alpha radiation levels. Results were recorded in the Radiological Contamination Survey Log.

3.0 FINDINGS

3.1 *FeV crushed slag radiological analysis*

Forty three samples were analyzed for ^{232}Th and ^{238}U concentrations in the FeV material. Ten 1000 ton and one 750 ton FeV piles were produced and sampled at one sample per 250 tons. Pile #11 had only three samples. Table 1 contains the analytical results for both, ^{232}Th and ^{238}U, assays. An arithmetic mean is supplied in the table for "pile to pile" comparisons during the complete crushing process. Characterization of the combined piles is demonstrated by mean to mean comparisons, showing overall consistency of the product material.

^{232}Th was analyzed by determining the ^{228}Actinium (Ac) concentration at 338.4, 911.1, 969.0 keV and ^{238}U was determined by ^{234}Th at 63.3 keV. As can be seen from the results, the processed FeV contains natural levels of ^{232}Th concentrations in the range of 3.56 to 7.28 pCi/g and ^{238}U in the range of 2.95 to 8.70 pCi/g. These results are consistent with previous analyses performed on FeV slag with ^{238}U quantities at 7 to 9 pCi/g and ^{232}Th quantities at 5 to 7 pCi/g (Reference 5.2).

3.2 *Contamination/Release Surveys*

Results of area and equipment surveys are contained in Appendix 1. In comparison to USNRC Regulatory Guide 1.86 for contamination release levels pertaining to ^{232}Th (3000 dpm/100 cm^2 for a fixed hot spot but averaged to 1000 dpm/100cm^2 and 200 dpm/100 cm^2 for removable contamination), excessive contamination was not found. Detectable surface contamination ranged from the alpha MDA of 21 dpm/100 cm^2 to 275 dpm/100 cm^2 and for beta/gamma from the MDA of 250 to 1990 dpm/100 cm^2. Removable contamination was below the release limits with detections ranging from the alpha MDA of 3 dpm/100 cm^2 to 49 dpm/100 cm^2. These results indicated fixed and removable contamination to be below the allowable residual contamination levels set forth in NRC Regulatory Guide 1.86.

3.3 *Area Air Monitoring*

Sampling for airborne particulates was performed during the slag crushing operation. Air sampling stations were positioned at down wind locations from the crushing unit. Results of airborne activity concentrations are contained in Appendix 2. These results showed all samples were below the limits of ^{232}Th for occupational exposure and effluent releases to the air (6×10^{-11} μg/ml and 2×10^{-12} μCi/ml respectively). The ^{232}Th limits were applied becuase they are the most restrictive of the natural occuring isotopes present.

3.4 *Personnel Monitoring*

3.4.1 *Thermoluminescent Dosimetry (TLD)*

Prior to each work day, workers were issued their respective TLD badges to comply with required radiological monitoring procedures for workers in a RCA. Results of TLD monitoring can be found in Table 5. Workers were monitored from July 19 through October 28, 1993, the duration of the project. TLD results for workers were consistent with results expected given the minimal exposure rate in the SMSY. TLD analyses ranged from less than detection limits to 17 mRem. Three project workers received a measureable whole body dose during the three month project. However, all three individuals were well within allowable limits of 5 Rem for external radiation exposure. The maximum dose was 17 mRem.

3.4.2 *Urinalysis (Bioassay)*

Included within the internal dosimetry, SMC site workers were required to participate in a bioassay (urinalysis) monitoring program. Prior to any work onsite, the worker supplied a 1 liter urine sample to establish the worker baseline radiological level. At conclusion of the project, the workers again supplied urine samples to measure any possible internal contamination uptake during the project. Thirteen workers, including SEC HP technicians, participated in the program, however, three workers did not supply final urine samples. Bioassay results for both ^{232}Th and ^{238}U are found in Table 3. This monitoring program data confirms that procedures in place at SMC for FeV slag processing, to be efficient and in compliance with ALARA practices.

4.0 SUMMARY

FeV slag processing was performed at the SMC Newfield Site during July 19 - October 28, 1993. Radiological monitoring determinations made by SEC during the project recorded minimal surface contamination on equipment and site areas which were all well within releasable limits. Air monitoring for airborne radiological particulates produced no observable radiological activity above the MPC for ^{232}Th during the FeV slag processing.

Gamma spectroscopy of crushed FeV slag pile(s) sample sets confirmed no elevated radiological source material present in the slag, above natural levels of 7-9 pCi/g for ^{238}U and 5-7 pCi/g for ^{232}Th. These analyses confirm the effectiveness of pre-screening the FeV slag prior to crushing.

Radiological monitoring of work area personnel was performed using TLD and bioassay samples to measure external and internal exposure during slag operations. Results confirm compliance with all applicable NRC limits.

5.0 REFERENCES

5.1 Teledyne Isotopes Report of Analysis, 11/91

5.2 TMA Eberline Report of Analysis, 01/90

5.3 Title 10, CFR, Part 20, Appendix B

5.4 US Nuclear Regulatory Commission, Regulatory Guide 1.86, June 1974.

5.5 Work Plan, Survey and Sampling Protocol for FeV slag at the SMC, Newfield, New Jersey, Amendment 1, 10/1992

TABLE 1

FERROVANADIUM SLAG ANALYSIS

Table 1
Thorium 232*

FeV Slag Pile No.	A (pCi/g)	B (pCi/g)	C (pCi/g)	D (pCi/g)	Mean (pCi/g)
65886-01	5.48	6.89	4.37	5.20	5.49
65886-02	5.93	4.19	4.62	3.56	4.58
65886-03	4.12	5.42	4.56	6.78	5.22
65886-04	7.28	4.33	6.06	5.84	5.88
65886-05	4.19	6.36	5.16	5.06	5.19
65886-06	6.30	5.63	6.67	6.01	6.15
65886-07	5.45	4.90	4.91	6.05	5.33
65886-08	5.86	5.77	5.71	5.53	5.72
65886-09	4.99	4.75	5.08	5.57	5.10
65886-10	4.81	3.79	4.62	5.05	4.57
65886-11	4.82	4.66	4.49		4.66

* As Ac228 at 338.4, 911.1, 969.0 keV Range 3.56 - 7.28 pCi/g

Uranium 238*

FeV Slag Pile No.	A (pCi/g)	B (pCi/g)	C (pCi/g)	D (pCi/g)	Mean (pCi/g)
65886-01	3.13	3.75	3.91	6.22	4.25
65886-02	2.95	4.75	5.57	5.68	4.74
65886-03	5.14	6.36	5.17	5.25	5.48
65886-04	6.95	5.69	5.25	3.73	5.41
65886-05	4.63	5.08	5.54	3.98	4.81
65886-06	5.96	4.94	4.55	4.76	5.05
65886-07	4.12	5.11	6.92	5.25	5.35
65886-08	5.05	5.41	5.53	5.45	5.36
65886-09	4.53	3.50	6.49	8.70	5.81
65886-10	5.32	5.00	5.47	3.84	4.91
65886-11	4.86	7.25	3.97		5.36

*As Th234 at 63.3 keV Range 3.56 - 7.28 pCi/g

TABLE 2

PERSONNEL MONITORING

THERMOLUMINESCENT DOSIMETRY

WHOLE BODY TLD RESULTS

Location: SMC, Newfield, New Jersey **Monitoring Period:** 7/19/93 to 10/28/93

TLD#	NAME	SOCIAL SECURITY NO.	RESULTS (mRem)
0001	CONTROL		
0002	F. Dimatteo	149-68-0854	14.000
0003	G. Musnoff	137-76-4910	17.000
0004	C. Leichtweis	111-54-4098	0.000
0005	R. Angelino	154-52-3785	0.000
0006	B. Kane	142-72-4653	0.000
0007	M. Darpino	146-66-9578	0.000
0008	S. Beamer	149-70-6906	0.000
0009	T. Beamer	143-42-3817	0.000
0010	R. D'Orazio	138-52-5260	0.000
0011	R. White	144-36-8452	0.000
0012	P. Coladonato	136-58-6215	11.000
0013	E. Murphy	147-74-2416	0.000
0014	R. Coladonato	136-58-7305	0.000
0015	J. Wilson	156-76-9394	0.000

TMA
Thermo Analytical Inc.

TMA Eberline

NVLAP

The dosimetry processor is accredited by NVLAP of the U.S. Department of Commerce as having the competence to perform specified tests in accordance with prescribed test methods and accreditation criteria.

CURRENT TLD OCCUPATIONAL RADIATION EXPOSURE REPORT

APPROVED FOR USE IN LIEU OF NRC FORM 5

CUSTOMER NO 8073

PAGE 1 OF 2

ROSE MARIE TAUCHE

DOSIMETRY SERVICES

DATE 11/13/93

BADGE NO / EXT	NAME	SOCIAL SECURITY NO / BIRTH DATE	AGE YRS	TYPE SERVICE / FREQ	DATE OF BADGE ISSUE / DATE OF BADGE RETURN	LOCATION / NEUTRON READING	TOTAL TLD NET COUNTS / PENETRATING NET COUNTS	DOSE FOR PERIOD (mrem) GAMMA / TOTAL DOSE FOR PERIOD (mrem) WHOLE BODY	BETA / SKIN	NEUTRON / EXTREMITY	ACCUMULATED DOSE (mrem) FOR CAL QTR WHOLE BODY / ACCUMULATED DOSE (mrem) FOR CAL YR WHOLE BODY	SKIN	EXTREMITY	PERMISSIBLE WB DOSE (mrem) CALENDAR QTR / LIFETIME OCCUPATIONAL DOSE (rem) ACTUAL	CALENDAR YR / PERMISSIBLE
0000	CONTROL			T	07/19/93		37								
					10/28/93		37								
0001				T	07/19/93		11	14	0		14	14	0	1.25	5.0
				Q	10/28/93		14	14	14		14	14	0	0.014	
0002				T	07/19/93		10	17	0		17	17	0	1.25	5.0
				Q	10/28/93		17	17	17		17	17	0	0.017	
0003				T	07/19/93		5	0	0		0	0	0	1.25	5.0
				Q	10/28/93		5	0	0		0	0	0	0.000	
0004				T	07/19/93		25	0	22		0	22	0	1.25	5.0
				Q	10/28/93		8	0	22		0	22	0	0.000	
0005				T	07/19/93		5	0	0		0	0	0	1.25	5.0
				Q	10/28/93		5	0	0		0	0	0	0.000	
0006				T	07/19/93		6	0	0		0	0	0	1.25	5.0
				Q	10/28/93		6	0	0		0	0	0	0.000	
0007				T	07/19/93		16	0	20		0	20	0	1.25	5.0
				Q	10/28/93		1	0	20		0	20	0	0.000	
0008				T	07/19/93		3	0	0		0	0	0	1.25	5.0
				Q	10/28/93		3	0	0		0	0	0	0.000	
0009				T	07/19/93		0	0	0		0	0	0	1.25	5.0
				Q	10/28/93		0	0	0		0	0	0	0.000	
0010				T	07/19/93		7	0	0		0	0	0	1.25	5.0
				Q	10/28/93		1	0	0		0	0	0	0.000	
0011				T	07/19/93		9	11	0		11	11	0	1.25	5.0
				Q	10/28/93		11	11	11		11	11	0	0.011	
0012				T	07/19/93		1	0	0		0	0	0	1.25	5.0
				Q	10/28/93		1	0	0		0	0	0	0.000	
0013				T	07/19/93		9	0	0		0	0	0	1.25	5.0
				Q	10/28/93		4	0	0		0	0	0	0.000	
0014				T	07/19/93		0	0	0		0	0	0	1.25	5.0
				Q	10/28/93		0	0	0		0	0	0	0.000	
0015				T	07/19/93		0	0	0		0	0	0	1.25	5.0
				Q	10/28/93		0	0	0		0	0	0	0.000	

TYPE SERVICE CODES
T - WHOLE BODY BADGE (BOX)
H - RING BADGE
J - ANKLE BADGE
K - WRIST BADGE
N - NEUTRON BADGE

FREQUENCY CODES
W - WEEKLY
B - BIWEEKLY
M - MONTHLY
P - BIMONTHLY
Q - QUARTERLY
I - IRREGULAR

NOTE CODES
D - BADGE DAMAGED
E - REPORTED BY TELEPHONE OR WIRE
F - BADGE NOT USED
G - ABNORMAL READING
X - CONTAMINATED
Z - CALCULATED CONTROL
*BETA INCLUDES NONPENETRATING X-RAYS

CUSTOMER SAFETY/ECOLOGY CONSULT
ATTENTION CHRIS LEICHTUEIS
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CITY OAK RIDGE TN 37830

TMA
Thermo Analytical Inc.
TMA Eberline
[illegible]
[illegible]
[illegible]

NVLAP

The dosimetry processor is accredited by NVLAP of the U.S. Department of Commerce as having the competence to perform specified tests in accordance with prescribed test methods and accreditation criteria.

CURRENT TLD OCCUPATIONAL RADIATION EXPOSURE REPORT

APPROVED FOR USE IN LIEU OF NRC FORM 5

CUSTOMER NO 8078

ROSE MARIE TAUCHE

DOSIMETRY SERVICES

DATE 11/12/93

BADGE NO / FACILITY	NAME	SOCIAL SECURITY NO / BIRTH DATE	AGE (YRS)	TYPE SERVICE / FREQ	DATE OF BADGE ISSUE / DATE OF BADGE RETURN	LOCATION / NEUTRON READING	NOTE	TOTAL TLD NET COUNTS / PENETRATING NET COUNTS	DOSE FOR PERIOD (mrem): GAMMA / TOTAL DOSE FOR PERIOD (mrem): WHOLE BODY	BETA* / SKIN	NEUTRON / EXTREMITY	ACCUMULATED DOSE (mrem) FOR CAL QTR: WHOLE BODY / ACCUMULATED DOSE (mrem) FOR CAL YR: WHOLE BODY	SKIN	EXTREMITY	PERMISSIBLE WB DOSE (rem): CALENDAR QTR / LIFETIME OCCUPATIONAL DOSE (rem): ACTUAL	CALENDAR YR / PERMISSIBLE
0016				T	07/19/93			0	0	0		0	0	0	1.25	5.0
				Q	10/28/93			0	0	0		0	0	0	0.000	
0017				T	07/19/93			1	0	0		0	0	0	1.25	5.0
				Q	10/28/93			1	0	0		0	0	0	0.000	
0018				T	07/19/93			0	0	0		0	0	0	1.25	5.0
				Q	10/28/93			0	0	0		0	0	0	0.000	
0019				T	07/19/93			0	0	0		0	0	0	1.25	5.0
				Q	10/28/93			0	0	0		0	0	0	0.000	
0020				T	07/19/93			0	0	0		0	0	0	1.25	5.0
				Q	10/28/93			0	0	0		0	0	0	0.000	

TYPE SERVICE CODES
T - WHOLE BODY BADGE (BGX)
H - RING BADGE
J - ANKLE BADGE
K - WRIST BADGE
N - NEUTRON BADGE

FREQUENCY CODES
W - WEEKLY
B - BIWEEKLY
M - MONTHLY
P - BIMONTHLY
Q - QUARTERLY
I - IRREGULAR

NOTE CODES
C - BADGE DAMAGED
E - REPORTED BY TELEPHONE OR WIRE
F - BADGE NOT USED
S - ABNORMAL READING
X - CONTAMINATED
Z - CALCULATED CONTROL
*BETA INCLUDES NONPENETRATING X RAYS

CUSTOMER SAFETY/ECOLOGY CONSULT
ATTENTION CHRIS LEICHTUEIS
ADDRESS PO BOX 6925
CITY OAK RIDGE TN 37830

CURRENT TLD OCCUPATIONAL RADIATION EXPOSURE REPORT

Each stripe contains two lines of information for each badge issued. The **first three columns** include data necessary for individual identification.

Columns four and five are used to specify the particular type of service and frequency of exchange, as well as the dates the badges are issued and returned. Column six is used to further identify work location and type of work performed. The second line of column six is used to record the neutron reading obtained by one of several techniques. Upon request, TMA/Eberline will assist with selection of a suitable technique and suggest calibration procedures.

Total TLD net counts, the reading of the dosimeter behind the 10 mg/cm² plastic decal, be reported in **column seven.** Also reported in this column are the penetrating net counts, the reading of the dosimeter behind the 285 mg/cm² aluminum absorber. Both readings are reported minus the reading of the control badge and corrected for the response factor of the dosimeter so that one count corresponds to one mrem of exposure from ^{137}Cs gamma radiation.

The dose reported as "gamma" in column eight is the penetrating dose equivalent and is due primarily to gamma and x-rays. The whole body dose for type os service T and N is the sum of the top line from **columns eight and ten.**

The dose reported as "beta" in **column nine** is the total TLD net counts less the penetrating net counts. The skin dose reported in the second line of this column is the sum of the top lines of **columns eight, nine, and ten.** This represents the total dose equivalent taken to be the dose to the skin for type of service T and N.

Column ten reports the neutron reading corrected by the customer using a calibration factor for that source of neutron. The extremity (service codes H, J, or K) dose recorded in the second line is the sum of the top line of columns eight, nine and ten.

Columns 11, 12 and 13 are the accumulated calendar quarter and year dose values in mrem for the whole body, skin and extremity. The corresponding limits, based on 10CFR20, section 20.101a are 1.25 rem whole body, 7.5 rem skin and 18.75 rem extremity for the quarter. The whole body dose limit for a calendar year is 5 rem. These limits are reported in the top line of **columns 14 and 15.**

The second line of **column 14** reports the actual lifetime accumulated occupational dose, provided dose history information has been supplied to TMA/Eberline. The second line of **column 15** gives the lifetime permissible whole body dose based on the formula 5(N-18), where N is the age of the person.

The current TLD Occupational Radiation Exposure Report used by TMA/Eberline has been approved for use in lieu of NRC Form 5.

TMA Eberline
Thermo Analytical Inc.
TMA/Eberline
5435 Jefferson Street NE
Albuquerque, NM 87109
(505) 354-9931

NVLAP

The dosimetry processor is accredited by NVLAP of the U.S. Department of Commerce as having the competence to perform specified tests in accordance with prescribed test methods and accreditation criteria.

CURRENT OCCUPATIONAL RADIATION EXPOSURE REPORT
APPROVED FOR USE IN LIEU OF NRC FORM 5

CUSTOMER NO. 6983

PAGE 1 OF 1 PAGES

DATE 08/24/90

DOSIMETRY SERVICES

BADGE NO. / FACILITY	NAME		SOCIAL SECURITY NO. / BIRTHDATE	AGE (YRS)	TYPE SERVICE / FREQ.	DATE OF BADGE ISSUE / DATE OF BADGE RETURN	LOCATION / NEUTRON READING	N	TOTAL TLD NET COUNTS / PENETRATING NET COUNTS	DOSE FOR PERIOD (mrem): GAMMA / TOTAL DOSE FOR PERIOD (mrem): WHOLE BODY	BETA* / SKIN	NEUTRON / EXTREMITY	ACCUMULATED DOSE (mrem) FOR CAL. QTR.: WHOLE BODY / ACCUMULATED DOSE (mrem) FOR CAL. YR.: WHOLE BODY	SKIN / SKIN	EXTREMITY / EXTREMITY	PERMISSIBLE WB. DOSE (rem): CALENDAR QTR. / LIFETIME OCCUPATIONAL DOSE (rem): ACTUAL	CALENDAR YR. / PERMISSIBLE
0000	CONTROL				T	07/01/90			19								
						08/24/90			19								
0011	SMITH	JL	251-25-4295		T	07/01/90			476	451	150		451	601	0	1.25	5.0
			09/07/61	28	I	08/24/90			451	451	601		451	601	0	0.451	45
0150	SMITH	JL	251-25-4295		K	07/01/90			2497	929	9408				10337		
			09/07/61	28	I	08/24/90			929			10337			10337		
0201	SMITH	JL	251-25-4295		H	07/01/90				176					176		
			09/07/61	28	I	08/24/90			176			176			176		
0300	CONTROL				N	07/01/90			13								
						08/24/90			13								
0306	JONES	JH	519-10-5190		N	07/01/90			1176	135	2936	661	796	3732	0	1.25	5.0
			05/21/56	34	I	08/24/90		551	686	796	3732		1784	4720	0	1.784	75
3000	CONTROL				A	07/01/90			12								
						08/24/90			12								
3001					A	07/01/90				0		501	501	501	0	1.25	5.0
					I	08/24/90		152	152	501	501		501	501	0	0.501	

"TYPE SERVICE" CODES
T - WHOLE BODY BADGE (BGO)
H - RING BADGE
J - ANKLE BADGE
K - WRIST BADGE
N - NEUTRON BADGE

"FREQUENCY" CODES
W - WEEKLY
B - BIWEEKLY
M - MONTHLY
P - BIMONTHLY
Q - QUARTERLY
I - IRREGULAR

"NOTE" CODES
C - BADGE DAMAGED
E - REPORTED BY TELEPHONE OR WIRE
F - BADGE NOT USED
G - ABNORMAL READING
X - CONTAMINATED
Z - CALCULATED CONTROL
*BETA INCLUDES NONPENETRATING X-RAYS

CUSTOMER: EBERLINE ANALYTICAL
ATTENTION: ERNEST A. SANCHEZ
ADDRESS: PO BOX 3674
CITY: ALBUQUERQUE NM 87190

TABLE 3

PERSONNEL MONITORING - URINALYSIS

Table 3
Bioassay Results

SS NO.	EMPLOYEE	URANIUM[238*] pCi/L		THORIUM[232**] pCi/L	
		Initial	Exit	Initial	Exit
149-68-0854	F. DiMatteo	<0.15	<0.08	<0.06	<0.10
137-76-4910	G. Musnoff	<0.15	<0.08	<0.06	<0.10
154-42-3785	R. Angelino	<0.15	<0.08	<0.06	<0.10
142-72-4653	B. Kane	<0.15	<0.08	<0.06	<0.10
146-66-9578	M. Dorpino	<0.15	<0.10	<0.06	<0.06
149-70-6906	S. Beamer	<0.15	<0.08	<0.06	<0.10
143-42-3817	T. Beamer	<0.15	<0.08	<0.06	<0.10
138-52-5260	R. D'Orazio	<0.15	***	<0.06	***
144-36-8452	R. White	<0.15	***	<0.06	***
136-58-6215	P. Coladonato	<0.15	***	<0.06	***
147-74-2416	E. Murphy	<0.15	<0.08	<0.06	<0.10
136-58-7305	R. Coladonato	<0.15	<0.10	<0.06	<0.06
156-76-9394	J. Wilson	*<0.10	<0.10	<0.06	<0.06

* As Th234 at 63.3 keV
** As Ac228 at 338.4, 911.1, 969.0 keV
*** Exit Bioassay Samples were not given for these employees

APPENDIX 1

Contamination - Release Surveys
Radiological Survey Log

SAFETY AND ECOLOGY CONSULTANTS, INC.

RADIOLOGICAL CONTAMINATION SURVEY

SEC PROJECT NO.: 1005

AREA SURVEYED: John Deer Front End Leader

SURVEYOR: F. DIMATTEO/G. MUSNOFF

SURVEY NO.:

DIRECT ACTIVITY DATE: 9/3/93

Survey Instruments	Alpha	Beta/Gamma
Scaler/Serial No.	ESP-1/03047	ESP-1/03049
Probe/Serial No.	AC-3/407083	HP-210/705796
Calibration Date	5/25/93	6/23/93
Efficiency cpm/dpm	0.177	0.238
Bkgd/Bkgd count time	10/5 min	161 min
Sample count time	1 min	1 min
MDA	25 dpm/100 cm^2	278 dpm/100 cm^2

Number Location	Gross cpm	dpm/ 100cm^2	Gross cpm	dpm/ 100cm^2
Inside bucket	7	49±52	26	<278
Left front tire fender	5	29±44	29	<278
et outside left	6	39±48	21	<278
Bucket outside right	9	68±59	24	<278
Bucket cutting edge	7	49±52	28	<278
Bucket outside top	2	<25	30	<278
Right front fender	2	<25	14	<278
Right front tire	4	<25	22	<278
Right inside bucket	1	<25	26	<278
Right step	3	<25	26	<278
Right rear tire	9	68±59	23	<278
Right rear bumper	3	<25	25	<278
Left rear bumper	14	117±72	65	899±449
Left rear tire	6	39±48	32	<278
Left step	5	29±44	27	<278
Left inside bracket	3	<25	18	<278
Left front tire	4	<25	24	<278
rear	12	97±67	67	943±455
eat	3	<25	29	<278
Cabin floor	5/3	29±44 / <25	38/29	<278 / <278

TRANSFERABLE ACTIVITY DATE: 9/3/93

Survey Instrument	Alpha	Beta/Gamma
Scaler/Serial No.	SAC-4/868	
Probe/Serial No.	NA/NA	
Calibration Date	7/30/93	
Efficiency cpm/dpm	.3638	
Bkgd/Bkgd count time	17.5/50 min	
Sample count time	1 min	
MDA	3 dpm/100 cm^2	

Number Location	Gross cpm	dpm/ 100cm^2	Gross cpm	dpm/ 100cm^2
1	1	<3		
2	0	<3		
3	0	<3		
4	1	<3		
5	0	<3		
6	0/1	<3/<3		
7	0	<3		
8	1	<3		
9	0	<3		
10	1	<3		
11	1	<3		
12	1	<3		
13	0	<3		
14	1	<3		
15	0/0	<3/<3		
16	0	<3		
17	2	5±8		
19	0	<3		
20	0	<3		
21	0	<3		

SAFETY AND ECOLOGY CONSULTANTS, INC.

RADIOLOGICAL CONTAMINATION SURVEY

SEC PROJECT NO.: 1005

AREA SURVEYED: John Deer Front End Leader

SURVEYOR: F. DIMATTEO/G. MUSNOFF

SURVEY NO.:

DIRECT ACTIVITY DATE: 9/3/93

Survey Instruments	Alpha	Beta/Gamma
Scaler/Serial No.	ESP-1/03047	ESP-1/03049
Probe/Serial No.	AC-3/407083	HP-210/705796
Calibration Date	5/25/93	6/23/93
Efficiency cpm/dpm	0.177	0.238
Bkgd/Bkgd count time	10/5 min	161 min
Sample count time	1 min	1 min
MDA	25 dpm/100 cm^2	278 dpm/100 cm^2

Number Location	Gross cpm	dpm/ 100cm^2	Gross cpm	dpm/ 100cm^2
Under seat	1	<25	23	<278
Behind seat	1	<25	19	<278

TRANSFERABLE ACTIVITY DATE: 9/3/93

Survey Instrument	Alpha	Beta/Gamma
Scaler/Serial No.	SAC-4/868	
Probe/Serial No.	NA/NA	
Calibration Date	7/30/93	
Efficiency cpm/dpm	.3638	
Bkgd/Bkgd count time	17.5/50 min	
Sample count time	1 min	
MDA	3 dpm/100 cm^2	

Number Location	Gross cpm	dpm/ 100cm^2	Gross cpm	dpm/ 100cm^2

SAFETY AND ECOLOGY CONSULTANTS, INC.

