APPENDIX D

SOIL CLEANUP AND VERIFICATION

DEPARTMENT OF HEALTH
Environmental Health Programs
Division of Radiation Protection

November 25, 1996

TO: Gary Robertson

FROM: Leo Wainhouse

SUBJECT: CONFIRMATION OF WESTERN NUCLEAR RADIOLOGICAL VERIFICATION PROGRAM

Overview of Western Nuclear, Sherwood Project (WNI) Radiological Verification Program:

WNI submitted its Radiological Verification Program (RVP) in October 1994 as Revision 6 to its Mill Decommissioning Plan. The RVP consists of a background (radium, uranium, and thorium) determination study and a combination of gamma surveys and direct soil sampling to verify compliance with soil cleanup standards. The department reviewed the RVP and responded to WNI with a letter dated January 24, 1995 (and various phone calls among Doug Wells of the department, WNI, and Shepherd Miller (WNI's consultant)). WNI responded back with Revisions 7 and 8 to the RVP, and the department formally accepted it with Amendment 19 to the WNI radioactive materials license (WN-I0133-1).

WNI's RVP is explained well in the Executive Summary of Revisions 6, 7, and 8, and in the Executive Summary of the *Radiological Verification Completion Report* dated July 1996. These documents should be reviewed by anyone wishing a detailed description of the RVP.

In 1993, WNI performed extensive surveying/sampling of the Sherwood site. It was determined that in some areas of the site an association between Radium 226 and Thorium 230 existed, and in some areas (those right around the mill--the barium chloride drainage and the clairicone spill area), no association existed. The association means no elevated levels of Thorium 230 were present without corresponding levels of Radium 226. In the areas where the association existed, WNI performed gamma surveys using Radium 226 as an indicator of Thorium 230. These were called gamma correlation surveys. Random soil samples were also taken in the so-called gamma-surveyed areas to confirm the correlation. The gamma correlation survey demonstrated that concentrations of Radium 226 and Thorium 230 were within regulatory limits.

As was stated above, in certain areas there was no association; these areas were 100% soil-sampled. In general these areas were: the areas around the mill building, the barium chloride drainage area, and the clairicone spill drainage.

The soil cleanup effort took approximately 12 months to complete, and WNI moved approximately 370,000 cubic yards of material to accomplish the task.

Description of Washington State Department of Health actions related to confirmation of the WNI RVP

The Washington State Department of Health had two responsibilities in its oversight of the WNI cleanup. The first was to review and approve a soil cleanup plan that would assure compliance with the standards. The second responsibility was to independently confirm that the licensee was following the plan through onsite inspection and third party laboratory analysis.

The department's primary reviewer of the RVP was Doug Wells, Ph.D. Doug's review of the RVP is documented in an e-mail message (Attachment 1) dated January 17, 1995, and was related to WNI in a letter dated January 24, 1995 (Attachment 2). WNI responded to this letter and some additional comments which resulted from a meeting between the department and WNI on March 8, 1995 (Attachment 3) with Revisions 7 and 8 of the RVP. With the review of the WNI RVP complete, they began work in the spring of 1995.

To fulfill the second responsibility, the department outlined a plan (Attachment 4) as guidance to proceed with confirmatory actions. The plan involved several approaches.

A microR survey was conducted at the site during July 1995 (Attachment 5). The purpose of the microR survey was to obtain for the file a background gamma readings over the entire site before cleanup actions occurred. Our logic was that we could use the microR survey in a way to confirm cleanup if the need ever arose. As of this writing, the department has not used this survey.

As a confirmation of WNI's sample analysis and WNI's laboratory, Yankee Atomic Environmental Laboratory, the department split approximately 100 soil samples with WNI. The reason was to use our results as a quality analysis of WNI's laboratory results. The department compared the results of our samples with the results of WNI's samples to confirm that WNI's lab had no bias (low) in its sample analysis. This is documented in Attachment 6. Attachment 6 has several parts, including results from our lab and WNI's lab, WDOH's sample plan, and the list of samples to be taken. The sample results were reviewed by Doug Wells and are deemed adequate as per Doug's final report received October 9, 1996.

As was stated above, the department performed onsite inspections at WNI to confirm that WNI personnel were adhering to procedures in the approved RVP. Documented inspection reports are in Attachment 7. The report entitled *Gamma Confirmation Surveys at Western Nuclear, Inc.* was written in July 1995. This report documents that Doug Wells and other staff from the Waste Management Section performed independent gamma surveys using WNI equipment and procedures, and compared their results with those performed by WNI. Other information in Attachment 7 is related to procedures for performing routine inspections, radiation safety for workers, and other documented events.

In following our confirmation plan developed in 1995, the department performed a confirmation gamma survey on selected grids after WNI completed all surveying, soil sampling (except for approximately 15 grids--Attachment 9), and removal of soil. The department observed the gamma surveying of 39 grids after WNI's RVP was completed (Attachment 8).

The department received WNI's completion report in July 1996. The report is entitled *Sherwood Project Radiological Verification Report*. Doug Wells reviewed it and submitted his report confirming satisfactory performance of the RVP (Attachment 10) on October 9, 1996.

Standards Used to Determine Compliance

See Attachment 11 for the regulatory compliance standards for soil cleanup at uranium mills. The letter dated April 4, 1996 in Attachment 11 refers to surface versus subsurface standards for Radium 226. There was a case of several soil grids on the WNI site using the subsurface standard as long as WNI showed the grids were covered with at least six inches of material which met the surface standard. WNI will submit a report documenting the grids and the recontouring that was performed.

Conclusions

After careful review of the record demonstrating the confirmation of the WNI RVP, it is recommended that this license be amended to release for unrestricted use the entire WNI property (except for the area designated as the tailings impoundment) which is currently under the control of the specific Washington State Department of Health radioactive materials license.

LW:krf

Attachments

DEPARTMENT OF HEALTH
Environmental Health Programs
Division of Radiation Protection

December 6, 1996

TO: Gary Robertson

FROM: Leo Wainhouse

SUBJECT: ADDENDUM TO MEMO DATED NOVEMBER 25, 1996

As per my memo of November 25, 1996, "Confirmation of Western Nuclear (WNI) Radiological Verification Program," it states on page 3 that WNI will submit a report documenting backfilling of certain grids to attain the subsurface soil standard for radium. The report is to verify the elevations of these grids to assure the department that at least six inches of soil were placed over the top. WNI's report, dated November 21, 1996, was reviewed along with a letter to WNI from Shepherd Miller, Inc., dated November 14, 1996. The report includes locations and backfill thickness. There are 11 grids total. The average fill depth is 4.2 feet, the thickest is 10.1 feet, and there is one grid with .6 feet fill.

I am recommending we accept this report and continue with our plans to release all lands associated with the WNI millsite.

LW:krf

WESTERN NUCLEAR, INC.

UNION PLAZA SUITE 300, 200 UNION BOULEVARD, LAKEWOOD, COLORADO 80228
TELECOPIER (303) 989-8993 TELEPHONE (303) 989-8675

Leo

NOV 2 2 1996

DIV. OF RADIATION PROTECTION

November 21, 1996

Mr. Gary Robertson, Head
Waste Management Section
Washington Department of Health
Division of Radiation Protection
Airdustrial Park, Bldg. 5
P.O. Box 47827
Olympia, WA 98504-7827

RE: WN-I0133-1, SHERWOOD MILL DECOMMISSIONING PLAN -- RADIOLOGICAL VERIFICATION PROGRAM:
1. TRANSMITTAL OF FINAL SURVEY ELEVATION DATA TO CONFIRM BACKFILL
2. REQUEST TO RELEASE ALL LANDS FOR UNRESTRICTED USE

Dear Mr. Robertson:

Via letter dated June 21, 1996, Western Nuclear, Inc. [WNI] requested unconditional release, as soon as possible and for unrestricted use, of the land associated with the barium chloride [$BaCl_2$] drainage and evaporation pond. On July 17, 1996, Washington Department Of Health [WDOH] conditionally approved the 06/21/96 WNI request.

Via letter dated July 31, 1996, Western Nuclear, Inc. [WNI] requested unconditional release for unrestricted use of all lands, including the WNI Sherwood millsite, subject to final radiological verification. On August 22, 1996, WDOH authorized WNI to regrade and to backfill the millsite area.

Via letter dated August 26, 1996, WNI confirmed the WDOH position that WDOH would authorize the release of all lands, excluding the reclaimed tailing impoundment area that must be restricted in perpetuity, contingent on WNI demonstrating that certain areas have been adequately backfilled and regraded. This letter transmits all information necessary to demonstrate that these specific areas, as identified by the listed 10 x 10 meter regulatory compliance grids, within the Sherwood Millsite and the Evaporation Pond have been backfilled with at least 6 inches of soil for purposes of complying with subsurface release standards for residual radioactive materials. Specifically as noted in our June 21, 1996 letter, one

grid in the millsite and eleven grids in barium chloride drainage/evaporation pond required backfilling to comply with applicable WDOH regulatory requirements.

In accordance with the April 1992 (as revised) Sherwood Mill Decommissioning Plan, WNI plans to submit the referenced completion report during January 1997. All debris from mill decommissioning has been previously removed from the Sherwood millsite and placed in the tailing impoundment. Further, the July 31, 1996 WNI completion report for the Radiological Verification Program, as supplemented by this submittal, document that all residual radioactive materials in affected lands are below applicable regulatory standards. Given the preceding, WNI requests that WDOH unconditionally release the lands, excluding the reclaimed tailing impoundment, for unrestricted use.

Please find enclosed eight [8] copies of this submittal. Additional copies are being submitted directly to Ms. Dorothy Stoffel [WDOH Spokane, WA].

We appreciate your ongoing prompt reviews of the Sherwood "Radiological Verification Program". If you have any questions or need additional information to expedite your review, please contact us at your earliest convenience.

Sincerely,

Stephanie J. Baker
Manager of Environmental Services
SJB/tic doh\radverify\finalrel.n96

w/attachments

cc: CA [w/ attach.]
KCB [w/o attach.]
MAP [w/o attach.]
LEF/LLM [SMI] [w/ attach.]
L. Pruett, Esq. [w/ attach.]
H. Shaver, Esq. [w/ attach.]
D. Stoffel [w/ attach.]

SHEPHERD MILLER
INCORPORATED

November 14, 1996

Ms. Stephanie J. Baker
Western Nuclear, Inc.
Union Plaza
200 Union Boulevard, Suite 300
Lakewood, Colorado 80228

SMI #09-353

SUBJECT: Backfill Elevations for Sherwood

Dear Ms. Baker:

The purpose of this letter is to update you on the status of the Sherwood Radiological Verification Program, concerning the issue of backfilling to meet subsurface release standards in the Mill area and in the Evaporation Pond.

As formalized on page 58 of the Sherwood Radiological Verification Completion Report (July, 1996), the verification plan was modified to include implementation of the subsurface release standards of 15 pCi ^{226}Ra/g (and corresponding ^{230}Th values) above background levels in areas that would receive six or more inches of clean backfill as part of the final site regrading plan. The modification was designed to include an elevation measurement at the center point of each grid, as documentation of the amount of clean fill added. Approval of this modification was granted by WDOH, via letter dated April 4, 1996 (attached).

A total of twelve grids were affected by this modification; one in the mill area and eleven in the evaporation pond. All of these grids have been backfilled with a minimum of six inches of clean fill, as measured at the center of each grid. The elevation of each grid center point-before and after backfilling-is shown on Table 1, as well as the actual thickness of clean fill added. The corresponding grid locations are shown in blue on Figure 1.

Submittal of this addendum signifies completion of the Sherwood Project Radiological Verification Program.

Sincerely,

SHEPHERD MILLER, INC.

Anne Woodland

Anne Woodland
Staff Scientist

Enclosures

cc: Corn Abeyta w/enclosures
Lou Miller

Environmental & Engineering Consultants

3801 Automation Way, Suite 100
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recycled paper

STATE OF WASHINGTON
DEPARTMENT OF HEALTH
DIVISION OF RADIATION PROTECTION
Airdustrial Center, Bldg. 5 • P.O. Box 47827 • Olympia, Washington 98504-7827

April 4, 1996

Stephanie J. Baker
Manager, Environmental Services
Western Nuclear, Inc.
200 Union Blvd., Suite 300
Lakewood, Colorado 80228

Dear Ms. Baker:

This letter is in response to questions raised during our February 7 and March 22, 1996 meetings, regarding soil cleanup standards applicable at the Sherwood site. As a result of those meetings and discussions, we are modifying our letter to you dated February 21, 1996. These modifications change the formula used to calculate acceptance criteria for uranium (U-234 + U-238). Your questions specifically addressed the state policy on the uranium soil cleanup standard and the circumstances under which the Radium-226 cleanup limit of 5 pCi/g and 15 pCi/g above the background level applies.

The regulatory requirement for soil cleanup at uranium mill sites is found in WAC 246-252, Appendix A, Criterion 6. The department's policy allows the subsurface limit for Ra-226 of 15 pCi/g to apply to the area below the upper six inches, for which the 5 pCi/g limit applies. This radium limit accounts for a relative Th-230 contribution due to ingrowth such that the total Ra-226 at 1,000 years will not exceed the applicable limit. The reported Th-230 concentration must not exceed $A_{(Th,O)}$ as calculated by the following equation:

$$A_{(Th,O)} = \frac{A_{(Ra,I)} - A_{(Ra,O)}e^{-\lambda t}}{1-e^{-\lambda t}}$$

Where:

$A_{(Th,O)}$ =	reported Th-230 concentration plus the analytic counting error at the 95% confidence limit;
$A_{(Ra,O)}$ =	reported Ra-226 concentration plus the analytic counting error at the 95% confidence limit;
$A_{(Ra,I)}$ =	6.07 pCi/g (surface) or 16.07 pCi/g (subsurface) for sand/float soil types or 6.44 (surface) or 16.44 (subsurface) for weathered quartz monzonite soil types;
t =	1000 years; and
λ =	the decay constant for Ra-226 = 4.32E-4 yrs^{-1}

NOTE: The sum of the reported Ra-226 concentration plus the analytic counting error at the 95% confidence limit must not exceed 6.07 pCi/g for sand/float soil types or 6.44 pCi/g for weathered quartz monzonite soil types.

If the original upper six inches have been removed, the subsurface limit for Ra-226 of 15 pCi/g applies to the material at this depth, *provided* adherence to ALARA standards has been demonstrated, and the exposed material is either recontoured or backfilled to include a cover of at least six inches of soil. The cover material must not exceed the background level by more than 5 pCi/g.

The department's policy on uranium (i.e., the arithmetic sum of U-234 and U-238) in the soil is consistent with the NRC 1981 Technical Position Paper, Federal Register #205, Volume 46, regarding cleanup of sites contaminated with radium and/or thorium. In applying this policy, the state considers the 30 pCi/g enriched uranium limit appropriate for areas where Ra-226 is at background levels. This level was calculated based on the increased relative contribution of U-234 in enriched uranium that is not present in natural or depleted uranium; therefore, this value would be slightly conservative for natural uranium. The uranium (U-234 + U-238) limit of 10 pCi/g will be applied if Ra-226 is in equilibrium with uranium (i.e., (U-234 + U-238) = 10 pCi/g and Ra-226 = 5 pCi/g).

The uranium (U-234 + U-238) limit will vary between 10 pCi/g and 30 pCi/g above background where Ra-226 values are between background and 5 pCi/g above background. The limit for uranium (U-234 + U-238) in the upper 6 inches will be calculated according to the following equation:

$$\frac{A_{(Ra,t)} - A_{(Ra,Bg)}}{5} + \frac{\left(A_{(U\text{-}238\ +\ U\text{-}234)} - A_{(U\text{-}238\ +\ U\text{-}234,\ Bg)} \right) - 10}{20} \leq 1$$

Where:

$A_{(Ra,t)}$	=	Ra-226 activity at t=0 or t=1000 years accounting for Ra-226 ingrowth (whichever is greater);
$A_{(Ra,Bg)}$	=	background Ra-226 activity = 1,0 pCi/g;
$A_{(U\text{-}238\ +\ 2\text{-}234)}$	=	U-238 + U-234 activity;
$A_{(U\text{-}238\ +\ U\text{-}234,\ Bg)}$	=	background U-238 + U-234 activity = 2.07 pCi/g.

The uranium (U-234 + U-238) limit for subsurface soils (i.e., below the top 6 inches) is 30 pCi/g above background regardless of the Ra-226 value which can vary from background to 15 pCi/g above background.

The department's evaluation of WNI's soil cleanup procedures and the cleanup work done to date is that they are consistent with ALARA principles and are protective of public health and the environment. The department also recognizes that Western Nuclear has gone beyond the required standards in meeting the ALARA principle.

The department has discussed the above policy and its applicability to WNI with the NRC, and has determined that it is consistent with NRC policy.

If you have any questions, please contact Leo Wainhouse at (360) 586-4878 or me at (360) 753-3459.

Sincerely,

Leo Wainhouse

for Gary Robertson, Head
Waste Management Section

cc: Elaine Brummett, NRC HQ
Dennis Sollenberger, NRC HQ
Lou Miller, SMI
Larry Fiske, SMI

TABLE 1. ELEVATION OF GRID CENTERS BEFORE AND AFTER BACKFILLING

Grid ID	Northing	Easting	Grid Center Elevation Prior To Backfilling	Grid Center Elevation After Backfilling	Backfill Thickness	Minimum Backfill Thickness Required
M1-296333F	331017.68	2666738.33	2057.9'	2064.3'	6.4'	0.5'
C3-420438F	329639.73	2668673.39	1957.6	1959.9'	2.3'	0.5'
C3-619636F	329213.18	2668772.62	1964.6'	1966.8'	2.2'	0.5'
C3-633649F	329180.48	2668706.64	1961.0'	1964.9'	3.9'	0.5'
C3-588605F	329277.85	2668805.74	1957.4'	1963.4'	6.0'	0.5'
C3-555572F	329344.60	2668772.39	1955.6'	1960.5'	4.9'	0.5'
C3-582599F	329278.97	2668608.28	1949.7'	1959.8'	10.1'	0.5'
C3-613630F	329213.99	2668575.63	1959.6'	1963.6'	4.0'	0.5'
C3-509524F	329475.85	2668608.61	1957.6'	1963.2'	5.6'	0.5'
C3-508523F	329475.68	2668575.47	1964.2'	1967.3'	3.1'	0.5'
C3-479495F	329508.50	2668608.50	1964.3'	1965.6'	1.3'	0.5'
C3-478494F	329508.50	2668575.50	1968.9'	1969.5'	0.6'	0.5'

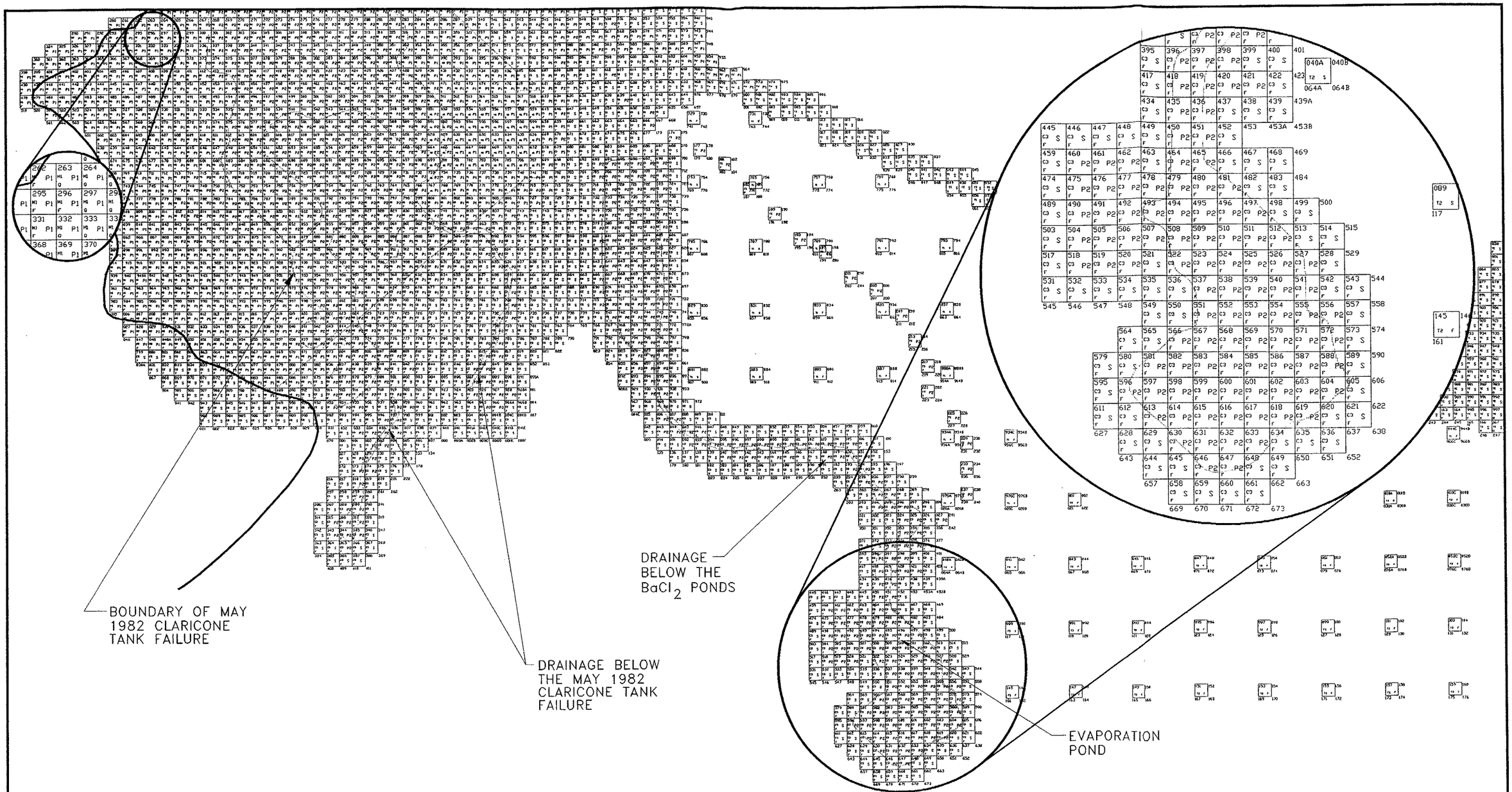

FIGURE 1
GRIDS VERIFIED BY
SUBSURFACE STANDARDS

SHEPHERD MILLER INCORPORATED

Date: NOV. 1996
Project: 09-353
File: FINAL\SUBSURF2

MICROR SURVEY AT WESTERN NUCLEAR, INC.

7/19/95

Instrument: Ludlum MicroR Meter, SN #101713, calibrated 2/15/95. Background was 13-14 microR/hr. Background was taken approximately 200 yards east of barium chloride drainage on access road. Department staff were Mike Elsen and Leo Wainhouse.

GRID	READING (uR)
C-3	
613	22
614	22
615	22
616	21
617	23
618	21
619	21
620	23
542	20
541	25
540	21
539	23
538	23
464	22
465	23
466	21
397	26
8	24
399	22
400	24
237	26
236	20
235	22
140	28
141	28
143	24
144	24
145	22
146	24
147	24
148	25
149	26
150	24
151	24
C-2	
859	32
857	28
856	60
5	18
716	21
717	24
718	22

GRID	READING (uR)
719	22
720	25
721	23
606	26
605	23
604	24
603	26
602	22
601	24
706	28
707	24
708	22
709	30
C-3	
386	22
385	28
257	20
258	24
259	26
260	21
036	34
035	24
034	24
033	22
032	27
031	29
C-2	
836	22
837	22
838	22
839	25
840	26
841	32
842	26
843	18
844	38
845	34
846	25
847	26
848	28
849	28
850	22

GRID	READING (uR)
851	18
852	19
712	22
711	17
710	18
709	22
708	22
707	22
706	22
705	20
704	19
703	17
702	20
701	20
700	19
699	22
698	24
M-2	
074	26
075	21
076	22
077	22
078	23
079	23
080	26
081	18
082	21
038	22
004	22
003	22
002	23
001	22
M-1	
999	24
998	24
997	24
996	24
995	23
994	22
993	26
992	24
991	23

GRID	READING (uR)
986	28
985	30
[illegible]4	30
[illegible]83	32
865	34
866	34
867	28
868	29
869	24
870	22
871	22
872	20
873	24
874	22
875	21
876	23
877	21
878	20
879	18
880	20
881	21
882	19
883	22
884	20
[illegible]5	18
[illegible]86	19
887	20
888	22
C-2	
587	22
588	19
589	19
590	20
591	21
592	21
593	20
594	22
595	20
596	20
597	18
598	22
599	20
600	22
C-1	
[illegible]	16
[illegible]4	36
703	28
702	21
701	23

GRID	READING (uR)
M-1	
740	24
739	24
738	20
737	20
736	18
735	20
734	22
733	20
732	22
731	22
730	22
729	22
728	22
727	20
726	22
725	20
724	22
723	22
722	22
721	22
720	26
719	28
718	32
717	30
716	30
715	36
714	32
713	28
712	31
711	38
710	36
709	42
478	44
479	36
480	32
481	32
482	30
483	30
484	29
485	30
486	30
487	32
488	30
489	28
490	28
491	28
492	28
493	22
494	24
495	20

GRID	READING (uR)
496	20
497	19
498	22
499	20
500	20
501	20
502	19
503	18
504	18
505	20
506	20
507	21
508	21
509	19
510	24
511	20
512	20
513	20
514	20
515	22
516	26
517	22
518	24
C-1	
633	22
TE	
833	44
821	47
810	48
800	48
790	50
781	60
772	62
763	65
755	65
746	72
738	68
730	72
733	65
722	75
713	85
704	85
697	60
698	55
699	45
700	55
701	55
702	55

Instrument: Ludlum MicroR Meter, SN #120873, calibrated 10/14/95. Background was 13 microR/hr. Department staff were Maxine Dunkelman and John Blacklaw.

GRID	READING (uR)
C-1	
001	21
002	20
003	19
004	20
037	21
036	19
035	19
034	21
033	22
032	21
031	21
074	21
075	20
076	19
078	19
079	20
080	20
081	19
082	19
083	20
4	18
85	19
086	18
179	21
178	19
177	19
176	19
175	19
174	19
173	19
172	20
171	19
170	20
169	19
168	18
167	18
M-1	
101	20
102	35
C-1	
2	30
3	22
284	22
285	19
286	20

GRID	READING (uR)
287	20
288	21
289	21
290	20
291	21
292	23
293	22
294	23
295	23
296	23
297	24
298	25
299	29
300	30
301	32
302	35
303	38
TW	
893	42
894	45
895	60
896	60
918	50
917	40
C-1	
413	30
412	30
411	30
410	30
409	25
408	25
407	24
406	
405	
404	
403	
402	28
401	24
400	24
399	30
398	32
397	30
396	32
395	30
394	32
393	33

GRID	READING (uR)
392	25
M-1	
138	24
137	22
136	22
135	22
134	23
133	21
132	23
130	32
129	34
128	35
127	34
213	35
214	34
215	34
216	33
217	31
218	29
219	31
220	29
221	27
222	28
223	25
224	28
225	29
226	25
227	24
228	23
229	22
230	19
231	20
232	22
233	19
C-1	
499	17
500	21
501	25
502	22
503	22
504	
505	
606	22
605	22

GRID	READING (uR)
M-1	
436	20
435	21
34	22
433	21
432	21
431	21
430	21
429	20
428	22
427	21
426	20
425	21
424	22
423	21
422	21
421	22
420	22
419	21
418	23
417	23
416	25
415	26
414	28
413	28
2	28
11	40
410	34
409	38
408	38
407	40
406	30
405	28
404	28
403	32
402	32
401	34
400	40
399	50
TW	
878	48
877	48
876	40
875	40
874	32
1	
7	32
236	26
235	27
234	26

GRID	READING (uR)
233	25
232	22
231	24
230	24
229	24
228	22
227	22
226	24
120	24
121	28
122	30
TW	
826	38
827	34
828	40
829	44
830	44
831	58
832	60
833	65
834	65
780	55
779	50
778	42
777	38
776	34
775	34
774	32
773	31
772	
713	30
714	34
715	34
716	34
717	38
718	39
719	42
720	44
721	42

GRID	READING (uR)

WDOH, DRP SAMPLING PLAN FOR THE APPROXIMATELY 100 QA SPLITS WE WILL TAKE WITH WNI, MARCH, 1995

INTRODUCTION:
The WDOH sampling plan will involve splitting approximately 100 soil samples with WNI to QA their lab. The samples will be taken from around the mill site and will be identified using WNI's system of grid coordinates.

STANDARDS:
5 pCi/gm Ra226 above background (in 1 thousand years) in the top 15 centimeters.
15 pCi/gm Ra226 above background (in 1 thousand years) in each 15 centimeter below.

WORK PLAN:
WDOH, DRP will split approximately 100 soil samples with WNI. The samples are identified on the attached sheet. The analysis to be performed by our lab is attached is the e-mail message from Lynn Albin, the grids identified with the asterisk will be analyzed using wet chemistry. In addition to the analysis listed on the e-mail our lab will perform an alpha spec. for all Thorium. Of the 100 samples we will take approximately 50% from their archives and the other 50% will be either direct samples by our staff or our staff will observe the sample being taken then split with WNI. We will use some samples from the WNI archives because we can not be out at the site 100% of the time. The archived samples are those taken by WNI within the last week to 10 days and stored in the C vans on-site. The criteria used in selecting the 100 samples was first is to have most of them in areas we determined to have a higher probability of being contaminated. Secondly, we wanted most samples in the 100% soil sampled areas.

The samples we will take from the archives can be picked up anytime staff go to the site. Direct samples will have to be scheduled with WNI. We will attempt to get the samples as soon as possible so our lab can begin work.

Our lab will perform a gamma scan and wet chemistry on their PES samples. We will compare our results of the PES with theirs.

We will use WNI's sampling procedures.

When the lab has finished and our QA evaluation is complete Doug will use the analysis to compare their lab against ours. We will use ours as the final authority.

WNI/DOH SPLIT SOIL SAMPLES

P-2 mill process area, 25 samples total

From Archives 13	Direct 12
M1-342-380	M1-850-877
M1-459-500	M1-787-820
M1-223-246	M1-785-818
M1-501-543	M1-717-752*
M1-382-422	M1-576-614
M1-310-347	M1-494-536
M1-226-249*	M1-337-375
M1-504-546	M1-268-302
M1-348-386	M1-217-240
M1-388-428	M1-219-242
M1-283-317	M1-271-305
M1-549-590*	M1-416-457
M1-552-593	

P-2 barium chloride pond and evaporation area, 20 samples total

From Archives 10	Direct 10
C3-101-147	C1-709-723
C3-150-194	C1-750-581
C3-266-295	C2-625-648
C3-398-421	C2-667-692*
C3-479-495	C2-745-772
C3-537-552	C2-794-827
C3-540-555	C2-895-932
C3-582-599	C3-044-092
C3-619-636	C3-094-140*
C3-647-661	C3-186-228

P-2 clair. drainage, 20 samples total

From Archives 10	Direct 10
M1-618-655	C3-316-345
M1-690-725	C2-997-037
M1-759-793*	C2-878-917
M1-794-827	C2-773-806
M1-623-660	M2-024-748
M1-858-885	M2-002-024
M1-797-830	M1-954-978
M1-697-732	M1-880-906
C2-568-589	M1-853-880
C2-614-637*	C2-757-784

P-1 mill area, 13 samples total

From Archives 17	Direct 6
M2-015-037*	M1-669-705
M1-949-973	M1-327-365
M1-894-920	M1-296-333*
M1-809-841	M1-176-197
M1-780-813	M1-123-136
M1-642-678	M1-115-125
M1-448-489	

P-1 scrap areas, 4 samples total

From Archives 0	Direct 4
	C1-041-050
	C1-019-028
	C1-218-241
	C1-210-235

P-1 tails line, 3 samples total

From Archives 0	Direct 3
	M1-211-232
	C1-544-562
	TW-947-954

P-1 haul road, 3 samples total

From Archives 3	Direct 0
C2-676-702	
C2-614-637	
C1-609-624	

Secondary area, 10 split soil samples total

From Archives 0	Direct 10
	C3-364-386
	C2-634-658
	C2-753-780
	C1-556-943
	C1-260-283
	TW-823-835*
	TE-864-878
	TE-383-388
	TW-299-312
	TW-469-478

Tertiary Area, 0 split soil samples total

* Indicates which samples will have wet chemistry analysis for Ra-226 and total uranium.

To: "Wainhouse,Leo"
Cc: "Albin,Lynn","Peterson,Karen","Wells,Doug"
From: Erickson, John
Subject: Western samples.
Date: 3/30/95 Time: 6:14p

I talked to Lynn today. This is what we came up with. Assuming we collect 100 samples for lab analysis. We will: gamma scan all of them for Ra226 and total Uranium(inexpensive and really doesn't cost much more to do uranium also); analyze all samples for Th 230 using wet chemistry(the only possible way): analyze 10% of the samples(approx 10) for Ra226 and total Uranium using wet chemistry to verify gamma scan; and analyze approx 6 PES samples using gamma and wet chemistry to verify their PES results(these analyses will be done up front as a batch to verify their work and not submitted blind to our lab. Karen please fax this to Lynn for review. Is this ok with everyone?

ERS 95-424

DEPARTMENT OF HEALTH
Environmental Health Programs
DIVISION OF RADIATION PROTECTION

April 17, 1995

TO: George Hilton

FROM: Sandi Green SG

SUBJECT: WNI SOIL SAMPLES

Attached is a list of the Western Nuclear soil samples that are to be collected by the end of the year. The asterisks indicate which samples are to have wet chemistry performed.

If you have any questions, please contact me or Lynn. Thanks.

SEG:KP

cc: Lynn Albin

WNI/DOH SPLIT SOIL SAMPLES

P-2 mill process area, 25 samples total

From Archives 13	Direct 12
M1-342-380	M1-850-877
M1-459-500	M1-787-820
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C3-479-495	C2-745-772
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C2-614-637	
C1-609-624	

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	C1-556-943
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	TW-823-835*
	TE-864-878
	TE-383-388
	TW-299-312
	TW-469-478

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* Indicates which samples will have wet chemistry analysis for Ra-226 and total uranium.

To: "Green,Sandi"
Cc: "Albin,Lynn","Hilton,George" @ LAB1.WA-DOH,"Wells,Doug"
From: Erickson, John
Subject: Western samples.
Date: 4/11/95 Time: 11:50a

Originated by: JLE0303 @ WA-DOH 3/30/95 6:14p
Forwarded by: JLE0303 @ WA-DOH 4/11/95 11:50a (CHANGED)

Sandi I sent this out a couple of weeks ago for comment. Have you had any discussions with Lynn on it? Please verify this proposal with Lynn/ Doug and add the LLD's required. Then prepare a memo to George for me outlining our needs, required turn around time(or our desires and ask the lab to estimate what they can/cannot do), when the samples will be coming in etc. Questions?

> ***** Original Message Follows *****

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1995 SAMPLE LOGBOOK

MEDIA	COLL'N DATE	SITE	PROJECT	SPLIT W/	COLLECTED BY	DATE TO LAB	LAB NUMBER	DATA RECEIVED FROM LAB	COMMENT
SOIL	3/28/95	DMC CRUSHER	U-MILL	DMC	CLARK	4/6/95	16479	8/3/95	
SOIL	3/28/95	DMC PARKING AREA	U-MILL	DMC	CLARK	4/6/95	16480	8/3/95	
SOIL	3/28/95	DMC SCALEHOUSE	U-MILL	DMC	CLARK	4/6/95	16481	8/3/95	
SOIL	4/11/95	WNI, CLOSURE	U-MILL	WNI	WAINHOUSE	4/14/95	16518	9/15/95	C3537552F
SOIL	4/11/95	WNI, CLOSURE	U-MILL	WNI	WAINHOUSE	4/14/95	16518	9/15/95	C3540555F
SOIL	4/11/95	WNI, CLOSURE	U-MILL	WNI	WAINHOUSE	4/14/95	16518	9/15/95	C3582599F
SOIL	4/11/95	WNI, CLOSURE	U-MILL	WNI	WAINHOUSE	4/14/95	16518	9/15/95	C3619636F
SOIL	4/11/95	WNI, CLOSURE	U-MILL	WNI	WAINHOUSE	4/14/95	16518	9/15/95	C3647661F
SOIL	4/24/95	WNI, CLOSURE	U-MILL	WNI	STOFFEL	4/28/95	16579		PES
SOIL	4/24/95	WNI, CLOSURE	U-MILL	WNI	STOFFEL	4/28/95	16580		M2002024S
SOIL	4/24/95	WNI, CLOSURE	U-MILL	WNI	STOFFEL	4/28/95	16581		M1717752S
SOIL	4/24/95	WNI, CLOSURE	U-MILL	WNI	STOFFEL	4/28/95	16582		M1954978S
SOIL	4/24/95	WNI, CLOSURE	U-MILL	WNI	STOFFEL	4/28/95	16583		M1785818
SOIL	4/24/95	WNI, CLOSURE	U-MILL	WNI	STOFFEL	4/28/95	16584		M1853880S
SOIL	4/24/95	WNI, CLOSURE	U-MILL	WNI	STOFFEL	4/28/95	16585		M1268302S
SOIL	4/24/95	WNI, CLOSURE	U-MILL	WNI	STOFFEL	4/28/95	16586		C2757784F
SOIL	4/24/95	WNI, CLOSURE	U-MILL	WNI	STOFFEL	4/28/95	16587		C3364386F
SOIL	4/24/95	WNI, CLOSURE	U-MILL	WNI	STOFFEL	4/28/95	16588		C3186228S
SOIL	4/24/95	WNI, CLOSURE	U-MILL	WNI	STOFFEL	4/28/95	16589		M1494536F
SOIL	4/24/95	WNI, CLOSURE	U-MILL	WNI	STOFFEL	4/28/95	16590		M1880906S
SOIL	4/24/95	WNI, CLOSURE	U-MILL	WNI	STOFFEL	4/28/95	16591		C1041050F
SOIL	4/24/95	WNI, CLOSURE	U-MILL	WNI	STOFFEL	4/28/95	16592		M1576614S
SOIL	4/24/95	WNI, CLOSURE	U-MILL	WNI	STOFFEL	4/28/95	16593		M1787820S
SOIL	4/24/95	WNI, CLOSURE	U-MILL	WNI	STOFFEL	4/28/95	16594		M1337375Q
SOIL	4/24/95	WNI, CLOSURE	U-MILL	WNI	STOFFEL	4/28/95	16595		M1669705S
SOIL	4/24/95	WNI, CLOSURE	U-MILL	WNI	STOFFEL	4/28/95	16596		C1019028F
SOIL	4/24/95	WNI, CLOSURE	U-MILL	WNI	STOFFEL	4/28/95	16597		M1850877S
SOIL	4/24/95	WNI, CLOSURE	U-MILL	WNI	STOFFEL	4/28/95	16598		C2667692S
SOIL	4/24/95	WNI, CLOSURE	U-MILL	WNI	STOFFEL	4/28/95	16599		TW823835F
SOIL	4/24/95	WNI, CLOSURE	U-MILL	WNI	STOFFEL	4/28/95	16600		C1709723S
SOIL	4/24/95	WNI, CLOSURE	U-MILL	WNI	STOFFEL	4/28/95	16601		C1750581S
SOIL	4/24/95	WNI, CLOSURE	U-MILL	WNI	STOFFEL	4/28/95	16602		C30440925
SOIL	4/24/95	WNI, CLOSURE	U-MILL	WNI	STOFFEL	4/28/95	16603		M1115125S

1995 SAMPLE LOGBOOK

MEDIA	COLL'N DATE	SITE	PROJECT	SPLIT W/	COLLECTED BY	DATE TO LAB	LAB NUMBER	DATA RECEIVED FROM LAB	COMMENT
SOIL	4/24/95	WNI, CLOSURE	U-MILL	WNI	STOFFEL	4/28/95	16604		M1123136S
SOIL	4/24/95	WNI, CLOSURE	U-MILL	WNI	STOFFEL	4/28/95	16605		C2895932F
SOIL	4/24/95	WNI, CLOSURE	U-MILL	WNI	STOFFEL	4/28/95	16606		C2794827F
SOIL	4/24/95	WNI, CLOSURE	U-MILL	WNI	STOFFEL	4/28/95	16607		C1210235F
SOIL	4/24/95	WNI, CLOSURE	U-MILL	WNI	STOFFEL	4/28/95	16608		C2625648S
SOIL	4/24/95	WNI, CLOSURE	U-MILL	WNI	STOFFEL	4/28/95	16609		C27457725
SOIL	4/24/95	WNI, CLOSURE	U-MILL	WNI	STOFFEL	4/28/95	16610		C3094140S
SOIL	5/10/95	INS TLD SITE	SER	INS	DANIELSON	5/11/95	16719		SPLIT W/INS
SOIL	5/18/95	WNP-2, STA 1	EFSEC	WNP-2	SCHLEDER	5/25/95	16748		
SOIL	6/22/95	WNI, CLOSURE	U-MILL	WNI	STOFFEL	6/26/95	16820		M2-015-037
SOIL	6/22/95	WNI, CLOSURE	U-MILL	WNI	STOFFEL	6/26/95	16821		M1-642-678
SOIL	6/22/95	WNI, CLOSURE	U-MILL	WNI	STOFFEL	6/26/95	16822		C2-676-702
SOIL	6/22/95	WNI, CLOSURE	U-MILL	WNI	STOFFEL	6/26/95	16823		M1-949-973
SOIL	6/22/95	WNI, CLOSURE	U-MILL	WNI	STOFFEL	6/26/95	16824		C2-614-637
SOIL	6/22/95	WNI, CLOSURE	U-MILL	WNI	STOFFEL	6/26/95	16825		M1-780-813
SOIL	6/22/95	WNI, CLOSURE	U-MILL	WNI	STOFFEL	6/26/95	16826		M1-226-249
SOIL	6/22/95	WNI, CLOSURE	U-MILL	WNI	STOFFEL	6/26/95	16827		M1-809-849
SOIL	6/22/95	WNI, CLOSURE	U-MILL	WNI	STOFFEL	6/26/95	16828		M1-894-920
SOIL	6/22/95	WNI, CLOSURE	U-MILL	WNI	STOFFEL	6/26/95	16829		PES, M1-055-061
SOIL	6/22/95	WNI, CLOSURE	U-MILL	WNI	STOFFEL	6/26/95	16830		M1-283-317
SOIL	6/22/95	WNI, CLOSURE	U-MILL	WNI	STOFFEL	6/26/95	16831		C2-806-840
SOIL	6/22/95	WNI, CLOSURE	U-MILL	WNI	STOFFEL	6/26/95	16832		C1-525-544
SOIL	6/22/95	WNI, CLOSURE	U-MILL	WNI	STOFFEL	6/26/95	16833		M1-618-655
SOIL	6/22/95	WNI, CLOSURE	U-MILL	WNI	STOFFEL	6/26/95	16834		M1-271-305
SOIL	6/22/95	WNI, CLOSURE	U-MILL	WNI	STOFFEL	6/26/95	16835		M1-416-457
SOIL	6/22/95	WNI, CLOSURE	U-MILL	WNI	STOFFEL	6/26/95	16836		M2-024-748
SOIL	6/22/95	WNI, CLOSURE	U-MILL	WNI	STOFFEL	6/26/95	16837		C2-997-037
SOIL	6/22/95	WNI, CLOSURE	U-MILL	WNI	STOFFEL	6/26/95	16838		C2-878-917
SOIL	6/22/95	WNI, CLOSURE	U-MILL	WNI	STOFFEL	6/26/95	16839		C3-316-345
SOIL	6/22/95	WNI, CLOSURE	U-MILL	WNI	STOFFEL	6/26/95	16840		PES
SOIL	6/22/95	WNI, CLOSURE	U-MILL	WNI	STOFFEL	6/26/95	16841		PES
SOIL	6/22/95	WNI, CLOSURE	U-MILL	WNI	STOFFEL	6/26/95	16842		PES
SOIL	7/12/95	WNI, CLOSURE	U-MILLS	WNI	AHMAD	8/4/95	17002		C3619636F

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MEDIA	COLL'N DATE	SITE	PROJECT	SPLIT W/	COLLECTED BY	DATE TO LAB	LAB NUMBER	DATA RECEIVED FROM LAB	COMMENT
SOIL	7/13/95	WNI, CLOSURE	U-MILLS	WNI	AHMAD	8/4/95	17003		C3582599F
SOIL	7/17/95	WNI, CLOSURE	U-MILLS	WNI	AHMAD	8/4/95	17001		C3540555F
SOIL	7/18/95	WNI, CLOSURE	U-MILLS	WNI	AHMAD	8/4/95	17000		C3647661F
SOIL	7/18/95	WNI, CLOSURE	U-MILLS	WNI	AHMAD	8/4/95	16999		C3537552F
SOIL	7/18/95	WNI, CLOSURE	U-MILLS	WNI	AHMAD	8/4/95	16998		C3479495F
SOIL	7/18/95	WNI, CLOSURE	U-MILLS	WNI	AHMAD	8/4/95	16997		C3398421F
SOIL	7/18/95	WNI, CLOSURE	U-MILLS	WNI	AHMAD	8/4/95	16996		C3586603F
SOIL	7/18/95	WNI, CLOSURE	U-MILLS	WNI	AHMAD	8/4/95	16995		M1223246S
SOIL	7/24/95	WNI, CLOSURE	U-MILLS	WNI	AHMAD	8/4/95	16980		TW823835F
SOIL	7/24/95	WNI, CLOSURE	U-MILLS	WNI	AHMAD	8/4/95	16981		TE383388F
SOIL	7/24/95	WNI, CLOSURE	U-MILLS	WNI	AHMAD	8/4/95	16982		TE864878F
SOIL	7/24/95	WNI, CLOSURE	U-MILLS	WNI	AHMAD	8/4/95	16983		TW299312F
SOIL	7/24/95	WNI, CLOSURE	U-MILLS	WNI	AHMAD	8/4/95	16984		CI556943F
SOIL	7/24/95	WNI, CLOSURE	U-MILLS	WNI	AHMAD	8/4/95	16985		CI418440F
SOIL	7/24/95	WNI, CLOSURE	U-MILLS	WNI	AHMAD	8/4/95	16986		CI401424F
SOIL	7/24/95	WNI, CLOSURE	U-MILLS	WNI	AHMAD	8/4/95	16987		CI702716F
SOIL	7/24/95	WNI, CLOSURE	U-MILLS	WNI	AHMAD	8/4/95	16988		MI183204S
SOIL	7/24/95	WNI, CLOSURE	U-MILLS	WNI	AHMAD	8/4/95	16989		C2725752F
SOIL	7/24/95	WNI, CLOSURE	U-MILLS	WNI	AHMAD	8/4/95	16990		M1211232S
SOIL	7/24/95	WNI, CLOSURE	U-MILLS	WNI	AHMAD	8/4/95	16991		M1296333F
SOIL	7/24/95	WNI, CLOSURE	U-MILLS	WNI	AHMAD	8/4/95	16992		C1218241F
SOIL	7/24/95	WNI, CLOSURE	U-MILLS	WNI	AHMAD	8/4/95	16993		C3584601F
SOIL	7/24/95	WNI, CLOSURE	U-MILLS	WNI	AHMAD	8/4/95	16994		TW947954F
SOIL	7/25/95	WNI, CLOSURE	U-MILLS	WNI	AHMAD	8/4/95	16977		M1936986F
SOIL	7/25/95	WNI, CLOSURE	U-MILLS	WNI	AHMAD	8/4/95	16978		C1481502F
SOIL	7/25/95	WNI, CLOSURE	U-MILLS	WNI	AHMAD	8/4/95	16979		C1609624F
SOIL	9/27/95	DMC, 2-3	U-MILL		CLARK	9/27/95	17263		QUARTERLY SAMPLES
SOIL	9/28/95	WNI, C	U-MILL		CLARK	9/28/95	17261S		QUARTERLY SAMPLES