RADIOLOGICAL CONTAMINATION SURVEY

SEC PROJECT NO.: 1005

AREA SURVEYED: John Deer Front End Leader

SURVEYOR: F. DIMATTEO/G. MUSNOFF

SURVEY NO.:

DIRECT ACTIVITY **DATE:**

Survey Instruments	Alpha	Beta/Gamma
Scaler/Serial No.		
Probe/Serial No.		
Calibration Date		
Efficiency cpm/dpm		
Bkgd/Bkgd count time		
Sample count time		
MDA		

Number Location	Gross cpm	dpm/ 100cm²	Gross cpm	dpm/ 100cm²

TRANSFERABLE ACTIVITY **DATE:** 9/3/93

Survey Instrument	Alpha	Beta/Gamma
Scaler/Serial No.	SAC-4/868	
Probe/Serial No.	NA/NA	
Calibration Date	7/30/93	
Efficiency cpm/dpm	.3638	
Bkgd/Bkgd count time	17/50 min	
Sample count time	1 min	
MDA	3 dpm/100 cm²	

Number Location	Gross cpm	dpm/ 100cm²	Gross cpm	dpm/ 100cm²
Front left inside wheel	0	<3		
Inside left rear wheel	0	<3		
Inside right rear wheel	0	<3		
Right front inside wheel	1	<3		
Right hand panel	0	<3		
Bucket control levels	0	<3		
Instrument panel	0	<3		
Foot pedal	3	7±9		
Steering wheel	0	<3		

SAFETY AND ECOLOGY CONSULTANTS, INC.

RADIOLOGICAL CONTAMINATION SURVEY

SEC PROJECT NO.: 1005 | **AREA SURVEYED:** Screener

SURVEYOR: F. DIMATTEO/G. MUSNOFF | **SURVEY NO.:**

DIRECT ACTIVITY DATE: 9/10/93

Survey Instruments	Alpha	Beta/Gamma
Scaler/Serial No.	ESP-1/03047	ESP-1/03049
Probe/Serial No.	AC-3/407083	HP-210/705796
Calibration Date	5/25/93	6/23/93
Efficiency cpm/dpm	0.177	0.238
Bkgd/Bkgd count time	4/5 min	138/5 min
Sample count time	1 min	1 min
MDA	16 dpm/100 cm^2	257 dpm/100 cm^2

Number Location	Gross cpm	dpm/ 100cm^2	Gross cpm	dpm/ 100cm^2
Front of goose neck	12	109±67	41	363±362
Back of goose neck	4	31±39	36	<257
Bottom section near front	5	41±43	35	<257
Fuel Tank	7	60±51	33	<257
Metal lip above fuel tank	10	90±61	29	<257
Back of screener (near front)	29	275±103	37	<257
Back of screener (middle)	13	119±69	40	336±358
Back of screener (near back)	27	255±99	101	1990±548
Rear axle (near back)	8	70±55	29	<257
Rear axle (near front)	7/14	60±51 / 129±72	41/29	363±362 / <257
Metal lip above wheels	18	168±81	49	580±392
Rear bracket in front of wheels	7	60±57	40	336±358
Inside wall (right)	18	168±81	49	580±392
Inside wall (center)	15	138±74	30	<257
Inside wall (left)	16	148±77	50	607±396
Bottom section near front side	2	<16	51	634±399
of goose neck	15	138±74	49	580±392
Top of engine compartment	23	216±92	50	607±396

TRANSFERABLE ACTIVITY DATE: 9/10/93

Survey Instrument	Alpha	Beta/Gamma
Scaler/Serial No.	SAC-4/868	
Probe/Serial No.	NA/NA	
Calibration Date	7/30/93	
Efficiency cpm/dpm	.3638	
Bkgd/Bkgd count time	27/50 min	
Sample count time	1 min	
MDA	3 dpm/100 cm^2	

Number Location	Gross cpm	dpm/ 100cm^2	Gross cpm	dpm/ 100cm^2
1	2	4±7		
2	1	<3		
3	0	<3		
4	3	7±9		
5	0/1	<3/<3		
6	6	15±13		
7	5/3	12±12 / 7±9		
8	4	10±11		
9	1	<3		
11	8	21±15		
12	2	4±7		
13	9	23±16		
14	1	<3		
15	6	15±13		
16	0	<3		
17	2	4±7		
18	6	15±13		

SAFETY AND ECOLOGY CONSULTANTS, INC.

RADIOLOGICAL CONTAMINATION SURVEY

SEC PROJECT NO.:	1005	AREA SURVEYED:	Screener
SURVEYOR:	F. DIMATTEO/G. MUSNOFF	SURVEY NO.:	

DIRECT ACTIVITY	DATE:		TRANSFERABLE ACTIVITY	DATE: 9/10/93	
Survey Instruments	**Alpha**	**Beta/Gamma**	**Survey Instrument**	**Alpha**	**Beta/Gamma**
Scaler/Serial No.			Scaler/Serial No.	SAC-4/868	
Probe/Serial No.			Probe/Serial No.	NA/NA	
Calibration Date			Calibration Date	7/30/93	
Efficiency cpm/dpm			Efficiency cpm/dpm	.3638	
Bkgd/Bkgd count time			Bkgd/Bkgd count time	27/50 min	
Sample count time			Sample count time	1 min	
MDA			MDA	3 dpm/100 cm^2	

Number Location	Gross cpm	dpm/ $100cm^2$	Gross cpm	dpm/ $100cm^2$	Number Location	Gross cpm	dpm/ $100cm^2$	Gross cpm	dpm/ $100cm^2$
					Rear left tire	1	<3		
					Rear right tire	5	12 ± 12		
					Screen bars (left)	0	<3		
					Screen bars (right)	0/1	<3/<3		
					Screen bars (center)	0	<3		

SAFETY AND ECOLOGY CONSULTANTS, INC.

RADIOLOGICAL CONTAMINATION SURVEY

SEC PROJECT NO.: 1005 | **AREA SURVEYED:** Kato Excavator

SURVEYOR: F. DIMATTEO/G. MUSNOFF | **SURVEY NO.:**

DIRECT ACTIVITY DATE: 9/14/93

Survey Instruments	Alpha	Beta/Gamma
Scaler/Serial No.	ESP-1/03047	ESP-1/03049
Probe/Serial No.	AC-3/407083	HP-210/705796
Calibration Date	5/25/93	6/23/93
Efficiency cpm/dpm	0.177	0.238
Bkgd/Bkgd count time	11/5 min	142/5 min
Sample count time	1 min	1 min
MDA	26 dpm/100 cm^2	261 dpm/100 cm^2

Number Location	Gross cpm	dpm/ 100cm^2	Gross cpm	dpm/ 100cm^2
Left side tracks (rear)	4	<26	23	<261
side tracks (middle)	2	<26	25	<261
Left side tracks (front)	8	56±55	27	<261
Left side compartment door near cab	4	<26	16	<261
Top side behind cab	0	<26	24	<261
Top of left rear	5	27±45	24	<261
Back portion side/backwall	8	56±55	29	<261
Top of cab	7	47±52	16	<261
Top side, middle portion behind boom	4	<26	29	<261
Top side, right rear	10/4	76±62 / <26	29/30	<261/<261
Deck near fuel cap	4	<26	28	<261
Right side wall	3	<26	17	<261
Right side tracks (rear)	4	<26	62	911±437
Right side tracks (middle)	8	56±55	56	748±417
Right side tracks (front)	1	<26	53	667±407
seat	2	<26	27	<261
Cab floor	6	37±48	25	<261

TRANSFERABLE ACTIVITY DATE: 9/14/93

Survey Instrument	Alpha	Beta/Gamma
Scaler/Serial No.	SAC-4/868	
Probe/Serial No.	NA/NA	
Calibration Date	7/30/93	
Efficiency cpm/dpm	.3638	
Bkgd/Bkgd count time	15/50 min	
Sample count time	1 min	
MDA	3 dpm/100 cm^2	

Number Location	Gross cpm	dpm/ 100cm^2	Gross cpm	dpm/ 100cm^2
1	1	<3		
2	0	<3		
3	0	<3		
4	0	<3		
5	0	<3		
6	0	<3		
7	1/1	<3/<3		
8	0	<3		
9	0	<3		
10	0	<3		
11	0	<3		
12	0	<3		
14	0	<3		
16	0	<3		
17	1/0	<3/<3		

SAFETY AND ECOLOGY CONSULTANTS, INC.

RADIOLOGICAL CONTAMINATION SURVEY

SEC PROJECT NO.: 1005

AREA SURVEYED: Kato Excavator

SURVEYOR: F. DIMATTEO/G. MUSNOFF

SURVEY NO.:

DIRECT ACTIVITY **DATE:**

Survey Instruments	Alpha	Beta/Gamma
Scaler/Serial No.		
Probe/Serial No.		
Calibration Date		
Efficiency cpm/dpm		
Bkgd/Bkgd count time		
Sample count time		
MDA		

Number Location	Gross cpm	dpm/ 100cm²	Gross cpm	dpm/ 100cm²

TRANSFERABLE ACTIVITY **DATE:** 9/14/93

Survey Instrument	Alpha	Beta/Gamma
Scaler/Serial No.	SAC-4/868	
Probe/Serial No.	NA/NA	
Calibration Date	7/30/93	
Efficiency cpm/dpm	.3638	
Bkgd/Bkgd count time	15/50 min	
Sample count time	1 min	
MDA	3 dpm/100 cm²	

Number Location	Gross cpm	dpm/ 100cm²	Gross cpm	dpm/ 100cm²
Boom control (left)	0	<3		
Foot pedal	0	<3		
Instrument panel	1	<3		
Track control (left)	0	<3		
Track control (right)	0	<3		
Boom control (right)	1/0	<3/<3		
Boom top (right)	0	<3		
Boom bottom (right)	1	<3		
Boom top (left)	3	7±9		
Boom bottom (left)	0	<3		
Underside (right)	0	<3		
Underside (left)	0	<3		
Leftside track roller casting	0/1	<3/<3		

SAFETY AND ECOLOGY CONSULTANTS, INC.

RADIOLOGICAL CONTAMINATION SURVEY

SEC PROJECT NO.: 1005

AREA SURVEYED: SEC Office Cave

SURVEYOR: F. DIMATTEO/G. MUSNOFF

SURVEY NO.:

DIRECT ACTIVITY **DATE:**

Survey Instruments	Alpha	Beta/Gamma
Scaler/Serial No.		
Probe/Serial No.		
Calibration Date		
Efficiency cpm/dpm		
Bkgd/Bkgd count time		
Sample count time		
MDA		

Number Location	Gross cpm	dpm/ 100cm²	Gross cpm	dpm/ 100cm²

TRANSFERABLE ACTIVITY **DATE:** 9/21/93

Survey Instrument	Alpha	Beta/Gamma
Scaler/Serial No.	SAC-4/868	
Probe/Serial No.	NA/NA	
Calibration Date	7/30/93	
Efficiency cpm/dpm	.3638	
Bkgd/Bkgd count time	10/50 min	
Sample count time	1 min	
MDA	2 dpm/100 cm²	

Number Location	Gross cpm	dpm/ 100cm²	Gross cpm	dpm/ 100cm²
Floor at door	0	<2		
Door knob	1	<2		
Light switch	0	<2		
Desk top	0	<2		
File top	1	<2		
Desk chair	0	<2		
Floor at desk	1	<2		
Floor at Control Point	0	<2		
Background Check Point	1	<2		
Table with Control Point	0/0	<2/<2		
Floor at bookcase	1	<2		
Bookcase top	1	<2		
Floor at end table	0	<2		
Chair #1 at end table	0	<2		
End table	0	<2		
Floor at table against wall	0	<2		
Chair at table against wall	0	<2		
Table against wall	1	<2		
Phone	0	<2		
OH Door control	0/0	<2/<2		

SAFETY AND ECOLOGY CONSULTANTS, INC.

RADIOLOGICAL CONTAMINATION SURVEY

SEC PROJECT NO.: 1005

AREA SURVEYED: Komatsu Front End Loader

SURVEYOR: F. DIMATTEO/G. MUSNOFF

SURVEY NO.:

DIRECT ACTIVITY DATE: 9/22/93

Survey Instruments	Alpha	Beta/Gamma
Scaler/Serial No.	ESP-1/03047	ESP-1/03049
Probe/Serial No.	AC-3/407083	HP-210/705796
Calibration Date	5/25/93	6/23/93
Efficiency cpm/dpm	0.177	0.238
Bkgd/Bkgd count time	12/5 min	130/5 min
Sample count time	1 min	1 min
MDA	27 dpm/100 cm^2	250 dpm/100 cm^2

Number Location	Gross cpm	dpm/ 100cm^2	Gross cpm	dpm/ 100cm^2
Inside left of bucket	7	45±52	29	<250
Left wheelwell	7	45±52	31	<250
side safety bracket	11	84±65	27	<250
Back left side	14	113±73	22	<250
Left battery compartment	4	<27	22	<250
Rear bumper	4	<27	25	<250
Right battery compartment	0	<27	30	<250
Back right side	8	55±56	19	<250
Right center (inside)	9	64±59	33	<250
Right wheelwell	4	<27	38	325±349
Top deck near window	3/3	<27/<27	33/20	<250
Top deck near exhaust stack	5	<27	25	<250
Cab seat	4	<27	17	<250
Cab floor	6	35±49	28	<250

TRANSFERABLE ACTIVITY DATE: 9/22/93

Survey Instrument	Alpha	Beta/Gamma
Scaler/Serial No.	SAC-4/868	
Probe/Serial No.	NA/NA	
Calibration Date	7/30/93	
Efficiency cpm/dpm	.3638	
Bkgd/Bkgd count time	10/50 min	
Sample count time	1 min	
MDA	2 dpm/100 cm^2	

Number Location	Gross cpm	dpm/ 100cm^2	Gross cpm	dpm/ 100cm^2
1	0	<2		
2	1	<2		
3	0	<2		
4	1	<2		
5	0	<2		
6	0	<2		
7	0	<2		
8	0	<2		
9	0	<2		
10	0	<2		
11	0	<2		
12	2/2	5±8 / 5±8		
13	0	<2		
14	1	<2		

SAFETY AND ECOLOGY CONSULTANTS, INC.

RADIOLOGICAL CONTAMINATION SURVEY

SEC PROJECT NO.: 1005

AREA SURVEYED: Komatsu Front End Loader

SURVEYOR: F. DIMATTEO/G. MUSNOFF

SURVEY NO.:

DIRECT ACTIVITY **DATE:**

Survey Instruments	Alpha	Beta/Gamma
Scaler/Serial No.		
Probe/Serial No.		
Calibration Date		
Efficiency cpm/dpm		
Bkgd/Bkgd count time		
Sample count time		
MDA		

Number Location	Gross cpm	dpm/ 100cm²	Gross cpm	dpm/ 100cm²

TRANSFERABLE ACTIVITY **DATE:** 9/22/93

Survey Instrument	Alpha	Beta/Gamma
Scaler/Serial No.	SAC-4/868	
Probe/Serial No.	NA/NA	
Calibration Date	7/30/93	
Efficiency cpm/dpm	.3638	
Bkgd/Bkgd count time	10/50 min	
Sample count time	1 min	
MDA	2 dpm/100 cm²	

Number Location	Gross cpm	dpm/ 100cm²	Gross cpm	dpm/ 100cm²
Right platform	0	<2		
Steering wheel	0	<2		
Control panel	2	5±8		
Bucket controls	1	<2		
CB radio	0/3	8±9		
Seat arm	0	<2		
Leftside main housing	0	<2		
Left front tire	2	5±8		
Right rear tire	2	5±8		
Left step ladder	2	5±8		
Left bucket arm	0	<2		
Left rear tire	1	<2		
Right front tire	0	<2		
Left platform	1/0	<2		

SAFETY AND ECOLOGY CONSULTANTS, INC.

RADIOLOGICAL CONTAMINATION SURVEY

SEC PROJECT NO.:	1005	AREA SURVEYED:	Crusher Plant
SURVEYOR:	F. DIMATTEO/G. MUSNOFF	SURVEY NO.:	

DIRECT ACTIVITY DATE:

Survey Instruments	Alpha	Beta/Gamma
Scaler/Serial No.	ESP-1/03047	ESP-1/03049
Probe/Serial No.	AC-3/407083	HP-210/705797
Calibration Date	5/25/93	7/27/93
Efficiency cpm/dpm	0.177	0.240
Bkgd/Bkgd count time	7/5 min	171/5 min
Sample count time	1 min	1 min
MDA	21 dpm/100 cm²	284 dpm/100 cm²

Number Location	Gross cpm	dpm/ 100cm²	Gross cpm	dpm/ 100cm²
Metal housing near front chute	16	142±77	33	<284
Metal housing near top front	12	103±67	25	<284
Left side bottom beam near t	14	123±72	93	1581±526
Left side bottom beam near ladder	9	74±58	68	909±456
Cover over springs near front	4	25±39	46	317±383
Cover over springs near ladder	5	35±44	50	425±397
Left side belt (front)	6	45±48	38	<284
Roof of engine	10	84±61	30	<284
Left side bottom beam near middle	2	<21	39	<284
Left side beam near crusher housing	10/7	84±61 / 55±52	39/21	<284 / <284
Round housing on left side of crusher	12	103±67	17	<284
Platform near wench	8	64±55	26	<284
Top of grizzly conveyor	6	45±48	74	1070±474
Left side bottom beam near grizzly conveyor	21	191±88	93	1581±526
Left side beam back cage	15	132±75	80	1231±491
Rear spring casting (left side)	7	55±52	39	<284
side beam above rear springs	9	74±58	47	344±387
Beam in back of crusher	3	<21	38	<284
Beam above springs in back	26	240±98	24	<284

TRANSFERABLE ACTIVITY DATE: 9/24/93

Survey Instrument	Alpha	Beta/Gamma
Scaler/Serial No.	SAC-4/868	
Probe/Serial No.	NA/NA	
Calibration Date	7/30/93	
Efficiency cpm/dpm	.3638	
Bkgd/Bkgd count time	13/50 min	
Sample count time	1 min	
MDA	3 dpm/100 cm²	

Number Location	Gross cpm	dpm/ 100cm²	Gross cpm	dpm/ 100cm²
1	8	21±15		
2	1	<3		
3	0	<3		
4	0	<3		
5	0	<3		
6	0	<3		
7	2	5±8		
8	0	<3		
9	0	<3		
10	0/0	<3		
11	0	<3		
12	0	<3		
		<3		
14	2	5±8		
16	2	5±8		
17	0	<3		
18	2	5±8		
19	0	<3		

SAFETY AND ECOLOGY CONSULTANTS, INC.

RADIOLOGICAL CONTAMINATION SURVEY

SEC PROJECT NO.: 1005 | **AREA SURVEYED:** Crusher Plant

SURVEYOR: F. DIMATTEO/G. MUSNOFF | **SURVEY NO.:**

DIRECT ACTIVITY **DATE:**

Survey Instruments	Alpha	Beta/Gamma
Scaler/Serial No.	ESP-1/03047	ESP-1/03049
Probe/Serial No.	AC-3/407083	HP-210/705797
Calibration Date	5/25/93	7/27/93
Efficiency cpm/dpm	0.177	0.240
Bkgd/Bkgd count time	7/5 min	171/5 min
Sample count time	1 min	1 min
MDA	21 dpm/100 cm^2	284 dpm/100 cm^2

Number Location	Gross cpm	dpm/ 100cm^2	Gross cpm	dpm/ 100cm^2
Rear hopper panel	10	84±61	35	<284
Right side beam near back	7/7	55±52 / 55±52	69/69	935±459 / 935±459
t side beams near tires	11	94±64	48	371±390
Box top near control panel	9	70±58	48	371±390
Control panel	10	80±61	20	<284
Beam between control panel and belt	11	90±64	62	747±437
Right side belt	15	129±75	24	<284
Right side beam below walkway	3	<24	31	<284
Right side beam above walkway	6	41±48	31	<284
Front right spring casting	7	51±52	34	<284
Control box in booth	5/4	31±44 / <24	27/36	<284 / <284

TRANSFERABLE ACTIVITY **DATE:** 9/24/93

Survey Instrument	Alpha	Beta/Gamma
Scaler/Serial No.	SAC-4/868	
Probe/Serial No.	NA/NA	
Calibration Date	7/30/93	
Efficiency cpm/dpm	.3638	
Bkgd/Bkgd count time	13/50 min	
Sample count time	1 min	
MDA	3 dpm/100 cm^2	

Number Location	Gross cpm	dpm/ 100cm^2	Gross cpm	dpm/ 100cm^2
21	1	<3		
22	3/1	8±9		
24	3	8±9		
25	1	<3		
26	1	<3		
27	0	<3		
28	3	8±9		
29	1	<3		
30	0/0	<3/<3		
31	0	<3		

SAFETY AND ECOLOGY CONSULTANTS, INC.

RADIOLOGICAL CONTAMINATION SURVEY

SEC PROJECT NO.: 1005

AREA SURVEYED: Crusher Plant

SURVEYOR: F. DIMATTEO/G. MUSNOFF

SURVEY NO.:

DIRECT ACTIVITY **DATE:**

Survey Instruments	Alpha	Beta/Gamma
Scaler/Serial No.		
Probe/Serial No.		
Calibration Date		
Efficiency cpm/dpm		
Bkgd/Bkgd count time		
Sample count time		
MDA		

Number Location	Gross cpm	dpm/ 100cm²	Gross cpm	dpm/ 100cm²

TRANSFERABLE ACTIVITY **DATE:** 9/24/93

Survey Instrument	Alpha	Beta/Gamma
Scaler/Serial No.	SAC-4/868	
Probe/Serial No.	NA/NA	
Calibration Date	7/30/93	
Efficiency cpm/dpm	.3638	
Bkgd/Bkgd count time	13/5 min	
Sample count time	1 min	
MDA	3 dpm/100 cm²	

Number Location	Gross cpm	dpm/ 100cm²	Gross cpm	dpm/ 100cm²
2nd to last belt roller	0	<3		
Hopper flap	1	<3		
Rear belt cover	0	<3		
Wench	2	5±8		
Springs near rear	1	<3		
I-beam near back	0/0	<3/<3		
Motor	0	<3		
Controls	0	<3		
5th roller from front	0	<3		
Belt cover	1	<3		
Left side ladder	0	<3		
1st left tire	2	5±8		
2nd left tire	1/0	<3/<3		
3rd left tire	0	<3		
1st right tire	0	<3		
2nd right tire	1	<3		
3rd right tire	0	<3		
Left side of hopper	0	<3		
Metal brace near top front	1	<3		
Belt roller near front	0	<3		
Belt cover	0	<3		

SAFETY AND ECOLOGY CONSULTANTS, INC.

RADIOLOGICAL CONTAMINATION SURVEY

SEC PROJECT NO.: 1005	AREA SURVEYED: Crusher Plant
SURVEYOR: F. DIMATTEO/G. MUSNOFF	SURVEY NO.:

DIRECT ACTIVITY DATE:

Survey Instruments	Alpha	Beta/Gamma
Scaler/Serial No.		
Probe/Serial No.		
Calibration Date		
Efficiency cpm/dpm		
Bkgd/Bkgd count time		
Sample count time		
MDA		

Number Location	Gross cpm	dpm/ 100cm²	Gross cpm	dpm/ 100cm²

TRANSFERABLE ACTIVITY DATE: 9/24/93

Survey Instrument	Alpha	Beta/Gamma
Scaler/Serial No.	SAC-4/868	
Probe/Serial No.	NA/NA	
Calibration Date	7/30/93	
Efficiency cpm/dpm	.3638	
Bkgd/Bkgd count time	13/5 min	
Sample count time	1 min	
MDA	3 dpm/100 cm²	

Number Location	Gross cpm	dpm/ 100cm²	Gross cpm	dpm/ 100cm²
2nd belt roller from front	0/0	<3/<3		

SAFETY AND ECOLOGY CONSULTANTS, INC.

RADIOLOGICAL CONTAMINATION SURVEY

SEC PROJECT NO.: 1005

AREA SURVEYED: Case Front End Loader

SURVEYOR: F. DIMATTEO/G. MUSNOFF

SURVEY NO.:

DIRECT ACTIVITY DATE: 9/24/93

Survey Instruments	Alpha	Beta/Gamma
Scaler/Serial No.	ESP-1/03047	ESP-1/03049
Probe/Serial No.	AC-3/407083	HP-210/705797
Calibration Date	5/25/93	7/27/93
Efficiency cpm/dpm	0.177	0.240
Bkgd/Bkgd count time	7/5 min	171/5 min
Sample count time	1 min	1 min
MDA	24 dpm/100 cm^2	284 dpm/100 cm^2

Number Location	Gross cpm	dpm/ 100cm^2	Gross cpm	dpm/ 100cm^2
Inside bucket	2	<21	27	<284
,of bucket (right side)	9	74±58	31	<284
Bucket arm (right side)	9	74±58	26	<284
Metal inner bucket near right front wheel	12	103±67	20	<284
Front main housing (right side)	4	25±39	24	<284
Right side cab exterior	6	45±48	16	<284
Rear main housing (right side)	3	<21	18	<284
Right side engine compartment	5	35±44	30	<284
Right rear side panel	11	94±64	23	<284
Panel below rear radiator	11/6	94±64 / 45±48	24/19	<284/284
Left rear side panel	6	45±48	12	<284
Left side engine compartment	5	35±44	28	<284
Left side safety bracket	0	<21	24	<284
Front main housing (left side)	3	<21	25	<284
'tal inner bracket near left ,it wheel	3	<21	39	<284
Top of bucket (left side)	7	55±52	31	<284
Cab floor	6	45±48	33	<284
Cab seat	5	35±44	26	<284

TRANSFERABLE ACTIVITY DATE: 9/24/93

Survey Instrument	Alpha	Beta/Gamma
Scaler/Serial No.	SAC-4/868	
Probe/Serial No.	NA/NA	
Calibration Date	7/30/93	
Efficiency cpm/dpm	0.3638	
Bkgd/Bkgd count time	10/50 min	
Sample count time	1 min	
MDA	2 dpm/100 cm^2	

Number Location	Gross cpm	dpm/ 100cm^2	Gross cpm	dpm/ 100cm^2
1	1	<2		
2	0	<2		
3	0	<2		
4	1	<2		
5	2	5±8		
6	0	<2		
7	0	<2		
8	0	<2		
9	0	<2		
10	0/0	<2/<2		
11	0	<2		
12	0	<2		
13	1	<2		
14	0	<2		
15	4	10±11		
16	0	<2		
17	0	<2		
18	1	<2		

SAFETY AND ECOLOGY CONSULTANTS, INC.