WNI SOIL SAMPLES, DATA SUMMARY pCi/g

	Th-232		U-238 (da)		U-235 (g)		Cs-137	
site location	activity	error	activity	error	activity	error	activity	error
C1-0190-28F	1.97	0.12	1.77	0.43	0.09	0.12		
C1-041-050F	1.24	0.11	3.35	0.39	0.23	0.03		
C1-210-235F	1.57	0.11	1.14	0.27	0.057	0.071	0.131	0.028
C1-218-241F			1.8	0.3	0.14	0.02	0.16	0.02
C1-481-502F	1.12	0.11	1.58	0.24	0.13	0.02		
C1-525-544	1.3	0.1	1.65	0.3	0.18	0.03		
C1-609-624F	1.15	0.1	1.01	0.26	0.02	0.06	0.05	0.014
C1-709-723S	1.11	0.09	1.21	0.26	0.09	0.02		
C1-750-581S	1.17	0.09	1.25	0.17	0.096	0.017		
C2-614-637	1.51	0.13	2	0.3	0.17	0.02		
C2-6256-48S	1.22	0.08	0.87	0.39	-0.01	0.01		
C2-667-692S	1.12	0.09	1	0.25	0.0944	0.0208		
C2-676-702	1.11	0.22	1.9	0.3	0.16	0.02		
C2-725-752F			1.3	0.2	0.11	0.02		
C2-745-772S	1.12	0.08	1.19	0.28	0.086	0.024		
C2-757-784F	1.46	0.12	1.46	0.4	0.05	0.11	0.052	0.024
C2-794-827F	1.12	0.08	1.59	0.38	0.071	0.068	0.028	0.011
C2-806-840	1.5	0.1	1.32	0.26	0.09	0.07		
C2-878-917	1.02	0.1	1.77	0.31	0.1	0.02		
C2-895-932F	3.98	0.17	1.77	0.31	0.15	0.03	0.072	0.018
C2-997-037	1.6	0.2	4.81	0.38	0.33	0.03	0.133	0.017
C3-044-092S	1.17	0.09	2.2	0.3	0.21	0.03	0.032	0.032
C3-094-140S	0.859	0.069	3.03	0.37	0.28	0.03	0.06	0.017
C3-186-228S	1.28	0.11	0.72	0.44	0.08	0.03	0.1	0.02
C3-316-345	0.73	0.1	1.77	0.32	0.16	0.02	0.017	0.011
C3-364-386F	1.25	0.11	1.64	0.46	0.11	0.12		
C3-398-421F	1.1	0.1	3.78	0.32	0.24	0.02		
C3-479-495F	1.42	0.11	0.629	0.23	0.131	0.018	0.035	0.011
C3-479-495F	1.3	0.1	1.71	0.29	0.13	0.02	0.03	0.016
C3-537-552F	6.45	0.24	1.58	0.3	0.12	0.02	0.036	0.013
C3-537-552F	1.2	0.1	2	0.34	0.14	0.02	0.053	0.017
C3-540-555F	1.58	0.13	3.53	0.43	0.21	0.03		
C3-540-555F	1.5	0.1	3.6	0.3	0.24	0.02		
C3-582-599F	1.31	0.11	1.48	0.3	0.1	0.02		
C3-582-599F	1.5	0.1	1.7	0.3	0.09	0.02		
C3-584-601F			1.3	0.3	0.09	0.02		
C3-586-603F	1.1	0.1	1.51	0.3	0.093	0.022		
C3-619-636F	1.55	0.13	1.28	0.29	0.12	0.02	0.055	0.003
C3-619-636F	1.6	0.1	1.66	0.26	0.134	0.022	0.043	0.017
C3-647-661F	1.57	0.13	1.02	0.42	0.13	0.03	0.089	0.032
C3-647-661F	1.6	0.1	1.2	0.3	0.13	0.02	0.041	0.011
CI-401-424F			1.5	0.3	0.12	0.02	0.08	0.01
CI-418-440F	1.69	0.12	7.22	0.52	0.751	0.049	0.06	0.021
CI-556-943F	1	0.1	1.14	0.29	0.08	0.07		
CI-702-716F			0.9	0.2	0.07	0.02	0.02	0.01
M1-115-125S	1.01	0.09	2	0.44	0.16	0.04		
M1-123-136S	1.21	0.1	1.5	0.3	0.1	0.02		

WNI SOIL SAMPLES, DATA SUMMARY pCi/g

	Th-232		U-238 (da)		U-235 (g)		Cs-137	
site location	activity	error	activity	error	activity	error	activity	error
M1-211-232S			1.5	0.3	0.14	0.02		
M1-223-246S	2.3	0.1	3.71	0.53	0.36	0.04		
M1-226-249	1.2	0.12	2	0.3	0.15	0.03		
M1-268-302S	4.86	0.24	6.24	0.56	0.43	0.04		
M1-271-305	2.8	0.1	1.43	0.39	0.15	0.03		
M1-283-317	1.1	0.1	1.87	0.34	0.09	0.07		
M1-296-333F			6.2	0.5	0.53	0.04		
M1-310-347S	1.54	0.11	5.58	0.7	0.447	0.056		
M1-337-375Q	2.15	0.15	4.48	0.57	0.4	0.05		
M1-342-380S	1.41	0.11	2.33	0.22	0.18	0.018		
M1-348-386S	1.25	0.1	2.05	0.32	0.185	0.027		
M1-382-422S	1.44	0.11	1.5	0.12	0.124	0.009		
M1-388-428S	1.38	0.11	1.43	0.28	0.043	0.07		
M1-416-457	2.9	0.2	2.1	0.35	0.13	0.03		
M1-459-500S	1.65	0.11	3.88	0.33	0.277	0.027		
M1-494-536F	1.54	0.12	3.04	0.37	0.25	0.03		
M1-50-543S	1.7	0.11	2.52	0.23	0.159	0.016		
M1-504-546S	1.6	0.12	1.31	0.24	0.09	0.021		
M1-549-590S	0.867	0.09	1.9	0.5	0.08	0.12		
M1-552-593S	1.27	0.1	1.46	0.19	0.09	0.014		
M1-576-614S	2.36	0.16	2.1	0.42	0.19	0.04		
M1-618-655	1.5	0.1	2.2	0.33	0.17	0.03		
M1-623-660S	1.44	0.12	1.34	0.37	0.09	0.11		
M1-642-678	0.945	0.096	1.5	0.3	0.08	0.07		
M1-669-705S	1.29	0.1	1.38	0.32	0.11	0.08		
M1-690-725S	1.09	0.1	1.4	0.19	0.14	0.02		
M1-697-732F	1.76	0.11	1.8	0.5	0.11	0.011		
M1-717-752S	1.09	0.09	2.4	0.5	0.3	0.06		
M1-759-793S	1.23	0.11	1.87	0.48	0.08	0.11		
M1-780-813	1.77	0.13	5.9	0.4	0.38	0.03		
M1-785-818S	0.878	0.099	1.1	0.3	0.12	0.03		
M1-787-820S	1.5	0.13	1.25	0.45	0.06	0.1		
M1-794-827S	1.18	0.1	1.23	0.28	0.14	0.08		
M1-797-830F	1.39	0.11	1.9	0.4	0.11	0.011		
M1-809-849	0.251	0.055	1.5	0.3	0.12	0.07		
M1-850-877S	1.1	0.09	1.04	0.41	0.06	0.1		
M1-853-880S	1.5	0.12	1.87	0.33	0.15	0.03		
M1-858-885F	1.08	0.07	2.4	0.4	0.13	0.03		
M1-880-906S	1.45	0.11	1.51	0.35	0.11	0.08		
M1-894-920	1.3	0.1	2.12	0.28	0.16	0.02		
M1-936-986F	1.41	0.11	1.61	0.32	0.15	0.02		
M1-949-973	1.19	0.11	2.1	0.3	0.14	0.02		
M1-954-978S	1.18	0.1	1.8	0.5	0.19	0.04		
M2-002-024S	0.615	0.064	1.9	0.5	0.13	0.04		
M2-015-037	1.16	0.11	2	0.3	0.14	0.02		
M2-024-748	1.32	0.09	1.79	0.34	0.11	0.02		
MI-183-204S			1.6	0.3	0.18	0.03		

WNI SOIL SAMPLES, DATA SUMMARY pCi/g

	Th-232		*U-238 (da)*		*U-235 (g)*		*Cs-137*	
site location	***activity***	***error***	***activity***	***error***	***activity***	***error***	***activity***	***error***
TE-383-388F	1.43	0.11	1.09	0.26	0.087	0.021	0.012	0.007
TE-864-878F	1.13	0.09	1.01	0.27	0.1	0.1		
TW-299-312F	1.14	0.1	1.01	0.25	0.1	0.1	0.02	0.012
TW-823-835F	1.42	0.11	1.15	0.29	0.099	0.024		
TW-823-835F	1.08	0.1	1.03	0.26	0.1	0.02		
TW-947-954F			1.2	0.3	0.09	0.02	0.02	0.01
PES	1.33	0.11	2.2	0.6	0.25	0.06		
PES	1.05	0.1	2.59	0.34	0.28	0.04		
PES	1.18	0.08	2.73	0.36	0.29	0.03		
PES	1.5	0.1	2.48	0.46	0.33	0.04		
PES 8113	1.22	0.12	2.54	0.56	0.34	0.06		
PES, M1-055-061	1.2	0.1	2.95	0.36	0.32	0.03		

WNI SOIL SAMPLES, DATA SUMMARY pCi/g

	Total U	
site location	***activity***	***error***
C1-0190-28F		
C1-041-050F		
C1-210-235F		
C1-218-241F		
C1-481-502F		
C1-525-544		
C1-609-624F		
C1-709-723S	2.19	0.15
C1-750-581S		
C2-614-637		
C2-6256-48S		
C2-667-692S		
C2-676-702		
C2-725-752F		
C2-745-772S		
C2-757-784F		
C2-794-827F		
C2-806-840		
C2-878-917		
C2-895-932F		
C2-997-037		
C3-044-092S		
C3-094-140S	5.82	0.22
C3-186-228S		
C3-316-345		
C3-364-386F		
C3-398-421F		
C3-479-495F		
C3-479-495F		
C3-537-552F		
C3-537-552F		
C3-540-555F		
C3-540-555F		
C3-582-599F		
C3-582-599F		
C3-584-601F		
C3-586-603F		
C3-619-636F		
C3-619-636F		
C3-647-661F		
C3-647-661F		
CI-401-424F		
CI-418-440F		
CI-556-943F		
CI-702-716F		
M1-115-125S		
M1-123-136S		

WNI SOIL SAMPLES, DATA SUMMARY pCi/g

	Total U	
site location	***activity***	***error***
M1-211-232S		
M1-223-246S		
M1-226-249	4.88	0.2
M1-268-302S		
M1-271-305		
M1-283-317		
M1-296-333F	14.2	0.3
M1-310-347S		
M1-337-375Q		
M1-342-380S		
M1-348-386S		
M1-382-422S		
M1-388-428S		
M1-416-457		
M1-459-500S		
M1-494-536F	6.22	0.23
M1-50-543S		
M1-504-546S		
M1-549-590S	3.84	0.18
M1-552-593S		
M1-576-614S		
M1-618-655		
M1-623-660S		
M1-642-678		
M1-669-705S		
M1-690-725S		
M1-697-732F		
M1-717-752S	6	0.22
M1-759-793S	2.93	0.16
M1-780-813		
M1-785-818S		
M1-787-820S		
M1-794-827S		
M1-797-830F		
M1-809-849		
M1-850-877S		
M1-853-880S		
M1-858-885F		
M1-880-906S		
M1-894-920		
M1-936-986F		
M1-949-973		
M1-954-978S		
M2-002-024S		
M2-015-037	3.79	0.18
M2-024-748		
MI-183-204S		

WNI SOIL SAMPLES, DATA SUMMARY pCi/g

	Total U	
site location	***activity***	***error***
TE-383-388F		
TE-864-878F		
TW-299-312F		
TW-823-835F	1.63	0.11
TW-823-835F		
TW-947-954F		
PES	6.62	0.24
PES	4.9	0.22
PES	5.42	0.21
PES	5.89	0.23
PES 8113	5.52	0.23
PES, M1-055-061	4.95	0.21

WNI SOIL SAMPLES, DATA SUMMARY pCi/g

			Ra-226 (da)		Th-228		Th-230	
site location	Colln	lab id	activity	error	activity	error	activity	error
C1-0190-28F	4/24/95	16596	1.24	0.06	1.93	0.13	1.47	0.11
C1-041-050F	4/24/95	16591	1.41	0.05	1.41	0.12	1.68	0.13
C1-210-235F	4/24/95	16607	1.13	0.04	1.71	0.12	1.46	0.11
C1-218-241F	7/24/95	16992	1.23	0.04				
C1-481-502F	7/25/95	16978	1.1	0.04	1.26	0.12	7.1	0.28
C1-525-544	6/22/95	16832	2.38	0.07	1.4	0.1	3.6	0.1
C1-609-624F	7/25/95	16979	1	0.05	1.33	0.11	1.29	0.11
C1-709-723S	4/24/95	16600	1.14	0.04	1.28	0.11	1.33	0.1
C1-750-581S	4/24/95	16601	1.63	0.17	1.32	0.11	4.93	0.19
C2-614-637	6/22/95	16824	1.4	0.1	1.78	0.14	4.67	0.23
C2-6256-48S	4/24/95	16608	1.03	0.06	1.31	0.09	1.13	0.08
C2-667-692S	4/24/95	16598	1.12	0.04	1.17	0.1	1.58	0.11
C2-676-702	6/22/95	16822	1.52	0.05	1.28	0.25	2.58	0.35
C2-725-752F	7/24/95	16989	1.12	0.04				
C2-745-772S	4/24/95	16609	1.12	0.04	1.17	0.08	1.16	0.09
C2-757-784F	4/24/95	16586	1.08	0.05	1.55	0.12	1.2	0.11
C2-794-827F	4/24/95	16606	1.38	0.06	1.28	0.09	1.77	0.1
C2-806-840	6/22/95	16831	1.07	0.04	1.6	0.1	1.2	0.1
C2-878-917	6/22/95	16838	1.22	0.04	1.04	0.1	0.72	0.09
C2-895-932F	4/24/95	16605	1.4	0.05	3.74	0.17	3.31	0.16
C2-997-037	6/22/95	16837	1.85	0.06	1.7	0.2	5.4	0.3
C3-044-092S	4/24/95	16602	1.7	0.1	1.37	0.11	4.5	0.18
C3-094-140S	4/24/95	16610	2.5	0.07	0.801	0.068	2.97	0.13
C3-186-228S	4/24/95	16588	1.02	0.06	1.34	0.11	1.19	0.11
C3-316-345	6/22/95	16839	1.68	0.07	0.92	0.11	1.12	0.12
C3-364-386F	4/24/95	16587	1.64	0.46	1.31	0.11	3.46	0.18
C3-398-421F	7/18/95	16997	1.08	0.04	1.3	0.1	3.8	0.2
C3-479-495F	4/11/95	16517	1.48	0.04	1.39	0.12	5.76	0.21
C3-479-495F	7/18/95	16998	1.51	0.05	1.3	0.1	1.24	0.3
C3-537-552F	4/11/95	16518	1.36	0.05	5.34	0.23	11.5	0.3
C3-537-552F	7/18/95	16999	1.1	0.05	1.3	0.1	12.5	0.3
C3-540-555F	4/11/95	16519	1.06	0.05	1.3	0.13	6.03	0.25
C3-540-555F	7/17/95	17001	1.18	0.04	1.3	0.1	6.7	0.2
C3-582-599F	4/11/95	16520	1.16	0.04	1.23	0.12	7.11	0.25
C3-582-599F	7/13/95	17003	0.99	0.05	1.3	0.1	15.7	0.3
C3-584-601F	7/24/95	16993	1.17	0.04				
C3-586-603F	7/18/95	16996	1.07	0.05	1.1	0.1	1.3	0.1
C3-619-636F	4/11/95	16521	1.18	0.04	1.73	0.15	17.2	0.4
C3-619-636F	7/12/95	17002	1.13	0.05	1.4	0.1	16.9	0.3
C3-647-661F	4/11/95	16522	1.34	0.06	1.61	0.15	21.4	0.5
C3-647-661F	7/18/95	17000	1.27	0.04	1.5	0.1	23.9	0.4
CI-401-424F	7/24/95	16986	1.15	0.04				
CI-418-440F	7/24/95	16985	7.34	0.16	1.53	0.11	8.59	0.26
CI-556-943F	7/24/95	16984	1.09	0.05	1.2	0.1	0.97	0.09
CI-702-716F	7/24/95	16987	1	0.04				
M1-115-125S	4/24/95	16603	1.68	0.07	1.19	0.1	1.65	0.11
M1-123-136S	4/24/95	16604	1.21	0.04	1.24	0.1	1.69	0.12

WNI SOIL SAMPLES, DATA SUMMARY pCi/g

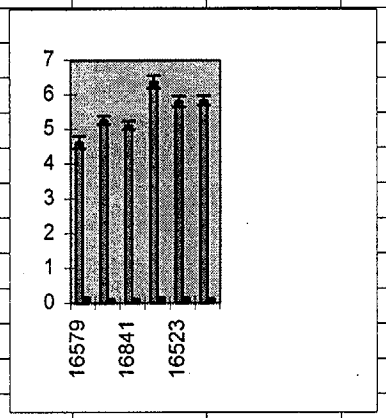
			Ra-226 (da)		Th-228		Th-230	
site location	Colln	lab id	activity	error	activity	error	activity	error
M1-211-232S	7/24/95	16990	1.45	0.05				
M1-223-246S	7/18/95	16995	3.94	0.13	2.5	0.1	5.1	0.2
M1-226-249	6/22/95	16826	1.9	0.1	1.59	0.14	4	0.21
M1-268-302S	4/24/95	16585	2.53	0.08	5.05	0.24	4.56	0.23
M1-271-305	6/22/95	16834	1.27	0.06	2.9	0.1	1.8	0.1
M1-283-317	6/22/95	16830	1.44	0.06	1.3	0.1	1.7	0.1
M1-296-333F	7/24/95	16991	4.6	0.1				
M1-310-347S	4/11/95	16512	4.46	0.13	1.48	0.12	4.96	0.2
M1-337-375Q	4/24/95	16594	2.73	0.09	2.13	0.15	3.7	0.2
M1-342-380S	4/11/95	16508	1.55	0.05	1.55	0.13	4.71	0.2
M1-348-386S	4/11/95	16514	1.77	0.06	1.3	0.11	2.63	0.15
M1-382-422S	4/11/95	16511	1.36	0.03	1.49	0.12	3.51	0.17
M1-388-428S	4/11/95	16515	1.12	0.04	1.47	0.12	1.28	0.11
M1-416-457	6/22/95	16835	1.19	0.04	2.7	0.2	1.8	0.1
M1-459-500S	4/11/95	16509	1.26	0.05	1.41	0.12	26	0.4
M1-494-536F	4/24/95	16589	1.97	0.06	1.72	0.13	11.5	0.3
M1-~~50~~-543S	4/11/95	16510	1.22	0.04	1.42	0.11	3.93	0.17
~~M1-504-546S~~	~~4/11/95~~	16513	1.08	0.06	1.75	0.13	1.26	0.11
M1-549-590S	4/11/95	16531	1.25	0.06	0.92	0.093	2.68	0.16
M1-552-593S	4/11/95	16516	1.1	0.03	1.37	0.12	1.52	0.11
M1-576-614S	4/24/95	16592	1.52	0.06	1.82	0.14	2.32	0.16
M1-618-655	6/22/95	16833	1.12	0.05	1.5	0.1	5.9	0.2
M1-623-660S	4/11/95	16527	1.08	0.05	1.47	0.14	1.23	0.12
M1-642-678	6/22/95	16821	1.1	0.1	1.07	0.1	0.766	0.09
M1-669-705S	4/24/95	16595	1.09	0.04	1.48	0.11	1.51	0.11
M1-690-725S	4/11/95	16524	1.11	0.05	1.16	0.12	0.92	0.09
M1-697-732F	4/11/95	16530	1.09	0.06	1.74	0.1	1.76	0.1
M1-717-752S	4/24/95	16581	3.3	0.1	1.28	0.1	4.32	0.18
M1-759-793S	4/11/95	16525	0.99	0.06	1.43	0.13	1.1	0.11
M1-780-813	6/22/95	16825	1.6	0.1	1.73	0.13	22	0.5
M1-785-818S	4/24/95	16583	1.09	0.06	1.1	0.11	1.16	0.12
M1-787-820S	4/24/95	16593	1.08	0.06	1.51	0.13	1.76	0.14
M1-794-827S	4/11/95	16526	1.07	0.04	1.21	0.12	1.15	0.11
M1-797-830F	4/11/95	16529	1.11	0.05	1.43	0.11	1.54	0.12
M1-809-849	6/22/95	16827	1.5	0.1	0.183	0.052	0.358	0.07
M1-850-877S	4/24/95	16597	1.01	0.06	1.11	0.1	1.14	0.1
M1-853-880S	4/24/95	16584	1.11	0.04	1.5	0.12	1.22	0.11
M1-858-885F	4/11/95	16528	1.06	0.05	1.07	0.08	0.759	0.067
M1-880-906S	4/24/95	16590	1.03	0.05	1.5	0.12	1.37	0.11
M1-894-920	6/22/95	16828	1.25	0.05	1.3	0.1	1.6	0.1
M1-936-986F	7/25/95	16977	1.39	0.05	1.27	0.11	1.42	0.11
M1-949-973	6/22/95	16823	1.17	0.04	1.24	0.11	1.39	0.17
M1-954-978S	4/24/95	16582	1.46	0.06	1.32	0.11	1.59	0.12
M2-002-024S	4/24/95	16580	1.1	0.05	0.615	0.069	0.562	0.068
M2-015-037	6/22/95	16820	1.27	0.04	1.15	0.11	1.58	0.13
M2-024-748	6/22/95	16836	1.27	0.06	1.32	0.09	1.97	0.11
MI-183-204S	7/24/95	16988	1.9	0.1				

WNI SOIL SAMPLES, DATA SUMMARY pCi/g

			Ra-226 (da)		Th-228		Th-230	
site location	***Colln***	***lab id***	***activity***	***error***	***activity***	***error***	***activity***	***error***
TE-383-388F	7/24/95	16981	1.07	0.04	1.72	0.13	1.22	0.11
TE-864-878F	7/24/95	16982	1.13	0.05	1.35	0.1	1.36	0.1
~~TW-299~~-312F	~~7/24/95~~	16983	1.09	0.39	1.65	0.12	1.11	0.1
TW-823-835F	4/24/95	16599	1.11	0.04	1.61	0.12	1.46	0.11
TW-823-835F	7/24/95	16980	1.12	0.04	1.32	0.11	0.98	
~~TW-947-954F~~	~~7/24/95~~	16994	1.17	0.04				
PES	4/24/95	16579	4.63	0.18	1.38	0.11	6.57	0.24
PES	6/22/95	16840	5.26	0.12	0.94	0.1	3.35	0.18
PES	6/22/95	16841	5.12	0.12	1.23	0.09	4.71	0.17
PES	6/22/95	16842	6.37	0.18	1.5	0.2	5.2	0.3
PES 8113	4/11/95	16523	5.81	0.16	1.31	0.14	4.24	0.23
PES, M1-055-061	6/22/95	16829	5.84	0.14	1.2	0.1	4.7	0.2

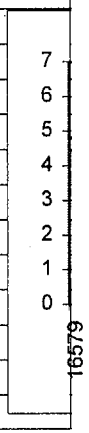
PES (pCi/g)

	Ra-226 (da)		Ra-226		Th-228		Th-230		Th-232		U-238 (da)	
lab id	activity	error	activitiy	error	activity	error	activity	error	activity	error	activity	error
16579	4.63	0.18	5.7	0.5	1.38	0.11	6.57	0.24	1.33	0.11	2.2	0.6
16840	5.26	0.12	4.6	0.3	0.94	0.1	3.35	0.18	1.05	0.1	2.59	0.34
16841	5.12	0.12	4.9	0.3	1.23	0.09	4.71	0.17	1.18	0.08	2.73	0.36
16842	6.37	0.18	5.2	0.4	1.5	0.2	5.2	0.3	1.5	0.1	2.48	0.46
16523	5.81	0.16	4.2	0.3	1.31	0.14	4.24	0.23	1.22	0.12	2.54	0.56
16829	5.84	0.14	5.2	0.3	1.2	0.1	4.7	0.2	1.2	0.1	2.95	0.36
mean	5.505		4.966667		1.26		4.795		1.246667		2.581667	
std.dev	0.620862		0.524087		0.190473		1.070229		0.153058		0.25119	



PES (pCi/g)

	U-238		U-235 (g)		U-235		U-234		Total U	
lab id	activity	error	activity	error	activity	error	activity	error	activity	error
16579	3.18	0.17	0.25	0.06	0.1	0.03	3.27	0.17	6.62	0.24
16840	2.34	0.15	0.28	0.04	0.068	0.028	2.44	0.16	4.9	0.22
16841	2.76	0.15	0.29	0.03	0.065	0.025	2.54	0.15	5.42	0.21
16842	2.84	0.16	0.33	0.04	0.082	0.029	2.89	0.16	5.89	0.23
16523	2.87	0.16	0.34	0.06	0.09	0.03	2.51	0.15	5.52	0.23
16829	2.47	0.14	0.32	0.03	0.07	0.03	2.33	0.14	4.95	0.21
mean	2.743333		0.301667		0.079167		2.663333		5.55	
std.dev	0.301242		0.034303		0.01392		0.35189		0.641997	



WNI SOIL SAMPLES, DATA SUMMARY pCi/g

	Ra-226		*U-238*		*U-235*		*U-234*	
site location	***activitiy***	***error***	***activity***	***error***	***activity***	***error***	***activity***	***error***
C1-0190-28F								
C1-041-050F								
C1-210-235F								
C1-218-241F								
C1-481-502F								
C1-525-544								
C1-609-624F								
C1-709-723S	1.1	0.2	0.99	0.1	0.035	0.022	1.14	0.11
C1-750-581S								
C2-614-637								
C2-6256-48S								
C2-667-692S								
C2-676-702								
C2-725-752F								
C2-745-772S								
C2-757-784F								
C2-794-827F								
C2-806-840								
C2-878-917								
C2-895-932F								
C2-997-037								
C3-044-092S								
C3-094-140S	2.2	0.2	2.83	0.15	0.11	0.03	2.84	0.15
C3-186-228S								
C3-316-345								
C3-364-386F								
C3-398-421F								
C3-479-495F								
C3-479-495F								
C3-537-552F								
C3-537-552F								
C3-540-555F								
C3-540-555F								
C3-582-599F								
C3-582-599F								
C3-584-601F								
C3-586-603F								
C3-619-636F								
C3-619-636F								
C3-647-661F								
C3-647-661F								
CI-401-424F								
CI-418-440F								
CI-556-943F								
CI-702-716F								
M1-115-125S								
M1-123-136S								

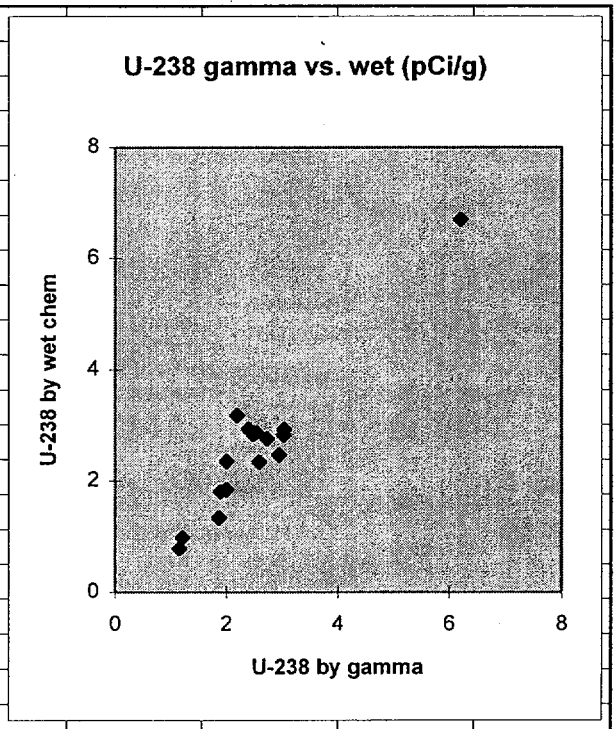
WNI SOIL SAMPLES, DATA SUMMARY pCi/g

	Ra-226		U-238		U-235		U-234	
site location	activitiy	error	activity	error	activity	error	activity	error
M1-211-232S								
M1-223-246S								
M1-226-249	2.6	0.3	2.35	0.14	0.076	0.026	2.38	0.14
M1-268-302S								
M1-271-305								
M1-283-317								
M1-296-333F	4.5	0.3	6.7	0.2	0.26	0.05	7.1	0.2
M1-310-347S								
M1-337-375Q								
M1-342-380S								
M1-348-386S								
M1-382-422S								
M1-388-428S								
M1-416-457								
M1-459-500S								
M1-494-536F	1.7	0.2	2.93	0.16	0.09	0.03	3.27	0.17
M1-50-543S								
M1-504-546S								
M1-549-590S	1.24	0.27	1.81	0.12	0.068	0.026	1.89	0.13
M1-552-593S								
M1-576-614S								
M1-618-655								
M1-623-660S								
M1-642-678								
M1-669-705S								
M1-690-725S								
M1-697-732F								
M1-717-752S	3.6	0.4	2.94	0.15	0.1	0.03	2.89	0.15
M1-759-793S	0.94	0.24	1.34	0.11	0.062	0.025	1.51	0.11
M1-780-813								
M1-785-818S								
M1-787-820S								
M1-794-827S								
M1-797-830F								
M1-809-849								
M1-850-877S								
M1-853-880S								
M1-858-885F								
M1-880-906S								
M1-894-920								
M1-936-986F								
M1-949-973								
M1-954-978S								
M2-002-024S								
M2-015-037	1.4	0.2	1.84	0.13	0.084	0.029	1.82	0.13
M2-024-748								
MI-183-204S								

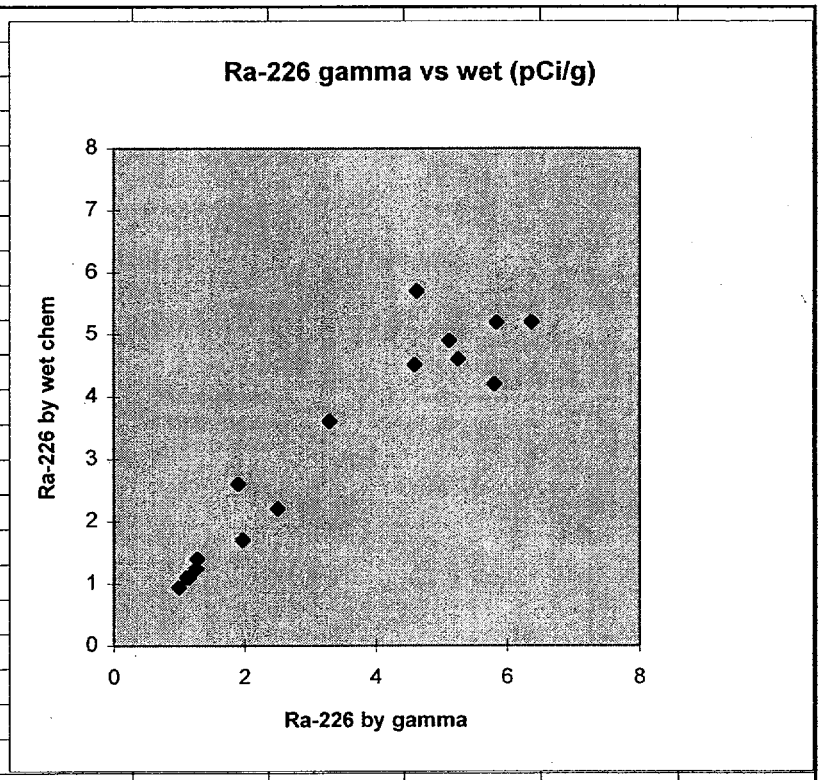
WNI SOIL SAMPLES, DATA SUMMARY pCi/g

	Ra-226		U-238		U-235		U-234	
site location	activitiy	error	activity	error	activity	error	activity	error
TE-383-388F								
TE-864-878F								
TW-299-312F								
TW-823-835F	1.1	0.2	0.79	0.08	0.03	0.02	0.79	0.08
TW-823-835F								
TW-947-954F*								
PES	5.7	0.5	3.18	0.17	0.1	0.03	3.27	0.17
PES	4.6	0.3	2.34	0.15	0.068	0.028	2.44	0.16
PES	4.9	0.3	2.76	0.15	0.065	0.025	2.54	0.15
PES	5.2	0.4	2.84	0.16	0.082	0.029	2.89	0.16
PES 8113	4.2	0.3	2.87	0.16	0.09	0.03	2.51	0.15
PES, M1-055-061	5.2	0.3	2.47	0.14	0.07	0.03	2.33	0.14

da	*wet*	difference					
1.15	0.79	0.36					
1.21	0.99	0.22					
1.87	1.34	0.53					
1.9	1.81	0.09					
2	2.35	-0.35					
2	1.84	0.16					
2.2	3.18	-0.98					
2.4	2.94	-0.54					
2.48	2.84	-0.36					
2.54	2.87	-0.33					
2.59	2.34	0.25					
2.73	2.76	-0.03					
2.95	2.47	0.48					
3.03	2.83	0.2					
3.04	2.93	0.11					
6.2	6.7	-0.5					
		-0.69	sum		*two tailed paired t-test*		
		-0.04313	avg.		*Ho= ud = 0*		
		0.422038	std dev				
		0.10551	sample std error				
		-0.40873	t=avg/std error				
		2.12	t .05,2,16				
			therefore, accept Ho				
			P(t)<0.5				



da	wet	deviation
0.99	0.94	0.05
1.11	1.1	0.01
1.14	1.1	0.04
1.25	1.24	0.01
1.27	1.4	-0.13
1.9	2.6	-0.7
1.97	1.7	0.27
2.5	2.2	0.3
3.3	3.6	-0.3
4.6	4.5	0.1
4.63	5.7	-1.07
5.12	4.9	0.22
5.26	4.6	0.66
5.81	4.2	1.61
5.84	5.2	0.64
6.37	5.2	1.17



two tailed paired t-test	
Ho= ud = 0	
2.88	sum
0.18	avg.
0.6457657	std dev
0.1614414	sample std error
1.1149555	t=avg/std error
2.12	t .05,2,16
	therefore, accept Ho
	0.2<P(t)<0.5

M1-211-232S	1.45			
M1-223-246S	3.94	5.1	1.29	
M1-226-249	1.9	4	2.11	
M1-268-302S	2.53	4.56	1.80	
M1-271-305	1.27	1.8	1.42	
M1-283-317	1.44	1.7	1.18	
M1-296-333F	4.6			
M1-310-347S	4.46	4.96	1.11	
M1-337-375Q	2.73	3.7	1.36	
M1-342-380S	1.55	4.71	3.04	
M1-348-386S	1.77	2.63	1.49	
M1-382-422S	1.36	3.51	2.58	
M1-388-428S	1.12	1.28	1.14	
M1-416-457	1.19	1.8	1.51	
M1-459-500S	1.26	26	20.63	
M1-494-536F	1.97	11.5	5.84	
M1-50-543S	1.22	3.93	3.22	
M1-504-546S	1.08	1.26	1.17	
M1-549-590S	1.25	2.68	2.14	
M1-552-593S	1.1	1.52	1.38	
M1-576-614S	1.52	2.32	1.53	
M1-618-655	1.12	5.9	5.27	
M1-623-660S	1.08	1.23	1.14	
M1-642-678	1.1	0.766	0.70	
M1-669-705S	1.09	1.51	1.39	
M1-690-725S	1.11	0.92	0.83	
M1-697-732F	1.09	1.76	1.61	
M1-717-752S	3.3	4.32	1.31	
M1-759-793S	0.99	1.1	1.11	
M1-780-813	1.6	22	13.75	
M1-785-818S	1.09	1.16	1.06	
M1-787-820S	1.08	1.76	1.63	
M1-794-827S	1.07	1.15	1.07	
M1-797-830F	1.11	1.54	1.39	
M1-809-849	1.5	0.358	0.24	
M1-850-877S	1.01	1.14	1.13	
M1-853-880S	1.11	1.22	1.10	
M1-858-885F	1.06	0.759	0.72	
M1-880-906S	1.03	1.37	1.33	
M1-894-920	1.25	1.6	1.28	
M1-936-986F	1.39	1.42	1.02	
M1-949-973	1.17	1.39	1.19	
M1-954-978S	1.46	1.59	1.09	
M2-002-024S	1.1	0.562	0.51	
M2-015-037	1.27	1.58	1.24	
M2-024-748	1.27	1.97	1.55	
MI-183-204S	1.9			
TE-383-388F	1.07	1.22	1.14	
TE-864-878F	1.13	1.36	1.20	

	Ra-226 (da	Th-230	(Th/Ra)*100	
site location	activity	activity		
C1-0190-28F	1.24	1.47	1.19	
C1-041-050F	1.41	1.68	1.19	
C1-210-235F	1.13	1.46	1.29	
C1-218-241F	1.23			
C1-481-502F	1.1	7.1	6.45	
C1-525-544	2.38	3.6	1.51	
C1-609-624F	1	1.29	1.29	
C1-709-723S	1.14	1.33	1.17	
C1-750-581S	1.63	4.93	3.02	
C2-614-637	1.4	4.67	3.34	
C2-6256-48S	1.03	1.13	1.10	
C2-667-692S	1.12	1.58	1.41	
C2-676-702	1.52	2.58	1.70	
C2-725-752F	1.12			
C2-745-772S	1.12	1.16	1.04	
C2-757-784F	1.08	1.2	1.11	
C2-794-827F	1.38	1.77	1.28	
C2-806-840	1.07	1.2	1.12	
C2-878-917	1.22	0.72	0.59	
C2-895-932F	1.4	3.31	2.36	
C2-997-037	1.85	5.4	2.92	
C3-044-0925	1.7	4.5	2.65	
C3-094-140S	2.5	2.97	1.19	
C3-186-228S	1.02	1.19	1.17	
C3-316-345	1.68	1.12	0.67	
C3-364-386F	1.64	3.46	2.11	
C3-398-421F	1.08	3.8	3.52	
C3-479-495F	1.48	5.76	3.89	
C3-479-495F	1.51	1.24	0.82	
C3-537-552F	1.36	11.5	8.46	
C3-537-552F	1.1	12.5	11.36	
C3-540-555F	1.06	6.03	5.69	
C3-540-555F	1.18	6.7	5.68	
C3-582-599F	1.16	7.11	6.13	
C3-582-599F	0.99	15.7	15.86	
C3-584-601F	1.17			
C3-586-603F	1.07	1.3	1.21	
C3-619-636F	1.18	17.2	14.58	
C3-619-636F	1.13	16.9	14.96	
C3-647-661F	1.34	21.4	15.97	
C3-647-661F	1.27	23.9	18.82	
CI-401-424F	1.15			
CI-418-440F	7.34	8.59	1.17	
CI-556-943F	1.09	0.97	0.89	
CI-702-716F	1			
M1-115-125S	1.68	1.65	0.98	
M1-123-136S	1.21	1.69	1.40	

TW-299-312F	1.09	1.11	1.02	
TW-823-835F	1.11	1.46	1.32	
TW-823-835F	1.12	0.98	0.88	
TW-947-954F	1.17			
PES	4.63	6.57	1.42	
PES	5.26	3.35	0.64	
PES	5.12	4.71	0.92	
PES	6.37	5.2	0.82	
PES 8113	5.81	4.24	0.73	
PES, M1-055-061	5.84	4.7	0.80	

SMI
SHEPHERD MILLER, INC.

MEMORANDUM

Project No. 09-353

TO: S.J. Baker

FROM: L.E. Fiske

DATE: February 23, 1996

SUBJECT: State split samples

cc:

Please find attached Table 1 which presents the analytical results from Yankee Atomic Environmental Laboratory on the soil samples split with the WDOH.

Samples shown shaded indicate analyses on samples taken after additional cleanup and do not represent WDOH/WNI split samples. WDOH/WNI split samples have been marked with an "a" or a "f" to indicate whether the sample was obtained from the archives or from the field.

Please note from Table 1 that some analyses are pending, however, all pending analyses are on samples taken after additional cleanup and do not represent WDOH/WNI split samples.

Also note that the analyses on WDOH/WNI split M2-024748S were canceled. This is because during verification other samples in this vicinity were identified as contaminated and all remaining analyses on samples in the area were canceled. The area was then cleaned and resampled. In such situations we typically did not cancel analyses on WDOH/WNI split samples, unfortunately, this sample was mistakenly canceled.

Area 3.5
Media 5
Units 2

Table 1.0 - Ra-226 and Th-230 results of State Splits

Lab #	Grid ID		LOT#	DATE	Ra-226			Ra-total	Th-230			Th-total	Ra-226 (1000)	Grid Status	State Sample Date	Licence #
					2				40							
596	C1-019028F	f	95-58	08/28/95	1.360	±	0.090	1.450	1.340	±	0.140	1.48	1.46	Validated	04/25/95	7417
591	C1-041050F	f	95-58	08/28/95	1.390	±	0.090	1.480	1.580	±	0.150	1.73	1.57	Validated	04/25/95	7418
6607	C1-210235F	f	95-59	08/28/95	0.940	±	0.080	1.020	0.910	±	0.120	1.03	1.02	Validated	04/24/95	7419
992	C1-218241F	f	95-121	10/31/95	1.510	±	0.110	1.620	1.440	±	0.150	1.59	1.61	Validated	07/24/95	7420
986	C1-401424F	f	95-121	10/31/95	0.990	±	0.080	1.070	1.320	±	0.140	1.46	1.21	Validated	07/24/95	7421
6985	C1-418440F	f	95-121	10/31/95	9.210	±	0.200	9.410	9.440	±	0.530	9.97	9.61	Unvalidated	07/24/95	7422
978	C1-481502F	f	95-128	09/11/95	0.917	±	0.080	0.997	8.18	±	0.52	8.70	3.70	Validated	07/25/95	7423
832	C1-525544F	f	95-106	10/31/95	2.160	±	0.110	2.270	3.210	±	0.230	3.44	2.68	Validated	06/22/95	7424
984	C1-556943F	f	95-121	10/31/95	1.210	±	0.080	1.290	1.260	±	0.140	1.40	1.33	Validated	07/24/95	7425
979	C1-609624F	f	95-128	09/11/95	1.030	±	0.080	1.110	1.450	±	0.160	1.61	1.29	Validated	07/25/95	7426
987	C1-702716F	f	95-121	10/31/95	1.070	±	0.090	1.160	1.070	±	0.120	1.19	1.17	Validated	07/24/95	7427
600	C1-709723S	f	95-59	08/28/95	1.230	±	0.080	1.310	0.930	±	0.120	1.05	1.22	Verified	04/24/95	7428
601	C1-750581S	f	95-59	08/28/95	1.200	±	0.070	1.270	3.470	±	0.290	3.76	2.14	Verified	04/24/95	7429
824	C2-614637F	a	95-105	10/26/95	1.690	±	0.100	1.790	4.180	±	0.300	4.48	2.73	Validated	06/22/95	7430
	C2-614637F		95-140	12/05/95	1.580	±	0.090	1.670	5.063	±	0.342	5.41	2.98	Validated		—
608	C2-625648S	f	95-59	08/28/95	1.000	±	0.080	1.080	0.890	±	0.120	1.01	1.06	Verified	04/24/95	7431
598	C2-667692S	f	95-59	08/28/95	1.030	±	0.090	1.120	1.260	±	0.150	1.41	1.22	Verified	04/24/95	7432
122	C2-676702F	a	95-105	10/26/95	1.170	±	0.080	1.250	2.580	±	0.230	2.81	1.80	Validated	06/22/95	7433
989	C2-725752F	f	95-121	10/31/95	1.250	±	0.090	1.340	1.620	±	0.150	1.77	1.49	Validated	07/24/95	7434
609	C2-745772S	f	95-59	08/28/95	0.910	±	0.080	0.990	1.080	±	0.130	1.21	1.07	Verified	04/24/95	7435
586	C2-757784F	f	95-58	08/28/95	1.040	±	0.080	1.120	1.180	±	0.110	1.29	1.18	Validated	04/25/95	7436
606	C2-794827F	f	95-59	08/28/95	1.270	±	0.090	1.360	2.370	±	0.230	2.60	1.79	Verified	04/24/95	7437
131	C2-806840F	f	95-106	10/31/95	1.100	±	0.090	1.190	1.740	±	0.180	1.92	1.45	Verified	06/22/95	7438
138	C2-878917F	f	95-106	10/31/95	1.490	±	0.100	1.590	1.430	±	0.130	1.56	1.58	Verified	06/22/95	7439
605	C2-895932F	f	95-59	08/28/95	1.500	±	0.100	1.600	1.560	±	0.180	1.74	1.65	Verified	04/24/95	7440
137	C2-997037F	f	95-106	10/31/95	2.540	±	0.120	2.660	2.760	±	0.190	2.95	2.76	Verified	06/22/95	7441
02	C3-044092S	f	95-59	08/28/95	2.100	±	0.110	2.210	3.630	±	0.300	3.93	2.81	Verified	04/24/95	7442
610	C3-094140S	f	95-59	08/28/95	2.760	±	0.120	2.880	4.170	±	0.350	4.52	3.46	Verified	04/24/95	7443
588	C3-186228S	f	95-58	08/28/95	0.900	±	0.080	0.980	0.860	±	0.110	0.97	0.98	Validated	04/25/95	7444
	C3-316345F		95-82	09/27/95	1.950	±	0.100	2.050	3.550	±	0.240	3.79	2.66	Verified		—
39	C3-316345F	f	95-106	10/31/95	3.130	±	0.130	3.260	5.750	±	0.320	6.07	4.25	Verified	06/22/95	7445
587	C3-364386F	f	95-58	08/28/95	1.570	±	0.100	1.670	3.840	±	0.310	4.15	2.54	Validated	04/25/95	7446
97	C3-398421F	a	95-120	10/31/95	1.270	±	0.090	1.360	3.050	±	0.230	3.28	2.03	Verified	07/18/95	7447
17	C3-479495F	a	95-35	08/07/95	1.420	±	0.100	1.520	5.650	±	0.320	5.97	3.08	Verified	04/11/95	7448
998	C3-479495F	a	95-117	10/20/95	1.260	±	0.090	1.350	4.540	±	0.320	4.86	2.58	Verified	07/18/95	7449
718	C3-537552F	a	95-31	06/05/95	1.130	±	0.090	1.220	11.980	±	0.640	12.62	5.22	Verified	04/11/95	7450

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Table 1.0 - Ra-226 and Th-230 results of State Splits

	Grid ID		LOT#	DATE	Ra-226			Ra-total	Th-230			Th-total	Ra-226 (1000)	Grid Status	State Sample Date	
999	C3-537552F	a	95-116	11/15/95	1.010	±	0.090	1.100	18.780	±	1.000	19.78	7.65	Failed	07/18/95	7451
	C3-537552F		95-155	11/29/95										Pending		
519	C3-540555F	a	95-32	08/07/95	1.160	±	0.090	1.250	6.300	±	0.460	6.76	3.18	Verified	04/11/95	7452
001	C3-540555F	a	95-116	11/15/95	1.020	±	0.090	1.110	7.420	±	0.480	7.90	3.49	Verified	07/17/95	7453
520	C3-582599F	a	95-34	08/11/95	1.150	±	0.090	1.240	5.350	±	0.400	5.75	2.82	Verified	04/11/95	7454
003	C3-582599F	a	95-114	10/31/95	1.000	±	0.080	1.080	2.260	±	0.200	2.46	1.56	Verified	07/13/95	7455
	C3-584601F		95-31	06/05/95	0.790	±	0.080	0.870	2.730	±	0.200	2.93	1.59	Verified		
993	C3-584601F	f	95-121	10/31/95	1.250	±	0.090	1.340	1.060	±	0.120	1.18	1.28	Verified	07/24/95	7456
996	C3-586603F	a	95-118	10/31/95	1.210	±	0.090	1.300	1.140	±	0.130	1.27	1.29	Verified	07/18/95	7457
521	C3-619636F	a	95-34	08/11/95	1.250	±	0.090	1.340	14.590	±	0.990	15.58	6.34	Failed	04/11/95	7458
002	C3-619636F	a	95-115	09/11/95	0.900	±	0.060	0.960	14.620	±	1.020	15.64	6.11	Failed	07/12/95	7459
	C3-619636F		95-155	11/29/95										Pending		
522	C3-647661F	a	95-34	08/11/95	1.340	±	0.090	1.430	19.600	±	1.300	20.90	8.26	Failed	04/11/95	7460
000	C3-647661F	a	95-115	09/11/95	1.010	±	0.090	1.100	19.070	±	1.220	20.29	7.83	Failed	07/18/95	7461
	C3-647661F		95-157	11/29/95										Pending		
503	M1-115125S	f	95-59	08/28/95	2.070	±	0.110	2.180	1.800	±	0.180	1.98	2.11	Validated	04/24/95	7462
604	M1-123136S	f	95-59	08/28/95	1.250	±	0.090	1.340	1.610	±	0.170	1.78	1.49	Validated	04/24/95	7463
988	M1-183204S	f	95-121	10/31/95	2.220	±	0.110	2.330	2.440	±	0.190	2.63	2.44	Validated	07/24/95	7464
	M1-211232S	f	95-121	10/31/95	1.530	±	0.100	1.630	1.950	±	0.170	2.12	1.80	Validated	07/24/95	
995	M1-223246S	a	95-120	10/31/95	3.660	±	0.130	3.790	5.010	±	0.350	5.36	4.34	Verified	07/18/95	7465
526	M1-226249S	a	95-105	10/26/95	1.910	±	0.110	2.020	3.730	±	0.280	4.01	2.72	Verified	06/22/95	7466
585	M1-268302Q	f	95-58	08/28/95	3.370	±	0.130	3.500	2.920	±	0.250	3.17	3.38	Verified	04/25/95	7467
534	M1-271305Q	f	95-106	10/31/95	1.470	±	0.100	1.570	1.550	±	0.140	1.69	1.61	Verified	06/22/95	7468
530	M1-283317S	f	95-106	10/31/95	1.810	±	0.100	1.910	1.760	±	0.160	1.92	1.91	Verified	06/22/95	7469
991	M1-296333F	f	95-121	10/31/95	4.910	±	0.140	5.050	6.730	±	0.410	7.14	5.78	Validated	07/24/95	7470
512	M1-310347S	a	95-16	08/07/95	2.070	±	0.100	2.170	4.310	±	0.340	4.65	3.04	Verified	04/11/95	7471
	M1-310347S		95-138	12/05/95	1.730	±	0.100	1.830	4.118	±	0.181	4.30	2.70	Verified		
594	M1-337375Q	f	95-58	08/28/95	2.880	±	0.120	3.000	3.170	±	0.210	3.38	3.13	Verified	04/25/95	7472
508	M1-342380S	a	95-14	08/21/95	1.750	±	0.100	1.850	3.450	±	0.290	3.74	2.51	Verified	04/11/95	7473
	M1-342380S		95-150	12/05/95	1.249	±	0.090	1.339	2.993	±	0.183	3.18	1.98	Verified		
514	M1-348386S	a	95-16	08/07/95	1.660	±	0.100	1.760	1.860	±	0.200	2.06	1.87	Verified	04/11/95	7474
	M1-348386S		95-137	12/05/95	1.150	±	0.090	1.240	1.912	±	0.178	2.09	1.54	Verified		
511	M1-382422S	a	95-34	08/11/95	1.490	±	0.100	1.590	1.990	±	0.210	2.20	1.80	Verified	04/11/95	7475
	M1-382422S		95-150	12/05/95	1.121	±	0.088	1.209	2.122	±	0.115	2.24	1.57	Verified		
[illegible]	M1-388428S	a	95-17	07/24/95	1.260	±	0.070	1.330	1.220	±	0.110	1.33	1.33	Verified	04/11/95	7476
535	M1-416457S	f	95-106	10/31/95	1.240	±	0.100	1.340	2.070	±	0.160	2.23	1.65	Verified	06/22/95	7477

No yellow

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Table 1.0 - Ra-226 and Th-230 results of State Splits

	Grid ID		LOT#	DATE	Ra-226			Ra-total	Th-230			Th-total	Ra-226 (1000)	Grid Status	State Sample Date	
509	M1-459500S	a	95-21	07/25/95	1.260	±	0.090	1.350	22.140	±	0.960	23.10	8.98	Failed	04/11/95	7478
	M1-459500S		95-137	12/05/95	1.120	±	0.090	1.210	2.882	±	0.246	3.13	1.88	Verified		
569	M1-494536F	f	95-58	08/28/95	2.660	±	0.120	2.780	9.080	±	0.480	9.56	5.16	Verified	04/25/95	7479
70	M1-501543S	a	95-10	08/21/95	1.340	±	0.090	1.430	3.930	±	0.380	4.31	2.44	Verified	04/11/95	7480
	M1-501543S		95-150	12/05/95	1.114	±	0.086	1.200	2.040	±	0.114	2.15	1.53	Verified		
513	M1-504546S	a	95-12	08/09/95	0.950	±	0.070	1.020	0.930	±	0.120	1.05	1.03	Verified	04/11/95	7481
531	M1-549590S	a	95-11	06/28/95	1.330	±	0.090	1.420	3.810	±	0.300	4.11	2.36	Verified	04/11/95	7482
	M1-549590S		95-139	11/16/95	1.070	±	0.080	1.150	1.240	±	0.110	1.35	1.22	Verified		
516	M1-552593S	a	95-13	06/26/95	1.010	±	0.090	1.100	0.990	±	0.130	1.12	1.11	Verified	04/11/95	7483
592	M1-576614S	f	95-58	08/28/95	1.430	±	0.090	1.520	2.240	±	0.160	2.40	1.83	Verified	04/25/95	7484
835	M1-618655S	f	95-106	10/31/95	1.330	±	0.080	1.410	6.070	±	0.380	6.45	3.18	Verified	06/22/95	7485
527	M1-623660S	a	95-11	06/28/95	0.970	±	0.080	1.050	1.020	±	0.130	1.15	1.09	Verified	04/11/95	7486
21	M1-642678F	a	95-105	10/26/95	1.010	±	0.080	1.090	1.160	±	0.130	1.29	1.16	Validated	06/22/95	7487
595	M1-669705S	f	95-58	08/28/95	1.070	±	0.090	1.160	1.180	±	0.120	1.30	1.21	Validated	04/25/95	7488
524	M1-690725S	a	95-23	05/25/95	0.920	±	0.060	0.980	0.730	±	0.100	0.83	0.93	Verified	04/11/95	7489
530	M1-697732F	a	95-13	06/26/95	1.220	±	0.090	1.310	1.400	±	0.180	1.58	1.40	Verified	04/11/95	7490
	M1-717752S	f	95-58	08/28/95	3.410	±	0.130	3.540	4.770	±	0.260	5.03	4.06	Verified	04/25/95	
525	M1-759793S	a	95-22	06/14/95	0.920	±	0.080	1.000	1.070	±	0.140	1.21	1.07	Verified	04/11/95	7491
825	M1-780813F	a	95-105	10/26/95	1.690	±	0.100	1.790	21.840	±	1.180	23.02	9.24	Unvalidated	06/22/95	7492
	M1-780813F		95-156	11/29/95										Pending		
583	M1-785818S	f	95-58	08/28/95	1.090	±	0.080	1.170	1.330	±	0.120	1.45	1.27	Verified	04/25/95	7493
593	M1-787820S	f	95-58	08/28/95	1.040	±	0.080	1.120	0.960	±	0.100	1.06	1.10	Verified	04/25/95	7494
526	M1-794827S	a	95-12	08/09/95	1.020	±	0.090	1.110	0.890	±	0.110	1.00	1.07	Verified	04/11/95	7495
529	M1-797830F	a	95-26	08/11/95	1.010	±	0.080	1.090	1.110	±	0.150	1.26	1.15	Verified	04/11/95	7496
827	M1-809841Q	a	95-105	10/26/95	1.570	±	0.100	1.670	2.180	±	0.190	2.37	1.92	Validated	06/22/95	7497
597	M1-850877S	f	95-58	08/28/95	0.970	±	0.080	1.050	1.570	±	0.140	1.71	1.28	Verified	04/25/95	7498
584	M1-853880S	f	95-58	08/28/95	1.000	±	0.080	1.080	1.110	±	0.110	1.22	1.13	Verified	04/25/95	7499
528	M1-858885F	a	95-25	05/17/95	1.000	±	0.090	1.090	1.050	±	0.120	1.17	1.12	Verified	04/11/95	7500
590	M1-880906S	f	95-58	08/28/95	0.980	±	0.080	1.060	1.130	±	0.130	1.26	1.13	Verified	04/25/95	7501
828	M1-894920F	a	95-105	10/26/95	1.220	±	0.090	1.310	1.680	±	0.210	1.89	1.51	Validated	06/22/95	7502
823	M1-949973F	a	95-105	10/26/95	1.090	±	0.090	1.180	1.530	±	0.170	1.70	1.36	Validated	06/22/95	7503
	M1-954978S	f	95-58	08/28/95	1.340	±	0.090	1.430	1.620	±	0.140	1.76	1.55	Verified	04/25/95	
977	M1-963986F	f	95-128	09/11/95	1.246	±	0.080	1.326	1.46	±	0.18	1.64	1.44	Validated	07/25/95	7504

Table 1.0 - Ra-226 and Th-230 results of State Splits

	Grid ID		LOT#	DATE	Ra-226			Ra-total	Th-230			Th-total	Ra-226 (1000)	Grid Status	State Sample Date	
580	M2-002024S	f	95-58	08/28/95	0.970	±	0.080	1.050	0.900	±	0.110	1.01	1.04	Verified	04/25/95	7505
820	M2-015037F	a	95-105	10/26/95	1.060	±	0.080	1.140	1.620	±	0.160	1.78	1.36	Validated	06/22/95	7506
	M2-024748S		95-141	11/16/95	1.200	±	0.090	1.290	1.780	±	0.150	1.93	1.51	Verified	#16836	
36	M2-024748S	f	95-106	CANCELED ANALYSES											06/22/95	7507
981	TE-383388F	f	95-121	10/31/95	0.90	±	0.08	0.980	1.20	±	0.13	1.33	1.10	Validated	07/24/95	7508
982	TE-864878F	f	95-121	10/31/95	1.22	±	0.08	1.300	1.61	±	0.16	1.77	1.46	Validated	07/24/95	7509
983	TW-299312F	f	95-121	10/31/95	0.96	±	0.08	1.040	1.06	±	0.12	1.18	1.09	Validated	07/24/95	7510
980	TW-823835F	f	95-121	10/31/95	1.02	±	0.08	1.100	0.99	±	0.12	1.11	1.10	Validated	07/24/95	7511
994	TW-947954F	f	95-121	10/31/95	1.42	±	0.09	1.510	2.01	±	0.17	2.18	1.75	Validated	07/24/95	7512

Note:

(1) Shading indicates that subsequent analyses, resulting from additional cleanup, have been performed on these grids.
(2) f = Sample split taken in the field with WDOH supervision.
a = Sample split taken by WDOH from WNI achieves.

16599 TW 823835F 4/24/95

SHEPHERD MILLER
INCORPORATED

February 23, 1996

Stephanie Baker
Western Nuclear
200 Union Blvd., Suite 300
Lakewood, CO 80228

Dear Stephanie:

The following is a summary of the criteria used to select grids for U_{nat} analyses. Please find attached Table 1 which presents the laboratory results. Note that samples marked by an * are state split samples. Samples marked by ** are samples taken in the same grids as state samples, but after further excavation, and therefore do not represent actual state splits.

The sampling frequencies were designed to be consistent with the overall program philosophy which has been to concentrate sampling efforts in areas where the greatest potential for contamination exists. In the case of uranium, the most likely area for observing elevated uranium would be in the claricone spill area, and to a lesser degree in the vicinity of the mill process area and the $BaCl_2$ ponds/drainage area. Therefore , the sampling frequency for uranium were designated as: 20% (1 in 5 grids) for the claricone spill area; 10% (1 in 10 grids) for the mill process area, and $BaCl_2$ pond/drainage/evaporation pond; and 5% (1 in 20) of confirmation grids in all other areas.

In an effort to minimize costs, most of the analyses for uranium were not initiated until laboratory analyses demonstrated that cleanup for ^{226}Ra and ^{230}Th were complete (i.e., ^{226}Ra and ^{230}Th concentrations were below the limit).

The selection criteria for grids to be analyzed for uranium were as follows:

1. grids with ^{226}Ra and ^{230}Th concentrations elevated above background, but below the limits;
2. grids that coincided with State split samples; and
3. spatial distribution to assure as wide spread, and random pattern as possible.

Grids with elevated ^{226}Ra and ^{230}Th concentrations were preferentially selected for analyses under the assumption that these grids were more likely to have significant uranium concentrations. The

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grids were selected by counting either 5, 10, or 20 grids, depending on the sampling frequency, and selecting the grid with the highest ^{226}Ra and/or ^{230}Th concentration. However, if one of the 5, 10, or 20 grids was a state split sample, that grid was sometimes selected in lieu of other grids so that uranium results from the split samples could be compared with state samples.

It should be noted that due to construction scheduling concerns, and laboratory turnaround time, some areas were analyzed for uranium prior to receiving ^{226}Ra or ^{230}Th results. In these areas, only selection criteria 2 and 3 could be observed.

As shown in Table 1, none of the grids sampled for U_{nat} exceed the limits of 10 pCi/g above background for samples where daughters are in equilibrium, or 30 pCi/g above background for samples where daughters are out of equilibrium by a U to ^{226}Ra ratio of 3:1 or greater

If you have any questions, please contact me at your convenience.

Sincerely,

SHEPHERD MILLER, INC.

Lawrence E. Fiske
Project Manager

LEF:mp

Table 1 (ınium Results

Linear 50
Median 5
Units 2

Lot 71X

Grid ID	LOT#	Ra-226 2			Th-230 40			Ra-226 (1000)	Grid Status	U-234 46			U-235 45			U-238 44			U-total 3		
C1-005014F	95-133	1.99	±	0.1	1.74	±	0.17	2.03	Verified	1.75	±	0.13	0.068	±	0.027	1.87	±	0.13	3.69	±	0.19
C1-275298F	95-123	0.850	±	0.080	1.18	±	0.12	1.06	Verified	0.875	±	0.088	0.044	±	0.02	0.843	±	0.087	1.76	±	0.13
C1-628641F	95-126	1.470		0.094	2.09	±	0.19	1.82	Verified	1.35	±	0.11	0.05	±	0.021	1.42	±	0.11	2.82	±	0.16
C1-706720S	95-60	1.240	±	0.090	7.670	±	0.510	3.73	Verified	0.96	±	0.11	0.072	±	0.031	0.91	±	0.10	1.93	±	0.15
C1-709723S	95-59	1.230	±	0.083	0.930	±	0.120	1.22	Verified	1.29	±	0.13	0.044	±	0.024	1.17	±	0.12	2.50	±	0.17
C1-750581S	95-59	1.203	±	0.070	3.470	±	0.290	2.15	Verified	1.23	±	0.12	0.055	±	0.026	1.09	±	0.12	2.38	±	0.17
C2-569590F	95-140	1.220	±	0.091	1.440	±	0.093	1.39	Verified	2.04	±	0.15	0.077	±	0.03	1.93	±	0.15	4.05	±	0.21
C2-591613F	95-152	1.239	±	0.094	1.66	±	0.13	1.49	Verified	1.489	±	0.087	0.089	±	0.022	1.473	±	0.087	3.05	±	0.12
C2-625648S	95-59	0.999	±	0.081	0.890	±	0.120	1.06	Verified	0.88	±	0.10	0.054	±	0.027	0.95	±	0.11	1.88	±	0.15
C2-636660F	95-140	2.170	±	0.10	4.76	±	0.26	3.24	Verified	4.06	±	0.26	0.206	±	0.051	4.14	±	0.27	8.41	±	0.38
C2-667692S	95-59	1.030	±	0.087	1.260	±	0.150	1.22	Verified	1.11	±	0.11	0.090	±	0.034	1.12	±	0.11	2.32	±	0.17
C2-693719S	95-99	1.084	±	0.073	3.88	±	0.34	2.23	Verified	0.96	±	0.11	0.082	±	0.032	1.03	±	0.11	2.08	±	0.16
C2-732759F	95-36B	1.066	±	0.081	1.280	±	0.150	1.25	Verified	1.56	±	0.11	0.06	±	0.021	1.46	±	0.11	3.08	±	0.16
C2-745772S	95-59	0.907	±	0.077	1.080	±	0.130	1.06	Verified	1.06	±	0.11	0.075	±	0.032	1.03	±	0.11	2.16	±	0.16
C2-794827F	95-59	1.272	±	0.093	2.370	±	0.230	1.80	Verified	1.57	±	0.14	0.072	±	0.028	1.52	±	0.13	3.16	±	0.19
C2-806840F	95-106	1.096	±	0.085	1.74	±	0.18	1.44	Verified	0.982	±	0.096	0.036	±	0.020	1.033	±	0.099	2.05	±	0.14
C2-816850F	95-27	2.373	±	0.085	6.724	±	0.485	4.12	Verified	5.14	±	0.29	0.219	±	0.049	5.09	±	0.29	10.44	±	0.41
C2-878917F	95-106	1.49	±	0.10	1.43	±	0.13	1.58	Verified	1.31	±	0.11	0.069	±	0.024	1.33	±	0.11	2.71	±	0.16
C2-895932F	95-59	1.503	±	0.095	1.560	±	0.180	1.65	Verified	1.71	±	0.15	0.071	±	0.029	1.70	±	0.15	3.48	±	0.21
C2-916956F	95-83	1.567	±	0.093	1.82	±	0.20	1.79	Verified	2.24	±	0.16	0.108	±	0.032	2.20	±	0.15	4.55	±	0.22
C2-953993F	95-83	1.242	±	0.092	1.68	±	0.17	1.51	Verified	1.61	±	0.13	0.084	±	0.028	1.66	±	0.13	3.36	±	0.18
C2-997037F	95-106	2.54	±	0.12	2.76	±	0.19	2.76	Verified	7.58	±	0.35	0.320	±	0.054	7.06	±	0.33	14.96	±	0.49
C3-036085F	95-82	3.36	±	0.13	7.08	±	0.54	4.94	Verified	7.35	±	0.35	0.343	±	0.057	0.343	±	0.057	8.03	±	0.36
C3-093136S	95-157				4.85	±	0.29			3.41	±	0.22	0.156	±	0.041	3.33	±	0.21	5.07	±	0.26
C3-099145S	95-68	1.286	±	0.094	2.77	±	0.20	1.94	Verified	1.59	±	0.14	0.048	±	0.025	1.56	±	0.14	3.20	±	0.20
C3-129175F	95-82	1.339	±	0.091	3.30	±	0.30	2.19	Verified	2.65	±	0.17	0.124	±	0.035	2.37	±	0.16	5.14	±	0.24
C3-149193S	95-68	1.70	±	0.10	3.75	±	0.22	2.56	Verified	1.79	±	0.15	0.068	±	0.028	1.73	±	0.15	3.58	±	0.22
C3-218260F	95-82	1.91	±	0.10	4.26	±	0.43	2.95	Verified	3.73	±	0.21	0.187	±	0.042	0.187	±	0.042	4.10	±	0.22
C3-294323F	95-69	1.239	±	0.096	1.72	±	0.18	1.54	Verified	1.34	±	0.13	0.050	±	0.024	1.43	±	0.13	2.83	±	0.19
C3-316345F	95-106	3.13	±	0.13	5.75	±	0.32	4.24	Verified	2.56	±	0.17	0.160	±	0.040	2.79	±	0.18	5.51	±	0.25
C3-373398F	95-99	1.64	±	0.10	11.46	±	0.75	5.41	Verified	1.97	±	0.16	0.101	±	0.034	2.06	±	0.16	4.12	±	0.23
C3-450465F	95-117	0.962	±	0.074	1.92	±	0.17	1.41	Verified	1.60	±	0.14	0.060	±	0.026	1.60	±	0.14	3.26	±	0.20
C3-492507F	95-126	2.890		0.120	17.44	±	0.83	8.36	Failed	2.56	±	0.16	0.129	±	0.033	2.52	±	0.16	5.21	±	0.23
C3-497512F	95-117	0.993	±	0.085	4.50	±	0.32	2.39	Verified	1.51	±	0.14	0.069	±	0.030	1.51	±	0.14	3.09	±	0.20
C3-522537F	95-116	1.393	±	0.096	9.44	±	0.52	4.46	Verified	1.31	±	0.13	0.058	±	0.026	1.21	±	0.12	2.58	±	0.18
C3-554571F	95-116	0.934	±	0.082	2.34	±	0.18	1.54	Verified	2.77	±	0.20	0.122	±	0.038	2.73	±	0.20	5.62	±	0.29
C3-581598F	95-114	1.043	±	0.082	3.46	±	0.25	2.03	Verified	1.19	±	0.12	0.040	±	0.022	1.21	±	0.12	2.44	±	0.17
C3-602619F	95-114	1.048	±	0.82	1.82	±	0.16	1.91	Verified	1.64	±	0.14	0.061	±	0.027	1.72	±	0.14	3.42	±	0.20

Table 1 - U ium Results

Grid ID	LOT#	Ra-226			Th-230			Ra-226 (1000)	Grid Status	U-234			U-235			U-238			U-total		
C3-615632F	95-115	0.932	±	0.084	1.50	±	0.18	1.25	Verified	1.05	±	0.11	0.072	±	0.031	1.03	±	0.11	2.15	±	0.16
C3-647661F	95-157				12.27	±	0.61			1.00	±	0.10	0.046	±	0.022	1.13	±	0.11	6.02	±	0.28
M1-223246S	95-120	3.66	±	0.13	5.01	±	0.35	4.34	Verified	4.84	±	0.25	0.223	±	0.045	5.13	±	0.26	10.20	±	0.37
M1-226249S	95-105	1.91	±	0.11	3.73	±	0.28	2.71	Verified	2.13	±	0.14	0.099	±	0.029	2.35	±	0.15	4.58	±	0.21
M1-268302Q	95-58	3.37	±	0.13	2.92	±	0.25	3.39	Verified	6.33	±	0.37	0.260	±	0.059	6.60	±	0.38	13.19	±	0.54
M1-271305Q	95-106	1.47	±	0.10	1.55	±	0.14	1.61	Verified	1.58	±	0.12	0.075	±	0.026	1.39	±	0.11	3.05	±	0.17
M1-283317S	95-106	1.81	±	0.10	1.76	±	0.16	1.92	Verified	1.72	±	0.13	0.065	±	0.024	1.67	±	0.13	3.46	±	0.18
M1-310347S	95-138	1.734	±	0.099	4.12	±	0.18	2.70	Verified	2.19	±	0.16	0.111	±	0.035	2.14	±	0.16	4.44	±	0.23
M1-337375Q	95-58	2.88	±	0.12	3.17	±	0.21	3.13	Verified	6.69	±	0.36	0.263	±	0.055	6.33	±	0.35	13.28	±	0.50
M1-342380S	95-150	1.249	±	0.090	2.99	±	0.18	1.98	Verified	1.96	±	0.11	0.136	±	0.028	2.08	±	0.11	4.18	±	0.16
M1-348386S	95-137	1.151	±	0.086	1.91	±	0.18	1.54	Verified	1.56	±	0.12	0.071	±	0.024	1.49	±	0.11	3.12	±	0.16
M1-356394S	95-43	1.72	±	0.10	4.630	±	0.347	2.93	Verified	2.33	±	0.14	0.086	±	0.025	2.47	±	0.14	4.89	±	0.20
M1-382422S	95-150	1.121	±	0.088	2.12	±	0.11	1.57	Verified	1.771	±	0.097	0.078	±	0.02	1.648	±	0.093	3.50	±	0.14
M1-388428S	95-17	1.264	±	0.068	1.22	±	0.11	1.33	Verified	1.43	±	0.13	0.052	±	0.026	1.10	±	0.11	2.58	±	0.17
M1-415456S	95-96	1.80	±	0.10	5.36	±	0.27	3.21	Verified	3.75	±	0.21	0.160	±	0.038	3.73	±	0.21	7.64	±	0.30
M1-459500S	95-137	1.118	±	0.086	2.88	±	0.25	1.88	Verified	4.67	±	0.23	0.227	±	0.042	4.88	±	0.24	9.78	±	0.34
M1-494536F	95-58	2.66	±	0.12	9.08	±	0.48	5.16	Verified	3.86	±	0.22	0.184	±	0.041	3.95	±	0.22	7.99	±	0.31
M1-501543S	95-150	1.114	±	0.086	2.04	±	0.11	1.53	Verified	1.693	±	0.095	0.073	±	0.019	1.805	±	0.099	3.57	±	0.14
M1-504546S	95-12	0.948	±	0.067	0.929	±	0.117	1.03	Verified	0.85	±	0.10	0.025	±	0.020	0.87	±	0.10	1.74	±	0.15
M1-510552S	95-18	1.650	±	0.100	4.98	±	0.36	3.01	Verified	2.42	±	0.18	0.092	±	0.034	2.51	±	0.18	5.02	±	0.26
M1-539580S	95-21	0.979	±	0.080	1.02	±	0.10	1.08	Verified	0.93	±	0.10	0.040	±	0.021	0.93	±	0.10	1.90	±	0.14
M1-552593S	95-13	1.006	±	0.086	0.990	±	0.125	1.10	Verified	1.11	±	0.12	0.057	±	0.027	1.06	±	0.12	2.23	±	0.17
M1-576614S	95-58	1.433	±	0.093	2.24	±	0.16	1.83	Verified	3.48	±	0.23	0.140	±	0.040	3.21	±	0.22	6.83	±	0.32
M1-585623S	95-12	1.012	±	0.084	0.920	±	0.094	1.07	Verified	1.75	±	0.16	0.078	±	0.033	1.93	±	0.17	3.75	±	0.24
M1-588626S	95-11	1.000	±	0.083	1.620	±	0.199	1.34	Verified	0.93	±	0.11	0.042	±	0.024	0.96	±	0.11	1.93	±	0.16
M1-614651S	95-85	1.081	±	0.082	4.17	±	0.36	2.34	Verified	3.46	±	0.18	0.148	±	0.033	3.38	±	0.18	6.99	±	0.26
M1-618655S	95-106	1.333	±	0.081	6.07	±	0.38	3.18	Verified	2.34	±	0.15	0.115	±	0.031	2.51	±	0.16	4.97	±	0.22
M1-623660S	95-11	0.966	±	0.081	1.019	±	0.126	1.08	Verified	1.37	±	0.15	0.033	±	0.024	1.12	±	0.13	2.52	±	0.20
M1-626663S	95-13	1.086	±	0.085	1.278	±	0.144	1.26	Verified	1.027	±	0.088	0.049	±	0.02	1.003	±	0.087	2.08	±	0.13
M1-657693S	95-15	1.025	±	0.082	1.010	±	0.120	1.12	Verified	1.22	±	0.12	0.049	±	0.024	1.32	±	0.13	2.59	±	0.18
M1-665701F	95-13	0.978	±	0.091	1.440	±	0.156	1.25	Verified	1.35	±	0.13	0.050	±	0.025	1.19	±	0.12	2.58	±	0.18
M1-687722S	95-22	0.849	±	0.065	1.290	±	0.140	1.09	Verified	1.71	±	0.15	0.055	±	0.028	1.57	±	0.14	3.33	±	0.21
M1-690725S	95-23	0.924	±	0.062	0.733	±	0.095	0.93	Verified	1.52	±	0.14	0.095	±	0.036	1.42	±	0.14	3.03	±	0.20
M1-694729S	95-15	1.008	±	0.084	1.330	±	0.140	1.22	Verified	1.20	±	0.12	0.051	±	0.025	1.16	±	0.12	2.40	±	0.17
M1-697732F	95-13	1.215	±	0.088	1.401	±	0.179	1.40	Verified	1.43	±	0.14	0.052	±	0.026	1.55	±	0.14	3.03	±	0.20
M1-717752S	95-58	3.41	±	0.13	4.77	±	0.26	4.06	Verified	4.28	±	0.27	0.194	±	0.049	4.38	±	0.28	8.85	±	0.39
M1-722757S	95-21	0.908	±	0.085	1.11	±	0.11	1.07	Verified	1.85	±	0.12	0.095	±	0.026	2.02	±	0.13	3.97	±	0.18
M1-733768F	95-13	1.117	±	0.087	1.751	±	0.184	1.46	Verified	1.243	±	0.099	0.053	±	0.02	1.26	±	0.1	2.56	±	0.14

Table 1 - .nium Results

	Grid ID	LOT#	Ra-226			Th-230			Ra-226 (1000)	Grid Status	U-234			U-235			U-238			U-total		
525	M1-759793S	95-22	0.918	±	0.076	1.070	±	0.140	1.07	Verified	1.93	±	0.16	0.066	±	0.030	1.86	±	0.16	3.85	±	0.23
	M1-763797S	95-12	1.030	±	0.065	1.035	±	0.099	1.11	Verified	1.5	±	0.11	0.073	±	0.023	1.52	±	0.11	3.09	±	0.16
**	M1-780813F	95-156				6.39	±	0.4			4.52	±	0.26	0.223	±	0.049	4.29	±	0.26	9.04	±	0.37
583*	M1-785818S	95-58	1.092	±	0.082	1.32	±	0.12	1.27	Verified	1.78	±	0.15	0.071	±	0.029	1.73	±	0.15	3.58	±	0.22
593*	M1-787820S	95-58	1.043	±	0.083	0.96	±	0.10	1.10	Verified	1.86	±	0.16	0.126	±	0.041	1.89	±	0.16	3.87	±	0.23
	M1-790823S	95-21	1.088	±	0.086	1.71	±	0.13	1.41	Verified	3.58	±	0.19	0.16	±	0.34	3.59	±	0.19	7.33	±	0.43
526	M1-794827S	95-12	1.017	±	0.085	0.889	±	0.109	1.07	Verified	0.96	±	0.11	0.041	±	0.023	1.06	±	0.12	2.05	±	0.16
527*	M1-797830F	95-26	1.006	±	0.080	1.105	±	0.153	1.15	Verified	1.46	±	0.14	0.071	±	0.030	1.41	±	0.13	2.94	±	0.19
	M1-824856S	95-22	1.090	±	0.086	1.180	±	0.130	1.22	Verified	1.84	±	0.16	0.069	±	0.029	1.79	±	0.15	3.70	±	0.22
	M1-833567F	95-26	1.101	±	0.086	1.398	±	0.153	1.31	Verified	1.58	±	0.11	0.06	±	0.021	1.61	±	0.11	3.25	±	0.16
597*	M1-850877S	95-58	0.974	±	0.082	1.56	±	0.14	1.28	Verified	1.13	±	0.12	0.043	±	0.025	1.25	±	0.13	2.43	±	0.17
58*4	M1-853880S	95-58	1.002	±	0.081	1.10	±	0.11	1.13	Verified	2.62	±	0.19	0.095	±	0.035	2.56	±	0.19	5.27	±	0.27
28*-	M1-858885F	95-25	1.004	±	0.087	1.050	±	0.120	1.12	Verified	2.84	±	0.21	0.111	±	0.038	3.04	±	0.22	5.99	±	0.31
90*	M1-880906S	95-58	0.984	±	0.080	1.13	±	0.13	1.13	Verified	1.70	±	0.14	0.076	±	0.029	1.53	±	0.13	3.30	±	0.20
	M1-886912F	95-140	0.929	±	0.080	1.366	±	0.090	1.17	Verified	1.11	±	0.11	0.049	±	0.023	1.11	±	0.11	2.27	±	0.16
	M1-903930S	95-24	0.920	±	0.078	1.08	±	0.14	1.08	Verified	1.22	±	0.12	0.044	±	0.023	1.14	±	0.12	2.40	±	0.17
	M1-907934F	95-25	1.070	±	0.084	0.990	±	0.110	1.14	Verified	6.62	±	0.37	0.289	±	0.060	6.45	±	0.37	13.36	±	0.52
	M1-936960F	95-140	0.868	±	0.080	0.975	±	0.073	0.98	Verified	0.962	±	0.07	0.045	±	0.016	0.932	±	0.068	1.94	±	0.10
4h*	M1-954978S	95-58	1.335	±	0.091	1.62	±	0.14	1.54	Verified	2.61	±	0.19	0.156	±	0.044	2.55	±	0.18	5.31	±	0.26
	M1-998021S	95-23	1.121	±	0.082	0.910	±	0.120	1.14	Verified	2.25	±	0.18	0.087	±	0.035	2.31	±	0.18	4.64	±	0.26
80*	M2-002024S	95-58	0.971	±	0.079	0.90	±	0.11	1.04	Verified	1.83	±	0.15	0.066	±	0.028	1.79	±	0.15	3.69	±	0.22
**	M2-024748S	95-141	1.195	±	0.085	1.78	±	0.15	1.51	Verified	1.92	±	0.14	0.075	±	0.026	1.98	±	0.14	3.98	±	0.20
	M2-037056F	95-43	3.61	±	0.13	3.310	±	0.266	3.68	Verified	2.57	±	0.15	0.109	±	0.028	2.57	±	0.15	5.25	±	0.21
	M2-042061F	95-93	3.28	±	0.13	3.07	±	0.30	3.40	Verified	3.23	±	0.18	0.146	±	0.033	3.2	±	0.18	6.58	±	0.26
	M2-058071F	95-102	2.64	±	0.12	5.25	±	0.41	3.77	Verified	2.61	±	0.16	0.102	±	0.03	2.66	±	0.17	5.37	±	0.24
	M2-061804F	95-83	1.403	±	0.090	4.04	±	0.32	2.50	Verified	2.69	±	0.17	0.142	±	0.036	3.31	±	0.20	6.14	±	0.26
	T1-111140F	95-74	0.855	±	0.084	0.81	±	0.11	0.93	Verified	0.892	±	0.078	0.034	±	0.015	0.82	±	0.075	1.75	±	0.11
	TE-497512Q	95-131	1.675	±	0.094	2.3	±	0.22	2.03	Verified	1.79	±	0.13	0.083	±	0.028	1.79	±	0.13	3.66	±	0.19
	TE-786797F	95-149	1.350	±	0.092	1.590	±	0.100	1.53	Verified	1.016	±	0.071	0.064	±	0.019	1.076	±	0.073	2.16	±	0.10
	TW-055065F	95-131	1.018	±	0.083	1.41	±	0.17	1.27	Verified	1.22	±	0.11	0.042	±	0.022	1.18	±	0.11	2.44	±	0.16
	TW-620645F	95-148	1.840	±	0.12	1.212	±	0.082	1.72	Verified	1.045	±	0.074	0.079	±	0.021	1.061	±	0.074	2.19	±	0.11

* Indicate results that coincide with the state results

** subsequent analyses, resulting from additional cleanup, have been performed on these grids.

Grids not marked are not state splits

Blank cells represent pending analyses

ATTACHMENT II

YANKEE ATOMIC ENVIRONMENTAL LABORATORY

Ra-226 Results via "Traditional" Method

Report Date: 10/26/95 Reference Date: 07/31/95

Sherwood Project Sample Identification From Lot No. 95-123	Ra-226 Activity Concentration Net +/- 2 Sigma(#) (pCi/g - dry)
C1-256279 F	0.981 +/- 0.082
C1-275298 F	0.850 +/- 0.080
C1-340363 F	0.751 +/- 0.067
C1-343366 F	0.919 +/- 0.080
C1-380403 F	1.731 +/- 0.097
C1-385022 F	6.01 +/- 0.30

- Quoted 2 sigma uncertainty is due to counting statistics only

RESULTS APPROVED

E. M. Moreno

A. D. Banavali

ATTACHMENT II

YANKEE ATOMIC ENVIRONMENTAL LABORATORY

Th-230 Alpha Spectrometry Results

Report Date: 10/17/95 Reference Date: 07/31/95

Sherwood Project Sample Identification From Lot No. 95-123	Th-230 Activity Concentration Net +/- 2 Sigma(#) (pCi/g - dry)
→ C1-256279F	1.33 +/- 0.18
→ C1-275298F	1.18 +/- 0.12
→ C1-340363F	0.99 +/- 0.13
→ C1-343366F	1.12 +/- 0.13
C1-380403F	2.46 +/- 0.21
C1-385022F	6.05 +/- 0.41

- Quoted 2 sigma uncertainty is due to counting statistics only

RESULTS APPROVED

E. M. Moreno

A. D. Banavali

ATTACHMENT II

YANKEE ATOMIC ENVIRONMENTAL LABORATORY

Ra-226 Results via "Traditional" Method

Report Date: 11/13/95 Reference Date: 07/31/95

Sherwood Project Sample Identification From Lot No. 95-126	Ra-226 Activity Concentration Net +/- 2 Sigma(≠) (pCi/g - dry)
C1-128149 F	1.036 +/- 0.083
C2-925965 F	4.96 +/- 0.15
C2-992032 F	1.395 +/- 0.094
C3-437453 F	1.065 +/- 0.084
C1-642655 F	1.165 +/- 0.083
C3-492507 F	2.89 +/- 0.12
C2-727754 F	1.252 +/- 0.085
C3-620637 F	1.103 +/- 0.085
C1-665677 F	1.143 +/- 0.085
C1-090106 F	1.381 +/- 0.091
C1-724739 S	0.965 +/- 0.080
C3-038087 F	1.73 +/- 0.10
C2-712738 F	1.075 +/- 0.084
→ TW-971980 S	1.439 +/- 0.093
C3-628644 F	0.897 +/- 0.074
C1-628641 F	1.470 +/- 0.094
C3-355377 F	1.141 +/- 0.085
C3-625062 F	6.90 +/- 0.18

≠ - Quoted 2 sigma uncertainty is due to counting statistics only

RESULTS APPROVED

E. M. Moreno

A. D. Banavali

ATTACHMENT II

YANKEE ATOMIC ENVIRONMENTAL LABORATORY

Th-230 Alpha Spectrometry Results

Report Date: 10/31/95 Reference Date: 07/31/95

Sherwood Project Sample Identification From Lot No. 95-126	Th-230 Activity Concentration Net +/- 2 Sigma(#) (pCi/g - dry)
C1-128149 F	1.44 +/- 0.14
C2-925965 F	17.9 +/- 1.1
C2-992032 F	1.90 +/- 0.20
C3-437453 F	1.39 +/- 0.15
C1-642655 F	1.34 +/- 0.15
C3-492507 F	17.44 +/- 0.83
C2-727754 F	1.16 +/- 0.11
C3-620637 F	4.82 +/- 0.29
C1-665677 F	1.41 +/- 0.16
C1-090106 F	1.42 +/- 0.16
C1-724739 S	1.10 +/- 0.11
C3-038087 F	3.64 +/- 0.23
C2-712738 F	1.12 +/- 0.11
TW-971980 S	1.23 +/- 0.14
C3-628644 F	0.94 +/- 0.11
C1-628641 F	2.09 +/- 0.19
C3-355377 F	4.32 +/- 0.31
C3-625062 F	4.59 +/- 0.33

- Quoted 2 sigma uncertainty is due to counting statistics only

RESULTS APPROVED

E. M. Moreno

A. D. Banavali

ATTACHMENT II

YANKEE ATOMIC ENVIRONMENTAL LABORATORY

Ra-226 Results via "Traditional" Method

Report Date: 11/07/95 Reference Date: 07/30/95

Sherwood Project Sample Identification From Lot No. 95-127	Ra-226 Activity Concentration Net +/- 2 Sigma(#) (pCi/g - dry)
TW-789801 F	0.986 +/- 0.064
C1-575591 F	1.451 +/- 0.096
TE-646664 Q	1.88 +/- 0.11
TW-728742 F	1.307 +/- 0.086
TE-537555 F	1.160 +/- 0.083
TW-842853 F	1.024 +/- 0.082
TW-669694 Q	1.021 +/- 0.081
TE-637655 F	1.241 +/- 0.093
TE-623642 F	1.539 +/- 0.092
C1-596611 F	1.945 +/- 0.097
TW-805818 F	1.132 +/- 0.086
TE-568586 F	1.116 +/- 0.089
TW-719734 F	0.958 +/- 0.086
TW-585057 F	7.47 +/- 0.30

- Quoted 2 sigma uncertainty is due to counting statistics only

RESULTS APPROVED

E. M. Moreno

A. D. Banavali

ATTACHMENT II

YANKEE ATOMIC ENVIRONMENTAL LABORATORY

Th-230 Alpha Spectrometry Results

Report Date: 10/31/95 Reference Date: 07/30/95

Sherwood Project Sample Identification From Lot No. 95-127	Th-230 Activity Concentration Net +/- 2 Sigma(≠) (pCi/g - dry)
TW-789801 F	1.065 +/- 0.085
C1-575591 F	1.33 +/- 0.12
TE-646664 Q	1.94 +/- 0.15
TW-728742 F	1.16 +/- 0.11
TE-537555 F	0.995 +/- 0.090
TW-842853 F	1.111 +/- 0.097
TW-669694 Q	0.942 +/- 0.079
TE-637655 F	1.45 +/- 0.12
TE-623642 F	1.24 +/- 0.10
C1-596611 F	2.58 +/- 0.16
TW-805818 F	1.082 +/- 0.097
TE-568586 F	1.203 +/- 0.098
TW-719734 F	1.028 +/- 0.082
TW-585057 F	5.28 +/- 0.24

≠ - Quoted 2 sigma uncertainty is due to counting statistics only

RESULTS APPROVED

E. M. Moreno

A. D. Banavali

ATTACHMENT II

YANKEE ATOMIC ENVIRONMENTAL LABORATORY

Ra-226 Results via "Traditional" Method

Report Date: 11/15/95 Reference Date: 07/31/95

Sherwood Project Sample Identification From Lot No. 95-131	Ra-226 Activity Concentration Net +/- 2 Sigma(#) (pCi/g - dry)
TW-256270 P	0.956 +/- 0.075
TE-597616 Q	1.528 +/- 0.081
TE-184191 F	1.292 +/- 0.089
→ TW-352363 F	1.204 +/- 0.086
TE-577595 F	1.178 +/- 0.093
TW-055065 F	1.081 +/- 0.083
TW-130153 F	1.050 +/- 0.081
TE-544562 Q	1.75 +/- 0.10
TW-167190 F	1.104 +/- 0.080
TW-001007 F	0.993 +/- 0.078
TE-131139 Q	1.118 +/- 0.084
TE-457467 Q	1.147 +/- 0.083
TE-497512 Q	1.675 +/- 0.094
TE-523540 F	1.043 +/- 0.083
→ TW-296309 F	1.089 +/- 0.077
TW-095114 F	0.805 +/- 0.067
TE-053059 F	0.995 +/- 0.080
TE-535001 F	7.33 +/- 0.15

- Quoted 2 sigma uncertainty is due to counting statistics only

RESULTS APPROVED

E. M. Moreno

A. D. Banavali

ATTACHMENT II

YANKEE ATOMIC ENVIRONMENTAL LABORATORY

Th-230 Alpha Spectrometry Results

Report Date: 11/07/95 Reference Date: 07/31/95

Sherwood Project Sample Identification From Lot No. 95-131	Th-230 Activity Concentration Net +/- 2 Sigma(#) (pCi/g - dry)
TW-256270 F	1.05 +/- 0.12
TE-597616 Q	1.81 +/- 0.19
TE-184191 F	1.06 +/- 0.14
TW-352363 F	1.12 +/- 0.14
TE-577595 F	0.99 +/- 0.13
TW-055065 F	1.41 +/- 0.17
TW-130153 F	1.18 +/- 0.15
TE-544562 Q	1.54 +/- 0.17
TW-167190 F	1.08 +/- 0.14
TW-001007 F	1.24 +/- 0.15
TE-131139 Q	1.23 +/- 0.15
TE-457467 Q	1.19 +/- 0.14
TE-497512 Q	2.30 +/- 0.22
TE-523540 F	1.13 +/- 0.14
TW-296309 F	1.10 +/- 0.14
TW-095114 F	1.22 +/- 0.15
TE-053059 F	0.92 +/- 0.12
TE-535001 F	3.47 +/- 0.25

- Quoted 2 sigma uncertainty is due to counting statistics only

RESULTS APPROVED

E. M. Moreno

A. D. Banavali

ATTACHMENT II

YANKEE ATOMIC ENVIRONMENTAL LABORATORY

Ra-226 Results via "Traditional" Method

Report Date: 11/20/95 Reference Date: 07/31/95

Sherwood Project Sample Identification From Lot No. 95-133	Ra-226 Activity Concentration Net +/- 2 Sigma(≠) (pCi/g - dry)
C1-005014 F	1.99 +/- 0.10
C1-396419 F	5.78 +/- 0.15
C1-133154 F	1.159 +/- 0.092
C1-358381 F	1.94 +/- 0.11
C1-266289 F	1.315 +/- 0.090
C1-023032 F	1.191 +/- 0.090
→ TW-877885 F	1.033 +/- 0.082
→ TW-901907 F	1.102 +/- 0.085
C1-167181B F	1.153 +/- 0.085
C1-177199 F	1.42 +/- 0.10
C1-489511 F	1.771 +/- 0.096
→ C1-161185 F	1.081 +/- 0.088
→ C1-389412 F	0.972 +/- 0.075
C1-415018 F	5.17 +/- 0.23

≠ - Quoted 2 sigma uncertainty is due to counting statistics only

RESULTS APPROVED

E. M. Moreno

A. D. Banavali

ATTACHMENT II

YANKEE ATOMIC ENVIRONMENTAL LABORATORY

Th-230 Alpha Spectrometry Results

Report Date: 10/31/95 Reference Date: 07/31/95

Sherwood Project Sample Identification From Lot No. 95-133	Th-230 Activity Concentration Net +/- 2 Sigma(#) (pCi/g - dry)
C1-005014 F	1.74 +/- 0.17
C1-396419 F	5.58 +/- 0.31
C1-133154 F	1.28 +/- 0.12
C1-358381 F	2.64 +/- 0.18
C1-266289 F	1.08 +/- 0.10
C1-023032 F	1.35 +/- 0.12
→ TW-877885 F	0.91 +/- 0.10
→ TW-901907 F	1.11 +/- 0.11
C1-167181B F	1.07 +/- 0.12
C1-177199 F	1.37 +/- 0.12
C1-489511 F	1.64 +/- 0.13
→ C1-161185 F	1.20 +/- 0.10
→ C1-389412 F	0.95 +/- 0.11
C1-415018 F	5.00 +/- 0.28

- Quoted 2 sigma uncertainty is due to counting statistics only

RESULTS APPROVED

E. M. Moreno

A. D. Banavali

ATTACHMENT II

YANKEE ATOMIC ENVIRONMENTAL LABORATORY

Th-230 Alpha Spectrometry Results

Report Date: 12/13/95 Reference Date: 10/17/95

Sherwood Project Sample Identification From Lot No. 95-148	Th-230 Activity Concentration Net +/- 2 Sigma(#) (pCi/g - dry)
TW-382392 F	1.28 +/- 0.12
TW-415424 Q	1.17 +/- 0.12
TW-446454 Q	1.08 +/- 0.13
TW-437446 Q	2.04 +/- 0.17
TW-462471 Q	2.26 +/- 0.16
TW-474484 Q	1.19 +/- 0.13
TW-620645 F	1.212 +/- 0.082
TW-504515 F	1.02 +/- 0.10
TW-602626 F	1.06 +/- 0.10
TW-538561 Q	1.23 +/- 0.11
TW-629654 Q	1.34 +/- 0.12
TW-639665 F	1.00 +/- 0.10
TW-701723 F	5.56 +/- 0.33

- Quoted 2 sigma uncertainty is due to counting statistics only

RESULTS APPROVED

E. M. Moreno

A. D. Banavali

ATTACHMENT II

YANKEE ATOMIC ENVIRONMENTAL LABORATORY

Ra-226 Results via "Traditional" Method

Report Date: 12/29/95 Reference Date: 10/17/95

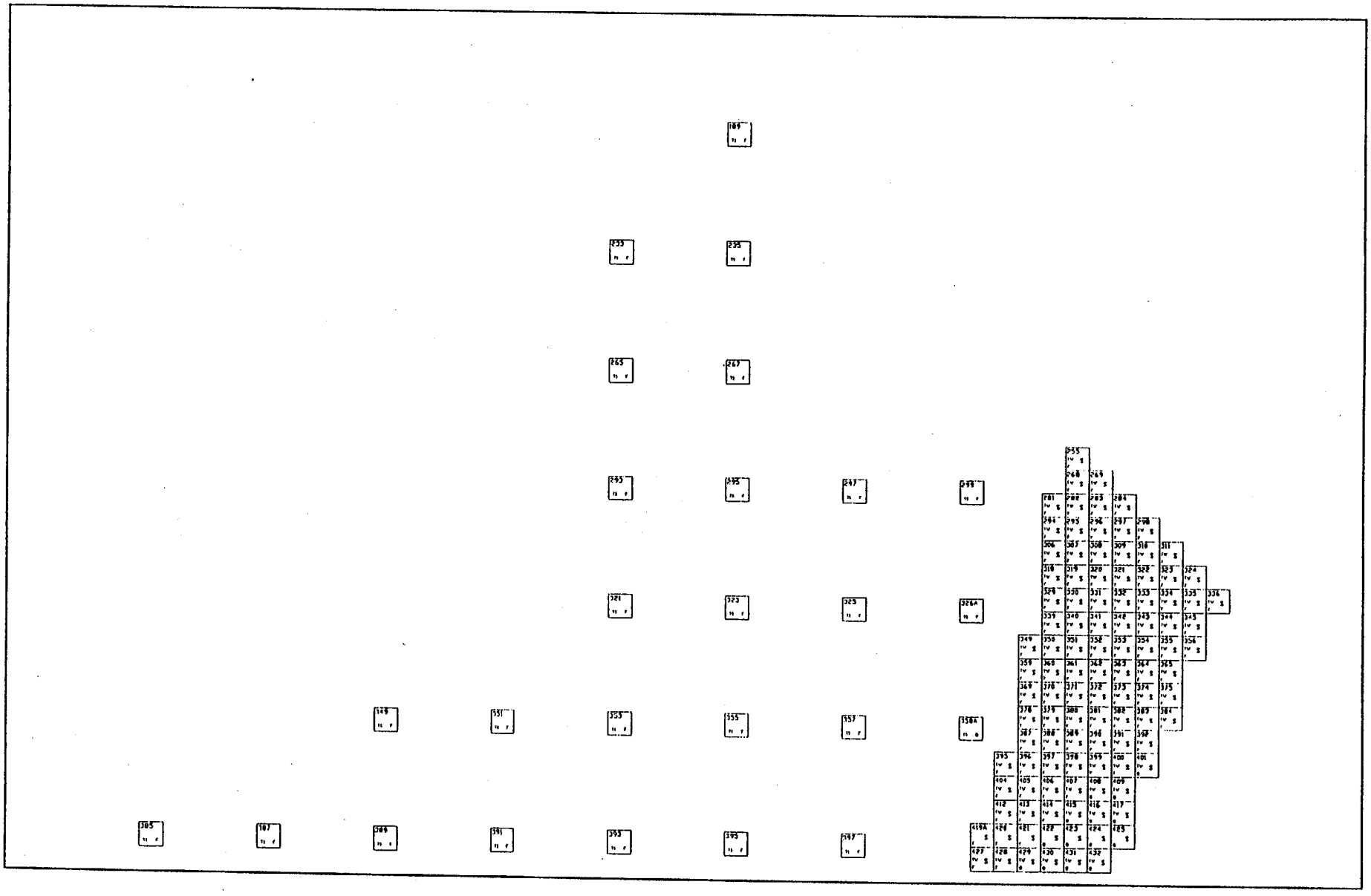
Sherwood Project Sample Identification From Lot No. 95-148	Ra-226 Activity Concentration Net +/- 2 Sigma(#) (pCi/g - dry)
TW-382392 F	1.083 +/- 0.086
TW-415424 Q	5.62 +/- 0.16
TW-446454 Q	0.991 +/- 0.088
TW-437446 Q	1.23 +/- 0.10
TW-462471 Q	1.199 +/- 0.099
TW-474484 Q	1.320 +/- 0.095
TW-620645 F	1.84 +/- 0.12
TW-504515 F	1.56 +/- 0.11
TW-602626 F	0.958 +/- 0.083
TW-538561 Q	0.933 +/- 0.078
TW-629654 Q	0.967 +/- 0.080
TW-639665 F	1.55 +/- 0.11
TW-701723 F	5.17 +/- 0.14

- Quoted 2 sigma uncertainty is due to counting statistics only

RESULTS APPROVED

E. M. Moreno

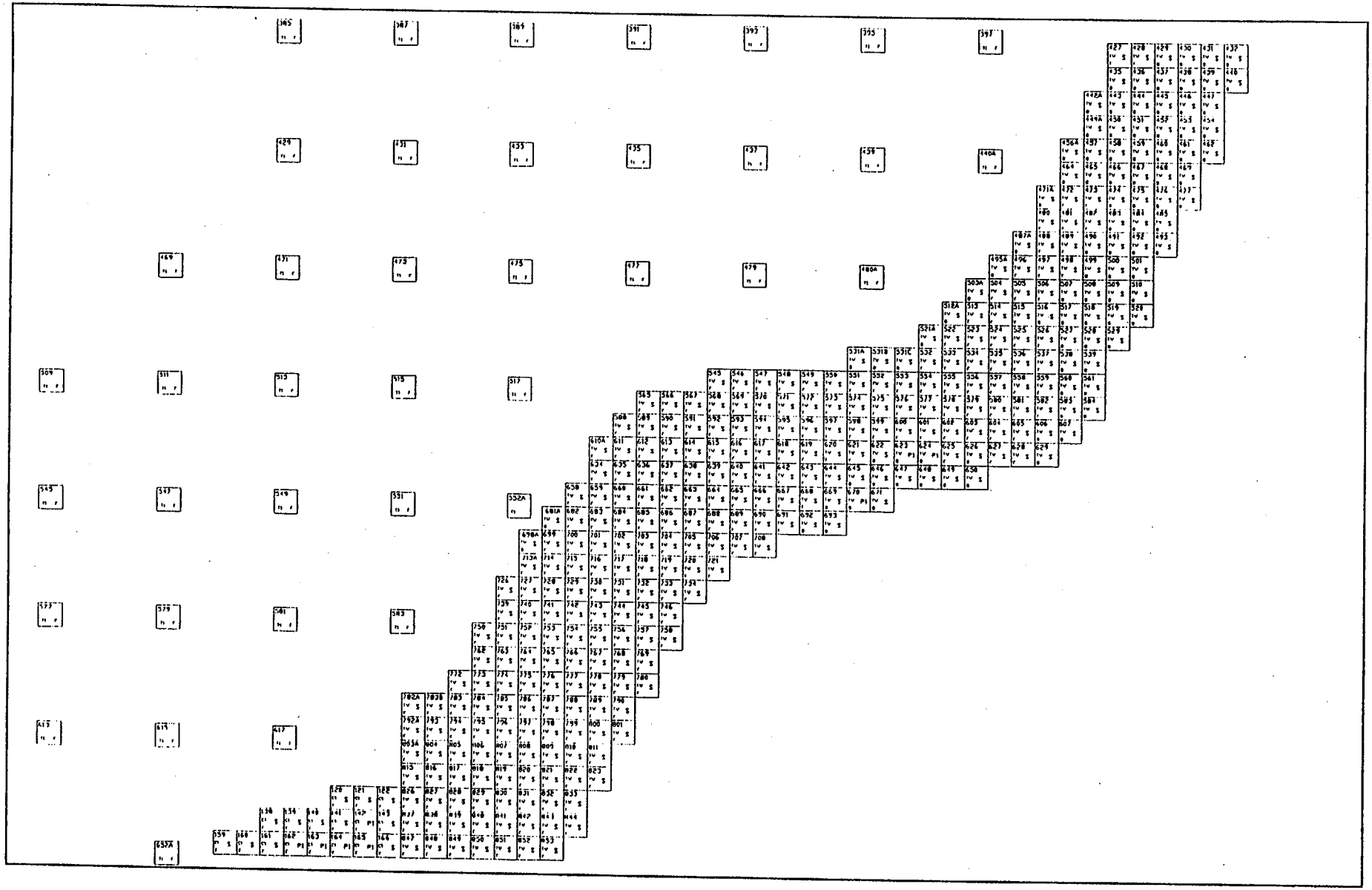
A. D. Banavali



SMI
SHEPHERD MILLER, INC.