RADIOLOGICAL CONTAMINATION SURVEY

SEC PROJECT NO.:	**1005**	**AREA SURVEYED:**	**Case Front End Loader**
SURVEYOR:	**F. DIMATTEO/G. MUSNOFF**	**SURVEY NO.:**	

DIRECT ACTIVITY **DATE: 9/24/93**

Survey Instruments	Alpha	Beta/Gamma
Scaler/Serial No.	ESP-1/03047	ESP-1/03049
Probe/Serial No.	AC-3/407083	HP-210/705797
Calibration Date	5/25/93	7/27/93
Efficiency cpm/dpm	0.177	0.240
Bkgd/Bkgd count time	7/5 min	171/5 min
Sample count time	1 min	1 min
MDA	24 dpm/100 cm^2	284 dpm/100 cm^2

Number Location	Gross cpm	dpm/ 100cm^2	Gross cpm	dpm/ 100cm^2
Rear ledge in cab	2	<21	24	<284
[illegible] gauge panel	1/3	<21/<21	23/18	<284/<284

TRANSFERABLE ACTIVITY **DATE: 9/24/93**

Survey Instrument	Alpha	Beta/Gamma
Scaler/Serial No.	SAC-4/868	
Probe/Serial No.	NA/NA	
Calibration Date	7/30/93	
Efficiency cpm/dpm	0.3638	
Bkgd/Bkgd count time	10/50 min	
Sample count time	1 min	
MDA	2 dpm/100 cm^2	

Number Location	Gross cpm	dpm/ 100cm^2	Gross cpm	dpm/ 100cm^2
19	0	<2		
20	1/0	<2/<2		

SAFETY AND ECOLOGY CONSULTANTS, INC.

RADIOLOGICAL CONTAMINATION SURVEY

SEC PROJECT NO.: 1005

AREA SURVEYED: Case Front End Loader

SURVEYOR: F. DIMATTEO/G. MUSNOFF

SURVEY NO.:

DIRECT ACTIVITY **DATE:**

Survey Instruments	Alpha	Beta/Gamma
Scaler/Serial No.		
Probe/Serial No.		
Calibration Date		
Efficiency cpm/dpm		
Bkgd/Bkgd count time		
Sample count time		
MDA		

Number Location	Gross cpm	dpm/ 100cm²	Gross cpm	dpm/ 100cm²

TRANSFERABLE ACTIVITY **DATE:** 9/24/93

Survey Instrument	Alpha	Beta/Gamma
Scaler/Serial No.	SAC-4/868	
Probe/Serial No.	NA/NA	
Calibration Date	7/30/93	
Efficiency cpm/dpm	.3638	
Bkgd/Bkgd count time	10/50 min	
Sample count time	1 min	
MDA	2 dpm/100 cm²	

Number Location	Gross cpm	dpm/ 100cm²	Gross cpm	dpm/ 100cm²
Right side of cab platform	1	<2		
Rear under body	0	<2		
Left front rim	0	<2		
Left front tire	2	5±8		
Left rear rim	0	<2		
Left rear tire	1	<2		
Right front rim	0	<2		
Right front tire	1/2	<2/5±8		
Right rear rim	0	<2		
Right rear tire	1	<2		
Left side of cab platform	1	<2		
Cab step ladder	0	<2		
Steering wheel	0	<2		
Cab Controls	0	<2		
Cab operators manual box	0	<2		
Foot pedal	2	5±8		
Cab emergency brake	1/0	<2		

SAFETY AND ECOLOGY CONSULTANTS, INC.

RADIOLOGICAL CONTAMINATION SURVEY

SEC PROJECT NO.: 1005

AREA SURVEYED: Conveyor Belt Stacker

SURVEYOR: F. DIMATTEO/G. MUSNOFF

SURVEY NO.:

DIRECT ACTIVITY DATE: 9/24/93

Survey Instruments	Alpha	Beta/Gamma
Scaler/Serial No.	ESP-1/03047	ESP-1/03049
Probe/Serial No.	AC-3/407083	HP-210/705797
Calibration Date	5/25/93	7/27/93
Efficiency cpm/dpm	0.177	0.240
Bkgd/Bkgd count time	7/5 min	171/5 min
Sample count time	1 min	1 min
MDA	21 dpm/100 cm^2	284 dpm/100 cm^2

Number Location	Gross cpm	dpm/ 100cm^2	Gross cpm	dpm/ 100cm^2
Front end and top of metal chute	9	74 ± 58	38	<284
Conveyor belt (front)	7	55 ± 52	35	<284
'eyor belt (middle)	7	55 ± 52	31	<284
Conveyor belt (middle)	9	74 ± 58	25	<284
Conveyor belt (rear)	8	64 ± 55	26	<284
Metal piece under front end (left side)	7	55 ± 52	26	<284
Control panel	11	94 ± 64	23	<284
Wheel direction control	8	64 ± 55	32	<284
Right side of axle	5	35 ± 44	59	667 ± 428
Metal piece under front end (right side)	9/6	74 ± 58 / 45 ± 48	32/30	<284

TRANSFERABLE ACTIVITY DATE: 9/24/93

Survey Instrument	Alpha	Beta/Gamma
Scaler/Serial No.	SAC-4/868	
Probe/Serial No.	NA/NA	
Calibration Date	7/30/93	
Efficiency cpm/dpm	.3638	
Bkgd/Bkgd count time	10/50 min	
Sample count time	1 min	
MDA	2 dpm/100 cm^2	

Number Location	Gross cpm	dpm/ 100cm^2	Gross cpm	dpm/ 100cm^2
1	1	<2		
2	0	<2		
3	1	<2		
4	0	<2		
5	0	<2		
6	1	<2		
7	0	<2		
8	0	<2		
9	0	<2		
10	1/7	<2 / 19 ± 14		

SAFETY AND ECOLOGY CONSULTANTS, INC.

RADIOLOGICAL CONTAMINATION SURVEY

SEC PROJECT NO.: 1005

AREA SURVEYED: Conveyor Belt Stacker

SURVEYOR: F. DIMATTEO/G. MUSNOFF

SURVEY NO.:

DIRECT ACTIVITY **DATE:**

Survey Instruments	Alpha	Beta/Gamma
Scaler/Serial No.		
Probe/Serial No.		
Calibration Date		
Efficiency cpm/dpm		
Bkgd/Bkgd count time		
Sample count time		
MDA		

Number Location	Gross cpm	dpm/ 100cm^2	Gross cpm	dpm/ 100cm^2

TRANSFERABLE ACTIVITY **DATE:** 9/24/93

Survey Instrument	Alpha	Beta/Gamma
Scaler/Serial No.	SAC-4/868	
Probe/Serial No.	NA/NA	
Calibration Date	7/30/93	
Efficiency cpm/dpm	.3638	
Bkgd/Bkgd count time	10/50 min	
Sample count time	1 min	
MDA	2 dpm/100 cm^2	

Number Location	Gross cpm	dpm/ 100cm^2	Gross cpm	dpm/ 100cm^2
Left rim	0	<2		
Left tire	0	<2		
Right rim	0	<2		
Right tire	1	<2		
Right front beam	2	5±8		
Right rear beam	0	<2		
Left rear beam	7	19±14		
Rail under control panel	1/2	<2/5±8		

SAFETY AND ECOLOGY CONSULTANTS, INC.

RADIOLOGICAL CONTAMINATION SURVEY

SEC PROJECT NO.:	1005	AREA SURVEYED:	Water Truck
SURVEYOR:	F. DIMATTEO/G. MUSNOFF	SURVEY NO.:	

DIRECT ACTIVITY	DATE: 9/24/93		TRANSFERABLE ACTIVITY	DATE:	
Survey Instruments	Alpha	Beta/Gamma	Survey Instrument	Alpha	Beta/Gamma
Scaler/Serial No.	ESP-1/03047	ESP-1/03049	Scaler/Serial No.		
Probe/Serial No.	AC-3/407083	HP-210/705797	Probe/Serial No.		
Calibration Date	5/25/93	7/27/93	Calibration Date		
Efficiency cpm/dpm	0.177	0.240	Efficiency cpm/dpm		
Bkgd/Bkgd count time	9/5 min	171/5 min	Bkgd/Bkgd count time		
Sample count time	1 min	1 min	Sample count time		
MDA	24 dpm/100 cm^2	284 dpm/100 cm^2	MDA		

Number Location	Gross cpm	dpm/ 100cm^2	Gross cpm	dpm/ 100cm^2	Number Location	Gross cpm	dpm/ 100cm^2	Gross cpm	dpm/ 100cm^2
Hood	2	<24	20	<284					
Driver's side step	6	41±48	35	<284					
Left rear fender	2	<24	21	<284					
Right rear bumper	3	<24	26	<284					
Left rear bumper	7	51±22	32	<284					
Right rear fender	8	60±55	35	<284					
Passenger side step	8	60±55	29	<284					
Cab seat	5	31±44	35	<284					
Cab stop	7	51±52	24	<284					
Tank top	5/3	31±44	25/28	<284/<284					

SAFETY AND ECOLOGY CONSULTANTS, INC.

RADIOLOGICAL CONTAMINATION SURVEY

SEC PROJECT NO.: 1005

AREA SURVEYED: John Deere Excavator

SURVEYOR: F. DIMATTEO/G. MUSNOFF

SURVEY NO.:

DIRECT ACTIVITY DATE: 9/27/93

Survey Instruments	Alpha	Beta/Gamma
Scaler/Serial No.	ESP-1/03047	ESP-1/03049
Probe/Serial No.	AC-3407083	HP-210/705797
Calibration Date	5/25/93	7/27/93
Efficiency cpm/dpm	0.177	0.240
Bkgd/Bkgd count time	10/5 min	158/5 min
Sample count time	1 min	1 min
MDA	25 dpm/100 cm²	273 dpm/100 cm²

Number Location	Gross cpm	dpm/ 100cm²	Gross cpm	dpm/ 100cm²
Engine Compartment top	8	58±55	21	<273
Engine Compartment top near stack	6	39±48	23	<273
Walking deck near back on left	3	<25	35	<273
Walking deck near fron on left	2	<25	18	<273
Left side panel	5	29±44	22	<273
Left side track	7	49±52	33	<273
Back panel - left portion	8	58±55	18	<273
Back panel - middle portion	6	39±48	22	<273
Back panel - right portion	11	88±64	20	<273
Right side track	39/38	360±120 351±118	67/63	952±451 844±439
Right side panel below cab platform	3	<25	23	<273
Boom bottom section	2	<25	30	<273
Boom top section	5	29±44	24	<273
Bucket	3	<25	27	<273
Cab floor	4	<25	44	333±374
Cab seat	0	<25	15	<273

TRANSFERABLE ACTIVITY DATE: 9/27/93

Survey Instrument	Alpha	Beta/Gamma
Scaler/Serial No.	SAC-4/868	
Probe/Serial No.	NA/NA	
Calibration Date	7/30/93	
Efficiency cpm/dpm	.3638	
Bkgd/Bkgd count time	13/50 min	
Sample count time	1 min	
MDA	3 dpm/100 cm²	

Number Location	Gross cpm	dpm/ 100cm²	Gross cpm	dpm/ 100cm²
1	0	<3		
2	2	5±8		
3	0	<3		
4	1	<3		
5	0	<3		
6	5	13±12		
7	0	<3		
8	3	8±9		
9	4	10±11		
10	17/18	46±22 49±23		
11	0	<3		
12	2	5±8		
13	2	5±8		
14	15	41±21		
15	4	10±11		
16	1/0	<3/<3		
Boom Control	0	<3		
Foot pedal	0	<3		

SAFETY AND ECOLOGY CONSULTANTS, INC.

RADIOLOGICAL CONTAMINATION SURVEY

SEC PROJECT NO.: 1005

AREA SURVEYED: Bobcat (Skid Steer)

SURVEYOR: F. DIMATTEO/G. MUSNOFF

SURVEY NO.:

DIRECT ACTIVITY DATE: 9/27/93

Survey Instruments	Alpha	Beta/Gamma
Scaler/Serial No.	ESP-1/03047	ESP-1/03049
Probe/Serial No.	AC-3407083	HP-210/705797
Calibration Date	5/25/93	7/27/93
Efficiency cpm/dpm	0.177	0.240
Bkgd/Bkgd count time	10/5 min	158/5 min
Sample count time	1 min	1 min
MDA	25 dpm/100 cm^2	273 dpm/100 cm^2

Number Location	Gross cpm	dpm/ 100cm^2	Gross cpm	dpm/ 100cm^2
Front right	4	<25	34	<273
Rear right	4	<25	19	<273
›e of engine	10	78±62	35	<273
Left rear	8	58±55	14	<273
Left side ledge	4	<25	21	<273
Bucket	1	<25	36	<273
Cab seat	4	<25	24	<273

TRANSFERABLE ACTIVITY DATE: 9/27/93

Survey Instrument	Alpha	Beta/Gamma
Scaler/Serial No.	SAC-4/868	
Probe/Serial No.	NA/NA	
Calibration Date	7/30/93	
Efficiency cpm/dpm	.3638	
Bkgd/Bkgd count time	15/50 min	
Sample count time	1 min	
MDA	3 dpm/100 cm^2	

Number Location	Gross cpm	dpm/ 100cm^2	Gross cpm	dpm/ 100cm^2
1	0	<3		
2	1	<3		
3	0	<3		
4	0	<3		
6	0	<3		
7	0	<3		
Foot Pedal	2	5±8		
Control for unit	0	<3		
Cab control panel	2	5±8		
Left front tire	0	<3		
Left rear tire	1	<3		
Right front tire	0	<3		
Right rear tire	0	<3		

SAFETY AND ECOLOGY CONSULTANTS, INC.

RADIOLOGICAL CONTAMINATION SURVEY

SEC PROJECT NO.: 1005

AREA SURVEYED: Mechanic's Can (Trailer)

SURVEYOR: F. DIMATTEO/G. MUSNOFF

SURVEY NO.:

DIRECT ACTIVITY DATE: 9/27/93

Survey Instruments	Alpha	Beta/Gamma
Scaler/Serial No.	ESP-1/03047	ESP-1/03049
Probe/Serial No.	AC-3/407083	HP-210/705797
Calibration Date	5/25/93	7/27/93
Efficiency cpm/dpm	0.177	0.240
Bkgd/Bkgd count time	7/5 min	171/5 min
Sample count time	1 min	1 min
MDA	25 dpm/100 cm^2	273 dpm/100 cm^2

Number Location	Gross cpm	dpm/ 100cm^2	Gross cpm	dpm/ 100cm^2
Front panel	8	64±55	19	<273
Connecting beam in front	4	<25	39	<273
: panel (front)	2	<25	16	<273
Left panel (back)	7	55±52	16	<273
Rear bumper	7	55±52	30	<273
Right rear door	13	113±70	20	<273
Right panel (back)	1	<25	16	<273
Right panel (front)	6	45±48	27	<273

TRANSFERABLE ACTIVITY DATE: 9/27/93

Survey Instrument	Alpha	Beta/Gamma
Scaler/Serial No.	SAC-4/868	
Probe/Serial No.	NA/NA	
Calibration Date	7/30/93	
Efficiency cpm/dpm	.3638	
Bkgd/Bkgd count time	10/50 min	
Sample count time	1 min	
MDA	3 dpm/100 cm^2	

Number Location	Gross cpm	dpm/ 100cm^2	Gross cpm	dpm/ 100cm^2
1	0	<3		
2	0	<3		
3	0	<3		
4	0	<3		
6	2	5±8		
7	0	<3		
8	1	<3		
Left front tire	0	<3		
Left rear tire	2	5±8		
Right front tire	0	<3		
Right rear tire	0	<3		

APPENDIX 2

AREA AIR RADIOLOGICAL MONITORING

SAFETY AND ECOLOG. CONSULTANTS, INC.
AIR PARTICULATE SAMPLE REPORTING LOG

Site: SMC-V40

Sample Count Time = 50 min. Background Count Time = 50 min.
Detector Used: Eberline SAC-4/Eberline RAS-1 #3 S/N: 0868/0888

SAMPLE DESCRIPTION							COUNTING DATA			RESULTS		
Sample Location/Person	Date	Start	Stop	Sample Time (min)	Flow Rate (lpm)	Sample Volume (l)	Bkg. cpm	Sample cpm	Detector Eff.	Activity (uCi/ml)	Std Dev. (uCi/ml)	MDA (uCi/ml)
V-40 Site Trailer TOP/F.D. (AS01)	8/30/93	0930	1610	400	39.8	15,920	.44	2.5	.3638	1.6 E-13	3.04 E-14	1.70 E-14 L_c
V-40 Site Trailer TOP/F.D. (AS02)	8/30/93	1610	1710	60	39.8	2,388	.44	1.06	.3638	<5.29 E-13	1.07 E-13	5.29 E-13 R_{max}

Remarks:

Recorded By: F.D.
Date: 8/30/93
Checked By: HC Luckhurst
Date: 11/30/93

Form 7A

SAFETY AND ECOLOG. CONSULTANTS, INC.
AIR PARTICULATE SAMPLE REPORTING LOG

Site: SMC-V40

Sample Count Time = 50 min. Background Count Time = 50 min.
Detector Used: Eberline SAC-4/Eberline RAS-1 #1 S/N: 0868/0888

SAMPLE DESCRIPTION							COUNTING DATA			RESULTS		
Sample Location/Person	Date	Start	Stop	Sample Time (min)	Flow Rate (lpm)	Sample Volume (l)	Bkg. cpm	Sample cpm	Detector Eff.	Activity (uCi/ml)	Std Dev. (uCi/ml)	MDA (uCi/ml)
V-40 Site Trailer TOP/F.D. (AS03)	8/31/93	0735	1145	250	38.2	9,550	.44	3.56	.3638	4.05 E-13	6.29 E-14	2.84 E-14 L_c
V-40 Site Trailer TOP/F.D. (AS04)	8/31/93	1145	1730	345	38.2	13,179	.44	2.62	.3638	2.06 E-13	3.81 E-14	2.06 E-14 L_c
V-40 Site Trailer TOP/F.D. (AS05)	9/1/93	0730	1205	275	38.2	10,505	.48	3.02	.3638	3.0 E-13	5.17 E-14	2.70 E-14 L_c
V-40 Site Trailer TOP/F.D. (AS06)	9/1/93	1205	1610	245	38.2	9,359	.48	0.96	.3638	<1.01 E-13	2.49 E-14	1.01 E-13 R_{max}
V-40 Site Trailer TOP/F.D. (AS07)	9/2/93	0705	1202	297	40.4	11,999	.6	6.76	.3638	6.36 E-13	7.29 E-14	2.64 E-14 L_c
V-40 Site Trailer TOP/F.D. (AS08)	9/2/93	1202	1610	248	38.2	9,474	.6	4.76	.3638	5.44 E-13	7.48 E-14	3.34 E-14 L_c
V-40 Site Trailer TOP/F.D. (AS09)	9/3/93	0713	1208	295	38.2	11,269	.22	1.88	.3638	<2.20 E-13	7.67 E-15	2.20 E-13 R_{max}
V-40 Site Trailer TOP/F.D. (AS10)	9/3/93	1208	1615	247	38.2	9,435	.22	1.48	.3638	1.22 E-13	4.12 E-14	2.03 E-14 L_c
V-40 Site Trailer TOP/G.M. (AS11)	9/7/93	0723	1207	284	34.9	9,912	.34	1.46	.3638	1.40 E-13	3.66 E-14	2.40 E-14 L_c
V-40 Site Trailer TOP/G.M. (AS12)	9/7/93	1300	1500	120	38.2	4,584	.34	1.62	.3638	3.46 E-13	8.48 E-14	5.20 E-14 L_c
V-40 Site Trailer TOP/F.D. (AS13)	9/8/93	0711	1410	419	36.55	15,314	.32	4.06	.3638	3.02 E-13	4.32 E-14	1.51 E-14 L_c
V-40 Site Trailer TOP/FD./GM. (AS14)	9/9/93	0715	1553	518	34.9	18,078	.3	1.08	.3638	5.34 E-14	1.68 E-14	1.24 E-14 L_c
V-40 Site Trailer TOP/F.D. (AS15) (QC)	9/10/93	0710	1320	370	36.55	13,524	.2	.76/.84	.3638	4.95 E-14 / 5.87 E-14	1.89 E-14 / 2.05 E-14	1.35 E-14 L_c / 1.35 E-14 L_c

Remarks: AS15 is a Quality Control

Recorded By: F.D.
Date: 8/31/93
Checked By: HC Lucthwas
Date: 11/30/93

Form 7A

SAFETY AND ECOLOGY CONSULTANTS, INC.
AIR PARTICULATE SAMPLE REPORTING LOG

Site: SMC-V40

Sample Count Time = 50 min. Background Count Time = 50 min.
Detector Used: Eberline SAC-4/Eberline RAS-1 #4 S/N: 0868/0888

SAMPLE DESCRIPTION							COUNTING DATA			RESULTS		
Sample Location/Person	Date	Start	Stop	Sample Time (min)	Flow Rate (lpm)	Sample Volume (l)	Bkg. cpm	Sample cpm	Detector Eff.	Activity (uCi/ml)	Std Dev. (uCi/ml)	MDA (uCi/ml)
V-40 Site Trailer TOP/F.D. (AS16) (QC)	9/10/93	1320	1530	130	34.9	4,537	.2	.52/.34	.3638	8.74 E-14 / <8.51 E-14	4.15 E-14 / 2.93 E-14	4.03 E-14 L_c / 8.51 E-14 R_{max}
V-40 Site Trailer TOP/F.D./GM (AS17) (QC)	9/13/93	0725	1611	526	36.55	19,225	.24	2/1.88	.3638	1.14 E-13 / 1.06 E-13	2.37 E-14 / 2.28 E-14	1.04 E-14 L_c / 1.04 E-14 L_c
V-40 Site Trailer TOP/F.D. (AS18)	9/14/93	0715	1625	550	38.2	21,010	.22	1.08	.3638	5.06 E-14	1.51 E-14	9.10 E-15 L_c
V-40 Site Trailer TOP/F.D. (AS19)	9/15/93	0713	1300	347	38.2	13,255	.2	0.96	.3638	7.10 E-14	2.26 E-14	1.38 E-14 L_c
V-40 Water Tanker TOP/F.D. (AS20)	9/15/93	1300	1545	165	38.2	6,303	.2	1.12	.3638	1.81 E-13	5.22 E-14	2.90 E-14 L_c
V-40 Water Tanker TOP/F.D./GM (AS21)	9/16/93	0710	1659	589	38.2	22,499	.2	3.88	.3638	2.02 E-13	2.92 E-14	8.10 E-15 L_c
V-40 Water Tanker TOP/F.D. (AS22)	9/17/93	0712	1250	338	36.55	12,354	.38	4.12	.3638	3.75 E-13	5.36 E-14	5.36 E-14 L_c
V-40 Water Tanker TOP/F.D. (AS23)	9/17/93	1250	1430	100	38.2	3,820	.38	2.08	.3638	5.50 E-13	1.17 E-13	6.59 E-14 L_c

Remarks: AS16 and AS17 are Quality Controls

Recorded By: F.D.
Date: 9/10/93
Checked By: H Christwas
Date: 11/30/93

Form 7A

SAFETY AND ECOLOGY CONSULTANTS, INC.
AIR PARTICULATE SAMPLE REPORTING LOG

Site: SMC-V40

Sample Count Time = 50 min.
Detector Used: Eberline SAC-4/Eberline RAS-1 #2

Background Count Time = 50 min.
S/N: 0868/0888

SAMPLE DESCRIPTION							COUNTING DATA			RESULTS		
Sample Location/Person	Date	Start	Stop	Sample Time (min)	Flow Rate (lpm)	Sample Volume (l)	Bkg. cpm	Sample cpm	Detector Eff.	Activity (uCi/ml)	Std Dev. (uCi/ml)	MDA (uCi/ml)
V-40 Site Water Tanker TOP/F.D. (AS24)	9/20/93	0715	1624	549	39.5	21,686	.26	2.44	.3638	1.25 E-13	2.35 E-14	9.61 E-15 L_c
V-40 Site Water Tanker TOP/F.D. (AS25) (QC)	9/21/93	0710	1638	568	39.5	22,436	.2	2.12/1.84	.3638	1.03 E-13 8.73 E-14	2.11 E-14 1.97 E-14	8.15 E-15 L_c
V-40 Site Water Tanker TOP/F.D. (AS26) (QC)	9/22/93	0706	1552	526	39.5	20,777	.26	.76/.66	.3638	2.98 E-14 2.38 E-14	1.15 E-14 1.03 E-14	1.00 E-14 L_c

Remarks: AS25 and AS26 is a quality control.

Recorded By: F.D.
Date: 7/20/93
Checked By: HC Leichtweis
Date: 11-30-93

Form 7A

APPENDIX 3

SAFETY AND ECOLOGY CONSULTANTS, INC.

WEEKLY FIELD SOURCE CHECK LOG

SITE NAME: SMC

BACKGROUND LOCATION AT: SEC office/cave

WEEK ENDING: 8-21-93 (8-15-93 to 8-21-93)

SCALER/RATE METER: Eberline ESP-1 SERIAL NO. 03049 CALIBRATION DATE 7-27-93 DUE 1-27-93

DETECTOR: Eberline HP260 SERIAL NO. _____ CALIBRATION DATE 5-23-93 DUE 11-23-93

DATE / TIME	SOURCE	SERIAL NO.	ACTIVITY	SOURCE -A- CHECK, cpm	BACKGROUND -B- CHECK, cpm	INSTRUMENT -C- CONV. - E#	SOURCE BY INSTRUMENT	H.V. AT	BAT	SPKR	DISP	OK / BY
8-17-93 / 0645	Sr Y90	91SR470 0213	59,350dpm	11080	35.8	.214	51,608 / .186	901	OK	OK		✓ / F.D.
8-18-93 / 0634	Sr Y90	91SR470 0213	59,350dpm	11720	34.4	.214	54,606 / .197	901	OK	OK		✓ / F.D.
8-19-93 / 0631	Sr Y90	91SR470 0213	59,350dpm	14200	34.4	.214	66,194 / .239	901	OK	OK		✓ / F.D.
8-20-93 / 0637	Sr Y90	91SR470 0213	59,350dpm	11220	35.4	.214	52,264 / .188	901	OK	OK		✓ / F.D.

CALCULATION OF SOURCE BY INSTRUMENT:

(-A-) SOURCE CHECK cpm - BACKGROUND cpm (-B) = dpm OR uR/hr (-D-)
(-C-) INSTRUMENT CONVERSION, OR E#

NOTE: CONVERT EFFICIENCY FROM PERCENT TO DECIMAL EXAMPLE 18% TO 0.18 (EFFICIENCY CALIBRATED PROBES ONLY)

REMARKS: _____

Form 4A

SAFETY AND ECOLOGY CONSULTANTS, INC.