FIGURE 3

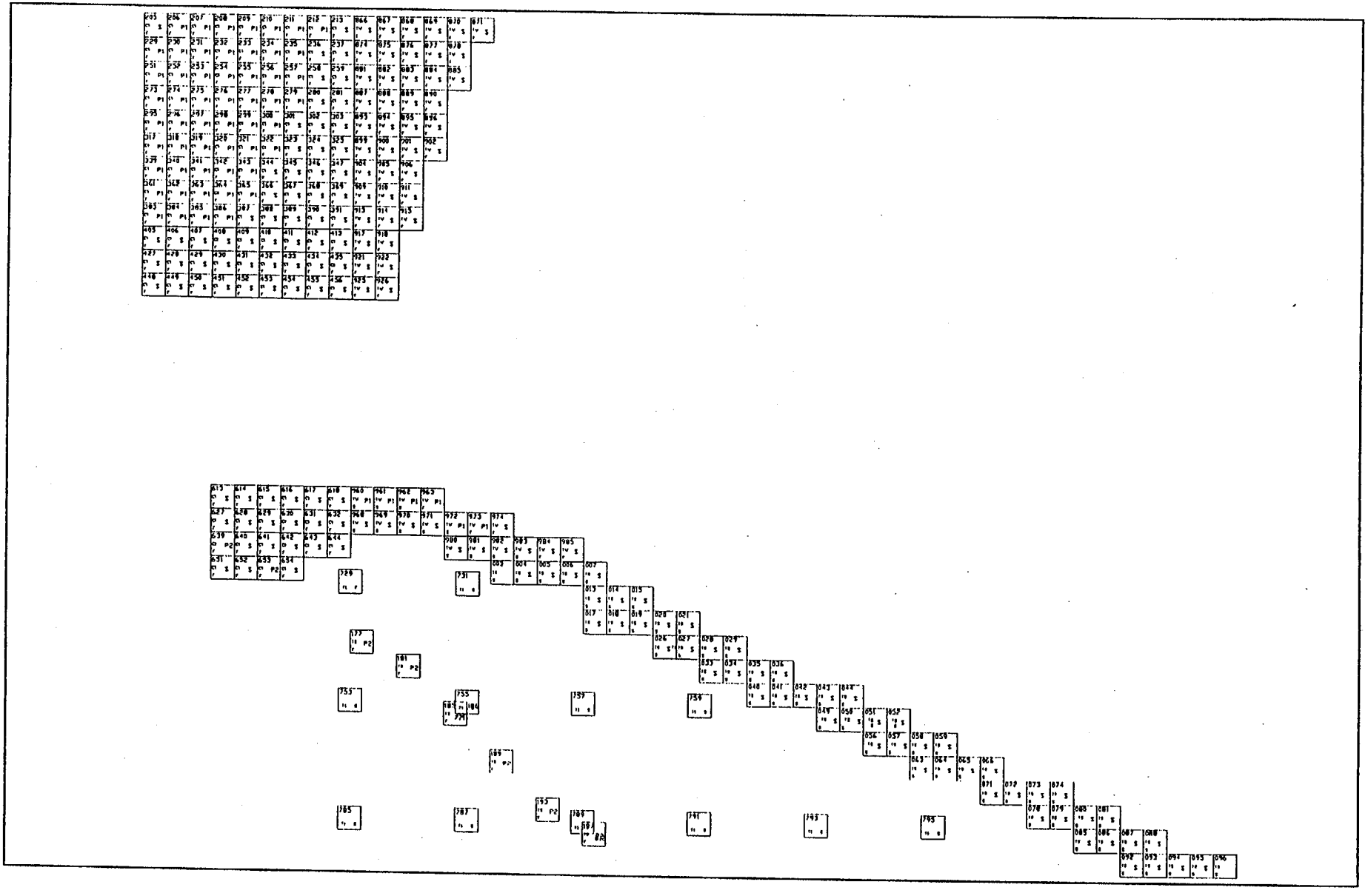
Date:	FEB., 1996
Project:	09-353
File:	FIG3



SMI
SHEPHERD MILLER, INC.

FIGURE 4

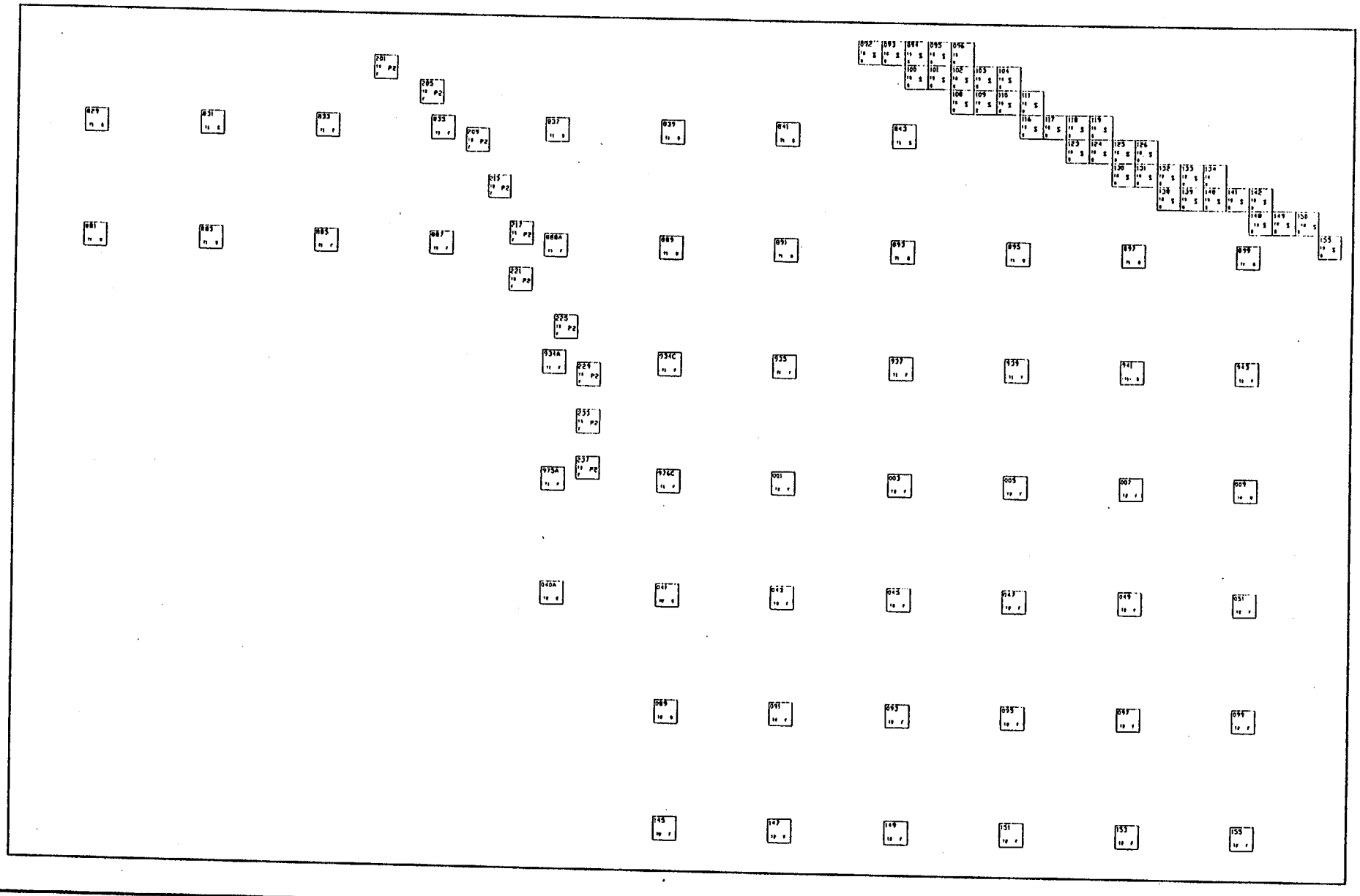
Date: FEB., 1996
Project: 09-353
File: FIG4



SMI
SHEPHERD MILLER, INC.

FIGURE 5

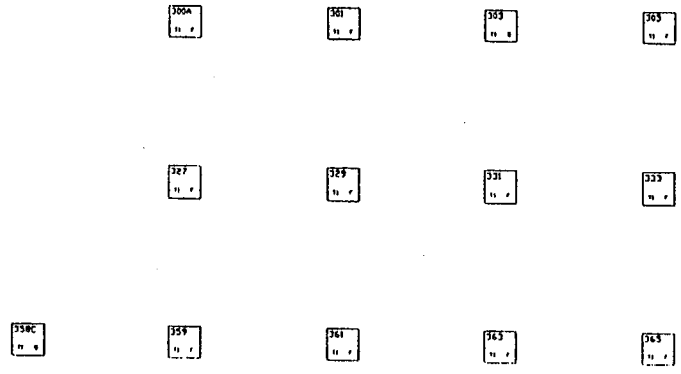
Date: FEB., 1996
Project: 09-353
File: FIG5



SMI
SHEPHERD MILLER, INC.

FIGURE 6

Date:	FEB., 1996
Project:	09-353
File:	FIG6



SMI
SHEPHERD MILLER, INC.

FIGURE 7

Date:	FEB., 1996
Project:	09-353
File:	FIG7

ATTACHMENT II

YANKEE ATOMIC ENVIRONMENTAL LABORATORY

Ra-226 Results via "Traditional" Method

Report Date: 10/17/95 Reference Date: 05/04/95

Sherwood Project Sample Identification From Lot No. 95-51	Ra-226 Activity Concentration Net +/- 2 Sigma(#) (pCi/g - dry)
T1-672C678DF	0.955 +/- 0.094
T1-160A180BF	0.919 +/- 0.092
T1-241258F	1.208 +/- 0.096
T1-075096F	1.006 +/- 0.082
T1-300A314BF	0.922 +/- 0.086
T1-480A500BF	0.990 +/- 0.084
T1-267019F	4.91 +/- 0.38

- Quoted 2 sigma uncertainty is due to counting statistics only

RESULTS APPROVED

E. M. Moreno

A. D. Banavali

ATTACHMENT II

YANKEE ATOMIC ENVIRONMENTAL LABORATORY

Th-230 Alpha Spectrometry Results

Report Date: 05/26/95 Reference Date: 04/27/95

Sherwood Project Sample Identification From Lot No. 95-S1	Th-230 Activity Concentration Net +/- 2 Sigma(#) (pCi/g - dry)
T1-672C678DF	1.13 +/- 0.13
T1-160A180BF	1.26 +/- 0.16
T1-241258F	1.02 +/- 0.13
T1-075096F	1.03 +/- 0.12
T1-300A314BF	1.28 +/- 0.13
T1-480A500BF	1.46 +/- 0.14
T1-267019F	3.64 +/- 0.22

- Quoted 2 sigma uncertainty is due to counting statistics only

RESULTS APPROVED

E. M. Moreno

A. D. Banavali

ATTACHMENT II

YANKEE ATOMIC ENVIRONMENTAL LABORATORY

Ra-226 Results via "Traditional" Method

Report Date: 09/27/95 Reference Date: 04/27/95

Sherwood Project Sample Identification From Lot No. 95-59	Ra-226 Activity Concentration Net +/- 2 Sigma(#) (pCi/g - dry)
M1-115125 S	2.07 +/- 0.11
C3-044092 S	2.10 +/- 0.11
M1-123136 S	1.245 +/- 0.086
C3-094140 S	2.76 +/- 0.12
C2-745772 S	0.907 +/- 0.077
C2-895932 F	1.503 +/- 0.095
C1-709723 S	1.230 +/- 0.083
C2-667692 S	1.030 +/- 0.087
C2-625648 S	0.999 +/- 0.081
C1-210235 F	0.942 +/- 0.080
C1-750581 S	1.203 +/- 0.070
TW-823835 F	1.036 +/- 0.080
C2-794527 F	1.272 +/- 0.093
C1-747030 F	6.15 +/- 0.16

- Quoted 2 sigma uncertainty is due to counting statistics only

RESULTS APPROVED

E. M. Moreno

A. D. Banavali

ATTACHMENT II

YANKEE ATOMIC ENVIRONMENTAL LABORATORY

Th-230 Alpha Spectrometry Results

Report Date: 08/28/95 Reference Date: 04/27/95

Sherwood Project Sample Identification From Lot No. 95-59	Th-230 Activity Concentration Net +/- 2 Sigma(#) (pCi/g - dry)
M1-115125 S	1.80 +/- 0.18
C3-044092 S	3.63 +/- 0.30
M1-123136 S	1.61 +/- 0.17
C3-094140 S	4.17 +/- 0.35
C2-745772 S	1.08 +/- 0.13
C2-895932 F	1.56 +/- 0.18
C1-709723 S	0.93 +/- 0.12
C2-667692 S	1.26 +/- 0.15
C2-625648 S	0.89 +/- 0.12
→ C1-210235 F	0.91 +/- 0.12
C1-750581 S	3.47 +/- 0.29
→ TW-823835 F	1.75 +/- 0.18
C2-794827 F	2.37 +/- 0.23
C1-747030 F	4.45 +/- 0.35

- Quoted 2 sigma uncertainty is due to counting statistics only

RESULTS APPROVED

E. M. Moreno

A. D. Banavali

ATTACHMENT II

YANKEE ATOMIC ENVIRONMENTAL LABORATORY

Ra-226 Results via "Traditional" Method

Report Date: 10/17/95 Reference Date: 06/05/95

Sherwood Project Sample Identification From Lot No. 95-74	Ra-226 Activity Concentration Net +/- 2 Sigma(#) (pCi/g - dry)
T1-157178 F	1.29 +/- 0.10
→ T1-357376 F	1.005 +/- 0.084
→ T1-547564 F	1.179 +/- 0.093
→ T1-433454 F	1.040 +/- 0.088
T1-121144 F	1.026 +/- 0.094
T1-001016 Q	1.029 +/- 0.096
T1-803826 F	1.32 +/- 0.10
T1-707716 F	1.040 +/- 0.096
→ T1-305320 F	1.43 +/- 0.11
T1-441462 F	1.03 +/- 0.10
T1-111140 F	0.855 +/- 0.084
→ T1-789812 F	1.446 +/- 0.096
→ T1-934A956B F	0.952 +/- 0.086
T1-944A966B Q	1.63 +/- 0.11
T1-106035 F	5.52 +/- 0.16

- Quoted 2 sigma uncertainty is due to counting statistics only

RESULTS APPROVED

E. M. Moreno

A. D. Banavali

ATTACHMENT II

YANKEE ATOMIC ENVIRONMENTAL LABORATORY

Th-230 Alpha Spectrometry Results

Report Date: 10/11/95 Reference Date: 06/05/95

Sherwood Project Sample Identification From Lot No. 95-74	Th-230 Activity Concentration Net +/- 2 Sigma(#) (pCi/g - dry)
T1-157178 F	1.07 +/- 0.14
T1-357376 F	1.83 +/- 0.19
T1-547564 F	1.34 +/- 0.15
T1-433454 F	1.01 +/- 0.14
T1-121144 F	0.96 +/- 0.13
T1-001016 Q	1.29 +/- 0.17
T1-803826 F	1.39 +/- 0.16
T1-707716 F	1.56 +/- 0.18
T1-305320 F	1.64 +/- 0.18
T1-441462 F	1.13 +/- 0.13
T1-111140 F	0.81 +/- 0.11
T1-789812 F	2.63 +/- 0.20
T1-934A956B F	1.00 +/- 0.13
T1-944A966B Q	2.05 +/- 0.20
T1-106035 F	3.92 +/- 0.31

- Quoted 2 sigma uncertainty is due to counting statistics only

RESULTS APPROVED

E. M. Moreno

A. D. Banavali

ATTACHMENT II

YANKEE ATOMIC ENVIRONMENTAL LABORATORY

Ra-226 Results via "Traditional" Method

Report Date: 10/18/95 Reference Date: 06/05/95

Sherwood Project Sample Identification From Lot No. 95-77	Ra-226 Activity Concentration Net +/- 2 Sigma(#) (pCi/g - dry)
C1-143847 F	1.007 +/- 0.083
C1-298321 F	0.955 +/- 0.085
TW-342354 F	1.035 +/- 0.087
C1-321344 F	0.903 +/- 0.082
C1-343366 F	1.002 +/- 0.083
TW-500510 Q	1.91 +/- 0.11
C1-257280 F	0.883 +/- 0.083
TW-446454 Q	1.092 +/- 0.093
TW-519530 Q	1.42 +/- 0.10
TW-505099 Q	5.38 +/- 0.15

- Quoted 2 sigma uncertainty is due to counting statistics only

RESULTS APPROVED

E. M. Moreno

A. D. Banavali

ATTACHMENT II

YANKEE ATOMIC ENVIRONMENTAL LABORATORY

Th-230 Alpha Spectrometry Results

Report Date: 10/11/95 Reference Date: 06/05/95

Sherwood Project Sample Identification From Lot No. 95-77	Th-230 Activity Concentration Net +/- 2 Sigma(#) (pCi/g - dry)
→ C1-143847 F	1.15 +/- 0.13
→ C1-298321 F	1.14 +/- 0.13
→ TW-342354 F	1.00 +/- 0.12
→ C1-321344 F	1.00 +/- 0.12
→ C1-343366 F	0.97 +/- 0.12
→ TW-500510 Q	2.62 +/- 0.23
→ C1-257280 F	1.10 +/- 0.13
→ TW-446454 Q	1.27 +/- 0.14
→ TW-519530 Q	1.61 +/- 0.16
TW-505099 Q	5.13 +/- 0.33

- Quoted 2 sigma uncertainty is due to counting statistics only

RESULTS APPROVED

E. M. Moreno

A. D. Banavali

ATTACHMENT II

YANKEE ATOMIC ENVIRONMENTAL LABORATORY

Ra-226 Results via "Traditional" Method

Report Date: 11/13/95 Reference Date: 07/31/95

Sherwood Project Sample Identification From Lot No. 95-121	Ra-226 Activity Concentration Net +/- 2 Sigma(#) (pCi/g - dry)
TW-947954 F	1.423 +/- 0.088
M1-183204 S	2.22 +/- 0.11
TW-823835 F	1.022 +/- 0.084
M1-296333 F	4.91 +/- 0.14
M1-211232 S	1.527 +/- 0.099
C1-218241 F	1.51 +/- 0.11
TW-299312 F	0.964 +/- 0.078
C1-418440 F	9.21 +/- 0.20
C1-556943 F	1.207 +/- 0.083
TE-383388 F	0.903 +/- 0.077
C2-725752 F	1.245 +/- 0.087
C3-584601 F	1.250 +/- 0.093
C1-702716 F	1.067 +/- 0.085
TE-864878 F	1.220 +/- 0.081
C1-401424 F	0.989 +/- 0.082
C3-585126 F	8.82 +/- 0.59

- Quoted 2 sigma uncertainty is due to counting statistics only

RESULTS APPROVED

E. M. Moreno

A. D. Banavali

ATTACHMENT II

YANKEE ATOMIC ENVIRONMENTAL LABORATORY

Th-230 Alpha Spectrometry Results

Report Date: 10/31/95 Reference Date: 07/31/95

Sherwood Project Sample Identification From Lot No. 95-121	Th-230 Activity Concentration Net +/- 2 Sigma(#) (pCi/g - dry)
TW-947954 F	2.01 +/- 0.17
M1-183204 S	2.44 +/- 0.19
→ TW-823835 F	0.99 +/- 0.12
M1-296333 F	6.73 +/- 0.41
M1-211232 S	1.95 +/- 0.17
C1-218241 F	1.44 +/- 0.15
TW-299312 F	1.06 +/- 0.12
C1-418440 F	9.44 +/- 0.53
C1-556943 F	1.26 +/- 0.14
TE-383388 F	1.20 +/- 0.13
C2-725752 F	1.62 +/- 0.15
C3-584601 F	1.06 +/- 0.12
C1-702716 F	1.07 +/- 0.12
TE-864878 F	1.61 +/- 0.16
C1-401424 F	1.32 +/- 0.14
C3-585126 F	3.57 +/- 0.26

- Quoted 2 sigma uncertainty is due to counting statistics only

RESULTS APPROVED

E. M. Moreno

A. D. Banavali

ATTACHMENT II

YANKEE ATOMIC ENVIRONMENTAL LABORATORY

Ra-226 Results via "Traditional" Method

Report Date: 11/13/95 Reference Date: 07/31/95

Sherwood Project Sample Identification From Lot No. 95-122	Ra-226 Activity Concentration Net +/- 2 Sigma(≠) (pCi/g - dry)
M1-680715 F	1.772 +/- 0.097
C1-184209 F	0.999 +/- 0.079
M1-867893 F	1.87 +/- 0.10
M2-004723 S	1.209 +/- 0.083
M2-009031 F	2.54 +/- 0.11
C1-607622 F	3.41 +/- 0.14
M1-708743 Q	1.56 +/- 0.10
M1-940A964 F	1.258 +/- 0.090
M1-959674 F	1.392 +/- 0.094
M1-433474 S	1.351 +/- 0.090
C1-678690 F	1.046 +/- 0.075
M1-736771 S	1.101 +/- 0.085
C1-250273 F	1.081 +/- 0.084
M1-807839 Q	3.28 +/- 0.13
M1-888608 F	1.410 +/- 0.090
C1-659671 F	1.250 +/- 0.089
M1-638674 Q	2.49 +/- 0.11
M1-635066 Q	7.90 +/- 0.20

≠ - Quoted 2 sigma uncertainty is due to counting statistics only

RESULTS APPROVED

E. M. Moreno

A. D. Banavali

ATTACHMENT II

YANKEE ATOMIC ENVIRONMENTAL LABORATORY

Th-230 Alpha Spectrometry Results

Report Date: 10/31/95 Reference Date: 07/31/95

Sherwood Project Sample Identification From Lot No. 95-122	Th-230 Activity Concentration Net +/- 2 Sigma(#) (pCi/g - dry)
M1-680715 F	2.02 +/- 0.16
C1-184209 F	1.14 +/- 0.12
M1-867893 F	2.38 +/- 0.19
M2-004723 S	1.29 +/- 0.13
M2-009031 F	2.51 +/- 0.20
C1-607622 F	3.41 +/- 0.23
M1-708743 Q	4.91 +/- 0.31
M1-940A964 F	1.99 +/- 0.16
M1-959674 F	2.50 +/- 0.19
M1-433474 S	2.46 +/- 0.18
C1-678690 F	1.07 +/- 0.11
M1-736771 S	1.36 +/- 0.13
C1-250273 F	0.98 +/- 0.11
M1-807839 Q	8.26 +/- 0.44
M1-888608 F	1.58 +/- 0.15
C1-659671 F	1.52 +/- 0.14
M1-638674 Q	6.65 +/- 0.41
M1-635066 Q	5.35 +/- 0.32

- Quoted 2 sigma uncertainty is due to counting statistics only

RESULTS APPROVED

E. M. Moreno

A. D. Banavali

Table 1.0 - Gamma Survey Data

Grid Identifcation	Gamma Reading	Allowable Gamma	Confirmation Sample Lot	Date Tested	Grid Status
TW-818830F	1440	2110		4/10/95	Verified
TW-819831F	1490	2110		4/10/95	Verified
TW-820832F	1463	2110		4/10/95	Verified
TW-821833F	1742	2110		4/10/95	Verified
TW-822834F	1703	2110		7/19/95	Verified
TW-823835F	1652	2110	95-59,95-121	7/17/95	Verified
TW-826838F	1615	2110		3/30/95	Verified
TW-827839F	1530	2110		4/26/95	Verified
TW-828840F	1394	2110		4/26/95	Verified
TW-829841F	1488	2110		4/10/95	Verified
TW-830842F	1496	2110		4/10/95	Verified
TW-831843F	1539	2110		4/26/95	Verified
TW-832844F	1566	2110		7/19/95	Verified
TW-833845F	1565	2110		7/19/95	Verified
TW-837848F	1508	2110		3/30/95	Verified
TW-838849F	1404	2250		5/11/95	Verified
TW-839850F	1293	2110		4/10/95	Verified
TW-840851F	1397	2110		4/10/95	Verified
TW-841852F	1523	2110		4/26/95	Verified
TW-842853F	1621	2110	95-127	7/19/95	Verified
TW-843854F	1595	2110		7/19/95	Verified
TW-844855F	1626	2110		7/19/95	Verified
TW-847858F	1549	2110		3/30/95	Verified
TW-848859F	1413	2110		4/10/95	Verified
TW-849860F	1423	2110		4/10/95	Verified
TW-850861F	1362	2110		4/10/95	Verified
TW-851862F	1532	2110		4/10/95	Verified
TW-852863F	1585	2110		7/19/95	Verified
TW-853864F	1560	2110		7/19/95	Verified
TW-857867F	1449	2110		3/30/95	Verified
TW-858868F	1481	2110		4/10/95	Verified
TW-859869F	1490	2110		4/10/95	Verified
TW-860870F	1433	2110		4/10/95	Verified
TW-861871F	1655	2110		7/19/95	Verified
TW-862872F	1693	2110		7/19/95	Verified
TW-863873F	1721	2110		7/19/95	Verified
TW-866875F	1483	2110		3/30/95	Verified
TW-867876F	1456	2110		4/10/95	Verified
TW-868877F	1558	2110		4/10/95	Verified
TW-869878F	1602	2110		7/19/95	Verified
TW-870879F	1584	2110		7/19/95	Verified
TW-871880F	1861	2110		7/19/95	Verified
TW-874882F	1518	2110		3/30/95	Verified
TW-875883F	1446	2110		4/10/95	Verified
TW-876884F	1443	2110		4/26/95	Verified
TW-877885F	1763	2110	95-133	7/19/95	Verified
TW-878886F	1765	2110		7/19/95	Verified

Table 1.0 - Gamma Survey Data

Grid Identifcation	Gamma Reading	Allowable Gamma	Confirmation Sample Lot	Date Tested	Grid Status
TW-881888F	1454	2110		3/30/95	Verified
TW-882889F	1508	2110		4/10/95	Verified
TW-883890F	1491	2110		4/26/95	Verified
TW-884891F	1681	2110		7/19/95	Verified
TW-885892F	1934	2110		7/19/95	Verified
TW-887894F	1390	2110		3/30/95	Verified
TW-888895F	1507	2110		4/10/95	Verified
TW-889896F	1657	2110		7/16/95	Verified
TW-890897F	1852	2110		7/19/95	Verified
TW-893900F	1452	2110		3/30/95	Verified
TW-894901F	1520	2110		4/10/95	Verified
TW-895902F	1649	2110		7/14/95	Verified
TW-896903F	1824	2110		7/14/95	Verified
TW-899905F	1469	2110		3/30/95	Verified
TW-900906F	1625	2110		7/14/95	Verified
TW-901907F	1783	2110	95-133	7/14/95	Verified
TW-902908F	1921	2110		7/14/95	Verified
TW-904910F	1439	2110		3/30/95	Verified
TW-905911F	1555	2110		7/14/95	Verified
TW-906912F	1696	2110		7/14/95	Verified
TW-909914F	1348	2110		3/30/95	Verified
TW-910915F	1653	2110		7/14/95	Verified
TW-911916F	1763	2110		7/19/95	Verified
TW-913918F	1399	2110		3/30/95	Verified
TW-914919F	1678	2110		7/14/95	Verified
TW-915920F	1715	2110		7/16/95	Verified
TW-917922F	1334	2110		3/30/95	Verified

Table 2.0 - Laboratory Results

Grid Identifcation	Sample Lot	^{226}Ra			^{230}Th			Actual $^{226}Ra_{(1000)}$	Allowable $^{226}Ra_{(1000)}$
C1-143847F	95-77	1.01	±	0.08	1.15	±	0.13	1.16	6.07
C1-161185F	95-133	1.08	±	0.09	1.20	±	0.10	1.22	6.07
C1-184209F	95-122	1.00	±	0.10	1.14	±	0.12	1.16	6.07
C1-210235F	95-59	0.94	±	0.08	0.91	±	0.12	1.02	6.07
C1-256279F	95-123	0.98	±	0.08	1.33	±	0.18	1.22	6.07
C1-257280F	95-77	0.88	±	0.08	1.10	±	0.13	1.05	6.07
C1-275298F	95-123	0.85	±	0.08	1.18	±	0.12	1.06	6.07
C1-298321F	95-77	0.96	±	0.09	1.14	±	0.13	1.13	6.07
C1-321344F	95-77	0.90	±	0.08	1.00	±	0.12	1.03	6.07
C1-340363F	95-123	0.75	±	0.07	0.99	±	0.13	0.93	6.07
C1-343366F	95-123	0.92	±	0.08	1.12	±	0.13	1.09	6.07
C1-343366F	95-77	1.00	±	0.08	0.97	±	0.12	1.08	6.07
C1-389412F	95-133	0.97	±	0.08	0.95	±	0.11	1.05	6.07
C1-628641F	95-126	1.47	±	0.09	2.09	±	0.19	1.81	6.07
C1-639652F	95-111	1.24	±	0.08	1.92	±	0.18	1.59	6.07
C1-642655F	95-126	1.17	±	0.08	1.34	±	0.15	1.33	6.07
T1-300A314BF	95-51	0.92	±	0.09	1.28	±	0.13	1.15	6.07
T1-305320F	95-74	1.43	±	0.11	1.64	±	0.18	1.64	6.07
T1-357376F	95-74	1.01	±	0.08	1.83	±	0.19	1.42	6.07
T1-433454F	95-74	1.04	±	0.09	1.01	±	0.14	1.14	6.07
T1-480A500BF	95-51	0.99	±	0.08	1.46	±	0.14	1.26	6.07
T1-547564F	95-74	1.18	±	0.09	1.34	±	0.15	1.35	6.07
T1-789812F	95-74	1.45	±	0.10	2.63	±	0.20	2.00	6.07
T1-934A956BF	95-74	0.95	±	0.09	1.00	±	0.13	1.07	6.07
T2-111140F	95-74	0.86	±	0.08	0.81	±	0.11	0.93	6.07
TS-174176F	95-111	1.13	±	0.09	1.21	±	0.13	1.26	6.07
TS-177180F	95-143	1.18	±	0.09	1.38	±	0.13	1.35	6.07
TS-181184F	95-143	1.2	±	0.09	1.58	±	0.13	1.44	6.07
TS-185188F	95-143	1.25	±	0.09	1.57	±	0.14	1.47	6.07
TS-189192F	95-143	1.68	±	0.1	1.71	±	0.14	1.80	6.07
TS-193196F	95-143	1.46	±	0.1	1.87	±	0.16	1.72	6.07
TS-197200F	95-143	1.44	±	0.09	1.6	±	0.13	1.60	6.07
TS-201204F	95-143	1.27	±	0.09	1.31	±	0.12	1.38	6.07
TS-205208F	95-143	1.15	±	0.09	1.16	±	0.11	1.25	6.07
TS-209212F	95-143	1.12	±	0.09	1.29	±	0.12	1.28	6.07
TS-213216F	95-143	1.18	±	0.09	1.56	±	0.13	1.42	6.07
TS-217220F	95-102	1.61	±	0.1	2.54	±	0.2	2.07	6.07
TS-221224F	95-102	2.09	±	0.12	3.74	±	0.29	2.85	6.07
TS-225228F	95-119	1.94	±	0.11	2.79	±	0.29	2.41	6.07
TS-229232F	95-119	1.6	±	0.1	4.14	±	0.31	2.66	6.07
TS-233236F	95-119	1.08	±	0.09	1.4	±	0.18	1.31	6.07
TS-237240F	95-119	1.21	±	0.09	2.58	±	0.35	1.87	6.07
TW-296309F	95-131	1.09	±	0.08	1.10	±	0.14	1.19	6.07
TW-342354F	95-77	1.04	±	0.09	1.00	±	0.12	1.13	6.07
TW-352363F	95-131	1.20	±	0.09	1.12	±	0.14	1.28	6.07
TW-382392F	95-148	1.08	±	0.09	1.28	±	0.12	1.25	6.07

Table 2.0 - Laboratory Results

Grid Identifcation	Sample Lot	^{226}Ra			^{230}Th			Actual $^{226}Ra_{(1000)}$	Allowable $^{226}Ra_{(1000)}$
TW-415424Q	95-148	5.62	±	0.16	1.17	±	0.12	4.20	6.44
TW-437446Q	95-148	1.23	±	0.10	2.04	±	0.17	1.64	6.44
TW-446454Q	95-77	1.09	±	0.09	1.27	±	0.14	1.26	6.44
TW-446454Q	95-148	0.99	±	0.09	1.08	±	0.13	1.13	6.44
TW-462471Q	95-148	1.20	±	0.10	2.26	±	0.17	1.70	6.44
TW-474484Q	95-148	1.32	±	0.10	1.19	±	0.13	1.38	6.44
TW-500510Q	95-77	1.91	±	0.11	2.62	±	0.23	2.31	6.44
TW-504515F	95-148	1.56	±	0.11	1.02	±	0.10	1.48	6.07
TW-519530Q	95-77	1.42	±	0.10	1.61	±	0.16	1.61	6.44
TW-538561Q	95-148	0.93	±	0.08	1.23	±	0.11	1.13	6.44
TW-602626F	95-148	0.96	±	0.08	1.06	±	0.10	1.08	6.07
TW-620645F	95-148	1.84	±	0.12	1.21	±	0.08	1.72	6.07
TW-629654Q	95-148	0.97	±	0.08	1.34	±	0.12	1.19	6.44
TW-639665F	95-148	1.55	±	0.11	1.00	±	0.10	1.46	6.07
TW-669694Q	95-127	1.02	±	0.08	0.94	±	0.08	1.07	6.44
TW-719734F	95-127	0.96	±	0.09	1.21	±	0.08	1.13	6.07
TW-728742F	95-127	1.31	±	0.09	1.16	±	0.11	1.35	6.07
TW-789801F	95-127	0.99	±	0.06	1.07	±	0.09	1.09	6.07
TW-805818F	95-127	1.13	±	0.09	1.08	±	0.10	1.21	6.07
TW-823835F	95-121	1.02	±	0.08	0.99	±	0.12	1.10	6.07
TW-823835F	95-59	1.04	±	0.08	1.75	±	0.18	1.40	6.07
TW-842853F	95-127	1.02	±	0.08	1.11	±	0.10	1.14	6.07
TW-877885F	95-133	1.03	±	0.08	0.91	±	0.10	1.07	6.07
TW-901907F	95-133	1.10	±	0.09	1.11	±	0.11	1.20	6.07
TW-971980S	95-126	1.44	±	0.09	1.23	±	0.14	1.47	6.07

WESTERN NUCLEAR, INC.

UNION PLAZA SUITE 300, 200 UNION BOULEVARD, LAKEWOOD, COLORADO 80228
TELECOPIER (303) 989-8993 TELEPHONE (303) 989-8675

FEB 2 8 1996
DIV. OF RADIATION PROTECTION

February 23, 1996

Mr. Gary Robertson, Head
Waste Management Section
Washington Department of Health
Division of Radiation Protection
Airdustrial Park, Bldg. 5
P.O. Box 47827
Olympia, WA 98504-7827

RE: WN-I0133-1, SHERWOOD PROJECT, ADDENDUM TO 12/22/94 TAILING RECLAMATION PLAN

Dear Mr. Robertson:

Via letters dated November 15, 1995 and January 18, 1996, Western Nuclear, Inc. [WNI] transmitted to Washington Department of Health [WDOH] radiological verification data representing two soil borrow stockpile areas and the area east of the tailing impoundment to be used as sources of soils for interim cover and requested WDOH approval of the use of these borrow areas for interim cover placement. Via letters dated November 21, 1995 and January 25, 1996, WDOH authorized WNI to use the two soil borrow stockpiles for interim cover.

This letter expands on the preceding to request WDOH approve all remaining areas, including diversion channel excavation areas and excepting the solution holding pond area and an associated access road, necessary to complete 1996 final tailing reclamation construction. These areas are shown on attached Figure 1. Since radiological soil confirmation data for the solution holding pond area were not available for inclusion with this submittal, backfill of the Solution Holding Pond area will be deferred until final soil confirmation analyses have been reviewed and approved by WDOH. To facilitate WDOH review, this Addendum provides the following:

1. Radiological verification data representing the areas to be disturbed by the 1996 final tailing reclamation construction.
2. WNI analyses of WDOH/WNI split soil samples.

In addition and in accordance with our February 7, 1996 discussions, please find attached an explanation of the selection criteria used in choosing radiological verification grids that were analyzed for uranium. Also enclosed are the laboratory results for

the uranium soil analyses.

In accordance with our July 20-21, 1995 and other recent discussions, seven [7] copies of this submittal are being transmitted to you in Olympia. We would appreciate if you would transmit the copies as you previously indicated, as listed below:

- Spokane Tribe of Indians (1 copy)
- Bureau of Indian Affairs (1 copy)
- Nuclear Regulatory Commission (1 copy)
- Clean file copy (1 copy)
- WDOH [Olympia, WA] (3 copies)

In addition, copies are being transmitted directly to the following parties:

- One copy of this particular submittal is being sent by WNI directly to Ms. Stoffel [WDOH; Spokane, WA].
- One [1] copy is being sent directly to Mr. Fordham [WDOH; Richland, WA].

Because of the 1996 tailing reclamation construction schedule relative to availability of final radiological confirmation data, we request your prompt review and approval of this Addendum. Should you have any questions, please contact us at your earliest convenience.

Sincerely,

Stephanie J. Baker
Manager of Environmental Services
SJB/tic doh\trp\trpadd96.f23

w/enclosures

cc: CA [w/ attach.]
KCB [w/o attach.]
MAP [w/o attach.]
L. Pruett, Esq. [w/ attach.]
LLM [SMI; w/ attach.]
D. Stoffel [WDOH; w/ attach.]
E. Fordham [WDOH; w/ attach.]

SHEPHERD MILLER
INCORPORATED

February 23, 1996

Stephanie Baker
Western Nuclear
200 Union Blvd., Suite 300
Lakewood, CO 80228

Dear Stephanie:

Attached you will find the radiological verification data for all remaining areas, including diversion channel excavation areas and excepting the solution holding pond area and an associated access road, necessary to complete 1996 final tailing reclamation construction. All data were collected and evaluated according to the procedures documented in The Sherwood Radiological Verification Program, Appendix H of Addendum [Revision #6 (10/94)] to the Sherwood Project Mill Decommissioning Plan (April, 1992).

Figure 1 shows the location of the radiological verification grids addressed in this letter, as well as previously approved areas, and the areas expected to be disturbed during construction. Table 1 presents the gamma survey data, and Table 2 presents the soil sample results.

As you can see, all of the grids are below the criteria for both gamma readings and soil ^{226}Ra and ^{230}Th values as presented in Appendix H of Addendum [Revision #6 (10/94)]. Therefore, the area shown on Figure 1 should be considered releasable for unrestricted use and the material in these areas can be used as clean fill.

Please contact us if you have any additional questions or concerns.

Sincerely,

SHEPHERD MILLER, INC.

Lawrence E. Fiske
Project Manager

Attachments

Consulting Environmental & Geotechnical Engineers & Scientists

3801 Automation Way, Suite 100
Fort Collins, CO 80525
Phone: (970) 223-9600
Fax: (970) 223-7171

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Table 1.0 - Gamma Survey Data

Grid Identifcation	Gamma Reading	Allowable Gamma	Confirmation Sample Lot	Date Tested	Grid Status
C1-120142F	1310	2250		6/5/95	Verified
C1-121143F	1324	2110		5/24/95	Verified
C1-122837F	1870	2110		5/24/95	Verified
C1-138162F	1218	2110		4/19/95	Verified
C1-139163F	1378	2110		4/20/95	Verified
C1-140164F	1656	2110		5/24/95	Verified
C1-141165F	1569	2110		5/24/95	Verified
C1-142166F	1528	2250		6/5/95	Verified
C1-143847F	1418	2250	95-77	5/22/95	Verified
C1-159183F	1225	2250		4/26/95	Verified
C1-160184F	1521	2110		4/20/95	Verified
C1-161185F	1678	2110	95-133	5/24/95	Verified
C1-162186F	1346	2110		5/24/95	Verified
C1-163187F	937	2250		6/5/95	Verified
C1-164188F	1240	2250		6/5/95	Verified
C1-165189F	1461	2110		3/30/95	Verified
C1-166857F	1558	2110		3/30/95	Verified
C1-181206F	1409	2250		4/26/95	Verified
C1-182207F	1357	2250		6/5/95	Verified
C1-183208F	1258	2250		6/21/95	Verified
C1-184209F	1575	2110	95-122	5/24/95	Verified
C1-185210F	1278	2250		6/21/95	Verified
C1-186211F	1269	2250		6/5/95	Verified
C1-187212F	1392	2110		3/30/95	Verified
C1-188213F	1498	2110		3/30/95	Verified
C1-189866F	1475	2110		3/30/95	Verified
C1-205230F	1402	2110		5/24/95	Verified
C1-206231F	1305	2250		6/21/95	Verified
C1-207232F	1233	2250		6/21/95	Verified
C1-208233F	1334	2250		6/21/95	Verified
C1-209234F	1332	2250		6/21/95	Verified
C1-210235F	1457	2110	95-59	3/30/95	Verified
C1-211236F	1457	2110		3/30/95	Verified
C1-212237F	1432	2110		3/30/95	Verified
C1-213874F	1461	2110		3/30/95	Verified
C1-229252F	1280	2110		5/24/95	Verified
C1-230253F	1388	2250		6/21/95	Verified
C1-231254F	1262	2250		6/5/95	Verified
C1-232255F	1595	2110		5/24/95	Verified
C1-233256F	1415	2110		3/30/95	Verified
C1-234257F	1426	2110		3/30/95	Verified
C1-235258F	1468	2110		3/30/95	Verified
C1-236259F	1423	2110		3/30/95	Verified
C1-237881F	1449	2110		3/30/95	Verified
C1-251274F	1224	2110		3/30/95	Verified
C1-252275F	1251	2110		3/30/95	Verified
C1-253276F	1378	2110		3/30/95	Verified

Table 1.0 - Gamma Survey Data

Grid Identifcation	Gamma Reading	Allowable Gamma	Confirmation Sample Lot	Date Tested	Grid Status
C1-254277F	1283	2110		3/30/95	Verified
C1-255278F	1386	2110		3/30/95	Verified
C1-256279F	1443	2110	95-123	3/30/95	Verified
C1-257280F	1340	2250	95-77	5/22/95	Verified
C1-258281F	1430	2110		3/30/95	Verified
C1-259887F	1440	2110		3/30/95	Verified
C1-273296F	1300	2110		3/30/95	Verified
C1-274297F	1205	2110		3/30/95	Verified
C1-275298F	1432	2110	95-123	3/30/95	Verified
C1-276299F	1426	2110		3/30/95	Verified
C1-277300F	1381	2110		3/30/95	Verified
C1-278301F	1394	2110		3/30/95	Verified
C1-279302F	1184	2110		3/30/95	Verified
C1-280303F	1417	2110		3/30/95	Verified
C1-281893F	1494	2110		3/30/95	Verified
C1-295318F	1244	2110		3/30/95	Verified
C1-296319F	1179	2110		3/30/95	Verified
C1-297320F	1383	2110		3/30/95	Verified
C1-298321F	1549	2250	95-77	5/22/95	Verified
C1-299322F	1476	2110		3/30/95	Verified
C1-300323F	1412	2110		3/30/95	Verified
C1-301324F	1221	2110		3/30/95	Verified
C1-302325F	1252	2110		3/30/95	Verified
C1-303899F	1489	2110		3/30/95	Verified
C1-317340F	1308	2110		3/30/95	Verified
C1-318341F	1267	2110		3/30/95	Verified
C1-319342F	1358	2110		3/30/95	Verified
C1-320343F	1442	2110		3/30/95	Verified
C1-321344F	1413	2250	95-77	5/22/95	Verified
C1-322345F	1440	2110		3/30/95	Verified
C1-323346F	1341	2110		3/30/95	Verified
C1-324347F	1338	2110		3/30/95	Verified
C1-325904F	1359	2110		3/30/95	Verified
C1-339362F	1241	2110		3/30/95	Verified
C1-340363F	1348	2110	95-123	3/30/95	Verified
C1-341364F	1318	2110		3/30/95	Verified
C1-342365F	1493	2110		3/30/95	Verified
C1-343366F	1342	2250	95-77,95-123	5/22/95	Verified
C1-344367F	1438	2110		3/30/95	Verified
C1-345368F	1350	2110		3/30/95	Verified
C1-346369F	1425	2110		3/30/95	Verified
C1-347909F	1298	2110		3/30/95	Verified
C1-361384F	1342	2110		3/30/95	Verified
C1-362385F	1345	2110		3/30/95	Verified
C1-363386F	1370	2110		3/30/95	Verified
C1-364387F	1383	2110		3/30/95	Verified
C1-365388F	1457	2110		3/30/95	Verified

Table 1.0 - Gamma Survey Data

Grid Identifcation	Gamma Reading	Allowable Gamma	Confirmation Sample Lot	Date Tested	Grid Status
C1-366389F	1429	2110		3/30/95	Verified
C1-367390F	1244	2110		3/30/95	Verified
C1-368391F	1370	2110		3/30/95	Verified
C1-369913F	1417	2110		3/30/95	Verified
C1-383406F	1236	2110		3/30/95	Verified
C1-384407F	1269	2110		3/30/95	Verified
C1-385408F	1269	2110		3/30/95	Verified
C1-386409F	1254	2110		3/30/95	Verified
C1-387410F	1213	2110		3/30/95	Verified
C1-388411F	1353	2110		3/30/95	Verified
C1-389412F	1246	2110	95-133	3/30/95	Verified
C1-390413F	1320	2110		3/30/95	Verified
C1-391917F	1441	2110		3/30/95	Verified
C1-405428F	1234	2110		3/30/95	Verified
C1-406429F	1244	2110		3/30/95	Verified
C1-407430F	1188	2110		3/30/95	Verified
C1-408431F	1068	2110		3/30/95	Verified
C1-409432F	1100	2110		3/30/95	Verified
C1-410433F	1373	2110		3/30/95	Verified
C1-411434F	1287	2110		3/30/95	Verified
C1-412435F	1185	2110		3/30/95	Verified
C1-413921F	1258	2110		3/30/95	Verified
C1-427449F	1357	2110		3/30/95	Verified
C1-428450F	1205	2110		3/30/95	Verified
C1-429451F	1042	2110		3/30/95	Verified
C1-430452F	1046	2110		3/30/95	Verified
C1-431453F	1147	2110		3/30/95	Verified
C1-432454F	1145	2110		3/30/95	Verified
C1-433455F	1232	2110		3/30/95	Verified
C1-434456F	1166	2110		3/30/95	Verified
C1-435925F	1200	2110		3/30/95	Verified
C1-448470F	1543	2110		3/30/95	Verified
C1-449471F	1252	2110		3/30/95	Verified
C1-450472F	1006	2110		3/30/95	Verified
C1-451473F	1045	2110		3/30/95	Verified
C1-452474F	1061	2110		3/30/95	Verified
C1-453475F	1133	2110		3/30/95	Verified
C1-454476F	1263	2110		3/30/95	Verified
C1-455477F	1315	2110		3/30/95	Verified
C1-456928F	1176	2110		3/30/95	Verified
C1-613628F	1538	2110		6/2/95	Verified
C1-614629F	1444	2110		5/30/95	Verified
C1-615630F	1310	2110		4/12/95	Verified
C1-616631F	1193	2110		4/12/95	Verified
C1-617632F	1405	2110		4/12/95	Verified
C1-618968F	1461	2110		4/12/95	Verified
C1-627640F	1608	2110		5/30/95	Verified

Table 1.0 - Gamma Survey Data

Grid Identifcation	Gamma Reading	Allowable Gamma	Confirmation Sample Lot	Date Tested	Grid Status
C1-628641F	1733	2110	95-126	5/30/95	Verified
C1-629642F	1379	2110		4/12/95	Verified
C1-630643F	1420	2110		4/12/95	Verified
C1-631644F	1346	2110		4/12/95	Verified
C1-632976F	1445	2110		4/12/95	Verified
C1-639652F	1428	2110	95-111	5/30/95	Verified
C1-640653F	1430	2110		5/30/95	Verified
C1-641654F	1381	2110		4/12/95	Verified
C1-642655F	1626	2110	95-126	4/12/95	Verified
C1-643656F	1518	2110		4/12/95	Verified
C1-644657F	1731	2110		4/12/95	Verified
C1-651665F	1483	2110		5/30/95	Verified
C1-652666F	1427	2110		5/30/95	Verified
C1-653667F	1556	2110		5/30/95	Verified
C1-654668F	1436	2110		4/12/95	Verified
T1-189212F	1234	2110		4/24/95	Verified
T1-233250F	1194	2110		4/24/95	Verified
T1-235252F	1230	2110		4/24/95	Verified
T1-265280F	1199	2110		4/24/95	Verified
T1-267282F	1198	2110		4/24/95	Verified
T1-293308F	1283	2110		4/24/95	Verified
T1-295310F	1363	2110		4/24/95	Verified
T1-297312F	1323	2110		4/24/95	Verified
T1-299314F	1400	2110		4/25/95	Verified
T1-300A314BF	1619	2110	95-51	4/12/95	Verified
T1-301316F	1407	2110		4/12/95	Verified
T1-303318Q	1907	2680		4/24/95	Verified
T1-305320F	1551	2250	95-74	5/11/95	Verified
T1-321336F	1242	2110		4/24/95	Verified
T1-323338F	1170	2110		4/24/95	Verified
T1-325340F	1063	2110		4/24/95	Verified
T1-326A340BF	1312	2110		4/12/95	Verified
T1-327342F	1357	2110		4/12/95	Verified
T1-329344F	1442	2110		4/24/95	Verified
T1-331346F	1367	2110		4/24/95	Verified
T1-333348F	1415	2110		4/24/95	Verified
T1-349368F	1138	2110		4/24/95	Verified
T1-351370F	1386	2110		4/24/95	Verified
T1-353372F	1082	2110		4/24/95	Verified
T1-355374F	1395	2110		4/24/95	Verified
T1-357376F	1434	2250	95-74	5/11/95	Verified
T1-358A376BQ	2369	2680		6/1/95	Verified
T1-358C376DQ	1767	2680		12/9/95	Verified
T1-359378F	1220	2110		4/12/95	Verified
T1-361380F	1179	2110		4/24/95	Verified
T1-363382F	1418	2110		4/24/95	Verified
T1-365384F	1239	2110		4/24/95	Verified

Table 1.0 - Gamma Survey Data

Grid Identifcation	Gamma Reading	Allowable Gamma	Confirmation Sample Lot	Date Tested	Grid Status
T1-385408F	1412	2110		4/25/95	Verified
T1-387410F	1285	2110		4/25/95	Verified
T1-389412F	1295	2110		4/25/95	Verified
T1-391414F	1346	2110		4/25/95	Verified
T1-393416F	1345	2110		4/25/95	Verified
T1-395418F	1387	2110		4/25/95	Verified
T1-397420F	1305	2110		4/12/95	Verified
T1-429450F	1378	2110		4/25/95	Verified
T1-431452F	1477	2110		4/25/95	Verified
T1-433454F	1254	2250	95-74	5/11/95	Verified
T1-435456F	1200	2250		4/27/95	Verified
T1-437458F	1401	2110		4/25/95	Verified
T1-439460F	1371	2110		4/12/95	Verified
T1-440A460BF	1386	2110		4/12/95	Verified
T1-469490F	1401	2110		4/25/95	Verified
T1-471492F	1136	2110		4/25/95	Verified
T1-473494F	1204	2110		4/25/95	Verified
T1-475496F	1488	2110		4/18/95	Verified
T1-477498F	1379	2110		4/18/95	Verified
T1-479500F	1353	2110		4/18/95	Verified
T1-480A500BF	1462	2110	95-51	4/12/95	Verified
T1-509528F	1195	2110		4/25/95	Verified
T1-511530F	1265	2110		4/25/95	Verified
T1-513532F	1133	2110		4/25/95	Verified
T1-515534F	1417	2110		7/19/95	Verified
T1-517536F	1349	2110		4/18/95	Verified
T1-545562F	1225	2110		4/25/95	Verified
T1-547564F	1454	2250	95-74	5/11/95	Verified
T1-549566F	1208	2110		4/25/95	Verified
T1-551568F	1160	2110		4/18/95	Verified
T1-552A568BF	1386	2110		4/18/95	Verified
T1-577596F	1189	2110		4/25/95	Verified
T1-579598F	1459	2110		4/25/95	Verified
T1-581600F	1148	2110		4/18/95	Verified
T1-583602F	961	2110		4/18/95	Verified
T1-613634F	1746	2110		6/1/95	Verified
T1-615636F	1445	2110		4/18/95	Verified
T1-617638F	1334	2110		4/18/95	Verified
T1-652A662BF	1370	2250		5/11/95	Verified
T1-753770S	1675	2110		6/1/95	Verified
T1-755772S	1663	2110		7/19/95	Verified
T1-757774S	1709	2110		4/20/95	Verified
T1-759776S	1834	2110		4/20/95	Verified
T1-785808S	1475	2110		4/20/95	Verified
T1-787810S	1369	2110		4/20/95	Verified
T1-789812F	1684	2250	95-74	5/11/95	Verified
T1-791814S	1903	2110		4/12/95	Verified

Table 1.0 - Gamma Survey Data

Grid Identifcation	Gamma Reading	Allowable Gamma	Confirmation Sample Lot	Date Tested	Grid Status
T1-793816S	1676	2110		4/20/95	Verified
T1-795818S	1789	2110		4/12/95	Verified
T1-829856S	1379	2110		7/19/95	Verified
T1-831858S	1656	2110		4/20/95	Verified
T1-833860F	1386	2110		4/20/95	Verified
T1-835862F	1537	2110		4/12/95	Verified
T1-837864S	1542	2110		4/12/95	Verified
T1-839866S	1924	2110		4/12/95	Verified
T1-841868S	1464	2110		4/12/95	Verified
T1-843870S	1583	2110		4/12/95	Verified
T1-881908S	1254	2110		4/20/95	Verified
T1-883910S	1456	2110		4/20/95	Verified
T1-885912F	1450	2110		4/20/95	Verified
T1-887914F	1412	2110		4/12/95	Verified
T1-888A914BF	1614	2110		4/20/95	Verified
T1-889916S	1588	2110		4/12/95	Verified
T1-891918S	1457	2110		4/12/95	Verified
T1-893920S	1541	2110		4/12/95	Verified
T1-895922S	1499	2110		4/12/95	Verified
T1-897924S	1669	2110		4/12/95	Verified
T1-899926S	1556	2110		4/12/95	Verified
T1-934A956BF	1367	2250	95-74	5/11/95	Verified
T1-934C956DF	1287	2110		4/26/95	Verified
T1-935958F	1306	2110		4/12/95	Verified
T1-937960F	1387	2110		4/12/95	Verified
T1-939962F	1429	2110		4/12/95	Verified
T1-941964S	1359	2110		4/12/95	Verified
T1-943966F	1430	2110		4/12/95	Verified
T1-975A020BF	1464	2110		4/26/95	Verified
T1-976C020DF	1390	2110		4/26/95	Verified
T2-001022F	1418	2110		4/20/95	Verified
T2-003024F	1311	2110		4/20/95	Verified
T2-005026F	1149	2250		4/27/95	Verified
T2-007028F	1452	2110		4/21/95	Verified
T2-009030Q	2040	2680		4/21/95	Verified
T2-040A064BS	1260	2250		4/27/95	Verified
T2-041066S	1334	2110		4/20/95	Verified
T2-043068F	1308	2110		4/20/95	Verified
T2-045070F	1373	2250		4/27/95	Verified
T2-047072F	1231	2110		4/21/95	Verified
T2-049074F	1335	2110		4/21/95	Verified
T2-051076F	1431	2110		4/21/95	Verified
T2-089118S	1313	2110		4/20/95	Verified
T2-091120F	1294	2110		4/20/95	Verified
T2-093122F	1199	2110		4/21/95	Verified
T2-095124F	1171	2110		4/21/95	Verified
T2-097126F	1256	2110		4/21/95	Verified

Table 1.0 - Gamma Survey Data

Grid Identifcation	Gamma Reading	Allowable Gamma	Confirmation Sample Lot	Date Tested	Grid Status
T2-099128F	1370	2110		4/21/95	Verified
T2-145162F	1197	2110		4/20/95	Verified
T2-147164F	1156	2110		4/20/95	Verified
T2-149166F	1171	2110		4/21/95	Verified
T2-151168F	1243	2110		4/21/95	Verified
T2-153170F	1097	2250		4/27/95	Verified
T2-155172F	1392	2110		4/21/95	Verified
TS-003010S	1835	2110		7/13/95	Verified
TS-004011S	2026	2110		7/13/95	Verified
TS-005012S	1926	2110		7/13/95	Verified
TS-006013S	2085	2110		7/13/95	Verified
TS-007014S	1810	2110		7/13/95	Verified
TS-013018S	1804	2110		7/13/95	Verified
TS-014019S	1722	2110		4/20/95	Verified
TS-015020S	1705	2110		4/20/95	Verified
TS-017024S	1638	2110		4/20/95	Verified
TS-018025S	1736	2110		4/20/95	Verified
TS-019026S	1653	2110		4/20/95	Verified
TS-020027S	1735	2110		4/20/95	Verified
TS-021028S	1788	2110		4/20/95	Verified
TS-026032S	1777	2110		4/20/95	Verified
TS-027033S	1722	2110		4/20/95	Verified
TS-028034S	1782	2110		4/20/95	Verified
TS-029035S	1739	2110		4/20/95	Verified
TS-033039S	1778	2110		4/20/95	Verified
TS-034040S	1710	2110		4/20/95	Verified
TS-035041S	1750	2110		4/20/95	Verified
TS-036042S	1790	2110		4/20/95	Verified
TS-040047S	2015	2110		7/13/95	Verified
TS-041048S	1722	2110		4/20/95	Verified
TS-042049S	1729	2110		4/20/95	Verified
TS-043050S	1722	2110		4/20/95	Verified
TS-044051S	1743	2110		4/20/95	Verified
TS-049055S	1621	2110		8/30/95	Verified
TS-050056S	1670	2110		4/20/95	Verified
TS-051057S	1718	2110		4/20/95	Verified
TS-052058S	1747	2110		4/21/95	Verified
TS-056062S	1655	2110		4/20/95	Verified
TS-057063S	1782	2110		4/21/95	Verified
TS-058064S	1649	2110		4/21/95	Verified
TS-059065S	1750	2110		4/21/95	Verified
TS-063069S	1664	2110		4/21/95	Verified
TS-064070S	1682	2110		4/21/95	Verified
TS-065071S	1766	2110		4/21/95	Verified
TS-066072S	1698	2110		4/21/95	Verified
TS-071077S	1659	2110		4/21/95	Verified
TS-072078S	1624	2110		4/21/95	Verified

Table 1.0 - Gamma Survey Data

Grid Identifcation	Gamma Reading	Allowable Gamma	Confirmation Sample Lot	Date Tested	Grid Status
TS-073079S	1651	2110		4/21/95	Verified
TS-074080S	1664	2110		4/21/95	Verified
TS-078084S	1781	2110		8/30/95	Verified
TS-079085S	1644	2110		4/21/95	Verified
TS-080086S	1775	2110		4/21/95	Verified
TS-081087S	1638	2110		4/21/95	Verified
TS-085091S	1719	2110		4/21/95	Verified
TS-086092S	1699	2110		4/21/95	Verified
TS-087093S	1764	2110		4/21/95	Verified
TS-088094S	1776	2110		4/21/95	Verified
TS-092099S	1652	2110		4/21/95	Verified
TS-093100S	1690	2110		4/21/95	Verified
TS-094101S	1733	2110		4/21/95	Verified
TS-095102S	1734	2110		4/21/95	Verified
TS-096103S	1753	2110		4/21/95	Verified
TS-100107S	1519	2110		4/21/95	Verified
TS-101108S	1643	2110		4/21/95	Verified
TS-102109S	1753	2110		4/21/95	Verified
TS-103110S	1698	2110		4/21/95	Verified
TS-104111S	1768	2110		4/21/95	Verified
TS-108114S	1471	2110		4/21/95	Verified
TS-109115S	1582	2110		4/21/95	Verified
TS-110116S	1776	2110		4/21/95	Verified
TS-111117S	1785	2110		4/21/95	Verified
TS-116122S	1572	2110		4/21/95	Verified
TS-117123S	1720	2110		4/21/95	Verified
TS-118124S	1723	2110		4/21/95	Verified
TS-119125S	1691	2110		4/21/95	Verified
TS-123129S	1733	2110		4/21/95	Verified
TS-124130S	1811	2110		4/21/95	Verified
TS-125131S	1735	2110		4/21/95	Verified
TS-126132S	1778	2110		4/21/95	Verified
TS-130137S	1508	2110		4/21/95	Verified
TS-131138S	1677	2110		4/21/95	Verified
TS-132139S	1616	2110		4/21/95	Verified
TS-133140S	1687	2110		4/21/95	Verified
TS-134141S	1651	2110		4/21/95	Verified
TS-138145S	1480	2110		4/21/95	Verified
TS-139146S	1716	2110		4/21/95	Verified
TS-140147S	1652	2110		4/21/95	Verified
TS-141148S	1642	2110		4/21/95	Verified
TS-142149S	1674	2110		4/21/95	Verified
TS-148153S	1611	2110		4/21/95	Verified
TS-149154S	1791	2110		4/21/95	Verified
TS-150155S	1736	2110		4/21/95	Verified
TS-155158S	1508	2110		4/21/95	Verified
TS-156158AS	1653	2110		4/21/95	Verified

Table 1.0 - Gamma Survey Data

Grid Identifcation	Gamma Reading	Allowable Gamma	Confirmation Sample Lot	Date Tested	Grid Status
TS-163245F	1270	2110		7/20/95	Verified
TS-164165F	1327	2110		7/20/95	Verified
TS-166247Q	1733	2680		7/20/95	Verified
TS-167248Q	2039	2680		7/20/95	Verified
TS-168249Q	2232	2680		7/20/95	Verified
TW-255269F	1561	2110		7/19/95	Verified
TW-268283F	1619	2110		7/19/95	Verified
TW-269284F	1428	2110		5/19/95	Verified
TW-281295F	1615	2110		7/19/95	Verified
TW-282296F	1552	2110		7/19/95	Verified
TW-283297F	1875	2110		5/19/95	Verified
TW-284298F	1413	2110		5/19/95	Verified
TW-294307F	1381	2110		5/19/95	Verified
TW-295308F	1430	2110		5/19/95	Verified
TW-296309F	1612	2110	95-131	5/19/95	Verified
TW-297310F	1378	2110		5/19/95	Verified
TW-298311F	1575	2110		5/19/95	Verified
TW-306319F	1627	2110		5/19/95	Verified
TW-307320F	1531	2110		5/19/95	Verified
TW-308321F	1705	2110		5/19/95	Verified
TW-309322F	1454	2110		5/19/95	Verified
TW-310323F	1392	2110		5/19/95	Verified
TW-311324F	1150	2110		5/19/95	Verified
TW-318330F	1390	2110		4/5/95	Verified
TW-319331F	1475	2110		4/5/95	Verified
TW-320332F	1448	2110		4/5/95	Verified
TW-321333F	1484	2110		5/8/95	Verified
TW-322334F	1359	2250		4/12/95	Verified
TW-323335F	1514	2110		4/5/95	Verified
TW-324336F	1495	2110		5/8/95	Verified
TW-329340F	1463	2110		4/5/95	Verified
TW-330341F	1467	2110		4/5/95	Verified
TW-331342F	1368	2110		5/8/95	Verified
TW-332343F	1397	2110		5/8/95	Verified
TW-333344F	1504	2110		4/5/95	Verified
TW-334345F	1397	2110		4/5/95	Verified
TW-335346F	1463	2110		5/8/95	Verified
TW-336347F	1508	2110		12/13/95	Verified
TW-339351F	1363	2250		4/12/95	Verified
TW-340352F	1485	2110		4/5/95	Verified
TW-341353F	1435	2110		5/8/95	Verified
TW-342354F	1409	2250	95-77	5/22/95	Verified
TW-343355F	1427	2110		4/5/95	Verified
TW-344356F	1389	2110		4/5/95	Verified
TW-345357F	1475	2110		5/8/95	Verified
TW-349360F	1464	2110		4/5/95	Verified
TW-350361F	1390	2110		4/5/95	Verified

Table 1.0 - Gamma Survey Data

Grid Identifcation	Gamma Reading	Allowable Gamma	Confirmation Sample Lot	Date Tested	Grid Status
TW-351362F	1509	2110		5/8/95	Verified
TW-352363F	1538	2110	95-131	5/8/95	Verified
TW-353364F	1509	2110		4/5/95	Verified
TW-354365F	1496	2110		4/5/95	Verified
TW-355366F	1477	2110		4/5/95	Verified
TW-356367F	1639	2110		12/12/95	Verified
TW-359370F	1437	2110		4/5/95	Verified
TW-360371F	1462	2110		4/5/95	Verified
TW-361372F	1423	2110		5/8/95	Verified
TW-362373F	1461	2110		4/5/95	Verified
TW-363374F	1474	2110		4/5/95	Verified
TW-364375F	1434	2110		4/5/95	Verified
TW-365376F	1473	2110		4/5/95	Verified
TW-369379F	1465	2110		4/5/95	Verified
TW-370380F	1412	2110		5/8/95	Verified
TW-371381F	1365	2110		5/8/95	Verified
TW-372382F	1428	2110		4/5/95	Verified
TW-373383F	1385	2110		4/5/95	Verified
TW-374384F	1429	2110		4/5/95	Verified
TW-375385F	1540	2110		4/5/95	Verified
TW-378388F	1377	2110		4/5/95	Verified
TW-379389F	1446	2110		7/19/95	Verified
TW-380390F	1414	2110		4/5/95	Verified
TW-381391F	1473	2110		4/5/95	Verified
TW-382392F	1542	2110	95-148	4/5/95	Verified
TW-383393F	1470	2110		4/5/95	Verified
TW-384394F	1755	2110		4/5/95	Verified
TW-387397F	1482	2110		7/19/95	Verified
TW-388398F	1402	2110		7/19/95	Verified
TW-389399F	1408	2110		4/5/95	Verified
TW-390400F	1440	2110		4/5/95	Verified
TW-391401F	1366	2110		4/5/95	Verified
TW-392402F	1516	2110		4/5/95	Verified
TW-395405F	1435	2110		5/8/95	Verified
TW-396406F	1446	2110		5/8/95	Verified
TW-397407F	1403	2110		4/5/95	Verified
TW-398408F	1394	2110		4/5/95	Verified
TW-399409F	1463	2110		4/5/95	Verified
TW-400410F	1547	2110		4/5/95	Verified
TW-401411Q	1576	2680		4/5/95	Verified
TW-404413F	1496	2110		5/8/95	Verified
TW-405414F	1498	2110		5/8/95	Verified
TW-406415F	1367	2110		4/5/95	Verified
TW-407416F	1456	2110		4/5/95	Verified
TW-408417Q	1525	2680		4/5/95	Verified
TW-409418Q	1691	2680		4/5/95	Verified
TW-412421F	1429	2110		5/8/95	Verified

Table 1.0 - Gamma Survey Data

Grid Identifcation	Gamma Reading	Allowable Gamma	Confirmation Sample Lot	Date Tested	Grid Status
TW-413422F	1440	2110		4/5/95	Verified
TW-414423F	1445	2110		4/5/95	Verified
TW-415424Q	1735	2680	95-148	4/5/95	Verified
TW-416425Q	1828	2680		4/5/95	Verified
TW-417426Q	2075	2680		4/5/95	Verified
TW-419A428F	1780	2110		5/8/95	Verified
TW-420429F	1435	2110		5/8/95	Verified
TW-421430F	1479	2110		4/5/95	Verified
TW-422431Q	1630	2680		4/5/95	Verified
TW-423432Q	1879	2680		4/5/95	Verified
TW-424433Q	2036	2680		4/5/95	Verified
TW-425434Q	2270	2680		8/30/95	Verified
TW-427436F	1651	2110		5/8/95	Verified
TW-428437F	1578	2110		4/5/95	Verified
TW-429438Q	1607	2680		4/5/95	Verified
TW-430439Q	1531	2680		4/5/95	Verified
TW-431440Q	1615	2680		4/5/95	Verified
TW-432441Q	2136	2680		4/5/95	Verified
TW-435444Q	1868	2680		8/29/95	Verified
TW-436445Q	2139	2680		8/29/95	Verified
TW-437446Q	2243	2680	95-148	8/29/95	Verified
TW-438447Q	2101	2680		8/29/95	Verified
TW-439448Q	1779	2680		8/29/95	Verified
TW-440449Q	1944	2680		8/29/95	Verified
TW-442A450Q	2063	2680		5/8/95	Verified
TW-443451Q	2352	2680		8/29/95	Verified
TW-444452Q	2388	2680		8/29/95	Verified
TW-445453Q	2288	2680		8/29/95	Verified
TW-446454Q	2428	2680	95-77,95-148	8/29/95	Verified
TW-447455Q	2224	2680		8/29/95	Verified
TW-449A458Q	1929	2380		9/8/95	Verified
TW-450459Q	2204	2680		8/28/95	Verified
TW-451460Q	2125	2680		8/28/95	Verified
TW-452461Q	2037	2680		8/28/95	Verified
TW-453462Q	2201	2680		8/28/95	Verified
TW-454463Q	2275	2680		8/28/95	Verified
TW-456A465Q	2161	2680		5/8/95	Verified
TW-457466Q	2263	2680		8/28/95	Verified
TW-458467Q	2378	2680		8/28/95	Verified
TW-459468Q	2370	2680		8/28/95	Verified
TW-460469Q	2374	2680		8/28/95	Verified
TW-461470Q	2414	2680		8/28/95	Verified
TW-462471Q	2549	2680	95-148	8/28/95	Verified
TW-464473Q	2085	2680		5/8/95	Verified
TW-465474Q	2106	2680		8/28/95	Verified
TW-466475Q	2154	2680		8/28/95	Verified
TW-467476Q	2399	2680		8/28/95	Verified

Table 1.0 - Gamma Survey Data

Grid Identifcation	Gamma Reading	Allowable Gamma	Confirmation Sample Lot	Date Tested	Grid Status
TW-468477Q	2374	2680		8/28/95	Verified
TW-469478Q	2533	2680		8/28/95	Verified
TW-471A481Q	1749	2680		5/8/95	Verified
TW-472482F	1827	2110		8/28/95	Verified
TW-473483F	1777	2110		8/28/95	Verified
TW-474484Q	2222	2680	95-148	8/28/95	Verified
TW-475485Q	2239	2680		8/28/95	Verified
TW-476486Q	2267	2680		8/28/95	Verified
TW-477487Q	2480	2680		8/28/95	Verified
TW-480489F	1649	2110		4/10/95	Verified
TW-481490F	1785	2110		4/5/95	Verified
TW-482491F	1683	2110		8/29/95	Verified
TW-483492Q	2094	2680		8/29/95	Verified
TW-484493Q	2258	2680		8/29/95	Verified
TW-485494Q	2375	2680		8/29/95	Verified
TW-487A497Q	1598	2680		5/8/95	Verified
TW-488498F	1408	2110		4/10/95	Verified
TW-489499F	1485	2110		4/10/95	Verified
TW-490500Q	2375	2680		8/29/95	Verified
TW-491501Q	2568	2680		8/29/95	Verified
TW-492502Q	2601	2680		8/29/95	Verified
TW-493503Q	2545	2680		8/29/95	Verified
TW-495A505Q	1639	2680		5/8/95	Verified
TW-496506F	1463	2110		4/10/95	Verified
TW-497507F	1509	2110		4/10/95	Verified
TW-498508F	1740	2110		4/10/95	Verified
TW-499509Q	2407	2680		8/29/95	Verified
TW-500510Q	2617	2680	95-77	8/29/95	Verified
TW-501511Q	BEDROCK			11/28/95	Verified
TW-503A514Q	1645	2680		5/8/95	Verified
TW-504515F	1426	2110	95-148	4/10/95	Verified
TW-505516F	1516	2110		4/10/95	Verified
TW-506517F	1437	2110		4/10/95	Verified
TW-507518Q	2213	2680		8/29/95	Verified
TW-508519Q	2502	2680		8/29/95	Verified
TW-509520Q	2370	2680		8/29/95	Verified
TW-510521Q	2623	2680		8/29/95	Verified
TW-512A523Q	1944	2680		5/8/95	Verified
TW-513524F	1588	2110		4/11/95	Verified
TW-514525F	1289	2110		4/10/95	Verified
TW-515526F	1314	2110		4/10/95	Verified
TW-516527Q	1413	2680		4/10/95	Verified
TW-517528Q	2209	2680		8/29/95	Verified
TW-518529Q	2349	2680		8/29/95	Verified
TW-519530Q	2413	2680	95-77	8/29/95	Verified
TW-520531Q	2643	2680		8/29/95	Verified
TW-521A533Q	2107	2680		5/8/95	Verified

Table 1.0 - Gamma Survey Data

Grid Identifcation	Gamma Reading	Allowable Gamma	Confirmation Sample Lot	Date Tested	Grid Status
TW-522534F	1599	2110		4/11/95	Verified
TW-523535F	1415	2110		4/11/95	Verified
TW-524536F	1368	2110		8/29/95	Verified
TW-525537F	1516	2110		8/29/95	Verified
TW-526538F	1437	2110		8/29/95	Verified
TW-527539Q	1964	2680		8/29/95	Verified
TW-528540Q	2174	2680		8/29/95	Verified
TW-529541Q	2243	2680		8/29/95	Verified
TW-531A552Q	2185	2680		5/8/95	Verified
TW-531B553Q	2316	2680		5/8/95	Verified
TW-531C554Q	2138	2680		5/8/95	Verified
TW-532555F	1682	2110		4/11/95	Verified
TW-533556F	1436	2110		8/29/95	Verified
TW-534557F	1443	2110		8/29/95	Verified
TW-535558F	1462	2110		8/29/95	Verified
TW-536559F	1480	2110		8/29/95	Verified
TW-537560F	1488	2110		8/29/95	Verified
TW-538561Q	1767	2680	95-148	8/29/95	Verified
TW-539562Q	2236	2680		8/29/95	Verified
TW-545569F	1446	2110		4/11/95	Verified
TW-546570F	1420	2110		4/11/95	Verified
TW-547571F	1439	2110		4/11/95	Verified
TW-548572F	1476	2110		4/11/95	Verified
TW-549573F	1455	2110		4/11/95	Verified
TW-550574F	1449	2110		4/11/95	Verified
TW-551575F	1593	2110		4/11/95	Verified
TW-552576F	1598	2110		4/11/95	Verified
TW-553577F	1599	2110		4/11/95	Verified
TW-554578F	1451	2110		4/11/95	Verified
TW-555579F	1537	2110		8/29/95	Verified
TW-556580F	1405	2110		8/29/95	Verified
TW-557581F	1465	2110		8/29/95	Verified
TW-558582F	1511	2110		8/29/95	Verified
TW-559583F	1424	2110		8/29/95	Verified
TW-560584Q	1863	2680		8/29/95	Verified
TW-561585Q	2211	2680		8/29/95	Verified
TW-565590F	1344	2110		4/11/95	Verified
TW-566591F	1436	2110		4/11/95	Verified
TW-567592F	1435	2110		4/11/95	Verified
TW-568593F	1487	2110		4/11/95	Verified
TW-569594F	1476	2110		4/11/95	Verified
TW-570595F	1501	2110		4/11/95	Verified
TW-571596F	1517	2110		4/11/95	Verified
TW-572597F	1377	2110		4/11/95	Verified
TW-573598F	1511	2110		4/11/95	Verified
TW-574599F	1498	2110		4/11/95	Verified
TW-575600F	1568	2110		4/11/95	Verified

Table 1.0 - Gamma Survey Data

Grid Identifcation	Gamma Reading	Allowable Gamma	Confirmation Sample Lot	Date Tested	Grid Status
TW-576601F	1423	2110		7/13/95	Verified
TW-577602F	1518	2110		7/13/95	Verified
TW-578603F	1459	2110		8/29/95	Verified
TW-579604F	1435	2110		8/29/95	Verified
TW-580605F	1457	2110		8/29/95	Verified
TW-581606F	1488	2110		8/29/95	Verified
TW-582607F	1461	2110		8/29/95	Verified
TW-583608Q	1776	2680		8/29/95	Verified
TW-584609Q	2050	2680		8/29/95	Verified
TW-588612F	1369	2110		4/11/95	Verified
TW-589613F	1395	2110		4/11/95	Verified
TW-590614F	1496	2110		4/11/95	Verified
TW-591615F	1434	2110		4/11/95	Verified
TW-592616F	1509	2110		4/11/95	Verified
TW-593617F	1524	2110		4/11/95	Verified
TW-594618F	1534	2110		4/11/95	Verified
TW-595619F	1505	2110		4/11/95	Verified
TW-596620F	1516	2110		4/11/95	Verified
TW-597621F	1617	2110		4/11/95	Verified
TW-598622F	1571	2110		7/14/95	Verified
TW-599623F	1608	2110		7/14/95	Verified
TW-600624F	1658	2110		7/13/95	Verified
TW-601625F	1782	2110		7/13/95	Verified
TW-602626F	1635	2110	95-148	8/29/95	Verified
TW-603627F	1692	2110		8/29/95	Verified
TW-604628F	1685	2110		8/29/95	Verified
TW-605629F	1494	2110		8/29/95	Verified
TW-606630Q	1443	2680		8/29/95	Verified
TW-607631Q	2118	2680		8/29/95	Verified
TW-610A635F	1359	2110		5/8/95	Verified
TW-611636F	1373	2110		4/11/95	Verified
TW-612637F	1514	2110		4/11/95	Verified
TW-613638F	1499	2110		4/11/95	Verified
TW-614639F	1518	2110		4/11/95	Verified
TW-615640F	1468	2110		4/11/95	Verified
TW-616641F	1335	2110		4/11/95	Verified
TW-617642F	1524	2110		4/11/95	Verified
TW-618643F	1500	2110		4/11/95	Verified
TW-619644F	1591	2110		7/14/95	Verified
TW-620645F	1664	2110	95-148	7/14/95	Verified
TW-621646F	1560	2110		7/18/95	Verified
TW-622647Q	1846	2680		7/18/95	Verified
TW-623648Q	2138	2680		7/13/95	Verified
TW-624649Q	2031	2680		8/29/95	Verified
TW-625650F	1964	2110		8/29/95	Verified
TW-626651Q	1904	2680		8/29/95	Verified
TW-627652F	1729	2110		8/29/95	Verified

Table 1.0 - Gamma Survey Data

Grid Identifcation	Gamma Reading	Allowable Gamma	Confirmation Sample Lot	Date Tested	Grid Status
TW-628653F	1752	2110		8/29/95	Verified
TW-629654Q	2096	2680	95-148	8/29/95	Verified
TW-634660F	1511	2110		4/12/95	Verified
TW-635661F	1503	2110		4/11/95	Verified
TW-636662F	1238	2250		4/20/95	Verified
TW-637663F	1587	2110		4/11/95	Verified
TW-638664F	1352	2110		4/11/95	Verified
TW-639665F	1554	2110	95-148	4/11/95	Verified
TW-640666F	1563	2110		4/11/95	Verified
TW-641667F	1540	2110		7/14/95	Verified
TW-642668F	1685	2110		7/14/95	Verified
TW-643669F	1534	2110		7/18/95	Verified
TW-644670F	1553	2110		7/18/95	Verified
TW-645671Q	1702	2680		7/18/95	Verified
TW-646672Q	2402	2680		8/29/95	Verified
TW-647673Q	2139	2680		7/13/95	Verified
TW-648674Q	2155	2680		8/29/95	Verified
TW-649675Q	2260	2680		8/29/95	Verified
TW-650676Q	1828	2680		8/29/95	Verified
TW-658683F	1540	2110		5/8/95	Verified
TW-659684F	1427	2110		4/12/95	Verified
TW-660685F	1509	2110		4/12/95	Verified
TW-661686F	1546	2110		4/12/95	Verified
TW-662687F	1459	2110		4/11/95	Verified
TW-663688F	1630	2110		4/11/95	Verified
TW-664689F	1640	2110		7/17/95	Verified
TW-665690F	1642	2110		7/14/95	Verified
TW-666691F	1538	2110		7/14/95	Verified
TW-667692F	1637	2110		7/18/95	Verified
TW-668693F	1651	2110		7/18/95	Verified
TW-669694Q	1736	2680	95-127	7/18/95	Verified
TW-670695Q	2002	2680		7/18/95	Verified
TW-671696Q	2162	2680		8/29/95	Verified
TW-681A700Q	1464	2680		5/8/95	Verified
TW-682701F	1513	2110		4/12/95	Verified
TW-683702F	1512	2110		4/12/95	Verified
TW-684703F	1479	2110		4/12/95	Verified
TW-685704F	1510	2110		4/12/95	Verified
TW-686705F	1445	2110		7/17/95	Verified
TW-687706F	1405	2110		7/17/95	Verified
TW-688707F	1576	2110		7/17/95	Verified
TW-689708F	1611	2110		7/14/95	Verified
TW-690709F	1519	2110		7/14/95	Verified
TW-691710F	1637	2110		7/18/95	Verified
TW-692711Q	1631	2680		7/18/95	Verified
TW-693712Q	1787	2680		7/18/95	Verified
TW-698A714Q	1521	2680		5/8/95	Verified

Table 1.0 - Gamma Survey Data

Grid Identifcation	Gamma Reading	Allowable Gamma	Confirmation Sample Lot	Date Tested	Grid Status
TW-699715F	1482	2110		4/12/95	Verified
TW-700716F	1670	2110		4/12/95	Verified
TW-701717F	1544	2110		4/12/95	Verified
TW-702718F	1593	2110		4/12/95	Verified
TW-703719F	1485	2110		7/17/95	Verified
TW-704720F	1526	2110		7/17/95	Verified
TW-705721F	1634	2110		7/17/95	Verified
TW-706722F	1510	2110		7/18/95	Verified
TW-707723F	1628	2110		7/14/95	Verified
TW-708724F	1492	2110		7/14/95	Verified
TW-713A728F	1450	2110		5/8/95	Verified
TW-714729F	1607	2110		4/12/95	Verified
TW-715730F	1584	2110		4/12/95	Verified
TW-716731F	1527	2110		4/12/95	Verified
TW-717732F	1488	2110		4/12/95	Verified
TW-718733F	1538	2110		7/17/95	Verified
TW-719734F	1694	2110	95-127	7/17/95	Verified
TW-720735F	1562	2110		7/18/95	Verified
TW-721736F	1434	2110		7/18/95	Verified
TW-726740F	1443	2110		5/8/95	Verified
TW-727741F	1613	2110		4/12/95	Verified
TW-728742F	1647	2110	95-127	4/12/95	Verified
TW-729743F	1596	2110		4/12/95	Verified
TW-730744F	1565	2110		4/12/95	Verified
TW-731745F	1539	2110		4/12/95	Verified
TW-732746F	1627	2110		7/17/95	Verified
TW-733747F	1583	2110		7/17/95	Verified
TW-734748F	1702	2110		7/18/95	Verified
TW-739752F	1465	2110		5/8/95	Verified
TW-740753F	1596	2110		4/12/95	Verified
TW-741754F	1561	2110		4/12/95	Verified
TW-742755F	1560	2110		4/12/95	Verified
TW-743756F	1501	2110		4/26/95	Verified
TW-744757F	1608	2110		4/10/95	Verified
TW-745758F	1716	2110		7/17/95	Verified
TW-746759F	1448	2110		7/17/95	Verified
TW-750763F	1455	2110		4/10/95	Verified
TW-751764F	1568	2110		4/12/95	Verified
TW-752765F	1583	2110		4/12/95	Verified
TW-753766F	1578	2110		4/10/95	Verified
TW-754767F	1522	2110		4/26/95	Verified
TW-755768F	1516	2110		4/26/95	Verified
TW-756769F	1686	2110		4/10/95	Verified
TW-757770F	1645	2110		7/17/95	Verified
TW-758771F	1379	2110		7/17/95	Verified
TW-762774F	1457	2110		4/10/95	Verified
TW-763775F	1467	2110		4/10/95	Verified

Table 1.0 - Gamma Survey Data

Grid Identifcation	Gamma Reading	Allowable Gamma	Confirmation Sample Lot	Date Tested	Grid Status
TW-764776F	1469	2110		4/10/95	Verified
TW-765777F	1537	2110		4/10/95	Verified
TW-766778F	1395	2250		5/11/95	Verified
TW-767779F	1608	2110		4/10/95	Verified
TW-768780F	1736	2110		4/10/95	Verified
TW-769781F	1641	2110		7/17/95	Verified
TW-772784F	1406	2110		4/10/95	Verified
TW-773785F	1422	2110		4/10/95	Verified
TW-774786F	1439	2110		4/10/95	Verified
TW-775787F	1492	2110		4/10/95	Verified
TW-776788F	1536	2110		4/26/95	Verified
TW-777789F	1617	2110		4/26/95	Verified
TW-778790F	1660	2110		4/10/95	Verified
TW-779791F	1643	2110		7/17/95	Verified
TW-780792F	1454	2110		7/17/95	Verified
TW-782A793F	1670	2110		5/24/95	Verified
TW-783795F	1371	2110		4/10/95	Verified
TW-783B794F	1519	2110		5/24/95	Verified
TW-784796F	1519	2110		4/26/95	Verified
TW-785797F	1432	2110		4/10/95	Verified
TW-786798F	1474	2110		4/10/95	Verified
TW-787799F	1539	2110		4/26/95	Verified
TW-788800F	1603	2110		4/10/95	Verified
TW-789801F	1675	2110	95-127	7/17/95	Verified
TW-790802F	1556	2110		7/17/95	Verified
TW-792A804F	1710	2110		5/24/95	Verified
TW-793805F	1539	2110		5/24/95	Verified
TW-794806F	1426	2110		4/10/95	Verified
TW-795807F	1471	2110		4/10/95	Verified
TW-796808F	1431	2110		4/10/95	Verified
TW-797809F	1419	2110		4/10/95	Verified
TW-798810F	1533	2110		4/26/95	Verified
TW-799811F	1761	2110		4/10/95	Verified
TW-800812F	1765	2110		7/17/95	Verified
TW-801813F	1456	2110		7/17/95	Verified
TW-803A816F	1433	2110		4/10/95	Verified
TW-804817F	1401	2110		4/10/95	Verified
TW-805818F	1602	2110	95-127	4/26/95	Verified
TW-806819F	1578	2110		4/26/95	Verified
TW-807820F	1437	2110		4/10/95	Verified
TW-808821F	1466	2110		4/10/95	Verified
TW-809822F	1595	2110		4/10/95	Verified
TW-810823F	1750	2110		4/10/95	Verified
TW-811824F	1490	2110		7/17/95	Verified
TW-815827F	1451	2110		4/10/95	Verified
TW-816828F	1487	2110		4/10/95	Verified
TW-817829F	1472	2110		4/26/95	Verified

GAMMA CONFIRMATION SURVEYS AT WESTERN NUCLEAR, INC.

7/24/95

Doug Wells, Jamil Ahmad, and John Blacklaw arrived onsite at 6:00 a.m. Jamil took soil samples: 8 adjacent to last week's samples, and 8 new ones (Doug selected this a.m. to be consistent with gamma sites).

Doug and John did gamma surveying per Doug's grid selections (100).

Shepherd, Miller, Inc. staff were Jim, Larry Fiske, Nicole High, and Francis.

A Ludlum Probe, Model 2350 was used, #44-10-102509; Data Logger, SN #98632. Calibration was checked (tag).

GAMMA SURVEY (SMI BACKPACK METHOD)

Grid ID#	Reading	Comments
TS 116112	1639	
TS 073079	1795	150 second count (started at 7:00 a.m.)
TS 139146	1623	
TS 156B158C	1568	
TE 974985	1822	(quartz)
TE 864878	1571	(soil sample grid)
TE 797808	1526	(cleanup area)
TE 769779	1510	
TE 730739	1333	
TE 709719	1860	(soil sample grid)
TE 586605	1372	
TE 542560	1506	
TE 446455	2215	(quartz)
TE 383388	1425	(soil sample grid again)
TE 315323	1381	
TE 283290	1383	
TE 247254	1856	(includes a BOM marker, N02N)
TE 196203	1491	
TW 002008	1411	
TE 038044	1484	

North end of solution holding pond has about six small (1-4 ft^2) holes in the liner near the top, and several holes about 30-50 feet from the top (4-10 ft^2), with one hole having significant soil with grass growing (about 30 ft^2).

Water level is down quite a bit from early spring. Using spray evaporation in pond and in north end of balance of impoundment (not on today).

Hauling soil from mine area and placing in center of impoundment and covering small wet area (about 30 acres).

Evidence of clearing and grubbing for diversion channel construction.

Grid ID#	Reading	Comments
TE 110117	1419	
TE 365371A	1433	

Download data (observed)
Performance check (observed)

TW 982004	1899	steep
TS 027033	1762	
TS 049055	1722	
TE 416423	1760	
TE 943956A	1523	road near ditch, quartz
M1 806743*	1504	
C1 702716	1294	cleanup/soil sample
M1 669705	1406	depression
M1 806743*	1393	*repeat, with John carrying
C2 614637	1444	tough terrain
C2 656681	1150	
break		
M1 159180	1919	
M1 183204	1565	
M1 123136	1425	
M1 115125	1487	
M1 192478	1301	
C1 481502	1362	

FINAL VERIFICATION SURVEY
7/24/95

Instrument #110644, Probe #44-40. Start with top of tailings impoundment (~~25~~ 2.5 minute count).

RID	READING (uR)
TW	
039-049	1491
109-131	1380
145-168	1372
228-245	1411
299-312	1300
407-416	1485
391-401	1420
361-372	1454
438-447	2140
469-478	2267
508-519	2319
534-557	1464
574-599	1436
614-639	1449
701-717	1474
765-777	1434
817-829	1345
849-860	1338
·1	
·02-325	1230
275-298	1231
210-235	1313
19-28	1317
41-50	1348
260-283	1538
M-1	
296-333	1821
327-365	1358
441-482	1469
448-489	3050
532-573	1470
642-678	1402
894-920	1348
780-813	1343
809-841	1578
963-986	1447
M-2	
033-052	1069
·5-037	1116
·5-068	1220
067-078	1207
065-076	1174
949-973	1415

GRID	READING (uR)
C-2	
725-752	1357
086-912	1370
C-3	
364-386	1506
176-222	1258

7/25/95
Ludlum #2350
Probe #44-10
Inst. #98632

GRID	READING (uR)
C-1	
401-424	1430
418-440	2161
525-544	1746
549-567	1374
563-580	1285
C-3	
499-514	1426
395-418	1350
C-2	
746-772	1561
893-930	1725
C-3	
182-224	1322
053-107	1450
C-2	
736-763	1373
755-782	1124

GRID	READING (uR)

SHERWOOD MILLSITE
SOIL VERIFICATION SURVEYS

7/25/95
(second day of inspection)

Witnessed calibration (with Doug Wells).

Doug, John checked in with Corn and Brad of WNI. Discussed status (good).

SMI: Larry Fiske, Jim, Nicole, Rosaline
Help: Francis

Doug to finish backpack counts with Larry Fiske. Jamil to come later (~10:00) and finish last two soil samples with Nicole or Rosaline. John to take bucket count gamma samples (5 each).

BUCKET SAMPLE LOCATIONS

Grid ID#	Comments
C1 218241	Why is this a bucket method? (level, easy to auger)
C2 614637	Steep, irregular
TE 284291	Down from diversion road, previous gamma (7/24)
TE 542560	Hilly (previous gamma (7/24)). Uphill is large cleanup area (east)
C3 580597	Claricone spill drainage cleanup on SW hill at top of cleanup

Observed mixing and splitting of five bucket samples.

Doug finished gamma backpack surveys. Jamil finished one soil sample. He needs a second sample and then splitting, bagging, etc. Nicole has eight archived samples for WDOH that were previously sampled, split, and prepared by SMI (archived samples). These eight samples are to go to the WDOH lab for our analysis (Doug concurred).

Bucket Sample Counting

Ludlum Model 2350 Data Logger
In Calibration Serial #98631
Probe #44-10 Serial #100842

Witnessed calibration this a.m. 120 second count.

BUCKET SAMPLE READINGS

Grid ID#	Reading	Comments (Data from SMI)
C3 580597	1274	1587
C2 614637	1297	1467
TE 542560	1449	1202
C1 218241	1220	1311
TE 284291	1278	1253

Counting is with lead cylinder ~8" diameter by 4" long around end of probe. Probe siting on top of bucket sample, in bucket. Located at lower background area.

Bckgrd count only (no bucket/ no soil)	1112

To: Leo Wainhouse, Dorothy Stoffel

From: Doug Wells

Regarding: WNI Survey Instruments

In response to Dorothy's FAX, there are a number of issues that we should watch carefully. In general, we want to make sure that sufficient care is taken so that the correlation from last years' study holds up. For example, does the use of five detectors in addition to the two used for the correlation study adversely affect the quality of the correlation? One aspect of this is the instrument-specific "trigger level" that tells WNI that a grid is dirty. I believe that the trigger-level for each instrument is calculated by multiplying the trigger-level of one of the correlation study instruments by the ratio of the calibration-average of the instrument in question to the calibration-average of the correlation study instrument:

Trigger Level = (Trigger Level[corr. study]) x (calibration/calibration[corr. study]).

Is the above ratio of calibration factors the "correction factor" in the upper left corner of the control charts? Perhaps Dorothy can confirm this or clarify this with Larry Fiske?

In addition, to keep on top of this survey we want:

1) to keep track of the month-by-month averages and confidence limits (upper (UCL) and lower (LCL)) and track their changes. It is particularly important to know that the averages, LCL's and any individual daily calibration measurements do not significantly decrease. If they were to decrease for a particular instrument, then that instrument would be counting at a lower rate and might fail to reach the "trigger level" on a grid that it should find "dirty". To help us keep track of this we should record:

a) Monthly averages and UCL's, LCL's for all instruments.

b) Complete monthly charts (in graphical form) for each instrument with dates and instrument identification numbers on the charts.

2) to make sure that all of the survey instruments are being used consistently to verify compliance. Since the correlation study only

used two of these instruments, it is important to compare:

a) Monthly averages and UCL's, LCL's with the averages and Cl's of the two "correlation study" instruments.

b) The current monthly averages and Cl's to results from previous months. Ideally, they would start each month's control chart with the previous month's average and Cl's.

FILE COPY

W.D.6

March 21, 1995

TO: Leo Wainhouse

FROM: Bob Clark

SUBJECT: Western Nuclear Trip Report, March 20, 1995

==========

On March 20, 1995, Dorothy and I were at the Sherwood site to observe training for the new employees that will be doing the soil verification survey. The radiological portion of the training was in the morning and was conducted by Brad. We arrived for the afternoon portion which was specific to their task and was conducted by Sheppard Miller personnel. There were seven new employees in attendance, three did not show. The verification survey training consisted of three operations; gamma survey, soil collection and soil splitting.