WEEKLY FIELD SOURCE CHECK LOG

SITE NAME: SMC

BACKGROUND LOCATION AT: SEC office/cave

WEEK ENDING: 8-28-93 (8-22-93 to 8-28-93)

SCALER/RATE METER: Eberline ESP-1 SERIAL NO.: 03049 CALIBRATION DATE: 7-27-93 DUE: 1-27-93

DETECTOR: Eberline HP260 SERIAL NO.: CALIBRATION DATE: 5-23-93 DUE: 11-23-93

DATE / TIME	SOURCE	SERIAL NO.	ACTIVITY	SOURCE -A- CHECK, cpm	BACKGROUND -B- CHECK, cpm	INSTRUMENT -C- CONV. - E#	SOURCE BY INSTRUMENT	H.V. AT	BAT	SPKR	DISP	OK / BY
8-23-93 0635	Sr Y90	91SR470 0213	59,350dpm	11660	40	.214	54,299 / .198	901	OK	OK		✓ F.D.
8-24-93 0637	Sr Y90	91SR470 0213	59,350dpm	9740	35.6	.214	45,348 / .164	901	OK	OK		✓ F.D.
8-25-93 0640	Sr Y90	91SR470 0213	59,350dpm	11300	34.4	.214	52,643 / .190	901	OK	OK		✓ F.D.
8-26-93 0643	Sr Y90	91SR470 0213	59,350dpm	10520	32.4	.214	49,007 / .177	901	OK	OK		✓ F.D.
8-27-93 0633	Sr Y90	91SR470 0213	59,350dpm	12520	31.2	.214	58,359 / .210	901	OK	OK		✓ F.D.

CALCULATION OF SOURCE BY INSTRUMENT:

(-A-) SOURCE CHECK cpm - BACKGROUND cpm (-B) = dpm OR uR/hr (-D-)
(-C-) INSTRUMENT CONVERSION, OR E#

NOTE: CONVERT EFFICIENCY FROM PERCENT TO DECIMAL EXAMPLE 18% TO 0.18 (EFFICIENCY CALIBRATED PROBES ONLY)

REMARKS:

Form 4A

SAFETY AND ECOLOGY CONSULTANTS, INC.

WEEKLY FIELD SOURCE CHECK LOG

SITE NAME: SMC

BACKGROUND LOCATION AT: SEC office/cave

WEEK ENDING: 9-4-93 (8-29-93 to 9-4-93)

SCALER/RATE METER: Eberline ESP-1 SERIAL NO. 03049 CALIBRATION DATE 7-27-93 DUE 1-27-93

DETECTOR: Eberline HP260 SERIAL NO. CALIBRATION DATE 5-23-93 DUE 11-23-93

DATE / TIME	SOURCE	SERIAL NO.	ACTIVITY	SOURCE -A- CHECK, cpm	BACKGROUND -B- CHECK, cpm	INSTRUMENT -C- CONV. - E#	SOURCE BY INSTRUMENT	H.V. AT	BAT	SPKR	DISP	OK / BY
8-30-93 / 0640	SrY90	91SR470 0213	59,350 dpm	8560	29.6	.214	39,862 / .144	901	OK	OK		✓ / F.D.
8-31-93 / 0640	SrY90	91SR470 0213	59,350 dpm	10640	35.8	.214	49552 / .179	901	OK	OK		✓ / F.D.
9-1-93 / 0640	SrY90	91SR470 0213	59,350 dpm	8613	35	.214	40,084 / .145	901	OK	OK		✓ / F.D.
9-2-93 / 0635	SrY90	91SR470 0213	59,350 dpm	11680	37.2	.214	54,406 / .196	901	OK	OK		✓ / F.D.
9-3-93 / 0640	SrY90	91SR470 0213	59,350 dpm	8540	33	.214	39,752 / .143	901	OK	OK		✓ / F.D.

CALCULATION OF SOURCE BY INSTRUMENT:

(-A-) SOURCE CHECK cpm - BACKGROUND cpm (-B) / (-C-) INSTRUMENT CONVERSION, OR E# = dpm OR uR/hr (-D-)

NOTE: CONVERT EFFICIENCY FROM PERCENT TO DECIMAL EXAMPLE 18% TO 0.18 (EFFICIENCY CALIBRATED PROBES ONLY)

REMARKS:

Form 4A

SAFETY AND ECOLOGY CONSULTANTS, INC.

WEEKLY FIELD SOURCE CHECK LOG

SITE NAME: SMC

BACKGROUND LOCATION AT: SEC office/cave

WEEK ENDING: 9-11-93 (9-5-93 to 9-11-93)

SCALER/RATE METER: Eberline ESP-1 SERIAL NO.: 03049 CALIBRATION DATE: 7-27-93 DUE: ~~1-27-93~~ 1-27-94 F.D.

DETECTOR: Eberline HP260 SERIAL NO.: CALIBRATION DATE: 5-23-93 DUE: 11-23-93

DATE / TIME	SOURCE	SERIAL NO.	ACTIVITY	SOURCE -A- CHECK, cpm	BACKGROUND -B- CHECK, cpm	INSTRUMENT -C- CONV. - E#	SOURCE BY INSTRUMENT	H.V. AT	BAT	SPKR	DISP	OK BY
9-7-93 0640	SrY90	91SR470 0213	59,350 dpm	11680	36.4	.214	54,073 / .196	901	OK	OK		✓ F.D.
9-8-93 0630	SrY90	91SR470 0213	59,350 dpm	13380	36	.214	62,355 / .225	897	OK	OK		✓ F.D.

CALCULATION OF SOURCE BY INSTRUMENT:

(-A-) SOURCE CHECK cpm - BACKGROUND cpm (-B) = dpm OR uR/hr (-D-)
(-C-) INSTRUMENT CONVERSION, OR E#

NOTE: CONVERT EFFICIENCY FROM PERCENT TO DECIMAL EXAMPLE 18% TO 0.18 (EFFICIENCY CALIBRATED PROBES ONLY)

REMARKS:

Form 4A

SAFETY AND ECOLOGY CONSULTANTS, INC.

WEEKLY FIELD SOURCE CHECK LOG

SITE NAME: SMC

BACKGROUND LOCATION AT: SEC office/cave

WEEK ENDING: 9-18-93 (9-12-93 to 9-18-93)

SCALER/RATE METER: Eberline ESP-1 SERIAL NO. 03049 CALIBRATION DATE 7-27-93 DUE 1-27-94

DETECTOR: Eberline HP260 SERIAL NO. _____ CALIBRATION DATE 5-23-93 DUE 11-23-93

DATE / TIME	SOURCE	SERIAL NO.	ACTIVITY	SOURCE -A- CHECK, cpm	BACKGROUND -B- CHECK, cpm	INSTRUMENT -C- CONV. - E#	SOURCE BY INSTRUMENT	H.V. AT	BAT	SPKR	DISP	OK BY
9-13-93 0635	Sr Y90	91SR470 0213	59,350 dpm	10720	35.6	.214	49,927 / .180	901	OK	OK		✓ F.D.
9-14-93 0635	Sr Y90	91SR470 0213	59,350 dpm	9840	34.6	.214	45,820 / .165	897	OK	OK		✓ F.D.
9-15-93 0633	Sr Y90	91SR470 0213	59,350 dpm	12020	35.6	.214	56,002 / .202	897	OK	OK		✓ F.D.
9-16-93 0635	Sr Y90	91SR470 0213	59,350 dpm	10180	35.8	.214	47,403 / .171	897	OK	OK		✓ F.D.
9-17-93 0640	Sr Y90	91SR470 0213	59,350 dpm	8620	36.8	.214	40,108 / .145	897	OK	OK		✓ F.D.

CALCULATION OF SOURCE BY INSTRUMENT:

(-A-) SOURCE CHECK cpm - BACKGROUND cpm (-B) = dpm OR uR/hr (-D-)
(-C-) INSTRUMENT CONVERSION, OR E#

NOTE: CONVERT EFFICIENCY FROM PERCENT TO DECIMAL EXAMPLE 18% TO 0.18 (EFFICIENCY CALIBRATED PROBES ONLY)

REMARKS: _____

Form 4A

SAFETY AND ECOLOGY CONSULTANTS, INC.

WEEKLY FIELD SOURCE CHECK LOG

SITE NAME: SMC

BACKGROUND LOCATION AT: SEC office/cave

WEEK ENDING: 9-25-93 (9-19-93 to 9-25-93)

SCALER/RATE METER: Eberline ESP-1 SERIAL NO. 03049 CALIBRATION DATE 7-27-93 DUE 1-27-94

DETECTOR: Eberline HP260 SERIAL NO. CALIBRATION DATE 5-23-93 DUE 11-23-93

DATE / TIME	SOURCE	SERIAL NO.	ACTIVITY	SOURCE -A- CHECK, cpm	BACKGROUND -B- CHECK, cpm	INSTRUMENT -C- CONV. - E#	SOURCE BY INSTRUMENT	H.V. AT	BAT	SPKR	DISP	OK BY
9-20-93 0637	Sr Y90	91SR470 0213	59,350 dpm	9140	37	.214	42,537 / .153	893	OK	OK		✓ F.D.
9-21-93 0640	Sr Y90	91SR470 0213	59,350 dpm	11040	40	.214	51,402 / .185	901	OK	OK		✓ F.D.
9-22-93 0632	Sr Y90	91SR470 0213	59,350 dpm	10800	35	.214	50,304 / .181	901	OK	OK		✓ F.D.
9-24-93 0620	Sr Y90	91SR470 0213	59,350 dpm	9680	35.4	.214	45,068 / .163	901	OK	OK		✓ F.D.

CALCULATION OF SOURCE BY INSTRUMENT:

(-A-) SOURCE CHECK cpm - BACKGROUND cpm (-B) / (-C-) INSTRUMENT CONVERSION, OR E# = dpm OR uR/hr (-D-)

NOTE: CONVERT EFFICIENCY FROM PERCENT TO DECIMAL EXAMPLE 18% TO 0.18 (EFFICIENCY CALIBRATED PROBES ONLY)

REMARKS:

Form 4A

SAFETY AND ECOLOGY CONSULTANTS, INC.

WEEKLY FIELD SOURCE CHECK LOG

SITE NAME: SMC

BACKGROUND LOCATION AT: SEC office/cave

WEEK ENDING: 7-31-93 (7-25-93 to 7-31-93)

SCALER/RATE METER: Ludlum 2221 SERIAL NO. 103942 CALIBRATION DATE 7-26-93 DUE 7-26-94

DETECTOR: Ludlum 44-10 SERIAL NO. 103835 CALIBRATION DATE _____ DUE _____

DATE / TIME	SOURCE	SERIAL NO.	ACTIVITY	SOURCE -A- CHECK, cpm	BACKGROUND -B- CHECK, cpm	INSTRUMENT -C- CONV. - E#	SOURCE BY INSTRUMENT	H.V. AT	BAT	SPKR	DISP	OK / BY
7-28-93 / 0631	Cs137	91CS250 3788	1.24 mCi 2,752,800dpm	283,904	5212	.1058	2,634,139 / .1012	909	OK	OK		✓ / F.D.
7-29-93 / 0637	Cs137	91CS250 3788	1.24 mCi 2,752,800dpm	287,293	5214	.1058	2,666,153 / .1025	909	OK	OK		✓ / F.D.
7-30-93 / 0640	Cs137	91CS250 3788	1.24 mCi 2,752,800dpm	287,536	5056	.1058	2,669,943 / .1026	909	OK	OK		✓ / F.D.

CALCULATION OF SOURCE BY INSTRUMENT:

(-A-) SOURCE CHECK cpm - BACKGROUND cpm (-B) = dpm OR uR/hr (-D-)
(-C-) INSTRUMENT CONVERSION, OR E#

NOTE: CONVERT EFFICIENCY FROM PERCENT TO DECIMAL EXAMPLE 18% TO 0.18 (EFFICIENCY CALIBRATED PROBES ONLY)

REMARKS: _____

Form 4A

SAFETY AND ECOLOGY CONSULTANTS, INC.

WEEKLY FIELD SOURCE CHECK LOG

SITE NAME: SMC

BACKGROUND LOCATION AT: SEC office/cave

WEEK ENDING: 7-31-93 (7-25-93 to 7-31-93)

SCALER/RATE METER: Ludlum 2221 SERIAL NO. 103977 CALIBRATION DATE 7-26-93 DUE 7-26-94

DETECTOR: Ludlum 44-10 SERIAL NO. 103834 CALIBRATION DATE _____ DUE _____

DATE / TIME	SOURCE	SERIAL NO.	ACTIVITY	SOURCE -A- CHECK, cpm	BACKGROUND -B- CHECK, cpm	INSTRUMENT -C- CONV. - E#	SOURCE BY INSTRUMENT	H.V. AT	BAT	SPKR	DISP	OK / BY
7-28-93 / 0631	Cs137	91CS250 3788	1.24 mCi 2,752,800 dpm	303892	5006	.1155	2,587,757 / .1086	903	OK	OK		✓ / F.D.
7-29-93 / 0637	Cs137	91CS250 3788	1.24 mCi 2,752,800 dpm	304,899	5058	.1155	2,630,658 / .1104	907	OK	OK		✓ / F.D.
7-30-93 / 0740	Cs137	91CS250 3788	1.24 mCi 2,752,800 dpm	306,666	5033	.1155	2,611,541 / .1095	908	OK	OK		✓ / F.D.

CALCULATION OF SOURCE BY INSTRUMENT:

(-A-) SOURCE CHECK cpm - BACKGROUND cpm (-B) = dpm OR uR/hr (-D-)
(-C-) INSTRUMENT CONVERSION, OR E#

NOTE: CONVERT EFFICIENCY FROM PERCENT TO DECIMAL EXAMPLE 18% TO 0.18 (EFFICIENCY CALIBRATED PROBES ONLY)

REMARKS: _____

Form 4A

SAFETY AND ECOLOGY CONSULTANTS, INC.

WEEKLY FIELD SOURCE CHECK LOG

SITE NAME: SMC

BACKGROUND LOCATION AT: SEC office / cave

WEEK ENDING: 8-7-93 (8-1-93 to 8-7-93)

SCALER/RATE METER: Ludlum 2221 SERIAL NO. 103942 CALIBRATION DATE 7-26-93 DUE ~~7-26-93~~ 7-26-94 F.D.

DETECTOR: Ludlum 44-10 SERIAL NO. 103835 CALIBRATION DATE _____ DUE _____

DATE / TIME	SOURCE	SERIAL NO.	ACTIVITY	SOURCE -A- CHECK, cpm	BACKGROUND -B- CHECK, cpm	INSTRUMENT -C- CONV. - E#	SOURCE BY INSTRUMENT	H.V. AT	BAT	SPKR	DISP	OK / BY
8-2-93 / 0637	Cs137	91CS250 3788	1.24 uCi 2,752,800dpm	296,037	5072	.1058	2,750,142 / .1057	909	OK	OK		✓ / F.D.
8-3-93 / 0635	Cs137	91CS250 3788	1.24 uCi 2,752,800dpm	294,511	5213	.1058	2,734,386 / .1051	909	OK	OK		✓ / F.D.
8-4-93 / 0637	Cs137	91CS250 3788	1.24 uCi 2,752,800dpm	295,782	5336	.1058	2,745,236 / .1055	909	OK	OK		✓ / F.D.
8-5-93 / 0636	Cs137	91CS250 3788	1.24 uCi 2,752,800dpm	297,036	5220	.1058	2,758,185 / .1060	909	OK	OK		✓ / F.D.
8-6-93 / 0632	Cs137	91CS250 3788	1.24 uCi 2,752,800 dpm	301,316	5252	.1058	2,798,336 / .1076	909	OK	OK		✓ / F.D.

CALCULATION OF SOURCE BY INSTRUMENT:

(-A-) SOURCE CHECK cpm - BACKGROUND cpm (-B) = dpm OR uR/hr (-D-)
(-C-) INSTRUMENT CONVERSION, OR E#

NOTE: CONVERT EFFICIENCY FROM PERCENT TO DECIMAL EXAMPLE 18% TO 0.18 (EFFICIENCY CALIBRATED PROBES ONLY)

REMARKS: _____

Form 4A

SAFETY AND ECOLOGY CONSULTANTS, INC.

WEEKLY FIELD SOURCE CHECK LOG

SITE NAME: SMC

BACKGROUND LOCATION AT: SEC office/cave

WEEK ENDING: 8-7-93 (8-1-93 to 8-7-93)

SCALER/RATE METER: Ludlum 2221 SERIAL NO. 103977 CALIBRATION DATE 7-26-93 DUE 7-26-94

DETECTOR: Ludlum 44-10 SERIAL NO. 103834 CALIBRATION DATE _____ DUE _____

DATE / TIME	SOURCE	SERIAL NO.	ACTIVITY	SOURCE -A- CHECK, cpm	BACKGROUND -B- CHECK, cpm	INSTRUMENT -C- CONV. - E#	SOURCE BY INSTRUMENT	H.V. AT	BAT	SPKR	DISP	OK / BY
8-2-93 / 0637	Cs137	91CS250 3788	1.24 mCi 2,752,800 dpm	311,113	4908	.1155	2,651,126 / .1112	908	OK	OK		✓ / F.D.
8-3-93 / 0635	Cs137	91CS250 3788	1.24 mCi 2,752,800 dpm	313,950	5031	.1155	2,674,623 / .1122	908	OK	OK		✓ / F.D.
8-4-93 / 0637	Cs137	91CS250 3788	1.24 mCi 2,752,800 dpm	314,643	5109	.1155	2,679,948 / .1124	908	OK	OK		✓ / F.D.
8-5-93 / 0636	Cs137	91CS250 3788	1.24 mCi 2,752,800 dpm	316,343	4944	.1155	2,696,095 / .1131	908	OK	OK		✓ / F.D.
8-6-93 / 0632	Cs137	91CS250 3788	1.24 mCi 2,752,800 dpm	322,193	4991	.1155	2,746,338 / .1152	908	OK	OK		✓ / F.D.

CALCULATION OF SOURCE BY INSTRUMENT:

(-A-) SOURCE CHECK cpm - BACKGROUND cpm (-B) = dpm OR uR/hr (-D-)
(-C-) INSTRUMENT CONVERSION, OR E#

NOTE: CONVERT EFFICIENCY FROM PERCENT TO DECIMAL EXAMPLE 18% TO 0.18 (EFFICIENCY CALIBRATED PROBES ONLY)

REMARKS: _____

Form 4A

SAFETY AND ECOLOGY CONSULTANTS, INC.

WEEKLY FIELD SOURCE CHECK LOG

SITE NAME: SMC

BACKGROUND LOCATION AT: SEC office / CGVC

WEEK ENDING: 8-14-93 (8-8-93 to 8-14-93)

SCALER/RATE METER: Ludlum 2221 SERIAL NO. 103977 CALIBRATION DATE 7-26-93 DUE 7-26-94

DETECTOR: Ludlum 44-10 SERIAL NO. 103834 CALIBRATION DATE _____ DUE _____

DATE / TIME	SOURCE	SERIAL NO.	ACTIVITY	SOURCE -A- CHECK, cpm	BACKGROUND -B- CHECK, cpm	INSTRUMENT -C- CONV. - E#	SOURCE BY INSTRUMENT	H.V. AT	BAT	SPKR	DISP	OK / BY
8-9-93 / 0637	Cs137	91CS250 3788	1.24mCi 2,753,800dpm	319,687	4978	.1155	2,724,753 / .1143	910	OK	OK		✓ / F.D.
8-10-93 / 0637	Cs137	91CS250 3788	1.24mCi	323,109	5067	.1155	2,753,610 / .1155	909	OK	OK		✓ / F.D.
8-11-93 / 0632	Cs137	91CS250 3788	1.24mCi	325,676	5076	.1155	2,775,757 / .1165	909	OK	OK		✓ / F.D.
8-11-93 / 1736	Cs137	91CS250 3788	1.24mCi	288,959	5200	.1155	2,456,788 / .1030	906	OK	OK		
8-12-93 / 0640	Cs137	91CS250 3788	1.24mCi	321,597	5058	.1155	2,740,597 / .1150	908	OK	OK		✓ / F.D.
8-13-93 / 0637	Cs137	91CS250 3788	1.24mCi	324,492	5089	.1155	2,765,394 / .1160	908	OK	OK		✓ / F.D.

CALCULATION OF SOURCE BY INSTRUMENT:

(-A-) SOURCE CHECK cpm - BACKGROUND cpm (-B) = dpm OR uR/hr (-D-)
(-C-) INSTRUMENT CONVERSION, OR E#

NOTE: CONVERT EFFICIENCY FROM PERCENT TO DECIMAL EXAMPLE 18% TO 0.18 (EFFICIENCY CALIBRATED PROBES ONLY)

REMARKS: _____

Form 4A

SAFETY AND ECOLOGY CONSULTANTS, INC.

WEEKLY FIELD SOURCE CHECK LOG

SITE NAME: SMC

BACKGROUND LOCATION AT: SEC office/cave

WEEK ENDING: 8-14-93 (8-8-93 to 8-14-93)

SCALER/RATE METER: Ludlum 2221 SERIAL NO. 103942 CALIBRATION DATE 7-26-93 DUE 7-26-94

DETECTOR: Ludlum 44-10 SERIAL NO. 103835 CALIBRATION DATE _____ DUE _____

DATE / TIME	SOURCE	SERIAL NO.	ACTIVITY	SOURCE -A- CHECK, cpm	BACKGROUND -B- CHECK, cpm	INSTRUMENT -C- CONV. - E#	SOURCE BY INSTRUMENT	H.V. AT	BAT	SPKR	DISP	OK / BY
8-9-93 / 0637	Cs137	91CS250 3788	1.24mCi 2,753,800dpm	296,830	5201	.1058	2,756,418 / .1059	911	OK	OK		✓ / F.D.
8-10-93 / 0637	Cs137	91CS250 3788	1.24mCi	300,105	5259	.1058	2,786,824 / .1071	911	OK	OK		✓ / F.D.
8-11-93 / 0632	Cs137	91CS250 3788	1.24mCi	300,758	5259	.1058	2,792,996 / .1073	910	OK	OK		✓ / F.D.
8-12-93 / 0640	Cs137	91CS250 3788	1.24mCi	302,618	5241	.1058	2,810,747 / .1080	910	OK	OK		✓ / F.D.
8-13-93 / 0637	Cs137	91CS250 3788	1.24mCi	301,901	5314	.1058	2,803,279 / .1077	909	OK	OK		✓ / F.D.

CALCULATION OF SOURCE BY INSTRUMENT:

(-A-) SOURCE CHECK cpm - BACKGROUND cpm (-B) = dpm OR uR/hr (-D-)
(-C-) INSTRUMENT CONVERSION, OR E#

NOTE: CONVERT EFFICIENCY FROM PERCENT TO DECIMAL EXAMPLE 18% TO 0.18 (EFFICIENCY CALIBRATED PROBES ONLY)

REMARKS: _____

Form 4A

SAFETY AND ECOLOGY CONSULTANTS, INC.

WEEKLY FIELD SOURCE CHECK LOG

SITE NAME: SMC

BACKGROUND LOCATION AT: SEC office/cave

WEEK ENDING: 8-21-93 (8-15-93 to 8-21-93)

SCALER/RATE METER: Ludlum 2221 SERIAL NO. 103942 CALIBRATION DATE 7-26-93 DUE 7-26-94

DETECTOR: Ludlum 44-10 SERIAL NO. 103835 CALIBRATION DATE _____ DUE _____

DATE / TIME	SOURCE	SERIAL NO.	ACTIVITY	SOURCE -A- CHECK, cpm	BACKGROUND -B- CHECK, cpm	INSTRUMENT -C- CONV. - E#	SOURCE BY INSTRUMENT	H.V. AT	BAT	SPKR	DISP	OK / BY
8-16-93 0640	Cs137	91CS250 3788	1.24 mCi 2,752,800 dpm	299,530	5182	.1058	2,782,117 / .1069	909	OK	OK		✓ F.D.
8-17-93 0645	Cs137	91CS250 3788	1.24 mCi	300,733	5260	.1058	2,792,350 / .1073	909	OK	OK		✓ F.D.
8-18-93 0634	Cs137	91CS250 3788	1.24 mCi	302,582	5565	.1058	2,807,344 / .1079	910	OK	OK		✓ F.D.
8-19-93 0631	Cs137	91CS250 3788	1.24 mCi	298,931	5643	.1058	2,772,098 / .1065	908	OK	OK		✓ F.D. ~~OK~~
8-20-93 0637	Cs137	91CS250 3788	1.24 mCi	303,103	5640	.1058	2,811,560 / .1080	908	OK	OK		✓ F.D.

CALCULATION OF SOURCE BY INSTRUMENT:

(-A-) SOURCE CHECK cpm - BACKGROUND cpm (-B) = dpm OR uR/hr (-D-)
(-C-) INSTRUMENT CONVERSION, OR E#

NOTE: CONVERT EFFICIENCY FROM PERCENT TO DECIMAL EXAMPLE 18% TO 0.18 (EFFICIENCY CALIBRATED PROBES ONLY)

REMARKS: _____

Form 4A

SAFETY AND ECOLOGY CONSULTANTS, INC.

WEEKLY FIELD SOURCE CHECK LOG

SITE NAME: SMC

BACKGROUND LOCATION AT: SEC office / CGVC

WEEK ENDING: 8-21-93 (8-15-93 to 8-21-93)

SCALER/RATE METER: Ludlum 2221 SERIAL NO. 103977 CALIBRATION DATE 7-26-93 DUE 7-26-94

DETECTOR: Ludlum 44-10 SERIAL NO. 103834 CALIBRATION DATE _____ DUE _____

DATE / TIME	SOURCE	SERIAL NO.	ACTIVITY	SOURCE -A- CHECK, cpm	BACKGROUND -B- CHECK, cpm	INSTRUMENT -C- CONV. - E#	SOURCE BY INSTRUMENT	H.V. AT	BAT	SPKR	DISP	OK BY
8-16-93 0640	Cs137	91CS250 3788	1.24uCi 2,753,800 dpm	324,311	4887	.1155	2,765,576 / .1160	908	OK	OK		✓ F.D.
8-17-93 0645	Cs137	91CS250 3788	1.24uCi	325,495	5319	.1155	2,772,086 / .1163	908	OK	OK		✓ F.D.
8-18-93 0634	Cs137	91CS250 3788	1.24uCi	328,934	5912	.1155	2,796,727 / .1173	908	OK	OK		✓ F.D.
8-19-93 0631	Cs137	91CS250 3788	1.24uCi	324,951	5761	.1155	2,763,550 / .1160	908	OK	OK		✓ F.D.
8-20-93 0637	Cs137	91CS250 3788	1.24uCi	329,649	5634	.1155	2,805,325 / .1177	907	OK	OK		✓ F.D.

CALCULATION OF SOURCE BY INSTRUMENT:

(-A-) SOURCE CHECK cpm - BACKGROUND cpm (-B) = dpm OR uR/hr (-D-)
(-C-) INSTRUMENT CONVERSION, OR E#

NOTE: CONVERT EFFICIENCY FROM PERCENT TO DECIMAL EXAMPLE 18% TO 0.18 (EFFICIENCY CALIBRATED PROBES ONLY)

REMARKS: _____

Form 4A

SAFETY AND ECOLOGY CONSULTANTS, INC.

WEEKLY FIELD SOURCE CHECK LOG

SITE NAME: SMC

BACKGROUND LOCATION AT: SEC office/cave

WEEK ENDING: 8-28-93 (8-22-93 to 8-28-93)

SCALER/RATE METER: Ludlum 2221 SERIAL NO. 103942 CALIBRATION DATE 7-26-93 DUE 7-26-94

DETECTOR: Ludlum 44-10 SERIAL NO. 103835 CALIBRATION DATE _____ DUE _____

DATE / TIME	SOURCE	SERIAL NO.	ACTIVITY	SOURCE -A- CHECK, cpm	BACKGROUND -B- CHECK, cpm	INSTRUMENT -C- CONV. - E#	SOURCE BY INSTRUMENT	H.V. AT	BAT	SPKR	DISP	OK / BY
8-23-93 / 0635	Cs137	91CS250 3788	1.24uCi 2,752,800 dpm	274,229	5556	.1058	2,539,442 / .0976	908	OK	OK		✓ / F.D.
8-24-93 / 0637	Cs137	91CS250 3788	1.24uCi	301,360	5477	.1058	2,796,626 / .1075	907	OK	OK		✓ / F.D.
8-25-93 / 0640	Cs137	91CS250 3788	1.24 uCi	301,268	5403	.1058	2,796,456 / .1075	906	OK	OK		✓ / F.D.
8-26-93 / 0643	Cs137	91CS250 3788	1.24 uCi	304,829	5409	.1058	2,830,057 / .1088	905	OK	OK		✓ / F.D.
8-27-93 / 0633	Cs137	91CS250 3788	1.24 uCi	302,526	5851	.1058	2,804,112 / .1078	905	OK	OK		✓ / F.D.

CALCULATION OF SOURCE BY INSTRUMENT:

(-A-) SOURCE CHECK cpm - BACKGROUND cpm (-B) = dpm OR uR/hr (-D-)
(-C-) INSTRUMENT CONVERSION, OR E#

NOTE: CONVERT EFFICIENCY FROM PERCENT TO DECIMAL EXAMPLE 18% TO 0.18 (EFFICIENCY CALIBRATED PROBES ONLY)

REMARKS: _____

Form 4A

SAFETY AND ECOLOGY CONSULTANTS, INC.

WEEKLY FIELD SOURCE CHECK LOG

SITE NAME: SMC

BACKGROUND LOCATION AT: SEC office / CSUC

WEEK ENDING: 8-28-93 (8-22-93 to 8-28-93)

SCALER/RATE METER: Ludlum 2221 SERIAL NO. 103977 CALIBRATION DATE 7-26-93 DUE 7-26-94

DETECTOR: Ludlum 44-10 SERIAL NO. 103834 CALIBRATION DATE _____ DUE _____

DATE / TIME	SOURCE	SERIAL NO.	ACTIVITY	SOURCE -A- CHECK, cpm	BACKGROUND -B- CHECK, cpm	INSTRUMENT -C- CONV. - E#	SOURCE BY INSTRUMENT	H.V. AT	BAT	SPKR	DISP	OK / BY
8-23-93 / 0635	Cs137	91CS250 3788	1.24uCi 2,752,800 dpm	331,293	5685	.1155	2,819,117 / .1183	907	OK	OK		✓ / F.D.
8-24-93 / 0637	Cs137	91CS250 3788	1.24uCi	329,377	5731	.1155	2,802,130 / .1176	907	OK	OK		✓ / F.D.
8-25-93 / 0640	Cs137	91CS250 3788	1.24uCi	329,037	5595	.1155	2,800,363 / .1175	906	OK	OK		✓ / F.D.
8-26-93 / 0643	Cs137	91CS250 3788	1.24uCi	332,529	5510	.1155	2,831,333 / .1188	905	OK	OK		✓ / F.D.
8-27-93 / 0633	Cs137	91CS250 3788	1.24uCi	332,452	5859	.1155	2,828,424 / .1187	905	OK	OK		✓ / F.D.

CALCULATION OF SOURCE BY INSTRUMENT:

(-A-) SOURCE CHECK cpm - BACKGROUND cpm (-B) = dpm OR uR/hr (-D-)
(-C-) INSTRUMENT CONVERSION, OR E#

NOTE: CONVERT EFFICIENCY FROM PERCENT TO DECIMAL EXAMPLE 18% TO 0.18 (EFFICIENCY CALIBRATED PROBES ONLY)

REMARKS: _____

Form 4A

SAFETY AND ECOLOGY CONSULTANTS, INC.

WEEKLY FIELD SOURCE CHECK LOG

SITE NAME: SMC

BACKGROUND LOCATION AT: SEC office / CSVC

WEEK ENDING: 9-4-93 (8-29-93 to 9-4-93)

SCALER/RATE METER: Ludlum 2221 SERIAL NO. 103977 CALIBRATION DATE 7-26-93 DUE 7-26-94

DETECTOR: Ludlum 44-10 SERIAL NO. 103834 CALIBRATION DATE _____ DUE _____

DATE / TIME	SOURCE	SERIAL NO.	ACTIVITY	SOURCE -A- CHECK, cpm	BACKGROUND -B- CHECK, cpm	INSTRUMENT -C- CONV. - E#	SOURCE BY INSTRUMENT	H.V. AT	BAT	SPKR	DISP	OK / BY
8-30-93 / 0640	Cs137	91CS250 3788	1.24uCi 2,752,800 dpm	333,622	6289	.1155	2,834,052 / .1189	905	OK	OK		✓ / F.D.
8-31-93 / 0640	Cs137	91CS250 3788	1.24uCi	239,469	3484	.1155	2,043,160 / .0857	907	OK	OK		✓ / F.D.
9-1-93 / 0640	Cs137	91CS250 3788	1.24uCi	331,309	7063	.1155	2,807,325 / .1177	906	OK	OK		✓ / F.D.
9-2-93 / 0635	Cs137	91CS250 3788	1.24uCi	335,098	7354	.1155	2,837,610 / .1191	906	OK	OK		✓ / F.D.
9-3-93 / 0640	Cs137	91CS250 3788	1.24uCi	335,397	6705	.1155	2,845,818 / .1194	905	OK	OK		✓ / F.D.

CALCULATION OF SOURCE BY INSTRUMENT:

(-A-) SOURCE CHECK cpm - BACKGROUND cpm (-B) = dpm OR uR/hr (-D-)
(-C-) INSTRUMENT CONVERSION, OR E#

NOTE: CONVERT EFFICIENCY FROM PERCENT TO DECIMAL EXAMPLE 18% TO 0.18 (EFFICIENCY CALIBRATED PROBES ONLY)

REMARKS: _____

Form 4A

SAFETY AND ECOLOGY CONSULTANTS, INC.

WEEKLY FIELD SOURCE CHECK LOG

SITE NAME: SMC

BACKGROUND LOCATION AT: SEC office/cave

WEEK ENDING: 9-4-93 (8-29-93 to 9-4-93)

SCALER/RATE METER: Ludlum 2221 SERIAL NO. 103942 CALIBRATION DATE 7-26-93 DUE 7-26-94

DETECTOR: Ludlum 44-10 SERIAL NO. 103835 CALIBRATION DATE _____ DUE _____

DATE / TIME	SOURCE	SERIAL NO.	ACTIVITY	SOURCE -A- CHECK, cpm	BACKGROUND -B- CHECK, cpm	INSTRUMENT -C- CONV. - E#	SOURCE BY INSTRUMENT	H.V. AT	BAT	SPKR	DISP	OK / BY
8-30-93 / 0640	Cs137	91CS250 3788	1.24uCi 2,752,800 dpm	300,776	6121	.1058	2,785,019 / .1070	906	OK	OK		✓ / F.D.
8-31-93 / 0640	Cs137	91CS250 3788	1.24uCi	304 685	6928	.1058	2,814,338 / .1082	906	OK	OK		✓ / F.D.
9-1-93 / 0640	Cs137	91CS250 3788	1.24uCi	306,561	6815	.1058	2,833,138 / .1089	906	OK	OK		✓ / F.D.
9-2-93 / 0635	Cs137	91CS250 3788	1.24uCi	311,777	7137	.1058	2,879,395 / .1107	906	OK	OK		✓ / F.D.
9-3-93 / 0640	Cs137	91CS250 3788	1.24uCi	311,758	6830	.1058	2,882,117 / .1108	905	OK	OK		✓ / F.D.

CALCULATION OF SOURCE BY INSTRUMENT:

(-A-) SOURCE CHECK cpm - BACKGROUND cpm (-B) / (-C-) INSTRUMENT CONVERSION, OR E# = dpm OR uR/hr (-D-)

NOTE: CONVERT EFFICIENCY FROM PERCENT TO DECIMAL EXAMPLE 18% TO 0.18 (EFFICIENCY CALIBRATED PROBES ONLY)

REMARKS: _____

Form 4A

SAFETY AND ECOLOGY CONSULTANTS, INC.

WEEKLY FIELD SOURCE CHECK LOG

SITE NAME: SMC

BACKGROUND LOCATION AT: SEC office/cave

WEEK ENDING: 7/24/93 (7/18/93 to 7/24/93)

SCALER/RATE METER: Eberline SRM-100 SERIAL NO. 313 CALIBRATION DATE 5/26/93 DUE 11/26/93

DETECTOR: Eberline AC-3 SERIAL NO. 407083 CALIBRATION DATE 5/26/93 DUE 11/26/93

DATE / TIME	SOURCE	SERIAL NO.	ACTIVITY	SOURCE -A- CHECK, cpm	BACKGROUND -B- CHECK, cpm	INSTRUMENT -C- CONV. - E#	SOURCE BY INSTRUMENT	H.V. AT	BAT	SPKR	DISP	OK / BY
7/21/93 0901	Th230	91TH470 3785	6500dpm	1078	1	.177	6084 / .166	890	OK	OK		✓ F.D.
7/21/93 1618	Th230	91TH470 3785	6500dpm	1076	1	.177	6073 / .165	901	OK	OK		✓ F.D.
7/22/93 0817	Th230	91TH470 3785	6500dpm	1149	1.2	.177	6485 / .176	894	OK	OK		✓ F.D.
7-23-93 0637	Th230	91TH470 3785	6500dpm	1154	.6	.177	6516 / .177	890	OK	OK		✓ G.H

CALCULATION OF SOURCE BY INSTRUMENT:

(-A-) SOURCE CHECK cpm - BACKGROUND cpm (-B) = dpm OR uR/hr (-D-)
(-C-) INSTRUMENT CONVERSION, OR E#

NOTE: CONVERT EFFICIENCY FROM PERCENT TO DECIMAL EXAMPLE 18% TO 0.18 (EFFICIENCY CALIBRATED PROBES ONLY)

REMARKS:

Form 4A

SAFETY AND ECOLOGY CONSULTANTS, INC.

WEEKLY FIELD SOURCE CHECK LOG

SITE NAME: SMC

BACKGROUND LOCATION AT: SEC office/cave

WEEK ENDING: 9-11-93 (9-5-93 to 9-11-93)

SCALER/RATE METER: Ludlum 2221 SERIAL NO. 103942 CALIBRATION DATE 7-26-93 DUE 7-26-94

DETECTOR: Ludlum 44-10 SERIAL NO. 103835 CALIBRATION DATE _____ DUE _____

DATE / TIME	SOURCE	SERIAL NO.	ACTIVITY	SOURCE -A- CHECK, cpm	BACKGROUND -B- CHECK, cpm	INSTRUMENT -C- CONV. - E#	SOURCE BY INSTRUMENT	H.V. AT	BAT	SPKR	DISP	OK / BY
9-7-93 / 0640	Cs137	91C5250 3788	1.24uCi 2,753,890 dpm	313,873	6874	.1058	2,901,691 / .1115	906	OK	OK		✓ / F.D.

CALCULATION OF SOURCE BY INSTRUMENT:

(-A-) SOURCE CHECK cpm - BACKGROUND cpm (-B) = dpm OR uR/hr (-D-)
(-C-) INSTRUMENT CONVERSION, OR E#

NOTE: CONVERT EFFICIENCY FROM PERCENT TO DECIMAL EXAMPLE 18% TO 0.18 (EFFICIENCY CALIBRATED PROBES ONLY)

REMARKS: _____

Form 4A

SAFETY AND ECOLOGY CONSULTANTS, INC.

WEEKLY FIELD SOURCE CHECK LOG

SITE NAME: SMC

BACKGROUND LOCATION AT: SEC office / CGVC

WEEK ENDING: 9-11-93 (9-5-93 to 9-11-93)

SCALER/RATE METER: Ludlum 2221 SERIAL NO. 103977 CALIBRATION DATE 7-26-93 DUE 7-26-94

DETECTOR: Ludlum 44-10 SERIAL NO. 103834 CALIBRATION DATE _____ DUE _____

DATE / TIME	SOURCE	SERIAL NO.	ACTIVITY	SOURCE -A- CHECK, cpm	BACKGROUND -B- CHECK, cpm	INSTRUMENT -C- CONV. - E#	SOURCE BY INSTRUMENT	H.V. AT	BAT	SPKR	DISP	OK BY
9-7-93 / 0640	Cs137	91CS250 3788	1.24uCi 2,752,800 dpm	336,707	6991	.1155	2,854,684 / .1198	906	OK	OK		✓ / F.D.
9-8-93 / 0630	Cs137	91CS250 3788	1.24uCi	332,169	6924	.1155	2,815,974 / .1182	906	OK	OK		✓ / F.D.
9-9-93 / 0635	Cs137	91CS250 3788	1.24uCi	337,571	6372	.1155	2,867,524 / .1203	907	OK	OK		✓ / F.D.
9-10-93 / 0640	Cs137	91CS250 3788	1.24uCi	334,368	6428	.1155	2,839,307 / .1212	907	OK	OK		✓ / F.D.

CALCULATION OF SOURCE BY INSTRUMENT:

(-A-) SOURCE CHECK cpm - BACKGROUND cpm (-B) = dpm OR uR/hr (-D-)
(-C-) INSTRUMENT CONVERSION, OR E#

NOTE: CONVERT EFFICIENCY FROM PERCENT TO DECIMAL EXAMPLE 18% TO 0.18 (EFFICIENCY CALIBRATED PROBES ONLY)

REMARKS: _____

Form 4A

SAFETY AND ECOLOGY CONSULTANTS, INC.

WEEKLY FIELD SOURCE CHECK LOG

SITE NAME: SMC

BACKGROUND LOCATION AT: SEC office / CGVC

WEEK ENDING: 10-9-93 (10-3-93 to 10-9-93)

SCALER/RATE METER: Ludlum 2221 SERIAL NO. 103977 CALIBRATION DATE 7-26-93 DUE 7-26-94

DETECTOR: Ludlum 44-10 SERIAL NO. 103834 CALIBRATION DATE _____ DUE _____

DATE / TIME	SOURCE	SERIAL NO.	ACTIVITY	SOURCE -A- CHECK, cpm	BACKGROUND -B- CHECK, cpm	INSTRUMENT -C- CONV. - E#	SOURCE BY INSTRUMENT	H.V. AT	BAT	SPKR	DISP	OK BY
10-4-93 0640	Cs137	91CS250 3788	1.24 mCi 2,752,800 dpm	335,616	7666	.1155	2,839,354 / .1191	908	OK	OK		✓ F.D.
10-5-93 0645	Cs137	91CS250 3788	1.24 mCi	334,893	7448	.1155	2,835,023 / .1189	908	OK	OK		✓ F.D.
10-6-93 0653	Cs137	91CS250 3788	1.24 mCi	334,246	7413	.1155	2,829,723 / .1187	909	OK	OK		✓ F.D.

CALCULATION OF SOURCE BY INSTRUMENT:

(-A-) SOURCE CHECK cpm - BACKGROUND cpm (-B) = dpm OR uR/hr (-D-)
(-C-) INSTRUMENT CONVERSION, OR E#

NOTE: CONVERT EFFICIENCY FROM PERCENT TO DECIMAL EXAMPLE 18% TO 0.18 (EFFICIENCY CALIBRATED PROBES ONLY)

REMARKS: _____

Form 4A

SAFETY AND ECOLOGY CONSULTANTS, INC.

WEEKLY FIELD SOURCE CHECK LOG

SITE NAME: SMC

BACKGROUND LOCATION AT: SEC office/cave

WEEK ENDING: 10-9-93 (10-3-93 to 10-9-93)

SCALER/RATE METER: Ludlum 2221 SERIAL NO. 103942 CALIBRATION DATE 7-26-93 DUE 7-26-94

DETECTOR: Ludlum 44-10 SERIAL NO. 103835 CALIBRATION DATE _____ DUE _____

DATE / TIME	SOURCE	SERIAL NO.	ACTIVITY	SOURCE -A- CHECK, cpm	BACKGROUND - B- CHECK, cpm	INSTRUMENT -C- CONV. - E#	SOURCE BY INSTRUMENT	H.V. AT	BAT	SPKR	DISP	OK BY
10-4-93 0640	Cs137	91CS250 3788	1.24uCi 2,752,800 dpm	310,821	7984	.1058	2,862,353 / .1100	909	OK	OK		✓ F.D.
10-5-93 0645	Cs137	91CS250 3788	1.24uCi	309,681	7994	.1058	2,851,484 / .1096	908	OK	OK		✓ F.D.
10-6-93 0653	Cs137	91CS250 3788	1.24uCi	311,685	7927	.1058	2,871,059 / .1103	909	OK	OK		✓ F.D.

CALCULATION OF SOURCE BY INSTRUMENT:

(-A-) SOURCE CHECK cpm - BACKGROUND cpm (-B) = dpm OR uR/hr (-D-)
(-C-) INSTRUMENT CONVERSION, OR E#

NOTE: CONVERT EFFICIENCY FROM PERCENT TO DECIMAL EXAMPLE 18% TO 0.18 (EFFICIENCY CALIBRATED PROBES ONLY)

REMARKS: _____

Form 4A

SAFETY AND ECOLOGY CONSULTANTS, INC.

WEEKLY FIELD SOURCE CHECK LOG

SITE NAME: SMC

BACKGROUND LOCATION AT: SEC office/cave

WEEK ENDING: 10-16-93 (10-10-93 to 10-16-93)

SCALER/RATE METER: Ludlum 2221 SERIAL NO. 103942 CALIBRATION DATE 7-26-93 DUE 7-26-94

DETECTOR: Ludlum 44-10 SERIAL NO. 103835 CALIBRATION DATE _____ DUE _____

DATE / TIME	SOURCE	SERIAL NO.	ACTIVITY	SOURCE -A- CHECK, cpm	BACKGROUND -B- CHECK, cpm	INSTRUMENT -C- CONV. - E#	SOURCE BY INSTRUMENT	H.V. AT	BAT	SPKR	DISP	OK / BY
10-12-93 / 0700	Cs137	91CS250 3788	1.24 uCi 2,752,800 dpm	310336	7885	.1058	285-8,705 / .1099	910	OK	OK		✓ / F.D.

CALCULATION OF SOURCE BY INSTRUMENT:

(-A-) SOURCE CHECK cpm - BACKGROUND cpm (-B) = dpm OR uR/hr (-D-)
(-C-) INSTRUMENT CONVERSION, OR E#

NOTE: CONVERT EFFICIENCY FROM PERCENT TO DECIMAL EXAMPLE 18% TO 0.18 (EFFICIENCY CALIBRATED PROBES ONLY)

REMARKS: _____

Form 4A

SAFETY AND ECOLOGY CONSULTANTS, INC.

WEEKLY FIELD SOURCE CHECK LOG

SITE NAME: SMC

BACKGROUND LOCATION AT: SEC office / CGUC

WEEK ENDING: 10-16-93 (10-10-93 to 10-16-93)

SCALER/RATE METER: Ludlum 2221 SERIAL NO. 103977 CALIBRATION DATE 7-26-93 DUE 7-26-94

DETECTOR: Ludlum 44-10 SERIAL NO. 103834 CALIBRATION DATE _____ DUE _____

DATE / TIME	SOURCE	SERIAL NO.	ACTIVITY	SOURCE -A- CHECK, cpm	BACKGROUND -B- CHECK, cpm	INSTRUMENT -C- CONV. - E#	SOURCE BY INSTRUMENT	H.V. AT	BAT	SPKR	DISP	OK BY
10-12-93 0700	Cs137	91C5250 3788	1.24 uCi 2,752,800 dpm	334833	7592	.1155	2,833,255 / .1189	909	OK	OK		✓ F.D.

CALCULATION OF SOURCE BY INSTRUMENT:

(-A-) SOURCE CHECK cpm - BACKGROUND cpm (-B) = dpm OR uR/hr (-D-)
(-C-) INSTRUMENT CONVERSION, OR E#

NOTE: CONVERT EFFICIENCY FROM PERCENT TO DECIMAL EXAMPLE 18% TO 0.18 (EFFICIENCY CALIBRATED PROBES ONLY)

REMARKS: _____

Form 4A

SAFETY AND ECOLOGY CONSULTANTS, INC.

WEEKLY FIELD SOURCE CHECK LOG

SITE NAME: SMC

BACKGROUND LOCATION AT: SEC office/cave

WEEK ENDING: 7-24-93 (7-18-93 to 7-24-93)

SCALER/RATE METER: Eberline ESP-1 SERIAL NO. 03047 CALIBRATION DATE 5-25-93 DUE 11-25-93

DETECTOR: Eberline SPA-3 SERIAL NO. 409184 CALIBRATION DATE NONE DUE NONE

DATE / TIME	SOURCE	SERIAL NO.	ACTIVITY	SOURCE -A- CHECK, cpm	BACKGROUND -B- CHECK, cpm	INSTRUMENT -C- CONV. - E#	SOURCE BY INSTRUMENT	H.V. AT	BAT	SPKR	DISP	OK / BY
7-23-93 / 0644	Cs137	91CS250	1.24uCi	272,000	4700			909	OK	OK		✓ / G.M.

CALCULATION OF SOURCE BY INSTRUMENT:

(-A-) SOURCE CHECK cpm - BACKGROUND cpm (-B) = dpm OR uR/hr (-D-)
(-C-) INSTRUMENT CONVERSION, OR E#

NOTE: CONVERT EFFICIENCY FROM PERCENT TO DECIMAL EXAMPLE 18% TO 0.18 (EFFICIENCY CALIBRATED PROBES ONLY)

REMARKS:

Form 4A

SAFETY AND ECOLOGY CONSULTANTS, INC.

WEEKLY FIELD SOURCE CHECK LOG

SITE NAME: SMC

BACKGROUND LOCATION AT: SEC OFFICE / CAVE

WEEK ENDING: 7-24-93 (7-18-93 to 7-24-93)

SCALER/RATE METER: Eberline SRM100 SERIAL NO. 313 CALIBRATION DATE 5-26-93 DUE 11-26-93

DETECTOR: Eberline SPA-3 SERIAL NO. 408462 CALIBRATION DATE 5-26-93 DUE 11-26-93

DATE / TIME	SOURCE	SERIAL NO.	ACTIVITY	SOURCE -A- CHECK, cpm	BACKGROUND -B- CHECK, cpm	INSTRUMENT -C- CONV. - E#	SOURCE BY INSTRUMENT	H.V. AT	BAT	SPKR	DISP	OK / BY
7-23-93 / 0647	Cs137	91C5250	1.24uCi	270,000	4526			890	OK	OK		✓ / G.M.

CALCULATION OF SOURCE BY INSTRUMENT:

(-A-) SOURCE CHECK cpm - BACKGROUND cpm (-B) = dpm OR uR/hr (-D-)
(-C-) INSTRUMENT CONVERSION, OR E#

NOTE: CONVERT EFFICIENCY FROM PERCENT TO DECIMAL EXAMPLE 18% TO 0.18 (EFFICIENCY CALIBRATED PROBES ONLY)

REMARKS:

Form 4A

SAFETY AND ECOLOGY CONSULTANTS, INC.

WEEKLY FIELD SOURCE CHECK LOG

SITE NAME: SMC

BACKGROUND LOCATION AT: SEC office/cave

WEEK ENDING: 7-31-93 (7-25-93 to 7-31-93)

SCALER/RATE METER: Eberline ESP-1 SERIAL NO. 03047 CALIBRATION DATE 5-25-93 DUE 11-25-93

DETECTOR: Eberline SPA-3 SERIAL NO. 409184 CALIBRATION DATE NONE DUE NONE

DATE / TIME	SOURCE	SERIAL NO.	ACTIVITY	SOURCE -A- CHECK, cpm	BACKGROUND -B- CHECK, cpm	INSTRUMENT -C- CONV. - E#	SOURCE BY INSTRUMENT	H.V. AT	BAT	SPKR	DISP	OK / BY
7-26-93 / 0628	Cs137	91CS250	1.24uCi	271,333	4787			909	OK	OK		✓ / F.D.
7-27-93 / 0630	Cs137	91CS250	1.24uCi	271,666	4530			909	OK	OK		✓ / F.D.

CALCULATION OF SOURCE BY INSTRUMENT:

(-A-) SOURCE CHECK cpm - BACKGROUND cpm (-B) = dpm OR uR/hr (-D-)
(-C-) INSTRUMENT CONVERSION, OR E#

NOTE: CONVERT EFFICIENCY FROM PERCENT TO DECIMAL EXAMPLE 18% TO 0.18 (EFFICIENCY CALIBRATED PROBES ONLY)

REMARKS:

SAFETY AND ECOLOGY CONSULTANTS, INC.

WEEKLY FIELD SOURCE CHECK LOG

SITE NAME: SMC

BACKGROUND LOCATION AT: SEC OFFICE/CAVE

WEEK ENDING: 7-31-93 (7-25-93 to 7-31-93)

SCALER/RATE METER: Eberline SRM-100 SERIAL NO. 313 CALIBRATION DATE 5-26-93 DUE 11-26-93

DETECTOR: Eberline SPA-3 SERIAL NO. 408462 CALIBRATION DATE 5-26-93 DUE 11-26-93

DATE / TIME	SOURCE	SERIAL NO.	ACTIVITY	SOURCE -A- CHECK, cpm	BACKGROUND -B- CHECK, cpm	INSTRUMENT -C- CONV. - E#	SOURCE BY INSTRUMENT	H.V. AT	BAT	SPKR	DISP	OK / BY
7-26-93 / 0628	Cs 137	91CS250	1.24uCi	270,666	4683			897	OK	OK		✓ / F.D.
7-27-93 / 0630	Cs 137	91CS250	1.24uCi	270,666	5050			893	OK	OK		✓ / F.D.