We discussed with Brad the radiological requirements that will implemented during the verification survey. He indicated that a specific RWP will be assigned for this project that each worker will be issued a TLD badge and monthly urinalysis will be performed. Occasional lapel air sampling will be performed at Brad's discretion. Brad will continually audit and observe the operation and implement additional requirements as necessary.

The gamma survey training was conducted in the maintenance building on a concrete slab. A simulated grid was marked out on the floor. The instructor described the equipment and demonstrated the use. The equipment consisted of a metal framed backpack setup with lead donuts to shield the detector located at the base of the backpack. The survey meter was a Ludlum model 2350 data logger with a Ludlum model 44-10 NaI detector that fits inside the lead donuts. Each employee was given the opportunity to practice by walking the serpentine pattern at least one time. They were instructed how to start the data logger and the speed at which they need to walk in order to complete the pattern within the 150 second count time. I did not observe instructions to operators describing how to enter grid locations or counting time as described in SOP-RS50-3.

Soil collection training was conducted in a grid where the guard shack used to be located. The employees were instructed that depending on the type of soil, either 9, 12 or 15 samples will be taken within each predetermined grid. They will be given instructions by a Sheppard Miller representative as to what grids to sample and how many samples will be taken in each grid.

The instructor demonstrated the use of the auger tool that will be used to collect each sample. He indicated that there are two types of augers, one for course soil and one for fine soil and that each auger is set for the depth of the soil to be collected. They are to collect the sample and place the soil from each sample within the grid in a five gallon bucket that will be marked with the grid number and leave the bucket inside the grid. They were also instructed that they are to brush off excess dirt from the auger before starting on the next sample.

The last part of the training was the soil mixing and splitting operation. They have a trailer setup with two separate work stations. In each work station is the soil splitting tool, 3/4 sieves and appropriate shovels, buckets, bags and marking pens. Outside of each station is an electric cement mixer that will be used to mix the sample prior to splitting. This part of the training was described to the trainees. They did not get a chance to operate the equipment. The end product will be two bags of soil, one for the lab and one to be archived just in case a second sample is needed by the lab. The remaining soil residue and debris will be disposed of in the tailings impoundment. Brad emphasized that this area is to be kept clean and that he will be taking air samples to determine the appropriate personnel protection. We also discussed with Larry about how we would obtain a split sample with them. This should be a topic in the upcoming meeting. Should we split some with them and collect some of our own?

Throughout the training, it was emphasized that someone from Sheppard Miller will be assisting during each operation of the verification survey. Additional training should consist of on the job training with a trained individual observing. I was expecting to see more detail relating to the operation of the data logger and procedural requirements. This may come as the employees become more familiar with the equipment and working environment. It also rained most of the day which could have limited the hands on part of the training.

The following employees were at the training.

Loren Kieffer	Craig Flett	Dale Sebasian
Mark Makison	Jason Wyneloop	Francis Wyneloop
Mark Sebasian		

Let us know if you have any question.

MEMORANDUM

FILE COPY
W.D.6

April 14, 1995

'O: WNI File

FROM: Dorothy B. Stoffel

SUBJECT: WNI Trip Report for Radiological Verification - April 13, 1995

I went to WNI on the morning of April 13, 1995 as an inspection of Radiological Verification activities at the site. It was raining, as it had been for the two previous days. The sampling crew was not on site because of the rain. Shepherd Miller, Inc personnel were preparing maps to take with them to Colorado to have copied.

I met with Larry Fisk of Shepherd Miller, Inc. I obtained copies of the Control Charts for all of the gauges. Larry explained that each gauge has a specific "correction/normalization factor". The factor utilized for each instrument is labeled on the upper left corner of each Control Chart.

Leo Wainhouse had requested copies of the gamma survey results for grids that have been determined to be "clean". Larry suggested that Leo might speak with Stephanie Baker about obtaining the results.

I met with Corn Abeyta previous to meeting with Larry Fisk in order to be updated on the construction activities taking place at the site. Work is continuing on soil cleanup and surface preparation of the tailings impoundment. We also discussed the schedule for monitoring well abandonment and casing extension of monitoring well MW-4.

I faxed copies of the Control Charts to Doug Wells and Leo Wainhouse upon returning to the office on the afternoon of April 13, 1995. I queried whether the charts indicated that the error bars were expanding on some of the gauges and whether dates should be on the charts as requested during the site visit on March 28, 1995.

W.U.6

TRIP REPORT

Western Nuclear, Inc. Sherwood Project
September 13, 1995 LEO W.

I met with Corn Abeyta and Brad DeWaard a the site. We discussed several items including: the status of the soil varification program. During mid September they moved the SMI office trailers and removed approximatly 6' of soil in the area of the trailers and a portion of the mill area. This was because some of the sample results in that area were reported back over limit. They have since re-staked the entire area and re-sampled some areas. In addition some telephone poles must be relocated.

They are regrading a portion of the tailings to take some parts down and build up other areas. This is in preparation for the subgrade of clean material they will place after the tailings are regraded. They are also spreading slime material out over dry hard tailings in an effort to dry out the slimes areas.

We took a site tour of the mill area and around the tailings impoundment. The removal of more soils in the mill area will mean a four month wait for soil results. DOH will possibly have to re-sample in some areas and re-survey. The evaporation systm was down at the time of my visit. There remains approximatly 6' of water in the solution retension pond. They are hauling clean material from the area where the stock piled sandy clay is located. This will be the clean sub grade material which will go over the tailings.

DEPARTMENT OF HEALTH
Environmental Health Programs
Division of Radiation Protection

October 16, 1996

TO: Gary Robertson

FROM: Leo Wainhouse LEW

SUBJECT: CONFIRMATORY GAMMA SURVEYS AT WESTERN NUCLEAR, INC.

On July 10, 1996, I met with Brad DeWaard of Western Nuclear (WNI) and Larry Fisk of Shepherd/Miller, Inc., consultant for WNI. The purpose of our meeting was for me to observe the surveying of approximately 40 grids (it turned out to be 39 by the end of the day) in the millsite areas where the gamma/radium correlation exists.

See Attachment 1 for identification numbers of the grids. The grids were selected first on the basis of their potential to be contaminated and second to cover the entire millsite. The survey technique used was the "Integrated Method" described in WNI's Radiological Verification Program. Attachment 2 shows the calibration of the two instruments used and the three performance checks throughout the day. Attachment 1 shows the gamma count obtained during my survey and the allowable gamma count as calculated in the Radiological Verification Program. As can be seen from Attachment 1, all the grids surveyed are below the allowable limits.

On the basis of this confirmatory survey, I am recommending unconditional release of the millsite upon satisfactory review of the radiological Soil Verification Program As-Built report. The As-Built report is due to WDOH by the end of July, 1996.

LEW

Attachment 1

SURVEY RESULTS AT WNI
JULY 10, 1996

GRID #	INST. #	WNI GAMMA #	WDOH CONFIRM. GAMMA #	ALLOWABLE GAMMA #
C1 026035 F	25	1682	1719	2110
C1 235258 F	25	1468	1377	2110
C1 508528 S	35	1686	1387	2110
C2 619642 S	25	1360	1337	2110
C2 649673 S	25	1316	1316	2110
C2 679705 F	35	1065	1402	2110
C2 920960 F	35	1659	1691	2110
C2 993033 F	25	1738	1690	2110
C2 999039 F	35	1455	1459	2110
C3 138182 S	25	1552	1753	2110
C3 190232 S	35	1322	1286	2110
C3 220262 F	35	1397	1365	2110
C3 268297 F	25	1256	1435	2110
C3 257288 F	25	1765	1628	2110
C3 417435 F	25	1395	1536	2110
C3 542557 F	25	1360	1552	2110
C3 549566 F	35	1325	1429	2110
C3 573590 F	35	1378	1473	2110
M1 200221 Q	35	2041	2086	2680
M1 205226 S	25	1526	1623	2110
M1 389429 S	25	1472	1615	2110
M1 453494 F	25	1712	1944	2110
M1 593631 F	35	1424	1483	2110
M1 611648 F	35	1541	1547	2110
M1 898924 F	25	1622	1482	2110
M1 776809 Q	35	1692	1720	2680

Att. 1 (continued)

GRID #	INST. #	WNI GAMMA #	WDOH CONFIRM. GAMMA #	ALLOWABLE GAMMA #
M1 894920 F	35	1537	1464	2110
M1 913630 F	25	1571	1608	2110
M1 982699 F	35	1598	1531	2110
M1 997020 F	35	1272	1367	2110
M2 056069 F	35	1595	1235	2110
T1 007022 F	35	1661	1842	2110
T1 193216 F	25	1409	1448	2110
T1 361380 F	25	1179	1364	2110
T1 403426 F	25	1073	1268	2110
T1 583602 F	25	961	1409	2110
T2 003024 F	35	1311	1445	2110
TS 066072 S	35	1698	1573	2110
TW 547571 F	35	1439	1420	2110

90

Truck Shop

7 10 96 CS 942501234

120625/614 LF

W33, T 204, BATT, 5.5, F90, D15

586 H588 H590 H592 H594

1851 14073 15511 ~~15564~~ 15569 15297

WOFF; T184; H592; BAT 5.5; D14; F60

= 21685

WOFF, T184, H592, 5.3, D14, 1506

= 21466

WOFF, T184, H592, BATT 5.3, D14, 1741

= 21484 fomito

7.10.96 CS 942501234

120635/507 LF

W33, T204, BATT 5.9, F90, D15

H546 H548 H550 H552 H554

12568 14493 15016 15276 15031

WOFF, T184, H552, BATT 5.8, D14, F60

C, 22147

WOFF; T184; H552; BAT 5.6; D14; F60; 1511

C = 21714

WOFF, T184, H552 BATT 5.5, D14, F60, 1738

C = 22180

WASHINGTON STATE DEPARTMENT OF HEALTH
1500 W. 4th Ave. Suite 305
Spokane WA 99204

TRANSMITTAL COVER SHEET

PHONE: (509) 456-3115 or SCAN: 545-3115
FAX: (509) 456-2997 OR SCAN 545-2997

DATE: ~~April 13~~ 14, 1995 **Number of Pages:** Cover + 5

To: [redacted] Leo Weinhouse

From: DB Stoffel **Telephone:**

Subject/Remarks: Here are copies of Control Charts that I picked up at WNI today.

1. * The number in upper left corner is the correction/normalizing factor Larry uses — call for him to explain.

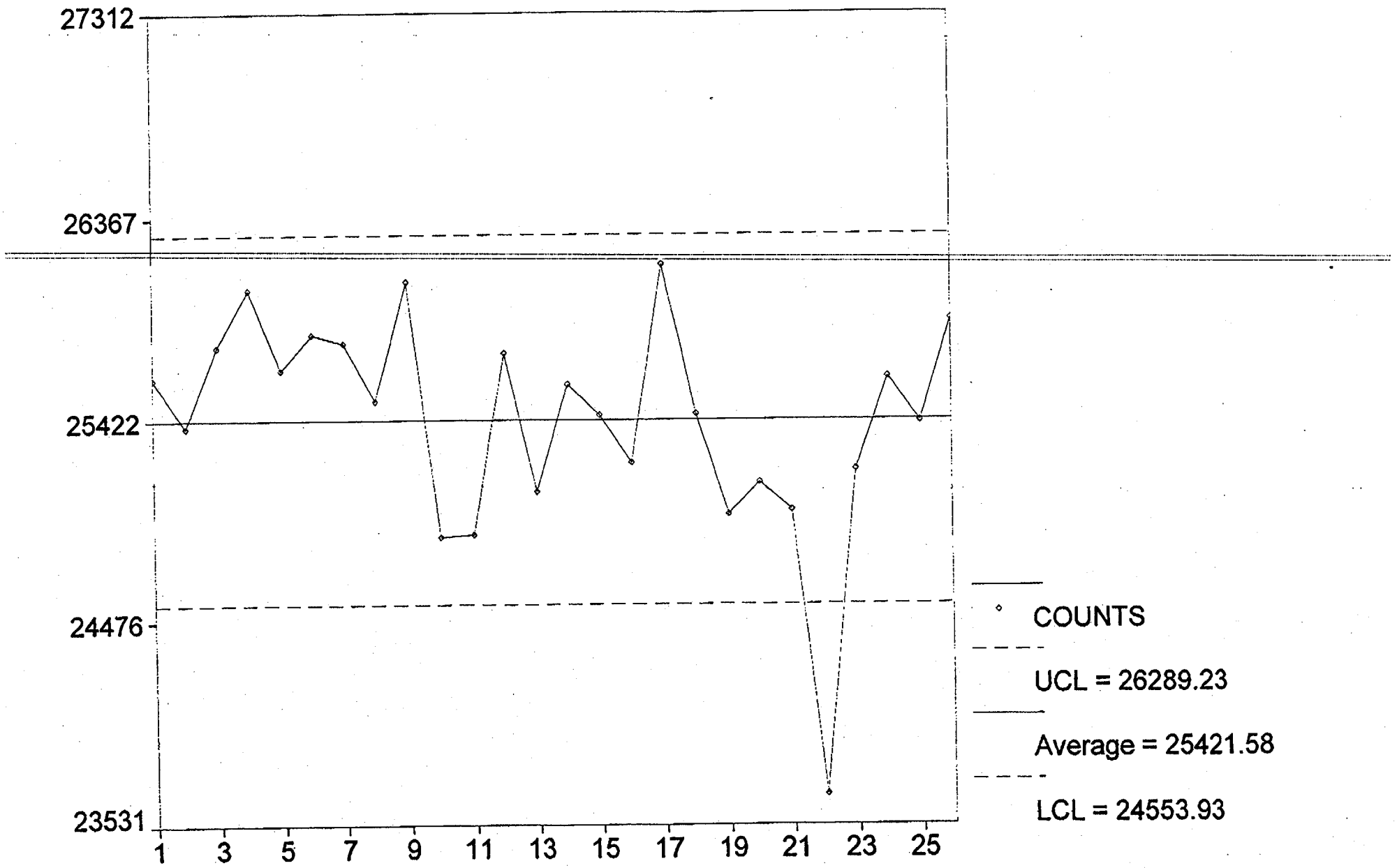
2. * Note — there are no dates on charts as requested by you on 3/28.

3. * To my untrained eye — the error bars do appear to be expanding associated with several gauges. Is that so?

Trip Report to follow.

x 1.0

Control Chart: 98631/842

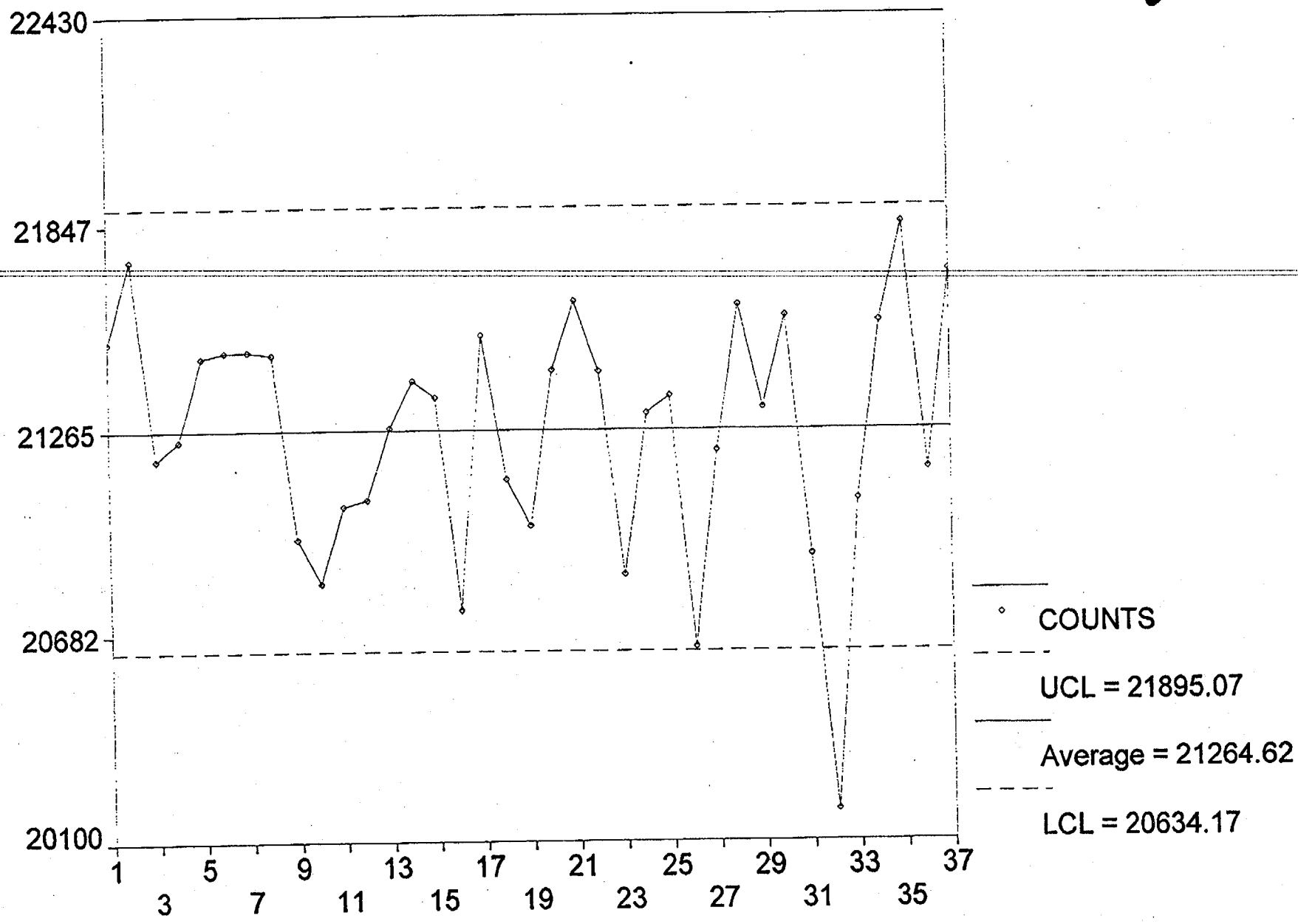


Sigma level: 2

1.091

I

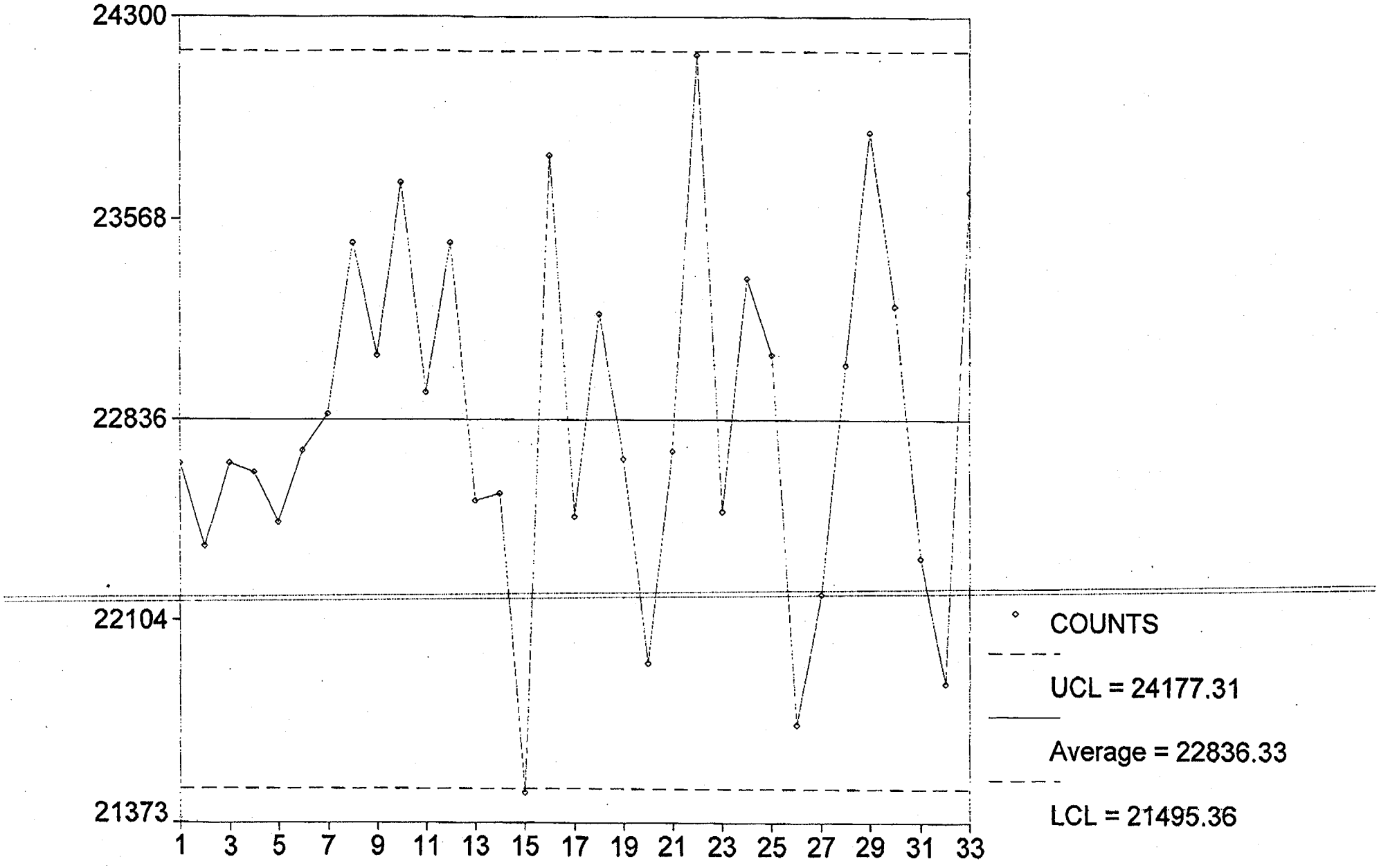
Control Chart: 98616/508



Sigma level: 2

I

Control Chart: 98632/509

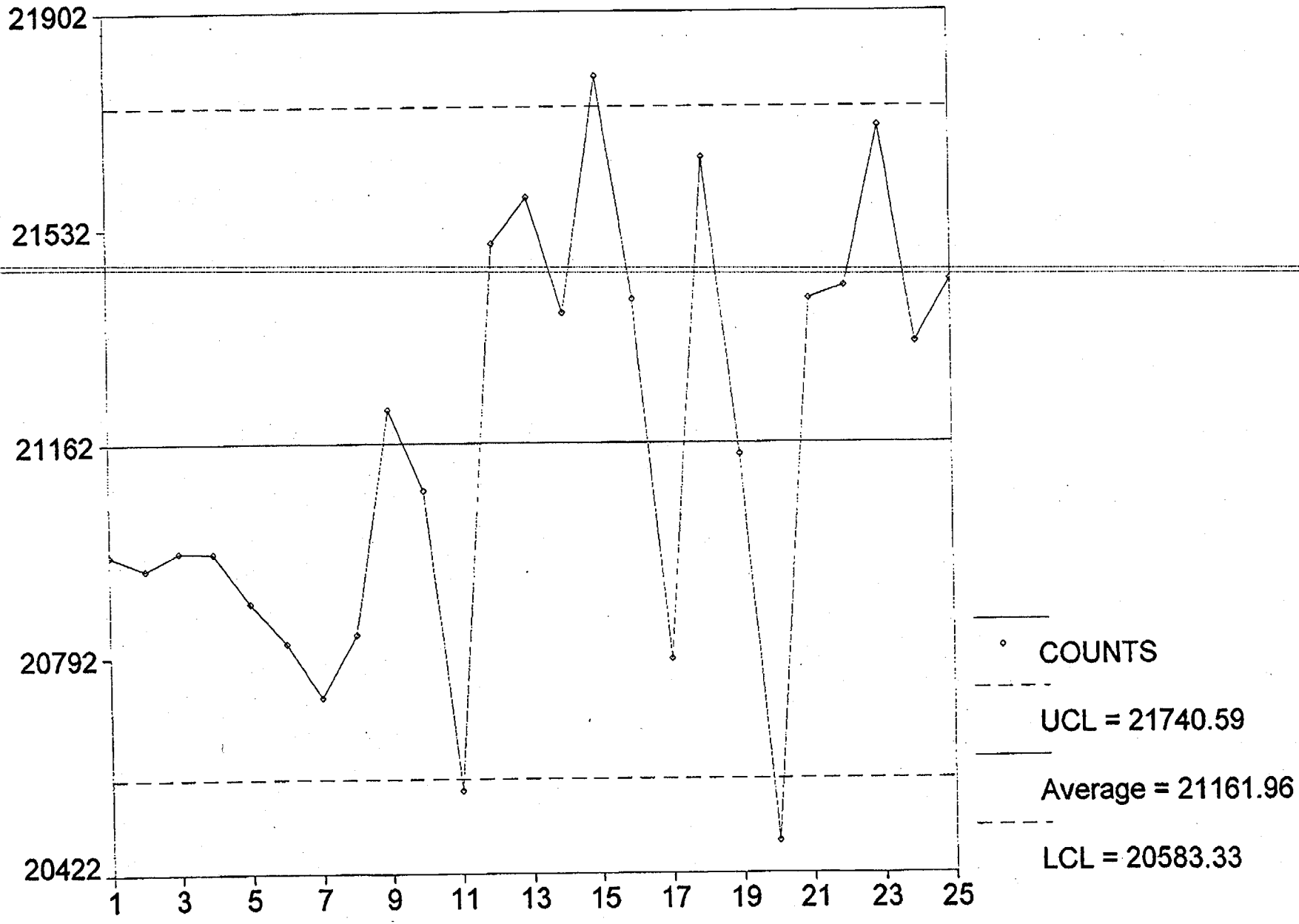


Sigma level: 2

x 1.13

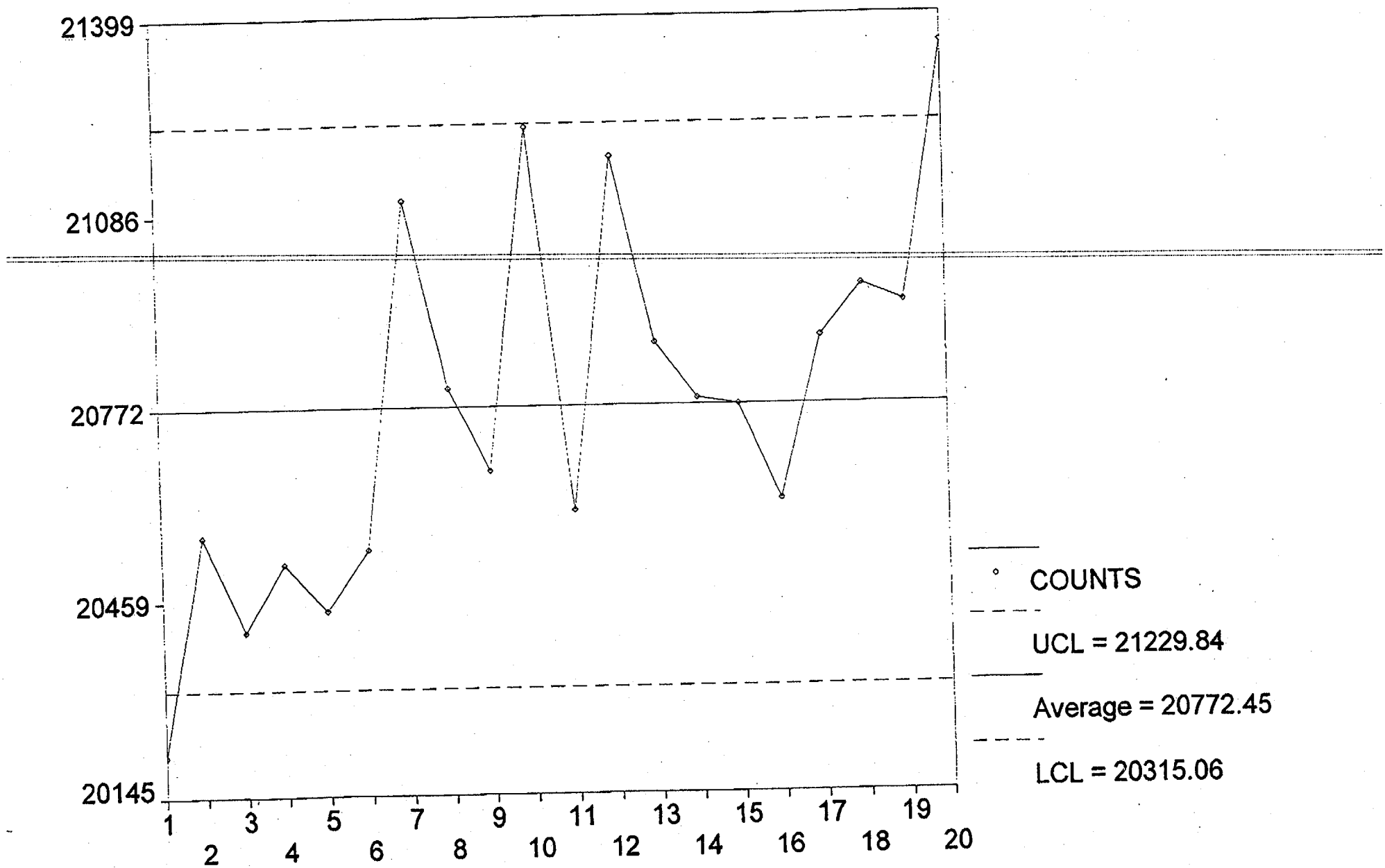
I

Control Chart: 110644/036



Sigma level: 2

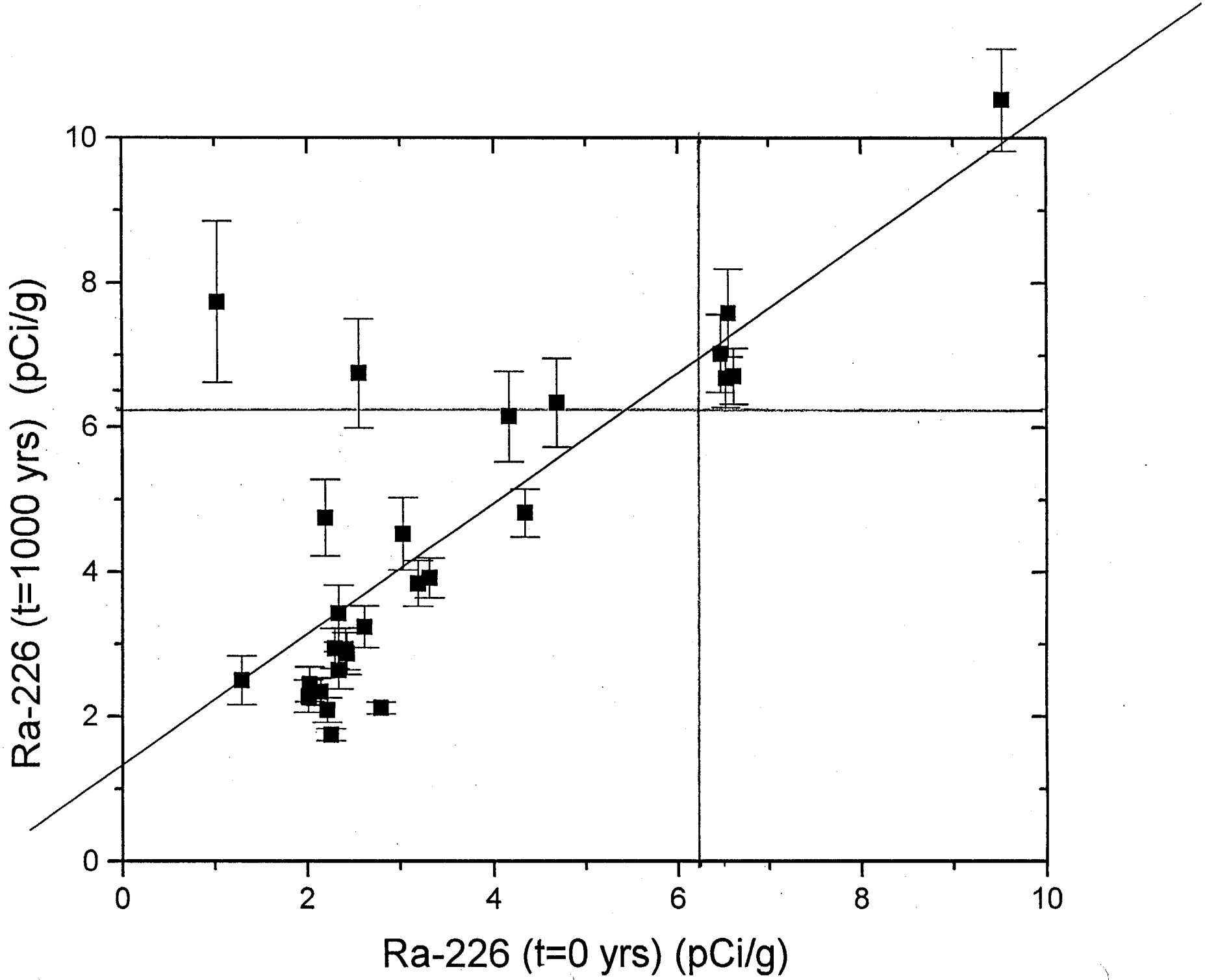
Control Chart: 120635/033

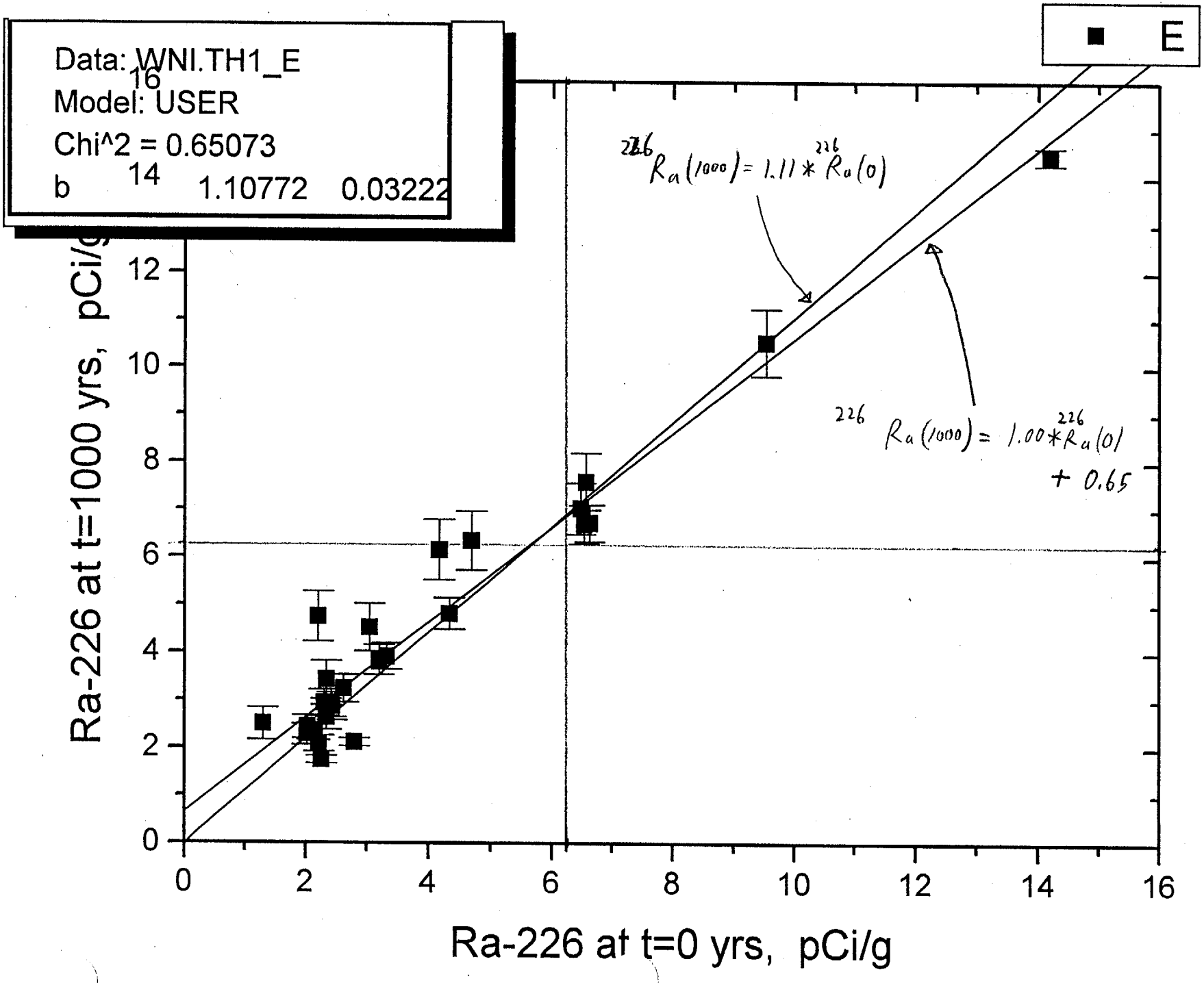


Sigma level: 2

To: *WNI GROUP @ EHP1.WA-DOH
Cc: "Wells, Doug"
From: Wainhouse, Leo
Subject: WNI/SMI RaTh correlation
Date: 3/08/95 Time: 7:08a

On Monday 3/6/95 Doug and I had a conversation with Lou Miller & Stephanie regarding their proposed use of a Ra/Th correlation in their soil verification plan. In a nutshell, Doug discovered the correlation doesn't work as good as they would like to claim. We told them at the end of the conversation they will either have to lower their Ra limit or increase the area where they will take direct soil samples. I haven't heard back from them yet but they are still planning to start the sampling/suveying on 3/23.


Ra-226 (t=1000 yrs) (pCi/g)
Ra-226 (t=0 yrs) (pCi/g)
0
2
4
6
8
10


Data: WNI.TH1_E
Model: USER
Chi^2 = 0.65073
b 1.10772 0.03222
E
226 Ra(1000) = 1.11 * 226 Ra(0)
226 Ra(1000) = 1.00 * 226 Ra(0) + 0.65
Ra-226 at t=1000 yrs, pCi/g
Ra-226 at t=0 yrs, pCi/g
0
2
4
6
8
10
12
14
16

SMI

Shepherd Miller, Inc.

Consulting Environmental
& Geotechnical Engineers & Scientists

TELEFAX MESSAGE

DATE: 3/6/95 SMI # 317

TO: Leo Waishouse / Doug Wells

FROM: Lou MILLER

FAX NO: 360 753 1496

SUBJECT:

OF PAGES INCLUDING THIS COVER SHEET: 3

Doug/Leo -

Attached are Plots of Ra-226 vs Th-230 for the grids in areas where we are Proposing Y with soil samples @ 20% or 5%. We did not plot values with radium contents greater than cleanup std.

I will call you -

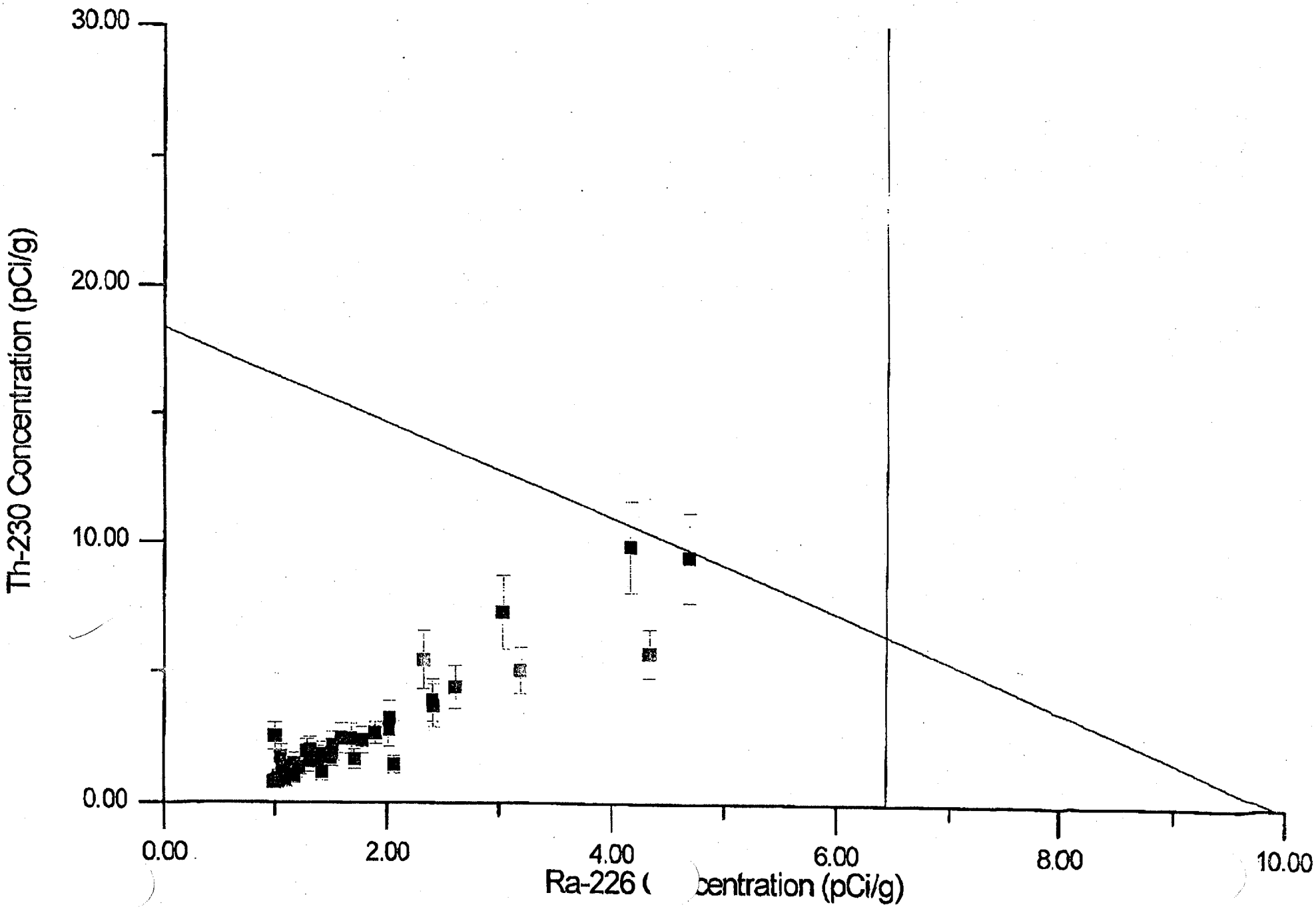
Thanks Lou.

If this copy is illegible or incomplete, or if there are other problems, please call 484-4414

1600 Specht Point Drive, Suite F, Fort Collins, CO 80525 • Tel:(303)484-4414 • Fax:(303) 484-7540

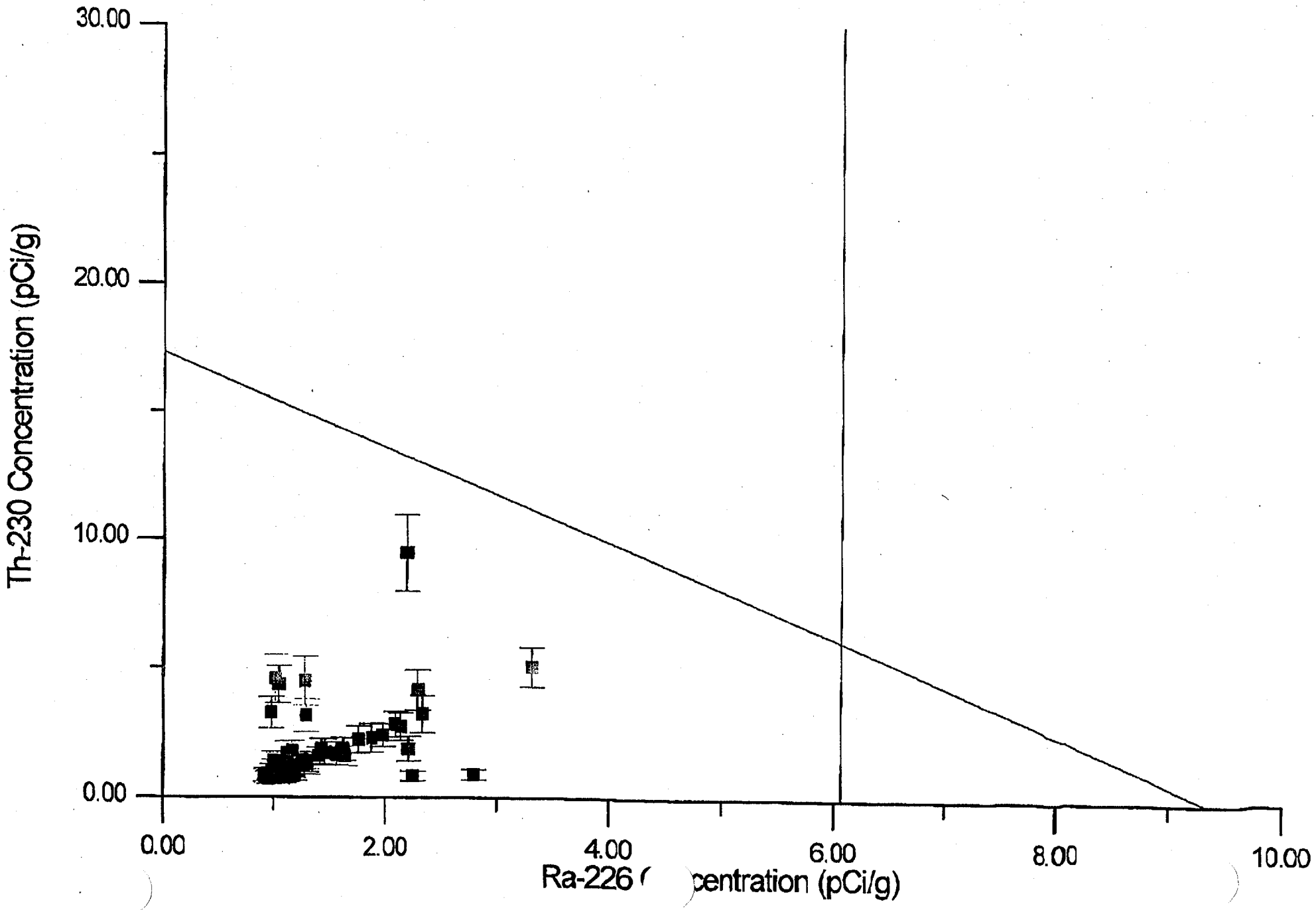
Quartz-Monzonite

44 Points Plotted



Sand/Float

70 Points Plotted



W.D.11.a

April 14, 1995

TO: Marina Silverstone

FROM: Bob Clark

SUBJECT: WNI Soil Sample Packing List

The following soil samples were collected from the Sherwood Millsite and are packaged in three boxes. Please analyze as per instructions from John Erickson and Leo Wainhouse.

M1-342380S	C3-479495F	M1-690725S
M1-459500S	C3-537552F	M1-759793S
M1-501543S	C3-540555F	M1-794827S
M1-382422S	C3-582599F	M1-623660S
M1-310347S	C3-619636F	M1-858885F
M1-504546S	C3-647661F	M1-797830F
M1-348386S	PES-8113	M1-697732F
M1-388428S		
M1-549590S		
M1-552593S		

If you have any question please contact me or Leo Wainhouse.

Bob Clark
(509)544-8102

Leo Wainhouse
(360)586-7848

WNI SOIL CLEAN UP

The Assistant Secretary finds that good cause exists for not publishing the supplement to the Puerto Rico State Plan as a proposed change and making the Regional Administrator's approval effective upon publication for the following reasons:

1. The standards are identical to the Federal standards which were promulgated in accordance with Federal law meeting requirements for public participation.

2. The standards were adopted in accordance with the procedural requirement of State Law and further participation would be unnecessary.

The decision is effective October 23, 1981.

(Sec. 18 Pub.-L. 91-596, 84 Stat. 1608 (29 U.S.C. 667))

Signed at New York City, New York, this 15th day of June 1981.

Roger A. Clark,

Regional Administrator.

[FR Doc. 81-30745 Filed 10-22-81; 8:45 am]

BILLING CODE 4510-26-M

NUCLEAR REGULATORY COMMISSION

Advisory Committee on Reactor Safeguards, Subcommittee on Callaway Plant; Location Change

The ACRS Subcommittee on Callaway Plant will hold a meeting on November 4 and 5, 1981, at the HOLIDAY INN-WEST, 1900 I-70 Drive Southwest, Columbia, MO instead of the Hilton Inn.

Notice of this meeting was published in the Federal Register on October 19, 1981 (46 FR 51329), and all other items remain the same except for the location change as indicated above.

Dated: October 19, 1981.

John C. Hoyle,

Advisory Committee, Management Officer.

[FR Doc. 81-30733 Filed 10-22-81; 8:45 am]

BILLING CODE 7590-01-M

Disposal or Onsite Storage of Thorium or Uranium Wastes From Past Operations

AGENCY: Nuclear Regulatory Commission (NRC).

ACTION: Discussion of options for NRC approval of applications for disposal or onsite storage of thorium or uranium wastes; interim use and public comment.

SUMMARY: This notice discusses five options for NRC approval of disposal or onsite storage of thorium or uranium wastes from past nuclear operations. The options are contained in a Branch Technical Position for administration by the Uranium Fuel Licensing Branch, Division of Fuel Cycle and Material Safety, Office of Nuclear Material Safety and Safeguards.