CALCULATION OF SOURCE BY INSTRUMENT:

(-A-) SOURCE CHECK cpm - BACKGROUND cpm (-B) = dpm OR uR/hr (-D-)
(-C-) INSTRUMENT CONVERSION, OR E#

NOTE: CONVERT EFFICIENCY FROM PERCENT TO DECIMAL EXAMPLE 18% TO 0.18 (EFFICIENCY CALIBRATED PROBES ONLY)

REMARKS:

Form 4A

SAFETY AND ECOLOGY CONSULTANTS, INC.

WEEKLY FIELD SOURCE CHECK LOG

SITE NAME: SMC

BACKGROUND LOCATION AT: SEC office/cave

WEEK ENDING: 7-24-93 (7-18-93 to 7-24-93)

SCALER/RATE METER: Eberline SRM-100 SERIAL NO. 314 CALIBRATION DATE 11-10-92 DUE 5-10-93

DETECTOR: Eberline AC-3 SERIAL NO. 407083 CALIBRATION DATE 6-23-93 DUE 12-23-93

DATE / TIME	SOURCE	SERIAL NO.	ACTIVITY	SOURCE -A- CHECK, cpm	BACKGROUND -B- CHECK, cpm	INSTRUMENT -C- CONV. - E#	SOURCE BY INSTRUMENT	H.V. AT	BAT	SPKR	DISP	OK / BY
7-21-93 / 0827	Th 230	91TH470 3785	6500 dpm	1100	5	.177	6186 / .168	900	OK	OK		

CALCULATION OF SOURCE BY INSTRUMENT:

(-A-) SOURCE CHECK cpm - BACKGROUND cpm (-B) / (-C-) INSTRUMENT CONVERSION, OR E# = dpm OR uR/hr (-D-)

NOTE: CONVERT EFFICIENCY FROM PERCENT TO DECIMAL EXAMPLE 18% TO 0.18 (EFFICIENCY CALIBRATED PROBES ONLY)

REMARKS:

Form 4A

SAFETY AND ECOLOGY CONSULTANTS, INC.

WEEKLY FIELD SOURCE CHECK LOG

SITE NAME: SMC

BACKGROUND LOCATION AT: SEC office/Cave

WEEK ENDING: 7-24-93 (7-18-93 to 7-24-93)

SCALER/RATE METER: Eberline ESP-1 SERIAL NO. 03049 CALIBRATION DATE 6-23-93 DUE 12-23-93

DETECTOR: Eberline AC-3 SERIAL NO. 407083 CALIBRATION DATE 6-23-93 DUE 12-23-93

DATE / TIME	SOURCE	SERIAL NO.	ACTIVITY	SOURCE -A- CHECK, cpm	BACKGROUND -B- CHECK, cpm	INSTRUMENT -C- CONV. - E#	SOURCE BY INSTRUMENT	H.V. AT	BAT	SPKR	DISP	OK / BY
7/19/93 / 0850	Th 230	91TH470 3785	6500dpm	1080	.6	.177	6098 / 16.6%	900	OK	OK		✓ / F.D.
7-20-93 / 0814	Th 230	91TH470 3785	6500dpm	1096	.8	.177	6188 / 16.8%	900	OK	OK		✓ / G.M.

CALCULATION OF SOURCE BY INSTRUMENT:

(-A-) SOURCE CHECK cpm - BACKGROUND cpm (-B) = dpm OR uR/hr (-D-)
(-C-) INSTRUMENT CONVERSION, OR E#

NOTE: CONVERT EFFICIENCY FROM PERCENT TO DECIMAL EXAMPLE: 18% TO 0.18 (EFFICIENCY CALIBRATED PROBES ONLY)

REMARKS:

Form 4A

SAFETY AND ECOLOGY CONSULTANTS, INC.

WEEKLY FIELD SOURCE CHECK LOG

SITE NAME: SMC

BACKGROUND LOCATION AT: SEC office/cave

WEEK ENDING: 8-28-93 (8-22-93 to 8-28-93)

SCALER/RATE METER: Eberline ESP-1 SERIAL NO. 03047 CALIBRATION DATE 5-26-93 DUE 11-26-93

DETECTOR: Eberline AC-3 SERIAL NO. 407083 CALIBRATION DATE 5-25-93 DUE 11-25-93

DATE / TIME	SOURCE	SERIAL NO.	ACTIVITY	SOURCE -A- CHECK, cpm	BACKGROUND -B- CHECK, cpm	INSTRUMENT -C- CONV. - E#	SOURCE BY INSTRUMENT	H.V. AT	BAT	SPKR	DISP	OK / BY
8-26-93 0643	Th 230	91TH470 3785	6,500dpm	1138	1	.177	6424 / .175	905	OK	OK		✓ F.D.
8-26-93 1737	Th 230	91TH470 3785	6,500dpm	1139	1.2	.177	6429 / .175	909	OK	OK		✓ F.D.
8-27-93 0633	Th 230	91TH470 3785	6,500dpm	1125	2.2	.177	6344 / .173	905	OK	OK		✓ F.D.
8-27-93 1607	Th 230	91TH470 3785	6,500dpm	1147	.8	.177	6476 / .176	909	OK	OK		✓ F.D.

CALCULATION OF SOURCE BY INSTRUMENT:

(-A-) SOURCE CHECK cpm - BACKGROUND cpm (-B) = dpm OR uR/hr (-D-)
(-C-) INSTRUMENT CONVERSION, OR E#

NOTE: CONVERT EFFICIENCY FROM PERCENT TO DECIMAL EXAMPLE 18% TO 0.18 (EFFICIENCY CALIBRATED PROBES ONLY)

REMARKS:

Form 4A

SAFETY AND ECOLOGY CONSULTANTS, INC.

WEEKLY FIELD SOURCE CHECK LOG

SITE NAME: SMC

BACKGROUND LOCATION AT: SEC office/cave

WEEK ENDING: 9-4-93 (8-29-93 to 9-4-93)

SCALER/RATE METER: Eberline ESP-1 SERIAL NO. 03047 CALIBRATION DATE 5-26-93 DUE 11-26-93

DETECTOR: Eberline AC-3 SERIAL NO. 407083 CALIBRATION DATE 5-25-93 DUE 11-25-93

DATE / TIME	SOURCE	SERIAL NO.	ACTIVITY	SOURCE -A- CHECK, cpm	BACKGROUND -B- CHECK, cpm	INSTRUMENT -C- CONV. - E#	SOURCE BY INSTRUMENT	H.V. AT	BAT	SPKR	DISP	OK / BY
9-3-93 0640	Th 230	91TH470 3785	6500dpm	1152	2	.177	6497 / .177	909	OK	OK		✓ F.D.
9-3-93 1035	Th 230	91TH470 3785	6500dpm	1150	1.2	.177	6490 / .177	909	OK	OK		✓ F.D.

CALCULATION OF SOURCE BY INSTRUMENT:

(-A-) SOURCE CHECK cpm - BACKGROUND cpm (-B) = dpm OR uR/hr (-D-)
(-C-) INSTRUMENT CONVERSION, OR E#

NOTE: CONVERT EFFICIENCY FROM PERCENT TO DECIMAL EXAMPLE 18% TO 0.18 (EFFICIENCY CALIBRATED PROBES ONLY)

REMARKS:

Form 4A

SAFETY AND ECOLOGY CONSULTANTS, INC.

WEEKLY FIELD SOURCE CHECK LOG

SITE NAME: SMC

BACKGROUND LOCATION AT: SEC office/cave

WEEK ENDING: 9-11-93 (9-5-93 to 9-11-93)

SCALER/RATE METER: Eberline ESP-1 SERIAL NO. 03047 CALIBRATION DATE 5-25-93 DUE 11-25-93

DETECTOR: Eberline AC-3 SERIAL NO. 407083 CALIBRATION DATE 5-26-93 DUE 11-26-93

DATE / TIME	SOURCE	SERIAL NO.	ACTIVITY	SOURCE -A- CHECK, cpm	BACKGROUND -B- CHECK, cpm	INSTRUMENT -C- CONV. - E#	SOURCE BY INSTRUMENT	H.V. AT	BAT	SPKR	DISP	OK BY
9-8-93 1115	Th230	91TH 470 3785	6500dpm	1137	1.6	.177	6415 / .175	909	OK	OK		✓ F.D.
9-9-93 0635	Th 230	91TH 470 3785	6500dpm	1418	2.2	.177	7999 / .218	905	OK	OK		✓ F.D.
9-10-93 0640	Th230	91TH470 3785	6500dpm	1082	.8	.177	6109 / .166	909	OK	OK		✓ F.D.

CALCULATION OF SOURCE BY INSTRUMENT:

(-A-) SOURCE CHECK cpm - BACKGROUND cpm (-B) = dpm OR uR/hr (-D-)
(-C-) INSTRUMENT CONVERSION, OR E#

NOTE: CONVERT EFFICIENCY FROM PERCENT TO DECIMAL EXAMPLE 18% TO 0.18 (EFFICIENCY CALIBRATED PROBES ONLY)

REMARKS:

Form 4A

SAFETY AND ECOLOGY CONSULTANTS, INC.

WEEKLY FIELD SOURCE CHECK LOG

SITE NAME: SMC

BACKGROUND LOCATION AT: SEC office/cave

WEEK ENDING: 9-18-93 (9-12-93 to 9-18-93)

SCALER/RATE METER: Eberline ESP-1 SERIAL NO. 03047 CALIBRATION DATE 5-25-93 DUE 11-25-93

DETECTOR: Eberline AC-3 SERIAL NO. 407083 CALIBRATION DATE 5-26-93 DUE 11-26-93

DATE / TIME	SOURCE	SERIAL NO.	ACTIVITY	SOURCE -A- CHECK, cpm	BACKGROUND -B- CHECK, cpm	INSTRUMENT -C- CONV. - E#	SOURCE BY INSTRUMENT	H.V. AT	BAT	SPKR	DISP	OK BY
9-14-93 1310	Th230	91TH470 3785	6500dpm	1123	2.2	.177	6332 / .172	905	OK	OK		✓ F.D.
9-14-93 1500	Th230	91TH470 3785	6500dpm	1118	1.8	.177	6306 / .172	905	OK	OK		✓ F.D.

CALCULATION OF SOURCE BY INSTRUMENT:

(-A-) SOURCE CHECK cpm - BACKGROUND cpm (-B) = dpm OR uR/hr (-D-)
(-C-) INSTRUMENT CONVERSION, OR E#

NOTE: CONVERT EFFICIENCY FROM PERCENT TO DECIMAL EXAMPLE 18% TO 0.18 (EFFICIENCY CALIBRATED PROBES ONLY)

REMARKS:

Form 4A

SAFETY AND ECOLOGY CONSULTANTS, INC.

WEEKLY FIELD SOURCE CHECK LOG

SITE NAME: SMC

BACKGROUND LOCATION AT: SEC office/cave

WEEK ENDING: 9-25-93 (9-19-93 to 9-25-93)

SCALER/RATE METER: Eberline ESP-1 SERIAL NO. 03047 CALIBRATION DATE 5-25-93 DUE 11-25-93

DETECTOR: Eberline AC-3 SERIAL NO. 407083 CALIBRATION DATE 5-26-93 DUE 11-26-93

DATE / TIME	SOURCE	SERIAL NO.	ACTIVITY	SOURCE -A- CHECK, cpm	BACKGROUND -B- CHECK, cpm	INSTRUMENT -C- CONV. - E#	SOURCE BY INSTRUMENT	H.V. AT	BAT	SPKR	DISP	OK / BY
9-22-93 / 1325	Th230	91TH470 3785	6500dpm	1105	2.4	.177	6229 / .170	905	OK	OK		✓ / F.D.
9-22-93 / 1502	Th230	91TH470 3785	6500dpm	1109	2.8	.177	6250 / .170	901	OK	OK		✓ / F.D.
9-23-93 / 0637	Th230	91TH470 3785	6500dpm	1097	2.6	.177	6183 / .168	901	OK	OK		✓ / F.D.
9-23-93 / 1502	Th230	91TH470 3785	6500dpm	1107	.4	.177	6252 / .170	901	OK	OK		✓ / F.D.
9-24-93 / 0614	Th230	91TH470 3785	6500dpm	1106	1.4	.177	6241 / .170	901	OK	OK	—	✓ / F.D.

CALCULATION OF SOURCE BY INSTRUMENT:

(-A-) SOURCE CHECK cpm - BACKGROUND cpm (-B) = dpm OR uR/hr (-D-)
(-C-) INSTRUMENT CONVERSION, OR E#

NOTE: CONVERT EFFICIENCY FROM PERCENT TO DECIMAL EXAMPLE 18% TO 0.18 (EFFICIENCY CALIBRATED PROBES ONLY)

REMARKS:

Form 4A

SAFETY AND ECOLOGY CONSULTANTS, INC.

WEEKLY FIELD SOURCE CHECK LOG

SITE NAME: SMC

BACKGROUND LOCATION AT: SEC office/cave

WEEK ENDING: 9-25-93 (9-19-93 to 9-25-93)

SCALER/RATE METER: Eberline ESP-1 SERIAL NO. 03047 CALIBRATION DATE 6-23-93 DUE 12-23-93

DETECTOR: Eberline AC-3 SERIAL NO. 407083 CALIBRATION DATE 5-25-93 DUE 11-25-93

DATE / TIME	SOURCE	SERIAL NO.	ACTIVITY	SOURCE -A- CHECK, cpm	BACKGROUND -B- CHECK, cpm	INSTRUMENT -C- CONV. - E#	SOURCE BY INSTRUMENT	H.V. AT	BAT	SPKR	DISP	OK BY
9-24-93 1350	Th 230	91TH 470 3785	6500 dpm	1138	1.8	.177	6419 / .175	905	OK	OK		✓ F.D.
9-24-93 1534	Th 230	91TH 470 3785	6500 dpm	1147	.4	.177	6478 / .176	905	OK	OK		

CALCULATION OF SOURCE BY INSTRUMENT:

(-A-) SOURCE CHECK cpm - BACKGROUND cpm (-B) = dpm OR uR/hr (-D-)
(-C-) INSTRUMENT CONVERSION, OR E#

NOTE: CONVERT EFFICIENCY FROM PERCENT TO DECIMAL EXAMPLE 18% TO 0.18 (EFFICIENCY CALIBRATED PROBES ONLY)

REMARKS:

Form 4A

SAFETY AND ECOLOGY CONSULTANTS, INC.

WEEKLY FIELD SOURCE CHECK LOG

SITE NAME: SMC

BACKGROUND LOCATION AT: SEC office/cave

WEEK ENDING: 10-2-93 (9-26-93 to 10-2-93)

SCALER/RATE METER: Eberline ~~HP~~ ESP1 F.D. SERIAL NO. 03047 CALIBRATION DATE 6-23-93 DUE 12-23-93

DETECTOR: Eberline AC-3 SERIAL NO. 407083 CALIBRATION DATE 5-25-93 DUE 11-25-93

DATE / TIME	SOURCE	SERIAL NO.	ACTIVITY	SOURCE -A- CHECK, cpm	BACKGROUND -B- CHECK, cpm	INSTRUMENT -C- CONV. - E#	SOURCE BY INSTRUMENT	H.V. AT	BAT	SPKR	DISP	OK / BY
9-27-93 / 0730	Th230	91TH470 3785	6500dpm	1134	2	.177	6395 / .174	901	OK	OK		✓ / F.D.
9-27-93 / 1513	Th230	91TH470 3785	6500dpm	1122	1.6	.177	6330 / .172	909	OK	OK		✓ / F.D.

CALCULATION OF SOURCE BY INSTRUMENT:

(-A-) SOURCE CHECK cpm - BACKGROUND cpm (-B) = dpm OR uR/hr (-D-)
(-C-) INSTRUMENT CONVERSION, OR E#

NOTE: CONVERT EFFICIENCY FROM PERCENT TO DECIMAL EXAMPLE 18% TO 0.18 (EFFICIENCY CALIBRATED PROBES ONLY)

REMARKS:

Form 4A

SAFETY AND ECOLOGY CONSULTANTS, INC.

WEEKLY FIELD SOURCE CHECK LOG

SITE NAME: SMC

BACKGROUND LOCATION AT: SEC office/cave

WEEK ENDING: 10-2-93 (9-26-93 to 10-2-93)

SCALER/RATE METER: Eberline ~~HP~~ ESA1 SERIAL NO. 03047 CALIBRATION DATE 6-23-93 DUE 12-23-93

DETECTOR: Eberline AC-3 SERIAL NO. 407083 CALIBRATION DATE 5-25-93 DUE 11-25-93

DATE / TIME	SOURCE	SERIAL NO.	ACTIVITY	SOURCE -A- CHECK, cpm	BACKGROUND -B- CHECK, cpm	INSTRUMENT -C- CONV. - E#	SOURCE BY INSTRUMENT	H.V. AT	BAT	SPKR	DISP	OK / BY
9-27-93 0730	Th230	91TH470 3785	6500dpm	1134	2	.177	6395 / .174	901	OK	OK		✓ F.D.
9-27-93 1513	Th230	91TH470 3785	6500dpm	1122	1.6	.177	6330 / .172	909	OK	OK		✓ F.D.

CALCULATION OF SOURCE BY INSTRUMENT:

(-A-) SOURCE CHECK cpm - BACKGROUND cpm (-B) = dpm OR uR/hr (-D-)
(-C-) INSTRUMENT CONVERSION, OR E#

NOTE: CONVERT EFFICIENCY FROM PERCENT TO DECIMAL EXAMPLE 18% TO 0.18 (EFFICIENCY CALIBRATED PROBES ONLY)

REMARKS:

Form 4A

SAFETY AND ECOLOGY CONSULTANTS, INC.

WEEKLY FIELD SOURCE CHECK LOG

SITE NAME: SMC

BACKGROUND LOCATION AT: SEC Office/Cave

WEEK ENDING: 7-24-93 (7-18-93 to 7-24-93)

SCALER/RATE METER: Eberline ESP-1 SERIAL NO. 03047 CALIBRATION DATE 5-25-93 DUE 11-25-93

DETECTOR: Eberline HP-210 SERIAL NO. 705796 CALIBRATION DATE 6-23-93 DUE 12-23-93

DATE / TIME	SOURCE	SERIAL NO.	ACTIVITY	SOURCE -A- CHECK, cpm	BACKGROUND -B- CHECK, cpm	INSTRUMENT -C- CONV. - E#	SOURCE BY INSTRUMENT	H.V. AT	BAT	SPKR	DISP	OK / BY
7-19-93 / 0822	SrY90	91SR470 0213	60848 dpm	7960	30	.238	33319 / .130	909	OK	OK		✓ / F.D.
7-19-93 / 1556	SrY90	91SR470 0213	60848 dpm	12400	29	.238	51979 / .203	909	OK	OK		✓ / F.D.
7-20-93 / 0814	SrY90	91SR470 0213	60848 dpm	8680	29.6	.238	36346 / .142	909	OK	OK		✓ / G.M.
7-21-93 / 0827	SrY90	91SR470 0213	60848 dpm	9380	28.8	.238	39291 / .154	913	OK	OK		✓ / F.D.
7/21/93 / 1618	SrY90	91SR470 0213	60848 dpm	10800	30.4	.238	45250 / .177	913	OK	OK		✓ / F.D.
7/22/93 / 0807	SrY90	91SR470 0213	60848 dpm	9860	30	.238	41303 / .162	909	OK	OK		✓ / F.D.

CALCULATION OF SOURCE BY INSTRUMENT:

(-A-) SOURCE CHECK cpm - BACKGROUND cpm (-B) / (-C-) INSTRUMENT CONVERSION, OR E# = dpm OR uR/hr (-D-)

NOTE: CONVERT EFFICIENCY FROM PERCENT TO DECIMAL EXAMPLE 18% TO 0.18 (EFFICIENCY CALIBRATED PROBES ONLY)

REMARKS:

Form 4A

SAFETY AND ECOLOGY CONSULTANTS, INC.

WEEKLY FIELD SOURCE CHECK LOG

SITE NAME: SMC

BACKGROUND LOCATION AT: SEC office / cave

WEEK ENDING: 9-4-93 (8-29-93 to 9-4-93)

SCALER/RATE METER: Eberline ESP-1 SERIAL NO. 03049 CALIBRATION DATE 7-27-93 DUE 1-27-93

DETECTOR: Eberline HP210 SERIAL NO. 705796 CALIBRATION DATE 6-23-93 DUE 12-23-93

DATE / TIME	SOURCE	SERIAL NO.	ACTIVITY	SOURCE -A- CHECK, cpm	BACKGROUND -B- CHECK, cpm	INSTRUMENT -C- CONV. - E#	SOURCE BY INSTRUMENT	H.V. AT	BAT	SPKR	DISP	OK BY
9-3-93 0710	Sr Y90	91SR470 0213	59,350 dpm	10,800	32.2	.238	45,243 / .181	901	OK	OK		✓ F.D.

CALCULATION OF SOURCE BY INSTRUMENT:

(-A-) SOURCE CHECK cpm - BACKGROUND cpm (-B) = dpm OR uR/hr (-D-)
(-C-) INSTRUMENT CONVERSION, OR E#

NOTE: CONVERT EFFICIENCY FROM PERCENT TO DECIMAL EXAMPLE 18% TO 0.18 (EFFICIENCY CALIBRATED PROBES ONLY)

REMARKS:

Form 4A

SAFETY AND ECOLOGY CONSULTANTS, INC.

WEEKLY FIELD SOURCE CHECK LOG

SITE NAME: SMC

BACKGROUND LOCATION AT: SEC office/cave

WEEK ENDING: 9-11-93 (9-5-93 to 9-11-93)

SCALER/RATE METER: Eberline ESP-1 SERIAL NO. 03049 CALIBRATION DATE 7-27-93 DUE 1-27-94

DETECTOR: Eberline HP210 SERIAL NO. 705796 CALIBRATION DATE 6-23-93 DUE 12-23-93

DATE / TIME	SOURCE	SERIAL NO.	ACTIVITY	SOURCE -A- CHECK, cpm	BACKGROUND -B- CHECK, cpm	INSTRUMENT -C- CONV. - E#	SOURCE BY INSTRUMENT	H.V. AT	BAT	SPKR	DISP	OK / BY
9-8-93 / 1115	Sr Y90	91SR470 0213	59,350 dpm	10940	30.8	.238	45,837 / .184	897	OK	OK		✓ / F.D.
9-9-93 / 0635	Sr Y90	91SR470 0213	59,350 dpm	9200	26.6	.238	38,544 / .155	901	OK	OK		✓ / F.D.
9-10-93 / 0640	Sr Y90	91SR470 0213	59,350 dpm	14800	27.6	.238	62,069 / .249	897	OK	OK		✓ / F.D.

CALCULATION OF SOURCE BY INSTRUMENT:

(-A-) SOURCE CHECK cpm - BACKGROUND cpm (-B) = dpm OR uR/hr (-D-)
(-C-) INSTRUMENT CONVERSION, OR E#

NOTE: CONVERT EFFICIENCY FROM PERCENT TO DECIMAL EXAMPLE 18% TO 0.18 (EFFICIENCY CALIBRATED PROBES ONLY)

REMARKS:

Form 4A

SAFETY AND ECOLOGY CONSULTANTS, INC.

WEEKLY FIELD SOURCE CHECK LOG

SITE NAME: SMC

BACKGROUND LOCATION AT: SEC office/cave

WEEK ENDING: 9-18-93 (9-12-93 to -9-18-93)

SCALER/RATE METER: Eberline ESP-1 SERIAL NO. 03049 CALIBRATION DATE 7-27-93 DUE 1-27-94

DETECTOR: Eberline HP210 SERIAL NO. 705796 CALIBRATION DATE 6-23-93 DUE 12-23-93

DATE / TIME	SOURCE	SERIAL NO.	ACTIVITY	SOURCE -A- CHECK, cpm	BACKGROUND -B- CHECK, cpm	INSTRUMENT -C- CONV. - E#	SOURCE BY INSTRUMENT	H.V. AT	BAT	SPKR	DISP	OK BY
9-14-93 1310	Sr Y90	91SR470 0213	59,350 dpm	9860	28.4	.238	41,309 / .166	901	OK	OK		✓ F.D.

CALCULATION OF SOURCE BY INSTRUMENT:

(-A-) SOURCE CHECK cpm - BACKGROUND cpm (-B) = dpm OR uR/hr (-D-)
(-C-) INSTRUMENT CONVERSION, OR E#

NOTE: CONVERT EFFICIENCY FROM PERCENT TO DECIMAL EXAMPLE 18% TO 0.18 (EFFICIENCY CALIBRATED PROBES ONLY)

REMARKS:

Form 4A

SAFETY AND ECOLOGY CONSULTANTS, INC.

WEEKLY FIELD SOURCE CHECK LOG

SITE NAME: SMC

BACKGROUND LOCATION AT: SEC office/cave

WEEK ENDING: 9-25-93 (9-19-93 to 9-25-93)

SCALER/RATE METER: Eberline ESP-1 SERIAL NO. 03049 CALIBRATION DATE 7-27-93 DUE 1-27-94

DETECTOR: Eberline HP210 SERIAL NO. 705796 CALIBRATION DATE 6-23-93 DUE 12-23-93

DATE / TIME	SOURCE	SERIAL NO.	ACTIVITY	SOURCE -A- CHECK, cpm	BACKGROUND -B- CHECK, cpm	INSTRUMENT -C- CONV. - E#	SOURCE BY INSTRUMENT	H.V. AT	BAT	SPKR	DISP	OK BY
9-22-93 1325	Sr90	91SR470 0213	59,350 dpm	11020	26	.238	46,193 / .185	905	OK	OK		✓ F.D.
9-23-93 0637	Sr90	91SR470 0213	59,350 dpm	10140	27.4	.238	42490 / .170	905	OK	OK		✓ F.D.

CALCULATION OF SOURCE BY INSTRUMENT:

(-A-) SOURCE CHECK cpm - BACKGROUND cpm (-B) = dpm OR uR/hr (-D-)
(-C-) INSTRUMENT CONVERSION, OR E#

NOTE: CONVERT EFFICIENCY FROM PERCENT TO DECIMAL EXAMPLE 18% TO 0.18 (EFFICIENCY CALIBRATED PROBES ONLY)

REMARKS:

Form 4A

SAFETY AND ECOLOGY CONSULTANTS, INC.

WEEKLY FIELD SOURCE CHECK LOG

SITE NAME: SMC

BACKGROUND LOCATION AT: SEC office / cave

WEEK ENDING: 9-25-93 (9-19-93 to 9-25-93)

SCALER/RATE METER: Eberline ESP-1 SERIAL NO. 03049 CALIBRATION DATE 7-27-93 DUE 1-27-94

DETECTOR: Eberline HP210 SERIAL NO. 705-797 CALIBRATION DATE 5-23-93 DUE 11-23-93

DATE / TIME	SOURCE	SERIAL NO.	ACTIVITY	SOURCE -A- CHECK, cpm	BACKGROUND -B- CHECK, cpm	INSTRUMENT -C- CONV. - E#	SOURCE BY INSTRUMENT	H.V. AT	BAT	SPKR	DISP	OK / BY
9-24-93 / 0620	Sr Y 90	915R470 0213	59,350 dpm	11200	34.2	.240	46524 / .188	901	OK	OK		✓ / F.D.

CALCULATION OF SOURCE BY INSTRUMENT:

(-A-) SOURCE CHECK cpm - BACKGROUND cpm (-B) = dpm OR uR/hr (-D-)
(-C-) INSTRUMENT CONVERSION, OR E#

NOTE: CONVERT EFFICIENCY FROM PERCENT TO DECIMAL EXAMPLE 18% TO 0.18 (EFFICIENCY CALIBRATED PROBES ONLY)

REMARKS:

Form 4A

SAFETY AND ECOLOGY CONSULTANTS, INC.

WEEKLY FIELD SOURCE CHECK LOG

SITE NAME: SMC

BACKGROUND LOCATION AT: SEC office/cave

WEEK ENDING: 10-2-93 (9-26-93 to 10-2-93)

SCALER/RATE METER: Eberline ESP-1 SERIAL NO. 03049 CALIBRATION DATE 7-27-93 DUE 1-27-94

DETECTOR: Eberline HP210 SERIAL NO. 705797 CALIBRATION DATE 5-23-93 DUE 11-23-93

DATE / TIME	SOURCE	SERIAL NO.	ACTIVITY	SOURCE -A- CHECK, cpm	BACKGROUND -B- CHECK, cpm	INSTRUMENT -C- CONV. - E#	SOURCE BY INSTRUMENT	H.V. AT	BAT	SPKR	DISP	OK / BY
7-27-93 / 0730	Sr Y90	91SR470 0213	5-9,350dpm	9600	31.6	.240	39,868 / .161	901	OK	OK		✓ / F.D.

CALCULATION OF SOURCE BY INSTRUMENT:

(-A-) SOURCE CHECK cpm - BACKGROUND cpm (-B) = dpm OR uR/hr (-D-)
(-C-) INSTRUMENT CONVERSION, OR E#

NOTE: CONVERT EFFICIENCY FROM PERCENT TO DECIMAL EXAMPLE 18% TO 0.18 (EFFICIENCY CALIBRATED PROBES ONLY)

REMARKS:

Form 4A

SAFETY AND ECOLOGY CONSULTANTS, INC.

WEEKLY FIELD SOURCE CHECK LOG

SITE NAME: SMC

BACKGROUND LOCATION AT: SEC office/cave

WEEK ENDING: 10-2-93 (9-26-93 to 10-2-93)

SCALER/RATE METER: Eberline ESP-1 SERIAL NO. 03049 CALIBRATION DATE 7-27-93 DUE 1-27-94

DETECTOR: Eberline HP210 SERIAL NO. 705797 CALIBRATION DATE 5-23-93 DUE 11-23-93

DATE / TIME	SOURCE	SERIAL NO.	ACTIVITY	SOURCE -A- CHECK, cpm	BACKGROUND -B- CHECK, cpm	INSTRUMENT -C- CONV. - E#	SOURCE BY INSTRUMENT	H.V. AT	BAT	SPKR	DISP	OK BY
9-27-93 0730	Sr 90	91SR470 0213	5-9,350 dpm	9600	31.6	.240	39,868 / .161	901	OK	OK		✓ F.D.

CALCULATION OF SOURCE BY INSTRUMENT:

(-A-) SOURCE CHECK cpm - BACKGROUND cpm (-B) = dpm OR uR/hr (-D-)
(-C-) INSTRUMENT CONVERSION, OR E#

NOTE: CONVERT EFFICIENCY FROM PERCENT TO DECIMAL EXAMPLE 18% TO 0.18 (EFFICIENCY CALIBRATED PROBES ONLY)

REMARKS:

Form 4A

SAFETY AND ECOLOGY CONSULTANTS, INC.

WEEKLY FIELD SOURCE CHECK LOG

SITE NAME: SMC

BACKGROUND LOCATION AT: SEC office / cave

WEEK ENDING: 9-4-93 (8-29-93 to 9-4-93)

SCALER/RATE METER: SAC-4 (Eberline) SERIAL NO.: 868 CALIBRATION DATE: 7-30-93 DUE: 1-30-94

DETECTOR: _____ SERIAL NO.: _____ CALIBRATION DATE: _____ DUE: _____

DATE / TIME	SOURCE	SERIAL NO.	ACTIVITY	SOURCE -A- CHECK, cpm	BACKGROUND -B- CHECK, cpm	INSTRUMENT -C- CONV. - E#	SOURCE BY INSTRUMENT	H.V. AT	BAT	SPKR	DISP	OK BY
9-3-93 0900	Th 230	91TM470 3785	6500 dpm	2325	.28	.3638	6390 / .3576	850	N/A	N/A		✓ F.D.

CALCULATION OF SOURCE BY INSTRUMENT:

(-A-) SOURCE CHECK cpm - BACKGROUND cpm (-B) / (-C-) INSTRUMENT CONVERSION, OR E# = dpm OR uR/hr (-D-)

NOTE: CONVERT EFFICIENCY FROM PERCENT TO DECIMAL EXAMPLE 18% TO 0.18 (EFFICIENCY CALIBRATED PROBES ONLY)

REMARKS: _____

Form 4A

SAFETY AND ECOLOGY CONSULTANTS, INC.

WEEKLY FIELD SOURCE CHECK LOG

SITE NAME: SMC

BACKGROUND LOCATION AT: SEC office/cave

WEEK ENDING: 9-11-93 (9-5-93 to 9-11-93)

SCALER/RATE METER: SAC-4 (Eberline) SERIAL NO. 868 CALIBRATION DATE 7-30-93 DUE 1-30-94

DETECTOR: _____ SERIAL NO. _____ CALIBRATION DATE _____ DUE _____

DATE / TIME	SOURCE	SERIAL NO.	ACTIVITY	SOURCE -A- CHECK, cpm	BACKGROUND -B- CHECK, cpm	INSTRUMENT -C- CONV. - E#	SOURCE BY INSTRUMENT	H.V. AT	BAT	SPKR	DISP	OK / BY
9-7-93 0640	Th 230	91TH470 3785	6500 dpm	2303	.44	.3638	6329 / .3542	850	N/A	N/A		✓ F.D.
9-8-93 0630	Th 230	91TH470 3785	6500 dpm	2361	.48	.3638	6488 / .3631	850	N/A	N/A		✓ F.D.
9-9-93 ~~9-8-93~~ 0635	Th 230	91TH470 3785	6500 dpm	2337	.6	.3638	6422 / .3594	850	N/A	N/A		✓ F.D.
9-10-93 0640	Th 230	91TH470 3785	6500 dpm	2340	.22	.3638	6432 / .3600	850	N/A	N/A		✓ F.D.

CALCULATION OF SOURCE BY INSTRUMENT:

(-A-) SOURCE CHECK cpm - BACKGROUND cpm (-B) = dpm OR uR/hr (-D-)
(-C-) INSTRUMENT CONVERSION, OR E#

NOTE: CONVERT EFFICIENCY FROM PERCENT TO DECIMAL EXAMPLE 18% TO 0.18 (EFFICIENCY CALIBRATED PROBES ONLY)

REMARKS: _____

Form 4A

SAFETY AND ECOLOGY CONSULTANTS, INC.

WEEKLY FIELD SOURCE CHECK LOG

SITE NAME: SMC

BACKGROUND LOCATION AT: SEC office/cave

WEEK ENDING: 9-18-93 (9-12-93 to 9-18-93)

SCALER/RATE METER: SAC-4 (Eberline) SERIAL NO.: 868 CALIBRATION DATE: 7-30-93 DUE: 1-30-94

DETECTOR: SERIAL NO.: CALIBRATION DATE: DUE:

DATE / TIME	SOURCE	SERIAL NO.	ACTIVITY	SOURCE -A- CHECK, cpm	BACKGROUND - B- CHECK, cpm	INSTRUMENT -C- CONV. - E#	SOURCE BY INSTRUMENT	H.V. AT	BAT	SPKR	DISP	OK BY
9-13-93 0635	Th230	91TH470 3785	6500dpm	2301	.54	.3638	6323 / .3539	850	N/A	N/A		✓ F.D.
9-14-93 0635	Th230	91TH470 3785	6500dpm	2321	.34	.3638	6379 / .3570	850	N/A	N/A		✓ F.D.
9-15-93 0633	Th230	91TH470 3785	6500dpm	2336	.32	.3638	6420 / .3593	850	N/A	N/A		✓ F.D.
9-16-93 0635	Th230	91TH470 3785	6500 dpm	2241	.3	.3638	6159 / .3447	850	N/A	N/A		✓ F.D.
~~9-16-93~~ 9-17-93 0640	F.D. Th230	91TH470 3785	6500dpm	2317	.2	.3638	6368 / .3564	850	N/A	N/A		✓ F.D.

CALCULATION OF SOURCE BY INSTRUMENT:

(-A-) SOURCE CHECK cpm - BACKGROUND cpm (-B) / (-C-) INSTRUMENT CONVERSION, OR E# = dpm OR uR/hr (-D-)

NOTE: CONVERT EFFICIENCY FROM PERCENT TO DECIMAL EXAMPLE 18% TO 0.18 (EFFICIENCY CALIBRATED PROBES ONLY)

REMARKS:

Form 4A

SAFETY AND ECOLOGY CONSULTANTS, INC.

WEEKLY FIELD SOURCE CHECK LOG

SITE NAME: SMC

BACKGROUND LOCATION AT: SEC office/cave

WEEK ENDING: 9-25-93 (9-19-93 to 9-25-93)

SCALER/RATE METER: Eberline SAC-4 SERIAL NO.: 868 CALIBRATION DATE: 7-30-93 DUE: 1-30-94

DETECTOR: SERIAL NO.: CALIBRATION DATE: DUE:

DATE / TIME	SOURCE	SERIAL NO.	ACTIVITY	SOURCE -A- CHECK, cpm	BACKGROUND -B- CHECK, cpm	INSTRUMENT -C- CONV. - E#	SOURCE BY INSTRUMENT	H.V. AT	BAT	SPKR	DISP	OK BY
9-20-93 0637	Th 230	91TH470 3785	6500dpm	2383	.24	.3638	6550 / .3666	850	N/A	N/A		✓ F.D.
9-21-93 0640	Th 230	91TH470 3785	6500dpm	2316	.22	.3638	6366 / .3563	850	N/A	N/A		✓ F.D.
9-22-93 0632	Th 230	91TH470 3785	6500dpm	2288	.2	.3638	6287 / .3520	850	N/A	N/A		✓ F.D.
9-23-93 0637	Th 230	91TH470 3785	6500dpm	2199	.2	.3638	6044 / .3383	850	N/A	N/A		✓ F.D.
9-24-93 0608	Th 230	91TH470 3785	6500dpm	2317	.38	.3638	6368 / .3564	850	N/A	N/A	—	✓ F.D.

CALCULATION OF SOURCE BY INSTRUMENT:

(-A-) SOURCE CHECK cpm - BACKGROUND cpm (-B) = dpm OR uR/hr (-D-)
(-C-) INSTRUMENT CONVERSION, OR E#

NOTE: CONVERT EFFICIENCY FROM PERCENT TO DECIMAL EXAMPLE 18% TO 0.18 (EFFICIENCY CALIBRATED PROBES ONLY)

REMARKS:

Form 4A

SAFETY AND ECOLOGY CONSULTANTS, INC.

WEEKLY FIELD SOURCE CHECK LOG

SITE NAME: SMC

BACKGROUND LOCATION AT: SEC office / cave

WEEK ENDING: 10-2-93 (9-26-93 to 10-2-93)

SCALER/RATE METER: Eberline SAC-4 SERIAL NO.: 868 CALIBRATION DATE: 7-30-93 DUE: 1-30-94

DETECTOR: SERIAL NO.: CALIBRATION DATE: DUE:

DATE / TIME	SOURCE	SERIAL NO.	ACTIVITY	SOURCE -A- CHECK, cpm	BACKGROUND -B- CHECK, cpm	INSTRUMENT -C- CONV. - E#	SOURCE BY INSTRUMENT	H.V. AT	BAT	SPKR	DISP	OK BY
9-27-93 0530	Th230	91TH470 3785	6500 dpm	2296	.26	.3638	6310 / .3532	850	N/A	N/A		✓ F.O.
9-28-93 0527	Th230	91TH470 3785	6500 dpm	2301	.2	.3638	6324 / .3540	850	N/A	N/A		✓ F.D.
9-29-93 0522	Th230	91TH470 3785	6500 dpm	2332	.26	.3638	6409 / .3587	850	N/A	N/A		✓ F.D.
9-30-93 0530	Th230	91TH470 3785	6500 dpm	2302	.3	.3638	6327 / .3541	850	N/A	N/A		✓ F.D.

CALCULATION OF SOURCE BY INSTRUMENT:

(-A-) SOURCE CHECK cpm - BACKGROUND cpm (-B) = dpm OR uR/hr (-D-)
(-C-) INSTRUMENT CONVERSION, OR E#

NOTE: CONVERT EFFICIENCY FROM PERCENT TO DECIMAL EXAMPLE 18% TO 0.18 (EFFICIENCY CALIBRATED PROBES ONLY)

REMARKS:

Form 4A

SAFETY AND ECOLOGY CONSULTANTS, INC.

WEEKLY FIELD SOURCE CHECK LOG

SITE NAME: SMC

BACKGROUND LOCATION AT: SEC office / cave

WEEK ENDING: 10-2-93 (9-26-93 to 10-2-93)

SCALER/RATE METER: Eberline SAC-4 SERIAL NO.: 868 CALIBRATION DATE: 7-30-93 DUE: 1-30-94

DETECTOR: SERIAL NO.: CALIBRATION DATE: DUE:

DATE / TIME	SOURCE	SERIAL NO.	ACTIVITY	SOURCE -A- CHECK, cpm	BACKGROUND -B- CHECK, cpm	INSTRUMENT -C- CONV. - E#	SOURCE BY INSTRUMENT	H.V. AT	BAT	SPKR	DISP	OK BY
9-27-93 0530	Th230	91TH470 3785	6500 dpm	2296	.26	.3638	6310 / .3532	850	N/A	N/A		✓ F.O.
9-28-93 0527	Th230	91TH470 3785	6500 dpm	2301	.2	.3638	6324 / .3540	850	N/A	N/A		✓ F.D.
9-29-93 0522	Th230	91TH470 3785	6500 dpm	2332	.26	.3638	6409 / .3587	850	N/A	N/A		✓ F.D.
9-30-93 0530	Th230	91TH470 3785	6500 dpm	2302	.3	.3638	6327 / .3541	850	N/A	N/A		✓ F.D.
10-1-93 0531	Th230	91TH470 3785	6500 dpm	2330	.38	.3638	6404 / .3584	850	N/A	N/A	—	✓ F.D.

CALCULATION OF SOURCE BY INSTRUMENT:

(-A-) SOURCE CHECK cpm - BACKGROUND cpm (-B) = dpm OR uR/hr (-D-)
(-C-) INSTRUMENT CONVERSION, OR E#

NOTE: CONVERT EFFICIENCY FROM PERCENT TO DECIMAL EXAMPLE 18% TO 0.18 (EFFICIENCY CALIBRATED PROBES ONLY)

REMARKS:

Form 4A

SAFETY AND ECOLOGY CONSULTANTS, INC.

WEEKLY FIELD SOURCE CHECK LOG

SITE NAME: SMC

BACKGROUND LOCATION AT: SEC office/cave

WEEK ENDING: 10-9-93 (10-3-93 to 10-9-93)

SCALER/RATE METER: Eberline SAC-4 SERIAL NO.: 868 CALIBRATION DATE: 7-30-93 DUE: 1-30-94

DETECTOR: SERIAL NO.: CALIBRATION DATE: DUE:

DATE / TIME	SOURCE	SERIAL NO.	ACTIVITY	SOURCE -A- CHECK, cpm	BACKGROUND -B- CHECK, cpm	INSTRUMENT -C- CONV. - E#	SOURCE BY INSTRUMENT	H.V. AT	BAT	SPKR	DISP	OK BY
10-4-93 0640	Th230	91TH470 3785	6500dpm	2241	.44	.3638	~~5093~~ 6158 / .3447 F.D.	850	N/A	N/A		✓ F.D.
10-5-93 0634	Th230	91TH470 3785	6500dpm	2266	.38	.3638	6228 / .3486	850	N/A	N/A		✓ F.D.
10-6-93 0643	Th230	91TH470 3785	6500dpm	2277	.36	.3638	6258 / .3502	850	N/A	N/A		✓ F.D.
10-7-93 0650	Th230	91TH470 3785	6500dpm	2244	.36	.3638	6167 / .3452	850	N/A	N/A		✓ F.D.

CALCULATION OF SOURCE BY INSTRUMENT:

(-A-) SOURCE CHECK cpm - BACKGROUND cpm (-B) = dpm OR uR/hr (-D-)
(-C-) INSTRUMENT CONVERSION, OR E#

NOTE: CONVERT EFFICIENCY FROM PERCENT TO DECIMAL EXAMPLE 18% TO 0.18 (EFFICIENCY CALIBRATED PROBES ONLY)

REMARKS:

Form 4A

SAFETY AND ECOLOGY CONSULTANTS, INC.

WEEKLY FIELD SOURCE CHECK LOG

SITE NAME: SMC

BACKGROUND LOCATION AT: SEC office / cave

WEEK ENDING: 10-16-93 (10-10-93 to 10-16-93)

SCALER/RATE METER: Eberline SAC-4 SERIAL NO.: 868 CALIBRATION DATE: 7-30-93 DUE: 1-30-94

DETECTOR: SERIAL NO.: CALIBRATION DATE: DUE:

DATE / TIME	SOURCE	SERIAL NO.	ACTIVITY	SOURCE -A- CHECK, cpm	BACKGROUND -B- CHECK, cpm	INSTRUMENT -C- CONV. - E#	SOURCE BY INSTRUMENT	H.V. AT	BAT	SPKR	DISP	OK / BY
10-12-93 / 0645	Th230	91TH470 3785	6500 dpm	2351	.36	.3638	6461 / .3616	850	N/A	N/A		✓ / F.D.
10-13-93 / 0640	Th230	91TH470 3785	6500 dpm	2338	.16	.3638	6426 / .3597	850	N/A	N/A		✓ / F.D.
10-14-93 / 0640	Th230	91TH 470 3785	6500 dpm	2356	.36	.3638	6475 / .3624	850	N/A	N/A		✓ / F.D.
10-15-93 / 0643	Th230	91TH 470 3785	6500 dpm	2261	.22	.3638	6214 / .3478	850	N/A	N/A		✓ / F.D.

CALCULATION OF SOURCE BY INSTRUMENT:

(-A-) SOURCE CHECK cpm - BACKGROUND cpm (-B) = dpm OR uR/hr (-D-)
(-C-) INSTRUMENT CONVERSION, OR E#

NOTE: CONVERT EFFICIENCY FROM PERCENT TO DECIMAL EXAMPLE 18% TO 0.18 (EFFICIENCY CALIBRATED PROBES ONLY)

REMARKS:

Form 4A

SAFETY AND ECOLOGY CONSULTANTS, INC.

WEEKLY FIELD SOURCE CHECK LOG

SITE NAME: SMC

BACKGROUND LOCATION AT: SEC office/cave

WEEK ENDING: 10-23-93 (10-17-93 to 10-23-93)

SCALER/RATE METER: Eberline SAC-4 SERIAL NO.: 868 CALIBRATION DATE: 7-30-93 DUE: 1-30-94

DETECTOR: SERIAL NO.: CALIBRATION DATE: DUE:

DATE / TIME	SOURCE	SERIAL NO.	ACTIVITY	SOURCE -A- CHECK, cpm	BACKGROUND -B- CHECK, cpm	INSTRUMENT -C- CONV. - E#	SOURCE BY INSTRUMENT	H.V. AT	BAT	SPKR	DISP	OK BY
10-18-93 0648	Th230	91TH470 3785	6500dpm	2303	.24	.3638	6330 / .3543	850	N/A	N/A		✓ F.D.

CALCULATION OF SOURCE BY INSTRUMENT:

(-A-) SOURCE CHECK cpm - BACKGROUND cpm (-B) = dpm OR uR/hr (-D-)
(-C-) INSTRUMENT CONVERSION, OR E#

NOTE: CONVERT EFFICIENCY FROM PERCENT TO DECIMAL EXAMPLE 18% TO 0.18 (EFFICIENCY CALIBRATED PROBES ONLY)

REMARKS:

Form 4A

APPENDIX 4

WORK PLAN

SURVEY AND SAMPLING PROTOCOL FOR FeV SLAG AT THE SHIELDALLOY CORPORATION NEWFIELD, NEW JERSEY

SHIELDALLOY METALLURGICAL CORPORATION
WEST BOULEVARD
NEWFIELD, NEW JERSEY 08344

ORIGINAL: OCTOBER 1991
AMENDMENT 1: OCTOBER 1992

TABLE OF CONTENTS

Cover Page 1

Table of Contents 2

SECTION 1.0 INTRODUCTION 3

1.1 Background
1.2 Site Work Area Description
1.3 Scope and Purpose

SECTION 2.0 HEALTH AND SAFETY REQUIREMENTS 5

2.1 Radiological Health and Safety
2.2 Occupational Health and Safety

SECTION 3.0 WORK PROCEDURE 9

3.1 Initial Radiation Survey
3.2 Transfer Operation and Detailed Survey
3.3. FeV Product Sampling
3.4 Equipment Release Surveys

SECTION 4.0 FINAL REPORT DOCUMENTATION 11

REFERENCES 11

ENCLOSURES 11

SECTION 1.0 INTRODUCTION

1.1 Background

The Shieldalloy Metallurgical Corporation (SMC) of Newfield, New Jersey manufactures a variety of specialty ferro alloys from ore materials. The process methods for two of the manufactured products each produces a byproduct from the operation; FeCb (ferrocolumbium) and FeV (ferrovanadium) slag. The FeCb slag is unique in that the ore contains naturally elevated concentrations of thorium and uranium. The thorium and uranium in the FeCb slag typically exceed 0.05% by weight and are subject to and controlled by the USNRC Source Material License held by SMC. The other FeV slag does not contain licensable quantities of radioactive material and SMC plans to sell this product to other manufacturers. Both types of slag are stockpiled in segregated areas located at the eastern end of the SMC property. This area is refered to as the Source Material Storage Yard (SMSY).

SMC has formatted a radiological, direct-reading screening and sampling protocol in order to assure the FeV slag product does not exceed the regulatory limits for radioactive source material and is not appreciably contaminated with other materials having higher concentrations of radioactivity than the FeV slag. This plan describes the radiological methodology designed to screen the FeV slag.

1.2 SMC Site Work Area Description

The general work area is the eastern end of the SMSY extending from the western limit of the FeV slag stockpile(s) to the site security fence. The work area is adjacent to the radiologically controlled area (RCA) associated with the FeCb source material slag piles.

Work activities in this area can be summarized as follows:

1.2.1 Removal of FeV slag from existing stockpile(s) and initial gamma radiation screening surveys of material directly upon removal.

1.2.2 Transfer of FeV slag to an intermediate laydown area for a detailed gamma radiation screening survey. If FeCb source material is found during the above gamma screening surveys are to be removed and later returned to the original FeCb

storage piles. This intermediate laydown area will be established east of the existing FeV slag piles in the open area of the east end of the SMSY. A schematic representation of the work area is shown as Enclosure E.

1.2.3 The subcontractor will draw screened material from the intermediate laydown area for crushing operations. Several product piles will be created and fully identified for later disposition. Sampling and gamma spectroscopy analysis for Th232 and U238 will be performed for each of the product piles as described in this plan.

The work area established in this plan has been previously characterized by others (ORAU 88) and has elevated gamma radiation levels contributed from shine by the two primary FeCb slag piles in the RCA.

The source material FeCb slag can be described as discrete rock-like material with no significant transferable contamination hazard, although small particle fines and other isolated areas of FeCb non-slag materials have been evidenced in the RCA.

For the purpose of this plan, the entire work area will be established and regarded as an RCA. The work area is shown as Enclosure A to this plan.

1.3 Scope and Purpose

The scope of this plan integrates the radiological survey, sampling and health and safety program with the subcontractors crushing operation. The purpose of this work activity as implemented in this plan is to assure that:

1.3.1 work is performed in a safe and efficient manner in accordance with SMC contractual requirements and USNRC regulatory requirements.

1.3.2 a creditable radiological survey and sampling program is maintained to ensure the FeV product material meets the permissible radioactivity concentration limits and that no appreciable contamination with source material or other licensed material is contained within.

The final confirmatory sampling of the FeV product material will provide the analytical basis for characterization of the product material as non-source material and that no appreciable contamination with source material or other licensed material is contained

within. 'Source material' means: (i) Uranium or thorium, or any combination thereof, in any physical or chemical form; or (ii) ores which contain by weight one-twentieth of one percent (0.05%) or more of (a) uranium (b) thorium or (c) any combination thereof. (10CFR20)

The gamma spectroscopy quantatative measurements described in this plan will measure the Thorium and Uranium radioactivity concentrations in the product material for direct comparison to the source material weight percent limits and confirmation of the non-radiological status of the product material.

SECTION 2.0 HEALTH AND SAFETY REQUIREMENTS

2.1 Radiological Health and Safety

2.1.1 Radiological Training

Federal law (10CFR19) requires licensees to provide instruction to workers involved with handling radioactive materials in restricted areas. The instruction is intended to inform personnel of the potential hazards and their individual responsibility, and that of the licensee, for implementation of the radiation safety program.

All project personnel shall receive this training and familiarization prior to the start of operations. Documentation of this training shall be signature verified on Enclosure B to this plan.

2.1.2 Personnel Radiation Exposure Monitoring

All personnel engaged in segregation and crushing operations shall wear a radiation exposure monitoring device called a Thermolumniscent Dosimeter (TLD). The TLD will be worn on the front portion of the trunk of the body and issued and returned on a daily basis. Upon project completion, the TLD's will be returned to an accredited dosimetric laboratory for analysis of integrated radiation exposure for each individual. Each worker may request and receive a copy of the TLD exposure report for this project for their personal and/or employer records.

The general gamma radiation level extant in the work area varies approximately from 20 uR/hr to 40 uR/hr. Although the work will be planned to take advantage of naturally shielded areas and selection of areas with lower radiation levels for stationary work, a potential exists for an individual to receive a detectable (mRem) gamma radiation exposure. However, detectable exposures are expected to be extremely small and well within allowable unrestricted area limits.