DATES: Comments on the options for disposal or onsite storage of thorium or uranium are encouraged. Such comments will be considered in any subsequent revision of the Branch Technical Position. Comments are due December 22, 1981.

Note.—Comments received after the expiration date will be considered if it is practical to do so, but assurance of consideration cannot be given except as to comments filed on or before that date.

FOR FURTHER INFORMATION CONTACT: Ralph G. Page, Chief, Uranium Fuel Licensing Branch, Division of Fuel Cycle and Material Safety, Office of Nuclear Material Safety and Safeguards, Washington, D.C. 20555, telephone 301-427-4309.

SUPPLEMENTARY INFORMATION:

I. Introduction

Some of the sites formerly used for processing thorium and uranium are known today to be contaminated with residual radioactive materials. Some are currently covered by NRC licenses. Others were once licensed, but the licenses to possess and use material have expired. In many cases, the total amount of contaminated soil is large, but the activity concentrations of radioactive materials are believed sufficiently low to justify their disposal on privately owned lands or storage onsite rather than their transport to a licensed radioactive materials disposal (commercial) site. In many instances packaging and transporting these wastes to a licensed disposal site would be too costly and not justified from the standpoints of risk to the public health or cost-benefit. Furthermore, because of the total volume of these wastes, limited commercial waste disposal capacity, and restrictions placed on receipt of long-lived wastes at commercial sites, it is not presently feasible to dispose of these wastes at commercial low-level waste disposal sites.

Effective January 28, 1981, NRC regulations in 10 CFR 20, "Standards for Protection Against Radiation", were amended (45 FR 71761-71762) to delete § 20.304 which provided general authority for disposal of radioactive materials by burial in soil. Under the amended regulations, licensees must apply for and obtain specific NRC approval to dispose of radioactive materials in this manner under the provisions of 10 CFR 20.302. A case-by-case review was believed needed to assure that burial of radioactive wastes would not present an unreasonable health hazard at some future date.

The deleted provisions of § 20.304 previously permitted burial of up to 100 millicuries of thorium or natural uranium at any one time, with a yearly limitation of 12 burials for each type of material at each site. The only disposal standards specified were (1) burial at a minimum depth of four feet, and (2) successive burials separated by at least six feet. Thus a total of 1.2 curies of these materials were permitted to be disposed of each year by burial in a 12 foot by 18 foot or larger plot of ground.

Under the amended regulations, it is incumbent on an applicant who wants to bury radioactive wastes to demonstrate that local land burial is preferable to other disposal alternatives. The evaluation of the application takes into account the following information:

- Types and quantities of material to be buried
- Packaging of waste
- Burial location
- Characteristics of burial site
- Depth of burial
- Access restrictions to disposal site
- Radiation safety procedures during disposal operations
- Recordkeeping
- Local burial restrictions, if any

For applications involving disposal of soils contaminated with low level concentrations of thorium and uranium (other than concentrations not exceeding EPA cleanup standards), the matters of principal importance are:

- Concentrations of thorium and uranium (either in secular equilibrium with their daughters or without daughters present)
- Volume of contaminated soil
- Costs for offsite and onsite disposal
- Availability of offsite burial space
- Disposal site characteristics
- Depth of burial and accessibility of buried wastes
- State and local government views

II. Branch Technical Position

There are five acceptable options for disposal or onsite storage of thorium and uranium contaminated wastes. Applications for disposal or storage will be approved if the guidelines discussed under any option are met. Applications for other methods of disposal may be submitted and these will be evaluated on their own merits.

1. Disposal of acceptably low concentrations (which meet EPA cleanup standards) of natural thorium with daughters in secular equilibrium, depleted or enriched uranium, and

uranium ores with daughters in secular equilibrium with no restriction on burial method.

Under this option, the concentrations of natural thorium and depleted or enriched uranium wastes are set sufficiently low that no member of the public is expected to receive a radiation dose commitment from the disposed materials in excess of 1 millirad per year to the lung or 3 millirads per year to the bone from inhalation and ingestion, under any foreseeable use of the material or property. These radiation dose guidelines were recommened by the Environmental Protection Agency (EPA) for protection against transuranium elements present in the environment as a result of unplanned contamination (42 FR 60956–60959). In addition, the concentrations are sufficiently low so that no individual may receive an external dose in excess of 10 microroentgens per hour above background. This is compatible with guidelines EPA proposed as cleanup standards for inactive uranium processing sites (46 FR 2556–2563).

For natural uranium ores having daughters in equilibrium, the concentration limit is equal to that set by the EPA (46 FR 2556–2563) for radium-226 (i.e., 5 pCi/gm, including background) and its decay products.

The concentrations specified below are believed appropriate to apply. It is expected, however, that currently licensed operations will be conducted in such a manner as to minimize the possibility of soil contamination and when such occurs the contamination will be reduced to levels as low as reasonably achievable.

Kind of material	Concentration (pCi/gm)
Natural thorium (Th-232 plus Th-228) if all daughters are present and in equilibrium	10
Depleted Uranium	35
Enriched Uranium	30
Natural Uranium Ores (U-238 plus U-234) if all daughters are present and in equilibrium	10

The analysis upon which the Branch Technical Position is based is available for inspection at the Commission's Public Document Room at 1717 H St., N.W., Washington, D.C.

The concentrations specified under this option may be compared with naturally occurring thorium and uranium ore concentrations of 1.3 pCi/gm in igneous rock and uranium concentrations of 120 pCi/gm in Florida phosphate rock and 50–80 pCi/gm in Tennessee bituminous shale. Concentration limits for natural thorium and natural uranium ore wastes containing daughters not at secular equilibrium can be calculated on a case-by-case basis using the applicable isotopic activities data.

2. Disposal of certain low concentrations of natural thorium with daughters in secular equilibrium and depleted or enriched uranium with no daughters present when buried under prescribed conditions with no subsequent land use restrictions and no continuing NRC licensing of the material.

Under this option the concentrations of natural thorium and uranium are set sufficiently low so that no member of the public will receive a radiation dose exceeding those discussed under option 1 when the wastes are buried in an approved manner absent intrusion into the burial grounds. This option will require establishing prescribed conditions for disposal in the license, such as depth and distribution of material, to minimize the likelihood of intrusion. Burial will be permitted only if it can be demonstrated that the buried materials will be stabilized in place and not be transported away from the site.

Acceptability of the site for disposal will depend on topographical, geological, hydrological and meteorological characteristics of the site. At a minimum, burial depth will be at least four feet below the surface. In the event that there is an intrusion into the burial ground, no member of the public will likely receive a dose in excess fo 170 millirems to a critical organ. An average dose not exceeding 170 millirems to the whole body for all members of a general population is recommended by international and national radiation expert bodies to limit population doses. With respect to limiting doses to individual body organs, the concentrations are sufficiently low that no individual will receive a dose in excess of 170 millirems to any organ from exposure to natural thorium, depleted uranium or enriched uranium.

The average activity concentration of radioactive material that may be buried under this option in the case of natural thorium (Th-232 plus Th-228) is 50 pCi/gm, if all daughters are present and in equilibrium; for enriched uranium it is 100 pCi/gm if the uranium is soluble and 250 pCi/gm if insoluble; for depleted uranium it is 100 pCi/gm if the uranium is soluble and 300 pCi/gm if insoluble. Natural uranium ores containing radium 226 and its daughters are not included under this option, because of possible radon 222 emanations and resultant higher than acceptable exposure of individuals in private residences if houses were built over buried materials.

3. Disposal of low concentrations of natural uranium ores, with all daughters in equilibrium, when buried under prescribed conditions in areas zoned for industrial use and the recorded title documents are amended to state that the specified land contains buried radioactive materials and are conditioned in a manner acceptable under state law to impose a covenant running with the land that the specified land may not be used for residential building. (There is no continuing NRC licensing of the material.)

Disposal will be approved if the burial criteria outlined in option 2 (including burial at a minimum of 4 feet) are met. Depending upon local soil characteristics, burials at depths greater than 4 feet may be required. In order to assure protection against radon 222 releases (daughter in decay chain of uranium 238 and uranium 234), it is necessary that the recorded title documents be amended to state in the permanent land records that no residential building should be permitted over specified areas of land where natural uranium ore residues (U-238 plus U-234) in concentrations exceeding 10 pCi/gm has been buried. Industrial building is acceptable so long as the concentration of buried material does not exceed 40 pCi/gm of uranium (i.e., Ra-226 shall not exceed 20 pCi/gm).

4. Disposal of land-use-limited concentrations of natural thorium or natural uranium with daughters in secular equilibrium and depleted or enriched uranium without daughters present when buried under prescribed conditions in areas zoned for industrial use and the recorded title documents are amended to state that the land contains buried radioactive material and are conditioned in a manner acceptable under state law to impose a covenant running with land that the land (1) may not be excavated below stated depths in specified areas of land unless cleared by appropriate health authorities, (2) may not be used for residential or industrial structures over specified areas where radioactive materials in concentrations higher than specified in options 2 and 3 are buried, and (3) may not be used for agricultural purposes in the specified areas. (There is no continuing NRC licensing of the disposal site.)

Under this option, conditions of burial will be such that no member of the public will receive radiation doses in excess of those discussed under option 1 absent intrusion into the burial ground. Criteria for disposal under these conditions is predicated upon the assumption that intentional intrusion is less likely to occur if a warning is given

n land documents of record not to excavate below burial depths in specified areas of land without clearance by health authorities; not to construct residential or industrial building on the site; and not to use specified areas of land for agricultural purposes. Because of this, we believe it appropriate to apply a maximum critical organ exposure limit of 500 millirems per year to thorium and uranium buried under this restriction instead of 170 millirems as used in options 2 and 3. In addition, any exposure to such materials is likely to be more transient than assumed (essentially continual exposure) under those options. These two factors combine to increase the activity concentration limits calculated under option 2 by about 10. Thus, the average concentration that may be buried under this option for thorium (Th-232 plus Th-228) is 500 pCi/gm if all daughters are present and in equilibrium; for enriched uranium it is 1000 pCi/gm if the uranium is soluble and 2500 pCi/gm if insoluble; and for depleted uranium it is 1000 pCi/gm if the uranium is soluble and 3000 pCi/gm if insoluble.

With respect to natural uranium with daughters present and in equilibrium, the concentration that may be buried under this option is 200 pCi/gm of U-238 plus U-234, i.e., 100 pCi/gm Ra-226. This concentration is based on a limited exposure of 2.4 hours per day to limit the radon dose to less than 0.5 working level month (WLM) which is equivalent to continuous exposure to 0.02 working level (WL). Depending upon local soil characteristics, burials at depths greater than 4 feet may be required.

SUMMARY OF MAXIMUM CONCENTRATIONS PERMITTED UNDER DISPOSAL OPTIONS

Kind of Material	Disposal Options			
	1 [1]	2 [2]	3 [3]	4 [4]
Natural Thorium (Th-232+Th-228) with daughters present and in equilibrium	10	50		500
Natural Uranium (U-238+U-234) with daughters present and in equilibrium	10		40	200
Depleted Uranium:				
*Soluble	35	100		1,000
*Insoluble	35	300		3,000
Enriched Uranium:				
*Soluble	30	100		1,000
*Insoluble	30	250		2,500

[1] Based on EPA cleanup standards.
[2] Concentrations based on limiting individual doses to 170 mrem/yr.
[3] Concentration based on limiting equivalent exposure to 0.02 working level or less.
[4] Concentrations based on limiting individual doses to 500 mrem/yr and, in case of natural uranium, limiting exposure to 0.02 working level or less.

4. Storage of licensed concentrations of thorium and uranium onsite pending the availability of an appropriate disposal site.

When concentrations exceed those specified in option 4, long term disposal other than at a licensed disposal site will not normally be a viable option under the provisions of 10 CFR 20.302. In such cases, the thorium and uranium may be permitted to be stored onsite under an NRC license until a suitable method of disposal is found. License conditions will require that radiation doses not exceed those specified in 10 CFR Part 20 and be maintained as low as reasonably achievable.

Before approving an application to dispose of thorium or uranium under options 2, 3, or 4, NRC will solicit the view of appropriate State health officials within the State in which the disposal would be made.

Dated at Silver Spring, Maryland this 19th day of October, 1981.

Richard E. Cunningham,

Director, Division of Fuel Cycle and Material Safety, Office of Nuclear Material Safety and Safeguards.

[FR Doc. 81-30808 Filed 10-22-81; 8:45 am]

BILLING CODE 7590-01-M

OFFICE OF PERSONNEL MANAGEMENT

Postponement of Application Deadline for Fund-Raising Privileges Among Federal Employees by Private Voluntary Organizations

Section 5.43 of the "Manual on Fund-Raising Within the Federal Service for Voluntary Health and Welfare Agencies" sets December 1 of each year as the deadline by which national voluntary agencies must submit applications for participation in the Combined Federal Campaign (CFC) to be conducted in the fall of the following year. This year's deadline is being postponed from December 1, 1981, to February 1, 1982. In June 1981, the U.S. Office of Personnel Management (OPM) announced that the eligibility criteria for participation in the 1982-83 CFC are being reviewed. The deadline date is being postponed to avoid national voluntary agencies having to revise their applications to meet eligibility criteria which may be changed.

Donald J. Devine,

Director.

[FR Doc. 81-30730 Filed 10-22-81; 8:45 am]

BILLING CODE 6325-01-M

OFFICE OF THE UNITED STATES TRADE REPRESENTATIVE

Resolution of Complaint of Price-Undercutting of Subsidized Cheese Imports

On October 1, 1981, the United States Trade Representative received a letter from the Secretary of Agriculture informing him of the Secretary's finding that imported Grade A Swiss type cheese produced in Finland has been offered for sale in the United States at duty-paid wholesale prices which are five cents per pound less than the domestic wholesale market price of similar cheese produced in the United States.

In accordance with Section 702(c)(2) of the Trade Agreements Act of 1979 (the Act) (19 U.S.C. 1202 note), the Office of the United States Trade Representative notified Finland of the price undercutting determination made by the Secretary of Agriculture, requested that corrective action be taken, and asked for appropriate assurances concerning the commitments made in the Arrangement Between the United States and Finland Concerning Cheese.

On October 14, 1981, Finland notified the United States Trade Representative that measures have been taken to ensure that the duty-paid wholesale price of imported Grade A Swiss type cheese produced in Finland will not be less than the domestic wholesale market price of similar cheese produced in the United States. In addition, Finland gave assurance that it will respect the price commitments in the Arrangement. Since the above notification by Finland has occurred within the 15-day period provided in Section 702(c)(3) of the Act, the United States Trade Representative has notified the Secretary of Agriculture of his belief that no further action is required.

William E. Brock,

United States Trade Representative.

[FR Doc. 81-30684 Filed 10-22-81; 8:45 am]

BILLING CODE 3190-01-M

SECURITIES AND EXCHANGE COMMISSION

[Release No. 22236; 70-6650]

Arkansas Power & Light Co.; Propose Issuance and Sale of First Mortgage Bonds

October 19, 1981.

Arkansas Power & Light Company

2/12/96
JRB

Telecon w/ Elaine Brummett ~~Stephanie R.~~ NRC
Leo, Gary, John

Questions:
(1) Background WNI
(2) 30 vs 35
(3) Dealing w/ some daughters

2/12/96
JRB

Elaine Brummett (NRC)
Dennis Sollenberger (NRC)
Gary, Leo, Doug, John B.

Gary - Some areas not in equilibrium
Doug - Same areas have Ra, Th, U all elevated. Background areas are in equilibrium.
Elaine - Some sites (NRC) have Ra, Th, U not in equilibrium.

Dennis - All standards (NRC policy) are above background. (Not necessarily so at EPA).

Doug – What if elevated for Ra, Th, U, and not in equilibrium.

Dennis – First, must meet Ra^{226} std. (5 pCi/gr)

Gary – What about depth, 5/15 pCi/g rule.

Dennis – Option 1 is for Release for un-restricted use. (See Generic EIS for calculation)

Regulations over-ride redundant issues. This covers Ra^{226}; but not Th, & U.

The 35 vs 30 pCi/g standard is not directly applicable for us. What do we use for U_{TOTAL} or $U_{natural}$. "35 is not conservative." $U_{natural}$ must be between 30 & 35. Therefore 30 is conservative and defensible.

If U or Th is below 15 pCi/gr, it would meet the ~~thorium~~ Ra^{226}.

Use final contours of site grading. Could put 6" back on top of areas that are ~~below~~ above 5 pCi/gr and less than 15 pCi/gr

Gary – Can we use a 30 pCi/g U ~~TOTAL~~ limit when Ra^{226} is within limits?

DENNIS – Applying guidance and technical judgement. Write it down and make your judgements. ~~Also~~,

Elaine – Must also include ALARA.

"Consistent w/ NRC policy."

Gary – What about when new reqs come into play in May, 1996.

Gary – In example with Ra^{226} at 3, Th^{230} at 8, U^{238} at 17(?), are we ok? Dennis – yes

---

11:00
2/12/96
JRB

Telecon (AT&T)

(NRC) Elaine Brummett, Dennis Sollenberger
(WDOH) Gary, Leo, Doug, John B
(WNI) Stephanie Baker
(SMI) Lou Miller, Larry Fiske

Gary – WDOH – WNI meets ALARA, very good effort. Have gone to an extra effort, but have a few

exceptions where WNI is "digging to to China". Ra^{226} at 5 pCi/g (or 15 pCi/g w/6" clean cover) will allow U to be w/out daughters. Therefore, U natural limit is 30 pCi/g.

Stephanie — ① U is 30 where Ra w/th ingrowth is w/in standard.
② Ra w/th ingrowth is at 15 if there is a 6" clean cover. "Recontouring to grade, of at least 6" is same as backfill of 6"."
Gary — Does this meet NRC policy?

Elaine — Must clarify 10/95 meeting. It should be 30, not 35. Or, if applying ALARA, 35 is ok. Also, "background" must allow for some variation. (Approximate background).

Larry — Ra — 1.06 to 3.7. Th — 2.7 to 6.7
U_{TOTAL} (including background) — 10 to 16.
(5 grids)

Lou — ~~Mayfield~~ All these cases have U_{TOTAL} high, compared w/ Ra & Th.

DENNIS — If greater the 3x (definitely >5x) its not out of equilibrium.

Current Data is at about 3X

Can just use Ra clean-up standard, without applying U ~~standard~~ from '81.

Dennis — If you have cleaned up Ra and others are at 3X or greater, you should look at it. This case is within that.

Stephanie — 5 guids where U is ≈3X Ra (max 15). No clean up is required. What if Ra = 5, Th = 5 & U_{TOTAL} = 25? OK!

Dennis — Yes! (Not WDOH decision!)

Gary / Dennis / Stephanie — WDOH is yes. Gary will write a letter. WDOH believes ~~it is~~ clean-up has been done appropriately. We will buy off. Down the road I we need NRC concurrence

Elaine — And consistent w/ what she is doing at other sites. (Split Rock).

Stephanie — Would like it in writing. And grandfathered prior to new regulations.

Policy Guideline & Directive
PG8-08, May, 1994.
Scenarios with ---.
Refers to people decommissioning
Interim clean-up.
(Guidance) mention option 1 & 2
from 1981 Technical position.

(Ba/Cl)

Stephanie – Drainage where Th > 15 Ra(low). The subsurface limit of 15 takes thorium to ≈ 47.

Gary – Is this consistent w/NRC.

Elaine – Have done this at DOE sites where ALARA has been well done.

If just one or 2 grids and ALARA is satisfied and you have already dug 15 feet deep. It's probably ok.

Dennis – It's no problem. Lay it out. Demonstration of the standard. (Make the argument). Can request site specific exemption (other word). (Health/Safety argument).

Stephanie – If one is backfilled, regraded, can that justify it. At ALARA, backfilled (15 pCi/g) standard is met.

Lou – May still have 1 or 2 grids. Still reviewing data. May have to continue clean-up.

Elaine – "or another approach".

Gary – Will put together a letter to NRC, stating within policy.

Dennis – Want to talk afterwards.

Gary – Practical and safe approach

Stephanie – Bumping into construction.

SMI/WNI off the line

Dennis — Concern. Hand holding. WDOH sets down the requirements, which is consistent w/NRC. WDOH doesn't need to write a letter.

Gary — We have a fear.

Dennis — It isn't warranted.

Gary — Put together letter. State that it appears to be consistent w/NRC. Applicable standards from Reg / License conditions. (Put in License)

Dennis — Will judge program by compliance to "Applicable standards." Put them in the "license". TER.
WDOH determination. Put it in writing. NRC will not force it. Will be putting it in formal format later.

Gary / Dennis — Write letter to WNI w/cc to NRC. Put a statement in that it is consistent w/NRC, if not ask NRC to correct it.

Elaine — What should be a confirmatory survey? (Split Rock?)

Gary — We will do verification of 40 to 100 grids w/ Gamma. We have already done some soil samples. (Some were final clean-up)

Elaine — Confirming their monitoring, not the clean-up. (Policy).

Gary — We will send a copy of our protocol.

WNI

STATE OF WASHINGTON
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February 14, 1996

Donna Bruce
Bureau of Indian Affairs
Spokane Agency
P.O. Box 389
Wellpinit, Washington 99040

Dear Ms. Bruce:

This is in response to our recent telephone conversation in which we discussed the necessity of a meeting among the Spokane Tribe of Indians, the Bureau of Indian Affairs, the U.S. Department of Energy, the U.S. Nuclear Regulatory Commission, Western Nuclear, Inc. and its consultant, and the Department of Health. The purpose of the meeting is to outline license termination criteria, federal concurrence requirements, arrangements between WNI and NRC for assuring long-term surveillance, DOE involvement, and release of surety.

The department has recently given final approval of the WNI closure plan, and WNI has scheduled construction of the final cap and the diversion channel during the 1996 construction season, plus site regrading and revegetation. Additionally, the department expects to give final approval of all soil cleanup activities. The meeting has been scheduled for 9:00 a.m. on March 21, 1996, at the Spokane Airport Ramada Inn (across from the airport, within easy walking distance). We expect the meeting to be done by 3:00 p.m. The Ramada Inn can be reached by calling 1-800-272-6232, or call the local number (509/838-5211).

If you have any questions, please feel free to contact me at (360) 753-3459.

Sincerely,

Gary Robertson

Gary Robertson, Head
Waste Management Section

GR:krf

STATE OF WASHINGTON
DEPARTMENT OF HEALTH
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February 14, 1996

Larry Goodrow
Executive Director
Spokane Tribe of Indians
P.O. Box 100
Wellpinit, Washington 99040-0100

Dear Mr. Goodrow:

This is in response to our recent telephone conversation in which we discussed the necessity of a meeting among the Spokane Tribe of Indians, the Bureau of Indian Affairs, the U.S. Department of Energy, the U.S. Nuclear Regulatory Commission, Western Nuclear, Inc. and its consultant, and the Department of Health. The purpose of the meeting is to outline license termination criteria, federal concurrence requirements, arrangements between WNI and NRC for assuring long-term surveillance, DOE involvement, and release of surety.

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If you have any questions, please feel free to contact me at (360) 753-3459.

Sincerely,

Gary Robertson

Gary Robertson, Head
Waste Management Section

GR:krf

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February 14, 1996

Lou Miller
Shepherd/Miller, Inc.
1600 Specht Point Drive
Suite F
Fort Collins, Colorado 80525

Dear Mr. Miller:

This is in response to our recent telephone conversation in which we discussed the necessity of a meeting among the Spokane Tribe of Indians, the Bureau of Indian Affairs, the U.S. Department of Energy, the U.S. Nuclear Regulatory Commission, Western Nuclear, Inc. and its consultant, and the Department of Health. The purpose of the meeting is to outline license termination criteria, federal concurrence requirements, arrangements between WNI and NRC for assuring long-term surveillance, DOE involvement, and release of surety.

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Sincerely,

Gary Robertson

Gary Robertson, Head
Waste Management Section

GR:krf

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February 14, 1996

Stephanie J. Baker
Manager, Environmental Services
Western Nuclear, Inc.
200 Union Blvd., Suite 300
Lakewood, Colorado 80228

Dear Ms. Baker:

This is in response to our recent telephone conversation in which we discussed the necessity of a meeting among the Spokane Tribe of Indians, the Bureau of Indian Affairs, the U.S. Department of Energy, the U.S. Nuclear Regulatory Commission, Western Nuclear, Inc. and its consultant, and the Department of Health. The purpose of the meeting is to outline license termination criteria, federal concurrence requirements, arrangements between WNI and NRC for assuring long-term surveillance, DOE involvement, and release of surety.

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Sincerely,

Gary Robertson

Gary Robertson, Head
Waste Management Section

GR:krf

cc: Dennis Sollenberger, NRC

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February 14, 1996

J. Virgona, Project Manager
Grand Junction Project Office
U.S. Department of Energy
P.O. Box 2567
6425 S. Highway 191
Grand Junction, Colorado 81502

Dear Mr. Virgona:

This is in response to our recent telephone conversation in which we discussed the necessity of a meeting among the Spokane Tribe of Indians, the Bureau of Indian Affairs, the U.S. Department of Energy, the U.S. Nuclear Regulatory Commission, Western Nuclear, Inc. and its consultant, and the Department of Health. The purpose of the meeting is to outline license termination criteria, federal concurrence requirements, arrangements between WNI and NRC for assuring long-term surveillance, DOE involvement, and release of surety.

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If you have any questions, please feel free to contact me at (360) 753-3459.

Sincerely,

Gary Robertson

Gary Robertson, Head
Waste Management Section

GR:krf

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February 14, 1996

Dan Gillen
Section Leader
Uranium Recovery Program
U.S. Nuclear Regulatory Commission
Mail Stop T7J9
Washington, DC 20555

Dear Mr. Gillen:

This is in response to our recent telephone conversation in which we discussed the necessity of a meeting among the Spokane Tribe of Indians, the Bureau of Indian Affairs, the U.S. Department of Energy, the U.S. Nuclear Regulatory Commission, Western Nuclear, Inc. and its consultant, and the Department of Health. The purpose of the meeting is to outline license termination criteria, federal concurrence requirements, arrangements between WNI and NRC for assuring long-term surveillance, DOE involvement, and release of surety.

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If you have any questions, please feel free to contact me at (360) 753-3459.

Sincerely,

Gary Robertson

Gary Robertson, Head
Waste Management Section

GR:krf

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February 21, 1996

Elaine Brummett
Uranium Recovery Program
U.S. Nuclear Regulatory Commission
Mail Stop T7J9
Washington, DC 20555

Dear Ms. Brummett:

This is in response to my telephone conversation with you and Dennis Sollenberger on February 12, 1996, regarding maximum soil cleanup concentrations at uranium mills. Stephanie Baker had specific questions concerning uranium soil cleanup standards and the circumstances under which the radium cleanup limit of 5 pCi/g and 15 pCi/g above the background level applies. I have enclosed my response to Stephanie, in which we addressed this issue. The department intends to amend WNI's radioactive materials license by March 8, using the soil cleanup concentration protocol outlined in the table and explanation found on Page Two of the enclosed letter. Please let me know if they do not accurately reflect NRC policy.

If you have any questions, please feel free to contact me at (360) 753-3459.

Sincerely,

Gary Robertson

Gary Robertson, Head
Waste Management Section

GR:krf

Enclosure

cc: Dennis Sollenberger

WNI W.D.82 1996

FILE COPY

STATE OF WASHINGTON
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Airdustrial Center, Bldg. 5 • P.O. Box 47827 • Olympia, Washington 98504-7827

December 13, 1996

Stephanie J. Baker
Manager, Environmental Services
Western Nuclear, Inc.
200 Union Blvd., Suite 300
Lakewood, Colorado 80228

Dear Ms. Baker:

The Department of Health has completed its review of revisions #1 through #4 to the Western Nuclear, Inc., Sherwood Reclamation Project Plans and Specifications as submitted and contained in final form (replacement pages) in your submittal dated November 11, 1996. In addition, the Department of Ecology, Dam Safety Section has been provided copies of your submittals and has notified DOH that the plans as submitted are acceptable.

Based on the plan review and staff inspection during the active phase of site construction, DOH approves the revised plans and specifications. Final department approval of the completion of the Tailings Reclamation Plan for the Sherwood site will be based on the submission of an as-built report by April, 1997, and subsequent review and approval by the department. The Department of Ecology, Dam Safety Section will also review your as-built submittal.

Sincerely,

John R. Blacklaw

John R. Blacklaw, P.E.
Environmental Engineer

cc: Jerald LaVasser, P.E., WDOE
Bruce Barker, P.E., WDOE
Bruce Wynne, Spokane Tribe of Indians
Mary Verner, Spokane Tribe of Indians
Alfred Peone, BIA
Stanley Speaks, BIA
Corn Abeyta, WNI
Moe Pasha, WNI
Lou Miller, P.E., SMI

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February 21, 1996

Stephanie J. Baker
Manager, Environmental Services
Western Nuclear, Inc.
200 Union Blvd., Suite 300
Lakewood, Colorado 80228

Dear Ms. Baker:

This letter is in response to questions you raised during our February 7, 1996 meeting, regarding soil cleanup standards applicable at the Sherwood site. Your questions specifically addressed the state policy on the uranium soil cleanup standard and the circumstances under which the radium cleanup limit of 5 pCi/g and 15 pCi/g above the background level applies.

The regulatory requirement for soil cleanup at uranium mill sites is found in WAC 246-252, Appendix A, Criterion 6. The department's policy allows the subsurface limit for radium of 15 pCi/g to apply to the area below the upper six inches, for which the 5 pCi/g limit applies. This radium limit accounts for a relative Th-230 contribution due to ingrowth such that the total radium at 1,000 years will not exceed the applicable limit. If the original upper six inches have been removed, the subsurface limit for radium of 15 pCi/g applies to the material at this depth, *provided* adherence to ALARA standards has been demonstrated, and the exposed material is either recontoured or backfilled to include a cover of at least six inches of soil. The cover material must not exceed the background level by more than 5 pCi/g.

The department's policy on total uranium (U-234 and U-238) in the soil is consistent with the NRC 1981 Technical Position Paper, Federal Register #205, Volume 46, regarding cleanup of sites contaminated with radium and/or thorium. In applying this policy, the state considers the 30 pCi/g enriched uranium limit appropriate for areas in which the uranium is not in equilibrium with radium. This level was calculated based on the increased relative contribution of U-234 in enriched uranium that is not present in natural or depleted uranium; therefore, this value would be slightly conservative for natural uranium. For example, you have reported that some of the 10 x 10 meter radiological verification grids at WNI had values of uranium that are approximately 3-5 times the radium value; these are clearly out of equilibrium, and the 30 pCi/g uranium limit would apply, provided the radium and thorium levels met the soil cleanup levels previously approved by the department.

To ensure clarity, we have prepared the following formula and table of soil cleanup standards for uranium mills. We propose to administratively amend WNI's radioactive materials license to incorporate this formula and table.

MAXIMUM SOIL CLEANUP CONCENTRATIONS AT URANIUM MILLS

RADIONUCLIDE	IN EQUILIBRIUM (limit above background)		IN DISEQUILIBRIUM (limit above background)	
	SURFACE	SUBSURFACE*	SURFACE	SUBSURFACE*
Ra-226**	5 pCi/g	15 pCi/g	5 pCi/g	15 pCi/g
Total Uranium U-238 + U-234	10 pCi/g	30 pCi/g	30 pCi/g	30 pCi/g

* To meet the subsurface limit, adherence to ALARA standards must be demonstrated, and the exposed material must be either recontoured or backfilled to include a cover (not exceeding background by more than 5 pCi/g) of at least six inches of soil.
** The reported Th-230 concentration must not exceed $A_{(Th,O)}$ as calculated by the following equation:

$$A_{(Th,O)} = \frac{A_{(Ra,t)} - A_{(Ra,O)} e^{-\lambda t}}{1 - e^{-\lambda t}}$$

Where:

$A_{(Th,O)}$ = reported Th-230 concentration plus the analytic counting error at the 95% confidence limit;

$A_{(Ra,O)}$ = reported Ra-226 concentration plus the analytic counting error at the 95% confidence limit;

$A_{(Ra,t)}$ = 6.07 pCi/g (surface) or 16.07 pCi/g (subsurface) for sand/float soil types or 6.44 (surface) or 16.44 (subsurface) for weathered quartz monzonite soil types;

t = 1000 years; and

λ = the decay constant for Ra-226 = 4.32E-4 yrs^{-1}

NOTE: The sum of the reported Ra-226 concentration plus the analytic counting error at the 95% confidence limit must not exceed 6.07 pCi/g for sand/float soil types or 6.44 pCi/g for weathered quartz monzonite soil types.

The department's evaluation of WNI's soil cleanup procedures and the cleanup work done to date is that they are consistent with ALARA principles and are protective of public health and the environment. The department also recognizes that Western Nuclear has gone beyond the required standards in meeting the ALARA principle.

The department has discussed the above policy and its applicability to WNI with the NRC, and has determined that it is consistent with NRC policy.

If you have any questions, please contact Leo Wainhouse at (360) 586-4878 or me at (360) 753-3459.

Sincerely,

Gary Robertson

Gary Robertson, Head
Waste Management Section

cc: Elaine Brummett, NRC HQ
Dennis Sollenberger, NRC HQ
Lou Miller, SMI
Larry Fiske, SMI

STATE OF WASHINGTON
DEPARTMENT OF HEALTH
DIVISION OF RADIATION PROTECTION
Airdustrial Center, Bldg. 5 • P.O. Box 47827 • Olympia, Washington 98504-7827

April 4, 1996

Stephanie J. Baker
Manager, Environmental Services
Western Nuclear, Inc.
200 Union Blvd., Suite 300
Lakewood, Colorado 80228

Dear Ms. Baker:

This letter is in response to questions raised during our February 7 and March 22, 1996 meetings, regarding soil cleanup standards applicable at the Sherwood site. As a result of those meetings and discussions, we are modifying our letter to you dated February 21, 1996. These modifications change the formula used to calculate acceptance criteria for uranium (U-234 + U-238). Your questions specifically addressed the state policy on the uranium soil cleanup standard and the circumstances under which the Radium-226 cleanup limit of 5 pCi/g and 15 pCi/g above the background level applies.

The regulatory requirement for soil cleanup at uranium mill sites is found in WAC 246-252, Appendix A, Criterion 6. The department's policy allows the subsurface limit for Ra-226 of 15 pCi/g to apply to the area below the upper six inches, for which the 5 pCi/g limit applies. This radium limit accounts for a relative Th-230 contribution due to ingrowth such that the total Ra-226 at 1,000 years will not exceed the applicable limit. The reported Th-230 concentration must not exceed $A_{(Th,O)}$ as calculated by the following equation:

$$A_{(Th,O)} = \frac{A_{(Ra,t)} - A_{(Ra,O)}e^{-\lambda t}}{1-e^{-\lambda t}}$$

Where:

$A_{(Th,O)}$ =	reported Th-230 concentration plus the analytic counting error at the 95% confidence limit;
$A_{(Ra,O)}$ =	reported Ra-226 concentration plus the analytic counting error at the 95% confidence limit;
$A_{(Ra,t)}$ =	6.07 pCi/g (surface) or 16.07 pCi/g (subsurface) for sand/float soil types or 6.44 (surface) or 16.44 (subsurface) for weathered quartz monzonite soil types;
t =	1000 years; and
λ =	the decay constant for Ra-226 = 4.32E-4 yrs^{-1}

NOTE: The sum of the reported Ra-226 concentration plus the analytic counting error at the 95% confidence limit must not exceed 6.07 pCi/g for sand/float soil types or 6.44 pCi/g for weathered quartz monzonite soil types.

If the original upper six inches have been removed, the subsurface limit for Ra-226 of 15 pCi/g applies to the material at this depth, *provided* adherence to ALARA standards has been demonstrated, and the exposed material is either recontoured or backfilled to include a cover of at least six inches of soil. The cover material must not exceed the background level by more than 5 pCi/g.

The department's policy on uranium (i.e., the arithmetic sum of U-234 and U-238) in the soil is consistent with the NRC 1981 Technical Position Paper, Federal Register #205, Volume 46, regarding cleanup of sites contaminated with radium and/or thorium. In applying this policy, the state considers the 30 pCi/g enriched uranium limit appropriate for areas where Ra-226 is at background levels. This level was calculated based on the increased relative contribution of U-234 in enriched uranium that is not present in natural or depleted uranium; therefore, this value would be slightly conservative for natural uranium. The uranium (U-234 + U-238) limit of 10 pCi/g will be applied if Ra-226 is in equilibrium with uranium (i.e., (U-234 + U-238) = 10 pCi/g and Ra-226 = 5 pCi/g).

The uranium (U-234 + U-238) limit will vary between 10 pCi/g and 30 pCi/g above background where Ra-226 values are between background and 5 pCi/g above background. The limit for uranium (U-234 + U-238) in the upper 6 inches will be calculated according to the following equation:

$$\frac{A_{(Ra,t)} - A_{(Ra,Bg)}}{5} + \frac{\left(A_{(U\text{-}238 + U\text{-}234)} - A_{(U\text{-}238 + U\text{-}234,\ Bg)} \right) - 10}{20} \leq 1$$

Where:

$A_{(Ra,t)}$	=	Ra-226 activity at t=0 or t=1000 years accounting for Ra-226 ingrowth (whichever is greater);
$A_{(Ra,Bg)}$	=	background Ra-226 activity = 1,0 pCi/g;
$A_{(U\text{-}238 + 2\text{-}234)}$	=	U-238 + U-234 activity;
$A_{(U\text{-}238 + U\text{-}234,\ Bg)}$	=	background U-238 + U-234 activity = 2.07 pCi/g.

The uranium (U-234 + U-238) limit for subsurface soils (i.e., below the top 6 inches) is 30 pCi/g above background regardless of the Ra-226 value which can vary from background to 15 pCi/g above background.

The department's evaluation of WNI's soil cleanup procedures and the cleanup work done to date is that they are consistent with ALARA principles and are protective of public health and the environment. The department also recognizes that Western Nuclear has gone beyond the required standards in meeting the ALARA principle.

The department has discussed the above policy and its applicability to WNI with the NRC, and has determined that it is consistent with NRC policy.

If you have any questions, please contact Leo Wainhouse at (360) 586-4878 or me at (360) 753-3459.

Sincerely,

Leo Wainhouse

for Gary Robertson, Head
Waste Management Section

cc: Elaine Brummett, NRC HQ
Dennis Sollenberger, NRC HQ
Lou Miller, SMI
Larry Fiske, SMI

SHEPHERD MILLER
INCORPORATED

WNI

November 14, 1996

Ms. Stephanie J. Baker
Western Nuclear, Inc.
Union Plaza
200 Union Boulevard, Suite 300
Lakewood, Colorado 80228

SMI #09-353

SUBJECT: Backfill Elevations for Sherwood

Dear Ms. Baker:

The purpose of this letter is to update you on the status of the Sherwood Radiological Verification Program, concerning the issue of backfilling to meet subsurface release standards in the Mill area and in the Evaporation Pond.

As formalized on page 58 of the Sherwood Radiological Verification Completion Report (July, 1996), the verification plan was modified to include implementation of the subsurface release standards of 15 pCi ^{226}Ra/g (and corresponding ^{230}Th values) above background levels in areas that would receive six or more inches of clean backfill as part of the final site regrading plan. The modification was designed to include an elevation measurement at the center point of each grid, as documentation of the amount of clean fill added. Approval of this modification was granted by WDOH, via letter dated April 4, 1996 (attached).

A total of twelve grids were affected by this modification; one in the mill area and eleven in the evaporation pond. All of these grids have been backfilled with a minimum of six inches of clean fill, as measured at the center of each grid. The elevation of each grid center point-before and after backfilling-is shown on Table 1, as well as the actual thickness of clean fill added. The corresponding grid locations are shown in blue on Figure 1.

Submittal of this addendum signifies completion of the Sherwood Project Radiological Verification Program.

Sincerely,

SHEPHERD MILLER, INC.

Anne Woodland

Anne Woodland
Staff Scientist

Enclosures

cc: Corn Abeyta w/enclosures
Lou Miller

Environmental & Engineering Consultants

3801 Automation Way, Suite 100
Fort Collins, CO 80525
Phone: (970) 223-9600
Fax: (970) 223-7171

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STATE OF WASHINGTON
DEPARTMENT OF HEALTH
DIVISION OF RADIATION PROTECTION
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April 4, 1996

Stephanie J. Baker
Manager, Environmental Services
Western Nuclear, Inc.
200 Union Blvd., Suite 300
Lakewood, Colorado 80228

Dear Ms. Baker:

This letter is in response to questions raised during our February 7 and March 22, 1996 meetings, regarding soil cleanup standards applicable at the Sherwood site. As a result of those meetings and discussions, we are modifying our letter to you dated February 21, 1996. These modifications change the formula used to calculate acceptance criteria for uranium (U-234 + U-238). Your questions specifically addressed the state policy on the uranium soil cleanup standard and the circumstances under which the Radium-226 cleanup limit of 5 pCi/g and 15 pCi/g above the background level applies.

The regulatory requirement for soil cleanup at uranium mill sites is found in WAC 246-252, Appendix A, Criterion 6. The department's policy allows the subsurface limit for Ra-226 of 15 pCi/g to apply to the area below the upper six inches, for which the 5 pCi/g limit applies. This radium limit accounts for a relative Th-230 contribution due to ingrowth such that the total Ra-226 at 1,000 years will not exceed the applicable limit. The reported Th-230 concentration must not exceed $A_{(Th,O)}$ as calculated by the following equation:

$$A_{(Th,O)} = \frac{A_{(Ra,I)} - A_{(Ra,O)}e^{-\lambda t}}{1-e^{-\lambda t}}$$

Where:

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$A_{(Ra,Bg)}$	=	background Ra-226 activity = 1,0 pCi/g;
$A_{(U\text{-}238\ +\ 2\text{-}234)}$	=	U-238 + U-234 activity;
$A_{(U\text{-}238\ +\ U\text{-}234,\ Bg)}$	=	background U-238 + U-234 activity = 2.07 pCi/g.

The uranium (U-234 + U-238) limit for subsurface soils (i.e., below the top 6 inches) is 30 pCi/g above background regardless of the Ra-226 value which can vary from background to 15 pCi/g above background.

The department's evaluation of WNI's soil cleanup procedures and the cleanup work done to date is that they are consistent with ALARA principles and are protective of public health and the environment. The department also recognizes that Western Nuclear has gone beyond the required standards in meeting the ALARA principle.

The department has discussed the above policy and its applicability to WNI with the NRC, and has determined that it is consistent with NRC policy.

If you have any questions, please contact Leo Wainhouse at (360) 586-4878 or me at (360) 753-3459.

Sincerely,

Leo Wainhouse

for Gary Robertson, Head
Waste Management Section

cc: Elaine Brummett, NRC HQ
Dennis Sollenberger, NRC HQ
Lou Miller, SMI
Larry Fiske, SMI

TABLE 1. ELEVATION OF GRID CENTERS BEFORE AND AFTER BACKFILLING

Grid ID	Northing	Easting	Grid Center Elevation Prior To Backfilling	Grid Center Elevation After Backfilling	Backfill Thickness	Minimum Backfill Thickness Required
M1-296333F	331017.68	2666738.33	2057.9'	2064.3'	6.4'	0.5'
C3-420438F	329639.73	2668673.39	1957.6	1959.9'	2.3'	0.5'
C3-619636F	329213.18	2668772.62	1964.6'	1966.8'	2.2'	0.5'
C3-633649F	329180.48	2668706.64	1961.0'	1964.9'	3.9'	0.5'
C3-588605F	329277.85	2668805.74	1957.4'	1963.4'	6.0'	0.5'
C3-555572F	329344.60	2668772.39	1955.6'	1960.5'	4.9'	0.5'
C3-582599F	329278.97	2668608.28	1949.7'	1959.8'	10.1'	0.5'
C3-613630F	329213.99	2668575.63	1959.6'	1963.6'	4.0'	0.5'
C3-509524F	329475.85	2668608.61	1957.6'	1963.2'	5.6'	0.5'
C3-508523F	329475.68	2668575.47	1964.2'	1967.3'	3.1'	0.5'
C3-479495F	329508.50	2668608.50	1964.3'	1965.6'	1.3'	0.5'
C3-478494F	329508.50	2668575.50	1968.9'	1969.5'	0.6'	0.5'

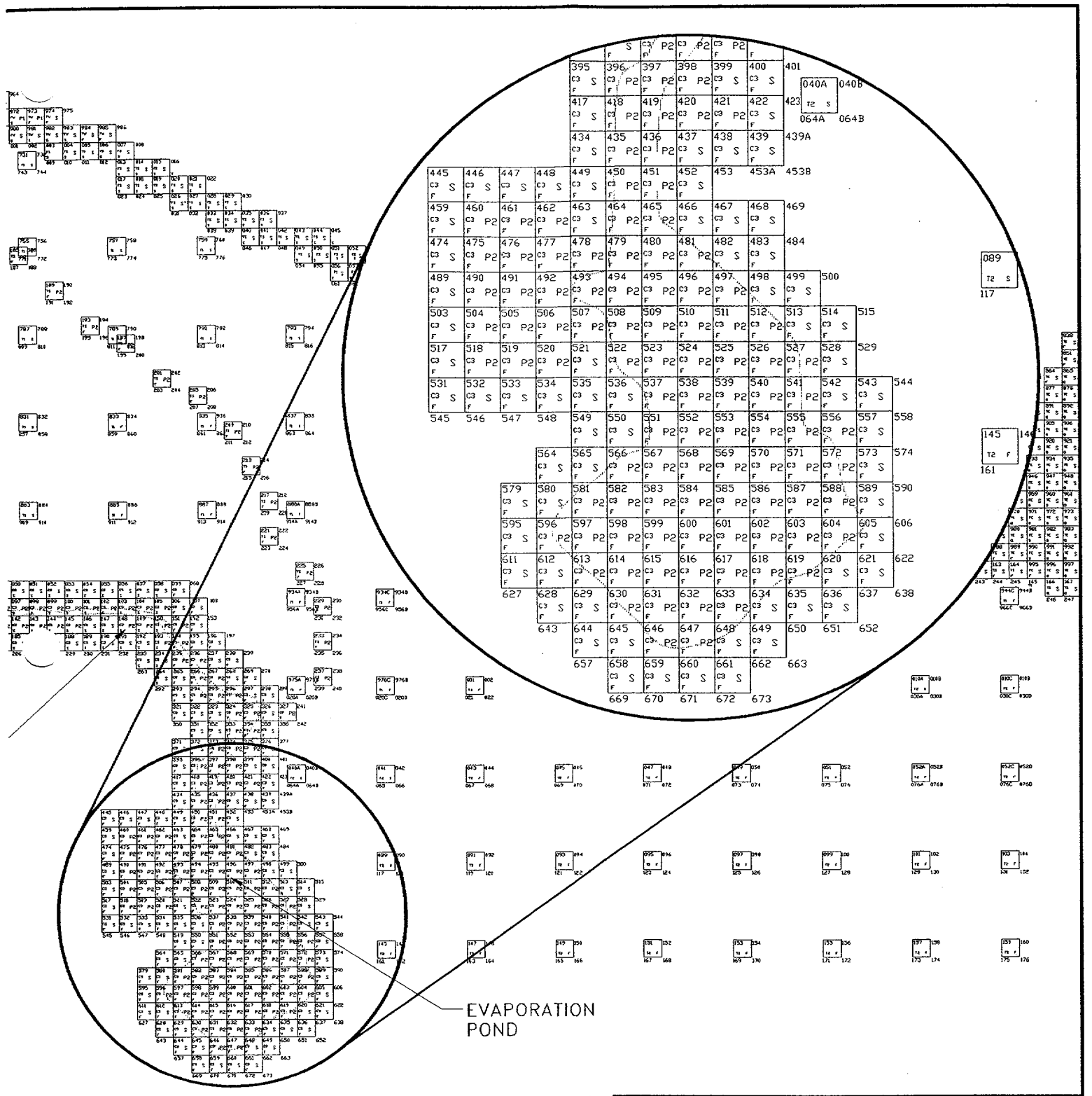
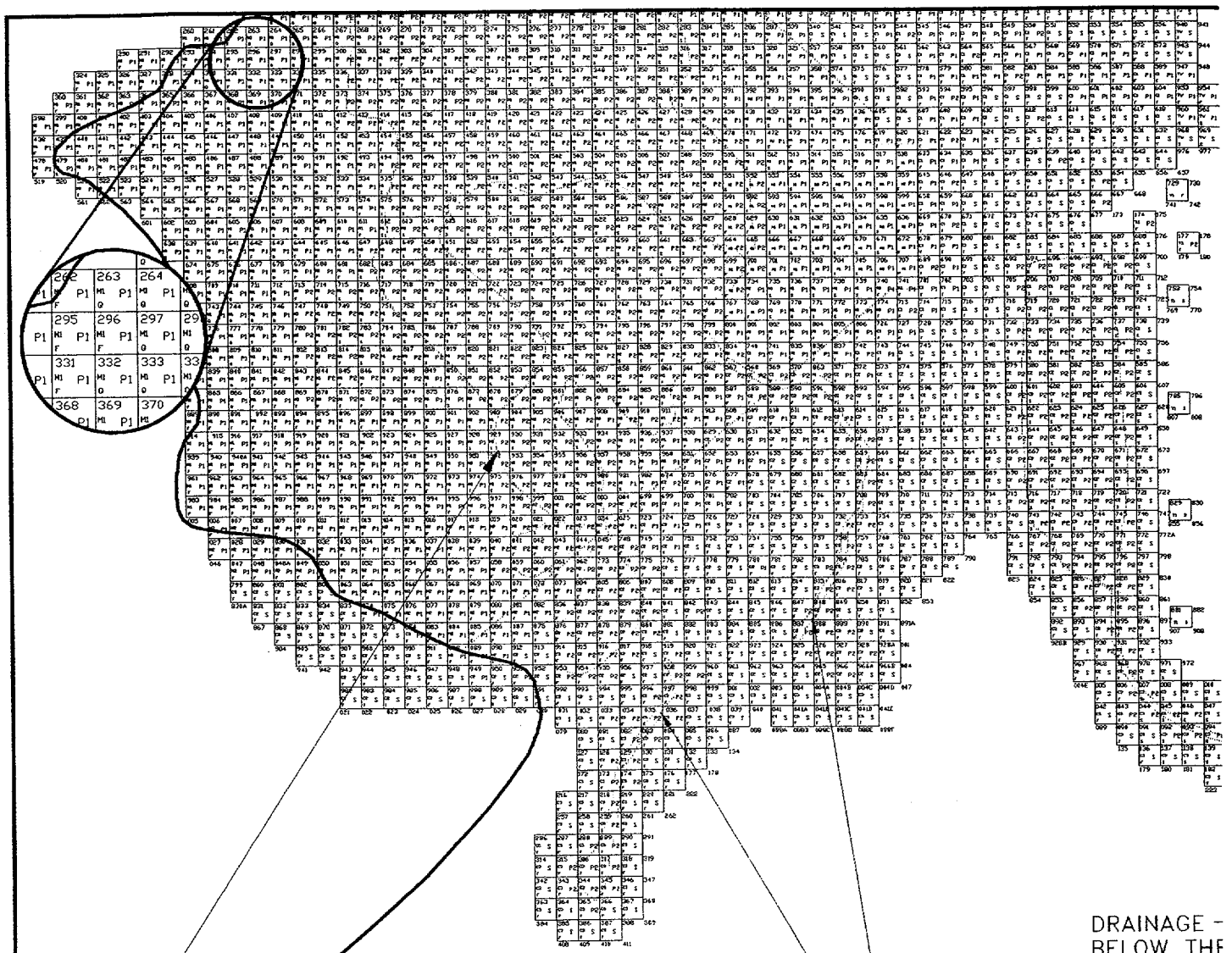


FIGURE 1
GRIDS VERIFIED BY
SUBSURFACE STANDARDS

SHEPHERD MILLER
INCORPORATED

Date: NOV. 1996
Project: 09-353
File: FINAL\SUBSURF2


BOUNDARY OF MAY 1982 CLARICONE TANK FAILURE
DRAINAGE BELOW THE MAY 1982 CLARICONE TANK FAILURE
DRAINAGE - BELOW THE $BaCl_2$ PON

WNI

To: Gary Robertson

From: Doug Wells

Regarding: WNI Cleanup Verification

I have finished my review of the Western Nuclear, Inc. (WNI) radiological verification report and data regarding the Sherwood site cleanup. I believe that their data, coupled with our independent sampling, is more than adequate to demonstrate compliance with applicable standards. Specifically, it is my opinion that the radiological verification program, of those areas of the Sherwood site that are to be free-released, has met all Department of Health (WDOH) criteria. The remainder of this memorandum documents my review of the 11 volume Western Nuclear, Inc. "Sherwood Project Radiological Verification Completion Report" (the verification report).