2.1.3 Bioassay Monitoring

Personnel will be monitored for the potential ingestion and inhalation of radioactive materials by urinalysis bioassay. Two one-liter urine samples shall be collected from personnel, one each at the start and termination of project operations and collected over a 24 hour period. An accredited vendor laboratory will perform radiochemical analysis for U238 and Th232 on each set of individual samples. No uptake of radioactive material is expected due to the physical form of the radioactive material (FeCb) and the limited handling of the FeCb slag. Results of bioassay monitoring can be requested by individuals.

2.1.4 Respiratory Protection and Personal Protective Equipment

Respiratory protection for airborne radionuclides will not be required for these work activities. No abrasive handling of radioactive material will be performed and work activities will be performed in areas well distanced from the FeCb slag piles. Air sampling will be performed on a periodic basis as discussed in 2.1.6.

Personal protective equipment and clothing for anti-contamination concerns will not be required for this work. Occupational health and safety PPE will be required as described in 2.2. Manual handling of manageable fragments of FeCb slag will be done using work gloves for hand protection. No removable contamination is expected from handling of FeCb material, however, nominal contamination control practices will be performed to verify contamination conditions as discussed in 2.1.5.

Eating and drinking will not be allowed in the

work area except in a break area approved by the licensee.

2.1.5 Contamination Controls

A program for contamination controls will be implemented for personnel and equipment to verify contamination status as follows:

2.1.5.1 periodic surveys of work gloves and other high contact items for beta-gamma contamination in allowable low background areas in the work area.

2.1.5.2 whole body beta-gamma surveys of personnel and equipment surveys after leaving the controlled area in the closest allowable low background area outside the controlled area.

Results of routine contamination surveys will be used to adjust contamination control program requirements.

2.1.6 Radiation Detection Instrumentation

Calibrated radiation detection instrumentation of the following types and applicability will be utilized on the project:

2.1.6.1 Portable ratemeters/scalers with 2" x 2" NaI gamma scintillation detectors for survey and segregation of slag material, e.g., Ludlum M.2221 with M.44-10 detector.

2.1.6.2 Portable ratemeters/scalers with gas flow proportional detectors for general beta-gamma surveys, e.g., Ludlum M.2221 with M.43-68 detector.

2.1.6.3 Portable ratemeters with alpha scintillation detectors, e.g., Ludlum M.3 with M.43-65.

2.1.6.4 Portable gamma scintillation detector for general gamma exposure rate surveys in uR per hour, e.g., Ludlum M.19.

2.1.6.5 Low volume (1 to 3 cfm) air samplers, e.g., Eberline RAS-1. Periodic air samples will be taken downwind of

handling and crushing areas during the duration of the project. Air samples will be analyzed to show compliance with the Th232 allowable air concentration limit of 1.0E-12 uCi/cc for unrestricted areas.

2.2 OCCUPATIONAL HEALTH AND SAFETY

2.2.1 Personal Protective Equipment and Training

All personnel shall wear hard hats, safety glasses, and safety (steel toe) shoes for this work as required by the SMC safety program for on-site work. All subcontractor personnel shall review and comply with all provisions of the SMC safety program while working at the SMC site.

2.2.2 Noise Monitoring and Abatement

SMC will provide noise monitoring during heavy equipment operations. Noise abatement methods and/or hearing protection will be provided by the subcontractor as required by SMC compliance requirements.

2.2.3 Dust Abatement

The contractor crushing mill shall not generate any visible dusts during operations. The contractor shall ensure that installed dust mitigation systems, e.g., water mist or ventilation containment, are operable and effective. SMC will monitor crushing operations for dust abatement integrity and compliance requirements.

2.2.4 Lifting and Handling

Personnel shall not lift or handle slag which require more than a nominal effort by one person. Large slag pieces destined for segregation shall be handled and transferred by front end loader or equivalent equipment.

Personnel shall not climb slag piles for access to survey. Surveys and handling of slag shall be done from a firm level surface.

SECTION 3.0 WORK PROCEDURE

Enclosure C presents a process flowchart of the work methodology.

3.1 Initial Radiation Survey

The FeV slag pile will be accessed on the south side for slag debris removal with a front end loader. Radiological control technicians (RCT) personnel will perform initial gamma radiation scan surveys of the slag material using 2" x 2" NaI detectors. Due to the variability in background gamma radiation and the discrete 'point source' radiation intensity of the FeCb slag, any indication of radiation which exceeds twice the background radiation shall be indicative of potential FeCb slag radiation contributions.

3.1.1 Large FeCb slag pieces shall be spray painted with a durable and highly visible mark for later removal with power equipment. Small pieces may be manually removed and set aside in a controllable area for later disposition.

3.1.2 The RCT will continue gamma suveys on accessible pieces of slag in the loading area and front end loader as work continues. Personnel shall stand well back from the slag pile during loading operations to avoid being struck by sliding material.

NOTE: The initial survey at the loading area will not be able to access all slag in the front end loader. The purpose of this survey point is to mark individual slag pieces on top of the load as well as to prevent large quantities of FeCb slag being added in the FeV pile.

3.2 Transfer and Detailed Radiation Survey

The front end loader will transfer the load to an intermediate laydown area, the extent of which has been initially surveyed with the NaI detector to determine the magnitude of the background radiation at the surface of the area. The FeV slag will be discharged and spread in rows as operations continue. The exposed slag will be surveyed to the

same criteria of 3.1. If radiation contributions which exceed twice background are detected, the immediate area of the slag will be investigated in a detailed manner with the NaI detector to identify radiation sources. The planar distribution of slag will allow for physical access and a detailed survey of the material. The contractor shall additionally scan the slag with a commercially available metal detector to discern fugitive metallic material which may be imbeded in the slag. Slag material which indicates metal content will be removed from the process flowpath and placed in an area designated by SMC for later disposition.

The front end loader may then transfer FeV slag material to a predetermined area selected for the subcontractors screening and crushing machinery after any identified FeCb slag has been removed. The discharge and removal of slag from the intermediate laydown area should be sequenced such that surveys and heavy equipment operations can continue in an uninterrupted manner. RCT personnel shall be responsible to ensure that suspect marked slag is removed and controlled prior to transfer of FeV slag to the crushing machinery location.

Prior to crushing operations, the slag shall be screened in contractor provided screening machinery sized to effectively remove all soils which may have been transferred with the slag during loader operations. Screened slag is then ready for crushing operations. Soil shall be transferred to an area designated by SMC.

3.3 FeV Product Sampling

Representative samples of the FeV product material will be taken during the crushing operations. Samples of small particle fines will be collected and transferred to 500 cc Marinelli geometry containers for gamma spectroscopy analysis. Four samples will be collected for each of the individually identified product piles created as a result of crushing operations. The product piles and samples will be uniquely marked and labeled for identification.

Enclosure D describes the analytical methods and criteria for confirmatory sampling of product material.

3.4 Equipment Release Surveys

All materials and equipment removed from the RCA shall be surveyed for fixed and removable contamination in accordance with the criteria of reference USNRC87:

3.4.1 1000 dpm per 100 cm2 for alpha and beta-gamma radioactivity averaged over an area not greater than 1 square meter.

3.4.2 A maximum of 3000 dpm per 100 cm2 for alpha and beta-gamma radioactivity within a 1 square meter area.

3.4.3 A maximum of 200 dpm per 100 cm2 of removable contamination for alpha and beta-gamma radioactivity.

The above contamination limits are to be independently applied for alpha and beta-gamma measurements.

SECTION 4.0 DOCUMENTATION

A final report of work task activities will be completed for transmittal to SMC which will include the following information:

- Work Plan
- Dosimetry results
- Bioassay results
- Instrumentation calibration certification sheets
- Gamma spectroscopy results
- Summary of project activities
- Applicable radiation and contamination survey forms
- Air sampling results

ENCLOSURES

Enclosure A	Site Work Area Location
Enclosure B	Radiation Safety & Familiarization Training
Enclosure C	Process Flowchart
Enclosure D	Analytical Methods and Criteria
Enclosure E	Work Area Operations Schematic

REFERENCES

10CFR19 Code of Federal Regulations, Title 10, Part 19, 'Notices, Instructions, and Reports to Workers; Inspections', 1989.

10CFR20 Code of Federal Regulations, Title 10, Part 20, 'Standards for Protection Against Radiation', 1989.

ORAU 88 'Radiological Survey of the Shieldalloy Corporation, Newfield, NJ', Final Report, July 1988, ORAU 88/G-79.

USNRC87 'Guidelines for Decontamination of Facilities and Equipment Prior to Release For Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material' USNRC Division of Industrial and Medical Nuclear Safety, August 1987.

RCP800A Hilbert Associates, Inc., Procedure RCP-800A, 'HpGe Gamma Spectroscopy Analysis'.

RCP200 Hilbert Associates, Inc., Procedure RCP-200, 'Radiation Detection Instrumentation'.

RCP225 Hilbert Associates, Inc., Procedure RCP-225, 'Radiation Surveys'.

RCP500 Hilbert Associates, Inc., Procedure RCP-500, 'Contamination Controls'.

GENERAL WORK AREA DESCRIPTION

SHIELDALLOY METALLURGICAL CORPORATION, NEWFIELD, NJ

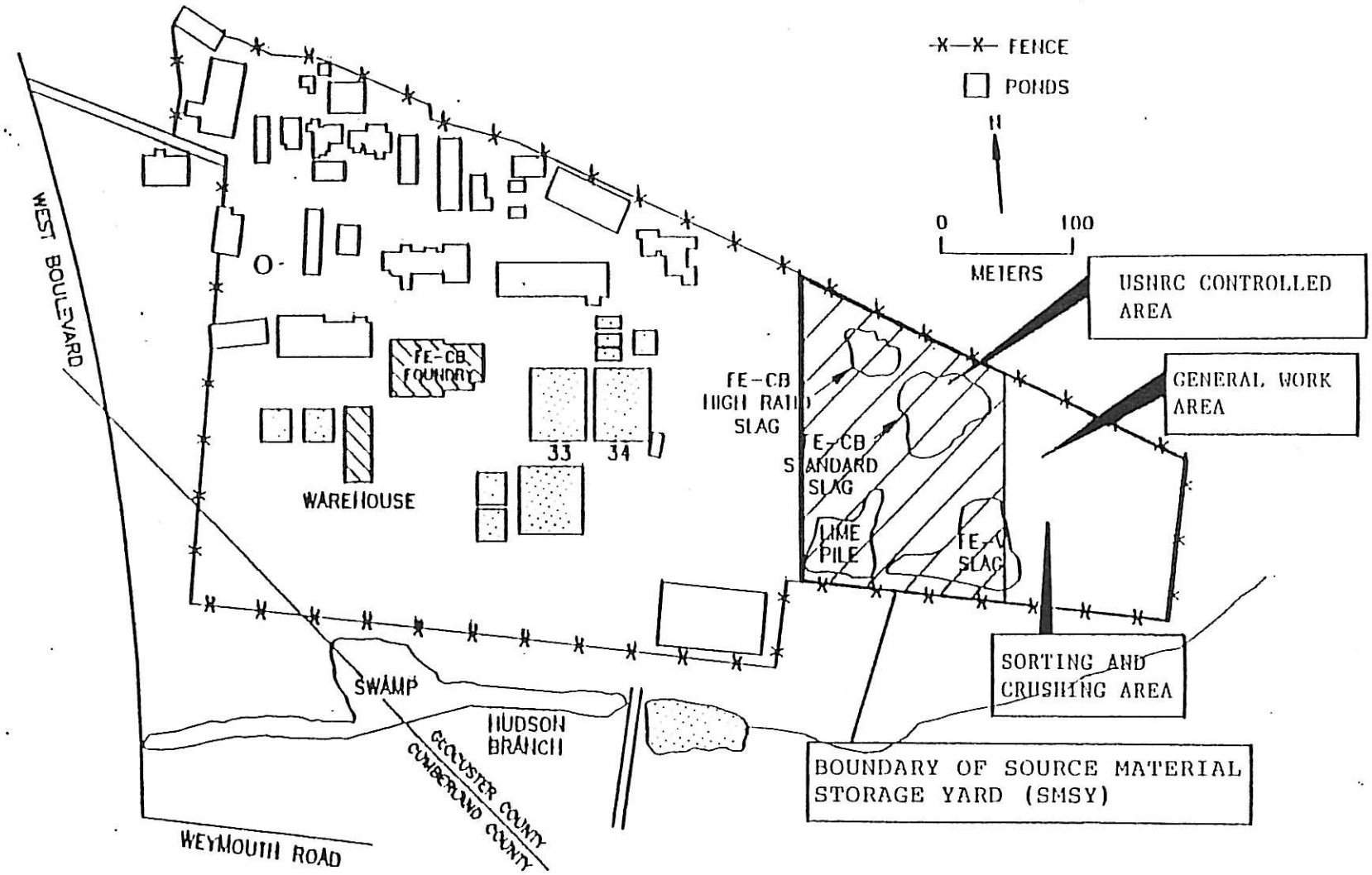


FIGURE 2: Layout of the Shieldalloy Plant in Newfield, New Jersey

NOTE: DRAWING ADOPTED FROM REFERENCE ORAU 1988

ENCLOSURE A

RADIATION SAFETY & FAMILIARIZATION TRAINING

The purpose of this training program is to instruct and inform supervision and technicians involved in work at the SMC site of the existing radiological conditions and of the radiation safety program requirements. Elements of this program to be reviewed include the following:

- Review and discussion of the known low level radioactive contaminants at the site.
- Radiation and contamination controls incorporated into the site Work Plan for excavation and crushing operations.
- Personnel monitoring for radiation exposure; dosimetry and bioassay requirements.
- 10CFR19 requirements for Instruction to Workers.

I have attended the above seminar/discussion and received instruction on the radiological safety program at the SMC site and understand the following:

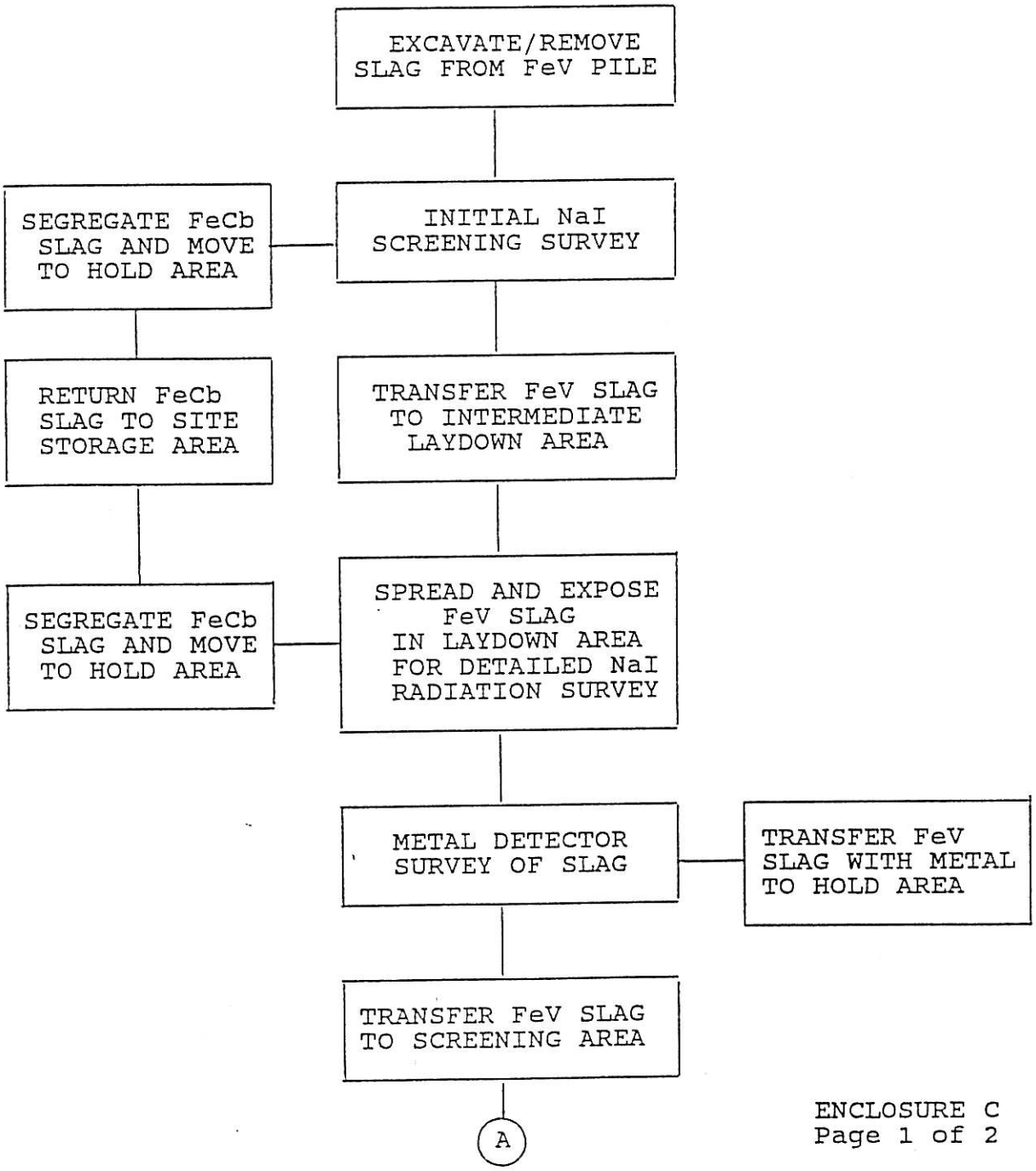
- Exposure to whole body radiation shall be monitored by personal TLD dosimeter. All radiation exposure and controls will confrom to the legal requirements of 10CFR20.
- I will be additionally monitored for uptake of radioactive materials by urinalysis bioassay.
- I can request and receive the results of radiation exposure monitoring and bioassay monitoring upon completion.
- I am aware of my individual responsibility for the implementation of the radiation safety program for this project.

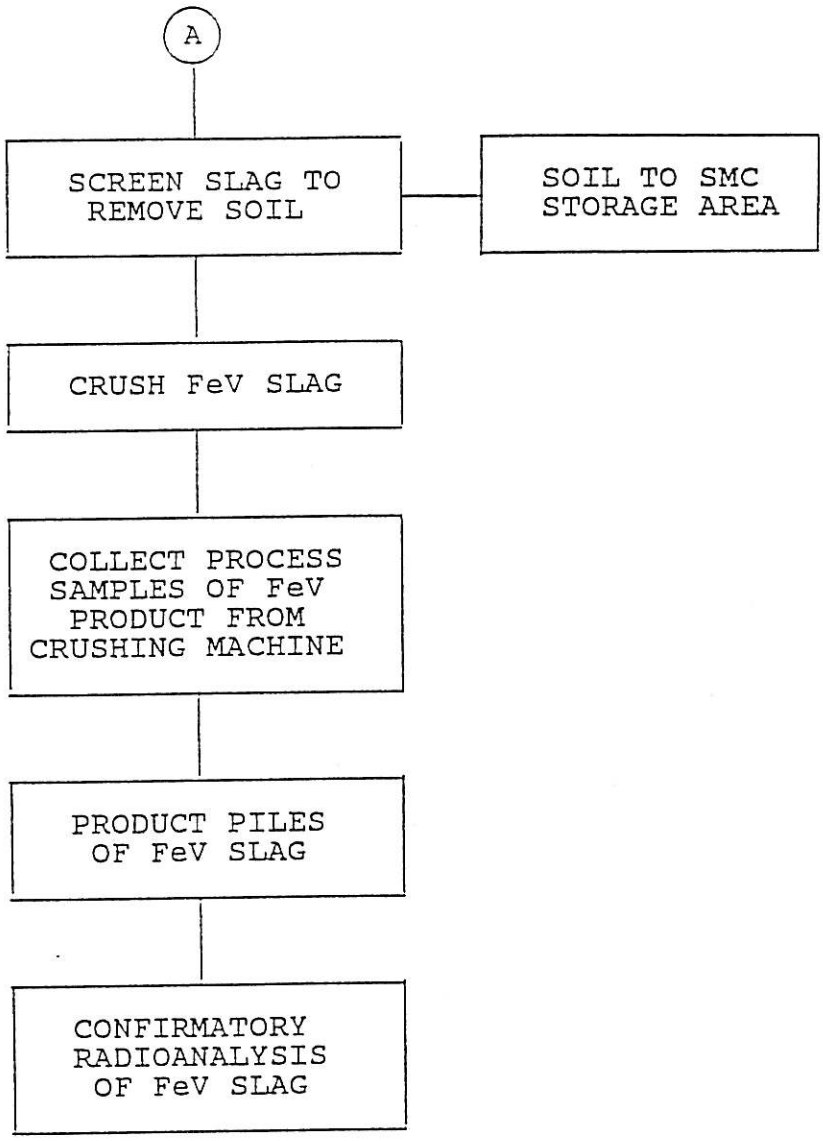
SIGNATURE _____ DATE _____

ENCLOSURE B

PROCESS FLOWCHART

SURVEY AND SEGREGATION OF FeCb SLAG
FROM FeV SLAG AT THE SMC SITE
NEWFIELD, NJ




A
SCREEN SLAG TO REMOVE SOIL
SOIL TO SMC STORAGE AREA
CRUSH FeV SLAG
COLLECT PROCESS SAMPLES OF FeV PRODUCT FROM CRUSHING MACHINE
PRODUCT PILES OF FeV SLAG
CONFIRMATORY RADIOANALYSIS OF FeV SLAG

HILBERT ASSOCIATES, INC.
RADIOLOGICAL ENGINEERS

GAMMA SPECTROSCOPY ANALYSIS

HpGe gamma spectroscopy analysis for product sample material will be performed for quantatative determination of the following primary radionuclide photopeaks at a 90% confidence level:

Th234 at 0.093 MeV
Ac228 at 0.911 MeV

Th234 is a daughter radionuclide in the naturally occuring Uranium (U238) decay series. The Th234 photopeak analysis result will be used to infer the U238 radioactivity concentration based upon secular equilibrium conditions.

Ac228 is a daughter radionuclide in the naturally occuring Thorium (Th232) decay series. The Ac228 photopeak analysis will be used to infer the Th232 radioactivity concentration based upon secular equilibrium conditions.

Other secondary photopeaks in the Uranium and Thorium decay series may be analyzed and reported as confirmatory radionuclides.

SOURCE MATERIAL RELEASE CRITERIA

The results of product confirmatory sample analyses are required to confirm the non-source material status of the FeV product material. The legal definition of source material (Natural Thorium and Natural Uranium), typically expressed as 0.05% by weight of Thorium and/or Uranium, can be alternately expressed as radioactivity concentration (pCi per gram of material) for direct comparison to HpGe radioanalysis results as follows:

Th232: 0.0005 x 1.09E+05 pCi/gram = 54 pCi/gram

This equivalent radioactivity concentration for Th232 will be limiting for combinatory Thorium and Uranium mixtures in this material. The actual results of sampling are expected to be well within this concentration and at or near the natural (1) radioactivity concentrations of U238 and Th232 in the FeV feed stock material:

Th232: Average natural concentration is 7 pCi/gram
U238: Average natural concentration is 8 pCi/gram

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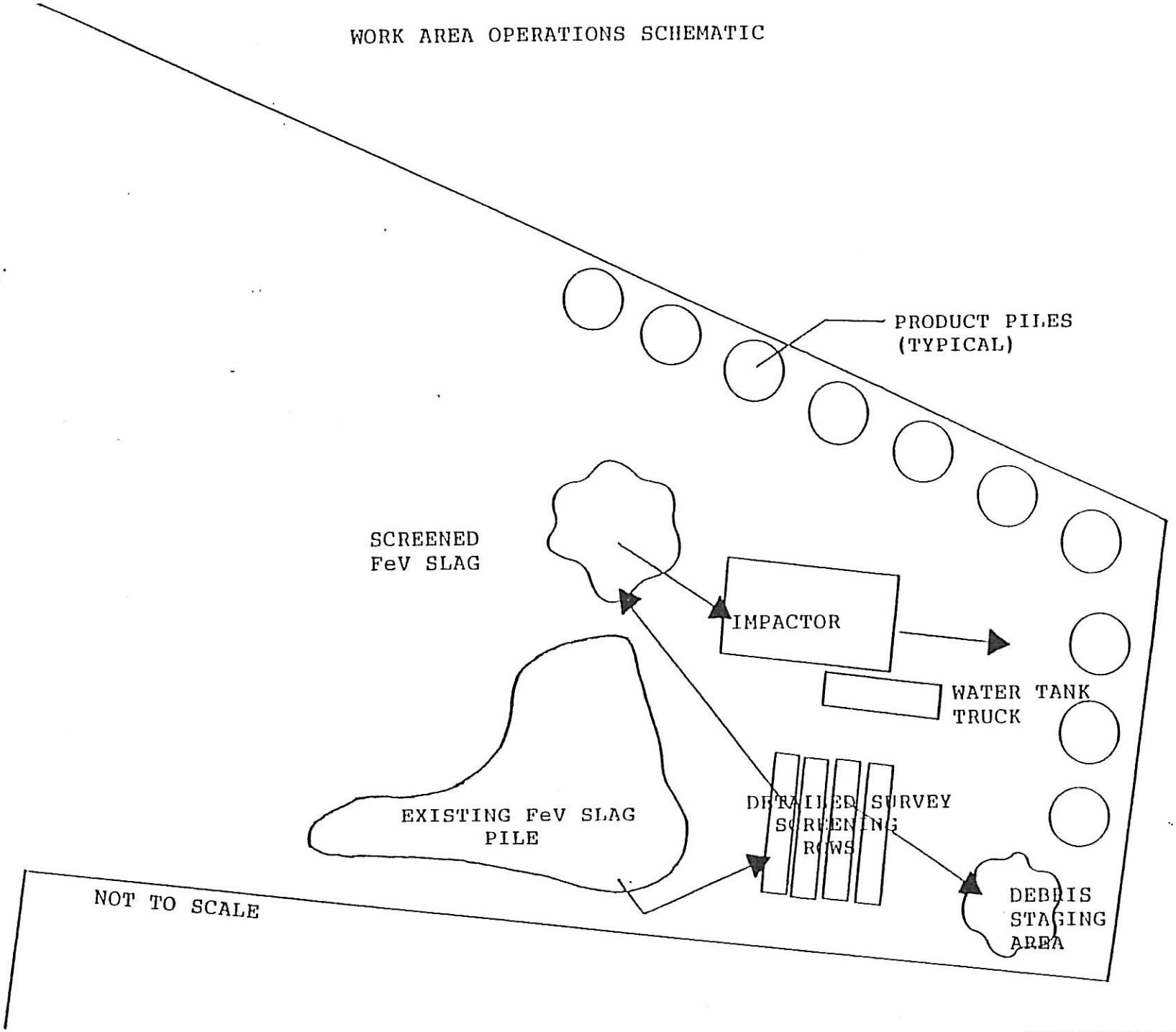
(1) From prior radiochemistry analysis of FeV slag by TMA Eberline for Shieldalloy Metallugical Corporation, 1/90.

WORK AREA OPERATIONS SCHEMATIC



ENCLOSURE E