Volume 1: This is an executive summary of the remaining volumes. It contains a brief summary of the radiological verification program, results and status. I find no flaws in this volume.

Volume II: This volume contains the heart of the argument for demonstration of compliance. It contains a review of the radiological verification program history, procedures, compliance protocols, and instrumentation. It also contains a summary of the compliance data, the WNI/WDOH sample splits, and the over-all QA/QC of the program. This volume claims that WNI has met all applicable criteria for free-release. Within the scope of my review I agree.

There are some issues that arise in this volume, however, that should be documented for the sake of completeness. First, the volume does not carefully discuss the protocol for treating WDOH/WNI gamma-survey splits. This is presumably due to the fact that no protocol was ever formally agreed upon (to my knowledge). WDOH and WNI, however, did agree informally over the telephone to subject this data to the same test as the soil splits that were sent to laboratories. This is the paired t-test that is documented in the radiological verification plan and in this volume on pages 44 through 46. It should be noted that WNI's gamma-survey data passed this test with flying colors.

In addition to comparing gamma-survey data, WNI compared their laboratory data to WDOH's for 226Ra, 230Th and 238U. I have independently

confirmed each of WNI's t-test results. For the record, the 226Ra populations were in agreement, while WNI's 238U results are biased high (relative to WDOH) and their 230Th results are biased low.

I also confirmed the regression analyses of WNI, which determine quantitatively the linear relationship between WNI's isotopic analyses and WDOH's analyses. Curiously, there was approximately a 0.1% difference between my regression results for 226Ra and WNI's results. I did not track down this small discrepancy because this data had already passed the compliance statistical test (the t-test), and therefore, any differences in regression results should have no compliance implications. My regression results for 230Th and 238U were in complete agreement with WNI's. All of these statistical results are documented in Volume 10, Appendix F, of the verification report.

Our confirmation of WNI's verification program depends upon an additional element. In addition to splitting soil samples to confirm their laboratory analysis and splitting gamma-surveys to confirm their field analysis, we verified the correlation between these two types of measurements in 1994. It is essentially impossible to reconfirm this relationship with the latest data because WNI removed so much soil that there are virtually no grids left that approach the cleanup standard. That is, essentially all of the grids are at or near background. This is shown in figures ES.1 through ES.4 of Volume 1 of the verification report.

If you need any additional details or documentation of this analysis, please let me know.

Volume 3: This volume is comprised of as-built drawings of the radiological verification grids. I see no errors here, but the reclassification of grids based upon geologic or regulatory criteria is beyond my scope and expertise.

Volume 4: (Appendix A) This contains all of the gamma-survey information. In particular, it contains all of the logbook entries of instrument calibrations and performance checks and all of the associated control charts. In addition, it contains detailed text that discuss the WNI gamma-survey QA/QC program and results. I believe this volume to be complete, thorough and defensible.

Vols. 5-9: (Appendix B) These volumes are simply data records and results regarding the soil analyses. It appears to be a complete record.

Volume 10: (Appendices C-H) These Appendices address many of the issues that arise when comparing WNI data with WDOH data. Appendix G, in particular, discusses some of the (relatively minor) discrepancies between the two data sets. It is my view that some of the discussion contains conceptual errors; however, none of this appears to have any regulatory significance.

Volume 11: (Appendix I) This volume simply contains correspondence between WNI and WDOH regarding radiological verification and/or license amendments. I do not see any problems here, but some of this is beyond my scope.

In summary, I have reviewed WNI's radiological verification report and data and believe that it demonstrates compliance with all applicable regulations. If you have any questions regarding this review, please call me at 208-528-2621.

cc: Leo Wainhouse
John Blacklaw
John Erickson
Deborah McBaugh

WNI

To: JRB0303 @ WA-DOH (Blacklaw, John)
From: wellsd
Subject: WNI report
Date: 12/29/96 Time: 11:54PM

Hi John:

Attached is the long-promised review of WNI's verification report. It is in WP6.1 format
(Wni-doh.96b) and WP5.1 format (wnidoh51.96b). Let me know if this is what you need, or
if you need more.

Also, could you ask Kristin (or does Karen do this for me?) to fill out a time sheet for me? I have worked 21 hours in the Dec.16-Dec.31 pay period on this stuff.

Thanks----Doug

[[WNI-DOH.96B : 19 in WNI-DOH.96B]][[WNIDOH51.96B : 20 in WNIDOH51.96B]]
--$----Novell--Attachment----$

X-NVL-Content-Type: BINARY
X-NVL-Content-Charset: X-IBM-437
X-NVL-Content-Filename: WNI-DOH.96B
X-NVL-Content-Transfer-Encoding: X-UUENCODE
X-NVL-Content-Modification-Date: 30-Dec-1996 00:49:00 -0700

--$----Novell--Attachment----$

X-NVL-Content-Type: BINARY
X-NVL-Content-Charset: X-IBM-437

X-NVL-Content-Filename: WNIDOH51.96B
X-NVL-Content-Transfer-Encoding: X-UUENCODE
X-NVL-Content-Modification-Date: 30-Dec-1996 00:50:00 -0700

--$----Novell--Attachment----$--

Attachments: WNI-DOH.96B, WNIDOH51.96B

To: Gary Robertson

From: Doug Wells

cc: John Blacklaw

Regarding: Review of WNI Sherwood Project Cleanup and their Radiological Verification Completion Report

Date: December 29, 1996

I have completed my review of the Sherwood Project cleanup and WNI's Radiological Verification Completion Report (the verification report). My review is limited to the soils radiological verification program. Further, this review follows the protocols of the U.S. Nuclear Regulatory Commission's (NRC) AFinal Standard Review Plan for the Review and Remedial Action of Inactive Mill Tailings Sites....@, Revision 1, 1993 (the SRP). I also depended heavily upon the NRC's AManual for Conducting Radiological Surveys in Support of License Termination@, NUREG/CR-5849 (the NUREG). The three primary elements that must be addressed in the review are the site characterization, standards for cleanup, and verification procedures and results. Each of these are addressed below.

1) Site Characterization:

1.1) Adequacy of radiological background values for radium, thorium and uranium:

NUREG/CR-5849 discusses the NRC's protocol for determining the statistical adequacy of background soil concentrations on page 8.15. This protocol requires that whenever background concentrations are greater than 10% of a cleanup standard, the background characterization effort must demonstrate that enough samples were taken to adequately determine average background concentrations. The minimum number of samples is given by equation 8.22 of the NUREG. Western Nuclear followed this protocol for 226Ra, 228Th, 230Th and 232Th. They demonstrated compliance with the NRC's protocol in tables C.5 through C.7 for each of the Sherwood site's soil types in their Sherwood Project Radiological Verification Program submittal of October 1994 (the verification plan). I have verified the results in these tables.

Uranium was not part of this background determination, however, because the necessity of addressing natural uranium in the cleanup only became apparent after the above background characterization. The approach that Western Nuclear Inc. took was to assume that background uranium concentrations were in secular equilibrium with radium, resulting in background total uranium concentrations that are twice that of 226Ra. This assumption seems reasonable and is consistent with both the Tumtum background data taken for the pre-reclamation radiological survey (see Table B.1, Appendix B of the verification plan) and the historical environmental sampling of the Department of Health.

In summary, Western Nuclear Inc. has adequately determined radiological background for the Sherwood site.

1.2) Adequacy of sampling to determine the areal extent and depth of contamination:

According to the NUREG (Chapters 2 and 3), an adequate characterization of the extent of the site's contamination includes a review of historical site activities and scoping and characterization surveys. Western Nuclear Inc.'s activities in these areas are summarized in Chapter 2 of Volume 2 of the verification report and discussed in detail in Chapter 2 and Appendix B of the verification plan.

First, in the pre-reclamation radiological survey, it was historical knowledge of operations that led to the six sub-site areas listed on page 10 of the verification plan. Subsequent work in the pre-reclamation survey (Appendix B of the verification plan) and the correlation study (Appendix G of the verification plan) were consistent with the historical expectations of contamination and contamination-free areas. This led to the led to the primary, secondary, tertiary and ancillary areas that are defined in Chapter 2 of the Volume 2 of the verification report. The importance of these classifications lies in the extent and nature of sampling that was applied to each of the areas during cleanup and verification. This work appears adequate by the standards of the NUREG. In addition, subsequent cleanup verification has supported the initial area classifications.

Second, the pre-reclamation survey and correlation studies (Appendices B and G respectively of the verification plan) include a combined total of approximately 100 grids and 200 samples. These sampling locations were distributed widely over the site based partly on historical operational data. The combined data from these two surveys is more that adequate to meet the requirements of the NUREG (see Sections 2.3 and 3.1 - 3.4 of the NUREG). As further confirmation of the adequacy of these surveys, it should be pointed out that subsequent cleanup verification has led to the reclassification of only a very small number of grids. The reclassification of grids based upon geologic or regulatory criteria, however, is beyond my scope and expertise.

1.3) Are the cleanup plans supported by the data?

Yes. Both the pre-cleanup and post cleanup data, in aggregate, support the verification plan.

2) Cleanup Standards:

Throughout this cleanup, we and Western Nuclear Inc. have strictly adhered to NRC standards for uranium, thorium and radium. When in doubt, we have directly consulted the NRC. There should be no problems here.

3) Verification Procedures and Results:

3.1) Do the verification procedures and results provide reasonable assurance of compliance with all applicable standards?

There are four elements that must be addressed to fully answer this question. These include the adequacy of sampling and analysis procedures, statistical procedures, QA/QC and completeness of the data.

3.1.1) Adequacy of Sampling and Analysis Procedures: There were three primary methods employed for sampling and analysis. These were in-field measurements with a portable NaI(Tl) detector, on-site measurements of composite samples with a NaI(Tl) detector, and laboratory measurements with isotopic analysis for radium, thorium and uranium. The on-site measurements utilized a demonstrated statistical correlation between gamma-counts and radium concentrations and an statistical association between radium and thorium. Each of these techniques are consistent with the NRC approved techniques documented in Chapters 4 - 6 of the NUREG.

It should be noted that each of the more than 4000 grids were sampled for both 226Ra and 230Th through either laboratory analysis or a demonstrated association with on-site measurements. The natural uranium measurements, in contrast, were done after the demonstrated compliance of all grids with the radium and thorium standards. Sampling and analysis frequencies for uranium was focussed upon areas of highest likely contamination and concentrated upon demonstrating an association with radium and thorium. The latter association is crucial because, like the on-site measurements, the statistical association is used to demonstrate that low radium concentrations necessarily implies low uranium concentrations.

3.1.2) Adequacy of Statistical Procedures: The primary requirement of the NUREG is that the data demonstrate that each grid meet NRC standards with 95% or greater confidence. This is documented in Chapter 8 of the NUREG. The statistical treatment of measurement technique was specifically designed to meet this requirement. The onsite measurement Aaction levels@, for example, were set so that if a particular grid was at or below the action level, then one could have 95% or greater confidence that NRC standards were met. Similarly, laboratory results had their 95% uncertainty added to them before comparing to NRC standards. These protocols are documented in Chapter of Volume 2 of the verification report.

Another major statistical procedure was the use of correlations between field measurements and laboratory measurements. This technique is widely employed in radiological verification and has been documented, for example, in the ABendix@ report (Bendix Field Engineering Corporation, U.S. Department of Energy, Division of Remedial Action Projects, Grand Junction, Colorado, 1984). The validity of in-field measurements depends entirely upon the correlation of laboratory 226Ra measurements with in-field measurements and the association of 230Th with 226Ra. In locations where either the correlation or association were not valid, Western Nuclear Inc. performed laboratory analysis. The correlation analysis is carefully documented in Appendix G of the verification plan. A similar association between uranium and radium was employed to demonstrate compliance with standards.

3.1.3) Adequacy of QA/QC: There are two QA/QC programs of relevance. One is Western Nuclear Inc.'s internal QA/QC program. This includes QA/QC activities in the field, at their contract laboratory, and data management and analysis. The other QA/QC program is the Department of Health's verification Asplits@ and intercomparisons.

Western Nuclear Inc.'s internal QA/QC is extensively documented in Chapters 5 and 6 of Volume 2 and Appendix A of Volume 4 of the verification report. Their internal QA/QC for soil samples includes matrix spikes, blanks and duplicates with each batch submitted to the laboratory. Their spikes employed NIST-traceable standards and they also submitted blind performance evaluation samples from on-site soils. In addition, their contract laboratory has its own internal QA/QC program. I believe that this part of their QA/QC program is more

than adequate to meet the requirements of Chapter 4 of the NUREG.

The internal QA/QC for on-site measurements included calibrations, thrice-daily performance checks and maintenance of control charts. These steps meet the requirements of Chapter 5 of the NUREG. All of this is documented in Chapter 3 of Volume 2 and Appendix A of Volume 4 of the verification report.

The major external QA/QC program includes the sample splits and result intercomparisons with the Department of Health. The in-field splits and intercomparisons is only weakly documented in Chapter 6 of Volume 2 of the verification report. In particular, the verification report does not carefully discuss the protocol for treating WDOH/WNI gamma-survey splits. This is presumably due to the fact that no protocol was ever formally agreed upon (to my knowledge). We and Western Nuclear Inc., however, did agree informally over the telephone to subject this data to the same test as the soil splits that were sent to laboratories. This is the paired t-test that is documented in the radiological verification plan and in this volume on pages 44 through 46. This test is designed to address whether there is a relative bias between the measurements of the Department of Health and those of Western Nuclear Inc. This is a well-accepted statistical test that is documented in any standard statistical treatise (see, for example, Chapter 3 of the National Bureau of Standard's Handbook 91: AExperimental Statistics@). It should be noted that WNI's gamma-survey data passed this test with flying colors.

In addition to comparing gamma-survey data, the external QA/QC included a comparison of Western Nuclear Inc.'s laboratory data to ours for 226Ra, 230Th and 238U. The results of these tests are documented in Chapter 5 of Volume 2 of the verification report. I have independently confirmed each of these t-test results. For the record, the 226Ra populations were in agreement, while Western Nuclear Inc.'s 238U results are biased high (relative to us) and their 230Th results are biased low.

I also confirmed the regression analyses of Western Nuclear Inc., which determined quantitatively the linear relationship between their isotopic analyses and ours. Curiously, there was approximately a 0.1% difference between my regression results for 226Ra and WNI's results. I did not track down this small discrepancy because this data had already passed the compliance statistical test (the t-test), and therefore, any differences in regression results should have no compliance implications. My regression results for 230Th and 238U were in complete agreement with WNI's. All of these statistical results are fully documented in Volume 10, Appendix F, of the verification report.

Our confirmation of WNI's verification program depends upon an additional element. In addition to splitting soil samples to confirm their laboratory analysis and splitting gamma-surveys to confirm their field analysis, we verified the correlation between these two types of measurements in 1994. It is essentially impossible to reconfirm this relationship with the latest data because WNI removed so much soil that there are virtually no grids left that approach the cleanup standard. That is, essentially all of the grids are at or near background. This is shown in figures ES.1 through ES.4 of Volume 1 of the verification report.

In addition, Appendices C-H of Volume 10 of the verification report address many of the issues that arise when comparing Western Nuclear Inc.'s data with our own. Appendix G, in particular, discusses some of the (relatively minor) discrepancies between the two data sets.

Some of that discussion contains conceptual errors; however, it does not have any regulatory significance.

It should be noted that the external QA/QC program discussed above significantly exceeds the discretionary protocols of Chapter 2 of the NUREG.

3.1.4) Completeness of the Data: The verification data is contained in Appendices A and B of Volumes 4 - 9 of the verification report. These volumes contain data records and results regarding the soil analyses. It appears to be a complete record.

3.2) Were Thorium and Uranium sampling and analysis adequately addressed?

Recognition of issues associated with 230Th occurred early in the cleanup planning. In fact, much of the verification plan and activities were driven by 230Th and its contribution to ingrowth of 226Ra. Each grid on the site was (effectively) sampled for 230Th through either laboratory analysis or via association with 226Ra. The sampling, analysis and QA/QC discussed above is more than adequate to demonstrate compliance with NRC standards for 230Th.

Uranium was addressed after the all grids met the radium and thorium standards. First, sampling locations for 100 grids were focussed upon areas of highest likely contamination based upon historical records. This identified areas where uranium was, and was not, in statistical association with radium. In those areas where an association held, compliance was demonstrated with radium or gamma-count values. In areas where an association did not hold, each grid was analyzed for uranium. In all, approximately 200 grids were analyzed for uranium. This is sufficient to demonstrate compliance with the NUREG.

3.3) Were new methods used? Are they referenceable and accepted by the NRC?

There were no new or novel techniques used in verifying the cleanup of this site. All of the techniques that Western Nuclear Inc. employed are discussed in the Bendix report or in the NUREG.

In summary, I have finished my review of the Western Nuclear, Inc. radiological verification report and data regarding the Sherwood site cleanup. I believe that their data, coupled with our independent sampling, is more than adequate to demonstrate compliance with applicable standards. Specifically, it is my opinion that the radiological verification program, of those areas of the Sherwood site that are to be free-released, has met all Department of Health and NRC criteria. If you have any questions regarding this review, please call me at 208-528-2621.

To: Gary Robertson

From: Doug Wells

cc: John Blacklaw

Regarding: Review of WNI Sherwood Project Cleanup and their Radiological Verification Completion Report

Date: December 29, 1996

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Uranium was not part of this background determination, however, because the necessity of addressing natural uranium in the cleanup only became apparent after the above background characterization. The approach that Western Nuclear Inc. took was to assume that background uranium concentrations were in secular equilibrium with radium, resulting in background total uranium concentrations that are twice that of 226Ra. This assumption seems reasonable and is consistent with both the Tumtum background data taken for the pre-reclamation radiological survey (see Table B.1, Appendix B of the verification plan) and the historical environmental sampling of the Department of Health.

In summary, Western Nuclear Inc. has adequately determined radiological background for the Sherwood site.

1.2) Adequacy of sampling to determine the areal extent and depth of contamination:

According to the NUREG (Chapters 2 and 3), an adequate characterization of the extent of the site's contamination includes a review of historical site activities and scoping and characterization surveys. Western Nuclear Inc.'s activities in these areas are summarized in Chapter 2 of Volume 2 of the verification report and discussed in detail in Chapter 2 and Appendix B of the verification plan.

First, in the pre-reclamation radiological survey, it was historical knowledge of operations that led to the six sub-site areas listed on page 10 of the verification plan. Subsequent work in the pre-reclamation survey (Appendix B of the verification plan) and the correlation study (Appendix G of the verification plan) were consistent with the historical expectations of contamination and contamination-free areas. This led to the led to the primary, secondary, tertiary and ancillary areas that are defined in Chapter 2 of the Volume 2 of the verification report. The importance of these classifications lies in the extent and nature of sampling that was applied to each of the areas during cleanup and verification. This work appears adequate by the standards of the NUREG. In addition, subsequent cleanup verification has supported the initial area classifications.

Second, the pre-reclamation survey and correlation studies (Appendices B and G respectively of the verification plan) include a combined total of approximately 100 grids and 200 samples. These sampling locations were distributed widely over the site based partly on historical operational data. The combined data from these two surveys is more that adequate to meet the requirements of the NUREG (see Sections 2.3 and 3.1 - 3.4 of the NUREG). As further confirmation of the adequacy of these surveys, it should be pointed out that subsequent cleanup verification has led to the reclassification of only a very small number of grids. The reclassification of grids based upon geologic or regulatory criteria, however, is beyond my scope and expertise.

1.3) Are the cleanup plans supported by the data?

Yes. Both the pre-cleanup and post cleanup data, in aggregate, support the verification plan.

2) Cleanup Standards:

Throughout this cleanup, we and Western Nuclear Inc. have strictly adhered to NRC standards for uranium, thorium and radium. When in doubt, we have directly consulted the NRC. There should be no problems here.

3) Verification Procedures and Results:

3.1) Do the verification procedures and results provide reasonable assurance of compliance with all applicable standards?

There are four elements that must be addressed to fully answer this question. These include the adequacy of sampling and analysis procedures, statistical procedures, QA/QC and completeness of the data.

3.1.1) Adequacy of Sampling and Analysis Procedures: There were three primary methods employed for sampling and analysis. These were in-field measurements with a portable NaI(Tl) detector, on-site measurements of composite samples with a NaI(Tl) detector, and laboratory measurements with isotopic analysis for radium, thorium and uranium. The on-site measurements utilized a demonstrated statistical correlation between gamma-counts and radium concentrations and an statistical association between radium and thorium. Each of these techniques are consistent with the NRC approved techniques documented in Chapters 4 - 6 of the NUREG.

It should be noted that each of the more than 4000 grids were sampled for both 226Ra and 230Th through either laboratory analysis or a demonstrated association with on-site measurements. The natural uranium measurements, in contrast, were done after the demonstrated compliance of all grids with the radium and thorium standards. Sampling and analysis frequencies for uranium was focussed upon areas of highest likely contamination and concentrated upon demonstrating an association with radium and thorium. The latter association is crucial because, like the on-site measurements, the statistical association is used to demonstrate that low radium concentrations necessarily implies low uranium concentrations.

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Another major statistical procedure was the use of correlations between field measurements and laboratory measurements. This technique is widely employed in radiological verification and has been documented, for example, in the ABendix@ report (Bendix Field Engineering Corporation, U.S. Department of Energy, Division of Remedial Action Projects, Grand Junction, Colorado, 1984). The validity of in-field measurements depends entirely upon the correlation of laboratory 226Ra measurements with in-field measurements and the association of 230Th with 226Ra. In locations where either the correlation or association were not valid, Western Nuclear Inc. performed laboratory analysis. The correlation analysis is carefully documented in Appendix G of the verification plan. A similar association between uranium and radium was employed to demonstrate compliance with standards.

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Western Nuclear Inc.'s internal QA/QC is extensively documented in Chapters 5 and 6 of Volume 2 and Appendix A of Volume 4 of the verification report. Their internal QA/QC for soil samples includes matrix spikes, blanks and duplicates with each batch submitted to the laboratory. Their spikes employed NIST-traceable standards and they also submitted blind performance evaluation samples from on-site soils. In addition, their contract laboratory has its own internal QA/QC program. I believe that this part of their QA/QC program is more

than adequate to meet the requirements of Chapter 4 of the NUREG.

The internal QA/QC for on-site measurements included calibrations, thrice-daily performance checks and maintenance of control charts. These steps meet the requirements of Chapter 5 of the NUREG. All of this is documented in Chapter 3 of Volume 2 and Appendix A of Volume 4 of the verification report.

The major external QA/QC program includes the sample splits and result intercomparisons with the Department of Health. The in-field splits and intercomparisons is only weakly documented in Chapter 6 of Volume 2 of the verification report. In particular, the verification report does not carefully discuss the protocol for treating WDOH/WNI gamma-survey splits. This is presumably due to the fact that no protocol was ever formally agreed upon (to my knowledge). We and Western Nuclear Inc., however, did agree informally over the telephone to subject this data to the same test as the soil splits that were sent to laboratories. This is the paired t-test that is documented in the radiological verification plan and in this volume on pages 44 through 46. This test is designed to address whether there is a relative bias between the measurements of the Department of Health and those of Western Nuclear Inc. This is a well-accepted statistical test that is documented in any standard statistical treatise (see, for example, Chapter 3 of the National Bureau of Standard's Handbook 91: AExperimental Statistics@). It should be noted that WNI's gamma-survey data passed this test with flying colors.

In addition to comparing gamma-survey data, the external QA/QC included a comparison of Western Nuclear Inc.'s laboratory data to ours for 226Ra, 230Th and 238U. The results of these tests are documented in Chapter 5 of Volume 2 of the verification report. I have independently confirmed each of these t-test results. For the record, the 226Ra populations were in agreement, while Western Nuclear Inc.'s 238U results are biased high (relative to us) and their 230Th results are biased low.

I also confirmed the regression analyses of Western Nuclear Inc., which determined quantitatively the linear relationship between their isotopic analyses and ours. Curiously, there was approximately a 0.1% difference between my regression results for 226Ra and WNI's results. I did not track down this small discrepancy because this data had already passed the compliance statistical test (the t-test), and therefore, any differences in regression results should have no compliance implications. My regression results for 230Th and 238U were in complete agreement with WNI's. All of these statistical results are fully documented in Volume 10, Appendix F, of the verification report.

Our confirmation of WNI's verification program depends upon an additional element. In addition to splitting soil samples to confirm their laboratory analysis and splitting gamma-surveys to confirm their field analysis, we verified the correlation between these two types of measurements in 1994. It is essentially impossible to reconfirm this relationship with the latest data because WNI removed so much soil that there are virtually no grids left that approach the cleanup standard. That is, essentially all of the grids are at or near background. This is shown in figures ES.1 through ES.4 of Volume 1 of the verification report.

In addition, Appendices C-H of Volume 10 of the verification report address many of the issues that arise when comparing Western Nuclear Inc.'s data with our own. Appendix G, in particular, discusses some of the (relatively minor) discrepancies between the two data sets.

Some of that discussion contains conceptual errors; however, it does not have any regulatory significance.

It should be noted that the external QA/QC program discussed above significantly exceeds the discretionary protocols of Chapter 2 of the NUREG.

3.1.4) Completeness of the Data: The verification data is contained in Appendices A and B of Volumes 4 - 9 of the verification report. These volumes contain data records and results regarding the soil analyses. It appears to be a complete record.

3.2) Were Thorium and Uranium sampling and analysis adequately addressed?

Recognition of issues associated with 230Th occurred early in the cleanup planning. In fact, much of the verification plan and activities were driven by 230Th and its contribution to ingrowth of 226Ra. Each grid on the site was (effectively) sampled for 230Th through either laboratory analysis or via association with 226Ra. The sampling, analysis and QA/QC discussed above is more than adequate to demonstrate compliance with NRC standards for 230Th.

Uranium was addressed after the all grids met the radium and thorium standards. First, sampling locations for 100 grids were focussed upon areas of highest likely contamination based upon historical records. This identified areas where uranium was, and was not, in statistical association with radium. In those areas where an association held, compliance was demonstrated with radium or gamma-count values. In areas where an association did not hold, each grid was analyzed for uranium. In all, approximately 200 grids were analyzed for uranium. This is sufficient to demonstrate compliance with the NUREG.

3.3) Were new methods used? Are they referenceable and accepted by the NRC?

There were no new or novel techniques used in verifying the cleanup of this site. All of the techniques that Western Nuclear Inc. employed are discussed in the Bendix report or in the NUREG.

In summary, I have finished my review of the Western Nuclear, Inc. radiological verification report and data regarding the Sherwood site cleanup. I believe that their data, coupled with our independent sampling, is more than adequate to demonstrate compliance with applicable standards. Specifically, it is my opinion that the radiological verification program, of those areas of the Sherwood site that are to be free-released, has met all Department of Health and NRC criteria. If you have any questions regarding this review, please call me at 208-528-2621.

STATE OF WASHINGTON
DEPARTMENT OF HEALTH
DIVISION OF RADIATION PROTECTION
Airdustrial Center, Bldg. 5 • P.O. Box 47827 • Olympia, Washington 98504-7827

February 10, 1998

Elaine Bramette
Waste Management/Uranium Recovery
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Ms. Bramette:

In response to your recent telephone request, I am providing information on the Western Nuclear, Inc. (WNI) Sherwood millsite soil verification and cleanup plan, which began in 1995 and concluded in the summer of 1996. The radionuclides of interest for the cleanup of the WNI Sherwood site are Radium 226, Thorium 230, Uranium 238, and Uranium 234.

In 1993, a gamma-radium correlation study was conducted at the millsite. As a result of the 1993 study, the Sherwood site was subdivided into area classifications according to the probability and nature of contamination. The areas were delineated as follows:

- Primary-1 areas were defined as areas of known or suspected contamination, where studies had demonstrated that an association existed between elevated levels of radium and elevated levels of thorium. These areas were cleaned up and verified, using gamma measurement techniques. The areas included: mill area, tailings discharge line, haul road, and scrap storage areas. Contaminated areas were cleaned and surveyed repeatedly until the survey results indicated the grid was clean.

- Primary-2 areas were defined as areas of known or suspected contamination, but due to the nature of the contamination, no association between elevated levels of Radium 226 and Thorium 230 could be established. P-2 areas could not be cleaned up or verified by gamma survey techniques. These areas included the mill process area, the claricone tank spill area, the barium chloride pond and its drainage, and the evaporation pond.

- Secondary areas were defined as areas which were not believed to be contaminated, but where the possibility of contamination existed, and there was an association between Radium 226 and Thorium 230. Secondary areas were between the mill area

and the scrap storage area, between the mill area and the tailings impoundment, between the mill area and the barium chloride pond, the margins around the tailings impoundment, and a 10-meter area outside the Primary 1 and 2 areas.

- Tertiary areas were defined as areas that had a low probability of contamination and no evidence to indicate that contamination existed, and where no contaminated soil excavation occurred. These areas included an area extending 100 meters beyond the tailings impoundment diversion channels, an area downstream of the tailings impoundment embankment, and an area inside the diversion channel. Tertiary areas were gridded off in 50-meter by 50-meter areas.

- Auxiliary areas were defined as areas that had no probability of contamination; however, some documentation of radiological compliance was necessary. These areas included the shoulders of the main road between the mill area and the main gate, and the shoulders of the road between the mill area and the lower pump-house. Samples were taken at a frequency of one sample from both shoulders of the road, at 500-meter intervals.

Initially, approximately 4,000 gamma survey grids were used to confirm the gamma/radium correlation in the P-1, secondary, tertiary, and auxiliary areas, and approximately 300 soil samples were collected and analyzed. In the P-2 area, approximately 800 soil samples were collected and analyzed for radium and thorium. Surveys determined that 95% of all grids were below the applicable regulatory standard for Radium 226, and approximately 85% of all grids were at background levels (less than 2.0 pCi/gm Radium 226).

When P-1 gamma surveys were completed, approximately 10% of all P-1 grids were soil-sampled and analyzed for Radium 226 and Thorium 230. Primary-2 areas were 100% soil-sampled and analyzed for Radium 226 and Thorium 230. Secondary areas and tertiary areas were gamma surveyed, and approximately 5% of the grids were soil-sampled and analyzed for Radium 226 and Thorium 230.

Following initial cleanup and sample analysis, approximately 200 grids were sampled and analyzed isotopically for uranium. Uranium analysis occurred only after soil analysis demonstrated that an area was in compliance for Radium 226 and Thorium 230. The sampling frequency for uranium was designed to be consistent with the overall radiological verification program philosophy, and required 20% of all P-2 grids to be re-sampled, 10% of all mill process area and barium chloride drainage evaporation pond grids to be re-sampled, and 5% of all soil confirmation grids to be re-sampled.

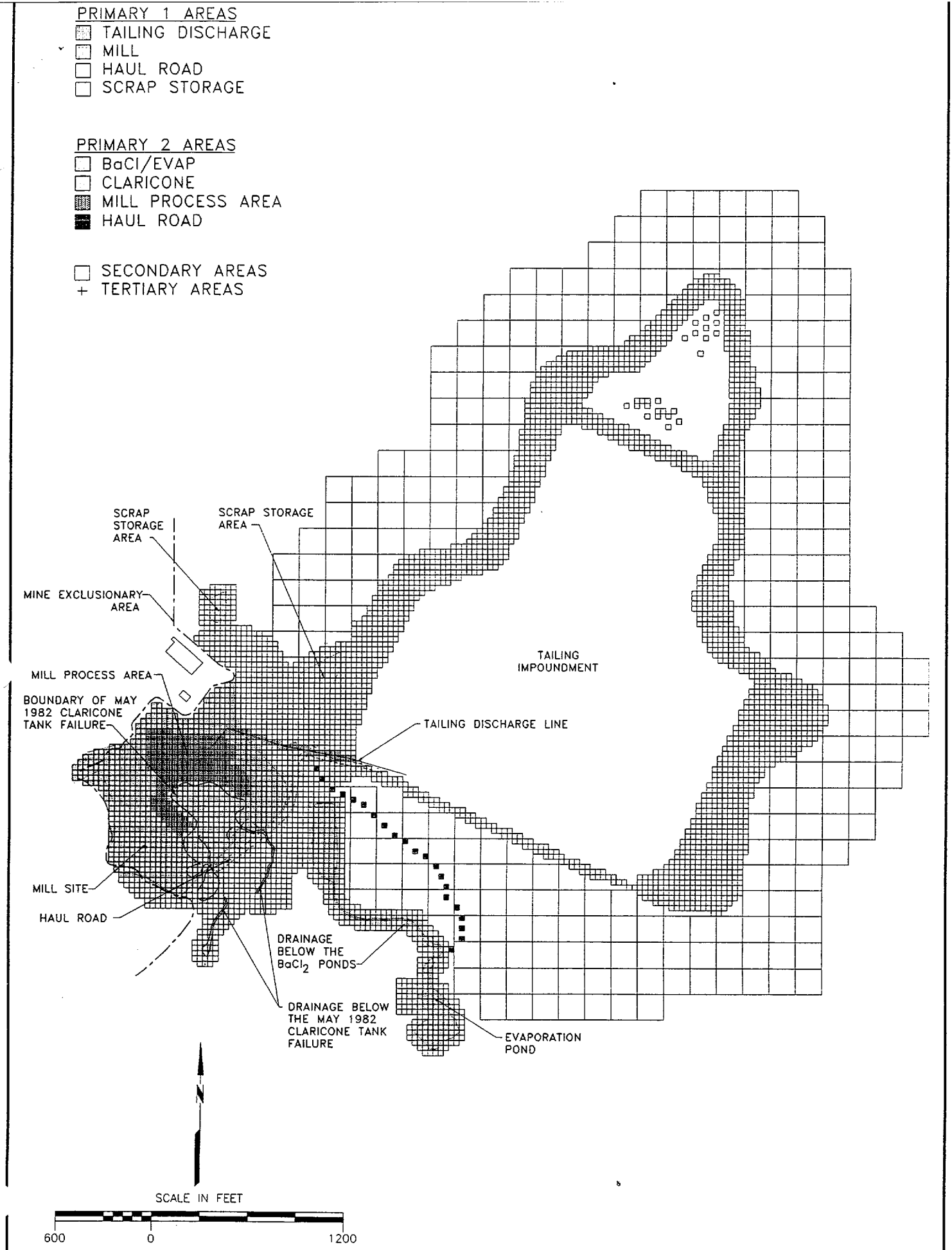
Of the total 1,100 grids from which soil samples were taken, 95% of the grids showed residual radionuclide concentrations below the applicable regulatory limits, when sampled for the first time, and 60% of the total showed residual radionuclide concentrations at essentially background. Because the protocol for surveying and cleanup required additional gamma surveys and soil samples for grids that did not comply in the initial surveys, a total of 4,968 gamma surveys and 1,320 soil samples were taken, and approximately 375,000 cubic yards of soil were excavated and placed in the tailings impoundment area.

If you have any questions, please feel free to contact me at (360) 753-3459.

Sincerely,

Gary Robertson, Head
Waste Management Section

GR:krf



SHEPHERD MILLER INCORPORATED

FIGURE 1
RADIOLOGICAL VERIFICATION AREAS AND GRID SYSTEMS

Date: JULY 1996
Project: 09-353/FINAL
File: RAD-GRID

APPENDIX E

DECOMMISSIONING OF MILLSITE STRUCTURES

STATE OF WASHINGTON
DEPARTMENT OF HEALTH
DIVISION OF RADIATION PROTECTION
Airdustrial Center, Bldg. 5 • P.O. Box 47827 • Olympia, Washington 98504-7827

September 19, 1997

Stephanie J. Baker
Manager, Environmental Services
Western Nuclear, Inc.
200 Union Blvd., Suite 300
Lakewood, Colorado 80228

Dear Ms. Baker:

The department has reviewed the Sherwood Millsite decommissioning completion report, entitled "Sherwood Project, Mill Decommissioning Construction Completion Report." Your report is accepted with the following requests:

Provide a listing of management audits conducted relative to mill decommissioning, for reference purposes.

Provide a reference list of records, related to mill decommission, held at the Sherwood site. At the appropriate time (transfer of license and responsibility), offer your records to the long-term custodian for the site. In the interim period, properly retain these records.

Two specific questions were developed. Please respond: (1) On page 30, it states that one bioassay was greater than LLD. What was the value? (2) On page 32, it states that an allowance was taken for respirator use. What was the value taken for the respirator protection factor?

If you have any questions, please contact me at (360) 753-3350, or Gary Robertson at (360) 753-3459.

Sincerely,

John R. Blacklaw

John R. Blacklaw, P.E.
Environmental Engineer

cc: Lou Miller, P.E., SMI
Bruce Wynne, Spokane Tribe
Mary Verner, Spokane Tribe
Sharon Yepa, BIA, WA
Stanley Speaks, BIA, OR
Shannon Work, Spokane Tribe
Gary Robertson
Earl Fordham
Bob Clark

STATE OF WASHINGTON
DEPARTMENT OF HEALTH
DIVISION OF RADIATION PROTECTION
Airdustrial Center, Bldg. 5 • P.O. Box 47827 • Olympia, Washington 98504-7827

November 6, 1997

Stephanie J. Baker
Manager, Environmental Services
Western Nuclear, Inc.
200 Union Blvd., Suite 300
Lakewood, Colorado 80228

Dear Ms. Baker:

The department has received your October 31, 1997 correspondence regarding responses to the department's questions for the Mill Decommissioning Construction Completion Report.

All responses are considered complete and appropriate. We appreciate your efforts in providing these additional responses.

Please consider the Mill Decommissioning Construction Completion Report and the applicable decommissioning efforts themselves accepted by the department. All related conditions in your license will be removed, as complete, at our earliest convenience.

If you should have questions in this regard, please contact me at (360) 753-3350, or Gary Robertson at (360) 753-3459.

Sincerely,

John R. Blacklaw

John R. Blacklaw, P.E.
Environmental Engineer

cc: Lou Miller, P.E., SMI
Bruce Wynne, Spokane Tribe
Mary Verner, Spokane Tribe
Sharon Yepa, BIA, WA
Stanley Speaks, BIA, OR
Shannon Work, Spokane Tribe

APPENDIX F

REMEDIAL ACTION (1999)

Washington State Department of Health
Environmental Health Programs
Division of Radiation Protection
Waste Management Section

JOHN ROLAND BLACKLAW
STATE OF WASHINGTON
30030
REGISTERED
PROFESSIONAL ENGINEER
EXPIRES 2/3/02

March 20, 2000

To: Gary Robertson

From: John R. Blacklaw, P.E.

Subject: **Technical Review and Justification for Western Nuclear, Inc. Sherwood Project Radioactive Material License Amendment 33**

Department staff have been diligently reviewing the Western Nuclear Inc. (WNI) Sherwood Project site for regulatory compliance and license condition completion in preparation of license termination of the site. Several inspections for structural stability and vegetation productivity were performed over the summer season of 1999. Several minor issues were found and either resolved by technical justifications or by re-construction activities.

After all inspections and re-constructions were complete, department staff reviewed WNI's final data submittal for license termination and resolved all remaining regulatory issues.

A Technical Evaluation Report (TER) supplement was written to document the department reviews performed and conclusions. A Completion Review Report (CRR) was written and sent to the Nuclear Regulatory Commission requesting termination of WNI's license.

The TER supplement justified that several license condition requirements were completed and no longer needed. Tailings Reclamation Plan requirements are complete, therefore license condition 34 is deleted. All inspection, monitoring and performance requirements from the post-construction Monitoring and Stabilization Plan (structural stability, vegetation productivity, and groundwater monitoring) have been completed, therefore license condition 22 has been deleted. Three environmental monitoring wells have been retained for monitoring by the U.S. Department of Energy, per their Long-Term Surveillance Plan (LTSP) and remaining wells have been abandoned, therefore license condition 35 is deleted.

Several other administrative license conditions have been deleted that have supported the technical requirements deleted above. Therefore, license conditions 13 (radiation protection, survey instruments), 20 (environmental impacts), 21 (cultural resources), 24 (quality assurance), 26 (document retention), 36 (closure reference documents), and 37 (engineering) have been deleted.

Financial surety requirements (license condition 28) and administrative requirements for bankruptcy (license condition 30) and notifications (license condition 31) have been retained until license termination is completed. License condition 29 (license termination) is also retained and governs the license termination procedure.

Cc: Earl Fordham
Dorothy Stoffel

STATE OF WASHINGTON
DEPARTMENT OF HEALTH
DIVISION OF RADIATION PROTECTION
7171 Cleanwater Lane, Bldg. 5 • P.O. Box 47827 • Olympia, Washington 98504-7827
TDD Relay 1-800-833-6388

April 6, 2000

Mr. Brad DeWaard
Radiation Safety Officer
Western Nuclear, Inc.
P.O. Box 392
Wellpinit, Washington 99049

Dear Mr. DeWaard:

This letter is a follow-up to our March 29, 2000 site visit, in which we inspected last year's re-worked areas and delivered Amendment Number 33 to your radioactive materials license, which relieves WNI of any remaining monitoring requirements. Our site visit confirmed that such monitoring is no longer necessary. Because ground water monitoring is no longer required under your radioactive materials license, WNI is no longer required to maintain custodianship of the ground water monitoring wells, and custodianship of the wells may now be transferred to the Department of Energy.

The remainder of your license contains only administrative requirements. However, as always, the department reserves the right to take appropriate actions or implement license requirements if warranted by potential for risk to the public or if regulations require.

Please contact John Blacklaw at (360) 236-3243 or me at (360) 236-3241, if you have any questions.

Sincerely,

Gary Robertson

Gary Robertson, Head
Waste Management Section

Enclosure

cc: Lou Miller, SMI
Harley Shaver, Shaver & Licht
Dennis Sollenberger, NRC
Bruce Wynne, Spokane Tribe
Mary Verner, Spokane Tribe
Sharon Yepa, BIA, WA
Stanley Speaks, BIA, OR
Shannon Work, Spokane Tribe

State of Washington

AMENDMENT NO. 33

Radioactive Materials License

Pursuant to the Nuclear Energy and Radiation Control Act, RCW 70.98, and the Radiation Control Regulations, Chapters 246-220 through 246-255 WAC, and in reliance on statements and representations heretofore made by the licensee designated below, a license is hereby issued authorizing such licensee to transfer, receive, possess and use the radioactive material(s) designated below; and to use such radioactive materials for the purpose(s) and at the place(s) designated below. **This license is subject to all applicable rules and regulations** promulgated by the State of Washington Department of Health.

1. Licensee Name 2. Address WESTERN NUCLEAR, INC. Sherwood Mill, P.O. Box 352 Wellpinit, Washington 99040	3. License Number WN-I0133-1 is amended in its entirety to read as follows: 4. Expiration Date Upon license termination 5. Reference number(s)

6. Radioactive Material (element and mass number)	7. Chemical and/or Physical Form	8. Maximum quantity licensee may possess at any one time
A&B. Natural Uranium, plus daughters.	A&B. Any.	A&B. Limited to unlimited.

<<->>+<<->>+<<->>+<<->>+<<->>+<<->>+<<->>+<<->>
<<->>+<<->>+<<->>+<<->>+<<->>+<<->>+<<->>+<<->>

CONDITIONS

9. A&B **Authorized use:** possession of byproduct material in the form of uranium mill tailings generated by the licensee's past milling operations authorized under radioactive materials license number WN-I0133-1.

10. **Regulatory requirements:** the licensee shall comply with the provisions of RCW 70.121.030, "Mill Tailings--Licensing and Perpetual Care;" Chapter 246-220 WAC, "Radiation Protection--General Provisions;" Chapter 246-221 WAC, "Radiation Protection Standards;" Chapter 246-222 WAC, "Radiation Protection--Worker Rights;" Chapter 246-235 WAC, "Radioactive Materials--Specific Licensees;" and Chapter 246-252 WAC, Radiation Protection--Uranium and/or Thorium Milling," and is subject to the rules, regulations, and orders of the Department of Health now or hereafter in effect, and to the additional conditions specified or incorporated in this license.

11. **Authorized place of use:** the licensee's Sherwood Project, uranium milling facilities located on the Spokane Indian Reservation, Section 2, Township 27 North, Range 37 East in Stevens County, approximately 8 miles southwest of Wellpinit, Washington.

12. **Management:** radioactive material shall be used by, or under the supervision of the Resident Manager.

13. DELETED

14. **Posting of the property:** all entrances to the property and fenceline boundaries shall be conspicuously posted in accordance with WAC 246-221-120.

15. DELETED

16. DELETED

17. DELETED

18. DELETED

19. DELETED

20. DELETED

21. DELETED

22. DELETED

23. DELETED

24. DELETED

25. DELETED

26. DELETED

27. DELETED

FINANCIAL SURETY

28. **Financial surety requirements:** the licensee shall maintain a department approved financial surety arrangement, consistent with WAC 246-252-030, Criteria 9 and 10, adequate to cover the estimated costs, if accomplished by a third party, for decommissioning and decontamination of the mill and millsite, for reclamation of any tailings or waste disposal areas, for performance verification of the monitoring and stabilization period, for groundwater restoration, as warranted, and for long-term care and maintenance activities required after license termination.

LICENSE TERMINATION

29. **License Termination:** The licensee shall expedite license termination and follow the U.S. Nuclear Regulatory Commission Procedure SA-900, as specifically identified in Appendix B(a).

ADMINISTRATIVE REQUIREMENTS

30. **Bankruptcy:** the licensee shall notify the department, in writing, immediately following the filing of a voluntary or involuntary petition for bankruptcy under any Chapters of Title II (Bankruptcy) of the United States Code (USC) by or against:

A. A licensee; or

B. An entity [as the term is defined in 11 USC, Section 101(14)] controlling a licensee or listing the license or licensee as property of the estate; or

C. An affiliate [as the term is defined in 11 USC, Section 101(2)] of the licensee, and

D. The licensee's notification must also indicate the bankruptcy court in which the petition for bankruptcy was filed; and

E. The date of the filing of the petition.

31. **Notifications:** notification to the department under WAC Title 246, and license conditions shall be made as follows:

    Required written notice to the department shall be made to: Head, Waste Management Section, Department of Health, Division of Radiation Protection, 7171 Cleanwater Lane, Building 5, P.O. Box 47827, Olympia, Washington 98504-7827.

32. DELETED

33. DELETED

34. DELETED

35. DELETED

36. DELETED

37. DELETED

FOR THE STATE OF WASHINGTON DEPARTMENT OF HEALTH

Date March 21, 2000

By Gary Robertson
Gary L. Robertson, Head
Waste Management Section